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SECTION H

GEOTECHNICAL REPORT

KESSLER PARK
DREAM FIELD PROJECT

FOR

BLOOMINGTON RECREATION & PARK DISTRICT
BLOOMINGTON, CALIFORNIA

PROJECT NO.: 30.30.0154

LIMITED GEOTECHNICAL INVESTIGATION

KESSLER PARK DREAM FIELD
18401 JURUPA AVENUE
UNINCORPORATED BLOOMINGTON, SAN BERNARDINO COUNTY, CALIFORNIA

GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

PSOMAS
RIVERSIDE, CALIFORNIA

PROJECT NO. W1613-99-01

JUNE 29, 2023

Project No. W1613-99-01
June 29, 2023

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Subject: LIMITED GEOTECHNICAL INVESTIGATION
KESSLER PARK DREAM FIELD
18401 JURUPA AVENUE, UNINCORPORATED BLOOMINGTON
SAN BERNARDINO COUNTY, CALIFORNIA

Dear Ladies and Gentlemen:

In accordance with your authorization of our proposal dated February 16, 2023, we have performed a limited geotechnical investigation for the proposed Kessler Park Dream Field located at 18401 Jurupa Avenue in Unincorporated Bloomington in San Bernardino County, California. The accompanying report presents the findings of our study, and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the improvements can be constructed as proposed, provided the recommendations of this report are followed and implemented during design and construction.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.

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LIMITED GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a limited geotechnical investigation for the proposed Kessler Park Dream Field located at 18401 Jurupa Avenue in Unincorporated Bloomington in San Bernardino County, California (see Vicinity Map, Figure 1). The purpose of the investigation was to evaluate subsurface soil and geologic conditions underlying the site and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of the proposed design and construction.

The scope of this investigation included a site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was explored on May 8 and 9, 2023, by excavating seven 4-inch diameter borings to a maximum depth of approximately 10.5 feet below the existing ground surface utilizing hand augers and manual digging equipment. The approximate locations of the exploratory borings are depicted on the Site Plan (see Figure 2). A detailed discussion of the field investigation, including boring logs, is presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to determine pertinent physical and chemical soil properties. Appendix B presents a summary of the laboratory test results.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE AND PROJECT DESCRIPTION

The project site is located within Kessler Park located at 18401 Jurupa Avenue in Unincorporated Bloomington in San Bernardino County, California. The area of proposed improvements is known as Ballfield No. 2 and is located at the southeast portion of the park. Existing improvements include a backstop netting system and shade structure, dugouts, batting cage, bleachers, fencing and temporary moveable structures in a dog park area just south of the field outside the fencing. Surface water drainage at the site appears to be by sheet flow along the existing ground contours toward the city streets and area drains (see Site Plan, Figure 2).

Based on the information provided by the Client, it is our understanding that the proposed project will consist of demolishing the existing Ballfield No. 2 and appurtenant structures, and constructing new hardscape, ballfield fencing, dugouts, bleachers, scoreboard, and synthetic turf field with appropriate drainage.

Based on the preliminary nature of the design at this time, structural loads for the proposed improvements are not available. It is anticipated that column loads for proposed improvements will be up to 100 kips and wall loads will be up to 2 kip per linear foot.

Once the design phase and foundation loading configuration proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Any changes in the design, location or elevation of any structure, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

3. PRIOR INVESTIGATION

Converse Consultants (Converse) performed a prior investigation for the *Kessler Park – Snack Bar Corridor* project located adjacent to the subject Ballfield No. 2 site in 2022. The investigation included the excavation and logging of four (4) borings to depths between approximately 4.3 feet and 51.5 feet beneath the ground surface. The borings were performed using truck mounted hollow stem auger drilling equipment. Groundwater was not encountered in any of the borings, drilled to a maximum depth of 51.5 feet below ground surface. Laboratory testing was performed on select soil samples and laboratory testing included moisture content, dry density, grain size distribution, direct shear, consolidation, expansion index (EI), R-Value, maximum density and optimum moisture content and corrosivity testing. The results of the corrosivity testing are presented in Appendix A of this report.

The soils encountered by Converse (2022) consist of approximately 4 to 5 feet of undocumented fill underlain by alluvium. The fill is described as predominately dry brown silty sand that is dense. The underlying alluvial soils consist of silty sand and gravelly sand with silt to a depth of approximately 25 feet. Below this depth, the alluvium consists of silty clay and sandy clay, to a depth of 35 feet, and then poorly graded sand to the maximum depth explored.

We have reviewed the report by Converse Consultants (Converse, 2022), and we assume responsibility for the utilization of the exploration and laboratory data presented within the geotechnical data report prepared by Converse (2022). A copy of the report by Converse (2022) is provided in Appendix A.

Geocon West, Inc. is the Geotechnical Consultant of Record and will be providing all necessary geotechnical consultation, plan review, design recommendations, inspection, and testing services for this project.

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation and published geologic maps of the area, the site is underlain by artificial fill and Holocene age alluvium (CGS, 2010). Detailed stratigraphic profiles of the materials encountered at the site are provided on the boring logs in Appendix A.

4.1 Artificial Fill

Artificial fill was not encountered within our borings. However, based on the previous report prepared by Converse Consultants, artificial fill is expected to be found in the EXISTING? bleacher and backstop area to a depth of 5 feet (Converse, 2022). The artificial fill consists of medium dense to dense silty sand that is dry with varying amounts of gravel, up to 2.5 inch in diameter (Converse, 2022).

4.2 Older Alluvium

Pleistocene age alluvium was encountered in our borings to the maximum depth explored. The older alluvium consists of brown to reddish brown silty sand and poorly graded sand with varying amounts of fine angular gravel. The alluvium is characterized as medium dense to dense, and dry to slightly moist. Trace porosity and rootlets were observed in the upper five to six feet.

5. GROUNDWATER

Groundwater was not encountered in the borings, excavated to a maximum depth of 10½ feet below the existing ground surface. Based on the lack of groundwater in the borings and the depth of the proposed construction, static groundwater is neither expected to be encountered during construction, nor have a detrimental effect on the project. However, it is not uncommon for groundwater levels to vary seasonally or for groundwater seepage conditions to develop where none previously existed, especially in impermeable fine-grained soils which are heavily irrigated or after seasonal rainfall. Proper surface drainage of irrigation and precipitation will be critical for future performance of the project. Recommendations for drainage are provided in the *Surface Drainage* section of this report (see Section 7.17).

6. SEISMIC DESIGN PARAMETERS

The following table summarizes the site-specific design criteria obtained from the 2022 California Building Code (CBC; Based on the 2021 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the online application *U.S. Seismic Design Maps*, provided by the Structural Engineers Association of California (SEAOC). The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2022 CBC and Table 20.3-1 of ASCE 7-16. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2022 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2022 CBC Reference
Site Class	D	Section 1613.2.2
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	1.5g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.6g	Figure 1613.2.1(3)
Site Coefficient, F_A	1.0	Table 1613.2.3(1)
Site Coefficient, F_V	1.7*	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	1.5g	Section 1613.2.3 (Eqn 16-20)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	1.02g*	Section 1613.2.3 (Eqn 16-21)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	1.0g	Section 1613.2.4 (Eqn 16-22)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.68g*	Section 1613.2.4 (Eqn 16-23)

*Per Supplement 3 of ASCE 7-16, a ground motion hazard analysis (GMHA) shall be performed for projects on Site Class "D" sites with 1-second spectral acceleration (S_1) greater than or equal to 0.2g, which is true for this site. However, Supplement 3 of ASCE 7-16 provides an exception stating that that the GMHA may be waived provided that the parameter S_{M1} is increased by 50% for all applications of S_{M1}. The values for parameters S_{M1} and S_{D1} presented above have **not** been increased in accordance with Supplement 3 of ASCE 7-16.

The table below on the following page the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-16 Reference
Mapped MCE_G Peak Ground Acceleration, PGA	0.62g	Figure 22-9
Site Coefficient, F_{PGA}	1.1	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.682g	Section 11.8.3 (Eqn 11.8-1)

Deaggregation of the MCE peak ground acceleration was performed using the USGS online Unified Hazard Tool, 2014 Conterminous U.S. Dynamic edition (v4.2.0). The result of the deaggregation analysis indicates that the predominant earthquake contributing to the MCE peak ground acceleration is characterized as a 7.1 magnitude event occurring at a hypocentral distance of 11.68 kilometers from the site.

Deaggregation was also performed for the Design Earthquake (DE) peak ground acceleration, and the result of the analysis indicates that the predominant earthquake contributing to the DE peak ground acceleration is characterized as a 6.89 magnitude occurring at a hypocentral distance of 13.65 kilometers from the site.

Conformance to the criteria in the above tables for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 It is our opinion that neither soil nor geologic conditions were encountered during the investigation that would preclude the construction of the proposed improvements provided the recommendations presented herein are followed and implemented during design and construction.

7.1.2 No artificial fill was encountered during our site exploration, however, up to 5 feet of artificial fill was encountered in the site vicinity during the prior investigation (Converse, 2022). The existing fill encountered is believed to be the result of past grading and construction activities at the site. Deeper fill may exist in other areas of the site that were not directly explored. The existing fill, in its present condition, is not suitable for direct support of proposed foundations. The existing fill and site soils are suitable for re-use as engineered fill provided the recommendations in the *Grading* section of this report are followed (see Section 7.4).

7.1.3 Proposed improvements may be supported on conventional shallow spread foundations deriving support in newly placed engineered fill or in competent alluvium at and below a depth of 3 feet below the existing ground surface.

7.1.4 For proposed improvements supported in engineered fill, at a minimum, it is recommended that the upper 3 feet of existing site soils be excavated and properly compacted within the proposed footprint area. Deeper excavations should be conducted as needed to remove any encountered fill or soft soils as necessary at the direction of the Geotechnical Engineer (a representative of Geocon). The excavations should extend laterally a minimum distance of 2 feet beyond the structure footprint areas, including appurtenances, or a distance equal to the depth of fill below the foundation, whichever is greater. The limits of existing fill and/or soft soil removal will be verified by the Geocon representative during site grading activities. Recommendations for earthwork are provided in the *Grading* section of this report (see Section 7.4).

7.1.5 As an alternative, deepened foundations consisting of cast-in-place end-bearing piles may be used for support of proposed improvements provided foundations derive support in the competent alluvial soils at and below a depth of 3 feet below the existing ground surface. The client and contractor should be aware that end-bearing piles require complete removal of all loose soils from the bottom of excavation. The bottom cleanout may be difficult to achieve due the granular nature of the soils. Consideration should also be given to the use of cast-in-place friction piles. Recommendations for deepened foundations are provided in Sections 7.8 through 7.10 of this report.

7.1.6 All foundation excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon) prior to placing steel or concrete.

7.1.7 Foundations for small outlying structures, such as block walls up to 6 feet in height, planter walls or trash enclosures which are not tied to an existing or proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, such as adjacent to property lines, foundations may derive support in the undisturbed alluvial soils generally at and below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials.

7.1.8 It is anticipated that stable excavations for the recommended grading can be achieved with sloping measures. Excavation recommendations are provided in the *Temporary Excavations* section of this report (Section 7.15).

7.1.9 Based on the results of percolation testing performed at the site, a stormwater infiltration system is considered feasible for this project. Recommendations for infiltration are provided in the *Stormwater Infiltration* section of this report (see Section 7.16).

7.1.10 Where new paving/synthetic turf is to be placed, it is recommended that all existing unsuitable fill and soft alluvial soils be excavated and properly compacted for paving/turf support. The client should be aware that excavation and compaction of all existing fill and soft alluvial soils in the area of new paving/turf is not required; however, paving constructed over existing uncertified fill or unsuitable alluvial soil may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of subgrade soil should be scarified, moisture conditioned, and properly compacted for paving/turf support. Additional paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 7.14).

7.1.11 Once the design and foundation loading configuration proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. If the proposed loads will exceed those presented herein, the potential for settlement should be reevaluated by this office.

7.1.12 Any changes in the design, location or elevation of improvements, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

7.2 Soil and Excavation Characteristics

7.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Caving should be anticipated in unshored excavations, especially where granular soils are encountered.

7.2.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations to maintain safety and maintain the stability of adjacent existing improvements.

7.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping and shoring. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 7.14).

7.2.4 The upper few feet of existing site soils are considered to have a "very low" (EI = 0) expansive potential and are classified as "non-expansive" in accordance with the 2022 California Building Code (CBC) Section 1803.5.3. The recommendations presented herein assume that the foundations and slabs will derive support in these materials.

7.3 Minimum Resistivity, pH, and Water-Soluble Sulfate

7.3.1 Potential of Hydrogen (pH) and resistivity testing as well as chloride content testing were performed on representative samples of soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered "mildly corrosive" to "moderately corrosive" with respect to corrosion of buried ferrous metals on site. Due to the corrosive potential of the soils, it is recommended that PVC, ABS or other approved plastic piping be utilized in lieu of cast-iron when in direct contact with the site soils. The results are presented in Appendix B (Figure B15) and should be considered for design of underground structures.

7.3.2 Laboratory tests were performed on representative samples of the site soils to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B15) and indicate that the on-site materials possess a sulfate exposure class of "S0" to concrete structures as defined by 2022 CBC Section 1904A and ACI 318 Chapter 19.

7.3.3 Geocon West, Inc. does not practice in the field of corrosion engineering and mitigation. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained to evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion of buried metal pipes and concrete structures in direct contact with the soils.

7.4 Grading

7.4.1 Grading is anticipated to include preparation of building pad, excavation of site soils for proposed foundations and utility trenches, as well as placement of backfill for trenches.

7.4.2 A preconstruction conference should be held at the site prior to the beginning of excavation operations with the owner, contractor, civil engineer, geotechnical engineer, and building official in attendance. Special soil handling requirements can be discussed at that time.

7.4.3 Earthwork should be observed, and compacted fill tested by representatives of Geocon West, Inc. The existing fill and alluvial soil encountered during exploration are suitable for re-use as an engineered fill, provided any encountered oversize material (greater than 6 inches) and any encountered deleterious debris are removed. The site soils have little to no cohesion and are prone to excessive caving. The contractor should be prepared for difficult excavation conditions. The presence of these materials and their impact on construction methods and equipment selection should be considered by both the owner and contractor prior to construction.

7.4.4 Grading should commence with the removal of all existing vegetation and existing improvements from the area to be graded. Deleterious debris such as wood and root structures should be exported from the site and should not be mixed with the fill soils. Asphalt and concrete should not be mixed with the fill soils unless approved by the Geotechnical Engineer. All existing underground improvements planned for removal should be completely excavated and the resulting depressions properly backfilled in accordance with the procedures described herein. Once a clean excavation bottom has been established it must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.4.5 Where conventional foundations are will be supported in engineered fill, it is recommended that at a minimum the upper 3 feet of existing earth materials in the improvement footprint areas be excavated and properly compacted for foundation and slab support. Deeper excavations should be conducted as needed to remove any encountered fill or soft soils as necessary at the direction of the Geotechnical Engineer (a representative of Geocon). The limits of existing fill and/or soft soil removal will be verified by the Geocon representative during site grading activities. The engineered fill blanket should extend laterally at least 2 feet beyond the edge of foundations or for a distance equal to the depth of fill below the foundations, whichever is greater.

7.4.6 Foundations for small outlying structures, such as block walls up to 6 feet in height, planter walls or trash enclosures, which are not tied to an existing or proposed structure, may be supported on conventional foundations deriving support on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, such as adjacent to property lines, foundations may derive support in the undisturbed alluvial soils at and below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials. If the soils exposed in the excavation bottom are soft or loose, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.

7.4.7 It is anticipated that stable excavations for the recommended grading associated with the proposed improvements can be achieved with sloping measures. Excavation recommendations are provided in the *Temporary Excavations* section of this report (Section 7.15).

7.4.8 All fill and backfill soils should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to optimum moisture content, and properly compacted to a minimum 90 percent of the maximum dry density in accordance with ASTM D 1557 (latest edition).

7.4.9 Where new paving/synthetic turf is to be placed, it is recommended that all existing unsuitable fill and soft alluvial soils be excavated and properly compacted for paving/turf support. The client should be aware that excavation and compaction of all existing fill and soft soils in the area of new paving/turf is not required; however, paving/turf constructed over existing uncertified fill or unsuitable alluvial soil may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of soil subgrade should be scarified, moisture conditioned to optimum moisture content and compacted to at least 95 percent relative compaction for paving support. Additional paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 7.14).

7.4.10 All imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site. Rocks larger than 6 inches in diameter shall not be used in the fill. If necessary, import soils used as structural fill should have an expansion index less than 20 and corrosivity properties that are equally or less detrimental to that of the existing onsite soils (see Figure B15).

7.4.11 Utility trenches should be properly backfilled in accordance with the following requirements. The pipe should be bedded with clean sands (Sand Equivalent greater than 30) to a depth of at least 1 foot over the pipe, and the bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of gravel is not acceptable unless used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of minimum 2-sack slurry is also acceptable as backfill. Prior to placing any bedding materials or pipes, the excavation bottom must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon)

7.4.12 All trench and foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding materials, fill, steel, gravel or concrete.

7.5 Shrinkage

7.5.1 Shrinkage results when a volume of material removed at one density is compacted to a higher density. A shrinkage factor of up to 5 percent should be anticipated when excavating and compacting the upper 5 feet of existing earth materials on the site to an average relative compaction of 92 percent.

7.4.2 If import soils will be utilized in the building pads, the soils must be placed uniformly and at equal thickness at the direction of the Geotechnical Engineer (a representative of Geocon West, Inc.). Soils can be borrowed from non-building pad areas and later replaced with imported soils.

7.6 Conventional Foundation Design

7.6.1 Subsequent to the recommended grading, a conventional shallow spread foundation system may be utilized for support of the proposed structures provided foundations derive support in newly placed engineered fill or competent undisturbed alluvial soil found at and below a depth of 3 feet below the existing ground surface.

7.6.2 Continuous footings may be designed for an allowable bearing capacity of 2,000 pounds per square foot (psf) and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing materials.

7.6.3 Isolated spread foundations may be designed for an allowable bearing capacity of 2,500 psf, and should be a minimum of 24 inches in width, 18 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing materials.

7.6.4 The soil bearing pressures above may be increased by 250 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable bearing pressure of 3,000 psf.

7.6.5 The allowable bearing pressures may be increased by one-third for transient loads due to wind or seismic forces.

7.6.6 If depth increases are utilized for the perimeter foundations, this office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

7.6.7 Continuous footings should be reinforced with four No. 4 steel reinforcing bars, two placed near the top of the footing and two near the bottom. Reinforcement for spread footings should be designed by the project structural engineer.

7.6.8 The above foundation dimensions and minimum reinforcement recommendations are based on soil conditions and building code requirements only, and are not intended to be used in lieu of those required for structural purposes.

7.6.9 No special subgrade presaturation is required prior to placement of concrete. However, the slab and foundation subgrade should be sprinkled as necessary; to maintain a moist condition as would be expected in any concrete placement.

7.6.10 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.6.11 This office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

7.7 Foundation Settlement

7.7.1 The maximum expected static settlement for proposed improvements supported on conventional foundations deriving support in the recommended bearing material and designed with a maximum bearing pressure of 3,000 psf is estimated to be approximately ½ inch and occur below the heaviest loaded structural element. Settlement of the foundation system is expected to occur on initial application of loading. Differential settlement is not expected to exceed ¼ inch over a distance of 20 feet.

7.7.2 Once the design and foundation loading configurations for the proposed structures proceeds to a more finalized plan, the estimated settlements presented in this report should be reviewed and revised, if necessary. If the final foundation loading configurations are greater than the assumed loading conditions, the potential for settlement should be reevaluated by this office.

7.8 End-Bearing Caissons

7.8.1 A deepened foundation system consisting of drilled cast-in-place end bearing caissons deriving support in undisturbed alluvial soils may be utilized for support of the proposed improvements. Caissons should be a minimum of 18 inches in diameter, and should be embedded a minimum of 5 feet in depth below the ground surface and 2 feet into undisturbed alluvium.

7.8.2 End-bearing caisson foundations may be designed for an allowable bearing capacity of 4,000 psf. The allowable soil bearing pressure above may be increased by 500 psf for each additional foot of foundation depth, up to a maximum allowable soil bearing pressure of 5,000 psf. The allowable bearing pressures may be increased by one-third for transient loads due to wind or seismic forces.

7.8.3 The maximum expected static settlement for the structure supported on end-bearing caissons is estimated to be less than ½ inch. Differential settlement between adjacent caissons foundations is not expected to exceed ¼ inch. The majority of the foundation settlement is expected to occur on initial application of loading and during construction.

7.8.4 Lateral capacities can be determined using the values presented in the Lateral design section below (see Section 7.12). If piles are spaced at least three diameters on center, no reduction in lateral capacity is considered necessary for group effects. If pile spacing is closer than three pile diameters, an evaluation for group effects including appropriate reductions should be incorporated into the pile design based on pile dimension, spacing, and the direction of loading.

7.8.5 Reinforcement for deepened foundations should be designed by the project structural engineer.

7.8.6 All loose soils must be completely removed from the bottom of all end-bearing foundation excavations. All drilled caisson excavations must be continuously observed by personnel of this firm to verify adequate depth and penetration into the recommended bearing materials. Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete.

7.9 Friction Pile Design

7.9.1 Cast-in-place friction piles may also be utilized for support of proposed improvements provided foundations derive support in the competent alluvium. Friction piles do not require the complete removal of all loose earth materials from the bottom of the excavation since the end-bearing capacity is not being considered for design; however, a cleanout of the excavation bottom will be required.

7.9.2 Friction piles should be a minimum of 18 inches in diameter and be embedded a minimum of 15 feet into the alluvial soils. Where not protected by pavement, the upper 2 feet of soil should be ignored when calculating axial and lateral capacity.

7.9.3 Friction piles may be designed based on an allowable skin friction capacity of 170 psf. Single pile uplift capacity can be taken as 60 percent of the downward capacity. Piles may be assumed fixed at an embedment depth of 7 feet below the ground surface. The downward capacity and uplift capacity may be increased by one-third when considering transient wind or seismic loads.

7.9.4 If piles are spaced at least three diameters on center, no reduction in axial capacity is considered necessary for group effects. If pile spacing is closer than three pile diameters, an evaluation for group effects including appropriate reductions should be incorporated into the pile design based on pile dimension, spacing, and the direction of loading.

7.9.5 The maximum expected static settlement for the structures supported on friction piles is estimated to be less than ½ inch. Differential settlement between adjacent pile foundations is not expected to exceed ¼ inch. The majority of the foundation settlement is expected to occur on initial application of loading and during construction.

7.9.6 All drilled pile excavations should be continuously observed by personnel of this firm to verify adequate penetration into the recommended bearing materials. The capacity presented is based on the strength of the soils. The compressive and tensile strength of the pile sections should be checked to verify the structural capacity of the piles.

7.10 Pile Installation

7.10.1 Casing will be required since caving is expected in the granular soils during excavation. The contractor should have casing available and should be prepared to use it. Extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than 5 feet. Continuous observation of the drilling and pouring of the piles by the Geotechnical Engineer (a representative of Geocon West, Inc.), is required.

7.10.2 End-bearing caissons will require the complete removal of all loose earth materials from the bottom of the excavation since the end-bearing capacity is utilized for foundation support. Friction piles do not require the complete removal of all loose earth materials from the bottom of the excavation since the end-bearing capacity is not being considered for design; however, a cleanout of the excavation bottom will be required.

7.10.3 Groundwater seepage was not encountered in the borings at depths up to 51½ feet beneath the existing ground surface (Converse, 2022). However, should groundwater or seepage be encountered during pile installation, the contractor should be prepared. Piles placed below the water level require the use of a tremie to place the concrete into the bottom of the hole. A tremie shall consist of a water-tight tube, with a hopper at the top. The tube shall be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie shall be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of the work to prevent water entering the tube and shall be entirely sealed at all times, except when the concrete is being placed. The tremie tube shall be kept full of concrete. The flow shall be continuous until the work is completed and the resulting concrete seal shall be monolithic and homogeneous. The tip of the tremie tube shall always be kept about 5 feet below the surface of the concrete and definite steps and safeguards should be taken to ensure that the tip of the tremie tube is never raised above the surface of the concrete.

7.10.4 A special concrete mix should be used for concrete to be placed below water. The design shall provide for concrete with a strength of 1,000 psi over the initial job specification. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste shall be included. The slump shall be commensurate to any research report for the admixture, provided that it shall also be the minimum for a reasonable consistency for placing when water is present.

7.10.5 Closely spaced piles should be drilled and filled alternately, with the concrete permitted to set at least eight hours before drilling an adjacent hole. Piles excavations should be filled with concrete as soon after drilling and inspection as possible; the holes should not be left open overnight.

7.11 Miscellaneous Foundations

7.11.1 Foundations for small outlying structures, such as block walls up to 6 feet in height, planter walls or trash enclosures which are not tied to an existing or proposed structure may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed or is undesirable, such as adjacent to property lines, foundations may derive support in the undisturbed alluvial soils at and below a depth of 24 inches, and should be deepened as necessary to maintain a minimum 12-inch embedment into the recommended bearing materials.

7.11.2 If the soils exposed in the excavation bottom are soft, compaction of the soft soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative. Miscellaneous foundations may be designed for a bearing value of 1,500 psf, and should be a minimum of 12 inches in width, 24 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

7.11.3 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated

7.12 Lateral Design

7.12.1 Resistance to lateral loading may be provided by friction acting at the base of foundations, slabs and by passive earth pressure. An allowable coefficient of friction of 0.40 may be used with the dead load forces in the competent alluvial soils or newly placed engineered fill.

7.12.2 Passive earth pressure for the sides of foundations and slabs poured against alluvial soils or newly placed engineered fill may be computed as an equivalent fluid having a density of 260 pcf with a maximum earth pressure of 2,600 pcf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

7.13 Concrete Slabs-on-Grade

7.13.1 Exterior concrete slabs-on-grade subject to vehicle loading should be designed in accordance with the recommendations in the *Preliminary Pavement Recommendations* section of this report (Section 7.14).

7.13.2 Exterior slabs for walkways or flatwork, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moisture conditioned to optimum moisture content and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.13.3 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06) and should be installed in general conformance with ASTM E 1643-98 and the manufacturer's recommendations. If California Green Code requirements apply to this project, the vapor retarder should be underlain by 4 inches of ½-inch clean aggregate and the vapor retarder should be in direct contact with the concrete slab. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in California Green Building Code, it is our opinion that the concrete slab-on-grade may be underlain by a vapor retarder over 4-inches of clean sand (sand equivalent greater than 30), since the sand will serve a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

7.13.4 Crack control joints should be spaced at intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. Construction joints should be designed by the project structural engineer.

7.13.5 The recommendations of this report are intended to reduce the potential for cracking of slabs due to settlement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.14 Preliminary Pavement Recommendations

7.14.1 Where new paving is to be placed, it is recommended that all existing fill and soft or unsuitable alluvial materials be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all existing artificial fill and soft alluvium in the area of new paving is not required; however, paving constructed over existing unsuitable material may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of paving subgrade should be scarified, moisture conditioned to optimum moisture content, and properly compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.14.2 The following pavement sections are based on an assumed R-Value of 20. Once site grading activities are complete an R-Value should be obtained by laboratory testing to confirm the properties of the soils serving as paving subgrade, prior to placing pavement.

7.14.3 The Traffic Indices listed below are estimates. Geocon does not practice in the field of traffic engineering. The actual Traffic Index for each area should be determined by the project civil engineer. If pavement sections for Traffic Indices other than those listed below are required, Geocon should be contacted to provide additional recommendations. Pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). It is anticipated that the majority of traffic will consist of automobile and large truck traffic.

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Parking and Driveways	4.0	3.0	4.0
Trash Truck & Fire Lanes	7.0	4.0	12.0

7.14.4 Asphalt concrete should conform to Section 203-6 of the "*Standard Specifications for Public Works Construction"* (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the "*Standard Specifications of the State of California, Department of Transportation"* (Caltrans). The use of Crushed Miscellaneous Base (CMB) in place of Class 2 aggregate base is acceptable. Crushed Miscellaneous Base should conform to Section 200-2.4 of the "*Standard Specifications for Public Works Construction"* (Green Book).

7.14.5 Unless specifically designed and evaluated by the project structural engineer, where exterior concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 6 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade. The subgrade and base material should be compacted to 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).

7.14.6 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, it is recommended that the perimeter curb be extended at least 12 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

7.15 Temporary Excavations

7.15.1 Excavations less than 5 feet in height are anticipated for construction of the proposed improvements. The excavations are expected to expose alluvial soils, which are suitable for vertical excavations up to 5 feet where loose soils or caving sands are not present or where not surcharged by adjacent traffic or structures.

7.15.2 Vertical excavations greater than 5 feet or where surcharged by existing structures will require sloping or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments could be sloped back at a uniform 1:1 slope gradient or flatter up to maximum height of 6 feet. A uniform slope does not have a vertical portion.

7.15.3 Where temporary construction slopes are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction slopes are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. Geocon personnel should inspect the soils exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. All excavations should be stabilized within 30 days of initial excavation.

7.16 Stormwater Infiltration

7.16.1 During the May 9, 2023 site exploration, borings B5 and B6 were utilized to perform percolation testing. The borings were advanced to the depth listed in the table below. Slotted casing was placed in the boring, and the annular space between the casing and excavation was filled with gravel. The borings were then filled with water to pre-saturate the soils. The casing was refilled with water and percolation test readings were performed after repeated flooding of the cased excavations. Based on the test results, the average infiltration rate (adjusted percolation rate), for the earth materials encountered, is provided in the following table. The field-measured percolation rate has been adjusted to infiltration rates in accordance with the County of San Bernardino Technical Guidance Document for Water Quality Management Plans (June 2013). Additional correction factors may be required and should be applied by the engineer in responsible charge of the design of the stormwater infiltration system and based on applicable guidelines. Percolation test field data and calculations of the measured percolation rate and design infiltration rate are provided on Figures 3 and 4.

Boring	Soil Type	Infiltration Depth (ft)	Average Infiltration Rate (in / hour)
B5	Silty Sand (SM)	3-5	7.33
B6	Silty Sand (SM)	3-5	7.56

7.16.2 The results of the percolation testing indicate that the soils are conductive to infiltration. It is our opinion that the soil zones encountered at the depths and locations as listed in the table above are suitable for infiltration of stormwater.

7.16.3 It is our opinion that the introduction of stormwater at the depth and location indicated above will not induce excessive hydro-consolidation, will not create a perched groundwater condition, will not affect soil structure interaction of existing or proposed foundations due to expansive soils, will not saturate soils supported by existing or proposed retaining walls, and will not increase the potential for liquefaction. Resulting settlements are anticipated to be less than ¼ inch, if any.

7.16.4 Where infiltration systems will be utilized, it is recommended that a minimum 10-foot horizontal and vertical setback be maintained from existing or proposed foundations. Additional setbacks may be required by the governing jurisdiction and should be incorporated into the stormwater infiltration system design as necessary.

7.16.5 Subsequent to the placement of the infiltration system, it is acceptable to backfill the resulting void space between the excavation sidewalls and the infiltration system with minimum two-sack slurry provided the slurry is not placed in the infiltration zone. It is recommended that pea gravel be utilized adjacent to the infiltration zone so communication of water to the soil is not hindered.

7.16.6 Due to the preliminary nature of the project at this time, the type of stormwater infiltration system and location of the stormwater infiltration systems has not yet been determined. The design drawings should be reviewed and approved by the Geotechnical Engineer. The installation of the stormwater infiltration system should be observed and approved by the Geotechnical Engineer (a representative of Geocon).

7.17 Surface Drainage

7.17.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the original designed engineering properties. Proper drainage should be maintained at all times.

7.17.2 All site drainage should be collected and controlled in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2019 CBC 1804.4 or other applicable standards. In addition, drainage should not be allowed to flow uncontrolled over any descending slope. Discharge from downspouts, roof drains and scuppers are not recommended onto unprotected soils within 5 feet of the building perimeter. Planters which are located adjacent to foundations should be sealed to prevent moisture intrusion into the soils providing foundation support. Landscape irrigation is not recommended within 5 feet of the building perimeter footings except when enclosed in protected planters.

7.17.3 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, it is recommended that consideration be given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

7.18 Plan Review

7.18.1 Grading, foundation, and shoring plans should be reviewed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.

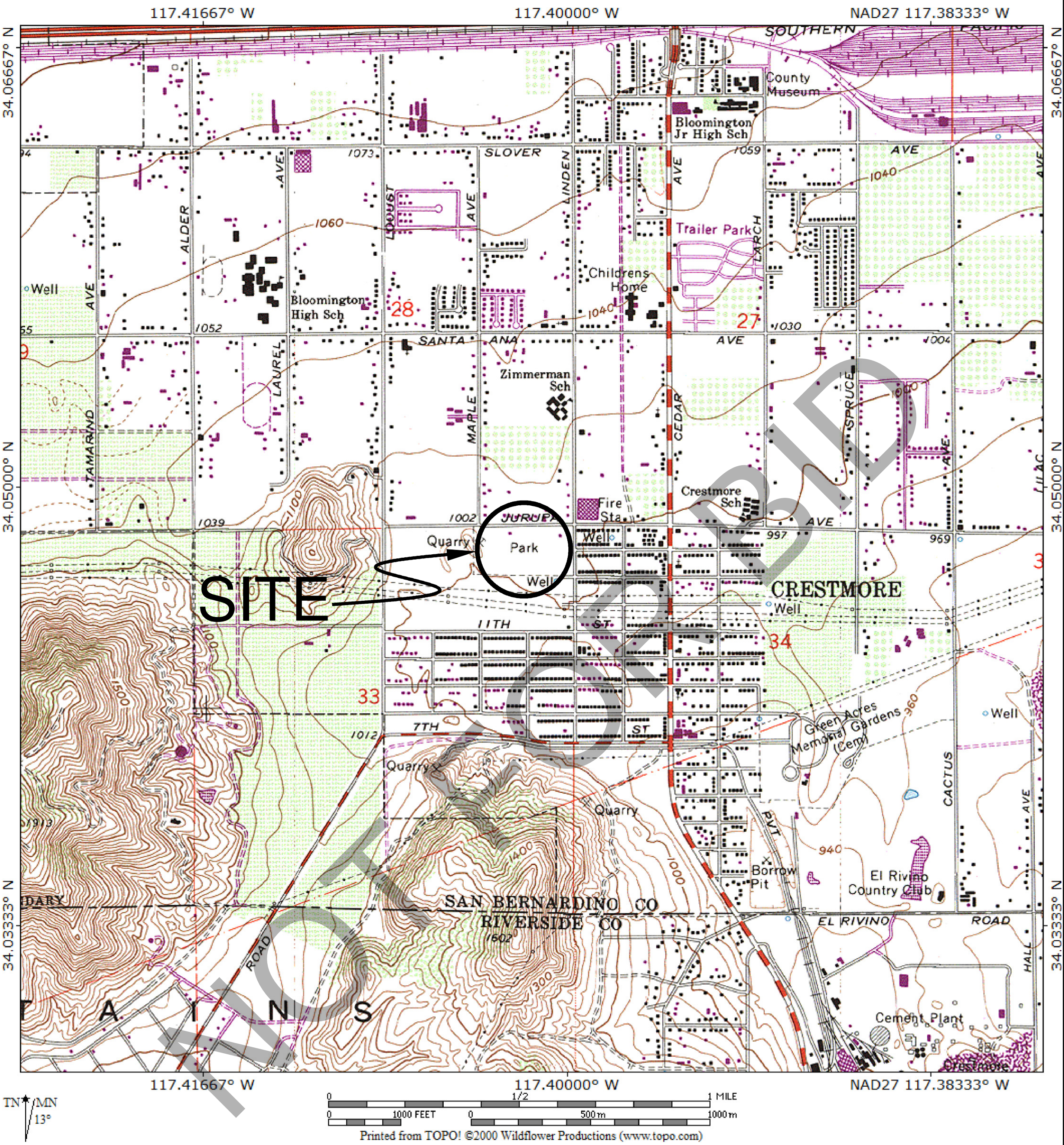
2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

LIST OF REFERENCES

United States Geological Survey, 2022, Unified Hazard Tool, accessed June 22, 2023, https://earthquake.usgs.gov/hazards/interactive/.



REFERENCE: U.S.G.S. TOPOGRAPHIC MAPS, 7.5 MINUTE SERIES, XXXXXXXXXX, CA QUADRANGLE

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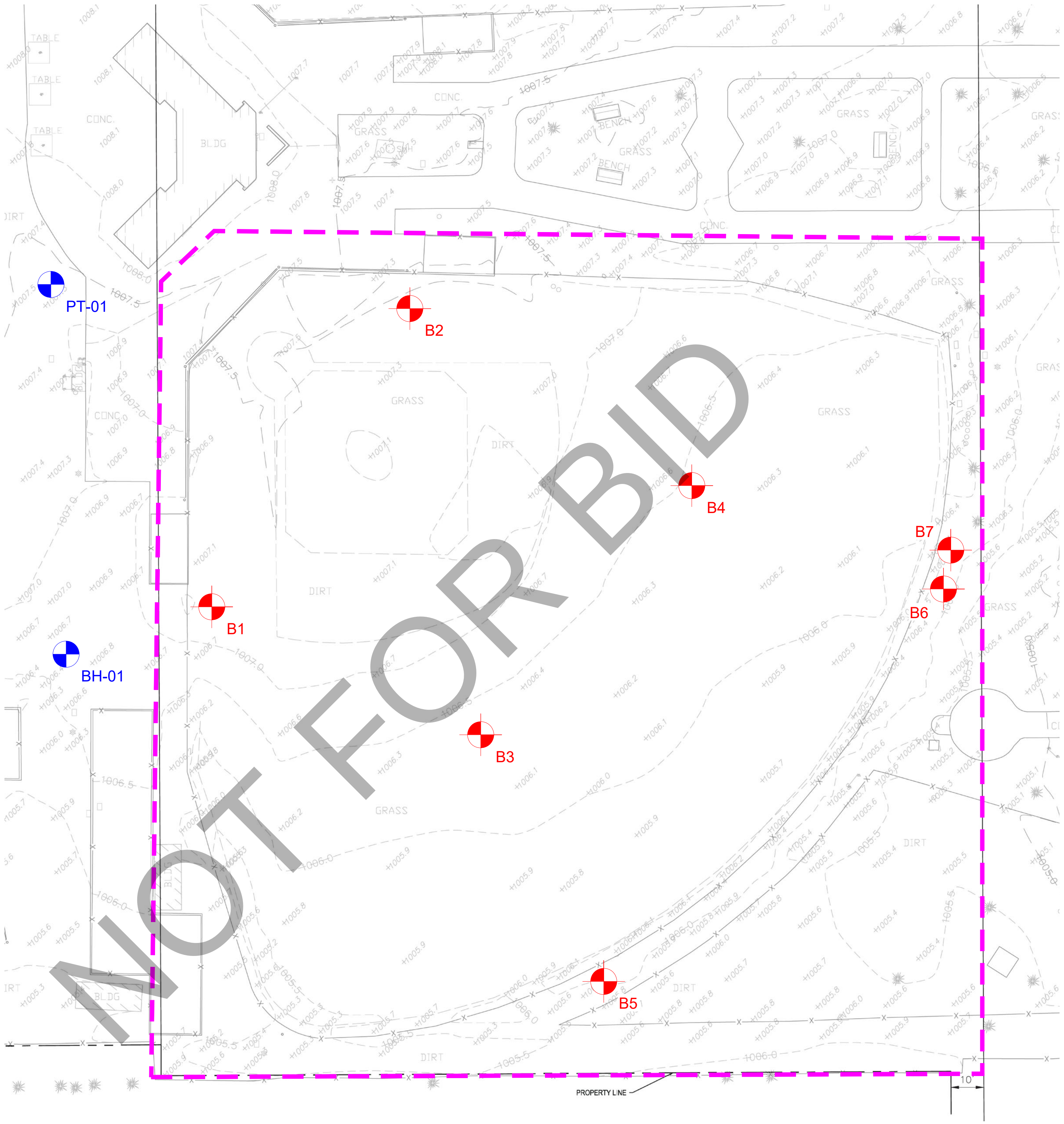
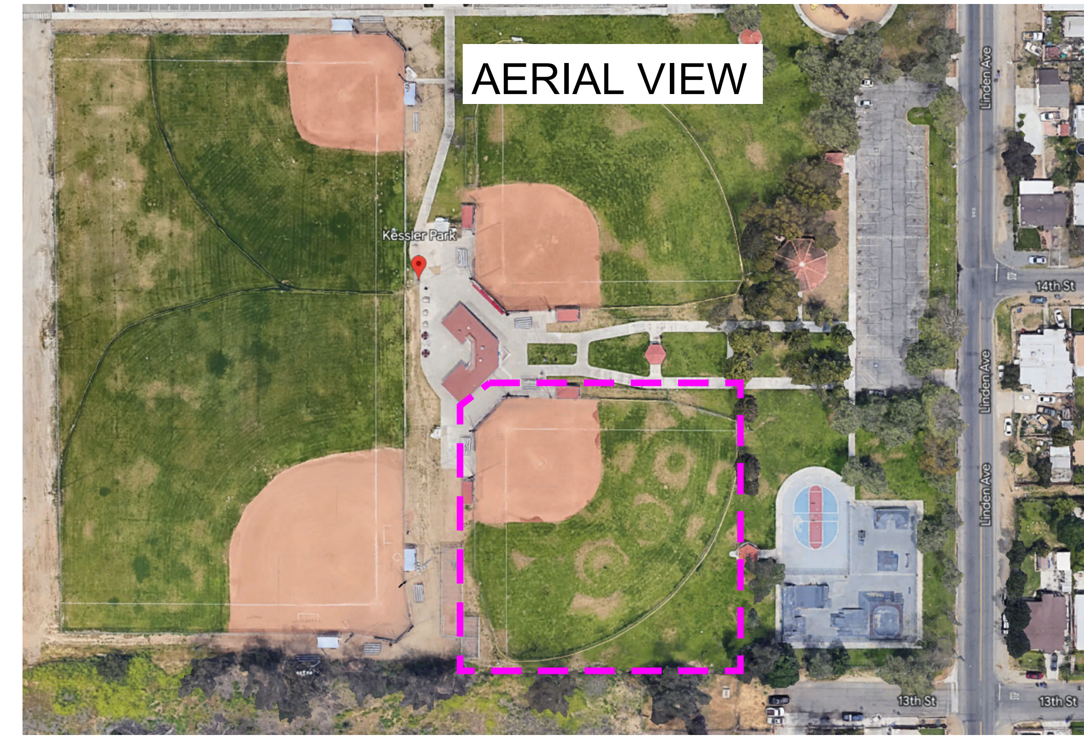
VICINITY MAP

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUNE 2023 | PROJECT NO. W1613-99-01 | FIG. 1





LEGEND

- B1 — Approximate Boring Location and ID (Geocon, 2023)
- Approximate Project Limts
- BH-01 — Approximate Boring Location and ID (Converse, 2022)

N

0 40' 80'

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SITE PLAN

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK
DISTRICT SAN BERNARDINO, CALIFORNIA

JUN. 2023 | PROJECT NO. W1613-99-01 | FIG. 2

PERCOLATION TEST DATA SHEET

Project:	Kessler Park Dream Field	Project No:	W1613-99-01	Date:	7/30/2021
Test Hole No:	B5	Tested By:	CT		
Depth of Test Hole, D_T:	5	USCS Soil Classification:	SP		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round) =	4	Sides (if rectangular) =	---	---	

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Greater than or Equal to 6"? (y/n)
1	10:00	10:25	25	36.0	58.8	22.8	y
2	10:30	10:55	25	36.0	58.8	22.8	y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements, taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Percolation Rate (min/in)
1	12:00	12:10	10	36.0	58.8	22.8	632
2	12:15	12:25	10	36.0	55.4	19.4	741
3	12:30	12:40	10	36.0	55.2	19.2	750
4	12:45	12:55	10	36.0	55.1	19.1	755
5	13:00	13:10	10	36.0	55.0	19.0	759
6	13:15	13:25	10	36.0	55.0	19.0	759
7							
8							

Infiltration Rate Calculation:

Time Interval, Δt =	10	minutes	Ho =	24.0	inches
Final Depth to Water, Df =	55.0	inches	Hf =	5.0	inches
Test Hole Radius, r =	2	inches	ΔH =	19.0	inches
Initial Depth to Water, Do =	36.0	inches	Havg =	14.5	inches
Total Depth of Test Hole, DT =	60.0	inches			

$$I_t = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Infiltration Rate, It = **7.33** inches/hour

Figure 3

PERCOLATION TEST DATA SHEET

Project:	Kessler Park Dream Field		Project No:	W1613-99-01		Date:	5/9/2023
Test Hole No:		B6	Tested By:	CT			
Depth of Test Hole, D_T:		5	USCS Soil Classification:		SP		
Test Hole Dimensions (inches)					Length	Width	
Diameter (if round) =		4	Sides (if rectangular) =		---	---	

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Greater than or Equal to 6"? (y/n)
1	10:00	10:25	25	36.0	59.9	23.9	y
2	10:30	10:55	25	36.0	59.9	23.9	y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements, taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_0 Initial Depth to Water (in)	D_f Final Depth to Water (in)	ΔD Change in Water Level (in)	Percolation Rate (min/in)
1	12:00	12:10	10	36.0	58.9	22.9	628
2	12:15	12:25	10	36.0	55.9	19.9	723
3	12:30	12:40	10	36.0	55.9	19.9	723
4	12:45	12:55	10	36.0	55.4	19.4	741
5	13:00	13:10	10	36.0	55.4	19.4	741
6	13:15	13:25	10	36.0	55.3	19.3	745
7							
8							

Infiltration Rate Calculation:

Time Interval, Δt =	10	minutes	Ho =	24.0	inches
Final Depth to Water, Df =	55.3	inches	Hf =	4.7	inches
Test Hole Radius, r =	2	inches	ΔH =	19.3	inches
Initial Depth to Water, Do =	36.0	inches	Havg =	14.3	inches
Total Depth of Test Hole, DT =	60.0	inches			

$$I_t = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Infiltration Rate, It = **7.56** inches/hour

Figure 4

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The site was explored on May 8 and 9, 2023, by excavating seven 4-inch diameter borings to a maximum depth of approximately 10½ feet below the existing ground surface utilizing hand augers and digging equipment. Representative and relatively undisturbed samples were obtained by driving a 3-inch, O. D., California Modified Sampler into the "undisturbed" soil mass with blows from a slide hammer. The California Modified Sampler was equipped with 1-inch by 2³/₈-inch diameter brass sampler rings to facilitate soil removal and testing. Bulk samples were also obtained.

The soil conditions encountered in the borings were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). The logs of the borings are presented on Figure A1 to A7. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained. The logs also include our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the boring logs were revised based on subsequent laboratory testing. The locations of the borings are shown on Figure 2.

BORING 1

ELEV. (MSL.) **- -** DATE COMPLETED **05/08/2023**

EQUIPMENT **HAND AUGER** BY: **CT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5'			SM	**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained.			
2	B1@2'						110.6	5.3
4					- fine-grained, trace porosity and rootlets			
	B1@5'						112.2	10.2
6				SP	Sand, poorly graded, dense, dry, brown, fine to coarse gravel.			
	B1@7'						115.5	6.2
8					- reddish brown, increase in coarse-grained			
					- fine- to medium-grained, some coarse-grained, trace fine angular gravel			
10	B1@10'						123.1	3.8

Total depth of boring: 10.5 feet
No fill.
No groundwater encountered.
Backfilled with soil cuttings and tamped.

NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

Figure A1,
Log of Boring 1, Page 1 of 1

W1613-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... DISTURBED OR BAG SAMPLE
- ... STANDARD PENETRATION TEST
- ... CHUNK SAMPLE
- ... DRIVE SAMPLE (UNDISTURBED)
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. W1613-99-01

BORING 2

ELEV. (MSL.) **- -** DATE COMPLETED **05/08/2023**

EQUIPMENT **HAND AUGER** BY: **CT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	BULK 0-5'				**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained.			
2	B2@2'			SM			110.8	9.2
					- fine-grained, trace porosity and rootlets			
4								
	B2@5'						116.0	9.9
6					Sand, poorly graded, dense, dry, slightly moist, brown, fine- to medium-grained.			
	B2@7'						127.1	5.2
8				SP	- some coarse-grained, trace fine gravel			
10	B2@10'				- orange brown, increase in coarse-grained		121.3	4.8

Total depth of boring: 10.5 feet
No fill.
No groundwater encountered.
Backfilled with soil cuttings and tamped.

NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

Figure A2,
Log of Boring 2, Page 1 of 1

W1613-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. W1613-99-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 3 ELEV. (MSL.) - - DATE COMPLETED 05/08/2023 EQUIPMENT HAND AUGER BY: CT	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0 2	BULK 0-3'			SM	**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained. - medium dense, fine-grained, trace porosity and rootlets			
					Total depth of boring: 3 feet No fill. No groundwater encountered. Backfilled with soil cuttings and tamped. NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.			

Figure A3,
Log of Boring 3, Page 1 of 1

W1613-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING 4

ELEV. (MSL.) - - DATE COMPLETED **05/08/2023**

EQUIPMENT **HAND AUGER** BY: **CT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 – 2	BULK 0-3'			SM	**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained.			
					Total depth of boring: 3 feet No fill. No groundwater encountered. Backfilled with soil cuttings and tamped. NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.			

Figure A4,
Log of Boring 4, Page 1 of 1

W1613-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING 5

ELEV. (MSL.) **- -** DATE COMPLETED **05/09/2023**

EQUIPMENT **HAND AUGER** BY: **CT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine- to medium-grained.			
2	B5@2'			SM			116.3	9.2
4								
	B5@5'				- fine- to coarse-grained		118.1	9.5

Total depth of boring: 5.5 feet
No fill.
No groundwater encountered.
Backfilled with soil cuttings and tamped.

NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

Figure A5,
Log of Boring 5, Page 1 of 1

W1613-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ⊠ ... DISTURBED OR BAG SAMPLE
- ◩ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. W1613-99-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 6 ELEV. (MSL.) - - DATE COMPLETED 05/09/2023 EQUIPMENT HAND AUGER BY: CT	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0					**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine-grained, trace rootlets.			
2	B6@2'			SM				
4					- trace porosity			
	B6@5'				- trace fine to coarse gravel (rounded and angular)			
					Total depth of boring: 5.5 feet No fill. No groundwater encountered. Backfilled with soil cuttings and tamped. NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.			

Figure A6,
Log of Boring 6, Page 1 of 1

W1613-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING 7

ELEV. (MSL.) - - DATE COMPLETED 05/09/2023

EQUIPMENT HAND AUGER BY: CT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**ALLUVIUM** Silty Sand, medium dense, slightly moist, brown, fine-grained.			
2	B7@2'							5.9
				SM				
4								
	B7@5'							11.0
6								
	B7@6.5'				- fine- to medium-grained, trace fine to coarse gravel			6.9

Total depth of boring: 7 feet
No fill.
No groundwater encountered.
Backfilled with soil cuttings and tamped.

NOTE: The stratification lines presented herein represent the approximate boundary between earth types; the transitions may be gradual.

Figure A7,
Log of Boring 7, Page 1 of 1

W1613-06-01 BORING LOGS.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

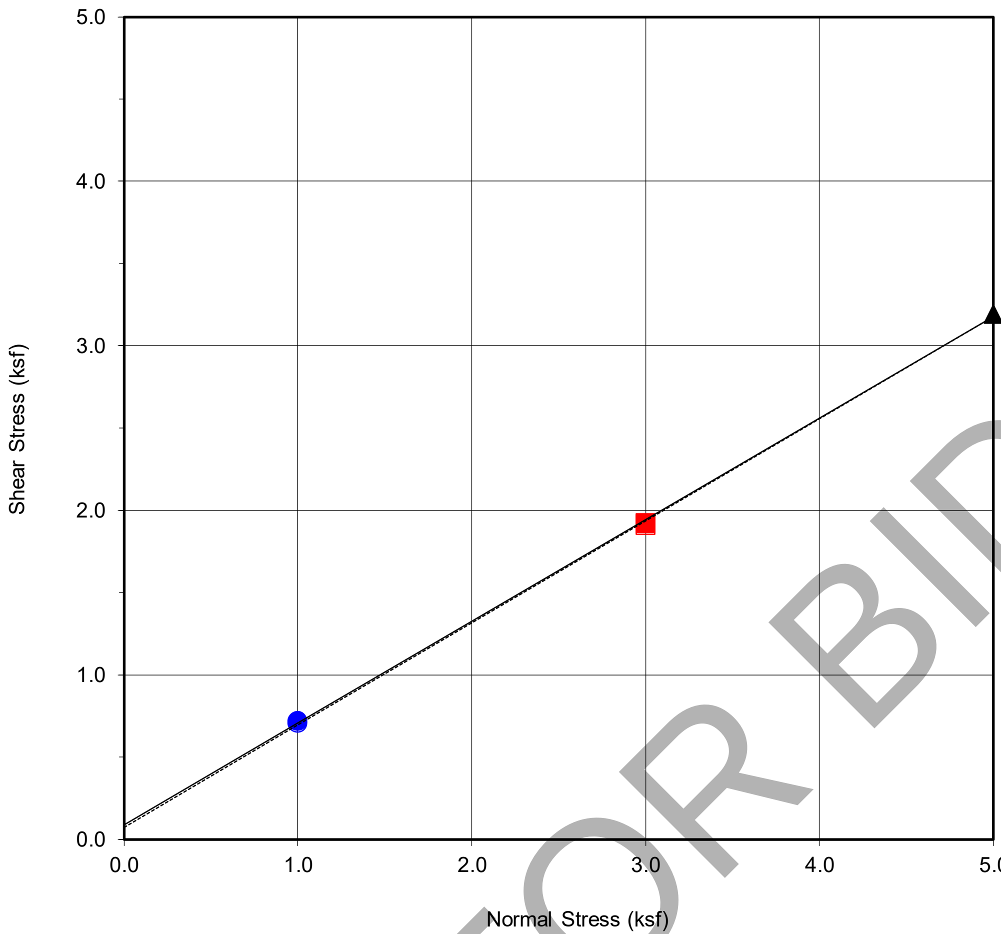
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the "American Society for Testing and Materials (ASTM)", or other suggested procedures. Selected samples were tested for direct shear strength, consolidation, maximum dry density, expansion index, in-place dry density and moisture content, and corrosivity. The results of the laboratory tests are summarized in Figures B1 through B15. The in-place dry density and moisture content of the samples are presented on the boring logs, Appendix A.



Boring No.	**B1+B2**
Sample No.	**B1+B2@0-5'**
Depth (ft)	**0-5'**
Sample Type:	REMOLD

Soil Identification:		
Silty Sand (SM)		
Strength Parameters		
	C (psf)	ϕ (°)
Peak	90	32
Ultimate	73	32

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 0.72	■ 1.92	▲ 3.19
Shear Stress @ End of Test (ksf)	○ 0.71	□ 1.91	△ 3.19
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	11.3	12.1	11.4
Initial Dry Density (pcf)	106.3	105.7	106.1
Initial Degree of Saturation (%)	52.0	54.8	52.3
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	18.2	18.1	18.0

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

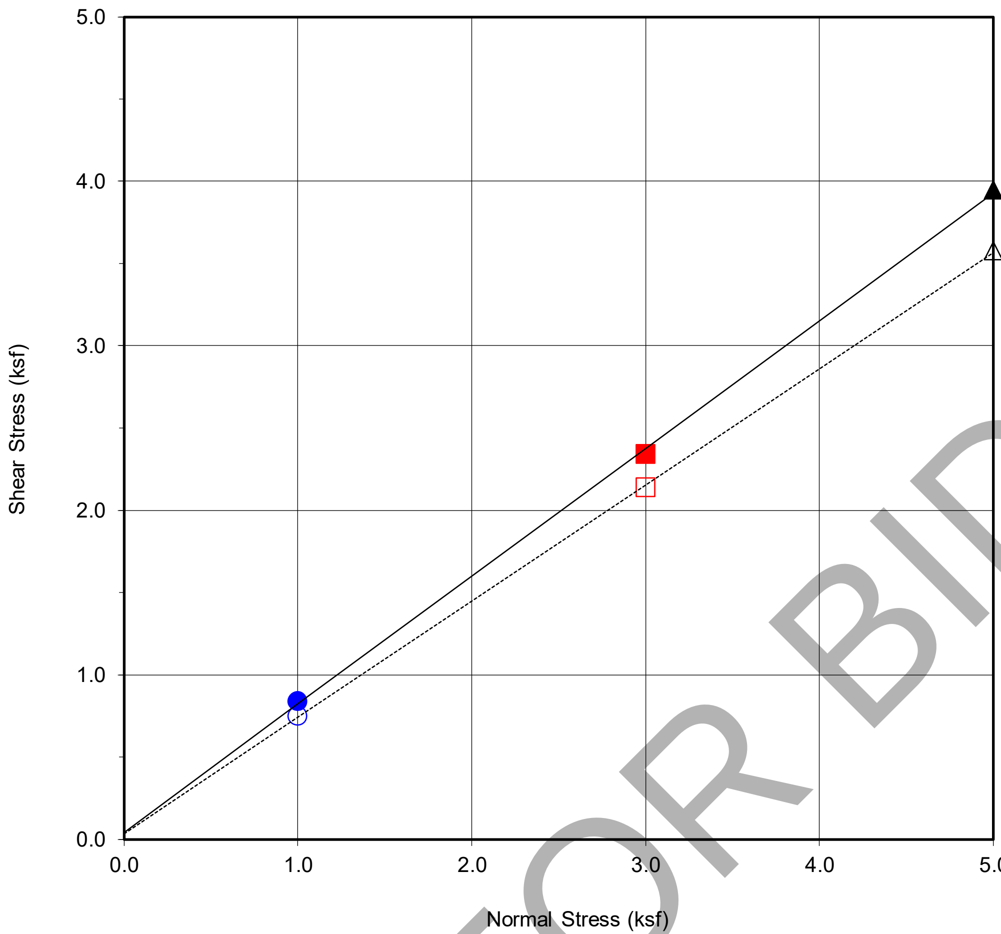
Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B1



Boring No.	**B1**
Sample No.	**B1@7'**
Depth (ft)	**7'**
Sample Type:	RING

Soil Identification:		
Poorly graded sand with gravel (SP)		
Strength Parameters		
	C (psf)	ϕ (°)
Peak	45	38
Ultimate	36	35

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 0.84	■ 2.34	▲ 3.95
Shear Stress @ End of Test (ksf)	○ 0.75	□ 2.14	△ 3.58
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	8.3	9.3	9.9
Initial Dry Density (pcf)	109.5	101.9	103.8
Initial Degree of Saturation (%)	41.6	38.3	42.8
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	16.4	17.4	18.6

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

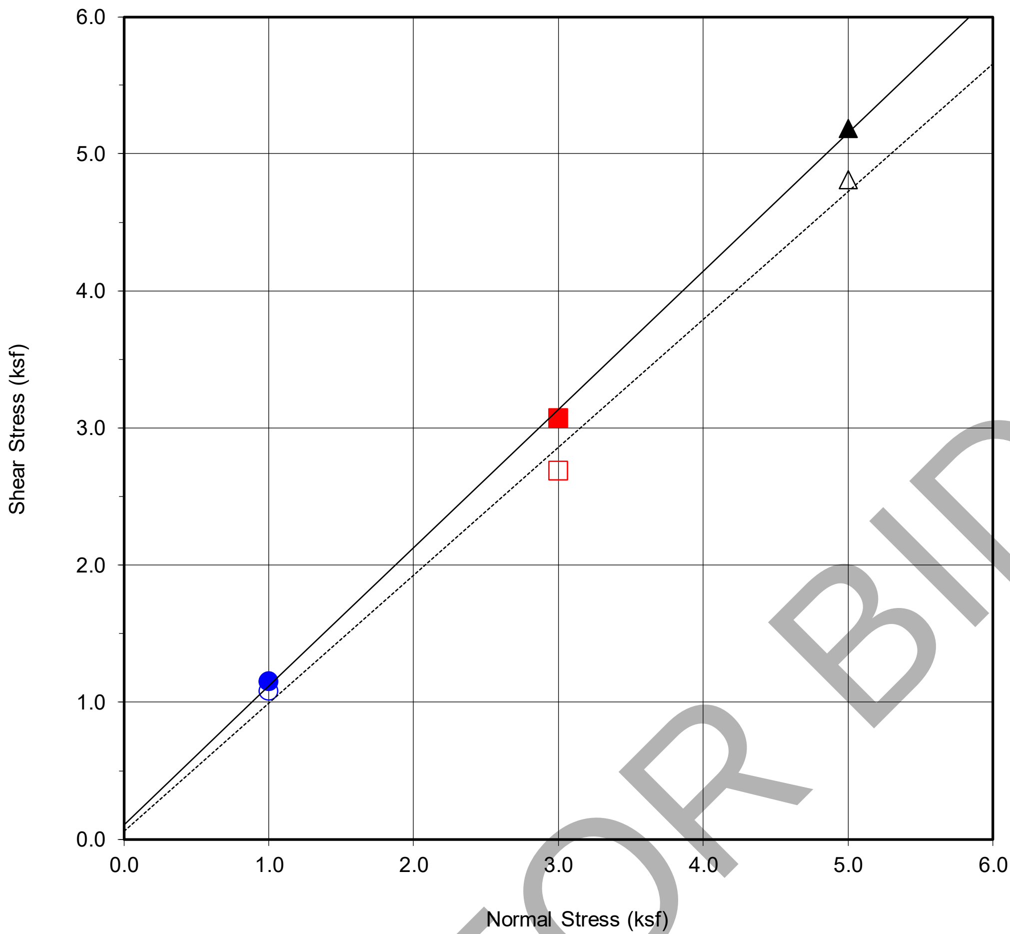
Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B2



Boring No.	**B1**
Sample No.	**B1@10'**
Depth (ft)	**10'**
Sample Type:	RING

Soil Identification:		
Poorly graded sand with gravel (SP)		
Strength Parameters		
	C (psf)	ϕ (°)
Peak	110	45
Ultimate	62	43

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 1.15	■ 3.07	▲ 5.18
Shear Stress @ End of Test (ksf)	○ 1.08	□ 2.69	△ 4.81
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	9.1	9.7	8.5
Initial Dry Density (pcf)	108.9	109.3	117.4
Initial Degree of Saturation (%)	45.0	48.3	52.6
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	13.8	14.0	13.3

GEOCON

DIRECT SHEAR TEST RESULTS

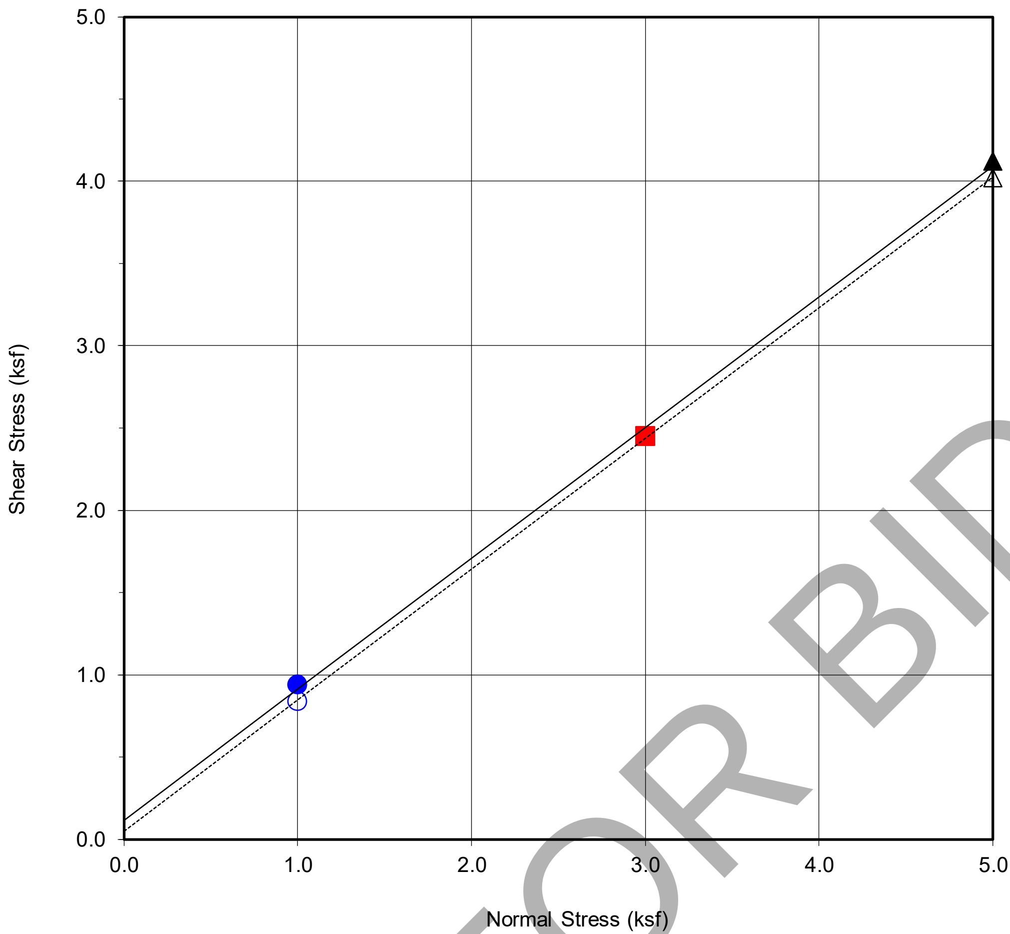
Consolidated Drained ASTM D-3080

Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023 Figure B3



Boring No.	**B2**
Sample No.	**B2@7'**
Depth (ft)	**7'**
Sample Type:	RING

Soil Identification:		
Poorly graded sand with gravel (SP)		
Strength Parameters		
	C (psf)	ϕ (^{o})
Peak	118	38
Ultimate	52	38

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 0.94	■ 2.45	▲ 4.12
Shear Stress @ End of Test (ksf)	○ 0.84	□ 2.45	△ 4.02
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	12.1	9.8	12.4
Initial Dry Density (pcf)	123.2	120.1	117.7
Initial Degree of Saturation (%)	88.7	65.5	77.3
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	16.8	14.3	14.3

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

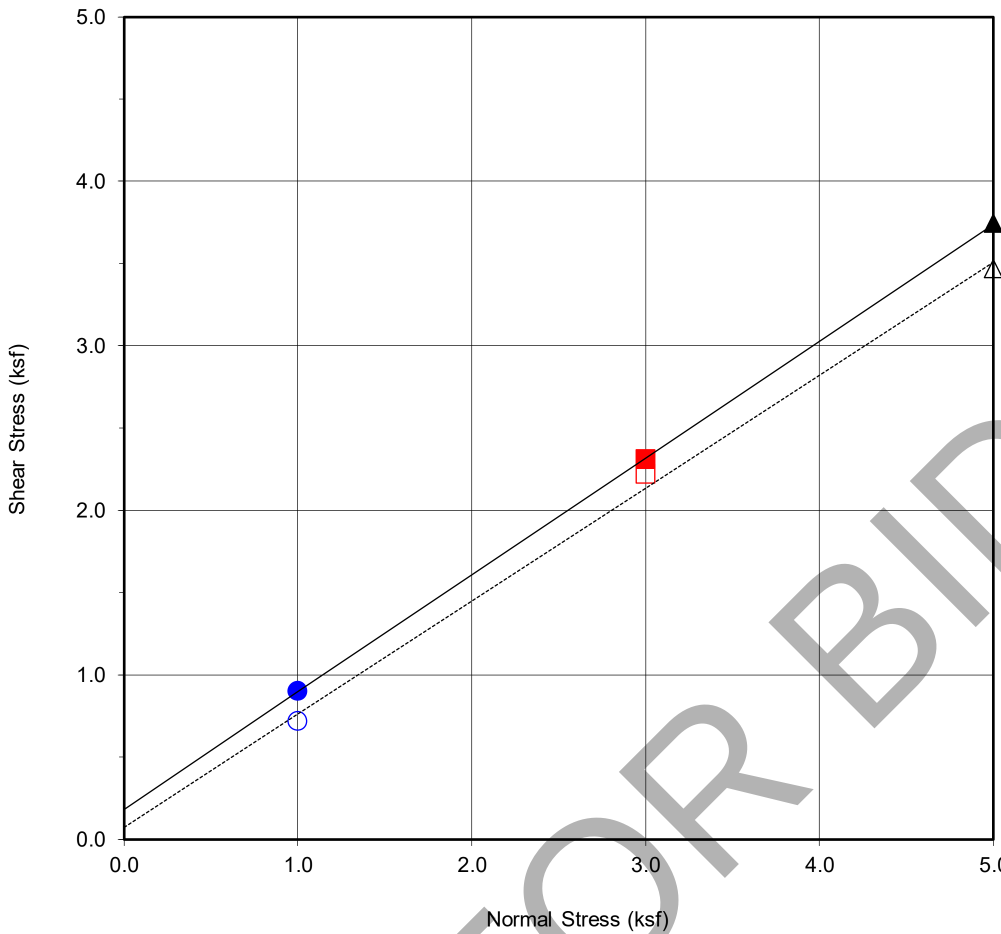
Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B4



Boring No.	**B2**
Sample No.	**B2@10'**
Depth (ft)	**10'**
Sample Type:	RING

Soil Identification:		
Poorly graded sand with gravel (SP)		
Strength Parameters		
	C (psf)	ϕ (^{o})
Peak	185	35
Ultimate	75	34

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 0.90	■ 2.31	▲ 3.74
Shear Stress @ End of Test (ksf)	○ 0.72	□ 2.22	△ 3.47
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	11.4	9.2	13.5
Initial Dry Density (pcf)	111.9	116.7	104.2
Initial Degree of Saturation (%)	60.6	55.8	59.1
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	14.8	14.6	20.1

GEOCON

DIRECT SHEAR TEST RESULTS

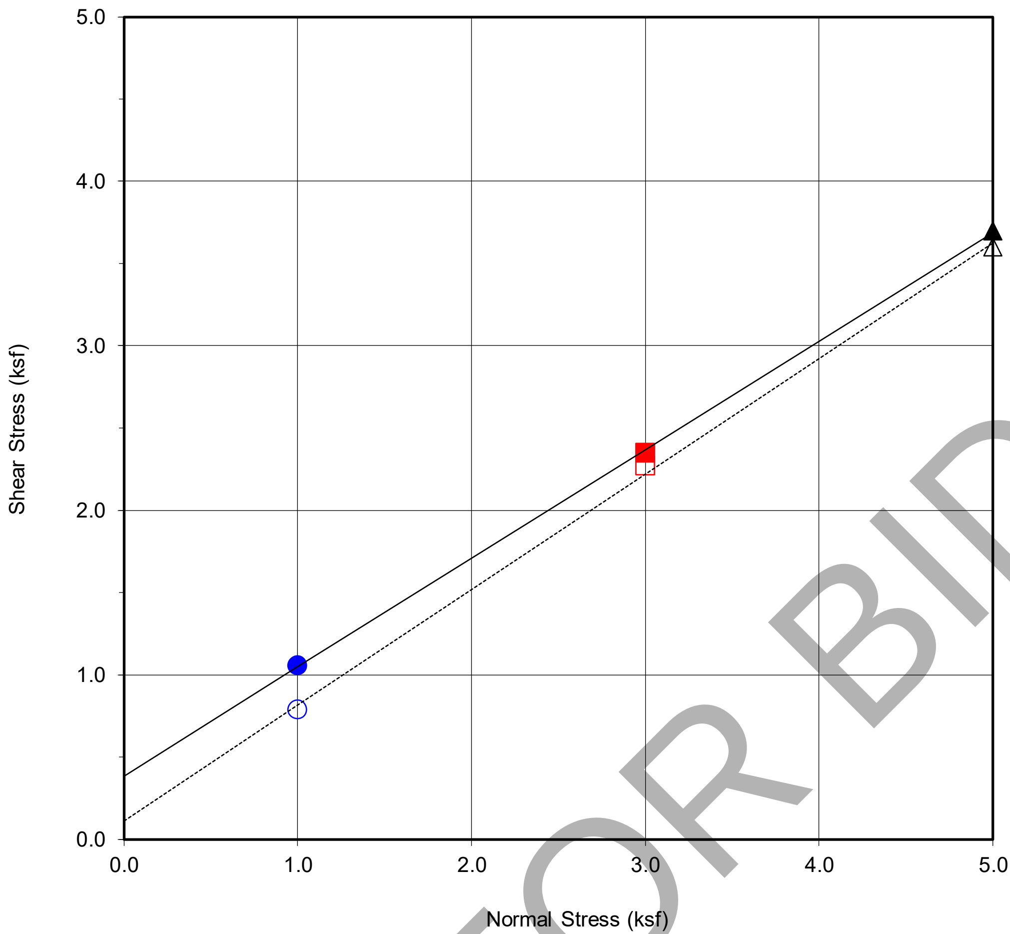
Consolidated Drained ASTM D-3080

Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023



Boring No.	B6
Sample No.	B6@5'
Depth (ft)	5'
Sample Type:	RING

Soil Identification:		
Silty sand (SM)		
Strength Parameters		
	C (psf)	ϕ (°)
Peak	387	33
Ultimate	112	35

Normal Stress (kip/ft²)	1	3	5
Peak Shear Stress (kip/ft²)	● 1.06	■ 2.35	▲ 3.70
Shear Stress @ End of Test (ksf)	○ 0.79	□ 2.27	△ 3.60
Deformation Rate (in./min.)	0.05	0.05	0.05
Initial Sample Height (in.)	1.0	1.0	1.0
Ring Inside Diameter (in.)	2.375	2.375	2.375
Initial Moisture Content (%)	14.2	17.7	14.3
Initial Dry Density (pcf)	117.8	109.9	114.5
Initial Degree of Saturation (%)	88.6	89.3	81.7
Soil Height Before Shearing (in.)	1.2	1.2	1.2
Final Moisture Content (%)	13.5	14.6	14.2

GEOCON

DIRECT SHEAR TEST RESULTS

Consolidated Drained ASTM D-3080

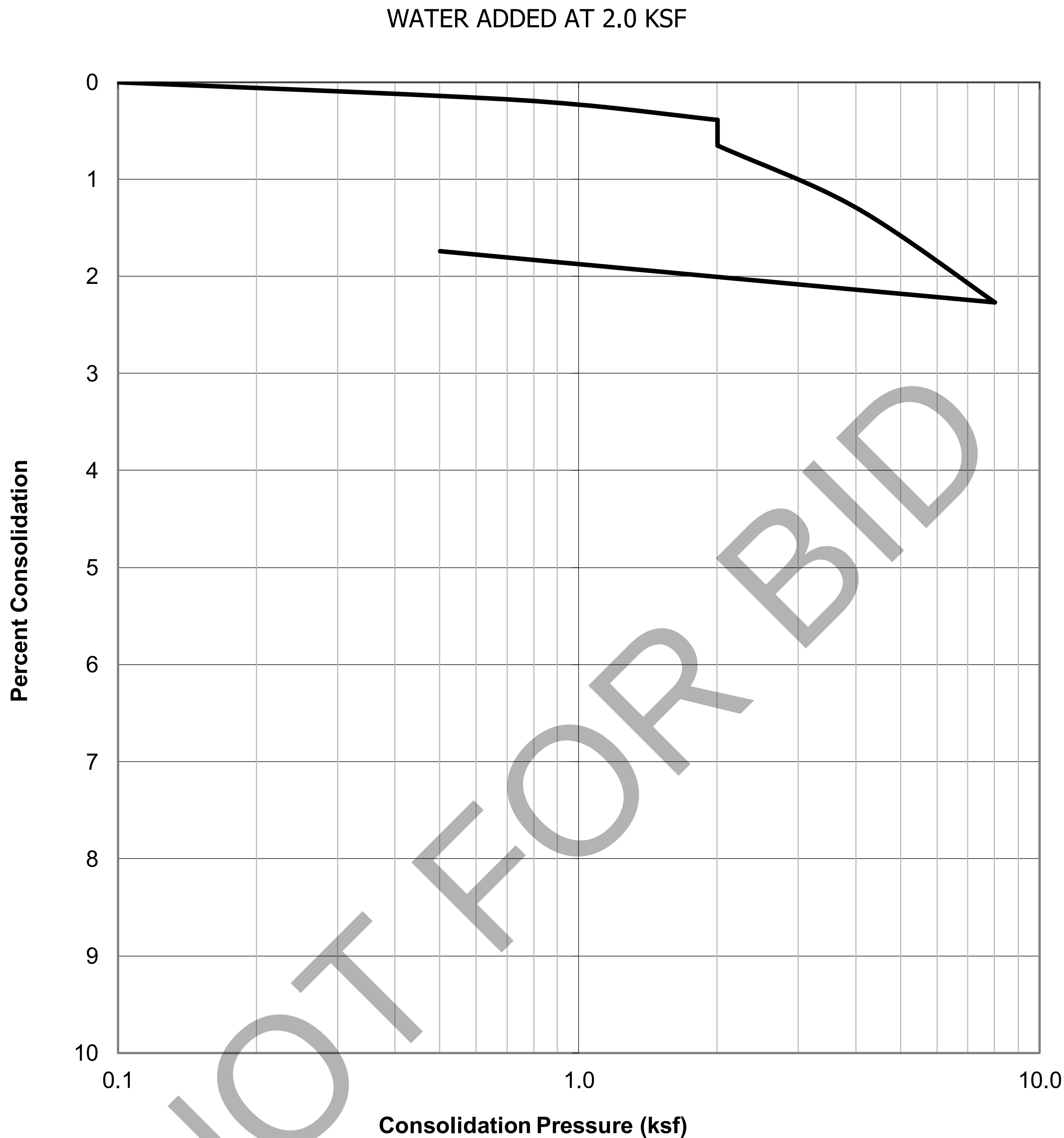
Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B6



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1@2'	Silty sand (SM)	106.9	6.9	18.5

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

Checked by: JMH

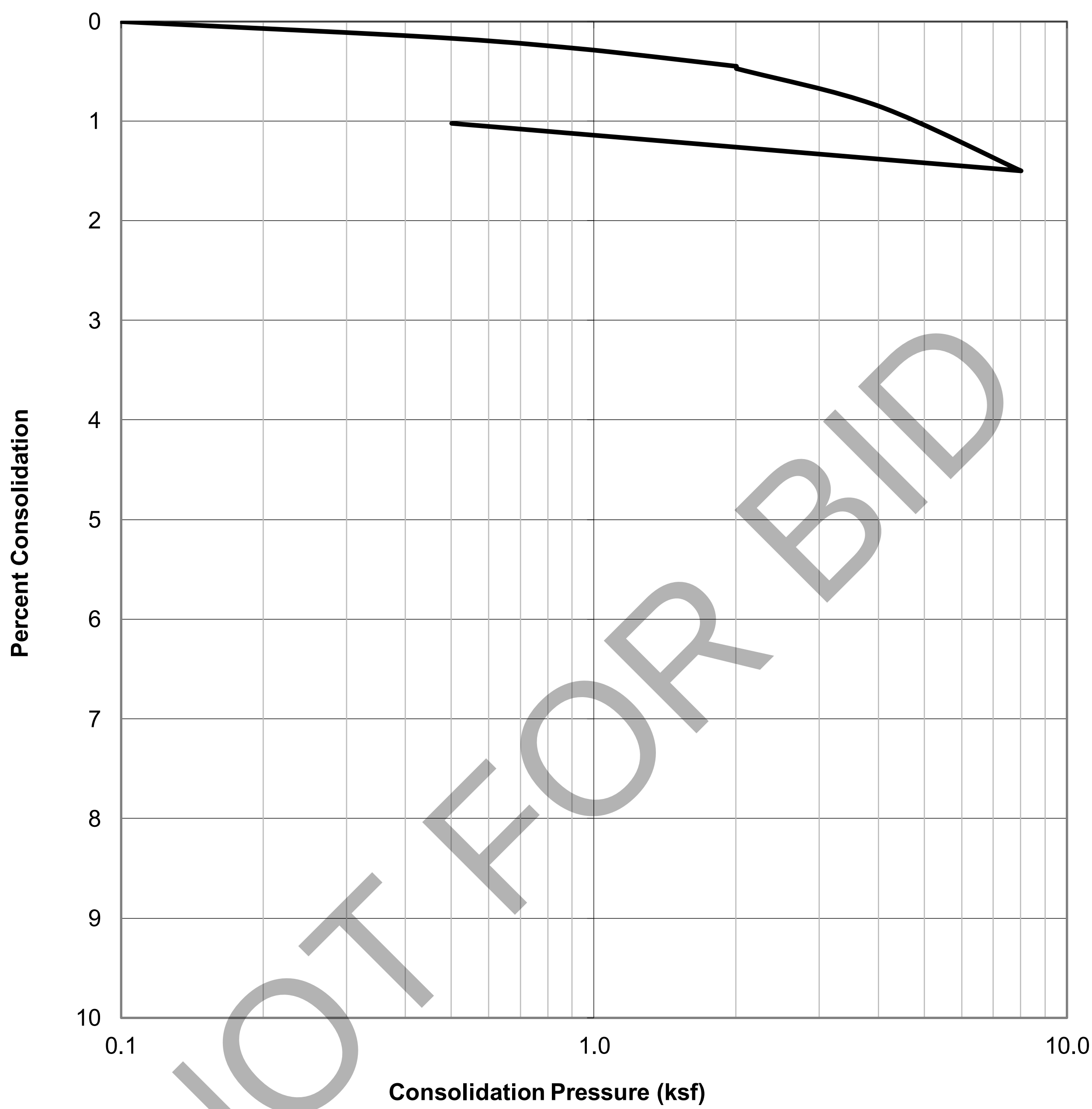
Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B7

WATER ADDED AT 2.0 KSF



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B1@5'	Silty sand (SM)	103.2	19.5	24.7

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

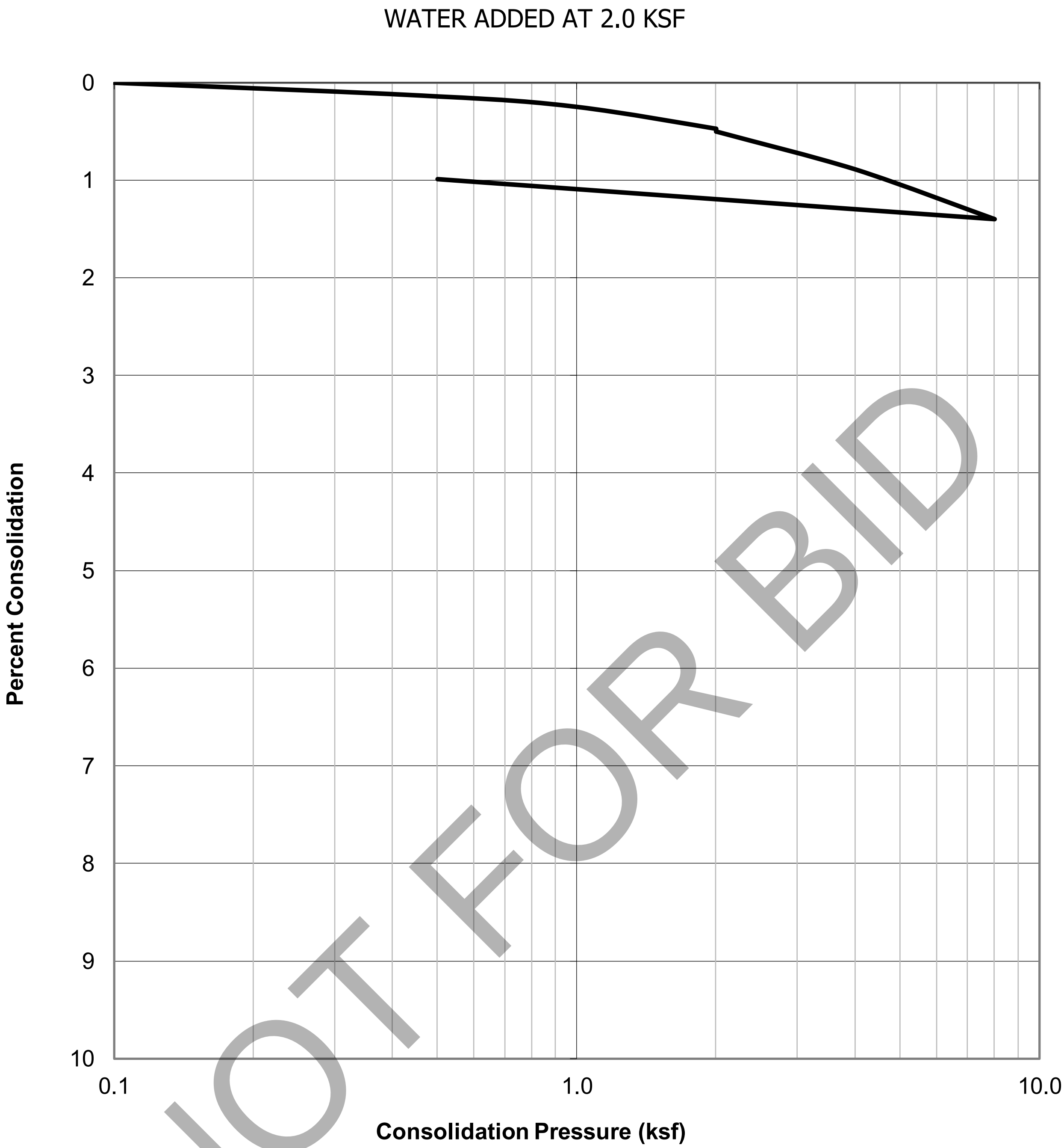
Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B8



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2@7'	Poorly graded sand with Gravel (SP)	120.0	8.8	13.4

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

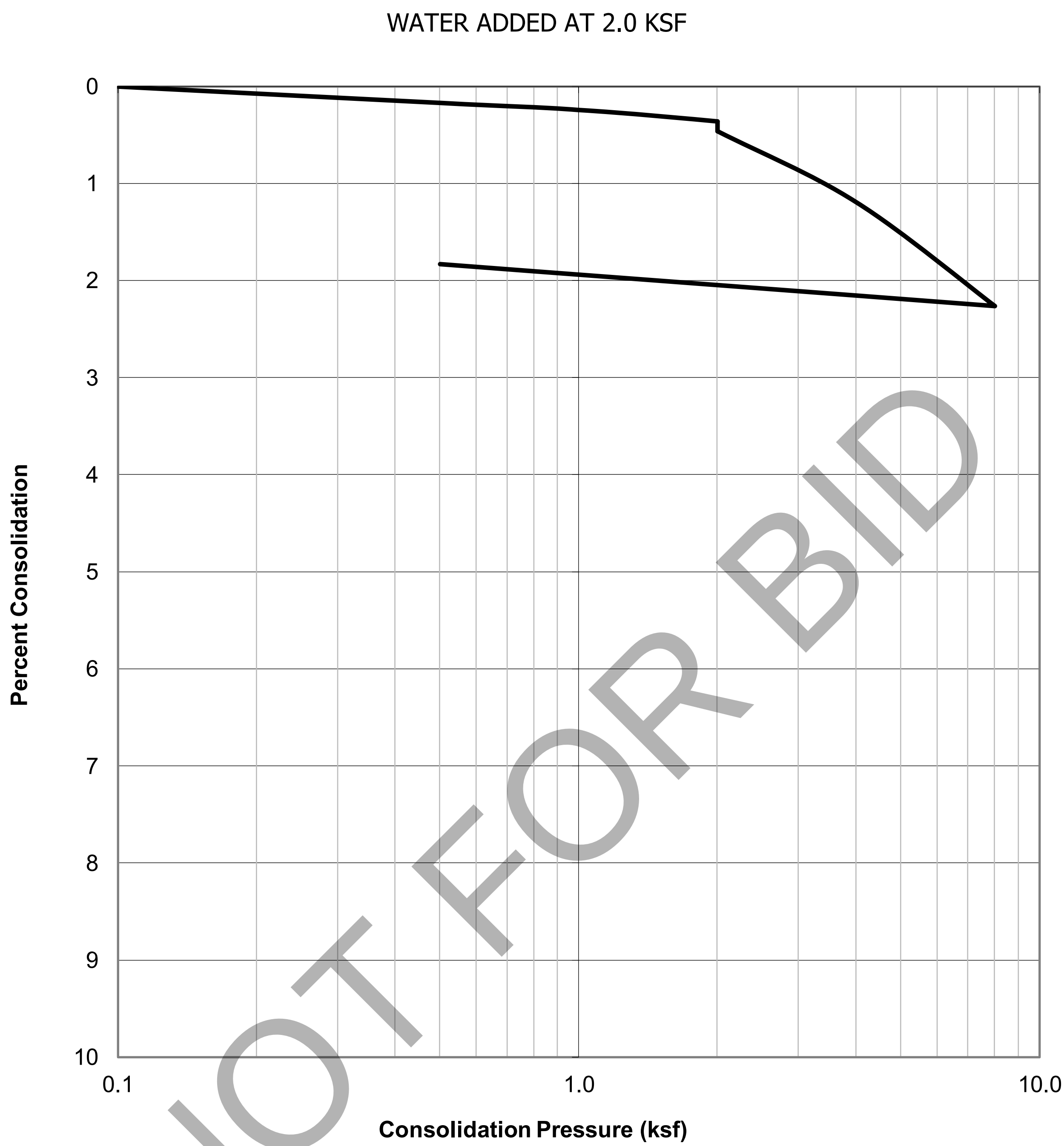
Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B9



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B2@10'	Poorly graded sand (SP)	107.6	8.3	17.7

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

Checked by: JMH

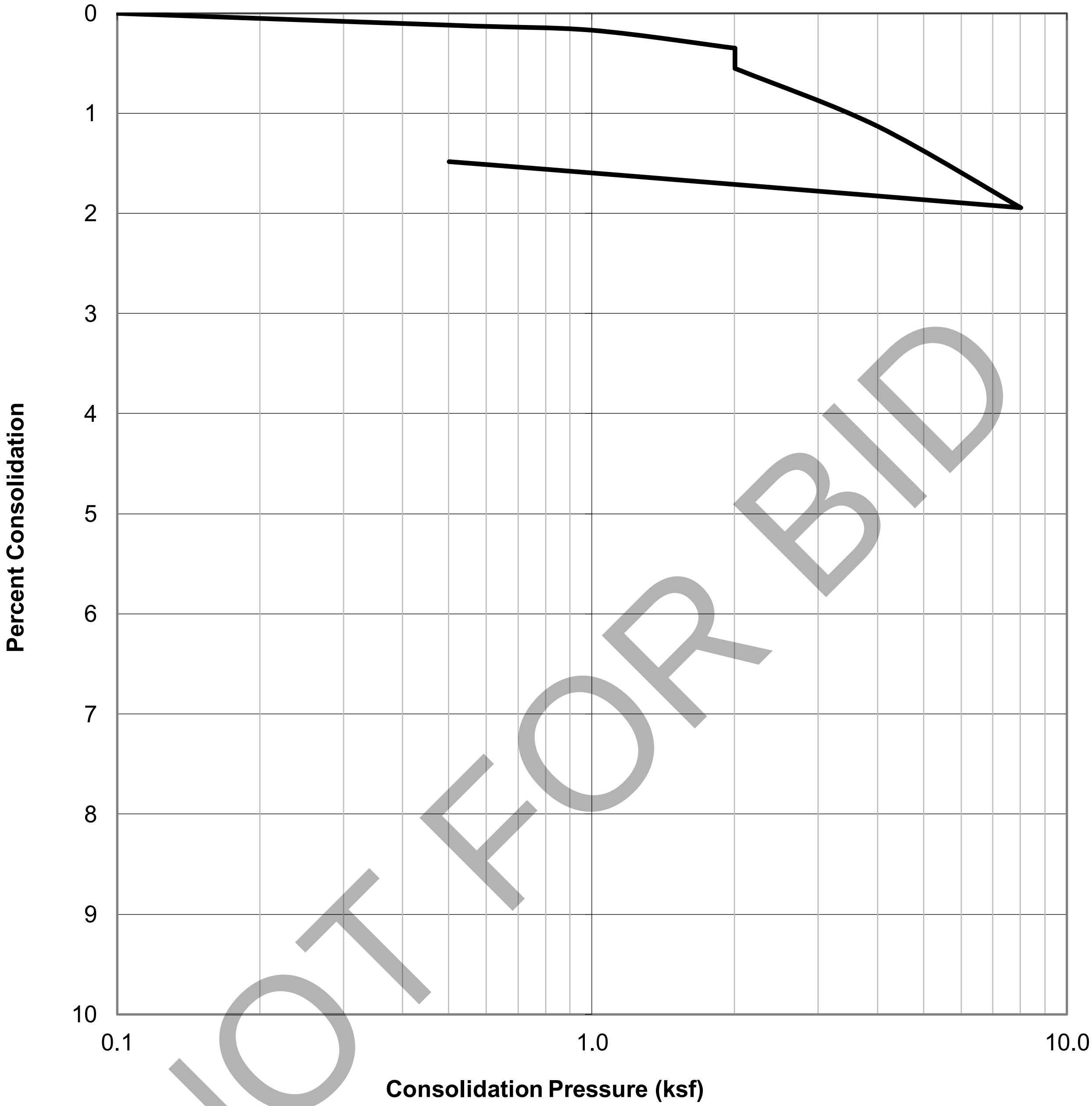
Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B10

WATER ADDED AT 2.0 KSF



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B5@5'	Silty sand (SM)	111.0	11.2	15.7

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

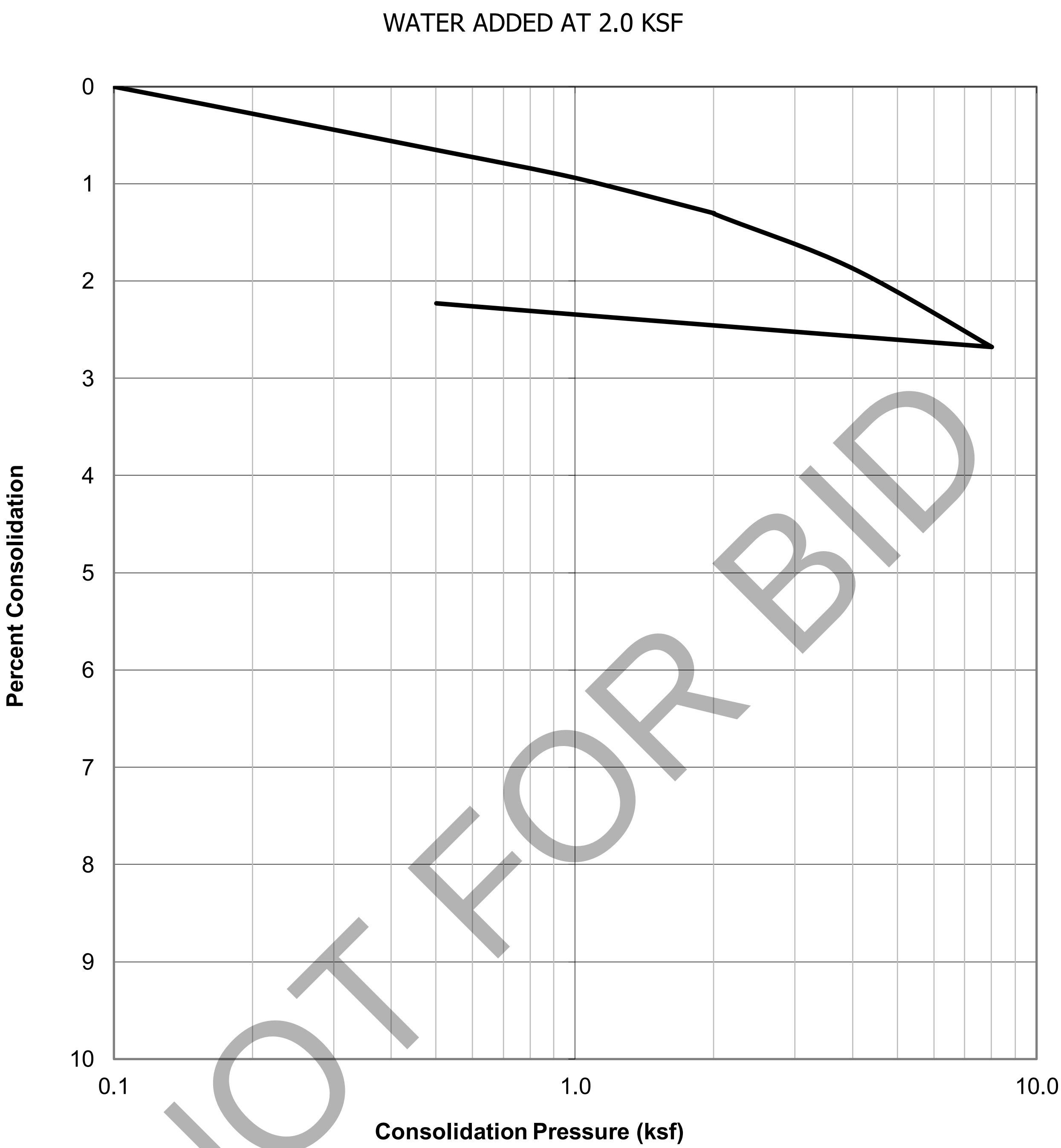
Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B11



SAMPLE ID.	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)
B6@5'	Silty Sand (SM)	125.0	11.6	11.1

GEOCON

CONSOLIDATION TEST RESULTS

ASTM D-2435

Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023

Figure B12

MIX B1+B2@0-5'

MOLDED SPECIMEN		BEFORE TEST	AFTER TEST
Specimen Diameter	(in.)	4.0	4.0
Specimen Height	(in.)	1.0	1.0
Wt. Comp. Soil + Mold	(gm)	570.5	581.0
Wt. of Mold	(gm)	169.9	169.9
Specific Gravity	(Assumed)	2.7	2.7
Wet Wt. of Soil + Cont.	(gm)	308.8	581.0
Dry Wt. of Soil + Cont.	(gm)	282.8	365.8
Wt. of Container	(gm)	8.8	169.9
Moisture Content	(%)	9.5	12.4
Wet Density	(pcf)	120.8	123.8
Dry Density	(pcf)	110.4	110.2
Void Ratio		0.5	0.5
Total Porosity		0.3	0.3
Pore Volume	(cc)	71.5	70.3
Degree of Saturation	(%) [S_{meas}]	49.0	64.4

Date	Time	Pressure (psi)	Elapsed Time (min)	Dial Readings (in.)
6/6/2023	10:00	1.0	0	0.4041
6/6/2023	10:10	1.0	10	0.4035
Add Distilled Water to the Specimen				
6/7/2023	10:00	1.0	1430	0.3978
6/7/2023	11:00	1.0	1490	0.3978

Expansion Index (EI meas) =	-5.7
Expansion Index (Report) =	**0**

Expansion Index, EI_{50}	CBC CLASSIFICATION *	UBC CLASSIFICATION **
0-20	Non-Expansive	Very Low
21-50	Expansive	Low
51-90	Expansive	Medium
91-130	Expansive	High
>130	Expansive	Very High

* Reference: 2022 California Building Code, Section 1803.5.3
** Reference: 1997 Uniform Building Code, Table 18-I-B.

GEOCON

EXPANSION INDEX TEST RESULTS

ASTM D-4829

Checked by: JMH

Project No.: W1613-99-01

KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

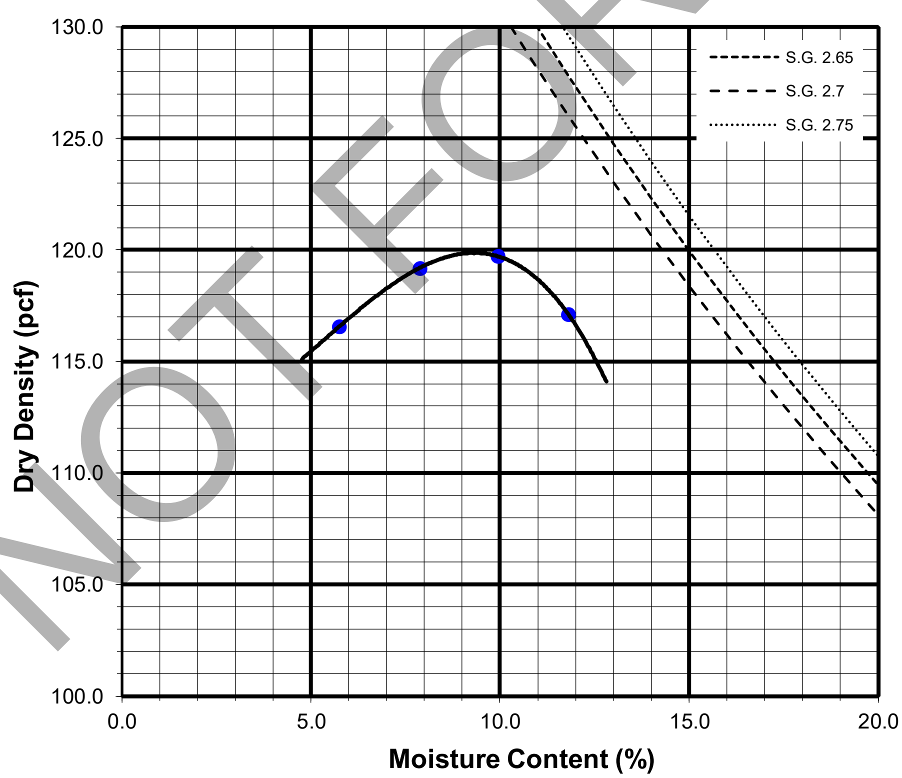
JUN. 2023

Sample No:

MIX B1+B2@0-5'	Silty Sand (SM), brown

TEST NO.		1	2	3	4	5	6
Wt. Compacted Soil + Mold	(g)	6144	6224	6270	6260		
Weight of Mold	(g)	4282	4282	4282	4282		
Net Weight of Soil	(g)	1862	1942	1988	1978		
Wet Weight of Soil + Cont.	(g)	2275.8	2339.4	2393.5	2389.9		
Dry Weight of Soil + Cont.	(g)	2174.3	2198.7	2214.0	2181.1		
Weight of Container	(g)	409.9	411.0	407.9	411.8		
Moisture Content	(%)	5.8	7.9	9.9	11.8		
Wet Density	(pcf)	123.3	128.6	131.6	131.0		
Dry Density	(pcf)	116.6	119.2	119.7	117.1		

Maximum Dry Density (pcf)	**120.5**	**Optimum Moisture Content (%)**	**9.0**



Preparation Method: A

GEOCON	**COMPACTION CHARACTERISTICS USING MODIFIED EFFORT TEST RESULTS** ASTM D-1557	Project No.: W1613-99-01 KESSLER PARK DREAM FIELD BLOOMINGTON RECREATION AND PARK DISTRICT SAN BERNARDINO, CALIFORNIA
	Checked by: JMH	JUN. 2023 Figure B14

SUMMARY OF LABORATORY
POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS
AASHTO T289 ASTM D4972 and AASHTO T288 ASTM G187

Sample No.	pH	Resistivity (ohm centimeters)
MIX B1+B2@0-5'	8.7	4400 (Moderately Corrosive)
MIX B3+B4@0-3'	8.1	11000 (Mildly Corrosive)

SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS
AASHTO T291 ASTM C1218

Sample No.	Chloride Ion Content (%)
MIX B1+B2@0-5'	0.006
MIX B3+B4@0-3'	0.007

SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS
AASHTO T290 ASTM C1580

Sample No.	Water Soluble Sulfate (% SO_4)	Sulfate Exposure
MIX B1+B2@0-5'	0.000	S0
MIX B3+B4@0-3'	0.001	S0

GEOCON

CORROSIVITY TEST RESULTS

Checked by: JMH

Project No.: W1613-99-01
KESSLER PARK DREAM FIELD
BLOOMINGTON RECREATION AND PARK DISTRICT
SAN BERNARDINO, CALIFORNIA

JUN. 2023 Figure B15