July 30, 2018 KA Project No. 022-16131

Mr. Ben Hobbs
Lancaster Baptist Church
4020 E. Lancaster Boulevard
Lancaster, California 93535
ben.hobbs@lancasterbaptist.org

Re: Geotechnical Engineering Investigation Update
Proposed LBC Children's Ministry Improvements
4020 E. Lancaster Boulevard
Lancaster, California

Dear Mr. Hobbs:

In accordance with your request, we are providing this Geotechnical Engineering Investigation Update for the proposed Lancaster Baptist Church Children's Ministry Improvements to be located at Lancaster Baptist Church, 4020 East Lancaster Boulevard, in Lancaster, California. The purpose of this Update is to address any changed site conditions and subsequent modifications or additions to the recommendations of the original report, as well as to verify continued conformance with requirements of the 2016 California Building Code (2016 CBC). This Update shall be applicable only for the currently site referenced herein.

A Geotechnical Engineering Investigation report was previously completed for the project by Krazan & Associates, Inc. (KA No. 022-16131), dated January 4, 2017. In our original report, we provided recommendations for foundation types and embedment depths, Engineered Fill, Drainage and Landscaping, Utility Trench Backfill, Floor Slabs and Exterior Flatwork, Lateral Earth Pressures and Retaining Walls, Seismic Design Parameters, Soil Cement Reactivity, Compacted Material Acceptance, and Testing and Inspection.

As of the time of this Update, the site conditions are unchanged from the time of our previous investigation. Therefore, the recommendations presented in the previous report, including seismic design parameters and references to the 2016 CBC, shall remain applicable to the currently proposed construction.

The recommendations and limitations provided in the previous report, dated January 4, 2017, which were not revised or superseded herein, will apply to this letter. If you have any questions, or if we can be of further assistance, please contact our office at (661) 837-9200.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Ryan K. Privett, PE
Project Engineer
RCE No. 59372

REGISTERED PROFESSIONAL ENGINEER
RYAN K. PRIVETT
NO. 59372
EXP 9/30/2019
CIVIL
STATE OF CALIFORNIA

RKP:rp

LIMITED
GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED LBC CHILDREN'S
MINISTRY IMPROVEMENTS
4020 E. LANCASTER BOULEVARD
LANCASTER, CALIFORNIA

PROJECT NO. 022-16131
JANUARY 4, 2017

Prepared for:

MR. BEN HOBBS
LANCASTER BAPTIST CHURCH
4020 E. LANCASTER BOULEVARD
LANCASTER, CALIFORNIA 93535

Prepared by:

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Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

January 4, 2017 KA No. 022-16131

Mr. Ben Hobbs
Lancaster Baptist Church
4020 E. Lancaster Boulevard
Lancaster, California 93535

RE: Geotechnical Engineering Investigation
Proposed LBC Children's Ministry Improvements
4020 E. Lancaster Boulevard
Lancaster, California

Dear Mr. Hobbs:

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 or (661) 837-9200.

REGISTERED PROFESSIONAL ENGINEER
DAVID R. JAROSZ II
No. 2698
EXP JUNE 30 2018
GEOTECHNICAL
STATE OF CALIFORNIA

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

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

DRJ:ht

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January 4, 2017

KA Project No. 022-16131

LIMITED GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED LBC CHILDREN'S MINISTRY IMPROVEMENTS
4020 E. LANCASTER BOULEVARD
LANCASTER, CALIFORNIA

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed LBC Children's Ministry Improvements to be located at 4020 E. Lancaster Boulevard in Lancaster, 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 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 November 9, 2016 (KA Proposal P608-16) and included the following:

- A review of the previous Geotechnical Engineering Investigation performed by CCL Engineering, Inc. dated July 7, 2009 for the above-referenced project site.
- A review of previous testing and inspection reports prepared by Krazan & Associates, Inc. during construction of the existing development.
- A site reconnaissance by a member of our engineering staff to evaluate the surface conditions at the project site.

- A recent field investigation consisting of drilling 3 borings to depths ranging from approximately 30 to 50 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 that the project will include improvements to the existing two-story building including new classrooms. It is anticipated the structure will utilize concrete slab-on-grade construction and drilled piers. Footing loads are anticipated to be light to moderately heavy. Modifications to on-site paved areas are also planned for the development of the project.

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 encompasses approximately 60 acres. The site is located at the southeast corner of Lancaster Boulevard and 40th Street East in Lancaster, California. The site is predominately surrounded by vacant land and existing developments. The area of proposed development is located in the northwestern portion of the site.

Presently, the site is occupied by an existing commercial building surrounded by concrete and asphaltic concrete pavements. Landscaping consisting of grass and trees surrounds portions of the site. Buried utility lines are located along the edges of the site and extend into the project site. The site is relatively level with no major changes in grade.

GEOLOGIC SETTING

The Antelope Valley, which includes the Lancaster area, is within the southwestern portion of the Mojave Desert Geometamorphic Providence. Lancaster is bounded by the Tehachapi Mountains of the Sierra Nevada Providence to the northwest and the San Gabriel of the Traverse Ranges to the southwest. A major portion of the Mojave Desert Providence is underlain by Mesozoic granitic rocks. Quaternary alluvium covers a majority of the Antelope Valley floor.

Both the Tehachapi and San Gabriel mountain ranges are geologically young mountain ranges and possess active and potentially active fault zones. The City of Lancaster is located north of the San Andreas Fault zone in the Antelope Valley. Although the San Andreas Fault is considered by the State of California as an active fault, there has not been any record of recent fault activity in the general area. The project area is not within an Earthquake Fault Zone (Special Studies Zone). The nearest faults within the project site vicinity are the San Andreas, San Gabriel, Garlock, Sierra Madre and Northridge faults located approximately 10.4, 28.8, 30.2, 31.8 and 32.3 miles from the site, respectively.

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 seismic events.

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 on the project site predominately consisted of silty sand, sandy silt, silty sand/sand and sand. Groundwater was not encountered below the site within a depth of 50 feet during our subsurface exploration. Information obtained from previous investigations performed in the vicinity of the project site as well as groundwater data provided in the State of California Seismic Hazard Zone Report for the Lancaster East 7.5 Minute Quadrangle (SHZR094) indicates that groundwater is present at a depth greater than 150 feet below site grade. Due to the depth of groundwater, liquefaction potential at the site is considered very low and measures to mitigate liquefaction potential are not necessary.

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling 3 borings to depths ranging from approximately 30 to 50 feet below existing site grade, using a truck-mounted drill rig. 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 and to obtain information regarding the engineering properties of the subsoils. 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, shear strength, atterberg limits 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 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, portions of the site are covered with concrete and asphaltic concrete pavements. Within areas not covered by pavement, the upper soils consisted of approximately 6 to 12 inches of very loose silty sand, sandy silt or sandy clay. Some of these soils were intermixed with varying amounts of gravel. These soils are disturbed, have low strength characteristics and are highly compressible when saturated.

Below the pavement section and loose surface soils, approximately 4 to 9 feet of fill material was encountered. The fill material predominately consisted of silty sands and sandy silts with varying amounts of gravel. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that some compaction effort was applied to the fill soils at the time of placement.

Beneath the fill material, approximately 4 to 5 feet of loose to medium dense silty sand or sandy silt were encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly to moderately compressible. Penetration resistance ranged from 8 to 27 blows per foot. Dry densities ranged from 110 to 125 pcf. Representative soil samples had angles of internal friction of 35 and 39 degrees.

Below 10 to 14 feet, alternating layers of predominately medium dense to dense silty sand, silty sand/sand, sand or sandy silt were encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 16 to 42 blows per foot. Dry densities ranged from 108 to 130 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 during our exploratory drilling. Information obtained from the State of California Geological Survey indicates that historical groundwater is typically greater than 150 feet within the project site and vicinity.

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 loose surface soils, fill material, and existing development, appear to be conducive to the development of the project. Portions of the site are covered with concrete and asphaltic concrete pavements. Within areas not covered by pavement, the surface soils have a loose consistency. These soils are disturbed, have low strength characteristics, and are highly compressible when saturated. Accordingly, it is recommended that the surface soils be recompacted. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Beneath the pavement section and loose surface soils, approximately 4 to 9 feet of fill material was encountered. The fill material predominately consisted of silty sands and sandy silts with varying amounts of gravel. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that some compaction effort was applied to the fill soils at the time of placement. It is recommended that fill soils that have not been properly compacted and certified be excavated and stockpiled so that the native soils can be prepared properly. Excavation should extend to a minimum of 5 feet beyond structural elements. Preliminary testing indicates the fill material will be suitable for reuse as Engineered Fill provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Alternatively, the structures can be supported on drilled piers extending below the fill.

It is recommended that following demolition, stripping and fill removal operations, the upper 3 feet of native soils within the area of structures to be supported on shallow conventional foundations be excavated, worked until uniform and free from large clods, moisture-conditioned as necessary and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that shallow conventional foundations be supported by a minimum of 12 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond structural elements. The on-site, native soils and fill material will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, the bottom of the excavation should be proof rolled to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation. Fill material should be compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Existing structures and buried structures, such as utility lines and landscape irrigation lines, are located within the project site vicinity. Demolition activities should include proper removal of any buried structures. Any buried structures encountered during construction should be properly removed and the resulting excavations cleaned to firm native ground and backfilled with Engineered Fill. Disturbed areas caused by demolition activities should be removed and/or recompacted.

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.

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 2,500 psf for dead-plus-live loads. Footings should have a minimum embedment of 18 inches.

Alternatively, the structures can be supported on drilled caissons. The caissons should have a minimum embedment depth of 20 feet.

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; concrete and metal debris; 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. 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.

Existing structures and buried utility lines are located within the project site and vicinity. In addition, utility lines trend within portions of the site. Demolition activities should include proper removal of any buried structures. Any buried structures encountered during construction should be properly removed and/or relocated and the resulting excavations backfilled. 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 site is covered with up to 9 feet of fill material. The fill material predominately consists of silty sands and sandy silts with varying amounts of gravel. The thickness and extent of fill material was determined based on limited test borings and visual observation. Thicker fill may be present at the site. Limited testing was performed on the fill soils during the time of our field and laboratory investigations. The limited testing indicates that some compaction effort was applied to the fill material at the time of placement. It is recommended compaction test reports be provided to our office for review. In the area of structures to be supported on shallow conventional foundations, it is recommended that fill soils that have not been properly compacted and certified be excavated and stockpiled so that the native soils can be prepared properly. Excavation should extend to a minimum of 5 feet beyond structural elements. The fill material will be suitable for reuse as Engineered Fill provided it is cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension.

It is recommended that following demolition, stripping and fill removal operations, the upper 3 feet of native soils within areas to be supported on shallow conventional foundations be excavated, worked until uniform and free from large clods, moisture-conditioned as necessary, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. In addition, it is recommended that the proposed conventional shallow foundations be supported by a minimum of 12 inches of Engineered Fill. Over-excavation should extend to a minimum of 5 feet beyond structural elements. The on-site, native soils and fill material will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, debris, and fragments larger than 4 inches in maximum dimension. Prior to backfilling, the bottom of the excavation should be proof rolled to verify stability. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation. Fill material should be compacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557.

Following stripping and fill removal operations, the exposed subgrade in exterior flatwork and pavement areas should be excavated to a minimum depth of 12 inches, worked until uniform and free from large clods, moisture-conditioned as necessary, and recompacted to a minimum of 90 percent of maximum density based on ASTM Test Method D1557. Limits of recompaction should extend 5 feet beyond structural elements. This compaction effort should stabilize the surface soils and located any unsuitable or pliant areas not found during our field investigation.

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 native soils and fill material are predominately silty sands, sandy silts, and sands. These soils are intermixed with varying amounts of gravel. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics and debris. Soils with an expansion index greater than 15 should not be used within the upper 18 inches of slab-on-grade and exterior flatwork areas.

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 Fill material should be predominately non-expansive granular material with a plasticity index less than 10 and a UBC Expansion Index less than 15. Imported Fill should be free from rocks and lumps greater than 4 inches in diameter. All Imported Fill material should be submitted for approval to the Soils Engineer at least 48 hours prior to delivery to the site.

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 2016 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 practices 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 reduced; 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 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 and gravelly 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. The 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

The proposed structure may be supported on a shallow foundation system bearing on a minimum of 12 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	1,875 psf
Dead-Plus-Live Load	2,500 psf
Total Load, Including Wind or Seismic Loads	3,325 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. Ultimate design of foundations and reinforcement should be performed by the project Structural Engineer.

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. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Foundations - Drilled Caissons

The proposed structures can be supported on drilled caissons using an allowable sidewall friction of 500 psf. This value is for dead-plus-live loads. This value may be increased by ⅓ for short duration loads, such as wind or seismic. The upper 24 inches should be neglected from friction calculations. Uplift loads can be resisted by caissons using an allowable sidewall friction of 300 psf of the surface area and the weight of the pier. Caissons should have a minimum embedment depth of 20 feet. The total settlement of the caissons is not expected to exceed 1 inch. Differential settlement between adjacent caissons should be less than ½ inch over 40 feet. Most of the settlement is expected to occur during construction as the loads are applied.

Caissons may be designed using a lateral bearing capacity of 200 psf/ft using the applicable formula for nonconstrained or constrained conditions in Sections 1807.3.2.1 and 1807.3.2.2 of the 2016 California Building Code. Nonconstrained or flexible cap conditions apply to isolated piers, and constrained or rigid cap (fixed against rotation) conditions apply to piers with a rigid connection to the structure. This value can be doubled for deflections up to ½ inch.

Sandy and gravelly soils were encountered at the site. These soils may be subject to caving during drilling operations. Accordingly, cased caissons may be required.

Floor Slabs and Exterior Flatwork

If drilled caissons are utilized, the slabs should be designed as structural slabs to span between grade beams and caissons. 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 floor slab should be designed by the Project's Structural Engineer. 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 reduce 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 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 60 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.

Seismic Parameters – 2016 California Building Code

The Site Class per Section 1613 of the 2016 California Building Code (2016 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 2016 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613.3.2
Site Coefficient F_a	1.000	Table 1613.3.3 (1)
S_s	1.500	Section 1613.3.1
S_{MS}	1.500	Section 1613.3.3
S_{DS}	1.000	Section 1613.3.4
Site Coefficient F_v	1.500	Table 1613.3.3 (2)
S_1	0.600	Section 1613.3.1
S_{M1}	0.900	Section 1613.3.3
S_{D1}	0.600	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 from 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 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 (661) 837-9200.

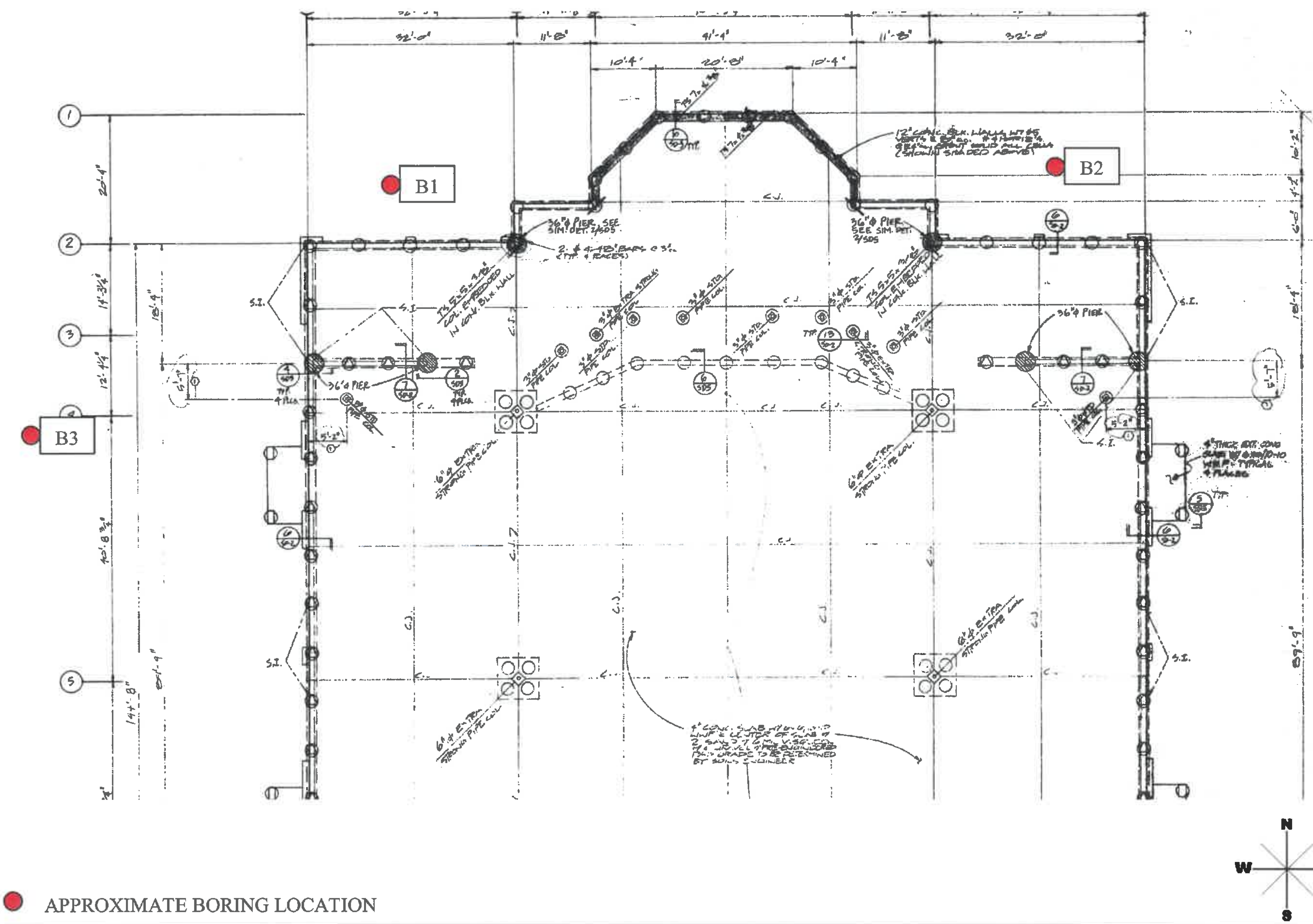
Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Steve Nelson
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
DAVID R. JAROSZ II
No. 2698
EXP JUNE 30 2018
GEOTECHNICAL
STATE OF CALIFORNIA

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

SN/DRJ:ht



APPROXIMATE BORING LOCATION

SITE MAP	Scale: NTS	Date: January 2017	Krazan GEOTECHNICAL ENGINEERING
LBC Children's Ministry Improvements 4020 E. Lancaster Boulevard Lancaster, California	Drawn by: HT	Approved by: DJ	
	Project No. 022-16131	Figure No. 1	

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 were performed at selected depths. This test represents the resistance to driving a 2½-inch diameter core barrel. 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. 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, direct shear, and atterberg limits 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

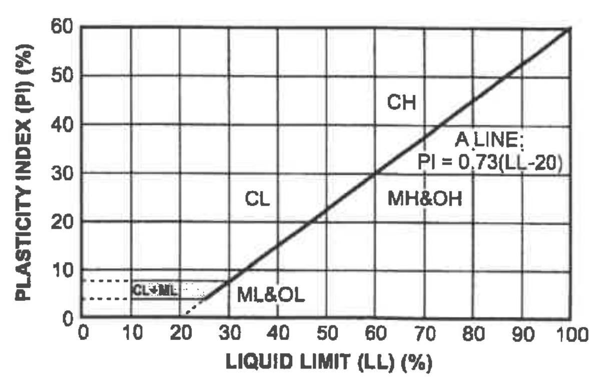
CONSISTENCY CLASSIFICATION

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

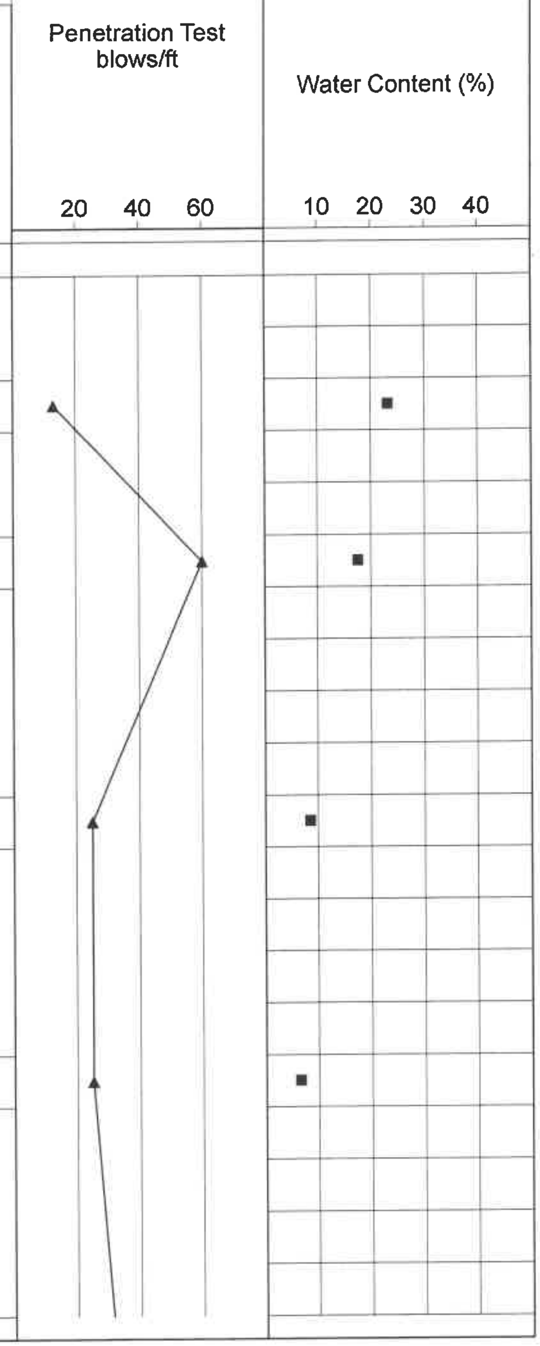
Project: LBC Children's Ministry Improvements **Project No:** 022-16131

Client: Lancaster Baptist Church **Figure No.:** A-1

Location: 4020 E. Lancaster Boulevard, Lancaster, CA **Logged By:** Dave Adams

Depth to Water> **Initial:** None **At Completion:** None

Depth (ft)	Description (Subsurface Profile)	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0	Ground Surface				
0–1.7	***GRAVELLY SILTY SAND (SM)*** FILL, fine- to coarse-grained; brown, damp, drills easily				
1.7–9	***SANDY SILT (ML)*** FILL, fine- to medium-grained; gray, moist, drills easily	111.4	23.3		13
	With GRAVEL and lenses of SILTY SAND below 5 feet	123.1	17.6		60
9–14	***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily	110.5	8.6		25
14–18	***SILTY SAND/SANDY SILT (SM/ML)*** Medium dense, fine- to medium-grained with thin lenses of fine-grained SANDY SILT; brown, damp, drills easily		6.6		25
18–20	***SILTY SAND (SM)*** Medium dense, fine- to medium-grained; brown, damp, drills easily				



Drill Method: Solid Flight **Drill Date:** 12-2-16

Drill Rig: CME 45C-3 **Hole Size:** 4½ Inches

Driller: Jim Watts **Elevation:** 50 Feet

Krazan and Associates

Log of Boring B1

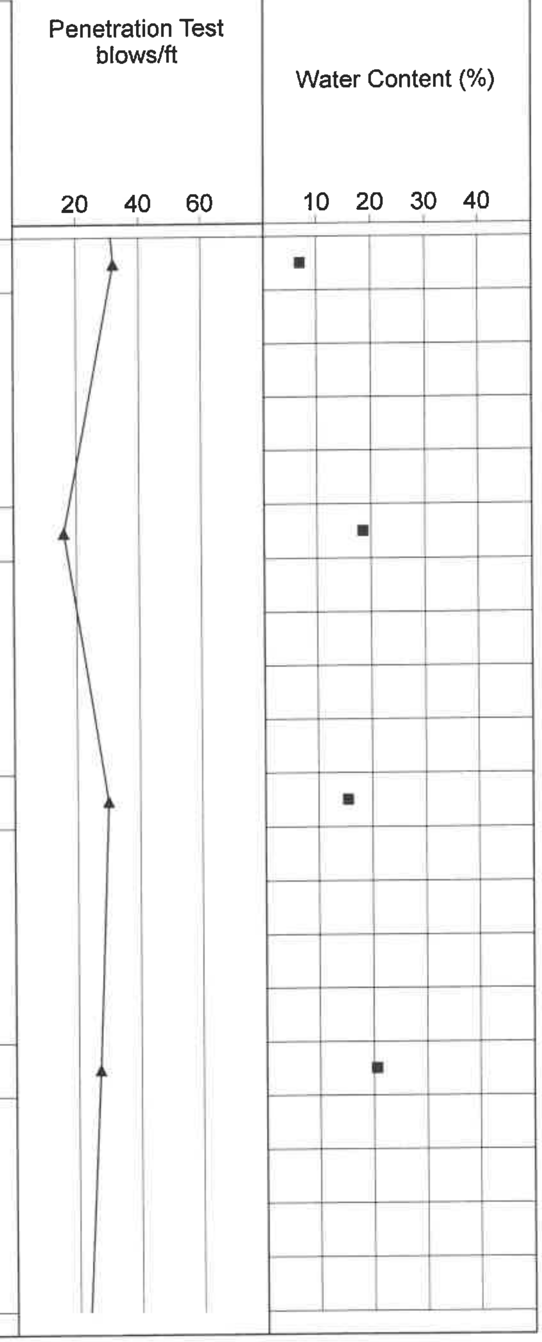
Project: LBC Children's Ministry Improvements | **Project No:** 022-16131

Client: Lancaster Baptist Church | **Figure No.:** A-1

Location: 4020 E. Lancaster Boulevard, Lancaster, CA | **Logged By:** Dave Adams

Depth to Water> **Initial:** None | **At Completion:** None

Depth (ft)	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
20–24		113.9	7.0		32
24–31	***SANDY SILT (ML)*** Medium dense, fine- to medium-grained; brown, damp, drills easily	109.5	18.6		16
		117.3	15.5		30
31–34	***SAND (SP)*** Medium dense, fine- to coarse-grained with GRAVEL; brown, damp, drills easily				
34–38	***SANDY SILT (ML)*** Medium dense, fine-grained; brown, moist, drills firmly	108.7	20.6		27
38–40	***SILTY SAND/SAND (SM/SP)*** Medium dense, fine- to coarse-grained with GRAVEL; light brown, damp, drills firmly				



Drill Method: Solid Flight | **Drill Date:** 12-2-16

Drill Rig: CME 45C-3 | **Hole Size:** 4½ Inches

Krazan and Associates

Driller: Jim Watts | **Elevation:** 50 Feet

Log of Boring B1

Project: LBC Children's Ministry Improvements
Project No: 022-16131

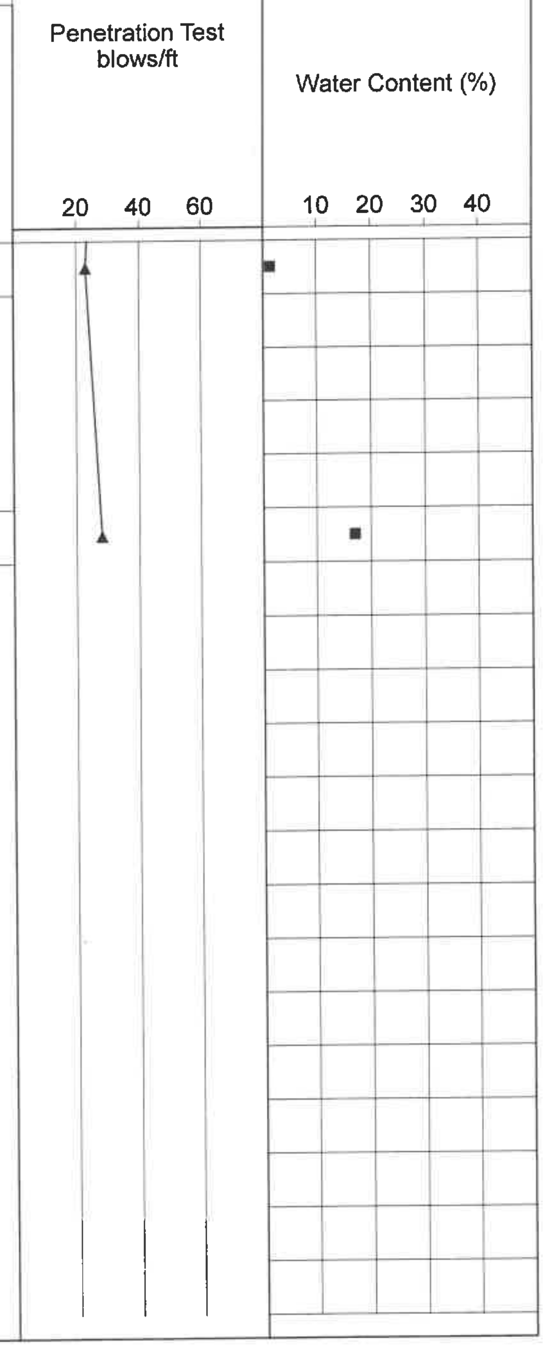
Client: Lancaster Baptist Church
Figure No.: A-1

Location: 4020 E. Lancaster Boulevard, Lancaster, CA
Logged By: Dave Adams

Depth to Water> **Initial:** None **At Completion:** None

Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
				1.4		23
42–50		***SANDY SILT (ML)*** Medium dense, fine- to medium-grained with thin lenses of fine- to coarse-grained SAND; brown, moist, drills firmly				
			108.4	17.1		28
50		End of Borehole				

Depth scale: 42, 44, 46, 48, 50, 52, 54, 56, 58, 60



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

Krazan and Associates

Drill Date: 12-2-16
Hole Size: 4½ Inches
Elevation: 50 Feet

Log of Boring B2

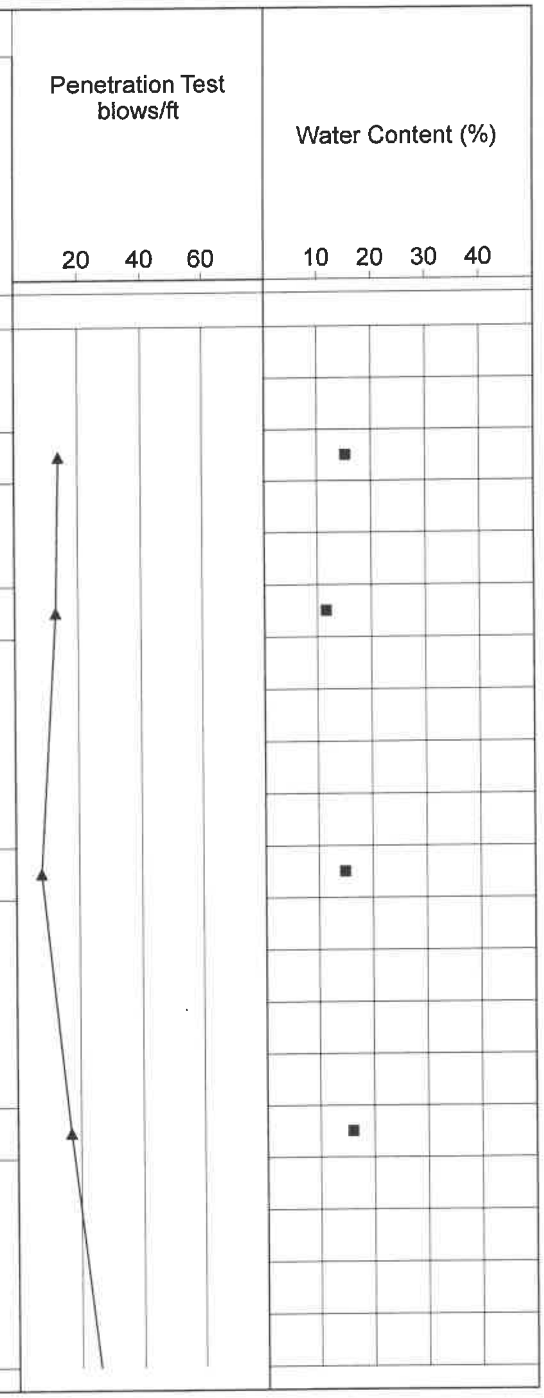
Project: LBC Children's Ministry Improvements | **Project No:** 022-16131

Client: Lancaster Baptist Church | **Figure No.:** A-2

Location: 4020 E. Lancaster Boulevard, Lancaster, CA | **Logged By:** Dave Adams

Depth to Water> | **Initial:** None | **At Completion:** None

Depth (ft)	Symbol	Description (SUBSURFACE PROFILE)	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
0		Ground Surface				
0–7		***SANDY SILT (ML)*** FILL, fine- to coarse-grained with GRAVEL; gray, damp, drills easily				
2.5			115.2	15.3	■	14
5.5			118.7	11.7	■	13
7–9.5		***SILTY SAND (SM)*** Loose, fine- to medium-grained with trace GRAVEL; brown, damp, drills easily				
9.5–20		***SANDY SILT (ML)*** Loose, fine- to medium-grained with thin lenses of fine- to coarse-grained SILTY SAND; brown, moist, drills easily				
10.5			113.9	14.9	■	8
15		Medium dense below 15 feet	118.7	16.1	■	17
20					■	



Drill Method: Solid Flight | **Drill Date:** 12-2-16

Drill Rig: CME 45C-3 | **Krazan and Associates** | **Hole Size:** 4½ Inches

Driller: Jim Watts | **Elevation:** 30 Feet

Log of Boring B2

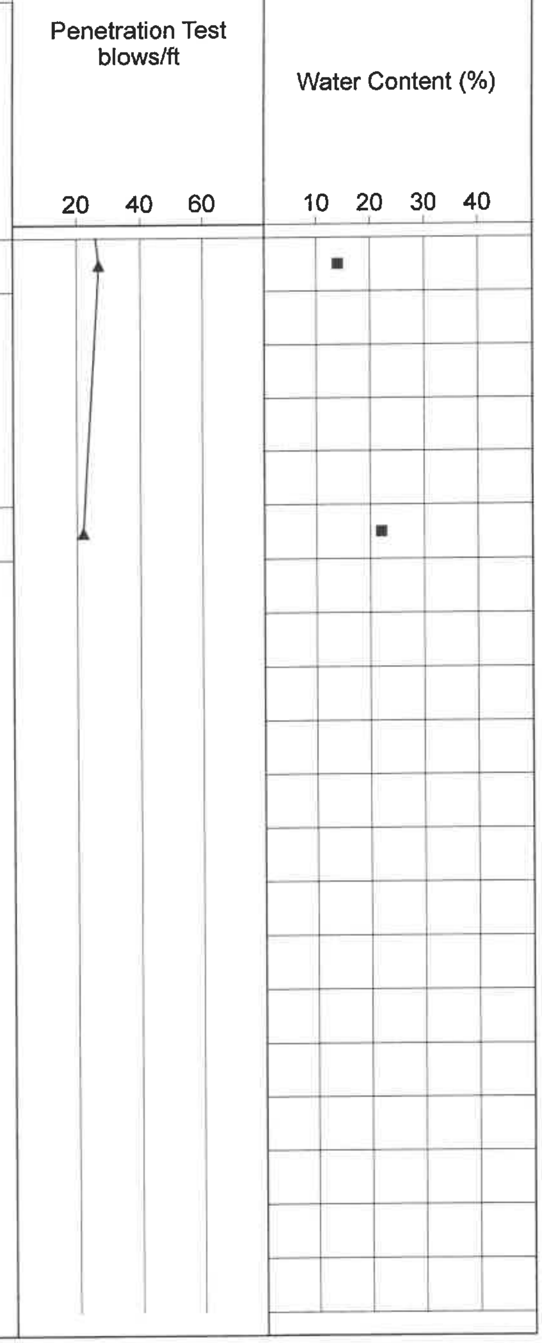
Project: LBC Children's Ministry Improvements
Project No: 022-16131

Client: Lancaster Baptist Church
Figure No.: A-2

Location: 4020 E. Lancaster Boulevard, Lancaster, CA
Logged By: Dave Adams

Depth to Water> **Initial:** None **At Completion:** None

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
20–23.5			122.7	14.0	■	27
23.5–30		***SILTY SAND (SM)*** Medium dense, fine-grained; gray, moist, drills easily	108.3	22.1	■	22
30		End of Borehole				



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

Krazan and Associates

Drill Date: 12-2-16
Hole Size: 4½ Inches
Elevation: 30 Feet
Sheet: 2 of 2

Log of Boring B3

Project: LBC Children's Ministry Improvements

Project No: 022-16131

Client: Lancaster Baptist Church

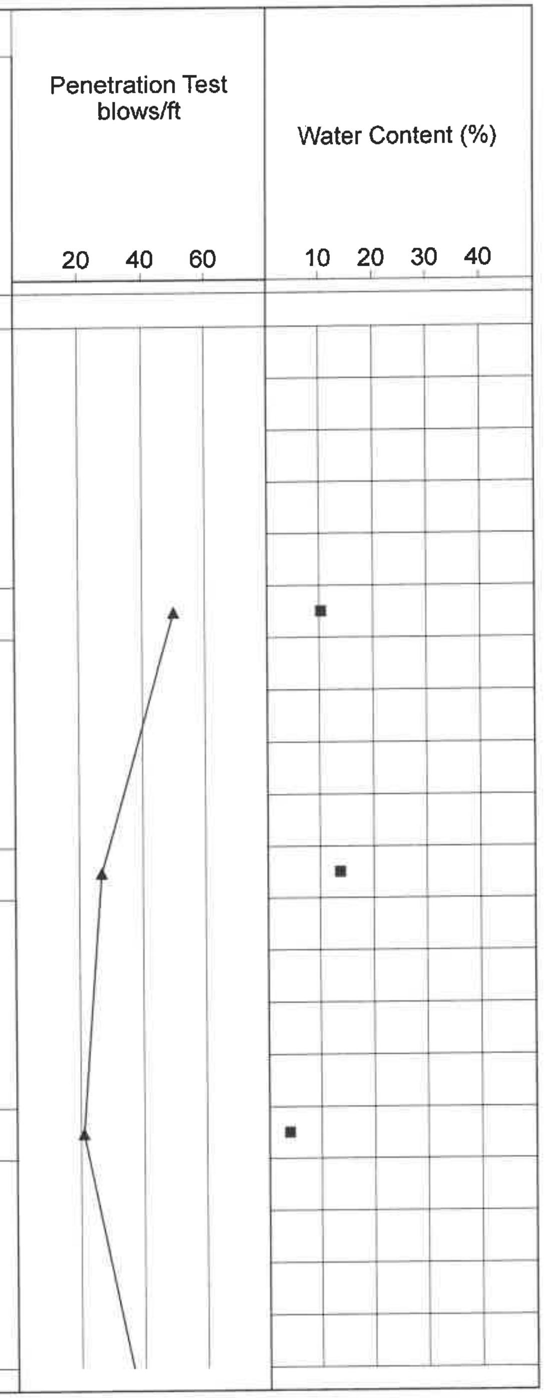
Figure No.: A-3

Location: 4020 E. Lancaster Boulevard, Lancaster, CA

Logged By: Dave Adams

Depth to Water> **Initial:** None **At Completion:** None

Depth (ft)	Description (Subsurface Profile)	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
	Ground Surface				
0	***SANDY SILT (ML)*** FILL, fine- to medium-grained; brown, damp, drills easily				
4	***SILTY SAND (SM)*** Dense, fine- to coarse-grained with trace GRAVEL; gray, damp, drills easily	125.2	10.4		50
9	***SILTY SAND/SANDY SILT (SM/ML)*** Medium dense, fine- to medium-grained; gray, moist, drills easily	122.4	13.8		27
14	***SILTY SAND (SM)*** Medium dense, fine- to coarse-grained with trace GRAVEL; brown, damp, drills easily	119.0	4.0		21



Drill Method: Solid Flight

Drill Rig: CME 45C-3

Driller: Jim Watts

Krazan and Associates

Drill Date: 12-2-16

Hole Size: 4½ Inches

Elevation: 30 Feet

Sheet: 1 of 2

Log of Boring B3

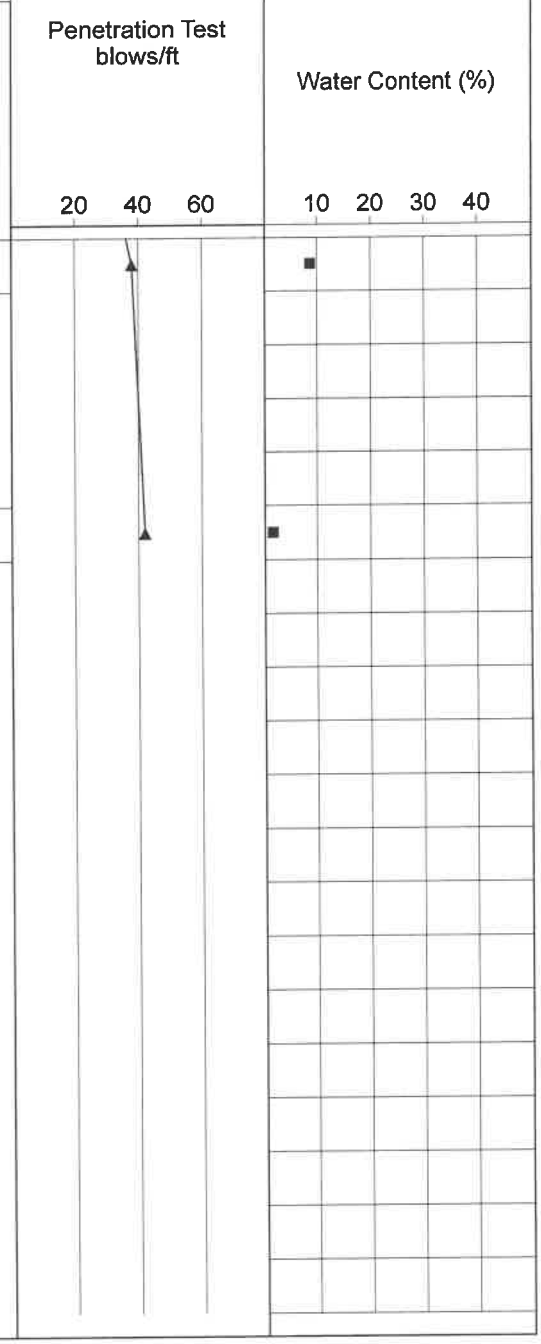
Project: LBC Children's Ministry Improvements
Project No: 022-16131

Client: Lancaster Baptist Church
Figure No.: A-3

Location: 4020 E. Lancaster Boulevard, Lancaster, CA
Logged By: Dave Adams

Depth to Water> **Initial:** None **At Completion:** None

SUBSURFACE PROFILE			SAMPLE			
Depth (ft)	Symbol	Description	Dry Density (pcf)	Moisture (%)	Type	Blows/ft.
20–23.5			125.5	8.8	■	38
23.5–30		***SAND (SP)*** Dense, fine- to coarse-grained; light brown, damp, drills easily	130.4	1.6	■	42
30		End of Borehole				



Depth scale (ft): 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

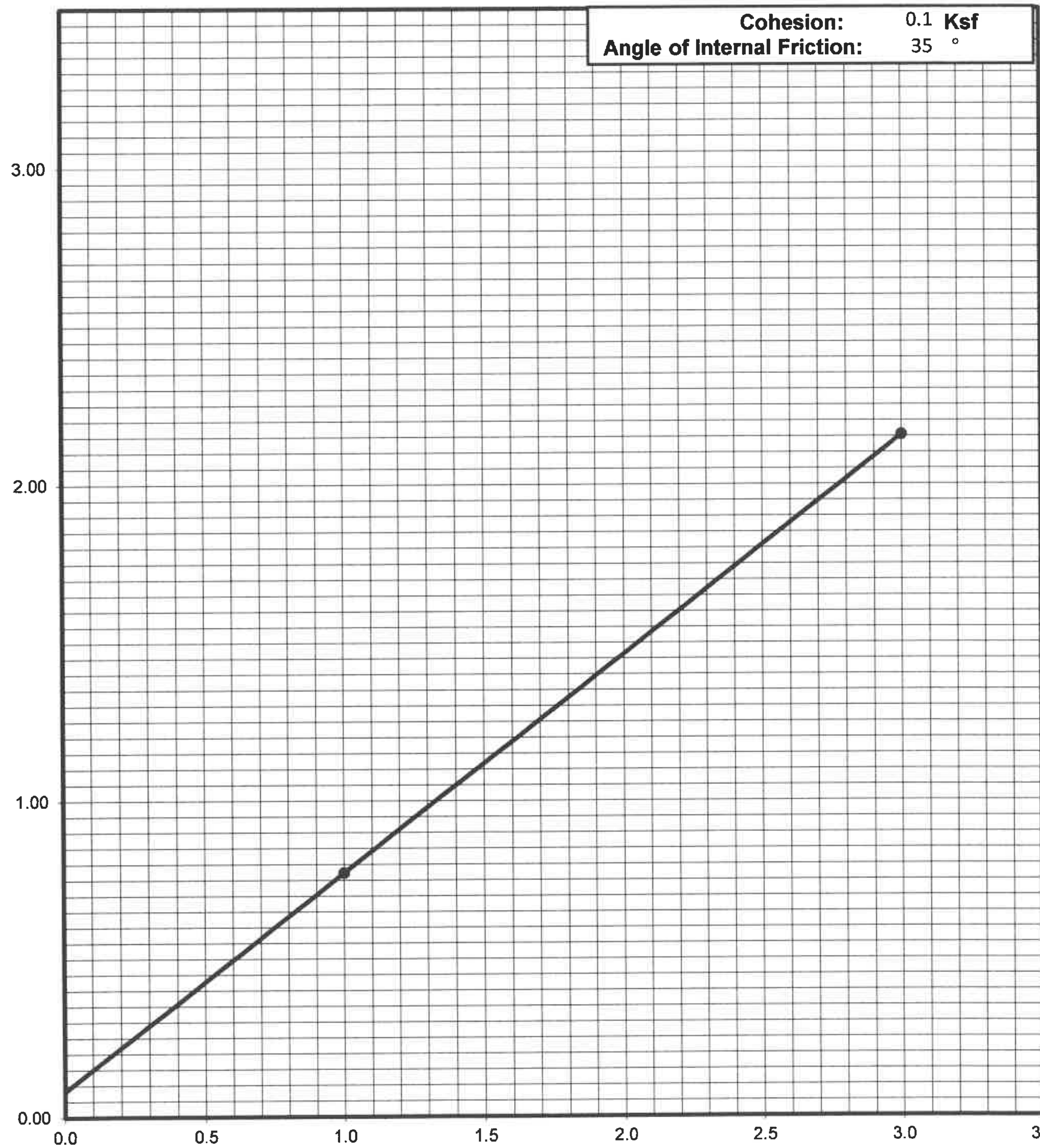
Drill Method: Solid Flight
Drill Date: 12-2-16

Drill Rig: CME 45C-3
Krazan and Associates
Hole Size: 4½ Inches

Driller: Jim Watts
Elevation: 30 Feet

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

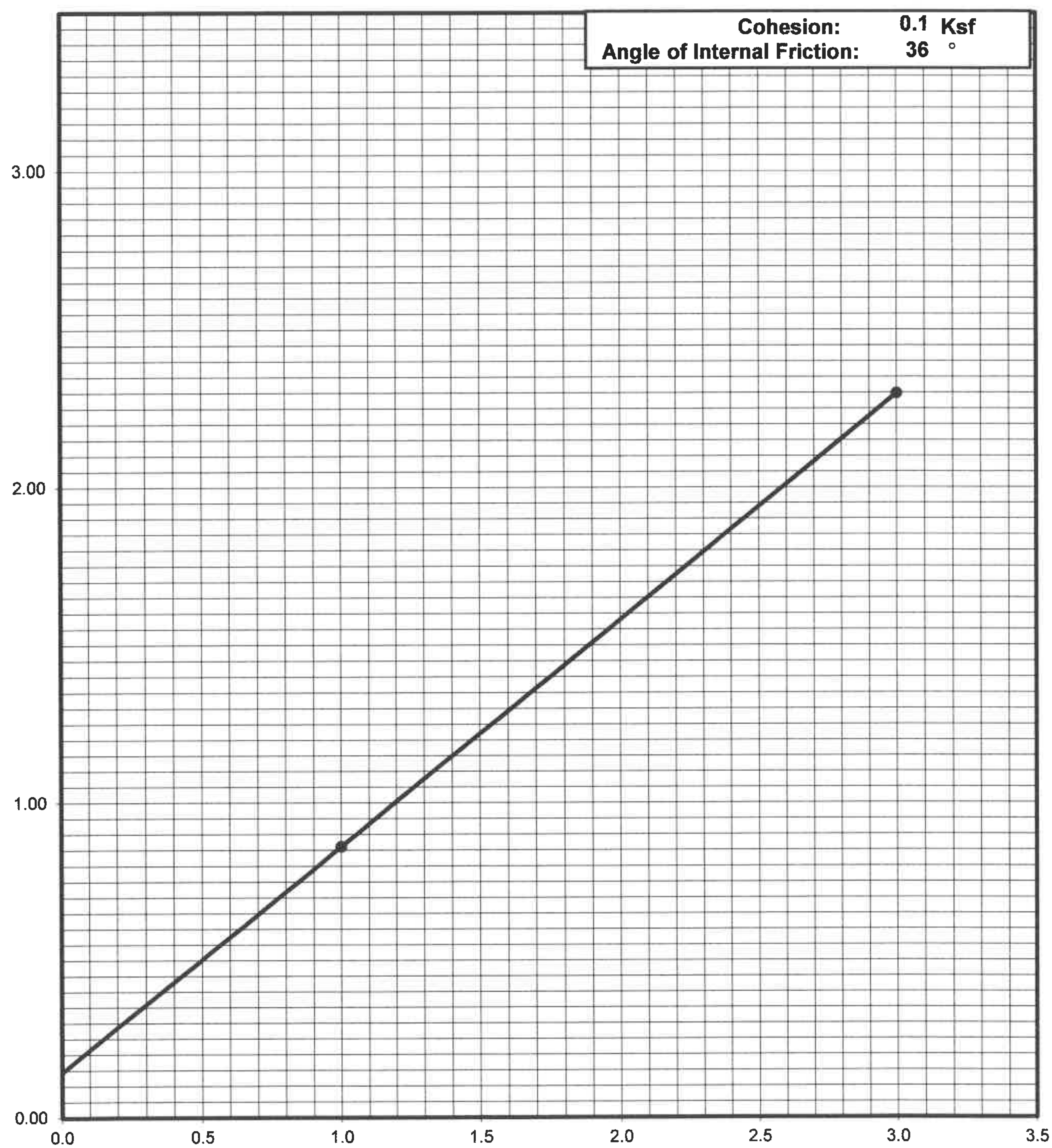
Project Number	Boring No. & Depth	Soil Type	Date
022-16131	B1 @ 2-3'	ML	12/30/2016



Krazan Testing Laboratory

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

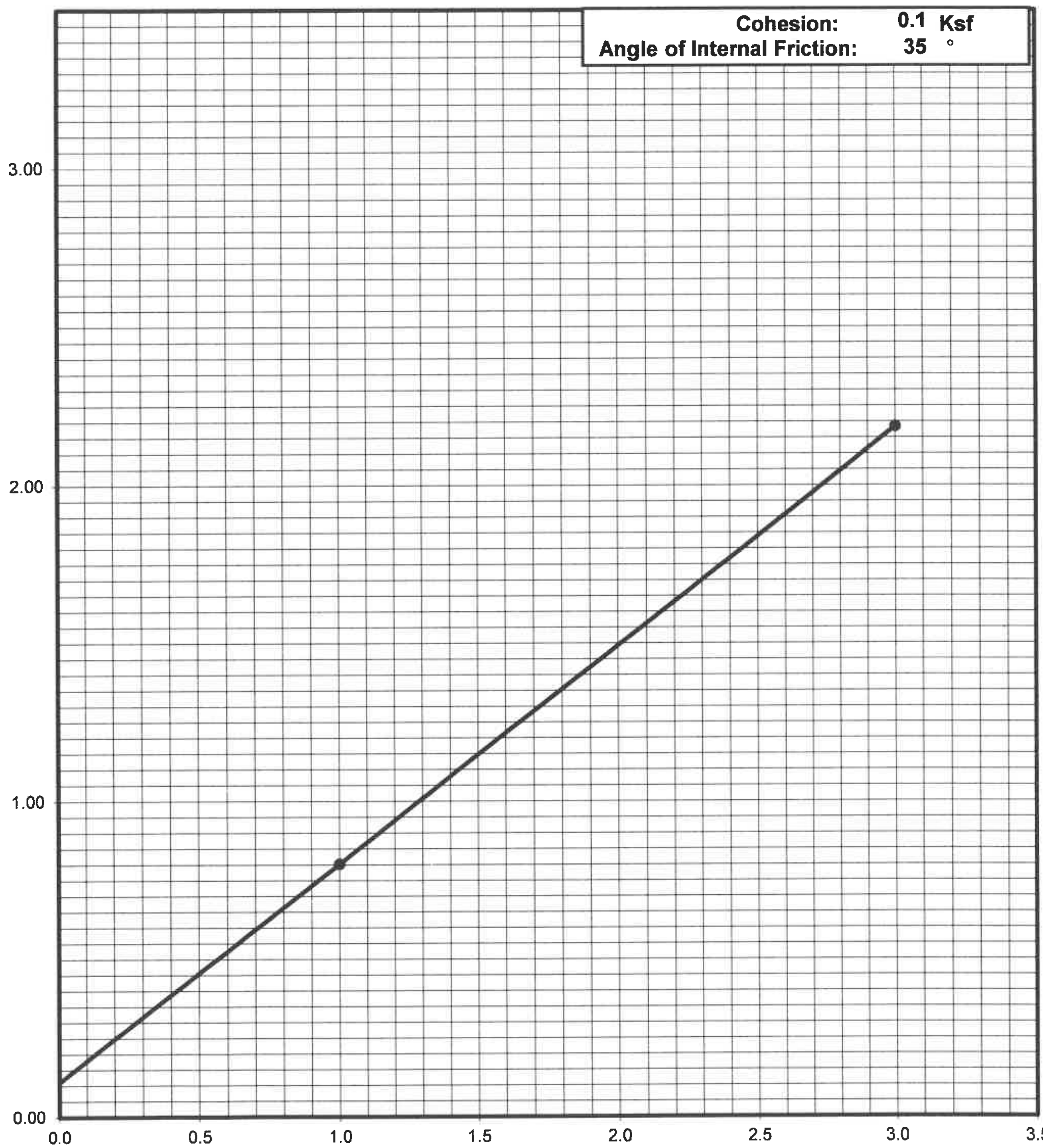
Project Number	Boring No. & Depth	Soil Type	Date
022-16131	B1 @ 5-6'	SM	12/30/2016



Krazan Testing Laboratory

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

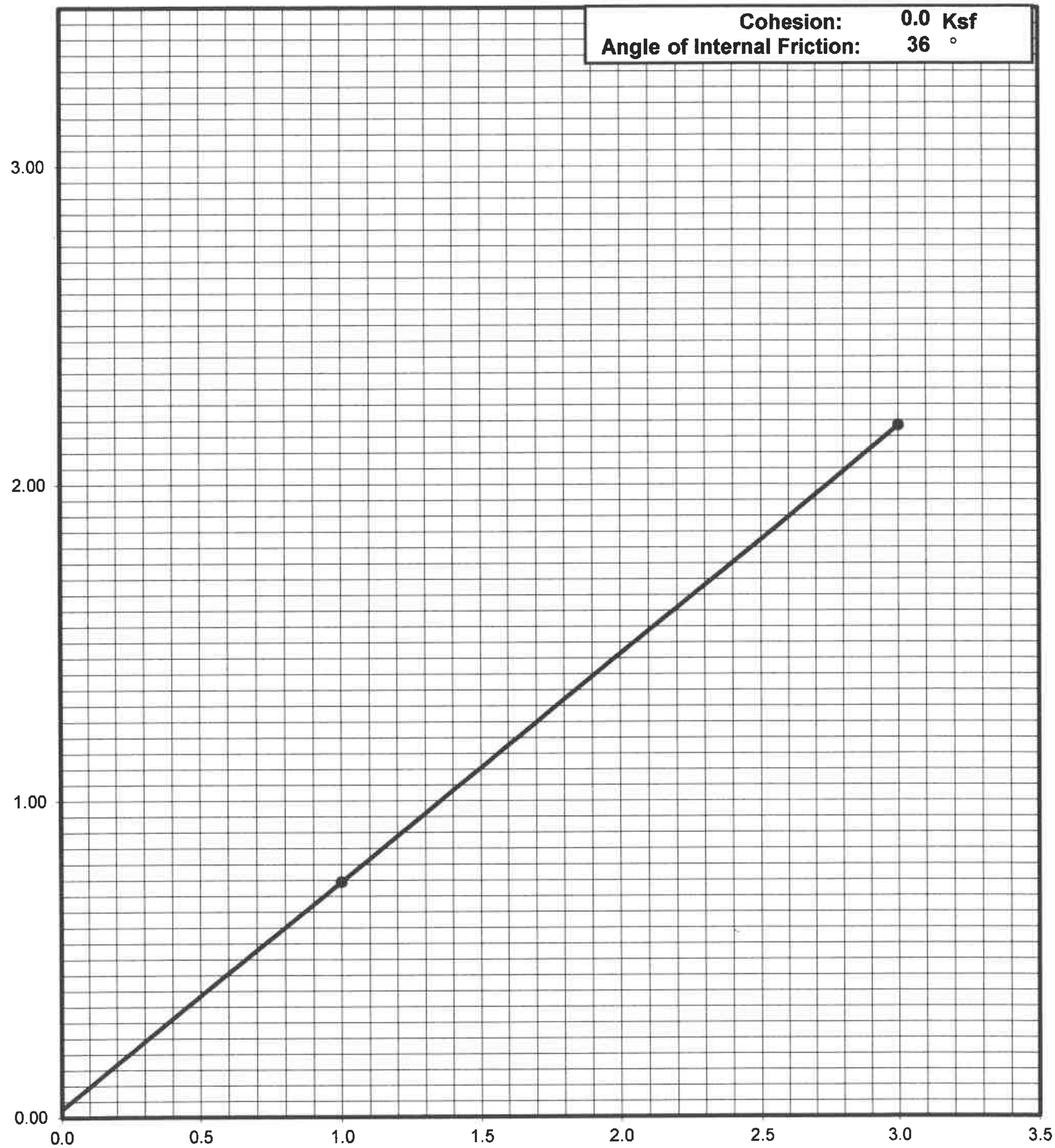
Project Number	Boring No. & Depth	Soil Type	Date
022-16131	B2 @ 10-11'	SM-ML	12/30/2016



Krazan Testing Laboratory

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

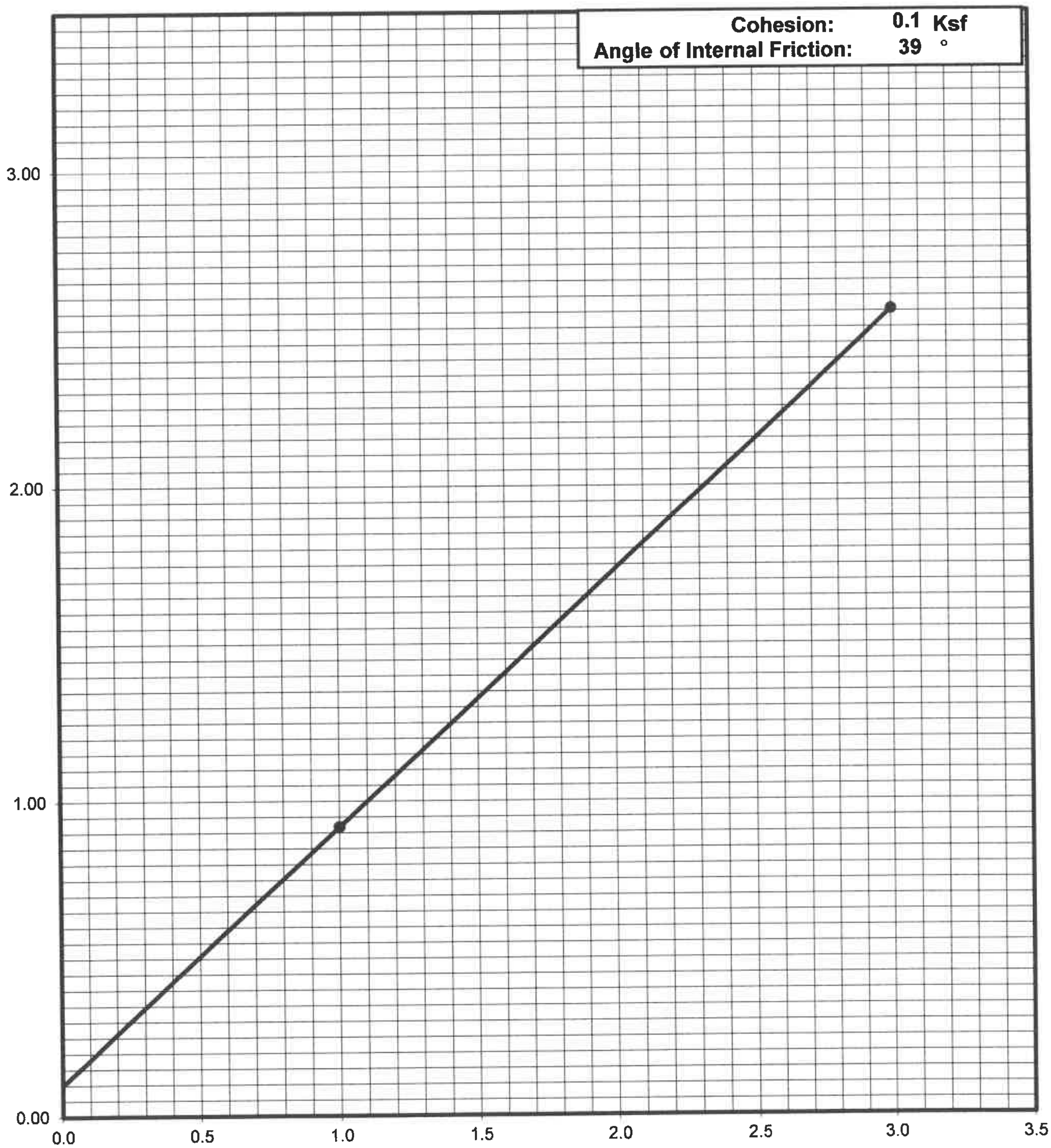
Project Number	Boring No. & Depth	Soil Type	Date
022-16131	B3 @ 5-6'	SM	12/30/2016



Krazan Testing Laboratory

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

Project Number	Boring No. & Depth	Soil Type	Date
022-16131	B3 @ 10-11'	SM-ML	12/30/2016



Krazan Testing Laboratory

Plasticity Index of Soils

ASTM D4318/AASHTO T89 T90/CT 204

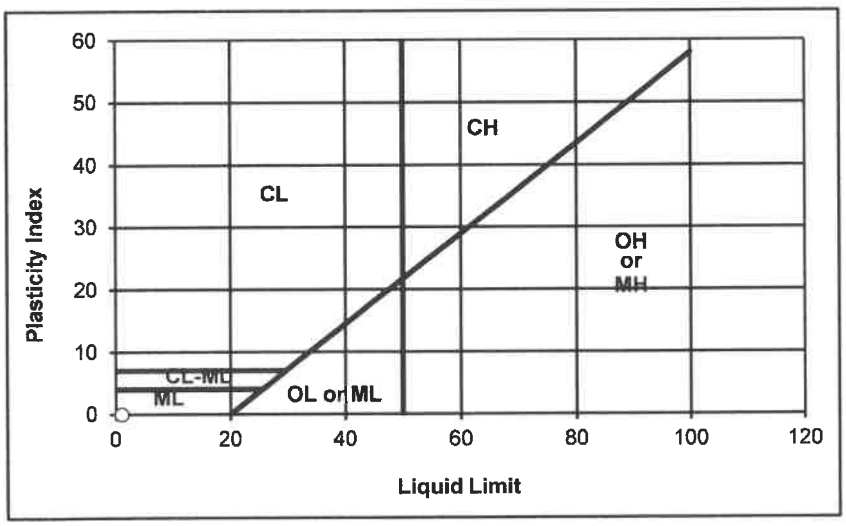
Project: **LBC Children's Ministry Improvements**
Project Number: **022-16131**
Date Sampled: 12/2/2016
Sampled By: DA
Sample Number:
Sample Location: B1 @ 30-31'
Sample Description: ML

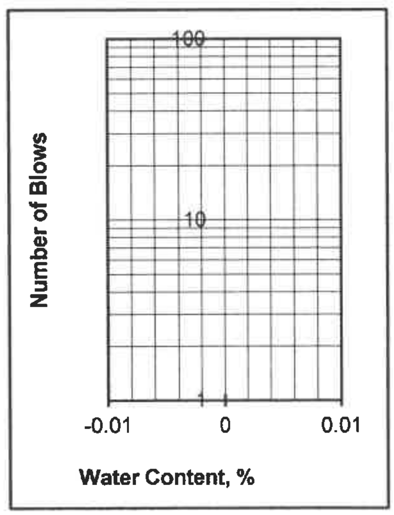
Date Tested: 12/30/2016
Tested By: J Dyer
Verified By: J Gruszczynski

	Plastic Limit			Liquid Limit		
Trial Number	1	2	3	1	2	3
Weight of Wet Soil & Tare (g)						
Weight of Dry Soil & Tare (g)						
Weight of Tare (g)						
Weight of water (g)						
Weight of Dry Soil (g)						
Water Content (% of dry wt.)						
Number of Blows						

Plastic Limit : N/D **Liquid Limit : N/D**

Plasticity Index : NON-PLASTIC
Unified Soil Classification : NON-PLASTIC **Requirement:**
Approx. % of Material Retained on # 40 Sieve:





Departures from Outlined Procedure:

Unusual Conditions, Other Notes:

Krazan & ASSOCIATES, INC.

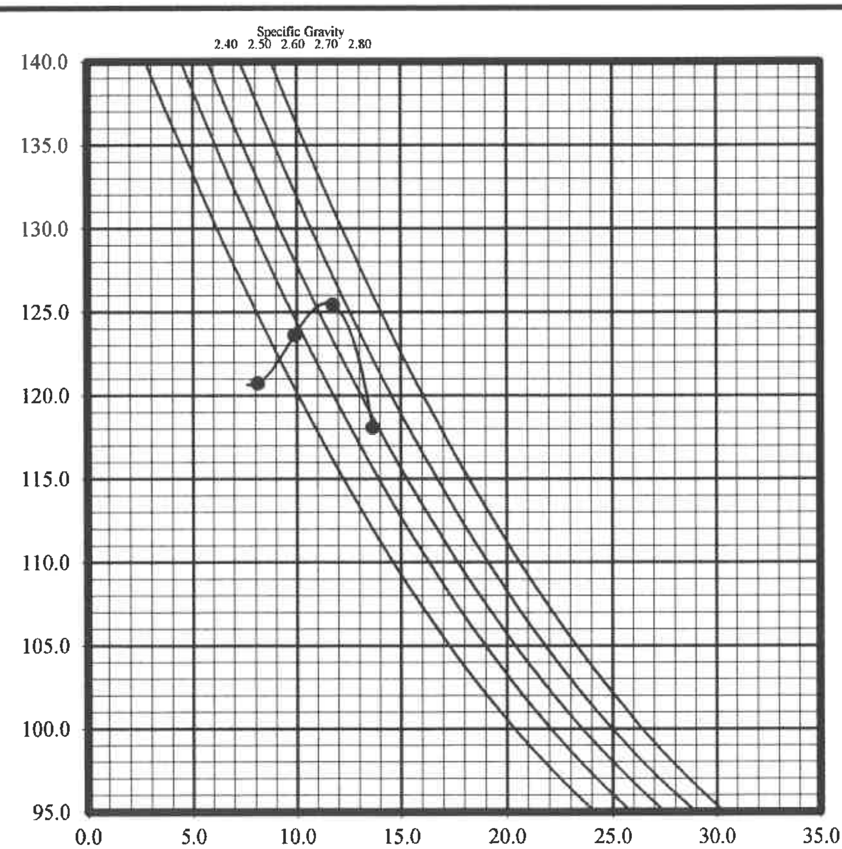
GEOTECHNICAL ENGINEERING ENVIRONMENTAL ENGINEERING CONSTRUCTION TESTING & INSPECTION

Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft. - lbf/ft^3)

ASTM D1557

Project Number	022-16131	Sample Number	C1
Project Name	LBC Shildren's Ministry	Soil Classification	SC
Technician	DJ 12075	Soil Description	Lt Brn Clayey Sand
Date	12/30/2016	Method	D1557a
Sample Location	1-4'		

	1	2	3	4
Mass of Moist Specimen & Mold, gm	4035.2	4100.0	4010.0	3954.7
Mass of Compaction Mold, gm	1983.0	1983.0	1983.0	1983.0
Mass of Moist Specimen, gm	2052.2	2117.0	2027.0	1971.7
Volume of Mold, cu./ft.	0.0333	0.0333	0.0333	0.0333
Wet Density, lbs./cu.ft.	135.9	140.2	134.2	130.5
Mass of Moisture (Wet), gm	200.0	200.0	200.0	200.0
Mass of Moisture (Dry), gm	182.0	179.0	176.0	185.0
Moisture Content (%)	9.9	11.7	13.6	8.1
Dry Density, lbs/cu.ft.	123.6	125.4	118.1	120.7



Maximum Dry Density, lbs.cu.ft.

125.5

Optimum Moisture Content

11.4%

SDS#: -

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

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 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.