david schaeffer engineering ltd
SMART SUBDIVISIONS™

600 Alden Road, Suite 500
Markham, Ontario L3R 0E7
Tel. (905) 475-3080
Fax (905) 475-3081
www.DSEL.ca

FUNCTIONAL SERVICING REPORT

FOR THE

BRONTE GREEN PROPERTY

TOWN OF OAKVILLE

REGION OF HALTON

PROJECT NO. 12-601

FEBRUARY 2014

© DSEL

FUNCTIONAL SERVICING REPORT
FOR THE
BRONTE GREEN PROPERTY

TOWN OF OAKVILLE
REGION OF HALTON

FEBRUARY 2014
OUR FILE: 12-601

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 PREVIOUS STUDIES AND REPORTS 1

3.0 WATER SUPPLY SERVICING 2

3.1 Water Supply Servicing Design Criteria 2

3.2 Existing Water Services 3

3.3 External Water Supply Requirements 4

3.4 Proposed Water Supply 4

4.0 WASTEWATER SERVICING 5

4.1 Region of Halton Wastewater Design Criteria 5

4.2 Existing Wastewater Services 5

4.3 Proposed Wastewater Servicing 6

5.0 STORM DRAINAGE 6

5.1 Existing Drainage Patterns 6

5.2 Minor System Design 7

5.3 Major System Design 7

6.0 STORMWATER MANAGEMENT STRATEGY 8

6.1 Stormwater Management Requirements 8

6.2 Water Balance 9

© DSEL

6.3 Thermal Mitigation 10
6.4 Sanitary Trunk Sewer Constraint 11
7.0 STORMWATER MANAGEMENT POND OPERATING CHARACTERISTICS .. 11
8.0 STORMWATER MANAGEMENT POND DESIGN ELEMENTS 13
8.1 Sediment Forebay 13
8.2 Permanent Pool 13
8.3 Extended Detention Storage 13
8.4 Quantity (Flood) Control 14
8.5 Access Road 14
8.6 Emergency Overflows 14
9.0 ON-SITE CONTROLS 14
10.0 ROADS 15
10.1 Municipal Roads 15
10.2 Sidewalks 16
11.0 GRADING 16
12.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION 16
13.0 CONCLUSIONS 16

© DSEL

FIGURES

Figure 1	Site Location Plan
Figure 2	Draft Plan
Figure 3	Existing Water Services
Figure 4	Conceptual Watermain
Figure 5	Existing Wastewater Servicing
Figure 6	Ex. 2400Ø Sanitary Trunk
Figure 7	Conceptual Sanitary Servicing
Figure 8	Pre-development Drainage Areas
Figure 9	Post-development Drainage Areas
Figure 10	SWM Pond

DRAWINGS

Drawing 1	Conceptual Grading Plan

TABLES

Table 3-1	Summary of Existing Watermains
Table 3-2	Summary of Regional Water Infrastructure
Table 4-1	Summary of Existing Wastewater Infrastructure
Table 7-1	Summary of Stormwater Management Facility Characteristics
Table 7-2	Summary of SWM Facility Discharge Characteristics
Table 9-1	Summary of On-site Stormwater Management Facility Characteristics

APPENDICES

Appendix A	Master Plan Update – Preferred Water and Wastewater Servicing
Appendix B	Preliminary Watermain Analysis (Genivar, January 2014)
Appendix C	Trunk Sewer Drawings – 2400 mm Sanitary Sewer
Appendix D	Sanitary Flow Calculations
Appendix E	Sanitary Capacity Analysis (Genivar, November 2013)
Appendix F	Water Balance Calculations (R. J. Burnside & Associates, January 2014)

© DSEL

Appendix G Preliminary Pond Sizing Results (JFSA, January 2014)
Appendix H Town of Oakville Standard ROW Cross-sections

© DSEL

FUNCTIONAL SERVICING REPORT
FOR THE
BRONTE GREEN PROPERTY

TOWN OF OAKVILLE
REGION OF HALTON

FEBRUARY 2014
OUR FILE: 12-601

1.0 INTRODUCTION

The Bronte Green Property in the Town of Oakville consists of approximately 55 hectares and is bounded by Fourteen Mile Creek to the east, Bronte Road to the west, Halton Regional Centre and Deerfield Golf Course to the south, and Upper Middle Road to the north, as illustrated in ***Figure 1***.

The subject lands are proposed to be developed for residential and related purposes. The plan includes single houses, townhouses, a high density block, a neighbourhood park, two parkettes, a mixed-used commercial area, two stormwater management ponds and municipal rights-of-way. The proposed draft plan is shown in ***Figure 2***.

The following report outlines the water, wastewater and stormwater servicing requirements for the project and confirms that adequate services are available to support the proposed development in accordance with the standards of Region of Halton, the Area Servicing Plan for the Merton Tertiary Plan Area and general industry practice.

2.0 PREVIOUS STUDIES AND REPORTS

The following material has been reviewed in order to identify the constraints, which govern development within the subject site:

- **2012 Development Charges Update Technical Report**

  Region of Halton, August 2011

  (Master Plan Update)

- **Design Criteria, Contract Specifications and Standard Drawings**

© DSEL

Region of Halton, February 2001 (updated 2007)

- **Development Engineering Procedures and Guidelines Manual**

  Development Engineering Department, Town of Oakville, January 2011

- **Design Guidelines for Drinking-Water Systems 2008**

  Ministry of the Environment

- **Design Guidelines for Sewage Works 2008**

  Ministry of the Environment

- **Geomorphic Assessment of Fourteen Mile Creek and Associated Tributaries**

  Parish Geomorphic, December 2013

- **Erosion and Sediment Control Guidelines for Urban Construction,**

  Conservation Halton et al, December 2006

- **Phase 2 Environmental Impact Study, Merton (QEW / Bronte Rd), Tertiary Planning Study**

  Beacon Environmental, December 2013

- **Area Servicing Plan for Merton Tertiary Plan Area**

  David Schaeffer Engineering Ltd., December 2013

3.0 WATER SUPPLY SERVICING

3.1 Water Supply Servicing Design Criteria

The water supply servicing in Bronte Green lands will be designed according to the Region of Halton design criteria, by taking into consideration watermain sizing, depth, crossings, valves, hydrants, and service connections such that adequate pressures and fire flows can be achieved. Water design flows will be designed with the following criteria:

Water Design Factors

Average Daily Demand	➢	275 litres per capita
Maximum Daily Demand Peaking Factor	➢	2.25
Maximum Hourly Demand	➢	4.00
Peaking Factor (Residential)		

Population Criteria

Single family	➢	55 persons / hectare
Townhouse	➢	135 persons / hectare
Community Services	➢	40 persons / hectare
Mixed use / High density residential (less than 6 stories)	➢	135 persons / hectare

3.2 Existing Water Services

Existing watermains are currently available in the vicinity of the Bronte Green Property as follows:

Table 3-1 Summary of Existing Watermains

Street	Size	Location
Zone O3		
Upper Middle Road	600 mm	Kitchen Reservoir to Reeves Gate
Zone O2		
Bronte Road	300 mm	Approx. 440m south of Upper Middle Road to North Service Road
Zone O1		
Bronte Road	1050 mm	Upper Middle Road to North Service Road

The existing watermains are illustrated in ***Figure 3***.

3.3 External Water Supply Requirements

In accordance with the ***Master Plan Update***, the Region is planning future water infrastructure to service lands throughout Oakville. This will be achieved through comprehensively planned infrastructure including transmission mains, pump stations, storage facilities, and distribution mains.

A summary of projects related to the study area are listed in Table 3-2 below:

Table 3-2 Summary of Proposed Regional Water Infrastructure

Project Description	Regional Project No.	Zone	Year
Kitchen Zone 3 Pumping Station expansion by 80ML/d	6701	3	2026/2027

The preferred servicing figure from the ***Master Plan Update*** illustrating the above projects is included in ***Appendix A***.

3.4 Proposed Water Supply

The subject site will be located within the existing Zone 2 and Zone 3 limits. The residential condo blocks north of Fourteen Mile Creek are proposed to be serviced by Zone 03 watermains, supplied by the 600mm Zone 03 watermain on Upper Middle Road. The balance of the Bronte Green lands will be serviced by Zone 02 watermains, supplied by the 300mm Zone 02 watermain on Bronte Road. Proposed 300mm watermains will supply Streets A, B and C with local watermains supplying the local rights of way, as illustrated on ***Figure 4***.

The water distribution system within the Bronte Green Property will be sized to meet the pressures and flows in accordance with the Region of Halton criteria under both interim and ultimate servicing scenarios. On a temporary basis, a small section of townhouses on Street G is unable to meet the fire flow requirements until the additional connection from North Service Road becomes available in the ultimate 2031 scenario. Under both the interim 2016 and ultimate 2031 conditions, the high density/mixed use blocks on Street A are unable to meet the fire flow requirements. Fire flow requirements should be evaluated at the time of building design. Details are provided in the preliminary watermain analysis in ***Appendix B***. The site south of Fourteen Mile Creek will be looped internally in order to provide system security. The condo blocks will not be looped as only one connection is available from Upper Middle Road. The watermain analyses, sizing and need for pressure reducing valves will be provided at the detailed design stage.

The proposed watermain network is illustrated in ***Figure 4***.

4.0 WASTEWATER SERVICING

4.1 Region of Halton Wastewater Design Criteria

The wastewater mains will be designed in accordance with the following Region of Halton design criteria:

Sewer Design Criteria

- Average dry weather flow ➢ 275 litres per capita per day
- Infiltration ➢ 0.286 litres per second per hectare
- Peaking Factor ➢ Peak Flow Factor – Harmon Formula
- ➢

Population Criteria

- Single family ➢ 55 persons / hectare
- Townhouse ➢ 135 persons / hectare
- Community Services ➢ 40 persons / hectare
- Mixed use / High density residential (less than 6 stories) ➢ 135 persons / hectare

4.2 Existing Wastewater Services

Existing sanitary sewers are currently available in the vicinity of the Bronte Green Property as the following:

Table 4-1 Summary of Existing Wastewater Mains

Street	Size	Location
To Mid-Halton Wastewater Treatment Plant		
Upper Middle Road	2400 mm	Bronte Road to Grand Oak Trail
Bronte Road	1200 mm	Westoak Trails Boulevard to Upper Middle Road
Bronte Road	2400 mm	Upper Middle Road diagonally across the subject lands to the Mid-Halton WWTP

To Oakville Southwest Wastewater Treatment Plant		
Bronte Road	300 mm	Approximately 600 m south of Upper Middle Road to North Service Road
North Service Road	450 mm	Bronte Road to QEW

The 2400mm gravity sewer that crosses the subject lands diagonally to the Mid Halton North Pumping Station will function as the outlet for the subject lands. The profile of the 2400mm sewer is provided in ***Figure 6***.

Background information on the design of the trunk sewer is included in ***Appendix C***.

4.3 Proposed Wastewater Servicing

The subject site will be serviced by a network of local gravity sewers designed in accordance with Region of Halton criteria. The local sewers will release into the existing 2400 mm trunk sewer that crosses the site diagonally from Bronte Road to the Mid Halton North Pumping Station. The total flow (including peaking factor and infiltration) produced by the subject lands is 35.58 L/s. Sanitary flow calculations are provided in ***Appendix D***. As per the Genivar ***Sanitary Capacity Analysis*** from the ***Area Servicing Plan***, the 2400mm trunk sewer has sufficient capacity to convey the sanitary flows to the Mid Halton North Pumping Station. The Genivar analysis can be found in ***Appendix E.*** Sanitary flows will be collected in local sewers and will drain into the trunk sewers Trunk 1A, Trunk 1B and Trunk 1C. The trunk sewers flows drain into the 2400 mm trunk sewer on Street A as illustrated in ***Figure 6***.

The wastewater servicing concept is illustrated in ***Figure 7***.

5.0 STORM DRAINAGE

5.1 Existing Drainage Patterns

The majority of the runoff from the subject lands currently drains overland to Fourteen Mile Creek. A small portion to the east of the Region of Halton works facilities drains to Bronte Creek via a culvert underneath the QEW. There are no storm sewers within the subject lands. The existing storm drainage areas are illustrated in ***Figure 8***.

5.2 Minor System Design

It should be noted that the Town of Oakville Engineering Standards require the post-development peak runoff to be maintained at pre-development levels for all events up to the 100-year level. As per the Town's standards and the Area Servicing Plan, the subject lands will be serviced by a conventional storm sewer system discharging to the proposed stormwater management facilities. Storm sewers will be sized using a 5 year return frequency and Town IDF curves.

Inlet control devices (ICD) or equivalent may be required to prevent surcharging of downstream system. The location, size, and number of ICD's or equivalent measures will be determined at the detailed design stage. Gravity storm connections will be provided throughout the site.

The development areas north of Fourteen Mile Creek will be treated on-site for quality and quantity control before being released into Fourteen Mile Creek, as described in **Section 9.0**.

The development areas south of Fourteen Mile Creek and south of the sanitary trunk sewer easement will flow through local sewers to the southern stormwater management pond. The development areas south of Fourteen Mile Creek and north of the sanitary trunk sewer easement will flow through local sewers to the northern stormwater management pond.

The lands west of Bronte Road have been accounted for in the subject lands' stormwater management strategy. As outlined in the ASP, the lands west of Bronte Road have the opportunity for either local stormwater management controls, or alternatively could be conveyed across Bronte Road to the centralized end-of-pipe stormwater management pond. The cost and technical effectiveness of each option are highly dependent on the proposed development plan for those lands. During the detailed design stage, the appropriate solution will be determined and advanced at that time.

The proposed storm sewer concept is illustrated in **Figure 9.**

5.3 Major System Design

In accordance with the Town of Oakville Engineering Standards, major system flows are to be safely conveyed through the site and onto the boundary roads where a continuous overland flow route is available.

Major system runoff in excess of the minor system and up and including the 100 year event will be conveyed within the road allowances via continuous overland flow routes to the proposed stormwater management ponds. The major system flow up to and including the 100 year event will not exceed the width of the road allowance. The ponds

will treat the major system flows for quantity and quality control before ultimately discharging to Fourteen Mile Creek.

The following Oakville standards will be carried through to detailed design:

- For all classes of roads, the product of depth of water (m) at the gutter times the velocity of flow (ms^{-1}) shall not exceed 0.65 m^2/s. In addition, during detailed design, design parameters from MNR's *Technical Guide River and Stream Systems: Flooding Hazard Limit,* such as a recommended depth velocity product of 0.4 m^2/s for the low risk zone for combined personal and vehicular access may be applied where required.
- For arterial roads, the depth of water at the crown shall not exceed 0.15 m.
- Flow across road intersections shall not be permitted for minor storms (generally 1:10 year). To meet criteria for major storm run-off, low points in roads must have adequate provision for the safe overland flow.

The conceptual major system is illustrated in **Figures 9**.

6.0 STORMWATER MANAGEMENT STRATEGY

6.1 Stormwater Management Requirements

In accordance with the Area Servicing Plan & the EIS, stormwater management must be practiced as follows:

Water Balance

- Infiltrate runoff on-site to meet the infiltration targets, to the extent feasible as set out in the *Hydrogeological Study* (R.J. Burnside & Associates, December 2013).
- Maintain surface and groundwater inputs at a level similar to the pre-development condition for all tributaries within the subject lands.

Water Quality Control

- Provide enhanced level of protection for receiving watercourses. The enhanced level of control provides for the average long-term removal of 80% of suspended solids, which is recommended when sensitive aquatic habitat will be affected by end-of-pipe discharge. This is the case for Fourteen Mile Creek and its tributaries that supports fish communities.

Erosion Control

- Provide extended detention storage to minimize post-development exceedance of distinct bed and bank erosion thresholds for select reaches of Fourteen Mile Creek and its tributaries, as outlined in the *Geomorphic Assessment* (Parish Geomorphic Ltd., December 2013):
  - SW-2: Bed Threshold 0.43 m^3/s / Bank Threshold 0.07 m^3/s
  - R-75a: Bed Threshold 4.02 m^3/s / Bank Threshold 0.27 m^3/s
  - R-73: Bed Threshold 4.26 m^3/s / Bank Threshold 0.63 m^3/s

Quantity Control

- Provide storage for stormwater runoff so as to not exceed pre-development flow rates and flood levels within Fourteen Mile Creek and its tributaries in the 1:2, 1:5, 1:10, 1:25, 1:50 and 1:100 design storm events, as per the pre-development flow rates defined in the Fourteen Mile Creek/ McCraney Creek Flood Management Alternative Assessment (AMEC, July 2013) and associated calibrated PCSWMM model.
- It has been determined that regional storage is not required, as the regional flow in Fourteen Mile Creek at Queen Elizabeth Way increases minimally by 200 L/s (0.1% of total) between existing and proposed uncontrolled post-development condition when considering the proposed development of the entire Merton TPA..

6.2 Water Balance

Detailed water balance calculations can be found in **Appendix F.**

The hydrogeological investigation, prepared by R. J. Burnside, has noted that with no mitigation measures, the development of the property could reduce the natural infiltration by approximately 35% to 40%. To address the infiltration deficit, it is recommended that the use 'low impact development' (LID) measures be implemented to maximize infiltration in pervious areas. As design of the development progresses, surficial LID techniques should be applied – such as increasing topsoil thickness, reducing lot grading, directing roof runoff to pervious areas, and disconnecting roof leaders – to increase the potential for post-development infiltration and mitigate any reductions in recharge. Reduced lot grading should be considered to the extent permitted by Town of Oakville. These measures would result in the pre-treatment of the runoff water as it passes through the vegetative medium, would reduce the volume of

runoff through initial abstraction and evaporation, would reduce peak flows by reducing the flow velocity, and would increase infiltration to the maximum extent possible.

Within the subject lands, the actual amount of water that infiltrates and moves through the subsurface to recharge groundwater is limited: the clayey silt till soils and shale bedrock within the subject lands have relatively low hydraulic conductivities that limit infiltration rates. As such, the use of large-scale engineered subsurface infiltration facilities is generally not considered to be suitable for use as part of the overall stormwater management strategy for the Bronte Green property for the purposes of controlling the quantity of stormwater runoff.

Specific LID measures, in keeping with the recommendations noted above, will be determined at the detailed design stage of the Bronte Green lands.

6.3 Thermal Mitigation

To protect the Redside Dace and other fish populations in Fourteen Mile Creek, a maximum discharge temperature 24^0C should be achieved in the implementation of the proposed stormwater management plan. Conservation Halton has suggested that it would be beneficial if a lower maximum discharge temperature of 22^0C were to be met, if possible.

Furthermore, to maintain the existing thermal regime in the Saw Whet tributaries (14W-W1, 14W-W1-2, 14W-W1-3) a maximum discharge temperature of 22°C is required for outflows directed to these specific reaches.

The following thermal mitigation measures are to be provided in the detailed design of the proposed stormwater management ponds, to provide temperature protection for the fish populations in Fourteen Mile Creek.

- A reverse-grade pipe in a deep pool will be provided to draw the cooler water from the deepest portions of the ponds. Permanent pool depths of 2 metres are proposed (see ***Section 8***), as per ***Oakville Engineering Guidelines***. At detailed design, increased permanent pool depth of 3 metres could be considered as per Conservation Halton's recommendation, to promote more significant thermal stratification and to better reduce temperatures for the reverse-grade bottom-draw outlet. Permanent pool depths beyond 3m are not recommended because the outflows can become anoxic (***MOE SWMP Design Manual***), and there is a potential for metals and nutrients to be remobilized, thus causing negative impacts to fish habitat in the receiving watercourses.

- The facilities will be designed with regard for a high length to width ratio to allow for effective shading with landscape material.

- The landscape plans should have regard for best management practices, such as the planting recommendations in the *Study Report: Thermal Impacts of*

Urbanization Including Preventative and Mitigation Techniques (Credit Valley Conservation, 2011).

- North south orientation of the longest axis of the pond will be provided, where practical, to optimize shading of the entire surface of the pond.
- Shading is to be provided by perimeter plantings and in-pond plantings, for example by way of peninsulas, etc. where practical and feasible.

6.4 Sanitary Trunk Sewer Constraint

The existing 2400 mm dia. sanitary trunk sewer and associated easement is a constraint to storm servicing for lands tributary to Fourteen Mile Creek. The large diameter and shallow depth of the sewer requires distinct drainage areas on each side of the trunk in some locations.

The majority of lands west of the trunk sewer will drain to a stormwater management facility west of the trunk sewer. It has been determined that the western stormwater management facility can drain through a storm sewer crossing underneath the sewer trunk to outlet into Fourteen Mile Creek. The facilities will not be located within the working easement of the trunk sanitary sewer.

7.0 STORMWATER MANAGEMENT POND OPERATING CHARACTERISTICS

Two stormwater management ponds are proposed within the subject lands to treat minor and major system flows for quality and quantity prior to being discharged to Fourteen Mile Creek. The location of the ponds is illustrated in **Figure 10**. The following sections provide storage requirements for both ponds. The SWM ponds have been designed in accordance with directions of the *Oakville Engineering Guidelines* and the *MOE SWM Design Manual*, and include the following features:

Sediment Forebay	➢ To improve sediment removal prior to entering the pond
Permanent Pool	➢ To buffer storm flows and trap pollutants
Extended Detention Storage	➢ To provide water quality and erosion control
Quantity Control Storage	➢ To attenuate post development flows to the allowable release rates

The conceptual designs for both ponds are illustrated in **Figure 10**. Sizing calculations for the ponds are provided in **Appendix G** (SWMHYMO Modeling files are available on CD)**.**

Table 7-1 Summary of Stormwater Management Facility Characteristics

Pond I.D.	Pond Type	Drainage Area (ha)	Imp. Coverage (%)[1]	Permanent Pool Volume (m^3)	Water Quality Volume (m^3)[2]	100 Year Flood Volume (m^3)	SWM Pond Block Area (ha)
North Pond	Wet	6.0	64	1026	240	3138	0.71
South Pond	Wet	52.7	58	8274	2108	26180	2.42

[1] Average impervious cover based on anticipated development density

[2] Quality control volume based on 40 m^3/ha, based on the minimum MOE quality controls and the downstream erosion analysis

Table 7-2 Summary of SWM Facility Discharge Characteristics

Pond I.D.	Imp. Area	Drainage Area (ha)	Unit Release Rates (m^3/s/ha)		Target Release Rates (m^3/s)	
			Extended Detention*	100 Year	Extended Detention*	100 Year
North Pond	384	6.0	N/A	0.037	0.0051	0.186
South Pond	3082	52.7	N/A	0.037	0.0410	1.630

* Extended detention unit outflow rate based on detention time between 24 and 48 hours.

The impervious coverage has been estimated based on the various land uses and their respective sizes in land use concept. The final impervious coverage will be refined at the detail design stage, at which time the calculations will be updated, and, if necessary, the pond sizing adjusted accordingly.

8.0 STORMWATER MANAGEMENT POND DESIGN ELEMENTS

8.1 Sediment Forebay

All SWM ponds include a sediment forebay in order to improve the pollutant removal by trapping larger particles near the inlet of the pond. The forebays have been designed with a length to width ratio of approximately 4:1 and do not exceed one third of the permanent pool surface area for wet ponds, as required in the *MOE SWMP Design Manual*. Furthermore, the forebays have a minimum depth of 1.2m to minimize the potential for re-suspension.

8.2 Permanent Pool

The permanent pools have been sized to provide 'Enhanced Protection' in accordance with the ***SWMP Design Manual***.

- The permanent pool will be approximately 2.0 metres deep, which falls within the one to two metre deep range recommended in the ***SWMP Design Guidelines*** and the 1.2 to 2.0 metre deep range prescribed by the ***Oakville Engineering Guidelines***.
- The slopes within the 3m horizontal zone above and below the normal water level will include minimum slopes of 7:1, as per the ***Oakville Engineering Guidelines.***
- Below this zone, to the pond bottom, the slopes in the permanent pools will be graded with side slopes of 5:1 (max 4:1), with minor localized variations, as per the ***Oakville Engineering Guidelines.***

8.3 Extended Detention Storage

Storage for each extended detention pond component will be provided in accordance with the release rates set out in ***Section 6.4.***

- The extended detention storage together with the quantity control component will not exceed 2.0 metre depth in accordance with ***Oakville Engineering Guidelines.***
- The extended detention component will be provided with side slopes of 5:1 with minor localized variations in accordance with ***Oakville Engineering Guidelines.***
- The details of the outlet structures for each pond will be determined at the detailed design stage. It is expected that the extended detention volume will outlet through a reverse graded pipe, with an orifice provided to discharge the

extended detention volume at the allowable release rate for erosion control. The primary outlet control pipe shall be bottom draw with perforated end.

8.4 Quantity (Flood) Control

Flood control is to be provided based on the release rates described in ***Section 7.1***.

- Each pond will be provided with an outlet pipe, controlling the outflows to the allowable release rates. The details of the outlet structures for each pond will be determined at the detailed design stage according to the orifice requirements set out in the ***Oakville Engineering Guidelines.***
- The quantity control component will be provided with side slopes of minimum 3:1.
- The quantity control component together with the extended detention storage will not exceed 2.0 metre depth in accordance with ***Oakville Engineering Guidelines.***

8.5 Access Road

In accordance with the Town's standards, 3.0m wide access roads are provided above the active storage elevation and 4.0m below the active storage elevation. Access roads are provided in order to facilitate routine inspection and maintenance activities. The maximum slope of access roads is 10:1 (H:V).

8.6 Emergency Overflows

In the event of a blockage or a storm greater than the design horizon, an emergency overflow weir will be provided.

9.0 ON-SITE CONTROLS

On-site quality and quantity controls will be provided for the development areas north of Fourteen Mile Creek prior to flows discharging into the tributary. Quality control will be provided up to 80% TSS removal with an oil / grit separator.

Extended detention runoff from the 25mm storm will be retained for 48 hours in order to meet erosion control requirements for Fourteen Mile Creek. The 2-year unit release rate of 10 L/s/ha is reduced by half to 5 L/s/ha to provide additional erosion control.

The Upper Middle Road at Bronte Road development area of 4.3 ha will be controlled at target release rates of 0.0037 m^3/s and 0.159 m^3/s under the 5-year and 100-year storm events, respectively, as per the analysis in ***Appendix G***. Underground and surface storage will be provided for the required storage volumes detailed in ***Appendix G***.

The northwest confluence development area of 1.2 ha will be controlled at target release rates of 0.020 m^3/s and 0.044 m^3/s under the 5-year and 100-year storm events, respectively, as per the analysis in ***Appendix G.*** Release rates and required storage volumes have been provided in Table 9-1.

Table 9-1 Summary of On-site Stormwater Management Facility Characteristics

Pond I.D.	Drainage Area (ha)	Imp. Coverage (%)[1]	Unit Release Rates ($m^3/s/ha$)		Target Release Rates (m^3/s)		Required storage (m^3)
			Extended Detention	100 Year	Extended Detention	100 Year	
Upper Middle Road at Bronte Road	6.3	46	N/A	0.037	0.0037	0.159	2158
Northwest Confluence	1.2	64	N/A	0.037	0.0010	0.044	606

[1] Average impervious cover based on anticipated development density

The 2.0 ha of external drainage adjacent to the 4.3 ha development area at Upper Middle Road and Bronte will be collected in a DICB and outlet directly into Fourteen Mile Creek via a clean water diversion pipe as shown on ***Figure 9***.

10.0 ROADS

10.1 Municipal Roads

Access to the subject lands is from Bronte Road. A series of municipal roads will include 16m, 18m and 20m rights of way, as per Town of Oakville standard cross-sections as seen in **Figure 2**. The Town of Oakville standard cross-sections are illustrated in ***Appendix H***.

10.2 Sidewalks

A sidewalk will been provided as per the Town of Oakville design standards.

11.0 GRADING

A conceptual grading plan has been prepared, and is illustrated in **Drawing 1.**

12.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

An Erosion and Sediment Control (ESC) strategy will be prepared and implemented in accordance with the Town and CH's *Erosion and Sediment Control Guideline for Urban Construction* (Greater Golden Horseshoe Conservation Authorities, 2006) prior to any earthworks or grading activities on the Subject Lands. The ESC strategy will include the following:

- methods for constructing SWM and environmental features in the dry;
- methods to stabilize disturbed areas to minimize transfer of sediment;
- special measures for works in or adjacent to stream corridors, such as culvert crossings, wetland construction, etc.;
- environment fencing;
- stone mud mat at all construction entrances;
- use of the permanent ponds as temporary silt basins during site construction activities;
- regular inspection of the ESC devices; and,
- removal and disposal of the ESC devices after the site has been stabilized.

13.0 CONCLUSIONS

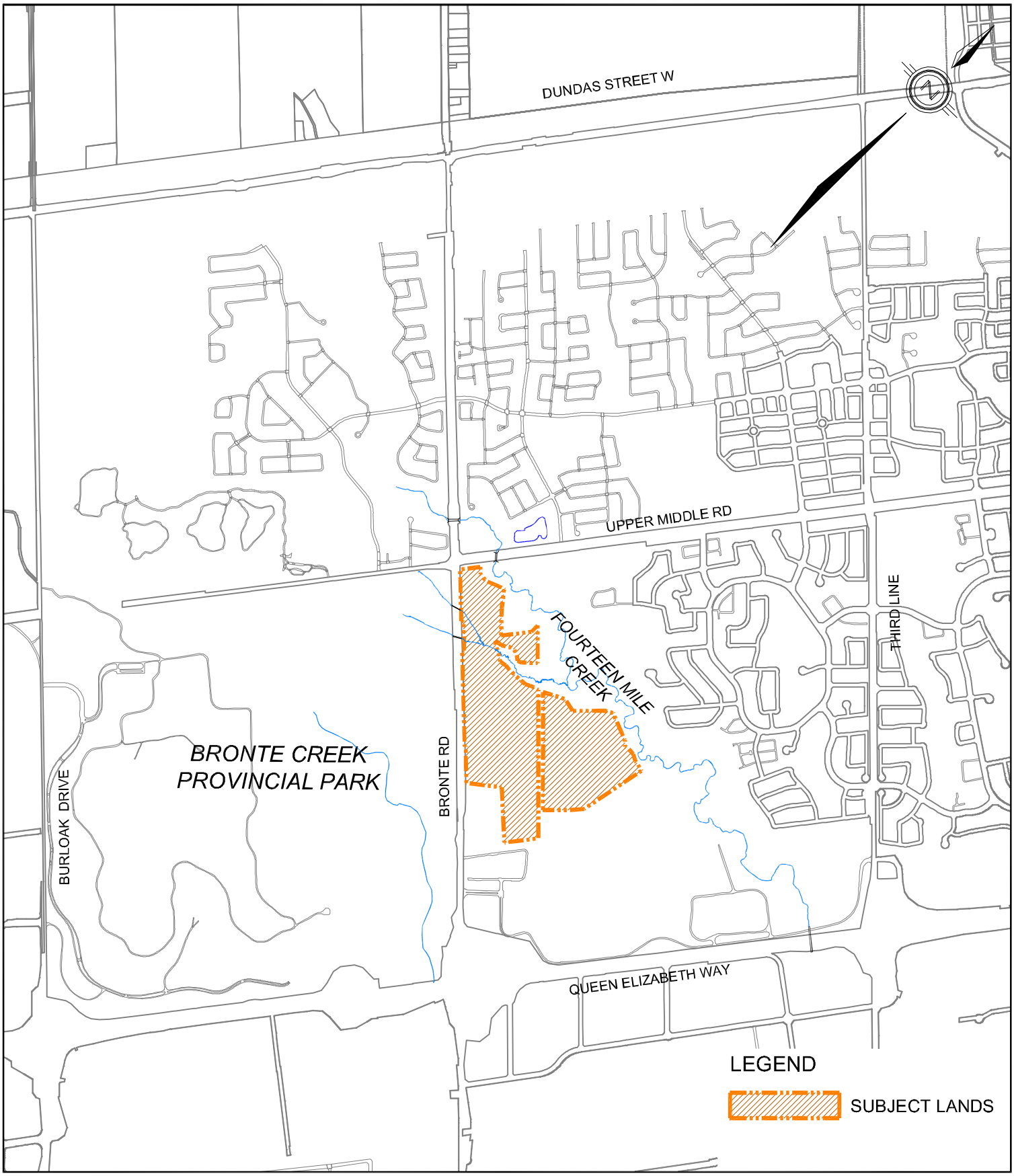
The Functional Servicing Report provides an overview of the servicing plan for the Bronte Green Property located within the Region of Halton. This report demonstrates the availability of water, wastewater and stormwater management services for the proposed subdivision in accordance with Regional criteria.

We trust you will find the contents of this report satisfactory.

Prepared by	Reviewed by,
David Schaeffer Engineering Ltd	**David Schaeffer Engineering Ltd**
Per: Tatiana Chiesa	Per: Mike Baldesarra

© DSEL

601_FSR_140106_tec-mb.doc

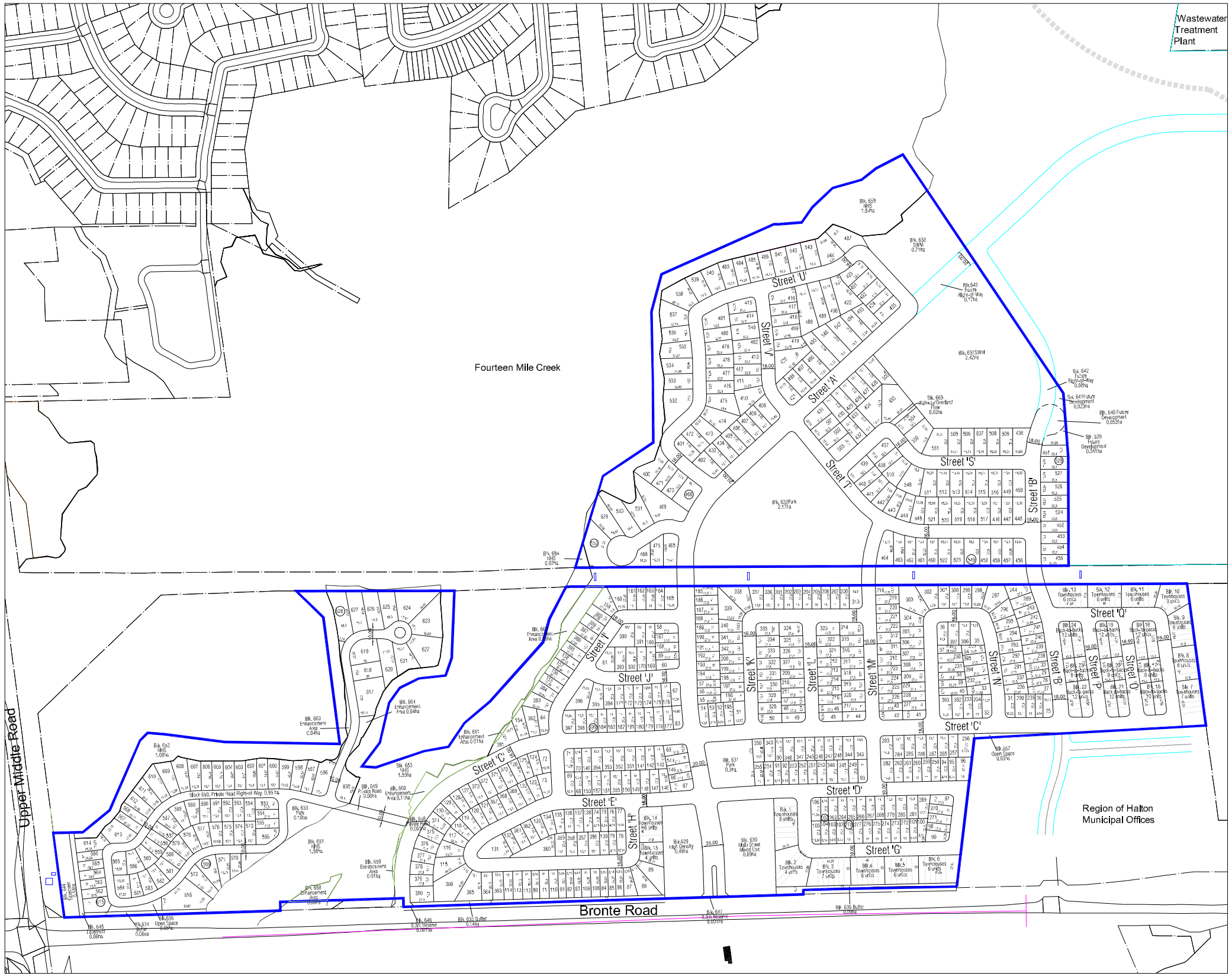


DSEL
david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

SITE LOCATION

DATE:	FEBRUARY 2014
SCALE:	1:25000
PROJECT No.:	12-601
FIGURE:	1



DRAFT PLAN OF SUBDIVISION

PART OF LOTS 28, 29 AND 30
CONCESSION 2, SOUTH OF DUNDAS STREET
(GEOGRAPHIC TOWNSHIP OF TRAFALGAR)
TOWN OF OAKVILLE
REGIONAL MUNICIPALITY OF HALTON

SCALE 1:5000 METRIC
10 0 20 40 60 80 100 metres

N

Owner's Certificate

I hereby authorize Sorenson Gravely Lowes Planning Associates Inc. to submit this plan for approval.

Saw Whet Golf Course Ltd. DATE

Surveyor's Certificate

I hereby certify that the boundaries of the land to be subdivided as shown on this plan, and their relationship to the adjacent land are accurately and correctly shown.

J.D. Barnes Limited DATE

Schedule of Land Use

	DESCRIPTION	LOTS / BLOCKS	AREA (na.)	UNITS
1.	Residential (townhouse)	1-15	0.94	86
2.	Residential (back-to-back)	16-24	0.91	94
3.	Residential (single - 9.14m)	25-107	2.41	83
4.	Residential (single - 11.02m)	108-278	5.36	171
5.	Residential (single - 13.12m)	279-466	8.74	191
6.	Residential (single - 15.24m)	467-528	3.44	61
7.	Residential (single - 15.30m)	529-549	.81	20
8.	Residential (single - 19.80m)	550-552	0.13	3
9.	Residential Condo (single - 11.00m)	553-569	0.49	17
10.	Residential Condo (single - 12.19m)	570-613	2.47	44
11.	Residential Condo (single - 18.30m)	614-631	.78	18
12.	Residential High Density	632	0.49	
13.	Main Street Mixed Use	633	0.68	
14.	Park	634-635	2.84	
15.	Buffer	636-638	0.29	
16.	SWM	639-640	3.13	
17.	Future Development	641-643	0.117	
18.	Future Right-of-Way	644-645	0.25	
19.	Easement	646-648	0.24	
20.	Open Reserve	649-652	0.002	
21.	Road Right-of-way	NA	1.10	
22.	Private Road Right-of-way	653-658	.031	
23.	Natural Heritage System	659-663	5.69	
24.	Open Space	664-667	0.08	
25.	Enhanced Area	668-944	0.45	
26.	Walkway/Overland flow	665	0.02	
TOTAL			33.10	785

TOTAL NUMBER OF UNITS: 785

Additional Information Required Under Section 51(17) of the Planning Act R.S.O. 1990, C.P.13

A. AS SHOWN
B. AS SHOWN
C. AS SHOWN
D. RESIDENTIAL, MIXED USE, PARK, STORMWATER MANAGEMENT, OPEN SPACE
E. AS SHOWN
F. AS SHOWN
G. AS SHOWN
H. MUNICIPAL WATER SUPPLY.
I. LOAM
J. AS SHOWN
K. ALL SERVICES AS REQUIRED
L. AS SHOWN

Revisions	DATE	INITIAL

Date: February 14, 2014
File Name: 140214 SGL Draft Plan.dwg

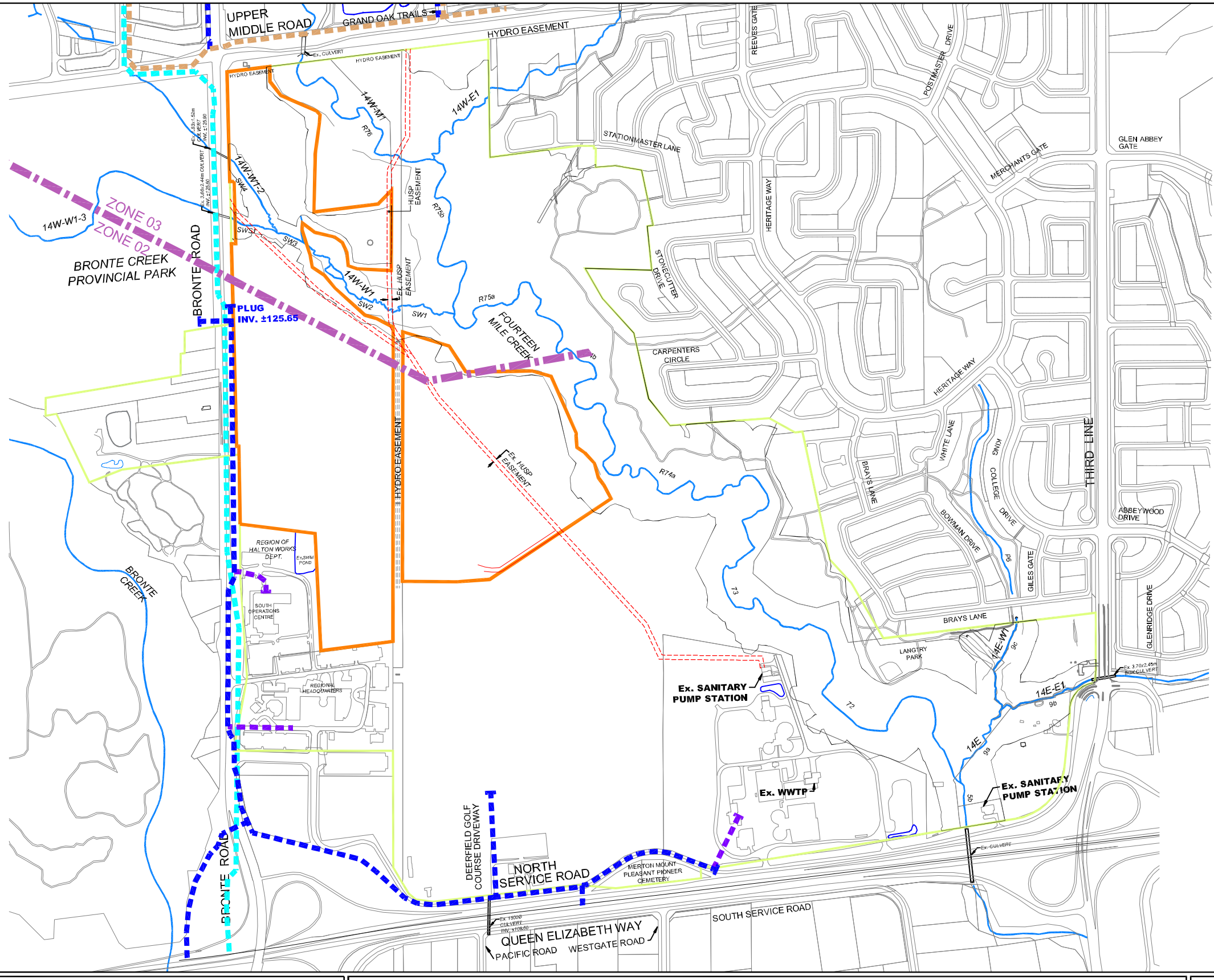
BRONTE GREEN DRAFT PLAN, February 14, 2014

david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

DRAFT PLAN

DATE:	FEBRUARY 2014
SCALE:	N.T.S.
PROJECT No.:	12-601
FIGURE	2

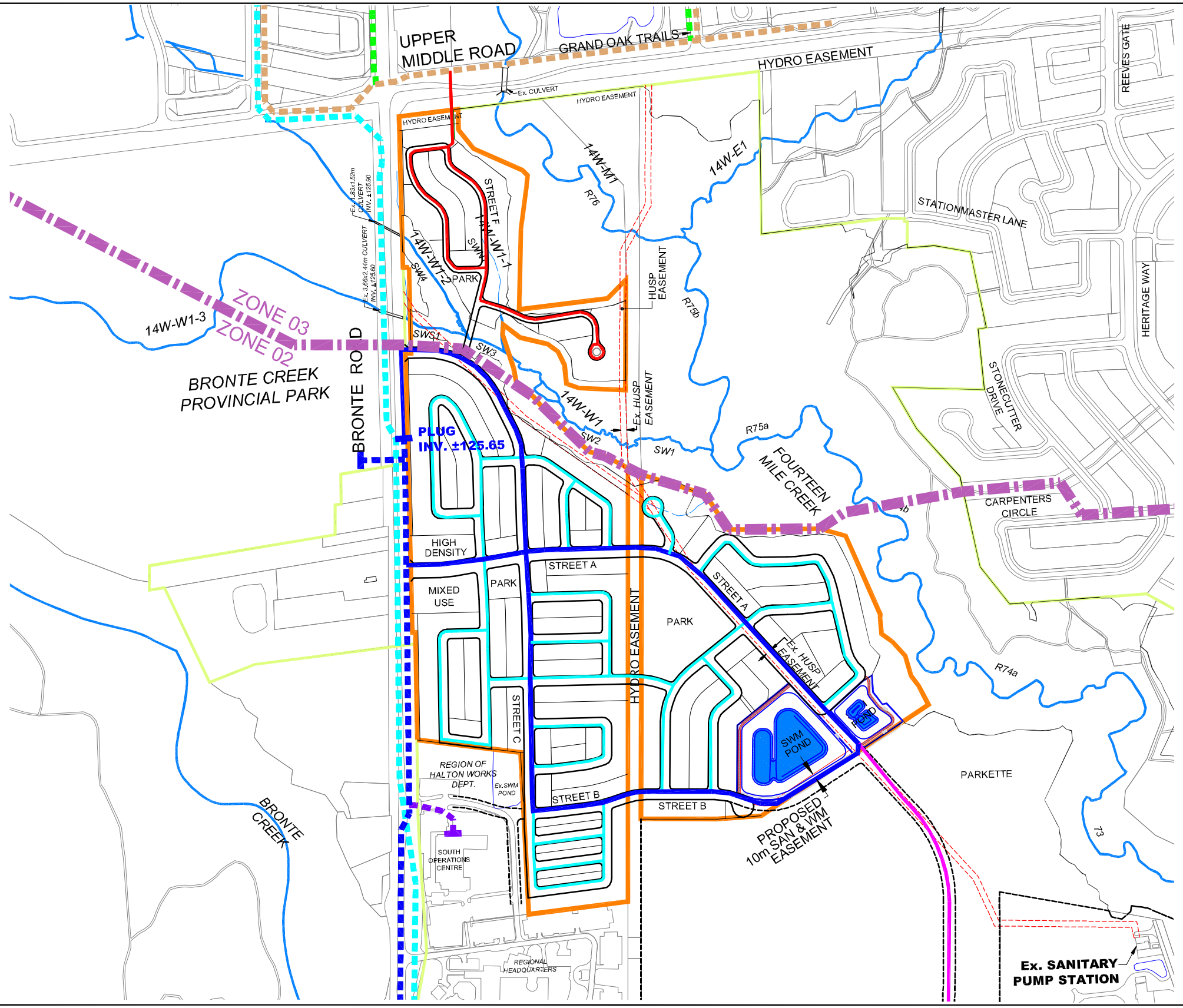


DSEL
david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

EXISTING WATER SERVICING

DATE:	FEBRUARY 2014
SCALE:	1:10000
PROJECT No.:	12-601
FIGURE	3



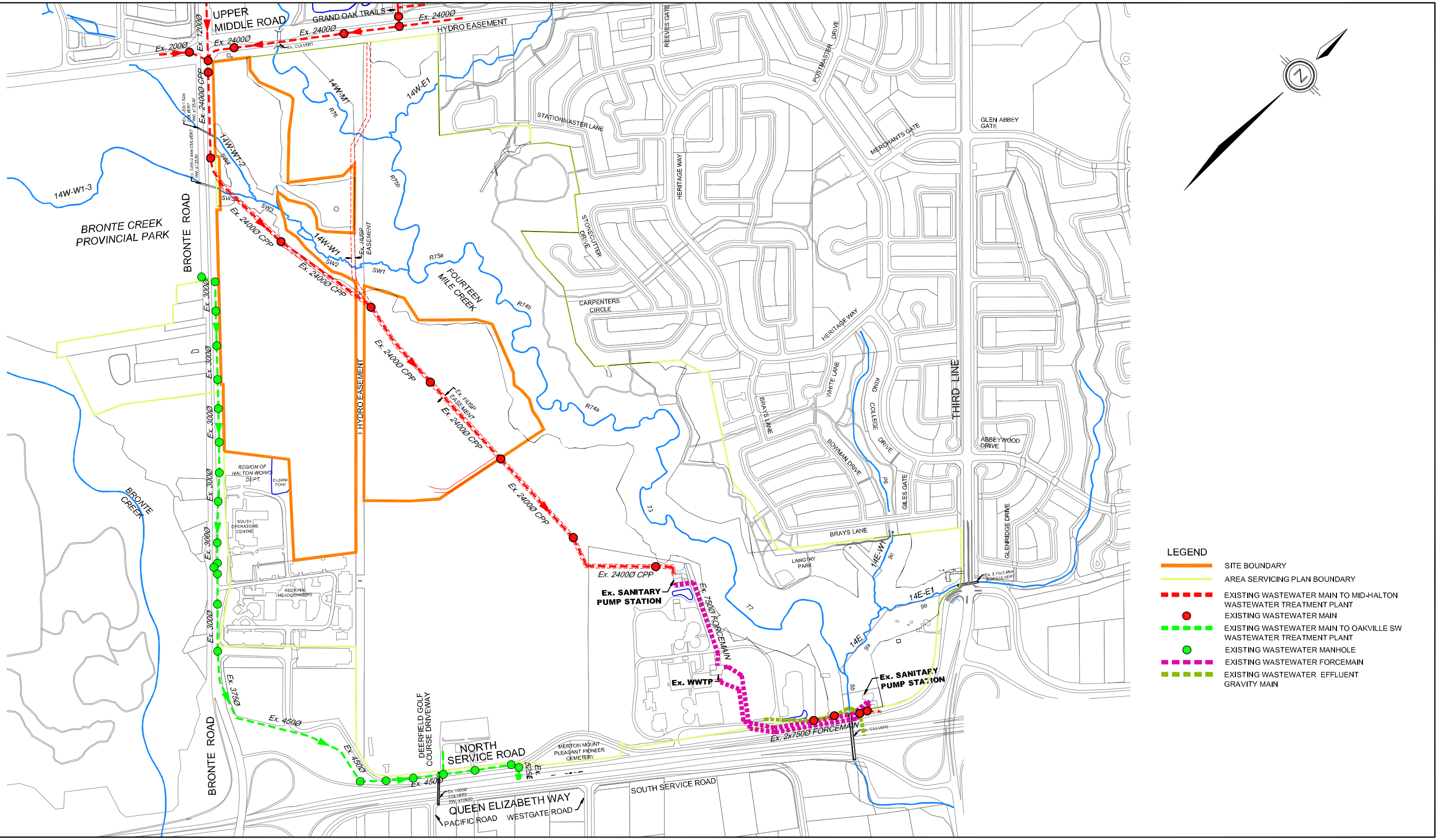
david schaeffer engineering ltd

600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

CONCEPTUAL WATERMAIN

DATE:	FEBRUARY 2014
SCALE:	1:7500
PROJECT No.:	12-601
FIGURE	4



LEGEND

- SITE BOUNDARY
- AREA SERVICING PLAN BOUNDARY
- EXISTING WASTEWATER MAIN TO MID-HALTON WASTEWATER TREATMENT PLANT
- EXISTING WASTEWATER MAIN
- EXISTING WASTEWATER MAIN TO OAKVILLE SW WASTEWATER TREATMENT PLANT
- EXISTING WASTEWATER MANHOLE
- EXISTING WASTEWATER FORCEMAIN
- EXISTING WASTEWATER EFFLUENT GRAVITY MAIN

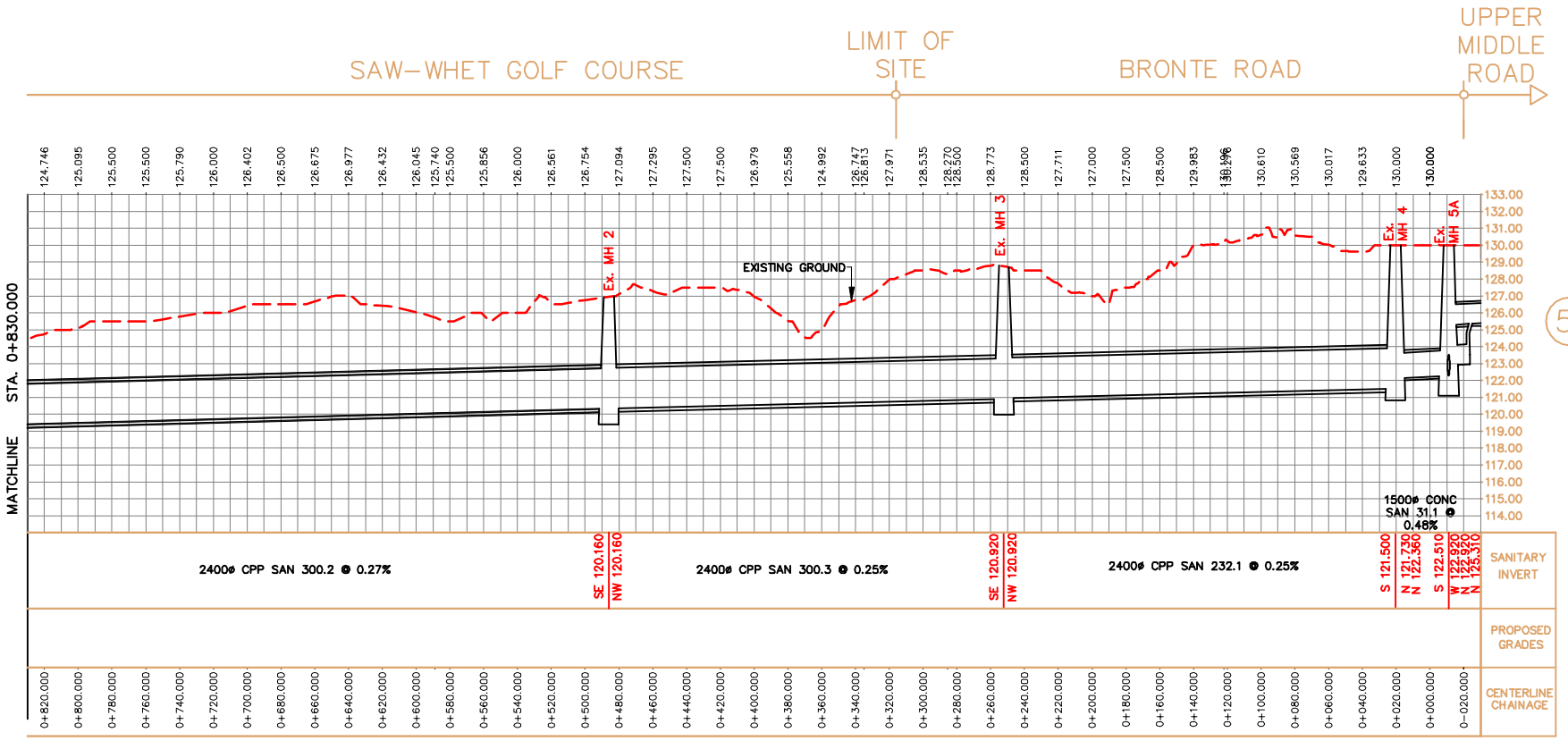
david schaeffer engineering ltd

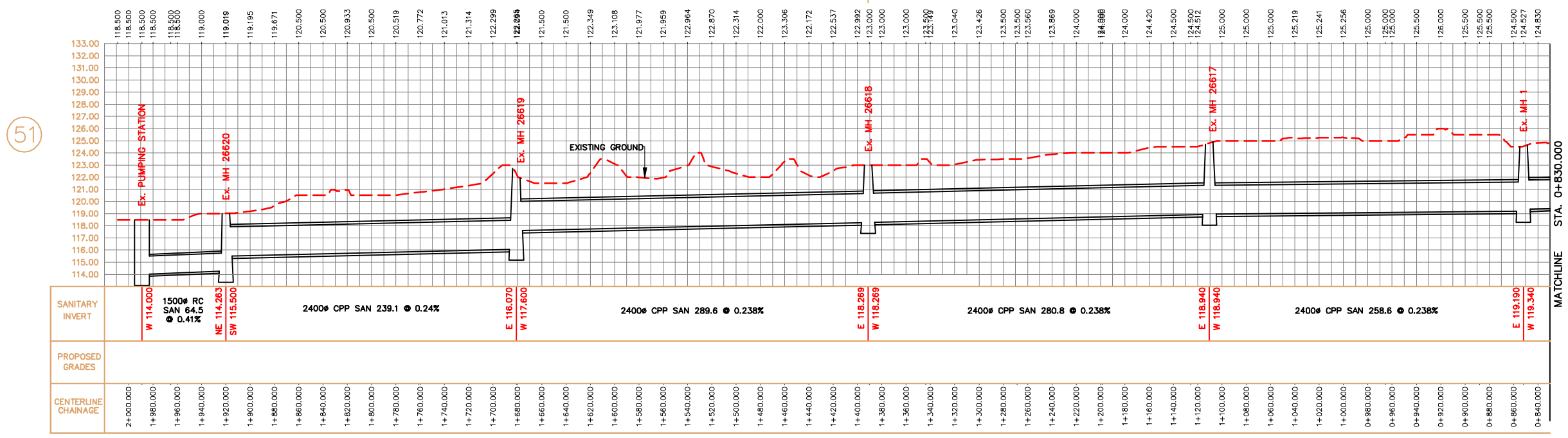
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

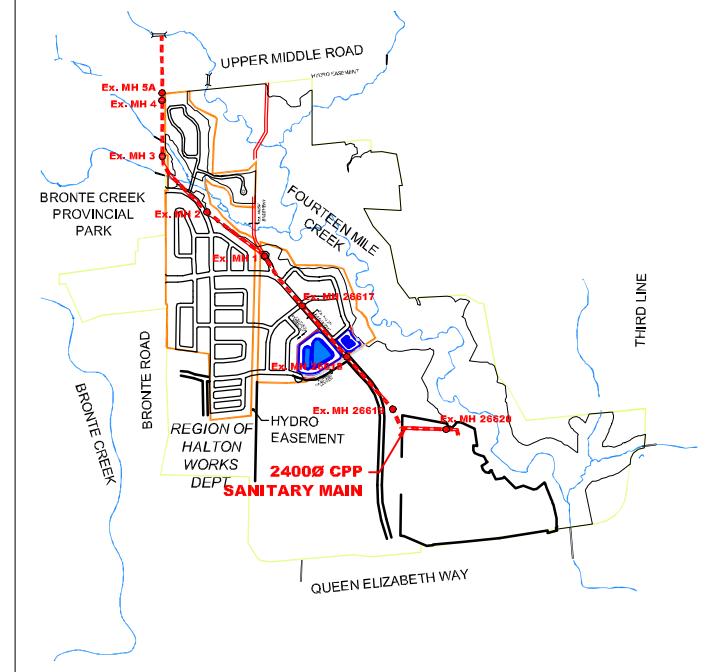
SAW-WHET GOLF COURSE

EXISTING WASTEWATER SERVICING

DATE:	FEBRUARY 2014
SCALE:	1:10000
PROJECT No.:	12-601
FIGURE	5







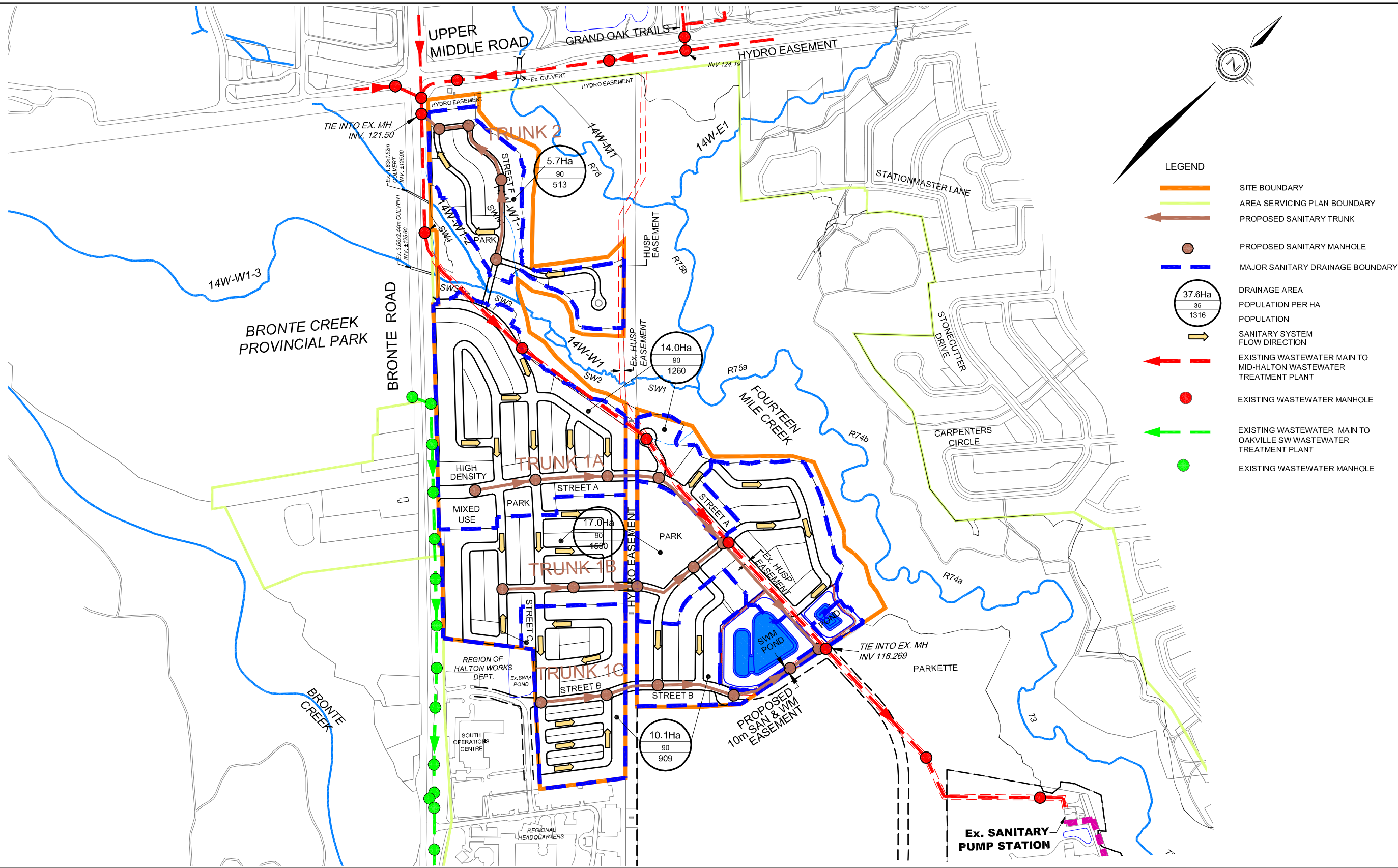
KEY PLAN
N.T.S

david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

Ex. 2400Ø SANITARY TRUNK

DATE:	FEBRUARY 2014
SCALE:	1:4000
PROJECT No.:	12-601
FIGURE	6



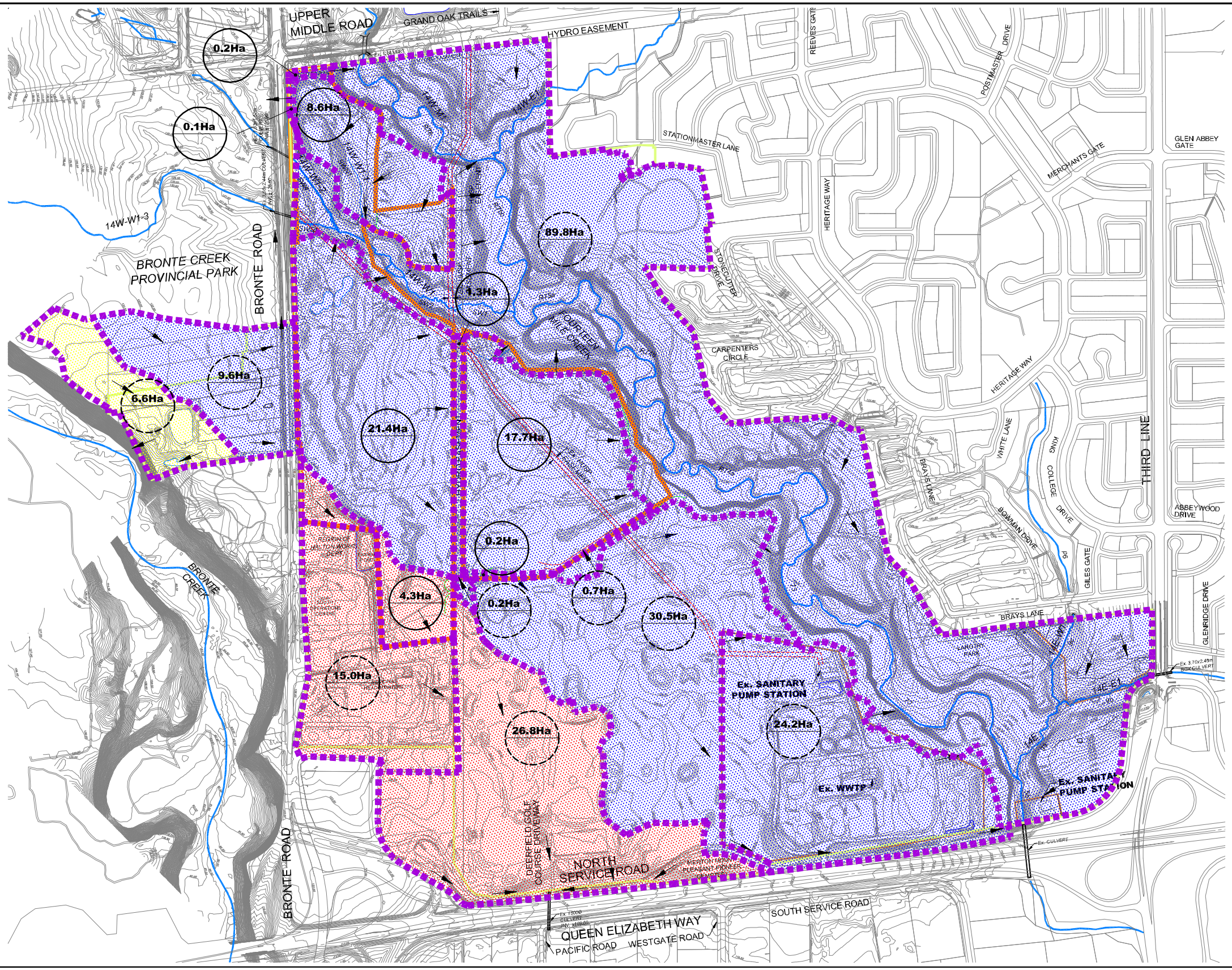
DSEL
david schaeffer engineering ltd

600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

CONCEPTUAL SANITARY SERVICING

DATE:	FEBRUARY 2014
SCALE:	1:7500
PROJECT No.:	12-601
FIGURE	7



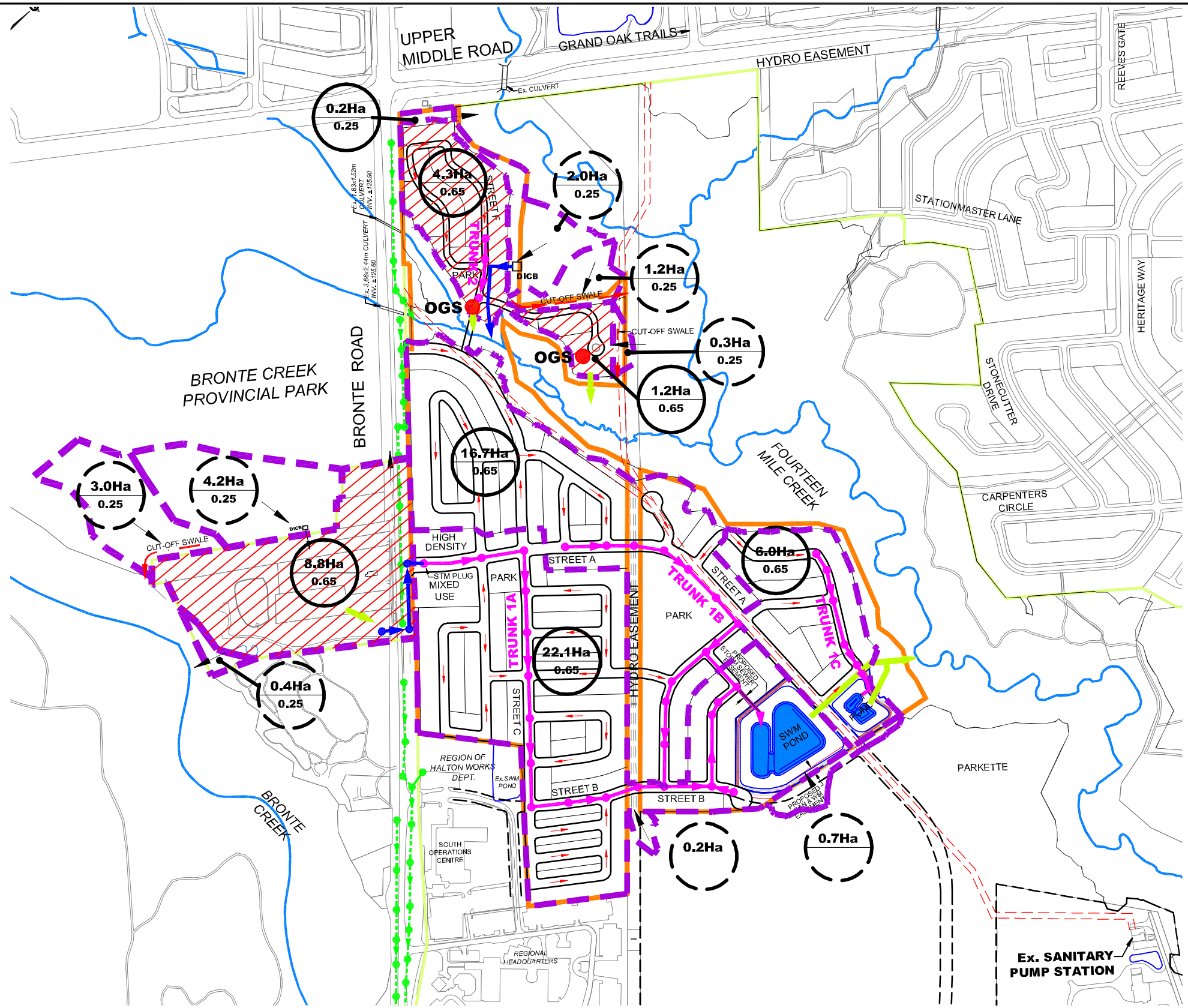
david schaeffer engineering ltd

600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

PRE-DEVELOPMENT DRAINAGE AREAS

DATE:	FEBRUARY 2014
SCALE:	1:10000
PROJECT No.:	12-601
FIGURE	8

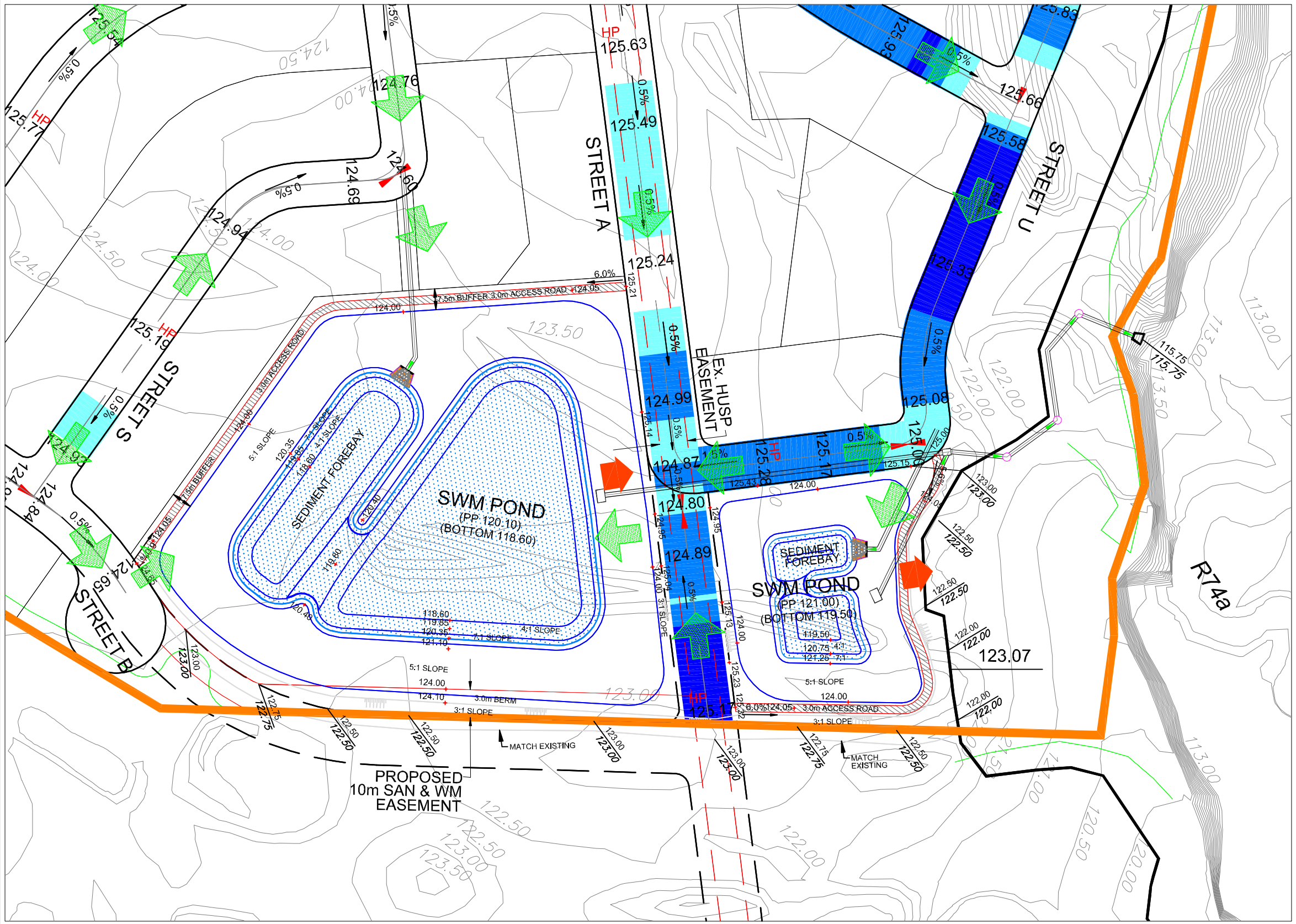


david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

POST-DEVELOPMENT DRAINAGE AREA

DATE:	FEBRUARY 2014
SCALE:	1:7500
PROJECT No.:	12-601
FIGURE	9



NOTE:
FINAL OUTFALL LOCATION TO BE DETERMINED WITH AGENCY CONSULTATION

LEGEND

- ACCESS ROAD
- PERMANENT POOL
- 259.50 / 263.00 — PROPOSED GRADE / EXISTING GRADE
- OVERLAND FLOW DIRECTION
- EMERGENCY OVERFLOW DIRECTION
- WATERCOURSE
- REGIONAL FLOODLINE
- SITE BOUNDARY
- POND INLET
- POND OUTLET

NORTH POND CHARACTERISTICS			
POND COMPONENT	VOLUME REQUIRED (m^3)	VOLUME PROVIDED (m^3)	ELEVATION (m)
PERMANENT POOL	1,026	1,245	121.00
100 YR	3,138	4,560	123.00

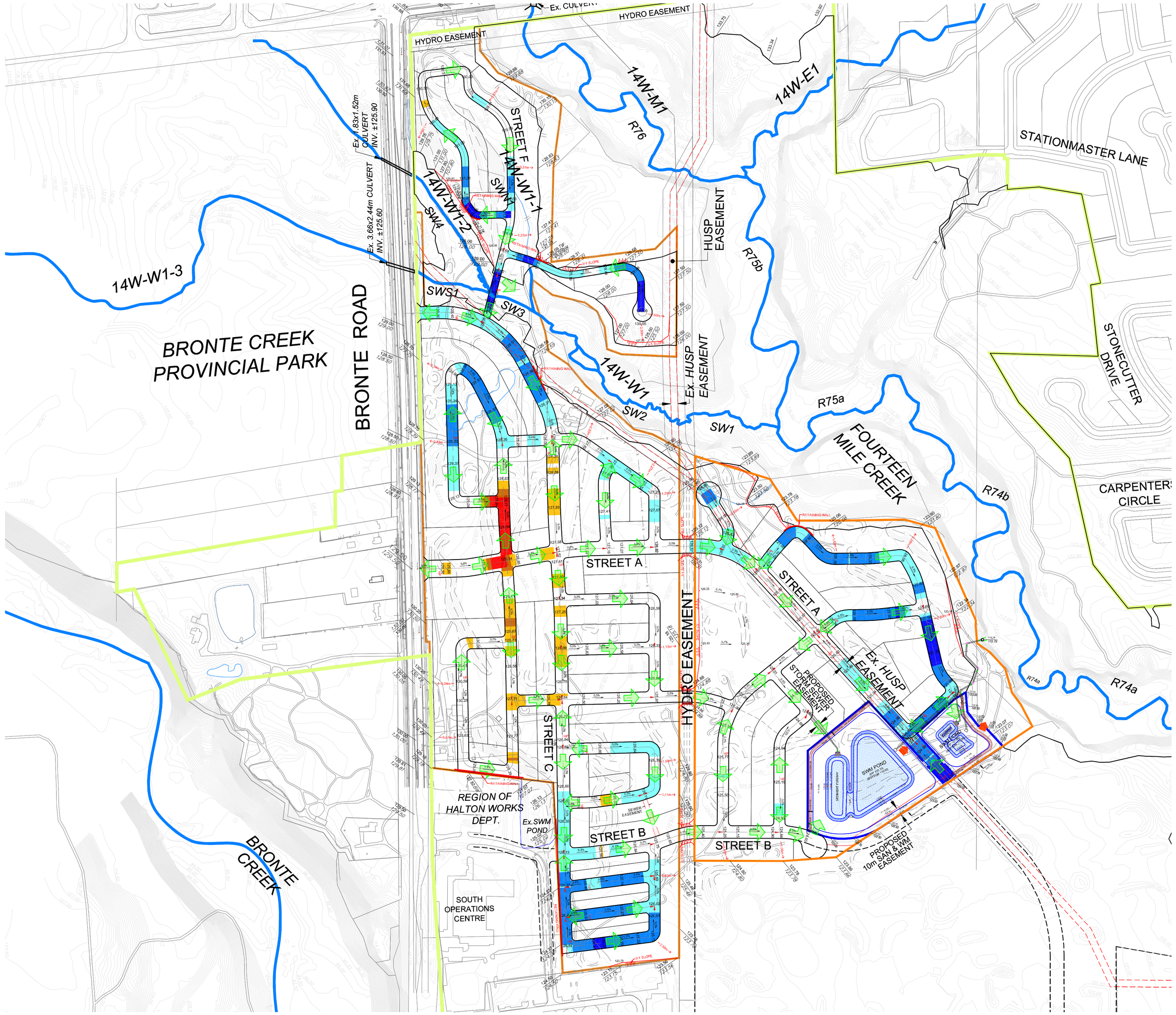
SOUTH POND CHARACTERISTICS			
POND COMPONENT	VOLUME REQUIRED (m^3)	VOLUME PROVIDED (m^3)	ELEVATION (m)
PERMANENT POOL	8,274	11,923	120.10
100 YR	26,180	26,346	122.10

DSEL
david schaeffer engineering ltd
600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

SWM POND

DATE:	FEBRUARY 2014
SCALE:	1:1500
PROJECT No.:	12-601
FIGURE	10



LEGEND

- SITE BOUNDARY
- AREA SERVICING PLAN BOUNDARY
- EXISTING ELEVATION
- 162.64 PROPOSED ELEVATION
- 168.00 EXISTING CONTOUR ELEVATION
- OVERLAND FLOW DIRECTION

CUT-FILL DEPTH ALONG CENTER LINE:

CUT DEPTH (m)	FILL DEPTH (m)
0 - 1	0 - 1
1 - 2	1 - 2
2 - 3	2 - 3
> 3	> 3

DSEL
david schaeffer engineering ltd

600 Alden Road, Suite 500
Markham, Ontario, L3R 0E7
Tel. (905) 475-3080
Fax. (905) 475-3081
www.DSEL.ca

SAW-WHET GOLF COURSE

CONCEPTUAL GRADING PLAN

DATE:	FEBRUARY 2014
SCALE:	1:3000
PROJECT No.:	12-601
DRAWING:	1

APPENDIX A

MASTER PLAN UPDATE, SEPTEMBER 2011
- Preferred water servicing
- Preferred wastewater servicing

Legend

Existing Infrastructure

- Water Pumping Station
- Water Well
- Water Standpipe
- Water Reservoir
- Water Purification Plant
- Elevated Water Tower
- Existing Watermain
- Watermain

Previously Approved Infrastructure

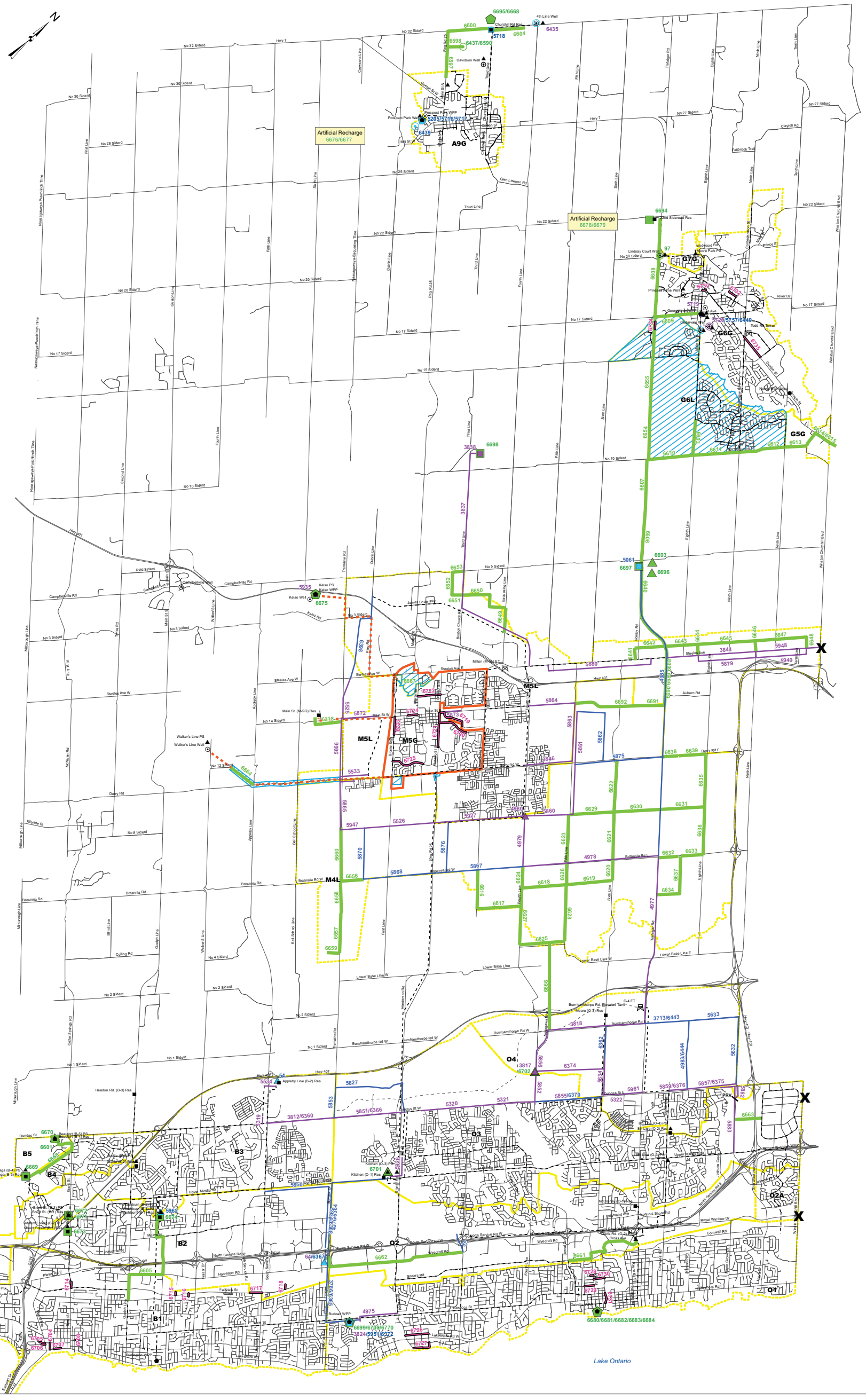
- Water Pumping Station
- Water Well
- Water Purification Plant
- Water Reservoir

Proposed/Upgrade Infrastructure

- Water Pumping Station
- Water Well
- Water Purification Plant
- Water Reservoir
- Watermain
- Distribution-Built Boundary Watermain

Funded Infrastructure

- Water Pumping Station
- Water Reservoir
- Funded Project - Watermain (2008 MP Projects)
- Existing Interregional connections
- Existing Milton Groundwater Servicing
- Existing Central Milton Groundwater Service Area Boundary
- Water Pressure Zones
- Proposed Lake Base Service Area



Halton Region

Sustainable Halton
Water and Wastewater Master Plan

Preferred Water Servicing Strategy
Figure 28

AECOM

Oct 07, 2011
1:40,000
601140562-363-W

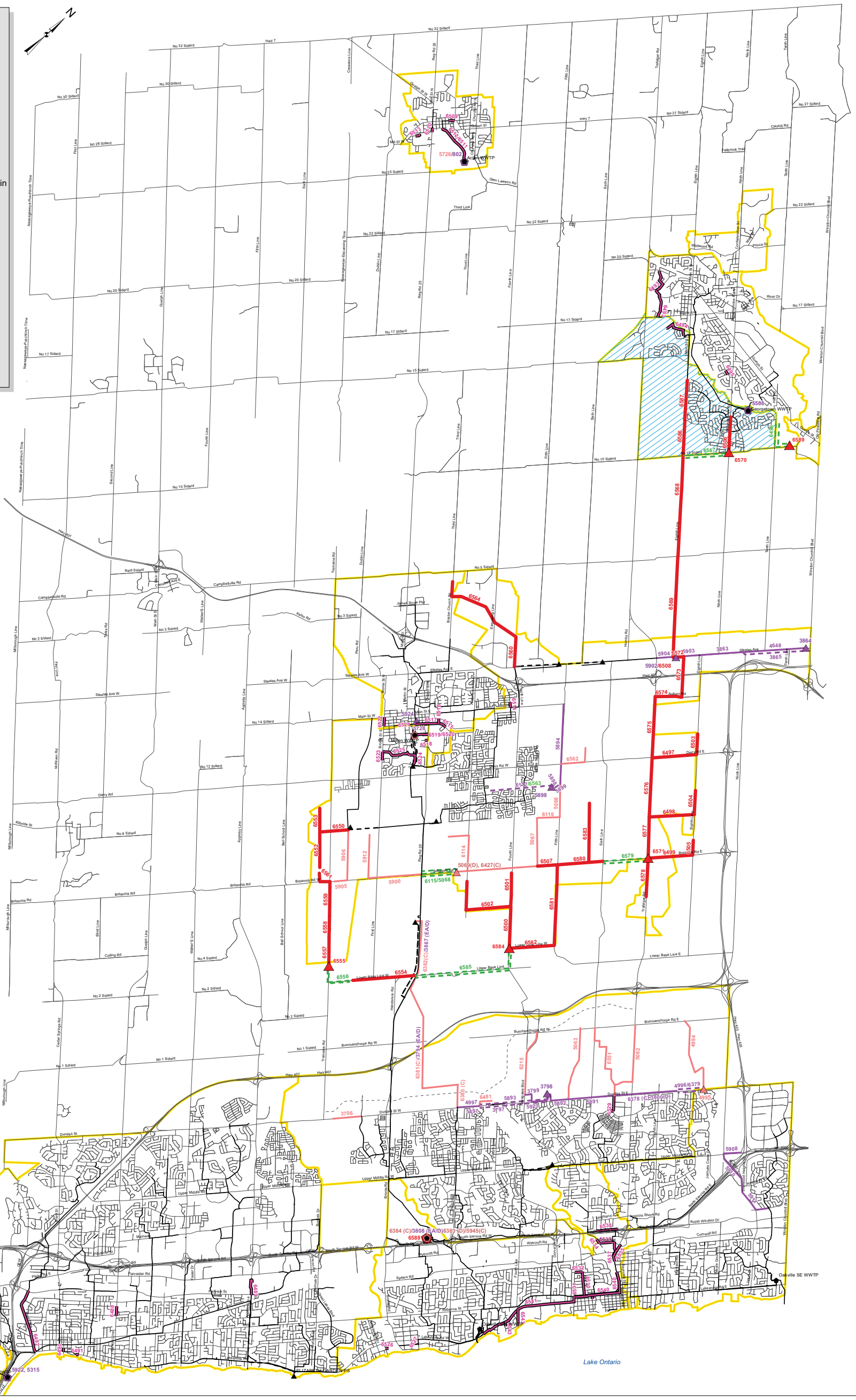
Legend

Existing Infrastructure
- Wastewater Pumping Station
- Wastewater Treatment Plant
- Wastewater Main
- Wastewater Forcemain

Previously Approved Infrastructure
- Wastewater Pumping Station
- Wastewater Treatment Plant
- Wastewater Main
- Distribution-Built Boundary Wastewater main

Proposed/Upgrade Infrastructure
- Wastewater Pumping Station
- Wastewater Treatment Plant
- Proposed Alignment - Wastewater Main
- Wastewater Forcemain

Funded Infrastructure
- Wastewater Pumping Station
- Wastewater Treatment Plant
- Wastewater Main
- Wastewater Forcemain
- WWTP Drainage Area
- Proposed Lake Base Service Area



Sustainable Halton
Water and Wastewater Master Plan

Preferred Wastewater Servicing Strategy
Figure 29

October, 2011
1:40,000
60114062-362-WW

APPENDIX B

PRELIMINARY WATERMAIN ANALYSIS
Genivar

DRAFT PLAN OF SUBDIVISION

PART OF LOTS 28, 29 AND 30
CONCESSION 2, SOUTH OF DUNDAS STREET
(GEOGRAPHIC TOWNSHIP OF TRAFALGAR)
TOWN OF OAKVILLE
REGIONAL MUNICIPALITY OF HALTON

SCALE 1:5000 METRIC
10 0 20 40 60 80 100 metres

N

Owner's Certificate

I hereby authorize Sorenson Gravely Lowes Planning Associates Inc.
to submit this plan for approval.

Saw Whet Golf Course Ltd. DATE

Surveyor's Certificate

I hereby certify that the boundaries of the land to be subdivided as shown on this plan, and their relationship to the adjacent land are accurately and correctly shown.

J.D. Barnes Limited DATE

Schedule of Land Use

	DESCRIPTION	LOTS / BLOCKS	AREA (ha.)	UNITS
1.	Residential (townhouse)	1-15	1.94	86
2.	Residential (back-to-back)	16-24	0.91	94
3.	Residential (single - 9.14m)	25-107	2.41	83
4.	Residential (single - 11.00m)	108-278	5.36	171
5.	Residential (single - 13.10m)	279-466	8.74	191
6.	Residential (single - 15.24m)	467-528	3.44	61
7.	Residential (single - 18.30m)	529-549	1.81	20
8.	Residential (single - 19.80m)	550-552	0.13	3
9.	Residential Condo (single - 11.00m)	553-569	0.49	17
10.	Residential Condo (single - 13.10m)	570-615	2.47	46
11.	Residential Condo (single - 18.30m)	616-628	1.18	13
12.	Residential High Density	629	0.49	
13.	Main Street Mixed Use	630	0.69	
14.	Park	631-633	2.64	
15.	Buffer	634-636	0.29	
16.	SWM	637-638	3.13	
17.	Future Development	639-641	0.117	
18.	Future Right-of-Way	642-643	0.25	
19.	Easement	644-645	0.24	
20.	0.3m Reserve	646-647	0.002	
21.	Road Right-of-way	NA	11.10	
22.	Private Road Right-of-way	648-650	1.031	
23.	Natural Heritage System	651-655	5.69	
24.	Open Space	656-657	0.08	
25.	Enhancement Area	658-664	0.45	
26.	Walkway/Overland Flow	665	0.02	
TOTAL			55.10	785

TOTAL NUMBER OF UNITS: 785

Additional Information Required Under Section 51(17) of the Planning Act R.S.O. 1990,C.P.13

A. AS SHOWN
B. AS SHOWN
C. AS SHOWN
D. RESIDENTIAL, MIXED USE, PARK, STORMWATER MANAGEMENT, OPEN SPACE
E. AS SHOWN
F. AS SHOWN
G. AS SHOWN
H. MUNICIPAL WATER SUPPLY.
I. LOAM
J. AS SHOWN
K. ALL SERVICES AS REQUIRED
L. AS SHOWN

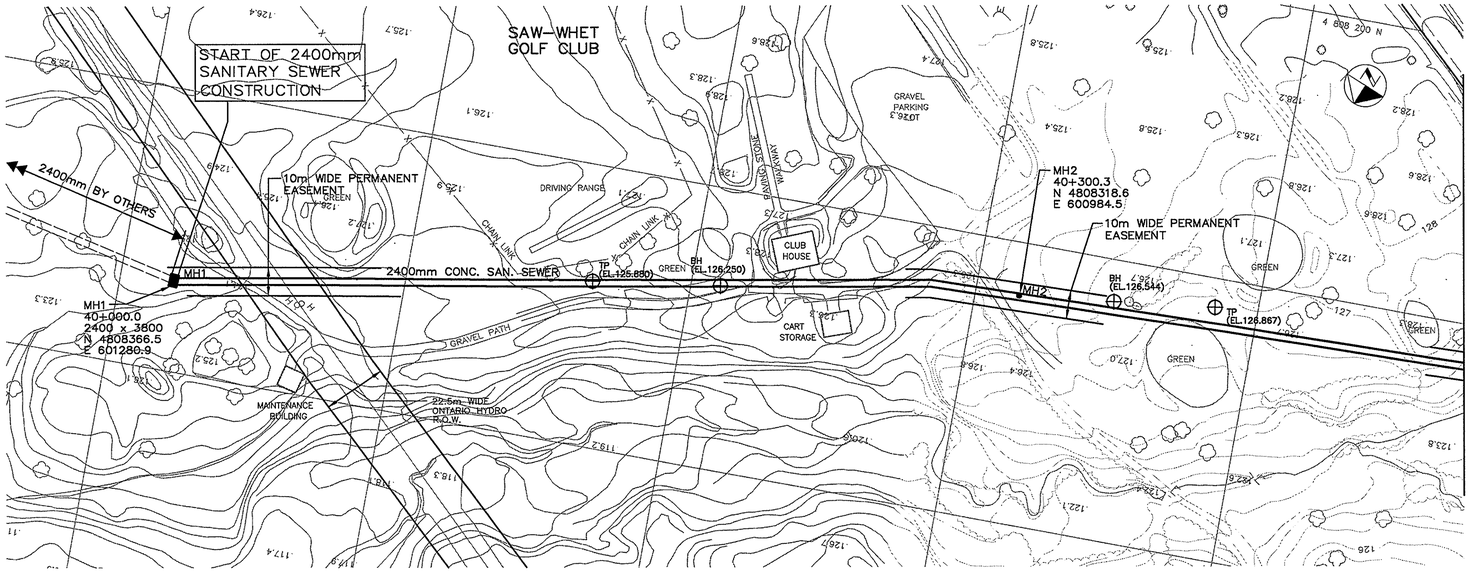
Revisions	DATE	INITIAL

Date: February 14, 2014
File Name: 140214 SGL Draft Plan.dwg

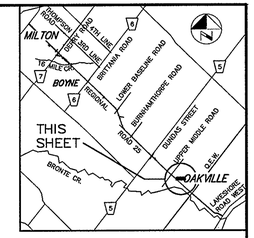
SGL
Sorensen Gravely Lowes Planning Associates Inc.

APPENDIX C

2400Ø SANITARY TRUNK SEWER DRAWINGS



EASEMENT



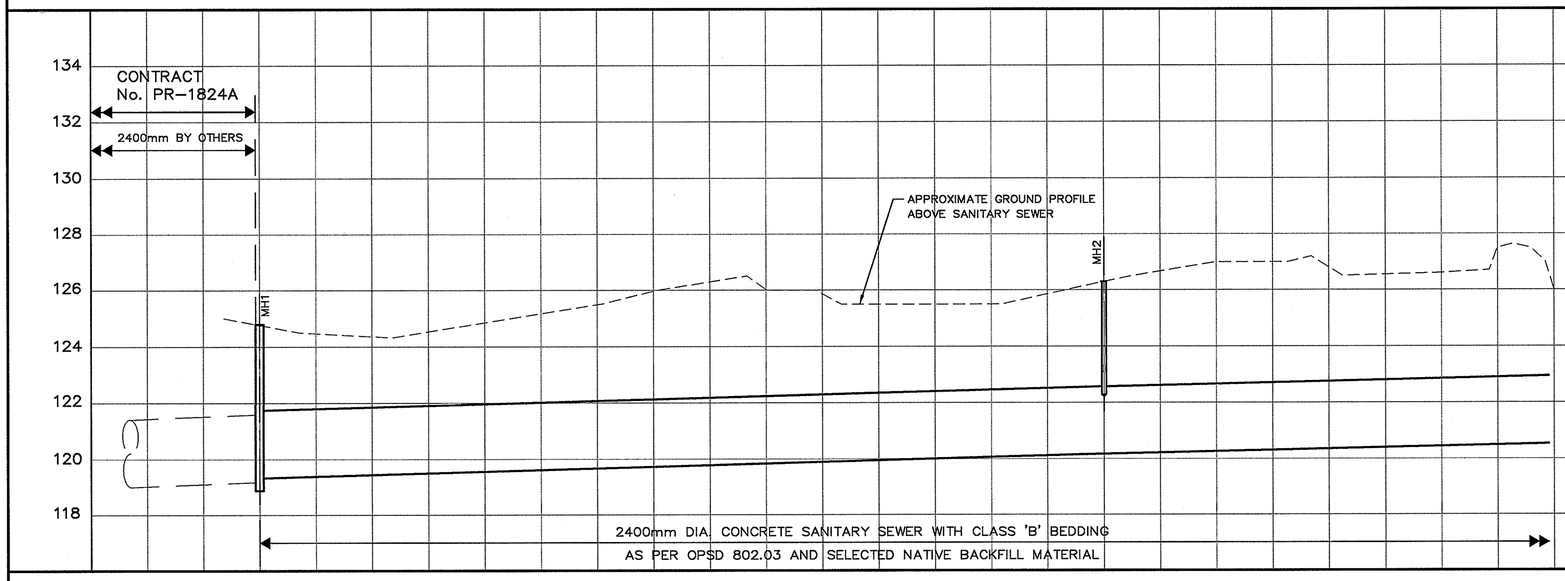
KEY PLAN

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
2. STATIONS ARE ALONG THE 2400mm SEWER CENTRELINE.
3. THE LOCATIONS OF ALL EXISTING UTILITIES ENCOUNTERED DURING CONSTRUCTION ARE APPROXIMATE. CONTACT THE APPLICABLE UTILITY OWNER FOR EXACT LOCATIONS.

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

This record document has been prepared based in part upon information furnished by others. Dillon Consulting Limited cannot assure the accuracy of others' information and thus is not responsible for the accuracy of this record document or for any error or omission that may have been incorporated into it as a result. Those relying on this record document are advised to obtain independent verification of its accuracy before applying it for any purpose.



5	09/12/01	GOH	RECORD DRAWING			
4	03/30/00	GOH	ISSUED FOR CONSTRUCTION			
3	02/21/00	GOH	REVISED ALIGNMENT			
2	02/11/00	GOH	ISSUED FOR COMMENT			
1	01/19/00	GOH	REVISED PER REGION COMMENTS			
0	11/04/99	GOH	ISSUED FOR DESIGN BASIS REPORT			
NO	Date	By	REVISIONS			MANU CAD

Design	HJG	Ch'kd	WAB	Date NOVEMBER 1999
Drawn	CLC/JC	Ch'kd	HJG	

Scale Horiz. 20 10 0 20 Vert. 2 1 0 2

References APPENDIX VI

APPROVALS

Municipal

Field Notes

Stamp

Regional

Director, Engineering Services

Manager, Design Services

D'ORAZIO / WALTER JOINT VENTURE

Halton

CENTRELINE ELEVATIONS

WATERMAIN INVERTS

SANITARY SEWER INVERTS

E119.19
W119.34

300.2 @ +0.27%
65-D ASTM C76

120.16

300.3 @ +0.25%
65-D ASTM C76

CHAINAGE

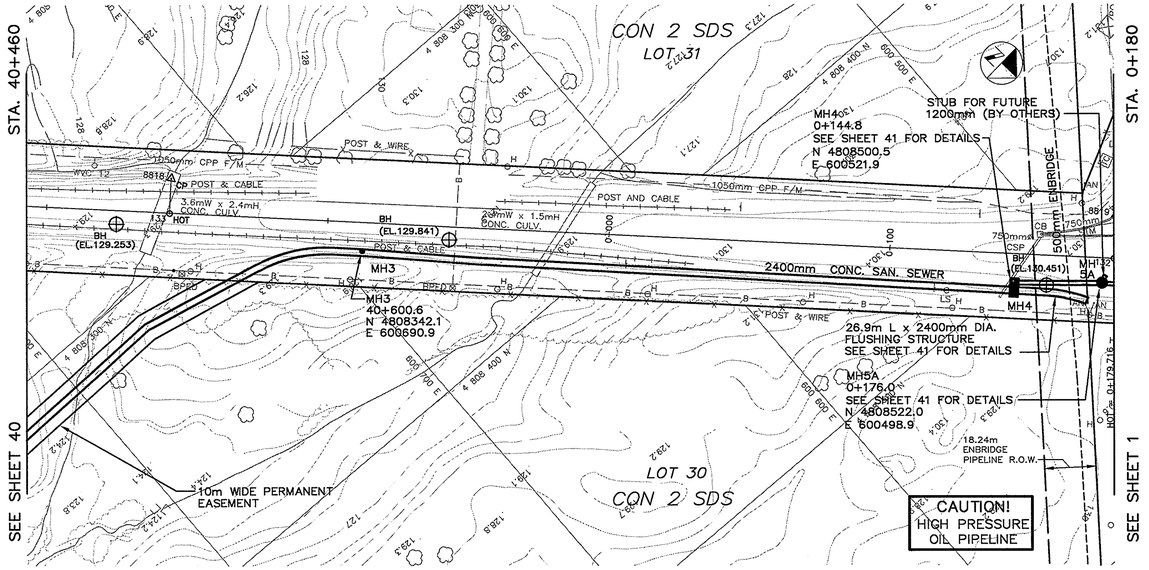
40+000 40+100 40+200 40+300 40+400 40+460

TITLE

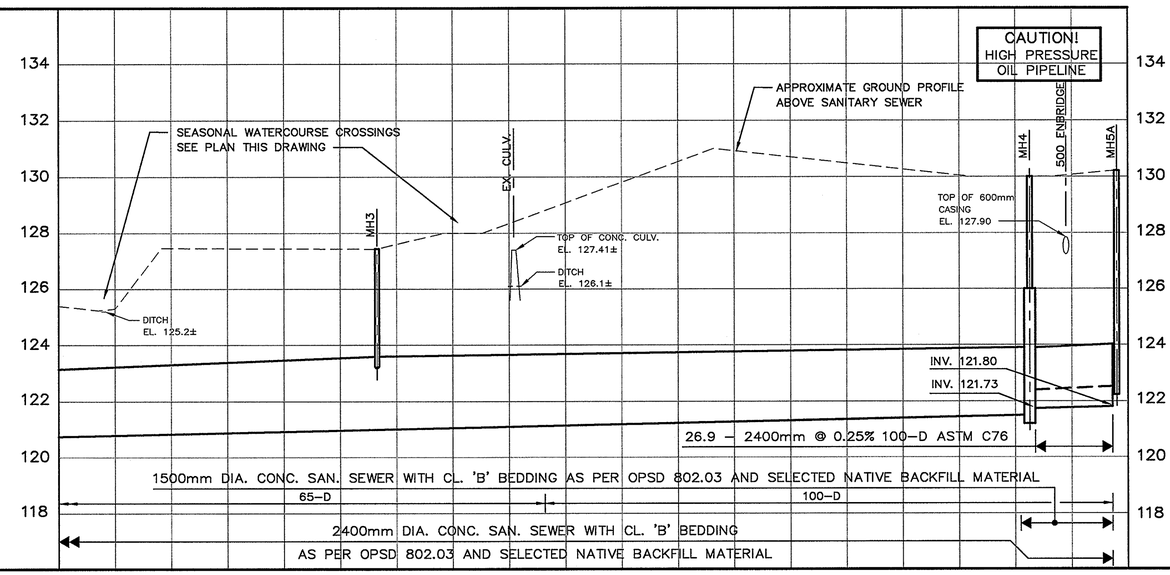
WASTEWATER TRUNK MAIN
EASEMENT & REGIONAL ROAD 25
FROM STA. 40+000 TO STA. 40+460
IN THE TOWN OF OAKVILLE

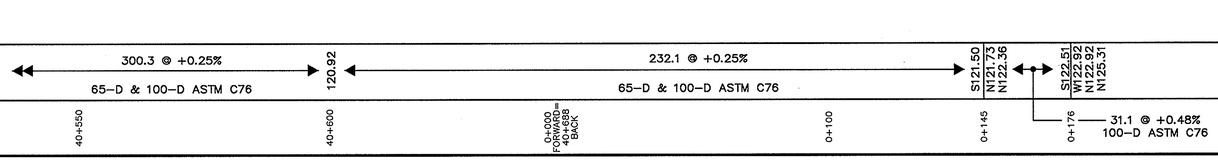
Consultant File NO 99-6749-06	Regional Drawing NO 0-11211
CONTRACT NO PR-1824B	Drawing NO SHEET 37 OF 43

PR-1823-XX 37 of 43 0-11211



REGIONAL ROAD 25



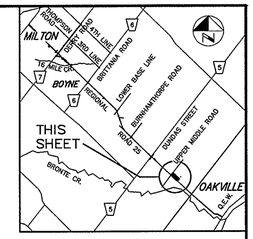


CENTRELINE ELEVATIONS

WATERMAIN INVERTS

SANITARY SEWER INVERTS

CHAINAGE



KEY PLAN

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
2. STATIONS ARE ALONG THE 2400mm SEWER CENTRELINE.
3. THE LOCATIONS OF ALL EXISTING UTILITIES ENCOUNTERED DURING CONSTRUCTION ARE APPROXIMATE. CONTACT THE APPLICABLE UTILITY OWNER FOR EXACT LOCATIONS.

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

This record document has been prepared based in part upon information furnished by others. Dillon Consulting Limited cannot assure the accuracy of others' information and thus is not responsible for the accuracy of this record document or for any error or omission that may have been incorporated into it as a result. Those relying on this record document are advised to obtain independent verification of its accuracy before applying it for any purpose.

NO	Date	By	REVISIONS			MANU CAD
9	09/12/01	GOH	RECORD DRAWING			
8	06/05/00	GOH	INTERIM AS CONSTRUCTED			
7	03/30/00	GOH	ISSUED FOR CONSTRUCTION			
6	02/21/00	GOH	REVISED ALIGNMENT			
5	02/18/00	GOH	REVISED CROSSING			
4	02/11/00	GOH	ISSUED FOR COMMENT			
3	02/01/00	GOH	ISSUED FOR CROSSING APPROVALS			
2	01/25/00	GOH	ISSUED FOR MOE C of A APPL'N			
1	01/19/00	GOH	REVISED PER REGION COMMENTS			
0	11/04/99	GOH	ISSUED FOR DESIGN BASIS REPORT			

Design	HJG	Ch'kd	WAB	Date NOVEMBER 1999
Drawn	CLC/JC	Ch'kd	HJG	

Scale Horiz. 20 10 0 20 / Vert. 2 1 0 2

References APPENDIX VI

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Field Notes

Stamp

D'ORAZIO / WALTER JOINT VENTURE

Halton

TITLE

WASTEWATER TRUNK MAIN
REGIONAL ROAD 25
FROM STATION 40+460 TO STA. 0+180
IN THE TOWN OF OAKVILLE

Consultant File NO	Regional Drawing NO
99–6749–06	0–11212
CONTRACT NO	Drawing NO
PR–1824B	SHEET 38 OF 43

PR–1823–XX 38 of 43 0–11212

APPENDIX D

SANITARY FLOW CALCULATIONS
DSEL

Sanitary Flow Calculation

Total developable area = 49.41 ha

Residential area = 30.06 ha

Single family homes = 21.89 ha @ 55 p/ha

Condo single family homes = 4.14 ha @ 55 p/ha

Townhouses = 2.85 ha @ 135 p/ha

High density = 0.49 ha @ 135 p/ha

Mixed use = 0.69 ha @ 135 p/ha

Area for infiltration = 45.46 ha

Population estimate

Single family homes = 1203.95 persons

Condo single family homes = 227.7 persons

Townhouses = 384.75 persons

High density = 66.15 persons

Mixed use = 93.15 persons

Total = 1976 persons

Average Day Dry Weather Flow = 275 L/cap/day x 1976 persons = 6.29 L/s

Peak Factor = $1 + 14/(4 + \sqrt{(1976/1000)}) = 3.59$

Infiltration and inflow = 0.286 L/s/ha x 45.46 ha = 13.00 L/s

Total sanitary flow = 6.29 L/s x 3.59 + 13.00 L/s = **35.58 L/s**

APPENDIX E

SANITARY CAPACITY ANALYSIS
Genivar

GENIVAR

131-17371-00

November 28, 2013

Mr. M. Baldesarra
David Schaeffer Engineering Ltd.
600 Alden Road
Suite 500
Markham, Ontario
L3R 0E7

Re: Merton Development Wastewater Analysis

Dear Mr. Baldesarra:

We are pleased to present the results of our wastewater analysis of the Merton development located near Bronte Road and Upper Middle Road in Oakville, Ontario.

WASTEWATER MODELING

Sanitary modeling was conducted on the Merton development. The analysis consisted of using the Region of Halton's (ROH) all-pipe sanitary model and adding to it the flows generated from the proposed development. The flows were added to the closest sanitary trunks that could provide a gravity outlet to the development area as shown in Figure 1.

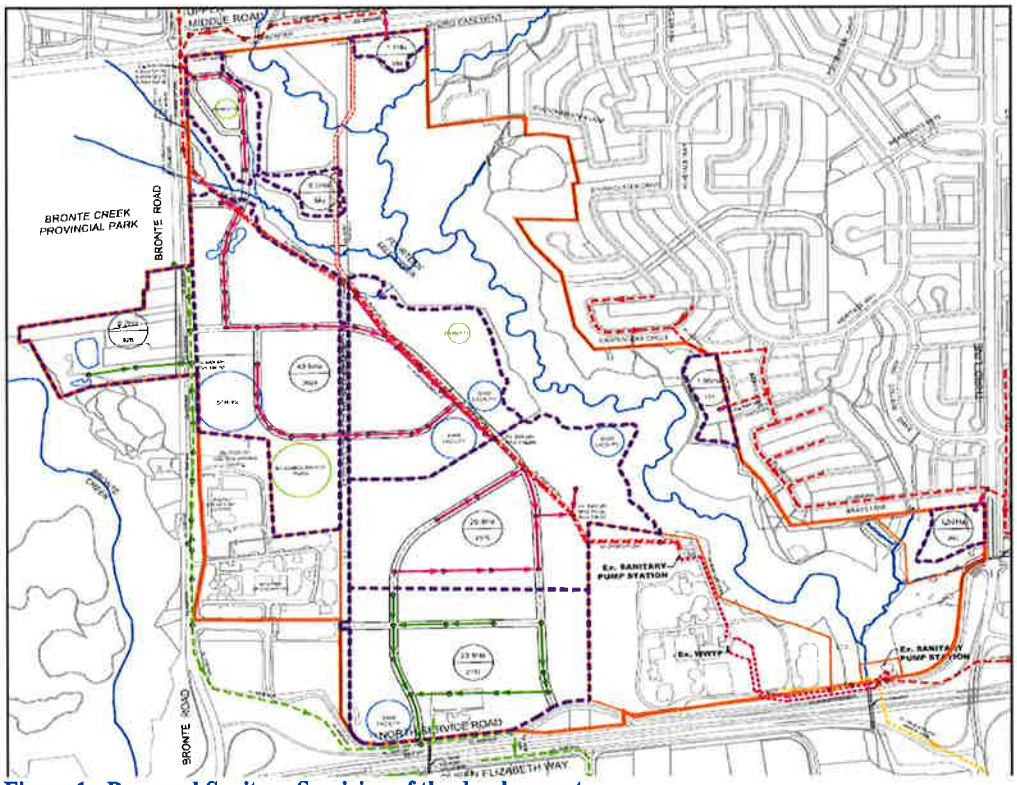


Figure 1: Proposed Sanitary Servicing of the development

600 Cochrane Drive, 5th Floor, Markham, Ontario L3R 5K3
Telephone: 905.475.7270 • Fax: 905.475.5994 • www.genivar.com

The majority of the area will connect to the 2400 mm sanitary trunk leading to Mid-Halton. The Southern parts of the development fall within the drainage area for Oakville Southwest Plant and its load was added to a trunk leading to the Southwest Plant.

Region's Sanitary Model

The Region's sanitary model is built in MWH Soft's InfoSewer software. The model consists of 2011, 2016, and 2021, and 2031 scenarios. Loading in the model consist of peakable (peaked using the Harmon formula) and non-peakable (Infiltration and Inflow) loads applied to the Manholes.

Design Criteria and Load Data

In order to assess the impact of the development on the existing and proposed future infrastructure, the load from the development was added to the 2031 scenario in the model. The ROH's design criteria was used in calculating the loads from the development. The load was added to the trunk sanitary sewers in the area as shown in Figure 1. A total of 3 different scenarios were examined namely Options A, B, and C. Options A, B, C are the conceptual development plans that consist of differing population numbers and distribution. The model input for each of the development options is summarized in Tables 1-3.
A fourth option, Option D was also evaluated that consists of Option C population numbers but with all the sanitary flows directed to Mid-Halton WWTP. This would be accomplished by a sewage pumping station at the southern end of the development that would direct flows to the Mid-Halton Plant. The modeling results are summarized next.

Table 1 – Sanitary Design Criteria and Model Loadings for Option A

Region's Design Criteria			
Average Day Dry Weather Flow (L/cap/day)	275		
Infiltration and Inflow (L/s/Ha)	0.286		
Model Loading			
Loading MH	# of Persons	Serviced Area (ha)	Total Flow (L/s)
SMH5447	607	8.8	4.45
SMH4893	2,925	23.4	16.00
SMH5472	180	2	1.14
SMH5021	238	1.92	1.31
MH-13-AB	126	1.4	0.80
SMH17864	303	5.5	2.54
SMH26617	2,760	44	21.37
SMH26619	3,288	26.3	17.99
SMH5547	149	2.7	1.25

Table 2: Sanitary Design Criteria and Model Loadings for Option B

Region's Design Criteria			
Average Day Dry Weather Flow (L/cap/day)	275		
Infiltration and Inflow (L/s/Ha)	0.286		
Model Loading			
Loading MH	# of Persons	Serviced Area (ha)	Total Flow (L/s)
SMH5447	582	8.8	4.37
SMH4893	2,925	23.4	16.00
SMH5472	0	0	0.00
SMH5021	171	1.92	1.09
MH-13-AB	126	1.4	0.80
SMH17864	303	5.5	2.54
SMH26617	2,552	40.1	19.59
SMH26619	3,136	27.1	17.73
SMH5547	149	2.7	1.25

Table 3 – Sanitary Design Criteria and Model Loadings for Options C

Region's Design Criteria			
Average Day Dry Weather Flow (L/cap/day)	275		
Infiltration and Inflow (L/s/Ha)	0.286		
Model Loading			
Loading MH	# of Persons	Serviced Area (ha)	Total Flow (L/s)
SMH5447	490	8.9	4.11
SMH4893	2925	23.4	16.00
SMH5472	189	1.4	1.00
SMH5021	171	1.9	1.09
MH-13-AB	126	1.4	0.80
SMH17864	303	5.5	2.54
SMH26617	2387	43.4	20.01
SMH26619	2680	23.2	15.17
SMH5547	338	2.7	1.85

Modeling Results

The model was run under the 2031 peak wet weather flow for the various scenarios. The scenarios consisted of the 3 main development options A, B,C. Other Scenarios modeled were Option D which consisted of all loads directed to the Mid-Halton Plant and a 2031 run without Merton loading. The results

are summarized in Appendix A in the form of trunk profiles showing water level and hydraulic grade conditions and detailed pipe output tables.

The results show that there are no capacity restrictions in the 2400 mm sewer leading to Mid-Halton Plant under any of the development scenarios modeled. The addition of Merton loading to the trunk increases its flow however, there is significant capacity remaining. The flows going south to Oakville Southwest show the there are some constrictions in the lower parts of the trunk near the lakeshore under all scenarios including the scenario without any Merton development. There are approximately 300 m of 750 mm pipe that are surcharged under the 2031 peak flow condition. From the surcharged sections, a 108 m section is severely surcharged with proposed flows greater than twice the pipe capacity. The rest are slightly surcharged by 10 – 20 %. A scenario was simulated with the surcharged sections upgraded to 900 mm and 1200 mm depending on the severity of surcharge. The results of this scenario is included in Appendix B.

Given that servicing of Merton is still at a conceptual level, it is recommended that all of Merton loading be directed towards the Mid-Halton Plant where there are no capacity restrictions.

The results are subject to the data inputs of the model provided, particularly pipe inverts and drainage area population numbers. It is recommended that survey of inverts and flow monitoring be conducted on the surcharged sections to field-verify the model outputs before any upgrades are planned.

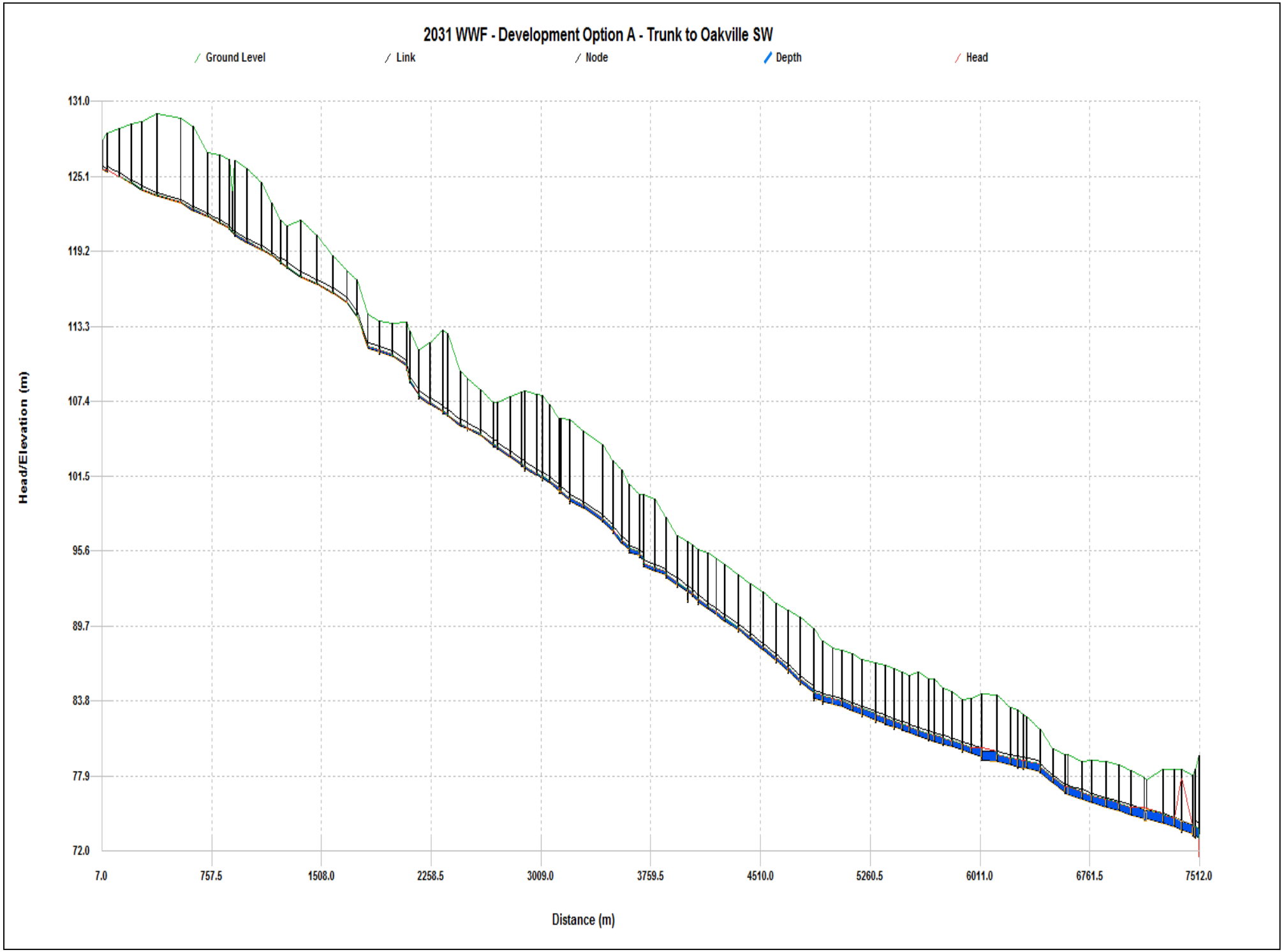
Yours truly,
GENIVAR Inc.

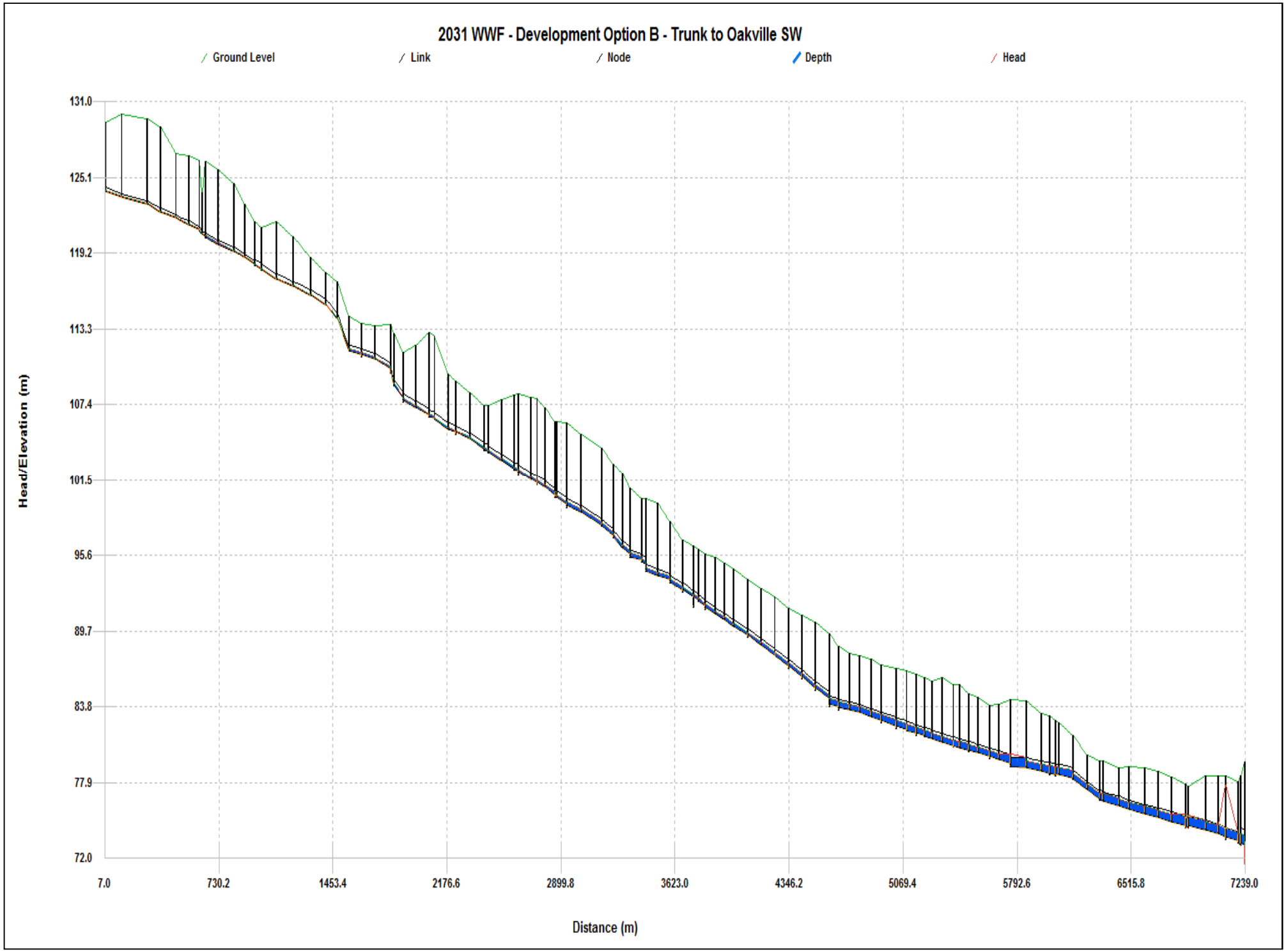
Stan Holden, P.Eng
Project Manager

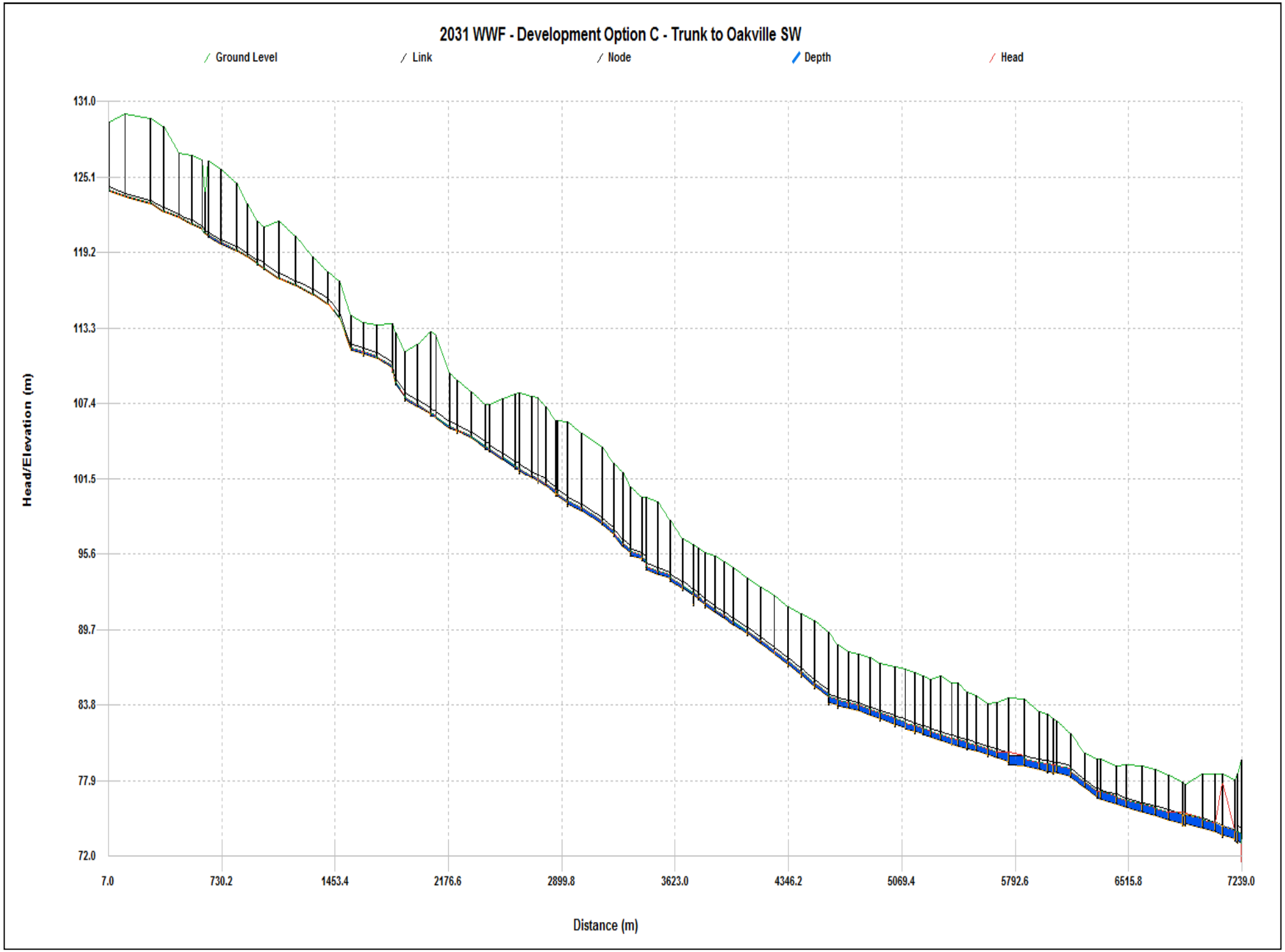
Arash Alkozai
Municipal Designer

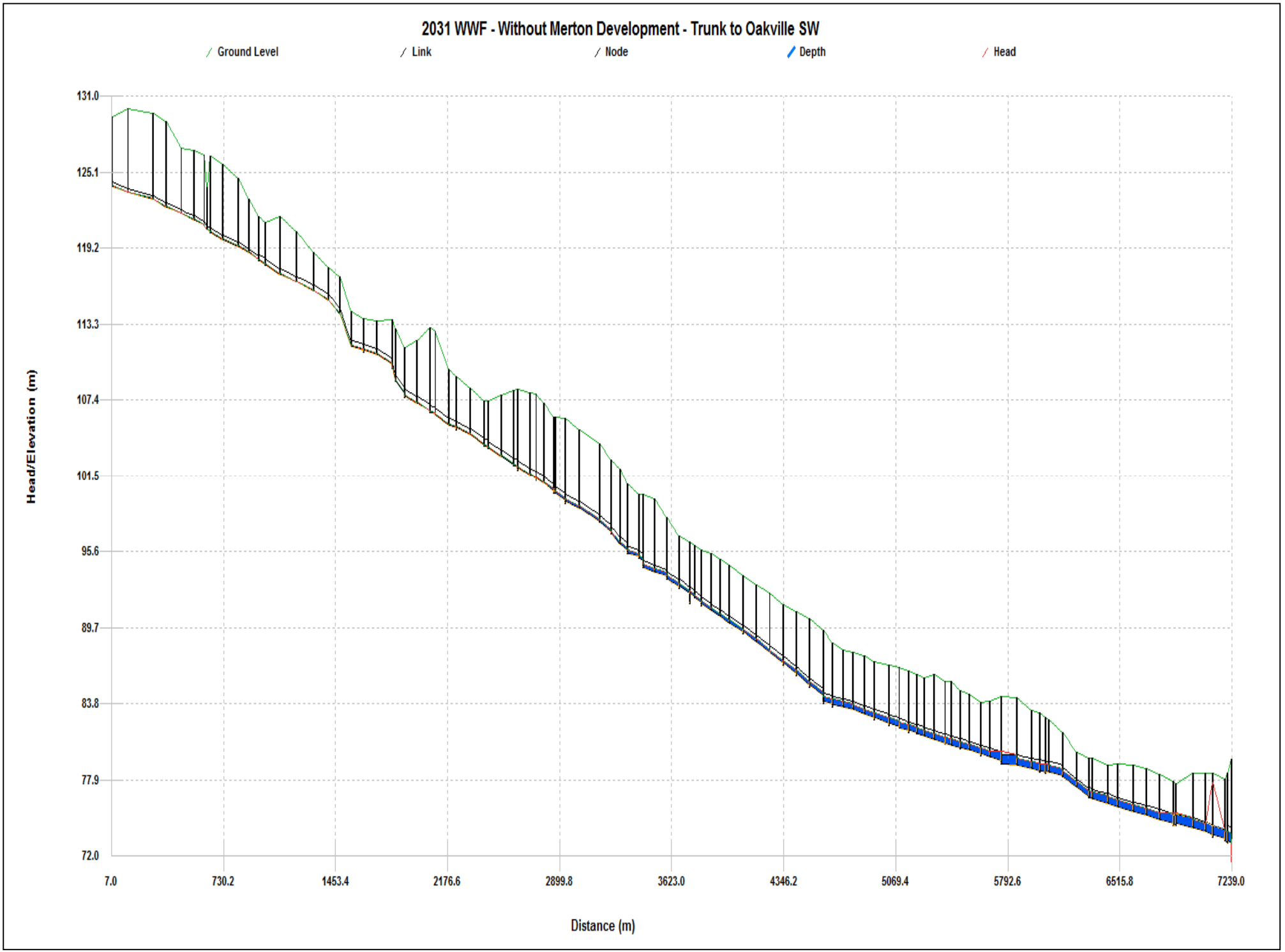
Appendix A

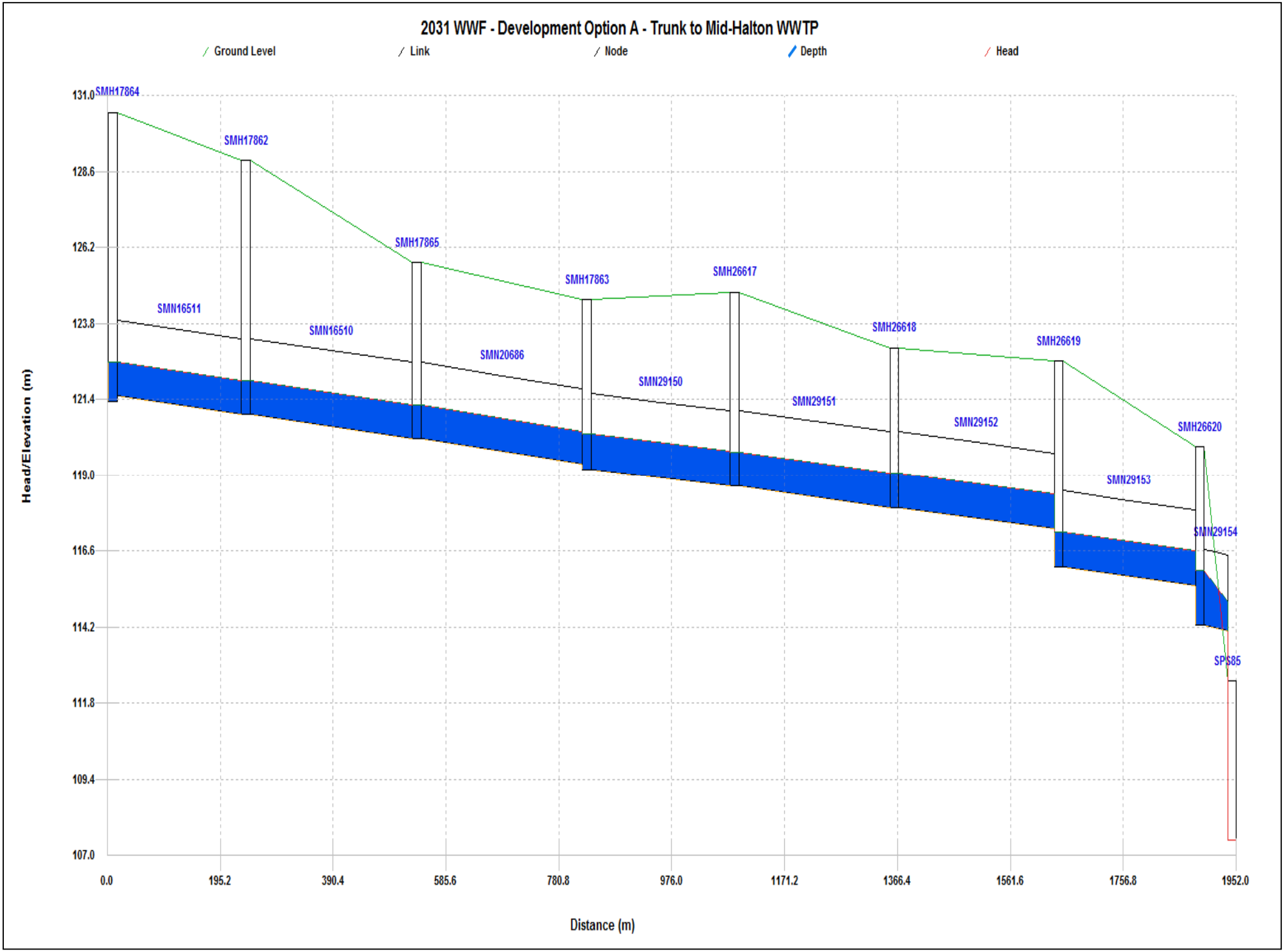
Sanitary Modeling Results

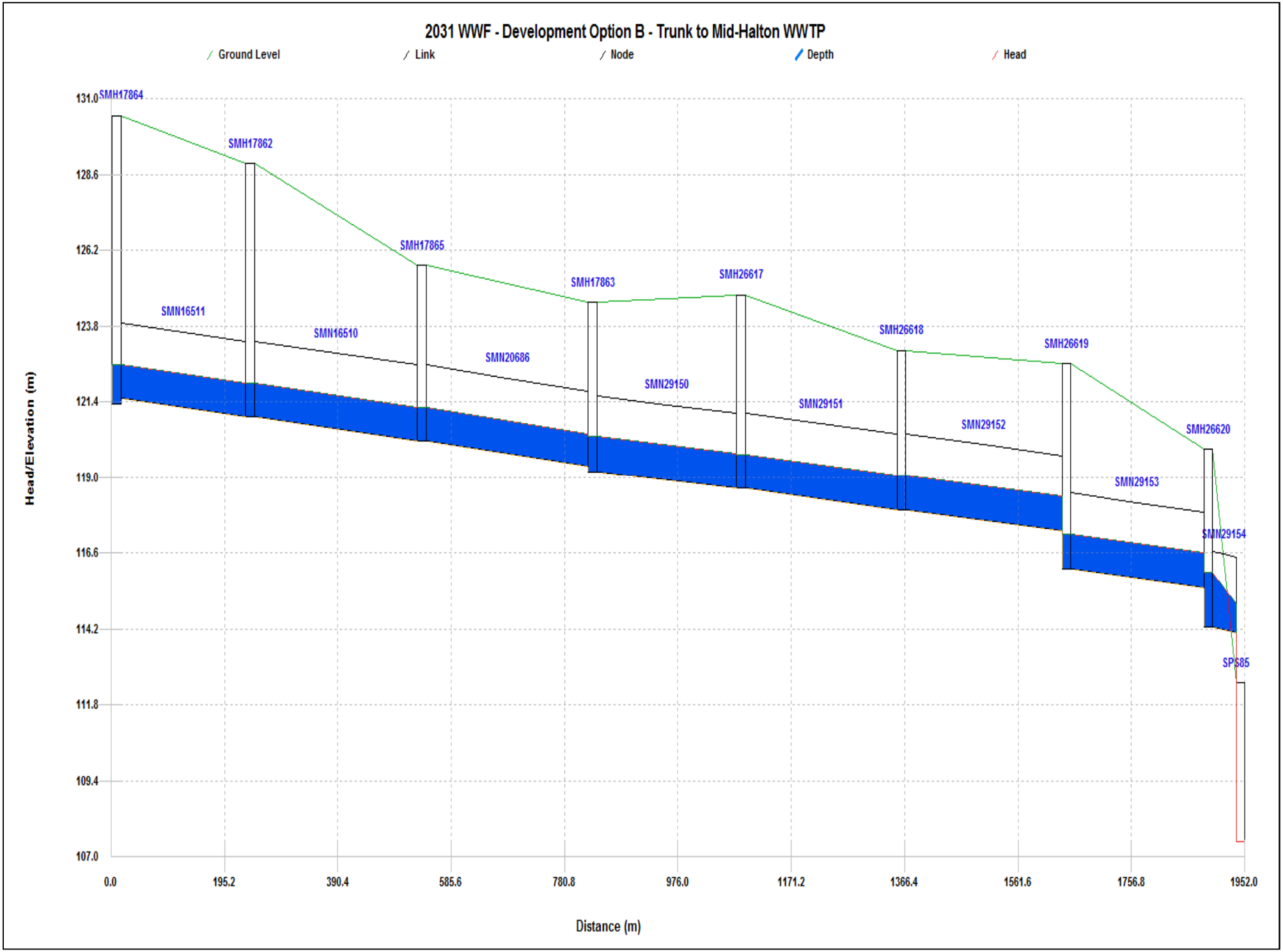

2031 WWF - Development Option A - Trunk to Oakville SW
Ground Level
Link
Node
Depth
Head
131.0
125.1
119.2
113.3
107.4
101.5
95.6
89.7
83.8
77.9
72.0
Head/Elevation (m)
7.0
757.5
1508.0
2258.5
3009.0
3759.5
4510.0
5260.5
6011.0
6761.5
7512.0
Distance (m)

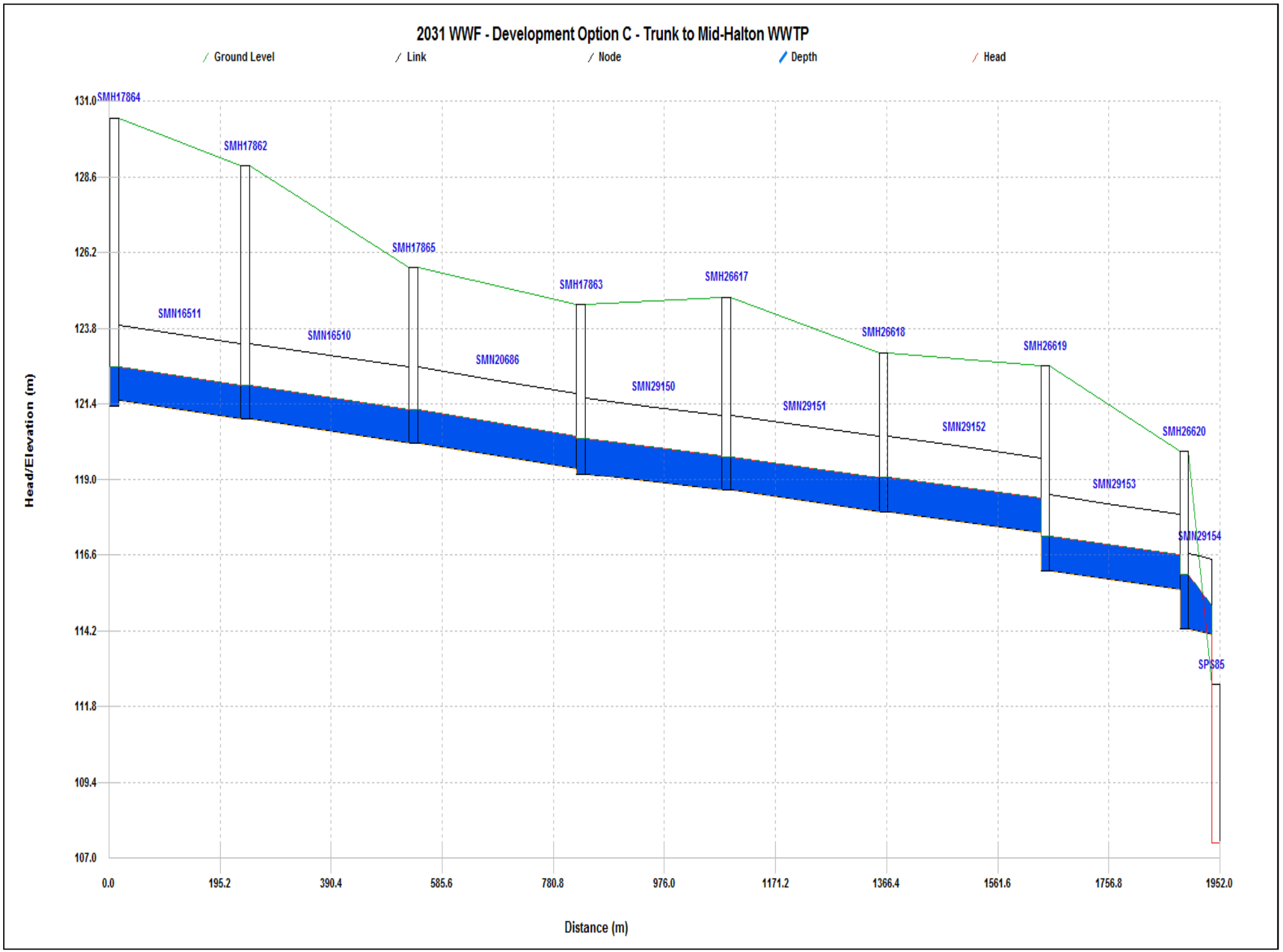

2031 WWF - Development Option B - Trunk to Oakville SW
Ground Level
Link
Node
Depth
Head
131.0
125.1
119.2
113.3
107.4
101.5
95.6
89.7
83.8
77.9
72.0
Head/Elevation (m)
7.0
730.2
1453.4
2176.6
2899.8
3623.0
4346.2
5069.4
5792.6
6515.8
7239.0
Distance (m)

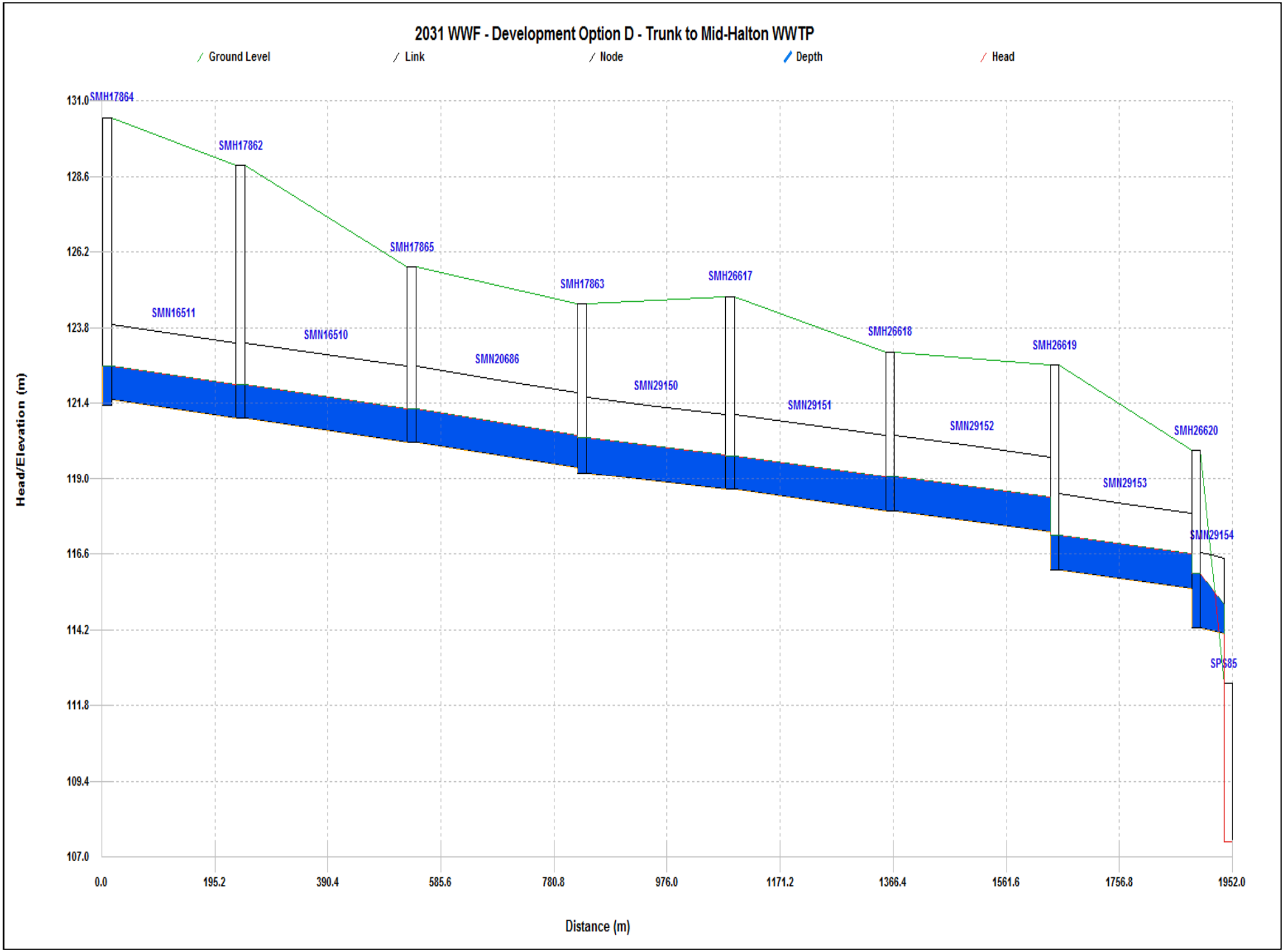

2031 WWF - Development Option C - Trunk to Oakville SW
Ground Level
Link
Node
Depth
Head
131.0
125.1
119.2
113.3
107.4
101.5
95.6
89.7
83.8
77.9
72.0
Head/Elevation (m)
7.0
730.2
1453.4
2176.6
2899.8
3623.0
4346.2
5069.4
5792.6
6515.8
7239.0
Distance (m)

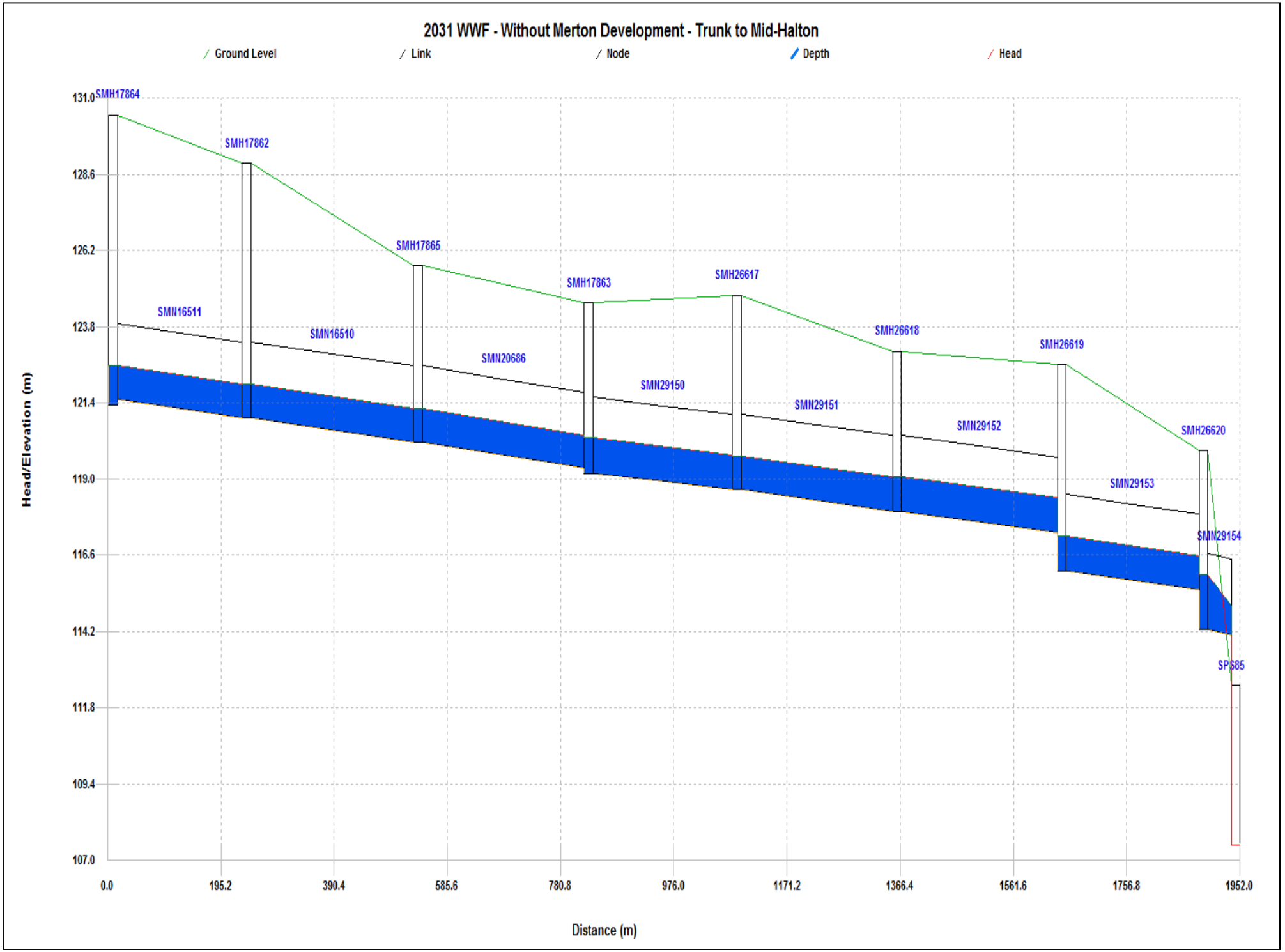

2031 WWF - Without Merton Development - Trunk to Oakville SW
Ground Level
Link
Node
Depth
Head
131.0
125.1
119.2
113.3
107.4
101.5
95.6
89.7
83.8
77.9
72.0
Head/Elevation (m)
7.0
730.2
1453.4
2176.6
2899.8
3623.0
4346.2
5069.4
5792.6
6515.8
7239.0
Distance (m)


2031 WWF - Development Option A - Trunk to Mid-Halton WWTP
Ground Level
Link
Node
Depth
Head
Head/Elevation (m)
131.0
128.6
126.2
123.8
121.4
119.0
116.6
114.2
111.8
109.4
107.0
SMH17864
SMH17862
SMH17865
SMH17863
SMH26617
SMH26618
SMH26619
SMH26620
SPS85
SMN16511
SMN16510
SMN20686
SMN29150
SMN29151
SMN29152
SMN29153
SMN29154
0.0
195.2
390.4
585.6
780.8
976.0
1171.2
1366.4
1561.6
1756.8
1952.0
Distance (m)


2031 WWF - Development Option B - Trunk to Mid-Halton WWTP
Ground Level
Link
Node
Depth
Head
Head/Elevation (m)
131.0
128.6
126.2
123.8
121.4
119.0
116.6
114.2
111.8
109.4
107.0
SMH17864
SMH17862
SMH17865
SMH17863
SMH26617
SMH26618
SMH26619
SMH26620
SMN16511
SMN16510
SMN20686
SMN29150
SMN29151
SMN29152
SMN29153
SMN29154
SPS85
0.0
195.2
390.4
585.6
780.8
976.0
1171.2
1366.4
1561.6
1756.8
1952.0
Distance (m)


2031 WWF - Development Option C - Trunk to Mid-Halton WWTP
Ground Level
Link
Node
Depth
Head
Head/Elevation (m)
131.0
128.6
126.2
123.8
121.4
119.0
116.6
114.2
111.8
109.4
107.0
SMH17864
SMH17862
SMH17865
SMH17863
SMH26617
SMH26618
SMH26619
SMH26620
SPS85
SMN16511
SMN16510
SMN20686
SMN29150
SMN29151
SMN29152
SMN29153
SMN29154
0.0
195.2
390.4
585.6
780.8
976.0
1171.2
1366.4
1561.6
1756.8
1952.0
Distance (m)


2031 WWF - Development Option D - Trunk to Mid-Halton WWTP
Ground Level
Link
Node
Depth
Head
Head/Elevation (m)
131.0
128.6
126.2
123.8
121.4
119.0
116.6
114.2
111.8
109.4
107.0
SMH17864
SMH17862
SMH17865
SMH17863
SMH26617
SMH26618
SMH26619
SMH26620
SMN16511
SMN16510
SMN20686
SMN29150
SMN29151
SMN29152
SMN29153
SMN29154
SPS85
0.0
195.2
390.4
585.6
780.8
976.0
1171.2
1366.4
1561.6
1756.8
1952.0
Distance (m)


2031 WWF - Without Merton Development - Trunk to Mid-Halton
Ground Level
Link
Node
Depth
Head
Head/Elevation (m)
131.0
128.6
126.2
123.8
121.4
119.0
116.6
114.2
111.8
109.4
107.0
SMH17864
SMH17862
SMH17865
SMH17863
SMH26617
SMH26618
SMH26619
SMH26620
SMN16511
SMN16510
SMN20686
SMN29150
SMN29151
SMN29152
SMN29153
SMN29154
SPS85
0.0
195.2
390.4
585.6
780.8
976.0
1171.2
1366.4
1561.6
1756.8
1952.0
Distance (m)

Option A												
Trunk to Oakville Southwest												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN18246	SMH6547	SMH6548	300	67	0.008	0.9	0.8	0.0	Free Surface	0.39	0.07	0.01
SMN5299	SMH5447	SMH5448	300	107	0.005	13.2	5.6	1.9	Free Surface	0.72	0.31	0.20
SMN5298	SMH5448	SMH5449	300	167	0.003	13.3	5.7	1.9	Free Surface	0.63	0.34	0.25
SMN5297	SMH5449	SMH5451	300	88	0.007	13.7	6.1	1.9	Free Surface	0.84	0.28	0.17
SMN5296	SMH5451	SMH5450	300	100	0.005	14.2	6.6	1.9	Free Surface	0.76	0.31	0.21
SMN5295	SMH5450	SMH5452	300	81	0.006	14.5	6.9	1.9	Free Surface	0.81	0.30	0.20
SMN5294	SMH5452	SMH5459	300	68	0.006	14.6	7.0	1.9	Free Surface	0.83	0.30	0.19
SMN5293	SMH5459	SMH5458	300	16	0.017	14.6	7.0	1.9	Free Surface	1.18	0.23	0.12
SMN5292	SMH5458	SMH5457	300	14	0.009	14.6	7.0	1.9	Free Surface	0.95	0.27	0.16
SMN5291	SMH5457	SMH5453	300	84	0.006	20.1	12.6	1.9	Free Surface	0.92	0.35	0.26
SMN5290	SMH5453	SMH5454	300	101	0.005	21.2	13.7	1.9	Free Surface	0.88	0.37	0.30
SMN5289	SMH5454	SMH5455	300	71	0.007	21.3	13.7	1.9	Free Surface	0.95	0.35	0.27
SMN5288	SMH5455	SMH5456	300	60	0.01	21.3	13.8	1.9	Free Surface	1.08	0.32	0.23
SMN5351	SMH5456	SMH5556	450	42	0.007	21.4	13.8	1.9	Free Surface	0.93	0.20	0.09
SMN5352	SMH5556	SMH5553	450	96	0.007	23.2	15.6	1.9	Free Surface	0.95	0.21	0.10
SMN5353	SMH5553	SMH5555	450	112	0.006	23.4	15.8	1.9	Free Surface	0.88	0.22	0.11
SMN4818	SMH5555	SMH5554	450	114	0.006	23.6	16.0	1.9	Free Surface	0.90	0.22	0.11
SMN5350	SMH5554	SMH5557	450	99	0.006	24.4	16.8	1.9	Free Surface	0.94	0.22	0.11
SMN5349	SMH5557	SMH5558	450	70	0.015	24.7	17.2	1.9	Free Surface	1.27	0.18	0.07
SMN5348	SMH5558	SMH4893	450	74	0.034	24.8	17.2	1.9	Free Surface	1.69	0.15	0.05
SMN5347	SMH4893	SMH4890	450	82	0.004	62.0	24.0	11.2	Free Surface	1.01	0.41	0.35
SMN5287	SMH4890	SMH4892	450	86	0.005	62.1	24.1	11.2	Free Surface	1.08	0.39	0.32
SMN12641	SMH4892	SMH14447	450	105	0.007	62.3	24.2	11.2	Free Surface	1.24	0.35	0.27
SMN12643	SMH14447	SMH14448	450	17	0.055	62.3	24.3	11.2	Free Surface	2.63	0.21	0.09
SMN12642	SMH14448	SMH6550	450	57	0.016	62.3	24.3	11.2	Free Surface	1.70	0.28	0.17
SMN5726	SMH6550	SMH6552	525	78	0.007	64.4	26.5	11.3	Free Surface	1.25	0.29	0.18
SMN5720	SMH6552	SMH6551	525	89	0.007	64.8	26.8	11.3	Free Surface	1.25	0.29	0.18
SMN5713	SMH6551	SMH6553	525	31	0.004	64.8	26.9	11.3	Free Surface	1.03	0.33	0.24
SMN5717	SMH6553	SMH6555	525	91	0.009	65.5	27.6	11.3	Free Surface	1.37	0.27	0.16
SMN5723	SMH6555	SMH6554	525	44	0.005	65.9	28.0	11.3	Free Surface	1.11	0.32	0.22
SMN5729	SMH6554	SMH6558	525	93	0.006	69.4	31.7	11.3	Free Surface	1.20	0.31	0.21
SMN5734	SMH6558	SMH6559	525	91	0.009	70.0	32.2	11.3	Free Surface	1.39	0.28	0.18
SMN5733	SMH6559	SMH6560	525	19	0.004	70.0	32.3	11.3	Free Surface	1.04	0.35	0.26
SMN5732	SMH6560	SMH6561	525	90	0.007	70.7	33.0	11.3	Free Surface	1.30	0.30	0.19
SMN5727	SMH6561	SMH6562	525	79	0.008	71.3	33.7	11.3	Free Surface	1.35	0.29	0.19
SMN5721	SMH6562	SMH6527	525	21	0.006	71.4	33.7	11.3	Free Surface	1.25	0.31	0.21
SMN5725	SMH6527	SMH6526	525	80	0.007	75.0	37.4	11.3	Free Surface	1.30	0.31	0.21
SMN5728	SMH6526	SMH6525	525	40	0.007	75.0	37.5	11.3	Free Surface	1.32	0.31	0.21
SMN5731	SMH6525	SMH6730	525	48	0.007	79.4	41.9	11.4	Free Surface	1.34	0.32	0.22
SMN5736	SMH6730	SMH6524	525	61	0.01	79.4	42.0	11.4	Free Surface	1.54	0.29	0.18
SMN15824	SMH6524	SMH6523	525	8	0.002	127.1	90.1	11.6	Free Surface	0.99	0.57	0.63
SMN15823	SMH6523	SMH6522	525	63	0.009	127.2	90.2	11.6	Free Surface	1.64	0.39	0.32
SMN15825	SMH6522	SMH6521	525	92	0.006	143.9	107.3	11.7	Free Surface	1.49	0.46	0.43
SMN15851	SMH6521	SMH17031	525	138	0.007	150.7	114.1	11.7	Free Surface	1.59	0.45	0.42
SMN15852	SMH17031	SMH17032	525	72	0.01	151.3	114.7	11.7	Free Surface	1.82	0.41	0.35
SMN38577	SMH17032	SMH34418	525	59	0.014	151.6	115.0	11.7	Free Surface	2.07	0.37	0.30
SMN38578	SMH34418	SMH17030	525	49	0.009	151.6	115.0	11.7	Free Surface	1.73	0.43	0.38
SMN15849	SMH17030	SMH25910	525	70	0.004	151.7	115.1	11.7	Free Surface	1.24	0.55	0.59
SMN27402	SMH25910	SMH17024	525	27	0.007	151.7	115.1	11.7	Free Surface	1.63	0.45	0.41
SMN15850	SMH17024	SMH17018	525	74	0.005	170.5	134.1	11.8	Free Surface	1.43	0.54	0.57
SMN5755	SMH17018	SMH6520	525	81	0.004	172.3	135.9	11.8	Free Surface	1.27	0.60	0.67
SMN6101	SMH6520	SMH6873	525	76	0.007	172.7	136.3	11.8	Free Surface	1.68	0.48	0.47
SMN6106	SMH6873	SMH6871	525	71	0.008	173.5	137.2	11.8	Free Surface	1.71	0.48	0.46
SMN6104	SMH6871	SMH6870	525	29	0.009	174.0	137.7	11.8	Free Surface	1.79	0.46	0.43
SMN6194	SMH6870	SMH6996	525	40	0.01	174.2	137.9	11.8	Free Surface	1.90	0.44	0.40
SMN6196	SMH6996	SMH6997	525	62	0.008	176.7	140.6	11.8	Free Surface	1.75	0.47	0.46
SMN6195	SMH6997	SMH6868	525	58	0.007	177.0	140.8	11.8	Free Surface	1.69	0.49	0.48
SMN6100	SMH6868	SMH6376	525	56	0.009	177.3	141.2	11.8	Free Surface	1.82	0.46	0.44
SMN5774	SMH6376	SMH6375	525	95	0.007	177.9	141.7	11.8	Free Surface	1.68	0.49	0.49
SMN14294	SMH6375	SMH16351	525	85	0.009	187.1	151.3	11.8	Free Surface	1.85	0.48	0.46

ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN14293	SMH16351	SMH16350	525	88	0.009	187.7	151.9	11.8	Free Surface	1.88	0.47	0.45
SMN14292	SMH16350	SMH16348	525	91	0.009	188.2	152.5	11.8	Free Surface	1.85	0.48	0.46
SMN14291	SMH16348	SMH16349	525	82	0.01	194.0	158.3	11.8	Free Surface	1.93	0.47	0.45
SMN14290	SMH16349	SMH6369	525	85	0.01	232.0	197.2	11.8	Free Surface	2.05	0.52	0.53
SMN5870	SMH6369	SMH6231	525	94	0.009	233.1	198.4	11.8	Free Surface	1.94	0.54	0.57
SMN5880	SMH6231	SMH6227	675	56	0.003	412.1	378.3	12.1	Free Surface	1.53	0.71	0.85
SMN5879	SMH6227	SMH6228	675	71	0.003	413.8	380.0	12.0	Free Surface	1.42	0.76	0.92
SMN5877	SMH6228	SMH6230	675	60	0.003	414.2	380.4	12.0	Free Surface	1.40	0.77	0.94
SMN5872	SMH6230	SMH6229	675	73	0.005	414.8	381.0	12.0	Free Surface	1.76	0.63	0.72
SMN5882	SMH6229	SMH6151	675	65	0.004	415.2	381.4	12.0	Free Surface	1.69	0.65	0.75
SMN5899	SMH6151	SMH6149	675	98	0.004	417.8	384.0	12.0	Free Surface	1.60	0.69	0.81
SMN5898	SMH6149	SMH6157	675	65	0.004	420.9	387.3	12.0	Free Surface	1.63	0.68	0.81
SMN5875	SMH6157	SMH6156	675	59	0.004	421.4	387.8	12.0	Free Surface	1.62	0.68	0.81
SMN5853	SMH6156	SMH6158	675	52	0.004	425.8	392.3	12.0	Free Surface	1.59	0.70	0.84
SMN5845	SMH6158	SMH6159	675	49	0.004	427.1	393.6	12.0	Free Surface	1.60	0.70	0.83
SMN5849	SMH6159	SMH6161	675	63	0.004	427.4	393.9	12.0	Free Surface	1.66	0.68	0.80
SMN5861	SMH6161	SMH6160	675	71	0.004	427.9	394.4	12.0	Free Surface	1.61	0.69	0.83
SMN5873	SMH6160	SMH6208	675	36	0.005	429.4	396.0	12.0	Free Surface	1.74	0.65	0.76
SMN5886	SMH6208	SMH6207	675	58	0.003	429.8	396.3	12.0	Free Surface	1.51	0.74	0.90
SMN5904	SMH6207	SMH6210	675	59	0.004	431.3	397.9	12.0	Free Surface	1.68	0.68	0.80
SMN5923	SMH6210	SMH6209	675	72	0.004	431.7	398.3	12.0	Free Surface	1.61	0.70	0.84
SMN5938	SMH6209	SMH6498	675	61	0.004	435.7	402.3	12.0	Free Surface	1.65	0.69	0.83
SMN5950	SMH6498	SMH6123	675	71	0.004	436.1	402.8	12.0	Free Surface	1.59	0.72	0.86
SMN5949	SMH6123	SMH6126	750	106	0.001	611.1	547.6	25.2	Pressurized	1.38	1.00	2.28
SMN36879	SMH6126	SMH33844	825	98	0.003	611.5	548.0	25.2	Free Surface	1.52	0.71	0.85
SMN36880	SMH33844	SMH7041	825	49	0.002	611.7	548.2	25.2	Free Surface	1.49	0.72	0.86
SMN6234	SMH7041	SMH6125	825	37	0.003	615.7	552.3	25.2	Free Surface	1.59	0.68	0.81
SMN36877	SMH6125	SMH33843	825	16	0.002	618.4	555.1	25.2	Free Surface	1.38	0.78	0.95
SMN36878	SMH33843	SMH6127	825	95	0.003	618.9	555.6	25.2	Free Surface	1.56	0.70	0.83
SMN5884	SMH6127	SMH6128	675	90	0.009	619.7	556.4	25.2	Free Surface	2.51	0.65	0.76
SMN5862	SMH6128	SMH6069	675	83	0.009	620.2	556.9	25.2	Free Surface	2.46	0.67	0.78
SMN5846	SMH6069	SMH6070	750	17	0.009	620.2	556.9	25.2	Free Surface	2.45	0.56	0.60
SMN5844	SMH6070	SMH6073	750	100	0.003	620.4	557.1	25.2	Free Surface	1.61	0.81	0.99
SMN6187	SMH6073	SMH6991	750	67	0.005	620.5	557.2	25.2	Free Surface	1.97	0.67	0.79
SMN6188	SMH6991	SMH6992	750	99	0.003	620.7	557.4	25.2	Free Surface	1.66	0.79	0.97
SMN6189	SMH6992	SMH6075	750	89	0.003	621.1	557.9	25.2	Free Surface	1.63	0.81	0.99
SMN6545	SMH6075	SMH6078	750	85	0.004	621.7	558.5	25.2	Free Surface	1.78	0.74	0.89
SMN6524	SMH6078	SMH6079	750	92	0.004	621.9	558.6	25.2	Free Surface	1.72	0.76	0.93
SMN6509	SMH6079	SFT114	750	13	0.003	651.5	588.7	25.2	Pressurized	1.70	0.81	0.99
SMN6502	SFT114	SMH6082	750	113	0.003	651.7	588.9	25.2	Pressurized	1.48	1.00	1.14
SMN6480	SMH6082	SMH6083	750	80	0.004	651.8	589.0	25.2	Free Surface	1.75	0.79	0.96
SMN6623	SMH6083	SMH6086	750	48	0.006	651.9	589.1	25.2	Free Surface	2.22	0.63	0.72
SMN6624	SMH6086	SMH6087	750	80	0.003	729.3	667.5	25.3	Pressurized	1.65	1.00	1.16
SMN20762	SMH6087	SMH26611	750	10	0.016	729.4	667.6	25.3	Free Surface	3.20	0.51	0.52
SMN28950	SMH26611	SPS25	1200	24	0.007	2001.4	1799.3	103.5	Free Surface	3.01	0.57	0.62

Option B												
Trunk to Oakville Southwest												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN18246	SMH6547	SMH6548	300	67	0.008	0.9	0.8	0.0	Free Surface	0.39	0.07	0.01
SMN5299	SMH5447	SMH5448	300	107	0.005	12.9	5.6	1.9	Free Surface	0.72	0.30	0.20
SMN5298	SMH5448	SMH5449	300	167	0.003	13.0	5.7	1.9	Free Surface	0.63	0.34	0.24
SMN5297	SMH5449	SMH5451	300	88	0.007	13.4	6.1	1.9	Free Surface	0.83	0.28	0.17
SMN5296	SMH5451	SMH5450	300	100	0.005	13.9	6.6	1.9	Free Surface	0.76	0.31	0.20
SMN5295	SMH5450	SMH5452	300	81	0.006	14.2	6.9	1.9	Free Surface	0.80	0.30	0.20
SMN5294	SMH5452	SMH5459	300	68	0.006	14.3	7.0	1.9	Free Surface	0.83	0.29	0.19
SMN5293	SMH5459	SMH5458	300	16	0.017	14.3	7.0	1.9	Free Surface	1.18	0.23	0.11
SMN5292	SMH5458	SMH5457	300	14	0.009	14.3	7.0	1.9	Free Surface	0.94	0.27	0.16
SMN5291	SMH5457	SMH5453	300	84	0.006	19.8	12.6	1.9	Free Surface	0.92	0.35	0.26
SMN5290	SMH5453	SMH5454	300	101	0.005	20.9	13.7	1.9	Free Surface	0.88	0.37	0.29
SMN5289	SMH5454	SMH5455	300	71	0.007	21.0	13.7	1.9	Free Surface	0.95	0.35	0.26
SMN5288	SMH5455	SMH5456	300	60	0.01	21.0	13.8	1.9	Free Surface	1.08	0.32	0.22
SMN5351	SMH5456	SMH5556	450	42	0.007	21.1	13.8	1.9	Free Surface	0.93	0.20	0.09
SMN5352	SMH5556	SMH5553	450	96	0.007	22.9	15.6	1.9	Free Surface	0.95	0.21	0.10
SMN5353	SMH5553	SMH5555	450	112	0.006	23.1	15.8	1.9	Free Surface	0.88	0.22	0.11
SMN4818	SMH5555	SMH5554	450	114	0.006	23.3	16.0	1.9	Free Surface	0.89	0.22	0.11
SMN5350	SMH5554	SMH5557	450	99	0.006	24.1	16.8	1.9	Free Surface	0.94	0.22	0.11
SMN5349	SMH5557	SMH5558	450	70	0.015	24.4	17.2	1.9	Free Surface	1.27	0.18	0.07
SMN5348	SMH5558	SMH4893	450	74	0.034	24.5	17.2	1.9	Free Surface	1.69	0.15	0.05
SMN5347	SMH4893	SMH4890	450	82	0.004	61.8	24.0	11.2	Free Surface	1.01	0.41	0.35
SMN5287	SMH4890	SMH4892	450	86	0.005	61.9	24.1	11.2	Free Surface	1.08	0.39	0.32
SMN12641	SMH4892	SMH14447	450	105	0.007	62.0	24.2	11.2	Free Surface	1.24	0.35	0.27
SMN12643	SMH14447	SMH14448	450	17	0.055	62.0	24.3	11.2	Free Surface	2.63	0.21	0.09
SMN12642	SMH14448	SMH6550	450	57	0.016	62.1	24.3	11.2	Free Surface	1.70	0.28	0.17
SMN5726	SMH6550	SMH6552	525	78	0.007	64.2	26.5	11.2	Free Surface	1.25	0.29	0.18
SMN5720	SMH6552	SMH6551	525	89	0.007	64.5	26.8	11.2	Free Surface	1.25	0.29	0.18
SMN5713	SMH6551	SMH6553	525	31	0.004	64.5	26.9	11.2	Free Surface	1.03	0.33	0.24
SMN5717	SMH6553	SMH6555	525	91	0.009	65.2	27.6	11.2	Free Surface	1.37	0.27	0.16
SMN5723	SMH6555	SMH6554	525	44	0.005	65.7	28.0	11.2	Free Surface	1.11	0.32	0.22
SMN5729	SMH6554	SMH6558	525	93	0.006	69.2	31.7	11.2	Free Surface	1.20	0.31	0.21
SMN5734	SMH6558	SMH6559	525	91	0.009	69.7	32.2	11.2	Free Surface	1.39	0.28	0.17
SMN5733	SMH6559	SMH6560	525	19	0.004	69.7	32.3	11.2	Free Surface	1.03	0.35	0.26
SMN5732	SMH6560	SMH6561	525	90	0.007	70.4	33.0	11.2	Free Surface	1.30	0.30	0.19
SMN5727	SMH6561	SMH6562	525	79	0.008	71.1	33.7	11.2	Free Surface	1.35	0.29	0.19
SMN5721	SMH6562	SMH6527	525	21	0.006	71.1	33.7	11.2	Free Surface	1.25	0.31	0.21
SMN5725	SMH6527	SMH6526	525	80	0.007	74.7	37.4	11.3	Free Surface	1.30	0.31	0.21
SMN5728	SMH6526	SMH6525	525	40	0.007	74.8	37.5	11.3	Free Surface	1.32	0.31	0.21
SMN5731	SMH6525	SMH6730	525	48	0.007	79.1	41.9	11.3	Free Surface	1.34	0.32	0.22
SMN5736	SMH6730	SMH6524	525	61	0.01	79.2	42.0	11.3	Free Surface	1.54	0.29	0.18
SMN15824	SMH6524	SMH6523	525	8	0.002	126.9	90.1	11.5	Free Surface	0.99	0.57	0.62
SMN15823	SMH6523	SMH6522	525	63	0.009	127.0	90.2	11.5	Free Surface	1.64	0.39	0.32
SMN15825	SMH6522	SMH6521	525	92	0.006	143.7	107.3	11.6	Free Surface	1.49	0.46	0.43
SMN15851	SMH6521	SMH17031	525	138	0.007	150.4	114.1	11.6	Free Surface	1.59	0.45	0.42
SMN15852	SMH17031	SMH17032	525	72	0.01	151.1	114.7	11.6	Free Surface	1.82	0.41	0.35
SMN38577	SMH17032	SMH34418	525	59	0.014	151.3	115.0	11.6	Free Surface	2.07	0.37	0.30
SMN38578	SMH34418	SMH17030	525	49	0.009	151.3	115.0	11.6	Free Surface	1.73	0.43	0.38
SMN15849	SMH17030	SMH25910	525	70	0.004	151.4	115.1	11.6	Free Surface	1.24	0.55	0.59
SMN27402	SMH25910	SMH17024	525	27	0.007	151.5	115.1	11.6	Free Surface	1.63	0.45	0.41
SMN15850	SMH17024	SMH17018	525	74	0.005	170.2	134.1	11.8	Free Surface	1.43	0.54	0.57
SMN5755	SMH17018	SMH6520	525	81	0.004	172.1	135.9	11.8	Free Surface	1.27	0.60	0.67
SMN6101	SMH6520	SMH6873	525	76	0.007	172.5	136.3	11.8	Free Surface	1.68	0.48	0.47
SMN6106	SMH6873	SMH6871	525	71	0.008	173.3	137.2	11.8	Free Surface	1.70	0.48	0.46
SMN6104	SMH6871	SMH6870	525	29	0.009	173.8	137.7	11.8	Free Surface	1.79	0.46	0.43
SMN6194	SMH6870	SMH6996	525	40	0.01	173.9	137.9	11.8	Free Surface	1.90	0.44	0.40
SMN6196	SMH6996	SMH6997	525	62	0.008	176.5	140.6	11.7	Free Surface	1.75	0.47	0.45
SMN6195	SMH6997	SMH6868	525	58	0.007	176.7	140.8	11.7	Free Surface	1.69	0.49	0.48
SMN6100	SMH6868	SMH6376	525	56	0.009	177.1	141.2	11.7	Free Surface	1.81	0.46	0.44
SMN5774	SMH6376	SMH6375	525	95	0.007	177.6	141.7	11.7	Free Surface	1.68	0.49	0.49
SMN14294	SMH6375	SMH16351	525	85	0.009	186.9	151.3	11.7	Free Surface	1.85	0.48	0.46
SMN14293	SMH16351	SMH16350	525	88	0.009	187.4	151.9	11.7	Free Surface	1.88	0.47	0.45
SMN14292	SMH16350	SMH16348	525	91	0.009	188.0	152.5	11.7	Free Surface	1.85	0.48	0.46
SMN14291	SMH16348	SMH16349	525	82	0.01	193.8	158.3	11.7	Free Surface	1.93	0.47	0.45

ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN14290	SMH16349	SMH6369	525	85	0.01	231.8	197.2	11.7	Free Surface	2.05	0.52	0.53
SMN5870	SMH6369	SMH6231	525	94	0.009	232.9	198.4	11.7	Free Surface	1.94	0.54	0.57
SMN5880	SMH6231	SMH6227	675	56	0.003	411.9	378.3	12.0	Free Surface	1.53	0.71	0.84
SMN5879	SMH6227	SMH6228	675	71	0.003	413.6	380.0	12.0	Free Surface	1.42	0.76	0.92
SMN5877	SMH6228	SMH6230	675	60	0.003	413.9	380.4	12.0	Free Surface	1.40	0.77	0.94
SMN5872	SMH6230	SMH6229	675	73	0.005	414.5	381.0	12.0	Free Surface	1.76	0.63	0.72
SMN5882	SMH6229	SMH6151	675	65	0.004	414.9	381.4	12.0	Free Surface	1.69	0.65	0.75
SMN5899	SMH6151	SMH6149	675	98	0.004	417.5	384.0	12.0	Free Surface	1.60	0.68	0.81
SMN5898	SMH6149	SMH6157	675	65	0.004	420.7	387.3	11.9	Free Surface	1.62	0.68	0.81
SMN5875	SMH6157	SMH6156	675	59	0.004	421.2	387.8	11.9	Free Surface	1.62	0.68	0.81
SMN5853	SMH6156	SMH6158	675	52	0.004	425.5	392.3	11.9	Free Surface	1.59	0.70	0.84
SMN5845	SMH6158	SMH6159	675	49	0.004	426.9	393.6	11.9	Free Surface	1.60	0.70	0.83
SMN5849	SMH6159	SMH6161	675	63	0.004	427.2	393.9	11.9	Free Surface	1.66	0.68	0.80
SMN5861	SMH6161	SMH6160	675	71	0.004	427.6	394.4	11.9	Free Surface	1.61	0.69	0.83
SMN5873	SMH6160	SMH6208	675	36	0.005	429.2	396.0	11.9	Free Surface	1.74	0.65	0.76
SMN5886	SMH6208	SMH6207	675	58	0.003	429.6	396.3	11.9	Free Surface	1.51	0.74	0.90
SMN5904	SMH6207	SMH6210	675	59	0.004	431.1	397.9	11.9	Free Surface	1.68	0.68	0.80
SMN5923	SMH6210	SMH6209	675	72	0.004	431.5	398.3	11.9	Free Surface	1.61	0.70	0.84
SMN5938	SMH6209	SMH6498	675	61	0.004	435.4	402.3	11.9	Free Surface	1.65	0.69	0.83
SMN5950	SMH6498	SMH6123	675	71	0.004	435.9	402.8	11.9	Free Surface	1.59	0.72	0.86
SMN5949	SMH6123	SMH6126	750	106	0.001	610.9	547.6	25.1	Pressurized	1.38	1.00	2.28
SMN36879	SMH6126	SMH33844	825	98	0.003	611.4	548.0	25.1	Free Surface	1.51	0.71	0.85
SMN36880	SMH33844	SMH7041	825	49	0.002	611.6	548.2	25.1	Free Surface	1.49	0.72	0.86
SMN6234	SMH7041	SMH6125	825	37	0.003	615.5	552.3	25.1	Free Surface	1.59	0.68	0.81
SMN36877	SMH6125	SMH33843	825	16	0.002	618.2	555.1	25.1	Free Surface	1.38	0.78	0.95
SMN36878	SMH33843	SMH6127	825	95	0.003	618.7	555.6	25.1	Free Surface	1.56	0.70	0.83
SMN5884	SMH6127	SMH6128	675	90	0.009	619.5	556.4	25.1	Free Surface	2.51	0.65	0.76
SMN5862	SMH6128	SMH6069	675	83	0.009	620.0	556.9	25.1	Free Surface	2.46	0.67	0.78
SMN5846	SMH6069	SMH6070	750	17	0.009	620.0	556.9	25.1	Free Surface	2.45	0.56	0.60
SMN5844	SMH6070	SMH6073	750	100	0.003	620.2	557.1	25.1	Free Surface	1.61	0.81	0.99
SMN6187	SMH6073	SMH6991	750	67	0.005	620.3	557.2	25.1	Free Surface	1.97	0.67	0.79
SMN6188	SMH6991	SMH6992	750	99	0.003	620.5	557.4	25.1	Free Surface	1.66	0.79	0.97
SMN6189	SMH6992	SMH6075	750	89	0.003	620.9	557.9	25.1	Free Surface	1.63	0.81	0.99
SMN6545	SMH6075	SMH6078	750	85	0.004	621.5	558.5	25.1	Free Surface	1.78	0.74	0.89
SMN6524	SMH6078	SMH6079	750	92	0.004	621.7	558.6	25.1	Free Surface	1.72	0.76	0.93
SMN6509	SMH6079	SFT114	750	13	0.003	651.3	588.7	25.1	Pressurized	1.70	0.81	0.99
SMN6502	SFT114	SMH6082	750	113	0.003	651.5	588.9	25.1	Pressurized	1.48	1.00	1.14
SMN6480	SMH6082	SMH6083	750	80	0.004	651.6	589.0	25.1	Free Surface	1.75	0.79	0.96
SMN6623	SMH6083	SMH6086	750	48	0.006	651.7	589.1	25.1	Free Surface	2.22	0.63	0.72
SMN6624	SMH6086	SMH6087	750	80	0.003	729.1	667.5	25.2	Pressurized	1.65	1.00	1.16
SMN20762	SMH6087	SMH26611	750	10	0.016	729.2	667.6	25.2	Free Surface	3.20	0.51	0.52
SMN28950	SMH26611	SPS25	1200	24	0.007	2001.2	1799.3	103.4	Free Surface	3.01	0.57	0.62

Option C												
Trunk to Oakville Southwest												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN18246	SMH6547	SMH6548	300	67	0.008	0.9	0.8	0.0	Free Surface	0.39	0.07	0.01
SMN5299	SMH5447	SMH5448	300	107	0.005	11.8	5.6	1.6	Free Surface	0.70	0.29	0.18
SMN5298	SMH5448	SMH5449	300	167	0.003	12.0	5.8	1.6	Free Surface	0.61	0.32	0.22
SMN5297	SMH5449	SMH5451	300	88	0.007	12.3	6.1	1.6	Free Surface	0.82	0.27	0.16
SMN5296	SMH5451	SMH5450	300	100	0.005	12.9	6.7	1.6	Free Surface	0.74	0.29	0.19
SMN5295	SMH5450	SMH5452	300	81	0.006	13.2	7.0	1.6	Free Surface	0.78	0.29	0.18
SMN5294	SMH5452	SMH5459	300	68	0.006	13.2	7.0	1.6	Free Surface	0.81	0.28	0.17
SMN5293	SMH5459	SMH5458	300	16	0.017	13.2	7.0	1.6	Free Surface	1.15	0.22	0.11
SMN5292	SMH5458	SMH5457	300	14	0.009	13.3	7.0	1.6	Free Surface	0.92	0.26	0.14
SMN5291	SMH5457	SMH5453	300	84	0.006	18.8	12.6	1.6	Free Surface	0.91	0.34	0.24
SMN5290	SMH5453	SMH5454	300	101	0.005	19.9	13.7	1.6	Free Surface	0.87	0.36	0.28
SMN5289	SMH5454	SMH5455	300	71	0.007	19.9	13.7	1.6	Free Surface	0.94	0.34	0.25
SMN5288	SMH5455	SMH5456	300	60	0.01	20.0	13.8	1.6	Free Surface	1.06	0.31	0.21
SMN5351	SMH5456	SMH5556	450	42	0.007	20.0	13.8	1.6	Free Surface	0.92	0.20	0.08
SMN5352	SMH5556	SMH5553	450	96	0.007	21.8	15.6	1.6	Free Surface	0.94	0.20	0.09
SMN5353	SMH5553	SMH5555	450	112	0.006	22.0	15.8	1.6	Free Surface	0.86	0.22	0.10
SMN4818	SMH5555	SMH5554	450	114	0.006	22.2	16.0	1.6	Free Surface	0.88	0.22	0.10
SMN5350	SMH5554	SMH5557	450	99	0.006	23.0	16.8	1.6	Free Surface	0.93	0.21	0.10
SMN5349	SMH5557	SMH5558	450	70	0.015	23.4	17.2	1.6	Free Surface	1.25	0.18	0.07
SMN5348	SMH5558	SMH4893	450	74	0.034	23.5	17.3	1.6	Free Surface	1.66	0.14	0.05
SMN5347	SMH4893	SMH4890	450	82	0.004	60.9	24.0	10.9	Free Surface	1.00	0.41	0.35
SMN5287	SMH4890	SMH4892	450	86	0.005	61.1	24.2	10.9	Free Surface	1.08	0.39	0.32
SMN12641	SMH4892	SMH14447	450	105	0.007	61.2	24.3	10.9	Free Surface	1.23	0.35	0.26
SMN12643	SMH14447	SMH14448	450	17	0.055	61.2	24.3	10.9	Free Surface	2.62	0.20	0.09
SMN12642	SMH14448	SMH6550	450	57	0.016	61.2	24.4	10.9	Free Surface	1.70	0.28	0.17
SMN5726	SMH6550	SMH6552	525	78	0.007	63.3	26.5	10.9	Free Surface	1.25	0.29	0.18
SMN5720	SMH6552	SMH6551	525	89	0.007	63.7	26.9	10.9	Free Surface	1.25	0.29	0.18
SMN5713	SMH6551	SMH6553	525	31	0.004	63.7	26.9	10.9	Free Surface	1.03	0.33	0.23
SMN5717	SMH6553	SMH6555	525	91	0.009	64.4	27.6	10.9	Free Surface	1.36	0.27	0.16
SMN5723	SMH6555	SMH6554	525	44	0.005	64.8	28.1	10.9	Free Surface	1.11	0.32	0.22
SMN5729	SMH6554	SMH6558	525	93	0.006	68.3	31.7	10.9	Free Surface	1.20	0.31	0.21
SMN5734	SMH6558	SMH6559	525	91	0.009	68.9	32.3	10.9	Free Surface	1.38	0.28	0.17
SMN5733	SMH6559	SMH6560	525	19	0.004	68.9	32.3	10.9	Free Surface	1.03	0.35	0.26
SMN5732	SMH6560	SMH6561	525	90	0.007	69.6	33.0	10.9	Free Surface	1.30	0.30	0.19
SMN5727	SMH6561	SMH6562	525	79	0.008	70.3	33.7	11.0	Free Surface	1.35	0.29	0.18
SMN5721	SMH6562	SMH6527	525	21	0.006	70.3	33.7	11.0	Free Surface	1.25	0.31	0.20
SMN5725	SMH6527	SMH6526	525	80	0.007	73.9	37.4	11.0	Free Surface	1.29	0.31	0.21
SMN5728	SMH6526	SMH6525	525	40	0.007	73.9	37.5	11.0	Free Surface	1.32	0.31	0.20
SMN5731	SMH6525	SMH6730	525	48	0.007	78.3	41.9	11.0	Free Surface	1.34	0.32	0.22
SMN5736	SMH6730	SMH6524	525	61	0.01	78.4	42.0	11.0	Free Surface	1.53	0.29	0.18
SMN15824	SMH6524	SMH6523	525	8	0.002	126.0	90.1	11.2	Free Surface	0.99	0.57	0.62
SMN15823	SMH6523	SMH6522	525	63	0.009	126.1	90.2	11.2	Free Surface	1.64	0.39	0.32
SMN15825	SMH6522	SMH6521	525	92	0.006	142.9	107.4	11.3	Free Surface	1.48	0.46	0.43
SMN15851	SMH6521	SMH17031	525	138	0.007	149.6	114.1	11.3	Free Surface	1.59	0.45	0.41
SMN15852	SMH17031	SMH17032	525	72	0.01	150.3	114.8	11.3	Free Surface	1.82	0.41	0.35
SMN38577	SMH17032	SMH34418	525	59	0.014	150.5	115.0	11.3	Free Surface	2.06	0.37	0.29
SMN38578	SMH34418	SMH17030	525	49	0.009	150.5	115.0	11.3	Free Surface	1.72	0.42	0.37
SMN15849	SMH17030	SMH25910	525	70	0.004	150.6	115.1	11.4	Free Surface	1.23	0.55	0.59
SMN27402	SMH25910	SMH17024	525	27	0.007	150.6	115.2	11.4	Free Surface	1.63	0.44	0.41
SMN15850	SMH17024	SMH17018	525	74	0.005	169.4	134.1	11.5	Free Surface	1.43	0.54	0.57
SMN5755	SMH17018	SMH6520	525	81	0.004	171.3	135.9	11.5	Free Surface	1.27	0.60	0.67
SMN6101	SMH6520	SMH6873	525	76	0.007	171.7	136.4	11.5	Free Surface	1.67	0.48	0.47
SMN6106	SMH6873	SMH6871	525	71	0.008	172.5	137.2	11.5	Free Surface	1.70	0.48	0.46
SMN6104	SMH6871	SMH6870	525	29	0.009	173.0	137.7	11.5	Free Surface	1.79	0.46	0.43
SMN6194	SMH6870	SMH6996	525	40	0.01	173.1	137.9	11.5	Free Surface	1.90	0.44	0.40
SMN6196	SMH6996	SMH6997	525	62	0.008	175.7	140.6	11.5	Free Surface	1.75	0.47	0.45
SMN6195	SMH6997	SMH6868	525	58	0.007	175.9	140.9	11.5	Free Surface	1.69	0.49	0.47
SMN6100	SMH6868	SMH6376	525	56	0.009	176.3	141.2	11.5	Free Surface	1.81	0.46	0.43
SMN5774	SMH6376	SMH6375	525	95	0.007	176.8	141.8	11.5	Free Surface	1.68	0.49	0.48
SMN14294	SMH6375	SMH16351	525	85	0.009	186.1	151.3	11.4	Free Surface	1.84	0.47	0.46
SMN14293	SMH16351	SMH16350	525	88	0.009	186.6	151.9	11.4	Free Surface	1.87	0.47	0.45
SMN14292	SMH16350	SMH16348	525	91	0.009	187.2	152.5	11.4	Free Surface	1.85	0.48	0.46

SMN14291	SMH16348	SMH16349	525	82	0.01	193.0	158.4	11.4	Free Surface	1.92	0.47	0.45
SMN14290	SMH16349	SMH6369	525	85	0.01	231.0	197.2	11.5	Free Surface	2.05	0.52	0.53
SMN5870	SMH6369	SMH6231	525	94	0.009	232.1	198.4	11.5	Free Surface	1.94	0.54	0.57
SMN5880	SMH6231	SMH6227	675	56	0.003	411.2	378.3	11.7	Free Surface	1.53	0.70	0.84
SMN5879	SMH6227	SMH6228	675	71	0.003	412.9	380.0	11.7	Free Surface	1.42	0.76	0.92
SMN5877	SMH6228	SMH6230	675	60	0.003	413.2	380.4	11.7	Free Surface	1.40	0.77	0.94
SMN5872	SMH6230	SMH6229	675	73	0.005	413.8	381.0	11.7	Free Surface	1.76	0.63	0.71
SMN5882	SMH6229	SMH6151	675	65	0.004	414.2	381.4	11.7	Free Surface	1.69	0.65	0.75
SMN5899	SMH6151	SMH6149	675	98	0.004	416.8	384.1	11.7	Free Surface	1.60	0.68	0.81
SMN5898	SMH6149	SMH6157	675	65	0.004	420.0	387.3	11.7	Free Surface	1.62	0.68	0.80
SMN5875	SMH6157	SMH6156	675	59	0.004	420.4	387.8	11.7	Free Surface	1.62	0.68	0.81
SMN5853	SMH6156	SMH6158	675	52	0.004	424.8	392.3	11.6	Free Surface	1.58	0.70	0.84
SMN5845	SMH6158	SMH6159	675	49	0.004	426.1	393.6	11.6	Free Surface	1.60	0.70	0.83
SMN5849	SMH6159	SMH6161	675	63	0.004	426.4	393.9	11.6	Free Surface	1.66	0.67	0.80
SMN5861	SMH6161	SMH6160	675	71	0.004	426.9	394.4	11.6	Free Surface	1.61	0.69	0.83
SMN5873	SMH6160	SMH6208	675	36	0.005	428.4	396.0	11.6	Free Surface	1.74	0.65	0.76
SMN5886	SMH6208	SMH6207	675	58	0.003	428.8	396.4	11.6	Free Surface	1.51	0.74	0.90
SMN5904	SMH6207	SMH6210	675	59	0.004	430.3	397.9	11.6	Free Surface	1.68	0.67	0.80
SMN5923	SMH6210	SMH6209	675	72	0.004	430.7	398.3	11.6	Free Surface	1.61	0.70	0.84
SMN5938	SMH6209	SMH6498	675	61	0.004	434.7	402.4	11.6	Free Surface	1.65	0.69	0.82
SMN5950	SMH6498	SMH6123	675	71	0.004	435.1	402.8	11.6	Free Surface	1.59	0.72	0.86
SMN5949	SMH6123	SMH6126	750	106	0.001	610.3	547.6	24.8	Pressurized	1.38	1.00	2.28
SMN36879	SMH6126	SMH33844	825	98	0.003	610.7	548.1	24.8	Free Surface	1.51	0.71	0.85
SMN36880	SMH33844	SMH7041	825	49	0.002	610.9	548.3	24.8	Free Surface	1.49	0.72	0.86
SMN6234	SMH7041	SMH6125	825	37	0.003	614.9	552.3	24.8	Free Surface	1.59	0.68	0.81
SMN36877	SMH6125	SMH33843	825	16	0.002	617.5	555.1	24.8	Free Surface	1.38	0.78	0.95
SMN36878	SMH33843	SMH6127	825	95	0.003	618.1	555.6	24.8	Free Surface	1.56	0.70	0.83
SMN5884	SMH6127	SMH6128	675	90	0.009	618.9	556.5	24.8	Free Surface	2.51	0.65	0.76
SMN5862	SMH6128	SMH6069	675	83	0.009	619.3	556.9	24.8	Free Surface	2.45	0.66	0.78
SMN5846	SMH6069	SMH6070	750	17	0.009	619.3	557.0	24.8	Free Surface	2.45	0.56	0.60
SMN5844	SMH6070	SMH6073	750	100	0.003	619.5	557.2	24.8	Free Surface	1.61	0.81	0.99
SMN6187	SMH6073	SMH6991	750	67	0.005	619.6	557.3	24.8	Free Surface	1.97	0.67	0.79
SMN6188	SMH6991	SMH6992	750	99	0.003	619.8	557.4	24.8	Free Surface	1.66	0.79	0.96
SMN6189	SMH6992	SMH6075	750	89	0.003	620.3	557.9	24.8	Free Surface	1.63	0.81	0.99
SMN6545	SMH6075	SMH6078	750	85	0.004	620.9	558.5	24.8	Free Surface	1.78	0.74	0.89
SMN6524	SMH6078	SMH6079	750	92	0.004	621.0	558.7	24.8	Free Surface	1.72	0.76	0.93
SMN6509	SMH6079	SFT114	750	13	0.003	650.6	588.7	24.8	Pressurized	1.70	0.81	0.99
SMN6502	SFT114	SMH6082	750	113	0.003	650.8	588.9	24.8	Pressurized	1.47	1.00	1.14
SMN6480	SMH6082	SMH6083	750	80	0.004	651.0	589.1	24.8	Free Surface	1.75	0.79	0.96
SMN6623	SMH6083	SMH6086	750	48	0.006	651.1	589.2	24.8	Free Surface	2.22	0.63	0.72
SMN6624	SMH6086	SMH6087	750	80	0.003	728.4	667.5	24.9	Pressurized	1.65	1.00	1.15
SMN20762	SMH6087	SMH26611	750	10	0.016	728.6	667.7	24.9	Free Surface	3.20	0.51	0.52
SMN28950	SMH26611	SPS25	1200	24	0.007	2000.7	1799.3	103.1	Free Surface	3.01	0.57	0.62

2031 WWF - Without Merton Development												
Trunk to Oakville SW												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN18246	SMH6547	SMH6548	300	67	0.008	0.9	0.8	0.0	Free Surface	0.39	0.07	0.01
SMN5299	SMH5447	SMH5448	300	107	0.005	3.1	3.1	0.0	Free Surface	0.47	0.15	0.05
SMN5298	SMH5448	SMH5449	300	167	0.003	3.2	3.2	0.0	Free Surface	0.42	0.17	0.06
SMN5297	SMH5449	SMH5451	300	88	0.007	3.6	3.6	0.0	Free Surface	0.57	0.15	0.05
SMN5296	SMH5451	SMH5450	300	100	0.005	4.1	4.1	0.0	Free Surface	0.53	0.17	0.06
SMN5295	SMH5450	SMH5452	300	81	0.006	4.4	4.4	0.0	Free Surface	0.57	0.17	0.06
SMN5294	SMH5452	SMH5459	300	68	0.006	4.5	4.5	0.0	Free Surface	0.59	0.16	0.06
SMN5293	SMH5459	SMH5458	300	16	0.017	4.5	4.5	0.0	Free Surface	0.84	0.13	0.04
SMN5292	SMH5458	SMH5457	300	14	0.009	4.5	4.5	0.0	Free Surface	0.67	0.15	0.05
SMN5291	SMH5457	SMH5453	300	84	0.006	10.0	10.0	0.0	Free Surface	0.76	0.24	0.13
SMN5290	SMH5453	SMH5454	300	101	0.005	11.1	11.1	0.0	Free Surface	0.74	0.27	0.16
SMN5289	SMH5454	SMH5455	300	71	0.007	11.2	11.2	0.0	Free Surface	0.79	0.25	0.14
SMN5288	SMH5455	SMH5456	300	60	0.01	11.2	11.2	0.0	Free Surface	0.90	0.23	0.12
SMN5351	SMH5456	SMH5556	450	42	0.007	11.3	11.3	0.0	Free Surface	0.77	0.15	0.05
SMN5352	SMH5556	SMH5553	450	96	0.007	13.1	13.1	0.0	Free Surface	0.80	0.16	0.06
SMN5353	SMH5553	SMH5555	450	112	0.006	13.3	13.3	0.0	Free Surface	0.74	0.17	0.06
SMN4818	SMH5555	SMH5554	450	114	0.006	13.4	13.4	0.0	Free Surface	0.76	0.17	0.06
SMN5350	SMH5554	SMH5557	450	99	0.006	14.3	14.3	0.0	Free Surface	0.80	0.17	0.06
SMN5349	SMH5557	SMH5558	450	70	0.015	14.6	14.6	0.0	Free Surface	1.09	0.14	0.04
SMN5348	SMH5558	SMH4893	450	74	0.034	14.7	14.7	0.0	Free Surface	1.45	0.12	0.03
SMN5347	SMH4893	SMH4890	450	82	0.004	14.8	14.8	0.0	Free Surface	0.67	0.20	0.08
SMN5287	SMH4890	SMH4892	450	86	0.005	14.9	14.9	0.0	Free Surface	0.72	0.19	0.08
SMN12641	SMH4892	SMH14447	450	105	0.007	15.0	15.0	0.0	Free Surface	0.82	0.17	0.07
SMN12643	SMH14447	SMH14448	450	17	0.055	15.1	15.1	0.0	Free Surface	1.72	0.10	0.02
SMN12642	SMH14448	SMH6550	450	57	0.016	15.1	15.1	0.0	Free Surface	1.13	0.14	0.04
SMN5726	SMH6550	SMH6552	525	78	0.007	17.3	17.2	0.0	Free Surface	0.85	0.15	0.05
SMN5720	SMH6552	SMH6551	525	89	0.007	17.7	17.6	0.0	Free Surface	0.86	0.15	0.05
SMN5713	SMH6551	SMH6553	525	31	0.004	17.7	17.7	0.0	Free Surface	0.71	0.17	0.07
SMN5717	SMH6553	SMH6555	525	91	0.009	18.5	18.4	0.0	Free Surface	0.94	0.15	0.05
SMN5723	SMH6555	SMH6554	525	44	0.005	19.0	18.8	0.0	Free Surface	0.78	0.17	0.06
SMN5729	SMH6554	SMH6558	525	93	0.006	22.7	22.5	0.1	Free Surface	0.87	0.18	0.07
SMN5734	SMH6558	SMH6559	525	91	0.009	23.3	23.0	0.1	Free Surface	1.01	0.16	0.06
SMN5733	SMH6559	SMH6560	525	19	0.004	23.4	23.1	0.1	Free Surface	0.76	0.20	0.09
SMN5732	SMH6560	SMH6561	525	90	0.007	24.1	23.8	0.1	Free Surface	0.95	0.17	0.07
SMN5727	SMH6561	SMH6562	525	79	0.008	24.8	24.5	0.1	Free Surface	0.99	0.17	0.07
SMN5721	SMH6562	SMH6527	525	21	0.006	24.8	24.5	0.1	Free Surface	0.92	0.18	0.07
SMN5725	SMH6527	SMH6526	525	80	0.007	28.6	28.2	0.1	Free Surface	0.98	0.19	0.08
SMN5728	SMH6526	SMH6525	525	40	0.007	28.7	28.3	0.1	Free Surface	1.00	0.19	0.08
SMN5731	SMH6525	SMH6730	525	48	0.007	33.1	32.7	0.1	Free Surface	1.04	0.20	0.09
SMN5736	SMH6730	SMH6524	525	61	0.01	33.2	32.8	0.1	Free Surface	1.20	0.19	0.08
SMN15824	SMH6524	SMH6523	525	8	0.002	82.0	80.9	0.3	Free Surface	0.89	0.44	0.40
SMN15823	SMH6523	SMH6522	525	63	0.009	82.1	81.0	0.3	Free Surface	1.45	0.31	0.21
SMN15825	SMH6522	SMH6521	525	92	0.006	99.7	98.1	0.5	Free Surface	1.35	0.37	0.30
SMN15851	SMH6521	SMH17031	525	138	0.007	106.5	104.9	0.5	Free Surface	1.45	0.37	0.30
SMN15852	SMH17031	SMH17032	525	72	0.01	107.1	105.5	0.5	Free Surface	1.66	0.34	0.25
SMN38577	SMH17032	SMH34418	525	59	0.014	107.4	105.8	0.5	Free Surface	1.88	0.31	0.21
SMN38578	SMH34418	SMH17030	525	49	0.009	107.4	105.8	0.5	Free Surface	1.57	0.35	0.27
SMN15849	SMH17030	SMH25910	525	70	0.004	107.6	105.9	0.5	Free Surface	1.13	0.45	0.42
SMN27402	SMH25910	SMH17024	525	27	0.007	107.6	105.9	0.5	Free Surface	1.49	0.37	0.29
SMN15850	SMH17024	SMH17018	525	74	0.005	126.9	124.9	0.6	Free Surface	1.33	0.45	0.42
SMN5755	SMH17018	SMH6520	525	81	0.004	128.7	126.7	0.6	Free Surface	1.19	0.50	0.50
SMN6101	SMH6520	SMH6873	525	76	0.007	129.1	127.1	0.6	Free Surface	1.55	0.41	0.35
SMN6106	SMH6873	SMH6871	525	71	0.008	130.0	128.0	0.6	Free Surface	1.58	0.41	0.35
SMN6104	SMH6871	SMH6870	525	29	0.009	130.5	128.5	0.6	Free Surface	1.66	0.39	0.32
SMN6194	SMH6870	SMH6996	525	40	0.01	130.7	128.7	0.6	Free Surface	1.76	0.38	0.30
SMN6196	SMH6996	SMH6997	525	62	0.008	133.3	131.4	0.6	Free Surface	1.63	0.40	0.34
SMN6195	SMH6997	SMH6868	525	58	0.007	133.5	131.6	0.6	Free Surface	1.57	0.42	0.36
SMN6100	SMH6868	SMH6376	525	56	0.009	133.9	132.0	0.6	Free Surface	1.69	0.40	0.33
SMN5774	SMH6376	SMH6375	525	95	0.007	134.4	132.5	0.6	Free Surface	1.56	0.42	0.37
SMN14294	SMH6375	SMH16351	525	85	0.009	143.9	142.1	0.6	Free Surface	1.72	0.41	0.35
SMN14293	SMH16351	SMH16350	525	88	0.009	144.5	142.7	0.6	Free Surface	1.75	0.41	0.35
SMN14292	SMH16350	SMH16348	525	91	0.009	145.1	143.2	0.6	Free Surface	1.73	0.41	0.36
SMN14291	SMH16348	SMH16349	525	82	0.01	150.9	149.1	0.6	Free Surface	1.80	0.41	0.35
SMN14290	SMH16349	SMH6369	525	85	0.01	189.8	188.0	0.6	Free Surface	1.95	0.46	0.43
SMN5870	SMH6369	SMH6231	525	94	0.009	191.0	189.2	0.6	Free Surface	1.85	0.48	0.47
SMN5880	SMH6231	SMH6227	675	56	0.003	371.5	369.1	0.8	Free Surface	1.50	0.65	0.76

ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN5879	SMH6227	SMH6228	675	71	0.003	373.2	370.8	0.8	Free Surface	1.40	0.70	0.83
SMN5877	SMH6228	SMH6230	675	60	0.003	373.5	371.1	0.8	Free Surface	1.38	0.71	0.85
SMN5872	SMH6230	SMH6229	675	73	0.005	374.1	371.8	0.8	Free Surface	1.72	0.59	0.65
SMN5882	SMH6229	SMH6151	675	65	0.004	374.5	372.2	0.8	Free Surface	1.65	0.61	0.68
SMN5899	SMH6151	SMH6149	675	98	0.004	377.2	374.8	0.8	Free Surface	1.57	0.64	0.73
SMN5898	SMH6149	SMH6157	675	65	0.004	380.4	378.1	0.8	Free Surface	1.59	0.63	0.73
SMN5875	SMH6157	SMH6156	675	59	0.004	380.8	378.5	0.8	Free Surface	1.59	0.64	0.73
SMN5853	SMH6156	SMH6158	675	52	0.004	385.3	383.0	0.8	Free Surface	1.56	0.65	0.76
SMN5845	SMH6158	SMH6159	675	49	0.004	386.7	384.4	0.8	Free Surface	1.57	0.65	0.76
SMN5849	SMH6159	SMH6161	675	63	0.004	387.0	384.7	0.8	Free Surface	1.63	0.63	0.72
SMN5861	SMH6161	SMH6160	675	71	0.004	387.4	385.2	0.8	Free Surface	1.58	0.65	0.75
SMN5873	SMH6160	SMH6208	675	36	0.005	389.0	386.8	0.8	Free Surface	1.71	0.61	0.69
SMN5886	SMH6208	SMH6207	675	58	0.003	389.4	387.1	0.8	Free Surface	1.49	0.69	0.81
SMN5904	SMH6207	SMH6210	675	59	0.004	390.9	388.7	0.8	Free Surface	1.65	0.63	0.72
SMN5923	SMH6210	SMH6209	675	72	0.004	391.3	389.1	0.8	Free Surface	1.58	0.65	0.76
SMN5938	SMH6209	SMH6498	675	61	0.004	395.3	393.1	0.8	Free Surface	1.62	0.65	0.75
SMN5950	SMH6498	SMH6123	675	71	0.004	395.8	393.6	0.8	Free Surface	1.56	0.67	0.78
SMN5949	SMH6123	SMH6126	750	106	0.001	574.4	538.4	13.9	Pressurized	1.30	1.00	2.15
SMN36879	SMH6126	SMH33844	825	98	0.003	574.8	538.8	13.9	Free Surface	1.50	0.67	0.80
SMN36880	SMH33844	SMH7041	825	49	0.002	575.0	539.0	13.9	Free Surface	1.48	0.68	0.81
SMN6234	SMH7041	SMH6125	825	37	0.003	579.0	543.1	13.9	Free Surface	1.57	0.65	0.76
SMN36877	SMH6125	SMH33843	825	16	0.002	581.7	545.8	13.9	Free Surface	1.37	0.74	0.90
SMN36878	SMH33843	SMH6127	825	95	0.003	582.3	546.4	13.9	Free Surface	1.54	0.67	0.78
SMN5884	SMH6127	SMH6128	675	90	0.009	583.1	547.2	13.9	Free Surface	2.48	0.63	0.72
SMN5862	SMH6128	SMH6069	675	83	0.009	583.5	547.7	13.9	Free Surface	2.43	0.64	0.74
SMN5846	SMH6069	SMH6070	750	17	0.009	583.6	547.7	13.9	Free Surface	2.42	0.54	0.56
SMN5844	SMH6070	SMH6073	750	100	0.003	583.7	547.9	13.9	Free Surface	1.61	0.77	0.94
SMN6187	SMH6073	SMH6991	750	67	0.005	583.9	548.0	13.9	Free Surface	1.95	0.64	0.74
SMN6188	SMH6991	SMH6992	750	99	0.003	584.0	548.2	13.9	Free Surface	1.65	0.75	0.91
SMN6189	SMH6992	SMH6075	750	89	0.003	584.5	548.7	13.9	Free Surface	1.62	0.76	0.93
SMN6545	SMH6075	SMH6078	750	85	0.004	585.1	549.3	13.9	Free Surface	1.77	0.70	0.84
SMN6524	SMH6078	SMH6079	750	92	0.004	585.2	549.4	13.9	Free Surface	1.71	0.72	0.87
SMN6509	SMH6079	SFT114	750	13	0.003	615.0	579.5	14.0	Pressurized	1.70	0.77	0.93
SMN6502	SFT114	SMH6082	750	113	0.003	615.2	579.7	14.0	Pressurized	1.39	1.00	1.08
SMN6480	SMH6082	SMH6083	750	80	0.004	615.4	579.8	14.0	Free Surface	1.74	0.75	0.91
SMN6623	SMH6083	SMH6086	750	48	0.006	615.5	579.9	14.0	Free Surface	2.19	0.61	0.68
SMN6624	SMH6086	SMH6087	750	80	0.003	693.3	658.3	14.1	Pressurized	1.57	1.00	1.10
SMN20762	SMH6087	SMH26611	750	10	0.016	693.4	658.4	14.1	Free Surface	3.16	0.50	0.50
SMN28950	SMH26611	SPS25	1200	24	0.007	1971.2	1790.1	92.3	Free Surface	2.99	0.57	0.61

Option A												
2400 mm Trunk to Mid-Halton WWTP												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN16510	SMH17862	SMH17865	2,400	301	0.003	5,071.19	3,594.7	926.7	Free Surface	2.613	0.444	0.407
SMN16511	SMH17864	SMH17862	2,400	232	0.003	5,070.99	3,594.5	926.7	Free Surface	2.607	0.445	0.408
SMN20686	SMH17865	SMH17863	2,400	300	0.003	5,094.85	3,618.4	926.7	Free Surface	2.695	0.435	0.393
SMN29150	SMH17863	SMH26617	2,400	259	0.002	5,095.02	3,618.6	926.7	Free Surface	2.457	0.467	0.445
SMN29151	SMH26617	SMH26618	2,400	281	0.002	5,129.31	3,640.5	935.5	Free Surface	2.568	0.454	0.423
SMN29152	SMH26618	SMH26619	2,400	290	0.002	5,191.98	3,703.2	935.5	Free Surface	2.547	0.461	0.435
SMN29153	SMH26619	SMH26620	2,400	246	0.002	5,210.30	3,710.9	943.0	Free Surface	2.6	0.455	0.425
SMN29154	SMH26620	SPS85	2,400	44	0.004	5,210.29	3,710.9	943.0	Free Surface	3.19	0.39	0.322

Option B												
2400 mm Trunk to Mid-Halton WWTP												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN16510	SMH17862	SMH17865	2,400	301	0.003	5,071.2	3,594.7	926.7	Free Surface	2.61	0.44	0.41
SMN16511	SMH17864	SMH17862	2,400	232	0.003	5,071.0	3,594.5	926.7	Free Surface	2.61	0.45	0.41
SMN20686	SMH17865	SMH17863	2,400	300	0.003	5,094.9	3,618.4	926.7	Free Surface	2.70	0.44	0.39
SMN29150	SMH17863	SMH26617	2,400	259	0.002	5,095.0	3,618.6	926.7	Free Surface	2.46	0.47	0.45
SMN29151	SMH26617	SMH26618	2,400	281	0.002	5,127.3	3,639.4	934.8	Free Surface	2.57	0.45	0.42
SMN29152	SMH26618	SMH26619	2,400	290	0.002	5,189.9	3,702.1	934.8	Free Surface	2.55	0.46	0.44
SMN29153	SMH26619	SMH26620	2,400	246	0.002	5,211.9	3,710.0	944.8	Free Surface	2.60	0.46	0.43
SMN29154	SMH26620	SPS85	2,400	44	0.004	5,211.9	3,710.0	944.8	Free Surface	3.19	0.39	0.32

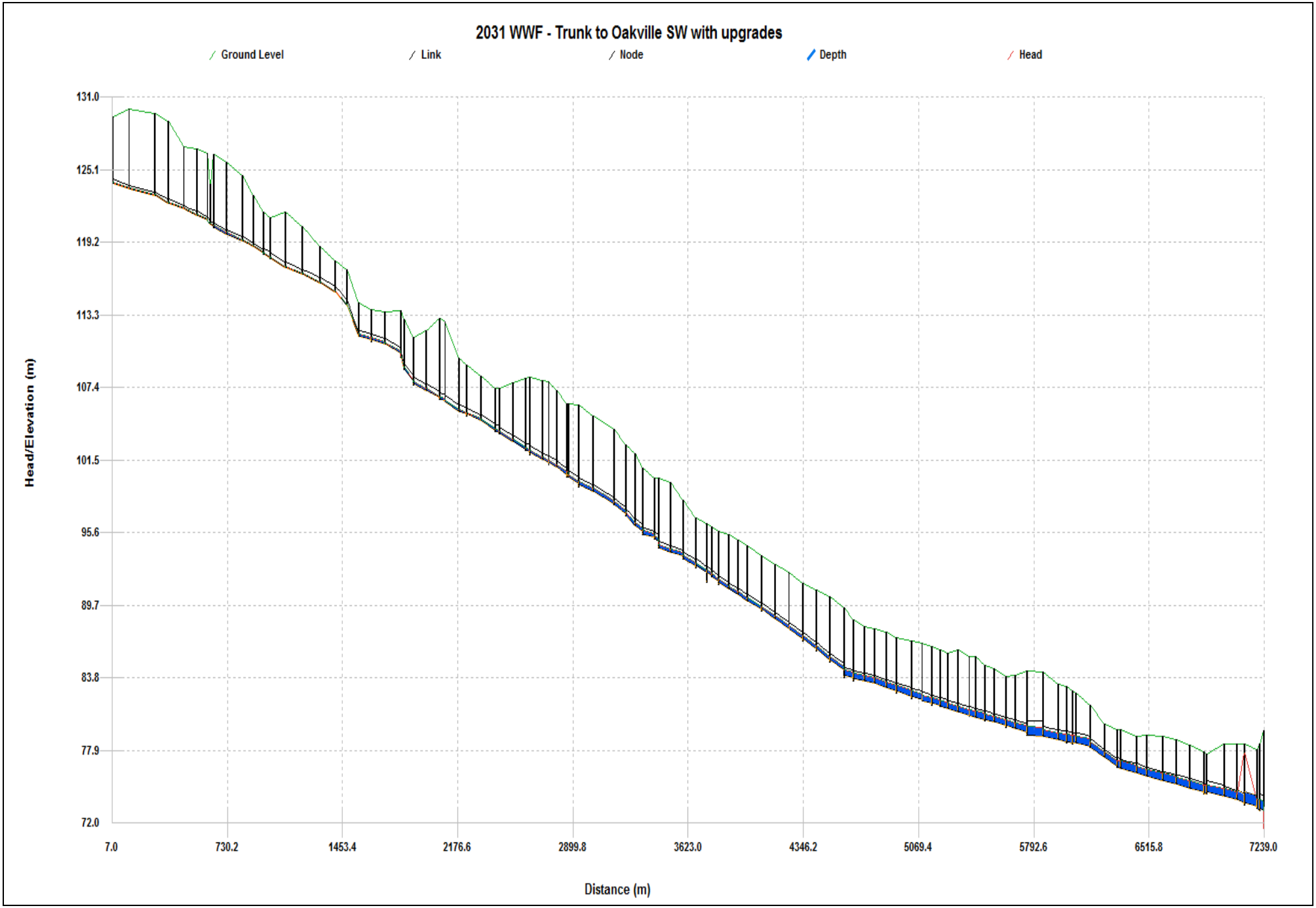
Option C												
2400 mm Trunk to Mid-Halton WWTP												
ID	From ID	To ID	Diameter (r	Length (m)	Slope	Total Flow	Unpeakabl	Coverage F	Flow Type	Velocity (m	d/D	q/Q
SMN16510	SMH17862	SMH17865	2,400	301	0.003	5,071.2	3,594.7	926.7	Free Surface	2.6	0.4	0.4
SMN16511	SMH17864	SMH17862	2,400	232	0.003	5,071.0	3,594.5	926.7	Free Surface	2.6	0.4	0.4
SMN20686	SMH17865	SMH17863	2,400	300	0.003	5,094.9	3,618.4	926.7	Free Surface	2.7	0.4	0.4
SMN29150	SMH17863	SMH26617	2,400	259	0.002	5,095.0	3,618.6	926.7	Free Surface	2.5	0.5	0.4
SMN29151	SMH26617	SMH26618	2,400	281	0.002	5,127.5	3,640.3	934.3	Free Surface	2.6	0.5	0.4
SMN29152	SMH26618	SMH26619	2,400	290	0.002	5,190.1	3,703.0	934.3	Free Surface	2.5	0.5	0.4
SMN29153	SMH26619	SMH26620	2,400	246	0.002	5,208.9	3,709.8	942.8	Free Surface	2.6	0.5	0.4
SMN29154	SMH26620	SPS85	2,400	44	0.004	5,208.9	3,709.8	942.8	Free Surface	3.2	0.4	0.3

Option D												
2400 mm Trunk to Mid-Halton WWTP												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN16510	SMH17862	SMH17865	2,400	301	0.003	5,071.2	3,594.7	926.7	Free Surface	2.613	0.444	0.407
SMN16511	SMH17864	SMH17862	2,400	232	0.003	5,071.0	3,594.5	926.7	Free Surface	2.607	0.445	0.408
SMN20686	SMH17865	SMH17863	2,400	300	0.003	5,094.9	3,618.4	926.7	Free Surface	2.695	0.435	0.393
SMN29150	SMH17863	SMH26617	2,400	259	0.002	5,095.0	3,618.6	926.7	Free Surface	2.457	0.467	0.445
SMN29151	SMH26617	SMH26618	2,400	281	0.002	5,127.5	3,640.3	934.3	Free Surface	2.568	0.454	0.423
SMN29152	SMH26618	SMH26619	2,400	290	0.002	5,190.1	3,703.0	934.3	Free Surface	2.547	0.461	0.435
SMN29153	SMH26619	SMH26620	2,400	246	0.002	5,233.4	3,719.0	953.7	Free Surface	2.603	0.456	0.427
SMN29154	SMH26620	SPS85	2,400	44	0.004	5,233.4	3,719.0	953.7	Free Surface	3.194	0.391	0.323

2031 WWF - Without Merton Development												
2400 mm Trunk to Mid-Halton WWTP												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN16511	SMH17864	SMH17862	2,400	232	0.003	5,067.1	3,592.6	925.3	Free Surface	2.61	0.45	0.41
SMN16510	SMH17862	SMH17865	2,400	301	0.003	5,067.3	3,592.8	925.3	Free Surface	2.61	0.44	0.41
SMN20686	SMH17865	SMH17863	2,400	300	0.003	5,091.0	3,616.4	925.3	Free Surface	2.69	0.44	0.39
SMN29150	SMH17863	SMH26617	2,400	259	0.002	5,091.1	3,616.6	925.3	Free Surface	2.46	0.47	0.45
SMN29151	SMH26617	SMH26618	2,400	281	0.002	5,100.5	3,626.0	925.3	Free Surface	2.57	0.45	0.42
SMN29152	SMH26618	SMH26619	2,400	290	0.002	5,163.2	3,688.6	925.3	Free Surface	2.54	0.46	0.43
SMN29153	SMH26619	SMH26620	2,400	246	0.002	5,163.3	3,688.8	925.3	Free Surface	2.59	0.45	0.42
SMN29154	SMH26620	SPS85	2,400	44	0.004	5,163.3	3,688.8	925.3	Free Surface	3.18	0.39	0.32

Appendix B

Upgrades to surcharges sections along the trunk of Oakville SW


2031 WWF - Trunk to Oakville SW with upgrades
Ground Level
Link
Node
Depth
Head
131.0
125.1
119.2
113.3
107.4
101.5
95.6
89.7
83.8
77.9
72.0
Head/Elevation (m)
7.0
730.2
1453.4
2176.6
2899.8
3623.0
4346.2
5069.4
5792.6
6515.8
7239.0
Distance (m)

With Upgrades to Surcharged sections along the lakeshore trunk												
Trunk to Oakville Southwest												
ID	From ID	To ID	Diameter (mm)	Length (m)	Slope	Total Flow (L/s)	Unpeakable Flow (L/s)	Coverage Flow (L/s)	Flow Type	Velocity (m/s)	d/D	q/Q
SMN18246	SMH6547	SMH6548	300	67	0.008	0.9	0.8	0.0	Free Surface	0.39	0.07	0.01
SMN5299	SMH5447	SMH5448	300	107	0.005	11.8	5.6	1.6	Free Surface	0.70	0.29	0.18
SMN5298	SMH5448	SMH5449	300	167	0.003	12.0	5.8	1.6	Free Surface	0.61	0.32	0.22
SMN5297	SMH5449	SMH5451	300	88	0.007	12.3	6.1	1.6	Free Surface	0.82	0.27	0.16
SMN5296	SMH5451	SMH5450	300	100	0.005	12.9	6.7	1.6	Free Surface	0.74	0.29	0.19
SMN5295	SMH5450	SMH5452	300	81	0.006	13.2	7.0	1.6	Free Surface	0.78	0.29	0.18
SMN5294	SMH5452	SMH5459	300	68	0.006	13.2	7.0	1.6	Free Surface	0.81	0.28	0.17
SMN5293	SMH5459	SMH5458	300	16	0.017	13.2	7.0	1.6	Free Surface	1.15	0.22	0.11
SMN5292	SMH5458	SMH5457	300	14	0.009	13.3	7.0	1.6	Free Surface	0.92	0.26	0.14
SMN5291	SMH5457	SMH5453	300	84	0.006	18.8	12.6	1.6	Free Surface	0.91	0.34	0.24
SMN5290	SMH5453	SMH5454	300	101	0.005	19.9	13.7	1.6	Free Surface	0.87	0.36	0.28
SMN5289	SMH5454	SMH5455	300	71	0.007	19.9	13.7	1.6	Free Surface	0.94	0.34	0.25
SMN5288	SMH5455	SMH5456	300	60	0.01	20.0	13.8	1.6	Free Surface	1.06	0.31	0.21
SMN5351	SMH5456	SMH5556	450	42	0.007	20.0	13.8	1.6	Free Surface	0.92	0.20	0.08
SMN5352	SMH5556	SMH5553	450	96	0.007	21.8	15.6	1.6	Free Surface	0.94	0.20	0.09
SMN5353	SMH5553	SMH5555	450	112	0.006	22.0	15.8	1.6	Free Surface	0.86	0.22	0.10
SMN4818	SMH5555	SMH5554	450	114	0.006	22.2	16.0	1.6	Free Surface	0.88	0.22	0.10
SMN5350	SMH5554	SMH5557	450	99	0.006	23.0	16.8	1.6	Free Surface	0.93	0.21	0.10
SMN5349	SMH5557	SMH5558	450	70	0.015	23.4	17.2	1.6	Free Surface	1.25	0.18	0.07
SMN5348	SMH5558	SMH4893	450	74	0.034	23.5	17.3	1.6	Free Surface	1.66	0.14	0.05
SMN5347	SMH4893	SMH4890	450	82	0.004	60.9	24.0	10.9	Free Surface	1.00	0.41	0.35
SMN5287	SMH4890	SMH4892	450	86	0.005	61.1	24.2	10.9	Free Surface	1.08	0.39	0.32
SMN12641	SMH4892	SMH14447	450	105	0.007	61.2	24.3	10.9	Free Surface	1.23	0.35	0.26
SMN12643	SMH14447	SMH14448	450	17	0.055	61.2	24.3	10.9	Free Surface	2.62	0.20	0.09
SMN12642	SMH14448	SMH6550	450	57	0.016	61.2	24.4	10.9	Free Surface	1.70	0.28	0.17
SMN5726	SMH6550	SMH6552	525	78	0.007	63.3	26.5	10.9	Free Surface	1.25	0.29	0.18
SMN5720	SMH6552	SMH6551	525	89	0.007	63.7	26.9	10.9	Free Surface	1.25	0.29	0.18
SMN5713	SMH6551	SMH6553	525	31	0.004	63.7	26.9	10.9	Free Surface	1.03	0.33	0.23
SMN5717	SMH6553	SMH6555	525	91	0.009	64.4	27.6	10.9	Free Surface	1.36	0.27	0.16
SMN5723	SMH6555	SMH6554	525	44	0.005	64.8	28.1	10.9	Free Surface	1.11	0.32	0.22
SMN5729	SMH6554	SMH6558	525	93	0.006	68.3	31.7	10.9	Free Surface	1.20	0.31	0.21
SMN5734	SMH6558	SMH6559	525	91	0.009	68.9	32.3	10.9	Free Surface	1.38	0.28	0.17
SMN5733	SMH6559	SMH6560	525	19	0.004	68.9	32.3	10.9	Free Surface	1.03	0.35	0.26
SMN5732	SMH6560	SMH6561	525	90	0.007	69.6	33.0	10.9	Free Surface	1.30	0.30	0.19
SMN5727	SMH6561	SMH6562	525	79	0.008	70.3	33.7	11.0	Free Surface	1.35	0.29	0.18
SMN5721	SMH6562	SMH6527	525	21	0.006	70.3	33.7	11.0	Free Surface	1.25	0.31	0.20
SMN5725	SMH6527	SMH6526	525	80	0.007	73.9	37.4	11.0	Free Surface	1.29	0.31	0.21
SMN5728	SMH6526	SMH6525	525	40	0.007	73.9	37.5	11.0	Free Surface	1.32	0.31	0.20
SMN5731	SMH6525	SMH6730	525	48	0.007	78.3	41.9	11.0	Free Surface	1.34	0.32	0.22
SMN5736	SMH6730	SMH6524	525	61	0.01	78.4	42.0	11.0	Free Surface	1.53	0.29	0.18
SMN15824	SMH6524	SMH6523	525	8	0.002	126.0	90.1	11.2	Free Surface	0.99	0.57	0.62
SMN15823	SMH6523	SMH6522	525	63	0.009	126.1	90.2	11.2	Free Surface	1.64	0.39	0.32
SMN15825	SMH6522	SMH6521	525	92	0.006	142.9	107.4	11.3	Free Surface	1.48	0.46	0.43
SMN15851	SMH6521	SMH17031	525	138	0.007	149.6	114.1	11.3	Free Surface	1.59	0.45	0.41
SMN15852	SMH17031	SMH17032	525	72	0.01	150.3	114.8	11.3	Free Surface	1.82	0.41	0.35
SMN38577	SMH17032	SMH34418	525	59	0.014	150.5	115.0	11.3	Free Surface	2.06	0.37	0.29
SMN38578	SMH34418	SMH17030	525	49	0.009	150.5	115.0	11.3	Free Surface	1.72	0.42	0.37
SMN15849	SMH17030	SMH25910	525	70	0.004	150.6	115.1	11.4	Free Surface	1.23	0.55	0.59
SMN27402	SMH25910	SMH17024	525	27	0.007	150.6	115.2	11.4	Free Surface	1.63	0.44	0.41
SMN15850	SMH17024	SMH17018	525	74	0.005	169.4	134.1	11.5	Free Surface	1.43	0.54	0.57
SMN5755	SMH17018	SMH6520	525	81	0.004	171.3	135.9	11.5	Free Surface	1.27	0.60	0.67
SMN6101	SMH6520	SMH6873	525	76	0.007	171.7	136.4	11.5	Free Surface	1.67	0.48	0.47
SMN6106	SMH6873	SMH6871	525	71	0.008	172.5	137.2	11.5	Free Surface	1.70	0.48	0.46
SMN6104	SMH6871	SMH6870	525	29	0.009	173.0	137.7	11.5	Free Surface	1.79	0.46	0.43
SMN6194	SMH6870	SMH6996	525	40	0.01	173.1	137.9	11.5	Free Surface	1.90	0.44	0.40
SMN6196	SMH6996	SMH6997	525	62	0.008	175.7	140.6	11.5	Free Surface	1.75	0.47	0.45
SMN6195	SMH6997	SMH6868	525	58	0.007	175.9	140.9	11.5	Free Surface	1.69	0.49	0.47
SMN6100	SMH6868	SMH6376	525	56	0.009	176.3	141.2	11.5	Free Surface	1.81	0.46	0.43
SMN5774	SMH6376	SMH6375	525	95	0.007	176.8	141.8	11.5	Free Surface	1.68	0.49	0.48
SMN14294	SMH6375	SMH16351	525	85	0.009	186.1	151.3	11.4	Free Surface	1.84	0.47	0.46
SMN14293	SMH16351	SMH16350	525	88	0.009	186.6	151.9	11.4	Free Surface	1.87	0.47	0.45
SMN14292	SMH16350	SMH16348	525	91	0.009	187.2	152.5	11.4	Free Surface	1.85	0.48	0.46

SMN14291	SMH16348	SMH16349	525	82	0.01	193.0	158.4	11.4	Free Surface	1.92	0.47	0.45
SMN14290	SMH16349	SMH6369	525	85	0.01	231.0	197.2	11.5	Free Surface	2.05	0.52	0.53
SMN5870	SMH6369	SMH6231	525	94	0.009	232.1	198.4	11.5	Free Surface	1.94	0.54	0.57
SMN5880	SMH6231	SMH6227	675	56	0.003	411.2	378.3	11.7	Free Surface	1.53	0.70	0.84
SMN5879	SMH6227	SMH6228	675	71	0.003	412.9	380.0	11.7	Free Surface	1.42	0.76	0.92
SMN5877	SMH6228	SMH6230	675	60	0.003	413.2	380.4	11.7	Free Surface	1.40	0.77	0.94
SMN5872	SMH6230	SMH6229	675	73	0.005	413.8	381.0	11.7	Free Surface	1.76	0.63	0.71
SMN5882	SMH6229	SMH6151	675	65	0.004	414.2	381.4	11.7	Free Surface	1.69	0.65	0.75
SMN5899	SMH6151	SMH6149	675	98	0.004	416.8	384.1	11.7	Free Surface	1.60	0.68	0.81
SMN5898	SMH6149	SMH6157	675	65	0.004	420.0	387.3	11.7	Free Surface	1.62	0.68	0.80
SMN5875	SMH6157	SMH6156	675	59	0.004	420.4	387.8	11.7	Free Surface	1.62	0.68	0.81
SMN5853	SMH6156	SMH6158	675	52	0.004	424.8	392.3	11.6	Free Surface	1.58	0.70	0.84
SMN5845	SMH6158	SMH6159	675	49	0.004	426.1	393.6	11.6	Free Surface	1.60	0.70	0.83
SMN5849	SMH6159	SMH6161	675	63	0.004	426.4	393.9	11.6	Free Surface	1.66	0.67	0.80
SMN5861	SMH6161	SMH6160	675	71	0.004	426.9	394.4	11.6	Free Surface	1.61	0.69	0.83
SMN5873	SMH6160	SMH6208	675	36	0.005	428.4	396.0	11.6	Free Surface	1.74	0.65	0.76
SMN5886	SMH6208	SMH6207	675	58	0.003	428.8	396.4	11.6	Free Surface	1.51	0.74	0.90
SMN5904	SMH6207	SMH6210	675	59	0.004	430.3	397.9	11.6	Free Surface	1.68	0.67	0.80
SMN5923	SMH6210	SMH6209	675	72	0.004	430.7	398.3	11.6	Free Surface	1.61	0.70	0.84
SMN5938	SMH6209	SMH6498	675	61	0.004	434.7	402.4	11.6	Free Surface	1.65	0.69	0.82
SMN5950	SMH6498	SMH6123	675	71	0.004	435.1	402.8	11.6	Free Surface	1.59	0.72	0.86
SMN5949	SMH6123	SMH6126	1,200	106	0.001	610.3	547.6	24.8	Free Surface	0.88	0.59	0.65
SMN36879	SMH6126	SMH33844	825	98	0.003	610.7	548.1	24.8	Free Surface	1.51	0.71	0.85
SMN36880	SMH33844	SMH7041	825	49	0.002	610.9	548.3	24.8	Free Surface	1.49	0.72	0.86
SMN6234	SMH7041	SMH6125	825	37	0.003	614.9	552.3	24.8	Free Surface	1.59	0.68	0.81
SMN36877	SMH6125	SMH33843	825	16	0.002	617.5	555.1	24.8	Free Surface	1.38	0.78	0.95
SMN36878	SMH33843	SMH6127	825	95	0.003	618.1	555.6	24.8	Free Surface	1.56	0.70	0.83
SMN5884	SMH6127	SMH6128	675	90	0.009	618.9	556.5	24.8	Free Surface	2.51	0.65	0.76
SMN5862	SMH6128	SMH6069	675	83	0.009	619.3	556.9	24.8	Free Surface	2.45	0.66	0.78
SMN5846	SMH6069	SMH6070	750	17	0.009	619.3	557.0	24.8	Free Surface	2.45	0.56	0.60
SMN5844	SMH6070	SMH6073	750	100	0.003	619.5	557.2	24.8	Free Surface	1.61	0.81	0.99
SMN6187	SMH6073	SMH6991	750	67	0.005	619.6	557.3	24.8	Free Surface	1.97	0.67	0.79
SMN6188	SMH6991	SMH6992	750	99	0.003	619.8	557.4	24.8	Free Surface	1.66	0.79	0.96
SMN6189	SMH6992	SMH6075	750	89	0.003	620.3	557.9	24.8	Free Surface	1.63	0.81	0.99
SMN6545	SMH6075	SMH6078	750	85	0.004	620.9	558.5	24.8	Free Surface	1.78	0.74	0.89
SMN6524	SMH6078	SMH6079	750	92	0.004	621.0	558.7	24.8	Free Surface	1.72	0.76	0.93
SMN6509	SMH6079	SFT114	750	13	0.003	650.6	588.7	24.8	Free Surface	1.70	0.81	0.99
SMN6502	SFT114	SMH6082	900	113	0.003	650.8	588.9	24.8	Free Surface	1.58	0.62	0.70
SMN6480	SMH6082	SMH6083	750	80	0.004	651.0	589.1	24.8	Free Surface	1.75	0.79	0.96
SMN6623	SMH6083	SMH6086	750	48	0.006	651.1	589.2	24.8	Free Surface	2.22	0.63	0.72
SMN6624	SMH6086	SMH6087	900	80	0.003	728.4	667.5	24.9	Free Surface	1.75	0.62	0.71
SMN20762	SMH6087	SMH26611	750	10	0.016	728.6	667.7	24.9	Free Surface	3.20	0.51	0.52
SMN28950	SMH26611	SPS25	1,200	24	0.007	2000.7	1799.3	103.1	Free Surface	3.01	0.57	0.62

APPENDIX F

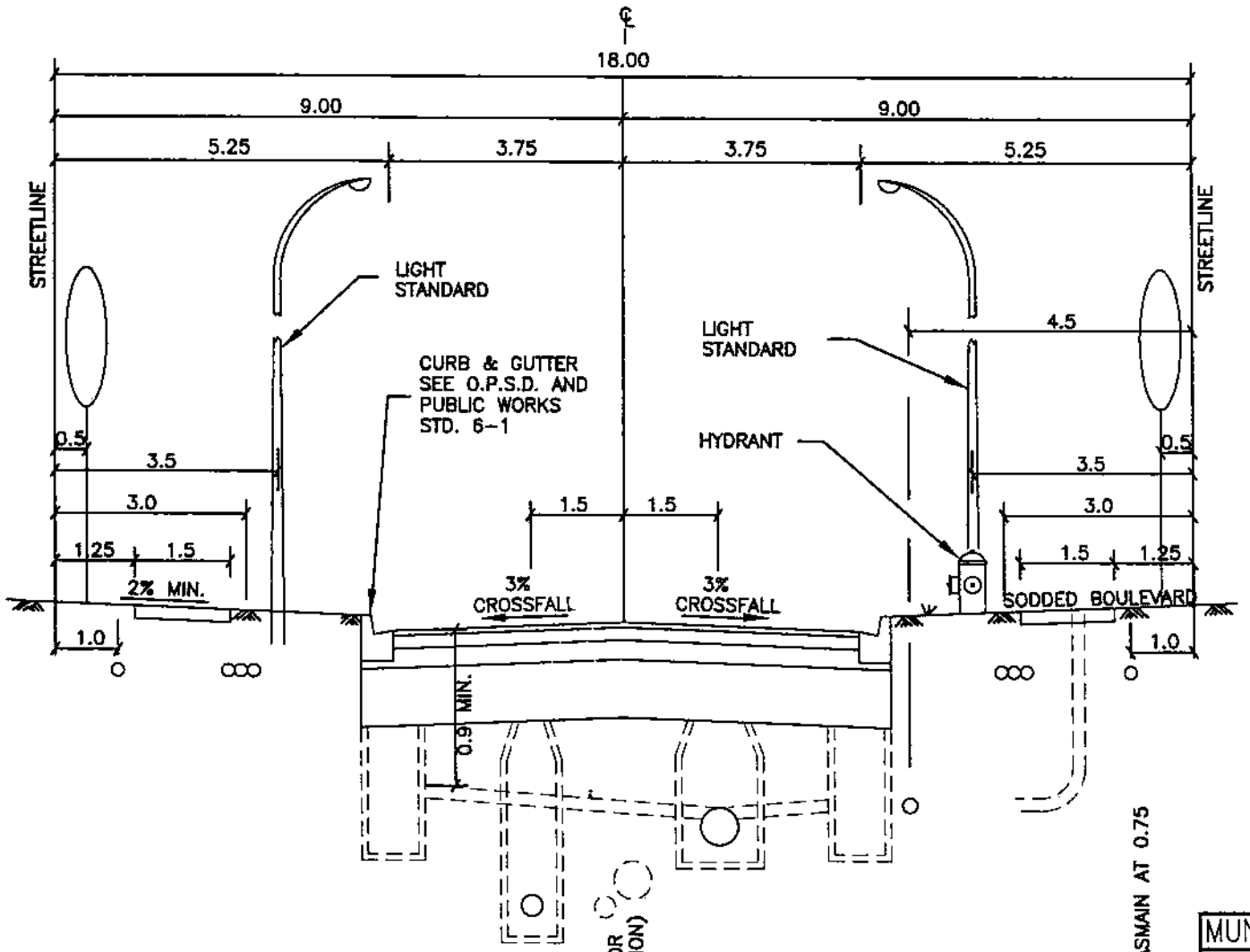
WATER BALANCE CALCULATIONS
R.J. Burnside & Associates Limited

APPENDIX G

PRELIMINARY POND SIZING RESULTS
JFSA

APPENDIX H

TOWN OF OAKVILLE STANDARD ROW CROSS SECTIONS



NOTE:

FOR GENERAL NOTES AND ASPHLALT REQUIREMENTS REFER TO STD. 7-2

DIMENSIONS IN m EXCEPT AS NOTED

MUNICIPALITY: TOWN OF OAKVILLE

STANDARD STREET SECTION FOR 18m ROAD ALLOWANCE

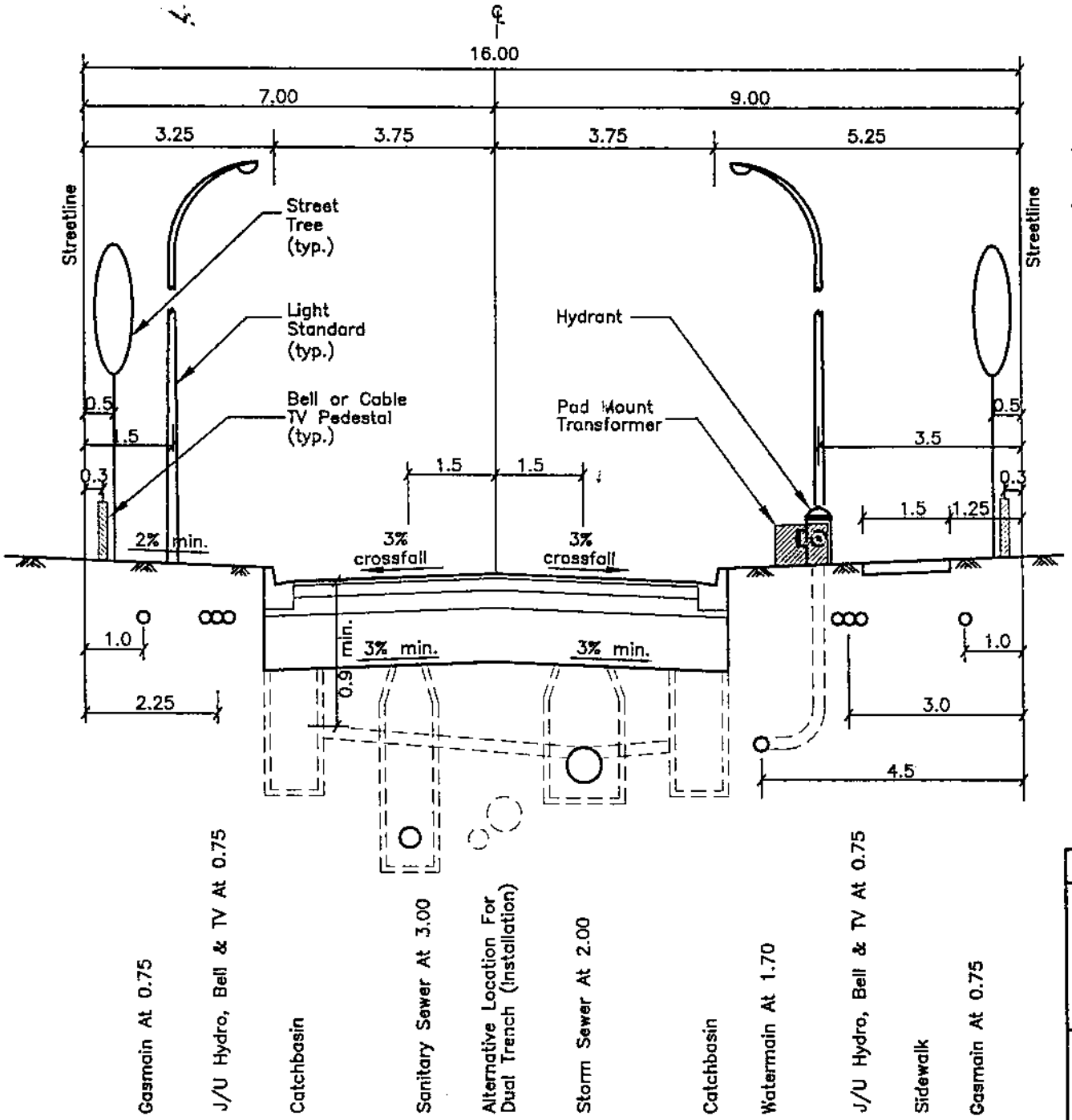
APPROVED

DIRECTOR OF PUBLIC WORKS

STD. 7-1

REVISION DATE

MARCH 22, 2001



Dimmensions In m Except As Noted

Notes

1. For additional notes and asphalt requirements refer to STD. 7–2.
2. STD. 7–1A applies to local residential streets serving less than 100 dwelling units.
3. Sidewalk may be deleted on a cul–de–sac without a park or walkway connection.
4. If sidewalk is required on both sides of the street, use STD. 7–1B.
5. 2m daylight triangles required at intersections.
6. Curb and Gutter is STD. 6–1 unless otherwise approved.

TOWN OF OAKVILLE

STANDARD STREET SECTION FOR 16m ROAD ALLOWANCE

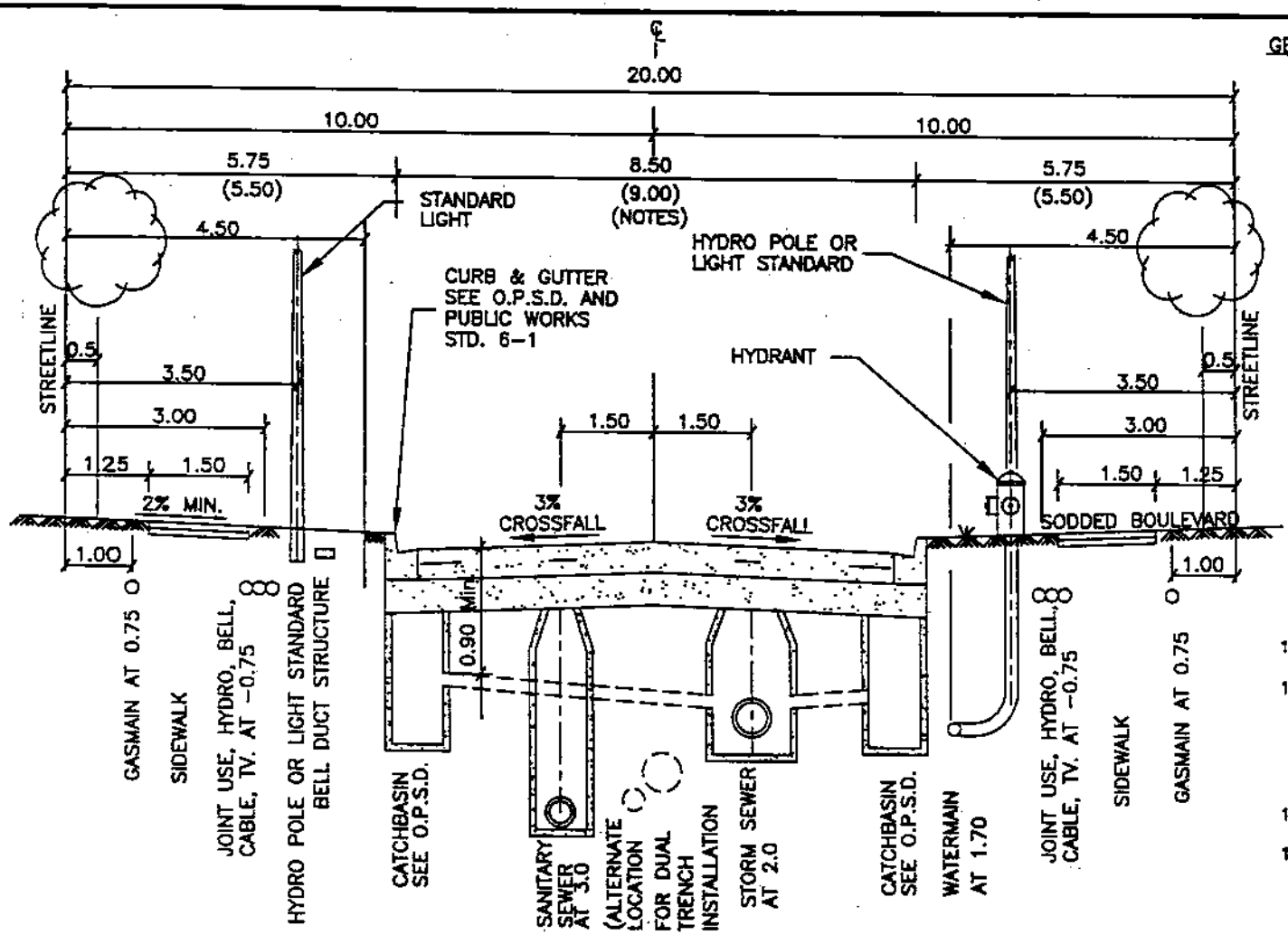
APPROVED

DIRECTOR OF PUBLIC WORKS

STD. 7–1A

REVISION DATE

MARCH 22, 2001



GENERAL NOTES:

1.–THE ELEVATION AT STREET LINE FOR LOT DRAINAGE SHALL BE 150mm HIGHER THAN THE FINISHED ROAD CROWN.
2.–GRANULAR 'B' SUB–BASE THICKNESSES MAY BE REDUCED BY 75mm WHEN GROUND CONDITIONS CONSIDERED SUITABLE BY THE DIRECTOR OF PUBLIC WORKS.
3.–MAXIMUM ROAD GRADIENT 7%.
4.–ALL MATERIAL TO MEET ONTARIO PROVINCIAL STANDARD SPECIFICATIONS.
5.–WATERMAINS AND SANITARY SEWERS TO CONFORM TO LATEST REGIONAL MUNICIPALITY OF HALTON SPECIFICATIONS AND REQUIREMENTS.
6.–ALL DRIVEWAYS BETWEEN CURB AND SIDEWALKS TO BE ASPHALTED.
7.–IF ANY TRENCH AFFECTS EITHER THE ROADWAY OR CURBS, THEN COMPACTED GRANULAR 'B' MATERIAL WILL BE REQUIRED FOR THE BACKFILL.
8.–9.00m PAVEMENT TO BE USED ON MINOR COLLECTOR AND LOCAL INDUSTRIAL ROADS.
9.–TOP COURSE ASPHALTIC CONCRETE SHALL BE ADDED TO THE ROAD ONLY AFTER ADJACENT BUILDINGS (HOMES, INDUSTRIAL, COMMERCIAL, ETC.) HAVE BEEN CONSTRUCTED AND OR ONLY WITH THE SPECIFIC CONSENT OF THE DIRECTOR OF PUBLIC WORKS.
10.–FULL LENGTH SUB–DRAINS ARE TO BE INSTALLED.
11.–AN EXTRA 150mm THICKNESS OF GRANULAR 'B' SHALL BE ADDED AT ARTERIAL AND INDUSTRIAL ROAD INTERSECTIONS. THIS EXTRA DEPTH SHALL BE EXTENDED FOR A MINIMUM OF 15mm FROM THE PROPERTY LINE OF THE INTERSECTING STREET.
12.–SUB–GRADE CROSS–FALL SHALL BE 3 PERCENT.
13.–SODDING REQUIREMENTS TO CONFORM TO OPSS 570 AND 571.

ASPHALT REQUIREMENTS:

A.–INDUSTRIAL AND COLLECTOR ROADS OR BUS ROUTES
40mm HL 3
80mm HL 8

B.–RESIDENTIAL ROADS (NO BUSES)
40mm HL 3
50mm HL 8

C.–DRIVEWAYS
50mm DRIVEWAYS MIX ASPHALT (HL–3A)

DIMENSIONS IN m EXCEPT AS NOTED

GRANULAR BASE REQUIRED:

A.–ALL ROADS
150mm OF GRANULAR 'A' MATERIAL
350mm OF GRANULAR 'B' SUB–BASE (SEE NOTE 2)

B.–DRIVEWAYS
150mm OF 19mm CRUSHER RUN STONE

MUNICIPALITY: TOWN OF OAKVILLE

STANDARD STREET SECTION FOR 20m ROAD ALLOWANCE

APPROVED
DIRECTOR OF PUBLIC WORKS

STD. 7–2

REVISION DATE
MAY 1, 2003

A1