GEOTECHNICAL ENGINEERING
AND LID INFILTRATION TEST RESULTS
DESTINO PASO
AIRPORT ROAD
PASO ROBLES, CALIFORNIA

April 11, 2016

Prepared for

Mrs. Karen Stier

Prepared by

Earth Systems Pacific
4378 Old Santa Fe Road
San Luis Obispo, CA 93401

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Earth Systems
Pacific

4378 Old Santa Fe Road
San Luis Obispo, CA 93401
Ph: 805.544.3276
esp@earthsystems.com
www.earthsystems.com

April 11, 2016

PID-000358-001

Mrs. Karen Stier
4301 Valley Meadow Road
Encino, CA 91436

PROJECT: DESTINO PASO
AIRPORT ROAD
PASO ROBLES, CALIFORNIA

SUBJECT: Geotechnical Engineering Report and LID Infiltration Test Results

REF: Proposal to provide a Geotechnical Engineering Report and LID Infiltration Testing, Destino Paso Hotel, Airport Road, Paso Robles, California, by Earth Systems Pacific, Doc. No. 1603-011.PRP, dated March 3, 2016

Dear Mrs. Stier:

As per your authorization of the referenced proposal, this geotechnical engineering report has been prepared for use in the development of plans and specifications for the proposed Destino Paso hotel project, in Paso Robles, California. Low Impact Development (LID) infiltration testing was also performed. Preliminary geotechnical engineering recommendations for site preparation, grading, utility trenches, foundations, interior slabs-on-grade and exterior pedestrian flatwork, screen and retaining walls, the swimming pool and spa, pavement sections, drainage and maintenance, and observation and testing are presented herein. Two bound copies and one electronic copy of the report are furnished for your use. As requested, an electronic copy has been forwarded as indicated below.

We appreciate the opportunity to have provided professional services for this project and look forward to working with you again in the future. If there are any questions concerning this report, please do not hesitate to contact the undersigned.

Sincerely,

Earth Systems Pacific

REGISTERED PROFESSIONAL ENGINEER
ROBERT W. DOWN
No. 70296
Exp. 9/30/16
CIVIL
STATE OF CALIFORNIA

Robert Down, PE
Senior Engineer
4/11/16

Kyle Martinez, PE
Project Engineer
4/11/16

REGISTERED PROFESSIONAL ENGINEER
KYLE J. MARTINEZ
No. 80666
Exp. 3/31/17
CIVIL
STATE OF CALIFORNIA

Copy to: Mr. Dick Sargon
North Coast Engineering, Attn.: Mr. Larry Werner
Stanton Architecture, Attn.: Mr. Michael Stanton

Doc. No.: 1604-024.SER/jr

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1.0 INTRODUCTION AND SITE SETTING

The new resort hotel will be constructed on the east side of Airport Road, approximately 0.5 miles north of its intersection with Highway 46 in Paso Robles, California. We understand that conceptual plans call for the site to be developed with three hotel buildings; a main hotel, a phase 2 hotel, and a lodge. At this phase of the development however, only the main hotel is planned for development and is, therefore the only structure addressed within this report. The structure will have a footprint of approximately 20,000 square feet, will be one to three stories, constructed of conventional stud framing, and will utilize slab-on-grade floors. We have assumed that conventional continuous and spread foundations are desired to support the structure. For the purposes of this report, we have assumed maximum continuous loads of 3 klf and maximum isolated loads of 150 kips.

Additional improvements will include a porte cochere, swimming pool, spa, pedestrian flatwork, landscaping, trash enclosures, and parking areas to serve the main hotel. Access to the hotel will be from Airport Road; the parking area will located on the east side of hotel. Roadway and parking areas will be surfaced with hot-mixed asphalt (HMA), Portland Cement Concrete (PCC), permeable pavers, or a combination of these. Low Impact Development (LID) Stormwater Control Measures (SCM), such as permeable pavers, bioswales, vegetated swales, and/or infiltration basins are planned to be incorporated into the project.

The site is currently occupied by a single family residence and barn structure. The planned location of the main hotel structure is relatively flat and lies at an elevation of approximately 100 feet higher than Airport Road. The site ascends mildly to the east from Airport Road for about 500 linear feet then transitions to a slightly steeper slope up to the proposed building pad area. Along the southern boundary of the building pad, the site descends at an approximate gradient of 3:1 to 2:1 (horizontal to vertical) for a height of about 35 feet. Grading for the planned improvements will entail cuts and fills on the order of 4 feet, or less; with less than 2 feet in the building area. Screen and/or retaining walls, not exceeding a height of 6 feet, may also be constructed to accommodate the planned grading. No sunken rooms or basements are planned for this project.

At the time that this report was prepared, the site was occupied with the single family residence and barn structures, and surfaced with seasonal grasses.

2.0 SCOPE OF SERVICES

The scope of work for the geotechnical engineering report included a general site reconnaissance, subsurface exploration, laboratory analysis of soil samples, geotechnical analysis of the data, and the preparation of this report. LID infiltration testing was also performed.

The geotechnical analysis and subsequent recommendations were based, in part, upon conceptual site plan and email information provided by Mr. Larry Werner of North Coast Engineering, the project's civil consultant. This report and recommendations are intended to comply with applicable requirements of Sections 1803.2 through 1803.6, J104.3 and J104.4 of the 2013 California Building Code (CBC), and common geotechnical engineering practice in this area under similar conditions at this time. The test procedures were accomplished in general conformance with the standards noted, as modified by common geotechnical engineering practice in this area under similar conditions at this time.

Preliminary geotechnical engineering recommendations for site preparation, grading, utility trenches, foundations, interior slabs-on-grade and exterior pedestrian flatwork, screen and retaining walls, the swimming pool and spa, pavement sections, drainage and maintenance, and observation and testing are presented herein. As there may be geotechnical issues yet to be resolved, the geotechnical engineer should be retained to provide consultation as the design progresses, to assist in verifying that the pertinent geotechnical issues have been addressed and to aid in the conformance with the intent of this report. It may also be advantageous to retain the geotechnical engineer to review the project plans as they near completion, to further aid in conformance of the plans with the intent of this report.

It is our intent that this report be used exclusively by the client to form the geotechnical basis of the design of the project and in the preparation of plans and specifications. Application beyond this intent is strictly at the user's risk.

This report does not address issues in the domain of contractors such as, but not limited to, site safety, loss of volume due to stripping of the site, shrinkage of soils during compaction, excavatability, temporary slope angles, shoring, construction means and methods, etc. Analyses of areal or site geology, or of the soil for corrosivity, lead or mold potential, radioisotopes, asbestos (either man-made or naturally occurring), hydrocarbons, or other chemical properties are beyond the scope of this report. Evaluation of ancillary features such as temporary access roads, fences, light and flag poles, signage, and nonstructural fills are all not within our scope and are also not addressed.

In the event that there are any changes in the nature, design, or location of improvements, or if any assumptions used in the preparation of this report prove to be incorrect, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report verified or modified in writing by the geotechnical engineer. The criteria presented in this report are considered preliminary until such time as any peer review or review by any jurisdiction has been completed, conditions are observed by the geotechnical engineer in the field during construction, and the recommendations have been verified as appropriate, or modified in writing by the geotechnical engineer.

As part of our work, infiltration tests were performed in the proposed LID improvement areas. The results of the tests were tabulated and conclusions were developed regarding the *general* suitability of the areas tested for disposal of stormwater runoff. However, specific evaluation of the infiltration test results, and development of infiltration criteria as they pertain to location, sizing, and design of stormwater systems are the responsibility of others.

3.0 FIELD INVESTIGATION

Exploratory Borings

On March 15, 2016, six exploratory borings were drilled to a maximum depth of 21.5 feet below the existing ground surface at the site. The approximate locations of the borings are shown on the Boring and Infiltration Test Location Map in Appendix A. A CME-75 Drill rig, equipped with an 8-inch outside diameter hollow stem auger and an automatic trip hammer for sampling was used to drill the borings. As the borings were drilled, soil samples were retrieved using a ring-lined barrel sampler (ASTM D 3550-01/07, with shoe similar to D 2937-10). Standard Penetration Tests (ASTM D 1586-11) were also conducted at selected depths in the borings and bulk samples were obtained from the auger cuttings.

Soils encountered in the borings were categorized and logged in general accordance with the Unified Soil Classification System and ASTM D 2488-09a. Logs of the borings are presented in Appendix A, along with a boring log legend. In reviewing the boring logs and legend, the reader should recognize that the legend is intended as a guideline only, and there are a number of conditions that may influence the soil characteristics as observed during drilling. These include, but are not limited to, the presence of cobbles or boulders, cementation, variations in soil moisture, presence of groundwater, and other factors. Consequently, the logger must exercise judgment in interpreting soil characteristics, possibly resulting in soil descriptions that vary from the legend.

LID Infiltration Borings

Also on March 15, 2016, eight infiltration test borings will drilled at the site using the same drill rig described above. The approximate locations of the test borings are shown on the Boring and Infiltration Test Location Map in Appendix A. The test borings are designated on the map as Infiltration Test Locations A through H and were drilled to depths ranging from 3.5 to 10 feet below the existing ground surface. The test procedure and results of the testing are discussed in the "LID Infiltration Testing" section below.

4.0 LABORATORY ANALYSIS

Selected ring samples were tested for bulk density (ASTM D 2937-10) and moisture (ASTM D 2216-10); two ring samples were tested for cohesion and angle of internal friction by direct shear (ASTM D 3080/D3080M-11). One bulk sample was tested for maximum density and optimum moisture (ASTM D 1557-12), expansion index (ASTM D 4829-11), sieve analysis (ASTM D 422-63/07), and R-Value (ASTM D 2844/D2844M-13). A second bulk sample was also tested for maximum density and optimum moisture. The laboratory test results can be found in Appendix B.

5.0 GENERAL SUBSURFACE PROFILE

Similar subsurface conditions were found throughout the site. The site was found to be surfaced with a 1 to 2.5-foot thick veneer of brown clayey sand topsoil in a loose to medium dense condition. Underlying the topsoil were deposits of the Paso Robles Formation. The Paso Robles Formation is a sedimentary formation that typically comprises mixtures of clay, silt, sand, and gravel. In some areas, the formation is characterized by rock-like structure, consistency and hardness, and is described as a sandstone, siltstone, claystone, or conglomerate material. In others, the material has more soil-like qualities. At this site, the formation exhibited soil-like qualities, and was logged as medium dense to very dense clayey sand and well graded sand. In Boring 2, a layer of hard sandy lean clay was encountered between 11 and 15.5 feet below the existing ground surface.

The soils were logged as being slightly moist to very moist. Free subsurface water was not encountered in any of the borings to the maximum depth explored of 21.5 feet

6.0 LID INFILTRATION TESTING

After drilling was completed, a 2-inch diameter perforated pipe was installed in each of the test borings and the annulus spaces around the pipes were filled with gravel. Infiltration testing was performed in general accordance with the referenced methods (Earth Systems Pacific 2013).

Initially, testing consisted of introducing water into each of the test borings to just below existing grade. This water level was then maintained at constant head for 30 minutes. After the 30-minute period, the water was shut off and the amount of water introduced into each of the test borings was recorded. Readings of the change in water level were then recorded at various time intervals over a period of approximately 2 to 5 hours. Following testing, the pipes were removed and the test borings were backfilled with on-site soil. The LID infiltration test results are presented in Appendix C.

Constant head infiltration testing resulted in introducing 0.01 to 1.39 cubic feet of water over a period of 30 minutes at 3.0 to 9.5 feet of head. Initial and final falling head tests resulted in infiltration rates of 4 to 444 inches per hour and 1 to 32 inches per hour, respectively. These test results indicate generally slow rates of infiltration in Infiltration Tests A though D and slow to moderate rates in Infiltration Tests E through H. It should also be noted that the rates are dependent upon head pressure. The test results only indicate the infiltration rates at the specific location and under specific conditions. Sound engineering judgment should be exercised in extrapolating the test results for other conditions or locations. Technical design references vary in methods they present for using these types of test results. However, most references include reduction, safety, and/or correction factors for several parameters including, but not limited to, size of the LID system relative to the test volume, number of tests conducted, variability in the soil profile, anticipated silt loading, anticipated biological buildup, anticipated long-term maintenance, and other factors. Typically, in aggregate these factors range from about 2.5 to 50 depending upon the method used. The final determination of the means by which these data are used is left to the design engineer.

7.0 CONCLUSIONS

In our opinion, the site is suitable, from a geotechnical engineering standpoint, for the proposed development and other improvements discussed in the “Introduction and Site Setting” section of the report, provided the recommendations contained herein are implemented in the design and construction. The primary geotechnical concerns at this site are the potential for differential settlement, and the proximity of the hotel structure, pool, and possible retaining walls to descending slopes. The expansion potential of the on-site materials, results of our seismic analysis, the potential for liquefaction, and the erodible nature of the site soils are also discussed below.

Differential Settlement

The planned finish floor elevation of the main hotel is currently unknown; however, based upon the anticipated cuts and fills described in the "Introduction and Site Setting" section of this report, there is a potential for the foundations of the structure to be founded in newly placed fill materials, in-site topsoil materials, in-situ Paso Robles formation materials, or a combination thereof. This creates a potential for differential settlement. Differential settlement occurs when the foundation of a particular structure spans materials having different settlement characteristics. This can stress and damage foundations, often resulting in severe cracks and displacement.

To reduce the potential of differential settlement, it is necessary for all foundations of the structure to bear within sufficiently uniform material. As a result, it is recommended that the foundations of the main hotel structure be founded within the underlying Paso Robles formation. If the building pad area is to be elevated above existing grade, additional and/or revised geotechnical engineering recommendations may be required.

Descending Slope

Foundations and/or improvements constructed on or near a descending slope may be subject to insufficient vertical and lateral support due to erosion, future grading, etc. Also, when a foundation, particularly one that carries sustained lateral loads such as the foundation of a retaining wall, sits near a descending slope, it tends to settle and move laterally toward the slope unless a sufficient depth and distance back from the slope is maintained. To reduce the potential for insufficient vertical and lateral support, and reduce potential for lateral movement, deepening of the footings or other measures may be necessary to ensure stability of the footings. This is further discussed in the "Foundations" and "Screen and Retaining Walls" sections of the report.

Expansive Soils

An expansion index test was performed on a sample of the Paso Robles formation, and produced a value of 0. This indicates that the on-site soils are nonexpansive and no remedial measures are considered to be necessary. It should be noted, however that a layer of sandy lean clay, which is believe to be expansive, was encountered in Boring 2 at an approximate depth of 11 feet below the existing ground surface. This is within the proposed pool and spa area. The depth of the pool is currently unknown, however if the excavation bottom for the pool shell is in close proximity to this layer, the pool should be adequately protected from expansive soils. This is further discussed in the "Swimming Pool and Spa" section of this report.

Seismic Analysis

A seismic analysis was undertaken to provide seismic acceleration design parameters. The ASCE 7-10 method (2013), available on the United States Geological Survey Earthquake Hazards Program website (USGS 2016), was used. The project was considered to be a "nonessential" facility from the perspective of risk category as described by the CBC. Site coordinates of 34.6504 degrees north and 120.6374 degrees west as taken from the Google Earth website (Europa Technologies 2016) were used in the analysis. Based upon the subsurface conditions encountered during our investigation, Site Class C (very dense soil) was used. The results of the seismic hazard analysis are presented in the "Foundations" section of this report.

Liquefaction Potential

Considering that the site us primarily underlain by Paso Robles Formation which dates to about 400,000 years ago, and was further logged as being medium dense to very dense, it is our opinion that the potential for liquefaction and seismically induce settlement to occur is very low.

Erosion Potential

The soils are considered to be highly erodible. Caution should be exercised to protect the soil from erosion during and following construction.

8.0 PRELIMINARY GEOTECHNICAL ENGINEERING RECOMMENDATIONS

These recommendations are applicable for the new development as described in the "Introduction and Site Setting" section of this report. If other improvements not previously mentioned are included, the geotechnical engineer should be contacted for revised recommendations.

Unless otherwise noted, the following definitions are used in these recommendations presented below. Where terms are not defined, definitions commonly used in the construction industry are intended.

- **Pad Grade:** The elevation of the building pad as shown on the grading plan; if no elevation is shown on the grading plan, the elevation to which the grading contractor typically will place compacted fill in the building area. Does not include any sand or gravel layer specified for protection of slabs from subsurface moisture.

- **Building Area:** The area within and extending to the perimeter foundation of the building. Includes the porte cochere, and any flatwork, exterior stairways, covered walkways, etc., which are connected to the building and are expected to perform in a manner similar to it.
- **Pool Area:** The footprint of the proposed swimming pool and spa.
- **Deck area:** The footprint of the planned pool deck.
- **Retaining and Screen Wall Foundation Areas:** The footprint of the footing for screen and/or retaining walls.
- **Flatwork Area:** Exterior PCC areas such as sidewalks, decks, and patios which will only be subjected to pedestrian foot traffic.
- **Pavement Areas:** The area within and extending to the perimeter of any areas to receive HMA, PCC, and/or permeable pavers that are to accommodate vehicle loads.
- **Grading Area:** The entire area to be graded, including the building area, pool area, deck area, retaining and screen wall foundation areas, flatwork areas, pavement areas, and other areas to receive site improvements.
- **Scarify or Scarified:** Ripping, or plowing of the soil in two orthogonal directions to a minimum depth of 12 inches prior to moisture conditioning and compaction.
- **Moisture Conditioning:** Adjusting the water content of the soil to optimum moisture content, or just above, and thoroughly mixing the soil prior to application of compactive effort.
- **Compaction or Compacted:** Scarified soils, or fill or backfill soils placed in level lifts not exceeding 8 inches in loose thickness, and compacted to a minimum of 90 percent of the maximum dry density, unless stated otherwise. Standard tests used to establish maximum dry density and field density should be ASTM D 1557-12 and ASTM D 6938-15 respectively, or other methods acceptable to the geotechnical engineer and jurisdiction.

Site Preparation

1. Throughout the grading area, the ground surface should be prepared for grading by removing all existing vegetation, large roots, debris, and other deleterious materials.

2. Existing utility lines that will not remain in service should be either removed or properly abandoned. The appropriate method of utility abandonment will depend upon the type and depth of the utility. Recommendations for abandonment can be made as necessary.

3. Voids created by the removal of materials or utilities described above and extending below the recommended depth of overexcavation should be called to the attention of the geotechnical engineer. No fill should be placed unless the underlying soil has been observed by the geotechnical engineer.

Grading

Building Area

1. Following site preparation, the soils in the building area should be excavated to pad grade elevation. The resulting soil surface should be scarified, moisture conditioned, and recompacted. If fill is required to reach pad grade, the exposed soil surface should be scarified, moisture conditioned, and recompacted prior to the placement of any fill. All fill in the building area should be nonexpansive as described below.

2. The soil in foundation footprint for the building and porte cochere should be excavated to planned bottom-of-footing elevation. The resulting soil surface should be moisture conditioned and recompacted. This should also be performed for any improvements connected to the building, intended to perform in a similar manner as the building, and supported by a conventional continuous or spread foundation.

Pool and Deck Areas

1. Following site preparation, the pool area should be excavated to a minimum of 6 inches below planned bottom-of-pool shell. As discussed in the "Conclusions" section, sandy lean clay soils may be found near the bottom of the pool shell. If clay soils are encountered at the bottom of the excavation, the excavation should be deepened by an additional 6 inches.

2. Following site preparation, the deck area should be excavated to planned bottom-of-deck elevation. The resulting soil surface should be scarified, moisture conditioned, and recompacted. All fill in the deck area should be nonexpansive.

Retaining and Screen Wall Foundation Areas

The soil in foundation areas for retaining screen walls should be excavated to planned bottom-of-footing elevation (not including any keyway). The resulting soil surface should be moisture conditioned and recompacted.

Flatwork Areas

The soil in areas to receive pedestrian flatwork should be excavated to subgrade elevation. The resulting soil surface should be scarified, moisture conditioned, and recompacted. If fill is required to reach subgrade, the exposed soil surface should be scarified, moisture conditioned, and recompacted prior to the placement of any fill.

Pavement Areas

Following site preparation, the pavement areas should be excavated to planned subgrade elevation. The resulting surface should be scarified, moisture conditioned, and recompacted *to a minimum of 95 percent of maximum dry density*. If fill is required to reach subgrade elevation, the prepared soil surface should be scarified, moisture conditioned, and recompacted prior to placement of fill. Fill should then be placed and compacted; the upper 12 inches of the subgrade and all aggregate base in areas to receive pavement should be compacted *to a minimum of 95 percent of maximum dry density*. Subgrade and aggregate base should be firm and unyielding when proofrolled with heavy, rubber-tired grading equipment prior to continuing construction.

Grading - General

1. In the remainder of the grading area, the prepared soil surfaces soil should be scarified, moisture conditioned, and recompacted prior to the placement of any fill.

2. Where fill will be placed on existing slopes that are steeper than 10 percent, the slope or existing grade should be cut into level benches. Soil exposed in the benches should be scarified a minimum of 12 inches, moisture conditioned, and recompacted. The geotechnical engineer should be contacted for additional recommendations if fill is to be placed on slopes steeper than 20%.

3. Voids created by dislodging rocks and/or debris during scarification should be backfilled and compacted, and the dislodged materials should be removed from the work area.

4. Nonexpansive materials are defined as materials that fall in the GW, GP, GM, GC, SP, SW, SC and SM categories per ASTM D 2487-11, and that have an expansion index of 10 or less (ASTM D 4829-11). Any proposed nonexpansive materials, if necessary, should be reviewed by the geotechnical engineer before being brought to the site, and on an intermittent basis during placement.

5. Fill soils should be placed, moisture conditioned, and compacted. In areas to be paved, the upper foot of subgrade and all aggregate base should be compacted to a *minimum of 95 percent* of maximum dry density. Subgrade and aggregate base in areas to be paved should be firm and unyielding when proofrolled with heavy, rubber-tired grading equipment prior to continuing construction.

6. All materials used as fill should be cleaned of all debris and any rocks larger than 3 inches in maximum dimension. When fill material includes rocks, the rocks should be placed in a sufficient soil matrix to ensure that voids caused by nesting of the rocks will not occur and that the fill can be properly compacted.

7. If the soils are overly moist so that they become unstable or if the recommended compaction cannot be readily achieved, drying the soil to optimum moisture content, or just above, may be necessary. Placement of gravel layers or geotextiles may also be necessary to help stabilize unstable soils. If such conditions are found, the geotechnical engineer should be contacted to assist the contractor in selecting appropriate measures for stabilization of unstable soils.

8. Permanent cut and fill slopes should not exceed a 2:1 (horizontal to vertical) slope angle.

Utility Trenches

1. Utility trenches adjacent to foundations should not be excavated within the zone of foundation influence, as shown in Typical Detail A in Appendix D.

2. Utilities that must pass beneath a foundation should be placed with properly compacted utility trench backfill and the foundation should be designed to span the trench.

3. A select, noncorrosive sand should be used as bedding and shading immediately around utilities, and as backfill within the building area. The site soil, similar imported soil, or additional select import may be used for trench backfill above the bedding and shading, in trenches that lie beyond the building area.

4. In general, trench backfill should be compacted a minimum of 90 percent of maximum dry density. A minimum of 95 percent of maximum dry density should be obtained in the upper foot of subgrade and in all aggregate base in pavement areas.

5. Trench backfill should be placed in level lifts not exceeding 6 inches in loose thickness and compacted to the minimums recommended above.

6. Compaction of trench backfill by jetting or flooding is not recommended except under extraordinary circumstances. However, to aid in *encasing* utility conduits, particularly corrugated drain pipes, and multiple, closely spaced conduits in a single trench, jetting or flooding may be useful. Flooding or jetting should only be attempted with extreme caution, and any jetting operation should be subject to review by the geotechnical engineer.

7. Long-term settlement of properly compacted imported sand or gravel trench backfill should be assumed to be about 0.25 to 0.5 percent of the depth of the backfill. Where trenches are backfilled with site soils, the anticipated settlement would be somewhat greater that of sand or gravel backfill. Improvements that are constructed over or near trenches should be designed to accommodate the potential for settlement.

8. Where utility trenches will pass through areas intended for infiltration, lean concrete or sand/cement slurry plugs should be placed in the trenches at the perimeter of the infiltration area to ensure that the stormwater is contained within the infiltration area and will not flow throughout the site in the utility trenches. The plugs should extend a minimum of 2 feet below the bottom of the trench and should be cut a minimum of 2 feet into the sides of the trench. The top of the plug should extend upward to the curb, cut off wall, or other feature intended to contain the infiltration area. If sand/cement slurry is used, is should contain a minimum of 3 sacks of cement per cubic yard of slurry mixture.

9. The recommendations of this section are minimums only, and may be superseded by the architect/engineer, requirements of pipe manufacturers, utility companies or the governing jurisdiction based upon soil corrosivity or other factors.

Foundations

1. Continuous and spread (pad) footings bearing a minimum of 6 inches into compacted Paso Robles formation material may be used to support the proposed main hotel. Footings supporting one or two stories should penetrate a minimum of 18 inches below pad grade or the lowest grade within 5 feet of the footing, whichever is deeper. Footings supporting three stories should penetrate a minimum of 24 inches below pad grade or the lowest grade within 5 feet of the footing, whichever is deeper.

2. Continuous footings should be reinforced, at a minimum, by two No. 5 rebar, one at the top and one at the bottom, or as required by the architect/engineer. Spread footings should be reinforced in accordance with the requirements of the architect/engineer.

3. Footings bearing in compacted Paso Robles formation material may be designed using maximum allowable bearing capacities of 2,500 psf dead load and 3,500 psf dead plus live loads. Using these criteria, maximum settlement and differential settlement are expected to be on the order of 3/4-inch and 1/2-inch in 25 feet, respectively.

4. In calculating resistance to lateral loads, a passive equivalent fluid pressure of 300 pcf for foundations bearing in Paso Robles formation may be used. A coefficient of friction for compacted soil of 0.4 may also be utilized in the design. Lateral capacity is based on the assumption that the soil adjacent to the foundations is properly undisturbed. Passive and friction resistance components may be combined in the analysis without reduction to either value.

5. Allowable capacities may be increased by one-third when transient loads such as wind or seismicity are included. Foundations may be designed using the following 2013 CBC seismic parameters:

SEISMIC PARAMETERS

Mapped Spectral Response Acceleration for Site Class B		**Site Coefficients for Site Class C**		**Adjusted MCE Spectral Response Accelerations for Site Class C**		**Design Spectral Response Accelerations for Site Class C**	
Seismic Parameter	Value (g)	Site Coefficient	Value	Seismic Parameter	Value (g)	Seismic Parameter	Value (g)
S_S	1.406	F_a	1.000	S_{MS}	1.406	S_{DS}	0.938
S_1	0.514	F_v	1.300	S_{M1}	0.668	S_{D1}	0.445
Peak Mean Ground Acceleration (PGA_M) : 0.511g							
Seismic Design Category: D							

6. Foundations constructed on or near a descending slope should be offset a minimum of 10 feet from the tops of any descending slopes, and deepened to maintain a minimum setback distance of 12 feet from the outermost face of the footing at its base to the face of the slopes.

7. Foundation excavations should be observed by the geotechnical engineer prior to placement of reinforcing steel or concrete. Footing excavations should be moisture conditioned prior to concrete placement.

Interior Slabs-on-Grade and Exterior Pedestrian Flatwork

1. Conventional interior slabs-on-grade and exterior pedestrian flatwork should have a minimum thickness of 4 full inches. All slabs and pedestrian flatwork should be reinforced per the specifications of the architect/engineer. At a minimum, nonstructural slabs should be reinforced with No. 3 rebar at 24-inch spacing each way; structural slabs should contain minimum rebar meeting the criteria of ACI-318, Section 7.12.2 (ACI 2011).

2. Due to the current use of impermeable floor coverings, water-soluble flooring adhesives, and the speed at which buildings are now constructed, moisture vapor transmission through slabs is a much more common problem than in past years. Where moisture vapor transmitted from the underlying soil would be undesirable, the slabs should be protected from subsurface moisture vapor. A number of options for vapor protection are discussed below; however, the means of vapor protection, including the type and thickness of the vapor retarder, if specified, are left to the discretion of the architect/engineer.

3. Where specified, vapor retarders should conform to ASTM E 1745-11. This standard specifies properties for three performance classes, Class “A”, “B” and “C”. The appropriate class should be selected based on the sensitivity of floor coverings to moisture intrusion and the potential for damage to the vapor retarder during placement of slab reinforcement and concrete.

4. Several recent studies, including those of American Concrete Institute (ACI) Committee 302, have concluded that excess water above the vapor retarder increases the potential for moisture damage to floor coverings and could increase the potential for mold growth or other microbial contamination. The studies also concluded that it is preferable to eliminate the typical sand layer beneath the slab and place the slab concrete in direct contact with a Class “A” vapor retarder, particularly during wet weather construction. However, placing the concrete directly on the vapor retarder requires special attention to using the proper vapor retarder (see discussion below), a very low water-cement ratio in the concrete mix, and special finishing and curing techniques.

5. Probably the next most effective option would be the use of vapor-inhibiting admixtures in the slab concrete mix and/or application of a sealer to the surface of the slab. This would also require special concrete mixes and placement procedures, depending upon the recommendations of the admixture or sealer manufacturer.

6. Another option that may be a reasonable compromise between effectiveness and cost considerations is the use of a subslab vapor retarder protected by a sand layer. If a Class "A" vapor retarder (see discussion below) is specified, the retarder can be placed directly on pad grade. The retarder should be covered with a minimum 2 inches of *clean* sand. If a less durable vapor retarder is specified (Class "B" or "C"), a minimum of 4 inches of clean sand should be provided on pad grade, and the retarder should be placed in the center of the clean sand layer. Clean sand is defined as well or poorly graded sand (ASTM D 2487-10) of which less than 3 percent passes the No. 200 sieve.

7. If sand is used between the vapor retarder and the slab, it should be moistened only as necessary to promote concrete curing; saturation of the sand should be avoided, as the excess moisture would be on top of the vapor retarder, potentially resulting in vapor transmission through the slab for months or years.

8. Regardless of the underslab vapor retarder selected, proper installation of the retarder is critical for optimum performance. All seams must be properly lapped, and all seams and utility penetrations properly sealed in accordance with the vapor retarder manufacturer's recommendations. Installation should conform to ASTM E 1643-11. The vapor retarder should be placed a minimum of 1 inch above the flow line of any drainage path surrounding the structure, 2 inches above retaining wall drains, or 1 inch above the area drain grates if area drains are used to collect runoff around the structure, whichever is higher.

9. Where it is desired to maintain the elevation of flatwork at doorways and other areas, the flatwork should be doweled to the perimeter foundations or adjacent improvements, at a minimum, by No. 3 dowels lapped to the flatwork rebar at 24 inches on-center. In other areas, the flatwork may be doweled to the foundation or the flatwork may be allowed to "float free," at the discretion of the architect/engineer. Flatwork that is intended to float free should be separated from foundations by a felt joint or other means.

10. To reduce shrinkage cracks in concrete, the concrete aggregates should be of appropriate size and proportion, the water/cement ratio should be low, the concrete should be properly placed and finished, contraction joints should be installed, and the concrete should be properly cured. This is particularly applicable to slabs that will be cast directly upon a vapor retarder and those that will be protected from transmission of vapor by use of admixtures or surface sealers. Concrete materials, placement, and curing specifications should be at the direction of the architect/engineer; ACI 302.1R-04 (ACI 2004) is suggested as a resource for the architect/engineer in preparing such specifications.

Screen and Retaining Walls

The following recommendations are for the screen and retaining walls described in the "Introduction and Site Setting" section with maximum wall heights of 6 feet.

1. Screen and site retaining walls should be founded in Paso Robles formation materials that have been moisture conditioned and recompacted per the recommendations presented in the "Grading" section of this report.

2. Foundations for all screen walls and site retaining walls up to 6 feet tall should have a minimum depth of 18 inches (not including keyway) below the lowest grade within 5 feet of the toe of the foundation. Wall foundations constructed on or near a descending slope should be deepened to maintain a minimum setback distance of 5 feet from toe of the footing at its base to the face of the slopes.

3. All retaining wall and sitework retaining wall excavations should be observed by the geotechnical engineer prior to placing reinforcing steel in the excavations.

4. Retaining wall design may be based on the following parameters:

   Active equivalent fluid pressure (site soil, imported sand, or gravel).....35 pcf

   At-rest equivalent fluid pressure (site soil, imported sand, or gravel).....55 pcf

   Passive equivalent fluid pressure (compacted fill) .....300 pcf

   Maximum toe pressure.....3,000 psf

   Coefficient of sliding friction..... 0.40

5. No surcharges are taken into consideration in the values presented above. The maximum bearing pressure is an *allowable* value to which factors of safety have been applied. No factors of safety, load factors or other factors have been applied to any of the remaining values.

6. The above pressures are applicable to a horizontal retained surface behind the wall. Walls having a retained surface that slopes upward from the wall should be designed for an additional equivalent fluid pressure of 1 pcf for the active case and 1.5 pcf for the at-rest case, for every degree of slope inclination.

7. Section 1803.5.12.1 of the 2013 CBC requires that dynamic seismic lateral earth pressures be provided by the geotechnical engineer for walls retaining more than 6 feet of backfill. Since the planned retaining wall heights for this project will not exceed a height of 6 feet, this is not considered to be necessary.

8. The final foot behind retaining walls should be backfilled with native soil, except in areas where pavement will abut the top of the wall. In those cases, the backfill should extend to the aggregate base underlying the pavement, as appropriate.

9. If crushed gravel is used as backfill, it should be vibrated by means of a vibrating plate compactor or other suitable equipment as it is placed. To reduce infiltration of the soil or other fines into any gravel backfill, if utilized, a permeable synthetic filter fabric conforming to the Standard Specifications (Caltrans 2010), Section 88-1.02B – Class C, should be placed between the two. Where backfill materials other than crushed gravel are utilized, they should be placed in level moisture conditioned lifts, not exceeding 6 inches in loose thickness, and compacted to a minimum of 90 percent of maximum dry density. Backfill within the upper foot of subgrade in areas to be paved, and in all aggregate base, should be compacted to a minimum of 95 percent of maximum dry density.

10. Long-term settlement of properly compacted imported sand or gravel retaining wall backfill should be assumed to be about 0.25 to 0.5 percent of the depth of the backfill. Long-term settlement of properly compacted site soil retaining wall backfill may be somewhat greater than that of sand or gravel backfill. Improvements that are constructed near the tops of retaining walls should be designed to accommodate the potential for settlement.

11. All retaining walls should be drained with perforated pipe encased in a free-draining gravel blanket. The pipe should be placed atop the wall foundation with perforations downward, and should discharge in a nonerosive manner away from foundations and other improvements. The gravel blanket should have a width of approximately 1 foot and should extend upward to approximately 1 foot from the top of the wall backfill. The upper foot should be backfilled with native soil and/or aggregate base, as described above. To reduce infiltration of the soil or other fines into the gravel, a permeable synthetic fabric, as defined above, should be placed between the two. Manufactured synthetic drains, such as Miradrain or Enkadrain are acceptable alternatives to the use of gravel, provided that they are installed in accordance with the recommendations of the manufacturer.

12. Where weep hole drainage can be properly discharged, the perforated pipe may be omitted in lieu of weep holes on maximum 4-foot centers. A filter fabric as described above should be placed between the weep holes and the drain gravel.

13. Walls facing areas where moisture transmission through the wall would be undesirable should be *thoroughly* waterproofed in accordance with the specifications of the architect/engineer.

14. The architect/engineer should bear in mind that retaining walls by their nature are flexible structures, and that surface treatments on walls often crack. Where walls are to be plastered or otherwise have a finish applied, the flexibility should be considered in determining the suitability of the surfacing material, spacing of horizontal and vertical control joints, etc. The flexibility should also be considered where a retaining wall will abut or be connected to a rigid structure, and where the geometry of the wall is such that its flexibility will vary along its length.

Swimming Pool and Spa

1. The pool area should be excavated as per the recommendations in the “Grading” section of this report.

2. The bottom of the excavation should be filled with 0.75 to 1.5-inch clean, *crushed* gravel to bottom-of-pool shell elevation. The gravel layer will function as a blanket drain beneath the pool and will provide a stable surface for placement of rebar and

construction of the pool. A rigid, 4-inch diameter PVC drain pipe should be placed from the lowest point of the gravel to daylight or a sump. Minimum slope of the drain pipe should be 1 percent. A screen or other means of keeping animals out should be fitted over the discharge end of the pipe.

3. As discussed in the "Conclusions" and "Grading" sections, if clay soils are exposed at the bottom of the pool area excavation, the excavation should be deepened an additional 6 inches and the *crushed* gravel section should be increased accordingly.

4. The drain system described above should not be relied upon to relieve all hydrostatic pressure in the event that the pool is drained. A hydrostatic relief valve should also be installed.

5. Expansion Index testing resulted in a value of 0. Accordingly, the pool and spa design may be based upon the nonexpansive soil category per CBC Table 18-I-B. If specific lateral pressures are needed for the designs, please see the "Screen and Retaining Walls" section. The design parameters in that section are for drained conditions.

6. The pool deck area should conform to the recommendations presented in the "Grading" section.

7. Unless there is a structural reason to do otherwise, the pool deck should be dowelled into the bond beams at the top of the pool shell by minimum No. 3 rebar lapped to the deck rebar. A felt or another type of spacer should be placed between the deck and the pool bond beam so that the connection will act as a hinge and allow minor movement between the deck and the pool shell. If the deck is not dowelled to the shell, more differential movement should be anticipated than if it is dowelled. Without the dowelling, a trip hazard could result around the rim of the pool.

8. The pool deck should slope toward drain inlets; no uncontrolled surface drainage should flow off the edges of the pool deck. All joints in the pool deck should be sealed with a flexible, UV resistant sealer.

Pavement Sections

HMA Pavement

The following HMA pavement sections are based upon a tested R-value, or resistance to deformation under repeated loading, of 21. The pavement sections are also based on assumed Traffic Indices (TIs) of 4.5 through 7.0. Determination of the appropriate TI for specific areas of the project is left to others. The AC sections were calculated in accordance with the method presented in the "Highway Design Manual" (Caltrans 2012). The calculated HMA and Class 2 aggregate base (AB) thicknesses are for compacted material. Normal Caltrans construction tolerances should apply. The R-value should be verified during construction.

R-value	Traffic Index	HMA (in)	Class 2 AB (in)
21	4.5	2.50	6.5
21	5.0	2.75	7.5
21	5.5	3.00	9.0
21	6.0	3.25	10.0
21	6.5	3.75	10.5
21	7.0	4.00	11.5

1. Aggregate base should conform to the requirements of Section 26 of the Standard Specifications (Caltrans 2010).

PCC Pavement

1. If plain Portland cement concrete pavement is planned, the following section is recommended:
    - 8 inches plain PCC (4,000 psi minimum)
    - #4 smooth joint dowels at 12-inch centers
    - 12 inches Class 2 aggregate base

2. If reinforced concrete pavement is planned, the following section may be used:
    - 6 inches PCC (4,000 psi minimum)
    - No. 4 rebar at 18-inch centers each way
    - No. 4 smooth joint dowels at 18-inch centers
    - 12 inches Class 2 aggregate base

3. Alternately, the pavement may be designed by the architect/engineer for the appropriate loads. Provided that a minimum of 12 inches of aggregate base compacted to a minimum of 95 percent is provided, the design may be based on a subgrade modulus of 300 pci (psi/in). Specification of concrete properties and reinforcing is left to the architect/engineer.

Permeable Pavers

1. Pavers should be installed per the manufacturer's recommendations.

2. Except where the paver manufacturer recommends otherwise, the pavers should generally be installed per ICPI Drawing ICPI-68 (ICPI 2011). A concrete curb should bound the outside of the pavers and the bed of No. 2 stone subbase; the subbase should not extend beyond the curb. The curb should be an "A" curb or a flush curb, as applicable and should penetrate a minimum of 6 inches below the subbase bed.

3. Unless otherwise recommended by the paver manufacturer, the structural paver section should consist of the following (from top to bottom):
   - Concrete pavers, 3.125-inch thickness, minimum
   - 1.5 to 2.0 inches No. 8 aggregate bedding course
   - 4 inches No. 57 open-graded stone base
   - 8 inches No. 2 stone subbase
   - Tensar, TriAx TX190 geogrid, or equivalent, conforming to the Greenbook, 2013 Supplement, Table 213-5.2 (E), Type R3 (BNI 2013)
   - Subgrade rolled to a smooth surface and compacted to the extent allowed by the architect/engineer; 95 percent of maximum dry density is preferable
   - Thickness of pervious concrete pavement is left to the discretion of the architect/engineer. Pervious concrete pavement should be placed over a minimum 8-inch thick layer of No. 57 open-graded stone base, No. 2 stone subbase, or a combination of the two. The subgrade should be rolled to a smooth surface and compacted to the extent allowed by the architect/engineer; 95 percent of maximum dry density is preferable. Tensar, TriAx TX190 geogrid, or equivalent, conforming to the Greenbook, 2013 Supplement, Table 213-5.2 (E), Type R3 (BNI 2013) should be placed over the subgrade

4. All No. 8 aggregate, No. 57 base, and No. 2 subbase should be *crushed*; rounded or river-run materials should not be used. Gradation of these materials should be per ASTM D 448-12. Drains should be provided in the subbase beneath the pavers as discussed in the following section.

5. The geogrid should be placed per the geogrid manufacturer's recommendations, throughout the subgrade area. At a minimum, the geogrid should be stretched tightly and pinned in position prior to placement of the subbase. Minimum overlap at roll ends and edges should be 2 feet unless the manufacturer recommends a larger overlap.

6. The No. 2 stone subbase should be placed over the geogrid and then rolled with a light static roller or otherwise compacted. At a minimum, rolling and compaction should be accomplished in two orthogonal directions.

7. The No. 57 base should then be placed and similarly compacted.

8. The No. 8 aggregate should then be placed and the pavers set as recommended by the manufacturer.

9. At a minimum, the permeable pavers should be properly maintained, and any ruts, depressions, broken pavers, etc. should be immediately repaired. Periodic removal of pavers and refurbishment of the No. 8 bedding course may also be necessary.

10. Permeable pavers should not be placed within 5 feet of any foundation. If for aesthetic reasons the pavers must encroach to within 5 feet of a foundation, the base and subbase should be discontinued and Portland cement concrete (PCC) should be used beneath the pavers.

11. In this 5-foot section adjacent foundations, the PCC beneath the pavers should have a minimum thickness of 5 full inches and should be reinforced, at a minimum by No. 4 rebar at 18-inch spacing each way. The PCC should be placed over a minimum 6 inches of Class 2 aggregate base compacted to a minimum of 95 percent of maximum dry density. The uppermost 12 inches of the subgrade beneath the aggregate base should be similarly compacted to a minimum of 95 percent of maximum dry density.

Pavement Sections - General

1. HMA and PCC pavement, and permeable pavers should be constrained by curbs, gutters, flatwork, walls, etc.; free edges to the pavement or pavers should be avoided.

2. HMA and PCC pavement, and permeable pavers should be set back a minimum of 4 feet from any descending slope. Alternately, deepened curbs may be used to constrain the pavement or paver sections. Where curbs will be deepened in lieu of the recommended set back, the individual situation should be reviewed and specific recommendations prepared by the geotechnical engineer.

3. The upper 12 inches of subgrade and all aggregate base in pavement areas should be compacted to a minimum of 95 percent of maximum dry density. Subgrade and aggregate base should be firm and unyielding when proofrolled with heavy, rubber-tired grading equipment prior to continuing construction.

4. Finished pavement surfaces should be sloped to freely drain toward appropriate drainage facilities. Water should not be allowed to stand or pond on or adjacent to pavement, as it could cause premature pavement deterioration or improvement damage.

5. To reduce migration of surface drainage into the subgrade, maintenance of pavement areas is critical. Any cracks that develop in the pavement should be promptly sealed.

6. The local jurisdiction may have additional requirements for pavement or pavers that could take precedence over the above recommendations.

Drainage and Maintenance

1. Unpaved ground surfaces should be *graded during construction* and, per Section 1804.3 of the CBC, *finish graded* to direct surface runoff away from foundations, slopes, retaining walls, and other improvements at a minimum 5 percent grade for a minimum distance of 10 feet. If this is not feasible due to the terrain, property lines, or other factors, swales with improved surfaces, area drains, or other drainage features should be provided to divert drainage away from these areas.

2. Finished surfaces should be sloped to freely drain toward appropriate drainage facilities. Water should not be allowed to stand or pond on or adjacent to foundations.

3. Any raised planter boxes constructed adjacent to the proposed structure should be installed with drains, and sealed sides and bottoms to reduce the potential for planter drainage gaining access to subslab areas. Drains should also be provided in all areas adjacent to foundations that would not otherwise drain freely.

4. All eaves of the building should be provided with roof gutters. Runoff from roof gutters, downspouts, area drains, etc., should discharge to an appropriate outlet in a nonerosive manner away from foundations and other improvements in accordance with the requirements of the governing agencies. Erosion protection should be placed at drainage outlets unless discharge is to an improved surface.

5. As recommended previously, where utility trenches will pass through areas intended for infiltration, lean concrete or sand/cement slurry plugs should be placed in the trenches at the perimeter of the infiltration area to ensure that the stormwater is contained within the infiltration area and will not flow throughout the site in the utility trenches. The plugs should extend a minimum of 2 feet below the bottom of the trench and should be cut a minimum of 2 feet into the sides of the trench. The top of the plug should extend upward to the curb, cut off wall, or other feature intended to contain the infiltration area. If sand/cement slurry is used, it should contain a minimum of 3 sacks of cement per cubic yard of slurry mixture.

6. The site soils are erodible. To reduce erosion damage, it is essential that the surface soils, particularly those disturbed during construction, be stabilized by vegetation or other means *during and following construction.* Care should be taken to establish and maintain vegetation. The landscaping and exterior flatwork should be installed to maintain the surface drainage recommended above.

7. Maintenance of drainage and other improvements is critical to the long-term stability of slopes and the integrity of the roadway improvements. Site improvements, particularly drainage improvements, should be inspected and maintained on a regular basis. All exterior drains should be maintained to be free-flowing.

8. Vegetation, erosion matting or other forms of erosion protection should be used in all areas disturbed by construction, as required by the architect/engineer. Vegetation, erosion matting, etc., should be maintained or augmented as needed to ensure a high level of erosion protection. Irrigation systems should be maintained so that the soils are not over-watered or allowed to desiccate.

9. To reduce the potential for disruption of drainage patterns and undermining of foundations and other improvements, rodent activity should be aggressively controlled.

Observation and Testing

1. It must be recognized that the recommendations contained in this report are based on a limited number of exploratory borings and rely on continuity of the subsurface conditions encountered. Therefore, the geotechnical engineer should be retained to provide consultation during the design phase, to review plans as they near completion, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation.

2. At a minimum, the geotechnical engineer should be retained to provide:
   - Consultation during the design phase
   - Professional observation during grading
   - Oversight of compaction testing during grading and backfill
   - Oversight of soil special inspection during grading and foundation construction

3. Special inspection of grading should be provided as per Section 1705.6 and Table 1705.6 of the 2013 CBC; the special inspector should be under the direction of the geotechnical engineer. In our opinion, there are no operations that are sufficiently critical as to warrant *continuous* special inspection; periodic special inspection should suffice. Subject to the approval of the Building Official, the exception to continuous special inspection (Section 1704.2, Subparagraph 1) should be specified by the architect/engineer and *periodic* special inspection of the following should be provided by the special inspector:
   - Stripping and clearing of existing improvements, vegetation, and debris
   - Utility trench backfill
   - Fill quality, placement, moisture conditioning, and compaction
   - Foundation excavations
   - Retaining wall drains and backfill
   - Pavement subgrade, sub-base, and AB

4. A program of quality control should be developed prior to beginning grading. The contractor or project manager should determine any additional inspection items required by the architect/engineer or the governing jurisdiction.

5. Locations and frequency of compaction tests should be as per the recommendation of the geotechnical engineer at the time of construction. The recommended test location and frequency may be subject to modification by the geotechnical engineer, based upon soil and moisture conditions encountered, size and type of equipment used by the contractor, the general trend of the results of compaction tests, or other factors.

6. A preconstruction conference among the owner, the geotechnical engineer, the soil special inspector, the architect/engineer, City of Paso Robles, and contractors is recommended to discuss planned construction procedures and quality control requirements.

7. The geotechnical engineer should be notified at least 48 hours prior to beginning construction operations.

9.0 CLOSURE

Our intent was to perform the investigation in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project under similar conditions. No representation, warranty, or guarantee is either expressed or implied. This report is intended for the exclusive use by the client as discussed in the “Scope of Services” section. Application beyond the stated intent is strictly at the user's risk.

This report is valid for conditions as they exist at this time for the type of project described herein. The conclusions and recommendations contained in this report could be rendered invalid, either in whole or in part, due to changes in building codes, regulations, standards of geotechnical or construction practice, changes in physical conditions, or the broadening of knowledge. If Earth Systems Pacific is not retained to provide construction observation and testing services, it shall not be responsible for the interpretation of the information by others or any consequences arising there from.

If changes with respect to project type or location become necessary, if items not addressed in this report are incorporated into plans, or if any of the assumptions used in the preparation of this report are not correct, the geotechnical engineer shall be notified for modifications to this report. Any items not specifically addressed in this report should comply with the CBC and the requirements of the governing jurisdiction.

The preliminary recommendations of this report are based upon geotechnical conditions encountered at the site, and may be augmented by additional requirements of the architect/engineer, or by additional recommendations provided by the geotechnical engineer based on peer or jurisdictional reviews, or conditions exposed at the time of construction.

This document, the data, conclusions, and recommendations contained herein are the property of Earth Systems Pacific. This report shall be used in its entirety, with no individual sections reproduced or used out of context. Copies may be made only by Earth Systems Pacific, the client, and the client's authorized agents for use exclusively on the subject project. Any other use is subject to federal copyright laws and the written approval of Earth Systems Pacific.

Thank you for this opportunity to have been of service. If you have any questions, please feel free to contact this office at your convenience.

End of Text.

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APPENDIX A

Boring and Infiltration Test Location Map

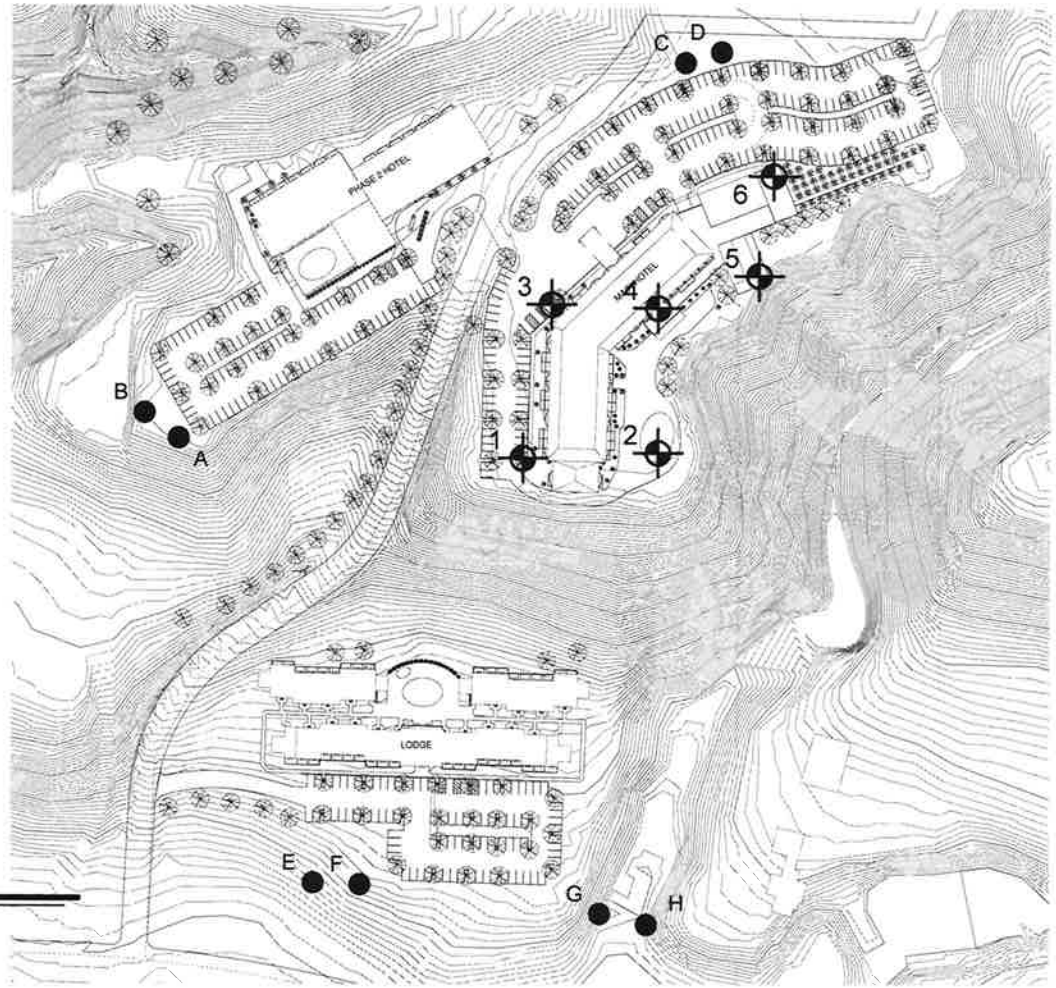
Boring Log Legend

Boring and Infiltration Logs

BORING AND INFILTRATION TEST LOCATION MAP

DESTINO PASO

Airport Road
Paso Robles, California



LEGEND

6 Boring Location (Approx.)

H Infiltration Test Location (Approx.)

NOT TO SCALE

Earth Systems Pacific

4378 Old Santa Fe Road
San Luis Obispo, CA 93401-8116

(805) 544-3276 • FAX (805) 544-1786
E-mail: esp@earthsystems.com

March 24, 2016

SB

PID-000358-001
DESTINO PASO-032416borings

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BORING LOG LEGEND

SAMPLE / SUBSURFACE WATER SYMBOLS	GRAPH. SYMBOL
CALIFORNIA MODIFIED	■
STANDARD PENETRATION TEST (SPT)	●
SHELBY TUBE	▭
BULK	○
SUBSURFACE WATER DURING DRILLING	▼
SUBSURFACE WATER AFTER DRILLING	▽

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTIONS	GRAPH. SYMBOL
COARSE GRAINED SOILS	MORE THAN HALF OF MATERIAL IS LARGER THAN #200 SIEVE SIZE	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		GP	POORLY GRADED GRAVELS, OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES	
		GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES	
		SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
		SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES	
		SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES	
		SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES	
FINE GRAINED SOILS	HALF OR MORE OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE	ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	

OBSERVED MOISTURE CONDITION

DRY	SLIGHTLY MOIST	MOIST	VERY MOIST	WET (SATURATED)

CONSISTENCY

COARSE GRAINED SOILS			FINE GRAINED SOILS		
BLOWS/FOOT		DESCRIPTIVE TERM	BLOWS/FOOT		DESCRIPTIVE TERM
SPT	CA SAMPLER		SPT	CA SAMPLER	
0-10	0-16	LOOSE	0-2	0-3	VERY SOFT
11-30	17-50	MEDIUM DENSE	3-4	4-7	SOFT
31-50	51-83	DENSE	5-8	8-13	MEDIUM STIFF
OVER 50	OVER 83	VERY DENSE	9-15	14-25	STIFF
			16-30	26-50	VERY STIFF
			OVER 30	OVER 50	HARD

GRAIN SIZES

U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENING		
# 200	# 40	# 10	# 4	3/4"	3"	12"

SILT & CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

TYPICAL BEDROCK HARDNESS

MAJOR DIVISIONS	TYPICAL DESCRIPTIONS
EXTREMELY HARD	CORE, FRAGMENT, OR EXPOSURE CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CAN ONLY BE CHIPPED WITH REPEATED HEAVY HAMMER BLOWS
VERY HARD	CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CORE OR FRAGMENT BREAKS WITH REPEATED HEAVY HAMMER BLOWS
HARD	CAN BE SCRATCHED WITH KNIFE OR SHARP PICK WITH DIFFICULTY (HEAVY PRESSURE); HEAVY HAMMER BLOW REQUIRED TO BREAK SPECIMEN
MODERATELY HARD	CAN BE GROOVED 1/16 INCH DEEP BY KNIFE OR SHARP PICK WITH MODERATE OR HEAVY PRESSURE; CORE OR FRAGMENT BREAKS WITH LIGHT HAMMER BLOW OR HEAVY MANUAL PRESSURE
SOFT	CAN BE GROOVED OR GOUGED EASILY BY KNIFE OR SHARP PICK WITH LIGHT PRESSURE, CAN BE SCRATCHED WITH FINGERNAIL; BREAKS WITH LIGHT TO MODERATE MANUAL PRESSURE
VERY SOFT	CAN BE READILY INDENTED, GROOVED OR GOUGED WITH FINGERNAIL, OR CARVED WITH KNIFE; BREAKS WITH LIGHT MANUAL PRESSURE

TYPICAL BEDROCK WEATHERING

MAJOR DIVISIONS	TYPICAL DESCRIPTIONS
FRESH	NO DISCOLORATION, NOT OXIDIZED
SLIGHTLY WEATHERED	DISCOLORATION OR OXIDATION IS LIMITED TO SURFACE OF, OR SHORT DISTANCE FROM, FRACTURES: SOME FELDSPAR CRYSTALS ARE DULL
MODERATELY WEATHERED	DISCOLORATION OR OXIDATION EXTENDS FROM FRACTURES, USUALLY THROUGHOUT; Fe-Mg MINERALS ARE "RUSTY", FELDSPAR CRYSTALS ARE "CLOUDY"
INTENSELY WEATHERED	DISCOLORATION OR OXIDATION THROUGHOUT; FELDSPAR AND Fe-Mg MINERALS ARE ALTERED TO CLAY TO SOME EXTENT, OR CHEMICAL ALTERATION PRODUCES IN SITU DISAGGREGATION
DECOMPOSED	DISCOLORATION OR OXIDATION THROUGHOUT, BUT RESISTANT MINERALS SUCH AS QUARTZ MAY BE UNALTERED; FELDSPAR AND Fe-Mg MINERALS ARE COMPLETELY ALTERED TO CLAY

drafting/masters/Boring Log Legend121714.dwg

Earth Systems Pacific

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

Boring No. 1
PAGE 1 OF 1
PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
1	SC		CLAYEY SAND: orange brown, medium dense, slightly moist, travel gravel (Paso Robles Formation)					
2								
3								
4			dense, slightly cemented					
5				5.0 - 6.0	■	111.9	2.9	36 50/3.0"
6	SW		WELL SAND: orange brown, medium dense, slightly moist, trace clay, travel gravel (Paso Robles Formation)					
7								
8								
9								
10			dense, moist, some clay	10.0 - 11.5	■	122.4	11.7	24 36 50/4.5"
11								
12								
13								
14								
15				15.0 - 16.5	●			6 12 20
16								
17			End of Boring @ 16.5' No subsurface water encountered					
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

Boring No. 2

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, loose, moist (Topsoil)					
1	SC		CLAYEY SAND: orange brown, medium dense, slightly moist (Paso Robles Formation)					
5			dense, slightly cemented, trace gravel	5.0 - 6.0	■	107.3	5.2	39 50/4.5"
9			medium dense, moist, increasing clay content	10.0 - 11.5	■	109.5	19.3	23 21 25
11	CL		SANDY LEAN CLAY: orange brown, hard, moist	12.0 - 14.0	○			
15				15.0 - 16.0	■	107.0	5.3	35 50/4.5"
16	SW		WELL GRADED SAND: orange brown, dense, slightly moist, trace to some clay, trace gravel					
20			very dense, trace caliche deposits	20.0 - 21.5	●			21 23 29
22			End of Boring @ 21.5' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

Boring No. 3

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: dark brown, medium dense, moist (Topsoil)					
1	SW		WELL GRADED SAND: orange brown, medium dense, slightly moist, trace clay (Paso Robles Formation)					
4			slightly cemented, very dense					
5				5.0 - 5.5	■	104.4	3.6	50
10				10.0 - 11.5	■	115.6	6.6	21 42 50/5.5"
13			moist, medium dense, increasing clay content					
15				15.0 - 16.5	■	124.7	10.9	6 15 24
20			trace caliche deposits	20.0 - 21.5	●			5 6 10
22			End of Boring @ 21.5' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

Boring No. 4

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, loose to medium dense, very moist (Topsoil)					
2	SW		WELL GRADED SAND: orange brown, medium dense, slightly moist, trace clay (Paso Robles Formation)					
5				5.0 - 6.5	■	116.4	3.4	16 24 27
6			cemented, trace gravel					
10			very dense, moist	10.0 - 11.5	■	120.7	8.7	24 34 50
14			medium dense, increasing clay content					
15				15.0 - 16.5	●			4 7 11
17			End of Boring @ 16.5' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample □ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

Boring No. 5
PAGE 1 OF 1
PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, loose to medium dense, moist (Topsoil)					
2	SW		WELL GRADED SAND: orange brown, medium dense, slightly moist, slightly cemented, trace to some clay (Paso Robles Formation)					
5			very dense, trace gravel	5.0 - 6.0	■	131.8	3.0	28 50/3.0"
8			well cemented					
10				10.0 - 10.5	■	105.0	5.6	50
15				15.0 - 16.5	●			20 29 14
16			moist, dense					
17			End of Boring @ 16.5' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

Boring No. 6
PAGE 1 OF 1
PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, loose, very moist (Topsoil)					
2	SC		CLAYEY SAND: orange brown, medium dense, moist (Paso Robles Formation)	2.0 - 6.0	○			
4			slightly moist, slightly cemented, dense					
5				5.0 - 6.5	■	113.3	3.0	15 32 50/5.0"
6			very dense, trace gravel					
7	SW		WELL GRADED SAND: orange brown, very dense, slightly moist, trace clay, trace gravel (Paso Robles Formation)					
9			dense, moist, cementation ends					
10				10.0 - 11.5	■	118.1	12.8	23 31 34
14			medium dense, increasing clay					
15				15.0 - 16.5	●			5 9 14
17			End of Boring @ 16.5' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Infiltration Test A

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
1	SW		WELL GRADED SAND: orange brown, medium dense, slightly moist, trace clay, travel gravel (Paso Robles Formation)					
2								
3								
4			End of Infiltration Test @ 4.0' No subsurface water encountered					
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Infiltration Test B

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
1	SW		WELL GRADED SAND: orange brown, medium dense, slightly moist, trace clay, travel gravel (Paso Robles Formation)					
5			End of Infiltration Test @ 4.8' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Infiltration Test C

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
1	SW		WELL GRADED SAND: orange brown, medium dense, slightly moist, trace clay, travel gravel (Paso Robles Formation)					
2								
3								
4			End of Infiltration Test @ 3.5' No subsurface water encountered					
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Infiltration Test D

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
3			orange brown, increasing clay					
5			End of Infiltration Test @ 4.5' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Infiltration Test E

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

PID-000358-001
DATE: 03/15/16

DEPTH (feet)	USCS CLASS	SYMBOL	DESTINO PASO Airport Road Paso Robles, California SOIL DESCRIPTION	SAMPLE DATA INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
2	SW		WELL GRADED SAND: orange brown, medium dense, slightly moist, trace clay, travel gravel (Paso Robles Formation)					
4			End of Infiltration Test @ 3.5' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Infiltration Test F

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
2	SW		WELL GRADED SAND: orange brown, medium dense, slightly moist, trace clay, travel gravel (Paso Robles Formation)					
5			trace gravel					
8			increasing coarse gravel to trace cobble					
10			End of Infiltration Test @ 10.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Infiltration Test G

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
2	SC		CLAYEY SAND: orange brown, medium dense, slightly moist (Paso Robles Formation)					
5			End of Infiltration Test @ 5.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Infiltration Test H

LOGGED BY: R. Wagner
DRILL RIG: CME-75
AUGER TYPE: 8" Hollow Stem Auger

PID-000358-001
DATE: 03/15/16

DESTINO PASO
Airport Road
Paso Robles, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0	SC		CLAYEY SAND: brown, medium dense, moist (Topsoil)					
3			decreasing clay					
4			End of Infiltration Test @ 4.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

APPENDIX B

Laboratory Test Results

Destino Paso

PID-000358-001

BULK DENSITY TEST RESULTS

ASTM D 2937-10 (modified for ring liners)

April 1, 2016

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
1	5.5 - 6.0	2.9	115.1	111.9
1	11.0 - 11.5	11.7	136.7	122.4
2	5.5 - 6.0	5.2	112.8	107.3
2	11.0 - 11.5	19.3	130.6	109.5
2	15.5 - 16.0	5.3	112.7	107.0
3	5.0 - 5.5	3.6	108.2	104.4
3	11.0 - 11.5	6.6	123.2	115.6
3	16.0 - 16.5	10.9	138.4	124.7
4	6.0 - 6.5	3.4	120.4	116.4
4	11.0 - 11.5	8.7	131.1	120.7
5	5.5 - 6.0	3.0	135.7	131.8
5	10.0 - 10.5	5.6	110.9	105.0
6	6.0 - 6.5	3.0	116.6	113.3
6	11.0 - 11.5	12.8	133.1	118.1

EXPANSION INDEX TEST RESULTS

ASTM D 4829-11

BORING NO.	DEPTH feet	EXPANSION INDEX
6	2.0 - 6.0	0

Destino Paso

PID-000358-001

PARTICLE SIZE ANALYSIS

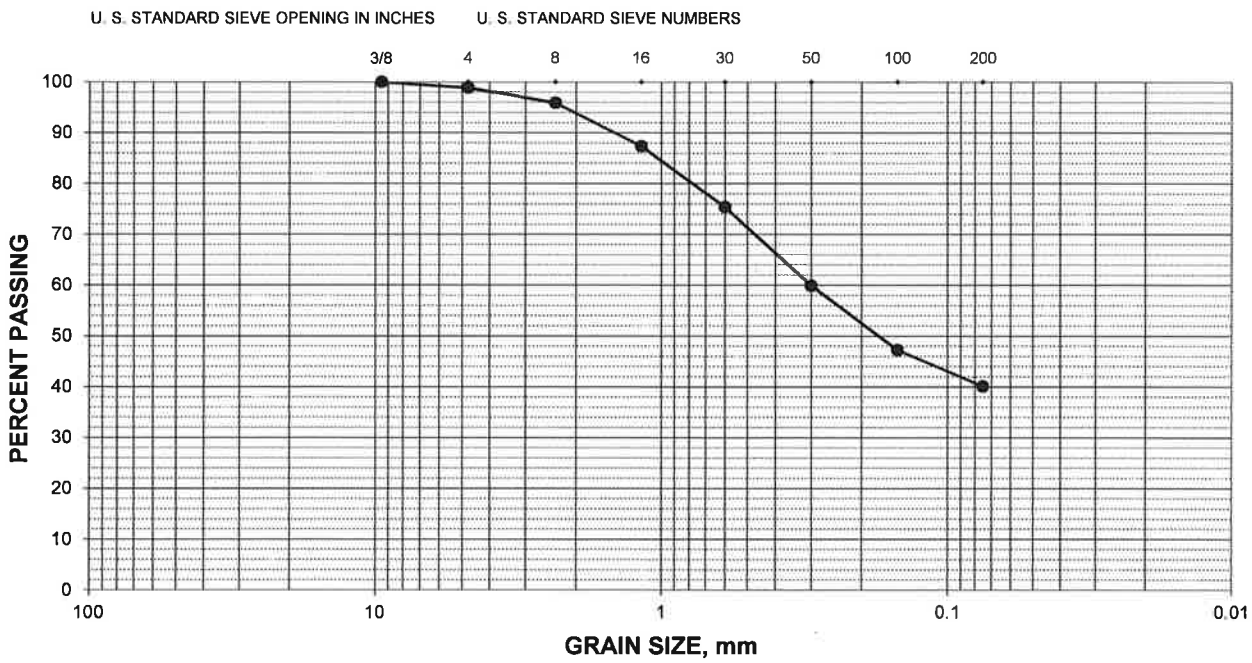
ASTM D 422-63/07; D 1140-06

Boring #6 @ 2.0 - 6.0'

April 1, 2016

Orange Brown Clayey Sand (SC)

Sieve size	% Retained	% Passing
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	4	96
#16 (1.18-mm)	13	87
#30 (600-µm)	25	75
#50 (300-µm)	40	60
#100 (150-µm)	53	47
#200 (75-µm)	60	40



Destino Paso

PID-000358-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

April 1, 2016

Boring #6 @ 2.0 - 6.0'

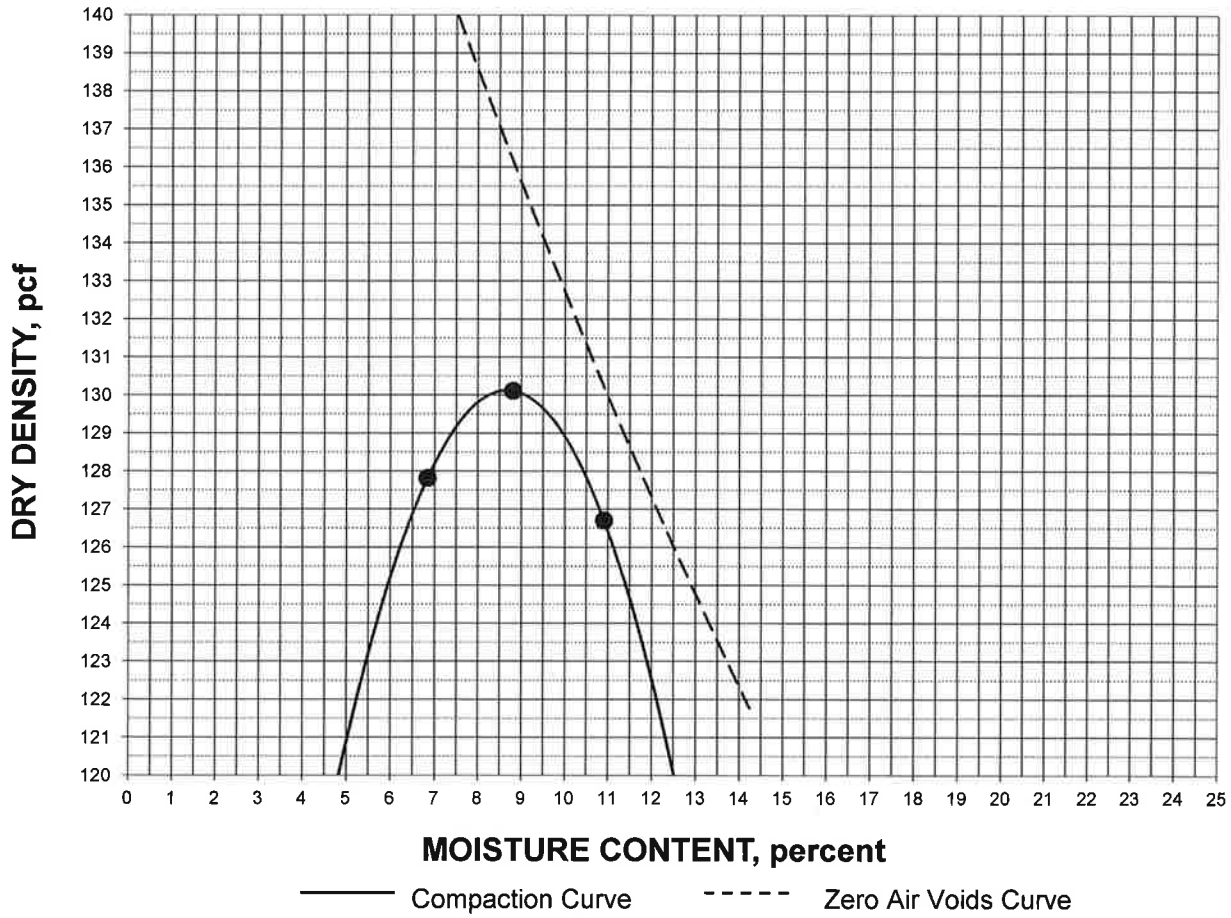
Orange Brown Clayey Sand (SC)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 130.1 pcf

OPTIMUM MOISTURE: 8.7%



Destino Paso

PID-000358-001

RESISTANCE '*R*' VALUE AND EXPANSION PRESSURE

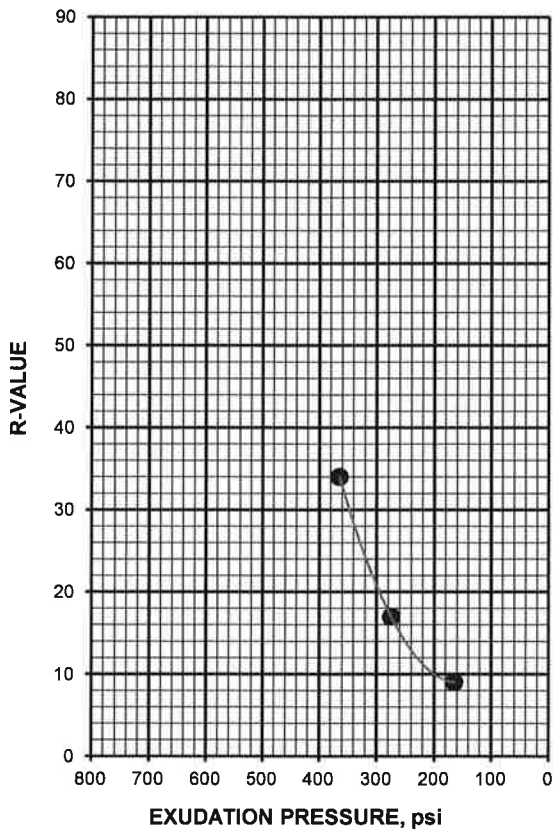
ASTM D 2844/D2844M-13

April 1, 2016

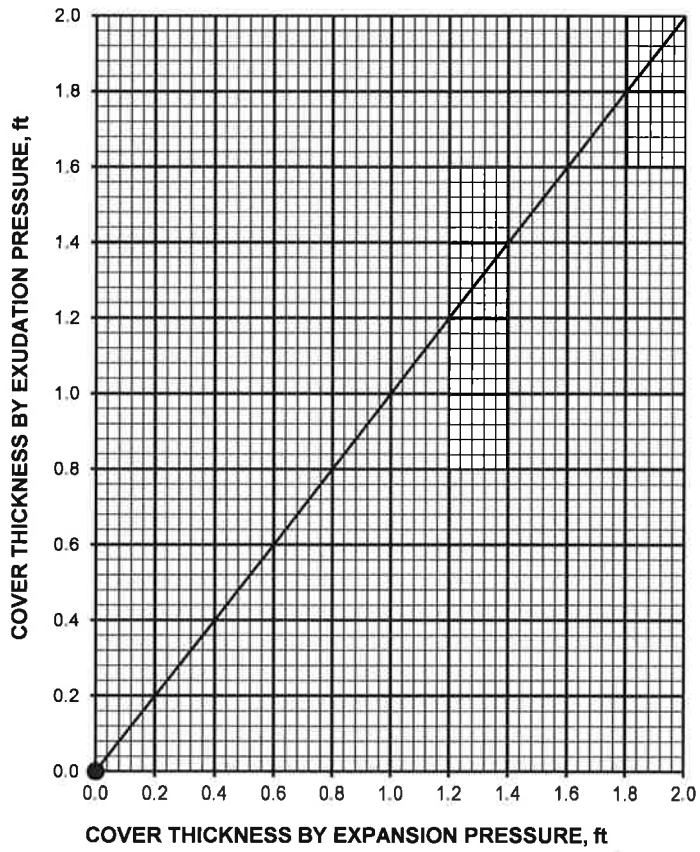
Boring #6 @ 2.0 - 6.0'
Orange Brown Clayey Sand (SC)

Dry Density @ 300 psi Exudation Pressure: 118.2-pcf
%Moisture @ 300 psi Exudation Pressure: 11.9%
R-Value - Exudation Pressure: 21
R-Value - Expansion Pressure: N/A
R-Value @ Equilibrium: 21

EXUDATION PRESSURE CHART



EXPANSION PRESSURE CHART



DIRECT SHEAR

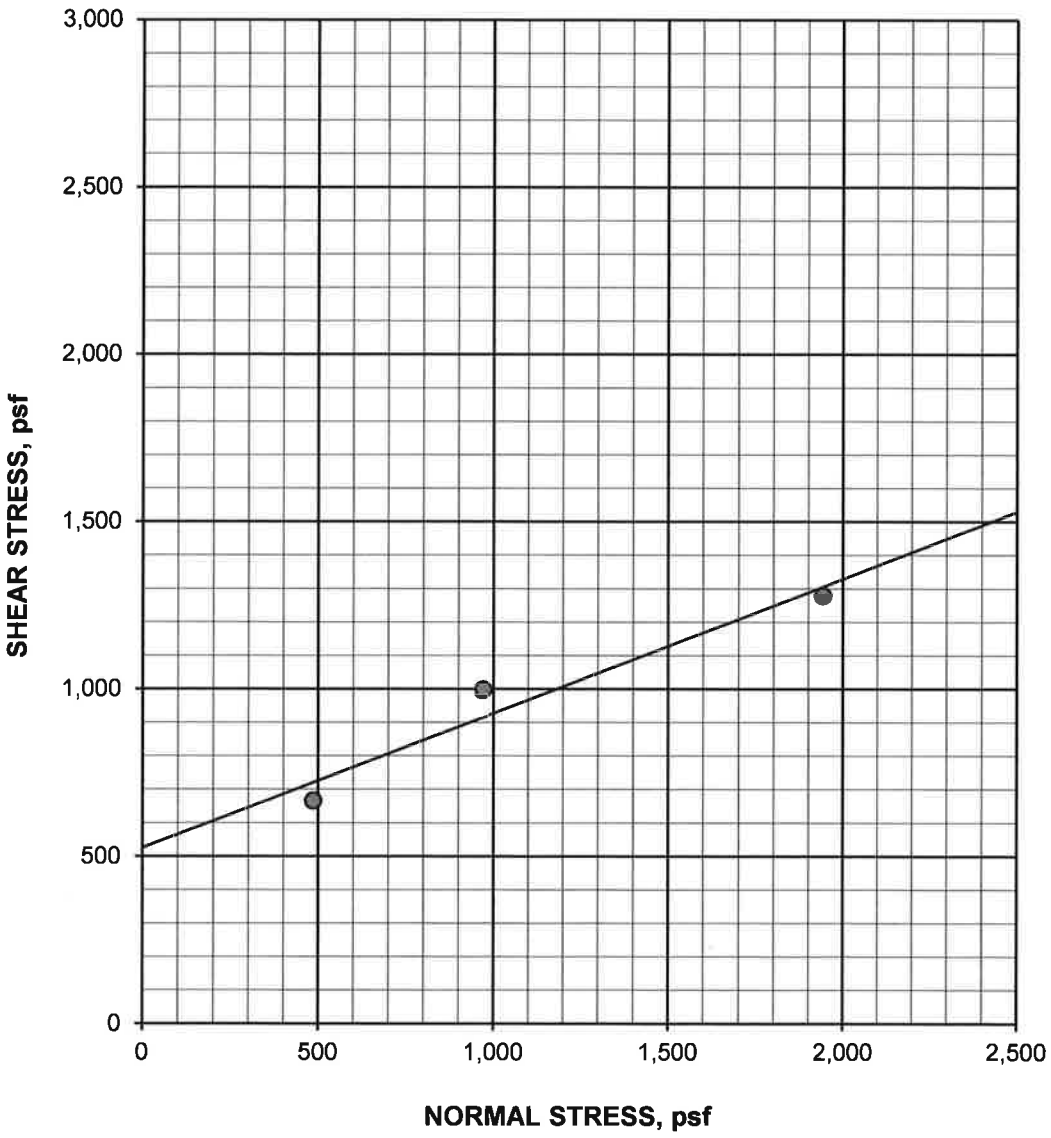
ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

April 1, 2016

Boring #2 @ 5.5 - 6.0'
Clayey Sand (SC)
Compacted to 90% RC, saturated

INITIAL DRY DENSITY: 102.7 pcf
INITIAL MOISTURE CONTENT: 5.2 %
PEAK SHEAR ANGLE (Ø): 22°
COHESION (C): 526 psf

SHEAR vs. NORMAL STRESS



DIRECT SHEAR continued

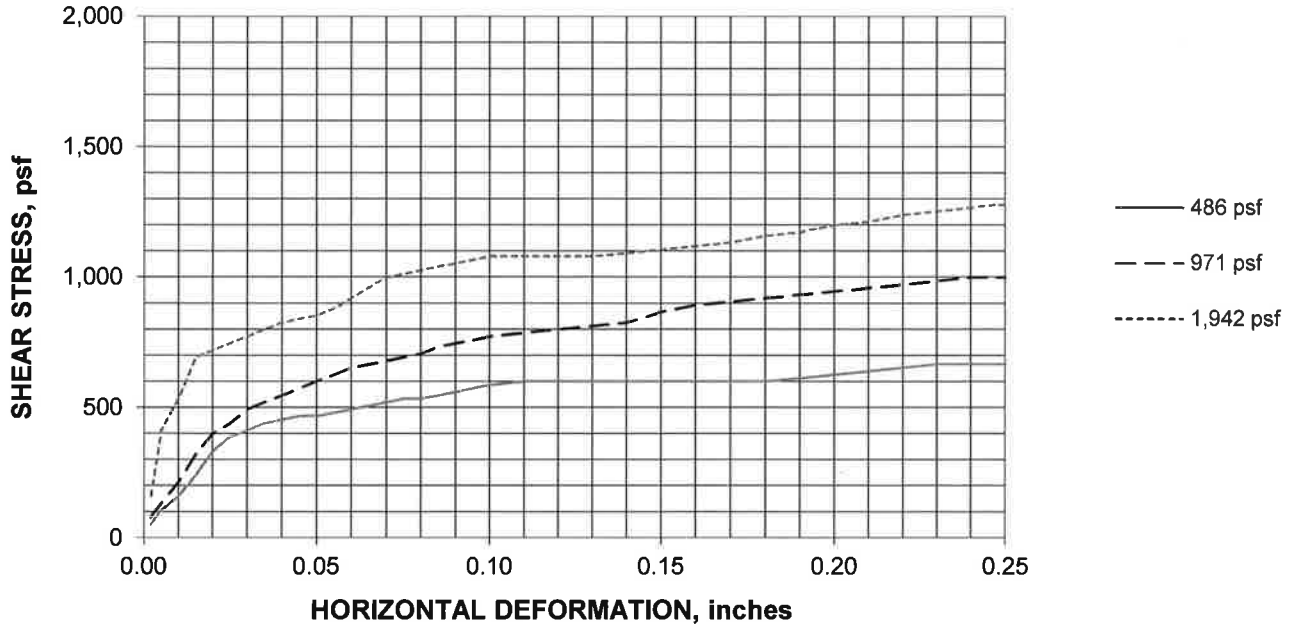
ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

Boring #2 @ 5.5 - 6.0' April 1, 2016

Clayey Sand (SC)

Compacted to 90% RC, saturated SPECIFIC GRAVITY: 2.65 (assumed)

SAMPLE NO.:	1	2	3	AVERAGE
INITIAL				
WATER CONTENT, %	5.2	5.2	5.2	5.2
DRY DENSITY, pcf	104.9	101.7	101.5	102.7
SATURATION, %	23.9	22.0	21.9	22.6
VOID RATIO	0.577	0.626	0.629	0.611
DIAMETER, inches	2.410	2.410	2.410	
HEIGHT, inches	1.00	1.00	1.00	
AT TEST				
WATER CONTENT, %	21.0	22.0	20.8	
DRY DENSITY, pcf	106.1	104.4	108.4	
SATURATION, %	100.0	100.0	100.0	
VOID RATIO	0.558	0.584	0.526	
HEIGHT, inches	0.99	0.97	0.94	



DIRECT SHEAR

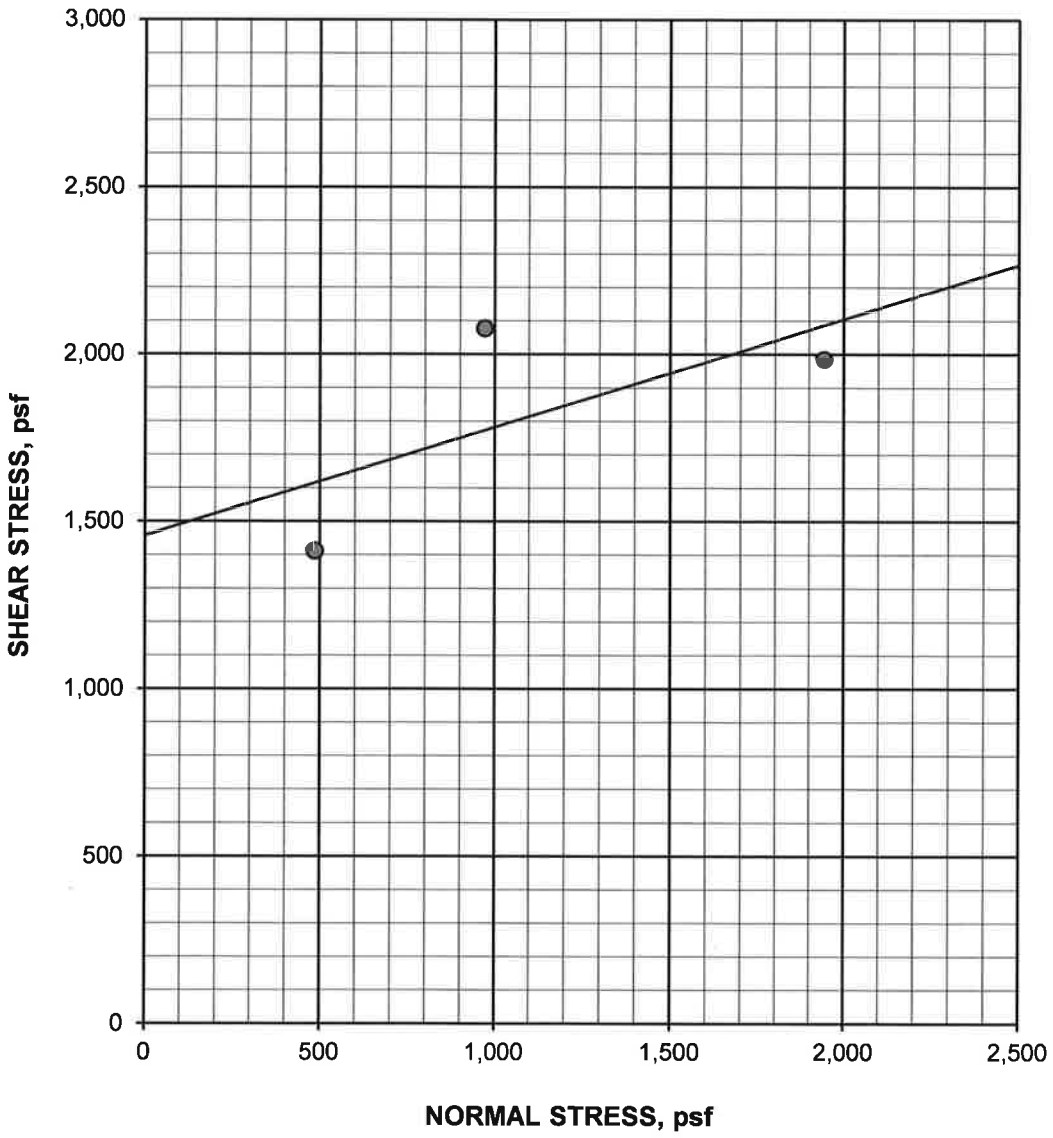
ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

April 1, 2016

Boring #2 @ 11.0 - 11.5'
Sandy Lean Clay (CL)
Compacted to 90% RC, saturated

INITIAL DRY DENSITY: 107.2 pcf
INITIAL MOISTURE CONTENT: 19.3 %
PEAK SHEAR ANGLE (Ø): 18°
COHESION (C): 1,459 psf

SHEAR vs. NORMAL STRESS



DIRECT SHEAR continued

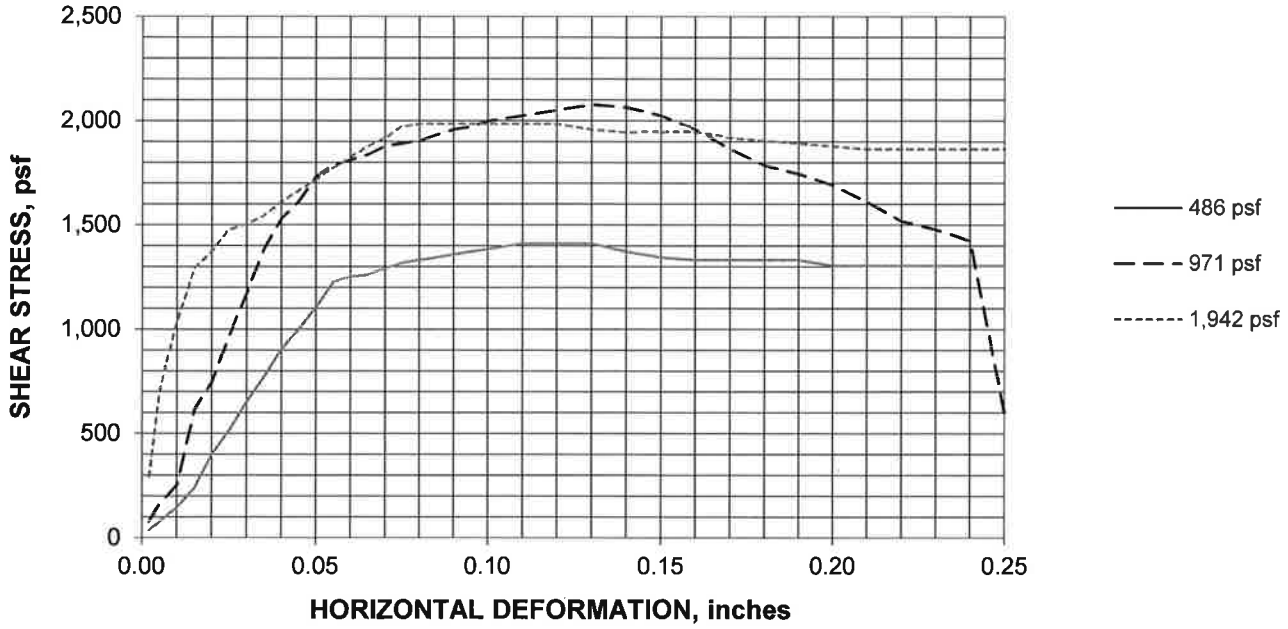
ASTM D 3080/D3080M-11 (modified for consolidated, undrained conditions)

Boring #2 @ 11.0 - 11.5' April 1, 2016

Sandy Lean Clay (CL)

Compacted to 90% RC, saturated SPECIFIC GRAVITY: 2.70 (assumed)

SAMPLE NO.:	1	2	3	AVERAGE
INITIAL				
WATER CONTENT, %	19.3	19.3	19.3	19.3
DRY DENSITY, pcf	105.1	108.4	108.2	107.2
SATURATION, %	86.5	94.1	93.4	91.3
VOID RATIO	0.602	0.554	0.558	0.571
DIAMETER, inches	2.410	2.410	2.410	
HEIGHT, inches	1.00	1.00	1.00	
AT TEST				
WATER CONTENT, %	25.5	19.1	21.9	
DRY DENSITY, pcf	105.9	109.9	114.6	
SATURATION, %	100.0	96.9	100.0	
VOID RATIO	0.591	0.534	0.471	
HEIGHT, inches	0.99	0.99	0.94	



APPENDIX C

LID Infiltration Test Results

INFILTRATION TEST RESULTS

INFILTRATION TEST: A

DATE DRILLED: 03/15/16

DATE TESTED: 03/16/16

TECHNICIAN: RW

TEST HOLE DIAMETER: 6 inches

TEST HOLE DEPTH: 4.0 feet

TEST DURATION: 5.5 hours

CONSTANT HEAD DATA

Time of Constant Head: 30 minutes

Volume Added During Constant Head: 0.01 cubic feet

FALLING HEAD DATA

INTERVAL (Minutes)	READING (Inches)	INCREMENTAL FALL (Inches)	INFILTRATION RATE (Minutes / Inch)	INFILTRATION RATE (Inches / Hour)
0	7.00	---	---	---
30	10.50	3.50	8.57	7
30	12.00	1.50	20.00	3
30	13.50	1.50	20.00	3
30	14.75	1.25	24.00	3
60	17.50	2.75	21.82	3
60	20.50	3.00	20.00	3
60	23.00	2.50	24.00	3

INFILTRATION TEST RESULTS

INFILTRATION TEST: B

DATE DRILLED: 03/15/16

DATE TESTED: 03/16/16

TECHNICIAN: RW

TEST HOLE DIAMETER: 6 inches

TEST HOLE DEPTH: 4.8 feet

TEST DURATION: 5.5 hours

CONSTANT HEAD DATA

Time of Constant Head: 30 minutes

Volume Added During Constant Head: 0.04 cubic feet

FALLING HEAD DATA

INTERVAL (Minutes)	READING (Inches)	INCREMENTAL FALL (Inches)	INFILTRATION RATE (Minutes / Inch)	INFILTRATION RATE (Inches / Hour)
0	7.50	---	---	---
30	9.25	1.75	17.14	4
30	11.75	2.50	12.00	5
30	14.25	2.50	12.00	5
30	16.25	2.00	15.00	4
60	19.00	2.75	21.82	3
60	20.00	1.00	60.00	1
60	21.00	1.00	60.00	1

INFILTRATION TEST RESULTS

INFILTRATION TEST: C

DATE DRILLED: 03/15/16

DATE TESTED: 03/16/16

TECHNICIAN: RW

TEST HOLE DIAMETER: 8 inches

TEST HOLE DEPTH: 3.5 feet

TEST DURATION: 5.5 hours

CONSTANT HEAD DATA

Time of Constant Head: 30 minutes

Volume Added During Constant Head: 0.12 cubic feet

FALLING HEAD DATA

INTERVAL (Minutes)	READING (Inches)	INCREMENTAL FALL (Inches)	INFILTRATION RATE (Minutes / Inch)	INFILTRATION RATE (Inches / Hour)
0	7.00	---	---	---
30	10.50	3.50	8.57	7
30	13.50	3.00	10.00	6
30	13.75	0.25	120.00	1
30	14.00	0.25	120.00	1
60	15.00	1.00	60.00	1
60	16.00	1.00	60.00	1
60	17.00	1.00	60.00	1

INFILTRATION TEST RESULTS

INFILTRATION TEST: D

DATE DRILLED: 03/15/16 **TEST HOLE DIAMETER: 8 inches**

DATE TESTED: 03/16/16 **TEST HOLE DEPTH: 4.3 feet**

TECHNICIAN: RW **TEST DURATION: 5.5 hours**

CONSTANT HEAD DATA

Time of Constant Head: 30 minutes

Volume Added During Constant Head: 0.51 cubic feet

FALLING HEAD DATA

INTERVAL (Minutes)	READING (Inches)	INCREMENTAL FALL (Inches)	INFILTRATION RATE (Minutes / Inch)	INFILTRATION RATE (Inches / Hour)
0	15.00	---	---	---
30	35.00	20.00	1.50	40
30	40.00	5.00	6.00	10
30	42.00	2.00	15.00	4
30	42.75	0.75	40.00	2
60	44.00	1.25	48.00	1
60	45.00	1.00	60.00	1
60	46.00	1.00	60.00	1

INFILTRATION TEST RESULTS

INFILTRATION TEST: E

DATE DRILLED: 03/15/16

DATE TESTED: 03/16/16

TECHNICIAN: RW

TEST HOLE DIAMETER: 6 inches

TEST HOLE DEPTH: 3.2 feet

TEST DURATION: 2.5 hours

CONSTANT HEAD DATA

Time of Constant Head: 30 minutes

Volume Added During Constant Head: 0.07 cubic feet

FALLING HEAD DATA

INTERVAL (Minutes)	READING (Inches)	INCREMENTAL FALL (Inches)	INFILTRATION RATE (Minutes / Inch)	INFILTRATION RATE (Inches / Hour)
0	2.00	---	---	---
5	3.50	1.50	3.33	18
5	6.00	2.50	2.00	30
5	10.00	4.00	1.25	48
5	11.50	1.50	3.33	18
5	13.00	1.50	3.33	18
5	14.25	1.25	4.00	15
5	16.00	1.75	2.86	21
5	18.00	2.00	2.50	24
5	20.00	2.00	2.50	24
5	21.00	1.00	5.00	12
5	22.00	1.00	5.00	12
5	23.00	1.00	5.00	12
20	26.50	3.50	5.71	11
20	30.00	3.50	5.71	11
20	33.00	3.00	6.67	9

INFILTRATION TEST RESULTS

INFILTRATION TEST: F

DATE DRILLED: 03/15/16

DATE TESTED: 03/16/16

TECHNICIAN: RW

TEST HOLE DIAMETER: 6 inches

TEST HOLE DEPTH: 9.5 feet

TEST DURATION: 2.5 hours

CONSTANT HEAD DATA

Time of Constant Head: 30 minutes

Volume Added During Constant Head: 1.39 cubic feet

FALLING HEAD DATA

INTERVAL (Minutes)	READING (Inches)	INCREMENTAL FALL (Inches)	INFILTRATION RATE (Minutes / Inch)	INFILTRATION RATE (Inches / Hour)
0	12.00	---	---	---
5	49.00	37.00	0.14	444
5	61.00	12.00	0.42	144
5	79.00	18.00	0.28	216
5	85.00	6.00	0.83	72
5	89.00	4.00	1.25	48
5	93.00	4.00	1.25	48
5	96.50	3.50	1.43	42
5	100.00	3.50	1.43	42
5	103.50	3.50	1.43	42
5	107.00	3.50	1.43	42
5	109.00	2.00	2.50	24
5	111.50	2.50	2.00	30
Recharge	7.00	---	---	---
20	79.00	72.00	0.28	216
20	94.50	15.50	1.29	47
20	105.00	10.50	1.90	32

INFILTRATION TEST RESULTS

INFILTRATION TEST: G

DATE DRILLED: 03/15/16

DATE TESTED: 03/16/16

TECHNICIAN: RW

TEST HOLE DIAMETER: 6 inches

TEST HOLE DEPTH: 4.7 feet

TEST DURATION: 2.5 hours

CONSTANT HEAD DATA

Time of Constant Head: 30 minutes

Volume Added During Constant Head: 0.2 cubic feet

FALLING HEAD DATA

INTERVAL (Minutes)	READING (Inches)	INCREMENTAL FALL (Inches)	INFILTRATION RATE (Minutes / Inch)	INFILTRATION RATE (Inches / Hour)
0	5.00	---	---	---
5	8.00	3.00	1.67	36
5	10.00	2.00	2.50	24
5	12.00	2.00	2.50	24
5	14.00	2.00	2.50	24
5	16.00	2.00	2.50	24
5	18.00	2.00	2.50	24
5	20.00	2.00	2.50	24
5	20.50	0.50	10.00	6
5	21.00	0.50	10.00	6
5	22.00	1.00	5.00	12
5	23.50	1.50	3.33	18
5	24.50	1.00	5.00	12
10	25.50	1.00	10.00	6
10	26.50	1.00	10.00	6
10	27.25	0.75	13.33	5
10	28.00	0.75	13.33	5
10	28.75	0.75	13.33	5
10	29.25	0.50	20.00	3

INFILTRATION TEST RESULTS

INFILTRATION TEST: H

DATE DRILLED: 03/15/16

DATE TESTED: 03/16/16

TECHNICIAN: RW

TEST HOLE DIAMETER: 6 inches

TEST HOLE DEPTH: 3.8 feet

TEST DURATION: 2.2 hours

CONSTANT HEAD DATA

Time of Constant Head: 30 minutes

Volume Added During Constant Head: 0.64 cubic feet

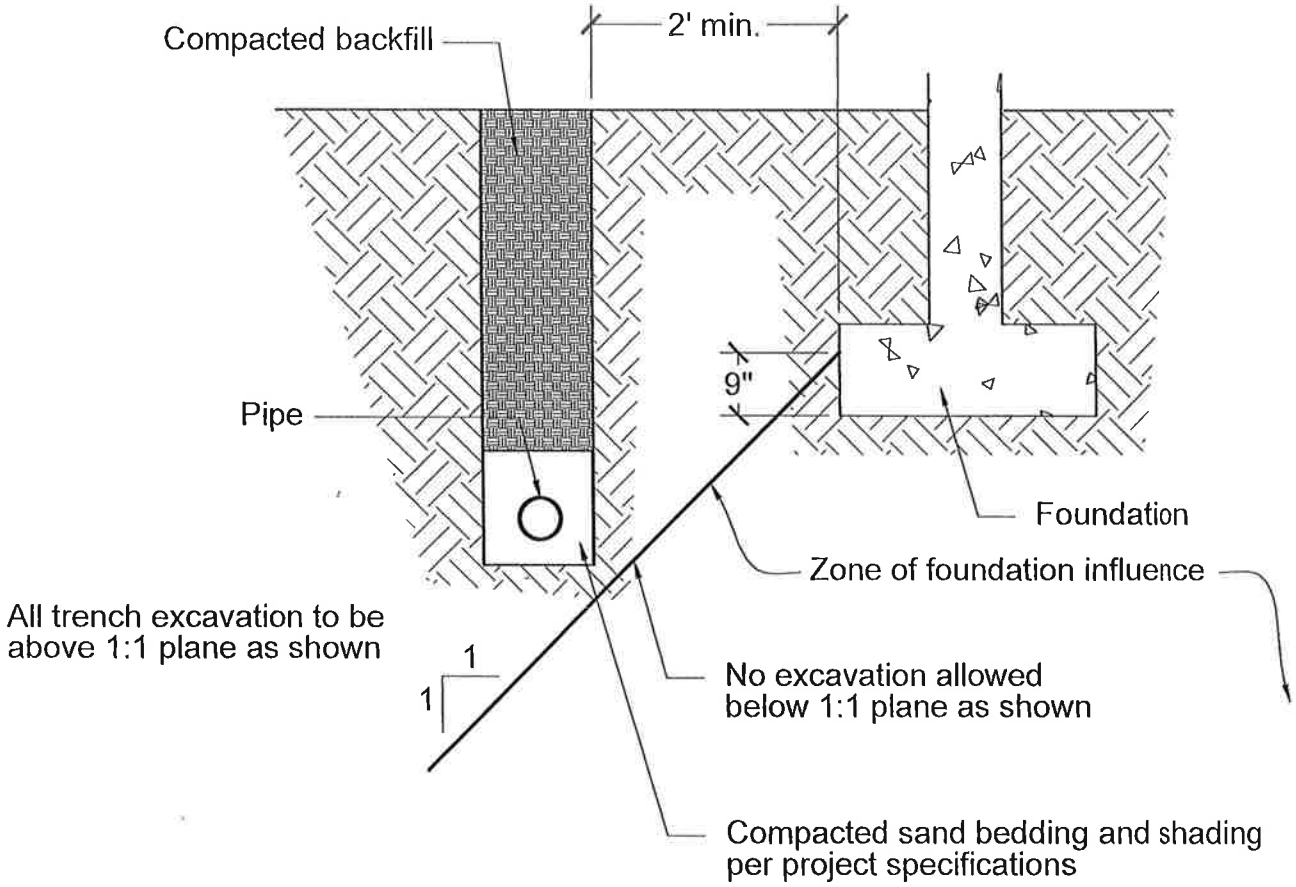
FALLING HEAD DATA

INTERVAL (Minutes)	READING (Inches)	INCREMENTAL FALL (Inches)	INFILTRATION RATE (Minutes / Inch)	INFILTRATION RATE (Inches / Hour)
0	3.50	---	---	---
5	20.00	16.50	0.30	198
5	27.00	7.00	0.71	84
5	32.00	5.00	1.00	60
5	36.00	4.00	1.25	48
5	39.00	3.00	1.67	36
5	40.50	1.50	3.33	18
5	42.00	1.50	3.33	18
5	43.50	1.50	3.33	18
5	45.00	1.50	3.33	18
Recharge	2.00	---	---	---
5	11.50	9.50	0.53	114
5	24.50	13.00	0.38	156
5	30.50	6.00	0.83	72
5	34.50	4.00	1.25	48
5	37.00	2.50	2.00	30
5	39.00	2.00	2.50	24
5	40.75	1.75	2.86	21
5	42.00	1.25	4.00	15
5	43.50	1.50	3.33	18
5	45.00	1.50	3.33	18

APPENDIX D

Typical Detail A: Pipe Placed Parallel to Footing

TYPICAL DETAIL A:
PIPE PLACED PARALLEL TO FOUNDATIONS



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NOT TO SCALE

Earth Systems Pacific

4378 Old Santa Fe Road
San Luis Obispo, CA 93401-8116

(805) 544-3276 • FAX (805) 544-1786
E-mail: esp@earthsys.com