APPENDIX D
Geotechnical Investigation

June 23, 2022
Kleinfelder Project No. 20230661.001A

Mr. Jack Lac
NorthPoint Development
12977 North Outer 40 Road, Suite 203
St. Louis, Missouri 63141

SUBJECT: Feasibility-Level Geotechnical Investigation
DRAFT Antelope LAC 234
Lancaster Area of Los Angeles County, California

Dear Mr. Lac:

Kleinfelder is pleased to present this DRAFT report summarizing the feasibility-level geotechnical investigation performed for the subject site, located at the southeast corner of West Avenue F and 20th Street in the Lancaster area of Los Angeles County, California. Our conclusions and recommendations for geotechnical design and construction are presented in the attached report.

We appreciate the opportunity to provide geotechnical engineering services to you on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Sincerely,

KLEINFELDER, INC.

Hector Marquez, E.I.T.
Staff Professional II

Jeffery D. Waller, P.E., G.E.
Senior Geotechnical Engineer

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DRAFT FEASIBILITY-LEVEL GEOTECHNICAL INVESTIGATION
ANTELOPE LAC 234
LANCASTER AREA OF
LOS ANGELES COUNTY, CALIFORNIA

KLEINFELDER PROJECT NO. 20230661.001A

JUNE 23, 2022

DRAFT

A Report Prepared for:

Mr. Jack Lac
NorthPoint Development
12977 North Outer 40 Road, Suite 203
St. Louis, Missouri 63141

DRAFT FEASIBILITY-LEVEL GEOTECHNICAL INVESTIGATION
ANTELOPE LAC 234
LANCASTER AREA OF LOS ANGELES COUNTY, CALIFORNIA

Prepared by:

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1 INTRODUCTION

This draft report presents the results of our feasibility-level geotechnical investigation for the proposed improvements at the southeast corner of West Avenue F and 20th Street West in the Lancaster area of Los Angeles County, California. The general location of the site is shown on Figure 1, Site Vicinity Map.

The purpose of this feasibility-level geotechnical investigation was to evaluate the subsurface soil conditions at the site in order to provide geotechnical recommendations for the design and construction of the proposed development. The scope of our services was presented in our proposal dated April 22, 2022. This report only provides recommendations for the proposed improvements discussed below.

1.1 PROJECT DESCRIPTION

Based on our review of a conceptual site plan provided by NorthPoint Development, the site area is approximately 238 acres and the proposed improvements include the construction of three approximately 1,117,000 square foot buildings. The buildings are anticipated to be concrete tilt-up distribution-type buildings and have warehouse areas with loading-dock high slab-on-grade floors. The project also includes Best Management Practices (BMPs) stormwater detention basins at the site.

We anticipate cuts and fills on the order of approximately 10 feet may be needed to develop the site. We anticipate that the proposed buildings may be supported on conventional shallow spread foundations. Foundation loads are not currently available, but based on our experience with similar past projects, we assume that maximum column loading will be on the order of 80 kips and maximum wall loads will be on the order of 4 to 8 kips per linear foot. Floor loads for proposed distribution-type buildings may be on the order of 500 pounds per square foot.

We anticipate parking lot and drive aisles will consist of asphaltic concrete (AC) pavement and loading dock areas will consist of Portland cement concrete pavement (PCCP). Ancillary construction is anticipated to include concrete flat work, landscaping, and installation of buried utilities.

1.2 SCOPE OF SERVICES

The scope of our preliminary geotechnical study consisted of a literature review, historical aerial photo review, subsurface exploration, geotechnical laboratory testing, engineering evaluation and analysis, and preparation of this report. Our report includes a description of the work performed, a discussion of the geotechnical conditions observed at the site, and preliminary recommendations developed from our engineering analysis of field and laboratory data. A description of our scope of services performed for this project is presented below.

Task 1 – Background Data Review. We reviewed published and unpublished geologic literature in our files and the files of public agencies, including selected publications prepared by the California Geological Survey and the U.S. Geological Survey. We also reviewed readily available seismic and faulting information, including data for designated earthquake fault zones and our in-house database of faulting in the general site vicinity.

Task 2 – Field Exploration. The subsurface conditions at the site were explored by drilling and logging five (5) hollow-stem auger geotechnical borings (B-1 to B-5). The geotechnical borings were drilled to depths ranging from approximately 26½ to 51½ feet bgs. The locations of our borings are shown on the attached Figure 2, Exploration Location Map.

Prior to commencement of the fieldwork, our proposed exploration locations were cleared for known existing utility lines and with the participating utility companies through Underground Service Alert (USA). A Kleinfelder representative supervised the field operations and logged the borings. Selected bulk and drive samples were retrieved, sealed and transported to Kleinfelder's laboratory in Ontario, California for laboratory testing. Our typical sampling interval for the hollow stem auger borings was every 5 feet to full depths explored. The number of blows necessary to drive California-type samplers were recorded. A description of the field exploration and the logs of the borings, including a Legend to the Log of Borings, are presented in Appendix A.

Task 3 – Laboratory Testing. Laboratory testing was performed on representative samples of soil collected from our excavations to substantiate field classifications and to provide engineering parameters for geotechnical design. Laboratory testing included moisture determination and unit weight, grain size distribution, plasticity testing, direct shear, consolidation, modified Proctor, expansion index, collapse potential, and preliminary corrosion potential. A summary of the testing performed and the results for this subject site are presented in Appendix B.

Task 4 – Geotechnical Analyses. Field and laboratory data were analyzed in conjunction with the proposed site plan presented on Figure 2 and assumed structural loads to develop geotechnical recommendations for the design and construction of the proposed development. We evaluated potential foundation systems, lateral earth pressures, settlement, and earthwork considerations. Potential geologic hazards, such as ground shaking, liquefaction hazard, seismic settlement potential, flood hazard, and fault rupture hazard were also evaluated.

Task 5 – Report Preparation. This report summarizes the work performed, data acquired, and our findings, conclusions, and geotechnical recommendations for the design and construction of the proposed development. Recommendations for the following are presented in this report:

- Earthwork, including site preparation, excavation, site drainage, and the placement of engineered fill;
- Design of suitable foundation systems including allowable capacities, lateral resistance, and settlement estimates;
- Seismic design parameters;
- Floor slab and slab-on-grade support, including subgrade preparation;
- Lateral earth pressures for design of retaining walls;
- Design and construction of asphalt and Portland cement concrete pavements, including driveways, fire lanes, and concrete walks; and
- Preliminary infiltration correlations of the site soils for design of BMPs.

This report also contains reference maps and graphics, as well as the logs of the borings and laboratory test results.

2 SITE AND SUBSURFACE CONDITIONS

2.1 SITE DESCRIPTION

The site is located at the southeast corner of West Avenue F and 20th Street West in the Lancaster area of Los Angeles County, California. The total site area is approximately 238 acres and is currently vacant and appears to not have had any previous development. The site is generally bounded by similarly vacant and undeveloped land in all directions. Topographic survey has not yet been provided to Kleinfelder for the proposed project. However, based on our review of Google Earth imagery, the site appears to generally slope from the west towards the east, approximately 6 feet.

2.2 SUBSURFACE CONDITIONS

Subsurface materials observed during drilling are described below and detailed descriptions of subsurface materials are provided in our boring logs presented in Appendix A.

<u>Alluvium/Native Soils:</u>

The alluvium/native soils were observed in all of the borings drilled for this investigation and generally consisted of clayey to silty sand, poorly graded to well graded sand with varying amounts of silt, and lean clays with varying amounts of sand to the total depth explored of approximately 51½ feet bgs. In-situ moisture content ranged from 0.8 to 35.3 percent and dry unit weight ranged from 86.3 to 123.4 pounds per cubic foot (pcf). Generally, the apparent density of the subsurface soils was stiff to hard for fine-grained soils and loose to very dense for coarse-grained soils.

2.3 GROUNDWATER CONDITIONS

Groundwater was not encountered in our borings to the maximum depth explored of approximately 51½ feet bgs during our geotechnical investigation within the 238-acre site. The closest wells to the site are approximately 0.17 miles northwest of the site

(347497N1181674W001) with a ground surface elevation of 2311.8 feet above mean sea level (MSL) and approximately 0.18 miles west of the site (347422N1181696W001) with a ground surface elevation of 2313.8 feet above mean sea level (MSL). The shallowest depth to groundwater last measured was approximately 14 feet bgs on April 27,1951 in the northwest well and approximately 13 feet on March 3, 1952 in the west well, (CDWR, 2022). Current depth to ground water is estimated to be greater than 50 feet bgs based on borings drilled on site and reported depth to groundwater for monitoring wells located approximately 1.8 miles east of the site (Geotracker, 2022).

Fluctuations of localized zones of perched water and rise in soil moisture content should be anticipated during the rainy season. Irrigation of landscaped areas may also lead to an increase in soil moisture content and fluctuations of intermittent shallow perched groundwater levels.

3 GEOLOGIC CONDITIONS

3.1 REGIONAL GEOLOGY

The subject site is located within the western portion of the Mojave Desert geomorphic province of California (Norris and Webb, 1990).

The Mojave Desert is approximately 25,000 square miles of desert situated in southeastern California. The area is enclosed on the southwest by the San Andreas fault and the Transverse Ranges and on the north and northeast by the Garlock fault, the Tehachapi Mountains and the Basin and Range. The Nevada state line and Colorado River form the arbitrary eastern boundary. The San Bernardino-Riverside county line designates the southern boundary.

The region is dominated by broad alluviated basins that are mostly aggrading sources receiving nonmarine deposits from the adjacent uplands. The highest general elevations of the Mojave Desert approach 4,000 feet above mean sea level (MSL) with most of the valleys between 2,000 and 4,000 feet MSL.

3.2 SITE GEOLOGY

The western approximately 2/3rd of site is underlain by Holocene alluvial fan deposits and the eastern approximately 1/3rd is underlain by Holocene alluvium fluvial deposits within the Armagosa Creek drainage (CGS, 2010).

3.3 GEOLOGIC HAZARDS

We have addressed below the potential geologic hazards for the site.

3.3.1 Active and Potentially Active Fault Search

Earthquakes and faulting occur as the tectonic plates, which comprise the Earth's crust, or lithosphere, move relative to one-another. Faults identified by the State as being active are not known to be present at the surface within the project limits. No portion of the site is located within a State of California-Special Studies Zone, formerly Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007). The closest zoned fault to the site is the San Andreas fault zone located approximately 10.8 miles southwest of the site (USGS, 1999). Because of the distance to known active faults, the lack of surficial evidence of fault breaks expressed in air photos or published geologic maps, the risk of surface rupture resulting from faulting is considered low.

3.3.2 Flooding

Surface water flow at the site is generally via sheet flow in a northeasterly direction toward the Armagosa creek drainage.

The western approximately 1/3rd of the site is within a flood hazard zone “X” according to FEMA (2008), where the flood hazard is “determined to be outside the 0.2% annual chance floodplain”. The eastern approximately 2/3rd of the site is within a flood hazard zone “AO” according to FEMA (2008), where the flood hazard is a “Special Flood Hazard Area subject to Inundation by the 1% Annual chance Flood”. Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths 1 foot.

A seiche is a wave or sloshing of a body of water that is at least partially impounded caused by strong wind or seismic shaking. The site is not downstream of large bodies of water or tanks which potentially could causes flooding and inundate the project site. The risk of seiche damage following a seismic event at the site is considered low.

3.3.3 Landslides

Landslides and other forms of mass wasting, including mud flows, debris flows, soil slips, and rock falls occur as soil or rock moves down slope under the influence of gravity. Landslides are frequently triggered by intense rainfall or seismic shaking. The site is not located within a State or county designated landslide hazard zone. The site is relatively flat and the risk at the site from landslides and other forms of mass wasting is considered very low.

3.3.4 Liquefaction and Seismic Settlement

Liquefaction occurs when saturated, loose, coarse-grained or silty soils are subjected to strong shaking resulting from earthquake motions. The coarse-grained or silty soils typically lose a portion or all of their shear strength and regain strength sometime after the shaking stops. Soil movements (both vertical and lateral) have been observed under these conditions due to consolidation of the liquefied soils.

The site is located within a mapped generalized liquefaction potential zone (CGS, 2005). We have performed a liquefaction analysis to assess the seismically induced settlement potential. The results of our liquefaction analysis are summarized in Section 4.2.2.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on the results of our field exploration, laboratory testing and geotechnical analyses conducted during this study, it is our professional opinion that the proposed project is geotechnically feasible, provided the recommendations presented in this report are incorporated into the project design and construction.

The following preliminary opinions, conclusions, and recommendations are based on the properties of the materials encountered in the explorations, the results of our literature review, the results of the laboratory testing program, and our engineering analyses performed. Our recommendations regarding the geotechnical aspects of the design and construction of the project are presented in the following sections. We recommend that the final grading plans be reviewed by Kleinfelder prior to the start of construction.

4.2 SEISMIC DESIGN CONSIDERATIONS

4.2.1 Seismic Design Parameters

According to ACSE/SEI 7-16 (2016), which is incorporated into the 2019 California Building Code (CBC) by reference, sites subject to liquefaction, as discussed below, should be classified as Site Class F, which requires a site response analysis. However, ACSE/SEI 7-16 states that for a short period (less than ½ second) structure on liquefiable soils, Site Class D or E may be used instead of Site Class F to estimate design seismic loading on the structure. The selection of Site Class D or E is based on the assessment of the site soil profile assuming no liquefaction. We have assumed that the period of the structures will be less than ½ second. The assumption that the structures have a period of less than ½ second should be verified by the project structural engineer.

Based on data obtained from our field explorations, published geologic literature and maps, and on our interpretation of the 2019 CBC criteria, it is our opinion that the project site may be classified as Site Class D, Stiff Soil, according to Section 1613 of 2019 CBC and Table 20.3-1 of ASCE/SEI 7-16 (2016). Approximate coordinates for the site are noted below.

- Latitude: 34.7445°N
- Longitude: 118.1598°W

The Risk-Targeted Maximum Considered Earthquake (MCER) mapped spectral accelerations for 0.2 seconds and 1 second periods (S_s and S_1) were estimated using Section 1613 of the 2019 CBC and the OSHPD seismic design maps web-based application (available at https://seismicmaps.org/). In accordance with Section 11.4.8 of ASCE 7-16, a site-specific ground motion analysis is required for Site Class D sites with an S1 greater than 0.2 g. However, a site-specific ground motion analysis is not required if the seismic response coefficient (Cs) is determined in accordance with requirements of Chapter 12 and exceptions as noted in Section 11.4.8. We have assumed that Cs will be determined in accordance with the requirements of Chapter 12 and exceptions as noted in Section 11.4.8. This assumption should also be verified by the project structural engineer. The 2019 CBC Seismic Design Parameters (non site-specific) for these structures are summarized in Table 1.

Table 1
2019 CBC Seismic Design Parameters

Design Parameter	Recommended Value
Site Class	D
S_s (g)	1.369
S_1 (g)	0.556
F_a	1.0
F_v	N/A*
S_{MS} (g)	1.369
S_{M1} (g)	N/A
S_{DS} (g)	0.912
S_{D1} (g)	N/A
PGA_M (g)	0.550

*Section 11.4.8 of ASCE 7-16 requires a site-specific ground motion hazard analysis be performed for Site Class D sites with S_1 values greater than or equal to 0.2g unless exceptions are taken. If exceptions are taken, then a F_v value of 1.74 could be used only to calculate the T_s value.

4.2.2 Liquefaction and Seismic Settlement

To assess the potential for liquefaction of subsurface soils at the site, we used the liquefaction analysis procedures outlined in Youd et al. (2001) based on standard penetration test (SPT) data. For estimating the resulting ground settlements, we used the methods proposed by Tokimatsu and Seed (1987). These methods utilize corrected SPT blow counts to estimate the amount of volumetric compaction or settlement during an earthquake.

Groundwater was not encountered during our current field exploration drilled to a maximum explored depth of 51½ feet bgs. Based on our groundwater research discussed in Section 2.3, a design groundwater depth of 13 feet was used in our analyses based on the historic high groundwater level. The historic high groundwater level may be further investigated since the current depth is much lower than the historic high.

As recommended in Section 1803.5.12 of 2019 CBC, the peak ground acceleration (PGA) used in the liquefaction analysis was estimated in accordance with Section 11.8.3 of ASCE 7-16. A PGAM of 0.55g with an earthquake magnitude of 8.1 was used as the design-level seismic event in our liquefaction analysis, which is defined as an earthquake event with 2 percent probability of being exceeded in 50 years (return period of about 2,475 years) according to the 2019 CBC and ASCE/SEI 7-16.

We evaluated the liquefaction potential at the site using the SPT data. Based on the SPT data and our engineering analyses, it is our opinion that layers of sands and silty sands at depths approximately 35 to 50 feet bgs (below the design groundwater depth) may be subject to liquefaction in the event of a major earthquake occurring on a nearby fault. Based on our analyses, the calculated total liquefaction-induced settlement is on the order of less than 1 inch. Differential liquefaction-induced settlement may be estimated as ½ of the total seismically-induced settlement over a distance of about 30 feet

4.3 FOUNDATIONS

4.3.1 General

Based on the results of our field exploration, laboratory testing, and geotechnical analyses, the proposed improvements may be supported on conventional shallow foundations on a zone of compacted fill provided the settlement estimates (both static and seismic) are tolerable. We have assumed that the proposed structures will be able to tolerate the estimated seismic settlement (i.e., it will not collapse creating a life safety issue). However, this assumption should be verified by the project structural engineer. It should be noted that the design intent of the 2019 California Building Code (CBC) during a design-level seismic event is life safety, not serviceability of the structure after an earthquake.

4.3.2 Allowable Bearing Pressure

Footings supported on at least 3 feet of compacted fill may be designed for a net allowable bearing pressure of 2,500 psf for dead plus sustained live loads. A one-third increase in the bearing value can be used for wind or seismic loads. All footings should be established at a depth of at least 24 inches below the lowest adjacent grade. The footing dimension and reinforcement should be designed by the structural engineer; however, continuous and isolated spread footings should have minimum widths of 18 and 24 inches, respectively.

4.3.3 Estimated Settlements

Total static settlement for foundations designed in accordance with the recommendations presented herein is estimated to be less than 1 inch. Differential static settlement between similarly loaded columns is estimated to be less than ½ inch over 40 to 70 feet. Note that this settlement is in addition to the estimated settlement due to seismic shaking.

4.3.4 Lateral Resistance

Resistance to lateral loads (including those due to wind or seismic forces) may be provided by frictional resistance between the bottom of concrete foundations and the underlying soils and by passive soil pressure against the sides of the foundations. A coefficient of friction of 0.3 may be used between cast-in-place concrete foundations and the underlying soil. The passive pressure available for engineered fill may be taken as equivalent to the pressure developed by a fluid with a unit weight of 300 pounds per cubic foot (pcf). A one-third increase in the passive resistance may be used for resistance to transient loads such as wind and seismic. The upper one foot of soil should be neglected when calculating passive resistance.

The lateral resistance parameters provided above are ultimate values. Therefore, a suitable factor of safety should be applied to these values for design purposes. The appropriate factor of safety will depend on the design condition and should be determined by the project Structural Engineer. Depending on the application, typical factors of safety could range from 1.5 to 2.0.

4.4 EARTHWORK

4.4.1 General

Recommendations for site preparation are presented below. All site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local, state or federal specifications. All references to maximum unit weights are established in accordance with the latest version of ASTM Standard Test Method D1557.

Grading operations during the wet season or in areas where the soils are saturated may require provisions for drying of soils prior to compaction. If the project necessitates fill placement and compaction in wet conditions, we can provide suggested alternative recommendations for drying the soil. Conversely, additional moisture may be required during the dry months. A sufficient water source should be available to provide adequate water during compaction. During dry months, moisture conditioning of the subgrade soils may be required if left exposed for greater than a few days.

4.4.2 Site Preparation

Prior to general site grading, existing vegetation, debris, and oversized materials (greater than 6 inches in maximum dimension) should be stripped and disposed outside the construction limits. We estimate the depth of stripping to be approximately 6 inches over most portions of the site. Deeper stripping or grubbing may be required where higher concentrations of vegetation are encountered during site grading. Stripped topsoil (less any debris) may be stockpiled and reused for landscaping purposes; however, this material should be evaluated for suitability if it is desired to use this material for engineered fill below structures.

All oversize and organic debris, including any produced by demolition operations, (wood, steel, piping, plastics, etc.), should be separated and disposed offsite. The material generated during demolition of the existing roadways and concrete structures may be reused onsite. If reused, the particles should be crushed to a maximum particle size of 6 inches and spread across the site to prevent nesting.

Existing utility pipelines (if encountered) which extend beyond the limits of the proposed construction and are to be abandoned in place should be plugged with cement grout to prevent migration of soil and/or water. Demolition, disposal, and grading operations should be observed and tested by a representative from our office.

4.4.3 Overexcavation

Recommendations for overexcavation of the proposed building pads (building foundations and floor slabs) and parking lots (pavements) are presented below. All site preparation and earthwork operations should be performed in accordance with applicable codes, safety regulations and other local, state, or federal specifications. All references to maximum unit weights are established in accordance with the latest version of ASTM Standard Test Method D1557.

Excavations within a 1:1 (horizontal: vertical) plane extending downward from a horizontal distance of 2 feet beyond the bottom outer edge of existing improvements (e.g. building foundations) or property lines should not be attempted without bracing and/or underpinning. All applicable excavation safety requirement and regulations, including OSHA requirements should be met.

4.4.3.1 Structural Areas

In order to provide uniform support for the proposed spread foundations and slab-on-grade floors, we recommend the site soils be overexcavated and replaced as engineered fill to a minimum depth of 3 feet from existing grade and at least 3 feet below the bottom of footings, whichever is greater. Building pads located in cut/fill transition areas should be overexcavated a minimum of 3 feet below the proposed bottom of footings/slabs. Although not encountered in our borings, any existing undocumented artificial fill soils should be removed until native alluvium is exposed. The overexcavation should extend horizontally at least 5 feet beyond the edges of foundations and a distance equivalent to the thickness of anticipated fill below the footing, whichever is greater. Depending on the observed condition of the existing soil and engineered fill, deeper overexcavation may be required in some areas. The Geotechnical Engineer of Record should be notified for supplemental recommendations if the minimum relative compaction of the soil is not achieved.

4.4.3.2 Non-structural Areas

Within the non-structural areas, such as truck aprons, pavements, sidewalks, other flatwork, etc., we recommend that these items be underlain by at least 24 inches of engineered fill. The overexcavation should extend beyond the proposed improvements a horizontal distance of at least two feet.

4.4.3.3 Additional Overexcavation Considerations

After site preparation and overexcavation, and prior to scarification or placement of compacted fills, the excavation bottom should be observed, evaluated, and approved by Kleinfelder. Additional removals may be needed if significant porosity or other adverse conditions are observed. The subgrade should then be scarified to a depth of approximately 12 inches, moisture conditioned to at least optimum moisture content; and recompacted. After compaction, the subgrade should be proof rolled using equipment with sufficient weight to evaluate surface deflection. Proof rolling should be performed to verify that the subgrade soils are firm and unyielding at the depth of the recommended overexcavation presented above.

4.4.4 Engineered Fill

We anticipate that most of the on-site soils may be reusable as engineered fill once any debris and oversized materials greater than 4 inches in diameter have been removed, and after any vegetation and organic debris is cleared. Engineered fill should contain less than 2 percent organic content and maximum material size should be less than 4 inches in maximum dimension. Disturbed/tilled soil, less vegetation, may be used in landscape areas, exported, or placed in a controlled manner and blended with the onsite soils, provided that the resulting engineered fill contains less than 2 percent organic content.

Fill should be placed in lifts no greater than 8 inches thick, loose measurement, and should be compacted to at least 90 percent of the maximum dry density. The moisture content of the on-site soils should be at or above the optimum moisture at the time of compaction.

Engineered fill placed below pavement should be compacted to at least 90 percent of the maximum dry density obtained by the ASTM D1557 method of compaction, with the upper 12 inches below pavements compacted to at least 95 percent relative compaction.

Although not anticipated, any imported fill materials to be used for engineered fill should be sampled and tested for approval by the geotechnical engineer prior to being transported to the site. The expansion index of an imported soil should be less than 20. In general, well-graded mixtures of gravel, sand and non-plastic silt are acceptable for use as import fill. A minimum notice of 3 working days will be required to allow for qualification testing prior to compaction of imported materials.

4.4.5 Temporary Excavations

All excavations must comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the information below solely as a service to our client. Under no circumstances should the information provided be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

Excavations within a 1:1 plane extending downward from a horizontal distance of 2 feet beyond the bottom outer edge of existing improvements (e.g. building foundations) should not be attempted without bracing and/or underpinning the improvements. The geotechnical engineer or their field representative should observe the excavations so that modifications can be made to the excavations, as necessary, based on variations in the encountered soil conditions. All applicable excavation safety requirements and regulations, including OSHA requirements, should be met.

Near-surface soils encountered during our field investigation consisted predominantly of sandy silt, silty sand and sands with varying amounts of gravel and cobble. In our opinion, these soils would be considered a Type 'C' soil with regard to the OSHA regulations. For this soil type, OSHA requires a maximum slope inclination of 1.5:1 (horizontal to vertical) or flatter for excavations 20 feet or less in depth. Temporary, shallow excavations with vertical side slopes less than 4 feet high should generally be stable, although sloughing may be encountered. Vertical excavations greater than 4 feet high should not be attempted without appropriate shoring to prevent local instability. All trench excavations should be braced and shored in accordance with good construction practice and all applicable safety ordinances and codes. The contractor should be responsible for the structural design and safety of the temporary shoring system, and we recommend that this design be submitted to Kleinfelder for review to check that our recommendations have been incorporated.

Stockpiled (excavated) materials should be placed no closer to the edge of an excavation than a distance equal to the depth of the excavation, but no closer than 4 feet. All trench excavations should be made in accordance with OSHA requirements.

4.4.6 Excavation Conditions

The borings were advanced using a truck-mounted or track-mounted hollow-stem auger drill rig. Drilling excavations were completed with easy to moderate effort through the existing site soils. Conventional earth moving equipment should be capable of performing the soil excavations.

4.4.7 Pipe Bedding and Trench Backfill

Pipe bedding and pipe zone material should consist of sand or similar granular material having a minimum sand equivalent value of 30. Onsite soils may be suitable, but should be tested and approved by the engineer of record prior to use. The sand should be placed in a zone that extends a minimum of 6 inches below and 6 inches above the pipe for the full trench width. The bedding material should be compacted to a minimum of 90 percent of the maximum dry density or to the satisfaction of the geotechnical engineer's representative observing the compaction of the bedding material. Bedding material should consist of sand, gravel, crushed aggregate, or native free-draining granular material with a maximum particle size of ¾ inch. Bedding materials should also conform to the pipe manufacturer's specifications, if available. Trench backfill above bedding and pipe zone materials may consist of approved, on-site or import soils placed in lifts no greater than 8 inches loose thickness and compacted to 90 percent of the maximum dry density based on ASTM Test Method D1557. Jetting of backfill is not recommended. The on-site soils are suitable for backfill of utility trenches from one foot above the top of the pipe to the surface provided the material is free of organic and deleterious substances.

4.5 CONCRETE SLABS SUPPORTED ON GRADE

4.5.1 General

Slab-on-grade floors should be underlain by engineered fill as discussed in the Earthwork Section of this report. We anticipate that the planned floor slabs will have a minimum thickness of 6 inches, will be unreinforced and dowelled at panel edges. Minimum reinforcement for floor slabs, if required, should be determined by the structural engineer. The structural engineer should design the slabs for any specific loading conditions. A modulus of subgrade reaction of 100 pounds per cubic inch may be used for design. The moisture content of the upper 18 inches of engineered fill should be at the recommended range for fill compaction at the time the floor slab is constructed. Precautions should be taken so as not to allow the upper engineered fill below the slab to dry out below the recommended moisture range between completion of the building pad and construction of the floor slab. Total static settlement for foundations designed in accordance with the recommendations presented herein, with an anticipated maximum load of 500 psf, is estimated to be less than a 1 inch.

Construction activities and exposure to the environment can cause deterioration of the prepared subgrade. We recommend that a Kleinfelder representative inspect the final subgrade conditions prior to placement of the concrete, and if necessary, perform additional moisture and density testing to determine the subgrade suitability. A low slump concrete should be used to reduce possible curling of the slab.

4.5.2 Exterior Flatwork

Where exterior flatwork, such as sidewalks, are to be constructed, the subgrade should be scarified to a depth of 8 inches and moisture conditioned to a moisture content above the optimum moisture content, and recompacted as recommended in the Earthwork Section of this report. Exterior, structurally loaded flatwork, such as truck docks or trash enclosures should adhere to the recommendations for rigid pavement presented in this report.

4.5.3 Vapor Retarder

Subsurface moisture and moisture vapor naturally migrate upward through the soil and, where the soil is covered by a building or pavement, this subsurface moisture will collect. To reduce the impact of this subsurface moisture and the potential impact of future introduced moisture (such as landscape irrigation or precipitation) on moisture sensitive flooring, the current industry standard is to place a vapor retarder on a compacted crushed rock layer and/or sand layers, 1 to 2 inches in thickness, placed above and below the vapor retarder. The crushed rock layer and/or sand layer may be omitted in accordance with the vapor barrier manufacturer's installation recommendations.

The necessity and placement of a vapor retarder should be evaluated by the structural engineer and/or flooring consultant. It should be noted that although vapor barrier systems are currently the industry standard, this system might not be completely effective in preventing floor slab moisture problems. These systems typically will not necessarily assure that floor slab moisture transmission rates will meet floor covering manufacturer standards and that indoor humidity levels be appropriate to inhibit mold growth. The design and construction of such systems are totally dependent on the proposed use and design of the proposed building and all elements of building design and function should be considered in the slab-on-grade floor design. Building design and construction may have a greater role in perceived moisture problems since sealed buildings/rooms or inadequate ventilation may produce excessive moisture in a building and affect indoor air quality.

4.5.4 Concrete Curing and Flooring

Various factors such as surface grades, adjacent planters, the quality of slab concrete and the permeability of the on-site soils affect slab moisture and can control future performance. In many cases, floor moisture problems are the result of either improper curing of floor slabs or improper application of flooring adhesives. We recommend contacting a flooring consultant experienced in the area of concrete slab-on-grade floors for specific recommendations regarding your proposed flooring applications. Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking or curling of the slabs. High water-cement ratio and/or improper curing also greatly increase the water vapor permeability of concrete. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute (ACI) Manual.

It is emphasized that we are not floor moisture-proofing experts. We make no guarantee, nor provide any assurance that use of the capillary break/vapor retarder system will reduce concrete slab-on-grade floor moisture penetration to any specific rate or level, particularly those required by floor covering manufacturers. The builder and designers should consider all available measures for slab moisture protection.

4.6 RETAINING WALLS

We have provided preliminary cantilever retaining wall recommendations below. Further evaluation will be needed once wall types, locations and heights are selected.

4.6.1 General

Design earth pressures for retaining walls depend primarily on the allowable wall movement, wall inclination, type of backfill materials, backfill slopes, surcharges, and drainage. The earth pressures provided assume that that a non-expansive granular backfill will be used and a drainage system will be installed behind the walls, so that external water pressure will not develop. If a drainage system will not be installed, the wall should be designed to resist hydrostatic pressure in addition to the earth pressure as well as reinforcement that should be protected from rust or other corrosion-inducing effects of moisture. Determination of whether the active or at-rest condition is appropriate for design will depend on the flexibility of the walls. Walls that are free to rotate at least 0.002 radians (deflection at the top of the wall of at least 0.002 x H, where H is the unbalanced wall height) may be designed for the active condition. Walls that are not capable of this movement should be assumed rigid and designed for the at-rest condition. The recommended active and at-rest earth pressure values are provided in Table 2, Earth Pressures for Retaining Walls.

Table 2
Earth Pressures for Retaining Walls
(Non-Expansive Backfill)

Wall Movement	Backfill Condition	Equivalent Fluid Pressure (pcf)	Seismic Increment * (pcf)
Free to Deflect (active condition)	Level	45	16
Restrained (at-rest condition)		65	N/A **

*Note: * Walls supporting more than 6 feet of backfill should be designed to support an incremental seismic lateral pressure, which is applied as a triangular pressure distribution with a maximum pressure at the bottom of the wall, not inverted.*

*** for restrained wall, use the static active earth pressure and seismic increment to check the seismic condition; use at-rest earth pressure only to check the static condition; the larger loading of both cases should be used for the design of restrained wall.*

In addition to the above lateral pressure, undrained walls will have to be designed for full hydrostatic pressure. The above lateral earth pressures do not include the effects of surcharges (e.g., traffic, footings), compaction, or truck-induced wall pressures. Any surcharge (live, including traffic, or dead load) located within a 1:1 plane drawn upward from the base of the excavation should be added to the lateral earth pressures. The lateral contribution of a uniform surcharge load located immediately behind walls may be calculated by multiplying the surcharge by 0.36 for cantilevered walls and 0.53 for restrained walls. Walls adjacent to areas subject to vehicular traffic should be designed for a 2-foot equivalent soil surcharge (250 psf). Lateral load contributions from other surcharges located behind walls may be provided once the load configurations and layouts are known.

4.6.2 Backfill Compaction

Care must be taken during the compaction operation not to overstress the wall. Wall backfill should be compacted to a least 90 percent relative compaction; however, heavy construction equipment should be maintained a distance of at least 3 feet away from the walls while the backfill soils are being placed. Kleinfelder should be contacted when development plans are finalized for review of wall and backfill conditions on a case-by-case basis.

4.6.3 Drainage

Walls should be properly drained or designed to resist hydrostatic pressures. Adequate drainage is essential to provide a free-draining backfill condition and to limit hydrostatic buildup behind the wall. Walls should also be appropriately waterproofed and include weep holes for drainage. In lieu of weep holes, a 4-inch diameter perforated PVC pipe, placed perforations down leading to a suitable gravity outlet, should be installed at the base of the walls. Another drainage alternative could be a manufactured prefabricated drainage composite panel such as Miradrain G100N or equivalent at regular intervals along the wall.

4.7 DRAINAGE AND LANDSCAPING

It is important that positive surface drainage be provided to prevent ponding and/or saturation of the soils in the vicinity of foundations, concrete slabs-on-grade, or pavements. We recommend that the site be graded to carry surface water away from the improvements and that positive measures be implemented to carry away roof runoff. Poor perimeter or surface drainage could allow migration of water beneath the building or pavement areas, which may result in distress to project improvements. If planted areas adjacent to structures are desired, we suggest that care be taken not to over irrigate and to maintain a leak-free sprinkler piping system. In addition, it is recommended that planter areas next to buildings have a minimum of 5 percent positive fall away from building perimeters to a distance of at least 5 feet. Drain spouts should be extended to discharge a minimum of 5 feet from the building, or some other method should be utilized to prevent water from accumulating in planters. Landscaping after construction should not promote ponding of water adjacent to structures.

4.8 EXPANSION POTENTIAL

Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors and may result in unacceptable settlement or heave of structures or concrete slabs supported on grade. Expansion index testing of surficial soils resulted in a value of 5, which indicates a very low expansion potential.

4.9 HYDRO-COLLAPSE POTENTIAL

Hydro-collapsible soils are characterized by their ability to undergo significant shrinkage (collapse) during inundation. Inundation in soils can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors, and may result in unacceptable settlement of structures or concrete slabs supported on grade. Based on the results of laboratory testing, the collapse potential of the surficial soils is approximately 1.3 percent collapse under inundation. Collapse potential less than 2 percent is considered low.

4.10 PRELIMINARY SOIL CORROSIVITY

The soil corrosivity potential of the on-site materials to steel and buried concrete was preliminarily evaluated using a sample collected during our investigation. Testing was performed in general accordance with California Test Methods 643, 417, and 422 for pH and resistivity, soluble chlorides, and soluble sulfates, respectively. The test results are presented in Table 3, Preliminary Corrosivity Test Results.

Table 3
Preliminary Corrosivity Test Results

Boring	Depth (ft)	pH	Sulfate (ppm)	Chloride (ppm)	Resistivity (ohm-cm)
B-3	0 – 5	8.2	2,468	3,872	118

These tests are only an indicator of soil corrosivity for the samples tested. Other soils found on site may be more, less, or of a similar corrosive nature. Imported fill materials should be tested to confirm that their corrosion potential is not more severe than those noted.

Resistivity values below 1,000 ohm-cm are considered extremely corrosive to buried ferrous metals (Roberge, 2006).

The concentrations of soluble sulfates indicate that the subsurface soils represent a Class S2 exposure to sulfate attack on concrete in contact with the soil based on ACI 318-14 Table 19.3.1.1 (ACI, 2014). Therefore, in accordance with ACI Building Code 318-14, a concrete mix of Type V cement with a minimum compressive strength of 4,500 psi and maximum water-cement ratio of 0.45 are specified for these sulfate concentrations.

Kleinfelder's scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included. A qualified corrosion engineer should be retained to review the test results for further evaluation and design protective systems, if considered necessary.

4.11 PAVEMENT SECTIONS

4.11.1 Asphalt-Concrete Pavement Sections

The required pavement structural sections will depend on the expected wheel loads, volume of traffic, and subgrade soils. The Traffic Indexes (TI's) assumed should be reviewed by the project Owner, Architect, and/or Civil Engineer to evaluate their suitability for this project. Changes in the TI's will affect the corresponding pavement section. The pavement subgrade should be prepared just prior to placement of the base course. Positive drainage of the paved areas should be provided since moisture infiltration into the subgrade may decrease the life of pavements. Table 4, Preliminary Asphalt Concrete Pavement Sections, presents our recommendations of asphalt concrete pavement sections.

Table 4
Preliminary Asphalt Concrete Pavement Sections
(Assumed Design R-value = 40)

Traffic Use	Assumed Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
General Parking Traffic	5	3.0	4.0
Heavy Truck Access Ways	7	4.0	7.0

Based on the size of the project area and the variation of near surface soil type, an assumed design R-Value of 40 was selected for pavement design. Additional R-Value testing and analysis should be performed to evaluate the site further during the final geotechnical design. Since the characteristics of the near-surface soils can change as a result of grading, we recommend that the subgrade soils be tested for pavement support characteristics, to confirm the parameters used in design and allow for a possible reduction in structural section thickness. Pavement sections provided above are contingent on the following recommendations being implemented during construction.

- The pavement sections recommended above should be placed on at least 18 inches of engineered fill compacted to at least 90 percent of maximum dry density with the upper 12 inches below pavements compacted to at least 95 percent relative compaction. The overexcavation of the pavement areas should be conducted as recommended in the earthwork section of this report. Prior to fill placement, the exposed subgrade should be scarified to a depth of 8 inches, uniformly moisture conditioned to the moisture content of granular soils (sands, silty sands and gravels) should be near the optimum moisture content at the time of compaction.
- Subgrade soils should be in a stable, non-pumping condition at the time aggregate base materials are placed and compacted.
- Aggregate base materials should be compacted to at least 95 percent relative compaction.
- Adequate drainage (both surface and subsurface) should be provided such that the subgrade soils and aggregate base materials are not allowed to become wet.
- Aggregate base materials should meet current Caltrans specifications for Class 2 aggregate base rock, or crushed miscellaneous base as specified in the "Standard Specifications for Public Work Construction" ("Greenbook").

- The asphalt pavement should be placed in accordance with "Green Book" specifications or the County of Los Angeles requirements, as appropriate. We recommend that the asphalt pavement be placed in a single layer of ½-inch aggregate mix for pavements 4 inches thick or less. If the pavement section is over 4 inches thick, then the asphalt should be placed in at least two layers of mix. The first layer should consist of a base or coarse layer (3/4-inch mix). The second layer (i.e., top layer) should consist of a medium or fine layer of ½-inch mix.
- Based on our analyses and our experience with similar projects, it is our professional opinion that the as-built asphalt pavement sections should have a tolerance of +/- ¼-inch in order to remain valid for satisfying the intent of the recommendations presented herein. Typically, the loose thickness should be ¼ inch per inch greater than the required compacted thickness. In addition to loose measurements prior to compaction, this is typically evaluated by averaging the thickness of several cores in a specific area. Individual measurements (loose thickness or core dimension) should be within at least ¾-inch of the design thickness.
- All concrete curbs separating pavement and landscaped areas should extend into the subgrade and below the bottom of adjacent, aggregate base materials.

Pavement sections provided above are based on the soil conditions encountered during our field investigation, our assumptions regarding final site grades, and limited laboratory testing. Since the actual pavement subgrade materials exposed during grading may be significantly different than those tested for this study, we recommend that representative subgrade samples be obtained and additional R-value tests performed. Should the results of these tests indicate a significant difference, the design pavement section(s) provided above may need to be revised.

4.11.2 Portland Cement Concrete Pavement

Concrete pavements may be desirable in loading dock and trash collection areas. The concrete pavement should have a minimum 28-day compressive strength of 3,000 psi. Control joints should be spaced approximately every 10 feet. The concrete pavement section should be placed on at least 18 inches of engineered fill compacted to at least 90 percent of the maximum dry density. Prior to fill placement, the exposed subgrade should be scarified to a depth of 8 inches, uniformly moisture conditioned to the moisture content range recommended in

Section 4.4 of this report. Table 5, Preliminary Recommended PCC Pavement Sections, presents our recommendations of Portland Cement Concrete pavement sections.

Table 5
Preliminary Recommended PCC Pavement Sections

Assumed Traffic Index (TI)	Concrete Thickness (inches; using a 28-day compressive strength of 3,000 psi)	Concrete Thickness (inches; using a 28-day compressive strength of 4,000 psi)
5	7.0	6.5
7	7.5	7.0

As an alternative to placing PCC pavements directly over 18 inches of engineered fill, 6 inches of aggregate base material may be added between the PCC and engineered fill to provide additional load distribution, drainage, and an option to reduce the thickness of the recommended PCC. If 6 inches of aggregate base material (compacted to 95% relative compaction) is used between the recommended 18 inches of engineered fill and PCC pavement, the recommended PCC thickness may be reduced by ½ inch. Aggregate base materials should meet current Caltrans specifications for Class 2 aggregate base, or crushed miscellaneous base as specified in the "Standard Specifications for Public Work Construction" ("Greenbook").

4.12 STORMWATER MANAGEMENT

We have preliminarily assessed the potential for storm water infiltration into the subgrade soils at the subject project site based on visual soil classification and laboratory testing of the soil samples collected during the field exploration. The onsite near-surface soils consist primarily of medium dense to dense clayey to silty sands. Based on these conditions, we anticipate a generally low infiltration capacity of the near-surface soils, and we preliminarily recommend alternatives to infiltration Best Management Practices (BMPs), such as bio-filtration/bio-retention systems (bio-swales and planter boxes), be implemented at the project site at these elevations. However, sand and sand with silt were observed in the upper 15 feet in limited layers in Borings B-1, B-2, and B-5. In-situ infiltration testing should be performed to confirm this preliminary assessment and determine design infiltration rates at the BMP design depth at specific locations at the site.

If bio-filtration/bio-retention systems are employed, we recommend that the BMPs be built such that water exiting from them will not seep into the foundation areas or beneath slabs and pavement. If planters are located within 10 feet of structures or foundations, or adjacent to slabs and pavements, then some means of diverting water away from the structures, foundation soils, or soils that support slabs and pavements would be required, such as lining the planters.

5 ADDITIONAL SERVICES

5.1 DESIGN LEVEL INVESTIGATION

This report presents preliminary geotechnical recommendations to develop a conceptual design and provide planning-level cost estimating. This study is not intended to be a design-level geotechnical study, and additional field and laboratory testing will be required in order to provide detailed geotechnical recommendations.

The preliminary recommendations provided in this report are based on our understanding of the described project information and on our interpretation of the data. We have made our recommendations based on experience with similar subsurface conditions under similar loading conditions. The recommendations apply to the specific project discussed in this report; therefore, any change in the structure configuration, loads, location, or the site grades should be provided to us so that we can review our conclusions and recommendations and make any necessary modifications.

6 LIMITATIONS

This report has been prepared for the exclusive use of NorthPoint Development, and its consultants and contractors for specific application to the proposed improvements for the proposed project. The findings, conclusions and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of our profession practicing under similar conditions in the geographic vicinity and at the time the services will be performed. No warranty or guarantee, express or implied, is made. Our field exploration program for the geotechnical study of this project was based on the approximate building locations provided to us by the client.

The client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. This report contains information that may be useful in the preparation of contract specifications. However, this report is not designed as a specification document and may not contain sufficient information for this use without proper modification.

This report may be used only by the client and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party, other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of this report and the nature of the new project, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and the client agrees to defend, indemnify, and hold harmless Kleinfelder from any claims or liability associated with such unauthorized use or non-compliance.

The scope of our geotechnical services did not include any environmental site assessment for the presence or absence of hazardous/toxic materials, including methane or other landfill related gases. Kleinfelder will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

7 REFERENCES

American Concrete Institute (ACI), 2014, Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14).

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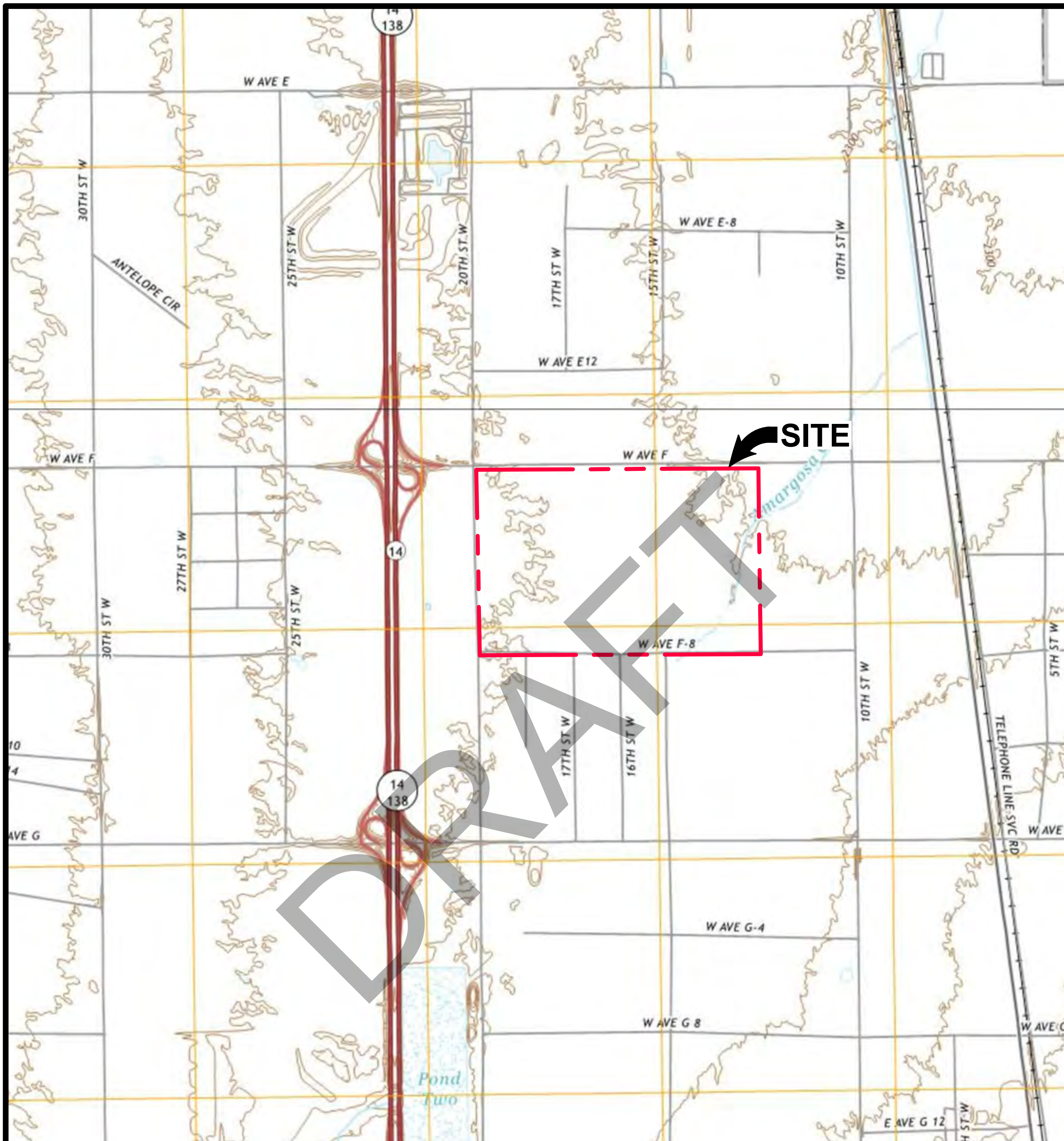
FIGURES



SOURCE: U.S.G.S. 7.5' topographic series,Lancaster West and Rosamond, California quadrangles dated 2018.

N

2,000 1,000 0 2,000

APPROXIMATE SCALE (feet)

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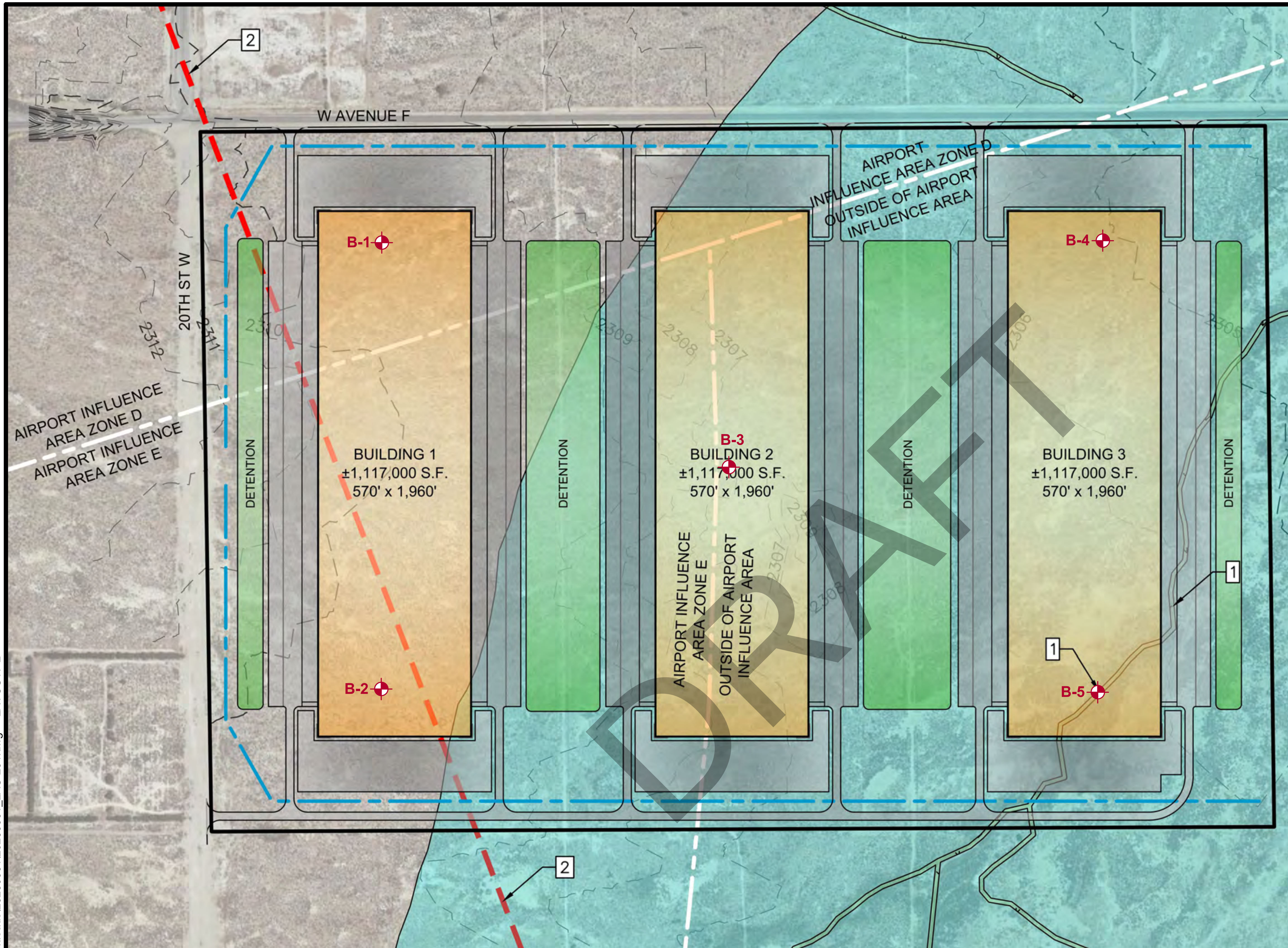
PROJECT: 20230661	SITE VICINITY MAP	FIGURE
DRAWN BY: DMF		
CHECKED BY: VF	FEASIBILITY-LEVEL GEOTECHNICAL INVESTIGATION ANTELOPE LAC 234 - LANCASTER AREA OF LOS ANGELES COUNTY, CALIFORNIA	1
DATE: 06/2022		
REVISED: -		

PLOTTED: 6/8/2022 11:44 AM BY: dean fahrney

CAD FILE: C:\Users\DFahrney\Downloads\20230661\20230661_LAC-234.dwg



EXPLANATION

B-5 APPROXIMATE BORING LOCATION

REFERENCE: CONCEPT SITE PLAN A1 PROVIDED BY NORTH POINT DEVELOPMENT, DATED 04/11/2022

PLOTTED: 6/8/2022 12:19 PM BY: dean fahmey

LAYOUT: 2

CAD FILE: C:\Users\DFahmey\Downloads\20230661\20230661_LAC-234.dwg

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PROJECT:	20230661
DRAWN BY	DMF
CHECKED BY	VF
DATE:	06/2022
REVISED:	-

EXPLORATION LOCATION MAP

FEASIBILITY-LEVEL GEOTECHNICAL INVESTIGATION
ANTELOPE LAC 234 - LANCASTER AREA OF
LOS ANGELES COUNTY, CALIFORNIA

FIGURE
2

APPENDIX A
FIELD EXPLORATIONS

APPENDIX A
FIELD EXPLORATIONS

The subsurface conditions at the site were explored by drilling and logging five (5) hollow-stem auger borings. Due to soft soil at the surface of the site, the hollow stem auger borings were drilled using either a truck-mounted or track-mounted drill rig. The hollow stem auger drill rigs were provided by 2R Drilling of Chino, California. The hollow stem auger drill rigs mentioned above were equipped with an automatic hammer system to drive the samplers. The locations of our borings are shown on Figure 2.

The logs of borings are presented as Figures A-3 through A-7. An explanation to the logs is presented on Figures A-1 and A-2. The Logs of Borings describe the earth materials encountered, samples obtained, and show field and laboratory tests performed. The logs also show the boring number, excavation date and the name of the logger and excavation subcontractor. A Kleinfelder geologist logged the borings utilizing the Unified Soil Classification System (USCS). The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Bulk and drive samples of representative earth materials were obtained from the borings at maximum intervals of about 5 feet.

A California-type sampler was used to obtain relatively undisturbed drive samples of the soil encountered. This sampler consists of a 3-inch O.D., 2.4 inch I.D. split barrel shaft that is driven a total of 18 inches into the soil at the bottom of the boring. The soil was retained in six 1-inch brass rings for laboratory testing. The sampler was driven using a 140-pound hammer falling 30 inches. The total number of hammer blows required to drive the sampler the final 12 inches is termed the blow count and is recorded on the Logs of Borings. Where the sample was driven less than 12 inches, the number of blows to drive the sample for each 6-inch segment, or portion thereof, is shown on the logs. For example, 50/4" indicates 50 blows to drive the sampler 4 inches to refusal.

Bulk samples of the sub-surface soils were retrieved directly from the soil cuttings and placed in large plastic bags.

DRILLING METHOD/SAMPLER TYPE GRAPHICS

- BULK SAMPLE
- CALIFORNIA SAMPLER (3 in. (76.2 mm.) outer diameter)
- GRAB SAMPLE

GROUND WATER GRAPHICS

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after stabilizing period)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Solid lines separating strata on the logs represent approximate boundaries only, dashed lines are inferred or extrapolated boundaries. Actual transitions may be gradual or differ from those represented.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System (ASTM D2488/D2487) designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., CL-ML, GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.

REFERENCES

1. American Society for Materials and Testing (ASTM), 2011, ASTM D2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System).

UNIFIED SOIL CLASSIFICATION SYSTEM[1]

COARSE GRAINED SOILS (More than 50% retained on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVEL WITH <5% FINES	GW	WELL-GRADED GRAVEL, WELL-GRADED GRAVEL WITH SAND
			GP	POORLY GRADED GRAVEL, POORLY GRADED GRAVEL WITH SAND
		GRAVELS WITH 5% TO 12% FINES	GW-GM	WELL-GRADED GRAVEL WITH SILT, WELL-GRADED GRAVEL WITH SILT AND SAND
			GW-GC	WELL-GRADED GRAVEL WITH CLAY (OR SILTY CLAY), WELL-GRADED GRAVEL WITH CLAY AND SAND (OR SILT CLAY AND SAND)
			GP-GM	POORLY GRADED GRAVEL WITH SILT, POORLY GRADED GRAVEL WITH SILT AND SAND
			GP-GC	POORLY GRADED GRAVEL WITH CLAY (OR SILTY CLAY), POORLY GRADED GRAVEL WITH CLAY AND (OR SILTY CLAY AND SAND)
		GRAVELS WITH > 12% FINES	GM	SILTY GRAVEL, SILTY GRAVEL WITH SAND
			GC	CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND
			GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL WITH SAND
	SANDS (50% or more of coarse fraction passes the No. 4 Sieve)	CLEAN SANDS WITH <5% FINES	SW	WELL-GRADED SAND, WELL-GRADED SAND WITH GRAVEL
			SP	POORLY GRADED SAND, POORLY GRADED SAND WITH GRAVEL
		SANDS WITH 5% TO 12% FINES	SW-SM	WELL-GRADED SAND WITH SILT, WELL-GRADED SAND WITH SILT AND GRAVEL
			SW-SC	WELL-GRADED SAND WITH CLAY (OR SILTY CLAY), WELL-GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
			SP-SM	POORLY GRADED SAND WITH SILT, POORLY GRADED SAND WITH SILT AND GRAVEL
			SP-SC	POORLY GRADED SAND WITH CLAY, POORLY GRADED SAND WITH CLAY AND GRAVEL (OR SILTY CLAY AND GRAVEL)
		SANDS WITH > 12% FINES	SM	SILTY SAND, SILTY SAND WITH GRAVEL
			SC	CLAYEY SAND, CLAYEY SAND WITH GRAVEL
			SC-SM	SILTY, CLAYEY SAND, SILTY, CLAYEY SAND WITH GRAVEL

FINE GRAINED SOILS (50% or more passes the No. #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	ML	SILT, SILT WITH SAND, SILT WITH GRAVEL
		CL	LEAN CLAY, LEAN CLAY WITH SAND, LEAN CLAY WITH GRAVEL
		CL-ML	SILTY CLAY, SILTY CLAY WITH SAND, SILTY CLAY WITH GRAVEL
		OL	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL
	SILTS AND CLAYS (Liquid Limit 50 or greater)	MH	ELASTIC SILT. ELASTIC SILT WITH SAND, ELASTIC SILT WITH GRAVEL
		CH	FAT CLAY, FAT CLAY WITH SAND, FAT CLAY WITH GRAVEL
		OH	ORGANIC CLAY, ORGANIC CLAY WITH SAND, ORGANIC CLAY WITH GRAVEL, ORGANIC SILT, ORGANIC SILT WITH SAND, ORGANIC SILT WITH GRAVEL

NOTE: USE MATERIAL DESCRIPTION ON THE LOG TO DEFINE A GRAPHIC THAT MAY NOT BE PROVIDED ON THIS LEGEND.

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PROJECT NO.: 20230661.001A		GRAPHICS KEY	FIGURE
DRAWN BY:	VF	Feasibility-Level Geotechnical Investigation Antelope LAC 234 - Lancaster Area of Los Angeles County, California	A-1
CHECKED BY:	JDW		
DATE:	6/10/2022		

PLOTTED: 06/15/2022 08:16 PM BY: HMarquez
gINT FILE: Klf_gint_master_2023 PROJECT NUMBER: 20230661.001A OFFICE FILTER: RIVERSIDE
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2023.GLB [_KLF_GEO_LEG1_GRAPHICS_KEY_W_USCS]

GRAIN SIZE[1]

DESCRIPTION		SIEVE SIZE	GRAIN SIZE
Boulders		>12 in.	>12 in. (304.8 mm.)
Cobbles		3 - 12 in.	3 - 12 in. (76.2 - 304.8 mm.)
Gravel	coarse	3/4 -3 in.	3/4 -3 in. (19 - 76.2 mm.)
	fine	#4 - 3/4 in.	0.19 - 0.75 in. (4.8 - 19 mm.)
Sand	coarse	#10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)
	medium	#40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)
	fine	#200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)
Fines		Passing #200	<0.0029 in. (<0.07 mm.)

SECONDARY CONSTITUENT[1]

Term of Use	AMOUNT	
	Secondary Constituent is Fine Grained	Secondary Constituent is Coarse Grained
Trace	<5%	<15%
With	≥5 to <15%	≥15 to <30%
Modifier	≥15%	≥30%

PLASTICITY[1]

DESCRIPTION	CRITERIA
Non-Plastic	A 1/8 in. (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

MOISTURE CONTENT[1]

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

CONSISTENCY - FINE-GRAINED SOIL[2, 3]

CONSISTENCY	SPT - N (# blows / ft)	Pocket Pen (tsf)	UNCONFINED COMPRESSIVE STRENGTH (Q_u)(psf)	VISUAL / MANUAL CRITERIA
Very Soft	<2	PP < 0.25	<500	Easily penetrated several inches by fist
Soft	2 - 4	0.25 ≤ PP <0.5	500 - 1,000	Easily penetrated several inches by thumb
Medium Stiff	4 - 8	0.5 ≤ PP <1	1,000 - 2,000	Can be penetrated several inches by thumb with moderate effort
Stiff	8 - 15	1 ≤ PP <2	2,000 - 4,000	Readily indented by thumb but penetrated only with great effort
Very Stiff	15 - 30	2 ≤ PP <4	4,000 - 8,000	Readily indented by thumbnail
Hard	>30	4 ≤ PP	>8,000	Indented by thumbnail with difficulty

APPARENT DENSITY - COARSE-GRAINED SOIL[2]

APPARENT DENSITY	SPT-N (# blows / ft)
Very Loose	<4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

STRUCTURE[1]

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. (6mm) thick, note thickness.
Laminated	Alternating layers of varying material or color with the layers less than 1/4-in. (6 mm) thick, note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout

ANGULARITY[1]

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

REACTION WITH HYDROCHLORIC ACID[1]

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

CEMENTATION[1]

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or little finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

REFERENCES

1. American Society for Materials and Testing (ASTM), 2017, ASTM D2488: Standard Practice for Description and Identification of Soils (Visual Manual Procedures).
2. Terzaghi, K and Peck, R., 1948, Soil Mechanics in Engineering Practice, John Wiley & Sons, New York.
3. United States Department of the Interior Bureau of Reclamation (USBR), 1998, Earth Manual, Part I.

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PROJECT NO.:	20230661.001A
DRAWN BY:	VF
CHECKED BY:	JDW
DATE:	6/10/2022

SOIL DESCRIPTION KEY
(For additional tables, see ASTM D2488)

Feasibility-Level Geotechnical Investigation
Antelope LAC 234 - Lancaster Area of
Los Angeles County, California

FIGURE
A-2

PLOTTED: 06/15/2022 08:16 PM BY: HMarquez
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PROJECT NUMBER: 20230661.001A
gINT FILE: Klf_gint_master_2023
gINT TEMPLATE: E:KLF_STANDARD_GINT_LIBRARY_2023.GLB [_KLF_GEO_LEG2_SOIL_DESC_KEY]

BORING LOG B-1

Date Begin - End: 5/20/2022
Drilling Co.-Lic.#: 2R Drilling - #709029
Logged By: C. Dang
Drill Crew: Eddie/Victor
Hor.-Vert. Datum: Not Available
Drilling Equipment: GT-16
Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees
Drilling Method: Hollow Stem Auger
Weather: Very Windy and Sunny
Exploration Diameter: 8 in. O.D.

FIELD EXPLORATION / LABORATORY RESULTS

Surface Condition: Bare Earth

Depth (feet)	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
0	**Alluvium** **Silty Clayey SAND (SC-SM)**: fine to medium sand, non-plastic, brown, dry	Bulk									Hand auger to 5 ft bgs Modified Proctor Expansion Index Direct Shear
4	**Clayey SAND (SC)**: fine to medium sand, low to medium plasticity, brown, dry, dense										
5		Drive	BC=14 29 40	18"	4.9	117.9					
10	fine to coarse sand, low plasticity, medium dense	Drive	BC=13 15 19	18"	5.3	110.4	100	41			
13	**Well-Graded SAND with Silt (SW-SM)**: fine to coarse sand, non-plastic, brown, dry, medium dense										
15		Drive	BC=10 12 15	18"	4.3	121.1					
18	**Sandy Lean CLAY (CL)**: fine to medium sand, medium plasticity, grayish brown, moist, stiff, calcium deposits										
20		Drive	BC=4 9 16	18"	22.2	105.5					
25	medium to stiff, increasing sand content	Drive	BC=6 2 4	18"	15.2	111.1					

The boring was terminated at approximately 26.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 20, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:

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PROJECT NO.: 20230661.001A
DRAWN BY: VF
CHECKED BY: JDW
DATE: 6/10/2022

BORING LOG B-1

Feasibility-Level Geotechnical Investigation
Antelope LAC 234 - Lancaster Area of
Los Angeles County, California

FIGURE A-3

Date Begin - End:	5/20/2022	**Drilling Co.-Lic.#:**	2R Drilling - #709029		**BORING LOG B-2**
Logged By:	C. Dang	**Drill Crew:**	Eddie/Victor		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	GT-16	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Very Windy and Sunny	**Exploration Diameter:**	8 in. O.D.		

Depth (feet)	Graphical Log	FIELD EXPLORATION Surface Condition: Bare Earth Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)		LABORATORY RESULTS Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
0		**Alluvium** **Clayey SAND (SC)**: fine to medium sand, low plasticity, brown, dry											Hand auger to 5 ft bgs
4		**Poorly Graded SAND (SP)**: medium to coarse sand, non-plastic, reddish brown, dry, very dense, trace subrounded gravel											
5				BC=17 30 48	18"		4.4	112.7					Collapse Potential
10		increasing moisture content, trace silt content		BC=13 15 18	18"		6.9	110.7					
15				BC=10 14 14	18"		7.1	120.5			NP	NP	
16		**Sandy Lean CLAY (CL)**: fine to medium sand, medium plasticity, brown, moist, stiff, calcium deposits											
20		interbedded silty sand		BC=12 24 19	18"		9.5	123.4					
23		**Silty SAND (SM)**: fine to medium sand, non-plastic, brown, moist, loose to medium dense											
25				BC=7 4 11	18"		35.3	91.0					

The boring was terminated at approximately 26.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 20, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:

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KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20230661.001A DRAWN BY: VF CHECKED BY: JDW DATE: 6/10/2022	BORING LOG B-2 Feasibility-Level Geotechnical Investigation Antelope LAC 234 - Lancaster Area of Los Angeles County, California	FIGURE A-4 PAGE: 1 of 1

BORING LOG B-3

Date Begin - End:	5/23/2022	**Drilling Co.-Lic.#:**	2R Drilling - #709029		
Logged By:	C. Dang	**Drill Crew:**	Jerry/Carlos		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	CME-55 Track Rig	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Very Windy and Sunny	**Exploration Diameter:**	8 in. O.D.		

FIELD EXPLORATION / LABORATORY RESULTS

Surface Condition: Bare Earth

Depth (feet)	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
0	**Alluvium** **Clayey SAND (SC)**: fine to medium sand, non-plastic, brown, dry	Bulk									Hand auger to 5 ft bgs Corrosion
5	dry to moist, medium dense	Drive	BC=10 13 13	18"	15.5	104.2					
10	low plasticity, dry, increase in sand, trace subrounded gravel	Drive	BC=10 20 25	18"	3.3	108.8					
15	dense, increasing moisture content	Drive	BC=19 28 36	17"	2.6	109.9	98	15			
18	**Well-Graded SAND (SW)**: fine to coarse sand, non-plastic, reddish brown, dry, dense, trace subrounded gravel										
20		Drive	BC=13 23 36	16"	1.6	103.8					
22		Bulk			3.4						
23	**Sandy Lean CLAY (CL)**: fine to medium sand, medium plasticity, brown, moist, stiff										
25		Drive	BC=6 7 15	18"	31.4	86.3			46	21	
28	**Lean CLAY with Sand (CL)**: fine to medium sand, medium to high plasticity, brown, moist, stiff, trace silt content										
30		Drive	BC=10 8 11	18"					48	29	
33	**Clayey SAND (SC)**: fine to coarse sand, low plasticity, reddish brown, dry to moist, very dense, trace subrounded gravel										

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PROJECT NO.: 20230661.001A		BORING LOG B-3	FIGURE
DRAWN BY:	VF	Feasibility-Level Geotechnical Investigation Antelope LAC 234 - Lancaster Area of Los Angeles County, California	A-5
CHECKED BY:	JDW		
DATE:	6/10/2022		PAGE: 1 of 2

BORING LOG B-3

Date Begin - End:	5/23/2022	**Drilling Co.-Lic.#:**	2R Drilling - #709029
Logged By:	C. Dang	**Drill Crew:**	Jerry/Carlos
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	CME-55 Track Rig
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger
Weather:	Very Windy and Sunny	**Exploration Diameter:**	8 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

Surface Condition: Bare Earth

Depth (feet)	Lithologic Description (FIELD EXPLORATION)	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)		Water Content (%) (LABORATORY RESULTS)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
	Clayey SAND (SC): fine to coarse sand, low plasticity, reddish brown, dry to moist, very dense, trace subrounded gravel	■	BC=7 14 50/5"	18"								
	Poorly Graded SAND with Silt (SP-SM): medium to coarse sand, non-plastic, reddish brown, dry to moist, medium dense											
40		■	BC=15 23 12	18"		13.2	106.7			47	26	
	Sandy Lean CLAY (CL): fine to medium sand, medium to high plasticity, brown, moist, stiff											
45		■	BC=5 9 18	18"		19.9	108.0			NP	NP	
	Silty SAND (SM): fine to medium sand, non-plastic, brown, moist, medium dense											
	Sandy Lean CLAY (CL): medium sand, medium plasticity, gray, moist, stiff, trace subrounded gravel											
50		■	BC=5 10 11	18"		14.3	110.6			42	26	

55

60

65

The boring was terminated at approximately 51.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 23, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:

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PROJECT NO.: 20230661.001A	BORING LOG B-3	FIGURE
DRAWN BY: VF	Feasibility-Level Geotechnical Investigation Antelope LAC 234 - Lancaster Area of Los Angeles County, California	A-5
CHECKED BY: JDW		
DATE: 6/10/2022		PAGE: 2 of 2

BORING LOG B-4

Date Begin - End:	5/23/2022	**Drilling Co.-Lic.#:**	2R Drilling - #709029
Logged By:	C. Dang	**Drill Crew:**	Jerry/Carlos
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	CME-55 Track Rig
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger
Weather:	Hot and Sunny	**Exploration Diameter:**	8 in. O.D.

Hammer Type - Drop: 140 lb. Auto - 30 in.

Surface Condition: Bare Earth

Depth (feet)	Graphical Log	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)		Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
0		**Alluvium** **Clayey SAND (SC)**: fine to medium sand, non-plastic, brown, dry											Hand auger to 5 ft bgs
4		**Silty SAND (SM)**: fine to medium sand, reddish brown, dry, dense, weakly cemented											
5				BC=25 33 43	18"								
8		**Sandy Lean CLAY (CL)**: fine to coarse sand, medium plasticity, brown, moist, very stiff											
10				BC=9 10 14	18"		19.1	89.9					Consolidation
11.5		**Clayey SAND (SC)**: fine to medium sand, non-plastic, reddish brown, moist, medium dense, trace subrounded gravel											
15				BC=10 10 24	18"		21.1	99.7					
20				BC=10 12 13	18"		14.6	114.9					
20.5		**Sandy Lean CLAY (CL)**: fine to medium sand, medium plasticity, mottled grayish brown, moist, very stiff											
23		**Silty SAND (SM)**: fine to medium sand, non-plastic, reddish brown, dry, loose											
25				BC=6 7 5	18"		11.0	111.2					
30													

The boring was terminated at approximately 26.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 23, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:

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PROJECT NO.: 20230661.001A
DRAWN BY: VF
CHECKED BY: JDW
DATE: 6/10/2022

BORING LOG B-4

Feasibility-Level Geotechnical Investigation
Antelope LAC 234 - Lancaster Area of
Los Angeles County, California

FIGURE
A-6

Date Begin - End:	5/23/2022	**Drilling Co.-Lic.#:**	2R Drilling - #709029		**BORING LOG B-5**
Logged By:	C. Dang	**Drill Crew:**	Jerry/Carlos		
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	CME-55 Track Rig	**Hammer Type - Drop:**	140 lb. Auto - 30 in.
Plunge:	-90 degrees	**Drilling Method:**	Hollow Stem Auger		
Weather:	Hot and Sunny	**Exploration Diameter:**	8 in. O.D.		

Depth (feet)	Graphical Log	FIELD EXPLORATION Surface Condition: Bare Earth Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in.	Recovery (NR=No Recovery)		LABORATORY RESULTS Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Alluvium **Sandy SILT (ML)**: fine to medium sand, low to medium plasticity, brown, dry, mud cracks present											Hand auger to 5 ft bgs
5		**Well-Graded SAND with Silt (SW-SM)**: fine to coarse sand, non-plastic, grayish brown, dry, dense, trace subangular gravel, trace silt content		BC=12 18 33	13"		0.8		100	5.8			Disturbed
10		**Sandy Lean CLAY (CL)**: fine to medium sand, medium plasticity, brown, moist, very stiff, calcium deposits		BC=10 12 13	18"		19.5						
15		**Poorly Graded SAND (SP)**: fine to medium sand, non-plastic, grayish brown, dry, medium dense, trace rounded gravel		BC=12 20 24	12"		1.0						
20		**Clayey SAND (SC)**: medium to coarse sand, non-plastic, grayish brown, moist, dense, trace rounded gravel		BC=9 23 27	18"		2.2						Disturbed
		Sandy Lean CLAY (CL): fine to medium sand, high plasticity, olive gray, moist, hard											
25		**Clayey SAND (SC)**: fine to coarse sand, non-plastic, dark gray, moist, medium dense, trace subrounded gravel		BC=12 15 20	17"		15.9						

The boring was terminated at approximately 26.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 23, 2022.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.

GENERAL NOTES:

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PROJECT NO.: 20230661.001A		BORING LOG B-5	FIGURE
DRAWN BY:	VF	Feasibility-Level Geotechnical Investigation Antelope LAC 234 - Lancaster Area of Los Angeles County, California	A-7
CHECKED BY:	JDW		
DATE:	6/10/2022		PAGE: 1 of 1

APPENDIX B
LABORATORY TESTING

APPENDIX B
LABORATORY TESTING

Laboratory tests were performed on drive and bulk soil samples to estimate engineering characteristics of the various earth materials encountered. The laboratory testing was performed by our laboratory located in Ontario, California or by AP Engineering & Testing, Inc. of Pomona, California. Testing was performed in general accordance with procedures outlined in the American Society for Testing and Materials, or other accepted procedures. Visual classifications presented on the lab figures performed by AP Engineering may differ from those presented on the boring logs provided in Appendix A.

LABORATORY MOISTURE DETERMINATIONS AND UNIT WEIGHTS

Natural moisture content and unit weight tests were performed on selected samples. The moisture content tests were performed in general accordance with ASTM Test Method D 2216 and the unit weight tests were performed in general accordance with ASTM Test Method D 2937. The results are presented on the Logs of Borings in Appendix A.

SIEVE ANALYSES

Sieve analyses were performed on selected samples of the materials encountered at the site to evaluate the grain size distribution characteristics of the soils and to aid in their classification. Tests were performed in general accordance with ASTM Test Method D 6913. Results of these tests are presented in the boring logs in Appendix A and attached as Figure B-1, Grain Size Distribution Curve.

ATTERBERG LIMITS (PLASTICITY INDEX)

Plasticity limit and liquid limit testing was performed on soil samples to evaluate behavior conditions at varying water contents. Testing was performed in general accordance with ASTM Standard Test Method D4318. The results are presented on the boring logs in Appendix A and attached as Figures B-2 and B-3, Plasticity Testing.

DIRECT SHEAR

Direct shear testing was performed on a remolded sample for shear strength and cohesion values of the in-situ soils in accordance with ASTM Standard Test Method D 3080. The result is presented as Figure B-4, Direct Shear Test.

CONSOLIDATION TESTS

Consolidation testing was performed on selected relatively undisturbed samples by AP Engineering in accordance with ASTM D 2435. The tests were performed on 1.0-inch-high, 2.41-inch diameter samples. After trimming the ends, the sample was placed in a consolidometer and an initial reading was recorded. The sample was saturated during loading, and thereafter, the sample was incrementally loaded. The test results are attached to this appendix.

ONE-DIMENSIONAL SWELL/COLLAPSE TEST

Laboratory testing was performed on selected soil samples to study the collapse potential of the subgrade soils. During this test, the soil sample is inundated with water at a specific surcharge loading and the percent swell or collapse is measured. This test was performed by AP Engineering in accordance with ASTM D4546. The test results are attached to this appendix.

PRELIMINARY CORROSIVITY TESTS

A series of chemical tests were performed on a selected sample of the near-surface soils to estimate pH, resistivity and sulfate and chloride contents. The sample was tested in general accordance with California Test Methods 643, 422, and 417 for pH and minimum resistivity, soluble chlorides, and soluble sulfates, respectively. Test results may be used by a qualified corrosion engineer to evaluate the general corrosion potential with respect to construction materials. The tests were performed by AP Engineering. The results of these tests are presented in Table B-1, Preliminary Corrosion Test Results.

MODIFIED PROCTOR

Maximum density-optimum moisture tests were performed on a select bulk sample of the on-site soils to determine compaction characteristics. The test was performed in accordance with ASTM Standard Test Method D 1557. The test results are presented in Table B-2, Modified Proctor Test Results.

EXPANSION INDEX

Expansion Index testing was performed on one near surface bulk sample to determine the expansion potential of the soil. The test was performed in accordance with ASTM Standard Test Method D4829. The test result is presented in Table B-3, Expansion Index Test Result.

Table B-1
Preliminary Corrosivity Test Results

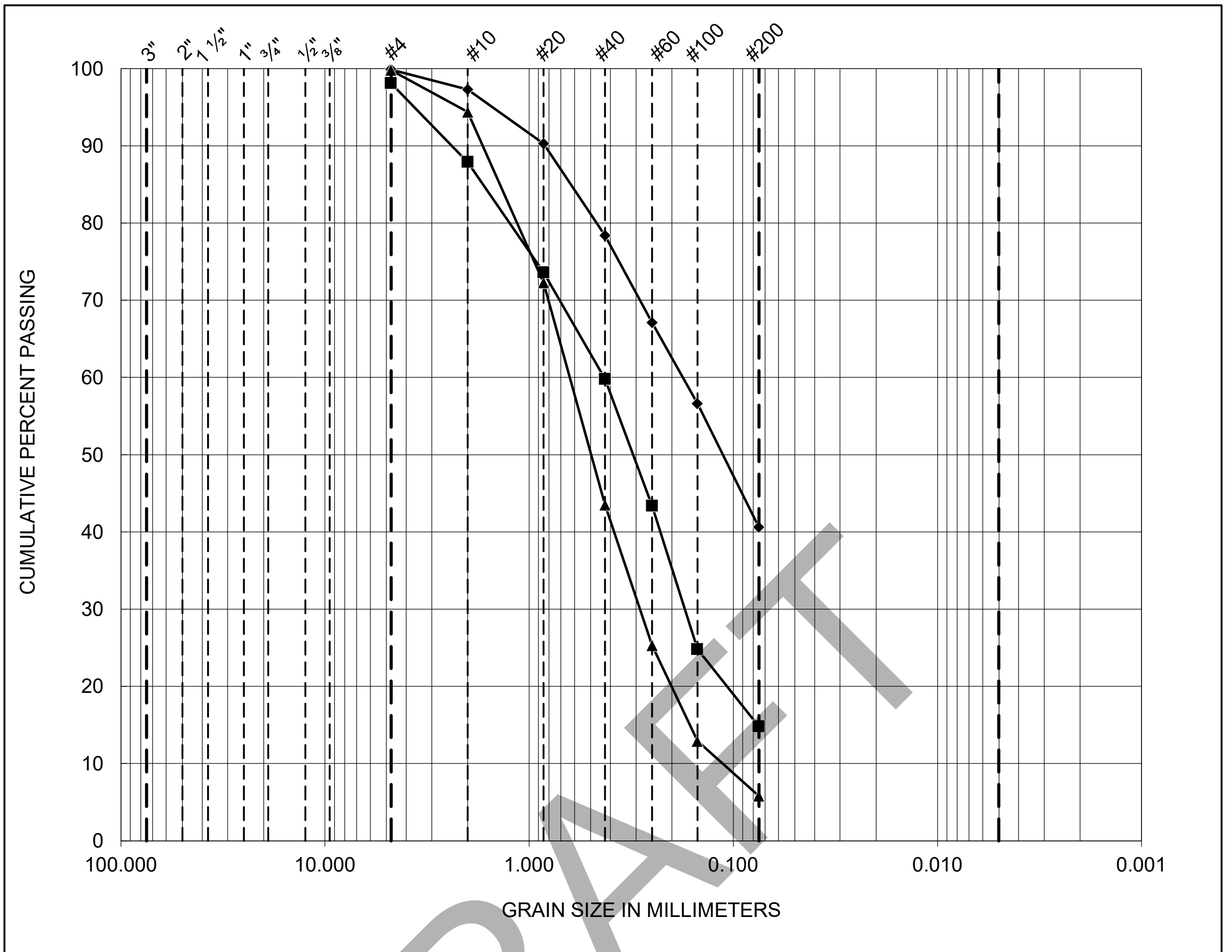
Boring	Depth (ft)	pH	Sulfate (ppm)	Chloride (ppm)	Resistivity (ohm-cm)
B-3	0 – 5	8.2	2,468	3872	118

Table B-2
Modified Proctor Test Results

Boring Number	Depth (ft)	Maximum Dry Density (pcf)	Optimum Moisture (%)
B-1	0 – 5	120.5	11.2

Table B-3
Expansion Index Test Result

Boring Number	Depth (ft)	Expansion Index	Expansion Potential
B-1	0 – 5	5	Very Low



COBBLE	GRAVEL	SAND	SILT	CLAY

SYMBOL	SAMPLE IDENTIFICATION			PERCENTAGES			ATTERBERG LIMITS			SOIL CLASSIFICATION
	BORING NO.	SAMPLE NO.	DEPTH (ft.)	GRAVEL	SAND	FINES	LL	PL	PI	
◆	B-1	3	10	0.1	59.3	40.6	NM	NM	NM	Clayey Sand (SC)
■	B-3	4	15	1.9	83.3	14.8	NM	NM	NM	Clayey Sand (SC)
▲	B-5	2	5	0.2	94.0	5.8	NM	NM	NM	Well Graded Sand with Silt (SW-SM)

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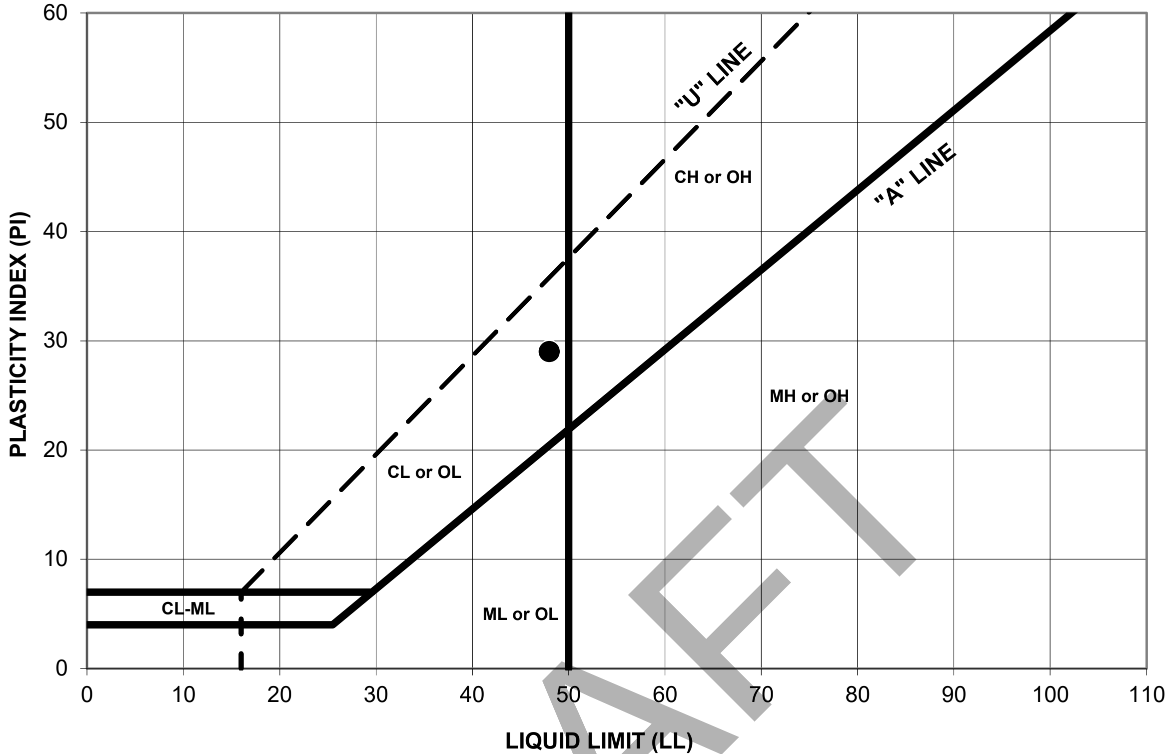
PROJECT NO.:	20230661.001A	GRAIN SIZE DISTRIBUTION	FIGURE
TESTED BY:	J. Calderon		
DATE:	5/26/2022		B-1
CHECKED BY:	M. Magaña	FEASIBILITY-LEVEL GEOTECHNICAL INVESTIGATION ANTELOPE LAC 234 - LANCASTER AREA OF LOS ANGELES COUNTY, CALIFORNIA	
DATE:	6/1/2022		



SYMBOL	SAMPLE IDENTIFICATION			ATTERBERG LIMITS			SOIL CLASSIFICATION
	BORING NO.	SAMPLE NO.	DEPTH (ft)	LL	PL	PI	
◆	B-2	3	15	NP	NP	NP	Poorly Graded Sand (SP)
●	B-3	7	30	48	19	29	Lean Clay with Sand (CL)

Testing performed in general accordance with ASTM D4318

KLEINFELDER
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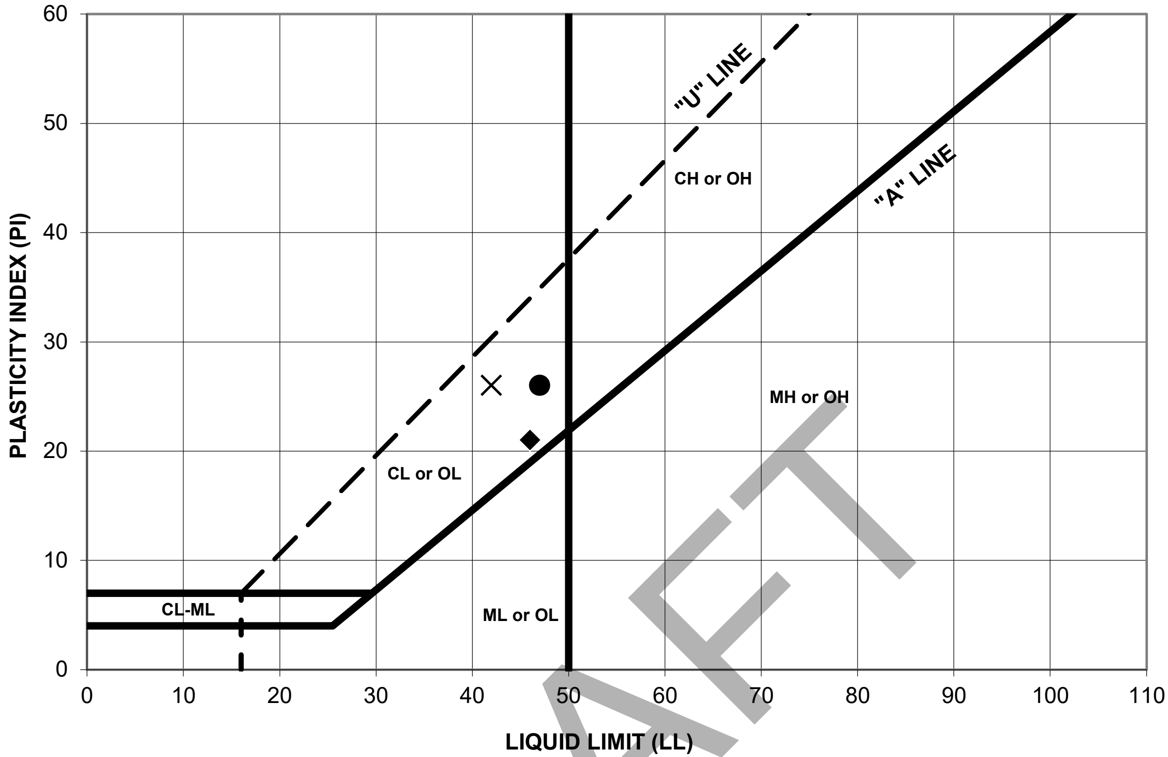
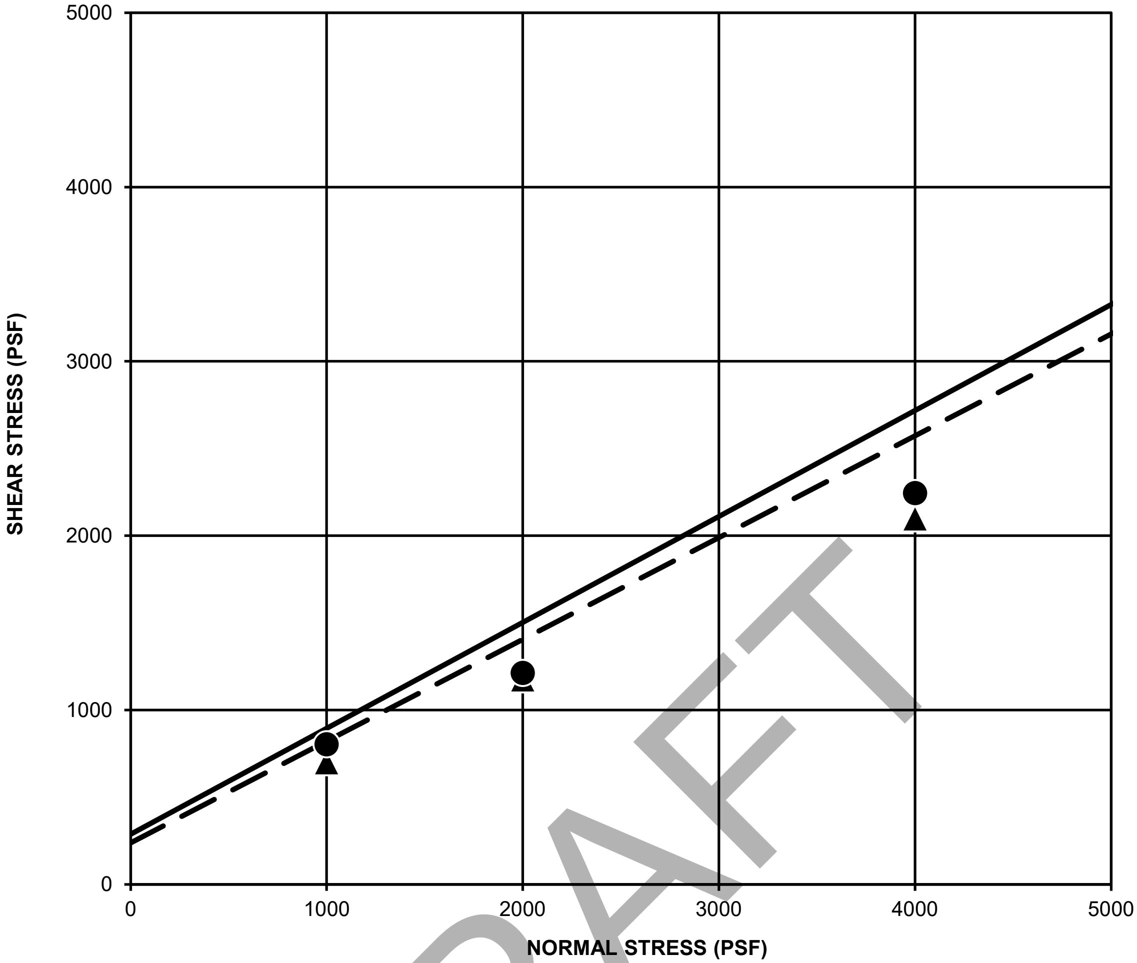
PROJECT NO.: 20230661.001A	PLASTICITY TESTING	FIGURE
TESTED BY: J. Calderon		
DATE: 5/31/2022	FEASIBILITY-LEVEL GEOTECHNICAL INVESTIGATION ANTELOPE LAC 234 - LANCASTER AREA OF LOS ANGELES COUNTY, CALIFORNIA	B-2
CHECKED BY: M. Magaña		
DATE: 6/1/2022		



SYMBOL	SAMPLE IDENTIFICATION			ATTERBERG LIMITS			SOIL CLASSIFICATION
	BORING NO.	SAMPLE NO.	DEPTH (ft)	LL	PL	PI	
◆	B-3	6	25	46	25	21	Sandy Lean Clay (CL)
●	B-3	9	40	47	21	26	Sandy Lean Clay (CL)
▲	B-3	10	45	NP	NP	NP	Silty Sand (SM)
×	B-3	11	50	42	16	26	Sandy Lean Clay (CL)

Testing performed in general accordance with ASTM D4318

KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20230661.001A TESTED BY: J. Calderon DATE: 5/31/2022 CHECKED BY: M. Magaña DATE: 6/1/2022	PLASTICITY TESTING FEASIBILITY-LEVEL GEOTECHNICAL INVESTIGATION ANTELOPE LAC 234 - LANCASTER AREA OF LOS ANGELES COUNTY, CALIFORNIA	FIGURE B-3



SYMBOL		BORING NO.	SAMPLE NO.	DEPTH (ft)	COHESION (psf)	FRICTION ANGLE (deg)	SOIL CLASSIFICATION
PEAK	●	B-1	1	0-5'	288.0	26	Silty Clayey Sand (SC-SM)
ULTIMATE	▲	B-1	1	0-5'	238.0	25	Silty Clayey Sand (SC-SM)

INITIAL MOISTURE (%):	11.2%	Normal Stress (psf)	1000	2000	4000
INITIAL DRY DENSTIY (pcf):	107.9	Peak Stress (psf)	804	1212	2244
FINAL MOISTURE (%):	18.3%	Ultimate Stress (psf)	700	1175	2100

Performed in general accordance with ASTM D 3080, Remolded to 90% Relative Compaction

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	20230661.001A	DIRECT SHEAR TEST	FIGURE
TESTED BY:	J. Calderon		
DATE:	6/1/2022	FEASIBILITY-LEVEL GEOTECHNICAL INVESTIGATION ANTELOPE LAC 234 - LANCASTER AREA OF LOS ANGELES COUNTY, CALIFORNIA	B-4
CHECKED BY:	M. Magaña		
DATE:	6/1/2022		

AP Engineering and Testing, Inc.
DBE|MBE|SBE
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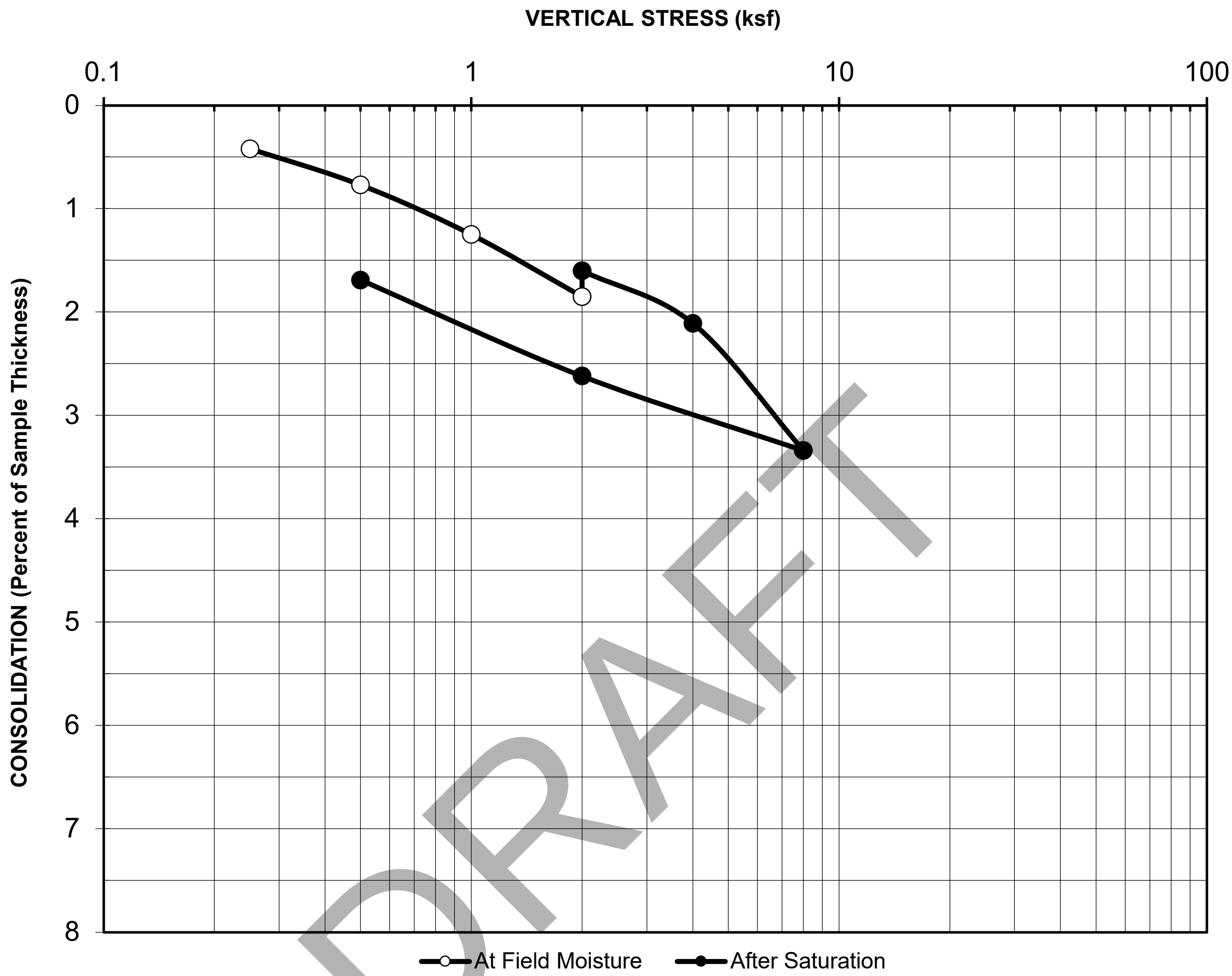

Boring No. :	B-4	Initial Dry Unit Weight (pcf):	89.9
Sample No.:	2	Initial Moisture Content (%):	19.1
Depth (feet):	10	Final Moisture Content (%):	23.7
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Lean Clay	Initial Void Ratio:	0.87
Remarks:	Swell= 0.25% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name: NorthPoint: Antelope LAC 234
Project No.: 20230661.001A
Date: 5/26/2022
AP No: 22-0557 **Sheet No:** 1

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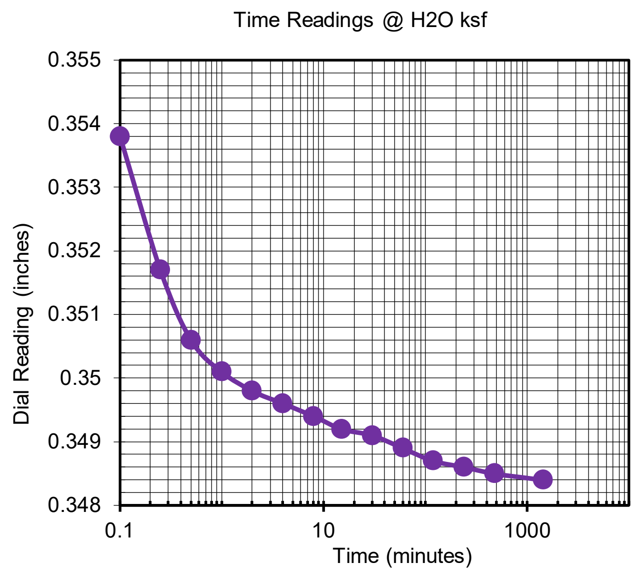

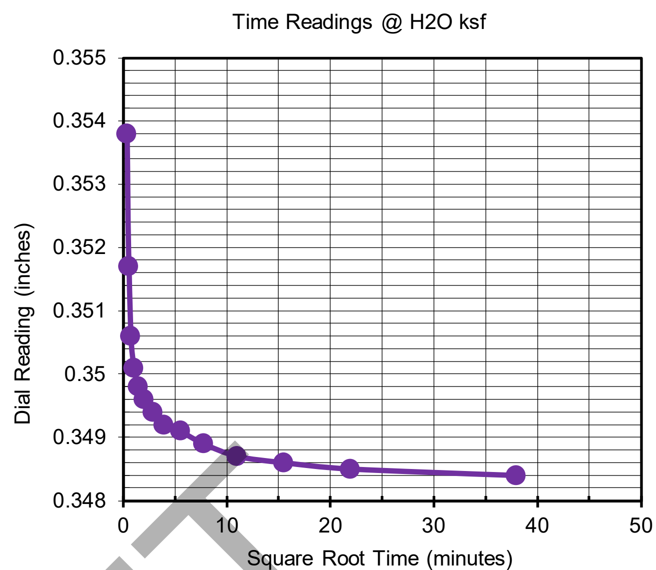

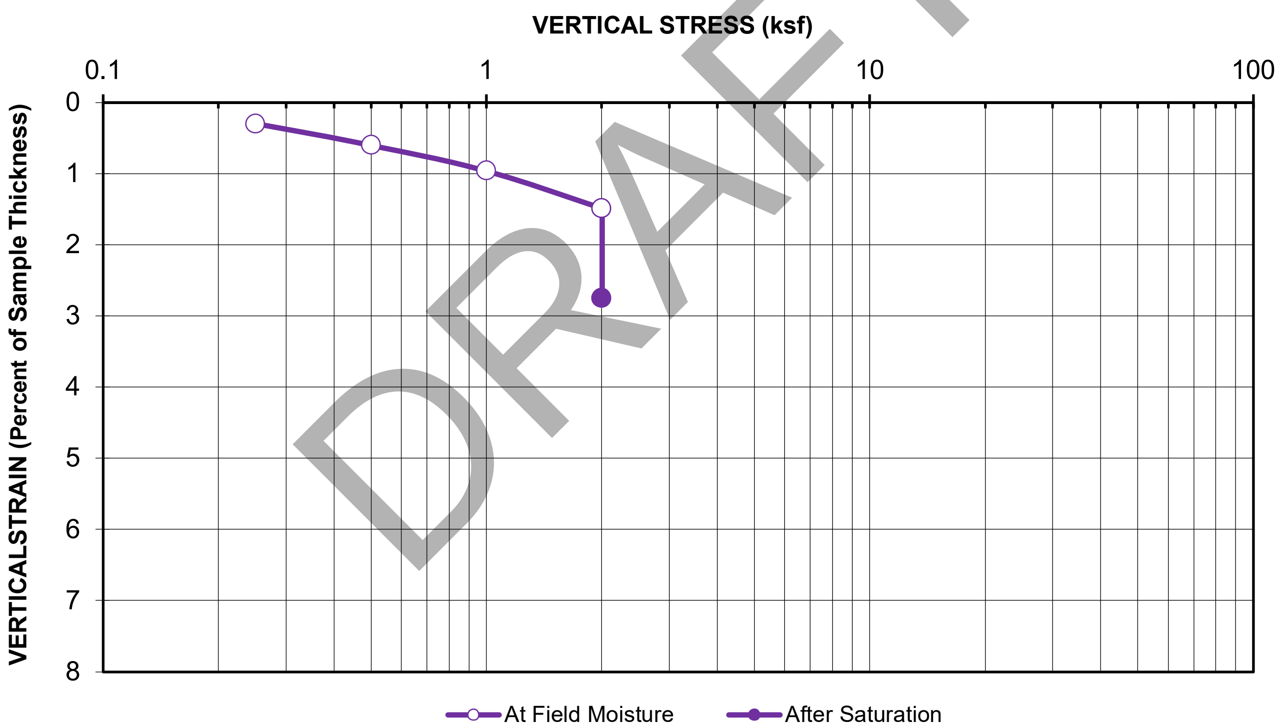

Boring No. :	B-2	Initial Dry Unit Weight (pcf):	112.7
Sample No.:	1	Initial Moisture Content (%):	4.4
Depth (feet):	5	Final Moisture Content (%):	16.4
Sample Type:	Mod Cal	Initial Void Ratio:	0.50
Soil Description:	Well-Graded Sand w/silt		
Remarks:	Collapse = 1.26% upon inundation		

1-D SWELL/COLLAPSE
ASTM D 4546-14, Method B

Project Name:	NorthPoint: Antelope LAC 234
Project No.:	20230661.001A
Date:	5/26/22
AP No:	22-0557