THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

BOARD OF VARIANCE MEETING

OF THE VILLAGE OF LIONS BAY

THURSDAY, MARCH 4TH, 2021 at 6:30 PM

VIA ZOOM VIDEO CONFERENCE

Link to join meeting: https://us02web.zoom.us/j/89865570189
To join via phone, dial 778-907-2071 - Meeting ID: 898 6557 0189

AGENDA

1. **Call to Order**

2. **Approval of the Agenda**

3. **Minutes – July 9, 2019**
   THAT these BOV Meeting minutes of July 9, 2019 be approved as circulated.

4. **Public Comments**

5. **New Business – Application to be heard**

   1)

Civic Address:	**105 Kelvin Grove Way, Lions Bay, BC**
Legal Description:	**Lot 53, Block B, Plan 18530, DL 1575**
Owner:	**Arya 121 Holdings Ltd Inc No. 565302**
Request:	**Approval sought for Front Yard Variance of 16 ft from 25 ft to 9 ft** **Per Zoning Bylaw 520,2017 sec 7.5.1**

5. **Public Questions & Comments**

6. **Adjournment**

Schedule "A"

Village of Lions Bay
Board of Variance Application Form

I hereby apply for a hearing before the Board of Variance for:

LAND SUBJECT OF THE APPLICATION
Street Address: 105 Kelvin Grove way,
Legal Description: Lot 53, Block 'B' District Lot 1575 Group One, New Westminster District Plan 18530
Zoning: RS-1
OWNER/CONTACT INFORMATION
Full Name(s) of Property Owner(s): arya121holdings Ltd
Full Name of Owner's Authorized Representative (if applicable): Hadi Khakpouri & Mohammad Dadashzadeh
Address to Which Notices Should be Mailed: 407-837 west Hastings, Vancouver, V6C-1B6
Daytime Phone # of Owner or Authorized Representative: 778-707-3391 604-913-6121
Name of Person Who Will Represent Applicant at the Hearing: Hadi Khakpouri
TYPE OF APPLICATION (Complete Applicable Section)
✓ A. VARIANCE OF BYLAW RESPECTING SITING, SIZE OR DIMENSION OF A BUILDING OR STRUCTURE [s.540(a)(i)]
Bylaw Name/Number & Section(s) from which relief is sought: zoning and development bylaw No.520/2017 zone Rs-1 siting
Variance From (current requirement): Front setback 25'
To (new requirement requested): Front setback 9'
B. EXEMPTION FROM PROHIBITION OF A STRUCTURAL ALTERATION OR ADDITION TO A BUILDING OR STRUCTURE WITH A NON-CONFORMING USE [s.540(c) and s.531(1)]
Bylaw Name/Number & Section(s) Which Previously Permitted Use:
Bylaw Name/Number & Section(s) Which Resulted in Legal Non-Conforming Status:

Continuing Non-Conforming Use:
Structural Alteration or Addition Desired: *Note: If alteration or addition will result in a structure contrary to current bylaw siting, size or dimension requirements, also complete Section A.*
C. APPEAL OF BUILDING INSPECTOR'S DETERMINATION OF DAMAGE TO NON-CONFORMING BUILDING [s.532(1) and s.544]
Date of Building Inspector's Determination (application must be filed within 30 days):
Summary of Building Inspector's Determination (copy attached):
Determination Requested of Board:
D. EXEMPTION TO RELIEVE HARDSHIP FROM EARLY TERMINATION OF LAND USE CONTRACT [s.543]
Bylaw Name(s)/Number(s) & Section(s) from which relief is sought:
Variance From (current requirement):
To (new requirement requested):
STATEMENT OF HARDSHIP (not required for Type C applicants)
I allege that compliance with either the bylaw or section 531(1) [strike one] would cause me hardship by: - have a look at attached geothetechnical report page 6-8 - have a look at attached site plan digram shows the average front setback between the mentioned property and its neighbor - based on average grade calculaton we couldn't have more front setback. - hardship to have proper slope ramp to the garage. (attach additional pages if necessary)
TIME REQUIRED TO COMPLETE
Respecting Type A or B applications, the Board may specify a time for completion of the construction of the Building or Structure permitted by the minor variance or exemption, after

which the permission or exemption would terminate. If your application is permitted, when do you expect to complete the work?

ADDITIONAL INFORMATION/REASONS SUPPORTING THE APPLICATION

(Attach additional pages if required)

ATTACHMENTS

Fee and Title Documents:

- ☑ A Non-refundable application fee of $500.00 (cash or cheque), payable to the Village of Lions Bay.
- ☐ A Title Search Print dated within 30 days of the application and copies of all registered non-financial encumbrances noted thereon.

Drawings Which May be Required:

- ☑ A site plan showing the location of all Buildings and Structures, or proposed Buildings or Structures, on the subject property, preferably prepared and signed by a BC Land Surveyor A floor plan (for existing and proposed Buildings) showing space uses and door and window locations, preferably certified by an architect or structural engineer.
- ☐ A Building or Structure elevation plan preferably certified by an architect or structural engineer, including original and proposed alterations to site levels, if applicable.

Other Documents Which May be Required:

- ☑ A geotechnical engineer's report with respect to drainage, topography, and other geotechnical considerations.
- ☐ Explanatory materials and such other additional information as may be advisable in support of the application (eg: photographs, letters of support, etc.)

The Village Building Department may have some of the documents noted above – check first before ordering new. Further information may be required to enable the Board of Variance members to visualize the proposal and its relationship to the surrounding area. Approval, if given by the Board, is for the plans submitted. Changes to plans after the Board's decision will require a new application.

SIGNED BY ALL OWNERS ON TITLE ON Jan (month) 4 (day), 2021 (year):

Note: Decisions of the Board of Variance regarding Type A, B or D applications are FINAL, other than an appeal to the BC Supreme Court in respect of procedure under the *Judicial Review Procedure Act*. Decisions regarding Type C applications may be appealed by the applicant or the Village of Lions Bay to the BC Supreme Court. Information in this application is subject to the *Freedom of Information and Protection of Privacy Act*.


1 PROPOSED UPPER FLOOR
1/4" = 1'-0"
2 PROPOSED MAIN FLOOR
1/4" = 1'-0"
MID LEVEL
REVISED
REVISED for B&V ONLY.
MAIN FLOOR
BALCONY
BED ROOM #3
BATH ROOM
WALK IN CLOSET
REF.
Wet Bar
TV ROOM
ELEVATOR
LAUNDRY
MED ROOM
BED ROOM #2
BATH ROOM
CLOSET
BED ROOM #4
UPPER FLOOR CUT-LINE
DOUBLE GARAGE
KITCHEN
WOK
MUD ROOM
DINING AREA
FIRE PLACE
FOYER
LIVING AREA
LIVING AREA
POWDER
BED ROOM #1
BATH ROOM

PROJECT SUMMARY
105 KELVIN GROVE WAY, LIONS BAY VILLAGE, BC

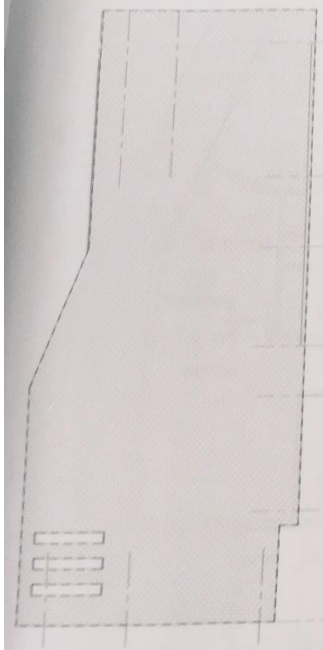
LEGAL DESCRIPTION	———
ZONING	RS-1
SITE AREA	15790 SF (1467 SM)

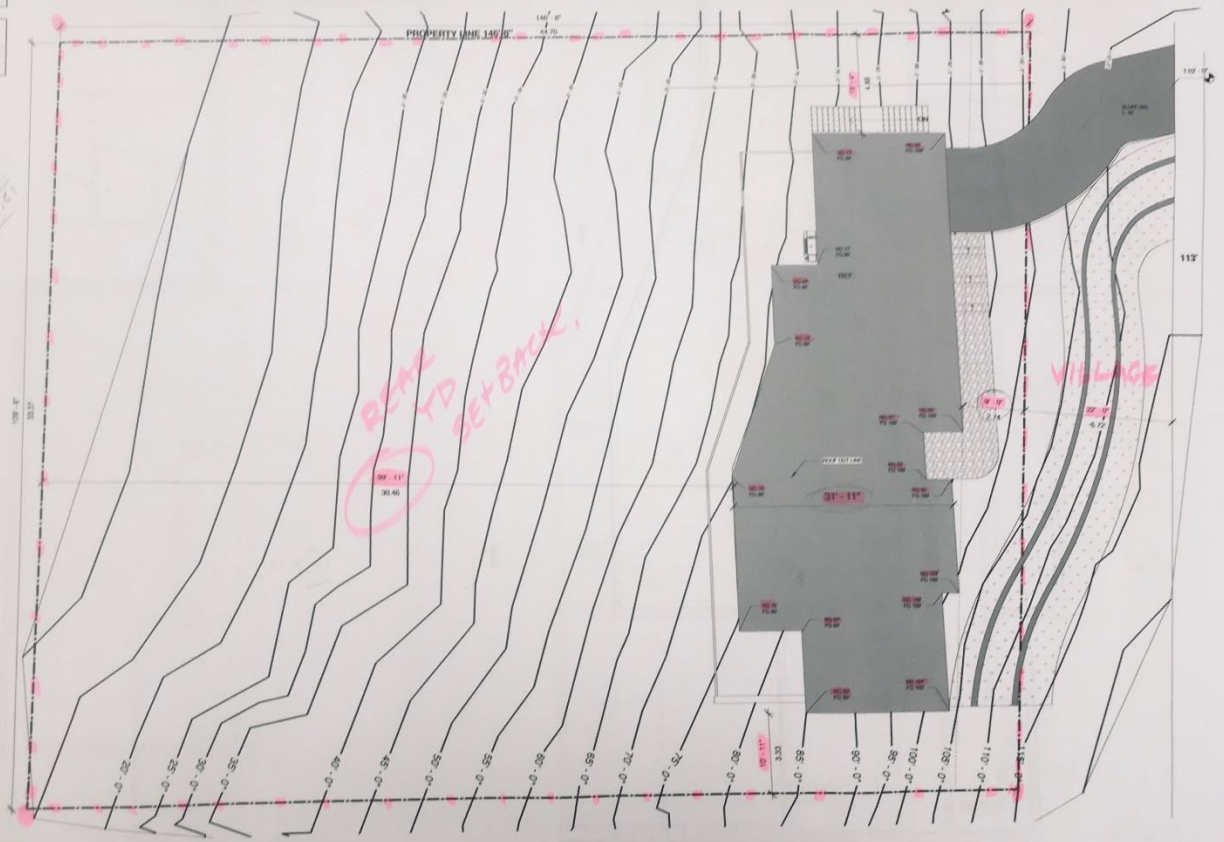
ZONING ANALYSIS

	REQUIRED/ALLOWABLE	PROPOSED
FLOOR SPACE RATIO	35%x15790 = 5526.5 SF / 513.5 sqm (ALLOWABLE)	4633 SF ✓
LOT COVERAGE	30%x15790 = 4737 SF(440SM)	2250 SF ✓
BUILDING DEPTH	MINIMUM 5 M	31'-11"
SETBACKS		
FRONT	25' F 7.5M	9' F
REAR	25' F 7.5M	100' F
NORTH SIDE	7.8' F 2.4 M	15'-4" F
SOUTH SIDE	7.8' F 2.4 M	10'-11"F

FLOOR AREA	PROPOSED
UPPER FLOOR AREA	1673 SF
MAIN FLOOR AREA	1748 SF
BASEMENT FLOOR AREA	1212 SF
BUILDING ACCESSORIES	n/a
TOTAL BUILDING	4633 SF

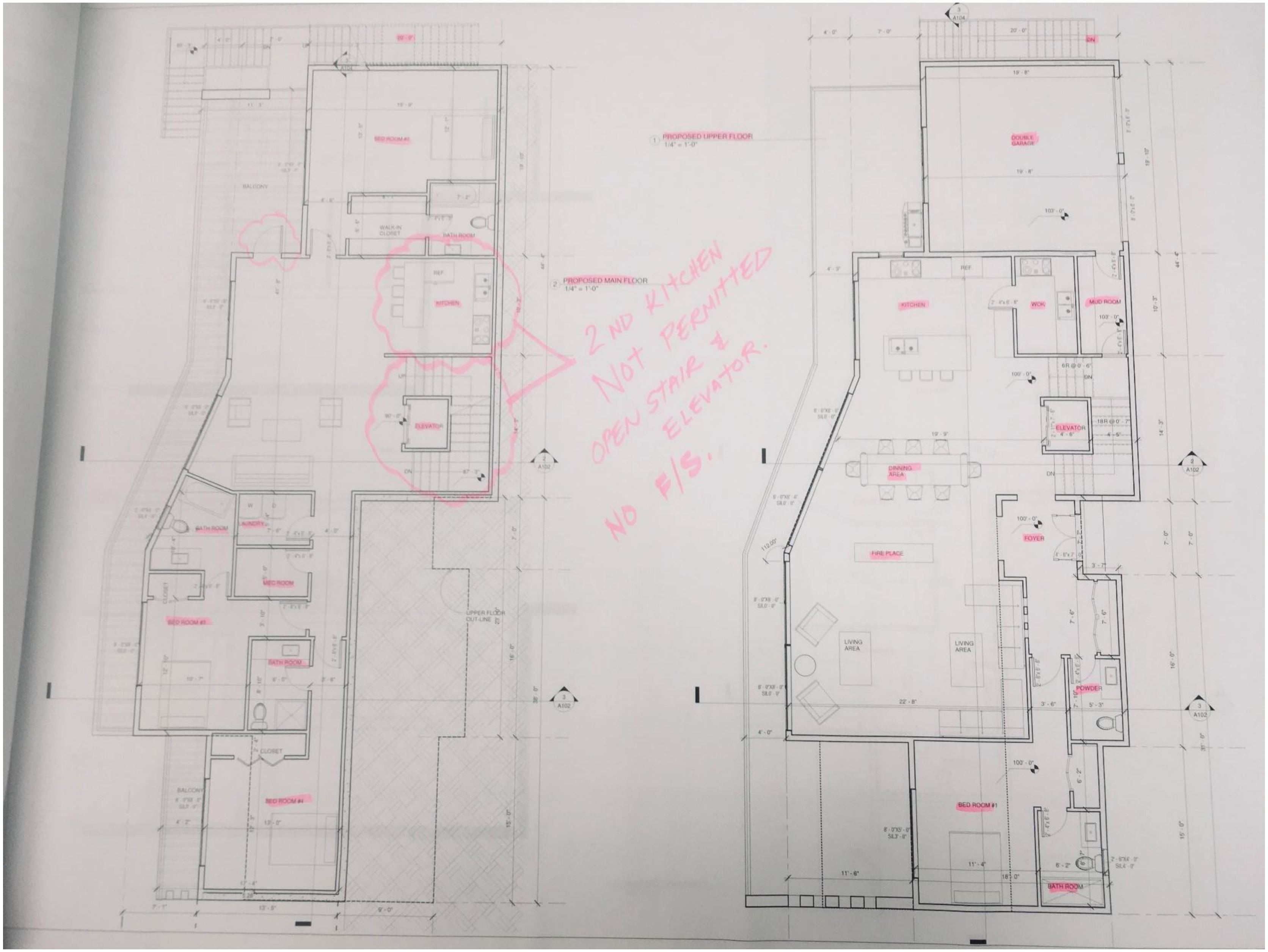
AVERAGE GRADE 83.5'
90'+95'+91'+97'+95'+103'+109'+104'+85'+83'+75'+70'+70'+69'+77'+73' = 1373
1373/16=85.9'
BUILDING HEIGHT 25'

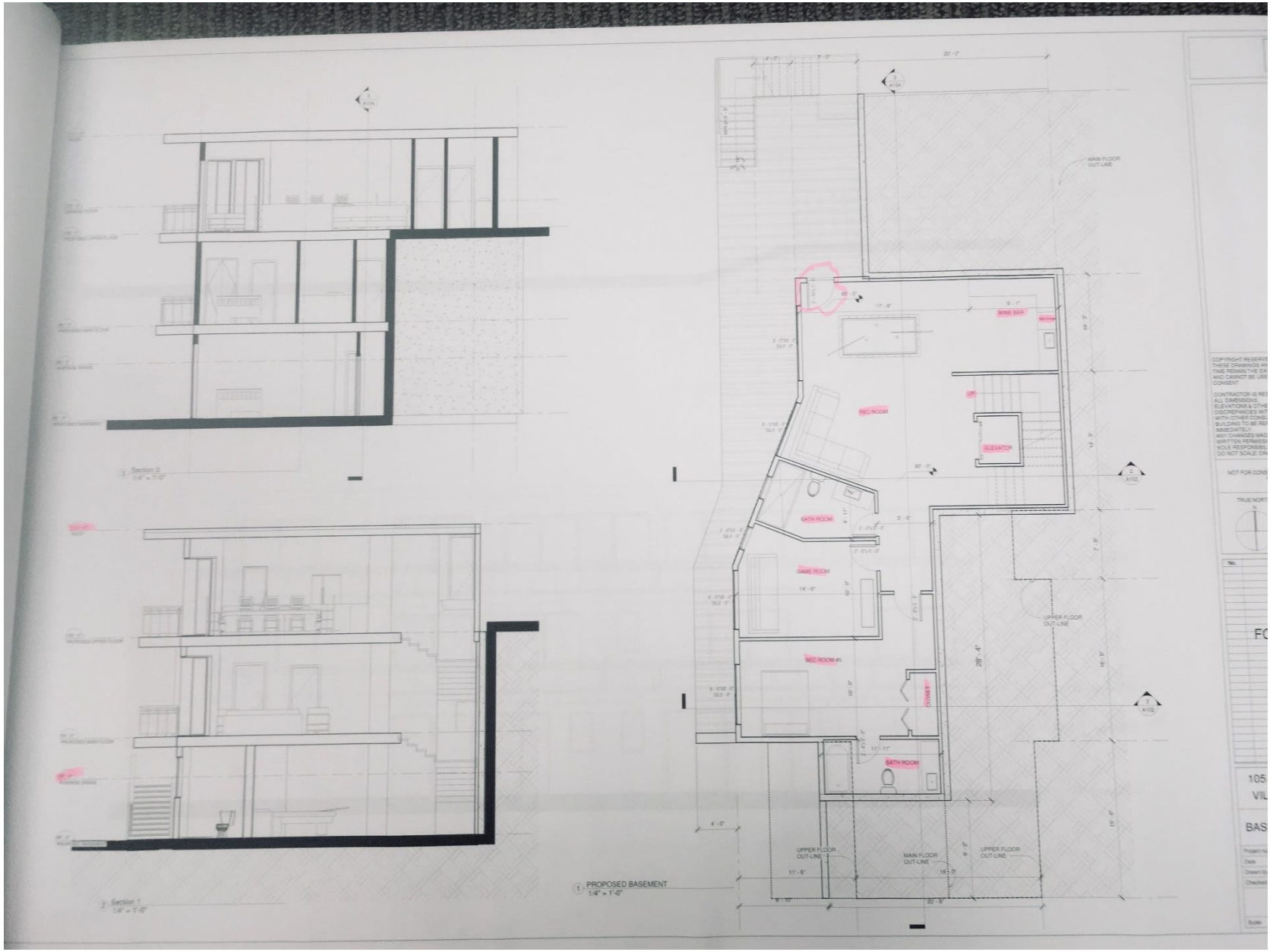


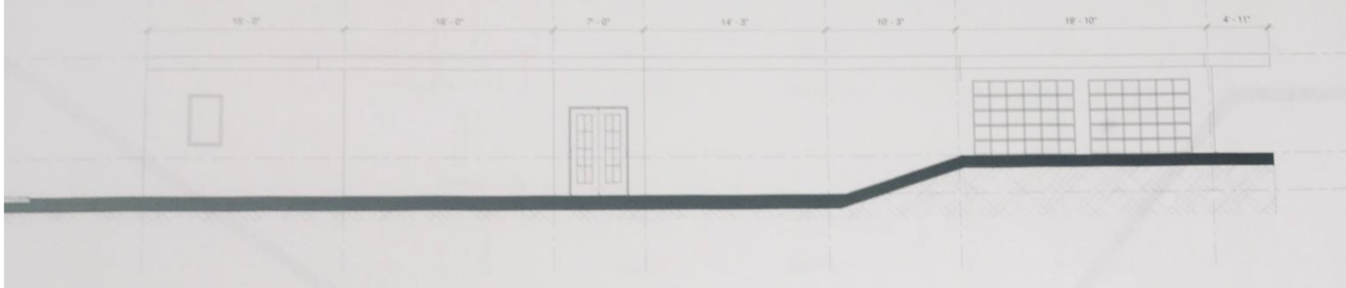


② ROOF
1/8" = 1'-0"

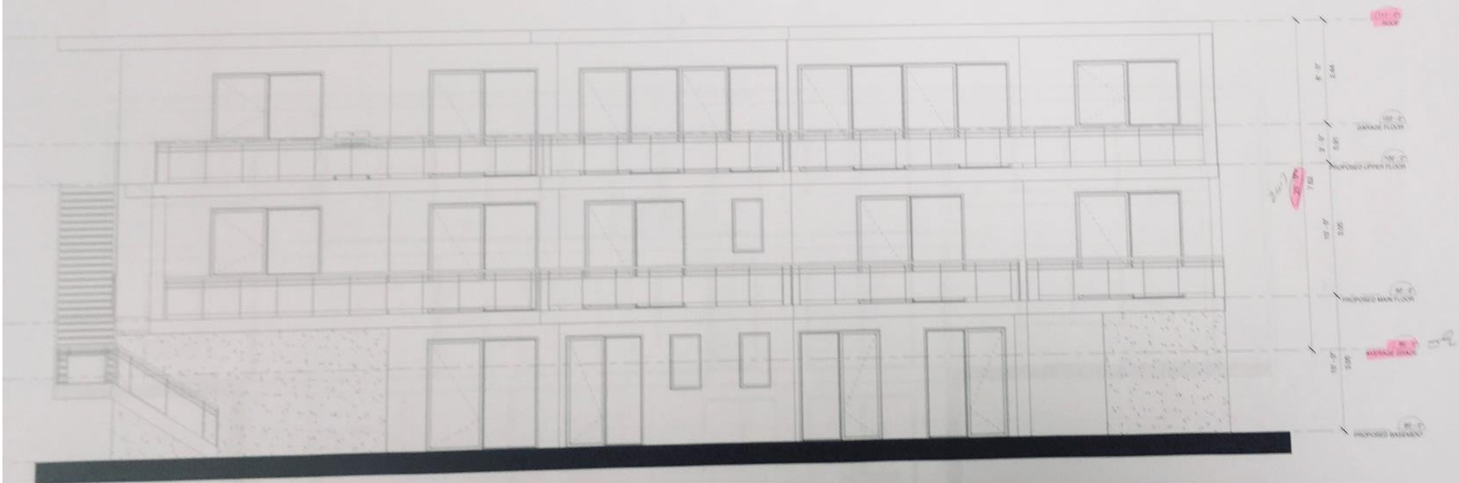
① SITE PLAN
1/8" = 1'-0"


PROPOSED UPPER FLOOR
1/4" = 1'-0"
PROPOSED MAIN FLOOR
1/4" = 1'-0"
2ND KITCHEN
Not PERMITTED
OPEN STAIR &
ELEVATOR.
NO F/S.
BED ROOM #1
BALCONY
WALK-IN CLOSET
BATH ROOM
KITCHEN
REF.
ELEVATOR
LAUNDRY
BED ROOM
BED ROOM #3
CLOSET
BED ROOM #4
UPPER FLOOR OUT-LINE
DOUBLE GARAGE
WOK
MUD ROOM
DINING AREA
FOYER
FIRE PLACE
LIVING AREA
POWDER
BED ROOM #1
BATH ROOM


MAIN FLOOR OUT-LINE
WINE BAR
REC ROOM
ELEVATOR
BATH ROOM
GAME ROOM
REC ROOM #5
TOILET
BATH ROOM
UPPER FLOOR OUT-LINE
UPPER FLOOR OUT-LINE
MAIN FLOOR OUT-LINE
UPPER FLOOR OUT-LINE
1 PROPOSED BASEMENT
1/4" = 1'-0"



EAST ELEVATION
1/4" = 1'-0"



CONTRACTOR IS RESPONSIBLE FOR VERIFICA
ALL DIMENSIONS.
ELEVATIONS & OTHER DATUM ON DRAWINGS
DISCREPANCIES WITHIN THIS SET OF DRAWIN
WITH OTHER CONSULTANTS' DRAWINGS AND
BUILDING TO BE REPORTED TO THE CONSUL
IMMEDIATELY.
ANY CHANGES MADE WITHOUT THE ARCHITE
WRITTEN PERMISSION SHALL BE THE CONTR
SOLE RESPONSIBILITY.
DO NOT SCALE. DIMENSIONS GOVERN.

NOT FOR CONSTRUCTION UNLESS NOTED
OTHERWISE

TRUE NORTH | PROJECT N

No.	Description

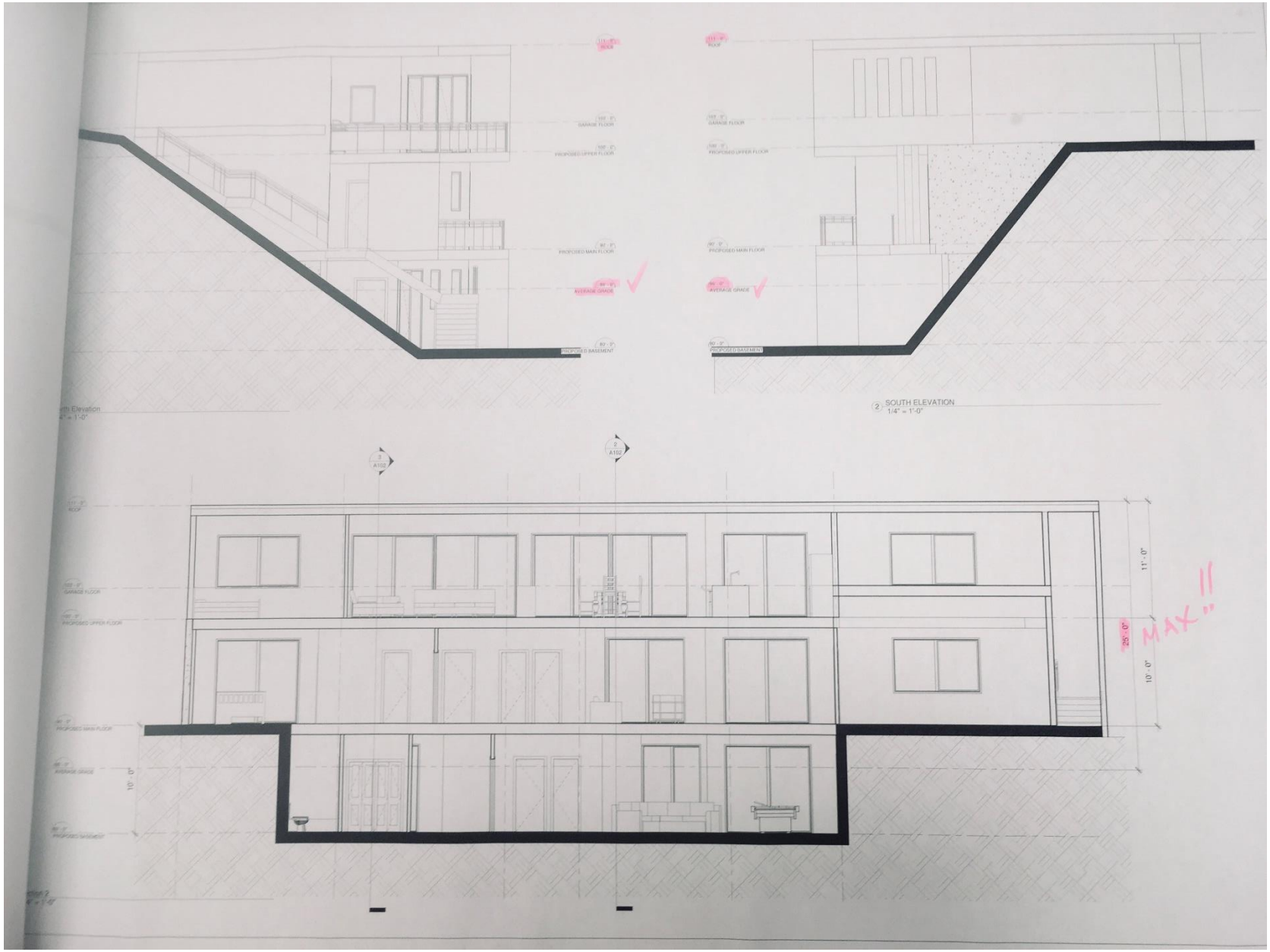
105 KELVIN GROV
VILLAGE OF LION

ELEVATION

Project number
Date
Drawn by
Checked by

A103

Scale



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

HORIZON ENGINEERING INC
220 - 18 Gostick Place
North Vancouver, BC
Canada V7M 3G3
P: 604-990-0546
F: 604-990-0583
www.horizoneng.ca

June 22, 2020

Our File: 120-4719

Arya121holdings Ltd
407 – 837 West Hastings St.
Vancouver, BC V6C 1B6

Attn: Mr Dadashzadeh

Re: **Proposed Residential Development**
105 Kelvin Grove Way, Lions Bay, BC
Geotechnical Report

1.0 INTRODUCTION

This document reports on the results of the site reconnaissance carried out at the above-noted site and provides geotechnical comments and recommendations for the proposed development. This report supersedes previous geotechnical reports published by Horizon Engineering (dated February 2006, File No. 106-1505 and dated December 10, 2016, File No. 116-4118) for the subject property

2.0 SITE DESCRIPTION

The subject property is located at 105 Kelvin Grove Way in the Village of Lions Bay shown on Figure 1, attached following the text of this report. The Legal Description of the property is "Lot 53, Block 'B' District Lot 1575 Group One, New Westminster District Plan 18530". The property has an approximately rectangular shaped footprint in plan and is about 143 feet long in the east-west direction and about 110 feet in the north-south direction. The site is bounded by Kelvin Grove Way to the west, Highway No. 99 to the east, and existing residential developments to the north and south. We have been provided with a survey plan of the property prepared by Richard J. Martin, British Columbia Land Surveyor (dated October 30, 2003; Job: 03139; File: L094-17) that shows the location of an approximately 20 feet wide, Right-of-Way and Easement (Reference Plan 155594) that crosses the site from north to south and is situated about 30 feet east of the west property line.

At the time of our site visit, the subject property can be divided into three portions as approximately shown in Figure 2, attached. The western portion of the site consisted of forested, sloping terrain located adjacent to Highway No. 99 and the central portion of the site consisted of an unpaved access trail located in the Right-of-Way as shown in Photograph 1 on Figure 3. The eastern portion of the site consisted of undeveloped, forested terrain as shown in Photograph 2 on Figure 3. No post concrete barriers have been placed along the west edge of Kelvin Grove Way and a BC Hydro transformer box and a BC Tel service box are present adjacent to the east property line. It is assumed that underground utility lines may be situated along the shoulder of Kelvin Grove Way.
Topographic contours for the east and central portions of the site have been included in the aforementioned survey plan based on a local datum set at a water valve located adjacent to the

southeast corner of the subject property. For the east portion of the site, the slope crest is located east of the east property line and there is an elevation difference of about 85 feet down to the toe of slope which forms the boundary between the east and central portions of the site. Slope gradients in the east portion of the site vary from about 30° to 45° with steeper slope gradients located at upper and mid slope elevations areas. The unpaved trail situated in the Right-of-Way slopes gently down towards the north. Topographic data for the west portion of the site is not provided in the survey plan; however, the slope gradient was estimated to be about 30° with an elevation difference of about 25 feet.

3.0 BACKGROUND INFORMATION

3.1 Geological Survey of Canada

Based on published information from the Geological Survey of Canada (Map 1152A Geology Vancouver North from GSC Memoir 335 by J.A. Roddick, 1965) the site and surrounding area is expected to be underlain by Upper Jurassic and Lower Cretaceous period (about 99 to 156 million years old) materials that form a complex assemblage of andesitic pyroclastic rocks, flows, and sediments that are collectively called the Gambier Group. The Gambier Group is estimated to be greater than 6000 feet thick and consists of "tuff, breccia, agglomerate, andesite, argillite, greywacke, quartzite, and conglomerate; minor schist, granulite, limestone, lime-silicate rock, skarn".

The surficial geology overlying the bedrock at the site and surrounding area is expected to consist of glaciomarine ice-contact deposits that were deposited by glacial meltwater during the Fraser Glaciation (Late Wisconsinan), which occurred approximately 11,000 to 26,000 years ago. These deposits are expected to consist of sand and gravel soil types that are generally greater than about 10 feet thick, are stratified to massive and commonly faulted, form hummocky surfaces, and may be fossiliferous (Surficial Geology and Landslide Inventory of the Lower Sea to Sky Corridor, Geological Survey of Canada, Open File 5322, 2008). No recorded landslides are at or in the general area of the subject site.

3.2 Seismic Hazard Calculation

The 2018 British Columbia Building Code does not provide site specific seismic data for the Village of Lions Bay; therefore, information from the 2015 National Building Code of Canada is used for the purpose of this document. Based on published information from Natural Resources Canada's online 2015 National Building Code Seismic Hazard Calculation, seismic events with a 2% probability of exceedance in 50 years at the subject property would have a peak ground acceleration of 0.332g, where g is the gravitational acceleration constant. An event with a 2% probability of exceedance in 50 years corresponds to an annual probability of 1/2475. This peak ground acceleration is for firm ground conditions and does not have a vertical acceleration component. The peak ground velocity associated with this design seismic event is 0.500 m/s. The recommended spectral accelerations for different natural periods are presented in Table 1.

Table 1: NBCC 2015 Spectral Acceleration (g) for 2% Probability of Exceedance in 50 Years

Sa(0.1)	Sa(0.2)	Sa(0.3)	Sa(0.5)	Sa(1.0)	Sa(2.0)
0.617	0.761	0.761	0.672	0.385	0.237

3.3 Village of Lions Bay

3.3.1 Natural Hazards Assessment Areas

Based on published information prepared for the Village of Lions Bay (ref. "The Village of Lions Bay: A Natural Hazards Assessment Area Strategy for Coastal, Creek and Hillslope Hazards." by Cordilleran Geoscience, Final V5 June 25, 2018), the subject property is identified as being located in Natural Hazards Assessment Areas (NHAA) 3A and 3C.

NHAA 3A delineates all terrain that may be vulnerable to open slope landslide activity as predicted by a 20% slope gradient projected from potentially unstable terrain and situated upslope of Highway No. 99. The subject property has been identified to have sloping terrain that is steeper than 60% (approximately 30°) and may have potentially unstable terrain conditions that require identification and assessment by a Qualified Professional.

NHAA 3C delineates areas that have sloping terrain steeper than 30% and where a Qualified Professional should provide a written report to address:

- the stability of foundations, excavations, fill slopes, and roads;
- the existence and/or mitigation of localized rockfall and/or landslide hazards; and,
- potential drainage related issues that may affect slope stability, erosion, sedimentation, and/or water ingress to buildings.

Evaluation of onsite and nearby municipal drainage structures should also be included with NHAA 3C reports.

3.3.2 Risk Tolerance Thresholds

In the Village of Lions Bay's Draft Natural Hazard Assessment Area Guidelines (that will be a part of the Village of Lions Bay Official Community Plan Designation Bylaw document Schedule A), the level of risk tolerance associated with a development type is presented in the following table.

Table 2: Risk Tolerance Thresholds for New Development, Village of Lions Bay

Type of Application	1:10,000* + ALARP	1:100,000*	FOS** > 1.3 (static)	FOS** > 1.5 (static)
New Development not requiring subdivision or rezoning	X		X	
Subdivision and/or rezoning to create 4 or fewer fee simple or strata parcels (including the original parcel)	X		X	
Subdivision and/or rezoning to create 5 or more fee simple or strata parcels (including the original parcel)		X		X

** Ratios denote annual probability of individual loss of life per the calculation set out in section 10.4.2 of the Village of Lions Bay Bylaw Schedule A.*
*** FOS means Factor of Safety, generally in relation to engineered slopes and ravine sidewall stability.*
+ ALARP means As Low As Reasonably Practicable and it must be possible to demonstrate that the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained.

4.0 PROPOSED DEVELOPMENT

We have been provided with a digital copy of architectural drawings published by Fact Homes Group (Drawings A100 to A104, Project number 200120, Dated May 19, 2020) that show the proposed development in plan, section, and elevation views. The proposed building location is situated at the upper elevation area of the property and is set back 9.0 feet from the east property line. The building footprint is up to approximately 87 feet long from north to south and about 32 feet wide from east to west. The building will be set back 15.3 feet and 10.9 feet from the north and south property lines, respectively. The proposed building will have three levels with the upper floor at elevation EL. 100.0 feet, the main floor at elevation EL. 90.0 feet, and the basement level at elevation EL. 80.0 feet. The upper level of the structure will be situated above the sloping terrain and provide access to the driveway located adjacent to the east side of the building. The main level of the structure will be below grade at the east side and daylight away from the slope for the balance. The basement level will be below grade at the east side and daylight towards the west with the north and south sides transitioning out from the slope. A set of stairs will be located adjacent to the north side of the building that will provide access from the driveway and upper floor. The driveway will slope down from Kelvin Grove Way adjacent to the northeast corner of the property and will require a series of retaining walls to facilitate the design grades. Retaining walls are also required in the area located between Kelvin Grove Way and the east side of the proposed building footprint to manage permanent site grades and slope conditions.

There is no information regarding development at the balance of the site which extends about 99 feet west and downslope from the building footprint; therefore, for the purpose of this document, it is understood that there will not be a requirement to alter the geometry or condition of the mid to lower elevation areas of the subject property.

At the time of publishing this document, no structural design drawings are available for reference; therefore, it is assumed that the proposed building will have design loads that are comparable to similar structures in the local vicinity and our experience.

5.0 SITE INVESTIGATION

Horizon Engineering carried out a geotechnical site investigation at the subject property on January 25, 2006 and a subsequent site reconnaissance on April 8, 2020. The original site investigation consisted of both a subsurface investigation and visual assessment of the slope conditions. The subsequent site reconnaissance allowed for verification of current site conditions and examination of exposed bedrock outcrops in the general vicinity of the site.

5.1 Subsurface Investigation

The subsurface investigation consisted of two test pits, labelled TP06-1 and TP06-2, that were advanced adjacent to the toe of slope in the east portion of the subject property as approximately shown on Figure 2, attached following the text of this document. The test pits were advanced using a tracked excavator that was supplied and operated by King Kubota Services of North Vancouver. Access for the excavator was along the unpaved trail in the aforementioned Right-of-Way and it was not practicable to advance additional test pits closer to the proposed building footprint or upper elevation areas due to access limitations.

The soil stratigraphy encountered at the test pits was consistent at both test hole locations and generally consisted of an approximately 0.3 metre thick topsoil underlain by a mixture of

weathered, sand, gravel, and cobble sized soil particles with angular rock fragments to depths of about 0.6 to 0.9 metre at which bedrock was encountered. The topsoil consisted of a dark brown, moist, organic sand with trace silt and some gravel, and was inferred to be loose. The soil underlying the topsoil was noted to include a brown, fine to medium grained sand with trace silt and organics. The coarser fraction of this soil consisted of gravel to approximately 200mm diameter, angular rock fragments and fractured rock that appeared weathered. The excavator was unable to advance the test pits into the bedrock; thus, both test pits were terminated at the bedrock surface. The intact bedrock exposed at the test pits was inferred to be strong to very strong.

5.2 Site Reconnaissance

At the time of our 2006 site investigation, the east portion of the property was observed to be covered with a layer of colluvium that consisted of the sand, gravel, cobbles, and rock fragments are previously described. The east portion of the subject site had a comparatively uniform and straight slope geometry and the colluvium was estimated to vary from a veneer to a blanket with respect to thickness of material overlying the bedrock.

At the time of our 2020 site visit, the coniferous trees were removed from most of this mid to upper elevation slope area as shown in Photograph 2 and Photograph 3 on Figure 4, attached. The conifers that remain along the north and south edges of this portion of the site appear to have vertical growth. With an exception of potential isolated rockfalls, no obvious indicator signs of recent or past, slow or rapid, mass movement was noted at the sloping terrain and within the subject property. More specifically, no landslide scarps, debris deposition lobes, tension or settlement cracks, jackstrawed or pistol butted coniferous trees, or other indicator signs of landslide activity were noted. It should be understood that leaning and/or pistol butted deciduous trees observed in the local and general vicinity of the site are not considered reliable slope stability indicator signs.

The potential isolated rockfalls were estimated to be derived from the on-site colluvium and possible fill materials near the slope crest since there were no prominent bedrock outcrops observed in the upper slope elevation areas of the subject property during our site visit. It was noted that there were angular, cobble-sized, rock fragments within and partially on the vegetation cover which may indicate comparatively recent and localized rockfall events as shown in Photograph 3. It was also noted that there was no talus slope or debris cone landform observed and there was no significant rockfall or colluvium deposited at the central portion of the site. Therefore, it is estimated that the rockfall events are of comparatively limited source and frequency.

No slope stability indicator signs or landslide activity were observed at the central and western portions of the subject property.

Although bedrock outcrops within the subject property were obscured by the overlying colluvium and organic matter, there were bedrock outcrops located at approximately mid-slope elevation in the neighbouring property to the north as shown in Photograph 4 on Figure 4 and at the east side of Kelvin Grove Way as shown in Photograph 5 on Figure 5, attached. These bedrock outcrops would be expected to be representative of bedrock conditions within the subject property. The exposed bedrock material was consistent with the published information from the Geological Survey of Canada. The intact bedrock was estimated to be strong to very strong.

It was noted that the bedrock had an approximately blocky fracture pattern and the discontinuities were attributed to joints and fractures in the rock mass. A number of the discontinuities including a dominant joint set are highlighted in Photograph 5. This dominant joint set dips steeply down towards the west and forms potential planar failure surfaces in the rock mass as shown in Photograph 5 and Photograph 6 on Figure 6, attached. It is estimated that potential wedge type failures are also kinematically permissible. The joints were estimated to be persistent with spacing that varied from close to wide. Joint apertures were estimated to vary from closed to open and there was evidence of past water flow at some of the gapped to open joints. No infilling was noted in the rock mass joints.

As shown in Photograph 5 and Photograph 7 on Figure 6, the pavement along Kelvin Grove Way has significant cracks. These pavement cracks were generally estimated to be associated with differential performance of subgrade materials in underground utility trenches that follow the road alignment. However, it was noted that there were also cracks in the pavement surface that coincided with the slope crest area adjacent to the subject property as highlighted in Photographs 5 and 7. More specifically, these specific pavement cracks appeared to form a broad arc in plan that terminated at the approximate north and south ends of the sloping terrain at the subject property. Although these cracks in the pavement are present at local areas adjacent to the slope crest, it should be emphasized that the cracks did not have significant vertical or horizontal ground displacement which would be an indicator sign of active ground displacement and soil movement. It was estimated that these cracks may be attributed to localized settlement or small displacements that have occurred in the fill materials forming the road prism and likely a portion of the slope crest in the subject property.

5.3 Groundwater and Surface Water Conditions

No groundwater discharge was noted in the test pits or at other observed locations in and adjacent to the subject property. It is estimated that local ground water conditions would be perched on the bedrock surface and seepage would follow the sloping bedrock interface down towards the west.

No surface water flows were noted within or immediately adjacent to the subject property. No evidence of concentrated surface water flows directed onto the sloping terrain was observed. Surface water that may be directed from pavement runoff would be expected to become near surface groundwater due to the colluvium at the subject property and sloping terrain.

6.0 CONCLUSIONS AND DISCUSSION

Based on the results of the site investigation, observed site conditions, and our experience with similar projects, it is our opinion that the Village of Lions Bay's Risk Tolerance Thresholds for a New Development not requiring subdivision or rezoning will be satisfied provided the recommendations in this report are implemented into the design and construction of the proposed development. Therefore, as required by Community Charter Section 56, it is our professional opinion that the land may be used safely for the use intended where "safe" is defined as satisfying the Village of Lions Bay's Risk Tolerance Thresholds.

With an exception of potential isolated rockfall from the colluvium and fill materials, there was no mass wasting or other landslide activity affecting the subject property. The pavement cracks observed adjacent to the slope crest are potential indicator signs of poor to marginal performance of subgrade fill materials and may represent where past ground movement has occurred under traffic loading. The condition of this cracked pavement did not appear to be particularly recent in

formation and was estimated to be limited to possible fill materials that are less confined along the slope. The cracked pavement and coincidence with the subject property is interpreted to be a local performance issue as opposed to an indicator of global slope instability. Thus, the ground settlement or movement did not appear to be active or an indictor sign of imminent slope failure conditions. It is envisaged that the construction of the driveway and associated retaining walls at the slope crest area for the proposed development will provide improved long term stability of the local ground conditions.

The proposed building footprint is to be located adjacent to the current slope crest; therefore, the building will not be exposed to rockfall hazards from the existing colluvium and fill materials when the driveway and permanent retaining walls are constructed at the area between the building footprint and Kelvin Grove Way. In addition, construction of the proposed driveway will provide improved confinement of existing fill materials that support the road.

The design basement floor slab elevation for the proposed house is expected to require excavation depths that vary up to about 17 feet below current site grades. It is expected that the colluvium and/or fill materials within the building footprint will be removed to facilitate the design elevations. Where bedrock is present above design foundation elevations, rock removal will be required as part of the excavation works. It is estimated that the building footprint at design basement elevation will extend westwards above the sloping ground surface. It is envisaged that a cantilevered building design will not be practicable; thus, transferring the building support down to the sloping terrain will be required. There are various design strategies that could be considered to achieve this building support; however, the solution must be compatible with seismic design requirement. From our review of potential foundation strategies, we do not recommend slender or isolated support systems for supporting the portion of the building that will extend out from the ground surface. We envisage a series of Wing Walls would provide the required support and seismic stability. The conceptual locations of these Wing Walls are shown in Figure 2 and sections that conceptually depict these wing walls are provided in Figures 7, 8, and 9, attached. The Wing Walls may be visualized as a series of parallel, load bearing, reinforced concrete walls that extend out from the hill slope and are anchored into the bedrock for seismic loading and stability design requirements.

The natural, undisturbed, intact, strong to very strong bedrock that is expected at design subgrade elevations is considered to be suitable for supporting the proposed development. Local perched groundwater may be expected near surface at the bedrock interface during periods of precipitation and is expected to be manageable by conventional drainage systems. Intercepted and collected water should not be disposed of on the sloping terrain and should instead be transported by solid pipe down to the toe of slope area for discharge at a suitable location without concentrating into the west portion of the site.

Seismic loading and slope stability are design considerations for supporting the proposed development on the sloping terrain. The discontinuities expected in the bedrock may be potentially unfavourable with kinematically permissible planar and wedge type failure mechanism. Under design seismic loading conditions, additional force would be applied to the rockmass that includes a horizontal acceleration component directed out from the slope face. In order to ensure the building is secured to intact ground conditions that are not susceptible to failure under seismic loading, the foundation elements should be anchored into the subsurface where the bedrock has sufficient resistance to the loading conditions. Therefore, it is envisaged that a series of vertical and inclined, drilled foundation ground anchors would be installed to depths where the bedrock provides both sufficient mass and strength to address the seismic slope stability and loading conditions. The ground anchor strategy is conceptually shown in Figure 7 to 9.

For temporary excavation slopes, it is expected that a combination of sloped and supported excavation strategies may be utilized for the proposed development. It is estimated that there may be a requirement for temporary encroachment into the Village of Lions Bay's property along Kelvin Grove to facilitate tie-back anchors for excavation shoring as conceptually shown in Figures 7 and 8. Details of the shoring system including confirmation of encroachment should be determined after detailed structural and landscape design drawings are available. If encroachment is determined to be required, permission from the Village of Lions Bay must be obtained prior to final shoring design.

Prior to earth works, a debris / rockfall runout barrier should be installed at the edge of the Right-of-Way and toe of slope for the east portion of the site in order to prevent escapement of materials that may occur during construction from impacting downslope areas that includes Highway No. 99. It is envisaged that a commercially available, rockfall fence would be appropriate for this purpose and should be left in-place post construction for added long-term rockfall runout protection. This fence should extend across the width of the subject property.

7.0 RECOMMENDATIONS

7.1 Slope Stability Management

In order to reduce the potential for landslide initiation and to maintain the existing slope stability, the following general recommendations are provided:

- no additional surcharge loads, such as fill, retaining walls, or other structures, should be placed on the sloping terrain or at the slope crest area without suitable engineering recommendations regarding slope stability;
- landscaping and/or yard waste material, including organic matter, is not be disposed of on or adjacent to the sloping terrain;
- vegetation and trees on the slope should be maintained and not removed where practicable;
- intercepted water from the house or any hard landscaped surfaces should not be directed onto the slope without suitable erosion control measures;
- rainwater leaders and perimeter drainage pipes for the proposed building should be connected to the municipal stormwater disposal system, an in-ground stormwater disposal system which has been designed by a qualified Professional Engineer, or with Village of Lions Bay approval, diverted to an approved and protected discharge location at the toe of the slope;
- the slope geometry should not be steepened by excavation works;
- should there be any signs of ground movement such as settlement or tension cracks, these areas should be immediately reviewed by a qualified professional engineer; and,
- a debris / rockfall barrier is to be installed along the toe of slope area located adjacent to the Right-of-Way.

Should there be any observed signs of ground movement such as settlement or tension cracks, or mobilization of the colluvium in the form of a debris slide, these areas should be immediately reviewed by a qualified professional engineer.

Earth works that results in a steeper slope geometry or removes material from the toe of the sloping terrain is to be avoided and must not be carried out without prior review and recommendations from a qualified professional engineer to address slope stability considerations and requirements.

7.2 Site Preparation

It is recommended that all topsoil, organic material, debris, disturbed, softened, loosened, or otherwise deleterious material be stripped from beneath settlement-sensitive structures, such as footings or foundation structures, to expose the natural, undisturbed, intact, strong to very strong bedrock. Any underground utilities that will be abandoned should also be removed. If there are any existing structures within the development footprint, these structures should also be removed where the new building footprint overlaps former building or infrastructure.

7.3 Temporary Excavations

It is recommended that unshored, temporary, excavation slopes less than 20 feet deep in soil and which are situated above the local groundwater level, be no steeper than 1.0 vertical to 1.0 horizontal in loose fill or weathered soil conditions, and no steeper than 4.0 vertical to 3.0 horizontal in the natural, undisturbed, compact to very dense / very stiff to hard soil conditions.

Unshored, temporary excavation slopes are estimated to be practicable for only the upper elevation areas of the project site and where bedrock is not encountered. For the balance of the building area, excavation depths of up to about 17 to 20 feet may be required. These excavation depths are expected to encounter bedrock. In order to reduce the volume of earthwork and rock removal from the site, steep excavation slopes with tie-back anchors for lateral stability are recommended. It is envisaged that tied-back anchors may be practicable and a reinforced shotcrete face may also be required if highly fractured rock or soil conditions are present. Horizon Engineering would be pleased to provide a shoring design under separate cover after details of the proposed building and design loads are available.

Excavation slopes are not to undermine or extend deeper than any existing foundation structures or underground utilities without prior review and site-specific recommendations from the Geotechnical Engineer.

These recommendations assume that there are no existing surcharge loads adjacent to the crest of the excavation within a horizontal distance equal to the excavation depth. Should there be existing surcharge loads within this horizontal distance, the area should be reviewed in detail and site-specific recommendations may be required.

It is envisaged that any groundwater discharge encountered in the excavation area may be controlled using conventional trenches, sumps and pumping.

Grade adjacent to an excavation should be sloped to direct surface runoff away from the excavation slopes. Alternatively, any surface water should be controlled such that it does not discharge over the crest into the excavation.

It is recommended that excavated spoil and construction materials be stockpiled no closer than the greater horizontal distance of 6 feet or half the excavation depth to the crest of the excavation slopes.

Unshored excavation slopes in soil should be protected by a layer of 6 mil polyethylene sheeting securely attached to the ground.

Excavations deeper than 4 feet should be reviewed by the Geotechnical Engineer of Record to confirm the slope conditions. Therefore, the Geotechnical Engineer of Record should be provided with opportunities to review the soil and groundwater conditions encountered during excavation to confirm the suitability of the ground conditions with respect to excavation slope stability.

It is estimated that the expected subsurface materials within the building footprint will encounter ground conditions that will require drilling and blasting / splitting, or other appropriate rock removal techniques. Rock excavation methods must not result in excessive ground vibration or escapement of materials, such as flyrock, that could impact neighbouring properties.

For the purpose of this document, large boulders that may be encountered and require splitting for removal or boulders which can not be ripped and have a volume in excess of 35 cubic feet (1.0 cubic metre); these boulders should be defined as “rock” for contractual purposes. Volumes should be quantified on-site and before splitting of boulders by the Owner or Owner’s representative.

7.4 Shallow Foundations

7.4.1 General

It is envisaged that conventional strip and pad footings for a conventional shallow foundation system would be appropriate for the proposed development. For the proposed building, the foundation structure should be anchored into the underlying bedrock.

The exposed subgrade should be prepared such that only natural, undisturbed materials are present at design subgrade elevations. Any loosened, softened, disturbed, organic, or otherwise deleterious material should be removed from the exposed subgrade prior to footing construction.

Foundation subgrades should be protected from freezing and any frozen subgrade materials should be removed prior to footing construction. In addition, groundwater and rainwater runoff should be directed to temporary sumps and footing subgrades should be kept free of standing water. Where the subgrade material consists of or contains more than trace amounts of fine-grained soil, such as silt or clay, the exposed subgrade material may be susceptible to water softening or disturbance when wet. As a precaution against delays where the exposed subgrade material at design footing elevation consists of soil, the footing area may be protected with a minimum 6 inch thickness of ¾ inch clear crushed gravel that is placed and compacted over the exposed subgrade immediately after excavating as a protective blinding layer against mechanical disturbance associated with worker and/or equipment traffic. Where footings will be anchored to the bedrock, the gravel layer is not recommended.

Horizon Engineering should be provided with an opportunity to review the exposed subgrade prior to placing a gravel blinding layer or footing construction.

7.4.2 Design Bearing Pressures

The natural, undisturbed subgrade material expected to consist of intact, strong to very strong bedrock is considered to be an approved subgrade material that is suitable for supporting the proposed development.

It is recommended that a Serviceability Limit States design bearing pressure of 8,000 psf be used for structural design and sizing of footings where the footing is supported directly on the approved subgrade material consisting of intact, strong to very strong bedrock.

If settlement sensitive structures, such as floor slabs and footings, are to be supported on Engineered Fill that is placed on the approved subgrade material and the fill thickness is not greater than 5.0 foot thick, it is recommended that a Serviceability Limit States design bearing pressure of up to 2,500 psf be used for the structural design and sizing of footings. It is also recommended that the Engineered Fill placed to support footings and other settlement sensitive structures should extend a horizontal distance beyond the edge of the footing equal to the fill thickness. Therefore, if a 2 foot thick Engineered Fill is required to restore grade to design underside of proposed footing elevation, this fill is to extend a horizontal distance of 2 feet beyond the outside edge of the footing at the depth of approved subgrade material elevation. If a fill thickness of greater than 5.0 feet is required, Horizon Engineering is to review the design requirements and provide specific recommendations under separate cover.

For Ultimate Limit States design, a factored geotechnical resistance of 12,000 psf is recommended for use in the analyses where the foundation structure is supported directly on the approved exposed subgrade consisting of bedrock. If the foundation structure is supported on a layer of Engineered Fill that is not greater than 5.0 foot thick and underlain by the bedrock subgrade material, a factored geotechnical resistance of 4,000 psf is recommended for Ultimate Limit States design.

Total settlement of footings under static loading and designed in accordance with the above recommendations should be less than 1.0 inch. Differential settlement would be expected to be less than ¾ inch over a span of 30 feet or 0.002 radians angular distortion. This corresponds to a deflection ratio of 1 in 500.

7.4.3 Footings – Typical

Minimum strip footing widths of 1.5 feet and minimum pad footing widths of 2 feet are recommended. If the building is to be designed in accordance with the Division B - Part 9 of the 2018 British Columbia Building Code, minimum strip and pad footing sizes should be designed in accordance with Table 9.15.3.4 in the British Columbia Building Code publication.

It is recommended that foundations supported on soil or Engineered Fill be placed at least 18 inches below final exterior grades for frost protection.

Foundations should step at no more than 1.0 vertical to 2.0 horizontal.

The design underside of proposed footing elevations should be no closer than 1.0 vertical to 2.0 horizontal from the underside of any adjacent conduits or underground utilities. If a footing is required to be located closer than the aforementioned utility setback distance, a

review of the exposed ground conditions and required footing loads should be carried out to provide site and loading specific recommendations.

7.4.4 Seismic Considerations

Based on the 2018 edition of the British Columbia Building Code, the subject site may be categorized as Site Class B as indicated in Table 4.1.8.4.A in Division B - Part 4.

Section 3.2 of this report provides site-specific, peak, horizontal, firm ground accelerations for design magnitude seismic event with 2% and 10% probabilities of exceedance in 50 years and the corresponding spectral accelerations for different natural periods.

7.5 Fill Materials

7.5.1 Re-Use of Excavation Material

Locally derived material consisting of well-graded sand which is free of any organics, debris, or deleterious material and satisfies the specifications for an Engineered Fill as defined in this report, may be considered suitable for re-use as an excavation backfill material.

Fine grained soil, such as silt or clay, are sensitive to moisture and typically not recommended for re-use as Engineered Fill due to the potential difficulty of placement and achieving suitable compaction. Fine grained soil may be suitable for landscaping purposes and where supporting settlement sensitive structures and free draining conditions are not required.

7.5.2 Engineered Fill

Within the context of this report, Engineered Fill should consist of select, inert, clean, well-graded granular material with less than 5% fines content by mass, 100% passing a 100 mm sieve designation, and capable of withstanding the effects of handling, spreading, and compaction without excessive degradation or production of deleterious fines. Fine grained soil is defined as particles passing the US #200 sieve (finer than 0.075 mm diameter). The particles should be reasonably uniform in quality and free from organic materials and deleterious matter.

Where settlement sensitive structures, such as the garage floor slab, are to be supported, Engineered Fill, within 2% of its optimum moisture content for compaction, should be placed in suitable lifts and compacted to the equivalent of at least 100% of its maximum dry density when determined in accordance with ASTM D698 (Standard Proctor).

Field density testing should be carried out on each lift of Engineered Fill placed and compacted.

The Geotechnical Engineer of Record, who is responsible for the long term performance of any settlement sensitive structure supported on Engineered Fill, should be provided with the opportunity to review the supplier's specifications, material, and actual compaction level achieved using periodic field density tests.

Density test results should be forwarded to the Geotechnical Engineer of Record for review. Field reviews should also be carried out by the Geotechnical Engineer of Record to confirm that fill placement procedures are satisfactory and density test results are representative.

7.5.3 Retaining Wall Backfill

Fill placed behind a retaining wall is to consist of free-draining, granular soil with a minimum internal angle of friction of 35° and a maximum moist unit weight of 115 pcf. Engineered Fill as specified in Section 6.5.2 of this report is considered suitable for use as backfill behind retaining walls. Use of 3/4 inch clear crushed gravel and other free-draining, inert, clean, granular soil, such as Sechelt Sand, may be suitable as backfill material with review and approval from the Geotechnical Engineer of Record.

It should be noted that even backfill materials compacted to the strictest criteria should be expected to experience post-construction settlement of up to approximately 1% of the total fill thickness. Therefore, any paved areas or hard landscaping spanning between the building/backfill and adjacent existing, ground surfaces should be designed accordingly.

7.6 Lateral Earth Pressures

7.6.1 General

The earth pressure on basement and retaining walls depends on a number of factors including the backfill material, surcharge loads, backfill slope, drainage, rigidity of the retaining wall, and method of construction; including sequence and degree of compaction.

The recommended design earth pressures provided below assume that the area behind the wall is horizontal, fully drained, and no adjacent structures or surcharges are situated within a distance of 1.0 vertical to 2.0 horizontal from the base of the wall. If it is not possible to provide drainage behind the wall, then hydrostatic pressures must be assumed to act on the wall and these hydrostatic pressures would be additive to the static design earth pressures. If the area behind the wall is sloping, the lateral earth pressure against the wall would be greater than the recommendations provided in this report and should be adjusted accordingly for the design geometry. The recommended lateral earth pressures are unfactored values.

7.6.2 Static Design

For basement and retaining walls that will be backfilled with granular material such as compacted Engineered Fill and that can move 0.2% of the wall height, then locally, the condition is presumed to be unrestrained. Therefore, it is recommended that the wall be designed on the basis of a **30 x h** (psf) triangular earth pressure distribution, where h is the distance from the top of the wall measured in feet.

In the circumstance that the backfill will be required to support settlement sensitive structures, such as concrete slabs or paved surfaces, these backfill areas will require compacting. Thus, a lateral compaction pressure of 100 psf uniform pressure distribution associated with comparatively light weight compaction equipment, such as a 1000 lb vibratory plate compactor, should be used for wall heights less than 13.5 feet.

The lateral earth pressures and compaction pressure are considered to be mutually exclusive in the design of the proposed retaining walls. Therefore, at depths where the lateral earth pressure is less than or equal to the compaction pressure, only the compaction pressure is recommended in design calculations. At depths where the lateral earth pressure is greater than the compaction pressure, only the lateral earth pressure is recommended.

7.6.3 Seismic Design

For seismic loading conditions, the effect of earthquake shaking can be assumed to add an additional triangular pressure to the top of the wall, decreasing to zero at the base of the wall. Based on the Mononobe-Okabe method (Mononobe and Matsuo, 1929; Okabe, 1924), the seismic surcharge pressure can be assumed to be **16.1 x (H-h)** (psf), where **h** is the distance from the top of the wall and **H** is the total wall height, both measured in feet. This seismic lateral earth pressure distribution is based on pseudo-static equivalent of the peak, horizontal, firm ground acceleration for a design seismic event with a 2% probability of exceedance in 50 years.

Although the Mononobe-Okabe method is recommended in the 4th edition of the Canadian Foundation Engineering Manual (2006), the equations do not account for the stiffness of the structure nor the soil-structure interaction. If a more accurate determination of seismic earth pressure is required, more rigorous analytical methods such as finite element analysis to account for soil-structure interaction should be carried out. We would be pleased to provide additional information regarding this type of engineering service if requested.

Seismic lateral earth pressures are not added at depths where the recommended static lateral earth pressure is governed by the compaction earth pressure.

7.6.4 Vehicle Loading

If a vehicle is to be operated behind the basement or retaining wall and located within a distance of 1.0 vertical to 2.0 horizontal from the base of the retaining wall, a surcharge load should be included in the retaining wall design. This vehicle surcharge load may be assumed to be an equivalent of an additional 2 feet of soil height against the basement or retaining wall.

7.7 Slabs-on-Grade

It is recommended that a 6 inch thick drainage layer of compacted ¾ inch clear crushed gravel be placed beneath the slab-on-grade. This drainage layer should be separated from the slab-on-grade by a layer of 6-mil polyethylene sheeting. The subgrade for the underslab drainage layer should be reviewed by the Geotechnical Engineer of Record prior to pouring concrete for the slab-on-grade.

The slab-on-grade support materials should be hydraulically connected to the foundation drains such that water cannot accumulate and build up pressure.

7.8 Foundation Drainage

To assist our Client and the project team, the following information is provided but should be augmented by the professional having responsibility of site and foundation drainage, as required.

For typical projects as described in this report and where the drainage is a gravity system, It is recommended that a 4 inch diameter, rigid, perforated, PVC pipe be placed around the perimeter of the building foundation. The maximum invert elevation of the drain pipe should be at least 4 inches below the elevation of the underside of the slab-on-grade (e.g. 8 inches below the slab-on-grade finished floor elevation for a 4 inch thick slab). The pipes should be bedded on and surrounded by a minimum of 6 inches of 3/4 inch clear crushed gravel. The crushed gravel should be covered with a layer of non-woven geotextile filter fabric (Nilex 4545, or an approved equivalent) prior to placing backfill as previously described.

The outlet / discharge point for the drainage system should be confirmed by the Jurisdiction Having Authority which is expected to be the Village of Lions Bay.

The suitability of this system is to be confirmed during construction by the professional having responsibility for site and foundation drainage in accordance with the 2018 edition of the British Columbia Building Code.

If a volumetric flowrate is required for design of the foundation drainage, it is recommended that measurements of intercepted ground water volume be taken during construction. The excavation area should be determined and the volume of intercepted water measured over a known period of time.

8.0 REVIEWS

It is recommended that Horizon Engineering Inc be provided with the opportunity to review Building Permit Application drawings from the architect, structural engineer, mechanical engineer, civil engineer, and landscape architect prior to tender in order that the recommendations in this report can be confirmed or augmented, as required.

In accordance with the 2018 edition of the British Columbia Building Code and the associated Letters of Assurance program, the Geotechnical Engineer of Record will be required to perform Field Reviews and consulting services regarding the following items:

Geotechnical - Temporary
7.1 Excavation
7.2 Shoring

Geotechnical - Permanent
8.1 Bearing capacity of the soil
8.3 Compaction of engineered fill
8.4 Structural considerations of soil, including slope stability and seismic loading
8.5 Backfill

Thus, Horizon Engineering should be given the opportunity to confirm the stability of temporary excavations, the installation of excavation shoring, the suitability of foundation and slab-on-grade subgrades, the suitability of Engineered Fill and backfill, the placement and compaction level of

the Engineered Fill, backfill and pavement base and sub-base courses. In addition, density test results for the aforementioned fill types should be forwarded to us in a timely fashion for our review. There will also be a requirement for continuous review of the installation and testing of the foundation ground anchors. Furthermore, density test results for the aforementioned fill types should be forwarded to us in a timely fashion for our review.

It is the responsibility of the Client to ensure that Horizon Engineering is contacted to carry out the aforementioned field reviews during construction. The British Columbia Building Code 2018 Schedule C-B Letters of Assurance cannot be completed without having carried out the required field reviews.

9.0 CLOSURE

This report has been prepared for the sole use of our Client, Arya121holdings Ltd., and other consultants for this project, as described. Any use or reproduction of this report for other than the stated intended purpose is prohibited without the written permission of Horizon Engineering Inc.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or require clarification of the above, please do not hesitate to contact us.

For
HORIZON ENGINEERING INC.

Karim Karimzadegan, M.A.Sc., P.Eng.
Principal

For
HORIZON ENGINEERING INC.

Robert Ng, P.Eng.
Senior Geotechnical Engineer

Attachments:

Figure 1 – Site Location Plan	[1 page]
Figure 2 – Site Plan	[1 page]
Figure 3 – Photographs 1 and 2	[1 page]
Figure 4 – Photographs 3 and 4	[1 page]
Figure 5 – Photograph 5	[1 page]
Figure 6 – Photographs 6 and 7	[1 page]
Figure 7 – Conceptual Excavation and Foundation Strategy Section A-A	[1 page]
Figure 8 – Conceptual Excavation and Foundation Strategy Section B-B	[1 page]
Figure 9 – Conceptual Excavation and Foundation Strategy Section C-C	[1 page]

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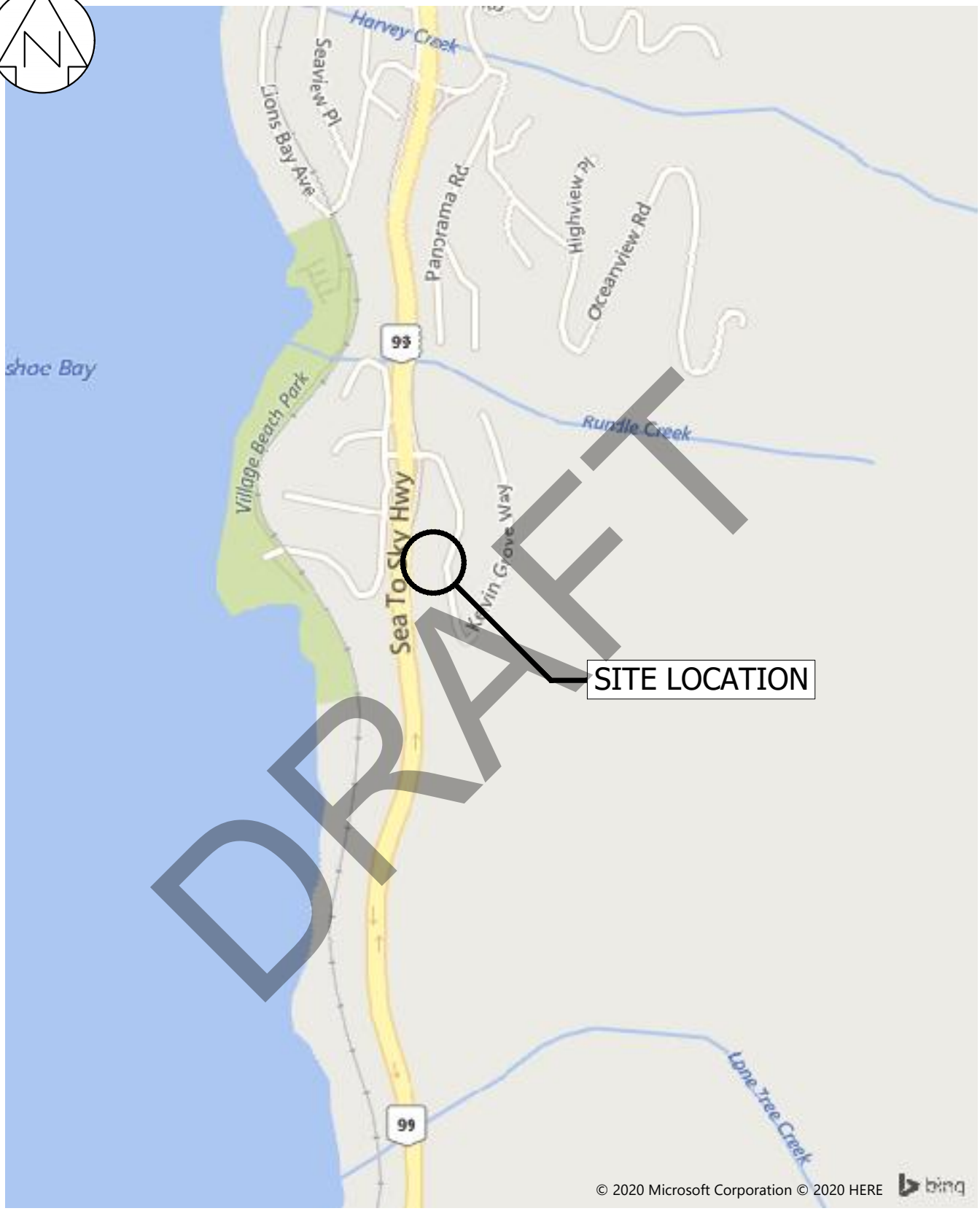

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PROPOSED RESIDENTIAL REDEVELOPMENT
105 Kelvin Grove Way, Lions Bay, BC

SITE LOCATION PLAN

HORIZON ENGINEERING INC

Scale:	File No:	Date:	FIGURE:
NTS	120-4719	JUN/2020	1

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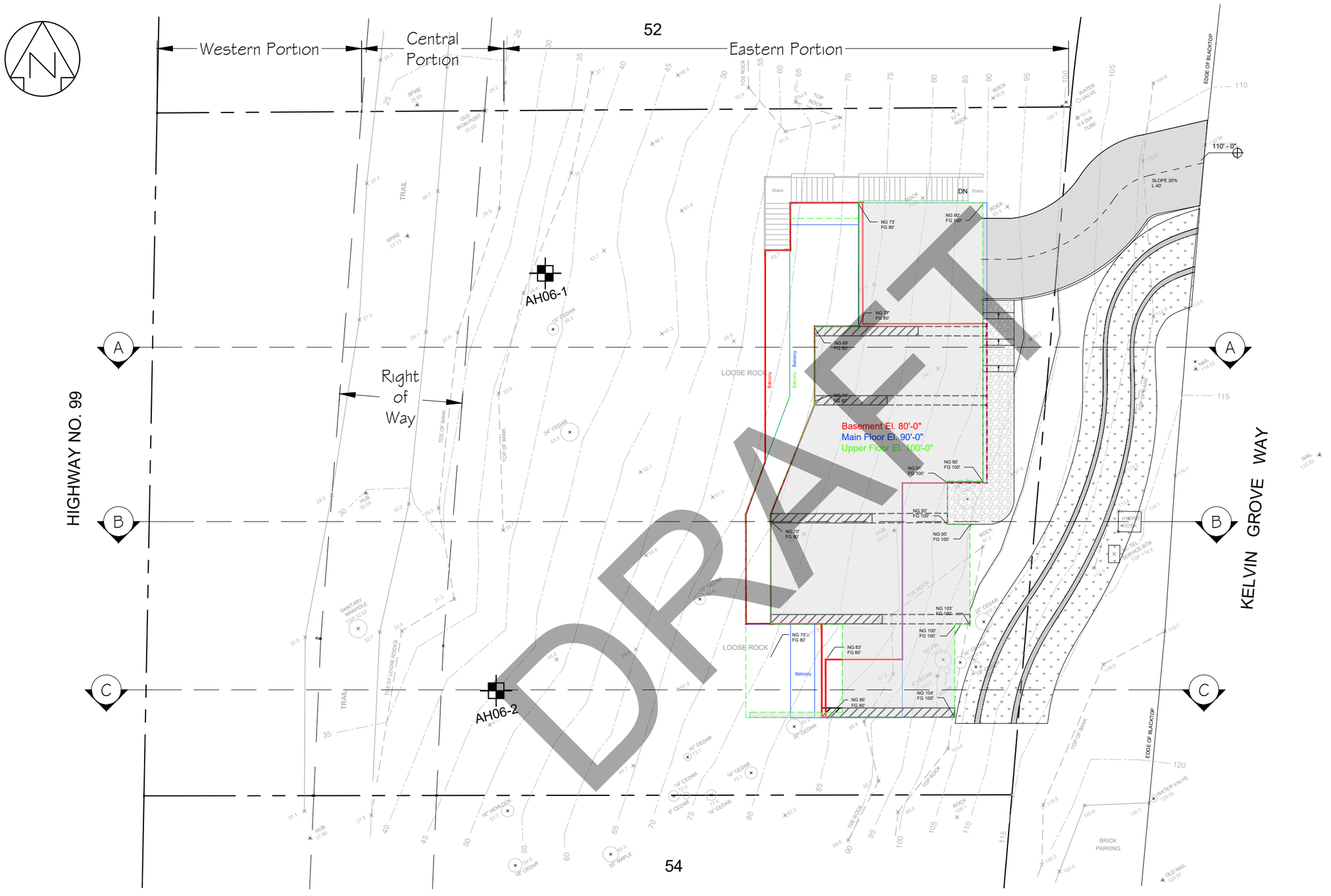

LEGEND

- Approximate location of Test Pit

NOTE: Anchors, retaining walls and foundation wing walls are shown for conceptual purposes only.

Legend

Conceptual location of wing wall and foundation ground anchors (extent to be determined)

REFERENCE DRAWINGS

Architectural drawings prepared by Fact Homes Group dated 19 May 2020.

NO	DATE	REVISION
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PROPOSED RESIDENTIAL DEVELOPMENT
105 Kelvin Grove Way
Lions Bay, BC

Conceptual Excavation and Foundation Strategy SITE PLAN

SCALE	DATE
1/16"=1'-0"	APR/2020

DESIGN	DRAWN	CHECKED
RN	CT	KK

FIGURE 2

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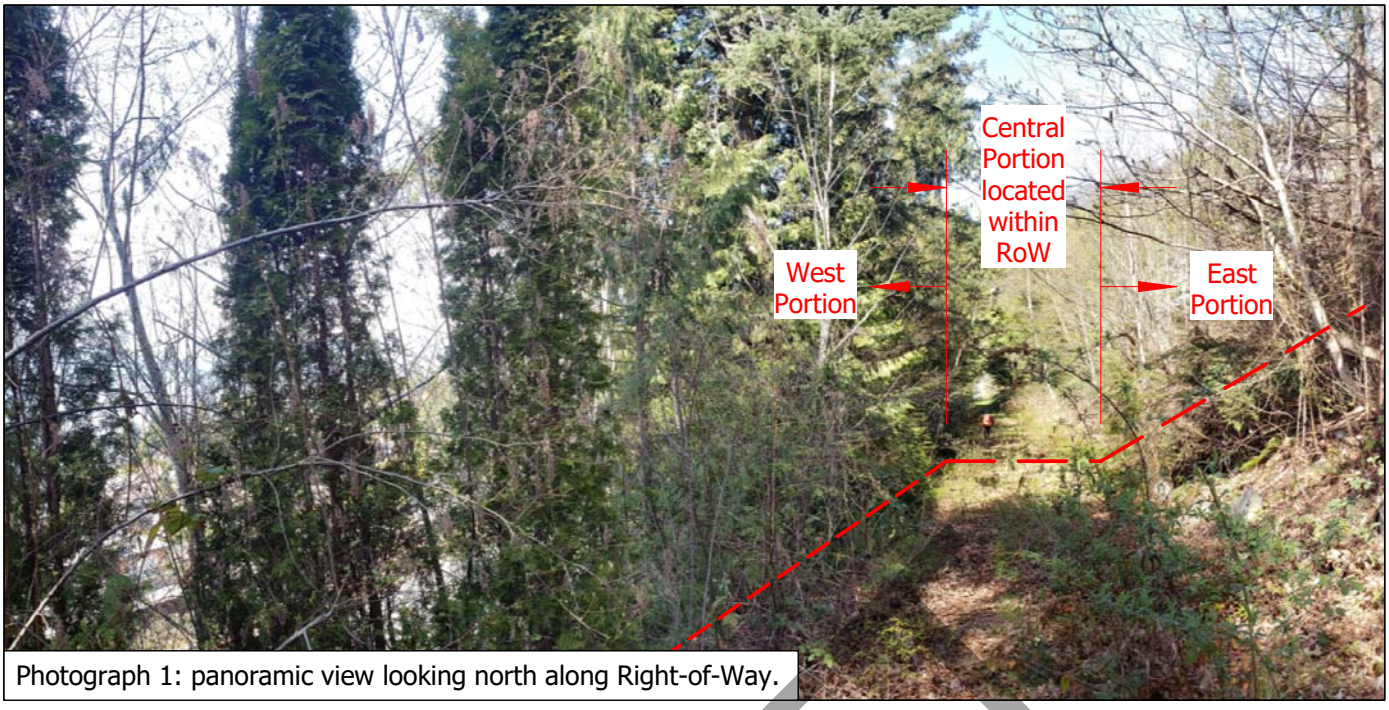

Photograph 1: panoramic view looking north along Right-of-Way.

Photograph 2: panoramic view looking northeast at area upslope of Right-of-Way.

Arya121holdings Ltd 407 - 837 West Hastings St. Vancouver, BC	Photographs 1 and 2	HORIZON ENGINEERING INC
Proposed Residential Development 105 Kelvin Grove Way Lions Bay, BC		SCALE NTS · FILE NO. 120-4719 · DATE JUN/2020 · FIGURE 3 DESIGN RN · DRAWN RN · CHECKED KK

Photograph 3: panoramic view of vegetation covered slope at east portion of site.

Photograph 4: bedrock outcrop at mid-slope elevation in north neighbouring property.

Arya121holdings Ltd 407 - 837 West Hastings St. Vancouver, BC	Photographs 3 and 4	HORIZON ENGINEERING INC
Proposed Residential Development 105 Kelvin Grove Way, Lions Bay, BC		SCALE NTS · FILE NO. 120-4719 · DATE JUN/2020 · FIGURE 4 DESIGN RN · DRAWN RN · CHECKED KK

Phtograph 5: Panoramic view looking south along Kelvin Grove Way

REFERENCE DRAWINGS		
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105 Kelvin Grove Way, Lions Bay, BC

Photograph 5

HORIZON ENGINEERING INC

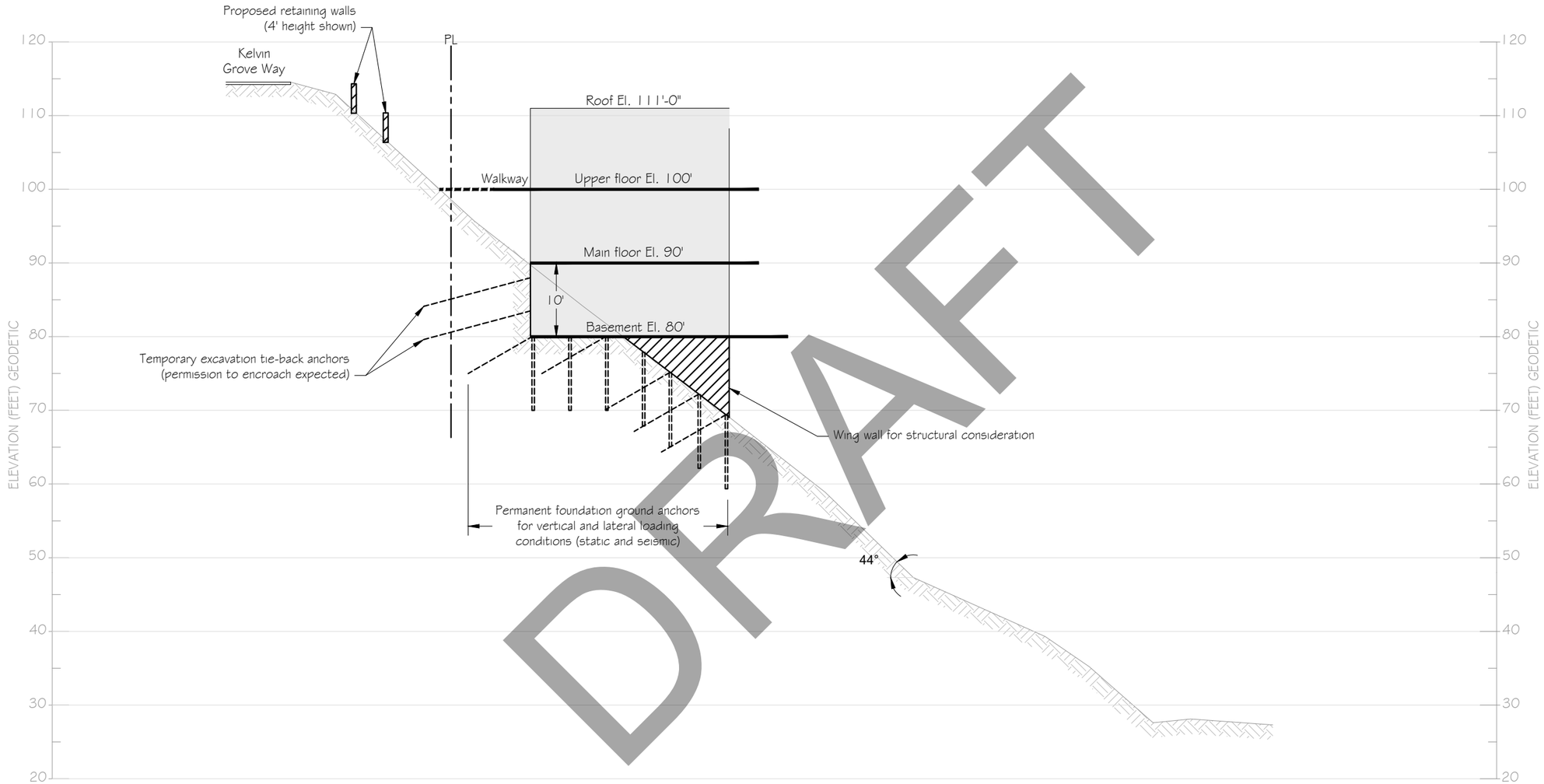
SCALE	FILE NO.	DATE	FIGURE
NTS	120-4719	JUN/2020	5

DESIGN	DRAWN	CHECKED
RN	RN	KK

Photograph 6: closer view of exposed bedrock discontinuities.

Photograph 7: view looking north showing cracked pavement beside slope crest.

Arya121holdings Ltd 407 - 837 West Hastings St. Vancouver, BC	Photographs 6 and 7	HORIZON ENGINEERING INC
Proposed Residential Development 105 Kelvin Grove Way, Lions Bay, BC		SCALE NTS · FILE NO. 120-4719 · DATE JUN/2020 · FIGURE 6 DESIGN RN · DRAWN RN · CHECKED KK



Section A-A
Scale: 1/16"=1'-0"

NOTE: Anchors, retaining walls and foundation wing walls are shown for conceptual purposes only.

REFERENCE DRAWINGS

Architectural drawings prepared by Fact Homes Group dated 19 May 2020.

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PROPOSED RESIDENTIAL DEVELOPMENT
105 Kelvin Grove Way
Lions Bay, BC

Conceptual Excavation and Foundation Strategy
SECTION A-A

SCALE	DATE
AS SHOWN	APR/2020

DESIGN	DRAWN	CHECKED
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FIGURE
7

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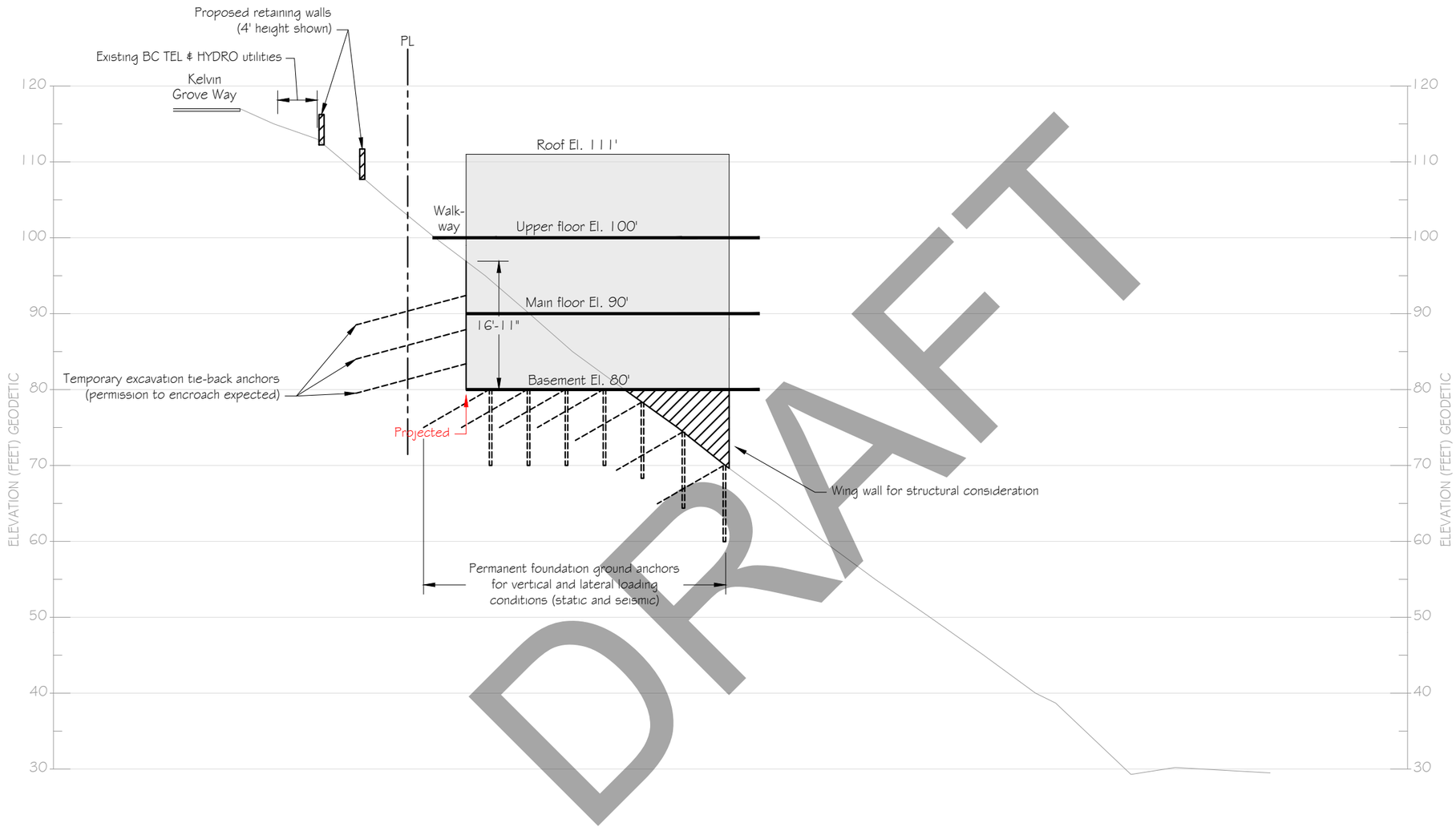

Section B-B

Scale: 1/16"=1'-0"

NOTE: Anchors, retaining walls and foundation wing walls are shown for conceptual purposes only.

REFERENCE DRAWINGS

Architectural drawings prepared by Fact Homes Group dated 19 May 2020.

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105 Kelvin Grove Way
Lions Bay, BC

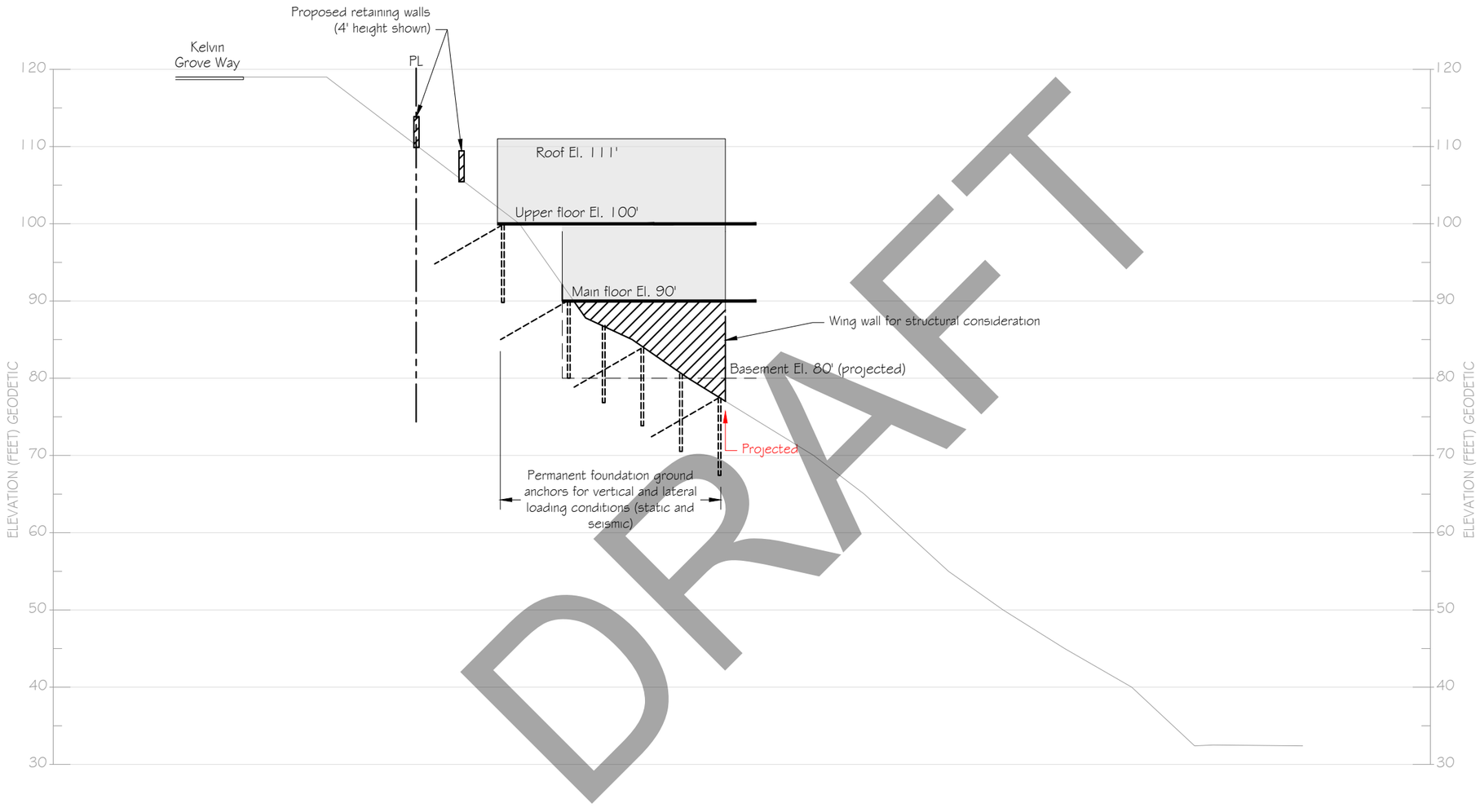
Conceptual Excavation and Foundation Strategy
SECTION B-B

SCALE	DATE
AS SHOWN	APR/2020

DESIGN	DRAWN	CHECKED
RN	CT	KK

FIGURE
8

FILE NUMBER
120-4719



Section C-C
Scale: 1/16"=1'-0"

NOTE: Anchors, retaining walls and foundation wing walls are shown for conceptual purposes only.

REFERENCE DRAWINGS

Architectural drawings prepared by Fact Homes Group dated 19 May 2020.

NO	DATE	REVISION
5		
4		
3		
2		
1		

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220 - 18 Gostick Place
North Vancouver, BC, V7M 3G3
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ARYA121
HOLDINGS LTD
407-837 W Hastings St
Vancouver, BC

PROPOSED RESIDENTIAL DEVELOPMENT
105 Kelvin Grove Way
Lions Bay, BC

Conceptual Excavation and Foundation Strategy
SECTION C-C

SCALE	DATE
AS SHOWN	APR/2020

DESIGN	DRAWN	CHECKED
RN	CT	KK

FIGURE
9

FILE NUMBER
120-4719