

GEOTECHNICAL INVESTIGATION

**VALEYEV RESIDENCE
22083 LEE DRIVE
JENNER, CALIFORNIA**

Project Number 13417.01

June 22, 2021

Brunsing Associates, Inc.



GEOTECHNICAL INVESTIGATION

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Project Number 13417.01

prepared for

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June 22, 2021



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1.0 INTRODUCTION

This report presents the results of the geotechnical investigation that Brunsing Associates, Inc. (BAI) has performed for the Valeyev residence, 22083 Lee Drive, Jenner, California. The site assessor's parcel number 109-420-055. The approximate location is shown on the Vicinity Map, Plate 1.

The purpose of our investigation was to evaluate the site soil conditions in order to provide conclusions and recommendations for the residence, including site grading, support of concrete slabs-on-grade, structure foundation support, and associated construction considerations. Our approach to providing the geotechnical guidelines for the design of the project utilized our knowledge of the soil and geologic conditions in the site vicinity, and experience with similar projects in the area. Field exploration for this investigation was directed toward confirming anticipated soil and geologic conditions, in order to provide the basis for our conclusions and recommendations.

As outlined in our Professional Services Agreement, dated April 28, 2021, our scope of services for the geotechnical investigation included geologic reconnaissance, subsurface exploration, and engineering and geologic analyses, in order to provide conclusions and recommendations regarding:

- Site preparation and grading, including excavation characteristics, and treatment of existing fill, expansive and porous soils, as appropriate.
- Suitable foundation types, with design criteria and estimated settlement behavior: alternatives such as spread footings or drilled piers, were evaluated, as appropriate.
- Seismic ground motion values per California Building Code.
- Regional and local geology and site geologic hazards, including liquefaction potential conditions.
- Support of concrete slab-on-grade floors and exterior slabs.
- Site drainage, subdrains, and underslab drains.
- Anticipated geotechnical construction problems, if appropriate.

2.0 INVESTIGATION

2.1 Research

As part of our investigation, we reviewed published geotechnical literature, including geologic, fault and seismic hazard maps for the site and vicinity. A list of selected published references reviewed for this investigation is presented in Appendix A.

2.2 Reconnaissance

On May 11, 2021, BAI's principle geotechnical engineer performed a reconnaissance of the property and marked boring locations. Our field reconnaissance included observations and photography of the site topography, current condition, surface soil exposures, vegetation, and drainage characteristics.



2.3 Field Exploration

Our subsurface exploration on May 20, 2021, consisted of drilling and sampling three auger test borings approximately 16.5 feet in depth, using a track mounted drill rig. Our project geologist logged the borings and obtained relatively undisturbed soil samples using a 3.0-inch outside diameter modified California (CA) split-barrel sampler driven by a 140-pound drop hammer falling 30-inches per blow. The sampler barrel contained interior liners for retaining the soil materials. Blows required to drive the CA sampler were converted to Standard Penetration Test (SPT) blow counts for correlation with empirical test data, using a conversion factor of 0.64. SPT blow counts provide a relative measure of soil consistency and strength and are utilized in our engineering analyses.

The test boring locations are shown on the Site Map, Plate 2. The logs of the test borings showing the various soil materials encountered and the depths at which samples were obtained is presented on Plates 3, 4 and 5. The soils are classified in accordance with the Unified Soil Classification System outlined on Plate 6. The soil descriptive properties are presented on Plate 7.

2.4 Laboratory Testing

Soil samples obtained during our subsurface exploration were transported to our laboratory and examined to confirm field classifications. Laboratory tests were performed on selected samples to estimate their pertinent geotechnical engineering characteristics. Laboratory testing consisted of moisture content, dry density, and unconsolidated-undrained triaxial compression tests.

The laboratory test results are presented opposite the samples tested on the boring logs. A key to test data is provided on Plate 5. Triaxial compression test data are presented on Plate 8.

3.0 SITE CONDITIONS

The property is situated in the coastal hills on the southwest flank of a northwest- trending ridge. The project site is located off the north side of Lee Drive. The property is bordered on the north, east and west by large residential lots, to the south Lee Drive.

Slope gradients vary from steep, in the east corner of the property, about 1.6 horizontal to one foot vertical (1.6H:1V), to about 2.6H:1V, in the planned residence location. Site vegetation consists of abundant trees, scattered brush . No surface water was observed during our reconnaissance or subsurface exploration. Groundwater was encountered at 15 feet below the ground surface in boring B-1, borings B-2 and B-3 did not encountered groundwater. Temporary perched groundwater, during and following wet weather periods, has been previously observed in the general project area.

4.0 SITE GEOLOGY AND SOIL CONDITIONS

According to the published geologic references we reviewed for this investigation, the bedrock of this part of Sonoma County is comprised of well-bedded sedimentary rocks of the Paleocene



Epoch German Rancho Formation, such as sandstone, siltstone, and conglomerate. The coastal bedrock has been carved into a series of steps, or terraces, cut by wave erosion during the Pleistocene Epoch, when periods of glaciation caused sea level fluctuations. Shallow marine sediments (Pleistocene terrace deposits) were deposited on the wave-cut, bedrock platforms while they were submerged beneath the ocean during interglacial sea-level high stands. Some of these marine deposits have been locally eroded as the terraces began to emerge from the ocean due to uplift associated with the San Andreas Fault Zone during the middle and late Pleistocene. According to the geologic references we reviewed for this investigation, the site is just south of a small area of remnant Pleistocene terrace deposits capping the German Rancho Formation strata.

The seismicity and tectonics of the Sonoma coastal regions are controlled by a network of generally northwest-trending strike-slip faults associated with the San Andreas Fault system. On the published geologic maps that we reviewed, there is a small, linear, north-trending non-active fault approximately 160 feet to the east of the property. The nearest active fault is the San Andreas Fault located approximately one mile to the northeast. Future, large magnitude earthquakes originating on these, or other nearby faults are expected to cause strong ground shaking at the site.

5.0 DISCUSSIONS AND CONCLUSIONS

5.1 General

Based upon the results of our investigation, we conclude that the site is suitable for the proposed residence. The main geotechnical considerations affecting the design and construction of the project are weak soils, settlement, and strong seismic shaking. These constraints are discussed in the following subsections, along with potential settlement.

5.2 Weak Soil Zones

The near-surface weak soils in their existing condition are not suitable for foundation, slab, or pavement support. The loads from the proposed new foundations, slabs and fills placed upon these soils could result in damaging differential settlement. Within slab-on-grade, pavement and/or fill areas, the near-surface weak soils will need to be removed and recompacted, as described in the recommendations section of this report.

5.3 Settlement

Assuming the building pad is properly prepared, and the footings are designed and constructed in accordance with our recommendations, we estimate that the post-construction settlement due to foundation loads will be less than $\frac{3}{4}$ inch. We estimate the post-construction differential settlement between adjacent footings or along a wall footing will be less than $\frac{1}{2}$ inch.

5.4 Seismicity and Faulting

As is typical of the Sonoma County area, the site will be subject to strong ground shaking during future, nearby, large magnitude earthquakes. The intensity of ground shaking at the site will depend on the distance to the causative earthquake epicenter, the magnitude of the shock, and the



response characteristics of the underlying earth materials. Generally, structures founded in supporting materials and designed in accordance with current building codes are well suited to resist the effects of ground shaking.

No evidence of faulting was observed at the site by BAI. The nearest potentially active fault is the San Andreas Fault, approximately one mile northeast of the property. No other active faults are shown in the site vicinity on the published geologic maps that we reviewed for this investigation. Therefore, the potential for fault rupture at the site is considered relatively low.

5.5 Soil Liquefaction

Liquefaction results in a loss of shear strength and potential soil volume reduction in saturated sandy, silty, silty/clayey, and also coarse gravelly soils below the groundwater table from earthquake shaking. The occurrence of this phenomenon is dependent on many factors, including the intensity and duration of ground shaking, the soil age, density, particle size distribution, and position of the groundwater table.

Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG) Hazard Viewer Map indicate that the site liquefaction hazard level has a very low susceptibility. Our test borings indicate that the upper 16.5 feet of the site soils do not have the potential for liquefaction. To confirm this conclusion, we performed a liquefaction analysis using our on-site and laboratory results.

Where the factor of safety for liquefaction was 1.3 or less, we performed an analysis to estimate induced vertical settlement due to liquefaction. This analysis was based on procedures by Idriss and Boulanger, 2008, with 2014 update. The results of our analysis indicate liquefaction induced settlement is essentially nil.

Lateral spreading is generally caused by liquefaction of marginally stable soils underlying gently to steeply inclined slopes. In these cases, the saturated soils move toward an unsupported face, such as an incised river channel or body of water. We conclude that the potential for lateral spreading on the near level site is essentially nil.

5.6 Slope Stability

No evidence of modern or ancient landslide activity or gross instability was observed on the moderately steep to steep slopes of the property; however, as with most steep slopes, some risk of instability exists and must be accepted by the property owner. The current standard of practice in geotechnical engineering makes it possible to identify most areas of existing instability, and/or to make recommendations which lower the risk of instability to levels that are generally acceptable but cannot make total assurances of mitigating possible future instability. Since the slopes are comprised of sandy soils, a slight potential for slope instability exists. Therefore, site grading should be limited such that slope stability is improved.



6.0 RECOMMENDATIONS

6.1 Site Grading

6.1.1 Clearing and Stripping

Areas to be graded should be cleared of existing vegetation and debris. After clearing, surface soils that contain organic matter should be stripped. In general, the depth of required stripping will be about 4 to 6 inches; deeper stripping and grubbing may be required to remove isolated concentrations of organic matter or roots. Soils containing roots should not be used as structural fill. The cleared materials should be removed from the site; however, strippings can be stockpiled for later use in landscape areas.

6.1.2 Structural Area Preparation

Within the building area and non-structural-supported slab areas, weak and porous soils should be removed to a depth of at least 12 to 18 inches, as determined by BAI. Removal of these soils should extend for a minimum distance of about 5 feet beyond the perimeter of the building foundation and about 3 feet beyond exterior concrete slabs. BAI should observe the soils exposed by the recommended excavations. The exposed soils should be scarified to about six inches deep; moisture conditioned to at least optimum moisture content and compacted to at least 90 percent relative compaction as determined by the ASTM D 1557 test procedure, latest edition.

Fill material, either imported or on-site, should be free of perishable matter and rocks greater than six inches in largest dimension, and should be approved by a representative of BAI before fill placement. We anticipate that the existing on-site soils to be excavated, in a "cleaned" condition (i.e., less any organics and debris) are satisfactory for reuse as compacted fill. Imported fill for use in structural areas should be of relatively low expansion potential (i.e., Expansion Index of 40 or less).

Low-expansive engineered fill, on-site or imported, should be placed in thin lifts (six to eight inches depending on compaction equipment), moisture conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction to achieve planned grades.

Alternatively, the interior underslab excavations may be backfilled with a thickened layer of clean, free-draining crushed gravel (see specifications for underslab gravels in "Concrete Slab-on-Grade" below). Gravel backfill should be vibrated into place in thin lifts (six to eight inches). BAI should be contacted to observe and probe the compacted gravel layer for interlock prior to placement of reinforcing steel or concrete.

6.1.3 Finish Grading

Finished pad surfaces should be graded to drain away from the foundations. A minimum surface drainage gradient of three percent is recommended for at least five feet away from the foundations.



Subgrade soil should be finished true to line and grade to present a smooth, firm, and unyielding surface. Finished surfaces should be maintained moist and free of shrinkage cracks until covered by permanent construction. Pad surfaces allowed to dry out and crack should be re-moisture conditioned to near optimum moisture content and re-compacted prior to foundation and concrete slab-on-grade installation.

6.2 Foundation Support

6.2.1 Spread Footings

The proposed structure can be supported on reinforced concrete footings founded in compacted fill placed in accordance with our recommendations or within supporting material. Footings can be designed using an allowable soil bearing pressure of 2,000 pounds per square foot (psf) for dead plus live loads. A 33 percent increase in bearing pressure is allowable for total loads, including wind or seismic loads.

Footings should be founded at least 12 and 18-inches below lowest adjacent finish grade for one-story and two-story construction, respectively. Wall footings should be no less than 12-inches wide. Where weak-porous soil are not removed, footing excavations should extend at least 12 inches into the supporting soils, resulting in footing excavations that are about 24 to 30 inches below existing grade. Deeper excavation might be required if loose soils are exposed in the excavations. Footings adjacent to a slope face should be bottomed so that the downhill side of footing toe is at least 8 feet horizontal distance from face of adjacent slope. Completed foundation excavations should be observed by a representative from BAI prior to the placement of reinforcing steel.

Resistance to lateral loads can be obtained using passive earth pressure against the face of the foundations. An allowable passive pressure of 200 psf per foot of depth below subgrade and frictional resistance of 0.30 times net vertical dead load, are appropriate for footing elements poured neat against supporting approved engineered fill soils, if required. Passive pressure should be neglected within the upper six inches of subgrade soils, unless slabs or pavement confine the surface.

6.2.2 Drilled Piers

The proposed structure can be supported on a system of drilled cast in place concrete piers interconnected with grade beams. Drilled piers should be at least 12 inches in diameter and should be embedded a minimum of five feet into supporting soil, as determined by BAI. The supporting material was encountered at approximately 12 to 18 inches below ground surface. The drilled piers should be at least six to seven feet in length. Pier length and diameter should be determined by a structural engineer based on our recommendations.

Pier spacing should be no closer than 3 pier diameters, center to center. The drilled piers should be designed to gain support from skin friction. A skin friction value of 300 pounds per square foot (psf) of shaft area may be used in the supporting soil, for dead loads plus live loads. For total downward loads due to wind or seismic forces, the pier capacity can be increased by one third.



Uplift frictional capacity for piers should be limited to 2/3 of the allowable downward capacity. When final pier depths have been achieved, as determined by BAI, the bottoms of the pier holes should be cleaned of loose materials. BAI should observe the drilling and final clean out of the pier holes, prior to the placement of reinforcing steel and/or concrete.

Resistance to lateral loads can be obtained using passive earth pressure against the face of the foundations. An allowable passive pressure of 200 psf (rectangular distribution) can be used. Passive pressure should be neglected within the upper two feet where weak soils are not removed. Passive pressure can be projected over two pier diameters.

6.3 Seismic Design Criteria

The structures should be designed and/or constructed to resist the effects of strong ground shaking (on the order of Modified Mercalli Intensity IX) in accordance with current building codes. The California Building Code (CBC) 2019 edition indicates that the site classification for the property is Site Class D. Accordingly, CBC indicates that the following seismic design parameters are appropriate for the site:

Table 1: Seismic Design Parameters

Site Class	=	D
Mapped Spectral Response Acceleration at 0.2 sec	$S_s =$	2.349g
Mapped Spectral Response Acceleration at 1.0 sec	$S_1 =$	0.983g
Modified Spectral Response Acceleration at 0.2 sec	$S_{MS} =$	2.349g
Modified Spectral Response Acceleration at 1.0 sec	$S_{M1} =$	1.671g
Design Spectral Response Acceleration at 0.2 sec	$S_{DS} =$	1.556g
Design Spectral Response Acceleration at 1.0 sec	$S_{D1} =$	1.114g
Site Coefficient	$F_a =$	1.0
Site Coefficient	$F_v =$	1.7
Long Period Transition	$T_L =$	12
Seismic Design Category	=	E

6.4 Concrete Slab-on-Grade

If a structural concrete slab is used (i.e., the slab is supported by and able to span between, interconnecting foundation elements without gaining support from underlying soil), then over-excavation of the near-surface weak soil zone is not required. However, topsoils containing organics should be removed beneath the planned slab (as much as four inches to six inches in depth below existing ground surface).

The weak soils in their present condition are not suitable for slab support. Concrete slab-on-grade floors not supported by foundation elements should be supported on properly compacted fill soils placed in accordance with our recommendations previously presented in Section 6.1 Site Grading.

During foundation and utility trench construction, previously compacted subgrade surfaces may be disturbed. Where this is the case, the subgrade should be moisture conditioned as necessary,



and re-rolled to provide a firm, smooth, unyielding surface compacted to at least 90 percent relative compaction before construction of slabs-on-grade.

Interior slab-on-grade floors should be underlain by at least 4 inches of clean, $\frac{3}{4}$ inch free-draining crushed gravel to act as a capillary moisture break. An underslab drain should be constructed as shown on Plate 9. Where migration of moisture through the floor slab would be detrimental to its intended use, install a vapor retarder membrane. The membrane, placed upon the crushed gravel layer, should be at least 15 mils thick (i.e., Stego® Wrap 15-mil Class A, Carlisle RMB 400 15-mil Class A, or equivalent), and installed in accordance with the manufacturer's specifications to prevent moisture migration through the seams. With a 15-mil minimum thickness membrane, the 2 inches of wetted sand typically placed upon the membrane may be omitted. Construction of moisture/vapor retarders does not guarantee the prevention of moisture moving through the floor slab.

6.5 Retaining Walls

Subsurface or retaining walls should be provided with permanent back drainage to prevent buildup of hydrostatic pressure. Drainage and backfill details are presented on Plate 10. In areas where movement of moisture/vapor through the wall would be detrimental to its intended use, installation of a vapor retarder membrane should be considered. Construction of vapor retarders does not guarantee the prevention of moisture moving through concrete walls. Quality, placement and compaction requirements for backfill behind subsurface walls are the same as previously presented for fill. Light compaction equipment should be used near the wall to avoid overstressing the walls. Retaining walls should be designed to resist the lateral earth pressure presented on Plate 11.

In addition to static loads, the retaining walls should also be designed to resist potential seismic loads, in accordance with CBC requirements. For seismic loads, a pressure increment equivalent to a triangular distribution is recommended, varying from 0 (zero) pounds per square foot (psf) at the top of the wall to $28H$ psf to the bottom of the embedded portion, where "H" is the height of the embedded portions (resultant dynamic thrust act at $\frac{1}{3}H$ above the base of the wall).

6.6 Site Drainage

Because surface and/or subsurface water is often the cause of foundation or slope stability problems, care should be taken to intercept and divert concentrated surface flows and subsurface seepage away from the building foundations. Drainage across the lot should be by sheet-flow. Surface grades should maintain a recommended three percent gradient away from building foundations.

If a raised wood floor is used, the area under the floor should be graded to drain towards an under house drain with a conduit outlet(s) through the footings/stem walls. Two-inch or four-inch PVC sleeves, or equivalent should be placed within the forms, at the lowest grade within the crawl space and outlet to an approved area, prior to concrete placement.



7.0 ADDITIONAL SERVICES

Prior to construction, BAI should review the final grading and foundation plans, and soil related specifications for conformance with our recommendations. During construction, BAI should be retained to provide periodic observations, together with field and laboratory testing, during site preparation, placement and compaction of fills, if required, and foundation construction. Foundation excavations should be reviewed by BAI while the excavation operations are being performed. Our reviews and tests would allow us to verify conformance of the work to project guidelines, determine that soil conditions are as anticipated, and to modify our recommendations, if necessary.

8.0 LIMITATIONS

This geotechnical investigation was performed in accordance with the usual and current standards of the profession, as they relate to this and similar localities. No other warranty, expressed or implied, is provided as to the conclusions and professional advice presented in this report. Our conclusions are based upon reasonable geological and engineering interpretation of available data.

The observations made, are considered to be representative of the site; however, soil and geologic conditions may vary significantly between test borings and across the site. As in most projects, conditions revealed during construction excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by BAI, and revised recommendations be provided as required.

This report is issued with the understanding that it is the responsibility of the Owner, or his/her representative, to ensure that the information and recommendations contained herein are brought to the attention of all other design professionals for the project, and incorporated into the plans, and that the Contractor and Subcontractors implement such recommendations in the field. The safety of others is the responsibility of the Contractor. The Contractor should notify the owner and BAI if he/she considers any of the recommended actions presented herein to be unsafe or otherwise impractical.

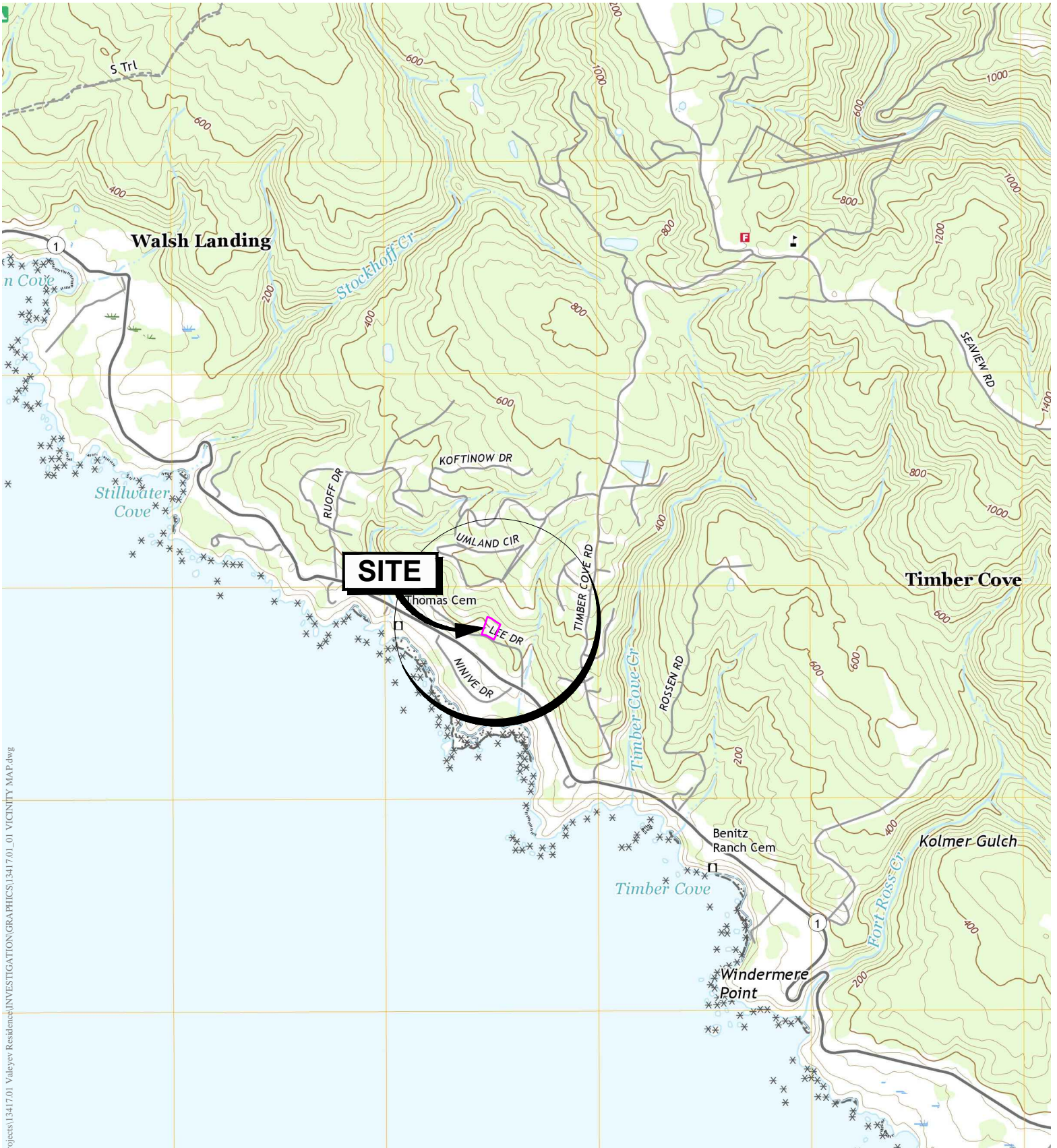
Changes in the condition of a site can occur with the passage of time, whether they are due to natural events or to human activities on this, or adjacent sites. In addition, changes in applicable or appropriate codes and standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, this report may become invalidated wholly or partially by changes outside of our control. Therefore, this report is subject to review and revision as changed conditions are identified.

The recommendations contained in this report are based on certain specific project information regarding type of construction and current building location, which have been made available to us. If conceptual changes are undertaken during final project design, we should be allowed to review them in light of this report to determine if our recommendations are still applicable.



ILLUSTRATIONS

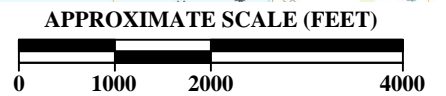




L:\Geotech Projects\13417.01 Valeyev Residence\INVESTIGATION\GRAPHICS\13417.01 VICINITY MAP.dwg

REFERENCE:
 Plantation Quadrangle
 7.5-Minute Series, USGS, 2018

Latitude: 38.540135
 Longitude: -123.281198



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 6/22/2021 1:03:13 PM plot date

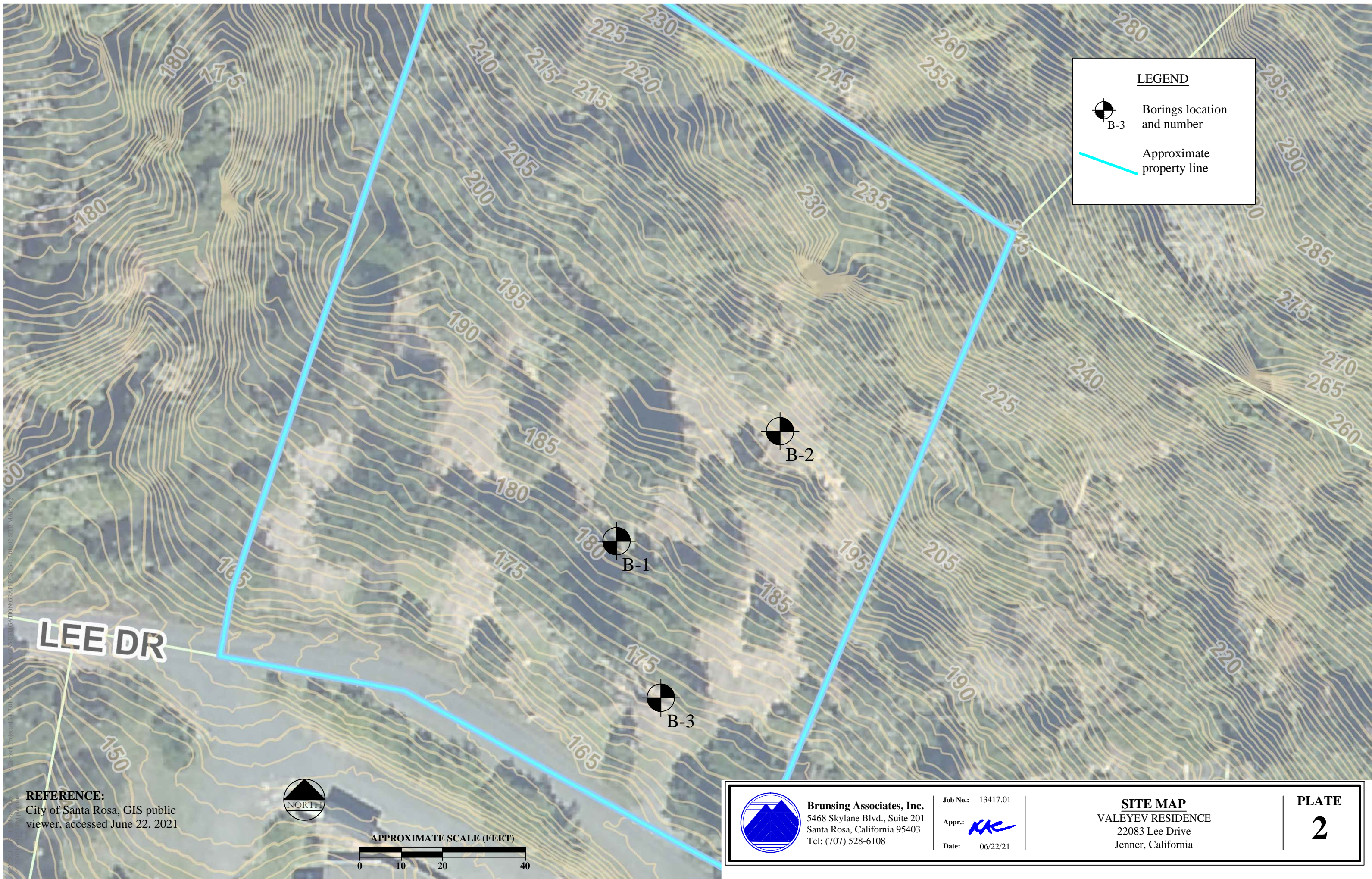


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Job No.: 13417.01
 Appr.: *KAC*
 Date: 06/22/21

VICINITY MAP
VALEYEV RESIDENCE
 22083 Lee Drive
 Jenner, California

PLATE
1





LEGEND

-  Borings location and number
-  Approximate property line

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	Brunsing Associates, Inc. 5468 Skylane Blvd., Suite 201 Santa Rosa, California 95403 Tel: (707) 528-6108	Job No.: 13417.01 Appr.:  Date: 06/22/21	SITE MAP VALEYEV RESIDENCE 22083 Lee Drive Jenner, California	PLATE 2
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Log of Boring B-1

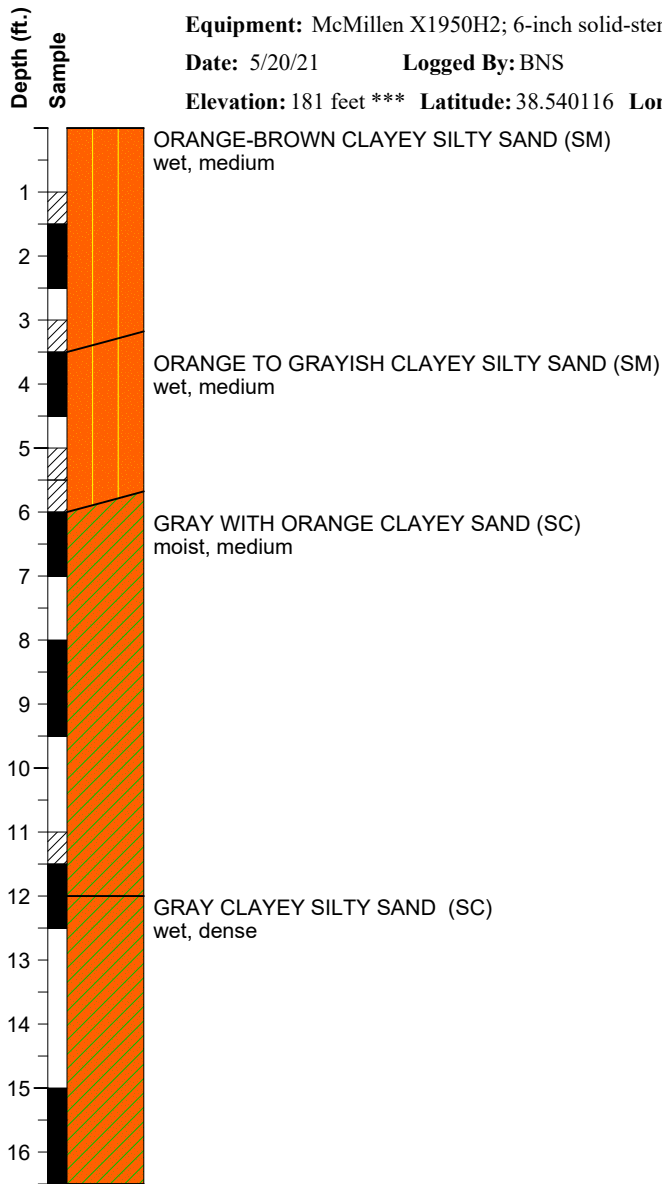
Equipment: McMillen X1950H2; 6-inch solid-stem flight auger

Date: 5/20/21 Logged By: BNS

Elevation: 181 feet *** Latitude: 38.540116 Longitude: -123.281175

Laboratory Tests

	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot
Tx 291 (576)	CA	16.9	107	15 **
	CA		13 **	
	CA		23 **	
		25.1	97	
	CA		26 **	
	CA		40 **	
	CA		37 **	





Notes:
 1. Free water encountered at approximately 15 feet
 2. No caving

BORING LOG: 1 PER PAGE, 13417.01 GINT.GPJ, 6/22/21

Latitude/Longitude estimated from Google Earth.
 * See Soil Classification Chart & Key to Test Data
 ** Equivalent "Standard Penetration" Blow Counts.
 *** Elevations interpolated from Plate 2.

Scale: 1" = 3'

 <p>Brunsing Associates, Inc. 5468 Skylane Blvd., Suite 201 Santa Rosa, California 95403 Tel: (707) 528-6108</p>	Job No.: 13417.01	<p>LOG OF BORING B-1 VALEYEV RESIDENCE 22083 Lee Drive Jenner, California</p>	<p>PLATE 3 SHEET 1 of 1</p>
	Appr.: 		
	Date: 06/22/21		

Log of Boring B-2

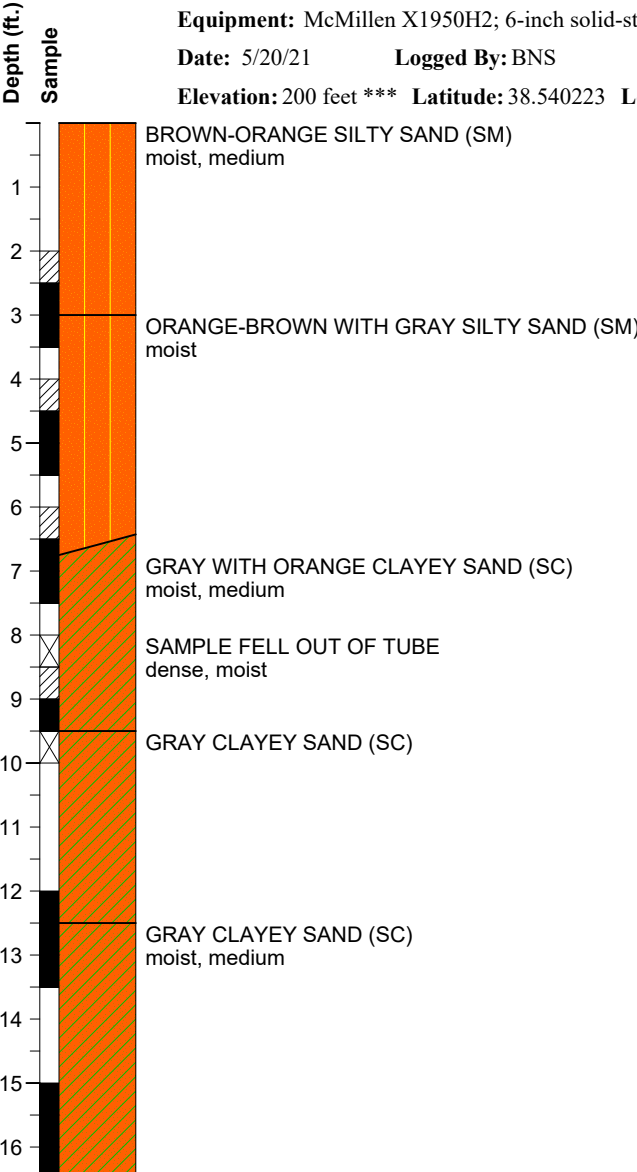
Equipment: McMillen X1950H2; 6-inch solid-stem flight auger

Date: 5/20/21 Logged By: BNS

Elevation: 200 feet *** Latitude: 38.540223 Longitude: -123.28096

Laboratory Tests

	Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot
	CA			15 **
Tx 417 (720)		18.2	109	
	CA			26 **
	CA	20.3	106	24 **
	CA			33 **
	CA			38 **
	CA			32 **





Notes:
 1. No water encountered
 2. No caving

BORING LOG: 1 PER PAGE, 13417.01 GINT.GPJ, 6/22/21

Latitude/Longitude estimated from Google Earth.
 * See Soil Classification Chart & Key to Test Data
 ** Equivalent "Standard Penetration" Blow Counts.
 *** Elevations interpolated from Plate 2.

Scale: 1" = 3'

	Brunsing Associates, Inc. 5468 Skylane Blvd., Suite 201 Santa Rosa, California 95403 Tel: (707) 528-6108	Job No.: 13417.01 Appr.:  Date: 06/22/21	LOG OF BORING B-2 VALEYEV RESIDENCE 22083 Lee Drive Jenner, California	PLATE 4 SHEET 1 of 1
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Log of Boring B-3

Equipment: McMillen X1950H2; 6-inch solid-stem flight auger

Date: 5/20/21 Logged By: BNS

Elevation: 173 feet *** Latitude: 38.539968 Longitude: -123.28113

Laboratory Tests

Sampler Type*	Moisture Content (%)	Dry Density (pcf)	Blows/foot
CA	19.3	104	15 **
CA			19 **
CA	17.5	106	26 **
CA			24 **
CA			22 **
CA			31 **

Tx 309 (864)



BROWN SILTY SAND (SM)
moist, medium

BROWN TO ORANGE-BROWN SILTY SAND (SM)
moist, medium

ORANGE-GRAY CLAYEY SAND (SC)
moist, medium

GRAY CLAYEY SILTY SAND (SC)
moist, medium


BLuish-GRAY CLAYEY SILTY SAND (SC)
moist, dense

- Notes:
1. No water
2. No caving

BORING LOG: 1 PER PAGE, 13417.01 GINT.GPJ, 6/22/21

Latitude/Longitude estimated from Google Earth.
* See Soil Classification Chart & Key to Test Data
** Equivalent "Standard Penetration" Blow Counts.
*** Elevations interpolated from Plate 2.

Scale: 1" = 3'

 <p>Brunsing Associates, Inc. 5468 Skylane Blvd., Suite 201 Santa Rosa, California 95403 Tel: (707) 528-6108</p>	Job No.: 13417.01	<p>LOG OF BORING B-3 VALEYEV RESIDENCE 22083 Lee Drive Jenner, California</p>	<p>PLATE 5 SHEET 1 of 1</p>
	Appr.: <i>KAC</i>		
	Date: 06/22/21		

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)	MAJOR DIVISIONS		SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPHIC	LETTER		
	MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% fines)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP		POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
GRAVELS WITH FINES (Greater than 12% fines)			GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
SAND AND SANDY SOILS 50% OR MORE OF COARSE FRACTION PASSING THROUGH NO. 4 SIEVE		CLEAN SANDS (Less than 5% fines)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
		SANDS WITH FINES (Greater than 12% fines)		SM	SILTY SANDS, SAND-SILT MIXTURES	
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES	
		SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
					CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY			
		MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS			
		CH	INORGANIC CLAYS OF HIGH PLASTICITY			
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS			
HIGHLY ORGANIC SOILS			PT	PEAT, HUMOUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS		

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

KEY TO TEST DATA

LL - Liquid Limit	Consol - Consolidation	Shear Strength, psf	Confining Pressure, psf
PI - Plasticity Index	EI - Expansion Index	Tx 1564 (1440) - Unconsolidated Undrained Triaxial	
■ Sample Retained	SA - Sieve Analysis	TxCU 1564 (1440) - Consolidated Undrained Triaxial	
▨ Sample Recovered, Not Retained		DS 2020 (1440) - Consolidated Drained Direct Shear	
⊠ Bulk Sample		FVS 520 - Field Vane Shear	
□ Sample Not Recovered		UC 1500 - Unconfined Compression	
CA - California Modified Split Barrel Sampler 3.0-inch O.D.		PP 1500 - Field Pocket Penetrometer	
CM - California Modified Split Barrel Sampler 2.5-inch O.D.		Sat - Sample saturated prior to test	
SPT - California Split Barrel Sampler 2.0-inch O.D.			
SH - Shelby Tube		▽ Initial Groundwater Level Reading	
RC - Rock Coring		▼ Second Groundwater Level Reading	
Recovery - Percent Core Recovered			
RQD - Rock Quality Designation (length of core pieces >= 4-inches / core length)			



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SOIL CLASSIFICATION CHART & KEY TO TEST DATA

VALEYEV RESIDENCE
 22083 Lee Drive
 Jenner, California

PLATE

6

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	Standard Penetration Test Blow Count (blows per foot)
Very loose	4 or less
Loose	5 to 10
Medium dense	11 to 30
Dense	31 to 50
Very dense	More than 50

CONSISTENCY OF FINE-GRAINED SOILS

Consistency	Identification Procedure	Approximate Shear Strength (psf)
Very soft	Easily penetrated several inches with fist	Less than 250
Soft	Easily penetrated several inches with thumb	250 to 500
Medium stiff	Penetrated several inches by thumb with moderate effort	500 to 1000
Stiff	Readily indented by thumb, but penetrated only with great effort	1000 to 2000
Very stiff	Readily indented by thumb nail	2000 to 4000
Hard	Indented with difficulty by thumb nail	More than 4000


NATURAL MOISTURE CONTENT

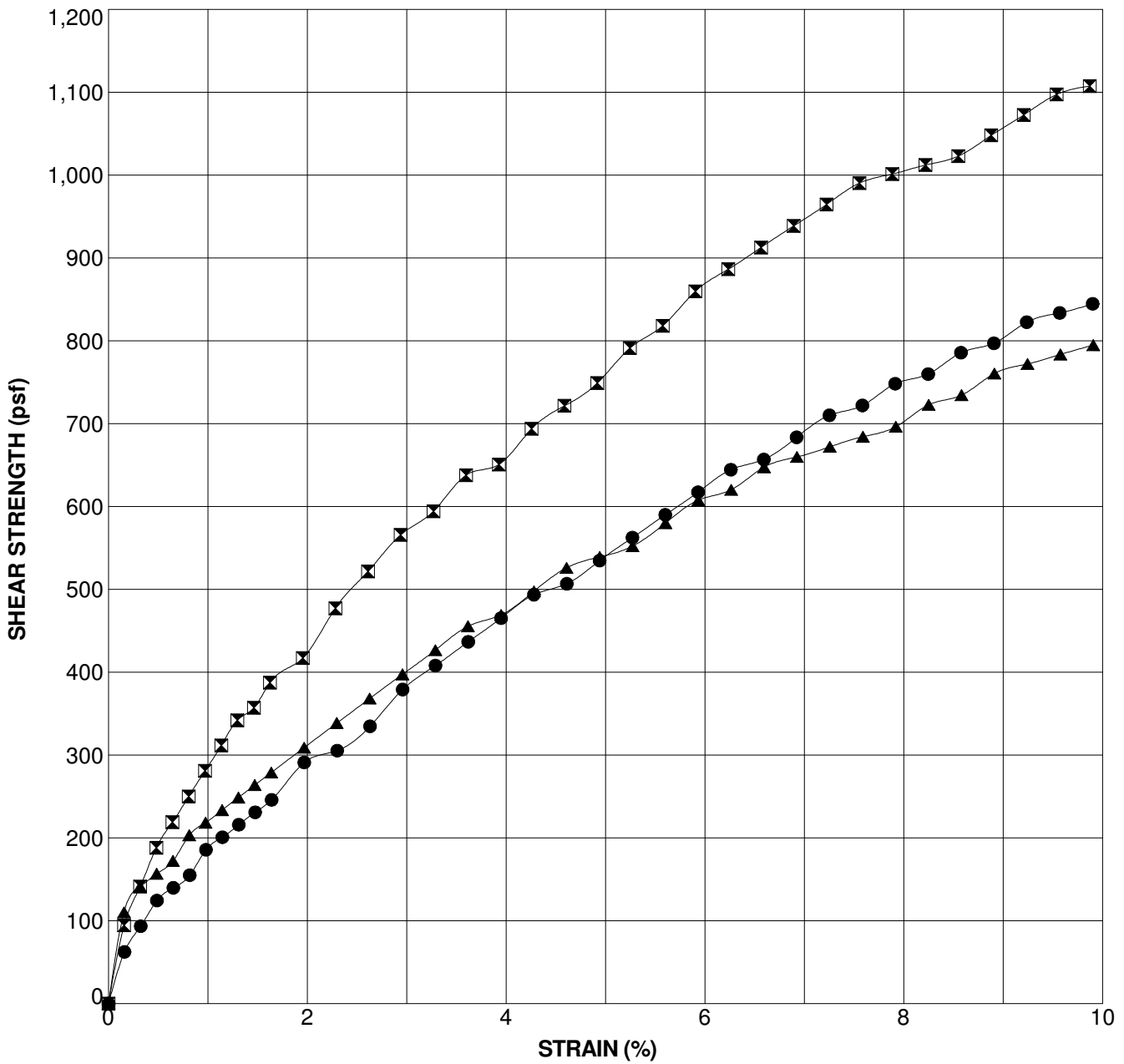
Dry	No noticeable moisture content. Requires considerable moisture to obtain optimum moisture content* for compaction.
Damp	Contains some moisture, but is on the dry side of optimum.
Moist	Near optimum moisture content for compaction.
Wet	Requires drying to obtain optimum moisture content for compaction.
Saturated	Near or below the water table, from capillarity, or from perched or ponded water. All void spaces filled with water.

* Optimum moisture content as determined in accordance with ASTM Test Method D1557, latest edition.

Where laboratory test data are not available, the above field classifications provide a general indication of material properties; the classifications may require modification based upon laboratory tests.

SOIL DESCRIPTIVE PROPERTIES: 13417.01 GINT.GPJ, 6/22/21

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Sample Source	Classification	Confining Pressure (psf)	Yield Strength (psf)	Strain (%)	Dry Density (pcf)	Moisture Content (%)
● B-1 at 2 ft	ORANGE-BROWN CLAYEY SILTY SAND (SM)	576	291	2.0	107	16.9
☒ B-2 at 4.5 ft	ORANGE-BROWN WITH GRAY SILTY SAND (SM)	720	417	2.0	109	18.2
▲ B-3 at 6 ft	BROWN SILTY SAND (SM)	864	309	2.0	106	17.5

UNCONFINED TRIAXIAL (YIELD), 13417.01 GINT.GPJ, 6/22/21



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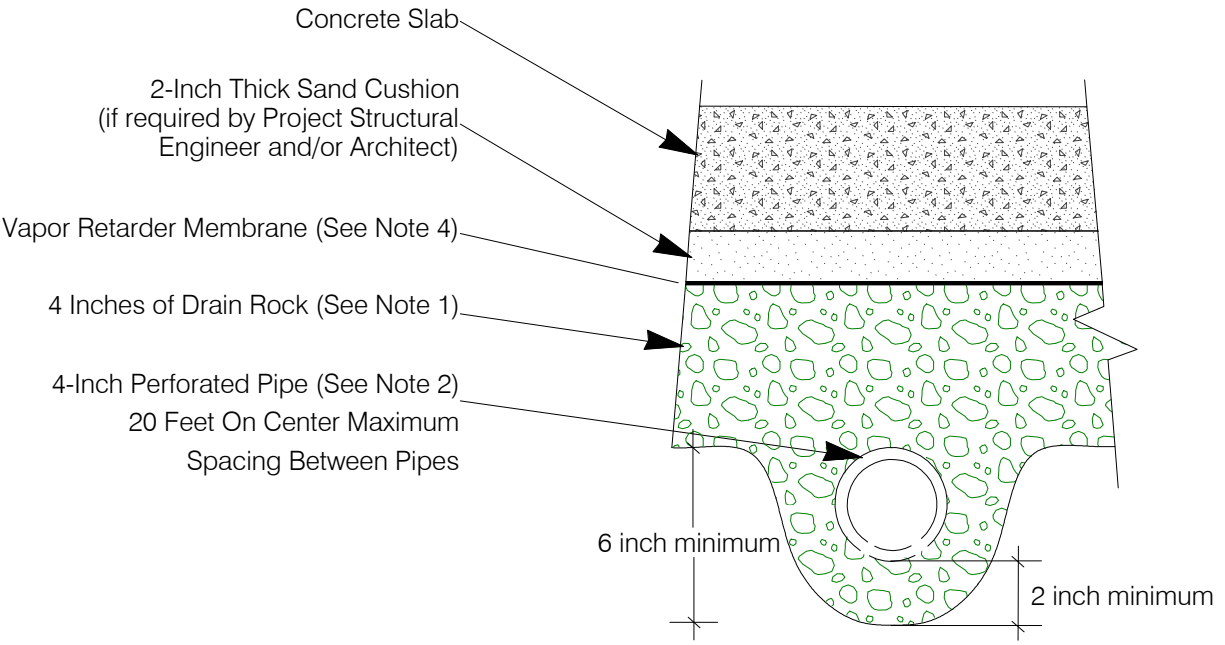
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UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST RESULTS

VALEYEV RESIDENCE
 22083 Lee Drive
 Jenner, California

PLATE
8


UNDERSLAB DRAINAGE DETAILS: 13417.01 GINT.GPJ, 6/22/21

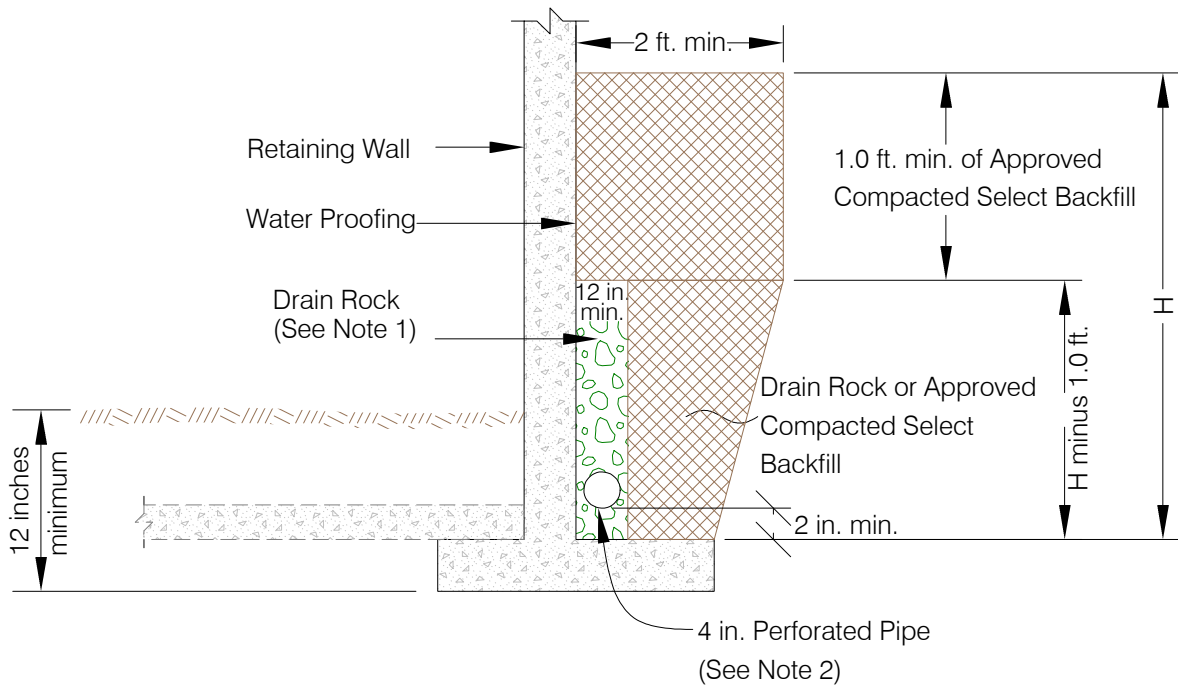


NOT TO SCALE

NOTES:

1. Drain rock should be clean, free-draining 3/4-inch crushed rock.
2. Pipe should be SDR 35 or equivalent, perforations placed down, sloped at least 1 percent to gravity outlet, or sump with automatic pump.
3. A clean-out pipe with cap should be installed at the up-slope end of perforated pipe.
4. Vapor retarder should be at least 15-mils thick and installed in accordance with the manufacturer's specifications.

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	Appr.: <i>KAC</i>		



RETAINING WALL DRAINAGE DETAIL

(Not to Scale)

NOTES:

- (1) Drain rock should be clean, free-draining material graded in size between the No. 4 and 3/4 inch sieves and should be wrapped in a non-woven geotextile filter fabric (Mirafi 140N or equivalent), or Class 2 permeable material, without filter fabric, per Caltrans standard specifications, latest edition.
- (2) Pipe should be SDR 35 or equivalent, placed with perforations down, and sloped at 1 percent to drain to gravity outlet or sump with automatic pump.
- (3) A clean-out pipe with cap should be installed at the up-slope end of perforated pipe, and pipe elbows should be 45 degrees or less (for "snake" access).

RETAINING WALL DRAINAGE DETAIL, 13417.01 GINT.GPJ, 6/22/21

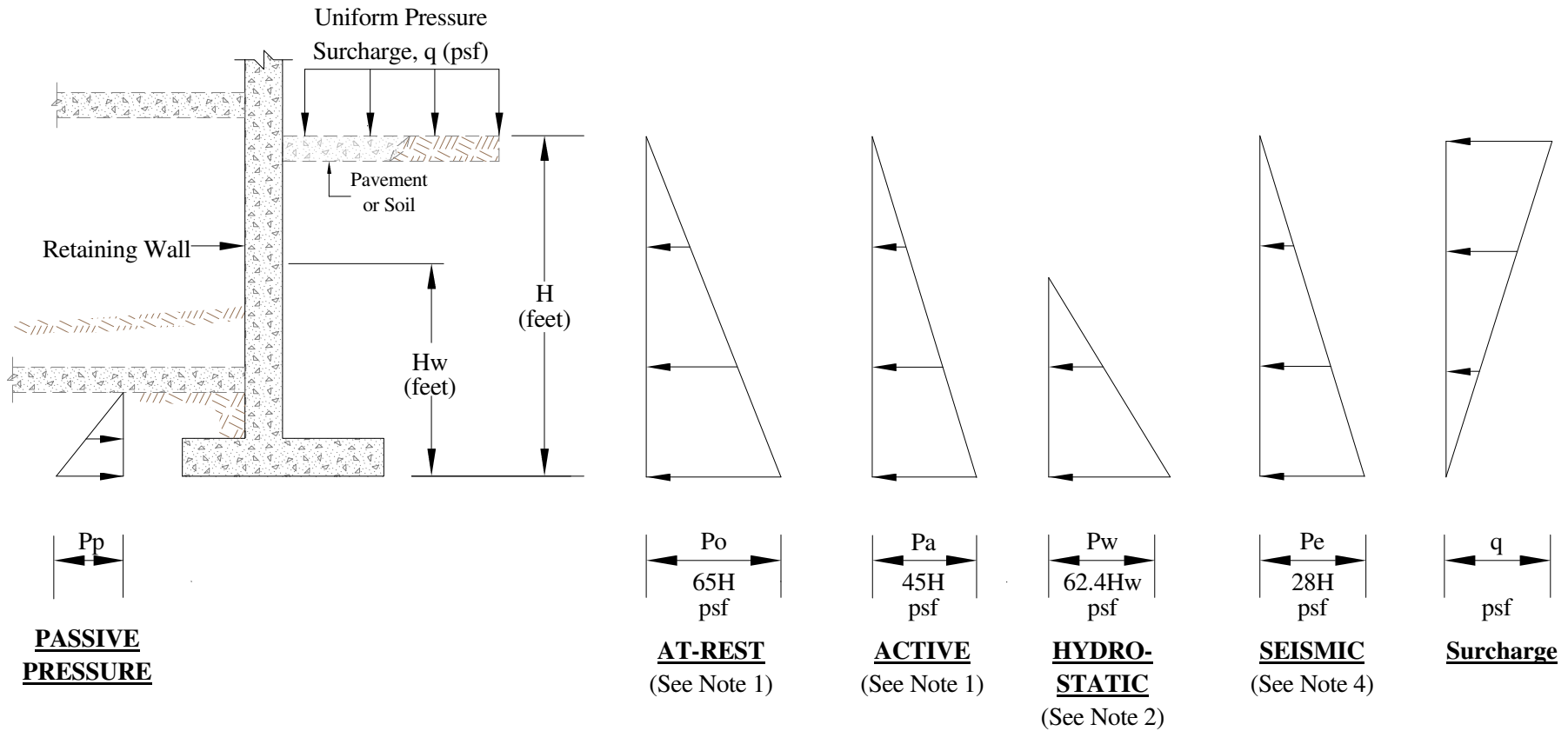


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RETAINING WALL DRAINAGE DETAIL
VALEYEV RESIDENCE
 22083 Lee Drive
 Jenner, California

PLATE
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NOTES:

- (1) If the wall at the surface of the backfill cannot move more than about 0.1 percent of its' height, at-rest soil pressures should be used.
- (2) If the wall is drained the above hydrostatic pressure does not have to be used. See Plate 10 for drainage and backfill details.
- (3) The above pressures should be used where backfill slope is flatter than 3 horizontal to 1 vertical (3H:1V). Where backfill slope is between 3H:1V and 1.5H:1V, use active pressure of 55H psf and at-rest pressure of 87H psf, respectively.
- (4) For additional design seismic pressures see the Retaining Walls section of this report.

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	Appr.: <i>KAC</i>	VALEYEV RESIDENCE 22083 Lee Drive Jenner, California	

APPENDIX A

- Blake, M.C., Jr., Terry-Smith, J., Wentworth, C.M., and Wright, R.H., 1971, Preliminary Geologic Map of Western Sonoma County and Northernmost Marin County, California: United States Geological Survey San Francisco Bay Region Environment and Resources Planning Study, Basic Data Contribution 12.
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- Huffman, M.E., and Armstrong, C.F., 1980, Geology for Planning in Sonoma County: California Division of Mines and Geology Special Report 120.
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- USGS, 2002, Geologic Map and Map Database of Western Sonoma, Northernmost Marin, and Southernmost Mendocino Counties, California. Miscellaneous Field Studies Map MF-2402.



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