INFORMATION HANDOUT

For Contract No. 04-4J6304
At 04-Sol-80-17.2

Identified by
Project ID 0415000375

MATERIALS INFORMATION

Foundation Reports

State of California
DEPARTMENT OF TRANSPORTATION

California State Transportation Agency

MEMORANDUM

Serious drought
Help save water!

To: MR. ROBERT E. TRAVIS JR
Office Chief
Office of Transportation Architecture

Attention: Joe Esfandiary
Edgardo Isidro

Date: September 9, 2014

File: 04-SOL-80 PM 17.2
EA 04-4J6301
E-FIS 0415000375
Fairfield Maintenance Station

From: SUNNY YANG / MENG-HSI HUNG
Transportation Engineer
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

HOOSHMAND NIKOUI
Chief, Branch A
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

Subject: **FOUNDATION REPORT**

This Foundation Report is prepared in response to your recent request to provide geotechnical recommendations for constructing a new material storage bins with canopy at Fairfield Maintenance Station, located adjacent to I-80 (PM 17.0) in Solano County.

1. SCOPE OF WORK

The following tasks were performed for the preparation of this FR:

- Performing geotechnical field exploration and laboratory testing,
- Development of soil engineering parameters and foundation design analysis,
- Selection of seismic design parameters, and
- Preparation of this FR.

2. PROJECT DESCRIPTION

Figure 1 shows the location of the new storage bins at Fairfield Maintenance Station. The structure plans provided by your Office indicate the new structure will be founded on shallow foundations, including reinforced concrete square and strip footings.

3. EXCEPTION TO POLICY

There is no known exception to Department policy relating to the investigation or design of the proposed structures.

4. FIELD INVESTIGATION AND TESTING PROGRAM

Two geotechnical exploratory borings were drilled by EarthMechanics, Inc., a subcontractor to our on-call consultant Kleinfelder, Inc. (Figure 1). One boring was auger boring and the other was rotary wash boring. Table 1 lists depths of these borings and recorded groundwater depths.

All samples were visually identified and recorded in the field log using standard method. For all borings, Standard Penetration Tests (SPT) were performed at 5-feet interval. Pocket Penetrometer (PP) tests were conducted on soil samples showing apparent cohesion.

Table 1. Summary of Field Borings

Boring ID	Total depth (ft)	Date of completion	Groundwater depth (ft)
A-14-001	26.5	8-15-14	16
R-14-002	26.5	8-15-14	16

5. LABORATORY TESTING PROGRAM

Laboratory tests were conducted on soil samples collected at depths of 3' and 10'. The tests included Atterberg Limits tests and moisture content tests.

6. SITE GEOLOGY AND SUBSURFACE CONDITIONS

Regional Geology

The project is located in the Coast Range Geomorphic Province of Central California, a series of northwest-trending mountain ranges (2,000 to 4,000, occasionally 6,000 feet elevation above sea level), and intermountain valleys, bounded in the east by the Great Valley and to the west by the Pacific Ocean. The Coast Ranges are composed of thick Cenozoic sedimentary and volcanic strata overlying Mesozoic metamorphic basement rock. The northern and southern ranges are separated by a depression containing the San Francisco Bay. The Coast Ranges are subparallel to the active San Andreas Fault, which is more than 600 miles long, extending from Pt. Arena to the Gulf of California.

Site Geology

According to the Geologic Map of the Northeastern San Francisco Bay Region, California, the site is underlain by fine-gained alluvial fan deposits (Qhff). These deposits are generally described mostly silt and clay with interbedded lenses of sand and minor gravel deposited at the distal margin of large alluvial fan complexes. A relevant portion of this map is included as Figure 2, Vicinity Geologic Map.

Site Seismicity

According to the latest California Seismic Hazard Map Version 2.0.4 (USGS, 2008), which is based on the United States Geological Survey (USGS) and California Geological Survey (CGS) maps, the nearest active faults are the Los Medanos – Roe Island, Gordon Valley, and Cordelia fault zones (Table 2). In Table 2, the fault distances represent the horizontal distances from the fault traces or surface projections of the top of rupture planes to the project site. The site is not located in an Alquist-Priolo Earthquake Fault Zone.

Table 2. Faults near Project Site

Fault	Distance (mile)	Fault ID	Maximum Magnitude (Mw)
Cordelia	4.0	107	6.5
Los Medanos – Roe Island	6.0	120	6.8
Great Valley, Gordon Valley	7.6	104	6.7

Subsurface Conditions

Borings A-13-001 and R-13-002 indicate that subsurface soil is predominantly stiff to very stiff fat clay and lean clay. Pocket penetrometer values ranged from 2.25 to 3.5 tsf in the top 10 feet of the profile. Laboratory test results indicate that the soil has a Plasticity Index ranging from 20 to 32. Therefore, the soil has a medium to high swelling potential.

Groundwater

Groundwater was encountered at 16' depth at both boreholes.

7. SEISMIC RECOMMENDATIONS

Using Caltrans ARS online (v2.2.06), the ARS curves were calculated. Based on our geotechnical exploration (Section 4), the site may be considered Soil Profile C, per Caltrans Seismic Design Criteria. Hence, a shear wave velocity of 1850 ft/s was used for the top 100 feet of soil profile (Vs30). The controlling curve is USGS probabilistic curve with peak ground acceleration of 0.62g (Figure 3). Per 2010 California Building Code, seismic parameters S_S and S_1 are 1.52 and 0.62, respectively.

8. FOUNDATION RECOMMENDATIONS

For foundation design purposes, the foundation soil can be considered as cohesive material with unit weight of 110 pcf, cohesion of 2.5 ksf, and zero friction angle. Using these parameters, the allowable bearing pressure for the square footing was calculated to be 5.3 ksf, and the allowable bearing pressure for the strip footings is 4.3 ksf. Modulus of subgrade reaction can be assumed to be 100 pci.

As mentioned above, the foundation soil has a medium to high swelling potential. It is recommended to over-excavate below all footings by one foot and backfill with Class 2 AB or structure backfill (95% relative compaction). Suitable drainage design and/or perimeter paving should be considered to prevent surface water from seeping under the structure and causing foundation soil to swell.

9. DISCLAIMER AND CONTACT INFORMATION

The recommendations contained in this report are based on specific project information regarding structure type, location, and design loads that have been provided by your Office. If any conceptual changes are made during final project design, the Office of Geotechnical Design

West, Design Branch A should review those changes to determine if these foundation recommendations are still applicable. Any questions regarding the above recommendations should be directed to the attention of Hooshmand Nikoui at (510) 286-4811.

c: TJPokrywka, HNikoui, Daily File, Route File, Translab File.

SYang/mm

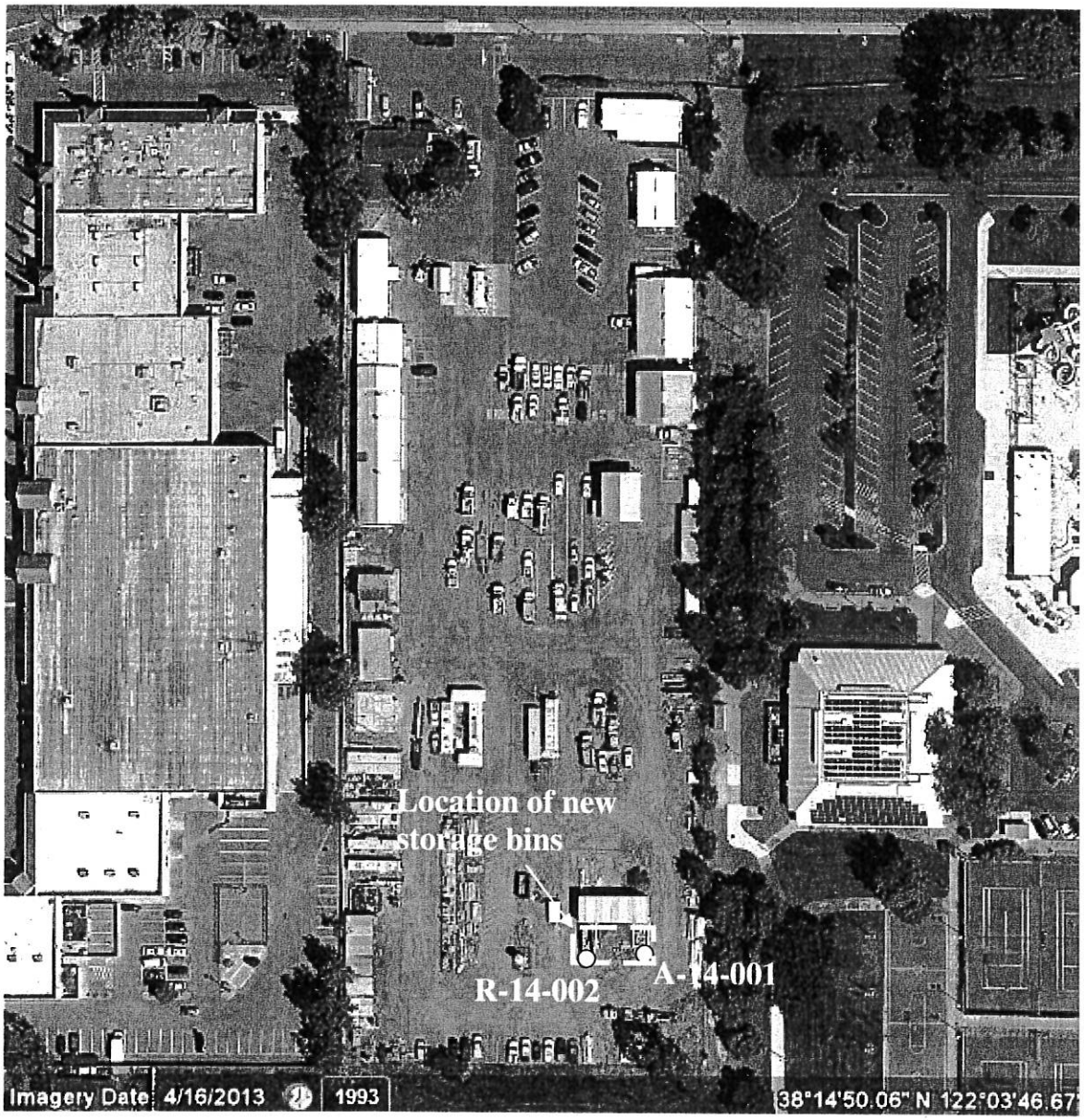

Figure 1: Project area and boring locations.

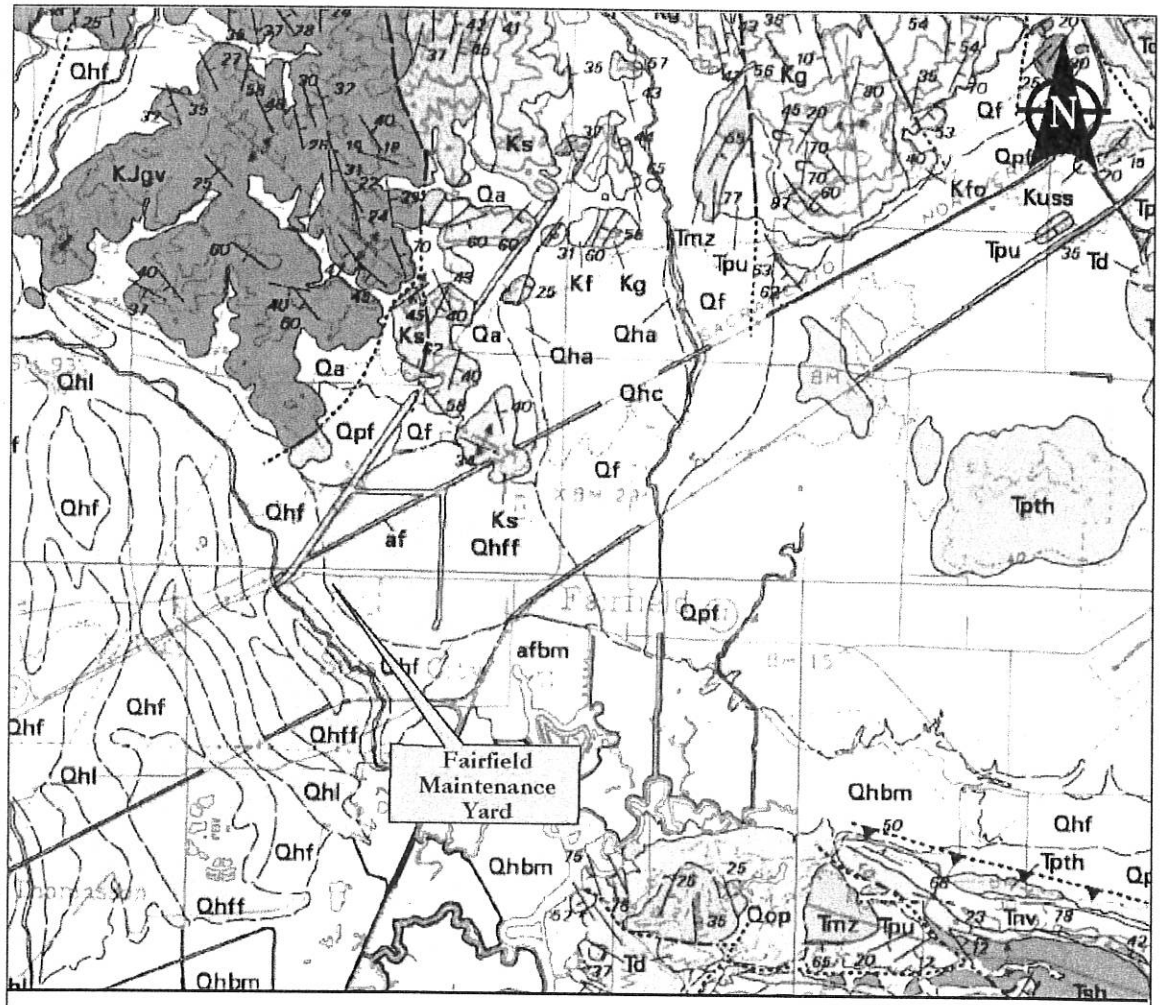

Figure 2: Vicinity Geology Map.

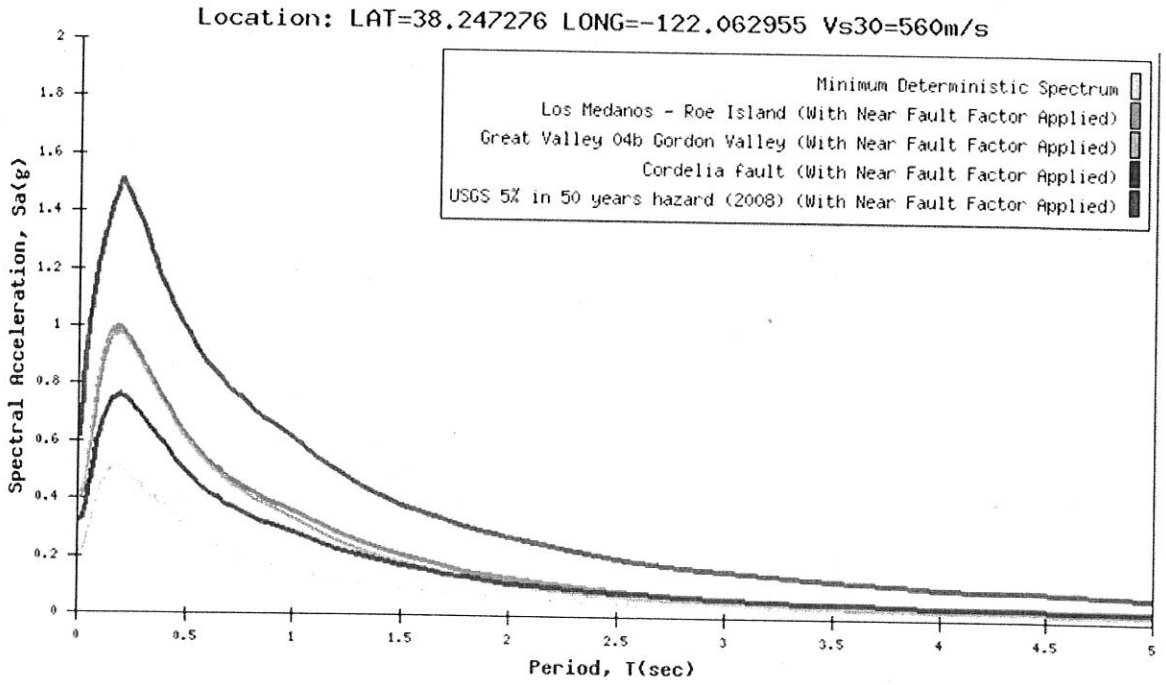

Figure 3: Calculated ARS curves (Caltrans ARS Online v2.2.06).