



Flood Construction Level Assessment

3767 Waring Place – Saanich, BC

Prepared for: **William Davis**
3761 Waring Place
Saanich, BC, V8P 5E9

Same as above
wmdavis@telus.net

Prepared by: **Ryzuk Geotechnical Ltd.**
#100-771 Vernon Avenue
Victoria, BC V8X 5A7

Shane Moore, P.Geo.
shane@ryzuk.com

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DRAFT

1. INTRODUCTION

As requested, we have completed an analysis of the flooding hazard at the referenced site to determine the minimum Flood Construction Level (FCL) for the proposed development. Our work has been undertaken in accordance with, and is subject to, the previously accepted Terms of Engagement.

Our scope for the present report is limited to FCL determination only. Our previous memo, dated September 23, 2025, outlines our assessment of the geotechnical bearing conditions for the proposed residence. Further assessment has been recommended therein, the findings from such will be detailed under a separate cover following additional investigation.

2. BACKGROUND

We have completed a desktop study reviewing the site information available online, including satellite imagery and approximate property lines from the Capital Regional District (CRD) Maps GIS, site topography data from LiDAR BC, and photography of the shoreline near the property from Google Street View. Our office-based study also included reviewing the design drawing package from Step One Design, dated October 7, 2025. The Site Plan and Building Sections from this drawing package are included as attachments to this report.

The project site is located roughly at the mid point along the Cadboro Bay foreshore, with an approximate area of 1000 m², and is bounded by Waring Place to the northwest, similar residential lots to the northeast and southwest, and the Cadboro Bay foreshore to the southeast. Topographically the site is generally flat/level, with a raised yard along the west side of the driveway about 1 m higher than the rest of the site grade. Along the Present Natural Boundary (PNB) there is a 0.3 m high existing concrete retaining wall. We understand this retaining wall will be kept as part of the final site landscaping.

The proposed development will be a renovation of the existing dwelling at the site which will include additions to the main floor footprint, and the addition of a second storey above the northeast half of the building. From the preliminary design drawings, the building will have a ground floor elevation at 3.25 m geodetic (referencing Canadian Geodetic Vertical Datum of 1928 [CGVD28]), per the Site Survey by J.E. Anderson & Associates, dated May 16, 2025. Proposed building setbacks are 10.51 m from the PNB, 3.70 m from the northeast property line, 3.17 m from the southwest property line, and 7.55 m from the northwest property line bordering Waring Place. Building setbacks are taken from the Site Plan by Step One Design.

3. FLOOD CONSTRUCTION LEVEL

The FCL established for a given site specifies the minimum required elevation for the underside of a wooden floor system or the top of a concrete slab for habitable buildings. The available publications reviewed and referenced for the purpose of calculating the FCL for the subject site include the following:

- Engineers and Geoscientists BC (EGBC) - Professional Practice Guidelines – *Legislated Flood Assessments in a Changing Climate in BC*, V2.1 August 28, 2018
- Province of British Columbia – *Flood Hazard Area Land Use Management (FHALUM) Guidelines*, May 2004, Amended January 2018 (Sections 3.5 & 3.6)
- Ausenco Sandwell – *Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use*; Draft Policy Discussion Paper, 27 January 2011 “AS(2011a)”
- Ausenco Sandwell – *Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use; Guidelines for Management of Coastal Flood Hazard Land Use*, 27 January 2011 “AS(2011b)”
- Kerr Wood Leidal - *Provincial Guidelines for Coastal Floodplain Mapping*, June 2011
- James, T.S. et al. – *Relative Sea-level Projections in Canada and the Adjacent Mainland United States*, 2014
- Capital Regional District (CRD) – *Capital Region Coastal Flood Inundation Mapping Project: Task 3 – Tsunami Modelling and Mapping Report*, Version 2.0, October 2021

The FCL for coastal areas was determined following the “Combined Method” provided in Subsections 3.5.6 and 3.5.5.1 of the FHALUM Guidelines. Additional information required to establish the FCL was obtained from the Canadian Hydrographic Service (CHS). The Combined Method utilizes the Higher High Water Large Tide (HHWLT, from the CHS) as a base, upon which the predicted Sea Level Rise (SLR), storm surge, wave effect, local uplift from isostatic rebound, and an additional free board factor are all added.

To obtain the HHWLT for the site, we referenced the data from nearest CHS tide station: Station 07140 (Finnerty Cove), which is about 1800 m north of the subject site. The data from the tide station measures the HHWLT at 3.19 m, referencing the Chart Datum. Converting to the CGVD28 datum yields 1.18 m for the HHWLT.

The *Provincial Guidelines for Coastal Floodplain Mapping* suggest a sea level rise of 1.0 m be considered from the year 2000 to 2100. Accordingly, we took our sea level rise component to be 0.74 m, accounting for the suggested sea level rise from the present year (2026) to the year 2100.

The design storm surge used in the Combined Method is recommended to be an event with a 1:200-year annual exceedance probability (AEP), as outlined in Table 6-1 of the Draft Policy Discussion Paper by Ausenco Sandwell in accordance with the FHALUM Guidelines. Table 3-2 in the *Guidelines for Management of Coastal Flood Hazard Land Use* (Ausenco Sandwell, 2011) provides storm surge and wave effect allowances for regions of Coastal BC with reference to the Policy Discussion Paper. Accordingly, for East Vancouver Island, a surge allowance of 1.3 m and wave effect allowance of 0.65 m are prescribed.

Another factor in computing the FCL for a site is the land uplift from isostatic rebound. Such is a product of the immense weight of glacial ice that historically covered Vancouver Island during the geologically recent Fraser Glaciation being removed as glaciers receded. A regional uplift rate of 0.58 mm/year was selected for the Victoria area based on “Relative Sea-level Projections in Canada and the Adjacent Mainland United States” by James et al. (2014); therefore, the FCL has been reduced by 0.58 mm/year over 74 years.

Finally, the “Combined Method” for computing the FCL includes a freeboard height of 0.3 m (see Subsection 3.5.5.1 of the FHALUM Guidelines). Table 1 below summarizes the components outlined above as well as the final FCL for the subject site.

Table 1: FCL Calculation (referencing the CGVD28).

Component Name	Component Depth (m)	Notes
Higher High Water Large Tide (HHWLT)	1.18	As per CHS, based on Finnerty Cove tidal gauge 07140
Total Storm Surge During “Designated Storm”	1.3	As per 2011 guidelines for 1:200 AEP storm event, taken from AS(2011b) Table 3-2 for East Vancouver Island
Estimated Wave Effect From “Designated Storm”	0.65	As per 2011 guidelines for 1:200 AEP storm event, taken from AS(2011b) Table 3-2 for East Vancouver Island
Regional Uplift/Isostatic Rebound	-0.043	Uplift rate of 0.58 mm/yr over 74 years per James et al. (2014) Table B2
Sea Level Rise (SLR)	0.74	As per Kerr Wood Leidal, 2011
Free Board	0.3	As per FHALUM Guidelines Subsection 3.5.5.1
Flood Construction Level (CGVD28)	+4.13	

Based on the above, and in accordance with the FHALUM Guidelines, an FCL of **+4.13 m (CGVD28)** has been calculated.

3.1 TSUNAMI INUNDATION

Regarding tsunami risk, we have not undertaken a detailed wave run-up analysis or associated magnitude return period analysis of potential tsunami events to quantify the risk at the referenced site. However, Table 4-2 from the *Tsunami Modeling and Mapping Report* (CRD, 2021) indicates a maximum water level of 2.67 m (referencing the CGVD2013 datum) for Oak Bay. This water level considers a Cascadia Subduction Zone Northern Segment design earthquake with a 1:500 AEP. The corresponding value given for Saanich is 2.55 m (CGVD2013). Considering Cadboro Bay is divided between these municipalities, we are using the larger value ascribed to Oak Bay for our assessment. Converting the maximum water level for Oak Bay to the CGVD28 datum (referencing Appendix N in the *Tsunami Modeling and Mapping Report*) gives 2.54 m (CGVD28).

3.2 DESIGN FCL

As per Amendment Section 3.5 of the FHALUM Guidelines, the greater of the tsunami maximum water level and FCL shall apply. As such, the FCL of **+4.13 m (CGVD28)** is recommended for the design of the proposed development. However, we recommend that residents review and understand the Provincial Tsunami Advanced Warning System.

The referenced design drawings for the proposed renovation specify a Garage Floor Elevation (GFE) of 3.25 m which maintains the existing garage elevation. Further, we understand that the unfinished basement slab will also maintain the existing slab elevation of 2.14 m. The proposed Main Floor Elevation (MFE) is 4.57 m. As described above, the FCL establishes the minimum elevation for the underside of a wooden floor system or top of concrete slab for habitable buildings. We discuss the implications of the proposed areas located below the design FCL in Section 6 below.

4. SETBACK

Since the proposed development does not involve a new subdivision of the existing lot, the Subsection 3.5.6 of the amended FHALUM Guidelines states that “standard” setbacks apply as noted in Subsection 3.5.5. Accordingly, the guidelines prescribe a building setback that is the greater of:

- 15 m from the Estimated Natural Boundary (ENB) of the sea at Year 2100, or
- Landward of the natural ground elevation contour equivalent to the Year 2100 FCL (calculated above).

Referring to the attached Site Survey, the ground elevations throughout the subject lot are below the 4.13 m (CGVD28) FCL. As such, we refer to Article 3.5.5.3 of the FHALUM Guidelines:

“On existing lots, if meeting the setback guidelines noted above would sterilize the lot (i.e., not allow even one of the land uses or structures permitted under the current zoning), the development approving official may agree to modify setback requirements as recommended by a suitably qualified Professional Engineer experienced in coastal engineering, provided that this is augmented through a restrictive covenant stipulating the hazard, building requirements, and liability disclaimer.”

However, it is also noted in the guideline that Year 2100 FCL requirements still apply when considering Article 3.5.5.3.

5. ROLE OF QUALIFIED PROFESSIONALS

Article 3.7.2.1 of the of the EGBC Professional Practice Guidelines, *Legislated Flood Assessments in a Changing Climate in BC*, notes that the Province of BC has not adopted Flood Risk tolerance criteria, yet professional practice standards generally imply some level of risk tolerance. Commentary within this Article advises that when a Qualified Professional (QP) provides the statement that “the land may be safely used for the use intended,” that the QP is declaring that the risks and consequences of a given Hazard Scenario are tolerable or acceptable. As defined by the Guidelines, “tolerable” risks are “those that society can live with given the

perceived or real benefit that emerges by developing in a hazardous area,” while “acceptable” risks are those broadly accepted by society. In the case of tolerable risks, such require monitoring and typically there are conditions associated with safe use of the land. It is not for the QP to stipulate the tolerable or acceptable risk criterion and accordingly the definition of safe use must be clearly outlined in the reports such that the Regulatory Agency is aware of the implications in their decision-making.

It is important to note that the objectives of the FHALUM Guidelines (and as elaborated upon in the EGBC Professional Practice Guidelines) are “to reduce or prevent injury, human trauma, and loss of life and to minimize property damage from flooding events in B.C.” It is also critically important to recognize that both documents have been prepared to address **all** types of flooding, not simply coastal flooding due to sea level rise. The potential for injury, trauma, loss of life and property damage is orders of magnitude greater when one considers flooding of major systems such as the Fraser River, or high energy events such as debris flows, torrents, or major channel avulsions. Sea level rise is foreseeable and, in conjunction with extreme tides, the design event will be highly predictable such that the public will have sufficient time to protect themselves and their assets before inundation would occur.

It also must be recognized that it is not an absolute requirement for a QP to adhere to every stipulation within either the EGBC or the FHALUM Guidelines. This is clearly stated in Section 1.4 of the EGBC Guidelines:

“Notwithstanding the purpose and scope of these guidelines, an Engineering/Geoscience Professional’s decision not to follow one or more aspects of the guidelines does not necessarily represent a failure to meet required professional obligations. Such judgements and decisions depend upon weighing facts and circumstances to determine whether another reasonable and prudent QP, in a similar situation, would have conducted himself/herself similarly.”

6. DISCUSSION

We maintain that the design FCL is conservative, and such is expressly stated in the EGBC Guidelines. Appendix G5 in the guideline reads (with emphasis added):

“Recent studies (Mazzotti et al. 2008) project relative sea level rise on the BC coast to 2100. For the Fraser River delta, the rise is expected to be between 32 and 68 cm, with a contribution of 1 to 2 mm/a (10 to 20 cm for a century) from sediment consolidation (Mazzotti et al., 2009). (On loaded sites, short-term subsidence may be an order of magnitude higher.) *At Victoria, the range of expected sea level rise is 17 to 34 cm*, and at Prince Rupert it is 18 to 75 cm (from projection of GPS trends). These results are different than global averages. On the outer coast of Vancouver Island, however, sea level is expected to fall because of tectonic effects, but that effect might be offset by the occurrence of a major earthquake. There is evidence for past sudden coastal subsidence of up to 2 m (Hyndman and Rogers, 2010). In view of changing rates of sea level rise, however, *a recent conservative estimate for planning purposes is that sea level rise on the BC coast may be as much as 1 m by the end of the century* (Ausenco Sandwell, 2011).

Ausenco Sandwell (2011) further discusses issues and guidelines to be incorporated into a program of upgrading sea defenses to meet the circumstances of rising sea level.”

Here, it is pertinent to draw a parallel between flood hazard and seismic hazard. Except in the case of post-disaster structures, it is generally accepted that many new buildings will sustain significant damage and may not be habitable following the design event. The critical test is that the building must remain safe for egress to protect against loss of life and human trauma. It is highly unlikely that lives will be lost, or human trauma at site will result from flooding associated with sea level rise. It is highly likely that economic losses will occur in the area, but this will occur regardless of whether development proceeds at the subject site.

As climate change and sea level rise occur, the impact of flooding events beyond the current boundary of the sea can be expected to advance incrementally with time. Accordingly, advance notice of months, or even years, would be available to owners/tenants to allow safe access and egress, removal of personal effects, as well as to consider floodproofing improvements to the building to mitigate the increasing level of risk. This is not a case where instantaneous, devastating, or unforeseeable conditions could occur, as might be anticipated with a high energy channel avulsion or debris flow path, high flow velocities, or deep flood water.

It is relevant here to also draw attention to the FHALUM Guidelines definition for “Habitable Area”. Such is defined as “any room or space within a building or structure that is or can be used for human occupancy, commercial sales, or storage of goods, possessions or equipment (including furnaces) which would be subject to damage if flooded.” The proposed development locates primary living areas on the main floor (elevation 4.57 m per the Site Plan), which is above the calculated FCL for the site (4.14 m per Section 3.2 above). Access and accessory uses (garage and unfinished basement) with concrete floor slabs located below the FCL could have flood protection measures established as necessary. Further, the garage and basement slab elevations will remain unchanged from the existing dwelling. In accordance with Appendix F2.2 of the referenced EGBC Guidelines, areas used solely for vehicle parking may be located below the FCL. The garage and basement areas could be abandoned, and damageable goods be relocated well in advance of sea level rise reaching a critical level, with the understanding that property damage could occur from future flooding if mitigative measures are not arranged.

7. SUMMARY

Given the low-lying nature of the site, geotechnical/zoning limitations on new construction above the FCL, incremental nature of coastal flood hazard, potential impacts of such to life safety, and considering that the areas below the FCL are existing elements from the original construction, we consider the garage and unfinished basement areas being maintained below the FCL to be reasonable given the proposed use.

Based on the above, it is our opinion that the land may be used safely for the use intended in accordance with Section 56 of the Community Charter as such relates to flooding hazard outlined herein. We recommend that critical mechanical/electrical equipment relied upon for life safety be constructed at/above the FCL or that the design allow for such to be relocated to/above the FCL, if necessary. Further, we recommend that any infrastructure below the FCL be designed to resist damage associated with short term water ingress.

A restrictive covenant should be registered on the land title such that current and future owners are aware of the risk for any part of the structure that is constructed below the FCL, while insurers and the District of Saanich are held harmless.

8. CLOSURE

We trust the preceding is suitable for your purposes at present, and that it satisfies the requirements. If you require anything further at this time or have any questions with respect to the above, please contact us.

Sincerely,
Ryzuk Geotechnical



Trevor Kinnee, EIT
Junior Engineer

Shane Moore, P.Geo.
President / Senior Geoscientist

Permit to Practice Number: 1002996

Attachment(s):

- Site Plan (Step One Design)
- Building Section (Step One Design)
- Site Survey (J. E. Anderson)
- Flood Assurance Statement