# APPENDIX 3.6-1

***Geotechnical Engineering Report***


***PREPARED FOR:***

**DEPARTMENT OF GENERAL SERVICES/RESD**
**707 3RD STREET, 4TH FLOOR**
**WEST SACRAMENTO, CALIFORNIA 95605**

***PREPARED BY:***

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**GEOCON PROJECT NO. S1445-05-04**

**NOVEMBER 2018**

Project No. S1445-05-04
November 15, 2018

Randall Mummert
Associate Civil Engineer
Department of General Services/RESD
707 3rd Street, 4th Floor
West Sacramento, California 95605

Subject: GEOTECHNICAL INVESTIGATION
CALIFORNIA DEPARTMENT OF MOTOR VEHICLES
REEDLEY FIELD OFFICE
REEDLEY, CALIFORNIA

Dear Mr. Mummert:

In accordance with Task Order No. 4 under Agreement No. 5901-C, we have prepared this geotechnical investigation report for the proposed California Department of Motor Vehicles facility to be located at the northwest corner of the intersection of East Dinuba Avenue and Orange Avenue in Reedley, California.

The accompanying report presents our findings, conclusions, and recommendations regarding the geotechnical aspects of the project as presently proposed. In our opinion, no adverse geotechnical conditions are present that would preclude development at the site provided the recommendations of this report are incorporated into the design and construction of the project.

Please contact us if you have any questions concerning the contents of this report or if we may be of further service.

Sincerely,

**GEOCON CONSULTANTS, INC.**

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## GEOTECHNICAL INVESTIGATION

### 1.0 PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed construction of a new California Department of Motor Vehicles (DMV) field office to be located at the northwest corner of the intersection of East Dinuba Avenue and Orange Avenue in Reedley, California. The approximate site location is depicted on the Vicinity Map, Figure 1.

The purpose of our geotechnical investigation was to observe and sample the subsurface conditions encountered at the site and provide conclusions and recommendations relative to the geotechnical aspects of designing and constructing the new improvements as presently proposed.

To prepare this report, we performed the following scope of services:

- Performed a limited geologic literature review to aid in evaluating the geologic conditions present at the site. A list of referenced material is included in Section 9.0 of this report.
- Performed a site reconnaissance to review project limits, determine exploration equipment access, and mark out exploratory excavation locations.
- Notified subscribing utility companies via Underground Service Alert (USA) a minimum of two working days (as required by law) prior to performing exploratory excavations at the site.
- Drilled seven exploratory borings (B1 through B7) to depths ranging from approximately 5 to 51½ feet using a truck-mounted drill rig. The approximate boring locations are depicted on the Site Plan, Figure 2.
- Performed three borehole field infiltration tests (Inf1 through Inf3) within the proposed parking area, generally where the subgrade storm water retention area is planned. The field infiltration test locations are depicted on the Site Plan, Figure 2.
- Obtained representative soil samples from the borings.
- Logged the borings in accordance with the Unified Soil Classification System (USCS).
- Upon completion, backfilled the borings with the excavated material.
- Performed laboratory tests to determine pertinent geotechnical parameters.
- Prepared this report summarizing our findings, conclusions, and recommendations regarding the geotechnical aspects of designing and constructing the project as presently proposed.

Details of our field exploration including boring logs and field infiltration test data sheets are presented in Appendix A. Approximate locations of the borings and infiltration tests, relative to the proposed project improvements, are shown on the Site Plan, Figure 2. Details of our laboratory testing program and test results are presented in Appendix B.

## 2.0 SITE AND PROJECT DESCRIPTION

The site consists of a currently undeveloped approximate 3.5-acre parcel located at the northwest corner of East Dinuba Avenue Orange Avenue in Reedley, California. At the time of our investigation, the site was vegetated with dry grasses and shrubs. The site is surrounded by residential development to the north and east, and commercial development to the south and west.

The project consists of constructing a new DMV field office at the site. Associated improvements will likely include underground utility infrastructure, paved drives and parking areas, concrete flatwork, a subgrade storm water retention system, and landscaping. The new building will likely be of steel-framed and concrete-masonry construction and will be supported on conventional shallow foundations. Existing site features and approximate locations of the proposed improvements are shown on the Site Plan, Figure 2.

## 3.0 SOIL AND GEOLOGIC CONDITIONS

We identified soil and geologic conditions by observing exploratory borings and reviewing referenced geologic/geotechnical literature (Section 9.0). Descriptions provided below include the USCS symbol where applicable.

### 3.1 Site and Regional Geology

The site is located within the Great Valley Geomorphic Province of California, more specifically referred to as the San Joaquin Valley. The San Joaquin Valley is a broad depression bounded by the Sierra Nevada range to the east and the Coast Ranges to the west. The San Joaquin Valley has been filled with a thick sequence of sediments derived from weathering of adjacent mountain ranges resulting in a stratigraphic section of Cretaceous, Tertiary, and Quaternary deposits.

Published geologic mapping depicts the site vicinity underlain by Quaternary-age Pleistocene non-marine deposits (map symbol Qc), which consists of interbedded mixtures of sand, silt, clay, and gravel (Matthews and Burnett, 1965).

### 3.2 Alluvium (Non-Marine Deposits)

We encountered alluvium in each of our exploratory borings to the maximum depth explored of approximately 51 feet. The alluvium generally consisted of medium dense to very dense silty sand (SM), silty clayey sand (SC-SM), and hard lean clay (CL), sandy lean clay (CL), and silt with sand (ML). Cemented soil (Hardpan) materials were encountered at depths ranging from approximately 3 to 5 feet.

Soil conditions described in the previous paragraphs is generalized. The exploratory boring logs included in Appendix A detail soil type, color, moisture, consistency, and USCS classification of the soils encountered at specific locations and elevations.

### 3.4 Infiltration Testing and Results

We performed three field infiltration tests (falling head method) using a driven casing within a borehole (Inf1 through Inf3) to evaluate soil infiltration characteristics. The tests were performed as follows:

1. The tests were performed in approximately 8-inch diameter borings excavated to approximately 4 to 5 feet below existing grade.
2. A 3.25-inch inside-diameter standpipe was driven into the bottom of each boring.
3. Water was poured into the standpipes and the test zones were allowed to soak for approximately 24 hours.
4. The water level drop under an approximate 1-foot head was measured until a stabilized infiltration rate was obtained.
5. Upon test completion, the standpipes were removed and the borings were backfilled with the soil cuttings.

The approximate test locations are shown on the Site Plan, Figure 2. Stabilized Infiltration rates are summarized in Table 3.2. Field Infiltration Test Data Sheets are presented in Appendix A.

**TABLE 3.2**
**SUMMARY OF INFILTRATION TEST RESULTS**

| Test Hole No. | Approximate Depth of Infiltration Test (feet) | USCS Soil Classification | Stabilized Infiltration Rate (inch/hour) |
|---|---|---|---|
| Inf1 | 5.0 | Silty clayey Sand (SC-SM) | 2.9 |
| Inf2 | 5.5 | Silty clayey Sand (SC-SM) | 3.8 |
| Inf3 | 4.0 | Silty clayey Sand (SC-SM) | 5.8 |

Soil infiltration rates are strongly influenced by soil type (percentage of fines), density, moisture content, and other factors. A small change in clay/silt content can greatly reduce/increase percolation rates. Therefore, we recommend applying an appropriate safety factor (2 or more) to account for variability in the measured percolation rates.

## 4.0 GROUNDWATER

We did not encounter groundwater in our borings performed on September 27, 2018, (maximum depth of 51 feet). We reviewed available depth-to-groundwater data on the California Department of Water Resources (DWR) Groundwater Information Center Interactive Map Application (GICIMA) (https://gis.water.ca.gov/app/gicima/#bookmark_DepthBelowGroundSurface). The GICIMA website indicates depth-to-groundwater at the site is approximately 70 feet (Fall 2017).

It should be noted that fluctuations in the level of groundwater may occur due to variations in precipitation, temperature, seasonal fluctuations, and other factors. Therefore, it is possible that future groundwater may be higher or lower than the levels observed during our investigation.

# 5.0 GEOLOGIC HAZARDS

## 5.1 Regional Active Faults

Based on our research, analyses, and observations, the site is not located on any known "active" earthquake fault trace. In addition, the site is not contained within an Alquist-Priolo Earthquake Fault Zone. Therefore, we consider the potential for ground rupture due to onsite active faulting to be low.

In order to determine the distance of known active faults within 50 miles of the site, we used the *2013 Caltrans Fault Database* KML overlay file for Google Earth. Principal references used within the *2013 Caltrans Fault Database* are Jennings and Bryant Fault Activity Map of California (2010) and The Working Group on California Earthquake Predictions (WGCEP), Uniform California Earthquake Rupture Forecast Version 3. Results are summarized in Table 5.1.

**TABLE 5.1**
**REGIONAL ACTIVE FAULTS**

| Fault Name | Approximate Distance From Site (miles) | Maximum Moment Magnitude ($M_W$) |
|---|---|---|
| Great Valley 14 (Kettleman Hills) | 48.7 | 7.1 |
| Great Valley 13 (Coalinga) | 48.8 | 7.0 |

## 5.2 Ground Shaking

We used the United States Geological Survey (USGS) *Unified Hazard Tool* (https://earthquake.usgs.gov/hazards/interactive/) to determine the deaggregated seismic source parameters including controlling magnitude and fault distance. The USGS estimated modal magnitude is 5.1 and the estimated Peak Ground Acceleration (PGA) for the Maximum Considered Earthquake (MCE) with a 2,475-year return period is 0.26g.

While listing PGA is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including frequency and duration of motion and soil conditions underlying the site. The site could be subjected to ground shaking in the event of an earthquake along the faults mentioned above or other area faults.

## 5.3 Liquefaction

Liquefaction is a phenomenon in which saturated cohesionless soils are subject to a temporary loss of shear strength due to pore pressure buildup under the cyclic shear stresses associated with intense earthquakes. Based on the relatively dense nature of the subsurface conditions encountered at the site and groundwater conditions, liquefaction is not considered a hazard for the project.

## 5.4 Slope Stability

Due to the relatively flat site topography, we do not consider slope instability to be a hazard for the site.

## 5.5 Expansive Soil

Laboratory Plasticity Index (PI) and Expansion Index (EI) tests on selected near-surface soil samples indicate low plasticity and corresponding low expansion potential. Expansive soil is not considered a constraint for the site. Specific design measures or mitigation with respect to expansive soils is not necessary.

## 5.6 Soil Corrosion Screening

We performed a soil corrosion potential screening by conducting laboratory testing on a representative near-surface soil sample. The laboratory test results and published screening levels are presented in Appendix B.

# 6.0 CONCLUSIONS AND RECOMMENDATIONS

## 6.1 General

6.1.1 No soil or geologic conditions were encountered during our investigation that would preclude construction of improvements at the site as planned, provided the recommendations contained in this report are incorporated into the design and construction of the project.

6.1.2 The primary geotechnical constraint at the site is the presence of cemented soil (hardpan) materials at depths ranging from approximately 3 to 5 feet. Hardpan materials may impact excavations at the site. Hardpan materials can also cause perched water conditions to develop at shallow depths (after prolonged heavy rainfall events or runoff) creating soft unstable near surface soils and can impact construction operations at the site.

6.1.3 Conclusions and recommendations provided in this report are based on our review of referenced literature, analysis of data obtained from our exploratory field exploration, laboratory testing program, and our understanding of the proposed development at this time.

6.1.4 We should review the project plans as they develop further, provide engineering consultation as needed during final design, and perform geotechnical observation and testing services during construction.

## 6.2 Seismic Design Criteria

6.2.1 Seismic design of the structures should be performed in accordance with the provisions of the 2016 California Building Code (CBC) which is based on the American Society of Civil Engineers (ASCE) publication: *Minimum Design Loads for Buildings and Other Structures* (ASCE 7-10). We used the United States Geological Survey (USGS) web application *US Seismic Design Maps* (http://earthquake.usgs.gov/designmaps/us/application.php) to evaluate site-specific seismic design parameters in accordance with the 2016 CBC/ASCE 7-10. Results are summarized in Table 6.2.1. The values presented are for the risk-targeted maximum considered earthquake ($MCE_R$).

**TABLE 6.2.1**
**2016 CBC SEISMIC DESIGN PARAMETERS**

| Parameter | Value | 2016 CBC / ASCE 7-10 Reference |
|---|---|---|
| Site Class | D | Section 1613.3.2/ Table 20.3-1 |
| $MCE_R$ Ground Motion Spectral Response Acceleration – Class B (short), $S_S$ | 0.536g | Figure 1613.3.1(1) / Figure 22-1 |
| $MCE_R$ Ground Motion Spectral Response Acceleration – Class B (1 sec), $S_1$ | 0.235g | Figure 1613.3.1(2) / Figure 22-2 |
| Site Coefficient, $F_A$ | 1.371 | Table 1613.3.3(1) / Table 11.4-1 |
| Site Coefficient, $F_V$ | 1.930 | Table 1613.3.3(2) / Table 11.4-2 |
| Site Class Modified $MCE_R$ Spectral Response Acceleration (short), $S_{MS}$ | 0.735g | Eq. 16-37 / Eq. 11.4-1 |
| Site Class Modified $MCE_R$ Spectral Response Acceleration (1 sec), $S_{M1}$ | 0.454g | Eq. 16-38 / Eq. 11.4-2 |
| 5% Damped Design Spectral Response Acceleration (short), $S_{DS}$ | 0.490g | Eq. 16-39 / Eq. 11.4-3 |
| 5% Damped Design Spectral Response Acceleration (1 sec), $S_{D1}$ | 0.303g | Eq. 16-40 / Eq. 11.4-4 |

6.2.2 Table 6.2.2 presents additional seismic design parameters for projects with Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean ($MCE_G$).

**TABLE 6.2.2**
**2016 CBC SITE ACCELERATION DESIGN PARAMETERS**

| Parameter | Value | ASCE 7-10 Reference |
|---|---|---|
| Mapped $MCE_G$ Peak Ground Acceleration, PGA | 0.191g | Figure 22-7 |
| Site Coefficient, $F_{PGA}$ | 1.418 | Table 11.8-1 |
| Site Class Modified $MCE_G$ Peak Ground Acceleration, $PGA_M$ | 0.271g | Section 11.8.3 (Eq. 11.8-1) |

6.2.3 Conformance to the criteria presented in Tables 6.2.1 and 6.2.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid structural damage, since such design may be economically prohibitive.

## 6.3 Soil and Excavation Characteristics

6.3.1 In our opinion, grading and excavations at the site may be accomplished with standard to moderate effort using heavy-duty grading/excavation equipment. Increased excavation effort should be expected in the hardpan materials. We do not anticipate excavations to generate oversized material (greater than 6 inches in dimension). Hardpan cementations should break down to 6-inch minus under the action of construction equipment.

6.3.2 Temporary excavation slopes must meet Cal-OSHA requirements as appropriate. Excavation sloping, benching, the use of trench shields, and the placement of trench spoils should conform to the latest applicable Cal-OSHA standards. The contractor should have a Cal-OSHA-approved "competent person" onsite during excavation to evaluate trench conditions and to make appropriate recommendations where necessary. It is the contractor's responsibility to provide sufficient and safe excavation support as well as protecting nearby utilities, structures, and other improvements, which may be damaged by earth movements.

6.3.3 The excavation support recommendations provided by Cal-OSHA are generally geared towards protecting human life and not necessarily towards preventing damage to nearby structures or surface improvements. The contractor should be responsible for using the proper active shoring systems or sloping to prevent damage to any structure or improvements near underground excavations.

6.3.4 If grading operations during or after the wet season (typically winter and spring), or in periods of precipitation, in-place soils may be wet and unstable due to the presence of hardpan soils at shallow depths (approximately 3 to 5 feet).

6.3.5 Earthwork operations in these conditions will likely be difficult with low productivity. Often, a period of at least one month of warm and dry weather is necessary to allow the site to dry sufficiently so that heavy grading equipment can operate effectively. Conversely, during dry summer and fall months, dry clay soils may require additional grading effort (discing, mixing, or other means) to attain proper moisture conditioning.

6.3.6 Permanent cut and fill slopes, if any, should be constructed no steeper than 2H:1V (horizontal to vertical).

## 6.4 Materials for Fill

6.4.1 Excavated soil generated from cut operations at the site are suitable for use as engineered fill in structural areas provided they are screened to exclude significant organics/roots and oversize materials (rock greater than 6 inches in maximum dimension).

6.4.2 Import fill soil should be primarily granular with a "very low" expansion potential (Expansion Index less than 20), a Plasticity Index less than 15, be free of organic material and construction debris, and not contain rock larger than 6 inches in greatest dimension.

6.4.3 Environmental characteristics and corrosion potential of import soil materials should also be considered. Proposed import materials should be sampled, tested, and approved by Geocon prior to its transportation to the site.

## 6.5 Grading

6.5.1 Earthwork operations should be observed and fills tested for recommended compaction and moisture content by a representative of our firm.

6.5.2 References to relative compaction and optimum moisture content in this report are based on the latest American Society for Testing and Materials (ASTM) D1557 Test Procedure. Structural building pad areas should be considered as areas extending a minimum of 5 feet horizontally beyond the outside dimensions of the building plus the surrounding flatwork.

6.5.3 Prior to commencing grading, a pre-construction conference with representatives of the client, grading contractor, and Geocon should be held at the site. Site preparation, soil handling and/or the grading plans should be discussed at the pre-construction conference.

6.5.4 Site preparation should begin with removal of existing vegetation and debris. Excavations or depressions resulting from site clearing operations, or other existing excavations or depressions, should be restored with engineered fill in accordance with the recommendations of this report.

6.5.5 The bottom of cut areas, areas left at grade, and areas to receive fill should be scarified at least 12 inches, uniformly moisture-conditioned at or above optimum moisture content and compacted to at least 90% relative compaction. Scarification and re-compaction operations should be performed in the presence of our representative to evaluate performance of the subgrade under compaction equipment loading and to identify any areas that may require additional removals.

6.5.6 Engineered fill should be compacted in horizontal lifts not exceeding 8 inches (loose thickness) and brought to final design elevations. Each lift should be moisture-conditioned at or above optimum moisture content, and compacted to at least 90% relative compaction.

6.5.7 The top 12 inches of building pads and final flatwork subgrade, whether completed at-grade, by excavation, or by filling, should be uniformly moisture-conditioned at or above optimum moisture content and compacted to at least 90% relative compaction.

6.5.8 The top 6 inches of final vehicular pavement subgrade, whether completed at-grade, by excavation, or by filling, should be uniformly moisture-conditioned at or above optimum moisture content and compacted to at least 95% relative compaction. Final pavement subgrade should be finished to a smooth, unyielding surface. We further recommend proof-rolling the subgrade with a loaded water truck (or similar equipment with high contact pressure) to verify the stability of the subgrade prior to placing AB. The subgrade minimum moisture content should be verified by testing within 24 hours prior to the placement of AB.

6.5.9 Pipe bedding, shading, and trench backfill should conform to the requirements of the appropriate utility authority. Material excavated from trenches should be adequate for use as general backfill above shading provided it does not contain deleterious matter, vegetation, or cementations larger than 6 inches in maximum dimension. Trench backfill should be placed in loose lifts not exceeding 8 inches, moisture-conditioned at or above optimum and compacted to at least 90% relative compaction. Compaction should be performed by mechanical means only; jetting of trench backfill is not recommended.

## 6.6 Foundation Design Criteria

6.6.1 Provided the building pad is graded in accordance with the recommendations of this report, the proposed new structure may be supported on a conventional shallow foundation bearing on engineered fill or undisturbed native soil.

6.6.2 Foundations should consist of continuous strip footings, isolated spread footings, or combinations thereof. Continuous footings should be at least 12 inches wide and spread footings should be at least 18 inches square. All footings should be embedded at least 12 inches below lowest adjacent exterior grade.

6.6.3 Underground utilities running parallel to footings should not be constructed in the zone of influence of footings. The zone of influence may be taken to be the area beneath the footing and within a 1:1 plane extending out and down from the bottom of the footing.

6.6.4 The project structural engineer should determine footing reinforcement based on the structural requirements. However, we recommend strip footings be reinforced with at least four No. 4 reinforcing bars, two each placed near the top and bottom of the footing to allow footings to span isolated soil irregularities.

6.6.5 Shallow foundations may be designed for an allowable bearing capacity of 3,000 pounds per square foot (psf) for dead plus live loads with a one-third increase for transient loads, including wind and seismic.

6.6.6 Allowable passive pressure used to resist lateral movement of footings may be assumed to be equal to a fluid weighing 330 pounds per cubic foot (pcf). The allowable coefficient of friction to resist sliding of footings is 0.30 for concrete against soil. Combined passive resistance and friction may be utilized for footing design provided that the frictional resistance is reduced by 50%.

6.6.7 Foundations designed in accordance with the recommendations above should experience total settlement of less than one inch and differential settlement of ½ inch or less over a distance of 50 feet. The majority of settlement will be immediate and occur as the building is constructed.

6.6.8 A Geocon representative should observe foundation excavations prior to placing reinforcing steel or concrete to observe that the exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

## 6.7 Interior Slabs-on-Grade

6.7.1 Interior concrete slab-on-grade floors in conjunction with conventional foundation systems recommended in this report are suitable for the proposed building. Slab thickness and reinforcement should be determined by the structural engineer based on the anticipated loading. However, at a minimum, slabs should be at least 4 inches thick and reinforced with No. 3 reinforcing bars placed 24 inches on center, each way. Structural requirements may require additional reinforcement or thicker concrete slabs.

6.7.2 If the near-surface soils of building pads become dry prior to constructing concrete slabs-on-grade, building pads should be re-moistened by soaking or sprinkling such that the upper 12 inches of soil is at or above optimum moisture content at least 24 hours before concrete placement.

## 6.8 Concrete Moisture Protection Considerations

6.8.1 Migration of moisture through concrete slabs or moisture otherwise released from slabs is not a geotechnical issue. However, for the convenience of the owner, we are providing the following general suggestions for consideration by the owner, architect, structural engineer, and contractor. The suggested procedures may reduce the potential for moisture-related floor covering failures on concrete slabs-on-grade, but moisture problems may still occur even if the procedures are followed. If more detailed recommendations are desired, we recommend consulting a specialist in this field.

6.8.2 A minimum 10-mil-thick vapor barrier meeting ASTM E1745-97 Class C requirements may be placed directly below the slab, without a sand cushion provided the concrete water/cement ratio is 0.45 or less. To reduce the potential for punctures, a higher quality vapor barrier (15 mil, Class A or B) may be used. The vapor barrier, if used, should extend to the edges of the slab, and should be sealed at all seams and penetrations.

6.8.3 At least 4 inches of ½- or ¾-inch crushed rock, with no more than 5 percent passing the No. 200 sieve, may be placed below the vapor barrier to serve as a capillary break.

6.8.4 The concrete water/cement ratio should be as low as possible. The water/cement ratio should not exceed 0.45 for concrete placed directly on the vapor barrier. This is critically important to reduce the potential for differential curing and excessive shrinkage cracks. Midrange plasticizers could be used to facilitate concrete placement and workability.

6.8.5 Proper finishing, curing, and moisture vapor emission testing should be performed in accordance with the latest guidelines provided by the American Concrete Institute, Portland Cement Association, and ASTM.

## 6.9 Exterior Concrete Flatwork

6.9.1 Onsite exterior concrete flatwork will likely experience seasonal movement. Therefore, some cracking and/or vertical offset should be anticipated. We are providing the following recommendations to reduce distress to concrete flatwork. Recommendations include moisture conditioning subgrade soils, providing deepened cut-off curbs (turned-down edges) adjacent to landscaped areas, using aggregate underlayment, and providing adequate construction and control joints. It should be noted that even with implementation of these measures, slab movement or cracking could still occur.

- Concrete flatwork and sidewalks should be at least 4 inches thick and underlain by at least 4 inches of Class 2 AB compacted to at least 95% relative compaction. In addition, doweling could be provided at joints to reduce the potential for vertical offset.
- The upper 12 inches of subgrade soil for exterior flatwork and sidewalks should be uniformly moisture-conditioned at or above optimum content and compacted to at least 90% relative compaction prior to placing AB.
- We recommend using construction and control joints in accordance with ACI and/or PCA guidelines. Construction joints that abut building foundations should include a felt strip, or approved equivalent, that extends the full depth of the exterior slab. Exterior slabs should be structurally independent of building foundations except at doorways, where vertical movement could impact doorway operation.
- To reduce the potential for concrete cracking, exterior concrete flatwork could be reinforced with No. 3 reinforcing bars spaced 24 inches center to center, each way.
- To reduce the potential for water from landscaped areas migrating under flatwork into the aggregate underlayment, consideration should be given to using full-depth curbs in areas where flatwork abuts irrigated landscaping. The full-depth curbs should be at least 4 inches wide and extend at least 4 inches or more into the soil subgrade beneath the AB.

## 6.10 Pavement – Hot Mix Asphalt

6.10.1 We collected several near-surface soil bulk samples (upper 5 feet) and tested for Resistance-Value (R-Value) in accordance with California Test Method (CTM) 301. The resulting R-Value was 61. To account for subgrade soil variability, we consider an R-Value of 50 to be applicable for design.

6.10.2 The project civil engineer should determine the appropriate Traffic Index (TI) for pavement design. Table 6.10 provides alternative pavement sections based on the design methods of Caltrans' *Highway Design Manual* for various TIs. We can provide additional section designs upon request.

**TABLE 6.10**
**FLEXIBLE PAVEMENT SECTIONS**

| Traffic Index | 5.0 | 5.5 | 6.0 | 7.0 |
|---|---|---|---|---|
| HMA (in.) | 3.0 | 3.5 | 3.5 | 4.0 |
| AB (in.) | 4.0 | 4.0 | 4.0 | 4.5 |
| Total Section Thickness (in.) | 7.0 | 7.5 | 7.5 | 8.5 |

6.10.3 The recommended alternative pavement sections are based on the following assumptions:

1. Subgrade soil has an R-Value of 50.
2. Class 2 AB has a minimum R-Value of 78 and meets the requirements of Section 26 of Caltrans 'latest *Standard Specifications*.
3. Class 2 AB is compacted to 95% or higher relative compaction at or above optimum moisture content. Prior to placing AC, the AB should be proof-rolled with a loaded water truck to verify stability.
4. AC should conform to Section 39 of Caltrans' latest *Standard Specifications*.

6.10.4 Asphalt pavement section recommendations for driveways and parking areas are based on the design procedures of Caltrans' *Highway Design Manual* (Design Manual), Chapter 600, updated November 20, 2017. It should be noted that most rational pavement design procedures are based on projected street or highway traffic conditions and, hence, may not be representative of vehicular loading that occurs in parking lots and driveways. Pavement proximity to landscape irrigation, reduced traffic speed and short turning radii increase the potential for pavement distress to occur in parking lots even though the volume of traffic is significantly less than that of an adjacent street. The *Design Manual* indicates that the resulting pavement sections for parking lots are "minimized to keep initial costs down but are reasonable because additional AC surfacing can be added later, if needed, and generally without incurring traffic hazards or traffic handling problems." It is generally not economically feasible to design and construct the entire parking lot and driveways for the unique loading conditions previously described. Periodic maintenance of the pavement in these areas, therefore, should be anticipated.

## 6.11 Rigid Concrete Pavement

6.11.1 Table 6.11 provides alternative rigid concrete pavement sections based on the design procedures outlined in ACI 330 (Chapter 2 – Pavement Design – *Guide for Design and*

*Construction of Concrete Parking Lots*). The project civil engineer should determine the appropriate traffic category for pavement design throughout the project. Portland Cement Concrete (PCC) pavement should be underlain by at least 4 inches of Class 2 AB meeting the requirements of Section 26 of Caltrans' *Standard Specifications* and compacted to at least 95% relative compaction. Subgrade soils should be prepared and compacted in accordance with the recommendations of this report.

**TABLE 6.11**
**RIGID CONCRETE PAVEMENT SECTIONS**

| Traffic Category | A[1] | A-1[2] | B[3] | C[4] |
|---|---|---|---|---|
| PCC (inches) | 4.0 | 4.5 | 5.0 | 6.0 |
| AB (inches) | 4.0 | | | |
| Total Section Thickness (inches) | 8.0 | 8.5 | 9.0 | 10.0 |

Notes: 1. Car parking areas and access lanes (autos, pickups, and panel trucks only).
2. Truck access lanes.
3. Parking area and interior lanes (truck type: single units – bobtailed trucks).
4. Entrance and exterior lanes, and truck parking areas (truck type: single units – bobtailed trucks).

6.11.2 PCC should have a minimum 28-day compressive strength of 3,500 pounds per square inch (psi). Adequate construction and crack control joints should be used to control cracking inherent in concrete construction. It would be advantageous to provide minimal reinforcement, such as No. 3 steel bars placed 18 inches on center in both horizontal directions to help control cracking.

6.11.3 In general, we recommend that concrete pavements be designed, constructed, and maintained in accordance with industry standards such as those provided by the ACI Committee and American Concrete Pavement Association.

## 6.12 Drainage

6.12.1 Adequate drainage is imperative to reduce the potential for erosion and subsurface seepage. Care should be taken to properly grade the finished surface around the building pad after the structure and other improvements are in place, so that drainage water is directed away from the building and toward appropriate drainage facilities. Final grade should slope a minimum of 2% away from the structure.

6.12.2 Experience has shown that even with these provisions, subsurface seepage may develop in areas where no such water conditions existed prior to site development. This is particularly true where a substantial increase in surface water infiltration has resulted from an increase in landscape irrigation.

# 7.0 FURTHER GEOTECHNICAL SERVICES

## 7.1 Plan and Specification Review

We should review the improvement plans and specifications prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required.

## 7.2 Testing and Observation Services

The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. If we are not retained for these services, we cannot assume any responsibility for other's interpretation of our recommendations or the future performance of the project.

## 8.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

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

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

The recommendations contained in this report are preliminary until verified during construction by representatives of our firm. Changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. Additionally, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated partially or wholly by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices used in this area at this time. No warranty is provided, express or implied.

## 9.0 REFERENCES


1. ACI Committee 330, *Guide for Design and Construction of Concrete Parking Lots*, October 1, 2001.
2. American Society of Civil Engineers, *ASCE 7-10 Minimum Design Loads for Buildings and Other Structures*, Sections 11.4 and 21.4, 2006.
3. American Concrete Institute, ACI 318-05, *Building Code Requirements for Structural Concrete and Commentary*, 2005.
4. California Building Standards Commission, *2016 California Building Code*, based on *2015 International Building Code*, International Code Council.
5. California Department of Water Resources (DWR), 2017, *Groundwater Information Center Interactive Map Application* (GICIMA), accessed November 12, 2018
6. California Geologic Survey, *Geologic Atlas of California Map No. 021, 1:250,000 Scale*, Charles Jennings, 1959.
7. Caltrans Fault Database, 2013, Google Earth Application (KML File): http://dap3.dot.ca.gov/ARS_Online/technical.php, accessed November 12, 2018.
8. Division of Mines and Geology, *Geologic Map of California – Fresno Sheet*, 1965, scale 1:250,000.
9. Hart, Earl W., Bryant, William A. "Alquist-Priolo Earthquake Fault Zone Program." California Division of Mines and Geology, 1999.
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12. Portland Cement Association, *Concrete Floors on Ground*, 2001.
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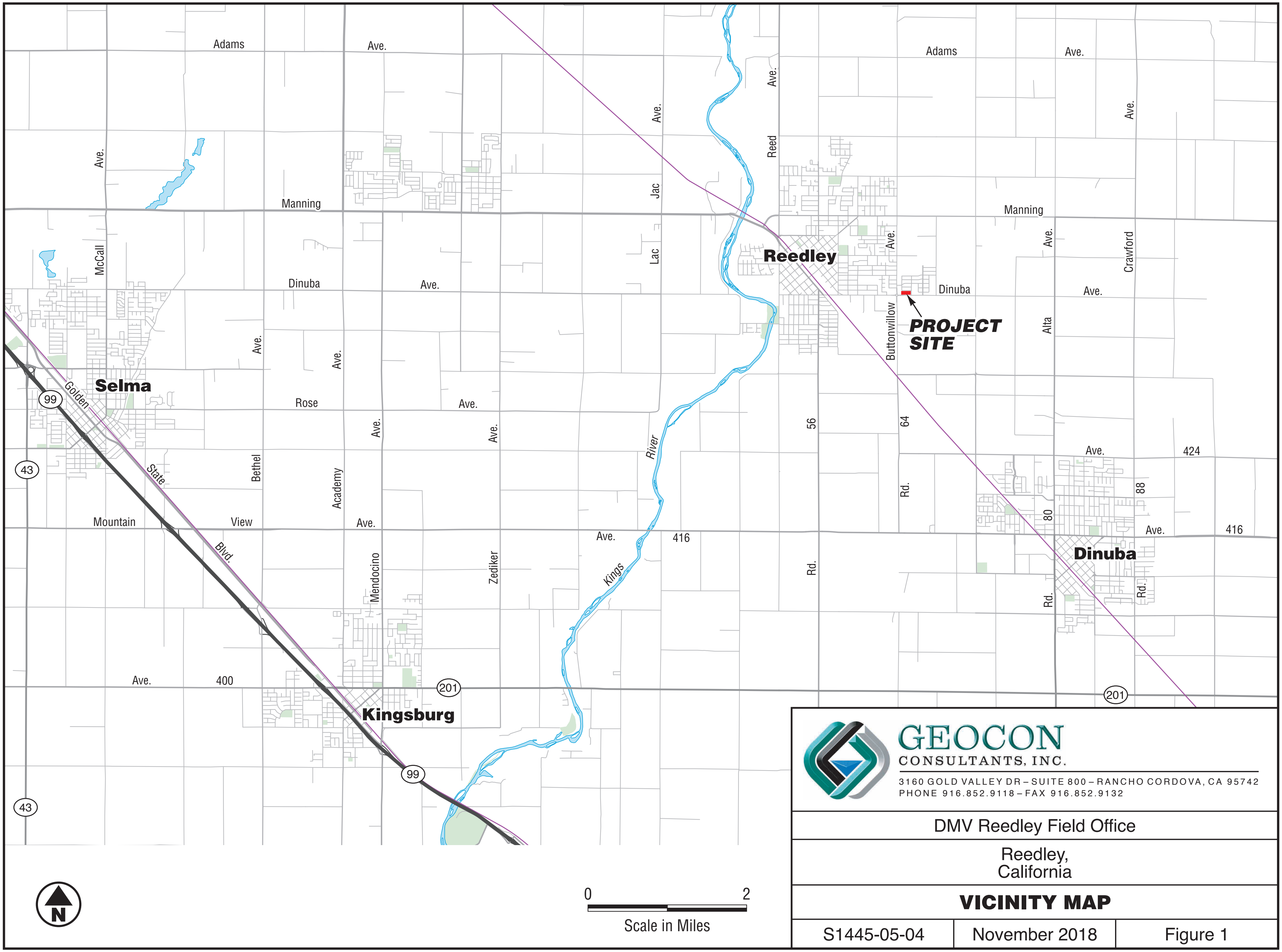
14. United States Geological Survey, US Seismic Design Maps, http://geohazards.usgs.gov/designmaps/us/ application.php.
15. Unpublished reports, aerial photographs, and maps on file with Geocon.

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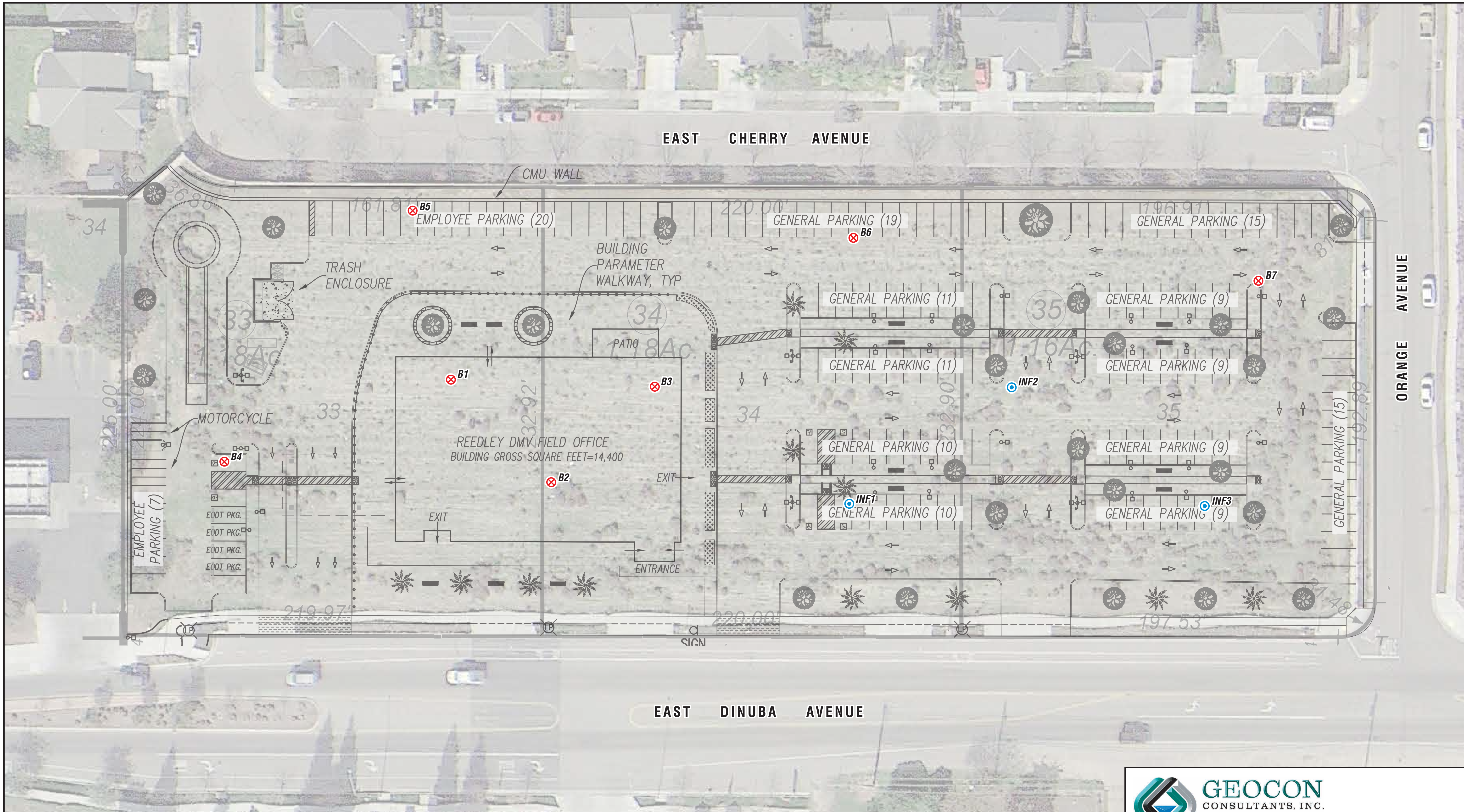
DMV Reedley Field Office

Reedley,
California

**VICINITY MAP**

| S1445-05-04 | November 2018 | Figure 1 |
|---|---|---|




LEGEND:

B7 ⊗ Approximate Boring Location

INF3 ⊙ Approximate Infiltration Test Location

N

0 50

Scale in Feet

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California

**SITE PLAN**

| S1445-05-04 | November 2018 | Figure 2 |
|---|---|---|

# APPENDIX A

# APPENDIX A

## FIELD EXPLORATION

Our geotechnical field investigation program was performed on September 27 and 28, 2018. Our investigation consisted of drilling seven exploratory borings (B1 through B7) and performing three field infiltration tests (standpipe method) (Inf1 through Inf3). The approximate locations are shown on the Site Plan, Figure 2.

Borings were performed using a truck-mounted drill rig equipped with 8-inch outside diameter (OD) hollow-stem augers and 6-inch OD solid flight augers. The drill rig sampled the soil using an automatic140-pound hammer with a 30-inch drop. We obtained samples using a 3-inch OD split-spoon (California Modified) sampler and 2-inch OD Standard Penetration Test (SPT) sampler. We recorded the number of blows required to drive the sampler the last 12 inches (or portion thereof) of the 18-inch sampling interval on the boring logs. Upon completion, the borings were backfilled with soil cuttings generated from the borings.

Subsurface conditions encountered in the exploratory borings were visually examined, classified and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D2488-90). This system uses the Unified Soil Classification System (USCS) for soil designations. The logs depict soil and geologic conditions encountered and depths at which samples were obtained. Where applicable, the field logs were revised based on subsequent laboratory testing. Logs of the exploratory borings as well as Field Infiltration Test Data sheets are presented herein.

## UNIFIED SOIL CLASSIFICATION

| MAJOR DIVISIONS | | | SYMBOL | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO.4 SIEVE SIZE | CLEAN GRAVELS WITH LITTLE OR NO FINES | GW | WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES |
| | | | GP | POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES |
| | | GRAVELS WITH OVER 12% FINES | GM | SILTY GRAVELS, SILTY GRAVELS WITH SAND |
| | | | GC | CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO.4 SIEVE SIZE | CLEAN SANDS WITH LITTLE OR NO FINES | SW | WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES |
| | | | SP | POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES |
| | | SANDS WITH OVER 12% FINES | SM | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS |
| | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS |
| | | | OL | ORGANIC SILTS OR CLAYS OF LOW PLASTICITY |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS |
| | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS |
| | | | OH | ORGANIC CLAYS OR CLAYS OF MEDIUM TO HIGH PLASTICITY |
| | HIGHLY ORGANIC SOILS | | PT | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## BORING/TRENCH LOG LEGEND

- No Recovery
- Shelby Tube Sample
- Bulk Sample
- SPT Sample
- Modified California Sample
- Groundwater Level (At Completion)
- Groundwater Level (Seepage)

**PENETRATION RESISTANCE**

| SAND AND GRAVEL | | | SILT AND CLAY | | | |
|---|---|---|---|---|---|---|
| RELATIVE DENSITY | BLOWS PER FOOT (SPT)* | BLOWS PER FOOT (MOD-CAL)* | CONSISTENCY | BLOWS PER FOOT (SPT)* | BLOWS PER FOOT (MOD-CAL)* | COMPRESSIVE STRENGTH (tsf) |
| VERY LOOSE | 0 - 4 | 0 - 6 | VERY SOFT | 0 - 2 | 0 - 3 | 0 - 0.25 |
| LOOSE | 5 - 10 | 7 - 16 | SOFT | 3 - 4 | 4 - 6 | 0.25 - 0.50 |
| MEDIUM DENSE | 11 - 30 | 17 - 48 | MEDIUM STIFF | 5 - 8 | 7 - 13 | 0.50 - 1.0 |
| DENSE | 31 - 50 | 49 - 79 | STIFF | 9 - 15 | 14 - 24 | 1.0 - 2.0 |
| VERY DENSE | OVER 50 | OVER 79 | VERY STIFF | 16 - 30 | 25 - 48 | 2.0 - 4.0 |
| | | | HARD | OVER 30 | OVER 48 | OVER 4.0 |

*NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE LAST 12 INCHES OF AN 18-INCH DRIVE

## MOISTURE DESCRIPTIONS

| FIELD TEST | APPROX. DEGREE OF SATURATION, S (%) | DESCRIPTION |
|---|---|---|
| NO INDICATION OF MOISTURE; DRY TO THE TOUCH | S<25 | DRY |
| SLIGHT INDICATION OF MOISTURE | 25≤S<50 | DAMP |
| INDICATION OF MOISTURE; NO VISIBLE WATER | 50≤S<75 | MOIST |
| MINOR VISIBLE FREE WATER | 75≤S<100 | WET |
| VISIBLE FREE WATER | 100 | SATURATED |

## QUANTITY DESCRIPTIONS

| APPROX. ESTIMATED PERCENT | DESCRIPTION |
|---|---|
| <5% | TRACE |
| 5 - 10% | FEW |
| 11 - 25% | LITTLE |
| 26 - 50% | SOME |
| >50% | MOSTLY |

## GRAVEL/COBBLE/BOULDER DESCRIPTIONS

| CRITERIA | DESCRIPTION |
|---|---|
| PASS THROUGH A 3-INCH SIEVE AND BE RETAINED ON A NO. 4 SIEVE (#4 TO 3") | GRAVEL |
| PASS A 12-INCH SQUARE OPENING AND BE RETAINED ON A 3-INCH SIEVE (3"-12") | COBBLE |
| WILL NOT PASS A 12-INCH SQUARE OPENING (>12") | BOULDER |

## LABORATORY TEST KEY

- CP – COMPACTION CURVE (ASTM D1557)
- CR – CORROSION ANALYSIS (CTM 422, 643, 417)
- DS – DIRECT SHEAR (ASTM D3080)
- EI – EXPANSION INDEX (ASTM D4829)
- GSA – GRAIN SIZE ANALYSIS (ASTM D422)
- MC – MOISTURE CONTENT (ASTM D2216)
- PI – PLASTICITY INDEX (ASTM D4318)
- R – R-VALUE (CTM 301)
- SE – SAND EQUIVALENT (CTM 217)
- TXCU – CONSOLIDATED UNDRAINED TRIAXIAL (ASTM D4767)
- TXUU – UNCONSOLIDATED UNDRAINED TRIAXIAL (ASTM D2850)
- UC – UNCONFINED COMPRESSIVE STRENGTH (ASTM D2166)

## BEDDING SPACING DESCRIPTIONS

| THICKNESS/SPACING | DESCRIPTOR |
|---|---|
| GREATER THAN 10 FEET | MASSIVE |
| 3 TO 10 FEET | VERY THICKLY BEDDED |
| 1 TO 3 FEET | THICKLY BEDDED |
| 3 5/8-INCH TO 1 FOOT | MODERATELY BEDDED |
| 1 1/4-INCH TO 3 5/8-INCH | THINLY BEDDED |
| 3/8-INCH TO 1 1/4-INCH | VERY THINLY BEDDED |
| LESS THAN 3/8-INCH | LAMINATED |

## STRUCTURE DESCRIPTIONS

| CRITERIA | DESCRIPTION |
|---|---|
| ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS AT LEAST 1/4-INCH THICK | STRATIFIED |
| ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS LESS THAN 1/4-INCH THICK | LAMINATED |
| BREAKS ALONG DEFINITE PLANES OF FRACTURE WITH LITTLE RESISTANCE TO FRACTURING | FISSURED |
| FRACTURE PLANES APPEAR POLISHED OR GLOSSY, SOMETIMES STRIATED | SLICKENSIDED |
| COHESIVE SOIL THAT CAN BE BROKEN DOWN INTO SMALLER ANGULAR LUMPS WHICH RESIST FURTHER BREAKDOWN | BLOCKY |
| INCLUSION OF SMALL POCKETS OF DIFFERENT SOIL, SUCH AS SMALL LENSES OF SAND SCATTERED THROUGH A MASS OF CLAY | LENSED |
| SAME COLOR AND MATERIAL THROUGHOUT | HOMOGENOUS |

## CEMENTATION/INDURATION DESCRIPTIONS

| FIELD TEST | DESCRIPTION |
|---|---|
| CRUMBLES OR BREAKS WITH HANDLING OR LITTLE FINGER PRESSURE | WEAKLY CEMENTED/INDURATED |
| CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE | MODERATELY CEMENTED/INDURATED |
| WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE | STRONGLY CEMENTED/INDURATED |

## IGNEOUS/METAMORPHIC ROCK STRENGTH DESCRIPTIONS

| FIELD TEST | DESCRIPTION |
|---|---|
| MATERIAL CRUMBLES WITH BARE HAND | WEAK |
| MATERIAL CRUMBLES UNDER BLOWS FROM GEOLOGY HAMMER | MODERATELY WEAK |
| 1/8-INCH INDENTATIONS WITH SHARP END FROM GEOLOGY HAMMER | MODERATELY STRONG |
| HAND-HELD SPECIMEN CAN BE BROKEN WITH **ONE** BLOW FROM GEOLOGY HAMMER | STRONG |
| HAND-HELD SPECIMEN CAN BE BROKEN WITH **COUPLE** BLOWS FROM GEOLOGY HAMMER | VERY STRONG |
| HAND-HELD SPECIMEN CAN BE BROKEN WITH **MANY** BLOWS FROM GEOLOGY HAMMER | EXTREMELY STRONG |

## IGNEOUS/METAMORPHIC ROCK WEATHERING DESCRIPTIONS

| DEGREE OF DECOMPOSITION | FIELD RECOGNITION | ENGINEERING PROPERTIES |
|---|---|---|
| SOIL | DISCOLORED, CHANGED TO SOIL, FABRIC DESTROYED | EASY TO DIG |
| COMPLETELY WEATHERED | DISCOLORED, CHANGED TO SOIL, FABRIC MAINLY PRESERVED | EXCAVATED BY HAND OR RIPPING (Saprolite) |
| HIGHLY WEATHERED | DISCOLORED, HIGHLY FRACTURED, FABRIC ALTERED AROUND FRACTURES | EXCAVATED BY HAND OR RIPPING, WITH SLIGHT DIFFICULTY |
| MODERATELY WEATHERED | DISCOLORED, FRACTURES, INTACT ROCK-NOTICEABLY WEAKER THAN FRESH ROCK | EXCAVATED WITH DIFFICULTY WITHOUT EXPLOSIVES |
| SLIGHTLY WEATHERED | MAY BE DISCOLORED, SOME FRACTURES, INTACT ROCK-NOT NOTICEABLY WEAKER THAN FRESH ROCK | REQUIRES EXPLOSIVES FOR EXCAVATION, WITH PERMEABLE JOINTS AND FRACTURES |
| FRESH | NO DISCOLORATION, OR LOSS OF STRENGTH | REQUIRES EXPLOSIVES |

## IGNEOUS/METAMORPHIC ROCK JOINT/FRACTURE DESCRIPTIONS

| FIELD TEST | DESCRIPTION |
|---|---|
| NO OBSERVED FRACTURES | UNFRACTURED/UNJOINTED |
| MAJORITY OF JOINTS/FRACTURES SPACED AT 1 TO 3 FOOT INTERVALS | SLIGHTLY FRACTURED/JOINTED |
| MAJORITY OF JOINTS/FRACTURES SPACED AT 4-INCH TO 1 FOOT INTERVALS | MODERATELY FRACTURED/JOINTED |
| MAJORITY OF JOINTS/FRACTURES SPACED AT 1-INCH TO 4-INCH INTERVALS WITH SCATTERED FRAGMENTED INTERVALS | INTENSELY FRACTURED/JOINTED |
| MAJORITY OF JOINTS/FRACTURES SPACED AT LESS THAN 1-INCH INTERVALS; MOSTLY RECOVERED AS CHIPS AND FRAGMENTS | VERY INTENSELY FRACTURED/JOINTED |

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**KEY TO LOGS**

Figure A1

PROJECT NO. **S1445-05-04** PROJECT NAME **DMV Reedley Field Office**

## BORING B1

ELEV. (MSL.) 345 DATE COMPLETED 9/27/2018

ENG./GEO. Victor Guardado DRILLER V&W Drilling

EQUIPMENT Truck-mounted CME75 with 8" HSA HAMMER TYPE 140 lb | Automatic

| DEPTH IN FEET | SAMPLE INTERVAL & RECOVERY | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) | ADDITIONAL TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | B1-Bulk | | | SM | **ALLUVIUM** Medium dense, dry to damp, yellow brown, Silty SAND, fine sand | | | | |
| 3 | B1-3.0<br>B1-3.5 | | | SC-SM | Medium dense, dry to damp, strong brown, Silty Clayey SAND, fine sand, moderately cemented | 41 | 118.9 | 7.5 | |
| 5 | B1-5.0 | | | | - very dense, hard drilling, moderately to strongly cemented | 50/4" | 98.9 | 10.7 | |
| 8 | | | | | - rig chatter | | | | |
| 10 | B1-10.0 | | | | - dense, moist, weakly cemented | 33 | | | |
| 15 | B1-15.5<br>B1-16.0 | | | | - dark yellow brown, weakly to moderately cemented, micaceous | 57 | | | |
| 17 | | | | | - sandy silt lense | | | | |
| 19 | | | | SM | Medium dense, dry to damp, dark yellow brown, Silty SAND, fine sand, micaceous | | | | |
| 20 | B1-20.0<br>B1-20.5<br>B1-21.0 | | | | - strong brown, clayey, weakly to moderately cemented | 45 | | | |

BORING TERMINATED AT 21.5 FEET
NO GROUNDWATER ENCOUNTERED
BACKFILLED WITH SOIL CUTTINGS

Figure A2, Log of Boring, page 1 of 1



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

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

PROJECT NO. **S1445-05-04** PROJECT NAME **DMV Reedley Field Office**

## BORING B2

ELEV. (MSL.) **345** DATE COMPLETED **9/27/2018**

ENG./GEO. **Victor Guardado** DRILLER **V&W Drilling**

EQUIPMENT **Truck-mounted CME75 with 8" HSA** HAMMER TYPE **140 lb | Automatic**

| DEPTH IN FEET | SAMPLE INTERVAL & RECOVERY | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) | ADDITIONAL TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | B2-Bulk | | | SM | **ALLUVIUM**<br>Medium dense, dry to damp, yellow brown, Silty SAND, fine to medium sand | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | B2-3.0<br>B2-3.5 | | | SC-SM | Medium dense, dry to damp, strong brown, Silty Clayey SAND, fine sand, weakly to moderately cemented | 27 | 107.4 | 7.1 | |
| 4 | | | | | | | | | |
| 5 | B2-5.0<br>B2-5.5 | | | | - very dense, moderately cemented | 50/5" | | 11.0 | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | B2-8.0<br>B2-8.5 | | | | - medium dense, weakly to moderately cemented, damp to moist, with fine to medium sand, with white and tan | 33 | 115.5 | 8.7 | |
| 9 | | | | | | | | | |
| 10 | B2-10.5<br>B2-11.0 | | | | - dense, moist, fine sand, trace mica | 54 | 115.7 | 12.9<br>10.1 | |
| 11 | | | | | | | | | |
| 12 | | | | | | | | | |
| 13 | | | | | | | | | |
| 14 | | | | | | | | | |
| 15 | B2-15.5<br>B2-16.0 | | | | - medium dense, dark yellow brown, fine to medium sand | 27 | 111.5 | 8.5 | |
| 16 | | | | | | | | | |
| 17 | | | | | | | | | |
| 18 | | | | | | | | | |
| 19 | | | | | | | | | |
| 20 | B2-20.5<br>B2-21.0 | | | | - dry to damp, fine sand | 29 | | | |
| 21 | | | | | | | | | |
| 22 | | | | | | | | | |
| 23 | | | | | | | | | |
| 24 | | | | CL | Hard, moist, strong brown, Sandy Lean CLAY, fine sand, few to little silt, weakly to moderately cemented, trace to few mica, PP>4.5 tsf | | | | |
| 25 | B2-25.0<br>B2-25.5<br>B2-26.0 | | | | | 72 | | | |
| 26 | | | | | | | | | |

Figure A3, Log of Boring, page 1 of 2

IN PROGRESS S1445-05-04 DMV REEDLEY FIELD OFFICE.GPJ 11/15/18

GEOCON

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

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

## BORING B2

ELEV. (MSL.) **345** DATE COMPLETED **9/27/2018**
ENG./GEO. **Victor Guardado** DRILLER **V&W Drilling**
EQUIPMENT **Truck-mounted CME75 with 8" HSA** HAMMER TYPE **140 lb | Automatic**

| DEPTH IN FEET | SAMPLE INTERVAL & RECOVERY | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) | ADDITIONAL TESTS |
|---|---|---|---|---|---|---|---|
| 27 | | | | | | | |
| 28 | | | | | | | |
| 29 | | | | | | | |
| 30 | | ML | Hard, moist, yellow brown, SILT with sand, few to little clay | | | | |
| 31 | B2-30.5<br>B2-31.0 | | | 79 | | | |
| 32 | | | | | | | |
| 33 | | | | | | | |
| 34 | | CL | Hard, moist, strong brown, Sandy Lean CLAY, fine to medium sand, moderately cemented, trace mica, PP>4.5 tsf | | | | |
| 35 | B2-35.0 | | | | | | |
| 36 | B2-35.5<br>B2-36.0 | | | 84/10" | | | |
| 37 | | | | | | | |
| 38 | | | | | | | |
| 39 | | | | | | | |
| 40 | B2-40.0<br>B2-40.5 | | | | | | |
| 41 | | | - weakly to moderately cemented, some to mostly sand, fine to medium sand, trace to few silt | 50/6" | | | |
| 42 | | | | | | | |
| 43 | | | | | | | |
| 44 | | | | | | | |
| 45 | | | | | | | |
| 46 | B2-45.5<br>B2-46.0 | | - lense of silty clay, blue gray, weakly to moderately cemented | 53 | | | |
| 47 | | | - becomes reddish yellow brown, fine to medium sand | | | | |
| 48 | | SP | Medium dense, dry, gray brown with white, orange, and black, Poorly-graded SAND, medium sand, trace to few mica | | | | |
| 49 | | | | | | | |
| 50 | | | | | | | |
| 51 | B2-51.0 | | - sample falling out of sampler barrel upon withdrawal | 38 | | | |

BORING TERMINATED AT 51.5 FEET
NO GROUNDWATER ENCOUNTERED
BACKFILLED WITH SOIL CUTTINGS

Figure A4, Log of Boring, page 2 of 2



GEOCON

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

PROJECT NO. **S1445-05-04** PROJECT NAME **DMV Reedley Field Office**

## BORING B3

ELEV. (MSL.) **345** DATE COMPLETED **9/27/2018**

ENG./GEO. **Victor Guardado** DRILLER **V&W Drilling**

EQUIPMENT **Truck-mounted CME75 with 8" HSA** HAMMER TYPE **140 lb | Automatic**

| DEPTH IN FEET | SAMPLE INTERVAL & RECOVERY | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) | ADDITIONAL TESTS |
|---|---|---|---|---|---|---|---|
| 0 | B3-Bulk | SM | **ALLUVIUM**<br>Medium dense, dry to damp, yellow brown, Silty SAND, fine sand | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | B3-2.5<br>B3-3.0 | SC-SM | Very dense, damp, strong brown, Silty Clayey SAND, fine sand, moderately cemented<br>- sampler bouncing<br>- hard drilling | 42/10" | | | |
| 4 | | | | | | | |
| 5 | B3-5.0<br>B3-5.5 | | | | | | |
| 6 | | | - very dense, dark yellow brown, fine sand, weakly to moderately cemented | 50/6" | 136.3 | 6.7 | |
| 7 | | | | | | | |
| 8 | B3-8.5 | | - medium dense, strong brown, weakly to moderately cemented | 37 | 117.4 | 6.2 | |
| 9 | | | | | | | |
| 10 | B3-10.5<br>B3-11.0 | | - sampler bouncing | 52/9" | | | |
| 11 | | CL | Hard, dark olive gray, moist, Lean CLAY, with clayey sand pockets, weakly to moderately cemented, few to little silt, PP>4.5 tsf | | | | |
| 12 | | | | | | | |
| 13 | | SC-SM | Medium dense to dense, damp to moist, dark yellow brown, Silty Clayey SAND, fine sand, weakly to moderately cemented | | | | |
| 14 | | | | | | | |
| 15 | B3-15.5<br>B3-16.0 | | | | | | |
| 16 | | | | 46 | 116.9 | 11.2 | |
| 17 | | | | | | | |
| 18 | | | | | | | |
| 19 | | | | | | | |
| 20 | B3-20.5<br>B3-21.0 | | | | | | |
| 21 | | | | 40 | | | |

BORING TERMINATED AT 21.5 FEET
NO GROUNDWATER ENCOUNTERED
BACKFILLED WITH SOIL CUTTINGS

Figure A5, Log of Boring, page 1 of 1



GEOCON

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

PROJECT NO. **S1445-05-04** PROJECT NAME **DMV Reedley Field Office**

## BORING B4

ELEV. (MSL.) **345** DATE COMPLETED **9/27/2018**

ENG./GEO. **Victor Guardado** DRILLER **V&W Drilling**

EQUIPMENT **Truck-mounted CME75 with 8" HSA** HAMMER TYPE **140 lb | Automatic**

| DEPTH IN FEET | SAMPLE INTERVAL & RECOVERY | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) | ADDITIONAL TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | B4-Bulk | | | SM | **ALLUVIUM** Medium dense, dry to damp, yellow brown, Silty SAND, fine sand | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | B4-3.5 | | | SC-SM | Dense, damp to moist, strong brown, Silty Clayey SAND, moderately to strongly cemented | | | | |
| 4 | B4-4.0 | | | | - sampler bouncing | 37/9" | | | |
| 5 | | | | | BORING TERMINATED AT 5 FEET<br>NO GROUNDWATER ENCOUNTERED<br>BACKFILLED WITH SOIL CUTTINGS | | | | |

Figure A6, Log of Boring, page 1 of 1



GEOCON

SAMPLE SYMBOLS

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

## BORING B5

ELEV. (MSL.) **345** DATE COMPLETED **9/27/2018**

ENG./GEO. **Victor Guardado** DRILLER **V&W Drilling**

EQUIPMENT **Truck-mounted CME75 with 8" HSA** HAMMER TYPE **140 lb | Automatic**

| DEPTH IN FEET | SAMPLE INTERVAL & RECOVERY | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) | ADDITIONAL TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | B5-Bulk | | | SM | **ALLUVIUM**<br>Medium dense, dry, yellow brown, Silty SAND, fine sand | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | B5-3.5 | | | SC-SM | Dense, damp to moist, strong brown, Silty Clayey SAND, fine sand, moderately cemented | | | | |
| 4 | B5-4.0 | | | | - sampler bouncing<br>- rig chatter | 43/6.5" | | | |
| 5 | | | | | BORING TERMINATED AT 5 FEET<br>NO GROUNDWATER ENCOUNTERED<br>BACKFILLED WITH SOIL CUTTINGS | | | | |

Figure A7, Log of Boring, page 1 of 1

IN PROGRESS S1445-05-04 DMV REEDLEY FIELD OFFICE.GPJ 11/15/18

GEOCON

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

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

PROJECT NO. **S1445-05-04** PROJECT NAME **DMV Reedley Field Office**

## BORING B6

ELEV. (MSL.) **345** DATE COMPLETED **9/27/2018**

ENG./GEO. **Victor Guardado** DRILLER **V&W Drilling**

EQUIPMENT **Truck-mounted CME75 with 8" HSA** HAMMER TYPE **140 lb | Automatic**

| DEPTH IN FEET | SAMPLE INTERVAL & RECOVERY | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) | ADDITIONAL TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | B6-Bulk | | | SM | **ALLUVIUM**<br>Medium dense, dry, yellow brown, Silty SAND, fine sand | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | B6-3.0 | | | SC-SM | Medium dense to dense, damp to moist, strong brown, Silty Clayey SAND, fine sand, moderately cemented | | | | |
| 4 | | | | | | 28 | | | |
| 5 | | | | | BORING TERMINATED AT 5 FEET<br>NO GROUNDWATER ENCOUNTERED<br>BACKFILLED WITH SOIL CUTTINGS | | | | |

Figure A8, Log of Boring, page 1 of 1



GEOCON

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

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

PROJECT NO. **S1445-05-04** PROJECT NAME **DMV Reedley Field Office**

## BORING B7

ELEV. (MSL.) **345** DATE COMPLETED **9/27/2018**

ENG./GEO. **Victor Guardado** DRILLER **V&W Drilling**

EQUIPMENT **Truck-mounted CME75 with 8" HSA** HAMMER TYPE **140 lb | Automatic**

| DEPTH IN FEET | SAMPLE INTERVAL & RECOVERY | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) | ADDITIONAL TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 0 | B7-Bulk | | | SM | **ALLUVIUM**<br>Medium dense, dry, yellow brown, Silty SAND, fine sand | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | B7-3.0 | | | SC-SM | Dense, damp to moist, strong brown, Silty Clayey SAND, fine sand, moderately cemented<br>- sampler bouncing | 50/4" | | | |
| 4 | | | | | | | | | |
| 5 | | | | | BORING TERMINATED AT 5 FEET<br>NO GROUNDWATER ENCOUNTERED<br>BACKFILLED WITH SOIL CUTTINGS | | | | |

Figure A9, Log of Boring, page 1 of 1



GEOCON

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

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## FIELD INFILTRATION TEST DATA - Falling Head Method (Standpipe)

Project Name: DMV Reedley Field Office

Project No.: S1445-05-04

By: V. Guardado

Date: 09/28/2018

Test Location: INF1

Pre-Soak: 24 hours

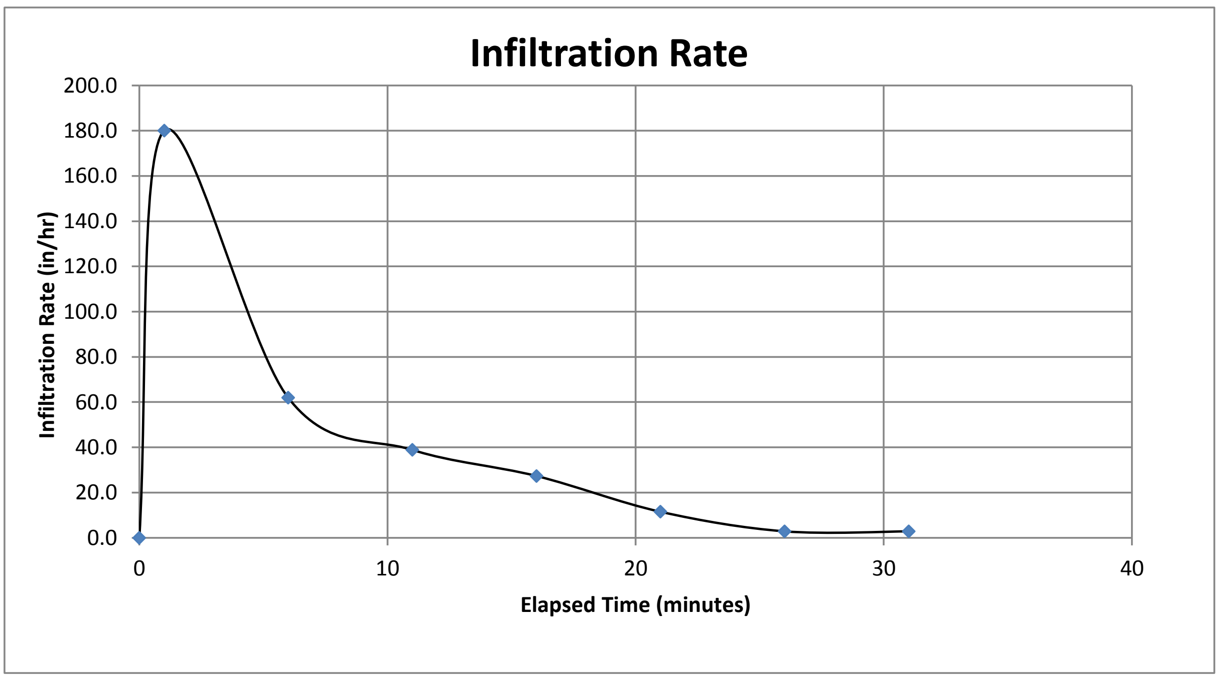
Test Duration: Approximately 30 Minutes

Depth of Test: 5'

Test Hole Dimensions: 3.25" outside diameter, 5' deep

| Time | Elapsed Time (min) | Change in time (min) | Reading (ft) | Fall (in) | Rate (in/hr) |
|---|---|---|---|---|---|
| 8:30 | 0 | 0 | 3.87 | 0 | 0 |
| 8:31 | 1 | 1 | 4.12 | 3 | 180 |
| 8:36 | 6 | 5 | 4.55 | 5.16 | 61.92 |
| 8:41 | 11 | 5 | 4.82 | 3.24 | 38.88 |
| 8:46 | 16 | 5 | 5.01 | 2.28 | 27.36 |
| 8:51 | 21 | 5 | 5.09 | 0.96 | 11.52 |
| 8:56 | 26 | 5 | 5.11 | 0.24 | 2.88 |
| 9:01 | 31 | 5 | 5.13 | 0.24 | 2.88 |

**Stabilized Infiltration Rate: 2.9 (in/hr)**



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## FIELD INFILTRATION TEST DATA - Falling Head Method (Standpipe)

Project Name: DMV Reedley Field Office

Project No.: S1445-05-04

By: V. Guardado

Date: 09/28/2018

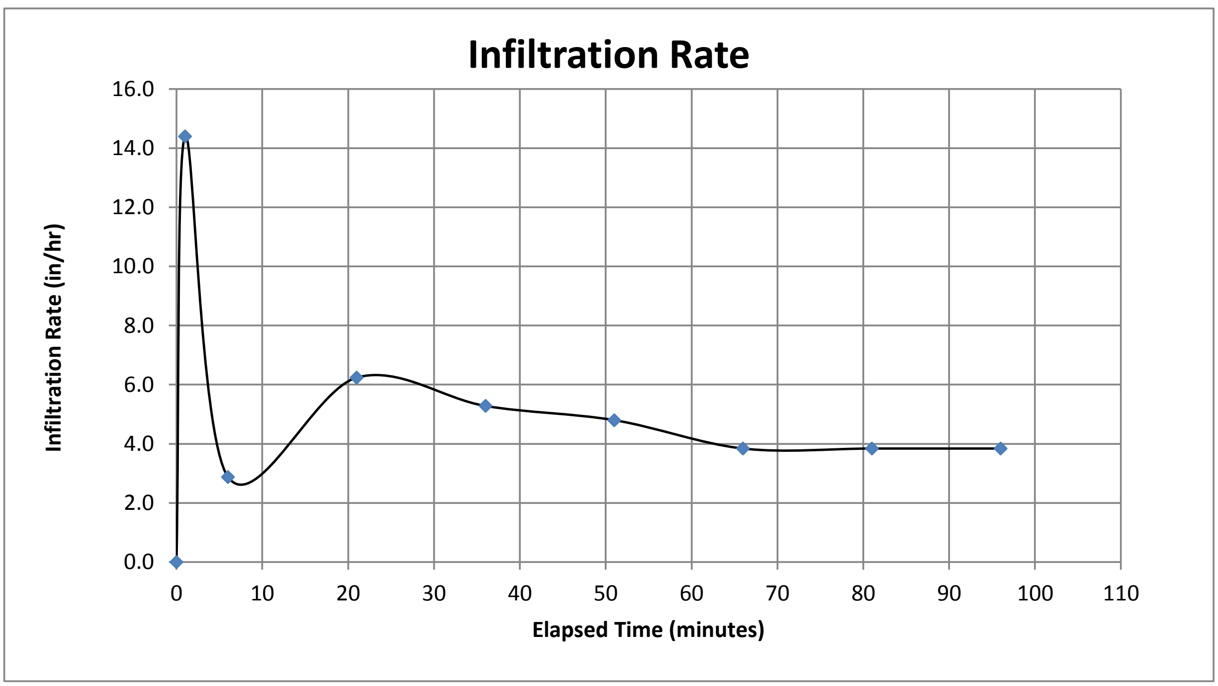
Test Location: INF2
Pre-Soak: 24 hours

Test Duration: Approximately 90 Minutes

Depth of Test: 5.5'
Test Hole Dimensions: 3.25" outside diameter, 5.5' deep

| Time | Elapsed Time (min) | Change in time (min) | Reading (ft) | Fall (in) | Rate (in/hr) |
|---|---|---|---|---|---|
| 9:20 | 0 | 0 | 3.76 | 0.00 | 0 |
| 9:21 | 1 | 1 | 3.78 | 0.24 | 14.40 |
| 9:26 | 6 | 5 | 3.8 | 0.24 | 2.88 |
| 9:41 | 21 | 15 | 3.93 | 1.56 | 6.24 |
| 9:56 | 36 | 15 | 4.04 | 1.32 | 5.28 |
| 10:11 | 51 | 15 | 4.14 | 1.20 | 4.80 |
| 10:26 | 66 | 15 | 4.22 | 0.96 | 3.84 |
| 10:41 | 81 | 15 | 4.3 | 0.96 | 3.84 |
| 10:56 | 96 | 15 | 4.38 | 0.96 | 3.84 |

**Stabilized Infiltration Rate: 3.8 (in/hr)**



GEOCON CONSULTANTS, INC.

## FIELD INFILTRATION TEST DATA - Falling Head Method (Standpipe)

Project Name: DMV Reedley Field Office

Project No.: S1445-05-04

By: V. Guardado

Date: 09/28/2018

Test Location: INF3

Pre-Soak: 24 hours

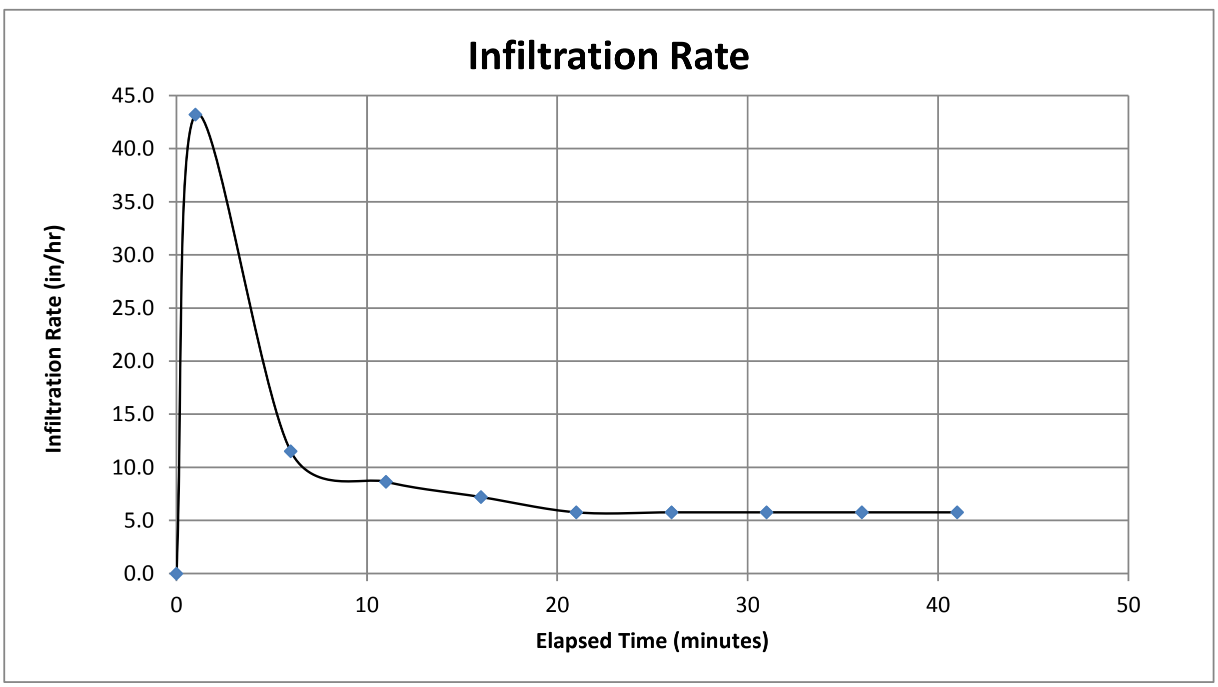
Test Duration: Approximately 40 Minutes

Depth of Test: 4'

Test Hole Dimensions: 3.25" outside diameter, 4' deep

| Time | Elapsed Time (min) | Change in time (min) | Reading (ft) | Fall (in) | Rate (in/hr) |
|---|---|---|---|---|---|
| 9:37 | 0 | 0 | 3.58 | 0.00 | 0 |
| 9:38 | 1 | 1 | 3.64 | 0.72 | 43.20 |
| 9:43 | 6 | 5 | 3.72 | 0.96 | 11.52 |
| 9:48 | 11 | 5 | 3.78 | 0.72 | 8.64 |
| 9:53 | 16 | 5 | 3.83 | 0.60 | 7.20 |
| 9:58 | 21 | 5 | 3.87 | 0.48 | 5.76 |
| 10:03 | 26 | 5 | 3.91 | 0.48 | 5.76 |
| 10:08 | 31 | 5 | 3.95 | 0.48 | 5.76 |
| 10:13 | 36 | 5 | 3.99 | 0.48 | 5.76 |
| 10:18 | 41 | 5 | 4.03 | 0.48 | 5.76 |

**Stabilized Infiltration Rate: 5.8 (in/hr)**



# APPENDIX B

## APPENDIX B

## LABORATORY TESTING PROGRAM

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their in-place dry density and moisture content, plasticity characteristics, grain-size distribution, maximum dry density and optimum moisture content, expansion index, corrosion potential, pavement support characteristics, and shear strength characteristics. The results of the laboratory tests are presented in the following tables and on the following pages.

### TABLE B1
### SOIL CORROSION PARAMETER TEST RESULTS
### (CALIFORNIA TEST METHODS 643, 417, AND 422)

| Sample No. | Sample Depth (ft.) | pH | Minimum Resistivity (ohm-cm) | Chloride (ppm) / (%) | Sulfate (ppm) / (%) |
|---|---|---|---|---|---|
| B1, B2, B3 Bulk | 0-5 | 7.4 | 3,220 | 4.4 / 0.00044 | 14.6 / 0.00146 |

*Caltrans considers a site corrosive to foundation elements if one or more of the following conditions exist for the representative soil samples at the site:

- The pH is equal to or less than 5.5.
- The resistivity is equal to or less than 1,000 ohm-cm.
- Chloride concentration is equal to or greater than 500 parts per million (ppm).
- Sulfate concentration is equal to or greater than 2,000 ppm.

According to the 2013 California Building Code Section 1904.1 which refers to the durability requirements of American Concrete Institute (ACI) 318 (Chapter 4), Type II cement may be used where soluble sulfate levels in soil are below 2,000 ppm.

### TABLE B2
### EXPANSION INDEX TEST RESULTS
### ASTM D4829

| Sample Number | Depth (feet) | Moisture Content (%) | | Expansion Index | Classification* |
|---|---|---|---|---|---|
| | | Before Test | After Test | | |
| B1, B2, B3 Bulk | 0-5 | 8.1 | 13.5 | 0 | Very Low |

**Expansion Potential Classification per ASTM D4829.*

### TABLE B3
### R-VALUE TEST RESULTS
### ASTM D2844

| Boring Number | Sample Depth (feet) | Average Dry Density (pcf) | Average Moisture Content (%) | R-Value |
|---|---|---|---|---|
| B6, B7 Bulk | 0-5 | 124.0 | 9.9 | 61 |

| Sample ID | Depth (feet) | Liquid Limit | Plastic Limit | Plasticity Index | Expansion Index | %<#200 Sieve | Water Content (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|---|---|
| B1,B2,&B3 Bulk | 0-5 | 18 | 14 | 4 | 0 | 47.1 | | |
| B1-3.5 | 3.5 | | | | | | 7.5 | 118.9 |
| B1-5 | 5 | | | | | | 10.7 | 98.9 |
| B2-3.5 | 3.5 | | | | | | 7.1 | 107.4 |
| B2-5 | 5 | | | | | 31.1 | 11.0 | |
| B2-8.5 | 8.5 | | | | | | 8.7 | 115.5 |
| B2-10.5 | 10.5 | | | | | | 12.9 | 115.7 |
| B2-11 | 11 | | | | | 30.5 | 10.1 | |
| B2-16 | 16 | | | | | | 8.5 | 111.5 |
| B3-5.5 | 5.5 | | | | | 35.5 | 6.7 | 136.3 |
| B3-8.5 | 8.5 | | | | | | 6.2 | 117.4 |
| B3-16 | 16 | | | | | | 11.2 | 116.9 |
| B6&B7 Bulk | 0-5 | 19 | 13 | 6 | | | | |
| Inf1-5 | 5 | | | | | 40.0 | | |
| Inf2-5.5 | 5.5 | | | | | 25.1 | | |
| Inf3-4 | 4 | | | | | 35.6 | | |



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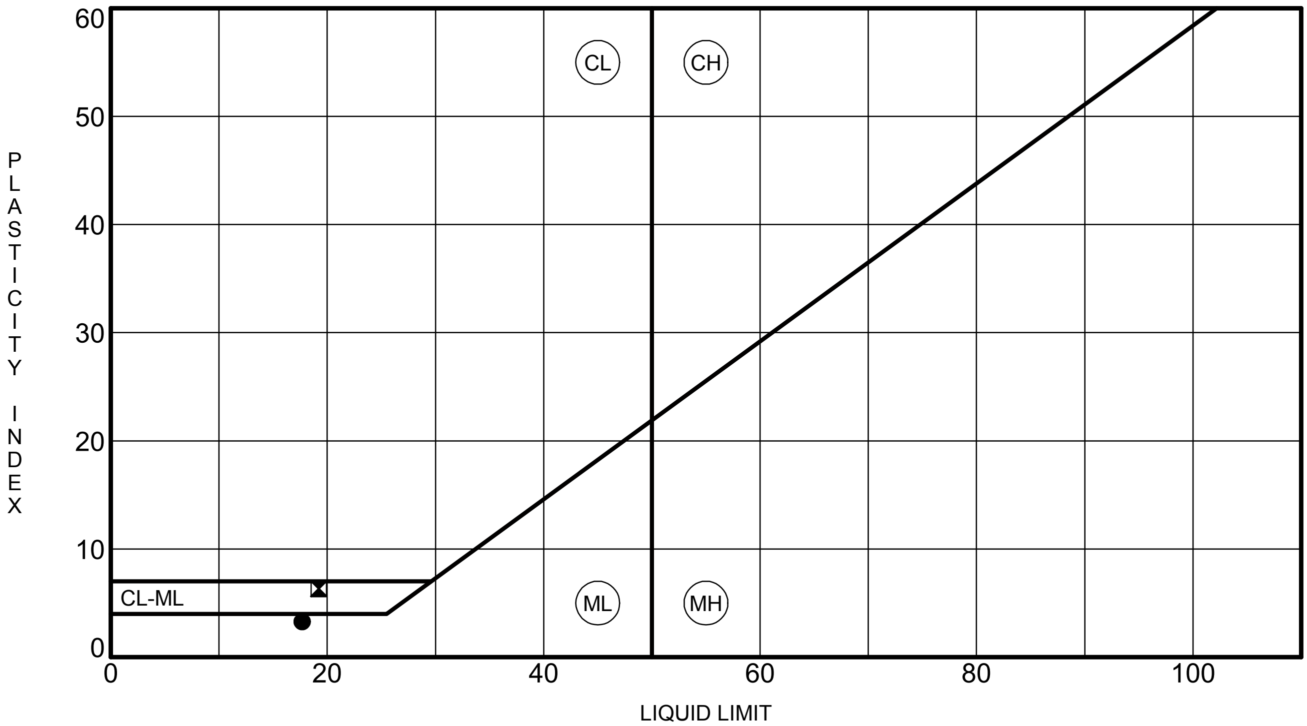
## Summary of Laboratory Results

Project: DMV Reedley Field Office
Location: Reedley, CA
Number: S1445-05-04
Figure: B1




| | Sample No. | Liquid Limit | Plastic Limit | Plasticity Index | % Pass #200 Sieve | Unified Soil Classification Description | Preparation Method |
|---|---|---|---|---|---|---|---|
| ● | **B1,B2,&B3 Bulk** | **18** | **14** | **4** | **47.1** | **SILT(ML)** | **dry** |
| ⧗ | **B6&B7 Bulk** | **19** | **13** | **6** | | **Silty CLAY (CL-ML)** | **dry** |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
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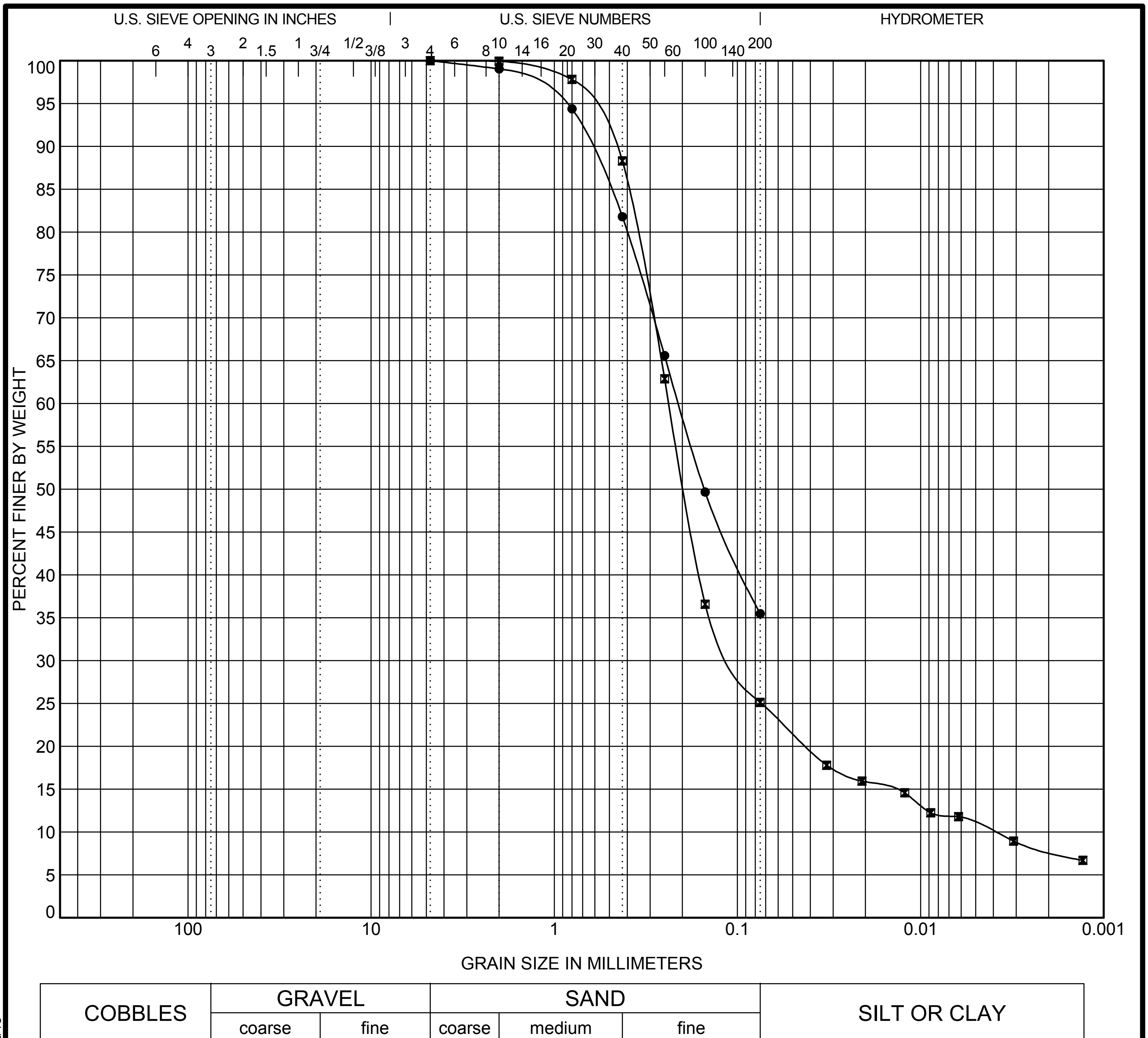
# ATTERBERG LIMITS (ASTM D4318)

Project: DMV Reedley Field Office
Location: Reedley, CA
Number: S1445-05-04
Figure: B2




GRAIN SIZE COPY 2 S1445-05-04 DMV REEDLEY FIELD OFFICE.GPJ US LAB.GDT 11/12/18

| | Sample No. | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|
| ● | **B3-5.5** | **Silty clayey SAND (SC-SM)** | | | | | |
| ⊠ | **Inf2-5.5** | **Silty clayey SAND (SC-SM)** | | | | **10.71** | **58.8** |

| | Sample No. | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|
| ● | **B3-5.5** | **4.75** | **0.209** | | | **0.0** | **64.5** | **35.5** | |
| ⊠ | **Inf2-5.5** | **4.75** | **0.236** | **0.101** | **0.004** | **0.0** | **74.9** | **14.2** | **10.9** |

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**GRAIN SIZE DISTRIBUTION (ASTM D422, D6913)**

Project: DMV Reedley Field Office

Location: Reedley, CA

Number: S1445-05-04

Figure: B3

# CURVE NO. 1

| | |
|---|---|
| Source of Material | B1,B2,B3 Bulk (0-5') |
| Description of Material | SILT(ML) |
| | |
| Test Method | D1557A |

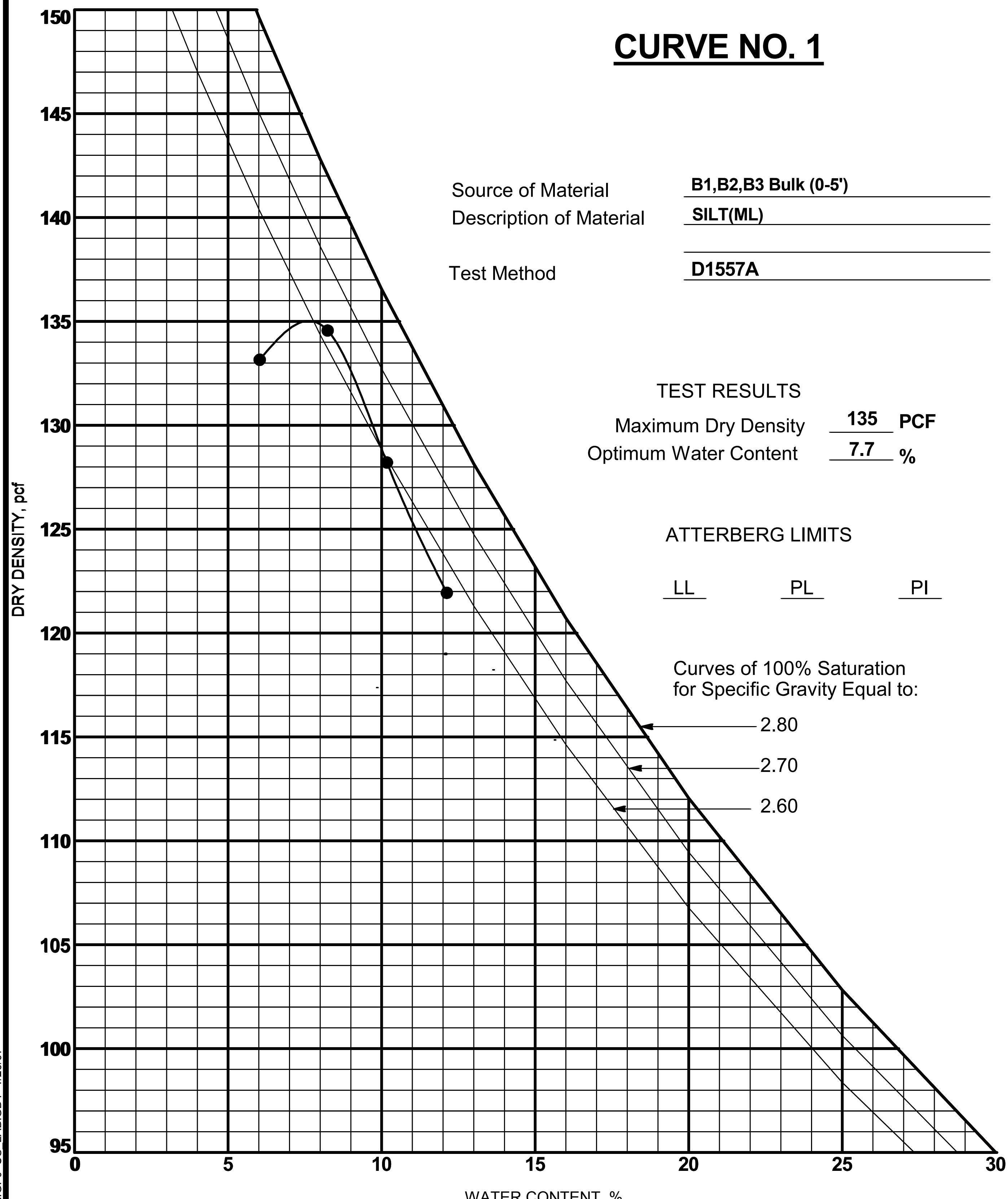
TEST RESULTS

Maximum Dry Density 135 PCF

Optimum Water Content 7.7 %

ATTERBERG LIMITS

| LL | PL | PI |
|---|---|---|
| | | |




## MOISTURE-DENSITY RELATIONSHIP

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Fax: (916) 852-9132

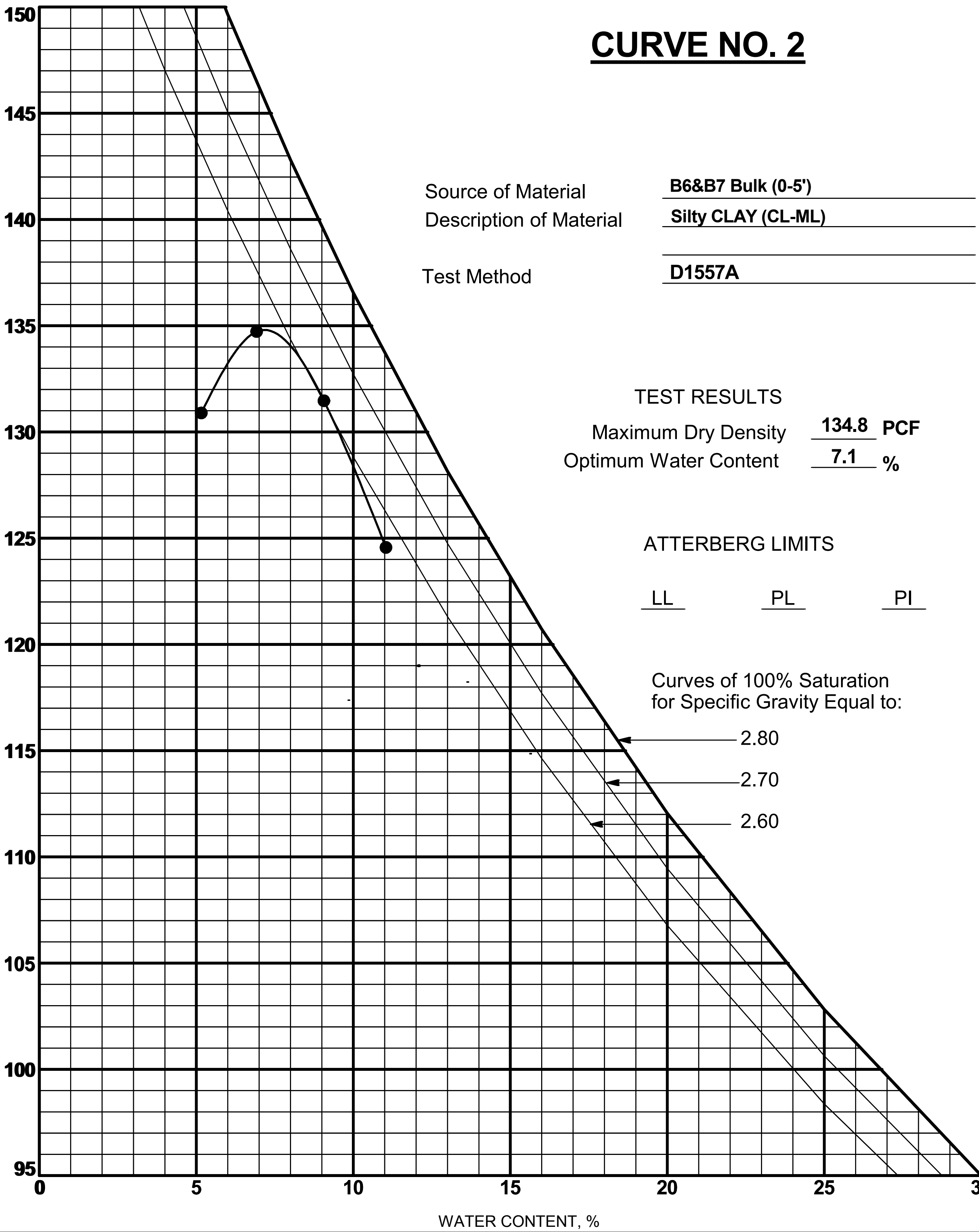
Project: DMV Reedley Field Office

Location: Reedley, CA

Number: S1445-05-04

Figure: B4

# CURVE NO. 2




| | |
|---|---|
| Source of Material | B6&B7 Bulk (0-5') |
| Description of Material | Silty CLAY (CL-ML) |
| Test Method | D1557A |

TEST RESULTS

Maximum Dry Density 134.8 PCF

Optimum Water Content 7.1 %

ATTERBERG LIMITS

| LL | PL | PI |
|---|---|---|

Curves of 100% Saturation for Specific Gravity Equal to:

2.80

2.70

2.60

US COMPACTION COPY 2.GPJ US LAB.GDT 1/26/07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## MOISTURE-DENSITY RELATIONSHIP

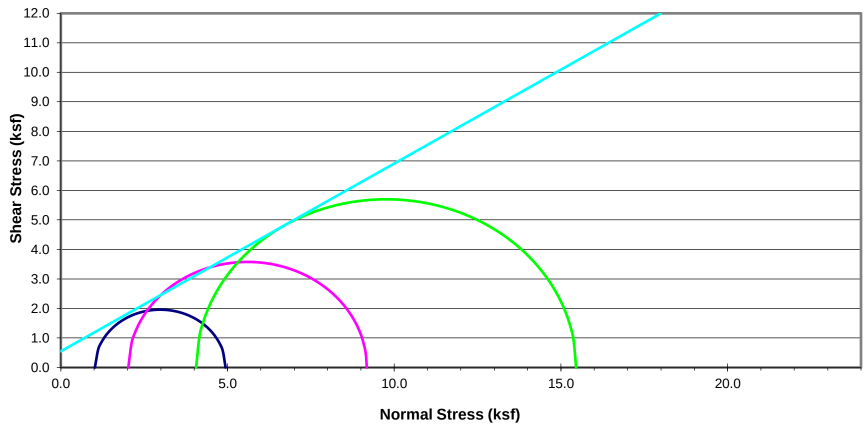
Project: DMV Reedley Field Office

Location: Reedley, CA

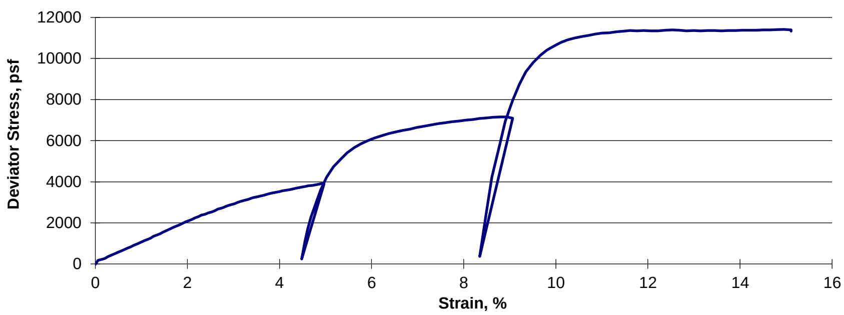
Number: S1445-05-04

Figure: B5

## MOHR'S CIRCLES




## STRESS-STRAIN




## Failure Photo

| | | | | |
|---|---|---|---|---|
| **Test Results** | | | | |
| ϕ, degrees | | **32.5** | | |
| c, psf | | **550** | | |
| **Sample Description** | | | | |
| Sample Number | | B2-5.5 | | |
| Sample Depth (feet) | | 5.5 | | |
| Material Description | | Strong Brown Silty Clayey SAND | | |
| **Initial Conditions at Start of Stage** | | | | |
| Sample ID (psf), minor principal stress | **1000** | **2000** | **4100** | |
| Height (inch) | 5.560 | 5.307 | 4.835 | |
| Diameter (inch) | 2.417 | 2.474 | 2.527 | |
| Moisture Content (%) | 11.7 | 11.7 | 11.7 | |
| Dry Density (pcf) | 108.4 | 108.4 | 108.4 | |
| Saturation (%) | 57.0 | 57.0 | 57.0 | |
| **Shear Test Conditions** | | | | |
| Strain Rate (%/min) | 0.2992 | 0.2962 | 0.2985 | |
| Major Principal Stress at Failure (psf) | 4940 | 9180 | 15460 | |
| Strain at failure (%) | 4.92 | 8.94 | 15.11 | |
| Deviator Stress and Fail (psf) | 3920 | 7150 | 11400 | |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**Triaxial Shear Strength - UU Test (staged)**

**Project:** DMV Reedley Field Office
**Location:** Reedley, California
**Number:** S1445-05-04
**Figure:** B6