Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

a) **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System and are presented on the exploration logs in Appendix A.

b) **MOISTURE-DENSITY:** In-place moisture contents and dry densities were determined for representative soil samples. This information was an aid to classification and permitted recognition of variations in material consistency with depth. The dry unit weight is determined in pounds per cubic foot, and the in-place moisture content is determined as a percentage of the soil's dry weight. The results of these tests are summarized in the exploration logs presented in Appendix A.

c) **DIRECT SHEAR:** Direct shear tests were performed to determine the failure envelope of selected soils based on yield shear strength. The shear box was designed to accommodate a sample having a diameter of 2.375 inches or 2.50 inches and a height of 1.0 inch. Samples were tested at different vertical loads and a saturated moisture content. The shear stress was applied at a constant rate of strain of approximately 0.05 inch per minute.

d) **EXPANSION INDEX TEST:** The expansion index of a selected soil was determined in accordance with ASTM D4829. A 1-inch-thick by 4-inch-diameter specimen was prepared by compacting the soil with a specified energy at approximately 50 percent saturation. The specimen was placed in a consolidometer with porous stones at the top and bottom and a total normal pressure of 144.7 psf was applied. The specimen was allowed to consolidate for a period of 10 minutes and then saturated. The change in vertical movement was recorded until the rate of expansion became nominal.

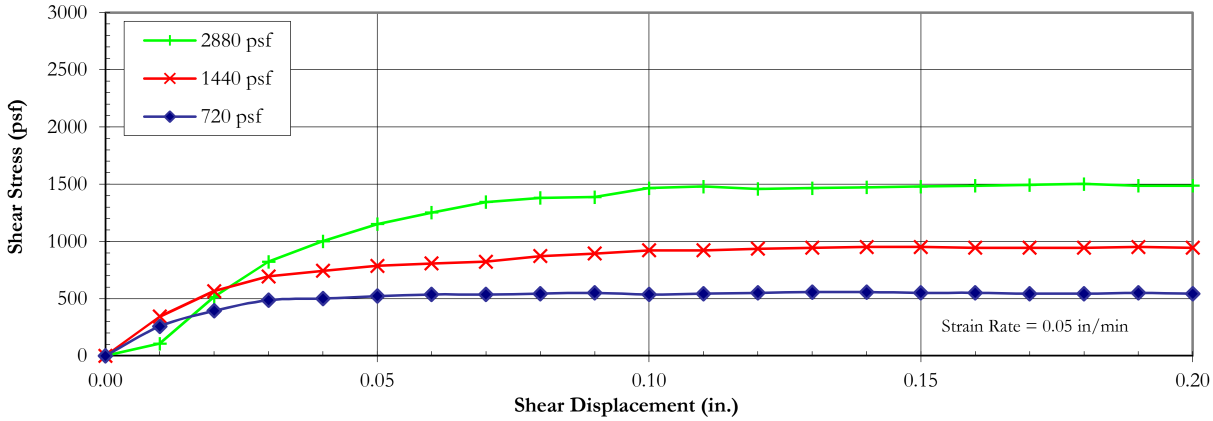
e) **GRAIN SIZE DISTRIBUTION:** The grain size distributions of selected samples were determined in accordance with ASTM C136 and/or ASTM D422.

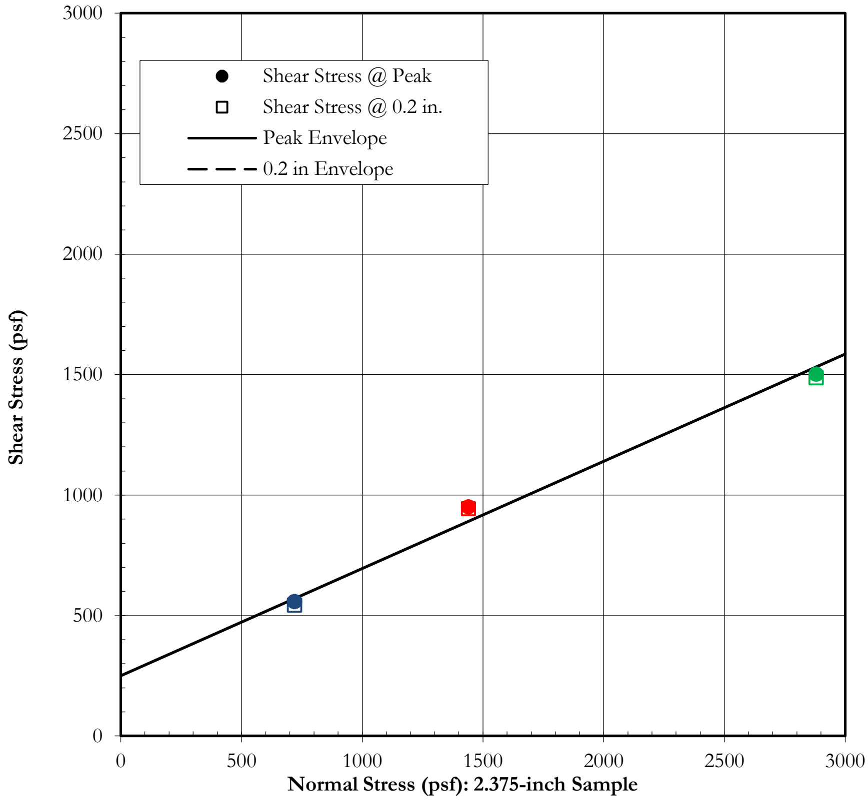
f) **MAXIMUM DENSITY & OPTIMUM MOISTURE CONTENT:** The maximum dry density and optimum moisture content of typical soils were determined in the laboratory in accordance with ASTM Standard Test D-1557, Method A.

g) **RESISTANCE VALUE:** The R-Value was determined for one or more samples of soil likely to be present at the subgrade level. The R-Value was determined in accordance with California Test Method 301.

h) **SOLUBLE SULFATES:** The soluble sulfate content was determined for samples of soil likely to be present at the foundation level. The soluble sulfate content was determined in accordance with California Test Method 417.

DIRECT SHEAR TEST (ASTM D3080)





Sample No. T-4 @ 2½'-4'

Sample Type: Remolded to 90%

Normal Stress (psf)	**720**	**1440**	**2880**
Peak Shear Stress (psf)	558	951	1502
Shear Stress at 0.2 in (psf)	543	944	1487
Initial Dry Density (pcf)	105.0	105.0	105.0
Initial Moisture Content (%)	11.9	11.9	11.9

	Peak	**at 0.2 in Displacement**
Friction Angle, ϕ (deg):	24	
Cohesion Intercept, c (psf):	250	

CHRISTIAN WHEELER ENGINEERING

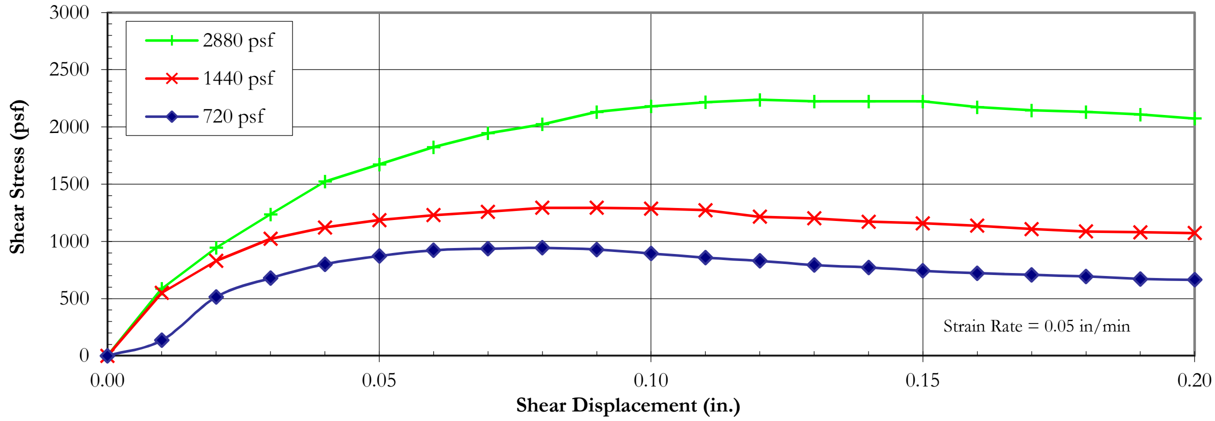
LABORATORY TEST RESULTS

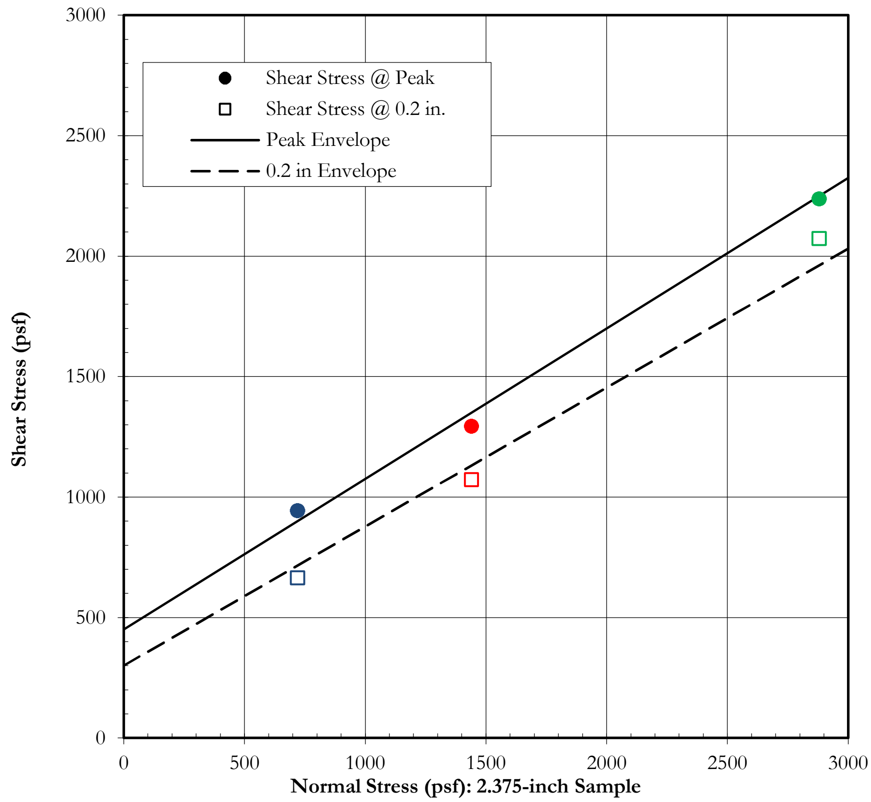
SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

FIGURE: B-2

BY: SCC | DATE: AUGUST 2016 | REPORT NO: 2150438.01

DIRECT SHEAR TEST (ASTM D3080)





Sample No. T-4 @ 4'-6'

Sample Type: Remolded to 90%

Normal Stress (psf)	**720**	**1440**	**2880**
Peak Shear Stress (psf)	944	1294	2238
Shear Stress at 0.2 in (psf)	665	1073	2074
Initial Dry Density (pcf)	118.0	118.0	118.0
Initial Moisture Content (%)	8.6	8.6	8.6

	Peak	**at 0.2 in Displacement**
Friction Angle, ϕ (deg):	32	30
Cohesion Intercept, c (psf):	450	300

CHRISTIAN WHEELER ENGINEERING

LABORATORY TEST RESULTS

SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

FIGURE: B-3

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EXPANSION INDEX (ASTM D2849)

Sample No.	Initial Moisture (%)	Initial Dry Density (pcf)	Final Moisture (%)	Expansion Index	Expansion Potential
T-4 @ 2½'-4'	10.1	107.6	21.7	35	Low

CLASSIFICATION OF EXPANSION POTENTIAL

Expansion Index	Expansion Potential
1-20	Very Low
21-50	Low
51-90	Medium
91-130	High
> 130	Very High

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LABORATORY TEST RESULTS

SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

FIGURE: B-4

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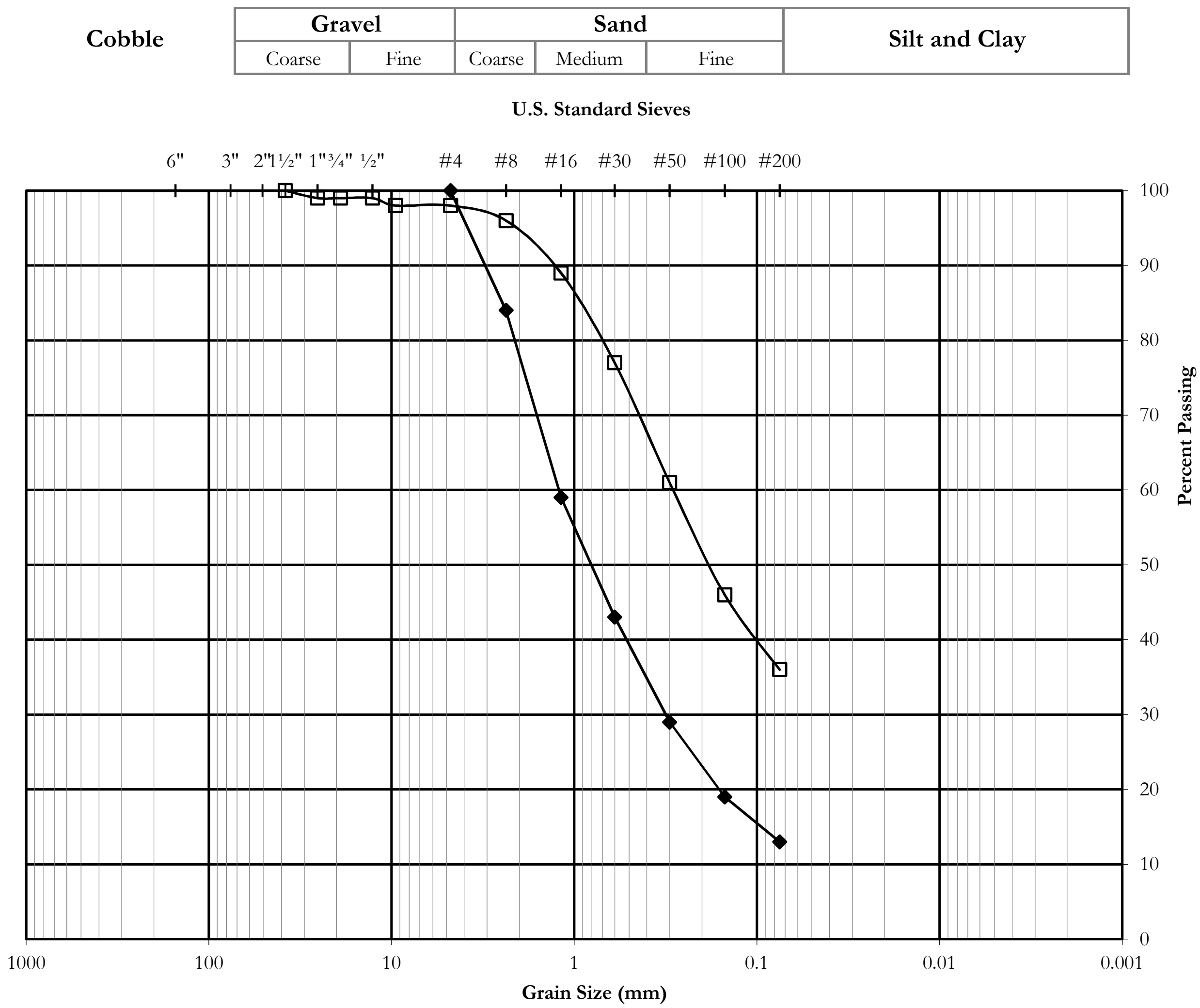
GRAIN SIZE DISTRIBUTION (ASTM D422)



Symbol	Sample No.	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	USCS
□	**T-4 @ 2½'-4'**									SC
♦	**T-4 @ 4'-6'**									SM

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LABORATORY TEST RESULTS

SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

FIGURE: B-5

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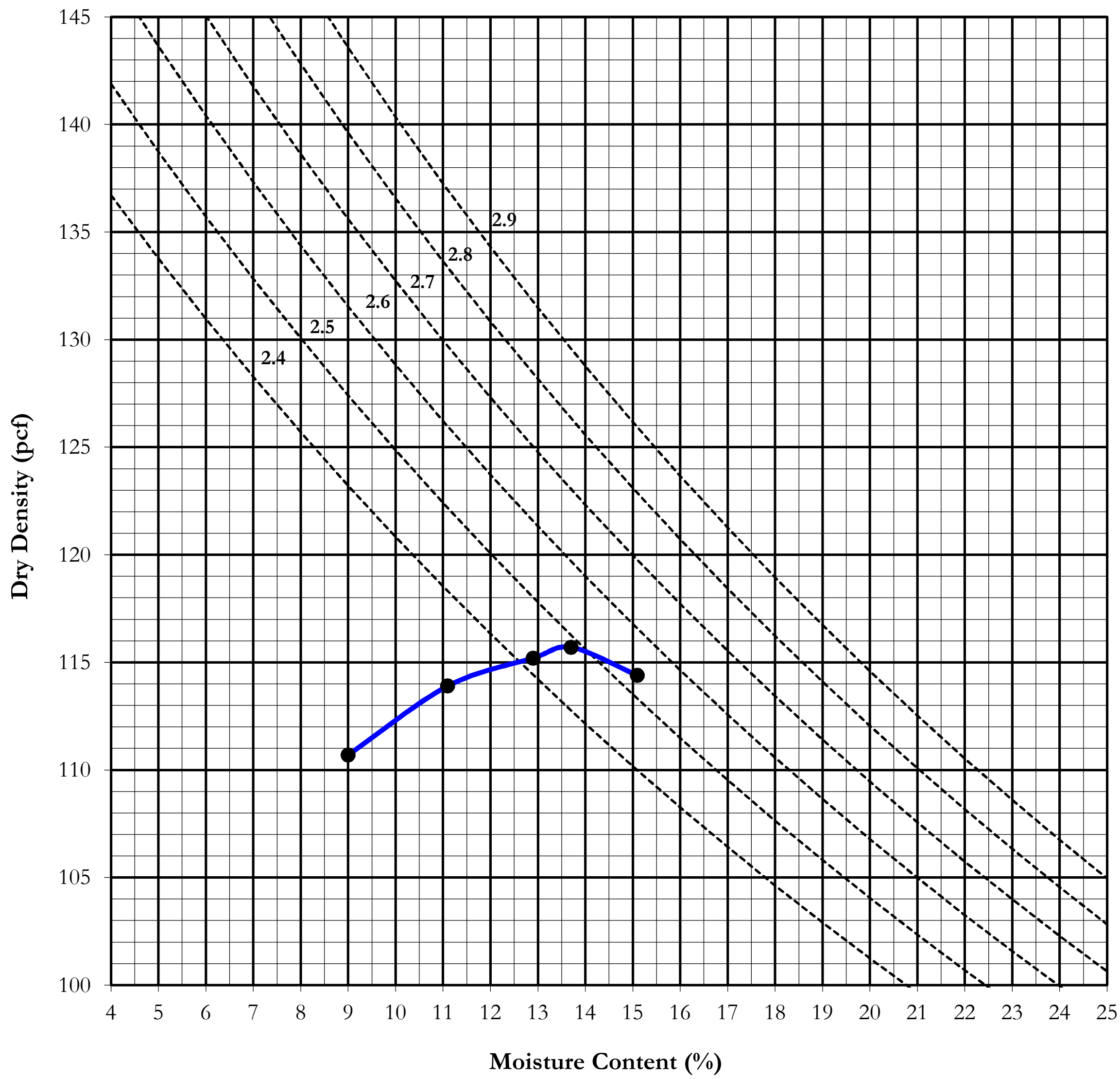
MAXIMUM DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557)



Sample No	Sample Description	Method	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
T-4 @ 2½'-4'	Reddish-brown, clayey sand	A	115.7	13.7

CHRISTIAN WHEELER
ENGINEERING

LABORATORY TEST RESULTS

SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

FIGURE: B-6

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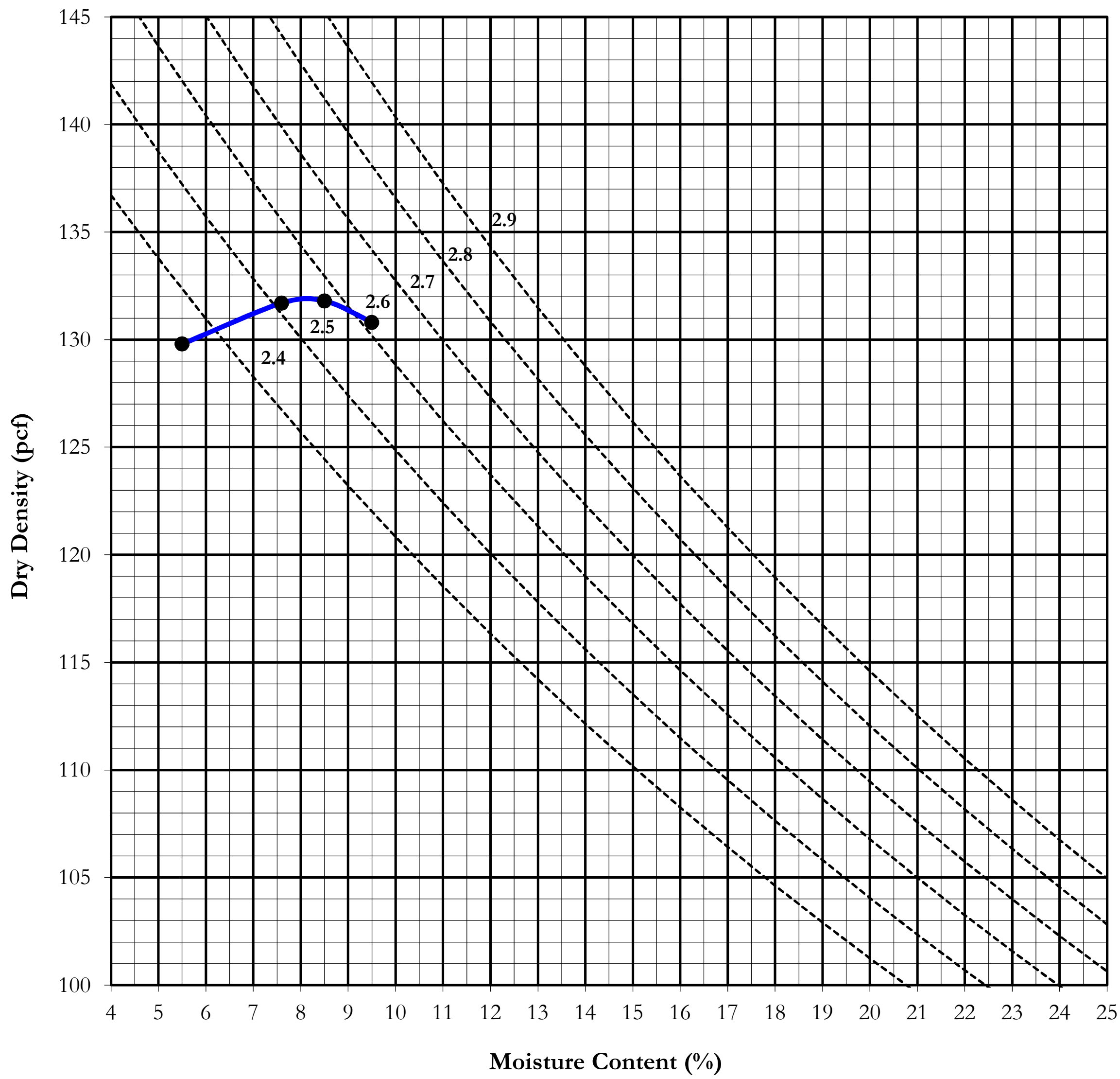
MAXIMUM DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557)



Sample No	Sample Description	Method	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
T-4 @ 4'-6'	Reddish- to grayish-brown, silty sand	A	131.8	8.5

CHRISTIAN WHEELER ENGINEERING

LABORATORY TEST RESULTS

SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

FIGURE: B-7

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RESISTANCE VALUE (CALTEST 301)

Sample No.	Sample Description	R-Value
T-2 @ 2'-5'	Reddish- to grayish-brown, silty sand	69
T-5 @ 0-2½'	Grayish-brown, silty sand	32

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ENGINEERING

LABORATORY TEST RESULTS

SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

FIGURE: B-8

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CORROSIVITY TESTS

Sample No.	CALTEST 417 Sulfate Content ($\% \; SO_4$)	CALTEST 643 pH	CALTEST 643 Resistivity (ohm-cm)	CALTEST 422 Chloride Content (ppm)
T-4 @ 2½'-4'	0.016	--	--	--

LABORATORY TEST RESULTS

CHRISTIAN WHEELER ENGINEERING

SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

FIGURE: B-9

BY: SCC | DATE: AUGUST 2016 | REPORT NO: 2150438.01

Appendix C

References

REFERENCES

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Hart, E. W. and Bryant, W. A., 1997, Fault-Rupture Hazard Zones in California; California Division of Mines and Geology Special Publication 42

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U.S. Geological Survey, Quaternary Faults in Google Earth, http://earthquake.usgs.gov/hazards/qfaults/google.php

Appendix D

Recommended Grading Specifications – General Provisions

RECOMMENDED GRADING SPECIFICATIONS - GENERAL PROVISIONS

SHADY OAK
27522 VALLEY CENTER ROAD
VALLEY CENTER, CALIFORNIA

GENERAL INTENT

The intent of these specifications is to establish procedures for clearing, compacting natural ground, preparing areas to be filled, and placing and compacting fill soils to the lines and grades shown on the accepted plans. The recommendations contained in the preliminary geotechnical investigation report and/or the attached Special Provisions are a part of the Recommended Grading Specifications and shall supersede the provisions contained hereinafter in the case of conflict. These specifications shall only be used in conjunction with the geotechnical report for which they are a part. No deviation from these specifications will be allowed, except where specified in the geotechnical report or in other written communication signed by the Geotechnical Engineer.

OBSERVATION AND TESTING

Christian Wheeler Engineering shall be retained as the Geotechnical Engineer to observe and test the earthwork in accordance with these specifications. It will be necessary that the Geotechnical Engineer or his representative provide adequate observation so that he may provide his opinion as to whether or not the work was accomplished as specified. It shall be the responsibility of the contractor to assist the Geotechnical Engineer and to keep him appraised of work schedules, changes and new information and data so that he may provide these opinions. In the event that any unusual conditions not covered by the special provisions or preliminary geotechnical report are encountered during the grading operations, the Geotechnical Engineer shall be contacted for further recommendations.

If, in the opinion of the Geotechnical Engineer, substandard conditions are encountered, such as questionable or unsuitable soil, unacceptable moisture content, inadequate compaction, adverse weather, etc., construction should be stopped until the conditions are remedied or corrected or he shall recommend rejection of this work.

Tests used to determine the degree of compaction should be performed in accordance with the following American Society for Testing and Materials test methods:

Maximum Density & Optimum Moisture Content - ASTM D-1557
Density of Soil In-Place - ASTM D-1556 or ASTM D-6938

All densities shall be expressed in terms of Relative Compaction as determined by the foregoing ASTM testing procedures.

PREPARATION OF AREAS TO RECEIVE FILL

All vegetation, brush and debris derived from clearing operations shall be removed, and legally disposed of. All areas disturbed by site grading should be left in a neat and finished appearance, free from unsightly debris.

After clearing or benching the natural ground, the areas to be filled shall be scarified to a depth of 6 inches, brought to the proper moisture content, compacted and tested for the specified minimum degree of compaction. All loose soils in excess of 6 inches thick should be removed to firm natural ground which is defined as natural soil which possesses an in-situ density of at least 90 percent of its maximum dry density.

When the slope of the natural ground receiving fill exceeds 20 percent (5 horizontal units to 1 vertical unit), the original ground shall be stepped or benched. Benches shall be cut to a firm competent formational soil. The lower bench shall be at least 10 feet wide or 1-1/2 times the equipment width, whichever is greater, and shall be sloped back into the hillside at a gradient of not less than two (2) percent. All other benches should be at least 6 feet wide. The horizontal portion of each bench shall be compacted prior to receiving fill as specified herein for compacted natural ground. Ground slopes flatter than 20 percent shall be benched when considered necessary by the Geotechnical Engineer.

Any abandoned buried structures encountered during grading operations must be totally removed. All underground utilities to be abandoned beneath any proposed structure should be removed from within 10 feet of the structure and properly capped off. The resulting depressions from the above described procedure should be backfilled with acceptable soil that is compacted to the requirements of the Geotechnical Engineer. This includes, but is not limited to, septic tanks, fuel tanks, sewer lines or leach lines, storm drains and water lines. Any buried structures or utilities not to be abandoned should be brought to the attention of the Geotechnical Engineer so that he may determine if any special recommendation will be necessary.

All water wells which will be abandoned should be backfilled and capped in accordance to the requirements set forth by the Geotechnical Engineer. The top of the cap should be at least 4 feet below finish grade or 3 feet below the bottom of footing whichever is greater. The type of cap will depend on the diameter of the well and should be determined by the Geotechnical Engineer and/or a qualified Structural Engineer.

FILL MATERIAL

Materials to be placed in the fill shall be approved by the Geotechnical Engineer and shall be free of vegetable matter and other deleterious substances. Granular soil shall contain sufficient fine material to fill the voids. The definition and disposition of oversized rocks and expansive or detrimental soils are covered in the geotechnical report or Special Provisions. Expansive soils, soils of poor gradation, or soils with low strength characteristics may be thoroughly mixed with other soils to provide satisfactory fill material, but only with the explicit consent of the Geotechnical Engineer. Any import material shall be approved by the Geotechnical Engineer before being brought to the site.

PLACING AND COMPACTION OF FILL

Approved fill material shall be placed in areas prepared to receive fill in layers not to exceed 6 inches in compacted thickness. Each layer shall have a uniform moisture content in the range that will allow the compaction effort to be efficiently applied to achieve the specified degree of compaction. Each layer shall be uniformly compacted to the specified minimum degree of compaction with equipment of adequate size to economically compact the layer. Compaction equipment should either be specifically designed for soil compaction or of proven reliability. The minimum degree of compaction to be achieved is specified in either the Special Provisions or the recommendations contained in the preliminary geotechnical investigation report.

When the structural fill material includes rocks, no rocks will be allowed to nest and all voids must be carefully filled with soil such that the minimum degree of compaction recommended in the Special Provisions is achieved. The maximum size and spacing of rock permitted in structural fills and in non-structural fills is discussed in the geotechnical report, when applicable.

Field observation and compaction tests to estimate the degree of compaction of the fill will be taken by the Geotechnical Engineer or his representative. The location and frequency of the tests shall be at the Geotechnical Engineer's discretion. When the compaction test indicates that a particular layer is at less than the required degree of compaction, the layer shall be reworked to the satisfaction of the Geotechnical Engineer and until the desired relative compaction has been obtained.

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction by sheepsfoot roller shall be at vertical intervals of not greater than four feet. In addition, fill slopes at a ratio of two horizontal to one vertical or flatter, should be trackrolled. Steeper fill slopes shall be over-built and cut-back to finish contours after the slope has been constructed. Slope compaction operations shall result in all fill material six or more inches inward from the finished face of the slope having a relative compaction of at least 90 percent of maximum dry density or the degree of compaction specified in the Special Provisions section of this specification. The compaction operation on the slopes shall be continued until the Geotechnical Engineer is of the opinion that the slopes will be surficially stable.

Density tests in the slopes will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the Contractor will be notified that day of such conditions by written communication from the Geotechnical Engineer or his representative in the form of a daily field report.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no cost to the Owner or Geotechnical Engineer.

CUT SLOPES

The Engineering Geologist shall inspect cut slopes excavated in rock or lithified formational material during the grading operations at intervals determined at his discretion. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer to determine if mitigating measures are necessary.

Unless otherwise specified in the geotechnical report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of the controlling governmental agency.

ENGINEERING OBSERVATION

Field observation by the Geotechnical Engineer or his representative shall be made during the filling and compaction operations so that he can express his opinion regarding the conformance of the grading with acceptable standards of practice. Neither the presence of the Geotechnical Engineer or his representative or the observation and testing shall release the Grading Contractor from his duty to compact all fill material to the specified degree of compaction.

SEASON LIMITS

Fill shall not be placed during unfavorable weather conditions. When work is interrupted by heavy rain, filling operations shall not be resumed until the proper moisture content and density of the fill materials can be achieved. Damaged site conditions resulting from weather or acts of God shall be repaired before acceptance of work.

RECOMMENDED GRADING SPECIFICATIONS - SPECIAL PROVISIONS

RELATIVE COMPACTION: The minimum degree of compaction to be obtained in compacted natural ground, compacted fill, and compacted backfill shall be at least 90 percent. For street and parking lot subgrade, the upper twelve inches should be compacted to at least 95 percent relative compaction.

EXPANSIVE SOILS: Detrimentally expansive soil is defined as clayey soil which has an expansion index of 50 or greater when tested in accordance with the American Society of Testing Materials (ASTM) Laboratory Test D4829-95.

OVERSIZED MATERIAL: Oversized fill material is generally defined herein as rocks or lumps of soil over six inches in diameter. Oversized materials should not be placed in fill unless recommendations of placement of such material is provided by the Geotechnical Engineer. At least 40 percent of the fill soils shall pass through a No. 4 U.S. Standard Sieve.

TRANSITION LOTS: Where transitions between cut and fill occur within the proposed building pad, the cut portion should be undercut a minimum of one foot below the base of the proposed footings and recompacted as structural backfill. In certain cases that would be addressed in the geotechnical report, special footing reinforcement or a combination of special footing reinforcement and undercutting may be required.

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