FOR CONTRACT NO.: 11-404304
EFIS NO.: 11000200144

INFORMATION HANDOUT

MATERIALS INFORMATION

RAILROAD RELATIONS AND INSURANCE REQUIREMENTS

GEOTECHNICAL DESIGN REPORT FINAL DATED JULY 30, 2012

ROUTE: 11-SD-5-PM R23.9/R25.5

State of California Business, Transportation and Housing Agency

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: MR. LEON EDMONDS
Office of District 11 Office Engineer

Date: December 12, 2012
File: 11-SD-5
P.M..: R23.9/R25.5

Attention: Dante Buenviaje
Arlene Gerstner

11158 –404301

From: **Brian Finkbeiner**
District 11 Railroad Coordinator
Right of Way Division – MS 310

Subject: Railroad Clearance

I have reviewed the plans for the above-referenced project and determined that the work does not require any coordination with the railroad identified within the project limits. This project is now cleared for advertising.

The short clauses required to protect railroad facilities are attached for insertion in the contract special provisions.

.

There is no work by the railroad and the project does not require any Railroad Protective Insurance.

Should the scope of this project, as it is currently proposed, change before Ready To List Date, then this Clearance Letter is revoked, and a new review and new Clearance Letter will be required.

Attachment

cc:	Rich Estrada	Project Manager
	Doni Decastro	Project Engineer
	Amy Lamott Vargas	Program/Project Coordination Branch
	Lane Hollerbach	Project Coordination
	Denny Fong	Right of Way Railroad Headquarters
	Elaine Lewis	Right of Way Railroad Headquarters

General

This project does not include work on the railroad property, but a railroad is shown on the general plan sheet within the project limits. Do not trespass on the Metropolitan Transit System , railroad property on Route 5.

You are responsible for all damages to railroad track, structure, embankment and appurtenances, and to railroad equipment operating on such track, resulting from your operations.

Conduct your operations in a manner that prevents debris, or any other material, from falling on the tracks and railroad right of way.

Emergency Hotline

Your personnel working near, below or above railroad tracks must have within their immediate reach the Emergency Hotline Number (800) 848-8715, Option 1, to report incidents along railroad tracks. This line is monitored 24 hours a day, 7 days a week.

GEOTECHNICAL DESIGN REPORT

Interstate-5 Outer Separation Barrier
Between Northbound Interstate-5 and Santa Fe Street

11-SD-5/PM R23.9/ R25.5

EA 11-404301
EFIS 1100020014

July 30, 2012

Prepared By:

OFFICE OF GEOTECHNICAL DESIGN-SOUTH 2 BRANCH D
7177 OPPORTUNITY ROAD
SAN DIEGO, CA 92111

Memorandum

To: Mr. Doni De Castro
Project Engineer

Date: July 30, 2012

File: 11-SD-5-(PM) R23.9-R 25.5
EA 11-404301/EFIS 1100020014

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
Geotechnical Services
Office of Geotechnical Design – South 2 Branch D

Subject: Geotechnical Design Report for the Interstate-5 Outer Separation Barrier Project, Between Northbound Interstate-5 and Santa Fe Street

Pursuant to your request, the Office of Geotechnical Design-South 2 (OGDS2) has prepared this Geotechnical Design Report (GDR) for the proposed Interstate-5 Outer Separation Barrier Project..

This GDR documents the prevailing site conditions and provides specific recommendations for the project features. The report defines the geotechnical conditions as evaluated from field investigations and archived data. This information is used in the geotechnical analyses and design. This report provides recommendations for project design and construction.

Please ensure that this GDR is included in the District Resident Engineer (RE) Pending File. OGDS2 staff will be available for further assistance. Should you have any questions or comments regarding this report, please contact Mike Fordham at (858) 467-3290 or Brian Hinman at (858) 467-4051.

Mike Fordham P.E.
Transportation Engineer (Civil)
Office of Geotechnical Design - South 2

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Geotechnical Archive	http://10.160.173.158/
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District Construction R.E. Pending File	It is the responsibility of the Project Design Manager to include this document in the District Construction R.E. Pending File.

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1.0 INTRODUCTION

This Geotechnical Design Report (GDR) has been prepared by the Office of Geotechnical Design South-2 (OGDS2) to address the geotechnical design considerations for the Interstate 5 (I-5) Outer Separation Barrier Project, in the City of San Diego, San Diego County, California hereafter referred to as the project. Figure 1 depicts the project location and aerial photograph of the project site. The project layouts and proposed improvements are depicted on Figure 2a through Figure 2F.

The project includes construction of a Caltrans standard concrete barrier on the east side of northbound I-5 from Mission Bay Overcrossing (OC) (Post Mile R23.9) to one and one half-miles (1.5-mi) south of the La Jolla Parkway Viaduct (Post Mile R25.5). The project will provide a barrier between the opposing traffic of Northbound I-5 and the frontage road, known as Santa Fe Street. A variable grade separation and slopes exist between northbound I-5 and Santa Fe Street. Because of this grade separation and the proximity of the roadways the project proposes placing a barrier on or near the hinge point of the slope. Appropriate standard concrete barrier foundations must be selected in order to resist the lateral forces of vehicle impacts and retained embankment.

The purpose of this GDR is to document subsurface geotechnical conditions, provide engineering evaluation of site conditions, and provide recommendations relevant to the design and construction of the project features. This report establishes a geotechnical baseline to be used in assessing the existence and scope of changed site conditions. The geotechnical information, evaluation, recommendations, and advisories contained in this GDR supersede any information that may have been previously conveyed through correspondences or documents concerning the project features addressed herein.

This GDR is based on site reconnaissance, research of archived resources, subsurface exploration, and engineering analyses. This GDR was prepared in accordance with the guidelines set forth in the *Caltrans: Guidelines for Preparing Geotechnical Design Report (GDR), Version 1.3, December 2006.*

A District Preliminary Geotechnical Report (DPGR) was prepared in 2010 for this project by OGDS2. The scope of the project remains the same as that described in the DPGR.

2.0 EXISTING FACILITIES AND PROPOSED IMPROVEMENT

Interstate 5 through Northern San Diego County is one of the most significant transportation facilities in the region connecting San Diego County to Orange County and Los Angeles. I-5 is the western most interstate freeway, running from the United States-Mexico Border in the south to the United States-Canadian Border in the north. The I-5 Freeway within San Diego County is a vital link between the City of San Diego, north San Diego county beach communities, Camp Pendleton, and beyond. Construction of the I-5 freeway within the project area occurred in the 1960's.

Project layout plans, profile plans, and cross sections were provided by Caltrans District 11 Traffic Project Development. All units referenced in this document are United States (U.S) Customary units, unless otherwise noted. All elevations referenced in this report are in feet and referenced to the NAVD88 vertical datum. Unless otherwise noted, all Stations are referenced to the SD-R Line.

2.1 Existing Facilities

Existing facilities along the project alignment include the Mission Bay Drive OC (Bridge No. 57-457), fill embankments, graded slopes, underground utilities, and highway drainage units. A frontage road, the metropolitan Transit Districts trolley track, the BNSF railroad track, and Rose Canyon Creek are located to the east of the project alignment.

As-Built Log of Test Boring (LOTB) for the Mission Bay Drive OC (Bridge No. 57-457), are included in Appendix I.

2.1.1 Existing Roadway

In the project area, I-5 consists of an eight-lane Portland Cement Concrete (PCC) freeway with asphalt concrete (AC) paved shoulders. The existing freeway includes: twelve-foot (12ft) wide travel lanes, eight-foot (8ft) wide inside shoulders, and outside shoulders that vary in width from five to ten-feet (5-10ft). The existing median is approximately fifty-feet (50ft) wide and consists of a well vegetated slope with a concrete barrier located along the inside shoulder of southbound I-5. Mission Bay Drive OC consists of two twelve-foot (12ft) AC lanes with approximately three-foot (3ft) AC inside and four to eight-foot (4-8ft) AC outside shoulders.

2.1.2 Existing Cut, Fill and Natural Slopes

Numerous cut slopes along the project alignment have a typical slope inclination of one and one half horizontal to one vertical (1.5H:1V) or steeper. All of the steep cut slopes are located to the west of southbound I-5. One cut slope is located along the eastside of northbound I-5 and has a slope inclination of approximately four horizontal to one vertical (4H:1V). This slope is the only cut slope located along the alignment of the separation barrier.

Cut slopes within the project limits expose stream terrace deposits and Mount Soledad Formation. Cut slopes along the west side of I-5 range from poorly to well vegetated with a mixture of native and non-native species. The cut slope along the east side is well vegetated with non native species. No seeps or springs were identified within the project area cut slopes. The steep slopes show no signs of instability.

Existing fill slopes along the project alignment vary in height from approximately six-feet (6ft) to twenty five-feet (25ft). The tallest fill slopes exist along the southern most portion of the project alignment between Stations 1299+06.91"B-2 Line" and 1317+00 and are inclined one and one-half horizontal to one vertical (1.5H:1V) or flatter.

Fill slopes appear to be composed of material derived from nearby cuts of native formations. Site reconnaissance and the subsurface data gathered indicate that the material is generally comprised of medium dense to dense silty sand and clayey sand. The fill slopes are well vegetated with native and non native species.

No natural slopes were identified within the project alignment. Natural slopes are located along the east facing flank of Mount Soledad within proximity to the west side of southbound I-5 and the proposed project. These natural slopes have a maximum height of roughly two hundred-feet (200ft), with slope inclinations ranging from one horizontal to one vertical (1H:1V) to two horizontal to one vertical (2H:1V). These slopes are typically vegetated by native scrub and intrusive, non native species.

2.1.3 Existing Development

Land use adjacent to the project is densely developed and consists of Commercial and light industrial facilities. The locations of the facilities in the area are depicted on Figure 1

2.1.4 Existing Utilities

Utilities present within the limits of the project include underground sewer and gas; and overhead electrical lines.

2.2 Proposed Improvements

The proposed project will widen the outside shoulder of northbound I-5 and add a concrete outer separation barrier between northbound I-5 and the frontage road, Santa Fe Street. Figure 1 depicts the project location and aerial photograph of the project site. The project layouts and the proposed improvements are depicted on Figure 2A through Figure 2F.

2.2.1 Proposed Roadways

The proposed project will widen the outside shoulder of northbound I-5 and the Mission Bay Drive OC onramp by approximately four-feet (4ft) and add a concrete outer separation barrier between northbound I-5 and the frontage road, Santa Fe Street.

2.2.2 Proposed Earth Retaining Systems

Because sections of the proposed barrier will be located at the slope hinge some use of barrier that can accommodate a lateral grade differential is necessary. Section 8.5 of this report discusses the different options available based on the proposed project geometry.

The approximate location of the barrier is depicted in Figure 1 and Figure 2A through Figure 2F.

3.0 PERTINENT REPORTS AND INVESTIGATIONS

Pertinent reports and investigations utilized in the preparation of this GDR include:

- Caltrans District Preliminary Geotechnical Report, *Concrete Safety Barrier,* 11-SD-5, PM R23.9/R25.5 EA 11-40430K/EFIS 1100020014

Additional references utilized in the preparation of this report are described in Section 15.0.

4.0 PHYSICAL SETTING

The following section describes the physical setting of the project including: the climate; topography and drainage; man-made and natural features of engineering and construction significance; regional geology and seismicity; and soil survey mapping.

4.1 Climate

San Diego has a Mediterranean to semi-arid climate that is characterized by warm, dry summers and mild winters with some rain. San Diego has mild, mostly dry weather with approximately two hundred (200) days above seventy degrees Fahrenheit (70°F). The extended summer and dry period lasts from May to October. Temperatures are mild to warm in the summer. High temperatures during the summer range between seventy and seventy-eight degrees Fahrenheit (70-78°F). Low temperatures during summer range between fifty-five and sixty-six degrees Fahrenheit (55–66°F). Temperatures exceed ninety degrees Fahrenheit (90°F) approximately four days a year. Winter is the rainy period and lasts from November to April. Temperatures are mild with periods of moderate to heavy precipitation. High temperatures during the winter range between sixty-six and seventy degrees Fahrenheit (66–70°F) Low temperatures during winter range between fifty and fifty-six degrees Fahrenheit (50–56°F). On average there are approximately ten-inches (10in) of rainfall in San Diego annually. However precipitation may range from three-inches (3.0in) to thirty-inches (30.0in) during any given year.

The project alignment is located in proximity to the Pacific Ocean. This proximity to the ocean will generally result in mild temperatures and wind. Thick marine fog is possible throughout the year. The marine fog is most prevalent in the early morning and late evening during the winter months, but can also appear during the summer months and can be thick enough to impact visibility.

4.2 Topography & Drainage

The project site topography may be described as a somewhat planar, coastal, terrace dissected by incised canyons. I-5 is constructed within the mouth of Rose Canyon. Mount Soledad is a tilted fault block that forms the west flank of Rose Canyon. The approximate elevation of I-5 at the project site ranges from thirty-feet (30ft) one hundred-feet (100ft) above mean sea level (MSL).

On the surrounding mesas, urban runoff is gathered and conveyed by a system of gutters and storm drains. Runoff from the project area is directed to Rose Canyon Creek that trends toward the south along the east side of I-5 until crossing under the freeway just south of Mission Bay Drive OC at the south end of the project. The flow is then directed west to Mission Bay and the Pacific Ocean

4.3 Regional Geology and Seismicity

The project site lies within the coastal plain of the Peninsular Range Geomorphic Province of California. The Peninsular Ranges are a group of mountain ranges that extend nine hundred-miles (900mi) from the Transverse Ranges and the Los Angeles Basin in Southern California to the southern tip of Mexico's Baja California. The southern segment of the Peninsular Ranges in Southern California is referred to as the San Diego Embayment. The San Diego Embayment consists of thick sequences of marine and non-marine sediments. The sedimentary rocks within the San Diego Embayment form an eastward thinning wedge of continental margin deposits that extend from Oceanside to the US-Mexico border.

The closest regional active fault to the project site is the Newport Inglewood Rose Canyon Fault System running on a north-northwest trend. The fault crosses the project near its midpoint. Data pertaining to the regional active faults are included in Table 1.

4.4 Soil Survey Mapping

The Soil Survey of San Diego Area, California prepared by U.S. Department of Agriculture, Soil Conservation Service and Forest Service (1973) was utilized to determine the surficial soils and their general properties. The results of the soil survey review are presented in Table 2.

5.0 EXPLORATION

A surface and subsurface investigation was conducted to help characterize the soil conditions present within the project alignment such as the presence of groundwater, depth and quality of artificial fill, and other conditions that could impact the design or construction of the proposed project features.

5.1 Drilling and Sampling

The subsurface investigation was conducted in July 2012. Six (6) exploratory borings, ranging in depth from two to six-feet (2-6ft) were developed using hand augers. The hand auger borings were conducted to identify the character of subsurface soils along the alignment of the proposed barrier. A review of the project site determined that the needed subsurface data could be obtained most economically and in a more expeditious manner through the use of hand augers. The locations of the exploratory borings are depicted on Figure 2A through Figure 2F. The hand auger boring records are summarized in Table 4. The data obtained from the hand auger subsurface investigation complimented observed surface conditions and archive data.

Logging of the borings was performed by a Caltrans geologist or engineer.

5.2 Geologic Mapping

The project site geologic overview map is presented in Figure 3. The geologic map is a modified version of the *California Divisions of Mines and Geology, Geology of the San Diego Metropolitan Area, California: Del Mar 7½ Minute Quadrangles, Kennedy, 1975.* The map depicts an overview of the geologic formations present at the project site and surrounding area. The map has been modified to display the approximate locations of the proposed barrier. Field mapping was performed to verify the accuracy of the geologic overview map.

5.3 Exploration Notes

All boring were backfilled with the material excavated from the boring. No potentially hazardous waste was identified during this study. Caving was observed within four-feet (4ft) of the surface of all six (6) borings.

6.0 GEOTECHNICAL TESTING

The sections below describe the in-situ and laboratory testing program performed for the proposed project.

6.1 In Situ Testing

No in situ soil testing was conducted as part of the subsurface exploration for this project.

6.2 Laboratory Testing

No laboratory tests were conducted for this project.

7.0 GEOTECHNICAL CONDITIONS

The following section describes geotechnical conditions that will affect the project.

7.1 Site Geology

The project site is underlain by a succession of sedimentary strata comprised of Ardath Shale conformably overlying the Mount Soledad Formation. However, the site geology has been rendered somewhat more complex by the Newport Englewood Rose Canyon Fault, which appears to cross the project near its midpoint. The geologic structure of the Newport Englewood Rose Canyon Fault and its influence on the site geology is described further in Section 7.1.2. The site geology is also complicated by alluvium and slope wash localized along the course of Rose Canyon Creek; and engineered roadway embankment that underlies all of northbound I-5 along the project alignment and that, depending on location, rest directly upon either the sedimentary strata or the alluvium/slope wash. A geologic overview map is depicted on Figure 3.

7.1.1 Lithology

The following formations are found in the project area and are depicted on the geologic overview map presented on Figure 3.

Artificial Fill (Qf): Artificial fill in the project area appear to be derived from material excavated from nearby cuts. Artificial fill encountered during the field investigation were determined to be engineered fill. The engineered fill is composed of medium dense to dense silty sand/clayey sand with the some gravel and cobbles.

Alluvium/Slope Wash (Qal/Qsw): The alluvium/slope wash is located within the of the Rose Canyon Creek drainage and often underlies engineered fill. The alluvium/slope wash is comprised primarily of medium dense silty sand and clayey sand with the presence of gravel.

Stream-terrace deposits (Qt): The Stream-terrace deposits consist of moderately dense, silty to clayey sand with varying amounts of gravel and cobbles which usually occur in isolated areas along the lower hillsides within Rose Canyon.

Bay Point Formation (Qbp): The Bay Point Formation consists of dense to very dense, fine grained sand with variable quantities of clay and underlies the majority of the fill soil, alluvium/slopewash, or is exposed at the surface in the absence of fill soils or alluvium/slopewash.

Ardath Shale (Ta): The Ardath Shale is predominantly weak fissle, olive-gray shale. Concretionary beds containing molluscan fossils are common.

Mount Soledad Formation (Tmsc): The Mount Soledad Formation southeast of the Newport Englewood Rose Canyon Fault has variable conglomerate content and can locally be composed almost entirely of medium grain sandstone

7.1.2 Structure

The sedimentary formations found along coastal San Diego are generally flat lying and laterally continuous for large distances. However, the area around I-5 near Soledad Mountain is complicated by deformations and offsets that have occurred along the Country Club, Mount Soledad, and Newport Englewood Rose Canyon Faults. Project area fault are depicted in Figure 3, Figure 4A and Figure 4B The Newport Englewood Rose Canyon Fault crosses I-5 near the projects midpoint. The Mount Soledad and the Country Club Faults cross I-5 outside the projects southern limits. To the west of the I-5 along Mount Soledad, several fault blocks have been up-lifted and down-dropped relative to one another. A northwest plunging anticline exists between Soledad Mountain Road and I-5. The limbs of the anticline dip two-degrees (2°) to the southwest and five-degrees (5°) to the northeast. Because of the relative movement between these geologic structures, the sedimentary strata in the project area display more abrupt changes in lateral continuity than elsewhere along coastal San Diego.

7.1.3 Natural Slope Stability

The project alignment bisects a developed landscape. Natural or unaltered slopes do not appear to exist within Caltrans right-of-way but exist within adjoining properties. The natural slopes in the project area appear to be stable with the exception of two mapped landslides located on the east flanks of Mount Soledad. Landslides along the east flank of Mount Soledad have been active in recent history, but have had no impact on the operation of I-5. Conversely the presence of I-5 has had no influence on the instability that exists along the east flank of Mount Soledad. Landslides are commonly associated with areas of the Ardath Shale where expansive claystone locally comprises as much as twenty five-percent (25%) of the geologic unit.

7.2 Subsurface Conditions

The following sections describe the relevant geotechnical conditions that impact project design and excavations.

7.2.1 Soil

Outcrops of sedimentary strata typical of the area are exposed west of the project along the east facing flank of Soledad Mountain. The sedimentary strata are comprised of inter layered sandstone and siltstone and conglomerate beds. The sandstone is soft to moderately soft. The siltstone is soft to moderately hard. Due to weak indurations and ample weathering, both the sandstone and siltstone have the characteristics of very dense soil. These formational soils will provide suitable subgrade for roadways and retaining structures.

Alluvium and slope wash occupy the bottom of Rose Canyon and other drainages within the project and often underlie the existing embankments.

Engineered fill of varying quality forms the roadway embankments. The engineered fill primarily consists of moist, medium dense to dense silty sand. The engineered fill will provide suitable subgrade for embankments, roadways, and retaining structures.

The data obtained from the subsurface investigation and archived data was used to develop soil strength parameters. These strength parameters have been used in evaluations of the proposed project features. The pertinent geologic units and the geotechnical strength parameters used in the evaluations are presented in Table 3.

7.2.2 Groundwater

A review of archived Log of Test Borings (LOTB) for three structures near or within the project limits found that groundwater was encountered just outside the southern limits of the project. Perched ground water was encountered in borings performed for the Rose Canyon Creek Undercrossing and Damon Street

Undercrossing, while no ground water was encountered at the Mission Bay Drive OC. The elevation above Mean Sea Level (MSL) of encountered groundwater in each boring is presented in Table 5. The elevation of the perched groundwater likely fluctuates seasonally in the alluvial soil within Rose Canyon and likely mirrors the adjacent creek elevation.

Groundwater was not encountered during the subsurface investigation for this project.

7.3 Surface Water

Rose Creek is a perennial stream that is located along the east side of the project and crosses I-5 south of the Mission Bay Drive OC. No other significant surface water exists within or near the project.

7.3.1 Scour

Because of the proximity of the Mission Bay Drive OC embankment to Rose Creek scour may be possible. The freeway embankment and creek channel, are well vegetated and no scour was evident during the field review. Based the visual observations the scour potential is low. North of the Mission Bay Drive OC the barrier is not located adjacent to Rose Creek so scour potential is not applicable.

7.3.2 Erosion

The relatively short existing fill slopes with a slope inclination of one and one-half horizontal to one vertical (1.5H:1V) appear stable against erosion. However, disturbed areas or areas of new engineered fill that have either been stripped of or lack vegetation are subject to erosion.

7.4 Site Seismicity

The project is located in proximity to the Newport Inglewood-Rose Canyon Fault Zone. Numerous other active fault zones including the Point Loma, Coronado Banks, San Clemente, and San Diego Trough lie within a moderate distance of the project. Ground motion caused by nearby and distant seismic events should be anticipated during the life of the facilities. Ground surface rupture caused by active faulting is considered likely within the project alignment because of the presence of a known active fault trace. The project lies within the La Jolla Alquist-Priolo special study zone.

The Newport Englewood Rose Canyon Fault is the only active fault that transects the project site. Two other faults transect I-5 near the project site. Those faults are The Mount Soledad and Country Club Faults, which are both considered to be inactive

8.0 GEOTECHNICAL ANALYSIS AND DESIGN

The following section describes the geotechnical analyses, parameters, and design criteria that should be utilized by project designers in the continued developed of the project.

8.1 Dynamic Analysis

This section describes the seismic parameters selected and dynamic analysis developed for the project.

The proximity of the Newport Inglewood-Rose Canyon Fault Zone to the project could result in significant impact to the project features as the result of a seismic event. The Newport Inglewood-Rose Canyon Fault displaces Holocene sediments and is therefore considered active by current standards of practice. The Caltrans Acceleration Response Spectra (ARS) Online Tool Version 1.0.4 (Caltrans ARS Online Tool) was used to determine pertinent seismic data. The Caltrans ARS Online Tool is a web based tool that calculates both deterministic and probabilistic ARS for any location in California based on the criteria set forth in the *Caltrans, Seismic Design Criteria (SDC) Version 1.6, November 2010, Appendix B*.

According to the *SDC Version 1.6, November 2010 Appendix B, Figure B.1 Soil Profile Types*, Soil Profile Type D has SPT values greater than/or equal to fifteen and less than fifty ($15 \leq N < 50$).

The archived soil data for the project area had SPT results that ranged from as low as fifteen (15) to greater than fifty (>50). Based on these SPT results and as defined in Appendix B of the SDC, the alluvium/slope wash that underlies the engineered fill has a Soil Profile Type D.

The latitude and longitude input into the Caltrans ARS Online Tool were 32.8239 and -117.2310, respectively. The Shear wave velocity used in the Caltrans ARS online tool was two hundred and seventy-meters per second (270m/s), which corresponds to a Soil Profile Type D. The closest regional active fault as indicated by the Caltrans ARS Online Tool is the Newport Inglewood Rose Canyon Fault. Data pertaining to the regional active faults are provided in Table 1.

Based on results produced by the Caltrans ARS Online Tool, the anticipated Peak Ground Acceleration (PGA) for the project site is thirty eight one hundredths-gravity (0.38g). The PGA corresponds to the Spectral Acceleration at a period of zero-seconds (0sec). The attenuation period for the fault is estimated to be five-seconds (5sec) with a probability of exceedence of five-percent (5%) in fifty years (50yrs) or a reoccurrence interval of nine hundred and seventy five-years (975yrs). The results produced by the Caltrans ARS Online Tool and the Caltrans Online Tool QA/QC Checklist are include in Appendix IV.

8.2 Liquefaction Analysis

Liquefaction involves the sudden loss of shear strength of a saturated, cohesionless soil subjected to cyclic loading produced by an earthquake. The cyclic loading and loss of shear strength cause the soil to temporarily exhibit the strength characteristic of a fluid mass. Typically, liquefaction occurs in areas where groundwater is less than fifty-feet (50ft) from the surface and where the soils are predominantly comprised of poorly consolidated poorly graded fine sands, silty sands, and non plastic silts.

The project primarily resides on medium dense engineered fill residing atop deposits of alluvium/slope wash or sedimentary formation. There is little potential for soil liquefaction to adversely impact project features.

8.3 Cuts and Excavations

This section presents the analyses used to determine the stability, rippability, and grading factors of materials in proposed cuts or excavations.

8.3.1 Stability

No significant cut slopes are proposed for this project; therefore no stability evaluation is warranted.

8.3.2 Rippability

The materials within the project area are considered rippable by conventional heavy duty grading equipment and may be drillable by conventional drill equipment.

8.3.3 Grading Factors

Earthwork factors relate the in place volume of material to be excavated to the in place volume of material after placement as fill. The factors are defined as in place volume of compacted fill divided by in place volume of material to be excavated.

$$G_f = V_{fill}/V_{exc}$$

An estimated grading factor of ninety eight one hundredths (0.98) may be used for material generated from cuts within existing fill slopes and one and two one hundredths (1.02) may be used for the material generated from cuts within the sedimentary formation.

8.4 Embankments

No significant embankments will be constructed as part of this project.

8.5 Barrier Foundations

Two types of Caltrans Standard Plan concrete barriers Type 60 and Type 736S/SV are each applicable in specific station intervals along the proposed barrier alignment. The specific barrier type evaluated to be appropriate for each station interval is presented in Table 6. In general, the subsurface conditions for the station intervals specified for the Type 736 S/SV barrier are suitable for CIDH pile foundations.

Concrete barriers are designed to resist the lateral forces applied to them by vehicle impacts. The lateral resistance forces are developed by the embedment and weight of the barrier when level ground is present on both sides. If an unfounded barrier is placed atop a slope the resistance forces are greatly diminished because of the lack of level ground behind the barrier. To develop the necessary resistance forces to counteract the lateral forces generated by a vehicle impact, barriers must incorporate appropriate foundations. Standard plan CIDH pile foundations are suitable for barriers located at a slope hinge.

It is not anticipated that groundwater will be encountered during pile excavation. Caving may occur during pile excavation within engineered fill. Cobbles are likely to be encountered during pile excavations.

9.0 MATERIAL SOURCES

No off site material source has been identified for this project. Material generated from on site excavations will consist primarily of sand and silt derived from artificial fill. The material generated on site is anticipated to be suitable for use as roadway embankment.

10.0 MATERIAL DISPOSAL

Examples of material unsuitable for embankment subgrade or fill include organic mud, highly expansive clay, stockpiled trash, and debris. The geotechnical site review suggests that no unsuitable material is present along the barrier alignment.

Material generated during construction that is found to be unsuitable for use as roadway subgrade, embankment fill, or topsoil should be placed in a suitable location within the projects limits or properly disposed.

11.0 RECOMMENDATIONS

1. Two types of Caltrans Standard Plan concrete barrier are applicable for this project. Caltrans Type 60 barrier is applicable in areas with flat lying topography on either side of the barrier. Type 736S/SV barrier is applicable in areas were the barrier will be located at a top slope hinge and have a grade difference. The location of each barrier type is presented in presented in Table 6.
2. Appropriate erosion control measures should be implemented to protect any newly grade slopes.
3. Surface water should be prevented from ponding behind the concrete barrier.

12.0 DESIGN ADVISORIES

1. The material derived from excavations in the sandstone, siltstone, conglomerate, and engineered fills within the project will be suitable for use as embankment fill.
2. The subsurface conditions along the proposed length of the barrier are suitable for Caltrans CIDH pile foundations. Caving of the upper four-feet (4ft) of the piles is likely within engineered fill. Casing provision for the upper five-feet (5ft) of drilled shaft should be included in the CIDH special provision or a greater concrete quantity could be incorporate in the design.

13.0 CONSTRUCTION CONSIDERATIONS

1. The on-site soils may generally be excavated with conventional heavy grading equipment. It should be anticipated that the presence of cobble may create occasional difficulties during drilling and trenching operations.
2. The presence of underground utilities traversing the project may require adjustments of the barrier CIDH pile layout.
3. Caving is anticipated to occur within shafts drilled in fill within five feet (5ft) of the surface. Caving conditions are anticipated to be widespread within fill. Drilled shafts that tend to cave may be cased to a depth of five-feet (5ft) or the placed volume of concrete may be increased.
4. Temporary cut slopes proposed by the Contractor should follow the guidelines set forth in the Caltrans Trenching and Shoring Manual.

14.0 ACTUAL VS. REPORTED SITE CONDITIONS

The characterizations of geotechnical conditions along the project alignment and presented in this report are based on the review of the design information provided, proposed project features, as-built plans, geologic maps, geologic literature, archival reports, and exploration by OGDS2. The evaluations and recommendations contained in this report are based on the information discovered and data gathered. If conditions are encountered during the project that appear to differ from the conditions conveyed in this report, or if construction difficulties related to soil conditions are encountered, a representative of OGDS2 Branch D should be consulted to assist with the assessment of the prevailing geotechnical conditions and to assist in formulating appropriate strategies to facilitate project completion.

Should project design features vary significantly from those described in this report an updated GDR should be prepared by OGDS2 Branch D to address the geotechnical considerations related to those features.

15.0 REFERENCES

USDA, Soil Conservation Service and Forest Service, (1973), *Soil Survey, San Diego Area, California.*

M.P. Kennedy, (1975), *Geology of The San Diego Metropolitan Area, California, Geology of The La Jolla Quadrangle San Diego County, California.*

Caltrans, Division of Engineering Services, Geotechnical Services, (2009), *Geotechnical Services Design Manual v.1.0, Section 1: Seismic Design Recommendation.*

Caltrans, Division of Engineering Services, Geotechnical Services, (2009), *Geotechnical Services Design Manual v.1.0, Appendix B.*

FIGURES

FIGURE 1: PROJECT LOCATION AND AERIAL PHOTOGRAPH

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5	R23.9/R25.5		

REGISTERED CIVIL ENGINEER DATE

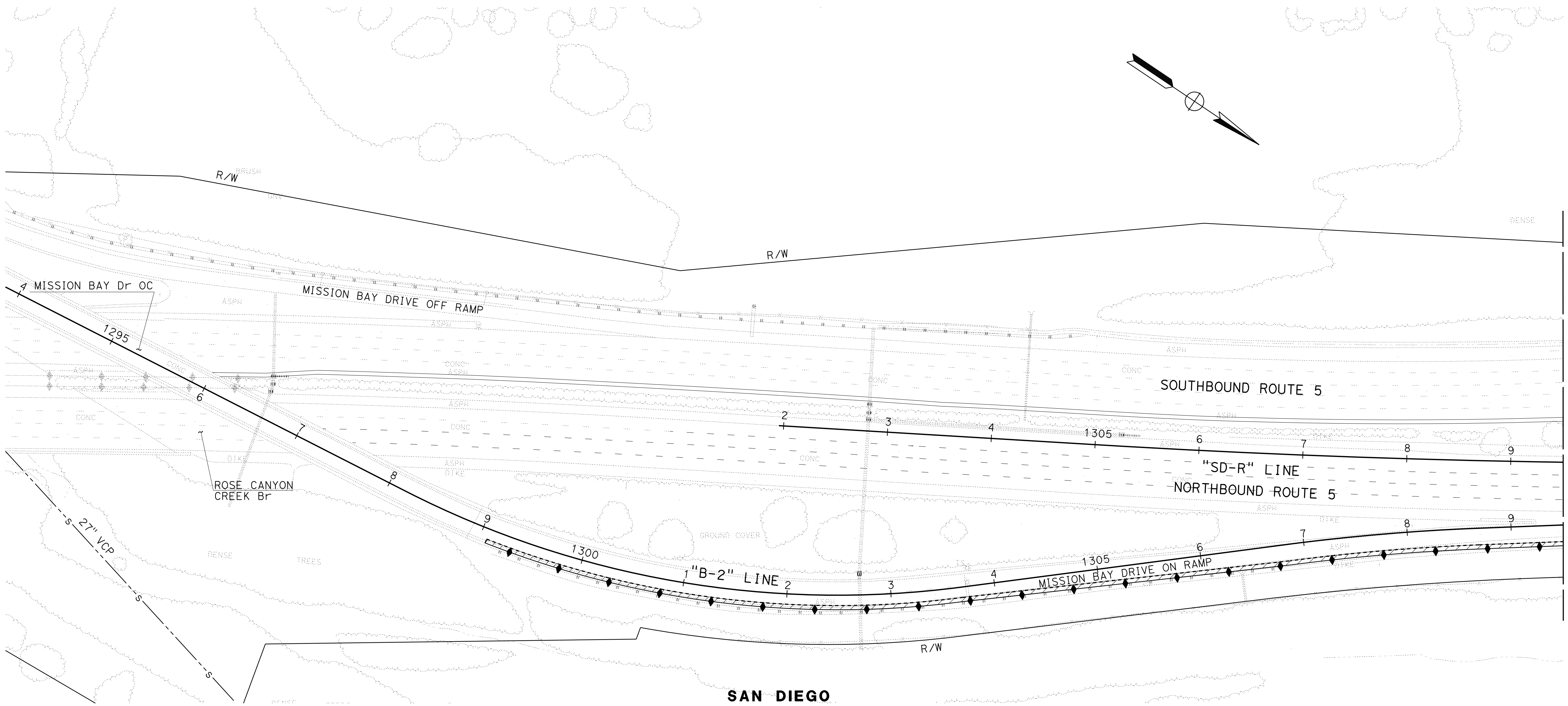
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

NOTE:

1. FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.
2. LOCATION OF UTILITY FACILITIES SHOWN ON THESE PLANS WERE OBTAINED FROM OWNERS' RECORDS AND/OR FROM FIELD SURVEYS.
3. ALL UTILITIES TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
4. SPACING OF CONCRETE PILING WILL BE ADJUSTED IN FIELD TO AVOID IMPACTING EXISTING UNDERGROUND UTILITY FACILITIES.



LEGEND:

——s—— - - ——s——	Exist SEWER OF CITY OF SAN DIEGO
——g—— - ——g——	Exist GAS LINE OF SAN DIEGO GAS AND ELECTRIC
—e—— ——(oh)—	Exist OVER HANG ELECTRICAL LINE OF SAN DIEGO GAS AND ELECTRIC

SCALE 1"=50'

UTILITY PLAN

U-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans TRAFFIC PROJECT DEVELOPMENT

FUNCTIONAL SUPERVISOR	CALCULATED-DESIGNED BY	DONI DE CASTRO	REVISED BY
RICHARD ESTRADA	CHECKED BY	MATT MACE	DATE REVISED

LAST REVISION 06-18-12 DATE PLOTTED => 11-JUL-2012 TIME PLOTTED => 09:23

BORDER LAST REVISED 7/1/2010 | USERNAME => s109745 DGN FILE => b1100020014ka001.dgn | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | UNIT 2771 | PROJECT NUMBER & PHASE 1100020014

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans TRAFFIC PROJECT DEVELOPMENT

FUNCTIONAL SUPERVISOR	CALCULATED-DESIGNED BY	DONI DE CASTRO	REVISED BY
RICHARD ESTRADA	CHECKED BY	MATT MACE	DATE REVISED

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5	R23.9/R25.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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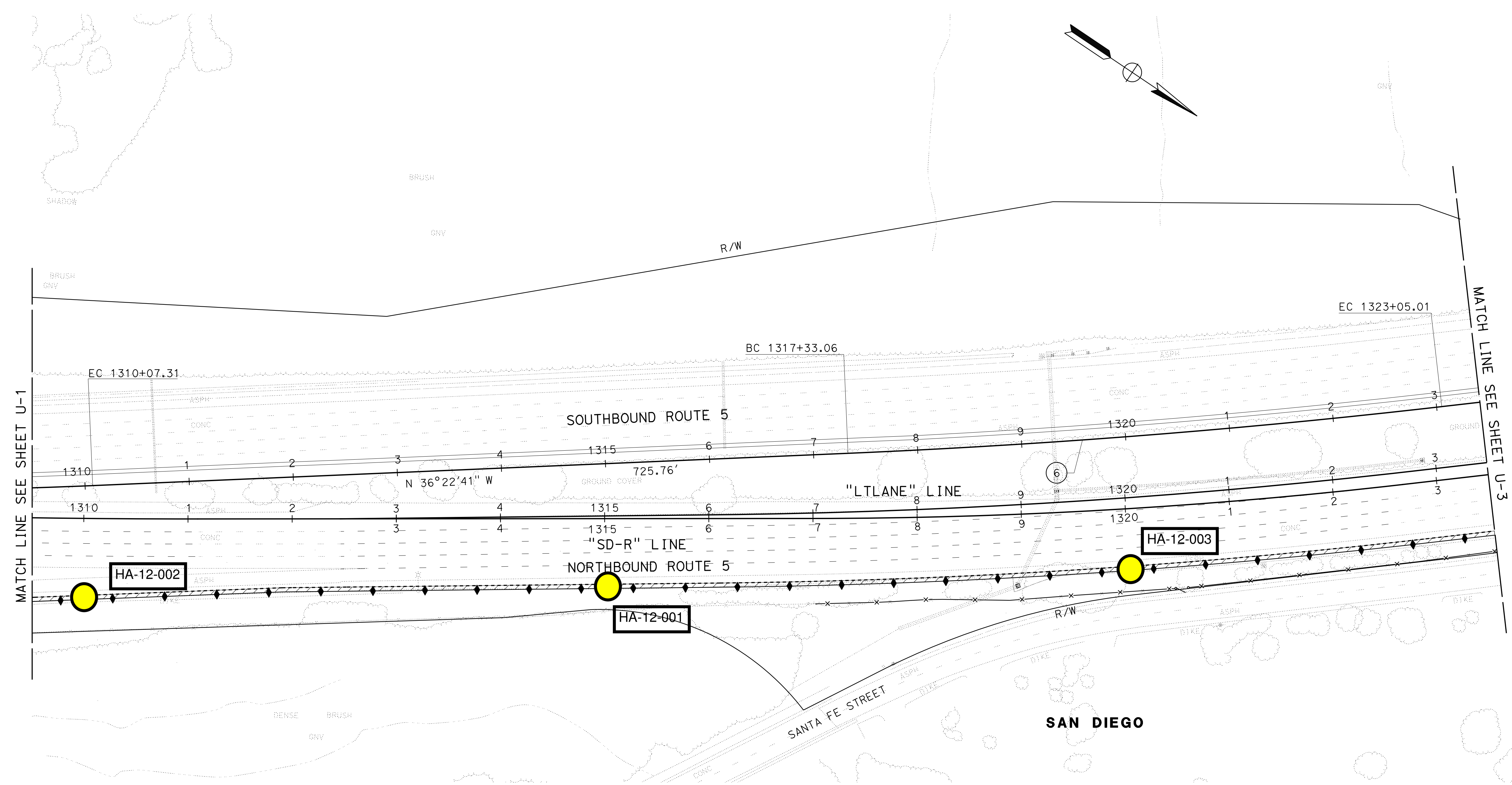
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

NOTE:

1. FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.



UTILITY PLAN

SCALE 1"=50'

U-2

LAST REVISION 06-18-12

DATE PLOTTED => 11-JUL-2012

TIME PLOTTED => 09:24

BORDER LAST REVISED 7/1/2010

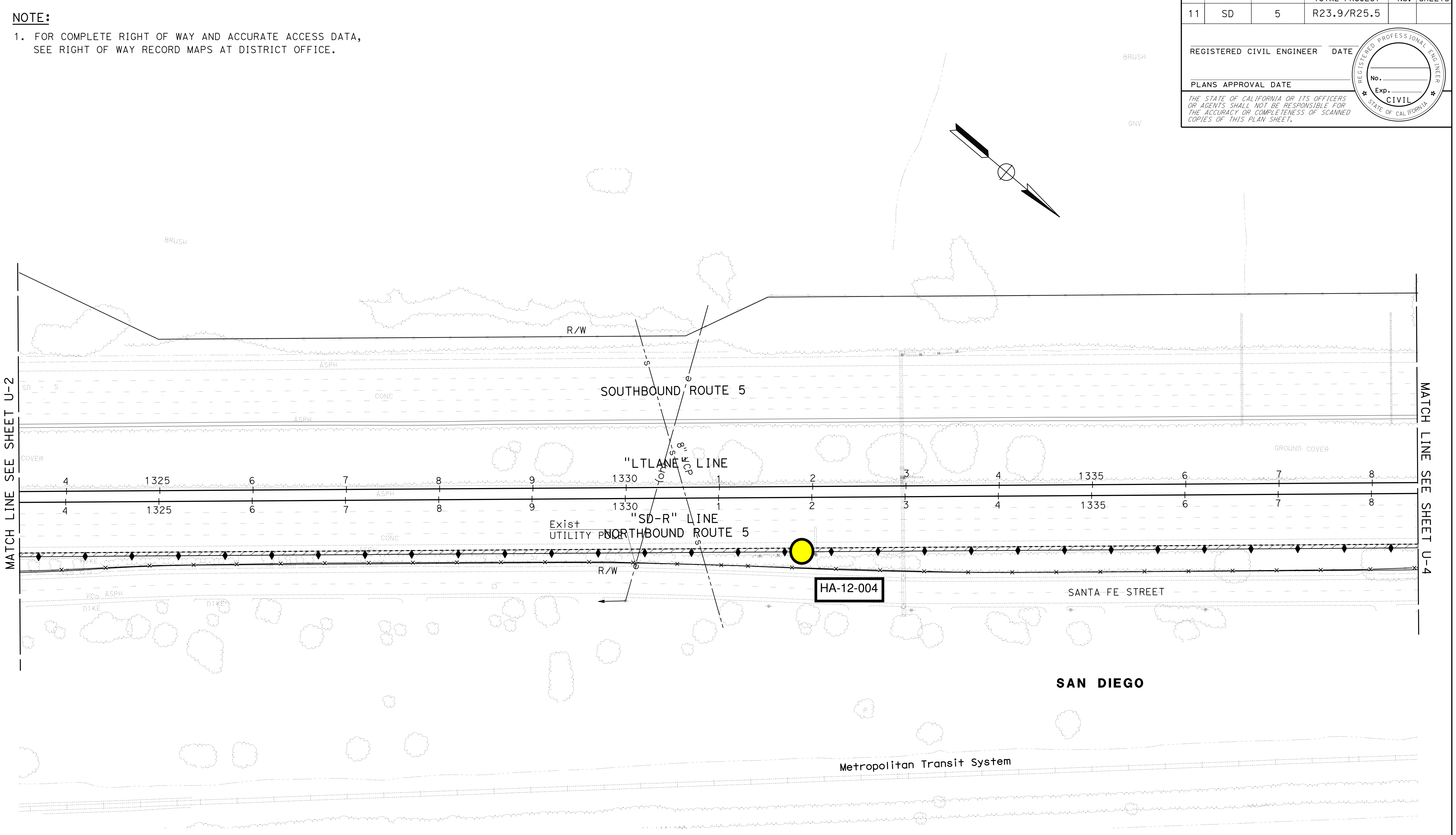
USERNAME => s109745

DGN FILE => b1100020014ka002.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 2771

PROJECT NUMBER & PHASE 1100020014



Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5	R23.9/R25.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans TRAFFIC PROJECT DEVELOPMENT

FUNCTIONAL SUPERVISOR: RICHARD ESTRADA

CALCULATED-DESIGNED BY: DONI DE CASTRO

CHECKED BY: MATT MACE

REVISED BY

DATE REVISED

UTILITY PLAN

SCALE 1"=50'

U-3

LAST REVISION 06-18-12 DATE PLOTTED => 11-JUL-2012 TIME PLOTTED => 09:24

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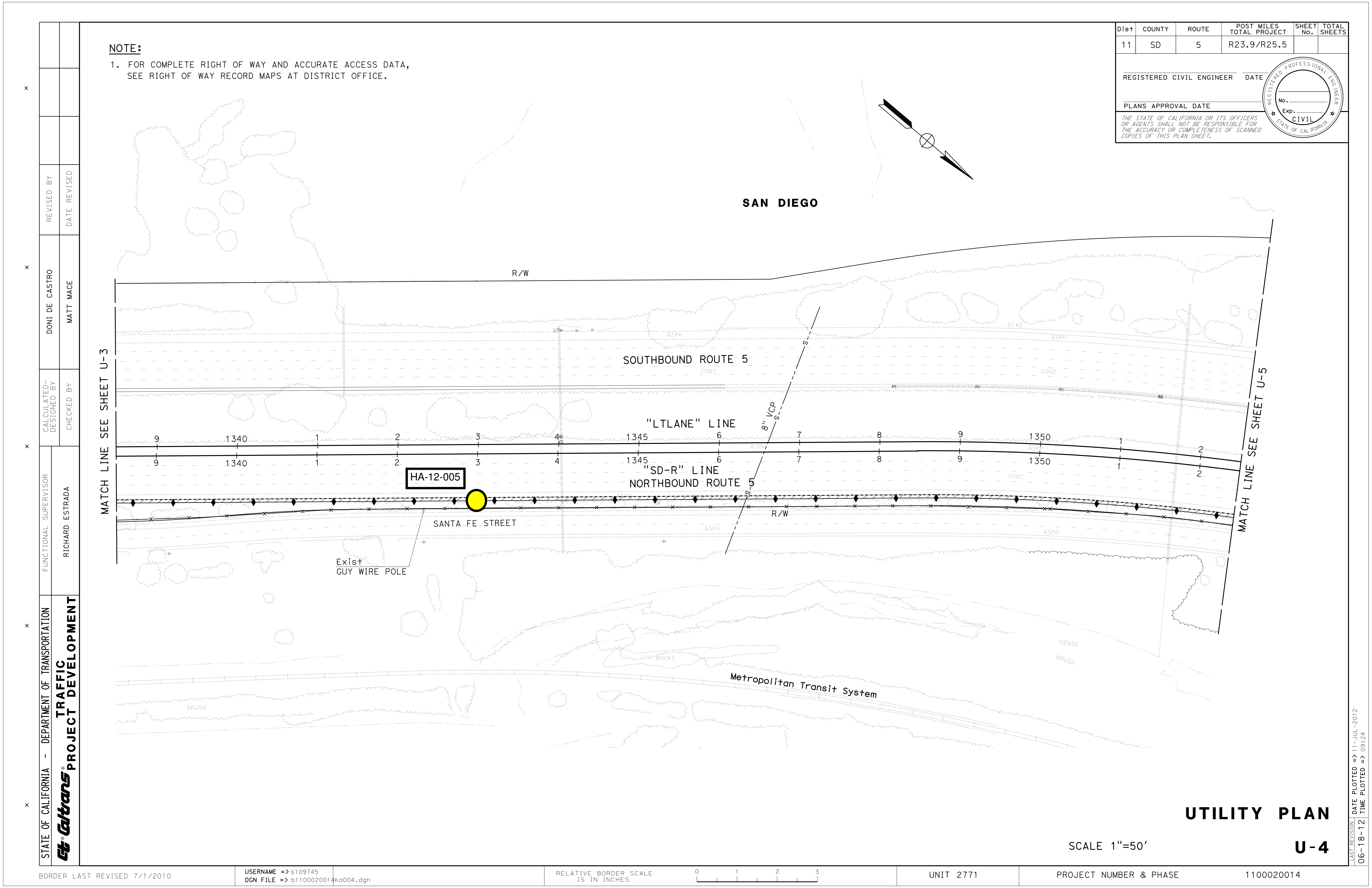
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans
TRAFFIC
PROJECT DEVELOPMENT
FUNCTIONAL SUPERVISOR
RICHARD ESTRADA
CALCULATED-DESIGNED BY
DONI DE CASTRO
CHECKED BY
MATT MACE
REVISED BY
DATE REVISED
NOTE:
1. FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.
Dist | COUNTY | ROUTE | POST MILES TOTAL PROJECT | SHEET No. | TOTAL SHEETS
11 | SD | 5 | R23.9/R25.5
REGISTERED CIVIL ENGINEER DATE
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REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA
SAN DIEGO
R/W
MATCH LINE SEE SHEET U-3
MATCH LINE SEE SHEET U-5
SOUTHBOUND ROUTE 5
"LTLANE" LINE
"SD-R" LINE
NORTHBOUND ROUTE 5
8" VCP
1340
1345
1350
HA-12-005
SANTA FE STREET
Exist
GUY WIRE POLE
Metropolitan Transit System
UTILITY PLAN
SCALE 1"=50'
U-4
LAST REVISION
06-18-12
DATE PLOTTED => 11-JUL-2012
TIME PLOTTED => 09:24
BORDER LAST REVISED 7/1/2010
USERNAME => s109745
DGN FILE => b1100020014ka004.dgn
RELATIVE BORDER SCALE IS IN INCHES
UNIT 2771
PROJECT NUMBER & PHASE
1100020014

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans TRAFFIC PROJECT DEVELOPMENT

FUNCTIONAL SUPERVISOR: RICHARD ESTRADA

CALCULATED-DESIGNED BY: DONI DE CASTRO

CHECKED BY: MATT MACE

REVISED BY

DATE REVISED

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
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REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

NOTE:

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UTILITY PLAN

SCALE 1"=50'

U-5

LAST REVISION 06-18-12 DATE PLOTTED => 11-JUL-2012 TIME PLOTTED => 09:24

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NOTE:

1. FOR COMPLETE RIGHT OF WAY AND ACCURATE ACCESS DATA, SEE RIGHT OF WAY RECORD MAPS AT DISTRICT OFFICE.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5	R23.9/R25.5		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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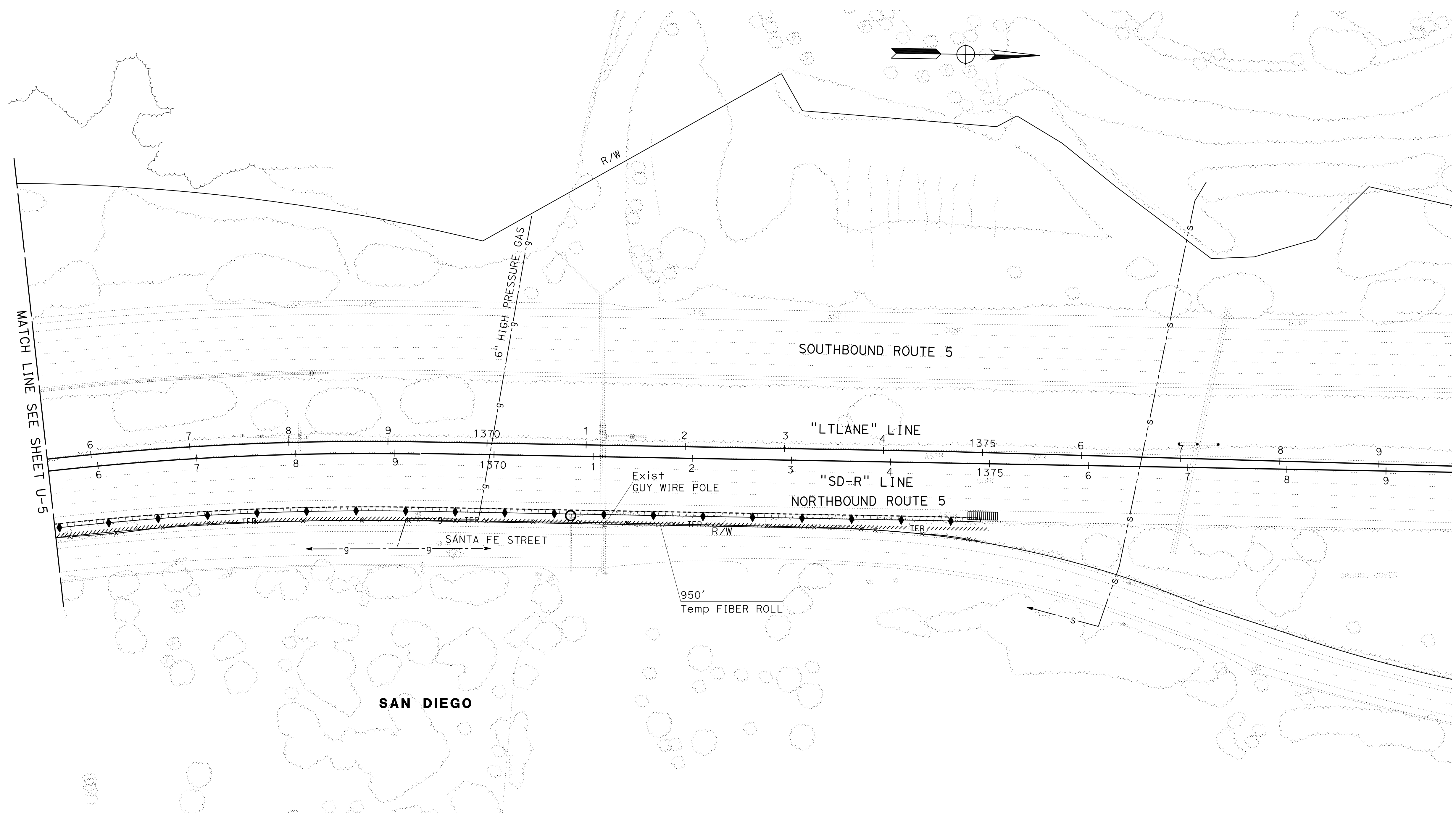


UTILITY PLAN

U-6

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans TRAFFIC PROJECT DEVELOPMENT

FUNCTIONAL SUPERVISOR: RICHARD ESTRADA

CALCULATED-DESIGNED BY: DONI DE CASTRO

CHECKED BY: MATT MACE

REVISED BY

DATE REVISED

LAST REVISION 06-18-12

DATE PLOTTED => 11-JUL-2012

TIME PLOTTED => 09:24

BORDER LAST REVISED 7/1/2010

USERNAME => s109745

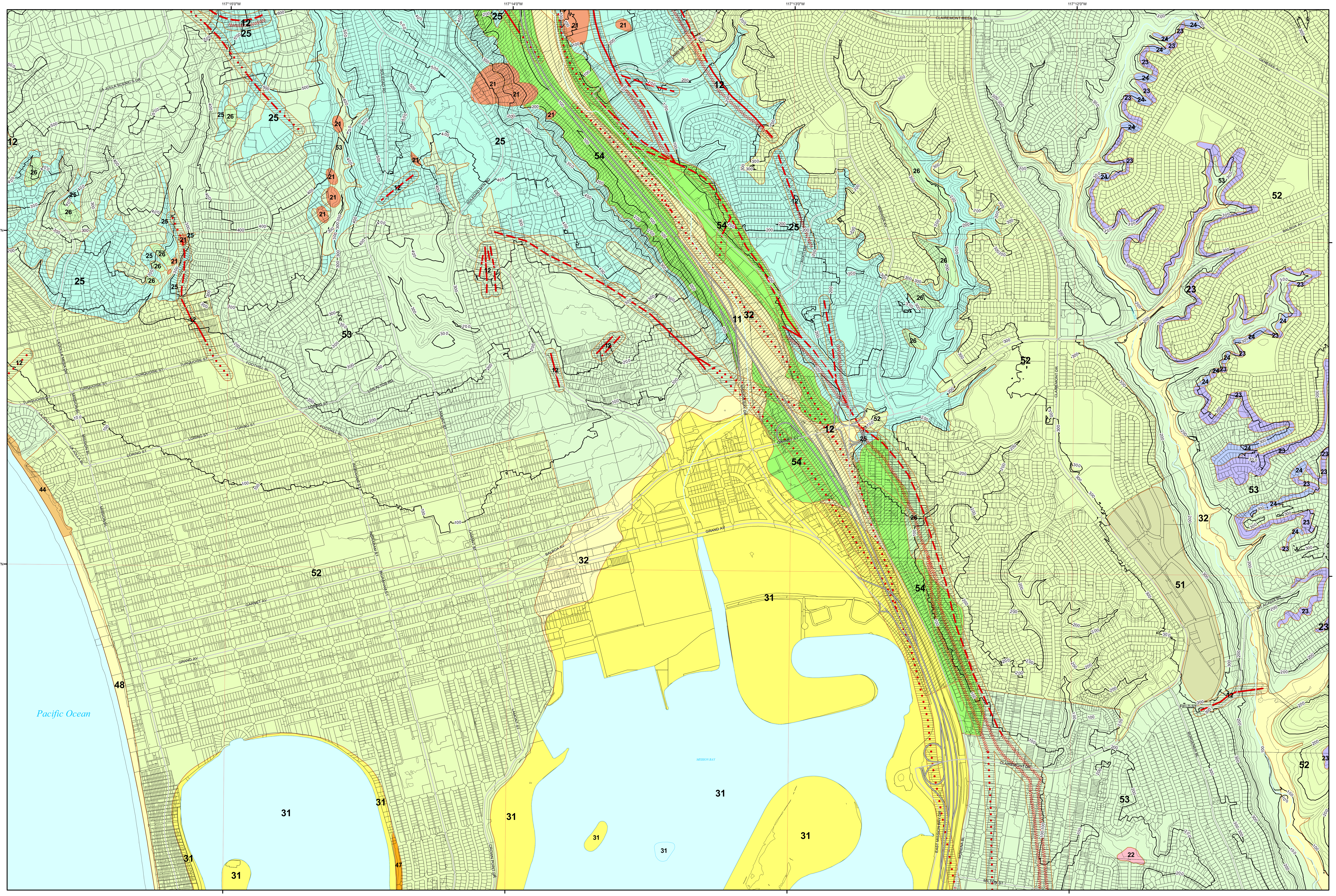
DGN FILE => b1100020014ka006.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 2771

PROJECT NUMBER & PHASE 1100020014

FIGURE 3: GEOLOGIC OVERVIEW MAP



LEGEND

Geologic Hazard Categories

FAULT ZONES

- 11 Active, Alquist-Priolo Earthquake Fault Zone
- 12 Potentially Active, Inactive, Presumed Inactive, or Activity Unknown
- 13 Downtown special fault zone

LANDSLIDES

- 21 Confirmed, known, or highly suspected
- 22 Possible or conjectured

SLIDE-PRONE FORMATIONS

- 23 Friars: neutral or favorable geologic structure
- 24 Friars: unfavorable geologic structure
- 25 Ardath: neutral or favorable geologic structure
- 26 Ardath: unfavorable geologic structure
- 27 Otay, Sweetwater, and others

LIQUEFACTION

- 31 High Potential -- shallow groundwater major drainages, hydraulic fills
- 32 Low Potential -- fluctuating groundwater minor drainages

COASTAL BLUFFS

- 41 Generally unstable Numerous landslides, high steep bluffs, severe erosion, unfavorable geologic structure
- 42 Generally unstable Unfavorable bedding plains, high erosion
- 43 Generally unstable Unfavorable jointing, local high erosion
- 44 Moderately stable Mostly stable formations, local high erosion
- 45 Moderately stable Some minor landslides, minor erosion
- 46 Moderately stable Some unfavorable geologic structure, minor or no erosion
- 47 Generally stable Favorable geologic structure, minor or no erosion, no landslides
- 48 Generally stable Broad beach areas, developed harbor

OTHER TERRAIN

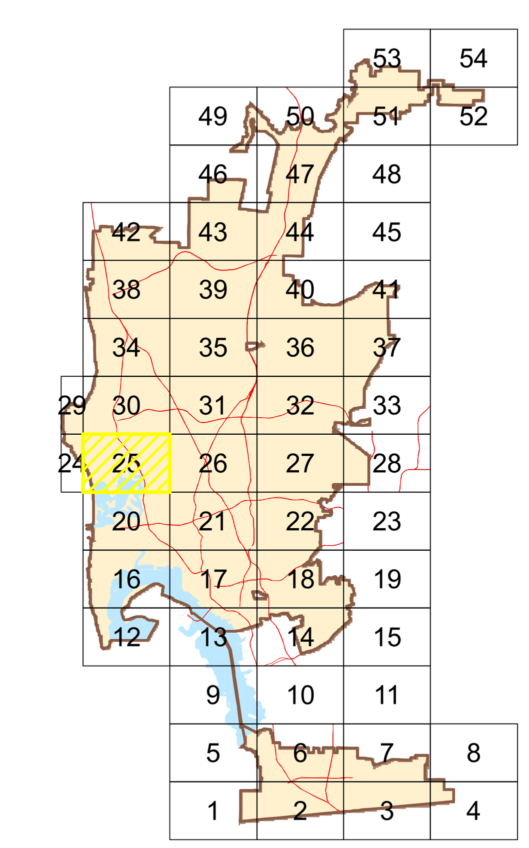
- 51 Level mesas -- underlain by terrace deposits and bedrock nominal risk
- 52 Other level areas, gently sloping to steep terrain, favorable geologic structure, Low risk
- 53 Level or sloping terrain, unfavorable geologic structure, Low to moderate risk
- 54 Steeply sloping terrain, unfavorable or fault controlled geologic structure, Moderate risk
- 55 Modified terrain (graded sites) Nominal risk

Water (Bays and Lakes)

FAULTS

- Fault
- Inferred Fault
- Concealed Fault
- Shear Zone

Index Map



SanGIS Basemap Accuracy

SanGIS Land (Lot) basemap data for the City of San Diego tested 20.7' horizontal accuracy at the 95% confidence level.

This data meets the ASPRS Standard for Class 1 Map Accuracy at a scale of 1:12,000 (1"=1,000').

This assessment assumes utilization of the data on a citywide basis. Localized data may exceed or fail to meet this accuracy with errors in excess of 100' possible.

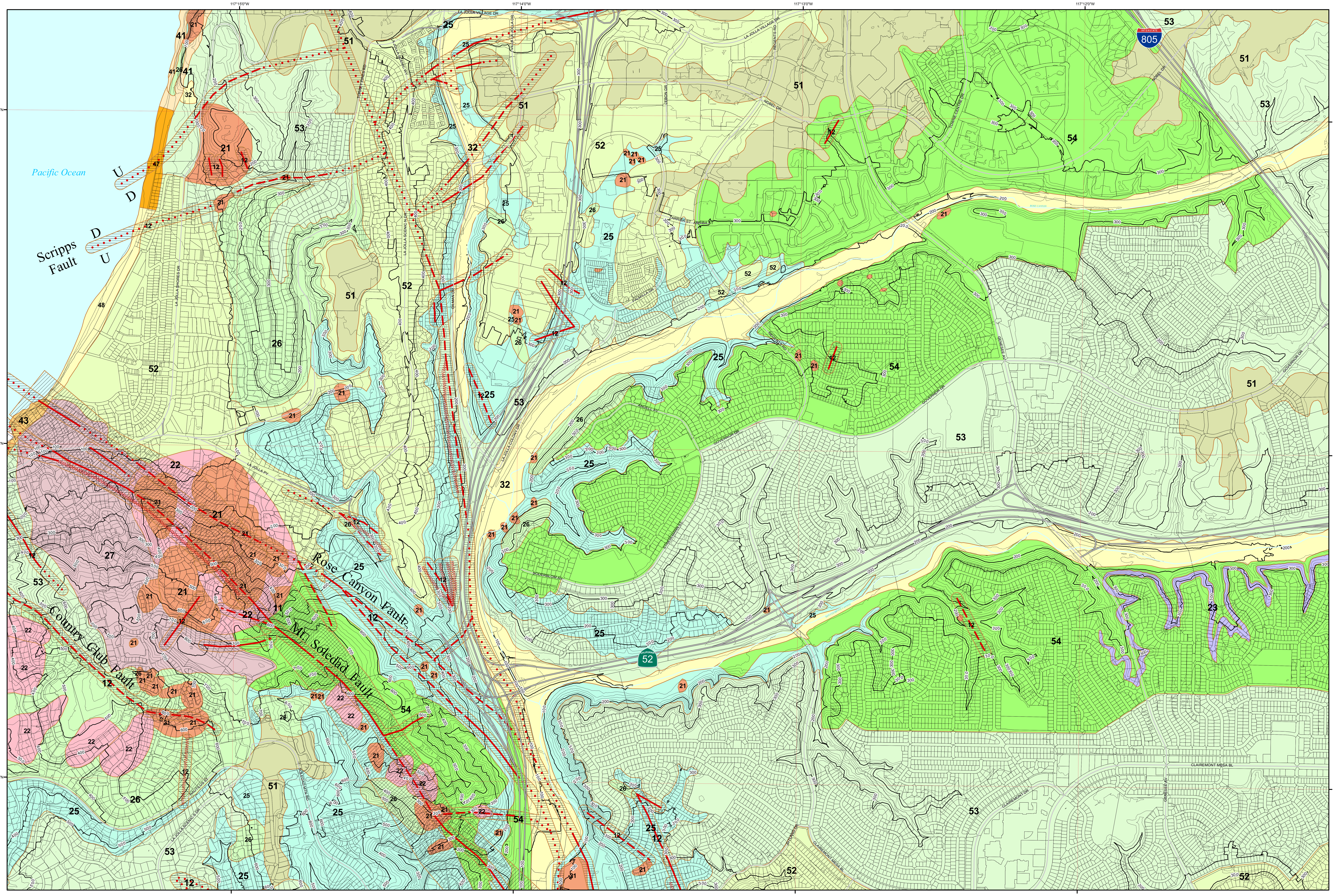
City of San Diego
SEISMIC SAFETY STUDY
Geologic Hazards and Faults

Development Services Department

Feet: 0 400 800 1,600 2,400
Meters: 0 120 240 480 720 960

GRID TILE: 25
GRID SCALE: 800
DATE: 4/3/2008

FIGURE 4A: CITY OF SAN DIEGO GEOLOGIC HAZARD MAP



LEGEND

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- 55 Modified terrain (graded sites) Nominal risk

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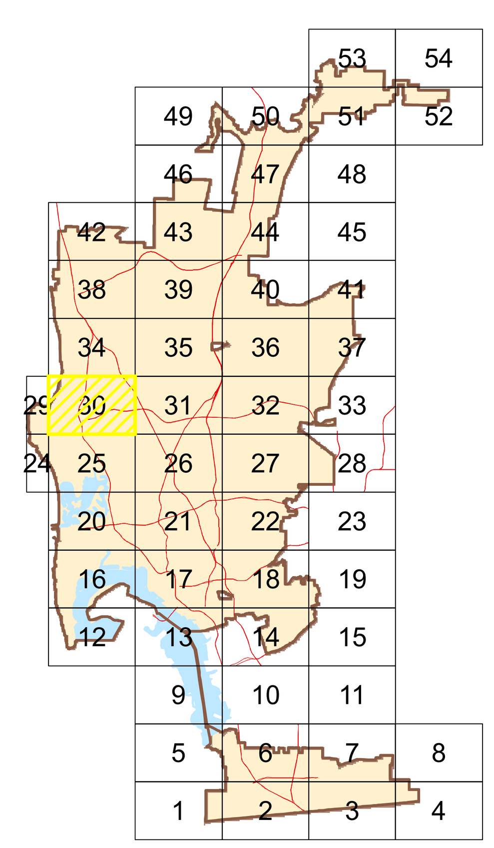
- Fault
- Inferred Fault
- Concealed Fault
- Shear Zone

Index Map



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City of San Diego
SEISMIC SAFETY STUDY
Geologic Hazards and Faults

Development Services Department

GRID TILE: 30
GRID SCALE: 800
DATE: 4/3/2008

TABLES

TABLE 1: REGIONAL ACTIVE FAULT(S)

Fault Name (Initials)	FID	M_{MAX}	Fault Type	Fault Dip	Dip Direction	Z_{BOT}	Z_{TOR}	R_{RUP}	R_{JB}	R_X	F_{NM}	F_{RV}
Newport Inglewood-Rose Canyon fz (San Diego section)	224	7.5	RLSS	90º	Vertical	8.1mi (13.0km)	0.0	2.1mi (3.4km)	2.1mi (3.4km)	2.1mi (3.4km)	0	0

Notes: FID = The fault ID number. Fault Identification Number (FID), used to identify a fault trace on the Caltrans Deterministic PGA Map.
M_{MAX} = Maximum Moment Magnitude: Defined as the largest earthquake a fault is capable of generating.
Fault Type = Right Lateral Strike Slip (RLSS).
Fault Dip = The angle between the fault plane and the horizontal plane.
Dip Direction = The direction the fault dips.
Z_{BOT} = The depth to the bottom of the rupture plane.
Z_{TOR} = The depth to the top of the rupture plane.
R_{RUP} = The closest distance to the fault rupture plane.
R_{JB} = The shortest horizontal distance to the surface projection of the rupture area (a.k.a. Joyner-Boone Distance).
R_X = The horizontal distance to the fault trace or surface projection of the top of the rupture plane.
F_{NM} = The faults identified as a normal fault.
F_{RV} = The faults identified as a reverse fault.

TABLE 2: SOIL SURVEY DATA

Soil Symbol	Soil Series	Soil Classification		Soil Depth (in)	Permeability (in/hr)	Erodibility by Water[a]	Hydraulic Group[b]
		Unified	AASHTO				
Md	Made Land	VA	VA	VA	VA	VA	D
HrE2	Huerhuero Loam 15 to 30 Percent Slope, Eroded	ML	A-4	0-12	0.63-2.0	SE(9)	D
		CL	A-6	12-55	<0.06		
		SM or SC	A-2 or A-4	55-68	0.63-2.0		

Notes:
a: Numerals indicate soil properties of qualities that effect erodibility.
(9) depth in feet to hard rock
b: Reference United States Department of Agriculture, Soil Survey (1973) and General Map (1971), San Diego Area, California
D = Soil with a very slow infiltration rate.
c: VA indicates variable conditions.

TABLE 3: SOIL STRENGTH PARAMETERS

Geologic Unit	Cohesion (psf)	Angle of Internal Friction (degrees)	In-Situ Dry Density (pcf)
Artificial Fill	0	35	115
Sandstone	200	35	125
Siltstone (Ardath Shale)	200	28	125

TABLE 4: SUBSURFACE SOIL DESCRIPTION

Boring No.	Alignment	Station	Offset (ft)	Depth (ft)	Comments
HA-12-001	"SD-R" Line	1315+00	72	5	Silty Sand (SM); Yellowish Brown; Moist; Fine Grain Sand with Few Rounded Gravel
HA-12-002	"B-2" Line	1310+00	19	3	Silty Sand (SM); Yellowish Brown; Moist; Fine Grain Sand with Few Rounded Gravel
HA-12-003	"SD-R" Line	1320+00	66	2	Silty Sand (SM); Yellowish Brown; Moist; Fine Grain Sand with Few Rounded Gravel and Cobbles
HA-12-004	"SD-R" Line	1332+00	68	6	Silty Sand (SM); Yellowish Brown; Moist; Fine Grain Sand with Few Rounded Gravel
HA-12-005	"SD-R" Line	1343+00	72	2	Silty Sand (SM); Yellowish Brown; Moist; Fine Grain Sand with Few Rounded Gravel
HA-12-006	"SD-R" Line	1356+20	55	4	Silty Sand (SM); Yellowish Brown; Moist; Fine Grain Sand with Few Rounded Gravel

TABLE 5: ARCHIVED GROUNDWATER ELEVATIONS

Bridge No.	Bridge Name	Archived Boring No.	Alignment	Station	Offset (ft)	Original Ground Elevation (ft)	Ground water Elevation (ft)	Date of Reading	Comments
57-457	Mission Bay Drive Direct Connection Overcrossing	B-9	"B-2" Line	260+67	45 "Rt"	26	13.5	11-13-1965	B-9 was performed closes to Rose Creek
57-289	Rose Canyon Creek Bridge	B-1	"C" Line	260+46	60 "Lt"	21.3	15.5	6-30-1952	
		B-3		262+15	53 "Rt"	20.4	18	7-8-1952	
		B-7		258+61	50 "Rt"	16.7	13.7	3-26-1953	
		B-12		261+14	60 "Lt"	26.17	15.0	11-13-1959	
		B-7	"P" Line	256+70	1 "Lt"	16.72	15.0	3-24-1953	
		B-8		259+05	89 "Lt"	18.5	13.0	3-26-1953	
		B-11		257+86	82 "Lt"	14.6	14	3-31-1953	
		B-1	"C" Line	260+46	60 "Lt"	21.3	16.5	6-30-1952	
		B-2		261+17	12 "Lt"	17.0	17.0	7-1-1952	
		B-3		262+15	55 "Rt"	20.0	18.0	7-8-1952	

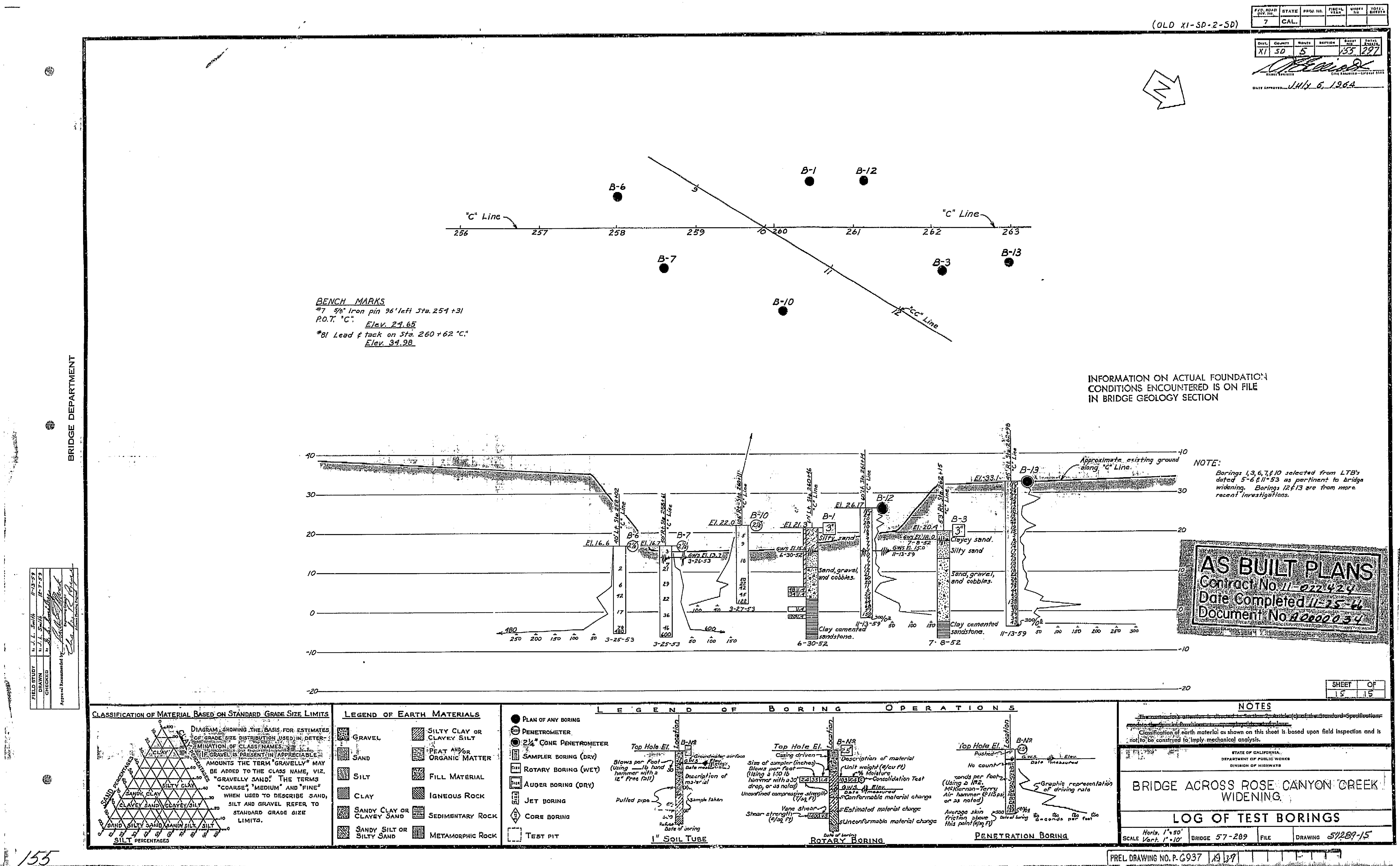
TABLE 6: BARRIER FOUNDATION

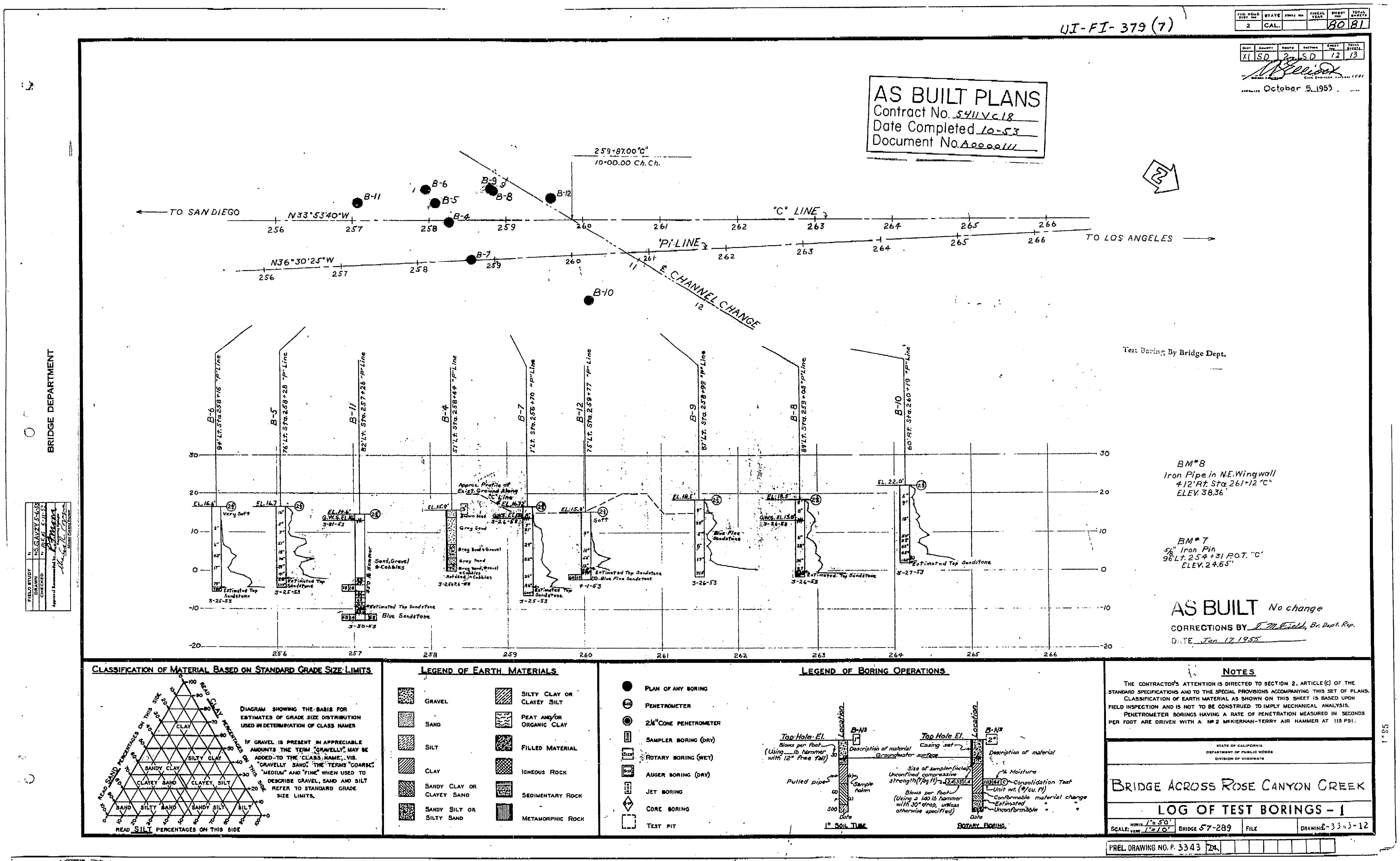
Alignment	Beginning Station	Ending Station	Length (ft)	Barrier Type	Pile Depth (ft)	Pile Spacing (ft)	Maximum He (ft)	Comments
"B-2" Line	1299+06.91	1312+45.66	1338.75	736S/SV	13.5	10	2.0	
"SD-R" Line	1312+45.91	1317+00	454.09	736S/SV	13.5	10	2.0	
"SD-R" Line	1317+00	1329+00	1100.00	Type 60	n/a	n/a	n/a	
"SD-R" Line	1329+00	1340+00	1200.00	736S/SV	13.5	10	2.0	
"SD-R" Line	1340+00	1360+00	2000.00	736S/SV	13.5	10	2.0	
"SD-R" Line	1360+00	1363+00	300.00	736S/SV	13.5	10	2.0	
"SD-R" Line	1363+00	1375+00	1200	Type 60	n/a	n/a		

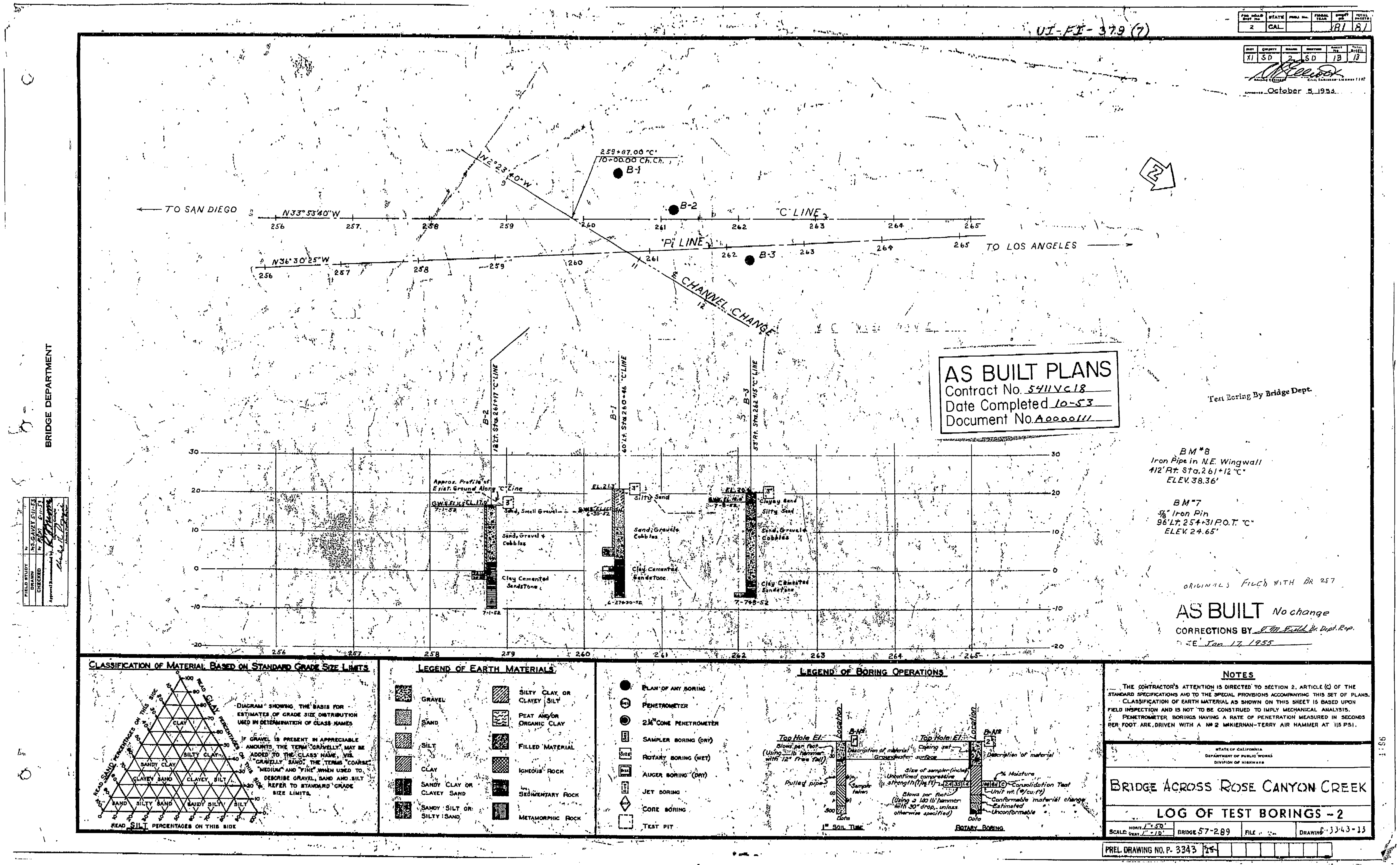
APPENDICES

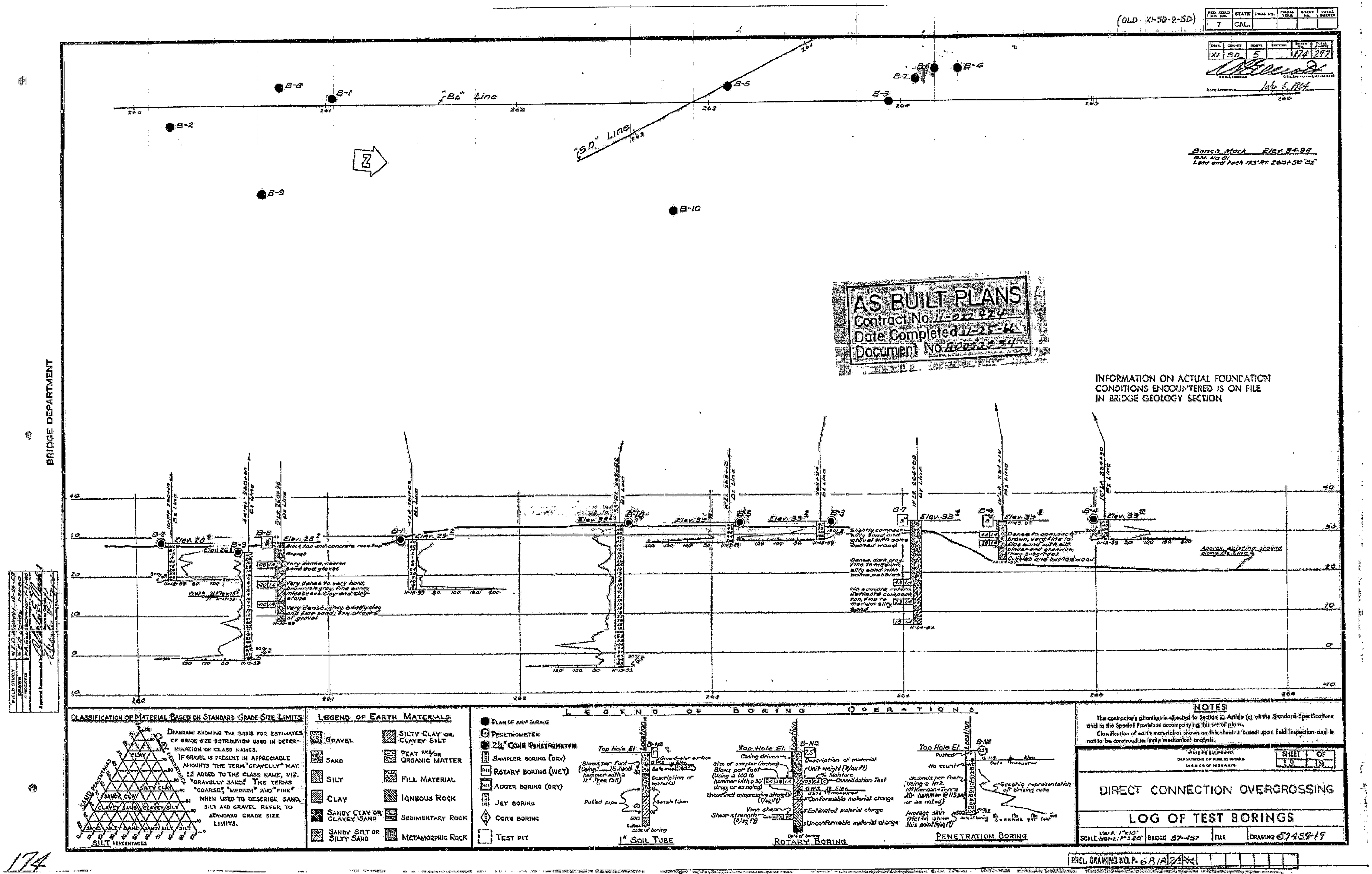
APPENDIX I

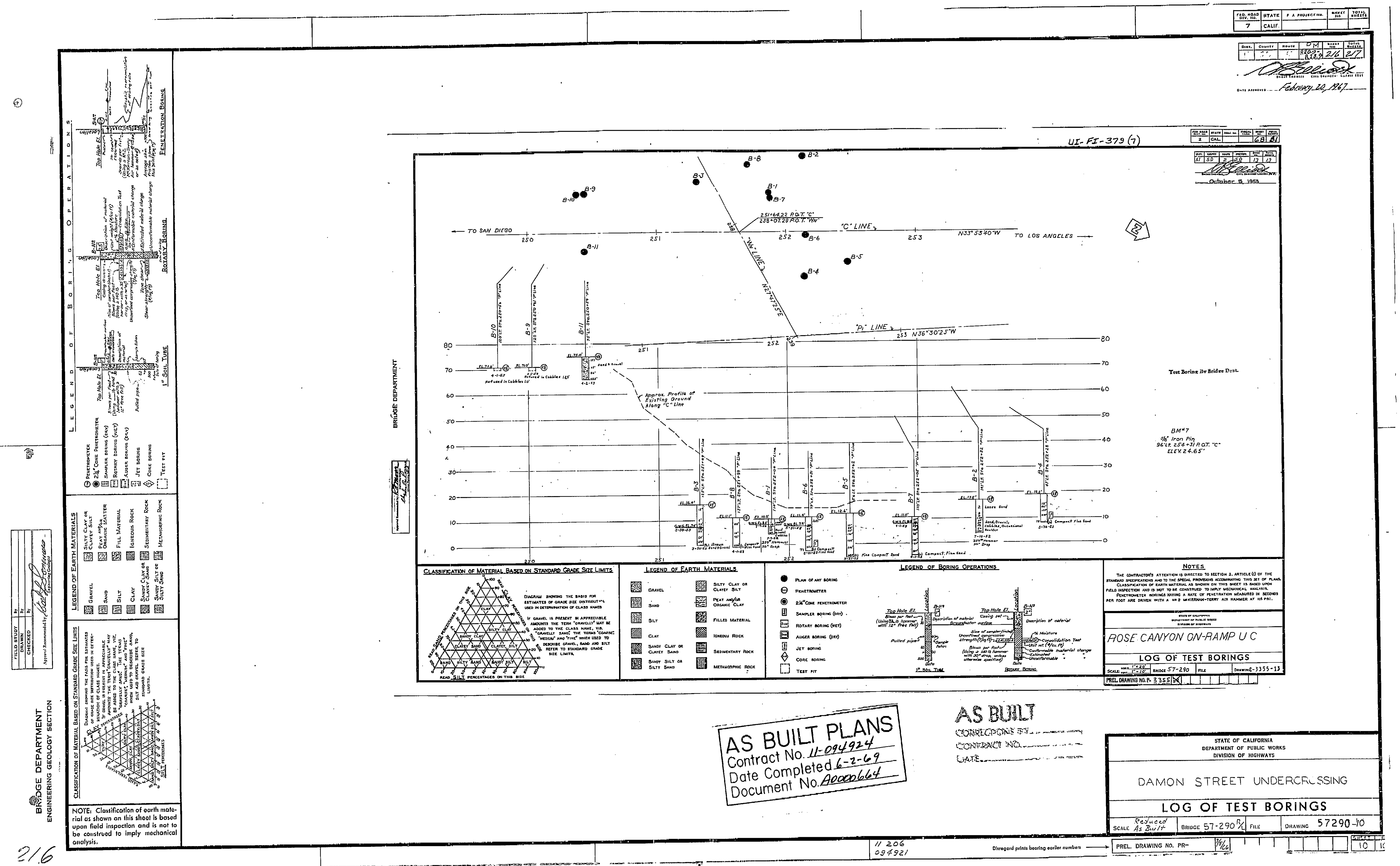
ARCHIVED LOG OF TEST BORING

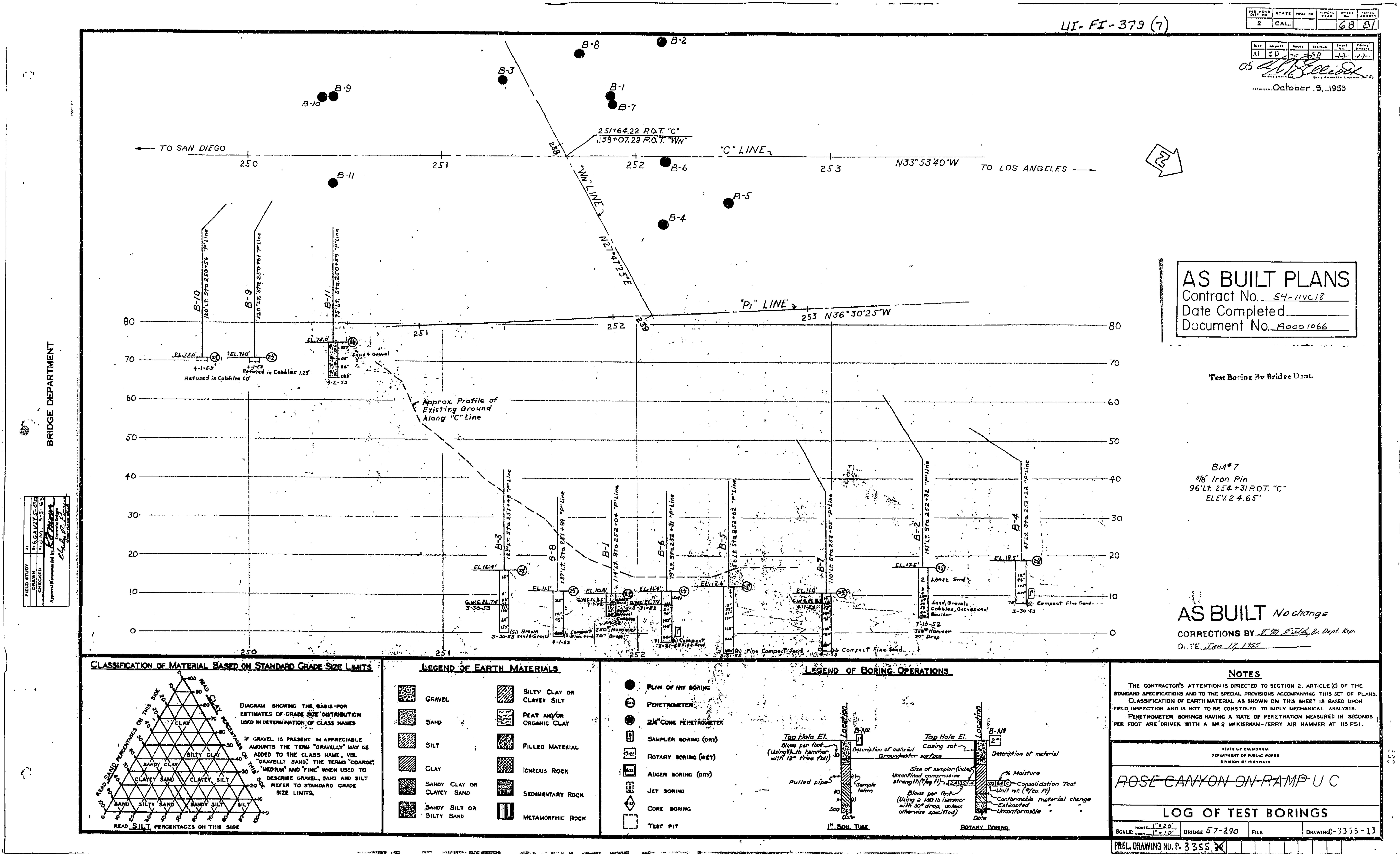

BRIDGE DEPARTMENT
FIELD STUDY J. L. Smith 11-13-59
DRAWN J. L. Smith 12-7-59
CHECKED
Approval Recommended by:
(OLD XI-SD-2-SD)
F.E.D. ROAD DIV. NO. 7 STATE CAL.
DIST. XI COUNTY SD ROUTE 5 SHEET 155 TOTAL SHEETS 297
DATE APPROVED July 6, 1964
"C" Line
256 257 258 259 260 261 262 263
B-6 B-7 B-1 B-12 B-10 B-3 B-13
"CC" Line
BENCH MARKS
#7 5/8" Iron pin 96' left Sta. 254+31 P.O.T. "C". Elev. 24.65
#81 Lead & tack on Sta. 260+62 "C." Elev. 34.98
INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION
NOTE:
Borings 1,3,6,7,&10 selected from LTB's dated 5-6 & 11-53 as pertinent to bridge widening. Borings 12 & 13 are from more recent investigations.
Approximate existing ground along "C" Line.
El. 16.6 El. 16.7 El. 22.0 El. 21.1 El. 26.17 El. 20.4 El. 33.1
Silty sand
Sand, gravel, and cobbles.
Clay cemented sandstone.
Clayey sand.
3-25-53 3-27-53 6-30-52 11-13-59 7-8-52
AS BUILT PLANS
Contract No. 11-022424
Date Completed 11-25-66
Document No. A0000034
SHEET 15 OF 15
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES. IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC MATTER
FILL MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PLAN OF ANY BORING
PENETROMETER
2½" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
1" SOIL TUBE
ROTARY BORING
PENETRATION BORING
NOTES
Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.
STATE OF CALIFORNIA DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS
BRIDGE ACROSS ROSE CANYON CREEK WIDENING.
LOG OF TEST BORINGS
SCALE Horiz. 1"=50' Vert. 1"=10'
BRIDGE 57-289
DRAWING 57289-15
PREL. DRAWING NO. P-G937
155


UI-FI-379 (7)
2 CAL. 80 81
XI SD 2 SD 12 13
October 5, 1953
FIELD STUDY
DRAWN S.GAVZY 5-6-53
CHECKED
BRIDGE DEPARTMENT
AS BUILT PLANS
Contract No. 54IIVC18
Date Completed 10-53
Document No. A0000111
259+87.00"C"
10+00.00 Ch.Ch.
TO SAN DIEGO
TO LOS ANGELES
N33°53'40"W
N36°30'25"W
"C" LINE
'P' LINE
℄ CHANNEL CHANGE
B-6 94'Lt. Sta.258+16 "P"Line
B-5 76'Lt. Sta.258+28 "P"Line
B-11 82'Lt. Sta.257+26 "P"Line
B-4 51'Lt. Sta.258+44 "P"Line
B-7 1'Lt. Sta.258+70 "P"Line
B-12 75'Lt. Sta.259+77 "P"Line
B-9 87'Lt. Sta.258+99 "P"Line
B-8 89'Lt. Sta.259+03 "P"Line
B-10 60'Rt. Sta.260+19 "P"Line
Test Boring By Bridge Dept.
BM#8
Iron Pipe in N.E.Wingwall
4.12'Rt. Sta.261+12 "C"
ELEV. 38.36'
BM#7
5/8" Iron Pin
96'Lt. 254+31 P.O.T. "C"
ELEV. 24.65'
AS BUILT No change
CORRECTIONS BY F.M.Field, Br. Dept. Rep.
DATE Jan 17, 1955
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND". THE TERMS "COARSE" "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS.
READ SAND PERCENTAGES ON THIS SIDE
READ CLAY PERCENTAGES ON THIS SIDE
READ SILT PERCENTAGES ON THIS SIDE
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC CLAY
FILLED MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PLAN OF ANY BORING
PENETROMETER
2½" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
1" SOIL TUBE
ROTARY BORING
NOTES
THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (C) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS.
CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.
PENETROMETER BORINGS HAVING A RATE OF PENETRATION MEASURED IN SECONDS PER FOOT ARE DRIVEN WITH A No 2 McKIERNAN-TERRY AIR HAMMER AT 115 PSI.
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
BRIDGE ACROSS ROSE CANYON CREEK
LOG OF TEST BORINGS - 1
SCALE: HORIZ. 1"=50' VERT. 1"=10'
BRIDGE 57-289
DRAWING C-3343-12
PREL. DRAWING NO. P. 3343


BRIDGE DEPARTMENT
UI-FI-379 (7)
October 5, 1953
TO SAN DIEGO
TO LOS ANGELES
N33°53'40"W
N36°30'25"W
N2°23'40"W
"C" LINE
"PI" LINE
℄ CHANNEL CHANGE
259+87.00 "C" 10+00.00 Ch.Ch.
B-1
B-2
B-3
B-2 18' Lt. Sta. 261+17 "C" LINE
B-1 60' Lt. Sta. 260+46 "C" LINE
B-3 53' Rt. Sta. 262+15 "C" LINE
Approx. Profile of Exist. Ground Along "C" Line
Sand, Small Gravel
Sand, Gravel & Cobbles
Clay Cemented Sandstone
Silty Sand
Sand, Gravel & Cobbles
Clayey Sand
AS BUILT PLANS
Contract No. 5411VC18
Date Completed 10-53
Document No. A00000111
Test Boring By Bridge Dept.
BM #8
Iron Pipe in N.E. Wingwall
412' Rt. Sta. 261+12 "C"
ELEV. 38.36'
BM #7
5/8" Iron Pin
96' Lt. 254+31 P.O.T. "C"
ELEV. 24.65'
ORIGINALS FILED WITH BR 257
AS BUILT No change
CORRECTIONS BY
Jan 17, 1955
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS, THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIS. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE GRAVEL, SAND AND SILT REFER TO STANDARD GRADE SIZE LIMITS.
READ SAND PERCENTAGES ON THIS SIDE
READ CLAY PERCENTAGES ON THIS SIDE
READ SILT PERCENTAGES ON THIS SIDE
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC CLAY
FILLED MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PLAN OF ANY BORING
PENETROMETER
2½" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
NOTES
THE CONTRACTOR'S ATTENTION IS DIRECTED TO SECTION 2, ARTICLE (C) OF THE STANDARD SPECIFICATIONS AND TO THE SPECIAL PROVISIONS ACCOMPANYING THIS SET OF PLANS.
CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.
PENETROMETER BORINGS HAVING A RATE OF PENETRATION MEASURED IN SECONDS PER FOOT ARE DRIVEN WITH A No 2 McKIERNAN-TERRY AIR HAMMER AT 115 PSI.
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
BRIDGE ACROSS ROSE CANYON CREEK
LOG OF TEST BORINGS - 2
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'
BRIDGE 57-289
DRAWING 5-3343-13
PREL. DRAWING NO. P-3343


BRIDGE DEPARTMENT
(OLD XI-SD-2-SD)
7 CAL.
XI SD 5 174 297
"B2" Line
"SD" Line
B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
Bench Mark Elev. 34.98
AS BUILT PLANS
Contract No. 11-022424
Date Completed 11-25-66
INFORMATION ON ACTUAL FOUNDATION CONDITIONS ENCOUNTERED IS ON FILE IN BRIDGE GEOLOGY SECTION
Block top and concrete road base
Gravel
Very dense, coarse sand and gravel
Very dense to very hard, brownish gray, fine sandy micaceous clay and clay-stone
Very dense, gray sandy clay and fine sand, few streaks of gravel
Slightly compact silty sand and gravel with some burned wood
Dense, dark gray, fine to medium silty sand with some pebbles
No sample return. Estimate compaction fine to medium silty sand
Dense to compact, brown, very fine to fine sand with silt binder and granules. (Very subgrade) Cobbles and burned wood
Approx. existing ground along B2 Line
CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.
LEGEND OF EARTH MATERIALS
GRAVEL
SAND
SILT
CLAY
SANDY CLAY OR CLAYEY SAND
SANDY SILT OR SILTY SAND
SILTY CLAY OR CLAYEY SILT
PEAT AND/OR ORGANIC MATTER
FILL MATERIAL
IGNEOUS ROCK
SEDIMENTARY ROCK
METAMORPHIC ROCK
LEGEND OF BORING OPERATIONS
PLAN OF ANY BORING
PENETROMETER
2¼" CONE PENETROMETER
SAMPLER BORING (DRY)
ROTARY BORING (WET)
AUGER BORING (DRY)
JET BORING
CORE BORING
TEST PIT
1" SOIL TUBE
ROTARY BORING
PENETRATION BORING
NOTES
The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provisions accompanying this set of plans.
Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
SHEET 19 OF 19
DIRECT CONNECTION OVERCROSSING
LOG OF TEST BORINGS
BRIDGE 57-457
DRAWING 57457-19
PREL. DRAWING NO. P-681A/23
174


BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION
LEGEND OF EARTH MATERIALS
LEGEND OF BORING OPERATIONS
BRIDGE DEPARTMENT
UI-FI-379 (7)
TO SAN DIEGO
"C" LINE
N33°55'40"W
TO LOS ANGELES
"P" LINE
N36°30'25"W
Approx. Profile of Existing Ground Along "C" Line
Test Boring By Bridge Dept.
October 5, 1955
February 20, 1967
NOTES
ROSE CANYON ON-RAMP U C
LOG OF TEST BORINGS
AS BUILT PLANS
Contract No. 11-094924
Date Completed 6-2-69
Document No. A0000664
AS BUILT
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
DAMON STREET UNDERCROSSING
LOG OF TEST BORINGS
BRIDGE 57-290
DRAWING 57290-10
Disregard prints bearing earlier numbers
PREL. DRAWING NO. PR-



I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 9/22/71 SIGNATURE [illegible] TITLE [illegible]

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS - MICROFILM

APPENDIX II

ANALYSES AND CALCULATIONS

2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

This document is to be filled out by *checker* to evaluate the fault parameters and design response spectrum used for seismic design recommendations for bridge structures. To facilitate the quality check, the designer shall provide the checker all pertinent project information, geologic information and approved exceptions (if applicable) needed to complete this form. The *checker* must be familiar with the Seismic Design Criteria (Appendix B), Deterministic PGA Map and ARS Online Report, and Geotechnical Services Design Manual in order to successfully perform a quality check. Tools available to checkers include the Deterministic Response Spectrum Spreadsheet, Probabilistic Response Spectrum Spreadsheet (after USGS), 2008 USGS National Seismic Hazard Map and the ARS Online web tool. The above documents and tools are available at http://dap3.dot.ca.gov/shake_stable/technical.php.

Project Information

Dist – EA: 11-404301 County: SD Route: 005 PM: R23.9/25.5

Bridge/Facility Name: N/A Bridge/Facility No.: N/A

Latitude: 32.8239 Longitude: -117.2310

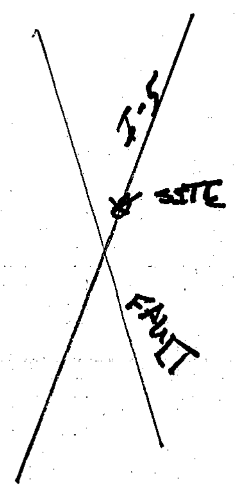
Deterministic Fault Information

Fault Name: N I ROSE CANYON Fault ID#: 224 M_{MAX}: 7.6 Fault Type: RLSS

Fault Dip: 90 Dip Direction: V Top of Rupture: 0 Bottom of Rupture: 13.0

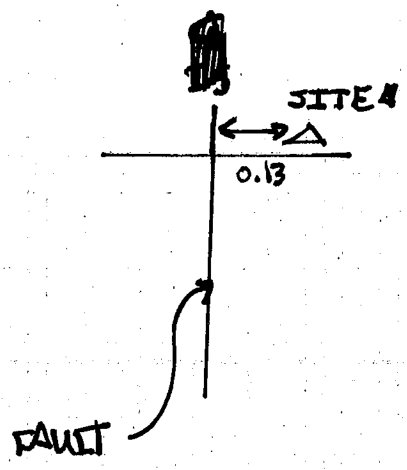
Plan View

(rough sketch; show dimensions)



Elevation View

(rough sketch; show dimensions)



Calculated or Measured Distances

R_{RUP}: 0.13 km ☒ Calculated / graphically ☐ Same as Rx (by definition)

R_{JB}: 0.13 km ☒ Calculated / graphically ☐ Same as Rx (by definition)

R_X: 0.13 km ☒ "Ruler" function on ARS Online ☐ Deterministic PGA Map

Caltrans

2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

Determination of V_{S30}

V_{S30} (m/s): 270

Method of Determining V_{S30}: SPT CORR (e.g. P-S logging, Geophysics, SPT correlations, etc)

Additional Explanation (if needed): ______

Determination of Z1.0 and Z2.5 (if site located in designated California deep basin)

$Z_{1.0}$ (m/s): 327 $Z_{2.5}$ (km/s): 2.0

Method of Determining $Z_{1.0}$ & $Z_{2.5}$: ARS (e.g. ARS Online, SDC figure, other)

Additional Explanation (if needed): ______

Deterministic - Special Conditions

Yes	No	N/A	
[X]	[ ]		Was the Errata Deterministic Fault Database Spreadsheet reviewed to ensure that the correct fault parameters used in the analysis.
[X]	[ ]	[ ]	Were the Near-Fault Factors applied correctly? *Applies to sites with a R_{RUP} distance of 25 km or less, as defined in the SDC.*
[ ]	[ ]	[X]	Were deep basin depths ($Z_{1.0}$ & $Z_{2.5}$) estimated correctly? *Applies to sites located in deep basins as shown in Figures B.5 - B.11 of the SDC or ARS Online.*
[ ]	[ ]	[X]	If the site is located within the Eastern California Shear Zone (ECSZ), was the design ARS larger than the minimum spectrum for the ECSZ (as defined in the SDC, Appendix B, Figure B.2)?
[ ]	[ ]	[X]	If the controlling fault is the Cascadia Subduction Zone, was the alternate seismic procedure applied correctly (as defined in the SDC, Appendix B)?
[X]	[ ]	[ ]	If the deterministic ARS falls below the Minimum Deterministic Spectra (as defined in the SDC), did the Minimum Deterministic Spectra control the deterministic design spectrum?
[X]	[ ]		Did the ARS Online deterministic spectrum correspond within 10% of the calculated deterministic spectrum? If not, note it in the comments section of this document and email a copy to the ARS Online development team, ARS_Online@dot.ca.gov, so that they may address the potential bug.

Probabilistic - Special Conditions

Yes	No	N/A	
[X]	[ ]	[ ]	Were Near-Fault Factors applied correctly (as defined by SDC)? *Applies to sites with a deaggregation R distance of 25 km or less.*
[ ]	[ ]	[X]	Were deep basin depths ($Z_{1.0}$ & $Z_{2.5}$) estimated correctly? *Applies to sites located in deep basins as shown in Figures B.5 - B.11 of the SDC or ARS Online.*
[X]	[ ]	[ ]	If the site has a V_{S30} of less than 300 m/s, was the resulting ARS curve checked against spectral acceleration from USGS Interactive Deaggregation tool?
[X]	[ ]	[ ]	If the USGS Interactive Deaggregation tool and spectral acceleration data were used, were the appropriate near-fault and basin correction factors applied?

2009 Deterministic Fault Information & Seismic Procedure QC/QA Checklist

Yes	No	N/A	
☐	☒	☐	If the probabilistic ARS falls below the Minimum Deterministic Spectra (as defined in the SDC), did the Minimum Deterministic Spectra control the design spectrum?
☒	☐		Did the ARS Online design spectrum correspond within 10% of the USGS spectral acceleration data from the verification spreadsheet? If not, note it in the comments section of this document and email a copy to the ARS Online development team, ARS_Online@dot.ca.gov, so that they may address the potential bug.

Comments / Observations Encountered during QC/QA process:

____

____

____

____

I certify that I have performed a quality check of the referenced fault information and design response spectrum provided by the geotechnical designer. The quality check is based on Seismic Design Criteria (Appendix B), Deterministic PGA Map and ARS Online Report, and the Geotechnical Services Design Manual.

ZIA YAZDANI — ASSOCIATE M&R ENGINEER
Checker (Print) — Title

[signature]
Checker (Signature) — Date: 7-25-12

I certify that the referenced project complies with Geotechnical Service's Quality Control/Quality Assurance procedures, as described in the memorandum, "Quality Control/Quality Assurance for the 2009 Seismic Design Procedures", dated August 12, 2009.

BRIAN HINMAN — SENIOR T.E.
Functional Supervisor (Print) — Title

[signature: Brian Hinman]
Functional Supervisor (Signature) — Date: 7/26/12

(This original checklist and signature sheet shall be placed in the geotechnical project file, and a copy sent to the Mark Willian of the Geotechnical Services Corporate Unit).

Fault & Site Data Input Sheet

Caltrans

The input sheet is to help the user organize the site data for developing the design response spectrum. Beta-Testers: If you fill out the fault and site information for each location, please provide this document and the *checker* to facilitate the QC/QA procedures listed in the 2009 Deterministic Fault Information & Seismic Procedures QC/QA checklist.

Project Information

Dist – EA: 11-404301 County: SD Route: 005 PM: R23.9/25.5

Bridge/Facility Name: N/A Bridge/Facility No.: N/A

Latitude: 32.8239 Longitude: -117.2310

Fault Information (#1)

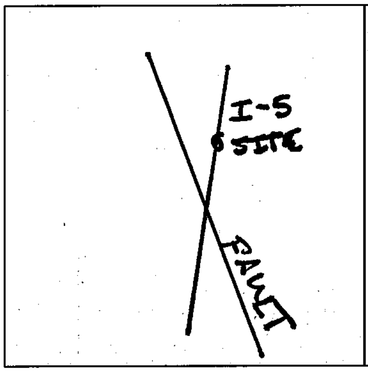
Fault Name: ROSE CANYON (NEWPORT INGLEWOOD) Fault ID#: 224

MMax: 7.5 Fault Type: RLSS

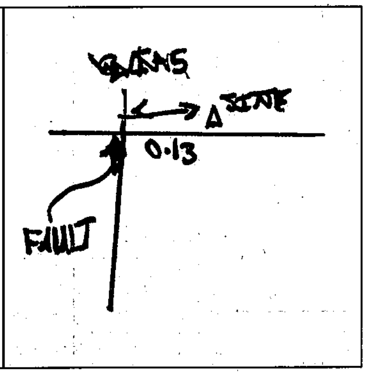
Fault Dip: 90° Dip Direction: V

Top of Rupture: 0 Km Bottom of Rupture: 13 Km

Plan View



Elevation View



Calculated or Measure Distances

R_{RUP}: 0.13 km

R_{JB}: 0.13 km

R_X: 0.13 km

Determination of V_{S30}

V_{S30} (m/s): 270

Determination of Z1.0 and Z2.5

$Z_{1.0}$ (m/s): 327m

$Z_{2.5}$ (km/s): 2.0 km

Notes:

Fault Information (#2)

Fault Name: ______ Fault ID#: ______

MMax: ______ Fault Type: ______

Fault Dip: ______ Dip Direction: ______

Top of Rupture: ______ Bottom of Rupture: ______

Plan View **Elevation View**

Calculated or Measure Distances

R_{RUP}: ______

R_{JB}: ______

R_X: ______

Determination of V_{S30}

V_{S30} (m/s): ______

Determination of Z1.0 and Z2.5

$Z_{1.0}$ (m/s): ______

$Z_{2.5}$ (km/s): ______

Notes:

Comparison of ARS Curves
(unlock sheet with "shmi")

Model Inputs

Fault

Magnitude	7.5	(5 to 8.5)
F_{RV}	0	(input 1 = Rev)
F_{NM}	0	(input 1 = Normal)
Dip (degree)	90	(0 to 90)
Z_{TOR} (km)	0	

Distance

R_{RUP} (km)	0.1	
R_{JB} (km)	0.1	
R_x (km)	0.1	
Hanging Wall?	☐ Yes?	
Near-Field Factor?	☑ Yes?	

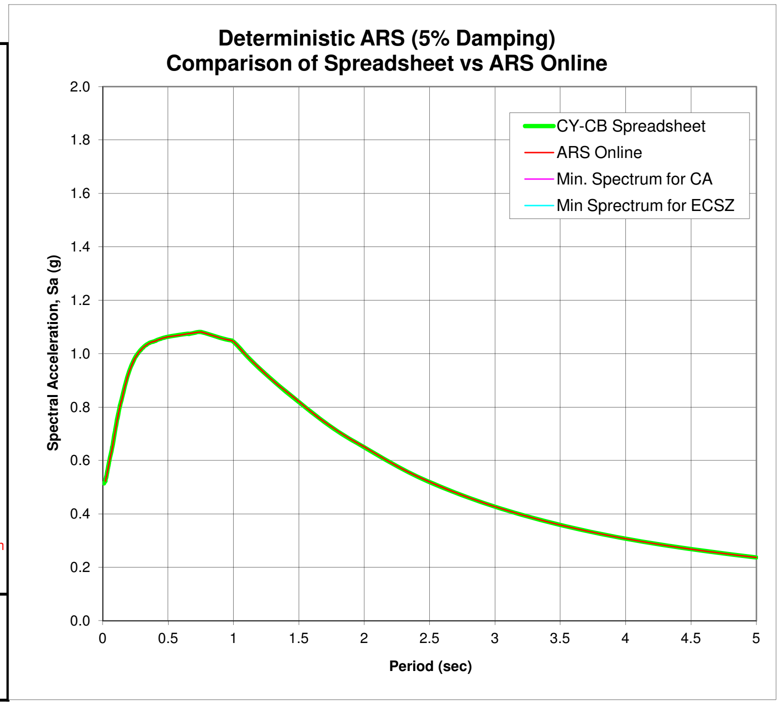
Site

V_{S30} (m/sec)	270	(270 to 1500 m/s)
$Z_{1.0}$ (m)	327	(0 - No Basin)
$Z_{2.5}$ (km)	2	(0 - No Basin)
No. Cal. Basin?	☐ Yes ?	(Check only for sites located within a Basin)
So. Cal. Basin?	☐ Yes ?	

Analysis

ARS Online vs CY-CB Spreadsheet Results

MAX. % Diff. = 0%



CY-CB Spreadsheet Results

T (sec)	CB-CY S(a)
0.010	0.51419
0.020	0.52250
0.022	0.52769
0.025	0.53454
0.029	0.54230
0.030	0.54477
0.032	0.55045
0.035	0.55844
0.036	0.56096
0.040	0.57049
0.042	0.57582
0.044	0.58107
0.045	0.58398
0.046	0.58678
0.048	0.59203
0.050	0.59723
0.055	0.60783
0.060	0.61902
0.065	0.63040
0.067	0.63537
0.070	0.64256
0.075	0.65483
0.080	0.66889
0.085	0.68300
0.090	0.69710
0.095	0.71128
0.100	0.72511
0.110	0.75219
0.120	0.77744
0.130	0.80041
0.133	0.80658
0.140	0.82023
0.150	0.83843
0.160	0.85978
0.170	0.87918
0.180	0.89776

Place ARS Online Deterministic Data Here "Paste"

T (sec)	Base S(a)	Basin Factor	Near Fault Factor	Final Adj. S(a)	Diff. (%)
0.01	0.514	1	1	0.514	0%
0.02	0.523	1	1	0.523	0%
0.022	0.528	1	1	0.528	0%
0.025	0.535	1	1	0.535	0%
0.029	0.542	1	1	0.542	0%
0.03	0.545	1	1	0.545	0%
0.032	0.55	1	1	0.55	0%
0.035	0.558	1	1	0.558	0%
0.036	0.561	1	1	0.561	0%
0.04	0.57	1	1	0.57	0%
0.042	0.576	1	1	0.576	0%
0.044	0.581	1	1	0.581	0%
0.045	0.584	1	1	0.584	0%
0.046	0.587	1	1	0.587	0%
0.048	0.592	1	1	0.592	0%
0.05	0.597	1	1	0.597	0%
0.055	0.608	1	1	0.608	0%
0.06	0.619	1	1	0.619	0%
0.065	0.63	1	1	0.63	0%
0.067	0.635	1	1	0.635	0%
0.07	0.643	1	1	0.643	0%
0.075	0.655	1	1	0.655	0%
0.08	0.669	1	1	0.669	0%
0.085	0.683	1	1	0.683	0%
0.09	0.697	1	1	0.697	0%
0.095	0.711	1	1	0.711	0%
0.1	0.725	1	1	0.725	0%
0.11	0.752	1	1	0.752	0%
0.12	0.777	1	1	0.777	0%
0.13	0.8	1	1	0.8	0%
0.133	0.807	1	1	0.807	0%
0.14	0.82	1	1	0.82	0%
0.15	0.838	1	1	0.838	0%
0.16	0.86	1	1	0.86	0%
0.17	0.879	1	1	0.879	0%
0.18	0.898	1	1	0.898	0%

For Comparsion Plots of Min. Sprectra, Paste Special into Cells

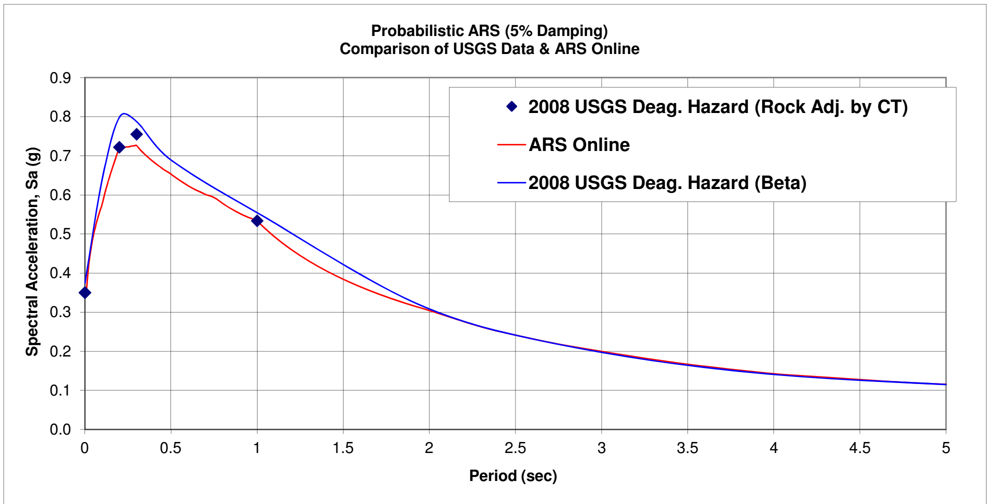
Min. Spectrum for CA		Min Sprectrum for ECSZ	
T (sec)	S (a)	T (sec)	S (a)

Deterministic_Response_Spectrum_072809.xls 7/23/2012 2:25 PM

Comparison spreadsheet of the 2008 USGS Probabilistic Seismic Hazard Data and ARS Online Probabilistic Data (unlock spreadsheet "shmi")
Spectral Accelerations Points from USGS Website at http://earthquake.usgs.gov/research/hazmaps/products_data/2008/data/

*** Note: This spreadsheet uses the given latitude and longitude data provided by the user to estimate spectral acceleration values with a probability of exceedence 5% in 50 yrs (or 975 yr return period). The four spectral acceleration data points plotted on the graph are from the USGS website and are based on a 0.05 degree grid. Basic interpolation is used to estimate intermediate values inside each grid. Raw Data points are provided in the tabs of this spreadsheet. Corner grid spectral acceleration data are shown in the "calculation" tab.**

Input Site Information	
Latitude	Longitude
32.8239	-117.2310
V_{S30} (m/s) =	270
Near Fault Factor, Derived from USGS Deagg. Dist (km) =	1.3
$Z_{1.0}$ (m) =	327
$Z_{2.5}$ (km) =	2



Place ARS Online Probabilistic Data Here "Paste"

T (sec)	Base Spectrum S(a)	Basin Factor	Near Fault Factor	Final Adj. Spectrum S(a)
0.01	0.35	1	1	0.35
0.02	0.406	1	1	0.406
0.022	0.415	1	1	0.415
0.025	0.426	1	1	0.426
0.029	0.44	1	1	0.44
0.03	0.443	1	1	0.443
0.032	0.449	1	1	0.449
0.035	0.458	1	1	0.458
0.036	0.461	1	1	0.461
0.04	0.471	1	1	0.471
0.042	0.476	1	1	0.476
0.044	0.481	1	1	0.481
0.045	0.484	1	1	0.484
0.046	0.486	1	1	0.486
0.048	0.49	1	1	0.49
0.05	0.495	1	1	0.495
0.055	0.505	1	1	0.505
0.06	0.514	1	1	0.514
0.065	0.523	1	1	0.523
0.067	0.527	1	1	0.527
0.07	0.532	1	1	0.532
0.075	0.539	1	1	0.539
0.08	0.547	1	1	0.547
0.085	0.554	1	1	0.554
0.09	0.561	1	1	0.561
0.095	0.567	1	1	0.567
0.1	0.574	1	1	0.574
0.11	0.592	1	1	0.592
0.12	0.609	1	1	0.609
0.13	0.625	1	1	0.625
0.133	0.63	1	1	0.63
0.14	0.64	1	1	0.64
0.15	0.655	1	1	0.655
0.16	0.669	1	1	0.669
0.17	0.682	1	1	0.682
0.18	0.695	1	1	0.695
0.19	0.707	1	1	0.707
0.2	0.719	1	1	0.719
0.22	0.721	1	1	0.721
0.24	0.723	1	1	0.723
0.25	0.723	1	1	0.723

Analysis of ARS Online Results vs USGS Deaggregation Hazard (Adj. By CT)

Period (sec)	USGS Interpolated Spectral Accel.	Adj. for Near Fault Effect	Adj. for Soil Amplification	Adj. For Basin Effect	Final Adj. USGS Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.327	1.000	1.071	1.000	0.351	0.35	0.1%
0.2	0.767	1.000	0.942	1.000	0.722	0.719	0.4%
0.3	0.636	1.000	1.189	1.000	0.756	0.727	3.8%
1	0.240	1.200	1.852	1.000	0.534	0.533	0.2%
						Max % Difference =	**3.8%**

USGS Deaggregation Hazard (Beta) with Near Field and Basin Factors

Period (sec)	INPUT USGS Deagg. Spec Accel	Adj. for Near Fault Effect	Adj. For Basin Effect	Final Adj. USGS Deagg Spec Accel	ARS Online Final Adj. Spect. Accel.	% Difference (bet. USGS & ARS Online)
0	0.3744	1.000	1.000	0.374	0.35	6.5%
0.1	0.6398	1.000	1.000	0.640	0.574	10.3%
0.2	0.7991	1.000	1.000	0.799	0.719	10.0%
0.3	0.7877	1.000	1.000	0.788	0.727	7.7%
0.5	0.6897	1.000	1.000	0.690	0.654	5.2%
1	0.4623	1.200	1.000	0.555	0.533	3.9%
2	0.257	1.200	1.000	0.308	0.305	1.1%
3	0.165	1.200	1.000	0.198	0.2	1.0%
4	0.1176	1.200	1.000	0.141	0.143	1.3%
5	0.096	1.200	1.000	0.115	0.116	0.7%
					Max % Difference =	**5.2%**

Probabilistic_Response_Spectrum_080409.xls 7/23/2012 2:24 PM

SITE DATA

Shear Wave Velocity, V_{S30}:	270 m/s
Latitude:	32.823900
Longitude:	-117.231000
Depth to Vs = 1.0 km/s:	327 m
Depth to Vs = 2.5 km/s:	2.00 km

DETERMINISTIC

Newport Inglewood-Rose Canyon fault zone (San Diego section)

Fault ID:	224
Maximum Magnitude (MMax):	7.5
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	13.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	0.13 km
Rjb:	0.13 km
Rx:	0.13 km
Fnorm:	0
Frev:	0

Period	SA (Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA (Final Spectrum)
0.01	0.514	1.000	1.000	0.514
0.02	0.523	1.000	1.000	0.523
0.022	0.528	1.000	1.000	0.528
0.025	0.535	1.000	1.000	0.535
0.029	0.542	1.000	1.000	0.542
0.03	0.545	1.000	1.000	0.545
0.032	0.550	1.000	1.000	0.550
0.035	0.558	1.000	1.000	0.558
0.036	0.561	1.000	1.000	0.561
0.04	0.571	1.000	1.000	0.571
0.042	0.576	1.000	1.000	0.576
0.044	0.581	1.000	1.000	0.581
0.045	0.584	1.000	1.000	0.584
0.046	0.587	1.000	1.000	0.587
0.048	0.592	1.000	1.000	0.592

0.05	0.597	1.000	1.000	0.597
0.055	0.608	1.000	1.000	0.608
0.06	0.619	1.000	1.000	0.619
0.065	0.630	1.000	1.000	0.630
0.067	0.635	1.000	1.000	0.635
0.07	0.643	1.000	1.000	0.643
0.075	0.655	1.000	1.000	0.655
0.08	0.669	1.000	1.000	0.669
0.085	0.683	1.000	1.000	0.683
0.09	0.697	1.000	1.000	0.697
0.095	0.711	1.000	1.000	0.711
0.1	0.725	1.000	1.000	0.725
0.11	0.752	1.000	1.000	0.752
0.12	0.777	1.000	1.000	0.777
0.13	0.800	1.000	1.000	0.800
0.133	0.807	1.000	1.000	0.807
0.14	0.820	1.000	1.000	0.820
0.15	0.838	1.000	1.000	0.838
0.16	0.860	1.000	1.000	0.860
0.17	0.879	1.000	1.000	0.879
0.18	0.898	1.000	1.000	0.898
0.19	0.915	1.000	1.000	0.915
0.2	0.931	1.000	1.000	0.931
0.22	0.956	1.000	1.000	0.956
0.24	0.978	1.000	1.000	0.978
0.25	0.988	1.000	1.000	0.988
0.26	0.994	1.000	1.000	0.994
0.28	1.008	1.000	1.000	1.008
0.29	1.013	1.000	1.000	1.013
0.3	1.019	1.000	1.000	1.019
0.32	1.028	1.000	1.000	1.028
0.34	1.036	1.000	1.000	1.036
0.35	1.038	1.000	1.000	1.038
0.36	1.041	1.000	1.000	1.041
0.38	1.045	1.000	1.000	1.045
0.4	1.047	1.000	1.000	1.047
0.42	1.052	1.000	1.000	1.052
0.44	1.055	1.000	1.000	1.055
0.45	1.057	1.000	1.000	1.057
0.46	1.059	1.000	1.000	1.059
0.48	1.061	1.000	1.000	1.061
0.5	1.064	1.000	1.000	1.064
0.55	1.046	1.000	1.020	1.067
0.6	1.030	1.000	1.040	1.071
0.65	1.014	1.000	1.060	1.075
0.667	1.009	1.000	1.067	1.076

0.7	0.998	1.000	1.080	1.078
0.75	0.983	1.000	1.100	1.082
0.8	0.959	1.000	1.120	1.074
0.85	0.936	1.000	1.140	1.067
0.9	0.913	1.000	1.160	1.059
0.95	0.892	1.000	1.180	1.053
1	0.871	1.000	1.200	1.045
1.1	0.827	1.000	1.200	0.993
1.2	0.787	1.000	1.200	0.945
1.3	0.750	1.000	1.200	0.901
1.4	0.716	1.000	1.200	0.860
1.5	0.684	1.000	1.200	0.821
1.6	0.650	1.000	1.200	0.780
1.7	0.619	1.000	1.200	0.743
1.8	0.591	1.000	1.200	0.710
1.9	0.566	1.000	1.200	0.679
2	0.543	1.000	1.200	0.651
2.2	0.494	1.000	1.200	0.593
2.4	0.452	1.000	1.200	0.542
2.5	0.433	1.000	1.200	0.520
2.6	0.416	1.000	1.200	0.499
2.8	0.384	1.000	1.200	0.461
3	0.356	1.000	1.200	0.428
3.2	0.331	1.000	1.200	0.398
3.4	0.309	1.000	1.200	0.371
3.5	0.299	1.000	1.200	0.359
3.6	0.289	1.000	1.200	0.347
3.8	0.272	1.000	1.200	0.326
4	0.256	1.000	1.200	0.307
4.2	0.242	1.000	1.200	0.290
4.4	0.229	1.000	1.200	0.275
4.6	0.218	1.000	1.200	0.261
4.8	0.207	1.000	1.200	0.249
5	0.197	1.000	1.200	0.237

To use above data in Excel, copy/paste:

```
0.01      0.514     1.000     1.000     0.514
0.02      0.523     1.000     1.000     0.523
```

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	SA (Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA (Final Spectrum)
0.01	0.350	1.000	1.000	0.350

0.02	0.406	1.000	1.000	0.406
0.022	0.415	1.000	1.000	0.415
0.025	0.426	1.000	1.000	0.426
0.029	0.440	1.000	1.000	0.440
0.03	0.443	1.000	1.000	0.443
0.032	0.449	1.000	1.000	0.449
0.035	0.458	1.000	1.000	0.458
0.036	0.461	1.000	1.000	0.461
0.04	0.471	1.000	1.000	0.471
0.042	0.476	1.000	1.000	0.476
0.044	0.481	1.000	1.000	0.481
0.045	0.483	1.000	1.000	0.483
0.046	0.486	1.000	1.000	0.486
0.048	0.490	1.000	1.000	0.490
0.05	0.495	1.000	1.000	0.495
0.055	0.505	1.000	1.000	0.505
0.06	0.514	1.000	1.000	0.514
0.065	0.523	1.000	1.000	0.523
0.067	0.527	1.000	1.000	0.527
0.07	0.531	1.000	1.000	0.531
0.075	0.539	1.000	1.000	0.539
0.08	0.547	1.000	1.000	0.547
0.085	0.554	1.000	1.000	0.554
0.09	0.561	1.000	1.000	0.561
0.095	0.567	1.000	1.000	0.567
0.1	0.574	1.000	1.000	0.574
0.11	0.592	1.000	1.000	0.592
0.12	0.609	1.000	1.000	0.609
0.13	0.625	1.000	1.000	0.625
0.133	0.630	1.000	1.000	0.630
0.14	0.640	1.000	1.000	0.640
0.15	0.655	1.000	1.000	0.655
0.16	0.669	1.000	1.000	0.669
0.17	0.682	1.000	1.000	0.682
0.18	0.695	1.000	1.000	0.695
0.19	0.707	1.000	1.000	0.707
0.2	0.719	1.000	1.000	0.719
0.22	0.721	1.000	1.000	0.721
0.24	0.723	1.000	1.000	0.723
0.25	0.723	1.000	1.000	0.723
0.26	0.724	1.000	1.000	0.724
0.28	0.725	1.000	1.000	0.725
0.29	0.726	1.000	1.000	0.726
0.3	0.727	1.000	1.000	0.727
0.32	0.717	1.000	1.000	0.717
0.34	0.708	1.000	1.000	0.708

0.35	0.704	1.000	1.000	0.704
0.36	0.700	1.000	1.000	0.700
0.38	0.692	1.000	1.000	0.692
0.4	0.685	1.000	1.000	0.685
0.42	0.678	1.000	1.000	0.678
0.44	0.671	1.000	1.000	0.671
0.45	0.668	1.000	1.000	0.668
0.46	0.665	1.000	1.000	0.665
0.48	0.660	1.000	1.000	0.660
0.5	0.654	1.000	1.000	0.654
0.55	0.625	1.000	1.020	0.638
0.6	0.600	1.000	1.040	0.624
0.65	0.578	1.000	1.060	0.612
0.667	0.571	1.000	1.067	0.609
0.7	0.558	1.000	1.080	0.602
0.75	0.540	1.000	1.100	0.594
0.8	0.517	1.000	1.120	0.579
0.85	0.496	1.000	1.140	0.565
0.9	0.477	1.000	1.160	0.553
0.95	0.460	1.000	1.180	0.543
1	0.444	1.000	1.200	0.533
1.1	0.411	1.000	1.200	0.494
1.2	0.384	1.000	1.200	0.460
1.3	0.360	1.000	1.200	0.432
1.4	0.339	1.000	1.200	0.407
1.5	0.321	1.000	1.200	0.385
1.6	0.304	1.000	1.200	0.365
1.7	0.290	1.000	1.200	0.348
1.8	0.277	1.000	1.200	0.332
1.9	0.265	1.000	1.200	0.318
2	0.255	1.000	1.200	0.305
2.2	0.230	1.000	1.200	0.276
2.4	0.210	1.000	1.200	0.252
2.5	0.202	1.000	1.200	0.242
2.6	0.194	1.000	1.200	0.232
2.8	0.179	1.000	1.200	0.215
3	0.167	1.000	1.200	0.200
3.2	0.155	1.000	1.200	0.186
3.4	0.144	1.000	1.200	0.173
3.5	0.139	1.000	1.200	0.167
3.6	0.135	1.000	1.200	0.162
3.8	0.127	1.000	1.200	0.152
4	0.119	1.000	1.200	0.143
4.2	0.114	1.000	1.200	0.137
4.4	0.109	1.000	1.200	0.131
4.6	0.104	1.000	1.200	0.125

4.8	0.100	1.000	1.200	0.120
5	0.096	1.000	1.200	0.116

To use above data in Excel, copy/paste:

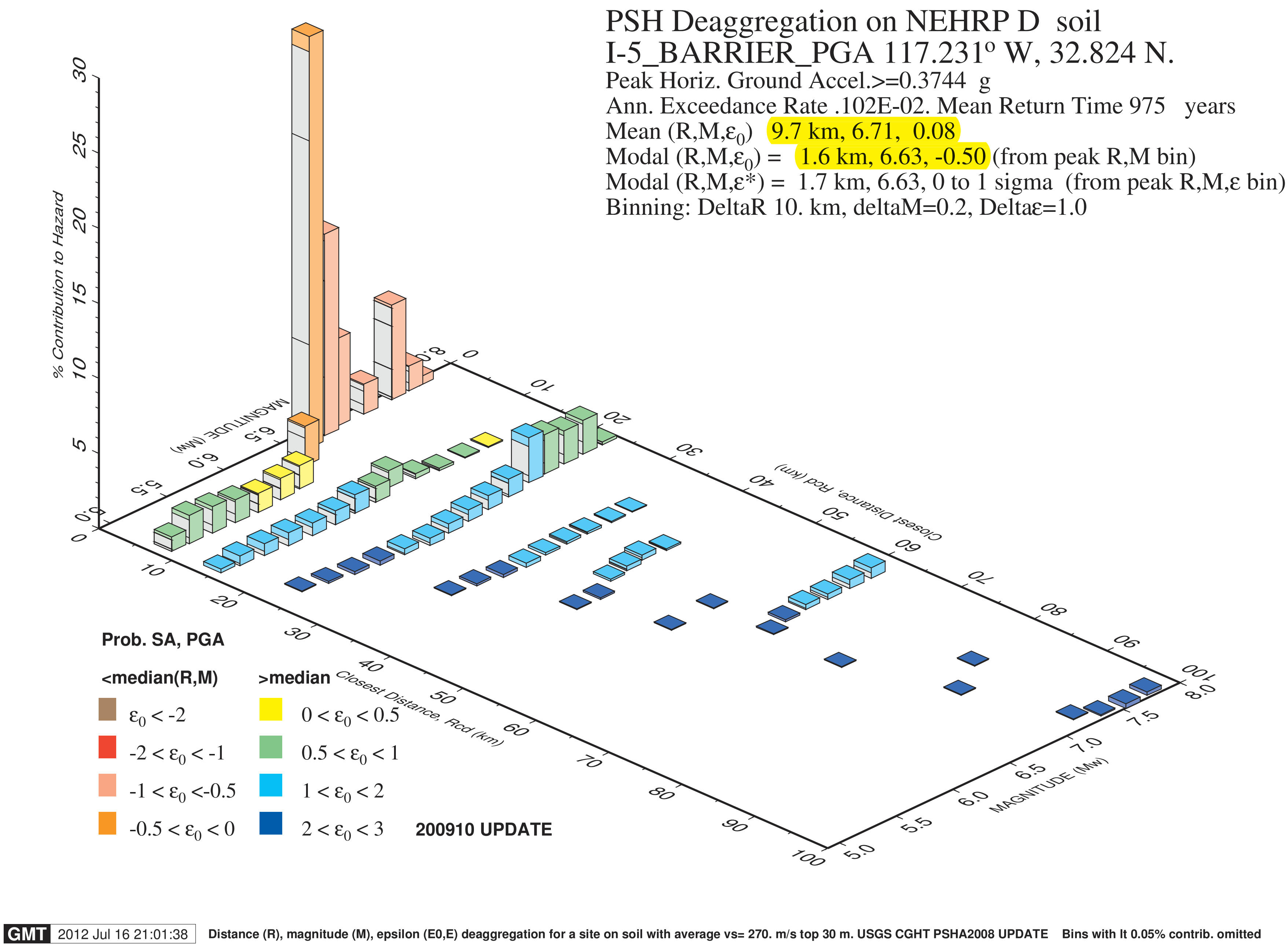
```
0.01      0.350     1.000     1.000     0.350
0.02      0.406     1.000     1.000     0.406
```

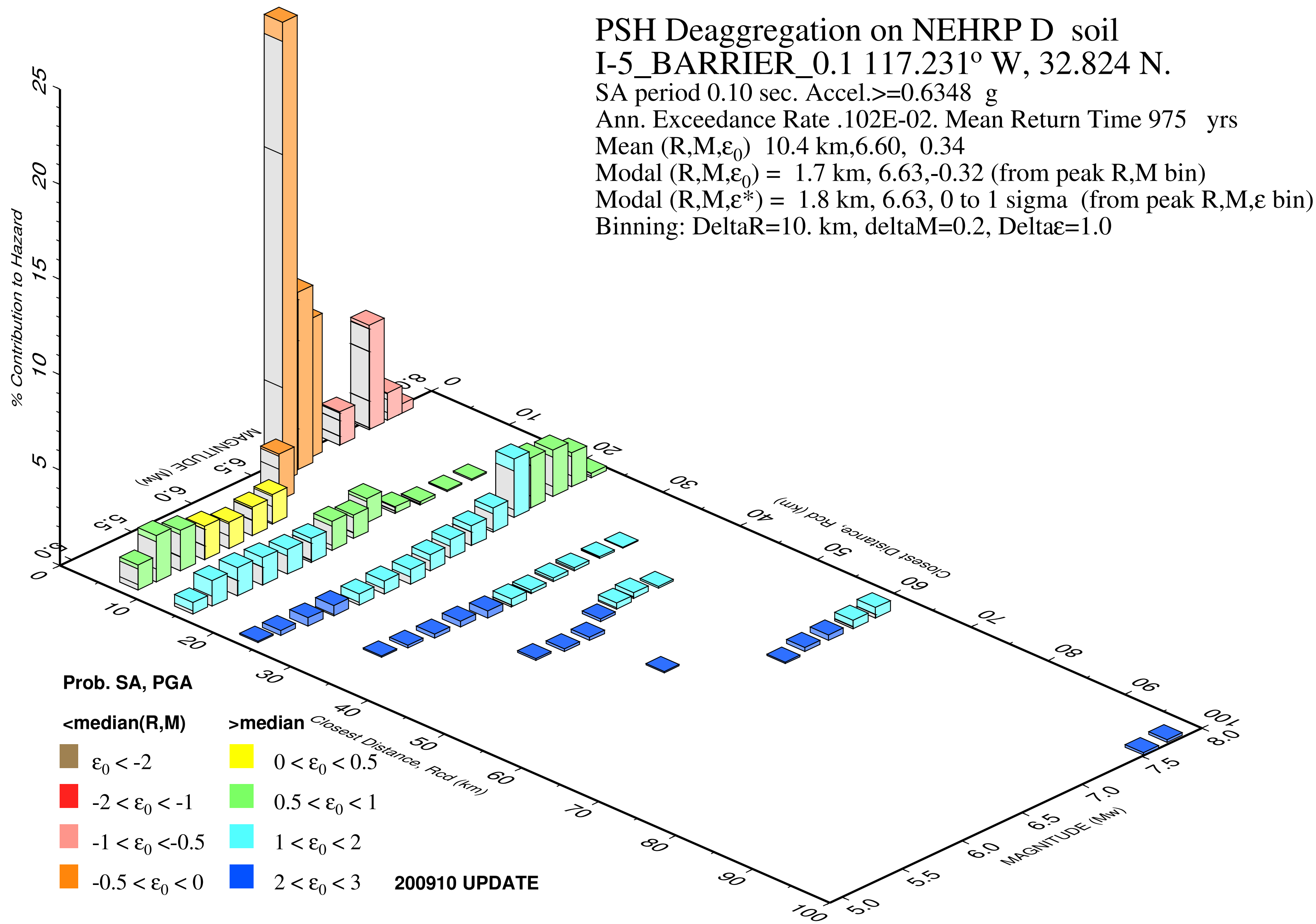
Envelope Data

Period	SA
0.01	0.514
0.02	0.523
0.022	0.528
0.025	0.535
0.029	0.542
0.03	0.545
0.032	0.550
0.035	0.558
0.036	0.561
0.04	0.571
0.042	0.576
0.044	0.581
0.045	0.584
0.046	0.587
0.048	0.592
0.05	0.597
0.055	0.608
0.06	0.619
0.065	0.630
0.067	0.635
0.07	0.643
0.075	0.655
0.08	0.669
0.085	0.683
0.09	0.697
0.095	0.711
0.1	0.725
0.11	0.752
0.12	0.777
0.13	0.800
0.133	0.807
0.14	0.820
0.15	0.838
0.16	0.860
0.17	0.879
0.18	0.898

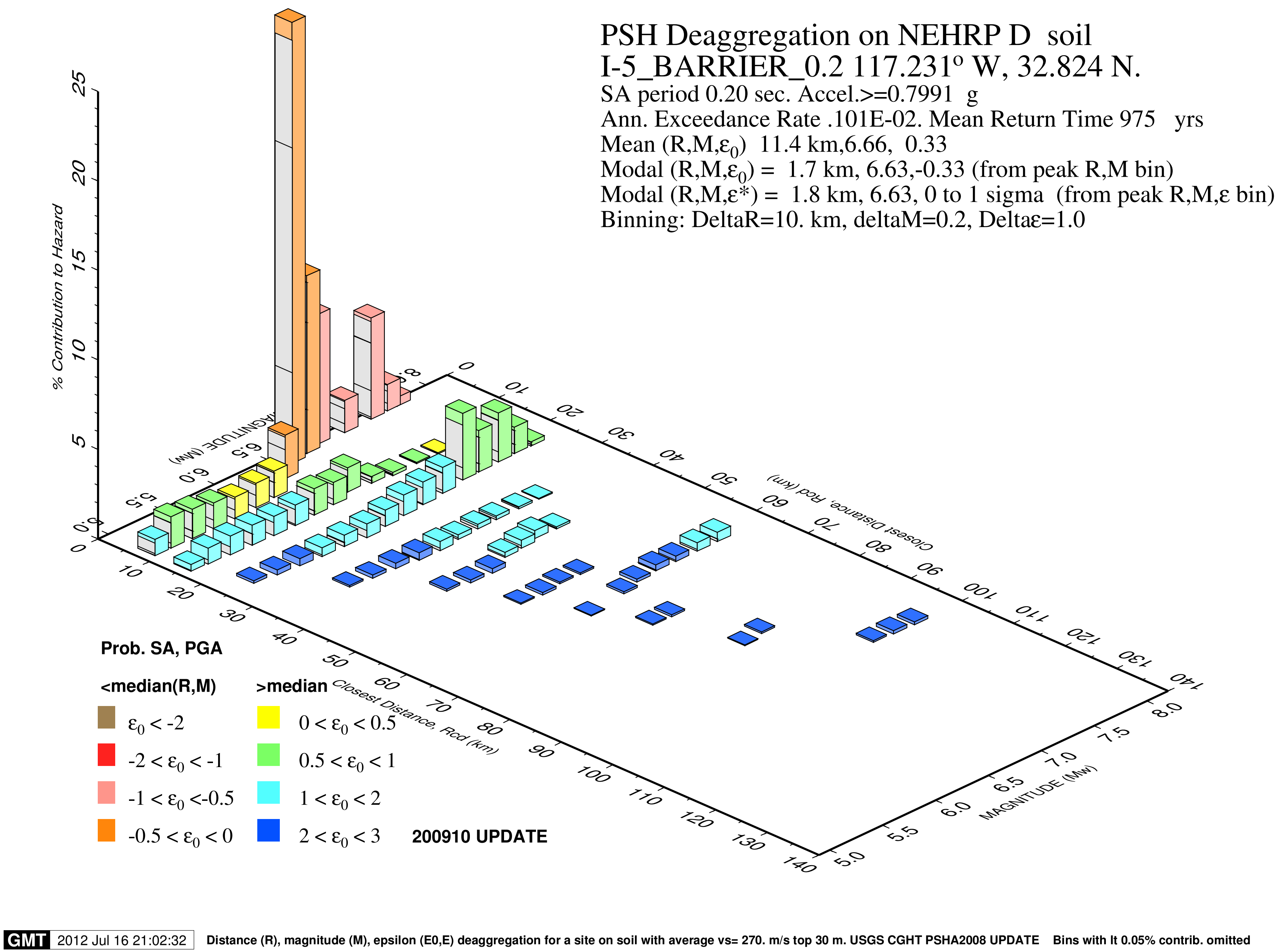
0.19	0.915
0.2	0.931
0.22	0.956
0.24	0.978
0.25	0.988
0.26	0.994
0.28	1.008
0.29	1.013
0.3	1.019
0.32	1.028
0.34	1.036
0.35	1.038
0.36	1.041
0.38	1.045
0.4	1.047
0.42	1.052
0.44	1.055
0.45	1.057
0.46	1.059
0.48	1.061
0.5	1.064
0.55	1.067
0.6	1.071
0.65	1.075
0.667	1.076
0.7	1.078
0.75	1.082
0.8	1.074
0.85	1.067
0.9	1.059
0.95	1.053
1	1.045
1.1	0.993
1.2	0.945
1.3	0.901
1.4	0.860
1.5	0.821
1.6	0.780
1.7	0.743
1.8	0.710
1.9	0.679
2	0.651
2.2	0.593
2.4	0.542
2.5	0.520
2.6	0.499

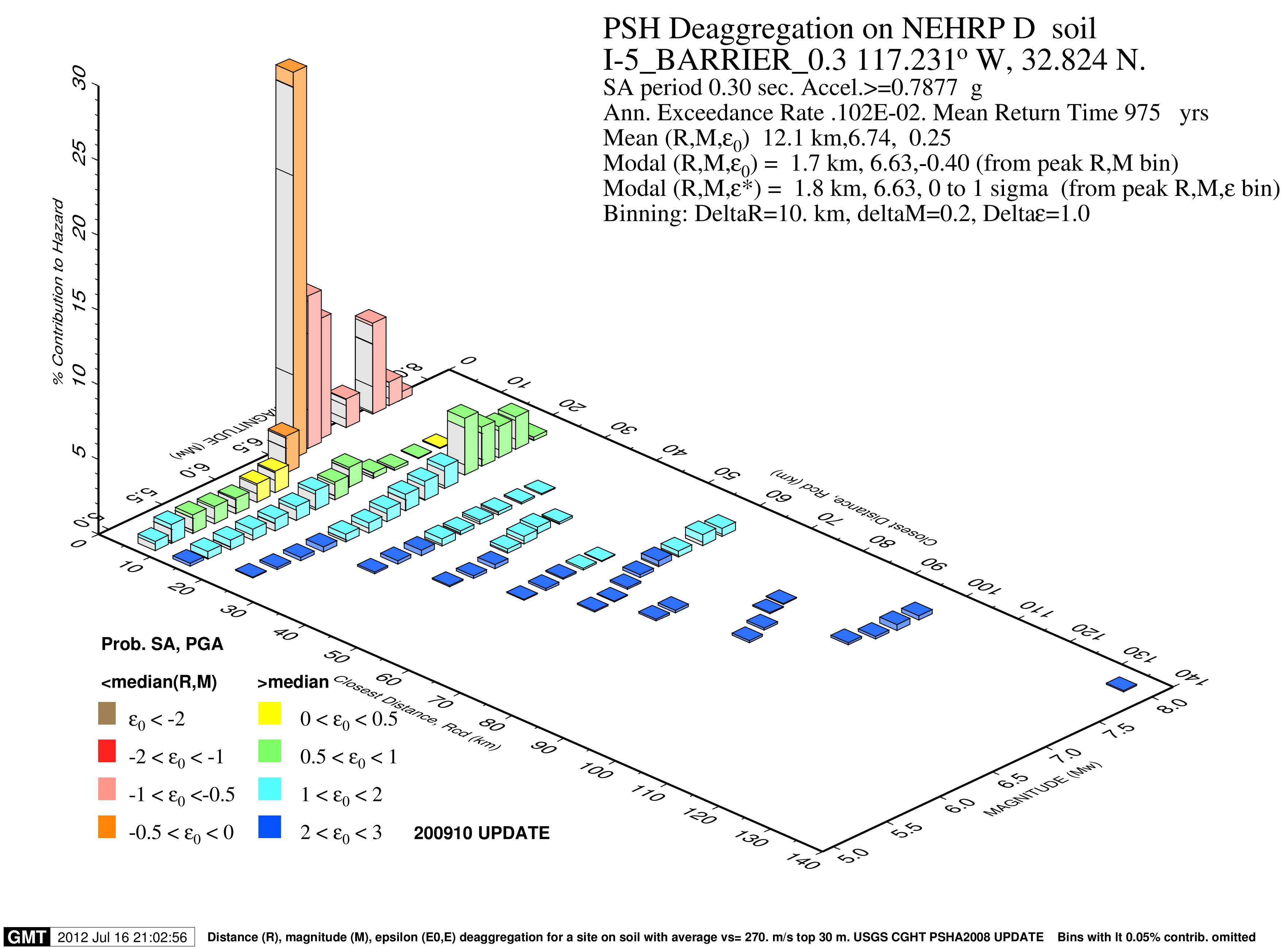
2.8	0.461
3	0.428
3.2	0.398
3.4	0.371
3.5	0.359
3.6	0.347
3.8	0.326
4	0.307
4.2	0.290
4.4	0.275
4.6	0.261
4.8	0.249
5	0.237
To use above data in Excel, copy/paste:	0.01 0.514 0.02 0.523


PSH Deaggregation on NEHRP D soil
I-5_BARRIER_PGA 117.231° W, 32.824 N.
Peak Horiz. Ground Accel.>=0.3744 g
Ann. Exceedance Rate .102E-02. Mean Return Time 975 years
Mean (R,M,ε0) 9.7 km, 6.71, 0.08
Modal (R,M,ε0) = 1.6 km, 6.63, -0.50 (from peak R,M bin)
Modal (R,M,ε*) = 1.7 km, 6.63, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2012 Jul 16 21:01:38
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

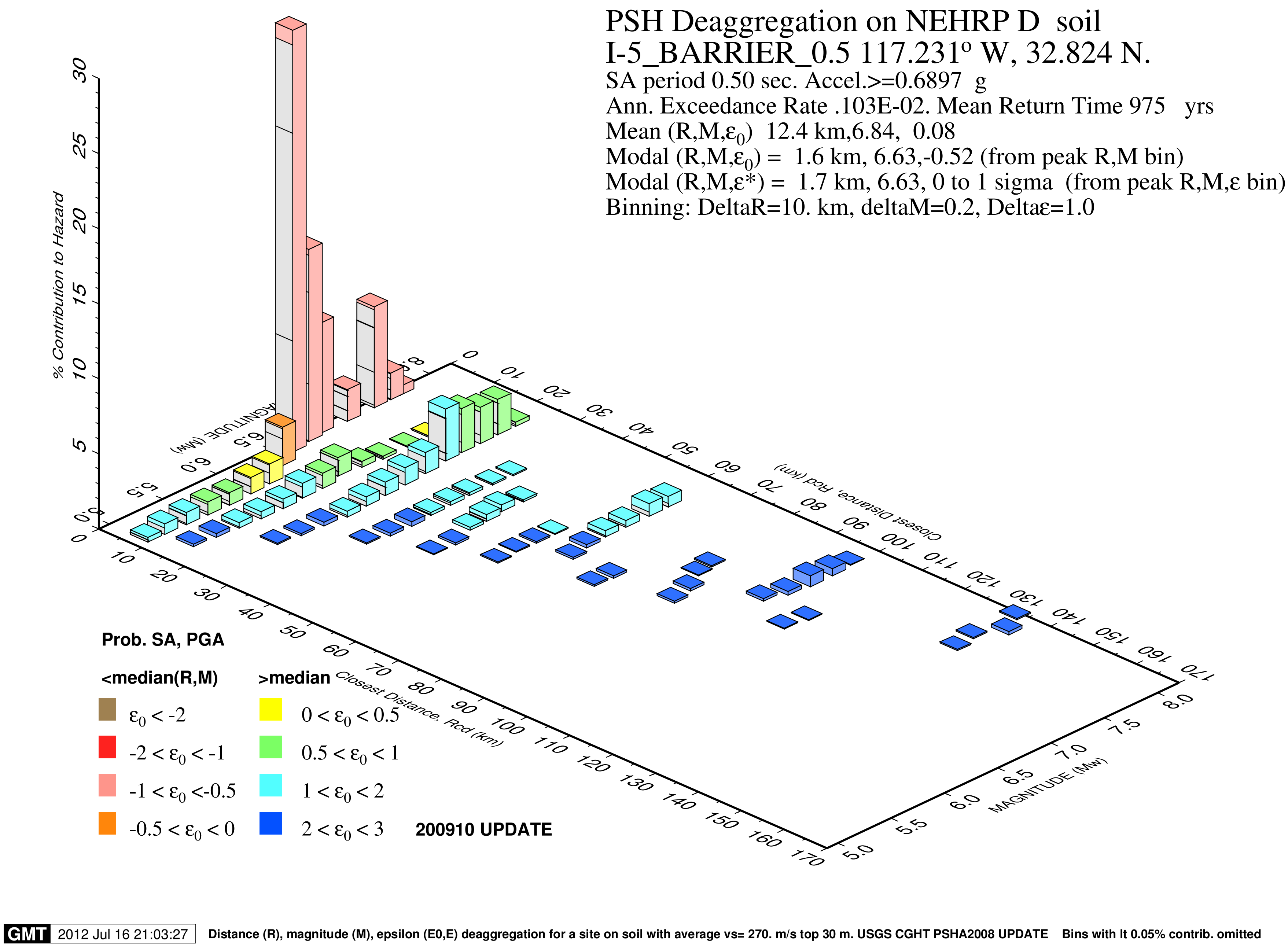


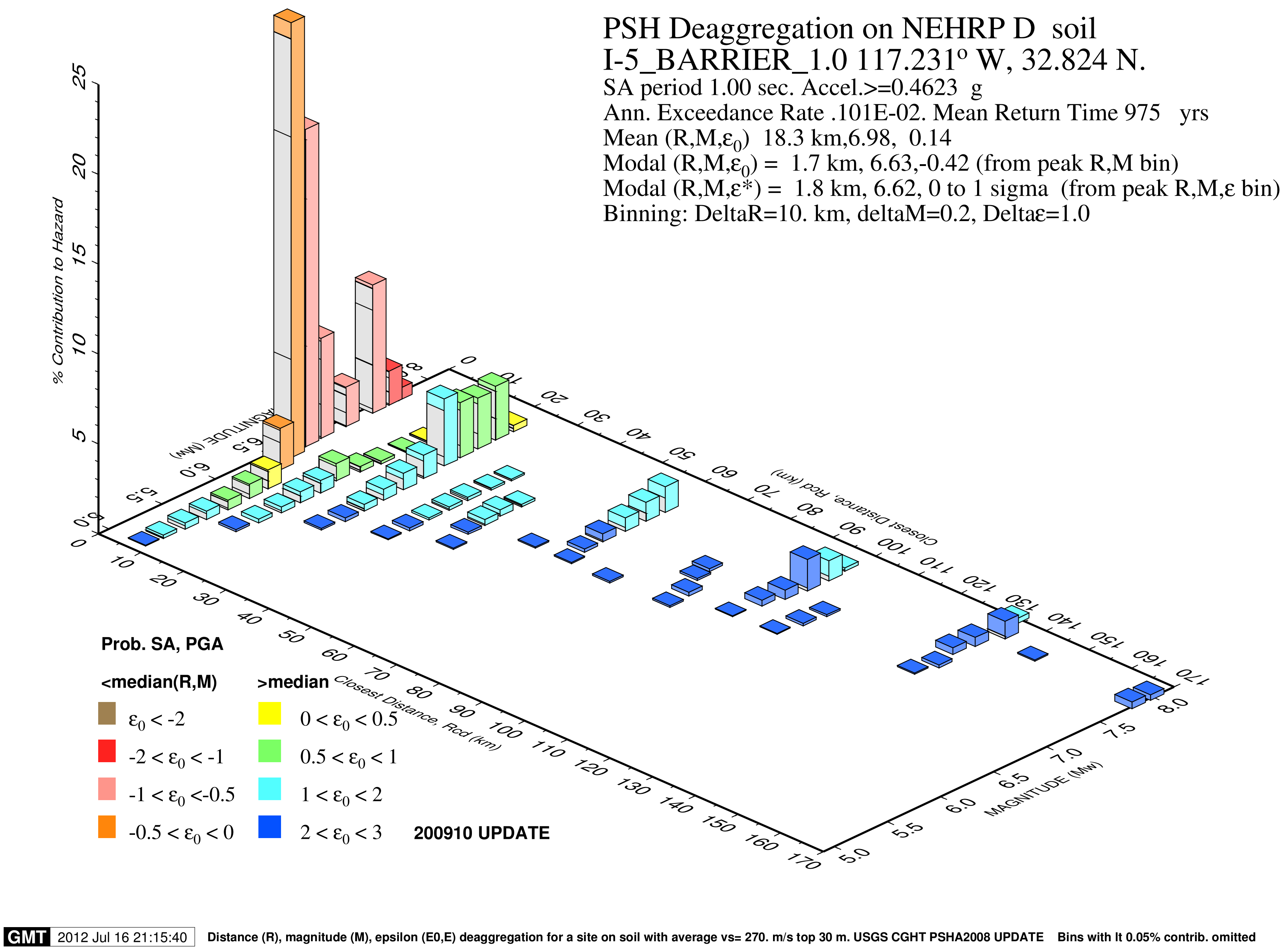
GMT 2012 Jul 16 21:02:14 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

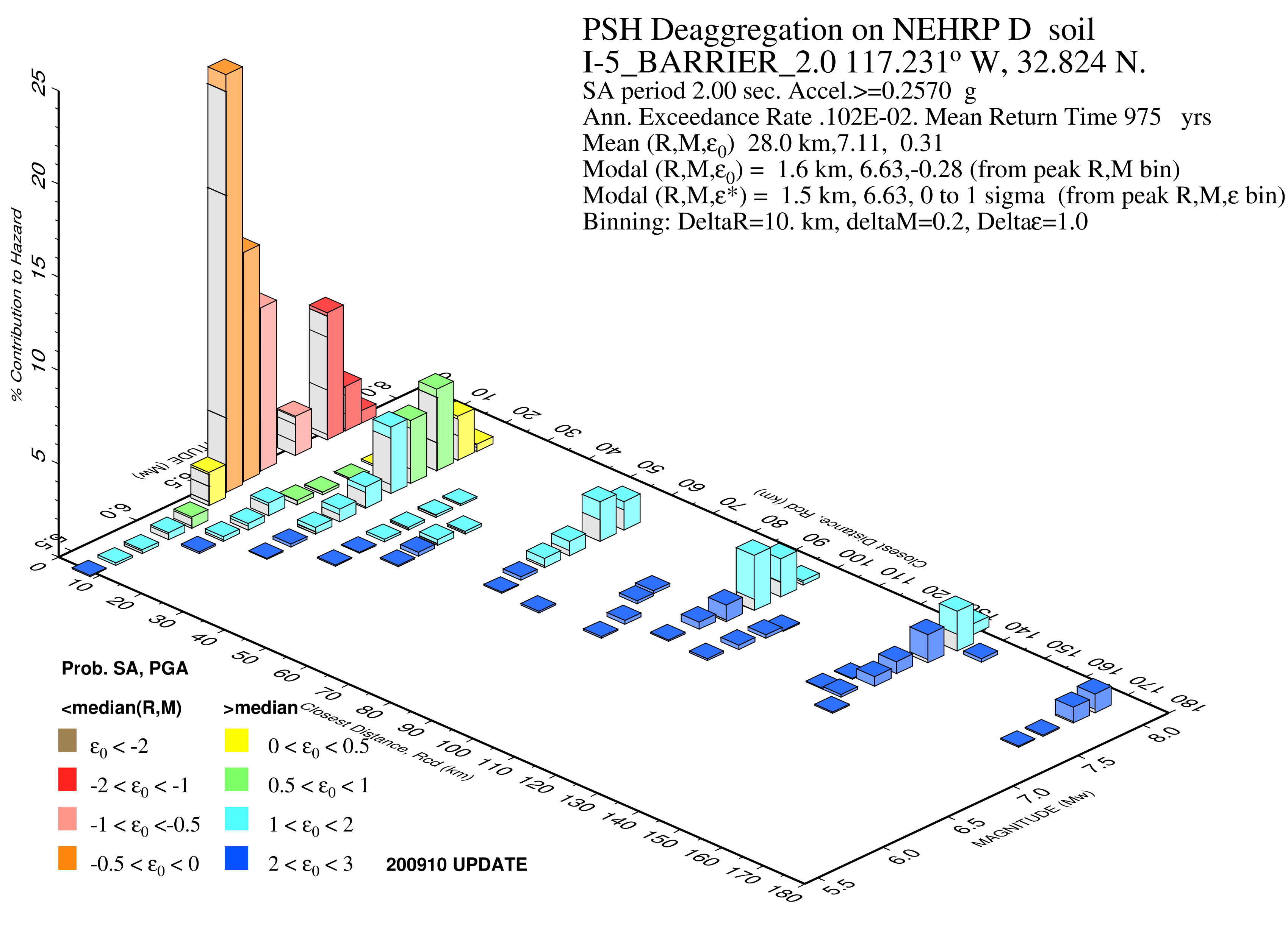

PSH Deaggregation on NEHRP D soil
I-5_BARRIER_0.2 117.231° W, 32.824 N.
SA period 0.20 sec. Accel.>=0.7991 g
Ann. Exceedance Rate .101E-02. Mean Return Time 975 yrs
Mean (R,M,ε0) 11.4 km,6.66, 0.33
Modal (R,M,ε0) = 1.7 km, 6.63,-0.33 (from peak R,M bin)
Modal (R,M,ε*) = 1.8 km, 6.63, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2012 Jul 16 21:02:32
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted



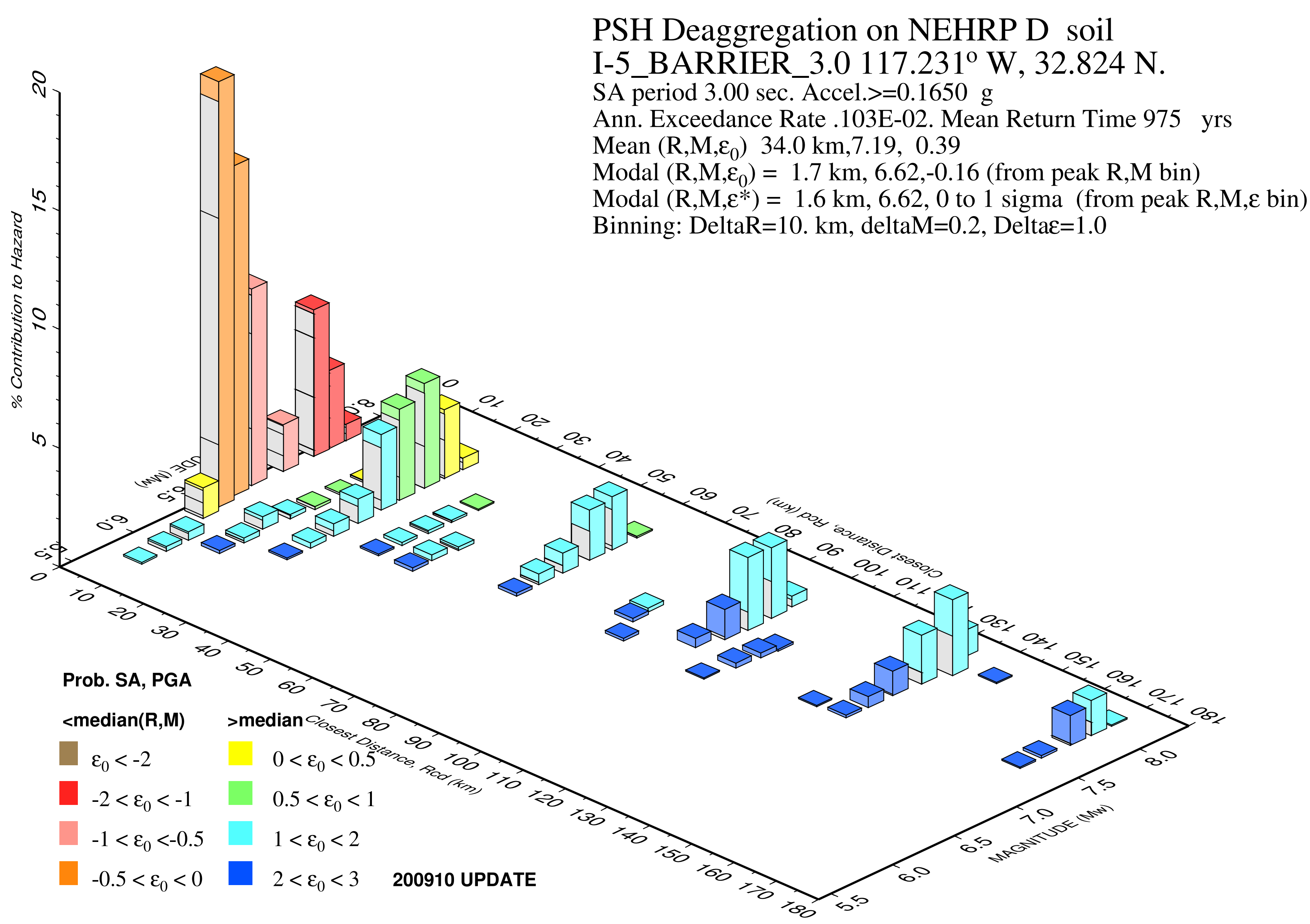
PSH Deaggregation on NEHRP D soil
I-5_BARRIER_0.3 117.231° W, 32.824 N.
SA period 0.30 sec. Accel.>=0.7877 g
Ann. Exceedance Rate .102E-02. Mean Return Time 975 yrs
Mean (R,M,ε0) 12.1 km,6.74, 0.25
Modal (R,M,ε0) = 1.7 km, 6.63,-0.40 (from peak R,M bin)
Modal (R,M,ε*) = 1.8 km, 6.63, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2012 Jul 16 21:02:56
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted


PSH Deaggregation on NEHRP D soil
I-5_BARRIER_0.5 117.231° W, 32.824 N.
SA period 0.50 sec. Accel.>=0.6897 g
Ann. Exceedance Rate .103E-02. Mean Return Time 975 yrs
Mean (R,M,ε0) 12.4 km,6.84, 0.08
Modal (R,M,ε0) = 1.6 km, 6.63,-0.52 (from peak R,M bin)
Modal (R,M,ε*) = 1.7 km, 6.63, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2012 Jul 16 21:03:27
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

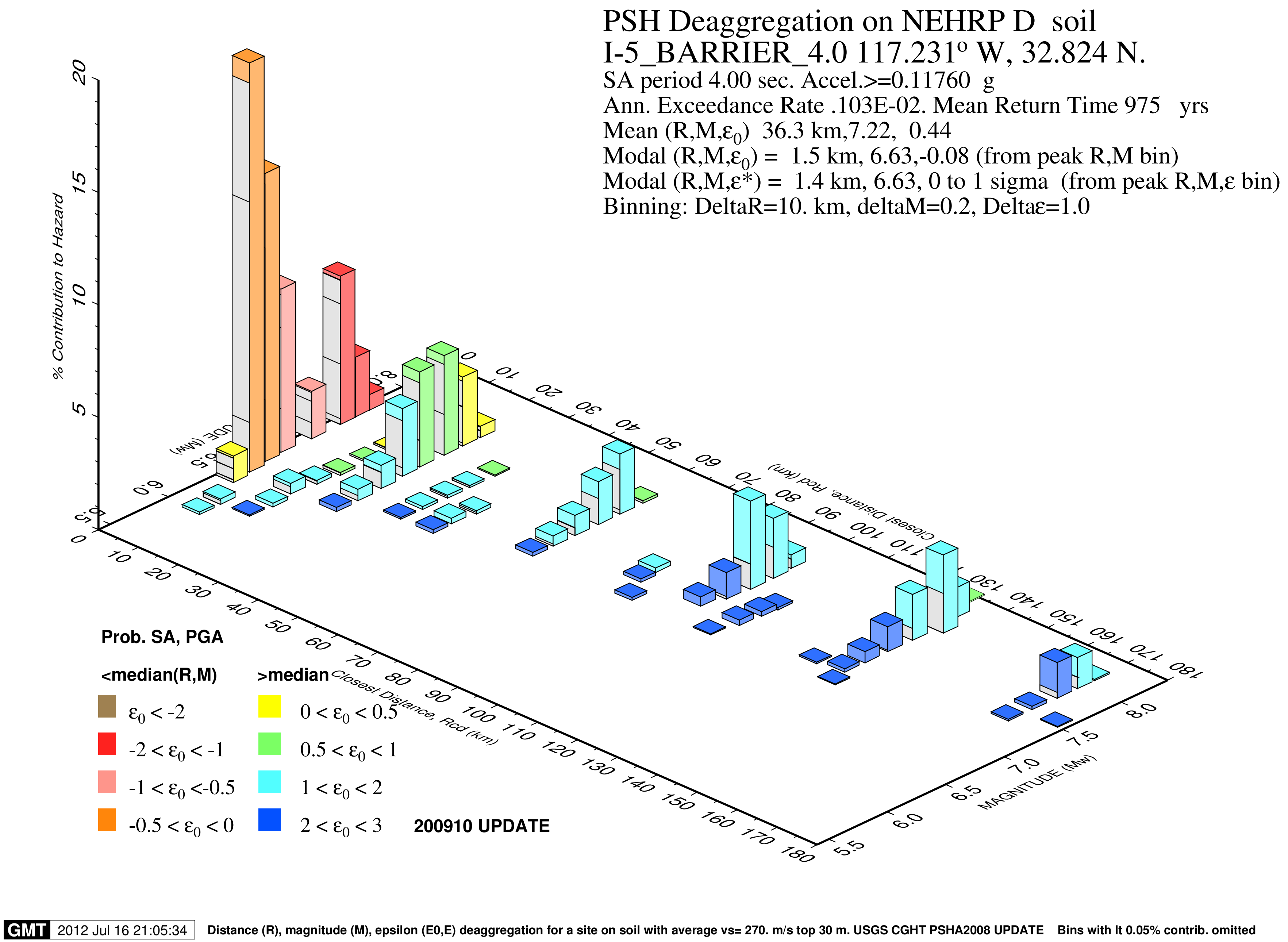

PSH Deaggregation on NEHRP D soil
I-5_BARRIER_1.0 117.231° W, 32.824 N.
SA period 1.00 sec. Accel.>=0.4623 g
Ann. Exceedance Rate .101E-02. Mean Return Time 975 yrs
Mean (R,M,ε0) 18.3 km,6.98, 0.14
Modal (R,M,ε0) = 1.7 km, 6.63,-0.42 (from peak R,M bin)
Modal (R,M,ε*) = 1.8 km, 6.62, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2012 Jul 16 21:15:40
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted



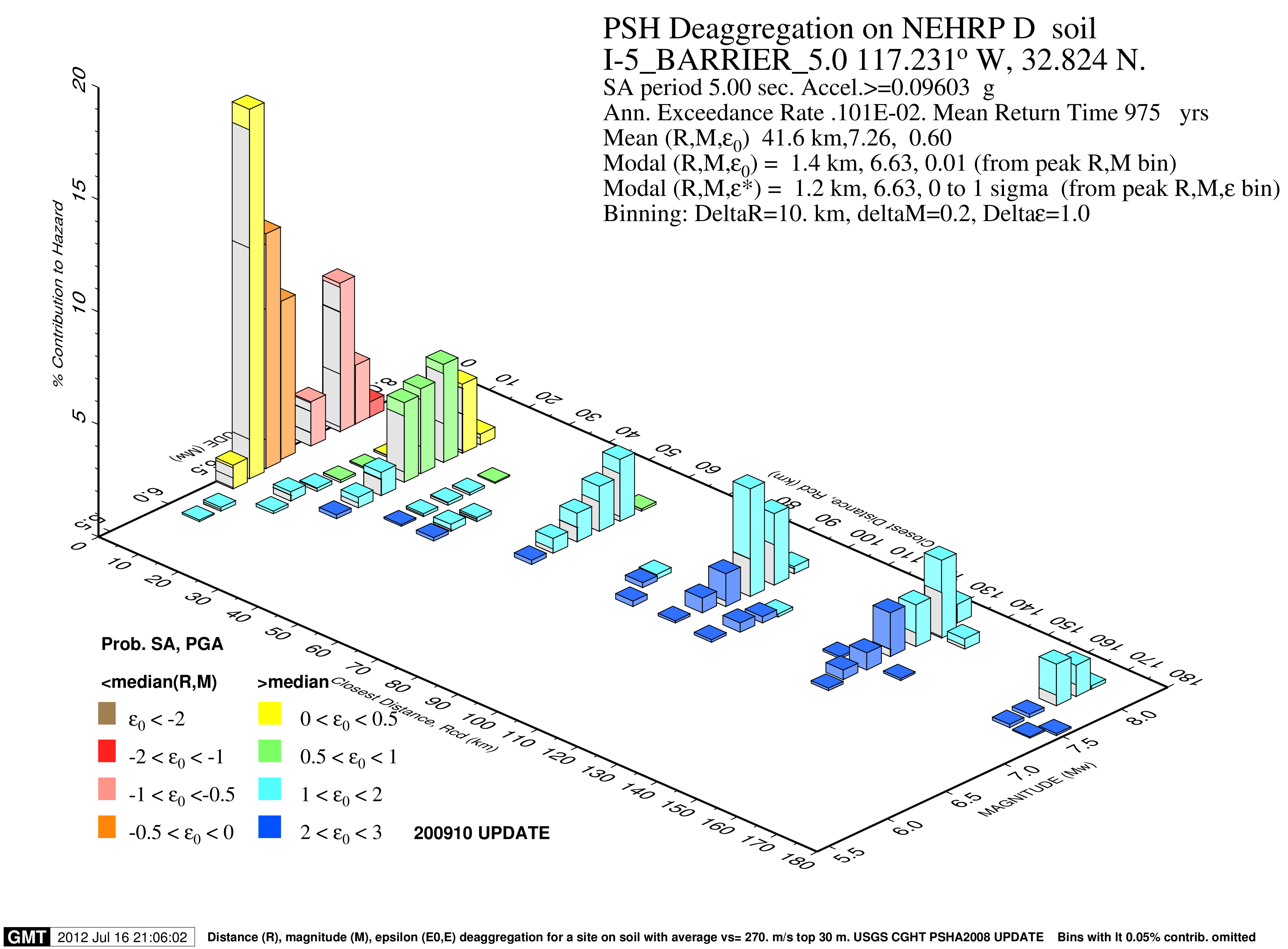
GMT 2012 Jul 16 21:04:22 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**



GMT 2012 Jul 16 21:05:00 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted



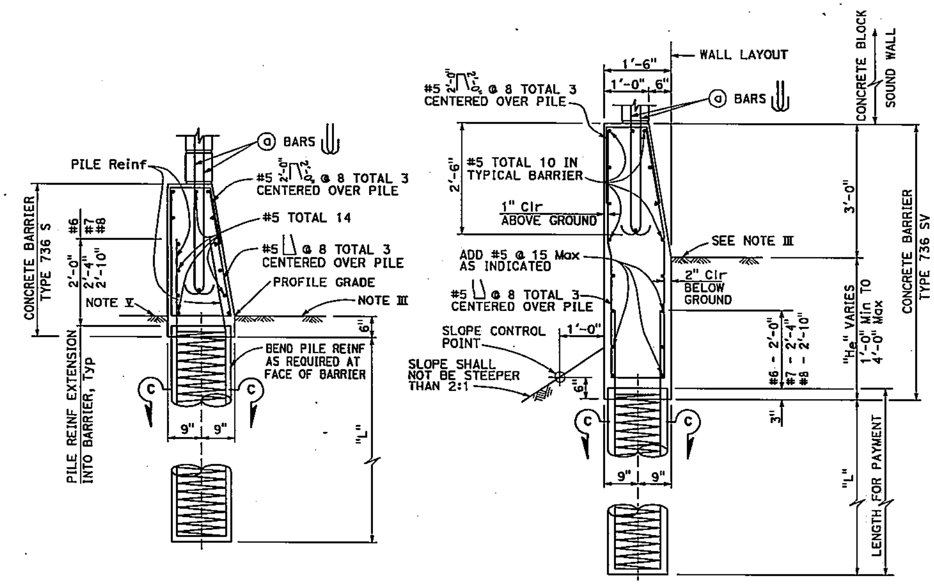
PSH Deaggregation on NEHRP D soil
I-5_BARRIER_4.0 117.231° W, 32.824 N.
SA period 4.00 sec. Accel.>=0.11760 g
Ann. Exceedance Rate .103E-02. Mean Return Time 975 yrs
Mean (R,M,ε0) 36.3 km,7.22, 0.44
Modal (R,M,ε0) = 1.5 km, 6.63,-0.08 (from peak R,M bin)
Modal (R,M,ε*) = 1.4 km, 6.63, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2012 Jul 16 21:05:34
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted



PSH Deaggregation on NEHRP D soil
I-5_BARRIER_5.0 117.231° W, 32.824 N.
SA period 5.00 sec. Accel.>=0.09603 g
Ann. Exceedance Rate .101E-02. Mean Return Time 975 yrs
Mean (R,M,ε0) 41.6 km,7.26, 0.60
Modal (R,M,ε0) = 1.4 km, 6.63, 0.01 (from peak R,M bin)
Modal (R,M,ε*) = 1.2 km, 6.63, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0
% Contribution to Hazard
Closest Distance, Rcd (km)
MAGNITUDE (Mw)
Prob. SA, PGA
<median(R,M)
>median
ε0 < -2
-2 < ε0 < -1
-1 < ε0 <-0.5
-0.5 < ε0 < 0
0 < ε0 < 0.5
0.5 < ε0 < 1
1 < ε0 < 2
2 < ε0 < 3
200910 UPDATE
GMT 2012 Jul 16 21:06:02
Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 270. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

APPENDIX III

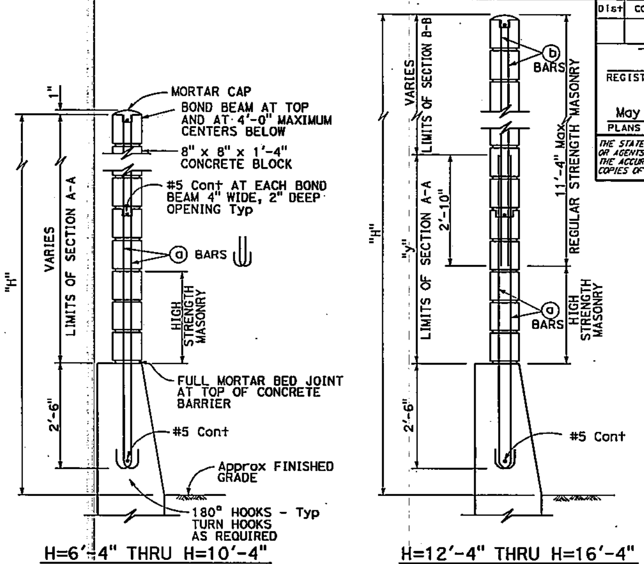
736S/SV BARRIER STANDARD PLAN



CASE 1
For details not shown, See Case 2.
Level ground ±10% on both sides of barrier.

CASE 2
For details not shown, See Case 1.
Level ground ±10% at the traffic side of barrier and sloping ground on the opposite side.

BARRIER SECTIONS



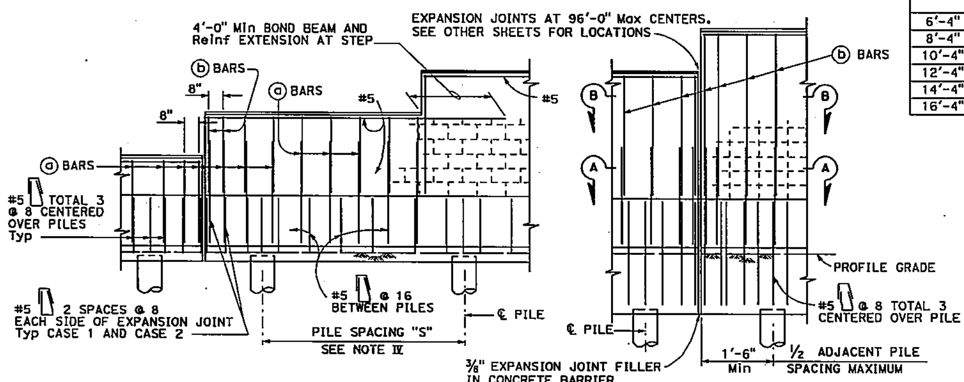
For details not shown, see H=6'-4" thru H=10'-4".

TYPICAL SECTIONS

See Standard Plan B15-8 for pile details.

SOUND WALL REINFORCEMENT TABLE

MAXIMUM H	(a) BARS @ 1'-4" Max	(b) BARS @ 1'-4" Max	"y"	f'm (psi)	COMPRESSIVE STRENGTH OF CMU (psi)	H
6'-4"	#4	---	---	1500	1900	6'-4"
8'-4"	#4	---	---	1500	1900	8'-4"
10'-4"	#4	---	---	1500	1900	10'-4"
12'-4"	#5	#4	5'-0"	1500	1900	12'-4"
14'-4"	#6	#4	7'-0"	1500	1900	14'-4"
16'-4"	#6	#4	9'-0"	2500	3750	16'-4"



CASE 1
For details not shown, See Case 2.

CASE 2
For details not shown, See Case 1.

PARTIAL ELEVATIONS

NOTES I THROUGH VI:

I. Details shown are primarily to conform design of sound walls to Type 736S and Type 736 SV Concrete Barriers. For sound wall details conforming with barriers see Standard Plans B15-7 and B15-8.

II. For details and sections not shown, see Standard Plans B15-7 and B15-8.

III. Slope ground at traffic side of barrier to drain. Maximum slope ±10%. See Std Plan B11-56, Note 3.

IV. Pile spacing may be varied, but shall not exceed the tabular values. See Standard Plan B15-8.

V. For Case 1 - ground line to be at the same elevation on both sides of the barrier. Barrier shall not be used to retain earth.

VI. See Standard Plan B15-9 for other details.

NOTES A THROUGH F:

A. For type of block, type of block bond, and joint finish, see other sheets.

B. When blocks are laid in stacked bond, ladder type, galvanized joint reinforcement shall be provided. A minimum of 2-9 gauge wires continuous at 4'-0" maximum to be used. Locate reinforcement in joints that are at the approximate midpoint between bond beams.

C. Horizontal joints shall be tooled concave or may be weathered. Vertical joints shall be tooled concave or may be raked.

D. For intermediate wall heights (H), or barrier depths (H_e), that are between the values given, use the tabular information for the next higher (H) or (H_e).

E. Concrete to be used for the barrier shall contain not less than 590 pounds of cementitious material per cubic yard.

F. Masonry strengths are listed in the "SOUND WALL REINFORCEMENT TABLE".

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER
May 20, 2011
PLANS APPROVAL DATE
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.
REGISTERED PROFESSIONAL ENGINEER Tillat Satter No. C42892 Exp. 3-31-12 CIVIL STATE OF CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

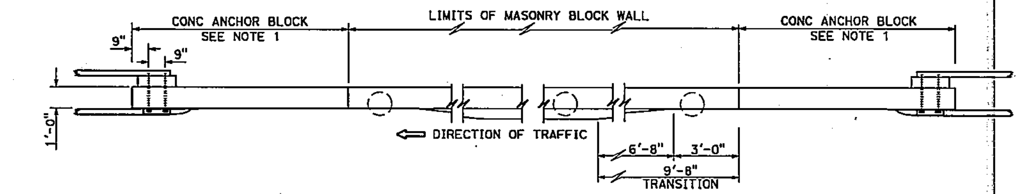
SOUND WALL MASONRY BLOCK ON TYPE 736S/SV BARRIER DETAILS (1)

NO SCALE

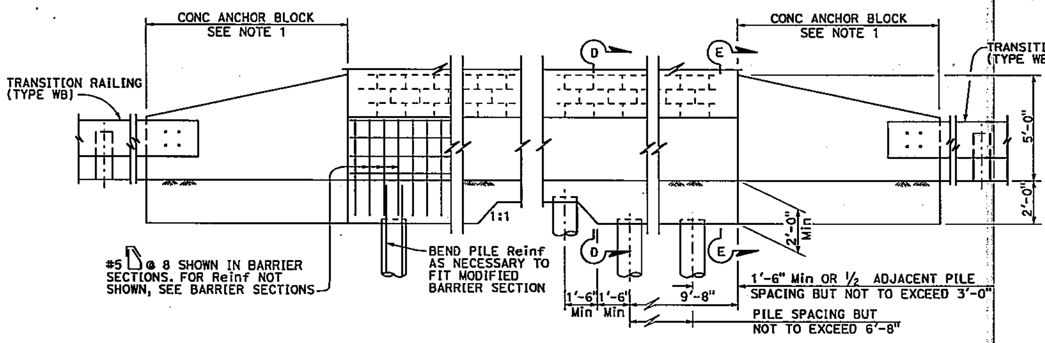
B15-6

2010 STANDARD PLAN B15-6

2-1-10



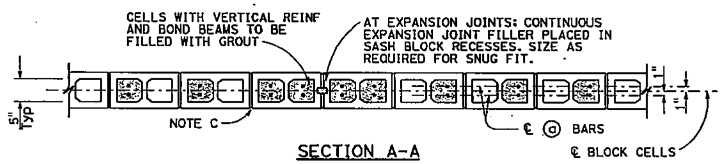
PLAN



ELEVATION

METAL BEAM GUARDRAIL ANCHORAGE

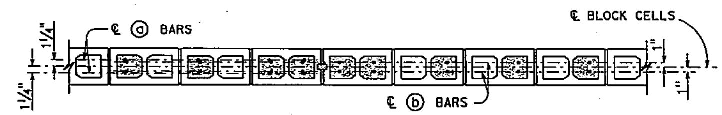
For details not shown, see Standard Plan B11-56.



SECTION A-A

For details not shown, see other details.

H=6'-4" THRU H=10-4"



SECTION A-A SECTION B-B

For details not shown, see other details.

H=12'-4" THRU H=16'-4"

NOTE:

1. For Concrete Anchor Block and connection details, see "Connection Detail DD" on Standard Plan A77J3.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

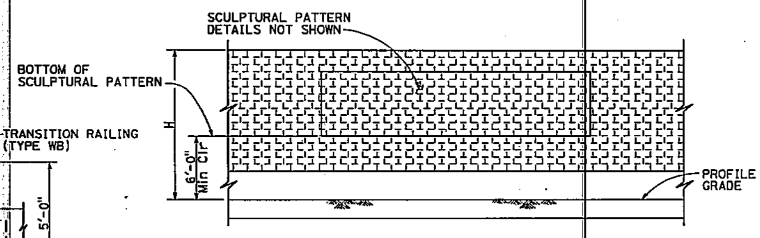
REGISTERED CIVIL ENGINEER

May 20, 2011

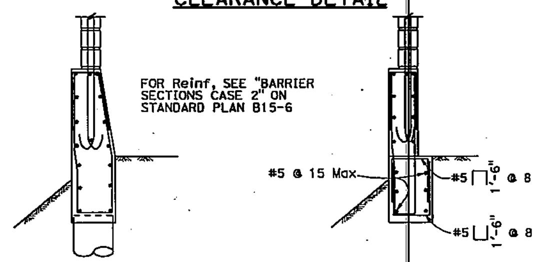
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

REGISTERED PROFESSIONAL ENGINEER — Tillat Satter — No. C42892 — Exp. 3-31-12 — CIVIL — STATE OF CALIFORNIA



CLEARANCE DETAIL



SECTION D-D SECTION E-E

DESIGN NOTES:

DESIGN

Uniform Building Code, 1997 Edition and the Bridge Design Specifications.

DESIGN WIND LOAD

27 psf

DESIGN SEISMIC LOAD

0.57 Dead load

REINFORCED CONCRETE

f'c = 3.6 ksi
fy = 60 ksi

CONCRETE MASONRY

REGULAR STRENGTH	HIGH STRENGTH	
f'm = 1500 psi	f'm = 2000 psi	f'm = 2500 psi
fb = 495 psi	fb = 660 psi	fb = 830 psi
fs = 24,000 psi	fs = 24,000 psi	fs = 24,000 psi
n = 25.8	n = 19.3	n = 15.5

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

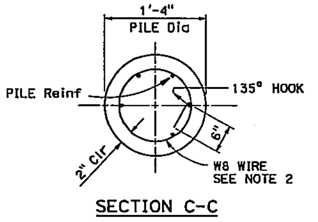
SOUND WALL MASONRY BLOCK ON TYPE 736S/SV BARRIER DETAILS (2)

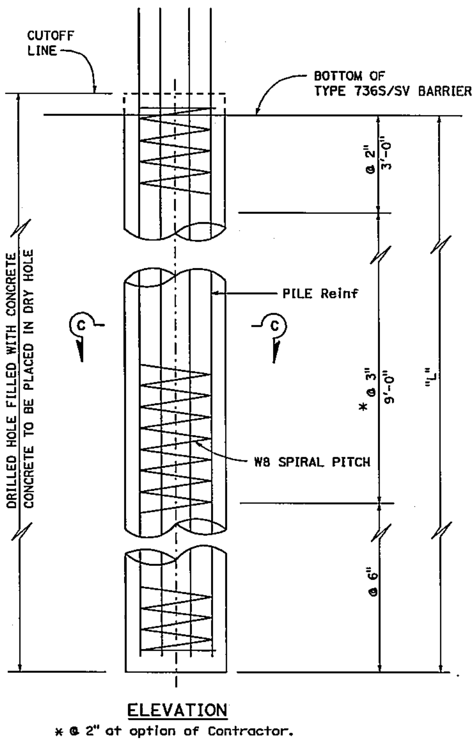
NO SCALE

B15-7

2010 STANDARD PLAN B15-7

6-10-05





* @ 2" at option of Contractor.

CASE 1: PILE DATA TABLE

MAXIMUM H	ø = 25 Min S	ø = 25 Min L	ø = 25 Min PILE Reinf	ø = 30 Min S	ø = 30 Min L	ø = 30 Min PILE Reinf	ø = 35 Min S	ø = 35 Min L	ø = 35 Min PILE Reinf	MAXIMUM H
6'-4"	10'-0"	8'-6"	#6 Tot 6	10'-0"	7'-0"	#6 Tot 6	10'-0"	6'-0"	#6 Tot 6	6'-4"
8'-4"	10'-0"	9'-6"	#6 Tot 6	10'-0"	8'-0"	#6 Tot 6	10'-0"	7'-0"	#6 Tot 6	8'-4"
10'-4"	10'-0"	10'-6"	#6 Tot 6	10'-0"	9'-0"	#6 Tot 6	10'-0"	7'-6"	#6 Tot 6	10'-4"
12'-4"	10'-0"	11'-6"	#7 Tot 6	10'-0"	9'-6"	#7 Tot 6	10'-0"	8'-6"	#6 Tot 6	12'-4"
14'-4"	10'-0"	12'-6"	#7 Tot 7	10'-0"	10'-6"	#7 Tot 7	10'-0"	9'-0"	#7 Tot 7	14'-4"
16'-4"	10'-0"	13'-0"	#8 Tot 7	10'-0"	11'-6"	#8 Tot 7	10'-0"	9'-6"	#7 Tot 7	16'-4"

CASE 2: PILE DATA TABLE

H_e	MAXIMUM H	ø = 30 Min S	ø = 30 Min L	ø = 30 Min PILE Reinf	ø = 35 Min S	ø = 35 Min L	ø = 35 Min PILE Reinf	MAXIMUM H
1'-0"	6'-4"	10'-0"	15'-0"	#7 Tot 6	10'-0"	12'-0"	#6 Tot 6	6'-4"
	8'-4"	9'-9"	16'-0'	#7 Tot 6	10'-0"	13'-0"	#7 Tot 6	8'-4"
	10'-4"	8'-0"	16'-0"	#7 Tot 6	10'-0"	14'-0"	#7 Tot 6	10'-4"
	12'-4"	6'-9"	16'-0"	#7 Tot 6	10'-0"	15'-0"	#8 Tot 7	12'-4"
	14'-4"	5'-9"	16'-0"	#7 Tot 6	9'-6"	15'-6'	#8 Tot 7	14'-4"
	16'-4"	5'-0"	16'-0"	#7 Tot 6	8'-9"	16'-0"	#8 Tot 7	16'-4"
2'-0"	6'-4"	8'-3"	16'-0"	#7 Tot 6	10'-0"	13'-6"	#7 Tot 6	6'-4"
	8'-4"	7'-0"	16'-0"	#7 Tot 6	10'-0"	14'-6"	#7 Tot 7	8'-4"
	10'-4"	6'-0"	16'-0"	#7 Tot 6	10'-0"	15'-3'	#8 Tot 7	10'-4"
	12'-4"	5'-3"	16'-0"	#7 Tot 6	9'-9"	16'-0"	#8 Tot 7	12'-4"
	14'-4"	4'-6"	16'-0"	#7 Tot 6	8'-4"	16'-0"	#8 Tot 7	14'-4"
	16'-4"	4'-0"	16'-0"	#7 Tot 6	7'-4"	16'-0"	#8 Tot 7	16'-4"
3'-0"	6'-4"	6'-0"	16'-0"	#7 Tot 6	10'-0"	15'-3"	#8 Tot 7	6'-4"
	8'-4"	5'-3"	16'-0"	#7 Tot 6	10'-0"	16'-0"	#8 Tot 7	8'-4"
	10'-4"	4'-6"	16'-0"	#7 Tot 6	8'-10"	16'-0"	#8 Tot 7	10'-4"
	12'-4"	4'-0"	16'-0"	#7 Tot 6	7'-10"	16'-0"	#8 Tot 7	12'-4"
	14'-4"	3'-6'	16'-0"	#7 Tot 6	6'-10"	16'-0"	#8 Tot 7	14'-4"
	16'-4"	3'-3"	16'-0"	#7 Tot 6	6'-2"	16'-0"	#8 Tot 7	16'-4"
4'-0"	6'-4"	4'-3"	16'-0"	#7 Tot 6	8'-0"	15'-6"	#8 Tot 7	6'-4"
	8'-4"	3'-10"	16'-0"	#7 Tot 6	7'-4"	15'-9"	#8 Tot 7	8'-4"
	10'-4"	3'-6"	16'-0"	#7 Tot 6	6'-10"	16'-0"	#8 Tot 7	10'-4"
	12'-4"	3'-2"	16'-0"	#7 Tot 6	6'-3"	16'-0"	#8 Tot 7	12'-4"
	14'-4"	3'-0"	16'-3"	#7 Tot 6	5'-8"	16'-0"	#8 Tot 7	14'-4"
	16'-4"	2'-10"	16'-6"	#7 Tot 6	5'-0"	16'-0"	#8 Tot 7	16'-4"

NOTES:

1. For details not shown, see Standard Plans B15-6 and B15-7.
2. Lapped splices in spiral reinforcement shall be lapped at least 80 wire diameters. Spiral reinforcement at splices and at ends shall be terminated with a 135° hook with a 6" tail hooked around a longitudinal bar.

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

May 20, 2011

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

REGISTERED PROFESSIONAL ENGINEER — Tillat Sattar — No. C42892 — Exp. 3-31-12 — CIVIL — STATE OF CALIFORNIA

2010 STANDARD PLAN B15-8

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

SOUND WALL MASONRY BLOCK ON TYPE 736S/SV BARRIER DETAILS (3)

NO SCALE

B15-8

6-10-09