

**APPENDIX H**  
**GEO TECHNICAL EXPLORATION REPORT**





# SALEM

engineering group, inc.

## GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED 7-ELEVEN C-STORE & FUEL STATION  
NORTHWEST CORNER (NWC) OF NORTHGATE BOULEVARD  
AND ROSIN COURT  
SACRAMENTO, CALIFORNIA

SALEM PROJECT NUMBER 4-225-0526  
JULY 11, 2025

*PREPARED FOR:*

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July 11, 2025

Project Number 4-225-0526

Mr. Raymond Parker  
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**Subject: GEOTECHNICAL ENGINEERING INVESTIGATION  
PROPOSED 7- ELEVEN C-STORE AND FUEL STATION  
NWC OF NORTHGATE BOULEVARD AND ROSIN COURT  
SITE COORDINATES: (38.6365, -121.4772)  
SACRAMENTO, CALIFORNIA**

Dear Mr. Parker:


As requested and authorized, SALEM Engineering Group, Inc. (SALEM) has prepared this Geotechnical Engineering Investigation report for the Proposed 7-Eleven C-Store and Fuel Station planned within a vacant site located on the northwest corner of Northgate Boulevard and Rosin Court in Sacramento, California


The accompanying report presents our findings, conclusions, and recommendations regarding the geotechnical aspects of designing and constructing the project as presently proposed. In our opinion, the proposed project is feasible from a geotechnical viewpoint provided our recommendations are incorporated into the design and construction of the project.

We appreciate the opportunity to assist you with this project. Should you have questions regarding this report or need additional information, please contact the undersigned at (559) 271-9700.

Respectfully Submitted,

**SALEM ENGINEERING GROUP, INC.**

  
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**GEOTECHNICAL ENGINEERING INVESTIGATION  
PROPOSED 7- ELEVEN C-STORE & FUEL STATION  
NORTHWEST CORNER (NWC) OF NORTHGATE BOULEVARD AND ROSIN COURT  
SACRAMENTO, CALIFORNIA**

**1. PURPOSE AND SCOPE**

This report presents the results of our geotechnical engineering investigation for the 7-Eleven Convenience Store and Fuel Station planned within the vacant undeveloped site located at the northwest corner (NWC) of Northgate Boulevard and Rosin Court, in Sacramento California., as depicted on Figure 1, Vicinity Map.

SALEM Engineering Group, Inc. (SALEM) has completed this geotechnical engineering investigation with the purpose to observe and sample the subsurface conditions encountered at the site, and provide conclusions and recommendations relative to the geotechnical aspects of constructing the project as presently proposed. The recommendations presented herein are based on analysis of the data obtained during the investigation and our local experience with similar soil and geologic conditions.

If project details vary significantly from those described herein, SALEM should be contacted to determine the necessity for review and possible revision of this report.

**2. SITE LOCATION AND DESCRIPTION**

The proposed 7- Eleven C-Store and Fuel Station is planned within the undeveloped parcel portion on the northwest corner of the intersection of Northgate Boulevard and Rosin Court. The area of the proposed C-Store and Fuel Stations is currently a vacant lot covered with wild grasses and bushes. The lot had been cleared of previous structures with the exception of the telecommunications line running through the middle of the site. Existing underground utilities were noted within the pavements surrounding the vacant lot, the overall project area comprises around 56,000 square-foot (SF) rectangular in shaped parcel. The immediate site area is bounded to the north by a new fast-food restaurant; to the east Northgate Blvd., the south by Rosin Court, followed by another fast-food restaurant and to the west by Rosin Court and beyond open fields.

At the time of this investigation, the area of the proposed 7-Eleven Fuel Station was vacant land covered with deep plowed soil and knee-high weeds

Existing underground utilities were noted around the perimeter of the site and within the vicinity of the proposed fueling station and a telecommunication line through the middle of the property, running East to West. The project site area is relatively flat. Based on review of Google Earth aerial imagery, site elevation is approximately 18 feet above mean sea level (AMSL).

### **3. PROJECT DESCRIPTION**

Based on the site plan provided by our client Guggenheim Development Services, it is our understanding that the new construction will include a convenience store building that will encompass an area of approximately 4,761sq.ft., canopy and fuel dispensers, underground storage tanks, trash enclosure, parking lot area and landscape. The proposed construction is anticipated to include CMU walls and/or wood framing with conventional shallow spread foundations and concrete slabs on grade. It is anticipated that appurtenant construction will likely include underground utilities, underground fuel tanks, Portland cement concrete, trash enclosure and asphaltic concrete pavement improvements.

Based on the existing flat grades at the project site during our field exploration, it is anticipated that cuts and fills will be on the order of 1 to 3 feet. In the event that changes occur in the nature or design of the project, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions of our report are modified. The site location and approximate locations of proposed improvements are shown on the Site Plan, Figure 2.

### **4. SITE HISTORY AND PREVIOUS STUDIES**

Based on review of available on-line aerial imagery, the site appears to have generally been vacant. However, the parcel to the north appeared to have been developed by commercial building from at least 1993 to 2008. The building was demolished sometime before July 2008. It is not clear, but a portion of the previous site development may have encroached within the northern limits of the site. Rosin Court to the west was constructed around 2022. The parcel to the north was constructed around 2023. However, it appears some soil disturbance occurred within the subject site between 2022 and 2023.

No previous reports were provided to SALEM for review. If available, these documents should be provided to SALEM for review.

### **5. FIELD EXPLORATION**

Our field exploration consisted of site surface reconnaissance and subsurface exploration. The exploratory test borings (B-1 through B-9) were drilled on June 18 and 19, 2025 within the site to the depths ranging from 11.5 feet to the maximum depth explored of 36.5 feet below site grade. The approximate locations of the test borings are shown on Figure No. 2, Site Plan. The test borings were advanced with 6-5/8 inch diameter hollow stem auger rotated by a truck-mounted CME-55 drill rig.

The materials encountered in the test borings were visually classified in the field, and logs were recorded by a field engineer at that time. Visual classification of the materials encountered in the test borings was generally made in accordance with the Unified Soil Classification System (ASTM D2487).

A soil classification chart and key to sampling is presented on the Unified Soil Classification Chart, in Appendix "A." The test boring logs are presented in Appendix "A." Subsurface soil samples were obtained by driving a Modified California sampler (MCS) or a Standard Penetration Test (SPT) sampler.

Penetration resistance blow counts were obtained in the hollow stem auger borings by dropping a 140-pound automated trip hammer through a 30-inch free fall to drive the sampler to a maximum penetration of 18 inches. The number of blows required to drive the last 12 inches, or less if very dense or hard, is recorded as Penetration Resistance (blows/foot) on the logs of borings.

Soil samples were obtained from the test borings at the depths shown on the boring logs. The MCS samples were recovered and capped at both ends to preserve the samples at their natural moisture content; SPT

samples were recovered and placed in a sealed bag to preserve their natural moisture content. At the completion of drilling and sampling, the test borings were backfilled with soil cuttings.

### **5.1. Infiltration Testing**

As requested, four (4) excavations were performed for double rings infiltration tests within the proposed storm drainage areas at depth between 4 and 5 feet below site grade. It should be noted that, two of double ring tests at locations of DR-1 and DR-3, were not completed. The very dense nature of the materials encountered impeded embedment of the rings into the subgrade soils. As an alternative, locations DR-1 and DR-3 were tested for infiltration using downhole percolation test methods. The results of the percolation tests were converted to estimated infiltration rates using the Porchet Method.

The double ring infiltration tests were performed in procedure described in accordance with ASTM D3385. Infiltration rates were measured by filling the test rings with clean water and measuring the water drops at a certain time interval. Approximately 3 to 6 inches of water were added to the rings during testing.

The percolation tests were conducted using an approximately 6 5/8-inch diameter percolation borehole using hollow stem auger. Approximately 2 inches of gravel was placed in the bottom of the hole followed by a 4-inch diameter perforated pipe. The holes were pre-saturated prior to percolation testing.

The findings of the infiltration and percolation testing are summarized in Section 7.4 of this report. The approximate locations of the infiltration and percolation tests are shown on the attached Site Plan, Figure 2.

## **6. LABORATORY TESTING**

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory-testing program was formulated with emphasis on the evaluation of natural moisture, density, shear strength, consolidation, expansion index, R-value, Atterberg limits, resistivity, and gradation of the materials encountered.

In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and the results of laboratory test are summarized in Appendix B. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

## **7. SOIL AND GROUNDWATER CONDITIONS**

### **7.1 Subsurface Soil Conditions**

The subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the soils encountered generally consisted of interbedded layers of firm to hard lean clay with sand or fat clay, to around 10 feet below ground surface, the clay layers is underlain by interbedded layers of sandy silt, silt or silty sand to the maximum depth explored of 36.5 feet below site grade. Undocumented fill soils were encountered in test boring B-9 to depths of at least 11 feet BSG. The precise depth and horizontal limits of the undocumented fills are not known. The fill soils encountered at location B-9 included pea gravel material and may have been associated with a previous underground tank. The precise limits of these fills are not known. It should be noted that the majority of test borings encountered hard to very dense materials throughout the depths explored.

One (1) consolidation test performed on near surface sample, resulted in about 15 percent consolidation under a load of 8 kips per square foot. When wetted under a load of 2.0 kips per square foot, the sample exhibited around 4.2 percent collapse. Three (3) direct shear tested on soils samples at 3.5 and 8.5 feet

depths, resulted in internal angles of friction of 36, 41, and 40 degrees with a cohesion values of 173, 182, and 53 pounds per square feet, respectively. Five (5) Atterberg Limits tests performed on a near surface soil samples resulted in plasticity indexes of 32, 13, 3, 0, and 2, with liquid limit values of 56, 32, 23, 18, and 30, respectively. An expansion test result in an expansion index of 63. An R-value test performed on a near surface soils resulted in an R-value of 12.

Soil conditions described in the previous paragraphs are generalized. Therefore, the reader should consult exploratory boring logs included in Appendix A for soil type, color, moisture, consistency, and USCS classification of the materials encountered at specific locations and elevations.

## 7.2 Groundwater

The test borings were checked for the presence of groundwater during and after the excavation operations. Groundwater was encountered at depths between 21 to 23 feet BSG. during the time of our subsurface investigation.

Based on review of available groundwater depth records with the California Department of Water Resources Groundwater (<https://wdl.water.ca.gov>) State Well No. 09N04E13R001M, located approximately 0.75 miles southwest of the project site, and recorded a historical high groundwater depth of 12.8 feet BSG, in April 2017. It should be noted that the referenced station is lower in elevation around 6 feet than the project site. In

It should be recognized that water table elevations may fluctuate with time, being dependent upon seasonal precipitation, irrigation, land use, localized pumping, and climatic conditions as well as other factors. Therefore, water level observations at the time of the field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report.

## 7.3 Soil Corrosion Screening

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete and the soil. The 2014 Edition of ACI 318 (ACI 318) has established criteria for evaluation of sulfate and chloride levels and how they relate to cement reactivity with soil and/or water. A soil sample was obtained from the project site and was tested for the evaluation of the potential for concrete deterioration or steel corrosion due to attack by soil-borne soluble salts and soluble chloride. The water-soluble sulfate concentration in the saturation extract from the soil samples was detected to be 273 mg/kg.

ACI 318 Tables 19.3.1.1 and 19.3.2.1 outline exposure categories, classes, and concrete requirements by exposure class. ACI 318 requirements for site concrete based upon soluble sulfate are summarized in Table 7.3 below.

**TABLE 7.3  
WATER SOLUBLE SULFATE EXPOSURE REQUIREMENTS**

Dissolved Sulfate (SO <sub>4</sub> ) in Soil % by Weight	Exposure Severity	Exposure Class	Maximum w/cm Ratio	Minimum Concrete Compressive Strength	Cementitious Materials Type
0.0237	Negligible	S0	N/A	2,500 psi	No Restriction

The water-soluble chloride concentration detected in saturation extract from the soil samples was 37 mg/kg. In addition, testing performed on a near surface soil resulted in a minimum resistivity value of 847 ohm-centimeters. Based on the results, these soils would be considered to have a “Corrosive” potential to buried metal objects (per National Association of Corrosion Engineers, Corrosion Severity Ratings). It is

recommended that, at a minimum, applicable manufacturer’s recommendations for corrosion protection of buried metal pipe be closely followed. Corrosion is dependent upon a complex variety of conditions, which are beyond the Geotechnical practice.

#### 7.4. Results of Infiltration Testing

Double ring infiltrometer tests were performed within the location specified by the civil engineer and were conducted in accordance with the guidelines established ASTM Test Method D3385. Results of the falling head tests are presented in the attachments to this report. The approximate locations of the infiltration tests are shown on the attached Site Plan, Figure 2.

The test pits were excavated by a backhoe to a depth of approximately between 4 and 5 feet below existing grade. The infiltration tests were conducted in accordance with ASTM Test Method D3385. The double-ring infiltrometer method consisted of driving 2 open cylinders, partially filling the rings with water, and then maintaining the water at a constant level. The volume of water added to the inner ring to maintain the water level constant, is the measure of the volume of water that infiltrates the soil. The maximum steady state or average incremental infiltration velocity, depending on the purpose/application of the test, is equivalent to the infiltration rate. The results of the double-ring infiltration test are as follows:

Test No.	Depth (feet)	Allowable Infiltration Rate* (inch/hour)	Soil Type**
DR-2	5	0.13	Silty Gravel with Sand
DR-4	4	0.18	Clay with Sand

\* The allowable infiltration rate reported above includes a minimum factor of safety of 4. The factor of safety was selected based on the materials encountered during drilling, including relative density and potential for aquitards. The stormwater designer should consider additional design constraints and include additional factors of safety if needed.

In addition, as discussed in section 5.1 of this report, infiltration testing at locations DR-1 and DR-3 was not feasible due to very dense cemented soils. The very dense materials prevented the ability to install the rings by driving the bottom of rings to 2 to 3 inches below surface grade. Therefore, two (2) percolation tests were attempted in downhole borings directly adjacent to the planned DR-1 and DR-3 locations. The percolation tests were installed at depths between 4 and 5 feet BSG. Approximately 2 inches of gravel was placed in the bottom the boring followed by a 4-inch diameter perforated pipe. The annulus surrounding the perforated pipe was backfilled with gravel. The holes were pre-saturated before percolation testing commenced. The percolation tests were filled with approximately 12 to 18 inches of water. Over a period of 2 to 3 hours no measurable drop in water level was observed. **Therefore, the soils around 4 to 5 feet BSG at these locations were determined to have little to no infiltration capacity.**

In general, the soils tested by percolation method or double ring infiltrometer method indicated the materials tested have limited capacity for infiltration.

Variations in soil type and soil density across the infiltration area of the system can influence the infiltration rate. Salem recommends additional test at varied depths to determine a depth that can handle the needs of the infiltration system that are to be placed. The findings of any testing performed during construction should be provided to the basin designer to determine if any modifications to the basin are warranted.

## 8. GEOLOGIC SETTING

The site is in the northerly portion of the Great Valley Geomorphic Province, near the northwest portion of the Sierra Nevada Geomorphic Province. The Great Valley is an alluvial plain about 50 miles wide and 400 miles long in the central part of California. Its northern part is the Sacramento Valley, drained by the Sacramento River and its southern part is the San Joaquin River. The Great Valley is a trough in which sediments have been deposited almost continuously since the Jurassic (about 160 million years ago). Great oil fields have been found in southernmost San Joaquin Valley and along anticlinal uplifts on its southwestern margin. In the Sacramento Valley, the Sutter Buttes the remnants of an isolated Pliocene volcano, rise above the valley floor.

Based on review of the preliminary Geologic Map of the Cenozoic deposits of the Davis, Knights Landing, Lincoln, and Fair Oaks quadrangle<sup>1</sup>, the area of the subject site is in an area mapped as underlain by Basin or Alluvial Deposits (Qhb/Qha). Based on the soils encountered during drilling, including dense material encountered, the materials encountered are considered consistent with the mixture of clay, silts, sands and gravels recovered.

## 9. GEOLOGIC HAZARDS

### 9.1 Faulting and Seismicity

Based on the proximity of several dominant active faults and seismogenic structures, as well as the historic seismic record, the area of the subject site is considered subject to relatively moderate seismicity.

The project area is not within an Alquist-Priolo Special Studies Zone and will not require a special site investigation by an Engineering Geologist. Soils on site are classified as Site Class D in accordance with Chapter 16 of the California Building Code. The proposed structures are determined to be in Seismic Design Category D.

To determine the distance of known active faults within 100 miles of the site, we used the United States Geological Survey (USGS) web-based application *2008 National Seismic Hazard Maps - Fault Parameters*. Site latitude is 38.6366 North; site longitude is -121.4772° West. The ten closest active faults are summarized below in Table 9.1.

**TABLE 9.1  
REGIONAL FAULT SUMMARY**

<b>Fault Name</b>	<b>Distance to Site (miles)</b>	<b>Maximum Earthquake Magnitude, <math>M_w</math></b>
Great Valley 4a, Trout Creek	29.22	6.6
Great Valley 3, Mysterious Ridge	31.16	7.1
Great Valley 4b, Gordon Valley	31.81	6.8
Great Valley 5, Pittsburg Kirby Hills	36.40	6.7
Hunting Creek-Berryessa	41.05	7.1
Green Valley Connected	41.93	6.8
West Napa	50.76	6.7
Great Valley 2	53.95	6.5

<sup>1</sup> Helley, E.J., 1979, Preliminary geologic map of Cenozoic deposits of the Davis, Knights Landing, Lincoln, and Fair Oaks quadrangles, California, U.S. Geological Survey, Open-File Report OF-79-583, scale 1:62,500

<b>Fault Name</b>	<b>Distance to Site (miles)</b>	<b>Maximum Earthquake Magnitude, <math>M_w</math></b>
Greenville Connected	55.43	7.0
Bartlett Springs	59.15	7.3

*The faults tabulated above and numerous other faults in the region are sources of potential ground motion. However, earthquakes that might occur on other faults throughout California are also potential generators of significant ground motion and could subject the site to intense ground shaking.*

## **9.2 Surface Fault Rupture**

The site is not within a currently established State of California Earthquake Fault Zone for surface fault rupture hazards. No active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low.

## **9.3 Ground Shaking**

Based on our experience in the Sacramento area and requirements of the 2022 CBC, a Site Class D (Stiff Soil) was selected for the site. Table 10.6.1 includes design seismic coefficients and spectral response parameters, based on the 2022 California Building Code (CBC) for the project foundation design.

Based on Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps, the estimated design peak ground acceleration adjusted for site class effects ( $PGA_M$ ) was determined to be 0.313 g (based on both probabilistic and deterministic seismic ground motion).

## **9.4 Liquefaction**

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. Primary factors that trigger liquefaction are: moderate to strong ground shaking (seismic source), relatively clean, loose granular soils (primarily poorly graded sands and silty sands), and saturated soil conditions (shallow groundwater). Due to the increasing overburden pressure with depth, liquefaction of granular soils is generally limited to the upper 50 feet of a soil profile.

In general, the soils encountered generally consisted of interbedded layers of firm to hard lean clay with sand or fat clay, to around 10 feet below ground surface, the clay layers is underlain by interbedded layers of sandy silt, silt or silty sand to the maximum depth explored of 36.5 feet below site grade. Undocumented fill soils were encountered in test boring B-9 to depths of at least 11 feet BSG. The precise depth and horizontal limits of the undocumented fills are not known. The fill soils encountered at location B-9 included pea gravel material and may have been associated with a previous underground tank. It should be noted that the majority of test borings encountered hard to very dense materials throughout the depths explored.

Groundwater was encountered around 21 feet BSG. Based on review available public records, a historic groundwater depth of 12.6 feet BSG is reported for the subject site.

A seismic hazard, which could cause damage to the proposed development during seismic shaking, is the post-liquefaction settlement of the liquefied sands. A 50 foot deep test boring for liquefaction analysis was not included as part of this investigation. Based on our experience in the project area, and due to the relative

density of the soils encountered and the nature of the soils, the potential for liquefaction/seismic settlement to impact the site is considered low.

### **9.5 Lateral Spreading**

Lateral spreading is a phenomenon in which soils move laterally during seismic shaking and is often associated with liquefaction. The amount of movement depends on the soil strength, duration and intensity of seismic shaking, topography, and free face geometry.

Due to the relatively flat site topography, we judge the likelihood of lateral spreading to be very low.

### **9.6 Landslides**

There are no known landslides at the site, nor is the site in the path of any known or potential landslides. We do not consider the potential for a landslide to be a hazard to this project.

### **9.7 Tsunamis and Seiches**

The site is not located within a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

## **10. CONCLUSIONS AND RECOMMENDATIONS**

### **10.1 General Conclusions**

- 10.1.1 Based upon the data collected during this investigation, and from a geotechnical engineering standpoint, it is our opinion that the site is suitable for the proposed construction of improvements at the site as planned, provided the recommendations contained in this report are incorporated into the project design and construction. Conclusions and recommendations provided in this report are based on our review of available literature, analysis of data obtained from our field exploration and laboratory testing program, and our understanding of the proposed development at this time.
- 10.1.2 The primary geotechnical considerations for the proposed development are the presence of potentially expansive soils, areas of undocumented fill soils (see B-9), and the potential for hard material to be encountered during grading. The Contractor should review this report entirely. This report includes recommendations for support of lightly loaded slabs on imported non expansive fill. In addition, the contractor should anticipate the potential for hard cemented soils to be encountered. Areas outside the building pad (B-9) encountered undocumented fill soils that could be associated with former pit backfill. This report recommends undocumented fills to be removed entirely and replaced with suitable compacted engineered fill.
- 10.1.3 Fill soils may be present onsite between our test boring locations. Prior to fill placement, Salem Engineering Group, Inc. should inspect the bottom of the excavation to verify no additional excavation will be required to remove undocumented fills. Verification of the extent of fill should be determined during site grading.

- 10.1.4 In general, the soils encountered generally consisted of interbedded layers of firm to hard lean clay with sand or fat clay, to around 10 feet below ground surface, the clay layers is underlain by interbedded layers of sandy silt, silt or silty sand to the maximum depth explored of 36.5 feet below site grade. Undocumented fill soils were encountered in test boring B-9 to depths of at least 11 feet BSG. The precise depth and horizontal limits of the undocumented fills are not known. The fill soils encountered at location B-9 included pea gravel material and may have been associated with a previous underground tank. It should be noted that the majority of test borings encountered hard to very dense materials throughout the depths explored.
- 10.1.5 Based on the results of laboratory testing conducted, the near surface soils have high compressibility characteristics, moderate collapse potential, and medium expansive potential (EI=63). When compacted as an engineered fill, the on-site soils have poor pavement support characteristics.
- 10.1.6 Based on the expansion potential of the near surface clays, this report includes recommendations to support interior concrete slabs on grade on 6 inches of non-recycled class 2 aggregate base over 18 inches of imported non expansive engineered fill over the depth of moisture conditioned on-site soils compacted as engineered fill extending to the depths recommended below foundations.
- 10.1.7 Foundations supported on engineered fill extending to the depths recommended in this report may be designed based on an allowable bearing capacity of 2,000 pounds per square foot (dead plus live loads) and an allowable static settlement of 1 inch total and differential static settlement of ½ inch in 30 feet.
- 10.1.8 Based on the subsurface conditions at the site, we assume that the proposed C-store building will be supported using conventional shallow foundations. However, canopies for fuel dispensers may be supported on either Cast in Drilled Hole (CIDH) or shallow spread foundations. The use of CIDH piers may prove difficult due to the hard/very dense, material encountered.
- 10.1.9 Provided the site is graded in accordance with the recommendations of this report and any new foundations constructed as described herein, we estimate that total settlement due to static loads to shallow spread foundations on the order of about 1-inch and differential static of ½ inch in 40 feet, should be anticipated for design.
- 10.1.10 Based on the chemistry testing performed, the near surface soils have ‘negligible’ for sulfate attack on concrete, and results of resistivity test rated the near soil to have “Corrosive” potential for corrosion to buried metal.
- 10.1.11 All references to relative compaction and optimum moisture content in this report are based on ASTM D 1557 (latest edition).
- 10.1.12 SALEM should be retained to review the project plans as they develop further, provide engineering consultation as-needed, and perform geotechnical observation and testing services during construction.

## **10.2 Surface Drainage**

- 10.2.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change to important engineering properties. Proper drainage should be maintained at all times.

- 10.2.2 The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than 5 percent for a minimum distance of 10 feet. Impervious surfaces within 10 feet of the building foundation should be sloped a minimum of 1 to 2 percent away from the building and drainage gradients maintained to carry all surface water to collection facilities and off site. These grades should be maintained for the life of the project. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed.
- 10.2.3 Roof drains should be installed with appropriate downspout extensions out-falling on splash blocks so as to direct water a minimum of 5 feet away from the structures or be connected to the storm drain system for the development.

### **10.3 Site Grading**

- 10.3.1 A representative of our firm should be present during all site clearing and grading operations to test and/or observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Geotechnical Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section as well as other portions of this report.
- 10.3.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer and geotechnical engineer in attendance.
- 10.3.3 Site demolition activities shall include removal of all surface obstructions not intended to be incorporated into final site design. In addition, undocumented fill, underground buried structures, existing foundations, and/or utility lines encountered during demolition and construction should be properly removed and the resulting excavations backfilled with Engineered Fill. After demolition activities, it is recommended that disturbed soils be removed and/or replaced with compacted engineered fill soils.
- 10.3.4 Site preparation should begin with removal of existing surface/subsurface structures, pavements, underground utilities (as required), foundations, disturbed soil, any existing uncertified/undocumented fill, and debris. Underground utilities within the limits of the proposed building pad should be removed and relocated. Excavations or depressions resulting from site clearing operations, or other existing excavations or depressions, should be restored with Engineered Fill in accordance with the recommendations of this report.
- 10.3.5 Surface vegetation consisting of grasses and other similar vegetation should be removed by stripping to a sufficient depth to remove organic-rich topsoil. The upper 2 to 4 inches of the soils containing, vegetation, roots and other objectionable organic matter encountered at the time of grading should be stripped and removed from the surface. Deeper stripping may be required in localized areas. The stripped vegetation will not be suitable for use as Engineered Fill or within 5 feet of building pads. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas or exported from the site.
- 10.3.6 As described in this report, undocumented fills were encountered at location B-9 to depths of at least 10 to 11 feet BSG. The undocumented fill materials encountered appeared similar to an open graded gravel, such as pea gravel. As recommended in 10.3.8 all undocumented fills within the building pad limits (if encountered) should be removed entirely. Undocumented fills outside of structural building pad areas could result in an increased risk of distress to planned improvements.

This report recommends these materials be removed entirely and replaced with compacted engineered fill (regardless of being located within or outside the building pad). The resultant excavation should be backfilled with approved compacted engineered fills. The precise depth and limits of the undocumented fills is not known. The limits of the undocumented fill material should be determined by potholing during construction. A SALEM Geotechnical representative should be scheduled to verify the removal of these fills.

- 10.3.7 Structural building pad areas and over-build zone should be considered as areas extending a minimum of 5 feet horizontally beyond the outside dimensions of buildings. The over-build zone for shallow canopy foundations may extend horizontally to 5 feet beyond foundations.
- 10.3.8 To provide uniform support for the proposed building, it is recommended that over-excavation extend to at least 24 inches below preconstruction site grade, 18 inches below deepest foundation, or to the depth required to remove any undocumented fills (if encountered-see boring logs), whichever is greater. The resulting bottom of excavation should be scarified to a minimum depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to 1 to 4 percent above optimum moisture, and compacted to 90 percent of the maximum density. The horizontal limits of the over-excavation should extend throughout the building over-build zone, laterally to a minimum of 5 feet beyond the outer edges of the proposed building pad.
- 10.3.9 Due to the medium expansive potential of soils encountered, interior slabs on grade should be supported on a minimum of 6 inches of non-recycled Class 2 aggregate base, compacted to 95 percent relative compaction over 18 inches of imported non expansive fill over the depth of engineered fill extending below foundations.
- 10.3.10 If desired to support the canopies on shallow foundations, to provide uniform support for the proposed canopy foundations, it is recommended that over-excavation extend to at least 24 inches below preconstruction site grade, 12 inches below the bottom of proposed foundations, or to the depth required to remove any loose soils or undocumented fills (if encountered – see boring logs), whichever is greater. The resulting bottom of excavation should be scarified to a minimum depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to 1 to 4 percent above optimum moisture, and compacted to 90 percent of the maximum density. The horizontal limits of the over-excavation should extend laterally to a minimum of 5 feet beyond the outer edges of the proposed footings.
- 10.3.11 Areas of exterior concrete slabs on grade located outside the building pad over-build zone, should be prepared by over-excavation to a minimum of 12 inches below preconstruction site grade or 18 inches below bottom of concrete slabs on grade, or the depth required to remove undocumented fills, whichever is greater. The zone of subgrade preparation should extend a minimum of 3 feet beyond these improvements. These soils should be moisture conditioned to slightly above optimum and compacted as engineered fill.

Exterior concrete slabs on grade should be supported on a minimum of 12 inches of Class 2 aggregate base compacted to 95 percent relative compaction over subgrade soils prepared as recommended above.

- 10.3.12 Areas of lightly loaded foundations such as retaining walls, screen walls, etc., should be prepared by over-excavation to a minimum of 12 inches below foundations, 12 inches below preconstruction site grade, or to the depth required to remove undocumented fills, whichever is greater. The resulting bottom of over-excavation should be scarified to a depth of at least 12 inches, worked until uniform and free from large clods, moisture-conditioned to 1 to 4 percent above optimum moisture, and compacted to 90 percent of the maximum density. The horizontal limits of the over-

excavation should extend, laterally to a minimum of 3 feet beyond the outer edges of the proposed footings.

- 10.3.13 Areas of asphaltic concrete or Portland cement concrete pavements should be prepared by over excavation to 12 inches below preconstruction site grade or 12 inches below pavement, whichever provides greater fill. The bottom of excavation should be scarified a minimum of 12 inches, moisture conditioned to slightly above optimum, and compacted as engineered fill. The horizontal limits of the over-excavation should extend, laterally to a minimum of 3 feet beyond pavements. The upper 12 inches below aggregate base sections should be compacted to a minimum of 95 percent relative compaction.
- 10.3.14 Areas to receive engineered fill outside the building pad over-build zone, should be prepared by scarification of the upper 12 inches below existing grade or 12 inches below the recommended base section, whichever is greater. These soils should be moisture conditioned to slightly above optimum and compacted as engineered fill.
- 10.3.15 An integral part of satisfactory fill placement is the stability of the placed lift of soil. If placed materials exhibit excessive instability as determined by a SALEM field representative, the lift will be considered unacceptable and should be remedied prior to placement of additional fill material. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.
- 10.3.16 The most effective site preparation alternatives will depend on site conditions prior to grading. We should evaluate site conditions and provide supplemental recommendations immediately prior to grading, if necessary.
- 10.3.17 We do not anticipate groundwater or seepage to adversely affect construction if conducted during the drier months of the year (typically summer and fall). However, groundwater and soil moisture conditions could be significantly different during the wet season (typically winter and spring) as surface soil becomes wet; perched groundwater conditions may develop. Grading during this time period will likely encounter wet materials resulting in possible excavation and fill placement difficulties. Project site winterization consisting of placement of aggregate base and protecting exposed soils during construction should be performed. If the construction schedule requires grading operations during the wet season, we can provide additional recommendations as conditions warrant.
- 10.3.18 Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material or placement of crushed rocks or aggregate base material; or mixing the soil with an approved lime or cement product.

The most common remedial measure of stabilizing the bottom of the excavation due to wet soil condition is to reduce the moisture of the soil to near the optimum moisture content by having the subgrade soils scarified and aerated or mixed with drier soils prior to compacting. However, the drying process may require an extended period of time and delay the construction operation. To expedite the stabilizing process, crushed rock may be utilized for stabilization provided this method is approved by the owner for the cost purpose.

If the use of crushed rock is considered, it is recommended that the upper firm and wet soils be replaced by 6 to 24 inches of ¾-inch to 1-inch crushed rocks. The thickness of the rock layer depends on the severity of the soil instability. The recommended 6 to 24 inches of crushed rock material will provide a stable platform. It is further recommended that lighter compaction

equipment be utilized for compacting the crushed rock. All open graded crushed rock/gravel should be fully encapsulated with a geotextile fabric (such as Mirafi 140N) to minimize migration of soil particles into the voids of the crushed rock. Although it is not required, the use of geogrid (e.g. Tensar BX 1100, BX 1200 or TX 160) below the crushed rock will enhance stability and reduce the required thickness of crushed rock necessary for stabilization.

Our firm should be consulted prior to implementing remedial measures to provide appropriate recommendations.

**10.4 Soil and Excavation Characteristics**

- 10.4.1 Based on soil conditions encountered in our borings, hard or very dense cemented are likely to be encountered. Excavations are likely require specialized breakers and heavy dozers with shingle shank rippers and pneumatic rock breakers to achieve required excavation depths. Prior to use as engineered fill excavated cemented soil material should be processed to less than 3 inches in diameter, blended with soils to a well graded mixture.
- 10.4.2 Due to the previous site development, undocumented fill material may be encountered throughout the site. This report includes recommendations that all abandoned subsurface structures, and undocumented fill material, be fully removed and/or compacted as engineered fill.
- 10.4.3 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable Occupational Safety and Health Administration (OSHA) rules and regulations to maintain safety and maintain the stability of adjacent existing improvements. Temporary excavations are further discussed in a later Section of this report.
- 10.4.4 The near surface soils identified as part of our investigation are, generally, moist to very moist due to the absorption characteristics of the soil. Earthwork operations may encounter very moist unstable soils which may require removal to a stable bottom. Exposed native soils exposed as part of site grading operations should not be allowed to dry out and should be kept continuously moist prior to placement of subsequent fill.

**10.5 Materials for Fill**

- 10.5.1 On-site soils are suitable for use as general Engineered Fill directly below the aggregate section below the equipment slabs and interior slabs on grade provided they are free of deleterious matter, organic material, or rock material larger than 3 inches in maximum dimension. Oversized cemented particles should be screened and/or hand-picked prior to re-use as engineered fill.
- 10.5.2 Imported Engineered Fill soil should be well-graded, very low-to-non-expansive slightly cohesive silty sand or sandy silt. This material should be approved by the Engineer prior to use and should typically possess the soil characteristics summarized below in Table 10.5.2.

**TABLE 10.5.2  
IMPORT FILL REQUIREMENTS**

Percent Passing 3-inch Sieve	100
Percent Passing No.4 Sieve	75-100
Percent Passing No 200 Sieve	15-40

Maximum Plasticity Index	15
Organic Content, Percent By Weight	Less than 3%
Maximum Expansion Index (ASTM D4829)	20

Prior to importing the Contractor should demonstrate to the Owner that the proposed import meets the requirements for import fill specified in this report. In addition, the material should be verified by the Contractor that the soils do not contain any environmental contaminants as regulated by local, state, or federal agencies, as applicable

- 10.5.3 All Engineered Fill (including scarified ground surfaces and backfill) should be placed in lifts no thicker than will allow for adequate bonding and compaction (typically 6 to 8 inches in loose thickness).
- 10.5.4 On-Site soils used as engineered fill soils should moisture conditioned to 1 to 4 percent above optimum moisture content, and compacted to at least 90 percent relative compaction.
- 10.5.5 Import Engineered Fill, if selected, should be placed, moisture conditioned to slightly above optimum moisture content, and compacted to at least 92 percent relative compaction.
- 10.5.6 The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since they have complete control of the project site.
- 10.5.7 Environmental characteristics and corrosion potential of import soil materials should also be considered.
- 10.5.8 Proposed import materials should be sampled, tested, and approved by SALEM prior to its transportation to the site.
- 10.5.9 Aggregate base material should meet the requirements of a Caltrans Class 2 Aggregate Base. Aggregate base within the building pad should be non-recycled. The aggregate base material should conform to the requirements of Section 26 of the Standard Specifications for Class 2 material, ¾-inch or 1½-inches maximum size. The aggregate base material should be compacted to a minimum relative compaction of 95 percent based ASTM D1557. The aggregate base material should be spread in layers not exceeding 6 inches and each layer of aggregate material course should be tested and approved by the Soils Engineer prior to the placement of successive layers.

## 10.6 Seismic Design Criteria

10.6.1 For seismic design of the structures, and in accordance with the seismic provisions of the 2022 CBC, our recommended parameters are shown below. These parameters were determined using California's Office of Statewide Health Planning and Development (OSHPD) (<https://seismicmaps.org/>) in accordance with the 2022 CBC. The Site Class was determined based on the soils encountered during our field exploration.

**TABLE 10.6.1  
2022 CBC SEISMIC DESIGN PARAMETERS**

Seismic Item	Symbol	Value	2016 ASCE 7 or 2022 CBC Reference
Site Coordinates (Datum = NAD 83)		38.6366 Lat -121.4772 Lon	
Site Class	--	D	ASCE 7 Table 20.3
Soil Profile Name	--	Stiff Soil	ASCE 7 Table 20.3
Risk Category	--	II	CBC Table 1604.5
Site Coefficient for PGA	$F_{PGA}$	1.372	ASCE 7-16 Table 11.8-1
Peak Ground Acceleration (adjusted for Site Class effects)	$PGA_M$	0.313	ASCE 7-16 Equation 11.8-1
Seismic Design Category	SDC	D	ASCE 7-16 Table 11.6-1 & 2
Mapped Spectral Acceleration (Short period - 0.2 sec)	$S_S$	0.543	CBC Figure 1613.2.1(1)
Mapped Spectral Acceleration (1.0 sec. period)	$S_1$	0.247	CBC Figure 1613.2.1(3)
Site Class Modified Site Coefficient	$F_a$	1.366	CBC Table 1613.2.3(1)
Site Class Modified Site Coefficient	$F_v$	<b>2.106*</b>	CBC Table 1613.2.3(2)
MCE Spectral Response Acceleration (Short period - 0.2 sec) $S_{MS} = F_a S_S$	$S_{MS}$	0.742g	CBC Equation 16-20
MCE Spectral Response Acceleration (1.0 sec. period) $1.5*S_{M1} = 1.5 (F_v S_1)$	$1.5*S_{M1}$	<b>0.780g*</b>	CBC Equation 16-21 / ASCE 7-16 Supplement 3
Design Spectral Response Acceleration $S_{DS} = \frac{2}{3}S_{MS}$ (short period - 0.2 sec)	$S_{DS}$	0.494g	CBC Equation 16-22
Design Spectral Response Acceleration $S_{D1} = \frac{2}{3}S_{M1}$ (1.0 sec. period)	$S_{D1}$	<b>0.520g*</b>	CBC Equation 16-23
Short Period Transition Period ( $S_{D1}/S_{DS}$ ), Seconds	$T_S$	1.053	ASCE 7-16, Section 11.4.6
Long Period Transition period (seconds)	$T_L$	12	ASCE 7-16, Figures 22-14 through 22-17

Note: \* Values  $F_v$ ,  $S_{M1}$ , and  $S_{D1}$  determined per ASCE Table 11.4.2 for use in calculating  $T_S$  only.

These values should not be used in structural design. Site Specific Ground Motion Analysis was not included in the scope of this investigation. Per ASCE 11.4.8, Structures on Site Class D, with  $S_1$  greater than or equal to 0.2 may

require Site Specific Ground Motion Analysis. The value reported for SM1 includes a 50% increase in accordance with exceptions listed in ASCE 7-16 - Supplement 3. In the event a site specific ground motion analysis is required, SALEM should be contacted for these services.

- 10.6.2 Conformance to the criteria in the above table for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

## 10.7 Shallow Foundations

- 10.7.1 The site is suitable for use of conventional shallow foundations consisting of continuous footings and isolated pad footings supported on engineered fill soils prepared in accordance with Section 10.3 of this report. Shallow foundations supported on engineered fill as recommended in this report may be designed based on total and differential static settlement of 1 inch and ½ inch in 40 feet, respectively.
- 10.7.2 The bearing wall footings considered for the C-Store building should be continuous with a minimum width of 15 inches and extend to minimum depths of 12 inches below the lowest adjacent grade. Interior spread foundations (if any) should have a minimum width of 12 inches and depth of 12 inches below bottom of slab on grade. The bottom of footing excavations should be maintained free of loose and disturbed soil. Footing concrete should be placed into a neat excavation.
- 10.7.3 Shallow foundations for the planned fueling canopies, if utilized, should have a minimum width of 24 inches and extend to the minimum depth of 24 inches below lowest adjacent grade. The bottom of footing excavations should be maintained free of loose and disturbed soil. Footing concrete should be placed into a neat excavation.
- 10.7.4 Shallow spread foundations supported on engineered fill to the depths recommended in this report may be designed based on an allowable bearing pressure of 2,500 pounds per square foot. This value may be increased by 1/3 for short term wind and seismic loading. (dead plus live loads). The weight of the concrete footing and soil backfill above the foundation may be neglected in the design.
- 10.7.5 Resistance to lateral footing displacement can be computed using a coefficient of friction factor of 0.34 acting between the base of foundations and engineered fill soils.
- 10.7.6 Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 300 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined provided that a 50% reduction of the frictional resistance factor is used in determining the total lateral resistance.
- 10.7.7 Foundation reinforcement should be determined by the Structural Engineer. At a minimum reinforcement for continuous footings should consist of four No. 4 steel reinforcing bars; two placed near the top of the footing and two near the bottom.
- 10.7.8 Underground utilities running parallel to footings should not be constructed in the zone of influence of footings. The zone of influence may be taken to be the area beneath the footing and within a 1:1 plane extending out and down from the bottom edge of the footing.
- 10.7.9 The footing excavations should not be allowed to dry out any time prior to pouring concrete. The foundation subgrade should be sprinkled as necessary to maintain a moist condition without significant shrinkage cracks as would be expected in any concrete placement. Prior to placing rebar reinforcement, foundation excavations should be evaluated by a representative of SALEM for

appropriate support characteristics and moisture content. Moisture conditioning may be required for the materials exposed at footing bottom, particularly if foundation excavations are left open for an extended period.

## **10.8 Cast in Drilled Hole Pier Foundations for Canopies and Pylon Signs**

- 10.8.1 The depth and diameter of CIDH pier foundations should be determined by the project Structural Engineer. At a minimum, Cast in Drilled Hole Pier foundations should have a minimum diameter of 18 inches and extend a minimum depth of 15 feet below the lowest adjacent grade.
- 10.8.2 Due to the hard to very dense nature of the materials encountered, the Contractor should anticipate the need for specialized equipment (such as rock teeth, rock coring methods, etc.) to achieve planed pier depth.
- 10.8.3 If groundwater is encountered, the shaft should be drilled with care, advancing the casing ahead of the auger and maintaining a water head inside the casing equal to (or higher) than the surrounding water table to limit the potential for drilled shaft hole collapse, when applicable
- 10.8.4 Casing of the drilled pier will be required if caving is encountered, and/or the drilled hole has to be left open for an extended period of time. The casing should be bedded into the soil unit near the design depth prior to placement of the reinforcing steel and concrete, and casing extraction.
- 10.8.5 The total settlement of the drilled Cast in Drilled Hole Piers are not expected to exceed 1 inch and ½ inch differential between piers or 30 feet, whichever is closer.
- 10.8.6 Skin friction within the upper 1 foot BSG should be neglected in design. The downward load capacity of the piers (extending to at least 15 feet BSG), may be designed based on an allowable skin friction value of 300 pounds per square foot. Provided the CIDH excavation is cleaned of loose soils, an allowable end bearing value of 4,000 pounds per square foot may be considered for design. These values may be increased by 1/3 for short duration wind and seismic loading.
- 10.8.7 Uplift loads can be resisted by piles using 60 percent of the allowable downward side friction value plus the weight of the pier.
- 10.8.8 The drilled Cast in Drilled Hole Piers should be designed neglecting the lateral capacity within the upper foot. Below a depth of one (1) foot, the lateral capacity can be designed for 300 pounds per square foot per foot of depth below the lowest adjacent grade to a maximum of 3,000 pounds per square foot. The lateral loading criteria is based on the assumption that the load application is applied at the ground level, flexible cap connections applied and a minimum embedment depth of 15 feet.

## **10.9 Interior Concrete Slabs-on-Grade**

- 10.9.1 Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. We recommend that non-structural slabs-on-grade be at least 4 inches thick and underlain by six (6) inches of class 2 aggregate base compacted to 95 percent relative compaction over 18 inches of imported non expansive engineered fill over the depth of engineered fill recommended below foundations.
- 10.9.2 We recommend reinforcing slabs, at a minimum, with No. 4 reinforcing bars placed 18 inches on center, each way. As an alternative, the use of welded wire or fiber mesh reinforcement may be considered by the Structural Engineer.

- 10.9.3 The spacing of crack control joints should be designed by the project structural engineer. In order to regulate cracking of the slabs, we recommend that full depth construction joints or control joints be provided at a maximum spacing of 15 feet in each direction for 5-inch thick slabs and 12 feet for 4-inch thick slabs.
- 10.9.4 Crack control joints should extend a minimum depth of one-fourth the slab thickness and should be constructed using saw-cuts or other methods as soon as practical after concrete placement. The exterior floors should be poured separately in order to act independently of the walls and foundation system.
- 10.9.5 It is recommended that the utility trenches within the structure be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the structures is recommended.
- 10.9.6 Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with manufacturer's recommendations and/or ASTM guidelines, whichever is more stringent. In addition, ventilation of the structure is recommended to reduce the accumulation of interior moisture.
- 10.9.7 In areas where it is desired to reduce floor dampness where moisture-sensitive coverings, coatings, underlayments, adhesives, moisture sensitive goods, humidity controlled environments, or climate cooled environments are anticipated, construction should have a suitable waterproof vapor retarder (a minimum of 15 mils thick, is recommended, polyethylene vapor retarder sheeting, Raven Industries "VaporBlock 15, Stego Industries 15 mil "StegoWrap" or W.R. Meadows Sealtight 15 mil "Perminator") incorporated into the floor slab design. The water vapor retarder should be a decay resistant material complying with ASTM E96 or ASTM E1249 not exceeding 0.01 perms, ASTM E154 and ASTM E1745 Class A. The vapor retarder should, maintain the recommended permeance **after** conditioning tests per ASTM E1745. The vapor barrier should be placed between the concrete slab and the compacted granular aggregate subbase material. The water vapor retarder (vapor barrier) should be installed in accordance with ASTM Specification E 1643-18.
- 10.9.8 The concrete may be placed directly on vapor retarder. The vapor retarder should be inspected prior to concrete placement. Cut or punctured retarder should be repaired using vapor retarder material lapped 6 inches beyond damaged areas and taped. Extend vapor retarder over footings and seal to foundation wall or slab at an elevation consistent with the top of the slab or terminate at impediments such as water stops or dowels. Seal around penetrations such as utilities or columns in order to create a monolithic membrane between the surface of the slab and moisture sources below the slab as well as at the slab perimeter.
- 10.9.9 Avoid use of stakes driven through the vapor retarder.
- 10.9.10 The recommendations of this report are intended to reduce the potential for cracking of slabs due to soil movement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to soil movement. This is common for project areas that contain expansive or loose soils since designing to eliminate potential soil movement is cost prohibitive. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the

placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

- 10.9.11 Proper finishing and curing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

**10.10 Exterior Concrete Slabs on Grade**

- 10.10.1 The following recommendations are intended for lightly loaded exterior slabs on grade not subject to vehicular traffic. Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. We recommend that non-structural slabs-on-grade be at least 4 inches thick and underlain by twelve (12) inches of class 2 aggregate base over subgrade soils prepared in accordance with the recommendations in section 10.3 of this report.
- 10.10.2 The spacing of crack control joints should be designed by the project structural engineer. In order to regulate cracking of the slabs, we recommend that full depth construction joints or control joints be provided at a maximum spacing of 15 feet in each direction for 5-inch thick slabs and 12 feet for 4-inch thick slabs.
- 10.10.3 Crack control joints should extend a minimum depth of one-fourth the slab thickness and should be constructed using saw-cuts or other methods as soon as practical after concrete placement.
- 10.10.4 Proper finishing and curing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

**10.11 Lateral Earth Pressures and Frictional Resistance**

- 10.11.1 Active, at-rest and passive unit lateral earth pressures against footings and walls are summarized in the table below:

Lateral Pressure Conditions	Soil Equivalent Fluid Pressure
Active Pressure, Drained, pcf	37
At-Rest Pressure, Drained, pcf	59
Allowable Passive Pressure, pcf	300
Allowable Coefficient of Friction	0.34
Maximum Unit Weight (pcf) [ $\gamma_{max}$ ]	135
Minimum Unit Weight (pcf) [ $\gamma_{min}$ ]	100

- 10.11.2 Active pressure applies to walls, which are free to rotate. At-rest pressure applies to walls, which are restrained against rotation. The preceding lateral earth pressures assume sufficient drainage behind retaining walls to prevent the build-up of hydrostatic pressure. The top one-foot of adjacent subgrade should be deleted from the passive pressure computation.
- 10.11.3 The allowable parameters include a safety factor of 1.5 and can be used in design for direct comparison of resisting loads against lateral driving loads.
- 10.11.4 If combined passive and frictional resistance is used in design, a 50 percent reduction in frictional resistance is recommended.

10.11.5 For lateral stability against seismic loading conditions, we recommend a minimum safety factor of 1.1.

10.11.6 For dynamic seismic lateral loading the following equation should be used:

<b>Dynamic Seismic Lateral Loading Equation</b>
Dynamic Seismic Lateral Load = $\frac{3}{8}\gamma K_h H^2$
Where: $\gamma$ = Maximum In-Place Soil Density (Section 10.11.1 above)
$K_h$ = Horizontal Acceleration = $\frac{2}{3}PGA_M$ (Section 10.6.1 above)
H = Wall Height

## 10.12 Retaining Walls

10.12.1 Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic-concrete or other suitable backfill to minimize surface drainage into the wall drain system. The gravel should conform to Class 2 permeable materials graded in accordance with the current Caltrans Standard Specifications.

10.12.2 Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

10.12.3 Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements.

10.12.4 The top of the perforated pipe should be placed at or below the bottom of the adjacent floor slab or pavements. The pipe should be placed in the center line of the drainage blanket and should have a minimum diameter of 4 inches. Slots should be no wider than 1/8-inch in diameter, while perforations should be no more than 1/4-inch in diameter.

10.12.5 If retaining walls are less than 5 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 2-inch minimum diameter holes (concrete walls) or unmortared head joints (masonry walls) and placed no higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to the Caltrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

10.12.6 During grading and backfilling operations adjacent to any walls, heavy equipment should not be allowed to operate within a lateral distance of 5 feet from the wall, or within a lateral distance equal to the wall height, whichever is greater, to avoid developing excessive lateral pressures. Within this zone, only hand operated equipment ("whackers," vibratory plates, or pneumatic compactors) should be used to compact the backfill soils.

### 10.13 Temporary Excavations

- 10.13.1 We anticipate that the majority of the dense site soils will be classified as Cal-OSHA “Type C” soil when encountered in excavations during site development and construction. Excavation sloping, benching, the use of trench shields, and the placement of trench spoils should conform to the latest applicable Cal-OSHA standards. The contractor should have a Cal-OSHA-approved “competent person” onsite during excavation to evaluate trench conditions and make appropriate recommendations where necessary.
- 10.13.2 It is the contractor’s responsibility to provide sufficient and safe excavation support as well as protecting nearby utilities, structures, and other improvements which may be damaged by earth movements. All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load.
- 10.13.3 Temporary excavations and slope faces should be protected from rainfall and erosion. Surface runoff should be directed away from excavations and slopes.
- 10.13.4 Open, unbraced excavations in undisturbed soils should be made according to the slopes presented in the following table:

**RECOMMENDED EXCAVATION SLOPES**

<b>Depth of Excavation (ft)</b>	<b>Slope (Horizontal : Vertical)</b>
0-5	1:1
5-10	1½:1
10-15	2:1
15-20	2½:1

- 10.13.5 If, due to space limitation, excavations near existing structures are performed in a vertical position, braced shorings or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavations and installation. A Specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction.
- 10.13.6 Braced shorings should be designed for a maximum pressure distribution of 30H, (where H is the depth of the excavation in feet). The foregoing does not include excess hydrostatic pressure or surcharge loading. Fifty percent of any surcharge load, such as construction equipment weight, should be added to the lateral load given herein. Equipment traffic should concurrently be limited to an area at least 3 feet from the shoring face or edge of the slope.
- 10.13.7 The excavation and shoring recommendations provided herein are based on soil characteristics derived from the borings within the area. Variations in soil conditions will likely be encountered during the excavations. SALEM Engineering Group, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations not otherwise anticipated in the preparation of this recommendation. Slope height, slope inclination, or excavation depth should in no case exceed those specified in local, state, or federal safety regulation, (e.g. OSHA) standards for excavations, 29 CFR part 1926, or Assessor’s regulations.

## **10.14 Underground Utilities**

- 10.14.1 Underground utility trenches should be backfilled with properly compacted material. The material excavated from the trenches should be adequate for use as backfill provided it does not contain deleterious matter, vegetation or rock larger than 3 inches in maximum dimension. Trench backfill should be placed in loose lifts not exceeding 8 inches and compacted to at least 92 percent relative compaction at or above optimum moisture content. The upper 12 inches of trench backfill within asphalt or concrete paved areas should be moisture conditioned to at or above optimum moisture content and compacted to at least 95 percent relative compaction.
- 10.14.2 Bedding and pipe zone backfill typically extends from the bottom of the trench excavations to approximately 12 inches above the crown of the pipe. Pipe bedding, haunches and initial fill extending to 1 foot above the pipe should consist of a clean well graded sand with 100 percent passing the #4 sieve, a maximum of 15 percent passing the #200 sieve, and a minimum sand equivalent of 20.
- 10.14.3 Underground fuel tanks should be installed in accordance with tank manufacturer requirements. Based on the granular nature of the soils encountered, temporary shoring and/or laying back of the excavation should be anticipated. Open graded materials such as pea gravel should be fully encased in a geotextile filter fabric such as Tensar Mirafi 140N.
- 10.14.4 It is suggested that underground utilities crossing beneath new or existing structures be plugged at entry and exit locations to the building or structure to prevent water migration. Trench plugs can consist of on-site clay soils, if available, or sand cement slurry. The trench plugs should extend 2 feet beyond each side of individual perimeter foundations.
- 10.14.5 The contractor is responsible for removing all water-sensitive soils from the trench regardless of the backfill location and compaction requirements. The contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

## **10.15 Pavement Design**

- 10.15.1 During grading subgrade samples should be tested to verify the recommendations included in this report remain valid. The Pavement design recommendations provided herein are based on the State of California Department of Transportation (CALTRANS) design manual. Based on the results of the laboratory tests performed an R-value of 12 was used for design. During grading subgrade samples should be tested to verify the recommendations included in this report remain valid.
- 10.15.2 The asphaltic concrete (flexible pavement) is based on a 20-year pavement life utilizing traffic indexes of ranging from 4.0 to 8.0. The Civil Engineer should select the appropriate pavement section based on the anticipated traffic loading. The following table shows the recommended pavement sections for various traffic indices.

**TABLE 10.15.2  
ASPHALT CONCRETE PAVEMENT THICKNESSES**

<b>Traffic Index</b>	<b>Asphaltic Concrete, (inches)</b>	<b>Class 2 Aggregate Base, (inches)*</b>	<b>Compacted Subgrade, (inches)*</b>
4.0	2.5	6.0	12.0
5.0	2.5	9.5	12.0
6.0	3.0	12.0	12.0
7.0	4.0	13.5	12.0
8.0	4.5	16.5	12.0

*\*95% compaction based on ASTM D1557 Test Method*

10.15.3 The following recommendations are for Portland Cement Concrete pavement sections.

**TABLE 10.15.3  
PORTLAND CEMENT CONCRETE PAVEMENT THICKNESSES**

<b>Traffic Index</b>	<b>Portland Cement Concrete, (inches)*</b>	<b>Class 2 Aggregate Base, (inches)**</b>	<b>Compacted Subgrade, (inches)**</b>
4.0	6.0	4.0	12.0
5.0	6.0	4.0	12.0
6.0	6.0	4.0	12.0
7.0	6.5	4.0	12.0
8.0	6.5	4.0	12.0

*\* Minimum Compressive Strength of 4,000 psi,  
\*\* 95% compaction based on ASTM D1557 Test Method*

- 10.15.4 Asphalt concrete should conform to Section 39 of Caltrans' latest Standard Specifications for ½ inch Hot Mix Asphalt (HMA) Type A. Asphaltic concrete pavements should be compacted in accordance with Caltrans Standard Specifications (current edition).
- 10.15.5 Excavations, depressions, or firm and pliant areas extending below planned finished subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill. Any buried structures encountered during construction should be properly removed and backfilled.
- 10.15.6 Buried structures encountered during construction should be properly removed/rerouted and the resulting excavations backfilled. It is suspected that demolition activities of the existing pavement will disturb the upper soils. After demolition activities, it is recommended that disturbed soils within pavement areas be removed and/or compacted as engineered fill.
- 10.15.7 An integral part of satisfactory fill placement is the stability of the placed lift of soil. Prior to placement of aggregate base, the subgrade soils should be proof-rolled by a loaded water truck (or equivalent) to verify no deflections of greater than ½ inch occur. If placed materials exhibit excessive instability as determined by a SALEM field representative, the lift will be considered unacceptable and should be remedied prior to placement of additional fill material. Additional lifts

should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable.

- 10.15.8 A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material.

## **11. PLAN REVIEW, CONSTRUCTION OBSERVATION AND TESTING**

### **11.1 Plan and Specification Review**

- 11.1.1 SALEM should review the project plans and specifications prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required.

### **11.2 Construction Observation and Testing Services**

- 11.2.1 The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. If we are not retained for these services, we cannot assume any responsibility for others interpretation of our recommendations, and therefore the future performance of the project.
- 11.2.2 SALEM should be present at the site during site preparation to observe site clearing, preparation of exposed surfaces after clearing, and placement, treatment and compaction of fill material.
- 11.2.3 SALEM's observations should be supplemented with periodic compaction tests to establish substantial conformance with these recommendations. Moisture content of footings and slab subgrade should be tested immediately prior to concrete placement. SALEM should observe foundation excavations prior to placement of reinforcing steel or concrete to assess whether the actual bearing conditions are compatible with the conditions anticipated during the preparation of this report.

## **12. LIMITATIONS AND CHANGED CONDITIONS**

This Geotechnical Investigation Report has been prepared for the exclusive use of S & L Building Inc. and its subsidiaries and affiliates. Unauthorized use of or reliance on the information contained in this report, unless given express written consent by SALEM, S & L Building Inc. is strictly prohibited.

The analyses and recommendations submitted in this report are based upon the data obtained from the test boring drilled at the approximate locations shown on the Site Plan, Figure 1. The report does not reflect variations which may occur between test boring locations explored. The nature and extent of such variations may not become evident until construction is initiated.

If variations then appear, a re-evaluation of the recommendations of this report will be necessary after performing on-site observations during the excavation period and noting the characteristics of such variations. The findings and recommendations presented in this report are valid as of the present and for the proposed construction. If site conditions change due to natural processes or human intervention on the property or adjacent to the site, or changes occur in the nature or design of the project, or if there is a substantial time lapse between the submission of this report and the start of the work at the site, the conclusions and

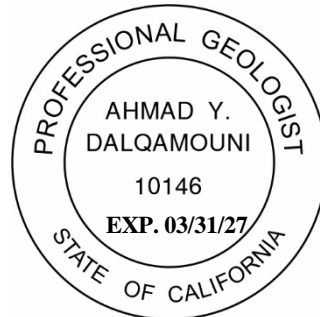
recommendations contained in our report will not be considered valid unless the changes are reviewed by SALEM and the conclusions of our report are modified or verified in writing. The validity of the recommendations contained in this report is also dependent upon an adequate testing and observations program during the construction phase. Our firm assumes no responsibility for construction compliance with the design concepts or recommendations unless we have been retained to perform the on-site testing and review during construction. SALEM has prepared this report for the exclusive use of the owner and project design consultants.

SALEM does not practice in the field of corrosion engineering. It is recommended that a qualified corrosion engineer be consulted regarding protection of buried steel or ductile iron piping and conduit or, at a minimum, that manufacturer's recommendations for corrosion protection be closely followed. Further, a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of concrete slabs and foundations in direct contact with native soil. The importation of soil and or aggregate materials to the site should be screened to determine the potential for corrosion to concrete and buried metal piping. The report has been prepared in accordance with generally accepted geotechnical engineering practices in the area. No other warranties, either express or implied, are made as to the professional advice provided under the terms of our agreement and included in this report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (559) 271-9700.

Respectfully Submitted,  
**SALEM ENGINEERING GROUP, INC.**

Ahmad Dalqamouni, PG, Ph.D., M.CE.  
Geotechnical Project Manager  
PG 10146

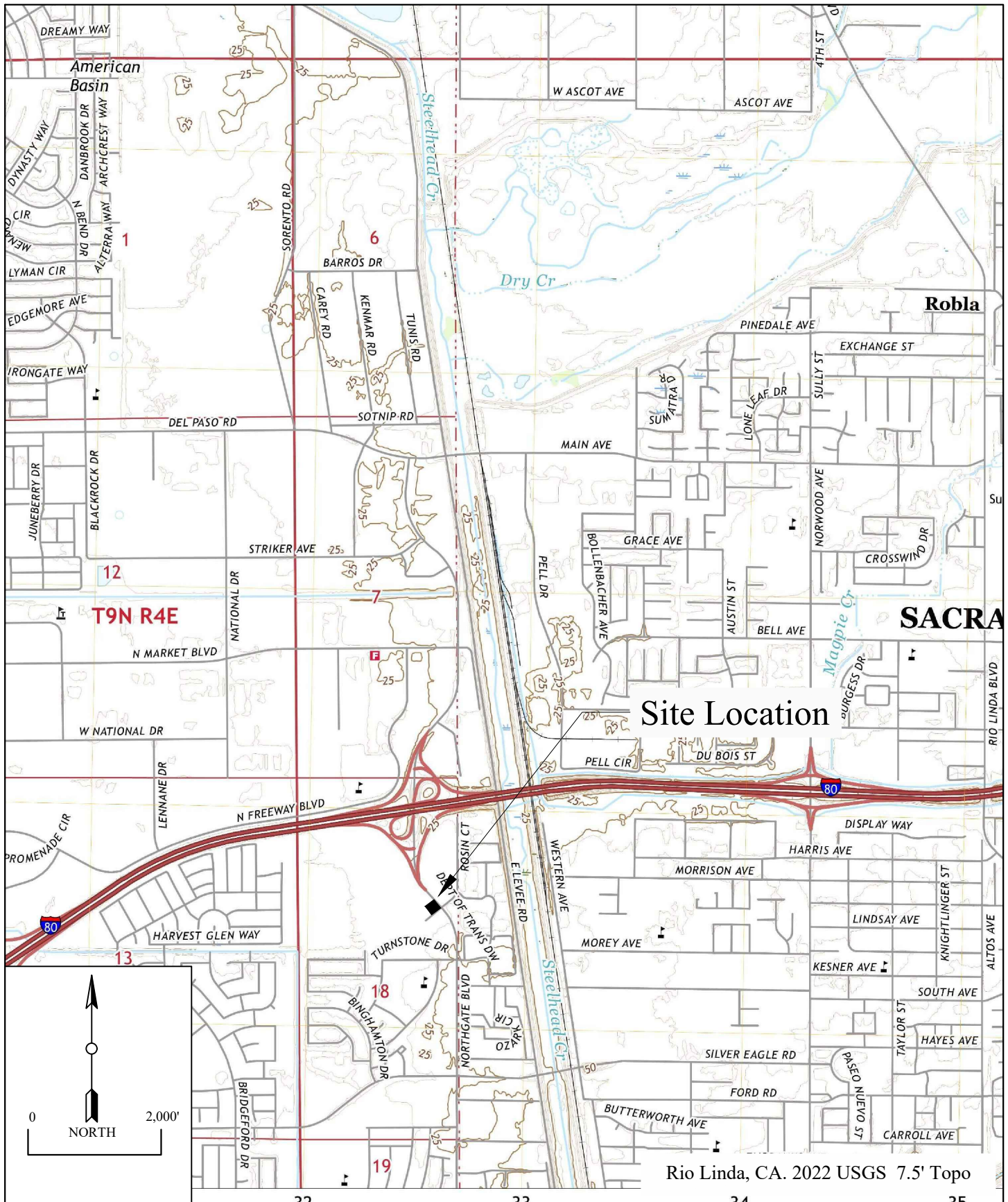


Dean B. Ledgerwood II, PE, PG, CEG  
Geotechnical Manager  
PE 94395 / PG 8725 / CEG 2613



R. Sammy Salem, PE, GE  
Principal Managing Engineer  
RCE 52762 / RGE 2549





Rio Linda, CA. 2022 USGS 7.5' Topo

**VICINITY MAP**

SCALE: 1" = 2,000'

DATE: June 2025

GEOTECHNICAL ENGINEERING INVESTIGATION  
 7-ELEVEN C-STORE & FUEL STATION  
 NWC OF NORTHGATE BLVD & ROSIN CT  
 SACRAMENTO, CALIFORNIA

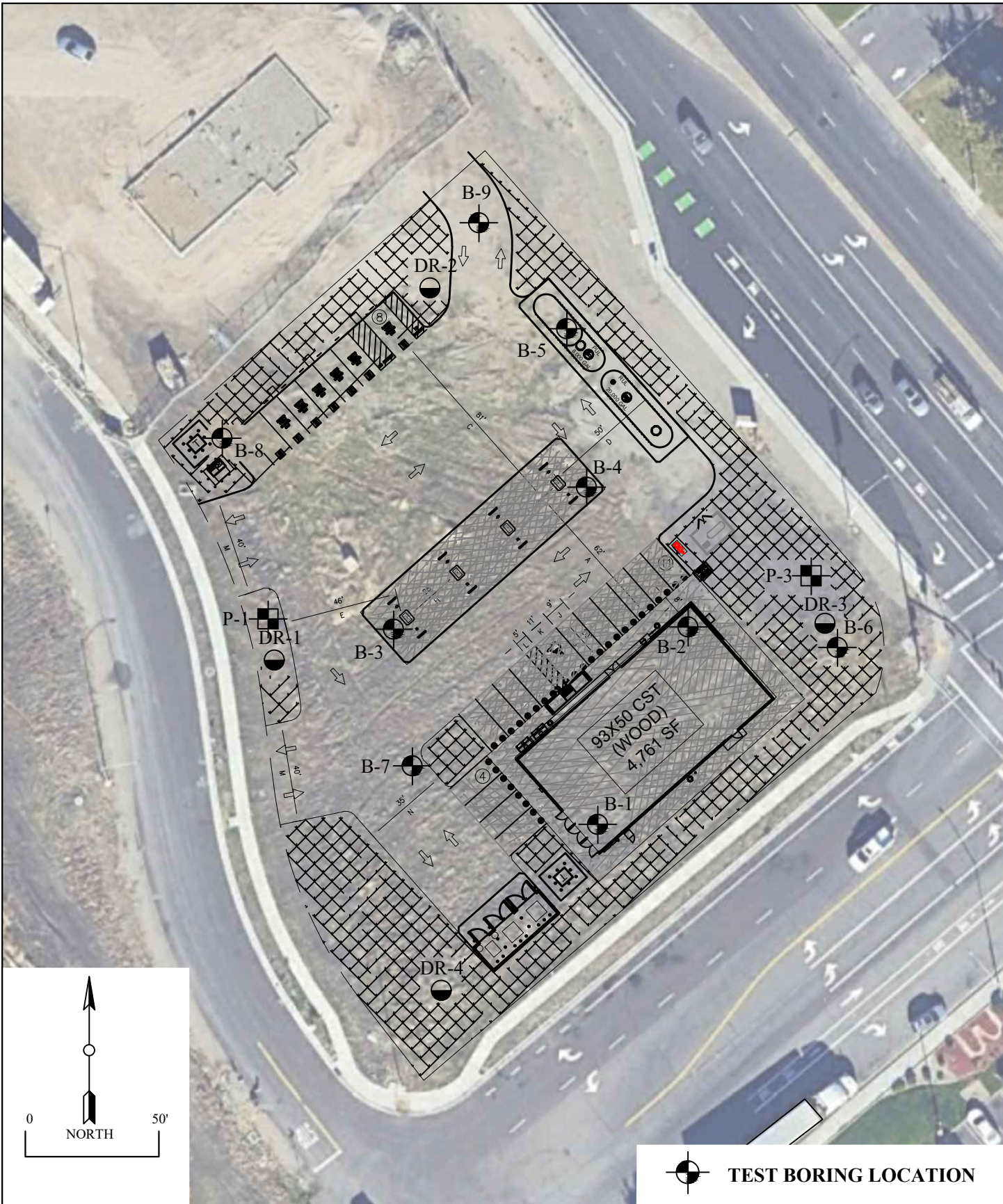
DRAWN BY: VT

APPROVED BY: AD

PROJECT NO. 4-225-0526

FIGURE NO. 1





**SITE PLAN**

SCALE:  
1" = 50'

DATE: June 2025

GEOTECHNICAL ENGINEERING INVESTIGATION  
7-ELEVEN C-STORE & FUEL STATION  
NWC OF NORTHGATE BLVD & ROSIN CT  
SACRAMENTO, CALIFORNIA

DRAWN BY: VT

APPROVED BY: AD

PROJECT No.: 4-225-0526

FIGURE NO. 1



# A



## **APPENDIX A**

### **FIELD EXPLORATION**

Fieldwork for our investigation was conducted on June 18 and 19, 2025 and included a site visit, subsurface exploration, and soil sampling. The locations of the exploratory borings are shown on the Site Plan, Figure 2. Boring logs for our exploration are presented in figures following the text in this appendix. Borings were located in the field using existing reference points. Therefore, actual boring locations may deviate slightly.

Our borings were drilled using a truck-mounted CME-55 drilling rig and 6-inch diameter solid flight auger. Sampling was accomplished by driving a 2-inch Standard Penetration Test (SPT) sampler and/or a 3-inch outside diameter Modified California Sampler (MCS) 18 inches into the soil. Penetration and/or Resistance tests were performed at selected depths. The resistance/N-Value obtained from driving was recorded based on the number of blows required to penetrate the last 12 inches. The driving energy was provided by an auto-trip hammer weighing 140 pounds, falling 30 inches. Relatively undisturbed MCS soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the SPT samples and auger cuttings. All samples were returned to our Fresno laboratory for evaluation. At the completion of drilling and sampling, the test borings were backfilled with cuttings, thus, some settlement should be anticipated.

Subsurface conditions encountered in the test borings were visually examined, classified and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D2488). This system uses the Unified Soil Classification System (USCS) for soil designations. The logs depict soil and geologic conditions encountered and depths at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the field logs were revised based on subsequent laboratory testing.



**Project:** Proposed 7-Eleven C-Store and Fuel Station

**Location:** NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

**Drilled By:** Salem Engineering Group, Inc. **Logged By:** RS

**Drill Type:** CME-55 **Elevation:** 14-ft. AMSL

**Auger Type:** 6-5/8in. Hollow Stem Auger **Initial Depth to Groundwater:** 23-ft.

**Hammer Type:** Automatic Trip - 140lbs./30in. **Final Depth to Groundwater:** 23-ft.

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		CL	Lean CLAY with Sand; hard, Brown, moist.	>50	13.9	118.5	#200 = 76% SAND = 24% PI = 13 LL = 32
5							
5			Grades as above;	>50	17.1	113.3	
10							
10		ML	Sandy SILT; hard, brown, moist, low plasticity. Moist.	40	18.3	106.1	#200 = 69% SAND = 31% PI = 3 LL = 23
15				12	19.5		
15		SM	Silty SAND; medium dense, brown, very moist.	28	25.5		
20							
20		ML	SILT; hard, brown to greyish brown, very moist, low plasticity.	>50	32.9		#200 = 96% SAND = 4% PI = 2LL = 301
25							
25			Grades as above;	46	38.6		
30							

Notes:

Figure Number A-1

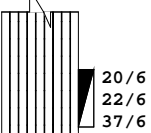



**SALEM**  
engineering group, inc.

**Project Number:** 4-225-0526

**Date:** 06/18/2025

**Test Boring:** B-1

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
-15 30			SILT; hard, brown to greyish brown, very moist, low plasticity.	>50	35.2		
-20 35			Grades as above;	>50	31.1		
-25 40			End of boring at 36.2 ft. BSG				
-30 45							
-35 50							
-40 55							
-45 60							

**Notes:**

**Figure Number A-1**



**Project:** Proposed 7-Eleven C-Store and Fuel Station

**Location:** NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

**Drilled By:** Salem Engineering Group, Inc. **Logged By:** RS

**Drill Type:** CME-55 **Elevation:** 14-ft. AMSL

**Auger Type:** 6-5/8in. Hollow Stem Auger **Initial Depth to Groundwater:** 21-ft.

**Hammer Type:** Automatic Trip - 140lbs./30in. **Final Depth to Groundwater:** 21-ft.

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		CL	Lean CLAY; firm, dark brown, dry to damp.	7	12.4	86.3	
10							
5		CL	Grades as above; Hard.	>50	14.5	113.2	
10							
10							
10		SM	Silty SAND; medium dense, brown, moist, fine grained.	17	17.0		
15							
15							
15		ML	Grades as above; Grey to brown.	19	16.7		SAND = 64% -#200 = 36% PI = 0 LL = 18
20							
20							
20		ML	SILT; hard, brown, moist, non-plastic, trace of sand.	39	30.7		
25							
25							
25		ML	Greyish brown, no sand.	45	39.8		
25							
25							

Notes:

Figure Number A-2

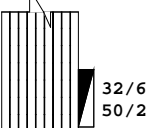



**SALEM**  
engineering group, inc.

**Project Number:** 4-225-0526

**Date:** 06/18/2025

**Test Boring:** B-2

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
-15 30			Brown to greyish brown, trace sand.	>50	27.7		
-20 35			Brown.	>50	28.7		
-25 40			End of boring at 36.1ft. BSG				
-30 45							
-35 50							
-40 55							
-45 60							

**Notes:**

**Figure Number A-2**



**Project:** Proposed 7-Eleven C-Store and Fuel Station

**Location:** NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

**Drilled By:** Salem Engineering Group, Inc. **Logged By:** RS

**Drill Type:** CME-55 **Elevation:** 14-ft. AMSL

**Auger Type:** 6-5/8in. Hollow Stem Auger **Initial Depth to Groundwater:** 23-ft.

**Hammer Type:** Automatic Trip - 140lbs./30in. **Final Depth to Groundwater:** 23-ft.

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		CL/CH	Lean CLAY/Fat Clay; stiff, brown to black, dry to moist, medium plasticity.	12	16.9	99.4	Organic smell
10			Grades as above; very stiff, greyish brown.	25	15.5	113.8	Low recovery.
5		ML	Sandy SILT; hard, brown, moist, fine grained.	38	14.2		
10							
0		SM	Silty SAND; medium dense, grey, very moist, with trace of clay.	16	19.9		
15							
-5		ML	SILT; hard, grey to brown, moist, non-plastic.	48	27.7		
20							
-10			Grades as above; very moist.	>50	38.1		
25							

Notes:

Figure Number A-3



**SALEM**  
engineering group, inc.

**Project Number:** 4-225-0526

**Date:** 06/18/2025

**Test Boring:** B-3

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
-15 30	20/6 30/6 50/5		Grades as above;	>50	28.4		
-20 35	25/6 28/6 50/3		Grades as above; trace of sand	>50	36.6		Low recovery.
-25 40			End of boring at 34.9-ft. BSG				
-30 45							
-35 50							
-40 55							
-45 60							

**Notes:**

**Figure Number A-3**



**Project:** Proposed 7-Eleven C-Store and Fuel Station

**Location:** NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

**Drilled By:** Salem Engineering Group, Inc. **Logged By:** RS

**Drill Type:** CME-55 **Elevation:** 14-ft. AMSL

**Auger Type:** 6-5/8in. Hollow Stem Auger **Initial Depth to Groundwater:** 23-ft.

**Hammer Type:** Automatic Trip - 140lbs./30in. **Final Depth to Groundwater:** 23-ft.

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		CL	Lean CLAY with sand; stiff, brown, moist, medium plasticity.	20	14.9	110.4	
10							
5							
5			Grades as above; hard.	>50	18.4	110.1	
10							
5			Grades as above; stiff, reddish brown, moist, with some sand.	14	17.1		
10							
0		SC-SM	Clayey silty SAND; medium dense, brown, moist, fine grained.	24	12.8		
15							
-5		ML	SILT; hard, brown, moist, non-plastic, trace sand.	47	25.9		
20							
-10			Very moist, with sand.	24	18.8		
25							

**Notes:**

**Figure Number A-4**



**SALEM**  
engineering group, inc.

Project Number: 4-225-0526

Date: 06/18/2025

Test Boring: B-4

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
-15 30	5/6 7/6 15/6		Very stiff, trace sand.	22	25.6		
-20 35	11/6 33/6 50/5		Hard.	>50	30.7		
-25 40			End of boring at 35-ft. BSG				
-30 45							
-35 50							
-40 55							
-45 60							

Notes:

Figure Number A-4



**Project:** Proposed 7-Eleven C-Store and Fuel Station

**Location:** NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

**Drilled By:** Salem Engineering Group, Inc. **Logged By:** RS

**Drill Type:** CME-55 **Elevation:** 14-ft. AMSL

**Auger Type:** 6-5/8in. Hollow Stem Auger **Initial Depth to Groundwater:** 21-ft.

**Hammer Type:** Automatic Trip - 140lbs./30in. **Final Depth to Groundwater:** 21-ft.

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		CL	Lean CLAY; stiff, brown, moist, medium plasticity, with some sand.	11	24.3		El = 63
5							
5		SC-SM	Grades as above;	15	20.0		
10							
5		SC-SM	Clayey Silty SAND; medium dense, brown, fine grained.	29	14.9	114.8	
10							
0		ML	Grades as above;	18	16.6		
15							
-5		ML	SILT; firm, light brown, very moist, non-plastic.	6	26.7		
20							
-10			Grades as above; hard, with sand.	33	31.4		
25							
			End of boring at 25ft. BSG				

**Notes:**

**Figure Number A-5**



**Project:** Proposed 7-Eleven C-Store and Fuel Station

**Location:** NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

**Drilled By:** Salem Engineering Group, Inc. **Logged By:** RS

**Drill Type:** CME-55 **Elevation:** 14-ft. AMSL

**Auger Type:** 6-5/8in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

**Hammer Type:** Automatic Trip - 140lbs./30in. **Final Depth to Groundwater:** N/A

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		CL	Lean CLAY with Sand; stiff, brown, moist, low plasticity.	14	14.4		
5		SM	Silty SAND; very dense, brown, damp, fine grained, with trace clay.	>50	13.2		
10		CL	Lean CLAY; very stiff, light brown, moist, trace of sand.	19	21.3		
			End of boring at 11.5-ft. BSG				
0							
15							
-5							
20							
-10							
25							

**Notes:**

**Figure Number A-6**



**Project:** Proposed 7-Eleven C-Store and Fuel Station

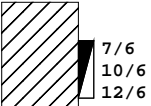


**Location:** NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

**Drilled By:** Salem Engineering Group, Inc. **Logged By:** RS

**Drill Type:** CME-55 **Elevation:** 14-ft. AMSL

**Auger Type:** 6-5/8in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

**Hammer Type:** Automatic Trip - 140lbs./30in. **Final Depth to Groundwater:** N/A

ELEVATION/DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		CL	Lean CLAY with Sand; very stiff, brown, dry to moist, medium plasticity.	22			
5		ML	SILT with Sand; hard, brown, moist, non-plastic.	53	17.2		
10			Grades as above; very stiff, greyish brown.	30	16.0		
			End of boring at 11.5-ft. BSG				

Notes:



**Project:** Proposed 7-Eleven C-Store and Fuel Station

**Location:** NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

**Drilled By:** Salem Engineering Group, Inc. **Logged By:** RS

**Drill Type:** CME-55 **Elevation:** 14-ft. AMSL

**Auger Type:** 6-5/8in. Hollow Stem Auger **Initial Depth to Groundwater:** N/A

**Hammer Type:** Automatic Trip - 140lbs./30in. **Final Depth to Groundwater:** N/A

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		CH	Fat CLAY; stiff, dark brown to brown, moist, medium plasticity, trace of sand.	13	29.5		#200 = 94% SAND = 5% R = 12
5		CL	Lean CLAY; very stiff, brown, moist, trace of sand.	20	18.7		
10			Grades as above;	16	16.8		
			End of boring at 11.5-ft. BSG				
0							
15							
-5							
20							
-10							
25							

**Notes:**

**Figure Number A-8**



Project Number: 4-225-0526

Date: 06/18/2025

Client: Guggenheim Development Services, LLC

Project: Proposed 7-Eleven C-Store and Fuel Station

Location: NWC of Northgate Boulevard & Rosin Court, Sacramento, CA.

Drilled By: Salem Engineering Group, Inc.      Logged By: RS

Drill Type: CME-55      Elevation: 14-ft. AMSL

Auger Type: 6-5/8in. Hollow Stem Auger      Initial Depth to Groundwater: N/A

Hammer Type: Automatic Trip - 140lbs./30in.      Final Depth to Groundwater: N/A

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Soil Description	N-Values blows/ft.	Moisture Content %	Dry Density, PCF	Remarks
0		FILL	Silty Sand with gravel; light brown, damp	22	3.1		
10			Silty SAND and Gravel; medium dense, brown, damp, fine to medium grained. (FILL)				
5			Silty GRAVEL and Sand; medium dense, grey, damp, coarse grained. (FILL)	24	3.6		
10			Grades as above; loose.	5	2.7		
			End of boring at 11.5-ft. BSG				
0							
15							
-5							
20							
-10							
25							








Notes:

Figure Number A-9



# KEY TO SYMBOLS

Symbol Description



## Strata symbols

	Lean Clay
	Silt
	Silty Sand
	Low-high plasticity clays
	Silty, Clayey SAND
	Fat Clay
	Fill

## Misc. Symbols

	Water table during drilling
	Boring continues

## Soil Samplers

	California sampler
	Standard penetration test

## Notes:

### Granular Soils

Blows Per Foot (Uncorrected)

	MCS	SPT
Very loose	<5	<4
Loose	5-15	4-10
Medium dense	16-40	11-30
Dense	41-65	31-50
Very dense	>65	>50

### Cohesive Soils

Blows Per Foot (Uncorrected)

	MCS	SPT
Very soft	<3	<2
Soft	3-5	2-4
Firm	6-10	5-8
Stiff	11-20	9-15
Very Stiff	21-40	16-30
Hard	>40	>30

MCS = Modified California Sampler

SPT = Standard Penetration Test Sampler

<b>Project Name</b>		Proposed 7-Eleven C-store and Fuel Station				<b>Infiltration Test #</b>		DR-2	
<b>Project Number:</b>		4-225-0526				<b>Date</b>		<b>Time</b>	
<b>Tested By:</b>		RS				<b>Presaturation</b>		6/19/2025	
<b>DATE:</b>		6/19/2025				<b>Checked</b>		6/19/2025	
<b>Depth to water table:</b>		N/A				<b>Penetration of Rings (in):</b>		1.125 inches	
<b>Depth of Test BSG (Ft)</b>		5				<b>Test Location:</b>		DR-2	
<b>Soil Type (USCS)</b>		Silty GRAVEL and Sand							
Trial #	Start / End	Time HR:MIN:SEC	Time Chg / Total Time (HR:Min:SEC)	Flow Readings		UNFACTORED Infiltration Rate		Remarks	
				Inner Ring Depth (In)	Change in Depth (In)	Infiltration Rate in/min	Infiltration Rate in/hr	Weather conditions Etc...	
1	Start Test	10:28:00 AM	0:41:00	3.38	0.94	0.02	1.37		
	End Test	11:09:00 AM	<b>0:41:00</b>	2.44					
2	Start Test	11:12:00 AM	0:36:00	3.75	1.19	0.03	1.98		
	End Test	11:48:00 AM	<b>1:20:00</b>	2.56					
3	Start Test	11:32:00 AM	1:33:00	4.06	1.75	0.02	1.13		
	End Test	1:05:00 PM	<b>2:37:00</b>	2.31					
4	Start Test	1:14:00 PM	0:54:00	3.75	0.50	0.01	0.56		
	End Test	2:08:00 PM	<b>3:40:00</b>	3.25					

<b>Project Name</b>		Proposed 7-Eleven C-store and Fuel Station				<b>Infiltration Test #</b>		DR-4	
<b>Project Number:</b>		4-225-0526				<b>Date</b>		<b>Time</b>	
<b>Tested By:</b>		RS				<b>Presaturation</b>		6/19/2025	
<b>DATE:</b>		6/19/2025				<b>Checked</b>		6/19/2025	
<b>Depth to water table:</b>		N/A				<b>Penetration of Rings (in):</b>		6.5 inches	
<b>Depth of Test BSG (Ft)</b>		4				<b>Test Location:</b>		Southwest corner of lot	
<b>Soil Type (USCS)</b>		Clay with Sand							
Trial #	Start / End	Time HR:MIN:SEC	Time Chg / Total Time (HR:Min:SEC)	Flow Readings		UNFACTORED Infiltration Rate		Remarks	
				Inner Ring Depth (In)	Change in Depth (In)	Infiltration Rate in/min	Infiltration Rate in/hr	Weather conditions Etc...	
1	Start Test	12:51:00 PM	0:36:00	3.19	1.00	0.03	1.66		
	End Test	1:27:00 PM	<b>0:36:00</b>	2.19					
2	Start Test	1:46:00 PM	1:05:00	4.19	0.57	0.01	0.52		
	End Test	2:51:00 PM	<b>2:00:00</b>	3.63					
3	Start Test	2:51:00 PM	1:03:00	3.63	1.07	0.02	1.02		
	End Test	3:54:00 PM	<b>3:03:00</b>	2.56					
4	Start Test	3:54:00 PM	0:30:00	4.31	0.38	0.01	0.75		
	End Test	4:24:00 PM	<b>3:33:00</b>	3.94					
5	Start Test	4:24:00 PM	0:30:00	3.94	0.57	0.02	1.13		
	End Test	4:54:00 PM	<b>4:03:00</b>	3.38					

**Percolation Test Worksheet**

**Project:** **Proposed 7-Eleven C-store and Fuel Station  
Sacramento, California**

**Job No.:** 4-225-0526  
**Date Drilled:** 6/19/2025  
**Soil Classification:** Lean Clay (CL)

Length of Pipe: 82 in.  
Pipe stickup: 2.0 ft  
Hole Dia.: 6.625 in.  
Pipe Dia.: 4 in.  
Gravel Below Pipe: 0.5 in.  
Gravel pack porosity: 0.40  
Gravel Correc Factor: 0.62

**Test Hole No.:** P-1  
**Tested By:** R.S.  
**Drilled Hole Depth:** 4.8 Feet

**Presoaking Date:** 6/19/2025  
**Test Date:** 6/19/2025

Time Start (hr:min:sec)	Time Finish (hr:min:sec)	Refill- Yes or No	Elapsed Time (hrs:min:sec)	Initial Water Level# (ft)	Final Water Level# (ft)	Level (in.)		Uncorrected Percolation Rate (min/in)	Gravel Pack Corrected Unfactored Percolation Rate (min/in)	Estimated Unfactored Infiltration Rate (inches/hr)
13:03:00	13:33:00	N	0:30:00	5.06	5.06	0.00	30.00			
13:33:00	14:03:00	N	0:30:00	5.06	5.06	0.00	30.00			
14:03:00	14:41:00	N	0:38:00	5.06	5.06	0.00	38.00			
14:43:00	15:15:00	N	0:32:00	5.06	5.06	0.00	32.00			
15:15:00	15:45:00	N	0:30:00	5.06	5.06	0.00	30.00			

**Percolation Test Worksheet**

**Project:** **Proposed 7-Eleven C-store and Fuel Station  
Sacramento, California**

**Job No.:** 4-225-0526  
**Date Drilled:** 6/19/2025  
**Soil Classification:** Lean Clay (CL)

Length of Pipe: 83 in.  
Pipe stickup: 2.7 ft  
Hole Dia.: 6.625 in.  
Pipe Dia.: 4 in.  
Gravel Below Pipe: 1.5 in.  
Gravel pack porosity: 0.40  
Gravel Correc Factor: 0.62

**Test Hole No.:** P-3  
**Tested By:** R.S.  
**Drilled Hole Depth:** 4.1 Feet

**Presoaking Date:** 6/19/2025  
**Test Date:** 6/19/2025

Time Start (hr:min:sec)	Time Finish (hr:min:sec)	Refill- Yes or No	Elapsed Time (hrs:min:sec)	Initial Water Level# (ft)	Final Water Level# (ft)	Level (in.)		Uncorrected Percolation Rate (min/in)	Gravel Pack Corrected Unfactored Percolation Rate (min/in)	Estimated Unfactored Infiltration Rate (inches/hr)
15:26:00	15:56:00	N	0:30:00	5.76	5.79	0.36	30.00			
15:56:00	16:26:00	N	0:30:00	5.79	5.79	0.00	30.00			
16:26:00	16:56:00	N	0:30:00	5.79	5.79	0.00	30.00			
16:56:00	17:30:00	N	0:34:00	5.79	5.79	0.00	34.00			

APPENDIX

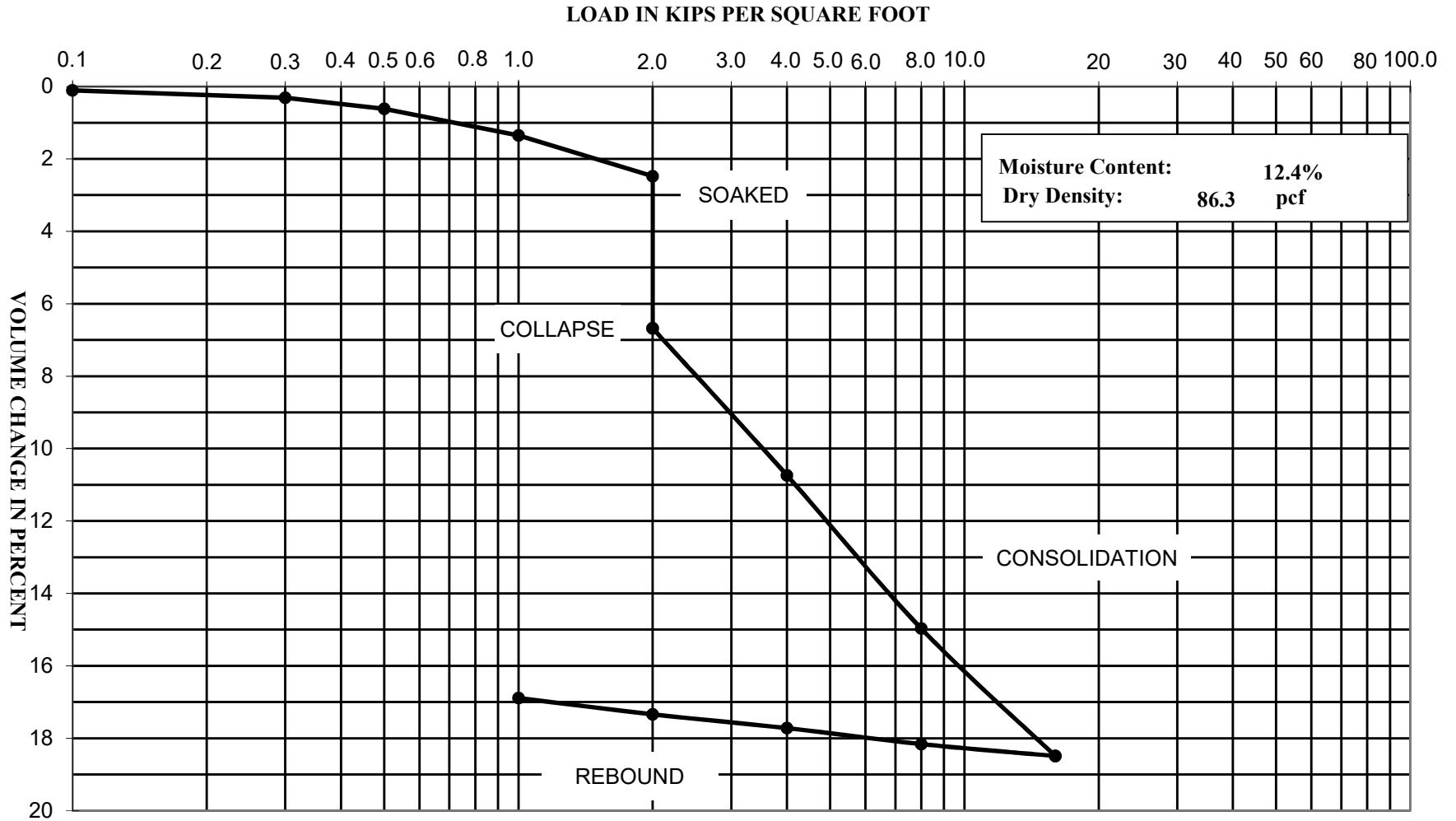
# B



**APPENDIX B**  
**LABORATORY TESTING**

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM), Caltrans, or other suggested procedures. Selected samples were tested for in-situ dry density and moisture content, corrosivity, consolidation, shear strength, expansion index, plasticity index, grain size distribution, and resistivity. The results of the laboratory tests are summarized in the following figures.

# CONSOLIDATION - PRESSURE TEST DATA ASTM D2435



Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Boring: B-2 @ 1'-2.5'



# Direct Shear Test (ASTM D3080)

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Client: Guggenheim Development Services, LLC

Boring: B-1 @ 8.5'-10'

Soil Type:

Sample Type: Undisturbed Ring

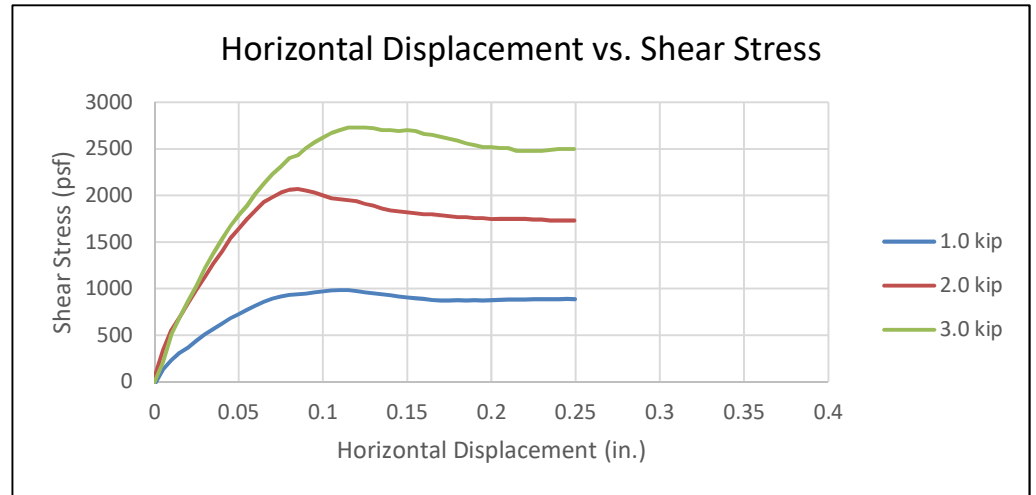
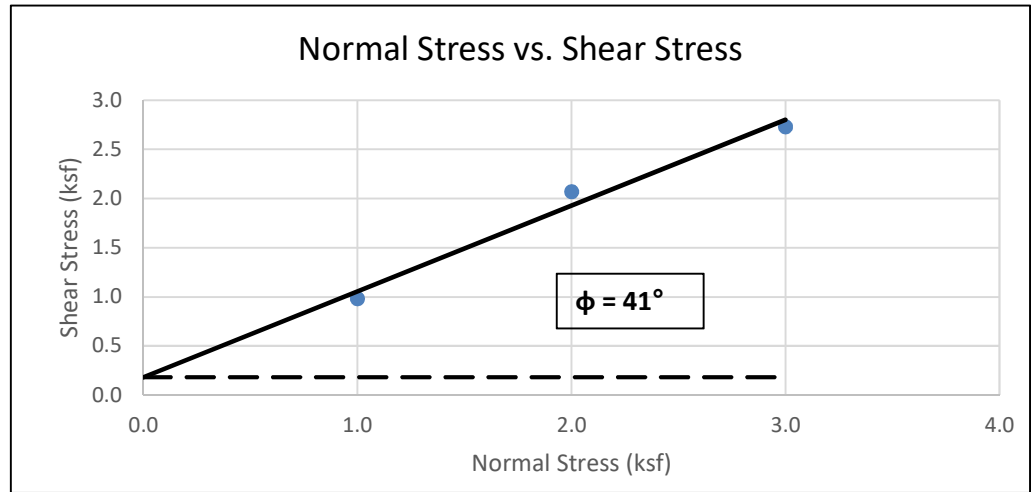
Tested By: NL / MC

Reviewed By:

Date of Test: 6/27/25 & 6/30/25

Test Equipment: GeoComp ShearTrac II

	Loading		
	1.0 kip	2.0 kip	3.0 kip
Normal Stress (ksf)	1.00	2.00	3.00
Shear Rate (in/min)	0.0025	0.0025	0.0025
Peak Shear Stress (ksf)	0.98	2.07	2.73



Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.963	0.950	0.913
Post-Shear Sample Height (in.)	0.961	0.946	0.902
Diameter of Sample (in)	2.4	2.4	2.4

Initial (pre-shear) Values			
Moisture Content (%)	18.3		
Dry Density (pcf)	107.2	108.2	104.9
Saturation %	85.1	87.3	80.2
Void Ratio	0.58	0.57	0.62
Consolidated Void Ratio	0.53	0.49	0.48

Final (post-shear) Values			
Final Moisture Content (%)	22.4	21.2	20.7
Dry Density (pcf)	109.4	111.9	113.2
Saturation %	106.0	110.8	114.6
Void Ratio	0.57	0.52	0.49

Peak Shear Strength Values	
Slope	0.87
Friction Angle	41
Cohesion (psf)	182

# Direct Shear Test (ASTM D3080)

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Client: Guggenheim Development Services, LLC

Boring: B-3 @ 3.5'-5'

Soil Type: Lean CLAY (CL) with Sar

Sample Type: Undisturbed Ring

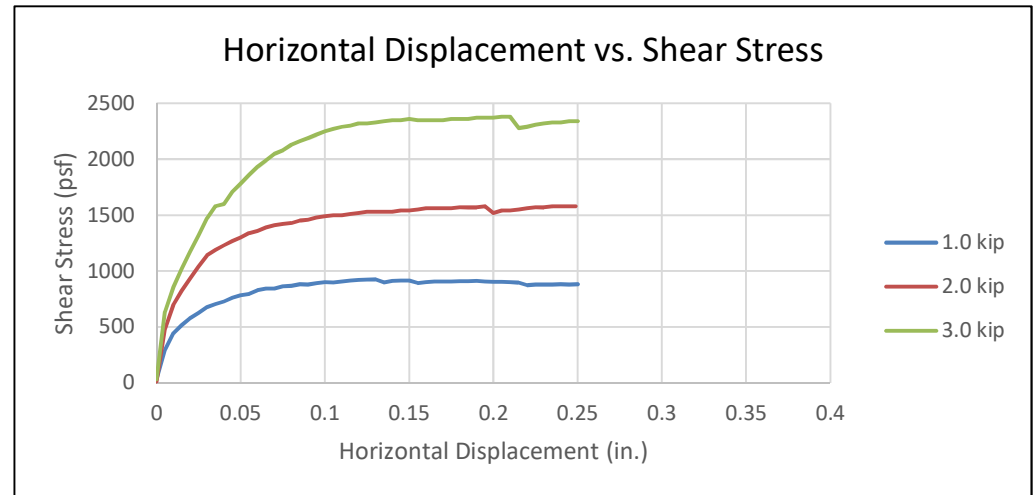
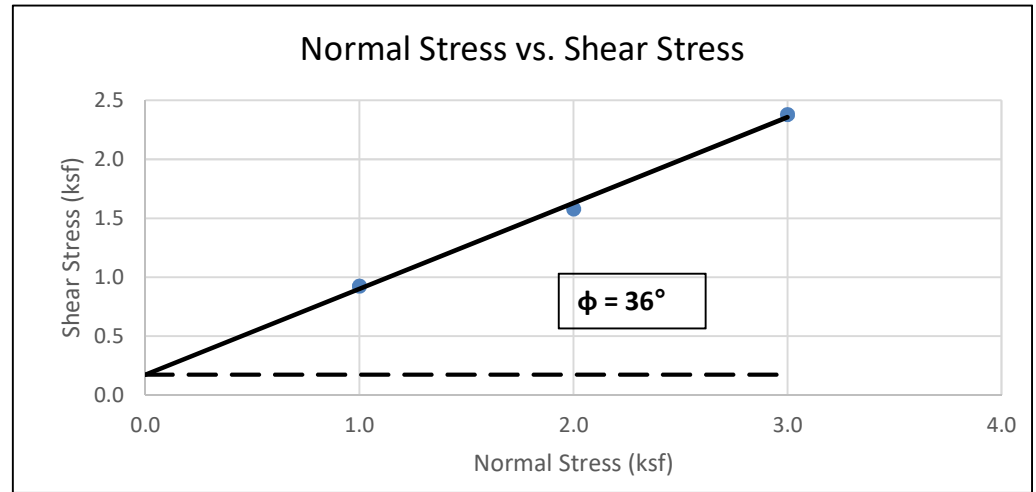
Tested By: NL / MC

Reviewed By:

Date of Test: 6/30/25 & 7/1/25

Test Equipment: GeoComp ShearTrac II

	Loading		
	1.0 kip	2.0 kip	3.0 kip
Normal Stress (ksf)	1.00	2.00	3.00
Shear Rate (in/min)	0.0025	0.0025	0.0025
Peak Shear Stress (ksf)	0.93	1.58	2.38



Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.944	0.895	0.845
Post-Shear Sample Height (in.)	0.932	0.877	0.826
Diameter of Sample (in)	2.4	2.4	2.4

Initial (pre-shear) Values			
Moisture Content (%)	15.5		
Dry Density (pcf)	111.4	112.2	109.5
Saturation %	80.3	81.9	76.3
Void Ratio	0.52	0.51	0.55
Consolidated Void Ratio	0.44	0.35	0.31

Final (post-shear) Values			
Final Moisture Content (%)	24.2	24.5	23.4
Dry Density (pcf)	114.4	119.7	125.3
Saturation %	125.0	154.3	172.3
Void Ratio	0.53	0.43	0.37

Peak Shear Strength Values	
Slope	0.73
Friction Angle	36
Cohesion (psf)	173

# Direct Shear Test (ASTM D3080)

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Client: Guggenheim Development Services, LLC

Boring: B-5 @ 8.5'-10'

Soil Type: Sandy SILT (ML)

Sample Type: Undisturbed Ring

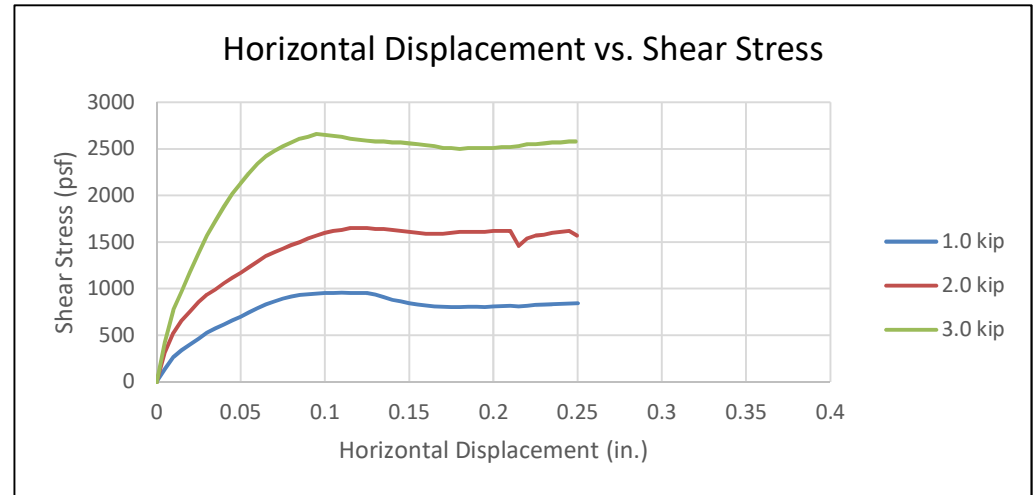
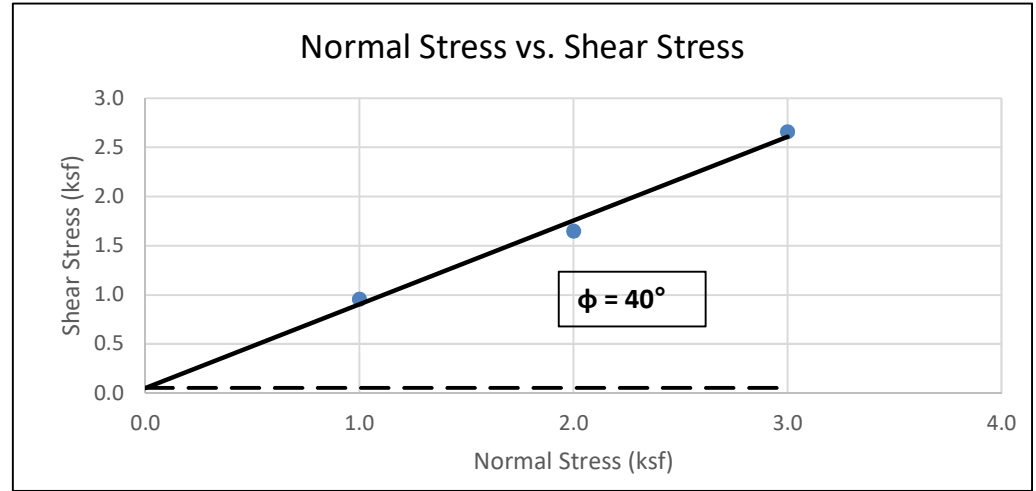
Tested By: MC / NL

Reviewed By:

Date of Test: 7/1/25

Test Equipment: GeoComp ShearTrac II

	Loading		
	1.0 kip	2.0 kip	3.0 kip
Normal Stress (ksf)	1.00	2.00	3.00
Shear Rate (in/min)	0.0025	0.0025	0.0025
Peak Shear Stress (ksf)	0.96	1.65	2.66



Initial Height of Sample (in)	1.000	1.000	1.000
Post-Consol. Sample Height (in.)	0.958	0.902	0.936
Post-Shear Sample Height (in.)	0.954	0.891	0.925
Diameter of Sample (in)	2.4	2.4	2.4

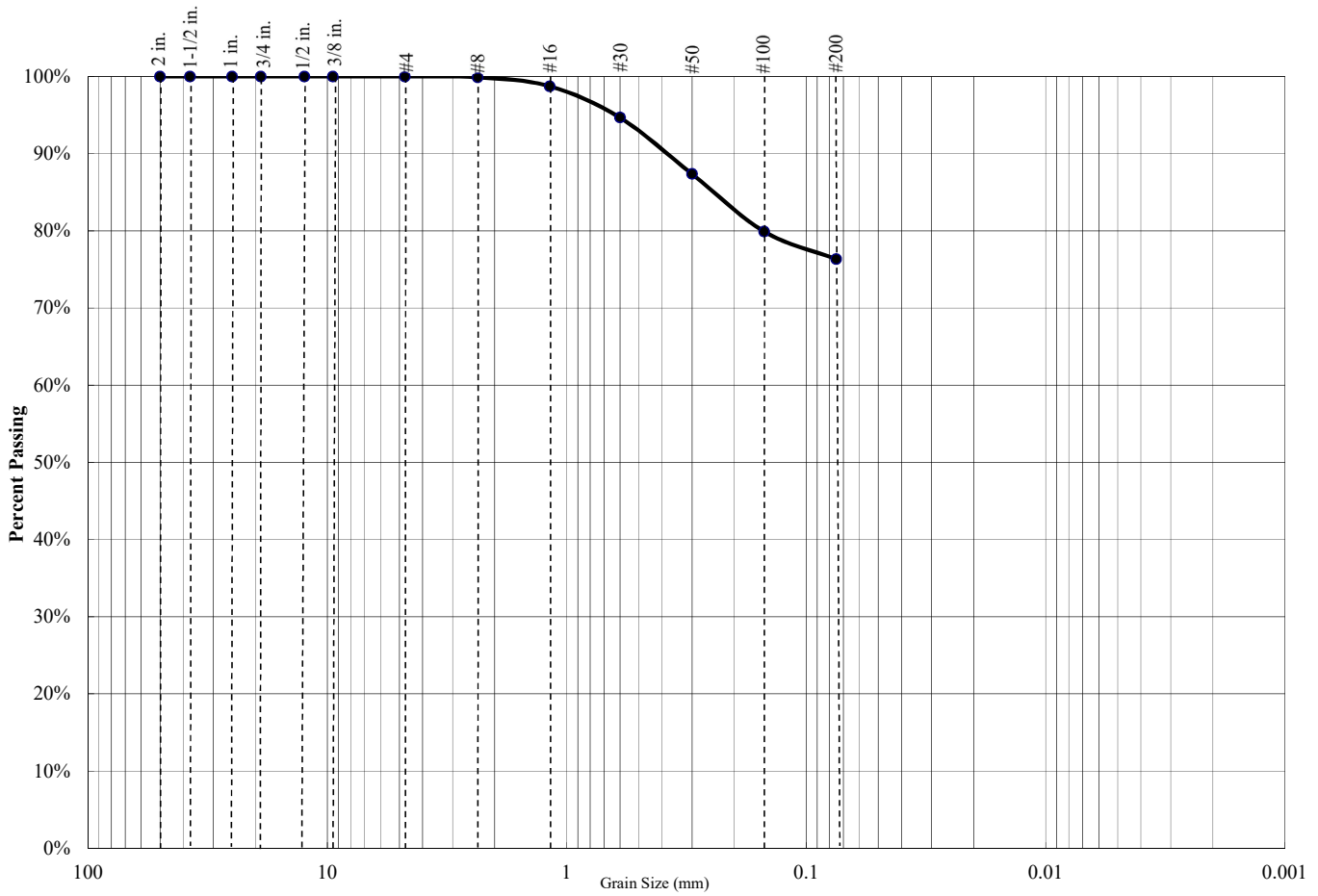
Initial (pre-shear) Values			
Moisture Content (%)	14.9		
Dry Density (pcf)	116.6	116.6	110.6
Saturation %	88.9	88.9	75.7
Void Ratio	0.46	0.46	0.54
Consolidated Void Ratio	0.39	0.31	0.44

Final (post-shear) Values			
Final Moisture Content (%)	19.7	19.2	19.0
Dry Density (pcf)	119.1	124.3	115.7
Saturation %	119.9	150.9	109.9
Void Ratio	0.45	0.35	0.47

Peak Shear Strength Values	
Slope	0.85
Friction Angle	40
Cohesion (psf)	53

## PARTICLE SIZE DISTRIBUTION DIAGRAM

### GRADATION TEST - ASTM C136



<b>Percent Gravel</b>	<b>Percent Sand</b>	<b>Percent Silt/Clay</b>
0%	24%	76%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	100.0%
#8	99.9%
#16	98.7%
#30	94.7%
#50	87.4%
#100	79.9%
#200	76.3%

Atterberg Limits		
PL=	LL=	PI=

Coefficients		
D85=	D60=	D50=
D30=	D15=	D10=
C <sub>u</sub> =	N/A	C <sub>c</sub> = N/A

USCS CLASSIFICATION
Lean CLAY with Sand (CL)

**Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA**

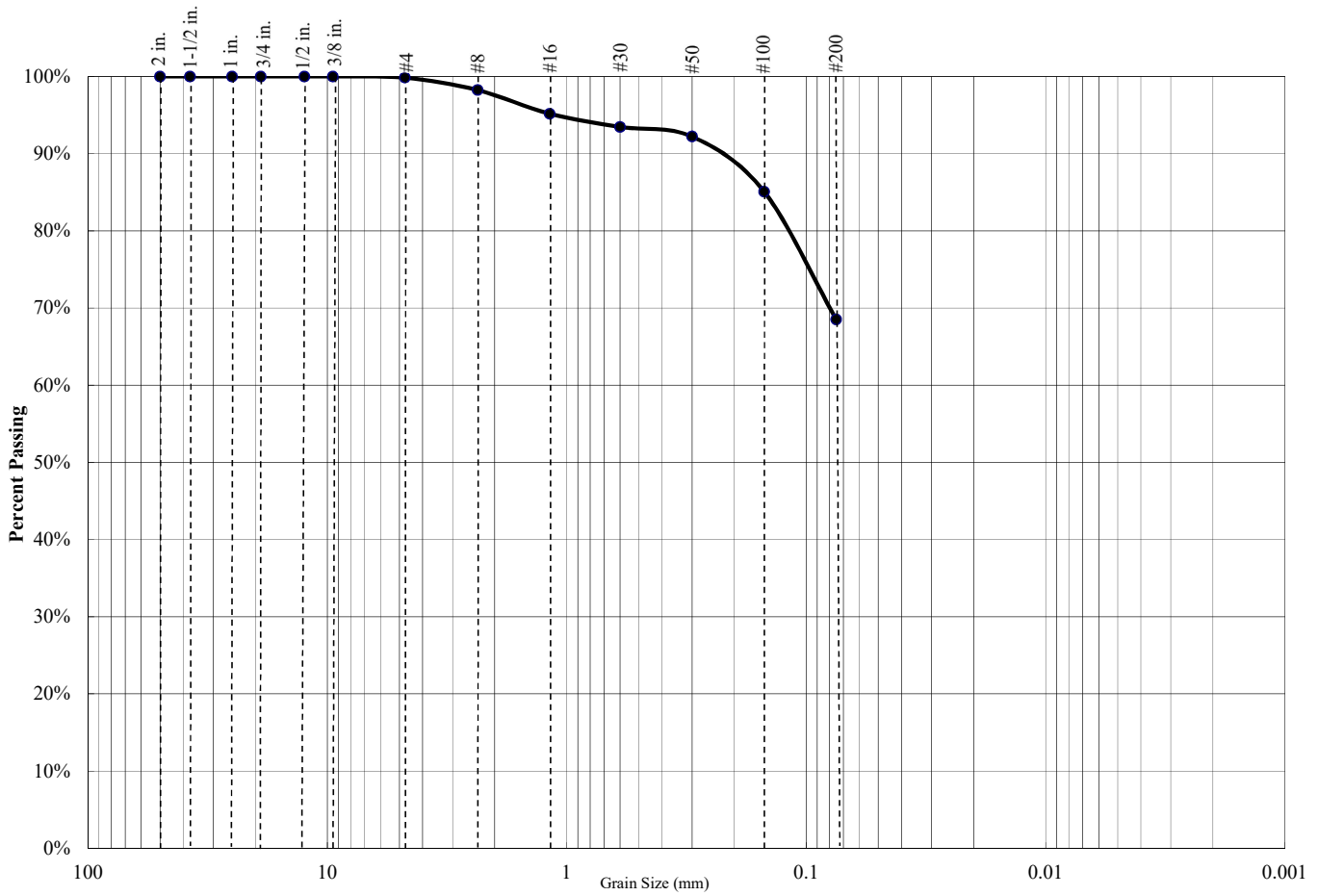
**Project Number: 4-225-0526**

**Boring: B-1 @ 2'-3.5'**



## PARTICLE SIZE DISTRIBUTION DIAGRAM

### GRADATION TEST - ASTM C136



<b>Percent Gravel</b>	<b>Percent Sand</b>	<b>Percent Silt/Clay</b>
0%	31%	69%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	99.8%
#8	98.2%
#16	95.2%
#30	93.5%
#50	92.2%
#100	85.1%
#200	68.5%

Atterberg Limits		
PL=	LL=	PI=

Coefficients		
D85=	D60=	D50=
D30=	D15=	D10=
C <sub>u</sub> =	N/A	C <sub>c</sub> = N/A

USCS CLASSIFICATION
Sandy SILT (ML)

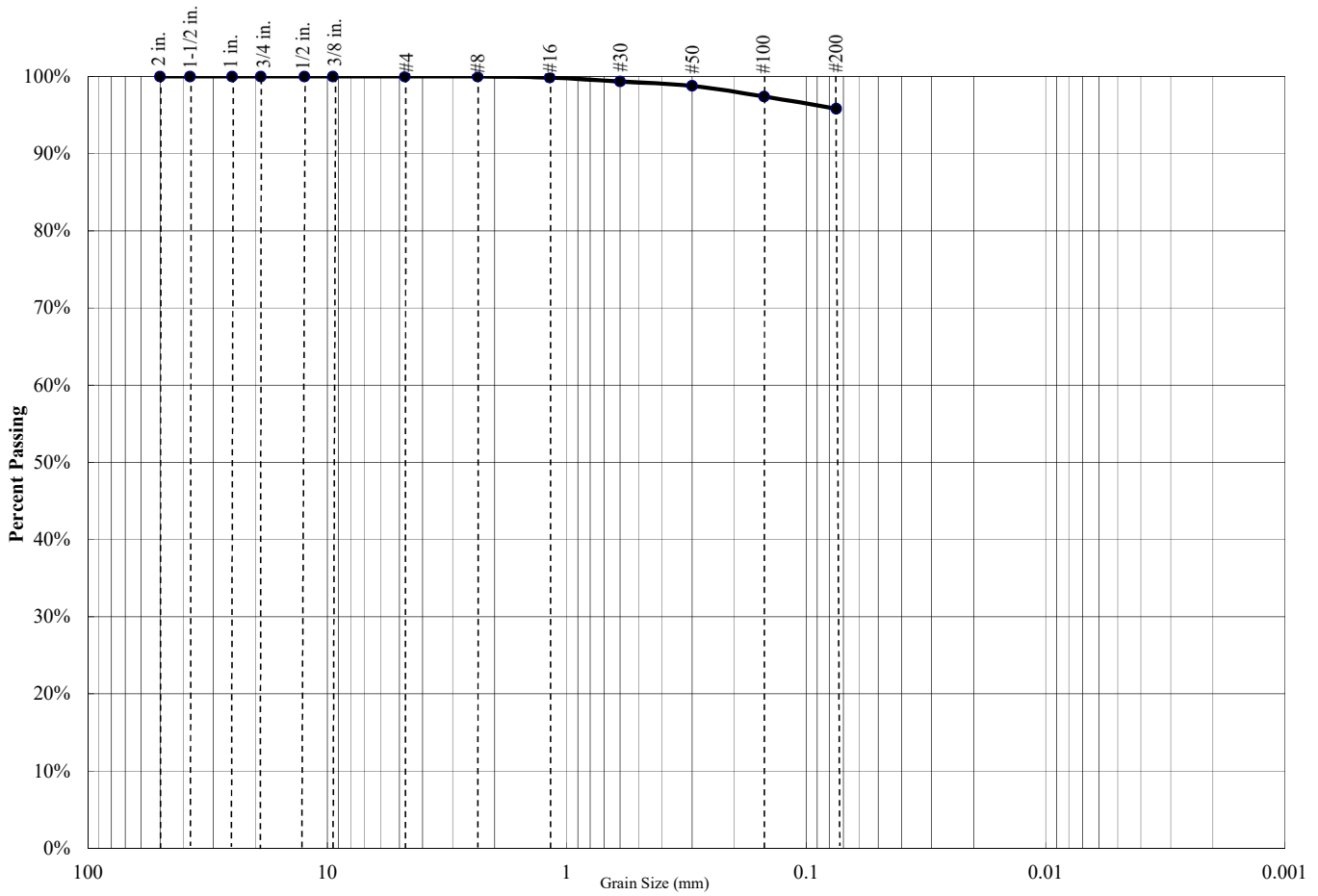
**Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA**

**Project Number: 4-225-0526**

**Boring: B-1 @ 8.5'-10'**



**PARTICLE SIZE DISTRIBUTION DIAGRAM  
GRADATION TEST - ASTM C136**



<b>Percent Gravel</b>	<b>Percent Sand</b>	<b>Percent Silt/Clay</b>
0%	4%	96%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	100.0%
#8	100.0%
#16	99.9%
#30	99.4%
#50	98.8%
#100	97.4%
#200	95.8%

Atterberg Limits		
PL=	LL=	PI=

Coefficients		
D85=	D60=	D50=
D30=	D15=	D10=
C <sub>u</sub> =	N/A	C <sub>c</sub> = N/A

USCS CLASSIFICATION
SILT (ML)

**Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA**

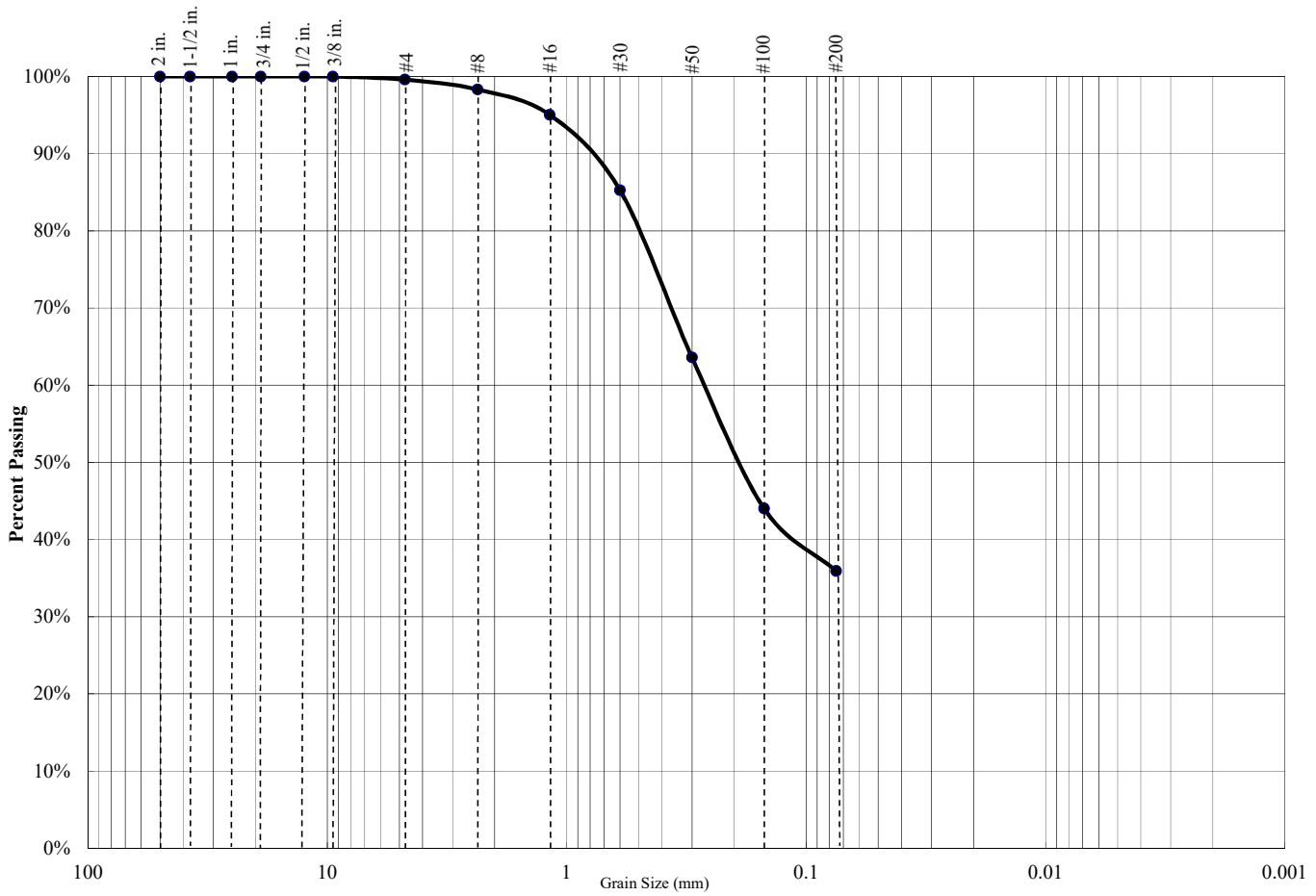
**Project Number: 4-225-0526**

**Boring: B-1 @ 20'-21.5'**



## PARTICLE SIZE DISTRIBUTION DIAGRAM

### GRADATION TEST - ASTM C136



<b>Percent Gravel</b>	<b>Percent Sand</b>	<b>Percent Silt/Clay</b>
0%	64%	36%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	100.0%
#4	99.6%
#8	98.3%
#16	95.0%
#30	85.3%
#50	63.6%
#100	44.0%
#200	35.9%

Atterberg Limits		
PL=	LL=	PI=

Coefficients		
D85=	D60=	D50=
D30=	D15=	D10=
C <sub>u</sub> =	N/A	C <sub>c</sub> = N/A

USCS CLASSIFICATION
Silty SAND (SM)

**Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA**

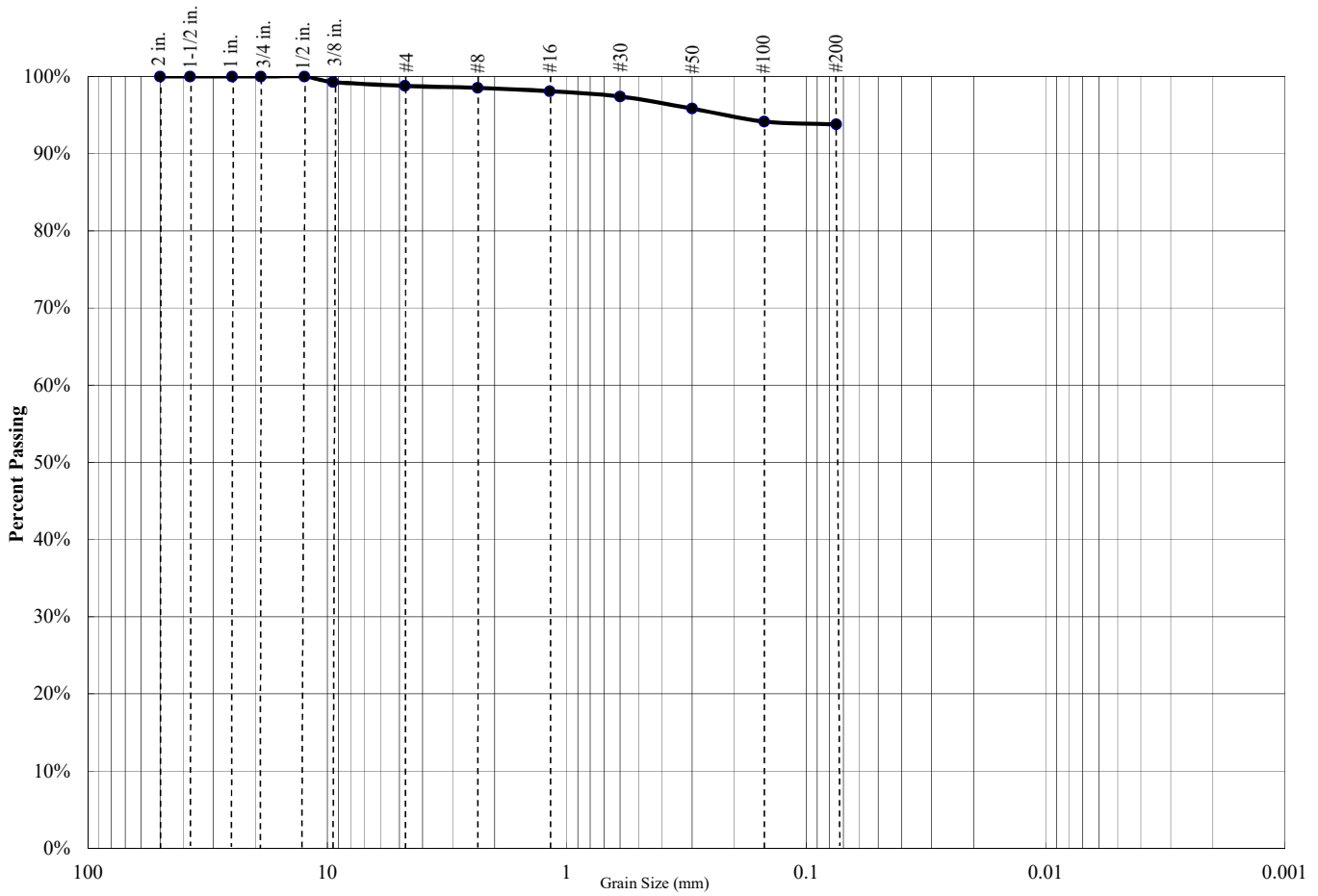
**Project Number: 4-225-0526**

**Boring: B-2 @ 15'-16.5'**



## PARTICLE SIZE DISTRIBUTION DIAGRAM

### GRADATION TEST - ASTM C136



<b>Percent Gravel</b>	<b>Percent Sand</b>	<b>Percent Silt/Clay</b>
1%	5%	94%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	99.3%
#4	98.8%
#8	98.5%
#16	98.1%
#30	97.4%
#50	95.8%
#100	94.2%
#200	93.8%

Atterberg Limits		
PL=	LL=	PI=

Coefficients		
D85=	D60=	D50=
D30=	D15=	D10=
C <sub>u</sub> =	N/A	C <sub>c</sub> = N/A

USCS CLASSIFICATION
Fat CLAY (CH)

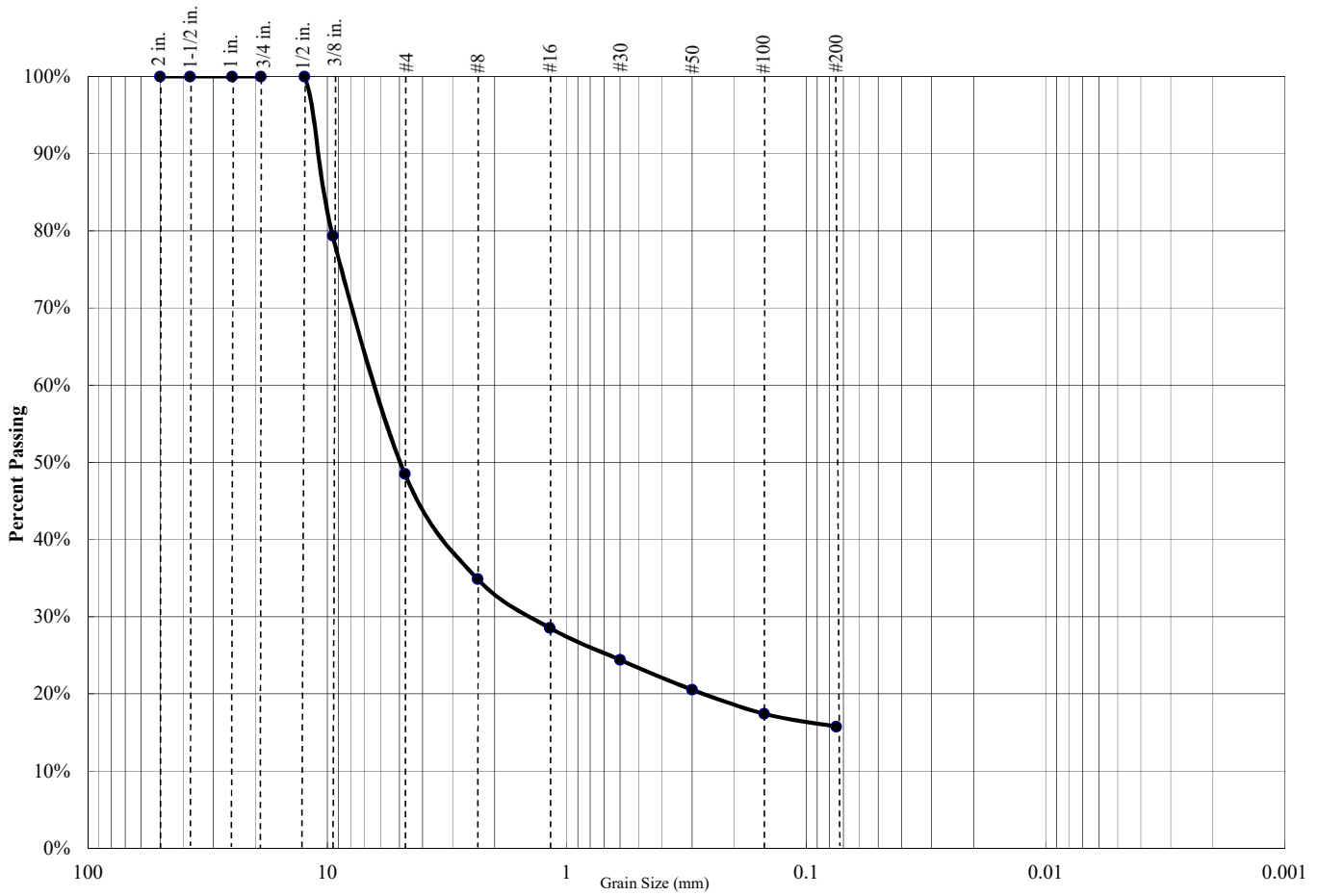
**Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA**

**Project Number: 4-225-0526**

**Boring: B-8 @ 1'-4'**



**PARTICLE SIZE DISTRIBUTION DIAGRAM  
GRADATION TEST - ASTM C136**



<b>Percent Gravel</b>	<b>Percent Sand</b>	<b>Percent Silt/Clay</b>
51%	33%	16%

Sieve Size	Percent Passing
3/4 inch	100.0%
1/2 inch	100.0%
3/8 inch	79.4%
#4	48.5%
#8	34.9%
#16	28.6%
#30	24.4%
#50	20.6%
#100	17.4%
#200	15.8%

Atterberg Limits		
PL=	LL=	PI=

Coefficients		
D85=	D60=	D50=
D30=	D15=	D10=
C <sub>u</sub> =	N/A	C <sub>c</sub> = N/A

USCS CLASSIFICATION
Silty Sandy GRAVEL (GM)

**Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA**

**Project Number: 4-225-0526**

**Boring: B-9 @ 5'-6.5'**



# Atterberg Limits Determination

## ASTM D4318

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

Date Tested: 6/25/25

Sampled By: SEG

Tested By: MC

Sample Location: B-1 @ 2'-3.5'

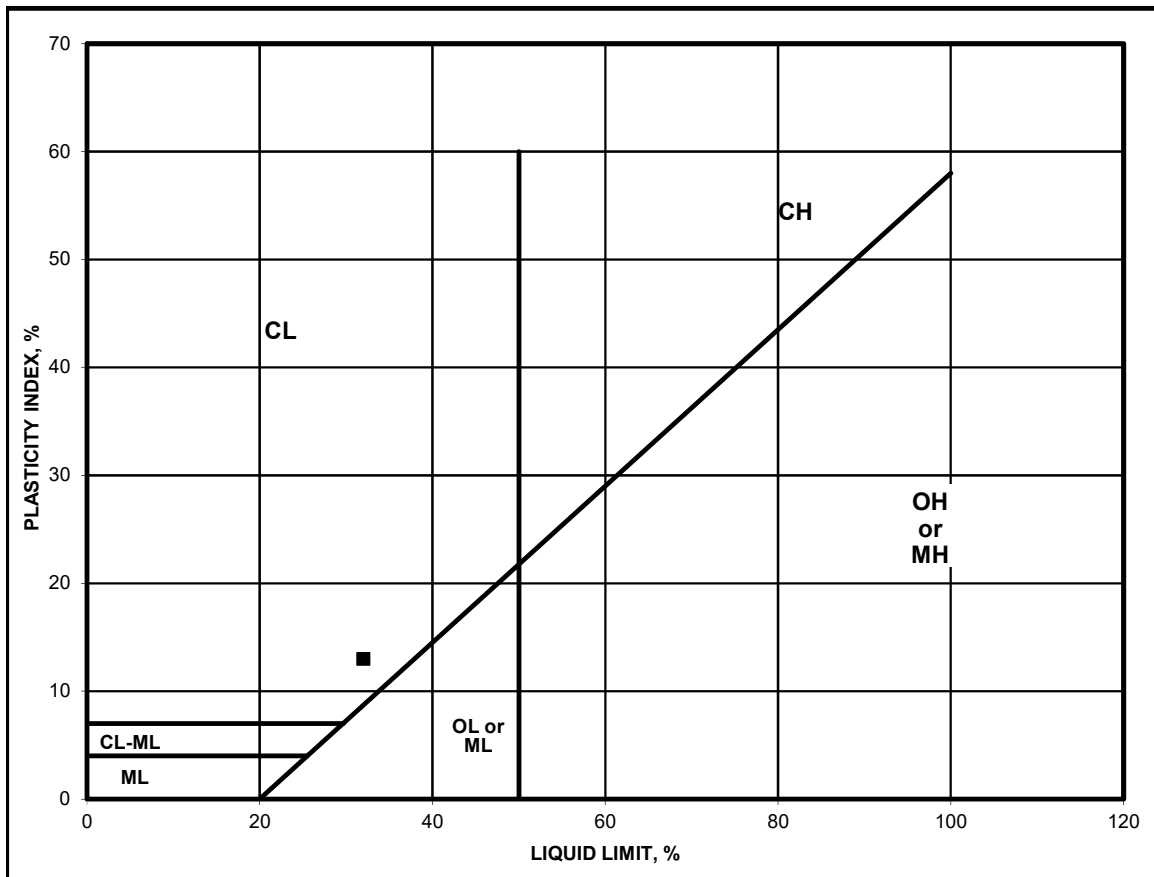
Run Number	Plastic Limit			Liquid Limit		
	1	2	3	1	2	3
Weight of Wet Soil & Tare	28.97	28.10	28.64	25.77	27.10	32.37
Weight of Dry Soil & Tare	27.76	26.85	27.42	23.35	24.33	29.59
Weight of Water	1.21	1.25	1.22	2.42	2.77	2.78
Weight of Tare	21.47	20.51	21.09	15.67	15.59	21.19
Weight of Dry Soil	6.29	6.34	6.33	7.68	8.74	8.40
Water Content	19.2	19.7	19.3	31.5	31.7	33.1
Number of Blows				30	26	18

Plastic Limit : 19

Liquid Limit : 32

Plasticity Index : 13

Unified Soil Classification : CL



# Atterberg Limits Determination

## ASTM D4318

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

Date Tested: 6/25/25

Sampled By: SEG

Tested By: MC

Sample Location: B-1 @ 8.5'-10'

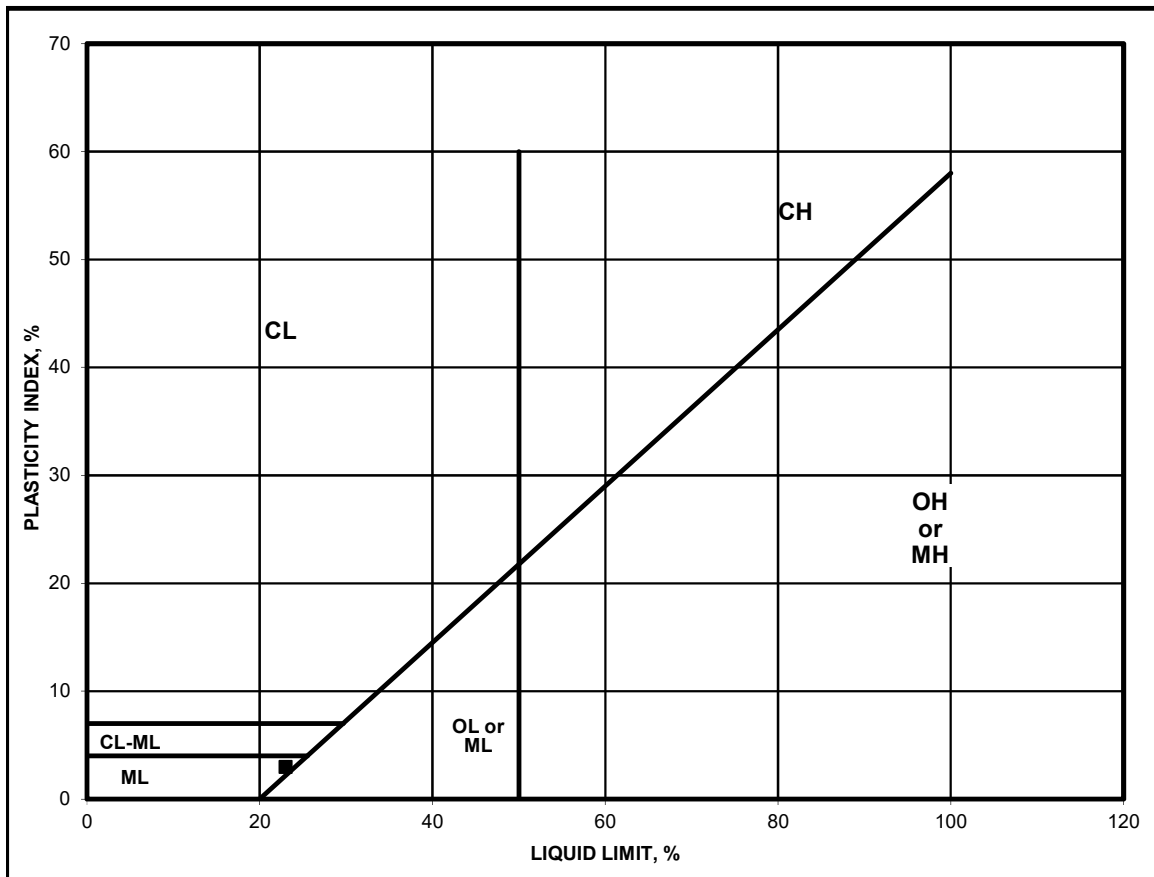
Run Number	Plastic Limit			Liquid Limit		
	1	2	3	1	2	3
Weight of Wet Soil & Tare	23.09	22.98	23.30	33.50	29.93	31.52
Weight of Dry Soil & Tare	21.85	21.73	21.99	31.10	27.33	29.29
Weight of Water	1.24	1.25	1.31	2.40	2.60	2.23
Weight of Tare	15.66	15.48	15.62	20.38	15.77	19.88
Weight of Dry Soil	6.19	6.25	6.37	10.72	11.56	9.41
Water Content	20.0	20.0	20.6	22.4	22.5	23.7
Number of Blows				33	28	21

Plastic Limit : 20

Liquid Limit : 23

Plasticity Index : 3

Unified Soil Classification : ML



# Atterberg Limits Determination

## ASTM D4318

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

Date Tested: 6/24/25

Sampled By: SEG

Tested By: MC

Sample Location: B-1 @ 20'-21.5'

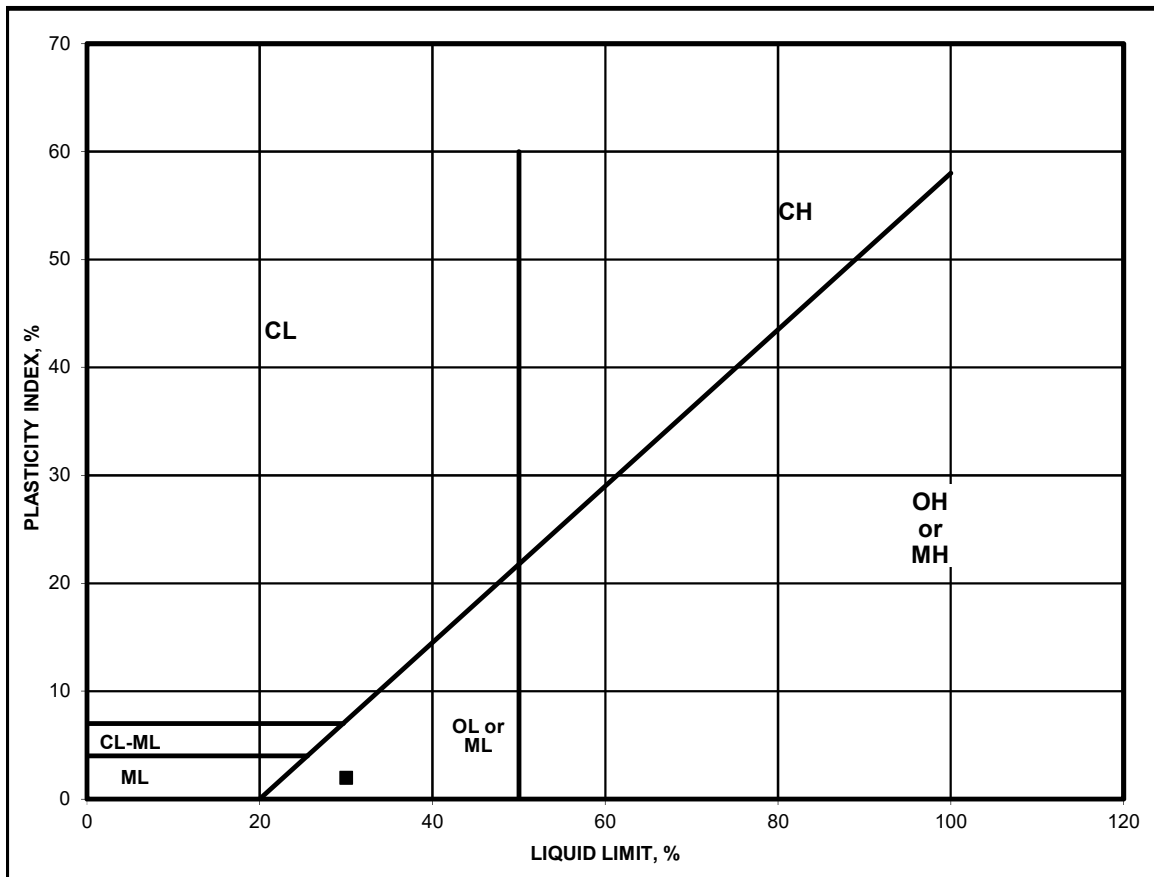
Run Number	Plastic Limit			Liquid Limit		
	1	2	3	1	2	3
Weight of Wet Soil & Tare	28.00	22.89	29.00	33.26	33.59	33.81
Weight of Dry Soil & Tare	26.40	21.29	27.38	30.42	30.72	30.78
Weight of Water	1.60	1.60	1.62	2.84	2.87	3.03
Weight of Tare	20.81	15.59	21.55	21.11	21.12	21.13
Weight of Dry Soil	5.59	5.70	5.83	9.31	9.60	9.65
Water Content	28.6	28.1	27.8	30.5	29.9	31.4
Number of Blows				29	24	17

Plastic Limit : 28

Liquid Limit : 30

Plasticity Index : 2

Unified Soil Classification : OL/ML



# Atterberg Limits Determination

## ASTM D4318

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

Date Tested: 6/25/25

Sampled By: SEG

Tested By: MC

Sample Location: B-2 @ 15'-16.5'

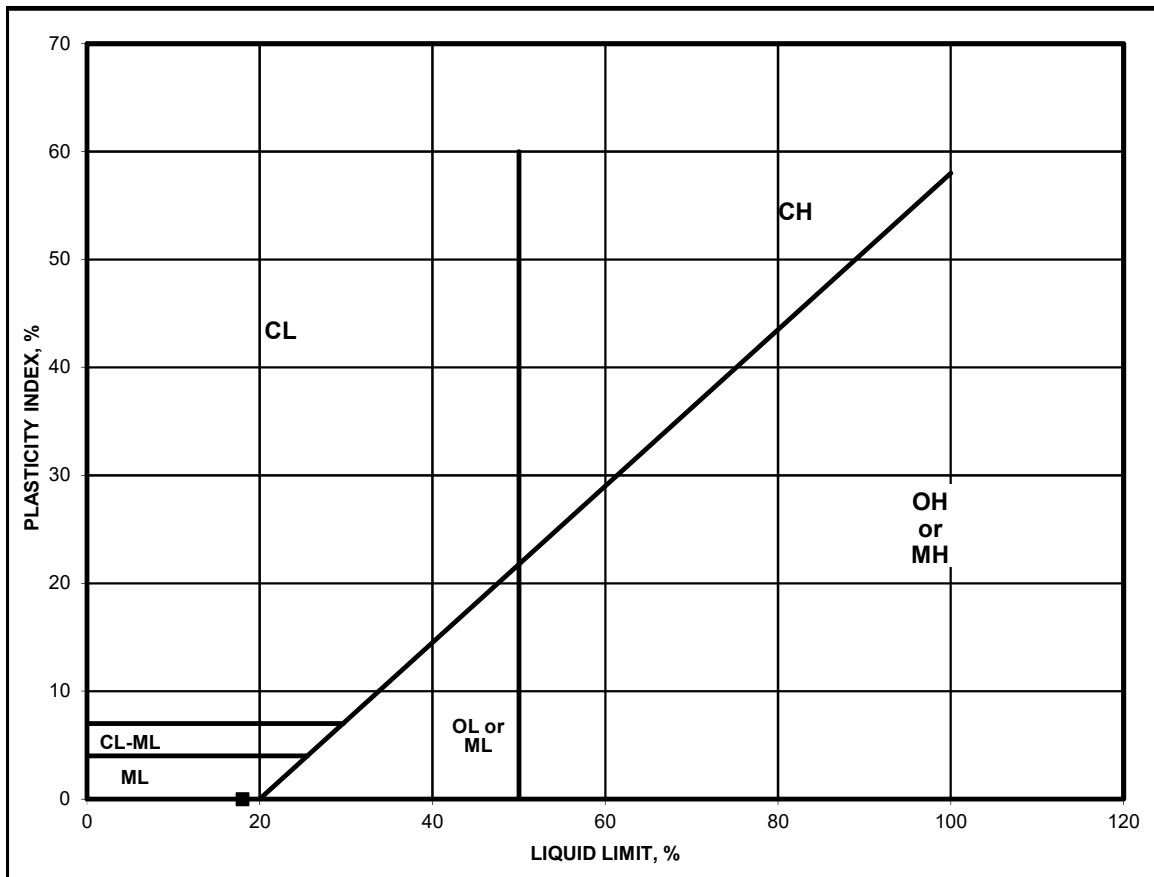
Run Number	Plastic Limit			Liquid Limit		
	1	2	3	1	2	3
Weight of Wet Soil & Tare	22.12	21.65	21.99	28.89	28.28	27.72
Weight of Dry Soil & Tare	21.14	20.72	20.99	26.87	26.32	25.80
Weight of Water	0.98	0.93	1.00	2.02	1.96	1.92
Weight of Tare	15.65	15.58	15.61	15.79	15.60	15.65
Weight of Dry Soil	5.49	5.14	5.38	11.08	10.72	10.15
Water Content	17.9	18.1	18.6	18.2	18.3	18.9
Number of Blows				29	23	17

Plastic Limit : 18

Liquid Limit : 18

Plasticity Index : 0

Unified Soil Classification : ML



# Atterberg Limits Determination

## ASTM D4318

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

Date Tested: 6/26/25

Sampled By: SEG

Tested By: MC

Sample Location: B-8 @ 1'-4'

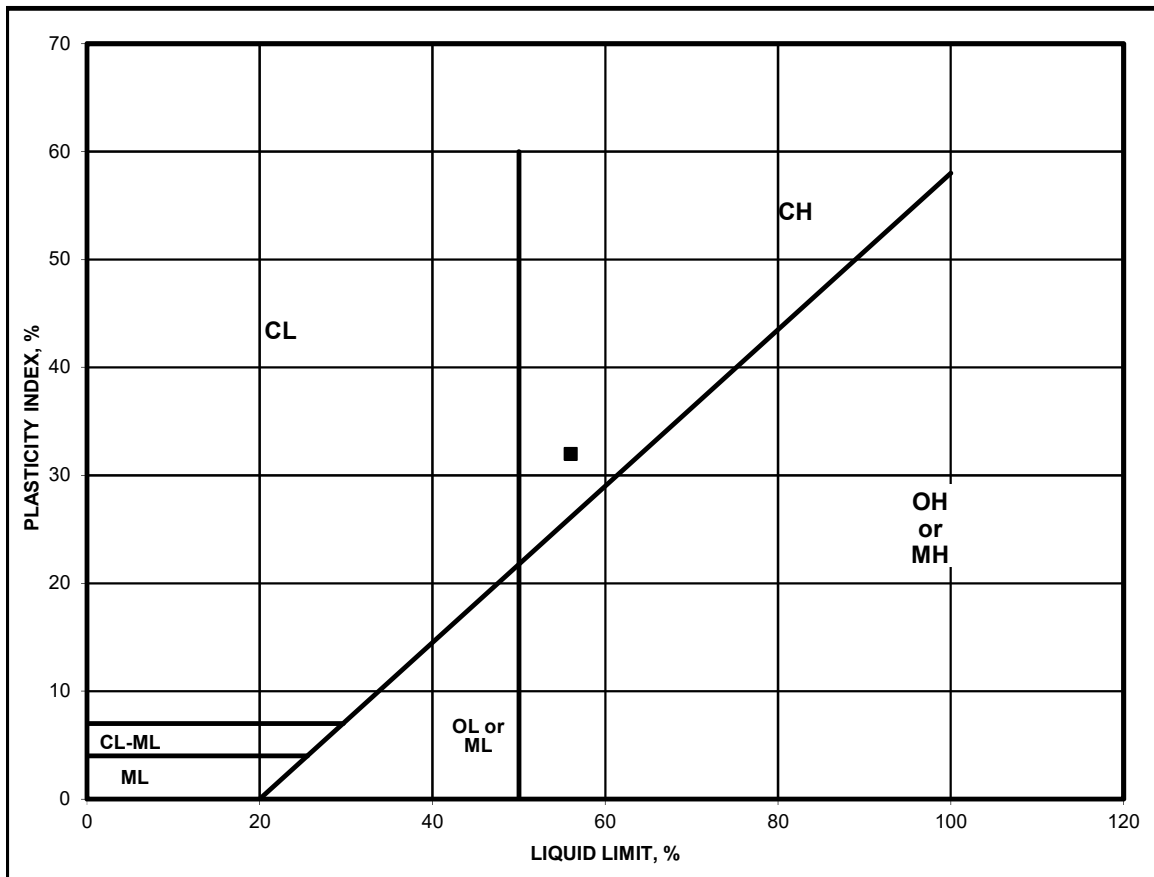
Run Number	Plastic Limit			Liquid Limit		
	1	2	3	1	2	3
Weight of Wet Soil & Tare	27.63	27.51	26.97	25.84	31.38	31.43
Weight of Dry Soil & Tare	26.29	26.10	25.64	22.30	27.39	27.32
Weight of Water	1.34	1.41	1.33	3.54	3.99	4.11
Weight of Tare	20.61	20.28	19.97	15.60	20.27	20.09
Weight of Dry Soil	5.68	5.82	5.67	6.70	7.12	7.23
Water Content	23.6	24.2	23.5	52.8	56.0	56.8
Number of Blows				34	26	19

Plastic Limit : 24

Liquid Limit : 56

Plasticity Index : 32

Unified Soil Classification : CH



# EXPANSION INDEX TEST

## ASTM D4829

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

Date Tested: 6/24/25

Sampled By: SEG

Tested By: FP

Sample Location: B-5 @ 1'-4'

Soil Description: Lean CLAY (CL) with Sand

Trial #	1	2	3
Weight of Soil & Mold, g.	538.4		
Weight of Mold, g.	185.9		
Weight of Soil, g.	352.5		
Wet Density, pcf	106.3		
Weight of Moisture Sample (Wet), g.	814.0		
Weight of Moisture Sample (Dry), g.	710.5		
Moisture Content, %	14.6		
Dry Density, pcf	92.8		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	48.2		

Time	Initial	30 min	1 hr	4 hrs	8 hrs	24 hrs
Dial Reading	0	0.04	0.0599	0.0625	0.064	0.0641

Expansion Index<sub>measured</sub> = 64.1

Expansion Index<sub>50</sub> = 62.8

**Expansion Index = 63**

Expansion Potential Table	
Exp. Index	Potential Exp.
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

**Resistance R-Value**  
**and Expansion Pressure of Compacted Soils**  
**ASTM D2844**

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

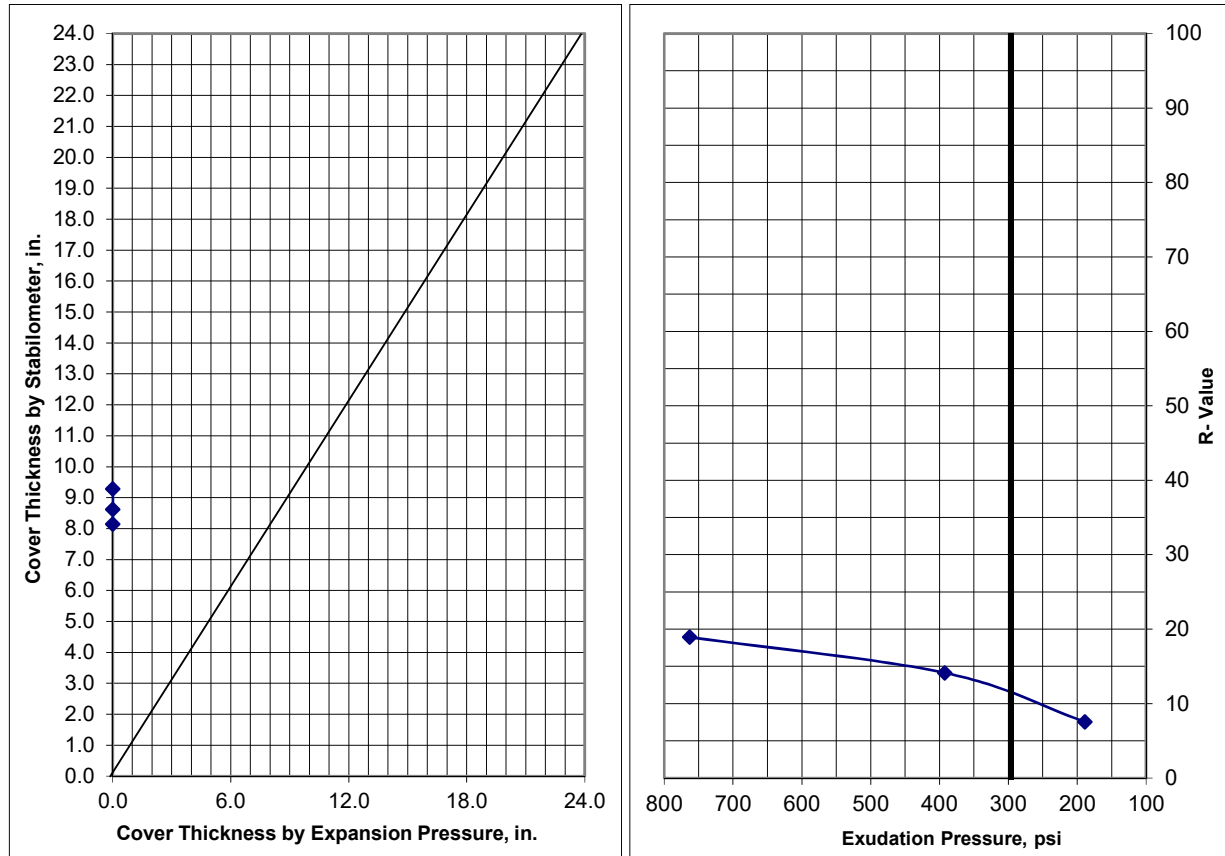
Date Tested: 6/26/25

Sampled By: SEG

Tested By: JTA

Sample Location: B-8 @ 1'-4'

Soil Description: Fat CLAY (CH)



Specimen	1	2	3
Exudation Pressure, psi	762.8	392.4	188.7
Moisture at Test, %	24.8	27.1	33.2
Dry Density, pcf	98.8	94.3	86.7
Expansion Pressure, psf	0	0	0
Thickness by Stabilometer, in.	8.1	8.6	9.3
Thickness by Expansion Pressure, in.	0.0	0.0	0.0
R-Value by Stabilometer	19	14	8
R-Value by Expansion Pressure	N/A		
R-Value at 300 psi Exudation Pressure	12		

<b>Controlling R-Value</b>	<b>12</b>
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## CHEMICAL ANALYSIS

### SO<sub>4</sub> - Modified CTM 417 & Cl - Modified CTM 417/422

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

Date Tested: 6/25/25

Sampled By: SEG

Tested By: MC

Soil Description: Lean CLAY (CL) with Sand

Sample Number	Sample Location	Soluble Sulfate SO <sub>4</sub> -S	Soluble Chloride Cl	pH
1a.	B-5 @ 1'-4'	230 mg/kg	38 mg/kg	7.5
1b.	B-5 @ 1'-4'	240 mg/kg	36 mg/kg	7.5
1c.	B-5 @ 1'-4'	240 mg/kg	37 mg/kg	7.5
<b>Average:</b>		<b>237 mg/kg</b>	<b>37 mg/kg</b>	<b>7.5</b>

# SOIL RESISTIVITY

## CTM 643

Project Name: 7-Eleven C-Store and Fuel Station - Sacramento, CA

Project Number: 4-225-0526

Date Sampled: 6/18-19/25

Date Tested: 6/24/25

Sample Location: B-5 @ 1'-4'

Sampled By: SEG

Tested By: FP

Soil Description: Lean CLAY (CL) with Sand

Chloride Content: 37 mg/Kg

Initial Sample Weight: 700 gms

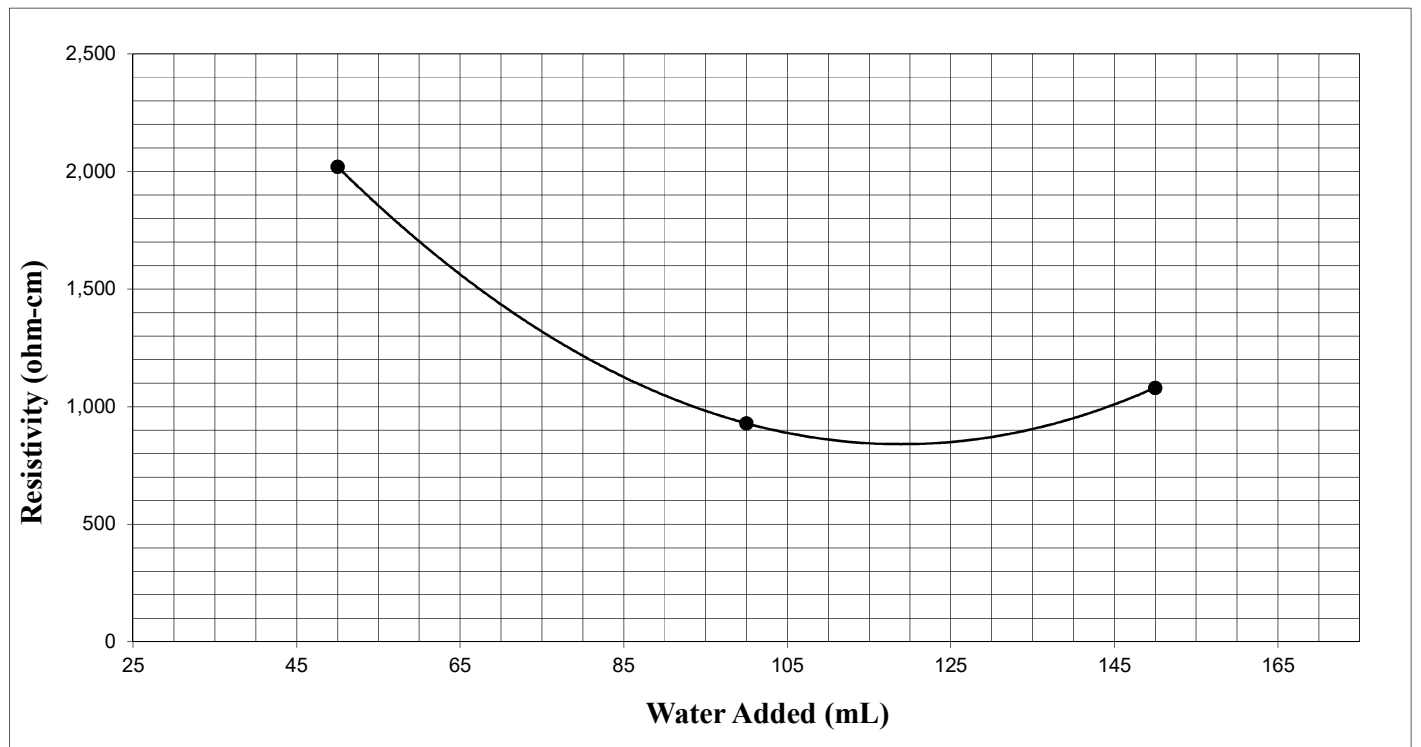
Sulfate Content: 237 mg/Kg

Test Box Constant: 1.010 cm

Soil pH: 7.5

**Test Data:**

Trial #	Water Added (mL)	Meter Dial Reading	Multiplier Setting	Resistance (ohms)	Resistivity (ohm-cm)
1	50	2.0	1,000	2,000	2,020
2	100	9.2	100	920	929
3	150	10.7	100	1,070	1,081



Minimum Resistivity:	<b>841</b>	ohm-cm
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APPENDIX

C



## APPENDIX C GENERAL EARTHWORK AND PAVEMENT SPECIFICATIONS

When the text of the report conflicts with the general specifications in this appendix, the recommendations in the report have precedence.

**1.0 SCOPE OF WORK:** These specifications and applicable plans pertain to and include all earthwork associated with the site rough grading, including, but not limited to, the furnishing of all labor, tools and equipment necessary for site clearing and grubbing, stripping, preparation of foundation materials for receiving fill, excavation, processing, placement and compaction of fill and backfill materials to the lines and grades shown on the project grading plans and disposal of excess materials.

**2.0 PERFORMANCE:** The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications. This work shall be inspected and tested by a representative of SALEM Engineering Group, Incorporated, hereinafter referred to as the Soils Engineer and/or Testing Agency. Attainment of design grades, when achieved, shall be certified by the project Civil Engineer. Both the Soils Engineer and the Civil Engineer are the Owner's representatives. If the Contractor should fail to meet the technical or design requirements embodied in this document and on the applicable plans, he shall make the necessary adjustments until all work is deemed satisfactory as determined by both the Soils Engineer and the Civil Engineer. No deviation from these specifications shall be made except upon written approval of the Soils Engineer, Civil Engineer, or project Architect.

No earthwork shall be performed without the physical presence or approval of the Soils Engineer. The Contractor shall notify the Soils Engineer at least 2 working days prior to the commencement of any aspect of the site earthwork.

The Contractor shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the Contractor shall defend, indemnify and hold the Owner and the Engineers harmless from any and all liability, real or alleged, in connection with the performance of work on this project, except for liability arising from the sole negligence of the Owner or the Engineers.

**3.0 TECHNICAL REQUIREMENTS:** All compacted materials shall be densified to no less than 90 percent of relative compaction (based on ASTM D1557 Test Method (latest edition), or as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

**4.0 SOILS AND FOUNDATION CONDITIONS:** The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the Geotechnical Engineering Report. The Contractor shall make his own interpretation of the data contained in the Geotechnical Engineering Report and the Contractor shall not be relieved of liability for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

**5.0 DUST CONTROL:** The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or wind-blown materials attributable to his work. Site preparation shall consist of site clearing and grubbing and preparation of foundation materials for receiving fill.

**6.0 CLEARING AND GRUBBING:** The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter and all other matter determined by the Soils Engineer to be deleterious. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed improvement areas should be removed to a minimum depth of 3 feet and to such an extent which would permit removal of all roots greater than 1 inch in diameter. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavations is not permitted until all exposed surfaces have been inspected and the Soils Engineer is present for the proper control of backfill placement and compaction. Burning in areas which are to receive fill materials shall not be permitted.

**7.0 SUBGRADE PREPARATION:** Surfaces to receive Engineered Fill and/or building or slab loads shall be prepared as outlined above, scarified to a minimum of 12 inches, moisture-conditioned as necessary, and compacted to 90 percent relative compaction.

Loose soil areas and/or areas of disturbed soil shall be moisture-conditioned as necessary and compacted to 90 percent relative compaction. All ruts, hummocks, or other uneven surface features shall be removed by surface grading prior to placement of any fill materials. All areas which are to receive fill materials shall be approved by the Soils Engineer prior to the placement of any fill material.

**8.0 EXCAVATION:** All excavation shall be accomplished to the tolerance normally defined by the Civil Engineer as shown on the project grading plans. All over-excavation below the grades specified shall be backfilled at the Contractor's expense and shall be compacted in accordance with the applicable technical requirements.

**9.0 FILL AND BACKFILL MATERIAL:** No material shall be moved or compacted without the presence or approval of the Soils Engineer. Material from the required site excavation may be utilized for construction site fills, provided prior approval is given by the Soils Engineer. All materials utilized for constructing site fills shall be free from vegetation or other deleterious matter as determined by the Soils Engineer.

**10.0 PLACEMENT, SPREADING AND COMPACTION:** The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. Compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer. Both cut and fill shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

**11.0 SEASONAL LIMITS:** No fill material shall be placed, spread, or rolled while it is frozen or thawing, or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill

operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill is as specified.

**12.0 DEFINITIONS** - The term "pavement" shall include asphaltic concrete surfacing, untreated aggregate base, and aggregate subbase. The term "subgrade" is that portion of the area on which surfacing, base, or subbase is to be placed.

The term "Standard Specifications": hereinafter referred to, is the most recent edition of the Standard Specifications of the State of California, Department of Transportation. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as determined by ASTM D1557 Test Method (latest edition).

**13.0 PREPARATION OF THE SUBGRADE** - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 95 percent based upon ASTM D1557. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

**14.0 AGGREGATE BASE** - The aggregate base material shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate base material shall conform to the requirements of Section 26 of the Standard Specifications for Class 2 material, ¾-inch or 1½-inches maximum size. The aggregate base material shall be compacted to a minimum relative compaction of 95 percent based upon ASTM D1557. The aggregate base material shall be spread in layers not exceeding 6 inches and each layer of aggregate material course shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

**15.0 AGGREGATE SUBBASE** - The aggregate subbase shall be spread and compacted on the prepared subgrade in conformity with the lines, grades, and dimensions shown on the plans. The aggregate subbase material shall conform to the requirements of Section 25 of the Standard Specifications for Class 2 Subbase material. The aggregate subbase material shall be compacted to a minimum relative compaction of 95 percent based on ASTM D1557, and it shall be spread and compacted in accordance with the Standard Specifications. Each layer of aggregate subbase shall be tested and approved by the Soils Engineer prior to the placement of successive layers.

**16.0 ASPHALTIC CONCRETE SURFACING** - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10, unless otherwise stipulated or local conditions warrant more stringent grade. The mineral aggregate shall be Type A or B, ½ inch maximum size, medium grading, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39. The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a combination steel-wheel and pneumatic rollers, as described in the Standard Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.