

GEOTECHNICAL INVESTIGATION
PROPOSED APARTMENT COMPLEX
APN 020-400-040 & 041
SWC FRANK SINATRA DRIVE & PORTOLA AVENUE
PALM DESERT, CALIFORNIA

Prepared By:

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May 17, 2022

Project No. 544-22072
22-05-298

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Subject: Geotechnical Investigation


Project: Proposed Apartment Complex
APN 620-400-030 & 031
SWC Frank Sinatra Drive and Portola Avenue
Palm Desert, California


Sladden Engineering is pleased to present the results of the geotechnical investigation performed for the proposed apartment complex to be constructed on the property (APN 620-400-030 & 031) located on the southwest corner of Frank Sinatra Drive and Portola Avenue in the City of Palm Desert, California. Our services were completed in accordance with our proposal for geotechnical engineering services dated February 3, 2022 and your authorization to proceed with the work. The purpose of our investigation was to explore the subsurface conditions at the site to provide recommendations for foundation design and the design of the various site improvements. Evaluation of environmental issues and hazardous wastes was not included within the scope of services provided.


The opinions, recommendations and design criteria presented in this report are based on our field exploration program, laboratory testing and engineering analyses. Based on the results of our investigation, it is our professional opinion that the proposed project should be feasible from a geotechnical perspective provided that the recommendations presented in this report are implemented in design and carried out through construction.


We appreciate the opportunity to provide service to you on this project. If you have any questions regarding this report, please contact the undersigned.

Respectfully submitted,
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SWC Frank Sinatra Drive and Portola Avenue
Palm Desert, California

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GEO-TECHNICAL INVESTIGATION
 PROPOSED APARTMENT COMPLEX
 APN 60 400 130 & 031
 SWC FRANK SINATRA DRIVE & PORTOLA AVENUE
 PALM DESERT, CALIFORNIA

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INTRODUCTION

This report presents the results of the geotechnical investigation performed by Sladden Engineering (Sladden) for the proposed apartment complex to be constructed on the property (APN 620-400-030 & 031) located on the southwest corner of Frank Sinatra Drive and Fortola Avenue in the City of Palm Desert, California. The site is located at approximately 33.7707 degrees north latitude and 116.3724 degrees west longitude. The approximate location of the site is indicated on the Site Location Map (Figure 1).

Our investigation was conducted in order to evaluate the engineering properties of the subsurface materials, to evaluate their *in situ* characteristics, and to provide engineering recommendations and design criteria for site preparation, foundation design and the design of various site improvements. This study also includes a review of published and unpublished geotechnical and geological literature regarding seismicity at and near the subject site.

PROJECT DESCRIPTION

It is our understanding that the proposed project will consist of constructing a new apartment complex on the currently undeveloped site. Concrete flatwork, landscape areas and various associated site improvements are also proposed. For our analysis we expect that the proposed structures will be of relatively lightweight wood-frame or light gauge steel-frame construction supported on conventional shallow spread footings and concrete slabs on grade.

Sladden expects that grading will be limited to minor cuts and fills in order to accomplish the desired elevations and to provide adequate gradients for site drainage. This does not include the removal and re-compaction of the near surface soil within the proposed building pad areas. Upon completion of the grading plans, Sladden should be retained to verify that the recommendations presented within in this report are properly incorporated into the design of the proposed project.

Structural foundation loads were not available at the time of this report. Based on our experience with relatively lightweight structures, we expect that isolated column loads will be less than 20 kips and contiguous wall loads will be less than 20 kips per linear foot. If these assumed loads vary significantly from the actual loads, we should be consulted to verify the applicability of the recommendations provided.

SCOPE OF SERVICES

The purpose of our investigation was to determine specific engineering characteristics of the surface and near surface soil in order to develop foundation design criteria and recommendations for site preparation. Specifically, our site characterization consisted of the following tasks:

- Site reconnaissance to assess the existing surface conditions on and adjacent to the site
- Drilling eleven (11) exploratory boreholes to depths ranging from approximately 5 to 31 feet bgs to characterize the subsurface soil conditions. Representative samples of the soil were classified in the field and retained for laboratory testing and engineering analyses
- Performing laboratory testing on selected samples to evaluate their engineering characteristics
- Reviewing geologic literature and discussing geologic hazards
- Performing site-specific ground motion procedures for the subject property
- Performing engineering analyses to develop recommendations for foundation design and site preparation
- The preparation of this report summarizing our work at the site.

SITE CONDITIONS

The project site is located in the southwest corner of Frank Sinatra Drive and Portola Avenue in the City of Palm Desert, California. The project site consists of two parcels that are normally identified by the County of Riverside as APN 626-110-030 & 031. The parcels occupy approximately 17.6 acres of land. At the time of our investigation, the property was undeveloped. The subject property is near the elevation of the adjacent properties and roadways and is bounded by Frank Sinatra Drive to the north, by Portola Avenue to the east and south, and by an abandoned golf course to the immediate west.

Based on our review of the Myoma Quadrangle (USGS, 2017) and Google Earth (2021), the site is situated at an approximate elevation of 277 feet above mean sea level (MSL).

No natural ponding of water or surface seeps were observed at or near the site during our investigation conducted on March 10, 2022. Site drainage appears to be controlled via sheet flow and surface infiltration. Regional drainage is provided by the Whitewater River that is located approximately 2 miles to the south of the property.

GEOLOGIC SETTING

The project site is located within the Colorado Desert Physiographic Province (also referred to as the Salton Trough) that is characterized as a northwest-southeast trending structural depression extending from the Gulf of California to the Banning Pass. The Salton Trough is dominated by several northwest trending faults, most notably the San Andreas Fault system. The Salton Trough is bounded by the Santa Rosa - San Jacinto Mountains on the southwest, the San Bernardino Mountains on the north, the Little San Bernardino - Chocoma - Chocoma Mountains on the east and extends through the Imperial Valley into the Gulf of California on the south.

A relatively thick sequence (20,000 feet) of sediment has been deposited in the Coachella Valley portion of the Salton Trough from Miocene to present times. These sediments are predominately terrestrial in nature with some lacustrine (lake) and marine marine deposits. The major contributor of these sediments has been the Colorado River. The mountains surrounding the Coachella Valley are composed primarily of Precambrian metamorphic and Mesozoic "granitic" rocks.

The Salton Trough is an internally draining area with no readily available outlet to Gulf of California and with portions well below sea level (-253' msl). The region is intermittently blocked from the Gulf of California by the damming effects of the Colorado River delta (current elevation +30' msl). Between about 500AD and 1600 AD (to 1700) the Salton Trough has been inundated by the river's water, forming ancient Lake Calhoun (max. elevation +58' msl). Since that time the floor of the Trough has been repeatedly flooded with other "fresh" water lakes (1849, 1861, and 1891), the most recent and historically long lived being the current Salton Sea (1905). The sole outlet for these waters is evaporation, leaving behind vast amounts of terrestrial sediment materials and evaporite materials.

The site has been mapped by Rogers (1965) to be immediately underlain by Quaternary age dune sand (Qs) deposits. The regional geologic setting for the site vicinity is presented on the Regional Geologic Map (Figure 2).

SUBSURFACE CONDITIONS

The subsurface conditions at the site were investigated by drilling eleven (11) exploratory boreholes to depths ranging from approximately 5 to 31 feet bgs. The approximate locations of the boreholes are illustrated on the Exploration Location Photograph (Figure 3). The boreholes were advanced using a truck-mounted Mobile B-61 drill-rig equipped with 8-inch outside diameter hollow stem augers and a truck-mounted John Deere 3X excavator equipped with a 8-inch outside diameter solid stem auger. A representative of Sladden was on-site to log the materials encountered and retrieve samples for laboratory testing and engineering analysis.

During our field investigation, native dune sand was encountered throughout the depth of the bores. The native soil throughout the site consists primarily of fine-grained sand (SP/SM). The native soil was found to be dry to slightly moist, loose to medium dense, and pale to light brown to grayish brown in *in-situ* color.

The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and tests of the field samples. The final logs are included in Appendix A of this report. The stratification lines represent the approximate boundaries between soil types although the transitions may be gradual and variable across the site.

Groundwater was not encountered to the maximum explored depth of 31.5 feet bgs during our field investigation. Based upon our review of the groundwater levels in the site vicinity (Tyley, 1874), it is our opinion that groundwater will not be a factor in the design and construction of the proposed project.

SEISMICITY AND FAULTING

The southwestern United States is a tectonically active and structurally complex region, dominated by northwest-trending dextral faults. The faults of the region are often part of complex fault systems, composed of numerous subparallel faults which splay or step from main fault traces. Strong seismic shaking could be produced by any of these faults during the design life of the proposed project.

We consider the most significant geologic hazard to the project to be the potential for moderate to strong seismic shaking that is likely to occur during the design life of the project. The proposed project is located in the highly seismic Southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California as a "sufficiently active and well defined fault" that has exhibited surface displacement within the Holocene epoch (about the last 11,000 years). A potentially active fault is defined by the State as a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago).

As previously stated, the site has been subjected to strong seismic shaking related to active faults that traverse through the region. Some of the more significant seismic events near the subject site within recent times include: M6.0 North Palm Springs (1986), M6.1 Joshua Tree (1992), M7.3 Landers (1992), M6.2 Big Bear (1992), M7.1 Hector Mine (1999), and M7.1 Ridgecrest (2019).

Table 1 lists the closest known potentially active faults that was generated in part using fault parameters from The Revised 2002 California Probabilistic Seismic Hazard Maps (Cao et al., 2003) and the Fault and Fold Database of the United States (USGS, 2022a). This table does not identify the probability of reactivation or the on-site effects from earthquakes occurring on any faults in the region.

**TABLE 1
CLOSEST KNOWN ACTIVE FAULTS**

| Fault Name | Distance (km) | Maximum Event |
|------------------------------|---------------|---------------|
| San Andreas - Coachella | 8.4 | 7.7 |
| San Andreas - Southern | 8.4 | 7.2 |
| Burnt Mountain | 10.4 | 6.5 |
| San Andreas - San Bernardino | 19.6 | 7.5 |
| Pinaka Peaks | 22.1 | 6.4 |
| San Jacinto - Arroyo | 34.8 | 7.2 |
| San Jacinto - Coyote Creek | 37.1 | 6.8 |
| *Timo Mountain | 38.4 | 7.0 |

SITE SPECIFIC GROUND MOTION PARAMETERS

Sladden has reviewed the 2019 California Building Code (CBC) and ASCE 7-16 and developed site specific ground motion parameters for the subject site. The project Seismic Design Maps and site-specific ground motion parameters are summarized in the following table and included within Appendix C. The project Structural Engineer should verify that all design parameters provided are applicable for the subject project.

**TABLE 2
GROUND MOTION PARAMETERS**

| | | | |
|---|----------------------------|------------------|----------------------|
| Latitude / Longitude | 33.7707/-116.3724 | | |
| Risk Category | II | | |
| Site Class | D | | |
| Code Reference Documents | ASCE 7-16, Chapter 11 & 21 | | |
| Description | Type | Map Based | Site-Specific |
| MCER Ground Motion (0.2 second period) | S | 1.666 | --- |
| MCER Ground Motion (1.0 second period) | S | 0.688 | --- |
| Site Modified Spectral Acceleration Value | S _{MS} | 1.666 | 1.900 |
| Site Modified Spectral Acceleration Value | S _{MS} | null | 1.697 |
| Maximum Seismic Design Value at 0.2 second SA | S _{MS} | 1.111 | 1.266 |
| Maximum Seismic Design Value at 1.0 second SA | S _{MS} | null | 1.131 |
| Site Amplification Factor at 0.2 second | F | 1.0 | 1.0 |
| Site Amplification Factor at 1.0 second | F | null | 2.5 |
| Site Peak Ground Acceleration | PGA | 0.739 | 0.737 |

GEOLOGIC HAZARDS

The subject site is located in an active seismic zone and will likely experience strong seismic shaking during the design life of the proposed project. In general, the intensity of ground shaking will depend on several factors including: the distance to the earthquake focus, the earthquake magnitude, the response characteristics of the underlying materials, and the quality and type of construction. Geologic hazards and their relationship to the site are discussed below:

- I. **Surface Rupture:** Surface rupture is expected to occur along preexisting, known active fault traces. However, surface rupture could potentially splay or step from known active faults or rupture along unidentified traces. Based on our review of Rogers (1965), Jennings (1994), and US (2022) known active faults are not mapped on the site. In addition, no signs of active surface faulting were observed during our review of our station digitized photographs of the site and site vicinity (Google Earth, 2022). Finally, no signs of active surface fault rupture or secondary seismic effects (lateral spreading, lurching, etc.) were identified during our field investigation. Therefore, it is our opinion that risks associated with primary surface ground rupture should be considered "low".

- II. **Ground Shaking:** The site has been subjected to past ground shaking by faults that traverse through the region. Strong seismic shaking from nearby active faults is expected to produce strong seismic shaking during the design life of the proposed project. Based on site-specific ground motion parameters developed for the property (Appendix C), the site modified peak ground acceleration (PGA_m) is estimated to be 0.733g.

- III. **Liquefaction:** Liquefaction is the process in which loose, saturated granular soil loses strength as a result of cyclic loading. The strength loss is a result of a decrease in granular void volume and a positive increase in pore pressure. Generally, liquefaction can occur if all of the following conditions apply, liquefaction-susceptible soil, groundwater within a depth of 50 feet or less, and strong seismic shaking.

Based on the depth to groundwater in the project vicinity (Clyde, 1971), risks associated with liquefaction are considered "negligible".

- IV. **Tsunamis and Seiches:** Because the site is situated at an island location and is not immediately adjacent to any impounded bodies of water, risks associated with tsunamis and seiches are considered "negligible".

- V. **Slope Failure, Landsliding, Rock Falls, Slope Instability:** Slope instability in the form of landslides and rock falls were not observed at or near the subject site. The site is situated on relatively flat ground and is not located immediately adjacent to any slopes. As such, risks associated with slope instability (landslides, mass wasting, and rock falls) are considered "negligible".

- VI. **Expansive Soil.** Generally, the near surface soil consists of sand (SP/SM). Based on the results of our laboratory testing, the materials underlying this site are considered "non-expansive".
- VII. **Static Settlement.** Static settlement resulting from the anticipated foundation loads should be tolerable provided that the recommendations included in this report are considered in foundation design and construction. The ultimate static settlement is expected to be less than 1 inch when using the recommended allowable bearing pressures. As a practical matter, differential static settlement between footings can be assumed as one-half of the total static settlement.
- VIII. **Subsidence.** Lateral subsidence can occur in valleys where aquifer systems have been subjected to extensive groundwater pumping, such that groundwater pumping exceeds groundwater recharge. Generally, pore water reduction can result in a rearrangement of skeletal grains and could result in elastic (recoverable) or inelastic (nonrecoverable) deformation of an aquifer system.
- Locally, no fissures or other surficial evidence of subsidence were observed at or near the subject site. However, site specific effects resulting from long term regional subsidence is beyond the scope of our investigation.
- IX. **Debris Flows.** Debris flows are viscous flows consisting of poorly sorted mixtures of sediment and water and are generally initiated on slopes steeper than approximately six horizontal to one vertical (6H:1V) (Boggs, 2001). Based on the flat nature of the site and the composition of the surface soil, we judge that the risks associated with debris flows should be considered "negligible".
- X. **Flooding and Erosion.** No signs of flooding or erosion were observed during our field investigation. Risks associated with flooding and erosion should be evaluated and mitigated by the project design Civil Engineer.

CONCLUSIONS

Based on the results of our investigation, it is our professional opinion that the project should be feasible from a geotechnical perspective provided that the recommendations included in this report are incorporated into design and carried out through construction. The main geotechnical concern is the presence of loose and potentially compressible near surface soil.

The proposed new apartment buildings may be supported upon conventional shallow spread footings. We recommend that remedial work within the proposed new building areas include over-excavation and re-compaction of the primary foundation bearing soil. Specific recommendations for foundation area preparation are presented in the Earthwork and Grading section of this report.

Caving did occur to varying degrees within each of our exploratory borings and the surface soil may be susceptible to caving within deeper excavations. All excavations should be constructed in accordance with the normal CalOESHA excavation criteria. Based on our observations of the materials encountered, we anticipate that the subsoil will conform to that described by CalOESHA as Type C. Soil conditions should be verified in the field by a "Competent person" employed by the Contractor.

EARTHWORK AND GRADING

All earthwork including excavation, backfill and preparation of the primary foundation and/or slab bearing soil should be performed in accordance with the geotechnical recommendations presented in this report and portions of the local regulatory requirements, as applicable. All earthwork should be performed under the observation and testing of a qualified soil engineer. The following geotechnical engineering recommendations for the proposed project are based on observations from the field investigation program, laboratory testing, and geotechnical engineering analyses:

- a. Site Clearing: Areas to be graded should be cleared of any existing vegetation, root systems, and debris. All areas scheduled to receive fill should be cleared of old fills and any erodible matter. Unsuitable material should be removed off-site. Voids left by obstructions should be properly backfilled in accordance with the compaction recommendations of this report.
- b. Preparation of Building Areas: In order to provide firm and uniform foundation bearing conditions, we recommend over-excavation and re-compaction throughout the proposed building areas. All disturbed and/or low density near surface soil should be removed to a depth of at least 1 foot below existing grade or 1 foot below the bottom of the footing, whichever is deeper. Remedial grading should extend laterally a minimum of 5 feet beyond the footing limits. The native soil exposed by over excavation should be scarified, moisture conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction prior to fill placement. The previously removed soil may then be replaced as engineered fill as recommended below.
- c. Compaction: Soil to be used as engineered fill should be free of organic material, debris, and other deleterious substances. All fill material should be placed in thin lifts, not exceeding six inches in a loose condition. If import fill is required, the material should be of a low to non-expansive nature and should meet the following criteria:

| | |
|---------------------------------|---------------------|
| Plastic Index | Less than 17 |
| Liquid Limit | Less than 35 |
| Percent Soil Passing #200 Sieve | Between 15% and 35% |
| Maximum Aggregate Size | 3 inches |

The subgrade and all fill should be compacted with acceptable compaction equipment, to at least 90 percent relative compaction. The bottom of the exposed subgrade should be observed by a representative of Sladden Engineering prior to fill placement. Compaction testing should be performed on all lifts in order to ensure proper placement of the fill materials. Table 3 provides a summary of the excavation and compaction recommendations.

**TABLE 5
SUMMARY OF RECOMMENDATIONS**

| | |
|---------------------------------|---|
| Remedial Grading | Excavation and re-compaction within the building envelope and extending laterally for 5 feet beyond the building limits and to a minimum of 5 feet below existing grade or 2 feet below the bottom of the footing, whichever is deeper. |
| Native / Impact Engineered Fill | Place in thin lifts not exceeding 6 inches in a loose condition, at near optimum moisture content and compact to a minimum of 90 percent relative compaction. |
| Concrete Sections | Compact the top 12 inches to at least 95 percent compaction at near optimum moisture content. |

*Actual depth may vary and should be determined by a representative of Sladden Engineering in the field during construction.

- d. Shrinkage and Subsidence: Volumetric shrinkage of the material that is excavated and replaced as controlled compacted fill should be anticipated. We estimate that this shrinkage should be between 10 and 20 percent. Subsidence of the surfaces that are scarified and compacted should be between 1 tenth and 2 tenths of a foot. This will vary depending upon the type of equipment used, the moisture content of the soil at the time of grading and the actual degree of compaction attained.

CONVENTIONAL SHALLOW SPREAD FOOTINGS

Conventional shallow spread footings are expected to provide adequate support for the proposed new apartment buildings. All footings should be founded upon properly compacted engineered fill soil and should have a minimum embedment depth of 12 inches measured from the lowest adjacent finished grade. Continuous and isolated pad footings should have minimum widths of 12 inches and 24 inches, respectively. Continuous and isolated pad footings supported upon properly compacted engineered fill soil may be designed using allowable (net) bearing pressures of 7800 and 2000 pounds per square foot (psf), respectively. Allowable increases of 200 psf for each additional 1 foot of width and 250 psf for each additional 6 inches of depth may be used, if desired. The maximum allowable bearing pressure should be 3000 psf. The allowable bearing pressures apply to combined dead and sustained live loads. The allowable bearing pressures may be increased by one third when considering transient live loads, including seismic and wind forces.

Based on the recommended allowable bearing pressures, the total static settlement of the shallow footings is anticipated to be less than one inch, provided foundation area preparation conforms with the recommendations included in this report. Static differential settlement is anticipated to be approximately one-half of the total settlement for similarly loaded footings spaced up to approximately 50 feet apart.

Lateral load resistance for the spread footings will be developed by passive pressure against the sides of the footings below grade and by friction acting at the base of the footings. An allowable passive pressure of 250 psf per foot of depth may be used for design purposes. An allowable coefficient of friction 0.45 may be used for dead and sustained live loads to compute the frictional resistance of the footing placed directly on compacted fill. Under seismic and wind loading conditions, the passive pressure and frictional resistance may be increased by one-third.

All footing excavations should be observed by a representative of the project geotechnical consultant to verify adequate embedment depths prior to placement of forms, steel reinforcement or concrete. The excavations should be trimmed and level and square. All loose, disturbed, sloughed or moisture-softened soils and/or any construction debris should be removed prior to concrete placement. Excavated soil generated from footing and/or utility trenches should not be stockpiled within the building envelope or in areas of exterior concrete flatwork. All footings should be reinforced in accordance with the project Structural Engineer's recommendations.

SLABS-ON-GRADE

In order to provide uniform foundation support, concrete slabs-on-grade must be placed on properly compacted engineered fill soil as outlined in the previous sections of this report. The slab subgrade should remain near optimum moisture content and should not be permitted to dry prior to concrete placement. Slab subgrade should be firm and unyielding. Disturbed soil should be removed and replaced with engineered fill soil compacted to a minimum of 90 percent relative compaction.

Slab thickness and reinforcement should be determined by the Structural Engineer. We recommend a minimum slab thickness of 4.0 inches and minimum reinforcement of #3 bars at 24 inches on center in both directions. All slab reinforcement should be supported on concrete chairs to ensure that reinforcement is placed at slab rise-height. Final floor slab design and reinforcement should be determined by the Structural Engineer.

Slabs with moisture sensitive surfaces should be underlain with a moisture vapor retarder consisting of a polyvinyl chloride membrane such as 10 mil visqueen, or equivalent. All laps within the membrane should be sealed and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface cannot be achieved by grading, consideration should be given to placing a thin leveling course of sand across the pad surface prior to placement of the membrane.

RETAINING WALLS

Minor retaining walls may be necessary to complete the proposed construction. Cantilever retaining walls may be designed using "active" pressures. Active pressures may be estimated using an equivalent fluid weight of 45 pcf for level native backfill soil acting in a triangular pressure distribution with drained backfill conditions. "At Rest" pressures should be utilized for restrained walls. At rest pressures may be estimated using an equivalent fluid weight of 55 pcf for native backfill soil with level drained backfill conditions.

We recommend that a back drain system be provided behind all retaining walls or that the walls be

designed for full hydrostatic pressures. The back drains should consist of a heavy walled, four inch diameter, perforated pipe sloped to drain to outlets by gravity, and of clean, free-draining, three-quarter to one and one-half inch crushed rock or gravel. The crushed rock or gravel should extend to within one foot of the surface. The upper one foot should be backfilled with compacted, fine-grained soil to exclude surface water. A Mirafi 150N (or equivalent) fiber cloth should be placed between the on-site native material and the drain rock.

We recommend that the ground surface behind retaining walls be sloped to drain. Under no circumstances should the surface water be diverted into back drains. Where migration of moisture through walls would be detrimental, the walls should be waterproofed.

PRELIMINARY PAVEMENT DESIGN

Asphalt concrete pavements should be designed in accordance with Topic 608 of the Caltrans Highway Design Manual based on R Value and Traffic Index. An R Value of 60 was assumed to develop the following preliminary pavement design sections. For Pavement design, a Traffic Index (TI) of 5.5 was used for the project. We assumed Asphalt Concrete (AC) over Class II Aggregate Base (AB). The preliminary flexible pavement design is as follows.

| ON-SITE ASPHALT PAVEMENT SECTION LAYER THICKNESS | |
|--|-----------------------|
| Pavement Material | Recommended Thickness |
| Asphalt Concrete Surface Course | TI = 5.5 11 inches |
| Class II Aggregate Base Course | 40 inches |
| Compacted Subgrade Soil | 120 inches |

Asphalt concrete should conform with the Standard Specifications for Public Works Construction ("Greenbook") or Caltrans. Class II aggregate base should conform to Greenbook or Caltrans standard Specifications. The aggregate base material should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Method D 1557.

CORROSION SERIES

The soluble sulfate concentrations of the surface soil were determined to be 60 parts per million (ppm). The soil is considered to have a "negligible" corrosion potential with respect to concrete. The use of Type V cement and special sulfate resistant concrete mixes would not be necessary. The soluble sulfate content of the surface soil should be reevaluated after grading and appropriate concrete mix designs should be established based upon post-grading test results.

The pH level of the surface soil was 8.3. Based on soluble chloride concentration testing (50 ppm) the soil is considered to have "negligible" corrosion potential with respect to normal grade steel. The minimum resistivity of the surface soil was found to be 2,000 ohm-cm which suggests the site soil is considered to have "moderate" corrosion potential with respect to ferrous metal installations.

UTILITY TRENCH BACKFILL

All utility trench backfill should be compacted to a minimum of 90 percent relative compaction. Trench backfill materials should be placed in lifts no greater than six inches in a loose condition, moisture conditioned (or air-dried) as necessary to achieve near optimum moisture content, and mechanically compacted to a minimum of 90 percent relative compaction. A representative of the project soil engineer should test the backfill to verify adequate compaction.

EXTERIOR CONCRETE FLATWORK

In order to provide uniform support and minimize settlement related cracking of concrete flatwork, the subgrade soil within concrete flatwork areas should be compacted to a minimum of 90 percent relative compaction. A representative of the project geotechnical consultant should observe and certify the density and moisture content of the soil prior to concrete placement.

DRAINAGE

All final grades should be provided with positive gradients away from foundations to provide rapid removal of surface water runoff to an adequate discharge point. No water should be allowed to be pond on or immediately adjacent to foundation elements. In order to reduce water infiltration into the subgrade soil, surface water should be directed away from building foundations to an adequate discharge point. Subgrade drainage should be evaluated upon completion of the precise grading plans and in the field during grading.

LIMITATIONS

The findings and recommendations presented in this report are based upon an investigation of the soil conditions between the exploratory bore locations and extrapolation of these conditions throughout the proposed building areas. Should conditions encountered during grading appear different than those indicated in this report, this office should be notified.

The use of this report by other parties or for other projects is not authorized. The recommendations of this report are contingent upon monitoring of the grading operation by a representative of Sladden Engineering. All recommendations are considered to be tentative pending our review of the grading operation and additional testing, if indicated. If others are employed to perform any soil testing, this office should be notified prior to such testing in order to coordinate any required site visits by our representative and to assure indemnification of Sladden Engineering.

We recommend that a pre-job conference be held on the site prior to the initiation of site grading. The purpose of this meeting will be to ensure a complete understanding of the recommendations presented in this report as they apply to the actual grading performed.

ADDITIONAL SERVICES

Once completed, final project plans and specifications should be reviewed by use prior to construction to confirm that the full extent of the recommendations presented herein have been applied to design and construction. Following review of plans and specifications, observation should be performed by the Soil Engineer during construction to document that foundation elements are founded over/extend into the properly compacted soil, and that suitable backfill soil is placed upon competent materials and properly compacted at the recommended moisture content.

Tests and observations should be performed during grading by the Soil Engineer or his representative in order to verify that the grading is being performed in accordance with the project specifications. Field density testing shall be performed in accordance with acceptable ASTM test methods. The minimum acceptable degree of compaction should be 90 percent for engineered fill soil and 95 percent for Class II aggregate base as obtained by ASTM Test Method D1557. Where testing indicates insufficient density, additional compactive effort shall be applied until retesting indicates satisfactory compaction.

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FIGURES

SITE LOCATION MAP
REGIONAL GEOLOGIC MAP
EXPLORATION LOCATION PLAN



SITE LOCATION MAP

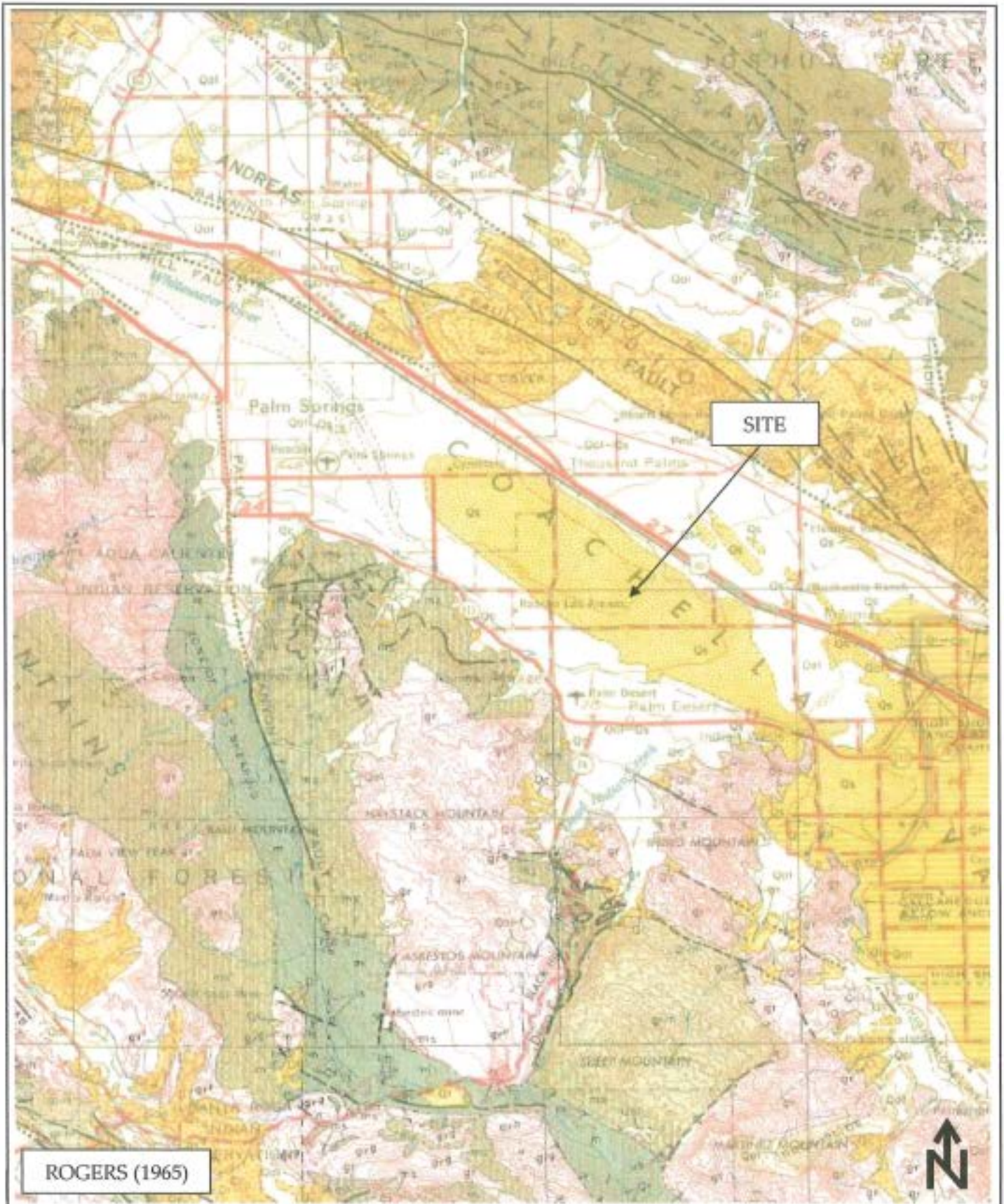
FIGURE

1



Sladden Engineering

| | |
|-----------------|--------------|
| Project Number: | 544-22072 |
| Report Number: | 22-05-298 |
| Date: | May 17, 2022 |



ROGERS (1965)



REGIONAL GEOLOGIC MAP

FIGURE

Project Number:

544-22072

Report Number:

22-05-298

Date:



May 17, 2022

2



Sladden Engineering

LEGEND

-  BH-11 Borehole Location
-  DR-2 Infiltration Test Location



MSA (2022)

EXPLORATION LOCATION PLAN

FIGURE

3



Sladden Engineering

| | |
|-----------------|--------------|
| Project Number: | 544-22072 |
| Report Number: | 22-05-298 |
| Date: | May 17, 2022 |

APPENDIX A
FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

For our field investigation eleven (11) exploratory boreholes were excavated on February 17, 2022 and March 10, 2022 utilizing a truck mounted hollow stem auger rig (Module B 61) and a track mounted excavator (John Deere 30). Continuous logs of the materials encountered were made by a representative of Sladden Engineering. Materials encountered in the boreholes were classified in accordance with the Unified Soil Classification System which is presented in this appendix.

Representative undisturbed samples were obtained within our borings by driving a thin-walled steel penetration sampler (California split spoon sampler) or a Standard Penetration Test (SPT) sampler with a 140 pound automatic-trip hammer dropping approximately 30 inches (ASTM D1586). The number of blows required to drive the samplers 18 inches was recorded in 6-inch increments and blowcounts are indicated on the boring logs.

The California samplers are 3.0 inches in diameter, carrying brass sample rings having inner diameters of 2.5 inches. The standard penetration samplers are 2.0 inches in diameter with an inner diameter of 1.5 inches. Undisturbed samples were removed from the sampler and placed in moisture sealed containers in order to preserve the natural soil moisture content. Bulk samples were obtained from the excavation spoils and samples were then transported to our laboratory for further observation and testing.



Sladden Engineering

HOURE 101G

Department
Electrical

Module ID#1
101E101

Date Dated,
Being No.

11/02/02
01-1

| sample | Blow Counts | Soils Sample #/ft | Expansion Index | % Moisture @200 | % Moisture | Density - pcf | Depth - Feet | Geographic Information | Description |
|--------|-------------|-------------------|-----------------|-----------------|------------|---------------|--------------|------------------------|---|
| | 1 | 1 | 0 | | | | 0 | | Soil Recovery |
| | 2 | 11 | | 5.3 | 13 | 11.1 | 2 | | Soil (S2), pale yellow silty clay, medium dense, fine grained (SC) |
| | 3 | 9 | | 9.7 | 21 | | 10 | | Soil (S2), pale yellow silty clay, dense, medium dense, fine grained (SC) |
| | 4 | 21 | | 5.4 | 16 | 11.0 | 16 | | Soil (S2), gray silty sand, clay, medium dense, fine grained (SC) |
| | 5 | 16 | | 5.3 | 16 | | 20 | | Soil (S2), gray silty sand, clay, dense, fine grained (SC) |
| | 6 | 32 | | 7.1 | 18 | 11.0 | 28 | | Soil (S2), gray silty sand, clay, medium dense, fine grained (SC) |
| | 7 | 15 | | 4.3 | 11 | | 30 | | Soil (S2), gray silty sand, clay, medium dense, fine grained (SC) |

Completion Notes:

FIGURE 1 DEPARTMENT COURT EX

505 FRANKS BLVD, OK AND 5000 N. AVE., PALM BEACH

Project No. 3447200

Report No. 22.01.018



Sladden Engineering

BORE LOG

Equipment: _____
 Location: _____
 Date: _____
 Project No.: _____
 Well No.: _____

| Sample | Blow Counts | Bar Sample | Expansive Index | Moisture % | Moisture | Depth, feet | Depth of Penetration | Groundwater | Description |
|--|-------------|------------|-----------------|------------|----------|-------------|----------------------|-------------|--|
| | | | | | | | 0 | | |
| | 8 | | | 55 | 11 | | 4 | | |
| | 9 | | | 62 | 16 | 10.5 | 6 | | Sand 60% gradation, dry, well air dries, fine grained (G3) |
| | 11 | | | 17 | 14 | | 10 | | Sand 60% gradation, dry, well air dries, fine grained (G3) |
| | 5 | | | 60 | 17 | 17.5 | 20 | | Sand 60% gradation, dry, well air dries, fine grained (G3) |
| | 5 | | | 71 | 20 | | 24 | | Sand 60% gradation, dry, well air dries, fine grained (G3) |
| | 15 | | | 56 | 11 | 29.5 | 30 | | Sand 60% gradation, dry, well air dries, fine grained (G3) |
| No. 100 Mesh 25-315 Sieves No. 200 Sieve Used No. Groundwater or Seepage Encountered | | | | | | | | | |

Completion Notes

PROJECT: PARKVIEW COMPLEX
 S/W FRANK SENYERS DR. AND FORTOLA AVE. PALMDALE
 Project No. 54128-02
 Sheet No. 07.05.206



Sladden Engineering

BORE LOG

| | | | |
|-----------|-----------------|-------------|---------|
| Equipment | Job Description | City/State | Job No. |
| Flowline | 27th St. 304 | Bozeman, MT | 1517 |

| Sample | Blow Counts | Blow Sample | Expansion in Inches | U.S. Units (200) | Penetration | Depth (ft) | Corrosion (alkalinity) | Description |
|--------|-------------|-------------|---------------------|------------------|-------------|------------|------------------------|-------------|
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Sand 10%, pH yellowish to white, medium dense fine grained (MS)

Terminated at 81 Feet Depth.
No Bedrock Encountered.
No Groundwater or Seepage Encountered.

Remarks:



Sladden Engineering

BORE LOG

| | | | |
|-------------|--------------|----------|-------|
| Project No. | Job Name No. | Date | Scale |
| 0100000 | 27311501 | 30/08/02 | B1:1 |

| Sample | Flow Counts | PH Sample | Exposure (days) | Gamma (dpm) | Chemistry (%) | Depth (feet) | Geologic Lithology | Description |
|--------|-------------|-----------|-----------------|-------------|---------------|--------------|--------------------|----------------------------|
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| | | | | | | 10 | | Terminated at 10 feet deep |
| | | | | | | 11 | | Method of Exposure test |
| | | | | | | 12 | | NaCl immersion test |
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| Completion Note: | | PROJECT: 27311501 COMPLETION | |
| | | SAC: PANK SENAPATI, AKC/FORDOLA AVE, FARMERSBURG | |
| Print No. | 500002 | | Page 4 |
| Report No. | 27311501 | | |



Sladden Engineering

BORE LOG

| | | | |
|-------------|-----------------|--------------|------------|
| Requirement | Jalan Tolong 30 | Date of Bore | 20/02/2023 |
| Elevation | 271.70 (MSL) | Bore No. | 5011 |

| Sample | Flow Chart | Flow Sample | Equipment Used | Scale of Log | Notes | Depth (m) | Geophysical Methods |
|--------|------------|-------------|----------------|--------------|-------|-----------|---------------------|
| | | | | | | 0 | |
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Requirement

Sand (95%) to top of bore, 40% to 100% sand (100%)

One set of 100' test logs
No. Rebar's borehole used
No. Case indicator or Survey Indicator used



Sladden Engineering

BORING LOG

| | | | |
|-------------|--------------|------------|----------|
| Client Name | 5501 Ave. C | Date Bored | 03/20/02 |
| Location | 2751 E. 35th | Boring No. | 3106 |

| | | | | | | | |
|-------|------------|--------------|-----------------|------------|------------|-------------|--------------|
| Depth | Flow Chart | Block Sample | Expansion Index | Moisture % | Void Ratio | Penetration | Depth (Feet) |
| | | | | | | | 0 |
| | | | | | | | 1 |
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|--------------|--|
| Depth (Feet) | Description |
| 0 - 3 | 4 in. (30) x 30 in. (762) gravelly brown sand (fine grain), 4 p.c.a. |
| 3 - 6 | Decomposed (1 - 2) zone (top) Kia (1) and (2) zone (top) No. 6 (1) and (2) zone (top) (1) zone (top) |

Comments/Notes:

PROJECT GUARANTEE COMPANY
 5501 AVENUE C AND PORTOLA AVE, PALM DESERT
 Permit No. 044-036-2
 Report No. 02-07-098



Sladden Engineering

BORE LOG

| | | | |
|------------|-------------------------|-------------|------------|
| Depth (m): | Plot Date: 30 | Plot Depth: | 2012/07/01 |
| Flow rate: | 0.511 m ³ /s | Boat No: | BE 7 |

| Sample | Flow (m ³ /s) | Plot Sample | Expanding Log | Plot Date | Plot Time | Depth (m) | Ground | Description |
|--------|--------------------------|-------------|---------------|-----------|-----------|-----------|--------|--|
| | | | | | | 0 | | |
| | | | | | | 1 | | |
| | | | | | | 2 | | |
| | | | | | | 3 | | |
| | | | | | | 4 | | Hard SP, yellowish brown to grey silty sand, fine to medium (S). |
| | | | | | | 5 | | |
| | | | | | | 6 | | |
| | | | | | | 7 | | |
| | | | | | | 8 | | |
| | | | | | | 9 | | Zone starts at 80 fathoms |
| | | | | | | 10 | | Soft to medium sand |
| | | | | | | 11 | | Not a sandstone or siltstone - composed |
| | | | | | | 12 | | |
| | | | | | | 13 | | |
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| | | | | | | 50 | | |



Sladden Engineering

BORE LOG

Equipment: 1000 PSI 50 FT Date: Dec 14 2012
Location: 270 E. 4th St. Spring No: 8118

| |
|------------------|
| Sample |
| Blow Counts |
| Penetration |
| Expansion Factor |
| Gravel |
| Coarse sand |
| Medium sand |
| Fine sand |
| Clay |
| Water |
| Other |
| Remarks |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Depth (feet) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| Geologic Description | <p>Drill hole</p> <hr/> <p>Sand (SP) light to med. sh. brown, 1/2", fine grained (10%)</p> <hr/> <p>continuous at 7.0 feet depth No Bedrock encountered No Coal detected (see page 8 for details)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



Sladden Engineering

BORE LOG

Client
Moya Pura

Location No
N711 N71

Date Drilled
10/10/2018

Sheet No
01/0

| Depth | Blow Counts | Blow Sample | Expans. of Fluid | Volume of Soil | Moisture | Gravim. (pH) | Depth (Feet) | Geotechnical Technology | Description |
|-------|-------------|-------------|------------------|----------------|----------|--------------|--------------|-------------------------|--|
| | | | | | | | 0 | | |
| | | | | | | | 1 | | 10' to 12' light silty sand (S) with fine grained materials (2%) |
| | | | | | | | 2 | | |
| | | | | | | | 3 | | |
| | | | | | | | 4 | | |
| | | | | | | | 5 | | Termination at 50 Feet (p) |
| | | | | | | | 6 | | No further logs required. |
| | | | | | | | 7 | | End of log because of 2 page limit on time |
| | | | | | | | 8 | | |
| | | | | | | | 9 | | |
| | | | | | | | 10 | | |
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Drawn by: [Name]

PROVIDED UNDER CONTRACT

5025 FRANKLIN AVENUE, PORTLAND, OREGON 97203

Sheet No. 01/0

Report No. 12-05-2018

Page 9



Sladden Engineering

WDR LOG

| | | | |
|-----------|-----------|-------------|----------|
| Equipment | Date Done | Date Failed | Page No. |
| Excavator | 12/11/08 | 12/11/08 | 1 of 1 |

| | | | | | | | |
|--------|-------------|--------------|-----------------|----------|------------------|--------------|-------------------|
| Sample | Blow Counts | Soils Sample | Expansion Index | Moisture | Specific Gravity | Depth (Feet) | Ground Conditions |
| | | | | | | 0 | |
| | | | | | | 1 | |
| | | | | | | 2 | |
| | | | | | | 3 | |
| | | | | | | 4 | |
| | | | | | | 5 | |
| | | | | | | 6 | |
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| | | | | | | 49 | |
| | | | | | | 50 | |

Excavator

Soils Sample

Expansion Index

Moisture

Specific Gravity

Depth (Feet)

Ground Conditions

0

1

2

3

4

5

6

7

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9

10

11

12

13

14

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Completion Notes

9600 E. 40th Avenue, Golden, CO

9600 E. 40th Avenue, Golden, CO



Sladden Engineering

BORE LOG

Equipment:
Pneum.

Location: 7711 MS...

Date: 01/03
Boring No:

217203
10101

| Depth | Bore Course | Bulk Sample | Caprock or Cales | Grains Size | Moisture | Penetration | Flow Rate | Remarks |
|-------|-------------|-------------|------------------|-------------|----------|-------------|-----------|---------|
| 0 | | | | | | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
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| 30 | | | | | | | | |

Sand (S), yellowish brown, dry to slightly moist, fine grained (p.10)

Gravel (G): 10%

No. Bedrock Encountered

No. Groundwater Encountered

any other data



Sladden Engineering

BORE LOG

| | | | |
|-----------|--------------|------------|---------|
| Equipment | San Diego 90 | Site/Well | 3072003 |
| Location | 275 E. 5th | Boring No. | 1-11 |

| | | | | | | | |
|--------|-----------|---------------------|-------------|----------|-----------|----------------------|----------|
| Sample | Bore/Case | Pump Description | Casing #/ID | S. Depth | Elevation | Geologic Description | 1-10 ft |
| | | | | | | | 10-20 ft |
| | | | | | | | 2-3 ft |
| | | | | | | | 3-4 ft |
| | | | | | | | 4-5 ft |
| | | | | | | | 5-6 ft |
| | | | | | | | 6-7 ft |
| | | | | | | | 7-8 ft |
| | | | | | | | 8-9 ft |
| | | | | | | | 9-10 ft |
| | | | | | | | 10-11 ft |
| | | | | | | | 11-12 ft |
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| | | | | | | | 15-16 ft |
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| | | | | | | | 22-23 ft |
| | | | | | | | 23-24 ft |
| | | | | | | | 24-25 ft |
| | | | | | | | 25-26 ft |
| | | | | | | | 26-27 ft |
| | | | | | | | 27-28 ft |
| | | | | | | | 28-29 ft |
| | | | | | | | 29-30 ft |
| | | | | | | | 30-31 ft |
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| | | | | | | | 32-33 ft |
| | | | | | | | 33-34 ft |
| | | | | | | | 34-35 ft |
| | | | | | | | 35-36 ft |
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| | | | | | | | 38-39 ft |
| | | | | | | | 39-40 ft |
| | | | | | | | 40-41 ft |
| | | | | | | | 41-42 ft |
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| | | | | | | | 43-44 ft |
| | | | | | | | 44-45 ft |
| | | | | | | | 45-46 ft |
| | | | | | | | 46-47 ft |
| | | | | | | | 47-48 ft |
| | | | | | | | 48-49 ft |
| | | | | | | | 49-50 ft |

10-11 ft
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 41-42 ft
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 43-44 ft
 44-45 ft
 45-46 ft
 46-47 ft
 47-48 ft
 48-49 ft
 49-50 ft

Sand (SP) w/lowish brown, sh., and gravel (G)

SP - 10-11 ft
 No Reduct. Environment
 No Gravel (G) in 10-11 ft
 No Gravel (G) in 12-13 ft

APPENDIX B
LABORATORY TESTING

APPENDIX B

LABORATORY TESTING

Representative bulk and relatively undisturbed soil samples were obtained in the field and returned to our laboratory for additional observations and testing. Laboratory testing was generally performed in two phases. The first phase consisted of testing in order to determine the compaction of the existing natural soil and the general engineering classifications of the soils underlying the site. This testing was performed in order to estimate the engineering characteristics of the soil and to serve as a basis for selecting samples for the second phase of testing. The second phase consisted of soil mechanics testing. This testing including consolidation, shear strength and expansion testing was performed in order to provide a means of developing specific design recommendations based on the mechanical properties of the soil.

CLASSIFICATION AND COMPACTION TESTING

Unit Weight and Moisture Content Determinations: Each undisturbed sample was weighed and measured in order to determine its wet weight. A small portion of each sample was then subjected to testing in order to determine its moisture content. This was used in order to determine the dry density of the soil in its natural condition. The results of this testing are shown on the Boring Logs.

Maximum Density-Optimum Moisture Determinations: Representative soil types were selected for maximum density determinations. This testing was performed in accordance with the ASTM Standard D1557-91, Test Method A. Graphic representations of the results of this testing are presented in this appendix. The maximum densities are compared to the field densities of the soil in order to determine the existing relative compaction to the soil.

Classification Testing: Soil samples were selected for classification testing. This testing consists of mechanical grain size analyses. This provides information for developing classifications for the soil in accordance with the Unified Soil Classification System which is presented in the preceding appendix. This classification system categorizes the soil into groups having similar engineering characteristics. The results of this testing is very useful in detecting variations in the soil and in selecting samples for further testing.

SOIL MECHANICS TESTING

Expansion Testing: One (1) bulk sample was selected for Expansion testing. Expansion testing was performed in accordance with the UBC Standard 78-2. This testing consists of remolding 4-inch diameter by 1-inch thick test specimens to a moisture content and dry density corresponding to approximately 50 percent saturation. The samples are subjected to a surcharge of 144 pounds per square foot and allowed to reach equilibrium. At that point the specimens are inundated with distilled water. The linear expansion is then measured until complete.

Direct Shear Testing: One (1) bulk sample was selected for Direct Shear testing. This test measures the shear strength of the soil under various normal pressures and is used to develop parameters for foundation design and lateral design. Tests were performed using a recompacted test specimen that was saturated prior to tests. Tests were performed using a strain controlled test apparatus with normal pressures ranging from 500 to 2300 pounds per square foot.

Consolidation/Hydro-Collapse Testing: One (1) relatively undisturbed sample was selected for consolidation testing. For this test, a one-inch thick test specimen was subjected to vertical loads varying from 575 psf to 1150 psf applied progressively. The consolidation at each load increment was recorded prior to placement of each subsequent load.

Corrosion Series Testing: The soluble sulfate concentrations of the surface soil were determined in accordance with California Test Method Number (CA) 517. The pH and Minimum Resistivity were determined in accordance with CA 643. The soluble chloride concentrations were determined in accordance with CA 473.



Sladden Engineering

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Maximum Density/Optimum Moisture

ASTM D698/D1557

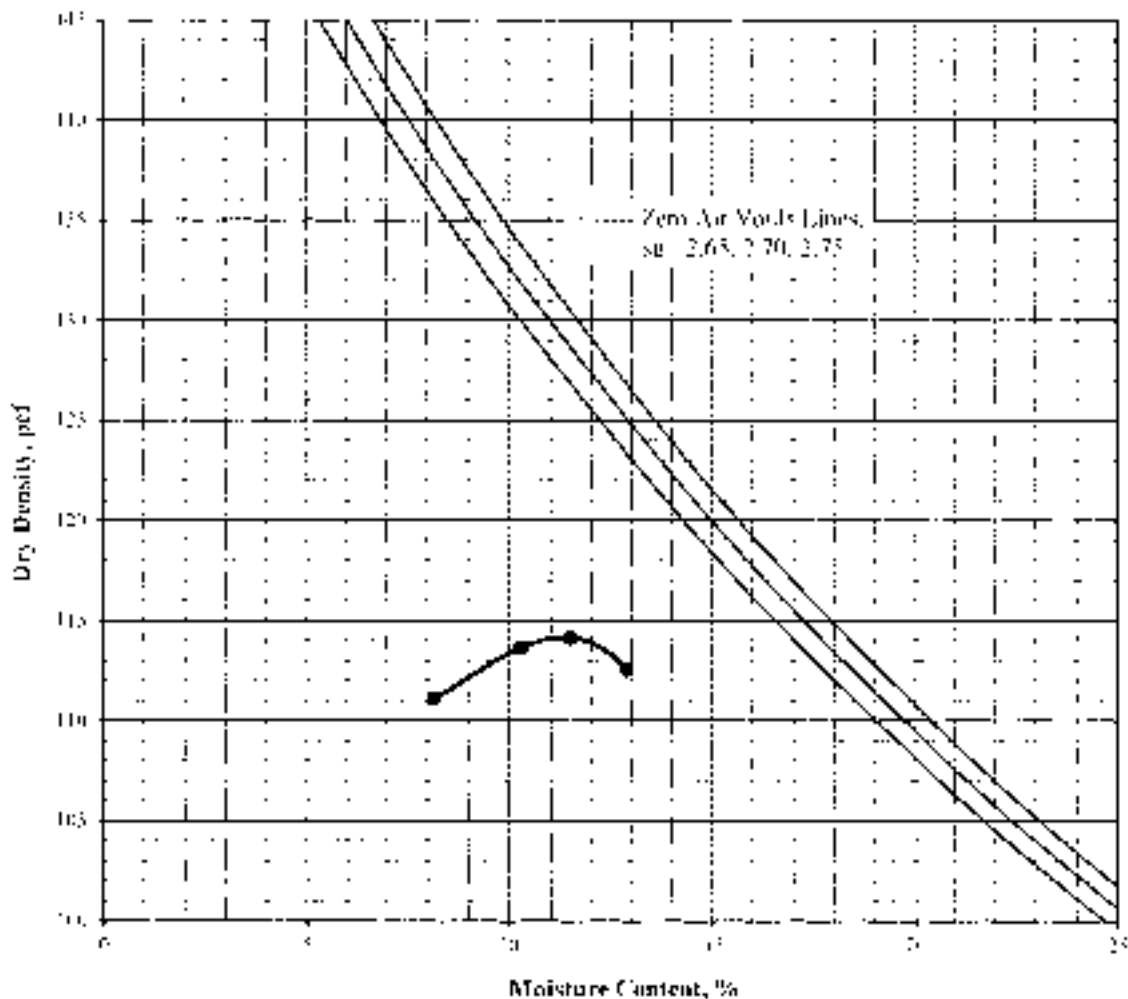
Project Number: S44-22077
 Project Name: SWC Frank Sinatra Drive & Perola Avenue
 Lab ID Number: LN6 22072
 Sample Location: B11-1 Bulk 1 to 0-5'
 Description: Gray Brown Sand w/Silt (SP-SM)

May 3, 2022

ASTM D-1557 A
 Rammer Type: Machine

Maximum Density: 114.5 pcf
 Optimum Moisture: 11%

| Sieve Size | % Retained |
|------------|------------|
| 3/4" | |
| 3/8" | |
| #1 | 0.1 |





Sladden Engineering

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Expansion Index

ASTM D 4829

Job Number: 544-22072
 Job Name: SWC Frank Sinatra Drive & Portola Avenue
 Lab ID Number: LAG-22072
 Sample ID: BE1 - Bulk 1 to 0.5'
 Soil Description: Gray Brown Sand w/Silt (SP-SM)

May 3, 2022

| | |
|-------------------|-------|
| Wt of Soil + Ring | 564.3 |
| Weight of Ring: | 191.0 |
| Wt of Wet Soil: | 373.3 |
| Percent Moisture: | 9.8% |
| Sample Height, in | 0.95 |
| Wet Density, pcf: | 119.5 |
| Dry Density, pcf: | 108.8 |

| | |
|---------------|------|
| % Saturation: | 48.2 |
|---------------|------|

Expansion Rack # 2

| | | |
|-----------------|-----------|---------|
| Date/Time | 4/27/2022 | 3:30 PM |
| Initial Reading | 0.0000 | |
| Final Reading | 0.0000 | |

Expansion Index _____ ft

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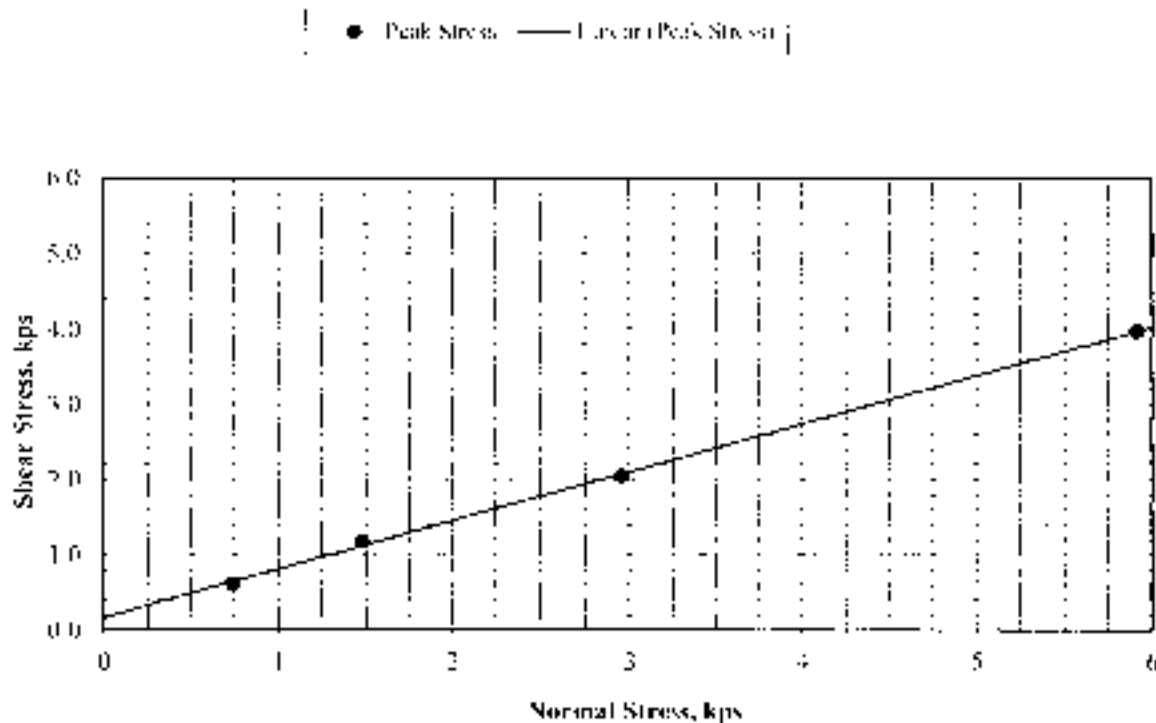
Direct Shear ASTM D 3080-04 (modified for unconsolidated condition)

Job Number: 544-22072
 Job Name SWC Frank Sinatra Drive & Portola Avenue
 Lab ID No. 1.N6-22072
 Sample ID BH-1 Bulk 1' @ 0-5'
 Classification Gray Brown Sand w/Silt (SP SM)
 Sample Type Remolded @ 90% of Maximum Density

May 3, 2022

Initial Dry Density: 102.9 pcf
 Initial Moisture Content: 11.1 %
 Peak Friction Angle (ϕ): 33°
 Cohesion (c): 170 psf

| Test Results | 1 | 2 | 3 | 4 | Average |
|---------------------|-------|-------|-------|-------|---------|
| Moisture Content, % | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 |
| Saturation, % | 75.8 | 75.8 | 75.8 | 75.8 | 75.8 |
| Normal Stress, kps | 0.739 | 1.179 | 2.958 | 5.916 | |
| Peak Stress, kps | 0.610 | 1.177 | 2.049 | 3.968 | |



Job Number: 544-22072
Job Name: SWC Frank Smatra Drive & Portola Avenue
Date: 5/3/2022

| Moisture Adjustment | | Remolded Shear Weight | |
|---------------------|--------------|-----------------------|-------|
| Wt of Soil: | <u>1,800</u> | Max Dry Density: | 114.5 |
| Moist As Is: | <u>0.3</u> | Optimum Moisture: | 11.0 |
| Moist Wanted: | <u>1.0</u> | | |
| ml of Water to Add: | 106.7 | Wt Soil per Ring, g: | 137.5 |

UBC



Sladden Engineering

450 Egan Avenue, Beaumont, CA 92223 (951) 845 7743 Fax (951) 845 8863

Gradation

ASTM C 117 & C 136

Project Number: 544 22072

May 3, 2012

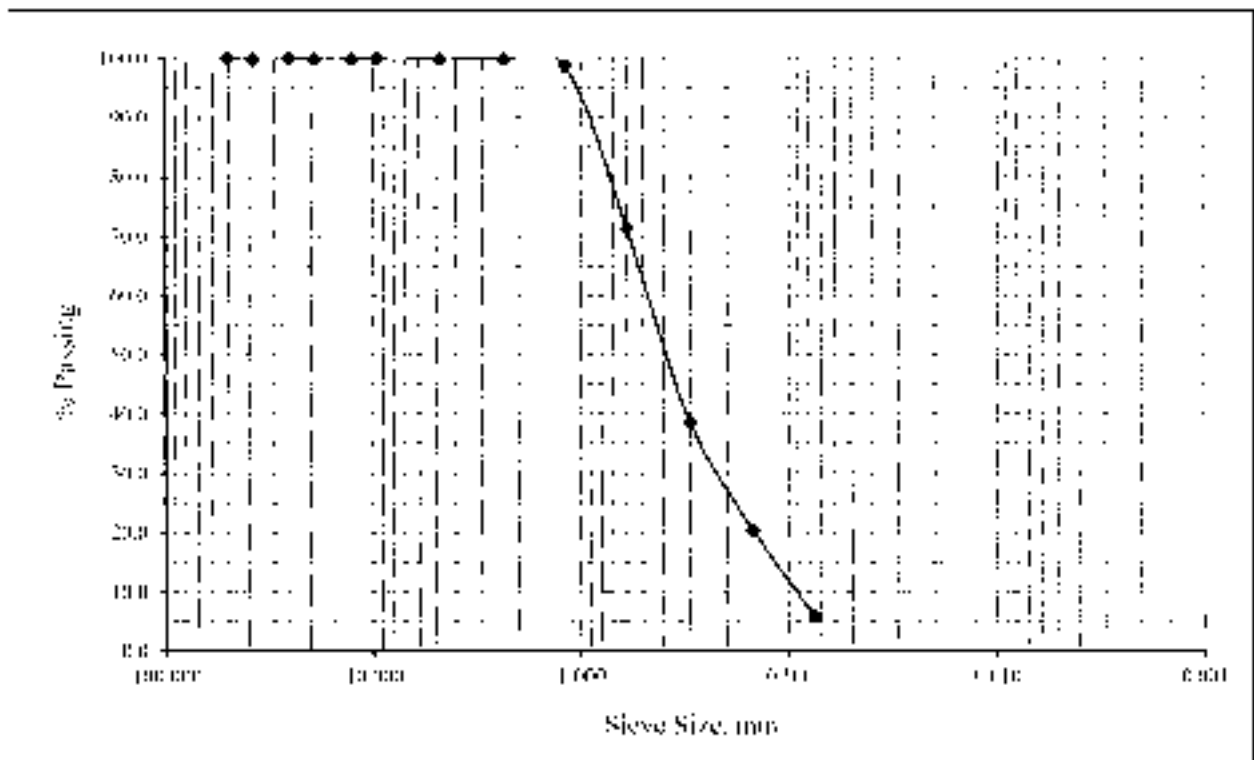
Project Name: SWC Frank Sinatra Drive & Portola Avenue

Lab ID Number: LN6-22072

Sample ID: BE-1 Bulk 1' @ 0-5'

Soil Classification: SP-SM

| Sieve Size, in | Sieve Size, mm | Percent Passing |
|-------------------|-------------------|--------------------|
| 2" | 50.8 | 100.0 |
| 1 1/2" | 38.1 | 100.0 |
| 1" | 25.4 | 100.0 |
| 3/4" | 19.1 | 100.0 |
| 1/2" | 12.7 | 100.0 |
| 3/8" | 9.53 | 100.0 |
| #4 | 4.75 | 99.9 |
| #8 | 2.36 | 99.9 |
| #16 | 1.18 | 98.8 |
| #30 | 0.60 | 71.3 |
| #50 | 0.30 | 38.6 |
| #100 | 0.15 | 20.5 |
| #200 | 0.075 | 5.9 |





Sladden Engineering

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Gradation

ASTM C117 & C136

Project Number: 544-22072

May 3, 2022

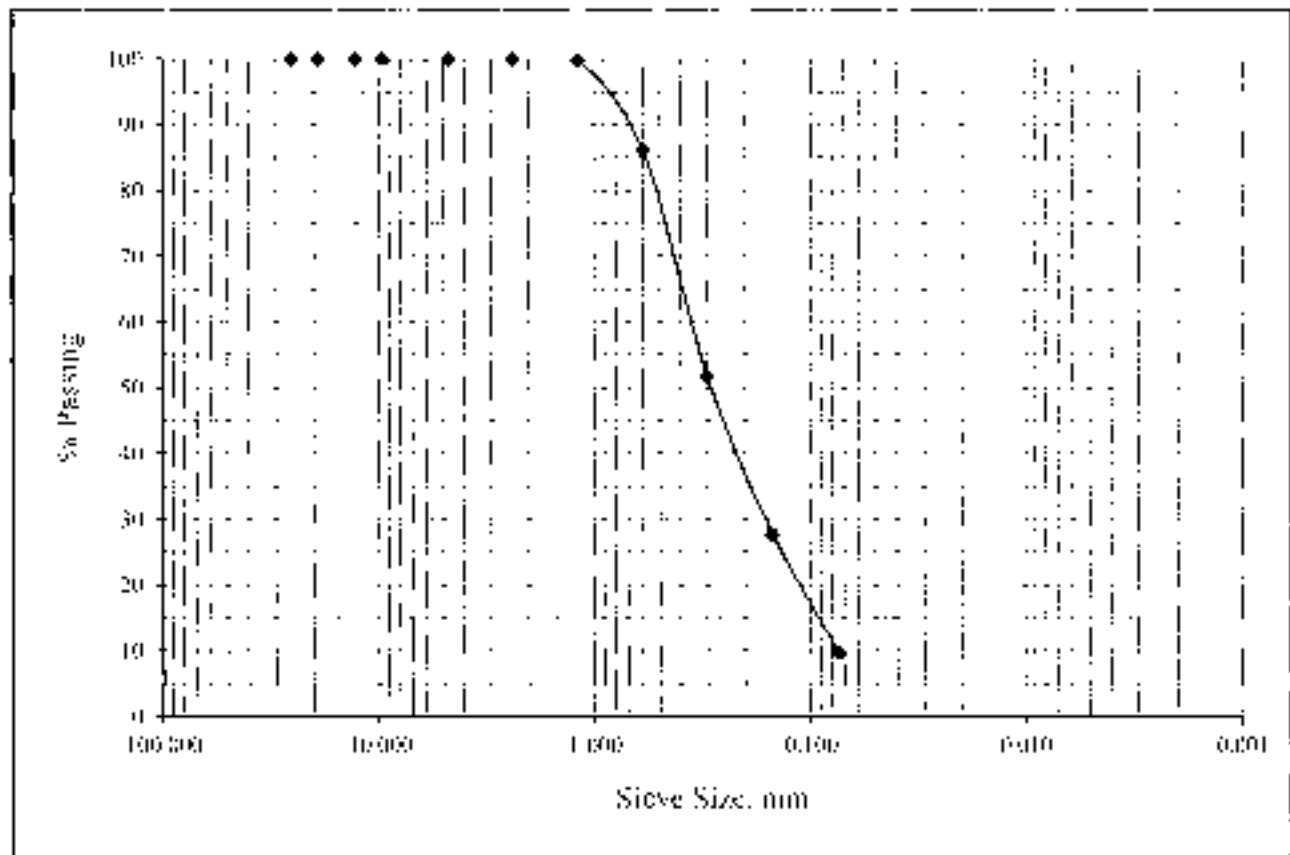
Project Name: SWC Frank Sinatra Drive & Pomala Avenue

Lab ID Number: 1 N6-22072

Sample ID: B11-1 S-3 to 10'

Soil Classification: SP SM

| Sieve Size, in | Sieve Size, mm | Percent Passing |
|----------------|----------------|-----------------|
| 1" | 25.4 | 100.0 |
| 3/4" | 19.1 | 100.0 |
| 1/2" | 12.7 | 100.0 |
| 3/8" | 9.53 | 100.0 |
| #4 | 4.75 | 100.0 |
| #8 | 2.36 | 100.0 |
| #16 | 1.18 | 99.7 |
| #30 | 0.60 | 86.2 |
| #50 | 0.30 | 51.7 |
| #100 | 0.15 | 27.8 |
| #200 | 0.075 | 9.7 |





Sladden Engineering

45C Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Gradation

ASTM C 136 & C 136

Project Number: 544-22072

May 3, 2022

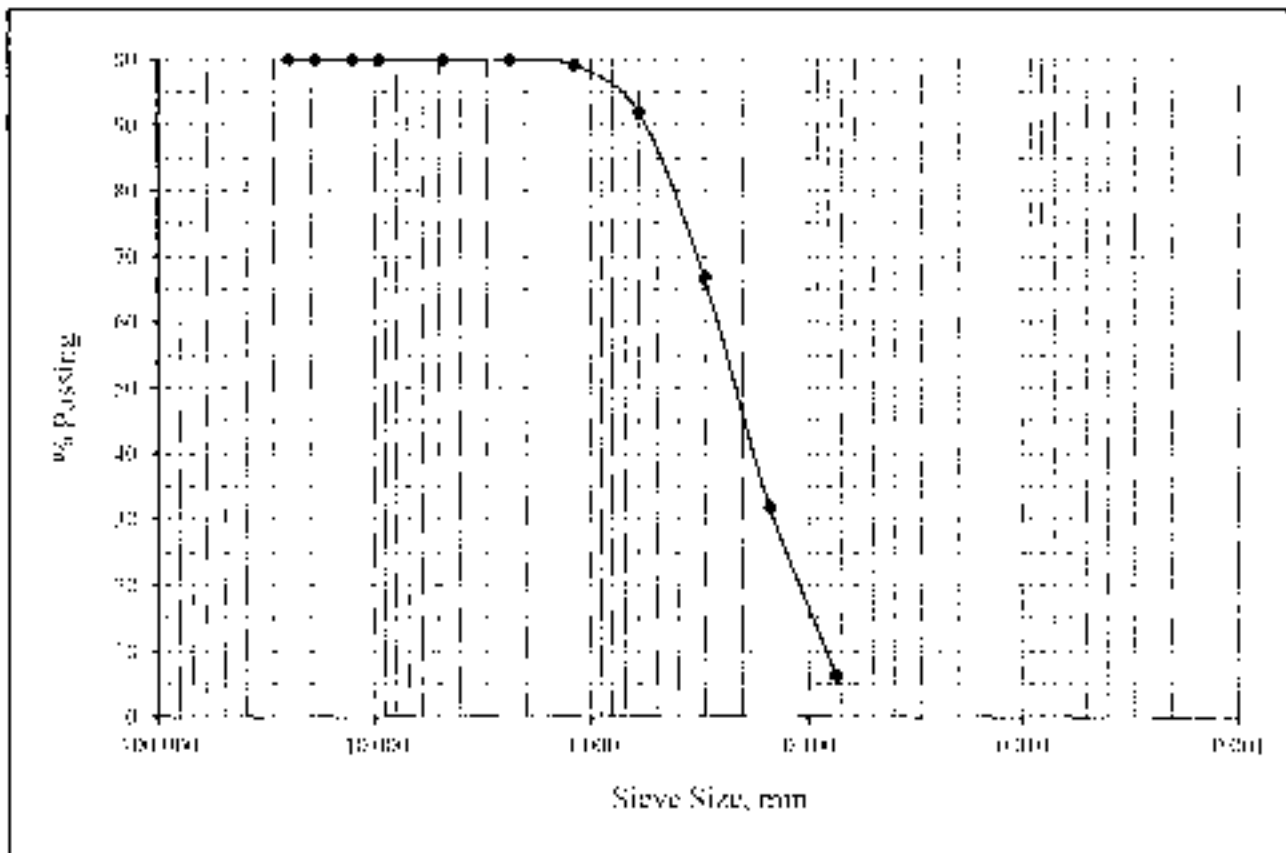
Project Name: SWC Frank Sinatra Drive & Portola Avenue

Lab ID Number: 1346-22072

Sample ID: BII-3 R-2 @ 10'

Soil Classification: SP-SM

| Sieve Size, in | Sieve Size, mm | Percent Passing |
|----------------|----------------|-----------------|
| 1" | 25.4 | 100.0 |
| 3/4" | 19.1 | 100.0 |
| 1/2" | 12.7 | 100.0 |
| 3/8" | 9.53 | 100.0 |
| #4 | 4.75 | 100.0 |
| #8 | 2.36 | 100.0 |
| #16 | 1.18 | 99.0 |
| #30 | 0.60 | 91.9 |
| #50 | 0.30 | 66.8 |
| #100 | 0.15 | 31.9 |
| #200 | 0.074 | 6.3 |





Sladden Engineering

450 Egan Avenue, Beaumont, GA 32223 (951) 845-7743 Fax (951) 845-0863

One Dimensional Consolidation

ASTM D2435 & D5111

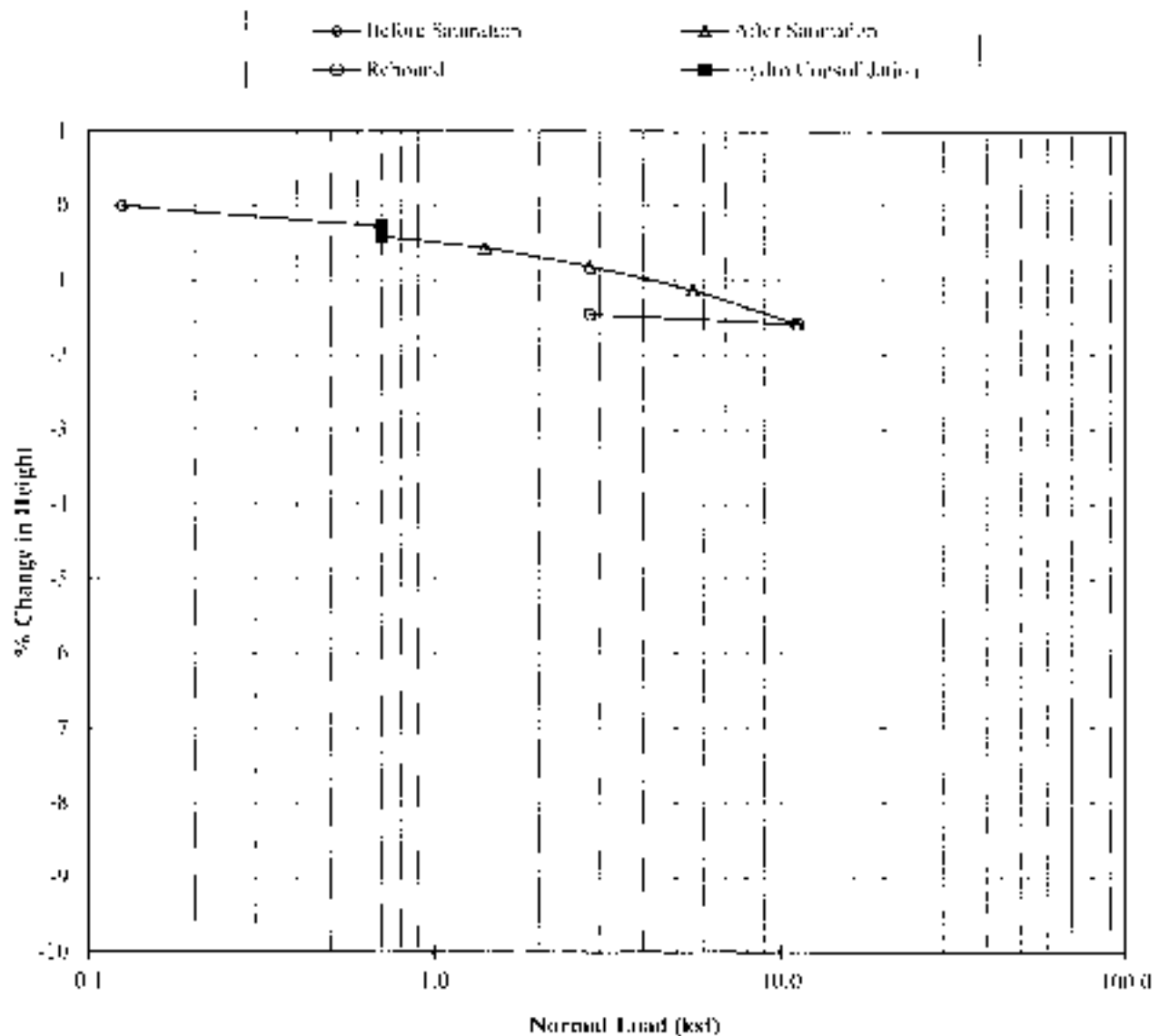
Job Number: S14-23072
 Job Name: SWC Frank Sinatra Drive & Portola Avenue
 Lab ID Number: LN6-22072
 Sample ID: BH-2 R-2 @ 10'
 Soil Description: Gray Brown Sand w/Silt (SP-SM)

May 3, 2022

Initial Dry Density, pcf: 114.1
 Initial Moisture, %: 1.0
 Initial Void Ratio: 0.461
 Specific Gravity: 2.67

Hydrocollapse: 0.1% w/ 0.702 ksf

% Change in Height vs Normal Pressure Diagram





Sladden Engineering

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Date: May 3, 2022

Account No.: 544-22072

Customer: Mr. Calvin Hayes, Hayes Dietrich, I LLC

Location: APN's 620 400-030 & 031, SWC Frank Sinatra Drive & Portola Avenue,
Palm Desert

Analytical Report

Corrosion Series

| | pH per CA 843 | Soluble Sulfates per CA 417 ppm | Soluble Chloride per CA 422 ppm | Min. Resistivity per CA 843 ohm-cm |
|-------------|------------------|---------------------------------------|---------------------------------------|--|
| BH 1 @ 0-5' | 8.3 | 60 | 50 | 4000 |

APPENDIX

SEISMIC DESIGN PARAMETERS
SEISMIC DESIGN MAPS



SWC Frank Sinatra Drive and Portola Avenue, Palm Desert

Latitude, Longitude: 33.7707, -116.3724



| | |
|---------------------------------------|------------------------|
| Date | 5/10/2022, 12:55:00 PM |
| Design Code Reference Document | ASCE7-16 |
| Risk Category | I |
| Site Class | D - Stiff Soil |

| Type | Value | Description |
|----------|--------------------------|--|
| S_0 | 1.866 | MCE_R ground motion, (for 0.2 second period) |
| S_1 | 0.688 | MCE_R ground motion, (for 1.0s period) |
| S_{MS} | 1.866 | Site-modified spectral acceleration value |
| S_{M1} | null -See Section 11.4.8 | Site-modified spectral acceleration value |
| S_{0S} | 1.111 | Numeric seismic design value at 0.2 second SA |
| S_{01} | null -See Section 11.4.8 | Numeric seismic design value at 1.0 second SA |

| Type | Value | Description |
|-----------|--------------------------|--|
| SDC | null -See Section 11.4.8 | Seismic design category |
| F_a | 1 | Site amplification factor at 0.2 second |
| F_v | null -See Section 11.4.8 | Site amplification factor at 1.0 second |
| PGA | 0.726 | MCE_G peak ground acceleration |
| F_{PGA} | 1.1 | Site amplification factor at PGA |
| PGA_M | 0.799 | Site modified peak ground acceleration |
| T_L | 8 | Long-period transition period in seconds |
| S_{sRT} | 2.007 | Probabilistic risk-targeted ground motion, (0.2 second) |
| S_{sUH} | 2.222 | Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration |
| S_{sD} | 1.866 | Factored deterministic acceleration value, (0.2 second) |
| S_{1RT} | 0.783 | Probabilistic risk-targeted ground motion, (1.0 second) |
| S_{1UH} | 0.883 | Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration |
| S_{1D} | 0.688 | Factored deterministic acceleration value, (1.0 second) |
| PGA_d | 0.726 | Factored deterministic acceleration value, (Peak Ground Acceleration) |
| C_{RS} | 0.903 | Mapped value of the risk coefficient at short periods |

| Type | Value | Description |
|----------------|-------|---|
| C _u | 0.057 | Mapped value of the risk coefficient as a period of 1 s |

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Project: SWC Frank Sinatra Drive and Portola Avenue, Palm Desert
 Project Number: 544-22072
 Client: Hayes Dietrich, LLC
 Site Lat/Long: 33.7707/-116.3724
 Controlling Seismic Source: San Andreas

| REFERENCE | NOTATION | VALUE |
|----------------------------------|-----------------------|------------|
| Site Class | C, D, D default, or E | D measured |
| Site Class D - Table 11.4-1 | F_a | 1.0 |
| Site Class D - 21.3(II) | F_v | 2.5 |
| $0.2*(S_{D1}/S_{D5})$ | T_0 | 0.140 |
| S_{D1}/S_{D5} | T_3 | 0.702 |
| Fundamental Period (12.8.2) | T | Period |
| Seismic Design Maps or Fig 22-14 | T_1 | 8 |
| Equation 11.4-4 - $2/3*S_{M1}$ | S_{D1} | 0.7797* |
| Equation 11.4-2 - F_v*S_1 | S_{M1} | 1.1696* |

RISK COEFFICIENT

| | | |
|--|----------|-------|
| Cr - At Periods ≤ 0.2 , $Cr=C_{R5}$ | C_{R5} | 0.903 |
| Cr - At Periods ≥ 1.0 , $Cr=C_{R1}$ | C_{R1} | 0.887 |

| REFERENCE | NOTATION | VALUE |
|--|----------------|--------|
| Fv (Table 11.4-2)[Used for General Spectrum] | F_v | 1.7 |
| Design Maps | S_x | 1.666 |
| Design Maps | S_1 | 0.688 |
| Equation 11.4-1 - F_a*S_5 | S_{MS} | 1.666* |
| Equation 11.4-3 - $2/3*S_{MS}$ | S_{D5} | 1.111* |
| Design Maps | PGA | 0.726 |
| Table 11.8-1 | F_{PGA} | 1.1 |
| Equation 11.8-1 - $F_{PGA}*PGA$ | PGA_M | 0.799* |
| Section 21.5.3 | 80% of PGA_M | 0.639 |
| Design Maps | C_{R5} | 0.903 |
| Design Maps | C_{R1} | 0.887 |

| Cr - At Periods between 0.2 and 1.0 use trendline formula to complete | Period | Cr |
|---|--------|-------|
| | 0.200 | 0.903 |
| | 0.300 | 0.901 |
| | 0.400 | 0.899 |
| | 0.500 | 0.897 |
| | 0.600 | 0.895 |
| | 0.680 | 0.893 |
| | 1.000 | 0.887 |

* Code based design value. See accompanying data for Site Specific Design values.

Mapped values from <https://seismicmaps.org/>



PROBABILISTIC SPECTRA¹
2% in 50 year Exceedence

Project No: 544-22072

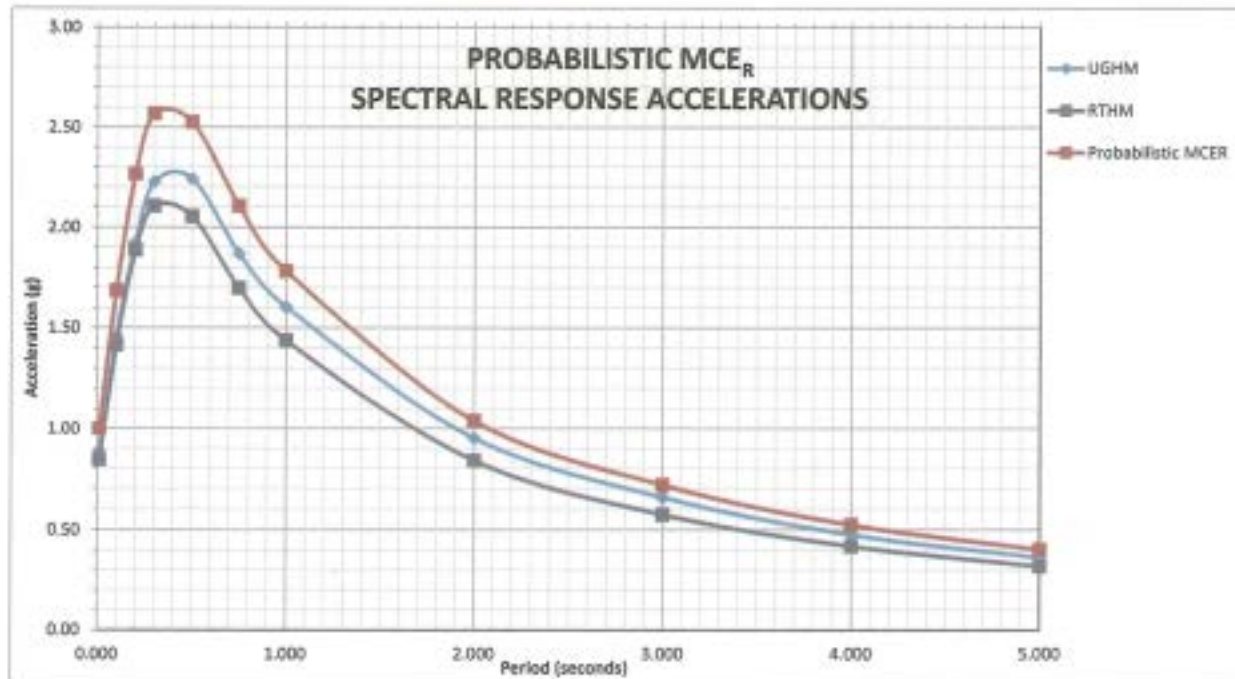
| Period | UGHM | RTHM | Max Directional Scale Factor ² | Probabilistic MCE |
|--------|-------|-------|---|-------------------|
| 0.010 | 0.883 | 0.843 | 1.19 | 1.003 |
| 0.100 | 1.459 | 1.417 | 1.19 | 1.686 |
| 0.200 | 1.923 | 1.888 | 1.20 | 2.266 |
| 0.300 | 2.225 | 2.105 | 1.22 | 2.568 |
| 0.500 | 2.240 | 2.054 | 1.23 | 2.526 |
| 0.750 | 1.870 | 1.698 | 1.24 | 2.106 |
| 1.000 | 1.605 | 1.438 | 1.24 | 1.783 |
| 2.000 | 0.954 | 0.839 | 1.24 | 1.040 |
| 3.000 | 0.658 | 0.574 | 1.25 | 0.718 |
| 4.000 | 0.477 | 0.419 | 1.25 | 0.524 |
| 5.000 | 0.364 | 0.320 | 1.26 | 0.403 |

¹ Data Sources:

<https://earthquake.usgs.gov/hazards/interactive/>
<https://earthquake.usgs.gov/designmaps/rtm/>

² Shahi-Baker RotD100/RotD50 Factors (2014)

Probabilistic PGA: 0.883
Is Probabilistic $S_{a(max)} < 1.2F_g$? **NO**



DETERMINISTIC SPECTRUM

Largest Amplitudes of Ground Motions Considering All Sources Calculated using Weighted Mean of Attenuation Equations¹

Controlling Source: San Andreas

Is Probabilistic $Sa_{(max)} < 1.2Fa$? **NO**

| Period | Deterministic PSa Median + 1.0 for 5% Damping | Max Directional Scale Factor ² | Deterministic MCE | Section 21.2.2 Scaling Factor Applied |
|--------|---|--|-------------------|---|
| 0.010 | 0.737 | 1.19 | 0.876 | 0.876 |
| 0.020 | 0.737 | 1.19 | 0.877 | 0.877 |
| 0.030 | 0.748 | 1.19 | 0.890 | 0.890 |
| 0.050 | 0.791 | 1.19 | 0.942 | 0.942 |
| 0.075 | 0.945 | 1.19 | 1.124 | 1.124 |
| 0.100 | 1.119 | 1.19 | 1.332 | 1.332 |
| 0.150 | 1.374 | 1.20 | 1.649 | 1.649 |
| 0.200 | 1.541 | 1.20 | 1.849 | 1.849 |
| 0.250 | 1.663 | 1.21 | 2.012 | 2.012 |
| 0.300 | 1.730 | 1.22 | 2.111 | 2.111 |
| 0.400 | 1.761 | 1.23 | 2.166 | 2.166 |
| 0.500 | 1.712 | 1.23 | 2.106 | 2.106 |
| 0.750 | 1.399 | 1.24 | 1.735 | 1.735 |
| 1.000 | 1.183 | 1.24 | 1.467 | 1.467 |
| 1.500 | 0.857 | 1.24 | 1.063 | 1.063 |
| 2.000 | 0.656 | 1.24 | 0.814 | 0.814 |
| 3.000 | 0.452 | 1.25 | 0.566 | 0.566 |
| 4.000 | 0.318 | 1.25 | 0.398 | 0.398 |
| 5.000 | 0.236 | 1.26 | 0.298 | 0.298 |

Project No: 544-22072

Is Deterministic $Sa_{(max)} < 1.5*Fa$? **NO**

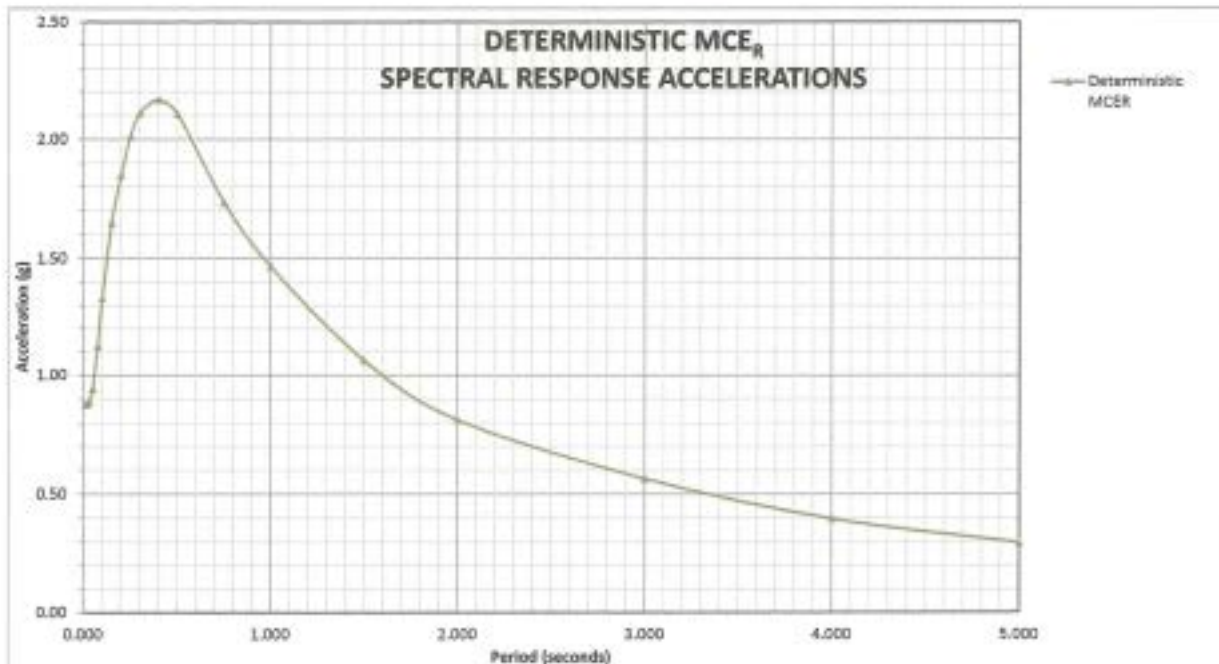
Section 21.2.2 Scaling Factor: **N/A**

Deterministic PGA: **0.737**

Is Deterministic PGA $>= F_{peak} * 0.5$? **YES**

¹ NGAWest 2 GMPE worksheet and Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) - Time Dependent Model

² Shah-Baker RotD100/RotD50 Factors (2014)



SITE SPECIFIC SPECTRA

| Period | Probabilistic MCE | Deterministic MCE | Site-Specific MCE | Design Response Spectrum (Sa) |
|--------|-------------------|-------------------|-------------------|-------------------------------|
| 0.010 | 1.003 | 0.876 | 0.876 | 0.584 |
| 0.100 | 1.686 | 1.332 | 1.332 | 0.888 |
| 0.200 | 2.266 | 1.849 | 1.849 | 1.233 |
| 0.300 | 2.568 | 2.111 | 2.111 | 1.407 |
| 0.500 | 2.526 | 2.106 | 2.106 | 1.404 |
| 0.750 | 2.106 | 1.735 | 1.735 | 1.156 |
| 1.000 | 1.783 | 1.467 | 1.467 | 0.978 |
| 2.000 | 1.040 | 0.814 | 0.814 | 0.543 |
| 3.000 | 0.718 | 0.566 | 0.566 | 0.377 |
| 4.000 | 0.524 | 0.398 | 0.398 | 0.265 |
| 5.000 | 0.403 | 0.298 | 0.298 | 0.198 |

| Period | ASCE 7 SECTION 11.4.6 General Spectrum | 80% General Response Spectrum |
|--------|--|-------------------------------|
| 0.005 | 0.468 | 0.374 |
| 0.010 | 0.492 | 0.393 |
| 0.020 | 0.539 | 0.431 |
| 0.030 | 0.587 | 0.469 |
| 0.050 | 0.682 | 0.545 |
| 0.060 | 0.729 | 0.583 |
| 0.075 | 0.800 | 0.640 |
| 0.090 | 0.871 | 0.697 |
| 0.100 | 0.919 | 0.735 |
| 0.110 | 0.966 | 0.773 |
| 0.120 | 1.014 | 0.811 |
| 0.136 | 1.090 | 0.872 |
| 0.150 | 1.111 | 0.889 |
| 0.160 | 1.111 | 0.889 |
| 0.170 | 1.111 | 0.889 |
| 0.180 | 1.111 | 0.889 |
| 0.200 | 1.111 | 0.889 |
| 0.250 | 1.111 | 0.889 |
| 0.300 | 1.111 | 0.889 |
| 0.400 | 1.111 | 0.889 |
| 0.500 | 1.111 | 0.889 |
| 0.600 | 1.111 | 0.889 |
| 0.700 | 1.111 | 0.889 |
| 0.750 | 1.040 | 0.832 |
| 0.850 | 0.917 | 0.734 |
| 0.900 | 0.866 | 0.693 |
| 0.950 | 0.821 | 0.657 |
| 1.000 | 0.780 | 0.624 |
| 1.500 | 0.520 | 0.416 |
| 2.000 | 0.390 | 0.312 |
| 3.000 | 0.260 | 0.208 |
| 4.000 | 0.195 | 0.156 |
| 5.000 | 0.156 | 0.125 |

**ASCE 7-16: Section 21.4
Site Specific**

| | Calculated Value | Design Value |
|---------------------|------------------|--------------|
| SDS: | 1.266 | 1.266 |
| SD1: | 1.131 | 1.131 |
| SMS: | 1.900 | 1.900 |
| SM1: | 1.697 | 1.697 |
| Site Specific PGAm: | 0.737 | 0.737 |
| Site Class: | D measured | |

Seismic Design Category - Short* D
 Seismic Design Category - 1s* D

* Risk Categories I, II, or III

Project No: 544-22072



SPECTRAL RESPONSE ACCELERATIONS

