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nhc
northwest hydraulic consultants ltd

NHC Ref. No. 3003558

2018 February 13
Revised 2022 October 03

A.A.G. Services Construction
6661 Hastings St.
Burnaby, BC, V5B 1S1

Attn: Mr. Alireza Ghafouri, CEO
via email: aag.services.crltd@gmail.com

c/o: **Farzin Yadegari Architect AIBC**
via email: farzin@fyarch.ca

Re: **148 Elgin Street, Port Moody, BC.**
Flood Hazard Assessment

This letter report summarizes the flood hazard assessment (FHA) conducted for 148 Elgin Street, Port Moody, British Columbia.

1 INTRODUCTION

The property, 148 Elgin Street, Port Moody, BC is located within a flood hazard zone as identified and defined by the City of Port Moody's hazardous lands map (*Official Community Plan, Development Permit Area 5, Hazardous Lands, Map 14*). Therefore a flood hazard assessment is required prior to receipt of a building permit. Two houses are proposed to be constructed on the property, listed as the southern and northern building within this document..

The objective of this assessment is to identify and evaluate the flood hazards that may affect the safe development and use of the property with respect to the proposed development. Based on the scale of the proposed development, which we understand to be two single family homes, the risk of exposure of vulnerable populations warrants a *Class 1* FHA as categorized by provincial guidelines (APEGBC, 2012)[1]. A *Class 1* FHA is applicable for developments of 3 to 10 single families .

Axford Creek and Ottley Creek pass through or near 148 Elgin Street. Axford crosses along the west side of the property and Ottley Creek is roughly 40 m to the west of the property on the other side of Elgin

[1] APEGBC, Association of Professional Engineers and Geoscientists of BC is now known as Engineers and Geoscientists of BC (EGBC)

Street. This report documents the identification, assessment, and mitigation of flood hazards associated with these two creeks. Hazards derived from other sources, such as earthquake, fire, site storm water, etc. are not covered by this assessment.

2 BACKGROUND REVIEW

The following information has been reviewed as part of our investigation of the possible hydraulic hazards located near the property site, and information pertinent to this FHA is summarized below:

- Greater Vancouver Sewerage And Drainage District Study of Coquitlam/Port Moody Drainage Area (Dayton & Knight, 1988), with all respective appendices which includes among others the Geotechnical Study of Coquitlam/Port Moody Drainage Area (Thurber Consultants 1988)
- *Chines Integrated Stormwater Management Plan (ISMP)* (Associated Engineering, 2016)
- *ViewPort* (Port Moody's Public GIS/Mapping System), accessed October/November 2017

The 1988 Coquitlam/Port Moody Drainage Area study and the 2016 ISMP provide mapping of Axford and Ottley Creek alignments. Furthermore they report on past landslide and debris events that have initiated in their headwaters and runout as the channels reach the community below the Chines, immediately upstream of the study site.

3 SITE DESCRIPTION

The following description is based on interpretation of available maps, air photos, and a site inspection conducted by NHC (Sarah Kuipers, EIT) 31 January 2018. The community of Port Moody is located on ground that gradually slopes up from the south shore of the east end of Burrard Inlet. This continues for roughly 500 m after which there is break in slope and the ground slopes steeply upwards to a terrace above. This steeply sloping region is known as the Chines. It is characterized by mature forest and numerous steep creeks that flow off this slope and across the developed portion of Port Moody before reaching Burrard Inlet.

The study site is located roughly 100 m downslope (north) of the Chines. It is a 0.09 ha residential property bounded by a Elgin Street to the west, Saint George Street to the south, and Saint Andrews Street to the north. The property is about 2 m lower in elevation than St George Street (Photo 1) and roughly level to St. Andrews Street. The neighbouring residential property to the east, appears to be similarly low with respect to the surrounding ground.

Axford and Ottley Creek originate along the steep north facing slope of the Chines (Figure 1). Axford Creek is conveyed from the base of the Chines to Burrard Inlet predominantly within below grade storm water pipe; as it is while flowing through the west side of the study property. Ottley Creek flow alternates between open channel and piped sections between the Chines and Burrard Inlet. It flows north on the west side of Elgin Street

![nhc]

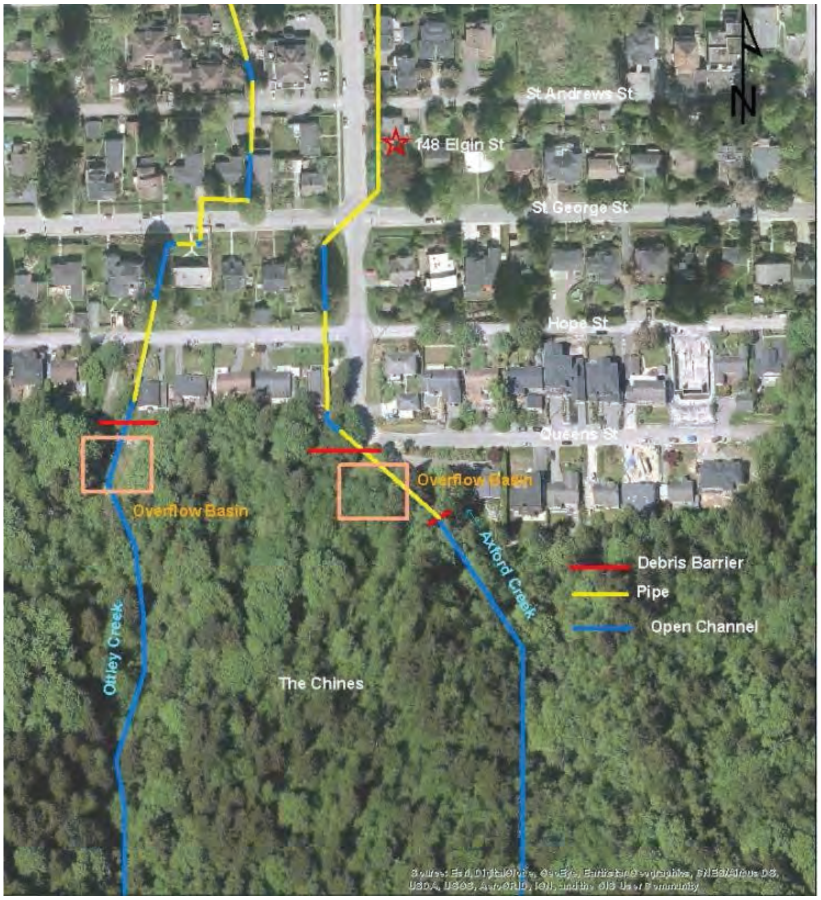

Figure 1. Project site overview map

Axford Creek

Axford Creek originates at the plateau above the Chines, where storm water pipes from the upper subdivision flow into the head of the creek. The grade of the Chines is approximately 20%. The bed consists of cobbles and boulders and the banks have a thick duff layer supporting mature deciduous and coniferous trees (Photo 9). At the base of the slope of the Chines, just north of Queens Street, is a debris basin. The basis was constructed to intercept and retain sediment and debris carried by the creek during a debris flood or flow, and limit the likelihood of such material reaching the downstream community. The creek flows into this basin and then enters a subsurface 450 mm diameter pipe through a 2 m high pyramid shaped debris rack (Photo 10). A series of retaining berms and walls and trash racks direct any overflow from the upper reaches to large catchment basins south of the debris racks(Photo 12).

The pipe conveys water from the debris basin intake under Hope Street where it resurfaces west of Elgin Street for a 40 m open channel section, before entering a 450 mm pipe (Photo 13). Based on mapping from the 2016 ISMP, the pipe crosses under Elgin Street at St. George Street and then continues north to Clarke Street. The creek is then piped east to Queens Street before continuing north to Burrard Inlet.

Axford Creek is in a pipe as it crosses along the west side of the study property. There is a manhole on Elgin Street adjacent to the property, one south of St George Street on the east side of Elgin St and one south of St George Street on the west side of Elgin Street. Axford Creek has been identified at medium risk for debris floods and medium-high for debris flows (Dayton & Knight Ltd., 1988).

Ottley Creek

Ottley Creek originates much like Axford Creek, with the discharge of numerous stormwater pipes along the plateau above the Chines. Ottley Creek flows down the steep forested slope of the Chines to reach the residential community at the south side of Hope Street halfway between Douglas Street and Elgin Street. Immediately upstream of Hope Street is a debris basin, similar but larger than the one on Axford Creek(Photo 17). Ottley Creek flows through a trash rack at the outlet of the debris basin and then about 5 m, into a 600 mm pipe. The pipe conveys the creek under Hope Street (Photo 18), after which the creek daylights and flows through a half corrugated metal pipe before returning to a 600 mm pipe upstream of Saint George Street (Photo 19). The flow goes in and out of pipes for each road crossing as it generally parallels Elgin Street on route to Burrard Inlet (Photo 20).

Ottley creeks have been identified at high risk for a debris flow or a debris flood (Dayton & Knight Ltd., 1988). It was reported in Dayton & Knight, 1988 that there was a large debris flow in Ottley Creek in December 1979 that moved a house. There is unverified information that the debris flow involved approximately 4000 m^3 of dumped fill at the crest of a ravine that moved down the steep embankments of the Chines destroying one house and inundating an apartment building.

4 FLOOD HAZARD ASSESSMENT

4.1 Hydrology

Axford and Ottley Creek are un-gauged watersheds with no record of water level or discharge. Therefore, the Rational Method was applied to determine design flows at the project location.

4.1.1 Watershed

Axford Creek and Ottley Creek watersheds both have a north facing aspect with a steep slope separating gradually sloping terraces. The steeper slopes are mature forest and the terraces urban development with a mix of open channel and piped flow. The elevation of the water shed ranges from El. 30 m at the project site to El. 150 m on the upper terrace. Watershed areas to the project site were delineated as 17.8 ha for Axford Creek and 20 ha for Ottley Creek.

4.1.2 Rational Method

The Rational Method uses rainfall data and the physical characteristics of the drainage basin to estimate peak runoff flows at the site. Data collected from an Environment Canada rain gauge stationed approximately 1 km northwest in Port Moody Glenayre, BC, (ID 1106CL2) was utilized for rainfall intensity. The Environment and Climate Change Canada (ECCC) prepared the Intensity-Duration-Frequency (IDF) for this station is based on 29 years of data collected from 1971-2001.

The general form of the Rational method formula is as follows:

$$Q = NCiA \quad (1)$$

where:

Q = flow (m^3/s),
C = runoff coefficient,
A = catchment area (hectares),
i = rainfall intensity value (mm/hr), and
N = 0.0028 metric coefficient.

A runoff coefficient of 0.95 was used with a sensitivity analysis from 0.85 to 1.05. The time of concentration (Tc) was calculated to be between 15 minutes and 1 hour. Using this approach a 200-year peak flow of 1.0 m^3/s was calculated for Axford Creek and 1.1 m^3/s for Ottley Creek.

Table 1. Instantaneous design flows, based on historic precipitation record.

Axford Creek				
Event	NHC Flow (m^3/s)	Dayton & Knight Ltd (m^3/s)	Metro Vancouver (m^3/s)	Scaled Metro Vancouver (m^3/s)
2-Yr	0.47	-	-	-
10-Yr	0.64	0.19	0.28	0.37
100-Yr	0.94	0.32	0.39	0.52
200-Yr	1.01	-	-	-
Ottley Creek				
Event	NHC Flow (m^3/s)	Dayton & Knight Ltd (m^3/s)	Metro Vancouver (m^3/s)	Scaled Metro Vancouver (m^3/s)
2-Yr	0.52	-	-	-
10-Yr	0.72	0.33	0.36	0.57
100-Yr	1.06	0.56	0.58	0.92
200-Yr	1.13	-	-	-

Notes:
1. Dayton & Knight Lt.d (1988) flow values are for a similar location in the watershed.
2. Metro Vancouver (2016) flow estimates for Axford and Ottley Creek are near the toe of the Chines. The scaled values are based on linear scaling by area.

4.1.3 Climate Change

To provide designs with long term resilience, the effects of climate change must be considered. NHC applied a previously developed tool which provides IDF values that account for the projected future changes in climate to the year 2100. This tool modifies the local rain station IDF to account for 9 Global Circulation Models (GCMs) and 3 RCP climate change scenarios. RCP is the representative concentration pathways for greenhouse gas concentration trajectories. Various RCPs are used to assess possible climate futures. RCP 8.5, which utilize radiative forcing peaks of +8.5 Wm^{-2} was used within this study (corresponds to an increased effect of radiation on the earth in the year 2100 relative to pre-industrial values). RCP 8.5 was selected, over lower level scenarios (RCP 2.6 and 4.5) to account for current climate and political projections.

Rainfall intensity is projected to increase by as much as 30% for extreme events by the year 2100. Assuming flood flows are proportional to rainfall intensity, than flood flow would go up by a similar amount. The following table presents the projected design flood flows using the year 2100 IDF values.

Table 2. Instantaneous design flows to the year 2100 (with climate change projections).

Event	Axford Creek (m^3/s)	Ottley Creek (m^3/s)
2-Yr	0.75	0.68
10-Yr	0.84	0.94
100-Yr	1.23	1.38
200-Yr	1.31	1.47

4.2 Hydraulic Analysis

The 200-year flow with an allowance for climate change is generally selected for the design flow. However, both creeks near the site have been reported as being at risk to debris floods and flows. These events are generally designed to the 500-year event when there is not a high risk of fatality (APEGBC, 2010), and can result in flows on the order of 4 to 40 times larger than the clear water design flood for debris flows and 2 times larger than the clear water design flood for debris floods (Wilford et. al. 2004). The upstream debris basins are expected to trap much of the sediment and debris, and potentially partially attenuate the flow.

As the existing pipe network is likely limited to conveying on the order of 0.15 to 0.3 m^3/s for Axford Creek and 0.3 to 0.6 m^3/s for Ottley Creek, overflow is expected during extreme clear water flow or debris events. It is likely to initiate at the debris basins; the open channel sections between road crossings are generally less than 30 m long with little local sources of debris for blockage. However, if adjacent vegetation is allowed to become overgrown, then the likelihood would increase. Based on local topography overflow from Axford Creek is expected to be conveyed north along Elgin Street. Overflow from Ottley Creek is likely to be split between Elgin Street and Douglas Street.

Based on the watershed morphometrics, the watershed appear most likely capable of supporting clear water floods with high sediment loads or debris floods and unlikely adequately steep to initiate a debris flow (Wilford et. al. 2004). Therefore, a design overflow event is expected to be limited to 2.5 to 5.1 m^3/s. Based on hydraulic calculations, it is expected that overflow during the design event is to be less than 0.1 m deep near the project site (except for possible localized depressions) with a velocity of 2 to 3 m/s across the property and potentially greater where flow is locally concentrated on smooth surfaces (i.e. Elgin Street).

4.3 Mitigation Measures

In order to address potential inundation from high water levels during the event of overflow flooding, it is recommended a flood construction level (FCL) be established for the site. The FCL is the designated level for which development above this level is expected to be safe for flood events up to and including the design event. The FCL is generally based on the open channel water profile during the design event plus an allowance or freeboard to account for debris, local turbulence, and uncertainty in the data and analysis. For this site, flow is conveyed past the site within a network of underground pipes. However, the capacity of the pipes may be exceeded (as noted earlier in the text) and water could then also flow on the surface. The grade of the land indicates that flow is likely to occur from south to north down Elgin Street. Elgin Street is higher than properties east of Elgin Street (such as the study property), and flow may entre these properties and flow north towards St. Andrews Street. The expected depth of such flow was calculated to be less than 0.1 m. Flow across the southern portion of the lot is bound by Elgin Street to the west and the northern lot to the north (the downslope side). Flow across the northern portion of the lot is bound by St. Andrews Street to the south.

To mitigate the risk of flooding the following are recommended,

- The southern home is constructed with a freeboard of 0.3 m above the adjacent Elgin Street to allow flow to exit back over Elgin Street without reliance for drainage from the eastern property or the northern half of the property.
- The northern home is constructed with a freeboard of 0.3 m above the crown elevation of St Andrews Street to allow flow to leave the property without backflooding into the home. In addition all entrances (windows and doors) should be a minimum of 0.3 m above adjacent potential flow paths (low point of adjacent ground) to allow south to north flow past the home without entering the home.

Due to the potential velocity of this flow, the building foundation should be protected from scour. Options for such protection include:

i) Fill that supports the structure be armoured to resist the erosion. This could be with paving or with placement of coarse rock, such as 100 to 150 mm diameter or larger, a minimum of 0.3 m thick, extending from the top of fill or FCL (which ever is less) for a width greater than 1.5 m or to a depth 0.5 m below adjacent surface grade[2],

ii) Structure foundations extend to 0.7 m or farther below the surrounding grade[2], or

iii) Building and site specific design provided by an appropriately qualified engineer.

The site is not exposed to an open channel, therefore no set back to account for channel erosion or migration is required.

The proposed mitigative measures are not expected to alter the local hydraulics or flow paths during a design flood event beyond those that currently exist to a degree that would transfer flood risk from Axford and Ottley Creek to neighbouring properties.

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[2] surface grade here is referring to the lowest elevation of adjacent ground within 2 to 5 m horizontal from the foundation

5 SUMMARY AND RECOMMENDATIONS

A flood hazard assessment was conducted for the property at 148 Elgin Street, Port Moody, BC. From this study, the following recommendations are made for safe use of the property.

For the southern home:

1) An FCL set to 0.3 m above Elgin Street where adjacent to the structure be adopted for future development of the southern portion of the site. Based on the building and lot survey[3] (see attached drawings) the elevation at Elgin Street is 27.94 m at the upslope building edge, and the corresponding FCL is 28.24 m.

2) Building entrances and windows to habitable space should be at or above the FCL, that is 0.3 m above Elgin Street adjacent to the upstream (south) end of the entrance or window.

For the northern home:

1) An FCL set to 0.3 m above the low point in the crown of St. Andrews Street adjacent to 148 Elgin Street be adopted for future development of the northern portion of the site. Based on 2019 LiDAR data (sourced from the City of Port Moody website) the crown elevation of St. Andrews Street is at an elevation of 24.00 m, suggesting the FCL should be 24.3 m. The LiDAR data has no metadata to confirm previous processing, quality control, or datum. It is therefore recommended that this elevation or the distance above the street be confirmed using site measurements.

2) Building entrances and windows to habitable space should be at or above the FCL, that is 0.3 m above St. Andrews Street. In addition, all entrances (windows and doors) should be a minimum of 0.3 m above the low point of adjacent ground to allow south to north flow past the structure without entering the structure.

For both the southern and northern homes:

3) The underside of any wooden floor system, or the top of any concrete floor system used for habitation is above the FCL.

4) No enclosed space to be used for habitation or storage of good that can be damaged by floodwaters are to be below the FCL.

5) Any areas below the FCL, such as parking must provide pedestrian exits above the FCL that are adequate for evacuation during a flood or lack of electrical power. Future users of the property – such as future buyers or renters – are to be informed of the flood risk for any areas below the FCL. For public structures this transfer of knowledge is often provided through signage posted at points of entry notifying users of the areas below the FCL.

[3] The City of Port Moody has publicly available LiDAR survey that provides a similar elevation, however this data has not been referenced as the ground survey is expected to have less uncertainty and the LiDAR data is lacking metadata that describes the previous processing of the data, quality control, uncertainty, and datum.

6) All main electrical and mechanical infrastructure are to be above the FCL. Any electrical supply below the FCL (i.e. outlet in parking areas) should be specified and installed following current professional practice guidelines for electrical equipment in flood prone areas (EGBC, 2020).
7) The building foundation be protected from scour, either by armouring of fill surrounding the foundation or seating the foundation deep enough in the ground to be unlikely be exposed to scour.

This flood hazard assessment was conducted following EGBC 2012 Class 1 flood hazard assessment guidelines. A summary of the EGBC criteria for such an assessment is presented in **Table 3**.

Table 3. Summary of EGBC typical Class 1 flood hazard assessment methods and deliverables

APEGBC Flood Hazard Assessment Component	Notes
Typical hazard assessment methods and climate/environmental change considerations	
Site visit and qualitative assessment of flood hazard	Completed by NHC 2018
Identify any very low hazard surfaces in the consultation area (i.e., river terraces)	Completed by NHC 2018
Estimate erosion rates along river banks	Project site is not adjacent to open channel
1-D, qualitative description of fluvial regime at the site and river stability, field inspections for evidence of previous floods.	Completed by NHC 2018
Identify upstream or downstream mass movement processes that could change flood levels (e.g., landslides leading to partial channel blockages, diverting water into opposite banks)	Potential blockage of culvert or sediment deposition in the channel considered possible mechanism of the flood scenario.
Conduct simple time series analysis of runoff data, review climate change predictions for study region, include in assessment if considered appropriate	Completed by NHC 2018, including allowance for climate change to year 2100
Quantify erosion rates by comparative air photograph analysis	No open channel at site
Typical deliverables	
Letter report or memorandum with at least water levels and consideration of scour and bank erosion	Completed by NHC 2018

6 SAFE CERTIFICATION

With respect to flood and erosion hazard, for flood events less than or equal to the 200-year peak instantaneous flow emanating from Axford and Ottley Creek, NHC certifies that the subject property is considered safe for the use intended if the recommendations in the previous section are followed. The assessment and hence this safe for use statement does not relate to hazards other than those resulting directly from flood emanating from Ottley and Axford Creek; that is site drainage (local runoff), fire, landslide, or any non-flood hazards are not included in this assessment.

7 CLOSURE

We hope this work and report meets your current needs. If you have any questions or would like to further discuss these findings, please contact Sarah Kuipers or Dale Muir at our North Vancouver office at (604) 980-6011 or by email (skuipers@nhcweb.com | dmuir@nhcweb.com).

Sincerely,

Northwest Hydraulic Consultants Ltd.

Original report prepared by: Sarah Kuipers, EIT

Reviewed and revised (2022) by:

PROFESSIONAL
PROVINCE OF
D.P. MUIR
27657
BRITISH COLUMBIA
ENGINEER

Dale Muir, P.Eng
Principal

Northwest Hydraulic Consultants Ltd. Professional Practice Permit No. 1003221

DISCLAIMER

This document has been prepared by Northwest Hydraulic Consultants Ltd. in accordance with generally accepted engineering practices and is intended for the exclusive use and benefit of A.A.G. Services Construction and Farzin Yadegari Architect Inc., and their authorized representatives for specific application to the flood hazard assessment at 148 Elgin Street, Port Moody, BC. for hazards from Axford Creek and Ottley Creek. The contents of this document are not to be relied upon or used, in whole or in part, by or for the benefit of others without specific written authorization from Northwest Hydraulic Consultants Ltd. No other warranty, expressed or implied, is made. Northwest Hydraulic Consultants Ltd. and its officers, directors, employees, and agents assume no responsibility for the reliance upon this document or any of its contents by any parties other than A.A.G. Services Construction and Farzin Yadegari Architect Inc.

References

APEGBC (2010). Guidelines for Legislated Landslide Assessments for Proposed Residential Developments in BC.

APEGBC. (2012). Professional Practice Guidelines for Legislated Flood Assessment in a Changing Climat in BC.

City of Port Moody. (2014). Community Plan: Development Permit Area 5, Hazardous Lands, Map 14.

Dayton & Knight Ltd. (1988). Coquitlam/Port Moody Drainage Area.

EGBC (2020). Electrical Engineering Considerations in Flood-Resilient Design of Buildings, Practice Advisory, Ver 1.0.

Metro Vancouver. (2016). The Chines Integrated Stormwater Management Plan.

Whilford, D., Sakals, M., Innes, J., Sidle, R., & Bergerud, W. (2004). Recognition of Debris Flow, Debris Flood and Flood Hazard Through Watershed Morphometrics.

Appendix A:
Photographs

Photo 1: 148 Elgin St. view from backyard

Photo 2: View of grade change between yard and St. George St. to the south; from centre of study property

Photo 3 Western side of property; parallel to Elgin St.

Photo 4: Looking into backyard of property from Elgin St. Note manhole in the lower right of the photo

Photo 5 Ally way between St George st and St Andrews St; behind property

Photo 6: Looking west down St. George St; edge of property in the left of photo

Photo 7: North view down Elgin St. Note storm water drain on the eastern side of Elgin st.

Photo 8: North view down Elgin St. Note the storm water drain on the western side of Elgin St.

Photo 9: Axford Creek facing upstream south of Queens St.

Photo 10: Axford Creek pipe inlet and pyramid trash rack south of the property

Photo 11: Inlet of pipe within the pyramid trash rack

Photo 12: Axford Creek trash rack and concrete lock barricade at the outlet of the debris basin, south of the site

Photo 13: Axford Creek open channel flow below the debris basin, south of Hope St

Photo 14: Axford Creek running parallel to Elgin St, opposite side (west) of the road and one block south of the site

Photo 15: Concrete lock blocks at Ottley Creek debris basin southwest of the site; south of Hope St.

Photo 16: Ottley Creek flowing through debris trash rack; facing north

Photo 17: Ottley debris basin

Photo 18: First pipe entrance below debris fence on Ottley Creek. Note the trash rack at the entrance of the pipe

Photo 19: Ottley Creek flow between houses south of St George St, southwest of the site

Photo 20: Ottley Creek running parallel to St George St. before entering 90^{o} bend into a pipe southwest of the site

Appendix B:
Flood Assurance Statement

FLOOD ASSURANCE STATEMENT

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

To: The Approving Authority

City of Port Moody

100 Newport Dr, Port Moody, BC, V3H 5C3

Jurisdiction and address

Date: 2022 June 30

With reference to (CHECK ONE):

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

For the following property ("the Property"):

148 Elgin Street, Port Moody, BC

Legal description and civic address of the Property

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

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

[CHECK TO THE LEFT OF APPLICABLE ITEMS]

___ 1. Consulted with representatives of the following government organizations:

____

✓ 2. Collected and reviewed appropriate background information

✓ 3. Reviewed the Proposed Development on the Property

___ 4. Investigated the presence of Covenants on the Property, and reported any relevant information

✓ 5. Conducted field work on and, if required, beyond the Property

✓ 6. Reported on the results of the field work on and, if required, beyond the Property

✓ 7. Considered any changed conditions on and, if required, beyond the Property

8. For a Flood Hazard analysis I have:

✓ 8.1 Reviewed and characterized, if appropriate, Flood Hazard that may affect the Property

✓ 8.2 Estimated the Flood Hazard on the Property

✓ 8.3 Considered (if appropriate) the effects of climate change and land use change

___ 8.4 Relied on a previous Flood Hazard Assessment (FHA) by others

✓ 8.5 Identified any potential hazards that are not addressed by the Flood Assessment Report

9. For a Flood Risk analysis I have:

___ 9.1 Estimated the Flood Risk on the Property

___ 9.2 Identified existing and anticipated future Elements at Risk on and, if required, beyond the Property

___ 9.3 Estimated the Consequences to those Elements at Risk

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

✓ 10.1 A standard-based approach

___ 10.2 A Risk-based approach

✓ 10.3 The approach outlined in the guidelines, Appendix F: Flood Assessment Considerations for Development Approvals

___ 10.4 No mitigation is required because the completed flood assessment determined that the site is not subject to a Flood Hazard

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

___ 11.1 Made a finding on the level of Flood Hazard or Flood Risk on the Property

___ 11.2 Compared the level of Flood Hazard or Flood Risk tolerance adopted by the Approving Authority with my findings

___ 11.3 Made recommendations to reduce the Flood Hazard or Flood Risk on the Property

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

✓ 12.1 Described the method of Flood Hazard analysis or Flood Risk analysis used

✓ 12.2 Referred to an appropriate and identified provincial or national guideline for level of Flood Hazard or Flood Risk

___ 12.3 Made a finding on the level of Flood Hazard of Flood Risk tolerance on the Property

✓ 12.4 Compared the guidelines with the findings of my flood assessment

✓ 12.5 Made recommendations to reduce the Flood Hazard or Flood Risk

✓ 13. Considered the potential for transfer of Flood Risk and the potential impacts to adjacent properties

___ 14. Reported on the requirements for implementation of the mitigation recommendations, including the need for subsequent professional certifications and future inspections.

Based on my comparison between:

[CHECK ONE]

☐ The findings from the flood assessment and the adopted level of Flood Hazard or Flood Risk tolerance (item 11.2 above)

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

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

[CHECK ONE]

☐ For <u>subdivision approval</u>, as required by the *Land Title Act* (Section 86), “that the land may be used safely for the use intended”:

[CHECK ONE]

☐ With one or more recommended registered Covenants.

☐ Without any registered Covenant.

✓ For a <u>development permit</u>, as required by the *Local Government Act* (Sections 919.1 and 920), my Flood Assessment Report will “assist the local government in determining what conditions or requirements under [Section 920] subsection (7.1) it will impose in the permit”.

☐ For a <u>building permit</u>, as required by the Community Charter (Section 56), “the land may be used safely for the use intended”:

that is, the proposed renovations does not increase flood risk or transfer flood risk for the site.

[CHECK ONE]

☐ With one or more recommended registered Covenants.

☐ Without any registered Covenant.

☐ For flood plain bylaw variance, as required by the *Flood Hazard Area Land Use Management Guidelines* and the *Amendment Section 3.5 and 3.6* associated with the *Local Government Act* (Section 524), “the development may occur safely”.

☐ For flood plain bylaw exemption, as required by the *Local Government Act* (Section 524), “the land may be used safely for the use intended”.

FLOOD ASSURANCE STATEMENT

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

2022 June 30

Date

Prepared by

Sarah Kuipers, EIT

Name (print)

Signature

30 Gostick Place, North Vancouver, BC

Address

604-980-6011

Telephone

dmuir@nhcweb.com

Email

Reviewed by

Dale Muir, M.Eng., P.Eng.

Name (print)

Signature

PROFESSIONAL
PROVINCE OF
D. P. MUIR
27657
BRITISH COLUMBIA
ENGINEER

2022 JUNE 30

(Affix PROFESSIONAL SEAL here)

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

I am a member of the firm Northwest Hydraulic Consultants Ltd. (NHC) (Name of firm)

and I sign this letter on behalf of the firm.

Appendix C:
Current Drawings

148 ELGIN (SOUTH LOT), PORT MOODY

PROPOSED SINGLE FAMILY HOUSE WITH SECONDARY SUITE

PROJECT DATA				
CIVIC ADDRESS: 148 ELGIN STREET PORT MOODY (SOUTH LOT)				
	ALLOWED		PROPOSED	
ZONING	RS1			RS1-S
	FT.	M.	FT.	M.
LOT AREA			4,356	404.68
FIRST FLOOR			1223.75	113.69
SECOND FLOOR			988.17	91.80
THIRD FLOOR			1080.07	100.34
PARKING EXEMPTION			247.57	23.00
F.A.R. = 70%	3049.2	283.28	3044.42	282.83
SITE COVERAGE				
182.10 SQ. M. (1,960 SQ. FT.)	1960.2	182.11	1372.91	127.55
AVERAGE GRADE CALCULATION				
(NW 26.20 + SW 26.95 + SE 26.50 + NE 25.55) / 4 = 105.20 / 4			86.29'	26.30
HEIGHT		10.50		11.15
FCL				**28.24**

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT: 148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

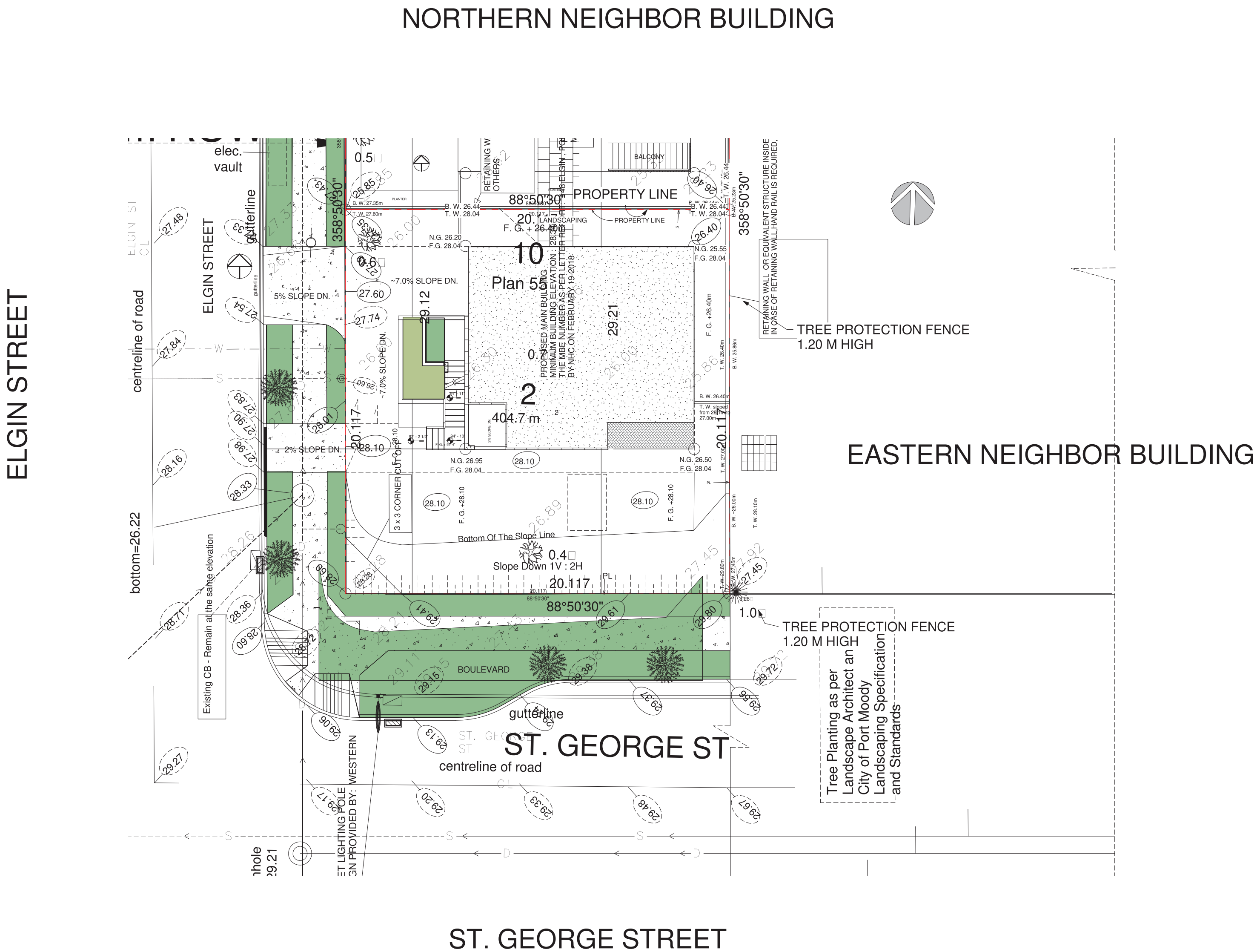
CHECKED BY: Checker

SCALE:

DATE: 2022-02-08

TITLE: PROJECT DATA

SHEET NO: A-1.0-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

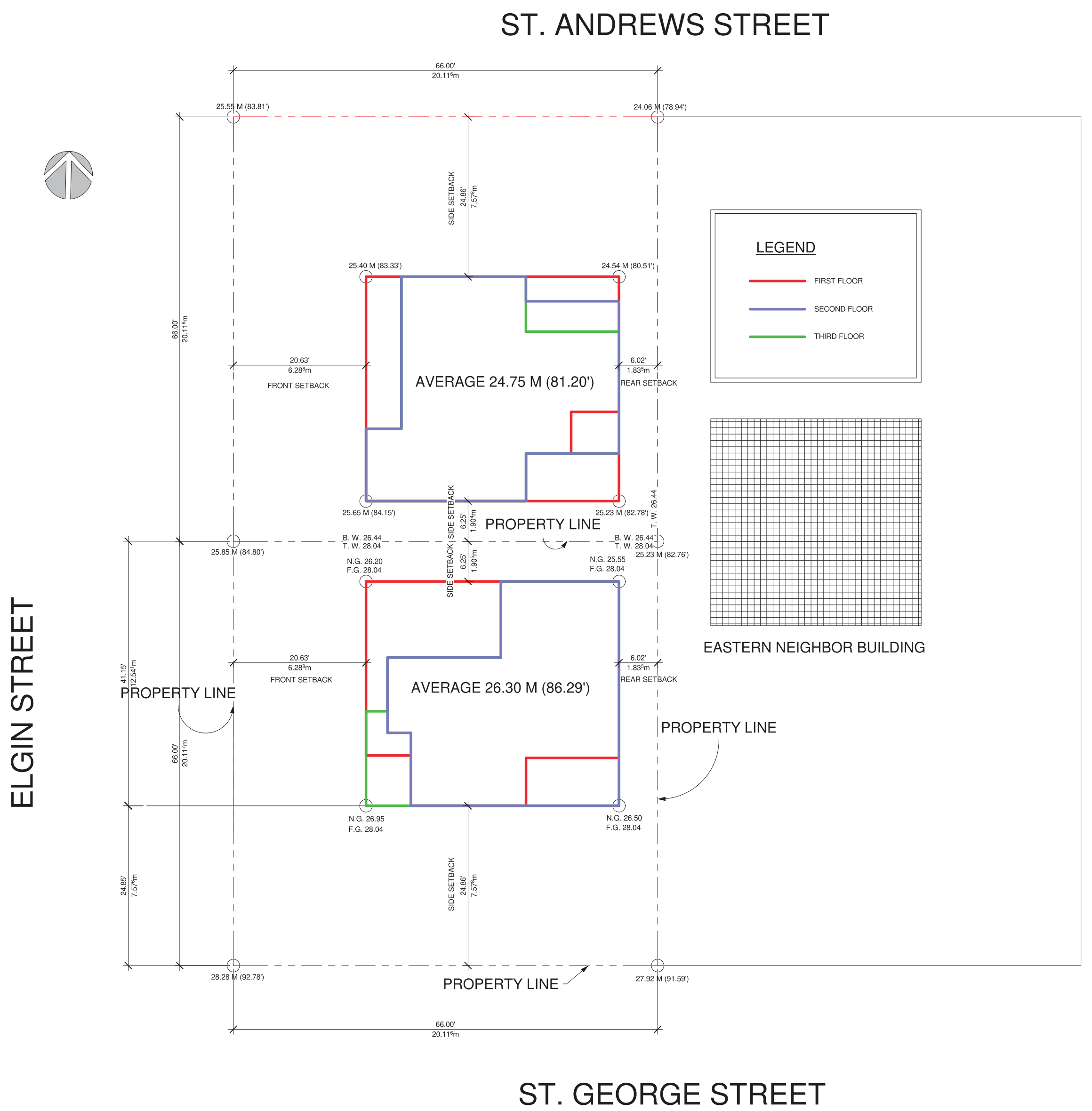
CHECKED BY: Checker

SCALE: 1 : 100

DATE: 2022-02-08

TITLE:
SITE PLAN

SHEET NO:
A-1.1-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

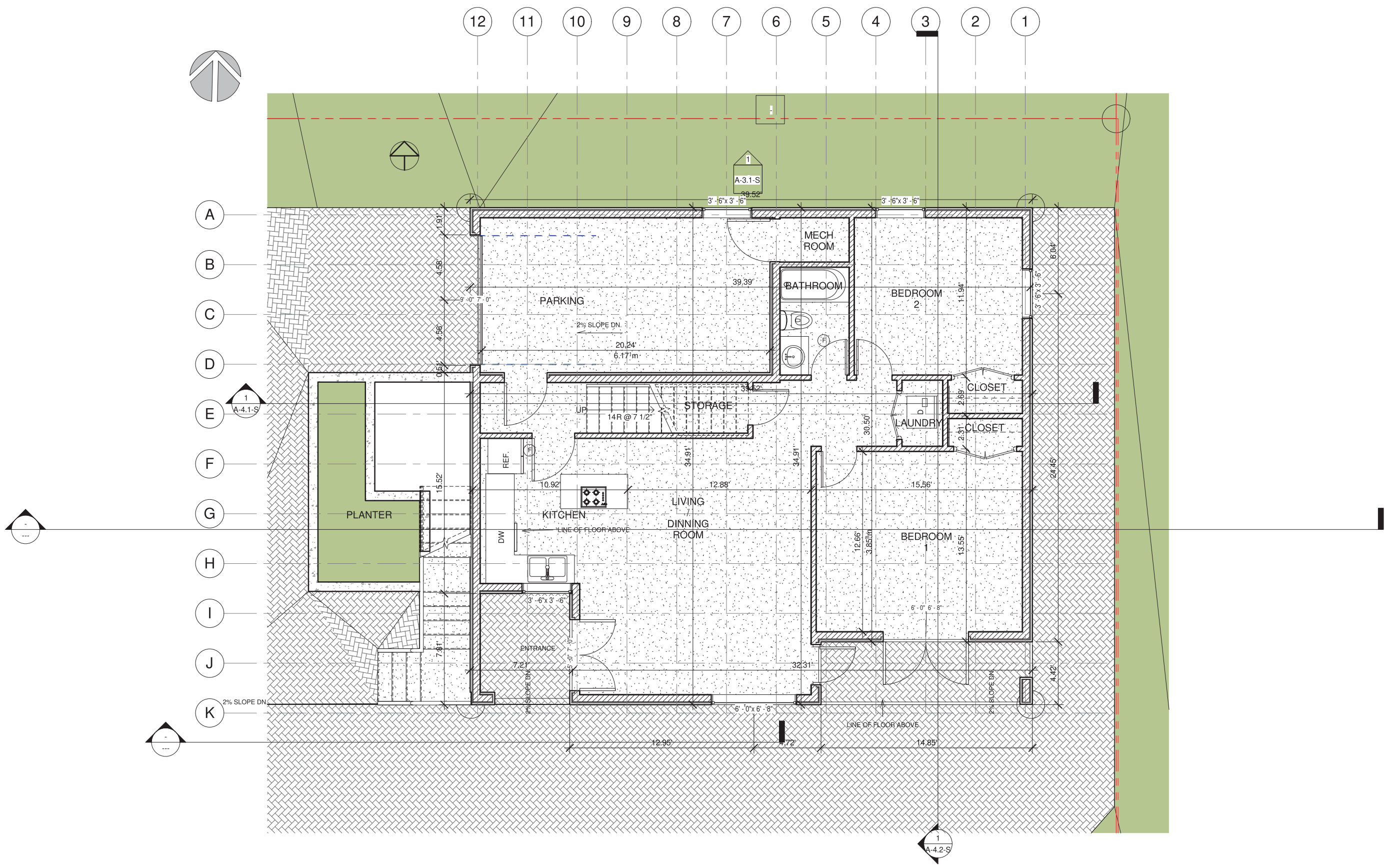
CHECKED BY: Checker

SCALE: 1 : 100

DATE: 2022-02-08

TITLE:
SITE PLAN SETBACK ONLY

SHEET NO: A-1.2



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

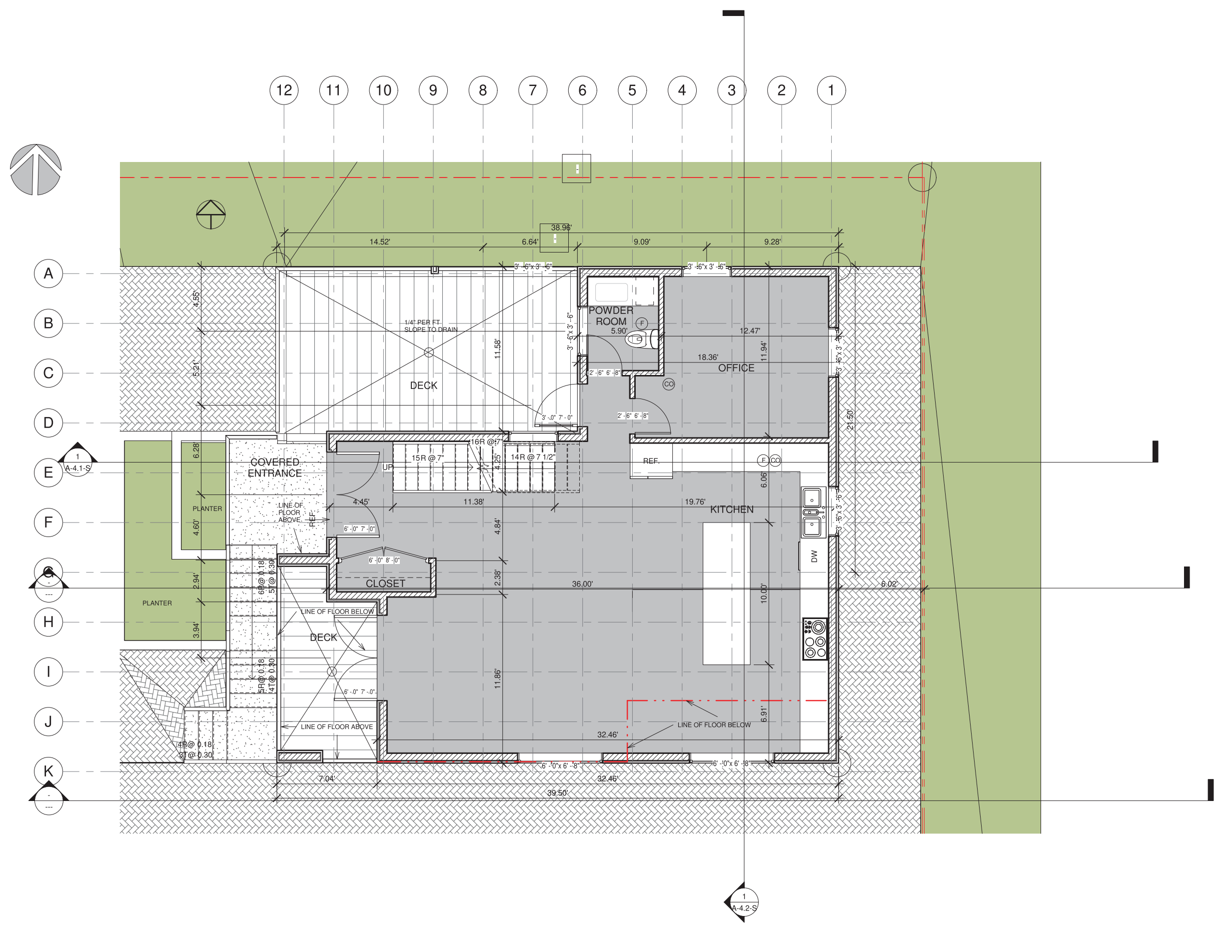
CHECKED BY: Checker

SCALE: 1 : 48

DATE: 2022-02-08

TITLE:
FIRST FLOOR PLAN

SHEET NO:
A-2.1-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 48

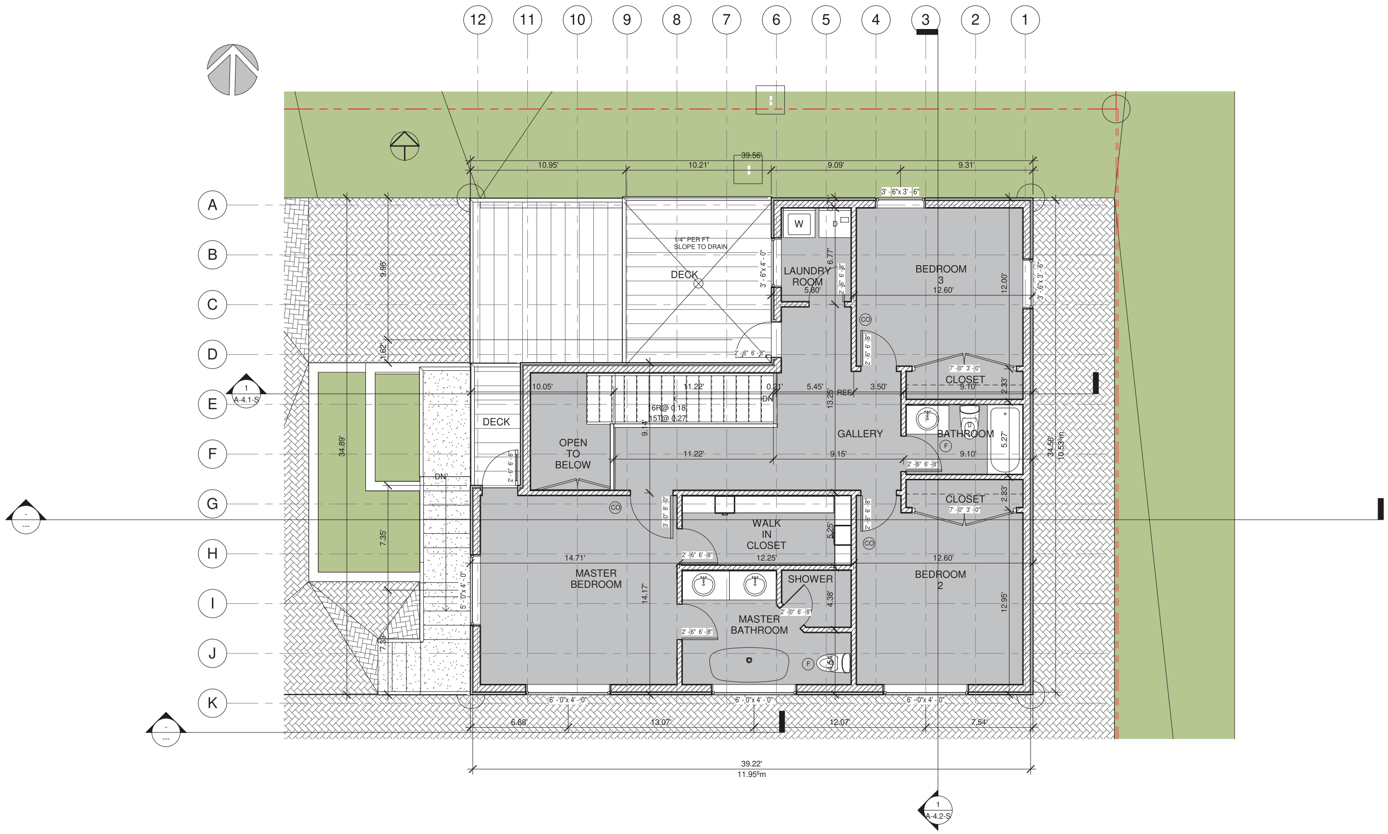
DATE: 2022-02-08

TITLE:

SECOND FLOOR PLAN

SHEET NO:

A-2.2-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 48

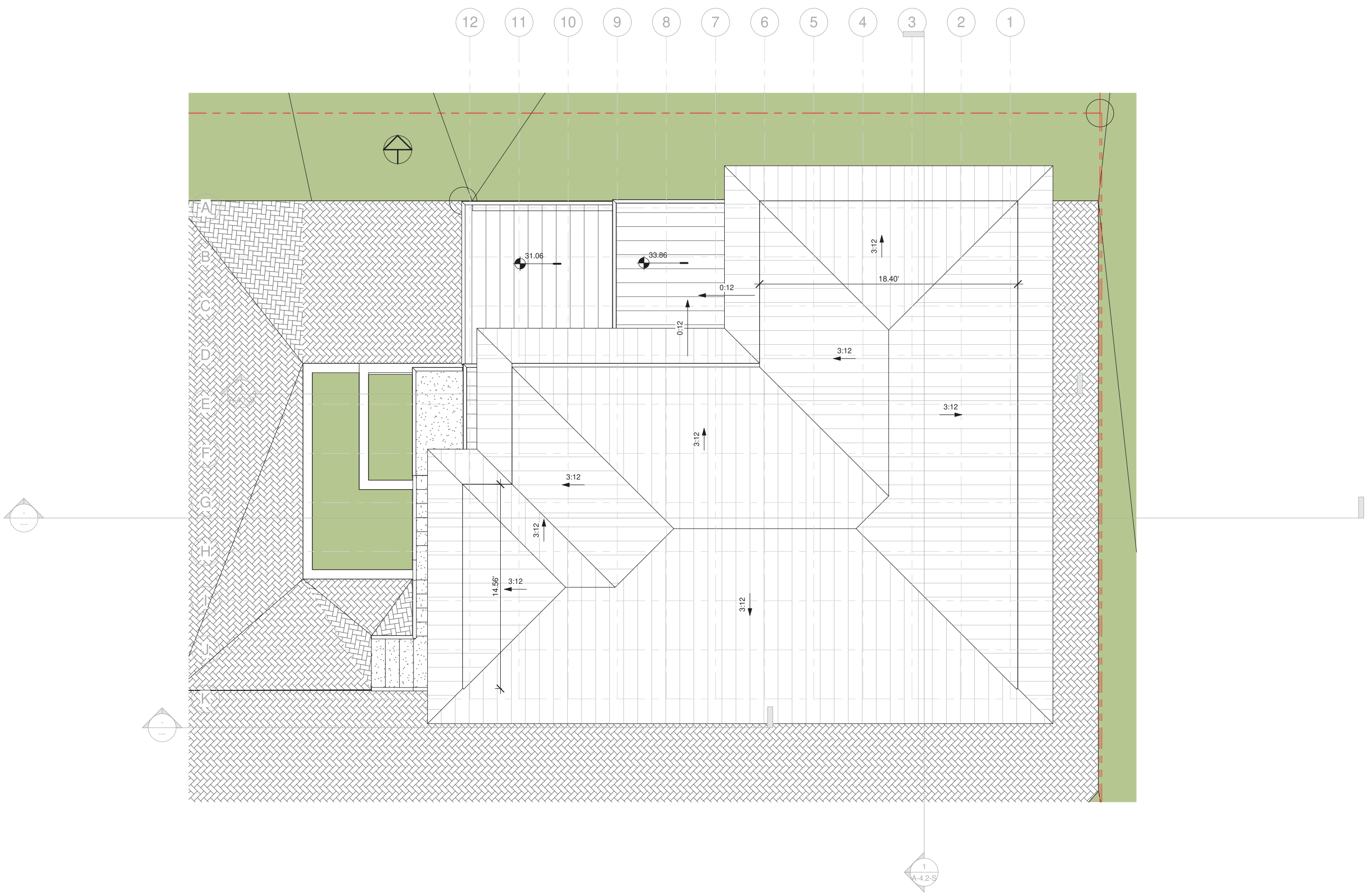
DATE: 2022-02-08

TITLE:

THIRD FLOOR PLAN

SHEET NO:

A-2.3-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 48

DATE: 2022-02-08

TITLE:

ROOF PLAN

SHEET NO:

A-2.4-S

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

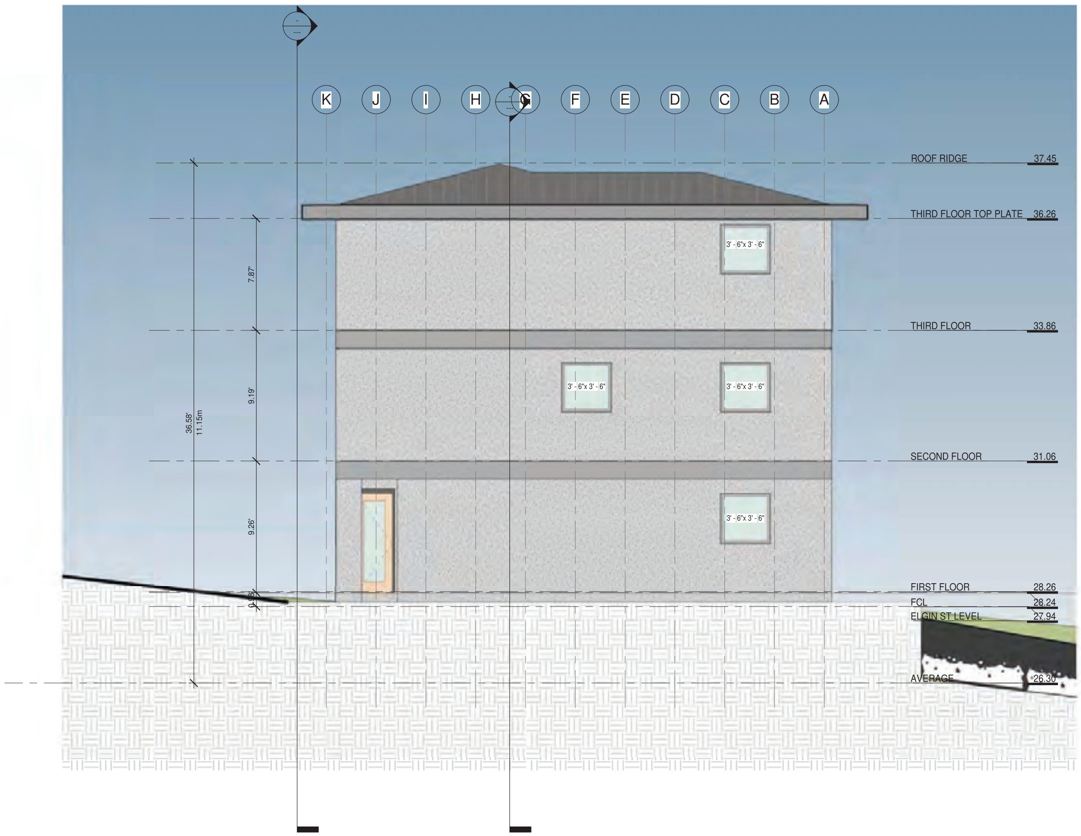
CHECKED BY: Checker

SCALE: 1 : 48

DATE: 2022-02-08

TITLE:
SOUTH ELEVATION

SHEET NO:
A-3.1-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

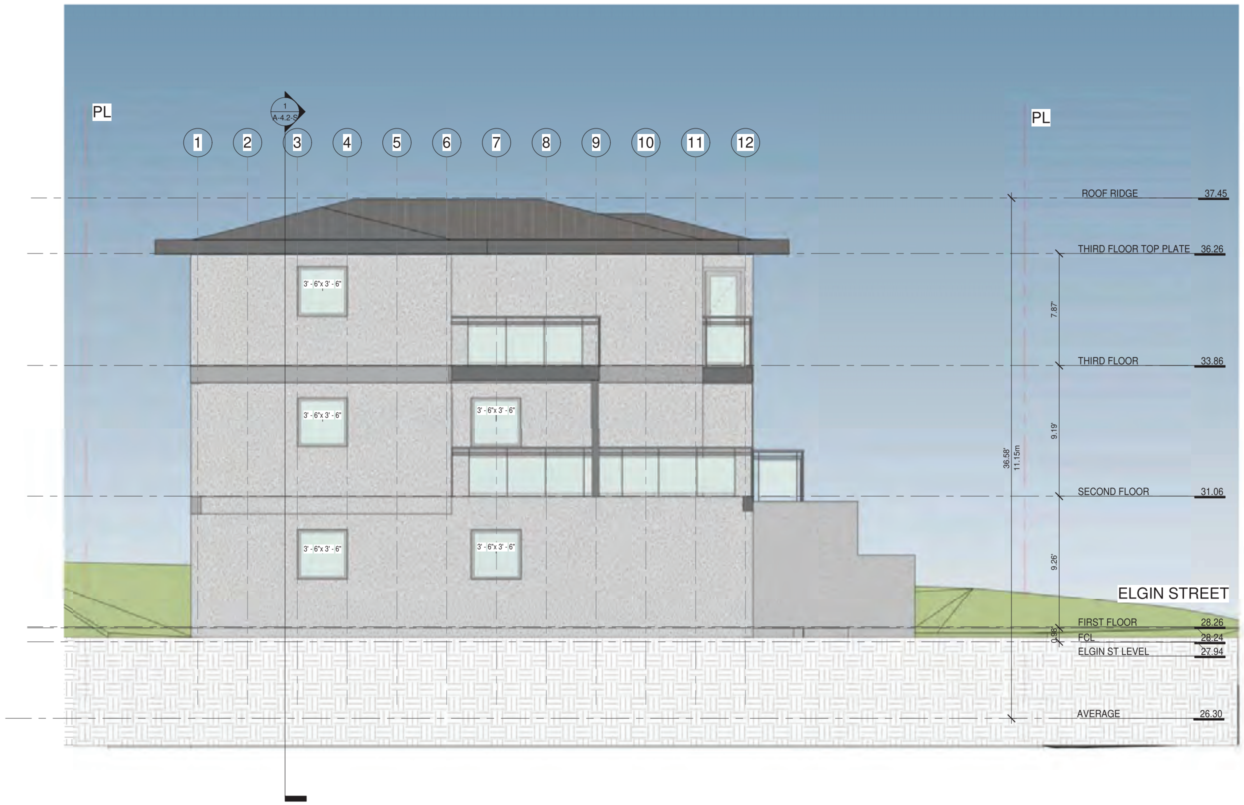
CHECKED BY: Checker

SCALE: 1 : 48

DATE: 2022-02-08

TITLE:
EAST ELEVATION

SHEET NO:
A-3.2-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

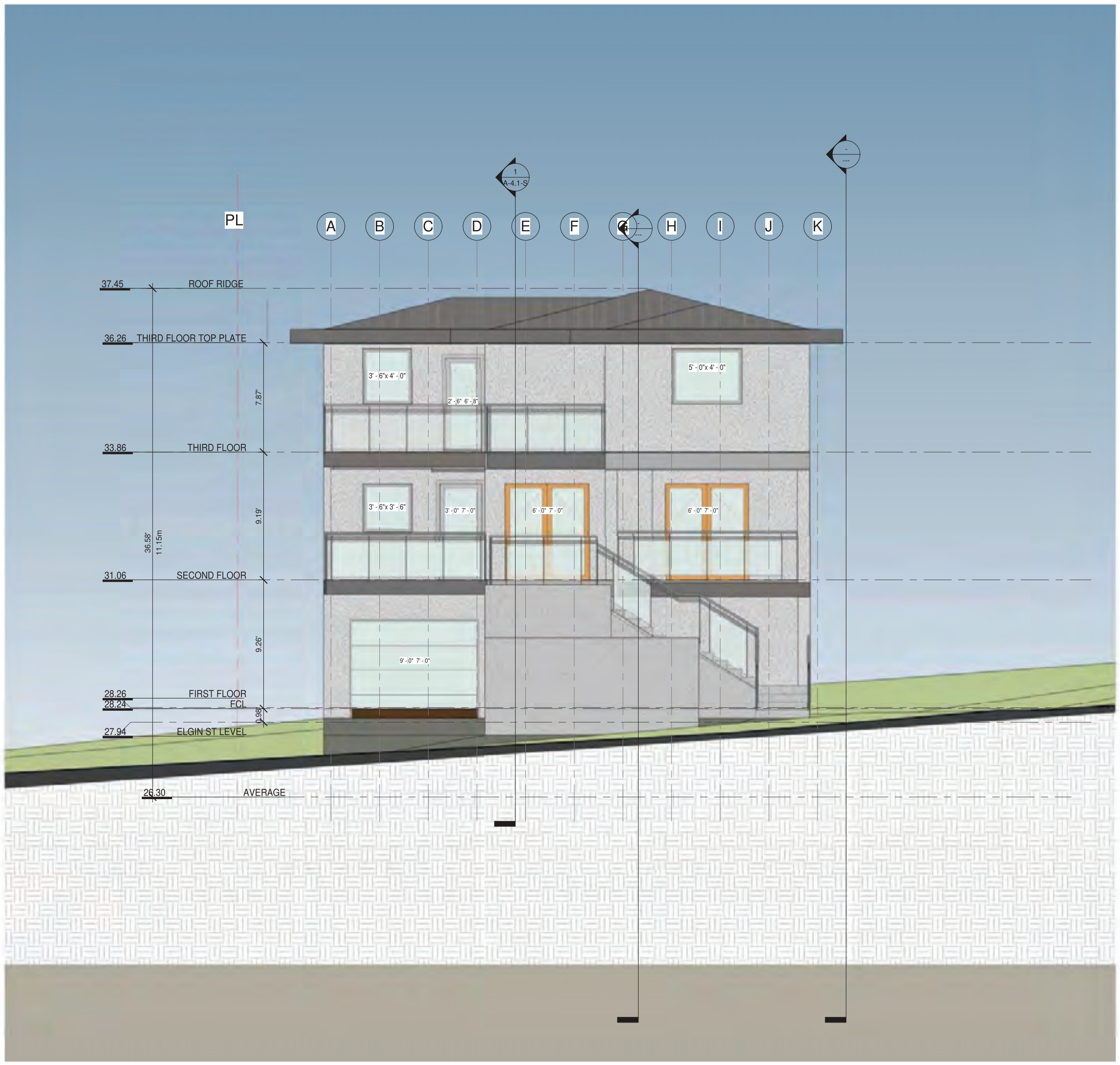
CHECKED BY: Checker

SCALE: 1 : 48

DATE: 2022-02-08

TITLE:
NORTH ELEVATION

SHEET NO:
A-3.3-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

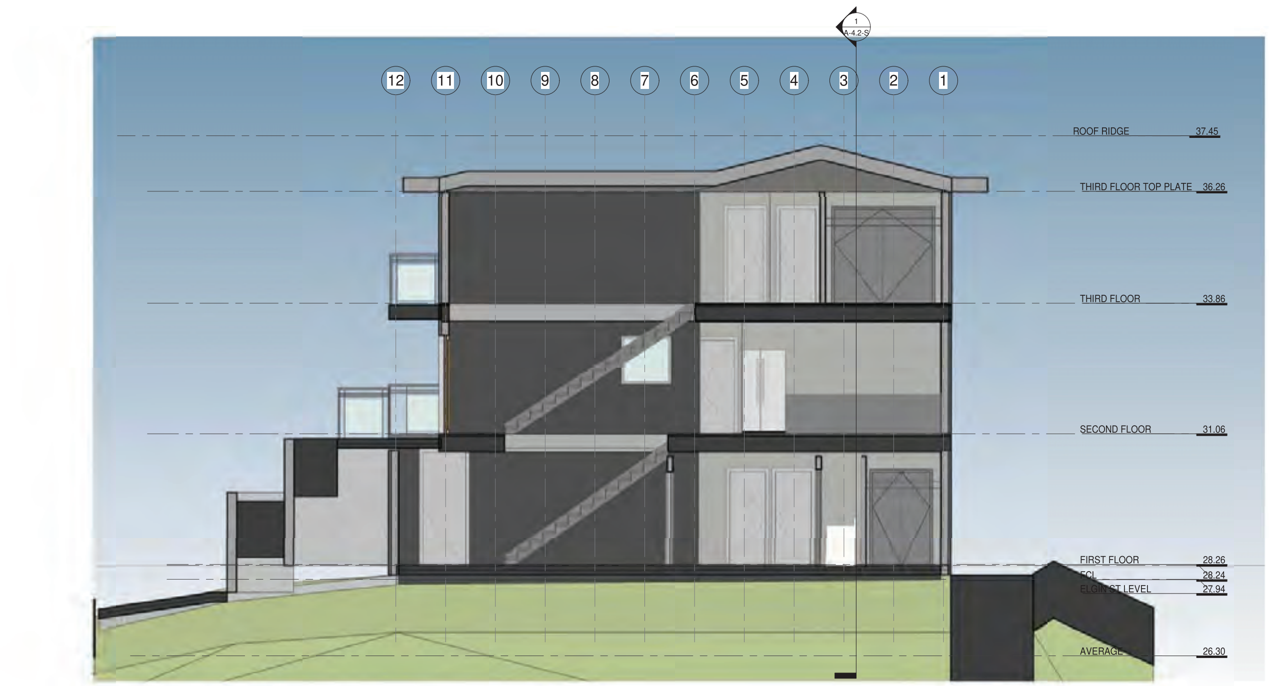
CHECKED BY: Checker

SCALE: 1 : 48

DATE: 2022-02-08

TITLE:
WEST ELEVATION

SHEET NO:
A-3.4-S



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 48

DATE: 2022-02-08

TITLE:

SECTION 1

SHEET NO:

A-4.1-S

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 48

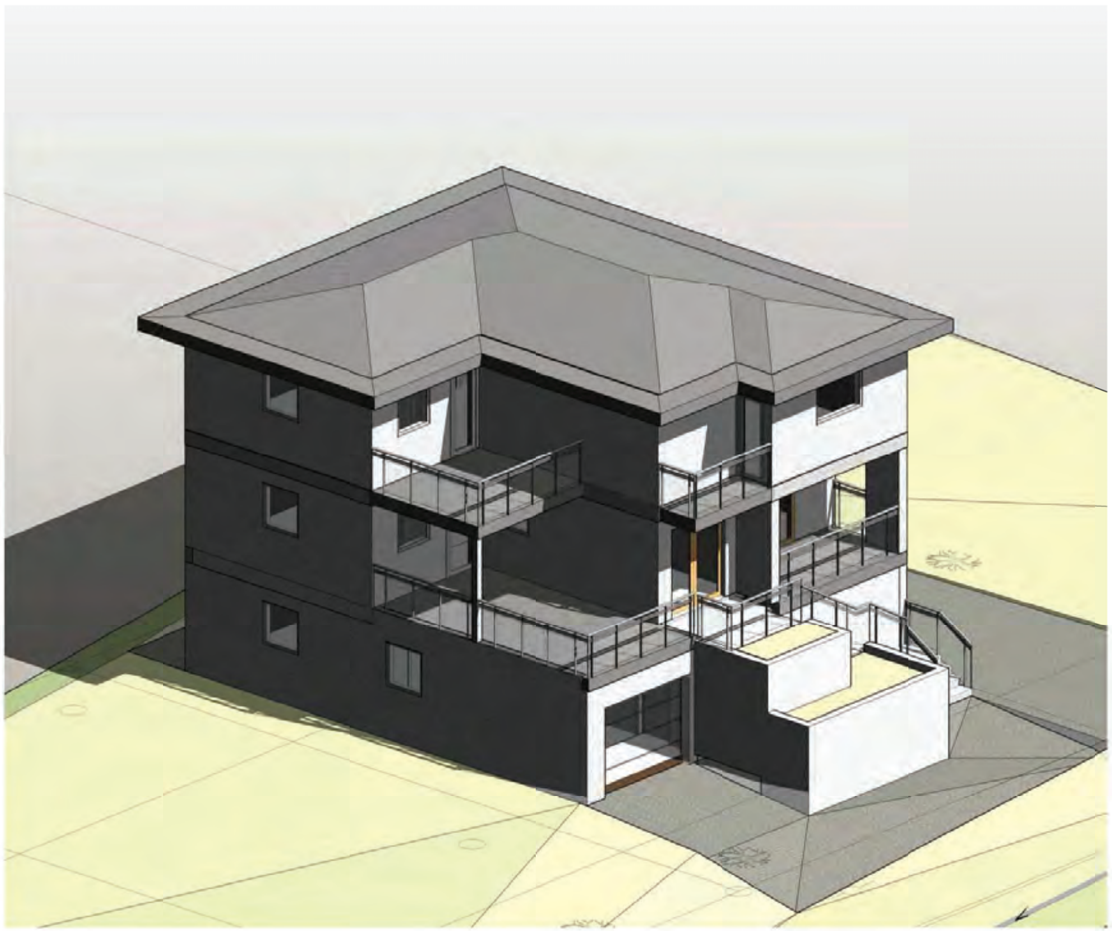
DATE: 2022-02-08

TITLE:

SECTION 2

SHEET NO:

A-4.2-S



FARZIN
YADEGARI
ARCHITECT INC
102 2341 CHIPPENDALE ROAD
WEST VANCOUVER, B.C. V7S 3J2
T 778 340 4142 WWW.FYARCH.CA

No.	.	Date

PROJECT:
148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE:

DATE: 2022-02-08

TITLE:
Northwest View

SHEET NO:
A-5.1-S

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN SOUTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE:

DATE: 2022-02-08

TITLE:

Southwest View

SHEET NO:

A-5.2-S

148 ELGIN (NORTH LOT), PORT MOODY

PROPOSED SINGLE FAMILY HOUSE WITH SECONDARY SUITE

PROJECT DATA

CIVIC ADDRESS: 148 ELGIN STREET PORTMOODY (NORTH LOT)

	ALLOWED		PROPOSED	
ZONING	RS1			RS1-S
	FT.	M.	FT.	M.
LOT AREA			4,356	404.68
FIRST FLOOR			1211.00	112.50
SECOND FLOOR			1039.92	96.61
THIRD FLOOR			1039.92	96.61
PARKING EXEMPTION			247.57	23.00
F.A.R. = 70%	3049.2	283.28	3043.27	282.73
SITE COVERAGE				
182.10 SQ. M. (1,960 SQ. FT.)	1960.2	182.11	1372.91	127.55
AVERAGE GRADE CALCULATION				
NW. 24.75 + S.W. 24.75 + S.E. 24.75 + N.E. 24.75 = 99.00/4			81.20'	24.75
HEIGHT		10.50		10.49
FCL				**24.30**

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT: 148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

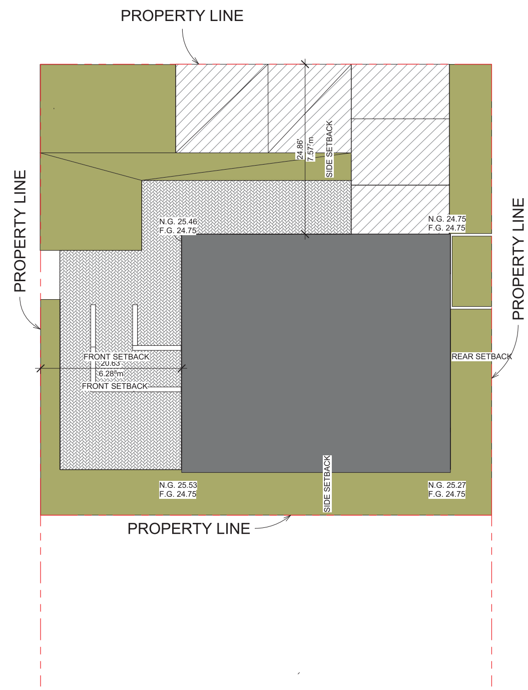
CHECKED BY: Checker

SCALE:

DATE: 2022-06-20

TITLE: PROJECT DATA

SHEET NO: A-0.1-N



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 100

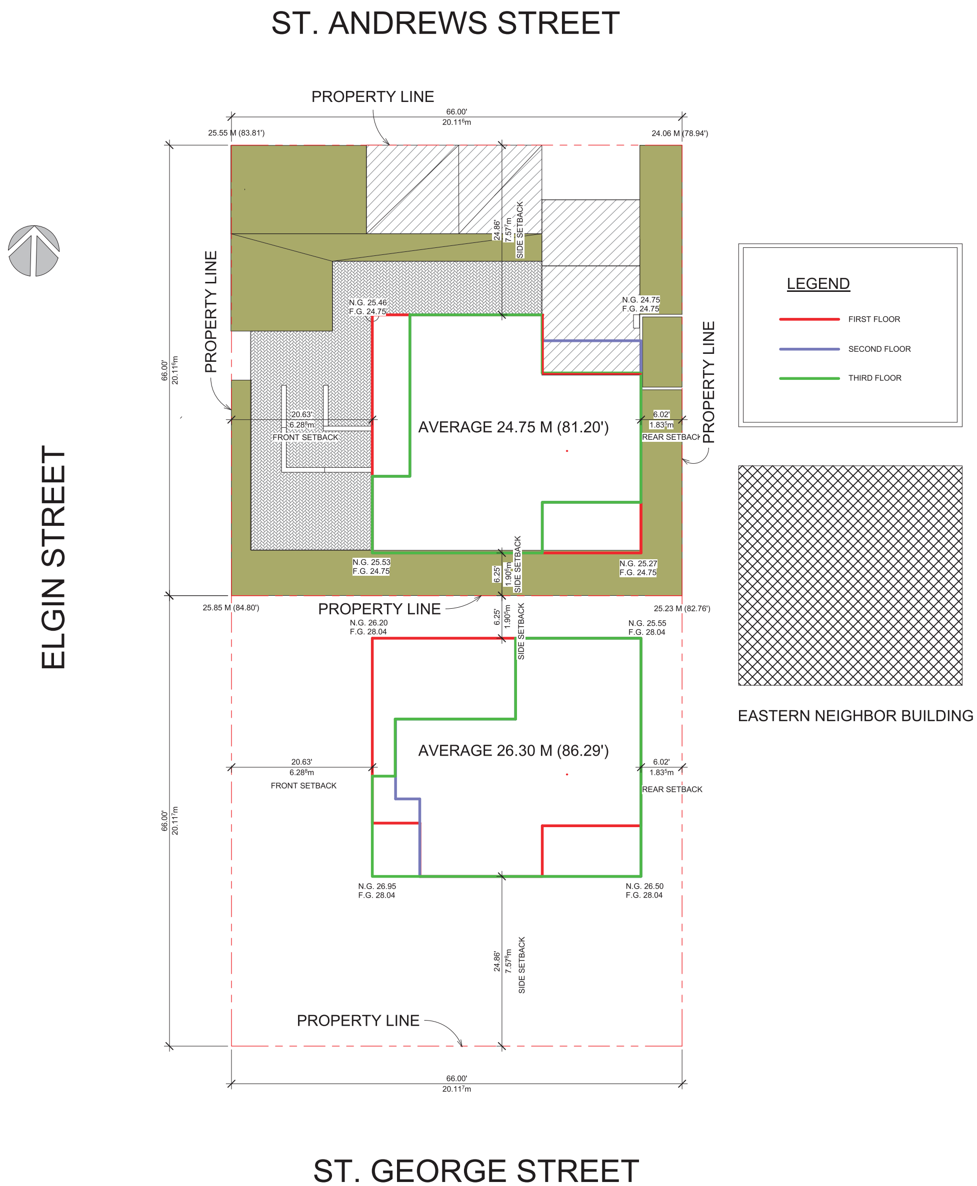
DATE: 2022-06-20

TITLE:

SITE PLAN

SHEET NO:

A-1.1-N



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 100

DATE: 2022-06-20

TITLE:
SITE PLAN SETBACK ONLY

SHEET NO: A-1.2

FARZIN
YADEGARI
ARCHITECT INC
102 - 2247 CHIPPENDALE ROAD
WEST VANCOUVER, B.C. V7S 2J7
T 778 340-8142 WWW.FYARCH.CA

1 NORTH ELEVATION HEIGHT COMPARISON
1 : 50

2 3D View 6

No.	.	Date

PROJECT:
148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

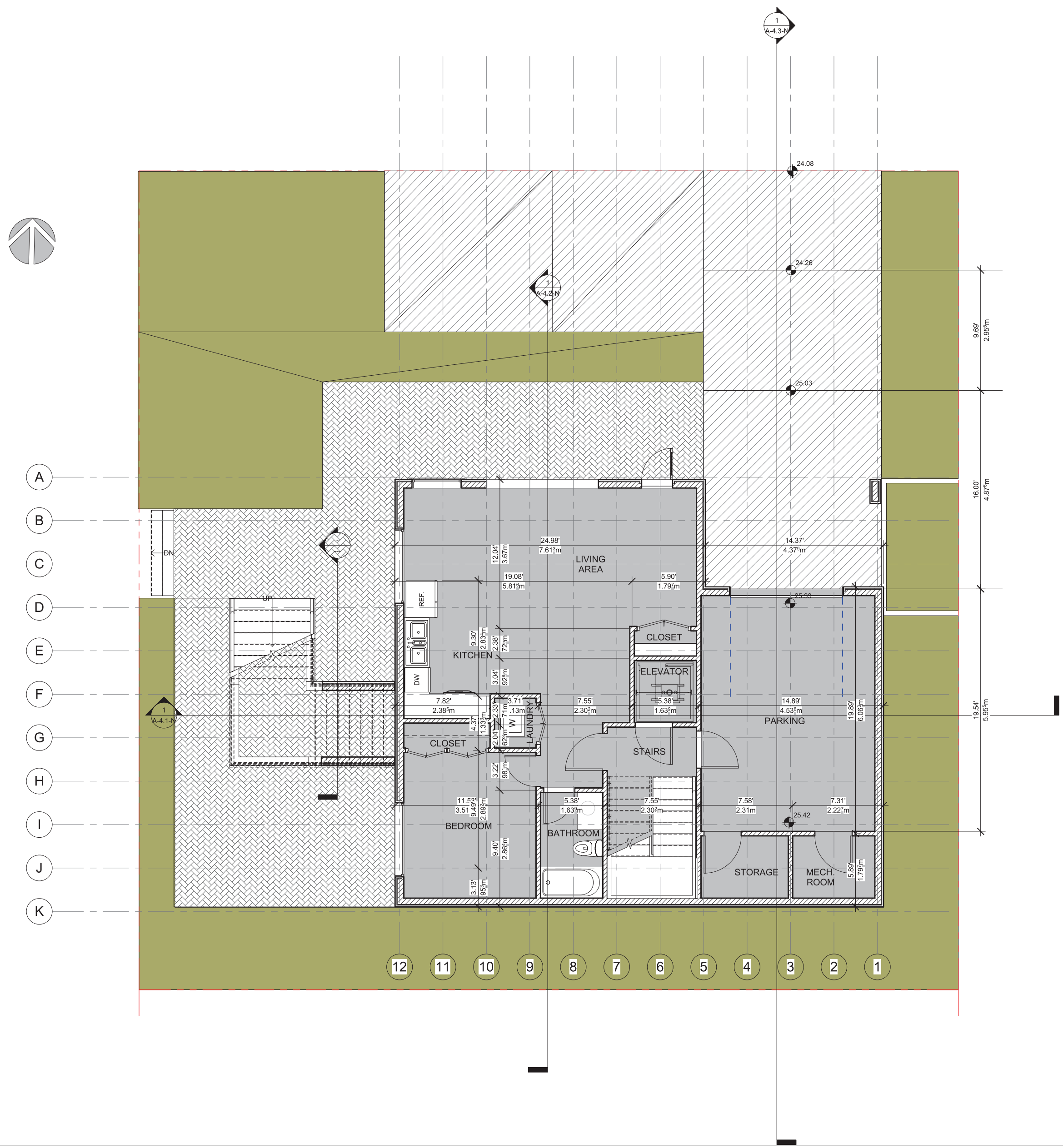
CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:
COMPARISON WITH THE NEIGHBOR

SHEET NO:
A-1.3



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

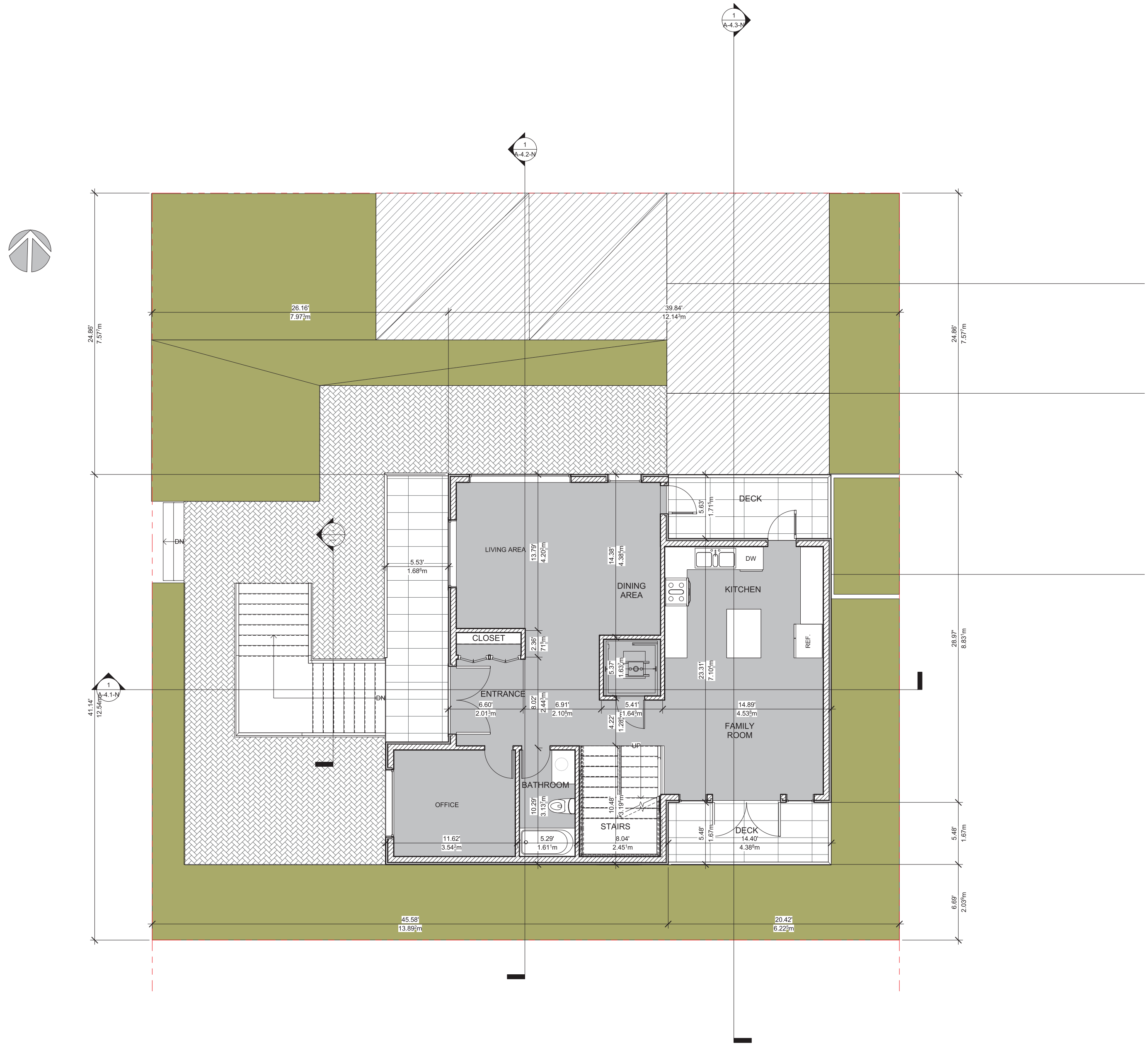
CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:
FIRST FLOOR PLAN

SHEET NO:
A-2.0-N



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

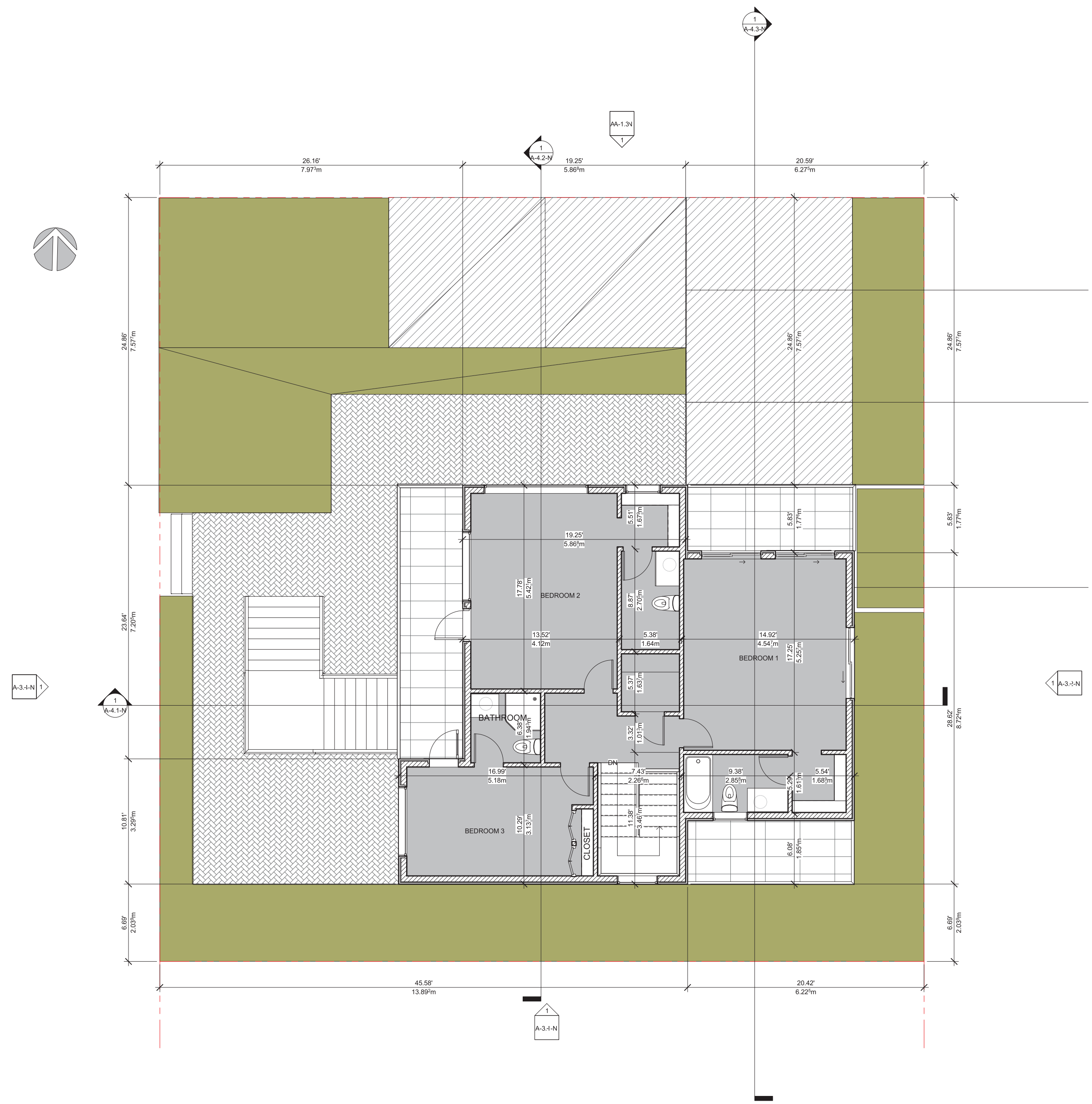
CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:
SECOND FLOOR PLAN

SHEET NO:
A-2.2-N



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

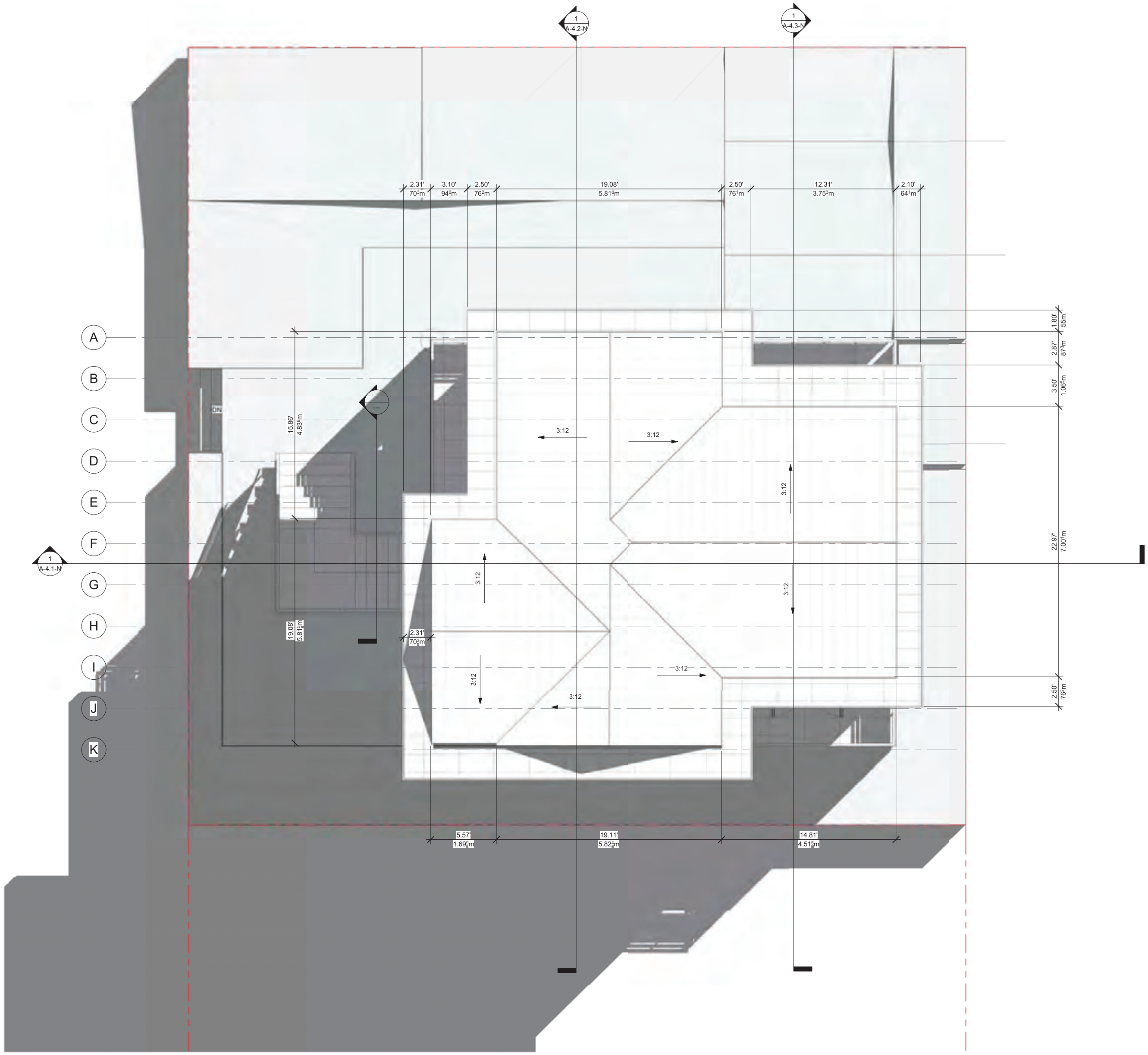
TITLE:

THIRD FLOOR PLAN

SHEET NO:

A-2.3-N

NOTE: THIS DRAWING IS FOR COORDINATIONANDOR REVIEW ONLY AND NOT FOR CONSTRUCTION UNLESS THE DRAWING IS SEALED AND SIGNED.



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

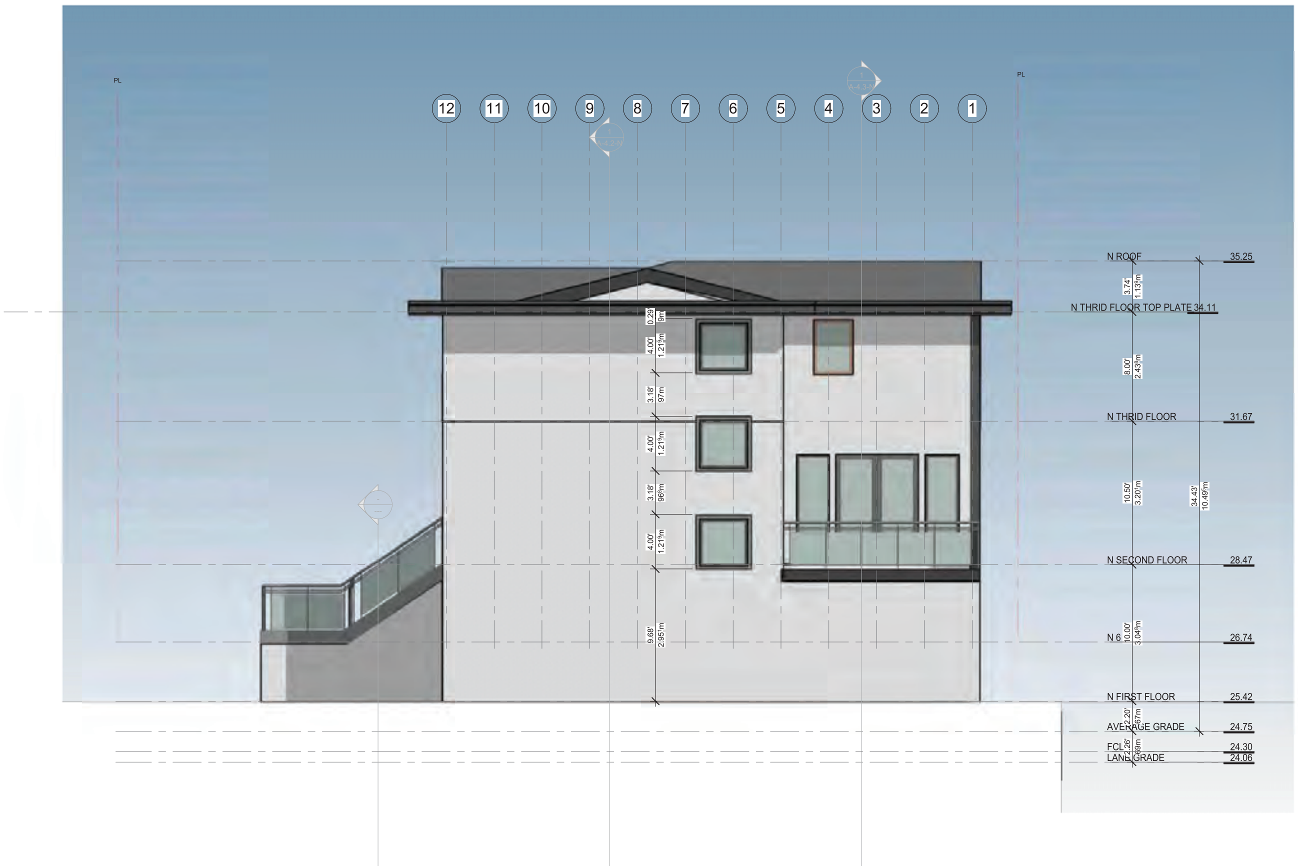
DATE: 2022-06-20

TITLE:

ROOF PLAN

SHEET NO:

A-2.4-N



FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:

SOUTH ELEVATION

SHEET NO:

A-3.1-N

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:
EAST ELEVATION

SHEET NO:
A-3.2-N

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

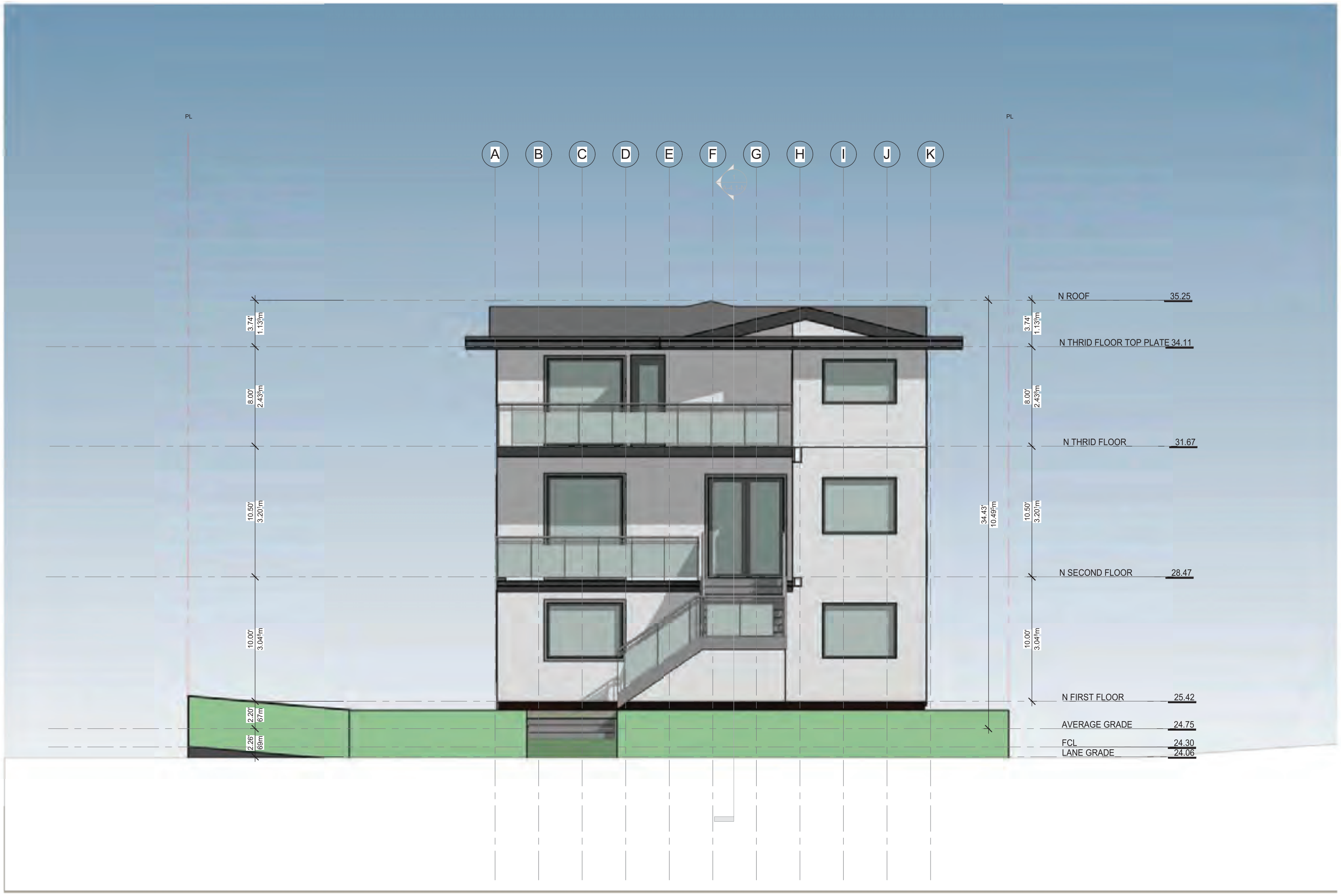
DATE: 2022-06-20

TITLE:

NORTH ELEVATION

SHEET NO:

A-3.3-N



FARZIN
YADEGARI
ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:

WEST ELEVATION

SHEET NO:

A-3.4-N

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:
SECTION 1

SHEET NO:
A-4.1-N

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:

SECTION 2

SHEET NO:

A-4.2-N

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:
148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE: 1 : 50

DATE: 2022-06-20

TITLE:
SECTION 3

SHEET NO: A-4.3-N

FARZIN YADEGARI ARCHITECT INC
102 - 2241 CHIPPENDALE ROAD
WEST VANCOUVER, B.C. V7S 3J5
T. 778 340 4142 WWW.FYARCH.CA

No.	.	Date

PROJECT: 148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE:

DATE: 2022-06-20

TITLE: Northwest View

SHEET NO: A-5.1-N

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE:

DATE: 2022-06-20

TITLE:

Northeast View

SHEET NO:

A-5.2-N

FARZIN YADEGARI ARCHITECT INC

No.	.	Date

PROJECT:

148 ELGIN NORTHERN LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE:

DATE: 2022-06-20

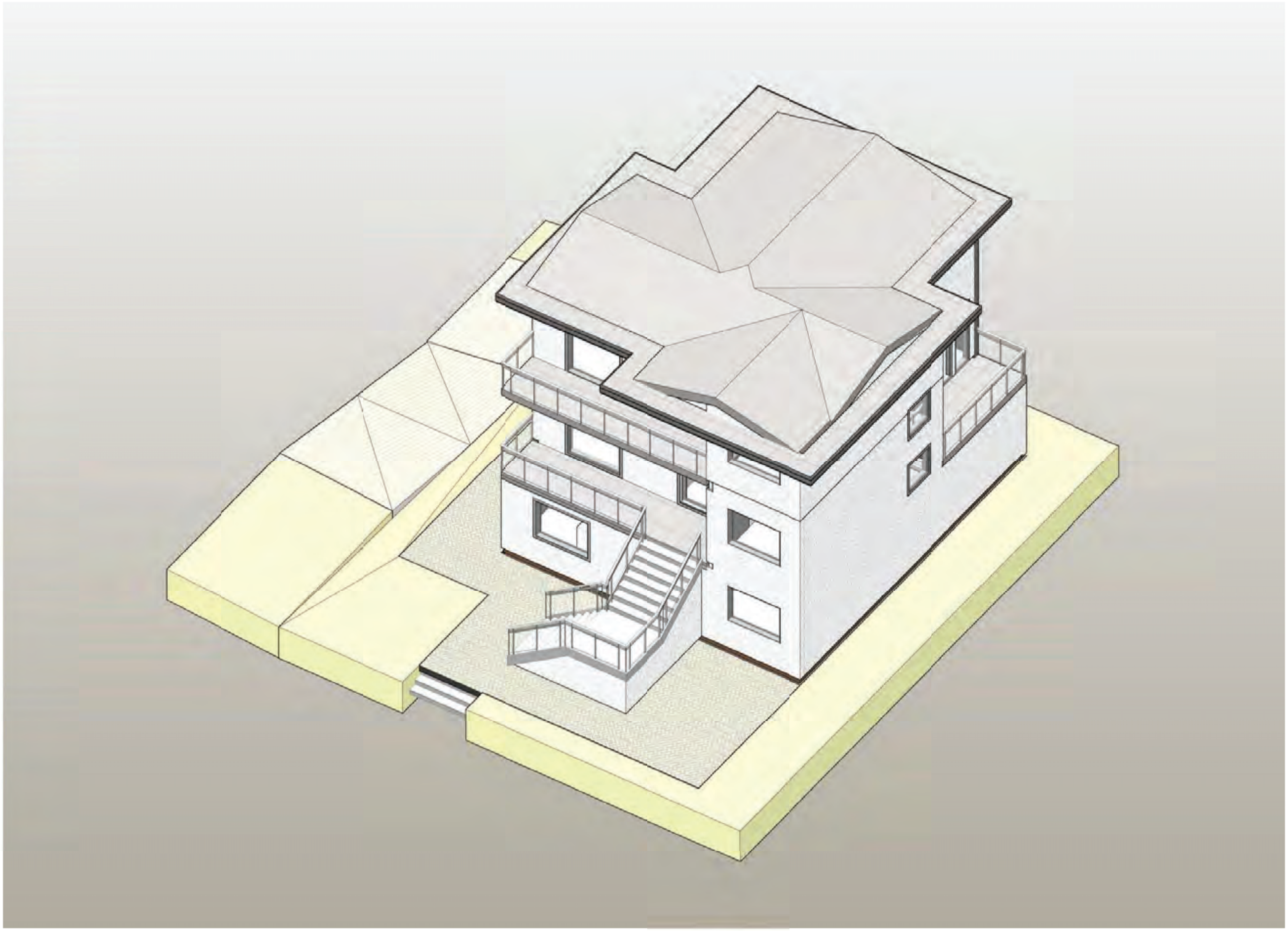
TITLE:

Southeast View

SHEET NO:

A-5.3-N

NOTE THIS DRAWING IS FOR COORDINATIONAND/OR REVIEW ONLY AND NOT FOR CONSTRUCTION UNLESS THE DRAWING IS SEALED AND SIGNED.



FARZIN
YADEGARI
ARCHITECT INC
CHIPPENDALE ROAD
WEST VANCOUVER, B.C.
WWW.FYARCH.CA

No.	.	Date

PROJECT:
148 ELGIN
NORTHERN
LOT

DRAWN BY: F.Y.

CHECKED BY: Checker

SCALE:

DATE: 2022-06-20

TITLE:
Southwest View

SHEET NO:
A-5.4-N