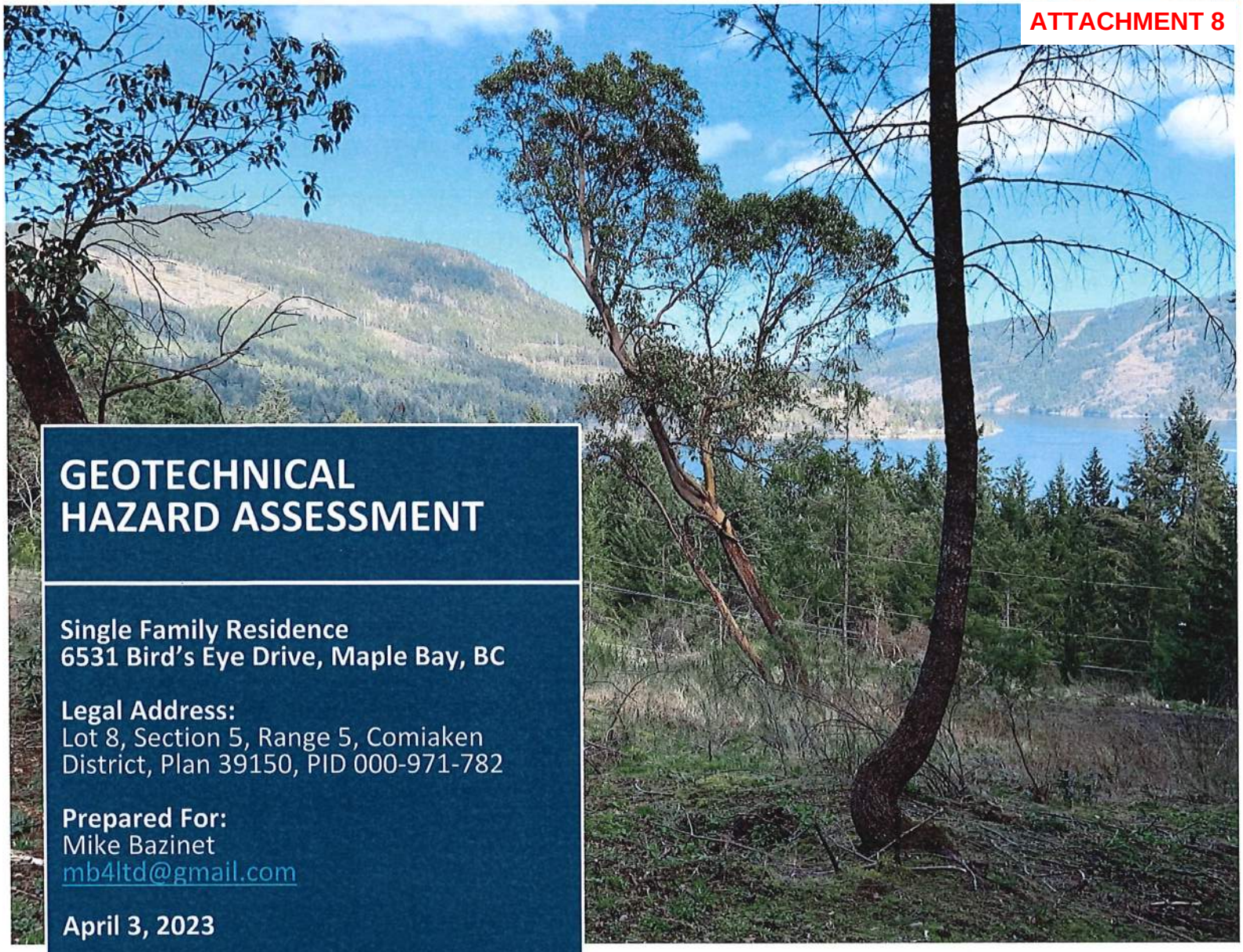
ATTACHMENT 8



GEOTECHNICAL HAZARD ASSESSMENT

Single Family Residence
6531 Bird's Eye Drive, Maple Bay, BC

Legal Address:
Lot 8, Section 5, Range 5, Comiaken District, Plan 39150, PID 000-971-782

Prepared For:
Mike Bazinet
mb4ltd@gmail.com

April 3, 2023

File No.: E2102.01
Revision No.: 00
Prepared by: Jeff Scott, P.Eng.
Reviewed by: Stuart Crossfield, P.Geo, P.L.Eng.

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Permit to Practice Number: 1001802

LEA Lewkowich Engineering Associates Ltd.

DISCLAIMER, ACKNOWLEDGMENTS AND LIMITATIONS

1. Lewkowich Engineering Associates Ltd. (LEA) acknowledges that this report, from this point forward referred to as "the Report," may be used by the Municipality of North Cowichan (MNC) as a precondition to the issuance of a development and/or building permit. It is acknowledged that Approving Officers and/or Building Officials of the MNC may rely on this Report when making a decision on application for development of the land. It is acknowledged that this Report and any conditions contained in the Report may be included in a restrictive covenant under Section 56 of the Community Charter and registered against the title of the Property at the discretion of the MNC.
2. This Report has been prepared in accordance with standard geotechnical engineering practice solely for and at the expense of Mike Bazinet. We have not acted for or as an agent of the MNC in the preparation of this Report.
3. The conclusions and recommendations submitted in this Report are based upon information from relevant publications, a visual site-assessment of the property, observed and inferred subsurface conditions, current construction techniques, and generally accepted engineering practices. No other warrantee, expressed or implied, is made. If unanticipated conditions become known during construction or other information pertinent to the structures becomes available, the recommendations may be altered or modified in writing by the undersigned.
4. This Report was authored, to the best of our knowledge at the time of issuance, with considerations for local requirements specific to the Authority Having Jurisdiction (AHJ) and their standards for the preparation of such reports, the 2018 British Columbia Building Code (BCBC), and current engineering standards. Updates to municipal bylaws, policies, or requirements of the AHJ, or updates to the BCBC and/or professional practice guidelines may impact the validity of this Report.
5. This Report has been prepared by Mr. Jeff Scott, P.Eng., and reviewed by Mr. Stuart Crossfield, P.Geo, P.L.Eng. Messrs. Scott and Crossfield are both adequately experienced and are also members in good standing with the Engineers and Geoscientists of British Columbia (EGBC).

EXECUTIVE SUMMARY

1. The following is a brief synopsis of the property, assessment methods, and findings presented in the Report. The reader must read the Report in its entirety; the reader shall not rely solely on the information provided in this summary.
2. The subject property, 6531 Bird's Eye Drive, Maple Bay, BC, from this point forward referred to as "the Property," is located in southeastern Vancouver Island within the jurisdictional boundaries of the MNC. The Property is within DPA 4 – Natural Hazard Areas for steep slopes > 50%. The proposed development for the Property at the time of this Report consists of a new single-family residence.
3. A site-specific hazard assessment was conducted to identify any potential geotechnical hazards for the proposed development. Our assessment identified steep slopes as a potential hazard.
4. The Report concludes the proposed development will not be impacted by the potential steep slope hazard in proximity to the development.
5. The findings confirm the land is considered safe for the use intended, and the development is considered safe as proposed, provided the recommendations in this Report are followed.

List of Abbreviations Used in the Report

Abbreviation	Title
AHJ	Authority Having Jurisdiction
BCBC	British Columbia Building Code
DPA	Development Permit Area
EGBC	Engineers and Geoscientists of British Columbia
LEA	Lewkowich Engineering Associates Ltd.
MNC	Municipality of North Cowichan
PGA	Peak Ground Acceleration
SLS	Service Limit States
ULS	Ultimate Limit States

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 General

a. As requested, LEA has carried out a Geotechnical Hazard Assessment of the subject Property with respect to the proposed residential development. This Report provides a summary of our findings and recommendations.

1.2 Background

a. We understand the proposed development consists of a new single-family residence. We further understand the proposed development will consist of conventional construction methods, including typical cast-in-place concrete foundations and a wood-framed superstructure.

b. The Property is within the jurisdictional limits of the MNC. As per the MNC Official Community Plan, we understand the Property is within DPA 4 - Natural Hazard Areas for steep slopes > 50%.[1] Therefore, a Geotechnical Assessment and report is required to assist in determining what conditions or requirements shall be included in the development permit so that the proposed development is protected from the hazard and no increase in hazard is posed to existing development.

1.3 Assessment Methodology

a. This assessment included a desktop review of relevant background information, including applicable MNC bylaws, available development plans, registered covenants on title, aerial photographs, and published geology and topography mapping. Please refer to the list of references at the end of this Report.

b. A site reconnaissance was conducted on March 30, 2023, to visually assess the current site and slope conditions throughout the Property. The Property was accessed from the existing Bird's Eye Drive frontage.

c. This assessment was prepared with consideration of the referenced *EGBC Landslide Assessments in British Columbia*.[2] Please refer to the attached EGBC assurance statement.

1.4 Covenant Review

a. As part of our assessment, we have reviewed the legal title of the Property, specifically relative to any restrictive covenants that may impact the conclusions or recommendations made in this Report.

b. At the time of this Report, there are no restrictive covenants relating to geotechnical hazards registered against the title of the Property.

2.0 SITE CONDITIONS

2.1 Physical Setting

a. The Property is located in southeastern Vancouver Island within the community of Maple Bay. Geographically, the Property is located on the northeast slopes of Mount Tzouhalem, overlooking Maple Bay / Bird's Eye Cove (ocean).

b. The Property is zoned Rural Residential Zone (A5). The Property is directly bordered by Bird's Eye Drive to the southwest, and similar A5 properties in all other immediate directions. At the time of our site reconnaissance, the neighbouring properties to the northwest and southeast were developed, and the property to the northeast was undeveloped. Please refer to Figure 2.1 below.

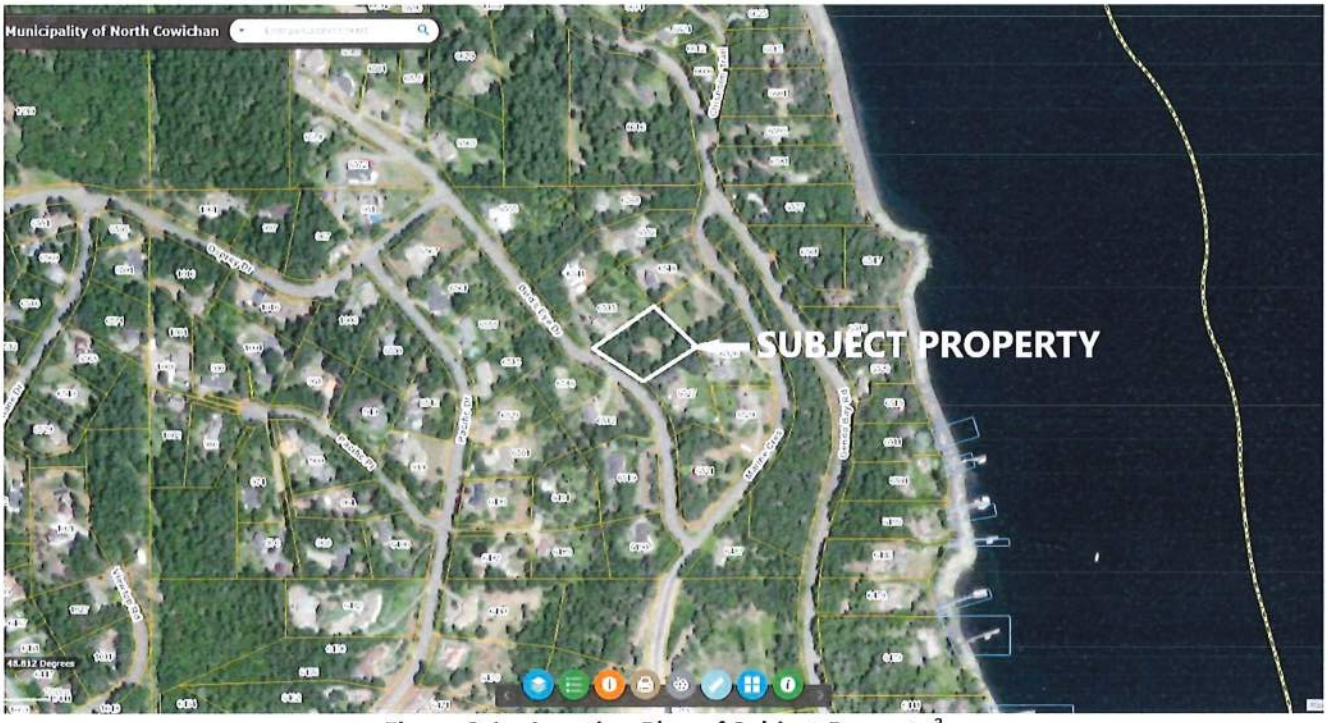


Figure 2.1 – Location Plan of Subject Property[3]

2.2 Terrain and Features

a. In general, the Property is located on the northeast slopes of Mount Tzouhalem, where the terrain moderately slopes downhill towards Maple Bay / Bird's Eye Cove (ocean) to the northeast. Elevations within the Property range from approximately 126m to 100m geodetic, for a total vertical relief of 26m.

b. A moderately steep bank declines into the Property from Bird's Eye Drive. Based on the attached topographic Survey Plan, the bank ranges in height from 5m to 9m, with average slope angles from 20° to 30° from the horizontal. The bank is moderately vegetated with Fir and Arbutus trees, and a minimal undergrowth.

c. Below the bottom of bank, the terrain transitions into a gentle slope with average slope angles from 10° to 15°. This area is also vegetated with scattered Fir and Arbutus trees primarily around the perimeter of the lot, with a central clearing covered by grass. We understand this is the proposed development area.

d. The Property is accessed from Bird's Eye Drive by a paved driveway and easement through the neighbouring property to the southeast. At the time of our site reconnaissance, the Property was undeveloped.

Photo 2.2.1: Moderately steep bank along Bird's Eye Drive, looking south.

Photo 2.2.2: Proposed development area, looking northeast.

2.3 Regional Geology

a. Surficial geology for the area is classified as a colluvial veneer generally less than 1m thick, described as diamicton with variable structure and texture including talus, avalanche, landslide, debris flow and other mass wastage products and weathered bedrock, overlying bedrock.[4,5]

b. Bedrock geology for the area is classified as the Nanaimo Group of undivided sedimentary rock from the Upper Cretaceous period, described as boulder, cobble and pebble conglomerate, coarse to fine sandstone, siltstone, shale, and/or coal.[6]

2.4 Soil Conditions

a. A subsurface investigation was not completed as part of this assessment. Visual inspection of the site allowed for observation of minor soil exposures throughout the Property.

b. Based on site observations, soil conditions are generally consistent with published surficial geology mapping, consisting of stoney topsoil and colluvium overlying sedimentary rock at shallow depth.

c. Frequent bedrock exposures were also observed underlying thin soil deposits throughout the Property. The observed bedrock consisted of weak, dark grey to black, siltstone / shale sedimentary rock. The exposed rock was of poor quality, heavily weathered, resulting in poor surface conditions with closely spaced fractures in a very blocky to disturbed rockmass structure. Based on LEA experience in the area, the rockmass becomes tightly jointed at shallow depth (<1.5m).

2.5 Groundwater Conditions

a. There was no ponding or flowing surface water observed within the Property, nor any evidence of abnormal groundwater conditions observed during our site reconnaissance.

b. Groundwater is expected to be confined to cracks and fissures within the bedrock mantel.

c. Groundwater flows can be expected to fluctuate seasonally with cycles of precipitation. Groundwater conditions at other times and locations can differ from those observed within the time of our investigation.

3.0 SLOPE HAZARD ASSESSMENT

a. The attached topographic Survey Plan shows the proposed location of the new residence in proximity to the moderately steep bank along Bird's Eye Drive. The bank ranges in height from 5m to 9m, with average slope angles from 20° to 30°. The bank is comprised of thin deposits of stoney topsoil and colluvium overlying a siltstone / shale rockmass. The proposed location of the new residence is shown to be greater than 9m from the bottom of the bank.

b. During the site reconnaissance, the bank was inspected for indicators of global instability, and none were observed. However, many of the trees on the bank had slightly bent / pistol-butt trunks, an indication of surficial creep due to seasonal cycles.

c. Detailed slope stability analyses are generally required when building development is proposed near the top or bottom of intact bedrock slopes steeper than 1 Horizontal to 1 Vertical (1H:1V / 45°), or fractured rockmass slopes steeper than 1.5H:1V (34°), or soil slopes steeper than 2H:1V (27°), excluding circumstances where indicators of global instability are present.

d. Considering the rockmass bank in proximity to the proposed development is less than 30°, we conclude the bank is in a stable configuration and has a very low risk hazard for a global slope stability failure. Furthermore, considering the new residence will be located greater than 9m from the bottom of the bank, the new residence is very unlikely to be impacted by potential ravelling / spalling of surficial weathered material. No further detailed slope stability assessment is warranted.

e. It should be noted that landslides can also occur due to human activity (i.e., excavation, placement of fill, removal of vegetation, etc.) or failure of civil infrastructure (i.e., underground water and sewer mains, stormwater disposal from existing development, etc.). The concentrated discharge of collected stormwater can lead to erosion, earth movement, or slope failure.

4.0 DESIGN PHASE

4.1 Foundation Design and Construction

a. Prior to construction, the new building areas should be stripped to remove all unsuitable materials to provide an undisturbed natural subgrade for the footing support.

b. Foundation loads should be supported on natural undisturbed material approved for use as a bearing stratum by our office, or structural fill, and may be designed using the following values.

   i. For foundations constructed on dense undisturbed mineral soil, or on greater than 300mm of structural fill overlying competent bedrock, an SLS bearing pressure of 150 kPa and a ULS of 200 kPa may be used for design purposes. These values assume a minimum 0.45m footing embedment depth.

   ii. For foundations constructed directly on competent bedrock, or on 300mm or less of structural fill over competent bedrock, an SLS bearing pressure of 250 kPa and a ULS of 330 kPa may be used for design purposes. These values assume a minimum 0.45m footing embedment depth.

c. As the elevation of competent bedrock is expected to vary throughout the building area, we recommend the Structural Engineer use the design values for dense undisturbed mineral soil / structural fill provided above. This will prevent conflict where the bedrock is not present at a "practical" building elevation. The design values provided above for structural fill can be achieved through the conventional placement and compaction of engineered fill over an approved naturally deposited subgrade.

d. Exterior footings should be provided with a minimum 0.45m depth of ground cover for frost protection.

e. The Geotechnical Engineer should evaluate subsurface conditions at the time of construction to confirm that soil and/or groundwater conditions do not materially differ to those observed and inferred during the site reconnaissance and that footings are based on appropriate and properly prepared founding material.

4.2 Seismic Criteria

a. No sensitive or liquefiable soils were identified during our assessment.

b. As per the 2018 BCBC, Division B, Part 4, Table 4.1.8.4.A, "Site Classification for Seismic Site Response," the observed and inferred subsurface conditions would be classified as Site Class C.

4.3 Lateral Earth Pressures

a. Any future retaining wall construction within the Property shall be reviewed by the Structural and/or Geotechnical Engineer(s).

b. Lateral earth pressure coefficients (K) for the design of the cast-in-place retaining walls are outlined in Table 4.3.1. It is assumed that there will be a level (0° from horizontal) backslope and no additional surcharge on the wall. It is noted that the methods employed are estimates and further analysis may be required after dimensions of the proposed structure have been determined.

c. An average soil friction angle of 27° has been used to calculate the lateral earth pressure coefficients. It is assumed that retained soils are free-draining, well compacted, cohesionless sands and gravels, with a unit weight of 21 kN/m^3.

d. Seismic forces used reflect values from the 2015 National Building Code interpolated seismic hazard values for this Property which are 0.501g PGA (2% in 50-year probability) and 0.269g PGA (10% in 50-year probability) (attached).

e. The Mononobe-Okabe Method has been used to calculate the seismic active lateral earth pressure coefficient (K_{aE}). The static active lateral earth pressure coefficient (K_a) has been calculated using Coulomb's theory. The static passive lateral earth pressure coefficient (K_p) has been calculated using Rankine's theory. See the following Table 4.3.1 for design values.

Table 4.3.1 – Lateral Earth Pressure Coefficients

Lateral Earth Pressure Condition	Earth Pressure Coefficient (K)	
Static Active	K_a	0.34
Static Passive	K_p	2.66
Seismic Active	K_{aE}	0.56

f. The thrust resulting from lateral earth pressures under each of the conditions outlined in Table 4.3.1 may be calculated using the relationship in Table 4.3.2. A minimum uniform static load of 20 kPa shall be considered for compaction forces during construction.

Table 4.3.2 – Thrust from Lateral Earth Pressure Relationship

$P = 0.5 * K * \gamma * H^2$
P = Thrust (kN/m length of wall)
K = Lateral Earth Pressure Coefficient
γ = Soil Unit Weight (kN/m^3)
H = Height of Wall (m)

g. The seismic active coefficient provides a value that combines both static and dynamic forces to determine total active thrust (P_{aE}). The static component (P_a) acts through a point that is approximately H/3 above the toe of the wall. The dynamic component (ΔP_{aE}) acts through a point at approximately 0.6H above the toe of the wall. The total active thrust may then be considered to act at a height from the base of the wall using the following relationship in Table 4.3.3.

Table 4.3.3 – Height from Base of Wall for Total Active Thrust

$$h = \frac{P_a * \left(\frac{H}{3}\right) + \Delta P_{aE} * (0.6H)}{P_{aE}}$$
h = Height from Base of Wall for Total Active Thrust (m)
P_a = Static Active Thrust (kN/m)
P_{aE} = Total Active Thrust (kN/m)
$\Delta P_{aE} = P_{aE} - P_a$ = Dynamic Active Thrust (kN/m)
H = Height of Wall (m)

h. The presented earth pressure coefficients are based on fully drained backfill conditions, through the use of free draining granular backfill and foundation drainage.

5.0 CONSTRUCTION PHASE

5.1 Site Grading

a. Considering the topography of the land, we expect some land terracing, cut/fill operations, and/or retaining walls may be required as part of the development.

b. Permanent fill slopes should not exceed 2H:1V for maintenance-free slopes, subject to geotechnical review. Adequate setback / subjacent support shall be reviewed by a Geotechnical Engineer for any foundations in proximity to slopes.

c. Terracing and/or vegetative or rock facing are recommended for final landscaping slopes in order to control surficial erosion. Other methods of erosion control can be considered upon request.

d. Any proposed retaining walls exceeding 1.2m in height must be designed by a Structural and/or Geotechnical Engineer. Setbacks are generally required for buildings in proximity to retaining walls. Any proposed stacked-rock walls shall include a level/horizontal rockfall area at the toe of wall equal to the height of the wall.

e. LEA shall be consulted prior to the re-use of any on-site materials.

5.2 General Excavation – Future Building Sites

a. Prior to construction, all unsuitable materials should be removed to provide a suitable base of support. Unsuitable materials include any non-mineral material such as vegetation, topsoil, peat, fill or other materials containing organic matter, as well as any soft, loose, or disturbed soils.

b. Groundwater ingressing into any excavations should be controlled with a perimeter ditch located just outside of the building areas, connected to positive drainage.

c. Prior to placement of concrete footings, any bearing soils that have been softened, loosened, or otherwise disturbed during the course of construction should be removed, or else compacted following our recommendations for structural fill. Compaction will only be feasible if the soil has suitable moisture content and if there is access to heavy compaction equipment. If no structural fill is placed, a smooth-bladed clean up bucket should be used to finish the excavation.

d. The Geotechnical Engineer is to confirm the removal of unsuitable materials and approve the exposed competent inorganic subgrade, prior to the placement of any structural fill.

5.3 Structural Fill

a. Where fill is required to raise areas that will support buildings or slabs, structural fill should be used. The Geotechnical Engineer should first approve the exposed subgrade in fill areas, to confirm the removal of all unsuitable materials.

b. Structural fill should never be placed on sloping terrain. Native soils must be benched and leveled prior to the placement of any structural fill.

c. Structural fill should be inorganic sand and gravel. If structural fill placement is to be carried out in the wet season, material with a fines content limited to 5% passing the 75µm sieve should be used, as such a material will not be overly sensitive to moisture, allowing compaction during rainy periods of weather.

d. Structural fill should be compacted to a minimum of 95% of Modified Proctor maximum dry density (ASTM D1557) in foundation and floor slab areas.

e. Structural fills under foundations (including any isolated pad footings) should include the zone defined by a plane extending down and outward a minimum 0.50m from the outer edge of the foundation at an angle of 45 degrees from horizontal to ensure adequate subjacent support. This support zone is shown below in Figure 5.3.

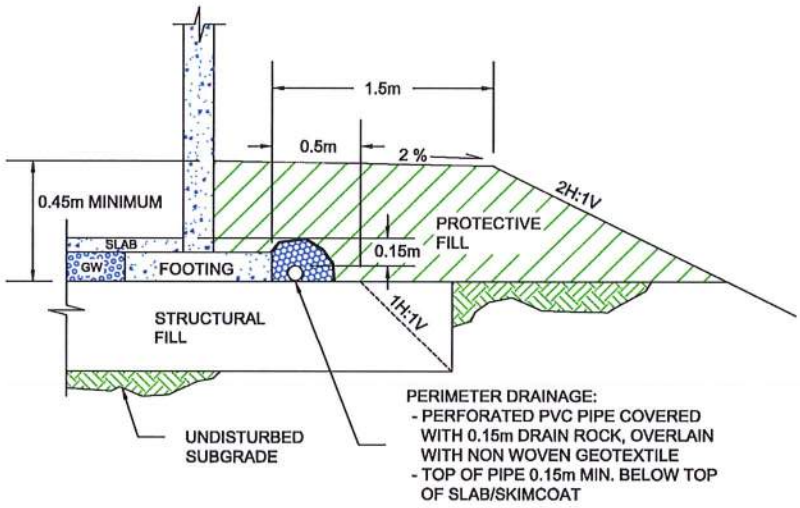


Figure 5.3 – Typical Section, Structural Fill

f. Compaction of fill should include moisture conditioning as needed to bring the soils to the optimum moisture content and compacted using vibratory compaction equipment in lift thicknesses appropriate for the size and type of compaction equipment used.

g. A general guideline for maximum lift thickness is no more than 100mm for light hand equipment such as a "jumping-jack," 200mm for a small roller and 300mm for a large roller or heavy (>500 kg) vibratory plate compactor or a backhoe mounted hoe-pac or a large excavator mounted hoe-pac, as measured loose.

h. It should be emphasized that the long-term performance of buildings and slabs is highly dependent on the correct placement and compaction of underlying structural fills. Consequently, we recommend that structural fills be observed and approved by the Geotechnical Engineer. This would include approval of the proposed fill materials and performing a suitable program of compaction testing during construction.

5.4 Foundation and Site Drainage

a. Our assessment did not identify any abnormal groundwater conditions that would necessitate special foundation drainage measures outside of Part 9 of the 2018 BCBC. Conventional requirements of the 2018 BCBC pertaining to building drainage are considered suitable at this site.

b. We assume the installed foundation and site drainage measures will be inspected and approved by Others (i.e., the Plumbing Inspector for the AHJ) during construction.

6.0 CONCLUSIONS

6.1 Local Government Conformance Statement

a. From a geotechnical point of view, and provided the recommendations in this Report are followed, the land is considered safe for the use intended (defined for the purposes of this Report as a single-family residence of conventional construction methods), with the probability of a geotechnical failure resulting in property damage of less than:

   i. 2% in 50 years for geotechnical hazards due to seismic events, including slope stability; and

   ii. 10% in 50 years for all other geotechnical hazards.

6.2 Geotechnical and Quality Assurance Statement

a. The 2018 BCBC requires that a Geotechnical Engineer be retained to provide Geotechnical Assurance services for the construction of buildings that are outside of Part 9 of the BCBC. Geotechnical Assurance services include review of the geotechnical components of the plans and supporting documents, and responsibility for field reviews of these components during construction.

7.0 CLOSURE

a. Lewkowich Engineering Associates Ltd. appreciates the opportunity to be of service on this project. If you have any comments, or additional requirements at this time, please contact us at your convenience.

Respectfully Submitted,
Lewkowich Engineering Associates Ltd.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. W. SCOTT
46419
2023-04-03

Jeff Scott, P.Eng.
Geotechnical Engineer

Reviewed By:

Stuart Crossfield, P.Geo., P.L.Eng.
Engineering Geologist

8.0 ATTACHMENTS

1. Butler Geomatics Professional Land Surveyors, Survey Plan Showing Proposed Building Location on Lot 8 Section 5 Range 5 Comiaken Plan 39150, Dwg No. 082-SVY R2, dated February 9, 2023.
2. EGBC, Appendix D: Landslide Assessment Assurance Statement.

9.0 REFERENCES

1. The Corporation of the District of North Cowichan, *Official Community Plan Bylaw*, Bylaw 3450, last amended June 6, 2018.
2. Engineers and Geoscientists British Columbia, *Landslide Assessments in British Columbia*, Version 4.1, dated March 1, 2023.
3. Municipality of North Cowichan, interactive web-map, accessed March 2023.
4. BC Ministry of Environment, *Soils of South Vancouver Island British Columbia*, Soil Survey Report No. 44, Sheet 1, 1986.
5. Province of BC, Ministry of Energy, Mines and Petroleum Resources, Geological Survey Branch, Open File 1993-27, *Surficial Geology of the Duncan Area*, 92B/13, 1993.
6. Province of BC, interactive web-map, *iMapBC*, accessed March 2023.

SURVEY PLAN SHOWING PROPOSED BUILDING LOCATION ON LOT 8 SECTION 5 RANGE 5 COMIAKEN PLAN 39150

PID No: 000-971-782

SCALE 1: 400 (metric)

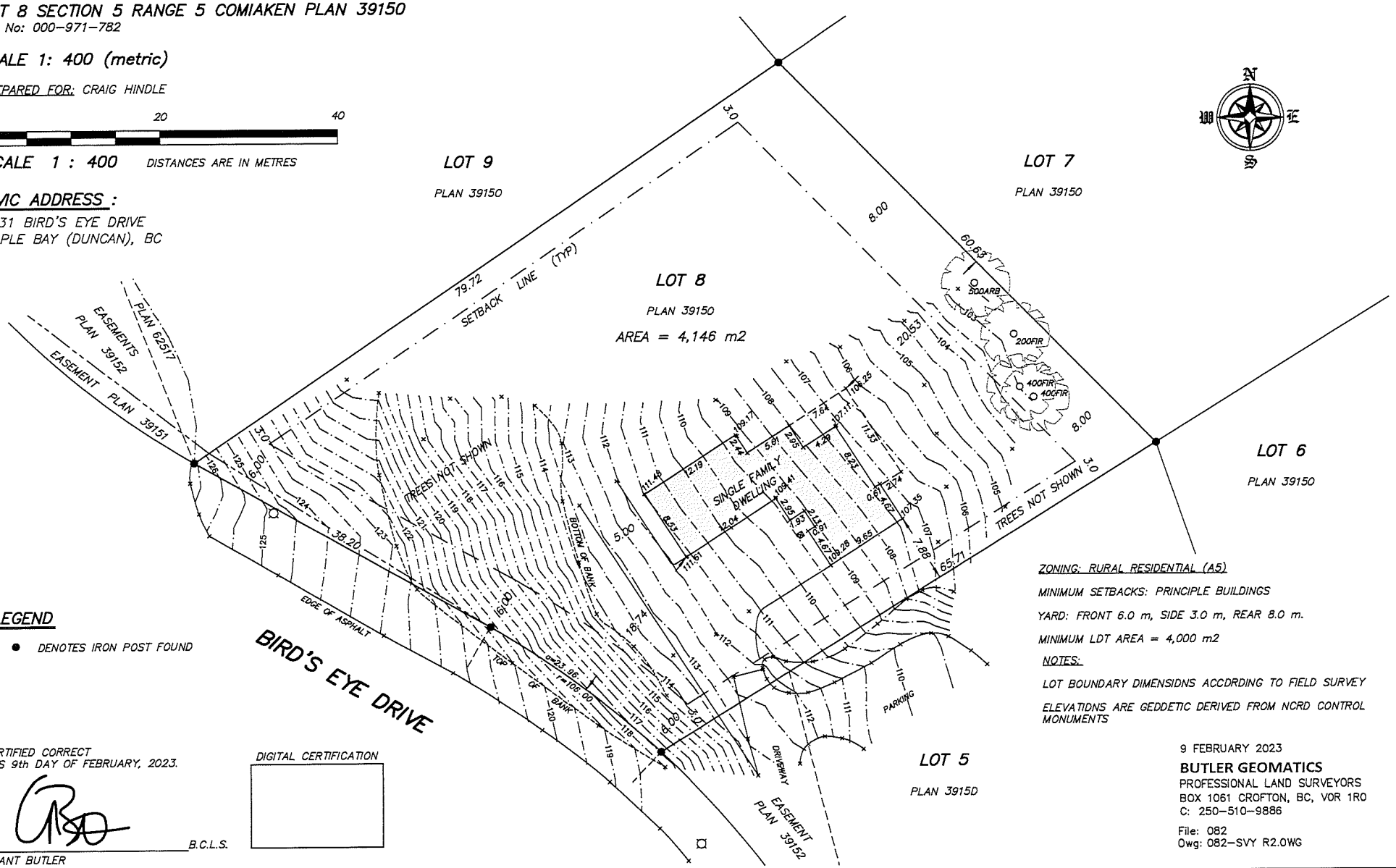
PREPARED FOR: CRAIG HINDLE

0 20 40

SCALE 1 : 400 DISTANCES ARE IN METRES

CIVIC ADDRESS :

6531 BIRD'S EYE DRIVE
MAPLE BAY (DUNCAN), BC



LEGEND

● DENOTES IRON POST FOUND

ZONING: RURAL RESIDENTIAL (A5)

MINIMUM SETBACKS: PRINCIPLE BUILDINGS

YARD: FRONT 6.0 m, SIDE 3.0 m, REAR 8.0 m.

MINIMUM LDT AREA = 4,000 m2

NOTES:

LOT BOUNDARY DIMENSIONS ACCORDING TO FIELD SURVEY

ELEVATIONS ARE GEODETIC DERIVED FROM NCRD CONTROL MONUMENTS

CERTIFIED CORRECT
THIS 9th DAY OF FEBRUARY, 2023.

B.C.L.S.
GRANT BUTLER

DIGITAL CERTIFICATION

9 FEBRUARY 2023

BUTLER GEOMATICS
PROFESSIONAL LAND SURVEYORS
BOX 1061 CROFTON, BC, V0R 1R0
C: 250-510-9886

File: 082
Dwg: 082-SVY R2.0WG

THIS DOCUMENT IS NOT VALID UNLESS ORIGINALLY SIGNED AND SEALED OR, IF PDF (DIGITAL), DIGITALLY CERTIFIED AND STAMP SHOWN HEREON.

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)

Municipality of North Cowichan

7030 Trans-Canada Highway, Duncan, BC V9L 6A1

Jurisdiction/name and address

Date: April 3, 2023 - LEA File E2102

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"):

Lot 8, Section 5, Range 5, Comiaken District, Plan 39150, PID 000-971-782 ; 6531 Bird's Eye Drive, Maple Bay

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

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[1] 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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[1] 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."

Jeff Scott, P.Eng
Name (print)

April 3, 2023
Date

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(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 Lewkowich Engineering Associates Ltd.
(Print name of firm)

with Permit to Practice Number 1001802
(Print permit to practice number)

and I sign this letter on behalf of the firm.