August 28, 2019

KA Project No. 112-19078

Mr. Jim Fielden
Fielden Engineering Group
410 E. Avenue K-12, Suite 101
Lancaster, CA 93535

RE: Update to Geotechnical Engineering Investigation Report
Proposed Light Industrial Facility
Indian Trail
Helendale, California 92342

Reference: Geotechnical Engineering Investigation, Proposed Warehouse Building, Indian Trail Near Wheeler Road, Helendale, California, Project No. 112-15020, dated April 29, 2015.

Dear Mr. Fielden:

In accordance with your request, we are providing this letter to update our previous Geotechnical Engineering Investigation report, KA Project No. 112-15020, dated April 29, 2015 for the above-referenced project site.

Based on our review of the proposed site plan and our discussions with the project representative, we understand that the proposed development includes construction of a new light industrial facility at the subject site located in Helendale, California. It is understood that the proposed structures will be of wood, metal or masonry construction supported on conventional shallow foundation systems.

Based on our recent observation of the subject site, review of the previous geotechnical investigation report, and review of the proposed preliminary development site plan, the site and proposed development are consistent with the conclusions and recommendations presented in the previous Geotechnical Engineering Investigation report. Additional information to conform to seismic design requirements of the 2016 California Building Code (2016 CBC) is provided below.

In the event these structural or grading details are inconsistent with the final design criteria, we should be notified so that we can evaluate the potential impacts of the changes on the recommendations presented in this report and provide an updated report as necessary.

The site class, per Table 1613.5.2, 2016 CBC, is based upon the site soil conditions. It is our opinion that a Site Class D is appropriate for building design at this site. For seismic design of the structures, in accordance with the seismic provisions of the 2016 CBC, we recommend the following parameters:

2016 CALIFORNIA BUILDING CODE		
Seismic Item	**Value**	**CBC Reference**
Site Class	D	Table 1613.5.2
Fa	1.019	Table 1613.5.3 (1)
Ss	1.203	Figure 1613.5 (3)
SMS	1.226	Section 1613.5.3
SDS	0.817	Section 1613.5.4
Fv	1.518	Table 1613.5.3 (2)
S1	0.482	Figure 1613.5 (4)
SM1	0.732	Section 1613.5.3
SD1	0.488	Section 1613.5.4

The recommendations and limitations provided in our Geotechnical Engineering Investigation report, KA Project No. 112-15020 apply to this letter and should be incorporated into the design and construction of the proposed development.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

James Kellogg PE, GE
Managing Engineer
RGE No. 2902/RCE No. 65092

REGISTERED PROFESSIONAL ENGINEER
JAMES M. KELLOGG
NO. 65092
EXP. 9/30/2018 21
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
JAMES M. KELLOGG
NO. 2902
EXP. 9/30/2018 21
GEOTECHNICAL
STATE OF CALIFORNIA

Krazan & ASOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

August 28, 2019 KA Project No. 112-19078

Mr. Jim Fielden
Fielden Engineering Group
410 E. Avenue K-12, Suite 101
Lancaster, CA 93535

RE: Update to Geotechnical Engineering Investigation Report
Proposed Light Industrial Facility
Indian Trail
Helendale, California 92342

Reference: Geotechnical Engineering Investigation, Proposed LMAC Helendale Giant Crane Project, Indian Trail Near Wheeler Road, Helendale, California, Project No. 112-15019, dated May 4, 2015.

Dear Mr. Fielden:

In accordance with your request, we are providing this letter to update our previous Geotechnical Engineering Investigation report, KA Project No. 112-15019, dated May 4, 2015 for the above-referenced project site.

Based on our review of the proposed site plan and our discussions with the project representative, we understand that the proposed development includes construction of a new light industrial facility at the subject site located in Helendale, California. It is understood that the proposed structures will be of wood, metal or masonry construction supported on conventional shallow foundation systems.

Based on our recent observation of the subject site, review of the previous geotechnical investigation report, and review of the proposed preliminary development site plan, the site and proposed development are consistent with the conclusions and recommendations presented in the previous Geotechnical Engineering Investigation report. Additional information to conform to seismic design requirements of the 2016 California Building Code (2016 CBC) is provided below.

In the event these structural or grading details are inconsistent with the final design criteria, we should be notified so that we can evaluate the potential impacts of the changes on the recommendations presented in this report and provide an updated report as necessary.

The site class, per Table 1613.5.2, 2016 CBC, is based upon the site soil conditions. It is our opinion that a Site Class D is appropriate for building design at this site. For seismic design of the structures, in accordance with the seismic provisions of the 2016 CBC, we recommend the following parameters:

2016 CALIFORNIA BUILDING CODE		
Seismic Item	**Value**	**CBC Reference**
Site Class	D	Table 1613.5.2
Fa	1.019	Table 1613.5.3 (1)
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Fv	1.518	Table 1613.5.3 (2)
S1	0.482	Figure 1613.5 (4)
SM1	0.732	Section 1613.5.3
SD1	0.488	Section 1613.5.4

The recommendations and limitations provided in our Geotechnical Engineering Investigation report, KA Project No. 112-15019 apply to this letter and should be incorporated into the design and construction of the proposed development.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

REGISTERED PROFESSIONAL ENGINEER JAMES M. KELLOGG NO. 65092 EXP. 9/30/2019 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER JAMES M. KELLOGG NO. 2902 EXP. 9/30/2019 GEOTECHNICAL STATE OF CALIFORNIA

James Kellogg PE, GE
Managing Engineer
RGE No. 2902/RCE No. 65092

August 28, 2019 KA No. 112-19078

Mr. Jim Fielden
Fielden Engineering Group
410 E. Avenue K-12, Suite 101
Lancaster, California 93535

RE: Results of Infiltration Testing
Proposed Light Industrial Facility
Indian Trail
Helendale, CA

Dear Mr. Fielden:

In accordance with your request and authorization we have performed infiltration testing at the subject site. The infiltration testing was performed at two locations within the proposed infiltration areas located at the subject site. The approximate test locations are identified on the attached site plan. In order to perform these tests, two (2) borings were drilled to depths of approximately five and ten feet below existing site grades. Infiltration testing has been performed at each of the boring locations. Infiltration testing has been performed using open borehole percolation testing. The infiltration rates have been calculated using the Inverse Borehole procedures.

In accordance with the County of San Bernardino Technical Guidance Document for Water Quality Management, the estimated infiltration rates were determined using the results of open borehole percolation testing at two locations at the subject site. The infiltration rates have been calculated using the Inverse Borehole procedures. Prior to infiltration testing, approximately four inches of gravel was placed at the bottom of each borehole. The borehole was pre-soaked prior to testing using clean water. The depth of the borehole was measured at each reading to verify the overall depth. The depth of water in the borehole was measured using a water level indicator or well sounder.

Infiltration Test Results

In accordance with the County of San Bernardino Technical Guidance Document for Water Quality Management, the estimated infiltration rates were determined using the results of open borehole percolation testing at two locations at the subject site. The infiltration rates have been calculated using the Inverse Borehole procedures.

The infiltration rates at the end of the tests indicated infiltration rates of approximately 1.22 and 1.64 inches per hour at depth of approximately 10 feet and 5 feet below site grade, respectively. Detailed results of the infiltration testing are included as an attachment to this report. The soil infiltration rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the infiltration system to compensate for these factors as determined appropriate by the designer. In addition, routine maintenance consisting of clearing the system of clogged soils and debris should be expected.

If there are any questions or if we can be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

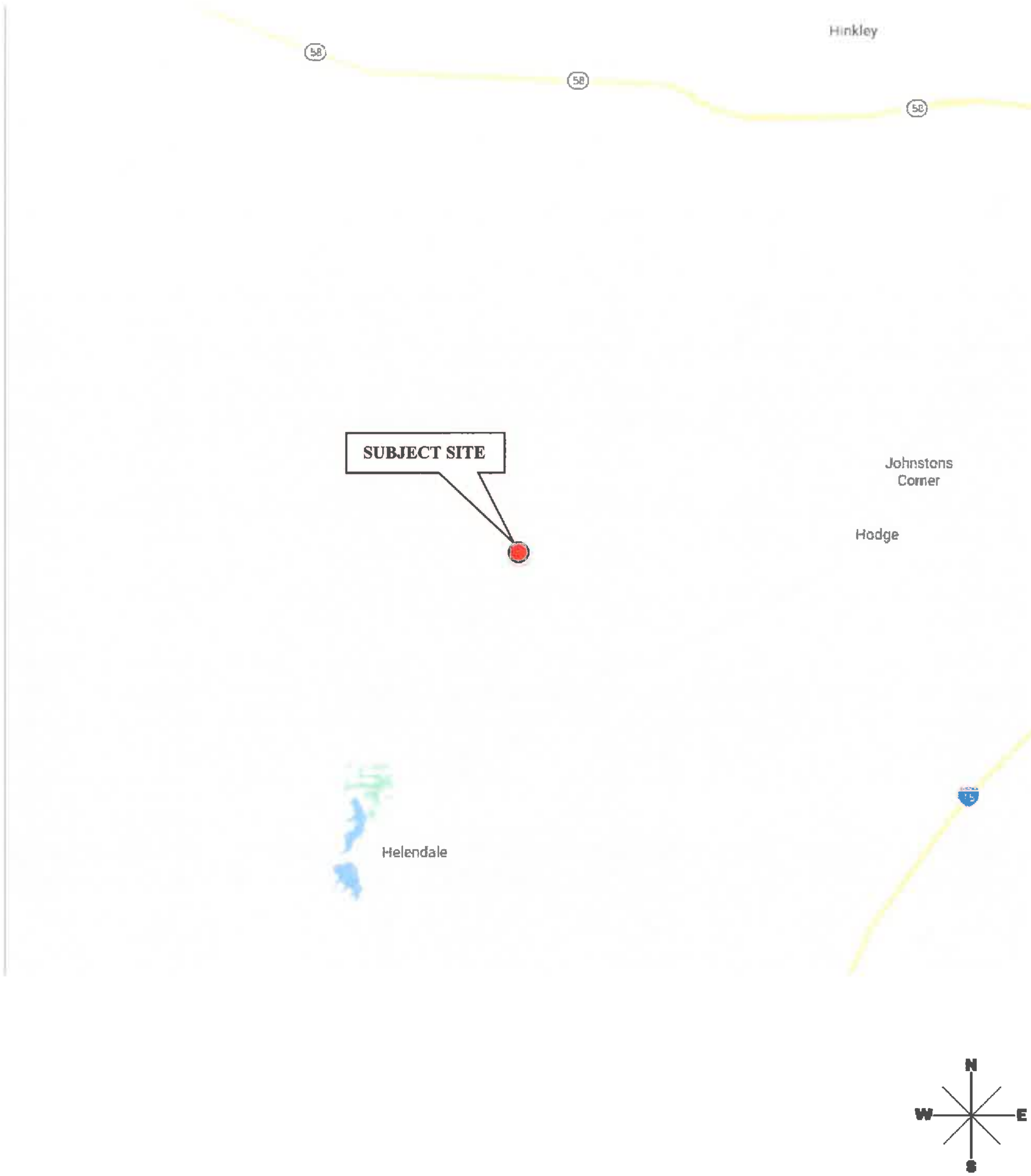
Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

REGISTERED PROFESSIONAL ENGINEER
JAMES M. KELLOGG
NO. 65092
EXP. 9/30/2019
CIVIL
STATE OF CALIFORNIA

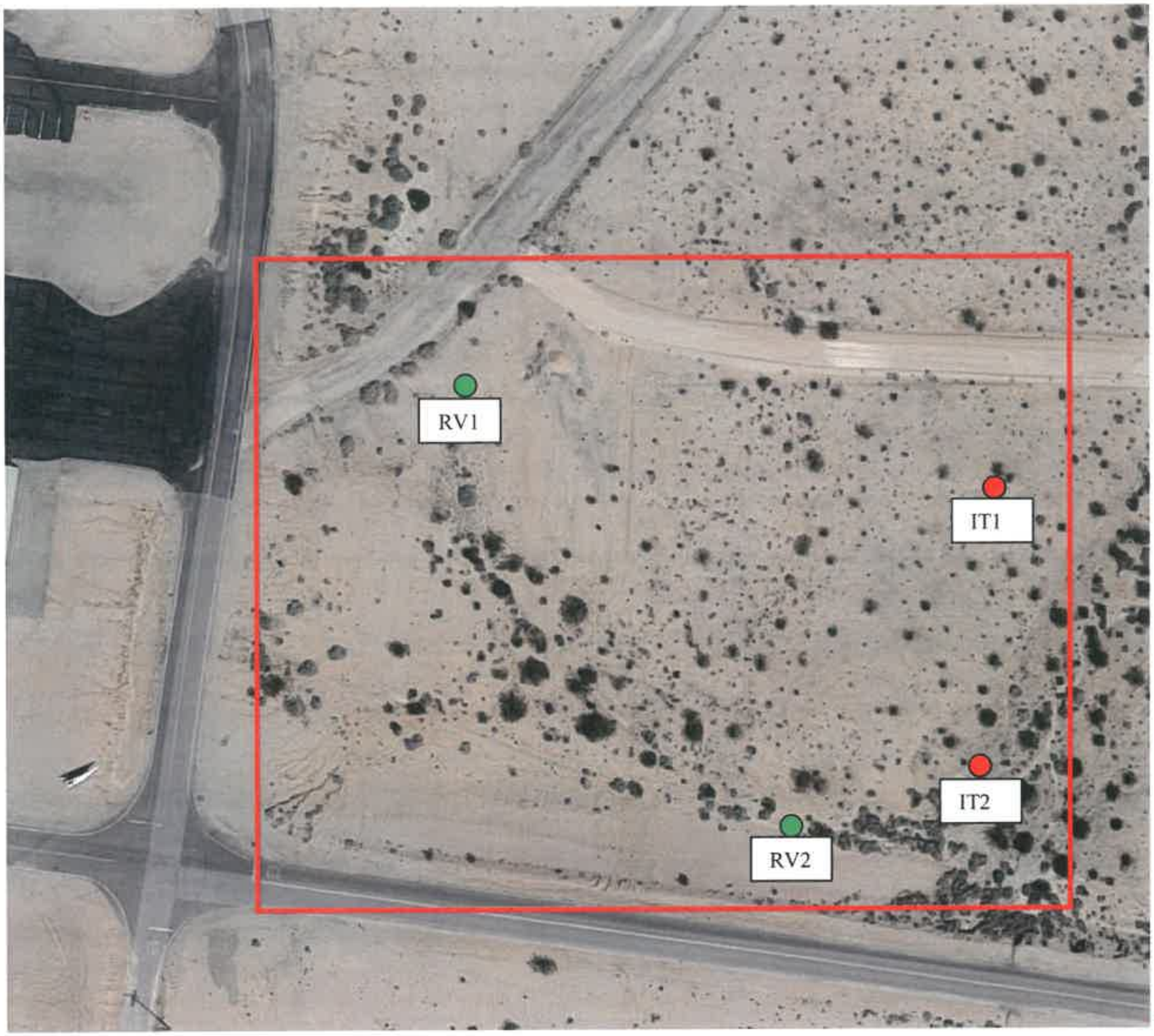
REGISTERED PROFESSIONAL ENGINEER
JAMES M. KELLOGG
NO. 2902
EXP. 9/30/2019
GEOTECHNICAL
STATE OF CALIFORNIA

James M. Kellogg, PE, GE
Managing Engineer
RCE No. 65092, GE No. 2902

Attachment: Infiltration Test Results



VICINITY MAP	Scale: NTS	Date: August, 2019	Krazan GEOTECHNICAL ENGINEERING
PROPOSED LIGHT INDUSTRIAL FACILITY INDIAN TRAIL HELENDALE, CALIFORNIA	Drawn by: JP	Approved by: JK	
	Project No. 112-19078	Figure No. 1	



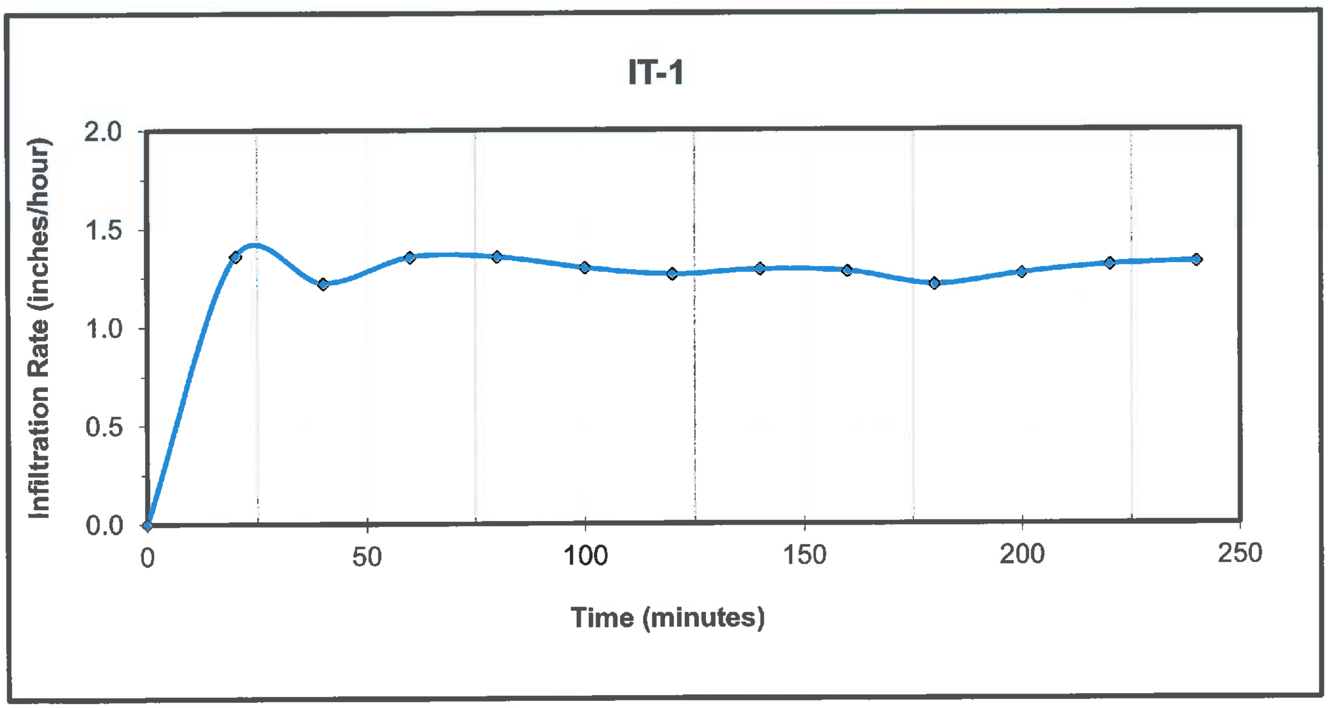
APPROXIMATE INFILTRATION TESTING LOCATION

APPROXIMATE R-VALUE LOCATION

SITE MAP	Scale: NTS	Date: August, 2019	Krazan GEOTECHNICAL ENGINEERING
PROPOSED LIGHT INDUSTRIAL FACILITY INDIAN TRAIL HELENDALE, CALIFORNIA	Drawn by: JP	Approved by: JK	
	Project No. 112-19078	Figure No. 2	

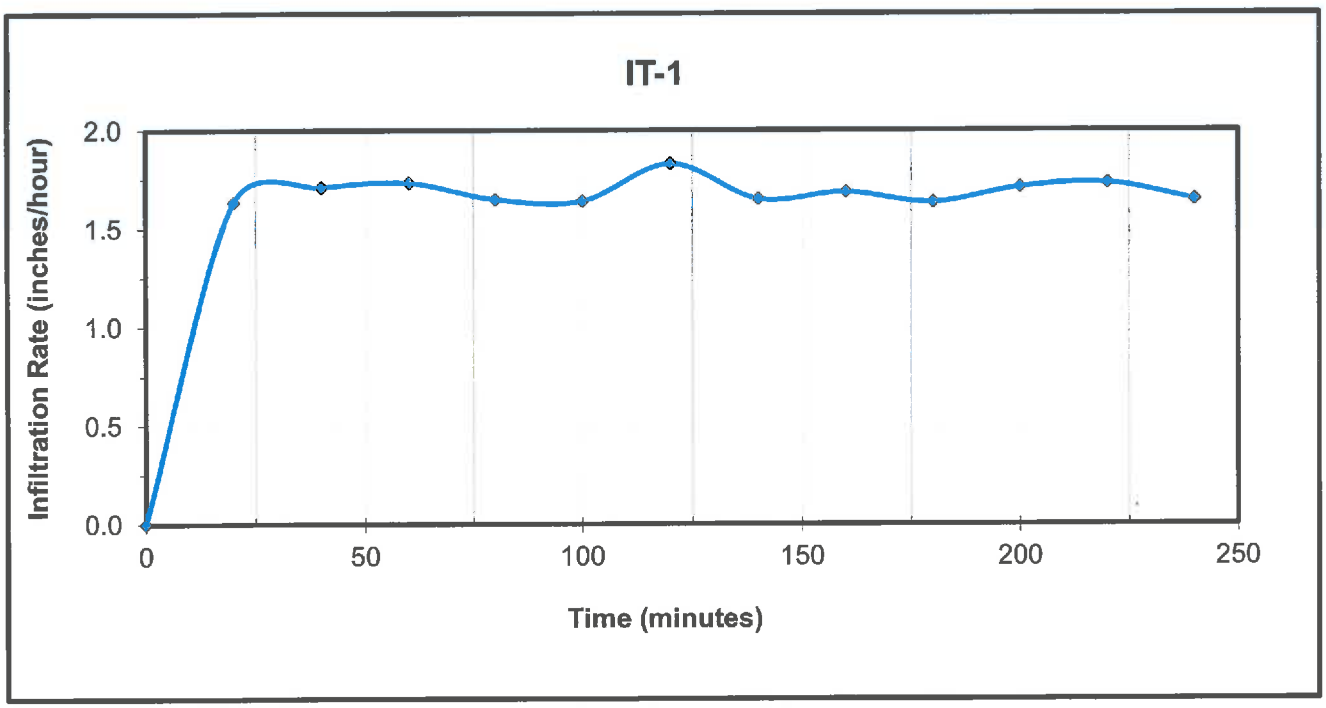
RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	11219078				Date	8/28/2019
Project Name	Light Industrial Facility					
Project Address	Helendale, CA					
Test No:	IT-1	Total Depth (in.)		120	Test Size (in)	9
Depth To Water	>50'	Soil Classification		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		6.0	--	--
1	20.00	20.00	6.0	24.0	18.00	1.36
2	40.00	20.00	24.0	38.0	14.00	1.22
3	60.00	20.00	38.0	51.0	13.00	1.36
4	80.00	20.00	51.0	62.0	11.00	1.36
5	100.00	20.00	62.0	71.0	9.00	1.30
6	120.00	20.00	71.0	78.5	7.50	1.27
7	140.00	20.00	78.5	85.0	6.50	1.29
8	160.00	20.00	85.0	90.5	5.50	1.28
9	180.00	20.00	90.5	95.0	4.50	1.22
10	200.00	20.00	95.0	99.0	4.00	1.27
11	220.00	20.00	99.0	102.5	3.50	1.31
12	240.00	20.00	102.5	105.5	3.00	1.33
	Infiltration Rate in Inches per Hour					1.22



RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	11219078			Date	8/28/2019	
Project Name	Light Industrial Facility					
Project Address	Helendale, CA					
Test No:	IT-2	Total Depth (in.)		60	Test Size (in)	9
Depth To Water	>50'	Soil Classification		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		6.0	--	--
1	20.00	20.00	6.0	16.0	10.00	1.64
2	40.00	20.00	16.0	24.5	8.50	1.71
3	60.00	20.00	24.5	31.5	7.00	1.73
4	80.00	20.00	31.5	37.0	5.50	1.65
5	100.00	20.00	37.0	41.5	4.50	1.64
6	120.00	20.00	41.5	45.5	4.00	1.83
7	140.00	20.00	45.5	48.5	3.00	1.65
8	160.00	20.00	48.5	51.0	2.50	1.69
9	180.00	20.00	51.0	53.0	2.00	1.64
10	200.00	20.00	53.0	54.7	1.70	1.71
11	220.00	20.00	54.7	56.1	1.40	1.73
12	240.00	20.00	56.1	57.2	1.10	1.65
	Infiltration Rate in Inches per Hour					1.64



August 28, 2019

KA Project No. 112-19078

Jim Fielden
Fielden Engineering Group
410 Avenue K-12, Suite 101
Lancaster, California 93535

RE: Pavement Section Recommendations
Proposed Light Industrial Facility
Indian Trail
Helendale, California

Dear Mr. Fielden:

In accordance with your request, we have prepared this letter in order to present recommended pavement sections for the proposed parking lot and drive lanes supporting emergency response vehicles with weights up to 80,000 pounds at the subject site in Helendale, California. This report presents recommended pavement sections for various traffic index values, using the CALTRANS design method.

Based on results of laboratory tests performed on representative samples of the subgrade soil present in the proposed parking and drive areas, the near surface soil present at the subject site consists of mostly silty sand with R-Values ranging from 40 to 45. Based on these tests results, an R-Value of 40 has been used for determination of the recommended pavement sections. If site grading exposes soils other than those anticipated, we should perform additional tests to confirm or revise the recommended pavement sections based on encountered field conditions.

R-Value Test Results

Two bulk soil samples were obtained from the project site for R-Value testing at the location shown on the attached site plan. The samples were tested in accordance with the State of California Materials Manual Test Designation 301. Results of the test are as follows:

Sample	Depth	Description	R-Value at Equilibrium
1	0-24"	Silty Sand (SM)	40
2	0-24"	Silty Sand (SM)	45

The test results indicate good subgrade support characteristics under dynamic traffic loads. The following table presents recommended pavement sections for various traffic indices.

Pavement Section Recommendations

Various flexible pavement sections based on the Caltrans Flexible Pavement Design Method are presented in Table I below:

TABLE I

Recommended Flexible Pavement Sections – CALTRANS Design Method

ASPHALT CONCRETE (FLEXIBLE) PAVEMENTS CALTRANS Design Method Subgrade R-Value = 40				
Traffic / Pavement Designation	**Traffic Index**	**Asphalt Concrete (inches)**	**Class 2 Aggregate Base (inches)**	**Depth of Compacted Subgrade (in)**
STANDARD DUTY	**7.0**	5.0	7.0	12.0
HEAVY DUTY	**8.0**	5.0	9.0	12.0

The following recommendations are for heavy-duty Portland Cement Concrete pavement sections.

TABLE II

HEAVY DUTY

Traffic Index	Portland Cement Concrete (inches)	Class II Aggregate Base (inches)	Compacted Subgrade (inches)
7.0	6.0	6.0	12.0

Site Preparation

General site clearing should include removal of vegetation; existing utilities; structures including foundations; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for use as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Overexcavation and Recompaction – Proposed Parking and Drive Areas

To reduce post-construction soil movement and provide uniform support for the proposed parking and drive areas, overexcavation and recompaction of the near surface soil in the proposed parking area should be performed to a minimum depth of at least twelve (12) inches below existing grades or proposed subgrade, whichever is deeper. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally at least three (3) feet beyond edges of the proposed paving limits or to the property boundary. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Any buried structures encountered during construction should be properly removed and the resulting excavations backfilled with Engineered Fill, compacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Excavations, depressions, or soft and pliant areas extending below planned finished subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures encountered, should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

The upper soils, during wet winter months become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Engineered Fill

The on-site upper native soils and fill material are predominately silty sand with varying amounts of gravel. The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site at that time.

Imported Non-Expansive Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Soils Engineer prior to use and should typically possess the following characteristics:

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	15 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and compacted to achieve at least 95 percent maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required density or if soil conditions are not stable.

LIMITATIONS

This report is based on observation of external surfaces and select sample locations, and may or may not, indicate problems not obvious from these types of observations. The report is prepared in accordance with generally accepted engineering practices. The report is limited to a period of one year from the date of preparation. No other warranties, either expressed or implied, are made as to the professional conclusions and evaluations rendered.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

REGISTERED PROFESSIONAL ENGINEER JAMES M. KELLOGG NO. 2902 EXP. 9/30/2019 GEOTECHNICAL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER JAMES M. KELLOGG NO. 65092 EXP. 9/30/2019 CIVIL STATE OF CALIFORNIA

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

James M. Kellogg
Managing Engineer
RGE No. 2902/RCE No. 65092

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED WAREHOUSE BUILDING
INDIAN TRAIL NEAR WHEELER ROAD
HELENDALE, CALIFORNIA

PROJECT NO. 112-15020
APRIL 29, 2015

Prepared for:

MR. JOE HODGE
FINE WOOD WORKING BY JOE HODGE
44131 80TH STREET WEST
LANCASTER, CALIFORNIA 93536

Prepared by:

KRAZAN & ASSOCIATES, INC.
GEOTECHNICAL ENGINEERING DIVISION
1100 OLYMPIC DRIVE #103
CORONA, CALIFORNIA 92881
(951) 273-1011

Krazan & ASSOCIATES, INC.
SITE DEVELOPMENT ENGINEERS

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

April 29, 2015

KA No. 112-15020

Mr. Joe Hodge
Fine Wood Working by Joe Hodge
44131 80th Street West
Lancaster, California 93536

RE: Geotechnical Engineering Investigation
Proposed Warehouse Building
Indian Trail near Wheeler Road
Helendale, San Bernardino County, California

Dear Mr. Hodge:

In accordance with your request, we have completed a Geotechnical Engineering Investigation for the above-referenced site. The results of our investigation are presented in the attached report.

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

REGISTERED PROFESSIONAL ENGINEER
DAVID R. JAROSZ II
NO. 2698
Expires June 30, 2016
GEOTECHNICAL
STATE OF CALIFORNIA

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

David R. Jarosz, II
Managing Engineer
RCE No. 60185/RGE No. 2698

DRJ:ht

TABLE OF CONTENTS

April 29, 2015

KA Project No. 112-15020

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED WAREHOUSE BUILDING
INDIAN TRAIL NEAR WHEELER ROAD
HELENDALE, SAN BERNARDINO COUNTY, CALIFORNIA

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed Warehouse Building to be located at Indian Trail near Wheeler Road in Helendale, San Bernardino County, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, soil cement reactivity, and pavement design.

A site plan showing the approximate boring locations is presented following the text of this report. A description of the field investigation, boring logs and the boring log legend are presented in Appendix A. Appendix A contains a description of laboratory testing phase of this study; along with laboratory test results. Appendices B and C contain guides to earthwork and pavement specifications. When conflicts in the text of the report occur with the general specifications in the appendices, the recommendations in the text of the report have precedence.

PURPOSE AND SCOPE

This investigation was conducted to evaluate the soil and groundwater conditions at the site, to make geotechnical engineering recommendations for use in design of specific construction elements and to provide criteria for site preparation and Engineered Fill construction.

Our scope of services was outlined in our proposal dated April 14, 2015 (KA Proposal No. P153-15) and included the following:

- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.
- A field investigation consisting of drilling 3 borings to depths ranging from approximately 10 to 20 feet for evaluation of the subsurface conditions at the project site.
- Performing laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Evaluation of the data obtained from the investigation and an engineering analysis to provide recommendations for use in the project design and preparation of construction specifications.

- Preparation of this report summarizing the results, conclusions, recommendations, and findings of our investigation.

PROPOSED CONSTRUCTION

We understand that design of the proposed development is currently underway; structural load information and other final details pertaining to the structures are unavailable. On a preliminary basis, it is understood the proposed development will include the construction of an approximately 20,000 square foot warehouse building. It is anticipated the building will be a single- or two-story structure utilizing conventional foundations and concrete slab-on-grade construction. Footing loads are anticipated to be light to moderately heavy. The warehouse will be equipped with a 30 ton crane. The site will be raised 10 to 12 feet from existing site grade.

In the event these structural or grading details are inconsistent with the final design criteria, the Soils Engineer should be notified so that we may update this writing as applicable.

SITE LOCATION AND SITE DESCRIPTION

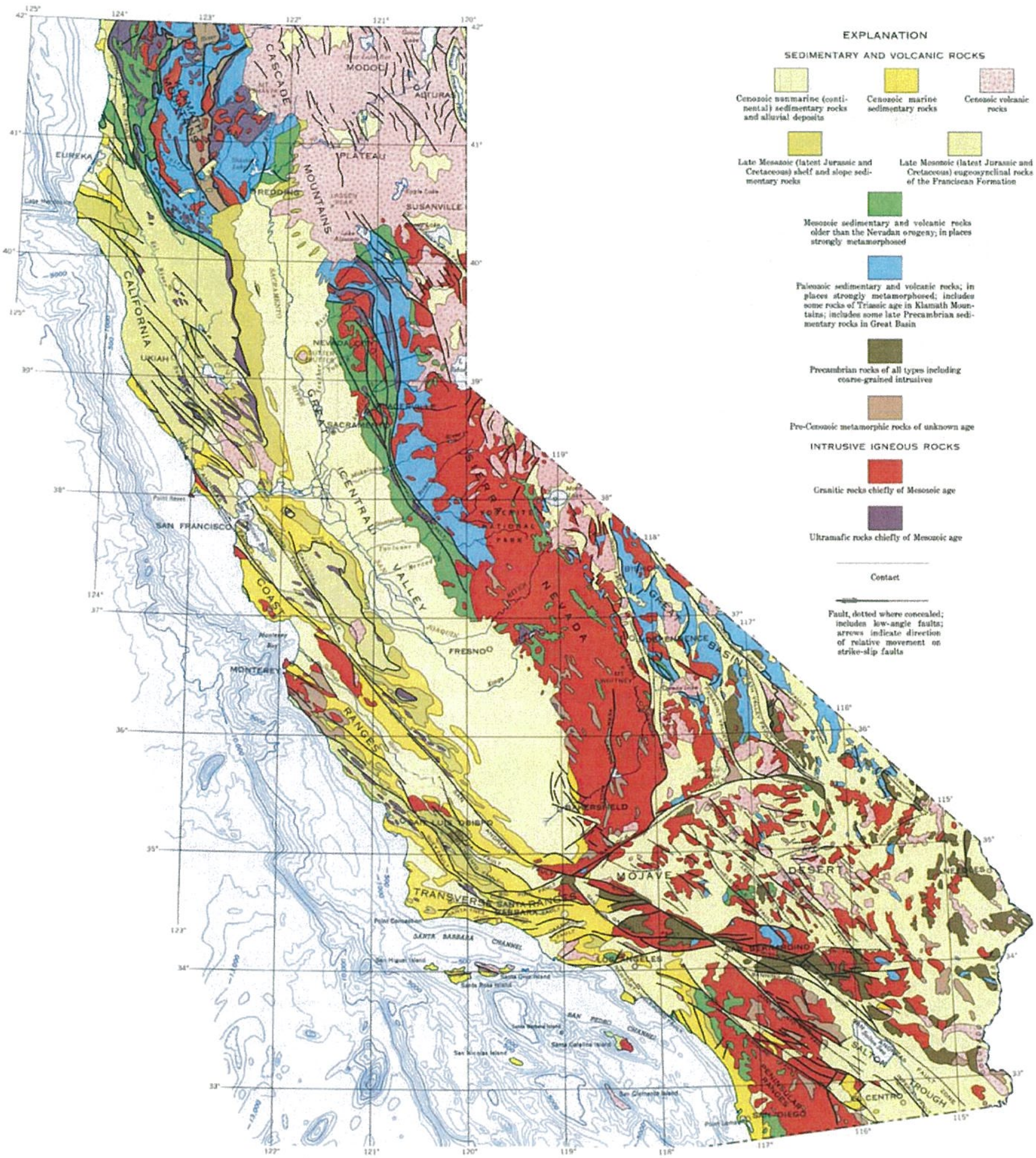
The site is rectangular in shape and encompasses approximately 1 acre. The site is located approximately 0.7 miles north of Wheeler Road and 1.8 miles west of Indian Trail in Helendale, San Bernardino County, California. Existing buildings are located north and west of the site. The remainder of the site is predominately surrounded by access roads and vacant land.

Presently, the site is predominately vacant. The site is covered by a sparse weed and brush growth and the surface soils have a loose consistency. The site is relatively level with gentle slopes toward the north, south, and west.

GEOLOGIC SETTING

The subject site is located near the community of Helendale, which is situated in the southwestern portion of the Mojave Desert Geomorphic Province. The Mojave Desert is bound by the Tehachapi Mountains of the Sierra Nevada Geomorphic Province to the northwest and the San Gabriel and San Bernardino Mountains of the Transverse Range Geomorphic Province to the south and southwest. A major portion of the Mojave Desert is underlain by Mesozoic granitic rocks. Quaternary alluvium and Pleistocene nonmarine sediments cover a majority of the Helendale area.

Both the Tehachapi and the San Gabriel mountain ranges are geologically young mountain ranges and possess active and potentially active fault zones. Numerous moderate to large earthquakes have affected the area of the subject site within historic time. Based on the proximity of several dominant active faults and seismogenic structures, as well as the historic seismic record, the area of the subject site is considered subject to relatively high seismicity. The site under consideration is located in a seismically active area of Southern California. The nearest significant active faults are the Helendale-



GEOLOGIC MAP OF CALIFORNIA

0 50 100 MILES

CALIFORNIA GEOLOGICAL SURVEY
CALIFORNIA CONSERVATION

South Lockhart, Lenwood-Lockhart-Old Woman Springs, Gravel Hills-Harper Lake, Blackwater, and Landers Faults located approximately 2.4, 9.9, 18, 20, and 22 miles from the site. The San Andreas Fault is located about 37 miles southwest of the site.

Geologic Hazards – Fault Rupture Hazard Zones

The Alquist-Priolo Geologic Hazards Zones Act went into affect in March, 1973. Since that time, the act has been amended 10 times (Hart, 1994). The purpose of the Act, as provided in DMG Special Publication 42 (SP 42), is to prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." The act was renamed the Alquist-Priolo Earthquake Fault Zoning Act in 1994, and at that time, the originally designated "Special Studies Zones" was renamed the "Earthquake Fault Zones."

A Fault-Rupture Hazard Zone map of the area in consideration has not been prepared to date. No evidence of surface faulting was observed on the property during our reconnaissance.

Geologic Hazards – Seismic Hazard Zones

In 1990, the California State Legislature passed the Seismic Hazard Mapping Act to protect public safety from the effects of strong shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. The Act requires that the State Geologist delineate various seismic hazards zones on Seismic Hazards Zones Maps. Specifically, the maps identify areas where soil liquefaction and earthquake-induced landslides are most likely to occur. A site-specific geotechnical evaluation is required prior to permitting most urban developments within the mapped zones. The Act also requires sellers of real property within the zones to disclose this fact to potential buyers. The area of the subject site is not included on any of the maps released to date. It is not known whether the subject site will be within a seismic hazard zone on a future map.

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling 3 borings to depths ranging from approximately 10 to 20 feet below existing site grade, using a truck-mounted drill. The approximate boring locations are shown on the site plan. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency, obtain information regarding the engineering properties of the subsoils and to retain soil samples for laboratory testing. The soils encountered were continuously examined and visually classified in accordance with the Unified Soil Classification System. A more detailed description of the field investigation is presented in Appendix A.

Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. The laboratory testing program was formulated with emphasis on the evaluation of natural moisture, density, gradation, shear strength, consolidation potential, and moisture-density relationships of the materials encountered. In addition, chemical tests were performed to evaluate the corrosivity of the soils to buried concrete and metal. Details of the laboratory test program and the results of laboratory test are summarized in Appendix A. This information, along with the field observations, was used to prepare the final boring logs in Appendix A.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. In general, the upper soils consisted of approximately 6 to 12 inches of very loose silty sand or silty sand with trace clay. These soils are disturbed, have low strength characteristics, and are highly compressible when saturated.

Beneath the loose surface soils, approximately 3 to 4 feet of loose to dense silty sand, silty sand with clay, or clayey sand were encountered. Field and laboratory tests suggest that these soils are moderately strong and moderately compressible. Penetration resistance ranged from 18 to 46 blows per foot. Dry densities ranged from 122 to 128 pcf. A representative soil sample consolidated approximately 4½ percent under a 2 ksf load when saturated. A representative soil sample had an angle of internal friction of 33 degrees.

Below 4 to 5 feet, predominately very dense silty sand, clayey sand, or silty sand/sand with gravel were encountered. Field and laboratory tests suggest these soils are moderately strong and slightly compressible. Penetration resistance was generally greater than 50 blows per foot. Dry densities ranged from 113 to 124 pcf. These soils had slightly stronger strength characteristics than the upper soils and extended to the termination depth of our borings.

For additional information about the soils encountered, please refer to the logs of borings in Appendix A.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Free groundwater was not encountered. Groundwater within the project site and vicinity is typically encountered at depths greater than 50 feet.

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

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of our field and laboratory investigations, along with previous geotechnical experience in the project area, the following is a summary of our evaluations, conclusions, and recommendations.

Administrative Summary

In brief, the subject site and soil conditions, with the exception of the moisture-sensitive upper native soils and existing development appear to be conducive to the development of the project. Of primary importance in the development of this site is the removal of the upper moisture sensitive soils from several areas of the proposed development. These soils are moderately to highly compressible and/or collapsible under saturated conditions. Structures within the general vicinity have experienced excessive post-construction settlement when the foundation soils become near-saturated. Accordingly, mitigation measures are recommended to reduce the potential of excessive soil settlement. It is recommended that the upper 4 feet of native soils within the proposed building areas be excavated, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that proposed structural elements within the proposed building areas be supported by a minimum of 2 feet of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond proposed footing lines. Prior to backfilling, the exposed subgrade soils should be scarified to a depth of 6 inches, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and recompacted prior to placement of Engineered Fill.

Any buried structures encountered during construction should be properly removed and/or relocated. The resulting excavations should be cleaned to firm native ground and backfilled with Engineered Fill. It is suspected that demolition activities of the existing structures will disturb the upper soils. After demolition activities, it is recommended that these disturbed soils be removed and/or recompacted. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

Sandy and gravelly soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing an allowable bearing pressure of 3,500 psf for dead-plus-live loads. Footings should have a minimum embedment of 18 inches.

Groundwater Influence on Structures/Construction

Based on our findings and historical records, it is not anticipated that groundwater will rise within the zone of structural influence or affect the construction of foundations and pavements for the project. However, if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, pump, or not respond to densification techniques. Typical remedial measures include discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Site Preparation

General site clearing should include removal of vegetation; existing utilities; concrete structures including foundations; basement walls and floors; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed.

Deeper stripping may be required in localized areas. These materials will not be suitable for use as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Any buried structures encountered during construction should be properly removed and/or relocated. The resulting excavations should be backfilled with Engineered Fill. Excavations, depressions, or soft and pliant areas extending below planned finished subgrade levels should be cleaned to firm, undisturbed soil and backfilled with Engineered Fill. In general, any septic tanks, debris pits, cesspools, or similar structures should be entirely removed. Concrete footings should be removed to an equivalent depth of at least 3 feet below proposed footing elevations or as recommended by the Soils Engineer. Any other buried structures should be removed in accordance with the recommendations of the Soils Engineer. The resulting excavations should be backfilled with Engineered Fill.

The upper on-site native soils are moderately to highly compressible and/or collapsible under saturated conditions. Accordingly, mitigation measures are recommended to reduce the potential of excessive soil settlement. It is recommended that following stripping operations and demolition activities, the upper 4 feet of native soils within the proposed building areas be excavated, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that proposed structural elements within the proposed building areas be supported by a minimum of 24 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond proposed footing lines. The exposed subgrade soils should be scarified to a depth of 6 inches, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted prior to placement of Engineered Fill.

Within proposed pavement and exterior flatwork areas following stripping operations, it is recommended that at a minimum, the upper 12 inches of exposed subgrade soil be excavated, worked until uniform and free from large clods, moisture-conditioned to a minimum of 2 percent above optimum moisture-content, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

The upper soils, during wet winter months, become very moist due to the absorptive characteristics of the soil. Earthwork operations performed during winter months may encounter very moist unstable soils, which may require removal to grade a stable building foundation. Project site winterization consisting of placement of aggregate base and protecting exposed soils during the construction phase should be performed.

A representative of our firm should be present during all site clearing and grading operations to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction is dependent upon compaction of the material and the stability of the material. The Soils Engineer may reject any material that does not meet compaction and stability requirements. Further recommendations of this report are predicated upon the assumption that earthwork construction will conform to recommendations set forth in this section and the Engineered Fill section.

Engineered Fill

The organic-free, on-site, upper soils are predominately silty sand, silty sand with clay and clayey sand. The clayey soils will not be suitable for reuse for fill placement within the upper 18 inches of slab-on-grade and exterior flatwork areas. These clayey soils will be suitable for reuse as General Engineered Fill, within pavement areas and below 18 inches from finished pad grade in building areas, provided they are cleansed of excessive organics and debris and are moisture-conditioned to at least 2 percent above optimum moisture. The on-site silty sand and sandy silt soils that do not contain clay will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics and debris.

The preferred materials specified for Engineered Fill are suitable for most applications with the exception of exposure to erosion. Project site winterization and protection of exposed soils during the construction phase should be the sole responsibility of the Contractor, since he has complete control of the project site at that time.

Imported non-expansive Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt, with relatively impervious characteristics when compacted. This material should be approved by the Soils Engineer prior to use and should typically possess the following characteristics.

Percent Passing No. 200 Sieve	20 to 50
Plasticity Index	10 maximum
UBC Standard 29-2 Expansion Index	15 maximum

Fill soils should be placed in lifts approximately 6 inches thick, moisture-conditioned as necessary, and compacted to achieve at least 90 percent of maximum density based on ASTM Test Method D1557. Additional lifts should not be placed if the previous lift did not meet the required dry density or if soil conditions are not stable

Drainage and Landscaping

The ground surface should slope away from building pad and pavement areas toward appropriate drop inlets or other surface drainage devices. In accordance with Section 1804 of the 2013 California Building Code, it is recommended that the ground surface adjacent to foundations be sloped a minimum of 5 percent for a minimum distance of 10 feet away from structures, or to an approved alternative means of drainage conveyance. Swales used for conveyance of drainage and located within 10 feet of foundations should be sloped a minimum of 2 percent. Impervious surfaces, such as pavement and exterior concrete flatwork, within 10 feet of building foundations should be sloped a minimum of 1 percent away from the structure. Drainage gradients should be maintained to carry all surface water to collection facilities and off-site. These grades should be maintained for the life of the project.

Utility Trench Backfill

Utility trenches should be excavated according to accepted engineering practice following OSHA (Occupational Safety and Health Administration) standards by a Contractor experienced in such work. The responsibility for the safety of open trenches should be borne by the Contractor. Traffic and vibration adjacent to trench walls should be minimized and cyclic wetting and drying of excavation side slopes should be avoided. Depending upon the location and depth of some utility trenches, groundwater flow into open excavations could be experienced, especially during or shortly following periods of precipitation.

Sandy soil conditions were encountered at the site. These cohesionless soils have a tendency to cave in trench wall excavations. Shoring or sloping back trench sidewalls may be required within these sandy soils.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 90 percent of maximum density based on ASTM Test Method D1557. Utility trench backfill placed in pavement areas should be compacted to at least 90 percent of maximum density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

The Contractor is responsible for removing all water sensitive soils from the trench regardless of the backfill location and compaction requirements. The Contractor should use appropriate equipment and methods to avoid damage to the utilities and/or structures during fill placement and compaction.

Foundations

After completion of the recommended site preparation, the site should be suitable for shallow footing support. The proposed structures may be supported on a shallow foundation system bearing on a minimum of 24 inches of Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	2,625 psf
Dead-Plus-Live Load	3,500 psf
Total Load, including wind or seismic loads	4,650 psf

The footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 12 inches, regardless of load.

The footing excavations should not be allowed to dry out any time prior to pouring concrete. It is recommended that footings be reinforced by at least one No. 4 reinforcing bar in both top and bottom.

The total settlement is not expected to exceed 1 inch. Differential settlement should be less than ½ inch. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.35 acting between the base of foundations and the supporting subgrade. Lateral resistance for footings can alternatively be developed using an allowable equivalent fluid passive pressure of 300 pounds per cubic foot acting against the appropriate vertical footing faces. The frictional and passive resistance of the soil may be combined without reduction in determining the total lateral resistance. A ⅓ increase in the above value may be used for short duration, wind, or seismic loads.

Floor Slabs and Exterior Flatwork

In areas that will utilize moisture-sensitive floor coverings, concrete slab-on-grade floors should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with accepted engineering practice. The water vapor retarder should consist of a vapor retarder sheeting underlain by a minimum of 3 inches of compacted, clean, gravel of ¾-inch maximum size. To aid in concrete curing an optional 2 to 4 inches of granular fill may be placed on top of the vapor retarder. The granular fill should consist of damp clean sand with at least 10 to 30 percent of the sand passing the 100 sieve. The sand should be free of clay, silt, or organic material. Rock dust which is manufactured sand from rock crushing operations is typically suitable for the granular fill. This granular fill material should be compacted.

It is recommended that the concrete slabs be reinforced at a minimum with #3 bars at 18 inches on center to reduce crack separation and possible vertical offset at the cracks. Thicker floor slabs with increased concrete strength and reinforcement should be designed wherever heavy concentrated loads, heavy equipment, or machinery is anticipated.

The exterior floors should be poured separately in order to act independently of the walls and foundation system. All fills required to bring the building pads to grade should be Engineered Fills.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To reduce moisture vapor intrusion, it is recommended that a vapor retarder be installed. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

Lateral Earth Pressures and Retaining Walls

Walls retaining horizontal backfill and capable of deflecting a minimum of 0.1 percent of its height at the top may be designed using an equivalent fluid active pressure of 40 pounds per square foot per foot of depth. Walls incapable of this deflection or are fully constrained walls against deflection may be designed for an equivalent fluid at-rest pressure of 60 pounds per square foot per foot of depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1, horizontal to vertical, or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways.

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

Seismic Parameters – 2013 California Building Code

The Site Class per Section 1613 of the 2013 California Building Code (2013 CBC) and Table 20.3-1 of ASCE 7-10 is based upon the site soil conditions. It is our opinion that a Site Class D is most consistent with the subject site soil conditions. For seismic design of the structures based on the seismic provisions of the 2013 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613.3.2
Site Coefficient F_a	1.019	Table 1613.3.3 (1)
S_s	1.203	Section 1613.3.1
S_{MS}	1.226	Section 1613.3.3
S_{DS}	0.817	Section 1613.3.4
Site Coefficient F_v	1.518	Table 1613.3.3 (2)
S_1	0.482	Section 1613.3.1
S_{M1}	0.732	Section 1613.3.3
S_{D1}	0.488	Section 1613.3.4

Soil Cement Reactivity

Excessive sulfate in either the soil or native water may result in an adverse reaction between the cement in concrete (or stucco) and the soil. HUD/FHA and UBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

Soil samples were obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentrations detected in these soil samples were greater than 150 ppm and are above the maximum allowable values established by HUD/FHA and UBC. Therefore, it is recommended that a Type II cement be utilized to compensate for sulfate reactivity with the cement.

Compacted Material Acceptance

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent on the stability of that material. The Soils Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with an in situ moisture content significantly less than optimum moisture. This type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

Testing and Inspection

A representative of Krazan & Associates, Inc. should be present at the site during the earthwork activities to confirm that actual subsurface conditions are consistent with the exploratory fieldwork. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. This representative can also verify that the intent of these recommendations is incorporated into the project design and construction. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

LIMITATIONS

Soils Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using the most appropriate and most current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Soils Engineering, physical changes in the site, either due to excavation or fill placement, new agency regulations, or possible changes in the proposed structure after the soils report is completed may require the soils report to be professionally reviewed. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that 2 years be considered a reasonable time for the usefulness of this report.

Foundation and earthwork construction is characterized by the presence of a calculated risk that soil and groundwater conditions have been fully revealed by the original foundation investigation. This risk is derived from the practical necessity of basing interpretations and design conclusions on limited sampling of the earth. The recommendations made in this report are based on the assumption that soil conditions do not vary significantly from those disclosed during our field investigation. If any variations or undesirable conditions are encountered during construction, the Soils Engineer should be notified so that supplemental recommendations may be made.

The conclusions of this report are based on the information provided regarding the proposed construction. If the proposed construction is relocated or redesigned, the conclusions in this report may not be valid. The Soils Engineer should be notified of any changes so the recommendations may be reviewed and re-evaluated.

This report is a Geotechnical Engineering Investigation with the purpose of evaluating the soil conditions in terms of foundation design. The scope of our services did not include any Environmental Site Assessment for the presence or absence of hazardous and/or toxic materials in the soil, groundwater, or atmosphere; or the presence of wetlands. Any statements, or absence of statements, in this report or on any boring log regarding odors, unusual or suspicious items, or conditions observed, are strictly for descriptive purposes and are not intended to convey engineering judgment regarding potential hazardous and/or toxic assessment.

The geotechnical engineering information presented herein is based upon professional interpretation utilizing standard engineering practices and a degree of conservatism deemed proper for this project. It is not warranted that such information and interpretation cannot be superseded by future geotechnical engineering developments. We emphasize that this report is valid for the project outlined above and should not be used for any other sites.

If you have any questions or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

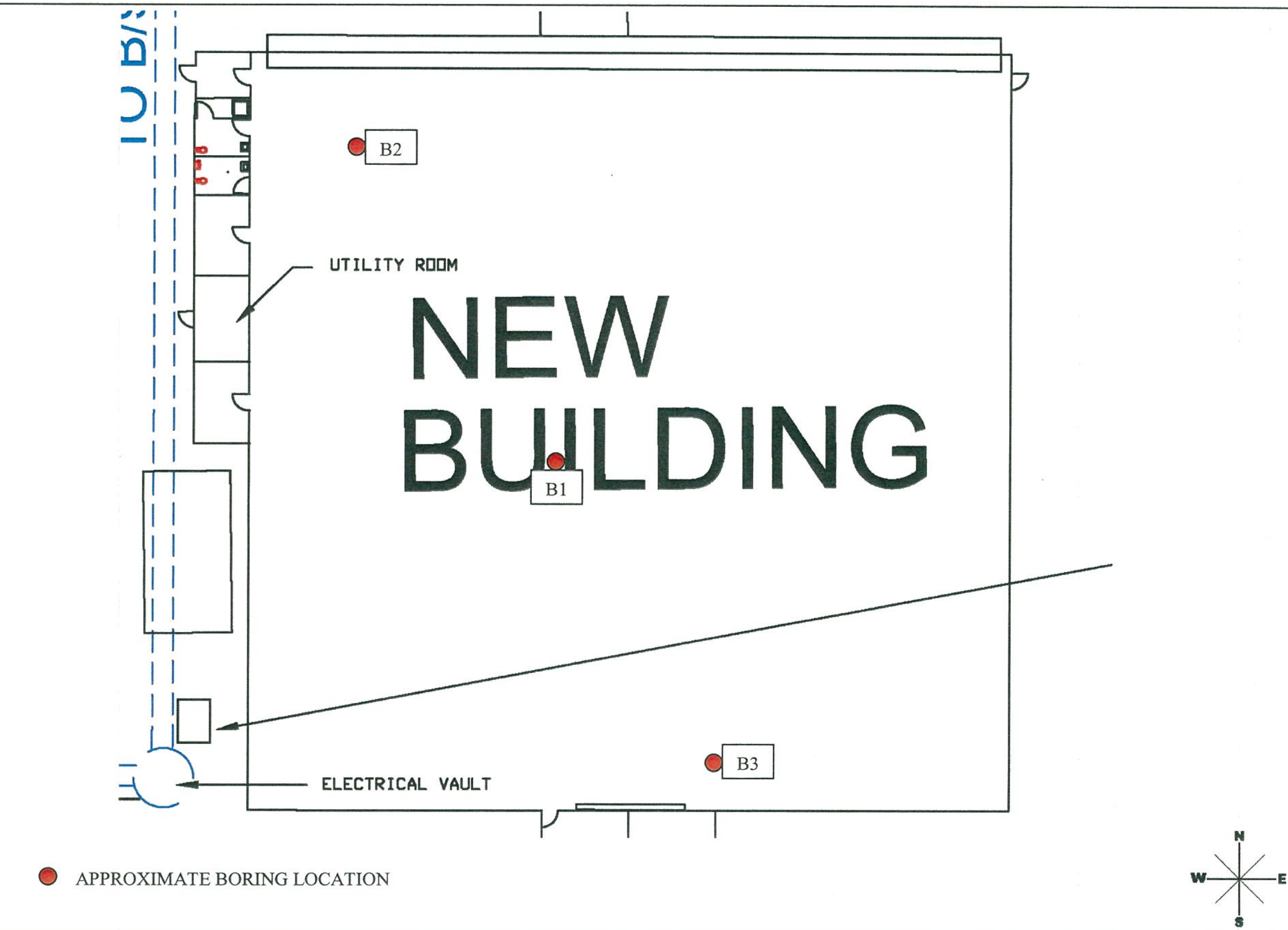
Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Steve Nelson
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
DAVID R. JAROSZ II
NO. 2698
Expires June 30, 2016
GEOTECHNICAL
STATE OF CALIFORNIA

David R. Jarosz II
Managing Engineer
RCE No. 60185/RGE No. 2698

SN/DRJ:ht



SITE MAP	Scale: NTS	Date: April 2015	Krazan GEOTECHNICAL ENGINEERING
Warehouse Building Indian Trail Palmdale, California	Drawn by: HT	Approved by: DJ	
	Project No. 112-15020	Figure No. 1	

Log of Borings
&
Laboratory Testing

Appendix A

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Three 4½-inch exploratory borings were advanced. The boring locations are shown on the site plan.

The soils encountered were logged in the field during the exploration and, with supplementary laboratory test data, are described in accordance with the Unified Soil Classification System.

Modified standard penetration tests and standard penetration tests were performed at selected depths. This test represents the resistance to driving a 2½-inch and 1½-inch diameter core barrel, respectively. The driving energy was provided by a hammer weighing 140 pounds falling 30 inches. Relatively undisturbed soil samples were obtained while performing this test. Bag samples of the disturbed soil were obtained from the auger cuttings. The modified standard penetration tests are identified in the sample type on the boring logs with a full shaded in block. The standard penetration tests are identified in the sample type on the boring logs with the central portion of the block shaded. All samples were returned to our Clovis laboratory for evaluation.

Laboratory Investigation

The laboratory investigation was programmed to determine the physical and mechanical properties of the foundation soil underlying the site. Test results were used as criteria for determining the engineering suitability of the surface and subsurface materials encountered.

In-situ moisture content, dry density, consolidation, direct shear, and sieve analysis tests were completed for the undisturbed samples representative of the subsurface material. These tests, supplemented by visual observation, comprised the basis for our evaluation of the site material.

The logs of the exploratory borings and laboratory determinations are presented in this Appendix.

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)		
	Clean Gravels (Less than 5% fines)	
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
	Clean Sands (Less than 5% fines)	
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

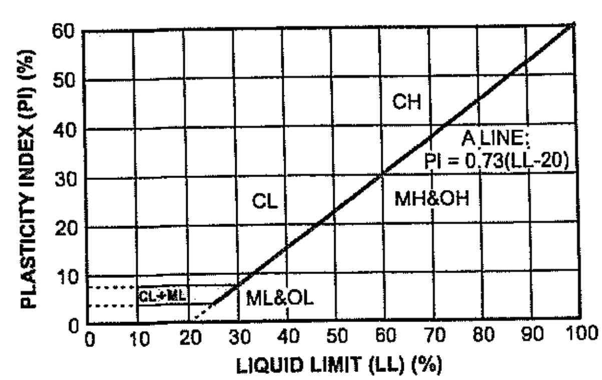
CONSISTENCY CLASSIFICATION

Description	Blows per Foot
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION

Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	12 to 13 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART

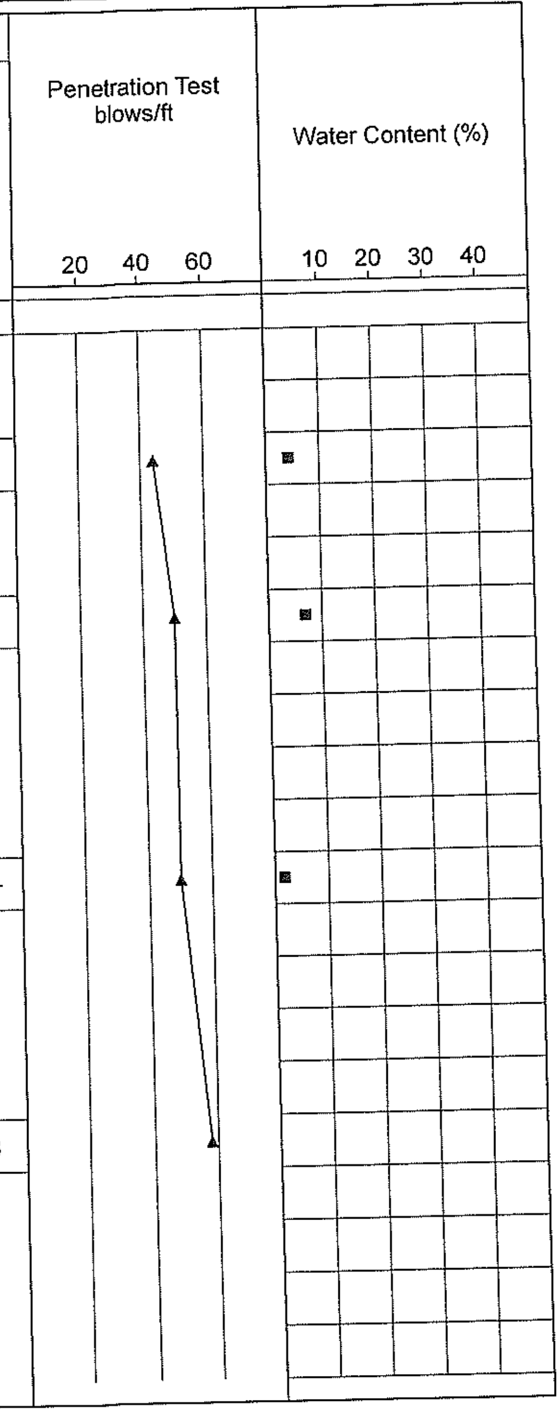


Log of Boring B1

Project: Warehouse Building
Client: Fine Wood Working by Joe Hodge
Location: Indian Trail, Palmdale, CA
Depth to Water> **Initial:** None

Project No: 112-15020
Figure No.: A-1
Logged By: Dave Adams
At Completion: None

Depth (ft)	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0	Ground Surface				
0	***SILTY SAND (SM)*** Very loose, fine- to medium-grained with trace CLAY; brown, damp, drills easily. Dense with interbeds of CLAYEY SAND below 2 feet				
2		128.5	4.3		44
3.5	***CLAYEY SAND (SC)*** Very dense, fine- to medium-grained; brown, damp, drills easily				
5		113.8	7.0		50+
8.5	***SILTY SAND/SAND (SM/SP)*** Very dense, fine- to coarse-grained with trace GRAVEL; gray, damp, drills easily				
10		124.9	1.9		50+
15	Dense below 15 feet				58
20					



Drill Method: Solid Flight
Drill Rig: CME 45C-3
Driller: Jim Watts

Krazan and Associates

Drill Date: 4-15-15
Hole Size: 4½ Inches
Elevation: 20 Feet
Sheet: 1 of 1

Log of Boring B2

Project: Warehouse Building

Client: Fine Wood Working by Joe Hodge

Location: Indian Trail, Palmdale, CA

Depth to Water> **Initial:** None

Project No: 112-15020

Figure No.: A-2

Logged By: Dave Adams

At Completion: None

Depth (ft)	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0	Ground Surface				
0	***SILTY SAND (SM)*** Very loose, fine- to medium-grained with trace CLAY; brown, damp, drills easily. Loose below 12 inches				
1.5	***CLAYEY SAND (SC)*** Dense, fine- to medium-grained; reddish-brown, damp, drills easily		3.9		46
4.5	***SILTY SAND (SM)*** Very dense, fine- to medium-grained; brown, damp, drills easily		5.3		50+
10	End of Borehole				

Penetration Test blows/ft: 20 40 60

Water Content (%): 10 20 30 40

Drill Method: Solid Flight

Drill Rig: CME 45C-3

Driller: Jim Watts

Krazan and Associates

Drill Date: 4-15-15

Hole Size: 4½ Inches

Elevation: 10 Feet

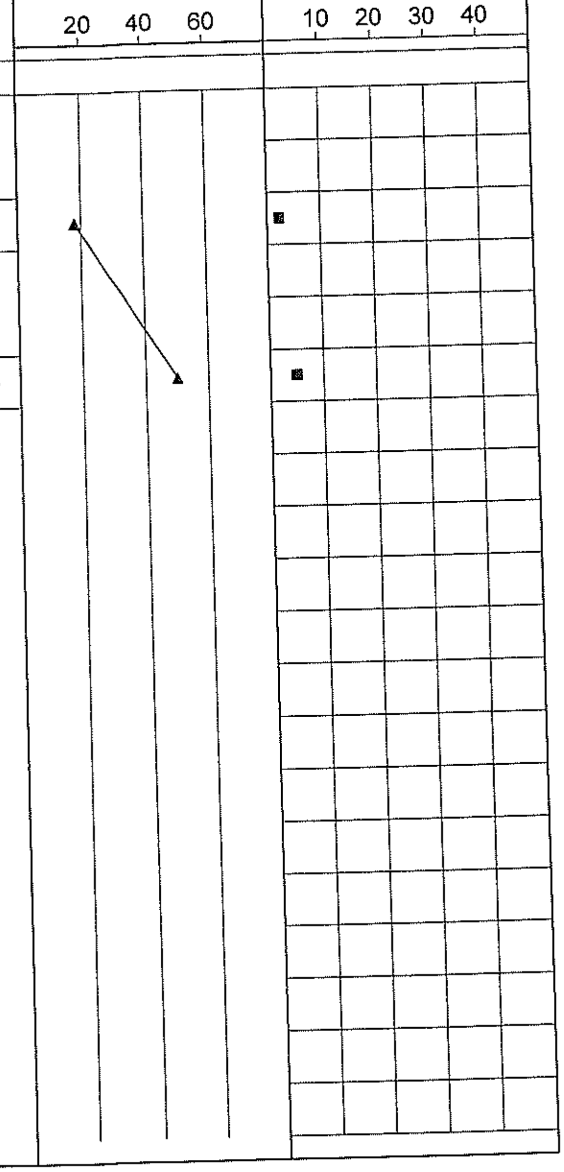
Sheet: 1 of 1

Log of Boring B3

Project: Warehouse Building
Client: Fine Wood Working by Joe Hodge
Location: Indian Trail, Palmdale, CA
Depth to Water> **Initial:** None

Project No: 112-15020
Figure No.: A-3
Logged By: Dave Adams
At Completion: None

SUBSURFACE PROFILE			SAMPLE				Penetration Test blows/ft	Water Content (%)
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.	20 40 60	10 20 30 40
		Ground Surface						
0	▥	***SILTY SAND (SM)*** Very loose, fine- to medium-grained with trace CLAY and GRAVEL; brown, damp, drills easily Loose below 12 inches Medium dense below 2 feet						
2			122.2	2.4	■	18		
4	▨	***CLAYEY SAND (SC)*** Very dense, fine- to medium-grained; reddish-brown, damp, drills easily						
5				5.1	■	50+		
10		End of Borehole						



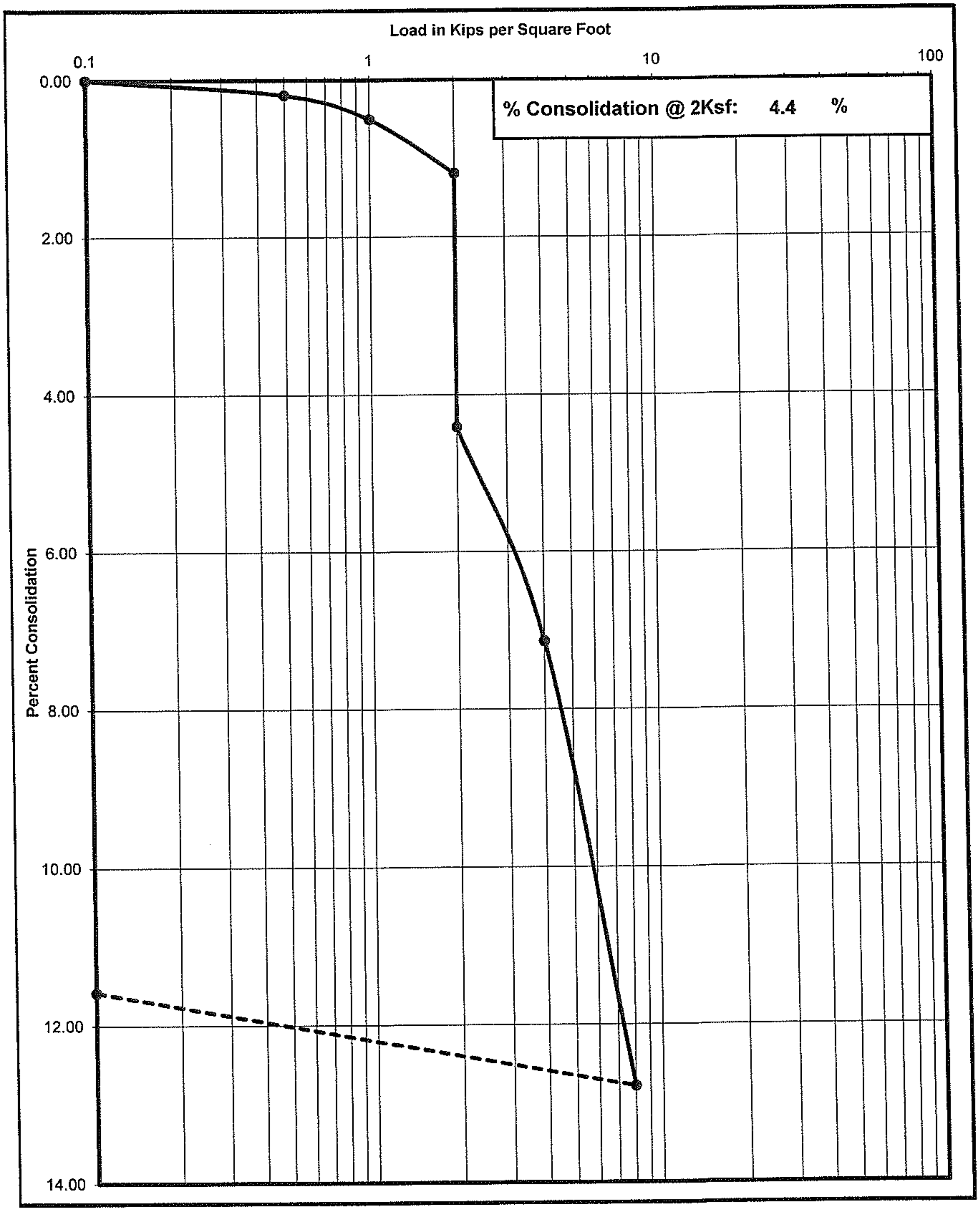
Drill Method: Solid Flight
Drill Rig: CME 45C-3
Driller: Jim Watts

Krazan and Associates

Drill Date: 4-15-15
Hole Size: 4½ Inches
Elevation: 10 Feet
Sheet: 1 of 1

Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
112-15020	B3 @ 2-3'	4/27/2015	SM w/ grvl



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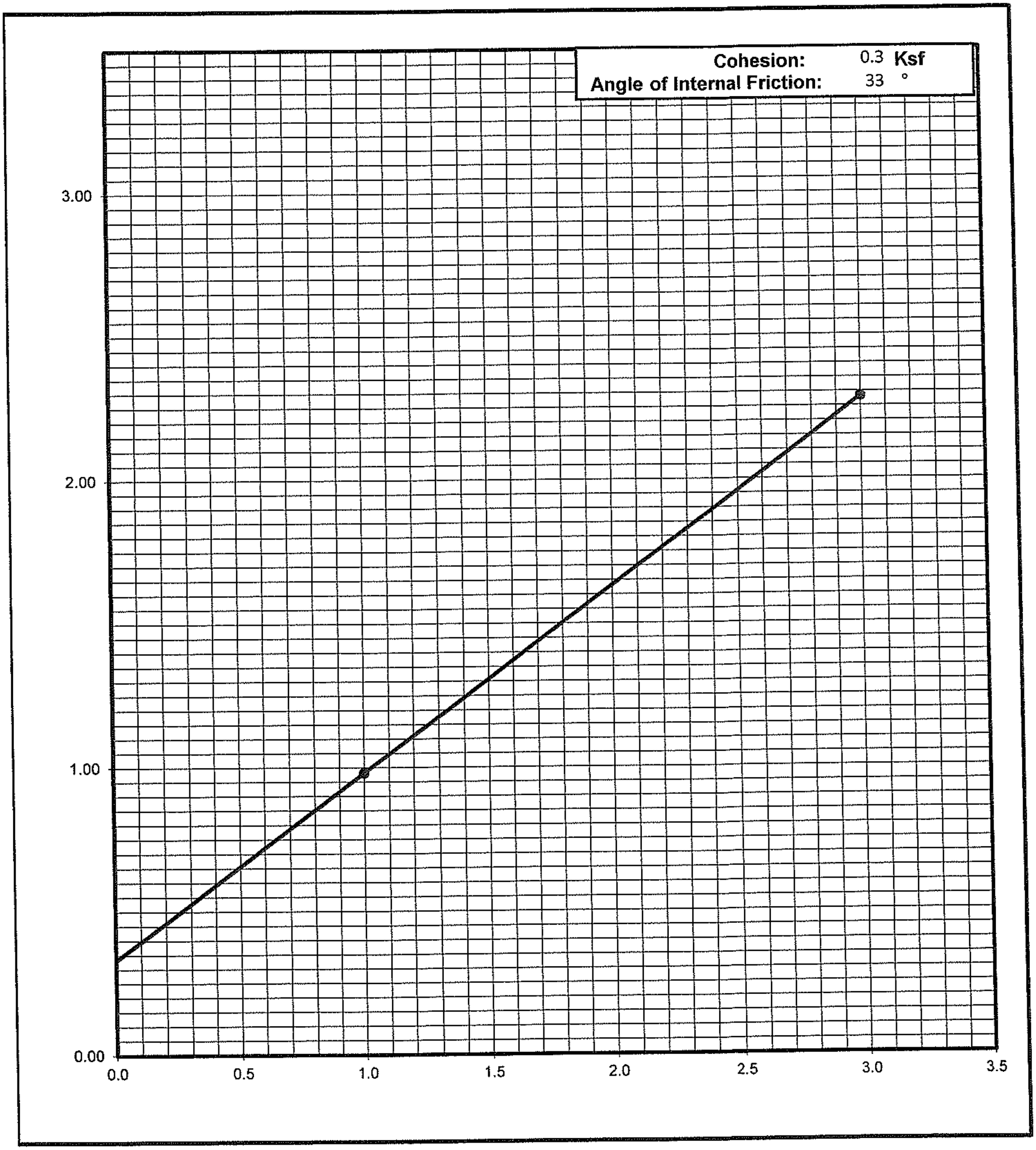
Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

Project Number	Boring No. & Depth	Soil Type	Date
112-15020	B1 @ 2-3'	SC	4/27/2015



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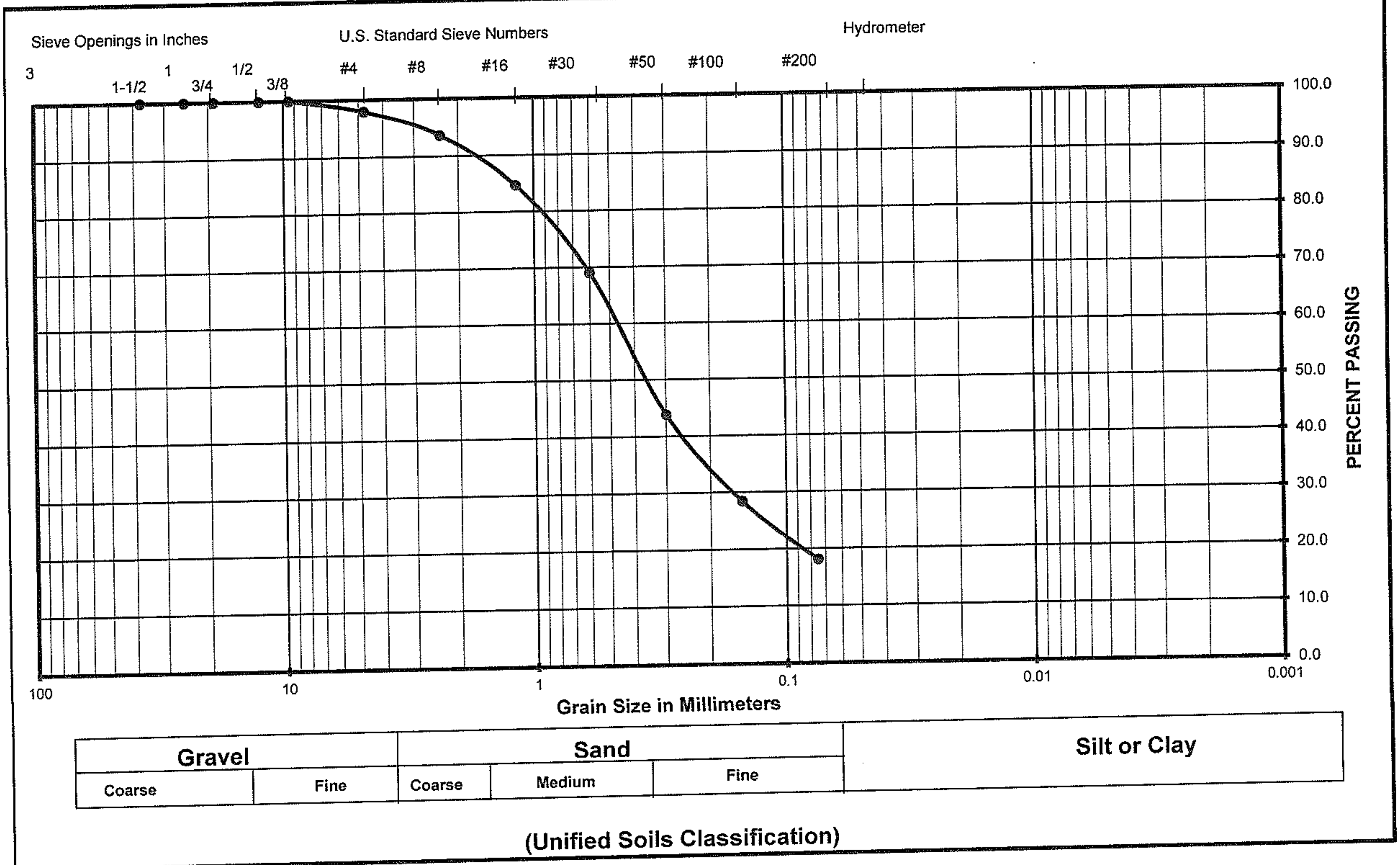
Grain Size Analysis



Project Name	Warehouse Building
Project Number	112-15020
Soil Classification	SM w/ grvl
Sample Number	B3 @ 2-3'

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Appendix B

General Earthwork Specifications

APPENDIX B

EARTHWORK SPECIFICATIONS

GENERAL

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

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

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

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

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

TECHNICAL REQUIREMENTS: All compacted materials shall be densified to a density not less than 90 percent relative compaction based on ASTM Test Method D1557 or CAL-216, as specified in the technical portion of the Soil Engineer's report. The location and frequency of field density tests shall be as determined by the Soils Engineer. The results of these tests and compliance with these specifications shall be the basis upon which satisfactory completion of work will be judged by the Soils Engineer.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the soil report.

The Contractor shall make his own interpretation of the data contained in said report, and the Contractor shall not be relieved of liability under the Contract documents for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

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

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing and the preparations of foundation materials for receiving fill.

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

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

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

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

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

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

PLACEMENT, SPREADING AND COMPACTION: The placement and spreading of approved fill materials and the processing and compaction of approved fill and native materials shall be the responsibility of the Contractor. However, compaction of fill materials by flooding, ponding, or jetting shall not be permitted unless specifically approved by local code, as well as the Soils Engineer.

Both cut and fill areas shall be surface-compacted to the satisfaction of the Soils Engineer prior to final acceptance.

SEASONAL LIMITS: No fill material shall be placed, spread, or rolled while it is frozen or thawing or during unfavorable wet weather conditions. When the work is interrupted by heavy rains, fill operations shall not be resumed until the Soils Engineer indicates that the moisture content and density of previously placed fill are as specified.

Appendix C

General Paving Specifications

APPENDIX C

PAVEMENT SPECIFICATIONS

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

The term "Standard Specifications": hereinafter referred to is the 2010 Standard Specifications of the State of California, Department of Transportation, and the "Materials Manual" is the Materials Manual of Testing and Control Procedures, State of California, Department of Public Works, Division of Highways. The term "relative compaction" refers to the field density expressed as a percentage of the maximum laboratory density as defined in the applicable tests outlined in the Materials Manual.

2. **SCOPE OF WORK** - This portion of the work shall include all labor, materials, tools, and equipment necessary for, and reasonably incidental to the completion of the pavement shown on the plans and as herein specified, except work specifically noted as "Work Not Included."

3. **PREPARATION OF THE SUBGRADE** - The Contractor shall prepare the surface of the various subgrades receiving subsequent pavement courses to the lines, grades, and dimensions given on the plans. The upper 12 inches of the soil subgrade beneath the pavement section shall be compacted to a minimum relative compaction of 90 percent. The finished subgrades shall be tested and approved by the Soils Engineer prior to the placement of additional pavement courses.

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

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

6. ASPHALTIC CONCRETE SURFACING - Asphaltic concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades and dimensions shown on the plans. The viscosity grade of the asphalt shall be PG 64-10. The mineral aggregate shall be Type B, ½ inch maximum size, medium grading and shall conform to the requirements set forth in Section 39 of the 2010 Standard Specifications. The drying, proportioning and mixing of the materials shall conform to Section 39 of the 2010 Standard Specifications, as well.

The prime coat, spreading and compacting equipment and spreading and compacting mixture shall conform to the applicable chapters of Section 39 of the 2010 Standard Specifications, with the exception that no surface course shall be placed when the atmospheric temperature is below 50° F. The surfacing shall be rolled with a combination of steel wheel and pneumatic rollers, as described in Section 39-6 of the 2010 Standard Specifications. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

7. FOG SEAL COAT - The fog seal (mixing type asphaltic emulsion) shall conform to and be applied in accordance with the requirements of Section 37.