

GEOTECHNICAL HAZARD ASSESSMENT

New Single-Family Residence

**287 (Lot 14) Castley Heights
Lake Cowichan, BC**

Legal Address:

Lot 14, Section 5, Renfrew District
(Situated in Cowichan Lake District), Plan
VIP54940, PID 017-909-244

Prepared For:

VCC Investment Group
#302 – 435 Trunk Road
Duncan, BC. V9L 2P5

Attention:

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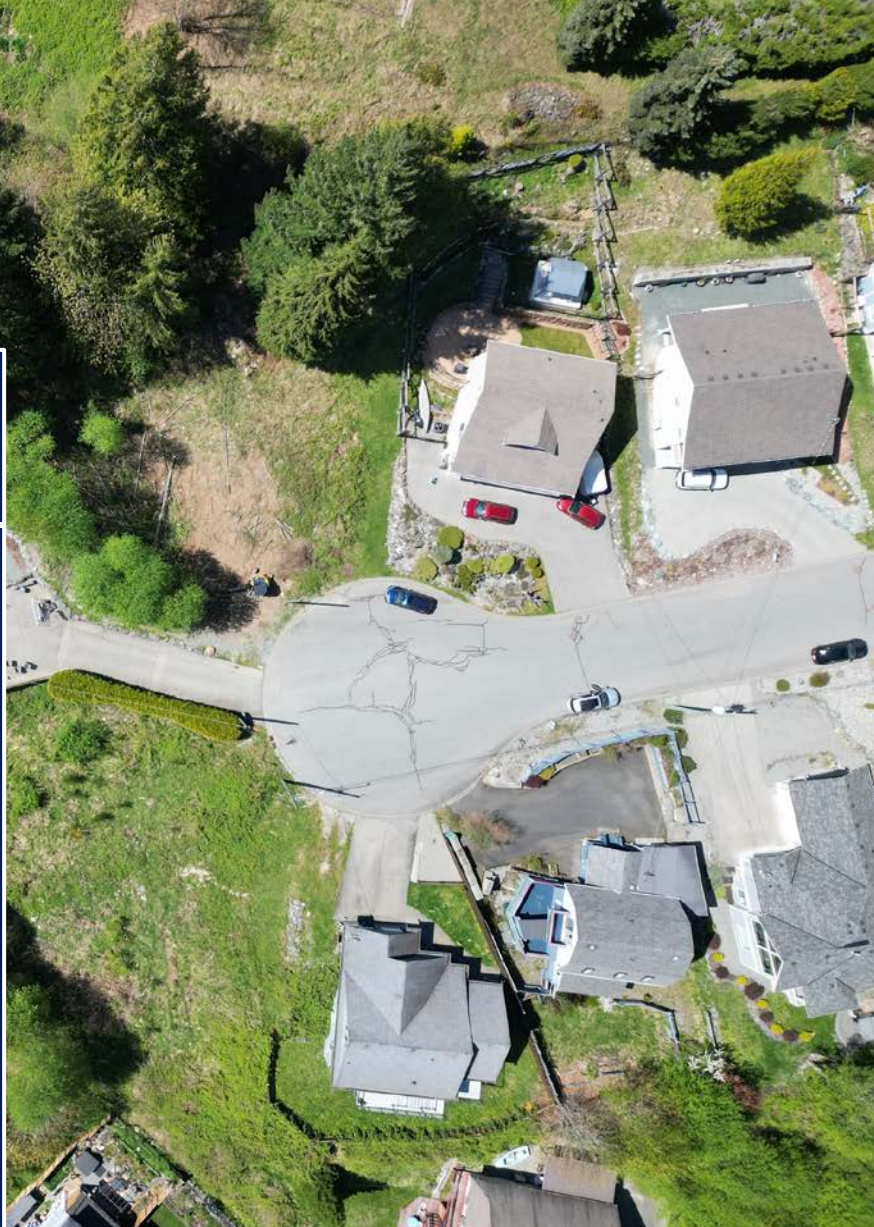
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LEA Lewkowich
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DISCLAIMER, ACKNOWLEDGMENTS, AND LIMITATIONS

1. Lewkowich Engineering Associates Ltd. (LEA) acknowledges that this report, from this point forward referred to as “the Report,” may be used by the Town of Cowichan Lake (TOLC) 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 TOLC 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 TOLC.
2. This Report has been prepared in accordance with standard geotechnical engineering practice solely for and at the expense of VCC Investment Group. We have not acted for or as an agent of the TOLC 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, encountered and inferred subsurface conditions, available floodplain mapping, 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 development becomes available, the recommendations may be altered or modified in writing by the undersigned.
4. The conclusions and recommendations submitted in this Report are based upon the data obtained from a limited number of subsurface explorations. Subgrade conditions are known only at the locations of the explorations and have been used to infer subgrade conditions throughout the site in preparation of this Report. The nature and extent of subgrade variation throughout the site may not become evident until construction or further investigation.
5. Future construction shall be carried out within the requirements and recommendations of the Environmental Consultant (if applicable), any defined jurisdictional bylaws, or any existing restrictive covenants, whichever is more stringent. Any environmental and/or jurisdictional limitations may supersede the recommendations in this Report.
6. 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 2024 British Columbia Building Code (BCBC), and current engineering standards. Updates to bylaws, policies, or requirements of the AHJ, or updates to the BCBC or professional practice guidelines, may impact the validity of this Report.
7. This Report has been prepared by Stuart Crossfield, P.Geo., P.L.Eng., and reviewed by Chris Hudec, M.A.Sc, P.Eng., 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, Lot 14 (287) Castley Heights, Lake Cowichan, BC, from this point forward referred to as “the Property,” is located in Vancouver Island within the jurisdictional boundaries of the TOLC. 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. Two hazards were identified and addressed in this Report: flooding from Cowichan Lake and slope stability.
4. The Report finds the Property is not at risk of flooding due to the greater than 20m of elevation difference between it and the mapped Flood Construction Level (FCL) of 167.33m CGVD28.
5. The Report concludes the slope within the Property is in a globally stable condition based on static and seismic slope stability analysis.
6. The findings confirm the land is considered safe for the use intended, 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
CGVD	Canadian Geodetic Vertical Datum
DPA	Development Permit Area
EGBC	Engineers and Geoscientists of British Columbia
FCL	Flood Construction Level
LEA	Lewkowich Engineering Associates Ltd.
MoE	Ministry of Environment
PGA	Peak Ground Acceleration
TOLC	Town of Lake Cowichan



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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 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 built on sloping topography including a rear/basement foundation wall. We understand the new construction will be of conventional construction methods and will include typical cast-in-place concrete foundations system.
- b. The Property is within the jurisdictional limits of the TOLC and is zoned Urban Core (R-3). As per the TOLC Official Community Plan¹, we understand the Property is within a geohazard DPA 2 for Floodplain and Steep Slopes. 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 identified natural hazards and no increase in hazard is posed to existing development on or near the Property.

1.3 Assessment Methodology

- a. This assessment included a desktop review of relevant background information, including applicable TOLC bylaws,¹ available development plans, registered covenants on title, aerial photographs, and published geology, topography, and floodplain mapping. Please refer to the list of references at the end of this Report. Further information has been gathered from LEA experience in the neighbourhood.
- b. An initial site reconnaissance was conducted on April 23, 2025, to visually assess site conditions throughout the Property.
- c. A subsurface investigation was carried out on May 8, 2025, using a Bobcat E50 excavator. Two TPs (TP 25-01 and TP 25-02) were advanced within the Property near the proposed location of the future residence. The TPs were backfilled upon completion of the investigation.
- d. Our assessment included evaluation of the global stability of the sloping terrain under both static and seismic conditions. A two-dimensional slope model was developed and assessed using slope stability analysis software. The slope stability analysis was completed to determine if the Property would be affected by a potential slope hazard.
- e. This assessment was prepared with consideration of the referenced EGBC professional practice guidelines, 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. No geotechnical covenants were found that will impact the geotechnical conclusions in this Report.

2.0 SITE CONDITIONS

2.1 Physical Setting

- a. The Property is located on southeastern Vancouver Island within the town of Lake Cowichan. The Property is between North Shore Road and River Road.
- b. The Property is immediately bordered by similar R-3 properties to the south, and an undeveloped lot to the north, Castley Heights to the east and a rural property to the west. Please refer to Figure 2.1 below.

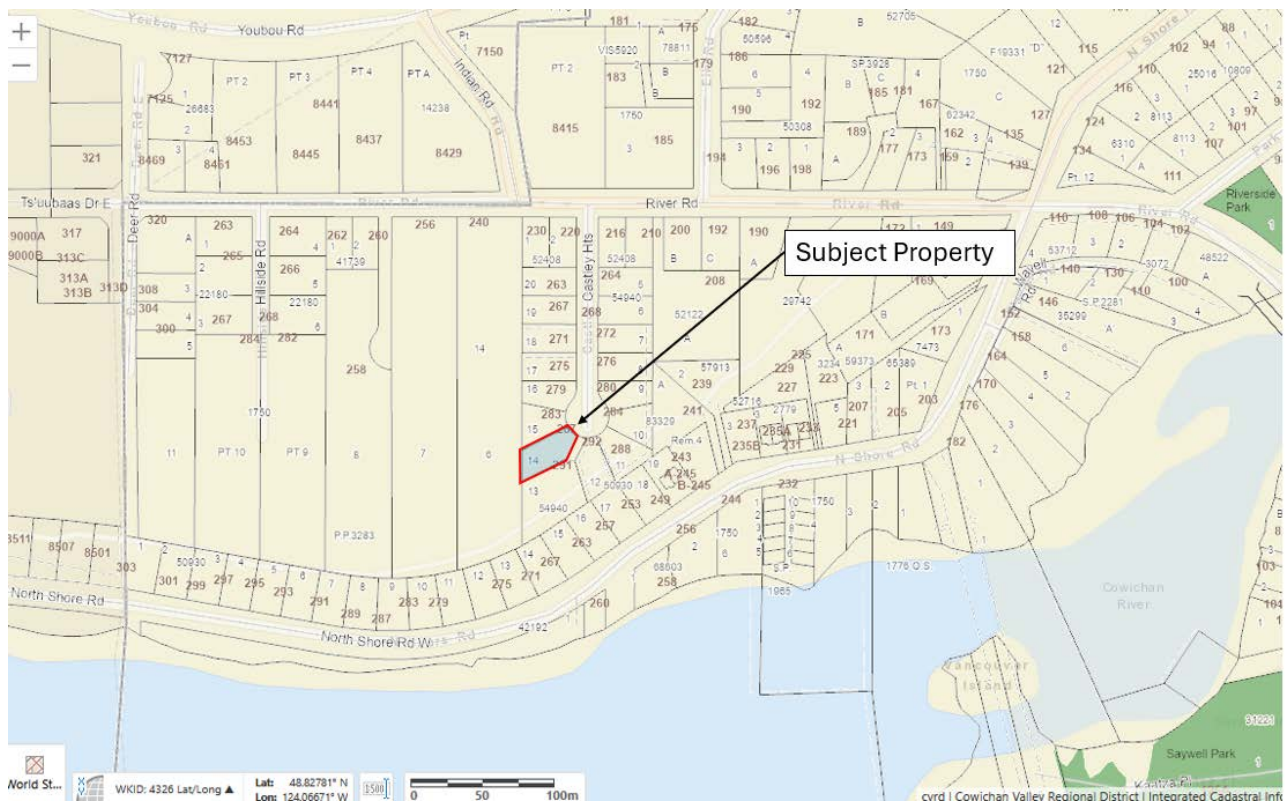


Figure 2.1 – Location of Subject Property³

2.2 Terrain and Features

- a. In general, the local terrain within the Property and surrounding neighbourhood consists of a typically consistent moderate slope (10 to 17deg) rising from the southern property up to the northwest direction. To the northwest the terrain rises up a total of 15 to 20m before levelling off. While below the property to the southeast, there is flat land which supports the neighbouring Property, which then proceeds down 10m to North Shore Road.
- b. The total elevation difference across the Property from southeast to northwest is 6m to 7m over a horizontal distance of 23m. This corresponds to a slope inclination of approximately 30% or 17 degrees.
- c. At the time of our assessment, the Property remains undeveloped with mainly low lying brush and a few mature trees at the rear and fence line.

2.3 Regional Geology

- a. Surficial geology for the area is classified as moraine deposits, consisting of well-drained, gravelly sandy loam (strongly cemented pan), with minor composition of fluvial deposits, of very gravelly, loamy sand (generally level landscape position).⁴
- b. Bedrock geology for the area is classified as the Nanaimo Group, comprised of undivided sedimentary rocks from the upper Cretaceous period, generally consisting of boulder, cobble, and pebble conglomerate, coarse to fine sandstone, siltstone, shale, and/or coal.⁵

2.4 Soil Conditions

- a. Relatively consistent soil strata were encountered during the subsurface investigation. The main soil strata are summarized in Table 2.4 below. Detailed descriptions of the subsurface conditions are provided on the attached TP logs (TP 24-01 and TP 24-02).

Table 2.4 – Summary of Encountered Soil Strata

Soil Stratum No.	Soil Description	Depth Range (m)	
		From	To
1	Sandy SILT, some organics (roots), compact, dark brown, moist.	0.0	0.4
2	Silty SAND, trace clay, compact, grey brown, moist to wet.	0.4	0.8
3	Silty SAND and GRAVEL, trace cobble, dense, brown, moist to wet.	0.8	1.1 (refusal)

- b. Test pits were excavated to practical refusal with the smooth cleanup bucket within very dense soils.



Photo 2.4.: Test pit TP25-01 soil conditions.

2.5 Groundwater Conditions

- a. Minor to moderate groundwater seepage was encountered during the subsurface investigation from sand lenses at 0.45m.
- b. We anticipate a perched groundwater table within more permeable layers above the low permeable very dense, silt, sand and gravel materials. We further expect moderate to heavy groundwater flow rates may be encountered based on our experience with neighbouring developments.
- c. Groundwater levels can be expected to fluctuate seasonally with cycles of precipitation. Groundwater conditions at other times and locations can differ from those observed at the time of our assessment.

3.0 COWICHAN LAKE FLOODING

- a. Historically, floodplain information for Cowichan Lake was prepared and provided by the provincial government, specifically the MoE Water Management Branch.⁵ This existing mapping was issued in 1984 and established a 200-year FCL of 167.33m CGVD28, which included an allowance for freeboard.
- b. Based on the attached site survey the lowest elevation on the subject Property is 187.5m CGVD28. The Property is therefore a little over 20m in elevation above the mapped FCL.

- c. LEA concludes there is no flood hazard for the Property, and no further review is required.

4.0 SLOPE STABILITY

4.1 Stability Assessment

- a. We reviewed the terrain surrounding the Property and there are no significant slopes above / off-property that would be a hazard for the proposed development.
- b. The Property contains a moderate slope that measures approximately 12m to 16m in height and has a relatively uniform slope angle of approximately 17 degrees. The subsurface conditions consist of up to 1m of an organic, compact sand, gravel, and cobble, overlying dense silty sand and gravel glacial till. The slope is well-vegetated with native forest. Refer to Photo 4.1 below (next page).



Photo 4.1: Typical slope conditions from aerial photograph

- c. The slope was inspected for signs of global instability (i.e., tension cracks, slumping, seepage, erosion, etc.), and none were observed. The slope is relatively uniform and featureless with respect to evidence of instability. The majority of the trees on the slope displayed vertical growth patterns, which is another indication of stable slope conditions.

- d. We understand that future development would require to be incised into the slope as shown on the attached Site Plan.
- e. Excluding circumstances where indicators of global instability are present, it is generally accepted that dense soil slopes that are less than 2 Horizontal to 1 Vertical (2H:1V / 27 degrees) are considered to be in both a static and seismically stable condition. Considering the natural slope is comprised of dense sand, silt and gravel mixture or glacial till and is less than 27 degrees, there are no anticipated global slope stability issues.
- f. As per EGBC guidelines and a Class 1 assessment, this was verified by completing a pseudo-static limit equilibrium slope stability analysis using GeoStudio Slope/W software. The analysis was performed for both static and 2% in 50-year seismic conditions (kh equal to k15), with a target FoS of 1.5 for the static condition and 1.0 for the seismic condition. The analysis considered global rotational failures employing the Morgenstern-Price method.
- g. The stability analysis was performed using effective stress conditions and frictional soil parameters as estimated based on published soil parameters, nearby well logs and LEA experience with similar soil conditions.
- h. Based on our assessment of test pits and nearest well logs, a perched groundwater level was applied to the upper sandy silt layer while the lower static piezometric level was established at roughly 6m below ground surface.
- i. The results of the stability analysis are summarized in Table 4.1 below. The detailed Slope/W output plots may also be found attached to this Report.

Table 4.1: Summary of Slope Stability Results

Analysis	Factor of Safety (FoS)
Static	> 3.29
Seismic	> 1.36

- j. The stability analysis confirms the slope is in a globally stable condition and meets minimum FoS for both static and seismic conditions.

4.2 Site Grading

- a. Considering the sloping 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. Any permanent soil slopes should not exceed 2H:1V for maintenance-free slopes, subject to geotechnical review.
- c. Adequate setback, benching, and/or subjacent support shall be reviewed by a Geotechnical Engineer for

- any foundations in proximity to slopes.
- d. Any permanent slopes should be finished with consideration for erosion control. Terracing and protective vegetative or rock facing are common methods of erosion control. Other methods of erosion control may be considered upon request.
 - e. Any proposed retaining walls exceeding 1.2m in height must be designed by a Structural and/or Geotechnical Engineer as per EGBC requirements.
 - f. Stacked rock walls could present a rockfall hazard for downslope development. Therefore, any stacked rock wall should include a level (flat) “no-build” rockfall zone at the base of the wall with a minimum lateral distance equal to the wall height. Any proposed stacked rock walls exceeding 1.2m in height must be designed and inspected during construction by a Geotechnical Engineer.
 - g. LEA shall be consulted prior to the re-use of any on-site materials, for re-use as structural fill, permanent slopes, retaining wall backfill, or otherwise.

4.3 Slope Maintenance

- a. It should be noted that landslides can occur due to human activity (i.e. excavation, placement of fill, removal of vegetation, etc.) or failure of civil infrastructure (i.e. leakage/rupture of underground water and sewer mains, stormwater disposal from existing development, etc.).
- b. Minimizing the infiltration of water into the slope is essential to reducing the risk of slope movement. It is important that water does not pond near the crest of slope. Surface water from precipitation events, collected stormwater, or from any other drainage system must be prevented from flowing in a concentrated manner down the slope. The concentrated discharge of collected stormwater can lead to erosion, earth movement, or slope failure.
- c. Where possible, the existing native vegetation cover on the slope should be maintained to control surficial erosion.

5.0 DESIGN PHASE

5.1 Foundation Design

- a. Prior to construction, the foundation areas should be stripped to remove all unsuitable materials to provide an undisturbed natural subgrade for footing support.
- b. We anticipate all surficial loose soils will require removal to expose competent dense glacial till subgrade. Due to the sensitivity of the finer grained soils to the elevated groundwater seepage, we expect loosening and softening of the subgrade soils will occur if left exposed. We therefore recommend over-excavation by 100mm to 150mm and replacement using a well graded, 19mm crush, sand and gravel structural fill.

- c. Foundation loads should be supported on natural undisturbed material or structural fill, approved for use as a bearing stratum by our office, and may be designed using the following values.
 - i. For foundations constructed on structural fill, placed and compacted as outlined in Section 6.2 of this Report, an SLS bearing pressure of 75 kPa and a ULS bearing pressure of 100 kPa may be used for design purposes. These values assume a minimum 0.45m footing embedment depth.
- d. Exterior footings should be provided with a minimum 0.45m depth of ground cover for frost protection.
- e. The Geotechnical Engineer should evaluate the subsurface conditions at the time of construction to confirm that soil and/or groundwater conditions do not materially differ to those encountered during the subsurface investigation and that footings are based on appropriate and properly prepared founding material.

5.2 Seismic Criteria

- a. As per the 2024 BCBC (Division B, Part 4, Table 4.1.8.4-B), the encountered and inferred subsurface conditions would be classified as “Site Class D” (stiff soil).

5.3 Lateral Earth Pressures

- a. Preliminary lateral earth pressure coefficients (K) for the design of cast-in-place concrete retaining walls are outlined below. Note that these values are based on assumed conditions and should be considered as preliminary. Further assessment will be required after the dimensions of the proposed structure and backslope conditions have been determined. Any future retaining wall construction within the Property should be reviewed by a Structural and/or Geotechnical Engineer.
- b. It is assumed that there will be a level (0° from horizontal) backslope and no additional surcharge on the wall. Note that any backslope or surcharge will increase the lateral earth pressure coefficients.
- c. An average soil friction angle of 30 degrees 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/m³.
- d. The seismic condition is based on 2020 National Building Code interpolated seismic hazard values for the Property location, considering a 2% in 50 year probability of exceedance and firm ground conditions, which provides a PGA of 0.694g.
- 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. Refer to Table 5.3.1 below for design values.

Table 5.3.1: Lateral Earth Pressure Coefficients

Earth Pressure Condition	Lateral Earth Pressure Coefficient (K)	
Static Active	K_a	0.29
Static Passive	K_p	3.00
Seismic Active	K_{aE}	0.63

- f. The thrust resulting from each earth pressure condition may be calculated using the relationship in Table 5.3.2 below. A minimum uniform static load of 12 kPa shall be considered for compaction forces.

Table 5.3.2: 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 relationship in Table 5.3.3 below.

Table 5.3.3: 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 lateral earth pressure coefficients are based on fully drained backfill conditions, through the use of free draining granular backfill and foundation drainage.

6.0 CONSTRUCTION PHASE

6.1 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. We anticipate all surficial soils will require removal to expose competent dense silty sand and gravel subgrade. The depth to competent subgrade as encountered within the TPs was 0.9m.
- c. Excavation work should conform to Occupational Health and Safety guidelines. Any excavations deeper than 1.2m should be reviewed in the field by a Qualified Professional. For preliminary planning purposes, we expect the surficial compact to dense soils may be temporarily stable at a 1H:1V slope configuration, assuming no seepage.
- d. Groundwater ingressing into any excavations should be controlled with a perimeter ditch located just outside of the building areas, connected to positive drainage.
- e. 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.
- f. 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 material.

6.2 Structural Fill

- a. Where fill is required to raise areas that will support buildings, slabs, or pavements, 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 not be placed on sloping ground; sloping ground should first be benched and leveled prior to the placement of structural fill.
- c. Structural fill should be inorganic sand and gravel. If structural fill placement is to be carried out during 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, as well as in paved roadway and parking areas.
- e. Structural fills under foundations (including any isolated pad footings), roadways, and pavements should

include the zone defined by a plane extending down and outward a minimum 0.5m 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 in Figure 6.2 below.

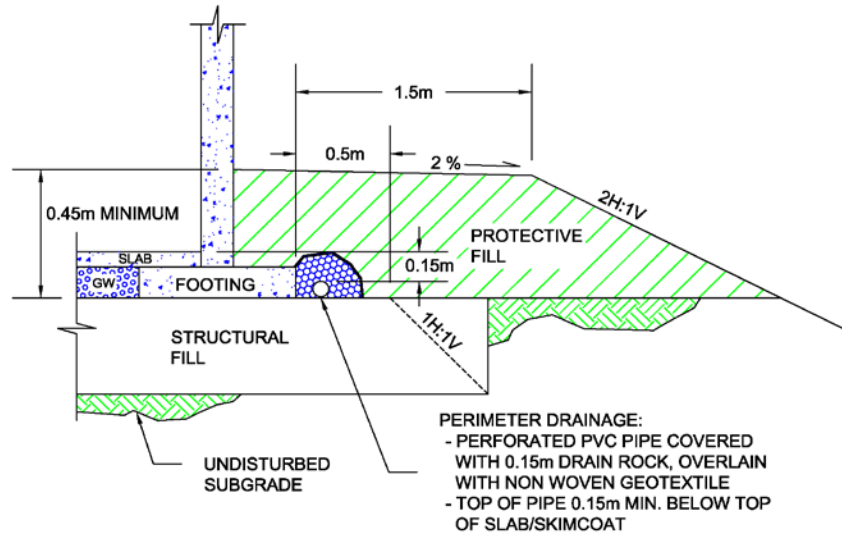


Figure 6.2 – Typical Section, Structural Fill

- 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.

6.3 Foundation Drainage

- a. As indicated in Section 2.5, the property will likely exhibit shallow groundwater seepage conditions during construction, and potentially have groundwater seepage year round. Conventional requirements of the 2024 BCBC pertaining to building drainage are not considered adequate and will require additional measures to ensure the installed measures will adequately dewater the soils around the residence.
- b. In addition to the standard BCBC requirements for permanent dewatering, we recommend the following additional measures:
 - i. Install additional and separate curtain drain on the upslope side of the foundation roughly 1m away

from footings, as well as two rows of interior sub-slab drainage connecting to rear/outside curtain drain all wrapped in fabric.

- ii. Install rubberized asphalt compound (Blueskin WP 200 membrane) around all exterior walls to provide a high-performance waterproofing barrier.
 - iii. Install a high-density polyethylene drainage core (Delta-Drain) against the Blueskin membrane. This will protect the Blueskin and allow incoming water to flow freely down to the perimeter drain, thus preventing the build-up of hydrostatic pressure against the foundation. The drainage membrane shall be installed as per manufacturer specifications (with the membrane's fabric layer facing out / facing the backfill). OR: The backfill material along the foundation wall must be comprised of a clear, 19mm fractured drain rock or a "clean" free-draining sand and gravel material. This will provide a capillary break between the foundation and slope; reducing the amount of hydrostatic pressure against the foundation. The use of 19mm fractured drain rock would require the placement of a non-woven geotextile between the excavation cut (wall) and the drain rock to prevent the migration of fines into the drain rock, which would reduce the hydraulic conductivity of the drain rock.
 - iv. The foundation should be designed in a manner so that the interior slab elevation is a minimum 0.5m above the perimeter drain invert. This will mitigate groundwater "upwelling", which is a result of hydrostatic pressure. Infill material shall comprise of free-draining pitrun sand and gravel (same as exterior).
- c. All the above options may be utilized for maximum perimeter drainage management.
 - d. Placement of a minimum thickness of 150mm of drain rock between under-slab fill and concrete slabs is strongly recommended.
 - e. Footing "knock-outs" are recommended at the lowest area of the perimeter so that any buildup of water within the footing perimeter can escape to the exterior perimeter drain system. Pony walls should also include knock-outs as they may prevent water from draining/escaping to the lower exterior knock-outs.
 - f. The system should be attached to a municipal storm service at the front of the property. The installation of an infiltration facility or "rock pit" is not recommended due to the shallow groundwater conditions, which are not conducive to stormwater infiltration.
 - g. The final site grades shall be sloped to direct surface water away from the building and foundation areas.
 - h. The Geotechnical Engineer is to confirm the correct installation of foundation drainage during construction.

6.4 Stormwater Management

- a. Runoff from paved areas, roof drains, and perimeter foundation drains should be collected and piped to the existing storm sewer.

- b. We understand LEA is providing a detailed Stormwater Management Plan under separate cover and will be consistent with the requirements presented in this Report.

7.0 CONCLUSIONS

7.1 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 new single-family residence), 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;
 - ii. 10% in 50 years for all other geotechnical hazards.

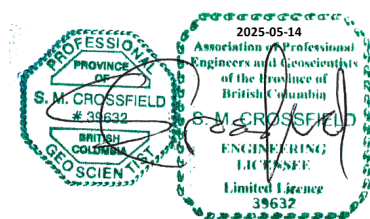
7.2 Geotechnical and Quality Assurance Statement

- a. The 2024 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.

8.0 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.



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

Reviewed by:

May 14, 2025

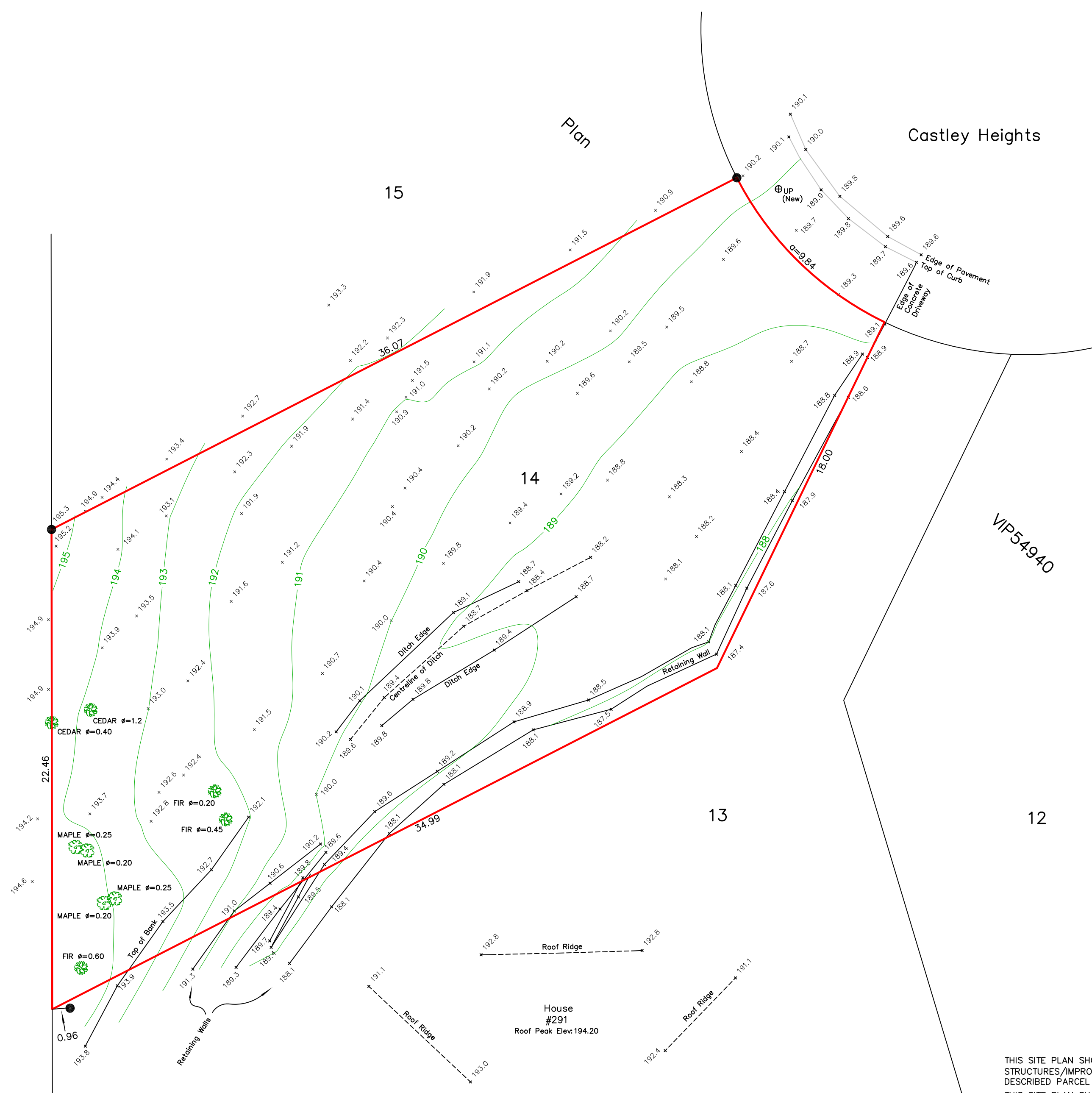
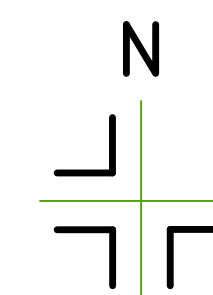
Chris Hudec, M.A.Sc., P.Eng.
Senior Project Engineer

9.0 ATTACHMENTS

1. Turner and Associates Land Surveying Inc., Titled "Site Plan Showing : Lot 14, Section 5, Renfrew District (Situating in Cowichan Lake District), Plan VIP54940, File No. 25-023, dated April 4, 2025.
2. McNeil Building Designs Limited, Drawing A1, "Site Plan, 3D View, General Specifications for Proposed Residence at Lot 14, Castley Heights, Lake Cowichan, BC", Dated April 2025.
3. LEA, Topographic Site Plan, Drawing E4464-01, Dated May 13, 2025
4. LEA, Test Pit Logs, TP 25-01 and TP 25-02, dated May 8, 2025.
5. LEA, Slope/W plots (2 plots).
6. EGBC Geohazard Assurance Statement.

10.0 REFERENCES

1. Town of Lake Cowichan, Bylaw No. 1097-2023. A Bylaw to Adopt an Official Community Plan for the Town of Lake Cowichan, December 19, 2023.
2. Engineers and Geoscientists of British Columbia, Landslide Assessments in British Columbia, Version 4.1, published March 1, 2023.
3. Cowichan Valley Regional District interactive web-map.
4. BC Ministry of Environment, Soils of South Vancouver Island British Columbia, Soil Survey Report No. 44, Sheet 2, 1986.
5. Province of BC, interactive web-map, iMapBC, accessed May 2025.
6. BC Ministry of Environment, Water Management Branch, Floodplain Mapping Cowichan Lake, Dwg No. 84-33-3, Sheet 1 of 6, dated June 1984.



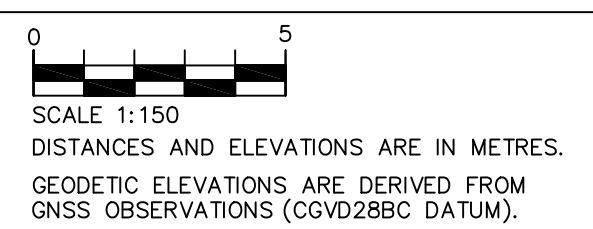
6
BLOCK 14
Plan 1750

- Legend**
- x 190.0 Denotes Spot Elevation
 - Denotes Standard Iron Post Found
 - ⊕ UP Denotes Utility Pole
 - 🌲 Denotes Coniferous Tree
 - 🌳 Denotes Deciduous Tree
 - ∅ Denotes Tree Trunk Diameter

THIS SITE PLAN SHOWS THE RELATIVE LOCATION OF THE EXISTING AND PROPOSED STRUCTURES/IMPROVEMENTS WITH RESPECT TO THE BOUNDARIES OF THE DESCRIBED PARCEL ONLY.
THIS SITE PLAN SHALL NOT BE USED TO DEFINE PROPERTY LINES OR PROPERTY CORNERS.
THE SIGNATORY ACCEPTS NO RESPONSIBILITY FOR AND HEREBY DISCLAIM ALL OBLIGATIONS AND LIABILITIES FOR DAMAGES ARISING OUT OF OR IN CONNECTION WITH ANY DIRECT OR INDIRECT USE OR RELIANCE UPON THE SITE PLAN BEYOND ITS INTENDED USE.

SITE PLAN SHOWING:
LOT 14, SECTION 5, RENFREW DISTRICT
(SITUATED IN COWICHAN LAKE DISTRICT), PLAN VIP54940.

CLIENT: VCC DEVELOPMENT LIMITED	CIVIC ADDRESS: 287 CASTLEY HEIGHTS, LAKE COWICHAN
FILE: 25-023	PROPERTY ZONING: R-3



NOTE:
THE REGISTERED TITLE OF THIS PROPERTY IS AFFECTED BY THE FOLLOWING LEGAL NOTATIONS AND REGISTERED CHARGES, LIENS AND INTERESTS:
M76302, EF108140.
THIS SITE PLAN DOES NOT VERIFY COMPLIANCE WITH THE ABOVE NOTED DOCUMENTS.

THE FIELD SURVEY REPRESENTED BY THIS PLAN WAS COMPLETED ON THE 4th DAY OF APRIL, 2025

B.C.L.S. #956
(THIS DOCUMENT IS NOT VALID UNLESS ORIGINALLY SIGNED AND SEALED.)

Turner & Associates
land surveying inc.
250.753.9778
435 TERMINAL AVENUE NORTH
NANAIMO, BC V9S 4J8
www.turnersurveys.ca

Revision Schedule		
Revision Number	Revision Description	Revision Date

General Specifications -Builder's Drawing Set

Owner and Contractor shall review this specification document, note and initial any mutually agreed upon changes if not already part of drawing set.

Preamble:
All work in these drawing documents shall conform to Part 9 of BCBC 2024. Further, warranty and insurance companies are requiring all aspects of construction to follow 'best practices'. Confirm these with your carrier. These drawings are a consolidation of many governing factors, including zoning, possibly covenants, development permits, etc. and so should not be digressed from without additional consultation with designer.

It is expected that contractor or owner/builder will have BCBC 2024 in their possession.

Environment BCBC 9.27
This building is deemed by this designer to NOT wholly meet coverage of 2' overhanging for every 8' wall, therefore considered to be in a weather exposed site.
Exterior cladding will be part of a rain-screen assembly with an interior "sealed polyethylene approach".
9.26 Also note balconies and decks with solid surface are deemed to be roofs and railings must be face mounted.
See note on sheet A1 regarding window ratings.

DIVISION 1 General Requirements
All construction shall conform to the requirements of Div B, Part 9 of the **British Columbia Building Code 2024**.

The contractor or owner shall obtain all permits, licenses, and certificates and pay all necessary fees for the performance of the work. The contractor shall give all required notices and comply with all laws, ordinances, rules, regulations, codes and orders of all authorities having jurisdiction relating to the work, to the preservation of public health and construction safety which are or become in force during the performance of the work.

Building contractor will verify all dimensions prior to commencing the work. Written dimensions will take precedence over dimensions. Any discrepancy will be referred to the designer for clarification. Discrepancies not referred become the responsibility of the contractor.

DIVISION 2 Site Work - Existing Conditions

02010 Subsurface Investigation
Seek a Geotechnical Engineer's opinion regarding excavation prior to pouring footings if deemed a concern.

02100 Excavation:
a) Excavations shall be made to depth and size required for formwork, drains, applications of damp-proofing, etc., as shown on drawings.
b) Excavations for footings shall be made to solid, undisturbed soil, and to acceptable depth below final finished grade.
c) Bottoms shall be level and free of loose and organic material and kept free of water at all times.

02110 Backfill: BCBC 9.12.3
a) Backfill outside of foundation shall be free of deleterious material and boulders larger than 50mm diameter within 0.6m.
b) Backfill shall be carefully placed to avoid damage to pipes, drains, or damp-proofing, graded to prevent drainage towards the foundation after setting.

02140 Downspout & Drainage: BCBC 9.14.2, 9.14.3
a) Perimeter drain pipe shall be 4" dia Perforated PVC pipe. Slope shall be 6" in 100 feet, minimum size of drain 4" dia. or as shown on drawings.
b) Cover top and sides of perimeter drains with clean, coarse granular material, containing not more than 10% of material which will pass a 4mm sieve to a minimum depth of 150mm above the top of the pipe.

DIVISION 3 Concrete: BCBC 9.3.1, 9.15, 9.16

03000 Materials:
Concrete shall be ready mixed, with compressive strengths per BCBC 9.3.1.6.

03100 Formwork:
Forms shall be plywood, clean and free of surface defects. Formwork shall be constructed to form, line and dimension shown on drawings. Formwork shall be properly braced to maintain position and tight enough to prevent leakage of mortar. Provide for all openings required by other trades, and install all anchors, bolts, hangers, etc. required for other work.

03200 Reinforcement:
Reinforcing steel shall be clean, intermediate grade, deformed steel bars. Reinforcing steel shall be placed as shown on drawings.

03300 Cast In Place Concrete:
Concrete shall be placed properly to avoid separation, vibrated and cured. Floor slabs shall be machine and hand trowelled to a smooth and perfect finish. Concrete where exposed shall have wires removed and imperfections filled and pargep smooth.

Moisture barrier under floor slab shall be 6 mil. polyethylene, ultraviolet ray protected, joints lapped 6" minimum. See Division 7

DIVISION 4 Unit Masonry BCBC 9.20

04000 General:
See Structural Engineer's drawings and notes if necessary.

04100 Materials:
All materials and workmanship to conform to BCBC 9.20.2.1
Mortar: Type S materials and workmanship to conform to BCBC 9.20.3.1

04200 Workmanship:
a) All masonry work shall be true and plumb and built to thickness, pattern and bond as shown on drawings. Engineer's drawings shall take precedence.
b) Mortar joints shall be in conformance with BCBC 9.20.4. Interior brick work shall have raked joints and exterior work raked joints unless otherwise noted on drawings.
c) All work shall be weather and water tight. Do not lay brick in temperatures below 40 degrees F.
d) Build in all flashings, bolts, irons, etc. required to complete masonry work or by other trades.

04300 Cleaning:
Leave all exposed masonry clean and free from mortar droppings, stains, efflorescence, etc.

All structural metalwork shop-drawings shall be reviewed by P.Eng.

DIVISION 5 Woodwork

05000 Framing Carpentry: BCBC 9.23

05100 Materials:
a) Protect all stored materials from the weather and damage.
b) Lumber for framing shall conform to the following grade schedule:
Wall studs: #2 SPF F1 or better
Posts, Beams: DF #2 or better
Blocking/bracing: Utility
Roof sheathing: as noted on dwgs
Wall sheathing: as noted on dwgs
c) IMPORTANT NOTE: Floor framing by engineered products MUST meet BCBC Vibration Criteria. Specified framing conforms to this. Other mills must provide sealed joints certifying equivalent rating.
d) Sheathing paper shall conform to CGSB No. 9-09-02.
e) Rough hardware shall be supplied and installed as required, including all nails, spikes, bolts, lags, screws, nuts, washers, anchors or post hangers to properly secure framing members. See 9.23.3.4

05200 Workmanship:
a) All framing shall conform to best practice.
b) All wood members shall be separated from direct contact with concrete or masonry per BCBC 9.23.2.3
c) Sit gables shall be bolted to foundation walls with a 3/8" dia. bolt at 4' O.C.
d) Double top plates to all stud walls, lapped at corners and partitions.
e) Stud walls shall be solid at all corners and well backed, double studs at openings. Cut and nail one row of girts at mid-height.
f) Install blocking between studs for all fixtures, accessories, backslashes, etc.
g) Caulk all joints where required for weatherproofing with an approved caulking compound.
h) Wood grounds where required shall be correct size for wall finish used.

05300 Finishing Carpentry

a) Protect all work from the weather and damage.
b) Install all doors and windows as noted on drawings.
c) Install all hardware.

05400 Materials:
a) Exterior casing and trim shall be KD Douglas Fir 'B' or better" or as noted on drawings.
b) Interior wood trims and casings shall be KD Douglas Fir 'B' or better".
c) Door frames, casing, wood base, and all other interior trim shall be KD Douglas Fir 'B' or better.

05500 Workmanship:
a) Millwork and finish carpentry shall be expert workmanship, free from defective work or materials.
b) All finishing work shall be smooth and free of machine and tool marks, mitre corners. Scrubbing and pairing shall be accurate and neat. Joints in fascias, valances, and siding shall be mitred. Door and window casings shall be of single length without joints.
c) Finish hardware shall be installed to manufacturer's directions and accurately fitted and adjusted.

DIVISION 7 Thermal and Moisture Protection BCBC 9.13

07000 Waterproofing:
a) Moisture proofing of foundation walls included in this section.
b) Moisture barrier to concrete slabs is specified under Division 3, Concrete.

Materials shall conform to the Section 9.13.2.1

Workmanship and Application:
a) Shall conform to Section 9.13.1.4

07500 Roofing and Sheet Metal: BCBC 9.26

a) Provide all roofing and sheet metal work indicated on the drawings and/or specifications.
b) Lead flashings to plumbing vents to be supplied by the plumbing contractor.

Materials:
a) All materials for the membrane roofing shall conform to the applicable CSA and CGSB Standard Specifications as listed in the MSMRCA Standards Manual.
b) Metal flashing shall be 26 gauge G.1 to detail or as required. End joints to be flat locked seams.
c) Rain water leaders shall conform to BCBC 9.26.18.2, connected to roof drains or gutters.
d) Roof drains in flat roofs shall be supplemented by scuppers.
e) Roof deck insulation shall be: 2" Roodmate by Dow Chemical. Surco Seal by Duradex on 3/4" plywood.

Workmanship:
a) Sheet metal shall be done in a thorough and workmanlike manner, neatly and carefully formed to suit details and to the MSMRCA Specifications.

Guarantee:
a) This contractor shall guarantee all roofing and sheet metal work for a period of two years or more, from completion of this contract. He shall make good any and all defects occurring within that time without cost to the Owner.

07700 Insulation: BCBC 9.25

Materials shall conform to: BCBC 9.25.2.2

Workmanship:
Care should be taken to ensure no required venting spaces are obstructed by the insulation.

07900 Air & Vapour Barrier: BCBC 9.25.4

Materials shall conform to Section 9.25.4.2, UV resistant Polyethylene.

DIVISION 8 Doors and Windows BCBC 9.6, 9.7

08000 General:
All shall conform to NAFS 08 for it locale.

DIVISION 9 Finishes

09250 Gypsum Drywall Finish:
Provide all materials, labour and equipment necessary to complete all gypsum board wall and ceiling finishes as noted on drawings, finish schedule and/or as specified.

Materials:
a) Gypsum board shall be materials as indicated on the drawings.
b) Ceiling beads and corner beads shall be galvanized steel or round pvc on all exterior corners.
c) Materials shall conform to BCBC 9.25.5.2.
d) All drywall fasteners shall be metal screws specially designed for application of gypsum panels to wood or metal studs as required and shall be the length and pattern recommended by the manufacturer of the gypsum panels used.

Workmanship:
a) Gypsum board shall be installed and finished in strict accordance with the manufacturer's printed instruction and the following directions:
b) Erect gypsum wallboard with long direction at right angles to supports, locate end joints over supports and offset from end joints in adjoining board.
c) Erect wallboard to ceiling first. Where wallboard is erected horizontally, fasten top panel first, butted against ceiling board.
d) Vertical application, from floor to ceiling is NOT a preferred method of application.
e) Install drywall corner cups where indicated.
f) Apply joint tape and fill joints and spot over screw heads in strict accordance with the manufacturer's printed instructions.
g) Do all cutting and fitting of the work required to accommodate all finishing work of other trades.
h) Finished work shall be smooth, seamless, plumb or level, square with adjoining work.

Protection and Cleanup
a) Protect materials and work of this division from damage by weather and other causes. Protect work of other divisions from damage resulting from work of this section.
b) Make good such damage at own expense to the satisfaction of the owner.
c) As the work proceeds and on completion clean up and remove from the premises all rubbish and surplus materials resulting from the work of this section. Abide by recycling bylaws and dispose of gypsum waste at a legal drop off point.

Guarantee:

The contractor shall guarantee all materials and workmanship free from defects for a period of one year from completion of the contract, and shall make good any and all defects without cost to the Owner.

09900 Painting

a) In general all interior and exterior surfaces shall be painted except: 1. those with a complete factory finish; 2. Non-ferrous metal surfaces other than flashing.
b) Examine all surfaces to be painted and detects in writing to the Owner, start of work constitutes acceptance of the work by this contractor.
c) All colours are as noted on the Exterior Finish Schedule or confirm with owner.

Materials:
a) Materials such as linseed oil, shellac, etc. shall be of best quality.
b) Paints, enamels, varnishes, and stains shall be of brand specified on painting schedule. Substitutions may be allowed only with prior approval of the owner.
c) Materials must be delivered to the site in original, unbroken, sealed, labeled containers and shall be used in strict accordance with manufacturer's printed instructions.

Workmanship:
a) Remove hardware, plates, etc. before painting and replace after completion.
b) Sand fit and prepare all surfaces as necessary. Sand wood surfaces smooth between coats.
c) First class workmanship is required, wall brushed out and free from defects, allow sufficient time between coats for proper drying.
d) Back prime or stain all interior and exterior trim, door, window frames and millwork.
e) On completion, clean, repair or replace damaged or splattered surfaces.

DIVISION 10 Specialties none

DIVISION 11 Equipment none

DIVISION 12 Furnishings

12000 Kitchen: Owner to confirm plan and details with cabinet manufacturer.

12500 Window Treatment

DIVISION 13 Special Construction none

DIVISION 14 Conveying Systems See plans for any allowance for future shaft.

DIVISION 15 Mechanical Systems

15000 See Mechanical Contractor for specifications for air conditioning, plumbing design and fixture specifications.

15300 Fire Protection: None.

DIVISION 21 Fire Suppression

Confirm if property is subject to interface fire regulations. See plans for any allowance of sprinklers

DIVISION 22 Plumbing Systems

DIVISION 23 Heating Ventilation & Airconditioning Systems

DIVISION 25 Integrated Automation

DIVISION 26 Electrical Systems

16000 See Electrical Contractor for specifications for Building/In-house service. Lighting plans for site, common building areas and separate suite plans.

16500 Intercom: system for Residential Entry

16600 See Owner for security system and stereo sound through out home.

DIVISION 27 Communication

DIVISION 28 Electronic Safety and Security

DIVISION 31 Earthwork - see Div 2

DIVISION 32 Exterior Improvements - Landscaping

DIVISION 33 Utilities

DIVISION 34 Transportation

DIVISION 48 Electrical Power Generation

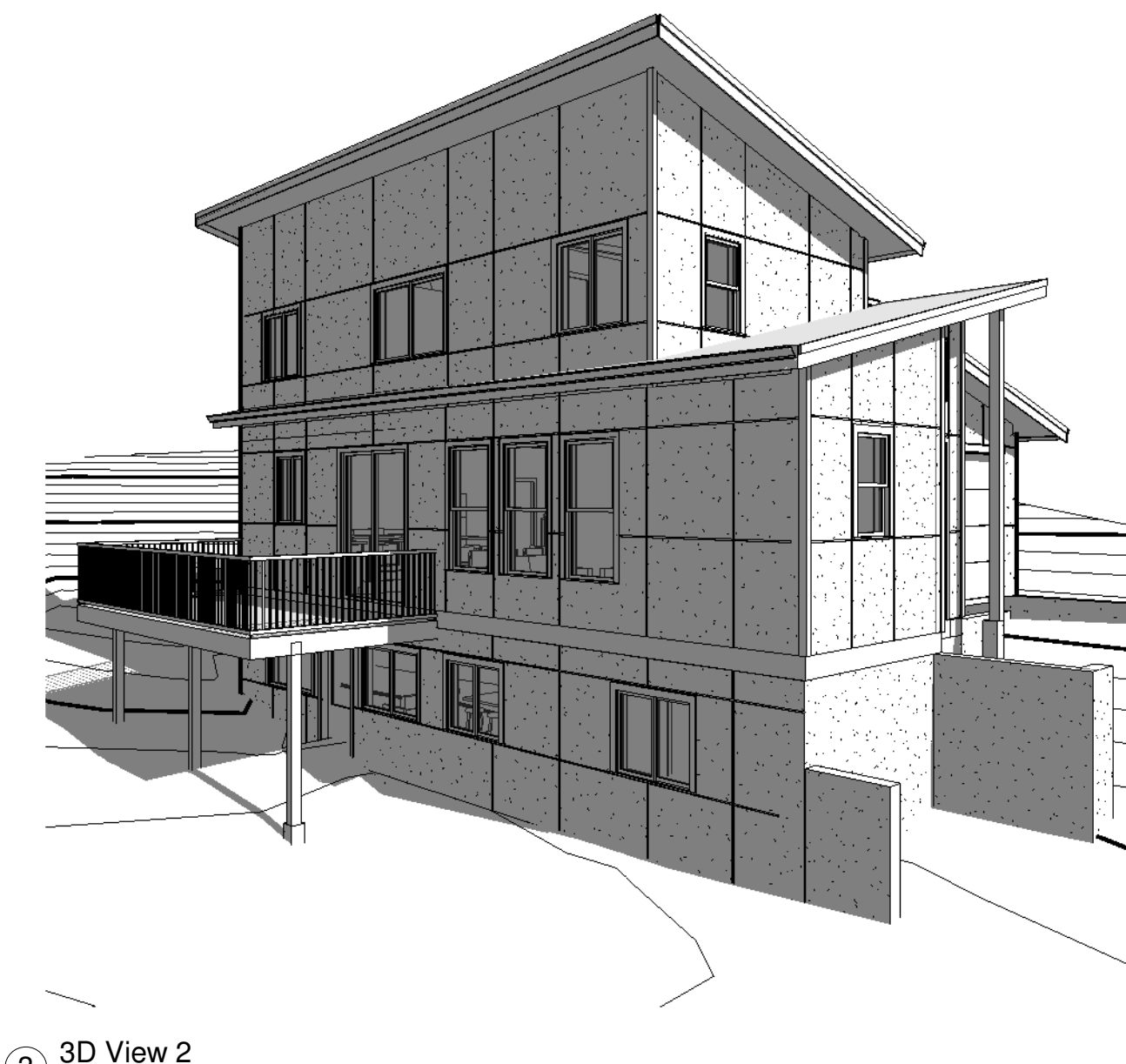
BCBC 2024 requires windows, skylights, and doors to meet NAFS 11

Using 'Duncan', < 10m, 'Rough' Terrain :

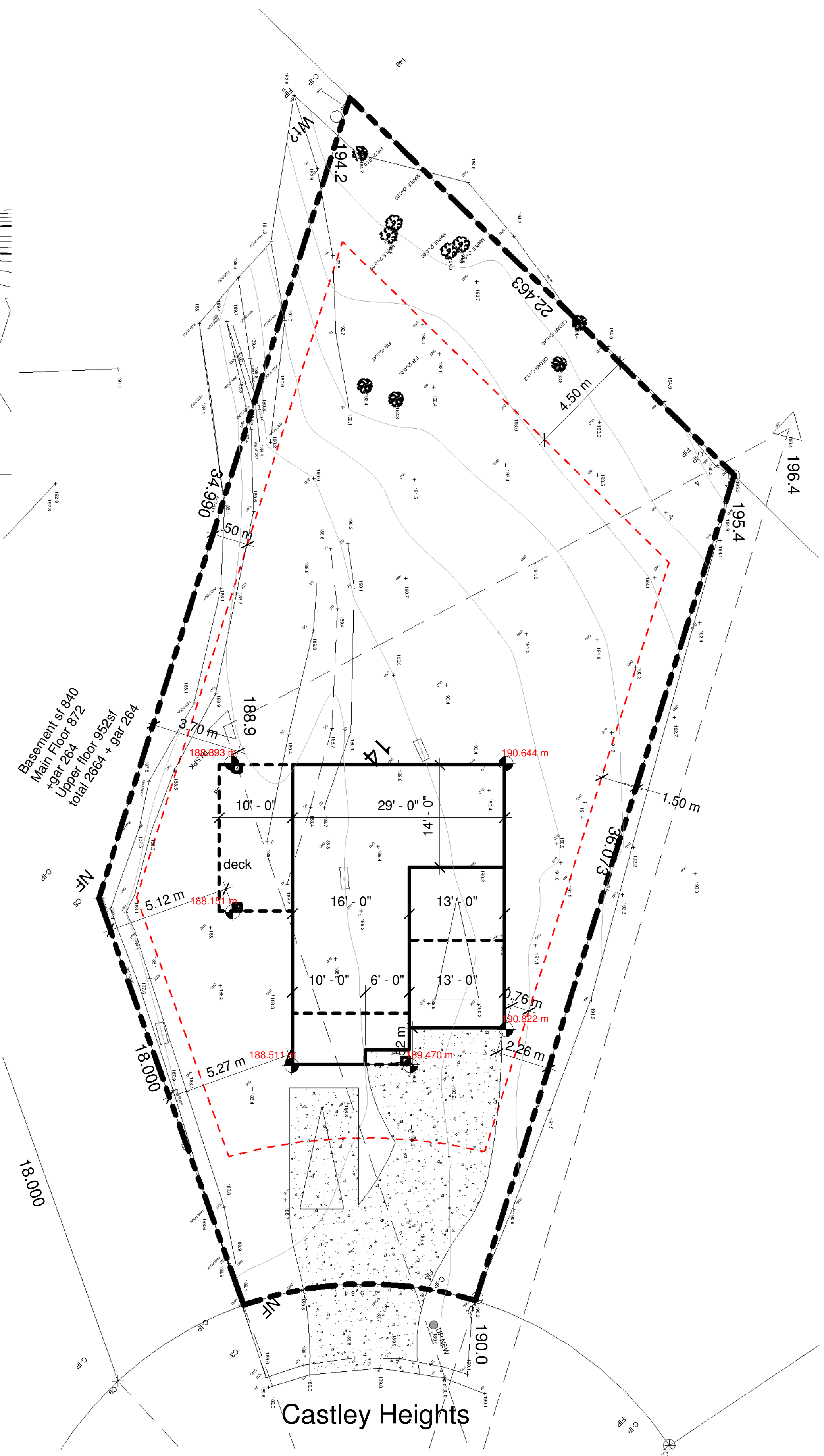
PG 20, +DP 960 Pa, -DP 960 Pa, H2O 180 Pa, Air Infil. A2



3D View 1



3D View 2



PROJECT DATA:

ZONING: R-3 Town of Lake Cowichan

SITE AREA: 8482 sf (788 sm)

SITE COVERAGE:
1324 sf = 15.6%

FLOOR AREAS:
BASEMENT 829 sf (77 sm)
MAIN 829 sf (77 sm)
SCND 856 sf (79.5 sm)
TOTAL: 2514 sf (233.5 sm)

GARAGE 286 sf (26.5 sm)

SUITE PORTION:
829 sf (000 sm) = 33.0%

AVERAGE GRADE: 188.511 + 188.151 + 188.893
+ 190.644 + 190.822 + 189.470 = 1136.491/6 = 189.415

BUILDING HEIGHT: max permitted 11.0 m
FROM AVG FIN GRADE 8.00 m (26.25')

1 Site Plan
1 : 125

Proposed Residence for :

VCC Developments
at: Lot 14, Castley Heights, Lake Cowichan, BC.

McNEIL BUILDING DESIGNS LIMITED

Ron McNeil, ASTIBC, BDA, S.T.
1304 Lovers Lane,
Cobble Hill, BC V0R1L6
Phone: 250.360.7307
info@mcneildesigns.bc.ca

SEAL MUST
APPEAR REQ TO
BE VALID

DATE: APR 2025

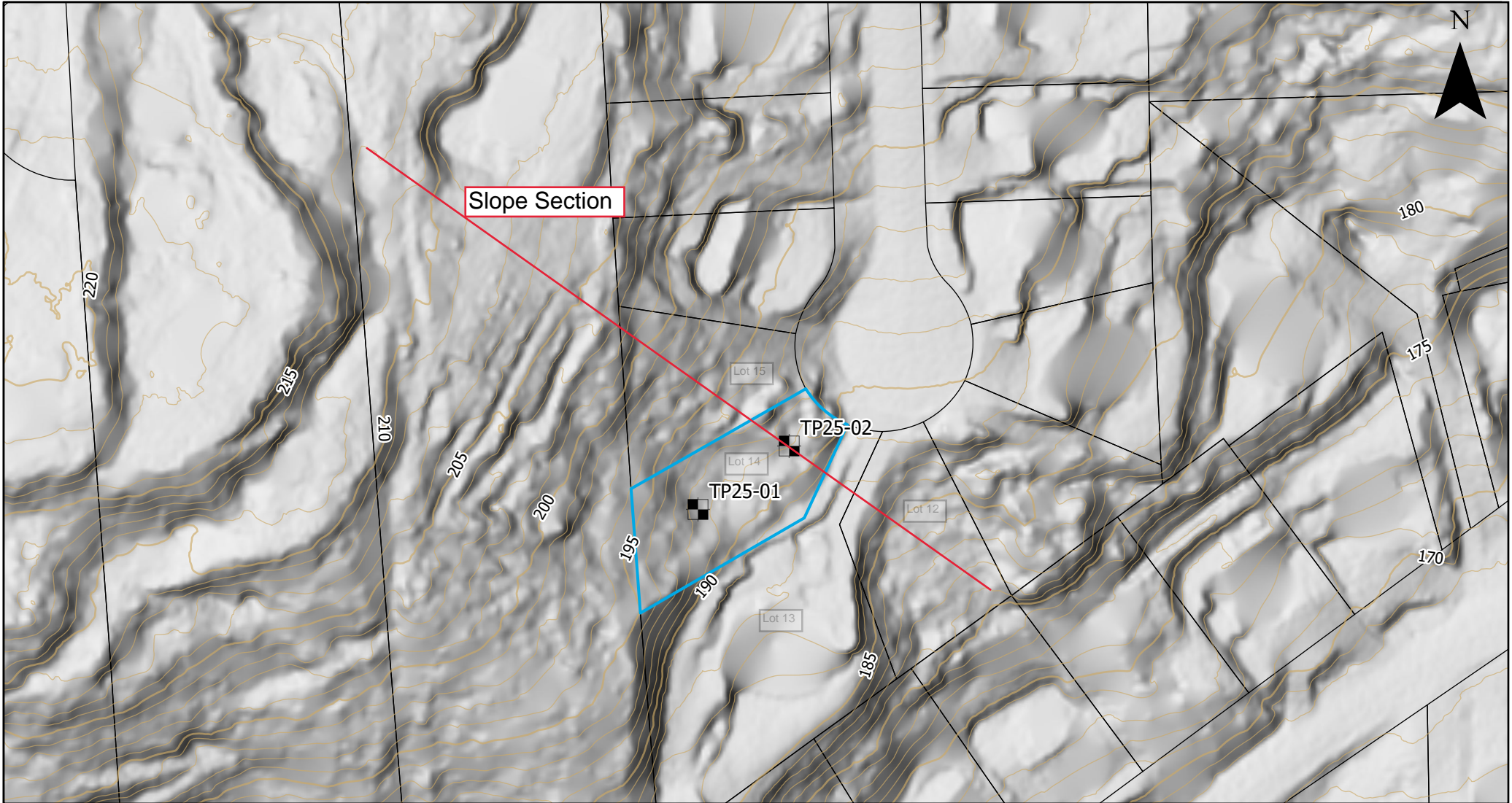
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JOB NO.:

SHEET:

A1

SHEET A1 OF A1



<p>Legend</p> <ul style="list-style-type: none"> Subject property Property Lines test pits <p>Contour</p> <ul style="list-style-type: none"> 1m 5m 	<p>PROJECT NAME</p> <p style="text-align: center;">Lot 14 - 287 Castley Heights, Lake Cowichan, BC</p>		<p>Drawing No.</p> <p style="text-align: center;">E4464-01</p>		
	<p>DRAWING TITLE</p> <p style="text-align: center;">Topographic Site Plan</p>		<p>Date:</p> <p>2025-05-13</p>	<p>Drawn By:</p> <p>TA</p>	
	<p>LEGAL DESCRIPTION</p> <p style="text-align: center;">Lot 14, Block 14, Plan VIP54940, Section 5, Cowichan Land District, PID 017-909-244</p>		<p>Lidar Aquisition Date: 2019 Coordinate System: NAD 1983 CSRS UTM Zone 10N Vertical Datum: CGVD 2013</p>		
				<p>0 10 20 30  Meters</p>	



TEST PIT LOG

File Number: E4464
Client: VCC Investment Group
Project: 287 Castley Heights,
Location: Lake Cowichan, BC

TP25-01

Coordinates: 48.8250973 N, -124.0656041 W

Depth (m)	Soil Symbol	Description
0.0		Ground Surface
0.0-0.3m		Sandy SILT, some organics (roots), compact, dark brown, moist
0.3-0.75m		Silty SAND, trace clay, compact, grey brown, moist to wet
0.75-1.0m		Silty SAND & GRAVEL, trace cobble, dense, brown, moist to wet SILT Lenses throughout
1.0		End of Hole at 1.00m. Minor to Moderate Groundwater Seepage Encountered at 0.45m.
1.5		
2.0		

Logged By: Spencer Woodward, GIT
Reviewed By: Stuart Crossfield, P.Geo, P.L.Eng.
Digging Method: Deere 50-P Excavator

Date: May 8, 2025
Page 1 of 1

1900 Boxwood Road,
Nanaimo, BC, V9S 5Y2
Phone: 250-756-0355
Fax: 250-756-3831
Email: geotech@lewkovich.com



TEST PIT LOG

File Number: E4464
Client: VCC Investment Group
Project: 287 Castley Heights,
Location: Lake Cowichan, BC

TP25-02

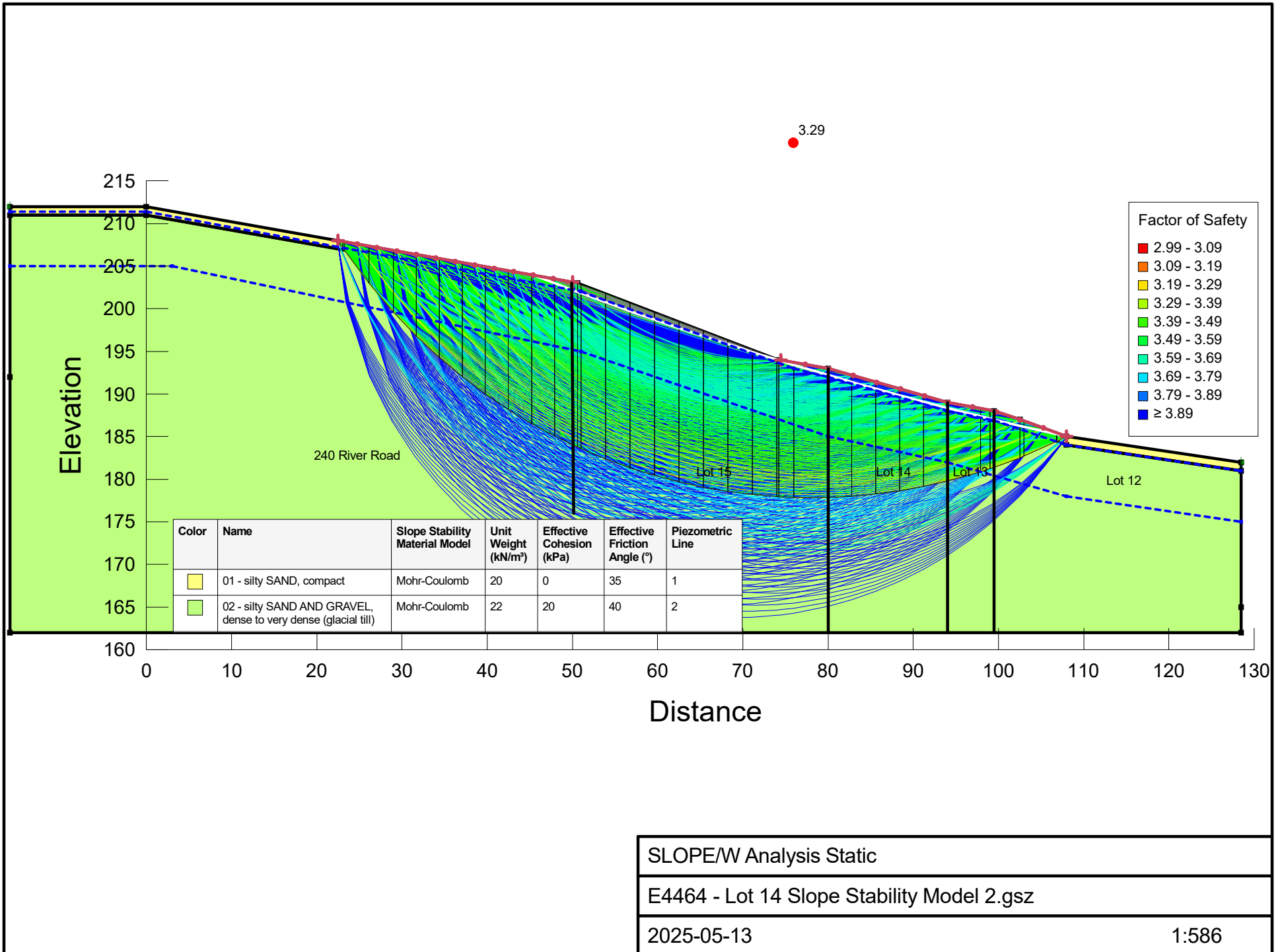
Coordinates: 48.8252112 N, -124.0653399 W

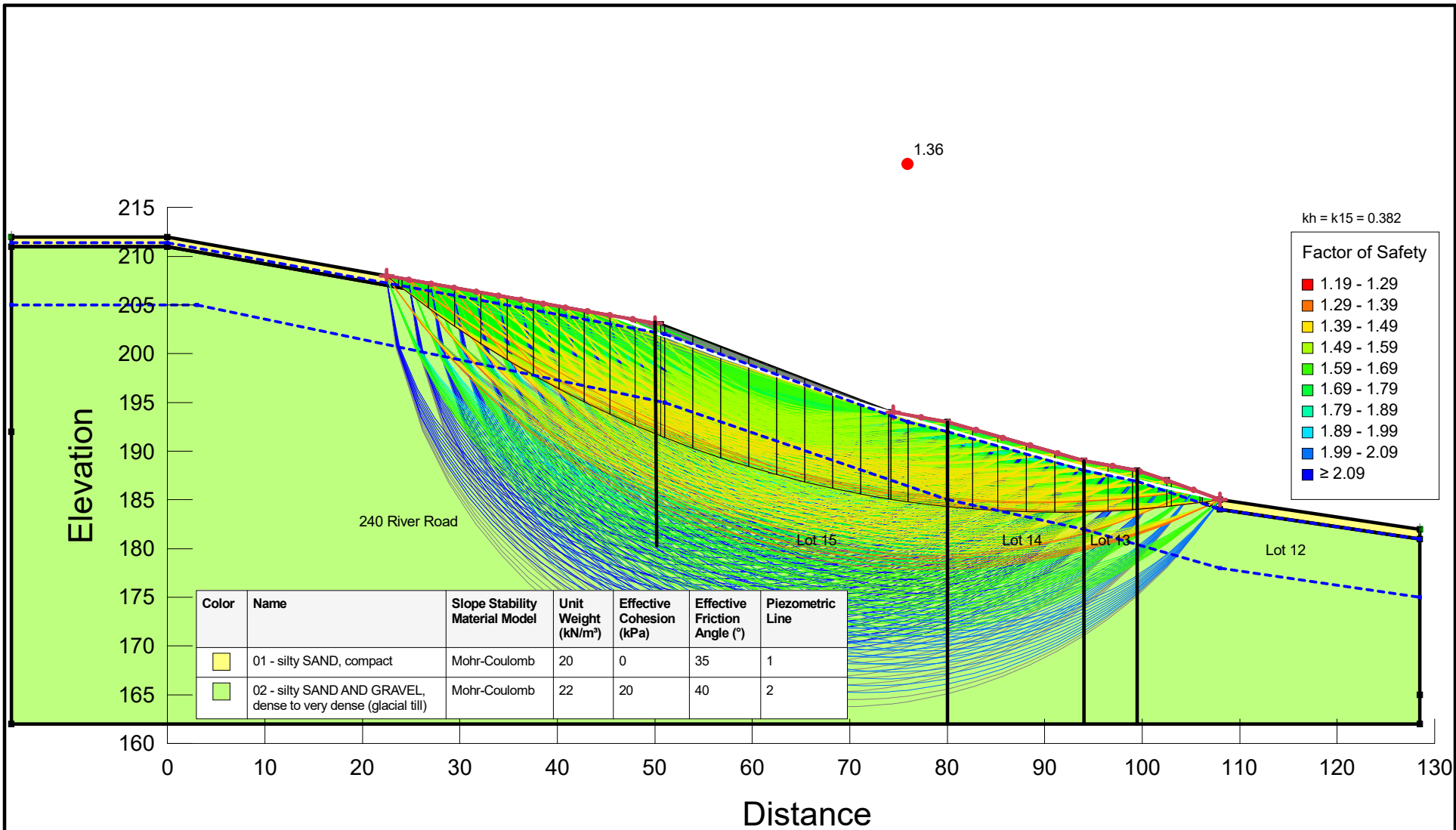
Depth (m)	Soil Symbol	Description
0.0		Ground Surface
0.0-0.45m		Sandy SILT, some organics (roots), loose, dark brown, moist to wet
0.45-0.9m		Sandy SILT, trace clay, compact, grey brown, moist to wet Lenses of SAND throughout
0.9-1.2m		Silty SAND & GRAVEL, trace cobble, dense, grey brown, wet
1.2-2.0m		End of Hole at 1.20m. Minor to Moderate Groundwater Seepage Encountered at 0.45m.

Logged By: Spencer Woodward, GIT
Reviewed By: Stuart Crossfield, P.Geo, P.L.Eng.
Digging Method: Deere 50-P Excavator

Date: May 8, 2025
Page 1 of 1

1900 Boxwood Road,
Nanaimo, BC, V9S 5Y2
Phone: 250-756-0355
Fax: 250-756-3831
Email: geotech@lewkovich.com





SLOPE/W Analysis Seismic	
E4464 - Lot 14 Slope Stability Model 2.gsz	
2025-05-13	1:586

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 14, 2025 File# E4464

Town of Cowichan Lake

39 South Shore Road, PO Box 860, Lake Cowichan, BC

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"):

Lot 14 Castley Heights, Lake Cowichan, 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

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 conditions¹ 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)

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."

LANDSLIDE ASSESSMENT ASSURANCE STATEMENT

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

May14, 2025

Name (print)

Date

1900 Boxwood Road

Address

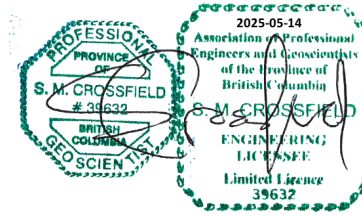
Nanaimo, BC V9S 5Y2

250 756 0355

Telephone

geotech@lewkowich.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 **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.