Terra-Dynamics inc.
432 Niagara Street, Unit 2 St. Catharines, ON L2M 4W3

September 19, 2025

The Town of Niagara-on-the-Lake
c/o [redacted] Engineering Technologist
1593 Four Mile Creek Road, P.O.Box 100
Virgil, Ontario L0S 1T0

Re: Hydrogeological Assessment Peer Review, 325 King Street, Proposed Hotel Development

Dear [redacted]

1.0 Introduction, Background Information and Purpose

Terra-Dynamics Inc. (Terra-Dynamics) respectfully submits this Hydrogeological Assessment Peer Review of Soil Engineers Ltd. (a) Hydrogeological Assessment, dated August 7, 2025 for redevelopment of 325 King Street, Town of Niagara-on-the-Lake (the Site) (Soil-Engineers Ltd., 2025a) and (b) A Hydrogeological Letter of Opinion for the Site, dated September 10, 2025 (Soil-Engineers Ltd., 2025b, Appendix D). Associated Engineering (Ont.) Ltd.'s previously provided peer review comments from SLR (2024) were also considered in this Peer Review.

Redevelopment of the Site (of about 1.65 ha) includes a building footprint of about 0.34 hectares (R.V. Anderson Associates Limited, 2023) but with two underground basement levels (P1 and P2) that are larger in area below ground at about 0.63 (38% of the Site) and 0.49 hectares (30% of the Site), respectively (Soil-Engineers Ltd., 2025c).

The lower basement level (i.e. P2) has a finished floor elevation of 80.85 metres above sea level (m ASL), however construction is expected to extend to a depth of 80.35 m ASL (base of excavation), 79.65 m ASL (footing elevation) and 79.35 m ASL (base of the elevator pit) (Soil-Engineers Ltd., 2025a). Construction will be below the measured on-site groundwater levels (Soil-Engineers Ltd., 2025a).

This peer review was completed to ensure sufficient investigation and analyses of the development (both with respect to construction and post-construction details) was completed to minimize future municipal risk.

1.1 Methodology

The methodology of this Hydrogeological Assessment Peer Review was completed via a review of:

1. Soil Engineers Ltd.'s *Hydrogeological Assessment, Proposed Hotel Development, Parliament Oak Hotel, 325 King Street, Town of Niagara-on-the-Lake (dated September 17, 2024)*;
2. SLR's *Peer Review for Hydrogeology Assessment, Proposed Hotel Development – 325 King Street, Niagara-on-the-Lake, ON (December 5, 2024)*;
3. Background review of regional surficial geology mapping and Niagara-on-the-Lake Watershed Plan;
4. Ministry of the Environment, Conservation and Parks (MECP) Water Well Information System record 7363911 at the Site (MECP, 2025);
5. Town of Niagara-on-the-Lake Geotechnical records (McGlone & Associates Ltd., 1994);

6. Soil Engineers Ltd.'s *Hydrogeological Assessment, Proposed Hotel Development, Parliament Oak Hotel, 325 King Street, Town of Niagara-on-the-Lake (dated August 7, 2025,* received August 8, 2025*)*;
7. Soil Engineers Ltd.'s *Hydrogeological Letter of Opinion, Proposed Hotel Development – 325 King Street, Town of Niagara-on-the-Lake, ON* (dated September 10, 2025, Appendix D);and
8. Soil Engineers Ltd.'s Borehole and Monitoring Well and Test Pit Location Plan, Hydrogeological Assessment, Proposed Hotel Development, 325 King Street, Town of Niagara-on-the-Lake. Dated August 18, 2025, received September 10, 2025 upon request (Appendix D).
9. Soil Engineers Ltd.'s Test Pit Investigation Letter Proposed Hotel Development, 325 King Street, Town of Niagara-on-the-Lake. Dated August 28, 225, received September 19, 2025.

It should be noted that Terra-Dynamics staff previously completed a Hydrogeological Dewatering Assessment for the Site for another party in 2020, however it is our understanding that our report was never submitted to the Town of Niagara-on-the-Lake. The planning consultant for that earlier application was contacted for release of this earlier report for the peer review, however, we were informed that the previous client was not interested in releasing that report for this peer review.

1.2 Physical Setting Background

The Site is fairly flat, with topography ranging from 87.5 to 86.5 metres above sea level (m ASL), sloping from south to north. The Site is a former elementary school that included a sports field and an asphalt parking area. The Site is located within a municipally serviced area with the closest watercourse being One Mile Creek 95 metres to the southwest of the Site (Appendix A). The Site's regional surficial geology is clay and silt associated with glaciolacustrine deepwater deposits (Ontario Geological Survey (OGS, 2003). However, a regional NOTL south-north hydrogeologic cross-section suggests a sand and gravel layer can be present on bedrock beneath the lower permeability 'Halton Till' (Appendix B). Halton Till is described as a silty and clayey till (Feenstra, 1984).

1.2.1 Historical Borehole Information

MECP Water Well Information System monitoring well record 7363911 (Appendix A) recorded 4.6 metres (15 feet) of silty sand becoming gravelly sand from 3.0 to 7.6 metres below ground surface (m BGS). This monitoring well was constructed in 2020 as part of a previous geotechnical investigation and it is our understanding is still present at the Site. Based upon a NPCA regional digital elevation model (NPCA, 2020), the ground surface at this location is about 87.2 m ASL, and therefore this silty sand to gravelly sand was logged by the water well drilling contractor as between 84.2 and 79.6 m ASL. This is a similar interval to nearby Town of Niagara-on-the-Lake geotechnical record BH6, immediately east of the Site, which recorded saturated sand to sand and gravel at 5.6 m BGS, or 82.7 m ASL to at least 7.8 m BGS or 80.5 m ASL (McGlone & Associates Ltd., 1994, Appendix C). It is believed that the sand unit at 7363911 has a hydraulic conductivity of about $1x10^{-3}$ m/s, based upon experience in the area, which is mid-way between published values for sand ($1x10^{-2}$ m/s) and silty sand ($1x10^{-4}$ m/s) (MECP, 2006).

2.0 *2024 Hydrogeological Assessment*

The 2024 Hydrogeological Assessment completed by Soil Engineers Ltd., dated September 17, 2024 was provided to Terra-Dynamics for review in summer 2025. Five boreholes and five monitoring wells were completed by Soil Engineers Ltd. for their 2024 investigation. Borehole depths were generally between 12.3

and 12.7 m BGS. The 2024 report identified that "*The native soil…consists mainly of silt overlying silty clay and silty clay till*...". Identification of at-depth sand layers/sandy soils was limited to small thicknesses noted at (i) BH/MW1 at about 6.5 m BGS or 81.1 m ASL, (ii) BH/MW2D at about 11 m BGS or 76.4 m ASL, and (iii) BH/MW3 at about 8 m BGS or 79.8 m ASL.

However, following this initial internal review, Terra-Dynamics subsequently notified Soil Engineers Ltd. via e-mail (Terra-Dynamics, 2025a) on August 6, 2025 of the information of Section 1.2.1, i.e. about the presence of a high-permeability sand on-site at-depth.

A digital meeting was then organized by Soil Engineers Ltd. August 7, 2025 for a review of this information with representatives from Solmar Development Corp., Town of Niagara on the Lake and Terra-Dynamics. After the digital meeting of August 7, 2025, Terra-Dynamics provided a follow-up e-mail to Soil Engineers Ltd. which included the following request: "*If your updated report could show in plan view the extent of future excavation, and elevator pit locations, not just the extent of above ground structures.".* (Terra-Dynamics, 2025b)

3.0 *2025 Hydrogeological Assessment*

The 2025 Hydrogeological Assessment completed by Soil Engineers Ltd., dated August 7, 2025 was provided to Terra-Dynamics and the Town of Niagara-on-the-Lake (Town) for review August 8, 2025. The updated report appears to have adequately addressed SLR's (2024) peer review comments. However, the August 7, 2025 report did not include the information discussed at the August 7, 2025 meeting with respect to the information of Section 1.2.1, i.e. with respect to a high-permeability sand on-site at-depth.

Town staff advised SGL Planning & Design Inc. (who sent the 2025 Hydrogeological Assessment to the Town and Terra-Dynamics) via e-mail (Town of Niagara-on-the-Lake, 2025a) that:

> *I assume you were briefed on the previous meeting* (i.e. held on August 7, 2025) *that was held between Town staff, our Hydrogeological consultant, and staff from Soil Engineers Limited where we had discussed a particular area of the site, and a monitoring well, that was not captured in the current assessment but had historically shown conditions and water levels that differed from the remainder of the site.*
>
> *Based on the outcome of that meeting, it seemed that Soil Engineers Limited was going to confirm in the field whether the discussed monitoring well was still present so that they could conduct the necessary testing and confirm the findings. Soil Engineers had asked during the meeting whether the current update they were working on should be submitted for review, and we had indicated that the major concern and key piece of missing information is related to the discussed monitoring well and associated area of interest, and that it would not make sense to review any update without having that information confirmed, so that any implications related to those findings could be addressed in the final report.*

SGL Planning and Design Inc. indicated by e-mail (SGL Planning & Design Inc., 2025) that:

> *Yes, I am aware of the matter you outlined … As I understand it, Soil Engineers has been on site and is working on the update as we speak...We will be in touch very soon with that update.*

4.0 *2025 Hydrogeological Letter of Opinion*

Following the August 7, 2025 meeting, Terra-Dynamics were provided a 'Hydrogeological Letter of Opinion" on September 10, 2025. We were not provided an updated report, but upon request we were provided a plan of the Site with the extents of the underground parking levels dated August 18, 2025 (Soil Engineers Ltd, 2025c, Appendix D).

The letter stated that Soil Engineers Ltd. completed (a) a test pit investigation and (b) hydraulic conductivity testing of a "*monitoring well previously installed by others*" following our August 7, 2025 meeting. It is assumed Soil Engineers Ltd. are referring to monitoring well 7363911 (Appendix A), or as labelled "*MW3 (previous consultant)*" on the August 18, 2025 plan provided with respect to the monitoring well testing. However, no details with respect to the hydraulic conductivity testing were provided in the letter, but the letter indicated that the "*Findings were shared with the client*."

The letter included some general discussion of where a '*permeable sand and gravel layer*' is not present with respect to the proposed building/excavation. With respect to where the '*permeable sand and gravel layer*' is present was stated, "*the east limit of the proposed underground parking level 2*". We subsequently received on September 19, 2025 a Test Pit Investigation Letter (Soil Engineers Ltd., 2025d) which indicated that at test pits 1A, 2 and 3 "*a sand and gravel layer with an approximate thickness of 0.7 m was contacted at approximately 6.8 m BGS beneath the silt/silty clay units*" (Appendix D).

With respect to construction dewatering of the '*permeable sand and gravel layer*' it was stated that "*the Developer … will have dewatering well points installed in the general area highlighted by the peer reviewer*".

4.1 Letter Review

The letter provided did not include updated hydrogeological assessment details with respect to:

a) Updated basal heave review (SLR, 2024) with respect to the '*permeable sand and gravel layer*';
b) Predicted construction dewatering pumping rates for the '*permeable sand and gravel layer*';
c) If an MECP Permit To Take Water is expected to be required for construction dewatering of the '*permeable sand and gravel layer*';
d) Groundwater quality of the '*permeable sand and gravel layer*';
e) Construction dewatering zone of influence for the '*permeable sand and gravel layer*';
f) Updated construction dewatering off-site settlement monitoring program details for dewatering the '*permeable sand and gravel layer*'; and
g) Post-construction foundation drainage control design (e.g. if sump pumps are proposed rather than bath-tubbing, how much will sump pumps will discharge and what is the ability of the stormsewer to accept such groundwater flows).

For your consideration, it is estimated that the Zone of Influence (Ro) to dewater 2.5 metres of groundwater within the '*permeable sand and gravel layer'* may extend greater than 200 m from MW3/7363911, based upon equation 1 (below) assuming a hydraulic conductivity of $1x10^{-3}$ m/s (Section 1.2.1).

$Ro = 3000(\Delta H)\sqrt{K}$ (Equation 1, Cashman and Preene, 2021)

Where: Ro is the radius of the zone influence in metres, ΔH is drawdown in metres, and K is the hydraulic conductivity in metres/second

4.2 Discussion

We have not been provided the expected short-term construction, or long-term post-construction dewatering rates, or zones of influence for construction in the area of P2 and the '*permeable sand and gravel layer*', i.e. near MW3 as shown on the stand-alone "*Borehole and Monitoring Well and Test Pit Location Plan*" (Appendix D). However, in the absence of being provided an updated Hydrogeological Assessment reflecting their investigations of August/September 2025, it is recommended that the Town of Niagara-on-the-Lake require as part of their conditional approval of the development:

1) 'Bath-tubbing' in areas of '*permeable sand and gravel*' to prevent long-term on-going dewatering discharge to the Town's stormsewer. Also, if other areas are determined to have sand layers requiring active dewatering these should also be completed with 'bath-tubbing'.

2) A settlement monitoring program be completed for at least 200 m from MW3 (Appendix D), unless a smaller radius is determined by the applicant's hydrogeological consultant and calculations provided.

3) Daily construction dewatering rates be provided to the Town on a monthly basis including daily total suspended solids values of post-filtered discharge.

It is recommended that the Town consider requiring an updated Hydrogeological Assessment with the items listed in Section 4.1., including requiring a stormsewer capacity study if long-term dewatering discharge is allowed by the Town to the stormsewer rather than requiring limited 'bath-tubbing'.

5.0 Site Alteration Request

It is our understanding the Town of Niagara-on-the-Lake has received a Site Plan Alteration request for partial excavation of the development, prior to formal Site Plan Approval and Building Permit issuance to a depth of 4 metres (Town of Niagara-on-the-Lake, 2025b).

Based upon the groundwater information provided for BH/MW1 and BH/MW3 it appears that the 'Phase 1 Excavation" to a depth of 4 metres would be expected to be above the groundwater levels (Soil Engineers Ltd., 2025a). It is recommended that if precipitation creates standing water in the excavation it be required to be removed. In the event water-bearing sand layers are encountered, the developer's hydrogeological consultant should be advised and a dewatering plan designed, i.e. for flow control, flow measurement and water quality management.

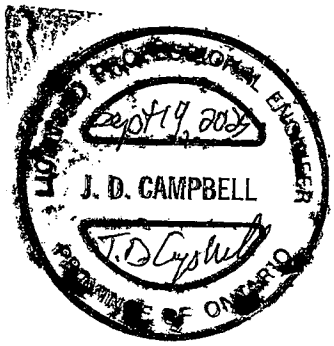
We would like to thank the Town of Niagara-on-the-Lake for retaining Terra-Dynamics Inc. to assist in this work. We trust this information is sufficient for your present needs. Please do not hesitate to contact us if you have any questions.

Yours truly,

TERRA-DYNAMICS INC.

[redacted]

Senior Water Resource Engineer



Attachments
Appendix A MECP Information
Appendix B NOTL Watershed Plan
Appendix C Town Geotechnical Information
Appendix D Soil Engineers Ltd. Documents

6.0 References

Aquafor Beech Limited, 2008. Niagara-on-the-Lake Watershed Study, Final Report. Report prepared for Niagara Peninsula Conservation Authority.

Associated Engineering (Ont.) Ltd., 2024. Peer Review Service for 325 King Street – Parliament Oak Inn, 1st Submission. Letter report to the Town of Niagara-on-the-Lake.

Cashman, P.M., and Preene, M., 2021. Groundwater Lowering in Construction, A Practical Guide to Dewatering, 3rd Edition.

Feenstra, B.H., 1984. Quaternary Geology of the Niagara-Welland Area; Ontario Geological Survey, Map 2496, Quaternary Geology Series, Scale 1:50,000, Geology 1969-1972.

McGlone & Associates Ltd., 1994. Geotechnical Investigation, Sanitary/Storm/Watermain Installation, King and Gage Streets, Niagara on the Lake. Prepared for Denco Engineering Ltd.

Ministry of the Environment, Conservation and Parks, 2025. Water Well Information System (https://www.ontario.ca/page/map-well-records .

Ministry of the Environment, Conservation and Parks, 2006. Assessment Report Draft Module 3 – Groundwater Vulnerability Analysis.

Niagara Peninsula Conservation Authority (NPCA), 2020. Digital Terrain Model.

Ontario Geological Survey (OGS), 2003. Surficial geology of southern Ontario. Miscellaneous Release Data – 128. Project Summary and Technical Document, 53 pp.

R.V. Anderson Associates Limited, 2023. Site Servicing Plan, Parliament Oak Inn, 325 King Street, NOTL.

SGL Planning & Design Inc., 2025. E-mail from David Riley (Principal) to Rober Alguire (Town of Niagara-on-the-Lake). Re: Parliament Oak - Update Hydro-G Assessment. Dated August 13, 2025.

SLR, 2024. Technical Memorandum: Peer Review for Hydrogeology Assessment, Proposed Hotel Development – 325 King Street, Niagara-on-the-Lake, ON. Prepared for Associated Engineering (AE) Andrea LaPlante.

Soil Engineers Ltd., 2025a. Hydrogeological Assessment, Proposed Hotel Development, Parliament Oak Hotel, 325 King Street, Town of Niagara-on-the-Lake. A report to Two Sisters Resorts Corp. Dated August 7, 2025. (received August 8, 2025)

Soil Engineers Ltd., 2025b. Hydrogeological Letter of Opinion, Proposed Hotel Development, 325 King Street, Town of Niagara-on-the-Lake. A letter to the Town of Niagara-on-the-Lake. Dated and received September 10, 2025.

Soil Engineers Ltd., 2025c. Borehole and Monitoring Well and Test Pit Location Plan, Hydrogeological Assessment, Proposed Hotel Development, 325 King Street, Town of Niagara-on-the-Lake. Dated August 18, 2025, received September 10, 2025.

Soil Engineers Ltd., 2025d. Test Pit Investigation Letter, Proposed Hotel Development, 325 King Street, Town of Niagara-on-the-Lake. Dated August 28, 2025, received September 19, 2025.

Soil Engineers Ltd., 2024. Hydrogeological Assessment, Proposed Hotel Development, Parliament Oak Hotel, 325 King Street, Town of Niagara-on-the-Lake, dated September 17, 2024.

Terra-Dynamics Inc., 2025a. E-mail from J. Campbell (Senior Water Resources Engineer) to Tarek Agha (Project Manager, Hydrogeological Services, Soil Engineers Ltd.). Re: Hydrogeological Review - 325 King Street - Parliament Oak Hotel Proposal, Town of Niagara-on-the-Lake. (date August 6, 2025)

Terra-Dynamics Inc., 2025b. E-mail from J. Campbell (Senior Water Resources Engineer) to Tarek Agha (Project Manager, Hydrogeological Services, Soil Engineers Ltd.). Re: Hydrogeological Review - 325 King Street - Parliament Oak Hotel Proposal, Town of Niagara-on-the-Lake. (date August 7, 2025)

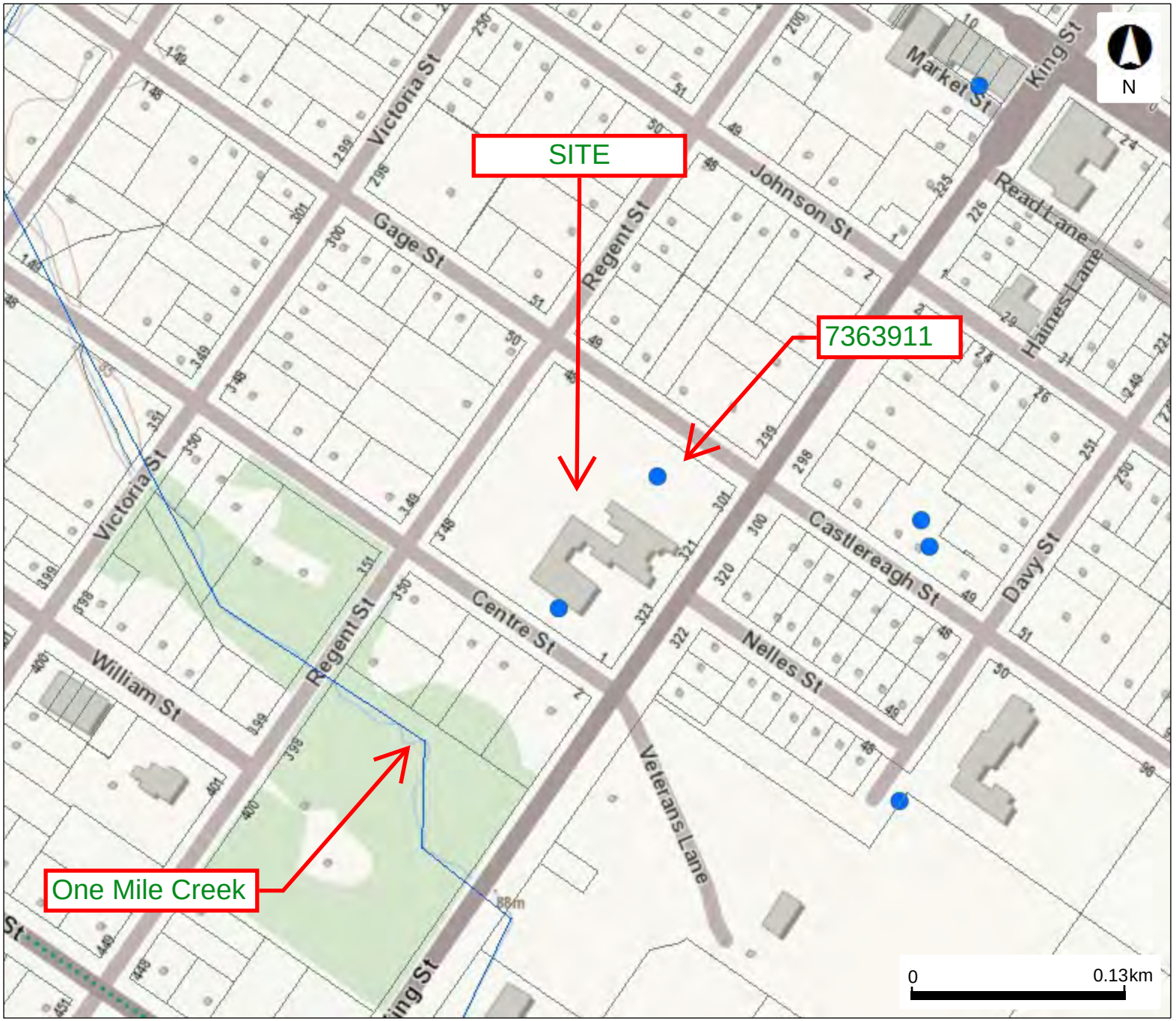
Town of Niagara-on-the-Lake, 2025a. E-mail from Robert Alguire (Engineering Technologist) to David Riley (Principal, SGL Planning & Design Inc.). Re: Parliament Oak - Update Hydro-G Assessment. Dated August 13, 2025.

Town of Niagara-on-the-Lake, 2025b. E-mail from Robert Alguire (Engineering Technologist) to Jayme Campbell (Senior Water Resource Engineer, Terra-Dynamics Inc.). Re: Parliament Oak - Update Hydro-G Assessment. Dated September 15, 2025.

Appendix A

MECP Information

MECP Water Well Information System Records



Legend

- Watercourse Direction
- Assessment Parcel
- Wells

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Ontario

Map Created: 9/18/2025
Map Center: 43.25243 N, -79.07429 W

Ontario

Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A296305

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	
[redacted]	[redacted]	[redacted]	☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
[redacted]	Niagara on the Lake	ON	[redacted]	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
325 King Street			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Niagara on The Lake	Ontario	L0S1J0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Subiot Number	Other
NAD 83	17	656360	4790668		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Black	Asphalt	granular	Hard	0	2'
brown	Clay	silt	Packed	2'	10'
grey	Sand	silt	loose	10'	20'
grey	Sand	gravel	loose	20'	25'
grey	Clay	silt	packed	25'	30'

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	19'	Bentonite	
19'	30'	Sand Pack	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☑ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
2.0"	Plastic	0.2"	0	20'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
2.5"	Plastic	10	20'	30'

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	30'	7.5"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

See Map Attached labelled "A296305"

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Davis Drilling Ltd.	7172

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
873 Nipissing rd.	Milton	ON	L9T1Z4	[redacted]

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
[redacted]	[redacted]	2788	[redacted]	2020/06/04

Well owner's information package delivered ☐ Yes ☑ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2020/05/21

Ministry Use Only

Audit No. Z338475

Received AUG 06 2020

C-7497
2338475

AUG 0 6 2020

Appendix B

NOTL Watershed Plan

LAKE ONTARIO

NIAGARA RIVER

WELLAND CANAL

ST. CATHARINES

NIAGARA-ON-THE-LAKE

THOROLD

Four Mile Pond

Two Mile Creek

Four Mile Creek

Eight Mile Creek

Six Mile Creek

A-A'

B-B'

C-C'

D-D'

KEY MAP

LEGEND:

- Municipal Boundary
- Watershed
- Escarpment
- Iroquois Shoreline
- Geological Cross-Section

Surficial Geology

- Fill (Man-Made)
- Sand and Gravel
- Sand
- Silt
- Clay
- Halton Till
- Bedrock

NOTES:

Base Mapping was provided by NPCA

0 2 4

Kilometers

8177 Torbram Road
Brampton, ON L6t 5C5
Phone: 905-794-2367
Fax: 905-790-4090

Aquafor Beech Limited

NIAGARA PENINSULA CONSERVATION AUTHORITY

250 Thorold Road West, 3rd Floor
Welland, Ontario L3C 3W2
Tel (905) 788-3135
Fax (905) 788-1121
E-mail: npca@conservation-niagara.on.ca

NIAGARA-ON-THE-LAKE WATERSHED STUDY

Surficial Geology

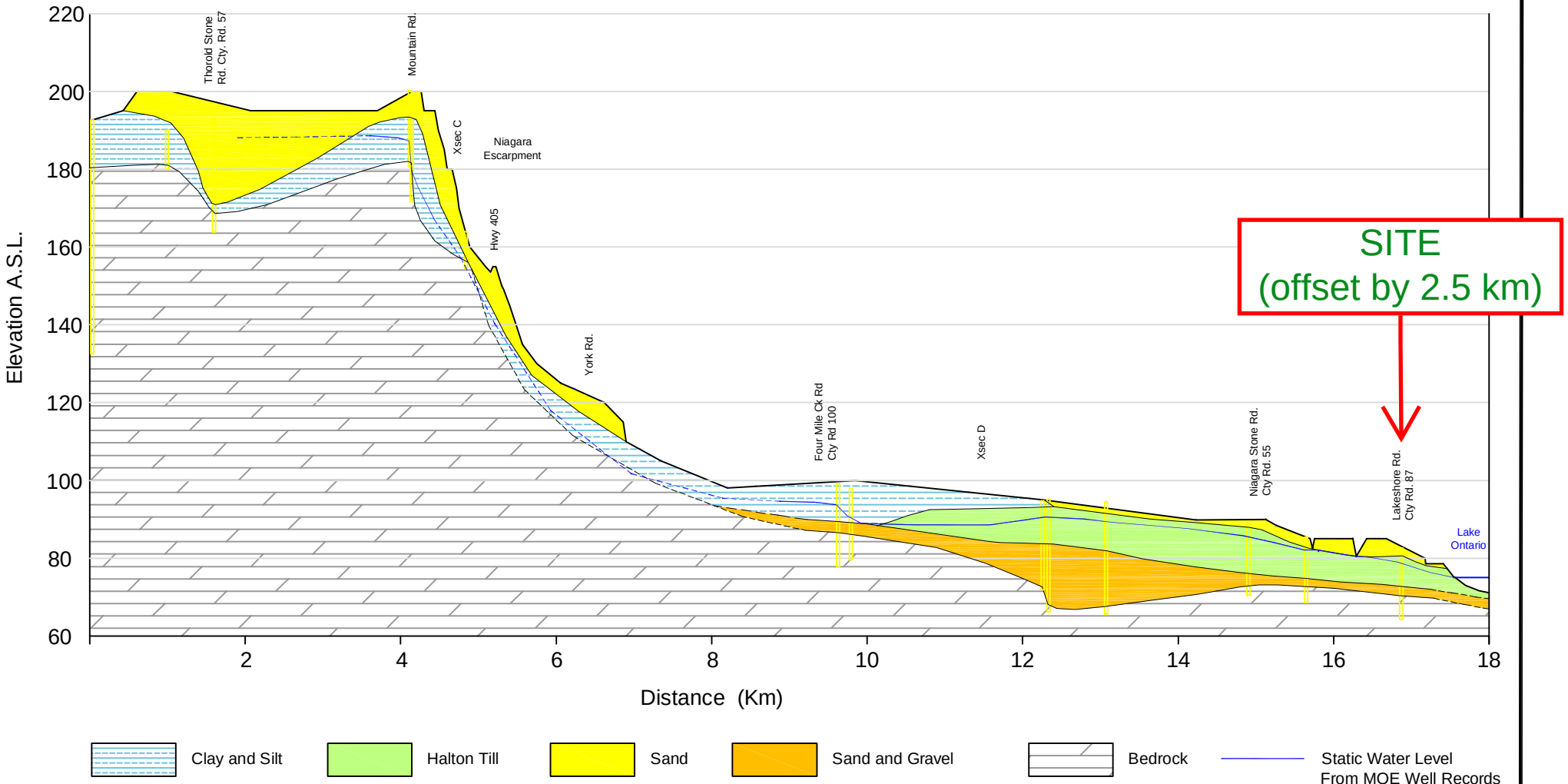
FIGURE No. 2.1

DATE: February 2008

South
B

Niagara-on-the Lake
Watershed Study
Geologic Cross-Section
Vertical Exaggeration: 50X

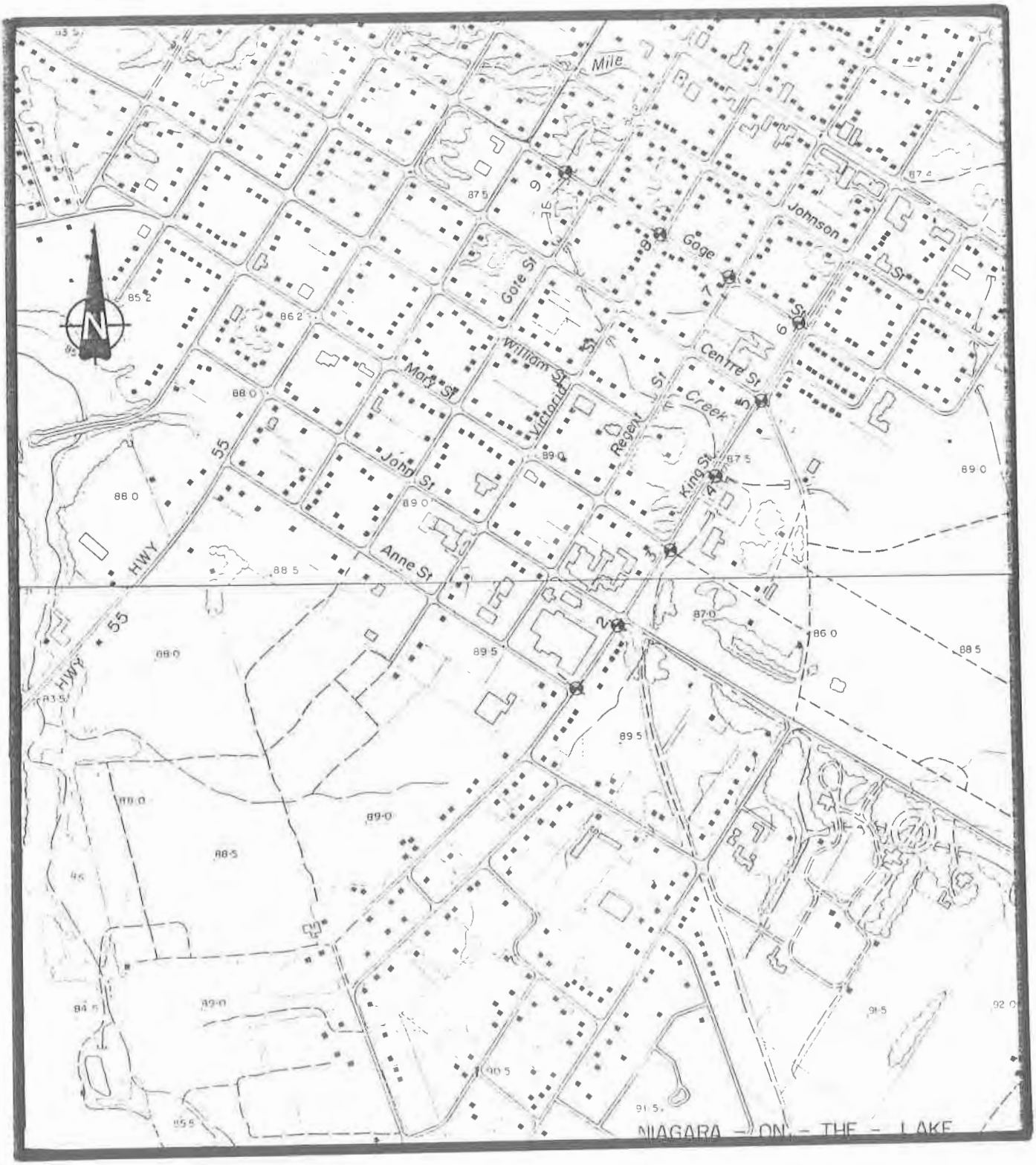
North
B'



NOTE: Dashed lines are interpolated

Appendix C

Town Geotechnical Information



GENERAL SITE & BOREHOLE LOCATION PLAN

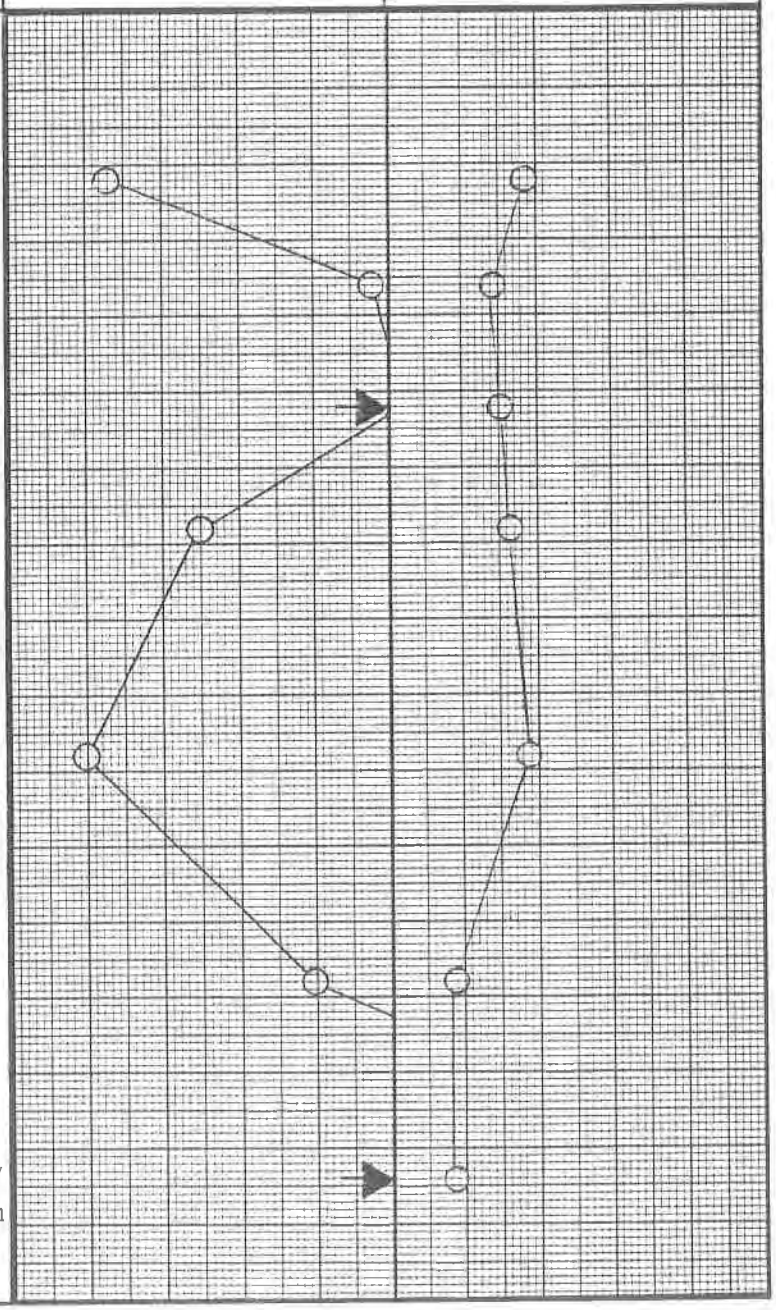
LOG OF BOREHOLE NO. 6

PROJECT New Sanitary/Storm/Watermain Installation, King and Gage Streets, N.O.T.L. **Job No.** 94269

CLIENT Denco Engineering Ltd. **Scale:** 1:50

Ground El. 88.3 m **Borehole Type** 114 mm Augers **Boring Date** 94 09 20

Depth/Elev.	DESCRIPTION	SAMPLE Number	Type	Blows/30cm
86.9	5 cm of SURFACE TREATMENT over GRANULAR to 18 cm, over brown CLAYEY SILT, wtpl, stiff.	1	SS	13
1.4± / 85.4	Brown SILT, minor cohesion, moist, dense to very dense.	2	SS	48
		3	SS	52
2.9± / 82.7	Brown changing to grey at 4.8 m (±), CLAYEY SILT with SILT seams, mostly clayey silt below 4.6 m (±), apl to wtpl, very stiff to stiff.	4	SS	25
		5	SS	10
5.6± / 80.5	Brown SAND to SAND and GRAVEL, saturated, dense to very dense.	6	SS	40
		7	SS	50/15 cm
7.8	Borehole terminated.			



COMMENTS: Upon Completion: Waterlevel at 5.0 m (±).
Borehole caved at 5.3 m (±).
Note: Spoon wet upon retrieval of Sample #6.
Augers grinding below 5.6 m (±) and at 7.2 m (±).

McGlone & Associates Ltd.
3300 Merrittville Hwy., Unit #5
S.S. #1, Thorold, Ontario L2V 4Y6

Appendix D

Soil Engineers Ltd. Documents

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 TEL: (416) 754-8515 FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

September 10, 2025

Town of Niagara-on-the-Lake
1593 Four Mile Creek Road
Virgil, Ontario
L0S 1T0

Attention: [redacted] Engineering Technologist

Re: Hydrogeological Letter of Opinion
Proposed Hotel Development
325 King Street
Town of Niagara-On-The Lake

Dear Sir:

Soil Engineers Ltd. (SEL) has previously completed at hydrogeological assessment report for the above noted project site (the Subject Site) with the findings presented in a report titled: "*Hydrogeological Assessment, Proposed Hotel Development, Parliament Oak Hotel, 325 King Street, Town of Niagara-On-The Lake*", dated September 17, 2024 (SEL Ref. No. 2405-W131).

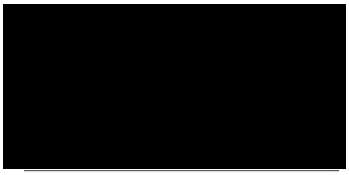
The above noted report was updated to address the peer review comments by drilling an additional deeper borehole to investigate potential groundwater bearing unit and associated risk for basal heave, and present the spring groundwater monitoring data. The findings were presented in the revised report titled: "*Hydrogeological Assessment, Proposed Hotel Development, Parliament Oak Hotel, 325 King Street, Town of Niagara-On-The Lake, Rev. 1*", dated August 7, 2025 (SEL Ref. No. 2405-W131).

We received emails and attended a meeting with the Town of Niagara-On-The Lake's peer reviewer, after conducting the investigation, regarding the presence of a permeable sand and gravel layer within the southeast corner and the south portion of the Subject Site close to the Subject Site boundary. SEL conducted a test pit investigation and carried out hydraulic conductivity testing in the monitoring well that was previously installed by others. Based on a review of the recently provided architectural drawings, the proposed underground structure includes a 2-level underground parking. Plan review indicates that the proposed underground parking level 2 does not extend to the south limit of the Subject Site where the permeable unit is expected, and the proposed underground parking level 1 remains above the permeable layer, with the exception of the east limit of the proposed underground parking level 2, where majority of the excavation will be completed within the low permeable soil.

Findings were shared with the client. It is understood that the findings were considered by the client to manage the potential groundwater seepage and associated impacts from the permeable layer extending along the east and south limits of the Subject Site for short-term dewatering and long-term foundation drainage control. Precautionary measures will be executed by the Developer who will have dewatering well points installed in the general area highlighted by the peer reviewer. SEL should continue to work with the Developer to monitor the ground quality and ground water through the construction process to ensure proper practices are in place.

We trust that the above-noted information is suitable for your review. If you have any questions regarding this information, please do not hesitate to contact the undersigned.

Yours very truly,
SOIL ENGINEERS LTD.



Tarek Agha, E.I.T., PMP.

Narjes Alijani, M.Sc., P.Geo.

656200
656300
656400
4790700
4790600
REGENT STREET
GAGE STREET
CASTLEREAGH STREET
KING STREET
CENTRE STREET
NELLES STREET
One Mile Creek
BH 7
BHMW 6
TP 1A
TP 1
P1
BH/MW 2D
BH/MW 2S
MW 3
TP 2
BH/MW 5
P2
BH 4
BH 2
BH/MW 1
TP 3
BH/MW 3
D:\Projects\2405-W131\

N

References: Ontario Ministry of Natural Resources and Forestry
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Key Map

Legend

- Approximate Boundary Of Subject Site
- Expressway/Freeway
- Major Road
- Local Road
- Railway
- Waterbody
- Watercourse
- Approximate Test Pit Location
- Borehole (Previous Consultant)
- Monitoring Well (Previous Consultant)
- Borehole
- Borehole With Monitoring Well

Soil Engineers Ltd.

Borehole and Monitoring Well and Test Pit Location Plan

Hydrogeological Assessment
Proposed Parliament Oak Hotel
325 King Street,
Town of Niagara-On-The-Lake

Reference No. 2405-W131

Date: August 18, 2025

Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 2

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 TEL: (416) 754-8515 FAX: (905) 881-8335

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August 28, 2025

Two Sisters Resorts Corp.
122 Romina Drive
Concord, Ontario
L4K 4Z7

Attention: [redacted]

Re: Test Pit Investigation Letter
Proposed Hotel Development
325 King Street
Town of Niagara-On-The Lake

Dear Sir:

Soil Engineers Ltd. (SEL) has previously completed at hydrogeological assessment report for the above noted project site (the Subject Site) with the findings presented in a report titled: "*Hydrogeological Assessment, Proposed Hotel Development, Parliament Oak Hotel, 325 King Street, Town of Niagara-On-The Lake*", dated September 17, 2024 (SEL Ref. No. 2405-W131).

The above noted report was updated to address the peer review comments by drilling an additional deeper borehole to investigate potential groundwater bearing unit and associated risk for basal heave, and present the spring groundwater monitoring data. The findings were presented in the revised report titled: "*Hydrogeological Assessment, Proposed Hotel Development, Parliament Oak Hotel, 325 King Street, Town of Niagara-On-The Lake, Rev. 1*", dated August 7, 2025 (SEL Ref. No. 2405-W131).

SEL was informed by Terra-Dynamics Inc. (acting on behalf of the Town of Niagara-on-the-Lake) of an existing monitoring well (MW3), previously installed by Soil-Mat in 2020, located at the Subject Site that indicated high permeable soil. **Drawing No. 1** presents the borehole and monitoring wells' location.

SEL was requested to conduct a test pit investigation to investigate the extent of the high permeable unit. On August 21, 2025 an SEL supervisor visited the Subject Site to supervise the test pit (TP) investigation. Four (4) TPs were excavated to a maximum depth of 7.2 metres below ground surface (mbgs). At three (3) of the four (4) TPs (TP 1A, 2, and 3) a sand and gravel layer with an approximate thickness of 0.7 m was contacted approximately 6.8 mbgs, beneath the silt/silty clay till units. The locations of the monitoring well and TPs are shown on **Drawing No. 1**.

The sand and gravel layer was not contacted in any of the boreholes drilled to a maximum termination depth of the investigation at 15.3 mbgs within the Subject Site. However, based on the findings of the test pit investigation, it extends along the east and south boundaries of the Subject Site.

Yours very truly,
SOIL ENGINEERS LTD.

[redacted]

Tarek Agha, E.I.T., PMP.

[redacted]

Narjes Alijani, M.Sc., P.Geo.

ENCLOSURES
Borehole, Monitoring Well, and Test Pit Location Plan…….. Drawing 1

Soil Engineers Ltd.
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GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

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DRAWING 1

REFERENCE NO. 2405-W131

N

References: Ontario Ministry of Natural Resources and Forestry
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Key Map

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Soil Engineers Ltd.

Borehole and Monitoring Well and Test Pit Location Plan

Test Pit Investigation Letter
Proposed Parliament Oak Hotel
325 King Street,
Town of Niagara-On-The-Lake

Reference No. 2405-W131

Date: August 18, 2025

Scale:
0 5 10 20 30 40 50
Metres

Drawing No. 1