Appendix D-1

Preliminary Geotechnical and Infiltration Feasibility Investigation Three Proposed Commercial Buildings APN 0463-441-07, Apple Valley

LOR Geotechnical

March 14, 2025
Revised January 28, 2026

LOR GEOTECHNICAL GROUP, INC.
Soil Engineering ▲ Geology ▲ Environmental

PRELIMINARY GEOTECHNICAL AND INFILTRATION FEASIBILITY INVESTIGATION THREE PROPOSED COMMERCIAL BUILDINGS APN 0463-441-07 APPLE VALLEY, CALIFORNIA

PROJECT NO. 14053.1
MARCH 14, 2025
REVISED JANUARY 28, 2026

Prepared For:

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Attention: Cindy Watson

March 14, 2025
Revised January 28, 2026

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Project No. 14053.1

Attention: Cindy Watson

Subject: Preliminary Geotechnical and Infiltration Feasibility Investigation, Three Proposed Commercial Buildings, APN 0463-441-07, Apple Valley, California.

LOR Geotechnical Group, Inc., is pleased to present this report of our geotechnical investigation for the subject project. In summary, it is our opinion that the proposed development is feasible from a geotechnical perspective, provided the recommendations presented in the attached report are incorporated into design and construction.

To provide adequate support for the proposed structures and structural improvements, we recommend that a compacted fill mat be constructed beneath footings and slabs. The compacted fill mat will provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils. All existing loose alluvial materials and any undocumented fill material should be removed from structural areas and areas to receive engineered compacted fills. The data developed during this investigation indicates that removals of approximately 2 to 3 feet will be required from currently planned development areas. The given removal depth is preliminary and the actual depths of the removals should be determined during the grading operation by observation and/or in-place density testing.

Low expansion potential, high soluble sulfate content, and fair R-value quality generally characterize the upper onsite materials tested. Near completion and/or at the completion of site grading, additional foundation and subgrade soils should be tested, as necessary, to verify their expansion potential, R-value quality, and soluble sulfate content.

Marginal infiltration rates were obtained for the soils tested.

LOR Geotechnical Group, Inc.

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INTRODUCTION

During February and March of 2025, a Preliminary Geotechnical and Infiltration Feasibility Investigation was performed by LOR Geotechnical Group, Inc., for three proposed commercial buildings within Assessor's Parcel Number (APN) 0463-441-07, Apple Valley, California. The purpose of this investigation was to provide a technical evaluation of the geologic setting of the site and to provide geotechnical design recommendations for the proposed development. The scope of our services included:

- Review of available geotechnical literature, reports, maps, and agency information pertinent to the study area;
- Interpretation of aerial photographs of the site and surrounding regions dated 1952 through 2024;
- Geologic field reconnaissance mapping to verify the areal distribution of earth units and significance of surficial features as compiled from documents, literature, and reports reviewed;
- A subsurface field investigation to determine the physical soil conditions pertinent to the proposed development;
- Laboratory testing of selected soil samples obtained during the field investigation;
- Development of geotechnical recommendations for site grading and foundation design; and
- Preparation of this report summarizing our findings, and providing conclusions and recommendations for site development.

The approximate location of the site is shown on the attached Index Map, Enclosure A-1, within Appendix A.

PROJECT CONSIDERATIONS

To orient our investigation at the site, a Site Plan prepared by Joshua Grading Development, dated December 2024, was furnished for our use. The current site conditions and proposed building configuration were indicated on this plan. The Site Plan was utilized as a base map for our field investigation and is presented as Enclosure A-2, within Appendix A.

As noted on the site plan, development of the site will include two single story and one double story, 10,000 square foot commercial buildings. Light to moderate foundation loads are anticipated with this type of structure.

Grading plans were not provided. However, based on the current topography of the site and adjacent areas, very minor cuts and fills are anticipated to create level surfaces for the proposed improvements.

AERIAL PHOTO ANALYSIS

The aerial photographs reviewed consisted of vertical aerial photograph images of varying scales. We reviewed imagery available from Google Earth Pro (2025) computer software and from online Historic Aerials (2025).

To summarize briefly, the site has remained vacant, natural land from prior to 1952 to present. Grading of the surrounding dirt roads occurred between 1984 and 1994. Aside from this, the site has remained in a relatively natural state. No evidence for the presence of faults traversing the site area or mass movement features was noted during our review of the photographs covering the site and nearby vicinity.

EXISTING SITE CONDITIONS

The approximately 10-acre site is located in the Town of Apple Valley, California, approximately 0.40 miles east of Dale Evans Parkway and along the south side of Quarry Road. The property consists of vacant desert land with sparse vegetation. The site slopes gently to the southwest. A wire fence runs along the northern portion, separating the site from Quarry Road. Trash and debris are abundant locally. Similar vacant desert land borders the site to the east, west, and south, with more vacant land beyond.

SUBSURFACE FIELD INVESTIGATION

Our subsurface field exploration program was conducted on February 11, 2025. The work consisted of advancing a total of 5 exploratory borings using a truck-mounted drill rig equipped with 8-inch diameter hollow stem augers. In addition, 4 borehole percolation tests were conducted in general accordance with the Shallow Percolation Test procedure as outlined in the Technical Guidance Document for Water Quality Management Plans (CDM Smith, 2013). The approximate locations of our exploratory borings and percolation tests are presented on Enclosure A-2, within Appendix A.

The subsurface conditions encountered in the exploratory borings were logged by a geologist from this firm. The borings were drilled to depths ranging from approximately 15.42 to a refusal depth of approximately 40.42 feet below the existing ground surface. Relatively undisturbed and bulk samples were obtained at a maximum depth interval of 5 feet, and returned to our geotechnical laboratory in sealed containers for further testing and evaluation.

A detailed description of the subsurface field exploration program and the boring logs are presented in Appendix B.

LABORATORY TESTING PROGRAM

Selected soil samples obtained during the field investigation were subjected to geotechnical laboratory testing to evaluate their physical and engineering properties. Laboratory testing included in-place moisture content and dry density, laboratory compaction characteristics, direct shear, sieve analysis, sand equivalent, R-value, expansion index, and corrosion screening. Physical testing was conducted in our geotechnical laboratory and chemical testing was conducted by our subconsultant, Project X Corrosion Engineering. A detailed description of the geotechnical laboratory testing program and the test results are presented in Appendix D.

GEOLOGIC CONDITIONS

Regional Geologic Setting

The site is situated along the southern edge of the Mojave Desert on a series of coalescing alluvial fans and terraces collectively referred to as the Cajon Fan. These fans and terraces have formed from sediment eroded from the San Gabriel and San Bernardino Mountains in Pleistocene and Recent times. The subject site is generally located on a large, wide fan region within the Cajon Fan series, referred to as the Baldy Mesa Fan. The Baldy Mesa Fan slopes to the northeast and is composed predominantly of silty sand and poorly graded to well graded sand, with lesser amounts of clayey sand and sandy clay. These fans lie on a very thick sequence of terrestrial sedimentary rocks, which in turn overlie crystalline bedrock (Dibblee, 1960).

This area north of the San Gabriel Mountains lies along the southeastern portion of a larger geomorphic province in southern California known as the Mojave Desert. The Mojave

Desert geomorphic province is essentially a very large, wedge shaped, alluviated plain of comparatively low relief, containing irregularly trending bedrock hills and low mountains. The Mojave Desert province is bounded on the southwest by the San Andreas fault zone and on the north by the Garlock fault zone. The eastern boundary of the Mojave Desert geomorphic province is not distinct, but gradually converges with the Basin and Range geomorphic province east of Death Valley and into Arizona and Nevada. The province is broken by many internal, major but discontinuous faults, predominately trending to the northwest showing rough parallelism with the trend of the San Andreas. Most of these faults have been active within the last 1.6 million years and many are still considered to be active or potentially active.

The closest known active fault to the subject site noted in the documents reviewed during our study is the Helendale fault located approximately 4.3 kilometers (2.7 miles) northeast of the site. A complete listing of the distances to known active faults in relation to the site is given in the Faulting section of this report.

The site and the regional geologic setting are shown on Enclosure A-3 within Appendix A.

Site Geologic Conditions

Alluvium: Alluvial materials were encountered within all of our exploratory borings to a depth of approximately 10 to 15 feet. These units were noted to mainly consist of silty sand with minor clayey sand and well graded sand with silt. These materials were typically light brown to reddish brown in color and were noted to contain abundant secondary calcite and trace pinhole porosity. The alluvial materials were in a relatively medium dense/very stiff to dense state at the surface becoming dense to very dense with depth based on our equivalent Standard Penetration Test (SPT) data and in-place density testing. Expansion index testing indicates a low expansion of the materials tested.

Bedrock: Igneous bedrock was encountered within all of our exploratory borings underlying the alluvial materials above to the maximum depths explored. These units were encountered at depths of approximately 10 to 15 feet and were noted to mainly consist of dry, light brown, coarse to medium grained granitic rock. The bedrock was in a very hard state based on our equivalent Standard Penetration Test (SPT) data and in-place density testing. Refusal was experienced within these materials at a depth of approximately 40 feet.

A detailed description of the subsurface soil and bedrock conditions as encountered within our exploratory borings is presented on the Boring Logs within Appendix B.

Groundwater Hydrology

Groundwater was not encountered within any of exploratory borings as advanced to a maximum depth of approximately 40.42 feet below the existing ground surface elevation of approximately 3,074 feet.

In order to estimate the approximate depth to groundwater in the site area, a search was conducted for local groundwater (well) level measurements within the State of California Department of Water Resources online database (CDWR, 2025). There were abundant wells within a one mile radius of the site however, groundwater measurements were limited within these wells. Most wells had one questionable recorded groundwater reading from the 1950's.

The well with the most readings within a one mile radius of the site is Local Well 06N03W17B001S located approximately 0.80 miles to the west of the site with 7 measurements from 1953 to 1957. The referenced ground surface elevation is 3,052 feet and depth to ground water is referenced at approximately 2,980 feet suggesting that the ground water elevation at the site is greater than 90 feet.

Additionally, since the site is underlain by bedrock at relatively shallow depths, groundwater may be present only as groundwater seeps within bedrock fractures at the site. Groundwater may seep into the bedrock beneath the site region along fractures and joints within the bedrock, the presence of bedrock beneath the site generally precludes the development of groundwater conditions or a groundwater table in these areas. Any groundwater that might be encountered during site development would likely be the result of infiltration of surface waters/irrigation waters traveling downward into the bedrock along these joints and fractures.

Based on this information, groundwater is not anticipated to be an adverse factor in site development.

Mass Movement

The site lies on a relatively flat surface. The occurrence of mass movement failures such as landslides, rockfalls, or debris flows within such areas is generally not considered common, and no evidence of mass movement was observed on the site.

Faulting

No active or potentially active faults are known to exist at the subject site. In addition, the subject site does not lie within a current State of California Earthquake Fault Zone (Hart and Bryant, 2010) nor does the site lie within a County of San Bernardino fault zone. No evidence of faulting projecting into or crossing the site was noted during our aerial photograph review or our review of published geologic maps.

As previously mentioned, the closest known active fault is the Helendale fault, located approximately 4.3 kilometers (2.7 miles) to the northeast. In addition, other relatively close active faults include the North Frontal fault located approximately 20.0 kilometers (12.4 miles) to the south, the Cleghorn fault located approximately 36.0 kilometers (22.4 miles) to the southwest, and the San Andreas fault located about 45 kilometers (28 miles) to the southwest.

The Helendale fault is a right-lateral strike slip fault. This fault has been active very recently. It is believed that the Helendale fault is capable of producing an earthquake magnitude on the order of 6.5 to 7.3.

The North Frontal fault zone of the San Bernardino Mountains is a zone consisting of numerous fault segments, many of which have their own names. The primary sense of slip is south dipping thrust. This fault seems to be offset (right-laterally) by the Helendale fault. It is believed that the North Frontal fault zone is capable of producing an earthquake magnitude on the order of 6.0 to 7.1.

The Cleghorn fault of the San Bernardino Mountains is a left-lateral strike-slip fault. The exact nature of the activity of this fault is questionable. The local landscape does not seem to express the reported slip rate (0.3 mm/yr) and some have dismissed Holocene displacement and rupture surfaces as caused by landsliding, not faulting. However, it is believed that the Cleghorn fault is capable of producing an earthquake magnitude on the order of 6.5.

The San Andreas fault is considered to be the major tectonic feature of California, separating the Pacific Plate and the North American Plate. While estimates vary, the San Andreas fault is generally thought to have an average slip rate on the order of 24mm/yr and capable of generating large magnitude events on the order of 7.5.

Current standards of practice included a discussion of all potential earthquake sources within a 100 kilometer (62 mile) radius. However, while there are other large earthquake faults within a 100 kilometer (62-mile) radius of the site, none of these are considered as relevant to the site as the faults described above, due to their greater distance and/or smaller anticipated magnitudes.

Historical Seismicity

In order to obtain a general perspective of the historical seismicity of the site and surrounding region a search was conducted for seismic events at and around the area within various radii. This search was conducted utilizing the historical seismic search website of the U.S.G.S. (2025). This website conducts a search of a user selected cataloged seismic events database, within a specified radius and selected magnitudes, and then plots the events onto a map. At the time of our search, the database contained data from January 1, 1932 through March 6, 2025.

In our first search, the general seismicity of the region was analyzed by selecting an epicenter map listing all events of magnitude 4.0 and greater, recorded since 1932, within a 100 kilometer (62 mile) radius of the site, in accordance with guidelines of the California Division of Mines and Geology. This map illustrates the regional seismic history of moderate to large events. As depicted on Enclosure A-4, within Appendix A, the site lies within a relatively active region associated with the San Andreas fault and various Mojave Desert faults to the east.

In the second search, the micro seismicity of the area lying within a 15 kilometer (9.2 mile) radius of the site was examined by selecting an epicenter map listing events on the order of 1.0 and greater since 1978. The results of this search is a map that presents the seismic history around the area of the site with much greater detail, not permitted on the larger map. The reason for limiting the time period for the events on the detail map is to enhance the accuracy of the map. Events recorded prior to the mid to late1970's are generally considered to be less accurate due to advancements in technology. As depicted on this map, Enclosure A-5, the Helendale fault appears to be the source of numerous events.

In summary, the historical seismicity of the site entails numerous small to medium magnitude earthquake events occurring in the region around the subject site. Any future developments at the subject site should anticipate that moderate to large seismic events could occur very near the site.

Secondary Seismic Hazards

Other secondary seismic hazards generally associated with severe ground shaking during an earthquake include liquefaction, seismic-induced settlement, seiches and tsunamis, earthquake induced flooding, landsliding, and rockfalls.

Liquefaction: The potential for liquefaction generally occurs during strong ground shaking within granular loose sediments where the groundwater is usually less than 50 feet below the ground surface. As groundwater is anticipated to lie greater than 50 feet beneath the site and the site is underlain by igneous bedrock at relatively shallow depths, the possibility of liquefaction at the site is considered nil.

Seiches/Tsunamis: The potential for the site to be affected by a seiche or tsunami (earthquake generated wave) is considered nil due to absence of any large bodies of water near the site.

Flooding (Water Storage Facility Failure): There are no large water storage facilities located on or near the site which could possibly rupture during in earthquake and affect the site by flooding.

Seismically-Induced Landsliding: Due to the low relief of the site and surrounding region, the potential for landslides to occur at the site is considered nil.

Rockfalls: No large, exposed, loose or unrooted boulders are present above the site that could affect the integrity of the site.

Seismically-Induced Settlement: Settlement generally occurs within areas of loose, granular soils with relatively low density. Since the site is underlain by relatively dense alluvial materials and igneous bedrock, the potential for settlement is considered very low. In addition, the recommended earthwork operations to be conducted during the development of the site should mitigate any near surface loose soil conditions.

SOILS AND SEISMIC DESIGN CRITERIA (California Building Code 2022)

Design requirements for structures can be found within Chapter 16 of the 2022 California Building Code (CBC) based on building type, use, and/or occupancy. The classification of use and occupancy of all proposed structures at the site, shall be the responsibility of the building official.

Site Classification

Chapter 20 of the ASCE 7-16 defines six possible site classes for earth materials that underlie any given site. Our investigation, mapping by others, and our experience in the site region indicates that the materials beneath the site are considered Site Class C very dense soil and soft rock.

CBC Earthquake Design Summary

Earthquake design criteria have been formulated in accordance with the 2022 CBC and ASCE 7-16 for the site based on the results of our investigation to determine the Site Class and an assumed Risk Category II. However, these values should be reviewed and the final design should be performed by a qualified structural engineer familiar with the region. In addition, the building official should confirm the Risk Category utilized in our design (Risk Category II). Our design values are provided below:

CBC 2022/ASCE 7-16 SEISMIC DESIGN SUMMARY* Site Location (USGS WGS84) 34.6146, -117.1989, Risk Category II	
Site Class Definition Chapter 20 ASCE 7	C
$\mathbf{S_s}$ Mapped Spectral Response Acceleration at 0.2s Period	1.015
$\mathbf{S_1}$ Mapped Spectral Response Acceleration at 1s Period	0.391
$\mathbf{S_{MS}}$ Adjusted Spectral Response Acceleration at 0.2s Period	1.218
$\mathbf{S_{M1}}$Adjusted Spectral Response Acceleration at 1s Period	0.586
$\mathbf{S_{DS}}$ Design Spectral Response Acceleration at 0.2s Period	0.812
$\mathbf{S_{D1}}$ Design Spectral Response Acceleration at 1s Period	0.391
$\mathbf{F_a}$ Short Period Site Coefficient at 0.2s Period	1.2
$\mathbf{F_v}$ Long Period Site Coefficient at 1s Period	1.5
$\mathbf{PGA_M}$ Site Modified Peak Ground Acceleration	0.524
Seismic Design Category	C
*Values obtained from OSHPD Seismic Design Maps Tool	

CONCLUSIONS

This investigation provides a broad overview of the geotechnical and geologic factors which are expected to influence future site planning and development. On the basis of our field investigation and testing program, it is the opinion of LOR Geotechnical Group, Inc., that the proposed development of the site for the proposed use is feasible from a geotechnical standpoint, provided the recommendations presented in this report are incorporated into design and implemented during grading and construction.

It should be noted that the subsurface conditions encountered in our exploratory borings are indicative of the locations explored and the subsurface conditions may vary. If conditions are encountered during the construction of the project that differ significantly from those presented in this report, this firm should be notified immediately so we may assess the impact to the recommendations provided.

Foundation Support

To provide adequate support for the proposed structures, we recommend that a compacted fill mat be constructed beneath footings and slabs. The compacted fill mat will provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils.

Conventional foundation systems utilizing either individual spread footings and/or continuous wall footings will provide adequate support for the anticipated downward and lateral loads when utilized in conjunction with the recommended fill mat.

Soil Expansiveness

The upper materials encountered during this investigation were tested and found to have a low expansion potential. Specialized construction procedures to specifically resist expansive soil activity for this type of soil are required and are provided within.

Corrosion Screening

A select representative sample from our borings was taken to Project X Corrosion Engineering for full corrosion series testing. Results from soil corrosivity testing completed by Project X Corrosion Engineering are presented within Appendix D.

The corrosivity test results indicate that soluble sulfate concentrations in the samples were 0.06 to 0.23 percent by weight. These concentrations indicate an exposure class of S0 to S2 for sulfate (ACI 318). Special mitigation methods are considered necessary.

The corrosivity test results indicate that chloride concentrations were below 500 ppm. This concentration indicates an exposure class C1 for chloride (ACI 318). Special mitigation measures are not considered necessary.

Soil pH for the sample was 7.6 and 8.5, neutral to slightly basic. Therefore, the need for specialized design is not anticipated.

Concentrations of ammonium and nitrate indicate the soil may be aggressive towards copper.

Resistivity result for the sample indicates the soil is severely corrosive to ferrous metals.

LOR Geotechnical does not practice corrosion engineering. If further information concerning the corrosion characteristics, or interpretation of the results submitted herein, is required, then a competent corrosion engineer should be consulted.

Infiltration

The results of our field investigation and test data indicate marginal infiltration characteristics for the soils tested with clear water results ranging from 1.4 to 3.3 inches per hour.

Geologic Mitigations

No special mitigation methods are deemed necessary at this time, other than the geotechnical recommendations provided in the following sections.

Seismicity

Seismic ground rupture is generally considered most likely to occur along pre-existing active faults. Since no known faults are known to exist at, or project into the site, the probability of ground surface rupture occurring at the site is considered nil.

Due to the site's close proximity to the faults described above, it is reasonable to expect a relatively strong ground motion seismic event to occur during the lifetime of the proposed development on the site. Large earthquakes could occur on other faults in the general area, but because of their lesser anticipated magnitude and/or greater distance, they are considered less significant than the faults described above from a ground motion standpoint.

The effects of ground shaking anticipated at the subject site should be mitigated by the seismic design requirements and procedures outlined in Chapter 16 of the California Building Code. However, it should be noted that the current building code requires the minimum design to allow a structure to remain standing after a seismic event, in order to allow for safe evacuation. A structure built to code may still sustain damage which might ultimately result in the demolishing of the structure (Larson and Slosson, 1992).

No secondary seismic hazards are anticipated to impact the proposed development.

RECOMMENDATIONS

Geologic Recommendations

No special geologic recommendations are deemed necessary at this time, other than the geotechnical recommendations provided in the following sections.

General Site Grading

It is imperative that no clearing and/or grading operations be performed without the presence of a qualified geotechnical engineer. An onsite, pre-job meeting with the developer, the contractor, the jurisdictional agency, and the geotechnical engineer should occur prior to all grading related operations. Operations undertaken at the site without the geotechnical engineer present may result in exclusions of affected areas from the final compaction report for the project.

Grading of the subject site should be performed in accordance with the following recommendations as well as applicable portions of the California Building Code, and/or applicable local ordinances.

All areas to be graded should be stripped of significant vegetation and other deleterious materials. Any undocumented fill encountered during grading should be completely removed, cleaned of significant deleterious materials and may then be reused as compacted fill. It is our recommendation that any existing fills under any proposed flatwork and paved areas be removed and replaced with engineered compacted fill. If this is not done, premature structural distress (settlement) of the flatwork and pavement may occur. Cavities created by the removal of any subsurface obstructions that could be encountered, such as foundations, utilities, and septic systems associated with the previous on-site development should be thoroughly cleaned of loose soil, organic matter and other deleterious materials, shaped to provide access for construction equipment, and backfilled as recommended in the following Engineered Compacted Fill section of this report.

Initial Site Preparation

The existing loose alluvial soils and any existing fill materials (if encountered) should be removed from all proposed structural and/or fill areas. The data developed during this investigation indicates that removals on the order of 2 to 3 feet deep will be required from proposed development areas in order to encounter competent alluvium upon which engineered compacted fill can be placed. The given removal depths are preliminary. Deeper removals may be required locally. Removals should expose alluvial materials with an in-situ relative compaction of at least 85 percent (ASTM D 1557). The actual depths of the removals should be determined during the grading operation by observation and/or in-place density testing.

Preparation of Fill Areas

Prior to placing fill, the surfaces of all areas to receive fill should be scarified to a minimum depth of 12 inches. The scarified soil should be brought to near optimum moisture content and compacted to a relative compaction of at least 90 percent (ASTM D 1557).

Engineered Compacted Fill

The onsite soils should provide adequate quality fill material, provided they are free from oversized and/or organic matter and other deleterious materials. Unless approved by the geotechnical engineer, rock or similar irreducible material with a maximum dimension greater than 6 inches should not be buried or placed in fills.

If required, import fill should be inorganic, non-expansive granular soils free from rocks or lumps greater than 6 inches in maximum dimension. Sources for import fill should be approved by the geotechnical engineer prior to their use. Fill should be spread in maximum 8-inch uniform, loose lifts, each lift brought to near optimum moisture content, and compacted to a relative compaction of at least 90 percent in accordance with ASTM D 1557.

Preparation of Foundation Areas

All footings should rest upon at least 24 inches of properly compacted fill material placed over competent alluvium. In areas where the required fill thickness is not accomplished by the recommended removals or by site rough grading, the footing areas should be further subexcavated to a depth of at least 24 inches below the proposed footing base grade, with the subexcavation extending at least 5 feet beyond the footing lines. The bottom of all excavations should be scarified to a depth of 12 inches, brought to near optimum moisture content, and recompacted to at least 90 percent relative compaction (ASTM D 1557) prior to the placement of compacted fill.

Concrete floor slabs should bear on a minimum of 24 inches of compacted soil. This should be accomplished by the recommendations provided above. The final pad surfaces should be rolled to provide smooth, dense surfaces upon which to place the concrete.

Short-Term Excavations

Following the California Occupational and Safety Health Act (CAL-OSHA) requirements, excavations 5 feet deep and greater should be sloped or shored. All excavations and shoring should conform to CAL-OSHA requirements. Short-term excavations of 5 feet deep and greater will conform to Title 8 of the California Code of Regulations, Construction Safety Orders, Section 1504 and 1539 through 1547. Based on the findings from our exploratory borings, it appears that Type C soils are the predominant type of soil on the project and all short-term excavations should be based on this type of soil.

Deviation from the standard short-term slopes are permitted using option four, Design by a Registered Professional Engineer (Section 1541.1).

Short-term excavation construction and maintenance are the responsibility of the contractor and should be a consideration of his methods of operation and the actual soil conditions encountered.

Slope Construction

Preliminary data indicates that cut and fill slopes should be constructed no steeper than two horizontal to one vertical. Fill slopes should be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction, then roll the final slopes to provide dense, erosion-resistant surfaces.

Slope Protection

Since the site soil materials are susceptible to erosion by running water, measures should be provided to prevent surface water from flowing over slope faces. Slopes at the project should be planted with a deep rooted ground cover as soon as possible after the completion of grading. The use of succulent ground covers such as iceplant or sedum is not recommended. If watering is necessary to sustain plant growth on slopes, then the watering operation should be monitored to assure proper operation of the irrigation system and to prevent over watering.

Soil Expansiveness

The upper materials encountered during this investigation were tested and found to have a low expansion potential. Specialized construction procedures to specifically resist expansive soil activity are required and are provided within.

Additional evaluation of on-site and any imported soils for their expansion potential should be conducted following completion of the grading operation.

Foundation Design

If the site is prepared as recommended, the proposed structures may be safely supported on conventional shallow foundations, either individual spread footings and/or continuous wall footings, bearing entirely on a minimum of 24 inches of engineered compacted fill placed over competent alluvial materials. All foundations should have a minimum width of 12 inches. Footings placed upon low expansive soils should be established a minimum of 18 inches below lowest adjacent grade.

For the minimum width and depth, spread foundations may be designed using an allowable bearing pressure of 2,000 psf. This bearing pressure may be increased by 200 psf for each additional foot of width, and by 500 psf for each additional foot of depth, up to a maximum of 4,000 psf. For example, a footing 2 feet wide and embedded 2 feet will have an allowable bearing pressure of 2,700 psf.

The above values are net pressures; therefore, the weight of the foundations and the backfill over the foundations may be neglected when computing dead loads. The values apply to the maximum edge pressure for foundations subjected to eccentric loads or overturning. The recommended pressures apply for the total of dead plus frequently applied live loads, and incorporate a factor of safety of at least 3.0. The allowable bearing pressures may be increased by one-third for temporary wind or seismic loading.

The resultant of the combined vertical and lateral seismic loads should act within the middle one-third of the footing width. The maximum calculated edge pressure under the toe of foundations subjected to eccentric loads or overturning should not exceed the increased allowable pressure.

Resistance to lateral loads will be provided by passive earth pressure and base friction. For footings bearing against compacted fill, passive earth pressure may be considered to be developed at a rate of 400 pounds per square foot per foot of depth. Base friction may be computed at 0.35 times the normal load. Base friction and passive earth pressure may be combined without reduction. These values are for dead load plus live load and may be increased by one-third for wind or seismic loading.

Due to the presence of low expansive soils at the site, footings should be reinforced with a minimum of two #4 rebars, one near the top and one near the bottom of the footings. More stringent parameters may be given by the structural engineer.

Settlement

Total settlement of individual foundations will vary depending on the width of the foundation and the actual load supported. Maximum settlement of shallow foundations designed and constructed in accordance with the preceding recommendations are estimated to be on the order of 0.5 inch. Differential settlements between adjacent footings should be about one-half of the total settlement. Settlement of all foundations is expected to occur rapidly, primarily as a result of elastic compression of supporting soils as the loads are applied, and should be essentially completed shortly after initial application of the loads.

Building Area Slab-on-Grade

To provide adequate support, concrete floor slabs-on-grade should bear on a minimum of 24 inches of engineered fill compacted soil placed over competent alluvium. The final pad surfaces should be rolled to provide smooth, dense surfaces.

Due to the presence of low expansive soils at the site, minimum slab reinforcement should consist of # 3 rebars placed at a maximum spacing of 18 inches on center, each way. Unless more stringent parameters are given by the structural engineer, the slab thickness should be a minimum of 4 inches.
Slabs to receive moisture-sensitive coverings should be provided with a moisture vapor retarder/barrier. We recommend that a vapor retarder/barrier be designed and constructed according to the American Concrete Institute 302.1R, Concrete Floor and Slab Construction, which addresses moisture vapor retarder/barrier construction. At a minimum, the vapor retarder/barrier should comply with ASTM E1745 and have a nominal thickness of at least 10 mils. The vapor retarder/barrier should be properly sealed, per the manufacturer's recommendations, and protected from punctures and other damage.

Per the Portland Cement Association, floor slabs with vapor-sensitive coverings, a layer of dry, granular material (sand) should be placed under the vapor retarder/barrier.

For slabs in humidity-controlled areas, a layer of dry, granular material (sand) should be placed above the vapor retarder/barrier.

The slabs should be protected from rapid and excessive moisture loss which could result in slab curling. Careful attention should be given to slab curing procedures, as the site area is subject to large temperature extremes, humidity, and strong winds.

The recommendations to counteract generally low expansive soil activity should be considered preliminary and should be revised upon the completion of the site grading. The given parameters are also subject to review of the project structural engineer experienced in expansive soil issues.

Exterior Flatwork

To provide adequate support, exterior flatwork improvements should rest on a minimum of 12 inches of soil compacted to at least 90 percent (ASTM D 1557).

Due to the presence of low expansive soils at the site, sidewalks, patio slabs, and driveways with a minimum dimension greater than 5 feet should be reinforced with # 3 rebars placed at a maximum spacing of 18 inches on center, each way. Reinforcement for curbing should be one continuous # 4 rebar at top and bottom. In addition, it is recommended that sidewalks, patio slabs, curbs, etc., have thickness of at least 4 inches, with saw cuts every 10 feet or less. Driveways should be at least 6-inch thick, with saw cuts every 15 feet or less.

Flatwork areas should be pre-saturated to 2 to 4 percent over optimum prior to placing concrete.

Again these recommendations to mitigate generally expansive soil activity should be considered preliminary and should be revised upon completion of the site grading.

The given parameters are also subject to review of the project structural engineer experienced in expansive soil issues.

Flatwork surface should be sloped a minimum of 1 percent away from buildings and slopes, to approved drainage structures.

Wall Pressures

The design of footings for retaining walls should be performed in accordance with the recommendations described earlier under Preparation of Foundation Areas and Foundation Design. For design of retaining wall footings, the resultant of the applied loads should act in the middle one-third of the footing, and the maximum edge pressure should not exceed the basic allowable value without increase.

For design of retaining walls unrestrained against movement at the top, we recommend an active pressure of 40 pounds per square foot (psf) per foot of depth be used. This assumes level backfill consisting of compacted, non-expansive, on-site soils placed against the structures and within the back cut slope extending upward from the base of the stem at 35 degrees from the vertical or flatter.

Retaining structures subject to uniform surcharge loads within a horizontal distance behind the structures equal to the structural height should be designed to resist additional lateral loads equal to 0.40 times the surcharge load. Any isolated or line loads from adjacent foundations or vehicular loading will impose additional wall loads and should be considered individually.

As noted before, low expansive soils are present at the site. Since these materials have a very low permeability, very uncertain behavior, and exert much higher lateral earth pressures on retaining structures, they should not be used as wall backfills. Select grading or import is anticipated.

To avoid over stressing or excessive tilting during placement of backfill behind walls, heavy compaction equipment should not be allowed within the zone delineated by a 45-degree line extending from the base of the wall to the fill surface. The backfill directly behind the walls should be compacted using light equipment such as hand operated vibrating plates and rollers. No material larger than three inches in diameter should be placed in direct contact with the wall.

Wall pressures should be verified prior to construction, when the actual backfill materials and conditions have been determined. Recommended pressures are applicable only to level, non-expansive, properly drained backfill with no additional surcharge loadings. If inclined backfills are proposed, this firm should be contacted to develop appropriate active earth pressure parameters.

Preliminary Pavement Design

Testing and design for preliminary onsite pavement was conducted in accordance with California Highway Design Manual and the Guild for the Design and Construction of Concrete Parking Lot (ACI33OR).

Based upon our preliminary sampling and testing, and upon an assumed Traffic Index generally used for similar projects, it appears that the structural section tabulated below should provide satisfactory pavements for the subject on-site pavement improvements:

AREA	T.I.	DESIGN R-VALUE	PRELIMINARY SECTION
On site vehicular parking	5.0	30	0.25’ AC / 0.45 AB

On site vehicular drive isles with occasional truck traffic (ADTT=10)	6.0	30	0.25’ AC / 0.70' AB or 5" JPCP / 4" AB
Light to moderate truck traffic (ADTT=25)	7.0	30	0.30’ AC / 0.85' AB or 6" JPCP / 4" AB
Moderate to heavy truck traffic (ADTT=100)	--	30	6.5" JPCP / 4" AB
AC - Asphalt Concrete AB - Class 2 Aggregate Base JPCP - Jointed Plain Concrete Pavement with MR ≥550 psi			

The above structural sections are predicated upon 90 percent relative compaction (ASTM D 1557) of all utility trench backfills and 95 percent relative compaction (ASTM D 1557) of the upper 12 inches of pavement subgrade soils and of any aggregate base utilized. In addition, the aggregate base should meet Caltrans specifications for Class 2 Aggregate Base.

The recommended concrete pavement sections should have a minimum modulus of rupture (MR) of 550 pounds per square inch (psi). Traverse joints should be sawcut in the pavement at approximately 12 to 15-foot intervals within 4 to 6 hours of concrete placement, or preferably sooner. Sawcut depth should be equal to approximately one quarter of slab thickness. Construction joints should be constructed such that adjacent sections butt directly against each other and are keyed into each other. Parallel pavement sections should also be keyed into each other.

In areas of the pavement which will receive high abrasion loads due to start-ups and stops or where trucks will move on a tight turning radius, consideration should be given to installing concrete pads. Such pads should be a minimum of 5-inch thick concrete over 4-inches of aggregate base. Concrete pads are also recommended in areas adjacent to trash storage areas where heavier loads occur due to operation of trucks lifting trash dumpsters.

It should be noted that all of the above pavement design was based upon results of preliminary sampling and testing, and should be verified by additional sampling and testing during construction when the actual subgrade soils are exposed.

Infiltration

Based upon our field investigation and infiltration test data, an average clear water absorption rate of approximately 2.0 inches per hour for the proposed water retention systems in the western and southern portions of the site was obtained. It is our opinion that a design clear water rate of 2.0 inches per hour is appropriate for the planned infiltration in the area and at the depths tested.

A factor of safety should be applied as indicated by the Technical Guidance Document for Water Quality Management Plans (CDM Smith, 2013). The design infiltration rate should be adjusted using Worksheet H, using the following factor values in determination of the suitability assessment, S_A:

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment method	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	2	0.50
		Depth to groundwater/impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \sum p$			1.25

The project design engineer should determine the suitability assessment S_B.

To ensure continued infiltration capability of the infiltration area, a program to maintain the facility should be considered. This program should include periodic removal of accumulated materials, which can slow the infiltration considerably and decrease the water quality. Materials to be removed from the catch basin areas typically consist of litter, dead plant matter, and soil fines (silts and clays). Proper maintenance of the system is critical. A maintenance program should be prepared and properly executed. At a minimum, the program should be as outlined in the Technical Guidance Document for Water Quality Management Plans (CDM Smith, 2013).

The program should also incorporate the recommendations contained within this report and any other jurisdictional agency requirements.

- Systems should be set back at least 10 feet from foundations or as required by the design engineer.

- Any geotextile filter fabric utilized should consist of such that it prevents soil piping but has greater permeability than the existing soil.

During site development, care should be taken to not disturb the area(s) proposed for infiltration as changes in the soil structure could occur resulting in a change of the soil infiltration characteristics.

Corrosion Protection

Based on the test results, this soil is classified as severely corrosive to ferrous metals and potentially aggressive towards copper. In addition, the soils are considered exposure class S2 per ACI 310 and special mitigation measures are recommended. The laboratory data above should be reviewed and corrosion design should be completed by a qualified corrosion engineer.

In lieu of corrosion design for metal piping, ABS/PVC may be used. Soil corrosion is not considered a factor with ABS/PVC materials. ABS/PVC is considered suitable for use due to the corrosion potential of the on-site soils with respect to metals.

LOR Geotechnical does not practice corrosion engineering. If further information concerning the corrosion characteristics, or interpretation of the results submitted herein, is required, then a competent corrosion engineer should be consulted.

Construction Monitoring

Post investigative services are an important and necessary continuation of this investigation. Project plans and specifications should be reviewed by the project geotechnical consultant prior to construction to confirm that the intent of the recommendations presented in this report have been incorporated into the design.

Additional R-value, expansion, and soluble sulfate content testing should be conducted after/during site rough grading.

During construction, sufficient and timely geotechnical observation and testing should be provided to correlate the findings of this investigation with the actual subsurface conditions exposed during construction. Items requiring observation and testing include, but are not necessarily limited to, the following:

1. Site preparation-stripping and removals.

2. Excavations, including approval of the bottom of excavations prior to the processing and preparation of the bottom areas for fill placement.

3. Scarifying and compacting prior to fill placement.

4. Foundation excavations.

5. Subgrade preparation for slabs-on-grade, flatwork, pavement, etc., including pre-saturation.

6. Placement of engineered compacted fill and backfill, including approval of fill materials and the performance of sufficient density tests to evaluate the degree of compaction being achieved.

LIMITATIONS

This report contains geotechnical conclusions and recommendations developed solely for use by Conco Construction, and their design consultants, for the purposes described earlier. It may not contain sufficient information for other uses or the purposes of other parties. The contents should not be extrapolated to other areas or used for other facilities without consulting LOR Geotechnical Group, Inc.

The recommendations are based on interpretations of the subsurface conditions concluded from information gained from subsurface explorations and a surficial site reconnaissance. The interpretations may differ from actual subsurface conditions, which can vary horizontally and vertically across the site. If conditions are encountered during the construction of the project, which differ significantly from those presented in this report, this firm should be notified immediately so we may assess the impact to the recommendations provided. Due to possible subsurface variations, all aspects of field construction addressed in this report should be observed and tested by the project geotechnical consultant.

If parties other than LOR Geotechnical Group, Inc., provide construction monitoring services, they must be notified that they will be required to assume responsibility for the geotechnical phase of the project being completed by concurring with the recommendations provided in this report or by providing alternative recommendations.

The report was prepared using generally accepted geotechnical engineering practices under the direction of a state licensed geotechnical engineer. No warranty, expressed or implied, is made as to conclusions and professional advice included in this report.

Any persons using this report for bidding or construction purposes should perform such independent investigations as deemed necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Governmental Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a significant amount of time without a review by LOR Geotechnical Group, Inc., verifying the suitability of the conclusions and recommendations.

CLOSURE

It has been a pleasure to assist you with this project. We look forward to being of further assistance to you as construction begins. Should conditions be encountered during construction that appear to be different than indicated by this report, please contact this office immediately in order that we might evaluate their effect.

Should you have any questions regarding this report, please do not hesitate to contact our office at your convenience.

Respectfully submitted,
LOR Geotechnical Group, Inc.

For

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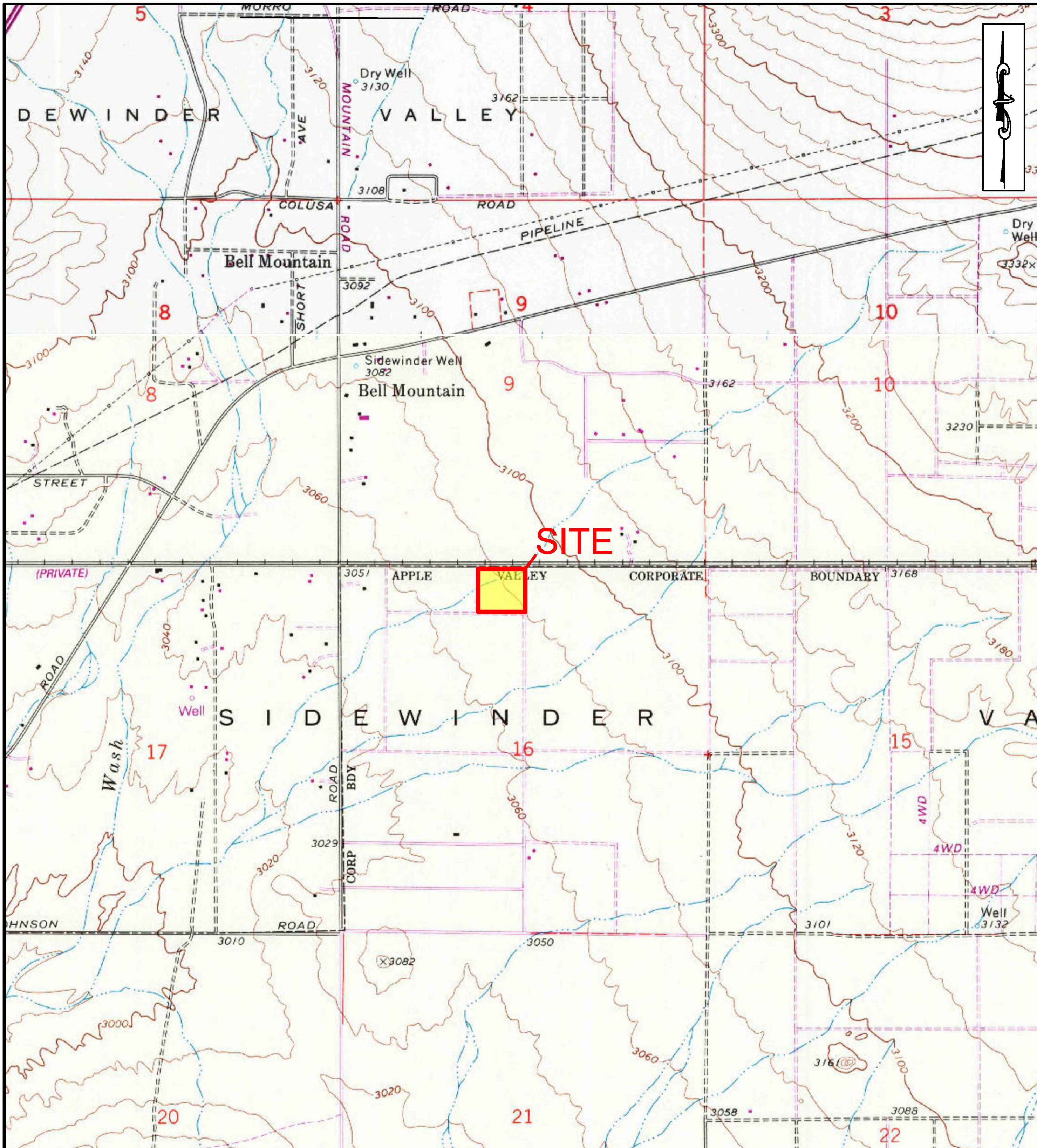
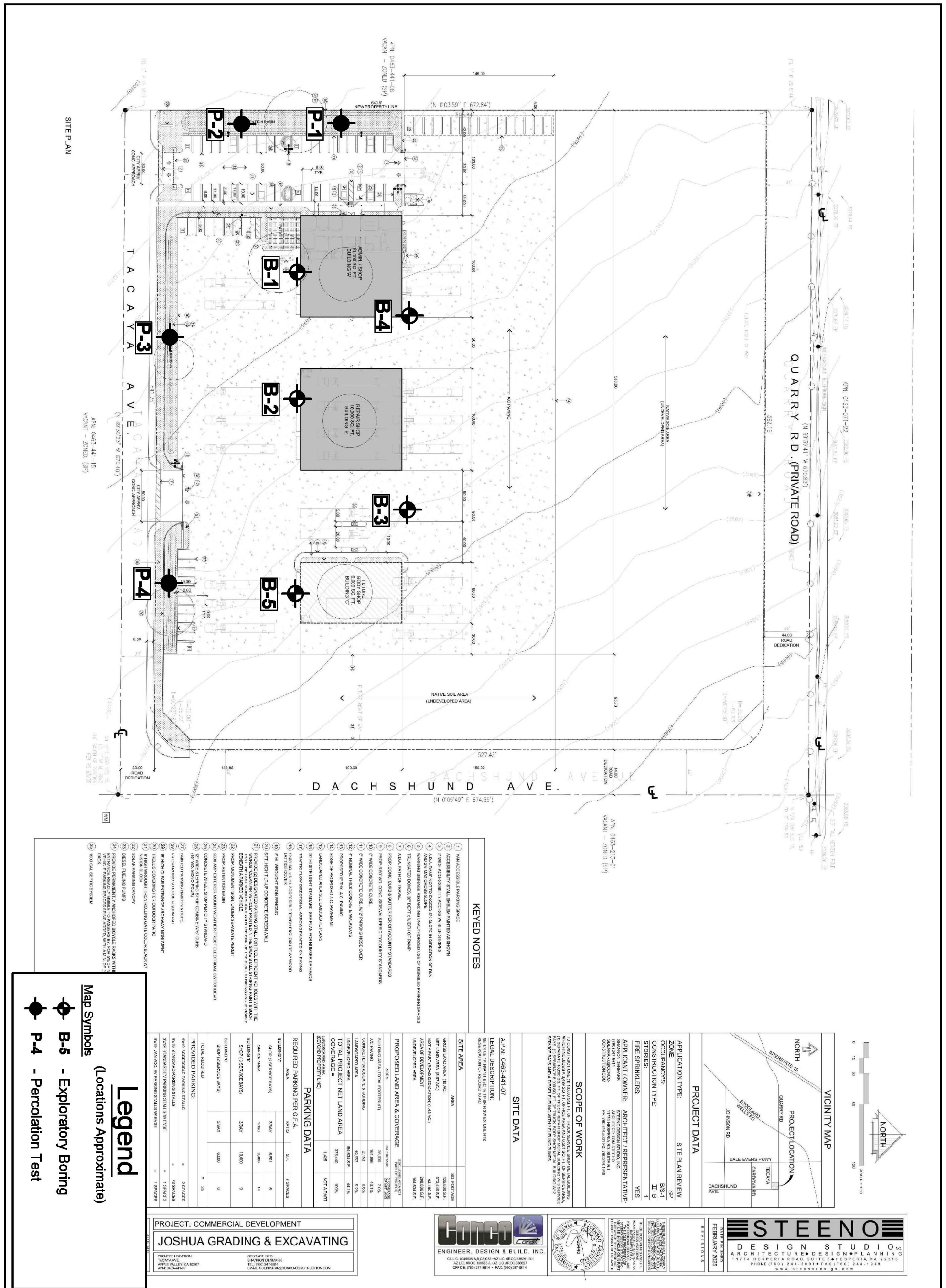
APPENDIX A

Index Map, Site Plan, Regional Geologic Map, and Historical Seismicity Maps



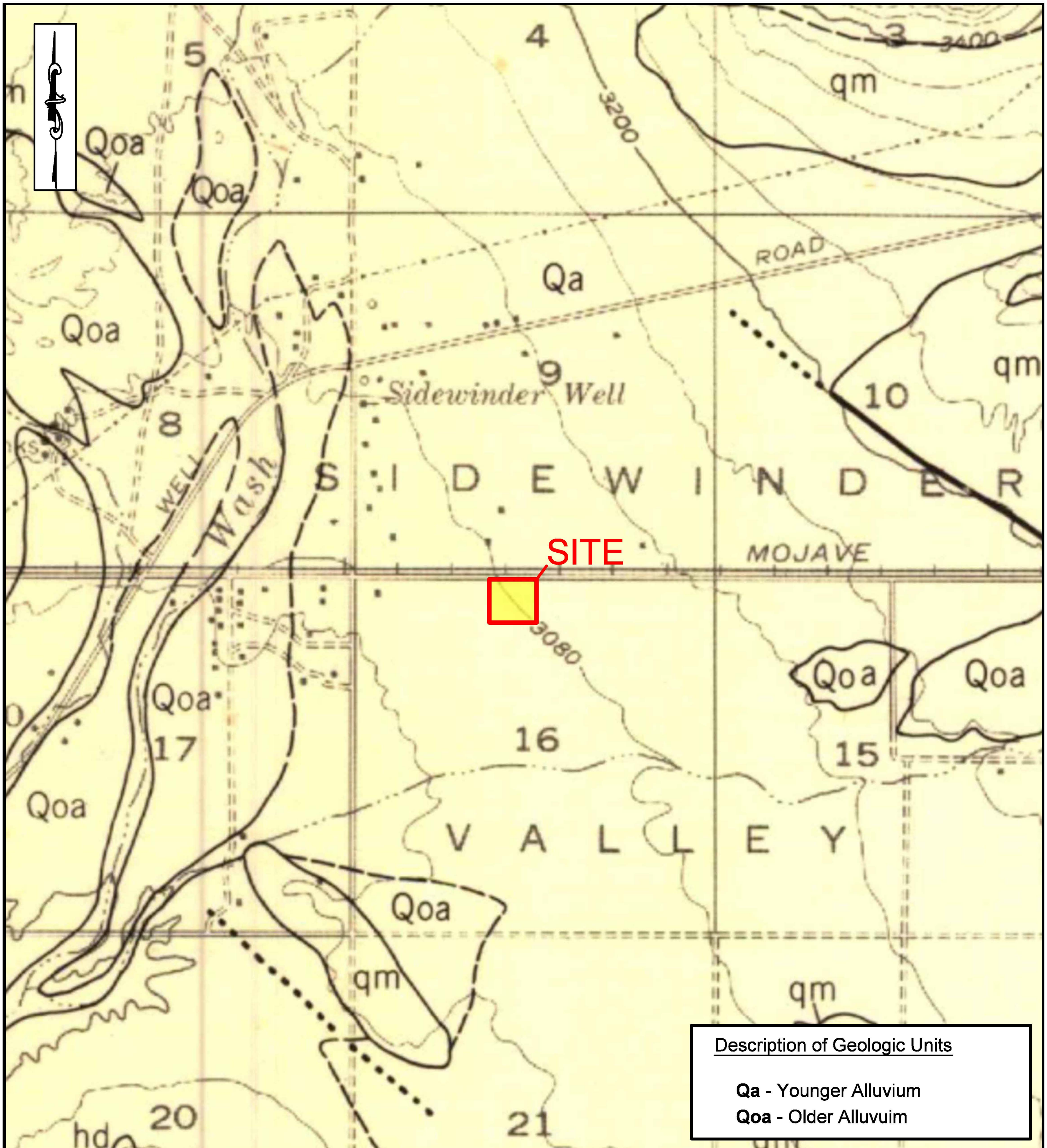
INDEX MAP

PROJECT:	Commercial Development, APN 0463-441-07, Apple Valley, California	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ENCLOSURE:**	A-1
LOR GEOTECHNICAL GROUP, INC.		**DATE:**	March 2025
		SCALE:	1" ≈ 2,000'



SITE PLAN

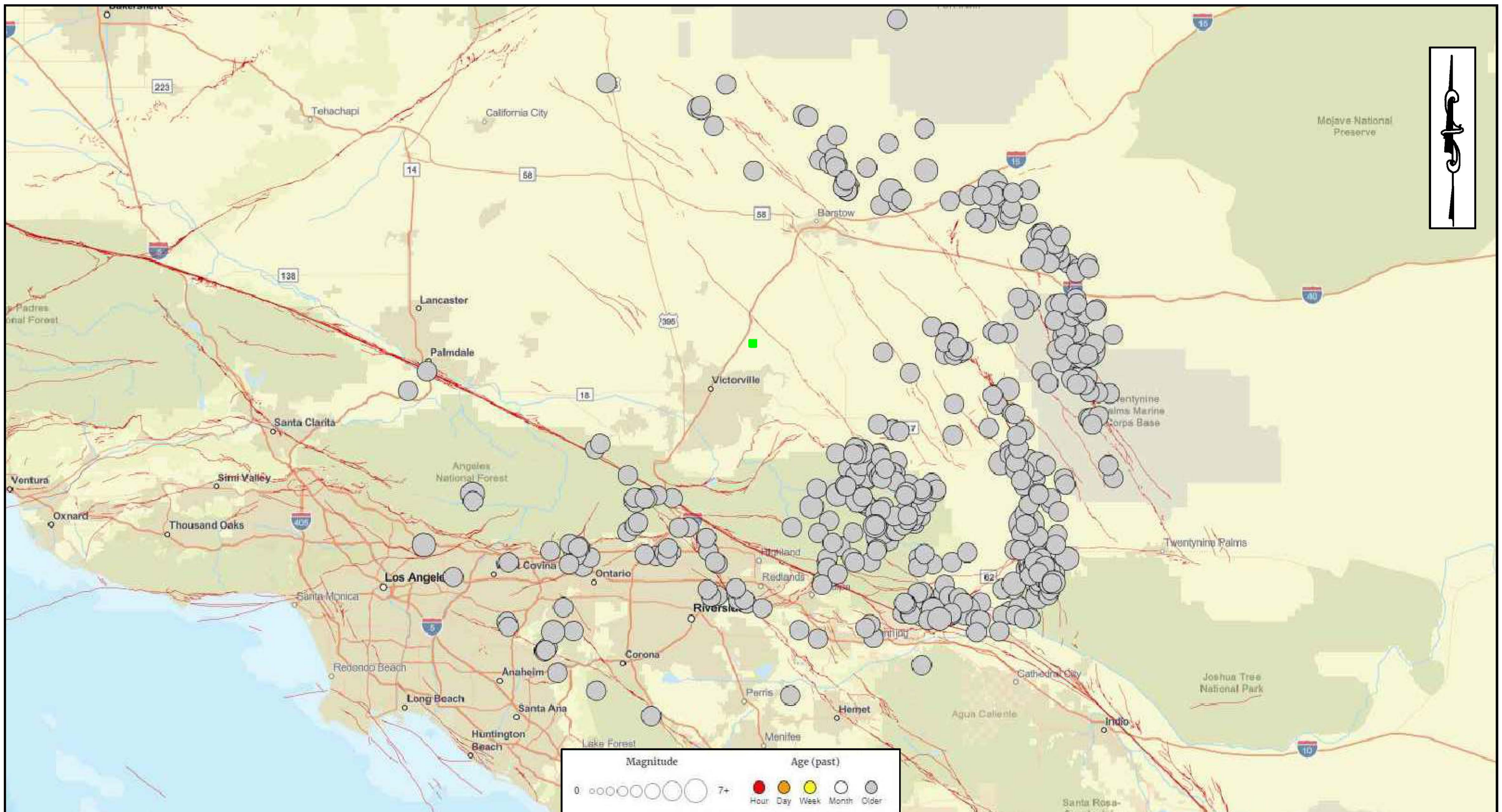
PROJECT:	Commercial Development, APN 0463-441-07, Apple Valley, California	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ENCLOSURE:**	A-2
LOR GEOTECHNICAL GROUP, INC.		**DATE:**	March 2025
		SCALE:	1" ≈ 90'



REGIONAL GEOLOGIC MAP

(Dibblee Jr., 1960)

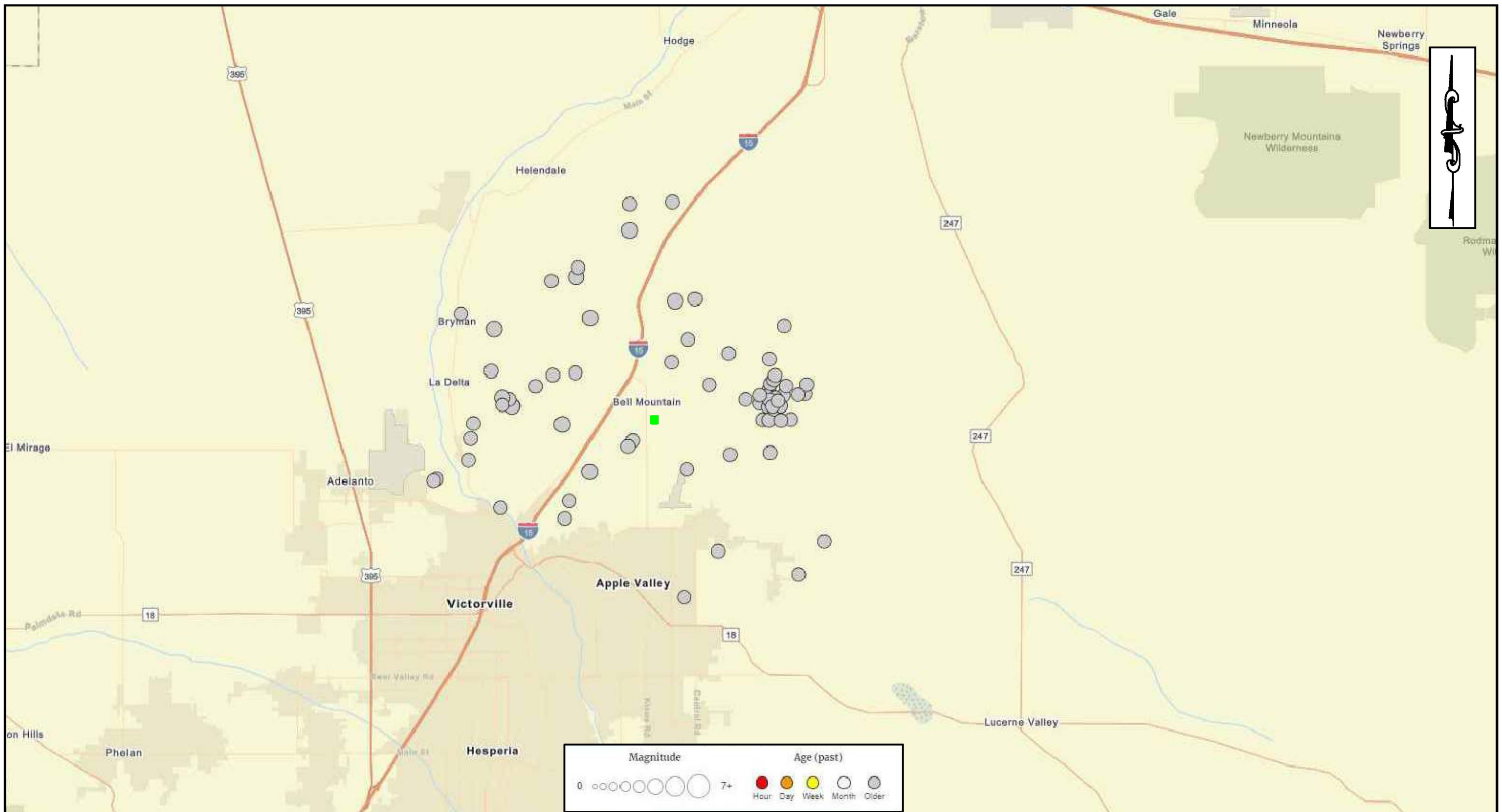
PROJECT:	Commercial Development, APN 0463-441-07, Apple Valley, California	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ENCLOSURE:**	A-3
LOR GEOTECHNICAL GROUP, INC.		**DATE:**	March 2025
		SCALE:	1" ≈ 2,000'



U.S. Geologic Survey (2025) real-time earthquake epicenter map. Plotted are 361 epicenters of instrument-recorded events from 01/01/32 to present (03/06/25) of local magnitude 4+ within a radius of ~62 miles (100 kilometers) of the site. Location accuracy varies. The site is indicated by the green square (■). The selected magnitude corresponds to a threshold intensity value where very light damage potential begins. These events are also generally widely felt by persons. Red lines mark the surface traces of known Quaternary-age faults.

HISTORICAL SEISMICITY MAP - 100km Radius

PROJECT:	Commercial Development, APN 0463-441-07, Apple Valley, California	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ENCLOSURE:**	A-4
LOR GEOTECHNICAL GROUP, INC.		**DATE:**	March 2025
		SCALE:	1" ≈ 20km



U.S. Geologic Survey (2025) real-time earthquake epicenter map. Plotted are 73 epicenters of instrument-recorded events from 01/01/78 to present (03/06/25) of local magnitude 1+ within a radius of ~9.3 miles (15 kilometers) of the site. Location accuracy varies. The site is indicated by the green square (■). The selected magnitude corresponds to a threshold intensity value where very light damage potential begins. These events are also generally widely felt by persons. Red lines mark the surface traces of known Quaternary-age faults.

HISTORICAL SEISMICITY MAP - 15km Radius

PROJECT:	Commercial Development, APN 0463-441-07, Apple Valley, California	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ENCLOSURE:**	A-5
LOR GEOTECHNICAL GROUP, INC.		**DATE:**	March 2025
		SCALE:	1" ≈ 5km

APPENDIX B

Field Investigation Program and Boring Logs

APPENDIX B
FIELD INVESTIGATION

Subsurface Exploration

Our subsurface exploration of the site consisted of drilling 5 exploratory borings to depths of approximately 15.42 feet, and a refusal depth of approximately 40.42 feet below the existing ground surface using a Mobile B-61 drill rig on February 11, 2025. The approximate locations of the borings are shown on Enclosure A-2 within Appendix A.

The drilling exploration was conducted using a Mobile B-61 drill rig equipped with 8-inch diameter hollow stem augers. The soils were continuously logged by a geologist from this firm who inspected the site, created detailed logs of the borings, obtained undisturbed, as well as disturbed, soil samples for evaluation and testing, and classified the soils by visual examination in accordance with the Unified Soil Classification System.

Relatively undisturbed samples of the subsoils were obtained at a maximum interval of 5 feet. The samples were recovered by using a California split barrel sampler of 2.50 inch inside diameter and 3.25 inch outside diameter or a Standard Penetration Sampler (SPT) from the ground surface to the total depth explored. The samplers were driven by a 140 pound automatic trip hammer dropped from a height of 30 inches. The number of hammer blows required to drive the sampler into the ground the final 12 inches were recorded and further converted to an equivalent SPT N-value. Factors such as efficiency of the automatic trip hammer used during this investigation (80%), borehole diameter (8"), and rod length at the test depth were considered for further computing of equivalent SPT N-values corrected for field procedures (N60) which are included in the boring logs, Enclosures B-1 through B-5.

The undisturbed soil samples were retained in brass sample rings of 2.42 inches in diameter and 1.00 inch in height, and placed in sealed plastic containers. Disturbed soil samples were obtained at selected levels within the borings and placed in sealed containers for transport to our geotechnical laboratory.

All samples obtained were taken to our geotechnical laboratory for storage and testing. Detailed logs of the borings are presented on the enclosed Boring Logs, Enclosures B-1 through B-5. A Boring Log Legend is presented on Enclosure B-i. A Soil Classification Chart is presented as Enclosure B-ii.

CONSISTENCY OF SOIL

SANDS

SPT BLOWS	CONSISTENCY
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
Over 50	Very Dense

COHESIVE SOILS

SPT BLOWS	CONSISTENCY
0-2	Very Soft
2-4	Soft
4-8	Medium
8-15	Stiff
15-30	Very Stiff
30-60	Hard
Over 60	Very Hard

SAMPLE KEY

Symbol **Description**

INDICATES CALIFORNIA SPLIT SPOON SOIL SAMPLE

INDICATES BULK SAMPLE

INDICATES SAND CONE OR NUCLEAR DENSITY TEST

INDICATES STANDARD PENETRATION TEST (SPT) SOIL SAMPLE

TYPES OF LABORATORY TESTS

1	Atterberg Limits
2	Consolidation
3	Direct Shear (undisturbed or remolded)
4	Expansion Index
5	Hydrometer
6	Organic Content
7	Proctor (4", 6", or Cal216)
8	R-value
9	Sand Equivalent
10	Sieve Analysis
11	Soluble Sulfate Content
12	Swell
13	Wash 200 Sieve

BORING LOG LEGEND

PROJECT: Proposed Commercial Development, Apple Valley, California

PROJECT NO.: 14053.1

CLIENT: Conco Construction

ENCLOSURE: B-i

DATE: March 2025

LOR GEOTECHNICAL GROUP, INC.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

PARTICLE SIZE LIMITS

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" No. 4 No. 10 No. 40 No. 200
(U.S. STANDARD SIEVE SIZE)

SOIL CLASSIFICATION CHART

PROJECT: Proposed Commercial Development, Apple Valley, California	**PROJECT NO.:** 14053.1
CLIENT: Conco Construction	**ENCLOSURE:** B-ii
LOR GEOTECHNICAL GROUP, INC.	**DATE:** March 2025

LOG OF BORING B-1

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	U.S.C.S.	DESCRIPTION
0						SM	@ 0 feet, ALLUVIUM: SILTY SAND, trace gravel to 2" approximately 15% coarse grained sand, 35% medium grained sand, 25% fine grained sand, 25% silty fines, light brown, dry, disturbed in the upper 0.5'.
	27		14.0		91.8	SC	@ 2 feet, CLAYEY SAND, approximately 15% coarse grained sand, 35% medium grained sand, 25% fine grained sand, 25% clayey fines of low plasticity, light brown, damp.
5	61		7.1		108.1	SM	@ 5 feet, SILTY SAND, approximately 25% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 15% silty fines, trace clay, white, abundant calcite coating.
	36		4.9		116.7	SW	@ 7 feet, WELL GRADED SAND, approximately, 30% coarse grained sand, 30% medium grained sand, 35% fine grained sand, 5% silty fines, light brown, damp, trace pinhole porosity, trace calcite.
10	38		7.6		107.9		
15	46 for 1"		3.0		109.4		@ 15 feet, IGNEOUS BEDROCK, slightly weathered granitics, dry, light brown, collected as well graded sand.
20	51 for 5"		2.4		115.1		
25	73 for 6"		2.4				@ 25 feet, IGNEOUS BEDROCK, slightly weathered granitics, dry, light brown, collected as well graded sand.
30	77 for 5"		2.4				
35	77 for 4"		4.1				@ 35 feet, damp.
40	77 for 5"		7.4				END OF BORING @ 40.42' due to refusal No fill No groundwater Bedrock @ 15'
45							

PROJECT:	Proposed Commercial Development	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ELEVATION:**	3,074
		DATE DRILLED:	February 11, 2025
LOR GEOTECHNICAL GROUP, INC.		**EQUIPMENT:**	Mobile B-61
		HOLE DIA.: 8"	**ENCLOSURE:** B-1

LOG OF BORING B-2

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, ALLUVIUM: SILTY SAND, trace gravel to 2" approximately 25% coarse grained sand, 25% medium grained sand, 30% fine grained sand, 20% silty fines, light brown, dry, disturbed in the upper 0.5'.
	52		9.8		113.4				@ 2 feet, SILTY SAND, trace gravel to 2 1/2" approximately 20% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 30% silty fines, trace clay, light brown, damp, abundant calcite coating, trace pinhole porosity.
5	37		8.3						@ 5 feet, decrease in silt, rings disturbed.
10	46 for 6"		3.9		107.5				@ 10 feet, IGNEOUS BEDROCK, slightly weathered granitics, dry, light brown, collected as well graded sand with silt, slight calcite coating.
15	46 for 6"		2.8		109.4				@ 15 feet, IGNEOUS BEDROCK, slightly weathered granitics, dry, brown, collected as well graded sand.
20	51 for 6"		3.0		112.8				END OF BORING @ 20.5' No fill No groundwater Bedrock @ 10'
25									

TEST DATA

PROJECT:	Proposed Commercial Development	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ELEVATION:**	3,076
		DATE DRILLED:	February 11, 2025
LOR GEOTECHNICAL GROUP, INC.		**EQUIPMENT:**	Mobile B-61
		HOLE DIA.: 8"	**ENCLOSURE:** B-2

LOG OF BORING B-3

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, ALLUVIUM SILTY SAND, trace gravel to 1" approximately 20% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 30% silty fines, light brown, dry, disturbed in the upper 0.5'.
	64		4.4		112.3			SC	@ 2 feet, CLAYEY SAND, approximately 25% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 25% clayey fines of low plasticity, light reddish brown, trace pinhole porosity, abundant calcite, dry.
5	54		7.7					SM	@ 5 feet, SILTY SAND, approximately 20% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 30% silty fines, trace clay, light brown, calcite coating, rings disturbed.
10	70		4.2		103.2			SW SM	@ 10 feet, WELL GRADED SAND with SILT, approximately, 20% coarse grained sand, 30% medium grained sand, 35% fine grained sand , 10% silty fines, light brown, slight calcite coating, trace pinhole porosity.
15	46 for 5"		3.2		104.6				@ 15 feet, IGNEOUS BEDROCK, slightly weathered granitics, dry, pink, collected as well graded sand.
20	51 for 3"								@ 20 feet, no recovery.
									END OF BORING @ 20.25' No fill No groundwater Bedrock @ 15'
25									

PROJECT:	Proposed Commercial Development	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ELEVATION:**	3,079
		DATE DRILLED:	February 11, 2025
LOR GEOTECHNICAL GROUP, INC.		**EQUIPMENT:**	Mobile B-61
		HOLE DIA.: 8"	**ENCLOSURE:** B-3

LOG OF BORING B-4

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, ALLUVIUM SILTY SAND, approximately 5% gravel to 3", 20% coarse grained sand, 25% medium grained sand, 30% fine grained sand, 20% silty fines, light brown, dry, disturbed in the upper 0.5'.
	27		7.8		96.0			SC	@ 2 feet, CLAYEY SAND, approximately 20% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 30% clayey fines of low plasticity, light brown, dry, trace pinhole porosity, calcite coating.
5	28		5.2		101.0				@ 5 feet, abundant calcite coating, white.
10	56		6.4		107.8				@ 10 feet, IGNEOUS BEDROCK, very weathered granitics, dry, light brown, collected as well graded sand.
15	46 for 5"		3.8		105.0				@ 15 feet, less weathered bedrock. END OF BORING @ 15.42' No fill No groundwater Bedrock @ 10'
20									
25									

PROJECT:	Proposed Commercial Development	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ELEVATION:**	3,076
LOR GEOTECHNICAL GROUP, INC.		**DATE DRILLED:**	February 11, 2025
		EQUIPMENT:	Mobile B-61
		HOLE DIA.: 8"	**ENCLOSURE:** B-4

LOG OF BORING B-5

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, ALLUVIUM: SILTY SAND, approximately 15% coarse grained sand, 25% medium grained sand, 30% fine grained sand, 30% silty fines, light brown, dry, disturbed in the upper 0.5'.
	40 for 6		3.4		113.8	■			@ 2 feet, SILTY SAND, approximately 20% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 30% silty fines, light reddish brown, calcite, trace pinhole porosity.
5	76		9.2			■			@ 5 feet, rings disturbed.
10	46 for 5"		3.7		97.8	■			@ 10 feet, IGNEOUS BEDROCK, weathered granitics, dry, light brown, collected as well graded sand.
15	46 for 6"		3.8		110.8	■			@ 15 feet, less weathered bedrock
20	51 for 4"		8.1		119.6	■			@ 20 feet, iron oxide staining.
									END OF BORING @ 20.33'
									No fill No groundwater Bedrock @ 10'
25									

PROJECT:	Proposed Commercial Development	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**ELEVATION:**	3,079
		DATE DRILLED:	February 11, 2025
LOR GEOTECHNICAL GROUP, INC.		**EQUIPMENT:**	Mobile B-61
		HOLE DIA.: 8"	**ENCLOSURE:** B-5

APPENDIX C

Borehole Percolation Testing Program and Infiltration Rate Test Results

APPENDIX C
BOREHOLE PERCOLATION TESTING PROGRAM AND INFILTRATION RATE TEST RESULTS

Four borehole percolation tests were conducted in general accordance with the Shallow Percolation Test procedure as outlined in the Technical Guidance Document for Water Quality Management Plans (CDM Smith, 2013). The general locations of our tests are illustrated on Enclosure A-2 and were conducted at the requested locations and depth. Subsequent to drilling, a 3-inch diameter, perforated PVC pipe wrapped in filter fabric was placed within each test hole and 3/4-inch gravel was placed between the outside of the pipe and the hole wall. Test holes were pre-soaked the same day as drilling. Testing took place the next day, February 12, 2025, within 26 hours but not before 15 hours, of the pre-soak. The holes were filled using water from a 200 gallon water tank. Test periods consisted of allowing the water to drop in approximately 30-minute intervals. After each reading, the hole was refilled. Testing was terminated after a total of 12 readings were recorded. The percolation test data was converted to an infiltration rate using the Porchet Method as outlined by the Technical Guidance Document (CDM Smith, 2013).

Infiltration test results are summarized in the following table:

Test No.	Depth* (ft)	Infiltration Rate** (in/hr)
P-1	5.0	3.3
P-2	5.0	1.4
P-3	5.0	1.9
P-4	5.0	1.6

* depth measured below existing ground surface
** Porchet Method determined clear water rate

The results of this testing are presented as Enclosures C-1 through C-4.

BOREHOLE METHOD PERCOLATION TEST RESULTS

Project:	APN 0463-441-07, Apple Valley, California	Test Date:	February 12, 2025
Project No.:	14053.1	Test Hole No.:	P-1
Soil Classificaiton:	(SM) Silty sand	Hole Diameter:	8.0 in.
Depth of Test Hole:	5.0 ft.	Date Excavated:	February 11, 2025
Tested By:	A.L.		

READING	TIME START	TIME STOP	TIME INTERVAL		TOTAL TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	INITIAL HOLE DEPTH	FINAL HOLE DEPTH	CHANGE IN WATER LEVEL	AVERAGE WETTED DEPTH	PERCOLATION RATE
			min	hr.	hr.	in.	in.	in.	in.	in.	in.	(gal/sf/day)
1	9:50 AM	10:20 AM	30	0.50	0.50	24.00	48.50	60.00	60.00	24.50	23.75	57.1
2	10:21 AM	10:51 AM	30	0.50	1.00	24.00	47.00	60.00	60.00	23.00	24.50	52.1
3	10:52 AM	11:22 AM	30	0.50	1.50	24.00	47.00	60.00	60.00	23.00	24.50	52.1
4	11:23 AM	11:53 AM	30	0.50	2.00	24.00	46.75	60.00	60.00	22.75	24.63	51.3
5	11:54 AM	12:24 PM	30	0.50	2.50	24.00	46.50	60.00	60.00	22.50	24.75	50.5
6	12:25 PM	12:55 PM	30	0.50	3.00	24.00	46.25	60.00	60.00	22.25	24.88	49.7
7	12:56 PM	1:26 PM	30	0.50	3.50	24.00	46.00	60.00	60.00	22.00	25.00	48.9
8	1:27 PM	1:57 PM	30	0.50	4.00	24.00	46.25	60.00	60.00	22.25	24.88	49.7
9	1:58 PM	2:28 PM	30	0.50	4.50	24.00	46.00	60.00	60.00	22.00	25.00	48.9
10	2:29 PM	2:59 PM	30	0.50	5.00	24.00	46.00	60.00	60.00	22.00	25.00	48.9
11	3:00 PM	3:30 PM	30	0.50	5.50	24.00	46.00	60.00	60.00	22.00	25.00	48.9
12	3:31 PM	4:01 PM	30	0.50	6.00	24.00	46.00	60.00	60.00	22.00	25.00	48.9

PERCOLATION RATE CONVERSION (Porchet Method):

H_O	36.00	
H_f	14.00	
ΔH	22.00	
H_{avg}	25.00	
I_t	**3.3**	in/hr (clear water rate)

BOREHOLE METHOD PERCOLATION TEST RESULTS

Project:	APN 0463-441-07, Apple Valley, California	Test Date:	February 12, 2025
Project No.:	14053.1	Test Hole No.:	P-2
Soil Classificaiton:	(SM) Silty sand	Hole Diameter:	8.0 in.
Depth of Test Hole:	5.0 ft.	Date Excavated:	February 11, 2025
Tested By:	A.L.		

READING	TIME START	TIME STOP	TIME INTERVAL		TOTAL TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	INITIAL HOLE DEPTH	FINAL HOLE DEPTH	CHANGE IN WATER LEVEL	AVERAGE WETTED DEPTH	PERCOLATION RATE
			min	hr.	hr.	in.	in.	in.	in.	in.	in.	(gal/sf/day)
1	9:53 AM	10:23 AM	30	0.50	0.50	24.00	37.00	60.00	60.00	13.00	29.50	24.8
2	10:24 AM	10:54 AM	30	0.50	1.00	24.00	36.00	60.00	60.00	12.00	30.00	22.5
3	10:55 AM	11:25 AM	30	0.50	1.50	24.00	36.00	60.00	60.00	12.00	30.00	22.5
4	11:26 AM	11:56 AM	30	0.50	2.00	24.00	35.75	60.00	60.00	11.75	30.13	21.9
5	11:57 AM	12:27 PM	30	0.50	2.50	24.00	35.50	60.00	60.00	11.50	30.25	21.4
6	12:28 PM	12:58 PM	30	0.50	3.00	24.00	35.50	60.00	60.00	11.50	30.25	21.4
7	12:59 PM	1:29 PM	30	0.50	3.50	24.00	35.25	60.00	60.00	11.25	30.38	20.8
8	1:30 PM	2:00 PM	30	0.50	4.00	24.00	35.25	60.00	60.00	11.25	30.38	20.8
9	2:01 PM	2:31 PM	30	0.50	4.50	24.00	35.00	60.00	60.00	11.00	30.50	20.3
10	2:32 PM	3:02 PM	30	0.50	5.00	24.00	35.00	60.00	60.00	11.00	30.50	20.3
11	3:03 PM	3:33 PM	30	0.50	5.50	24.00	35.00	60.00	60.00	11.00	30.50	20.3
12	3:34 PM	4:04 PM	30	0.50	6.00	24.00	35.25	60.00	60.00	11.25	30.38	20.8

PERCOLATION RATE CONVERSION (Porchet Method):

H_O	36.00	
H_f	24.75	
ΔH	11.25	
H_{avg}	30.38	
I_t	**1.4**	in/hr (clear water rate)

BOREHOLE METHOD PERCOLATION TEST RESULTS

Project:	APN 0463-441-07, Apple Valley, California	Test Date:	February 12, 2025
Project No.:	14053.1	Test Hole No.:	P-3
Soil Classificaiton:	(SM) Silty sand	Hole Diameter:	8.0 in.
Depth of Test Hole:	5.0 ft.	Date Excavated:	February 11, 2025
Tested By:	A.L.		

READING	TIME START	TIME STOP	TIME INTERVAL		TOTAL TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	INITIAL HOLE DEPTH	FINAL HOLE DEPTH	CHANGE IN WATER LEVEL	AVERAGE WETTED DEPTH	PERCOLATION RATE
			min	hr.	hr.	in.	in.	in.	in.	in.	in.	(gal/sf/day)
1	9:56 AM	10:26 AM	30	0.50	0.50	24.00	42.00	60.00	60.00	18.00	27.00	37.2
2	10:27 AM	10:57 AM	30	0.50	1.00	24.00	40.00	60.00	60.00	16.00	28.00	32.0
3	10:58 AM	11:28 AM	30	0.50	1.50	24.00	39.25	60.00	60.00	15.25	28.38	30.1
4	11:29 AM	11:59 AM	30	0.50	2.00	24.00	39.50	60.00	60.00	15.50	28.25	30.7
5	12:00 PM	12:30 PM	30	0.50	2.50	24.00	39.00	60.00	60.00	15.00	28.50	29.5
6	12:31 PM	1:01 PM	30	0.50	3.00	24.00	39.00	60.00	60.00	15.00	28.50	29.5
7	1:02 PM	1:32 PM	30	0.50	3.50	24.00	39.25	60.00	60.00	15.25	28.38	30.1
8	1:33 PM	2:03 PM	30	0.50	4.00	24.00	38.75	60.00	60.00	14.75	28.63	28.9
9	2:04 PM	2:34 PM	30	0.50	4.50	24.00	38.75	60.00	60.00	14.75	28.63	28.9
10	2:35 PM	3:05 PM	30	0.50	5.00	24.00	39.00	60.00	60.00	15.00	28.50	29.5
11	3:06 PM	3:36 PM	30	0.50	5.50	24.00	38.50	60.00	60.00	14.50	28.75	28.3
12	3:37 PM	4:07 PM	30	0.50	6.00	24.00	38.50	60.00	60.00	14.50	28.75	28.3

PERCOLATION RATE CONVERSION (Porchet Method):

H_O	36.00	
H_f	21.50	
ΔH	14.50	
H_{avg}	28.75	
I_t	**1.9**	in/hr (clear water rate)

BOREHOLE METHOD PERCOLATION TEST RESULTS

Project:	APN 0463-441-07, Apple Valley, California	Test Date:	February 12, 2025
Project No.:	14053.1	Test Hole No.:	P-4
Soil Classificaiton:	(SM) Silty sand	Hole Diameter:	8.0 in.
Depth of Test Hole:	5.0 ft.	Date Excavated:	February 11, 2025
Tested By:	A.L.		

READING	TIME START	TIME STOP	TIME INTERVAL		TOTAL TIME	INITIAL WATER LEVEL	FINAL WATER LEVEL	INITIAL HOLE DEPTH	FINAL HOLE DEPTH	CHANGE IN WATER LEVEL	AVERAGE WETTED DEPTH	PERCOLATION RATE
			min	hr.	hr.	in.	in.	in.	in.	in.	in.	(gal/sf/day)
1	10:00 AM	10:30 AM	30	0.50	0.50	24.00	40.75	60.00	60.00	16.75	27.63	33.9
2	10:31 AM	11:01 AM	30	0.50	1.00	24.00	38.00	60.00	60.00	14.00	29.00	27.1
3	11:02 AM	11:32 AM	30	0.50	1.50	24.00	37.50	60.00	60.00	13.50	29.25	25.9
4	11:33 AM	12:03 PM	30	0.50	2.00	24.00	37.75	60.00	60.00	13.75	29.13	26.5
5	12:04 PM	12:34 PM	30	0.50	2.50	24.00	37.25	60.00	60.00	13.25	29.38	25.3
6	12:35 PM	1:05 PM	30	0.50	3.00	24.00	37.00	60.00	60.00	13.00	29.50	24.8
7	1:06 PM	1:36 PM	30	0.50	3.50	24.00	37.00	60.00	60.00	13.00	29.50	24.8
8	1:37 PM	2:07 PM	30	0.50	4.00	24.00	37.00	60.00	60.00	13.00	29.50	24.8
9	2:08 PM	2:38 PM	30	0.50	4.50	24.00	36.50	60.00	60.00	12.50	29.75	23.6
10	2:39 PM	3:09 PM	30	0.50	5.00	24.00	36.75	60.00	60.00	12.75	29.63	24.2
11	3:10 PM	3:40 PM	30	0.50	5.50	24.00	36.25	60.00	60.00	12.25	29.88	23.1
12	3:41 PM	4:11 PM	30	0.50	6.00	24.00	36.50	60.00	60.00	12.50	29.75	23.6

PERCOLATION RATE CONVERSION (Porchet Method):

H_O	36.00	
H_f	23.50	
ΔH	12.50	
H_{avg}	29.75	
I_t	**1.6**	in/hr (clear water rate)

APPENDIX D

Laboratory Testing Program and Test Results

APPENDIX D
LABORATORY TESTING

General

Selected soil samples obtained from the borings were tested in our geotechnical laboratory to evaluate the physical properties of the soils affecting foundation design and construction procedures. Laboratory testing included in-place moisture content and dry density, laboratory compaction characteristics, direct shear, sieve analysis, sand equivalent, R-value, expansion index, and corrosion screening. Descriptions of the laboratory tests are presented in the following paragraphs:

Moisture Density Tests

The moisture content and dry density information provides an indirect measure of soil consistency for each stratum, and can also provide a correlation between soils on this site. The dry unit weight and field moisture content were determined for selected undisturbed samples, in accordance with ASTM D 2921 and ASTM D 2216, respectively, and the results are shown on the boring logs, Enclosures B-1 and B-2 for convenient correlation with the soil profile.

Laboratory Compaction

A selected soil sample was tested in the laboratory to determine compaction characteristics using the ASTM D 1557 compaction test method. The results are presented in the following table:

LABORATORY COMPACTION				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.C.S.)**	**Maximum Dry Density (pcf)**	**Optimum Moisture Content (percent)**
B-5	0-3	(SM) Silty Sand	131.0	6.5

Direct Shear Test

Shear tests are performed in general accordance with ASTM D 3080 with a direct shear machine at a constant rate-of-strain (0.04 inches/minute). The machine is designed to test a sample partially extruded from a sample ring in a single shear. Samples are tested at varying normal loads in order to evaluate the shear strength parameters, angle of internal friction and cohesion. Samples are tested in remolded condition (90 percent relative compaction per ASTM D 1557) and soaked, to represent the worst case conditions expected in the field.

The results of the shear test on a selected soil sample is presented in the following table:

DIRECT SHEAR TEST				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.C.S.)**	**Apparent Cohesion (psf)**	**Angle of Internal Friction (degrees)**
B-5	0-3	(SM) Silty Sand	500	26

Sieve Analysis

A quantitative determination of the grain size distribution was performed for selected samples in accordance with the ASTM D 422 laboratory test procedure. The determination is performed by passing the soil through a series of sieves, and recording the weights of retained particles on each screen. The results of the grain size distribution analyses are presented graphically on Enclosure D-1.

Sand Equivalent

The sand equivalent of selected soils were evaluated using the California Sand Equivalent Test Method, Caltrans Number 217. The results of the sand equivalent tests are presented with the grain size distribution analyses on Enclosure D-1.

R-Value Test

Based on the indicator testing above, a soil sample was selected and tested to determine its R-value using the California R-Value Test Method, Caltrans Number 301. The results of the R-value test are presented on Enclosure D-1.

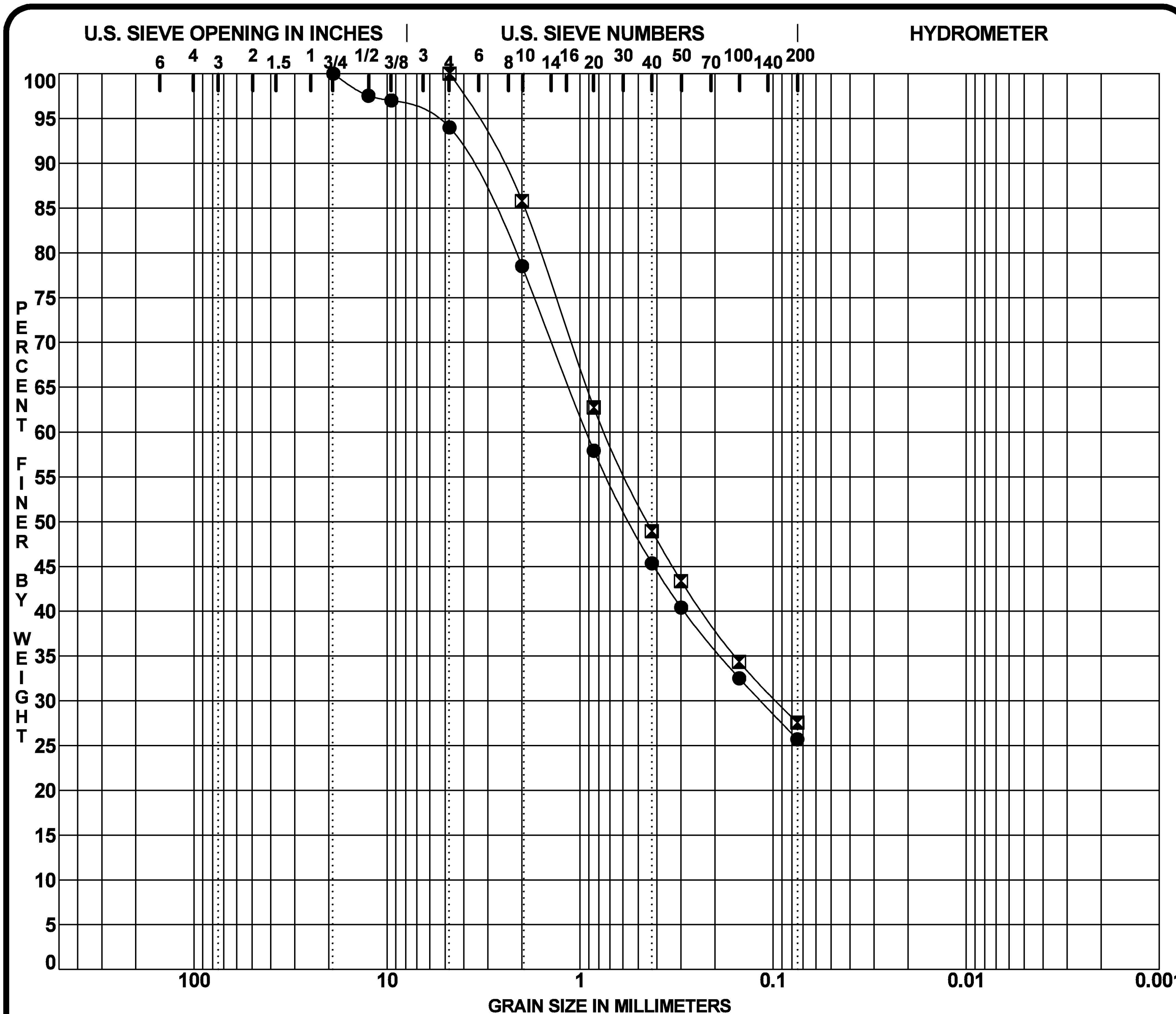
Expansion Index Test

Remolded samples are tested to determine their expansion potential in accordance with the Expansion Index (EI) test. The test is performed in accordance with the Uniform Building Code Standard 18-2. The test result for a select soil sample is presented in the following table:

EXPANSION INDEX TEST				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.C.S.)**	**Expansion Index (EI)**	**Expansion Potential**
B-4	2-5	(SC) Clayey Sand	25	Low
B-5	0-3	(SM) Silty Sand	20	Very Low to Low
Expansion Index:	0-20 Very low	21-50 Low	51-90 Medium	91-130 High

Corrosion

Corrosion testing was conducted by our subconsultant, Project X Corrosion Engineering. Test results are enclosed.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Soil Classification	SE	RV	PL	PI	Cc	Cu
● B-1	@ 0-3'	(SM) Silty Sand	20	--				
⊠ B-5	@ 0-3'	(SM) Silty Sand	19	34				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	@ 0-3'	19.00	0.93	0.116		6.0	68.3	25.7	
⊠ B-5	@ 0-3'	4.75	0.74	0.096		0.0	72.5	27.5	

PROJECT:	Proposed Commercial Development	**PROJECT NO.:**	14053.1
CLIENT:	Conco Construction	**DATE:**	March 2025

GRADATION CURVES

LOR GEOTECHNICAL GROUP, INC.

ENCLOSURE: D-1

Results Only Soil Testing for APN 0463-441-07 Apple Valley, California

February 14, 2025

Prepared for:

Cristina Carranza
LOR Geotechnical Group, Inc.
6121 Quail Valley Ct
Riverside, CA 92507
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Project X Job#: S250213G
Client Job or PO#: 14053.1

Prepared by:
D. Bobrova

Respectfully Submitted,

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NACE Corrosion Technologist #16592
Professional Engineer
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REGISTERED PROFESSIONAL ENGINEER
EDUARDO HERNANDEZ
No. M37102
MECHANICAL
STATE OF CALIFORNIA

Soil Analysis Lab Results

Client: LOR Geotechnical Group, Inc.
Job Name: APN 0463-441-07 AppleValley, California
Client Job Number: 14053.1
Project X Job Number: S250213G
February 14, 2025

	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51	ASTM G200	SM 4500-D	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327
Bore# / Description	**Depth**	**Sulfates** SO_4^{2-}		**Chlorides** Cl^-		**Resistivity** As Rec'd	Minimum	**pH**	**Redox**	**Sulfide** S^{2-}	**Nitrate** NO_3^-	**Ammonium** NH_4^+	**Lithium** Li^+	**Sodium** Na^+	**Potassium** K^+	**Magnesium** Mg^{2+}	**Calcium** Ca^{2+}	**Fluoride** F_2^{2-}	**Phosphate** PO_4^{3-}
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ω-cm)	(Ω-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
RV-1 - B-1 Silty Sand (SM)	0-3	640.5	0.0641	388.3	0.0388	33,500	871	8.5	210	0.06	9.6	11.7	ND	547.7	10.5	11.7	71.0	12.7	5.2
RV-2 - B-5 Silty Sand (SM)	0-3	2,388.3	0.2388	18.2	0.0018	64,320	804	7.6	209	ND	3.7	6.8	ND	255.6	13.1	59.7	454.7	11.2	166.7

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract
PPM = mg/kg (soil) = mg/L (Liquid)

For AWWA 105C: 0-3mg/kg sulfide = Negative; 3-6mg/kg = trace; >6mg/kg = Positive

Note: Sometimes a bad sulfate hit is a contaminated spot. Typical fertilizers are Potassium chloride, ammonium sulfate or ammonium sulfate nitrate (ASN). So this is another reason why testing full corrosion series is good because we then have the data to see if those other ingredients are present meaning the soil sample is just fertilizer-contaminated soil. This can happen often when the soil samples collected are simply surface scoops. This is why it's best to dig in a foot, throw away the top and test the deeper stuff. Dairy farms are also notorious for these items.

If one sample pops up much more corrosive than all others, we would recommend collecting more samples surrounding the problem sample location to determine if the peak is isolated to it. This allows us to conclude it was a contaminated sample and able to declare it an outlier.

Try out our new online forms: SOIL CORROSIVITY & THERMAL RESISTIVITY LAB REQUEST FORM & IN-SITU WENNER 4 PIN QUOTE REQUEST FORM

Project X Corrosion Engineering

Lab Request Sheet Chain of Custody

Phone: (213) 928-7213 · Fax (951) 226-1720 · www.projectxcorrosion.com

Ship Samples To: 29990 Technology Dr, Suite 13, Murrieta, CA 92563

Project X Job Number: S250213G LOR 14053.1 APPLE VALLEY 2 FULL

IMPORTANT: Please complete Project and Sample Identification Data as you would like it to appear in report & include this form with samples.

Company Name:	LOR Geotechnical Group, Inc.	Contact Name:	Cristina Carranza
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Accounting Contact:	John Leuer	Invoice Email:	atardie@lorgeo.com
Client Project No:	14053.1	Project Name:	APN 0463-441-07 Apple Valley, California
P.O. #:	--		

	3-5 Day Standard	3 Day Guarantee 50% mark-up	24 Hour RUSH 100% mark-up
(Business Days) Turn Around Time:	●		

For Corrosion Control Recommendations (350g soil sample):
NEED (1) Groundwater depth and
(2) Soil Sample Locations Map

FOR THERMAL RESISTIVITY PROVIDE (1,500g soil sample):
(1) Optimal Moisture %
(2) Dry Density{PCF}
(3) Desired Compaction
Date & Received By:

METHOD ANALYSIS REQUESTED (Please circle)

Group	Analysis	Default Method
Full Corrosion Series – Geo Quad	Soil Resistivity	ASTM G187
Full Corrosion Series – Geo Quad	pH	ASTM G51
Full Corrosion Series – Geo Quad	Sulfate	ASTM D4327
Full Corrosion Series – Geo Quad	Chloride	ASTM D4327
Full Corrosion Series	Redox Potential	ASTM G200
Full Corrosion Series	Sulfide	SM 4500-S2
Full Corrosion Series	Ammonia	ASTM D4327
Full Corrosion Series	Nitrate	ASTM D4327
Full Corrosion Series	Flouride	SM 2320B
Full Corrosion Series	Phosphate	ASTM D4327
Full Corrosion Series	Lithium	ASTM D4327
Full Corrosion Series	Sodium	ASTM D4327
Full Corrosion Series	Potassium	ASTM D4327
Full Corrosion Series	Magnesium	ASTM D4327
Full Corrosion Series	Calcium	ASTM D4327
	Full Corrosion Series	350g Sample
Reports	Soil Corrosivity Evaluation Report	*Req: Min. 3 Samples, site map, and groundwater info
Reports	Water Corrosivity Mini Report	
	Moisture Content	ASTM D2216
	Total Alkalinity	SM 2320B
	Soil Remolding	ASTM D698
	Thermal Resistivity	IEEE 442 6-inch
	(ANC) Alk Neutr Cap	1,500g Sample
	(SRB) Sulfate Reducing	HACH BART
	Puckorius Index	
	XRF Elemental Analysis	ASTM E1621
	Water Hardness	

	#	SAMPLE ID - BORE # - Description	DEPTH (ft)	DATE COLLECTED	Analyses requested
154	1	RV-1 - B-1 - Silty Sand (SM)	0-3	2/11/2025	Full Corrosion Series ●
155	2	RV-2 - B-5 - Silty Sand (SM)	0-3	2/11/2025	Full Corrosion Series ●
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