



RYZUK GEOTECHNICAL
Engineering & Materials Testing

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File No: 9437-17

Backyard Bungalows Inc.
#300, 1095 McKenzie Avenue
Victoria, B.C. V8P 2L5

Attn: Nick Kardum (by email: friends@backyardbungalows.ca)

Re: Tsunami Risk Assessment
314 Uganda Avenue – Esquimalt, BC

As requested, we have conducted a tsunami inundation review for the referenced site. We understand that the site is designated as part of the Development Permit Area No. 2 – Protection of Development from Hazardous Conditions by the Township of Esquimalt. Our assessment included a review of the site survey plan (dated September 30, 2021) and architectural drawings (received December 18, 2022) prepared by Backyard Bungalows Inc. as well as associated study reports of tsunami modeling for the Capital Regional District (CRD) and background information from various sources. Our scope of work is a tsunami risk assessment for the proposed garden suite. Our work and recommendations herein have been provided in accordance with, and are subject to, the previously accepted Terms of Engagement.

Unless otherwise noted, elevations referenced in this document are stated using the Canadian Geodetic Vertical Datum of 2013 (CGVD2013). Where necessary, elevations are converted from the previous datum, CGVD28, using the local Esquimalt conversion factor of 159 mm (CRD 2020).

PROPOSED DEVELOPMENT

The referenced site comprises a wedge shaped residential lot. The lot frontage on Uganda Avenue is to the northwest, with developed residential buildings on the neighboring properties to the southwest, northeast and southeast. The site is currently occupied by a single-family residence and driveway which will remain. The site elevation is in the order of 3.6 to 6.4 m CGVD28, rising gently from north to south. The existing grade around the proposed residential accessory building is in the order of 5.0 to 6.0 m CGVD28.

Based on the provided architectural drawings, we understand that the proposed suite with a footprint of 10.6 by 4.3 m is to be located to the southeast of the existing building and will have a top of main floor slab elevation of 5.35 m CGVD28. Converting to the updated vertical datum, the main floor slab elevation is 5.509 m.

TSUNAMI INUNDATION REVIEW

Based on the tsunami hazard map provided by the Township of Esquimalt, the entire property generally falls within the potential tsunami hazard zone. Further, we have reviewed the most recent tsunami modeling reports (CRD 2011a,b). Generally, the tsunami inundation hazard in this area relates to several potential sources including the Cascadia Subduction Zone (CSZ), the Alaska-Aleutian Subduction Zone, and local shallow crustal faults.

The CSZ Northern Segment (CSZ-NS) event with an associated return period of 500 to 600 years is recommended as the flood construction standard event (CRD 2011a,b). The CSZ-NS event accounts for potential earthquakes with moment magnitudes of 8.5 to 9.0. The modeled average water surface elevation induced by the CSZ-NS event is 4.47 m for the municipality (Esquimalt). It should be noted that the model accounts for the tsunami arriving at the coastline during the higher high water mean tide (HHWMT).

It is also necessary to consider the tsunami planning level suggested by Emergency Management BC (MOFLNRO 2011). The planning level is the total of expected wave height plus run-up, adjusted for an appropriate factor of safety and earthquake induced subsidence. It is measured from the normal highest tide. For the Juan de Fuca Strait, the suggested planning level is 4 metres. The normal highest tide level (i.e. HHWMT) adjusted to the standard vertical datum (CRD 2020) is 0.89 m based on data from tidal gauge 07120 at Victoria Harbour (CHS 2022).

Based on the above, terrain below **4.89 m Geodetic** should be considered potentially at risk of tsunami inundation. Tsunami risk would be primarily associated with aggressive floodwater and wave energy for a short duration during tsunami run-up.

SUMMARY

We have not directly undertaken detailed wave run-up analyses or associated magnitude return period frequency analyses of tsunami events to quantify the risk at the referenced site. Instead, the average water surface elevation as noted above was based on the most recent tsunami modeling project (CRD 2021a,b; CRD 2020). It is important to note that no account for the predicted relative sea-level rise was taken in the modeling. Additionally, a joint probability analysis of a tsunami occurring at the same time as a high tide, storm surge, and wave run-up has also not been undertaken but is considered remote (CRD 2021b).

On the basis of the above, terrain below 4.89 m is considered potentially at risk of tsunami inundation and associated scour. For the proposed structure, we understand that the top of the floor slab is at an elevation of 5.509 m, which will be higher than the anticipated tsunami planning level as well as the modeled average water surface elevation under the CSZ-NS event. As such, potential tsunami impacts on the proposed habitable spaces are not anticipated, given the designated CSZ-NS event with a return period of 500 to 600 years; however, such may be subject to change under a more severe tsunami event with a greater return period [e.g., CSZ-L1 source event with a return period of 2500 years (CRD 2011b)].

In general, it is our opinion that the property may be considered safe for intended use given the relatively low probability of occurrence of a considerable tsunami event (e.g., CSZ-NS event with a return period of 500 to 600 years) during the typical target design service life of 60 to 100 years (BC Housing 2019). We recommend that residents review and understand the Provincial Tsunami Advanced Warning System.

We trust the preceding is suitable for your purposes at present. If you have any questions or require further clarification, please contact us.

Yours truly,

Ryzuk Geotechnical



Neil Klassen, P.Eng.
Lead Geotechnical Engineer

PTPN 1002996

REFERENCES

1. Capital Regional District (CRD). Coastal Flood Inundation Mapping Project Summary, Version 2.0. November 2021a.
2. Capital Regional District (CRD). Task 3 – Tsunami Modelling and Mapping Report, Coastal Flood Inundation Mapping Project, Version 2.0. October 2021b.
3. Capital Regional District (CRD). Task 1 – DEM Development Report, Coastal Flood Inundation Mapping Project, Version 2.0. March 2020.
4. Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). Coastal Floodplain Mapping – Guidelines and Specifications. June 2011.
5. Township of Esquimalt. Official Community Plan – Schedule “A” Bylaw No. 2922. June 2018.
6. Township of Esquimalt. Tsunami Hazard Zone Map – Interactive Version. Accessed via <https://www.esquimalt.ca/public-safety/emergency-program/tsunami>.
7. Fisheries and Oceans Canada. Canadian Hydrographic Service (CHS). Accessed via <https://tides.gc.ca/en/stations/07120> on December 20, 2022.
8. BC Housing. Design Guidelines and Construction Standards. 2019.