



Project: 20998

October 19, 2020

Green Bay Landing Inc.
3697 Green Bay Landing
West Kelowna, BC V4T 2B7

Attention: Ted Wenner

Re: Pad 15A - 1375 Green Bay Road, West Kelowna – Flood Hazard Assessment

This report has been prepared to address the requirements set out by the City of West Kelowna regarding the placement of a mobile home on Pad 15A at 1375 Green Bay Road and the requirements set out in the City of West Kelowna Bylaw 0154 regarding the Green Bay Canal. The legal description of the property is Lot B, Plan KAP76165, DL 523, ODYD. The location of the subject property is shown in Figure 1. The flood hazard assessment was required by the city since the former mobile home on the pad had been removed and Green Bay Landing Inc. proposes to rent the pad for another mobile home.

1. Scope of work

This report has been prepared to address the issue of the 15m floodplain setback and the flood construction level (FCL) requirements for mobile home Pad 15A with regards to the Green Bay Canal.

2. Bylaw 0154

The requirements set out in the City of West Kelowna Bylaw 0154 section 3.24 Floodplain Regulations require that;

3.24.1 The underside of any floor system, and the top of any pad supporting any space or room that is used for dwelling purposes, business, or the storage of goods which are susceptible to damage by floodwater, shall be above the following levels:

(a) 343.66m (1,127.5ft) above the Geodetic Survey of Canada datum for a parcel abutting Okanagan Lake, and

(b) 1.5m (4.9ft) above the natural boundary of any stream.

3.24.3 Any landfill placed to elevate a floor system or pad to achieve the levels specified in Section 3.24.1 shall be sited at least:

(a) 15.0m (49.2 ft) from the natural boundary of Okanagan Lake;

(c) 15.0m (49.2 ft) from the natural boundary of any stream.

The additional comments from the city in its communications with Green bay Landing Inc. are:

As we discussed, an application for a Floodplain Exemption would require a report from an engineer to provide a Flood Hazard Assessment and provide recommendations for the mobile home to meet the Flood Construction Levels. An indemnification save harmless covenant would be required to be registered on the property as a condition of the Floodplain Exemption if approved. In discussion with our Building Department, it was confirmed that requirements to meet the Flood Construction Level would be for the mobile home (underside of the floor system) not the top of the pad in this case.

3. Summary of Flood Hazards from the Green Bay Canal

The Green Bay Canal is a man-made watercourse connected to Okanagan Lake. The water levels in the canal are controlled by the level in the lake. The only natural inflow to the canal is the inflow from the lake. 1375 Green Bay Road is a mobile home park with 38 pads situated around the canal on both the east and west sides as indicated in Figure 1. The flood hazards are related to high water levels as a result of high lake levels, as were experienced in 2017 and 2018. Due to the nature of the lot and the canal, most, if not all of the mobile homes are set within 2-5m of the edge of the canal, not 15m from the natural boundary of the canal as the property configuration does not accommodate such a set back. It appears that when the canal was constructed in 1960s, the canal banks were protected by a wood retaining wall that still exists along the canal today, although the original wall is an aged structure. The wall, in conjunction with typically protected waters with little to no water movement, results in limited erosion of the canal banks.

4. Flood Hazard Assessment at Pad 15A

The site assessment of Pad 15A indicated that the former mobile home that was situated on the pad was set ~3m back from the top of the canal bank, based on the remaining concrete footings (Photo 1). The setback is generally consistent with other units located along the canal. The elevation of the underside of the previous mobile home is not known but, based on the flood assessments that I completed during the 2017 flood, I do not recall the unit flooding.



Photo 1 - Showing 3m setback from canal

To control water levels in the canal and to mitigate flooding in 2017 and 2018 the city installed sheet pile walls across the canal and a large pump downstream of the trailer park to control the water levels in the canal. This works underscores the requirement that the FCL for Pad 15A meet or exceed the required 343.66m elevation. Pilling and Associates completed a survey of the elevations at Pad 15A in August 2020 (Figure 2). The typical ground elevations are in the 343.2m range.

As indicated in Section 3, the high flood hazard is the water level that is controlled by the Okanagan Lake. The setback from the man-made canal is a low risk as there is very limited, slow water movement in the canal and it is not subject to wave action from the lake. The low risk of bank erosion is further supported by the fact that there has been no known significant erosion damage affecting this, or any other units along the canal.

The potential impacts of climate change on water levels in Okanagan Lake were considered in this assessment.

The OBWB released a report by Northwest Hydraulic Consultants regarding future water levels for Okanagan Lake and recommendations for revised FCLs. The results of this study are currently under review by local governments at this time. The recommended FCL of 343.66m in the bylaw is considered to be adequate at this time. Should the city decide to revise the FCL in its bylaw, the mobile home could be easily raised if necessary.

5. Conclusions

Based on my knowledge of flood issues along the Green Bay Canal and my site inspection of Pad 15A, the following has been concluded regarding the flood hazards:

- a) The most significant flood hazard at Pad 15A is from highwater levels during high water levels in Okanagan Lake, therefore the elevation of the underside of the mobile home floor system, i.e. the underside of the mobile home frame should meet or exceed the FCL of 343.66m.
- b) The risks from erosion along the canal banks are low due to the existing bank protection works and the fact that there is effectively no flow in the canal. Therefore, the setback from the top of the canal bank could be less than the 15m specified in the bylaw. The requested setback would allow for future maintenance of the retaining wall, should it be required.

6. Recommended Flood Construction Level and Floodplain Setback

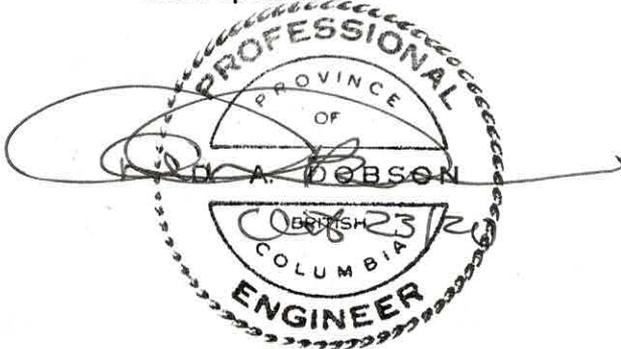
- a) Flood Construction Level – It is recommended that any mobile home placed on Pad 15A meet or exceed an FCL of 343.66m for the underside of the structure frame.
- b) Floodplain Setback – It is recommended that the floodplain setback from the top of the bank of the Green Bay Canal be relaxed to no less than 5m from the required 15m stated in Bylaw 0154.

7. Flood Assurance Statement

The professional practice guidelines *Legislated Flood Assessments in a Changing Climate in BC (2018)*, prepared by the Engineers and Geoscientists of BC, requires that a Flood Assurance Statement be completed as part of this assessment. A copy of the signed statement is provided in Appendix A.

8. Closure and Limitations

This report has been prepared exclusively for use by Green Bay Landing Inc. and the City of West Kelowna. The assessments were carried out in accordance with generally accepted practice. Professional judgment has been applied in the interpretations provided in this report. No other warranty is made, either expressed or implied. Please note that the flood hazard assessment is based on the conditions at the subject property at the time of the assessments. If conditions change, or if observed features are found to be different, please contact the undersigned for a follow up review.



Prepared by D.A. Dobson, PEng

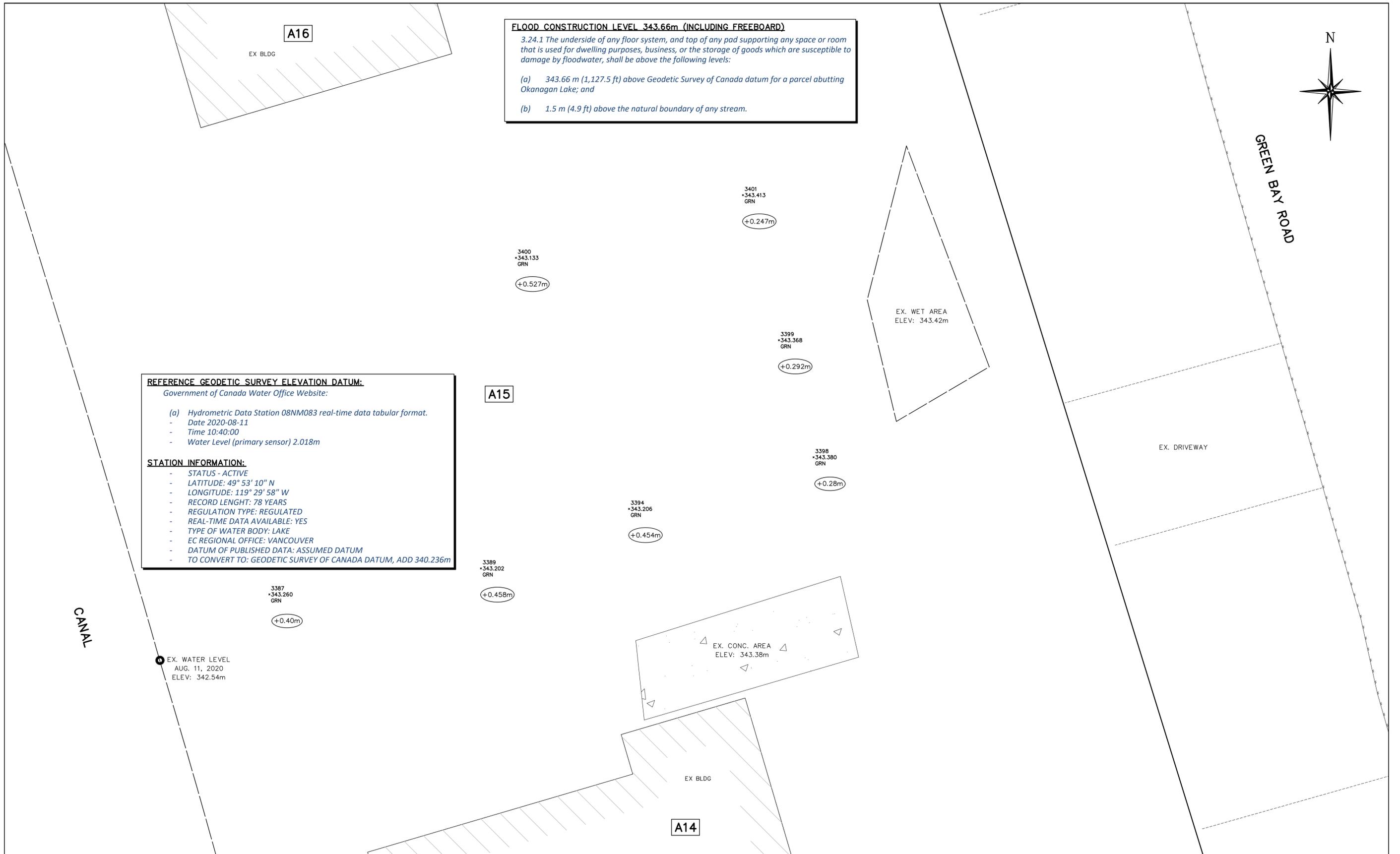


Jennifer Clarke

Reviewed by J. Clarke, PGeo



Figure 1 – 1375 Green Bay Road and Pad 15A



| <p>LEGEND</p> <p>CABLE TV -----] CAP</p> <p>GAS -----] CATCH BASIN</p> <p>SAN. SEWER -----] ELECTRICAL BOX</p> <p>STORM SEWER -----] HYDRANT</p> <p>U.G. ELECTRICAL -----] VALVE</p> <p>U.G. TELEPHONE -----] LAMP STANDARD</p> <p>WATER -----]</p> | <p>○ SAN# SANITARY MH (EXISTING OR FUTURE)</p> <p>● SAN# SANITARY MH (PROPOSED)</p> <p>○ STM# STORM MH (EXISTING OR FUTURE)</p> <p>● STM# STORM MH (PROPOSED)</p> <p>☒ TRANSFORMER</p> <p>☒ UTILITY JUNCTION BOX</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No.</th> <th>MM/DD/YY</th> <th>DATE</th> <th>BY</th> <th>REVISION</th> <th>Chk'd</th> <th>No.</th> <th>MM/DD/YY</th> <th>DATE</th> <th>BY</th> <th>REVISION</th> <th>Chk'd</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table> | No. | MM/DD/YY | DATE | BY | REVISION | Chk'd | No. | MM/DD/YY | DATE | BY | REVISION | Chk'd | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | <p>DAVID K.Y. MORI, P.ENG.</p> | <p>DRAWN K.W.</p> <p>DESIGN P.A.C.E.</p> <p>APPROVED D.K.Y.M.</p> <p>DATE AUG. 20, 2020</p> <p>SCALE 1:50</p> | <p>D.E. Pilling & ASSOC.</p> <p>CONSULTING ENGINEERING</p> <p>#200-540 Groves Avenue, Kelowna, B.C. V1Y 4Y7 Ph: 250.763.2315 Fx: 250.763.6559 E: reception@pilling.ca</p> <p>GREEN BAY LANDING INC.</p> <p>LOT PAD 15A SURVEY</p> | <p>DRAWING NO.</p> <p>1886-15A</p> <p>REV. NO.</p> <p>0</p> |
|---|--|--|-----|----------|-------|-----|----------|-------|-----|----------|-------|----|----------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------------------|---|---|---|
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Figure 2 - Ground elevations at Pad 15A

Appendix A

EGBC Flood Guidelines Flood Assurance Statement

FLOOD ASSURANCE STATEMENT

Note: This statement is to be read and completed in conjunction with the current Engineers and Geoscientists BC *Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC* ("the guidelines") and is to be provided for flood assessments for the purposes of the *Land Title Act*, *Community Charter*, or the *Local Government Act*. Defined terms are capitalized; see the Defined Terms section of the guidelines for definitions.

To: The Approving Authority
City of West Kelowna

Date: October 10, 2020

2760 Cameron Road, West Kelowna, BC V1Z 2T6

Jurisdiction and address

With reference to (CHECK ONE):

- Land Title Act* (Section 86) – Subdivision Approval
- Local Government Act* (Part 14, Division 7) – Development Permit
Community Charter (Section 56) – Building Permit
- Local Government Act* (Section 524) – Flood Plain Bylaw Variance
- Local Government Act* (Section 524) – Flood Plain Bylaw Exemption

For the following property ("the Property"):

Lot B, Plan KAP76165, DL 523, ODYD - Pad 15A

Legal description and civic address of the Property

The undersigned hereby gives assurance that he/she is a Qualified Professional and is a Professional Engineer or Professional Geoscientist who fulfils the education, training, and experience requirements as outlined in the guidelines.

I have signed, sealed, and dated, and thereby certified, the attached Flood Assessment Report on the Property in accordance with the guidelines. That report and this statement must be read in conjunction with each other. In preparing that Flood Assessment Report I have:

[CHECK TO THE LEFT OF APPLICABLE ITEMS]

- 1. Consulted with representatives of the following government organizations:
City of West Kelowna Planning Staff
- 2. Collected and reviewed appropriate background information
- 3. Reviewed the Proposed Development on the Property
- 4. Investigated the presence of Covenants on the Property, and reported any relevant information
- 5. Conducted field work on and, if required, beyond the Property
- 6. Reported on the results of the field work on and, if required, beyond the Property
- 7. Considered any changed conditions on and, if required, beyond the Property
- 8. For a Flood Hazard analysis I have:
 - 8.1 Reviewed and characterized, if appropriate, Flood Hazard that may affect the Property
 - 8.2 Estimated the Flood Hazard on the Property
 - 8.3 Considered (if appropriate) the effects of climate change and land use change
 - 8.4 Relied on a previous Flood Hazard Assessment (FHA) by others
 - 8.5 Identified any potential hazards that are not addressed by the Flood Assessment Report
- 9. For a Flood Risk analysis I have:
 - 9.1 Estimated the Flood Risk on the Property
 - 9.2 Identified existing and anticipated future Elements at Risk on and, if required, beyond the Property
 - 9.3 Estimated the Consequences to those Elements at Risk

FLOOD ASSURANCE STATEMENT

10. In order to mitigate the estimated Flood Hazard for the Property, the following approach is taken:

- 10.1 A standard-based approach
- 10.2 A Risk-based approach
- 10.3 The approach outlined in the guidelines, Appendix F: Flood Assessment Considerations for Development Approvals
- 10.4 No mitigation is required because the completed flood assessment determined that the site is not subject to a Flood Hazard

11. Where the Approving Authority has adopted a specific level of Flood Hazard or Flood Risk tolerance, I have:

- 11.1 Made a finding on the level of Flood Hazard or Flood Risk on the Property
- 11.2 Compared the level of Flood Hazard or Flood Risk tolerance adopted by the Approving Authority with my findings
- 11.3 Made recommendations to reduce the Flood Hazard or Flood Risk on the Property

12. Where the Approving Authority has not adopted a level of Flood Hazard or Flood Risk tolerance, I have:

- 12.1 Described the method of Flood Hazard analysis or Flood Risk analysis used
- 12.2 Referred to an appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk
- 12.3 Made a finding on the level of Flood Hazard or Flood Risk tolerance on the Property
- 12.4 Compared the guidelines with the findings of my flood assessment
- 12.5 Made recommendations to reduce the Flood Hazard or Flood Risk

- 13. Considered the potential for transfer of Flood Risk and the potential impacts to adjacent properties
- 14. Reported on the requirements for implementation of the mitigation recommendations, including the need for subsequent professional certifications and future inspections.

Based on my comparison between:

[CHECK ONE]

- The findings from the flood assessment and the adopted level of Flood Hazard or Flood Risk tolerance (item 11.2 above)
- The findings from the flood assessment and the appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk tolerance (item 12.4 above)

I hereby give my assurance that, based on the conditions contained in the attached Flood Assessment Report:

[CHECK ONE]

- For subdivision approval, as required by the *Land Title Act* (Section 86), "that the land may be used safely for the use intended":
 - [CHECK ONE]
 - With one or more recommended registered Covenants.
 - Without any registered Covenant.
- For a development permit, as required by the *Local Government Act* (Part 14, Division 7), my Flood Assessment Report will "assist the local government in determining what conditions or requirements it will impose under subsection (2) of this section [Section 491 (4)]".
- For a building permit, as required by the *Community Charter* (Section 56), "the land may be used safely for the use intended":
 - [CHECK ONE]
 - With one or more recommended registered Covenants.
 - Without any registered Covenant.
- For flood plain bylaw variance, as required by the *Flood Hazard Area Land Use Management Guidelines* and the *Amendment Section 3.5 and 3.6* associated with the *Local Government Act* (Section 524), "the development may occur safely".
- For flood plain bylaw exemption, as required by the *Local Government Act* (Section 524), "the land may be used safely for the use intended".

FLOOD ASSURANCE STATEMENT

I certify that I am a Qualified Professional as defined below.

October 10, 2020
Date

Dobson Engineering Ltd.
Prepared by

Don Dobson, PEng
Name (print)



Signature

5087 Seon Crescent
Address
Kelowna, BC V1W 5G8

250-878-4502
Telephone

ddobson@dobsoneng.com
Email

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

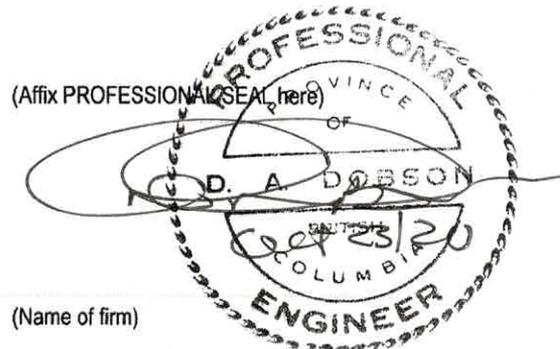
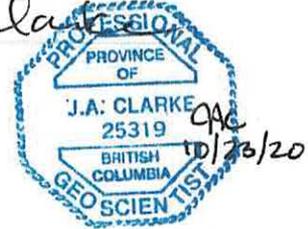
I am a member of the firm Dobson Engineering Ltd.
and I sign this letter on behalf of the firm.

Clarke Geoscience Ltd.
Reviewed by

Jennifer Clarke, PGeo
Name (print)



Signature



(Affix PROFESSIONAL SEAL here)

(Name of firm)