

DISTRICT OF WEST VANCOUVER
750 17TH STREET, WEST VANCOUVER BC V7V 3T3

7.

COUNCIL REPORT

Date:	October 1, 2021
From:	Kaelin Koufogiannakis, Assistant Planner
Subject:	Proposed Rezoning and Development Variance Permit for 2870 Bellevue Avenue
File:	1010-20-21-078

RECOMMENDATION

THAT proposed “Zoning Bylaw No. 4662, 2010, Amendment Bylaw No. 5161, 2021” be read a first time.

RECOMMENDATION

THAT proposed “Zoning Bylaw No. 4662, 2010, Amendment Bylaw No. 5161, 2021” be presented at a Public Hearing scheduled for November 23, 2021 at 6 p.m. at West Vancouver Municipal Hall via electronic communication facilities, and that notice be given of the scheduled Public Hearing.

RECOMMENDATION

THAT proposed Development Variance Permit No. 21-078 be presented at a public meeting scheduled for November 23, 2021 at 6 p.m. at West Vancouver Municipal Hall via electronic communication facilities, to be held concurrently with the Public Hearing scheduled for November 23, 2021 at 6 p.m. at West Vancouver Municipal Hall via electronic communication facilities, and that notice be given of the scheduled public meeting.

1.0 Purpose

The purpose of this report is to:

- Rezone a portion of land from M1 (Marine 1) to RS4 (Single Family Dwelling Zone 4) to consolidate the zoning for the subject site at 2870 Bellevue (**Appendix A**); and
- Provide for variances as part of the single family dwelling proposal to accommodate development relative to the Flood Construction Level through a proposed Development Variance Permit (**Appendix B**).

2.0 Legislation/Bylaw/Policy

Local Government Act

The *Local Government Act* requires that a Public Hearing be held on the proposed rezoning bylaw, in accordance with Sections 464 through 470.

A Development Variance Permit (DVP) may be issued by resolution of Council in accordance with Section 498 of the *Local Government Act*. The DVP is a permit that changes regulation(s) for a particular development site allowing development to proceed or exist in a manner otherwise not allowed by the Zoning Bylaw. A DVP cannot vary the use or density of land, or a floodplain specification.

Community Charter

For development sites that may be subject to flooding, Section 56 of the *Community Charter* authorizes the District's Chief Building Inspector to require a qualified professional report to certify the conditions under which the land may be used safely for the intended use.

Furthermore, on this basis, a building permit may only be issued following the condition that the owner of the land covenants with the municipality to use the land in accordance with the conditions specified in the qualified professional's report. As a result, the District requires that new homes in areas predisposed to flooding events are safe for habitation.

Zoning Bylaw No. 4662, 2010 (as amended)

Due to the accretion of private land along the foreshore, the site at 2870 Bellevue is split-zoned RS4 (Single Family Dwelling Zone 4) and M1 (Marine Zone 1). A rezoning is required to consolidate the zoning of the subject site as RS4.

3.0 Council Strategic Objective(s)/Official Community Plan

Council's Strategic Plan (2020-2021) includes Objective 3.2 to "address the threats of wildfires and floods". More specifically, Council directed staff to prepare a Development Permit Area (DPA) for Coastal Flooding and Foreshore Protection (as directed by Official Community Plan (OCP) policy 2.6.12). When Council considered first reading of the DPA at its June 14, 2021 meeting, Council directed staff to conduct further public consultation which is scheduled to begin on October 12, 2021.

The OCP recognizes that climate change impacts, such as sea level rise and more frequent extreme weather events, are occurring around the world. Policy 2.6.11 supports the development of updated shoreline protection strategies and Flood Construction Level (FCL) requirements to protect lands from sea level rise, reduce shoreline erosion, preserve and enhance habitat. Prior to District-wide shoreline protection strategies and FCL requirements, the subject proposal include development measures that comply with the OCP to address sea level rise and extreme weather events.

4.0 Financial Implications

There are no financial impacts to the District of West Vancouver.

5.0 Background

5.1 Previous Decisions

Although not specific to this site, Council has approved a number of similar DVPs allowing for variances due to FCL requirements, including for 4358 Ross Crescent on January 13, 2020; for 4369 Erwin Drive on July 20, 2020; and for 4428/4430 Ross Crescent on September 13, 2021.

5.2 History

Floodplain Legislation

Section 524 of the *Local Government Act* authorizes the District to designate, as a floodplain, land Council considers may be subject to flooding. Once the District designates land as a floodplain, the District may also specify FCL requirements for that land. In addition, or alternatively, the District can regulate development in areas prone to flooding by establishing one or more Development Permit Areas (DPAs) under Section 488 of the *Local Government Act*.

In the absence of a bylaw designating a floodplain, or a DPA designation, there is no legislated FCL for any particular property in West Vancouver. However, Section 56 of the *Community Charter* specifically authorizes the Chief Building Inspector to require “safe use” certifications, as discussed in Section 2.0 of this report.

6.0 Analysis

6.1 Discussion

Site Context

2870 Bellevue Avenue is a waterfront property with an area of 1,034.6 m². The portion of the site zoned RS4 is 999.2 m² in area while the portion of the site zoned M1 is 35.4 m². There is currently a one-storey single family home located on the site along with a parking pad and accessory building, as seen in Figure 1. The adjacent properties at 2874 and 2866 Bellevue Avenue are occupied by two-storey single family homes built in the 1920s (with later additions / renovations).

The property is generally flat and low lying, between approximately 3 and 7 metres above sea level (ASL), and is therefore subject to flooding due to sea level rise and storm events. There is an existing concrete patio located within the foreshore area, and a short rock wall beyond the property line (Figure 2). In the area, foreshore conditions are characterized by a mix of concrete and rock walls of varying heights (Figure 3).

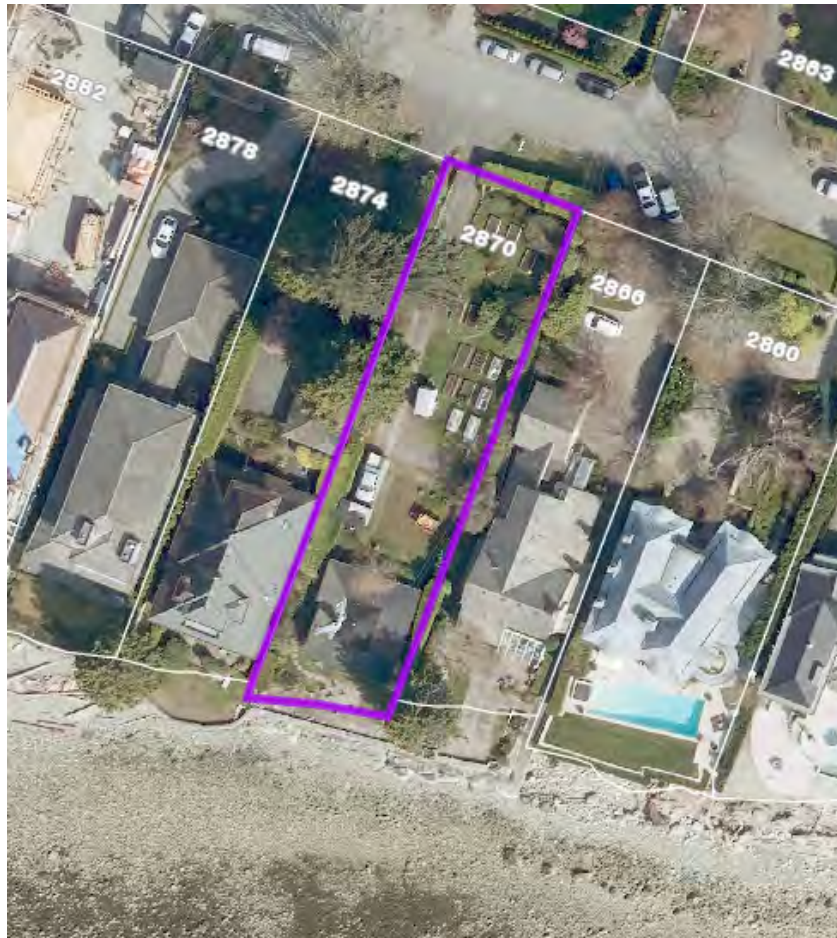


Figure 1 – Subject property



Figure 2 – Existing rock wall and home at 2870 Bellevue



Figure 3 – Existing foreshore conditions in the area

Flood Construction Level (FCL)

Coastal engineers, Westmar Advisors, Inc., determined the flood hazard protection measures applicable to the property. The protection measures incorporate (1) raising of the grade of the site to construct the main level of the dwelling above the FCL to ensure safe use of the property, (2) retention of the existing foreshore rock wall and construction of a reinforced concrete retaining wall around the basement, and (3) incorporation of safe means of egress from the basement.

The coastal engineer determined the FCL for the subject site to be 6.4 m Canadian Geodetic Datum (CGD). The flood hazard report and FCL calculation methodology are included as Schedule C of **Appendix B**.

Proposal Overview

The applicant proposes to build a new two-storey single-family home above the FCL of 6.4 m, as well as a basement constructed within a reinforced concrete retaining wall below the FCL (Figure 4). The DVP (**Appendix B**) includes a condition ensuring a qualified professional certifies the basement “floodproof” per the recommendations of the flood hazard report, prior to the issuance of a building permit.

While the proposal includes a pool and terraces in the rear yard, the existing structures located on the public foreshore are proposed to remain and not be altered (Figures 4 and 5).

The increased elevation of the site has been designed through stepped retaining walls along the neighbouring lots east and west of the site. Landscaping and impacts on neighbours have been considered throughout the design and review process, and are addressed further

below. Renderings of the proposed building are shown in Figure 6. The architectural package detailing the proposal can be found in Schedule A of **Appendix B**.

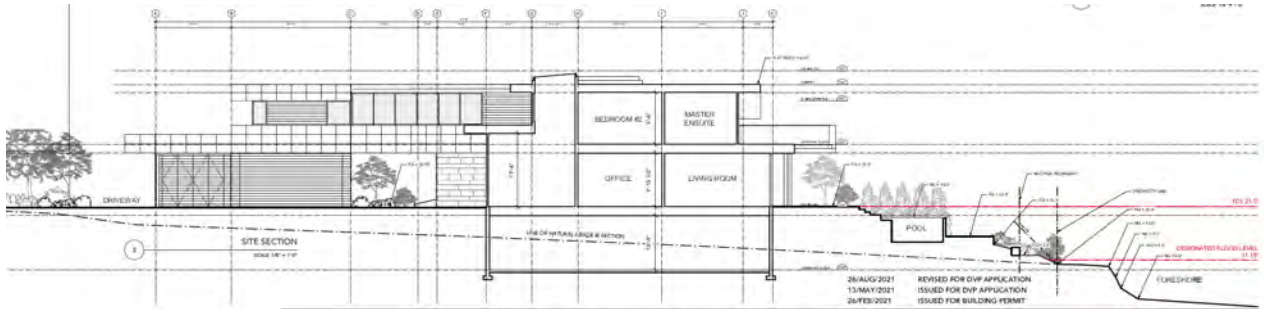


Figure 4 – Section view looking east



Figure 5 – Landscape plan



Figure 6 – Renderings from street view (left) & foreshore view (right)

Proposed Variances

The average natural grade for the site is 4.8 m, while the FCL is 6.4 m. The proposed variances are required to allow calculation of average grade to be based on the FCL for the purposes of building height, highest building face and for basement exemption calculations. Retaining wall height is also proposed to be varied to allow for a stepped transition up to the required FCL.

- *Single Family Dwelling Height:* The RS4 zone stipulates a maximum building height of 7.62 m, measured from the lower of average natural (i.e. existing) or finished grade. The proposed home is 6.86 m in height (above the FCL). This results in a modest difference of 0.86 m between the height allowed under current zoning and the proposed height. The proposed height is 0.24 m below the roof peak of the home to the west, and 1.8 m above the roof peak of the home to the east.
- *Highest Building Face:* The RS4 zone stipulates a maximum highest building face envelope of 6.7 m. The proposed variance will allow the Highest Building Face to be measured from the FCL, resulting in a difference of approximately 2.0 m for the rear façade. As this building elevation faces the foreshore it would not have an impact on the adjacent sites.
- *Basement Floor Area Ratio (FAR) Exemption:* Under Section 130.08(3) of the Zoning Bylaw, an underground basement can be fully or partially exempted from FAR, in part based on the average grade. Under current zoning regulations, only about half of the proposed basement would be able to be exempted. The proposed variance would allow the basement exemption to be calculated using the FCL, resulting in 100% exemption from FAR.
- *Retaining Walls:* Retaining walls are measured from lower of natural or finished grade. In order to accommodate terracing of the site to achieve the required FCL for the proposed houses, retaining walls are proposed. The proposed variances to Sections 120.22 and 130.13 of the Zoning Bylaw would allow for the retaining walls as shown in the plans attached to the DVP. No retaining wall will exceed 1.2 m exposed height.

Staff support the proposed variances for building height, highest building face envelope, basement FAR exemption, and retaining walls. The increase in grade surrounding the dwelling is needed to achieve the FCL that is necessary to protect this site that is subject to flooding.

Impact on Neighbours

Design considerations have been made by the applicant to minimize the difference in building height compared to neighbouring properties. The proposed house is designed with a flat roof 6.86 m above the FCL,

resulting in an elevation height of 13.26 m ASL. Figure 7 shows the rooflines and height comparison of the four neighbouring properties.

Property	Elevation roof peak height	
	<i>Imperial</i>	<i>Metric</i>
2860 Bellevue (A)	46.5 ft.	14.17 m
2866 Bellevue (B)	37.6 ft.	11.46 m
2874 Bellevue (C)	44.3 ft.	13.50 m
2878 Bellevue (D)	42.0 ft.	12.81 m
Average of the A-D	42.6 ft.	12.99 m
2870 Bellevue (Proposed)	43.5 ft.	13.26 m
Average Difference in Height	0.9 ft.	0.27 m

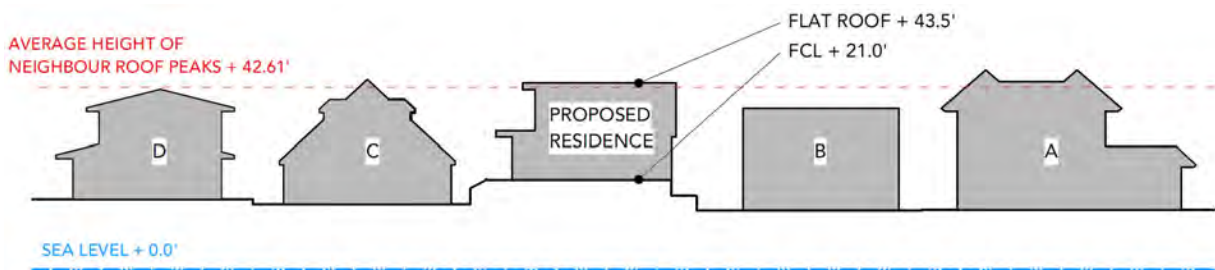


Figure 7 – Height of neighbouring properties

The interface with neighbours on the east and west sides has been designed to provide a transition with landscaping and retaining walls terracing up from the side property lines with no retaining wall exposed greater than the 1.2 metre height limit (Figure 8). The proposal has incorporated setbacks and landscaping to improve privacy in the side yards, with a larger side setback on the west side where the neighbouring home has a smaller side setback. Balconies are located primarily on the south face of the building (toward the waterfront).

No trees are being removed to accommodate the proposal, and the tree and planting plan includes a considerable re-planting scheme throughout the site that will provide additional greenery and privacy to neighbours (Figure 5 and Schedule B of **Appendix B**).

Stormwater management requirements will be addressed in detail through the building permit process to ensure that neighbouring properties are protected from stormwater runoff and flooding. The DVP (**Appendix B**) includes a condition ensuring standard building permit requirements are met, with the provision of a stormwater management plan integrated with a landscape plan, in advance of the approval of a building permit.

The stormwater management plan will be required to be prepared by a qualified professional, approved by the District’s Land Development

Engineer, and demonstrate that surface runoff is retained on the subject property and managed in accordance with the District's onsite stormwater management criteria.

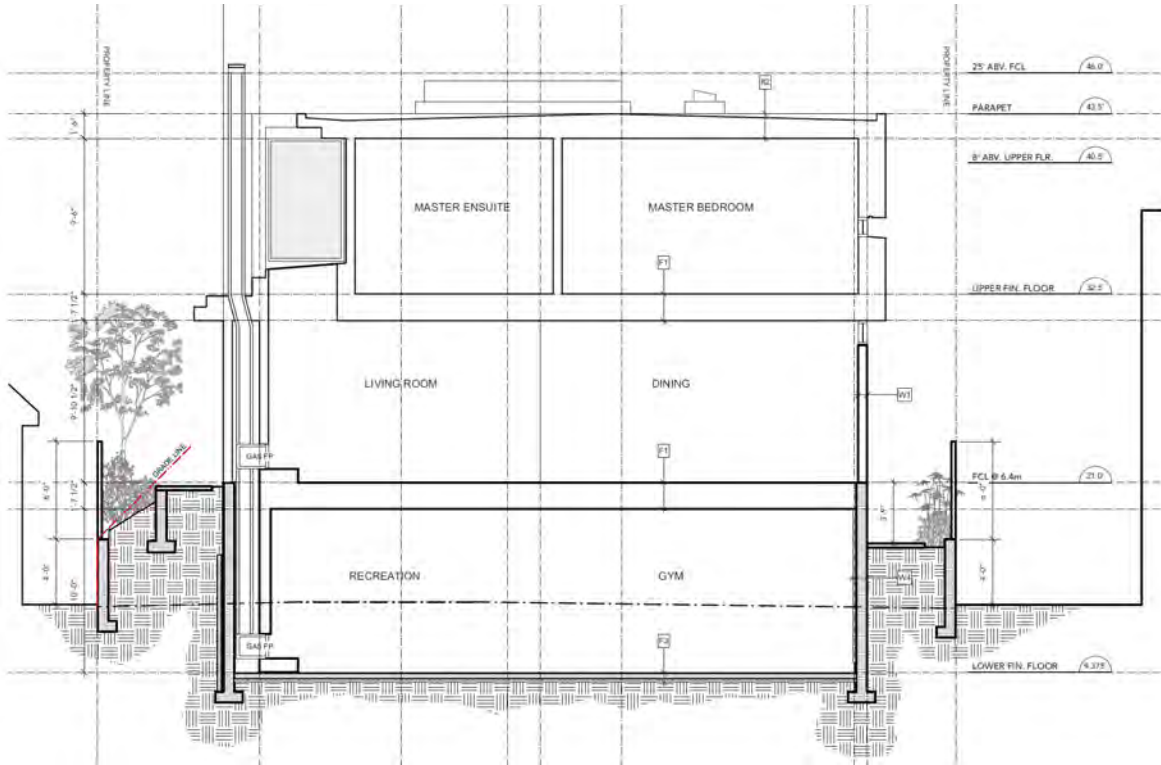


Figure 8 – Section view looking north

Zoning Amendment

The zoning amendment is proposed to allow rezoning of a portion of the site (35.4 m²) along the foreshore from M1 to RS4 to consolidate the zoning across the whole site (**Appendix A**). Generally, the M1 zone is intended to apply public foreshore lands, not private residential lands. The owner wishes to rezone the portion of accreted land to allow residential use of the area (such as garden and landscaping) and for a slightly greater allowed floor area and site coverage for the proposed house.

The waterfront setback regulations of Section 130.13 of the Zoning Bylaw would still apply, ensure that the rear setback of the home is measured from the original natural boundary (the previously existing waterfront property line prior to accretion).

Staff support the proposed zoning amendment as it:

- Consolidates the site under a single residential zone;
- Is consistent with nearby properties where land has been accreted, and

- Does not allow the proposed house location to move closer to the waterfront, as the waterfront setback remains measured from the previously existing waterfront property line.

Community Amenity Contributions

New developments where rezoning is proposed are typically expected to deliver Community Amenity Contributions (CACs) intended to address the growth related impacts of new development. The value of the amenity is expected to be proportional to the increased potential of land use in comparison with existing zoning. In this case, the accretion of land is where private land is increased due to natural processes along the foreshore. If the site were created today, the M1 zoned portion would not exist (i.e. the whole site would be zoned RS4) as this zone is intended to apply public foreshore lands. Secondly, it is noted that there are no growth related impacts as the proposal is for a single family house which can already be developed on the existing parcel (i.e. no increase in residential units). Therefore, staff do not recommend a CAC for the proposed rezoning.

6.2 Sustainability

The OCP identifies numerous directions to enable the District to become more resilient from social, economic, and environmental perspectives. The proposed variances would allow the proposed home to be constructed at the required FCL, protecting the subject property from future storm events and sea level rise. The proposed home will be required to attain Step Code requirements as outlined in the building bylaw.

Additionally, no trees are proposed to be removed during development, and new planting is proposed including 29 trees and over 300 shrubs (see Schedule B of **Appendix B**). The substantial plantings will help groundwater infiltration, foster biodiversity, and provide a more sustainable alternative to sod lawns.

6.3 Public Engagement and Outreach

Preliminary Consultation

In May 2021, prior to submission, the applicant conducted public consultation and shared the proposal with property owners nearby the site. There were 17 letters of support provided from neighbours, including the directly adjacent property owners at 2866 and 2874 Bellevue Avenue.

Notification

Following first reading of the proposed bylaw and scheduling a Public Hearing by Council, staff will give notification of the Public Hearing and the proposed DVP consistent with District policy and legislated requirements to property owners, businesses, and residents. The applicant will also advertise and host virtual public engagement as required by the Development Procedures Bylaw No. 4940, 2017.

Website

In alignment with current practice, a description of the proposal is available online. Applicable dates will be updated should the proposal advance.

6.4 Other Communication, Consultation, and Research

Planning staff has consulted with District staff on the application and proposed conditions are included in the proposed DVP addressing staff comments.

7.0 Options

7.1 Recommended Option

- a) Give first reading to the proposed Zoning Amendment Bylaw and consider the Development Variance Permit concurrently with the zoning amendment.

7.2 Considered Options

- b) Give first reading to the proposed bylaw and set an alternate date for the Public Hearing (to be specified); or
- c) Request further information (to be specified) to assist in consideration of the application; or
- d) Reject the application.

8.0 Conclusion

If adopted, the proposed rezoning would consolidate the zoning for the subject site, while the DVP would accommodate the site's redevelopment in order to mitigate future impacts of flooding. The proposal is supported by OCP policy for sites adjacent to the foreshore, and is based on coastal engineering specifications of the flood hazard report submitted as part of the application.

Potential impacts on neighbouring properties have been addressed through design, landscaping, and stormwater management planning that will be required prior to construction. Early applicant-led consultation with neighbours indicated support from adjacent property owners. Staff support the proposal and recommend that Council give the proposed Zoning Amendment Bylaw first reading and schedule DVP No. 21-078 for consideration.

Date: October 1, 2021
From: Kaelin Koufogiannakis, Assistant Planner
Subject: Proposed Rezoning and Development Variance Permit for 2870 Bellevue

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Author: 
Kaelin Koufogiannakis, Assistant Planner

Concurrence: 
Michelle McGuire, Senior Manager of Current Planning and Urban Design

Appendices:

A – Zoning Bylaw No. 4662, 2010, Amendment Bylaw No. 5161, 2021

B – Proposed Development Variance Permit No. 21-078



District of West Vancouver

**Zoning Bylaw No. 4662, 2010,
Amendment Bylaw No. 5161, 2021**
(2870 Bellevue Avenue)

Effective Date:

District of West Vancouver

Zoning Bylaw No. 4662, 2010, Amendment Bylaw No. 5161, 2021

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District of West Vancouver

Zoning Bylaw No. 4662, 2010, Amendment Bylaw No. 5161, 2021

A bylaw to rezone a portion of land located at 2870 Bellevue Avenue to RS4.

Previous amendments: Amendment bylaws 4672, 4677, 4678, 4679, 4689, 4701, 4680, 4710, 4697, 4716, 4712, 4737, 4726, 4736, 4757, 4752, 4767, 4787, 4788, 4784, 4772, 4791, 4805, 4809, 4828, 4854, 4873, 4866, 4895, 4839, 4898, 4927, 4944, 4905, 4974, 4967, 4982, 4962, 4928, 4992, 5001, 5021, 5024, 5009, 4938, 5044, 5055, 5051, 5068, 5065, 5087, 5069, 5110, 5106, and 5132.

WHEREAS the Council of The Corporation of the District of West Vancouver deems it expedient to provide for amendment of the zoning bylaw;

NOW THEREFORE, the Council of The Corporation of the District of West Vancouver enacts as follows:

Part 1 Citation

- 1.1 This bylaw may be cited as Zoning Bylaw No. 4662, 2010, Amendment Bylaw No. 5161, 2021.

Part 2 Severability

- 2.1 If a portion of this bylaw is held invalid by a Court of competent jurisdiction, then the invalid portion must be severed and the remainder of this bylaw is deemed to have been adopted without the severed section, subsection, paragraph, subparagraph, clause or phrase.

Part 3 Amends Zoning Maps

- 3.1 Zoning Bylaw No. 4662, 2010, Schedule A, Section 852, Schedule 2, Zoning Maps is hereby amended by changing the zoning of Lands as shown hatched outline on the map in **Schedule A** to this bylaw,

FROM: M1 – Marine 1

TO: RS4 – Single Family Dwelling 4

Schedules

Schedule A – Zoning Map Amendment

READ A FIRST TIME on

PUBLICATION OF NOTICE OF PUBLIC HEARING on

PUBLIC HEARING HELD on

READ A SECOND TIME on

READ A THIRD TIME on

ADOPTED by the Council on

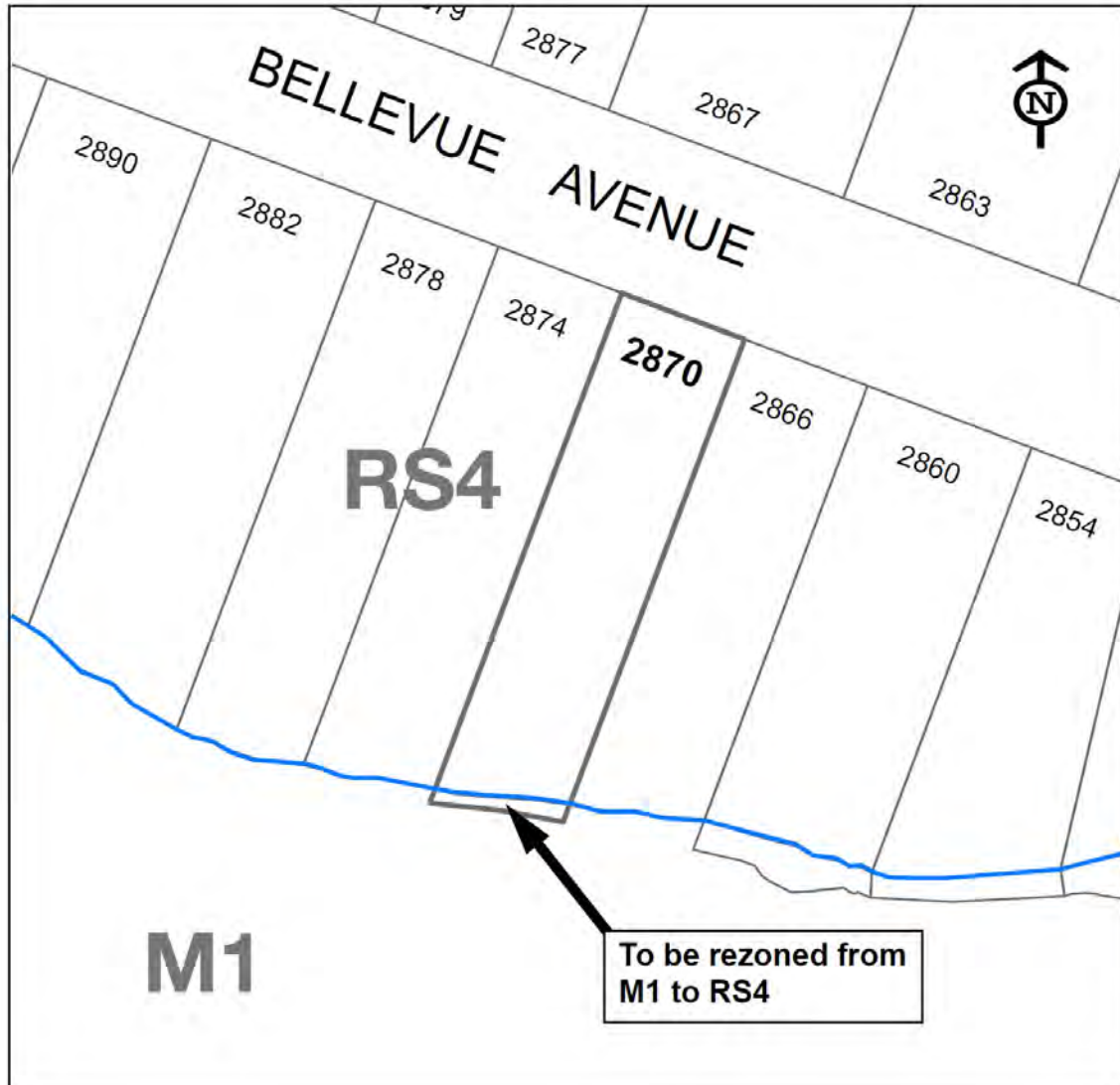
Mayor

Corporate Officer

Schedule A – Zoning Map Amendment

Amendment to Zoning Bylaw No. 4662, 2010, Schedule A, Section 852, Schedule 2, Zoning Maps.

The area shown on the map below rezones the subject Land to RS4.



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District of West Vancouver
Proposed
Development Variance Permit No. 21-078

REGISTERED OWNER: 0888493 B.C. LTD.

THIS DEVELOPMENT VARIANCE PERMIT APPLIES TO:

CIVIC ADDRESS: 2870 Bellevue Avenue

LEGAL DESCRIPTION: LOT 1 DISTRICT LOTS 556 GROUP 1 NEW
WESTMINSTER DISTRICT PLAN EPP28171
PID: 029-027-829
(the 'Lands')

1. For the purposes of this Development Variance Permit, the Lands shall be developed in substantial compliance with the drawings approved by Council, attached as Schedule A, and specifically in compliance with the regulation and variances listed hereunder.
2. This Development Variance Permit is issued and varies and supplements the District's Zoning Bylaw No. 4662, 2010, as amended, as follows:
 - (a) Section 120.17 (Average Grade Calculation for Building and Structure Height) is varied to calculate maximum building height using the flood construction level at 6.4 m as average grade.
 - (b) Section 120.22 (Retaining Wall Grade Line and Buildup of Grade) and Section 130.13 (Waterfront Yard Requirements) are varied to allow retaining wall heights as shown in Schedule A, except that no retaining wall will exceed 1.2 m in exposed face height.
 - (c) Section 130.08(3) (Floor Area) is varied to allow basement Floor Area Ratio exemption to be calculated using the flood construction level at 6.4 m as average grade.
 - (d) Section 130.10(2)(c) (Highest Building Face Envelope) is varied to allow maximum highest building face to be calculated using the flood construction level at 6.4 m as average grade.
3. The proposed structures, retaining walls, and site landscaping must be constructed and finished in substantial compliance with attached Schedules A and B.
4. Prior to the issuance of a Building Permit and as security for the due and proper completion of the landscaping as set forth in Section 3 of this Development Variance Permit, the Owner shall:

-
- (a) Provide a landscape cost estimate consistent with the landscape plan in Schedule B acceptable to Director of Planning and Development Services;
 - (b) Provide security in the amount of 125% of the landscape cost estimate to the District in the form of cash or an unconditional, irrevocable auto-renewing letter of credit issued by a Canadian chartered bank or credit union; and
 - (c) Maintain the security for a minimum of one year after completion of the landscaping, and not prior to the date on which the District authorizes in writing the release of the security.
 5. Prior to issuance of a Building Permit, the Owner must complete the following:
 - (a) Provide the District Facilities Department an “as-built” BCLS Survey to capture all foreshore infrastructure south of the site; and
 - (b) Initiate a new foreshore encroachment agreement with the District.
 6. Prior to issuance of a Building Permit, a suitably qualified professional will identify conditions as enabling the safe use of the basement and land for the use intended with consideration to coastal flooding hazards. A section 219 covenant, in accordance with the Land Titles Act, shall be registered against the certificate of title for the Lands certifying that the land will be used in accordance with the conditions specified in the Flood Hazard Assessment Report (Schedule C).
 7. Prior to issuance of a Building Permit, a design for the basement, below the FCL, must be submitted by a qualified professional to certify that the basement is “floodproof” as per recommendations outlined in Flood Hazard Assessment Report (Schedule C).
 8. Prior to the issuance of a Building Permit, a stormwater management plan that is integrated with a landscape plan must be submitted and demonstrate that surface runoff is retained on the subject property and managed in accordance with the District’s onsite stormwater management criteria. The stormwater management plan must be prepared by a qualified professional and approved by the District’s Land Development Engineer.
 9. This Development Variance Permit lapses if construction of the additions and renovations has not commenced, under an issued Building Permit, within 24 months of the date this permit is issued.

THE COUNCIL OF WEST VANCOUVER APPROVED THIS PERMIT BY
RESOLUTION PASSED ON _____.

MAYOR

CORPORATE OFFICER

THE REQUIREMENTS AND CONDITIONS UPON WHICH THIS PERMIT IS
ISSUED ARE ACKNOWLEDGED AND AGREED TO BY THE CURRENT
OWNER. IT IS UNDERSTOOD:

- THAT OTHER PERMITS / APPROVALS MAY BE REQUIRED INCLUDING PERMITS / APPROVALS FOR BUILDING CONSTRUCTION, SOIL AND ROCK REMOVAL OR DEPOSIT, BOULEVARD WORKS, AND SUBDIVISION; AND
- THE DEVELOPMENT MUST ATTAIN REQUIREMENTS OF THE BC BUILDING CODE AND ANY VARIANCES TO THE ZONING BYLAW ARE THE RESPONSIBILITY OF THE OWNER AND MUST BE RECTIFIED AT THE BUILDING PERMIT STAGE.

FOR THE PURPOSES OF SECTION 9, THIS PERMIT IS ISSUED ON
_____.

Schedules:

A – Architectural Plans for 2870 Bellevue prepared by Lamoureux Architect Incorporated dated August 2021.

B – Landscaping Plans for 2870 Bellevue prepared by Paul Sangha Creative dated September 2021.

C – Flood Hazard Assessment (MEM_002_R0) for 2870 Bellevue prepared by Westmar Advisors Inc. dated May 7, 2021, along with the memorandum MEM_001_R1 dated August 26, 2021.

SCHEDULE A



PROJECT DESCRIPTION				
CIVIC ADDRESS	2870 BELLEVUE AVE, WEST VANCOUVER, BC			
LEGAL DESCRIPTION	Lot 1 District Lots 556 Group 1 New Westminster District Plan EPP28171			
ZONING	R5-4 - Single Family Residential			
SITE AREA	11136 sf	1034.57 sm	=	362.099 sm
FAR (Allowable) METRIC	0.35 x	1034.57 sm	=	362.099 sm
FAR (Allowable) IMPERIAL	0.35 x	11136.00 sf	=	3897.60 sf
FLOOR AREAS				
		Proposed (sf)	Proposed (sm)	
UPPER FLOOR		1898.4 sf	176.37 sm	
MAIN FLOOR	LIVING	1873.7 sf	174.07 sm	
	GARAGE	553.5 sf	51.42 sm	
		2427.2 sf	225.49 sm	
BASEMENT FLOOR	LIVING	1855.2 sf	172.36 sm	
	STORAGE/MECH	742.7 sf	69.00 sm	
		2597.9 sf	241.35 sm	
SUBTOTAL		6923.5 sf	643.21 sm	
EXEMPTIONS				
GARAGE EXEMPTION		441.3 sf	41.00 sm	
BASEMENT EXEMPTION	PARTIAL	2585.6 sf	240.21 sm	
		2585.6 sf	240.21 sm	
(PORTION OF BSMT APPLICABLE TO FAR)		-78.7 sf	-7.03 sm	
TOTAL EXEMPTIONS		3026.9 sf	281.21 sm	
TOTAL AREA APPLICABLE TO FAR		3896.6 sf	362.00 sm	-1.04 sf (UNDER)
FSR (Proposed)	Allowable 0.35	Proposed 0.3499	Proposed 0.3499	
	Allowable/Required	Proposed (IMP.)	Proposed (METRIC)	
BUILDING HEIGHT	25'0" (midpoint)	22'6"	-	see Elevations
SITE WIDTH		52'5 3/4"	16.00 m	
FRONT YARD SETBACK	29'10 3/8"	46'4 1/4"	14.13 m	see Site Plan
REAR YARD SETBACK	29'10 3/8"	43'0 1/2"	13.12 m	see Site Plan
SIDE YARD (EAST)	5'3"	5'4 7/8"	1.65 m	see Site Plan
SIDE YARD (WEST)	5'3"	9'11"	3.02 m	see Site Plan
SIDEYARD COMBINED	13'1 1/2"	15'3 7/8"	4.67 m	see Site Plan
PARKING	1 stalls		2 stalls	
SPATIAL SEPARATION		conforms	conforms	see Elevations
SITE COVERAGE	3341 sf (30%)	3307.86 sf	307.31 sm	29-70%
FRONT YARD AREA		1567.25 sf	145.60 sm	
IMPERVIOUS SURFACE	MAX 50%	39.51%		
HIGHEST BUILDING FACE	2/3 to conform	conforms	conforms	100%
BC ENERGY STEP CODE	3 (as of Feb 27, 2021)	Step 3		

DVP PROJECT TEAM

ARCHITECTURAL	LAMOUREUX ARCHITECT INC. 3392 Marine Drive, West Vancouver BC V7V 1M9 604-925-5170 brad@lamoureuxarchitect.ca
LANDSCAPE	PAUL SANGHA CREATIVE 125 East 4th Avenue, Vancouver BC V5T 1G4 604-736-2323 paul@paulsangha.com
COASTAL ENGINEERING	WESTMAR ADVISORS INC. 700-1901 Rosser Avenue, Burnaby BC V5C 6R6 604-770-4787 vramadhas@westmaradvisors.com

GENERAL NOTES

- No retaining walls exceed max 1.2m in height along the property lines
- No trees proposed to be removed
- Existing structures located on the public foreshore will remain and will not require any alterations
- Only native plants are permitted within the rock wall on the public foreshore, and no landscaping is proposed in the public foreshore area, on the water side of the wall

DVP BRIEF

We were informed by the District of West Vancouver that all new development in Flood Hazard Areas would be required to provide a flood hazard report by a Coastal Engineer to determine how the site can be safely used for residential construction. We retained Westmar Advisors Inc. In their report, it was determined that this site would require the main floor of the house to be sited at the flood construction level (FCL) of 21.0' (6.4m) above the mean sea level based on the January 2018 Provincial Flood Hazard Land Use Guidelines.

With an average natural grade of 15.67' (4.78m), the proposed development is requesting a zoning variance to allow Building Height, Highest Building Face and the Basement Exemption calculations to be measured from the FCL. These relaxations would help alleviate the undue hardships if needed to comply with both FCL and average natural grade, which would severely compromise Building Heights, Highest Building Face and FAR calculations. A development variance permit (DVP) would be required to allow for these zoning variances.

Careful considerations have been given during the design process to minimize the difference of Building Height with the neighbouring properties. For example, our Building Height would only be 22.5' above the FCL level measured to the parapet of the flat roof, resulting in an elevation height of 43.5'. In comparison, the roof peak of 2878 Bellevue is at 42.03', 2874 Bellevue is at 44.3', 2866 Bellevue is at 37.6', and 2860 Bellevue is at 46.5'. The average height of these four neighbouring properties is 42.61', which is reasonably close to the height of our proposed residence.

We are also aware that staff are working on developing development permit area guidelines for foreshore properties that are anticipated to be considered by Council later this year. Working with Paul Sangha Creative, we are also seeking opportunities to address these guidelines with respect to the protection of the foreshore environment. Note that we are also including a rigorous re-planting scheme throughout the site, while the interface with neighbours on the east and west sides has been designed to ensure that there is no retaining wall greater than the four foot height as per Zoning Bylaw.

26/AUG/2021
13/MAY/2021
26/FEB/2021

REVISED FOR DVP APPLICATION
ISSUED FOR DVP APPLICATION
ISSUED FOR BUILDING PERMIT

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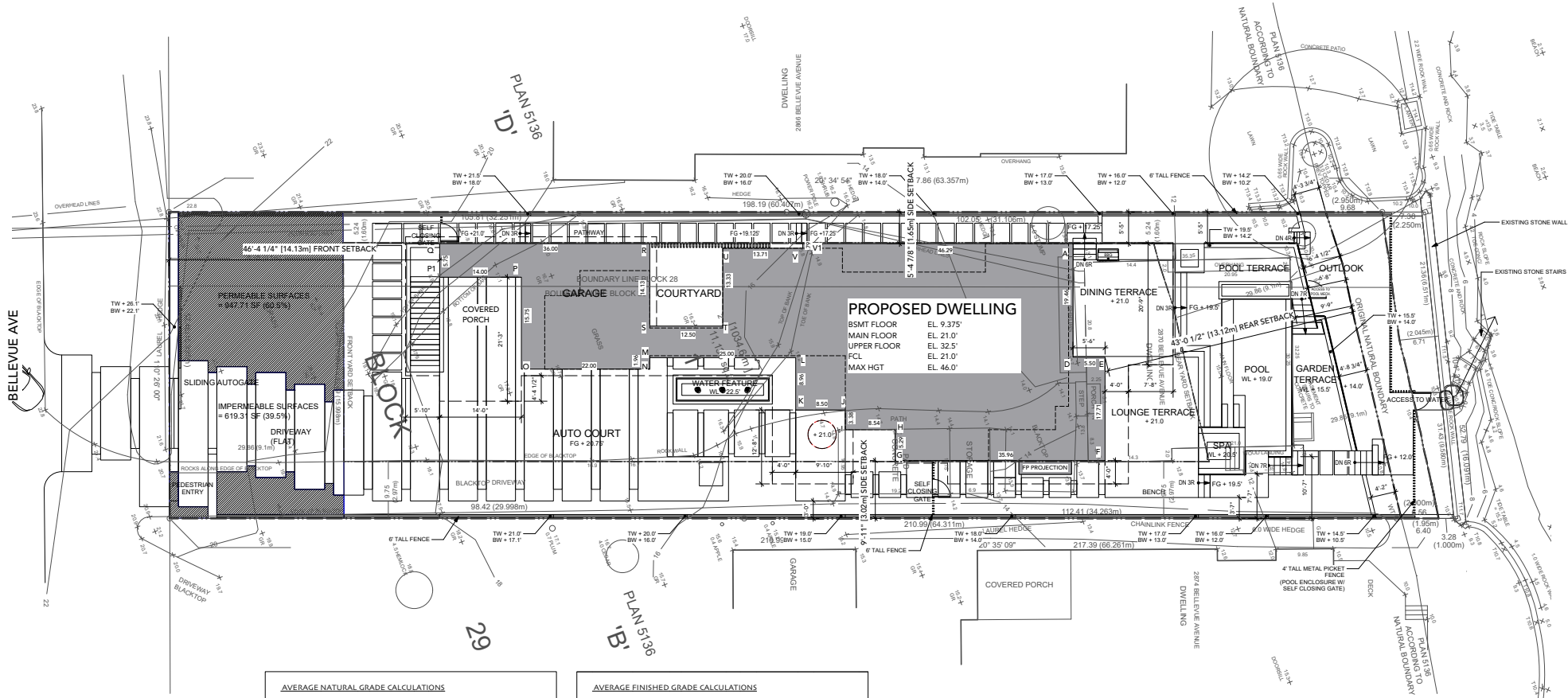
PROJECT
GAROFALO RESIDENCE
2870 BELLEVUE AVE
WEST VANCOUVER, BC

DATE
26/AUG/2021
SCALE
N/A

CHECKED BY
BL
DRAWN BY
JL

ISSUED
26/AUG/2021
DRAWING TITLE
COVER SHEET

PROJECT NO.
02101
DRAWING NO.
A0.0



AVERAGE NATURAL GRADE CALCULATIONS				
SEGMENT	1ST PT. ELEV.	2ND PT. ELEV.	LENGTH	AVERAGE ELEV.
A-D	13.20 +	13.70 / 2 X	19.46 -	263.71
D-E	13.70 +	13.70 / 2 X	5.50 -	75.35
E-F	13.70 +	13.70 / 2 X	17.71 -	242.63
F-G	13.70 +	14.60 / 2 X	35.94 -	508.81
G-H	14.60 +	14.60 / 2 X	5.50 -	77.23
H-I	14.60 +	14.80 / 2 X	8.54 -	125.54
I-J	14.80 +	14.70 / 2 X	3.38 -	49.86
J-K	14.70 +	15.00 / 2 X	8.50 -	120.33
K-L	15.00 +	15.30 / 2 X	8.96 -	135.30
L-M	15.30 +	16.40 / 2 X	25.00 -	395.00
M-N	16.40 +	16.40 / 2 X	1.96 -	32.14
N-O	16.40 +	17.50 / 2 X	23.00 -	375.00
O-P	17.50 +	16.90 / 2 X	15.75 -	270.00
P-Q	16.90 +	18.90 / 2 X	14.00 -	350.60
Q-R	18.90 +	19.80 / 2 X	5.75 -	111.26
R-S	19.80 +	16.40 / 2 X	36.00 -	651.60
S-T	16.40 +	16.40 / 2 X	14.13 -	331.73
T-U	16.40 +	16.40 / 2 X	12.50 -	203.18
U-V	16.10 +	16.15 / 2 X	13.33 -	214.95
V-W	16.15 +	15.80 / 2 X	13.71 -	219.02
W-X	15.80 +	15.80 / 2 X	0.79 -	12.48
X-A	15.80 +	13.90 / 2 X	46.59 -	673.58
TOTALS:			334.51	5343.90
AVERAGE GRADE:	5343.90 /	334.51 =		15.67

AVERAGE FINISHED GRADE CALCULATIONS				
SEGMENT	1ST PT. ELEV.	2ND PT. ELEV.	LENGTH	AVERAGE ELEV.
A-D	21.00 +	21.00 / 2 X	19.46 -	408.66
D-E	21.00 +	21.00 / 2 X	5.50 -	115.50
E-F	21.00 +	21.00 / 2 X	17.71 -	371.91
F-G	20.75 +	20.75 / 2 X	35.94 -	748.97
G-H	20.75 +	20.75 / 2 X	5.50 -	109.77
H-I	20.75 +	20.75 / 2 X	8.54 -	177.31
I-J	20.75 +	20.75 / 2 X	3.38 -	70.14
J-K	20.75 +	20.75 / 2 X	8.50 -	176.88
K-L	20.75 +	20.75 / 2 X	8.96 -	185.93
L-M	20.75 +	20.75 / 2 X	25.00 -	518.75
M-N	20.75 +	20.75 / 2 X	1.96 -	40.67
N-O	20.75 +	20.75 / 2 X	23.00 -	455.50
O-P	20.75 +	20.75 / 2 X	15.75 -	326.81
P-Q	20.75 +	20.75 / 2 X	14.00 -	290.50
Q-R	19.13 +	19.13 / 2 X	5.75 -	52.60
R-S	20.75 +	20.75 / 2 X	36.00 -	717.84
S-T	20.75 +	20.75 / 2 X	14.13 -	293.20
T-U	20.75 +	20.75 / 2 X	12.50 -	259.38
U-V	19.13 +	17.35 / 2 X	13.71 -	249.38
V-W	17.35 +	17.35 / 2 X	0.79 -	13.63
W-X	17.35 +	17.35 / 2 X	60.50 -	1043.63
TOTALS:			348.72	6901.03
AVERAGE GRADE:	6901.03 /	348.72 =		19.79

PARTIAL EXEMPTION FORMULA				
PARTIAL BASEMENT EXEMPTION =	LOWEST AVERAGE GRADE	-	BASEMENT FLOOR ELEVATION	x 100
	MAIN FLOOR ELEVATION	-	BASEMENT FLOOR ELEVATION	
	=	21	-	9.375
		21	-	9.375
	=	100.0		x 100



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PROJECT: **GAROFALO RESIDENCE**
2870 BELLEVUE AVE
WEST VANCOUVER, BC

DATE: **13/MAY/2021**
SCALE: **1" = 1/8"**

ISSUED FOR DVP APPLICATION
26/FEB/2021
ISSUED FOR BUILDING PERMIT
CHECKED BY: **BL**
DRAWN BY: **JL**

DRAWING TITLE: **SITE PLAN**
PROJECT NO.: **02101**
DRAWING NO.: **A1.0**



EXISTING DRIVEWAY OF 2870 BELLEVUE



EXISTING STREET VIEW OF 2870 BELLEVUE



EXISTING ROCK WALL AT FORESHORE ALONG 2870 BELLEVUE



EXISTING NEIGHBOURHOOD FORESHORE CONDITIONS



2860 BELLEVUE
ROOF PEAK + 46.5'

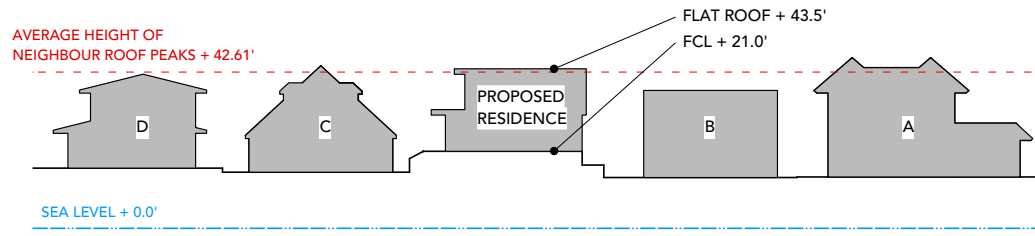
2866 BELLEVUE
ROOF PEAK + 37.6'

2874 BELLEVUE
ROOF PEAK + 44.3'

2878 BELLEVUE
ROOF PEAK + 42.03'

* AVERAGE HEIGHT OF NEIGHBOUR ROOF PEAKS (A, B, C, D) = 42.61'
 ** HEIGHT OF PROPOSED RESIDENCE @ 2870 BELLEVUE + 43.5'

1 CONEXT PLAN W/ WESTMAP AERIAL 2020
 SCALE: 1/32" = 1'-0"



2 ROOF PEAKS COMPARISON DIAGRAM
 SCALE: 1/16" = 1'-0"

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PROJECT
GAROFALO RESIDENCE
 2870 BELLEVUE AVE
 WEST VANCOUVER, BC

DATE
 13/MAY/2021
 SCALE
 AS NOTED

ISSUED FOR DVP APPLICATION
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 JL

DRAWING TITLE
CONEXT PLAN

PROJECT NO.
 02101
 DRAWING NO.
A1.1



1 STREET VIEW RENDERING



2 ENTRY VIEW RENDERING



3 SOUTHWEST VIEW RENDERING



4 SOUTHEAST VIEW RENDERING

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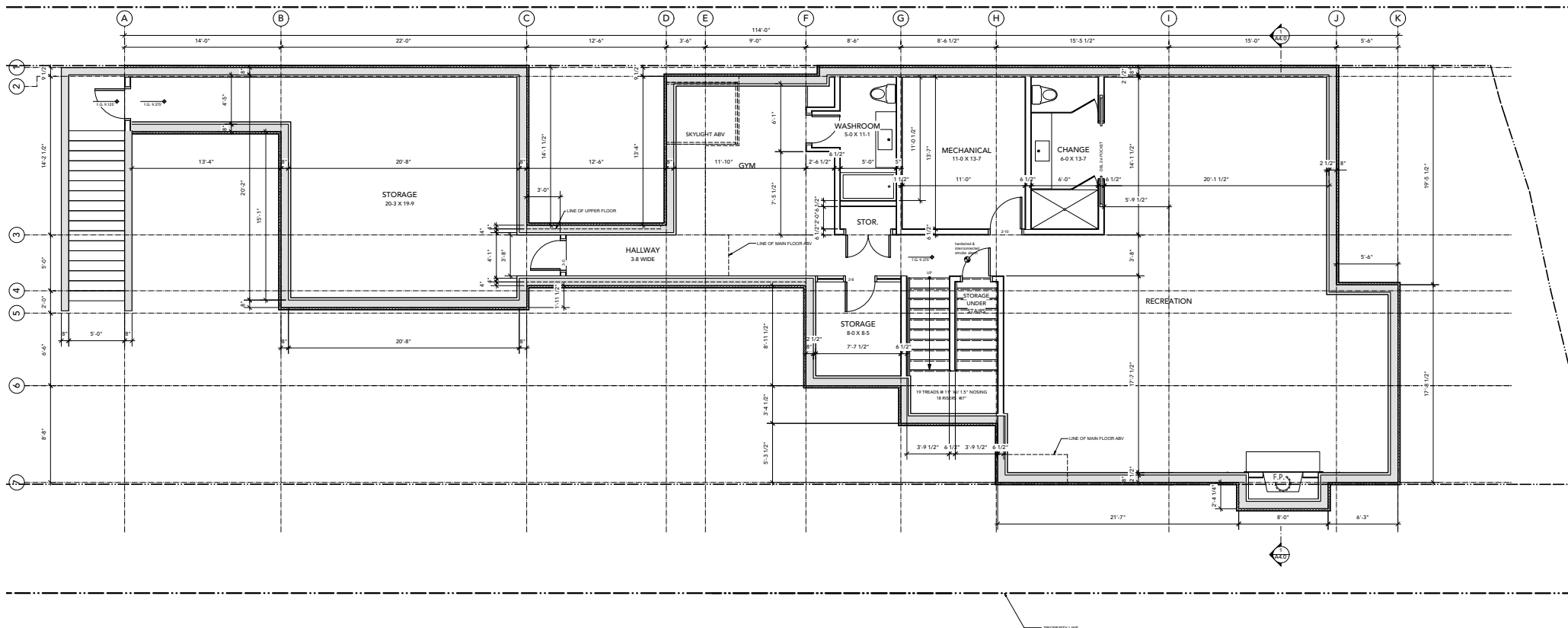
PROJECT
GAROFALO RESIDENCE
2870 BELLEVUE AVE
WEST VANCOUVER, BC

DATE
13/MAY/2021
SCALE
NTS
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BL
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13/MAY/2021
DRAWN BY
JL

ISSUED FOR DVP APPLICATION
ISSUED FOR BUILDING PERMIT

DRAWING TITLE
3D RENDERINGS

PROJECT NO.
02101
DRAWING NO.
A1.2



FLOOR AREAS	AREA SF	AREA SQ.M.
UPPER FLOOR	1898.39 sf	175.37 sq.m.
MAIN FLOOR	1873.66 sf	174.07 sq.m.
GARAGE AFTER 4613 SF EXEMPTION	113.39 sf	10.43 sq.m.
BASEMENT AFTER EXEMPTION	32.33 sf	3.01 sq.m.
Total Floor Area	3896.58 sf	363.00 sq.m.

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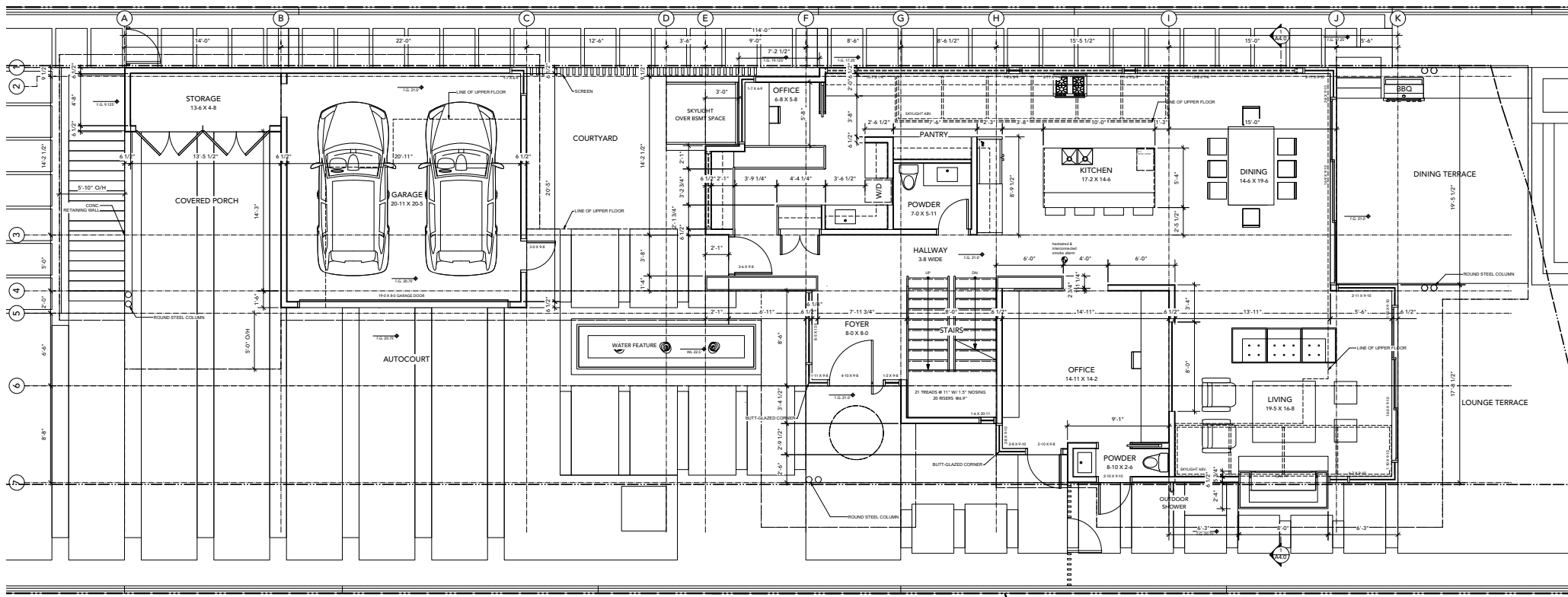
PROJECT
GAROFALO RESIDENCE
 2870 BELLEVUE AVE
 WEST VANCOUVER, BC

DATE
 13/MAY/2021
 SCALE
 1" = 1/4"

CHECKED BY
 BL
 DRAWN BY
 JL

ISSUED
 13/MAY/2021
 DRAWING TITLE
BASEMENT PLAN

PROJECT NO.
 02101
 DRAWING NO.
A2.1



FLOOR AREAS	AREA SF	AREA SQ.M.
UPPER FLOOR	1898.30 sf	175.37 sq.m.
MAIN FLOOR	1873.66 sf	174.07 sq.m.
GARAGE AFTER 46.13 SF EXEMPTION	113.20 sf	10.43 sq.m.
BASEMENT AFTER EXEMPTION	32.33 sf	3.00 sq.m.
Total Floor Area	3896.58 sf	363.00 sq.m.

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PROJECT
GAROFALO RESIDENCE
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 WEST VANCOUVER, BC

DATE
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 SCALE
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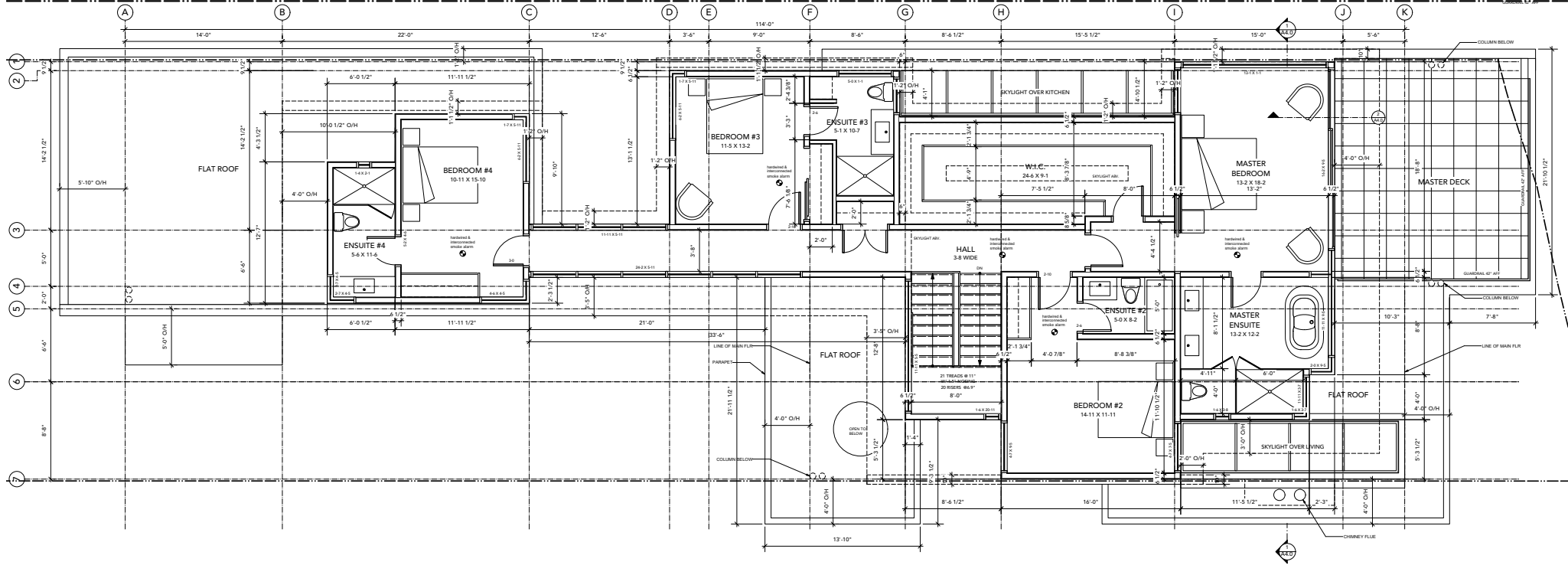
ISSUED
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DRAWING TITLE
MAIN FLOOR PLAN

PROJECT NO.
 02101

DRAWING NO.
A2.2



FLOOR AREAS	AREA SF	AREA SQ.M.
UPPER FLOOR	1898.30 sf	175.37 sq.m.
MAIN FLOOR	1873.66 sf	174.07 sq.m.
GARAGE AFTER 46.13 SF EXEMPTION	113.20 sf	10.43 sq.m.
BASEMENT AFTER EXEMPTION	32.33 sf	3.01 sq.m.
Total Floor Area	3896.58 sf	363.00 sq.m.



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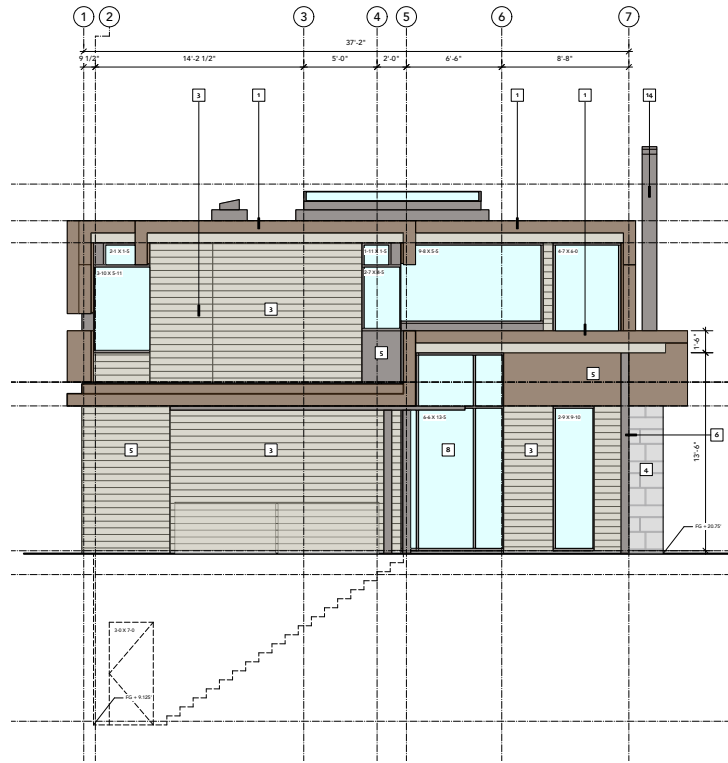
PROJECT
GAROFALO RESIDENCE
 2870 BELLEVUE AVE
 WEST VANCOUVER, BC

DATE
 13/MAY/2021
 SCALE
 1" = 1/4"

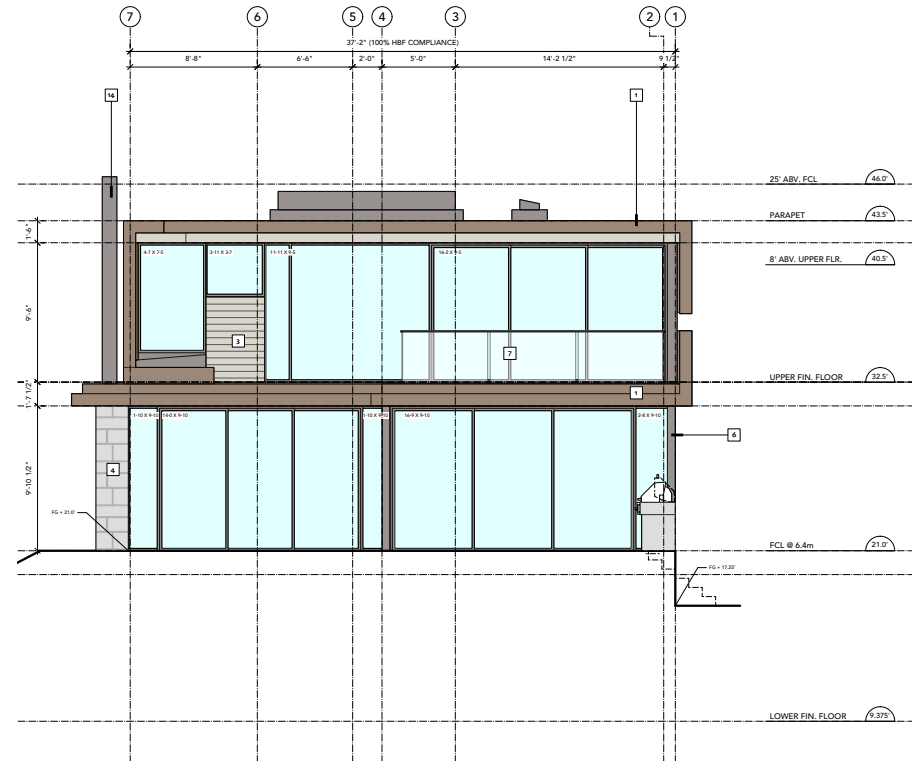
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DRAWING TITLE
UPPER FLOOR PLAN

PROJECT NO.
 02101
 DRAWING NO.
A2.3



1 NORTH ELEVATION
SCALE: 1/4" = 1'-0"



2 SOUTH ELEVATION
SCALE: 1/4" = 1'-0"

MATERIAL LEGEND	
1. FASCIAS.	Painted Metal Finish, Copper Colour.
2. SOFFITS.	1x4" T&G Cedar Soffit boards, Stain.
3. WALL.	Wood 1X4" Cedar, Stain.
4. WALL.	Stone Clad.
5. WALL.	Painted Metal Finish, Copper Colour.
6. COLUMNS & WINDOW HEADERS	Metal Clad Steel Columns
7. GUARD and HANDRAILS.	Engineered Glass
8. WINDOWS.	Curtain Wall Glazing System, Pre Finished Aluminum.
9. DOORS.	Double-glazed Fiberglass
10. GUTTERS AND DOWNSPOUTS.	Built-in Gutter Downspouts to be round
11. FLASHING.	Painted Aluminum
12. ROOF.	Standing seam metal.
13. CONCRETE RETAINING WALLS & PLANTERS	Architectural Finished Concrete
14. CHIMNEY CAP	Custom Powder-coated Aluminum

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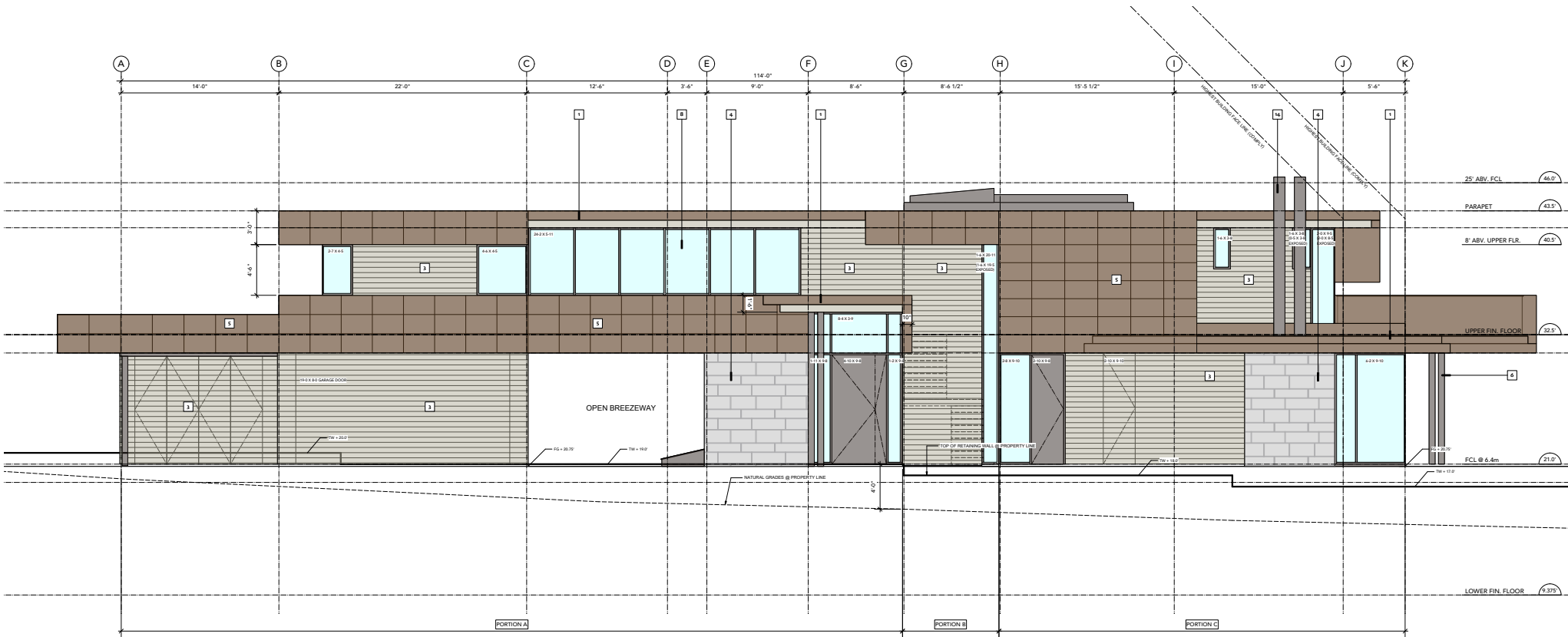
PROJECT
GAROFALO RESIDENCE
2870 BELLEVUE AVE
WEST VANCOUVER, BC

DATE
13/MAY/2021
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ISSUED FOR BUILDING PERMIT
ISSUED
13/MAY/2021
CHECKED BY
BL
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JL

DRAWING TITLE
ELEVATIONS

PROJECT NO.
02101
DRAWING NO.
A3.0



MATERIAL LEGEND

- FASCIAS.**
Painted Metal Finish, Copper Colour.
- SOFFITS.**
1x4" T&G Cedar Soffit boards, Stain.
- WALL.**
Wood 1x4" Cedar, Stain.
- WALL.**
Stone Clad.
- WALL.**
Painted Metal Finish, Copper Colour.
- COLUMNS & WINDOW HEADERS.**
Metal Clad Steel Columns
- GUARD and HANDRAILS.**
Engineered Glass
- WINDOWS.**
Curtain Wall Glazing System, Pre Finished Aluminum.
- DOORS.**
Double-glazed Fiberglass
- GUTTERS AND DOWNSPOUTS.**
Built-in Gutter
Downspouts to be round
- FLASHING.**
Painted Aluminum
- ROOF.**
Standing seam metal.
- CONCRETE RETAINING WALLS & PLANTERS.**
Architectural Finished Concrete
- CHIMNEY CAP.**
Custom Powder-coated Aluminum

WEST ELEVATION SPATIAL SEPARATION BCSC 9.10.15
Total Exposing Building Face = 217.0 m²

PORTION	Limiting Distance =	Area of Vertical Portion =	Permitted % of Glazed Openings	Permitted Aggregate Area of Glazed Openings	Proposed Aggregate Area of Glazed Openings
PORTION A	5.66m	123.5 m ²	17.5	21.6 m ²	21.5 m ²
PORTION B	4.44 m	18.6 m ²	14%	2.6 m ²	2.6 m ²
PORTION C	3.02 m	74.9 m ²	10%	7.5 m ²	7.5 m ²

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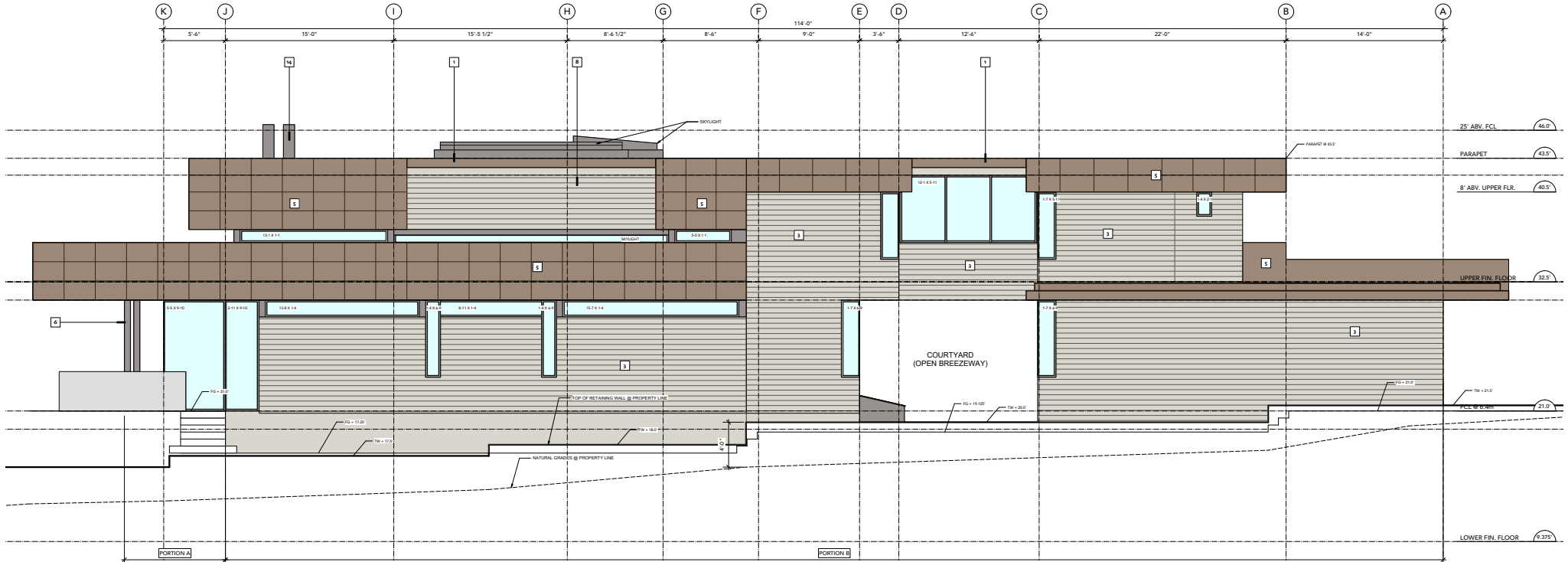
PROJECT
GAROFALO RESIDENCE
2870 BELLEVUE AVE
WEST VANCOUVER, BC

13/MAY/2021
26/FEB/2021

ISSUED FOR DVP APPLICATION
ISSUED FOR BUILDING PERMIT

DATE
13/MAY/2021
SCALE
1" = 1/4"

ISSUED
13/MAY/2021
DRAWN BY
JL
DRAWING TITLE
WEST ELEVATION
PROJECT NO.
02101
DRAWING NO.
A3.1



MATERIAL LEGEND

- FASCIAS.**
Painted Metal Finish, Copper Colour.
- SOFFITS.**
1x4" T&G Cedar Soffit boards, Stain.
- WALL.**
Wood 1X4" Cedar, Stain.
- WALL.**
Stone Clad.
- WALL.**
Painted Metal Finish, Copper Colour.
- COLUMNS & WINDOW HEADERS.**
Metal Clad Steel Columns
- GUARD and HANDRAILS.**
Engineered Glass
- WINDOWS.**
Curtain Wall Glazing System, Pre Finished Aluminum.
- DOORS.**
Double-glazed Fiberglass
- GUTTERS AND DOWNSPOUTS.**
Built-in Gutter
Downspouts to be round
- FLASHING.**
Painted Aluminum
- ROOF.**
Standing seam metal.
- CONCRETE RETAINING WALLS & PLANTERS**
Architectural Finished Concrete
- CHIMNEY CAP.**
Custom Powder-coated Aluminum

EAST ELEVATION SPATIAL SEPARATION BCRC 9.10.15
Total Exposing Building Face = 216.1 m²

PORTION	Limiting Distance =	Area of Vertical Portion =	Permitted % of Glazed Openings	Permitted Aggregate Area of Glazed Openings	Proposed Aggregate Area of Glazed Openings
PORTION A	7.8 m	8.3 m ²	27%	2.24 m ²	2.24 m ²
PORTION B	1.65 m	207.8 m ²	7.5%	15.6 m ²	15.6 m ²

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PROJECT
GAROFALO RESIDENCE
2870 BELLEVUE AVE
WEST VANCOUVER, BC

DATE
13/MAY/2021
SCALE
1" = 1/4"

CHECKED BY
BL

ISSUED
13/MAY/2021
DRAWN BY
JL

13/MAY/2021 ISSUED FOR DVP APPLICATION
26/FEB/2021 ISSUED FOR BUILDING PERMIT

DRAWING TITLE
SOUTHEAST ELEVATION

PROJECT NO.
02101
DRAWING NO.
A3.2

CONSTRUCTION ASSEMBLIES

- R1. SLOPING ROOF ASSEMBLY - Un-vented Over Interior**
- Standing Seam Metal Roofing, 22 GA. Min. Concealed Fasteners, on
 - 2 ply torch-on membrane on
 - Self-adhered membrane
 - 3/4" plywood
 - Pre-engineered trusses c/w
 - 2lb spray on insulation c/w integrated vapour barrier c/w
 - 5/8" GWB

- R1.A SLOPING ROOF ASSEMBLY - Vented Over Exterior**
- Standing Seam Metal Roofing, 22 GA. Min. Concealed Fasteners, on
 - Self-adhered membrane
 - 3/4" plywood
 - 2x4 cross purlins
 - Pre-engineered trusses c/w
 - 1x4 T&G soffits and metal trim c/w 1 1/2" continuous vents

NOTE:
Provide continuous lower screened venting at eave (25% min) and relief see Architectural Details

- R2. FLAT ROOF ASSEMBLY - Un-Vented Over Interior**
- protection board on
 - 2 ply torch-on membrane on
 - 3/4" plywood on
 - Pre-engineered trusses on
 - 2lb spray on insulation c/w integrated vapour barrier on
 - 5/8" GWB

- R2.A FLAT ROOF ASSEMBLY - Vented Over Exterior**
- 2 ply torch-on membrane on
 - protection board on
 - 3/4" plywood on
 - 2x4 cross purlins
 - Pre-engineered trusses on
 - 1x4 T&G soffits c/w 1 1/2" continuous vents

NOTE:
Provide continuous lower screened venting at eave (25% min) and relief see Architectural Details

- W1. EXTERIOR WALL ASSEMBLY - WOOD SIDING**
- 1x4 T&G siding c/w 1/2" channel on
 - Keene Drivall RainScreen nomm
 - Self-adhered air and weather barrier wrap on
 - 1/2" unsanded fir plywood on
 - 2x6 wood studs @ 16" O.C. with
 - 2lb spray on insulation c/w integrated vapour barrier on
 - 1/2" GWB

- W2. EXTERIOR WALL ASSEMBLY - METAL CLAD**
- ACM c/w fasteners and integrated insulated panel on
 - 1/2" rainscreen on
 - Self-adhered air and weather barrier wrap on
 - 1/2" unsanded fir plywood on
 - 2x6 wood studs @ 16" O.C. with
 - 2lb spray on insulation c/w integrated vapour barrier on
 - 1/2" GWB

- W3. EXTERIOR WALL ASSEMBLY - ARCHITECTURAL CONCRETE**
- C.I.P. Concrete wall w/ concrete sealer on
 - 2" XPS rigid insulation on
 - C.I.P. Concrete wall

- W3. INTERIOR WALLS - C**
- 1/2" GWB on both sides of
 - 2x6 wood studs @ 16" O.C. (2x4 studs where noted)
 - acoustic batt insulation where necessary

- W4. FOUNDATION WALL - D**
- 8" reinforced concrete wall on footing (Unless otherwise noted. See struct. Dwg.)

- EXTERIOR:**
- Drainmat on
 - Rigid Insulation
 - c/w 2 coats of waterproofing [In the case of exposed high wall keep below grade line]
 - Perimeter Wall drainage to include- 6"cont., perforated footing drain c/w filter cloth and gravel bed.
 - Separate Perimeter solid PVC RWL drain line (connect to District Storm)

- INTERIOR (typical)**
- 2x4 wood studs on flat on
 - 2lb spray on insulation c/w integrated vapour barrier c/w
 - 1/2" GWB

- F1. FLOOR ASSEMBLY - TJI SYSTEM**
- Finished flooring [See Arch. plans and specs], on
 - 1 1/2" concrete skim coat w/ radiant in-floor heating on
 - 3/4" plywood subfloor (NOTE: provide 1/4" min. plywood under all areas to receive tile) on
 - TJI (as per Structural Drawings) on
 - 5/8" GWB ceiling

- F2. FLOOR ASSEMBLY - TJI SYSTEM OVER EXTERIOR**
- Finished flooring [See Arch. plans and specs], on
 - 1 1/2" concrete skim coat w/ radiant in-floor heating on
 - 3/4" plywood subfloor (glued and screwed (NOTE: provide 1/4" min. plywood under all areas to receive tile) on
 - TJI (as per Structural Drawings) w/ 2lb spray on insulation on
 - Shimming as req'd
 - 3/4" T&G cedar soffit

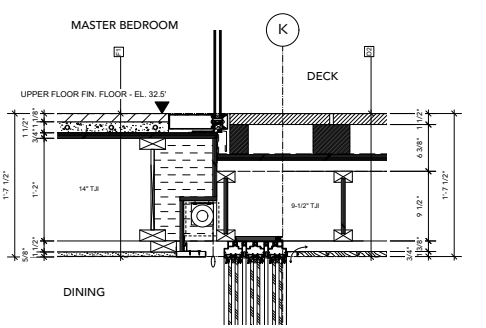
- F3. FLOOR ASSEMBLY - SLAB ON GRADE**
- Finished flooring [See Arch. plans and specs], on
 - 4" Reinforced concrete slab w/ radiant in-floor heating on
 - Min. 6 mil poly vapour barrier (no mil recommended) on
 - 3" rigid insulation (must be impervious to moisture eg. XPS) on
 - 5" compacted granular fill or native soil
 - (Soil Bearing Capacity requirements to be verified by Structural Engineer)

- D1. DECK ASSEMBLY - OVER LIVING**
- select stone pavers 1 1/4"
 - adjustable pedestals on
 - 2-ply torch-on waterproof membrane on
 - 1/2" protection board
 - 2x4 unsanded ply at 2x6 slope minimum
 - TJI per Struct' w/ 2lb spray on polyurethane insulation
 - 5/8" GWB ceiling where applicable

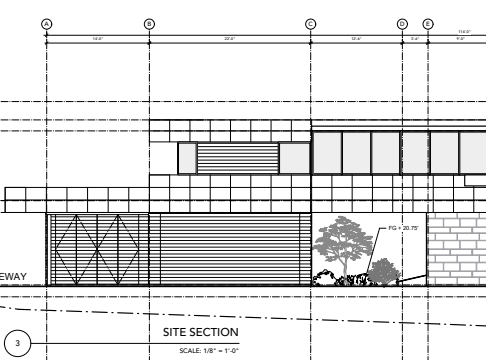
- D2. DECK ASSEMBLY - OVER EXTERIOR**
- select stone pavers 1 1/4"
 - adjustable pedestals on
 - 2-ply torch-on waterproof membrane on
 - 1/2" protection board
 - 2x4 unsanded ply at 2x6 slope minimum
 - TJI per Struct'
 - strappings
 - T&G wood soffits

- D3. TERRACE**
- select stone pavers [thickness to be determined] on pedestals on
 - sloped to drain concrete slab on
 - compacted gravel and soil fill

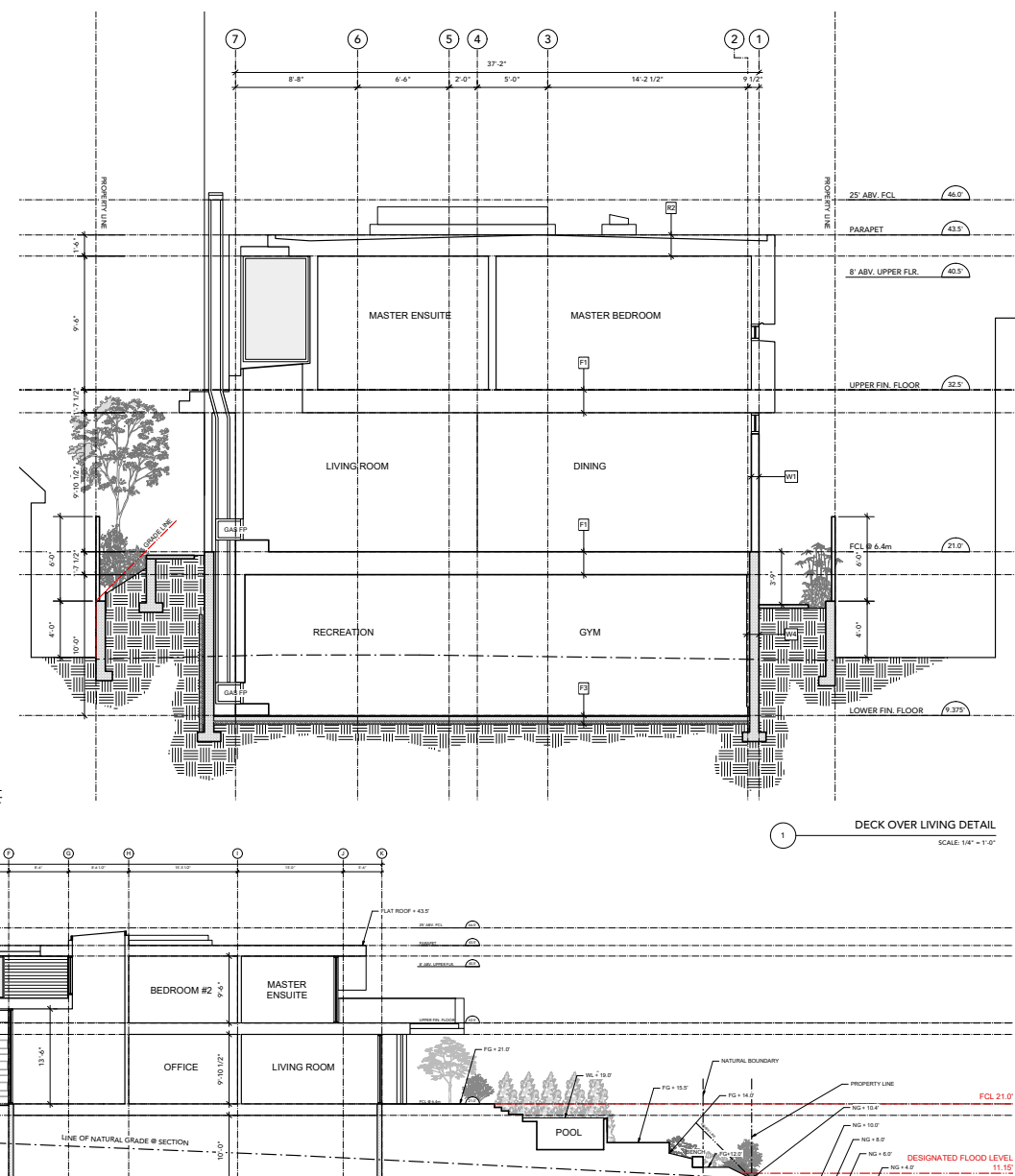
WINDOWS, DOORS, AND SKYLIGHTS
Shall conform to NF55 - North American Fenestration Standard/Specification for Windows, Doors and Skylights (Harmonized Standard) and CSA A440.03
Refer to Energy Report for required U and SHGC requirements for fenestration



DECK OVER LIVING DETAIL
SCALE: 1:1/2" = 1'-0"



SITE SECTION
SCALE: 1/8" = 1'-0"



DECK OVER LIVING DETAIL
SCALE: 1:1/2" = 1'-0"

26/AUG/2021
13/MAY/2021
26/FEB/2021

REVISED FOR DVP APPLICATION
ISSUED FOR DVP APPLICATION
ISSUED FOR BUILDING PERMIT

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LAMOUREUX ARCHITECT
INCORPORATED
www.lamoureuxarchitect.ca
3822 avenue west Vancouver bc Canada V7R 4N5
p 604.682.8178 f 604.682.8178 hrd@lamoureuxarchitect.ca

PROJECT
GAROFALO RESIDENCE
2870 BELLEVUE AVE
WEST VANCOUVER, BC

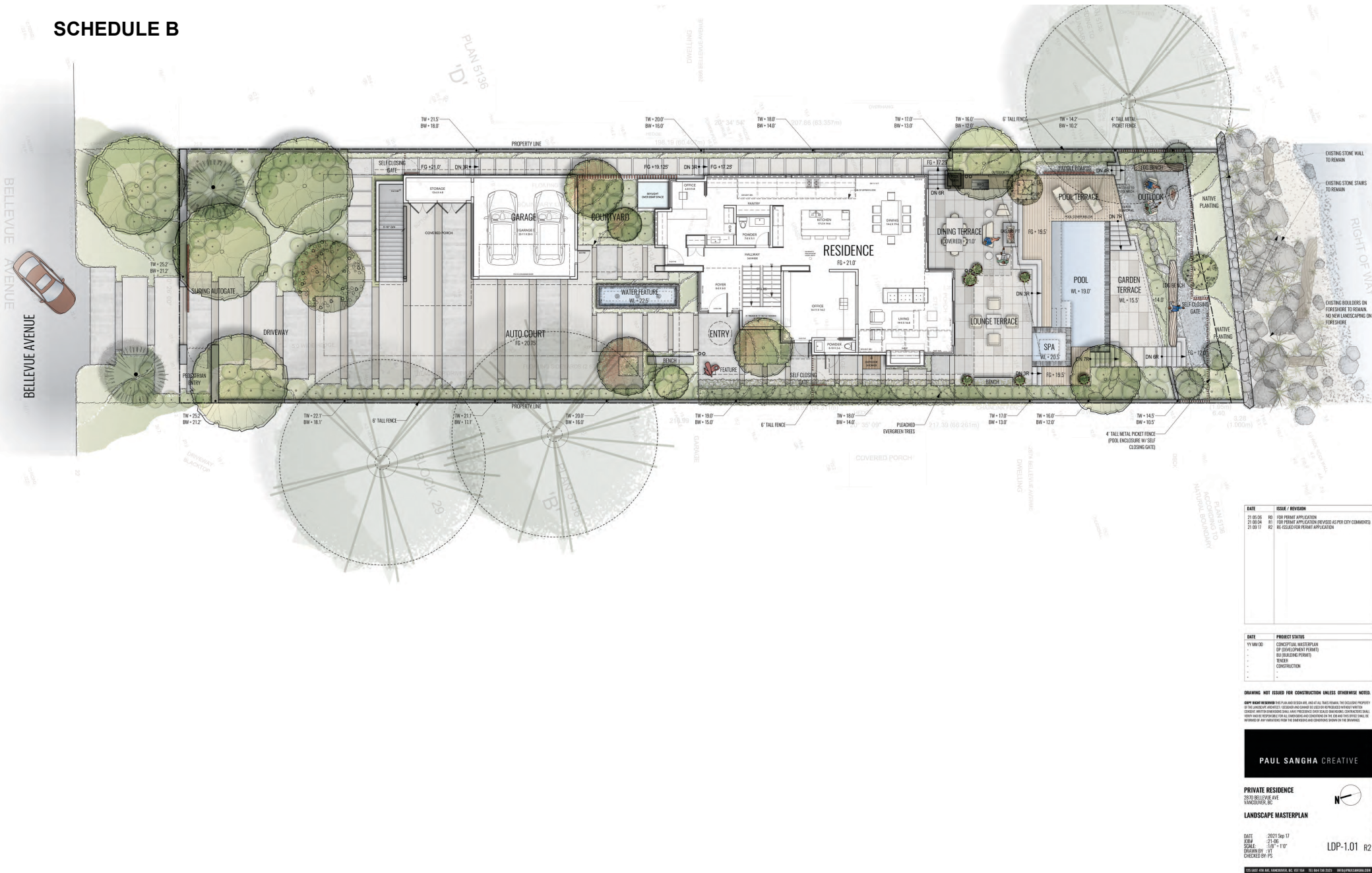
DATE
26/AUG/2021
SCALE
AS NOTED

CHECKED BY
BL
ISSUED
26/AUG/2021
DRAWN BY
JL

DRAWING TITLE
SECTIONS

PROJECT NO.
02101
DRAWING NO.
A4.0

SCHEDULE B



DATE	ISSUE / REVISION
21 03 06	R0 FOR PERMIT APPLICATION
21 03 04	R1 FOR PERMIT APPLICATION (REVISED ACCORDING TO CITY COMMENTS)
21 03 17	R2 ISSUED FOR PERMIT APPLICATION

DATE	PROJECT STATUS
-	CONCEPTUAL MASTERPLAN
-	FOR DEVELOPMENT PERMIT
-	FOR BUILDING PERMIT
-	TENDER
-	CONSTRUCTION

DRAWING NOT ISSUED FOR CONSTRUCTION UNLESS OTHERWISE NOTED:
 ANY WORK SHOWN ON THIS DRAWING IS THE PROPERTY OF PAUL SANGHA CREATIVE. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AUTHORITIES. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AUTHORITIES. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AUTHORITIES. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AUTHORITIES.

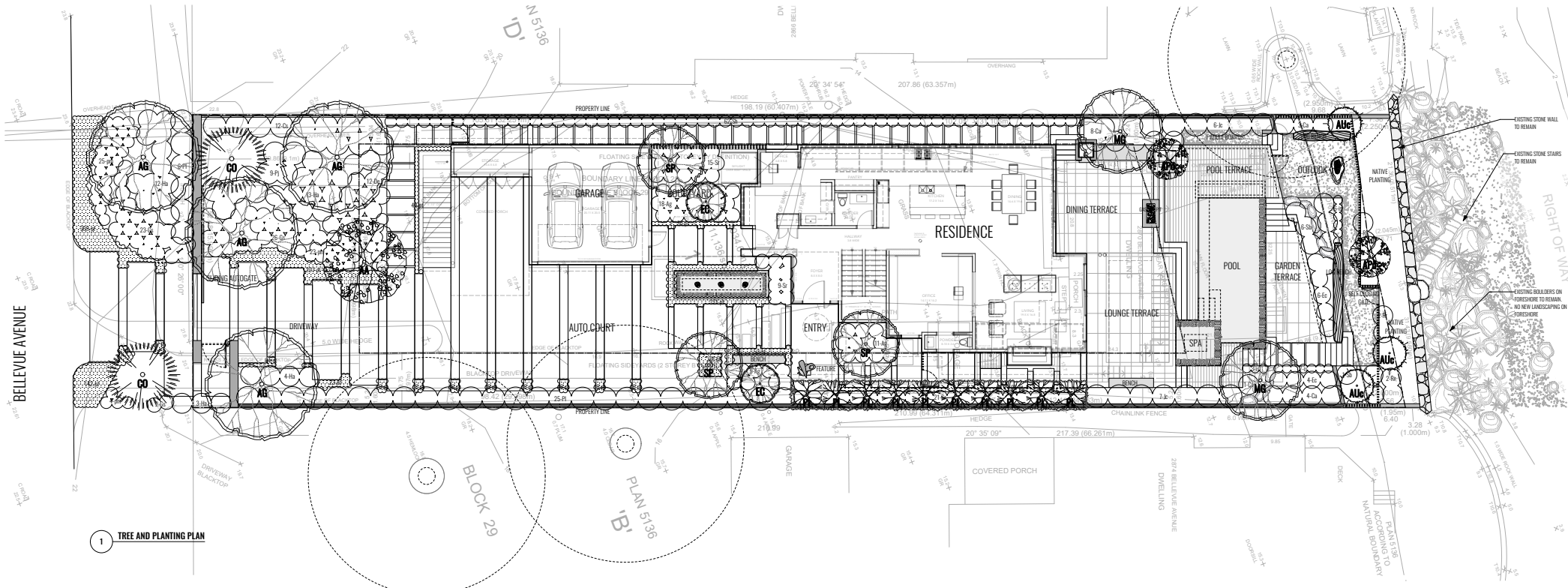
PAUL SANGHA CREATIVE

PRIVATE RESIDENCE
 2010 BELLEVUE AVE
 WASHINGTON, DC

LANDSCAPE MASTERPLAN

DATE: 2021 Sep 17
 DRAWN BY: JY
 CHECKED BY: PS

LDP-1.01 R2

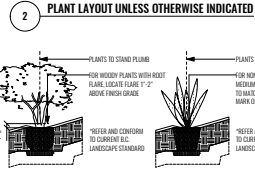
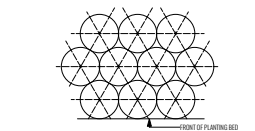


1 TREE AND PLANTING PLAN

ID	QUANTITY	LATIN NAME	COMMON NAME	SCHEDULED SIZE
AA	2	ACER PALMIFORME 'ACONITIFOLIUM'	BURNING JAPANESE MAPLE	3" CAL. 10-12' HI. SPECIMEN, BBB
AC	4	ACER GRISEUM	JAPANESE MAPLE	3" CAL. 12-14' HI. SPECIMEN, BBB
AP	2	ACER PALMIFORME VAR. DISSECTUM	JAPANESE MAPLE	4"-5" HI. SPECIMEN, BBB
AAJ	2	ARDISIA URBENS COMPACTA	DIANE'S STARBUCKERY TREE	4"-5" HI.
AD	2	CHAMAECYPARUS BREVISA	MINOR CYPRIPRESS	10'-12' HI.
EC	2	EMMENANTHE GAMBELII	BEVERLY ENIGMATICUS	5'-6" HI. SPECIMEN, BBB
MB	2	MAGNOLIA GRANDIFLORA	FLORISSANT MAGNOLIA	3" CAL. 2" DB
PL	10	PERSEA LANCEATA	PORTUGUESE LAUREL	6" DB, 10'-15' DB
SP	3	STENANTHERA PSEUDOCAMELLIA	JAPANESE STEWARTIA	3" CAL. 12-14' HI. SPECIMEN, BBB

ID	QUANTITY	LATIN NAME	COMMON NAME	SCHEDULED SIZE
SA	3	SAURURIA CUNEATA	SAURURIA	#1 POT 3" x 2" x 2" DC
CS	12	CAMELLIA GALEANDRA	APPLE BLOSSOM CAMELLIA	#1 POT 4" x 4" x 4" DC
CS	16	CAMELLIA 'ALICE PLUM'	ALICE PLUM	#1 POT 3" x 3" x 3" DC
DR	12	DRYMONIA 'STELLA PARVIFLORA'	PERSONAL ORNAMENTAL DRAGON	#1 POT 3" x 3" x 3" DC
ES	10	ESCALONIA COMPACTA	DIANE'S ESCALONIA	#1 POT 3" x 3" x 3" DC
GS	51	GALIA NEREA SPINULOSA	SAGE	#1 POT 2" x 2" x 2" DC
HR	32	HYDRANGEA LANCEOLATA	ANNONCEE HYDRANGEA	#1 POT 3" x 3" x 3" DC
IL	13	IMPATIENS 'CHIMENIS' 'TOBILOISA'	HELVETIA IMPATIENS	6" HI. POT 4" x 4" x 4" DC
PI	31	PERSEA JAPONICA	LELLER THE VALLEY	#1 POT 4" x 4" x 4" DC
PI	31	PERSEA LANCEATA	PORTUGUESE LAUREL	10" HI. BBS 8" x 12" DC
PI	6	PERSEA LANCEATA	PORTUGUESE LAUREL	#1 POT 3" x 3" x 3" DC
SP	62	SARDOCOSMA 'HEAVENLY' 'FIRMUS'	DIANE'S SHEET BEEB	#1 POT 2" x 2" x 2" DC
SP	42	SARDOCOSMA 'PROSPERITA'	PERSEUS SHEET BEEB	#1 POT 2" x 2" x 2" DC
SP	9	SYRIGIA 'BLOSSOMING' 'PINK PERLE'	DIANE'S PINK LEAF	#1 POT 3" x 3" x 3" DC

ID	QUANTITY	LATIN NAME	COMMON NAME	SCHEDULED SIZE
AR	40	ARIZONICA 'CONCORDIA'	ARIZONICA 'CONCORDIA'	#1 POT 4" x 4" x 4" DC
AR	1100	ARIZONICA 'TERRAZZINI'	JAPANESE ARIZONICA	#1 POT 4" x 4" x 4" DC
AR	50	ARIZONICA 'MANTILLA'	ARIZONICA	#1 POT 4" x 4" x 4" DC



- PLANTING NOTES:**
- CONTRACTOR TO PROVIDE SOIL REPORT C/W RECOMMENDATIONS TO LANDSCAPE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION. REPORT SHALL BE DATED EARLIER THAN ONE MONTH EARLIER THAN DATE PROVIDED TO LANDSCAPE ARCHITECT. RECOMMENDATIONS OF REPORT TO BE FOLLOWED BY CONTRACTOR.
 - IRRIGATION PLAN TO BE PROVIDED FOR REVIEW AND APPROVAL BY LANDSCAPE ARCHITECT PRIOR TO INSTALLATION. SYSTEM DESIGN AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE IRRIGATION INDUSTRY OF BC STANDARDS AND GUIDELINES.
 - ALL PLANT MATERIAL, INCLUDING TREES SUPPLIED BY CONTRACTOR, TO BE APPROVED BY LANDSCAPE ARCHITECT PRIOR TO ITS PURCHASE AND DELIVERY TO SITE.
 - PLANT SIZES SHALL BE AS THE CURRENT BC LANDSCAPE STANDARD, UNLESS OTHERWISE SPECIFIED.
 - ALL PLANT MATERIAL SUPPLIED TO THE SITE TO BE CERTIFIED SOIL FREE. SOIL CERTIFICATION TO BE PROVIDED BY EVERY SUPPLIER OF PLANT MATERIALS.
 - LAWN TO BE NO. 1 PREMIUM GRADE UNNETTED SSD OR LAWN SEED TO BE DIRECT SEEDING LANDSCAPE MIX OR APPROVED EQUIVALENT.
 - ALL SOIL SHALL BE FREE OF PLASTIC AND ANY OTHER FOREIGN OBJECTS.
 - TOP DRESS ALL PLANTING BEDS WITH 1" (2" AGED) BLACK BARK MULCH.
 - SUB-SURFACE GRADE TO BE SLOPED TOWARDS DRAINAGE PIPE.
 - ENSURE POSITIVE DRAINAGE AWAY FROM THE BUILDING WHEN PLANTING SOIL IS TO BE RUN AGAINST THE BUILDING FACE.
 - ALL PLANTING BEDS TO BE BERMED UP MINIMUM 4" ABOVE ADJACENT LAWN OR HARD SURFACE AREAS, EXCEPT AROUND EXISTING TREES. EXISTING TREES ARE NOT TO HAVE GRASSES ADJUSTED AROUND THEM.
 - UNLESS NOTED OTHERWISE ON PLANTING PLAN, MINIMUM SOIL DEPTHS ARE TO BE 12" IN LAWN, 18" IN GROUND COVER, 24" IN SHRUB AREAS, EACH TREE - INSTALLED TO HAVE ONE CUBIC YARD SOIL DISTRIBUTED TO 24" DEPTH AROUND THE TREE.
 - FOR GRADING AND LAWFY REFER GRADING AND LAYOUT PLANS.
 - ALL EXISTING PLANTS TO BE RETAINED AND TO BE PROTECTED DURING INSTALLATION/CONSTRUCTION. ROOT ZONES, AS DEMARCATED BY TREE PROTECTION FENCING SHALL NOT BE USED FOR STORAGE OF ANY KIND.
 - ALL PLANT MATERIAL SHALL BE SOURCED FROM SAME USDA CLIMATE ZONE AS PROJECT LOCATION, OR ONE LOWER, UNLESS OTHERWISE APPROVED BY LANDSCAPE ARCHITECT.
 - AREA OF PLANT SOURCING TO INCLUDE WESTERN CANADA AND WESTERN UNITED STATES.
 - LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL PLANT MATERIAL DURING CONSTRUCTION, TO THE EXTENT IN WHICH IT IS NOT OTHERWISE SPECIFIED.
 - SEEDING OF TREES SHALL ONLY BE PERMITTED IN THE EVENT THAT SITE CONDITIONS OR CONDITIONS OF THE TREE ARE SUCH THAT THE TREE IS ANTICIPATED TO BE UNSTABLE. THE CONTRACTOR SHALL SUBMIT IN WRITING, FOR APPROVAL OF THE LANDSCAPE ARCHITECT, A REQUEST TO STABILIZE ANY TREE. THE SUBMISSION SHALL INCLUDE THE TYPE AND LOCATION REASON WHY STABILIZATION IS REQUESTED AND THE STABILIZATION METHODS TO BE EMPLOYED.
 - APPLY MUCKSPRINK TO TREE ROOTZONES DURING PLANTING TO SUPPORT ROOT SYSTEM ESTABLISHMENT.
 - ALL PLANTING AREAS INCLUDING PLANTINGS TO BE IRRIGATED AND PROPERLY DRAINAGE. HOSE BIBS TO BE PROVIDED IN PRIVATE PATIO AREAS.
 - SOIL RELEASE GRANULAR FERTILIZER TO BE ADDED TO ALL THE PLANTING BEDS, TREES AND HERBS AFTER ALL THE PLANTS ARE INSTALLED.
- GENERAL NOTES:**
- ALL LANDSCAPE MATERIAL AND CONSTRUCTION TO MEET OR EXCEED THE BC CLIMATE LANDSCAPE STANDARD LATEST EDITION.
 - ALL ELEVATIONS AND DIMENSIONS TO BE VERIFIED ON SITE PRIOR TO CONSTRUCTION. LAYOUT TO BE APPROVED BY LANDSCAPE ARCHITECT.
 - CONTRACTOR TO PROTECT THE EXISTING TREES AND VEGETATION UNLESS OTHERWISE MENTIONED DURING CONSTRUCTION.
 - TYPICAL SUB-BASE FOR HARD LANDSCAPE TO BE 4" OF COMPACTED 3/4" MINUS CRUSHED ROCK BASE ON COMPACTED SUBGRADE (90% SP6) OR ON BEDROCK.
 - ALL FILL TO BE COMPACTED IN 6" LIFTS, TO 90% SP6 LAWN PAVING AREAS AND 90% IN PLANTING AREAS. FILL TO BE FREE DRAINING AND WITHOUT ORGANIC MATERIAL. FILL OR SOIL TO BE APPROVED BY ARCHITECT PRIOR TO CONSTRUCTION.
 - INSTALL 3" DIAMETER IRRIGATION/SLICING SLEEVE UNDER NEW PAVING AND THROUGH WALLS (BELOW GRADES) SUCH THAT ALL PAVING AREAS ARE ACCESSIBLE FOR IRRIGATION/LIGHTING FLAG ENDS OF EACH SLEEVE.
 - INSTALL DRAINAGE SLEEVES WHERE REQUIRED BY DRAINAGE PLAN.
 - INSTALL LIGHTING SLEEVES. SEE LIGHTING PLAN.
 - ANY DISCREPANCIES IN THE DRAWINGS OR MISSING INFORMATION TO BE BROUGHT TO THE NOTICE OF THE LANDSCAPE ARCHITECT BEFORE PROCEEDING WITH WORK ON SITE.
 - ALL PROPOSED GRADES ARE IN FEET.
 - ALL DIMENSIONS ARE IN FEET AND INCHES.

DATE	ISSUE / REVISION
21.05.06	ISSUED FOR PERMIT APPLICATION
21.08.04	FOR PERMIT APPLICATION (AS REQUESTED BY CITY COMMENTS)

DATE	PROJECT STATUS
21.05.06	CONCEPTUAL MASTERPLAN
21.08.04	BY (DEVELOPMENT PERMIT) (AS BUILDING PERMIT)
	TENDER CONSTRUCTION

DRAWING NOT ISSUED FOR CONSTRUCTION UNLESS OTHERWISE NOTED.
 ANY WORK REFERRED TO IN THIS DRAWING IS TO BE DONE IN ACCORDANCE WITH THE BC CLIMATE LANDSCAPE STANDARD LATEST EDITION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE RELEVANT AUTHORITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE RELEVANT AUTHORITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE RELEVANT AUTHORITIES.



PRIVATE RESIDENCE
 2870 BELLEVUE AVE
 VANCOUVER, BC

PERMIT PLANTING PLAN

DATE: Aug 4, 2021
 DRAWN BY: [Name]
 SCALE: 1/8" = 1'-0"
 CHECKED BY: SP/PS



LDP-401 R1

Client	Beedie Construction c/o Lamoureux Architects Inc.		
Project Name	Flood Construction Level at 2870 Bellevue Avenue		
Project No.	1210123	Document No.	1210123_MEM_002_R0
Date	07 May 2021		
Attention to	Brad Lamoureux	Lamoureux Architects Inc.	
Copies	Joe Lee	Lamoureux Architects Inc.	
	Vignesh Ramadhas	Westmar Advisors Inc.	
	Daniel Leonard	Westmar Advisors Inc.	
Subject	2870 Bellevue Avenue, West Vancouver - Risk Identification		

1 Introduction

Westmar Advisors Inc. (Westmar) was retained by Beedie Construction, c/o Lamoureux Architects Inc (the Client) to estimate the Flood Construction Level (FCL) for a waterfront property located at 2870 Bellevue Avenue in West Vancouver. Based on the Provincial Guidelines, Westmar estimated the FCL for the property to be 6.4 m referenced to Geodetic Datum (GD). A detailed description of Westmar's methodology for estimating FCL at the property is presented in Westmar's Memorandum no. 1210123_MEM_001_R0 dated 13 April 2021. [\[Revised: 1210123_MEM_001_R1 dated 26 August 2021.\]](#)

It is proposed that the basement of the house be constructed with a finished floor elevation of 2.85 m GD (9.375 ft). This elevation is lower than the 6.4 m GD (21 ft) FCL estimated for the property. The Client has engaged Westmar to review potential risks to the house and occupants resulting from constructing the basement below FCL and recommend mitigative measures to address identified risks. Risks associated with the design flood event and proposed mitigative measures are outlined in this memorandum.

2 Risks Identification

Westmar has identified the following risks associated with locating the basement of the house below the estimated FCL:

- **Water Breach into Basement:** Water breach into the basement of the house could occur if there is ingress of ground water or during flood events. The basement of the proposed house is encased in a reinforced concrete retaining wall that is designed to prevent ground water ingress. During flood events, water could enter the basement if waves overtop the main floor elevation and then flow into the basement through the stairwells in the house. At the project site, the design wave crest elevation is estimated to be 5.8 m GD and the main floor elevation is proposed to be at 6.4 m GD. As such, wave overtopping above the main floor is not expected.
- **Utilities:** Electrical and mechanical utilities located below the FCL could be susceptible to damage during flood events. Although flood water ingress into the basement is not expected,

consideration should be given to either locate utilities above the FCL or install appropriate safety systems recommended by a professional electrical and/or mechanical engineer.

3 Evaluation of Risks

In evaluating the identified risks and developing strategies to mitigate them, due consideration should be given to the following:

- **Life Safety:** Safety of occupants is paramount and identified risks will have to be sufficiently mitigated such that life safety is not compromised.
- **Safe means of egress:** In the event of flooding or water breach, however unlikely, satisfactory mitigation measures should be put in place to allow occupants to safely exit the house.
- **Commercial Impact:** Components of the house that sustain damage during the design flood event will require replacement or repair and commercial impacts of such risks should be considered by owners of the property.

4 Risk Mitigation

4.1 Life Safety

From a life safety perspective, ground water ingress and flooding of the basement are addressed as described below.

- As discussed in Section 2, it is proposed that the basement of the house be encased in a 200 mm thick reinforced concrete wall that is designed to prevent ground water ingress and surface runoff. To this extent, the wall will be waterproofed and designed to withstand hydrostatic and lateral earth pressure from the surrounding soil.
- The 6.4 m FCL estimated for the project site includes an allowance of 0.6 m for freeboard above the estimated wave crest elevation of 5.8 m GD. It is noted that the wave crest elevation does not correspond to the elevation of standing water during storm events but rather the top of the wave after wave effects are included. This wave crest elevation is lower than the elevation of the finished main floor level. Hence, wave overtopping of the main floor during the design flood event is not expected and as such, water ingress into the basement from above is unlikely.

4.2 Safe means of Egress

As discussed in Section 4.1, ingress of both ground water and flood water into the basement is considered highly unlikely. Furthermore, both these scenarios will not result in instantaneous flooding of the basement. Rather, ingress of water would be gradual with sufficient warning to building occupants to exit the basement.

In the event of water ingress into the basement, it is important that occupants are provided with safe means of egress from the basement to higher grounds. Accordingly, the basement is designed with two staircases: one on the north side of the property that leads to the front of the property; and a second located centrally in the house that could be used to access the main floor level which is located above the FCL elevation. Location of the staircases in the basement are shown in Figure 1.

Given the low likelihood of water ingress into the basement, the nature of water ingress i.e. gradual with sufficient warning, and the availability of two staircases that allow safe egress to higher grounds, locating the basement below FCL is not considered a risk to life safety.

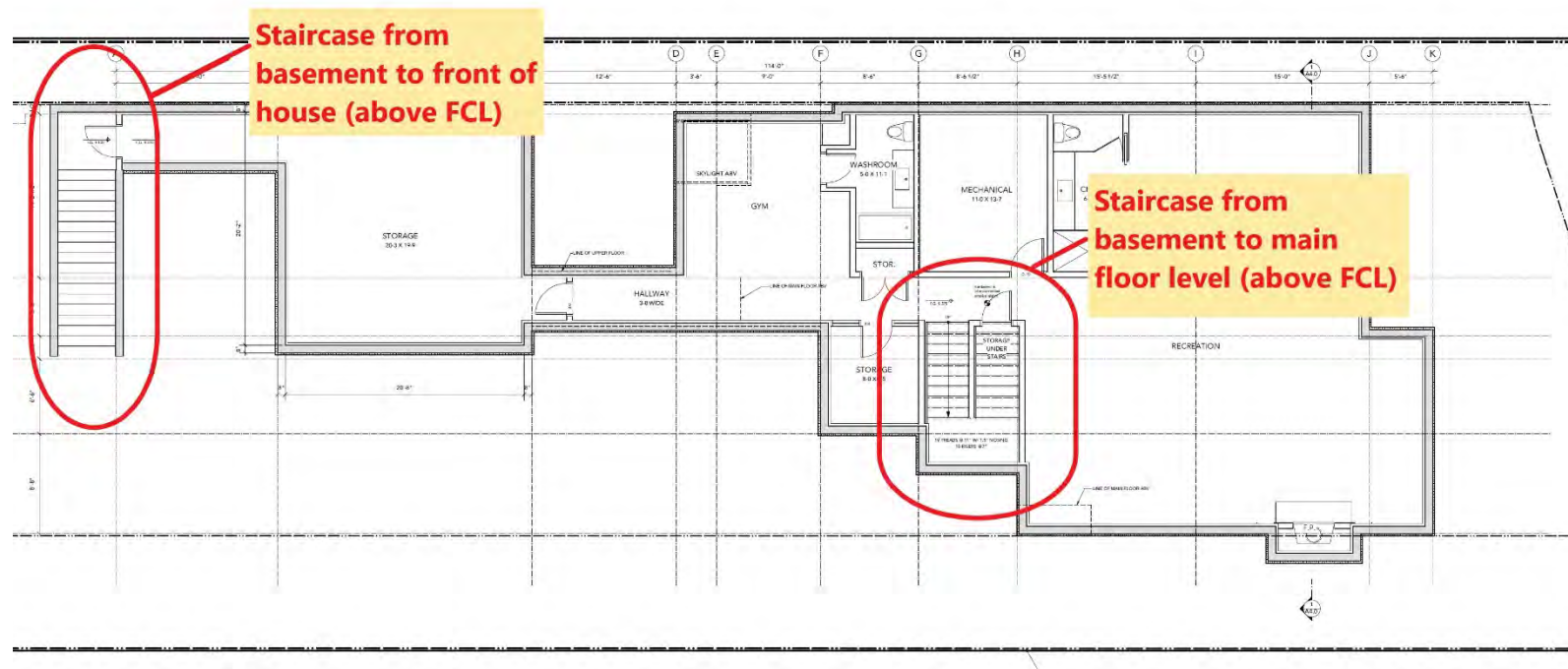


Figure 1 – Location of staircases in the Basement that lead to higher ground (Lamoureux Architect, adapted)

4.3 Commercial Impact

Water breach into the basement could result in water damage to the interior of the basement including damage to flooring, utilities and mechanical and electrical systems. While damage to these components is not considered to have an impact on the safety of occupants, repairs will be required following water ingress.

As discussed in Section 2, consideration should be given to either locate utilities above the FCL or install appropriate safety systems recommended by a professional electrical and/or mechanical engineer.

5 Conclusion

It is proposed that the basement of the house at 2870 Bellevue Avenue be constructed below the estimated FCL for the project site. Westmar has reviewed the risks associated with constructing the basement below the project FCL and findings from Westmar's review are summarized below:

- Water breach into the basement is considered unlikely due to the presence of a reinforced concrete retaining wall around the basement that is waterproofed and designed to withstand hydrostatic and earth pressure from the surrounding ground. Further, the main floor of the house is located above FCL and hence, wave overtopping is not expected.
- Water ingress and flooding inside the basement is not expected to be instantaneous and occupants will have sufficient time to safely exit the basement during such scenarios. To this extent, two staircases leading from the basement to higher ground has been incorporated in the design.
- Water damage to flooring, utilities, and mechanical and electrical components could occur in the event of water ingress. However, this is not expected to compromise life safety.
- Design of the reinforced concrete retaining wall around the basement will be such that water ingress, hydrostatic and earth pressure can be safely resisted. The elevation of the main floor is above FCL to prevent wave overtopping. In the event of water breach, occupants can safely exit the basement through one of two staircases. Based on this, it is Westmar's opinion that locating the basement below the project FCL does not compromise life safety.

We trust this meets your immediate requirements. Please do not hesitate to contact us at 604-729-8125 or via email at vramadhas@westmaradvisors.com should you have any questions or require additional information or clarification.

Sincerely,

*Vignesh
Ramadhas*

Vignesh Ramadhas, P.Eng.

Practice Lead – Infrastructure, Westmar Advisors Inc.

CC: Daniel Leonard, P.Eng. | Westmar Advisors Inc.
Joe Lee. | Lamoureux Architects Inc.



Client	Beedie Construction c/o Lamoureux Architects Inc.		
Project Name	Flood Construction Level at 2870 Bellevue Avenue		
Project No.	1210123	Document No.	1210123_MEM_001_R1
Date	26 August 2021		
Attention to	Brad Lamoureux	Lamoureux Architects Inc.	
Copies	Vignesh Ramadhas	Westmar Advisors Inc.	
	Michael Isaacson	Westmar Advisors Inc.	
Subject	Flood Construction Level at 2870 Bellevue Avenue, West Vancouver		

1 Introduction

Westmar Advisors Inc. (Westmar) has been retained by Beedie Construction, c/o Lamoureux Architects Inc (the Client) to estimate the Flood Construction Level (FCL) for a waterfront property located at 2870 Bellevue Avenue in West Vancouver. This is required to enable permitting of the project and completion of the building design. The FCL has been estimated in accordance with Provincial Guidelines. Based on the methodology adopted, the FCL requires estimates of component contributions that include the 1-in-200-year extreme water level due to tides and storm surge taken together; sea level rise to the year 2100, wave runup estimates associated with a 1-in-200-year storm event, and the inclusion of a specified freeboard. This report summarizes the relevant guidelines, describes the development of estimates of the various components contributing to the FCL, and provides a recommended value of the FCL.

2 Reference Material

The following references are relied upon in this study:

1. Coastal Engineering Manual, U.S. Army Corps of Engineers, 2002 (with subsequent changes).
2. Flood Hazard Area Land Use Management, May 2004; with Amendments by the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development to Sections 3.5 and 3.6, January 2018.
3. Flood Control for West Vancouver Waterfront Buildings Interim Planning for Coastal Flooding & Sea Level Rise, WSP Canada Inc. (WSP), report to the District of West Vancouver, October 2019.
4. Guidelines for Management of Coastal Flood Hazard Land Use, Ausenco Sandwell report to BC Ministry of Environment, January 2011.

3 FCL Requirements

The FCL and its determination are described in various Provincial Guidelines, including Refs. 2 and 4, referred to in this report as “the Guidelines.” In general terms, the FCL is obtained as:

$$\text{FCL} = \text{High Tide Level} + \text{Sea Level Rise} + \text{Land Subsidence} + \text{Storm Surge} + \text{Wave Effects} + \text{Freeboard}$$

The Guidelines describe two alternative approaches to determining the FCL, termed the “Combined Method” and the “Probabilistic Method.” In the former, the high tide level is taken as Higher High Water Large Tide (denoted HHWLT) and may be obtained from nautical charts; Sea Level Rise (SLR) is obtained for the year 2100 based on the Guidelines that propose 10 mm/yr; and local land subsidence or uplift is used to adjust SLR to “relative SLR” such that the FCL relative to local land surfaces is uninfluenced by land uplift/subsidence. Storm surge and wave effects (i.e., the maximum wave crest elevation) are obtained for a “designated storm”, which is taken to correspond to an annual exceedance probability of 0.5%, i.e., corresponding to a return period of 200 years. Finally, the freeboard is specified as 0.3 m.

The “Probabilistic Method” instead takes account of the joint probability of occurrence of high tide levels and large storm surge, and so determines the 1-in-200-year water level due to tide levels and storm surge taken together. For this method, the freeboard is specified as 0.6 m.

The Guidelines also refer to areas that are and are not “subject to significant tsunami hazard.” The Strait of Georgia is considered not to be subject to significant tsunami hazard, and therefore considerations of tsunami inundation are discounted.

Specifically, the Guidelines provided in Ref. 2 include the following statements:

- *The FCL is used to establish the elevation of the underside of a wooden floor system or top of concrete slab for habitable buildings but does not relate to the crest level of a sea dike.*
- *Requirements for buildings, subdivision, and zoning should allow for SLR to the year 2100.*
- *Allowance for Global Sea Level Rise of 0.5 m by 2050, 1.0 m by 2100 and 2.0 m by 2200 relative to the year 2000.*
- *Adjust for regional uplift and subsidence using the most recent and best information available. Where no information is available, assume neutral conditions (i.e., no uplift or subsidence).*

Probabilistic Method

The Year 2100 FCL should be determined as the sum of:

- *The 1:200 Annual Exceedance Probability (AEP) total water level as determined by probabilistic analyses of tides and storm surge.*
- *Allowance for future SLR to the year 2100.*
- *Allowance for regional uplift, or subsidence to the year 2100.*
- *Estimated wave effects associated with the Designated Storm with an AEP of 1:200.*
- *A minimum freeboard of 0.6 metres.*

Combined Method

Alternatively, the Year 2100 FCL can be determined by a more conservative “Combined Method” where the FCL is determined as the sum of:

- *Allowance for future SLR to the year 2100.*
- *Allowance for regional uplift, or subsidence to the year 2100.*

- Higher high water large tide (HHWLT).
- Estimated storm surge for the Designated Storm with an AEP of 1:200.
- Estimated wave effects associated with the Designated Storm.
- A minimum freeboard of 0.3 metres.

Of direct relevance to this study, WSP (Ref. 3) undertook an FCL study in 2019 for the District of West Vancouver. For the area where 2870 Bellevue Avenue is located, the WSP report includes FCL components for both the combined and probabilistic methods as shown in Table 1.

Table 1 – WSP values of FCL components

FCL Component	Combined Method (m)	Probabilistic Method (m)
HHWLT ¹	1.90	2.56 ²
Storm Surge	1.08	
Sea Level Rise	1.0	1.0
Land Uplift	0.04	0.04
Wave Effect	2.74 ³	2.59 ³
Freeboard	0.30	0.60
FCL	7.06	6.79

Notes to Table 1:

1. HHWLT is given relative to the Canadian Geodetic Datum (formally referred to as CGVD2013), denoted in this report as CGD.
2. Tide level and storm surge are considered in combination for the Probabilistic Method.
3. The wave effect values differ slightly between the two methods since the two methods predict different values of the local mean water depth.

The information in Table 1 provides a useful benchmark for the present study.

In this study, we have adopted the Probabilistic Method outlined above. That is, we have estimated in turn: the maximum water elevation due to tides and storm surge taken together, corresponding to a 200-year return period; Sea Level Rise and Land Subsidence for the year 2100, and the maximum wave runup at the site for a storm with a 200-year return period. The various components are summarized in the following sections.

4 Tides and Storm Surge

The Combined Method relies on HHWLT and the 1-in-200-year storm surge, whereas the Probabilistic Method (adopted here) considers the 1-in-200-year water level due to tides and storm surge in combination. For reference, comments are first provided for tide levels and storm surge considered independently, and then considered simultaneously.

4.1 Tide Levels

HHWLT levels are provided in nautical charts. Specifically, for Point Atkinson, CHS Chart 3496 – Approaches to Vancouver Harbour, published in 2019, lists HHWLT as 5.0 m relative to Chart Datum (CD).

For this to be expressed relative to the CGD, the elevation of CD below CGD is required. The WSP report (Ref. 3) uses a value of 3.066 m and refers to alternative values that have been adopted, ranging from 3.04 to 3.10 m. Based on a value of 3.066 m, HHWLT is at an elevation of 1.9 m CGD.

4.2 Storm Surge

Storm surge levels may be determined by subtracting predicted tide levels, i.e., astronomical tide levels, from measured water levels, which includes storm surge. Predicted and measured tide levels at Point Atkinson may be obtained from the Canadian Hydrographic Service over an extended duration. The extreme differences – which correspond to extreme storm surge values – may then be applied to an extreme value analysis so as to obtain the storm surge level corresponding to a 200-year return period. WSP undertook such an analysis of Point Atkinson data, and thereby determined a value 1.08 m for a 200-year return period. Related to this, StormSurgeBC (www.stormsurgebc.ca) indicates a maximum measured storm surge for Point Atkinson over 50 years as 1.03 m.

4.3 Tide and Storm Surge

When tide levels and storm surge are considered simultaneously, as required for the Probabilistic Method, extreme values of measured water levels – which correspond to tide level plus storm surge – may be applied to an extreme value analysis so as to obtain the combined water level corresponding to a 200-year return period. Measured hourly water levels at Point Atkinson have been obtained from the Canadian Hydrographic Service over the 70-year period, 1950 – 2020. We have thereby developed maximum measured water levels at Point Atkinson for distinct events and applied these to an extreme value analysis to obtain the combined water level for a 200-year return period. WSP has undertaken a corresponding analysis, and thereby determined a value 2.56 m. Our analysis indicates a result very close to this, and therefore we have adopted this value.

5 Sea Level Rise and Land Subsidence

5.1 Sea Level Rise

BC Provincial Guidelines (see Ref. 3) recommend that SLR should be accounted for on the basis of a linear rise of 10.0 mm/yr, corresponding to a value of 1.0 m for the year 2100 relative to the base year 2000. On the basis of this rate, the SLR from the present time to 2100 will be 0.79 m. It is noted that the WSP report (and other studies) have assumed a SLR value of 1.0 m, which corresponds to SLR relative to the year 2000 and not relative to the present time.

However, a more careful and detailed assessment of SLR for the year 2100 relative to the present time has been provided to the District of West Vancouver (see Appendix A). This suggests that an improved SLR estimate to be used for this project is 0.6 m. However, in order to retain additional conservatism, we have adopted a SLR value for this project as 0.8 m.

5.2 Land Subsidence

As described earlier, the Guidelines recommend that local land uplift or subsidence is included, so that, in effect, the SLR is adjusted to “relative SLR” so as to assure that the FCL relative to local land surfaces is uninfluenced by land uplift/subsidence. Note that, when land subsidence occurs the sea level rise relative to local land surfaces increases. Therefore, land subsidence is assigned a positive value and land uplift a negative value. The WSP report makes reference to a subsidence rate of 0.5 mm/yr, so that, over

approximately 80 years to 2100, the land subsidence is taken to be 0.04 m. We have adopted this value in the present study.

6 Wave Effect

The wave effect component of the FCL refers to the maximum wave surface elevation at the site relative to the local mean water level. The mean water level, which is referred to as the Designated Flood Level (DFL) in the Guidelines, corresponds to the high tide, storm surge, sea level rise and land subsidence contributions.

In fact, the wave effect corresponds to two components, termed wave runup and wave setup. The wave runup is the maximum water level reached at the shore relative to the local mean water level and is outlined below. The wave setup refers to a contribution to the mean water level associated with wave action. However, this is already included in the estimate of the tide and storm surge component, since those were based on an analysis of measured water levels that includes wave setup. Therefore, wave setup is not included here within the wave effect.

The determination of wave runup normally includes a determination of extreme wind conditions corresponding to a 200-year return period; the application of these wind conditions to a hindcast analysis to determine the corresponding deep water wave conditions, the transformation of these deep water waves, primarily by shoaling and refraction, to determine the corresponding wave conditions in the nearshore area; and finally an assessment of the more complex interaction of the nearshore waves with the specific ground profile, including the presence of seawalls and other features. In some studies, some of these steps may be combined through suitable numerical models.

In fact, the maximum wave height as the waves approaches the shoreline is limited by wave breaking due to the local depth. That is, the largest waves in the design storm event will break offshore, and so do not contribute to the most severe waves reaching the site. Therefore, an estimate of the maximum wave crest elevation approaching the submerged seawall, is instead obtained, based on the local water depth, the beach slope and the wave period.

6.1 Deep Water Wave Conditions

Design wave conditions are normally described by the significant wave height and peak period of the waves. The significant wave height, which is a representative wave height commonly used in coastal engineering practice, is the average height of the highest one-third of the waves in a storm; and the peak period is the wave period in a storm at which the wave energy distribution with wave frequency is a maximum. The wave height itself is the vertical distance from trough to crest of the waves; and the wave period is the duration between successive wave crests crossing a stationary point.

Design wind conditions may be developed by a suitable analysis of available wind data. In this case, hourly wind speeds and directions at Vancouver International Airport over the period January 1, 1953 to December 31, 2020 have been analysed. The design wave event will be associated with waves generated over the longer fetches from approximately 220° N to 260° N, in conjunction with winds blowing over a sufficient duration. An extreme probability analysis using an assumed Gumbel probability distribution was then applied to the selected storm events; and this was used to obtain a set of design wind speeds, directions and durations. Design wave conditions were evaluated from these based on a desktop wave hindcasting method as described by the US Army Corps of Engineers (Ref. 1). On this basis, 200-year wave conditions at the site have been obtained as follows:

- Significant wave height: 3.2 – 4.0 m

- Peak period: 6.4 - 6.6 s

These compared to significant wave heights of 3.5 – 4.4 m and peak periods of 7.7 – 8.5 s provided by WSP. The differences are not especially critical since the wave elevations at the site are in any case limited by wave breaking and do not depend on the largest design wave heights.

The site is also exposed to vessel-generated waves. It is anticipated that vessel-generated waves at the site have a wave height of approximately 0.9 m and a period of 3.5 s, and therefore these do not govern.

6.2 Site Description

In order to assess the transformation of waves as they reach the shore and propagate over the subject property, there is a need to assess first the characteristics of the shoreline and the shore protection structures at the site and in the vicinity of the site. Therefore, a description of these features is initially given.

Figures 1 - 3 provide photographs relevant to such a description. Fig. 1 provides an aerial view of the shoreline in the general vicinity of the site; Fig. 2 provides a view of the shoreline at the site – the subject property is adjacent to the lower seawall in the distance, seen in the photo to the left of the higher seawall; and Fig. 3 shows a close-up view of the seawall fronting the subject property.



Figure 1 – Aerial view of the shoreline in the general vicinity of the site (ShoreZone BC)



Figure 2 – View of the shoreline at the site (Lamoureux Architect)



Figure 3 – Close-up view of the seawall and upper foreshore at the site (Lamoureux Architect)

Finally, Fig. 4 shows a section across the seaward extent of the property, as proposed, and the adjacent shoreline. That is, the current rock seawall will be retained, and a second retaining wall will be constructed between the rock seawall and the proposed building. These will both have an impact on changes to the wave crest elevation as the waves propagate towards the building. The figure also shows the Flood Construction Level and Designated Flood Level.

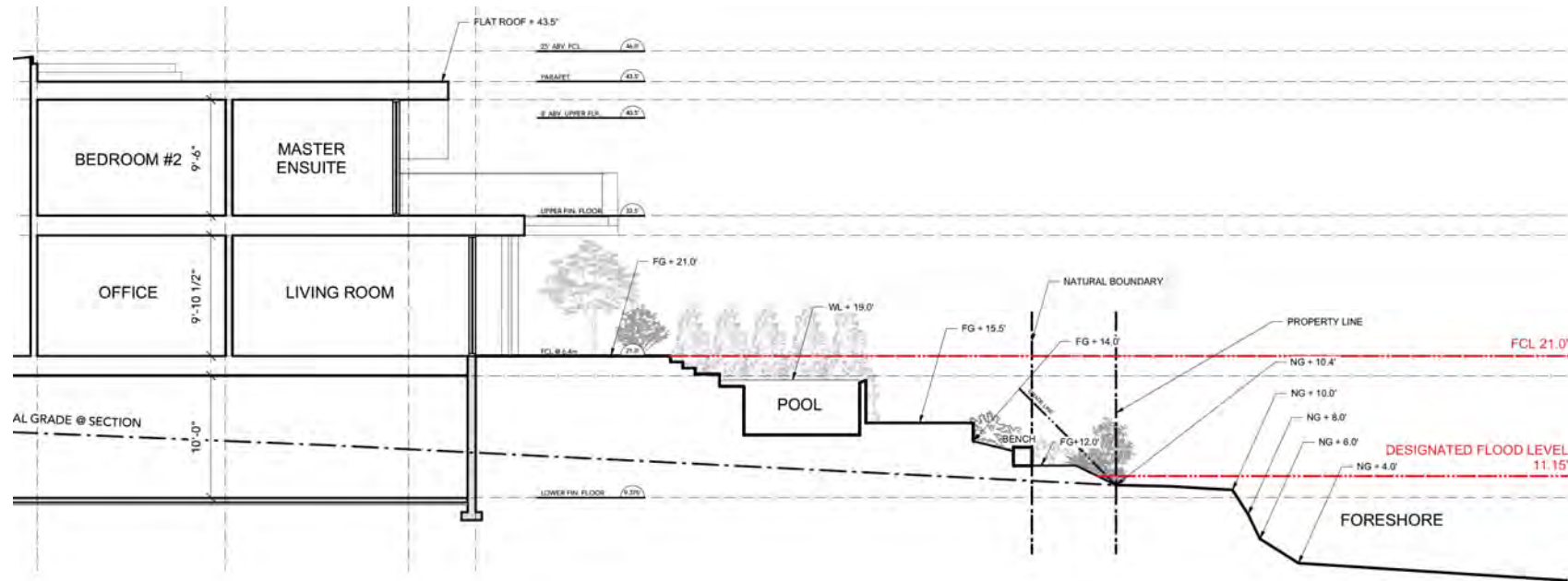


Figure 4 – Section of the proposed development and the upper foreshore (Lamoureux Architects)

6.3 Wave Runup

For the design event (1-in-200-year storm occurring in 2100), the mean water level submerges the rock seawall shown in Figs. 3 and 4 and will extend part way up the retaining wall shown in Fig. 4. Specifically, the mean water level is projected to be at 3.40 m CGD, which corresponds to a water depth of 2.06 m above the upper end of the beach, 0.26 m above the top of the rock wall, and 0.93 m below the top of the retaining wall.

Therefore, as an extreme wave arrives at the site, it will be transformed by partial reflection off the submerged seawall, and then partial reflection off the retaining wall with some overtopping of the retaining wall. Based on information contained in Ref. 1 and a related literature review, the impacts of these reflections and depth changes on changes to the wave crest elevation have been estimated. The maximum wave crest elevation above the local mean water level is thereby estimated to be 2.4 m.

This compares to a value of 2.6 m obtained by WSP. However, WSP's work was not site-specific, but rather related to the entire West Vancouver shoreline, relying on known formulae for the maximum wave runup, depending on different beach slopes and deep water wave conditions. Therefore, the different estimate of wave effect obtained in this study is understandable.

7 Estimated FCL

Based on the foregoing, and taking account of the 0.6 m of freeboard that is specified in the guidelines, we have estimated the FCL and its component values at the site to be as given in Table 2:

Table 2 – Estimated FCL components and FCL

FCL Component	Value
Tides & Storm Surge	2.56 m CGD
+ Sea Level Rise	0.80 m
+ Land Subsidence	0.04 m
+ Wave Effect	2.40 m
+ Freeboard	0.60 m
FCL	6.40 m CGD

Again, this differs from the value of 6.8 m obtained by WSP on account of our reliance on 0.8 m versus 1.0 m for SLR and 2.4 m versus 2.6 m for the wave effect.

8 Conclusion

Based on the foregoing, we have estimated the Flood Construction Level for 2870 Bellevue Avenue in West Vancouver to be 6.4 m CGD. This is based on the Probabilistic Method as recommended by Provincial Guidelines.

End of Memorandum

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Aug 26, 2021

Signed

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Signed

Appendix A

Response to the District regarding SLR

Response to the District of West Vancouver (the District)'s comment # 12 as follows:

12. FCL Calculation

The FCL calculation, completed by Westmar, includes re-benchmarking sea level rise to the current year rather than from the year 2000. This is an acceptable approach; however, the assumption of sea level rise occurring at a rate of 10 mm/year is potentially not accurate as sea level rise may increase at a faster rate in later years and sea level rise in the past 20 years has not occurred at that rate. For more accuracy, the re-benchmarking should account for the actual sea level rise that occurred in the last 20 years and subtracting that from the 1.0 m sea level rise projection. This could be done using the estimates produced by DFO, which are benchmarked to 2010 (link), and correct for the SLR that should have occurred to date. Please update the FCL calculation accordingly.

We very much appreciate the District's comments that have been made and agree entirely that the assumption of SLR occurring at a constant rate of 10 mm/yr starting in the year 2000, is not accurate. Our initial approach had been to conform to one particular interpretation of the Guidelines, i.e. relying on this 10 mm/yr rate going forward. However, in light of the District's comments, we have analysed alternate interpretations of the 2011 Guidelines more carefully, including the approach proposed by the District, and find that none of them are especially suitable. Instead, we have obtained an SLR estimate that relies on more up-to-date and reliable information and an updated methodology.

First, for reference, the 2011 Guidelines state the following:

Recommended Sea Level Rise Scenario for BC

Allow for Global Sea Level Rise of 0.5 m by 2050, 1.0 m by 2100 and 2.0 m by 2200 relative to the year 2000 as per Figure 1.

Adjust for regional uplift and subsidence using the most recent and best information available. Where no information is available, assume neutral conditions (i.e., no uplift or subsidence).

The scenario in Figure 1 is intended to be reviewed every 10 years or sooner if there is significant new scientific information. [Figure 1 that is referred to above is reproduced below.]

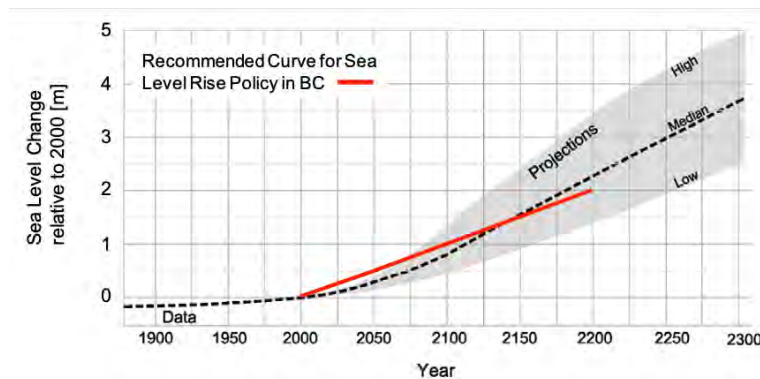


Fig. 1. Recommended global sea level rise curve for planning and design in BC (from 2011 BC Guidelines).

There are alternative ways of interpreting the above statement with respect to estimating the SLR for the year 2100:

- One approach is to take the SLR for 2100 as 1 m, regardless of the current date. However, this does not account for SLR occurring between 2000 and the present time, and as well the assumed constant rate of 10 mm/yr over the entire 100-year period is unreliable.

- A second approach has been to rely instead on the recommended red line in Fig 1, but taken between the present time and the year 2100. That is, a constant rate of 10 mm/yr is assumed going forward from the present time. This is the approach adopted in an initial submission to the District and leads to an estimate of about 0.8 m. Again, this is unreliable because of the assumed constant rate of 10 mm/yr over the entire period.
- A third approach is to rely on the recommended SLR value of 1 m since 2000, but then to subtract the actual SLR from 2000 to the present time. This is, in effect, the approach proposed by the District, and gives rise to an estimate of about 0.93 m. However, this approach is equivalent to assuming that the constant rate from the current time to 2100 is increased to about 11.8 mm/yr, which is also unrealistic.

That is, none of the above approaches that rely on the 2011 Guidelines are particularly accurate or reliable. However, we will describe below an alternative approach that we do consider to be more reliable.

But before doing so, we note that the District has suggested a correction for the SLR that has occurred to date by making reference to SLR estimates produced by DFO. While this is very helpful information and may be used to undertake the third approach above, this does not detract from the unsuitability of that approach in any case. At the same time, it is noted that the DFO website provides an independent SLR estimate for 2100 of about 0.48 m. This is much lower than the BC Guidelines estimate, and so reinforces the unsuitability of the 1 m value indicated in the Guidelines – as we have also determined.

In any event, subsequent to the publication of the 2011 Guidelines, there has been extensive work undertaken and additional information that has become available, enabling the development of a more careful estimate of SLR for the year 2100. In fact, Westmar has researched this matter (see Ref. 1 below) and we have developed an improved estimate of SLR for use in the FCL calculation. This takes account of the considerations indicated below.

As with other projections, this estimate continues to assume an RCP8.5 emission scenario (“business as usual”). And it relies on the science including and subsequent to the IPCC Fifth Assessment Report (2013).

It includes a regional adjustment to SLR – which is identified but not quantified in the 2011 Guidelines. This regional adjustment is associated with the sea level being non-uniform across the globe on account of oceanographic (density, salinity, winds and currents) considerations, and gravitational and deformational factors associated with future ice melting. [This is distinct from local land uplift/subsidence, which is accounted for separately in the FCL calculation.]

Another feature of the approach is the following. It is not clear whether one should depend on median SLR projections for 2100, or the SLR with some other exceedance probability. In fact, we have established the SLR estimate such that the FCL in the year 2100 itself has an annual exceedance probability of 0.5% (i.e. 1-in-200 years), consistent with exceedance levels used for the wave and storm surge components of FCL.

Finally, we measure SLR relative to the present time rather than the base year 2000 by taking account of the measured SLR from 2000 to the present (available from NASA).

On the basis of the foregoing, we have projected that the SLR in southern BC for the year 2100 to be 0.60 m relative to 2022 (and 0.66 m relative to 2000).

Of particular relevance in supporting this conclusion is recent work (Ref. 2) undertaken to develop SLR projections for Washington State. That study and others have found that the regional SLR adjustment is significant. The information in Ref. 2 (Table 1, page 14), shows a median estimate of SLR of 0.61 m for Washington State for the year 2100 relative to 2000 (again based on the RCP8.5 emission scenario).

When a suitable non-median value of SLR is used, this leads to the identical estimates for Washington State as for southern BC.

Therefore, we propose that a more careful SLR estimate to be used for this project is 0.6 m rather than 0.8 m. However, in order to retain additional conservatism, we propose to maintain the SLR value for this project as 0.8 m.

We trust that this suitably responds to your comments.

References

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Miller, I.M., et al. 2019. Projected Sea Level Rise for Washington State – a 2018 Assessment. Updated July, 2019. Prepared for the Washington Coastal Resilience Project.

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