ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Suite B
Escondido, California 92029
Telephone: (619) 867-0487 Fax: (714) 409-3287

C. H. Realty Partners, LCC
18032 Lemon Drive, Suite 367
Yorba Linda, California 92886

March 22, 2022
P/W 2202-09
Report No. 2202-09-B-2

Attention: **Mr. Michael Masterson**

Subject: **EIR Level Geotechnical Study, Proposed Industrial Development, APNs 3064-401-03, -04, -05, West Side of Highway 395, Hesperia, California**

References: Appendix A

Gentlemen:

Presented herein is Advanced Geotechnical Solutions, Inc.'s, (AGS) limited geotechnical evaluation in support of your EIR level studies for the subject project located on three contiguous parcels west of Highway 395 in Hesperia, California. The intent of AGS's study is to identify key geotechnical/geologic constraints that may have significant impacts to the development of the site.

1.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The ~29 acre site is located west of Highway 395 and north of Phelan Road / Main Street in Hesperia, California (Figure 1, Site Location Map). The site encompasses three contiguous parcels- APNs 3064-401-03, 3064-401-04, and 3064-401-05 with a total area of 29.37 acres. The site is currently vacant. Based on our review of historical aerial imagery, the site appears to have been mostly undeveloped except for some dirt roads and the unpaved Caliente Road crossing from the northeastern corner to the southwestern corner.

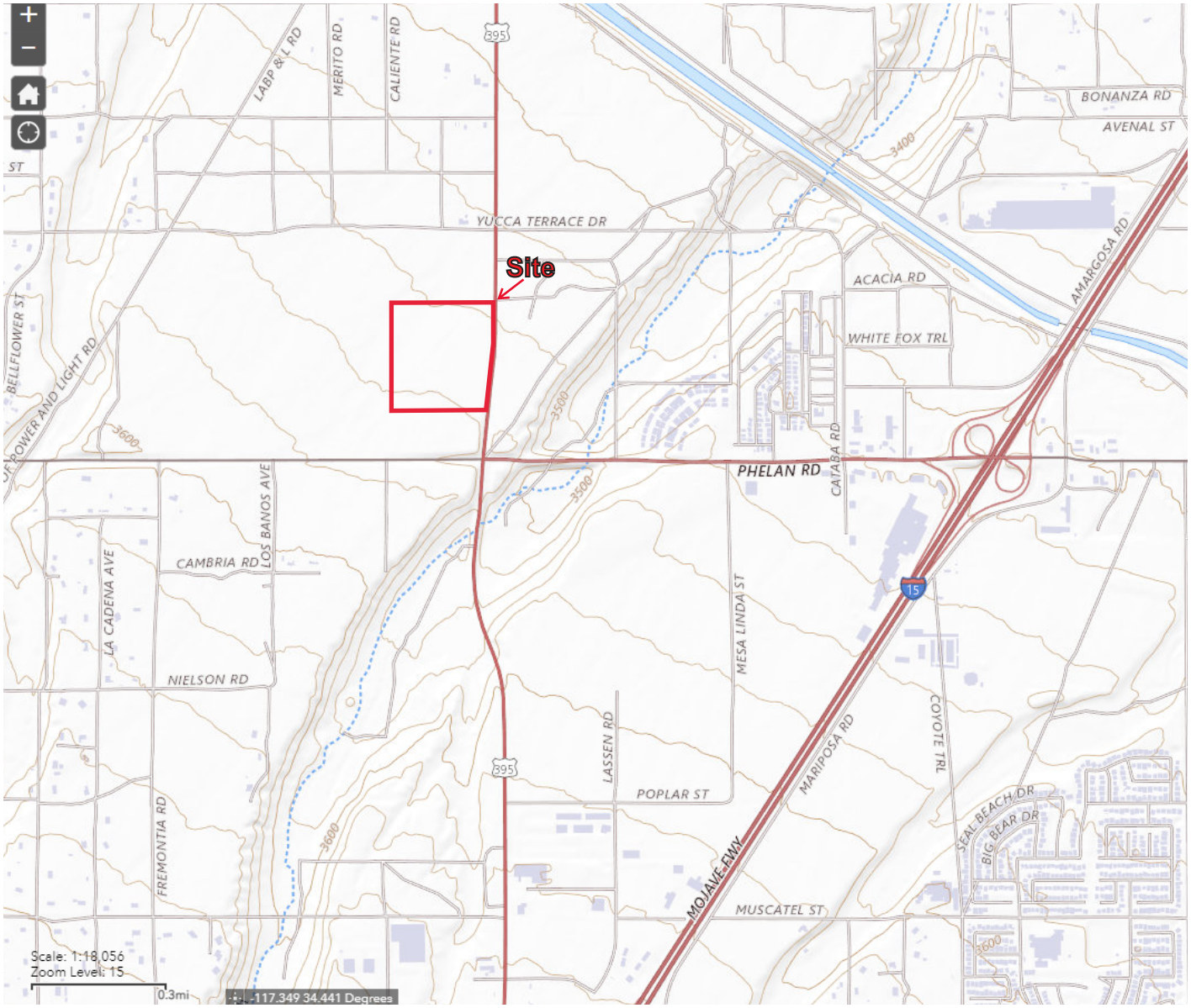
The site is not within a mapped liquefaction potential zone by the County of Riverside nor within a mapped fault zone. Regional geologic maps show that the site is underlain by alluvial fan deposits (Figure 2, Regional Geologic Map).

The site slopes and drains gently to the northeast. Based on the Site Development Plan prepared by Alliance Land Planning dated February 23, 2022, approximate site elevations range between 3,562 feet above mean sea level (msl) on the southwestern corner to 3,537 feet msl on the northeastern corner of the site.

According to the site development plan, the project consists of a 655,520 square foot warehouse with loading docks to the east and west, offices and mezzanine areas. Associated improvements including a retaining wall along the southern boundary, driveways, parking areas, landscape areas, a storm water detention basin on the northern boundary, a public road on the western boundary and utility installations. Cuts up to 7 feet in depth and fills to about 10 feet are anticipated.

2.0 SITE INVESTIGATION

On February 21, 2022, AGS performed subsurface exploration at the site which consisted of advancing five hollow-stem auger borings (B-1 through B-5) and four percolation test borings (P-1 through P-4) with a truck-mounted drill rig to approximate depths of 5 and 51.5 feet below existing ground surface (bgs). On March 4, 2022, AGS drilled an additional percolation test borings (P-5) with a hand auger to an approximate depth 6.5 feet bgs and excavated seven trenches (T-1 through T-7) to approximate depths ranging between



N

SCALE: 1 in. = 2000 ft.

SITE LOCATION MAP
29-ACRE PROPERTY
HESPERIA, CALIFORNIA

FIGURE 1

SOURCE MAP(S): USGS The National Map

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Ste B, Escondido, California 92029
Telephone: (619) 867-0487
P/W 2201-09

4 and 10 feet bgs with a JD 410J backhoe (22,000 lb). All borings and trenches were logged and sampled by our geologist or engineer. Logs of the borings and trenches are presented in Appendix B. The approximate trench locations are shown on Plate 1, Exploration Location Map. Representative bulk samples were transported to our laboratory for testing. Laboratory testing consisted of in-situ moisture and density, expansion index, consolidation, maximum density and optimum moisture content, remolded direct shear, and R-value tests. Percolation testing was completed on March 4, 2022, and the results of the tests are presented in a separate infiltration feasibility report.

3.0 SITE GEOLOGY

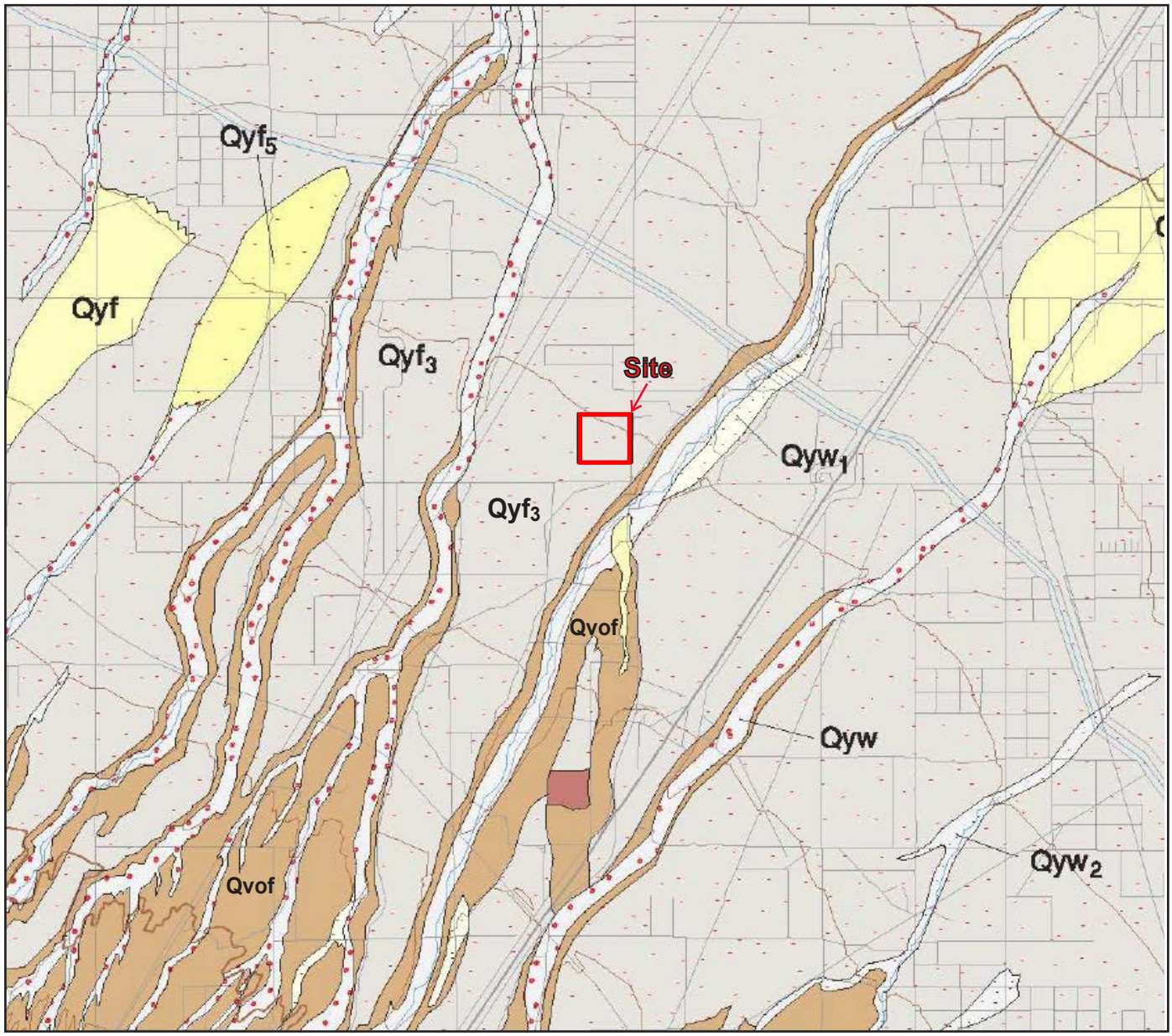
Hesperia lies across the boundary of two very distinct geomorphic provinces. The southern edge of the City encroaches into the Transverse Ranges Province, a region whose characteristic features are a series of east-west trending ranges that include the San Gabriel and San Bernardino Mountains. The rocks that form these mountains have been sheared and fractured under the strain of tectonic movement.

The northern part of Hesperia lies within the Mojave Desert Province, an arid region of overlapping alluvial fans, desert plains, dry lakebeds and scattered mountain ranges. The project site is underlain by young and old alluvial fan deposits which are composed of sediments ranging from early Pleistocene to Holocene age that were shed primarily from the San Gabriel Mountains. Deposition is still ongoing, with the younger alluvium filling drainage channels and the Mojave River floodplain. An excerpt of the regional geologic map by Morton and Miller (2006) is presented in Figure 2. Morton and Miller has mapped the surficial deposits onsite as Young Alluvial Fan Deposits, Unit 3, with Very Old Alluvial Fan Deposits mapped on the slopes of the nearby Oro Grande wash located southeast of the site. Dibblee and Minch (2008) and Dibblee (1967) show the site as being underlain by Pleistocene aged older alluvial fan deposits. Bortugno and Spittler (1996) show the site as being underlain by undifferentiated Older Alluvium. For purposes of this report, we have classified the site as being underlain by Alluvium and Older Alluvium.

Faults in the Mojave Desert Province have a predominant northwesterly trend; however, some faults aligned with the Transverse Ranges are present. The east-west trending Garlock Fault defines the northern boundary of the province, whereas the northwest-trending San Andreas Fault roughly defines its western boundary. Hesperia is near the San Andreas Fault and other seismically active earthquake sources including the North Frontal, Cleghorn, Helendale and San Jacinto Faults. All of these faults have the potential to generate moderate to large earthquakes. Major tectonic activity associated with these and other faults within this regional tectonic framework consists of strike-slip, thrust and reverse movement.

3.1. Subsurface Conditions

Based on our site reconnaissance, subsurface excavations, and review of the referenced geologic maps, the site is mantled by topsoil and alluvium underlain by older alluvial deposits. A brief description of the earth materials encountered onsite is presented in the following sections. More detailed descriptions of these materials are provided in the subsurface logs included in Appendix B.



N

SCALE: 1 in. = 4000 ft.

REGIONAL GEOLOGIC MAP
29-ACRE PROPERTY
HESPERIA, CALIFORNIA

Qyf_3	Young Alluvial Fan Deposits, Unit 3 (Middle Holocene)
Qvof	Very Old Alluvial Fan Deposits (Middle to Early Pleistocene)

FIGURE 2

SOURCE MAP(S): Morton and Miller, 2006, Digital Geologic Map of the San Bernardino and Santa Ana 30' by 60' Quadrangles

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Ste B, Escondido, California 92029
Telephone: (619) 867-0487
P/W 2202-09

3.1.1. Topsoil

The majority of the site is mantled by topsoil consisting as light yellow brown to light brown, dry to slightly moist, fine- to coarse-grained, silty sand with some roots that is in a loose condition. The topsoil was observed to be 0.3 to 1 foot thick.

3.1.2. Alluvium

The alluvium consists of light brown to yellow brown, dark brown and black, dry to slightly moist, loose to medium dense, porous, fine- to coarse-grained, silty sand with trace gravel and some roots. The alluvium extended to variable depths ranging between 1.7 and 3.3 feet.

3.1.3. Older Alluvium

Older alluvium underlies the alluvium onsite. The differentiation is based upon the density changes observed. This unit consists of light brown, orange brown and red brown, slightly moist to moist, medium dense to very dense, fine- to coarse-grained, silty sand and sand with silt; which is slightly indurated and cemented, and contains gravel and cobbles. The older alluvium extended to the maximum depth of exploration of 51.5 feet.

3.2. Groundwater

Groundwater was not encountered during our subsurface exploration. Nearby groundwater wells indicate groundwater depths are several hundred feet below the surface. Localized perched groundwater may develop at a later date, most likely at or near fill/bedrock contacts, due to fluctuations in precipitation, irrigation practices, or factors not evident at the time of our field explorations.

3.3. Flooding

According to available FEMA maps, the site is not within a FEMA identified flood hazard area.

3.4. Subsidence/Ground Fissuring

According to a recent USGS study by Brandt and Sneed (2022), subsidence was not detected within the project site area during a study period between 2014 and 2019. Subsidence was detected in the vicinities of 5 dry lakebeds that are not located near the site. Monitoring of the Mojave Groundwater Basin for subsidence is ongoing.

3.5. Landsliding/Slope Instability

Given the relatively flat gradients across the site and the surrounding area, landsliding, mass wasting, and/or surficial instability onsite is considered to be remote.

4.0 SEISMIC HAZARDS

The site is located in the tectonically active Southern California area and will likely experience shaking effects from earthquakes. The type and severity of seismic hazards affecting the site are to a large degree dependent upon the distance to the causative fault, the intensity of the seismic event, and the underlying

soil characteristics. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction or dynamic settlement.

4.1. Surface Fault Rupture

No known active faults have been mapped at or near the subject site. The nearest known active surface fault is the San Andreas (San Bernardino section) fault zone which is located approximately 10.9 miles southwest of the subject site. Accordingly, the potential for fault surface rupture on the subject site is very low. This conclusion is based on literature review and aerial photographic analysis.

4.2. Seismicity

The potential exists for strong ground motion that may affect future improvements. At this point in time, non-critical structures (commercial, residential, and industrial) are designed according to the 2019 California Building Code and guidelines of the controlling local agency.

4.3. Seismic Design Parameters

Based on our subsurface exploration, the site may be classified as Seismic Site D consisting of a stiff soil profile. Table 4.3 presents seismic design parameters in accordance with the 2019 CBC and mapped spectral acceleration parameters (United States Geological Survey, 2021). Site coordinates of Latitude 34.4300°N and Longitude 117.4034°W were utilized.

TABLE 4.3
2019 CBC SEISMIC DESIGN PARAMETERS

Seismic Site Class	D
Mapped Spectral Acceleration Parameter at Period of 0.2-Second, S_s	1.5g
Mapped Spectral Acceleration Parameter at Period 1-Second, S_1	0.6g
Site Coefficient, F_a	1.000
Site Coefficient, F_v	N/A[3]
Adjusted MCE_R[1] Spectral Response Acceleration Parameter at Short Period, S_{MS}	1.5g
1-Second Period Adjusted MCE_R[1] Spectral Response Acceleration Parameter, S_{M1}	N/A[3]
Short Period Design Spectral Response Acceleration Parameter, S_{DS}	1.0g
1-Second Period Design Spectral Response Acceleration Parameter, S_{D1}	N/A[3]
Peak Ground Acceleration, PGA_M[2]	0.55g
Seismic Design Category	N/A[3]

Notes:

[1] Risk-Targeted Maximum Considered Earthquake

[2] Peak Ground Acceleration adjusted for site effects

[3] Requires Site Specific Ground Motion Hazard Analysis per ASCE 7-16 Section 11.4.8 unless, per Exception 2, the value of the seismic response coefficient, C_S, is determined by Equation (12.8-2) for values of $T \leq 1.5T_S$ and taken as equal to 1.5 times the values computed with either Equation (12.8-3) for $T_L \geq T > 1.5Ts$ or Equation (12.8-4) for $T > T_L$.

4.4. Liquefaction

Liquefaction is the phenomenon in which the buildup of excess pore pressures, in saturated granular soils due to seismic agitation, results in a temporary "quick" or "liquefied" condition. Due to the absence of groundwater and dense nature of the underlying older alluvium, the potential for seismically induced liquefaction is anticipated to be "very low".

4.5. Dynamic Settlement

Dynamic settlement occurs in response to an earthquake event affecting loose sandy earth materials. The upper alluvial deposits have a high potential for dynamic settlement due to their low density. Below a depth of a few feet, the alluvial deposits were observed to be medium dense to very dense; as such, the potential for dynamic settlement in the underlying deposits is considered low. Removal and recompaction of the upper loose deposits is recommend to mitigate the dynamic settlement potential.

4.6. Lateral Spreading

Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore pressure build-up or liquefaction in a shallow underlying deposit during an earthquake. Since the site is fairly flat and the potential for liquefaction is low, the potential for lateral spreading is also low.

4.7. Seismically Induced Landsliding

Significant slopes are not located adjacent to the site. Seismically induced landsliding is not considered to be a hazard at the site.

4.8. Earthquake Induced Flooding

Earthquake induced flooding can be caused by tsunamis, dam failures, or seiches. Earthquakes can cause landslides that dam rivers and streams, and flooding can occur upstream above the dam and also downstream when these dams are breached. A seiche is a free or standing-wave oscillation on the surface of water in an enclosed or semi-enclosed basin. The wave can be initiated by an earthquake and can vary in height from several centimeters to a few meters. Due to the lack of a freestanding body of water nearby, the potential for a seiche impacting the site is considered to be non-existent. Considering the distance of the site from the coastline, the potential for flooding due to tsunamis is negligible.

5.0 GEOTECHNICAL ENGINEERING

Presented herein is a general discussion of the geotechnical properties of the various soil types and earth materials observed by AGS. It should be anticipated that detailed site-specific geotechnical analyses of the project should be conducted during the design and entitlement phase. Dependent upon these future studies these recommendations could change. The following is a summary of our opinions based upon the available data.

5.1. Material Properties

5.1.1. Excavation Characteristics

Based on our previous experience with similar projects in the vicinity of the site, it is our opinion that topsoil, artificial fill, alluvium and older alluvium can be readily excavated with conventional grading equipment.

5.1.2. Compressibility

The topsoil, artificial fill, alluvium and upper weathered portion of older alluvium are expected to be compressible in their current condition. Mitigation would include removing and replacing the upper compressible soils with compacted fill.

5.1.3. Collapse Potential/Hydro-Consolidation

The hydro-consolidation process is a singular response to the introduction of water into collapse-prone alluvial soils. Upon initial wetting, the soil structure and apparent strength are altered and an immediate settlement response occurs. Based on the results of consolidation testing, site soils were found to have a slight to moderate potential for collapse. Mitigation measures for collapse-prone soils include removal and recompaction during site grading or design of improvements for additional settlement.

5.1.4. Expansion Potential

Based on our observations and test results, the majority of the site soils are expected to have “very low” to “low” expansion potential when classified in accordance with ASTM D 4829.

5.1.5. Pavement Support Characteristics

Two surficial soil samples were tested for R-value to evaluate pavement support characteristics. Compacted fill derived from onsite soils is expected to possess excellent pavement support characteristics.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Construction of the proposed warehouse and associated improvements is considered feasible, from a geotechnical standpoint, provided that the conclusions and recommendations presented herein and in future studies are incorporated into the design and construction of the project. Presented below are specific issues identified by this study as possibly affecting site development. Recommendations to mitigate these issues are presented in the text of this report.

6.1. Earthwork Recommendations

Grading shall be accomplished under the observation and testing of the project soils engineer and engineering geologist or their authorized representative.

6.1.1. Unsuitable Soil Removals

In areas to receive settlement sensitive improvements or structures, the topsoil, young alluvium and weathered older alluvium should be removed. It is anticipated that the upper 5 feet of onsite soils will require removal and recompaction. Localized areas may require deeper removals. Vegetation, organics, and oversized materials greater than 6 inches in maximum dimension should be separated from the on-site soil and legally disposed off-site prior to the placement of any compacted fill.

Removal bottoms should expose competent older alluvium materials in a firm and unyielding condition. At the completion of unsuitable soil removals, the exposed bottom should be scarified to a minimum depth of four to six inches, moisture conditioned to at least optimum moisture and compacted in-place to the standards set forth in this report.

The resulting removal bottoms should be observed by a representative of AGS to verify that adequate removal of unsuitable materials has been conducted prior to fill placement.

6.1.2. Cut/Fill Transition

Where design grades and/or remedial grading activities create a cut/fill transition, the cut and shallow fill portions of the building pad should be overexcavated a minimum depth of three (3) feet and replaced to design grade with compacted fill. All undercuts should be graded such that a gradient of at least one (1) percent is maintained toward deeper fill areas or the front of the pad. The entire pad area should be undercut.

6.2. Earthwork Considerations

6.2.1. Compaction Standards

All fills should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. All loose and or deleterious soils should be removed to expose firm native soils or bedrock. Prior to the placement of fill, the upper 6 to 8 inches should be ripped, moisture conditioned to optimum moisture or slightly above optimum, and compacted to a minimum of 95 percent of the maximum dry density obtained per ASTM D1557. Fill should be placed in thin (6 to 8-inch) lifts, moisture conditioned to optimum moisture or slightly above, and compacted to 95 percent relative compaction until the desired grade is achieved.

6.2.2. Benching

Where the natural slope or existing grade is steeper than 5-horizontal to 1-vertical and where determined by the Geotechnical Consultant, compacted fill material shall be keyed and benched into competent materials.

6.2.3. Mixing and Moisture Control

In order to prevent layering of different soil types and/or different moisture contents, mixing and moisture control of materials will be necessary. The preparation of the earth materials through mixing and moisture control should be accomplished prior to and as part

of the compaction of each fill lift. Water trucks or other water delivery means may be necessary for moisture control. Discing may be required when either excessively dry or wet materials are encountered.

6.2.4. Haul Roads

All haul roads, ramp fills, and tailing areas shall be removed prior to engineered fill placement.

6.2.5. Import Soils

Import soils, if required, should consist of clean, structural quality, compactable materials similar to the on-site soils and should be free of trash, debris or other objectionable materials. Import soils should be tested and approved by the Geotechnical Consultant prior to importing. At least three working days should be allowed in order for the geotechnical consultant to sample and test the potential import material.

6.2.6. Fill Slope Construction

Fill slopes may be constructed by preferably overbuilding and cutting back to the compacted core or by back-rolling and compacting the slope face. The following recommendations should be incorporated into construction of the proposed fill slopes.

Care should be taken to avoid spillage of loose materials down the face of any slopes during grading. Spill fill will require complete removal before compaction, shaping and grid rolling.

Seeding and planting of the slopes should follow as soon as practical to inhibit erosion and deterioration of the slope surfaces. Proper moisture control will enhance the long-term stability of the finish slope surface.

6.2.6.1. Overbuilding Fill Slopes

Fill slopes should be overfilled to an extent determined by the contractor, but not less than 2 feet measured perpendicular to the slope face, so that when trimmed back to the compacted core, the compaction of the slope face meets the minimum project requirements for compaction.

Compaction of each lift should extend out to the temporary slope face. The sloped should be back-rolled at fill intervals not exceeding 4 feet in height unless a more extensive overfilling is undertaken.

6.2.6.2. Compacting the Slope Face

As an alternative to overbuilding the fill slopes, the slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Back-rolling at more frequent intervals may be required. Compaction of each fill should extend to the face of the slope. Upon completion, the slopes should be watered, shaped, and track-walked with a D-8 bulldozer or

similar equipment until the compaction of the slope face meets the minimum project requirements. Multiple passes may be required.

6.3. Preliminary Foundation Design Recommendations

Preliminary foundation design recommendations provided below are based on assumed as-graded conditions and structural loads. The proposed warehouse structure can be supported by conventional slab-on-grade-foundation systems.

Foundations supported on compacted fill may be designed using the values provided below.

Allowable Bearing: 2,000 lbs./sq.ft.

Lateral Bearing: 300 lbs./sq.ft. to a maximum of 2,000 lbs./sq.ft. (level condition)

Sliding Coefficient: 0.35

Settlement: Total = 1 inch

Differential: 1/2 inch in 20 feet

These values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building code and structural design considerations may govern depth and reinforcement requirements and should be evaluated.

6.3.1. Conventional Foundation Design Criteria

Based upon the onsite soil conditions and information supplied by the 2019 CBC, conventional foundation systems should be designed in accordance with Section 7.1 and Table 6.3.1 below.

TABLE 6.3.1
CONVENTIONAL SLAB ON GRADE FOUNDATION DESIGN RECOMMENDATIONS

Expansion Potential	***Very Low to Low***
Soil Category	**I**
Footing Depth Below Lowest Adjacent Finish Grade	
	12 inches
Footing Width	
One-Story	12 inches
Two-Story	15 inches
Footing Reinforcement	No. 4 rebar one (1) on top one (1) on bottom
Slab Subgrade Moisture	Minimum of 100 percent of optimum moisture prior to placing concrete.
Isolated Spread Footings Isolated spread footings should be embedded a minimum of 12 inches below lowest adjacent finish grade and should at least 18 inches wide. Final depth, width and reinforcement should be determined by the structural engineer.	
Footing Embedment Next to Swales and Slopes If exterior footings adjacent to drainage swales are to exist within five (5) feet horizontally of the swale, the footing should be embedded sufficiently to assure embedment below the swale bottom is maintained. Footings adjacent to slopes should be embedded such that a least seven (7) feet are provided horizontally from edge of the footing to the face of the slope.	

6.3.2. Moisture and Vapor Barrier

A moisture and vapor retarding system should be placed below the slabs-on-grade in portions of the structure considered to be moisture sensitive. The concrete slab underlayment should consist of a 15-mil vapor retarder, Stego-wrap or equivalent, with all laps sealed per the 2019 CBC and the manufacturer's recommendation. The vapor retarder should comply with the ASTM E 1745 - Class A criteria, and be installed in accordance with ACI 302.1R-04 and ASTM E 1643 on four inches of clean, angular, open-graded ⅜-inch gravel. The use of this system or other systems, materials, or techniques can be considered, at the discretion of the post-tensioned slab designer, provided the system reduces the vapor transmission rates to acceptable levels.

6.3.3. Earth Pressures for Retaining Wall Design and Buried Structures

The foundations for retaining walls should bear entirely on properly compacted fill. Retaining walls should be designed to resist earth pressures presented in Table 6.3.3.

TABLE 6.3.3
RETAINING WALL EARTH PRESSURES

"Select"* Backfill Materials (γ=130 pcf, Friction Angle=31 degrees, EI<20, SE>20)				
	Level Backfill		**Sloping (2:1) Backfill**	
	Rankine Coefficients	**Equivalent Fluid Pressure (psf / lineal foot)**	**Rankine Coefficients**	**Equivalent Fluid Pressure (psf / lineal foot)**
Active Pressure	$K_a = 0.32$	42	$K_a = 0.50$ (ascending)	65
Passive Pressure	$K_p = 3.12$	406	$K_p = 1.18$ (descending)	153
At Rest Pressure	$K_o = 0.48$	63	$K_o = 0.88$ (ascending)	114

Note: * "Select" backfill materials should be granular, structural quality backfill with a Sand Equivalent of 20 or better and Expansion Index of 20 or less. "Select" backfill must extend at least one-half the wall height behind the wall.

For design of rigid restrained walls it is recommended that "at-rest" values be used. For cantilever retaining walls which can undergo minor rotation, active pressures can be used. The above values may be increased by 1/3 as allowed by Code to resist transient loads. Building Code and structural design considerations may govern.

In addition to the above static pressures, unrestrained retaining walls should be designed to resist seismic loading as required by the 2019 CBC. The seismic load can be modeled as a thrust load applied at a point 0.4H above the base of the wall, where H is equal to the height of the wall. This seismic load (in pounds per lineal foot of wall) is represented by the following equation:

$$Pe = \tfrac{3}{8} * \gamma * H^2 * k_h$$

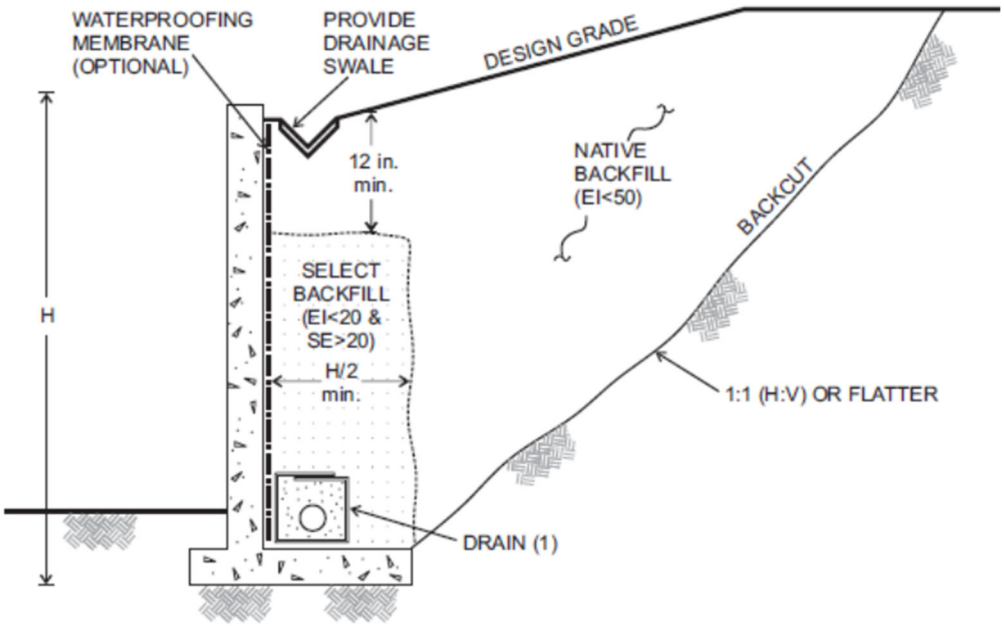
Where: Pe = Seismic thrust load
H = Height of the wall (feet)
γ = soil density = 125 pounds per cubic foot (pcf)
k_h = seismic pseudostatic coefficient = 0.5 * PGA_M

Walls should be designed to resist the combined effects of static pressures and the above seismic thrust load.

6.3.4. Retaining Wall Backfill and Drainage Recommendations

Retaining wall backfill should consist of free-draining granular soil with sand equivalent "SE" >20. Retaining walls should be provided with a drainage system adequate to prevent buildup of hydrostatic pressures. A heel drain should be placed at the heel of the wall (see Figure 6.3.4) and should consist of a 4-inch diameter perforated pipe (SDR35 or SCHD 40) surrounded by 1 cubic feet of crushed rock (3/4-inch) per lineal foot, wrapped in filter fabric (Mirafi® 140N or equivalent).

FIGURE 6.3.4
Retaining Wall Backfill and Drainage



Proper drainage devices should be installed along the top of the wall backfill, which should be properly sloped to prevent surface water ponding adjacent to the wall. In addition to the wall drainage system, for building perimeter walls extending below the finished grade, the

wall should be waterproofed and/or damp-proofed to effectively seal the wall from moisture infiltration through the wall section to the interior wall face.

The wall should be backfilled with granular soils placed in loose lifts no greater than 8-inches thick, at or near optimum moisture content, and mechanically compacted to a minimum 90 percent of the maximum dry density as determined by ASTM D1557. Flooding or jetting of backfill materials generally do not result in the required degree and uniformity of compaction and, therefore, is not recommended. No backfill should be placed against concrete until minimum design strengths are achieved as verified by compression tests of cylinders. The geotechnical consultant should observe the retaining wall footings, back drain installation, and be present during placement of the wall backfill to confirm that the walls are properly backfilled and compacted.

6.4. Trench Excavation

All utility trenches should be shored or laid back in accordance with applicable OSHA standards. Artificial fill and alluvial materials are considered Type 'C' soil per OSHA. Temporary, unsurcharged excavation sides may be sloped back at 1.5:1 (horizontal: vertical) in fill and alluvial materials. AGS personnel should observe the excavations so that any necessary modifications based on variations in the encountered soil conditions can be made. All applicable safety requirements and regulations, including CalOSHA requirements, should be met.

Shoring will be necessary for vertical excavations that are greater than 4 feet in depth, where there is the potential for caving soils or for support of adjacent buried utilities. Shoring should be maintained throughout the installation. Shoring design parameters may be provided by AGS, if requested. Barricades should be placed around temporary excavations so that vehicles and storage loads do not encroach within 10 feet of the top of the excavated slopes. No surcharge loads should be imposed above excavations. This includes spoil piles, lumber, concrete trucks or other construction materials and equipment. Drainage above excavations should be directed away from the banks. Care should be taken to avoid saturation of the soils. If temporary construction slopes are to be maintained during the rainy season, we recommend that berms be graded along the tops of the slopes in order to prevent runoff water from entering the excavation and eroding the slope faces.

6.5. Trench Backfill

Pipe trench backfill should conform to the recommendations presented in this report, City of Hesperia standard plans and specifications, and Section 306 of the Greenbook.

6.6. Flexible Pavement Design

Preliminary R-Value testing yielded results ranging from 62 to 75. For preliminary design and estimating purposes the pavement structural sections presented in Table 6.6 can be used for the range of likely traffic indices. These structural sections conform to the current Caltrans pavement design guidelines utilizing Class II aggregate base and subgrade design R-value of 62. Final pavement design will be determined based upon sampling and testing of post-grading conditions.

TABLE 6.6 PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS[1]		
Traffic Index	**Asphalt Concrete (inches)**	**Class II Aggregate Base (inches) [2]**
5.0	3.0	4.0
6.0	4.0	4.0
7.0	4.0	4.0
8.0	5.0	4.0
9.0	6.0	4.0
10.0	7.0	4.0
Notes: [1] - Pavement design per Caltrans Highway Design Manual 7th Edition (20 year design life) [2] – Minimum recommend aggregate base section.		

Pavement subgrade soils should be at or near optimum moisture content and should be compacted to a minimum of 95 percent relative compaction. Aggregate base should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557 and should conform with the specifications listed in Section 26 of the *Standard Specifications for the State of California Department of Transportation* (Caltrans) or Section 200-2 of the *Standard Specifications for Public Works Construction* (Green Book). The asphalt concrete should conform to Section 26 of the Caltrans *Standard Specifications* or Section 203-6 of the Green Book.

6.7. Concrete Pavement Design Recommendations

Portland cement concrete may be used for heavy truck traffic areas. The following concrete pavement sections were determined using the recommendations provided in "Design of Concrete Pavement for City Streets" by the American Concrete Pavement Association. Testing of subgrade soils should be performed once driveway subgrades are achieved to determine the actual R-Value of the subgrade soils and/or corresponding modulus of subgrade reaction.

TABLE 6.7 PORTLAND CEMENT CONCRETE PAVEMENT					
Traffic Classification	**Traffic Index**	**Portland Cement Concrete Section (inches)**	**Class II Aggregate Base (inches)**	**k* (pci)**	**MR* (psi)**
Heavy Truck Traffic	8.0	6.0	4.0	150	650
	9.0	7.0	4.0	150	650
	10.0	8.5	4.0	150	650
*Notes: k = Modulus of subgrade reaction MR=Flexural strength of concrete (Modulus of Rupture)					

Joints should be provided at a minimum spacing of 10 feet. The joints should be caulked and sealed with a flexible compound to reduce the potential for moisture infiltration. The civil engineer should determine the need for reinforcement and doweling.

The subgrade should be moisture conditioned and compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557. Subgrade soils should be at or near the optimum moisture content to a depth of 12-inches immediately prior to placing concrete.

6.8. Concrete Flatwork

6.8.1. Subgrade Compaction

The upper one foot of subgrade below exterior slabs and sidewalks should be compacted to a minimum of 95 percent relative compaction.

6.8.2. Subgrade Moisture

The subgrade below exterior slabs, sidewalks, and driveways should be moisture conditioned to minimum 100 percent of optimum moisture content prior to concrete placement.

6.8.3. Slab Thickness

Concrete flatwork should be designed utilizing 4-inch minimum thickness. Consideration should be given to construct a thickened edge (scoop footing) at the perimeter of slabs and walkways adjacent to landscape areas to minimize moisture variation below these improvements. The thickened edge (scoop footing) should extend approximately 8 inches below concrete slabs and should be a minimum of 6 inches wide. Weakened plane joints should be installed on walkways at intervals of approximately 6 to 8 feet. Exterior slabs should be designed to withstand shrinkage of the concrete. Consideration should be given to reinforcing any exterior flatwork.

6.9. Concrete Design

The onsite bedrock and fill soils are anticipated to possess a sulfate concentration that corresponds to class S0 sulfate exposure when classified in accordance with ACI 318. Sulfate resistant concrete is not anticipated.

6.10. Corrosion

The onsite soils are expected to be slightly corrosive to buried metallic materials. AGS recommends minimally that the current standard of care be employed for protection of metallic construction materials in contact with onsite soils or that consultation with an engineer specializing in corrosion to determine specifications for protection of the construction materials. Steel reinforcement in contact with onsite soils should be protected with an epoxy coating, adequate concrete cover, or other approved methods as detailed by the structural engineer.

6.11. Site Drainage

Final site grading should assure positive drainage away from structures. Planter areas should be provided with area drains to transmit irrigation and rain water away from structures. The use of gutters and down spouts to carry roof drainage well away from structures is recommended. Raised planters should be provided with a positive means to remove water through the face of the containment wall.

7.0 SLOPE AND LOT MAINTENANCE

Maintenance of improvements is essential to the long-term performance of structures and slopes. Although the design and construction during mass grading create slopes that are considered both grossly and surficially stable, certain factors are beyond the control of the soil engineer and geologist. The owner must implement certain maintenance procedures.

Fill derived from onsite materials is considered highly susceptible to erosion. Drainage devices should be constructed above fill slopes to direct runoff away from slopes. Slope planting should be conducted as soon as possible and temporary erosion control will be necessary until vegetation has been established. The following recommendations should be implemented.

7.1. Slope Planting

Slope planting should consist of ground cover, shrubs and trees that possess deep, dense root structures and require a minimum of irrigation. The owner should be advised of their responsibility to maintain such planting.

7.2. Lot Drainage

Roof and pad drainage should be collected and directed away from structures and slopes and toward approved disposal areas. Design fine-grade elevations should be maintained through the life of the structure, or if design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid discharge of water away from structures and slopes. The owner is responsible for maintenance and cleaning of all drainage terraces, downdrains, and other devices that have been installed to promote structure and slope stability.

7.3. Slope Irrigation

The owner should be advised of their responsibility to maintain irrigation systems. Leaks should be repaired immediately. Sprinklers should be adjusted to provide maximum uniform coverage with a minimum of water usage and overlap. Overwatering with consequent wasteful run-off and ground saturation should be avoided. If automatic sprinkler systems are installed, their use must be adjusted to account for natural rainfall conditions.

7.4. Burrowing Animals

The owner should undertake a program for the elimination of burrowing animals. This should be an ongoing program in order to maintain slope stability.

8.0 FUTURE STUDY NEEDS

8.1. Future Geotechnical Studies

Design plans have not yet been developed. The recommendations provided herein are considered preliminary and subject to change based on the actual design. When available, AGS should review detailed construction plans.

8.2. Observation during Construction

Geologic exposures afforded during remedial and rough grading operations provide the best opportunity to evaluate the anticipated site geologic structure. Continuous geologic and geotechnical observations, testing, and mapping should be provided throughout site development. Additional near-surface samples should be collected by the geotechnical consultant during grading and subjected to laboratory testing. Final design recommendations should be provided in a grading report based on the observations and test results collected during grading.

9.0 LIMITATIONS AND FUTURE STUDIES

This limited geotechnical evaluation report is based on the project as described and the information obtained during our recent site exploration, reviewed maps and available geologic literature within the general area. Services performed by AGS have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are preliminary and based on the assumption that additional design level studies including additional subsurface investigations and testing will be performed and an appropriate level of field review during construction will be provided by geotechnical engineers and engineering geologists who are familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this and future reports. AGS should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations of this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of AGS.

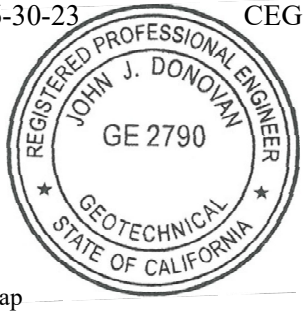
AGS has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the CONTRACTOR, or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

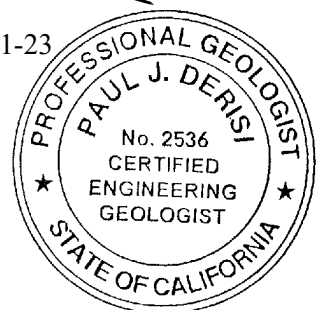
Advanced Geotechnical Solutions, Inc., appreciates the opportunity to provide you with geotechnical consulting services and professional opinions. If you have any questions, please contact the undersigned at (619) 867-0487.

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.

JOHN J. DONOVAN
RCE 65051, RGE 2790, Reg. Exp. 6-30-23

PAUL J. DERISI
CEG 2536, Reg. Exp. 5-31-23





Distribution: (1) Addressee (pdf)

Attachments: Figure 1 - Site Location Map
Figure 2 - Regional Geologic Map
Plate 1 - Exploration Location Plan
Appendix A - References
Appendix B - Subsurface Exploration
Appendix C - Laboratory Test Results

2202-09-B-2 (Mar 22, 2022, EIR Geotechnical Study, Hesperia 29-Acre Business Center).docx

APPENDIX A
REFERENCES

Bortugno, E.J, and Spittler, T.E., 1986, Morton, D. M., and Miller, F. K., 2006, *Geologic Map of the San Bernardino Quadrangle, California*, *1:250,000*, United States Geological Survey (USGS) Regional Geologic Map Series, San Bernardino Quadrangle, Map No. 3A (Geology).

Brandt, J.T. and Sneed, M., 2022, *Land Subsidence in the Mojave River and Morongo Groundwater Basins, Southwestern Mojave Desert, California, 2014–2019*, https://ca.water.usgs.gov/mojave/mojave-subsidence-2014-2019.html

California Building Standards Commission, 2019, 2019 California Building Code, Title 24, Part 2, Volumes 1 and 2.

California Geological Survey, 2008, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, dated September 11, 2008, Special Publication 117A.

Dibblee, T.W., and Minch, J.A., 2008, *Geologic map of the Hesperia 15 minute quadrangle, San Bernardino County, California*, Dibblee Foundation Map DF-382.

Jennings, C.W., 1994, Fault Activity Map of California and Adjacent Areas: California Geological Survey, California Geologic Data Map No. 6, Scale 1:750,000.

Morton, D. M., and Miller, F. K., 2006, *Geologic Map of the San Bernardino and Santa Ana 30′ x 60′ Quadrangles, California*, with digital preparation by Cossette, Pamela M., and Bovard, Kelly R.: United States Geological Survey (USGS) Open-File Report 2006-1217.

Soils Southwest, Inc., 2020, "Due Diligence Report of Geotechnical Evaluations, Proposed 80+ acre U.S. Freezer/Cold Storage Distribution Center, NEC U.S. Highway 395 and Yucca Terrace Drive, City of Hesperia, San Bernardino County, California, 92344, A.P.N. 3064-421-01-0000, 02 & 03," Project No. 19042-F, April 20, 2020.

Southern California Earthquake Center, 2002, *Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California*, dated June 2002.

United States Geological Survey, 2022, Seismic Design Maps, https://seismicmaps.org/ developed by SEAOC and OSHPD.

United States Geological Survey, 2022, Unified Hazards Tool, https://earthquake.usgs.gov/hazards/interactive

APPENDIX B

SUBSURFACE EXPLORATION

BORING NUMBER B-1

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3554 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SC	**Older Alluvium (Qoal):** Clayey SAND, yellowish brown, slightly moist, dense, fine- to coarse-grained; some gravel.	BU					RV				
5				MC	17-21-27 (48)	125	4.1	33	Consol				
10		SM	@ 10 ft. Silty SAND, yellowish brown, moist, dense, fine-grained; some clay.	MC	18-20-31 (51)	113	7.5	43					
15			@ 15 ft. brown with iron oxide staining, very dense, fine- to coarse-grained; some fine gravel.	MC	19-38-46 (84)	130	5.7	55					
20			@ 20 ft. with sub-rounded gravel.	MC	18-33-48 (81)	122	1.8	13					
25				MC	12-22-38 (60)	127	3.9	34					

(Continued Next Page)

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies **PROJECT NAME** Industrial Development

PROJECT NUMBER 2202-09 **PROJECT LOCATION** APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
30		SM	**Older Alluvium (Qoal):** (continued) Silty SAND, yellowish brown, moist, dense, fine-grained; some clay; with gravel.										
		SP-SM	@ 30 ft. interbedded Silty SAND and gravelly SAND, fine-to coarse-grained, yellowish brown, dry, dense.	SPT	11-14-15 (29)								
35		SP	@ 35 ft. SAND, fine-to coarse-grained, light gray, dry, friable.	MC	13-37-48 (85)	114	2.3	13					
40		SP-SM	@ 40 ft. interbedded Silty SAND and SAND, fine-to coarse-grained, yellowish brown, dry, dense.	SPT	11-11-18 (29)								
45		ML	@ 46 ft. SILT, brown, wet, stiff; some clay.	MC	13-15-35 (50)	124	9.0	73					
50		SP	@ 50 ft. Gravelly SAND, brown, very dense, fine- to coarse-grained; some silt, metamorphic and granitic clasts to 1/2-inch size.	MC	18-34-40 (74)	117	2.4	15					

Total Depth= 51.5 ft.
No water. No caving

BORING NUMBER B-2

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3553 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Older Alluvium (Qoal):** Silty SAND, yellowish brown, slightly moist, dense, fine- to coarse-grained.	BU					EI Max DSR Chem				
				MC	8-16-17 (33)	124	2.0	16					
5													
				MC	16-22-27 (49)	123	4.7	36					
10													
15			@ 15 ft. some metamorphic clasts to 1/2-inch size (quartzite).	MC	16-22-25 (47)	126	8.1	69					
20		SP	@ 20 ft. SAND, fine-to coarse-grained, light yellowish brown to light reddish brown, dry.	MC	12-19-27 (46)	121	3.1	22					
25				MC	12-15-29 (44)	115	3.1	18					
			Total Depth= 26.5 ft. No water. No caving										

BORING NUMBER B-3

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3553 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Older Alluvium (Qoal):** Silty SAND, yellowish brown, slightly moist, medium dense, fine- to coarse-grained.										
5				MC	5-7-8 (15)	118	1.8	12					
10			@ 10 ft. medium- to coarse-grained, light yellowish brown, dry.	MC	24-41-50 (91)	129	2.5	24					
15			@ 15 ft. Silty SAND, yellowish brown, slightly moist, dense, fine-grained; abundant subrounded gravel to 1/2-inch size.	MC	35-50/5"	132	4.1	42					
20		SP	@ 20 ft. Gravelly SAND, yellowish to reddish brown, very dense, fine- to coarse-grained; metamorphic clasts to 1/2-inch size.	MC	32-39-50 (89)	121	1.9	14					
			Total Depth= 21.5 ft. No water. No caving										

BORING NUMBER B-4

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3554 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Older Alluvium (Qoal):** Silty SAND, yellowish brown, dry, medium dense, fine- to medium-grained.	MC	6-9-11 (20)	117	1.9	12					
5		SP	@ 7 ft. SAND, light red, slightly moist, dense, fine-grained to coarse-grained; some subrounded gravel to 3/4-inch size.	MC	6-10-14 (24)	111	2.8	15	Consol				
10													
15				MC	27-36-50 (86)	130	5.4	53					
20			@ 20 ft. Gravelly SAND, light red, dry, very dense, fine- to coarse-grained; some gravel to 3/4-inch size.	MC	16-27-48 (75)	119	3.0	20					

Total Depth= 21.5 ft.
No water. No caving

BORING NUMBER B-5

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3545 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Older Alluvium (Qoal):** Silty SAND, yellowish brown, dry, medium dense, fine- to medium-grained.										
5				MC	24-50/5"	115	2.7	16					
			@ 7 ft. less silt; with coarse gravel.	BU									
10				MC	27-39-43 (82)	121	2.7	19	Consol				
15		SC	@ 15 ft. Clayey SAND, light yellowish brown, dry, dense, fine- to medium-grained; some gravel to 3/4-inch size.	MC	29-50/5"	134	5.2	58					
20		SP	@ 20 ft. SAND, light gray, dry, dense, fine- to coarse-grained; friable.	SPT	5-12-17 (29)								

Total Depth= 21.5 ft.
No water. No caving

BORING NUMBER P-1

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3540 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	Silty SAND, fine- to coarse-grained, yellowish brown, slightly moist, loose; with subrounded gravel to 3/4-inch size.										
5			@ 2 ft. light yellowish brown, slightly moist.										
			Total Depth= 6 ft. No water. No caving										

BORING NUMBER P-2

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3540 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SM	Silty SAND, fine- to coarse-grained, yellowish brown, slightly moist, loose; with subrounded gravel to 3/4-inch size.										
5			Total Depth= 5 ft. No water. No caving										

BORING NUMBER P-3

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3541 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SM	Silty SAND, fine- to coarse-grained, yellowish brown.										
			Total Depth= 4 ft. No water. No caving										

BORING NUMBER P-4

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3545 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SM	Silty SAND, fine to coarse-grained, light brown, dry.										
			Total Depth= 4 ft. No water. No caving										

BORING NUMBER P-5

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 3/4/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3545 ft **HOLE SIZE** 8
DRILLING CONTRACTOR
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger
AT TIME OF DRILLING ---
LOGGED BY SD **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	Silty SAND, fine to coarse-grained, light brown, dry.										
5		SP	SAND with silt, fine to coarse-grained, light brown.										
			Total Depth= 7 ft. No water. No caving										

Date Excavated: 2/21/2022, 3/4/2022
Logged by: SD
Equipment: JD 410J Backhoe

LOG OF TEST PITS

Excavation No.	Depth (ft.)	USCS	Description
T-1	0.0 – 0.5	SM	**Topsoil** SILTY SAND, fine- to coarse-grained, light brown, with roots, dry, loose, numerous rodent holes.
	0.5 – 3.3	SM	**Alluvium (Qal)?** SILTY SAND, fine- to coarse-grained, trace gravel, light brown, dry, loose, porous.
	3.3 – 10.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, trace gravel, light brown, medium dense, rodent hole at 3.8 feet in depth.
			@ 5 ft., coarser grained, slightly moist, medium dense.
		SP-SM	@ 5.5 ft., SAND with Silt, trace cobbles.
			@ 9 ft., more cobbles, medium dense to dense.
			TOTAL DEPTH 10 FT. NO WATER, SOME CAVING BELOW 6 FT.

Excavation No.	Depth (ft.)	USCS	Description
T-2	0.0 – 0.3	SM	**Topsoil** SILTY SAND, fine- to medium-grained, light yellow brown, some roots, dry, loose.
	0.3 – 1.7	SM	**Alluvium (Qal)?** SILTY SAND, fine-grained, yellow brown, slightly moist, loose.
	1.7 – 8.5	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, light brown, dry, medium dense. @ 4.5 ft., dense. @ 5.5 ft., fine-grained, slightly indurated, very dense. TOTAL DEPTH 8.5 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-3	0.0 – 0.7	SM	**Topsoil** SILTY SAND, fine- to medium-grained, light yellow brown, some roots, dry, loose.
	0.7 – 2.8	SM	**Alluvium (Qal)?** SILTY SAND, fine-grained, light yellow brown, slightly moist.
	2.8 – 6.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, less silt, yellow brown, medium dense.
	6.0 – 10.0	SP-SM	@ 6 ft., SAND with Silt, fine to coarse-grained, with gravel, light yellow brown, dense. @ 8 ft., dense to very dense. TOTAL DEPTH 10 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-4	0.0 – 1.0	SM	**Topsoil** SILTY SAND, fine- to coarse-grained, yellow brown, some roots, slightly moist, loose.
	1.0 – 3.0	SM	**Alluvium (Qal)?** SILTY SAND, fine- to coarse-grained, yellow brown, dry to slightly moist, loose, roots down to 30 inches in depth.
	3.0 – 5.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, less silt, light yellow brown, medium dense.
	5.0 – 6.0	SP-SM	@ 5 ft., SAND with Silt, fine to coarse-grained, some gravel, orange brown, slightly moist, medium dense.
	6.0 – 8.0	SM	@ 6 ft., SILTY SAND, fine to coarse-grained, orange brown, slightly indurated, dense, more difficult to excavate. TOTAL DEPTH 8 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-5	0.0 – 2.0	SM	**Alluvium (Qal)** SILTY SAND, fine- to medium-grained, yellow brown, slightly moist, loose, some roots.
	2.0 – 4.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, some gravel, less silt, yellow brown, dry, medium dense.
	4.0 – 5.0	SM	@ 4 ft., fine to coarse-grained, with gravel, medium dense to dense.
	5.0 – 10.5	SP-SM	@ 5 ft., SAND with silt, fine to coarse-grained, some gravel, orange brown, slightly moist, slightly indurated, dense. TOTAL DEPTH 10.5 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-6	0.0 – 2.0	SM	**Alluvium (Qal)** SILTY SAND, fine- to medium-grained, yellow brown, slightly moist, loose to medium dense.
	2.0 – 2.5	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, trace gravel, less silt, lightly moist, light brown, dry, medium dense.
	2.5 – 7.5	SM	@ 2.5 ft., fine to coarse-grained, with gravel, light brown, dry, dense. @ 4 ft., slightly indurated, dense, harder to excavate. TOTAL DEPTH 7.5 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-7	0.0 – 2.7	SM	**Alluvium (Qal)** SILTY SAND, fine -grained, yellow brown, dry to slightly moist, loose, some roots down to 2 feet in depth.
	2.7 – 4.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, some gravel, yellow brown, dry, medium dense to dense.
	4.0 – 7.5	SP-SM	@ 4 ft., SAND with silt, fine to coarse-grained, with gravel, red brown, moist, slightly indurated, dense.
	7.5 – 10.0	SP	@ 7.5 ft., SAND, fine to coarse-grained, with gravel and cobbles, red brown, dense.
	10.0 – 12.0	SP-SM	@ 10 ft., SAND with silt, fine to coarse-grained, slightly indurated, dense, harder to excavate. @ 11 ft., light grey brown, slightly cemented. TOTAL DEPTH 12 FT. NO WATER, SLIGHT CAVING 7.5 to 10 FEET

APPENDIX C

LABORATORY TEST RESULTS

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

EXPANSION INDEX - ASTM D4829

AGS FORM E-6

Project Name:	Hesperia 29-Acre Site	Excavation/Tract:	B-2
Location:	Hesperia, CA	Depth/Lot:	0-4 ft
P/W:	2202-09	Description:	SM
Date:	3/14/22	Tested by:	FV
		Checked by:	AB

Expansion Index - ASTM D4829	
Initial Dry Density (pcf):	121.7
Initial Moisture Content (%):	7.2
Initial Saturation (%):	50.5
Final Dry Density (pcf):	122.2
Final Moisture Content (%):	11.6
Final Saturation (%):	82.6
Expansion Index:	0
Potential Expansion:	Very Low

ASTM D4829 - Table 5.3	
Expansion Index	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
>130	Very High

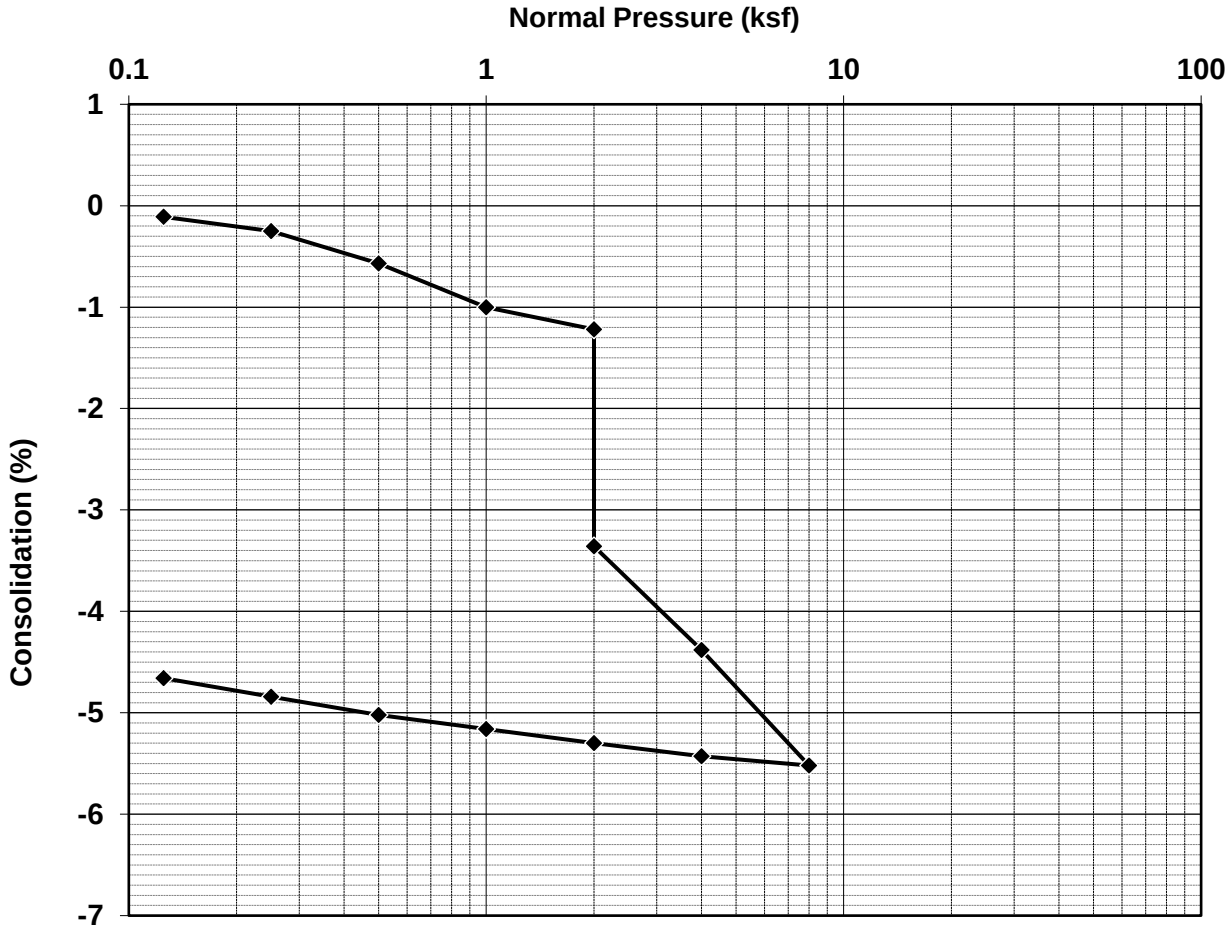
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CONSOLIDATION - ASTM D2435

AGS Form E-3

Project Name:	Hesperia 29-Acre Site	Excavation:	B-1
Location:	Hesperia, CA	Depth:	5 ft
Project No:	2202-09	Description:	SC
Date:	3/2/2022	By:	FV

Consolidation-Pressure Curve



Test Description:

	Before Test	After Test
Water Content, w	4.1%	12.0%
Void Ratio, e	0.44	0.37
Saturation, S	25%	87%
Dry Density (pcf)	117.2	122.9
Wet Density (pcf)	122.0	137.7

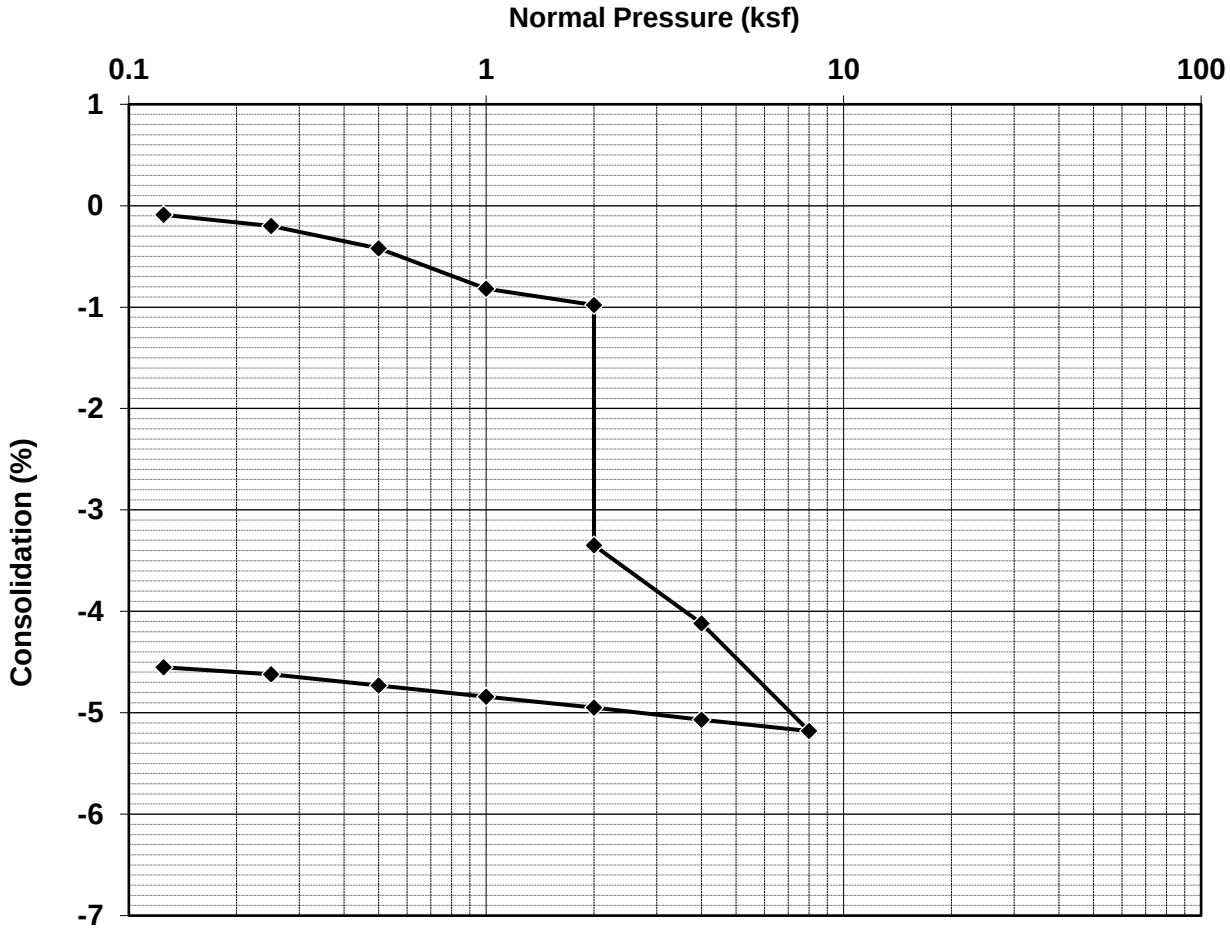
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CONSOLIDATION - ASTM D2435

AGS Form E-3

Project Name:	Hesperia 29-Acre Site	Excavation:	B-4
Location:	Hesperia, CA	Depth:	7 ft
Project No:	2202-09	Description:	SP
Date:	3/2/2022	By:	FV

Consolidation-Pressure Curve



Test Description:

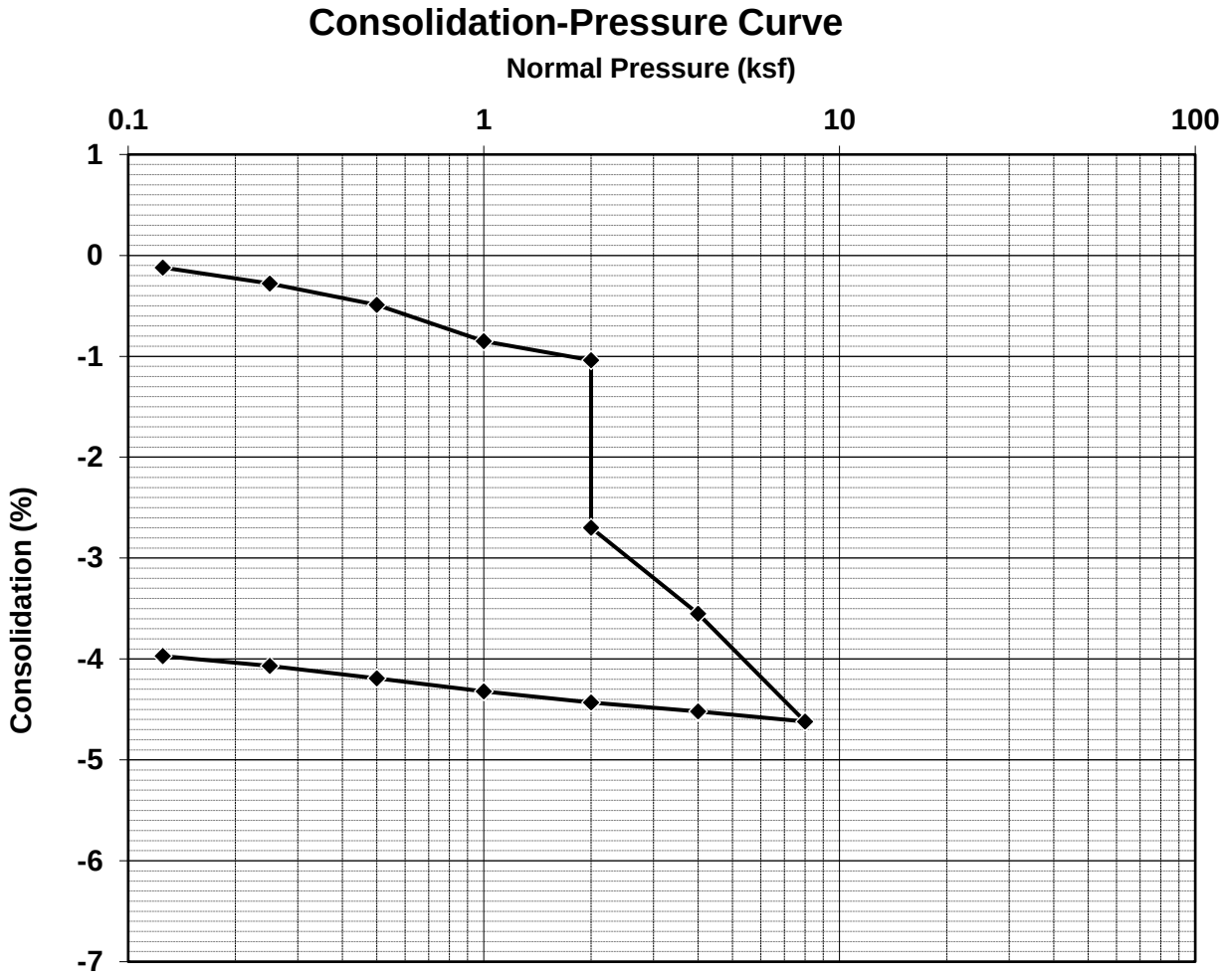
	Before Test	After Test
Water Content, w	2.8%	16.1%
Void Ratio, e	0.59	0.52
Saturation, S	13%	84%
Dry Density (pcf)	105.8	110.9
Wet Density (pcf)	108.8	128.7

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CONSOLIDATION - ASTM D2435

AGS Form E-3

Project Name:	Hesperia 29-Acre Site	Excavation:	B-5
Location:	Hesperia, CA	Depth:	10 ft
Project No:	2202-09	Description:	SM
Date:	3/2/2022	By:	FV



Test Description:

	Before Test	After Test
Water Content, w	2.7%	12.4%
Void Ratio, e	0.47	0.41
Saturation, S	15%	81%
Dry Density (pcf)	114.4	119.2
Wet Density (pcf)	117.5	134.0

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

MAXIMUM DENSITY - ASTM D1557

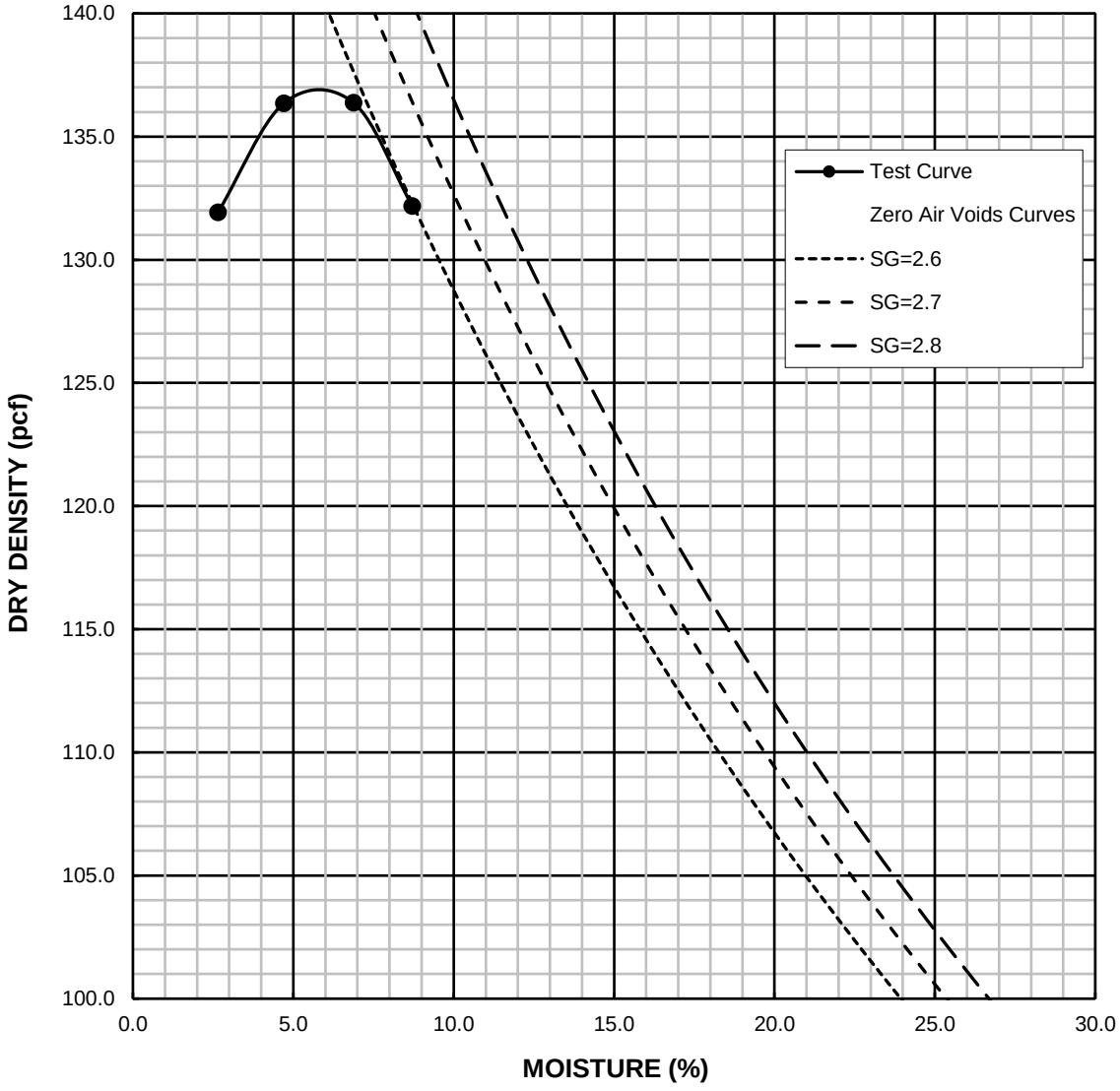
AGS FORM E-8

Project Name: Hesperia 29 Acre
Location: Hesperia, CA
P/W No.: 2202-09
Date: 03-2022

Excavation: B-2
Depth: 0-4 ft
Soil Type: SM
Tested by: FV
Checked by: SD

Method:	A	Oversize Retained: 3.4 %		
Point No.	1	2	3	4
Dry Density (pcf)	131.9	136.4	136.4	132.2
Moisture Content (%)	2.7	4.7	6.9	8.7

MAXIMUM DENSITY CURVE



Corrected Max. Dry Density **137.6 pcf**
Max. Dry Density **136.8 pcf**

Corrected Moisture **5.7** %
Optimum Moisture **5.9** %

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

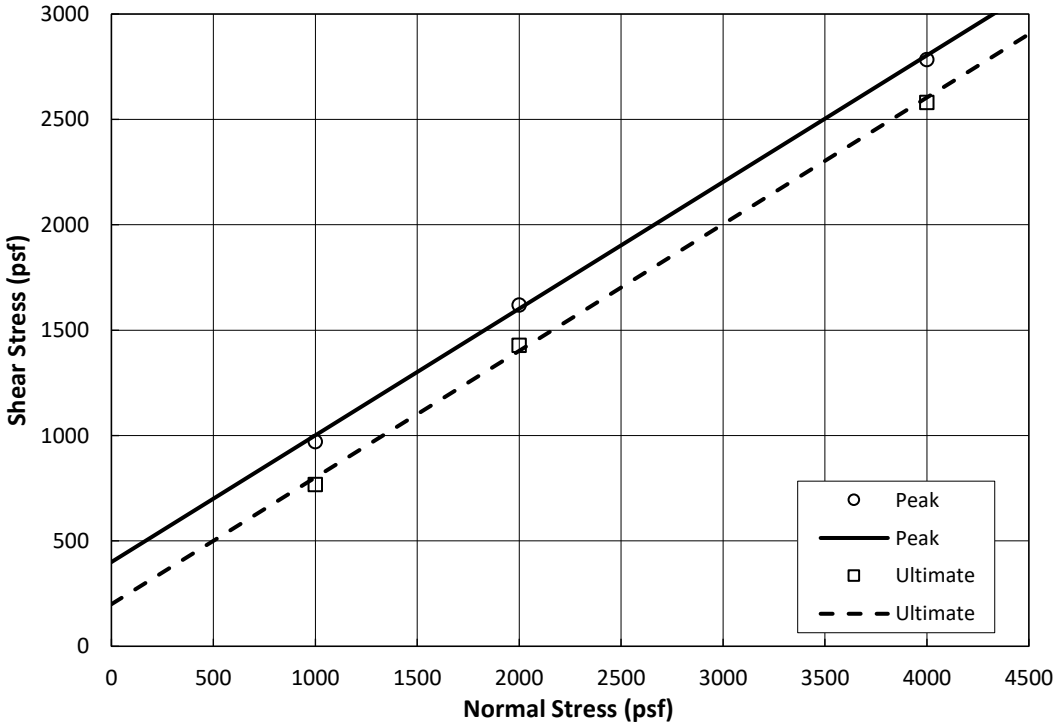
DIRECT SHEAR - ASTM D3080

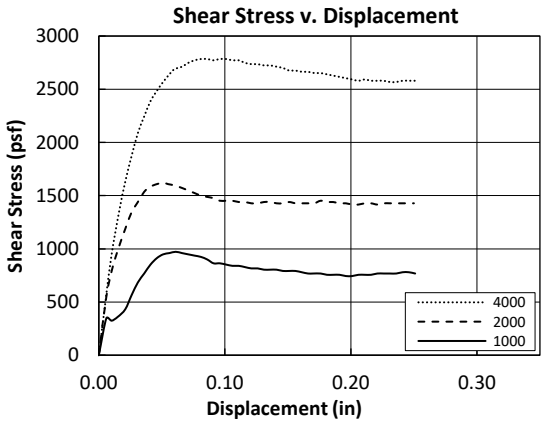
Project Name:	Hesperia 29-Acre Site	Excavation:	B-2
Location:	Hesperia	Depth:	0-4 ft
Project No.:	2202-09	Tested by:	FV
Date:	3/15/2022	Reviewed by:	AB

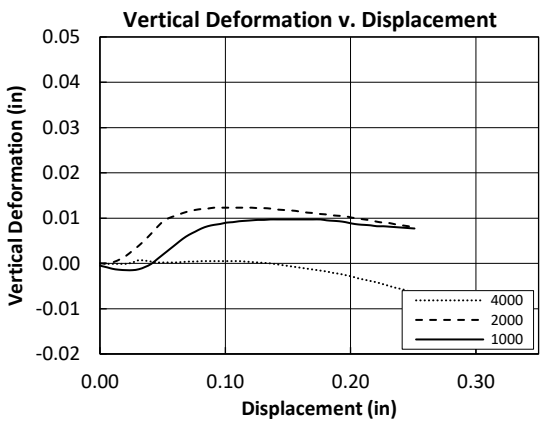
Samples Tested	1	2	3
Intial Moisture (%)	5.9	5.9	5.9
Initial Dry Density (pcf)	123.1	123.1	123.1
Normal Stress (psf)	1000	2000	4000
Peak Shear Stress (psf)	972	1620	2784
Ult. Shear Stress (psf)	768	1428	2580

Soil Type:	SM
Test:	Remolded 90%
Method:	Drained
Consolidation:	Yes
Saturation:	Yes
Shear Rate ($^{in}/_{min}$):	0.01

Strength Parameters	Peak	Ultimate
Friction Angle, phi (deg)	31	31
Cohesion (psf)	400	200







ANAHEIM TEST LAB, INC

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

Advanced Geotechnical Solutions
485 Corporate Ave., Suite B
Escondido, CA 92029

DATE: 3/15/2022

P.O. NO.: Chain of Custody

LAB NO.: C-5759, 1-2

SPECIFICATION: CTM-301

MATERIAL: Soil

Project No.: 2202-09
Project: Hesperia 29 Acre
Sample Date: 2/21/2022

ANALYTICAL REPORT

"R" VALUE

	BY EXUDATION	BY EXPANSION
1) B-1 @ 0-5'	62	N/A
2) T-7 @ 1-2'	75	N/A

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: Advanced Geotechnical Solutions **ATL No.:** C 5759-1 **Date:** 3/15/2022

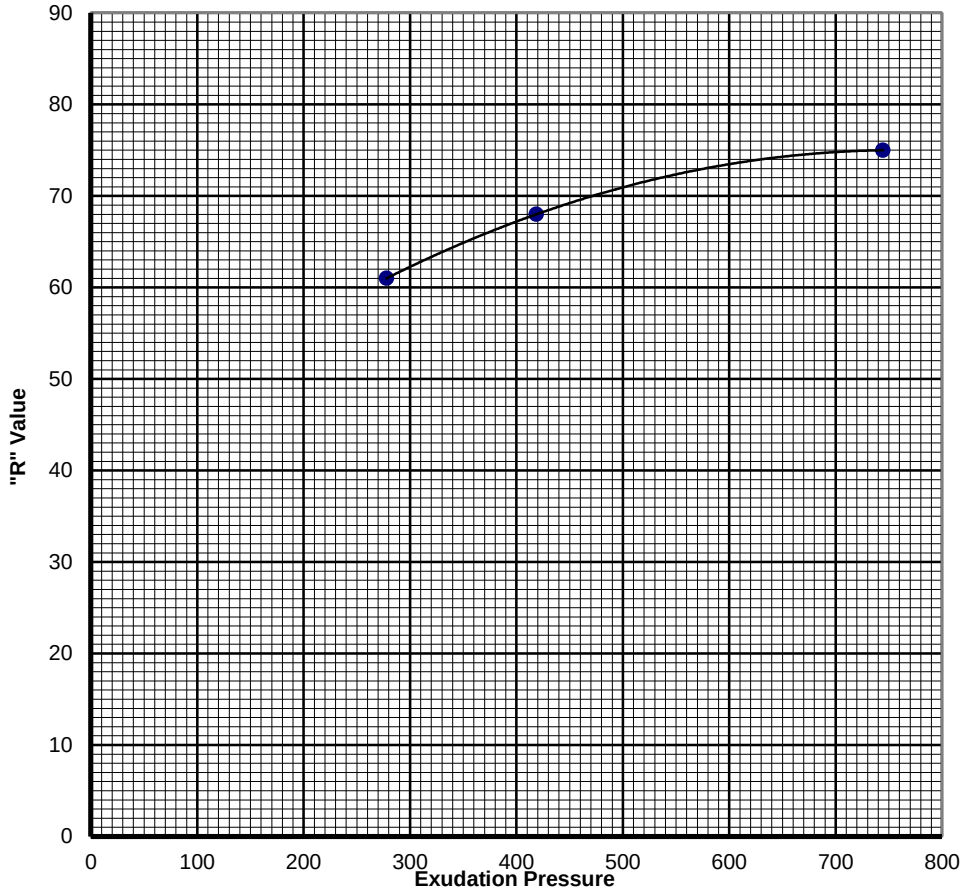
Client Reference No.: 2202-09

Sample: B-1 @ 0-5' **Soil Type:** Brown, Silty Sand w. Gravel

.

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	250	350	350	
Initial Moisture Content	%	1.2	1.2	1.2	
Moisture at Compaction	%	8.3	7.9	7.5	
Briquette Height	in.	2.53	2.51	2.47	
Dry Density	pcf	129.9	129.2	130.4	
EXUDATION PRESSURE	psi	278	419	744	
EXPANSION PRESSURE	psf	0	0	0	
Ph at 1000 pounds	psi	25	20	17	
Ph at 2000 pounds	psi	43	35	28	
Displacement	turns	4.35	4.21	3.91	
"R" Value		61	68	75	
CORRECTED "R" VALUE		61	68	75	

Final "R" Value	
BY EXUDATION: @ 300 psi	**62**
BY EXPANSION: TI = 5.0	**N/A**



"R" VALUE CA 301

Client: Advanced Geotechnical Solutions **ATL No.:** C 5759-2 **Date:** 3/15/2022

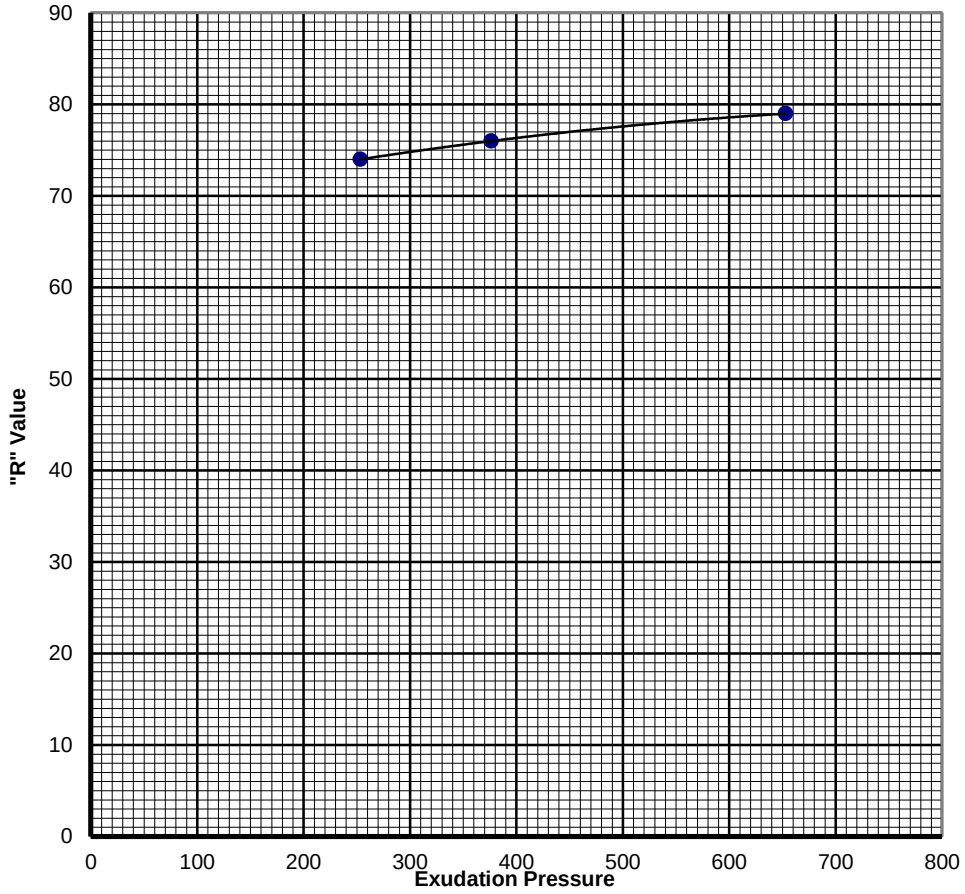
Client Reference No.: 2202-09

Sample: T-7 @ 1-2' **Soil Type:** Brown, Silty Sand w. trace Gravel

.

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	350	350	350	
Initial Moisture Content	%	1.9	1.9	1.9	
Moisture at Compaction	%	7.8	8.3	7.4	
Briquette Height	in.	2.50	2.54	2.48	
Dry Density	pcf	128.2	127.8	129.0	
EXUDATION PRESSURE	psi	376	253	653	
EXPANSION PRESSURE	psf	13	0	35	
Ph at 1000 pounds	psi	15	19	14	
Ph at 2000 pounds	psi	27	30	24	
Displacement	turns	3.95	3.9	3.71	
"R" Value		76	74	79	
CORRECTED "R" VALUE		76	74	79	

Final "R" Value	
BY EXUDATION: @ 300 psi	**75**
BY EXPANSION: TI = 5.0	**N/A**



ANAHEIM TEST LAB, INC

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

DATE: 3/11/2022

Advanced Geotechnical Solutions, Inc.
485 Corporate Ave., Suite B
Escondido, CA 92029

P.O. NO.: Chain of Custody

LAB NO.: C-5758

SPECIFICATION: CTM-643/417/422

MATERIAL: Soil

Project No.: 2202-09
Project: Hesperia 29 Acre
Sample Date: 2/21/2022
Sample ID: B-2 @ 0-4'

ANALYTICAL REPORT

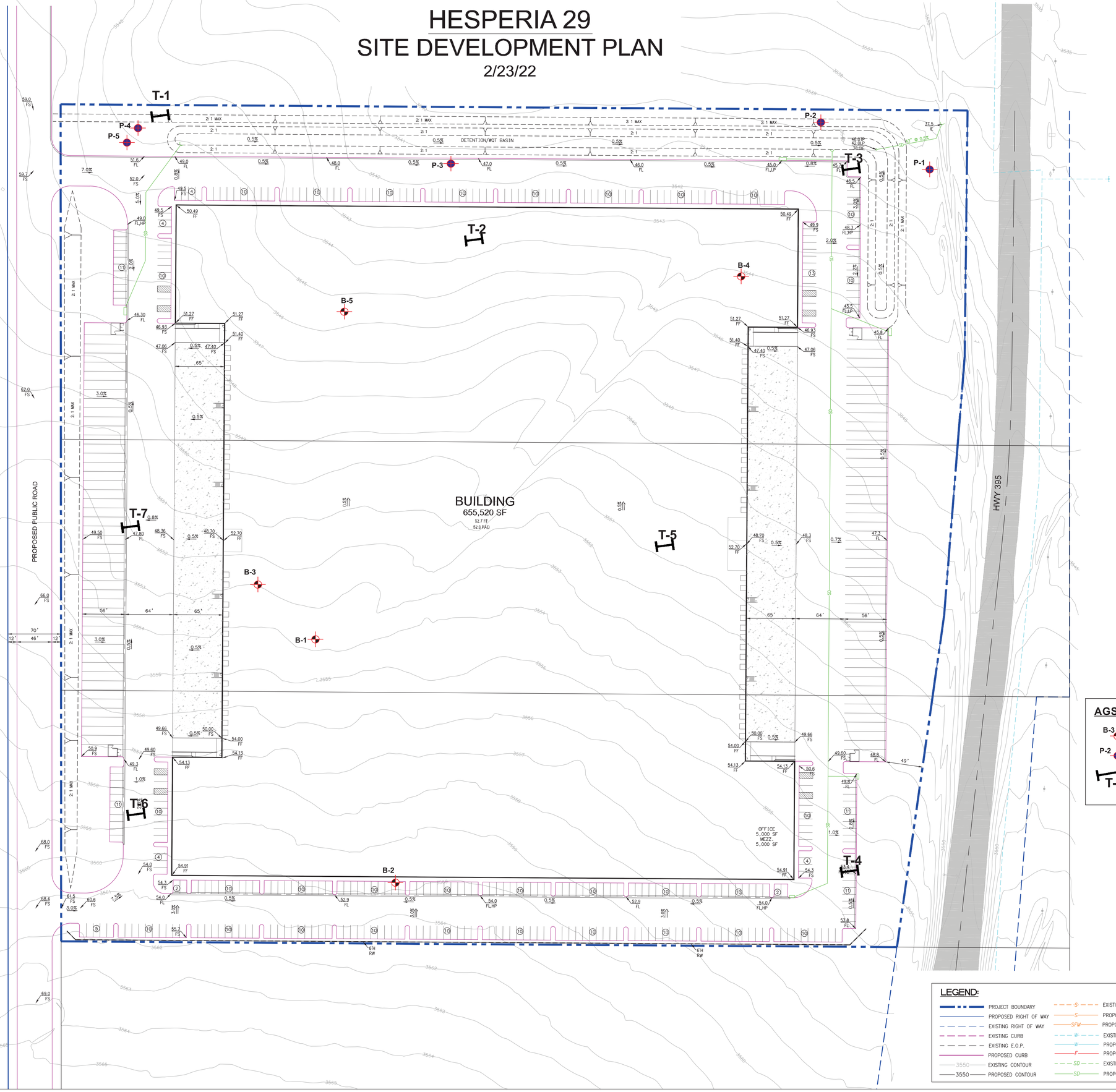
CORROSION SERIES
SUMMARY OF DATA

pH	MIN. RESISTIVITY per CT. 643 ohm-cm	SOLUBLE SULFATES per CT. 417 ppm	SOLUBLE CHLORIDES per CT. 422 ppm
8.1	15,000	135	42

RESPECTFULLY SUBMITTED

WES BRIDGER, LAB MANAGER

HESPERIA 29
SITE DEVELOPMENT PLAN
2/23/22



AGS LEGEND:

B-3	Approximate location of hollow stem auger borings (AGS, 2022)
P-2	Approximate location of percolation (AGS, 2022)
T-6	Approximate location of test pit (AGS, 2022)

PLATE 1
Exploration Location Plan

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

Project:	Report:	Date:
P/W 2202-09	2202-09-B-2	Mar. 2022

LEGEND:

PROJECT BOUNDARY	EXISTING SEWER
PROPOSED RIGHT OF WAY	PROPOSED SEWER
EXISTING RIGHT OF WAY	PROPOSED SEWER FORCE MAIN
EXISTING CURB	EXISTING WATER
EXISTING E.O.P.	PROPOSED WATER
PROPOSED CURB	PROPOSED FIRE WATER
EXISTING CONTOUR	EXISTING STORM DRAIN
PROPOSED CONTOUR	PROPOSED STORM DRAIN

SCALE: 1"=50'

NOTE: ADD 3500 TO ALL PROPOSED ELEVATIONS SHOWN.

ALLIANCE
LAND PLANNING & ENGINEERING INC.
2248 FARADAY AVE.
CARLSBAD, CA 92008
TEL: (760) 431-8896
FAX: (760) 431-8802
27413 TOURNEY ROAD
SUITE 120
VALENCIA, CA 91355
TEL: (661) 799-2760
CIVIL ENGINEERING • LAND PLANNING • HILLSIDE DESIGN • SURVEYING