

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

Braun Geotechnical  
19059 95A Avenue  
Surrey, BC  
V4N 4P3  
Tel: 604-513-4190  
Fax: 604-513-4195

***Foundations***

***Excavation &  
Shoring***

***Slope Stability***

***Natural Hazards***

***Pavement Design  
and Management***

***Reinforced Soil  
Walls and Slopes***

PTP # 1002594

June 21, 2024 (rev.1)

Reference: 24-9815

Via email: [jent1@shaw.ca](mailto:jent1@shaw.ca)

**c/o Jent Construction**

20164 123A Ave  
Maple Ridge, BC  
V2X 6A7

Attention: Nick Faber, Project Manager

Re: Geotechnical Exploration and Assessment Report  
**Proposed Single-Family Dwelling (SFD)**  
**23436 Dogwood Avenue, Maple Ridge, BC**

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## **1.0 INTRODUCTION**

As requested, Braun Geotechnical Ltd. (BGL) has carried out a geotechnical exploration and assessment for the above-referenced project. The geotechnical work has been performed in general accordance with the terms and conditions of the BGL Fee Estimate dated April 15, 2024 (our reference No. 24-9815). The geotechnical work included completion of a geotechnical exploration and provision of this geotechnical report with comments and recommendations pertaining site preparation and foundation design.

The scope of services was limited to the evaluation of geotechnical characteristics of the site and no consideration has been given to any environmental issues.

BGL should be forwarded the final architectural/structural drawings when they become available and be provided the opportunity to comment on geotechnical aspects.

## **2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT**

The subject site is located at 23436 Dogwood Avenue, Maple Ridge, BC. The site is relatively flat lying with existing site grades ranging from approximately El. 18 m to 20 m. The property is approximately rectangular in shape with maximum overall plan dimensions of 39 x 155 m. An existing watercourse (Dogwood Creek) is located immediately west of the subject site, with portions of the watercourse (right bank) located within the west site area. Watercourse setback criteria for Dogwood Creek were provided by Envirowest Consultants Inc (ECI) and are attached for reference.

At the time of the field exploration, the northern half of the site was occupied by an existing SFD with associated gravel driveway, shed and landscape areas. The remainder of the site was observed to be densely vegetated with generally medium to large trees and low underbrush type vegetation.

It is understood that the proposed at grade SFD *will be constructed adjacent and to the north of the existing SFD occupying the central portion of the property.*

### 3.0 DESK STUDY INFORMATION

The following documents were reviewed:

- Topographical/terrain data for the study site area available from City of Maple Ridge online Ridgeview Map,
- Historical aerial photos from Geographic Information Center at UBC for various years between 1940 to 2004 of varying scales and quality and available satellite imagery from the Google Earth website,
- The Geological Survey of Canada map 1484A titled “Surficial Geology New Westminster” with a scale of 1:50,000,
- “North and South Alouette River Floodplain Areas” dated November 16, 2009 from the District of Maple Ridge,
- Provincial floodplain map, “Alouette & North Alouette Rivers, DWG No. 89-44-1” designated under the Canada/BC Floodplain Mapping Agreement,
- Northwest Hydraulic Consultants Phase 2 Report, “North Alouette and South Alouette Rivers Assessment and Additional Floodplain Analysis 11\_5255-20-60”, dated February 24, 2016.
- Northwest Hydraulic Consultants Draft Map, “Alouette Rivers Assessment and Floodplain Analysis, 200-Year Flood Extents Including Freeboard”, dated April 21, 2015.

### 4.0 AIR PHOTO INFORMATION

Historical government air photos available for most decades dating back to 1940 and satellite imagery from Google Earth website were reviewed. The air photos review noted the following:

- Obvious visible features and/or tones to indicate past or incipient slope movements on or in the immediate vicinity of the site were not observed on the air photographs.
- Obvious visible features and/or tones to indicate past flood damage at the study site were not observed on the air photos, or on Google Earth imagery.

### 5.0 SOUTH ALOUETTE RIVER TRIBUTARY FLOODING

Based on information provided by the City of Maple Ridge, it is understood that the tributary drainage channels adjacent to, or encroaching the property approximately trace a 200-year Floodplain and Freeboard limit of the South Alouette River. According to the information from the NHC flood assessment map dated January 19, 2016, the 200-year Flood Construction Level (Flood Level including 0.6 m Freeboard) near the project site lies between the 19 m and the 20 m FCL Isoline.

Information presented in the BC Hydro Water Use Plan (April 15, 2009) confirmed that current levels of flood mitigation in Alouette River below the Alouette Dam are to be maintained.

Preliminary assessment of flooding potential was carried out in accordance with EGBC Guideline of Legislated Flood Assessments in Changing Climate in BC Version 2.1 dated August 28, 2018 at a Class 1 level of effort flood hazard assessment (FHA). Key elements of a Class 1 include:

- Site reconnaissance and qualitative assessment of flood hazard, including identification of very low hazard areas.
- Qualitative assessment of channel bank erosion rates.

- Qualitative assessment of fluvial geomorphic regime including a river stability assessment and evidence of previous study site flooding.
- Assessment of upstream and downstream mass movement processes with potential to impact flood levels at the study site.
- Review of climate change predictions.
- Review of historical air photos and other available documentation with a view to quantify channel bank erosion rates.

A review of available floodplain modelling included 1991 provincial floodplain mapping, and modelling carried out by Northwest Hydraulic Consultants (NHC) in 2011 and 2015. The subject site is bordered (or marginally encroached) by tributary drainage channels draining north to the South Alouette River. Historical 1:200 year annual return flooding (~440m<sup>3</sup>/s at BC Hydro Dam) is expected to impact topographic low areas along these tributary channels.

The 2011 NHC study made reference to climate change impact on flooding events (i.e. Hot/Dry and Cool/Wet climate change scenarios) but provided no quantitative impact assessments. The 2015 NHC study confirmed that the South Alouette River occupies an oversized channel with flows released by BC Hydro such that warmer wetter winters or increased frequency of short-duration high intensity rainfall events are not considered likely to significantly impact risk of 200 year flooding at the study site.

The study site is located at a reach of the South Alouette River with channel elevation substantially higher than the Pitt Meadows South Floodplain and Lower Alouette Rivers Floodplain areas. The Alouette Rivers are considered to be affected by the level of the Fraser River and by tidal action west of 216 Street, Maple Ridge. As such, the study site is not expected to be inundated by current Fraser River design flooding (200yr and ~475yr returns) including flood levels impacted by current climate change scenarios.

Based on the project Site Plan, a minimum floor elevation of el. 19.5 m in accordance with the NHC FCL mapping. The minimum floor elevation defined as top of slab or underside of floor joist and should be verified by a BC Land Surveyor (BCLS).

## **6.0 SUBSURFACE EXPLORATION**

Five test pits (TP24-01 to TP24-05) were excavated on April 24, 2024, using a tracked excavator under subcontract to BGL. The test pits were excavated to depths of 1.1 m to 1.8 m.

Subsurface conditions were logged in the field by BGL, and representative disturbed soil samples were collected from the excavator bucket for further visual classification and laboratory moisture content testing.

An infiltration test (IT24-01) was carried out within TP24-05 using Eijkelkamp double ring infiltrometer at a depth of approximately 1.1 m below existing grade. The purpose of the testing was to estimate infiltration rates of natural soils.

Approximate test pit and infiltration test locations are shown on the attached Location Plan (Dwg. no. 24-9815-01).

## **7.0 SOIL AND GROUNDWATER CONDITIONS**

### **7.1 Soil Conditions**

A review of available published and in-house geological information indicated that the study site area is underlain by post-glacial mountain stream marine deltaic deposits comprising medium to coarse gravel with trace to some sand.

The findings of the test pit exploration are detailed below.

FILL/ORGANICS

Dark brown to brown, damp, firm to stiff sandy SILT to SILT with some sand to compact silty SAND with trace to some gravel, some organics, occasional cobbles and occasional root/rootlets (FILL/ORGANICS) encountered within each test pit to depths of approximately 0.15 to 0.6 m.

Dark Brown to rust brown, moist, soft to firm fibrous PEAT with occasional organic fibres (with interlayers of sandy silt) and occasional wooden debris was encountered within TH24-01 & -05 to the depth of 1.1 m each. TH24-01 was terminated within this zone due to utility conflict.

SAND/SAND & GRAVEL

Rust brown, damp, compact to dense SAND & GRAVEL to SAND with some silt to silty SAND with occasional root/rootlets was encountered within TH24-02, -03 & -05 to depths of 0.5 to 0.75 m approximately.

Gravelly SAND to SANDY GRAVEL

Rust brown to grey brown, damp to moist, dense to very dense gravelly SAND to sandy GRAVEL to SAND & GRAVEL with trace silt, occasional cobbles/boulders was encountered within each test pit except TP24-01 to the maximum depth of test pit exploration at 1.2 m to 1.8 m approximately.

GROUNDWATER

Groundwater seepage was encountered within all test pits except TP24-01 at depths ranging from 0.9 m to 1.5 m at the time of the test pit exploration. Depending on the season and/or weather conditions, near-surface seepage flows should be anticipated within natural and fill soil layers. Groundwater levels and near-surface run-off flows are expected to fluctuate seasonally, and with drainage conditions.

The subsurface conditions described above were encountered at the test pit location only. It should be noted that subsurface conditions at other locations could vary.

## 7.2 ***Infiltration Test Results***

A Double Ring Infiltrometer test (IT24-01) was conducted within TP24-05 at a depth of approximately 1.1 m below existing grade. A field saturated infiltration rate of  $2.94 \times 10^{-6}$  m/s was measured within double ring infiltration test conducted within IT24-01.

Available published information (Freeze & Cherry) suggests the hydraulic conductivity of dense to very dense sand with gravel soils to be in the range of  $10^{-7}$  m/s to  $10^{-4}$  m/s. In view of the above, a factored infiltration rate of  $3 \times 10^{-6}$  m/s may be adopted for infiltration system design for preliminary considerations.

A Stormwater Management Plan for the study site (provided under separate cover) is required by City of Maple Ridge to include an infiltration gallery (i.e. rock pit) and flow rate control system. The infiltration gallery may be inefficient for reduction of stormwater disposal during the wet winter season when relatively shallow depth to seepage can be expected. However, the flow rate control system is expected to remain functional during seasonally wet conditions.

In the event of South Alouette River flooding sufficient to raise water levels in Dogwood Creek (i.e. greater than 10 yr return), the building should remain dry, but the stormwater system and infiltration gallery may be rendered ineffective.

## **8.0 GEOTECHNICAL COMMENTS AND RECOMMENDATIONS**

### **8.1 General**

The subsurface exploration encountered fill/organics over natural compact to dense sand/sand & gravel over dense to very dense gravelly sand to sandy gravel with occasional silt and occasional cobbles.

It is considered that the proposed SFD footings can be supported on the underlying natural dense to very dense gravelly sand to sandy gravel and/or on structural fills placed thereon, using conventional shallow strip or spread footings.

The following sections provide our geotechnical recommendations for site preparation and foundation design.

### **8.2 Site Preparation**

General site stripping below the proposed SFD should include removal of any existing surficial vegetation and organic rich material to expose existing natural dense to very dense gravelly sand to sandy gravel. Final trimming should be carried out using an excavator equipped with a smooth bucket. Based on observed conditions, the depth of stripping for removal of unsuitable materials is expected to be in the order of 0.75 m or less.

Granular sand subgrade areas should be compacted to at least 95% Modified Proctor Density (MPD), and the compacted subgrade should be reviewed by BGL. Soft/loose areas that cannot be re-compacted should be sub-excavated and replaced with structural fill. Drainage measures should be implemented to reduce potential for water ponding on exposed subgrades.

### **8.3 Structural Fill**

Subgrade restoration fills should consist of structural fill comprised of MMCD compliant subbase material 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. Structural fill placed under the structures should extend beyond the edge of footing a distance equal to at least the thickness of the confined structural fill. The structural fill should extend by a horizontal distance equal to 2 times the fill thickness for unconfined conditions. Density testing should be carried out during site fill placement on a regular basis to confirm adequacy of compaction, and the results forwarded to BGL for review. BGL should also be contacted to review fill quality, and placement and compaction procedures.

### **8.4 Foundations**

Foundations for the proposed SFD may be supported on the natural, dense to very dense gravelly sand to sandy gravel and/or structural fills placed thereon.

The following soil resistance (bearing) values may be adopted for preliminary foundation design:

Foundation Subgrade	Limit States Design		Working Stress Design
	Factored Ultimate Bearing (ULS) <sup>1</sup>	Serviceability Limit State (SLS)	Allowable Bearing Pressure DL + LL
Dense to Very Dense gravelly Sand to sandy Gravel / Compacted Structural Fill	180 kPa (3,750 psf)	120 kPa (2,500 psf)	120 kPa (2,500 psf)

Note: 1. The factored ultimate bearing resistance values include a geotechnical resistance factor of 0.5.  
 2. Higher bearing values may be feasible for specific situations, subject to review by BGL.

The above design bearing pressures for soil subgrade assume the following:

- Strip and pad footings have minimum widths of 450 mm (18”) and 600 mm (24”), respectively.
- Footings are founded at least 450 mm (18”) below final finished adjacent grade.
- 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, retaining structures, etc.
- Footings are placed below a 1H:1V line projected up from lower footings or buried structures such as utility lines, sumps, etc.
- Silty subgrade areas are protected immediately after exposure.

Foundation bearing surfaces should be reviewed by a Geotechnical Engineer. Any soft, wet, or deleterious material encountered at bearing surface level should be sub-excavated and replaced with compacted structural fill and/or clear crushed gravel.

### 8.5 Slab on Grade

Slab on grade structures should be underlain by a drainage layer comprising a minimum 100 mm (4”) thick layer of 20mm clear crushed gravel (no sand, no fines). This drainage layer should have a suitable discharge to the permanent storm system. Polyethylene sheeting should also be provided beneath the floor slab to further reduce potential slab dampness.

Compaction testing should be carried out on underslab fills to confirm that fill placed below building slabs has been compacted to at least 95% MPD. Prior to placement of any grade restoration fills, the subgrade should be reviewed by the geotechnical consultant.

### 8.6 Drainage and Backfill

Requirements for perimeter drainage should be evaluated on a per building basis when proposed grades and building design have been further developed. For geotechnical considerations, footing level perimeter drainage is not considered necessary for structures where building slabs are situated at least 200 mm (8”) above surrounding grades, and where proposed final site grades provide for surface discharge away from proposed building structures.

If deemed necessary, perimeter drainage should consist of a perforated 150 mm (6”) PVC pipe, placed around the building perimeter, with the invert elevation at footing level and connected to a suitable discharge. The perforated pipe should be sized accordingly by the mechanical engineer/consultant. The perimeter drain should be surrounded by at least 150 mm (6”) of 19 mm

( $\frac{3}{4}$ " clear crushed gravel. A 150 mm (6") thick layer of Birdseye gravel should be placed over the clear crushed gravel to act as a filter layer. Perimeter drains should also be provided adjacent to any steps in the foundation walls.

Backfill placed around perimeter foundation walls should typically consist of free-draining granular material such as sand or sand and gravel with less than 5% fines.

## 9.0 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 (2024), City of Maple Ridge Bulletin 2012-02, and Section 56 of the Community Charter. The intended use is defined as a Single-Family Dwelling with habitable floor elevation located outside the limit of the 200-year flood level (plus 0.6m freeboard) of the South Alouette River and proximal tributary channels. 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" and current EGBC document, "Landslide Assessments in British Columbia, Version 4.1, March 1, 2023". Geotechnical hazards with potential to impact the project area were considered and included mountain stream erosion, avulsion, debris flows, debris floods, small scale rock fall and regional-scale landslides.

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 an "authenticated report" (EGBC, 2023).

## 10.0 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 ensure that the recommendations of the geotechnical report are understood and followed. Geotechnical field reviews should be arranged by the Contractor to address the following:

- Site review at the time of excavation to confirm soil and groundwater conditions;
- Confirm suitability of exposed footing subgrade;
- Review of perimeter drain installation with respect to geotechnical considerations only;
- Field review and density testing of structural fill and perimeter fill.

## 11.0 CLOSURE

This report is prepared for the exclusive use of Mr. Nick Faber and his designated representatives and may not be used by other parties without the written permission of BGL. The City of Maple Ridge may also rely on the findings of the Geotechnical Report.

If the development plans change, or if during construction soil conditions are noted to be different from those described in this report, BGL 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 BGL during construction.

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 attached Report Interpretation and Limitations. 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.**

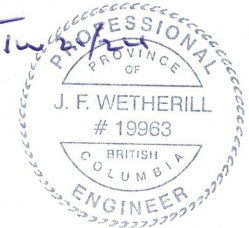
 - June 21, 2024

Avninder Singh Cheema, EIT  
Geotechnical Engineer

**Braun Geotechnical Ltd.**

  
James Wetherill, P.Eng.  
Geotechnical Engineer

PTP: 1002594



**Independently Reviewed by:**



2024-06-21

Joseph Oh, M.Eng., P.Eng.  
Geotechnical Engineer

Encl: Report Interpretation and Limitations  
Revised Location Plan and Test Pit Logs  
Appendix D and J Statements

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## **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. 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 1 month 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.

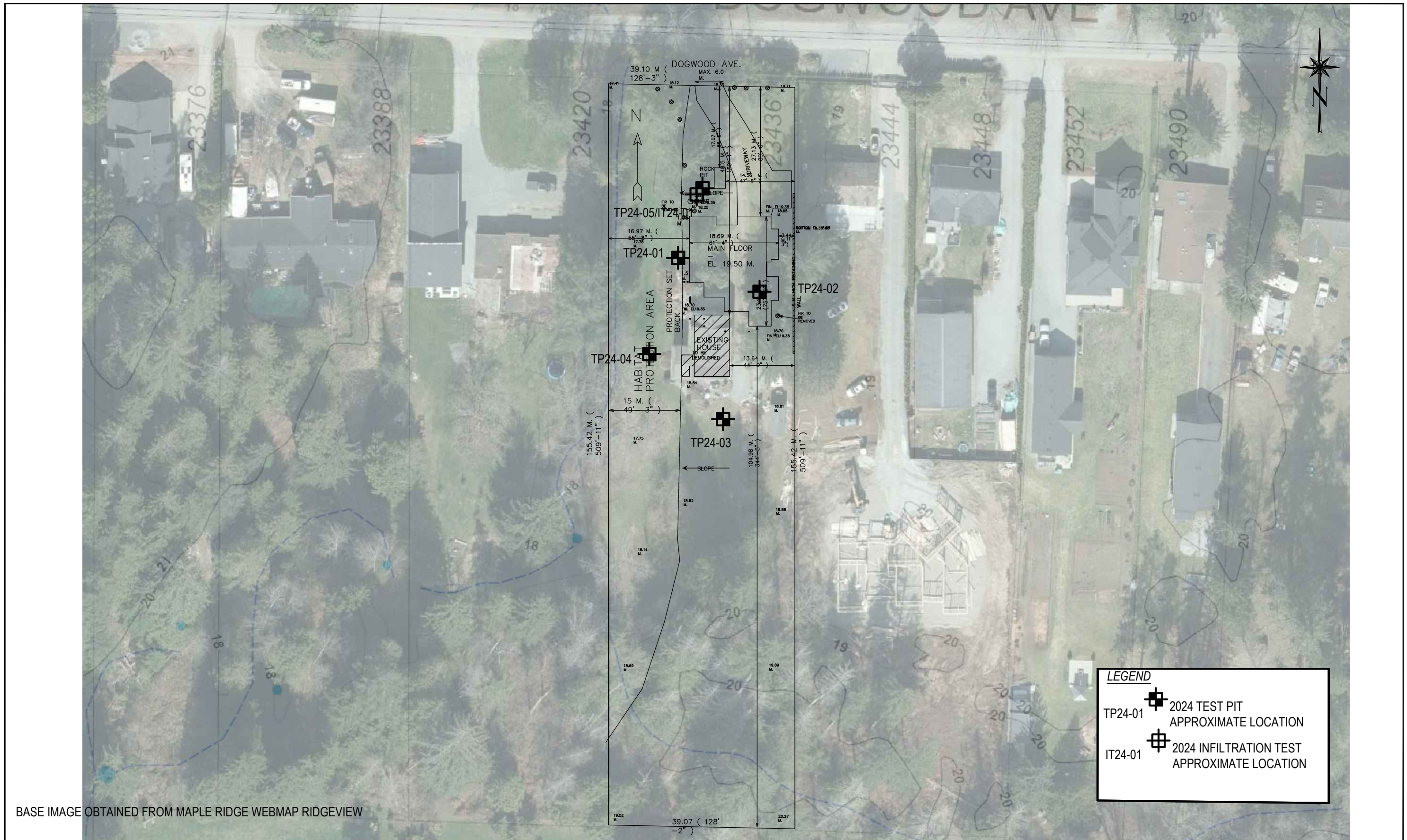
## **8. SUBCONSULTANTS AND CONTRACTORS**

Engineering studies frequently require hiring the services of individuals and companies with special expertise and/or services which Braun 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 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 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 will not be a cause for either action or dispute.




BASE IMAGE OBTAINED FROM MAPLE RIDGE WEBMAP RIDGEVIEW

**LEGEND**

 2024 TEST PIT APPROXIMATE LOCATION  
 TP24-01

 2024 INFILTRATION TEST APPROXIMATE LOCATION  
 IT24-01

	Rev.	Description	Date	Client	Jent Construction Ltd.			Title			
				Project	Proposed Single-Family Dwelling 23436 Dogwood Ave, Maple Ridge, BC			LOCATION PLAN			
				Project no.	24-9815	Drawn	DD	Design	AC	Checked	JFW
				Date	June 10, 2024	Scale	1:750	Drawing no.	24-9815-01		











## LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

Notes: This statement is to be read and completed in conjunction with the Engineers and Geoscientists BC *Professional Practice Guidelines – Landslide Assessments in British Columbia* ("the guidelines") and the current *BC Building Code (BCBC)*, and is to be provided for Landslide Assessments (not floods or flood controls), particularly those produced for the purposes of the *Land Title Act, Community Charter, or Local Government Act*. Some jurisdictions (e.g., the Fraser Valley Regional District or the Cowichan Valley Regional District) have developed more comprehensive assurance statements in collaboration with Engineers and Geoscientists BC. Where those exist, the Qualified Professional is to fill out the local version only. Defined terms are capitalized; see the Defined Terms section of the guidelines for definitions.

To: The Approving Authority (or Client)

Date: MAY 15/24

CITY OF MAPLE RIDGE  
11995 HANLEY PL.

Jurisdiction/name and address

With reference to (CHECK ONE):

- A. *Land Title Act* (Section 86) – Subdivision Approval  
 B. *Local Government Act* (Sections 919.1 and 920) – Development Permit  
 C. *Community Charter* (Section 56) – Building Permit  
 D. Non-legislated assessment

For the following property (the "Property"):

33436 DOGWOOD PL, MAPLE RIDGE, BC

Civic address of the Property

The undersigned hereby gives assurance that they are a Qualified Professional and a professional engineer or professional geoscientist who fulfils the education, training, and experience requirements as outlined in the guidelines.

I have signed, authenticated, and dated, and thereby certified, the attached Landslide Assessment Report on the Property in accordance with the guidelines. That report must be read in conjunction this statement.

In preparing that report I have:

[CHECK TO THE LEFT OF APPLICABLE ITEMS]

1. Collected and reviewed appropriate background information  
 2. Reviewed the proposed Residential Development or other development on the Property  
 3. Conducted field work on and, if required, beyond the Property  
 4. Reported on the results of the field work on and, if required, beyond the Property  
 5. Considered any changed conditions on and, if required, beyond the Property  
6. For a Landslide Hazard analysis or Landslide Risk analysis, I have:  
 6.1 reviewed and characterized, if appropriate, any Landslide that may affect the Property  
 6.2 estimated the Landslide Hazard  
 6.3 identified existing and anticipated future Elements at Risk on and, if required, beyond the Property  
 6.4 estimated the potential Consequences to those Elements at Risk  
7. Where the Approving Authority has adopted a Level of Landslide Safety, I have:  
 7.1 compared the Level of Landslide Safety adopted by the Approving Authority with the findings of my investigation  
 7.2 made a finding on the Level of Landslide Safety on the Property based on the comparison  
 7.3 made recommendations to reduce Landslide Hazards and/or Landslide Risks

PROFESSIONAL PRACTICE GUIDELINES  
LANDSLIDE ASSESSMENTS IN BRITISH COLUMBIA

## LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

8. Where the Approving Authority has **not** adopted a Level of Landslide Safety, or where the Landslide Assessment is not produced in response to a legislated requirement, I have:
- 8.1 described the method of Landslide Hazard analysis or Landslide Risk analysis used
  - 8.2 referred to an appropriate and identified provincial, national, or international guideline for Level of Landslide Safety
  - 8.3 compared those guidelines (per item 8.2) with the findings of my investigation
  - 8.4 made a finding on the Level of Landslide Safety on the Property based on the comparison
  - 8.5 made recommendations to reduce Landslide Hazards and/or Landslide Risks
9. Reported on the requirements for future inspections of the Property and recommended who should conduct those inspections

Based on my comparison between:

[CHECK ONE]

- the findings from the investigation and the adopted Level of Landslide Safety (item 7.2 above)
- the appropriate and identified provincial, national, or international guideline for Level of Landslide Safety (item 8.4 above)

Where the Landslide Assessment is not produced in response to a legislated requirement, I hereby give my assurance that, based on the conditions<sup>1</sup> contained in the attached Landslide Assessment Report:

### A. SUBDIVISION APPROVAL

- For subdivision approval, as required by the *Land Title Act* (Section 86), "the land may be used safely for the use intended"  
[CHECK ONE]
  - with one or more recommended additional registered Covenants
  - without an additional registered Covenant(s)

### B. DEVELOPMENT PERMIT

- For a development permit, as required by the *Local Government Act* (Sections 488 and 491), my report will "assist the local government in determining what conditions or requirements it will impose under subsection (2) of [Section 491]"  
[CHECK ONE]
  - with one or more recommended additional registered Covenants
  - without an additional registered Covenant(s)

### C. BUILDING PERMIT

- For a building permit, as required by the *Community Charter* (Section 56), "the land may be used safely for the use intended"  
[CHECK ONE]
  - with one or more recommended additional registered Covenants
  - without any additional registered Covenant(s)

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<sup>1</sup> When seismic slope stability assessments are involved, Level of Landslide Safety is considered to be a "life safety" criteria, as described in Commentary JJJ of the *National Building Code of Canada (NBC) 2015*, Structural Commentaries (User's Guide – NBC 2015; part 4 of division B). This states:

"The primary objective of seismic design is to provide an acceptable level of safety for building occupants and the general public as the building responds to strong ground motion; in other words, to minimize loss of life. This implies that, although there will likely be extensive structural and non-structural damage, during the DGM (design ground motion), there is a reasonable degree of confidence that the building will not collapse, nor will its attachments break off and fall on people near the building. This performance level is termed 'extensive damage' because, although the structure may be heavily damaged and may have lost a substantial amount of its initial strength and stiffness, it retains some margin of resistance against collapse."

LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

JAMES WETHERILL, P.Eng.  
Name (print)

MAY 15/24  
Date

#102-19049 95A AVE  
Address

SURREY, BC V4N 4P3

604-573-4190  
Telephone

JAMES@BRUNCO.COM  
Email



(Affix PROFESSIONAL SEAL and signature here)

The Qualified Professional, as a registrant on the roster of a registrant firm, must complete the following:

I am a member of the firm BRUN COFFEEWAL LTD.  
(Print name of firm)

with Permit to Practice Number PTP: 1002594  
(Print permit to practice number)

and I sign this letter on behalf of the firm.

## FLOOD ASSURANCE STATEMENT

Note: This statement is to be read and completed in conjunction with the current Engineers and Geoscientists BC *Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC* ("the guidelines") and is to be provided for flood assessments for the purposes of the *Land Title Act*, *Community Charter*, or the *Local Government Act*. Defined terms are capitalized; see the Defined Terms section of the guidelines for definitions.

To: The Approving Authority

Date: MAY 15/24

CITY OF MAPLE RIDGE  
11995 HANCOCK PL.  
Jurisdiction and address

With reference to (CHECK ONE):

- Land Title Act* (Section 86) – Subdivision Approval
- Local Government Act* (Part 14, Division 7) – Development Permit
- Community Charter* (Section 56) – Building Permit
- Local Government Act* (Section 524) – Flood Plain Bylaw Variance
- Local Government Act* (Section 524) – Flood Plain Bylaw Exemption

For the following property ("the Property"):

23436 DOGWOOD AVE, MAPLE RIDGE, BC  
Legal description and civic address of the Property

The undersigned hereby gives assurance that he/she is a Qualified Professional and is a Professional Engineer or Professional Geoscientist who fulfils the education, training, and experience requirements as outlined in the guidelines.

I have signed, sealed, and dated, and thereby certified, the attached Flood Assessment Report on the Property in accordance with the guidelines. That report and this statement must be read in conjunction with each other. In preparing that Flood Assessment Report I have:

[CHECK TO THE LEFT OF APPLICABLE ITEMS]

- 1. Consulted with representatives of the following government organizations:  
CITY OF MAPLE RIDGE, BC HYDRO. (PREVIOUS PROJECT IN VICINITY).
- 2. Collected and reviewed appropriate background information
- 3. Reviewed the Proposed Development on the Property
- 4. Investigated the presence of Covenants on the Property, and reported any relevant information
- 5. Conducted field work on and, if required, beyond the Property
- 6. Reported on the results of the field work on and, if required, beyond the Property
- 7. Considered any changed conditions on and, if required, beyond the Property
- 8. For a Flood Hazard analysis I have:
  - 8.1 Reviewed and characterized, if appropriate, Flood Hazard that may affect the Property
  - 8.2 Estimated the Flood Hazard on the Property
  - 8.3 Considered (if appropriate) the effects of climate change and land use change
  - 8.4 Relied on a previous Flood Hazard Assessment (FHA) by others
  - 8.5 Identified any potential hazards that are not addressed by the Flood Assessment Report
- 9. For a Flood Risk analysis I have:
  - 9.1 Estimated the Flood Risk on the Property
  - 9.2 Identified existing and anticipated future Elements at Risk on and, if required, beyond the Property
  - 9.3 Estimated the Consequences to those Elements at Risk

## FLOOD ASSURANCE STATEMENT

10. In order to mitigate the estimated Flood Hazard for the Property, the following approach is taken:
- 10.1 A standard-based approach
  - 10.2 A Risk-based approach
  - 10.3 The approach outlined in the guidelines, Appendix F: Flood Assessment Considerations for Development Approvals
  - 10.4 No mitigation is required because the completed flood assessment determined that the site is not subject to a Flood Hazard
11. Where the Approving Authority has adopted a specific level of Flood Hazard or Flood Risk tolerance, I have:
- 11.1 Made a finding on the level of Flood Hazard or Flood Risk on the Property
  - 11.2 Compared the level of Flood Hazard or Flood Risk tolerance adopted by the Approving Authority with my findings
  - 11.3 Made recommendations to reduce the Flood Hazard or Flood Risk on the Property
12. Where the Approving Authority has not adopted a level of Flood Hazard or Flood Risk tolerance, I have:
- 12.1 Described the method of Flood Hazard analysis or Flood Risk analysis used
  - 12.2 Referred to an appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk
  - 12.3 Made a finding on the level of Flood Hazard or Flood Risk tolerance on the Property
  - 12.4 Compared the guidelines with the findings of my flood assessment
  - 12.5 Made recommendations to reduce the Flood Hazard or Flood Risk
13. Considered the potential for transfer of Flood Risk and the potential impacts to adjacent properties
14. Reported on the requirements for implementation of the mitigation recommendations, including the need for subsequent professional certifications and future inspections.

Based on my comparison between:

[CHECK ONE]

- The findings from the flood assessment and the adopted level of Flood Hazard or Flood Risk tolerance (item 11.2 above)
- The findings from the flood assessment and the appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk tolerance (item 12.4 above)

I hereby give my assurance that, based on the conditions contained in the attached Flood Assessment Report:

[CHECK ONE]

- For subdivision approval, as required by the *Land Title Act* (Section 86), "that the land may be used safely for the use intended":
  - [CHECK ONE]
  - With one or more recommended registered Covenants.
  - Without any registered Covenant.
- For a development permit, as required by the *Local Government Act* (Part 14, Division 7), my Flood Assessment Report will "assist the local government in determining what conditions or requirements it will impose under subsection (2) of this section [Section 491 (4)]".
- For a building permit, as required by the *Community Charter* (Section 56), "the land may be used safely for the use intended":
  - [CHECK ONE]
  - With one or more recommended registered Covenants. *FCL @ 19.5m EL.*
  - Without any registered Covenant.
- For flood plain bylaw variance, as required by the *Flood Hazard Area Land Use Management Guidelines* and the *Amendment Section 3.5 and 3.6* associated with the *Local Government Act* (Section 524), "the development may occur safely".
- For flood plain bylaw exemption, as required by the *Local Government Act* (Section 524), "the land may be used safely for the use intended".

PROFESSIONAL PRACTICE GUIDELINES  
LEGISLATED FLOOD ASSESSMENTS IN A CHANGING CLIMATE IN BC

# FLOOD ASSURANCE STATEMENT

I certify that I am a Qualified Professional as defined below.

MAY 15/24  
Date

Prepared by  
JAMES WETHERILL, P. ENG  
Name (print)

[Signature]  
Signature

102 - 19049 95A AVENUE  
Address

SURREY BC V4N 4P3

604-513-4190  
Telephone

JAMES@BRANCO.COM  
Email

Reviewed by  
JOSEPH CH, P. ENG.  
Name (print)

[Signature] MAY 15, 2024  
Signature



(Affix PROFESSIONAL SEAL here)

If the Qualified Professional is a member of a firm, complete the following:

I am a member of the firm BRANCO CONSULTING LTD.  
and I sign this letter on behalf of the firm. (Name of firm)