Appendix D:
Geology and Soils Supporting Information

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Geotechnical Engineering Report

Shiloh Senior Living Community
Windsor, Sonoma County, California

November 17, 2017
Revised May 7, 2019
Terracon Project No. NB175148

Prepared for:

Wolff Enterprises III, LLC
Scottsdale, Arizona

Prepared by:

Terracon Consultants, Inc.
Sacramento, California

November 17, 2017
Revised May 7, 2019

Wolff Enterprises III, LLC
6710 E. Camelback Road, Suite 100
Scottsdale, Arizona 85251

Attn: Ms. Katie Reiner
P: (480) 264 3913
E: kreiner@awolff.com

Re: Geotechnical Engineering Report
Shiloh Senior Living Community
295 Shiloh Road
Windsor, Sonoma County, California
Terracon Project No. NB175148

Dear Ms. Reiner:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with our proposal number PNB175148 dated November 17, 2017. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project. This report has been updated from our original report dated November 17, 2017, for the purpose of incorporating the revised site development plans

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

PROFESSIONAL GEOLOGIST NICHOLAS NOVOTNY 9626 STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER GARRET S.H. HUBBART No. 2588 GEOTECHNICAL STATE OF CALIFORNIA

Nicholas Novotny, P.G.
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Office Manager

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section, and clicking on the logo in the top right corner will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

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Exhibit D-1	Liquefaction Analysis Figures

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	■ The project site consists of a 6-acre lot planned for development of a multi-story clubhouse (1-3 stories) with two 3-story residential wings and a single-story pool house, asphalt paved parking and drives, exterior concrete sidewalks, and landscaping
Geotechnical Characterization	■ Some areas of the parcel were overlain by uncontrolled fill up to 3 feet deep consisting of clayey sand with gravel and variable concrete debris. Onsite fills are considered undocumented and are not suitable to support the proposed improvements. ■ Native subsurface soils underlying the fill generally consisted of lean to fat clays to a depth of 5 to 7.5 feet bgs underlain by clayey sands to sandy lean clays with variable gravels to a depth of approximately 15 to 16.5 feet. Clayey sands and gravels were underlain by interbedded silts, sands, and clays to the maximum depth of exploration of 51.5 feet. ■ Highly expansive soils are present on this site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and (at least minor) cracking in the structure should be anticipated. The severity of cracking and other damage such as uneven floor slabs will probably increase if modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. Some of these options are discussed in this report such as complete replacement of expansive soils or a structural slab. ■ Groundwater was encountered at a depth of 22 feet during our investigation.
Earthwork	■ Existing fill materials, where encountered, should be completely removed down to native soils. Fill materials may be stockpiled for reuse. Existing fill materials may be suitable for use as engineered fill provided they are processed to conform with the requirements for engineered fill outlined in **Earthwork** ■ The near surface foundation soils are highly expansive and subject to volume changes with fluctuating moisture contents. In an effort to mitigate the impacts of the expansive soils, we recommend the building slabs be underlain by either 18-inches of imported non-expansive engineered fill, or the surface 12-inches of the native expansive clays be chemically treated with lime. ■ Onsite near surface clays are sensitive to moisture variation and may pump and become unstable if grading occurs during wet weather conditions. The amount of stabilization required would be highly dependent upon weather conditions during construction, drainage measures implemented during mass

Topic [1]	Overview Statement [2]
	grading and construction, and the level of construction traffic. Methods for subgrade stabilization are discussed in **Earthwork**
Foundations	■ Shallow foundations will be sufficient to support the proposed construction. Spread footings should bear a minimum of 24 inches bgs and be designed with an allowable bearing pressure of 3,500 lbs/sq ft. ■ Detect and remove zones of fill as noted in **Earthwork** ■ Provided the recommendations of this report are implemented the expected total settlements for these structures should be less than 1 inch.
Pavements	With subgrade prepared as noted in **Earthwork** Anticipated Traffic Indices (TI) are as follows: ■ Auto parking: 4.0 ■ Auto Drives: 5.0 ■ Light delivery and trash collection vehicles: 6.0 ■ The pavement design period is 20 years.
Construction Monitoring	Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. We therefore recommend that Terracon be retained to monitor this portion of the work.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geotechnical Engineering Report

Shiloh Senior Living Community
295 Shiloh Road
Windsor, Sonoma County, California
Terracon Project No. NB175148
November 17, 2017
Revised May 7, 2019

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed assisted living facility to be located at 295 Shiloh Road in Windsor, Sonoma County, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Pavement design and construction
- Excavation considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per CBC
- Lateral earth pressures

The geotechnical engineering scope of services for this project included the advancement of 12 test borings to depths ranging from approximately 5 to 50 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section of this report.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 295 Shiloh Road in Windsor, Sonoma County, California. Approximate Latitude/Longitude: 38.5266°, -122.7847° See **Site Location**
Existing Improvements	The site is currently undeveloped and appears to consist of agricultural land.
Current Ground Cover	Earthen, lightly-vegetated.
Existing Topography	Relatively flat.
Previous Development	Our investigation included a review of historical aerial photographs of the site dating back to 1993. Based on our review of the aerial photographs, we have determined that previous structures existed on the southeast portion of the site (pre 1993 to 2007). We also noted that that end-dumped stockpiles of soil were present in the northern and eastern portion of the site (2003). The presence of undocumented fill materials along the northern portion of the site suggests that stockpiled soil may have been graded into the site after 2003. A **Historical Development Plan** has been prepared indicating the approximate location of these previously existing features.
Geology	The site is situated within the Coast Range Geomorphic Provence of Northern California. Geologic structures within this Provence generally consist of northwest trending hills and valleys running subparallel to the San Andres Fault System. Bedrock in the Coast Ranges typically consists of low to high grade metamorphic rock of marine and terrestrial origin. The Coast Range Geomorphic Provence extends south to the Transverse Range, and is bounded by the Great Valley to the east, the Pacific Ocean to the west, and the Klamath Mountains to the north.[1, 2] Surficial geologic units mapped at the site consists of Alluvial fan deposits of recent age (Q_{al}) [3] with nearby outcrops of older alluvial fan material (Q_{poaf}). According to the map, alluvial deposits are Quaternary in age (2.6 million years ago to present) and consist predominantly of sands and gravels with interbedded silts and clays.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed in the project planning stage. Our final understanding of the project conditions is as follows:

[1] Harden, D. R., "*California Geology, Second Edition*," Pearson Prentice Hall, 2004.

[2] Norris, R. M. and Webb, R. W., *"Geology of California, Second Edition,"* John Wiley & Sons, Inc., 1990.

[3] Blake, M.C., Graymer, R.W., and Stamski, R.E., 2002, "*Geologic Map and Map Database of Western Sonoma, northernmost Marin, and Southernmost Mendocino Counties, California" U.S. Geological survey, Miscellaneous field Studies Map MF-2402, scale 1:100,000*

Item	Description
Information Provided	Site plan sent via email from Katie Reiner of Wolff Company on April 2nd, 2019 (Plan dated December, 18th, 2018)
Project Description	The project site consists of a 6-acre lot planned for development of a multi-story clubhouse (1-3 stories) with two 3-story residential wings and a single story pool house, asphalt paved parking and drives, exterior concrete sidewalks, and landscaping.
Proposed Structures	The project includes the following structures: ■ Multi-story clubhouse (~18,000 SF) ■ Three-story residential wings (~38,000 SF) ■ Single-story poll house (~4,000 SF)
Building Construction	The proposed structures are anticipated to consist of wood or metal stud framing and be founded on a shallow spread footing with slab on grade floors.
Maximum Loads	■ Columns: 100 kips maximum (assumed) ■ Walls: 5 kips per linear foot maximum (assumed) ■ Slabs: 100 pounds per square foot maximum (assumed)
Pavements	Paved driveway and parking will be constructed on approximately 1.5 acres of the parcel. We assume both rigid (concrete) and flexible (asphalt) pavement sections should be considered. Please confirm this assumption. Anticipated Traffic Indices (TI) are as follows: ■ Auto parking: 4.0 ■ Auto Drives: 5.0 ■ Light delivery and trash collection vehicles: 6.0 The pavement design period is 20 years.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

Some areas of the parcel were overlain by uncontrolled fill, up to 3 feet deep, consisting of clayey sand with gravel and variable concrete debris. A review of historical aerial photographs revealed that end-dumped piles of fill were present in areas commensurate with where we encountered fill in our test borings. The on-site fill likely originated by grading the end-dumped fill into the site. Onsite fills are considered undocumented and are not suitable to support the proposed improvements.

Subsurface conditions at the boring locations can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum (feet)	Material Description	Consistency/Density
Surface	0.5 to 3.0	**Existing Fill**: Clayey Sand with Gravel and Concrete Debris	Medium Dense
1	3 to 7.5	Lean to Fat Clay with Variable Sand	Medium Stiff to Very Stiff, Highly Expansive
2	15 to 16.5	Clayey Sand to Clayey Gravel	Medium Dense to Very Dense
3a	Undetermined: Borings terminated within this stratum at the planned depth of approximately 51.5 feet	Interbedded Lean to Fat Clay and Silt with Variable Sand	Soft to Very Stiff
3b		Clayey Sand	Loose to Medium Dense

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the boreholes can be found on the boring logs in **Exploration Results**, and are summarized below.

Boring Number	Approximate Depth to Groundwater while Drilling (feet) [1]	Approximate Depth to Groundwater after Drilling (feet) [1]
B-4	25	22

1. Below ground surface

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Some areas of the parcel were overlain by uncontrolled fill, up to 3 feet deep, consisting of clayey sand with gravel and variable concrete debris. A review of historical aerial photographs revealed that end-dumped piles of fill were present in areas commensurate with where we encountered fill in our test borings. The on-site fill likely originated by grading the end-dumped fill into the site. Onsite fills are considered undocumented and are not suitable to support the proposed improvements. The **Earthwork** section addresses over excavation of undocumented fill materials onsite.

The near surface foundation soils are highly expansive and subject to volume changes with fluctuating moisture contents. In an effort to mitigate the effects of the expansive soils, we recommend the building slabs be underlain with either 18-inches of imported non-expansive engineered fill, or the surface 12-inches of the native expansive clays be chemically treated with lime. The **Shallow Foundations** section addresses support of the building bearing on native stiff to hard lean to fat clays or engineered fill. The **Floor Slabs** section addresses slab-on-grade support of the building.

The near surface clay soil could become unstable and pumping subgrade conditions could develop after precipitation events. If possible, the grading should be performed during the warmer and drier time of the year. If grading is performed during the winter months, an increased risk for possible development of unstable soil conditions will persist. Additional site preparation recommendations including subgrade improvement and fill placement are provided in the **Site Preparation** section.

Recommendations for both Rigid and Flexible pavement systems are provided for this site. The **Pavements** section addresses the design of pavement systems.

Expansive soils are present on this site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and (at least minor) cracking in the structure should be anticipated. The severity of cracking and other damage such as uneven floor slabs will probably increase if modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. Some of these options are discussed in this report such as complete replacement of expansive soils or a structural slab.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork will include clearing and grubbing, over excavation of undocumented fills, excavations and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria as necessary to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Site Preparation

Site Preparation will include stripping of existing vegetation and topsoil, and over excavation of undocumented fill materials across the site.

After the site has been stripped and all undocumented fills have been over-excavated down to native soil, the resulting subgrade should be proof-rolled with an adequately loaded vehicle such as a fully loaded tandem axle dump truck. The proof-rolling should be performed under the direction of the Geotechnical Engineer. Areas excessively deflecting under the proof-roll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified by stabilizing with lime. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

Existing Undocumented Fill

As noted in **Geotechnical Characterization**, our investigation encountered some areas of the parcel that were overlain by uncontrolled fill, up to 3 feet deep, consisting of clayey sand with gravel and variable concrete debris. A review of historical aerial photographs revealed that end-dumped piles of fill were once present is areas commensurate with where we encountered fill in our test borings. The on-site fill likely originated by grading the end-dumped fill into the site. Onsite fills are considered undocumented and are not suitable to support the proposed improvements.

Undocumented fills onsite should be completely over excavated down to native soil. Over excavated fills may be stockpiled for reuse, if desired. Stockpiled soil may be suitable for reuse as engineered fill for this project provided it is processed to conform with the requirements for engineered fill outlined in this report and any deleterious material is removed prior to placing. Any organic soils removed during site preparation should not be used as engineered fill beneath the proposed new buildings or pavements, but could be used in green landscaping areas.

Engineered Fill Material Types

All fill materials should be inorganic soils free of vegetation, debris, and fragments not larger than four inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Approved imported non-expansive fill materials shall be used beneath foundations and under concrete slab-on-grade. The on-site clay soils are not suitable for use as non-expansive engineered fill.

On-site clay soils are suitable for use as general fill material and in non-structural areas.

Imported non-expansive engineered fill soils should conform to low volume change materials as indicated as follows:

Gradation	Percent Finer by Weight (ASTM C 136)
■ 3”	100
■ No. 4 Sieve	40 to 100
■ No. 200 Sieve	20 to 40
■ Liquid Limit	30 (Max)
■ No. 200 Sieve	20 to 40
■ Plasticity Index	15 (max)
■ Maximum expansive index*	20 (max)

*ASTM D 4829

The on site clay soils will not meet the specifications above. Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed eight inches in loose thickness.

Fill Compaction Requirements

Compaction requirements for other structural and general fill should meet the following compaction requirements.

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
Approved import non-expansive structural fill soils:			
Beneath foundations:	90%	0%	+4%
Beneath slabs:	90%	0%	+4%
Utility trenches (structural areas):	95%	0%	+4%
On-site clay soils:			
Bottom of excavation receiving fill:	90%	1%	+4%
Miscellaneous backfill:	90%	1%	+4%
Utility trenches (Landscape areas):	90%	1%	+4%
Beneath asphalt pavements:	95%	1%	+3%
Beneath concrete pavements:	95%	1%	+3%
Aggregate base (beneath pavements):	95%	0%	+4%

Grading and Drainage

All final grades must provide effective drainage away from the building improvements during and after construction. Water permitted to pond next to the building can result in greater soil movements than those discussed in this report. These greater movements can result in unacceptable differential floor slab movements, cracked slabs and walls, and roof leaks. Estimated movements described in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained.

Exposed ground should be sloped at least 2 percent away from the building extending a minimum of 10 feet beyond the perimeter of the building. After building construction and landscaping, we recommend the Civil Engineer/Surveyor verify final grades to document that effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary, as part of the structure's maintenance program.

Planters located within 10 feet of the structure should be self-contained to prevent water accessing the building and pavement subgrade soils. Trees should be placed a minimum distance equal to the mature height of the tree away from the building as to ensure the root structure does not affect the soil moisture content at or near the building. Locate sprinkler mains and spray heads a minimum of 5 feet away from the building line. Collect roof runoff in drains or gutters. Discharge roof drains and downspouts onto pavements which slope away from the building or tie the down spout discharge run off to the storm drain system.

Sprinkler systems should not be installed within 5 feet of foundation walls. Landscaped irrigation adjacent to the foundation system should be maintained and include low-volume or drip style systems.

Earthwork Construction Considerations

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. At the time of our study, moisture contents of the surface and near-surface native soils ranged from 10 to 28 percent. Based on these moisture contents, some moisture conditioning will likely be required in order to meet the compaction requirements specified above for the project.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of the floor slab. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, frozen, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and re-compacted prior to floor slab and pavement construction.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigation measures beyond that which would be expected during the drier summer and fall months. This could include ground stabilization utilizing chemical treatment of the subgrade, diversion of surface runoff around exposed soils, and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.
Surface water should not be allowed to pond on the site and soak into the soil during construction. Construction staging should provide drainage of surface water and precipitation away from the building and pavement areas. Any water that collects over or adjacent to construction areas should be promptly removed, along with any softened or disturbed soils. Surface water control in the form of sloping surfaces, drainage ditches and trenches, and sump pits and pumps will be important to avoid ponding and associated delays due to precipitation and seepage.

Groundwater was encountered at approximately 22 feet during our exploration. Based on our understanding of the proposed development, we do not expect groundwater to affect construction. If groundwater is encountered during construction, some form of temporary or permanent dewatering may be required. Conventional dewatering methods, such as pumping from sumps, should likely be adequate for temporary removal of any groundwater encountered during excavation at the site. Well points would likely be required for significant groundwater flow, or where excavations penetrate groundwater.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of over-excavation of undocumented fill materials.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing pressure [1, 2]	3,500 psf
Required Bearing Stratum [3]	Undisturbed native clay soils
Minimum Foundation Dimensions	Columns: 24 inches Continuous: 12 inches
Maximum Foundation Dimensions	Columns: 72 inches Continuous: 36 inches
Ultimate Passive Resistance [4] **(equivalent fluid pressures)**	300 pcf (cohesive backfill)
Ultimate Coefficient of Sliding Friction [5]	0.30
Minimum Embedment below Finished Grade [6]	24 inches
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement [2, 7]	About 2/3 of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. These bearing pressures can be increased by 1/3 for transient loads unless those loads have been factored to account for transient conditions. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2. Values provided are for maximum loads noted in **Project Description**.
3. Unsuitable or soft soils should be over-excavated and replaced according to the recommendations presented in the **Earthwork**.
4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. If sliding friction is used in conjunction with passive pressure for lateral restraint, the sliding resistance should be reduced by 25%.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
6. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
7. Differential settlements are as measured over a span of 50 feet.

Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. Excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards.

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7-13.

DESCRIPTION	VALUE
2016 California Building Code Site Classification (CBC) [1]	D [2]
Site Latitude	N 38.5267°
Site Longitude	W -122.7848°
S_s Spectral Acceleration for a Short Period [3]	2.180g
S_1 Spectral Acceleration for a 1-Second Period [3]	0.900g
S_{MS} Maximum Considered Earthquake (MCE) Spectral [3]	2.180g
S_{M1} Maximum Considered Earthquake (MCE) Spectral [3]	1.350g
Design Spectral Acceleration Value (Short Period), S_{DS} [3]	1.453g
Design Spectral Acceleration Value (1-Second Period), S_{D1} [3]	0.900g
F_a Site Coefficient for a Short Period [3]	1.000
F_v Site Coefficient for a 1-Second Period [3]	1.500

1. Seismic site classification in general accordance with the 2016 *California Building Code*, which refers to ASCE 7-13
2. The 2016 California Building Code (CBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope does not include the required 100 foot soil profile determination. Borings extended to a maximum depth of 51.5 feet, and this seismic site class definition considers that similar soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be necessary to confirm and/or modify the above site class.
3. These values were obtained using online seismic design maps and tools provided by the USGS (http://earthquake.usgs.gov/hazards/designmaps/).

The site is located in Northern California, which is a seismically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. The table below indicates the distance of the fault zones and the associated maximum credible earthquake that can be produced by nearby seismic events, as calculated using the USGS Earthquake Hazard Program Unified Hazard tool.

Characteristics and Estimated Earthquakes for Regional Faults			
Fault Name	**Percent Contribution (%)**	**Approximate Distance to Site (kilometers)**	**Maximum Credible Earthquake (MCE) Magnitude**
Rodgers Creel – Healdsburg [8]	24.23	5.04	7.26
Maacama [1]	6.17	8.46	7.35
San Andreas (North Coast) [12]	2.94	31.23	7.38

Based on the ASCE 7-10 Standard, the peak ground acceleration (PGA_M) at the subject site approximately 0.837g. Based on the USGS 2008 interactive deaggregations, the project site has a mean magnitude of 7.16.

The site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.[4]

LIQUEFACTION

Liquefaction is a mode of ground failure that results from the generation of excess pore-water pressures during earthquake ground shaking, causing loss of shear strength. This phenomenon generally occurs in areas of high seismicity, where groundwater is shallow, and loose granular soils or relatively non-plastic fine-grained soils are present. The California Geologic Survey (CGS) has designated certain areas within California as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the likely presence of a relatively shallow water table. The project site is not located within a mapped potential liquefaction hazard zone as indicated by the CGS. However, it is located in a zone of low to moderate liquefaction potential by the U.S. Geological Survey Liquefaction Susceptibility maps [5].

[4] California Department of Conservation Division of Mines and Geology (CDMG), "Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region", CDMG Compact Disc 2000-003, 2000.

[5] *https://earthquake.usgs.gov/learn/topics/geologicmaps/liquefaction.php*

The subsurface soils encountered in our investigation were generally consistent between borings and consisted of stiff lean to fat clay to a depth of 5 to 7 feet, underlain by medium dense to dense clayey sand to sandy lean clay with variable gravel to a depth of 13 to 16.5 feet, underlain by interbedded soft to stiff lean to fat clay to a depth of 28 feet. Clays were directly underlain by medium dense silty sands and very stiff sandy silts to a depth of 40 feet, which in turn were underlain by medium dense clayey sand to a depth of 50 feet. Clayey sands were underlain by very stiff sandy lean clay to the maximum depth of exploration of 51½ feet bgs. Groundwater was encountered at a depth of approximately 22 feet bgs during our exploration.

The liquefaction study utilized the Simplified Procedure originally developed by Seed and Idriss (1971) and most recently refined by Idriss and Boulanger (2014). This analysis was based on the soil data from Boring B-4. A Maximum Credible Earthquake (MCE) magnitude of 7.16 and a Peak Ground Acceleration (PGA_M) of 0.837g was used. Calculations utilized a ground water depth of 22 feet. A summary of liquefaction potential analysis is attached in Appendix D of this report.

Based on our analysis, potential for liquefaction induced settlement could exist within the medium dense clayey sand strata encountered between 40 and 50 feet in our investigation. Our calculations indicate that seismically-induced settlement of saturated sands between 40 and 50 feet could be on the order of 3 to 4 inches. However, the consequences of one-dimensional settlement may be largely mitigated by the presence of a thick, non-liquefiable layer above potentially liquefiable soils (Ishihara 1985, Naesgaard et al. 1998, Buckovalas and Dakoulas 2007). It is our opinion that the presence of dense to stiff unsaturated soils and clays (non-liquefiable layer) found to a depth of 40 feet may act as a bridging layer that redistributes stresses and therefore results in more uniform ground surface settlement. Based on our experience in the area and the presence of non-liquefiable soils in the upper 40 feet at this site, we conclude that the risk of potential structural distress from a liquefaction event is low.

Given the lack of free face near the site and the depth of the potentially liquefiable zone, we conclude that the potential for seismically induced lateral spreading is also considered low.

FLOOR SLABS

The near surface foundation soils are highly expansive and subject to volume changes with fluctuating moisture contents. In an effort to mitigate the impacts of the expansive soils, we recommend the building slabs be underlain by either 18-inches of imported non-expansive engineered fill, or the surface 12-inches of the native expansive clays be chemically treated with lime.

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and. positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor Slab Support [1]	At least 18 inches of non-expansive engineered fill or 12 inches of lime treated native clay subgrade.
Estimated Modulus of Subgrade Reaction [2]	150 pounds per square inch per inch (psi/in) for point loads
Aggregate Base Course/Capillary Break	Minimum 4 inches of free-draining (less than 6% passing the U.S. No. 200 sieve) crushed aggregate compacted to at least 95% of ASTM D 698 [2, 3]

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.
3. Free-draining granular material should have less than 5 percent fines (material passing the #200 sieve). Other design considerations such as cold temperatures and condensation development could warrant more extensive design provisions.

If floor slabs are to be supported by lime treated subgrade soils, the following recommendations should be utilized:

- Native sandy clay soils should be scarified to a depth of 12 inches, moisture conditioned and compacted per the compaction requirements in **Earthwork**.
- Once building pads are brought to grade, the upper 12 inches of subgrade should be thoroughly mixed with high calcium quick lime and compacted. The amount of lime to be used should be determined by laboratory testing at least three weeks prior to the start of any grading operations. For budgeting purposes, we recommend assuming a spread rate of 5 pounds of lime for a 12-inch deep treated section.
- Lime treatment should be performed in accordance with Section 24 of the Cal Trans Standard Specifications, latest edition.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

In areas of exposed concrete, control joints should be saw-cut into the slab after concrete placement in accordance with ACI Design Manual, Section 302.1R-37 8.3.12 (tooled control joints are not recommended). To control the width of cracking (should it occur), continuous slab reinforcement should be considered in exposed concrete slabs.

Floor Slab Construction Considerations

Interior trench backfill placed beneath slabs should be compacted in accordance with recommendations outlined in the Earthwork section of this report. Other design and construction considerations, as outlined in the ACI Design Manual, Section 302.1R are recommended.

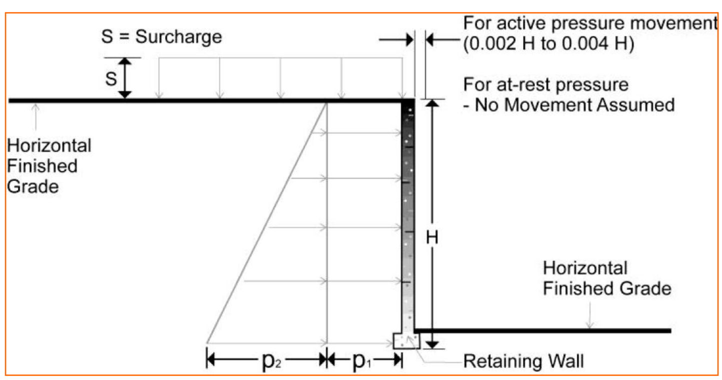
On most project sites, the site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrade may not be suitable for placement of aggregate base rock and concrete and corrective action will be required.

We recommend the area underlying the floor slab be rough graded and then thoroughly proof-rolled with a loaded tandem axel dump truck prior to final grading and placement of aggregate base rock. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted fill. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the aggregate base rock and concrete.

LATERAL EARTH PRESSURES

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	**Coefficient for Backfill Type** [2]	**Surcharge Pressure** [3, 4, 5] **p_1 (psf)**	**Effective Fluid Pressures (psf)** [2, 4, 5]	
			Unsaturated [6]	**Submerged** [6]
Active (Ka)	0.50	(0.50)S	(55)H	-- --
At-Rest (Ko)	0.65	0.65)S	(70)H	-- --
Passive (Kp)	2.50	--- ---	(300)H	-- --

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95 percent of the ASTM D 1557 maximum dry density, rendering a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.
6. In order to achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Below Grade Walls** below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs, noted in this section, must be applied to the site, which has been prepared as recommended in the **Site Preparation** section.

Support characteristics of subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade, such as soils encountered on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

Pavement Design Parameters

Design of Asphaltic Concrete (AC) pavements are based on the procedures outlined in the California Department of Transportation (CalTrans) Highway Design Manual. Design of Portland Cement Concrete (PCC) pavement sections were designed using PCA "Thickness Design for Concrete Highway and Street Pavements."

A subgrade R-Value of 5 was used for the AC pavement designs, and a modulus of subgrade reaction of 100 pci was use for the PCC pavement designs. The values were derived from laboratory R-Value testing conducted on soil collected from the upper 36 inches at the site and our understanding of the quality of the subgrade as prescribed by the **Site Preparation** conditions as outlined in **Earthwork**. A modulus of rupture of 600 psi was used for pavement concrete.

Pavement Section Thicknesses

The following table provides options for AC and PCC Sections:

Asphaltic Concrete Design				
Traffic Area	**Traffic Index (TI)**	**AC (inches)**	**Aggregate Base (inches)**	**Total Thickness (inches)**
Auto Parking	4.0	2.5	8.0	10.5
Auto Drives	5.0	3.0	9.0	12.0
Delivery Truck	6.0	3.5	12.0	15.5

Portland Cement Concrete Design				
Traffic Area	**Traffic Index (TI)**	**PCC (inches)**	**Aggregate Base (inches)**	**Total Thickness (inches)**
Auto Parking	4.0	5.0	4.0	9.0
Auto Drives	5.0	6.0	4.0	10.0
Delivery Truck	6.0	6.0	6.0	12.0

The above sections represent minimum design thicknesses and, as such, periodic maintenance should be anticipated. The Portland cement concrete pavement should have a minimum 28-day compressive strength of 4,000 psi.

The estimated pavement sections provided in this report are minimums for the assumed design criteria, and as such, periodic maintenance should be expected. Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles. A maintenance program including surface sealing, joint cleaning and sealing, and timely repair of cracks and deteriorated areas will increase the pavement's service life. As an option, thicker sections could be constructed to decrease future maintenance.

Concrete for rigid pavements should have a minimum 28-day compressive strength of 4,000 psi, and be placed with a maximum slump of 4 inches. A minimum 4-inch thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its "green" state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. This is especially applicable for islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils. The civil design for the pavements with these conditions should include features to restrict or to collect and discharge excess water from the islands. Examples of features are edge drains connected to the storm water collection system, longitudinal subdrains, or other suitable outlet and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

Dishing in parking lots surfaced with ACC is usually observed in frequently-used parking stalls (such as near the front of buildings), and occurs under the wheel footprint in these stalls. The use of higher-grade asphaltic cement, or surfacing these areas with PCC, should be considered. The dishing is exacerbated by factors such as irrigated islands or planter areas, sheet surface drainage to the front of structures, and placing the ACC directly on a compacted clay subgrade.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

Based on the possibility of shallow and/or perched groundwater, we recommend installing a pavement subdrain system to control groundwater, improve stability, and improve long term pavement performance.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage
- Install below pavement drainage systems surrounding areas anticipated for frequent wetting
- Install joint sealant and seal cracks immediately
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils
- Place compacted, low permeability backfill against the exterior side of curb and gutter; and
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials

CORROSIVITY

The table below lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary						
Boring	**Sample Depth (feet)**	**Soil Description**	**Soluble Sulfate (percent)**	**Soluble Chloride (percent)**	**Electrical Resistivity (Ω-cm)**	**pH**
B-5	2.5	CH	77	53	4,317	8.91

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 4.3.1 of the ACI Design Manual. Concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the geotechnical conditions in the area, the data obtained from our site exploration and from our understanding of the project. Variations will occur between exploration point locations, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes only. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

APPENDIX - A
FIELD EXPLORATION

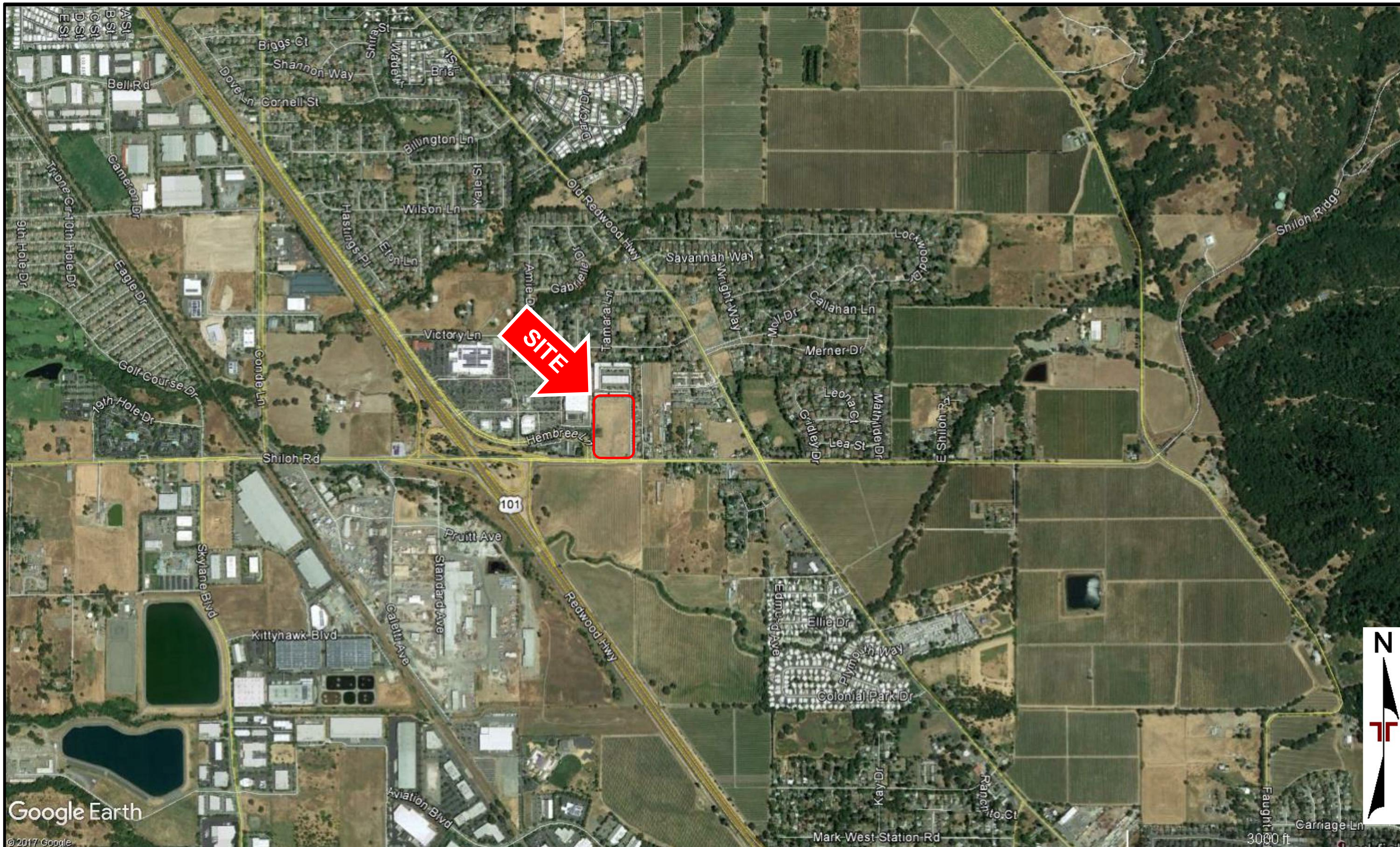


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

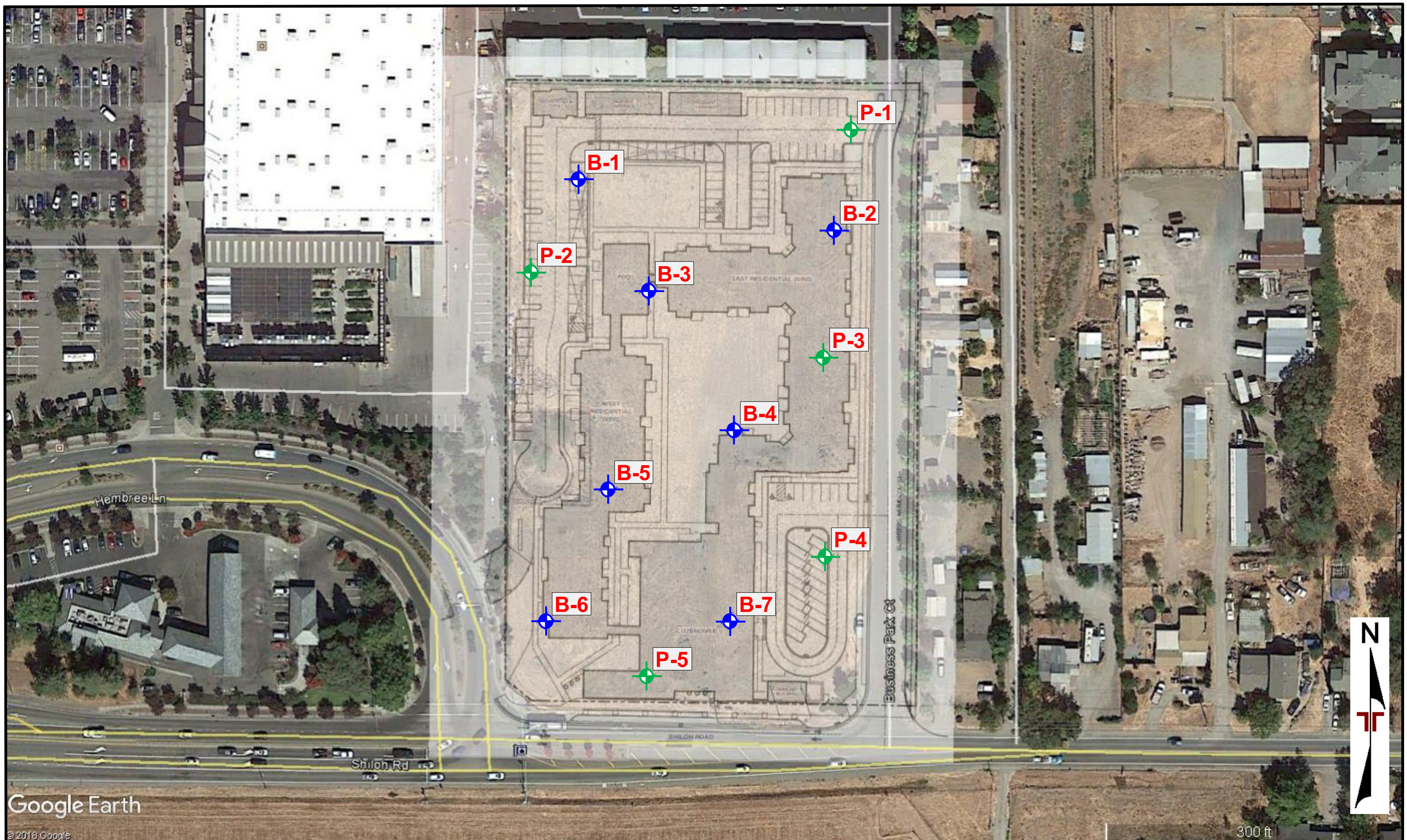
Project Manager: RH	Project No. NB175148		
Drawn by: NMN	Scale: AS SHOWN		
Checked by: RH	File Name: 175148.Exhibits		
Approved by: RH	Date: OCT 2017		

Terracon
Consulting Engineers & Scientists
50 Goldenland Court, Suite 100 Sacramento, CA 95834
PH. (916) 928-4690 FAX. (916) 928-4694

SITE LOCATION

SHILOH TOAD SENIOR LIVING COMMUNITY
295 SHILOH ROAD
WINDSOR, CALIFORNIA

Exhibit
A-1



Google Earth aerial photograph taken September, 2018

LEGEND

P-1	APPROXIMATE PAVEMENT BORING LOCATION
B-1	APPROXIMATE STRUCTURAL BORING LOCATION

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	RH	Project No.	NB175148
Drawn by:	BDD	Scale:	AS SHOWN
Checked by:	RH	File Name:	175148.Exhibits
Approved by:	RH	Date:	APR 2019

Terracon
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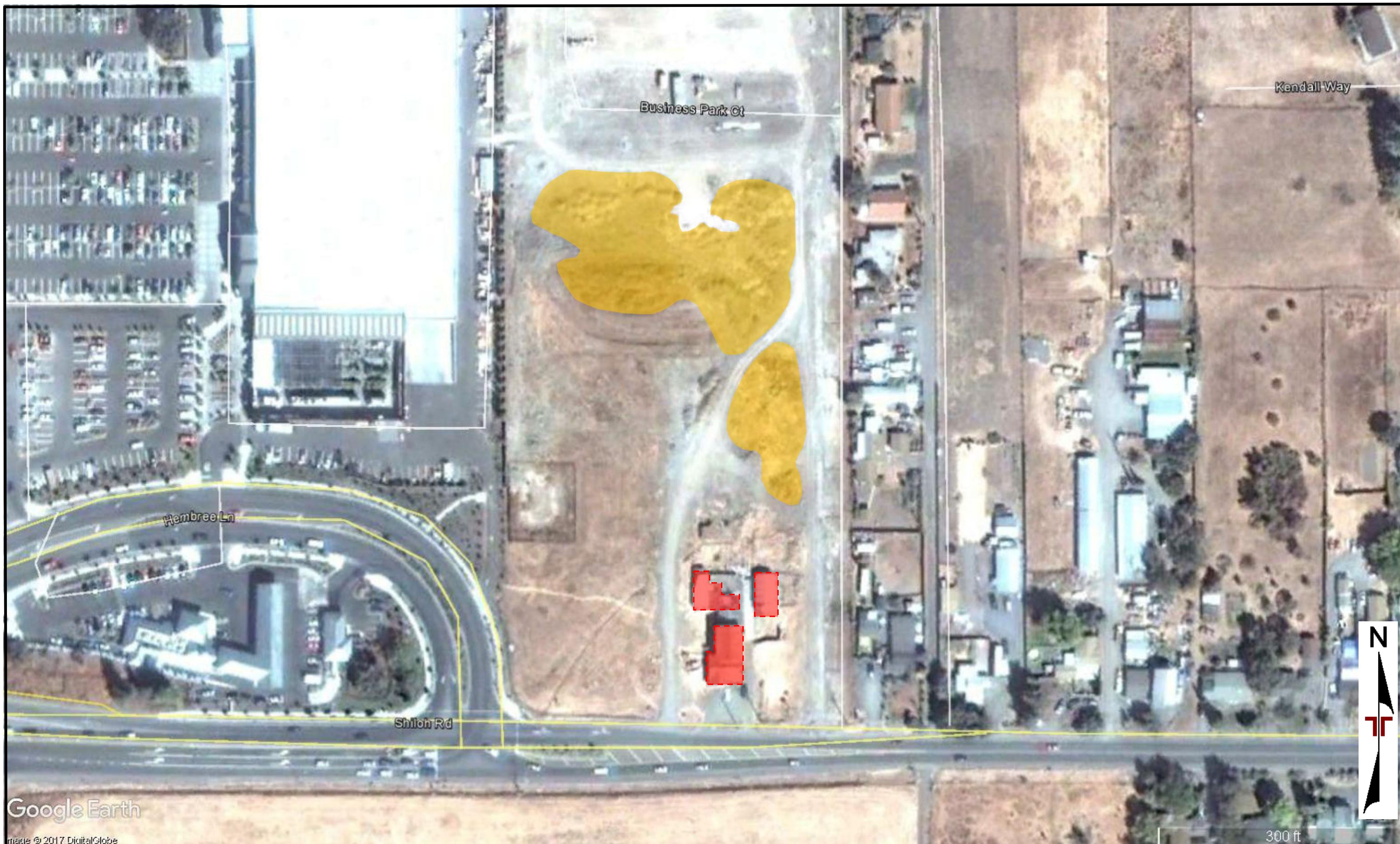
PH. (916) 928-4690 FAX. (916) 928-4694

EXPLORATION PLAN

SHILOH TOAD SENIOR LIVING COMMUNITY
295 SHILOH ROAD
WINDSOR, CALIFORNIA

Exhibit
A-2a



Google Earth aerial photograph taken September, 2003

LEGEND	
(yellow)	HISTORICAL SOIL STOCKPILES
(red)	HISTORICAL STRUCTURES

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Manager:	RH	Project No.	NB175148
Drawn by:	NMN	Scale:	AS SHOWN
Checked by:	RH	File Name:	175148.Exhibits
Approved by:	RH	Date:	OCT 2017

Terracon
Consulting Engineers & Scientists
50 Goldenland Court, Suite 100 Sacramento, CA 95834
PH. (916) 928-4690 FAX. (916) 928-4694

HISTORICAL DEVELOPMENT PLAN

SHILOH TOAD SENIOR LIVING COMMUNITY
295 SHILOH ROAD
WINDSOR, CALIFORNIA

Exhibit
A-2

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
6	18	Planned Building Area
1	51½	Liquefaction Analysis
5	5	Planned Asphalt Parking and Drives

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provide the boring layout. Coordinates are obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations are obtained by interpolation from Google Earth based on the site plan provided to us. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advance the borings with a truck-mounted rotary drill rig using continuous flight augers (solid stem and/or hollow stem as necessary depending on soil conditions). Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. Ring-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure; however, blow counts are typically recorded for 6-inch intervals for a total of 12 inches of penetration. We observe and record groundwater levels during drilling and sampling. For safety purposes, all borings are backfilled with auger cuttings after their completion. Pavements are patched with cold-mix asphalt and/or pre-mixed concrete, as appropriate.

The sampling depths, penetration distances, and other sampling information are recorded on the field boring logs. The samples are placed in appropriate containers and taken to our soil laboratory for testing and classification by a geotechnical engineer. Our exploration team prepares field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs are prepared from the field logs. The final boring logs represent the geotechnical engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

BORING LOG NO. B-01

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5273° Longitude: -122.7853°

GRAPHIC LOG / DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris										
	FAT CLAY (CH), trace sand, fine grained, high plasticity, dark brown, medium stiff				4-4-4	2.1 (HP)		26	87		
7.0	stiff	5			3-6-8	3.2 (HP)		26	90	58-20-38	90
10.0	**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, reddish brown to yellow, medium dense, rounded gravel to 2 inches in dimension				8-13-18			21	98		
14.0	**CLAYEY SAND (SC)**, trace gravel, fine to coarse grained, tan, dense, moderate cementation	10			20-50/3"			19	86		
	LEAN CLAY WITH SAND (CL), fine grained, medium plasticity, tan to black, stiff	15			4-6-8	3.2 (HP)		34	81		
18.0					3-5-8 N=13			24	90		
	Boring Terminated at 18 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-4

BORING LOG NO. B-02

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5272° Longitude: -122.7843°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris										
	FAT CLAY WITH SAND (CH), fine to medium grained, high plasticity, grayish brown to red, very stiff				9-16-18	4.5 (HP)		15	110	51-19-32	77
7.5	dark brown, stiff	5			5-8-11		4.52	20	96		
	CLAYEY SAND (SC), fine grained, tan, medium dense				7-9-17	4.8 (HP)		17	106		
	gravelly, rounded gravel to 1 inch in dimension	10			8-10-18	3.1 (HP)		13	112		21
16.0	trace gravel, fine grained, orange to brown	15			4-8-15			24	94		
18.0	**LEAN CLAY WITH SAND (CL)**, fine grained, medium plasticity, brown to tan, stiff				4-6-9 N=15	3.6 (HP)		23	99		

Boring Terminated at 18 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-5

BORING LOG NO. B-03

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.527° Longitude: -122.7851°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3.0	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to gray, medium dense, undocumented fill, variable gravel and concrete debris			Sample	8-8-7			17	101		36
7.0	**FAT CLAY WITH SAND (CH)**, fine grained, high plasticity, dark brown, stiff	5		Sample	2-6-11	3.2 (HP)		24	91		
10.0	**GRAVELLY LEAN CLAY (CL)**, fine to coarse grained, medium plasticity, reddish brown to yellow, very stiff			Sample	6-10-16	1.8 (HP)		18	105		56
12.5	**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, reddish brown to yellow, medium dense	10		Sample	10-15-19			11	118		
	CLAYEY SAND (SC), trace gravel, fine to medium grained, brown to black, dense	15		Sample	14-21-31			16	109		
18.0	medium dense			Sample	19-18-17 N=35			18	106		
	Boring Terminated at 18 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-6

BORING LOG NO. B-04

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company Scottsdale, AZ

SITE: 285 Shiloh Road Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5267° Longitude: -122.7846°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.5	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris										
	FAT CLAY WITH SAND (CH), fine grained, high plasticity, dark gray to dark brown, stiff				2-5-7	2.2 (HP)	2.08	21	98		
7.0	sandy, brown, very stiff	5			6-10-15	4.5 (HP)		17	107		
9.0	**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, reddish brown to yellow, medium dense, rounded gravel to 1.5 inches in dimension				10-14-16			13	108		
13.0	**CLAYEY SAND (SC)**, fine to medium grained, brown to yellow, dense	10			12-22-25			18	97		
	LEAN CLAY (CL), trace sand, medium plasticity, tan to red, medium stiff to stiff	15			3-4-7	3.1 (HP)		28	89		
		20									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" HSA

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

While sampling

At completion of drilling

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-7

BORING LOG NO. B-04

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5267° Longitude: -122.7846°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, medium plasticity, tan to red, medium stiff to stiff *(continued)* trace silt, gray to olive, stiff				4-7-9	3.5 (HP)		40	77		
			∇ (while sampling)								
	25.0	25	∇ (at completion of drilling)								
	SANDY FAT CLAY (CH), trace organics, fine grained, high plasticity, dark bluish gray mottled with red, soft				1-2-2	1.7 (HP)		50	72		70
	28.0										
	SILTY SAND (SM), fine to coarse grained, greenish black, medium dense	30			6-9-16			39	81		30
	32.0										
	SANDY SILT (ML), fine grained, nonplastic, greenish black, very stiff	35			10-12-15			35	82		62
	40.0	40									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" HSA

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

∇ *While sampling*

∇ *At completion of drilling*

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-7

BORING LOG NO. B-04

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company Scottsdale, AZ

SITE: 285 Shiloh Road Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5267° Longitude: -122.7846°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY SAND (SC), fine to medium grained, tan to orange, medium dense				7-7-8			27	79		39
	fine grained, gray to orange	45			6-7-14			29	88		18
	50.0										
	SANDY LEAN CLAY (CL), trace gravel, fine to medium grained, medium plasticity, dark brown to orange, very stiff	50			12-9-13	2.7 (HP)		30	90		60
	51.5										
	Boring Terminated at 51.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" HSA

Abandonment Method:
Boring backfilled with cement-bentonite grout upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *While sampling*
- *At completion of drilling*

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-7

BORING LOG NO. B-05

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company, Scottsdale, AZ

SITE: 285 Shiloh Road, Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5266° Longitude: -122.7854°

Depth (Ft.)	Description	Water Level Observations	Sample Type	Field Test Results	Laboratory HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
0.0–1.0	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris									
1.0–6.0	**LEAN CLAY WITH SAND (CL)**, fine grained, medium plasticity, brown, stiff, weak cementation									
				6-8-12			10	110		
	hard, moderate cementation			21-27-28	2.7 (HP)		27	93		
6.0–13.0	**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, brown mottled with orange, medium dense, rounded gravel to 2 inches in dimension			14-18-15	4.5 (HP)		15	108		18
				9-13-13			19	101		
13.0–18.0	**LEAN CLAY WITH SAND (CL)**, fine grained, medium plasticity, tan to black, stiff			4-7-9			24	97		
				4-6-10 N=16			27	95		
18.0	***Boring Terminated at 18 Feet***									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method: 6" SSA

Abandonment Method: Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon, 50 Golden Land Ct Ste 100, Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-8

BORING LOG NO. B-06

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5261° Longitude: -122.7854°

DEPTH (Ft.)	Material Description	Sample Type	Field Test Results	Laboratory HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
0.5	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris								
	LEAN CLAY WITH SAND (CL), fine to medium grained, low to medium plasticity, dark brown, medium stiff								
			3-3-5			28	93	32-21-11	77
5.0	**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, brown mottled with orange, medium dense		6-8-17			17	103		20
7.5	**SANDY LEAN CLAY (CL)**, fine grained, low plasticity, brown to black, very stiff, weak cementation		10-15-20			17	101		64
10.0	**CLAYEY SAND (SC)**, fine to coarse grained, tan to black, medium dense		6-9-21			20	103		
	fine grained, loose		4-5-7			29	80		
	loose to medium dense		4-4-5 N=9			22	100		
18.0	***Boring Terminated at 18 Feet***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-9

BORING LOG NO. B-07

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5261° Longitude: -122.7846°

DEPTH	Material Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris										
	SANDY LEAN CLAY (CL), fine grained, medium plasticity, dark brown, very stiff				6-8-16	5.75 (HP)	6.16	20	102		
7.0	trace gravel, low plasticity, tan	5			7-12-17			19	102		59
10.0	**CLAYEY SAND (SC)**, fine grained, tan, very dense				10-37-41			23	100		
12.5	**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, brown, medium dense	10			13-15-22			20	105		21
	LEAN CLAY WITH SAND (CL), fine grained, medium plasticity, tan to black, stiff	15			4-5-10			27	90		
18.0	very stiff				6-7-12 N=19			24	98		
	Boring Terminated at 18 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-10

BORING LOG NO. P-01

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company Scottsdale, AZ

SITE: 285 Shiloh Road Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5275° Longitude: -122.7843°

GRAPHIC LOG	DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2.0	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, light brown to brown, medium dense, undocumented fill, variable gravel and concrete debris				14-15-20			12	104		
		FAT CLAY WITH SAND (CH), fine to coarse grained, high plasticity, dark brown, stiff										
	6.5	tan to brown	5			5-8-11						
		Boring Terminated at 6.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-11

BORING LOG NO. P-02

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5271° Longitude: -122.7854°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, medium dense, undocumented fill, variable gravel and concrete debris										
	FAT CLAY WITH SAND (CH), fine to medium grained, high plasticity, dark brown, very stiff				6-10-14			13	94		51
6.5		5			4-6-12			22	92		
	Boring Terminated at 6.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-12

BORING LOG NO. P-03

PROJECT: Shiloh Road Senior Living Community

**CLIENT: The Wolff Company
Scottsdale, AZ**

**SITE: 285 Shiloh Road
Windsor, CA**

LOCATION See Exhibit A-2

Latitude: 38.5268° Longitude: -122.7843°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris										
	SANDY FAT CLAY (CH), fine grained, high plasticity, gray to dark brown, very stiff			X	12-13-15			8			
5.0		5									
	CLAYEY SAND (SC), fine to coarse grained, grey to brown, medium dense			X	11-13-13			11	102		
6.5	***Boring Terminated at 6.5 Feet***										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-13

BORING LOG NO. P-04

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5262° Longitude: -122.7843°

DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris										
	FAT CLAY (CH), trace sand, high plasticity, dark brown, medium stiff to stiff				4-5-6			23	96	58-22-36	90
5.0		5									
	CLAYEY SAND (SC), fine grained, tan to brown, medium dense				7-10-25			22	88		
6.5	***Boring Terminated at 6.5 Feet***										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-14

BORING LOG NO. P-05

PROJECT: Shiloh Road Senior Living Community

CLIENT: The Wolff Company
Scottsdale, AZ

SITE: 285 Shiloh Road
Windsor, CA

LOCATION See Exhibit A-2

Latitude: 38.5259° Longitude: -122.785°

GRAPHIC LOG	DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.5	**FILL - CLAYEY SAND WITH GRAVEL (SC)**, fine to medium grained, light brown to brown, undocumented fill, variable gravel and concrete debris										
		LEAN CLAY (CL), fine grained, medium plasticity, dark brown to tan, stiff				3-4-9			24	84		
	6.5	low plasticity, tan to brown, very stiff	5			6-10-21			19	98		
		Boring Terminated at 6.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" SSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

Boring Started: 11-02-2017	Boring Completed: 11-02-2017
Drill Rig: B-53	Driller: D. Peterson
Project No.: NB175148	Exhibit: A-15

APPENDIX – B
LABORATORY TESTING

Laboratory Testing

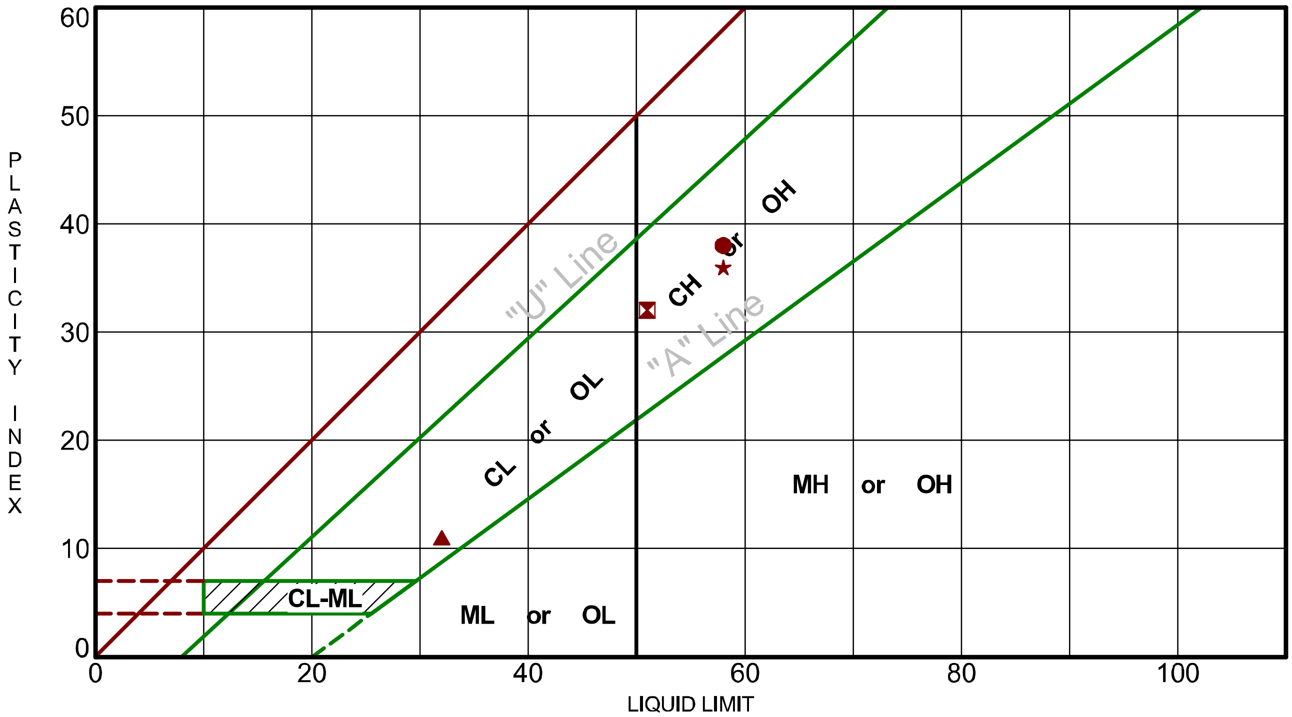
The project engineer reviews the field data and assigns various laboratory tests to better understand the engineering properties of the various soil strata as necessary for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods are applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
- ASTM D2166/D2166M Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
- ASTM D2844 Standard Test Method for Resistance R-Value
- AAWA 4500H pH Analysis
- ASTM D516 Water Soluble Sulfate
- ASTM D512 Chlorides
- ASTM G57 Soil Resistivity

The laboratory testing program often includes examination of soil samples by an engineer. Based on the material's texture and plasticity, we describe and classify the soil samples in accordance with the Unified Soil Classification System.

ATTERBERG LIMITS RESULTS

ASTM D4318



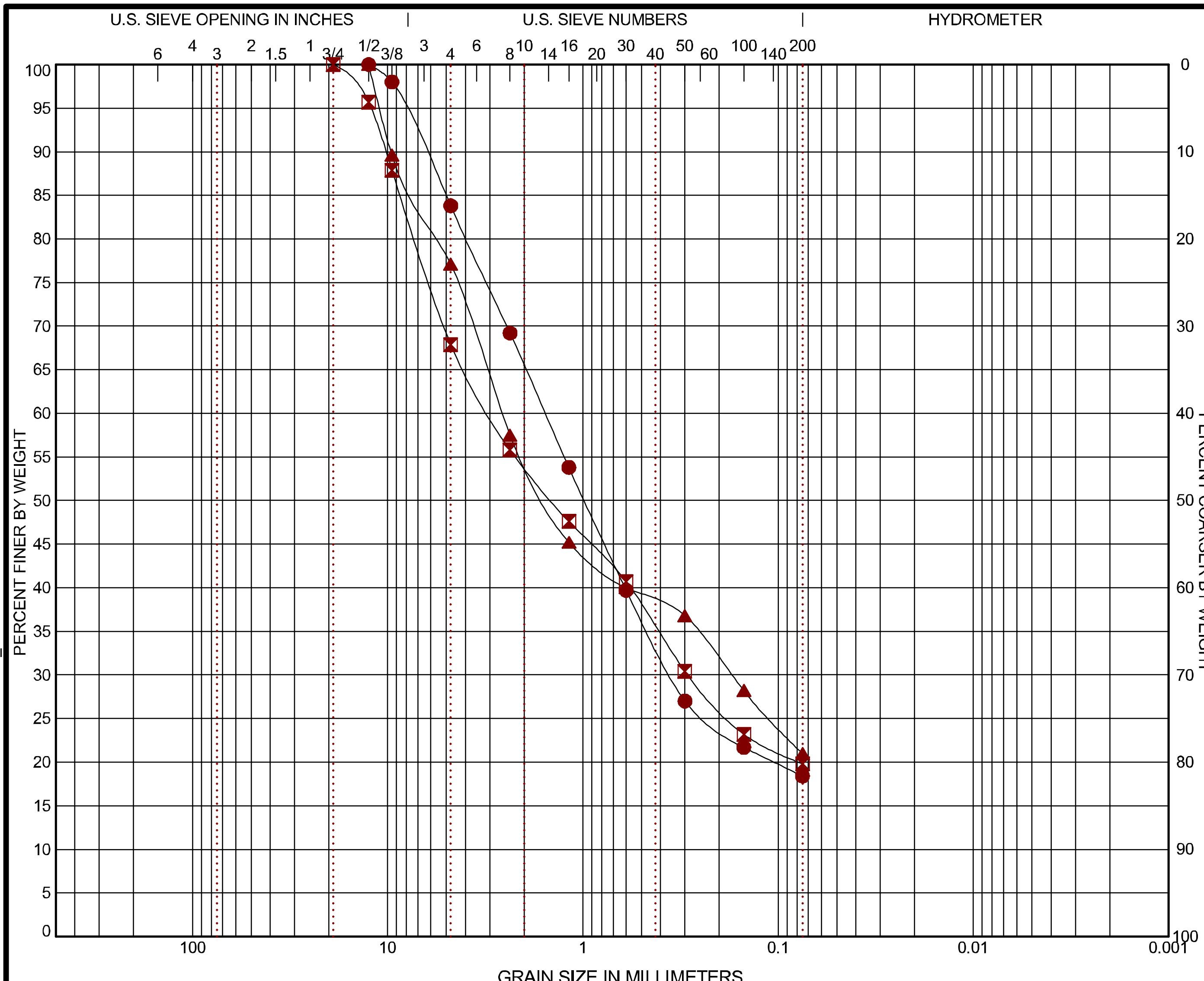
	Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
●	B-01	5 - 6.5	58	20	38	90	CH	FAT CLAY
⊠	B-02	2 - 3.5	51	19	32	77	CH	FAT CLAY with SAND
▲	B-06	2.5 - 4	32	21	11	77	CL	LEAN CLAY with SAND
★	P-04	1 - 2.5	58	22	36	90	CH	FAT CLAY

PROJECT: Shiloh Road Senior Living Community	PROJECT NUMBER: NB175148
SITE: 285 Shiloh Road Windsor, CA	CLIENT: The Wolff Company Scottsdale, AZ
	EXHIBIT: B-2

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**B-05**	**7.5 - 9**	**0.0**	**16.2**	**65.4**		**18.4**		
⊠	**B-06**	**5 - 6.5**	**0.0**	**32.1**	**48.1**		**19.8**		
▲	**B-07**	**10 - 11.5**	**0.0**	**22.9**	**56.1**		**21.0**		

	GRAIN SIZE		
	●	⊠	▲
D_{60}	**1.56**	**3.009**	**2.58**
D_{30}	**0.353**	**0.289**	**0.173**
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
1/2"	**100.0**	**3/4"**	**100.0**	**1/2"**	**100.0**
3/8"	**98.0**	**1/2"**	**95.7**	**3/8"**	**89.6**
#4	**83.8**	**3/8"**	**87.9**	**#4**	**77.1**
#8	**69.2**	**#4**	**67.9**	**#8**	**57.5**
#16	**53.8**	**#8**	**55.8**	**#16**	**45.2**
#30	**39.7**	**#16**	**47.6**	**#30**	**40.0**
#50	**27.0**	**#30**	**40.7**	**#50**	**36.8**
#100	**21.7**	**#50**	**30.4**	**#100**	**28.2**
#200	**18.4**	**#100**	**23.2**	**#200**	**21.0**
		#200	**19.8**		

SOIL DESCRIPTION
- ● CLAYEY SAND with GRAVEL (SC)
- ⊠ CLAYEY SAND with GRAVEL (SC)
- ▲ CLAYEY SAND with GRAVEL (SC)

REMARKS
- ●
- ⊠
- ▲

PROJECT: Shiloh Road Senior Living Community

SITE: 285 Shiloh Road
Windsor, CA

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

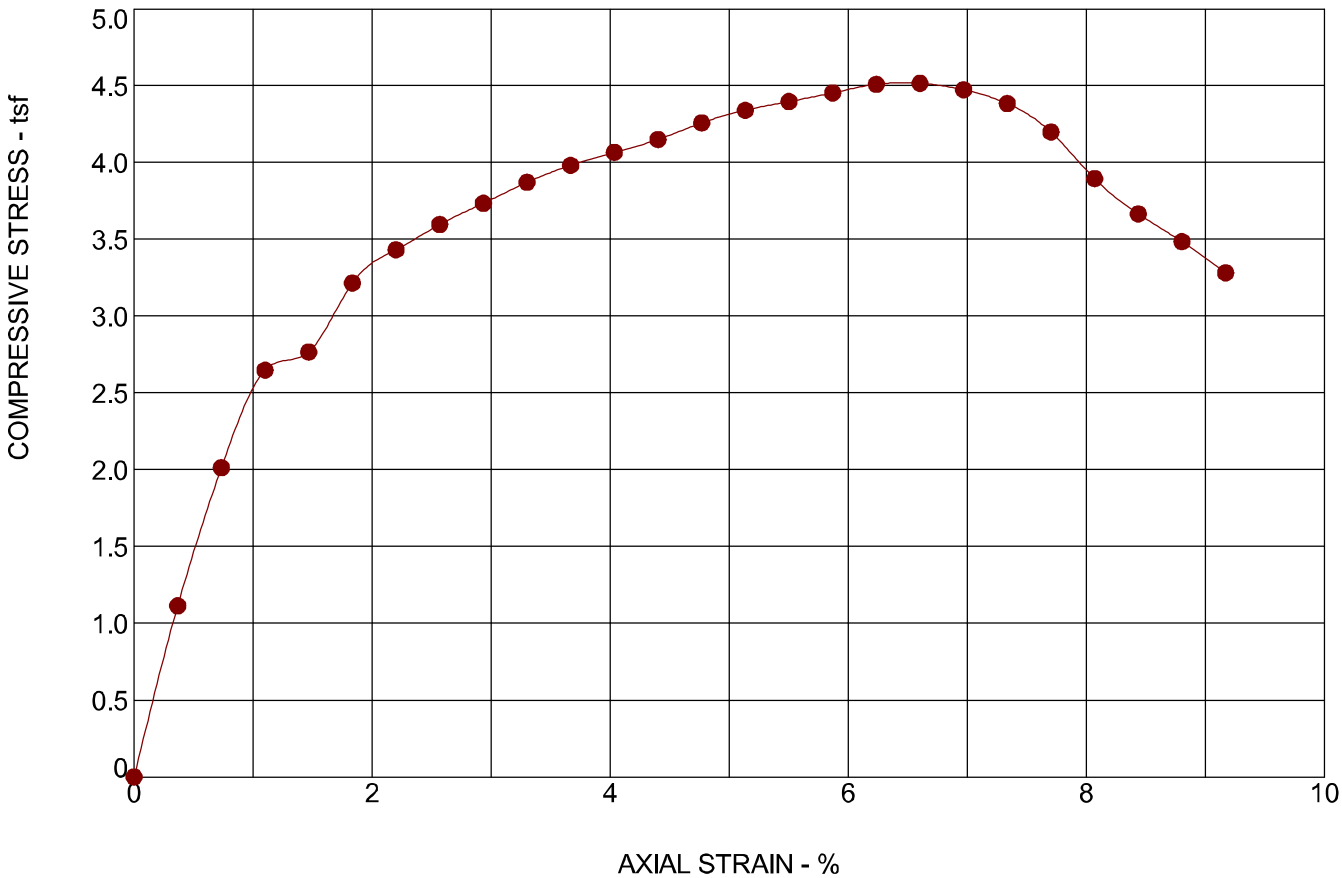
PROJECT NUMBER: NB175148

CLIENT: The Wolff Company
Scottsdale, AZ

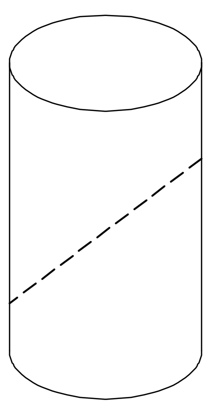
EXHIBIT: B-3

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE MODE	SPECIMEN TEST DATA		
	Moisture Content:	%	20
	Dry Density:	pcf	96
	Diameter:	in.	1.88
	Height:	in.	5.45
	Height / Diameter Ratio:		2.90
	Calculated Saturation:	%	
	Calculated Void Ratio:		
	Assumed Specific Gravity:		
	Failure Strain:	%	6.60
	Unconfined Compressive Strength	(tsf)	4.52
	Undrained Shear Strength:	(tsf)	2.26
	Strain Rate:	in/min	
	Remarks:		



Failure Mode: Shear (dashed)

SAMPLE TYPE: CA RING	SAMPLE LOCATION: B-02 @ 5 - 6.5 feet			
DESCRIPTION: FAT CLAY with SAND (CH)	LL	PL	PI	Percent < #200 Sieve

PROJECT: Shiloh Road Senior Living Community

SITE: 285 Shiloh Road
Windsor, CA

Terracon
50 Golden Land Ct Ste 100
Sacramento, CA

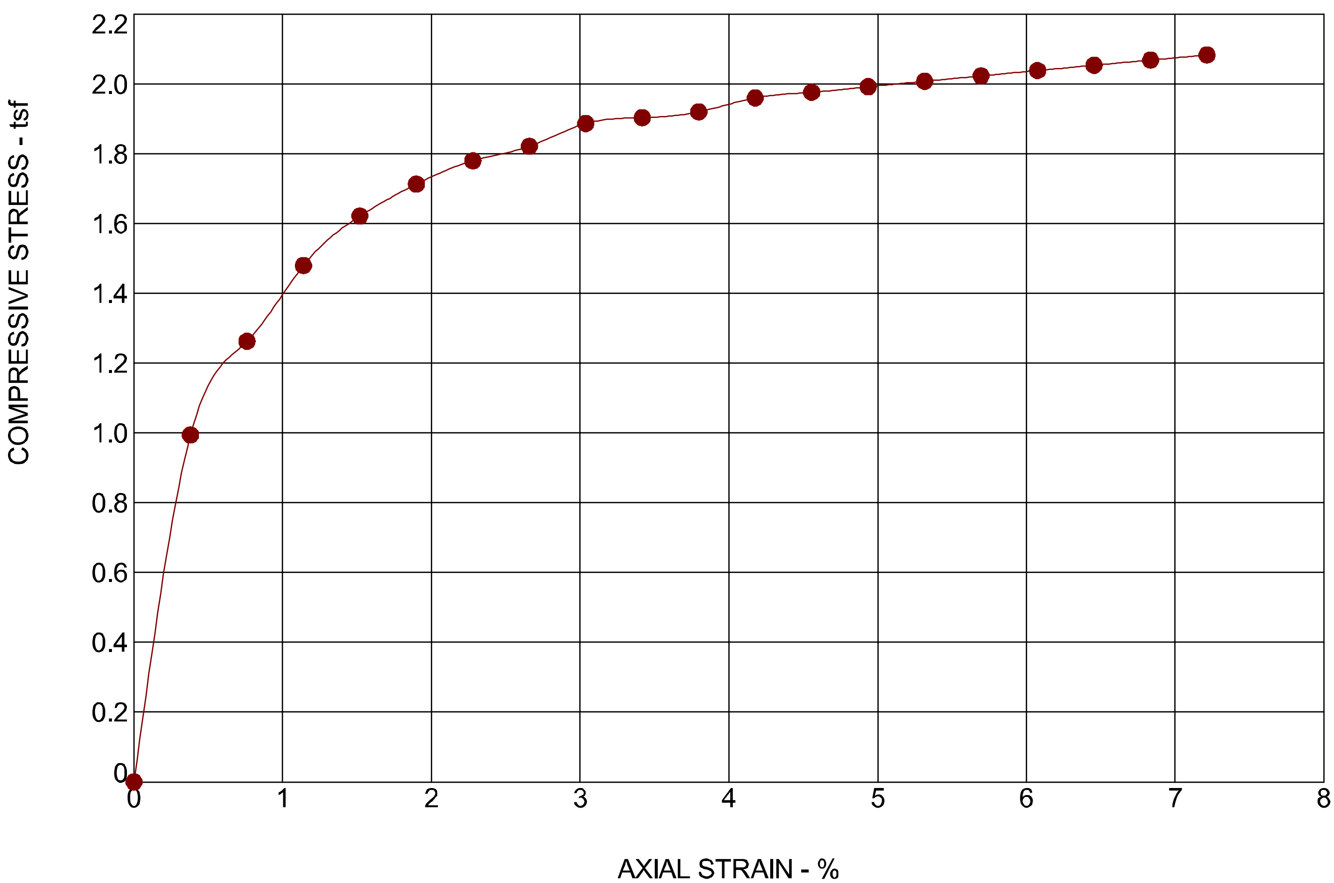
PROJECT NUMBER: NB175148

CLIENT: The Wolff Company
Scottsdale, AZ

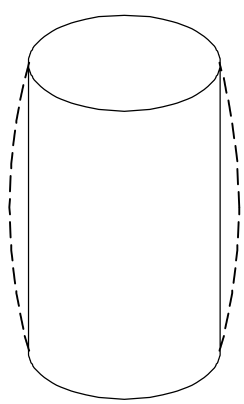
EXHIBIT: B-4

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE MODE



Failure Mode: Bulge (dashed)

SPECIMEN TEST DATA

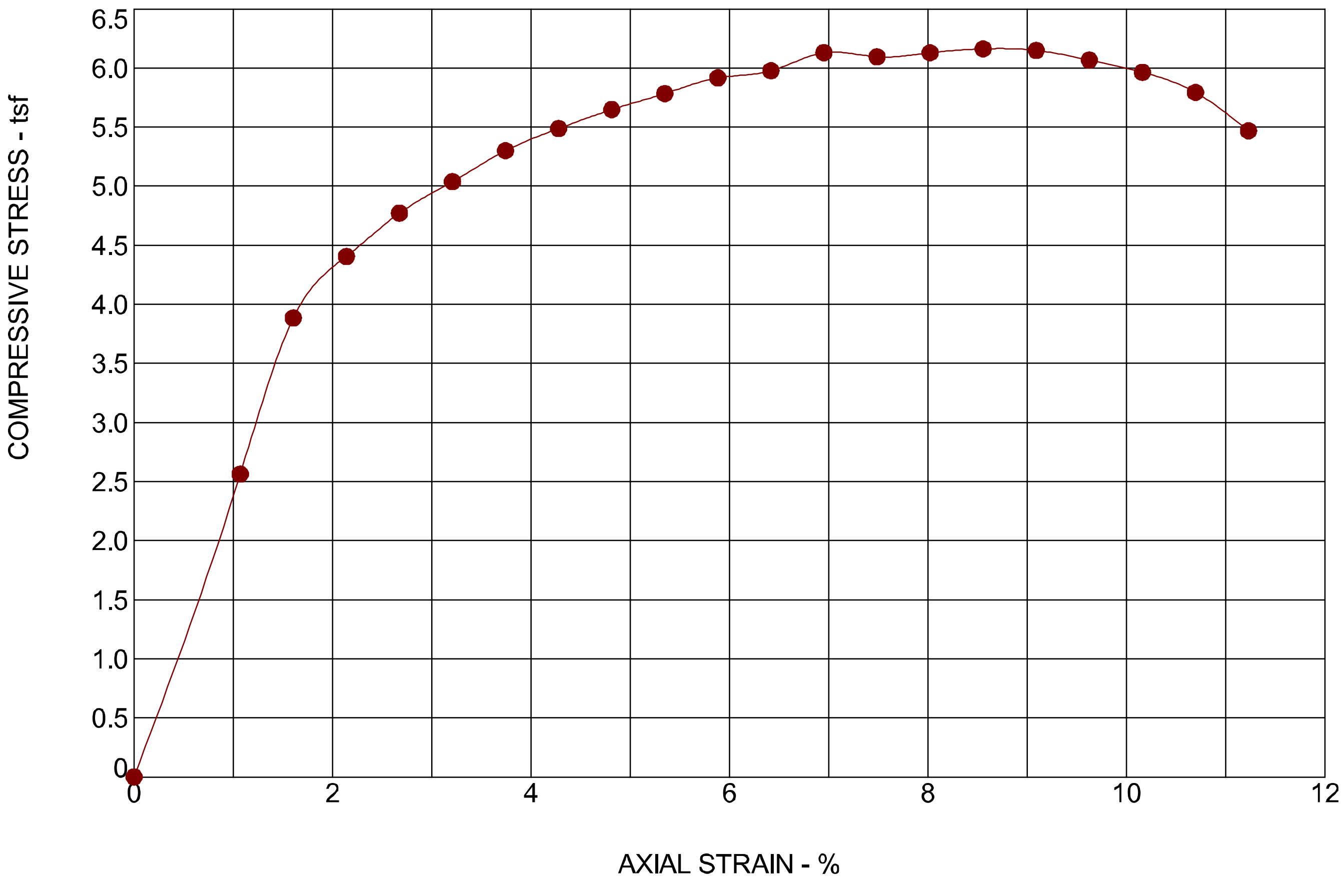
Moisture Content:	%	21
Dry Density:	pcf	98
Diameter:	in.	1.92
Height:	in.	5.27
Height / Diameter Ratio:		2.75
Calculated Saturation:	%	
Calculated Void Ratio:		
Assumed Specific Gravity:		
Failure Strain:	%	7.21
Unconfined Compressive Strength	(tsf)	2.08
Undrained Shear Strength:	(tsf)	1.04
Strain Rate:	in/min	
Remarks:		

SAMPLE TYPE: CA RING	SAMPLE LOCATION: B-04 @ 2.5 - 4 feet			
DESCRIPTION: FAT CLAY with SAND (CH)	LL	PL	PI	Percent < #200 Sieve

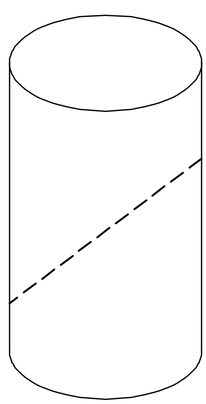
PROJECT: Shiloh Road Senior Living Community	Terracon 50 Golden Land Ct Ste 100 Sacramento, CA	PROJECT NUMBER: NB175148
SITE: 285 Shiloh Road Windsor, CA		CLIENT: The Wolff Company Scottsdale, AZ
		EXHIBIT: B-5

UNCONFINED COMPRESSION TEST

ASTM D2166



SPECIMEN FAILURE MODE	SPECIMEN TEST DATA		
	Moisture Content:	%	20
	Dry Density:	pcf	102
	Diameter:	in.	1.91
	Height:	in.	3.74
	Height / Diameter Ratio:		1.96
	Calculated Saturation:	%	
	Calculated Void Ratio:		
	Assumed Specific Gravity:		
	Failure Strain:	%	8.56
	Unconfined Compressive Strength	(tsf)	6.16
	Undrained Shear Strength:	(tsf)	3.08
	Strain Rate:	in/min	
	Remarks:		



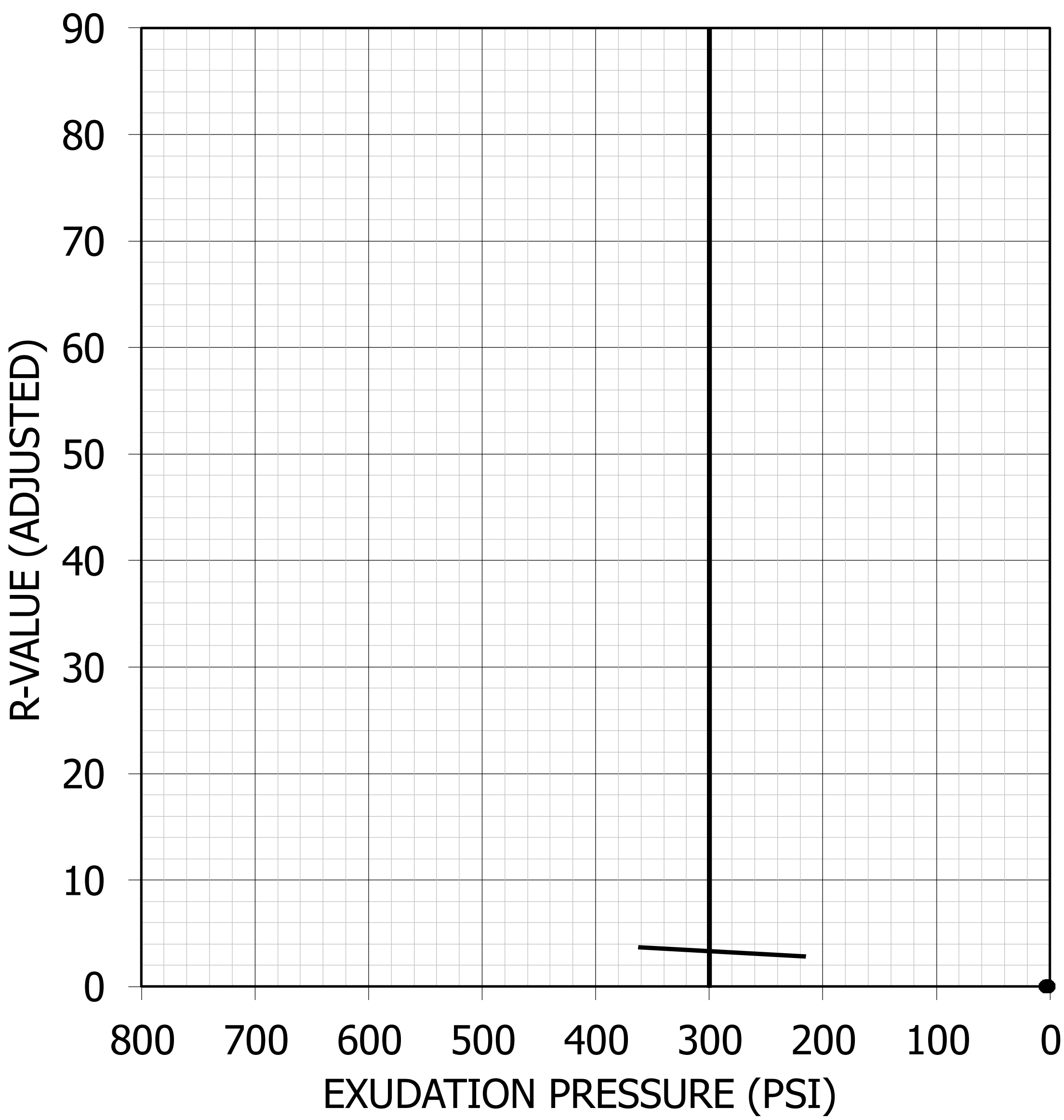
Failure Mode: Shear (dashed)

SAMPLE TYPE: CA RING	SAMPLE LOCATION: B-07 @ 2.5 - 4 feet			
DESCRIPTION: SANDY LEAN CLAY (CL)	LL	PL	PI	Percent < #200 Sieve

PROJECT: Shiloh Road Senior Living Community	Terracon 50 Golden Land Ct Ste 100 Sacramento, CA	PROJECT NUMBER: NB175148
SITE: 285 Shiloh Road Windsor, CA		CLIENT: The Wolff Company Scottsdale, AZ
		EXHIBIT: B-6

JOB NAME:	Shiloh Road Senior Living Comm.	JOB #:	NB175148
SAMPLE NUMBER:	1	Location:	TP 3
SAMPLE CLASSIFICATION:	Fat Clay		

R-VALUE GRAPH



R-VALUE AT 300 PSI EXUDATION PRESSURE: **<5**

NOTES:
Material visually and mechanically classified by Geotechnical Engineer PE and determined that soil R-Value would not exceed 5.

EXHIBIT: B-7

Terracon Consultants, Inc. 902 Industrial Way Lodi, California
P [209] 367 3701 F [209] 333 8303 terracon.com

CHEMICAL LABORATORY TEST REPORT

Project Number: NB175148
Service Date: 11/13/17
Report Date: 11/15/17
Task:

Terracon
750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client

Project
Shiloh Rd Senior Living

Sample Submitted By: Terracon (NB) **Date Received:** 11/10/2017 **Lab No: 17-1147**

Results of Corrosion Analysis

Sample Number	
Sample Location	B5-1-1
Sample Depth (ft.)	2
pH Analysis, AWWA 4500 H	8.91
Water Soluble Sulfate (SO4), ASTM D 516 (mg/kg)	77
Chlorides, ASTM D 512 (mg/kg)	53
Resistivity, ASTM G 57 (ohm-cm)	4317

Analyzed By:

Trisha Campo
Chemist

The tests were performed in general accordance with applicable ASTM, AASHTO, or DOT test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

APPENDIX - C
SUPPORTING INFORMATION

UNIFIED SOIL CLASSIFICATION SYSTEM

Shiloh Senior Living Community ■ Windsor, Sonoma County, California

November 17, 2017 ■ Terracon Project No. NB175148

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ‡ 4 and 1 £ Cc £ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or 1 > Cc > 3 [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ‡ 6 and 1 £ Cc £ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or 1 > Cc > 3 [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ‡ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ‡ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ‡ 30% plus No. 200 predominantly sand, add "sandy" to group name.

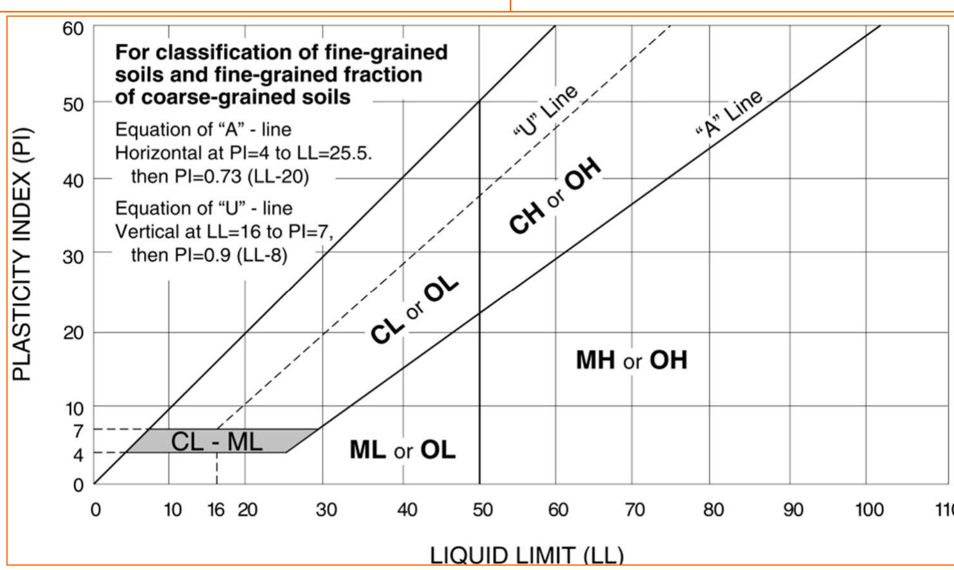
[M] If soil contains ‡ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ‡ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



USGS Design Maps Detailed Report

ASCE 7-10 Standard (38.5267°N, 122.78483°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1] S_S = 2.180 g

From Figure 22-2 [2] S_1 = 0.900 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index *PI* > 20, • Moisture content *w* ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

EXHIBIT: C-2

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at Short Period				
	$S_S \le 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \ge 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = D and S_S = 2.180 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE $_R$ Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \le 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \ge 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 0.900 g, F_v = 1.500

EXHIBIT: C-2

Equation (11.4–1): $S_{MS} = F_aS_S = 1.000 \times 2.180 = 2.180$ g

Equation (11.4–2): $S_{M1} = F_vS_1 = 1.500 \times 0.900 = 1.350$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4–3): $S_{DS} = ⅔\ S_{MS} = ⅔ \times 2.180 = 1.453$ g

Equation (11.4–4): $S_{D1} = ⅔\ S_{M1} = ⅔ \times 1.350 = 0.900$ g

Section 11.4.5 — Design Response Spectrum

From Figure 22-12 [3] T_L = 8 seconds

Figure 11.4–1: Design Response Spectrum

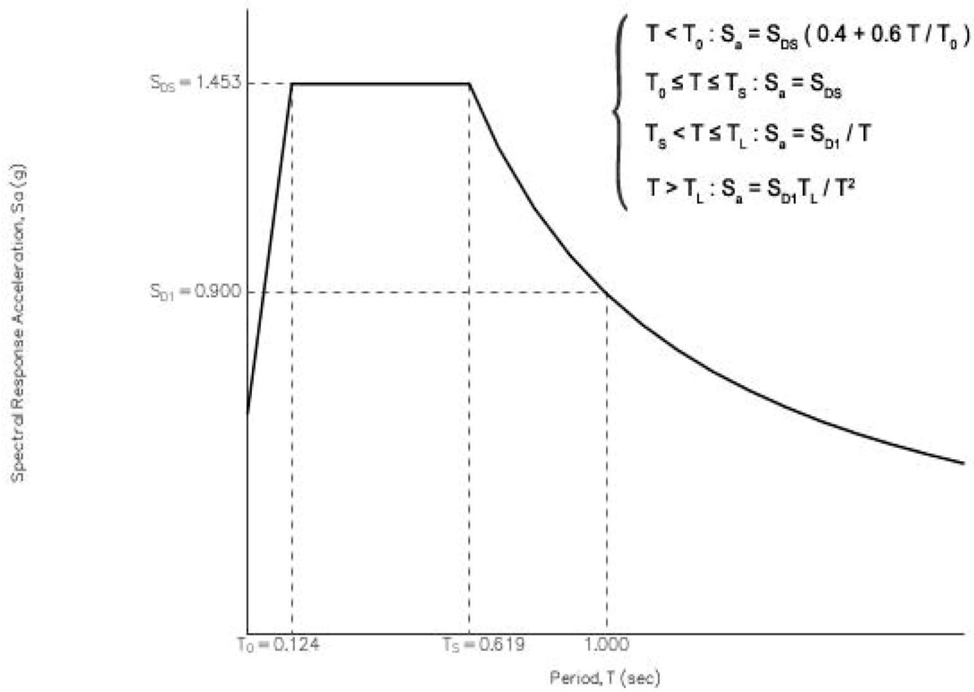


EXHIBIT: C-2

Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.

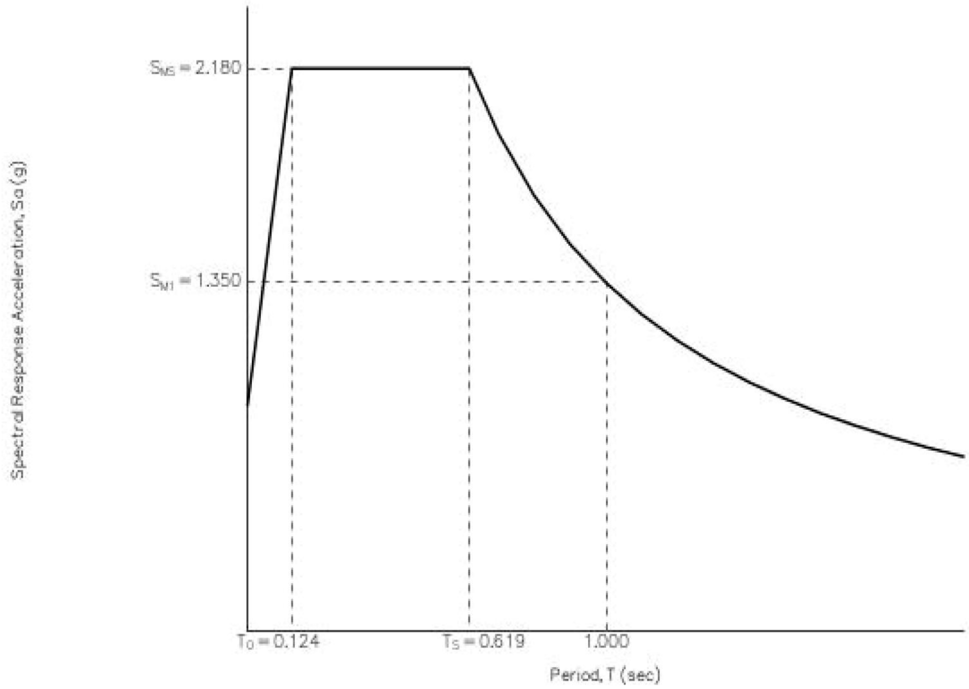


EXHIBIT: C-2

Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4]	PGA = 0.837
Equation (11.8–1):	$PGA_M = F_{PGA}PGA = 1.000 \times 0.837 = 0.837$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.837 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5]	C_{RS} = 0.952
From Figure 22-18 [6]	C_{R1} = 0.935

EXHIBIT: C-2

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 1.453 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 0.900 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = E

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

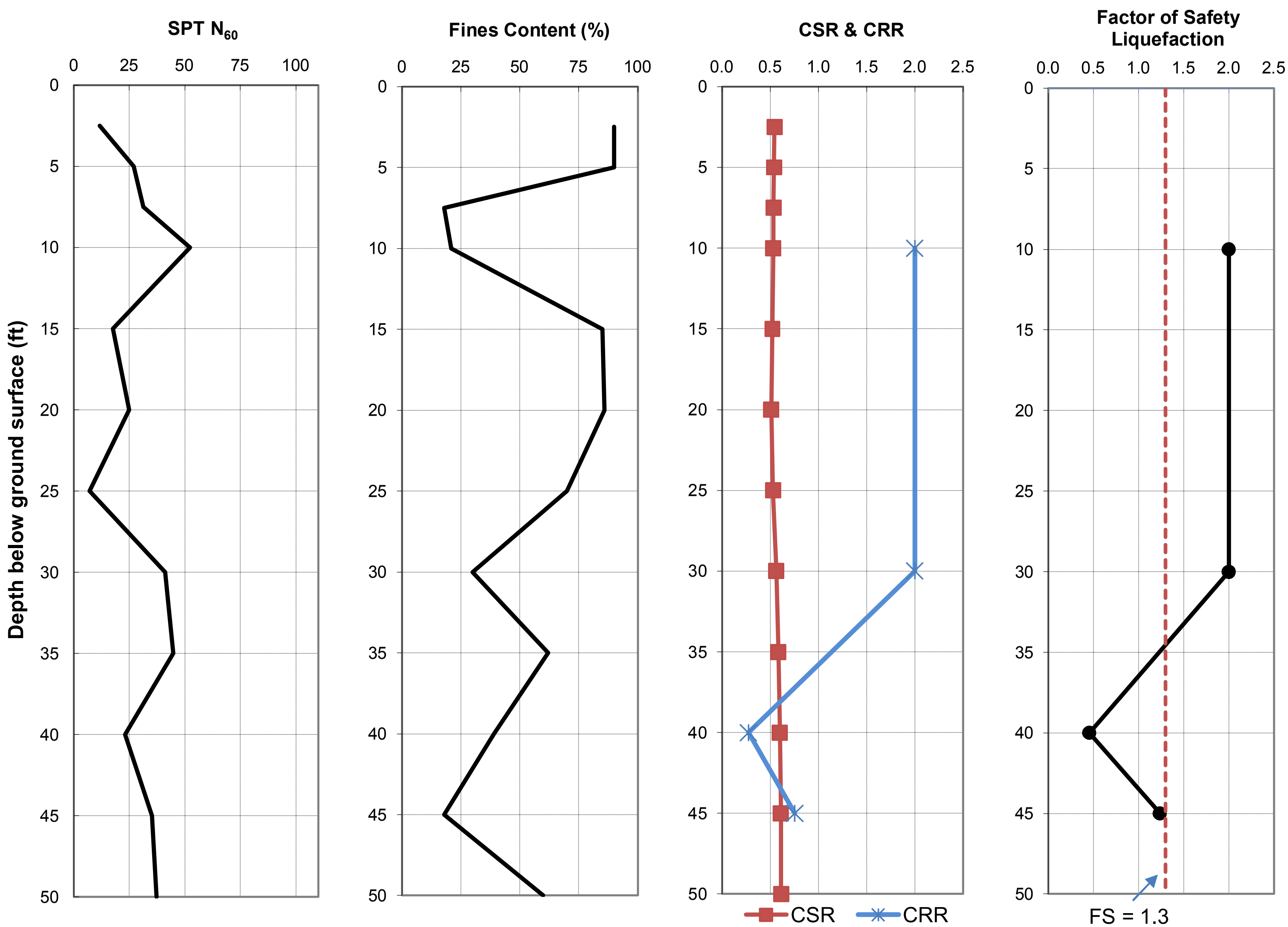
References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

EXHIBIT: C-2

APPENDIX – D
LIQUEFACTION ANALYSIS

Shiloh Road B-4



Kenneth L. Finger, Ph.D.
Consulting Paleontologist

18208 Judy St., Castro Valley, CA 94546-2306 510.305.1080 klfpaleo@comcast.net

February 4, 2019

Dana DePietro
FirstCarbon Solutions
1350 Treat Boulevard, Suite 380
Walnut Creek, CA 94597

Re: Paleontological Records Search: Revel Windsor Project (3249.0011), Town of Windsor, Sonoma County

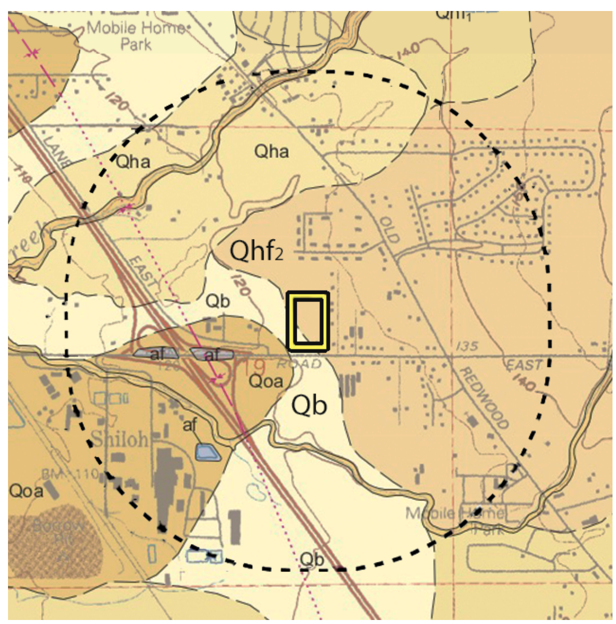
Dear Dr. DePietro:

As per your request, I have performed a records search on the University of California Museum of Paleontology (UCMP) database for the Revel Windsor project in the town of Windsor. This site is located on the north side of Shiloh Road and west side of Business Park Court. Its Public Land Survey (PLS) location is SW¼, NE¼, Sec. 19, T8N, R8W, Healdsburg quadrangle (USGS 7.5-series topographic map). Google Earth imagery shows this terrain is mostly covered with low-lying vegetation, and there appears to be evidence of prior agricultural use.

Geologic Units

Key to mapped units

af	Artificial fill (historical)
Qha	Alluvial deposits, undivided (latest Holocene)
Qhf_2	Older Holocene alluvial fan deposits
Qb	Basin deposits (Holocene to latest Pleistocene)
Qoa	Older alluvium (early–late Pleistocene, undivided)



According to the part of the geologic map by Delattre and Gutierrez (2013) shown here, the project site (outline at center) and much of the surrounding half-mile search area (dashed outline) are located on older Holocene alluvium (Qhf_2) and Holocene to latest Pleistocene basin deposits (Qb). Other units mapped in the search perimeter are latest Holocene alluvial deposits (Qha) and older alluvium (Qoa) of early to late Pleistocene age. The older alluvium is mapped adjacent to the southwest corner of the site, so it is likely to be in the site's shallow subsurface below the basin deposits. In turn, the basin deposits would extend in the shallow subsurface below the older Holocene alluvium; hence, Pleistocene deposits could be disturbed by excavations anywhere in the project site. Holocene deposits are too young to be fossiliferous, while Pleistocene deposits have a high paleontological sensitivity but low potential for significant paleontological resources.

Paleontological Records Search

The paleontological record search for the Revel Windsor project was performed on the UCMP (University of California Museum of Paleontology) database and focused on the Pleistocene of Sonoma County. The results are 12 vertebrate specimens from 10 localities ascribed to the Rancholabrean North Ameican Land Mammal Stage (NALMS), which is late Pleistocene; no plant localities are recorded. The paleofauna includes *Clemmys* (pond turtle), *Glossotherium harlandi* (Harlan's ground sloth), *G. robustus* (robust ground sloth), *Bison bison antiquus*, *Mammut americanum* (American mastodon). Nearest to the project site is V90056 (Rincon Valley West), 8 miles to the southeast, which yielded *Equus* (horse) teeth.

Remarks and Recommendations

Potentially fossiliferous deposits are mapped within the southwest corner of the project site but likely extend in the shallow subsurface below the rest of the site. I do not recommend paleontological monitoring at this time because few Pleistocene vertebrates have been recovered from Sonoma County and none was found within 8 miles of the site, Instead, I recommend that a professional paleontologist provide training of the project crew prior to construction activities so they are aware of what kinds of vertebrate fossils they should be on the lookout for and what they should do if any are encountered during excavations. On that visit to the site, the paleontologist should also perform a walkover survey of the site, primarily to inspect several barren areas visible on satellite imagery for any evidence of fossils.

Should any significant fossils (i.e., bones, teeth, or unusually abundant and well-preserved invertebrates or plants) be unearthed by construction activities, the construction crew should not attempt to remove them, as they could be extremely fragile and therefore prone to crumbling, and to allow for proper recording of the details of its occurrence. All work \should be diverted at least 15 feet from the discovery until a professional paleontologist has assessed the find and, if deemed significant, salvaged it in a timely manner. The paleontologist will then reassess whether a monitoring program should be initiated. Recovered fossils should be deposited in an appropriate repository, such as the UCMP, where they will be properly curated and made accessible for future study.

If I can be of further assistance on this project, please do not hesitate to contact me.

Sincerely

Reference Cited

Delattre, M.P, and Gutierrez, C.I., 2013. Preliminary geologic map of the Healdsburg 7.5' quadrangle, Sonoma County, California: a digital database version 1.0. ftp://ftp.consrv.ca.gov/pub/dmg/rgmp/Prelim_geo_pdf/Healdsburg24k_v1-0.pdf