APPENDIX D:
GEOTECHNICAL REPORT

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED TRACTOR SUPPLY
INTERSECTION OF ENTERPRISE WAY
AND COLLIER AVENUE
LAKE ELSINORE, CALIFORNIA

PROJECT NO. 112-13042
SEPTEMBER 3, 2013

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TABLE OF CONTENTS

September 3, 2013 KA Project No. 112-13042

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INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the Proposed Tractor Supply facility to be located at the western corner of Enterprise Way and Collier Avenue, in the city of Lake Elsinore, 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, and soil cement reactivity.

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 also contains a description of the laboratory testing phase of this study, along with the 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 August 12, 2013 (KA Proposal No. 112036-13) 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 eight (8) borings to depths ranging from approximately 10 to 50 feet below site grades for evaluation of the subsurface conditions at the project site.

- One percolation test in order to provide a recommended percolation rate for the subject 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 and as such, structural loading information and other final details pertaining to the structure are not available. On a preliminary basis, it is understood that development will consist of construction of a Tractor Supply store and associated site improvements. The proposed building is understood to be a single-story structure incorporating a slab-on-grade floor. The proposed building is understood to be a masonry or steel framed structure. Footing loads are anticipated to be relatively moderate and include a shallow foundation system.

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 subject site is roughly rectangular in shape and encompasses approximately 3.4 acres. The site is located at the western most corner of Enterprise Way and Collier Avenue in the city of Lake Elsinore, California. The site is currently vacant of any above grade structures. Ground cover at the site consists of exposed soil and sparse weed and brush growth. The subject site is located at an elevation of approximately 1,275 feet above mean sea level.

The site is bound to the north-northeast by Collier Avenue, to the south-southwest by Enterprise Way, and to the west by undeveloped land. Sidewalks are located along the perimeter of the subject site. Buried utilities are located along the perimeter of the site as well. The site is relatively flat and level with no major changes in grade.

GEOLOGIC SETTING

The subject site is located within the Lake Elsinore Valley area. The Lake Elsinore valley is located east of the Elsinore Range, within the Peninsular Ranges Geomorphic Province of California. The Lake Elsinore Valley is transverse by the Elsinore Fault Zone. Metasedimentary and Quartz-rich Mesozoic bedrock underlies the younger quaternary alluvium in the vicinity of the site. Tectonism of the region is dominated by the interaction of the East Pacific Plate and the North American Plate along a transform boundary.

The near-surface deposits in the vicinity of the subject site are indicated to be comprised of recent alluvium consisting of unconsolidated sands, silt, and clays derived from erosion of local mountain ranges. Deposits encountered on the subject site during exploratory drilling are discussed in detail in this report.

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 seismic hazard most likely to impact the site is ground shaking due to a large earthquake on one of the major active regional faults. The Lake Elsinore is located within the 5 km of the site. Because of the proximity to the subject site and the maximum probable events for these faults, it appears that a maximum probable event along these fault zones could produce a peak horizontal acceleration of approximately 0.42g (SDS/2.5) when uncertainty is used (mean plus one standard deviation). With respect to this hazard, the site is comparable to others in this general area within similar geologic settings.

FIELD AND LABORATORY INVESTIGATION

Subsurface soil conditions were explored by drilling eight (8) borings to depths ranging from approximately 10 to 50 feet below existing site grades, using a hollow stem, truck-mounted drill rig. The approximate boring and bulk sample locations are shown on the site plan. During drilling operations, penetration tests were performed at regular intervals to evaluate the soil consistency and to obtain information regarding the engineering properties of the subsurface soils. Soil samples were retained 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, expansion 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 results of the laboratory tests 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 at the boring locations appear typical of those found in the geologic region of the site. Groundcover at the boring locations consisted of exposed soil and localized weed and brush growth. The near surface soil consisted of up to six feet of loose, disturbed sand with varying gravel content. The near surface soil was found to posses varying consistencies and moisture contents. A representative sample of the near surface soil indicated an expansion index of 0. A remolded sample of the near surface sand was found to have an angle of internal friction of 30 degrees.

Below the near surface loose sand, medium dense to dense sand was encountered to depths of up to 50 feet below existing site grade. Limited testing was performed on these soils during the time of our field and laboratory investigations. Penetration resistance in these soils ranged from 7 to 41 blows per foot.

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 encountered at a depth of approximately 20 feet below existing site grade. 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.

SOIL LIQUEFACTION

Soil liquefaction is a state of soil particles suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by a seismic event.

To evaluate the liquefaction potential of the site, the following items were evaluated:

1) Soil type
2) Groundwater depth
3) Relative density
4) Initial confining pressure
5) Intensity and duration of groundshaking

The soils encountered within a depth of 50 feet below the project site predominately consist of medium dense to dense sands and silty sands with varying gravel content. Groundwater was encountered below the site at a depth of approximately 20 feet during this subsurface exploration. Available groundwater depth mapping, as well as our experience in the area, indicates that historically groundwater has been located at depths of approximately 20 feet below grade in the general vicinity of the site.

The potential for soil liquefaction during a seismic event was evaluated using the LiquefyPro computer program (version 5.8h) developed by CivilTech Software. For the analysis, a maximum earthquake magnitude of 7.0 M_w and a peak horizontal ground surface acceleration of 0.42g were considered appropriate for the liquefaction analysis (SDs/2.5). A groundwater depth of 20 feet was used for the analysis. The computer analysis indicates that soils to a depth of 50 feet are non-liquefiable. The analysis indicates that the total and differential seismic induced settlement is not anticipated to exceed 1.3 inches and 0.5 inches, respectively. Accordingly, the liquefaction potential at the site is considered low and measures to mitigate the liquefaction potential are not considered warranted.

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 11 times (Hart, 2007). The purpose of the Act, as provided in California Geologic Survey (CGS) 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."

The area of the subject site is included on the Lake Elsinore Quadrangle. The site is not within a Fault-Rupture Hazard Zone. The nearest zoned fault is the Elsinore Fault zone, located approximately 5.0 miles from the subject site.

SEISMIC HAZARDS 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 included in the area of Lake Elsinore Quadrangle. A Seismic Hazard Zones Map for the Lake Elsinore Quadrangle has not been prepared to date. The area of the subject is, however, located in an area designated as a moderate liquefaction hazard zone as indicated in the Riverside County General Plan.

SEISMIC SETTLEMENT

The estimated seismic settlement was determined at the site using the settlement analysis method by Tokimatsu, Seed, and Bolton (1987). The results of the settlement analysis are included as follows:

Location	Seismic Settlement (inches)			
	Saturated Settlement	Unsaturated Settlement	Total Settlement	Differential Settlement
B6	1.0	0.30	1.30	0.5

The total seismic-induced settlement is not expected to exceed 1.3 inches. Differential settlement caused by a seismic event should be less than 0.5 inch. The anticipated differential settlement is estimated over a distance of 100 feet.

The native soils within the project site are not considered conducive to significant hydro-collapse due to the relatively dense soil conditions, low void ratio and moderate penetration resistance measured. Any loose fill materials at the site could be vulnerable to hydro-collapse. However, the hazard can be mitigated by following the design and construction recommendations of current and future Geotechnical Engineering Investigation reports.

The proposed development will include grading of the subject site and surrounding area to construct a relatively level site. Groundwater has historically been encountered at depths greater than 20 feet below existing site grade. Provided the planned grading complies with the current code requirements and the recommendations of current and future Geotechnical Engineering Investigation reports, the site will not likely be subject to lateral spreading hazards.

INFILTRATION TESTING

Estimated infiltration rates were determined using the results of percolation testing conducted in open borehole drilled at the subject site. Testing was performed at a depth ranging from approximately three to eight feet below site grades. The resulting infiltration rates indicated the area tested possesses an estimated percolation rate of approximately 0.5 feet per hour. Detailed results of the infiltration rates are attached in tabular format.

SOIL CORROSIVITY

Corrosion tests were performed to evaluate the soil corrosivity to the buried structures. The tests consisted of sulfate content, chloride content, and resistivity and the results of the tests are included as follows:

Parameter	Results	Test Method
Resistivity	1,870 ohms-cm	CALTRANS
Sulfate	374 ppm	EPA 9038
Chloride	140 ppm	EPA 9253
pH Value	7.66	EPA 9045C

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 to the loose near surface soil, appear to be conducive to the development of the project.

Following stripping, fill removal, and any demolition activities, it is recommended that at a minimum, remedial grading in building or other structural areas include removal and replacement of the existing soil to a depth of at least five feet below existing site grade, five feet below proposed subgrade, or three feet below foundation bearing grade, whichever is deeper. Remedial grading should be performed to a horizontal distance of at least five feet beyond the proposed foundation limits. Follow the recommended overexcavation, the upper twelve inches of exposed subgrade soils beneath the overexcavated area should be scarified, worked until uniform and free from large clods, moisture-conditioned to within 2 percent of optimum moisture-content, and recompacted to a minimum of 95 percent of the maximum density based on ASTM Test Method D1557. Remedial grading should be performed in building areas, proposed wall locations, and any area which utilizes the recommended bearing capacity values included in this report.

Within the pavement and exterior flatwork areas, the exposed subgrade should be excavated to a depth of 24 inches, worked until uniform and free from large clods and moisture-conditioned to within 2 percent of optimum moisture-content and recompacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan & Associates, Inc. to verify stability. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

Trees and shrubs are located within the project site. Tree and shrub removal operations should include roots greater than 1/4 inch in diameter. The resulting excavations should be backfilled with Engineered Fill compacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557.

Based on the soil liquefaction analysis performed within the site, the subsurface soil conditions are not considered liquefiable. The subsurface soil conditions are however, subject to seismic settlement. The estimated total seismic-induced settlement is approximately 1.3 inches. Differential settlement caused by a seismic event is estimated to be on the order of 0.5 inch. The anticipated differential settlement is estimated over a width of 100 feet. If these potential movements are not tolerable then mitigation measures are recommended to reduce structural damage due to seismic settlement. The project's structural engineer should evaluate the structures ability to withstand these potential movements associated with soil liquefaction and seismic settlement.

After completion of the recommended site preparation and over-excavation, the site should be suitable for shallow footing support. The proposed structure footings may be designed utilizing an allowable bearing pressure of 2,500 psf for dead-plus-live loads. Footings should have a minimum embedment of 18 inches.

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 45 pounds per square foot per foot of depth. Walls that are incapable of this deflection or walls that are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 66 pounds per square foot per foot per 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. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Groundwater Influence on Structures/Construction

During our field investigation, groundwater was encountered at a depth of approximately 20 feet below existing grade. Based on the anticipated depth of construction, groundwater is not anticipated to impact the proposed construction. Very moist soils were encountered at the subject site however, and should be anticipated during construction.

Historic groundwater levels are reported at a depth on the order of 20 feet below existing site grade. If groundwater is encountered, our firm should be consulted prior to dewatering the site. Installation of a standpipe piezometer is suggested prior to construction should groundwater levels be a concern. The Contractor should refer to the soil boring logs in Appendix A for available information regarding groundwater levels at specific locations.

In addition to the groundwater level, 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; structures including foundations; basement walls and floors; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. In the event that previously unidentified debris pits or underground utilities are encountered, those objects should be removed in their entirety. Any abandoned underground utilities that are exposed and found to extend into adjacent properties should be capped.

Additional fill soil may be present at the site between our boring locations. Any fill soil encountered should be excavated and stockpiled so that the native soils can be properly prepared. Any clayey soil encountered at the site will not be suitable for reuse as non-expansive Engineered Fill. However, clayey soil will be suitable for reuse as General Engineered Fill, provided they are cleansed of excessive organics and debris, and are moisture-conditioned to a minimum of 2 percent above optimum moisture-content. Prior to fill placement Krazan & Associates, Inc. should observe the bottom of excavations in order to verify no additional removal will be required.

Clearing activities should include proper removal of any buried structures. Any surface or buried structures, such as utilities or loosely backfilled excavations, encountered during construction should be properly removed and the resulting excavations backfilled. After demolition activities, it is recommended that these disturbed soils be removed and/or recompacted. 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.

Trees and shrubs are located within the project site. Tree and shrub removal operations should include roots greater than 1/4 inch in diameter. The resulting excavations should be backfilled with Engineered Fill compacted to a minimum of 95 percent of the maximum density based on ASTM Test Method D1557.

Following stripping, fill removal, and any demolition activities, it is recommended that at a minimum, remedial grading in building or other structural areas include removal and replacement of the existing soil to a depth of at least five feet below existing site grade, five feet below proposed subgrade, or three feet below foundation bearing grade, whichever is deeper. Remedial grading should be performed to a horizontal distance of at least five feet beyond the proposed foundation limits. Follow the recommended overexcavation, the upper twelve inches of exposed subgrade soils beneath the overexcavated area should be scarified, worked until uniform and free from large clods, moisture-conditioned to within 2 percent of optimum moisture-content, and recompacted to a minimum of 95 percent of maximum density based on ASTM Test Method D1557. Remedial grading should be performed in building areas, proposed wall locations, and any area which utilizes recommended bearing capacity values included in this report.

Within the pavement and exterior flatwork areas, the exposed subgrade should be excavated to a depth of 24 inches, worked until uniform and free from large clods and moisture-conditioned to within 2 percent of optimum moisture-content and recompacted to a minimum of 95 percent of the maximum dry density based on ASTM Test Method D1557. Prior to backfilling, the bottom of the excavation should be proof-rolled and observed by Krazan & Associates, Inc. to verify stability. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

In areas where slab-on-grade construction will be utilized, it is recommended that the upper 24 inches of soil within proposed slab-on-grade and exterior flatwork areas consist of non-expansive Engineered Fill. The fill placement serves two functions: 1) it provides a uniform amount of soil which will more evenly distribute the soil pressures and 2) it reduces moisture content fluctuation in the clayey material beneath the building area. The non-expansive fill material should be a well-graded silty sand or sandy silt soil. A clean sand or very sandy soil is not acceptable for this purpose. Imported Fill should be approved by the Soils Engineer prior to placement. The fill should be placed as specified in the Engineered Fill section of this report.

The upper soils, during wet winter months, may 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 and 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 native soils are predominately sand and silty sand. The sand and silty sand soils that do not contain clay will be suitable for reuse as non-expansive Engineered Fill provided they are cleansed of excessive organics and debris. Clayey soils will not be suitable for reuse as non-expansive Engineered Fill. Any clayey soils should be at or above optimum moisture content during mixing operations. Clayey soils will be suitable for reuse as General Engineered Fill, within flexible pavement areas and below 24 inches from finished grade in building areas, provided they are cleansed of excessive organics, debris, and moisture-conditioned to within 2 percent of the optimum moisture content.

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

Imported non-expansive Fill should consist of a well-graded, slightly cohesive, fine silty sand or sandy silt soil, 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 context, and compacted to achieve at least 95 percent of the maximum density based on ASTM 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 1803 of the 2010 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 2 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.

Slots or weep holes should be placed in drop inlets or other surface drainage devices in pavement areas to allow free drainage of adjoining base course materials. Cutoff walls should be installed at pavement edges adjacent to vehicular traffic areas. These walls should extend to a minimum depth of 12 inches below pavement subgrades to limit the amount of seepage water that can infiltrate the pavements. Where cutoff walls are undesirable subgrade drains can be constructed to transport excess water away from planters to drainage interceptors. If cutoff walls can be successfully used at the site, construction of subgrade drains is considered unnecessary.

Temporary Excavation Stability

All excavations should comply with the current requirements of Occupational Safety and Health Administration (OSHA). All cuts greater than 4 feet in depth should be sloped or shored. Temporary excavations should be sloped at 1½:1 (horizontal to vertical) or flatter, up to a maximum depth of 8 feet, and at 2:1 (horizontal to vertical) to a maximum depth of 12 feet. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within five feet of the top (edge) of the excavation. Where sloped excavations are not feasible due to site constraints, the excavations will require shoring. The design of the shoring system is normally the responsibility of the contractor or shoring designer, and therefore, is outside the scope of this report. The design of the temporary shoring should take into account lateral pressures exerted by the adjacent soil, and, where anticipated, surcharge loads due to adjacent buildings and any construction equipment or traffic expected to operate alongside the excavation.

The excavation/shoring recommendations provided herein are based on soil characteristics derived from our test borings within the area. Variations in soil conditions will likely be encountered during the excavations. Krazan & Associates, Inc. should be afforded the opportunity to provide field review to evaluate the actual conditions and account for field condition variations, not otherwise anticipated in the preparation of this recommendation.

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; 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 following periods of precipitation.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum density based on ASTM Test Method D1557. The utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the 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 - Conventional

After completion of the recommended site preparation and over-excavation, the site should be suitable for shallow footing support. The proposed structures, including buildings, walls, or any structural element incorporating the recommended bearing capacity values below, may be supported on a shallow foundation system bearing on a minimum of 3 feet of Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	1,875 psf
Dead-Plus-Live Load	2,500 psf
Total Load, Including Wind or Seismic Loads	3,320 psf

The footings should have a minimum embedment depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is lower. Footings should have a minimum width of 15 inches, regardless of load. The actual design of foundations should be performed by the project structural engineer. Shallow foundation systems should be designed to tolerate the anticipated static and seismic settlement.

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 actual design of foundations should be performed by the project structural engineer.

Resistance to lateral footing displacement can be computed using an allowable friction factor of 0.30 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 250 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. An ⅓ increase in the value above may be used for short duration, wind, or seismic loads. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

The total static movement is not expected to exceed ¾ inch. Differential static movement should be less than ½ inch. Most of the static settlement is expected to occur during construction, as the loads are applied. However, additional post-construction movement may occur if the foundation soils are flooded or saturated. The total and differential seismic-induced settlement is estimated to be approximately 1.3 inches and 0.5 inch, respectively. The anticipated seismic differential settlement is estimated over a distance of 100 feet. The seismic settlements would develop if liquefaction of the underlying saturated sandy soils were to occur during a seismic event.

Floor Slabs and Exterior Flatwork

To reduce post-construction soil movement beneath floor slabs and exterior flatwork, it is recommended that mitigation measures be performed. For conventional slab-on-grade, it is recommended that the upper 24 inches of soil consist of non-expansive Engineered Fill.

Concrete slab-on-grade floors should be underlain by a water vapor retarder. The water vapor retarder should be installed in accordance with ASTM Specification E 1643-98. According to ASTM Guidelines, 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 with at least No. 3 reinforcing bars, placed at 18 inches on center in each direction within the slabs middle third, 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. Exterior finish grades should be sloped a minimum of 2 percent away from all interior slab areas to preclude ponding of water adjacent to the structures. 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 minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with ASTM guidelines. 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 45 pounds per square foot per foot of depth. Walls that are incapable of this deflection or walls that are fully constrained against deflection may be designed for an equivalent fluid at-rest pressure of 66 pounds per square foot per foot per 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. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

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.

Retaining and/or below grade walls should be drained with either perforated pipe encased in free-draining gravel or a prefabricated drainage system. The gravel zone should have a minimum width of 12 inches wide and should extend upward to within 12 inches of the top of the wall. The upper 12 inches of backfill should consist of native soils, concrete, asphaltic concrete or other suitable backfill to minimize surface drainage into the wall drain system. The aggregate should conform to Class II permeable materials graded in accordance with the CalTrans Standard Specifications (May 2006). Prefabricated drainage systems, such as Miradrain®, Enkadrain®, or an equivalent substitute, are acceptable alternatives in lieu of gravel provided they are installed in accordance with the manufacturer's recommendations. If a prefabricated drainage system is proposed, our firm should review the system for final acceptance prior to installation.

Drainage pipes should be placed with perforations down and should discharge in a non-erosive manner away from foundations and other improvements. The pipes should be placed no higher than 6 inches above the heel of the wall in the center line of the drainage blanket and should have a minimum diameter of 4 inches. Collector pipes may be either slotted or perforated. Slots should be no wider than ⅛ inch in diameter, while perforations should be no more than ¼ inch in diameter. If retaining walls are less than 6 feet in height, the perforated pipe may be omitted in lieu of weep holes on 4 feet maximum spacing. The weep holes should consist of 4-inch diameter holes (concrete walls) or unmortared head joints (masonry walls) and not be higher than 18 inches above the lowest adjacent grade. Two 8-inch square overlapping patches of geotextile fabric (conforming to the CalTrans Standard Specifications for "edge drains") should be affixed to the rear wall opening of each weep hole to retard soil piping.

As indicated previously, fill material is located throughout the site. It is recommended that any uncertified fill material encountered within pavement areas, be removed and/or recompacted. The fill material should be moisture-conditioned to near optimum moisture and recompacted to a minimum of 95 percent of the maximum density based on ASTM Test Method D1557. As an alternative, the Owner may elect not to recompact the existing fill within paved areas. However, the Owner should be aware that the paved areas may settle which may require annual maintenance. At a minimum, it is recommended that the upper 12 inches of subgrade soil be moisture-conditioned as necessary and recompacted to a minimum of 95 percent of the maximum density based on ASTM Test Method D1557.

Seismic Parameters – 2010 California Building Code

The Site Class per Table 1613.5.2, of the 2010 California Building Code (2010 CBC) is based upon the site soil conditions. It is our opinion that 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 2010 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Table 1613.5.2
Site Coefficient Fa	1.0	Table 1613.5.3 (1)
Ss	1.569	Figure 1613.5 (3)
SMS	1.569	Section 1613.5.3
SDS	1.046	Section 1613.5.4
Site Coefficient Fv	1.5	Table 1613.5.3 (2)
S1	0.600	Figure 1613.5 (4)
SM1	0.900	Section 1613.5.3
SD1	0.600	Section 1613.5.4

Pavement Design

Based on the established standard practice of designing flexible pavements in accordance with State of California Department of Transportation (Caltrans) for projects within California, we have developed pavement sections in accordance with the procedure presented in Caltrans Standard Test Method 301.

This pavement design procedure is based on the volume of traffic (Traffic Index) and the soil resistance "R" value (R-value).

Asphalt Concrete (Flexible) Pavements

One (1) near-surface soil sample was obtained from the soil borings at the project site for laboratory R-Value testing. The sample was tested in accordance with California Test 301. Results of the test are as follows:

R-VALUE TEST RESULTS			
Sample Number	**Sample Depth (ft)**	**Description**	**R-Value at Equilibrium**
RV #1	0-3'	Sand	40

The Civil Engineer should consult with the client to confirm the truck count prior to assigning the Traffic Index and selecting the pavement sections for incorporation into the project plans.

Based on our understanding of the project specifications, a Traffic Index of 5.5 has been used for design of pavements for automobile parking lots and drive lanes.

Based on a review of the boring logs and the R-value data presented above, the near surface soil of the site consists of mostly silty sand with an R-value of 40. If site grading exposes soil other than that assumed, we should perform additional tests to confirm or revise the recommended pavement sections for actual field conditions. Various alternative pavement sections based on the Caltrans Flexible Pavement Design Method are presented below:

ASPHALT CONCRETE (FLEXIBLE) PAVEMENTS Subgrade R-value = 40				
Traffic / Pavement Designation	**Traffic Index**	**Asphalt Concrete (inches)**	**Class 2 Aggregate Base (inches)**	**Depth of Compacted Subgrade (in)**
STANDARD DUTY	**5.5**	4.0	6.0	12.0

We recommend that the subgrade soil be prepared as discussed in this report. The compacted subgrade should be non-yielding when proof-rolled with a loaded ten-wheel truck, such as a water truck or dump truck, prior to pavement construction. Subgrade preparation should extend a minimum of 2 feet laterally behind the edge of pavement or back of curbs.

Pavement areas should be sloped and drainage gradients maintained to carry all surface water off the site. A cross slope of 2 percent is recommended in asphalt concrete pavement areas to provide good surface drainage and to reduce the potential for water to penetrate into the pavement structure.

Unless otherwise required by local jurisdictions, paving materials should comply with the materials specifications presented in the Caltrans Standard Specifications Section. Class 2 aggregate should comply with the materials requirements for Class 2 base found in Section 26.

The mineral aggregate shall be Type B, ½-inch or ¾-inch maximum, medium grading, for the wearing course and ¾-inch maximum, medium grading for the base course, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The asphalt concrete materials should comply with and be placed in accordance with the specifications presented in Section 39 of the Caltrans Standard Specifications, latest edition. Asphalt concrete should be compacted to a minimum of 96 percent of the maximum laboratory compacted (kneading compactor) unit weight.

ASTM Test procedures and should be used to assess the percent relative compaction of soils, aggregate base and asphalt concrete. Aggregate base and subbase, and the upper 12 inches of subgrade should be compacted to at least 95 percent based on the Modified Proctor maximum compacted unit weight obtained in accordance with ASTM test method D1557. Compacted aggregate base should also be stable and unyielding when proof-rolled with a loaded ten-wheel water truck or dump truck.

Portland Cement Concrete (Rigid) Pavement

A six-inch layer of compacted Class 2 aggregate base should be placed over the prepared subgrade prior to placement of the concrete. We recommend that the rigid pavement be a minimum of five (5) inches thick. The final rigid pavement design and section should be determined by the project Structural Engineer.

RIGID PAVEMENT			
Traffic/Pavement Designation	Portland Cement Concrete (inches)	Class 2 Aggregate Base (inches)	Compacted Subgrade (inches)
Standard Duty	5.0	6.0	12.0

Prior to the construction of any rigid pavement, we recommend that concrete mix histories with flexural strength data be obtained from the proposed supplier. In the absence of flexural strength history, we recommend that laboratory trail batching and testing be performed to allow for confirmation that the proposed concrete mix is capable of producing the required flexural strength.

The concrete pavements should be designed with both longitudinal and transverse joints. The saw-cut or formed joints should extend to a minimum depth on one-fourth of the pavement thickness plus ¼ inch. Joint spacing should not exceed 15 feet. Steel reinforcement of all rigid pavements is recommended to keep the joints tight and to control temperature cracking.

Keyed joints are recommended at all construction joints to transfer loads across the joints. Joints should be reinforced with a minimum of ½ inch diameter by 48-inch long deformed reinforcing steel placed at mid-slab depth on 18-inch center-to-center spacing to keep the joints tight for load transfer. The joints should be filled with a flexible sealer. The sealer should be fuel-resistant where placed at the gasoline station facility. Expansion joints should be constructed only where the pavements abut structures or fixed objects.

Smooth bar dowels, with a diameter of d/8, where d equals the thickness of the concrete, at least 14 inches in length, placed at a spacing of 12 inches on centers, may also be considered for construction joints to transfer loads across the joints. The dowels should be centered across the joints with one side of the dowel lubricated to reduce the bond strength between the dowel and the concrete and fitted with a plastic cap to allow for bar expansion.

Infiltration Testing

The anticipated percolation rate was determined using the results of an open borehole percolation test. The percolation testing indicated an approximate percolation rate 0.5 feet per hour. Detailed results of the percolation test are attached. The data is presented in tabular format. The soil percolation rate is based on tests conducted with clean water. The resulting percolation rates may vary with time as a result of soil clogging from water impurities. The results presented are unfactored and a factor of safety should be incorporated into the design of the percolation system to compensate for these factors.

Historic high groundwater levels indicate a depth to water of approximately 20 feet below ground surface. Based on our understanding of the anticipated project grading requirements, only minor cuts and fills, one to two feet or less from existing grades will be required to achieve final finished grades. The soil conditions encountered at the site consist of predominately granular soil to a depth of at least fifty (50) feet below site grades. Based on this information, there is no indication that on site infiltration will result in adverse transmission along impervious layers located within 10 feet of the bottom of proposed infiltration areas. Based on the historic depth to groundwater there is no indication that on site infiltration will impact groundwater located within 10 feet of the bottom of proposed infiltration areas.

It is recommended that the storm water infiltration system be a deepened system so that moisture infiltration into the soil does not over-saturate the surface soil and cause settlement or expansion. This may impact the proposed or existing foundations. It is recommended that the infiltration system be established at least ten horizontal feet from adjacent property lines or the edge of any foundations. Infiltration systems should be located at least five feet from the edge of any right of way.

If infiltration systems are located within ten feet from foundations, it is recommended that the system be impermeable from the finished surface to a depth that will achieve a diagonal distance of at least ten feet from the bottom of the closest foundation.

Soil Cement Reactivity

Excessive sulfate or chloride in either the soil or native water may result in an adverse reaction between the cement in concrete and the soil. California Building Code has developed criteria for evaluation of sulfate and chloride levels and how they relate to cement reactivity with soil and/or water. The soil samples from the subject site were tested to have moderate sulfate and chloride concentrations. Therefore, no special design requirements are necessary to compensate for sulfate or chloride reactivity with the cement.

Electrical resistivity testing of the soils (1,870 ohms-cm) indicates that the onsite soils have a high potential for metal loss from electrochemical corrosion process. A qualified corrosion engineer should be consulted regarding the corrosion effects of the onsite soils on underground metal utilities.

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.

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

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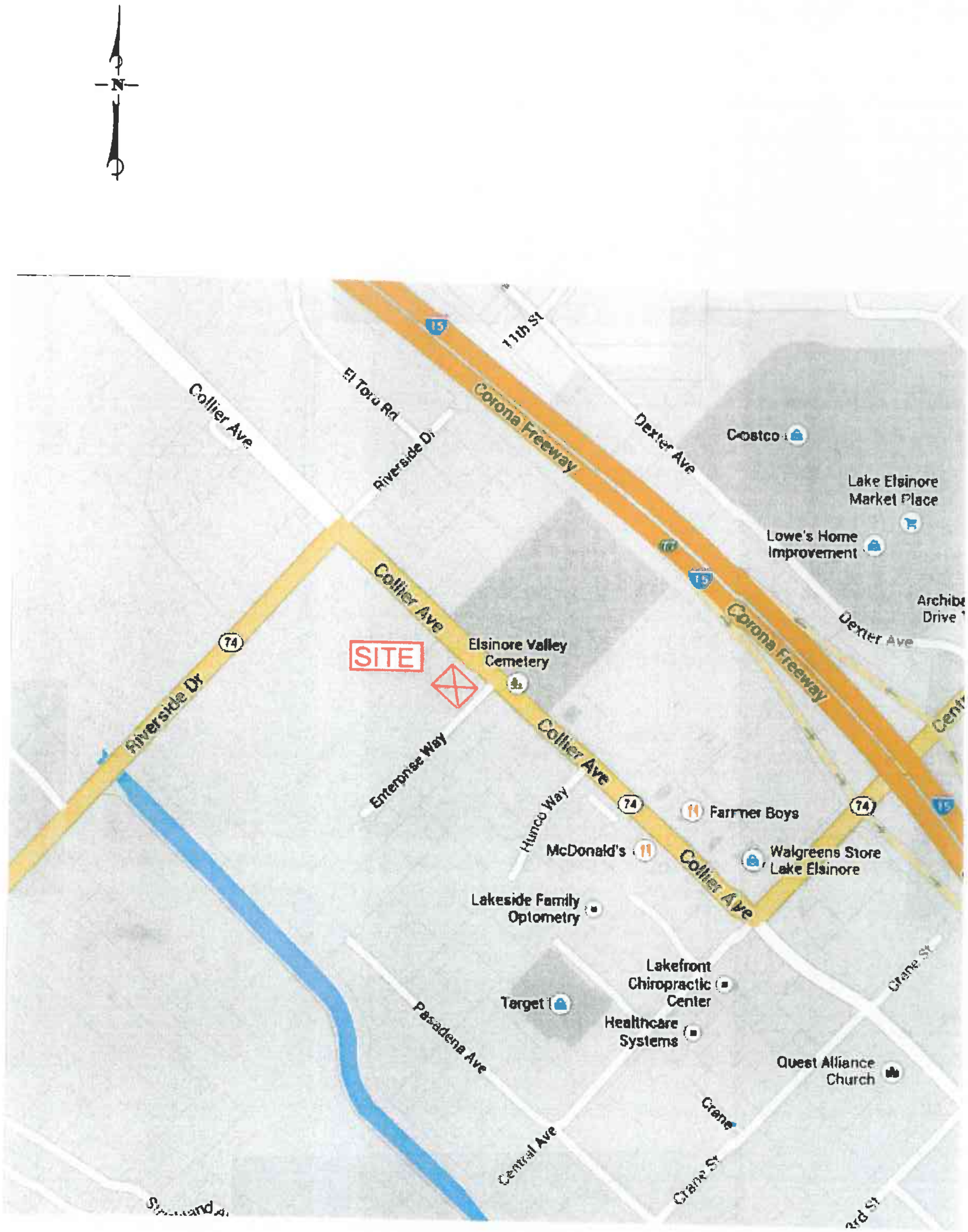
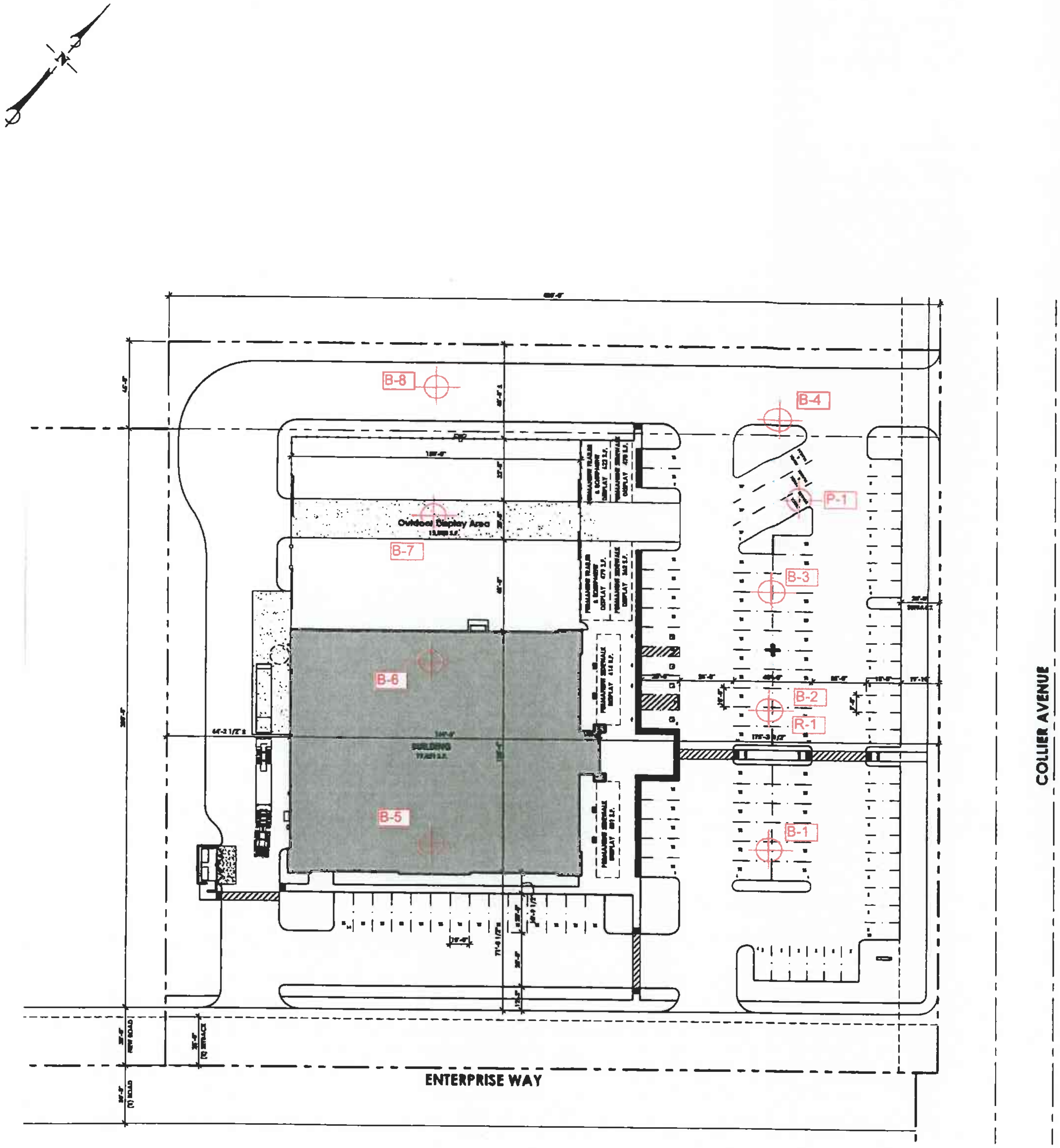
Figures



GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED TRACTOR SUPPLY LAKE ELSINORE, CALIFORNIA	Scale: NTS	Date: Set. 3, 2013	Krazan SITE DEVELOPMENT ENGINEERS Offices Serving the Western United States
	Drawn by: JMK	Approved by: JMK	
VICINITY MAP	Project No. 112-13042	Figure No. 1	



GEOTECHNICAL ENGINEERING INVESTIGATION PROPOSED ITRACTOR SUPPLY LAKE ELSINORE, CALIFORNIA	Scale: NTS	Date: Sept. 3, 2013	Krazan SITE DEVELOPMENT ENGINEERS Offices Serving the Western United States
	Drawn by: JMK	Approved by: JMK	
SITE MAP	Project No. 112-13042	Figure No. 2	

Appendix A

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Eight - 7½-inch diameter exploratory borings were advanced. The boring locations are shown on the attached 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 split barrel sampler, 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 one-half of the block shaded. All samples were returned to our Fresno 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. Expansion index and R-value tests were completed for select bag samples obtained from the auger cuttings. 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

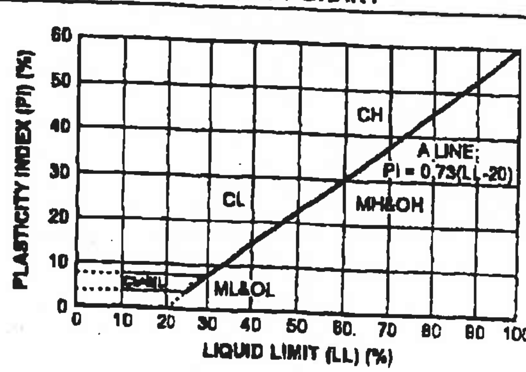
CONSISTENCY CLASSIFICATION

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	3 to 12 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

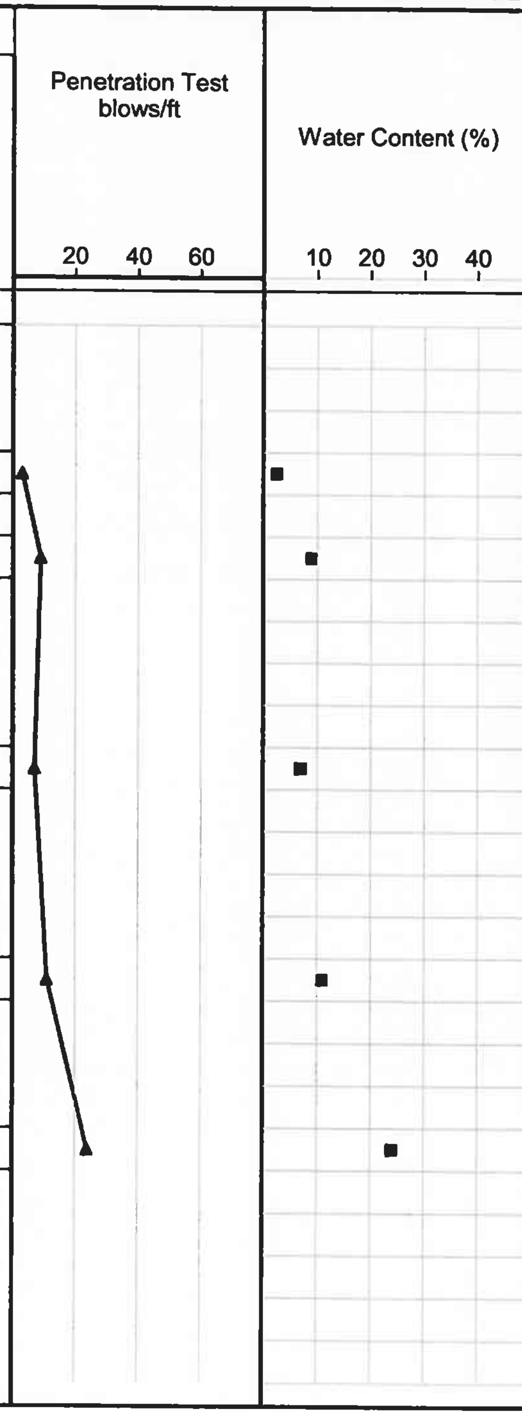


Log of Drill Hole B-1

Project: Proposed Tractor Supply
Client: California Gold Development
Location: Lake Elsionore, CA
Depth to Water: Not Encountered
Initial:

Project No: 11213042
Figure No.: A-1
Logged By: EB
At Completion:

Depth (ft)	Symbol	Description (SUBSURFACE PROFILE)	Sample Depth (SAMPLE)	Sample Type	Moisture	N-Value (Blows/ft.)
0		Ground Surface				
0–4		***Sand (SW)*** Fine to medium grained, trace fine gravel, light brown, loose, dry	SPT		2.6	3
4–20		***Sand (SW)*** Fine to medium grained, trace fine gravel, brown, medium dense, damp	SPT		5.9	9
			SPT		5.2	7
			SPT		7.0	11
			SPT		8.9	24
20		End of Borehole				



Drill Method: HSA
Driller: BE

Krazan and Associates

Drill Date: 8/20/13
Sample Method: SPT
Sheet: 1 of 1

Log of Drill Hole B-2

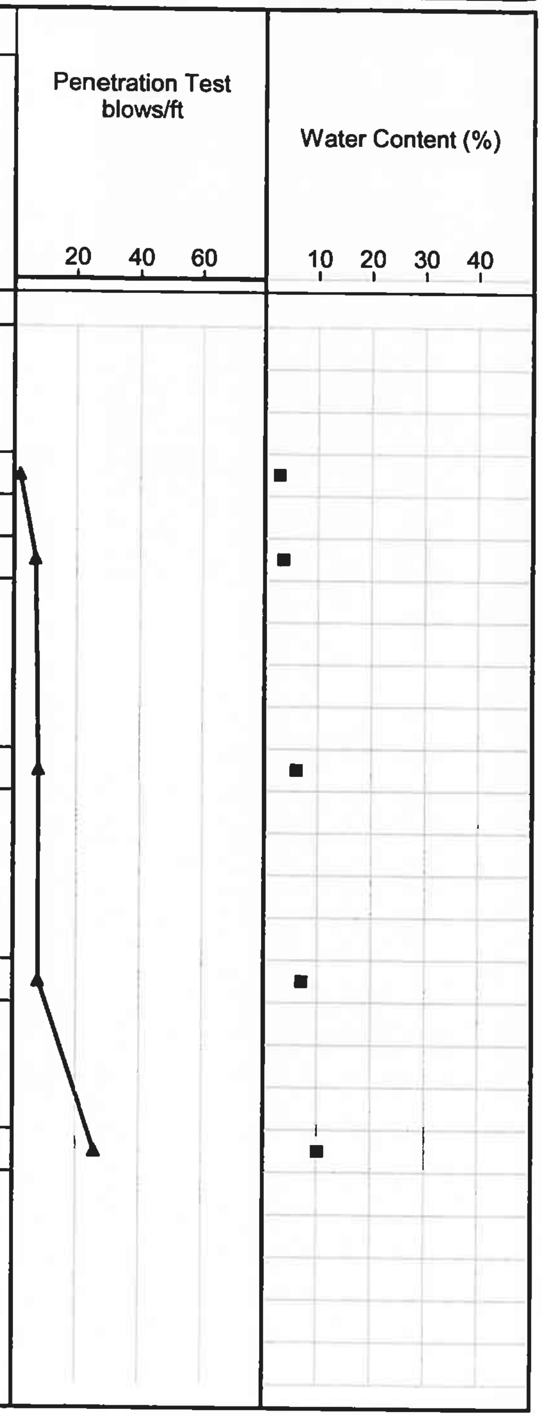
Project: Proposed Tractor Supply
Project No: 11213042

Client: California Gold Development
Figure No.: A-2

Location: Lake Elsionore, CA
Logged By: EB

Depth to Water: Not Encountered
Initial:
At Completion:

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Sample Depth	Sample Type	Moisture	N-Value (Blows/ft.)
0		Ground Surface				
0–4.5		***Sand (SW)*** Fine to medium grained, trace fine gravel, light brown, loose, dry	SPT		2.8	2
4.5–20		***Sand (SW)*** Fine to medium grained, trace fine gravel, brown, medium dense, damp	SPT		3.6	7
			SPT		6.1	8
			SPT		7.2	8
			SPT		10.2	26
20		End of Borehole				



Drill Method: HSA
Driller: BE

Krazan and Associates

Drill Date: 8/20/13
Sample Method: SPT
Sheet: 1 of 1

Log of Drill Hole B-3

Project: Proposed Tractor Supply

Client: California Gold Development

Location: Lake Elsionore, CA

Depth to Water: Not Encountered

Initial:

Project No: 11213042

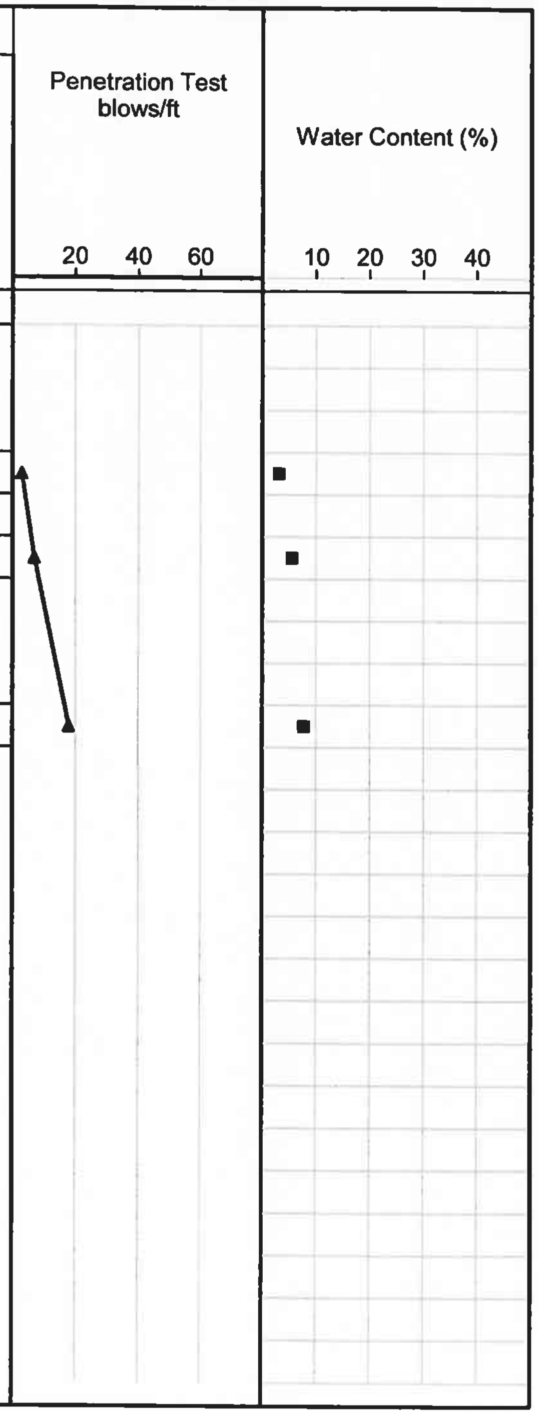
Figure No.: A-3

Logged By: EB

At Completion:

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Sample Depth	Sample Type	Moisture	N-Value (Blows/ft.)
		Ground Surface				
0–4		***Sand (SW)*** Fine to medium grained, trace fine gravel, light brown, loose, dry	SPT		3.2	3
4–10		***Sand (SW)*** Fine to medium grained, trace fine gravel, brown, medium dense, damp	SPT		5.6	7
			SPT		7.8	18
10		End of Borehole				

Depth scale (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24



Drill Method: HSA

Driller: BE

Krazan and Associates

Drill Date: 8/20/13

Sample Method: SPT

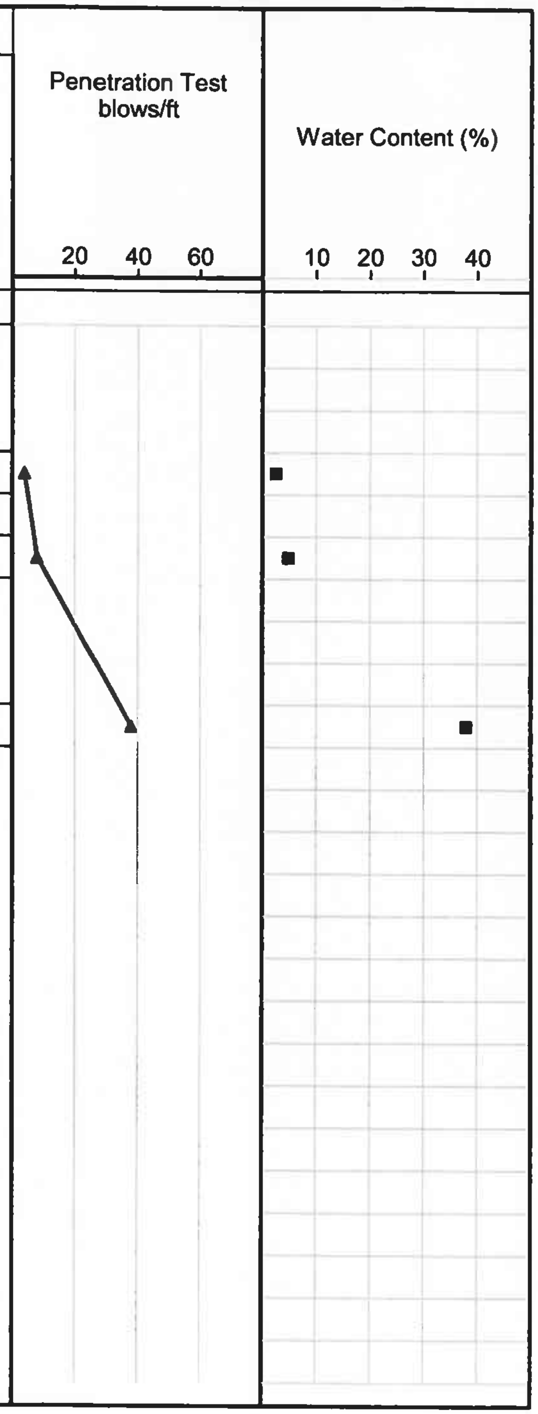
Sheet: 1 of 1

Log of Drill Hole B-4

Project: Proposed Tractor Supply
Client: California Gold Development
Location: Lake Elsionore, CA
Depth to Water: Not Encountered
Initial:

Project No: 11213042
Figure No.: A-4
Logged By: EB
At Completion:

Depth (ft)	Symbol	Description	Sample Depth	Sample Type	Moisture	N-Value (Blows/ft.)
0		Ground Surface				
0–4		***Sand (SW)*** Fine to medium grained, trace fine gravel, light brown, loose, dry	SPT		2.6	4
4–10		***Sand (SW)*** Fine to medium grained, trace fine gravel, brown, medium dense to dense, damp	SPT		4.9	8
			SPT		8.2	38
10		End of Borehole				



Drill Method: HSA
Driller: BE

Krazan and Associates

Drill Date: 8/20/13
Sample Method: SPT
Sheet: 1 of 1

Log of Drill Hole B-5

Project: Proposed Tractor Supply
Project No: 11213042

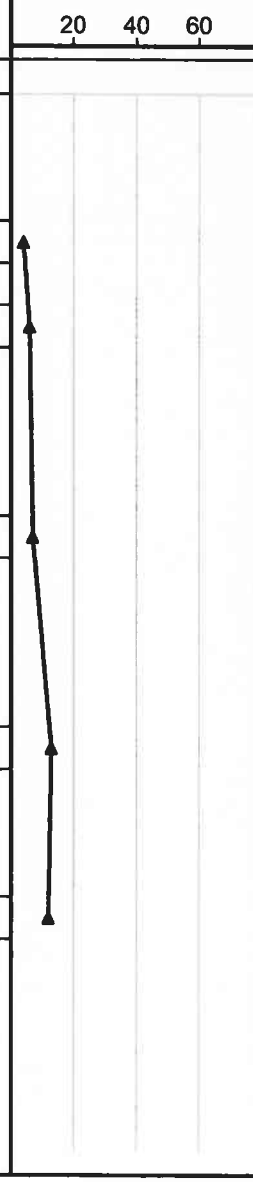
Client: California Gold Development
Figure No.: A-5

Location: Lake Elsionore, CA
Logged By: EB

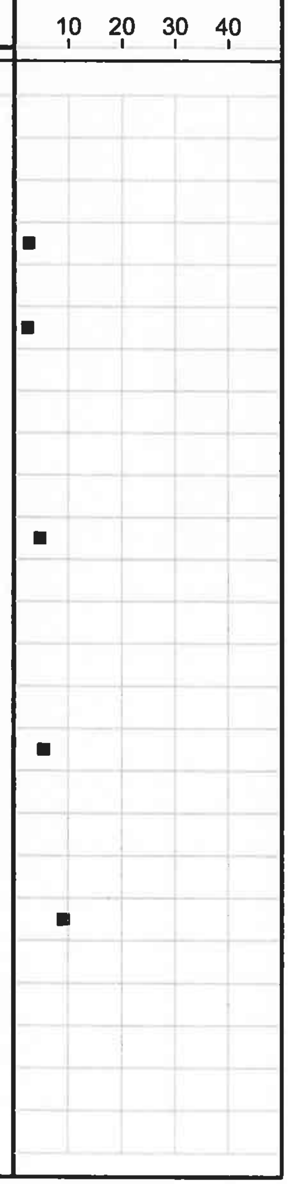
Depth to Water: Not Encountered
Initial:
At Completion:

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Sample Depth	Sample Type	Moisture	N-Value (Blows/ft.)
0		Ground Surface				
0–6		***Sand (SW)*** Fine to medium grained, trace fine gravel, light brown, loose, dry				
			SPT		2.8	4
			SPT		2.6	6
6–20		***Sand (SW)*** Fine to medium grained, trace fine gravel, brown, medium dense, damp				
			SPT		4.9	7
			SPT		5.6	13
			SPT		9.2	12
20		End of Borehole				

Penetration Test blows/ft



Water Content (%)



Drill Method: HSA
Driller: BE

Krazan and Associates

Drill Date: 8/20/13
Sample Method: SPT

Log of Drill Hole B-6

Project: Proposed Tractor Supply

Client: California Gold Development

Location: Lake Elsionore, CA

Depth to Water: Not Encountered

Initial:

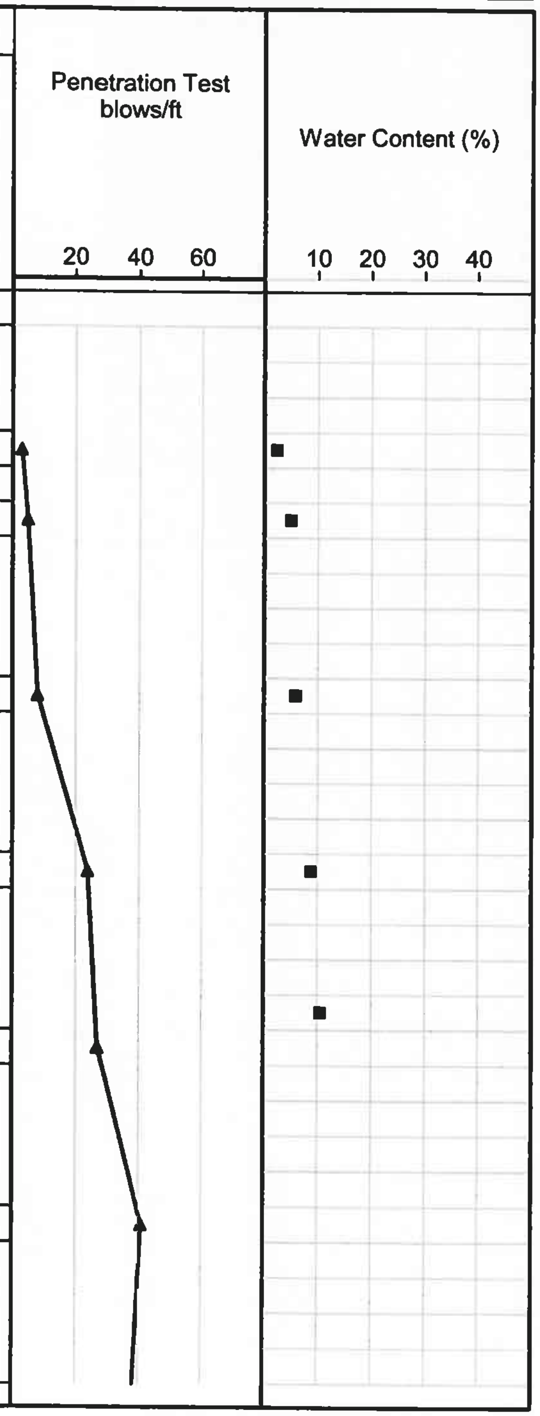
Project No: 11213042

Figure No.: A-6

Logged By: EB

At Completion:

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Sample Depth	Sample Type	Moisture	N-Value (Blows/ft.)
0		Ground Surface				
0–4.5		***Sand (SW)*** Fine to medium grained, trace fine gravel, light brown, loose, dry	SPT		2.4	3
4.5–21		***Sand (SW)*** Fine to medium grained, trace fine gravel, brown, medium dense, damp	SPT		5.1	5
			SPT		5.9	8
			SPT		8.9	24
			SPT		10.6	27
21–30		***Gravelly Sand (SG)*** Brown to dark brown, dense, wet Water Encountered at 21.0'	SPT			41
						38



Drill Method: HSA

Driller: BE

Krazan and Associates

Drill Date: 8/20/13

Sample Method: SPT

Sheet: 1 of 2

Log of Drill Hole B-6

Project: Proposed Tractor Supply
Project No: 11213042

Client: California Gold Development
Figure No.: A-6

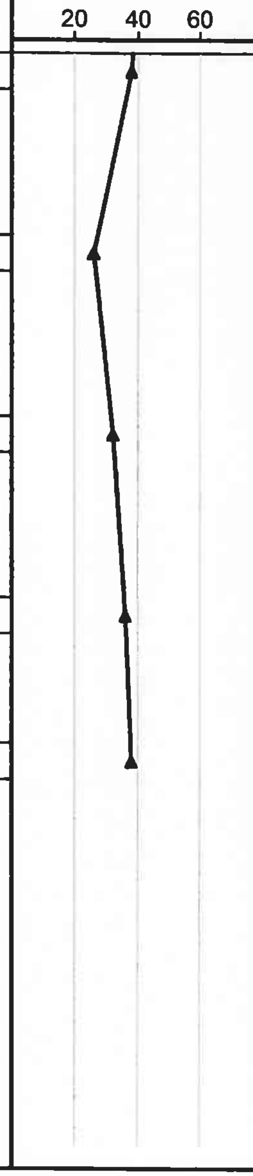
Location: Lake Elsionore, CA
Logged By: EB

Depth to Water: Not Encountered
Initial:
At Completion:

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Sample Depth	Sample Type	Moisture	N-Value (Blows/ft.)
30–50			SPT			38
			SPT			26
			SPT			32
			SPT			36
			SPT			38
50		End of Borehole				

Depth (ft): 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60

Penetration Test blows/ft



Water Content (%)

10 20 30 40

Drill Method: HSA
Driller: BE

Krazan and Associates

Drill Date: 8/20/13
Sample Method: SPT
Sheet: 2 of 2

Log of Drill Hole B-7

Project: Proposed Tractor Supply
Project No: 11213042

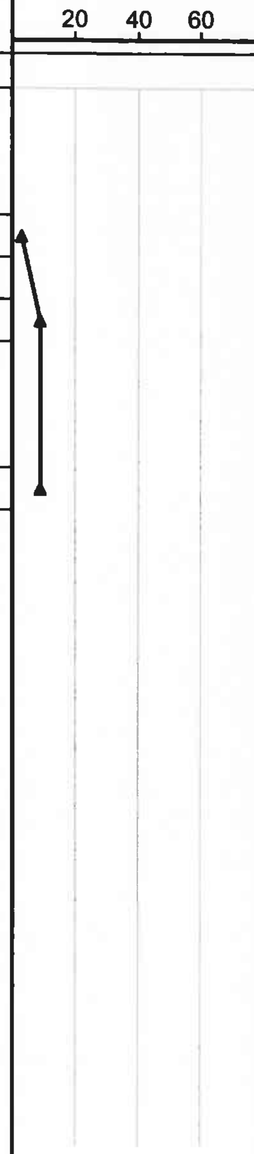
Client: California Gold Development
Figure No.: A-7

Location: Lake Elsionore, CA
Logged By: EB

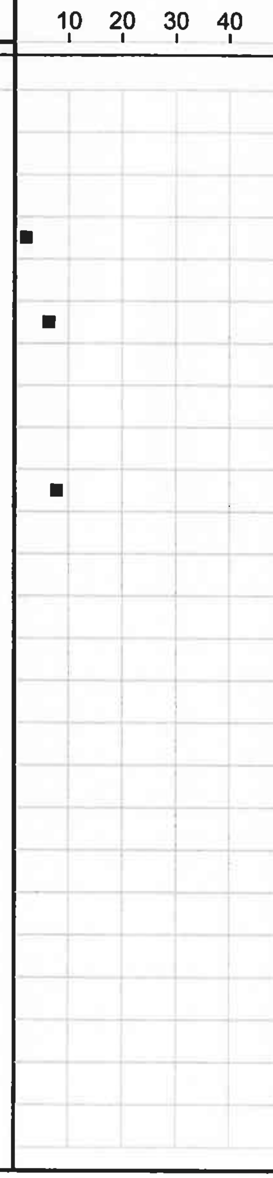
Depth to Water: Not Encountered
Initial:
At Completion:

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Sample Depth	Sample Type	Moisture	N-Value (Blows/ft.)
		Ground Surface				
0–4		***Sand (SW)*** Fine to medium grained, trace fine gravel, light brown, loose, dry	SPT		2.2	3
4–10		***Sand (SW)*** Fine to medium grained, trace fine gravel, brown, medium dense to dense, damp	SPT		6.4	9
			SPT		7.9	9
10		End of Borehole				

Penetration Test blows/ft



Water Content (%)



Drill Method: HSA
Driller: BE

Krazan and Associates

Drill Date: 8/20/13
Sample Method: SPT
Sheet: 1 of 1

Log of Drill Hole B-8

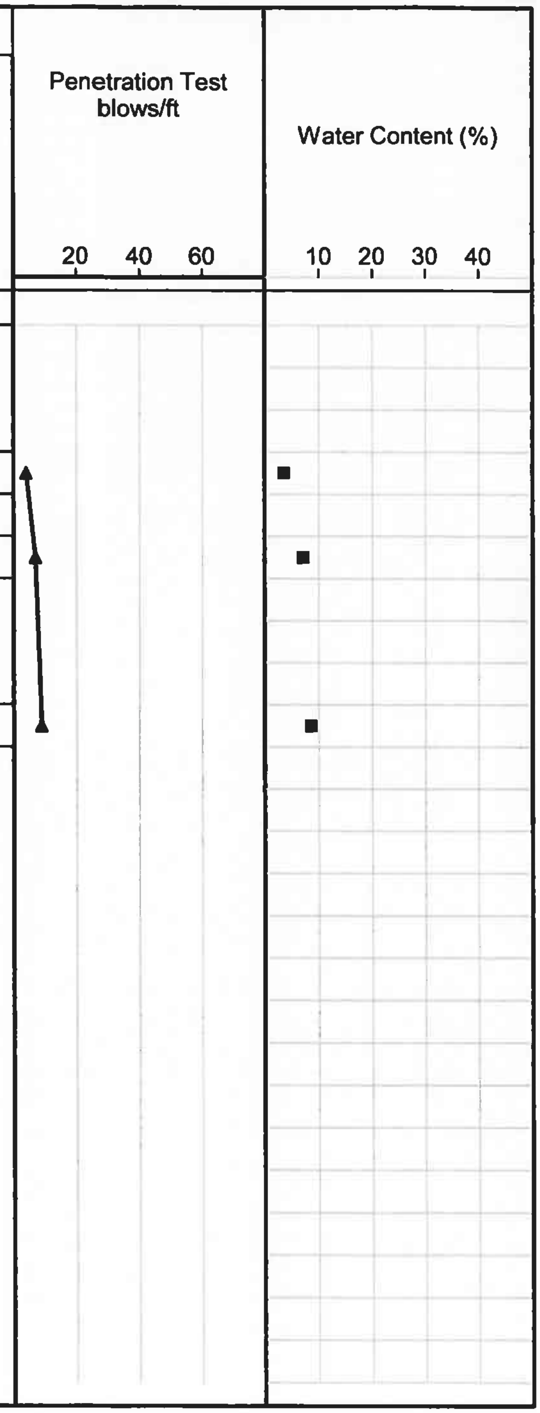
Project: Proposed Tractor Supply
Project No: 11213042

Client: California Gold Development
Figure No.: A-8

Location: Lake Elsionore, CA
Logged By: EB

Depth to Water: Not Encountered
Initial:
At Completion:

Depth (ft)	Description	Sample Depth	Sample Type	Moisture	N-Value (Blows/ft.)
0	Ground Surface				
0–4	***Sand (SW)*** Fine to medium grained, trace fine gravel, light brown, loose, dry	SPT		3.6	4
4–10	***Sand (SW)*** Fine to medium grained, trace fine gravel, brown, medium dense to dense, damp	SPT		7.2	7
		SPT		8.6	9
10	End of Borehole				



Drill Method: HSA
Driller: BE

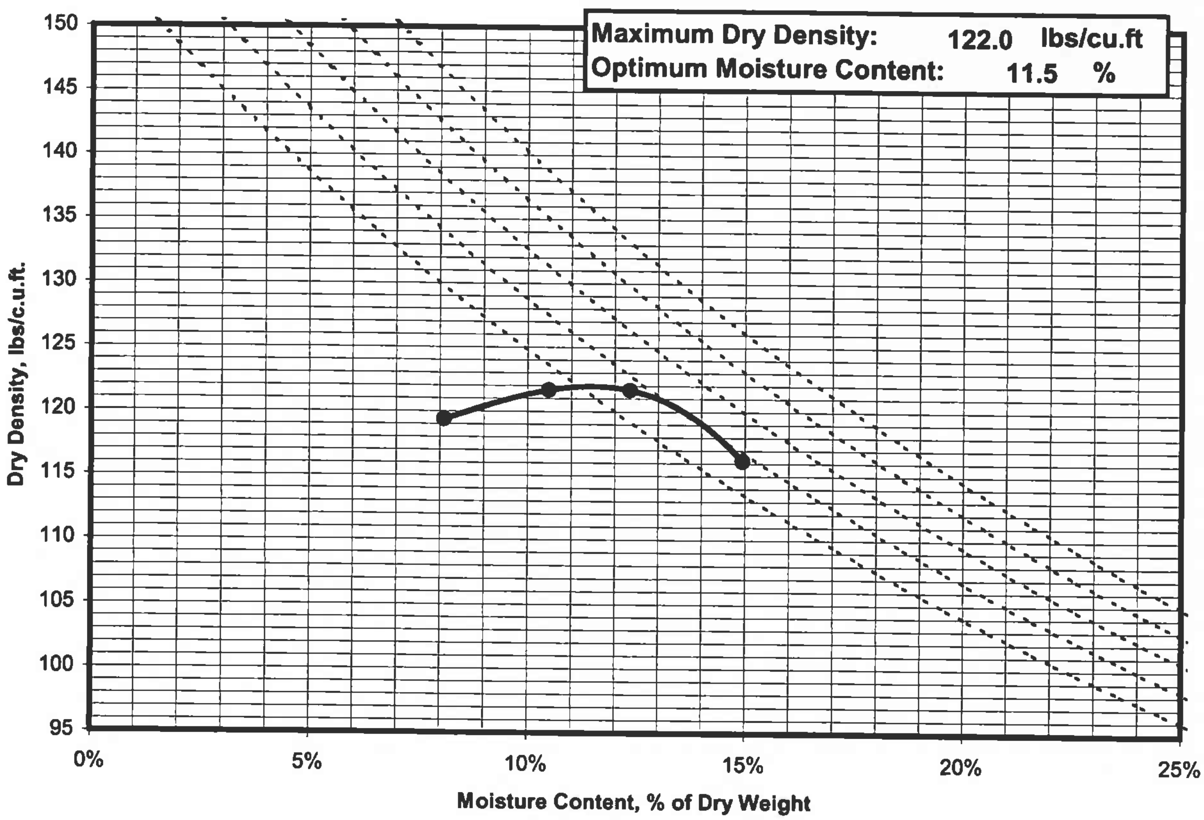
Krazan and Associates

Drill Date: 8/20/13
Sample Method: SPT
Sheet: 1 of 1

Laboratory Compaction Curve
ASTM - D1557, D698

Project Number	: 11213042
Project Name	: Proposed Tractor Supply
Date	: 08/30/13
Sample location	: B-1
Sample/Curve Number	: "A"
Soil Classification	: Sand
Test Method	: D1557

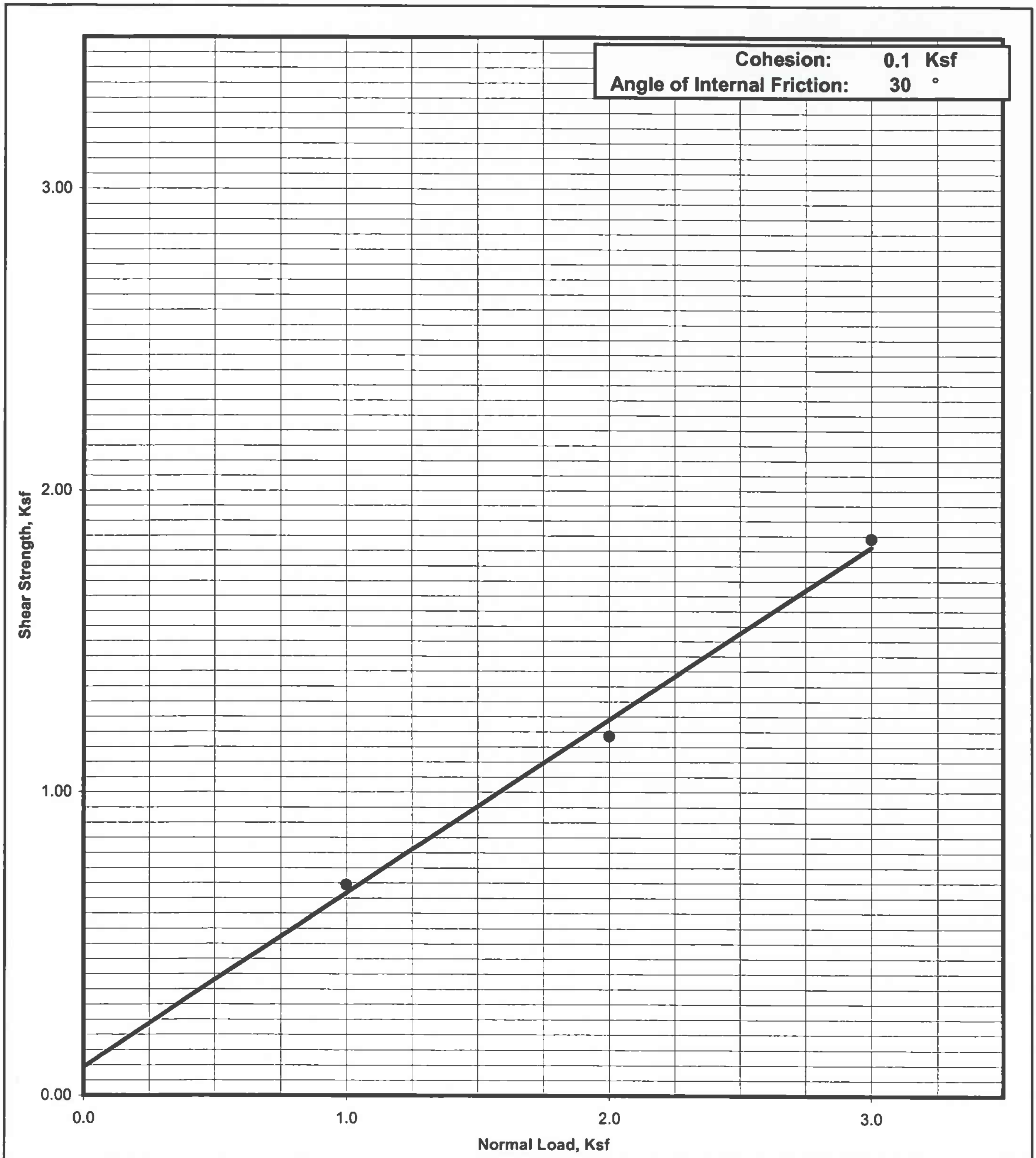
	1	2	3	4
Weight of Moist Specimen & Mold, gm	4698.0	4778.0	4812.0	4765.0
Weight of Compaction Mold, gm	2766.0	2766.0	2766.0	2766.0
Weight of Moist Specimen, gm	1932.0	2012.0	2046.0	1999.0
Volume of mold, cu. ft.	0.0330	0.0330	0.0330	0.0330
Wet Density, lbs/cu.ft.	129.1	134.4	136.7	133.5
Weight of Wet (Moisture) Sample, gm	200.0	200.0	200.0	200.0
Weight of Dry (Moisture) Sample, gm	185.0	181.0	178.0	174.0
Moisture Content, %	8.1%	10.5%	12.4%	14.9%
Dry Density, lbs/cu.ft.	119.4	121.6	121.6	116.2



Krazan Testing Laboratory

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

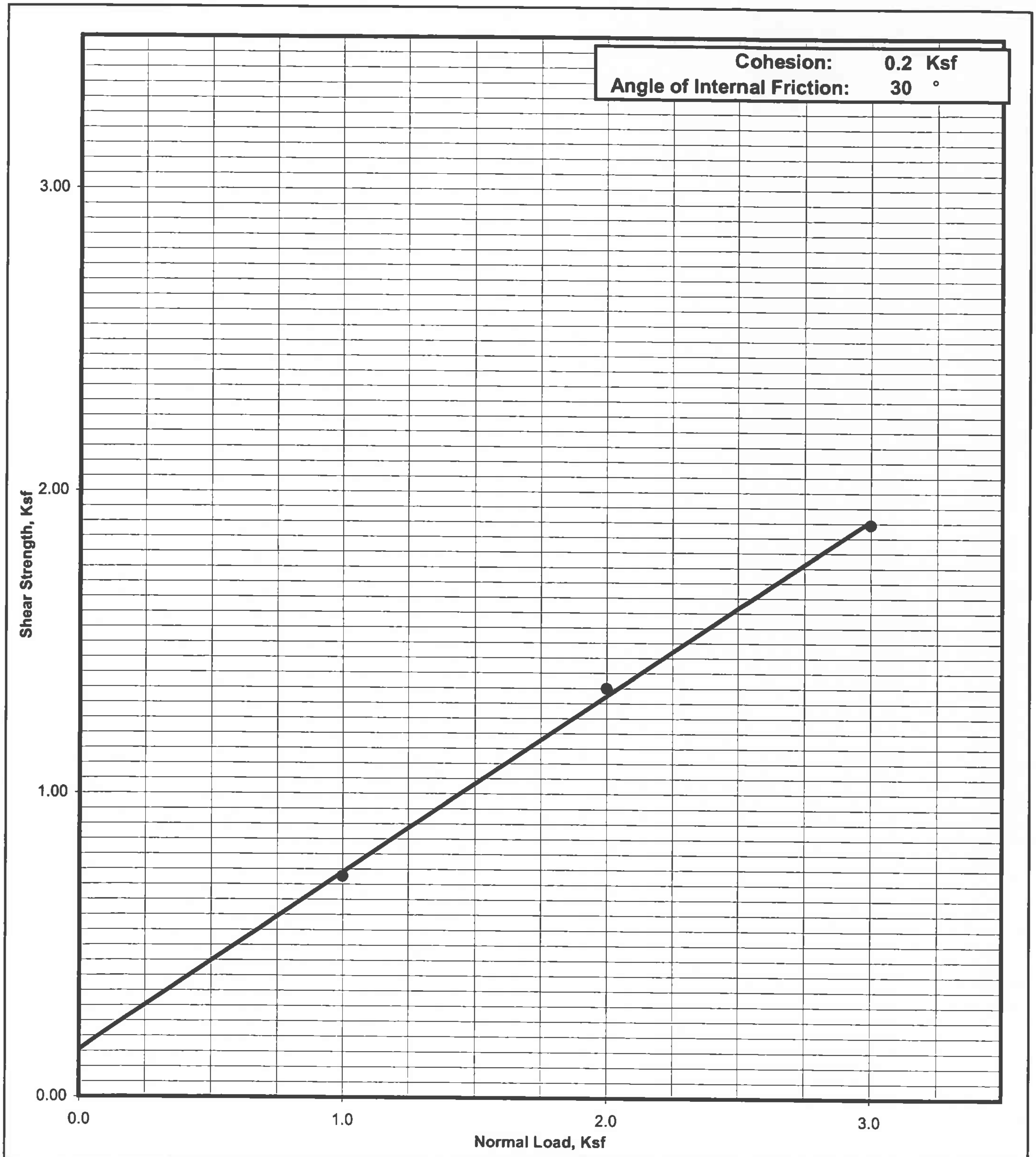
Project Number	Boring No. & Depth	Soil Type	Date
11213042	B-2 @ 5'	Sand	8/26/2013



Krazan Testing Laboratory

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

Project Number	Boring No. & Depth	Soil Type	Date
11213042	B-3 @ 3'	Sand	8/27/2013



Krazan Testing Laboratory

Expansion Index Test

ASTM D - 4829/ UBC Std. 18-2

Project Number	: 1.1E+07
Project Name	: Proposed Tractor Supply
Date	: 8/26/2013
Sample location/ Depth	: B-6 0-3
Sample Number	: --
Soil Classification	: Sand

Trial #	**1**	**2**	**3**
Weight of Soil & Mold, gms	586.9		
Weight of Mold, gms	170.9		
Weight of Soil, gms	416.0		
Wet Density, Lbs/cu.ft.	125.5		
Weight of Moisture Sample (Wet), gms	300.0		
Weight of Moisture Sample (Dry), gms	275.0		
Moisture Content, %	9.1		
Dry Density, Lbs/cu.ft.	115.0		
Specific Gravity of Soil	2.7		
Degree of Saturation, %	52.8		

Time	Inital	30 min	1 hr	6hrs	12 hrs	24 hrs
Dial Reading	--	--	--	--	--	0

Expansion Index $_{measured}$ = 0

Expansion Index $_{50}$ = 0.0

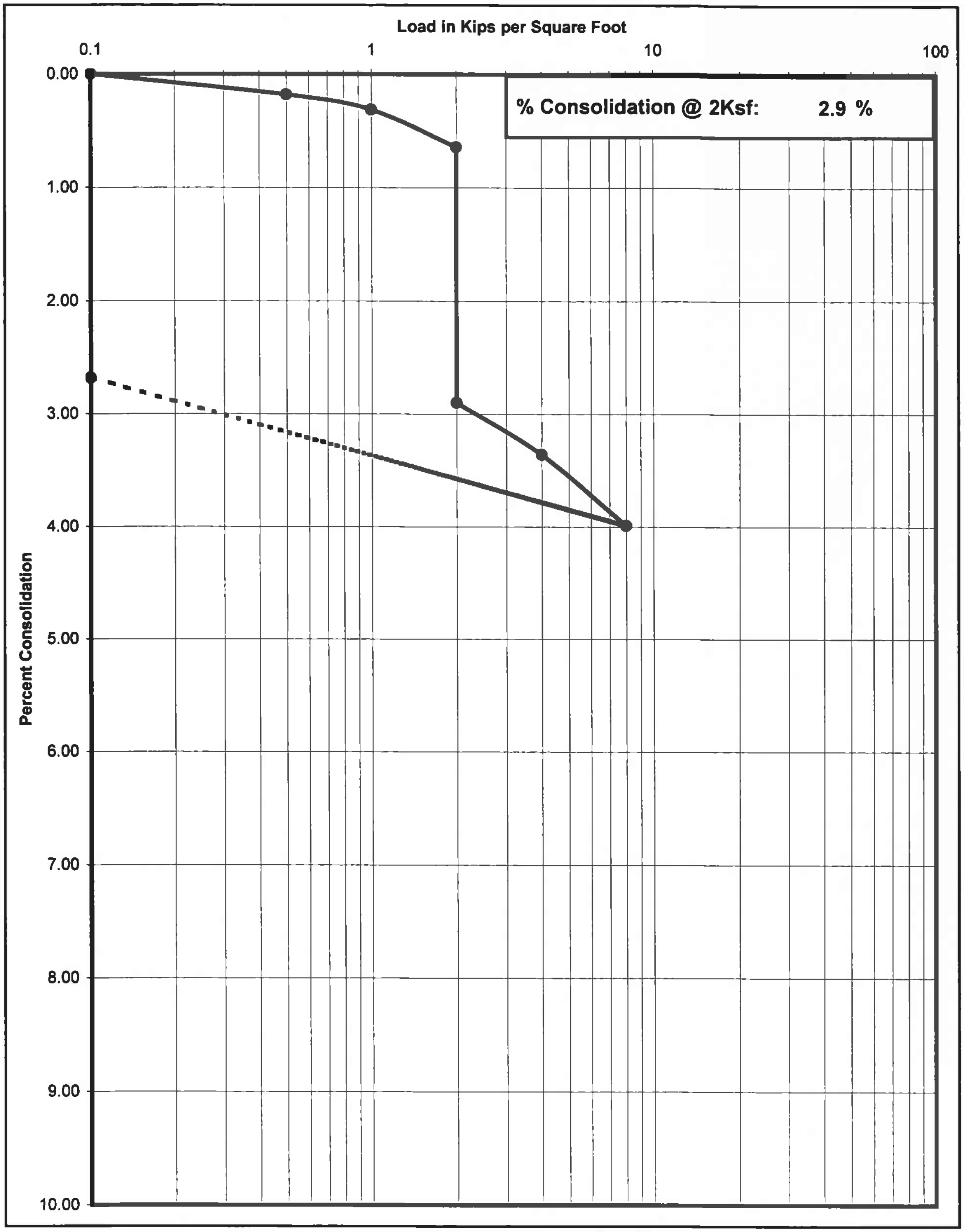
Expansion Index = 0

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

Krazan Testing Laboratory

Consolidation Test

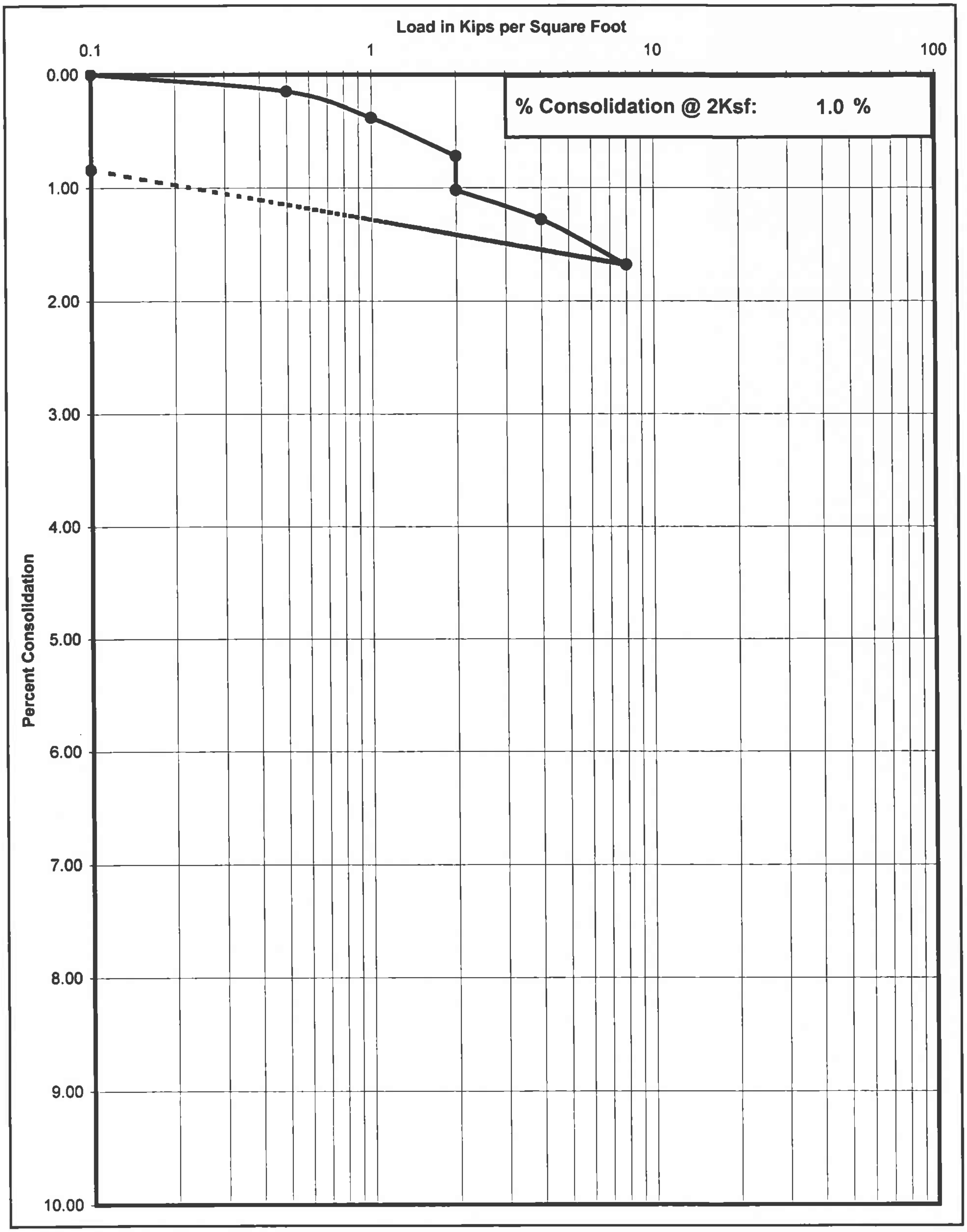
Project No	Boring No. & Depth	Date	Soil Classification
11213042	B-2 @ 5'	8/26/2013	Sand



Krazan Testing Laboratory

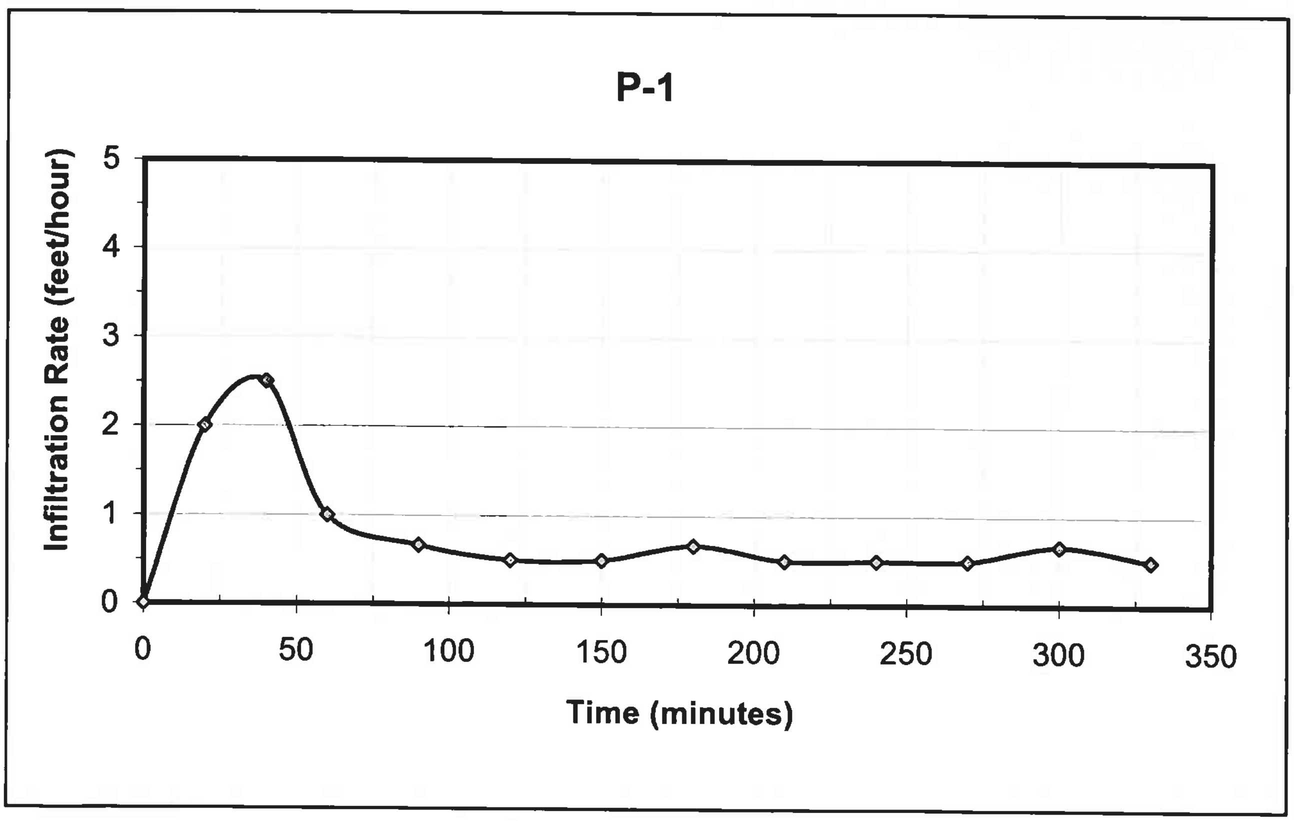
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
11213042	B-4 @ 5'	8/26/2013	Sand



Krazan Testing Laboratory

RESULTS OF INFILTRATION TESTS					
Project #	11213042			Date	8/26/2013
Project Name	Proposed Tractor Supply				
Project Address	Lake Elsinore, California				
Test No:	P-1	Total Depth	8.0'	Test Size	7.5"
Depth To Water	>20	Soil Classification	SP		
Reading	Elasped Time(min.)	Incremental Time (min.)	Water Column(in.)	Incremental Fall of Water(ft.)	Incremental Percolation Rate (ft/hr)
Start	0	0.00	60.00	--	
2	20.00	20.00	52.00	0.67	2.00
3	40.00	20.00	42.00	0.83	2.50
4	60.00	20.00	38.00	0.33	1.00
			60.00		
5	90.00	30.00	56.00	0.33	0.67
6	120.00	30.00	53.00	0.25	0.50
7	150.00	30.00	50.00	0.25	0.50
			58.00		
8	180.00	30.00	54.00	0.33	0.67
9	210.00	30.00	51.00	0.25	0.50
10	240.00	30.00	48.00	0.25	0.50
			60.00		
11	270.00	30.00	57.00	0.25	0.50
12	300.00	30.00	53.00	0.33	0.67
13	330.00	30.00	50.00	0.25	0.50
	Percolation Rate in Feet per Hour				0.50



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.

General Paving Specifications

Appendix C

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 May 2006 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 II 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 II 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 Standard Specifications. The drying, proportioning and mixing of the materials shall conform to Section 39.

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