SOILS SOUTHWEST, INC.

SOILS, MATERIALS AND ENVIRONMENTAL ENGINEERING CONSULTANTS

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Feasibility Study Report of Soils and Foundation Evaluations
Proposed Prairie View Multi-Family Development
NEC Dale Street & Wilson Avenue
Perris, California
APN: 311502-001-5

Project No. 20003-F
January 17, 2022

Prepared for:

ACAA Limited Partnership
422 Wier Road
San Bernardino, CA 92408

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Established 1984

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Reference: Site Location Map supplied by Goodman & Associates, Inc.

Gentlemen:

Presented herewith is the Report of Soils and Foundation Evaluations for the site of the proposed Prairie View Apartment Complex to be constructed at northeast corner of Dale Street and Wilson Avenue in the City of Perris, California. In absence of precise grading and development plan the recommendations included should be considered "preliminary", subject to revision following detailed development plan review.

Based on the geotechnical explorations completed, it is our opinion that the soils encountered primarily consist of upper silty fine to medium coarse sands with scattered pebbles and rock fragments overlying clayey silty sands to the maximum 50 feet depth explored. No free groundwater was encountered. Descriptions of the soils encountered are provided in the Log of Borings, B-1 to B-9, attached.

Based on the information published by the Department of Conservation, State of California, it is understood that the site is not situated within an A-P Special Study Zone, where no known earthquake fault passes through the site or to its adjacent.

Considering the presence of clayey silty sandy soils with high SPT blow counts as recorded during test explorations, and with historical groundwater table at about 42 feet below grade, computer evaluations (attached) indicate the site being non-susceptible to soils liquefaction in event of a strong motion earthquake.

Based on the investigations completed, it is our opinion that the subject site should be considered suitable for the planned development provided the opinions and recommendations included are incorporated in design and construction.

We offer no other warranty, express or implied.

Respectfully submitted,
Soils Southwest, Inc.

Moloy Gupta, RCE 31708
dist/1-addressee

John Flippin, Project Coordinator

1.0 Introduction

This report presents the results of Feasibility Studies Report - Soils and Foundation Evaluations conducted for the site of the proposed Prairie View Apartment complex to be constructed at northeast corner of Dale Street and Wilson Avenue in the City of Perris, California.

The purpose of this evaluation is to determine the nature and engineering properties of the near grade and subsurface soils, and to provide geotechnical recommendations for foundation design, slab-on-grade, paving, parking, site grading and inspection during construction. A separate report of WQMP-BMP water filtration design rate is provided in a separate report dated February 10, 2020.

The geotechnical recommendations contained reflect our best estimate of the soils conditions as encountered during field investigations conducted for the site. It is not to be considered as a warranty of the soils for other areas, or for the depths beyond the explorations advanced at this time.

The recommendations supplied should be considered valid and applicable when the following conditions, are fulfilled:

i. Pre-grade meeting with contractor, public agency and soils engineer,
ii. Excavated bottom inspections and verifications by soils engineer prior to backfill placement,
iii. Continuous observations and testing during site preparation and structural fill soils placement,
iv. Observation and inspection of footing trenching prior to steel and concrete placement,
v. Plumbing trench backfill placement prior to concrete slab-on-grade placement,
vi. On and off-site utility trench backfill testing and verifications, and
vii. Consultations as required during construction, or upon your request

In absence of precise grading plan, the geotechnical recommendations supplied should be considered as 'preliminary'. Supplemental recommendations may be warranted following grading plan review.

1.1 Proposed Development

Based on the preliminary grading plans supplied, it is understood that the subject site will be developed to accommodate approximately fourteen (14) multi-story multi-family unit structures along with an office/clubhouse building and detached enclosed garage structures. Use of conventional wood-frame and stucco construction with spread footings and concrete slabs-on-grade are expected. Associated construction of interior driveways, offsite street improvements, curb-gutter, flatworks, paving, swimming pool (if planned) and landscaping are anticipated to complete the project. Moderate site clearance and grading should be expected with the development planned.

1.2 Site Description

The irregularly shaped parcel of unknown acreage is currently vacant and undeveloped. In general, the site is bounded on the north by undeveloped previously graded building pads, on the south by future Dale Street, on the west by paved Wilson Avenue, and on the east by paved Murrieta Road. Overall vertical relief within the parcel is unknown, but is estimated to be less than 5 feet, with sheet-flow from incidental rainfalls appears to flow towards the west. With exception of surface weeds and scattered debris, no other significant features are noted.

2.0 Scope of Services

Geotechnical evaluations included review of the available publications for the site and its adjacent. The subsurface explorations, soil sampling, necessary laboratory testing, engineering analyses and the preparation of this report. No geological or environmental site assessments are included.

In general, our Scope of Services include the following:

o **Field Explorations**

Nine (9) exploratory test borings using a Hollow-Stem Auger (HAS) drill rig advanced to maximum depth of 50 feet below grade. During explorations, the soils encountered were continuously logged, bulk and undisturbed samples were procured were recorded. Collected samples were subsequently transferred to our laboratory for necessary geotechnical testing. Description of the soils encountered is shown on the Log of Borings in Appendix A.

Prior to test excavations, an underground utility clearance was established with Underground Service Alert (USA) of Southern California to avoid possible subsurface life-line obstruction and rupture. Following necessary soil sampling and in-situ testing, the test excavations were backfilled with local soils using minimum compaction effort. Collected samples were subsequently transferred to our laboratory for necessary geotechnical testing. Approximate test excavation locations are shown on the attached Plate 1.

o **Laboratory Testing**

Representative bulk and undisturbed site soils were tested in laboratory to aid in the soils classification and to evaluate relevant engineering properties pertaining to the project requirements. The laboratory tests completed include the following:

- In-situ moisture contents and dry density (ASTM Standard D2216),
- Maximum Dry Density and Optimum Moisture Content (ASTM Standard D1557),
- Direct Shear (ASTM Standard D3080),
- Soil consolidation (ASTM Standard D2435),
- Soil Expansion Potential Index (ASTM D4829) and
- Soil Gradation Analysis (ASTM D422-63)

No soils chemical analysis is currently included. Post-grading soil chemical analysis analyses, including pH, sulfate, chloride and resistivity will be performed prior to actual construction and concrete pour.

Description of the test results and test procedures used are provided in Appendix B.

o Based on the field investigation and laboratory testing, engineering analyses and evaluations were made on which to base our preliminary recommendations for design of foundations, slab-on-grade, paving and parking, site preparations and grading, and monitoring during construction.

o Preparation of this report for initial use by the project design professionals. The recommendations supplied should be considered as preliminary subject to revision and/or upgrading following review of the final grading and development plans, when supplied.

3.0 Existing Site Conditions

3.1 Subsurface Conditions

In general, the soils encountered primarily consists of variegated layers of upper silty fine to medium coarse sands with scattered pebbles and rock fragments, overlying silty sands with traces of clay as encountered to the maximum 50 feet depth explored. No free groundwater was encountered. Descriptions of the soils encountered are provided in the Log of Borings, B-1 to B-9, attached.

Laboratory shear tests conducted on undisturbed and on bulk samples remolded to 90 percent exhibit moderate shear strengths under increased moisture conditions. Results of the laboratory shear tests are provided in Plate B-1 of this report.

Consolidation tests conducted on the upper bulk soils remolded to 90% and on the undisturbed samples procured at a depth in excess of 4 feet indicate low potential for compressibility under the expected structural loadings. The results of soils consolidation tests are shown on Plate B-2.

Silty sandy in nature, the site soils are considered non-critically expansive in characteristics, thereby requiring no special geotechnical reinforcements other than those as described in this report.

Based on the relatively loose site soils existing as described it is our opinion that for adequate structural support, the areas of the planned development should be graded as described in Section 4.1.1 of this report.

3.2 Excavatibility

It is our opinion that the site preparations and grading required for the project may be accomplished by using conventional heavy-duty construction equipment. No blasting or jackhammering should be warranted.

3.3 Groundwater

No shallow depth groundwater was encountered, and no shallow depth free flowing groundwater should be anticipated during grading and construction. The following table lists the historical groundwater table based on the information as supplied by the local reporting agency.

GROUNDWATER TABLE	
Reporting Agency	California Department of Water Resources: Water Data Library website
Well I.D.	EMWD14497
Well Monitoring Agency	Eastern Municipal Water Dist./West San Jacinto GSA
Well Location: Township/Range/Section	T4S-R3W-Section 32/33
Well Elevation:	1420.05
Current Depth to Water (Measured in feet)	45.5
Current Date Water was Measured	October 12,2021
Depth to Water (Measured in feet) (Shallowest)	42.7
Date Water was Measured (Shallowest)	March 17,2014

3.4 Subsurface Variations

Based on exploratory test boring completed it is our opinion that variations in subsoils continuity and depths of subsoils deposits may be expected. Due to the nature and depositional characteristics of the soils underlying, care should be exercised in interpolating and/or extrapolating of the subsurface conditions existing in between and beyond the test explorations described.

3.5 Soil Corrosivity Analyses

Since change in soils conditions are expected during site preparations and grading, no laboratory testing on existing soil samples were evaluated at this time for soil corrosivity potential. Following mass grading completions evaluations on such are recommended for the soils expected in contact with concrete and metals. Evaluations of such should include, in minimum, pH, sulfate, chloride and resistivity.

3.6 Faulting and Seismicity

3.6.1 Direct or Primary Seismic Hazards

Surface ground rupture along with active fault zones and ground shaking represent primary or direct seismic hazards to structures. There are no known active or potentially active faults that pass through or towards the subject site, and the site is not situated within an AP Special Studies Zone. With the distant proximity of nearby earthquake faults, it is our opinion that the effects of surface fault rupture from should be considered remote. However, moderate to severe ground shaking will be a primary seismic hazard to the site.

According to the current CBC, the site is considered to be within Seismic Zone 4. As a result, it is likely that during the life expectancy of the structure, moderate to severe ground shaking may have potential for adverse effects on the site.

3.6.2 Induced or Secondary Seismic Hazards

In addition to ground shaking, effects of seismic activity may include surface fault rupture, soil liquefaction, differential settlements, ground lurching, landslides, lateral spreading, and earthquake induced flooding. Potential effects of such are as described below.

3.6.2.1 Surface Fault Rupture

The site is not situated within an AP Special Studies Zone. Based on review of existing geologic information, no major fault is noted to cross through or extends towards the site. The potential for surface rupture resulting from nearby fault movement is not known for certainty but is considered "low" due to the distance to the nearby fault as described earlier.

3.6.2.2 Flooding

Flooding hazards include tsunamis (seismic sea waves), Seiches, and failure of manmade reservoirs, tanks and aqueducts. The potential for these hazards is considered "remote" considering the inland site location and the distance to any nearby bodies of water.

3.6.2.3 Land-Sliding

Seismically induced landslides and other slope failures are common occurrences during or soon after and earthquake. Considering that the subject site and its adjacent being relatively flat, it is our opinion that potential for seismically induced landslides should be considered as "remote".

3.6.2.4 Lateral Spreading

Seismically induced lateral spreading involves lateral movement of existing soils due to ground shaking. Lateral spreading is demonstrated by near vertical cracks with predominantly horizontal movement of the soil mass involved. The topography of the site being near level, it is our opinion that the potential for seismically induced lateral spreading should be considered as "remote".

3.6.2.5 Settlement and Subsidence

Based on subsequent laboratory analyses conducted on undisturbed samples procured at this time, it is our opinion that the near surface soils existing at their present state should be considered relatively compressible and susceptible to subsidence.

3.6.2.6 Liquefaction

Liquefaction is caused by build-up of excess hydrostatic pressure in saturated non-cohesive soils due to cyclic stress generated by ground shaking during an earthquake. The significant factors on which soil liquefaction potential depends include, among others, the soil type, soil relative density, intensity of earthquake, duration of ground-shaking, and depth of groundwater.

Soil liquefaction evaluations completed using CivilTech Liquefy computer program, along with using the high SPT blow counts as recorded and using historical groundwater table at about 42 feet as described earlier, it is our opinion the site soils should be considered non-susceptible to liquefaction in event of a strong motion earthquake. Pre and Post-construction seismically induced soils settlements are estimated to about 0.45-inch and 0.25-inch, respectively. Liquefaction evaluations are attached in Appendix D.

3.7 Seismic Design Coefficients

Using Site Coordinates of 33.792049.°N, -117.211200°W and considering the site being situated at about 8.94 miles from the San Jacinto: A+C Fault. For foundation and structural design, the following seismic parameters are suggested based on the current 2019 CBC:

Recommended values are based upon the USGS ASCE 7-Hazard Reports Parameters and the California Geologic Survey: PSHA Ground Motion Interpolator Supplemental seismic parameters are provided in Appendix C of this report. The following presents the seismic design parameters as based on the available publications as currently published by the California Geological Survey and 2019 CBC

The following presents the seismic design parameters as based on available publications as currently published by the California Geological Survey and 2019 CBC.

TABLE 3.7.1 Seismic Source Type

Based on California Geological Survey-Probabilistic Seismic Hazard Assessment Peak Horizontal Ground Acceleration (PHGA) having a 10 percent probability of exceedance in a 50- year period is described as below:

Seismic Source Type / Appendix C	
Nearest Maximum Fault Magnitude	M>\=7.5
Peak Horizontal Ground Acceleration	0.454g

In design, vertical acceleration may be assumed to about 1/3 to 2/3 of the estimated horizontal ground accelerations described.

TABLE 3.7.2 Seismic Design Parameters

CBC Chapter 16	2019 ASCE 7-16 Standard Seismic Design Parameters	Recommended Values
1613A.5.2	Site Class	C
1613.5.1	The mapped spectral accelerations at short period	S_s
1613.5.1	The mapped spectral accelerations at 1.0-second period	S_1
1613A5.3(1)	Site Class B / Seismic Coefficient, S_s	1.463 g
1613A5.3(2)	Site Class B / Seismic Coefficient, S_1	0.544 g
1613A5.3(1)	Site Class D / Seismic Coefficient, F_a	1.000 g
1613A5.3(2)	Site Class D/ Seismic Coefficient, F_v	NA
16A-37 Equation	Spectral Response Accelerations, $S_{Ms} = F_a S_s$	1.463 g
16A-38 Equation	Spectral Response Accelerations, $S_{M1} = F_v S_1$	NA
16A-39 Equation	Design Spectral Response Accelerations, $S_{Ds} = 2/3 \times S_{Ms}$	0.975 g
16A-40 Equation	Design Spectral Response Accelerations, $S_{D1} = 2/3 \times S_{Ms}$	NA

It should be noted that lateral force requirement in design by structural engineer should be intended to resist total structural collapse during an earthquake. During lifetime use of the structure built, it is our opinion that some structural damage may be anticipated requiring some structural repairs. Adequate structural design and implementation of such in construction should be strictly observed.

4.0 Evaluations and Recommendations

4.1 General Evaluations

Based on field explorations, laboratory testing, engineering analysis the following conclusions and recommendations are presented for the site under study:

(i) From geotechnical viewpoint, the site is considered grossly stable and suitable for the proposed development provided the recommendations supplied are implemented during grading and construction.

(ii) With the presence of the upper dry loose and compressible soils existing as described, it is our opinion that no load bearing foundations and/or concrete slabs should be installed bearing directly on the grade surface currently existing.

(iii) For structural support, site preparations should include subexcavations of the upper existing dry, loose and compressible soils, followed by their replacement as engineered fills compacted to minimum 95%. For adequate support, a minimum 24-inch thick compacted fill mat blanket underneath footings comprised of the local gravelly sandy soils or its equivalent or better, is recommended.

(iv) It is recommended that structural footings should be established exclusively into engineered fills of local gravelly sandy soils compacted to minimum 95%. Construction of footings and slabs straddling over cut/fill transition shall be avoided.

(v) Structural design consideration should include probability for moderate to high peak ground acceleration from relatively active nearby earthquake faults. The adverse effects of ground shaking, however, can be minimized by implementing the seismic design parameters and procedures as outlined in the current CBC, and as described earlier in this report.

(vi) Although no shallow depth groundwater was encountered, provisions should be maintained during construction to divert incidental rainfall away from the structural pads constructed.

(vii) It is our opinion that, if site preparations and grading are performed as recommended herein, the proposed development will not adversely affect the stability of the site, or it's adjacent.

4.1.1 Recommendations for Site Preparations and Grading for Structural Support

In absence of precise grading plan, the planned structural pad grades are assumed at/or near the existing grade surface. For adequate structural support, it is our opinion that moderate site preparations and grading should be included in form of sub-excavations of the near grade dry and compressible soils and their replacement as engineered fills compacted to minimum 95%.

In general, site preparations and grading should include sub-excavations of the near surface soils to about,

(i) 5 feet below the current grade surface, or
(ii) to the depth as required to expose the underlying moist and dense natural subgrades, or
(iii) to the depth as required to maintain a 24" thick compacted fill mat blanket below foundation bottoms, whichever is greater.

The site preparations and grading described should encompass, in minimum, the proposed structural foot-print areas and minimum 5 feet beyond. No cut and fill transitional conditions should be allowed.

Within areas requiring fill soils, if any, such may be placed following sufficient subexcavations to expose the underlying dense subgrades as approved by the project soils engineer. During grading, the engineered fills placed should be compacted to near Optimum Moisture and with minimum 95% compaction of soil's Maximum Dry Density as determined by the ASTM D1557 test method.

The sub-excavation depths described should be considered as "preliminary". Localized additional sub-excavations may be required within areas underlain by undocumented old fills, buried utilities and abandoned sewer and/or buried septic systems. It is recommended that the excavated subgrades should be verified and approved by soils engineer prior to structural fill soil placement. Supplemental recommendations may be warranted following detailed development plans review

Mass grading required for the project is recommended to encompass, in minimum, the entire individual structural pads, including front, rear and side yards.

The subexcavation depths described should be considered as "approximate". Actual subexcavation depths should be determined by soils engineer during grading.

For reference, supplemental general mass grading recommendations are included Section 5 of this report.

4.1.2 Structural Fill Material Requirements

(i) Non-expansive in nature, the on-site soils free of organic, debris and rocks larger than 6-inch in diameter, should be considered suitable for re-use as structural backfills.

(ii) Following mass-grading completion, representative site soils sampled from graded fills expected in contact with footings and utilities should be laboratory tested to verify presence of Sulfate, pH, chloride and Resistivity. Based on the chemical test results, supplemental design recommendations will be supplied prior to concrete pour. Such chemical testing will be programmed when requested by the addressee.

4.1.3 Cut/Fill Transition Pad Preparations (if applicable)

Use of cut/fill transitions should be avoided to minimize potentials for differential settlements to footings and concrete slab-on-grade. Within cut/fill transition areas, if becomes essential, it is suggested that following necessary cut, the entire structural pad should be prepared so as to establish an uniform bearing compacted fill mat prepared in conformance to the general guidelines as described below.

Table 1.0 Pad Preparation Guideline for Cut/Fill Transition Areas

Fill Depth Required for Finish Grade (Within low-lying areas)	Overexcavation Depth below Finish Grade (within cut areas)
Up to 5 feet	Equal Depth
5 to 10 feet	5 feet
Greater than 10 feet	One-half the maximum thickness of fills placed on the "fill" portion (20 feet maximum)

Cut portions should be over-excavated beyond the structural perimeter lines for a horizontal distance equal to the depth of over excavation or to a minimum distance of 5 feet, whichever is greater. Actual subexcavation depths should be determined by soils engineer during grading.

4.2 Structural Foundation Design Parameters

For structural support, it is assumed that for load bearing support conventional continuous wall foundations and isolated round/square footings will be used established into the engineered graded fills placed during site preparations and grading as described. Static structural loadings of 40 kips and 4 klf are assumed for isolated column and continuous wall footings, respectively.

In absence of detailed development plan review, it is assumed that two-story to three-story conventional wood frame and stucco construction will be used with concrete slab-on-grade. Use of load bearing continuous wall and/or isolated spread footings will be used underlain by at least 24-inch-thick engineered fill mat of local soils compacted to minimum 95% as recommended earlier.

Under static loading conditions, with a Factor of Safety, F. S=3.0, an allowable soil vertical bearing capacity of 2000 psf may be considered in design. The soil bearing capacity described may be increased by 200 psf for each additional footing depth or width to a total not exceeding 3000 psf. If normal code requirements are applied, the above capacities may further be increased by an additional 1/3 for short duration of loading, which includes the effect of wind and seismic forces.

From geotechnical viewpoint, 15" wide x18" deep, and 18" wide x 24" deep foundation dimensions may be considered for two and three-story construction planned. Actual foundation dimensions, including foundation thickness against punching shear etc., should be determined by the project structural engineer based on the static loading and seismic PGA described earlier.

The footing depths described should be measured vertically from the lowest *adjacent outside grade, and NOT from the finished pad grade or from finished floor surface.* Footing depths and dimensions shall be verified by soils engineer prior to footing-forming, rebar and concrete placement. It will be the contractor's responsibly to arrange such verification by soils engineer.

From geotechnical viewpoint under static loading conditions, use of minimum reinforcements consisting of 2-#5 rebar placed near the top and 2-#5 rebar near bottom footings, are recommended. Additional reinforcements, if specified by project structural engineer, should be incorporated in construction.

Based on the laboratory determined soils consolidation characteristics, settlements to properly designed and constructed foundations supported exclusively into engineered fills of site soils or its equivalent or better, and carrying maximum assumed maximum structural loadings are expected to be within tolerable limits. Under static loading conditions, over a 40-ft. span, estimated total and differential settlements should be about 1 and 1/2-inch, respectively, provided the foundations being supported by engineered fills of local soils compacted to minimum 95%. Most of the elastic deformations, however, are expected to occur during construction.

4.3 Concrete Slab-on-Grade

No concrete slabs, sidewalks and flatworks should be placed bearing directly on the surface soils currently existing. The prepared subgrades described to receive footings should be adequate for concrete slab-on-grade placement. For estimation purposes, use of 4.5-inch thick (net) concrete slab-on-grade is suggested reinforced with #3 rebar at 18-inch o/c. Actual slab-on-grade thickness, however, should be designed by the project structural engineer based upon structural loading, the seismic design parameters, and the Peak Horizontal Ground Acceleration (PGA) as described. Concrete slab-on-grade positive contact with footings s suggested as designed by the project structural engineer.

Within moisture sensitive areas, concrete slabs should be underlain by 2-inch of compacted clean sand, followed by 10-mil thick vapor barrier, such as commercially available StegoWrap , Visqueen or other approved covering, overlying an additional 2-inch thick sands. Sands used should have a Sand Equivalent, SE, of 30 or greater.

Subgrades to receive concrete foundations and slab-on-grade should be "'dampened" as would be expected in any such concrete placement. Use of low-slump concrete is recommended. In addition, it is recommended that utility trenches underlying concrete slabs and driveways should be thoroughly backfilled with gravelly sandy soils mechanically compacted to minimum 95%. Concrete construction joint requirements should be supplied by the project structural engineer.

Finished slab subgrade verifications, including buried utility trench backfills, etc., should be verified by soils engineer immediately prior to vapor barrier placement. No water jetting should be allowed in an effort to compact utility trench backfills.

For driveways, it is our opinion that concrete slabs should be 6-inch thick (net) with thickened edges, placed over local sandy soils compacted to at least 95%. Driveway slab reinforcing and construction and expansion joints etc. should be incorporated if required by the project structural engineer.

No concrete should be placed during extreme weather conditions, such as during high outside temperature and/or during high Santa Ana wind conditions. Use of excess water on finished grade is not recommended to prevent post-placement concrete "warpping".

4.3.1 Concrete Curing

In order to minimize potential for excessive concrete shrinkage or cracking, concrete slabs shall be adequately "cured" by using water or by using commercially available chemical curing agents.

4.4 Resistance to Lateral Loads

Resistance to foundation lateral displacement can be achieved by friction acting at the base of foundation and by passive earth pressures. A coefficient friction of 0.35 may be assumed with normal dead load forces for footing established on engineered compacted fills of local soils.

An allowable passive lateral earth resistance of 250 pounds per square foot per foot of depth may be assumed for the sides of foundations poured against compacted fills. The maximum lateral passive earth pressure is recommended not to exceed 2500 pounds.

For design, active lateral pressures from local soils when used as backfills may be estimated from the following equivalent fluid density:

CONDITIONS	EQUIVALENT FLUID DENITY (pcf)	
	Level Backfill	2:1 Backfill Sloping Upwards
Active	35	55
At Rest	60	73
Seismic	75% of active earth pressures	75% of active earth pressures

4.5 Swimming Pool (if planned)

For adequate structural support, it is recommended that swimming pool shell should be established exclusively on underlying competent natural subgrades, or entirely into compacted engineered fills of local soils or its equivalent, or better. No cut-fill transition subgrade conditions should be allowed.

For swimming pool shell design, the following criteria may be considered:

1. Swimming pool full, with no passive resistance,
2. Swimming pool empty, with lateral active pressures from surrounding soils, and
3. Swimming pool full, with supported soil surroundings.

With soil vertical bearing capacity of 1800 psf, for design, lateral active pressures, and passive resistance in form of "equivalent fluid density" from horizontal backfill, may be considered from the lateral active and passive resistance described. Supplemental recommendations on such will be supplied on request.

4.6 Shrinkage and Subsidence

It is our opinion that during grading the upper soils may be subjected to a volume change. Assuming a 95% relative compaction for structural fills and assuming an overexcavation and re-compaction depth as described, such volume change due to shrinkage may be on the order of 10 to 15 percent. Further volume change may be expected due to supplemental shrinkage during preparation of subgrade soils. For estimation purpose, such may be approximated to about 2-inch when conventional construction equipment is used.

4.7 Construction Consideration

4.7.1 Unsupported Excavation

Gravelly sandy site soils encountered are considered highly susceptible to caving. Temporary excavations up to 4 feet in depth may be made without rigorous lateral supports. Excavated surface should be "'wetted" during construction in order to minimize potential surface soil raveling. No surcharge loading should be allowed within an imaginary 1:1 line drawn upward from toe of temporary excavations.

4.7.2 Supported Excavations

If vertical excavations exceeding 4 feet in depths become warranted, such should be achieved using shoring to support sidewalls.

4.8 Structural Pavement Thickness

Based on estimated Traffic Index (TI) of 6.5 and on soils R-value of 50, it is our opinion that before normal auto traffic flexible paving of 3.5" of ac over 4" Class II base compacted to 95% may be considered. Supplemental recommendations on such will be supplied following mass grading completions and additional soil R-value determinations of the representative soils sampled from street grades. In general, subgrade soils to receive paving should be scarified to 12" and recompacted to 95% prior to base placement. Prior to actual paving, soils R-value should be determined on representative samples procured from the near finished street grades.

4.9 Soil Caving

Considering dry gravelly in nature, the site soils are considered "highly" susceptible to caving. Temporary excavations in excess of 5 feet should be made at a slope 2 to 1 (h:v), or flatter, and as per the construction guidelines provided by the Cal-Osha.

4.10 Retaining Wall (if planned)

It is unknown if any retaining structure will be associated with development proposed. It is our opinion that retaining foundations should be designed based on a soils vertical bearing capacity of 1800 psf, along with the lateral active pressures as described below:

Slope of Retained Material (H:V)	Equivalent Fluid Density, pcf	
	Clean Sand	Local Soil
level	30	35
2:1	42	55

Walls adjacent to traffic areas should be designed to resist a uniform lateral pressure of 100 pounds per square foot, which is a result of an assumed 300 pounds per square foot surcharge behind the walls due to normal traffic. If the traffic is kept back ten feet from the wall, the traffic surcharge may be neglected.

The design parameters do not include any hydrostatic pressure build-up. Consequently, installation of "'french-drain" behind retaining walls is recommended to minimize water pressure build-up behind retaining walls. Use of impervious material is preferred within upper the 18 inches of the backfills placed.

Backfills behind retaining wall should be compacted to a minimum 90 percent of the soils Maximum Dry Density as determined by the ASTM D15571 test method. Flooding and/or jetting behind wall should not be permitted.

4.11 Utility Trench Backfill

Utility trenches backfills within structural pad areas and beyond should be placed in accordance with the following recommendations:

- Trench backfill should be placed in 6 to 8-inch thin lifts mechanically compacted to 90 percent or better of the laboratory maximum dry density for the soils used. Jetting is not recommended within utility trench backfill. Within streets, upper 2 feet of the trench backfill should be compacted to 95% or better.

- Exterior trenches along a foundation or a toe of a slope and extending below a 1:1 imaginary line projected from the outside bottom edge of the footing or toe of the slope should be compacted to 90 percent of the Maximum Dry Density for the soils used during backfill. Excavations should conform to the requirements of Cal-Osha

4.12 Pre-Construction Meeting

It is recommended that no clearing of the site or any grading operation be performed without the presence of a representative of this office. An on-site pre-grading meeting should be arranged between the soils engineer and the grading contractor prior to any construction.

4.13 Seasonal Limitations

No fill shall be placed, spread or rolled during unfavorable weather conditions. Where the work is interrupted by heavy rains, fill operations shall not be resumed until moisture conditions are considered favorable by the soils engineer.

4.14 Planters

In order to minimize potential differential settlement to foundations, use of planters requiring heavy irrigation *should be restricted from being used adjacent to structural footings.* In event such becomes unavoidable, planter boxes with sealed bottoms, should be considered.

4.15 Landscape Maintenance

Only the amount of irrigation necessary to sustain plant life should be provided. Pad drainage should be directed towards streets and to other approved areas away from foundations. Slope areas should be planted with draught resistant vegetation. Over watering landscape areas could adversely affect the proposed site development during its life-time use.

4.16 Observations and Testing During Construction

Recommendations provided are based on the assumption that structural footings and slab-on-grade be established exclusively into compacted fills. Excavated footings should be inspected, verified and certified by soils engineer prior to steel and concrete placement to ensure their sufficient embedment and proper bearing as recommended. Structural backfills discussed should be placed under direct observations and testing by this facility. Excess soils generated from footing excavations should be removed from pad areas and such should not be allowed on subgrades underlying concrete slab.

4.17 Plan Review

No precise grading or development plans are prepared and none such is available for review. Prior to actual mass grading, grading and foundation plans should be available to ensure applicability of the assumptions made in preparing this report. If during construction, conditions are observed different from those as presented, revised and/or supplemental recommendations will be required.

5.0 Earth Work/General Grading Recommendations

The site soils primarily consist of dry loose compressible fine silty clayey sands of up to about 5 feet below existing grade, overlying variegating layers of silty clayey fine to medium coarse sands. Prior to grading commencement, it is suggested that all debris and loose stockpiles, if any, should be cleared and disposed off-site to the satisfaction of soils engineer. In general, site preparations and grading for the project should include, in minimum the following:

Structural Backfill:

Local soils free of organic, debris and rocks larger than 6-inch in overall diameter should be considered suitable for reuse as structural backfill. Loose soils, formwork and debris should be removed prior to backfilling retaining walls. Local soils backfill should be placed and compacted in accordance with the recommended specifications provided below. Where space limitations do not allow conventional backfilling operations, special backfill materials and procedures may be required. Pea gravel or other select backfill can be used within limited space areas. Additional recommendations on such will be provided during construction.

Percentage Compaction during Mass Grading

With the presence of silty site soils as encountered and assuming moderately high dead load and seismic peak ground acceleration as described, it is our opinion that structural fills placed should be compacted to the minimum as described in the main text of this report. During grading, use of vibratory sheeps-foot roller may be warranted.

Site Drainage

Adequate positive drainage should be provided maintained away from structural pad in order to prevent water from ponding and to reduce potential percolation into backfill. A desirable slope for surface drainage is 2 percent in landscape areas and 1 percent in paved areas. Planters and landscaped areas adjacent to building perimeter should be adequately designed to minimize water filtration into subsoils. Considerations should be given to the use of closed planter bottoms, concrete slabs, and perimeter subdrains where applicable.

Utility Trenches

Buried utility conduits should be bedded and backfilled around the conduit in accordance with the project specifications. Where conduit underlies concrete slab-on-grade and pavement, the remaining trench backfill above the pipe should be placed and compacted to at least 95%.

General Grading Recommendations:

Recommended general specifications for surface preparation to receive fill and compaction for structural and utility trench backfill and others are presented below.

1. Areas to be graded, backfilled or paved, shall be grubbed, stripped and cleaned of all buried and undetected debris, structures, concrete, vegetation and other deleterious materials prior to grading.

2. Where compacted fill is to provide vertical support for foundations, all loose, soft and other incompetent soils should be removed to full depth as approved by soils engineer.

3. Compaction for structural fills shall be determined relative to the maximum dry density as determined by ASTM D1557 compaction methods. All in-situ field density of compacted fill shall be determined by the ASTM D1556 standard methods or by other approved procedures.

4. All new imported soils, if required, shall be clean, granular, non-expansive material requiring prior approval by soils engineer.

5. During grading, fill soils shall be placed as thin layers, thickness of which following compaction shall not exceed six inches.

6. In accordance with the CBC rock sizes greater than 12 inches (305 mm) and up to 24 inches (610 mm) in maximum dimension shall be three feet (914 mm) or more below grade, measured vertically. Rock sizes greater than 24 inches (610 mm) in maximum dimension shall be 10 feet (3048 mm) or more below grade, measured vertically.

7. No jetting and/or water tampering be considered for backfill compaction for utility trenches without prior approval of the soils engineer. For such backfill, hand tampering with fill layers of 8 to 12 inches in thickness or as approved by the soils engineer is recommended.

8. Any and all utility trenches at depth as well as cesspool and abandoned septic tank within building pad area and beyond, should either be completely excavated and removed from the site, or should be backfilled with gravel, slurry or by other material, as approved by soils engineer.

9. Any and all import soils if required during grading should be equivalent to the site soils or better. The soils engineer prior to their use should approve such.

10. Any and all grading required for pavement, side-walk or other facilities to be used by general public, should be constructed under direct observation of soils engineer, or as required by the local public agencies.

11. A site meeting should be held between grading contractor and soils engineer prior to actual site preparations and grading. Two days of prior notice will be required for such meeting.

6.0 Closure

The conclusions and recommendations presented are based upon the findings and observations as made during subsurface test excavations and subsequent laboratory testing and engineering evaluations as currently used in the Geotechnical industry. The recommendations supplied should be considered "preliminary" since they are based on soil samples only. If during construction, the subsoil conditions appear different from those as disclosed during field investigation this office should be notified to consider any possible need for modification by the geotechnical recommendations as provided in this report.

Recommendations provided are based on the assumptions that structural footings will be established exclusively into compacted fill. No footings and/or slabs should be allowed straddling over cut/fill transition interface.

Site grading observations and testing must be performed by a representative of this office. Further, it is recommended that excavated footings should be verified and approved by soils engineer prior to steel and concrete placement to ensure that foundations are founded into satisfactory soils and excavations are free of loose and disturbed materials.

A pregrading meeting between grading contractor and soils engineer is recommended prior to construction preferably at the site, to discuss the grading procedures to be implemented and other requirements described in this report to be fulfilled.

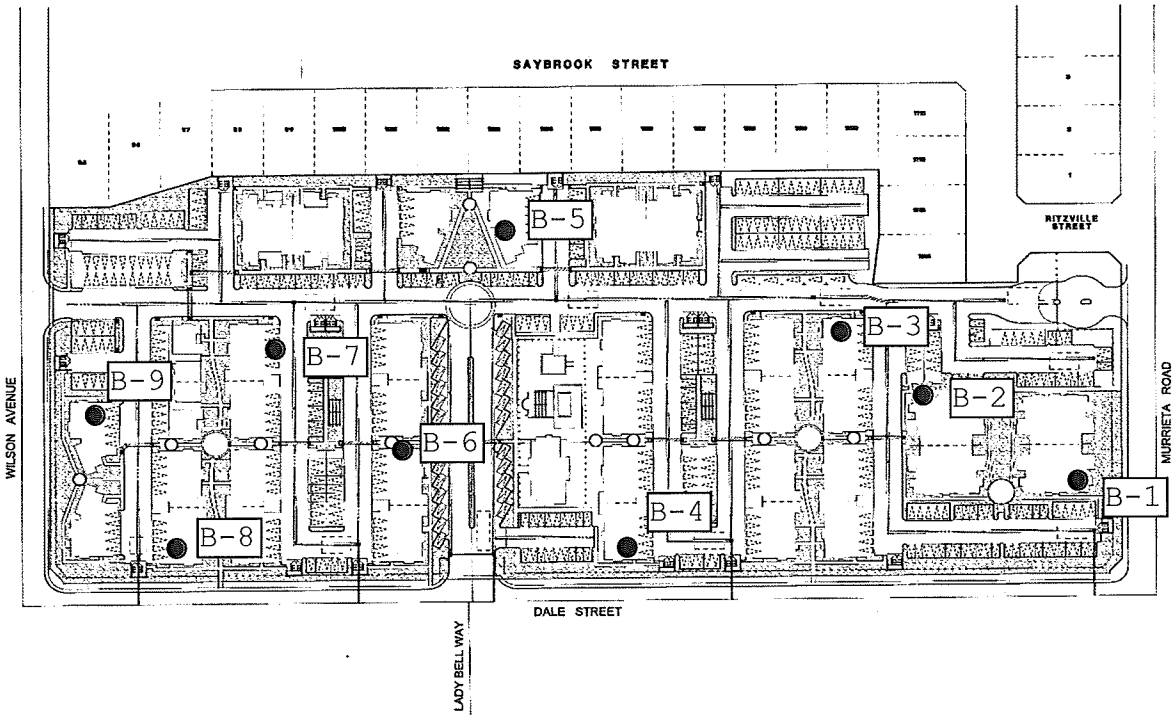
This report has been prepared exclusively for the use of the addressee for the project referenced in the context. It shall not be transferred or be used by other parties without a written consent by Soils Southwest, Inc.

Should the project be delayed beyond one year after the date of this report, the recommendations presented shall be reviewed to consider any possible change in site conditions.

The recommendations presented are based on the assumption that the necessary geotechnical observations and testing during construction will be performed by a representative of this office. The field observations are considered a continuation of the geotechnical investigation performed.

If another firm is retained for geotechnical observations and testing, our professional liability and responsibility shall be limited to the extent that Soils Southwest, Inc. would not be the geotechnical engineer of record. Use of the geotechnical recommendations by others will relieve Soils Southwest of any liability that may arise during lifetime use of the structure constructed.

PLOT PLAN AND TEST LOCATIONS
(Not to Scale)



Legend: ● B-1 Approximate Location of Test Boring Plate 1

7.0 APPENDIX A

Field Explorations

For geotechnical evaluations field evaluations included nine (9) exploratory test borings (B-1 and B-9) using a hollow-stem auger drilling rig advanced to maximum 50 feet below grade. Approximate test exploration locations are shown on attached Plate 1.

Soils encountered during explorations were logged and such were classified by visual observations in accordance with the generally accepted classification system. The field descriptions were modified, where appropriate, to reflect laboratory test results.

In addition to undisturbed soils sampling during test borings, within areas of excavated test pits portable nuclear gauge is used for determining relative soil density and moisture content (ASTM D2216). The bulk and undisturbed soil samples procured were sent to our laboratory for geotechnical analyses as described in the attached Test Boring Logs.

Logs of test explorations are presented in the following summary sheets that include the description of the soils and/or fill materials encountered.

LOG OF TEST EXPLORATIONS

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-1

Project: Prairie View Multi-Family Development | **Job No.:** 20003-F
Logged By: John F. | **Boring Diam.:** 8" HSA | **Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP-SM			seasonal grass and weeds
								SAND - grayish light brown, slightly silty, traces of clay, fine to medium, damp
								- (Max Dry Density = 117 pcf @ 14.5%)
10								- color change to light gray, traces of clay, slightly silty, traces of cemented white nodules, fine to medium, occasional pebbles and scattered rock fragments
							5	
21		11	108.6	92.8	SM			
					SM-ML			- color change to light brown, silty, traces of clay, fine to medium, pebbles rock fragments, medium dense/stiff
14								- color change to light yellowish grayish brown, fine, traces of white nodules
							10	
11.0		49	73.7	63.0	SP			-low to medium dense
								SAND- color change to light brown, fine to medium, pebbles, occasional rock fragments, low density
							15	
3					SM-ML			- color change to gray-brown, silty, traces of white silty, fine, loose, moist
								- End of test boring @ 16.0 ft.
								- no bedrock
								- no groundwater
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Multi-Family Development Complex
Dale Street & Wilson Avenue
Perris, California

Plate #

Bulk/Grab sample | Standard penetration test | California sampler

Soils Southwest, Inc.
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(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-2

Project: Prairie View Multi-Family Development | **Job No.:** 20003-F
Logged By: John F. | **Boring Diam.:** 8" HSA | **Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM			seasonal weeds and grass SAND - grayish light brown, silty, traces of clay, fine to medium, damp
27	■	26	95.9	82.0	SP SM-ML			- color change to light brown, fine to medium, pebbles, occasional rock fragments moist to very moist
16	◪						5	- color change to yellowish light brown, silty, traces of clay, fine, damp - color change to gray brown, silty, fine traced white nodules, damp to moist
89	■	23	89	76				- color change to light yellow gray-brown, traces of white, silty, fine
9	◪						10	- loose - loose
								- End of test boring @ 11.0 ft. - no bedrock - no groundwater
							15	
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Multi-Family Development Complex
Dale Street & Wilson Avenue
Perris, California

Plate #

◪ Bulk/Grab sample ◪ Standard penetration test ■ California sampler

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LOG OF BORING B-3

Project: Prairie View Multi-Family Development		**Job No.:** 20003-F
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM-ML			seasonal weeds and grass
								SAND - light grayish brown, silty, traces of clay, fine, dry to damp
								- color change to light yellowish gray brown silty, fine with traces of white specks and isolated cemented nodules, dense
							5	
47								- color change to grayish light brown, silty fine with traces of white specks
42		22	93.6	80.0	SM			- color change to light brown, silty, traces of clay, fine to medium, pebbles occasional rock fragments
					SM-ML			
							10	- color change to light yellow brown, silty fine, scattered pebbbles
13								- color change to light yellowish gray-brown with traces of white cemented nodules, fine, low to medium dense, damp
							15	
16								- color change to light yellowish gray-brown to orangish light brown, silty, fine
								- End of test boring @ 16.0 ft.
								- no bedrock
								- no groundwater
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Multi-Family Development Complex Dale Street & Wilson Avenue Perris, California	**Plate #**

Bulk/Grab sample Standard penetration test California sampler

Soils Southwest, Inc.
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LOG OF BORING B-4

Project: Prairie View Multi-Family Development | **Job No.:** 20003-F
Logged By: John F. | **Boring Diam.:** 8" HSA | **Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP-SM			low surface weeds, scattered organic debris, and other debris
9	■	22	93.5	80				SAND - light grayish brown, slightly silty, traces of clay, fine to medium, scattered pebbles, loose, damp to moist
22	◪						5	- trace white cemented nodules - gravely, traces of clay, slightly silty, fine to medium coarse, pebbles, rock fragments, medium dense, damp
					SM-ML			
19	■	51	65.45	56	SM			- color change to light yellow to white with some cemented nodules, silty, dry
6	◪						10	- silty, traces of clay, fine, with white nodules, pebbles, very moist - very loose
							15	
11	◪				SM-ML			- color change to tan, silty, fine, scattered pebbles and rock fragments, low density, damp
								- End of test boring @ 16.0 ft. - no bedrock - no groundwater
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Multi-Family Development Complex
Dale Street & Wilson Avenue
Perris, California

Plate #

■ Bulk/Grab sample ◪ Standard penetration test ■ California sampler

Soils Southwest, Inc.
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LOG OF BORING B-5

Project: Prairie View Multi-Family Development | **Job No.:** 20003-F
Logged By: John F. | **Boring Diam.:** 8" HSA | **Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM			seasonal grass and weeds
								SAND - grayish light brown, silty, traces of clay, fine to medium, occasional pebbles, dry to damp
22								- silty, traces of clay, traces of cemented white nodules, fine to medium with pebbles occasional rock fragments, medium dense
24		24	96	87			5	
								- color change to light yellow gray brown, silty, fine to medium, moist
19								- color change to grayish light brown with isolated white cemented nodules
							10	
17		27	87	70				- color change to yellowish light brown, silty, fine to medium, pebbles, very moist
					ML		15	SILT
								- scattered white cemented nodules
							20	
								- End of test boring @ 20.0 ft. - no bedrock - no groundwater
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Multi-Family Development Complex
Dale Street & Wilson Avenue
Perris, California

Plate #

Bulk/Grab sample | Standard penetration test | California sampler

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LOG OF BORING B-6

Project: Prairie View Multi-Family Development | **Job No.:** 20003-F
Logged By: John F. | **Boring Diam.:** 8" HSA | **Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP-SM			grasses
								SAND - light yellow brown with white cemented nodules, slightly silty, fine to medium, occasional pebbles and scattered rock 1", dry to damp
							5	
23								- medium dense, scattered pebbles, dry
30		25	84	72	SM			- traces of clay, fine to medium, pebbles rock fragments, very moist
					SM-ML			- color change to light brown, silty, fine scattered pebbles and rock fragments
							10	
16		26	89	76	ML			SILT- color change to light yellow with trace white cemented nodules, soft
					SM-ML			SAND - color change to light brown, silty, traces of clay, fine, very moist
							15	
							20	- color change to reddish gray-brown, silty traces of clay, fine, soft, moist
							25	
							30	
					ML			SILT- slightly clayey with scattered pebbles very moist
								- color change to gray-brown, traces of

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Multi-Family Development Complex
Dale Street & Wilson Avenue
Perris, California

Plate #

Bulk/Grab sample | Standard penetration test | California sampler

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LOG OF BORING B-6

Project: Prairie View Multi-Family Development | **Job No.:** 20003-F

Logged By: John F. | **Boring Diam.:** 8" HSA | **Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
								clay, scattered pebbles, moist
								- color change to gray
							40	
51								- color change to grayish brown with white cemented nodules, very stiff, moist
							45	
44					SM			SAND - color change to light yellow grayish brown, silty, fine to medium coarse, granitic origin material, moist
							50	
								- End of test boring @ 50.0 ft. - no bedrock - no groundwater
							55	
							60	
							65	
							70	

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LOG OF BORING B-7

Project: Prairie View Multi-Family Development		**Job No.:** 20003-F
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM-ML			seasonal grass and weeds with scattered debris
								SAND - light grayish brown, silty, fine
14		23	86.6	74	SM			- color change to light brown, silty, traces of clay, fine to medium, pebbles, rock fragments with traces of white specks loose
30							5	- color change to light gray with traces of white specks, scattered pebbles and rock fragments - dense
					SP-SM		10	- occasional white specks, slightly silty, fine to medium, pebbles, scattered rocks
10								- color change to orangish light brown, slightly silty, traces of white, fine, damp to moist, low density
							15	
11					SM-ML			- color change to light brown transition to light yellowish brown, silty, fine, low to medium density, damp to moist
							20	- End of test boring @ 16.0 ft. - no bedrock - no groundwater
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Multi-Family Development Complex
Dale Street & Wilson Avenue
Perris, California

Plate #

Bulk/Grab sample Standard penetration test California sampler

Soils Southwest, Inc.
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LOG OF BORING B-8

Project: Prairie View Multi-Family Development | **Job No.:** 20003-F
Logged By: John F. | **Boring Diam.:** 8" HSA | **Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP-SM			seasonal weeds and grass
								SAND - yellowish brown to isolated gray lenses, slightly silty, traces of clay, fine to medium, scattered pebbles, damp
					ML		5	SILT- color change to light gray, traces of clay, stiff, damp
43					SP-SM			SAND- color change to grayish light brown, slightly silty, traces of clay, traces of white specks, damp to moist
8.0		35	77	66				- color change to light yellow brown, white cemented nodules, fine to medium, pebbles rock fragments, soft, very moist
14					VS		10	SILT/SAND mixture - color change to light brown transition to tan, fine, low to medium dense, damp
							15	
					SM			SAND - color change to grayish light brown, silty, traces of clay, fine, occasional pebbles, scattered rock fragments, moist
15					SM-ML		20	- color change to reddish brown, silty, fine damp
								- End of test boring @ 21.0 ft. - no bedrock - no groundwater
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Multi-Family Development Complex
Dale Street & Wilson Avenue
Perris, California

Plate #

Bulk/Grab sample | Standard penetration test | California sampler

Soils Southwest, Inc.
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LOG OF BORING B-9

Project: Prairie View Multi-Family Development | **Job No.:** 20003-F
Logged By: John F. | **Boring Diam.:** 8" HSA | **Date:** February 11, 2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP-SM			seasonal weeds and grass
								SAND - light gray brown, slightly silty, traces of clay, fine to medium, scattered pebbles, damp to moist
							5	
					SM-ML			- color change to light brown, silty, fine, scattered pebbles, damp
35		59	59	51	SM			- color change to tan with white cemented nodules, silty, traces of clay, fine to medium, pebbles and rock fragments, very moist
							10	
32								- dense
							15	
5					SM-ML			- color change to light brown, silty, fine, very loose/soft, moist
								- End of test boring @ 16.0 ft. - no bedrock - no groundwater
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Multi-Family Development Complex
Dale Street & Wilson Avenue
Perris, California

Plate #

Bulk/Grab sample | Standard penetration test | California sampler

8.0 APPENDIX B

Laboratory Test Programs

Laboratory tests were conducted on representative soils for the purpose of classification and for the determination of the physical properties and engineering characteristics. The number and selection of the types of testing for a given study are based on the geotechnical conditions of the site. A summary of the various laboratory tests performed for the project is presented below.

Moisture Content and Dry Density (ASTM D2937):

Data obtained from these tests performed on undisturbed samples are used to aid in geotechnical soil classification and correlation of the soils and to provide qualitative information regarding in-situ soil strengths.

Direct Shear (ASTM D3080):

Data obtained from this test performed at increased and field moisture conditions on relatively undisturbed and remolded soil sample is used to evaluate soil shear strengths. Samples contained in brass sampler rings placed directly on test apparatus are sheared at a constant strain rate of 0.002 inch per minute under saturated conditions and under varying loads appropriate to represent anticipated structural loadings. Shearing deformations are recorded to failure. Peak and/or residual shear strengths are obtained from the measured shearing load versus deflection curve. Test results, plotted on graphical form, are presented on Plate B-1 of this section.

Consolidation (ASTM D2835):

Drive-tube samples are tested at their field moisture contents and at increased moisture conditions since the soils may become saturated during lifetime use of the planned structure.

Data obtained from this test performed on relatively undisturbed and/or remolded samples, were used to evaluate the consolidation characteristics of foundation soils under anticipated foundation loadings. Preparation for this test involved trimming the sample, placing it in one-inch-high brass ring, and loading it into the test apparatus which contained porous stones to accommodate drainage during testing. Normal axial loads are applied at a load increment ratio, successive loads being generally twice the preceding.

Soil samples are usually under light normal load conditions to accommodate seating of the apparatus. Samples were tested at the field moisture conditions at a predetermined normal load. Potentially moisture sensitive soil typically demonstrated significant volume change with the introduction of free water. The results of the consolidation tests are presented in graphical forms on Plate B-2 of this section.

Potential Expansion (ASTM Standard D4829)

Silty sandy in nature, the soils are considered 'very low' in expansion characteristics with an Expansion Index, EI, less than 20. Supplemental soil expansion testing may be warranted following mass grading completion.

Laboratory Test Results

Table I. Maximum Dry Density - Optimum Moisture Content (ASTM D1557)

Test Boring No. & Sample Depth, ft.	Max. Dry Density, pcf.	Optimum Moisture, %
B-1 @ 1-5'	117.0	14.5

Table II. In-Situ Moisture-Density Determinations (ASTM D2216)

Test Boring No.	Sample Depth, ft.	Dry Density, pcf.	Moisture Content, %
1	5.0	108.6	11
2	3.0	95.89	26
3	7.0	93.63	22
4	8.0	65.45	51
5	5.0	96.00	24
5	10.0	87.06	27
6	7.0	83.99	25
7	3.0	86.63	23
8	8.0	77.06	35
9	7.0	59.40	59

Table III: Direct Shear (ASTM D3080)

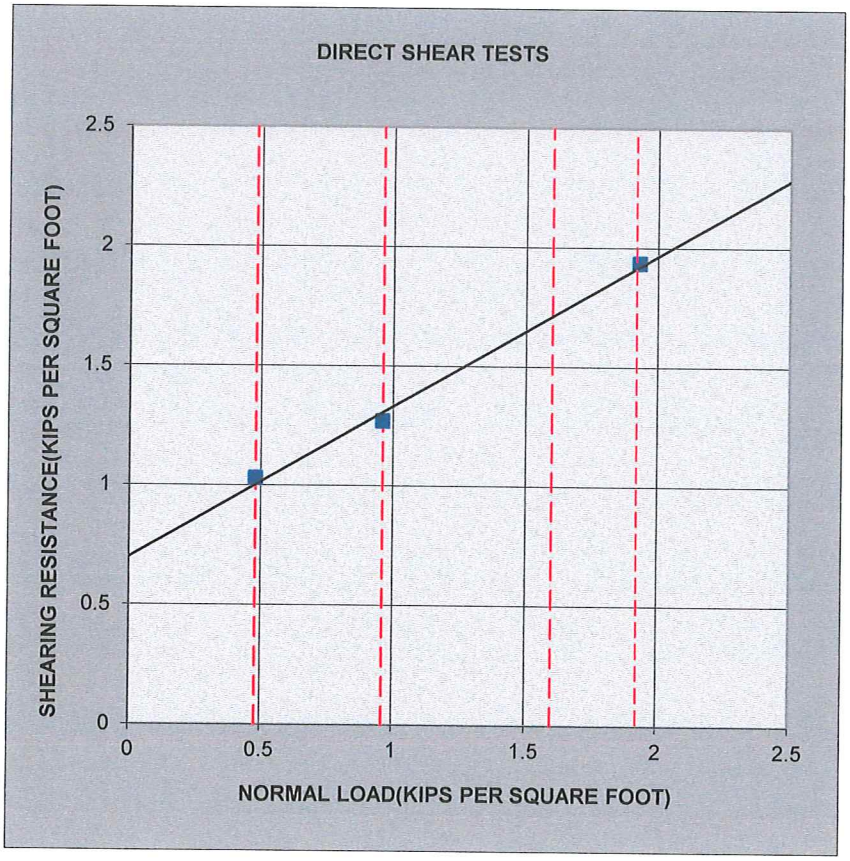
Test Boring & Sample Depth	Test Condition	Cohesion (PSF)	Friction (Degree)
B-1 @ 1-5 ft	Remolded to 90%	700	32
B-5 @ 5.0	Undisturbed	175	55
B-9 @ 7.0	Undisturbed	600	38

Table IV: Consolidation (D2435)

Sample #	Depth (ft.)	Consolidation prior to saturation (%) @ 2 kips	Hydro collapse (%) @ 2 kips	Total Consolidation (%@ 8 kips) (saturated)
B-1 (remolded to 90%)	1-5	1.3	3.6	10.6
1 (undisturbed)	5.0	0.8	0.1	1.9
2 (undisturbed)	3.0	0.8	0.0	1.7
3 (undisturbed)	7.0	0.6	0.0	1.4
5 (undisturbed)	5.0	0.8	0.9	4.0
5 (undisturbed)	10.0	0.8	-0.2	1.9
7 (undisturbed)	3.0	0.8	0.6	3.1

Table V. Soils Expansion Index, EI. (ASTM D4829)

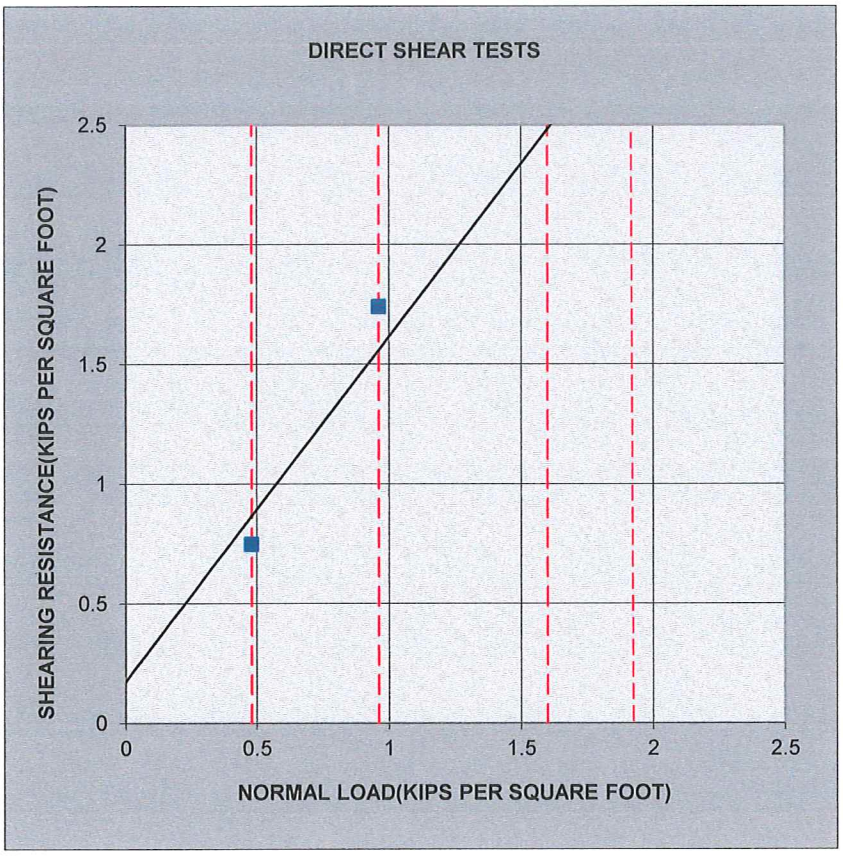
Sample Location & Soils Type	Soil Expansion Index, EI	Expansion Potential
B-1 @ 1-5'	18	"very low"



SYMBOL	LOCATION	DEPTH (FT)	TEST CONDITION	COHESION (psf)	FRICTION (degree)
■	B-1	0 to 5	Remolded to 90%	700.04	32.35

Proposed Multi-Family Unit Development NEC Dale St. & Wilson Aveue Perris, California	PROJECT NO.	20003-F
	PLATE	B-1

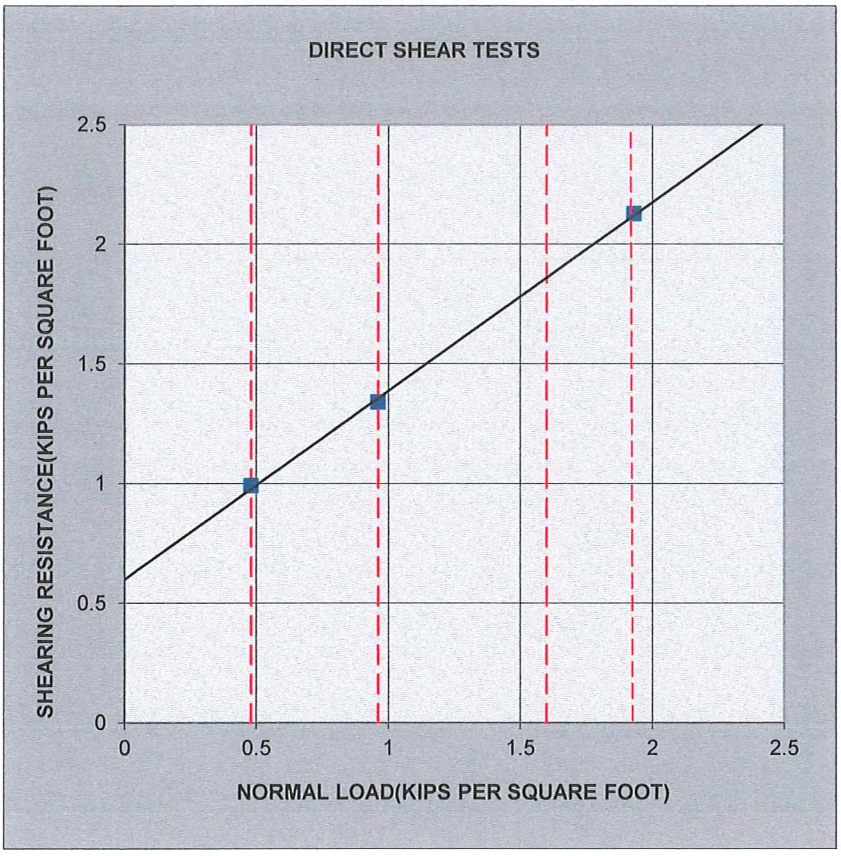
SOILS SOUTHWEST, INC.
Consulting Foundation Engineers



SYMBOL	LOCATION	DEPTH (FT)	TEST CONDITION	COHESION (psf)	FRICTION (degree)
■	B-5	5.0	Undisturbed	175.33	55.27

Proposed Multi-Family Unit Development NEC Dale St. & Wilson Aveue Perris, California	PROJECT NO.	20003-F
	PLATE	B-1-1

SOILS SOUTHWEST, INC.
Consulting Foundation Engineers

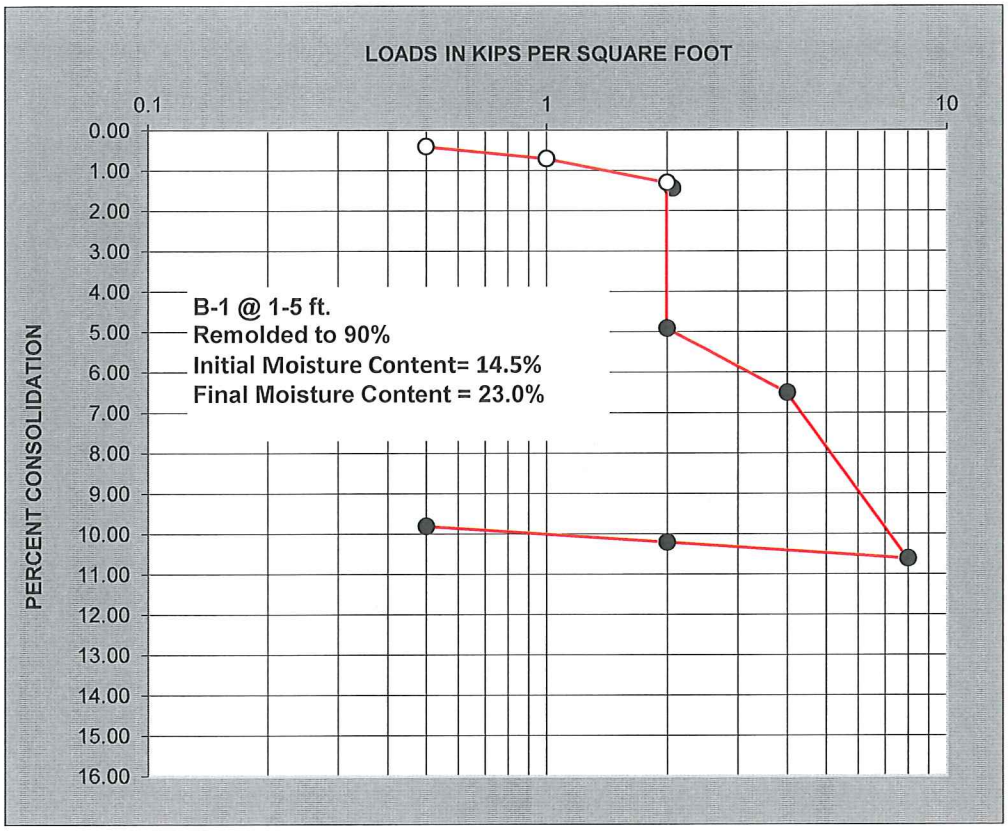


SYMBOL	LOCATION	DEPTH (FT)	TEST CONDITION	COHESION (psf)	FRICTION (degree)
■	B-9	7.0	Undisturbed	600.38	38.24

Proposed Multi-Family Unit Development NEC Dale St. & Wilson Aveue Perris, California	PROJECT NO.	20003-F
	PLATE	B-1-2

SOILS SOUTHWEST, INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS

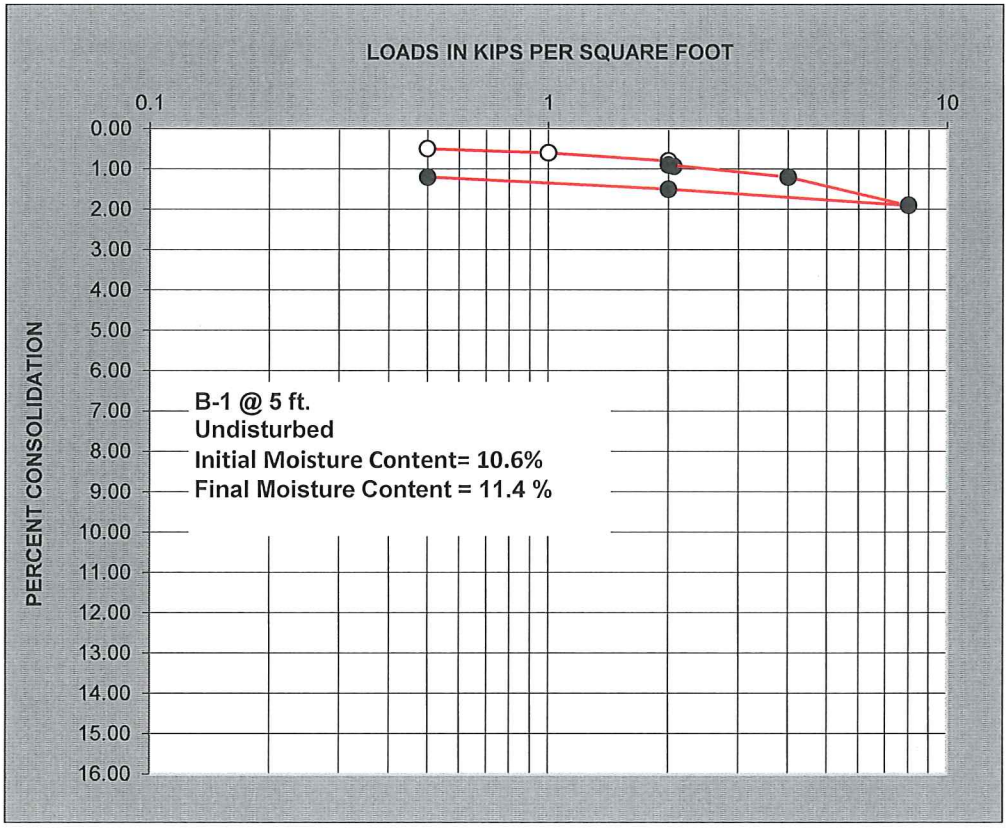


- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Apartment Complex NEC Dale St. & Wilson Ave., Perris		
	PROJECT NO.	20003-F	PLATE	B-2

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS

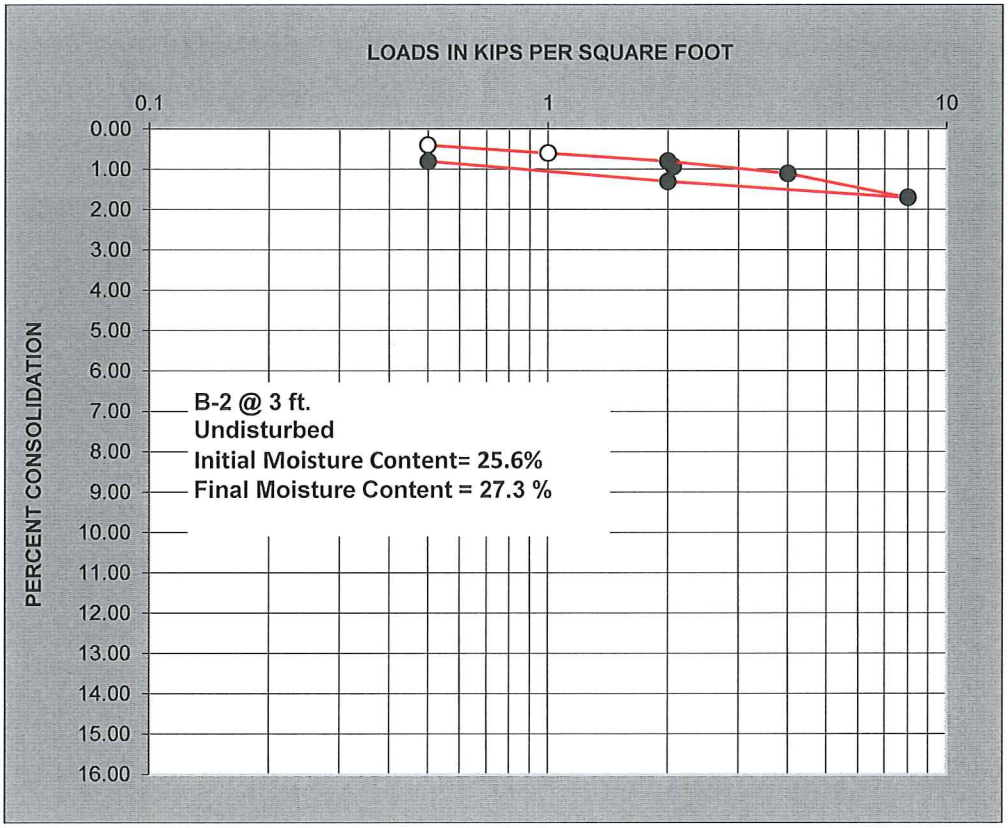


- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Apartment Complex NEC Dale St. & Wilson Ave., Perris		
	PROJECT NO.	20003-F	PLATE	B-2-1

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS

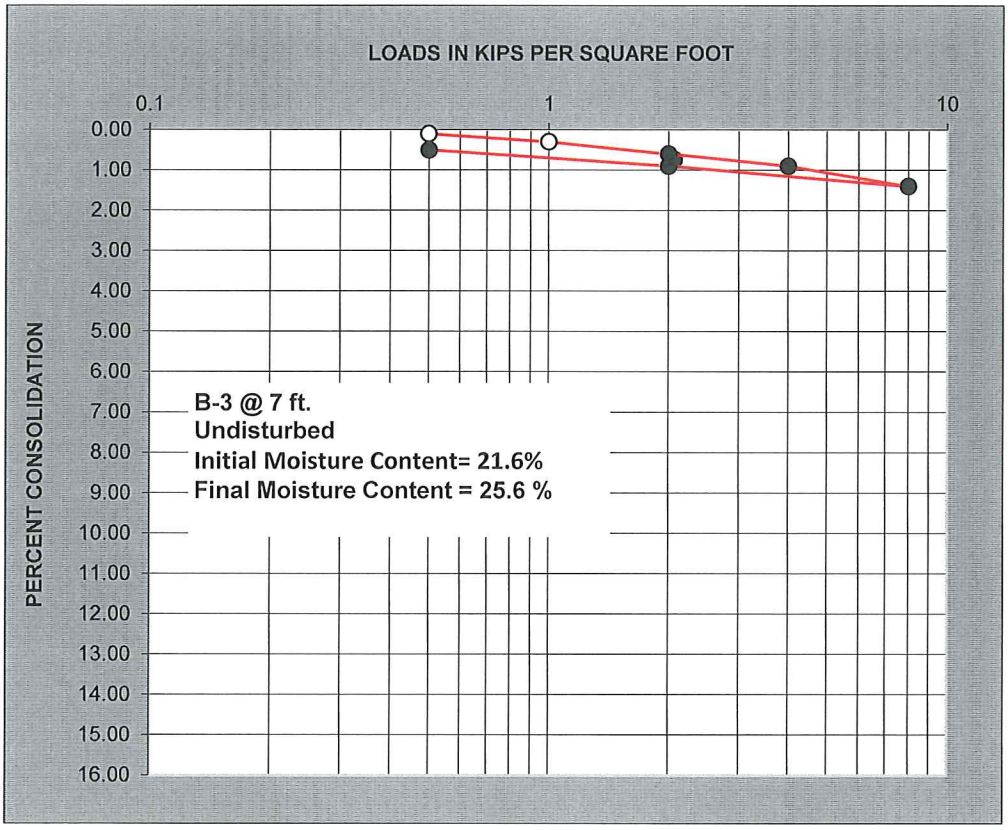


- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Apartment Complex NEC Dale St. & Wilson Ave., Perris		
	PROJECT NO.	20003-F	PLATE	B-2-2

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS

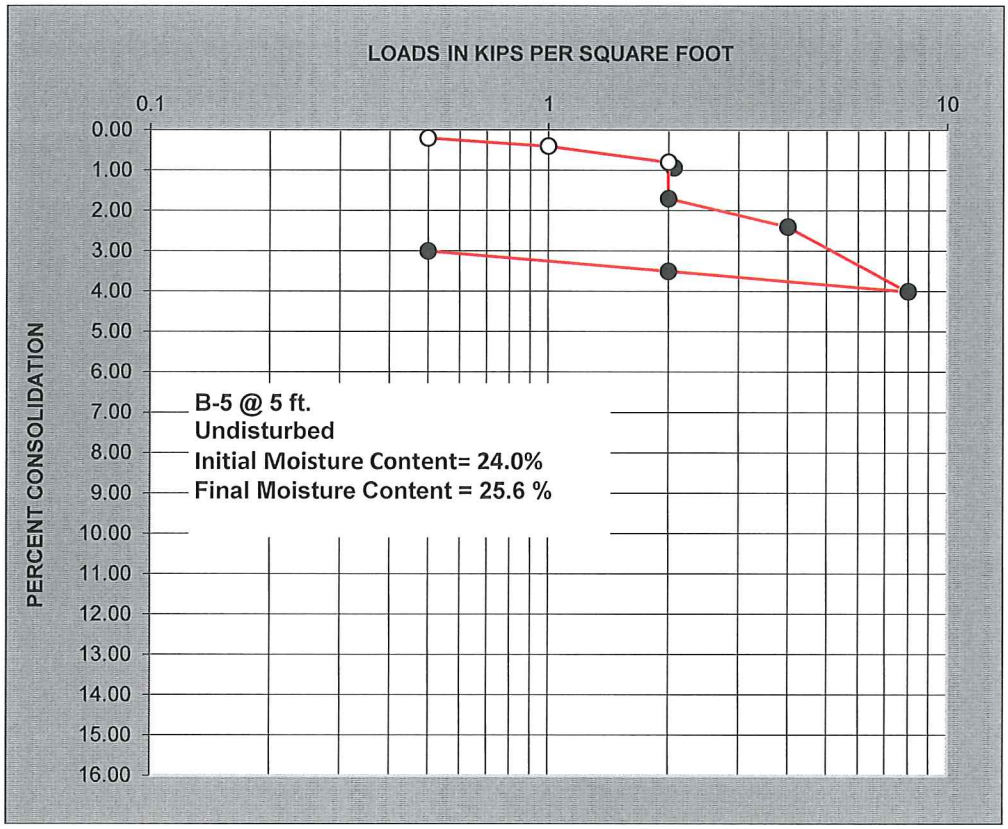


- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Apartment Complex NEC Dale St. & Wilson Ave., Perris		
	PROJECT NO.	20003-F	PLATE	B-2-3

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS

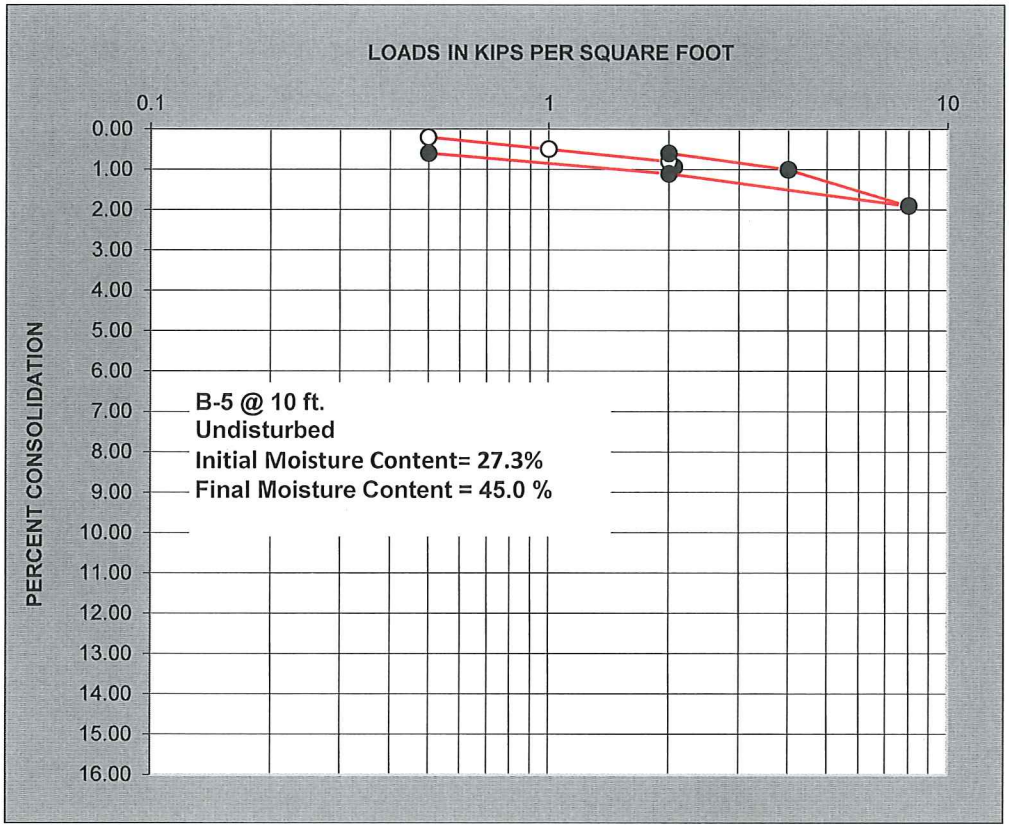


- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Apartment Complex NEC Dale St. & Wilson Ave., Perris		
	PROJECT NO.	20003-F	PLATE	B-2-4

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS

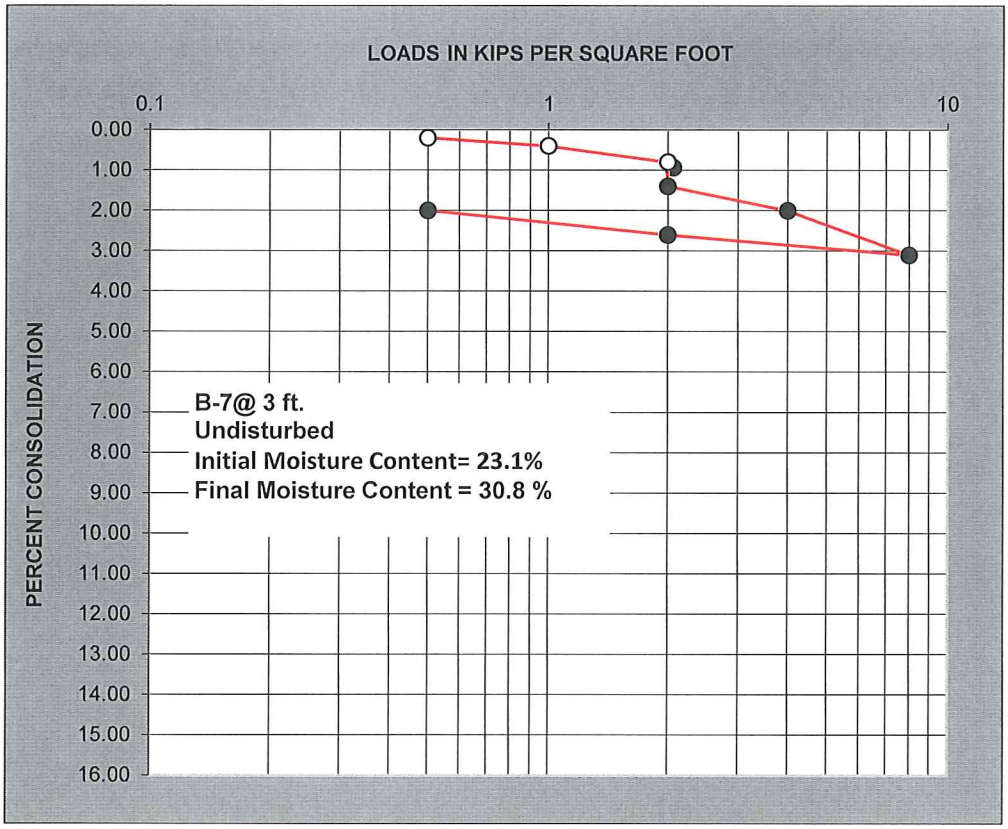


- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Apartment Complex NEC Dale St. & Wilson Ave., Perris		
	PROJECT NO.	20003-F	PLATE	B-2-5

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS



- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Apartment Complex NEC Dale St. & Wilson Ave., Perris		
	PROJECT NO.	20003-F	PLATE	B-2-6

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

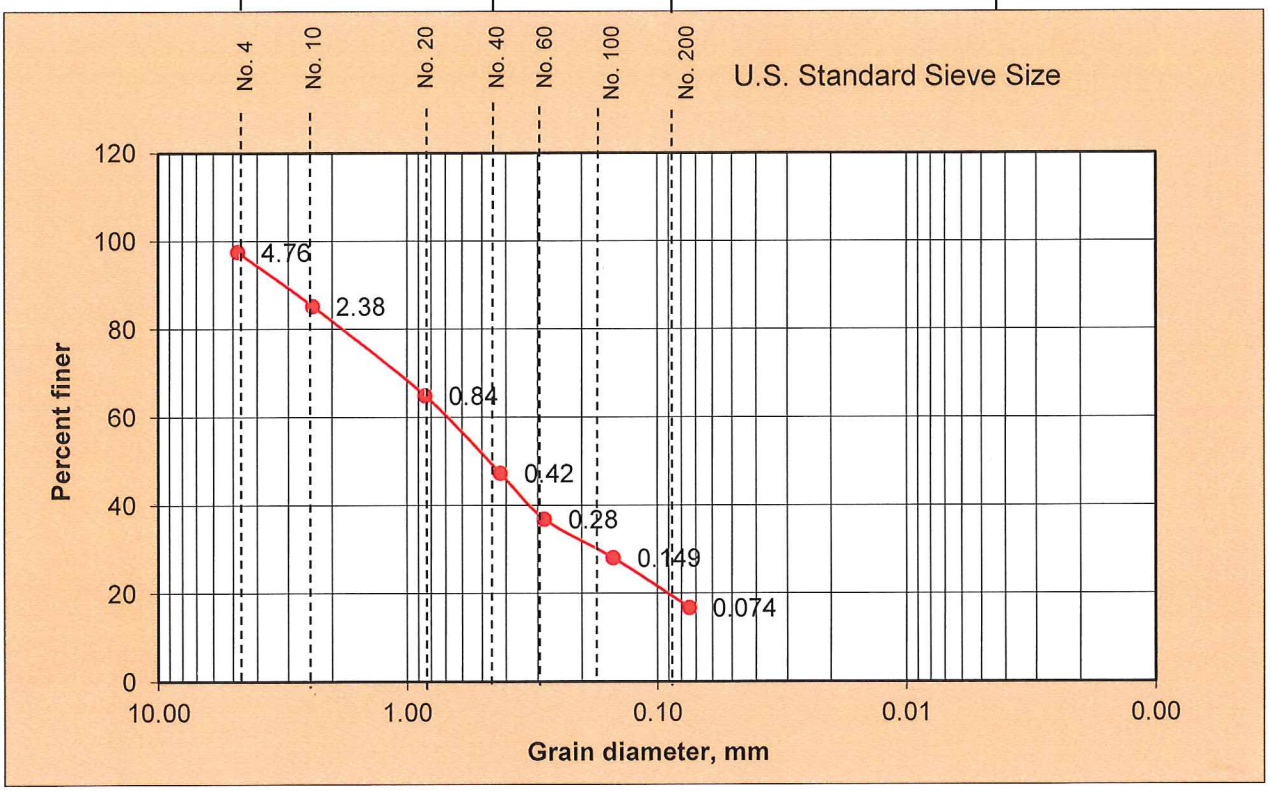
GRAIN SIZE DISTRIBUTION ASTM D422

Project: Praire View Apartments **Job #** 20003-F
Location: NEC Dale St & Wilson Avenue Perris **Boring No:** B-1 @ 0-5' **Sample No:** 1
Description of Soil: SP-SM fine to coarse
Date of Sample: 2/11/2020
Tested By: JF **Date of Testing:** 1/18/2022

Sieve No.	Sieve Openings in mm	Percent Finer
4	4.76	97.56
10	2.38	85.28
20	0.84	64.94
40	0.42	47.32
60	0.28	36.86
100	0.149	28.08
200	0.074	16.76

Grain Size	% Retained
Gravel	2.5
Med. to Crs	47.5
Fines	31
Silts	19

Gravel	Sand			
	Coarse to Medium	Fine	Silt	Clay



Visual Soil Description : SP-SM fine to coarse sands with some silts.

Soil Classification: SP-SM

System: USC

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

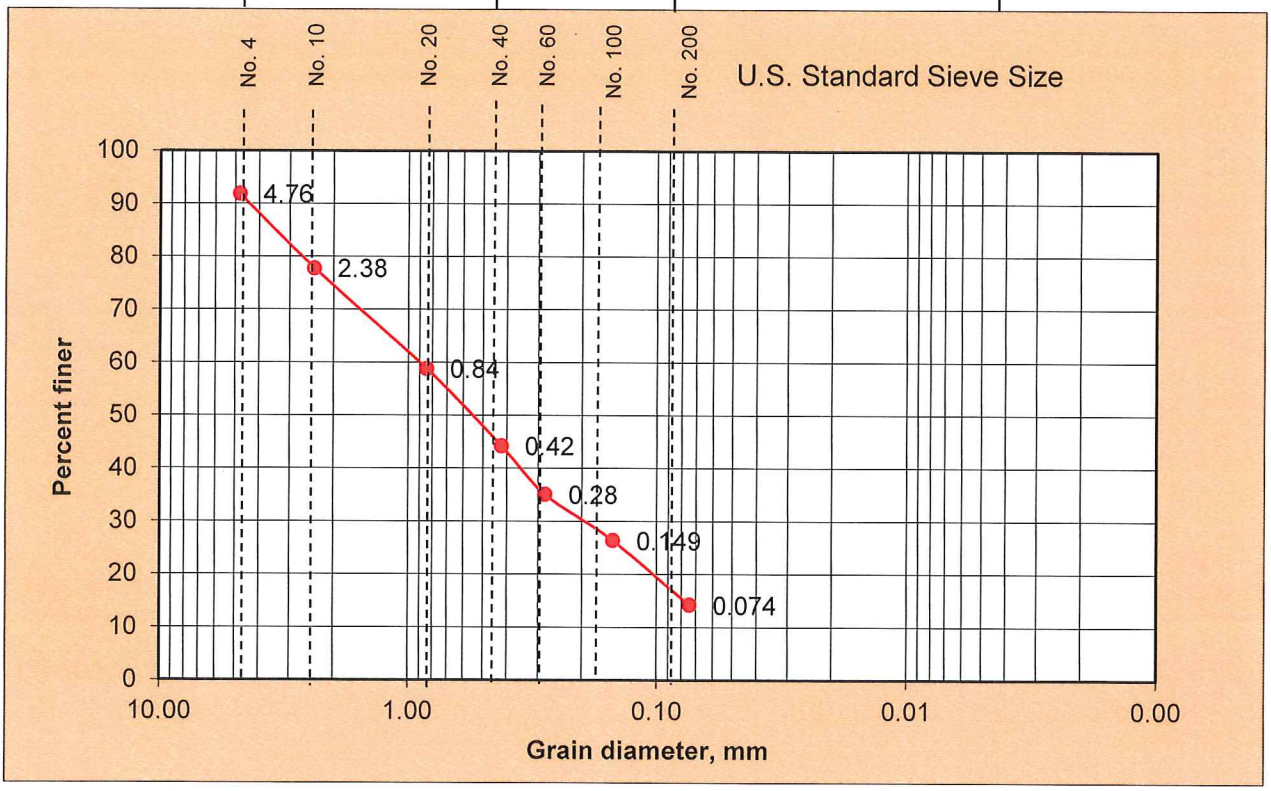
GRAIN SIZE DISTRIBUTION ASTM D422

Project: Praire View Apartments **Job #** 20003-F
Location: NEC Dale St & Wilson Avenue Perris **Boring No:** B-7 @ 5-10 **Sample No:** 2
Description of Soil: SP-SM fine to coarse
Date of Sample: 2/11/2020
Tested By: JF **Date of Testing:** 1/18/2022

Sieve No.	Sieve Openings in mm	Percent Finer
4	4.76	91.88
10	2.38	77.82
20	0.84	58.84
40	0.42	44.26
60	0.28	35.10
100	0.149	26.40
200	0.074	14.24

Grain Size	% Retained
Gravel	8
Med. to Crs	46
Fines	30
Silts	16

Gravel	Sand			
	Coarse to Medium	Fine	Silt	Clay



Visual Soil Description : SP-SM fine to coarse sands with some silts.

Soil Classification: SP-SM

System: USC

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

APPENDIX C

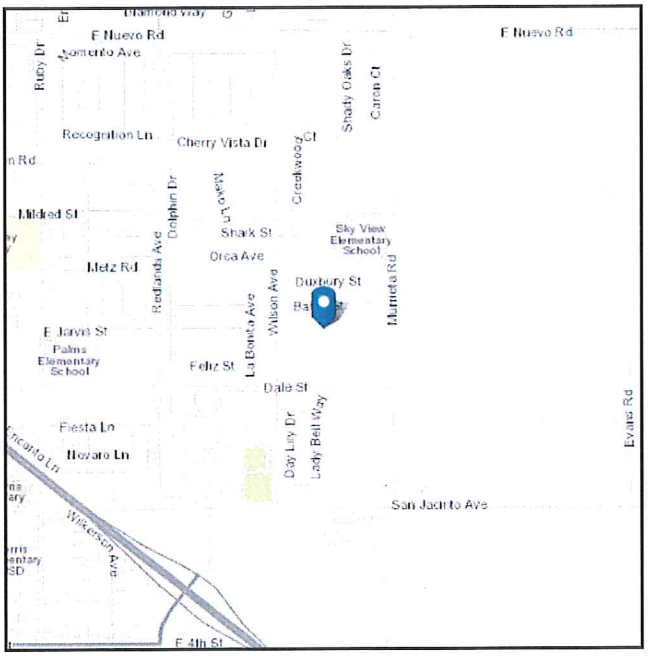
Supplemental Seismic Design Parameters

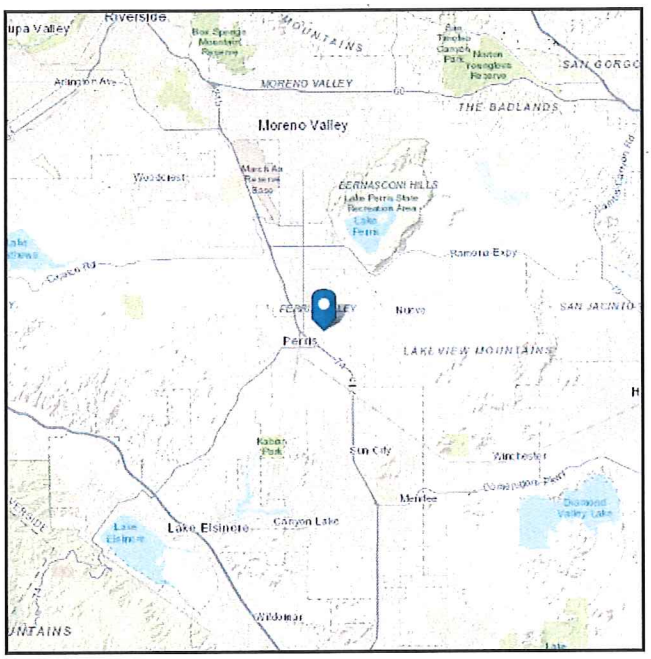
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: III
Soil Class: D - Stiff Soil

Elevation: 1420.54 ft (NAVD 88)
Latitude: 33.792049
Longitude: -117.2112





ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.463	S_{D1} :	N/A
S_1 :	0.544	T_L :	8
F_a :	1	PGA :	0.5
F_v :	N/A	PGA_M :	0.55
S_{MS} :	1.463	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1.25
S_{DS} :	0.975	C_v :	1.393

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Thu Jan 13 2022

Date Source: USGS Seismic Design Maps

Ground Motion Interpolator (2008)

Longitude: -117.2112

Latitude: 33.792049

VS30: 270 (180-1050 m/sec)

Return Period:

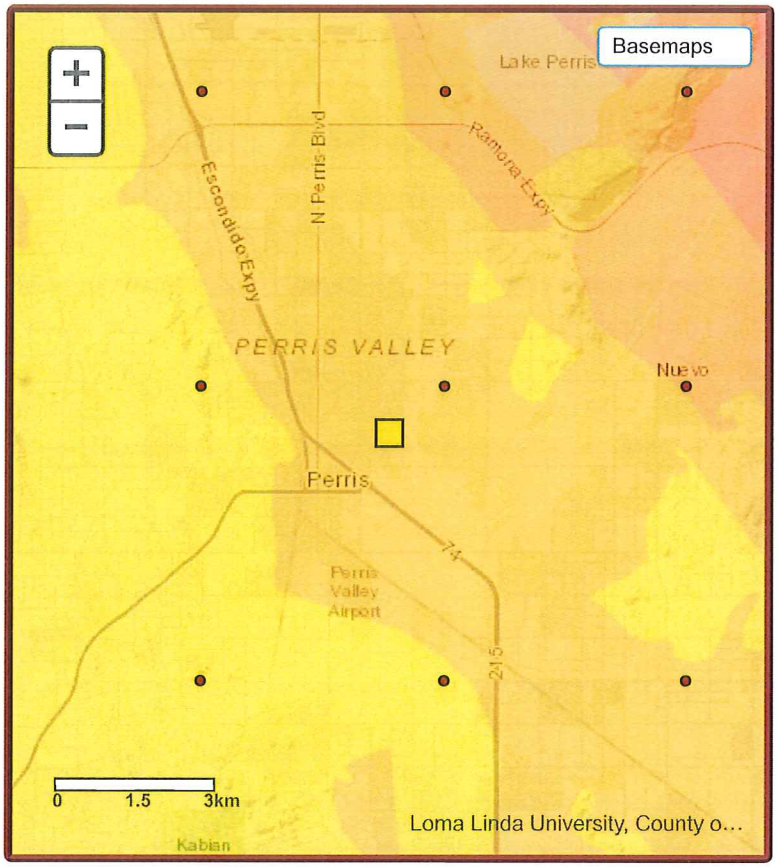
2% in 50 years 10% in 50 years

Spectral Acceleration:

PGA 0.2 second SA 1.0 second SA

Submit

Inputs:	**Result:**
-117.2112, 33.792049 vs30: 270 m/sec 10% in 50 years PGA	**0.454 g**



Information and Disclaimer

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Distance in Miles	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)	Length (km)
8.94	San Jacinto;A+C	CA	n/a	90	V	strike slip	0	17	118
8.94	San Jacinto;A+CC	CA	n/a	90	V	strike slip	0	16	118
8.94	San Jacinto;A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	178
8.94	San Jacinto;A+CC+B	CA	n/a	90	V	strike slip	0.1	15	152
8.94	San Jacinto;A	CA	9	90	V	strike slip	0	17	71
10.33	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16	134
10.33	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17	181
10.33	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16	181
10.33	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	215
10.33	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	241
10.33	San Jacinto;SJV+A	CA	n/a	90	V	strike slip	0	17	89
10.33	San Jacinto;SJV+A+C	CA	n/a	90	V	strike slip	0	17	136
10.33	San Jacinto;SJV+A+CC	CA	n/a	90	V	strike slip	0	16	136
10.33	San Jacinto;SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	170
10.33	San Jacinto;SJV+A+CC+B+SM	CA	n/a	90	V	strike	0.1	15	196

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Fault Name	State
San Jacinto;A+C	California

GEOMETRY	
Dip (degrees)	90
Dip direction	V
Sense of slip	strike slip
Rupture top (km)	0
Rupture bottom (km)	17
Rake (degrees)	180
Length (km)	118

MODEL VALUES		
Slip Rate	n/a	
Probability of activity	1	
	ELLSWORTH	HANKS
Minimum magnitude	6.5	6.5
Maximum magnitude	7.50	7.47

APPENDIX D

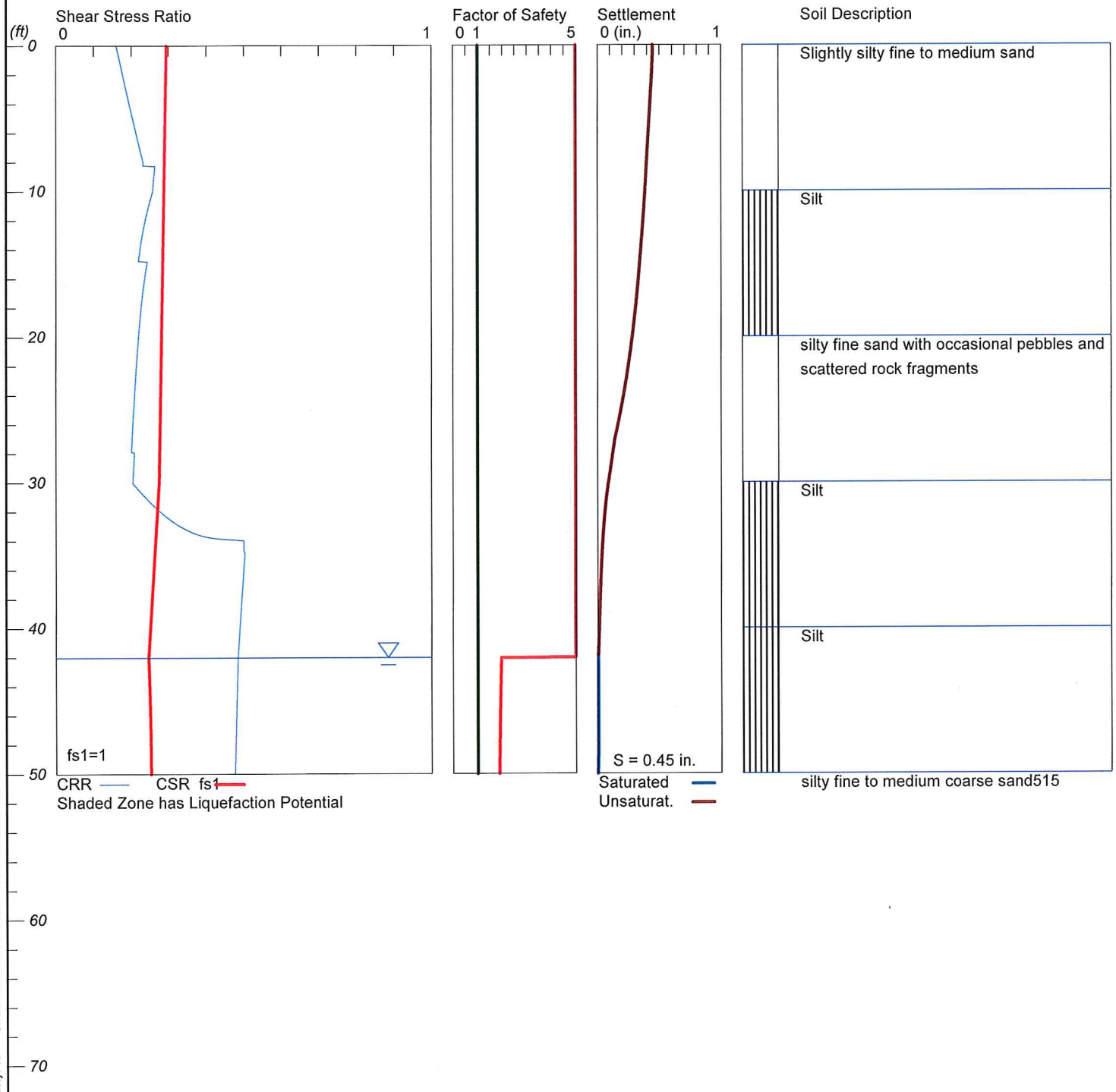
Liquefaction/Settlement Analysis

LIQUEFACTION ANALYSIS

Prairie View Apartments-Pre Construction

Hole No.=B-1 Water Depth=42 ft Surface Elev.=1420

Magnitude=7.5
Acceleration=0.454g



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LIQUEFACTION ANALYSIS SUMMARY

www.civiltech.com

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Input File Name: E:\Liquefy5\20003 Prairie View_Perris.liq

Title: Prairie View Apartments- ***Pre-Construction***

Subtitle: 20003-F

Surface Elev.=1420

Hole No.=B-1

Depth of Hole= 50.00 ft

Water Table during Earthquake= 42.00 ft

Water Table during In-Situ Testing= 42.00 ft

Max. Acceleration= 0.45 g

Earthquake Magnitude= 7.50

Input Data:

Surface Elev.=1420

Hole No.=B-1

Depth of Hole=50.00 ft

Water Table during Earthquake= 42.00 ft

Water Table during In-Situ Testing= 42.00 ft

Max. Acceleration=0.45 g

Earthquake Magnitude=7.50

No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.

2. Settlement Analysis Method: Ishihara / Yoshimine

3. Fines Correction for Liquefaction: Modify Stark/Olson

4. Fine Correction for Settlement: During Liquefaction*

5. Settlement Calculation in: All zones*

6. Hammer Energy Ratio, Ce = 1.0

7. Borehole Diameter, Cb= 1

8. Sampling Method, Cs= 1

9. User request factor of safety (apply to CSR) , User= 1.3

Plot one CSR curve (fs1=1)

10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth	SPT	gamma	Fines
ft		pcf	%
0.00	9.00	93.50	19.00
10.00	16.00	89.00	16.00
20.00	15.00	87.00	25.00
30.00	15.00	105.00	29.00
40.00	51.00	110.00	35.00
50.00	44.00	110.00	6.00

Output Results:

Settlement of Saturated Sands=0.00 in.

Settlement of Unsaturated Sands=0.44 in.

Total Settlement of Saturated and Unsaturated Sands=0.45 in.

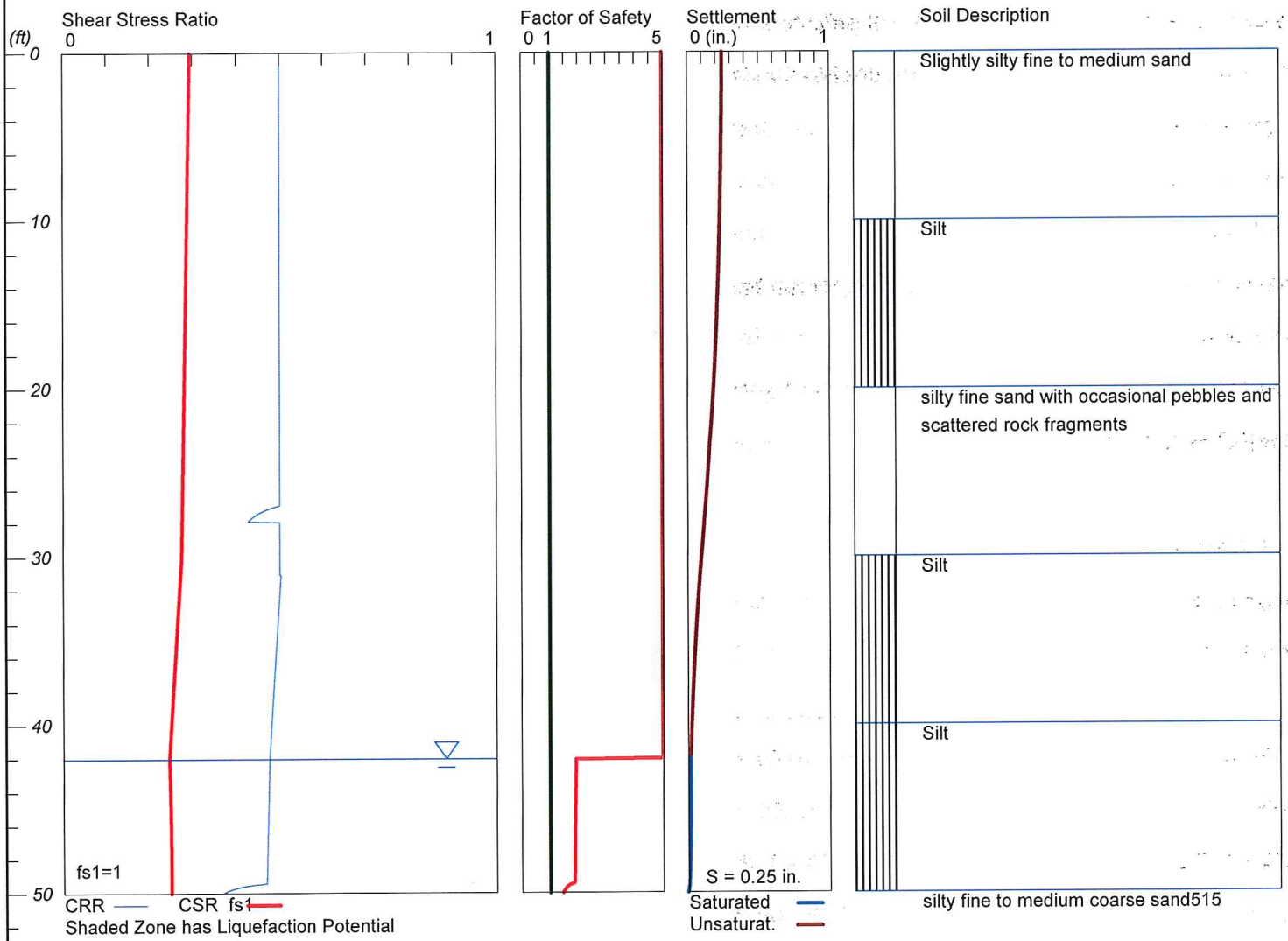
Differential Settlement=0.224 to 0.295 in.

LIQUEFACTION ANALYSIS

Prairie View Apartments-Post Construction

Hole No.=B-1 Water Depth=42 ft Surface Elev.=1420

Magnitude=7.5
Acceleration=0.454g



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LIQUEFACTION ANALYSIS SUMMARY

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Input File Name: E:\Liquefy5\20003 Prairie View_Perris.liq

Title: Prairie View Apartments-***Post Construction***

Subtitle: 20003-F

Surface Elev.=1420

Hole No.=B-1

Depth of Hole= 50.00 ft

Water Table during Earthquake= 42.00 ft

Water Table during In-Situ Testing= 42.00 ft

Max. Acceleration= 0.45 g

Earthquake Magnitude= 7.50

Input Data:

Surface Elev.=1420

Hole No.=B-1

Depth of Hole=50.00 ft

Water Table during Earthquake= 42.00 ft

Water Table during In-Situ Testing= 42.00 ft

Max. Acceleration=0.45 g

Earthquake Magnitude=7.50

No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.

2. Settlement Analysis Method: Ishihara / Yoshimine

3. Fines Correction for Liquefaction: Modify Stark/Olson

4. Fine Correction for Settlement: Post Liquefaction

5. Settlement Calculation in: All zones*

6. Hammer Energy Ratio, Ce = 1.0

7. Borehole Diameter, Cb= 1

8. Sampling Method, Cs= 1

9. User request factor of safety (apply to CSR) , User= 1.3

Plot one CSR curve (fs1=1)

10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth	SPT	gamma	Fines
ft		pcf	%
0.00	30.00	105.00	19.00
10.00	30.00	105.00	16.00
20.00	30.00	105.00	25.00
30.00	30.00	105.00	29.00
40.00	51.00	110.00	35.00
50.00	44.00	110.00	6.00

Output Results:

Settlement of Saturated Sands=0.02 in.

Settlement of Unsaturated Sands=0.23 in.

Total Settlement of Saturated and Unsaturated Sands=0.25 in.

Differential Settlement=0.125 to 0.165 in.

PROFESSIONAL LIMITATIONS

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances by other reputable Soils Engineers practicing in these general or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The investigations are based on soil samples only, consequently the recommendations provided shall be considered 'preliminary'. The samples taken and used for testing and the observations made are believed representative of site conditions; however, soil and geologic conditions can vary significantly between boring. As in most major projects, conditions revealed by excavations may vary with preliminary findings. If this occurs, the changed conditions must be evaluated by the Project Soils Engineer and designs adjusted as required or alternate design recommended.

The report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the project architect and engineers. Appropriate recommendations should be incorporated into structural plans. The necessary steps should be taken to see that out such recommendations in field.

The findings of this report are valid as of this present date. However, changes in the conditions of a property can occur with the passage of time, whether they due to natural process or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur from legislation or broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by change outside of our control. Therefore, this report is subject to review and should be updated after a period of one year.

RECOMMENDED SERVICES

The review of grading plans and specifications, field observations and testing by a geotechnical representative of this office is integral part of the conclusions and recommendations made in this report. If Soils Southwest, Inc. (SSW) is not retained for these services, the Client agrees to assume SSW's responsibility for any potential claims that may arise during and after construction, or during the life-time use of the structure and its appurtenant.

The recommendations supplied should be considered valid and applicable, provided the following conditions, in minimum, are met:

i. Pre-grade meeting with contractor, public agency and soils engineer,
ii. Excavated bottom inspections and verification s by soils engineer prior to backfill placement,
iii. Continuous observations and testing during site preparation and structural fill soils placement,
iv. Observation and inspection of footing trenching prior to steel and concrete placement,
v. Subgrade verifications including plumbing trench backfills prior to concrete slab-on-grade placement,
vi. On and off-site utility trench backfill testing and verifications,
vii. Precise-grading plan review, and
viii. Consultations as required during construction, or upon your request.

Soils Southwest, Inc. will assume no responsibility for any structural distresses during its life-time use; in event the above conditions are not strictly fulfilled.