



DEVELOPMENT PERMIT

NO. **DP- 2018-17 (Geotech)**

TO: **Bayside Studios Inc.**

ADDRESS: **#524 – 2288 West Broadway
Vancouver, B.C. V6K 0V3
(Permittee)**

- 1) This Development Permit is issued subject to compliance with all of the Bylaws of the Town of Gibsons applicable thereto, except those specifically varied or supplemented by this Permit.
- 2) The Development Permit applies to those "lands" within the Town of Gibsons described below:

Parcel Identifier: 004-236-939

Legal Description: Lot A, Block 16, District Lot 685, Plan 7109

Civic Address: 505 Gower Point Road
- 3) These lands are within Development Permit Areas of the Town of Gibsons Official Community Plan (Bylaw 985, 2005). This permit applies to the following Development Permit Area:
 - Development Permit Area No. 1 (Geotechnical Hazards) for the purpose of protection of development from hazardous conditions.
- 4) The "land" described herein shall be developed strictly in accordance with the terms and conditions and provisions of this Permit, and any plans and specifications attached to this Permit which shall form a part thereof; specifically:
 - Geotechnical Memorandum, dated November 23, 2018, by Boundary Consulting Services Ltd., stamped by Benjamin A. Smale, P.Eng., Geotechnical Engineer.
 - Appendix J: Flood Hazard and Risk Assurance Statement, dated November 23, 2018, by Boundary Consulting Services Ltd., stamped by Benjamin Smale, P.Eng.
- 5) All requirements of the plan(s) are to be followed. On site monitoring by the Geotechnical Engineer during construction as outlined in the plan(s) is required.
- 6) Minor changes to the aforesaid drawings that do not affect the intent of this Development Permit are permitted only with the approval of the Town of Gibsons and Geotechnical Engineer.
- 7) If the Permittee does not commence the development permitted by this Permit within twenty four months of the date of this Permit, this Permit shall lapse.

- 8) Upon completion of the works, a letter from a qualified professional is required to confirm all conditions of this permit were met.
- 8) This Permit is NOT a Building Permit.

ISSUED THIS 26th DAY OF JULY, 2019.

A handwritten signature in blue ink, appearing to read 'LAS', with a long horizontal line extending to the right.

Lesley-Ann Staats, RPP
Director of Planning

Copy of permit to Boundary Consulting Services Ltd.



MEMORANDUM

To:	Jesse Waldorf	Date:		November 23, 2018	
		Project No:		BCS-0014	
Company:	-	T.	604.740.0424	F.	-
		E.	Jesse.spanidev@gmail.com		
Cc:	-	T.	-	F.	-
		E.	-		
From:	Ben Smale	T.	604.989.0031	F.	-
		E.	smale.benjamin@gmail.com		
Subject:	Flood Review – Building Extension 505 Gower Point Road, Gibsons, BC				

PLEASE CALL IF YOU EXPERIENCE ANY DIFFICULTIES IN RECEIVING THIS DOCUMENT.

This message is intended only for the confidential use of the individual or entity to which it is addressed. Any Distribution, copying, or disclosure is strictly prohibited. If you have received this message in error, please notify us immediately by telephone and destroy the original without making a copy. Thank you.

BOTTOM LINE UP FRONT

Based on the information and analysis described in this report, the proposed extension may be considered safe for intended use from a geotechnical hazard standpoint to the 1 in 200 year return period relevant for river flooding. The site is not subject to other hazards such as debris flow or debris flood, as described above.

SCOPE

Boundary Consulting Services Ltd. (Boundary Consulting) presents this memo providing the results of a recent flood review for a building extension located in a hotel building at 505 Gower Point Road, Gibsons, BC. The intent of this flood review is provide the owner, developer, and approving authority with the information required to evaluate the risk to the building extension from geotechnical hazard – specifically with respect to potential flooding from Charman Creek. This document intended to satisfy the requirements for the Town of Gibsons Development Permit Area 2 “Low Geotechnical Hazards”, specifically with respect to flooding in Charman Creek. This document has been prepared in accordance with general engineering practices and principles in British Columbia and in accordance with the Engineers and Geoscientists of British Columbia *Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate in BC, 2012*.

The scope of work for this project includes:

1. A field review of the proposed building extension and the mapped Charman Creek floodplain area. This includes review of critical drainage infrastructure managed by the Town of Gibsons.



2. A desktop study to review the available reference data for analysis including previous flood assessment reports, flow monitoring data, topographic maps, geological maps, and other reference resources.
3. A memo report summarizing the results of the field review and desktop study identifying the potential risk of the development to flooding. This report includes evaluation of safety for use, in conjunction with Town of Gibsons and EGBC guidelines.

The scope of work for this flood assessment does not include;

1. Risk assessment of engineering aspects outside of flood impact.
2. Environmental impact assessment risk assessment.

DISCUSSION

The reviewed development is located at 505 Gower Point Road in Gibsons, BC. The proposed development is a building extension to the existing hotel structure. The building extension is comprised of an elevator placed in the centre of the structure. The extension, for the most part, resides within the three dimensional existing building envelope. However, the extension required a small excavation (3 m x 3 m x 0.6 m) and foundation for the elevator bay below the base slab elevation of the existing building.

The reviewed development exists on a rectangular lot with a length and width of 22 m and 88 m, respectively, with an area of 0.29 ha (SCRD, 2018). The lot is bound on its northwestern extent by Gower Point Road, its northeastern extent by Dougall Road, its southeastern extent by multifamily residential development (and Charman Creek), and its southwestern extent by single family residential development. Access to the property is provided through Gower Point Road along the lots northwestern extents.

The site is located in Lower Gibsons – an area of the Town of Gibsons that is located at the base of the slope that comprises the majority of the Town of Gibsons. Lower Gibsons is situated around the Gibsons Harbour which is a sheltered bay at the edge of Howe Sound and the Strait of Georgia. It contains several creek watersheds that collect from Upper Gibsons that flow into Gibsons Harbour. Some of these watersheds are large enough to create potential flood hazard, debris flow hazard, or debris flood hazard. Charman Creek has been identified by the Town of Gibsons as a potential flood hazard (Town of Gibsons, 2015). The basis of this hazard identification is from a hazard assessment performed for the Town of Gibsons in 1991 (Thurber, 1991).

The topography of the area directly relevant to 505 Gower Point Road can be generally described as flat (approximately 2% slope gradient) and slightly sloping from the southwest downward to northeast. The hotel is situated on this flat slope. It is bound on its northeastern extent by a small channel, approximately 2 m in depth and approximately 4 m wide with moderately steep side slopes (approximate slope gradient of 30%). At the time of the site investigation, this channel was mostly dry with a small amount of flow percolating along the channel bed (<1 LPS). The channel adjacent to the site can be described as developed – it has been modified from its natural form to accommodate the



storm flow in Charman Creek. The channel bed can be described as having a concrete finished bed with gravel/vegetation lined sides at the slope angles described above. The overall slope of the channel is between 1% and 6% within the developed extents of Lower Gibsons. Upper extents of the channel varies in slope angle up to 50% slope gradient.

The Charman Creek lies in a lowland watershed that can be described as semi developed. The watershed encompasses an area of approximately 82 ha. The watershed is functionally bound by Gibsons Way to the north, as storm collection in that area of Gibsons is collected and diverted to other locations. The watershed is divisionally split between its upper reaches and lower reaches by the slope that spans Upper Gibsons to Lower Gibsons. The relief between these two reaches is approximately 100 m. The upper reaches are primarily comprised of second growth forest, while the lower reaches are primarily comprised of developed area.

Charman Creek has three potential flooding hazards: debris flow, debris flood, and river flooding. The potential for these different flooding events can be screened using the Melton Ratio equation. To use this equation, the user specifies a critical point in the system to evaluate and compares the ratio between square root of upstream watershed area and upstream watershed relief to a standard chart. Melton Ratios below 0.3 are generally considered not subject to debris flood or debris flow.

For this project, the critical point in the flooding network would be considered to be the intersection between Charman Creek and South Fletcher Road. A debris flow or debris flood in this area would clog critical drainage infrastructure and cause flooding in Lower Gibsons. The following presents the results of this evaluation:

Watershed Area above Critical Point = 82.00 ha, Square Rooted = 9.05 ha
Relief from Critical Point = 100 m
Melton Ratio = 0.09

The results indicate that this project would not be subject to effects from debris flow or debris flood. The remaining hazard, river flood, is typically evaluated based on the results of long-term meteorological and stream monitoring analysis. This information, typically provided by the municipality and not leveraged by private development, could potentially be used to evaluate the potential for the predicted 1 in 200 year event to overtop the creek channel adjacent to the proposed development. An alternative to this analysis is to calculate the approximate flow potential of the upstream channel and downstream channel and compare those results to the channel adjacent to the site. This network criticality analysis provides where a potential flood breakout would occur during design floods.

Due to the developed nature of the lower reaches of the Charman Creek Watershed, any upstream critical breakouts would result in flood flows diverted onto the streets in sheet flow, and eventually into Gibsons Harbour. Any downstream critical breakouts would not affect the subject site as those flows would not cause overland flooding into the subject site.



It is important to note in the following discussion that culvert flow rate calculations are difficult to make without knowing the critical flooding flow rate, water levels, etc. at each culvert location. As an alternative, the maximum flow rate for each culvert is based on the head/diameter charts for each culvert type using the road embankment height as a maximum upstream head level for each culvert. This assumption means that all culverts are considered to be head-limited. This is not an ideal analysis, but at least provides an indication of where critical points exist in the system to evaluate whether or not that critical point exists adjacent to the site or not, and accordingly, whether Charman Creek can flood the building extension.

The layout of Charman Creek in Lower Gibsons can be found in Figure 1. Charman Creek enters Lower Gibsons on South Fletcher Road. The creek crosses Charman Road through a 1200 mm reinforced concrete pipe (RCP) culvert that is half buried and blocked with vegetation (Figure 2). The creek continues east through Beach Comber Lane Where it passes through a 900 mm corrugated steel pipe (CSP) culvert that is relatively free and clear for full pipe flow (Figure 3). The stream then flows northeast to cross Glassford Road through a 900 mm CSP culvert that is relatively free and clear for full pipe flow (Figure 4). The creek passes by the site in the creek channel aforementioned in this document. From there, the creek continues northwest to cross Dougall Road through a 900 mm CSP culvert that is relatively free and clear for full pipe flow (Figure 5). The creek beyond this point becomes very constricted and delineated and eventually flows into Gibsons Harbour.

The maximum calculated flow rates of each culvert is provided in Table 1. This is combined with the flow rate data provided by the Town of Gibsons in a study performed in 2017 (Skye Consulting, 2017). This consulting report also contains the stage/discharge curve for the creek immediately adjacent to the subject site. The maximum flow rate based on this stage/discharge is also provided in the table. This report does not provide the potential flood levels in the creek as not enough information is available at this time to predict the 1 in 200 year flood event.

Table 1: Charman Creek critical flow rate data.

Description	Flow Rate (LPS)
Maximum Observed Flow Rate near Site (2016/2017)	1,593
Maximum Calculated Flow Rate of Creek near Site	2,250
Maximum Calculated Flow Rate of South Fletcher Culvert	1,900
Maximum Calculated Flow Rate of Beachcomber Culvert	1,900
Maximum Calculated Flow Rate of Glassford Culvert	2,000
Maximum Calculated Flow Rate of Dougall Culvert	1,900

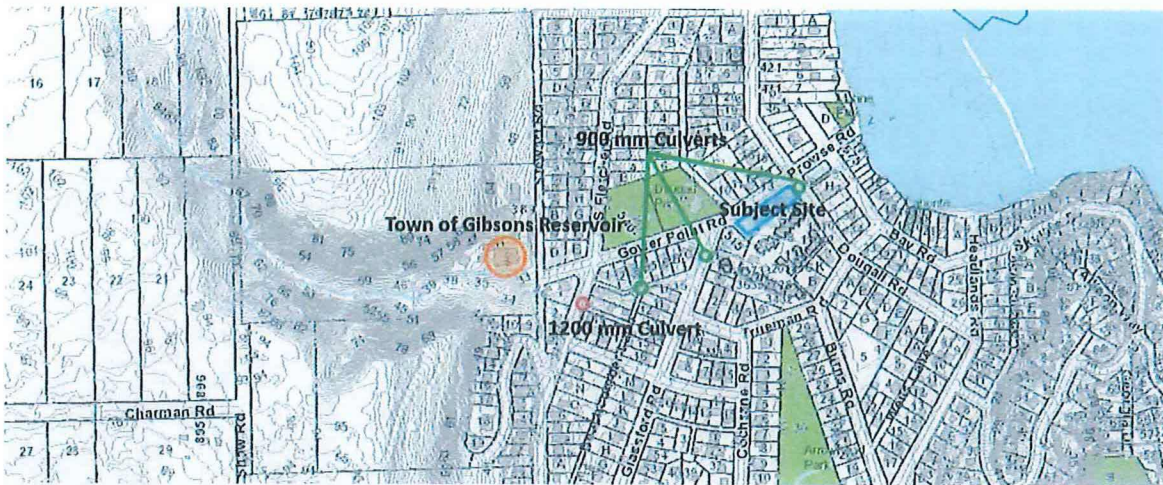


Figure 1: Charman Creek layout in Lower Gibsons.

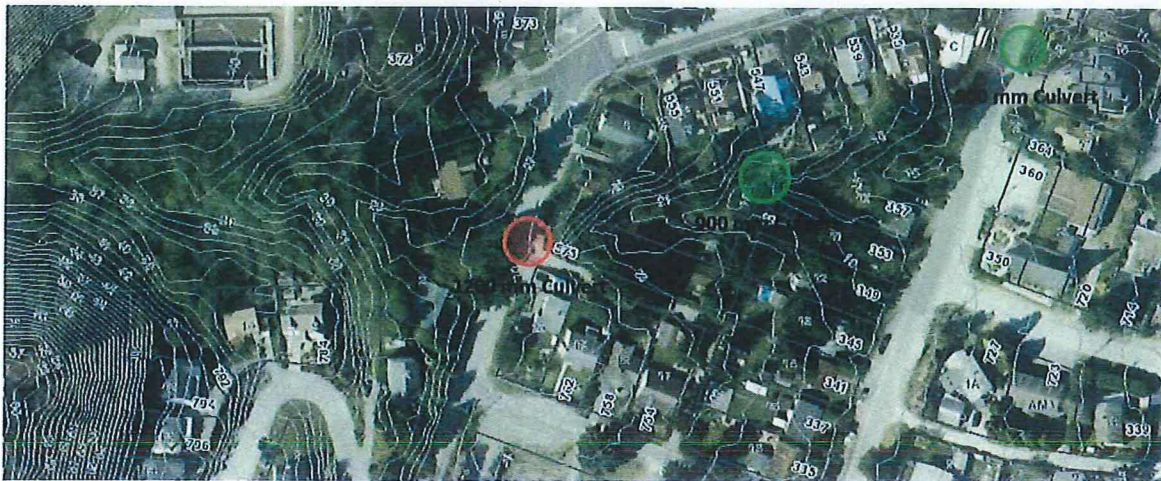


Figure 2: Culvert crossing on South Fletcher Road.



Figure 3: Culvert crossing on Beachcomber Lane.



Figure 4: Culvert crossing on Glassford Road.



900 W 11th Avenue

Subject Site

[illegible]

The information provided in Table 1 indicates that the critical point in the system is currently the culvert crossing at South Fletcher Road. If the creek were to flood at this point, it would cross South Fletcher Road and likely be carried in overland flow to the northeast. If this culvert were to be cleared, the next most critical point would be the Beachcomer Lane culvert. Since this culvert is already free and clear for flow, it would become the most critical point in the system until it is upgraded. Flooding at Beachcomer Lane would not likely impact the subject site. As-built, the culverts in Charman Creek carry less capacity than the channel adjacent to the subject site. Accordingly, flood potential at the subject site is controlled by the Town of Gibsons. It is reasonable to assume that the Town will remain faithful stewards of this drainage network, and any changes to culvert capacity will be made with due consideration to downstream impacts on developed sites such as the subject site.



Based on the information and analysis described in this report, the proposed extension may be considered safe for intended use from a geotechnical hazard standpoint to the 1 in 200 year return period relevant for river flooding. The site is not subject to other hazards such as debris flow or debris flood, as described above.

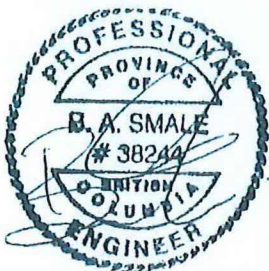
LIMITATIONS

This report is based on the information provided by the Owner and/or the Owner's Agent. Boundary Consulting cannot accept responsibility for inaccuracies, misstatements, omissions and/or deficiencies in this report resulting from the sources of this information.

CLOSURE

We hope that this document contains the relevant information required at this time. If further information is required, please do not hesitate to contact our office.

Sincerely,
Boundary Consulting Services Ltd.



Benjamin A. Smale, P.Eng.
Geotechnical Engineer

APPENDIX J: FLOOD HAZARD AND RISK ASSURANCE STATEMENT

Note: This Statement is to be read and completed in conjunction with the "APEGBC Professional Practice Guidelines - Legislated Flood Assessments in a Changing Climate, March 2012 ("APEGBC Guidelines") and is to be provided for flood assessments for the purposes of the Land Title Act, Community Charter or the Local Government Act. Italicized words are defined in the APEGBC Guidelines.

To: The Approving Authority

Date:

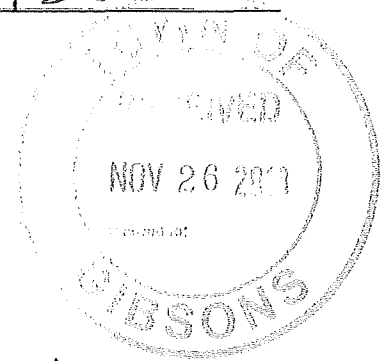
Town of Gibsons

2015/11/23

Jurisdiction and address

With reference to (check one):

- ☒ Land Title Act (Section 86) – Subdivision Approval
- ☒ Local Government Act (Sections 919.1 and 920) – Development Permit
- ☐ Community Charter (Section 56) – Building Permit
- ☐ Local Government Act (Section 910) – Flood Plain Bylaw Variance
- ☐ Local Government Act (Section 910) – Flood Plain Bylaw Exemption



For the Property:

505 Cove Point Road, Gibsons, BC (PID 604-236-937)

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*.

I have signed, sealed and dated, and thereby certified, the attached flood assessment report on the Property in accordance with the APEGBC Guidelines. That report must be read in conjunction with 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* 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 *flood hazard analysis* or *flood risk analysis* I have:
 - ☒ 6.1 reviewed and characterized, if appropriate, floods that may affect the Property
 - ☒ 6.2 estimated the *flood hazard* or *flood risk* on the property
 - ☒ 6.3 included (if appropriate) the effects of climate change and land use change
 - ☒ 6.4 identified existing and anticipated future *elements at risk* on and, if required, beyond the Property
 - ☒ 6.5 estimated the potential *consequences* to those *elements at risk*
- ☐ 7. Where the *Approving Authority* has adopted a specific level of *flood hazard* or *flood risk* tolerance or return period that is different from the standard 200-year return period design criteria⁽¹⁾, I have
 - ☐ 7.1 compared the level of *flood hazard* or *flood risk* tolerance adopted by the *Approving Authority* with the findings of my investigation
 - ☐ 7.2 made a finding on the level of *flood hazard* or *flood risk* tolerance on the Property based on the comparison
 - ☐ 7.3 made recommendations to reduce the *flood hazard* or *flood risk* on the Property

⁽¹⁾ *Flood Hazard Area Land Use Management Guidelines* published by the BC Ministry of Forests, Lands, and Natural Resource Operations and the 2009 publication *Subdivision Preliminary Layout Review – Natural Hazard Risk* published by the Ministry of Transportation and Public Infrastructure. It should be noted that the 200-year return period is a standard used typically for rivers and purely fluvial processes. For small creeks subject to debris floods and debris flows return periods are commonly applied that exceed 200 years. For life-threatening events including debris flows, the Ministry of Transportation and Public Infrastructure stipulates in their 2009 publication *Subdivision Preliminary Layout Review – Natural Hazard Risk* that a 10,000-year return period needs to be considered.

8. Where the Approving Authority has not adopted a level of flood risk or flood hazard tolerance I have:

- ☒ 8.1 described the method of flood hazard analysis or flood risk analysis used
- ☒ 8.2 referred to an appropriate and identified provincial or national guideline for level of flood hazard or flood risk
- ☒ 8.3 compared this guideline with the findings of my investigation
- ☒ 8.4 made a finding on the level of flood hazard or flood risk tolerance on the Property based on the comparison
- ☒ 8.5 made recommendations to reduce flood risks

☒ 9. Reported on the requirements for future inspections of the Property and recommended who should conduct those inspections. *Not required,*

Based on my comparison between

Check one

- ☐ the findings from the investigation and the adopted level of flood hazard or flood risk tolerance (Item 7.2 above)
- ☒ the appropriate and identified provincial or national guideline for level of flood hazard or flood risk tolerance (Item 8.4 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* (Sections 919.1 and 920), my report will "assist the local government in determining what conditions or requirements under [Section 920] subsection (7.1) it will impose in the 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 registered covenants.
- ☐ without any registered covenant.
- ☐ for flood plain bylaw variance, as required by the *Flood Hazard Area Land Use Management Guidelines* associated with the *Local Government Act* (Section 910), "the development may occur safely".
- ☐ for flood plain bylaw exemption, as required by the *Local Government Act* (Section 910), "the land may be used safely for the use intended".

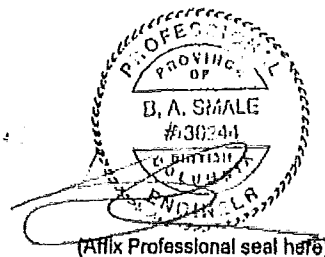
Name (print)

Signature

Address

Telephone

Date



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

I am a member of the firm Boundary Consulting Services Ltd.
and I sign this letter on behalf of the firm.

(Print name of firm)