

***Foundations,
Excavation &
Shoring
Specialists***

Braun Geotechnical
102 – 19049 95A Ave.
Surrey, BC
V4N 4P3
Tel: 604-513-4190
Fax: 604-513-4195
info@braungeo.com

www.braungeo.com

Foundations

***Excavation &
Shoring***

Slope Stability

Natural Hazards

***Pavement Design
and Management***

***Reinforced Soil
Walls and Slopes***

May 9, 2019

Reference: 19-8025

Via email: rosa@pacificlandgroup.ca

c/o Pacific Land Group
212 – 12992 76 Avenue
Surrey, BC V7Y 1C6

Attn: Rosa Shih, M.A. (Planning)

Re: Geotechnical Exploration Report
Proposed Lumber Yard
10880 Dyke Road, Surrey, BC

1.0 INTRODUCTION

As requested, Braun Geotechnical Ltd. carried out a geotechnical exploration and report for the above referenced project. The geotechnical work has been performed in general accordance with the Braun Geotechnical Fee Estimate dated January 21, 2019 (our reference no. P19-6209). The scope of work included completion of a site reconnaissance, a geotechnical drill exploration, and provision of this geotechnical report with preliminary discussion and recommendations pertaining to site preparation and foundation design. No consideration has been given to any environmental aspects.

Braun Geotechnical should be forwarded architectural/civil and structural drawings when they become available and be provided the opportunity to comment on geotechnical aspects of proposed foundation design. This report should be considered preliminary and subject to review for final design.

2.0 SITE INFORMATION AND PROPOSED DEVELOPMENT

The site is located at 10880 Dyke Road, in the City of Surrey, BC. Note, additional addresses have been assigned to the site (City of Surrey Cosmos), however, 10880 Dyke Road is used in this Report with respect to the subject site area. It is understood that the subject site is owned by the Port of Vancouver.

The subject site is approximately northeast/southwest orientated, and is approximately rectangular in shape with plan dimensions of approximately 500 x 80m. The subject site area is shown on the attached Location Plan (Dwg. 19-8025-01). The subject site is relatively flat lying, with grades in the order of +/- El. 4.0m on the northeast and +/- El. 2.5m on the southwest, with localized material stockpile areas with higher grades. The subject site is bound by the Fraser River to the northwest, existing industrial parcels to the northeast and southwest, and an existing railway line (Canadian National Railway) and access road/pathway to the southeast.

It is understood that the subject site may be used as an outdoor lumber storage facility, with an office building comprising prefabricated modular trailers on the

southern portion of the site. It is understood that racking may be considered for the proposed lumber storage.

At the time of the site exploration, the southwestern approximately 300m of the site was asphalt paved and/or gravel surfaced, and the northeastern approximately 200m of the site was surfaced granular/mineral fill. An existing approximately 75 x 65m building was located within the gravel surfaced area, and was utilized for lumber storage.

3.0 DESK STUDY INFORMATION

The Desk Study phase of the geotechnical assessment was non-intrusive in nature, and involved update and review of available geological and geotechnical information and review of available historical government air photos.

The following geotechnical comments based on the desk study information are provided:

- Available published geological information indicated the study site area is underlain by Bog, Swamp, and Shallow lake deposits, comprising lowland peat up to 14m thick, in part overlying Fraser River Sediments, comprising overbank sandy to silt loam up to 2m thick, overlying 15 or more of deltaic and distributary channel fill (including tidal flat deposits) sandy to silt loam, interbedded fine to medium sand and minor silt beds.
- The subject site is located within the Fraser River flood plain. Desk study review to quantify Fraser River flood hazard, limited to review of BC Ministry of Environment document “Fraser River Model Update – Water Surface Profile Plan and Dike Layout Lower Model,” dated March 2008 and the Northwest Hydraulic Consultants Report “Fraser River Hydraulic Model Update – Final Report,” dated March 2008, was carried out for the subject site. Based on the documents, the design flood elevation for the subject site El. 4.0m. Allowing for 0.6m freeboard, a Minimum Building Elevation (MBE) of El. 4.6m is recommended for the proposed residence, with respect to Flood Construction Level (FCL).
- MBE is typically defined at the top of slab elevation for slab-on-grade areas and bottom of floor joists for crawl-space type construction, and is typically applicable for habitable spaces only.
- Historical government air photos available for most decades dating back to the 1930’s were reviewed. Comments from the air photo review have been provided below:
 - Historical air photos show differing site conditions between the north and south areas.
 - The northern portion of the site was observed to be occupied by various buildings and/or stockpiled equipment/materials between the 1938 to 1984 historical air photos.
 - Buildings on the northern portion of the site were not visible on the 1989 and newer historical air photos. Filling/re-grading was inferred prior to the 1989 historical air photo. From the 1994 to the current historical air photo, the northern portion of the site was observed to be in various stages of stockpiled materials with drive isles in between.
 - An inferred “inlet” was observed on the northern portion of the site 1973 and older historical air photos, and was not visible in the 1980 and newer historical air photos. It is considered that the “inlet” may have been constructed for riverfront lumber catchment/storage, and was filled in sometime between 1973 and 1980 (Figure 1 and Figure 2).



Figure 1: 1949 Historical Air Photo (from City of Surrey Cosmos) with approximate location of inferred “inlet” shown in **RED**.



Figure 2: 2018 City of Surrey Cosmos Air Photo with approximate historic location of “inlet” shown in **RED**.

- The southern portion of the site was generally vacant on the 1951 and older historical air photos.
- The southern portion of the site was observed to be occupied by various buildings and/or stockpiled equipment/materials from the 1954 to current historical air photos.
- Various stages of filling/regrading were inferred along the southern portion of the site, including along the shoreline.

- The existing building that currently occupies the southern portion of the site was visible on the 1973 and newer historical air photos, with possible roof and/or building upgrades after 1994.
- The site was generally similar to current conditions on the 1994 and newer historical air photos.

4.0 SITE EXPLORATION

The geotechnical exploration was carried out on April 1 and April 2, 2019, using a truck mounted solid stem auger drill under subcontract to Braun Geotechnical. The exploration included the following:

- Four auger drilled test holes (TH19-01 to TH19-04) to depths of 7.6 to 9.1m.
- A Seismic Cone Penetration Test (SCPT19-01) advanced to a depth of 30m in the vicinity of TH19-01.
- A Dynamic Cone Penetration Test (DCPT) advanced at the location of TH19-04 to a depth of 9.1m. Local experience indicates that the DCPT results can be approximately correlated with Standard Penetration Test (SPT) N-values.

The test holes were logged in the field by Braun and representative disturbed samples were collected from the augers for routine laboratory moisture content testing. The approximate test hole locations are shown on the attached Location Plan.

5.0 SOIL AND GROUNDWATER CONDITIONS

The findings of the test hole exploration are detailed on the attached test hole logs. A generalized subsoil profile based on the test holes has been summarized below.

FILL

FILL, including, tan to dark-grey, damp, compact to dense SAND to SAND with some gravel, with trace to some silt (granular FILL) and grey, damp, compact SAND with some silt to silty SAND (mineral FILL), was encountered within each of the test holes except TH19-04 to depths of 1.2 to 1.8m. TH19-04 encountered a thin zone of surficial fill/organics.

Organics Rich Soils

Dark-grey to dark-brown, damp, soft sandy SILT to silty SAND, with some organics, trace gravel, occasional fibers and occasional roots/rootlets was encountered within each of the test holes except TH19-03 to depths of 0.5 to 2.7m.

SAND/SILT

Grey, moist to wet, SILT with trace sand to SAND (with occasional compact zones) with coarse sand with trace silt (including silty fine SAND/fine sandy SILT), with occasional zones with some sand to SAND with some silt, with trace to some gravel and occasional fibers was encountered below the fill/organic rich zones to the depth of the test hole exploration. Zones of clayey zones are also anticipated within the silt. The silt was generally noted to be soft to firm, and the sand generally loose (with occasional compact zones) to depths of 7.5 to 9.1m.

SCPT19-01 generally encountered interlayered SAND/silty SAND below to a depth of 30m. The sand was noted to be compact (with occasional loose zones) to a depth of approximately 17m, and compact to dense below.

Groundwater

Semi-static groundwater was encountered within each of the test holes at depths of approximately 3.0 to 3.7m at the time of drilling. Groundwater was inferred to be at a depth of approximately 1.4m below existing grade at the location of SCPT19-01 (drilled out above). Note that groundwater levels measured during drilling and shortly thereafter are typically influenced by the disturbance caused during drilling. Groundwater levels are expected to fluctuate seasonally, and with drainage conditions, and are expected to be impacted by water levels in the Fraser River.

The subsurface conditions described above were encountered at the test hole locations only. Subsurface conditions at other locations could vary.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 General

The subsurface exploration generally encountered existing granular fill over thin organic rich soils underlain by soft to firm silt/loose sand, over compact/compact to dense sand to the depth of exploration.

It is understood that the proposed office building would be modular construction with the building elevated, such that site grades would not be increased. It is recommended that the bottom of floor joists for the prefabricated structures be established at or above the MBE of El. 4.6m.

The natural underlying organic rich soils and natural soft to firm silt are typically expected to consolidate and compress when subjected to vertical loading from site fills and building loads. Additionally, long term settlement due to secondary compression and consolidation of organic soil layers may also typically be anticipated. Settlements can typically be reduced to within tolerable limits using a preload surcharge treatment.

As the existing site fills/site grades have been in place for greater than 15 years, and an increase in site grades is not anticipated, a preload surcharge treatment is not considered warranted for the lightly loaded modular office building. Additionally, preload surcharge treatment is not considered warranted for the proposed lumber storage.

Note, in the absence of a preload surcharge treatment, settlements in the order of +/- 50mm should be anticipated. Periodic maintenance and repair (i.e. re-levelling) of the office structure and stored lumber may be required.

The following sections provide further comments and recommendations for site preparation and foundation design.

6.2 Site Preparation

Subgrade preparation below the proposed structure and asphalt paved areas should include removal of any existing near-surface vegetation, and organic rich soils to expose the existing granular fill and/or the underlying natural sand/silt. Deep stripping for removal of surficial granular fill and the underlying organic rich soils is not required.

Where encountered, the existing granular fill should be re-compacted to at least 95% Modified Proctor Density (MPD). If adequate compaction cannot be achieved, the existing fill should be stripped a minimum thickness of 0.6m, and replaced with minimum 0.6m of structural fill.

Following suitable re-compaction, the subgrade should proof roll tested under review of Braun Geotechnical using a fully loaded dump truck. Any areas exhibiting "pumping" during the proof roll should be stripped to a minimum thickness of 0.6m and replaced with 0.6m of structural fill.

6.3 Structural Fill

Subgrade restoration fills should consist of structural fill comprised of well graded, free draining 75mm minus sand and gravel with less than 5% fines (percent passing the #200 sieve). Structural fill should be placed and compacted in maximum 300mm loose lifts with each lift compacted to at least 95% MPD. For confined areas, structural fill placed under building and pavement areas should extend horizontally beyond by a distance equal to at least the thickness of structural fill. Unconfined fills should typically extend horizontally by a distance equal to 2 times the thickness of structural fill.

Density testing should be carried out during fill placement on a regular basis to confirm adequacy of compaction, and the results forwarded to Braun Geotechnical for review. Braun Geotechnical should also be contacted to review fill quality, and placement and compaction procedures.

6.4 Foundation Design

Conventional shallow strip and spread foundation support is considered feasible following site preparation as described in Section 6.2. The following soil resistance (bearing) values for the structural fill may be adopted for preliminary foundation design:

Foundation Subgrade	Limit States Design		Working Stress Design
	Factored Ultimate Bearing Capacity (ULS)	Serviceability Limit State (SLS)	Allowable Bearing Pressure DL + LL
Compacted Granular Fill	110 kPa	75 kPa	75 kPa

The above design bearing pressures for subgrade assume the following:

- Any existing fill subgrades are re-compacted to at least 95%MPD and proof rolled under review by Braun Geotechnical.
- Strip and pad footings have minimum widths of 460 mm and 600 mm respectively.
- Footings are founded at least 460mm below finished adjacent grade for frost protection.
- Site preparation is completed as indicated above and load-bearing surfaces are reviewed and approved by the Geotechnical Engineer.
- Foundation bearing surfaces are no higher than 2H:1V (Horizontal to Vertical) from the base or toe of adjacent walls, sumps, etc.
- Footings are placed below a 1H:1V line projected up from lower footings or buried structures such as utility lines.

6.5 Preliminary Pavement Section

Note, detailed pavement design would be provided once maximum equipment tire loading details have been finalized. A preliminary pavement design has been provided below.

With subgrade preparation completed in the manner recommended above, the minimum recommended pavement structure for the proposed lumber yard is outlined below.

<i>Thickness</i>	<i>Material</i>
125mm	Hot Mix Asphalt Surface (MoTI Class I Medium Mix Hot Mix Asphalt, HMA)
150mm	19mm minus Granular Base
300mm	Granular Subbase (SGSB)

The gradation of the above materials should comply with the appropriate Master Municipal Specifications outlined above. The road construction materials should be placed and compacted in compliance with the current MMCD specifications. Adequate drainage and/or cross falls should be provided to ensure that the base and subbase materials will not become saturated.

6.6 Seismic Considerations

There is the potential that loose zones within the underlying sand may be susceptible to liquefaction and that soft to firm zones within the underlying silt/clay may be susceptible to strain softening in a design seismic event.

Without ground improvement, lateral movements in the order of 1.0 to 2.0m and surface settlements of approximately 0.3m are estimated at the site, which would be tolerable for the proposed lumber storage use. Note that the above values for lateral movements and surface settlements are estimates, and could vary based on actual subsurface conditions and seismic shaking intensity. Building structures should be designed to structurally accommodate estimated movements without collapse.

The current BC Building Code classifies a site with potentially liquefiable soils as Site Class F. For structures with a period equal to or less than 0.5s that are built on liquefiable soils, Site Class and the corresponding values of F_a and F_v may be determined by assuming that the soils are not liquefiable. As such, the proposed building structures may be designed for Site Class E seismic parameters, assuming the proposed structures have a period equal to or less than 0.5s. If the period of the structure is greater than 0.5s (potentially for racking), a Site Specific Response Analysis may be required in order to determine the F_a and F_v values.

The following geotechnical comments and recommendations should be adopted in the structural design of the proposed structure foundations:

- The foundations for the proposed structure should be structurally tied together to resist separation caused by permanent horizontal displacements that may occur due to liquefaction.
- Greater displacements and settlement should be anticipated at the location of the filled “inlet” identified in Figure 1 and Figure 2.
- The existing/fill is expected to provide adequate resistance to potential for punch-through type bearing failure of the lightly loaded foundations in the event of pile breakage.

Note, the above noted recommendations may not be applicable if the proposed prefabricated modular trailer office building is considered an unoccupied temporary structure, subject to review/approval by the City of Surrey and/or the Port of Vancouver.

7.0 GEOTECHNICAL FIELD REVIEW

Geotechnical field reviews are required by the Geotechnical Engineer of Record and to satisfy the requirements of the Letters of Professional Assurance required for the Building Permit. Field

reviews are essential to confirm that the recommendations of the geotechnical report are understood and followed. As a minimum, Geotechnical field reviews should be arranged by the Contractor to address the following:

- Review exposed subgrade (pavement and building areas);
- Proof roll testing;
- Review structural fill placement and compaction.

8.0 APPLICABLE LEGISLATION

It is our opinion that the “land may be used safely for the use intended” with reference to the current BC Building Code and Section 56 of the Community Charter. The intended use is defined as a lumber storage yard with a prefabricated modular trailer office building, with the underside of floor joists established at or above the MBE. Safe use is considered to be in reference to hazard acceptability criteria presented in the government document, “*Hazard Acceptability Thresholds for Development Approvals by Local Government, 1993.*” Geotechnical hazards with potential to impact the project area were considered and included terrestrial, marine, and geotechnical hazards, including mountain stream erosion, avulsion, flooding, debris flows, debris floods, small-scale rock fall and regional-scale landslides.

Applicable hazards for the site were considered to be Fraser River flooding, and seismic considerations. Recommendations with respect to MBE and seismic considerations have been provided in Sections 6.1 and 6.6, respectively.

In accordance with Section 86 of the Land Title Act, and Section 56 of the Community Charter this report has been signed and sealed by a Professional Engineer and as such is considered a “certified report” (APEGBC, 2010, now EGBC).

9.0 CLOSURE

This report should be considered preliminary and is subject to review and revision as required, once layout and structural drawings have been finalized.

This report is prepared for the exclusive use of Pacific Land Group and their designated representatives and may not be used by other parties without the written permission of Braun Geotechnical Ltd. The City of Surrey and Port of Vancouver may also rely on the findings of this report. If the development plans change, or if during construction soil conditions are noted to be different from those described in this report, Braun Geotechnical should be notified immediately in order that the geotechnical recommendations can be confirmed or modified, if required. Further, this report assumes that field reviews will be completed by Braun Geotechnical during construction.

It should be noted that the recommendations and comments provided in this geotechnical report are based on a limited number of test holes. Subsurface conditions at other locations could vary and the actual extent of subsidence could be substantially different from anticipated values.

The site Contractor should make their own assessment of subsurface conditions and select the construction means and methods most appropriate to the site conditions.

This report should not be included in the specifications without suitable qualifications approved by the geotechnical engineer.

The use of this report is subject to the conditions on the Report Interpretation and Limitations sheet which is included with this report. The reader’s attention is drawn specifically to those conditions, as it is considered essential that they be followed for proper use and interpretation of this report.

We hope the above meets with your requirements. Should any questions arise, please do not hesitate to contact the undersigned.

Yours truly,

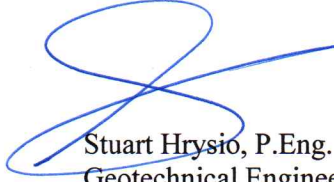
Braun Geotechnical Ltd.



A circular professional seal for H. Dhillon, P.Eng. The seal contains the text: "PROFESSIONAL ENGINEER OF BRITISH COLUMBIA", "H. DHILLON", "# 39484", and "2019". A blue signature is written over the seal.

Harman Dhillon, P.Eng.
Geotechnical Engineer

Braun Geotechnical Ltd.



A blue ink signature of Stuart Hrysiu.

Stuart Hrysiu, P.Eng.
Geotechnical Engineer

Encl: Report Interpretation and Limitations
Location Plan
Test Hole Logs
SCPT Log

X:\2019 Projects\19-8025 Proposed Lumber Yard- 10880 Dyke Road, Surrey, BC\Report\Preliminary Geotechnical Report 19-8025 2019-05-09.docx

REPORT INTERPRETATION AND LIMITATIONS

1. STANDARD OF CARE

Braun Geotechnical Ltd. (Braun) has prepared this report in a manner consistent with generally accepted engineering consulting practices in this area, subject to the time and physical constraints applicable. No other warranty, expressed or implied, is made.

2. COMPLETENESS OF THIS REPORT

This Report represents a summary of paper, electronic and other documents, records, data and files and is not intended to stand alone without reference to the instructions given to Braun by the Client, communications between Braun and the Client, and/or to any other reports, writings, proposals or documents prepared by Braun for the Client relating to the specific site described herein.

This report is intended to be used and quoted in its entirety. Any references to this report must include the whole of the report and any appendices or supporting material. Braun cannot be responsible for use by any party of portions of this report without reference to the entire report.

3. BASIS OF THIS REPORT

This report has been prepared for the specific site, development, design objective, and purpose described to Braun by the Client or the Client's Representatives or Consultants. The applicability and reliability of any of the factual data, findings, recommendations or opinions expressed in this document pertain to a specific project as described in this report and are not applicable to any other project or site, and are valid only to the extent that there has been no material alteration to or variation from any of the descriptions provided to Braun. Braun cannot be responsible for use of this report, or portions thereof, unless we were specifically requested by the Client to review and revise the Report in light of any alterations or variations to the project description provided by the Client.

If the project does not commence within 18 months of the report date, the report may become invalid and further review may be required.

The recommendations of this report should only be used for design. The extent of exploration including number of test pits or test holes necessary to thoroughly investigate the site for conditions that may affect construction costs will generally be greater than that required for design purposes. Contractors should rely upon their own explorations and interpretation of the factual data provided for costing purposes, equipment requirements, construction techniques, or to establish project schedule.

The information provided in this report is based on limited exploration, for a specific project scope. Braun cannot accept responsibility for independent conclusions, interpretations, interpolations or decisions by the Client or others based on information contained in this Report. This restriction of liability includes decisions made to purchase or sell land.

4. USE OF THIS REPORT

The contents of this report, including plans, data, drawings and all other documents including electronic and hard copies remain the copyright property of Braun Geotechnical Ltd. However, we will consider any reasonable request by the Client to approve the use of this report by other parties as "Approved Users." With regard to the duplication and distribution of this Report or its contents, we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of this Report by those parties. The Client and "Approved Users" may not give, lend, sell or otherwise make this Report or any portion thereof available to any other party without express written permission from Braun. Any use which a third party makes of this Report – in its entirety or portions thereof – is the sole responsibility of such third parties. BRAUN GEOTECHNICAL LTD. ACCEPTS NO RESPONSIBILITY FOR DAMAGES SUFFERED BY ANY PARTY RESULTING FROM THE UNAUTHORIZED USE OF THIS REPORT.

Electronic media is susceptible to unauthorized modification or unintended alteration, and the Client should not rely on electronic versions of reports or other documents. All documents should be obtained directly from Braun.

5. INTERPRETATION OF THIS REPORT

Classification and identification of soils and rock and other geological units, including groundwater conditions have been based on exploration(s) performed in accordance with the standards set out in Paragraph 1. These tasks are judgemental in nature; despite comprehensive sampling and testing programs properly performed by experienced personnel with the appropriate equipment, some conditions may elude detection. As such, all explorations involve an inherent risk that some conditions will not be detected.

Further, all documents or records summarizing such exploration will be based on assumptions of what exists between the actual points sampled at the time of the site exploration. Actual conditions may vary

significantly between the points investigated and all persons making use of such documents or records should be aware of and accept this risk.

The Client and "Approved Users" accept that subsurface conditions may change with time and this report only represents the soil conditions encountered at the time of exploration and/or review. Soil and ground water conditions may change due to construction activity on the site or on adjacent sites, and also from other causes, including climactic conditions.

The exploration and review provided in this report were for geotechnical purposes only. Environmental aspects of soil and groundwater have not been included in the exploration or review, or addressed in any other way.

The exploration and Report is based on information provided by the Client or the Client's Consultants, and conditions observed at the time of our site reconnaissance or exploration. Braun has relied in good faith upon all information provided. Accordingly, Braun cannot accept responsibility for inaccuracies, misstatements, omissions, or deficiencies in this Report resulting from misstatements, omissions, misrepresentations or fraudulent acts of persons or sources providing this information.

6. DESIGN AND CONSTRUCTION REVIEW

This report assumes that Braun will be retained to work and coordinate design and construction with other Design Professionals and the Contractor. Further, it is assumed that Braun will be retained to provide field reviews during construction to confirm adherence to building code guidelines and generally accepted engineering practices, and the recommendations provided in this report. Field services recommended for the project represent the minimum necessary to confirm that the work is being carried out in general conformance with Braun's recommendations and generally accepted engineering standards. It is the Client's or the Client's Contractor's responsibility to provide timely notice to Braun to carry out site reviews. The Client acknowledges that unsatisfactory or unsafe conditions may be missed by intermittent site reviews by Braun. Accordingly, it is the Client's or Client's Contractor's responsibility to inform Braun of any such conditions.

Work that is covered prior to review by Braun may have to be re-exposed at considerable cost to the Client. Review of all Geotechnical aspects of the project are required for submittal of unconditional Letters of Assurance to regulatory authorities. The site reviews are not carried out for the benefit of the Contractor(s) and therefore do not in any way effect the Contractor(s) obligations to perform under the terms of his/her Contract.

7. SAMPLE DISPOSAL

Braun will dispose of all samples 3 months after issuance of this report, or after a longer period of time at the Client's expense if requested by the Client. All contaminated samples remain the property of the Client and it will be the Client's responsibility to dispose of them properly.

8. SUBCONSULTANTS AND CONTRACTORS

Engineering studies frequently requires hiring the services of individuals and companies with special expertise and/or services which Braun Geotechnical Ltd. does not provide. These services are arranged as a convenience to our Clients, for the Client's benefit. Accordingly, the Client agrees to hold the Company harmless and to indemnify and defend Braun Geotechnical Ltd. from and against all claims arising through such Subconsultants or Contractors as though the Client had retained those services directly. This includes responsibility for payment of services rendered and the pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. These conditions apply to specialized subconsultants and the use of drilling, excavation and laboratory testing services, and any other Subconsultant or Contractor.

9. SITE SAFETY

Braun Geotechnical Ltd. assumes responsibility for site safety solely for the activities of our employees on the jobsite. The Client or any Contractors on the site will be responsible for their own personnel. The Client or his representatives, Contractors or others retain control of the site. It is the Client's or the Client's Contractors responsibility to inform Braun of conditions pertaining to the safety and security of the site – hazardous or otherwise – of which the Client or Contractor is aware.

Exploration or construction activities could uncover previously unknown hazardous conditions, materials, or substances that may result in the necessity to undertake emergency procedures to protect workers, the public or the environment. Additional work may be required that is outside of any previously established budget(s). The Client agrees to reimburse Braun for fees and expenses resulting from such discoveries. The Client acknowledges that some discoveries require that certain regulatory bodies be informed. The Client agrees that notification to such bodies by Braun Geotechnical Ltd. will not be a cause for either action or dispute.



BASE IMAGE OBTAINED FROM: CITY OF SURREY (COSMOS)




Client		c/o Pacific Land Group			Title LOCATION PLAN		
Project		Proposed Lumber Yard 10880 Dyke Road, Surrey, BC					
Project no.	Drawn	Design	Checked	Date	Scale	Drawing no.	
19-8025	GK	SH	SH	February 28, 2019	1:2500	19-8025-01	

Test Hole Log: TH19-01

File: 19-8025
 Project: Proposed Lumber Yard
 Client: c/o Pacific Land Group
 Location: 10880 Dyke Road, Surrey, BC



Depth	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	Remarks
0 ft 0 m			grey, damp, dense SAND, some gravel, trace silt (FILL)			
1 5						
2		○	grey, damp to moist, compact, silty SAND, some organics, trace gravel	S1	70%	
3		○	grey, moist to wet, loose SAND, some silt to soft to firm, sandy SILT, trace gravel, occasional organics - occasional compact zones	S2	33%	 Water Level (at time of drilling)
4		○		S3	39%	
5		○		S4	38%	
6						
7						
8			End of Test Hole @ 7.6m			
9						
10						
11						

Equipment: Truck Mounted Auger Rig
 Sampling method: Grab Off Auger Flight

Datum: Ground Surface
 Water Depth: @ 3.0m
 (at time of drilling)

Logged By: GK
 Exploration Date: April 1, 2019
 Dwg No.: 19-8025-TH01
 Page: 1 of 1

Test Hole Log: TH19-02

File: 19-8025
 Project: Proposed Lumber Yard
 Client: c/o Pacific Land Group
 Location: 10880 Dyke Road, Surrey, BC



Depth	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	Remarks
0	100		ASPHALT			
0			dark-grey to grey, damp, dense SAND, some gravel, trace silt (FILL)			
1						
5		○	grey, damp, compact SAND, some silt to silty SAND	S1	33%	
		○	dark-grey/ brown, damp, soft, sandy SILT, some organics, occasional fibers	S2	112%	
2						
		○	grey, damp to moist, soft to firm SILT, trace sand, trace to some gravel	S3	42%	
10						
			grey, wet, loose, fine silty SAND to soft to firm, sandy SILT - occasional compact zones			
4						
15		○		S4	35%	
5						
20		○		S5	38%	
6						
25		○		S6	48%	
7						
30			End of Test Hole @ 9.1m			
8						
35						
11						

Water Level
(at time of drilling)

Test Hole Log: TH19-03

File: 19-8025
 Project: Proposed Lumber Yard
 Client: c/o Pacific Land Group
 Location: 10880 Dyke Road, Surrey, BC



Depth	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	Remarks
0 ft	0 m		grey, damp, dense SAND, some gravel, trace to some silt (FILL)			
1		○	tan-brown, damp, compact SAND, some silt (FILL)	S1	16%	
5		○	grey, damp to moist, loose SAND, trace silt, occasional fibers	S2	26%	
10		○		S3	39%	
10			grey, moist to wet, soft to firm, fine sandy SILT			- Seepage @ 3.7m
15		○		S4	36%	
20		○	grey, moist to wet, loose SAND, some silt - occasional compact zones	S5	36%	
25			End of Test Hole @ 7.6m			
30						
35						

Equipment: Truck Mounted Auger Rig
 Sampling method: Grab Off Auger Flight


Datum: Ground Surface
 Water Depth: Seepage @ 3.7m
 (at time of drilling)

Logged By: GK
 Exploration Date: April 1, 2019
 Dwg No.: 19-8025-TH03
 Page: 1 of 1

Test Hole Log: TH19-04

File: 19-8025
 Project: Proposed Lumber Yard
 Client: c/o Pacific Land Group
 Location: 10880 Dyke Road, Surrey, BC

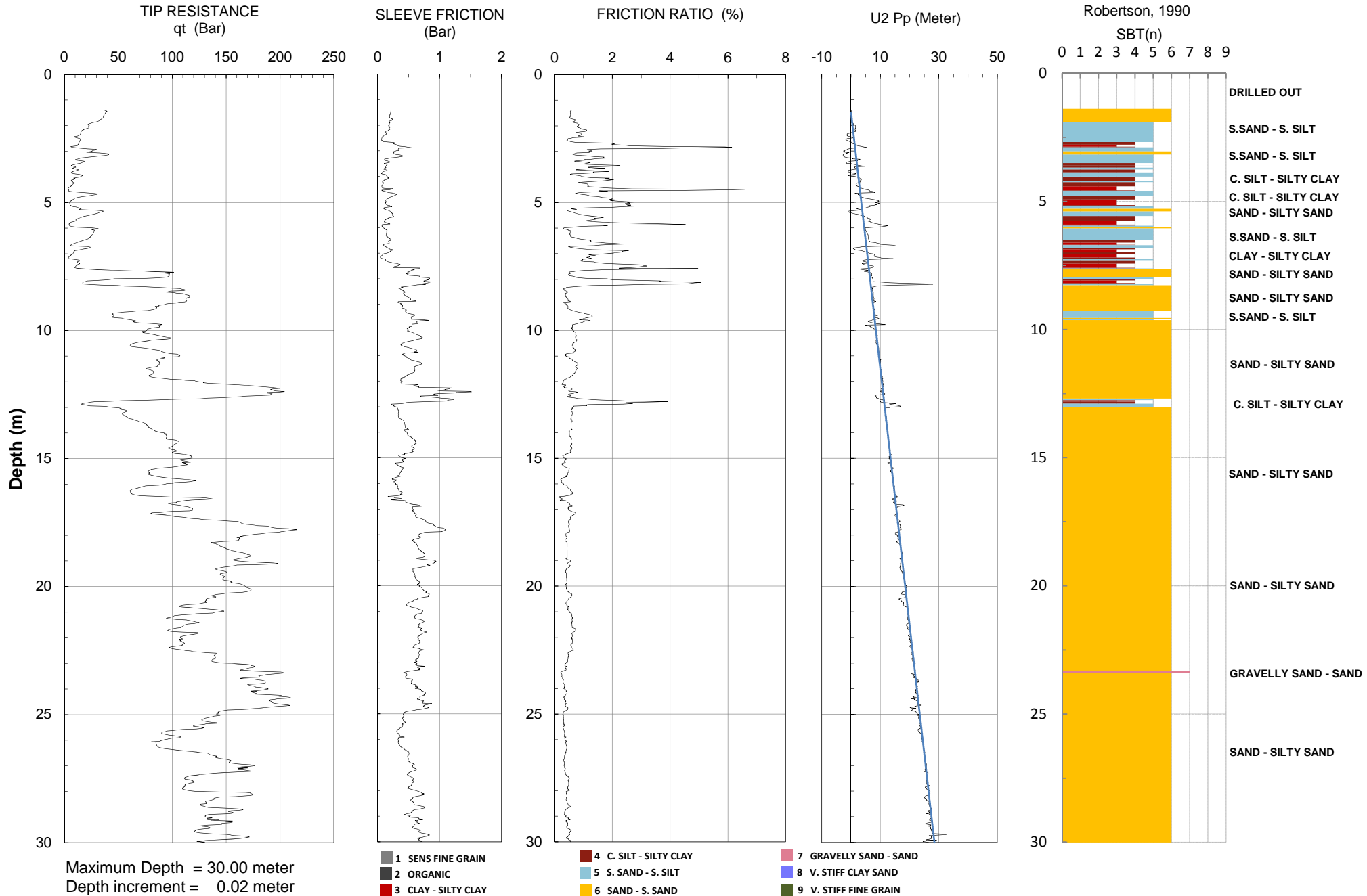


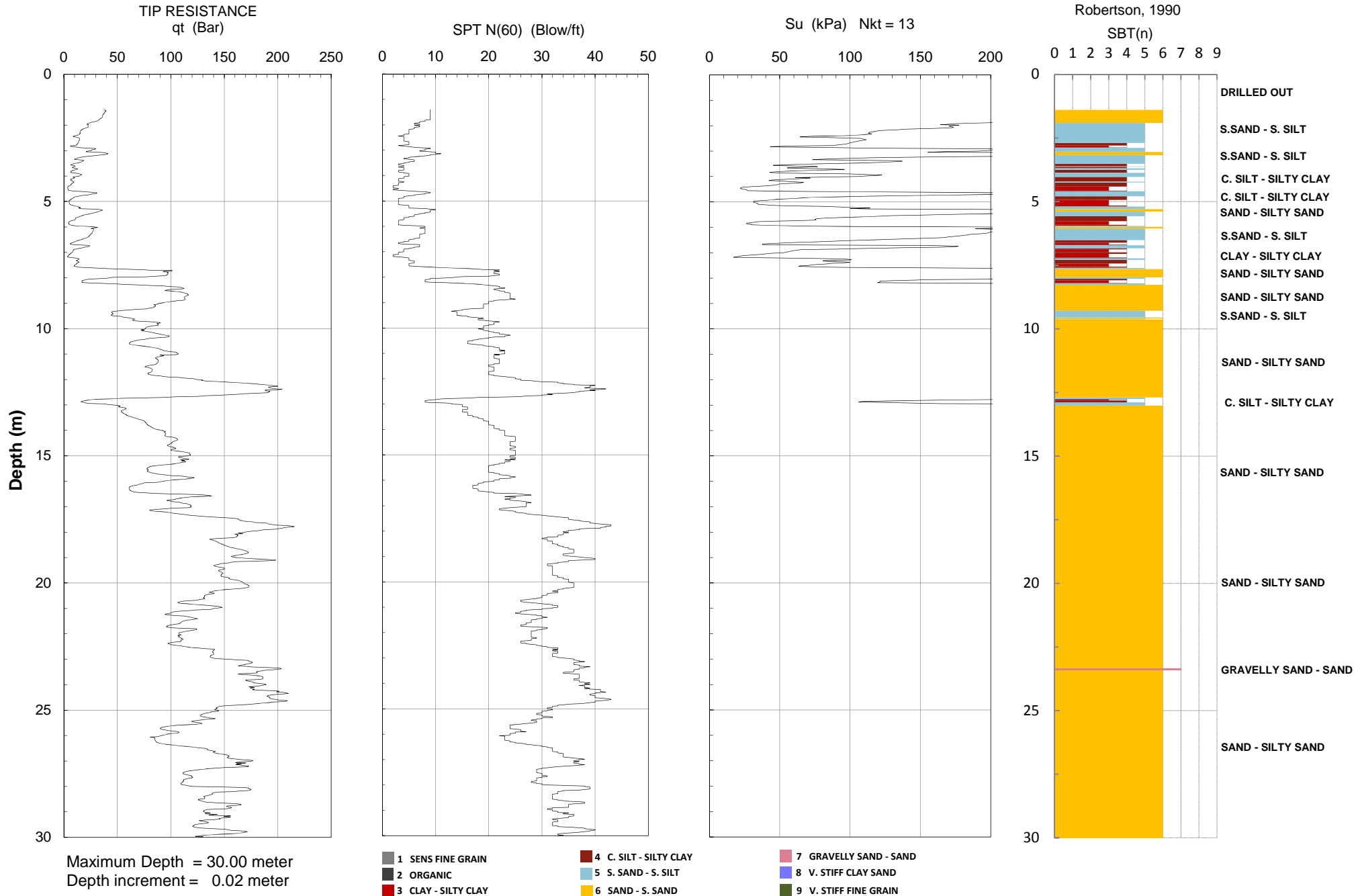
Depth ft m	Thickness (mm)	Sample	Soil Description	Sample #	Water cont.	DCPT (Blows per ft)							Remarks	
						0	10	20	30	40	50	60		
0	0		dark-brown, damp, loose, silty SAND, some organics, occasional roots/rootlets	S1	33%									Water Level (at time of drilling) 
		○	(FILL/ORGANICS)	S2	27%									
		○	grey-brown, damp, loose, silty fine SAND	S3	31%									
1			grey, moist to wet, loose SAND, some silt, occasional cobbles - occasional compact zones											
5														
2		○		S4	33%									
10														
3														
4														
15		○		S5	37%									
5														
20														
6														
7		○		S6	35%									
25														
8														
30		○	grey, wet, compact, coarse SAND, some gravel, trace silt	S7	16%									
9			End of Test Hole @ 9.1m			End of DCPT @ 9.1m								
10														
35														
11														

Equipment: Truck Mounted Auger Rig
 Sampling method: Grab Off Auger Flight

Datum: Ground Surface
 Water Depth: @ 3.0m
 (at time of drilling)

Logged By: GK
 Exploration Date: April 3, 2019
 Dwg No.: 19-8025-TH04
 Page: 1 of 1







SHEAR WAVE VELOCITY DATA

Client: Braun Geotechnical
Test: SCPT19 - 01
Site: 10880 Dyke Road
Surrey, BC

Date: April 1, 2019
Cone ID: DPG1428
Source offset: 1.10 m
Source: Beam

CONE TIP DEPTH (m)	GEOPHONE DEPTH (m)	INTERVAL VELOCITY (m/sec)
2.04	1.79	115
3.04	2.79	124
4.04	3.79	119
5.04	4.79	146
6.04	5.79	116
7.04	6.79	140
8.04	7.79	207
9.04	8.79	199
10.04	9.79	184
11.04	10.79	199
12.04	11.79	226
13.04	12.79	188
14.04	13.79	208
15.04	14.79	204
16.04	15.79	181
17.04	16.79	208
18.04	17.79	263
19.04	18.79	225
20.04	19.79	219
21.04	20.79	227
22.04	21.79	259
23.04	22.79	247
24.04	23.79	312
25.04	24.79	256
26.04	25.79	238
27.04	26.79	256
28.04	27.79	238
29.04	28.79	231
30.00	29.75	

SHEAR WAVE VELOCITY PROFILE

Client: Braun Geotechnical
Test: SCPT19 - 01
Site: 10880 Dyke Rd, Surrey
Surrey, BC

Date: April 1, 2019
Cone ID: DPG1428
Source offset: 1.10 m
Source: Beam

