November 15, 2021
J.N.: 3029.00

Mr. Steve Armanino
The Olson Company
3010 Old Ranch Parkway, Suite 100
Seal Beach, California 90740

Subject: **Geotechnical Due-Diligence Investigation, Proposed Multi-Family Residential Development, 1030 West Foothill Boulevard, Claremont, California**

Dear Mr. Armanino,

***Albus & Associates, Inc*.** is pleased to present to you our geotechnical due-diligence report for the proposed multi-family residential development at the subject site. This report presents a summary of our literature review, subsurface exploration, laboratory testing, and engineering analyses. Conclusions relevant to the feasibility of the proposed site development are also presented herein based on the findings of our work.

We appreciate this opportunity to be of service to you. If you should have any questions regarding the contents of this report, please do not hesitate to call our office.

Sincerely,

ALBUS & ASSOCIATES, INC.

Paul Kim
Associate Engineer

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of our work was to evaluate the feasibility of proposed site development in order to assist you in your land acquisition evaluation and due-diligence review. The scope of our work for this investigation was focused primarily on the geotechnical issues that we expect could have significant fiscal impacts on future site development. While this report is comprehensive for feasibility purposes, it is not intended for final design purposes. As such, additional geotechnical studies may be warranted based on our review of future rough grading plans and foundation plans. The scope of our work for this investigation included the following:

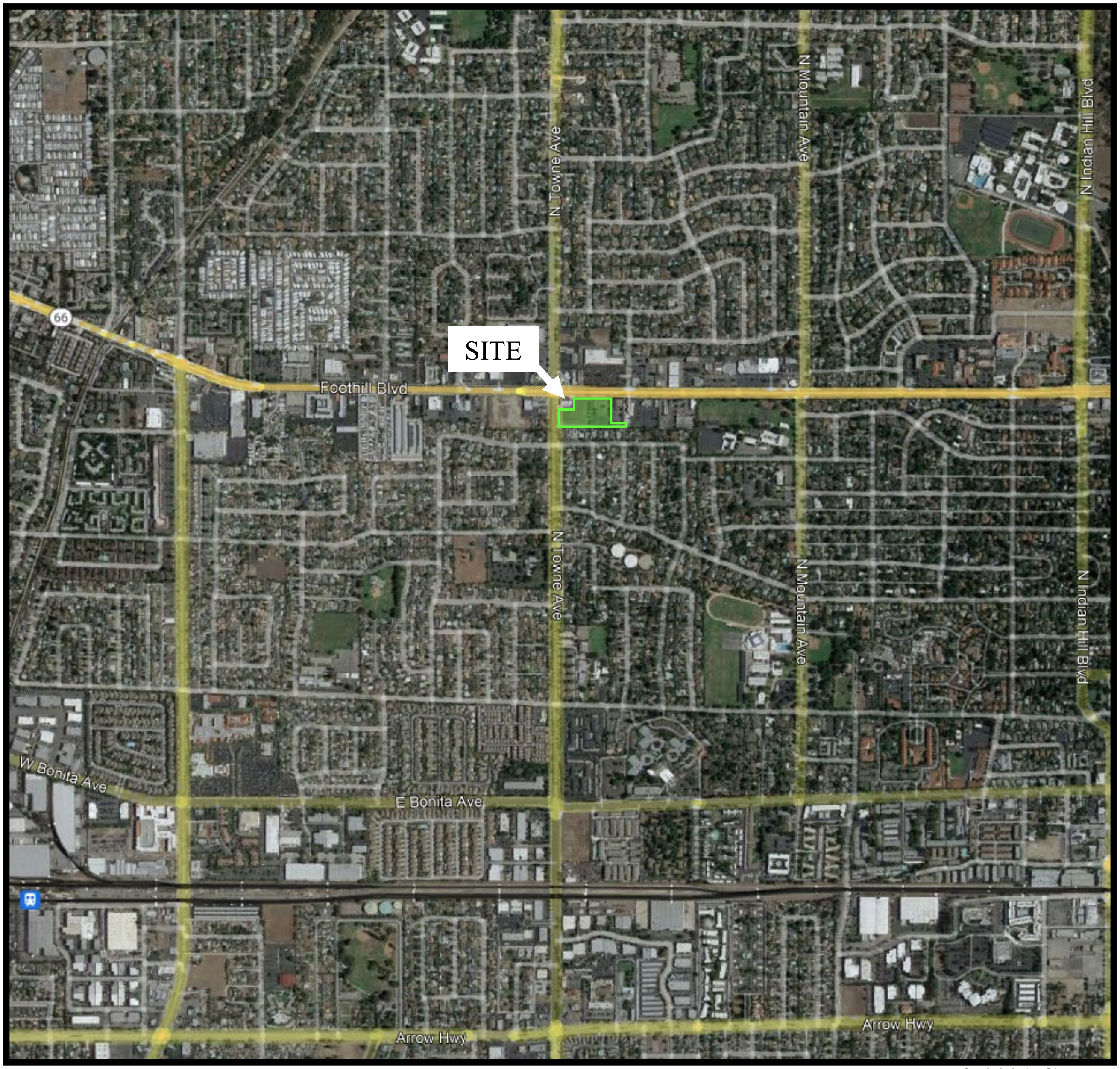
- Review of published geologic and seismic data for the site and surrounding area
- Exploratory drilling and soil sampling
- Laboratory testing of select soil samples
- Engineering analyses of data obtained from our review, exploration, and laboratory testing
- Evaluate site seismicity, liquefaction potential, and settlement potential
- Preparation of this report

1.2 SITE LOCATION AND DESCRIPTION

The site is located at 1030 West Foothill Boulevard, within the city of Claremont, California. The west half of the site is currently undeveloped and the east half of the site is vacant. The site is bordered by single-family homes to the south, North Towne Avenue to the west, a gas station the northwest, Foothill Boulevard to the north, and a commercial building to the east. The location of the site and its relationship to the surrounding area is shown on Figure 1, Site Location Map.

The project site and overall property is relatively flat with elevation ranging from 1192 to 1206 feet above mean sea level (based on Google Earth) descending gently to the southwest.

The site consists of 3.1 acres of land. The eastern half of the site was previously occupied by a restaurant. However, the building has been demolished and wasted from the site and only the asphalt and hardscape improvements remain. The parking lot is in poor condition due to the numerous asphalt cracks. The western portion of the site is undeveloped. An alley, likely used also as a utility easement is present along the south property line. The south and northeast property lines are bordered by a masonry block wall. Vegetation consists of medium to large trees mostly within the eastern half of the site.



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SITE LOCATION MAP

The Olson Company
Proposed Multi-Family Residential Development
1030 West Foothill Boulevard
Carson, California

NOT TO SCALE

FIGURE 1

1.3 PROPOSED DEVELOPMENT

We understand that the site will be redeveloped for residential use. We anticipate the proposed site development will consist of attached three-story townhomes. The structures are expected to be wood-framed and developed with concrete slabs on grade yielding relatively light foundation loads. We anticipate the proposed site will also consist of associated interior driveways, perimeter/retaining walls, underground utilities, and a storm water infiltration system.

2.0 INVESTIGATION

2.1 RESEARCH

We have reviewed the referenced geologic publications, maps, and historical aerial photos of the vicinity. Data from these sources were utilized to the development of some of our findings and conclusions presented in this report.

We have also reviewed historical aerial photographs for the site and surrounding area. Research of aerial photographs indicate that as early as 1938, the site was used for agricultural purposes. Between 1948 to 1953 the site continues to be vacant land but may have been mass graded as part of the development of the residential units to the south. During this time, a structure is present at the southeast corner of the undeveloped portion of the site. By 1959, the gas station to the northwest has been constructed and the structure that was previously visible is no longer present. By 1972, construction has begun on the eastern portion of the site. Between 2018 to 2021, the restaurant was demolished. The site appears to represent the current site configuration since then.

2.2 SUBSURFACE EXPLORATION

Subsurface explorations for this investigation were conducted on November 11, 2021 and consisted of drilling one soil boring and nine test pits. The soil boring was drilled to a maximum depth of approximately 46.5 feet below the existing ground surface (bgs). The boring was drilled using a truck-mounted, continuous-flight, hollow-stem-auger drill rig. The test pits were excavated to the maximum depth of 10 feet below the existing ground surface utilizing a backhoe. Representatives of *Albus & Associates, Inc*. logged the exploratory borings and test pits. Visual and tactile identifications were made of the materials encountered, and their descriptions are presented on the Exploration Logs in Appendix A. The approximate locations of the borings are shown on the enclosed Geotechnical Map, Plate 1.

Bulk, relatively undisturbed and Standard Penetration Test (SPT) samples were obtained at selected depths for subsequent laboratory testing. Relatively undisturbed samples were obtained using a 3-inch O.D., 2.5-inch I.D., California split-spoon soil sampler lined with brass rings. SPT samples were obtained using a standard SPT soil sampler. During each sampling interval, the samplers were driven 18 inches with successive drops of a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampler was recorded for each six inches of advancement. The total blow count for the lower 12 inches of advancement per soil sample is recorded on the exploration log.

Samples were placed in sealed containers or plastic bags and transported to our laboratory for analyses and testing. The borings were backfilled with soil cuttings upon completion of drilling.

Two percolation test wells (P-1 and P-2) were drilled adjacent to exploratory boring B-1 for subsequent percolation testing. The percolation test wells should be completely removed and backfilled with compacted fill.

2.3 LABORATORY TESTING

Selected samples of representative earth materials from the borings were tested in our laboratory. Tests consisted of in-situ moisture and dry density, maximum dry density and optimum moisture content, soluble sulfate content, grain size analysis, direct shear, and corrosivity. Descriptions of laboratory testing and a summary of the test results are presented in Appendix B and on the exploration log in Appendix A.

3.0 SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

Artificial fill materials were generally encountered up to about 3 feet below the existing ground surface within the existing building pad located at the east half of the site and within test pit TP-7. Artificial fill was not encountered within the remaining portion of the site.

Alluvial deposits were encountered below the fill materials or at ground surface to the maximum depths explored of 46.5 feet. The alluvial materials consist of sand with varying amounts of silt and gravels, brown, dry to moist, medium dense to very dense.

A more detailed description of the interpreted soil profile at each of the boring locations, based upon the borehole cuttings and soil samples, are presented in Appendix A. The stratigraphic descriptions in the logs represent the predominant materials encountered and relatively thin, often discontinuous layers of different material may occur within the major divisions.

3.2 GROUNDWATER

Groundwater was not encountered during this firm’s subsurface exploration to a maximum depth of 46.5 feet below the existing ground surface. The CDMG Seismic Hazard Zone Report 040 indicates historic groundwater is estimated to be 150 feet below the existing ground surface.

3.3 ACTIVE FAULTS

Based on our review of the referenced publications and seismic data, no active faults are known to project through or immediately adjacent the subject sites and the sites do not lie within an "Earthquake Fault Zone" as defined by the State of California in Earthquake Fault Zoning Act. Table 3.1 presents a summary of known seismically active faults within 10 miles of the sites based on the 2008 USGS National Seismic Hazard Maps.

TABLE 3.1
Summary of Active Faults

Name	Distance (miles)	Slip Rate (mm/yr.)	Preferred Dip (degrees)	Slip Sense	Rupture Top (km)	Fault Length (km)
Sierra Madre Connected	1.18	2	51	reverse	0	76
Sierra Madre	1.18	2	53	reverse	0	57
San Jose	1.29	0.5	74	strike slip	0	20
Cucamonga	1.32	5	45	thrust	0	28
Chino, alt 2	5.1	1	65	strike slip	0	29
Chino, alt 1	5.22	1	50	strike slip	0	24

4.0 ANALYSES

4.1 SEISMICITY

Following ASCE7-16, Section 21.5.3, we have estimated mapped Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration PGA_M = 0.884g. Per Section 11.2 (Page 79), this value should be used for evaluation of liquefaction, lateral spreading, seismic settlements, and other soil-related issues. Based on the results of deaggregation analysis performed using USGS Unified Hazard Tool, the mean event associated with a probability of exceedance equal to 2% over 50 years has a moment magnitude of 7.0 and the mean distance to the seismic source is 6.92 miles.

4.2 STATIC SETTLEMENT

Analyses were performed to estimate settlement of footings for the anticipated loading conditions and configurations. Based on the anticipated foundation loads and provided the existing near-surface materials are removed and recompacted to provide a uniform layer of engineered compacted fill, the total and differential static settlements are not anticipated to exceed 1 inch and ½-inch over 30 feet, respectively, for the proposed 3-story residential structures.

5.0 CONCLUSIONS

5.1 FEASIBILITY OF PROPOSED DEVELOPMENT

From a geotechnical point of view, the proposed site development is considered feasible. Furthermore, it is also our opinion that the proposed development will not adversely impact the stability of adjoining properties. The adequacy and sufficiency of the preliminary findings and conclusions provided herein should be assessed based upon the final grading and structural plans. A supplemental geotechnical investigation report will be required for design, permitting and construction.

5.2 GEOLOGIC HAZARDS

5.2.1 Ground Rupture

From a geotechnical point of view, the proposed site development is considered feasible. Furthermore, it is also our opinion that the proposed development will not adversely impact the stability of adjoining properties. The adequacy and sufficiency of the preliminary findings and conclusions provided herein should be assessed based upon the final grading and structural plans. A supplemental geotechnical investigation report will be required for design, permitting and construction.

5.2.2 Ground Shaking

The site is situated in a seismically active area that has historically been affected by generally moderate to occasionally high levels of ground motion. The site lies in relatively close proximity to several seismically active faults; therefore, during the life of the proposed structures, the property will probably experience similar moderate to occasionally high ground shaking from these fault zones, as well as some background shaking from other seismically active areas of the Southern California region. Potential ground accelerations have been estimated for the site and are presented in Section 4.1 of this report. Design and construction in accordance with the current California Building Code (C.B.C.) requirements is anticipated to adequately address potential ground shaking.

5.2.3 Liquefaction

Engineering research of soil liquefaction potential (Youd, et al., 2001) indicates that generally three basic factors must exist concurrently in order for liquefaction to occur. These factors include:

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose silty and/or sandy soil.
- A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

The site is not located within a State-designated zone of potentially liquefiable soils. Additionally, groundwater was not encountered during our investigation and historic groundwater is estimated be at 150 feet. As a result, the potential of liquefaction occurring during a seismic event is considered to be very low.

5.3 STATIC SETTLEMENT

The earth materials at the site are generally very medium dense to very dense and are anticipated to result in minor settlement due to the weight of new foundations. Provided the existing artificial fill soils and near-surface earth materials are removed and recompacted, total and differential static settlement can likely be limited to a maximum of 1 inch and ½-inch over 30 feet, respectively. These estimated magnitudes of static settlements are considered within tolerable limits for the proposed residential structures.

5.4 EARTHWORK AND MATERIAL CHARACTERISTICS

In general, the existing fill materials and near-surface earth materials are considered unsuitable in their existing condition to support proposed structural fills and site development. This condition can be mitigated by removal and recompaction of unsuitable soils. The existing upper 3 feet of artificial fill encountered within the existing building pad should be removed and recompacted to support proposed structural fills and site development. Depending on proposed grade conditions, a minimum of 2 feet of engineered fill should be provided below the proposed foundations.

Based on anticipated grading to be completed at the site, oversized materials are expected to be generated. Oversize rocks greater than 6 inches in diameter are expected to be encountered during earthwork operations. Results of our two large-sample gradation tests indicate that up to 35% of the materials (by dry weight) within the upper 2 to 5 feet consist of particles that are greater than 6 inches in diameter. The results in an overall weighted average of approximately 20% of these materials are over 6 inches in diameter within the upper 5 feet of earth materials. To facilitate trenching for the residential buildings, the upper 2 feet of materials will need to limit rock to less than 6 inches in diameter. Rocks larger than 12 inches will require disposal offsite or special handling for onsite disposal. Limited engineered fill depths are anticipated, hence there will be relatively little area to dispose of the oversized material on site. Therefore, oversized materials would primarily require export from the site and import of finer-grained soils as a replacement, if necessary for earthwork balance.

Vertical excavations exposing the sandy materials will likely have no tolerance for a vertical cut and require laybacks at a 1.5:1 gradient (H:V). Site materials may be prone to sloughing and caving.

Due to the existing foundation slab and pavement, significant portions of concrete and asphalt debris can likely be reduced in size to less than 4 inches and incorporated within fill soils during earthwork operations.

Onsite disposal systems, clarifiers, and other underground improvements are likely to be present on site. If encountered during future rough grading, these improvements will require proper abandonment or removal.

Off-site improvements exist near and along the property lines. The presence of the existing offsite improvements will limit removals of unsuitable materials adjacent the property lines. Special grading techniques, such as slot cutting, will be required adjacent to the property lines were offsite structures are nearby. Additionally, grading along public right-of-ways will require special grading techniques, especially if construction fences are placed inside of the property lines which limit removals. Construction of perimeter site walls will require special consideration so as not to disturb the existing property line walls.

Subsurface soils are anticipated to be relatively easy to excavate with conventional heavy earthmoving equipment. Removal and recompaction of the site materials will result in some moderate shrinkage and subsidence. Design of site grading will require consideration of this loss when evaluating earthwork balance issues.

The sandy soils are below optimum moisture content. Some minor addition of water will likely be required to elevate the moisture content to achieve proper compaction.

5.5 SOIL EXPANSION

Based on USCS visual manual classification, the near-surface sandy soils within the site are generally anticipated to possess a **Very Low** expansion potential. Additional testing for soil expansion will be required subsequent to rough grading and prior to construction of foundations and other concrete work to confirm these conditions.

5.6 FOUNDATIONS

Conventional shallow spread and continuous footings may be utilized to support the proposed residential buildings and wall structures at the site. Considering the **Very Low** expansion potential, the foundations for the proposed structures and other site improvements, such as retaining walls, screen walls, and flatwork, will likely require only nominal reinforcement and depths.

5.7 CONCRETE MIX DESIGN

Laboratory testing of onsite soil indicates negligible soluble sulfate content. Concrete designed to follow the procedures provided in ACI 318, Section 4.3, Table 4.3.1 for **negligible** sulfate exposure are anticipated to be adequate for mitigation of sulfate attack on concrete. Upon completion of rough grading, an evaluation of as-graded conditions and further laboratory testing will be required for the site to confirm or modify the conclusions provided in this section.

5.8 CORROSION POTENTIAL

Laboratory testing of onsite soil indicates indicate a minimum resistivity of 11,000 ohm-cm, chloride content of 25 ppm, and a pH of 7.41. Based on laboratory test results, site soils are **Slightly Corrosive** to metals. Structures fabricated from metals should have appropriate corrosion protection if they will be in direct contact with site soils. Under such conditions, a corrosion specialist should provide specific recommendations.

5.9 PAVEMENT SECTIONS

Existing near-surface sandy soils are anticipated to have a high R-value. Based on the assumed R-value of 40 and a traffic index of 5, a preliminary pavement structural section of 3 inches asphaltic concrete over 4 inches of aggregate base, may be used for planning and estimating purpose. R-value testing will be required subsequent to rough grading and prior to construction of interior driveways to confirm these conditions.

5.10 PERCOLATION CHARACTERISTICS

Groundwater was not encountered to the maximum depth explored of 46.5 feet at the time of our investigation and historical levels suggest groundwater may be below 150 feet.

6.0 LIMITATIONS

This report is based on the proposed development and geotechnical data as described herein. The materials described herein and in other literature are believed representative of the total project area, and the conclusions contained in this report are presented on that basis. However, soil materials can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observation and testing by a geotechnical consultant prior to and during the grading and construction phases of the project are essential to confirming the basis of this report.

This report summarizes several geotechnical topics that should be beneficial for project planning and budgetary evaluations. *The information presented herein is intended only for a preliminary feasibility evaluation and* ***is not*** *intended to satisfy the requirements of a site specific and detailed geotechnical investigation required for further planning and permitting.*

This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty.

This report should be reviewed and updated after a period of one year or if the site ownership or project concept changes from that described herein.

This report has been prepared for the exclusive use of **The Olson Company** to assist the project consultants in determining the feasibility of the proposed development. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

Respectfully submitted,

ALBUS & ASSOCIATES, INC

Paul Hyun Jin Kim
Associate Engineer
GE 3106

REFERENCES

Publications

American Society of Civil Engineers, 2017, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, ASCE 7-16.

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Youd, T.L., Idriss, I.M., Andrus, R.D., Arango, I., Castro, G., Christian, J., Dobry, R., Finn, W.D.L., Harder, L.F., Hynes, M.E., Ishihara, K., Koester, J.P., Liao, S.S.C., Marcuson, W.F., Martin, G.R., Mitchell, J.K., Moriwaki, Y., Power, M.S., Robertson, P.K., Seed, R.B., and Stokoe, K.H. 2001. "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils." Journal of Geotechnical and Geoenvironmental Engineering, 127 (10): 817-833.

APPENDIX A

EXPLORATION LOGS

APPENDIX B

LABORATORY TEST PROGRAM

LABORATORY TESTING PROGRAM

Soil Classification

Soils encountered within the exploratory borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (ASTM D 2487). The samples were re-examined in the laboratory and classifications reviewed and then revised where appropriate. The assigned group symbols are presented on the Exploration Logs provided in Appendix A.

In Situ Moisture and Density

Moisture content and unit dry density of in-place soil materials were determined in representative strata. Test data are summarized in the Boring Logs, Appendix A.

Maximum Dry Density and Optimum Moisture Content

Maximum dry density and optimum moisture content were performed on representative samples of the site materials obtained from our field explorations. The test was performed in accordance with ASTM D 1557. Pertinent test values are given in Table B.

Soluble Sulfate Content

Chemical analysis was performed on selected samples to determine soluble sulfate content. The test was performed in accordance with California Test Method No. 417. The test result is included on Table B.

Particle Size Analyses

Particle size analyses were performed on representative samples of site materials in accordance with ASTM D 422-63. The results are presented graphically on the attached Plates B-1 and B-6.

Direct Shear

The Coulomb shear strength parameters, angle of internal friction and cohesion, were determined for a bulk sample obtained from one our borings. The tests were performed in general conformance with Test Method ASTM D 3080. The sample was remolded to 90 percent of maximum dry density and at the optimum moisture content. Three specimens were prepared for each test, artificially saturated, and then sheared under varied loads at an appropriate constant rate of strain. Results are graphically presented on Plate B-7.

Corrosion

Select samples were tested for minimum resistivity and pH in accordance with California Test Method 643. Results of these tests are provided in Table B-1.

TABLE B-1
SUMMARY OF LABORATORY TEST RESULTS

Boring No.	Sample Depth (ft)	Soil Description	Test Results	
B-1	0-5	Sand (SP)	Max. Dry Density (pcf): Opt. Moisture Content (%): Soluble Sulfate Content: Sulfate Exposure: pH: Chloride content (ppm): Resistivity (ohms):	135.5 6.5 0.003 % Negligible 7.41 25.0 11,000