WAYNE TING & ASSOCIATES, INC.
GEOTECHNICAL CONSULTANTS

Project No. 5768
3 June 2021

Mr. Indy Pahwa
Bay Valley Group
2323 Monte Vista Drive
Pinole, CA 94564

Subject: **GEOTECHNICAL INVESTIGATION**
Proposed 20-Unit Three-Story Single Family Development
APN 417-310-004, Chattleton Lane and Luna Lane
San Pablo, California

References:
1. Seismic Hazard Zone Report for the Richmond 7.5-Minute Quadrangle, Alameda County, California, 2003.
2. Seismic Hazard Zones Official Map, Richmond Quadrangle, February 14, 2003.

Dear Mr. Pahwa:

In accordance with your authorization, **Wayne Ting & Associates, Inc. (WTAI)** has completed a geotechnical investigation for the proposed 20-unit development at the subject site. The purpose of this study was to investigate the subsurface conditions and obtain geotechnical data for use in the design and construction of the proposed 20-unit development. The scope of this investigation included the following:

a. A site and area reconnaissance by the Project Engineer.
b. An excavation, logging, and sampling of 4 exploratory borings.
c. Laboratory testing of selected soil samples.
d. An engineering analysis of the data and information obtained.
e. Preparation and writing of this report which presents our findings, conclusions, and recommendations.

SITE LOCATION AND DESCRIPTION

The subject site is located at APN 417-310-004, Chattleton Lane and Luna Lane, San Pablo, California. The property is located to the southwest of Chattleton Lane. It is bounded on other side by a Wildcat Creek. The subject property is an empty lot at the time of our investigation. The ground surface is relatively flat along the property. A vicinity map is provided in Figure 1.

PROPOSED PROJECT

The proposed project consists of constructing 20-unit, 3-story, single family dwelling development. We anticipate that the proposed structures will utilize wood-framed construction. Moderate building loads are typically associated with this type of construction.

FIELD INVESTIGATION

WTAI conducted the field investigation on May 20, 2021. The field investigation consisted of a site reconnaissance by the Project Engineer and an excavation of four exploratory borings. The borings were excavated using a truck mounted drill rig using 6-inch hollow stem augers. The approximate locations of the borings are shown on the Site Plan, Figure 2.

Soils encountered during the excavation operation were continuously logged in the field. Relatively undisturbed samples were obtained by dynamically driving 18 inches using a 3.0-inch outside diameter Modified California Sampler with a 140-pound hammer free falling 30 inches. Blow counts were recorded for every 6-inch penetration interval, and reported corresponding to the last 12 inches of penetration. A correction factor of 0.6 was used to convert the blows for the last 12 inches of penetration for Modified California samples to corrected SPT values presented in the boring log. These samples were then sealed and returned to the laboratory for testing. The classifications, descriptions, natural moisture contents, dry densities, and depths of the obtained samples are shown in the Boring Log, Figures 3 through 6 of Appendix A.

LABORATORY TESTING

CLASSIFICATION

The field classifications of the samples were visually verified in the laboratory in accordance with the Unified Soil Classification System. These classifications are presented in the Boring Logs, Figures 3 through 6.

MOISTURE-DENSITY

The natural moisture contents and/or dry weights were determined for selected soil samples obtained during our field investigation. The data is presented in the aforementioned Boring Logs.

ATTERBERG LIMITS

The Atterberg Limits Test was determined for the selected soil sample to classify, as well as to obtain an indication of the expansion and shrinkage potential with respect to moisture content variations. The liquid limit and plasticity index of the soil were found to be:

Sample	*Liquid Limit*	*Plasticity Index*
Boring 1-1	50%	30

The Atterberg Limits tests indicate that a representative sample of the soil is of high plasticity. The expansion potential for these soils is thus high.

SUBSURFACE SOIL CONDITIONS

The following soil descriptions were derived from our site reconnaissance and information obtained from our exploratory boring samples. Detailed descriptions of the materials encountered in the exploratory boring and results of the laboratory testing are presented in the Boring Logs, Figures 3 through 6.

Borings 1 through 4 soils encountered at the site consisted of dark brown and brown silty clay and sandy clay, stiff to hard, and moist, to the maximum depth explored of 18.5 feet below the existing ground surface.

No groundwater was encountered in the exploratory borings at the time of our field study. Fluctuations in the groundwater table are anticipated to vary with respect to seasonal rainfall.

SEISMIC CONSIDERATIONS

According to the published maps by the International Conference of Building Officials (I.C.B.O.), in February 1998, the distances from active faults to the subject site are listed in the following table.

Fault Name	**Distance (kilometers)**	**Direction From Site**
Hayward	1.1	Northeast
Rodgers Creek	14.6	North

Damage resulting from earthquakes is not necessarily related directly to the distance from the fault. More important than distance, are the foundation materials upon which structures are to be built. If structures are not located across the trace of the fault, are located on structurally competent materials, and are designed with state-of-the-art seismic considerations, the probability of continued usefulness after an earthquake is relatively good.

CALIFORNIA BUILDING CODE SITE CHARACTERIZATION

The following design values are base on the geologic information, longitude and latitude of the site, and the USGS computer program. Furthermore, in accordance with California Building Code 2019 (ASCE 7-16), the site seismic design values are provided as follow:

CBC Category/Coefficient 2019 ASCE 7-16	Design Value
Short-Period MCE at 0.2s, Ss	2.20
1.0s Period MCE, S1	0.85
Soil Profile Type, Site Class	D
Site Coefficient, Fa	1.0
Site Coefficient, Fv	See Section 11.4.8 or 1.7
S_{MS} = Fa x S_s Spectral Response Accelerations	2.20
S_{M1} = Fv x S_1Spectral Response Accelerations	See Section 11.4.8
S_{DS} = 2/3 x S_{MS} Design Spectral Response Accelerations	1.47
S_{D1}= 2/3 x S_{M1} Design Spectral Response Accelerations	See Section 11.4.8
** Latitude: 37.957353 Longitude: -122.339957	

It is noted that final values should be determined by the project structural engineer according to site class, risk categories of the proposed structures, and ASCE 7-16 Table 11.4-1 and 11.4-2.

SITE GEOLOGY

Slope Instability

The site is on a level area surrounded by flat ground and there is not any apparent hazard from landsliding.

Soil Liquefaction

Soil liquefaction is a phenomenon in which saturated (submerged) cohesionless soils can be subjected to a temporary loss of strength due to the buildup pore water pressures, especially as a result of cyclic loadings such as induced by earthquakes. In the process, the soil acquires a mobility sufficient to permit both horizontal and vertical deformations, if not confined. Soils that are most susceptible to liquefaction are clean, loose, saturated, uniformly graded, fine sands.

It is noted that this project is located outside the potential liquefiable site zone in the Seismic Hazard Map, Richmond Quadrangle, State of California, 2003 (Reference 2).

Based on our review of this data, the boring logs, and the absence of ground water, it is the opinion of WTAI that the probability of liquefaction of the soil within our boring depth underlying this site is low.

Total and Differential Settlement

During moderate and large earthquakes, soft or loose, natural or fill soils can become densified and consolidate, often unevenly across a site. This earthquake-induced consolidation can result in differential settlement of structures supported in these soils. Based on our subsurface exploration, the majority of the subsurface materials encountered in our boring at the site appear to be medium dense. Therefore, in our opinion, differential compaction should not constitute a significant hazard to the proposed structure provided that they are supported on foundations designed in accordance with the recommendations presented in this report.

Surface Displacement due to Seismically Induced Lateral Spreading or Lateral Flow

The site is on a level area surrounded by flat ground. From the above discussion of liquefaction, there is low to no potential liquefaction at the subject site. Therefore, potential lateral spreading or lateral flows occur at the site is low

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

1. Based on the results of our investigation, WTAI concludes that the subject site is geotechnically suitable for the proposed 20-unit development provided the recommendations presented in this report are incorporated into the project plans and specifications.

2. WTAI should review the grading and foundation plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications.

3. It is recommended that WTAI be retained for observation during foundation construction phases to help determine that the design requirements are fulfilled. Our firm should be notified at least two working days prior to grading and/or foundation operations on the property.

4. Any work related to the grading and foundation operations performed without the direct observation of WTAI will invalidate the recommendations of this report.

5. The recommendations given in this report are applicable only for the design of the previously described 20-unit development and only at the location indicated on the site plan. They should not be used for any other purpose.

SITE PREPARATION AND GRADING

6. Prior to grading, the proposed structure areas should be cleared of all obstructions and deleterious materials. After clearing and removing, the proposed structure and driveway areas should be stripped of all organic topsoil. It is estimated that stripping depths of 4 to 6 inches may be necessary. The

predominantly organic material from the stripping should be removed from the site. If uncontrolled fills are encountered, it should be overexcavated.

7. After the organic topsoil has been stripped, the entire site should be scarified, watered or aerated as necessary to bring the soil to about 3 percent above the optimum moisture content. The subgrade should then be uniformly recompacted to between 90 percent relative compaction. Relative compaction is based on the maximum dry density as determined by ASTM D1557 Latest Version Laboratory Test Procedure.

8. Following recompaction of the native subgrade soils, the site may be filled to the desired finished grade using select fill as described in Item 9 or native soil. This fill should be placed in lifts not exceeding 8 inches in uncompacted thickness and should be compacted to a minimum relative compaction of 90 percent, at 2% above optimum moisture content. Each layer shall be spread evenly and thoroughly and shall be blade mixed to provide uniformity of the soil in each layer. Compaction of each layer shall be continuous over the entire fill area and continued until the required density is obtained.

9. Should select import material be used to establish the proper grading for the proposed development, the import material should (a) be free of organic material; (b) have a Plasticity Index between four (4) and twelve (12); (c) be no more than 15% passing the No. 200 Sieve; (d) not contain rocks or lumps over 6 inches in greatest dimension; and (e) not more than 15% passing the No. 200 sieve. The import fill should be approved by WTAI before it is transported to the site. Placement and compaction of the select fill should be performed in accordance with the above mentioned criteria.

FOUNDATION

10. Due to on-site highly expansive soil, the proposed structure should be supported on a pier and grade beam foundation system or a mat slab foundation.

Pier and Grade Beam Foundation System

11. The drilled piers should have a minimum diameter of 16 inches and a minimum embedment of 20 feet below the bottom of grade beams. The piers should be designed for an allowable skin friction value of 450 pounds per square foot for dead plus live loads. This value can be increased by one-third for total loads which include wind or seismic forces. This value is only applicable after a minimum penetration of 5 feet below the lowest adjacent pad grade has been achieved. The validity of this value is based on a minimum pier spacing of 3 pier diameters measured center-to-center. The spacing between the piers should be maximized. This minimizes the number of piers that are necessary, and increases the dead load on each shaft. The increased downward load on each shaft helps to offset some of the upward forces due to the zone of expansive soils. All piers should be tied together with grade beams to act as a unit in resisting differential soil movement. Steel reinforcing

should be extended for the full length of piers and should be tied to the top bar of the grade beam as specified by the project Structural Engineer.

12. Due to the highly expansive surface material, swelling and soil movement may result in uplift pressures applied to the bottom of the grade beam and the upper 5 feet of the pier constructed in the upper level. Therefore, grade beams should be kept to the minimum width that is structurally practical to avoid high uplift force due to the expansive soils. In addition, a minimum 4-inch void or state-of-the-art equivalent should be provided between the bottom of the grade beam and the active clay soils. This void may be accomplished by using a collapsible cardboard form or equivalent product that would provide temporary support of the concrete beam prior to setting. The ultimate pressure exerted along the circumference of the piers would be equivalent to the adhesion of the soil. An adhesion value of 450 pounds per square foot in the upper 5 feet of the pier should be used for design. The skin friction value of 450 pounds per square foot can be used to provide uplift resistance. In addition, the bottoms of grade beams should be extended at least 12 inches into the ground surface.

13. Resistance to lateral force may be provided by passive earth pressure mobilized along the pier length below the depth of 5 feet. Passive earth pressure may be computed as an equivalent fluid weighing of 300 pounds per cubic foot acting on 2 pier diameters.

14. After the pier drilling completed, the bottom of pier holes should be cleaned of excessive loose materials prior to placing the reinforcing steel and concrete.

15. Care should be exercised during concrete placement to prevent concrete from spilling around pier shafts. If excess spillage occurs, the fresh concrete should be removed.

A Mat Slab Foundation

16. Modulus of subgrade reaction of 50 k.c.f. may be used in the mat slab foundation design. The edges of the mat slabs should be founded at least 8 inches below the bottom of the crushed rock which is recommended in item 20c.

17. The slabs should be designed based on the allowable bearing capacity of 1,800 p.s.f. due to dead loads plus design live loads, and 2,700 p.s.f. due to all loads which include wind or seismic forces.

18. The available resistance to lateral loads when utilizing structural slabs is limited to a sliding resistance along the base of the slabs. Sliding resistance between the bottom of the slabs and the underlying soil should be based on a friction value of 0.30.

19. Regardless the types of foundations, the movements under the anticipated building loads are expected to be within tolerable limits for the proposed structure. We estimate that the total movement will be less than 1.5-inches, and post-construction differential settlements across the

building should not exceed approximately 0.75-inches during the life of the building following construction.

CONCRETE SLABS ON GRADE

20. To reduce the potential cracking of the concrete slabs, the following recommendations are made:

a. Slabs-on-grade should be reinforced by the structural engineer and should not be doweled into the perimeter foundation.

b. Slabs at garage door openings should be constructed with a thickened edge extending a minimum of 8 inches into the native ground or compacted fill.

c. Any concrete slab-on-grade should be underlain by at least 4 inches of clean crushed, 3/4-inch size rock, to act as a cushion and capillary break between the subsoil and the slab. In addition, 18 inches of class II baserock should be placed below the crush rock and compacted to 95 percent relative compaction.

d. As alternative to the placing above baserock, approximately 5 percent Hi-Cal Quick lime or Dolomitic lime by dry unit weight of soil should be added to the upper 18 inches of subgrade to reduce its plasticity index to 12 or less. Processing of the lime stabilized material should be in accordance with "Standard Specifications, State of California, Department of Transportation." The lime stabilized soil should then be uniformly compacted to a minimum of 95% of ASTM D1557-02 maximum density at a moisture content within 2% of optimum.

e. In areas where moisture transmission through slabs is undesirable, a 15-mil membrane serving as a vapor retarder (not a waterproofing material) should be placed above the crushed rock. A better impermeable membrane of such as, Bituthene, Paraseal or equal may be installed according to the instruction of the manufacture. Design waterproofing for any slab-on-grade is not within the scope of work of WTAI. Waterproofing should be designed by a professional waterproofing designer.

TRENCH BACKFILL

21. Backfilling and compaction of utility trenches must meet the requirements published by the City of San Pablo, Department of Public Works. All trench backfill under pavement areas must be backfilled with imported baserock and compacted to at least 95% relative compaction as determined by ASTM D1557 latest version Laboratory Test Procedure.

22. The backfill of utility trenches extending under the building and landscaping area should be properly compacted to 90% to ensure against water migration underneath the structure.

23. Specific excavation considerations are beyond the scope of this report. However, stable excavations over 5 feet deep for utility construction will require a temporary stable cut slope and/or proper shoring. Proper shoring and stable cut slope construction should be in accordance with the Occupational Safety and Health Administration (OSHA) requirements as well as other applicable building code requirements.

DRIVEWAY

24. Prior to any paving construction, the upper 12 inches of the subgrade soil should be scarified, lime treated, and recompacted to 95% of the maximum dry density at 2% above the optimum moisture content as defined by ASTM D1557 latest version testing procedure.

25. After the compaction of the subgrade, Class II aggregate base should then be placed on top of the subgrade and compacted to a minimum relative compaction of 95% at optimum moisture content as defined by the aforementioned ASTM Test Procedure.

26. Pavement Sections: The recommended pavement sections are based on several Traffic Indexes (T.I.) and R-value of 5 and are presented in the following Table.

Traffic Index (TI)	Asphaltic Concrete Pavement (inches)	Class II Aggregate Base (inches)	Total Depth (inches)
5	3.0	10.0	13.0
6	3.5	13.0	16.5
7	4.0	16.0	20.0

GENERAL CONSTRUCTION REQUIREMENTS

27. If a pier and grade beam foundation is used, WTAI recommends a foundation drain be provided around the foundation perimeter to prevent the surface water from seeping to the crawl space. The foundation drain should be constructed at a lateral distance of 6 inches from the perimeter foundation and extended at least 18 inches below the bottom of the grade beams. A typical cross section of the foundation drain is provided in Figure 7. The perforated pipe shown in Figure 7 will pass into a solid line pipe at the end drain then be directed to a suitable discharge area. Cleanout risers should be provided at the upgradient end of the perforated pipe, at sharp bends, and at 100 foot maximum intervals.

28. All finished grading must be adjusted to provide positive drainage away from the structure to prevent ponding of water toward the building.

29. All roof drains should be collected by a system of gutters and downspouts and discharged to a solid pipe to carry storm water away from the building structure.

30. Flowerbeds and planting are not recommended along the building perimeter. Only drip systems can be installed where they may cause saturation of the foundation soils. Landscape mounds or concrete flatwork should not block or obstruct the surface drainage measures.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

31. Our client should recognize that this report is prepared for the exclusive use of the proposed 20-unit development. Our professional services, findings, and recommendations were prepared in accordance with generally accepted engineering principles and practices. No other warranty, expressed or implied, is made.

32. The conclusions and recommendations contained in this report will not be considered valid after a period of two years unless the changes are reviewed, and the conclusions of this report are modified or verified in writing.

33. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure the information and recommendations contained in this report are brought to the attention of the Architect, Engineer, and Contractor. In all cases, the contractor shall retain responsibility for the quality of the work and for repairing defects regardless of when they are found. It is also the responsibility of the contractor for conforming to the project plans and specifications.

Should you have any questions relating to the contents of this report, please contact our office at your convenience.

Very truly yours,

WAYNE TING & ASSOCIATES, INC.

Wayne Ting

REGISTERED PROFESSIONAL ENGINEER
WAYNE L. TING
NO. C 46276
CIVIL
STATE OF CALIFORNIA

Wayne L. Ting, C.E.
Principal Engineer

Copy: 1 to Mr. Pahwa

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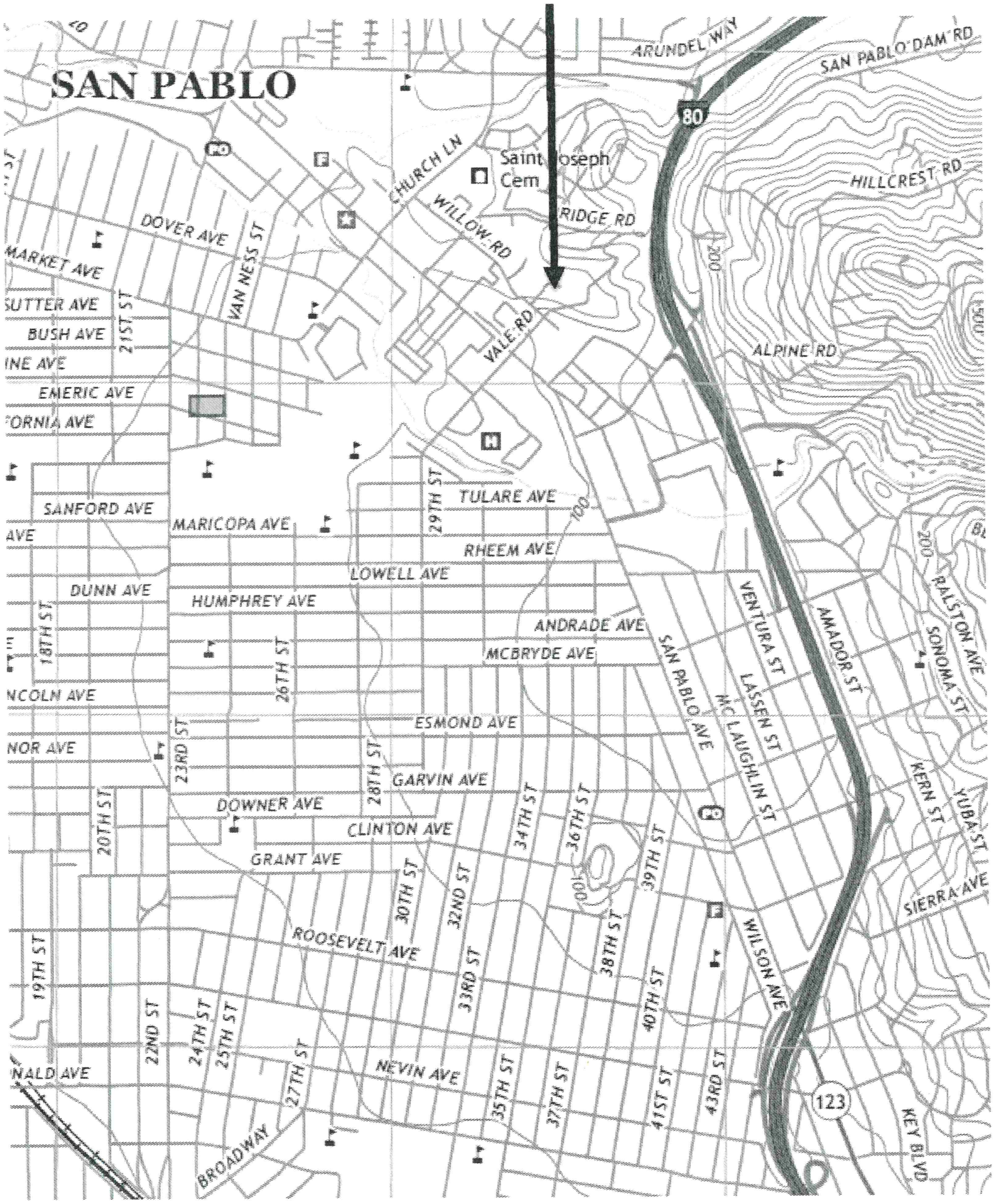
3 June 2021

APPENDIX A

Project Site Location



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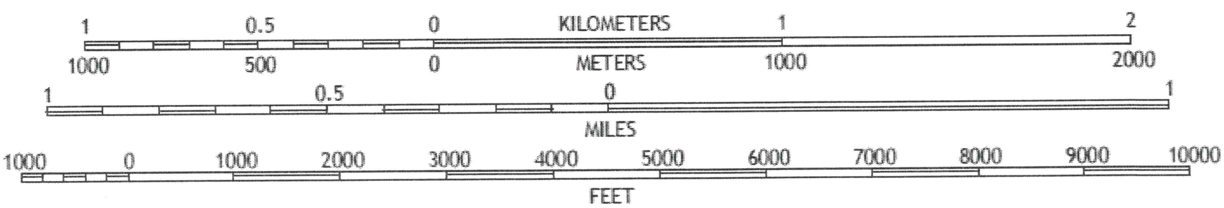
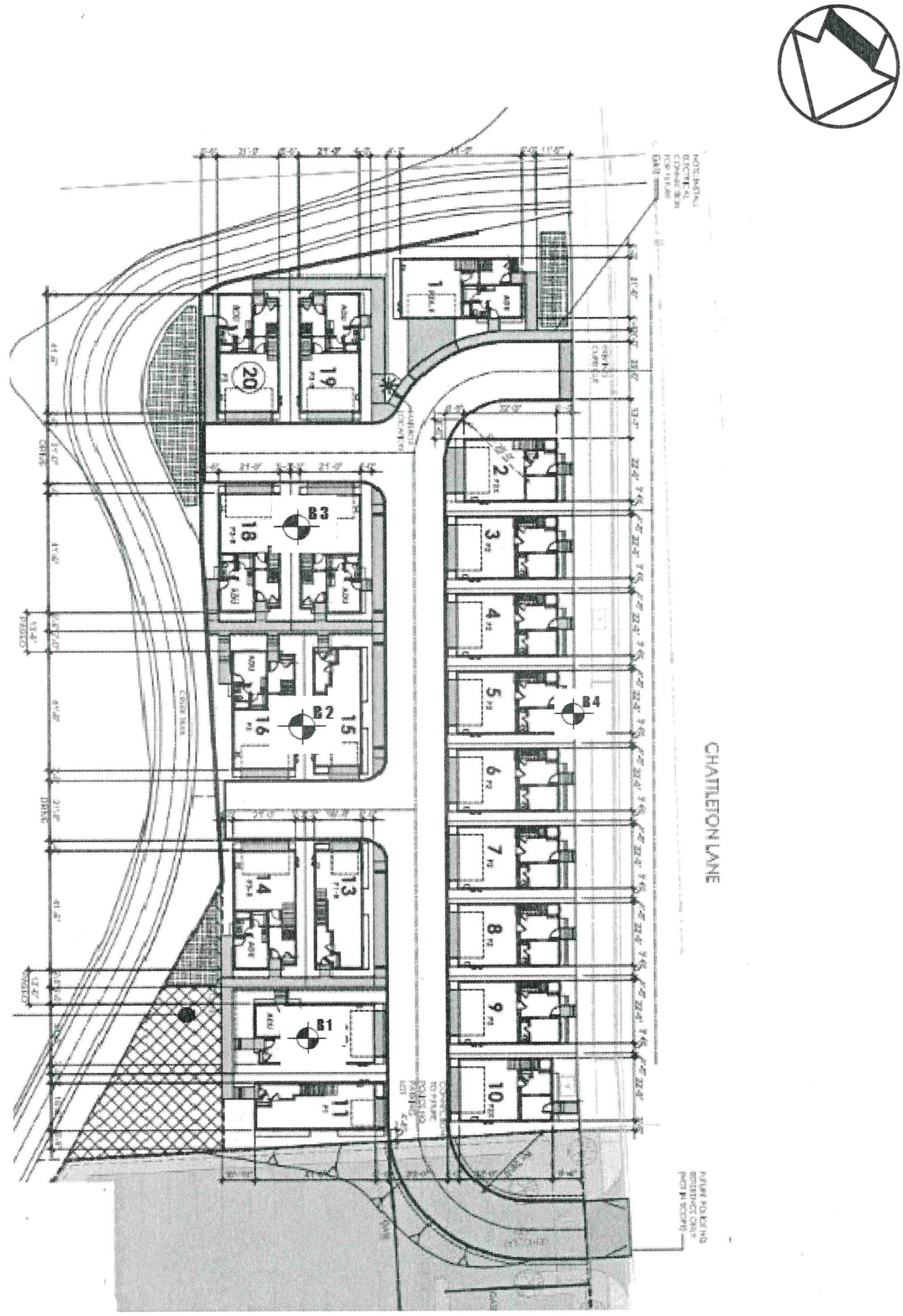


WAYNE TING & ASSOCIATES, INC.	***VICINITY MAP***	*Figure No. 1*
GEOTECHNICAL CONSULTANTS	Scale: N / A	*Page No. 12*



WAYNE TING & ASSOCIATES, INC.	***SITE PLAN***	*Figure No. 2*
GEOTECHNICAL CONSULTANTS	Scale : N/A	*Page No. 13*

Depth (Feet)	Description	Sample No.	Unified Soil Classification	Blows/Foot (350 Ft.-Lbs)	Dry Density (P.C.F)	Moisture (% Dry Density)	Pocket Penet. (T.S.F)	Remarks
	Dark brown silty clay, stiff and moist		CH					
1								
2	Brown, very stiff							
3		1-1		29	112.2	17.4	3.0	
4								
5								
6								
7								
8		1-2		41	112.1	17.4	4.0	
9								
10								
11								
12								
13	Brown sandy clay, hard and moist	1-3	CL	32	122.4	11.7		
14								
15								
16								
17								
18		1-4		14	103.8	20.3		
19	Boring terminated at 18.5 feet. No groundwater encountered.							
20								
21								
22								
23								
24								
25								

WAYNE TING & ASSOCIATES, INC.	***BORING LOG NO. 1***	*Figure No. 3*
GEOTECHNICAL CONSULTANTS	*Date Drilled:* 28 April 2021 *By:* D.V.	

Depth (Feet)	Description	Sample No.	Unified Soil Classification	Blows/Foot (350 Ft.-Lbs)	Dry Density (P.C.F)	Moisture (% Dry Density)	Pocket Penet. (T.S.F)	Remarks
0	Dark brown silty clay, stiff and moist		CH					
1								
2								
3	Brown, stiff and moist	2-1		16	108.5	17.7	2.0	
4								
5								
6								
7								
8		2-2		23	112.2	12.9	3.5	
9								
10								
11								
12								
13	Brown sandy clay, very stiff and moist	2-3	CL	23	104.3	11.8	1.5	
14								
15								
16								
17								
18		2-4		20	101.2	22.0	3.0	
19	Boring terminated at 18.5 feet. No groundwater encountered.							
20								
21								
22								
23								
24								
25								

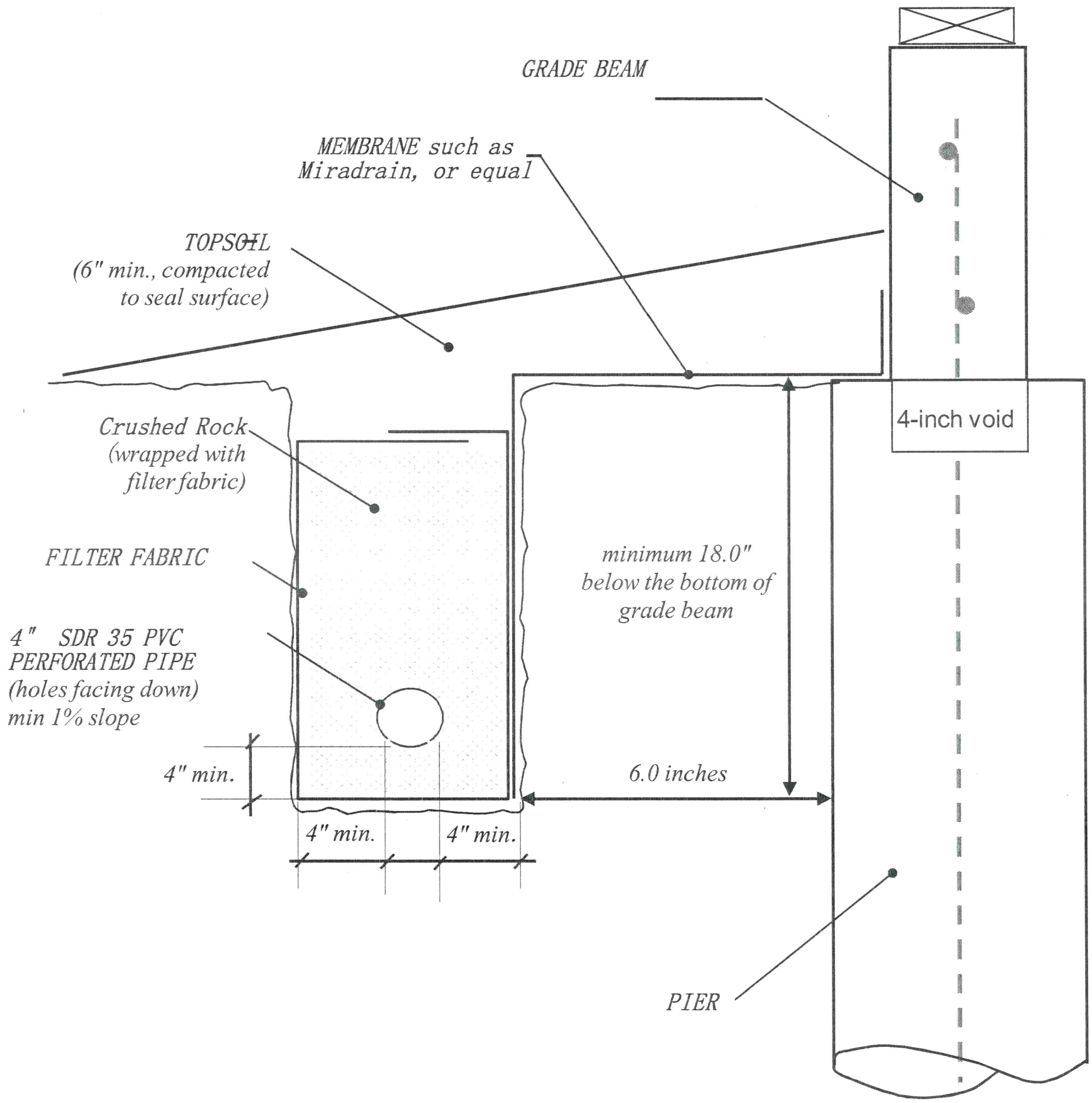
WAYNE TING & ASSOCIATES, INC.	*BORING LOG NO. 2*	*Figure No. 4*
GEOTECHNICAL CONSULTANTS	*Date Drilled:* 28 April 2021 *By:* D.V.	*Page No. 15*

Depth (Feet)	Description	Sample No.	Unified Soil Classification	Blows/Foot (350 Ft.-Lbs)	Dry Density (P.C.F)	Moisture (% Dry Density)	Pocket Penet. (T.S.F)	Remarks
	Brown silty clay, stiff and moist		CH					
3	Brown silty clay, very stiff and moist	3-1		24	114.8	13.6		
8		3-2		44	107.5	9.1		
13	Brown sandy clay, hard and moist	3-3	CL	52	112.4	14.9	4	
18		3-4		16	95.5	23.9	2.0	
19	Boring terminated at 18.5 feet. No groundwater encountered.							

WAYNE TING & ASSOCIATES, INC.	*BORING LOG NO. 3*	*Figure No. 5*
GEOTECHNICAL CONSULTANTS	*Date Drilled:* 28 April 2021 *By:* D.V.	*Page No. 16*

Depth (Feet)	Description	Sample No.	Unified Soil Classification	Blows/Foot (350 Ft.-Lbs)	Dry Density (P.C.F)	Moisture (% Dry Density)	Pocket Penet. (T.S.F)	Remarks
	Dark brown silty clay, stiff and moist							
1								
2	very stiff							
		4-1		22	106.8	13.2	3.5	
3	Brown silty clay and moist							
4								
5								
6								
7								
8	Brown	4-2		36	117.0	10.5		
9								
10								
11								
12								
13	Brown sandy clay, very mosit and moist	4-3	CL	23	111.2	14.7		
14								
15								
16								
17								
18		4-4		32				
19	Boring terminated at 18.5 feet. No groundwater encountered.							
20								
21								
22								
23								
24								
25								

WAYNE TING & ASSOCIATES, INC.	***BORING LOG NO. 4***	*Figure No. 6*
GEOTECHNICAL CONSULTANTS	*Date Drilled:* 28 April 2021 *By:* D.V.	*Page No. 17*



WAYNE TING & ASSOCIATES, INC. GEOTECHNICAL CONSULTANTS	**FOUNDATION DRAIN**	*Figure No. 7*
	Scale: N/A	*Page No. 18*

Project No. 5768
21 July 2021

WAYNE TING & ASSOCIATES, INC.

GEOTECHNICAL CONSULTANTS
42329 Osgood Road, Unit A, Fremont, CA 94539
Phone (510) 623-7768 Email: wayne@wayneting.net

Mr. Indy Pahwa
Bay Valley Group
2323 Monte Vista Drive
Pinole, CA 94564

Subject: **SUPPLEMENTAL POST-TENSIONED FOUNDATION RECOMMENDATIONS**
Proposed 20-Unit Three-Story Single Family Development
APN 417-310-004, Chattleton Lane and Luna Lane
San Pablo, California

Reference: 1) Geotechnical Investigation
By Wayne Ting & Associates, Inc.
Dated 3 June 2021

Dear Mr. Pahwa:

At your request, **WAYNE TING & ASSOCIATES, INC. (WTAI)** has reviewed Reference 1 to determine if the Geotechnical recommendations provided in the original report still apply to the construction of the proposed 20-unit development. Based on our review, WTAI's opinion is that Reference 1 presents acceptable data and recommendations for the design and construction of the subject project. However, supplemental post-tensioned foundation recommendations provided below should be incorporated into the project design. It is noted that all other recommendations contained in the original referenced report must strictly be followed.

POST-TENSION SLAB FOUNDATION

1. The proposed structures can each be satisfactorily supported on a post-tensioned slab foundation. The soil design parameters presented below assume that post-tensioned slabs are designed according to the method recommended in "Design of Post-Tensioned Slabs-On-Ground" (Post-Tensioning Institute, 2004, 3rd Edition).

2. Slabs should be designed for allowable bearing pressures of 1,800 p.s.f. due to dead loads plus design live loads, and 2,700 p.s.f. due to all loads which include wind or seismic forces.

Edge Moisture Variation Distance:	
Em (Edge Lift)	= 5.0 feet
Em (Center Lift)	= 9.0 feet
Differential Movement:	
Y_m (Edge Lift)	= 1.30 inches
Y_m (Center Lift)	= 0.55 inches

3. The available resistance to lateral loads when utilizing a post-tension slab is limited to the sliding resistance along the base of the slab. Sliding resistance between the bottom of the slab and the underlying soil should be based on a friction value of 0.30.

4. Settlements under the anticipated building loads are expected to be within tolerable limits for each of the proposed structures. We estimate that the total settlement for each structure will be less than 1.5-inches, and post-construction differential settlements across each structure should not exceed approximately 0.75- inches during the life of each structure following construction.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

5. The conclusions and recommendations contained in this report will not be considered valid after a period of two years unless the changes are reviewed, and the conclusions of this report are modified or verified in writing. This report is prepared for the exclusive use of this project. Our professional services, findings, and recommendations were prepared in accordance with generally accepted engineering principles and practices. No other warranty, expressed or implied, is made.

6. This report is issued with the understanding that it is the responsibility of the owner or his representative, to ensure the information and recommendations contained in this report are brought to the attention of the Architect, Engineer and Contractor. In all cases, the contractor shall retain responsibility for the quality of the work and for repairing defects regardless of when they are found. It is also the responsibility of the contractor for conforming to the project plans and specifications.

Should you have any questions relating to the contents of this report, please contact our office at your convenience.

Very truly yours,

WAYNE TING & ASSOCIATES, INC.

Wayne L. Ting, C.E.
Principal Engineer

Copy: 1 to Mr. Pahwa