



**GEOTECHNICAL ASSESSMENT
Residential Development
Pemberton Benchlands, Pemberton, BC**

Document Type: Issued for Review

Date: February 26, 2020

Project No.: **K-191204-00**

Submitted to:

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Attention: Caroline Lamont, Land Development Manager
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Submitted by:

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Per: Evan Sykes, P.Eng.
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1.0 INTRODUCTION

As requested, Kontur Geotechnical Consultants Inc. (Kontur) has completed a geotechnical assessment of the proposed residential development, Pemberton Benchlands, Pemberton, BC. The purpose of the assessment was to provide a characterization of observed potential naturally occurring geologic hazards, including locations of the potential hazards, opinions as to the nature of the hazard, consequences and influence areas of the identified potential hazards. Kontur's assessment of potential naturally occurring geologic hazard events follow the generally accepted guidelines provided by the Engineers and Geoscientists of British Columbia (EGBC) "Guidelines for Legislated Landslide Assessment for Proposed Residential Developments in BC", dated May 2010.

As the Village of Pemberton does not provide a level of geologic hazard acceptability, Kontur has referenced the British Columbia Ministry of Transportation and Infrastructure (MOTI) guidance for acceptability of geologic hazard occurrence. The MOTI guidelines are:

- 1 in 475 years for damaging events related to landslides;
- 1 in 200 years for damaging events related to flooding;
- 1 in 300 years for damaging events related to snow avalanches;
- 1 in 10,000 years for life threatening events.

It should be noted that MOTI does not provided acceptability limits for hazard risk associated with development and the approving authority must determine risk acceptability for development approval.

Specifically, this assessment focused on the following naturally occurring geologic hazard events:

- Slope instabilities;
- Rockfall;
- Snow Avalanche;
- Debris flows/ torrents;
- Flooding.

Attached to this report are a Site Plan, Test Pit Logs, Site Photos and an Appendix D for the "Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC".

2.0 SOURCES OF INFORMATION

This geotechnical assessment is based on the following information:

- Historic aerial photographs extending back over a time frame of over about 70 years, specifically aerial photographs for the years 1948, 1950, 1958, 1962, 1969, 1973, 1977, 1981, 1986, 1990, 1994, 2005 and 2016 were reviewed;
- Topographic mapping of the subject property provided by Ekistics;
- A Development Yield Plan and Conceptual Phasing Plan provided by Ekistics;
- Previous experience by Kontur personnel in the vicinity of the proposed development;
- Site reconnaissance by senior Kontur personnel to observe, record and photograph features of geotechnical significance.



3.0 UNDERSTANDING OF PROJECT

The subject property consists of the following lots:

- DL 8820, Lillooet District;
- Lot 1, DL 202, District Plan KAP 76575;
- Lot 49, DL 164, Lillooet District Plan 883;
- Lot 48, DL 164, Lillooet District Plan 883 Except Plan H10996;
- DL 2297, Lillooet District;
- Block A, DL 202, Lillooet District;
- Block I, DL 202, Lillooet District;
- Block H, DL 202, Lillooet District;
- DL 8410, Lillooet District;
- Block A, DL 8556, Lillooet District.

A site plan of the subject property is attached to this report.

Based on discussions with the developer and a review of the Development Yield Plan it is understood that the proposed development generally consists of single-family and multi-family residential lots. Single-family residential lots are generally to be located in the central northern, southeastern and central southern portions of the property, multi-family residential is generally to be located along the western side of the proposed subdivision and the central and eastern portions of the property with apartments being proposed for the central portion of the property. No development is proposed for the northernmost lot of the property. The proposed subdivision layout provided by Ekistics is attached to this report. Proposed access to the property would be from Eagle Drive.

4.0 SITE DESCRIPTION

4.1 General

The subject property was located northeast of the Village of Pemberton. The property is irregular in shape being comprised of ten (10) connected lots. The eastern property boundary is irregular and defined by existing single-family lots along the west side of Eagle Drive. The southern boundary is generally a straight line in an east-west direction with a minor jog to the north about half way along heading west, then changes direction to the northwest at about a 45° angle for the westernmost third. The western boundary is a straight line oriented in a north-south direction. The northern boundary is a straight line oriented in an east-west direction with a significant jog to the south about a third of the way to the east and then continues in an east-west direction. The property is bounded by single family residential lots, Pemberton Valley Road and small areas of undeveloped land to the east, undeveloped land to the south and west and farmland to the north.

Anthropogenic development of the subject property included a gravel access road to communication towers located in the northwest corner of the property, south of the northernmost lot. Two water reservoirs were constructed in the southeastern portion of the property with an access road.

A watercourse was located in the southwest portion of the property flowing from northwest to southeast, transitioning to a west to east flow in the southernmost portion of the property. The watercourse did not



have water flow at the time of site reconnaissance and generally consisted of a gully up to about 1m in depth and 3m in width. The gully did not appear to be significantly eroded and had some vegetation. Another identified watercourse was located in the central portion of the property flowing from a small pond to the south where it appears to infiltrate into the ground. At the time of site reconnaissance, the pond was shallow and the watercourse had no water flow. The gully was shallow (less than about 0.5m) with a width of less than about 1m. Pemberton Creek flows from west to east in the southeast corner of the southern most lot in a deeply incised channel. The creek is wide and is a significant watercourse with high (up to about 4m to 5m) banks on the north side and lower banks on the south side. Exposed soils on the creek banks appeared to consist of dense silty sand with some gravel.

The subject property is located in mountainous terrain on the eastern side of a bedrock hill with a peak elevation of about 950m. The hill contained very steep bedrock bluffs cresting at an elevation of about 700m. The subject property elevations ranged from about 220m for the northernmost property boundary and about 260m in the area of the eastern property boundary to about 400m along the western property boundary. A north facing bedrock-controlled slope was located north of the communication towers with the crest at an elevation of about 360m. A bedrock knoll was located in the central portion of the property with a height of about 25m and about 30m in diameter.

Talus deposits were noted in the southwest corner of the property in a band that trended to the northwest away from the property. Isolated large boulders up to about 3m diameter were noted on the slopes below the talus deposits. An additional talus deposit, not connected to the above-mentioned talus deposit, was noted along the western property boundary extending from about 125m south of the southern boundary of the northernmost lot to about 200m north of the boundary and about 75m into the property. Isolated talus and colluvium deposits were noted throughout the northeastern portion of the northernmost lot extending to the crest of the slope about 50m south of the south boundary (near the communication tower). A talus deposit was also noted in the central portion of the property on the south side of the bedrock knoll.

Vegetation generally consisted of widely spaced coniferous trees with trunk diameters up to about 600mm.

4.2 Soil Conditions

Based on a review of surficial geology plan Open File 5324 "Surficial Geology and Landslide Inventory of the Upper Sea to Sky Corridor" obtained from the Geologic Survey of Canada the subject property consists of bedrock though the central and northeast portions of the property, are underlain by Glaciofluvial Terrace Sediments consisting of sand and gravel, stratified to massive, forming flat surface perched well above alluvial deposits or associate with meltwater channels in the southern portion of the property, with Talus Rubble and block accumulations at the bottom of steep slopes in aprons and cones along the southwest property boundary and Colluvial Veneer rock fragments in a matrix of boulders, gravel, sand, silt, usually less than 3m thick formed by bedrock weathering or reworking of unconsolidated deposits within the northernmost lot of the property.

A geotechnical exploration program consisting of fifteen (15) test pits generally excavated in the area identified on the surficial geology map as Glaciofluvial Terrace Sediments. The test pits were excavated with a subcontracted backhoe with test pits locations determined in conjunction with the environmental



review. Test pits were logged and sampled by Kontur personnel with samples being returned to Kontur's laboratory for further visual classification. The depths of test pits ranged from about 0.2m to 2.4m.

The test pits generally encountered a layer of compact SILTY SAND with some gravel overlying either till-like soils (TP19-01 and TP19-02), bedrock (TP19-03 through TP19-06, TP19-09 and TP19-10) or COBBLES AND BOULDERS with a silty sand and gravel matrix. Test pits TP19-08 and TP19-15 encountered a very thin layer of ORGANIC SILT (0.03m thick) below the silty sand layer. The organic silt was underlain by SANDY SILT in both test pits. The sandy silt was underlain by till-like soils in TP9-08 and broken, weathered rock in TP19-15. Test pits TP 19-11 and TP19-12 encountered COBBLES, BOULDERS with a silty sand and gravel matrix at surface, underlain by the SILTY SAND layer. Test pit TP19-11 encountered sand and gravel below the silty sand and TP19-12 encountered cobbles and boulders in a silty sand with some gravel matrix below the silty sand. TP19-07 encountered bedrock at surface. The table below summarizes the soils encountered in the test pits and detailed test pit logs are attached to this report.

UNIT	SOIL DESCRIPTION	DEPTH TO TOP OF LAYER (m)	LAYER THICKNESS (m)	COMMENTS
Unit A	SILTY SAND with some gravel, compact	0.0 to 0.3m	0.2 to 1.8	Interbedded with Unit C in TP 19-15
Unit B	SILTY SAND with some gravel, dense to very dense, (Till-like)	0.6 to 1.5	0.3	Bottom of till-like layer encountered in TP19-04 only
Unit C	ORGANIC SILT	0.6 to 0.9	0.03	Localized very thin layer
UNIT D	COBBLES AND BOULDERS in a silty sand with some gravel matrix	0.0 to 1.5	0.3	At surface in TP 19-11 and TP19-12 and below Unit A in TP19-12, TP19-13 and TP19-14
Unit E	Bedrock	0.0 to 2.4		

Frequent bedrock outcrops were noted during site reconnaissance in the central portion of the property (bedrock knoll) and in the northern portion of the property in the area of the communication towers. Talus slopes were noted along the southern portion of the western property boundary.

Observations during site reconnaissance and geotechnical explorations generally concur with the published surficial geology map.



4.3 Groundwater Conditions

No groundwater was observed in the test pits nor were any significant surface water runoff or seepage noted on any of the hillsides (other than noted watercourses).

5.0 DISCUSSION, COMMENTS AND RECOMMENDATIONS

5.1 General

The subject property is located in an area gentle to steep slopes and subsurface conditions generally ranging from bedrock to talus cover overlying bedrock to silty sand with some gravel overlying till-like soils underlain by bedrock. It is considered that the subsurface soils are generally suitable for construction of residential buildings with adequate bearing capacity and settlements within typical tolerances for such buildings.

The sections below provided comments and recommendations with regards to potential naturally occurring geologic hazards within and adjacent to the subject property that could influence proposed developments.

5.2 Geologic Hazards

As previously discussed, the subject property is located in mountainous terrain with nearby watercourses, there fore the potential for such natural events as snow avalanche, debris flows, debris slides, rockfall and other landslides to influence the proposed development should be considered.

Based on observations and interpretations during site reconnaissance and historical aerial photographs review, Kontur has developed a geotechnical characterization of the subject property, mountain slopes and drainage basins within and adjacent to the subject property. This characterization forms the basis from which Kontur's opinions are provided regarding the likelihood of naturally occurring geologic events influencing proposed developments.

5.3 Slope Stability

The subject property contains slopes which are generally bedrock controlled and covered with relatively thin veneers or mantles of overlying soil. The global stability of the bedrock-controlled slopes are considered adequate for static and seismic conditions. No significant indications (curved or leaning trees, undulating ground surface, etc.) were noted during the site reconnaissance; however, some surficial soil movement may occur in areas where the bedrock has soil overburden steeper than about 1.5H: 1V (Horizontal: Vertical).

The northern banks of Pemberton Creek are steep without vegetation, indicating ongoing erosion of the creek banks. Geotechnical setbacks from the toe of the creek banks of 30m should be maintained to mitigate potential slope instabilities caused by erosion of the creek bank.

The probability of slope instabilities influencing the property is considered to be very low.



5.4 Debris Flows/ Debris Floods

No significant indications of previous flooding or debris events within the subject property were noted during the site reconnaissance, desk top reviews or geotechnical exploration. Small watercourses were located in the southwestern and central portions of the property. Both watercourses were dry at the time of site reconnaissance and had some vegetation growing within the gullies. The banks of both watercourses were smooth and no significant erosion noted. This indicates that the water flows in these watercourses are not eroding the surficial soils and blockage of the watercourses allowing for buildup and sudden release of water and debris is very low.

Pemberton Creek flows through a small area of the southeast corner of the subject property. The banks of the creek are steep and free of vegetation, indicating ongoing erosion. The creek bank on the south side on the creek is lower than the north bank and debris flow/ flood events would likely flow to the south.

The probability of debris flows/ flood influencing the subject property is considered to be low.

5.5 Rockfall

Based on review of aerial photographs, the talus deposits located in the area of the southwestern property originate from very steep bedrock bluffs up to about 500m above the elevation of the property. Field observations of loose isolated boulders originating from the same source were noted up to about 75m from the western property boundary at the north end to about 175m along the diagonal boundary in the southwest corner of the property.

The talus deposit in the central portion of the western property boundary originating from lower bedrock bluffs extended about 75m east of the boundary and appeared to be confined by a gully.

A talus deposit located in the central portion of the property, associated with the bedrock knoll, was limited in extent to about 75m from the bluff.

Loose boulders were noted in the area of bedrock bluffs located in the northeastern portion of the property. Rockfall mitigation of the existing Eagle Drive below some of these bluffs consists of rock anchoring and a rockfall fence. Similar bluffs exist throughout this area and extensive on-slope or catchment structures would be required to reduce the potential hazard to very low.

Isolated, localized talus/ colluvium deposits located on the eastern side of the northern portion of the property were generally limited in extent from the source bluffs. This area is identified on the attached site plan in blue hatch. It is considered that the potential hazard from rockfall in this area could be reduced to very low with on-slope and/or catchment structures (fencing/ ditches and berm). Development in this area should be reviewed by a Geotechnical Engineers on a site specific basis.

Recommended setbacks to mitigate the rockfall hazards presented for bedrock bluffs are shown on the attached Site Plan. Setbacks for southwestern, western and central talus deposits and the rockfall area on the eastern portion of the property are identified with black hatching and proposed development should avoid these areas. Implementation of rockfall barriers of other mitigative measures is considered to be economically prohibitive.



5.6 Snow Avalanche

In general, avalanche paths can be identified by vegetation consisting of deciduous trees such as aspen or cottonwood, grouped together and separated from the surrounding coniferous trees. No area fitting this description were noted during site reconnaissance or aerial photograph review. The probability of snow avalanches influencing the subject property is considered to be very low.

6.0 CLOSURE

The above noted and attached information presents Kontur's understanding of the proposed development, interpretations of site conditions and opinions as to the existence of naturally occurring geologic hazards, within and adjacent to the subject property, and the influence areas that could affect the proposed development. The lack of comprehensive historical records with respect to naturally occurring geologic hazards within or adjacent to the subject property limits the ability of Kontur to complete a quantitative assessment of specifically identified hazards. Therefore, Kontur has provided a qualitative assessment based on Kontur's experience and interpretations of existing site conditions. Some understanding of terminology and associated ranges of annual probability of occurrence connected with this approach is provided in a reference prepared by the Resource Inventory Committee, Government of British Columbia, Slope Stability Task Force (1996), as shown in Table A below.



TABLE A
Relative Terms and Ranges of Annual Probability of Hazard Occurrence
(Resource Inventory Committee, 1996)

Relative Term of Probability	Range of Annual Probability of Occurrence (Pa)	Comments
Very High	$>1/20$	Indicates the hazard is imminent and well within the lifetime a person or typical structure. Events occurring with a return interval of 1/20 or less generally have clear and relatively fresh signs of disturbance.
High	1/100 to 1/20	Indicates that the hazard can happen within the approximate lifetime of a person or typical structure. Events are clearly identifiable from deposits and vegetation but may not appear fresh.
Moderate	1/500 to 1/100	Indicates that the hazard, within a given lifetime, is not likely but possible. Signs of previous events, such as vegetation damage may not be easily noted.
Low	1/2500 to 1/500	Indicates the hazard is of uncertain significance
Very Low	$<1/2500$	

Kontur trusts that the information described above meets your current requirements. If you should have any concerns or questions, please do not hesitate to contact the undersigned.



Sincerely,

Kontur Geotechnical Consultants Inc.

Per:



February 26, 2020

Evan Sykes, P.Eng.
Principal | Geotechnical Engineer

Reviewed by:



Mathew Yip, M.Eng., P.Eng.
Principal | Geotechnical Engineer

Attachments: Site Plan (Figure 1)
Development Yield Plan Draft v1.0 (Ekistics) with Rockfall Setbacks (Figure 2)
Test Pit Location Plan (Figure 3)
Test Pit Logs



APPENDIX A ■
Interpretation and Use of Study and Report Document



INTERPRETATION AND USE OF STUDY AND REPORT DOCUMENT

1.0 STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering consulting practices in this area. No other warranty, expressed or implied, is made. Engineering studies and reports do not include environmental engineering or consulting.

2.0 COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3.0 BASIS OF THE REPORT

The Report has been prepared for the specific site, development, building, design or building assessment objectives and purpose that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document are only valid to the extent that there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4.0 USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT. WE WILL CONSENT TO ANY REASONABLE REQUEST BY THE CLIENT TO APPROVE THE USE OF THIS REPORT BY OTHER PARTIES AS "APPROVED USERS". The contents of the Report remain our copyright property and we authorise only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of the Report by those parties. The Client and Approved Users may not give, lend, sell or otherwise make the Report, or any portion thereof, available to any party without our written permission. Any use which a third party makes of the Report, or any portion of the Report, are the sole responsibility of such third parties. We accept no responsibility for damages suffered by any third party resulting from unauthorised use of the Report.

5.0 INTERPRETATION OF THE REPORT

Nature and Exactness of Descriptions: Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations, or building envelope descriptions, utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarising such investigations will be based on assumptions of what exists between the actual points sampled. 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. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

Reliance on Provided information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the report as a result of misstatements, omissions, misrepresentations or fraudulent acts of persons providing information.

To avoid misunderstandings, KONTUR should be retained to work with the other design professionals to explain relevant engineering findings and to review their plans, drawings, and specifications relative to engineering issues pertaining to consulting services provided by KONTUR. Further, KONTUR should be retained to provide field reviews during the construction, consistent with building codes guidelines and generally accepted practices. Where applicable, the field services recommended for the project are the minimum necessary to ascertain that the Contractor's work is being carried out in general conformity with KONTUR's recommendations. Any reduction from the level of services normally recommended will result in KONTUR providing qualified opinions regarding adequacy of the work.

6.0 ALTERNATE REPORT FORMAT

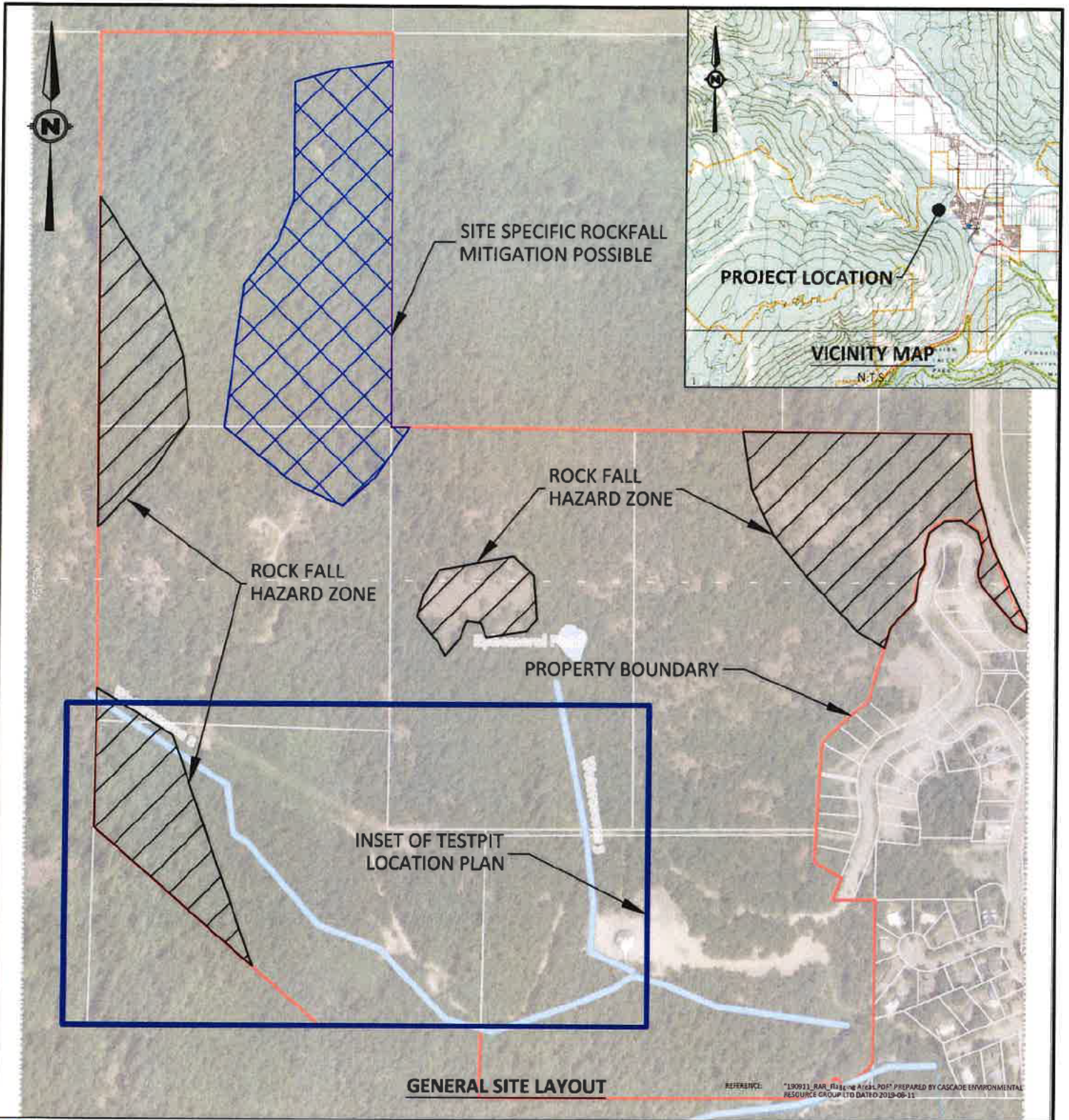
When KONTUR submits both electronic file and hard copies of reports, drawings and other documents and deliverables (KONTUR's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by KONTUR shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancy, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by KONTUR shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of KONTUR's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except KONTUR. The Client warrants that KONTUR's instruments of professional service will be used only and exactly as submitted by KONTUR.

The Client recognizes and agrees that electronic files submitted by KONTUR have been prepared and submitted using specific software and hardware systems. KONTUR makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.



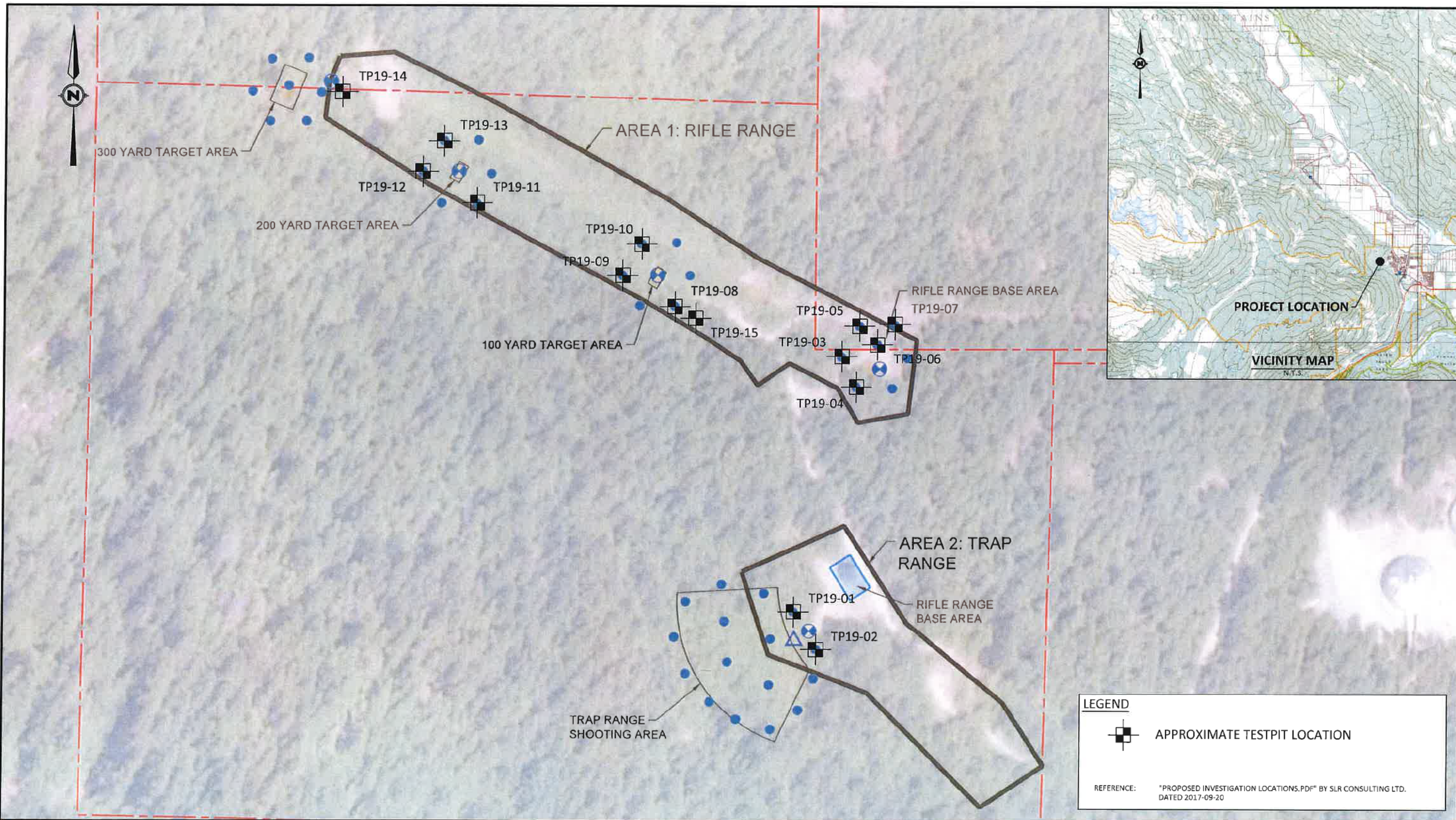
APPENDIX B 
Figures



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TITLE ROCKFALL HAZARD AREAS	DATE: 2019-10-23		PROJECT NO.: K-191204-00
	SCALE: 1:5500		DWG NO.: FIGURE 1
CLIENT SKENKENAM DEVELOPMENTS INC.	NO.	REVISIONS	DATE
	0	ISSUED FOR REPORT	2020-02-21
PROJECT PROPOSED BENCHLANDS DEVELOPMENT PEMBERTON, B.C.	DRAFT: JL		DESIGN: -
			CHECK: EGS

February 26, 2020 2:32:13 PM



January 3, 2020 10:36:32 AM

Unit 65, 1833 Coast Meridian Road, Port Coquitlam, B.C. V3C 6G5
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SEAL

REVISIONS		
NO	DESCRIPTION	DATE
0	ISSUED FOR REPORT	2020-01-03

TITLE TESTPIT LOCATION PLAN	PROJECT NO.: K-191204-00
CLIENT BETHEL LAND CORPORATION	DATE: 2020-01-03
PROJECT LOCATION BENCHLAND, PEMBERTON B.C.	SCALE: 1:1500
	DWG NO.: G100
	DRAFT: JL
	DESIGN: -
	CHECK: EGS

DEVELOPMENT YIELD PLAN DRAFT V1.0

LEGEND PROJECT NUMBER: 191204

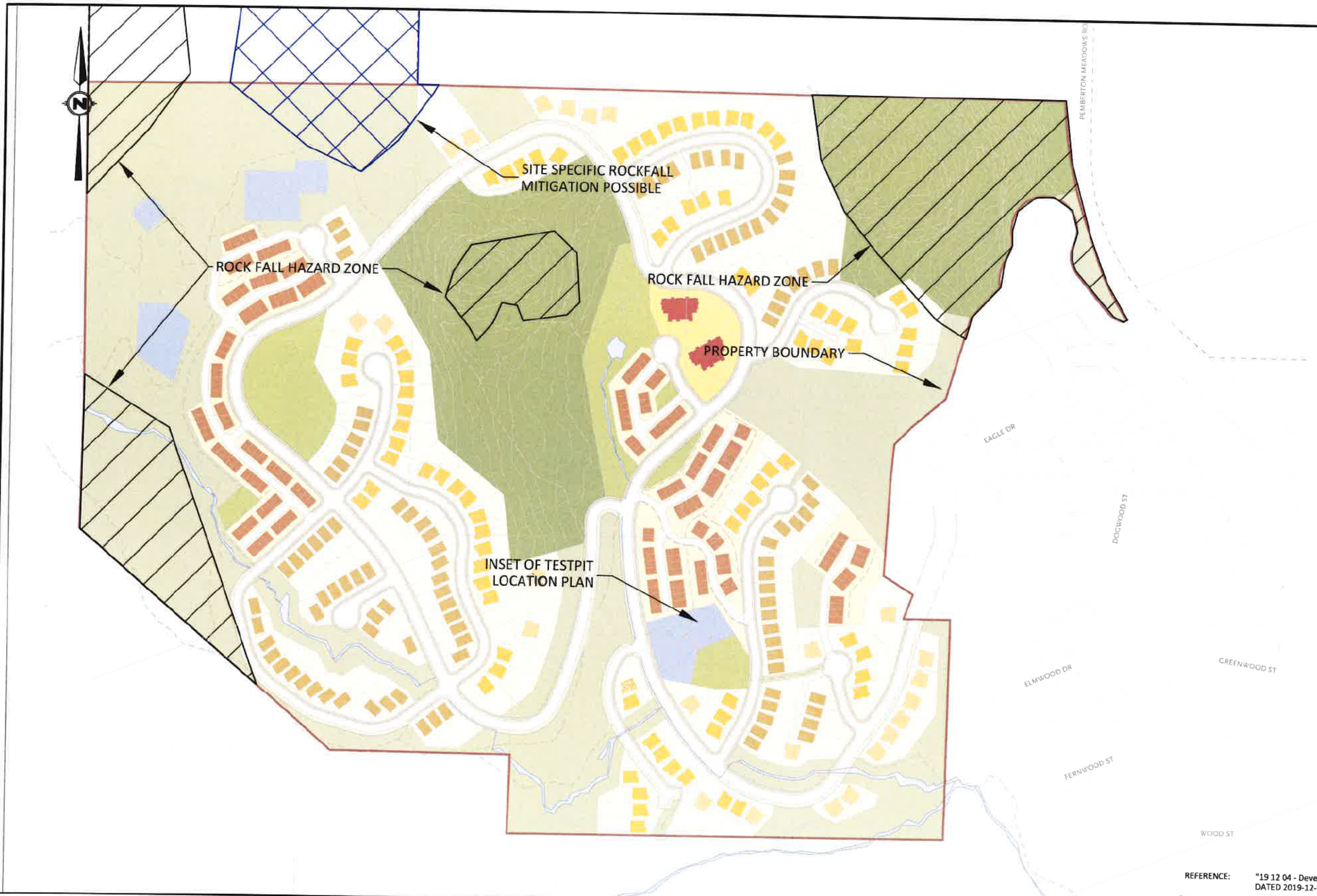
- Site Boundary
67.52 ha | 167.02 ac
- Legal Property Lines
- 5m Contour
- ALR Boundary
- Surveyed + Realigned Streams
- Draft Trail Locations
- Draft Sidewalk Locations

LAND USE

28%	Single Family Development Areas	14.16 ha 34.99 ac
8%	Strata Townhome Development Areas	3.99 ha 9.86 ac
1%	Apartment Development Areas	0.56 ha 1.38 ac
2%	Civic Infrastructure	0.94 ha 2.32 ac
4%	Neighbourhood Park	1.86 ha 4.60 ac
17%	Nature Park	8.39 ha 20.75 ac
28%	Natural Area	13.84 ha 34.20 ac
12%	Public Road ROW	5.85 ha 14.46 ac
100%		49.59 ha 122.54 ac

DRAFT YIELD

	Large Single Family 18m	24	5%
	Medium Single Family 15m	86	17%
	Small Single Family 12m	704	14%
	Townhome 6m	194	4%
	Apartment	40	8%
	TOTAL	448	90%



REFERENCE: "19 12 04 - Development Yield Plan.PDF" BY EKISTICS ARCHITECTURE INC. DATED 2019-12-04

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SEAL

REVISIONS		
NO	DESCRIPTION	DATE
0	ISSUED FOR REPORT	2020-02-21


TITLE	ROCKFALL HAZARD ZONE DEVELOPMENT PLAN
CLIENT	SKENKENAM DEVELOPMENTS INC.
PROJECT LOCATION	BENCHLAND, PEMBERTON B.C.

PROJECT NO.:	K-191204-00		
DATE:	2020-02-21	SCALE:	1:6000
DWG NO.:	FIGURE 3		
DRAFT:	JL	DESIGN:	-
CHECK:	EGS		



February 26, 2020
Project No.: K-191204-00

Geotechnical Assessment
Residential Development
Pemberton Benchlands, Pemberton, BC

APPENDIX C 
Test Pit Logs



Kontur Geotechnical Consultants Inc.
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 Telephone: (778) 730 1747

RECORD OF TEST PIT : TP19-01

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ▽ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m ▲ 20 40 60 80	POCKET PEN. (kPa) ⊙ 100 200 300 400	FINES CONTENT (%) □ 20 40 60 80	GROUNDWATER
				NUMBER	TYPE	RECOVERY %				
1		SILTY SAND, some gravel, some cobbles, trace root/lets, brown, moist, (compact)								
1.4		SILTY SAND, some gravel, some cobble, grey brown, moist, (dense to very dense), (TILL-LIKE)	1.4							

Bottom of test pit at 1.5m.



Kontur Geotechnical Consultants Inc.
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RECORD OF TEST PIT : TP19-02

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ▽ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER	
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80		
							DYNAMIC CONE BLOWS/0.3m	FIELD VANE SHEAR (kPa)	PLASTIC & LIQUID LIMIT WATER CONTENT		
							20 40 60 80	Peak Remold	PL MC LL		
							40 80 120 160	40 80 120 160	20 40 60 80		
1		SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)									
2		SILTY SAND, some gravel, some cobble, occasional boulder, grey brown, moist, (dense to very dense), (TILL-LIKE)	1.5								

Bottom of test pit at 2.0m.



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RECORD OF TEST PIT : TP19-03

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ∇ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER			
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80				
0.1	[Strata Diagram]	SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)					▲	⊙	□				
0.2													
0.3													

Bedrock encountered at 0.3m
Bottom of test pit at 0.3m.



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RECORD OF TEST PIT : TP19-04

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ▽ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80	
0.5		SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)					▲	☉	☐	
		SILTY SAND, some gravel, some cobble, occasional boulder, grey brown, moist, (dense to very dense), (TILL-LIKE)	0.6				▲	☉	☐	

Bedrock encountered at 0.9
 Bottom of test pit at 0.9m.



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RECORD OF TEST PIT : TP19-05

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ∇ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80	
0.1	III	SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)					▲	□		
							▲	□		

Bedrock encountered at 0.15m
 Bottom of test pit at 0.2m.



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RECORD OF TEST PIT : TP19-06

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ∇ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 50 80	
0.1		SILTY SAND and crushed rocks, trace rootlets, brown, moist, (compact to dense)					▲	⊙	□	
0.2							■	●	○	
0.3										

Bedrock encountered at 0.3m
 Bottom of test pit at 0.3m.



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RECORD OF TEST PIT : TP19-07

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ∇ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

D E P T H (m)	S T R A T A	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80	
							DYNAMIC CONE BLOWS/0.3m	FIELD VANE SHEAR (kPa)	PLASTIC & LIQUID LIMIT WATER CONTENT	
0.1		Bedrock Outcrop								
								Peak Remold	PL MC LL 	

Bottom of test pit at 0.2m.



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RECORD OF TEST PIT : TP19-08

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER	
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80		
							DYNAMIC CONE BLOWS/0.3m	FIELD VANE SHEAR (kPa)	PLASTIC & LIQUID LIMIT WATER CONTENT		
							20 40 60 80	Peak Remold	PL MC LL		
								40 80 120 160	20 40 60 80		
		SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)									
1		interbed layer of orgnic silt (about 0.03m thick)	0.9								
		SANDY SILT, some gravel, trace roots, grey, moist, (firm)	0.9								
2		SILT, some sand, some gravel, grey mottled orange, (dense to very dense), pockets of organic silt, (TILL-LIKE)	1.5								

Bottom of test pit at 2.4m.



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RECORD OF TEST PIT : TP19-09

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ▽ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80	
							DYNAMIC CONE BLOWS/0.3m	FIELD VANE SHEAR (kPa)	PLASTIC & LIQUID LIMIT WATER CONTENT	
		SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)				▲	⊙	□		
						■	● ○	PL MC LL		
1		Bedrock encountered at 0.9m	0.9							

Bottom of test pit at 1.2m.



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RECORD OF TEST PIT : TP19-10

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ∇ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80	
		SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)					▲ 20 40 60 80 DYNAMIC CONE BLOWS/0.3m □ 20 40 60 80	⊙ 100 200 300 400 FIELD VANE SHEAR (kPa) Peak ● Remold ○ 40 80 120 160	□ 20 40 60 80 PLASTIC & LIQUID LIMIT WATER CONTENT PL MC LL ----- ----- 20 40 60 80	
1		Bedrock encountered at 0.9m	0.9							

Bottom of test pit at 1.2m.



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RECORD OF TEST PIT : TP19-11

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 GROUNDWATER DEPTH AT TIME OF EXCAVATION 1.8m
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m	POCKET PEN. (kPa)	FINES CONTENT (%)	GROUNDWATER
				NUMBER	TYPE	RECOVERY %	20 40 60 80	100 200 300 400	20 40 60 80	
							DYNAMIC CONE BLOWS/0.3m	FIELD VANE SHEAR (kPa)	PLASTIC & LIQUID LIMIT WATER CONTENT	
							20 40 60 80	Peak Remold	PL MC LL	
							20 40 60 80	40 80 120 160	20 40 60 80	
		COBBLES BOULDERS, SILTY SAND AND GRAVEL, (compact)								
		SILTY SAND, some gravel, some cobbles, occasional boulders, trace rootlets, brown, (compact)	0.3							
		SAND AND GRAVEL, some cobbles, trace to some silt, grey, moist, (compact to dense)	1.2							

Bottom of test pit at 1.8m.



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RECORD OF TEST PIT : TP19-12

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ∇ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m ▲ 20 40 60 80	POCKET PEN. (kPa) ⊙ 100 200 300 400	FINES CONTENT (%) □ 20 40 60 80	GROUNDWATER
				NUMBER	TYPE	RECOVERY %				
1		COBBLES BOULDERS, SILTY SAND AND GRAVEL, (compact)								
		SILTY SAND, some gravel, some cobbles, occasional boulders, trace rootlets, brown, (compact)	0.3							
		COBBLES BOULDERS, SAND AND GRAVEL, (dense to very dense)	0.9							

Refusal at 1.1m depth
Bottom of test pit at 1.1m.



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RECORD OF TEST PIT : TP19-13

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ∇ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m ▲ 20 40 60 80	POCKET PEN. (kPa) ⊙ 100 200 300 400	FINES CONTENT (%) □ 20 40 60 80	GROUNDWATER
				NUMBER	TYPE	RECOVERY %				
1		SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)								
		COBBLES BOULDERS, SAND AND GRAVEL, (dense to very dense)	1.2							

Refusal at 1.3m depth
 Bottom of test pit at 1.4m.



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RECORD OF TEST PIT : TP19-14

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 ∇ GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m ▲ 20 40 60 80	POCKET PEN. (kPa) ⊙ 100 200 300 400	FINES CONTENT (%) □ 20 40 60 80	GROUNDWATER
				NUMBER	TYPE	RECOVERY %				
1		SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)								
		COBBLES BOULDERS, SAND AND GRAVEL, (dense to very dense)	1.5							

Refusal at 1.8m depth
Bottom of test pit at 1.8m.



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RECORD OF TEST PIT : TP19-15

CLIENT Bethel Land Corporation
 PROJECT NAME Proposed Residential Subdivision
 EXCAVATION DATE 2019-10-22
 EXCAVATION METHOD Test Pit
 EXCAVATION CONTRACTOR Coastal Mountain Excavations Ltd.
 EQUIPMENT TYPE Tracked Excavator

PROJECT NUMBER K-191204-00
 PROJECT LOCATION Benchlands, Pemberton BC
 TEST PIT LOCATION _____
 ELEVATION _____
 GROUNDWATER DEPTH AT TIME OF EXCAVATION _____
 LOGGED BY JL CHECKED BY EGS

DEPTH (m)	STRATA	SOIL DESCRIPTION	ELEV. DEPTH (m)	SAMPLES			SPT 'N' VALUE BLOWS/0.3m ▲ 20 40 60 80	POCKET PEN. (kPa) ⊙ 100 200 300 400	FINES CONTENT (%) □ 20 40 60 80	GROUNDWATER
				NUMBER	TYPE	RECOVERY %				
1		SILTY SAND, some gravel, some cobbles, trace rootlets, brown, moist, (compact)								
		Interbed layer of organic silt (about 0.03m thick)	0.6							
		SANDY SILT, some gravel, trace roots, grey, moist, (firm)	0.6							
		WEATHERED ROCKS, broken, rocks are subangular	1.2							

Refusal at 1.5m depth
Bottom of test pit at 1.5m.



February 26, 2020
Project No.: K-191204-00

Geotechnical Assessment
Residential Development
Pemberton Benchlands, Pemberton, BC

APPENDIX D 
Photos



Photograph 1 – Talus Deposit, Large Boulders - P1



Photograph 2 – Communication Towers – P2



Photograph 3 – Overhanging Bluff, Rockfall Source– P3



Photograph 4 – Talus Deposit – P4



Photograph 5 – Moss Covered Talus Slope – P5



Photograph 6 – Bedrock Bluff, Talus Source – P5



Photograph 7 – Mossy Talus Slope – P7



Photograph 8 – Mossy Talus Slope – P7



Photograph 9 – Loose Boulders – P8



Photograph 10 – Slope, No Talus – P9



Photograph 11 – Old Access Road – P10



Photograph 12 – Bedrock Bluff Rockfall Source – P11



Photograph 13 – Large Loose Boulders – P13



Photograph 14 – Lower Access Road – P14



Photograph 15 – Loose Boulders Above Lower Access Road – P15



Photograph 16 – Bedrock Bluff Lower Access Road – P16



Photograph 17 – Bedrock Slope Above Lower Access Road – P18



Photograph 18 – Bedrock Slope – P18



Photograph 19 – Bedrock Slope – P19



Photograph 20 – Loose Boulders – P26



Photograph 21 – Talus Deposit – P27



Photograph 22 – Bedrock Bluff, Talus Source – P27



Photograph 23 – Bedrock with some Broken Rock on Slope Below Ridge – P28



Photograph 24 – Talus Slope Below Ridge – P28



Photograph 25 – Bedrock Ridge – P30



Photograph 26 – Large Boulder – P23



Photograph 27 – Large Boulder – P22



Photograph 28 – Bedrock Controlled Slope, No Loose Boulders – P21



Photograph 29 – South End of Bounder Field Looking North – P24




Photograph 30 – Bedrock Controlled Slope, South End Boulder Field – P24



February 26, 2020
Project No.: K-191204-00

Geotechnical Assessment
Residential Development
Pemberton Benchlands, Pemberton, BC

APPENDIX E 
Appendix D: Landslide Assurance Statement

APPENDIX D: LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

Note: This Statement is to be read and completed in conjunction with the "APEGBC Guidelines for Legislated Landslide Assessments for Proposed Residential Development in British Columbia", March 2006/Revised September 2008 ("APEGBC Guidelines") and the "2006 BC Building Code (BCBC 2006)" and is to be provided for *landslide assessments* (not floods or flood controls) for the purposes of the Land Title Act, Community Charter or the Local Government Act. Italicized words are defined in the APEGBC Guidelines.

To: The Approving Authority

Date: February 24, 2020

Village of Pemberton

Box 100, 7400 Prospect St Pemberton, BC V0N 2L0

Jurisdiction and address

With reference to (check one):

- Land Title Act (Section 86) – Subdivision Approval
- Local Government Act (Sections 919.1 and 920) – Development Permit
- Community Charter (Section 56) – Building Permit
- Local Government Act (Section 910) – Flood Plain Bylaw Variance
- Local Government Act (Section 910) – Flood Plain Bylaw Exemption
- British Columbia Building Code 2006 sentences 4.1.8.16 (8) and 9.4 4.4.(2) (Refer to BC Building and Safety Policy Branch Information Bulletin B10-01 issued January 18, 2010)

DL 8820, Lillooet District; Lot 1 CL 202 DP KAP 76575; Lot 49, DL 164 LDP 883; Lot 48, DL 164 LDP 883 except Plan H10996; DL 2297 Lillooet District; Block A, DL 202 Lillooet District; Block I, DL 202, Lillooet District; Block H, DL 202, Lillooet District; DL 8410, Lillooet District; Block A, DL 8556, Lillooet District

The undersigned hereby gives assurance that he/she is a *Qualified Professional* and is a *Professional Engineer or Professional Geoscientist*.

I have signed, sealed and dated, and thereby certified, the attached *landslide assessment* report on the Property in accordance with the *APEGBC Guidelines*. That report must be read in conjunction with this Statement. In preparing that report I have:

Check to the left of applicable items

- X 1. Collected and reviewed appropriate background information
- X 2. Reviewed the proposed *residential development* on the Property
- X 3. Conducted field work on and, if required, beyond the Property
- X 4. Reported on the results of the field work on and, if required, beyond the Property
- X 5. Considered any changed conditions on and, if required, beyond the Property
- 6. For a *landslide hazard analysis* or *landslide risk analysis* I have:
 - X 6.1 reviewed and characterized, if appropriate, any *landslide* that may affect the Property
 - X 6.2 estimated the *landslide hazard*
 - X 6.3 identified existing and anticipated future *elements at risk* on and, if required, beyond the Property
 - X 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*
- 8. Where the Approving Authority has **not** adopted a *level of landslide safety* 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 this guideline 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)

I hereby give my assurance that, based on the conditions^[1] contained in the attached *landslide 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 (Sections 919.1 and 920), my report will "assist the local government in determining what conditions or requirements under [Section 920] subsection (7.1) it will impose in the 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 registered covenants.
- without any registered covenant.

- for flood plain bylaw variance, as required by the "Flood Hazard Area Land Use Management Guidelines" associated with the Local Government Act (Section 910), "the development may occur safely".
- for flood plain bylaw exemption, as required by the Local Government Act (Section 910), "the land may be used safely for the use intended".

Evan Sykes, P.Eng.

Name (print)

February 24, 2020

Date

Signature

^[1] When seismic slope stability assessments are involved, *level of landslide safety* is considered to be a "life safety" criteria as described in the National Building Code of Canada (NBCC 2005), Commentary on Design for Seismic Effects in the User's Guide, Structural Commentaries, 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".

Address

Telephone



(Affix Professional seal here)

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

I am a member of the firm Kontur Geotechnical Consultants Inc.
and I sign this letter on behalf of the firm. (Print name of firm)