GEOTECHNICAL ENGINEERING INVESTIGATION
SOUTH OF IRIS LLC
SEQ IRIS AVENUE & INDIAN STREET
MORENO VALLEY, CALIFORNIA

KA PROJECT NO. 112-22039
APRIL 25, 2022

Prepared for:

MR. MICHAEL PATTON
PATTON DEVELOPMENT
41 CORPORATE PARK #250
IRVINE, CALIFORNIA 92606

Prepared by:

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

Krazan & ASSOCIATES, INC.

GEOTECHNICAL ENGINEERING • ENVIRONMENTAL ENGINEERING
CONSTRUCTION TESTING & INSPECTION

April 25, 2022 KA Project No. 112-22039

Mr. Michael Patton
Patton Development
41 Corporate Park #250
Irvine, CA 92606
(949) 852-0266

RE: Geotechnical Engineering Investigation
Proposed South of Iris, LLC
SEQ Iris Avenue & Indian Street
Moreno Valley, California

Dear Mr. Patton:

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

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

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Jorge A. Pelayo, PE
Project Engineer
RCE No. 91269

JAP

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MORENO VALLEY, CALIFORNIA

INTRODUCTION

This report presents the results of our Geotechnical Engineering Investigation for the proposed South of Iris residential development to be located in the southeast quadrant of Iris Avenue and Indian Street, in the City of Moreno Valley, California. Discussions regarding site conditions are presented herein, together with conclusions and recommendations pertaining to site preparation, Engineered Fill, utility trench backfill, drainage and landscaping, foundations, concrete floor slabs and exterior flatwork, retaining walls, soil cement reactivity, pavement design, and water infiltration rates.

A site plan showing the approximate boring locations is presented following the text of this report, the attached Site Map, Figure 1. 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 subject 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 February 15, 2022 (KA Proposal No. G22017CAC) 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 a total of nineteen (19) borings to depths of approximately 10 to 50 feet below existing site grades for evaluation of the subsurface conditions at the project site.

- Performance of laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Performance of four (4) water infiltration tests at the subject site in order to obtain approximate water infiltration rates for the near surface soil conditions.

- Collection of a bulk sample for laboratory testing of R-value used in our pavement design recommendations.

- 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 have reviewed the Site Plan, prepared by Kevin L. Crook Architect Inc. for the proposed development. The proposed development is understood to include construction of a residential development which is anticipated to consist of seventy-eight (78) residential units and one hundred and ninety-nine (199) residential parking spaces. In addition, the proposed development is anticipated to include a tot lot, dog park, a retention basin to the southeast corner of the site, trash enclosures, and asphalt/concrete pavements.

The anticipated finished grade elevation for the proposed structure is assumed to be relatively close to the existing site grades. As a result, only minor cuts and fills are anticipated at the site to account for site drainage. 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 9.4 acres. The subject site is located on Iris Avenue and east of Indian Street in the city of Moreno Valley, California, see the attached Vicinity Map, Figure 2. The site is bound to the south by vacant undeveloped land, to the west by two churches, Indian Street, and a distribution facility beyond, to the north by Iris Avenue and Rainbow Ridge Elementary School beyond, and to the east by a church and residential properties beyond.

The site is currently undeveloped and previously had a single residential house that has since been demolished that was located at the southern portion of the subject site. Ground surface at the site consists of exposed soil and localized weed and brush growth. The site topography is relatively flat and level with no major changes in topography at an approximate elevation of 1502 feet above mean sea level. The site currently drains to the north side of the property.

GEOLOGIC SETTING

The subject site is located within the Peninsular Ranges Geomorphic Province (CGS Note 36). The Peninsular Ranges is a series of ranges is separated by northwest trending valleys, subparallel to faults branching from the San Andreas Fault. The trend of topography is similar to the Coast Ranges, but the geology is more like the Sierra Nevada, with granitic rock intruding the older metamorphic rocks. The Peninsular Ranges extend into lower California and are bound on the east by the Colorado Desert. The Los Angeles Basin and the island group (Santa Catalina, Santa Barbara, and the distinctly terraced San Clemente and San Nicolas islands), together with the surrounding continental shelf (cut by deep submarine fault troughs), are included in this province.

Locally, the site is located within the inactive floodplain of the Santa Ana River near its confluence with Cajon and Lytle Creeks southwest of San Bernardino in the central portion of the Inland Valley. The Inland Valley is bound to the southwest by the Chino Hills, to the north by the San Gabriel Mountains, to the northeast by the San Bernardino Mountains, and to the southeast by the hilly uplands that separate it from the San Jacinto Basin. These mountain ranges are part of the Transverse Ranges Geomorphic Province of California. The Inland Valley is dominated by faults and adjacent anticlinal uplifts. The intervening synclinal troughs are filled with poorly consolidated Upper Pleistocene and unconsolidated Holocene sediments. 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 nearest significant active faults are the San Jacinto and Elsinore fault zones, which are approximately 6.5 and 15.9 miles away from the subject site, respectively. The area in consideration shows no mapped faults on-site according to maps prepared by the California Geologic Survey and published by the International Conference of Building Officials (ICBO). No evidence of surface faulting was observed on the property during our reconnaissance.

FIELD AND LABORATORY INVESTIGATIONS

Subsurface soil conditions were explored by drilling a total of nineteen (19) borings (B-1 to B-19) to depths of approximately 10 to 50 feet below existing site grade, using a truck-mounted drill rig; in addition, four (4) borings (IT-1 and IT-4) were advanced to a depth of ten to fifteen feet for the purpose of infiltration testing. A bulk subgrade sample was obtained from the site for laboratory R-Value testing. The approximate boring and bulk sample locations are shown on the attached, Site Map, Figure 1. 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, R-Value, 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 appear typical of those found in the geologic region of the site. In general, the surface soils consisted of approximately 6 to 12 inches of very loose silty sand. These soils are disturbed, have low strength characteristics and are highly compressible when saturated.

Beneath the loose surface soils, medium dense to very dense silty sand encountered up to the maximum depth explored, 50 feet below ground surface. Groundwater was not encountered during our field exploration and data suggests that groundwater in the vicinity of the subject site is estimated at depths in excess of 50 feet below surface.

Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance ranged from 14 to 54 blows per foot. Dry densities ranged from 110 to 127 pcf. Representative soil samples consolidated approximately 0.8 and 1.3 percent under a 2 ksf load when saturated. Representative soil samples had angles of internal friction of 31 degrees with cohesion values of 100 psf. These soils strength characteristics 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. Groundwater was not encountered during our field exploration. Although, 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.

SEISMICITY AND LIQUEFACTION POTENTIAL

Seismicity is a general term relating to the abrupt release of accumulated strain energy in the rock materials of the earth's crust in a given geographical area. The recurrence of accumulation and subsequent release of strain have resulted in faults and fault systems. Fault patterns and density reflect relative degrees of regional stress through time, but do not necessarily indicate recent seismic activity;

therefore, the degree of seismic risk must be determined or estimated by the seismic record in any given region.

Soil liquefaction is a state of soil particle 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 clean 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 ground shaking

The State of California has not prepared a State of California Seismic Hazard Zones Map for the area where the project site is situated. Thus, the subject site is not located in an area designated by the State of California as a liquefaction hazard zone. Furthermore, the Riverside County GIS Map for Liquefaction identifies the subject site in an area designated as a low Liquefaction Potential Hazard Zone.

Subsurface soil conditions encountered at the subject site consisted of dense to very dense granular soil. Groundwater was not encountered at the subject site and is not anticipated to be located within a depth of 50 feet below site grades. Based on the conditions encountered and the results of our laboratory testing, the subsurface conditions encountered at the subject site are not considered to be subject to liquefaction.

FAULT RUPTURE HAZARD ZONES

The Alquist-Priolo Geologic Hazards Zones Act went into effect 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." Review of the Earthquake Zones of Required Investigation (EQZApp) prepared by the CGS indicates that no earthquake fault zones are located on or projected to cross the vicinity of the subject site. The nearest zoned fault is a portion of the San Jacinto Fault Zone, located approximately 6.5 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. A Seismic Hazard Zones Map has not been prepared for the vicinity of the subject site to date. Furthermore, the County of Riverside Liquefaction Susceptibility Map has identified the site as having a Low Liquefaction Potential.

OTHER HAZARDS

Rockfall, Landslide, Slope Instability, and Debris Flow: The subject site is relatively flat and level. It is our understanding that there are no significant slopes proposed as part of the proposed development. Provided the recommendations presented in this report are implemented into the design and construction of the anticipated development, rockfalls, landslides, slope instability, and debris flows are not anticipated to pose a hazard to the subject site.

Seiches: Seiches are large waves generated within enclosed bodies of water. The site is not located in close proximity to any lakes or reservoirs. As such, seiches are not anticipated to pose a hazard to the subject site.

Tsunamis: Tsunamis are tidal waves generated by fault displacement or major ground movement. The site is several miles from the ocean. As such, tsunamis are not anticipated to pose a hazard to the subject site.

Hydroconsolidation: The near surface soils encountered at the subject site were found to be medium dense to dense. The underlying native soils were found to be dense to very dense. Provided the recommendations in this report are incorporated into the design and construction of the proposed development, hydroconsolidation is not anticipated to be a significant concern for the subject site.

Expansive Soil

The near-surface silty sand soils encountered at the site have been identified through laboratory testing as having a low expansion potential. Expansive soils have the potential to undergo volume change, or shrinkage and swelling, with changes in soil moisture. As expansive soils dry, the soil shrinks; when moisture is reintroduced into the soil, the soil swells.

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	5,000 ohm-cm	CA 643
Sulfate	181 ppm	CA 417
Chloride	52 ppm	CA 422
pH	7.6	EPA 9045C

INFILTRATION TESTING

Estimated infiltration rates were determined using the results of open borehole percolation testing performed at the subject site. The percolation testing indicated that the near surface dense silty sand soil was found to have infiltration rates of approximately 0.46, 0.53, 0.58, and 0.73 inch per hour, respectively. The locations of these infiltration tests are presented on the attached Site Map, Figure 1.

The soil infiltration rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the infiltration system to compensate for these factors as determined appropriate by the designer. In addition, routine maintenance consisting of clearing the system of clogged soils and debris should be expected.

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 surficial soils, appear to be conducive to the development of the project.

Fill material was not encountered in our borings. However, fill may be located between or beyond our borings. It is anticipated fill soils will consist of silty sands. The thickness and extent of fill material was determined based on limited test borings and visual observation. Verification of the extent of fill should be determined during site grading. It is recommended that fill soils that have not been properly compacted and certified be excavated and recompacted. Prior to backfilling, the bottom of the excavation should be observed by Krazan & Associates, Inc. to verify no additional removal is required.

Presently, the site consists of vacant land surrounded by churches, residential neighborhoods, and vacant land. Associated with the surrounding developments may be buried structures, such as utility lines and irrigation lines that extend into the project site. Demolition activities should include proper removal of any buried structures or loosely backfilled excavations encountered. The resulting excavations should be backfilled with Engineered Fill. It is suspected that demolition activities of the existing structures will disturb the upper soils. After demolition activities, it is recommended that these disturbed soils be removed and/or recompacted. This compaction effort should stabilize the upper soils and locate any unsuitable or pliant areas not found during our field investigation.

To reduce post-construction soil movement and provide uniform support for the buildings and other foundations, overexcavation and recompaction within the proposed building footprint areas should be performed to a minimum depth of at least five (5) feet below existing grades or two (2) feet below the bottom of the proposed foundation bearing grades. In addition, any fill soil present in the building area should be removed and re-placed as compacted Engineered Fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The exposed subgrade at the base of the overexcavation should then be scarified, moisture-conditioned as necessary, and compacted. The overexcavation and recompaction should also extend laterally five feet (5') beyond edges of the proposed footings or building limits. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

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

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

Unless designed by the project structural engineer, concrete slabs-on-grade should be a minimum of five (5) inches thick. It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. We recommend at least No. 3 reinforcing bars placed on 18-inch centers, be used for this purpose. 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.

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.

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.

Groundwater Influence on Structures/Construction

During our field investigation free groundwater was not encountered in any of the borings drilled as part of this investigation. It is not anticipated that groundwater will impact the proposed development. If groundwater is encountered, our firm should be consulted prior to dewatering the site. 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; existing stockpiled soil; trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for use as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Overexcavation and Recompaction – Building and Foundation Areas

To reduce post-construction soil movement and provide uniform support for the buildings and other foundations, overexcavation and recompaction within the proposed building footprint areas should be performed to a minimum depth of at least five (5) feet below existing grades or two (2) feet below the bottom of the proposed foundation bearing grades. In addition, any fill soil present in the building area should be removed and re-placed as compacted Engineered Fill. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The exposed subgrade at the base of the overexcavation should then be scarified, moisture-conditioned as necessary, and compacted. The overexcavation and recompaction should also extend laterally five feet (5') beyond edges of the proposed footings or building limits. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Overexcavation and Recompaction – Proposed Parking Area

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

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

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

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

Engineered Fill

The on-site upper native soils are predominately silty sand soils. These soils will be suitable for reuse as Engineered Fill, provided they are cleansed of excessive organics, fragments greater than 6 inches in diameter, and debris.

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

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

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

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

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 1804.4 of the 2019 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.

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 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.

Utility trench backfill placed in or adjacent to buildings and exterior slabs should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Utility trench backfill placed in pavement areas should be compacted to at least 95 percent of the maximum dry density based on ASTM Test Method D1557. Pipe bedding should be in accordance with pipe manufacturer's recommendations.

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 and gravelly soils.

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

The proposed structures may be supported on a shallow foundation system bearing on a minimum of three (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	2,000 psf
Dead-Plus-Live Load	2,600 psf
Total Load, including wind or seismic loads	3,500 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 15 inches, regardless of load.

The total soil movement is not expected to exceed 1 inch. Differential movement measured across a horizontal distance of 30 feet should be less than ½ inch. Most of the settlement is expected to occur during construction as the loads are applied. However, additional post-construction settlement may occur if the foundation soils are flooded or saturated.

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.

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. 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.

Floor Slabs and Exterior Flatwork

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 practices. 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.

Unless designed by the project structural engineer, concrete slabs-on-grade should be a minimum of five (5) inches thick. It is recommended that the concrete slab be reinforced to reduce crack separation and possible vertical offset at the cracks. We recommend at least No. 3 reinforcing bars placed on 18-inch centers, be used for this purpose. 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 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 39 pounds per square foot per foot of depth. Walls incapable of this deflection or are fully constrained walls against deflection may be designed for an equivalent fluid at-rest pressure of 59 pounds per square foot per foot of depth. Expansive soils should not be used for backfill against walls. The wedge of non-expansive backfill material should extend from the bottom of each retaining wall outward and upward at a slope of 2:1

(horizontal to vertical) or flatter. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways.

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

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 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 reduce surface drainage into the wall drain system. The aggregate should conform to Class 2 permeable materials graded in accordance with CalTrans Standard Specifications (2018). 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 four 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 CalTrans Standard Specifications for “edge drains”) should be affixed to the rear wall opening of each weep hole to retard soil piping.

R-Value Test Results and Pavement Design

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

Sample	Depth	Description	R-Value at Equilibrium
R1	0-36"	Silty Sand (SM)	65

The test results are moderate and indicate good subgrade support characteristics under dynamic traffic loads. The following table shows the recommended pavement sections for various traffic indices.

Traffic Index	Asphaltic Concrete	Class II Aggregate Base*	Compacted Subgrade**
4.0	2.0"	4.0"	12.0"
4.5	2.5"	4.0"	12.0"
5.0	2.5"	4.0"	12.0"
5.5	3.0"	4.0"	12.0"
6.0	3.0"	4.0"	12.0"
6.5	3.5"	4.0"	12.0"
7.0	4.0"	4.0"	12.0"
7.5	4.0"	4.0"	12.0"

**** 95% compaction based on ASTM Test Method D1557 or CAL 216***
***** 95% compaction based on ASTM Test Method D1557 or CAL 216***

If traffic indices are not available, an estimated (typical value) index of 4.5 may be used for light automobile traffic and an index of 7.0 may be used for light truck traffic. Following grading operations, it is recommended additional R-Value testing be performed to verify the design R-Value.

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

PORTLAND CEMENT PAVEMENT
LIGHT DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
4.5	5.0"	--	12.0"

HEAVY DUTY

Traffic Index	Portland Cement Concrete***	Class II Aggregate Base*	Compacted Subgrade**
7.0	6.5"	--	12.0"

**** 95% compaction based on ASTM Test Method D1557 or CAL 216***
***** 95% compaction based on ASTM Test Method D1557 or CAL 216***
******Minimum compressive strength of 3000 psi***

Seismic Parameters – 2019 California Building Code

The Site Class per Section 1613 of the 2019 California Building Code (2019 CBC) and ASCE 7-16, Chapter 20 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 2019 CBC, we recommend the following parameters:

Seismic Item	Value	CBC Reference
Site Class	D	Section 1613.2.2
Site Coefficient F_a	1.000	Table 1613.2.3 (1)
S_S	1.500	Section 1613.2.1
S_{MS}	1.500	Section 1613.2.3
S_{DS}	1.000	Section 1613.2.4
Site Coefficient F_v	1.700	Table 1613.2.3 (2)
S_1	0.600	Section 1613.2.1
S_{M1}	1.020	Section 1613.2.3
S_{D1}	0.680	Section 1613.2.4
T_S	0.680	Section 1613.2
PGA_M	0.638	Figure 22.7

***** Based on Equivalent Lateral Force (ELF) Design Procedure being used.

<u>Infiltration Testing</u>

The shallow soil conditions present at the subject site were evaluated by drilling shallow borings in the vicinity of the infiltration test. The borings drilled at the site indicated the subsurface soil conditions consisted of medium dense to dense silty sand.

Infiltration rates were determined using the results of open borehole infiltration testing performed at the subject site. Infiltration testing performed on the near surface silty sand soil indicate infiltration rates of approximately 0.46, 0.53, 0.58, and 0.73 inch per hour, respectively. Detailed results of the percolation test and infiltration rate results are attached in tabular format. The soil percolation rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the percolation system to compensate for these factors as determined appropriate by the designer. In addition, periodic maintenance consisting of clearing the bottom of the system of clogged soils should be expected.

It is recommended that the location of the infiltration systems not be closer than ten feet (10') as measured laterally from the edge of the adjacent property line, ten feet (10') from the outside edge of any foundation and five (5') from the edge of any right-of way to the outside edges of the infiltration system.

If the infiltration location is within ten feet (10') of the proposed foundation, it is recommended that this infiltration system should be impervious from the finished ground surface to a depth that will achieve a diagonal distance of a minimum of ten feet (10') below the bottom of the closest footing in the project.

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 CBC have developed criteria for evaluation of sulfate levels and how they relate to cement reactivity with soil and/or water.

One soil sample was obtained from the site and tested in accordance with State of California Materials Manual Test Designation 417. The sulfate concentration detected from the soil sample indicated moderate sulfate exposure value as established by HUD/FHA and CBC. Therefore, it is recommended that concrete in contact with soil utilize Type II Cement and have a minimum compressive strength of 4,000 psi and a water to cement ratio of 0.50.

Electrical resistivity testing of the soil indicates that the onsite soils may have a moderate 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 upon 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 are 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.

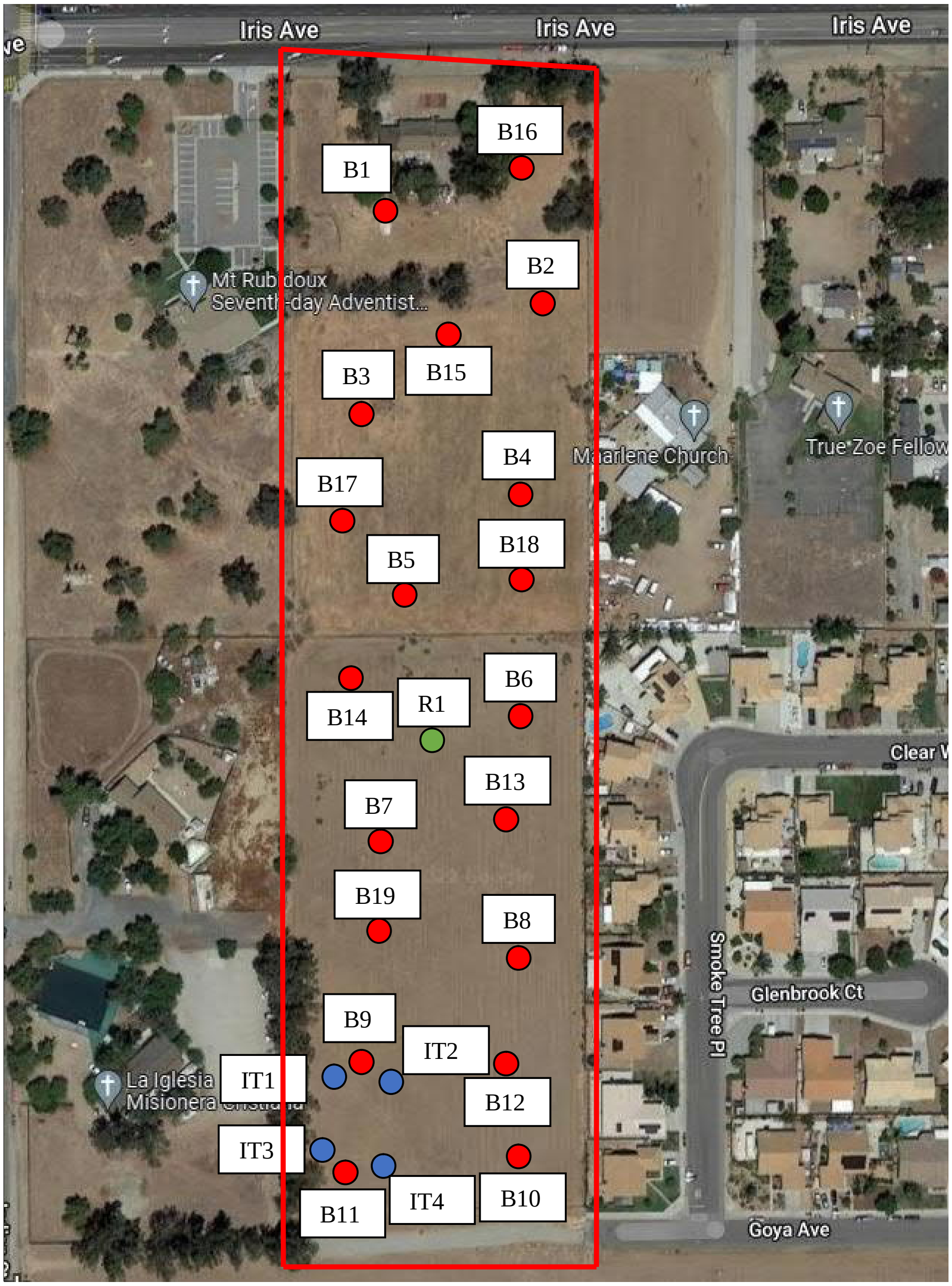
If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

Jorge A. Pelayo, MS, PE
Project Engineer
RCE No. 91269

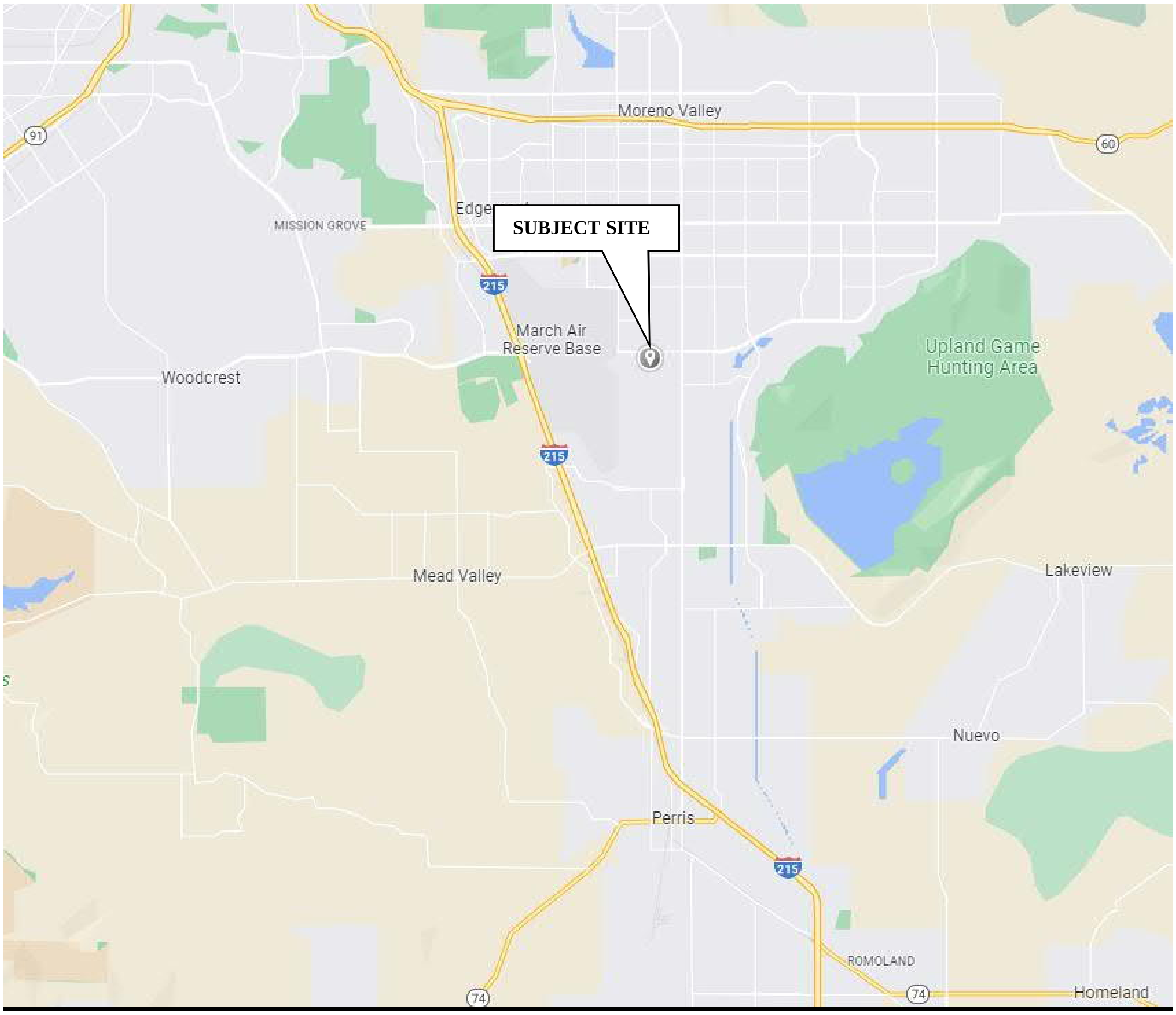
Angel Menchaca, EIT
Staff Engineer

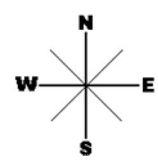
Figures



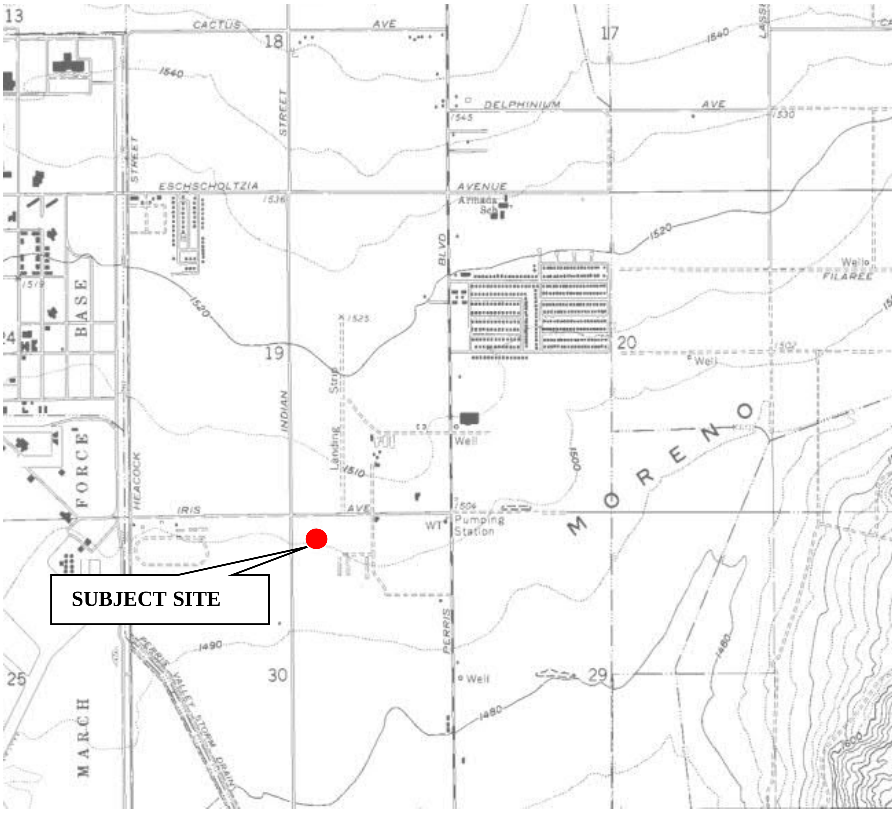
- Approximate Boring Location
- Approximate R-Value Location
- Approximate Infiltration Test Location

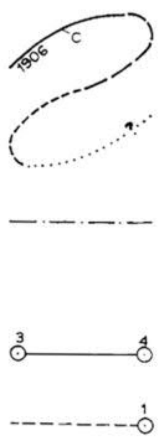
SITE MAP	Scale: NTS	Date: April, 2022	Krazan GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	Drawn by: AM	Approved by: JP	
	Project No. 112-22039	Figure No. 1	





VICINITY MAP	Scale: NTS	Date: April, 2022	Krazan GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	Drawn by: AM	Approved by: JP	
	Project No. 112-22039	Figure No. 2	





MAP EXPLANATION

Potentially Active Faults

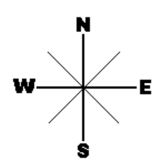
Faults considered to have been active during Quaternary time; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

Aerial photo lineaments (not field checked); based on youthful geomorphic and other features believed to be the results of Quaternary faulting.

Special Studies Zone Boundaries

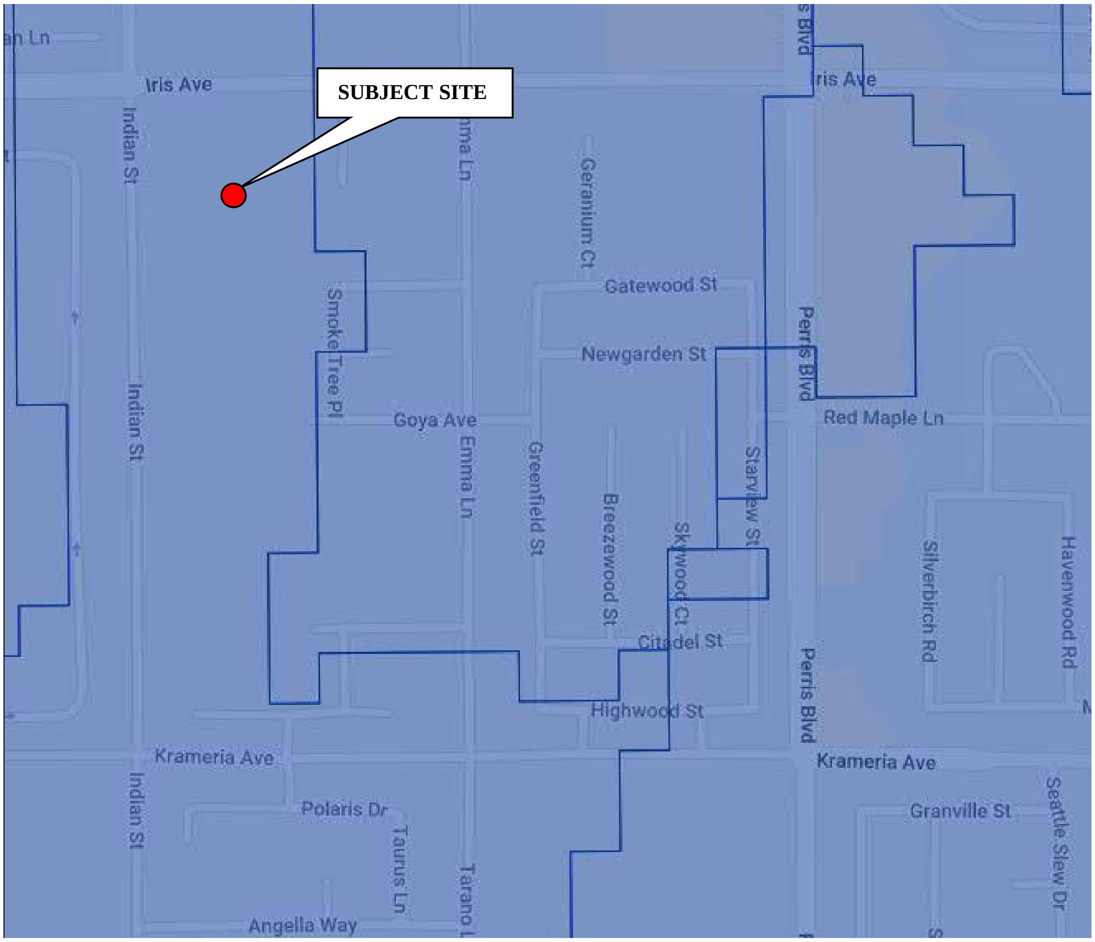
These are delineated as straight-line segments that connect consecutively numbered turning points so as to define one or more special studies zone segments.

Seaward projection of zone boundary.

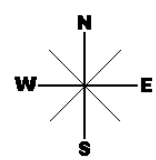


Source: State of California Seismic Hazards Map, Sunnymead Quadrangle

EARTHQUAKE ZONES OF REQUIRED INVESTIGATION MAP	**Scale:** NTS	**Date:** April, 2022	Krazan GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 3	



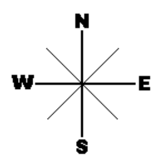
SUSCEPTIBILITY	Low
DEFINITION_4	N/A
DEFINITION_2	50'<GW<100' Contains Etypes: SED{TPud, TPaud, Pud, PMCaud, PMCaf, PINDmf, PINDauf, PINDaud, PINDaf, PHWClf, PDWr, Paud, Paf}
DEFINITION_3	50'<GW<100', Contains Etype: SED{TPHUCac, Phac, HUCac, HPUCac, Hac}



Source: gis.countyofriverside.us

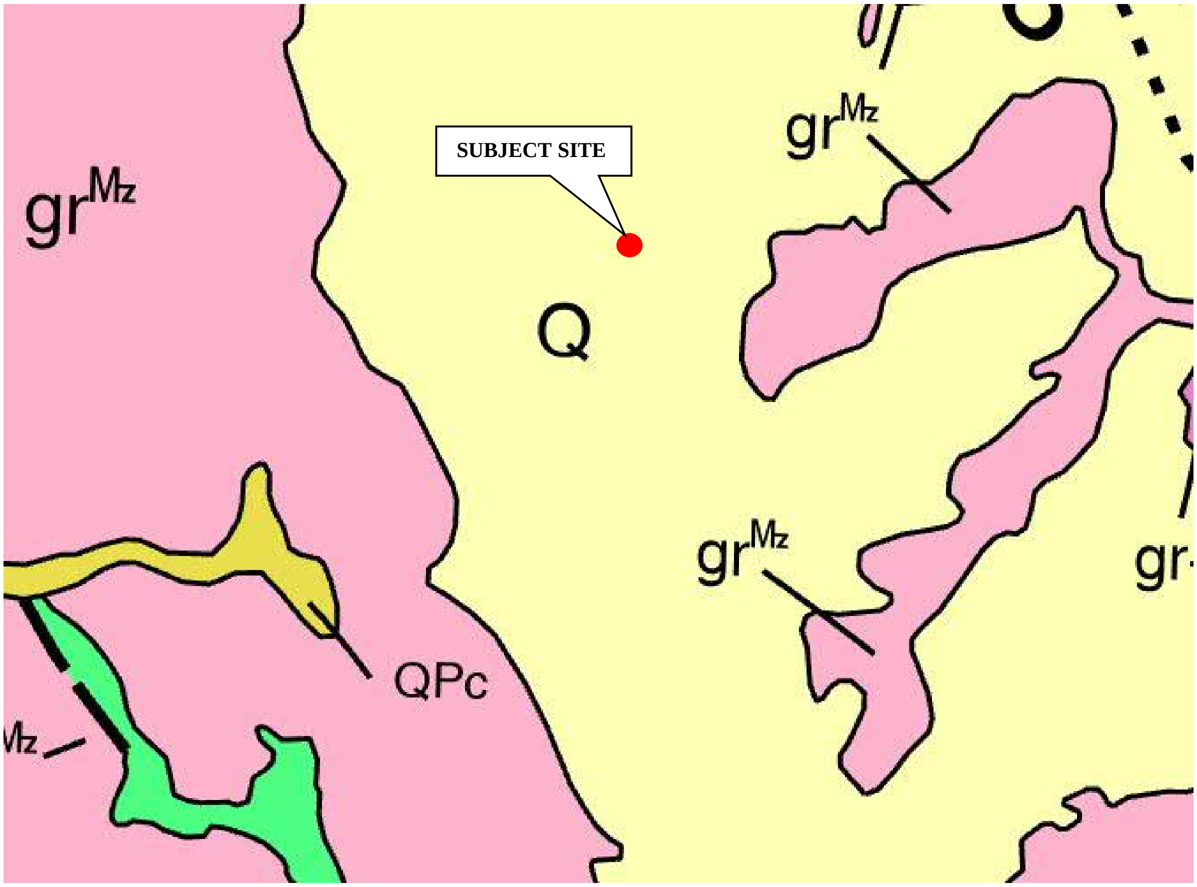
LIQUEFACTION: COUNTY OF RIVERSIDE GIS LIQUEFACTION MAP	**Scale:** NTS	**Date:** March, 2022	**Krazan** GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 4	

Depth to groundwater about 60 feet below the ground surface elevation measured at well number 338982N1171940W001 about 2.4 miles northeast from the project site



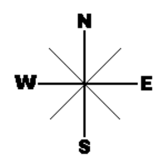
Source: Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA

HISTORICAL GROUNDWATER	**Scale:** NTS	**Date:** March, 2022	**Krazan** **GEOTECHNICAL ENGINEERING**
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 5	



Generalized Rock Types: Q

General Lithology	marine and nonmarine (continental) sedimentary rocks
Age	Pleistocene-Holocene
Description	Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated. Mostly nonmarine, but includes marine deposits near the coast.



Source: Department of Conservation: Geologic Map of California, 2010

GEOLOGIC MAP	**Scale:** NTS	**Date:** March, 2022	Krazan GEOTECHNICAL ENGINEERING
PROPOSED SOUTH OF IRIS LLC SEQ IRIS AVENUE AND INDIAN STREET MORENO VALLEY, CA	**Drawn by:** AM	**Approved by:** JP	
	Project No. 112-22039	**Figure No.** 6	

Log of Borings
&
Laboratory Testing

Appendix A

APPENDIX A

FIELD AND LABORATORY INVESTIGATIONS

Field Investigation

The field investigation consisted of a surface reconnaissance and a subsurface exploratory program. Nineteen (19) 8½-inch diameter exploratory borings were advanced. The boring locations are shown on the attached Site Plan, Figure 1.

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 Corona 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.

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

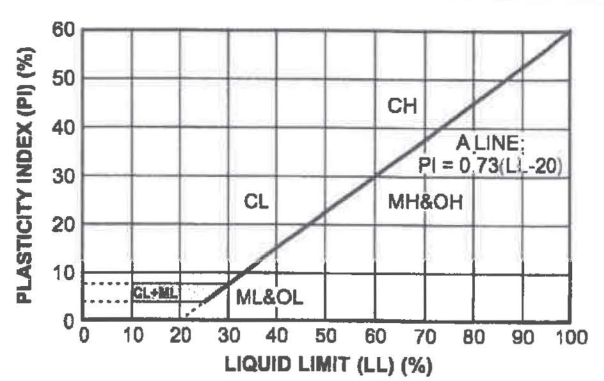
CONSISTENCY CLASSIFICATION

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



Standard Penetration Split Spoon Sampler

California Modified Split Spoon Sampler

Sieve Analysis

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 10'
Soil Classification : SM

Wet Weight	:	737.30
Dry Weight	:	737.30
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	9.1	1.2	1.2	98.8
#8	2.36	54.5	7.4	8.6	91.4
#16	1.18	88.1	11.9	20.6	79.4
#30	0.60	103.5	14.0	34.6	65.4
#50	0.30	138.3	18.8	53.4	46.6
#100	0.15	69.4	9.4	62.8	37.2
#200	0.08	106.7	14.5	77.3	22.7

Krazan Testing Laboratory

Grain Size Analysis

Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 10'

Krazan Testing Laboratory

Sieve Analysis

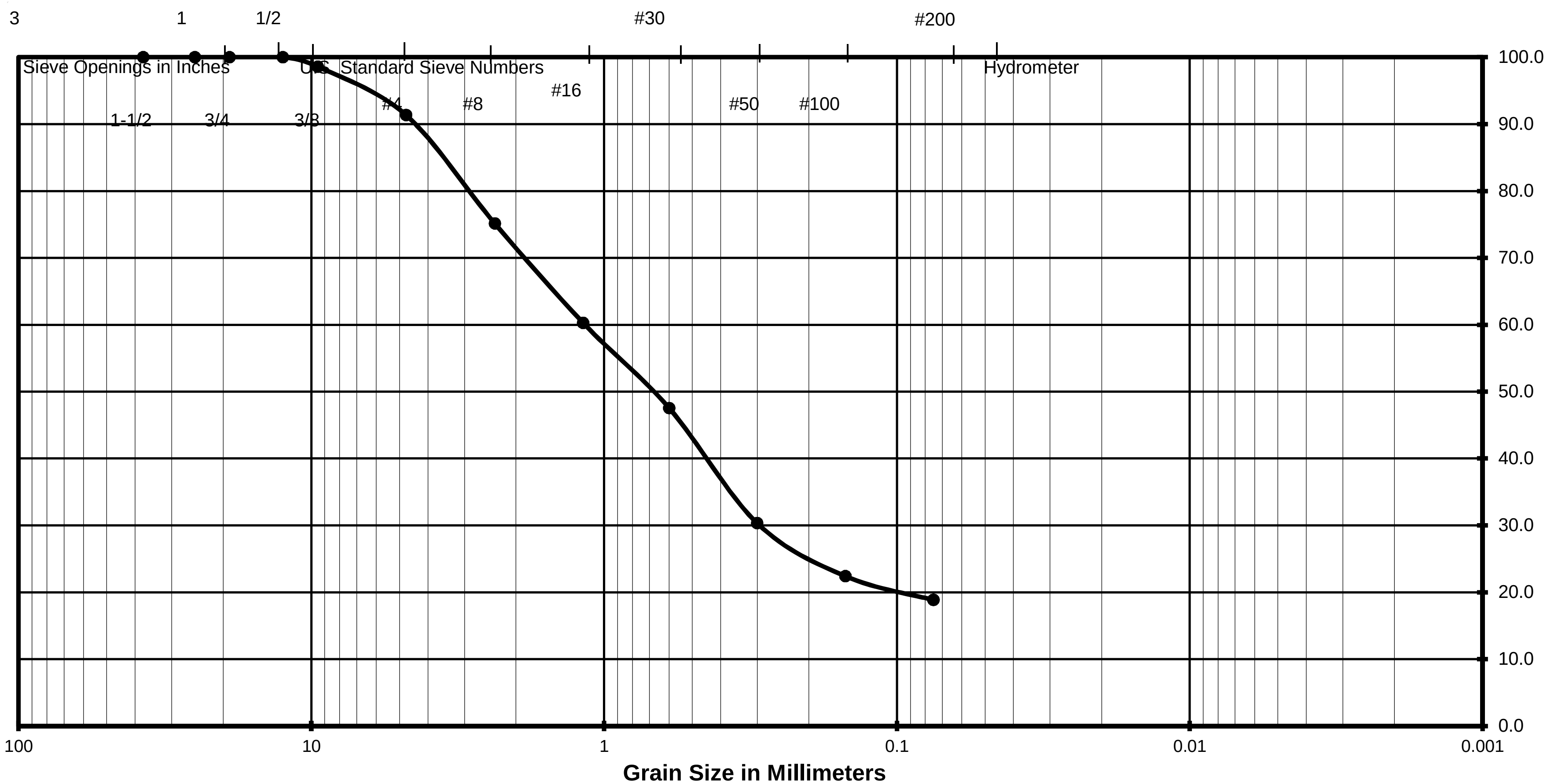
Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 15'
Soil Classification : SM

Wet Weight	:	678.10
Dry Weight	:	678.10
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50	9.7	1.4	1.4	98.6
#4	4.75	48.9	7.2	8.6	91.4
#8	2.36	110.1	16.2	24.9	75.1
#16	1.18	100.6	14.8	39.7	60.3
#30	0.60	86.4	12.7	52.5	47.5
#50	0.30	116.8	17.2	69.7	30.3
#100	0.15	53.7	7.9	77.6	22.4
#200	0.08	24.0	3.5	81.1	18.9

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 15'

Krazan Testing Laboratory

Sieve Analysis

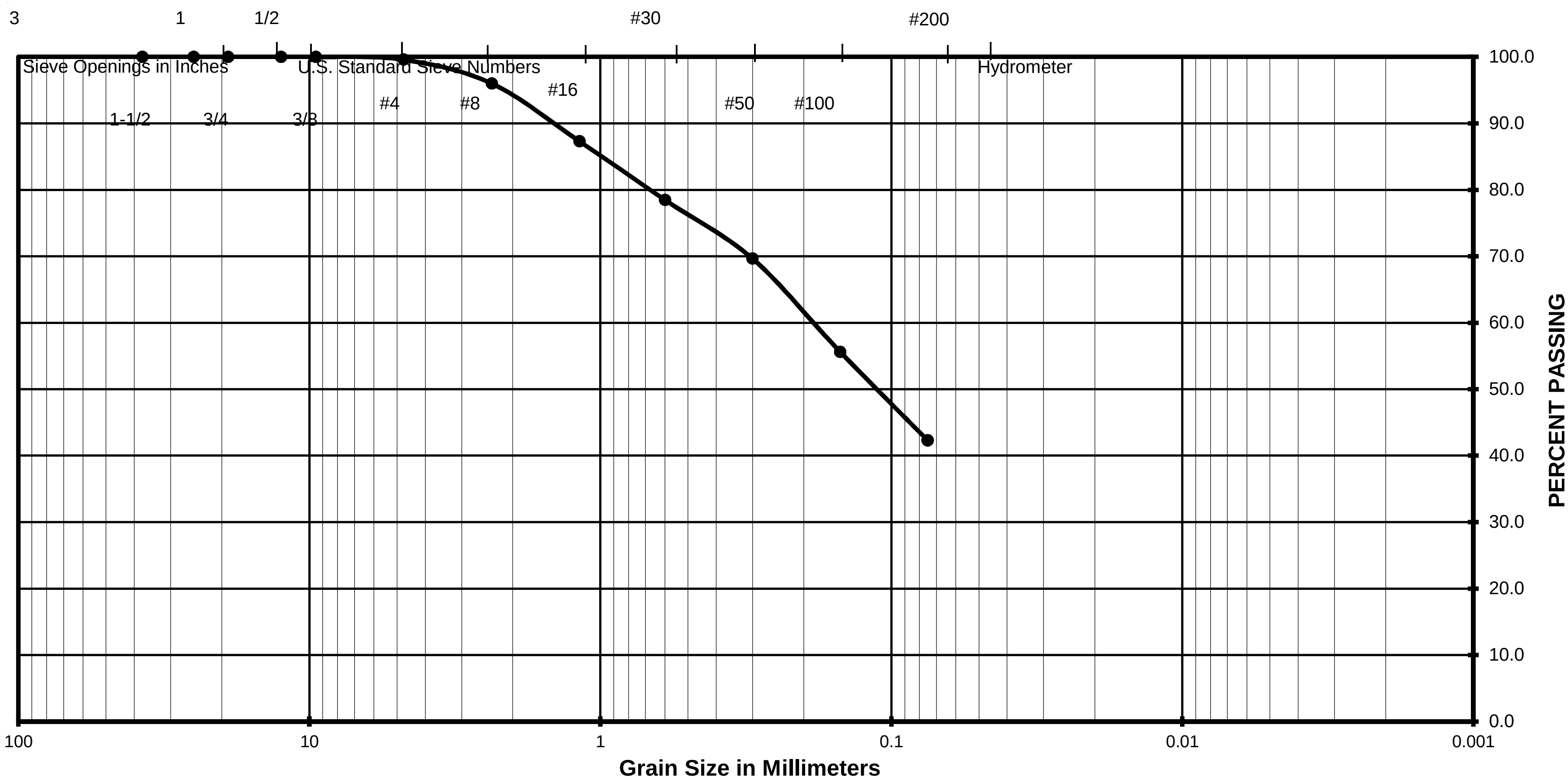
Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/25/2022
Sample Location	: B-1 @ 20'
Soil Classification	: SM

Wet Weight	:	475.30
Dry Weight	:	475.30
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	2.0	0.4	0.4	99.6
#8	2.36	17.1	3.6	4.0	96.0
#16	1.18	41.3	8.7	12.7	87.3
#30	0.60	41.9	8.8	21.5	78.5
#50	0.30	42.0	8.8	30.4	69.6
#100	0.15	66.6	14.0	44.4	55.6
#200	0.08	63.4	13.3	57.7	42.3

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 20'

Krazan Testing Laboratory

Sieve Analysis

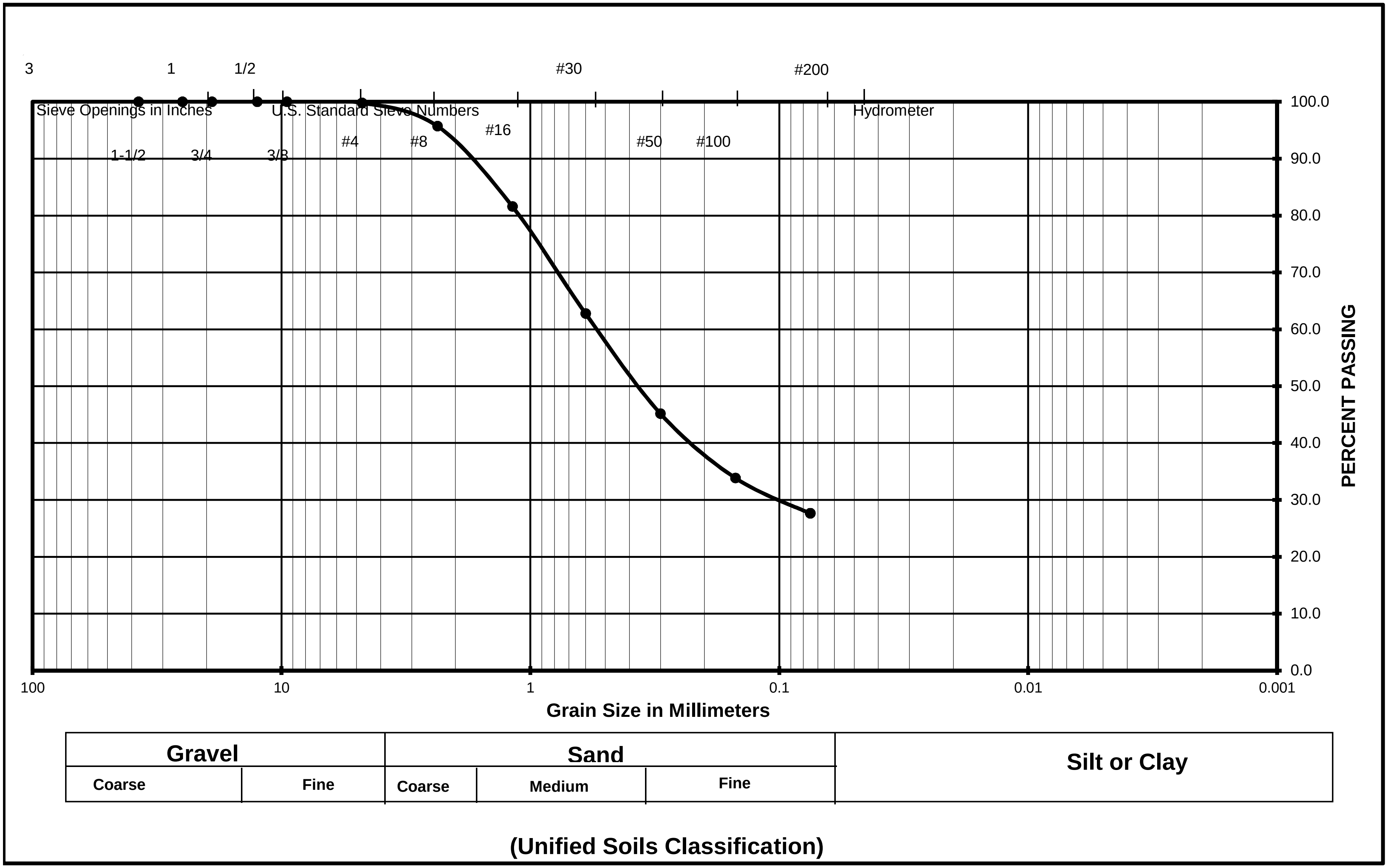
Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 25'
Soil Classification : SM

Wet Weight	:	432.30
Dry Weight	:	432.30
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	0.8	0.2	0.2	99.8
#8	2.36	17.8	4.1	4.3	95.7
#16	1.18	61.1	14.1	18.4	81.6
#30	0.60	81.3	18.8	37.2	62.8
#50	0.30	76.1	17.6	54.8	45.2
#100	0.15	48.9	11.3	66.2	33.8
#200	0.08	26.9	6.2	72.4	27.6

Krazan Testing Laboratory

Grain Size Analysis



Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 25'

Krazan Testing Laboratory

Sieve Analysis

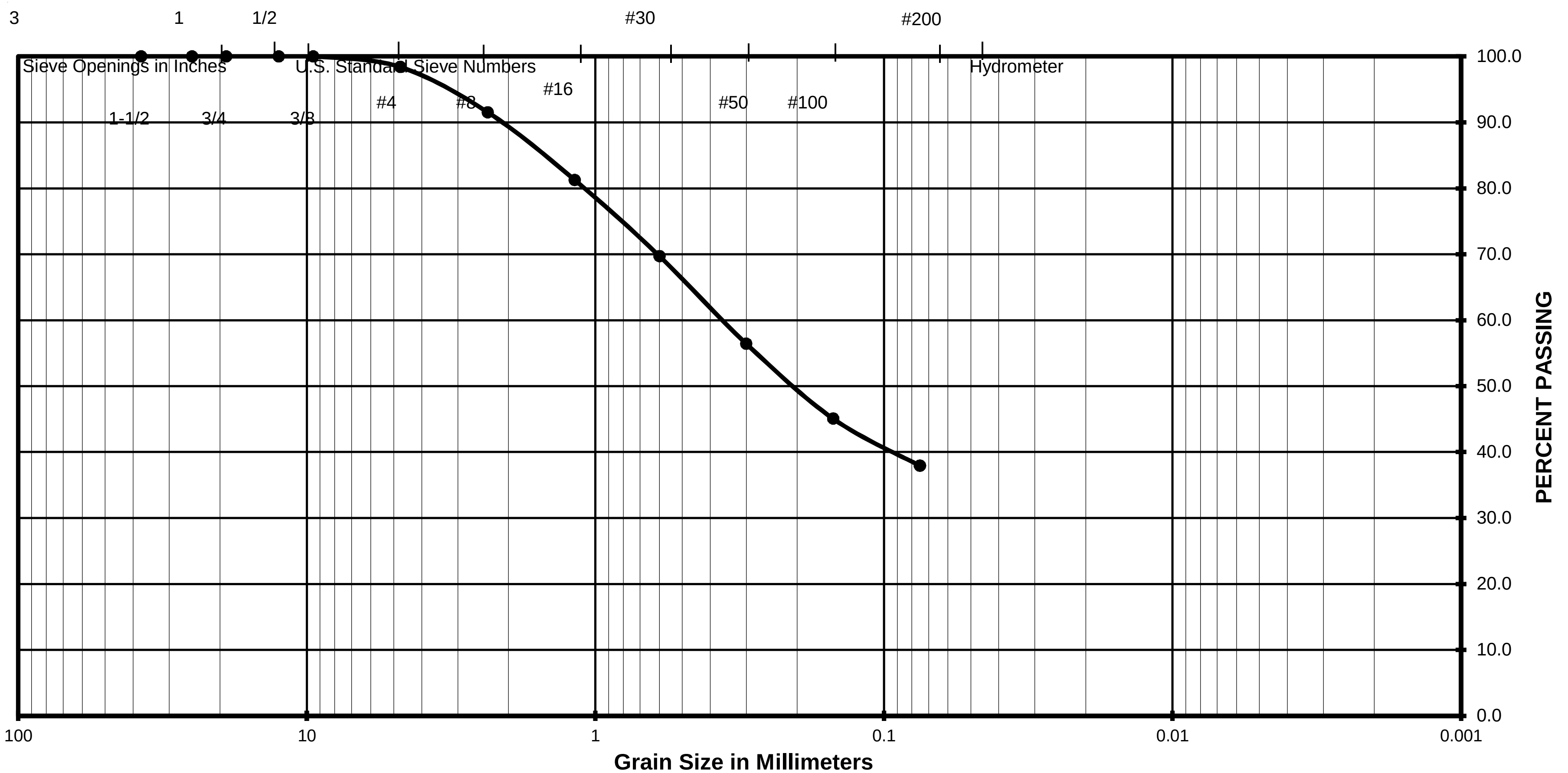
Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 30'
Soil Classification : SM

Wet Weight	:	450.70
Dry Weight	:	450.70
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	7.2	1.6	1.6	98.4
#8	2.36	31.0	6.9	8.5	91.5
#16	1.18	46.2	10.3	18.7	81.3
#30	0.60	52.1	11.6	30.3	69.7
#50	0.30	59.9	13.3	43.6	56.4
#100	0.15	51.2	11.4	54.9	45.1
#200	0.08	32.2	7.1	62.1	37.9

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 30'

Krazan Testing Laboratory

Sieve Analysis

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 35'
Soil Classification : SM

Wet Weight	:	442.80
Dry Weight	:	442.80
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	3.3	0.7	0.7	99.3
#8	2.36	20.2	4.6	5.3	94.7
#16	1.18	39.2	8.9	14.2	85.8
#30	0.60	41.0	9.3	23.4	76.6
#50	0.30	48.3	10.9	34.3	65.7
#100	0.15	49.0	11.1	45.4	54.6
#200	0.08	40.4	9.1	54.5	45.5

Krazan Testing Laboratory

Grain Size Analysis

Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 35'

Krazan Testing Laboratory

Sieve Analysis

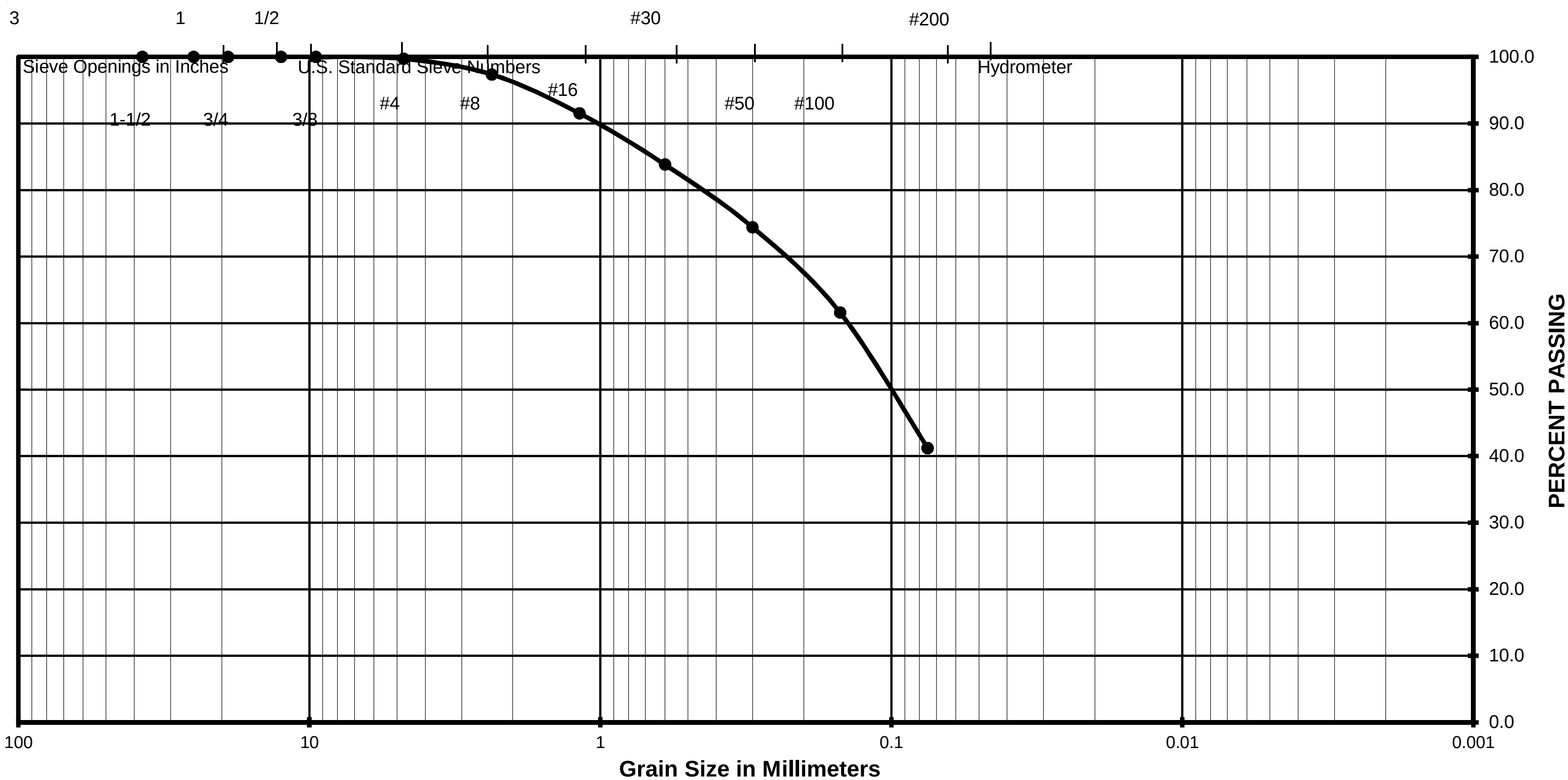
Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-1 @ 40'
Soil Classification : SM

Wet Weight	:	439.90
Dry Weight	:	439.90
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	1.2	0.3	0.3	99.7
#8	2.36	10.4	2.4	2.6	97.4
#16	1.18	25.7	5.8	8.5	91.5
#30	0.60	33.9	7.7	16.2	83.8
#50	0.30	41.4	9.4	25.6	74.4
#100	0.15	56.4	12.8	38.4	61.6
#200	0.08	89.6	20.4	58.8	41.2

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 40'

Krazan Testing Laboratory

Sieve Analysis

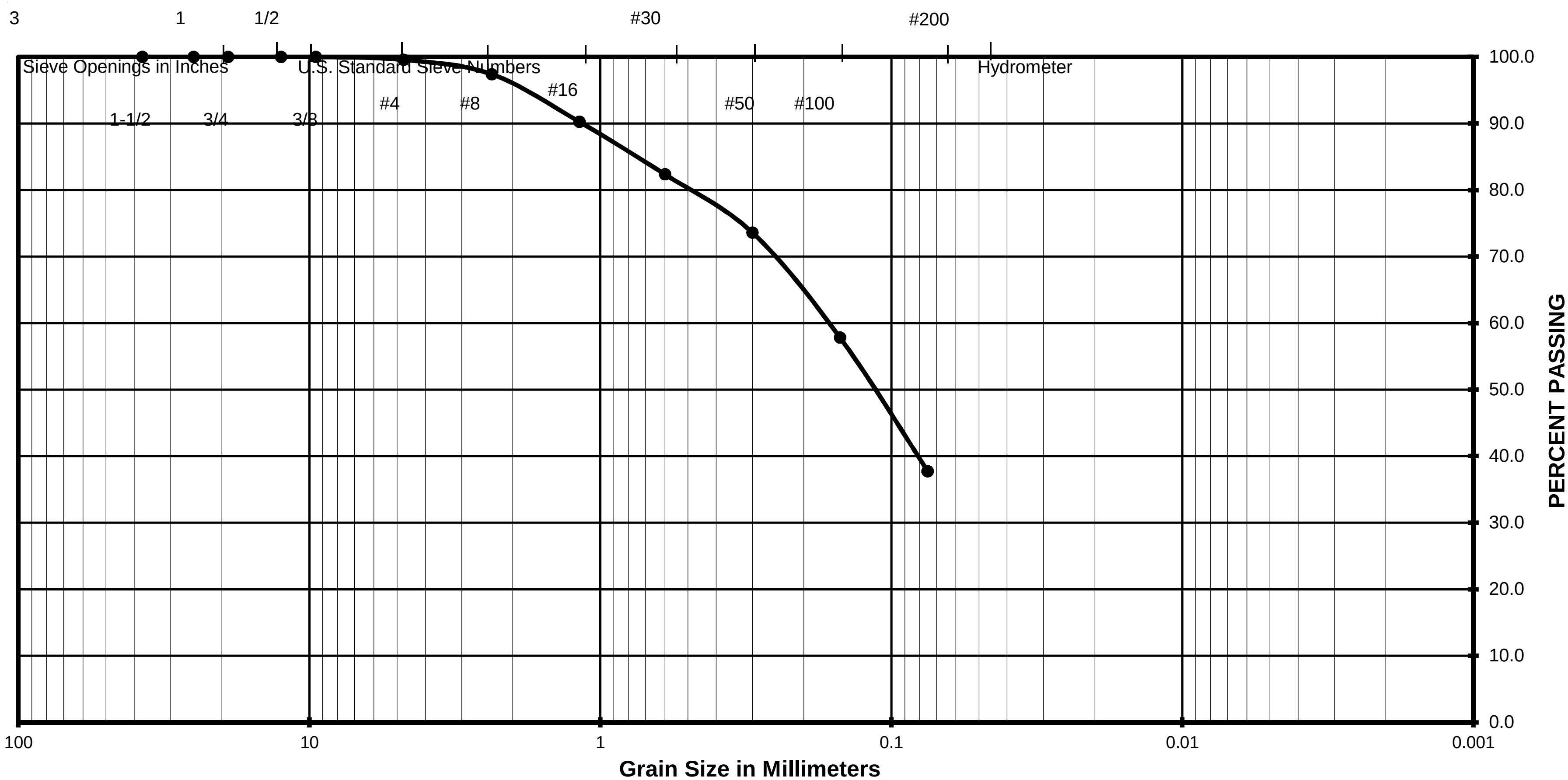
Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/25/2022
Sample Location	: B-1 @ 45'
Soil Classification	: SM

Wet Weight	:	371.70
Dry Weight	:	371.70
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	1.6	0.4	0.4	99.6
#8	2.36	8.1	2.2	2.6	97.4
#16	1.18	26.6	7.2	9.8	90.2
#30	0.60	29.3	7.9	17.6	82.4
#50	0.30	32.6	8.8	26.4	73.6
#100	0.15	58.6	15.8	42.2	57.8
#200	0.08	74.6	20.1	62.3	37.7

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 45'

Krazan Testing Laboratory

Sieve Analysis

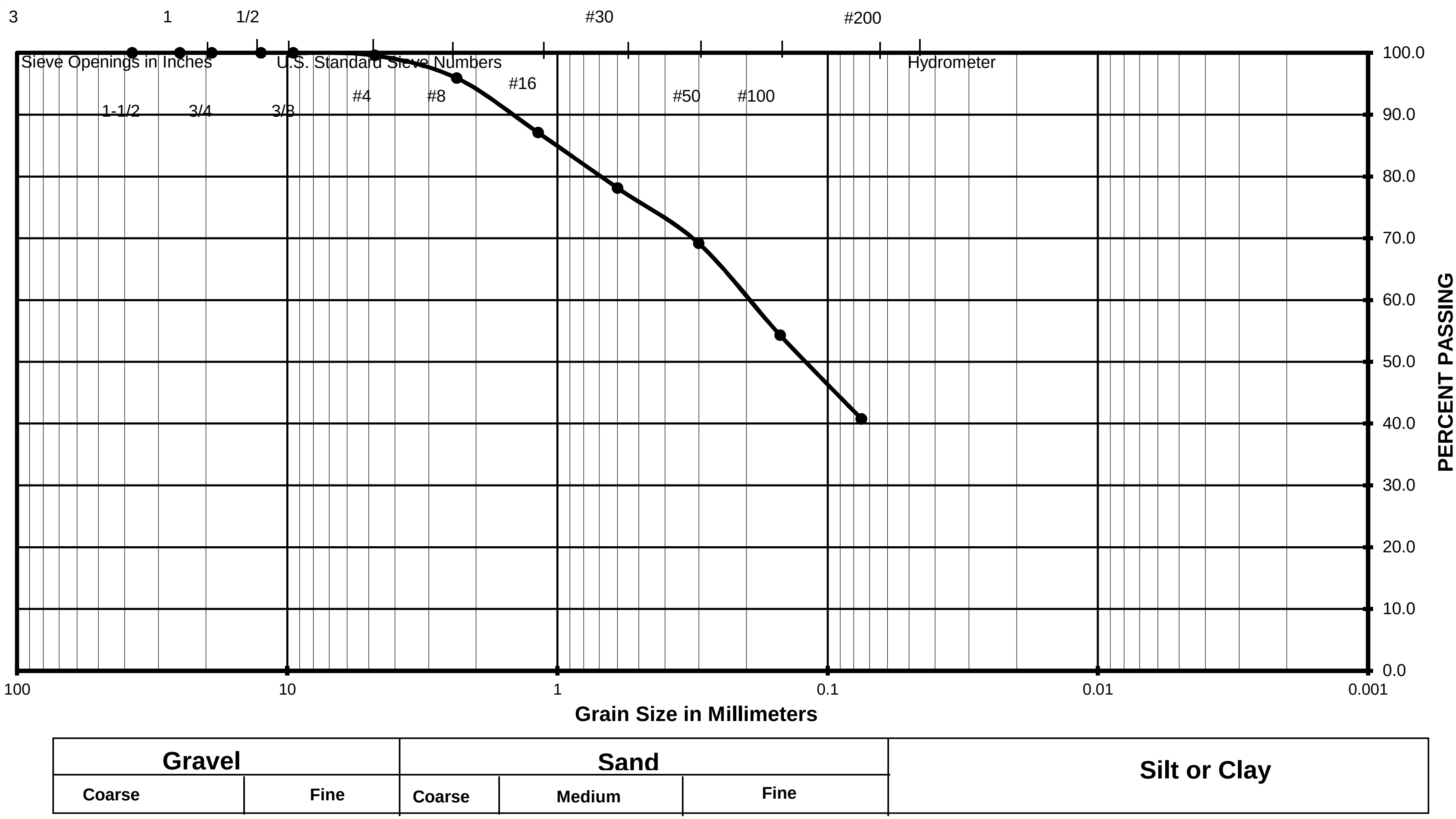
Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/25/2022
Sample Location	: B-1 @ 50'
Soil Classification	: SM

Wet Weight	:	467.80
Dry Weight	:	467.80
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	2.0	0.4	0.4	99.6
#8	2.36	17.1	3.7	4.1	95.9
#16	1.18	41.3	8.8	12.9	87.1
#30	0.60	41.9	9.0	21.9	78.1
#50	0.30	42.0	9.0	30.8	69.2
#100	0.15	69.4	14.8	45.7	54.3
#200	0.08	63.4	13.6	59.2	40.8

Krazan Testing Laboratory

Grain Size Analysis



(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 50'

Krazan Testing Laboratory

Sieve Analysis

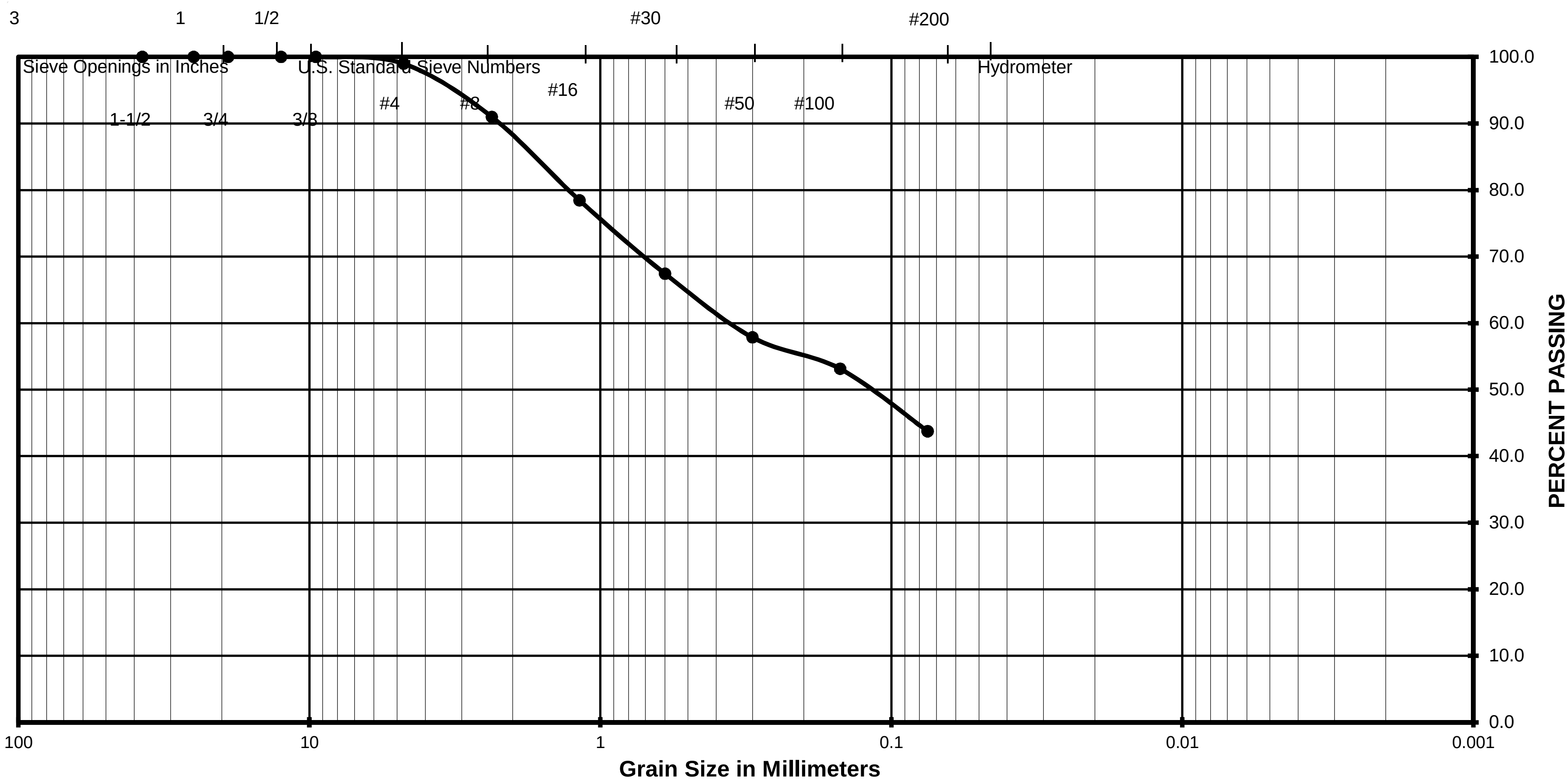
Project Number	: 11222039
Project Name	: South of Iris GEI Moreno Valley
Date	: 4/24/2022
Sample Location	: B-1 @ 50'
Soil Classification	: SM

Wet Weight	:	481.10
Dry Weight	:	481.10
Moisture Content	:	0%

Sieves Size/Number	Sieve Size, mm	Retained Weight	Retained. %	Cum % Retained	Cum. % Passing.
1-1/2"	37.50				100.0
1"	25.00				100.0
3/4"	19.00				100.0
1/2"	12.50				100.0
3/8"	9.50				100.0
#4	4.75	4.9	1.0	1.0	99.0
#8	2.36	38.5	8.0	9.0	91.0
#16	1.18	60.3	12.5	21.6	78.4
#30	0.60	53.0	11.0	32.6	67.4
#50	0.30	46.1	9.6	42.2	57.8
#100	0.15	22.7	4.7	46.9	53.1
#200	0.08	45.2	9.4	56.3	43.7

Krazan Testing Laboratory

Grain Size Analysis



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

(Unified Soils Classification)

Project Name	South of Iris GEI Moreno Valley
Project Number	11222039
Soil Classification	SM
Sample Number	B-1 @ 50'

Krazan Testing Laboratory

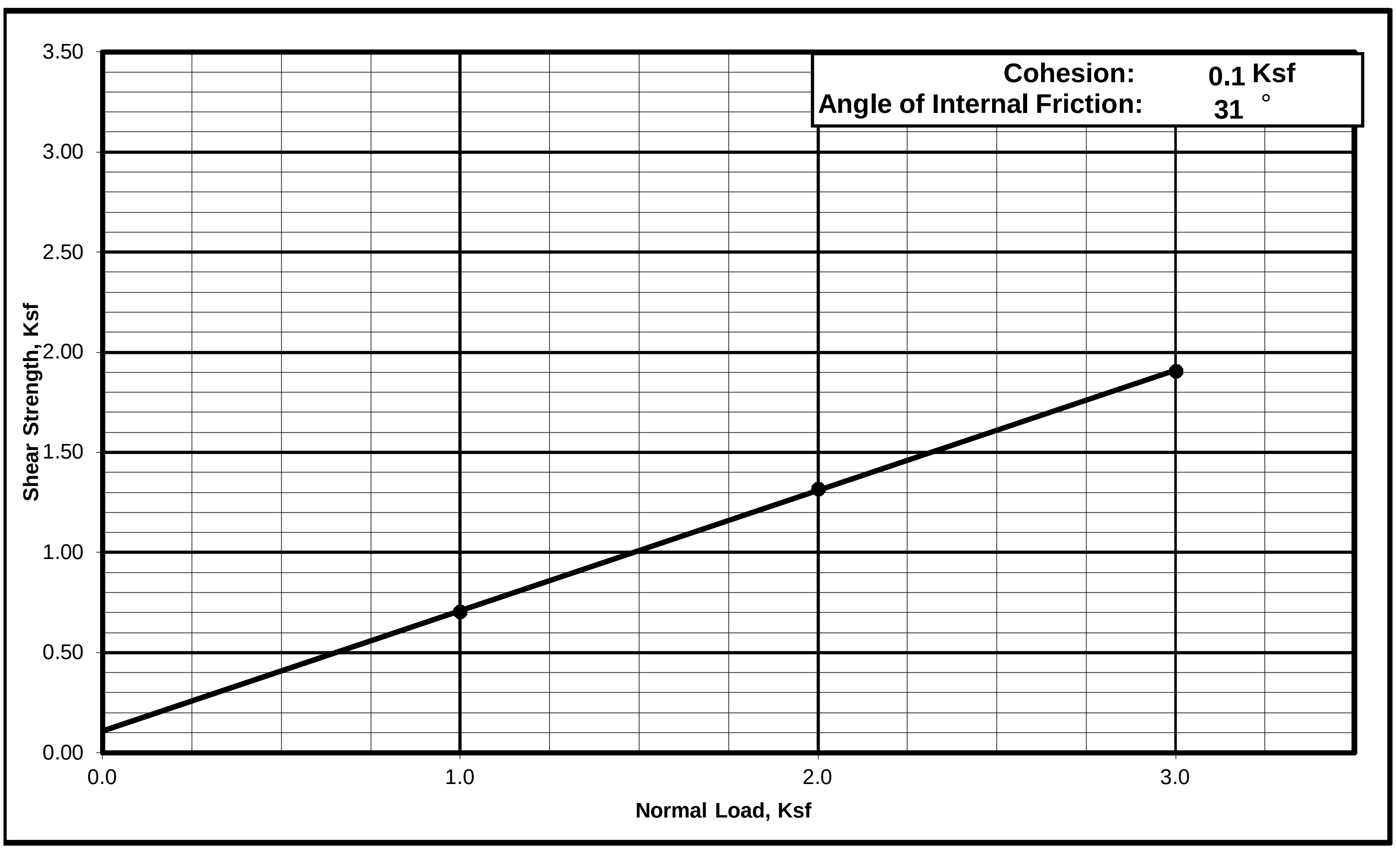
Direct Shear of Consolidated, Drained Soils
ASTM D - 3080 / AASHTO T - 236

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-2 @ 5'
Soil Classification : SM
Sample Surface Area : 0.0289

STRESS DISPLACEMENT DATA

Lat. Disp. (in.)	Normal Load 1000	Normal Load 2000	Normal Load 3000
0	0	0	0
0.030	8	15	29
0.060	15	29	46
0.090	20	45	55
0.120	26	51	72
0.150	35	58	89
0.180	43	64	102
0.210	49	69	119
0.240	53	78	130
0.270	57	90	141
0.300	60	101	155
0.330	61	117	171
0.360	61	115	165

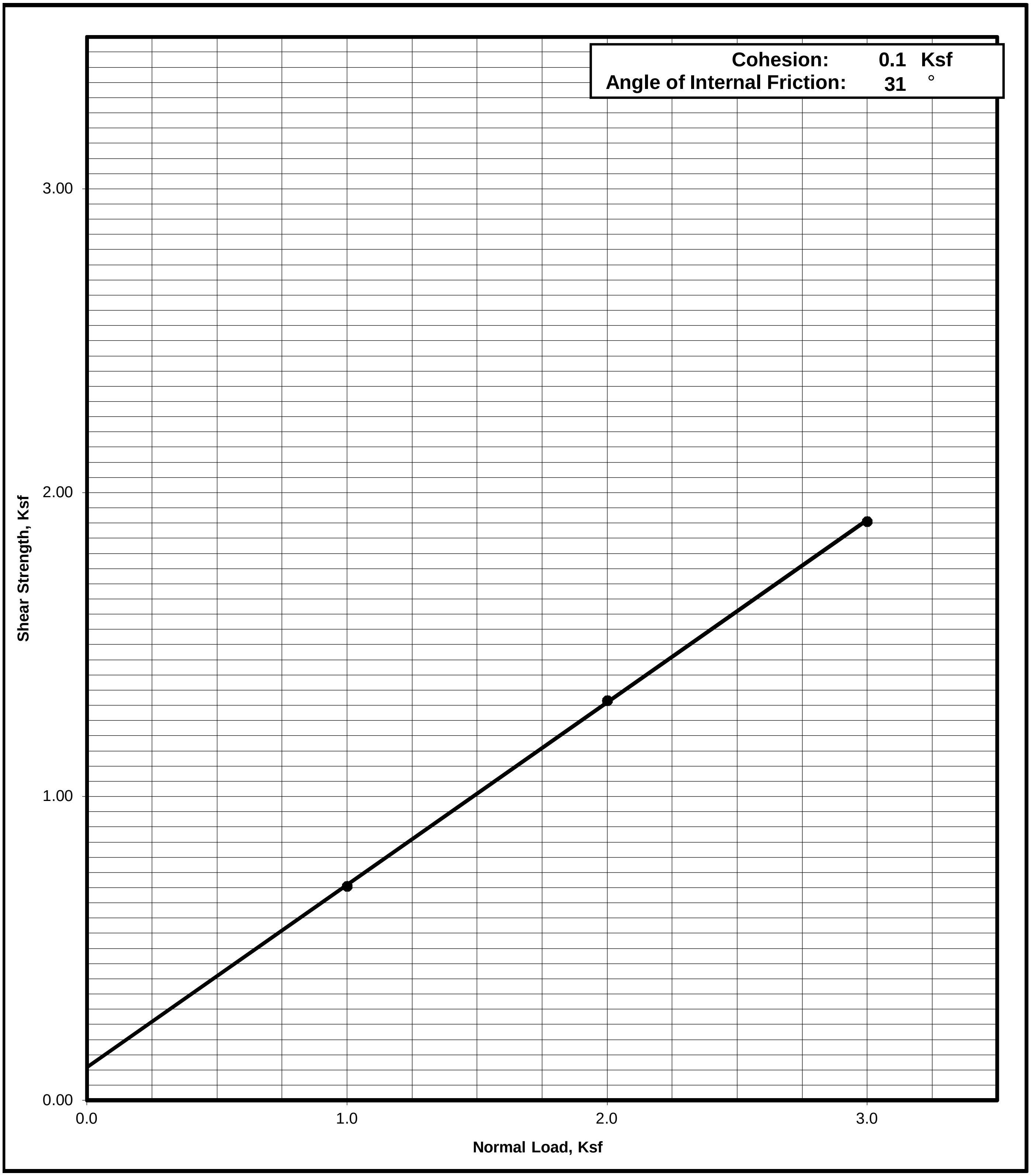
Normal Load psf	Shear force lbs	Shear Stress psf
1000	20.4	705
2000	38.0	1316
3000	55.1	1906



Krazan Testing Laboratory

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

Project Number	Boring No. & Depth	Soil Type	Date
11222039	B-2 @ 5'	SM	4/25/2022



Krazan Testing Laboratory

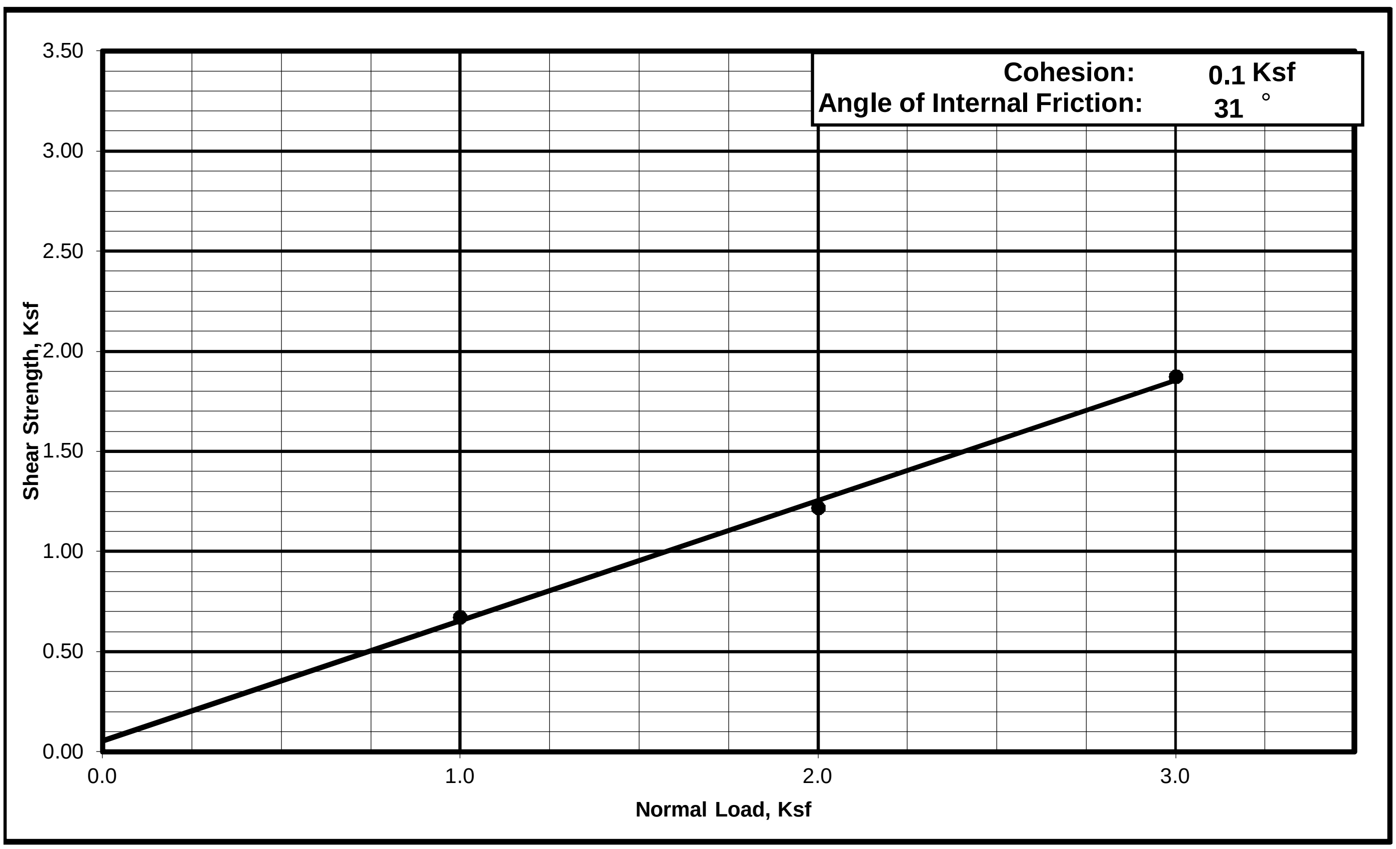
Direct Shear of Consolidated, Drained Soils
ASTM D - 3080 / AASHTO T - 236

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-19 @ 5'
Soil Classification : SM
Sample Surface Area : 0.0289

STRESS DISPLACEMENT DATA

Lat. Disp. (in.)	Normal Load		
	1000	2000	3000
0	0	0	0
0.030	10	15	25
0.060	12	29	42
0.090	18	45	50
0.120	24	51	68
0.150	32	58	85
0.180	40	64	98
0.210	45	68	115
0.240	48	72	125
0.270	54	80	132
0.300	58	90	145
0.330	58	105	155
0.360	58	108	168

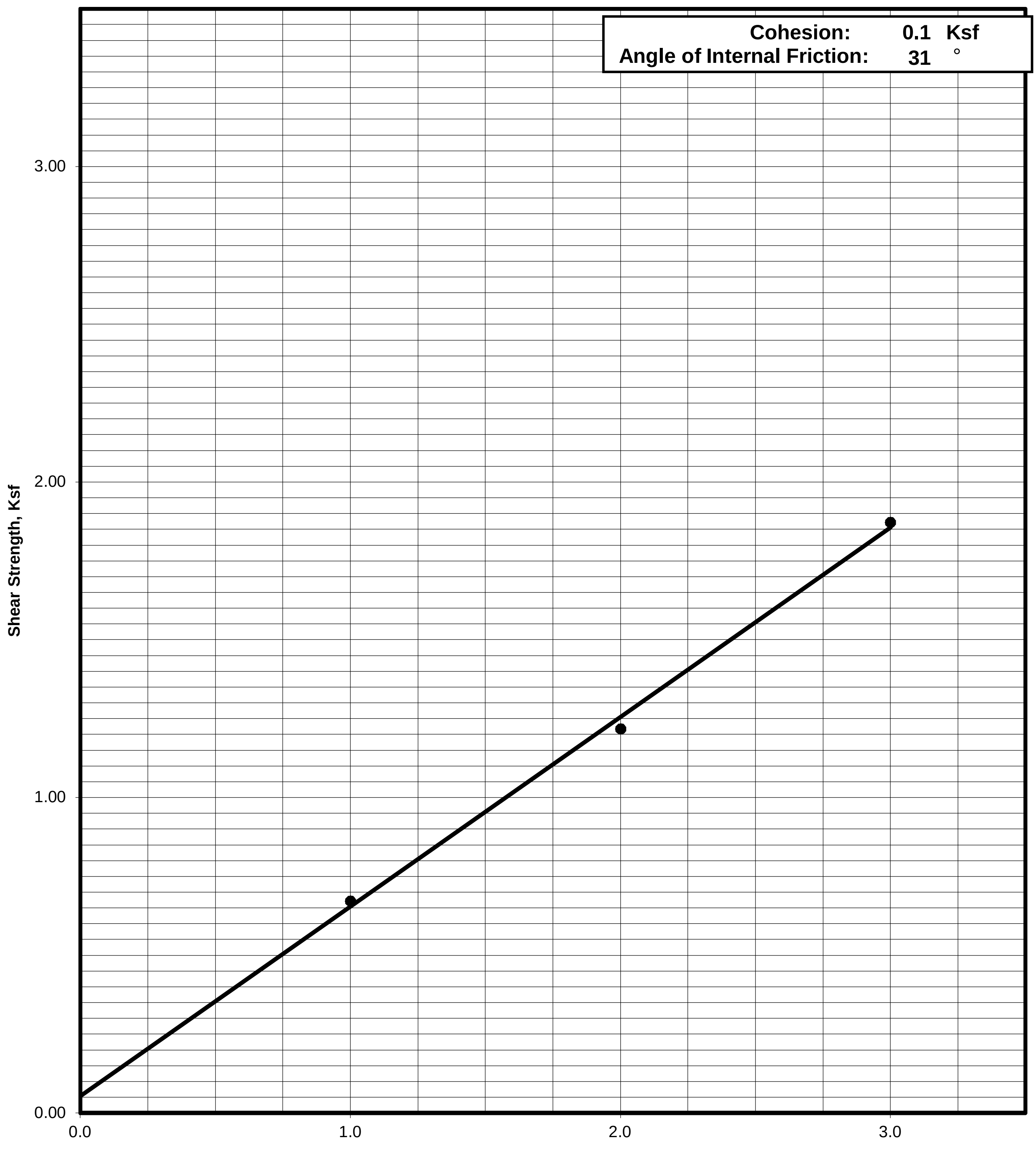
Normal Load psf	Shear force lbs	Shear Stress psf
1000	19.4	672
2000	35.2	1218
3000	54.1	1873



Krazan Testing Laboratory

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

Project Number	Boring No. & Depth	Soil Type	Date
11222039	B-19 @ 5'	SM	4/25/2022

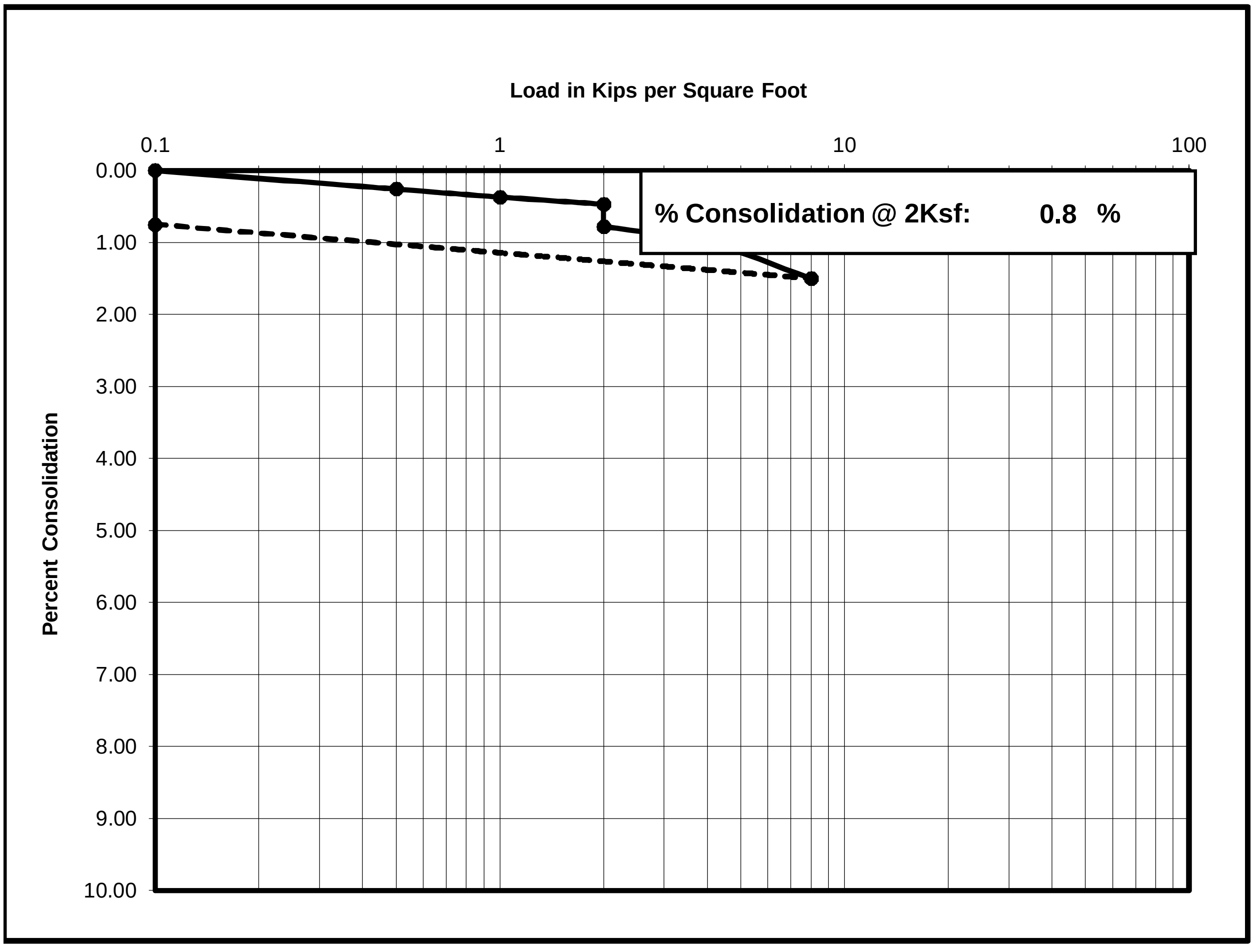


Krazan Testing Laboratory

One Dimensional Consolidation Properties of Soil
ASTM D - 2435 / AASHTO T - 216

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-3 @ 5'
Soil Classification : SM
Sample Condition : Undisturbed

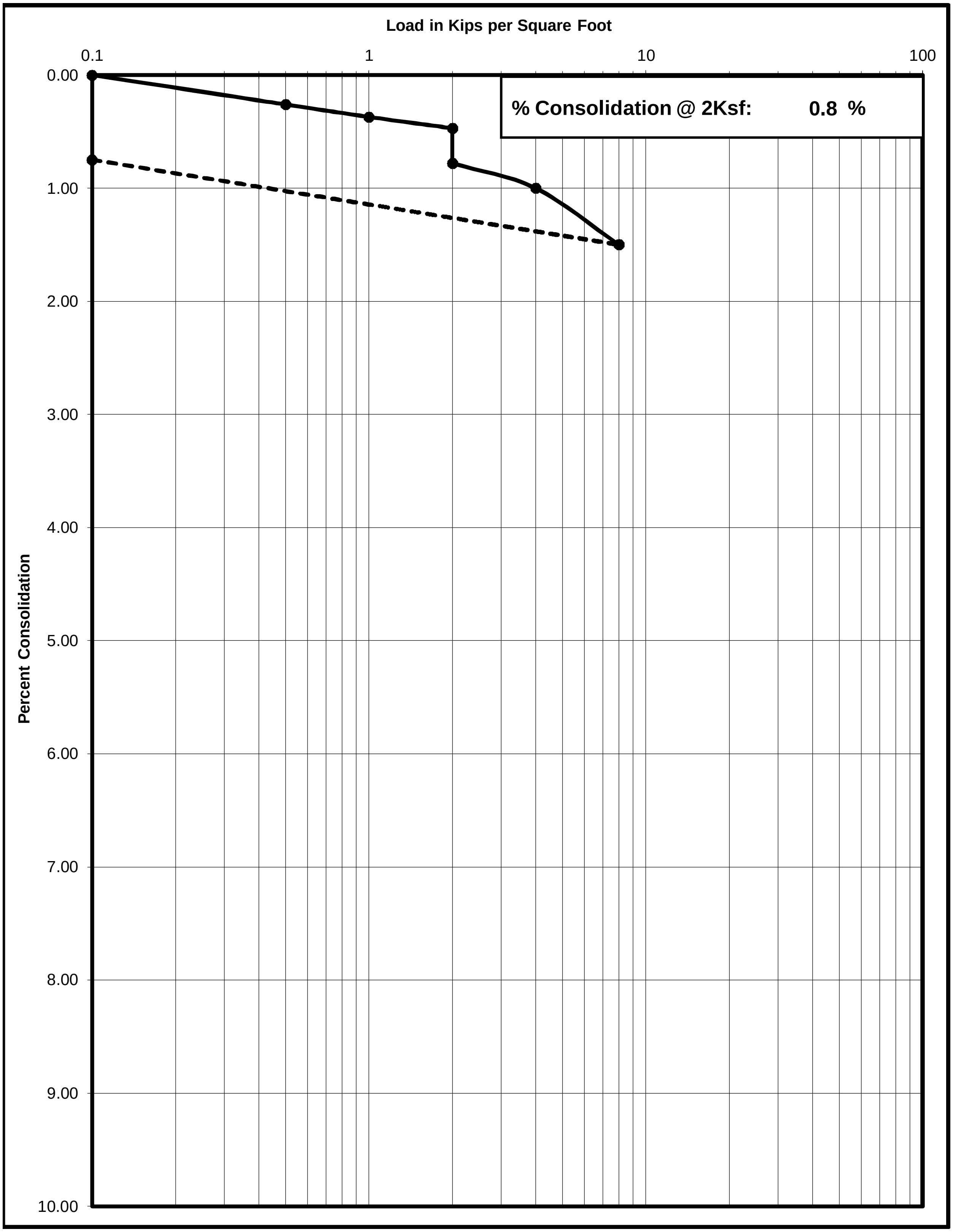
LOAD (ksf)	Reading	% Consolidation
0.1	0.0014	--
0.5	0.0026	0.26
1	0.0037	0.37
2	0.0047	0.47
Satur.	0.0078	0.78
4	0.01	1.00
8	0.015	1.50
0.1	0.0075	0.75



Krazan Testing Laboratory

Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
11222039	B-3 @ 5'	4/25/2022	SM



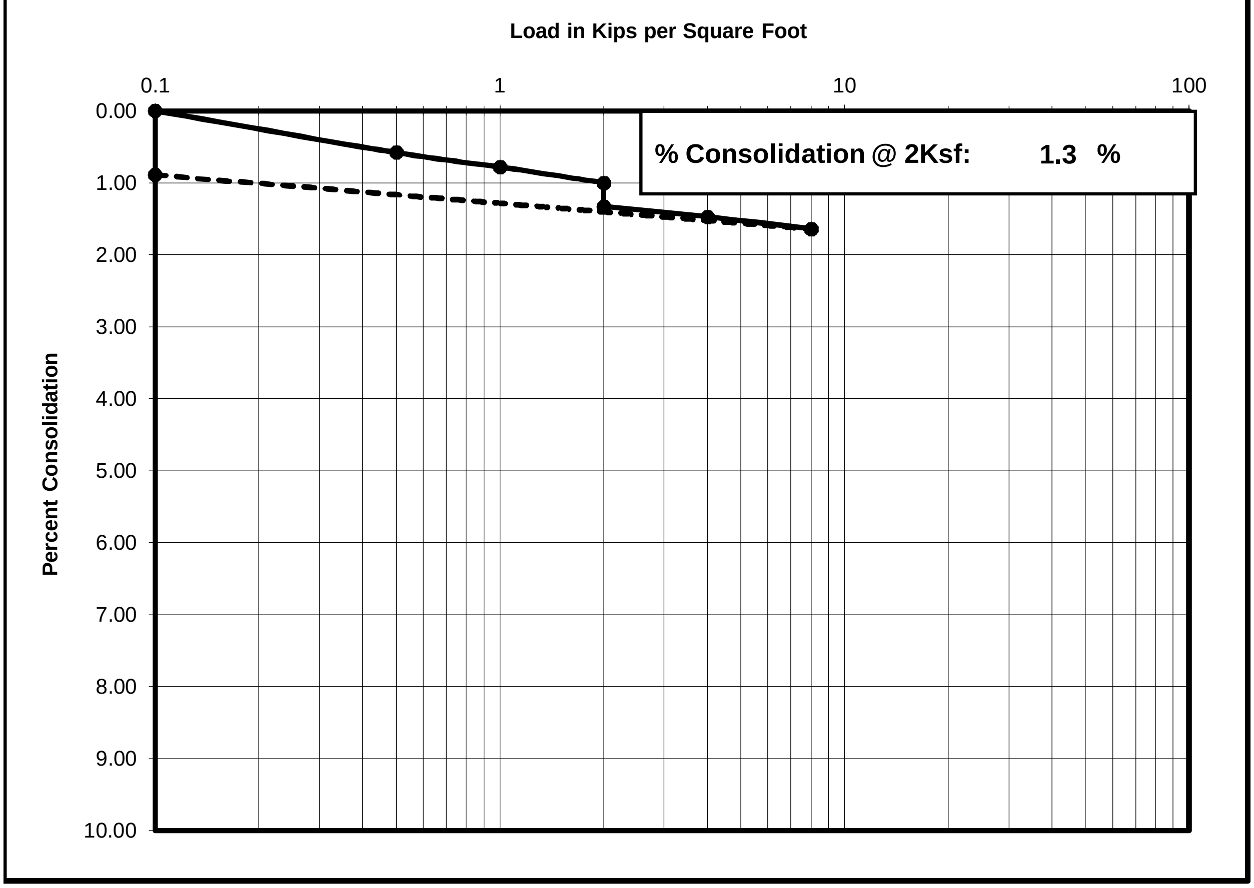
Krazan Testing Laboratory

One Dimensional Consolidation Properties of Soil

ASTM D - 2435 / AASHTO T - 216

Project Number : 11222039
Project Name : South of Iris GEI Moreno Valley
Date : 4/25/2022
Sample Location : B-8 @ 5'
Soil Classification : SM
Sample Condition : Undisturbed

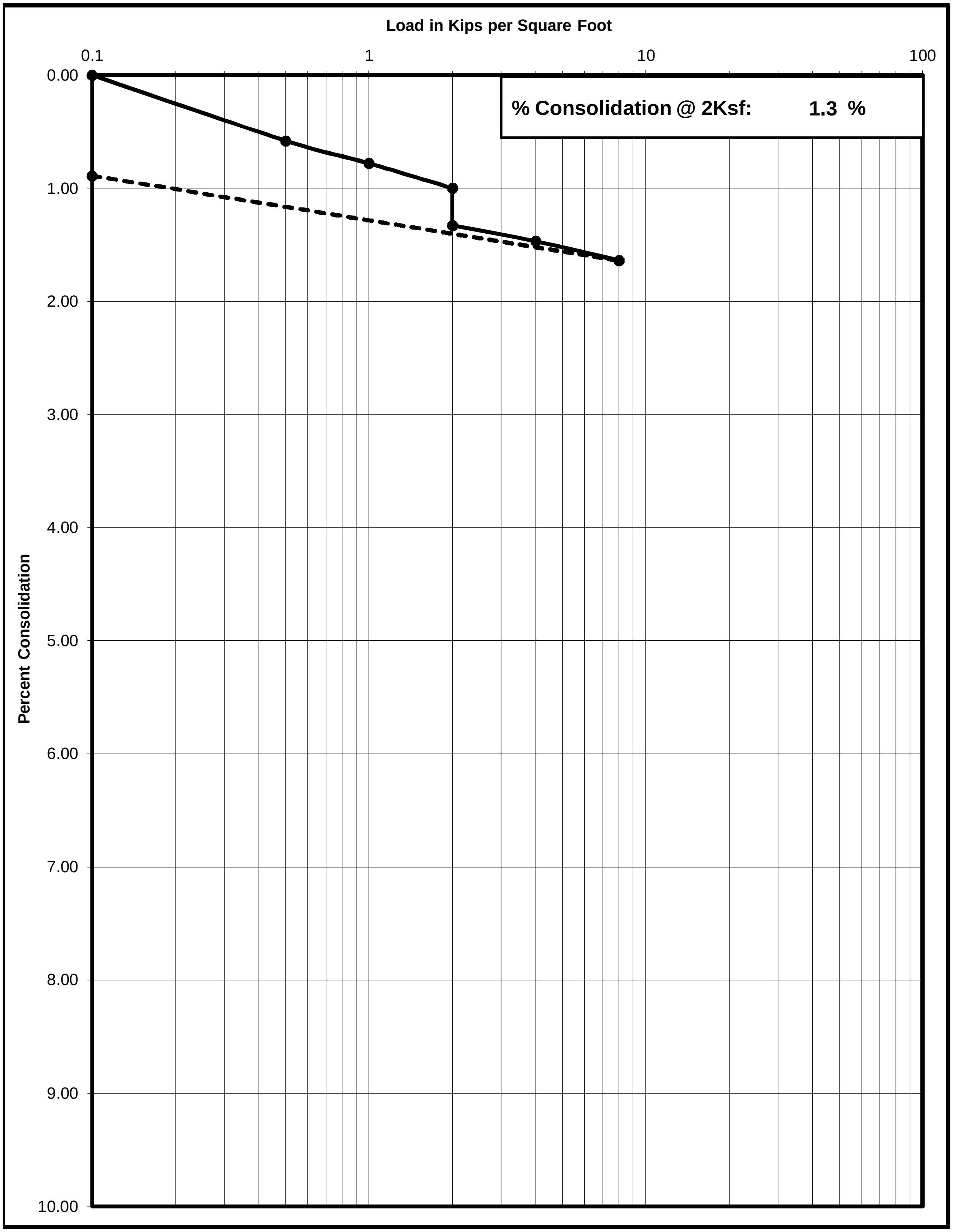
LOAD (ksf)	Reading	% Consolidation
0.1	0.0035	--
0.5	0.0058	0.58
1	0.0078	0.78
2	0.01	1.00
Satur.	0.0133	1.33
4	0.0147	1.47
8	0.0164	1.64
0.1	0.0089	0.89



Krazan Testing Laboratory

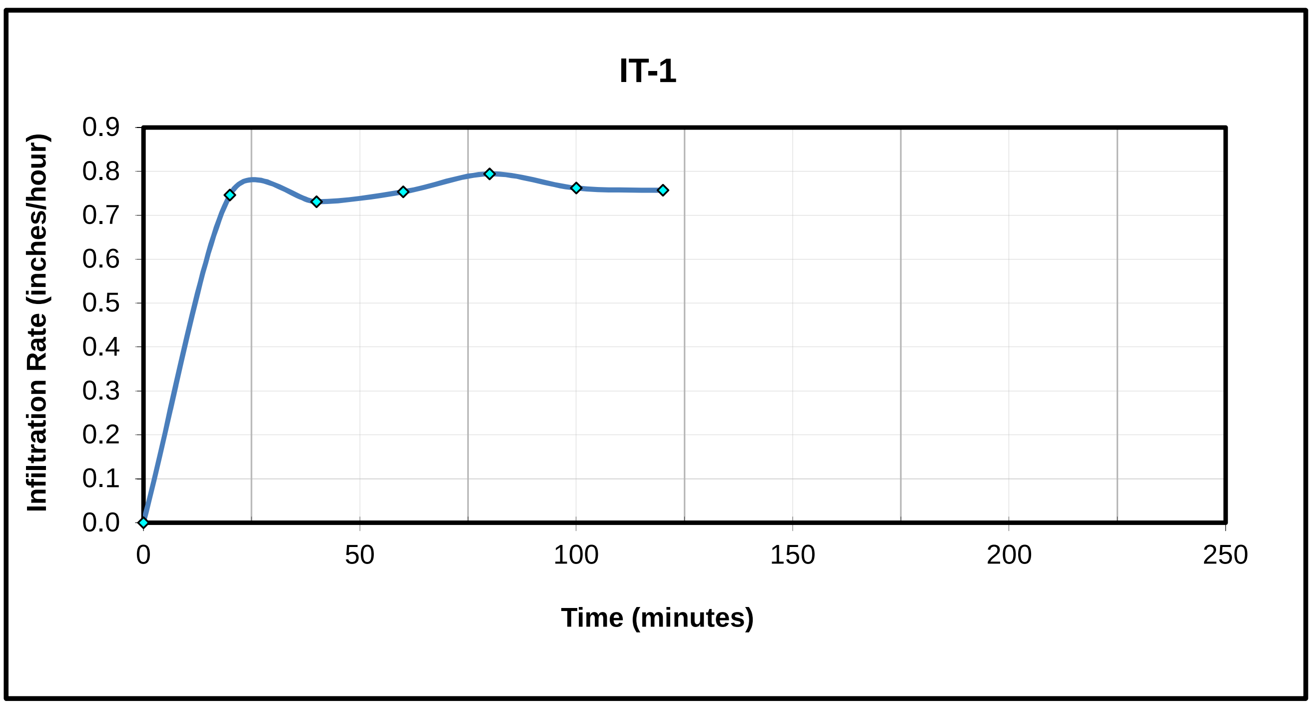
Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
11222039	B-8 @ 5'	4/25/2022	SM



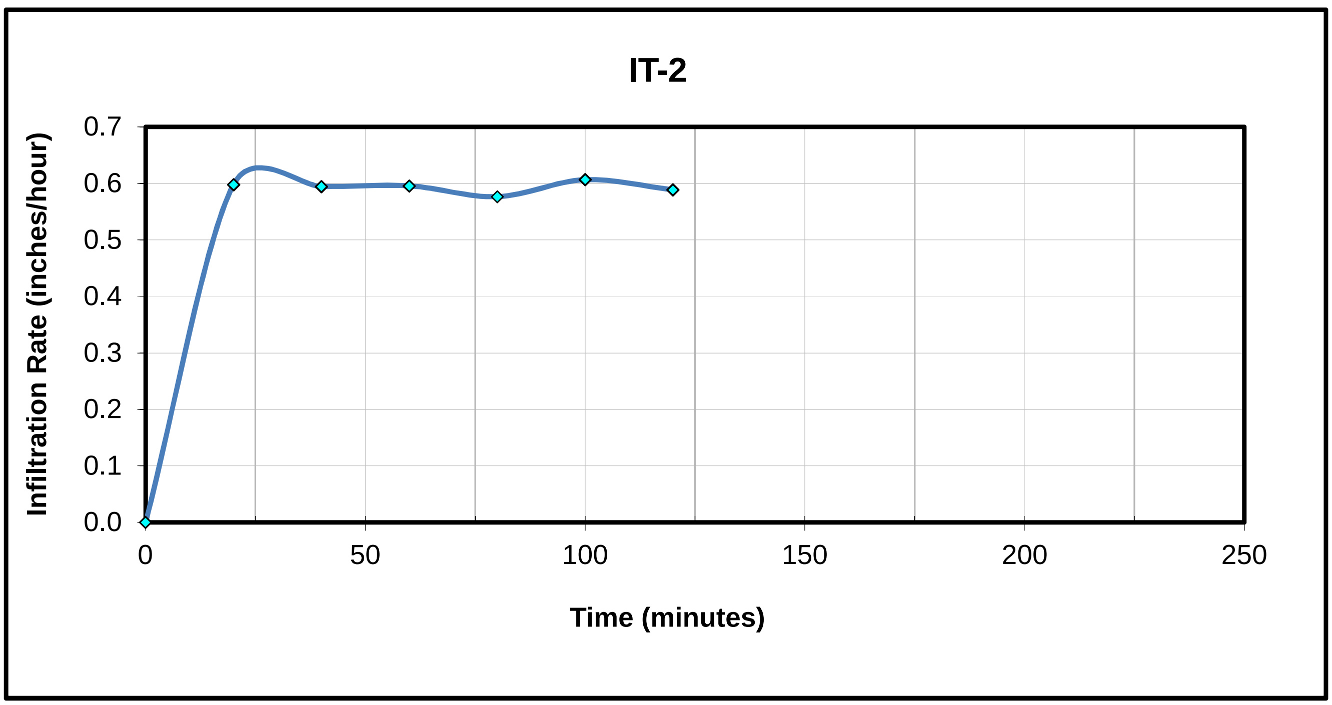
Krazan Testing Laboratory

RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11222039**				**Date**	**3/18/2022**
Project Name	South of Iris GEI Moreno Valley					
Project Address	Southeast Quadrant Iris Avenue and Indian Street, Moreno Valley, CA					
Test No:	IT-1	**Total Depth (in.)**		120	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SM		
Reading	**Elasped Time(min.)**	**Incremental Time (min.)**	**Initial Depth To Water(in.)**	**Final Depth To Water(in.)**	**Incremental Fall of Water(in.)**	**Incremental Infiltration Rate (in/hr)**
Start	0	0.00		11.00	--	--
1	20.00	20.00	11.00	24.00	13.00	0.75
2	40.00	20.00	24.00	35.25	11.25	0.73
3	60.00	20.00	35.25	45.50	10.25	0.75
4	80.00	20.00	45.50	55.00	9.50	0.79
5	100.00	20.00	55.00	63.00	8.00	0.76
6	120.00	20.00	63.00	70.00	7.00	0.76
	Infiltration Rate in Inches per Hour					**0.73**



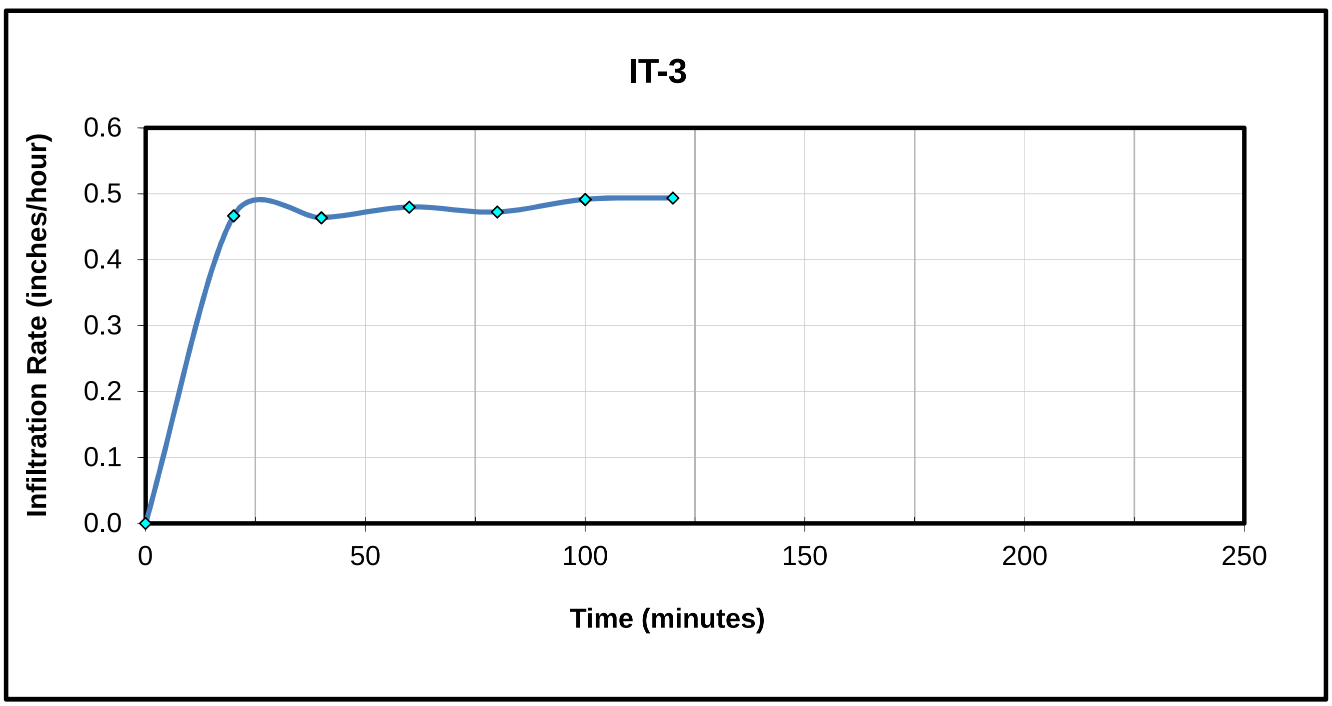
RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11222039**				**Date**	**3/18/2022**
Project Name	South of Iris GEI Moreno Valley					
Project Address	Southeast Quadrant Iris Avenue and Indian Street, Moreno Valley, CA					
Test No:	IT-2	**Total Depth (in.)**		180	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		24.00	--	--
1	20.00	20.00	24.00	39.00	15.00	0.60
2	40.00	20.00	39.00	52.50	13.50	0.59
3	60.00	20.00	52.50	64.75	12.25	0.60
4	80.00	20.00	64.75	75.50	10.75	0.58
5	100.00	20.00	75.50	85.75	10.25	0.61
6	120.00	20.00	85.75	94.75	9.00	0.59
	Infiltration Rate in Inches per Hour					**0.58**



RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE						
Project #	**11222039**				**Date**	**3/18/2022**
Project Name	South of Iris GEI Moreno Valley					
Project Address	Southeast Quadrant Iris Avenue and Indian Street, Moreno Valley, CA					
Test No:	IT-3	**Total Depth (in.)**		180	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SM		

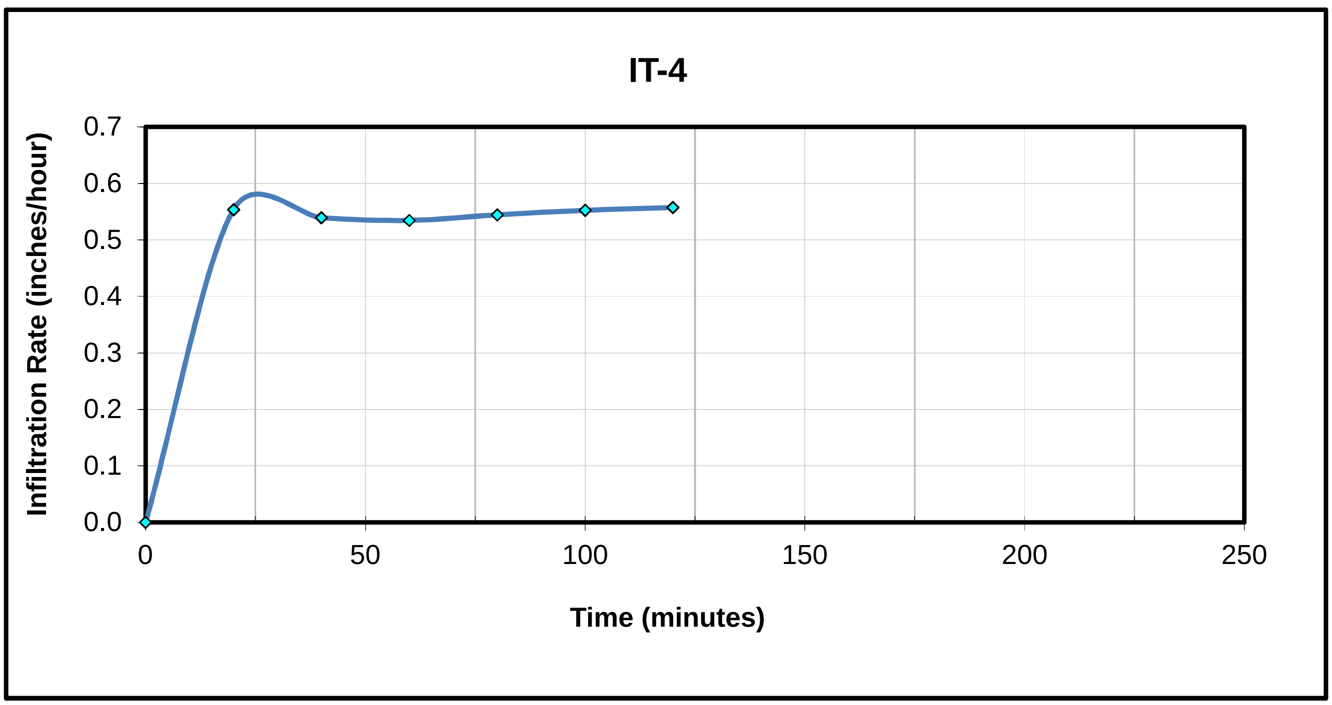
Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		15.00	--	--
1	20.00	20.00	15.00	27.50	12.50	0.47
2	40.00	20.00	27.50	39.00	11.50	0.46
3	60.00	20.00	39.00	50.00	11.00	0.48
4	80.00	20.00	50.00	60.00	10.00	0.47
5	100.00	20.00	55.00	65.00	10.00	0.49
6	120.00	20.00	65.00	74.25	9.25	0.49
	Infiltration Rate in Inches per Hour					**0.46**



RESULTS OF INFILTRATION TESTS - REVERSE BOREHOLE

Project #	**11222039**				**Date**	**3/18/2022**
Project Name	South of Iris GEI Moreno Valley					
Project Address	Southeast Quadrant Iris Avenue and Indian Street, Moreno Valley, CA					
Test No:	IT-4	**Total Depth (in.)**		120	**Test Size (in)**	8
Depth To Water	>50'	**Soil Classification**		SM		

Reading	Elasped Time(min.)	Incremental Time (min.)	Initial Depth To Water(in.)	Final Depth To Water(in.)	Incremental Fall of Water(in.)	Incremental Infiltration Rate (in/hr)
Start	0	0.00		20.00	--	--
1	20.00	20.00	20.00	29.00	9.00	0.55
2	40.00	20.00	29.00	37.00	8.00	0.54
3	60.00	20.00	37.00	44.25	7.25	0.53
4	80.00	20.00	44.25	51.00	6.75	0.54
5	100.00	20.00	51.00	57.25	6.25	0.55
6	120.00	20.00	57.25	63.00	5.75	0.56
	Infiltration Rate in Inches per Hour					**0.53**



ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949)336-6544

DATE: 4/20/2022

Krazan & Associates, Inc.
1100 Olympic Drive, Ste. 103
Corona, CA 92888

P.O. NO: Verbal

LAB NO: C-5877

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No: 11222039
Project Name: Moreno Valley
Sample ID: B9 @ 0-5'

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
7.6	5,000	181	52

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

Krazan & Associates, Inc.
1100 Olympic Drive, Ste. 103
Corona, CA 92888

DATE: 4/20/2022

P.O. NO.: Verbal

LAB NO.: C-5882

SPECIFICATION: CA 301

MATERIAL: Brown, Silty Sand w. F. Gravel

Project No.: 11222039
Project: Moreno Valley
Sample ID: R1 @ 0-3'

ANALYTICAL REPORT
"R" VALUE

BY EXUDATION	BY EXPANSION
65	N/A

RESPECTFULLY SUBMITTED

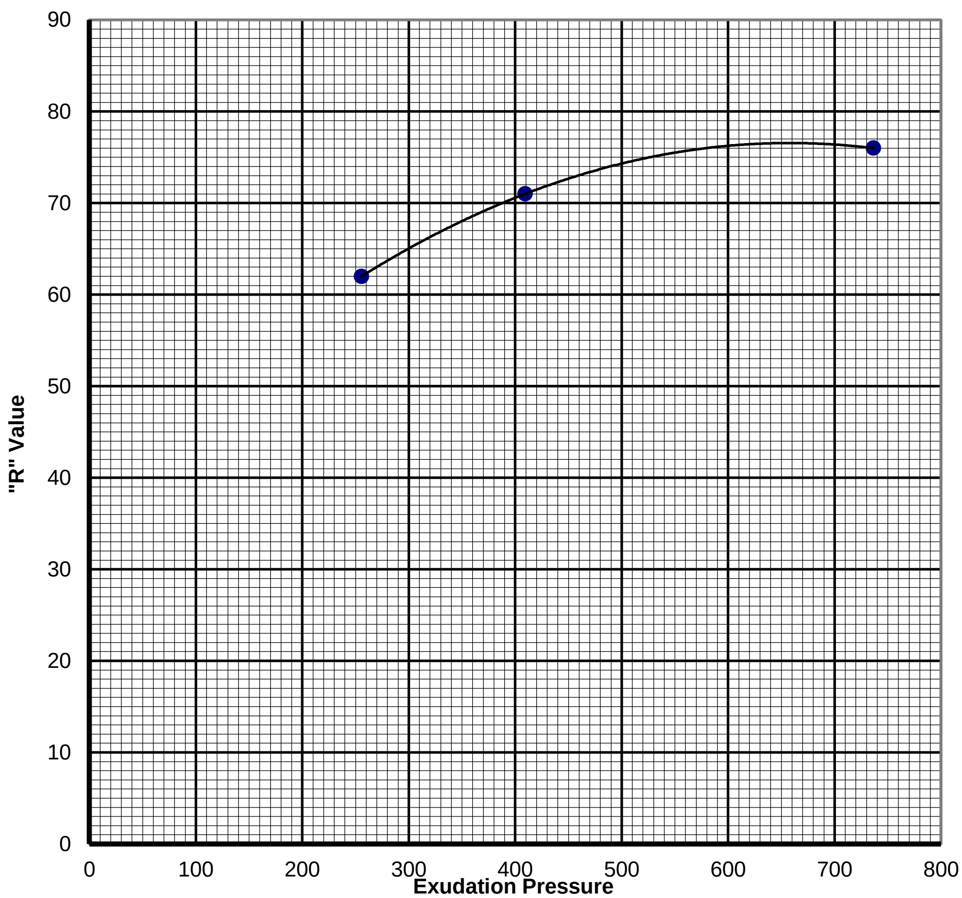
WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: Krazan & Associates, Inc. **ATL No.:** C 5882 **Date:** 4/20/2022
Client Reference No.: 11222039
Sample: R1 @ 0-5' **Soil Type:** Brown, Silty Sand w. F Gravel

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	350	350	350	
Initial Moisture Content	%	2.1	2.1	2.1	
Moisture at Compaction	%	8.9	8.4	8.0	
Briquette Height	in.	2.52	2.53	2.51	
Dry Density	pcf	127.1	129.6	130.3	
EXUDATION PRESSURE	psi	256	409	736	
EXPANSION PRESSURE	psf	0	26	52	
Ph at 1000 pounds	psi	26	20	17	
Ph at 2000 pounds	psi	43	34	28	
Displacement	turns	4.21	3.81	3.68	
"R" Value		62	71	76	
CORRECTED "R" VALUE		62	71	76	

Final "R" Value	
BY EXUDATION: @ 300 psi	**65**
BY EXPANSION: TI = 5.0	**N/A**



General Earthwork Specifications

Appendix B

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 95 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 95 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 95 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 2018 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 notes 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 95 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 compacted to a minimum relative compaction of 95 percent. 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.

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 the 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 degrees F. The surfacing shall be rolled with a combination 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.
