DISTRICT PRELIMINARY GEOTECHNICAL REPORT

FOR THE

INTERSTATE 5/STATE ROUTE 56 INTERCHANGE PROJECT

Prepared for:

CALTRANS – DISTRICT 11
Office of Geotechnical Design South 2
7177 Opportunity Road
San Diego, CA 92111

Prepared by:

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October 2009

October 19, 2009

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Subject: DISTRICT PRELIMINARY GEOTECHNICAL REPORT
INTERSTATE 5/STATE ROUTE 56
INTERCHANGE PROJECT
SAN DIEGO COUNTY, CALIFORNIA

Dear Mr. Hinman:

This letter transmits Dokken Engineering's Draft District Preliminary Geotechnical Report for the Interstate 5/State Route 56 Interchange Project, located in San Diego County, California. This report has been edited to reflect the recent updates to the Caltrans seismic design procedures and to incorporate the changes in the Caltrans Seismic Design Criteria (Appendix B) and utilize the ARS Online, Design Spectrum Tool, v1.0 (Caltrans, 2009) that is being used in conjunction with the newly developed Caltrans Deterministic PGA Map (Caltrans, 2007).

Dokken Engineering would like to thank you for allowing us the opportunity to prepare this Draft District Preliminary Geotechnical Report for the subject project. If you have any questions or with to discuss this report, please call us at (916) 858-0642.

Respectfully Submitted,
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1. INTRODUCTION

1.1 General

State Route 56 (SR 56) is a four lane facility servicing the northern communities of the City of San Diego. Completed in 2004, the facility serves as a vital interregional east-west link between Interstate 5 (I-5) to the west and Interstate 15 (I-15) to the east. The I-5/SR 56 Interchange Project proposes to maintain or improve the existing and future traffic operations along the I-5 and SR 56 corridors between Del Mar Heights Road, Carmel Valley Road, and Carmel Country Road, (see Figure 1, Project Location Map), in order to improve the safe and efficient local and regional movement of people and goods, while minimizing environmental and community impacts for the planning design year of 2030.

1.2 Purpose and Scope of Work

The proposed project is located in the northern portion of the City of San Diego and City of Del Mar in San Diego County. The purpose of this study is to review, identify and discuss general geology, soils, seismicity, and potential geologic hazards and geotechnical considerations within the study area that may impact the project.

Our assessments involved the following general scope of work, previous reviews, and limitations:

1. Review documented sources describing area topography, geology, soils, seismicity, groundwater conditions, and mineral resources.

2. Review of existing data, including published reports, maps, as-built plans, Log of Test Borings (LOTB's), aerial photographs, and other pertinent geotechnical references.

3. Perform a field reconnaissance to identify readily visible geologic (soil and rock) conditions within the project limits.

4. Review existing geotechnical analysis and parameters, within and adjacent to this project.

5. Preparation of this report.

The analysis and recommendations presented in this preliminary report are in accordance with current Caltrans standards and practices.

2. EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 Background

Interstate 5 and I-15 are principal north-south arterials for the western United States, linking the Mexican border in the south to the Canadian border to the north. Regionally, I-5 and I-15 serve as a commuter link for North San Diego County with significant intraregional, interregional and international traffic. Located in Central San Diego County, SR 56 serves as an east-west corridor for I-5 and I-15. SR 56 was completed in three phases with the final phase opening to traffic in 2004 as a four-lane facility.

A previous project to reduce congestion along I-5 from the I-5 / Interstate 805 (I-805) interchange to Del Mar Heights Road was completed in phases beginning in 1995, with the final phase completed in April of 2007. This project entailed the addition of high occupancy vehicle (HOV) lanes in the northbound (NB) and southbound (SB) directions, a four-lane SR 56 bypass in the NB and SB directions, and the construction of NB to eastbound (EB) and westbound (WB) to SB freeway-to-freeway connectors. Traffic projections prior to the North City Future Urbanizing Area phase shifts indicated that connectors were not warranted, limiting construction of the WB to NB and SB to EB freeway-to-freeway connectors. Drivers traveling SB on I-5 or WB SR 56 must use Carmel Valley Road and El Camino Real to travel on EB SR 56 and NB I-5, respectively.

In 1996 and again in 1998, the citizens of San Diego voted to phase shift the relatively undeveloped section of the North City Future Urbanizing Area from "future" to "planned" urbanizing. This phase shift and the associated developments will increase the population and traffic demand in the region utilizing the SR 56 facility.

Caltrans, now as the lead federal agency, in cooperation with the San Diego Association of Governments (SANDAG) and the City of San Diego, are preparing a Draft Environmental Impact Statement/Environmental Impact Report (DEIS/DEIR) for a transportation project located on I-5 and SR 56 in the northern portion of the City of San Diego. The proposed project would begin south of Carmel Valley along I-5 at post mile (PM) 32.7 (kilometer post (KP) 52.6) and continue to PM 34.8 (KP 56.0) north of Del Mar Heights Road. Along SR 56, the project would begin at PM 0.0 (KP 0.0) at El Camino Real and continue to PM 2.5 (KP 4.1) east of Carmel Country Road.

Currently, local streets and the surrounding communities experience increased demand and congestion during peak hours from I-5 and SR 56 traffic. The current network forces drivers to exit the freeway to travel between SB I-5 to EB SR 56 and WB SR 56 to NB I-5. This causes congestion at the El Camino Real and Carmel Valley Road intersection. A recent widening to the westbound SR 56 off-ramp has improved current operations, but will need to be evaluated with future traffic projections. During peak hours, in order to avoid traffic congestion at the I-5/SR 56 interchange, drivers use alternate routes including El Camino Real, Carmel Valley Road, and Carmel Creek Road causing increased traffic on surface streets near the project area.

The increased congestion negatively impacts the surrounding communities by increasing the traffic through neighborhoods. Continued regional development and inter-regional travel will further increase traffic volumes and reduce traffic operational quality.

2.2 Existing Facilities

The project study area is located in San Diego County and is included in the Cities of San Diego and Del Mar. The study area includes I-5 from just north of the Del Mar Heights overcrossing southward to SR 56; SR 56 from the I-5 interchange to Carmel County Road; and various local streets.

The existing facilities in the project area include bridges, culverts, graded slopes, buried utilities and adjacent commercial and residential development. I-5 has four 3.66 m wide Portland cement concrete lanes in each direction. SR 56 has two 3.66 m wide asphalt concrete lanes in each direction and a 7.6 m wide median.

Project Location along I-5 and SR 56

Route	From	To
I-5	PM 32.7 (KP 52.6)	PM 34.8 (KP 56.0)
SR 56	PM 0.00 (KP 0.00)	PM 2.5 (KP 4.1)

2.2.1 Existing Roadways

Existing I-5 is an eight-lane, Portland cement concrete paved freeway with asphalt concrete paved shoulders. Existing SR-56 is a four lane, asphalt concrete paved freeway with asphalt concrete paved shoulders.

2.2.2 Existing Cut, Fill and Natural Slopes

As is typical in San Diego County, I-5 crosses lagoons, small canyons and arroyos, and cuts through mesas. Typically, embankments are constructed to cross the lagoons, canyons and arroyos and transitions to cut-slopes to traverse the mesas. In the project area, I-5 transitions from embankment fill to cross Carmel Valley into a cut slope as the topography rises towards Del Mar Heights Road. SR 56 transitions through a series of embankment fills and shallow cuts from I-5 eastward to Carmel Country Road.

Natural slopes typically exhibit slope inclinations of approximately 1:2 (vertical to horizontal) and range up to 50 feet in height along I-5 and up to 45 feet in height along the SR 56 corridor within the study area. The slopes along I-5 in the project area are generally vegetated with exotic plants, native grasses, some shrubs and occasional mature trees. The slopes along SR 56 are also generally vegetated with exotic plants, native grasses, some shrubs and occasional mature trees.

Existing Cut Slopes

Cut slopes along I-5, within the project area occur between Station 542+00 to Station 570+00. The general trend of the topography in this area is downhill to the east-southeast and the taller slopes are found along the west side of I-5 and range up to 130 feet. The cut-slope inclinations along the west side of I-5 are approximately 1:2 (vertical to horizontal) in areas where retaining walls are not used. The cut-slope inclinations along the east side of I-5 are approximately 1:2 (vertical to horizontal).

Cut-slopes along SR 56 within the project area occur between Station 27+00 to Station 48+00.

Existing Fill Slopes

Embankment fills along I-5, within the project area occur between approximately Station 537+60 to Station 543+00 and also at the abutments for the Del Mar Heights Road overcrossing and on- and off-ramps. Embankment fills for SR 56 within the study area are encountered at various locations where SR 56 crosses small canyons and arroyos and the fills vary in thickness. A review of the available boring logs indicated that the fill materials generally consist of medium dense sands. Slope inclinations of these embankment fills generally ranged between approximately 1:2 (vertical to horizontal), or flatter and are generally vegetated with native and exotic species of plants and grasses.

2.2.3 Existing Development

Beyond the I-5 freeway right-of-way, the adjacent properties are moderately to densely developed with residential and commercial properties. Above the west side of the I-5 cut slopes, the mesa had been terraced for residential and minor commercial development. East of I-5, the adjacent properties had been graded to both terrace the existing slope and also fill the former un-named arroyo.

The development adjacent to the SR 56 right-of-way consists predominantly of residential development with some commercial development north of the freeway and mainly open, undeveloped land with some residential development south of the freeway.

2.2.4 Existing Utilities

Numerous buried and overhead utilities exist within the study area and include (but are not limited to) buried culverts and storm sewers and buried and overhead electric, gas and telecommunications facilities. A listing of existing utilities, within the study area, is presented in Table 5.

2.3 Proposed Improvements

This project proposes improvements between the Del Mar Heights Road interchange and SR 56 along I-5 and between the Carmel Country Road interchange and I-5 along SR 56. The project is anticipated to

include improvements to the surface streets, the addition of auxiliary lanes along SR 56 and I-5, interchange improvements, or new freeway-to-freeway connector ramps.

Currently, there are three viable alternatives for the project, the Direct Connector Alternative, the Auxiliary Lane Alternative and the Hybrid Alternative. The Direct Connector Alternative proposes the construction of direct freeway - to - freeway structures in the westbound to northbound and southbound to eastbound directions and improvements on and along I-5 and SR-56 to accommodate for the structures. The connector ramps will have two general purpose lanes. The Auxiliary Lane Alternative proposes the construction of an auxiliary lane along southbound I-5, improvements to the southbound off-ramp and northbound on-ramp at Carmel Valley Road, and improvements to the eastbound El Camino Real on-ramp. The Hybrid Alternative is a combination of the alternatives mentioned above, proposing construction of the Direct Connector Alternative's direct freeway - to - freeway connector structure in the westbound to northbound direction, in addition to the Auxiliary Lane Alternative's ramp, freeway and local street improvements in the southbound to eastbound direction.

Two northbound and two southbound HOV lanes are proposed for I-5 as part of the I-5 North Coast Widening project. As part of the I-5/SR 56 Connector project, HOV lanes are proposed for the on-ramps located at the Del Mar Heights Road interchange.

2.3.1 Proposed Roadways

This project proposes multiple improvements within the project limits. This project will accommodate the I-5 North Coast Widening project. The I-5 North Coast Widening project will widen the existing 8-lane freeway to a 10-lane facility and it will also construct four HOV lanes (two in each direction) in the median.

<u>The Direct Connector Alternative</u>

The Direct Connector Alternative includes the extension of the local bypass in both the northbound and southbound directions to the Del Mar Heights Road Interchange. Travelers who want to use the southbound local bypass must access the bypass just south of the Del Mar Heights Road interchange. A concrete barrier will separate the freeway mainline traffic from the local bypass and connector ramps in the northbound and southbound directions. A barrier separated collector/distributor system along westbound SR 56 will separate the westbound to southbound traffic from the westbound to northbound traffic just east of the Carmel Creek Road interchange. To eliminate the weave movement between the drivers exiting the northbound to eastbound connector to access Carmel Creek Road and drivers entering eastbound SR-56 from El Camino Real, a barrier will be constructed along SR 56 between El Camino Real and Carmel Creek Road. Drivers traveling from I-5 to eastbound SR-56 will need to use local street alternative routes to access Carmel Creek Road.

Carmel Valley Road will be widened to four lanes east of I-5. Improvements will be made to the intersection of El Camino Real and Carmel Valley Road south of SR 56; the intersection and eastbound SR-56 on-ramp will be widened to accommodate higher traffic volumes.

An auxiliary lane will be constructed along eastbound SR 56 between Carmel Creek Road and Carmel Country Road, and along northbound and southbound I-5 between the connector ramps and Del Mar Heights Road. Several local street interchanges will be modified in order to accommodate for the new configurations on and along I-5 and SR 56. Improvements are proposed for the northbound on- and off-ramps and southbound off-ramp at Carmel Valley Road as well as for the eastbound and westbound Carmel Creek Road on- and off-ramps. Portofino Circle will be realigned and reconstructed as well.

The Auxiliary Lane Alternative

Carmel Valley Road will be widened to four lanes east of I-5. Improvements will be made to the intersection of El Camino Real and Carmel Valley Road south of SR 56; the intersection will be widened to accommodate higher traffic volumes.

State Route 56 westbound will be widened to the north to accommodate an additional general purpose lane and the future construction of HOV lanes within the median. Due to this addition, the westbound Carmel Creek Road loop on-ramp and off-ramp and the Carmel Country Road loop on-ramp will be realigned. An additional auxiliary lane along southbound I-5 and associated operational improvements are also proposed with this alternative. As with the Direct Connector Alternative, access to Carmel Creek Road from the northbound to eastbound connector will be eliminated. Drivers traveling from northbound I-5 to eastbound SR-56 will need to use local street alternative routes to access Carmel Creek Road.

The Hybrid Alternative

The Hybrid Alternative includes the extension of the local bypass in both the northbound direction to the Del Mar Heights Road Interchange. A barrier separated collector/distributor system along westbound SR 56 will separate the westbound to southbound traffic from the westbound to northbound traffic just east of the Carmel Creek Road interchange. As with the Direct Connector and Auxiliary Lane Alternatives, access to Carmel Creek Road from the northbound to eastbound connector will be eliminated. Drivers traveling from northbound I-5 to eastbound SR-56 will need to use local street alternative routes to access Carmel Creek Road.

Carmel Valley Road will be widened to four lanes east of I-5. Improvements will be made to the intersection of El Camino Real and Carmel Valley Road south of SR 56; the intersection and eastbound SR-56 on-ramp will be widened to accommodate higher traffic volumes.

2.3.2 Proposed Bridges

The Direct Connector Alternative

The Direct Connector Alternative proposes the construction of direct freeway - to - freeway structures in the westbound SR-56 to northbound I-5 and southbound I-5 to eastbound SR-56 directions. The connector ramps will have two general purpose lanes.

The Del Mar Heights interchange (Bridge # 57 0487; PM R034.13 [KP 111.98]) will be reconstructed; the overcrossing will be replaced and the northbound and southbound on- and off-ramps will be reconfigured. The bridge at El Camino Real will be widened to accommodate the westbound to northbound connector ramp. To improve operations and to accommodate the connector ramps, the northbound and southbound bypass lanes will be realigned north of Carmel Valley Road.

The Auxiliary Lane Alternative

Reconstruction of the Del Mar Heights Road overcrossing would also be performed for this alternative.

The Hybrid Alternative

The Hybrid Alternative proposes construction of a direct freeway - to - freeway structure in the westbound SR-56 to northbound I-5 direction. The connector ramp will have two general purpose lanes.

Reconstruction of the Del Mar Heights Road overcrossing and widening of the El Camino Real undercrossing will also be performed for this alternative.

2.3.3 Proposed Retaining Walls

The Direct Connector Alternative

Numerous retaining walls will be constructed for this alternative, and are presented in Table 12.

The Auxiliary Lane Alternative

Numerous retaining walls will be constructed for this alternative, and are presented in Table 13.

The Hybrid Alternative

Numerous retaining walls will be constructed for this alternative, and are presented in Table 14.

2.3.4 Proposed Soundwalls/Sound Berms

The number and location of soundwalls and berms has not yet been determined for this project.

3. PERTINENT REPORTS AND INVESTIGATIONS

The following reports and investigations were reviewed for this study:

California Department of Transportation, 1992, *Foundation Recommendations, Carmel Valley Creek (Replace) Bridge No. 57-0590, September 18, 1992.*

California Department of Transportation, 1992, *Foundation Recommendations, Carmel Valley Creek Connector Bridge No. 57-0990, September 18, 1992.*

California Department of Transportation, 1992, *Foundation Recommendations, Carmel Valley Creek Connector Bridge No. 57-0590G, September 18, 1992.*

California Department of Transportation, 1992, *Foundation Recommendations, Route 56/5 Separation Bridge No. 57-0989F, September 18, 1992.*

California Department of Transportation, 1992, *Foundation Recommendations, El Camino Real UC Bridge No. 57-1004R/L, September 18, 1992.*

California Department of Transportation, 1993, *Memo in Lieu of Materials Report, Interstate 5 between the I-5/I-805 Junction and the I-5/Del Mar Heights Interchange, January 12, 1993.*

Boyle Engineering Corporation, 1999, *Draft Geotechnical Design Report, Middle Segment, State Route 56 Project, City of San Diego, California, 11-SD-56, KP 3.3/10.5, EA 172820, February 22, 1999.*

California Department of Engineering, 1999, *Memorandum, Structural Section Recommendations, 11-SD-5, 56, KP 52.9/53.7, 0.0/0.8, EA 11-17790K, March 5, 1999.*

California Department of Transportation, 2001, *Geotechnical Investigation Report, Interstate 5 and 805 Interchange, Proposed Retaining Walls, 11-SD-5/805, KP 48.9–51.2/43.9-46.5, EA 11-0301U1, April 12, 2001.*

California Department of Transportation, 2005, *Preliminary Geotechnical Report (PGR), Interstate 5 Widening, 11-SD-5, PM R28.4/R55.3, EA 235800, October 5, 2005.*

A listing of all pertinent reports and investigations reviewed for this study are presented in Appendix A; References. Copies of the above reports and investigations are presented in Appendix B, Previous Reports. Copies of Log of Test Borings (LOTB's) reviewed for this study are also presented in Appendix B. The locations of the previous borings are shown on Figures 1 through 8 in Appendix C.

4. PHYSICAL SETTING

4.1 Climate

Climate data provided by the USDA Soil Survey of San Diego County (USDA, 1973), indicated that the project area is located in a semi-arid region, with the climate considered mild marine, with mean temperatures ranging between 47º F and 78º F and annual precipitation of approximately 13 inches per year. Precipitation generally occurs between the months of November and March.

4.2 Topography and Drainage

Within the project limits the prominent physical features include uplifted terraces (mesas) which have been eroded by ephemeral streams to form canyons and arroyos. The more prominent canyons typically trend east-west and drain larger ephemeral streams to the Pacific Ocean. The smaller arroyos are generally found trending to the north and south, incising the mesas with the smaller creeks feeding the larger streams. The mesas along the I-5 corridor typically range up to approximately 300 feet or less, while the stream and lagoon elevations are closer to sea level.

The project topography trends generally downhill from the Del Mar Heights Road/I-5 interchange to the south-southeast towards Carmel Valley and the Soledad Valley estuary. A small un-named stream was shown on the 1975 geologic map of the Del Mar quadrangle, following the east side of El Camino Real, trending downhill to the south towards Carmel Valley. Carmel Valley Creek was mapped as trending downhill to the southeast within Carmel Valley and flowing under I-5 towards the confluence with the Soledad Valley estuary, and the Pacific Ocean further to the west. Two additional un-named creeks were depicted on the 1975 geologic map of the Del Mar quadrangle, trending southward towards Carmel Valley Creek, one east, and one west of existing Carmel County Road. A third un-named creek parallels the west side of Carmel Country Road, south of Carmel Valley, flowing into Carmel Valley Creek.

4.3 Man-Made and Natural Features of Engineering and Construction Significance

The man-made and natural features of engineering and construction significance within the project area include the following:

Man-Made and Natural Features of Engineering and Construction Significance

Overcrossings	Undercrossings	Lagoons and Rivers (Embankment Fills and Bridges)	Major Cuts	Major Culverts	Existing Retaining Walls
Del Mar Heights Road	Carmel Valley Road	Carmel Valley Creek	Del Mar Heights Area	Culvert/detention basin bordering Carmel Valley Road – NB on-ramp	Del Mar Heights Road – NB/SB on-ramps (Type 1 wall)
Carmel Creek Road	El Camino Real	Soledad Valley Estuary			
Carmel Country Road					

4.4 Regional Geology and Seismicity

4.4.1 Regional Geology

The project study area is located within the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges Geomorphic Province is characterized by northwest trending mountains and valleys and associated northwest trending faults and fault zones. San Diego County can be divided among three distinct geomorphic regions: the Coastal Plain region as exposed west of the Peninsular Ranges; the Peninsular Range region, and the Salton Trough region as exposed east of the Peninsular Ranges. This geomorphic division reflects a basic geologic difference between the three regions, with Mesozoic metavolcanic, metasedimentary, and plutonic rocks predominating in the Peninsular Ranges, and primarily Cenozoic sedimentary rocks predominating to the west and east of the central mountain range. The irregular contact between these geologic regions reflects the ancient topography of this area before it was buried by the thick sequence of Cretaceous and Tertiary sedimentary rocks deposited over the last 75 million years by ancient rivers and in ancient seas (Demere, 2008).

The Peninsular Ranges geomorphic province encompasses an area that extends 125 miles, from the Transverse Ranges and the Los Angeles Basin, south to the Mexican border, and beyond another 795 miles to the tip of Baja, California. This geomorphic province varies in width from 30 to 100 miles, most of which is characterized by northwest trending mountain ranges separated by sub-parallel fault zones. The Peninsular Ranges Region is underlain primarily by Cretaceous-age plutonic (i.e., granitic) rocks that formed from the cooling of molten magmas deep within the earth's crust. These magmas were generated during subduction of an oceanic crustal plate that was converging on the North American Plate between 140 and 90 million years ago. Over this long period of time, extensive masses of granitic rocks accumulated at depth to form the Southern California Batholith. Intense heat associated with these plutonic magmas metamorphosed the ancient sedimentary rocks into which the plutons intruded. These metasediments are now preserved in the Peninsular Range Region as marbles, slates, schist, quartzites, and gneiss. The western-most portion of the province in San Diego County generally consists of uplifted Upper Cretaceous-, Tertiary-, and Quaternary age sedimentary rocks (Harden, 1997; Kennedy, 1997; CGS, 2004).

In the Coastal Plain region (which includes the study area), resistant peaks composed of Mesozoic crystalline rocks (such as at Rock Mountain on the north side of Otay Valley, Black Mountain near Rancho Penasquitos, and Cowles Mountain near San Carlos) are actually "rooted" at depth to the buried Mesozoic crystalline rock terrain. These basement "highs" poke through the younger Cretaceous and Tertiary sedimentary cover and demonstrate the amount of topographic relief on the buried landscape of western San Diego County.

The Coastal Plain Region is underlain by a "layer cake" sequence of marine and non-marine sedimentary rock units that record portions of the last 140 million years of earth history. Over this period of time the relationship of land and sea has fluctuated drastically so that today we have ancient marine rocks preserved up to elevations around 900 feet above sea level and ancient river deposits as high as 1,200 feet. Faulting related to the local La Nacion and Rose Canyon fault zones has broken up this "layer cake" sedimentary sequence into a number of distinct fault blocks in the southwestern part of the county. North of La Jolla the effects of faulting are not as great and the rock units here are relatively undeformed.

The Coastal Plain Region is traversed by several major active faults. The Newport-Englewood (offshore), Agua Blanca-Coronado Bank and San Clemente faults are active faults located to the northwest and west-southwest. The local Rose Canyon fault zone, located west of the site, has also been recognized as active by the State of California. Major tectonic activity associated with these and other faults within this regional tectonic framework is right-lateral strike-slip movement. These faults, as well as other faults in the region, have the potential for generating strong ground motions at the project site.

The basement rocks within the study area are predominantly granodiorites and tonalites, related to the regional Southern California Batholith of the Peninsular Ranges Geomorphic Province which are overlain

by undifferentiated sedimentary rocks of Upper Cretaceous and Eocene age. The structure of the Peninsular Ranges is characterized by a series northwest trending mountain ranges separated by northwest trending valleys, sub-parallel to faults branching from the San Andreas Fault. The trend of the major tectonic activity associated with these and other faults within this regional tectonic framework is right-lateral strike-slip movement. The trend of topography is similar to the Coast Ranges, but the geology is more like the Sierra Nevada, with granitic rock intruding the older metamorphic rocks, east of the coastal plain (CGS, 2004).

The Peninsular Ranges extend into Lower California and are bound on the east by the Colorado Desert. The Los Angeles Basin and the island group (Santa Catalina, Santa Barbara, and the distinctly terraced San Clemente and San Nicolas islands), together with the surrounding continental shelf (cut by deep submarine fault troughs), are included in this province.

4.4.2 Regional Seismicity

Earthquake magnitudes generated by faulting are related to the size (length) and type of fault displacement. With little exception, the longer a fault, the greater the magnitude earthquake a fault is considered able to produce. Short length faults may not be capable of producing an earthquake or, if they do, it is likely to be relatively minor. Often, short faults develop as sympathetic movements related to a major earthquake. At other times, minor faults are produced by gravity effects of basin subsidence in which case earthquakes may not occur. Regional uplift or doming may even develop surface ruptures, which do not produce earthquakes.

Seismicity relates to the earthquake activity within a particular area. Compared with other portions of California, the Peninsula Ranges region has had moderate seismic activity, based on historical records spanning almost 200 years. An earthquake search (Blake, 2000) was performed to identify previous earthquakes with a Moment Magnitude between 4.0 and 9.0, and lying within a radius of approximately 63 miles (100 km) from the project area.

The searches produced a record of 208 earthquakes within 63 miles (100 km) of the centroid of the project study area. The maximum magnitude earthquake inside the search area occurred in 1918, with an approximate magnitude of 6.8 and an epicenter located approximately 58 miles northeast of the project study area. The closest recorded earthquake (estimated magnitude 6.5) occurred in 1800, approximately 5 miles northwest of the site.

4.5 Soil Survey Mapping

Surface soil conditions within the project area generally reflect the nature of the underlying sediments and/or parent bedrock. The Soil Survey of San Diego County, California (USDA, 1973), indicated that there are 11 different soil units identified within the project study area. These units are presented in Table 3.

5. EXPLORATION

This report is preliminary and is based on review of available geologic and geotechnical data and site reconnaissance. No subsurface exploration was performed specifically for this report. Previous studies reviewed for this report are presented in Appendix B.

5.1 Geologic Mapping

Site specific geologic mapping was not performed for this preliminary study. Geologic data was interpreted from existing geologic maps that included the study area. A cursory site reconnaissance was performed to verify the mapped geologic units.

6. GEOTECHNICAL TESTING

No laboratory testing was performed specifically for this report. Preliminary soil parameters were determined from previous geotechnical investigations for studies performed in the near vicinity of the current project. Previous studies reviewed for this report are presented in Appendix B, which contains subsurface information from previous studies.

7. GEOTECHNICAL CONDITIONS

7.1 Site Geology

The geology of the project area was evaluated based on a general site reconnaissance, and review of existing geologic maps and literature. Figure 2 shows the general geology that has been mapped within the project area (Kennedy, 1975, 2005).

The northern portion of the project study area (I-5 and Del Mar Heights Road) is located on an upland area between the San Dieguito Valley to the north and Carmel Valley and Soledad Valley to the south. The southern portion of the project (I-5 and the SR 56 interchange to the SR 56 and Carmel County Road interchange) trends along the lowlands of the Carmel Valley.

The upland areas, including the Del Mar Heights Road interchange with I-5, is primarily underlain by Eocene-age Torrey Sandstone and is described as, white to light brown, medium to coarse-grained, arkosic sandstone. The Delmar Formation, which is stratigraphically older that the Torrey Sandstone, is mapped as outcropping just northeast of the I-5/SR 56 interchange, and is described as pale gray to white, marine, sandstone, clayey siltstone, and claystone. Landslides and surficial slope failures are commonly associated with this formation. The stratigraphically younger Bay Point Formation and Stream-Terrace Deposits (Late Pleistocene-age), overlie the Delmar Formation and Torrey Sandstone. The Bay Point Formation is mapped as outcropping just north of the I-5/SR 56 interchange and along the southern slope of Carmel Valley west of Carmel Country Road, within the study area. The Bay Point Formation is described as poorly consolidated medium-grained, pale brown fossiliferous sandstone. The Stream-Terrace Deposits have been mapped along the northern flanks of Carmel Canyon in the vicinity of Carmel Creek Road eastward to Carmel Country Road. The Stream-Terrace Deposits are generally described as poorly consolidated , conglomeratic sand deposits and coarse-grained sand, (Kennedy, 1975).

A portion of the I-5/SR 56 interchange is founded on recent artificial fill, which is underlain by Holocene-age alluvium and estuary (lagoon) deposits. Previous studies have indicated that the undifferentiated artificial fills are described as slightly compact to compact and typically range between 12 to 18 feet in thickness. These fills have been described as performing well at slope inclinations of 1:2 (vertical to horizontal), however some large areas of settlement have been detected, which may be the result of settlement of the underlying alluvial materials (Caltrans, 2005). The alluvial materials have been described as poorly consolidated stream deposits of silt, sand and cobble-size particles and the estuary deposits as very loose to loose, dark grey to blue-black, fossiliferrous, silty sands to micaceous silts and highly plastic clays, (Kennedy, 1973, 2005). These alluvial soils may be susceptible to consolidation settlement and bearing capacity failure when subjected to the application of additional overburden (Caltrans, 2005).

The majority of the upland areas within the study area are covered by pavement, building construction or landscaping. Where occasionally exposed on the slope above (west) of I-5, south of Del Mar Heights Road, the surface of the Torrey Sandstone appeared to be moderately weathered such that is was easily gouged with a rock hammer. The slope however, appeared to be stable with no obvious slumps or slides between the Del Mar Heights overcrossing and the SR 56 interchange. Based on geologic mapping it appears that the Bay Point Formation and Torrey Sandstone strike northwest-southeast and dip gently towards the northeast in the vicinity of the study area.

7.1.1 Stratigraphy

The general stratigraphy of the project study area (after Kennedy, et al, 1975; Caltrans, 2005), from youngest to oldest, is as follows:

Artificial Fills
Recent, man-made fills consisting generally of medium dense silty sand placed for freeway embankments.

Estuary Deposits
Holocene-age, fine, sandy (and occasionally gravelly), organic rich deposits adjacent to lagoons. Poorly consolidated, relatively soft and loose.

Alluvial and Colluvial Deposits
Holocene-age, silty, sandy, gravelly river and stream deposits and clayey, silty, sandy, gravelly slope wash.

Stream-Terrace Deposits
Pleistocene-age, poorly consolidated conglomeratic sands and coarse-grained sands.

Bay Point Formation
Pleistocene-age, marine and non-marine, poorly consolidated, pale brown, fossiliferous, fine and medium-grained sandstone.

Torrey Sandstone
Eocene-age, white to light brown, medium to coarse grained, sub-angular, moderately well indurated, broadly cross-bedded (near shore depositional environment), arkosic sandstone.

Delmar Formation
Eocene-age, pale gray to white, marine, sandstone, clayey siltstone, and claystone.

7.1.2 Natural Slope Stability

A review of aerial photographs and topographic maps of the project area, combined with a brief site reconnaissance, did not reveal any significant slope stability issues. No distinct evidence of recent or past landslides was observed during our site visit or previously mapped by others within the project study area.

The general topography of the project area slopes downhill from Del Mar Heights Road towards Carmel Valley Creek, which trends west–southwesterly toward the Soledad Valley lagoon and Pacific Ocean. The southern portion of the project area is located on gently to moderately sloping ground within the Carmel Valley Creek floodplain with the steeper slopes on the upland areas north of Carmel Valley Creek along the SR 56 corridor. The native slopes generally range between 1:5 (vertical to horizontal) to approximately 1:2½ (and locally steeper).

Beyond the slopes adjacent to I-5 and SR 56 within the study area, the lands are covered predominantly by residential structures and commercial structures. A detailed survey of the surrounding uplands, however, was beyond the scope of this study.

A review of the study entitled "*Landslide Hazards in the Northern Part of the San Diego Metropolitan Area, San Diego County, California* (Tan and Giffen, 1995) indicated that the majority of the study area is situated in Landslide Susceptibility Areas considered *Generally Susceptible (Subarea 3-1)*, and the lowland portion of the study area within an area considered *Marginally Susceptible (Area 2)*. A limited area of the project study area is considered *Most Susceptible (Subarea 4-1)*, and is situated just northeast of the I-5/SR 56 interchange on the south-facing slope above Carmel Valley.

Tan and Giffen described the *Generally Susceptible* areas as: "slopes that are at, or near their stability limits due to a combination of weak materials and steep slopes (many slopes exceed 15 degrees). Although most slopes within Subarea 3-1 do not currently contain landslide deposits, they can be expected to fail, locally when adversely modified".

Tan and Giffen described the *Marginally Susceptible* areas as: "areas that include gentle to moderate slopes, where slope angles are generally less than 15 degrees. This area typically includes low-lying bottoms of broad valleys/basins and large elevated surfaces of Pleistocene terrace deposits. Landslides and other slope failures are rare within this area, although slope hazards are possible on some steeper slopes within the area or along its borders".

Tan and Giffen described the *Most Susceptible* areas as: "areas that are outside the boundaries of definite mapped landslides but contains observably unstable slopes underlain by both weak materials (particularly, geologic units that contain rocks with abundant expansive clay material such as the Ardath Shale, Del Mar Formation and Friars Formation, and adverse geologic structure (dip slopes and/or daylighted bedding planes)."

Based on our preliminary research, the potential for landslides in native slopes within, or adjacent to the study area appears to be low. However, the potential for unstable slopes created by site grading and over-steepening of the existing slopes requires further study.

7.1.3 Erosion

In general, the potential for erosion of soil found within the study area ranges from slight within the Carmel Valley Creek channel to low within the floodplain and Soledad Valley Estuary. The potential for soil erosion on the upland areas ranged from moderate to severe (USDA, 1973). Visual observations did not detect significant erosion features within the study area. However, localized areas susceptible to water erosion may become evident during the rainy season.

7.2 Subsurface Soil Conditions

This assessment to the subsurface conditions within the project area was based on review of available literature, previous geotechnical investigations and available log of test borings (LOTB's). Previous investigations and LOTB's indicate that the formational soils within the project area (Delmar Formation and Torrey Sandstone) found within the upland areas generally consisted of medium dense to dense (and occasionally loose) sands, silty sands and silts. These soils typically provide adequate bearing capacity for structures and are suitable for re-use as engineered fill. The alluvial/fluvial deposits in the low lying areas may be subject to settlement and bearing capacity failures when additional loads are applied. Site specific analysis should be performed to determine the specific characteristics of the subsurface conditions at each structure/embankment location. Based on a previous study by Caltrans (*Draft Geotechnical Design Report, Northern San Diego I-5 Widening, EA 235800, 2005*) the following table lists the pertinent geologic units and their typical geotechnical parameters:

Archival Soil Strength Parameters[1]

Geotechnical Unit	Cohesion (lbs/ft^2)	Angle of Internal Friction (degree)	In-Situ Dry Density (lbs/ft^3)
Torrey Sandstone	200	33	120
Bay Point Formation	500	38	125
Existing Fill	200	32	120
Structural Fill/Backfill	200	36	120
Sand – Alluvium	0.00	26	120*
Lagoon Alluvium (short-term loading)	400*	0*	120*
Lagoon Alluvium (long-term loading)	600*	15*	120*

[1] Archival soil parameters are generalized and should be used for **preliminary analysis only**.

*Soil strength parameters are based on engineering judgment and local knowledge. These strength parameters are a rough approximation and are preliminary design only.

7.2.1 Expansive Soil

Expansive soils tend to shrink and swell due to changes in moisture content. Repeated shrinking and swelling can cause damage to pavement and structures. The degree of shrink and swell will depend on the amount of clay in the soil and the type of clay (some clays tend to swell more than others). According to the *United States Department of Agriculture, Soil Survey of the San Diego Area, California* (USDA, 1973), and previous geotechnical studies within the project area, the majority of the soils in the upland areas within the Torrey Sandstone and Bay Point Formation consist of non-plastic sands and silty sands which have a low shrink-swell potential. Previous studies and geologic mapping have indicated that the low lying areas within Carmel Valley and the Soledad Valley Estuary contain clay deposits with a moderate to high shrink-swell potential.

7.2.2 Compressible Soil

Compressible soils are not expected in the upland granular soils associated with the Torrey Sandstone and Bay Point Formation. However, based on previous studies, the lowland areas within Carmel Valley and the Soledad Valley Estuary contain areas of soft/loose soils, within the study area, which may be susceptible to settlement caused by compression from loading due to structures and/or embankments.

7.2.3 Collapsible Soil

Soils with a porous structure and low cohesion can have the potential to collapse upon saturation and/or loading. Based on review of available literature, no indication of the presence of collapsible soil in the project area was found. The potential for collapsible soil in the project area is expected to be low.

7.2.4 Subsidence

Subsidence is a general lowering of the ground surface. The primary causes of subsidence are groundwater withdrawal, settlement and oxidation of peat deposits, and withdrawal of oil and gas. No record of damaging subsidence, that has occurred, or is occurring within the project area, was found. Based on the relatively shallow depth to sedimentary rock in the upland areas and lack of recognized significant subsidence in the alluvial soils, potential for significant subsidence within the project area is considered to be low.

7.3 Water

7.3.1 Surface Water

The project study area is located within the South Coast Hydrologic Region, which consists of many small coastal range watersheds in the western U.S. and Mexico. Typical of these watersheds, the headwaters are in the Peninsular Ranges of Southern California, which locally reach elevations of 5,900 feet. Annual precipitation varies from 45 inches in the upper reaches of the watershed to as low as 12 inches in the trunk valleys and coastal areas. The Coastal Plain typically consists of incised, narrow valleys with perennial streams that flow towards coastal estuaries.

The southern portion of the project is located within Carmel Valley and Carmel Valley Creek flows east to west beneath I-5 through the existing triple box culvert. Carmel Valley Creek and its associated tributaries flow into the Soledad Valley estuary, west of I-5. Carmel Valley Creek is a sinuous, perennial stream and according to previous studies, shows no incision below the active flood plain (Caltrans, 1992). A visual site reconnaissance of the project study area indicated that several of the tributaries to Carmel Creek, which were depicted on older topographic/geologic maps, had been directed to man-made conveyances due to recent construction. On the slope immediately west of I-5, (between Del Mar Heights Road and approximately Station 552+00 and including the southbound Del Mar Heights Road on-ramp to I-5), surface flow at the top of the slope is directed to a concrete-lined ditch, which is then directed to slope drains along the west side of I-5.

A review of the *Federal Emergency Management Agency* (FEMA, 1997) floodplain maps indicates that the southern portion of the project area, within Carmel Valley (and Soledad Valley to the west) has been mapped as being inside of the 100-year flood zone. Accordingly, a portion of the project study area is considered to have a high potential for significant surface flooding.

7.3.2 Groundwater

Various groundwater basins underlie east-west-trending alluvium-filled valleys located along the western coast of San Diego County. The bedrock of the Peninsular Ranges is formed by Mesozoic intrusions of gabbro, tonalite, and granite. Paleozoic and Mesozoic metasedimentary and metavolcanic rocks form screens between the plutonic masses. These crystalline rocks are cut by joint sets that provide secondary permeability, as does weathering, but in general the crystalline rocks behave like aquitards at a regional scale. In contrast, Quaternary alluvium, present along the coastal valleys, and their tributary canyons, host viable aquifers. These alluvial prisms appear to be narrow (generally less than 1 mile) and comparatively thin (a few hundred feet), but they are also fairly continuous and transmissive.

Based on previous borings performed in the general project area, groundwater should be expected at shallow levels in the estuary and alluvial materials during the wetter months (typically December to April). Due to irrigation in the upland areas, groundwater in the form of springs and seeps may be encountered on the sides of slopes and at slope bottoms within the more permeable sandstone formations.

7.3.3 Flooding and Scour

As stated earlier in this report, a portion of the project area (Carmel Valley floodplain) has been mapped by FEMA (FEMA, 1997) as being inside of the 100-year flood zone. Accordingly, a portion of the project study area (within the defined Carmel Valley floodplain) is considered to have a high potential for significant surface flooding. During heavy storms, some of the smaller streams and drainage features may also be subjected to localized flooding.

Structures constructed within the Carmel Valley floodplain and, to a lesser extent, upland tributaries, may be subjected to scour during infrequent high flows. The potential depth and extent of scour within these watercourses will require additional study.

7.4 Project Site Seismicity

7.4.1 Ground Motion

When displacement occurs along a fault, it may or may not produce surface ground rupture, but it most likely will cause ground shaking. The magnitude of ground shaking depends on many geologic and tectonic parameters. Ground motions are measured relative to a percentage of the earth's gravitational acceleration. The amount of ground motion at a site is directly related to the magnitude of an earthquake, the distance from the earthquake source, and the type of media (soil, rock) through which the seismic waves travel. There are cases, however, in which amplification or even a focusing effect of the earthquake wave will cause severe shaking, even at great distances from the epicenter. These later effects are known and are presently being studied but no design criteria have been established to date.

To review the degree of potential ground shaking, capable faults (Holocene/Late Quaternary age) within a 63-mile (100-km) radius of the project area were identified. Three faults or fault zones were identified within the search radius of the site that could have significant influence on the project improvements relative to ground shaking and include the Rose Canyon Fault Zone, the Coronado Bank Fault and the Newport-Inglewood Fault (Offshore). Deterministic data were used to estimate the maximum Peak Horizontal Ground Acceleration (PHGA) at the project location from the identified faults. A computer program (Blake, 2000) was used to estimate the PHGA for the project area. The attenuation relationship used was from Sadigh, et al, 1997 (assuming a random-mean event and Site Class NEHRP C).

According to our review, the highest PHGA estimated to occur at the project area is 0.55g for a maximum earthquake event of magnitude 7.2 along the Rose Canyon Fault Zone.

Ground acceleration data are presented in Table 1 and are based on maximum values resulting from a deterministic calculation of earthquake events at central portion of the project site.

The California Department of Transportation (Caltrans) developed the California Seismic Hazard Map which assigns peak acceleration contours based on maximum credible earthquakes from nearby seismic sources (Maulchin, 1996, updated 2006). Based on this map (Figure 3) the PHGA for the project area will range between 0.50 and 0.60g.

More recently, the United States Geological Survey (USGS) in concert with the California Geological Survey (CGS) developed probabilistic-based levels of shaking (Petersen, et al, 1999; updated 2008) for the region. Based on maps of the area, the PHGA for the project area will range from 0.20 to 0.30g with a 10 percent chance of exceedance for a 50-year recurrence interval.

7.4.2 Ground Surface Rupture and Displacement Due to Faulting

The project area is located in the western portion of the Peninsular Ranges geomorphic province that has several known faults (Jennings, 1994; Southern California Earthquake Data Center (SCEDC), 2006). In general, earthquakes occur as a result of movement along faults. For the purpose of fault classification, faults are often grouped into the following categories:

Holocene - displacement has occurred within the last 10,000 years.
Late Quaternary - displacement has occurred within the last 700,000 years but evidence of Holocene activity is lacking.

Quaternary - evidence of displacement within the last 1.6 million years.
Pre-Quaternary - no recognized evidence of displacement in Quaternary time.

In general, faults with Holocene rupture are often considered to be "active". Late Quaternary or Quaternary age faults are often referred to as "potentially active".

Faults within a radius of approximately 63 miles (California Division of Mines and Geology, Note 43) of the project study areas are considered to have the greatest potential for impacting the project. Table 2 provides a listing of the closest distance, from the project area, to known Quaternary faults within 63 miles of the centroid of the project study area. Maximum earthquake magnitudes (moment magnitude) are based on maximum historic earthquakes, recurrence intervals, fault length, and fault displacement parameters (Blake, 2000). A fault map is presented on Figure 4.

The Rose Canyon Fault, Coronado Bank Fault and Newport- Inglewood Fault (Offshore) are expected to have the greatest potential impact on the project study area.

The Rose Canyon Fault in San Diego, California, has many well-expressed geomorphic characteristics of an active strike-slip fault, including scarps, offset and deflected drainages and channel walls, pressure ridges, a closed depression, and vegetation lineaments. The Rose Canyon Fault is part of a zone of structural weakness that includes the Newport-Inglewood Fault Zone (Abbott, 1989). Geomorphic expression of the fault zone from Mount Soledad south to Mission Bay indicates that the Mount Soledad strand is the most active. The Rose Canyon Fault has been mapped locally as approximately 1 km wide and is composed of both dip-slip and en echelon faults that extend from La Jolla Cove to San Diego Bay and beyond, with a total length of approximately 30 km (Kennedy, 1975). Based on work by Lindvall and Rockwell (1995), a network of trenches were excavated across the Mount Soledad strand in Rose Creek and demonstrated a minimum of 8.7 m of dextral slip in a distinctive early to middle Holocene gravel-filled channel that crossed the fault zone. Radiocarbon dates on detrital charcoal recovered from the sediments beneath the channel yield a maximum calibrated age of about 8.1 ±0.2 kyr. The minimum amount of slip along with the maximum age yielded a minimum slip rate of 1.07±0.03 mm/yr on this strand of the Rose Canyon Fault for much of Holocene time. Other strands of the Rose Canyon Fault may also have had Holocene activity. Based on the study by Lindvall and Rockwell (1995) fault traces within the Rose Canyon Fault, along with the results of their trenching study, they estimated the maximum likely slip rate at about 2 mm/yr with a best estimate of about 1.5 mm/yr. the Lindvall and Rockwell study indicated stratigraphic evidence of at least three events during the past 8,000 years. The most recent surface rupture displaced the modern A horizon (topsoil), suggesting that this event probably occurred within the past 500 years (Lindvall and Rockwell, 1995).

The inner continental borderland offshore of southern California accommodates about 7 mm/yr of slip between the North American and Pacific plates. Nearly half of this total is thought to be taken up on the Palos Verdes and Coronado Bank fault zones, which are modeled as a single, continuous fault zone in recent seismic hazard assessments for southern California. However, there appears to be no active connection between the Palos Verdes and Coronado Bank fault zones (Conrad, J., et al, 2008). A connection between these faults increases the estimated maximum potential magnitude of an earthquake, since it would allow the entire length of both faults to rupture in a single event. Although these faults lie roughly on strike with each other, a connection between these faults has not been clearly demonstrated by previous data. The Coronado Bank Fault is thought to have a length of approximately 90 km with slip rates of approximately 2.0 mm/year (Southern California Earthquake Data Center, 2006).

The Newport-Inglewood zone of deformation (Hill, 1971), 40 km southwest of the Elsinore fault, is a narrow (1-3 km wide) belt of echelon folds and left-stepping fault segments, characterized by oblique right slip, chiefly down to the west (Harding, 1973). Quaternary folding and faulting is expressed as an aligned series of anticlinal hills and by deformed and faulted upper Pliocene and Pleistocene deposits (Barrows, 1974). The overall structural trend is commonly mapped as the Newport-Inglewood fault but individual segments are less continuous and less closely aligned than along other major strike-slip faults in the San Andreas system. Moreover, many anticlines along the zone retain their original ellipsoidal form even where they are cut by strike-slip faults (Harding, 1973). The offshore part of the zone is defined by folding and faulting in Tertiary and Quaternary deposits beneath the sea floor. Whether this zone of deformation is continuous with aligned but more distant offshore faults, such as the Rose Canyon fault near San Diego, is unresolved; if the zone is continuous, its overall length is at least 240 km.

Three smaller faults have been mapped within, or in close proximity to the study area. These included the Carmel Valley Fault, which crosses I-5 just south of the I-5/SR 56 interchange trending northeast and crosses SR 56 just west of the Carmel Creek Road/SR 56 interchange, and is mapped as continuing approximately 2,000 feet northeast of SR 56. Further to the east, an un-named fault is mapped as trending approximately northwest, crossing SR 56 approximately 2,000 feet west of the Carmel Country Road/SR 56 interchange, continuing to the northwest approximately 2, 500 feet. A second un-named fault has been mapped west of I-5 trending northeast toward Del Mar Heights Road, west of the study area. The inferred projection of this un-named fault would cross the southbound off-ramp from I-5 to Del Mar Heights Road, if it continued beyond its mapped location. All of these faults are shown on Figure 2, Geologic Map (Kennedy, 1975). No significant data is readily available on these faults and they have not been mapped or described as active faults (producing Holocene movement). All three of these faults appear to have dip-slip movement, with the Carmel Valley Fault and the un-named fault west of I-5 dipping approximately 60º to the northwest and striking generally northeast, nearly perpendicular to the regional fault trends. The un-named fault located just west of Carmel County Road also is mapped as having dip-slip movement, however the dip angle and direction was not shown.

No known or mapped Holocene (active) faults project toward or directly through the project area. The project area is not located near an Alquist-Priolo Earthquake Fault Zone (Fault Rupture Hazard Zones; Hart, et al, 1997; supplements 1999 and 2003). No known Holocene/Late Quaternary faults pass adjacent or cross the project area. Surface rupture due to faulting within the study area is not expected to occur unless some unknown faults were to rupture.

7.4.3 Liquefaction

A preliminary review of potential liquefaction of the site soils was performed to determine the possible extent of liquefaction at the site. Liquefaction is the process in which the seismic shear waves cause an increase in the pore water pressure in a cohesionless (sand and some non-cohesive silts) soil strata. This increase in pore water pressure reduces the effective stress confining the soil. The reduction in effective stress causes a reduction in the shear modulus of the soil, which in turn, results in increased soil deformation. Also associated with liquefaction is a loss in bearing strength. In the case of full liquefaction, when the increase in pore water pressure reduces the confining stress to zero, the soil experiences a full loss of strength and undergoes large viscous deformations. Lateral spreading (large lateral deformations) are possible when liquefaction occurs in ground having even minimal slope. Additionally included with liquefaction analyses are a dry settlement analyses. Cohesionless soils which are in a loose to medium dense state when subjected to seismic shear waves compact in place in a similar manner to being compacted with a vibratory roller. The energy of the seismic event reorganizes the grains to a more dense state and subsequently causes a reduction in the overall volume resulting in settlement of the soil.

A portion of the study area is underlain by alluvial deposits within the Carmel Valley floodplain and one of the former upland tributaries near El Camino Real. These alluvial deposits have been generally described as silts, sands, gravels and cobbles. Liquefaction would most likely affect areas where structures would be located within and adjacent to the floodplains of the Carmel Valley and associated tributaries, due to the anticipated presence of unconsolidated, sands, silty sands and non-plastic silts and, at certain times of the year, elevated groundwater levels.

Previous liquefaction studies performed for the existing I-5/SR 56 interchange structures indicated a moderate to high potential for liquefaction within the tidal flat area at the western end of Carmel Valley and within the Soledad Valley Estuary (Caltrans, 1993). Previous studies have indicated that the estuarine and fluvial deposits have a moderate to high susceptibility to liquefy during seismic events and that site specific liquefaction studies be performed in areas where these deposits occur. To mitigate the effects of liquefaction the Caltrans Office of Geotechnical Engineering recommended that stone columns be constructed at a minimum depth of 50 feet in the areas of the bridge structures. These stone columns were placed around the bents, abutments and approach embankments for the purpose of reducing the potential for liquefaction and the effects of lateral spreading of the unconsolidated alluvial soils during a

seismic event. The locations of the existing stone columns, which are located in the vicinity of the proposed improvements, are presented in Appendix D; Existing Stone Column Locations.

Additional liquefaction studies will need to be performed within the project area, where future subsurface investigations indicate the presence of potentially liquefiable materials.

7.4.4 Seismic Settlement and Lateral Spreading

Seismic settlement can occur as a result of compaction, densification, and/or reorientation of grains in embankment soils or the underlying native soil. Seismic settlement is not well understood; however, loose granular soil and elastic silts would be most susceptible to the phenomenon.

There is a relatively moderate to high potential for significant ground motions in the project area. Due to the anticipated medium dense to dense nature of the underlying soils and relatively shallow depth to bedrock in the upland areas, the potential for seismic settlement is expected to be low in the upland areas of the study area. However, the loose granular soils and soft non-plastic silts and sandy silts within the Carmel Valley floodplain and Soledad Valley Estuary may be susceptible to seismic settlement during a significant seismic event.

Liquefaction-induced lateral spreading is the lateral displacement of gently sloping ground as a result of pore pressure build-up or liquefaction in a shallow underlying deposit during an earthquake. Liquefaction-induced lateral spreading generally occurs on mild slopes underlain by loose sands and high groundwater. If liquefaction occurs, the unsaturated overburden soil can slide as intact blocks, over the lower liquefied deposit. The geologic conditions conducive to lateral spreading (gentle surface slopes, high groundwater, and cohesionless soils) are frequently found along streams or other water courses, in recent alluvial or deltaic deposits and in loose, saturated sandy fills. Lateral spreading can cause slumping (settlement) of embankments and rotation of structures. The potential for lateral spreading is generally low in the upland areas. However, the potential for liquefaction-induced lateral spreading of embankment fills over soft/loose alluvial/lagoonal soils in the low lying areas within Carmel Valley and the Soledad Valley Estuary is moderate to high during a significant seismic event. Previous embankment fills for I-5 and SR 56 within the tidal flat areas of the project have been graded to maximum slope inclinations of 1:2 (vertical to horizontal) and have included strut fills to provide additional lateral support. These embankments were also subjected to additional surcharge loads during embankment construction to help minimize settlement and densify the underlying native soils prior to roadway construction.

Additional studies will need to be performed within the project area, where future subsurface investigations indicate the presence of potentially liquefiable materials, which may lead to seismic settlement and/or lateral spreading.

7.4.5 Tsunamis

Tsunamis are great sea waves generated by earthquake shaking or displacement of large, submerged groundmasses. The I-5/SR 56 interchange is just over 1-mile from the coastline, and the roadways are either supported by bridge structures or raised embankments (approximately 20 to 30 feet above mean sea level). Therefore, tsunamis are not considered to be a significant hazard to the project.

7.4.6 Seiche

A seiche is wave action created within restricted bodies of water that can occur in response to an earthquake. The conditions required to develop a seiche are not well understood, but elongated, deep bodies of water with unconfined shores seem to be the most susceptible. With the absence of sizeable confined bodies of water within the study area, seiches are not considered to be a potential hazard for the project area.

8. GEOTECHNICAL ALALYSIS AND DESIGN

8.1 Dynamic Analysis

8.1.1 Parameter Selection

A seismic study was performed at the site to develop seismic design parameters for the proposed project. The project is located in west-central San Diego County, which is an area of moderate seismicity. Following *the Caltrans Seismic Design Criteria, Version 1.4* and the *Caltrans Guidelines for Preparing Geotechnical Design Reports, Version 1.3*, a seismic analysis was performed for the project site to develop seismic design parameters and identify potential seismic hazards, such as liquefaction and/or lateral spreading. Using the *Caltrans California Seismic Hazards Map, 1996 (revised 2006)* and *A Technical Report to Accompany the Caltrans California Seismic Hazards Map (Based upon Maximum Credible Earthquakes), 1996* (updated by Lalliana Mualchin), it has been determined that the Newport-Inglewood –Rose Canyon Fault Zone will have the greatest potential impact on the project study area. The Rose Canyon and Newport-Inglewood (Offshore) Faults are Holocene right-lateral faults, when combined, are a fault zone roughly 90 km in length, with a slip rate between 0.8 and 2.1 mm/yr (Jennings, 1994). The closest trace of this fault zone is approximately 3 miles to the northwest of the project alignment. This fault zone is believed to be capable of producing a Maximum Credible Earthquake (MCE) event of moment magnitude 7.0 with an associated Peak Bedrock Acceleration (PBA) up to 0.5g (where "g" is the acceleration due to gravity) and have a duration of 15 to 20 seconds (from the California Seismic Hazard Map 1996 by Lalliana Mualchin).

Concurrently, a seismic study was performed for the project site. This study was performed using determinist seismic relationship program EQFAULT and probabilistic seismic relationship program FRISKSP. These programs were developed by Thomas F. Blake to predict design levels of ground shaking and peak ground accelerations. For this study, the attenuation relationships by Sadigh in accordance with Caltrans methodology for both deep soil and shallow bedrock sites were used for the seismic analyses. The results indicate that the predicted deterministic levels of shaking are controlled by the Rose Canyon Fault and the Moment Magnitude Event will be on the order of 7.2 (M_W=7.2), with an associated peak ground acceleration of 0.55g. This acceleration was in good agreement with the 0.5g to 0.6 acceleration obtained from the Caltrans California Seismic Hazards Map.

Site specific **A**cceleration, **R**ock Spectra, and **S**oil Amplification (ARS) curves should be determined for each structure in the project, once these structure locations have been established. These curves should be determined in accordance with *Caltrans Seismic Design Criteria, Version 1.4.*

Additionally, two levels of earthquake shaking were reviewed for the project for any improvements which fall within the design requirements of the California Building Code (CBC). The first is called the Design Basis Earthquake (DBE), defined as having a 10-percent chance of occurrence within a 50-year time frame, or about a one in 475-year recurrence interval. The second is called the Upper-Bound Earthquake (UBE), defined as having a 10-percent chance of occurrence within 100-years, with a recurrence interval of about one in 949 years.

Our probabilistic seismic hazard analysis (PSHA) was used to determine the design-based PHGA expected to occur at the project site. This evaluation was performed using the computer program FRISKSP v.4.0, (Blake, 2000). FRISKSP is a computer program for the probabilistic estimation of seismic hazard using three-dimensional faults as earthquake sources. The program was set to a search radius of 100-km (63-miles) of the centroid project. The attenuation relationships used for estimating ground motion were by Sadigh et al (1997), with five percent damping.

A PHGA of 0.29g was estimated for a DBE event with a 10 percent chance of exceedance in 50 years, which corresponds to a recurrence frequency of once in 475-years. A PHGA of 0.46g was determined for an UBE event with a 10 percent chance of exceedance in 100 years, which corresponds to a recurrence frequency of once in 949 years.

The effective seismic horizontal coefficient, k_h, used in pseudo-static slope stability analysis is specified in *Caltrans Guidelines for Foundation Investigation and Reports (Version 2.0)* as ⅓ of the peak ground acceleration and not exceeding 0.2g (Caltrans, 2006).

8.1.2 Analysis of Seismic Effects

During a significant seismic event, portions of the project area could experience secondary seismic effects including liquefaction, seismic settlement and lateral spreading, which were discussed in Sections 7.4.3, Liquefaction, 7.4.4, Seismic Settlement and Lateral Spreading. Previous studies have determined that seismically-induced slope failures should not pose a significant hazard to the study area. However, slope stability analysis should be performed for planned cut/fill slopes for the project once the final alignments have been determined.

8.2 Cuts and Excavation

Temporary and permanent cuts and excavations are anticipated for the proposed project, particularly for the widening of the west side of I-5 within the project limits. The locations of the planned cut slopes are presented in Tables 7, 9 and 11 .

8.2.1 Cut Slope Stability

Slope stability is a function of various factors including slope geometry, soil and/or rock strength, geologic structure, degree of saturation and pore water pressure, and external loading. Most of the cut slopes within the project limits are inclined at 1:2 (vertical to horizontal) or flatter and appear to be relatively stable. Slope inclinations of 1:2 are generally considered stable in this region, unless adverse conditions are encountered, such as weak or adverse bedding planes, clay lenses or existing landslides. Steeper slopes may be permitted where favorable geologic conditions are encountered (such as competent sedimentary formations or massive rock). However, slopes with inclinations greater than 1:2 are typically difficult to landscape and maintain. For final design, the global stability of the various slopes within the project limits should be analyzed using site specific soil and rock data.

Caltrans criteria for slope stability on newly designed non-existing permanent slopes dictate that slopes meet a minimum static factor of safety of 1.5 and a pseudo static (seismic) factor of safety of 1.1 (Caltrans, 2005).

8.2.2 Temporary Cut Slopes and Trench Excavations

Caltrans criteria for slope stability on temporary slopes dictates that slopes meet a minimum static factor of safety of 1.2 under the anticipated conditions throughout the life of the temporary slope. For preliminary design of temporary slopes within the project limits, the allowable inclination of temporary cut slopes as a function of slope height in various soils can be derived from Table 4, Preliminary Design Recommendations for Temporary Cut Slopes (Caltrans, 2005).

It is anticipated that new utilities, or relocated existing utilities will be constructed for the proposed project. It is expected that most utility excavations will typically encounter materials can be excavated with conventional earthmoving equipment. Temporary excavations, up to a maximum depth of twenty feet (20-feet) and above groundwater, may be cut as steep as one and one half horizontal to one vertical (1½H:1V) as the majority of the soils within the project limits are nearest to a Type C soil per the State of California Construction Safety Orders (CALOSHA). Deeper cuts should be considered on a case-by-case basis due to variable conditions and the potential for shallow groundwater.

Excavations located either in the travel way, or with space constraint limitations, should be shored with some type of temporary shoring. The owner and contractor should make themselves aware of, and become familiar with, applicable local, state and federal safety regulations, including the current CALOSHA Excavation and Trench Safety Standards. Construction site safety generally is the sole

responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. Dokken Engineering is providing this information as a service to our client. Under no circumstances should the information provided be interpreted to mean that Dokken Engineering is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

The impact of equipment vibrations and other outside influences should be evaluated at the time of construction. Surcharge loads such as trench spoils, equipment, etc., should not be placed adjacent to an open excavation (within a distance of 1½ times the height of the excavation). Where loads are planned adjacent to proposed excavations, the conditions should be evaluated for the necessity of shoring, bracing, or underpinning. In general, any temporary or permanent structure closer to an open excavation than 1½ times the excavation's height (H) should be evaluated. This distance may be greater if soft or caving soil conditions are encountered.

If the excavation is shored, then the soil loading applied to the shoring will be dependent on the depth of the excavation, proximity to surcharge loading, groundwater depth, and type of shoring employed. The soil diagrams located on pg. 104, Figure 28, in *Naval Facilities Design Manual 7.2* (NAVFAC DM-7.2) should be used to generate the loading on the temporary shoring. The applicable figure for the site soils is the top figure, "Cut in Cohesionless Soil". All shoring made in, or within H of the travel way, shall have at a minimum a 250 pound per square foot infinite surcharge loading applied to the side(s) adjacent to the loading. Also, if construction equipment is to pass within H of the shoring, a minimum of a 500 pound per square foot infinite surcharge shall be applied to the shoring design as well. Should large point loads also be applied such as crane outriggers, wheels, or large excavator tracks adjacent to the shoring, the loading shall be included in the shoring design and a method, such as Bousinesque or other generally accepted method of determining lateral surcharge loading will be used to determine the additional lateral loading from the vertical surcharge.
The presence of groundwater should be determined using site specific subsurface investigations and the effects of ground water should be incorporated into temporary slope design on a case-by case basis. Measures such as berms, swales, and diversion ditches should be incorporated to prevent surface water from irrigation and storm water runoff from entering the excavations. The trench bottoms may become soft and pump if excess water is introduced into an open excavation.

8.2.3 Cut Slope Benches

Typically, the higher the cut slope the more susceptible the slope is to erosion. Caltrans recommends that all cut slopes in sedimentary materials higher than 20 m (65 ft) should be constructed with mid-slope benches. Benches should be designed in accordance with section 304.3 of Caltrans Highway Design Manual. Benches are not necessary where slope drainage is interrupted by mid-slope retaining walls designed to intercept surface runoff. Rock cuts do not require benches (Caltrans, 2005).

8.2.4 Rippability – Drillability

The majority of the project alignment is underlain by Quaternary and Tertiary sedimentary rocks and, to a lesser extent, Quaternary alluvium/colluvium and lagoonal deposits. Generally, if the site soils can be drilled with a hollow-stem auger, they can be excavated with standard heavy hydraulic excavation equipment such as a CAT 325 or equal. A review of previous investigations indicated that occasional cemented units may yield oversized blocks of rock-like material and concretions, which may present difficulties for conventional excavation and tunnel boring. Occasional hard rock excavation should be anticipated in any of the sedimentary rock units. Future subsurface investigations for the project should carefully log the cemented layers (and strata that present difficult drilling) in the sedimentary rock units to help quantify potential hard rock excavation.

8.2.5 Earthwork Grading Factors

Based upon a review of visual classifications and the results of the laboratory testing for previous investigations in the project vicinity, the granular site soils derived from sedimentary formations are expected to be acceptable for use as fill material. The fine-grained cohesive soils encountered sporadically within the project limits are not acceptable for re-use as fill material and will have to be disposed of off-site or in non-structural applications. Should an area of borrow soils be encountered which do not match those which are described on the borings logs, a representative of the Geotechnical Engineer of Record should be allowed to evaluate the encountered soils for their use as a borrow for the proposed project. For site granular soils that are in a loose to medium dense state in-situ, previous studies indicated that a shrinkage factor of 0.96 (where placed at 90% relative compaction) to 0.94% (where placed at 95% relative compaction) should be applied to the excavated quantity for determining the amount of placed borrow (Caltrans, 2005). Additionally, settlement on the order of 1- to 2-inches can be expected at the subgrade level where excavated for the new structural pavement section. This will occur predominantly in the granular soils when they are scarified, moisture conditioned, and compacted to 95-percent of their maximum dry density as determined by CTM 216.

8.3 Embankment

8.3.1 General Description

It is anticipated that a significant portion of the widening for I-5 and SR 56, within the project limits, will require the placement of embankment fill. It is also anticipated that the majority of the material need to construct the fills will be derived from planned cut slopes within the project limits. Based on previous investigations, it is assumed that these cuts will yield predominantly granular soil, which is well suited for roadway construction. Lesser cuts that include silty and clayey soils, could be blended with granular soils to provide acceptable materials for roadway construction. The approximate proposed fill areas are listed in Tables 6, 8 and 10. Fills constructed adjacent to existing embankments shall be keyed into the existing slope, per the project specifications.

8.3.2 Embankment Stability

Embankment stability is a function of slope geometry, soil strength parameters (of both the embankment materials and foundation soils), saturation and pore water pressure (of both the embankment materials and foundation soils), and external loading. For the roadway extension portions of the proposed project, fill slopes generally may be constructed at a gradient of 2:1 (horizontal to vertical) or flatter, provided the fill consists of approved locally derived soil or approved import. However, adverse foundation soils (e.g. weak lagoonal or alluvial soils) may lead to embankment instability.
Prior to grading for the planned road extension, trash, debris, and vegetation should be removed from the work area. Depressions left by any such removal should be backfilled in accordance with the Standard Specifications. Loose soil should be removed from embankment footprint prior to fill placement. A firm subgrade should be exposed prior to filling. The subgrade should then be scarified to a depth of 12-inches and be re-compacted in accordance with the project specifications prior to fill placement. It is expected that the materials generated from new cuts in lagoonal soils (and other alluvial soils) will not meet the fill requirements for the project, therefore, engineered borrow fill is warranted, where necessary.

An analysis of the slope stability of proposed embankments constructed over lagoonal/alluvial materials should be performed during future investigations, following the acquisition of site specific subsurface data. Future slope stability models should consider both short term (unconsolidated, undrained) and long term (consolidated, drained) loading conditions.

Caltrans criteria for slope stability on newly designed permanent embankment slopes dictate that slopes meet a minimum static factor of safety of 1.5 and a pseudo static (seismic) factor of safety of 1.1.

Moderate surficial erosion should be anticipated on slopes with gradients of 2:1 unless the slope is protected against overland flow. Slope protection using a vegetative cover or a geotextile fabric is anticipated to be the most cost effective option. A flatter slope gradient may be used to reduce potential erosion; however, some erosion is still likely to occur unless storm water flow is diverted away from the face of the slope.

8.3.3 Reinforced Soil Slopes (RSS)

Where an embankment fill footprint needs to be decreased (or side slope inclinations increased), it may be possible to do so by placing layers of geosynthetic soil reinforcement into the compacted fill. Several proprietary reinforced soil slope systems and slope facing systems are currently available. Design of reinforced soil slopes should be undertaken following the completion of site specific subsurface investigations for any planned embankment.

8.3.4 Fill Slope Benches

Higher fill slopes generally are more susceptible to surface erosion and surficial sloughing and have a lower factor of safety. Caltrans recommends that any slope greater than 20 m (65 ft.) in height be constructed with a mid-slope bench constructed in accordance with Section 304.3 of the Caltrans Highway Design Manual (current edition).

8.3.5 Settlement of Embankments

Embankment construction on formational soils in the upland areas should not produce significant settlement. However, it is anticipated that the construction new embankments materials placed on the loose/soft alluvial soils will cause settlement. Upon placement of the embankment fill material, the soils will increase in density and decrease in volume due to the applied load of the embankment fills. This settlement is elastic (one-time) and will occur as the embankment materials are placed. A significant portion of this settlement will occur in the upper 50-feet of the existing site soils and any existing utilities which are to remain should be checked to determine if they can accept this settlement without being damaged.

Some embankment fills for this project may be on the order of 40-feet tall. Even with compaction of the fill material to 90-percent of the maximum dry density as determined by CTM 216, the embankment soils will exhibit a time-dependent creep, which is a common and well-documented occurrence in deep fills. This creep/settlement of the fill material should be on the order of 2- to 3-inches. As there is no analytical method to determine the time a fill will cease appreciably creeping, a settlement period of up to 6-months (or greater) from the time the fill is complete to when the asphalt and finish flatwork is to be placed may be required. Settlement plates should be installed to measure the settlement of the embankment in real time. The actual settlement times can be reduced if the settlement measurements indicate the embankment settlement has completed.

8.3.6 Embankment Placement and Subgrade Preparation

The site preparation and grading operations for the proposed areas to receive new pavements and other permanent structural improvements should commence with the removal of vegetation and the stripping of the surficial organic soils. Minor topsoil, consisting of the natural accumulation of native trees, grasses and weeds, are anticipated along the project alignment. Removal of the organic matter to a depth of 2- to 6-inches will be required. Any organic-laden soils free from debris may be stockpiled for later use in non-structural areas where approved by the owner, but such material should not be used for structure fill.

Any voids left by the removal of existing pavements or other buried objects, including existing site improvements, abandoned buried utilities, and root balls should be cleared of all loose soils and properly backfilled as described below. All stripped vegetation and debris should be removed from the areas receiving structural improvements. Clearing and grubbing operations should be performed in accordance with recommendations presented in this report and with the requirements specified in the Standard Specifications.

All site grading should conform to *Section 19* of the latest *Caltrans Standard Specifications*. Generally, if the site soils can be drilled with a hollow-stem auger, they can be excavated with standard heavy hydraulic excavation equipment such as a CAT 325 or equal.

After clearing and grubbing, any exposed subgrade soils, which will receive either new structural pavement sections or roadway embankment fills, should be scarified to a minimum depth of 12-inches, moisture conditioned, and compacted to at least 95-percent relative compaction. Relative compaction refers to the in-place wet density of a soil and is expressed as a percentage of the maximum wet density of the same material, as determined by the CTM 216 or ASTM D1557 test procedures. If unsuitable materials (such as organic, soft, and/or yielding soil) are encountered during the grading operations, these areas should be stabilized prior to fill placement or paving. Stabilization methods may include complete excavation and replacement, and/or installation of a fabric or geogrid for additional stabilization. The depth and extent of required soil removal and remedial repair should be reviewed and approved in the field by the Geotechnical Engineer of Record.

Based upon the visual classifications and the results of the laboratory testing, the granular site soils are acceptable for use as fill material. Should an area of borrow soils be encountered which do not match those which are described on the borings logs, the Geotechnical Engineer of Record should be allowed to evaluate the encountered soils for their use as a borrow for the proposed project.

8.3.7 Trench Backfill

Trench backfill may consist of reprocessed granular native soils or imported non-expansive materials. Trench backfill must be free-draining granular material with a minimum Sand Equivalent (CTM 217) of at least 20, or a slurry cement backfill conforming to the Section 19-3.062, Slurry Cement Backfill, of the Caltrans Standard Specifications should be used in the pipe zone where a pipe manufacturer's specification is not provided. Also, in lieu of any manufacturers' installation specifications, a Class B pipe bedding will be required to bed the pipe in the trench excavation. The pipe zone (all material in the trench above and below the pipe) material should be compacted to a minimum of 95 percent relative compaction or the manufacturer's recommendations where available.
Excavation, backfill, and shaped bedding should conform to the requirements in *Section 19-3, "Structure Excavation and Backfill."* Trenches should be backfilled with fill placed in lifts of approximately 8-inches in non-compacted thickness. However, thicker lifts can be used provided the method of compaction is approved by the Geotechnical Engineer and the required minimum degree of compaction is achieved. Backfill should be placed by mechanical means only. Imported sand trench backfill should be compacted to at least 95 percent relative compaction and sufficient water is added during backfilling operations to prevent the soil from "bulking" during compaction. Jetting and ponding are not permitted as acceptable methods of compaction.

Some of the native soils excavated from the trench excavation may be saturated from either perched or transient groundwater and can have a water content above the optimum moisture content as determined by CTM 216. If these excavated soils are to be used for backfill of the excavated trench, they must be brought to the optimum moisture content to obtain the minimum required compaction. Typical methods of achieving this are drying them in wind rows or blending them with dry import fill to reduce the overall moisture content of the blended fill material.

To prevent the migration of water within the trench backfill, clay plugs should be installed. Clay plugs should be installed at a minimum of 500-foot centers and at the edges of where the trench crosses into and out of the roadway limits. In lieu of installing clay plugs, lean cement concrete can be used as a plug material as long as it forms a complete seal in the trench and around the pipe.

8.3.8 Surface and Subsurface Drainage

In accordance with Caltrans criteria, drainage for improvements within Caltrans right-of-way should be constructed in accordance with *Chapter 800* of the *Caltrans Highway Design Manual* (current edition). Embankments should be protected from erosion due to surface water (overland flow) or groundwater (seeps and piping). Surface water should be directed to storm drain systems and not be allowed to be discharged over slope faces. Where groundwater is present, subsurface drainage devises should be installed (Caltrans, 2005).

8.4 Earth Retaining Systems

It is expected that numerous retaining walls will be constructed for both the I-5 and SR 56 portion of the proposed improvements. At the time of this report the preferred alignment had not been determined. Depending upon the nature and location of the required retaining structure, several retaining wall options may be appropriate for the project including Caltrans standard retaining walls (Type 1 through Type 5) and crib walls, Mechanically Stabilized Earth (MSE) walls, Type 1 walls on pile foundations, tie-back walls and soil nail walls. Caltrans standard retaining walls (Type 1 through Type 5) and crib walls may be used without special design. Non-standard walls (such as MSE walls, Type 1 walls on pile foundations, tie-back walls and soil nail walls) will require a structure specific Foundation Report.

The following paragraphs and Sections 8.4.2 through 8.4.4 are excerpted from *the Draft Geotechnical Design Report, Northern San Diego Widening EA 235800, (Caltrans, 2005),* which provide preliminary geotechnical design parameters that are generally applicable for preliminary design of the I-5/SR 56 Improvements Project.

The following Earth Retaining System parameters are for preliminary design purposes only and should not be used for final design. Final design parameters for the I-5/SR 56 Improvements Project should be determined based on a project-specific geotechnical design report.

Retaining walls must satisfy Caltrans requirements for internal and external (global) stability. For internal stability calculations, the minimum static sliding factor of safety is 1.5. Under seismic loading, a minimum sliding factor of safety of 1.1 is required. The factor of safety against overturning is considered acceptable if the resultant force on the base of the foundation falls within the middle 1/3 of the footing.

For external (global) stability consideration, the retaining wall and adjacent embankment geometry must be reviewed and analyzed as a slope stability problem and evaluated according to the criteria presented in sections 8.2 and 8.3. The wall and embankment geometry must also be viewed and analyzed for potential bearing capacity failure if soft foundation soils lay beneath the embankment. The anticipated differential settlement must also be within the tolerable limits for the type of retaining system.

Wall Type	Differential Settlement Tolerance (S/L)[1]
Concrete Gravity	1/500
Concrete Cantilever	1/500
Concrete Crib	1/300
MSE (Modular Block Facing)	1/200
MSE (Precast Facing)	1/100
Reinforced Soil Slope	1/60

[1]Settlement/Length

Global stability analyses simulating embankment widening with retaining walls over soft lagoon sediment should be performed where these conditions exist.

Standard Retaining Walls

Caltrans Standard Retaining Walls Type 1 through 6 are designed for use at both cut and fill locations. Caltrans Standard Crib Walls are designed for use at fill locations only. Applicable design criteria for these walls are presented in the following report sections. Designers must also consider the stability and extent of temporary back cuts necessary for wall construction and how back cuts may impact the existing roadway or right-of-way. Limitations on temporary cut slopes are presented in section 8.2.1.1.

The section of wall type and allowable wall height is highly dependant on the foundation soil. For preliminary design consideration, Type 1 Retaining Walls up to 5.5 meters (~18 feet) in height may be placed on compacted embankment fill. Type 1 Retaining Walls up to 9 meters (~29.5 feet) in height may be placed on sedimentary foundation. Crib walls may be selected from the Standard Plans for placement on either fill or formation. Standard cast-in-place retaining walls and crib walls are not recommended for use over lagoon alluvium where large differential settlement is anticipated.

Mechanically Stabilized Earth Walls

MSE walls are appropriate for fill locations only. These walls are generally considered economical where wall heights are greater than 3 meters (~9.8 feet). Applicable design criteria for these walls are presented in the following report sections. Designers must consider the stability and extent of temporary back cuts necessary for wall construction and how back cuts may impact the existing roadway or right-of way. Designers should also consider potential conflicts between underground features such as storm drains and utilities and the embedded soil reinforced behind MSE wall face.

Due to the potential for corrosive soil conditions, it is likely that the steel reinforcing strips or grids will not be suitable for soil reinforcement on the project. Geosynthetic soil reinforcement will be likely component of MSE wall design.

For preliminary design consideration, MSE walls up to 4 meters (~13 feet) in height may be suitable for placement above lagoon alluvium provided the wall foundation is kept within the limits of the existing embankment and strut fill. A more accurate determination is dependent on the final design cross sections and the results of subsurface exploration and testing. MSE walls greater the 4 meters (~13 feet) in height placed above lagoon alluvium may necessitate ground improvement of the underlying alluvium (section 8.6). At all other fill locations, MSE walls of significant height may be considered for the project.

Tie-Back Walls

Typically tie-back retaining walls are appropriate for cut locations only. These walls are constructed from the top down and typically consist of either soldier beams and horizontal timber lagging that are anchored by a series of tie-backs into competent sedimentary formations or can be precast panels which are anchored in the center and made monolithic after stressing of the tieback anchor. The soldier beams are usually either steel beams or cast-in-place concrete piles. The steel beams are usually either installed in a drilled hole, and then grouted in place with concrete, or are driven in-place to a determined depth below the proposed level of excavation. The cast-in-place concrete piles are installed as a Cast-In-Drilled-Hole (CIDH) piles as for any typical CIDH installation. As excavation proceeds in front of the wall in lifts, lagging is installed between the soldier beams. The lagging typically consists of timbers but reinforced shotcrete can be used in lieu of timber lagging in certain circumstances, provided it can be positively connected to the soldier beams. Excavation of the tieback retaining wall typically consists of excavating a working face of 1.5 m exposed, and installing lagging. The tieback anchors are usually installed and stressed prior to excavating the next working face. Typically two or more rows of ground anchors are installed. The embedment length and ground anchor geometry shall be based on site specific geotechnical investigations. Designers must consider the impact of the ground anchor lengths on existing underground facilities and right-of-way requirements. For permanent walls, a concrete facing is typically installed. Wall drainage which typically consists of strip drains, shall be incorporated into design of the wall to prevent the buildup of hydrostatic pressure. Some tieback retaining walls incorporate a foundation to

resist the vertical component of the tieback anchors, which must be considered when designing the tieback wall system.

Soil Nail Walls

Soil nail walls are usually only appropriate for cut locations only. These walls are constructed from the top down and have no real designed footing. They are well suited as retaining structures in the competent sedimentary formations that are common on this project, particularly where mid slope walls are desired. The types of soils where soil nail walls are well suited are clays, cemented silts and sands, weak sedimentary and marine rocks (lithified sands), and other moderately competent to competent soils which allow the unbraced working face excavation and the stable soil nail hole drilling. Soil nail walls are usually highly economical (more cost effective than other types of retaining structure systems) for wall heights exceeding 2 meters (~6.5 feet). The wall appearance is generally considered to be more aesthetic when the walls are slightly battered and can have a multitude of wall face treatments. Designers must consider the impact of the nail lengths on existing underground facilities and right-of-way requirements. Soil nail walls have been constructed in excess of 30 m in exposed height, but typically are between 3 to 13 m in exposed height. Soil nail walls exceeding 13 m in height typically require tiebacks in the upper portions of the soil nail wall to provide resisting forces and local stability as the nail lengths exceed reasonable constructible dimensions.

Exact retaining wall geometry is not yet known for the I-5/SR 56 Improvements Project. Several anticipated slope and soil nail wall configurations were modeled for internal and global stability. For the purpose of preliminary design, the length of the soil nails (l) may be determined as follows:

L= 1.0 to 1.25(H), H= Wall Height

L_{min} =3 m (~9.8 ft)

The nail length may be less based on the final wall cross section geometry, batter of the face of the soil nail wall, and more precise site specific soil parameters. The preliminary findings were based on mid slope walls up to 9 meters in height in competent sedimentary formation.

8.4.1 Wall Subgrade Preparation

Concrete spread footings, crib walls, or MSE walls may be founded on new compacted fill, competent sedimentary formations, or competent rock. Materials that can not be proof rolled or recompacted should be removed to competent material and replaced with compacted fill in accordance with *Section 19-3.06 of Caltrans Standard Specifications*. All foundation excavation should be observed by competent personnel to confirm the foundation subgrade meets the requirements of the geotechnical design report prior to placing steel or concrete.

8.4.2 Wall Embedment

Concrete footings founded on level ground should have minimum bottom-of footing embedment of 0.6m (~2 feet) below the lowest adjacent grade. MSE wall foundations on level ground should have a minimum embedment of 0.6m (~2 feet) or 10% of the wall height whichever is greater. All concrete or MSE wall foundations located on or adjacent to slopes should have a minimum bottom footing embedment of 1.5 meters (~5 feet) at the slopeward edge of foundations. Crib walls should have minimum embedment and slope setback as specified in the Caltrans Standard Plans.

8.4.3 Allowable Bearing Pressure

The following Allowable Bearing Pressures may be assumed for the purpose of preliminary wall design.

Wall Type	Sedimentary Formation	Engineered Fill
Standard CIP	385 kPa (8000 lbs/ft^2)	200 kPa (4100 lbs/ft^2)
Crib	385 kPa (8000 lbs/ft^2)	200 kPa (4100 lbs/ft^2)
MSE	385 kPa (8000 lbs/ft^2)	265 kPa (5500 lbs/ft^2)

The above Allowable Bearing Pressures are preliminary in nature. Geotechnical borings should be performed at each wall location, and in sufficient quantity, to determine the actual in situ soil bearing capacities for final design.

8.4.4 Wall Drainage

All of the above recommendations assume that the walls have adequate drainage provisions to prevent the buildup of hydrostatic pressures in the soil backfill. The drainage system for Type 1 walls shall be designed in accordance with *Caltrans Standard Plan BO-3, Detail 3-1*. MSE walls shall have an appropriate underdrain system. Soil nail walls shall have appropriate vertical strip drains between columns.

8.5 Sound Walls

The following is excerpted from *Section 8.5 of the Draft Geotechnical Design Report, Northern San Diego Widening EA 235800, (Caltrans, 2005),* which provide preliminary geotechnical design parameters that are generally applicable for preliminary design of the I-5/SR 56 Improvements Project.

The I-5/SR 56 Interchange Project does not currently include proposed soundwall locations. However, soundwalls may be a project feature. The following information can be used for preliminary soundwall design.

Soundwalls are generally supported on Cast-in-Drilled-Holes (CIDH) piles when located in embankment fill or at the slope hinge line. CIDH pile, trench footings or spread footing foundations may be used in sedimentary formation when soundwalls are located 2 meters (~6.5 feet) or more from the slope hinge, with foundation type selection being based on economics. For Caltrans Standard soundwall designs (XS Sheets) we recommend an ultimate lateral soil pressure (SP) of 70.5 kPa/m (for design of CIDH piles or trench footings in sedimentary formations. For soundwall founded in compacted fill, we recommend an ultimate soil pressure of 47.1 kPa/m. All three of the above foundation types are located in the *Caltrans Standard Plans 2004 (Figure B15-1, page 291 and Figure B15-3, page 293)*. For preliminary design of the soundwall piles a f = 30 degrees should be used with pile data tables located on *page 295* of the *2004 Standard Plans* unless Ardath Shale is predominant (which is not expected to be encountered within the project limits). In such a case a f angle of 25 should be used.

Soundwall foundations should be readily excavated in either fill of sedimentary formation using conventional equipment. Occasional hard cemented lenses and concretions should be anticipated during footing or pile excavation. A foundation study to confirm final foundation type should be performed once the soundwall locations are determined.

8.6 Ground Improvement

The following is excerpted from *Section 8.6 of the Draft Geotechnical Design Report, Northern San Diego Widening EA 235800, (Caltrans, 2005),* which provide preliminary geotechnical design parameters that are generally applicable for preliminary design of the I-5/SR 56 Improvements Project.

Soft foundation soils, such as the alluvium deposits at lagoons, may require ground improvement prior to placement of additional freeway embankment. Typical ground improvement methods for loose, soft, and weak foundation conditions include:

- Wick Drains
- Stone Columns (Vibro Replacement)
- Dynamic Compaction
- Soil Mixing
- Grouting (Jet and Compaction)

Of the listed methods; wick drains, soil mixing, and stone columns have been used in the I-5 corridor. With the possible exception of wick drains, ground improvement techniques are very costly. It should be anticipated that widening the embankment slopes over the lagoons will require the use of wick drains to speed the dissipation of excess pore pressure in soft clayey foundation soil and accelerate settlement. It should also be anticipated that the design of large, near vertical retaining structures greater than 4 meters in height to accommodate embankment widening over lagoons would likely dictate that an extensive program of ground improvement be implemented in order to preclude wall failure and excessive settlement. This likelihood is evident through the results of the preliminary stability analysis conducted. Any size retaining wall placed on lagoon sediment beyond the current embankment footprint would likely require extensive ground improvement for underlying soil. Such ground improvement programs would have a large impact footprint, be cost prohibitive, and may result in excessive construction delays and claims. It is therefore recommended that the use of large retaining structures to accommodate embankment widening over lagoons be avoided during project planning.

8.7 Lightweight Fill

The following is excerpted from *Section 8.7 of the Draft Geotechnical Design Report, Northern San Diego Widening EA 235800, (Caltrans, 2005),* which provide preliminary geotechnical design parameters that are generally applicable for preliminary design of the I-5/SR 56 Improvements Project.

The instability and settlement problems of soft/weak foundation soils may often be minimized through the use of lightweight fill. Many types of lightweight fill have been used for roadway embankment construction. These included geofoam (expanded polystyrene), tire sheds, and fly ash. The use of lightweight fill is not prevalent within Caltrans. The use of lightweight fills is generally confined to situations of special circumstances, such as where a lightweight material is available as a nearby waste product, or where the settlement produced by a conventional fill is intolerable. Within the project limits, all such lightweight fill material would need to be imported over large distances and likely require special processing and placement techniques. The use of lightweight fill should not be incorporated into the preliminary project design.

8.8 Corrosion

Fine-grained soil (silt and clay) is often corrosive to buried metal and deleterious to concrete, particularly when saturated. According to the *United States Department of Agriculture, Soil Survey of the San Diego Area, California* (USDA, 1973), and previous geotechnical studies within the project area, the majority of the soils in the upland areas within the Torrey Sandstone and Bay Point Formation generally consist of non-plastic sands and silty sands which have a low corrosive potential.

However, the lagoonal deposits within the Soledad Valley Estuary (representing a salt water environment), the Ardath Shale Formation (which is not expected to be encountered within the project limits) and some alluvial deposits within Carmel Valley are comprised of silt and clay and are known to be corrosive to very corrosive.

For preliminary design purposes, all soils should be considered corrosive.

The California Department of Transportation (Caltrans) has the following definition of corrosive soils:

- "For structural elements, the Department considers a site to be corrosive if one or more of the following conditions exists for the representative soil and/or water samples taken at the site:
- Chloride concentration is 500 ppm or greater,
- Sulfate Concentration is 2000 ppm or greater,
- pH is 5.5 or less".

Future corrosion sampling and testing for the I-5/SR 56 Interchange Project should conducted following the guidelines laid out in *Section 5.1 Corrosion Sampling for Foundations and Geotechnical Investigations for Bridge Structures* of the *Corrosion Guidelines, Version 1.0, September, 2003.*
For preliminary design and cost purposes, even where the soils are found to be non-corrosive, the following mitigation measures should be employed as prudent engineering practice. For concrete, the use of mineral admixtures (such as fly ash, silica fume, metakolin, etc…), a reduced water content, and increased cementitious material content generally result in a high-density, durable concrete which is more resistant to corrosion. Table 854.1A in the *Guide for the Protection of Reinforced and Unreinforced Concrete Against Acid and Sulfate Exposure Conditions*, and *Section 8.22* of the *Bridge Design Specifications*, the maximum water-to-cementitious material shall not exceed 0.40 and a minimum of 3-inches clear cover for all reinforcing bars where the concrete is cast against the surrounding soils. We also recommend the use of a minimum of 675 pounds per cubic yard of cementitious material and Type II Modified or Type V cement with 25-percent mineral admixtures be used on all locations where the concrete is to remain in permanent contact with the surrounding soils. Using *Figure 854.3B Minimum Thickness of Metal Pipe for 50 Years of Maintenance Free Service Life* from the *Caltrans Highway Design Manual*, the minimum corrugated metal pipe thickness should be 16-gauge and should be constructed of galvanized steel. This is minimum thickness based upon the results of the corrosion analysis only and the pipe section should be checked structurally to determine the minimum thickness based upon the proposed loading requirements.

8.9 Infiltration / Detention Basins

Infiltration is defined as the process of water entering the soil and the rate of infiltration is the maximum velocity at which water enters the soil surface. The rate of infiltration is influenced by several factors including soil type (texture) and structure, surface crust, compaction, water content, porosity and organic content. The level of groundwater also influences the rate of infiltration. Generally, high groundwater levels tend to limit the downward migration of surface water, reducing the surface infiltration rate. Areas overlain by loose sands and gravels will have higher infiltration rates than areas overlain by consolidated silts and clays. Infiltration rates of areas overlain by sedimentary rock are generally dependent on factors such as the amount and direction of fracturing, cementation and surface weathering. The viability of potential infiltration facilities should be determined on site specific subsurface investigations and laboratory analysis.

Based on our visual observations, review of existing boring logs and readily available published literature, we expect infiltration rates to be highest in the unconsolidated granular soils within the Carmel Valley floodplain, while infiltrations rates in the upland areas will be wholly dependent on the subsurface conditions at individual locations.

Infiltration basins may be required as part of the proposed project to help mitigate additional storm water runoff due to new roadway construction. Typical hydraulic conductivity rates (K) for unconsolidated sands and gravels range between 102 to 10^{-3} centimeters per second (cm/s), which is considered pervious to semi-pervious. Hydraulic conductivity rates for fine sands and silts typically range between 10^{-3} to 10^{-6} cm/s, which is considered semi-pervious to impervious. Infiltration basins should be designed to be a minimum of 2 to 4 feet above the seasonal high groundwater levels (or minimum levels determined by the regulatory agency overseeing the project).

9. MATERIAL SOURCES

It is expected that material required for the project will come from both on-site and imported sources. Materials excavated from upland sources (e.g. Torrey Sandstone) within the project limits should yield predominantly sands and silty sands, which should be acceptable for roadway embankment construction. All materials used for the proposed project shall conform to material requirements in the *Caltrans Standard Specifications* (current edition).

Any existing asphalt concrete pavements removed during grading operations can be processed into base material for the project. As of February 2007, Caltrans allows the use of recycled materials as Class 2 aggregate base material. The following is from the 2007 Caltrans Standard Specifications:

The first paragraph of *Section 26-1.02A, "Class 2 Aggregate Base,"* of the Standard *Specifications* is amended to read:

"Aggregate must be clean and free from organic matter and other deleterious substances. Aggregate must consist of any combination of:

1. Broken stone
2. Crushed gravel
3. Natural rough surfaced gravel
4. Sand
5. Up to 100 percent of any combination of processed:
   - 5.1. Asphalt concrete
   - 5.2. Portland cement concrete"

As long as the recycled materials meets the minimum grading requirements and quality requirements which are shown on pg. 233, Section 26: Aggregate Bases of the State of California Department of Transportation Standard Specifications dated May 2006, the recycled materials can be re-used as Class 2 or Class 3 aggregate base throughout the project. Recycled asphalt concrete will have a swell factor of approximately 1.1 with respect to the in-place volume when recycled into Class 2 or Class 3 aggregate base. We also recommend waiving the Durability Index testing as this test is not applicable to recycled asphalt concrete. Recycled asphalt concrete can be blended with base rock and additional Class 2 aggregate base materials to meet the gradation and Sand Equivalent requirements, if required.

10. MATERIAL DISPOSAL

Any materials which are generated from the grading operations and not used for fill within the project limits will need to be disposed of off-site. The Contractor shall make arrangements for disposing of the materials outside the highway right of way and shall pay all costs involved. Disposal of the soil material should be in accordance with *Section 7-1.13 "DISPOSAL OF MATERIAL OUTSIDE THE HIGHWAY RIGHT OF WAY"* of the *Standard Specifications*.

11. PRELIMINARY DESIGN CONSIDERATIONS

11.1 Design Advisories

The following is excerpted from *Section 11.1 of the Draft Geotechnical Design Report, Northern San Diego Widening EA 235800, (Caltrans, 2005),* which provide preliminary geotechnical design parameters that are generally applicable for preliminary design of the I-5/SR 56 Improvements Project.

1. The soil at lagoon and river crossings is likely to be predisposed to liquefaction during seismic events. The selection of project features such as wall types and structure foundations should include consideration of liquefaction potential.

2. The allowable inclination of permanent cut slopes is 1:2 (vertical to horizontal). Slightly steeper cut slopes up to 1:1.75 may be suitable based on a site specific finding of favorable soil conditions such as well cemented sandstone with no adverse bedding present.

3. The allowable inclination of temporary cut slopes is 1:1 in formation and 1:1.5 in fill. Steeper temporary cut slopes may be permitted based on a site specific soil properties, slope geometry, and analysis. Temporary slopes should not be allowed to stand unprotected during wet season.

4. Cut and fill slopes higher than 20 meters (~65 feet) should be designed with mid-slope benches. Benches may not be necessary where the slope is interrupted by retaining walls with appropriate slope drainage features.

5. The on-site soils are expected to be rippable and drillable. It should be anticipated that hard cemented lenses and concretions will be encountered sporadically during excavation. Trenching, boring, and tunneling operations should be employ equipment and methods capable of handling random occurrences of hard rock.

6. The predominantly granular cut soils will be suitable for embankment fill. Clayey soil may be mixed with granular soil to produce suitable roadway embankment.

7. For embankment material generated on site, the following grading factor (Gf) should be applied:

Placed at 90% relative compaction: Gf = 0.96
Placed at 95% relative compaction: Gf = 0.94

8. Unreinforced embankment fill slopes may be inclined at 1:2 or flatter.

9. Reinforced embankment fill slopes may be inclined at 1:1.5. Slope facing should be designed to provide adequate erosion control.

10. Embankment placed over lagoon and river alluvium will cause settlement. Embankment settlement should have minimal impact on existing freeway lanes. Settlement must be taken into account during the selection of earth retaining structures.

11. The rate of embankment settlement will vary with subsurface soil conditions. A settlement waiting period of six months to one year may be necessary before final roadway features can be constructed. The waiting period may be reduced by the installation of wick drains.

12. Over lagoon and river sediments it may be necessary to place embankments in stages to allow pore water pressures to dissipate and prevent embankment failure.

13. Due to stability, settlement, and cost considerations, embankment fills and reinforced soil slope fills (RSS) are recommended for roadway widening over soft lagoon and river sediments.

14. Relatively rigid cast-in-place walls, such as Type 1, are not recommended as earth retaining systems above soft soil locations.

15. Mechanically Stabilized Earth (MSE) walls greater than 4 meters (~13 feet) in height are not recommended as retaining systems above soft soil locations.

16. Retaining wall selection and preliminary design should follow the guidelines presented in Section 8 of this report.

17. Wall construction features such as temporary back cuts or soil nail lengths may impact existing facilities and right-of-way requirements.

18. Large, near vertical earth retaining systems located above soft lagoon and river alluvium are likely to necessitate ground improvements of the foundation soil. Such a ground improvement program would have a large impact footprint, be cost prohibitive, and may result in excessive construction delays and claims.

19. The corrosive potential of on site soils varies greatly. Final design of project features should be based on site specific corrosion testing.

11.2 Construction Monitoring and Instrumentation

A representative of the Geotechnical Engineer of Record should be present during project construction to observe all cuts, foundation subgrade, and embankment subgrade to ensure that the provisions set forth in the documents are appropriately enforced. When and if unanticipated conditions are encountered, the geotechnical personnel should make recommendations to the Resident Engineer who will in return direct the contractor. Instrumentation for measuring settlement or slope distress is likely to be included in final geotechnical recommendations. A program of periodic surveying for ground movement should be included in project construction where the potential for ground movement and failure exists.

11.3 Hazardous Waste Considerations

An environmental investigation was outside the scope of this preliminary geotechnical investigation.

11.4 Differing Site Conditions

Characterization of the geotechnical conditions along the project corridor is based on several sources including the review of preliminary plans, as-built plans, geologic maps, geologic literature, and archived report files. Interpolation and analysis included in this preliminary geotechnical report was based on the information discovered. Except for the limited field reconnaissance, no exploration was specifically conducted for this report. Final geotechnical recommendations contained in Geotechnical Design Reports and Foundation Reports should be based on final project plans and feature specific exploration, sampling, testing and analysis.

12. RECOMMENDATIONS AND SPECIFICATIONS

All grading and roadway work should be performed in accordance with the *Caltrans Standard Plans and Specifications*. Final recommendations and Special Provisions should be based on the findings of subsurface exploration, testing, and analysis as presented in final Geotechnical Design Reports and Foundation Reports. These reports should be based on accurate project features and alignments as they are established.

13. LIMITATIONS

This preliminary investigation was performed in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, expressed or implied, is made as to the conclusions and professional recommendations made in this letter report.

Site assessment activities were performed, our findings obtained, and our recommendations prepared in accordance with currently and generally accepted principles and practices for a Preliminary Geotechnical Report. Site observations were made by reconnaissance of visible surface features only. A detailed site reconnaissance, exploratory drilling, soil or groundwater sampling and analysis were specifically excluded from the scope of services. No representation as to the potential subsurface presence of features is neither made, expressed, or implied. This assessment is based upon various selected information sources readily available to us at the time of our investigation. These sources may not have accurate or complete information. Our conclusions and recommendations are based on the information available and our interpretation of this information.

This document is intended only for its expressed purpose and only for the intended client(s). Use of this assessment by third parties may only be permitted by consent of Dokken Engineering. These conclusions and recommendations contained in this report are based upon the data relating only to this specific project and locations discussed herein. The proposed use of the project area, site conditions, adjacent properties, and regulatory requirements may change.

This Preliminary Geotechnical Report did not include an investigation regarding the existence, location, or type of possible hazardous materials. In addition, if any hazardous materials are encountered during construction of the project, the proper regulatory officials should be notified immediately. A determination of flooding potential, the existence of wetlands, or corrosive soil was beyond the scope of this report.

TABLES

TABLE 1 – Quaternary Faults
Within a 63- Mile (100-km) Radius of the Project Study Area
(Peak Site Acceleration)

Fault Name	Maximum Earthquake[2]	Peak Site Acceleration (g)
Rose Canyon[1]	7.2	0.55
Coronado Bank[1]	7.6	0.23
Newport – Inglewood (Offshore)[1]	7.1	0.15
Elsinore – Julian[1]	7.1	0.08

[1] Closest distance to project area
[2] Moment Magnitude (Blake, 2000)

TABLE 2 – Quaternary Faults
Within a 63-Mile (100-km) Radius of the Project Study Area
(Maximum Earthquake)

Fault Name	Distance (miles)[1], General Direction	Maximum Earthquake[2]
Rose Canyon	3.0, NW	7.2
Coronado Bank	16.3, SW	7.6
Newport – Inglewood (Offshore)	18.3, NW	7.1
Elsinore - Julian	31.9, NE	7.1
Elsinore - Temecula	32.8, NE	6.8
Earthquake Valley	41.7, NE	6.5
Palos Verdes	46.8, NW	7.3
Elsinore – Glen Ivy	48.8, NE	6.8
San Joaquin Hills	50.0, NW	6.6
Elsinore – Coyote Mountain	51.1, NE	6.8
San Jacinto - Anza	54.5, SE	7.2
San Jacinto – Coyote Creek	55.4, NE	6.6
San Jacinto – San Jacinto Valley	58.2, NE	6.9
Newport – Englewood (Los Angeles Basin)	60.5, NW	7.1

[1] Closest distance to project area
[2] Moment Magnitude (Blake, 2000)

TABLE 3 – USDA Soil Associations

Group Number	Map Symbol	Soil Association
6	**CsB**	**Corralitos loamy sand, 0 to 5 percent slopes**
6	**CsC**	**Corralitos loamy sand, 5 to 9 percent slopes**
6	**CsD**	**Corralitos loamy sand, 9 to 15 percent slopes**
7	**TuB**	**Tujunga sand, 0 to 5 percent slopes**
10	**HrC2**	**Huerhuero loam, 5 to 9 percent slopes, eroded**
10	**HrD**	**Huerhuero loam, 9 to 15 percent slopes**
10	**HrE2**	**Huerhuero loam, 15 to 30 percent slopes, eroded**
10	**LvF3**	**Loamy alluvial land-Huerhuero complex, 9 to 50 percent slopes, severely eroded**
--	**Md**	**Made land**
12	**OhC**	**Olivenhain cobbly loam, 2 to 9 percent slopes**
--	**Tf**	**Tidal flats**

Reference: Soil Survey, San Diego Area, California, 1973.

TABLE 4 – Temporary Cut Slopes

Soil Type	Approximate Temporary Slope Height (M)	Factor of Safety	Slope Inclination (H:V)
Torrey Sandstone	**9**	**1.3**	**1:1**
	12	**1.2**	**1:1**
	15	**1.2**	**1:1**
	20	**1.2**	**1:1.2**
	30	**1.3**	**1:1.5**
Bay Point Formation	**9**	**2.2**	**1:1**
	12	**1.9**	**1:1**
	15	**1.8**	**1:1**
	20	**1.7**	**1:1.2**
	30	**1.6**	**1:1.3**
Existing Fill	**9**	**1.3**	**1:1**
	12	**1.2**	**1:1**
	15	**1.2**	**1:1.2**
	20	**1.2**	**1:1.2**
	30	**1.3**	**1:1.3**

Reference: Preliminary Design Report, I-5 Widening, Caltrans, 2005.
*This table is to be used for preliminary design only. This table is based on an ideal situation. Adverse bedding planes may exist.

TABLE 5 – Existing Utilities

Alignment Line Name	Alignment Description	Alignment Station	Utility Company	Company Facility
Del Mar Heights	E-W Arterial Roadway, Crossing Over I-5	557+00 to 561+00	Time Warner	750 STD & 750 STY CATV
Del Mar Heights	E-W Arterial Roadway, Crossing Over I-5	557+00 to 561+00	SDG&E	Electrical
Del Mar Heights	E-W Arterial Roadway, Crossing Over I-5	557+00 to 561+00	Pac Bell	18-4" MCD Telephone Conduit
Del Mar Heights	E-W Arterial Roadway, Crossing Over I-5	557+00 to 561+00	SDG&E	Gas
WN	WB SR-56 to NB I-5 Direct Connector	558+00	AT&T	Telephone
WN	WB SR-56 to NB I-5 Direct Connector	546+40 to 556+40	Pac Bell	18-4" MCD Telephone Conduit
WN	WB SR-56 to NB I-5 Direct Connector	538+60	AT&T	OH Telephone
WN	WB SR-56 to NB I-5 Direct Connector	539+70	Pac Bell	Telephone
WN	WB SR-56 to NB I-5 Direct Connector	539+60	SDG&E	Electric
WN	WB SR-56 to NB I-5 Direct Connector	538+70		Sewer
WN	WB SR-56 to NB I-5 Direct Connector	537+70	Time Warner	CATV
WN	WB SR-56 to NB I-5 Direct Connector	540+60		Gas
DEL2	NB I-5 Off-Ramp @ Del Mar Heights Rd	555+40 to 557+40	Pac Bell	Telephone
DEL5	SB I-5 Off-Ramp @ Del Mar Heights Rd	561+80	AT&T	Telephone

Alignment Line Name	Alignment Description	Alignment Station	Utility Company	Company Facility
DEL 5	SB I-5 Off-Ramp @ Del Mar Heights Rd	562+10		Water
SE	SB I-5 to EB SR-56 Direct Connector	546+00 to 557+00	AT&T	Telephone
SE	SB I-5 to EB SR-56 Direct Connector	539+40		Water
SE	SB I-5 to EB SR-56 Direct Connector	539+20 to 539+60	Time Warner	CATV
SE	SB I-5 to EB SR-56 Direct Connector	539+30		Sewer
SE	SB I-5 to EB SR-56 Direct Connector	539+00	SDG&E	Electric
SE	SB I-5 to EB SR-56 Direct Connector	538+25		OH CATV
SE	SB I-5 to EB SR-56 Direct Connector	539+60		Gas
Portofino Cir	N-S Arterial Roadway, West of I-5	12+00 to 14+40		Water
Portofino Cir	N-S Arterial Roadway, West of I-5	12+00 to 14+40		Sewer
Portofino Cir	N-S Arterial Roadway, West of I-5	12+00 to 14+40	Time Warner	860 QR CATV Line
Portofino Cir	N-S Arterial Roadway, West of I-5	12+00 to 14+40	SDG&E	Electric
Portofino Cir	N-S Arterial Roadway, West of I-5	12+00 to 14+40	Pac Bell	Telephone - Joint Trench
C4	WB SR-56 Loop On-Ramp @ Carmel Creek Rd	23+00 to 23+40	Pac Bell	6-4" CPC Telephone Conduit
C4	WB SR-56 Loop On-Ramp @ Carmel Creek Rd	23+00 to 23+40		Sewer

Alignment Line Name	Alignment Description	Alignment Station	Utility Company	Company Facility
C4	WB SR-56 Loop On-Ramp @ Carmel Creek Rd	23+00 to 23+40		Water
C4	WB SR-56 Loop On-Ramp @ Carmel Creek Rd	23+00 to 23+40	SDG&E	Electric
C4	WB SR-56 Loop On-Ramp @ Carmel Creek Rd	23+00 to 23+40	Time Warner	750 STD CATV Line
SR-56	E-W Freeway	33+00	Kinder & Morgan	16" & 10" Oil Pipelines
CC4	WB SR-56 Loop On-Ramp @ Carmel Country Rd	38+80 to 39+40	SDG&E	Electric
CC4	WB SR-56 Loop On-Ramp @ Carmel Country Rd	38+80 to 39+40	Time Warner	750 STD & 860 QR CATV Lines
CC4	WB SR-56 Loop On-Ramp @ Carmel Country Rd	38+80 to 39+40	SDG&E	8" H.P. Gas Line
CC4	WB SR-56 Loop On-Ramp @ Carmel Country Rd	38+80 to 39+40	Pac Bell	9-4" MCD Telephone Conduit

TABLE 6 – Direct Connector Fill Slopes

Slope Designation	Freeway Segment	Beginning Station	High Point Station	Ending Station	Maximum Height(m)	Slope Faces	Maximum Slope Inclination (vertical to horizontal)
F01	SB Exit-Carmel Valley	539+00	540+80	541+60	1.5	W	1 to 4
F02	Southbound I-5 Bypass	539+50	539+60	540+80	5	W	1 to 4
F03	Southbound I-5 Bypass	560+80	561+40	562+40	1.5	E	1 to 4
F04	SB Daim. On-Del Mar Heights	558+20	558+40	558+40	1	SW	1 to 4
F05	SB Exit-Del Mar Heights	558+50	558+80	559+20	0.5	SW	1 to 4
F06	SB Exit-Del Mar Heights	559+40	559+80	560+00	2.5	SE	1 to 4
F07	Northbound I-5 Bypass	540+80	540+80	541+60	4.5	E	1 to 4
F08	NB Exit-Del Mar Heights	556+70	558+60	558+70	9	W	1 to 4
F09	NB Exit-Del Mar Heights	558+40	558+60	558+90	7	E	1 to 2
F10	NB Entrance-Del Mar Heights	559+30	559+60	559+90	4	NE	1 to 2
F11	NB Entrance-Del Mar Heights	559+30	559+80	560+60	3	W	1 to 3
F12	WB Entrance-Carmel Creek	527+40	528+20	529+10	1.5	N/A	1 to 4
F13	Westbound C-D	528+80	528+80	529+30	2	S	1 to 4
F14	WB Exit-El Camino Real	534+80	535+20	535+70	0.5	NE	1 to 4
F15	Westbound C-D	536+00	537+00	537+00	5	NE	1 to 2
F16	WB Exit-El Camino Real	536+20	536+50	536+80	1	NE	1 to 4
F17	WB Exit-Carmel Creek	23+00	23+40	24+40	1.75	N	1 to 4
F18	Eastbound SR-56	45+50	48+80	48+80	0.5	SE	1 to 4

TABLE 7 – Direct Connector Cut Slopes

Slope Designation	Freeway Segment	Beginning Station	High Point Station	Ending Station	Maximum Height (m)	Slope Faces	Maximum Slope Inclination (vertical to horizontal)
C01	Southbound I-5 Bypass	556+00	556+80	556+80	6	E	1 to 2
C01	SB Loop-Del Mar Heights	556+80	558+00	561+00	15	E	1 to 2
C02	SB Exit-Del Mar Heights	559+20	560+20	560+60	6	E	1 to 2
C01	Southbound I-5 Bypass	559+80	560+20	560+50	2	E	1 to 2
C03	Southbound I-5	560+50	561+00	562+10	3	E	1 to 2
C03	SB Exit-Del Mar Heights	561+40	563+40	563+40	7	E	1 to 2
C03	Southbound I-5	563+40	564+00	569+40	9	E	1 to 2
C04	NB Exit-Carmel Valley	537+70	538+30	539+40	2.75	NW	1 to 2
C05	NB Entrance-Carmel Valley	539+90	540+30	541+20	2.75	W	1 to 2
C06	Northbound I-5	540+80	542+40	542+80	4	E	1 to 2
C08	Northbound Bypass	556+80	557+60	557+80	3	W	1 to 4
C09	Northbound I-5	559+20	559+20	560+60	7	W	1 to 2
C10	NB Exit-Del Mar Heights	560+00	560+20	560+40	1.5	W	1 to 2
C11	Northbound I-5	561+60	562+80	569+20	9	W	1 to 2
C13	Westbound C-D	534+00	534+10	534+60	2.25	SE	1 to 2
C14	WB Entrance-Carmel Country	37+80	39+80	40+60	0.75	N/A	1 to 2
C15	EB Entrance-Carmel Creek	24+40	24+40	25+00	3	N	1 to 2
C16	EB Exit-Carmel Country	37+80	38+80	38+80	1	NW	1 to 2
C17	EB Entrance-Carmel Country	39+80	40+40	43+20	2	NW	1 to 2
C18	Eastbound SR-56	43+20	43+20	45+50	0.5	NW	1 to 2

TABLE 8 – Auxiliary Lane Fill Slopes

Slope Designation	Freeway Segment	Beginning Station	High Point Station	Ending Station	Maximum Height(m)	Slope Faces	Maximum Slope Inclination (vertical to horizontal)
F01	SB Entrance-Del Mar Heights	558+20	558+40	558+40	1	W	1 to 4
F02	Eastbound Del Mar Heights	560+70	560+80	561+00	0.75	SE	1 to 4
F03	WB Entrance-Carmel Creek	24+20	24+00	25+60	1	N/A	1 to 4
F04	WB Exit-Carmel Creek	23+10	23+40	24+50	1.5	N	1 to 4
F05	WB Exit-Carmel Creek	24+60	23+40	25+80	0.75	S	1 to 4

TABLE 9 – Auxiliary Lane Cut Slopes

Slope Designation	Freeway Segment	Beginning Station	High Point Station	Ending Station	Maximum Height(m)	Slope Faces	Maximum Slope Inclination (vertical to horizontal)
C01	SB Exit-Carmel Valley	538+90	539+40	541+80	1.25	W	1 to 2
C02	Southbound I-5	551+20	551+20	554+70	2.5	E	1 to 2
C03	Southbound I-5	555+60	556+90	556+90	8	E	1 to 2
C04	SB Loop-Del Mar Heights	556+90	558+30	561+40	15	N/A	1 to 2
C05	Southbound I-5	560+50	561+40	562+20	2.5	E	1 to 2
C06	NB Exit-Carmel Valley	537+70	538+30	539+40	2.75	W	1 to 2
C07	NB Entrance-Carmel Valley	540+00	540+20	541+30	2.25	W	1 to 2
C08	Westbound SR-56	18+40	19+00	19+20	1.25	SE	1 to 2
C09	Westbound SR-56	21+10	21+20	21+20	1	SE	1 to 2
C10	WB Entrance-Carmel Creek	21+20	23+80	23+80	1.5	SE	1 to 2
C11	WB Exit-Carmel Creek	24+50	24+60	25+00	0.5	S	1 to 2
C12	Westbound SR-56	27+00	27+20	30+40	1	SE	1 to 2
C12	Westbound SR-56	34+80	35+40	37+80	1.75	SE	1 to 2
C13	WB Entrance-Carmel Country	37+90	39+60	40+00	0.5	SE	1 to 2

TABLE 10 – Hybrid Fill Slopes

Slope Designation	Freeway Segment	Beginning Station	High Point Station	Ending Station	Maximum Height(m)	Slope Faces	Maximum Slope Inclination (vertical to horizontal)
F01	SB Entrance-Del Mar Heights	558+20	558+40	558+40	1	W	1 to 4
F02	Eastbound Del Mar Heights	560+70	560+80	561+00	0.75	SE	1 to 4
F03	Northbound I-5 Bypass	540+80	540+80	541+60	4.5	E	1 to 4
F04	NB Exit-Del Mar Heights	556+70	558+60	558+70	9	W	1 to 4
F05	NB Exit-Del Mar Heights	558+40	558+60	558+90	7	E	1 to 2
F06	NB Entrance-Del Mar Heights	559+30	559+60	559+90	4	NE	1 to 2
F07	NB Entrance-Del Mar Heights	559+30	559+80	560+60	3	W	1 to 3
F08	WB Entrance-Carmel Creek	527+40	528+20	529+10	1.5	N/A	1 to 4
F09	Westbound C-D	528+80	528+80	529+30	2	S	1 to 4
F10	WB Exit-El Camino Real	534+80	535+20	535+70	0.5	NE	1 to 4
F11	Westbound C-D	536+00	537+00	537+00	5	NE	1 to 2
F12	WB Exit-El Camino Real	536+20	536+50	536+80	1	NE	1 to 4
F13	WB Exit-Carmel Creek	23+00	23+40	24+40	1.75	N	1 to 4

TABLE 11 – Hybrid Cut Slopes

Slope Designation	Freeway Segment	Beginning Station	High Point Station	Ending Station	Maximum Height(m)	Slope Faces	Maximum Slope Inclination (vertical to horizontal)
C01	SB Exit-Carmel Valley	538+90	539+40	541+80	1.25	W	1 to 2
C02	Southbound I-5	551+20	551+20	554+70	2.5	E	1 to 2
C03	Southbound I-5	555+60	556+90	556+90	8	E	1 to 2
C04	SB Loop-Del Mar Heights	556+90	558+30	561+40	15	N/A	1 to 2
C05	Southbound I-5	560+50	561+40	562+20	2.5	E	1 to 2
C06	NB Exit-Carmel Valley	537+70	538+30	539+40	2.75	NW	1 to 2
C07	NB Entrance-Carmel Valley	539+90	540+30	541+20	2.75	W	1 to 2
C08	Northbound I-5	540+80	542+40	542+80	4	E	1 to 2
C09	Northbound Bypass	556+80	557+60	557+80	3	W	1 to 4
C10	Northbound I-5	559+20	559+20	560+60	7	W	1 to 2
C11	NB Exit-Del Mar Heights	560+00	560+20	560+40	1.5	W	1 to 2
C12	Northbound I-5	561+60	562+80	569+20	9	W	1 to 2
C13	Westbound C-D	534+00	534+10	534+60	2.25	SE	1 to 2
C14	WB Entrance-Carmel Country	37+80	39+80	40+60	0.75	N/A	1 to 2

TABLE 12- Proposed Direct Connector Retaining Walls

WALL VICINITY	WALL NO.	STATION TO STATION	AREA (M2)	LENGTH (M)	AVG. HEIGHT (M)	MAX. HEIGHT (M)	CUT \ FILL
I-5 SB	559	559+40 to 570+20	4,368	1,070	4.1	7.1	C
I-5 SB	542	541+65 to 558+20	17,000	1,650	10.3	14.7	C
I-5 SB	SE1	542+65 to 544+05	350	140	2.5	5.0	F
I-5 SB	SE2	542+65 to 544+05	370	141	2.6	5.2	F
I-5 NB	541	541+20 to 543+08	570	188	3.0	6.1	F
I-5 NB	WN1	542+95 to 544+40	390	145	2.7	5.4	F
I-5 NB	WN2	542+95 to 544+40	345	145	2.4	4.8	F
I-5 NB	543	543+60 to 549+80	2,100	618	3.4	5.4	F
I-5 NB	550	550+00 to 552+80	1,220	288	4.2	9.2	C
I-5 NB	555	555+00 to 558+45	780	345	2.3	4.9	F
I-5 NB	560	556+00 to 569+20	3,080	916	3.4	10.0	C
SR-56 WB	18	529+90 to 534+00	823	410	2.0	3.0	C
SR-56 WB	24	24+70 to 27+20	671	245	2.7	5.1	C
SR-56 EB	15	15+55 to 17+70	220	215	1.0	2.8	C
SR-56 EB	22	22+84 to 23+58	396	74	5.4	6.8	C
SR-56 EB	23	23+46 to 26+51	512	301	1.7	3.3	C
		TOTALS	***33,195***	***6,891***			

TABLE 13 – Proposed Auxiliary Lane Retaining Walls

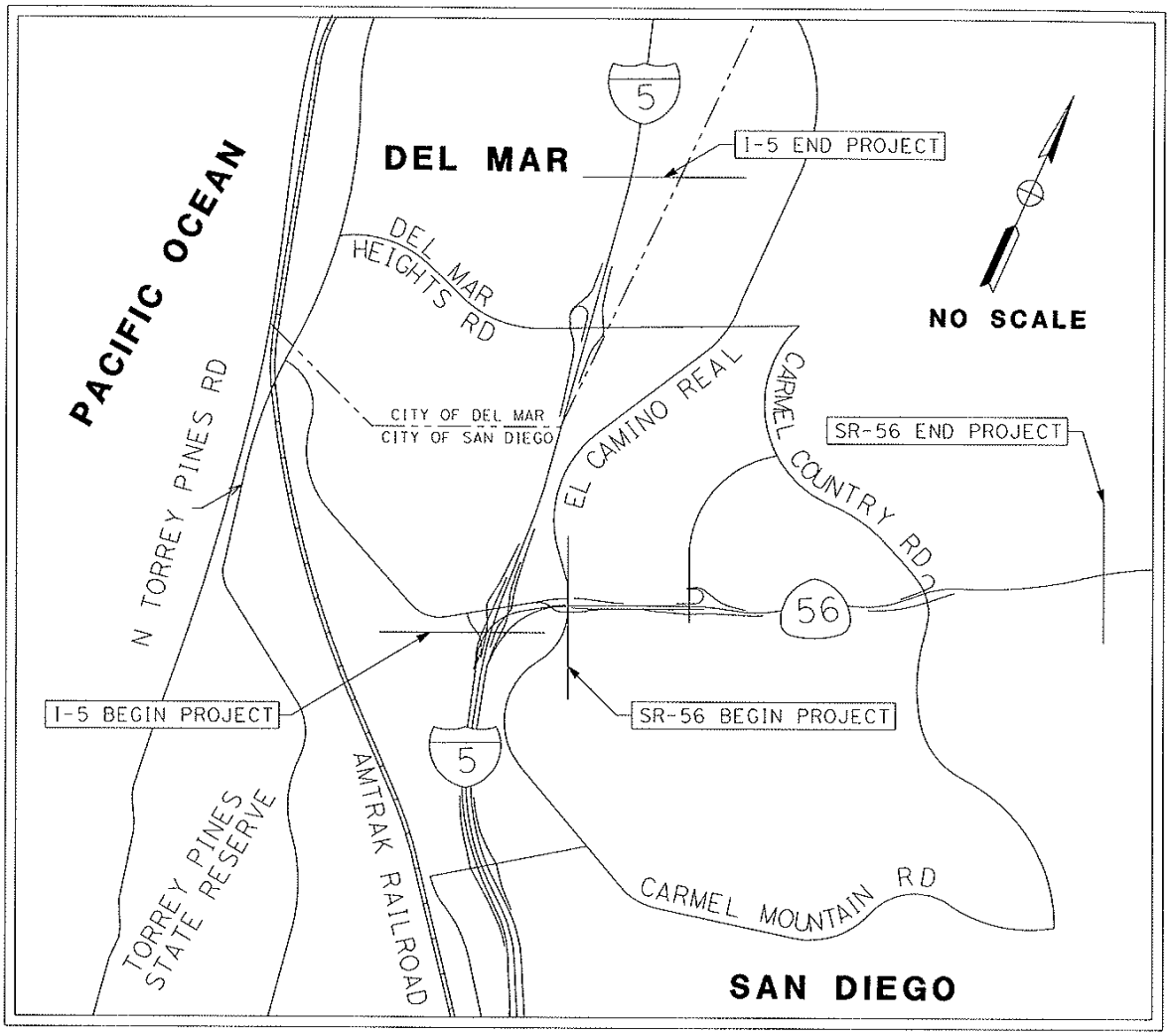
WALL VICINITY	WALL NO.	STATION to STATION	AREA (M2)	LENGTH (M)	AVG. HEIGHT (M)	MAX. HEIGHT (M)	CUT \ FILL
I-5 SB	556	556+75 to 558+20	140	138	1.0	2.0	F
I-5 SB	539	539+54 to 556+60	7,500	1,697	4.4	9.0	C
I-5 NB	541	541+36 to 545+49	1,861	413	4.5	7.0	F
SR-56 WB	19	19+16 to 21+10	210	190	1.1	1.4	C
SR-56 WB	24	24+93 to 27+05	480	211	2.3	4.5	C
SR-56 EB	15	15+60 to 17+45	509	191	2.6	4.0	C
		TOTALS	***10,700***	***2,840***			

TABLE 14 – Proposed Hybrid Retaining Walls

WALL VICINITY	WALL NO.	STATION TO STATION	AREA (M2)	LENGTH (M)	AVG. HEIGHT (M)	MAX. HEIGHT (M)	CUT \ FILL
I-5 SB	556	556+75 to 558+20	140	138	1.0	2.0	F
I-5 SB	539	539+54 to 556+60	7,500	1,697	4.4	9.0	C
I-5 NB	541	541+20 to 543+08	570	188	3.0	6.1	F
I-5 NB	WN1	542+95 to 544+40	390	145	2.7	5.4	F
I-5 NB	WN2	542+95 to 544+40	345	145	2.4	4.8	F
I-5 NB	543	543+60 to 549+80	2,100	618	3.4	5.4	F
I-5 NB	550	550+00 to 552+80	1,220	288	4.2	9.2	C
I-5 NB	555	555+00 to 558+45	780	345	2.3	4.9	F
I-5 NB	560	556+00 to 569+20	3,080	916	3.4	10.0	C
SR-56 WB	18	529+90 to 534+00	823	410	2.0	3.0	C
SR-56 WB	24	24+70 to 27+20	671	245	2.7	5.1	C
SR-56 EB	15	15+60 to 17+45	509	191	2.6	4.0	C
		TOTALS	***18,128***	***5,326***			

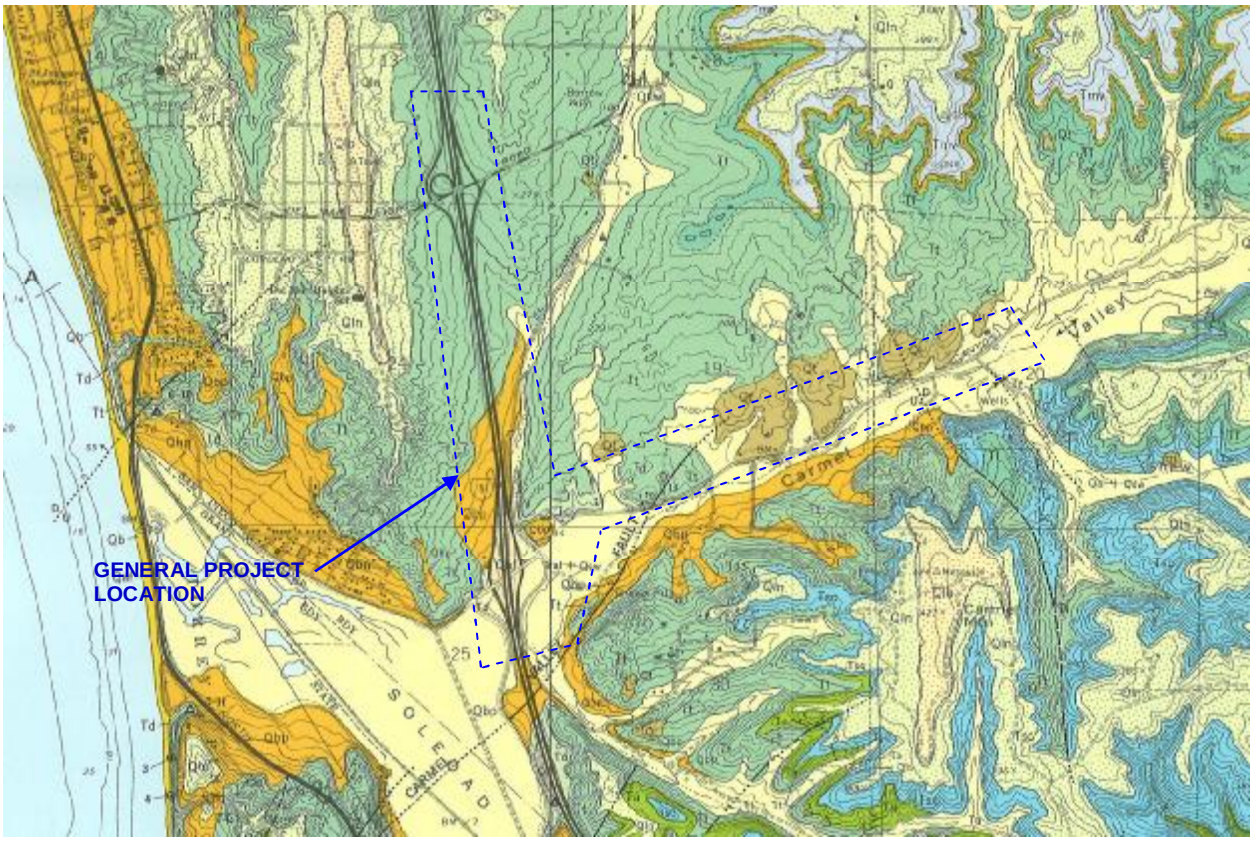
FIGURES

Figure 1
Project Vicinity Map



Ref: Dokken Engineering, 2008

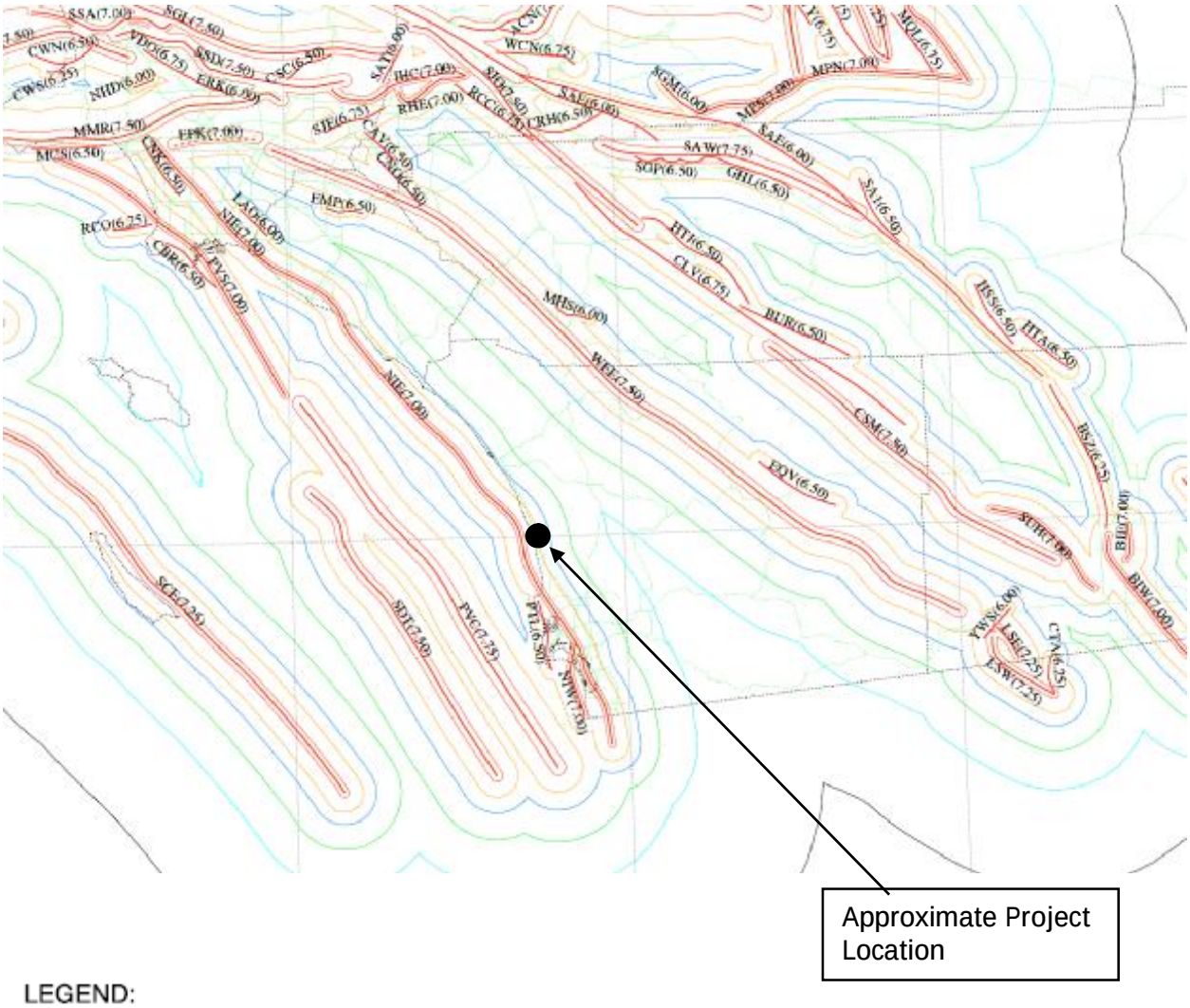
Figure 2
Geologic map



Qaf	**Artificial fill (Holocene)** – Artificially compacted earth materials derived from many sources.
Qal + Qsw	**Alluvium and slopewash undifferentiated (Holocene)** – Poorly consolidated stream deposits of silt, sand and cobble-size particles.
Qt	**Stream-terrace deposits (Late Pleistocene)** – Unconsolidated sand and gravel deposits in active alluvial flood plains.
Qbp	**Bay Point Formation (Late Pleistocene)** – Poorly consolidated fossiliferous sandstone, medium-grained, pale brown.
Qln/Qlb	**Lindavista Formation (Pleistocene)** – Interbedded sandstone and conglomerate, moderate reddish-brown, consisting of near-shore (Qln) and beach (Qlb) deposits.
Tt	**Torrey Sandstone (Eocene)** – Arkosic sandstone, white to light brown, medium to coarse-grained, subangular, moderately well indurated.
Td	**Delmar Formation (Eocene)**– Sandy claystone, dusky yellowish-green interbedded with medium-gray, coarse-grained sandstone.

Ref: USGS Geologic Map of the Del Mar 7.5' Quadrangle, San Diego County, California by M. Kennedy, 1975.

Figure 3
California Seismic Hazard Map

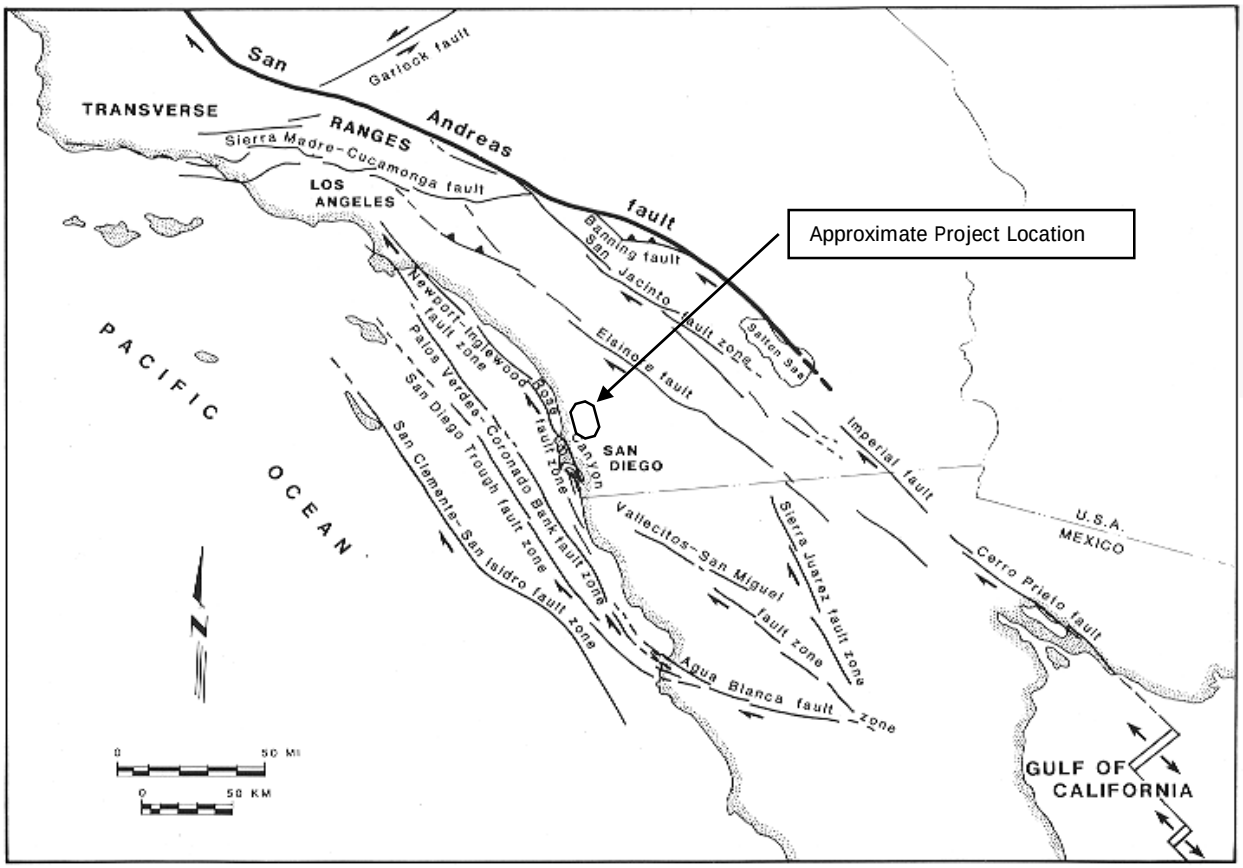


LEGEND:

- 0.7g Peak Acceleration Contour
- 0.6g Peak Acceleration Contour
- 0.5g Peak Acceleration Contour
- 0.4g Peak Acceleration Contour
- 0.3g Peak Acceleration Contour
- 0.2g Peak Acceleration Contour
- 0.1g Peak Acceleration Contour
- Special Seismic Source (SSS)
- Faults with Fault Codes (MCE)
- State Highways
- County Boundary
- Latitude & Longitude

Ref: Caltrans Seismic Hazards Map, 1996 by Lilliana Maulchin (revised 2006)

Figure 4
Regional Fault Map



Ref: Abbott, 1989

APPENDIX A

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APPENDIX B

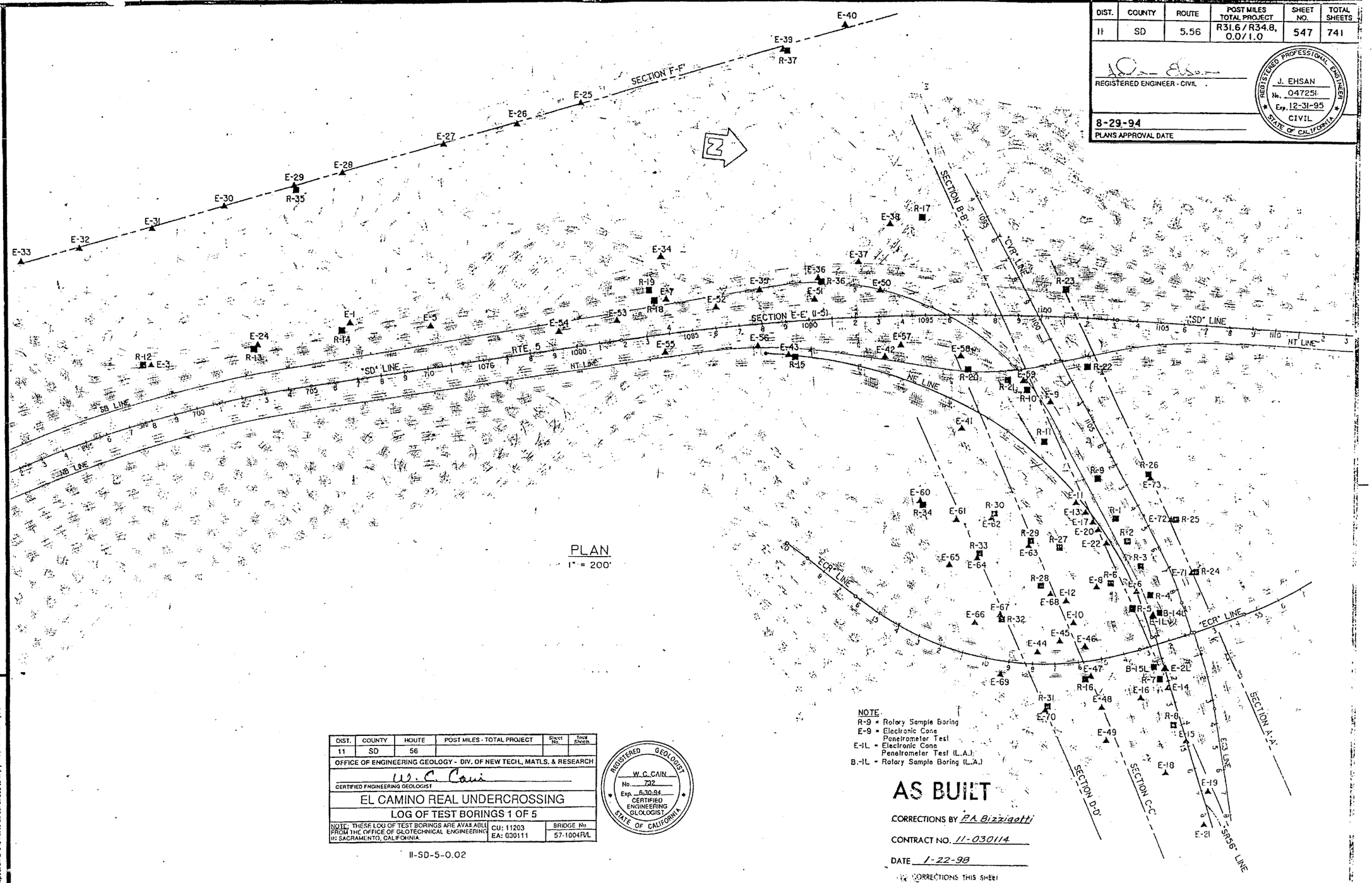
Previous Reports

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5.56	R31.6 / R34.8, 0.0/1.0	547	741

REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER J. EHSAN No. 047251 Exp. 12-31-95 CIVIL STATE OF CALIFORNIA

8-29-94
PLANS APPROVAL DATE



PLAN
1" = 200'

NOTE:
R-9 = Rotary Sample Boring
E-9 = Electronic Cone Penetrometer Test
E-1L = Electronic Cone Penetrometer Test (L.A.)
B.-1L = Rotary Sample Boring (L.A.)

AS BUILT

CORRECTIONS BY R.A. Bizziqotti

CONTRACT NO. 11-030114

DATE 1-22-98

(CORRECTIONS THIS SHEET)

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS: GRAVEL, SAND, SILT, CLAY, SANDY CLAY w/ GRAVEL, SANDY SILT w/ GRAVEL, SILTY SAND, SILTY CLAY, CLAYEY SILT, PEAT (with ORGANIC MATTER), FILL MATERIAL, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration No. (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis

DIST.	COUNTY	HOUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

EL CAMINO REAL UNDERCROSSING

LOG OF TEST BORINGS 1 OF 5

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No. 57-1004R/L

11-SD-5-0.02

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH | OFFICE OF GEOTECHNICAL ENGINEERING

DRAWN BY IRMA GAMARRA 10/91

CHECKED BY

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-1004 L/R
POST MILE

SD 5/56 INTERCHANGE

LOG OF TEST BORINGS 1 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 19 OF 32

TL 6052 REV 8/90

ClibPDF - www.fastio.com

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	548	741

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST — W. C. CAIN No. 132 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

8-29-94
PLANS APPROVAL DATE

AS BUILT

CORRECTIONS BY P.A. Bizzigotti

CONTRACT NO. 11-030114

DATE 1-22-98

NOTES:

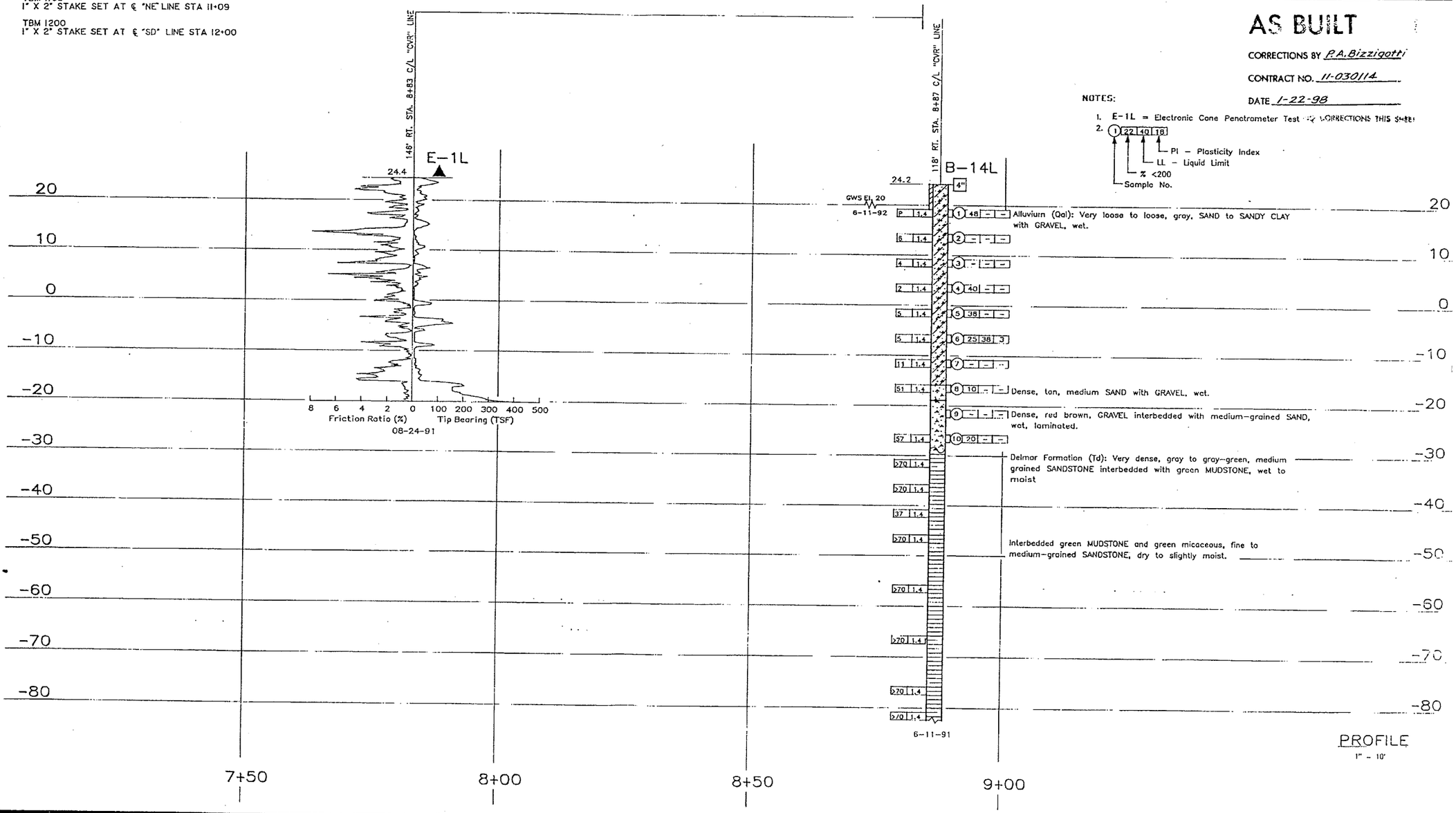
1. E-1L = Electronic Cone Penetrometer Test
2. (1) 22 40 18 — PI – Plasticity Index; LL – Liquid Limit; % <200; Sample No.

FOR PLAN VIEW, SEE "LOG OF TEST BORING" SHEET 1 OF 5

BENCH MARK

TBM 1109
1" X 2" STAKE SET AT ℄ "NE" LINE STA 11+09

TBM 1200
1" X 2" STAKE SET AT ℄ "SD" LINE STA 12+00



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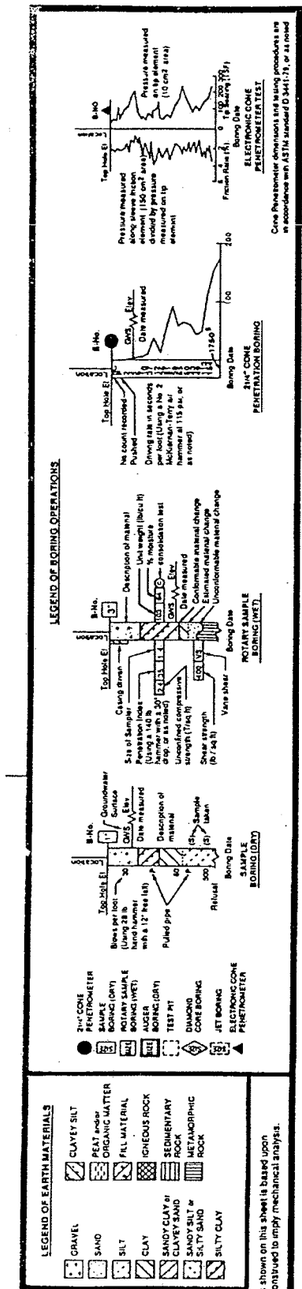


DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	OFFICE OF ENGINEERING GEOLOGY
DRAWN BY K. WAHL 9-92	
CHECKED BY T.RAYBOURN 11-92	

FIELD INVESTIGATION BY: J. KNOTT

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-1004R/L
POST MILE 0.02

EL CAMINO REAL UNDERCROSSING
LOG OF TEST BORINGS 2 OF 5

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11203
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

TL 0051 REV 2/92

FOR PLAN VIEW, SEE "LOG OF TEST BORINGS", SHEET 1 OF 8

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	522	741

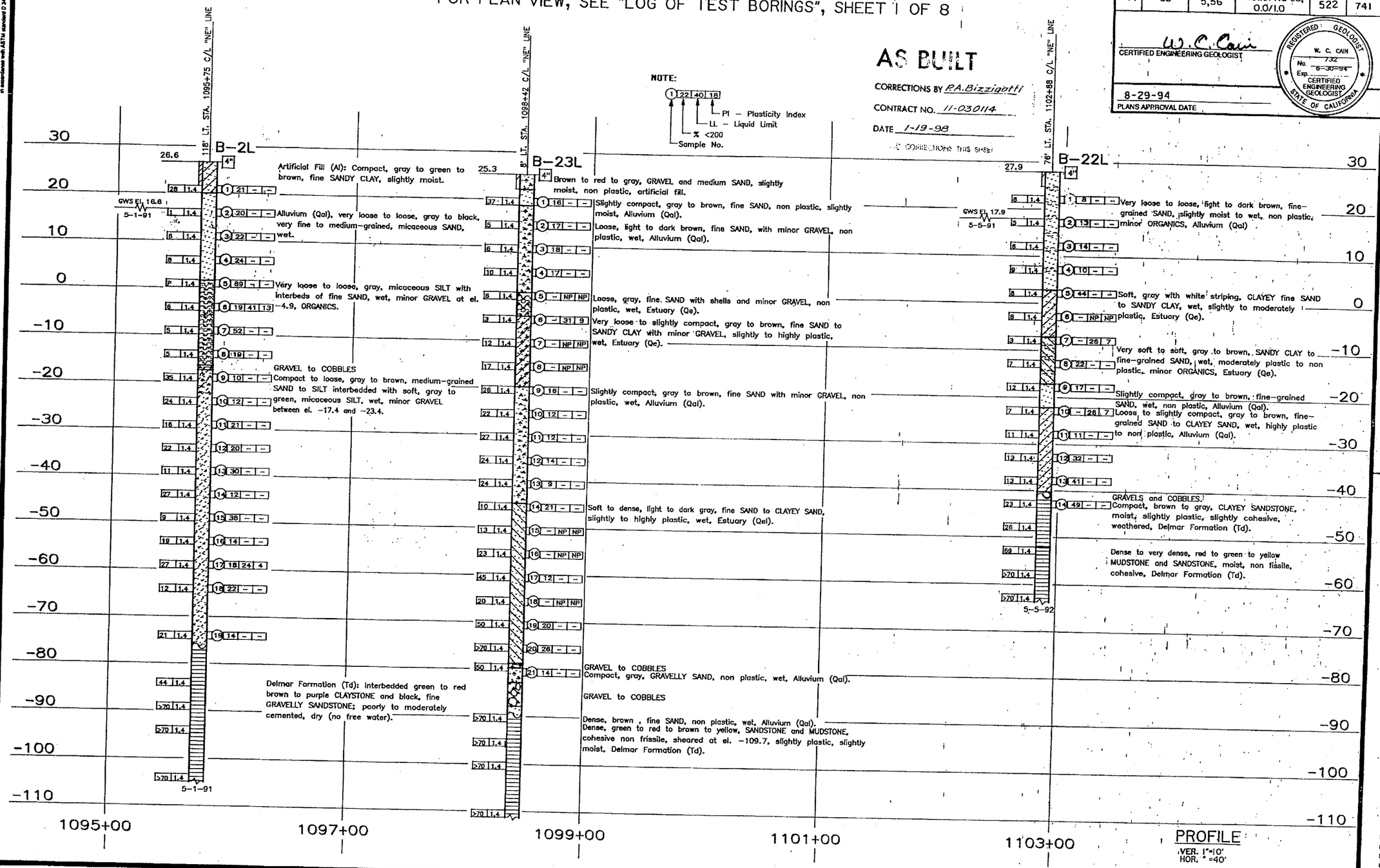
W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

8-29-94
PLANS APPROVAL DATE

AS BUILT
CORRECTIONS BY R.A. Bizzigotti
CONTRACT NO. 11-030114
DATE 1-19-98
CORRECTIONS THIS SHEET

NOTE:
1 | 22 | 40 | 18
1 – Sample No.
22 – % <200
40 – LL – Liquid Limit
18 – PI – Plasticity Index



PROFILE
VER. 1"=10'
HOR. 1"=40'

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS: GRAVEL, SAND, SILT, CLAY, SANDY CLAY or CLAYEY SAND, SANDY SILT or SILTY SAND, SILTY CLAY, CLAYEY SILT, PEAT and/or ORGANIC MATTER, FILL MATERIAL, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-18	Slightly compact	Stiff
19-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	OFFICE OF ENGINEERING GEOLOGY
DRAWN BY K. WAHL 9-92	
CHECKED BY T.RAYBOURN 11-92	

FIELD INVESTIGATION BY: J. KNOTT

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-0990G
POST MILE R32.88

CARMEL VALLEY CREEK CONNECTOR
LOG OF TEST BORINGS 2 OF 8

CU 11203
EA 030111

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES 12/12/98

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 37 OF 43

TL 6051 REV. 2/92

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DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	5			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

CARMEL VALLEY CREEK CONNECTOR

LOG OF TEST BORINGS 4 OF 8

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No. 57-0990G

REGISTERED GEOLOGIST — W. C. CAIN — No. 732 — Exp. 6-30-94 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	524	741

REGISTERED ENGINEER - CIVIL

8-29-94
PLANS APPROVAL DATE

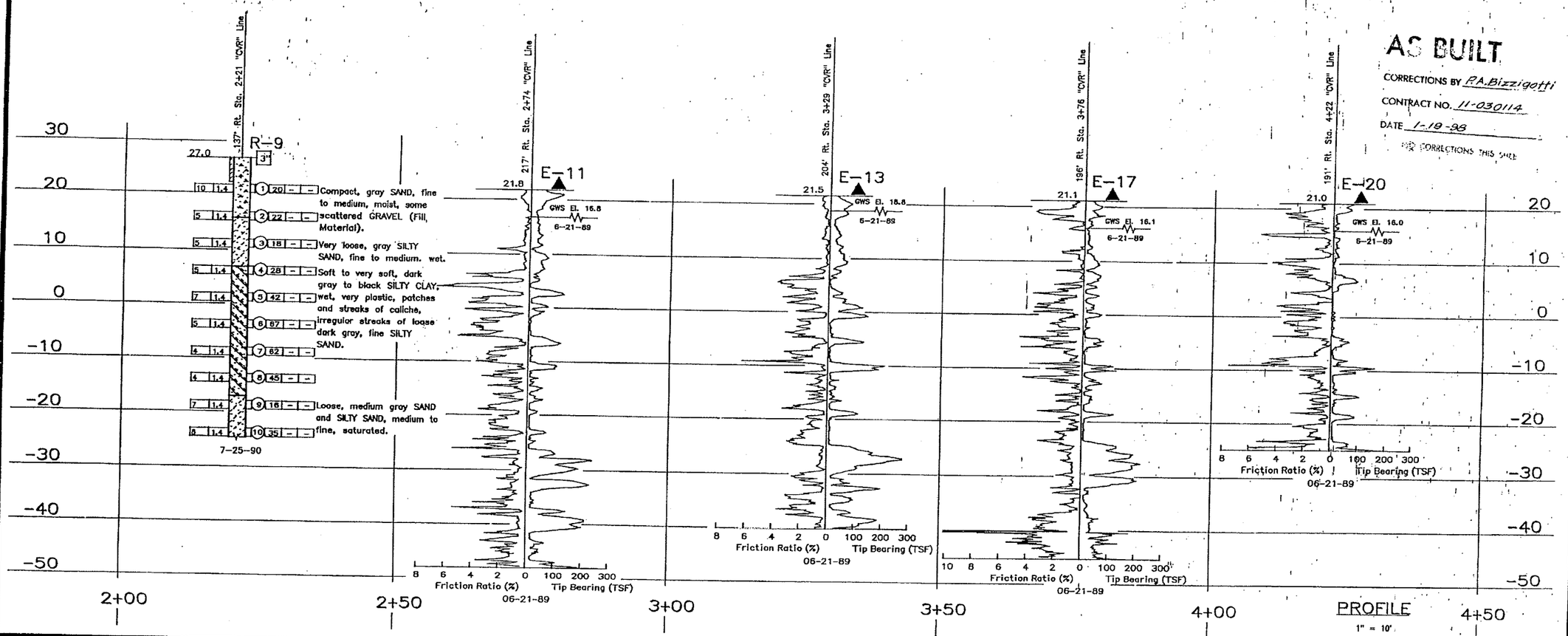
REGISTERED PROFESSIONAL ENGINEER — J. ESHAN — No. 047251 — Exp. 12-31-95 — CIVIL — STATE OF CALIFORNIA

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 of 32

NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. 1 | 22 | 40 | 18
   - Sample No.
   - % <200
   - LL – Liquid Limit
   - PI – Plasticity Index

AS BUILT
CORRECTIONS BY R.A. Bizzigotti
CONTRACT NO. 11-030114
DATE 1-19-98
NO CORRECTIONS THIS SHEET



LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS: GRAVEL, SAND, SILT, CLAY, SANDY CLAY or CLAYEY SAND, SANDY SILT or SILTY SAND, SILTY CLAY, CLAYEY SILT, PEAT and/or ORGANIC MATTER, FILL MATERIAL, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY K. WAHL 5-92	
CHECKED BY	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-0990G
POST MILE 32.88

SC-5/56 INTERCHANGE
(SECTION B – B')

LOG OF TEST BORINGS 4 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/8/92 12/7/94

SHEET 39 OF 43

TL 6052 REV. 8/90

CADPDF - www.fastio.com

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	5			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain

CERTIFIED ENGINEERING GEOLOGIST

CARMEL VALLEY CREEK CONNECTOR

LOG OF TEST BORINGS 6 OF 8

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No. 57-0990G

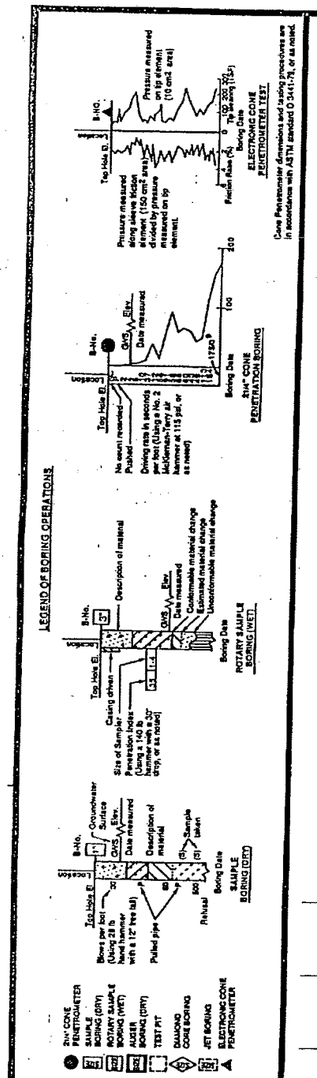
REGISTERED GEOLOGIST — W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

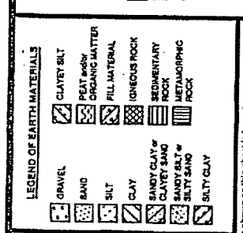
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	526	741

REGISTERED ENGINEER - CIVIL

8-29-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — J. EHSAN No. 047251 Exp. 12-31-95 CIVIL — STATE OF CALIFORNIA





CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis unless gradations and Unified Soil Classification are shown.

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

AS BUILT

CORRECTIONS BY P.A. Bizzigotti

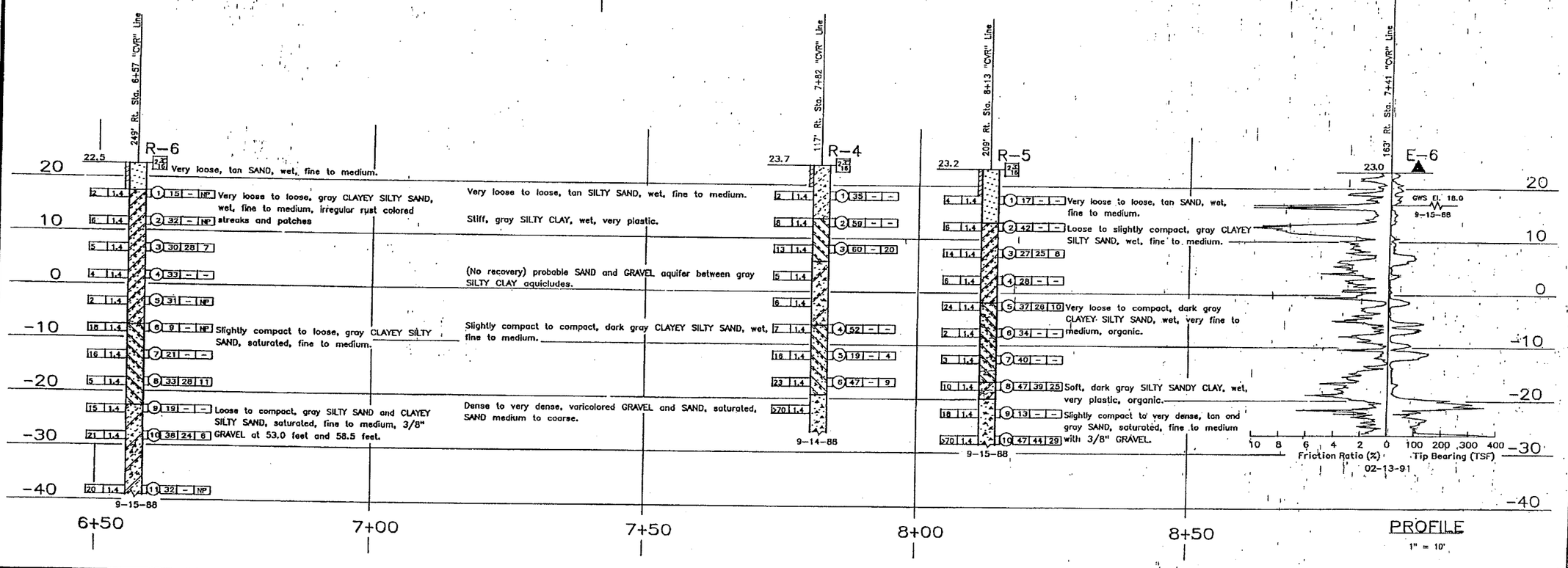
CONTRACT NO. 11-030114

DATE 1-19-98

NO CORRECTIONS THIS SHEET

NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. (1) 22 40 16
   - Sample No.
   - % <200
   - LL – Liquid Limit
   - PI – Plasticity Index



GEOTECHNICAL ENGINEERING BRANCH - TRANSPORTATION LABORATORY

DRAWN BY K. WAHL 10-91

CHECKED BY

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

BRIDGE NO. 57-0990G

POST MILE 32.88

SD-5/56 INTERCHANGE (SECTION B-B')

LOG OF TEST BORINGS 6 OF 32

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5-11-92 12/1/92

SHEET 41 OF 43

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DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	5			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

CARMEL VALLEY CREEK CONNECTOR

LOG OF TEST BORINGS 7 OF 8

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No. 57-0990G

REGISTERED GEOLOGIST — W. C. CAIN, No. 732, Exp. 6-30-94, CERTIFIED ENGINEERING GEOLOGIST, STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	527	741

REGISTERED ENGINEER - CIVIL

8-29-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — J. EHSAN, No. 047251, Exp. 12-31-95, CIVIL, STATE OF CALIFORNIA

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

NOTES:

1. R-9 = Rotary Sample Boring.
2. E-9 = Electronic Cone Penetrometer Test
3. (1) 22 40 18
   - Sample No.
   - % <200
   - LL – Liquid Limit
   - PI – Plasticity Index

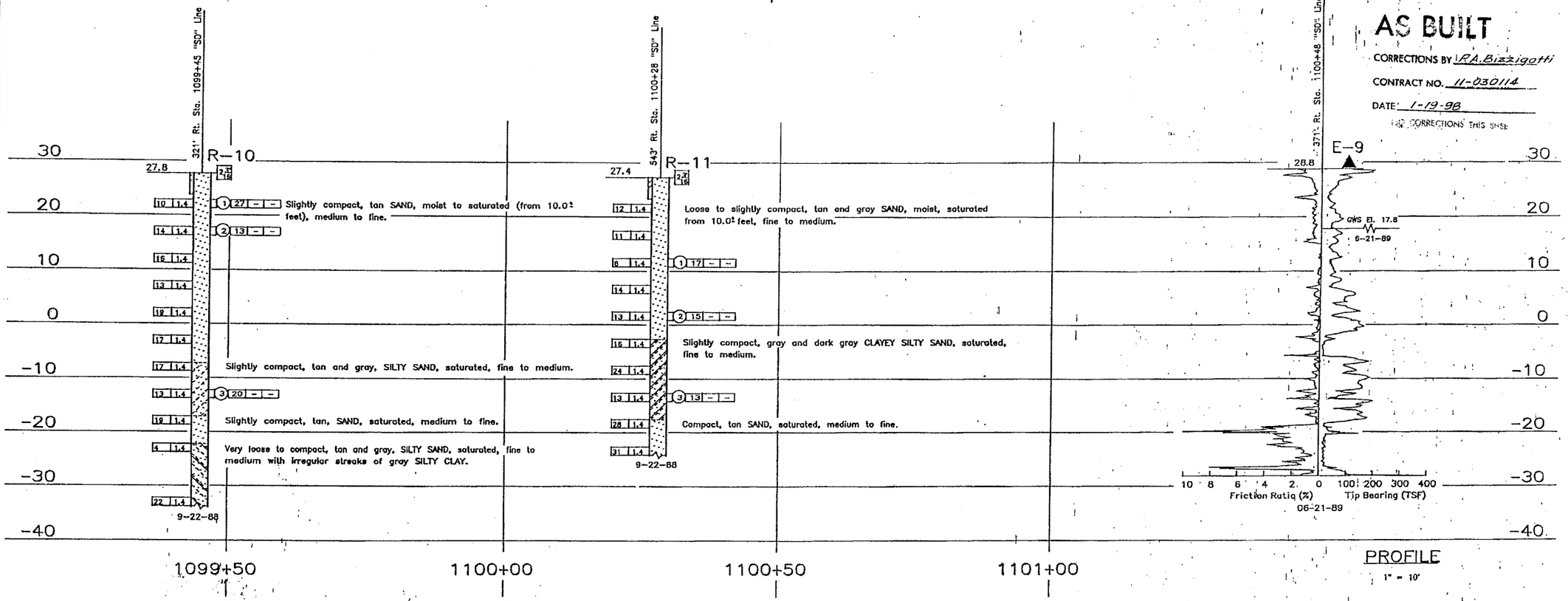
AS BUILT

CORRECTIONS BY R.A. Bizzigotti

CONTRACT NO. 11-030114

DATE 1-19-98

NO CORRECTIONS THIS SHEET



PROFILE
1" = 10'

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS: GRAVEL, SAND, SILT, CLAY, SANDY CLAY or CLAYEY SAND, SANDY SILT or SILTY SAND, SILTY CLAY, CLAYEY SILT, PEAT and/or ORGANIC MATTER, FILL MATERIAL, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis unless gradations and Unified Soil Classification are shown.

GEOTECHNICAL ENGINEERING BRANCH - TRANSPORTATION LABORATORY

DRAWN BY K. WAHL 10-91
CHECKED BY

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE NO. 57-0990G
POST MILE 32.88

SD-5/56 INTERCHANGE
(SECTION B-B')

LOG OF TEST BORINGS 10 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 7-11-92 12/11/92

SHEET 42 OF 43

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DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	5			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

CARMEL VALLEY CREEK CONNECTOR

LOG OF TEST BORINGS 8 OF 8

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No. 57-0990G

REGISTERED GEOLOGIST — W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	528	741

REGISTERED ENGINEER - CIVIL

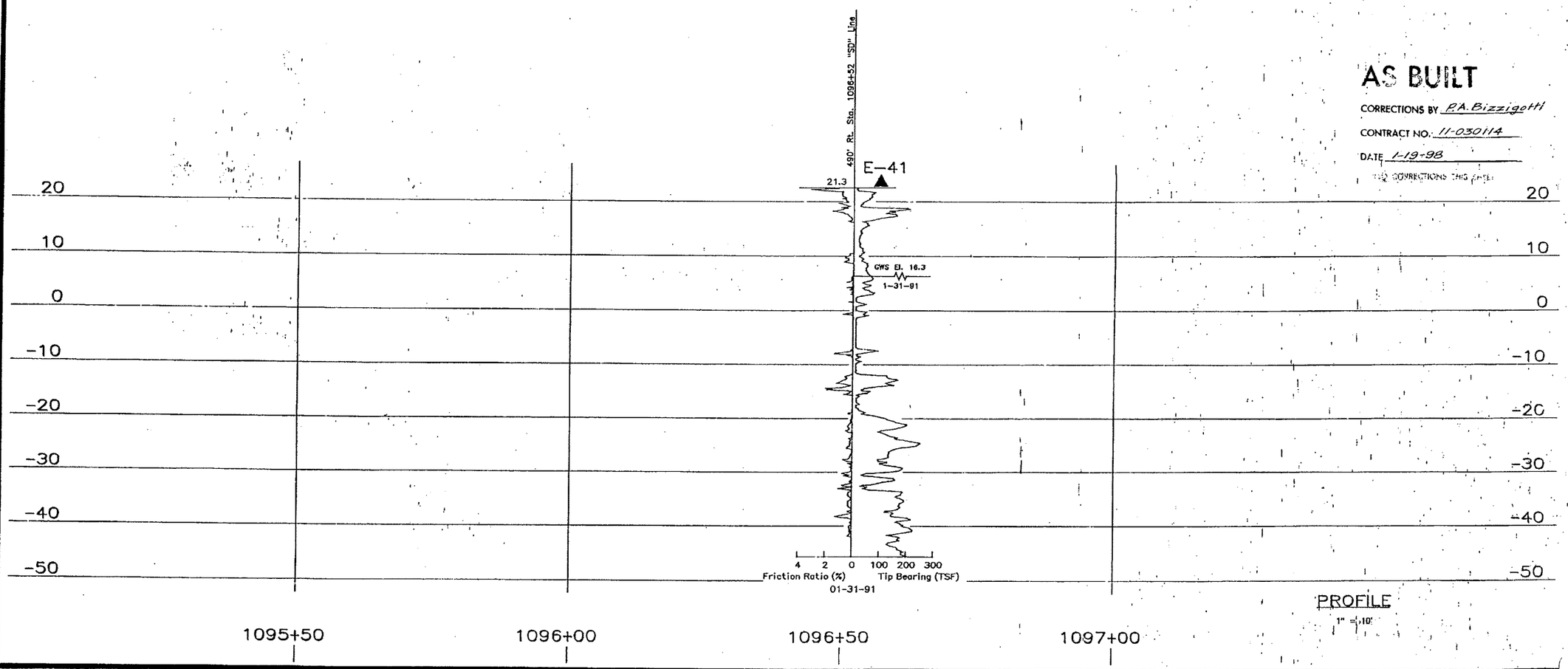
REGISTERED PROFESSIONAL ENGINEER — J. EHSAN No. 047251 Exp. 12-31-95 CIVIL — STATE OF CALIFORNIA

8-29-94
PLANS APPROVAL DATE

NOTE:

1. E-9 = Electronic Cone Penetrometer Test

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32



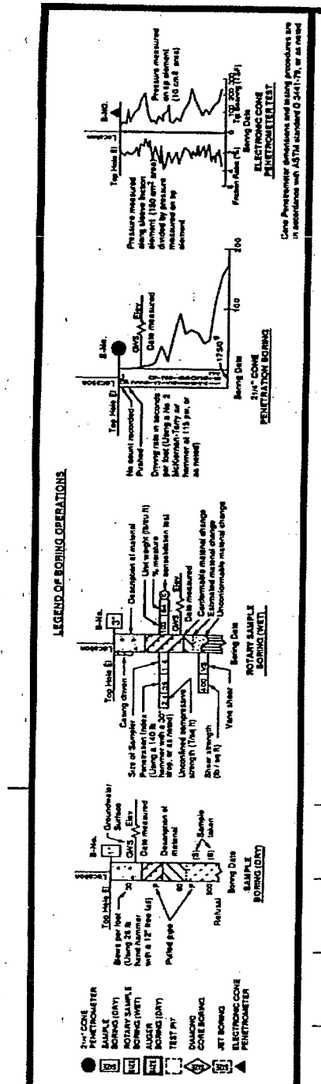
AS BUILT

CORRECTIONS BY R.A. Bizzigotti

CONTRACT NO. 11-030114

DATE 1-19-98

NO CORRECTIONS THIS DATE



LEGEND OF EARTH MATERIALS

GRAVEL, SAND, SILT, CLAY, SANDY CLAY or CLAYEY SAND, SANDY SILT or SILTY SAND, SILTY CLAY, CLAYEY SILT, HEAT under ORGANIC MATTER, FILL MATERIAL, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOIL'S

According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon visual inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY	K. WAHL 10-91
CHECKED BY	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN

BRIDGE NO. 57-0990G
POST MILE 32.88

SD-5/56 INTERCHANGE (SECTION C-C')

LOG OF TEST BORINGS 17 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/12/92 12/7/94

SHEET 43 OF 43

TL 6052 REV. 8/90

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DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	5			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

CARMEL VALLEY CREEK CONNECTOR

LOG OF TEST BORINGS 5 OF 8

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No. 57-0990G

REGISTERED GEOLOGIST — W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	525	741

REGISTERED ENGINEER - CIVIL

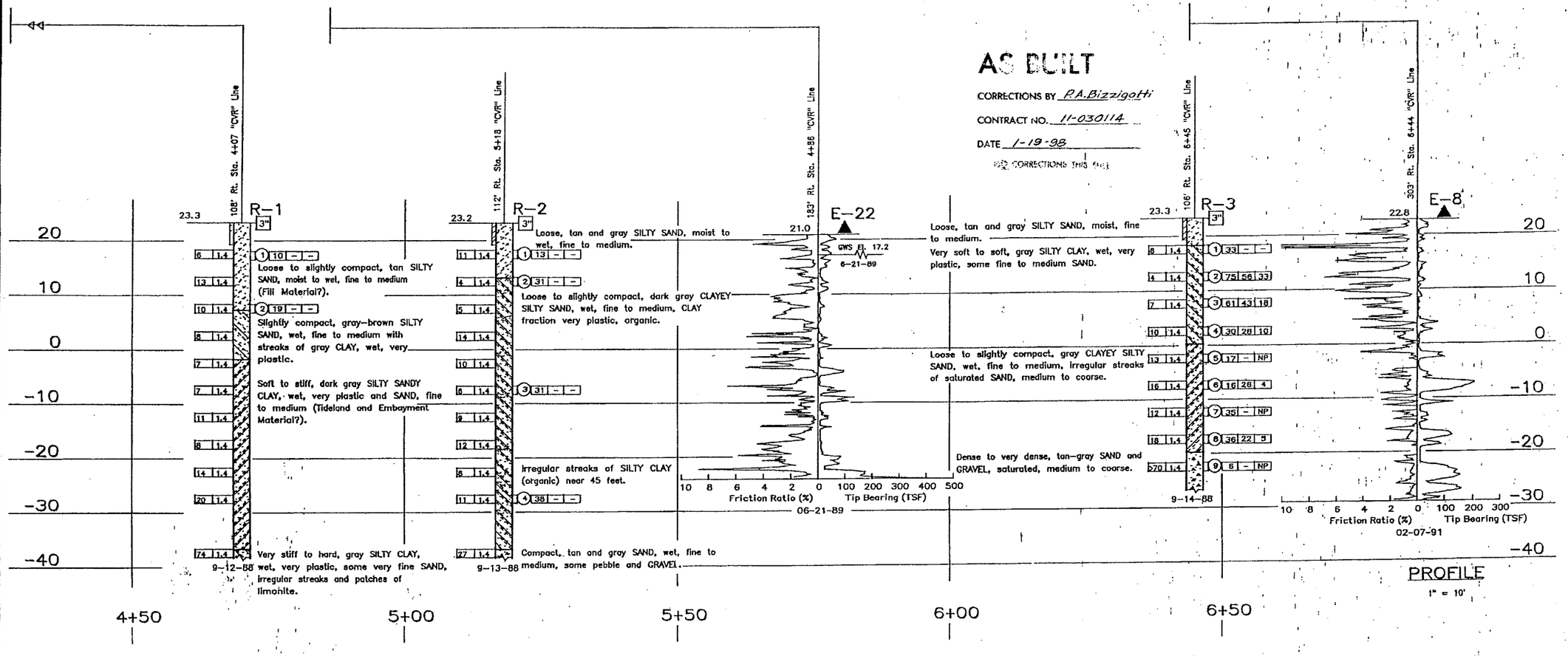
8-29-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — J. ESHAN No. 047251 Exp. 12-31-95 CIVIL — STATE OF CALIFORNIA

ES: 1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. 1 | 22 | 40 | 18
- Sample No.
- % <200
- LL – Liquid Limit
- PI – Plasticity Index

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

AS BUILT
CORRECTIONS BY P.A. Bizzigotti
CONTRACT NO. 11-030114
DATE 1-19-98
NO CORRECTIONS THIS SHEET



PROFILE
1" = 10'

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS: GRAVEL, SAND, SILT, CLAY, SANDY CLAY or CLAYEY SAND, SANDY SILT or SILTY SAND, SILTY CLAY, CLAYEY SILT, PEAT and/or ORGANIC MATTER, FILL MATERIAL, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-50	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY K. WAHL 5-92	
CHECKED BY	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-0990G
POST MILE 32.88

SC-5/56 INTERCHANGE (SECTION: B – B')

LOG OF TEST BORINGS 5 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 3/12/92 12/17/92

SHEET 40 OF 43

ClibPDF - www.fastio.com

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	523	741

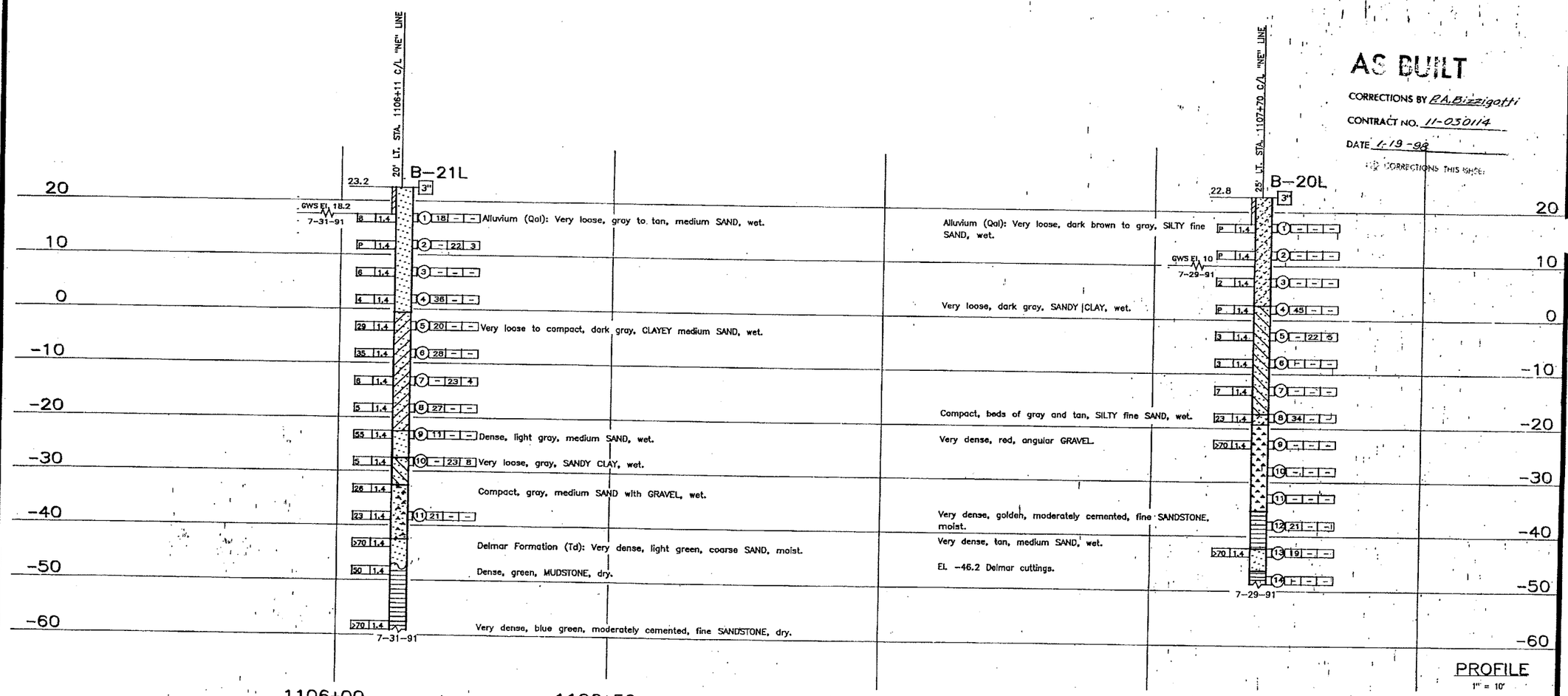
W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

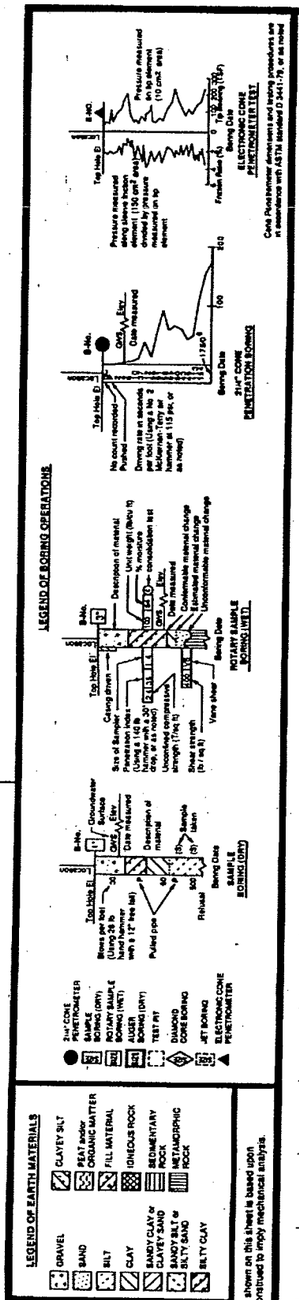
REGISTERED GEOLOGIST — W. C. CAIN — No. 732 — Exp. 6-30-94 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

8-29-94
PLANS APPROVAL DATE

FOR PLAN VIEW, SEE "LOG OF TEST BORING" SHEET 1 OF 8

AS BUILT
CORRECTIONS BY R.A.Bizzigotti
CONTRACT NO. 11-050114
DATE 1-19-98
CORRECTIONS THIS SHEET





NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	OFFICE OF ENGINEERING GEOLOGY
DRAWN BY K. WAHL 9-92	
CHECKED BY T.RAYBOURN 11-92	

FIELD INVESTIGATION BY: J. KNOTT

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

CU 11203
EA 030111

BRIDGE NO. 57-0990G
POST MILE R32.88

CARMEL VALLEY CREEK CONNECTOR
LOG OF TEST BORINGS 3 OF 8

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 12/7/92

SHEET 38 OF 43

ClibPDF - www.fastio.com

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	5			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

CARMEL VALLEY CREEK CONNECTOR

LOG OF TEST BORINGS 7 OF 8

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No. 57-0990G

REGISTERED GEOLOGIST — W. C. CAIN, No. 732, Exp. 6-30-94, CERTIFIED ENGINEERING GEOLOGIST, STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	527	741

REGISTERED ENGINEER - CIVIL

8-29-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — J. EHSAN, No. 047251, Exp. 12-31-95, CIVIL, STATE OF CALIFORNIA

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

NOTES:

1. R-9 = Rotary Sample Boring.
2. E-9 = Electronic Cone Penetrometer Test
3. (1) 22 40 18
   - Sample No.
   - % <200
   - LL – Liquid Limit
   - PI – Plasticity Index

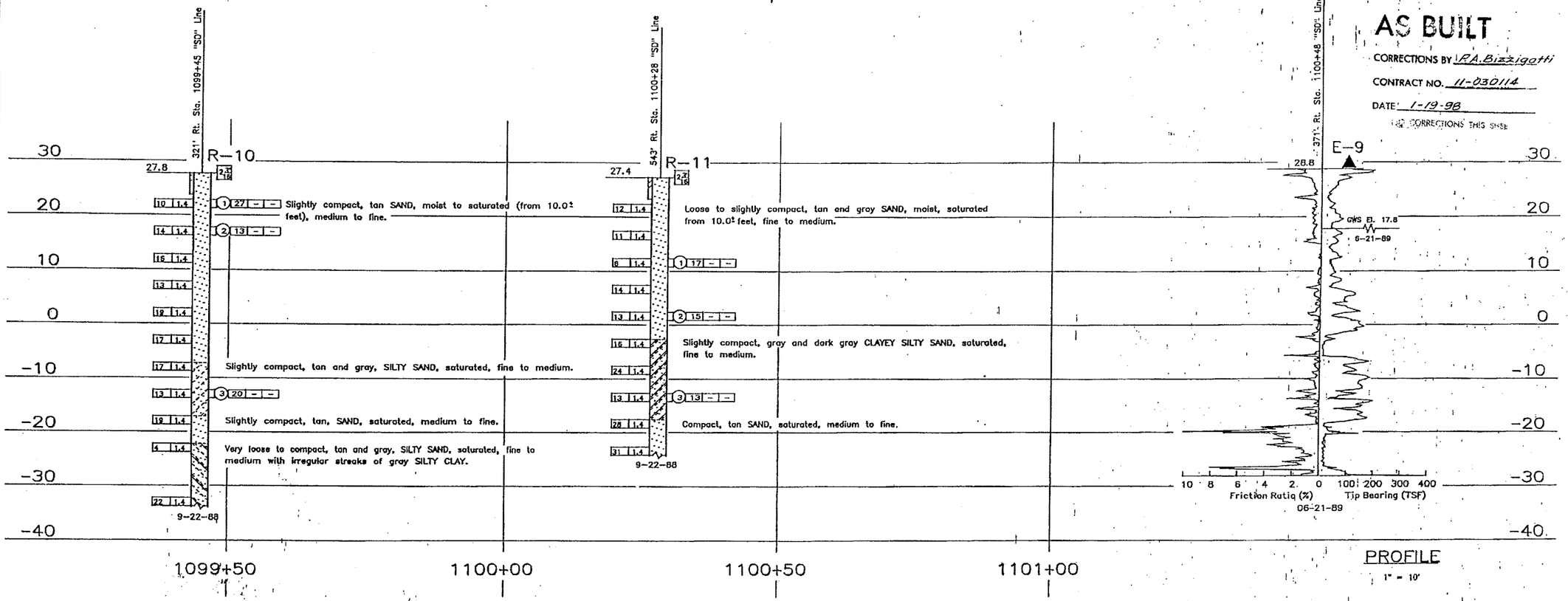
AS BUILT

CORRECTIONS BY R.A. Bizzigotti

CONTRACT NO. 11-030114

DATE 1-19-98

NO CORRECTIONS THIS SHEET



PROFILE
1" = 10'

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS: GRAVEL, SAND, SILT, CLAY, SANDY CLAY or CLAYEY SAND, SANDY SILT or SILTY SAND, SILTY CLAY, CLAYEY SILT, PEAT and/or ORGANIC MATTER, FILL MATERIAL, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC ROCK

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NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis unless gradations and Unified Soil Classification are shown.

GEOTECHNICAL ENGINEERING BRANCH - TRANSPORTATION LABORATORY

DRAWN BY K. WAHL 10-91
CHECKED BY

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE NO. 57-0990G
POST MILE 32.88

SD-5/56 INTERCHANGE
(SECTION B-B')

LOG OF TEST BORINGS 10 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 7-11-92 12/11/92

SHEET 42 OF 43

ClibPDF - www.fastio.com

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	5			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

CARMEL VALLEY CREEK CONNECTOR

LOG OF TEST BORINGS 8 OF 8

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No. 57-0990G

REGISTERED GEOLOGIST
W. C. CAIN
No. 732
Exp. 6-30-94
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

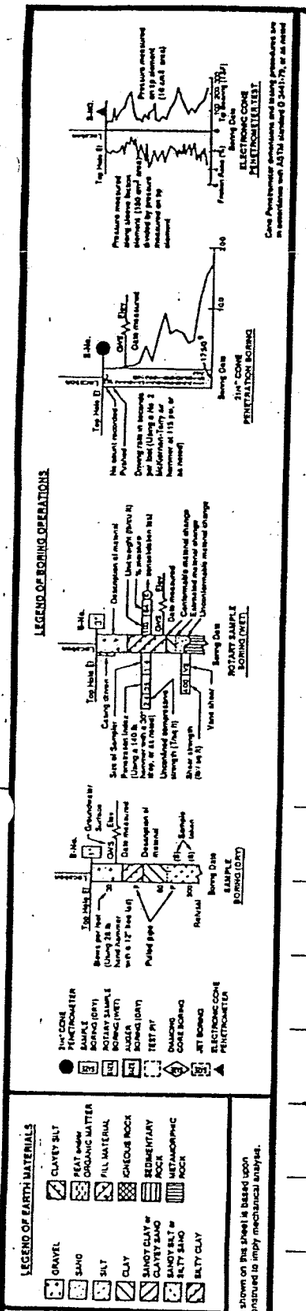
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	528	741

REGISTERED ENGINEER - CIVIL

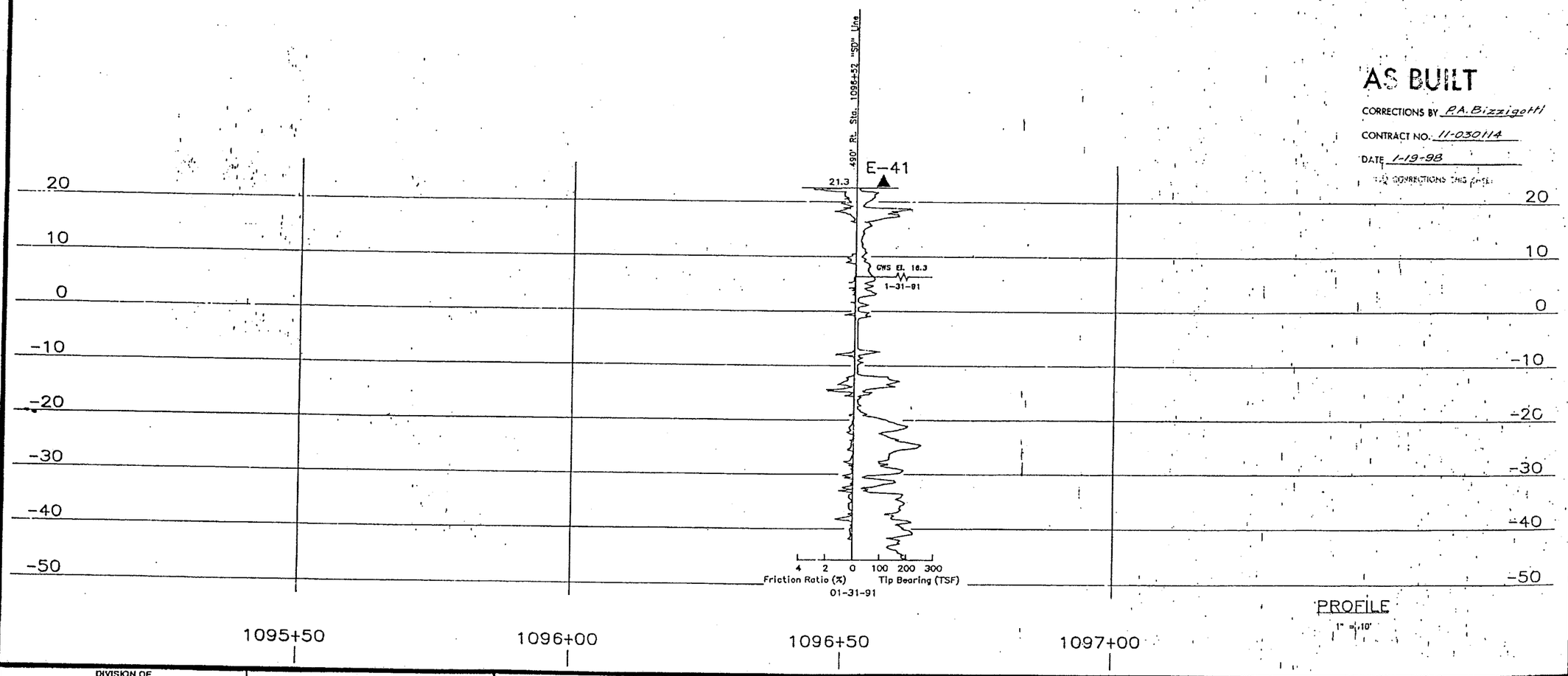
8-29-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
J. EHSAN
No. 047251
Exp. 12-31-95
CIVIL
STATE OF CALIFORNIA

NOTE:
1. E-9 = Electronic Cone Penetrometer Test



FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32



AS BUILT
CORRECTIONS BY P.A. Bizzigotti
CONTRACT NO. 11-030114
DATE 1-19-98
NO CORRECTIONS THIS PHASE

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY K. WAHL 10-91	
CHECKED BY	

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-0990G
POST MILE 32.88

SD-5/56 INTERCHANGE
(SECTION C-C')

LOG OF TEST BORINGS 17 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)
5/12/92 11/7/94

SHEET 43 OF 43

TL 6052 REV. 8-93

PDF - www.fastio.com

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	548	741

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST — W. C. CAIN No. 132 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

8-29-94
PLANS APPROVAL DATE

AS BUILT

CORRECTIONS BY P.A. Bizzigotti

CONTRACT NO. 11-030114

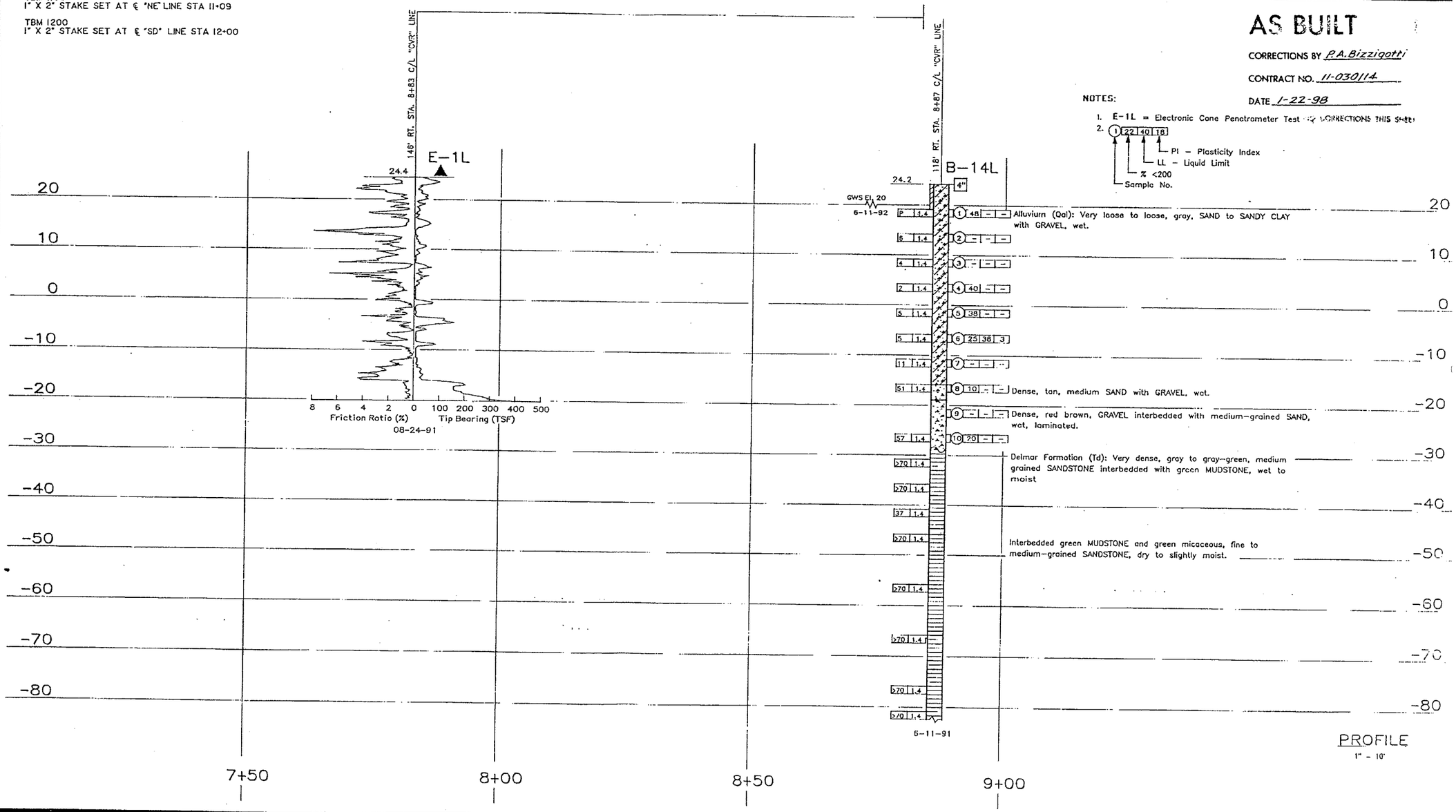
DATE 1-22-98

FOR PLAN VIEW, SEE "LOG OF TEST BORING" SHEET 1 OF 5

BENCH MARK

TBM 1109
1" X 2" STAKE SET AT ℄ "NE" LINE STA 11+09

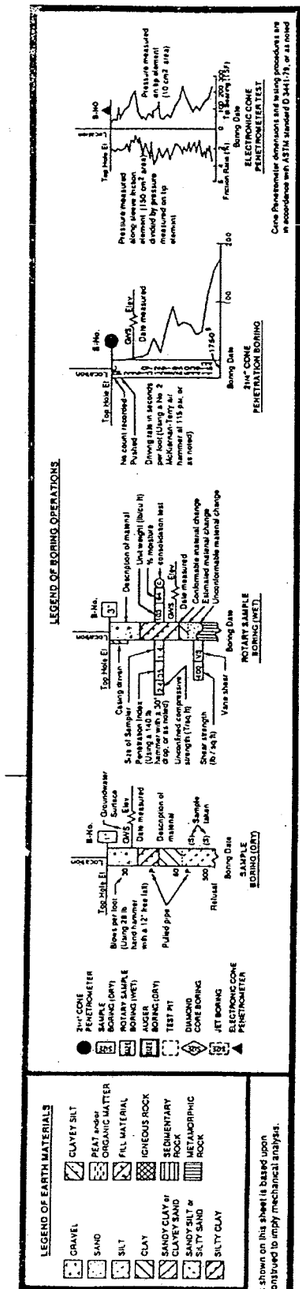
TBM 1200
1" X 2" STAKE SET AT ℄ "SD" LINE STA 12+00



NOTES:

1. E-1L = Electronic Cone Penetrometer Test (CORRECTIONS THIS SHEET)
2. 1 22 40 18
   - Sample No.
   - % <200
   - LL – Liquid Limit
   - PI – Plasticity Index

PROFILE
1" = 10'



DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	OFFICE OF ENGINEERING GEOLOGY
DRAWN BY K. WAHL 9-92	
CHECKED BY T.RAYBOURN 11-92	

FIELD INVESTIGATION BY: J. KNOTT

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-1004R/L
POST MILE 0.02

EL CAMINO REAL UNDERCROSSING
LOG OF TEST BORINGS 2 OF 5

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11203
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

TI 6051 REV 2/92

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8, 0.0/1.0	549	741

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

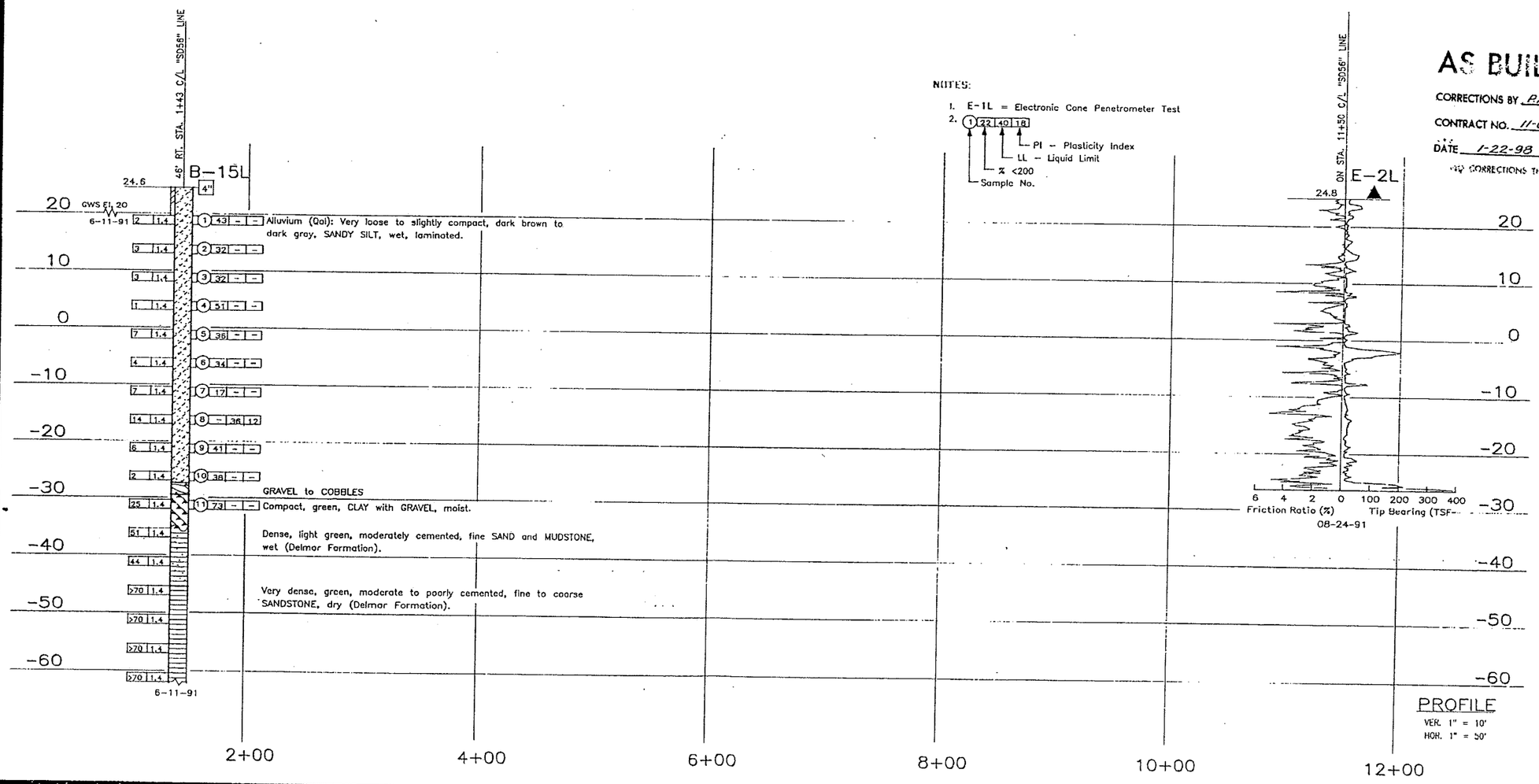
REGISTERED GEOLOGIST W. C. CAIN No. 232 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

8-29-94
PLANS APPROVAL DATE

FOR PLAN VIEW, SEE "LOG OF TEST BORING" SHEET 1 OF 5

NOTES:

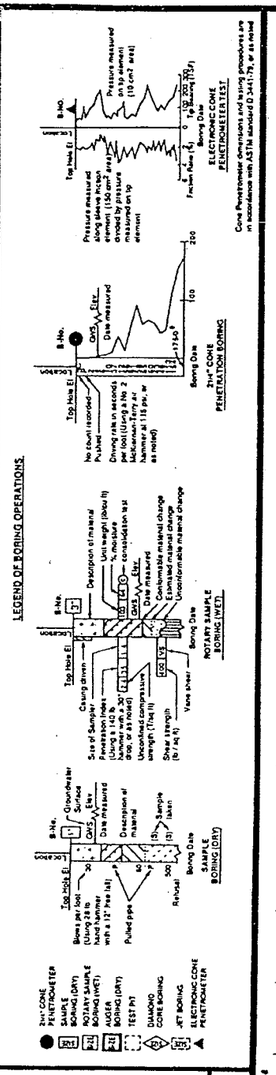
1. E-1L = Electronic Cone Penetrometer Test
2. (1) 22 40 18
   - PI – Plasticity Index
   - LL – Liquid Limit
   - % <200
   - Sample No.



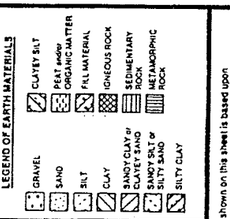
AS BUILT
CORRECTIONS BY P.A. Bizzigotti
CONTRACT NO. 11-030114
DATE 1-22-98
NO CORRECTIONS THIS SHEET

PROFILE
VER. 1" = 10'
HOR. 1" = 50'

LEGEND OF BORING OPERATIONS



LEGEND OF EARTH MATERIALS



CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on the sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	OFFICE OF ENGINEERING GEOLOGY
DRAWN BY K. WAHL 10-92	
CHECKED BY T.RAYBOURN 11-92	

FIELD INVESTIGATION BY: J. KNOTT

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-1004R
POST MILE 0.02

EL CAMINO REAL UNDERCROSSING
LOG OF TEST BORINGS 3 OF 5

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11203
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

TL 6051 REV. 2/92

CLIBPDF - www.fastio.com

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

CERTIFIED ENGINEERING GEOLOGIST

EL CAMINO REAL UNDERCROSSING

LOG OF TEST BORINGS 5 OF 5

NOTE: THESE LOG OF TEST BORINGS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CALIFORNIA.

CU: 11203
EA: 030111

BRIDGE No.
57-1004R/L

REGISTERED GEOLOGIST
W. C. CAIN
No. 732
Exp. 6-30-94
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	
11	SD	56	R31.6/R34.8, 0.0/1.0	554	741

REGISTERED ENGINEER - CIVIL

8-29-94

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

NOTES:

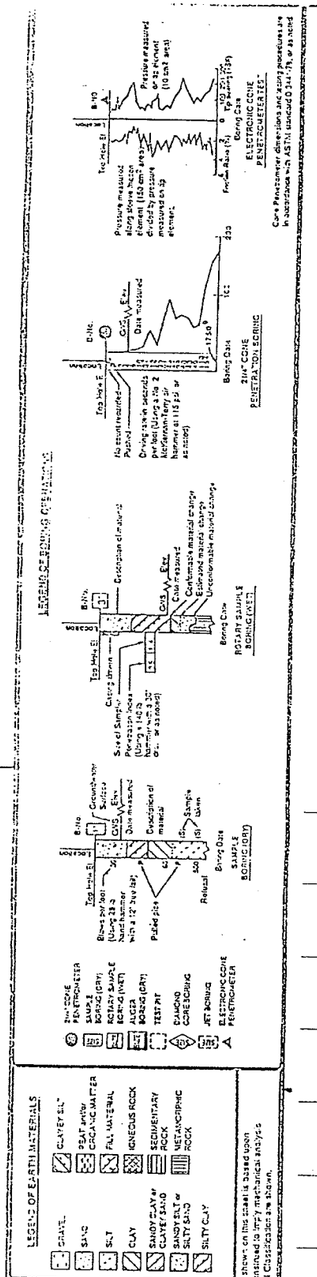
1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. (1) 22 40 10
   - PI = Plasticity Index
   - LL = Liquid Limit
   - % <200
   - Sample No.

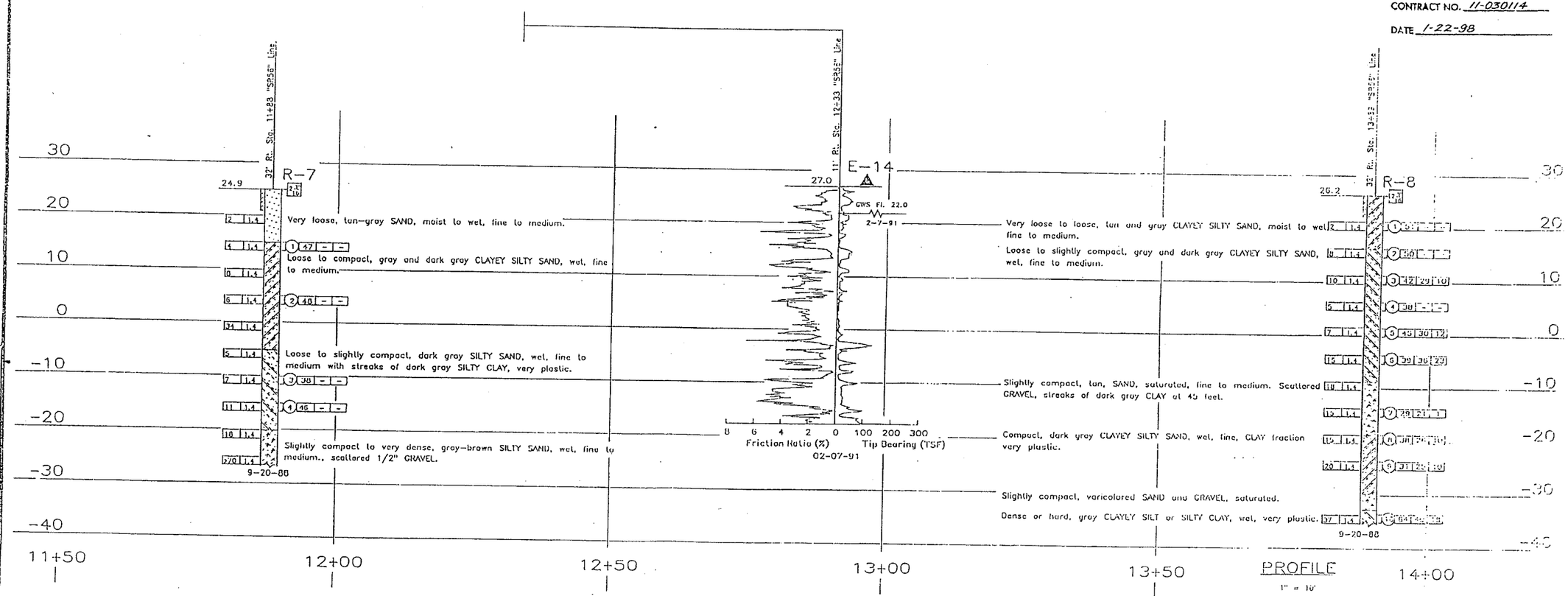
AS BUILT

CORRECTIONS BY R.A. Bizzigotti

CONTRACT NO. 11-030114

DATE 1-22-98





GEOTECHNICAL ENGINEERING BRANCH - TRANSPORTATION LABORATORY

DRAWN BY K. WAHL 10-91

CHECKED BY

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE NO. 57-1004 L/R

POST MILE

SD-5/56 INTERCHANGE
(SECTION B-B')

LOG OF TEST BORINGS 7 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

ClibPDF - www.fastio.com

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8 0.0/1.0	613	741

REGISTERED ENGINEER - CIVIL

J. EHSAN No. 047251 Exp. 12-31-95 CIVIL STATE OF CALIFORNIA REGISTERED PROFESSIONAL ENGINEER

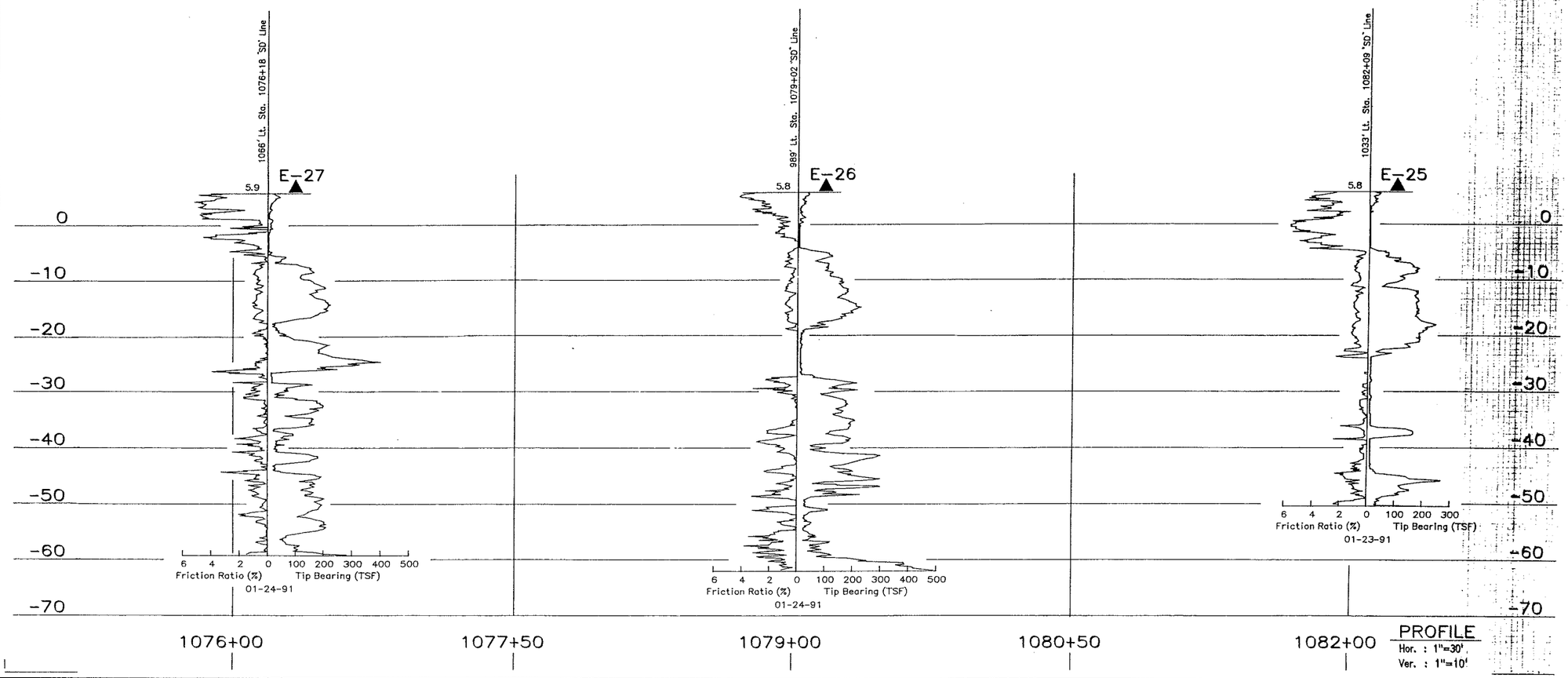
8-29-94

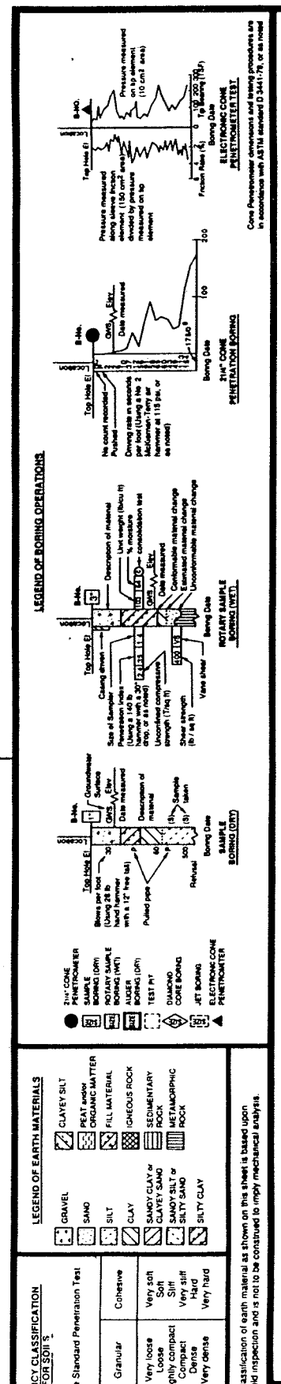
PLANS APPROVAL DATE

FOR "PLAN VIEW"
SEE LOG OF TEST BORINGS 1 OF 32

NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test





CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY	E. FONG 10-91
CHECKED BY	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN

BRIDGE NO. VARIES

POST MILE VARIES

SD-5/56 INTERCHANGE (SECTION F-F')

LOG OF TEST BORINGS 32 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

5/12/92

SHEET 62 OF 62

TL 6052 REV 8/90

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO	TOTAL SHEETS
11	SD	5, 56	R31.6/R34.8, 0.0/1.0	678	741

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

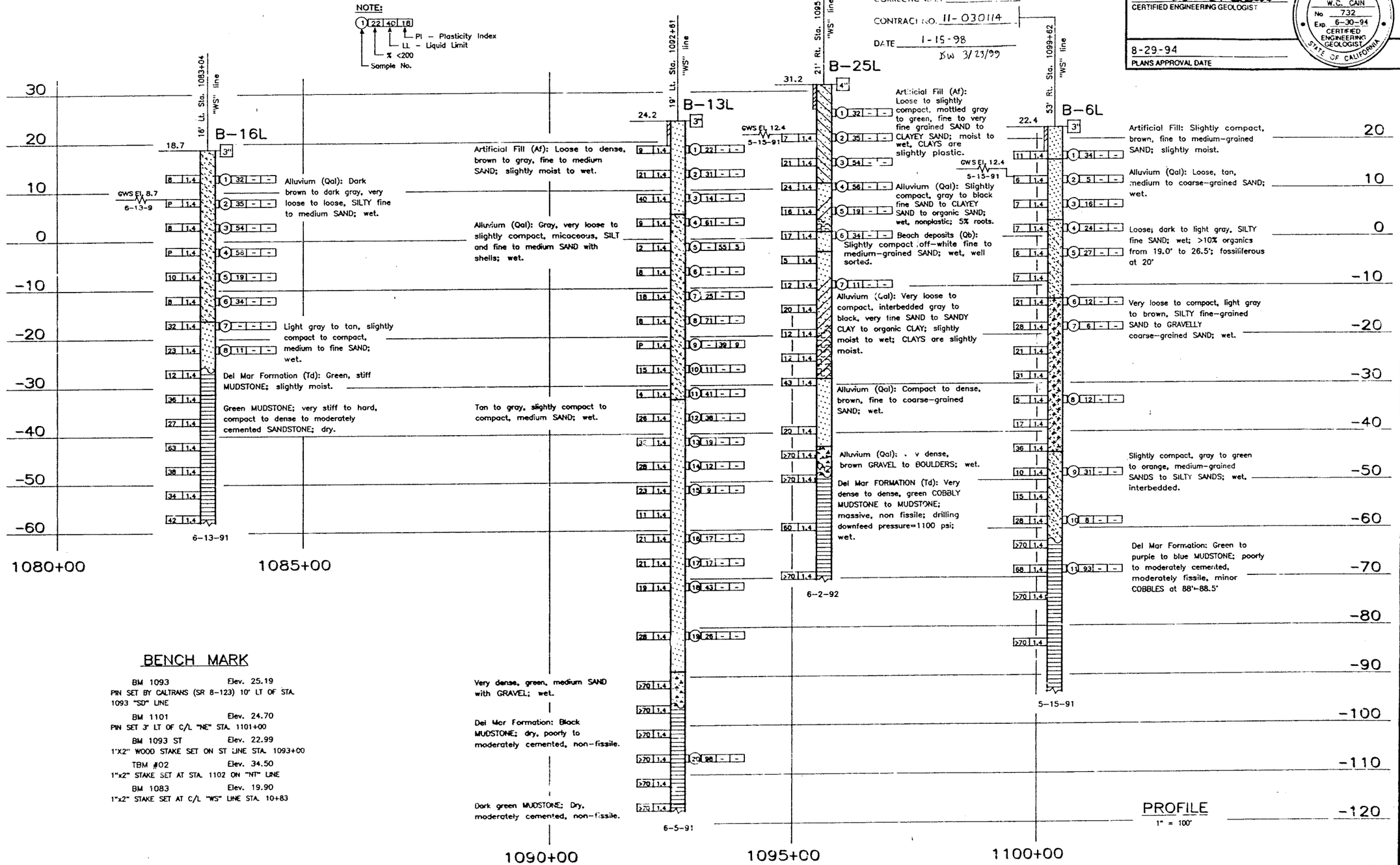
REGISTERED GEOLOGIST W.C. CAIN No 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

8-29-94
PLANS APPROVAL DATE

FOR PLAN VIEW, SEE "LOG OF TEST BORINGS 1 OF 12"

NO AS BUILT CHANGES
CORRECTIONS BY P.A. BIZZIGOTTI
CONTRACT NO. 11-030114
DATE 1-15-98
JSW 3/23/99

NOTE:
1 22 40 18
PI – Plasticity Index
LL – Liquid Limit
% <200
Sample No.



BENCH MARK

BM 1093 Elev. 25.19
PIN SET BY CALTRANS (SR 8-123) 10' LT OF STA. 1093 "SD" LINE

BM 1101 Elev. 24.70
PIN SET 3' LT OF C/L "NE" STA. 1101+00

BM 1093 ST Elev. 22.99
1"X2" WOOD STAKE SET ON ST LINE STA. 1093+00

TBM #02 Elev. 34.50
1"x2" STAKE SET AT STA. 1102 ON "NT" LINE

BM 1083 Elev. 19.90
1"x2" STAKE SET AT C/L "WS" LINE STA. 10+83

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS

CLASSIFICATION CHART

According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on the sheet is based upon field inspection and is not to be construed to imply mechanical analysis

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	OFFICE OF ENGINEERING GEOLOGY
DRAWN BY I. GAMARRA 9/92	
CHECKED BY T.RAYBOURN 11-92	

FIELD INVESTIGATION BY: J. KNOTT

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-0989F
POST MILE 0.00

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 2 OF 12

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11203
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

TL 6001 REV 2-92

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain

CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST — W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 4 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA.

CU: 11203
EA: 030111

BRIDGE No. 57-0989F

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56	R31.6/R34.8, 0.0/1.0	6.0	741

J. Eshan

REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER — J. ESHAN No. 042751 Exp. 12-31-95 CIVIL — STATE OF CALIFORNIA

8-29-94

PLANS APPROVAL DATE

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 r 32

NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. 1 | 22 | 40 | 18
   - Sample No.
   - % <200
   - LL – Liquid Limit
   - PI – Plasticity Index

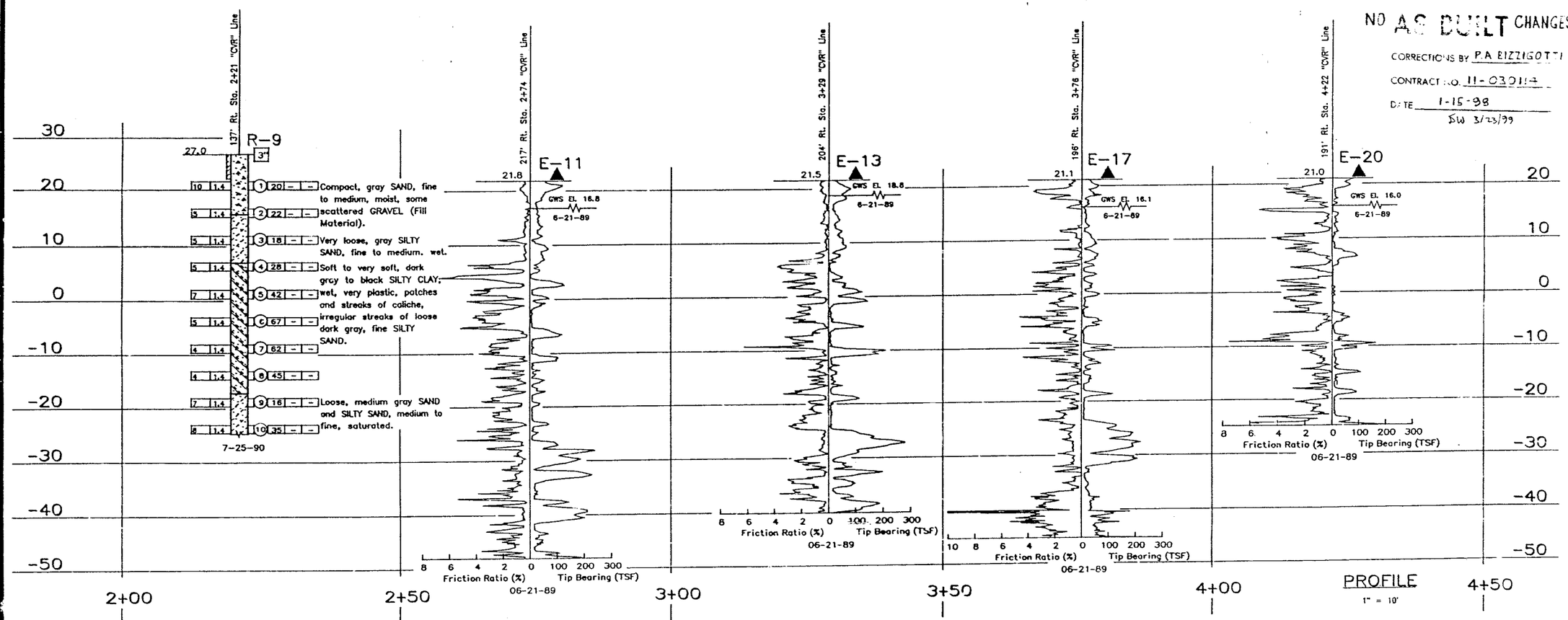
NO AS BUILT CHANGES

CORRECTIONS BY P.A. BIZZIGOTTI

CONTRACT NO. 11-030114

DATE 1-15-98

SW 3/23/99



PROFILE
1" = 10'

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS

CONSISTENCY — According to the Standard Penetration Test

Penetration Index (Blows/Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
+70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY K. WAHL 5-92	
CHECKED BY	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN

BRIDGE NO.

POST MILE

SC-5/56 INTERCHANGE (SECTION B – B')

LOG OF TEST BORINGS 4 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/22/92

SHEET 27 OF 32

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8 0.0/1.0	682	741

REGISTERED ENGINEER - CIVIL

8-29-94

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — J. ENSAN — No. 047251 — Exp. 12-31-95 — CIVIL — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain

CERTIFIED ENGINEERING GEOLOGIST

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 6 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA. — CU: 11203 — EA: 030111 — BRIDGE No. 57-0989F

REGISTERED GEOLOGIST — W. C. CAIN — No. 732 — Exp. 6-30-94 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. (1) 22 40 18 — PI – Plasticity Index; LL – Liquid Limit; % <200; Sample No.

NO AS BUILT CHANGES

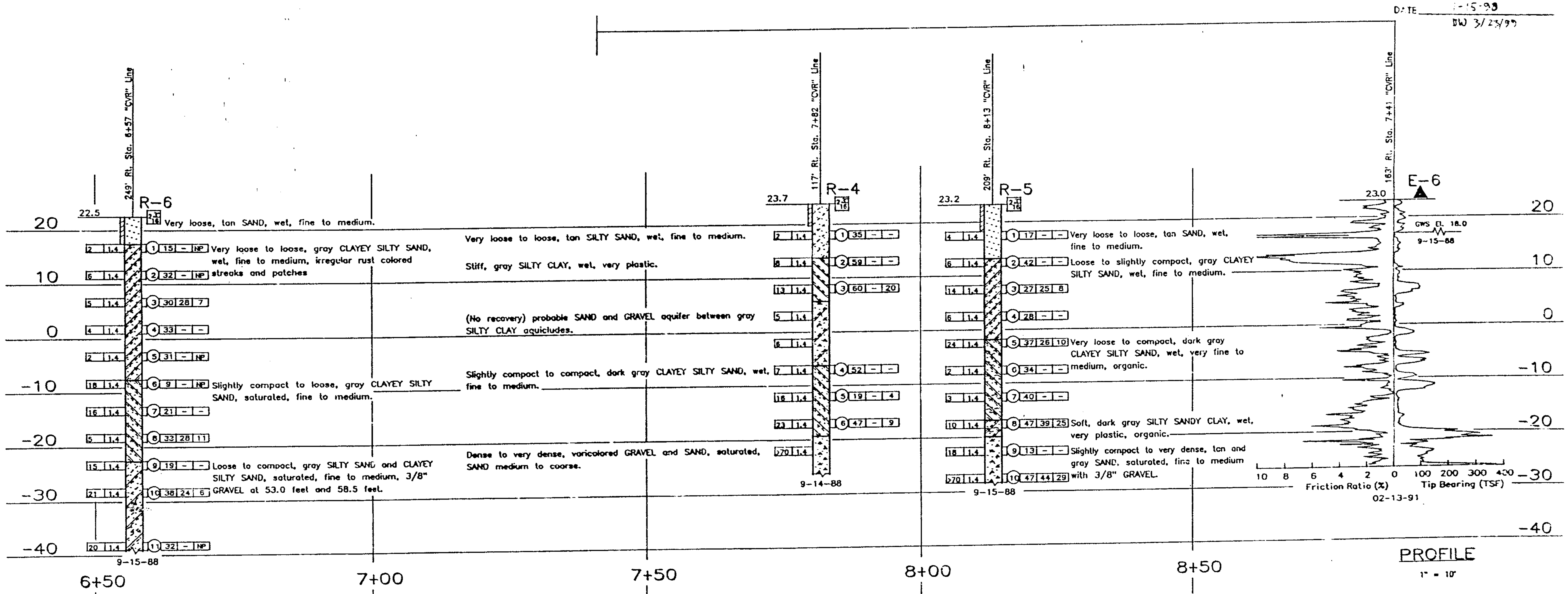
CORRECTIONS BY P.A. BIZZIGOTTI

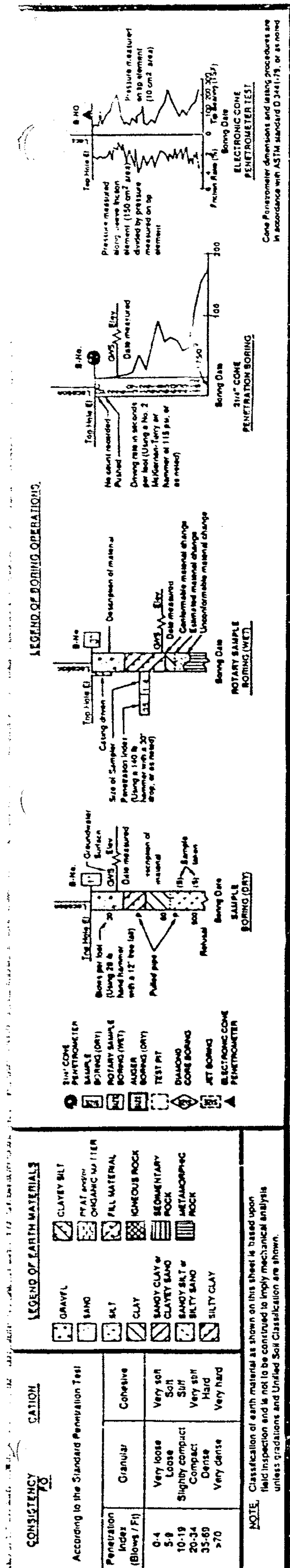
CONTRACT NO. 11-030114

DATE 1-15-99

DW 3/23/99

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32





NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis unless gradations and Unified Soil Classification are shown.

GEOTECHNICAL ENGINEERING BRANCH - TRANSPORTATION LABORATORY

DRAWN BY	K. WAHL	10-91
CHECKED BY		

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11 EA 030111

BRIDGE NO. — POST MILE

SD-5/56 INTERCHANGE (SECTION B-B')

LOG OF TEST BORINGS 6 OF 32

DISREGARD PRINTS BEARING EARLIER REVISION DATES — 5-11-92

REVISION DATES (PRELIMINARY STAGE ONLY)

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 9 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA.

CU: 11203
EA: 030111

BRIDGE No. 57-0989F

REGISTERED GEOLOGIST
W. C. CAIN
No. 732
Exp. 6-30-94
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8 0.0/1.0	685	741

REGISTERED ENGINEER - CIVIL

8-29-94
PLANS APPROVAL DATE

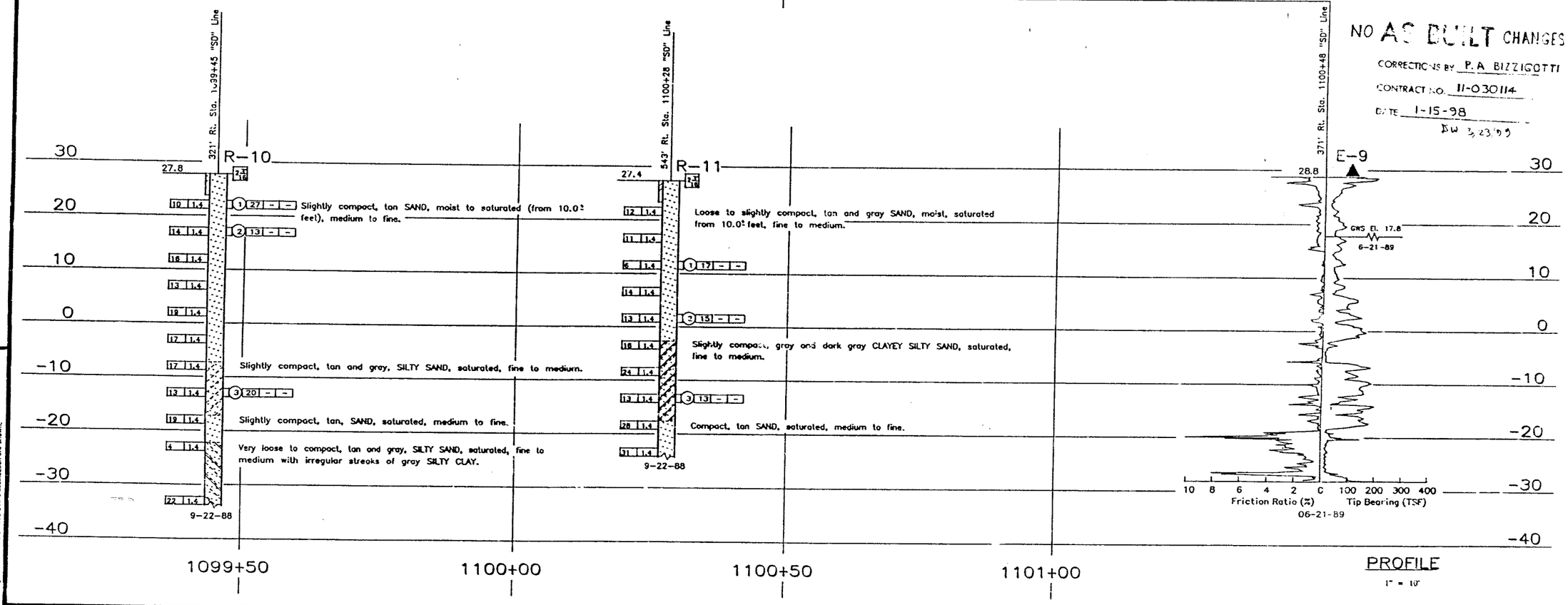
REGISTERED PROFESSIONAL ENGINEER
J. EHSAN
No. 047251
Exp. 12-31-95
CIVIL
STATE OF CALIFORNIA

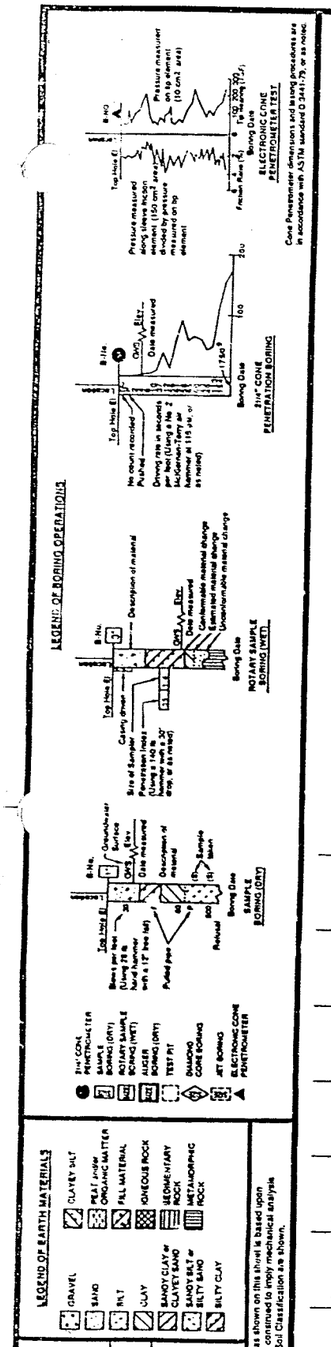
FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. 1 | 22 | 40 | 18
   - PI – Plasticity Index
   - LL – Liquid Limit
   - % <200
   - Sample No.

NO AS BUILT CHANGES
CORRECTIONS BY P. A. BIZZIGOTTI
CONTRACT NO. 11-030114
DATE 1-15-98
DW 3-23-99





GEOTECHNICAL ENGINEERING BRANCH - TRANSPORTATION LABORATORY

DRAWN BY K. WAHL 10-91
CHECKED BY

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE NO.
POST MILE

SD-5/56 INTERCHANGE
(SECTION B-B')

LOG OF TEST BORINGS 10 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)
5-11-92

SHEET

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 11 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA.

CU: 11203
EA: 030111

BRIDGE No. 57-0989F

REGISTERED GEOLOGIST — W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56	R31.6/R34.8 0.0/1.0	687	741

REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER — J. ESHAN No. 047251 Exp. 12-31-95 CIVIL — STATE OF CALIFORNIA

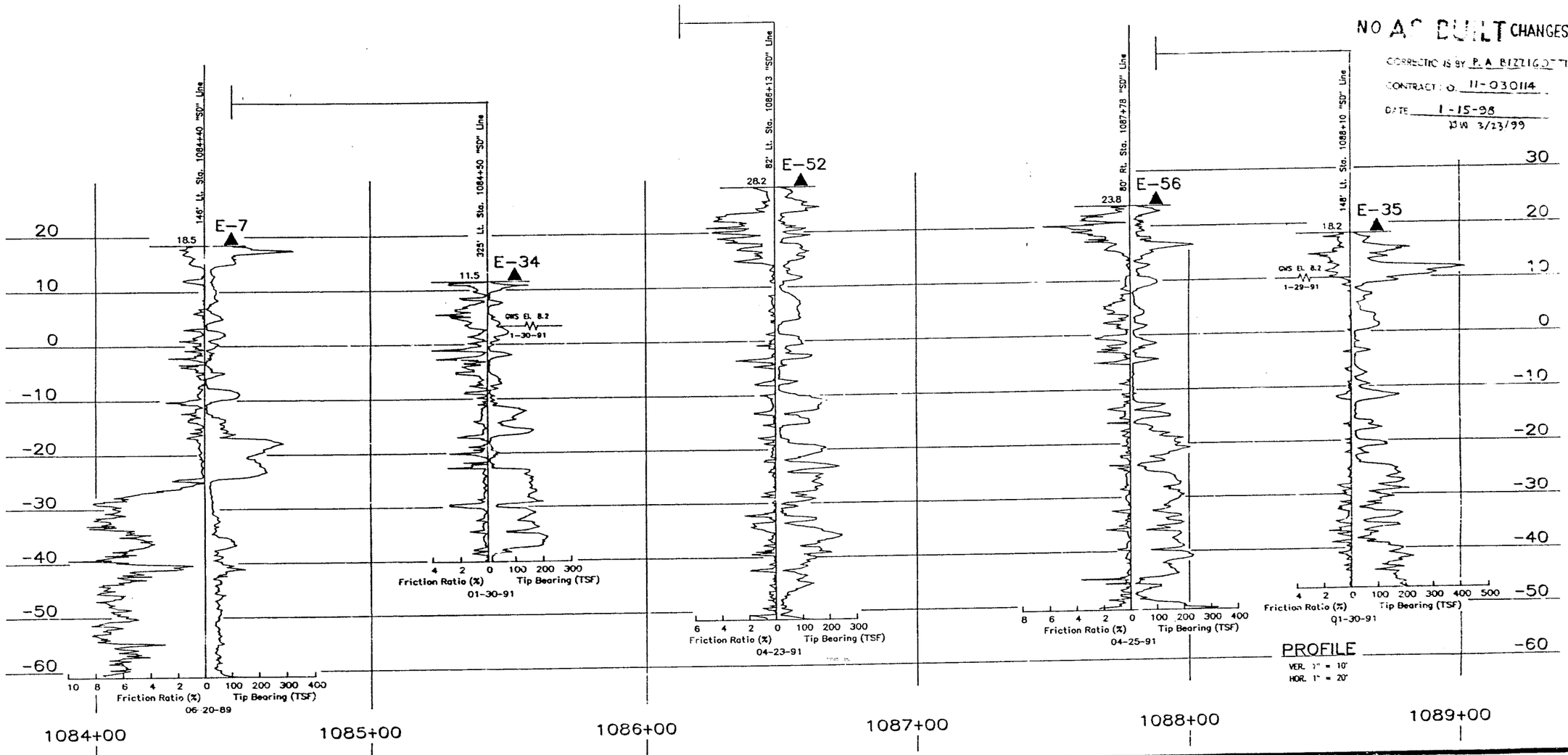
8-29-94
PLANS APPROVAL DATE

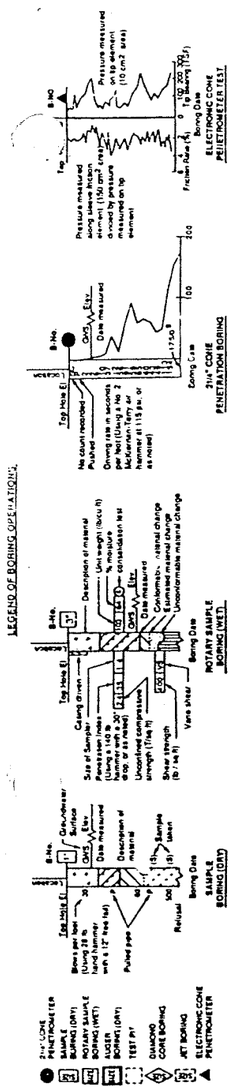
FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

NOTE:

1. E-9 = Electronic Cone Penetrometer Test

NO AS BUILT CHANGES
CORRECTION BY P. A. BIZZIGOTTI
CONTRACT NO. 11-030114
DATE 1-15-98
DW 3/23/99





CONSISTENCY CLASSIFICATION

According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon hand inspection and is not to be construed to imply mechanical analysis

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY K. WAHL 5-92	
CHECKED BY	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO.
POST MILE

SC-5/56 INTERCHANGE
(SECTION E - E')

LOG OF TEST BORINGS 25 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/12/92

SHEET OF

52 REV 8/90

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.
11	SD	5,56	R31.6/R34.8 0.0/1.0	684

REGISTERED ENGINEER - CIVIL

8-29-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL J. EHSAN No. 047259 Exp. 12-31-95 CIVIL STATE OF CALIFORNIA

FOR PLAN VIEW, SEE LOG OF TEST BORINGS I OF 32

NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. (1) (22) (40) (18)
   - PI – Plasticity Index
   - LL – Liquid Limit
   - % <200
   - Sample No.

NO AS BUILT CHANGES
CORRECTIONS BY P.A. BIZZIGOTTI
CONTRACT NO. 11-030114
DATE 1-17-98
DW 3/23/99

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

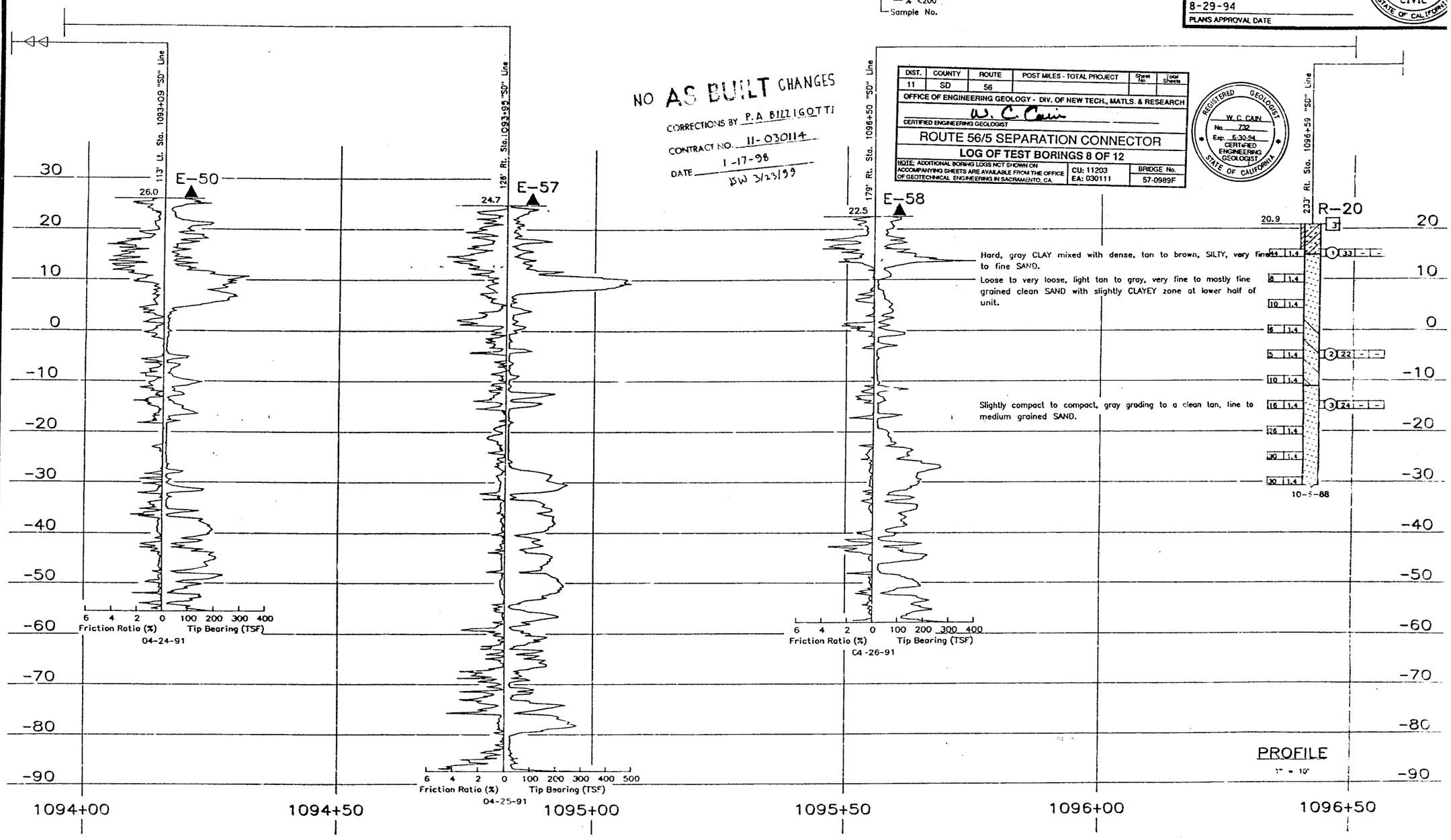
OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH
W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

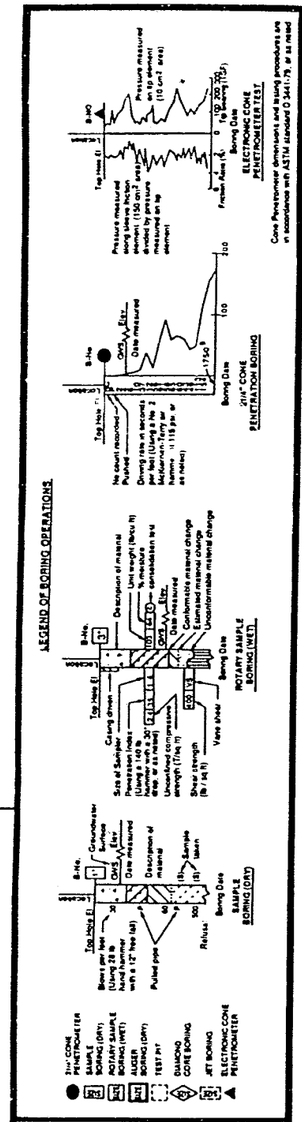
ROUTE 56/5 SEPARATION CONNECTOR
LOG OF TEST BORINGS 8 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA.

CU: 11203
EA: 030111
BRIDGE No. 57-0989F

REGISTERED GEOLOGIST W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA





NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY	K. WAHL 10-91
CHECKED BY	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO.
POST MILE

SD-5/56 INTERCHANGE (SECTION E-E')
LOG OF TEST BORINGS 28 OF 3

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET

TL 6052 (REV 8/90)

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.- 00/1.0	688	741

REGISTERED ENGINEER - CIVIL

8-29-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER J. ESHAN No. ~~047251~~ Exp. ~~12-31-95~~ CIVIL STATE OF CALIFORNIA

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

NO AS BUILT CHANGES

CORRECTIONS BY P.A. BIZZIGOTTI

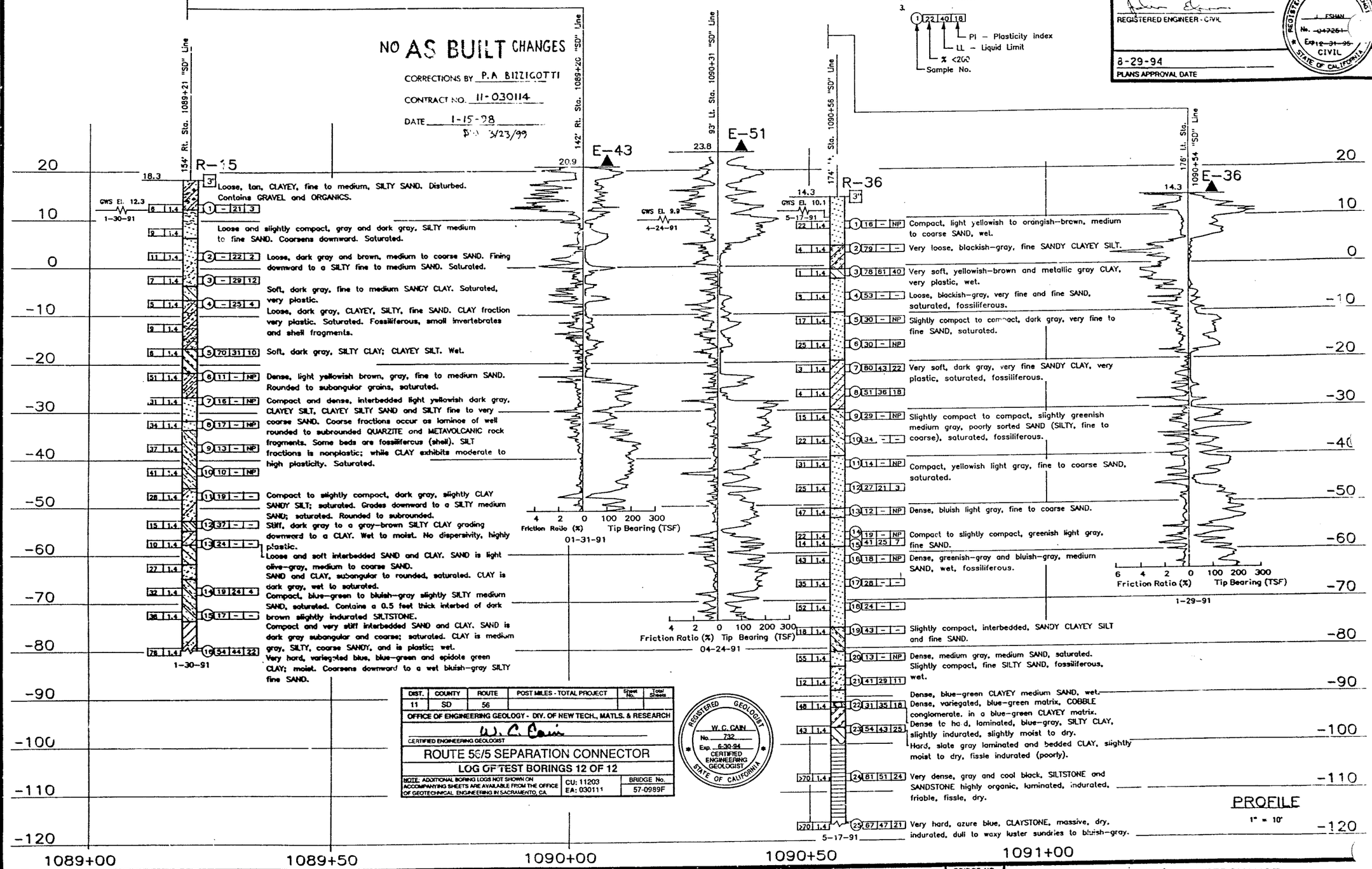
CONTRACT NO. 11-030114

DATE 1-15-98

3/23/99

NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. 1 22 40 18 — 1: Sample No.; 22: % <200; 40: LL – Liquid Limit; 18: PI – Plasticity Index



PROFILE
1" = 10'

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 12 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA.

CU: 11203
EA: 030111

BRIDGE No. 57-0989F

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS: GRAVEL, SAND, SILT, CLAY, CLAYEY SILT, SANDY CLAY or CLAYEY SAND, SILTY SAND or SILTY CLAY, PEAT and/or ORGANIC MATTER, FILL MATERIAL, IGNEOUS ROCK, SEDIMENTARY ROCK, METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOIL*

According to the Standard Penetration Test

Penetration Resistance (Blows/Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-10	Loose	Soft
11-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon visual inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH | ENGINEERING GEOLOGY BRANCH

DRAWN BY K. WAHL 5-92

CHECKED BY

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES STRUCTURE DESIGN

BRIDGE NO.

POST MILE

SC-5/56 INTERCHANGE (SECTION E – E')

LOG OF TEST BORINGS 26 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5-12-92

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 10 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA.

CU: 11203
EA: 030111

BRIDGE No. 57-0989F

REGISTERED GEOLOGIST — W. C. CAIN — No. 732 — Exp. 6-30-94 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34 - 00/10	686	741

REGISTERED ENGINEER - CIVIL

8-29-94
PLANS APPROVAL DATE

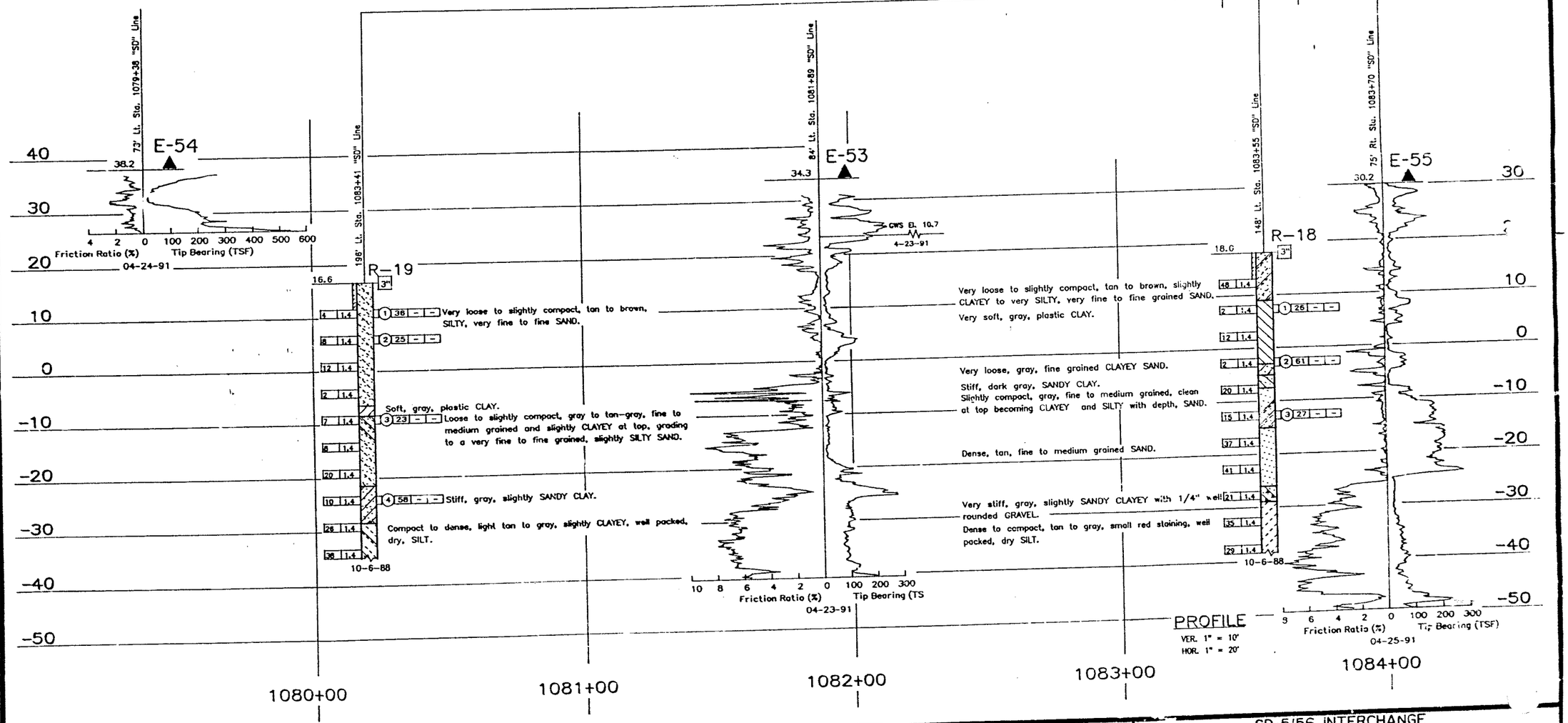
REGISTERED PROFESSIONAL ENGINEER — J. EHSAN — No. 047251 — Exp. 12-31-95 — CIVIL — STATE OF CALIFORNIA

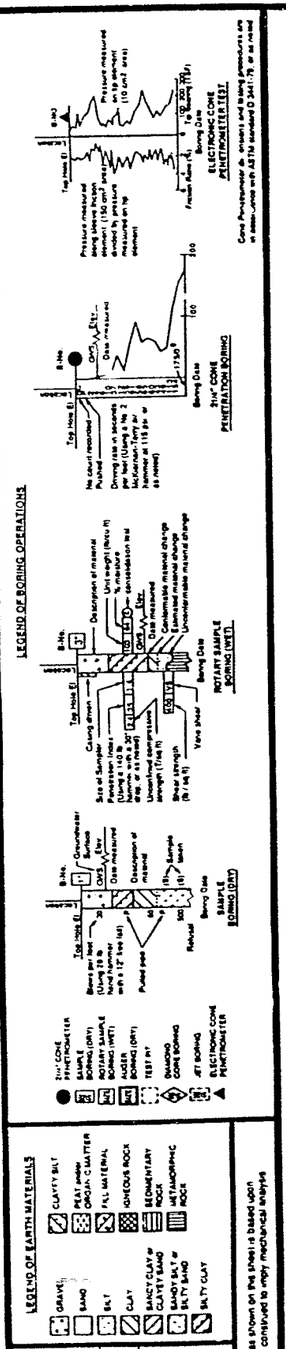
NOTES:

1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. 1 22 40 18
   - 1 — Sample No.
   - 22 — % <200
   - 40 — LL – Liquid Limit
   - 18 — PI – Plasticity Index

FOR PLAN VIEW, SEE LOG OF TEST BORINGS I OF 32

NO AS BUILT CHANGES
CORRECTIONS BY P.A. BIZZIGOTTI
CONTRACT No. 11-030114
DATE 1-15-98
BW 3/23/99





DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY K. WAHL 10-91	
CHECKED BY	

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO.
POST MILE

SD-5/56 INTERCHANGE (SECTION E-E')

LOG OF TEST BORINGS 24 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

S-E-E1 73

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 7 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA.

CU: 11203
EA: 030111

BRIDGE No. 57-0989F

REGISTERED GEOLOGIST — W. C. CAIN — No. 732 — Exp. 6-30-94 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5.56	R31.8/R34.8, C.0/1.0	683	741

REGISTERED ENGINEER - CIVIL

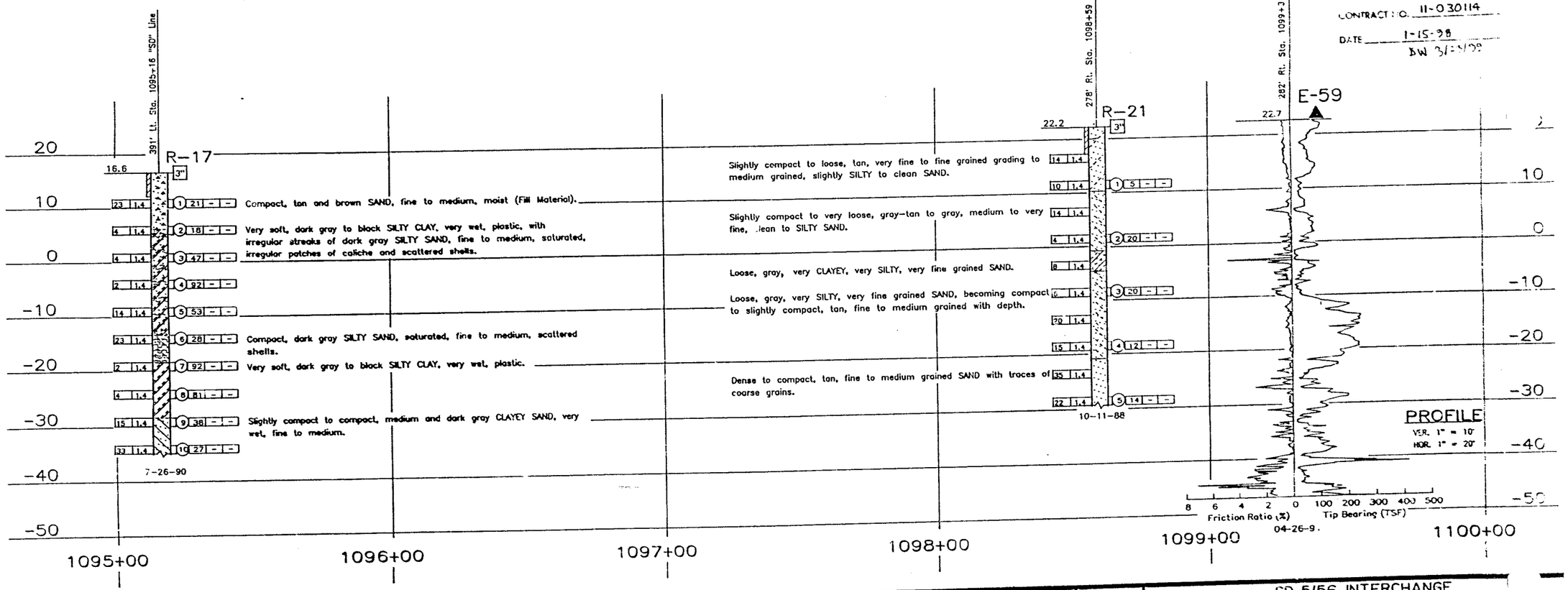
8-29-94
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — J. EHSAN — No. 047259 — Exp. 12-31 — CIVIL — STATE OF CALIFORNIA

NOTES:

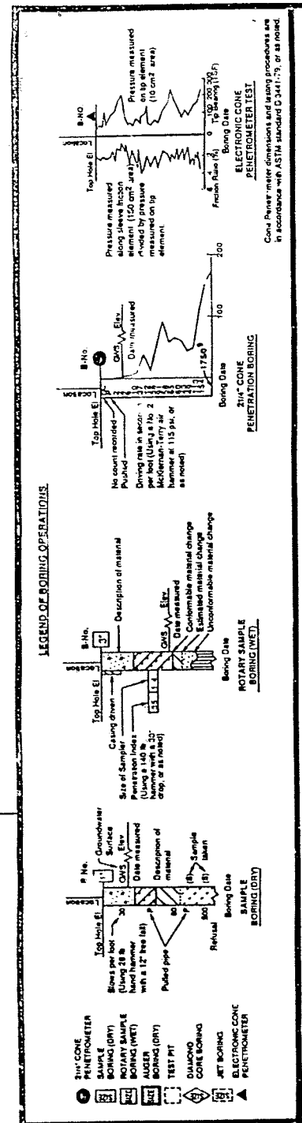
1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. (1) 22 43 18
   - 18 — PI – Plasticity Index
   - 43 — LL – Liquid Limit
   - 22 — % <200
   - 1 — Sample No.

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

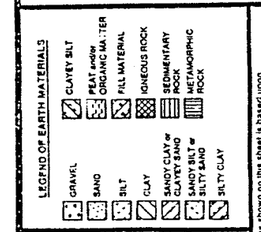


NO AS BUILT CHANGES
CORRECTIONS BY P.A. BIZZIGOTTI
CONTRACT NO. 11-030114
DATE 1-15-98
DW 3/25/98

LEGEND OF BORING OPERATIONS



LEGEND OF EARTH MATERIALS



CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis unless indications and Unified Soil Classification are shown.

GEOTECHNICAL ENGINEERING BRANCH - TRANSPORTATION LABORATORY

DRAWN BY K. WAHL 10-91
CHECKED BY

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

BRIDGE NO.
POST MILE

SD-5/56 INTERCHANGE
(SECTION B-B')

LOG OF TEST BORINGS 9 OF 32

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5-11-92

SHEET

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
11	SD	56			

OFFICE OF ENGINEERING GEOLOGY - DIV. OF NEW TECH., MATLS. & RESEARCH

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST W. C. CAIN No. 732 Exp. 6-30-94 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 5 OF 12

NOTE: ADDITIONAL BORING LOGS NOT SHOWN ON ACCOMPANYING SHEETS ARE AVAILABLE FROM THE OFFICE OF GEOTECHNICAL ENGINEERING IN SACRAMENTO, CA.

CU: 11203
EA: 030111

BRIDGE No. 57-0989F

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.6/R34.8 0.0/1.0	681	741

REGISTERED ENGINEER - CIVIL

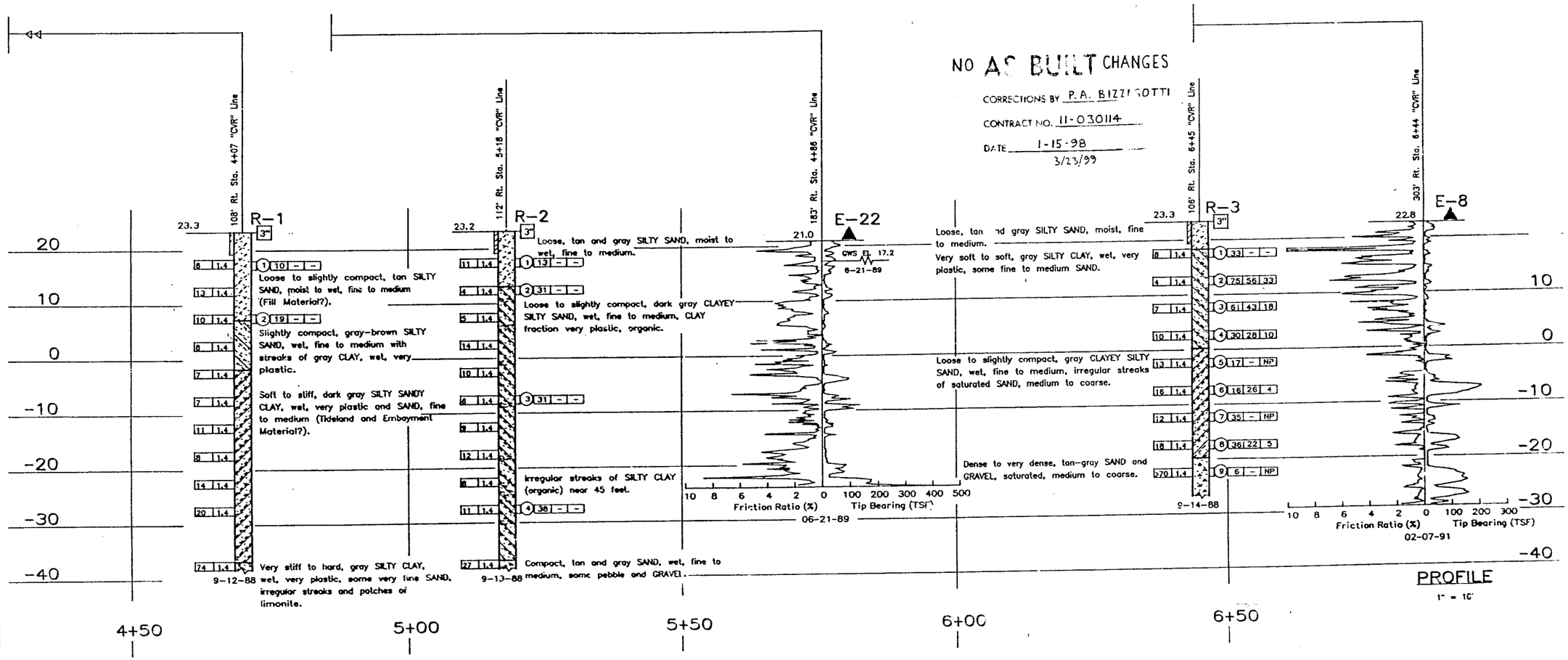
REGISTERED PROFESSIONAL ENGINEER J. ESHAN No. 04725 Exp. 12-31 CIVIL STATE OF CALIFORNIA

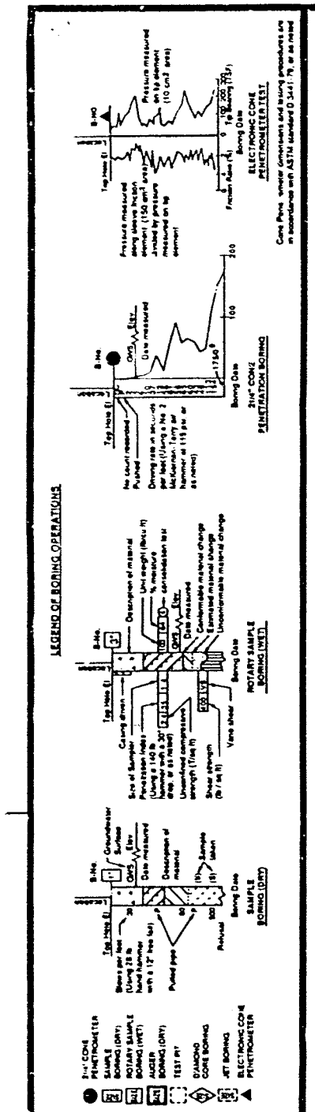
8-29-94
PLANS APPROVAL DATE

NOTES:
1. R-9 = Rotary Sample Boring
2. E-9 = Electronic Cone Penetrometer Test
3. (1) 22 40 18
   - 1 = Sample No.
   - 22 = % <200
   - 40 = LL - Liquid Limit
   - 18 = PI - Plasticity Index

FOR PLAN VIEW, SEE LOG OF TEST BORINGS 1 OF 32

NO AS BUILT CHANGES
CORRECTIONS BY P.A. BIZZIGOTTI
CONTRACT NO. 11-030114
DATE 1-15-98
3/23/99





CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-50	Dense	Hard
>50	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY K. WAHL 5-92	
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State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO.
POST MILE

SC-5/56 INTERCHANGE (SECTION B - B')

LOG OF TEST BORINGS 5 OF 32

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 030111

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) 5/12/92

SHEET

TL 6052 REV 8/90

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56	R31.6/R34.8, 0.0/1.0	6.3	741

FOR PLAN VIEW, SEE "LOG OF TEST BORINGS 1 OF 12"

NO AS BUILT CHANGES

CORRECTIONS BY P.A. BIZZIGOTTI

CONTRACT NO. 11-030114

DATE 1-15-98 JW 3/23/99

W. C. Cain
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST W.C. CAIN No 732 Exp 6-30-94 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

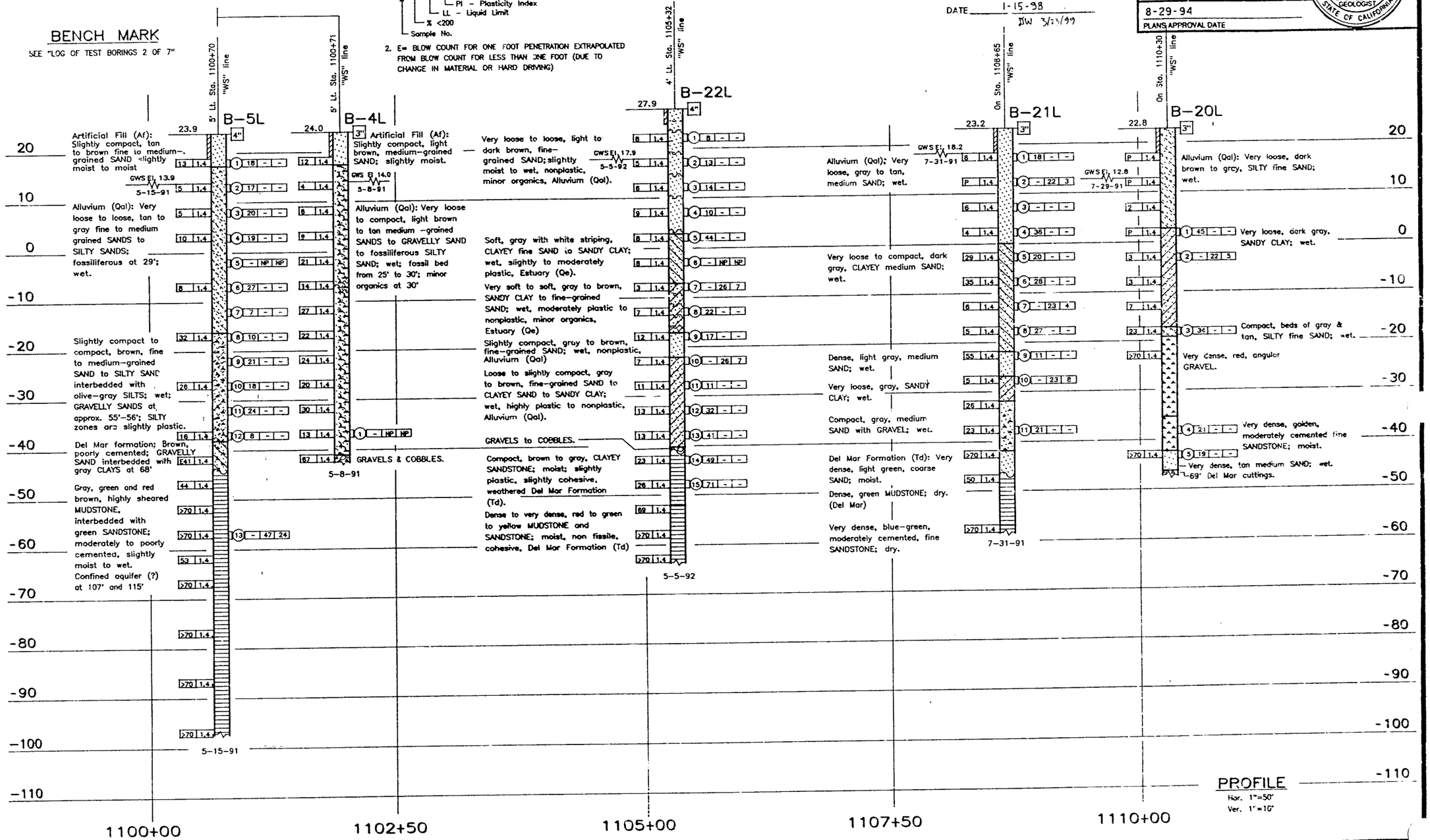
8-29-94
PLANS APPROVAL DATE

NOTES:

1. (1) 22 40 18
   - (1) Sample No.
   - 22 — % <200
   - 40 — LL – Liquid Limit
   - 18 — PI – Plasticity Index
2. E= BLOW COUNT FOR ONE FOOT PENETRATION EXTRAPOLATED FROM BLOW COUNT FOR LESS THAN ONE FOOT (DUE TO CHANGE IN MATERIAL OR HARD DRIVING)

BENCH MARK

SEE "LOG OF TEST BORINGS 2 OF 7"



PROFILE
Hor. 1"=50'
Ver. 1"=10'

LEGEND OF BORING OPERATIONS

LEGEND OF EARTH MATERIALS

CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DIVISION OF NEW TECHNOLOGY, MATERIALS AND RESEARCH	OFFICE OF ENGINEERING GEOLOGY
DRAWN BY I. GAMARRA 9/92	
CHECKED BY T.RAYBOURN 11-92	

FIELD INVESTIGATION BY: J. KNOTT

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

CU 11203
EA 030111

BRIDGE NO. 57-0989F
POST MILE 0.0

ROUTE 56/5 SEPARATION CONNECTOR

LOG OF TEST BORINGS 3 OF 12

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES

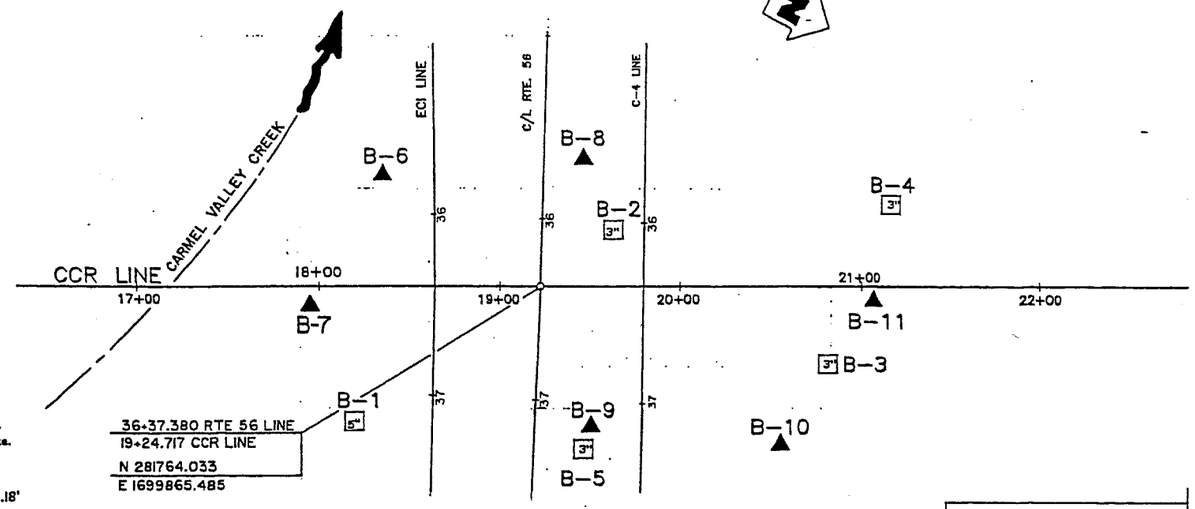
REVISION DATES (PRE. PRELIMINARY STAGE ONLY)

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56	R31.8/R32.6, 0.9/2.4	480	545

W. C. Cain 732
CERTIFIED ENGINEERING GEOLOGIST

REGISTERED GEOLOGIST W.C. CAIN No. 732 Exp. 6-30-92 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

2-24-92
PLANS APPROVAL DATE

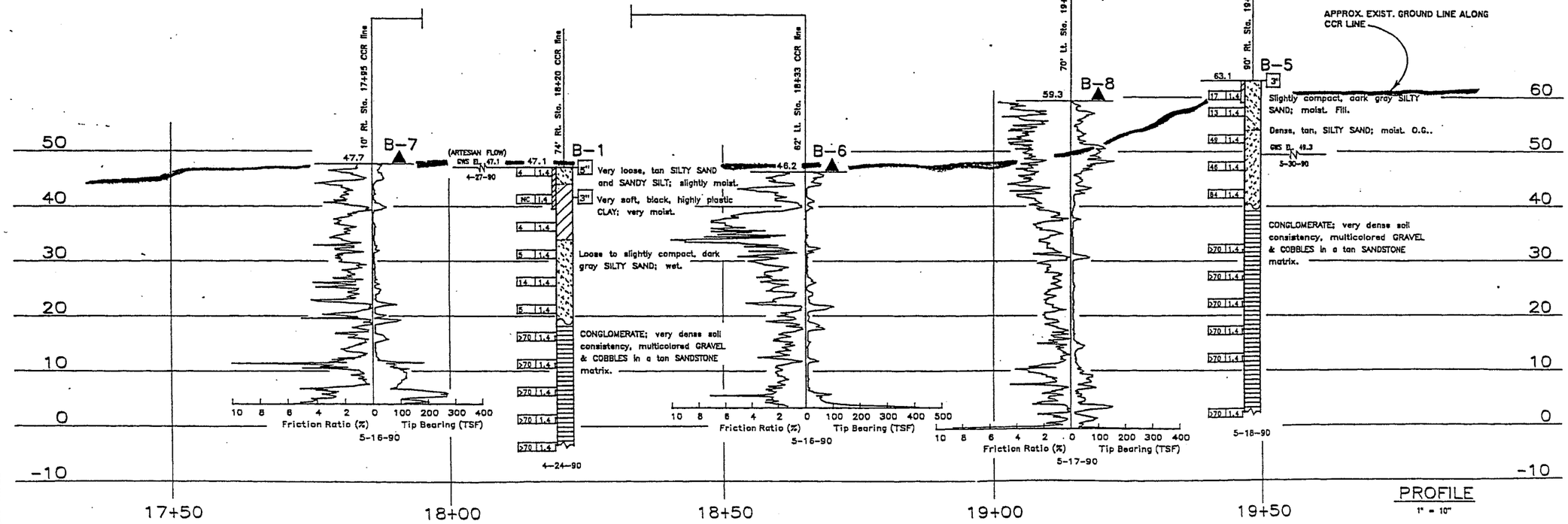


PLAN
1" = 40'

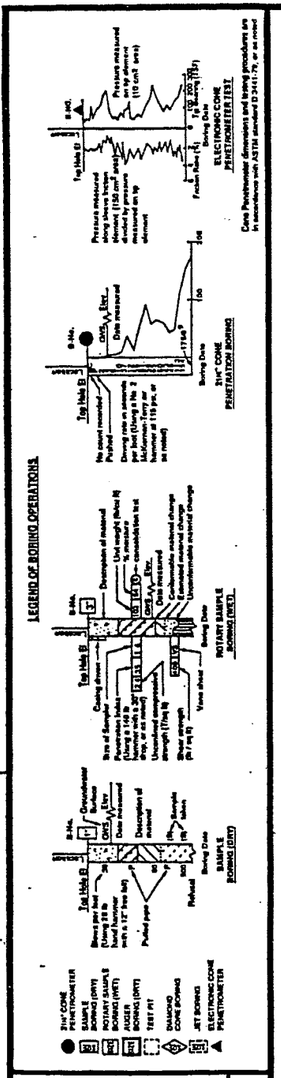
BENCH MARK

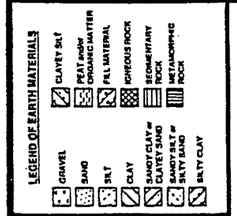
Found CADH Br. Disk Set in A . . . . 2 " Iron pipe. The Mon. is located on the SO. side of Carmel Valley Road, 1.1 mile east of Rte. 5, 0.25 mile east of the intersection of Carmel Valley Road and Carmel Creek Road.

BM # 56-1.1 ELEV. 70.18'



PROFILE
1" = 10'





CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Penetration Index (Blows / Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Very hard
>70	Very dense	

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

OFFICE OF TRANSPORTATION MATERIALS & RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY	IRMA GAMARRA 8/90
CHECKED BY	Robert Carl Dorin 8/90

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-1005
POST MILE 0.8

CARMEL CREEK ROAD OVERCROSSING
LOG OF TEST BORINGS 1 OF 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 010051

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)
10/29/91

SHEET 22 OF 23

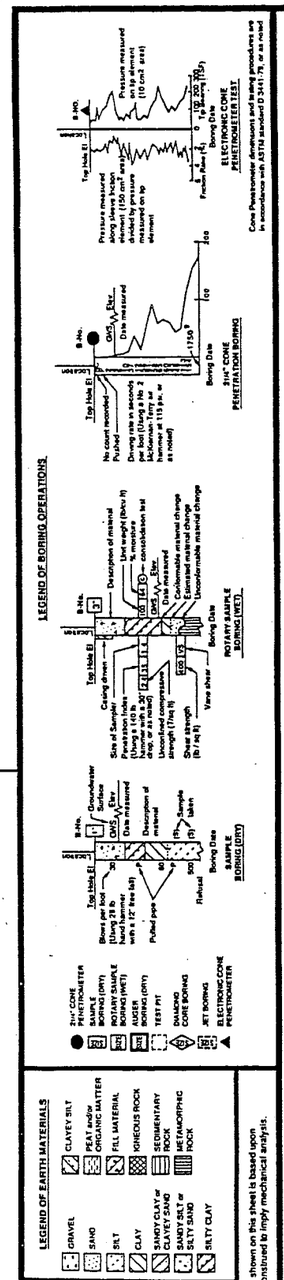
TL 6051 REV 3/90

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TO SHE
11	SD	5,56	R31.8/R32.6, 0.3/2.4	481	54

W. C. Cain 732
CERTIFIED ENGINEERING GEOLOGIST

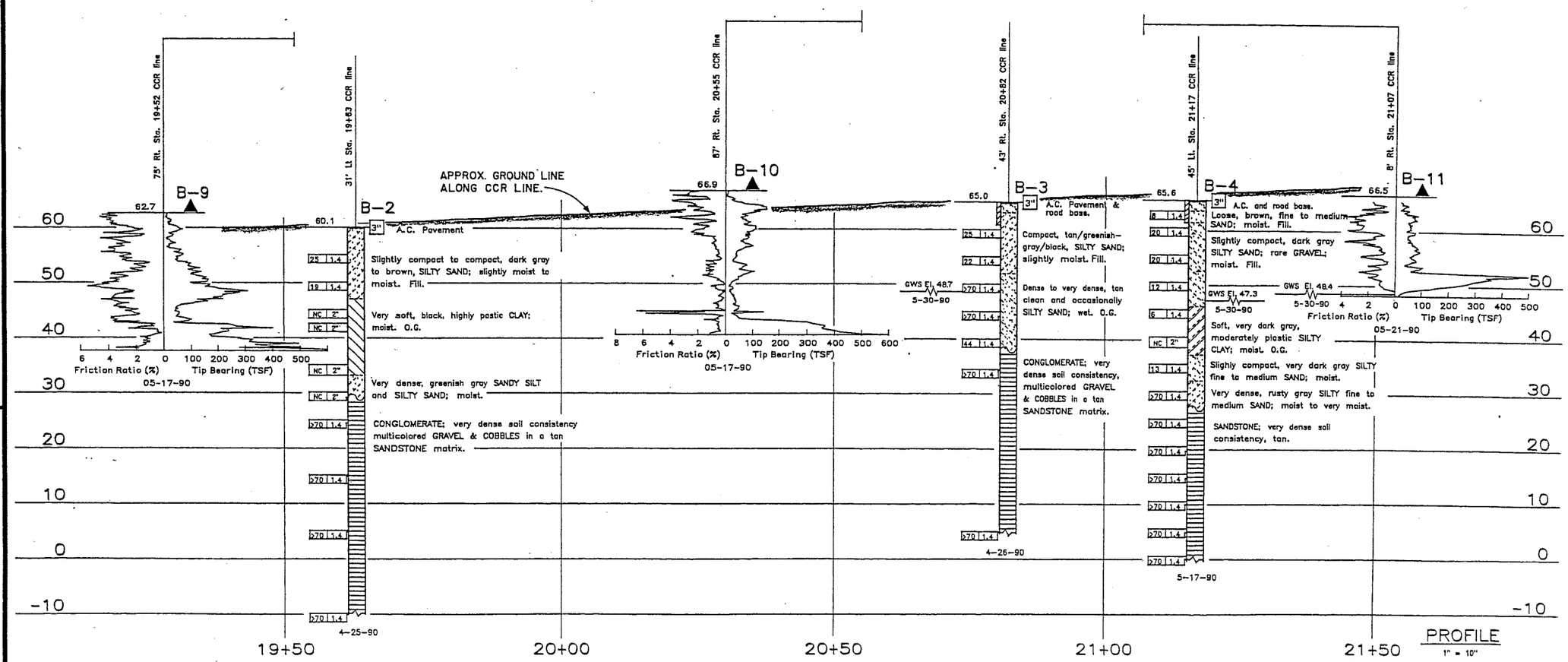
2-24-92
PLANS APPROVAL DATE

REGISTERED GEOLOGIST W. C. CAIN No. 732 Exp. 6-30-92 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA



NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

FOR PLAN VIEW SEE
"LOG OF TEST BORINGS 1 OF 2"



OFFICE OF TRANSPORTATION MATERIALS & RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY	IRMA GAMARRA 8/90
CHECKED BY	Robert Carl Davis 8/90

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-1005
POST MILE 0.8

CARMEL CREEK ROAD OVERCROSSING
LOG OF TEST BORINGS 2 OF 2

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11203
EA 01C051

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 23 OF 23

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.8/R32.6, 0.3/2.4	498	545

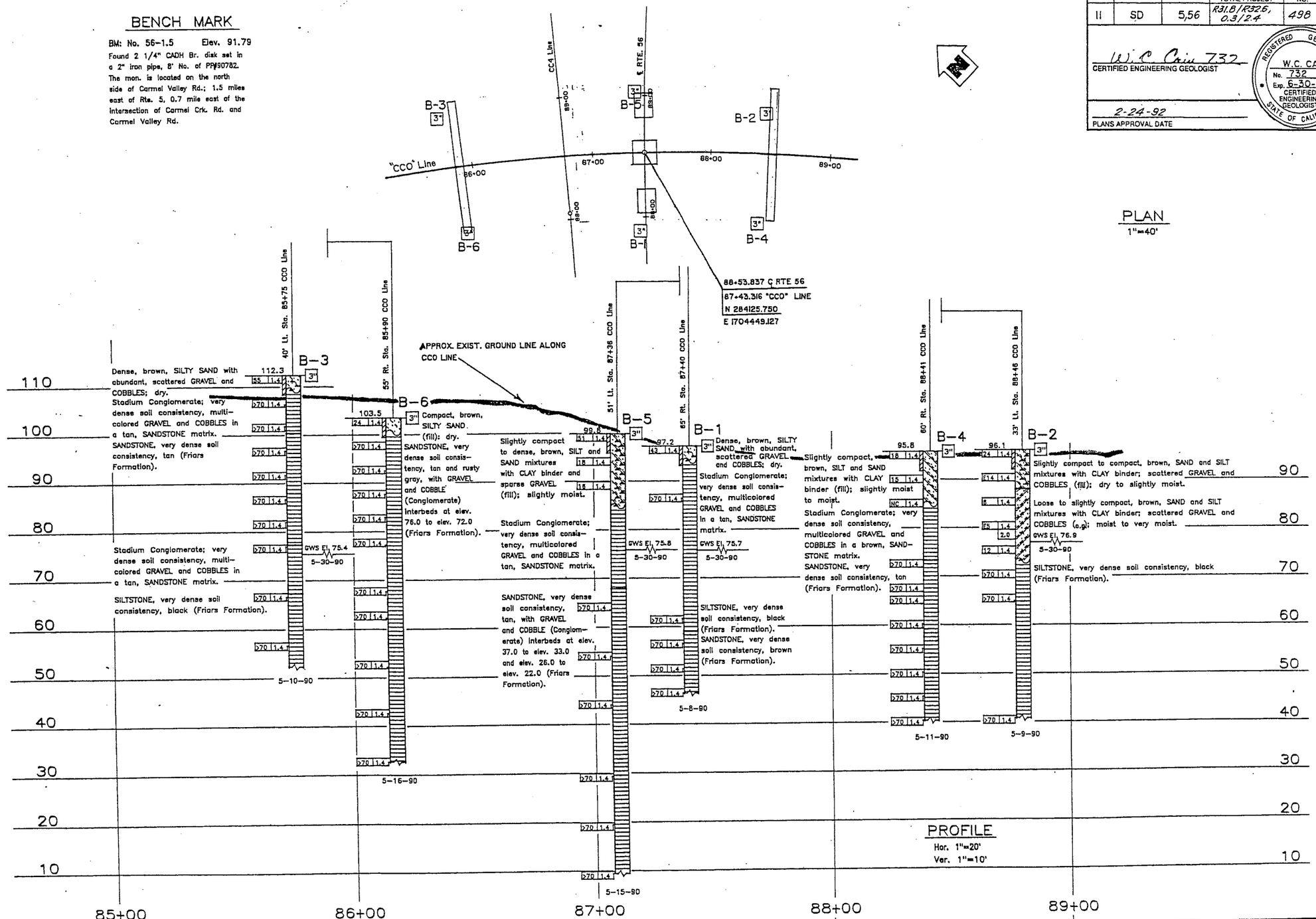
W.C. Cain 732
CERTIFIED ENGINEERING GEOLOGIST

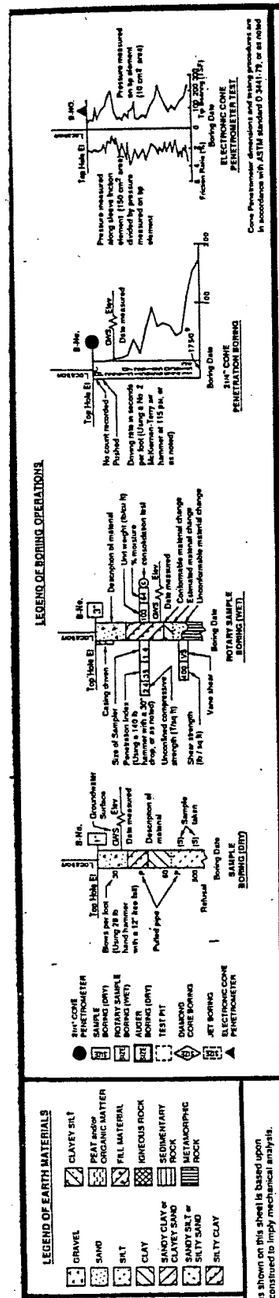
REGISTERED GEOLOGIST W.C. CAIN No. 732 Exp. 6-30-92 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

2-24-92
PLANS APPROVAL DATE

BENCH MARK

BM: No. 56-1.5 Elev. 91.79
Found 2 1/4" CADH Br. disk set in a 2" iron pipe, 8' No. of PP/90782. The mon. is located on the north side of Carmel Valley Rd.; 1.5 miles east of Rte. 5, 0.7 mile east of the intersection of Carmel Crk. Rd. and Carmel Valley Rd.





NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

OFFICE OF TRANSPORTATION MATERIALS & RESEARCH	ENGINEERING GEOLOGY BRANCH
DRAWN BY	JOHN L. THORNE 8/90
CHECKED BY	Robert Cal Drin 8/90

State of CALIFORNIA DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN

BRIDGE NO. 57-1006
POST MILE 1.8

CARMEL COUNTRY ROAD OC
LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11
EA 010051

DISREGARD PRINTS BEARING EARLIER REVISION DATES 19540

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 17 OF 17

TL 6051 REV 3/90

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.8/R32.6, 0.3/2.4	512	545

GEOTECHNICAL PROFESSIONAL

2-24-92
PLANS APPROVAL DATE

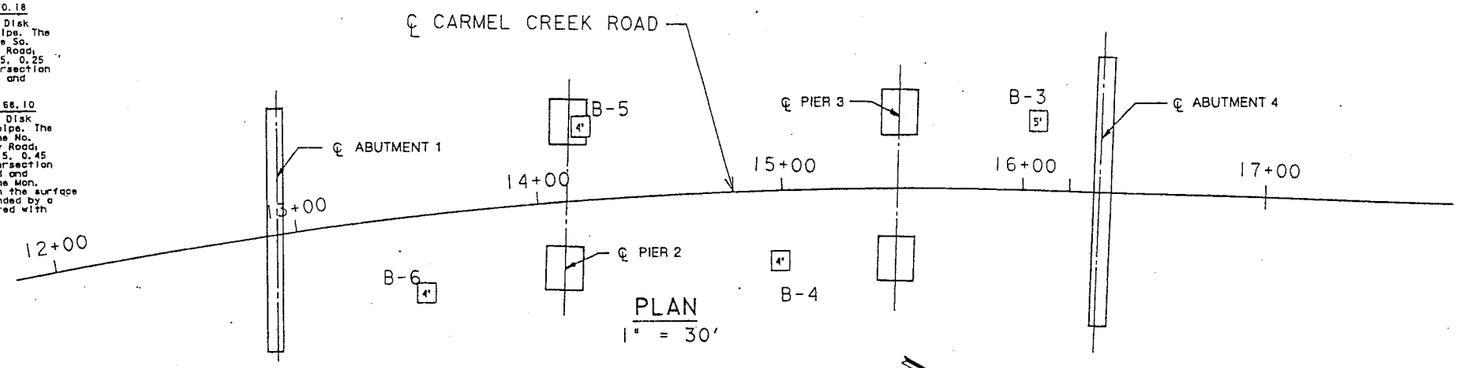
REGISTERED PROFESSIONAL ENGINEER — LUIS MOURA No. 2130 Exp. 12/31/93 GEOTECHNICAL STATE OF CALIFORNIA

AGS, INC.
120 HOWARD STREET
SUITE 600
SAN FRANCISCO, CALIFORNIA 94105

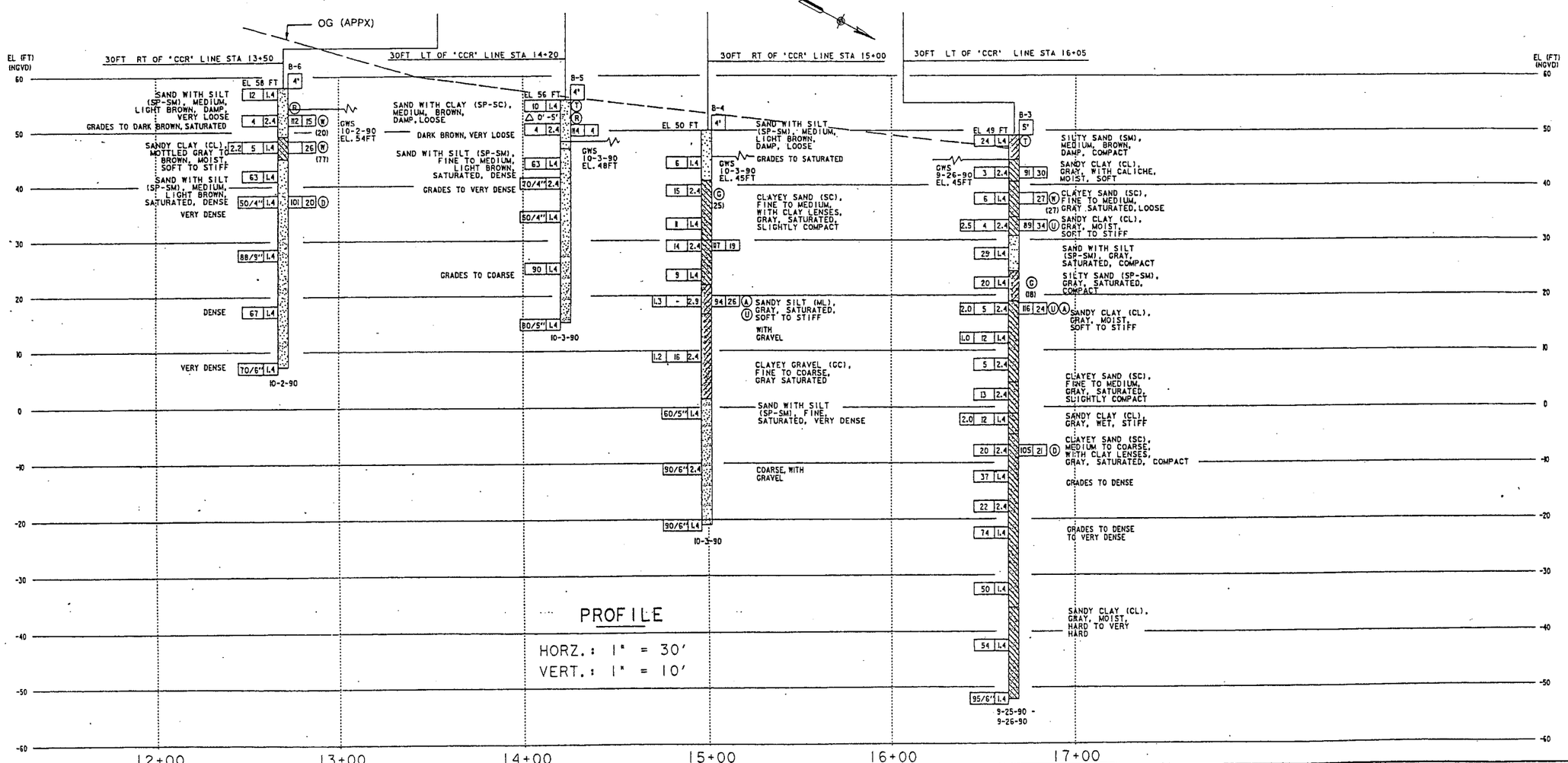
BENCH MARK

BM=56-1.1 ELEV. = 70.18
Found 2/4 in. CADH Br. Disk set in a 2 in. Iron pipe. The Mon. is located on the So. side of Carmel Valley Road, 1.1 mile east of Rte 5, 0.25 mile east of the intersection of Carmel Valley Road and Carmel Creek Road.

BM=56-1.3 ELEV. = 68.10
Found 2/4 in. CADH Br. Disk set in a 2 in. Iron pipe. The Mon. is located on the No. side of Carmel Valley Road, 1.3 mile east of Rte 5, 0.45 mile east of the intersection of Carmel Valley Road and Carmel Creek Road. The Mon. is 2.2 ft. lower than the surface of the ground surrounded by a 8" PVC pipe and covered with a piece of plywood.



PLAN
1" = 30'



PROFILE
HORZ.: 1" = 30'
VERT.: 1" = 10'

NOTE: CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.

LEGEND OF BORING OPERATIONS

LOCATION — TOP HOLE EL. — B-NO. — DESCRIPTION OF MATERIAL — DRY UNIT WEIGHT (LB/CU FT) — MOISTURE CONTENT (%) — LABORATORY TEST — DATE SAMPLED — MATERIAL CHANGE — BORING DATE

CASING DRIVEN — SIZE OF SAMPLER — PENETRATION INDEX (BLOWS PER FOOT) — HAMMER WITH A 30-IN DROP, OR AS NOTED — UNCONFINED COMPRESSIVE STRENGTH (KSF) — MEASURED WITH POCKET PENETROMETER — SHEAR STRENGTH (LB/SQFT) — VANE SHEAR

SAMPLE BORING

LABORATORY TESTS

- (C) COMPACTION
- (CO) CONSOLIDATION
- (G) GRAIN SIZE ANALYSIS (WITH % FINES CONTENT)
- (W) WASH ANALYSIS (WITH % FINES CONTENT)
- (DS) DIRECT SHEAR
- (A) ATTERBERG LIMITS
- (UC) UNCONFINED COMPRESSION
- (R) R-VALUE
- (CR) CORROSIVITY

PUSH — PUSH SAMPLE
2-1/4-IN. CONE PENETROMETER
ROTARY SAMPLE BORING (WET)
AUGER BORING (DRY)
TEST PIT
DIAMOND CORE BORING
ELECTRIC CONE PENETROMETER
BULK SAMPLE LOCATION (0'-5' DEPTH)

LEGEND OF EARTH MATERIALS

GRAVEL — SAND — SILT — CLAY — SANDY CLAY OR CLAYEY SAND — SANDY SILT OR SILTY SAND — SILTY CLAY — CLAYEY SILT — PEAT AND/OR ORGANIC MATTER — FILL MATERIAL — IGNEOUS ROCK — SEDIMENTARY ROCK — METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS

ACCORDING TO THE STANDARD PENETRATION TEST

PENETRATION INDEX (BLOWS/FT)	GRANULAR	COHESIVE
0-4	VERY LOOSE	VERY SOFT
5-9	LOOSE	SOFT
10-19	SLIGHTLY COMPACT	STIFF
20-34	COMPACT	VERY STIFF
35-69	DENSE	HARD
> 70	VERY DENSE	VERY HARD

DESIGN OVERSIGHT (11/4/91)	DRAWN BY	MNL	RFS
SIGN OFF DATE	CHECKED BY	RFS/LEM	FIELD INSPECTION DATE 9/90-10/90

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

LUIS MOURA
PROJECT ENGINEER

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 11203
EA 010051

BRIDGE NO. 57C-606
POST MILE 1.8

CARMEL CREEK ROAD BRIDGE
LOG OF TEST BORINGS

DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES (PRELIMINARY STAGE ONLY) 9-18-91 10-24-91

SHEET 14 OF 14

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5,56	R31.8/R32.6, 0.3/24	526	545

GEOTECHNICAL PROFESSIONAL

2-24-91
PLANS APPROVAL DATE

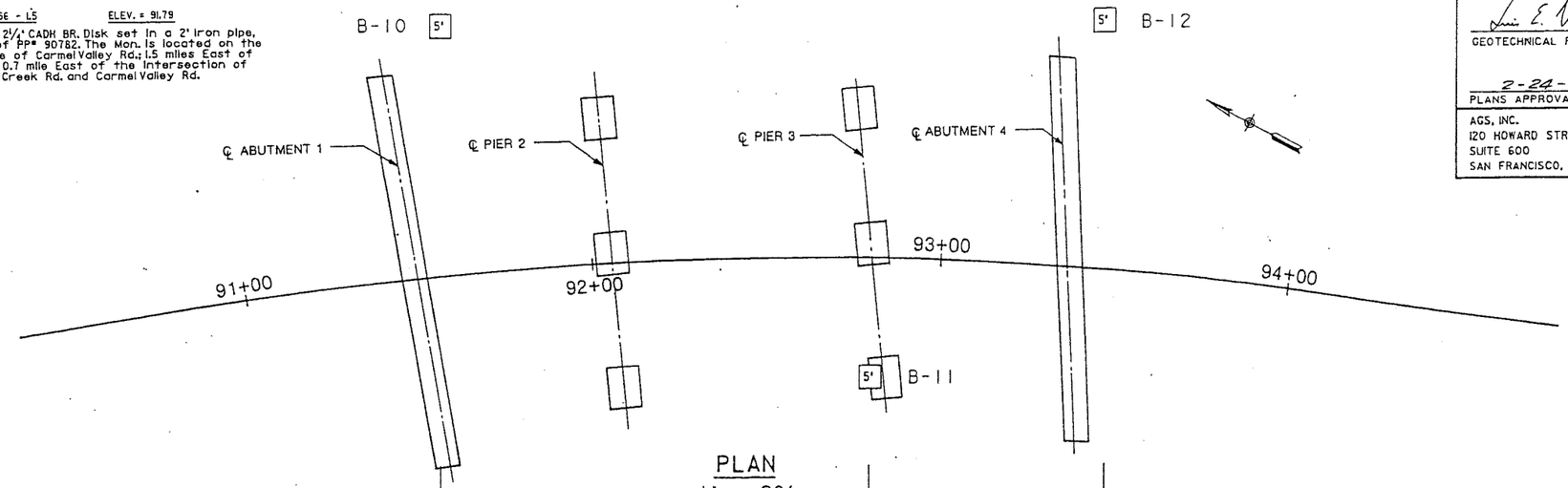
REGISTERED PROFESSIONAL ENGINEER — LUIS MOURA No. 2130 Exp. 12/31/93 GEOTECHNICAL — STATE OF CALIFORNIA

AGS, INC.
120 HOWARD STREET
SUITE 600
SAN FRANCISCO, CALIFORNIA 94105

BENCH MARK

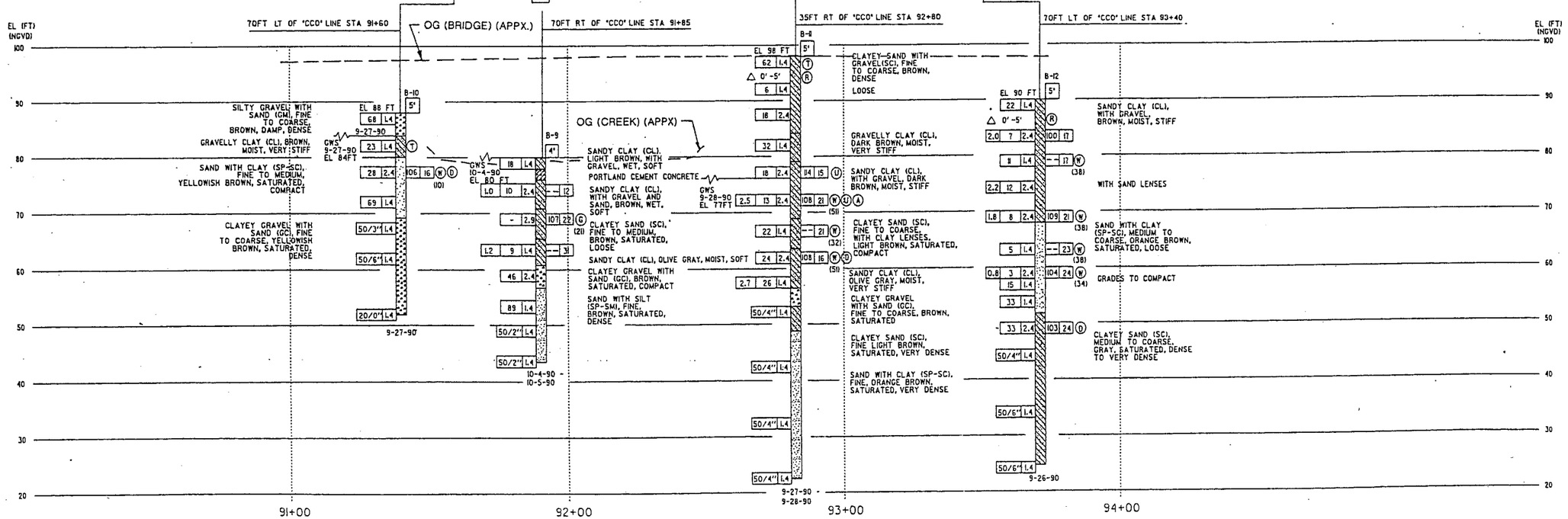
BM NO. 56 - L5 ELEV. = 91.79

Found 2¼" CADH BR. Disk set in a 2" iron pipe, 8' No. of PP# 90782. The Mon. is located on the No. side of Carmel Valley Rd.; 1.5 miles East of Rte 5, 0.7 mile East of the Intersection of Carmel Creek Rd. and Carmel Valley Rd.



PLAN

1" = 20'



PROFILE

HORZ. 1"=20'

VERT. 1"=10'

LEGEND OF BORING OPERATIONS

LOCATION TOP HOLE EL — B-NO. — 8" — CASING DRIVEN SIZE OF SAMPLER — PENETRATION INDEX BLOWS/FT USING A 140-LB HAMMER WITH A 30-IN DROP, UNLESS NOTED — UNCONFINED COMPRESSIVE STRENGTH (T/SQFT) AS MEASURED WITH POCKET PENETROMETER — SHEAR STRENGTH (LB/SQFT) VANE SHEAR — BORING DATE — DESCRIPTION OF MATERIAL — DRY UNIT WEIGHT (LB/CU FT) — MOISTURE CONTENT (%) — LABORATORY TEST — DATE MEASURED — MATERIAL CHANGE — SAMPLE BORING

LABORATORY TESTS

(C)	COMPACTION
(Co)	CONSOLIDATION
(G)	GRAIN SIZE ANALYSIS (WITH % FINES CONTENT)
(M)	MESH ANALYSIS (WITH % FINES CONTENT)
(S)	DIRECT SHEAR
(A)	ATTERBERG LIMITS
(U)	UNCONFINED COMPRESSION
(R)	R-VALUE
(T)	CORROSIVITY

PUSH — PUSH SAMPLE
2-1/4-IN. CONE PENETROMETER
HSA — ROTARY SAMPLE BORING (WET)
HSA — AUGER BORING (DRY)
TP — TEST PIT
DCB — DIAMOND CORE BORING
ECP — ELECTRIC CONE PENETROMETER
0-5' — BULK SAMPLE LOCATION (ft/DEPTH)

LEGEND OF EARTH MATERIALS

GRAVEL — SAND — SILT — CLAY — SANDY CLAY OR CLAYEY SAND — SANDY SILT OR SILTY SAND — SILTY CLAY — CLAYEY SILT — PEAT AND/OR ORGANIC MATTER — FILL MATERIAL — IGNEOUS ROCK — SEDIMENTARY ROCK — METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS

ACCORDING TO THE STANDARD PENETRATION TEST

PENETRATION INDEX (BLOWS/FT)	GRANULAR	COHESIVE
0-4	VERY LOOSE	VERY SOFT
5-9	LOOSE	SOFT
10-19	SLIGHTLY COMPACT	STIFF
20-34	COMPACT	VERY STIFF
35-69	DENSE	HARD
> 70	VERY DENSE	VERY HARD

NOTE: CLASSIFICATION OF EARTH MATERIAL AS SHOWN ON THIS SHEET IS BASED UPON FIELD INSPECTION AND IS NOT TO BE CONSTRUED TO IMPLY MECHANICAL ANALYSIS.

DESIGN OVERSIGHT 11/4/91	DRAWN BY	MNL	RFS
SIGN OFF DATE	CHECKED BY	RFS/LEM	FIELD INSPECTION DATE 9/90-10/90

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

LUIS MOURA
PROJECT ENGINEER

CU 11203
EA 010051

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

BRIDGE NO. 57C-607
POST MILE 1.8

CARMEL COUNTRY ROAD BRIDGE

LOG OF TEST BORINGS

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 9-18-91 10-26-91

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET 14 OF 14

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56, 805	Var	760	1549

CERTIFIED ENGINEERING GEOLOGIST — DATE 04-23-01

REGISTERED GEOLOGIST — JEFF J. TESAR No. 2137 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

9-3-01
PLANS APPROVAL DATE

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Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

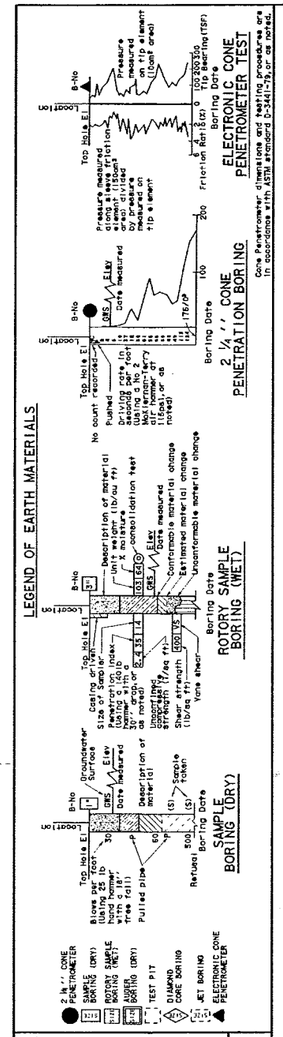
Caltrans Metric

BORING No. : 569-B1

Date Drilled: 08/30/99
Project Name : I-5/805 Retaining Walls
Location : 21L;568+97 "SD" Line
Drilling Method : Mud Rotary

Top of hole elevation : 34.9 m

SAMPLE				PROFILE	
DEPTH M	NUMBER	TYPE	BLOWS PER 0.30 METER (N)	SYMBOL	DESCRIPTION OF MATERIALS
0.0					Ground Surface
					ASPHALT PAVEMENT
					FILL (base and subbase)
-1.00					SAND (SP) : (Bay Point Fm.) Brown, moist, fine to medium grained, dense.
	1	SPT	35		
-2.00					
-3.00					- at 3.0 m: grades to very dense
	2	SPT	66		
-4.00					
	3	SPT	58		- at 4.5 m : grades to gray color, fine grained, slightly silty



CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration test

Penetration resistance (Blows/ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
370	Very dense	Very hard

LEGEND OF EARTH MATERIALS

CLAY, CLAYEY SILT, FILL, ASPHALT PAVEMENT, SAND, SILTSTONE, GRAVEL, SILT, SANDY CLAY, CLAYEY SAND, BEDROCK, SANDY SILT, SILTY SAND, SILTY CLAY

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DRAWN BY
CHECKED BY

CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ORIGINAL SCALE IS IN INCHES FOR REDUCED PLANS 0 1 2 3

BRIDGE NO
POST MILE

BORING: 569-B1 R-94

LOG OF TEST BORINGS (of)

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

CU 11275 EA 0301U1

DATE PLOTTED => 10-SEP-2001
TIME PLOTTED => 08:37

FORM DC-OE-92-PF (REV. 3/88)

USERNAME => trmikes1
DGN FILE => b0301uq94.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56, 805	Var	762	1549

CERTIFIED ENGINEERING GEOLOGIST — DATE 04-23-01

REGISTERED GEOLOGIST — JEFF J. TESAR No. 2137 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

9-3-01
PLANS APPROVAL DATE

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Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

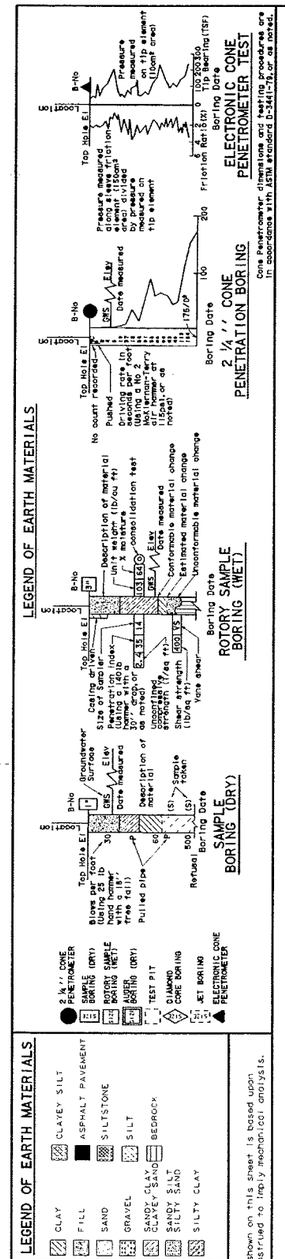
Caltrans Metric

BORING No. : 569-B3

Date Drilled: 08/30/99
Project Name : I-5/805 Retaining Walls
Location : 21L; 571+61 "SD" Line
Drilling Method : Mud Rotary

Top of hole elevation : 42.9 m

SAMPLE				PROFILE	
DEPTH M	NUMBER	TYPE	BLOWS PER 0.30 METER (N)	SYMBOL	DESCRIPTION OF MATERIALS
0.0					Ground Surface
					ASPHALT PAVEMENT
					FILL (base and subbase)
-1.00					SAND (SP) : (Torrey Sandstone Fm.) Brown, moist, medium grained, medium dense, traces of gravel.
	1	SPT	23		
-2.00					
-3.00					- at 3.0 m: grades to very dense and weakly cemented (Sandstone)
	2	SPT	>50		
-4.00					
					- at 4.0 m - 4.6 m : grades to gravelly
	3	SPT	REFUSAL		



DRAWN BY
CHECKED BY

CALIFORNIA
DEPARTMENT OF TRANSPORTATION

ORIGINAL SCALE IS IN INCHES FOR REDUCED PLANS 0 1 2 3

BRIDGE NO.
POST MILE

BORING: 569-B3 R-96

LOG OF TEST BORINGS (of)

DISREGARD PRINTS BEARING EARLIER REVISION DATES →
REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

CU 11275 EA 0301U1

FORM DC-OE-92-PF (REV. 3/88)

USERNAME => trmikesi
DGN FILE => b0301uq96.dgn

DATE PLOTTED => 10-SEP-2001
TIME PLOTTED => 06:37

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56, 805	Var	764	1549

CERTIFIED ENGINEERING GEOLOGIST DATE 04-23-01

REGISTERED GEOLOGIST JEFF J. TESAR No. 2137 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

9-03-01
PLANS APPROVAL DATE

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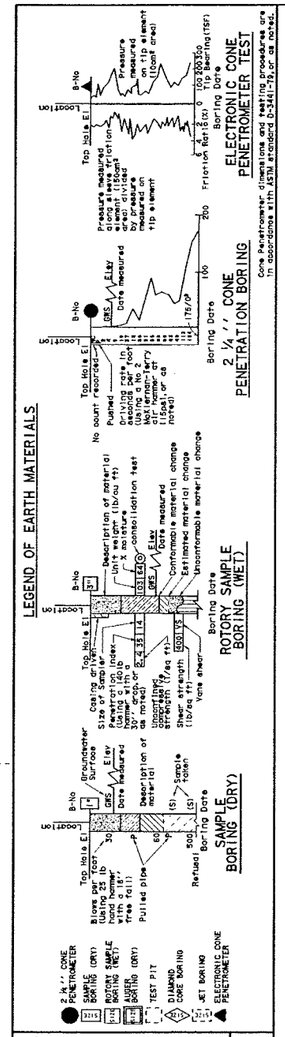
Caltrans Metric

BORING No. : 569-B5

Date Drilled: 08/30/99
Project Name : I-5/805 Retaining Walls
Location : 21L;573+61 "SD" Line
Drilling Method : Mud Rotary

Top of hole elevation : 49.0 m

SAMPLE				PROFILE	
DEPTH M	NUMBER	TYPE	BLOWS PER 0.30 METER (N)	SYMBOL	DESCRIPTION OF MATERIALS
0.0					Ground Surface
					ASPHALT PAVEMENT
					FILL (base and subbase)
-1.00					SANDSTONE : (Torrey Sandstone Fm.)
	1	SPT	>50		Brown, moist to damp, slightly laminated (mottled), fine to medium grained, micaceous, locally rusty bands/laminas, weakly to moderately cemented.
-2.00					
-3.00	2	SPT	>50		
-4.00					
	3	SPT	>50		



CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration test

Penetration (Blows/ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

LEGEND OF EARTH MATERIALS

CLAY, CLAYEY SILT, FILL, ASPHALT PAVEMENT, SAND, SILTSTONE, GRAVEL, SILT, SANDY CLAY, CLAYEY SAND, BEDROCK, SANDY SILT, SILTY SAND, SILTY CLAY

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

DRAWN BY
CHECKED BY

CALIFORNIA
DEPARTMENT OF TRANSPORTATION

BRIDGE NO
POST MILE

BORING: 569-B5 R-98

LOG OF TEST BORINGS (of)

ORIGINAL SCALE IS IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

CU 11275 EA 0301U1

FORM DC-OE-92-PF (REV. 3/88)

USERNAME => trmnguye
DGN FILE => b0301uq98.dgn

DATE PLOTTED => 10-SEP-2001
TIME PLOTTED => 07:28

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56, 805	Var	763	1549

CERTIFIED ENGINEERING GEOLOGIST DATE 04-23-01

REGISTERED GEOLOGIST JEFF J. TESAR No. 2137 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

9-3-01
PLANS APPROVAL DATE

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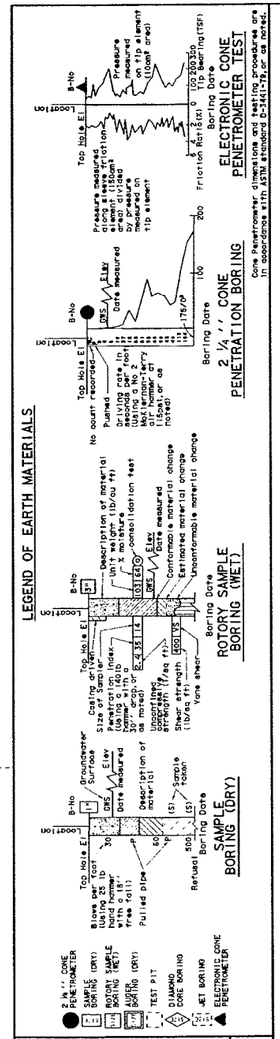
Caltrans Metric

BORING No. : 569-B4

Date Drilled: 08/30/99
Project Name : I-5/805 Retaining Walls
Location : 21L;572+61 "SD" Line
Drilling Method : Mud Rotary

Top of hole elevation : 46.0 m

SAMPLE				PROFILE	
DEPTH M	NUMBER	TYPE	BLOWS PER 0.30 METER (N)	SYMBOL	DESCRIPTION OF MATERIALS
0.0					Ground Surface
					ASPHALT PAVEMENT
					FILL (base and subbase)
-1.00					SANDSTONE : (Torrey Sandstone Fm.)
	1	SPT	>50		Brown, moist to damp, laminated, micaceous, locally rusty, with lumps/lenses/layers of gray firm Siltstone, traces of fine gravel.
-2.00					
-3.00	2	SPT	>50		
-4.00					- at 4.5 m : cave-in occured



CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration Index (Blows/Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

LEGEND OF EARTH MATERIALS

CLAY, FILL, SAND, GRAVEL, SANDY CLAY, CLAYEY SAND, SANDY SILT, SILTY SAND, SILTY CLAY, CLAYEY SILT, ASPHALT PAVEMENT, SILTSTONE, SILT, BEDROCK

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

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DEPARTMENT OF TRANSPORTATION

ORIGINAL SCALE IS IN INCHES FOR REDUCED PLANS 0 1 2 3

BRIDGE NO.
POST MILE

BORING: 569-B4 R-97

LOG OF TEST BORINGS (of)

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

CU 11275 EA 0301U1

USERNAME => trmikesl
DGN FILE => b0301uq97.dgn

PLOTTED => 10-SEP-2001
PLOTTED => 06:37

FORM DC-OE-92-PF (REV. 3/88)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	5, 56, 805	Var	761	1549

CERTIFIED ENGINEERING GEOLOGIST — DATE 04-23-01

REGISTERED GEOLOGIST — JEFF J. TESAR No. 2137 CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

9-3-01
PLANS APPROVAL DATE

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Caltrans Metric

BORING No. : 569-B2

Date Drilled: 08/30/99

Project Name : I-5/805 Retaining Walls

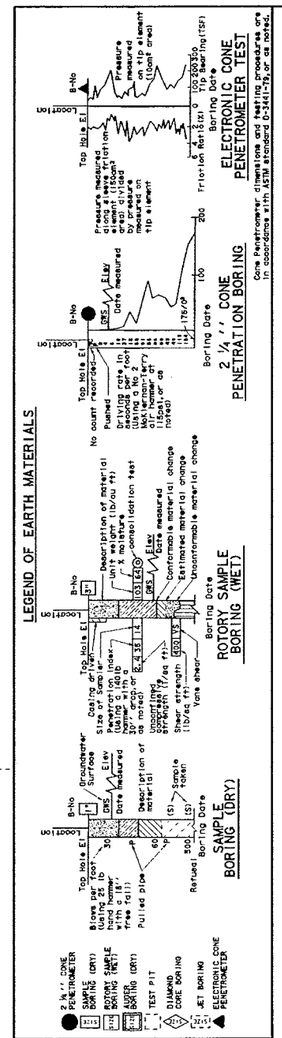
Location : 21L;570+60 "SD" Line

Drilling Method : Mud Rotary

Top of hole elevation : 39.8 m

SAMPLE				PROFILE	
DEPTH M.	NUMBER	TYPE	BLOWS PER 0.30 METER (N)	SYMBOL	DESCRIPTION OF MATERIALS
0.0					Ground Surface
					ASPHALT PAVEMENT
					FILL (base and subbase)
-1.00					SAND (SP)/SANDSTONE : (Torrey Sandstone Fm.) Brown, moist, medium grained, slightly micaceous, traces of fine gravel, very dense.
	1	SPT	>50		
-2.00					
-3.00					
	2	SPT	>50		
-4.00					
	3	SPT	>50		- at 4.5 m : with some coarse grained sand

LEGEND OF EARTH MATERIALS



CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration test

Penetration index (Blows/ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

LEGEND OF EARTH MATERIALS

CLAY — CLAYEY SILT
FILL — ASPHALT PAVEMENT
SAND — SILTSTONE
GRAVEL — SILT
SANDY CLAY / CLAYEY SAND — BEDROCK
SANDY SILT / SILTY SAND
SILTY CLAY

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

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BRIDGE NO.
POST MILE

BORING: 569-B2 R-95

LOG OF TEST BORINGS (of)

ORIGINAL SCALE IS IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

CU 11275 EA 0301U1

USERNAME => trmikesl
DGN FILE => b0301uq95.dgn

PLOTTED => 10-SEP-2001
PLOTTED => 06:37

FORM DC-OE-92-PF (REV. 3/88)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5, 56, 805	Var	785	1549

CERTIFIED ENGINEERING GEOLOGIST DATE 04-23-01

REGISTERED GEOLOGIST JEFF J. TESAR No. 2137 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

9-03-01
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Caltrans Metric

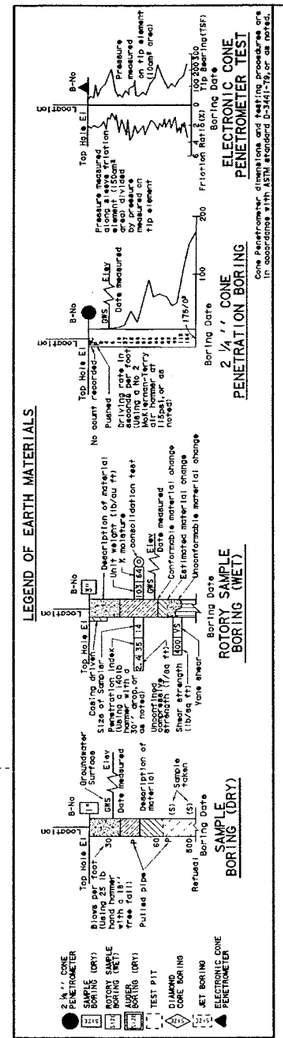
BORING No. : 569-B6

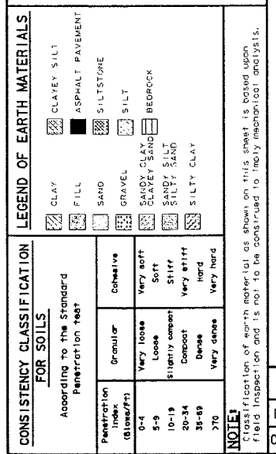
Date Drilled: 02/09/2001
Project Name : I-5/805 Retaining Walls
Location : 23L; 567+30 "SD" Line
Drilling Method : Flight Auger

Top of hole elevation : 29.8 m

SAMPLE				PROFILE	
DEPTH M	NUMBER	TYPE	BLOWS PER 0.30 METER (N)	SYMBOL	DESCRIPTION OF MATERIALS
0.0					Ground Surface
					ASPHALT PAVEMENT
					FILL (base and subbase)
-1.00	1	SPT	30		FILL: Sand (SP): Brown, moist, medium dense, medium grained.
-2.00	2	SPT	25		BAY POINT FORMATION: Sand (SP): Light brown, moist, loose, medium grained, traces of fine gravel.
-3.00	3	SPT	10		-at 2.7 m: Grades to medium to coarse grained.
-4.00	4	SPT	10		
-5.00	5	SPT	12		- at 4.6 m: Grades to medium dense
-6.00	6	SPT	11		

No water encountered





CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration test

Penetration Index (Blows/Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

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ORIGINAL SCALE IS IN INCHES FOR REDUCED PLANS 0 1 2 3

BRIDGE NO.
POST MILE

BORING: 569-B6 **R-119**

LOG OF TEST BORINGS (of)

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

CU 11275 EA 0301U1

DATE PLOTTED => 10-SEP-2001
TIME PLOTTED => 07:28

USERNAME => trmnguye
DGN FILE => b0301uqb9.dgn

FORM DC-OE-92-PF (REV. 3/88)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5,56, 805	Var	783	1549

CERTIFIED ENGINEERING GEOLOGIST DATE 04-23-01

REGISTERED GEOLOGIST JEFF J. TESAR No. 2137 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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Caltrans Metric

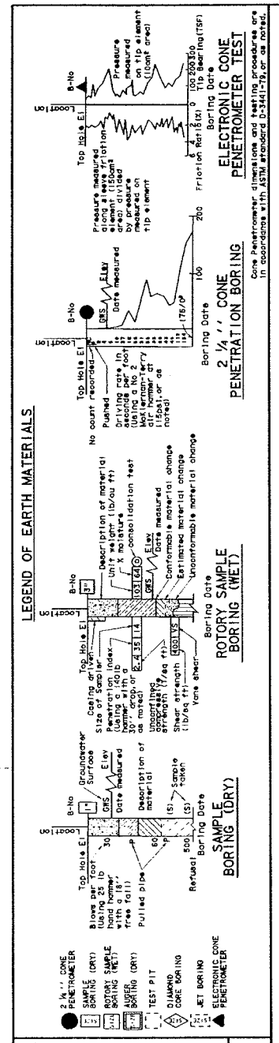
BORING No. : 565-B1

Date Drilled: 02/09/2001
Project Name : I-5/805 Retaining Walls
Location : 36L;566+02 "SD" Line
Drilling Method : Flight Auger

Top of hole elevation : 26.40 m

SAMPLE				PROFILE	
DEPTH M	NUMBER	TYPE	BLOWS PER 0.30 METERS (N)	SYMBOL	DESCRIPTION OF MATERIALS
					Ground Surface
0.0					FILL: SAND (SP): Brown, moist, medium dense, medium to fine grained, locally slightly clayey.
-1.00	1	SPT	14		
-2.00	2	SPT	14		BAY POINT FORMATION: SAND (SP): Brown, moist, medium dense, medium to fine grained.
-3.00	3	SPT	14		
-4.00					- at 3.7 m: Grades to fine grained and light brown in color
-5.00	4	SPT	16		
-6.00	5	SPT	15		

No water encountered



CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration test

Penetration Index (Blows/ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

LEGEND OF EARTH MATERIALS
CLAY, FILL, SAND, GRAVEL, SANDY CLAY, SANDY SILT, SILTY CLAY, CLAYEY SILT, ASPHALT PAVEMENT, SILTSTONE, SILT, BEDROCK

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

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BRIDGE NO.
POST MILE

BORING:569A-B1 R-117

LOG OF TEST BORINGS (of)

ORIGINAL SCALE IS IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

CU 11275 EA 0301U1

FORM DC-OE-92-PF (REV. 3/88)

USERNAME => trmnguye
DGN FILE => b0301uqb7.dgn

D*** PLOTTED => 10-SEP-2001
%LOTTED => 07:28

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	5, 56, 805	Var	784	1549

CERTIFIED ENGINEERING GEOLOGIST DATE 04-23-01

REGISTERED GEOLOGIST JEFF J. TESAR No. 2137 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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Caltrans Metric

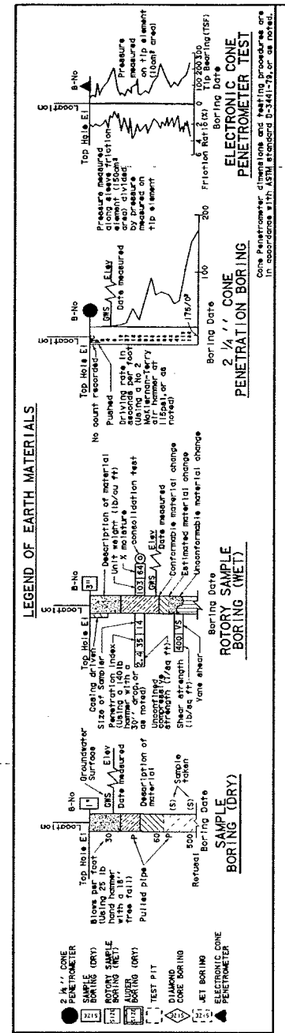
BORING No. : 565-B2

Date Drilled: 02/09/2001
Project Name : I-5/805 Retaining Walls
Location : 44L;564+82 "SD" Line
Drilling Method : Flight Auger

Top of hole elevation : 22.30 m

SAMPLE				PROFILE	
DEPTH M	NUMBER	TYPE	BLOWS PER 0.30 METER (N)	SYMBOL	DESCRIPTION OF MATERIALS
0.0					Ground Surface
					FILL: Disturbed Native Soils of the BAY POINT FORMATION - SAND (SP): Brown, moist, very loose, medium to fine grained.
-1.00	1	SPT	3		
					at 1.5 m: Grades to loose
-2.00	2	SPT	5		
-3.00					BAY POINT FORMATION: Sand (SP): Light brown, moist, loose, medium to fine grained
	3	SPT	7		
-4.00					-at 3.4 m: Locally clayey bands, presence of shells
	4	SPT	7		
-5.00					
-6.00					- at 6.0 m: Grades to medium dense
	5	SPT	13		

No water encountered



CONSISTENCY CLASSIFICATION FOR SOILS
According to the Standard Penetration Test

Penetration Resistance (Blows/Ft)	Granular	Cohesive
0-4	Very loose	Very soft
5-9	Loose	Soft
10-19	Slightly compact	Stiff
20-34	Compact	Very stiff
35-69	Dense	Hard
>70	Very dense	Very hard

LEGEND OF EARTH MATERIALS: CLAY, CLAYEY SILT, FILL, ASPHALT PAVEMENT, SAND, SILTSTONE, GRAVEL, SILT, SANDY CLAY, CLAYEY SAND, BEDROCK, SANDY SILT, SILTY SAND, SILTY CLAY

NOTE: Classification of earth material as shown on this sheet is based upon visual inspection and is not to be construed to imply mechanical analysis.

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ORIGINAL SCALE IS IN INCHES FOR REDUCED PLANS 0 1 2 3

BRIDGE NO
POST MILE

BORING: 565-B2 R-118

LOG OF TEST BORINGS (of)

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY) SHEET OF

CU 11275 EA 0301U1

DATE PLOTTED => 10-SEP-2001
TIME PLOTTED => 07:28

FORM DC-OE-92-PF (REV. 3/88)

USERNAME => trmnguye
DGN FILE => b0301uqb8.dgn

APPENDIX C

Location Plans for Previous Borings

LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST
- ROTARY SAMPLE BORING (L.A.)
- ELECTRONIC CONE PENETROMETER TEST (L.A.)

56 BRIDGE BORING LOCATIONS FROM LOG INFO - 1992

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

I-5 / I-805 RW BORING LOCATIONS FROM LOG INFO - 2001

- MUD ROTARY SAMPLE BORING (WET)
- FLIGHT AUGER SAMPLE BORING (DRY)

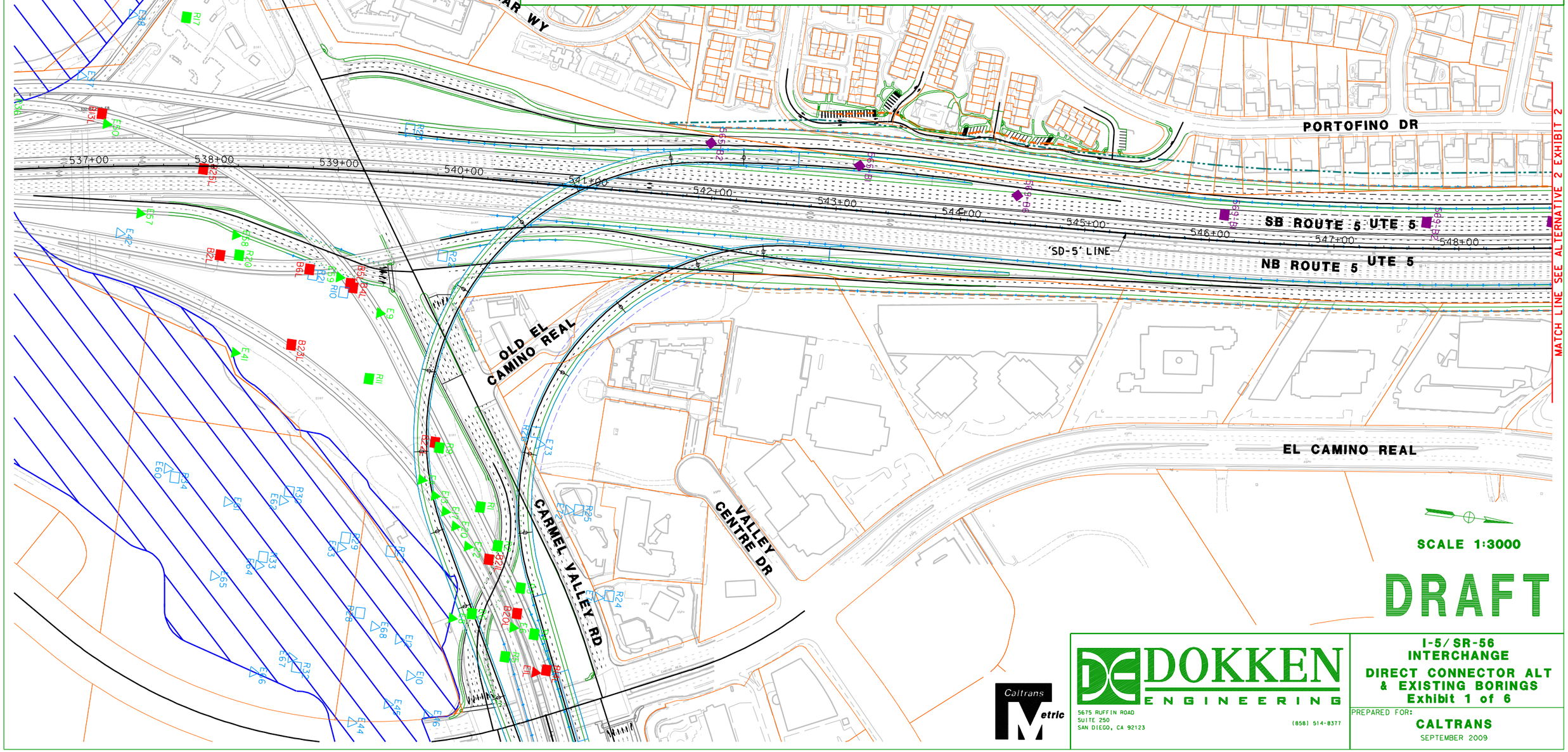
SR-56 BORING LOCATIONS FROM LOG INFO - 1999

- TEST PIT (TP) SAMPLE BORING
- BUCKET AUGER (BA) SAMPLE BORING

DEL MAR HEIGHTS RD BORING LOCATIONS FROM LOG INFO - 1986

- ROTARY SAMPLE BORING

- EXISTING FEATURES
- PROPOSED CENTERLINE
- PROPOSED PAVEMENT DELINEATION
- PROPOSED ROADWAY IMPROVEMENTS
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED CONCRETE BARRIER
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED SUBSURFACE EASEMENT
- PROPOSED CONSTRUCTION EASEMENT
- PROPOSED AERIAL EASEMENT



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DOKKEN ENGINEERING

5675 RUFFIN ROAD
SUITE 250
SAN DIEGO, CA 92123

(858) 514-8377

I-5/ SR-56 INTERCHANGE

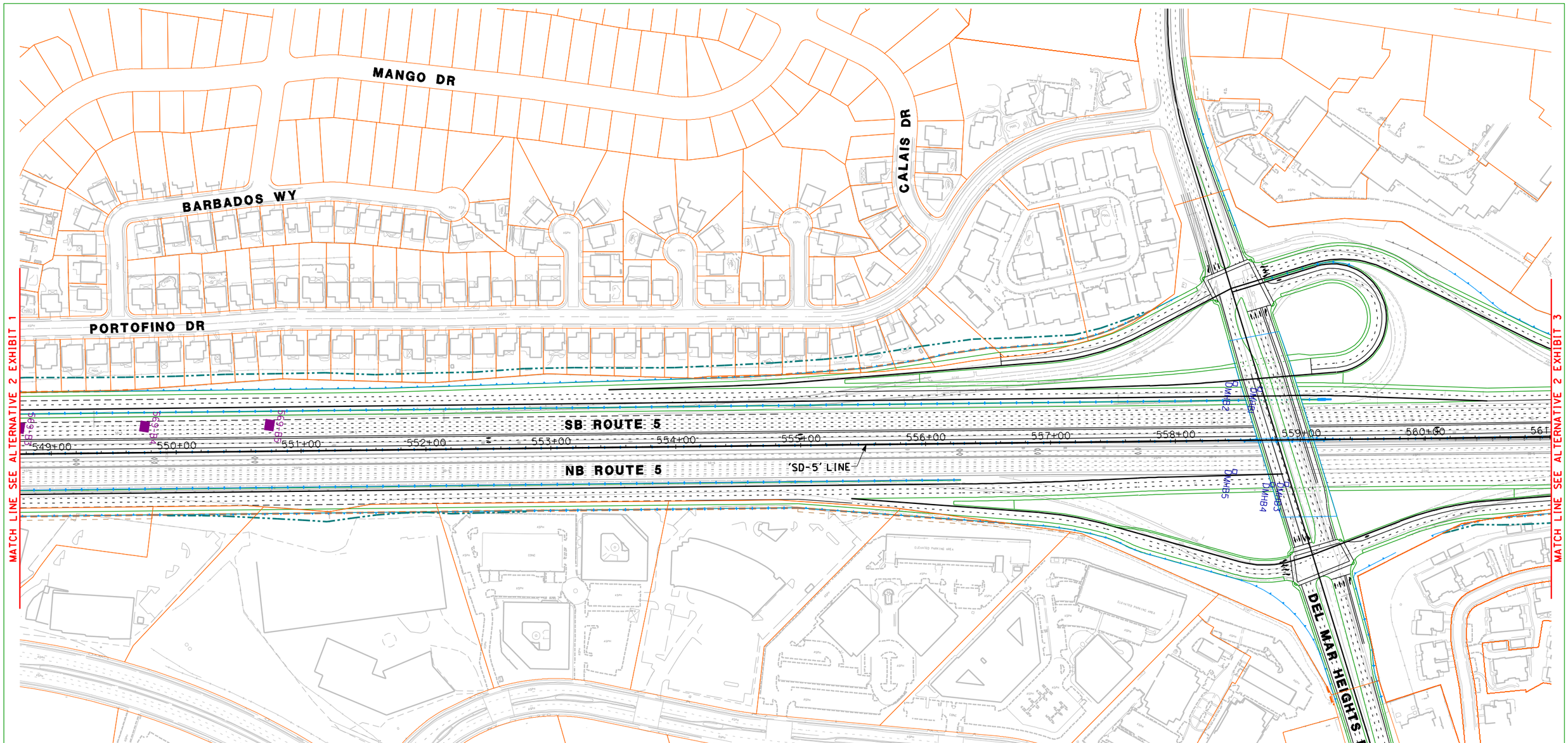
DIRECT CONNECTOR ALT & EXISTING BORINGS

Exhibit 1 of 6

PREPARED FOR:

CALTRANS

SEPTEMBER 2009



LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST
- ROTARY SAMPLE BORING (L.A.)
- ELECTRONIC CONE PENETROMETER TEST (L.A.)

56 BRIDGE BORING LOCATIONS FROM LOG INFO - 1992

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

I-5 / I-805 RW BORING LOCATIONS FROM LOG INFO - 2001

- MUD ROTARY SAMPLE BORING (WET)
- FLIGHT AUGER SAMPLE BORING (DRY)

SR-56 BORING LOCATIONS FROM LOG INFO - 1999

- TEST PIT (TP) SAMPLE BORING
- BUCKET AUGER (BA) SAMPLE BORING

DEL MAR HEIGHTS RD BORING LOCATIONS FROM LOG INFO - 1986

- ROTARY SAMPLE BORING

- EXISTING FEATURES
- PROPOSED CENTERLINE
- PROPOSED PAVEMENT DELINEATION
- PROPOSED ROADWAY IMPROVEMENTS
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED CONCRETE BARRIER
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED SUBSURFACE EASEMENT
- PROPOSED CONSTRUCTION EASEMENT
- PROPOSED AERIAL EASEMENT

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SCALE 1:3000

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I-5/SR-56 INTERCHANGE

DIRECT CONNECTOR ALT & EXISTING BORINGS

Exhibit 2 of 6

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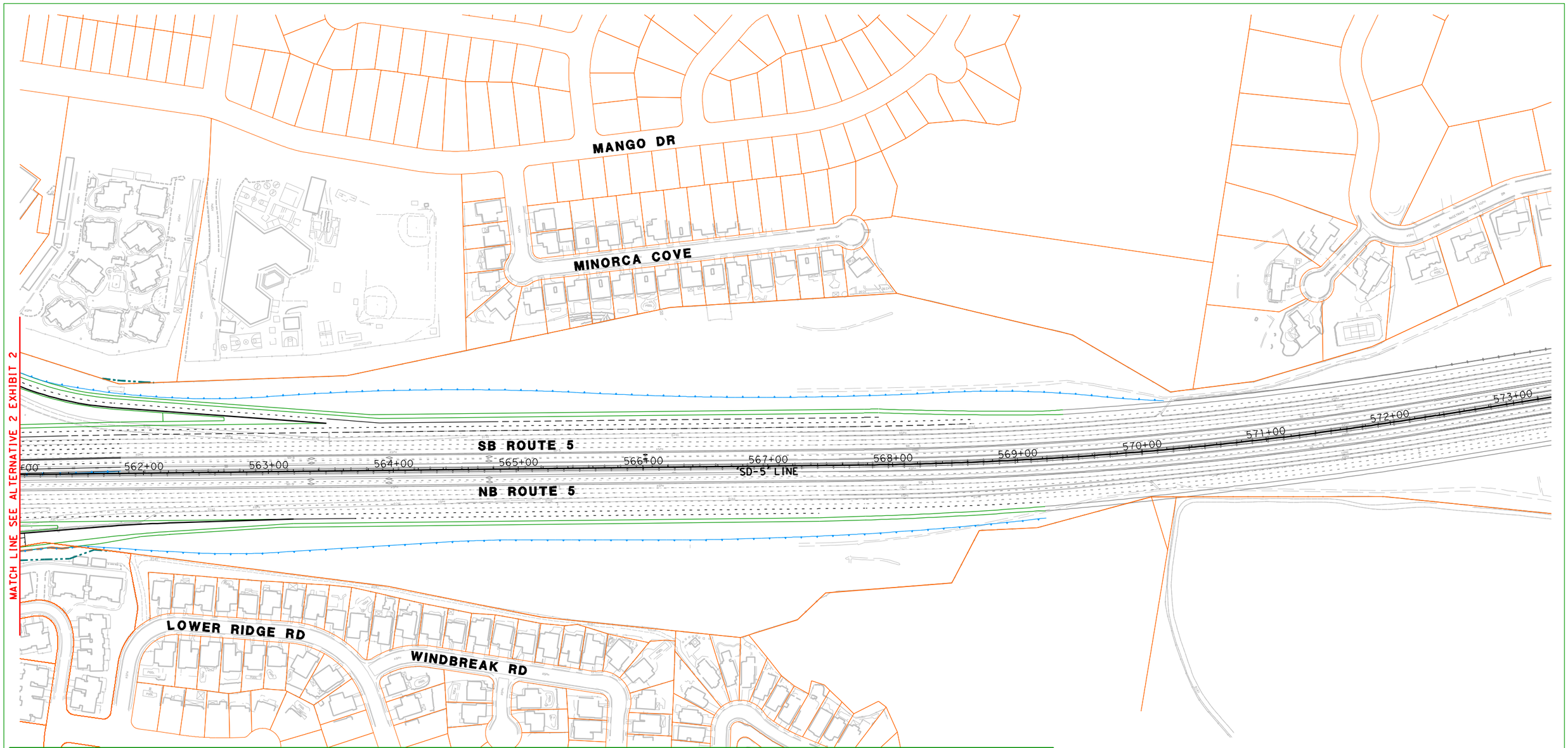

LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST
- ROTARY SAMPLE BORING (L.A.)
- ELECTRONIC CONE PENETROMETER TEST (L.A.)

56 BRIDGE BORING LOCATIONS FROM LOG INFO - 1992

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

I-5 / I-805 RW BORING LOCATIONS FROM LOG INFO - 2001

- MUD ROTARY SAMPLE BORING (WET)
- FLIGHT AUGER SAMPLE BORING (DRY)

SR-56 BORING LOCATIONS FROM LOG INFO - 1999

- TEST PIT (TP) SAMPLE BORING
- BUCKET AUGER (BA) SAMPLE BORING

DEL MAR HEIGHTS RD BORING LOCATIONS FROM LOG INFO - 1986

- ROTARY SAMPLE BORING

- EXISTING FEATURES
- PROPOSED CENTERLINE
- PROPOSED PAVEMENT DELINEATION
- PROPOSED ROADWAY IMPROVEMENTS
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED CONCRETE BARRIER
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED SUBSURFACE EASEMENT
- PROPOSED CONSTRUCTION EASEMENT
- PROPOSED AERIAL EASEMENT

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SCALE 1:3000

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I-5/ SR-56 INTERCHANGE

DIRECT CONNECTOR ALT & EXISTING BORINGS

Exhibit 3 of 6

PREPARED FOR:

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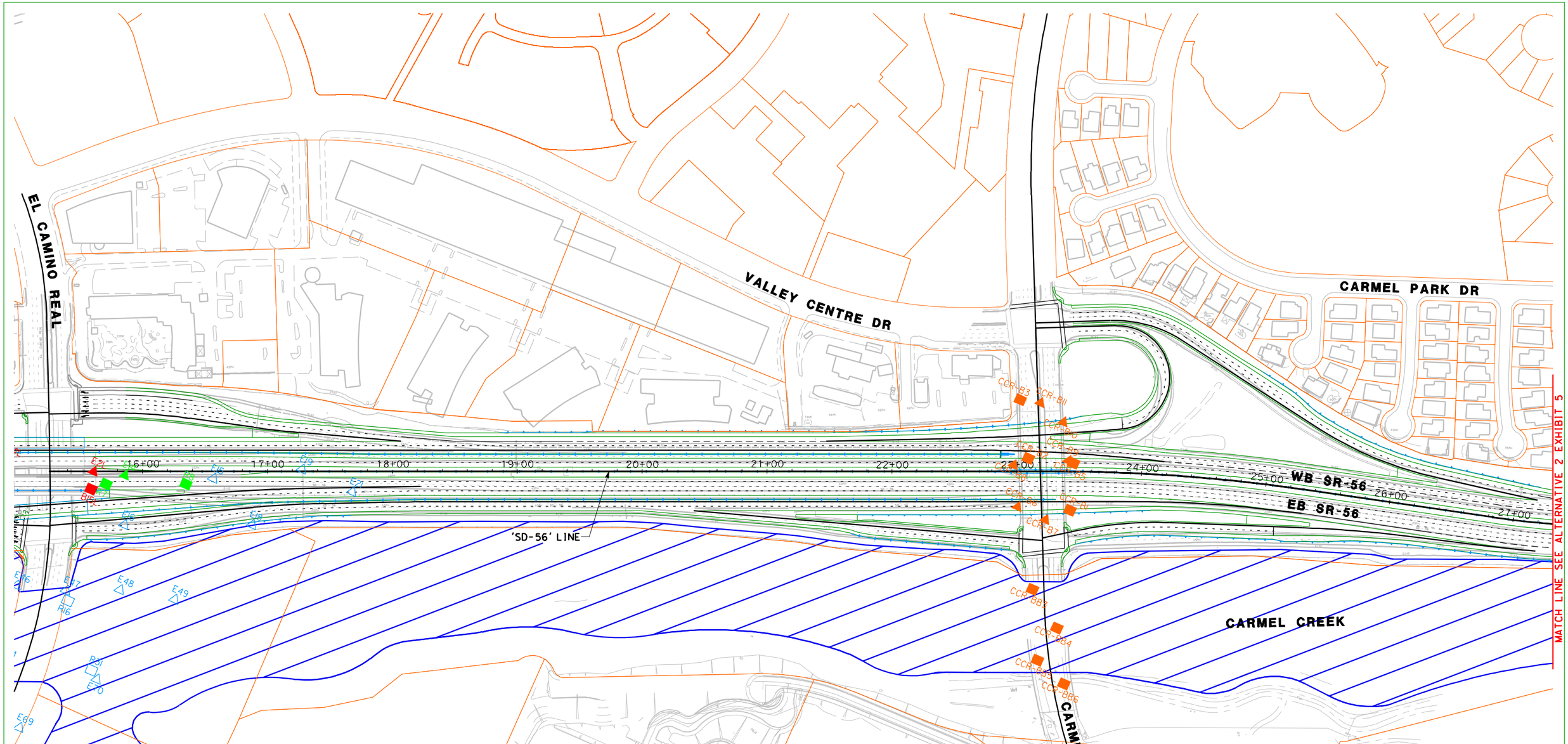
SEPTEMBER 2009



LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST
- ROTARY SAMPLE BORING (L.A.)
- ELECTRONIC CONE PENETROMETER TEST (L.A.)

56 BRIDGE BORING LOCATIONS FROM LOG INFO - 1992

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

I-5 / I-805 RW BORING LOCATIONS FROM LOG INFO - 2001

- MUD ROTARY SAMPLE BORING (WET)
- FLIGHT AUGER SAMPLE BORING (DRY)

SR-56 BORING LOCATIONS FROM LOG INFO - 1999

- TEST PIT (TP) SAMPLE BORING
- BUCKET AUGER (BA) SAMPLE BORING

DEL MAR HEIGHTS RD BORING LOCATIONS FROM LOG INFO - 1986

- ROTARY SAMPLE BORING

- EXISTING FEATURES
- PROPOSED CENTERLINE
- PROPOSED PAVEMENT DELINEATION
- PROPOSED ROADWAY IMPROVEMENTS
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED CONCRETE BARRIER
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED SUBSURFACE EASEMENT
- PROPOSED CONSTRUCTION EASEMENT
- PROPOSED AERIAL EASEMENT

SCALE 1:3000

Caltrans Metric

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SUITE 250
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(858) 514-8377

I-5/ SR-56 INTERCHANGE
DIRECT CONNECTOR ALT & EXISTING BORINGS
Exhibit 4 of 6

PREPARED FOR:
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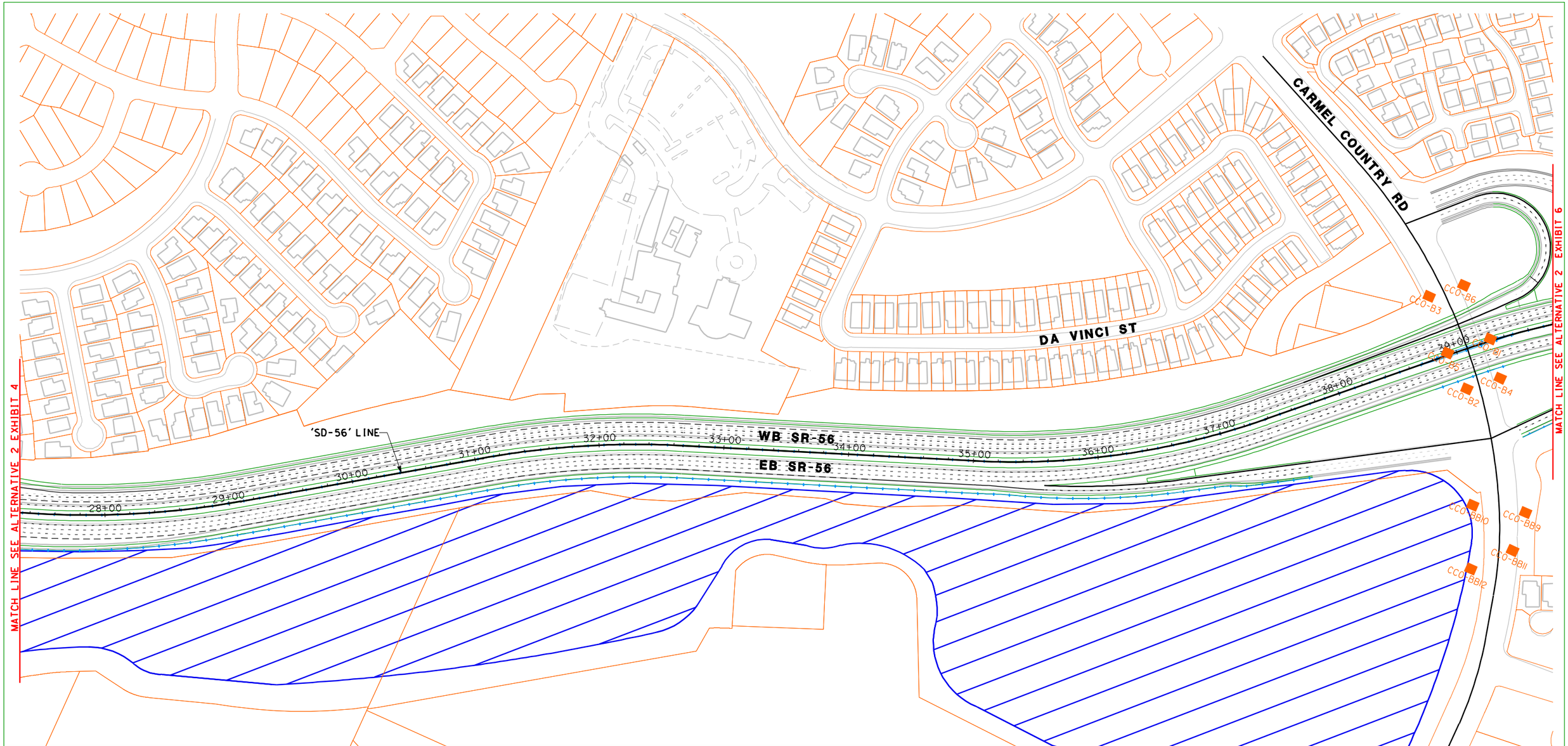
SEPTEMBER 2009



LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST
- ROTARY SAMPLE BORING (L.A.)
- ELECTRONIC CONE PENETROMETER TEST (L.A.)

56 BRIDGE BORING LOCATIONS FROM LOG INFO - 1992

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

I-5 / I-805 RW BORING LOCATIONS FROM LOG INFO - 2001

- MUD ROTARY SAMPLE BORING (WET)
- FLIGHT AUGER SAMPLE BORING (DRY)

SR-56 BORING LOCATIONS FROM LOG INFO - 1999

- TEST PIT (TP) SAMPLE BORING
- BUCKET AUGER (BA) SAMPLE BORING

DEL MAR HEIGHTS RD BORING LOCATIONS FROM LOG INFO - 1986

- ROTARY SAMPLE BORING

- EXISTING FEATURES
- PROPOSED CENTERLINE
- PROPOSED PAVEMENT DELINEATION
- PROPOSED ROADWAY IMPROVEMENTS
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED CONCRETE BARRIER
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED SUBSURFACE EASEMENT
- PROPOSED CONSTRUCTION EASEMENT
- PROPOSED AERIAL EASEMENT

Caltrans Metric

SCALE 1:3000

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I-5/ SR-56 INTERCHANGE
DIRECT CONNECTOR ALT & EXISTING BORINGS
Exhibit 5 of 6

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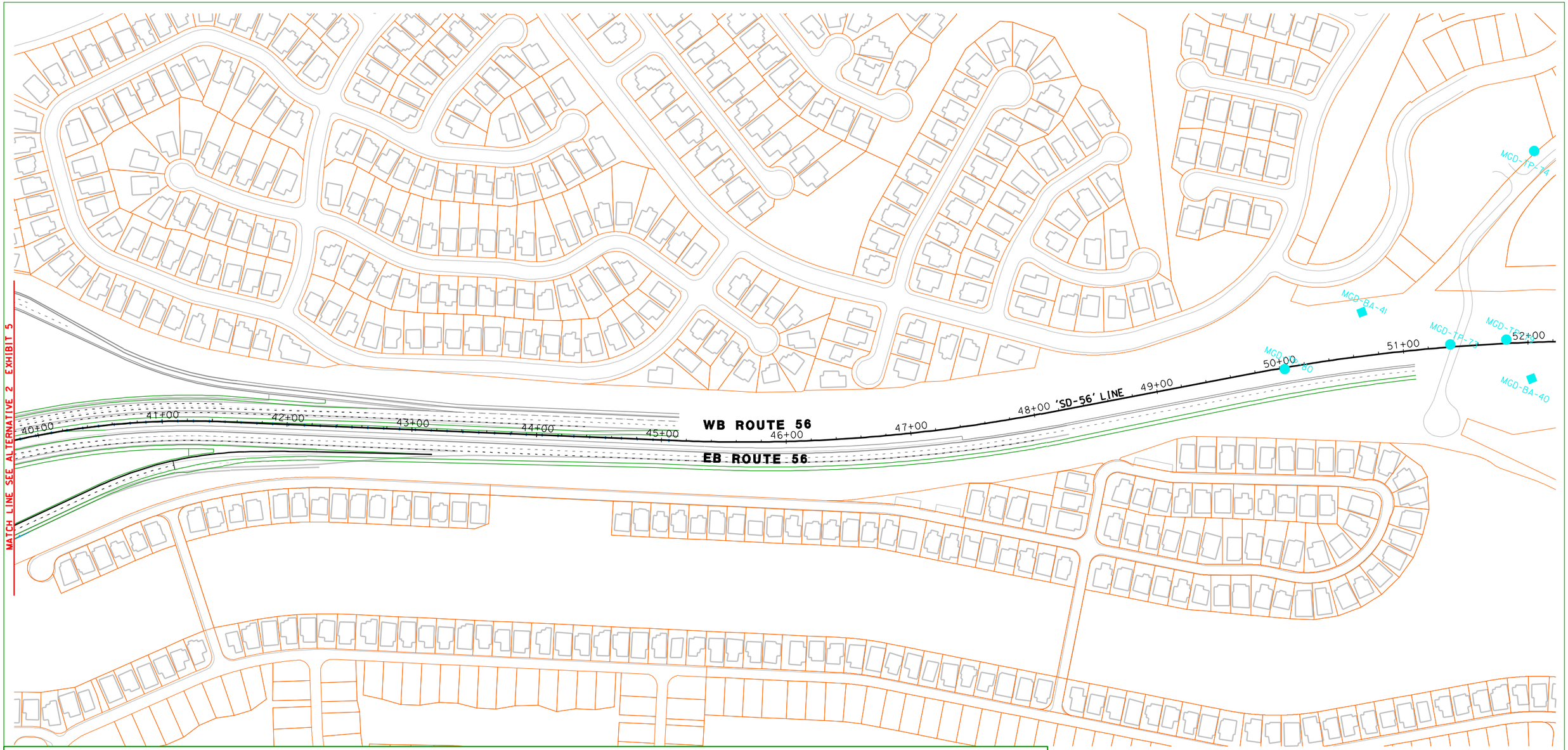

LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

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- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

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56 BRIDGE BORING LOCATIONS FROM LOG INFO - 1992

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I-5 / I-805 RW BORING LOCATIONS FROM LOG INFO - 2001

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I-5/ SR-56 INTERCHANGE
DIRECT CONNECTOR ALT & EXISTING BORINGS
Exhibit 6 of 6

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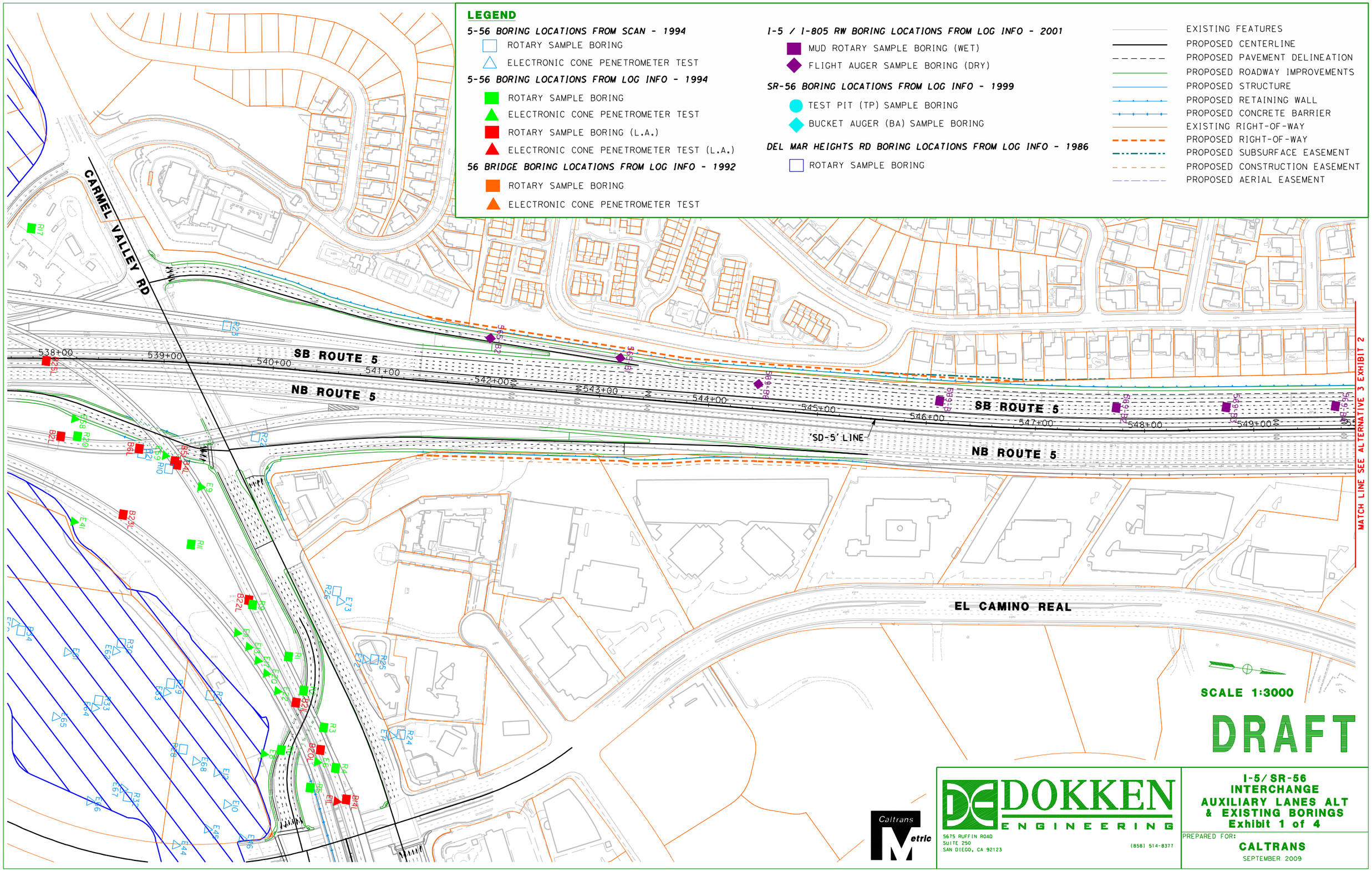
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CARMEL VALLEY RD
SB ROUTE 5
NB ROUTE 5
SB ROUTE 5
NB ROUTE 5
EL CAMINO REAL
'SD-5' LINE
538+00
539+00
540+00
541+00
542+00
543+00
544+00
545+00
546+00
547+00
548+00
549+00
MATCH LINE SEE ALTERNATIVE 3 EXHIBIT 2
SCALE 1:3000
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Caltrans Metric
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AUXILIARY LANES ALT & EXISTING BORINGS
Exhibit 1 of 4
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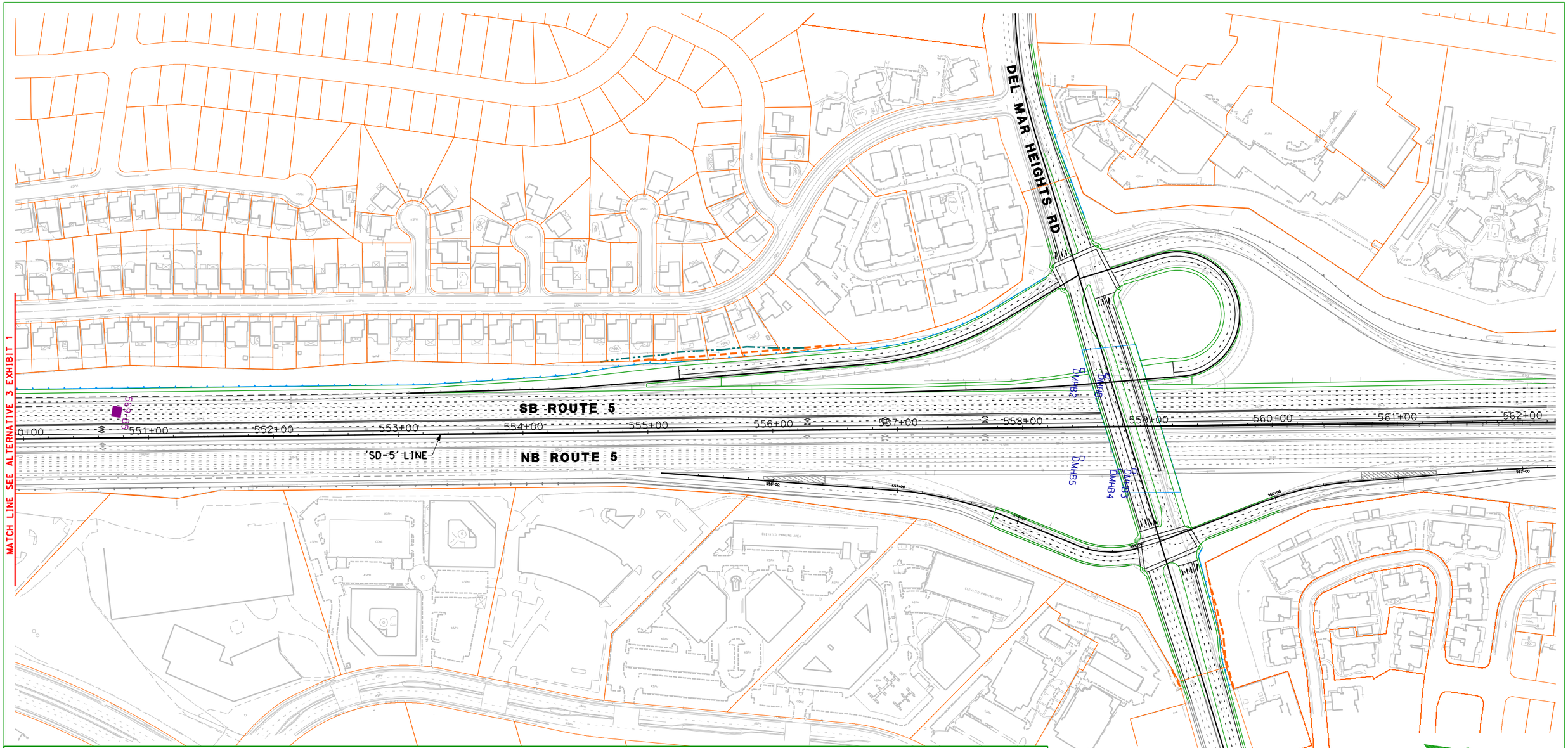

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Exhibit 2 of 4

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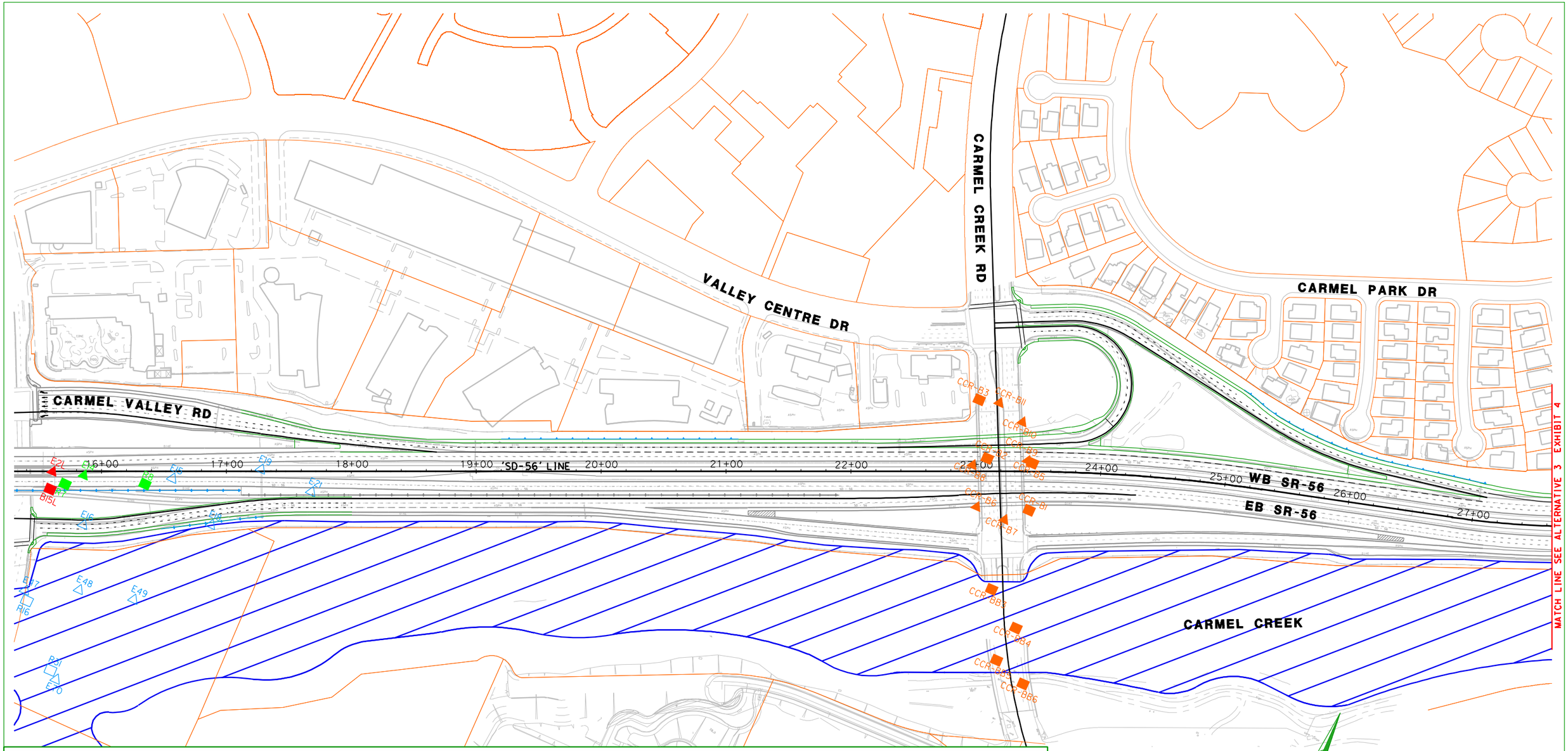

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Caltrans Metric

SCALE 1:3000

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I-5/ SR-56 INTERCHANGE AUXILIARY LANES ALT & EXISTING BORINGS
Exhibit 3 of 4

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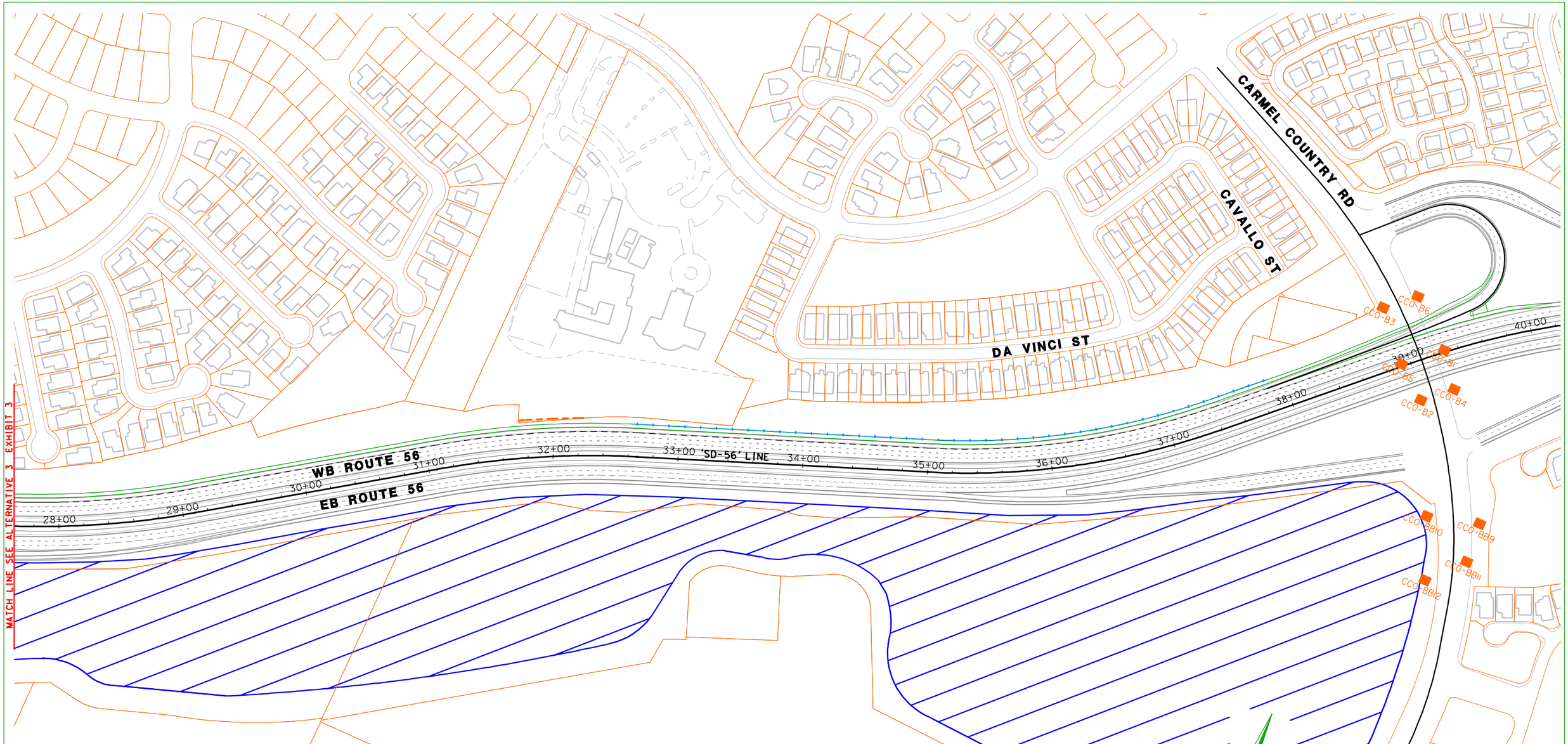

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I-5/ SR-56 INTERCHANGE AUXILIARY LANES ALT & EXISTING BORINGS
Exhibit 4 of 4

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SEPTEMBER 2009

LEGEND

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POINTE DEL MAR WY

PORTOFINO DR

537+00 538+00 539+00 540+00 541+00 542+00 543+00 544+00 545+00 546+00 547+00 548+00

'SD-5' LINE

SB ROUTE 5 UTE 5

NB ROUTE 5 UTE 5

MATCH LINE SEE ALTERNATIVE 4 EXHIBIT 2

OLD EL CAMINO REAL

CARMEL VALLEY RD

VALLEY CENTRE DR

EL CAMINO REAL

SCALE 1:3000

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I-5/ SR-56 INTERCHANGE

HYBRID ALT & EXISTING BORINGS

Exhibit 1 of 6

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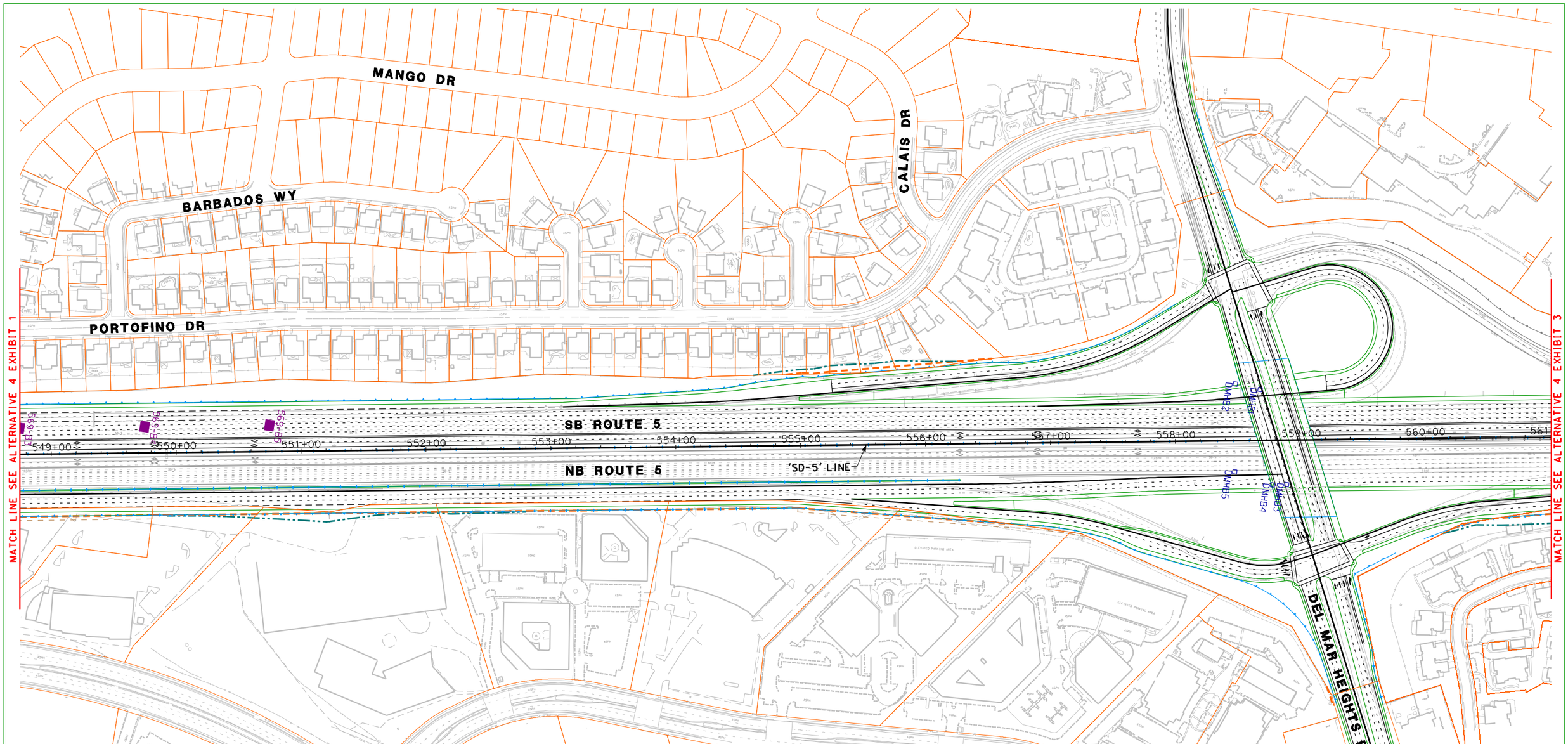

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I-5/SR-56 INTERCHANGE
HYBRID ALT & EXISTING BORINGS
Exhibit 2 of 6

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SEPTEMBER 2009

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I-5/ SR-56 INTERCHANGE
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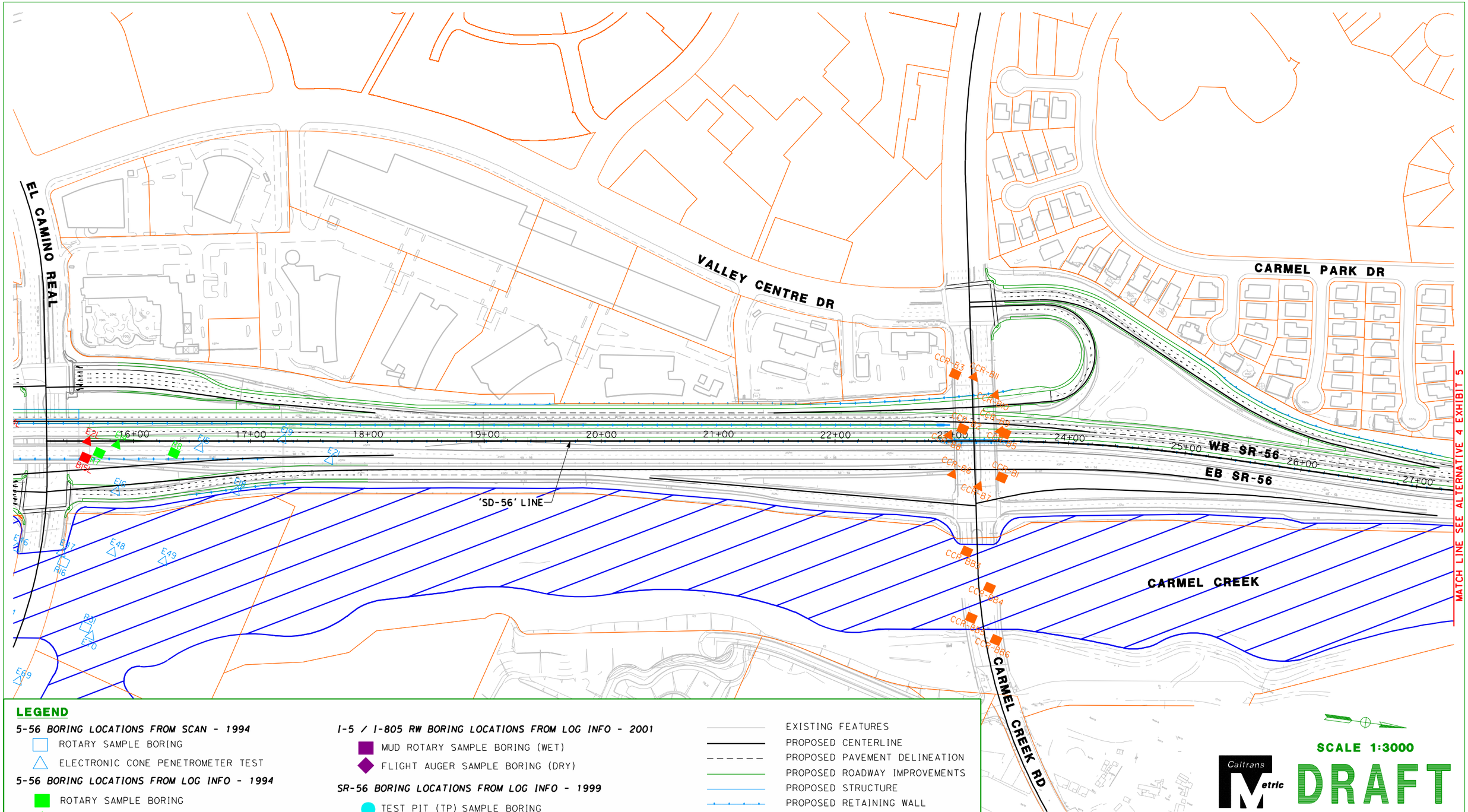

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I-5/ SR-56 INTERCHANGE
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Exhibit 4 of 6

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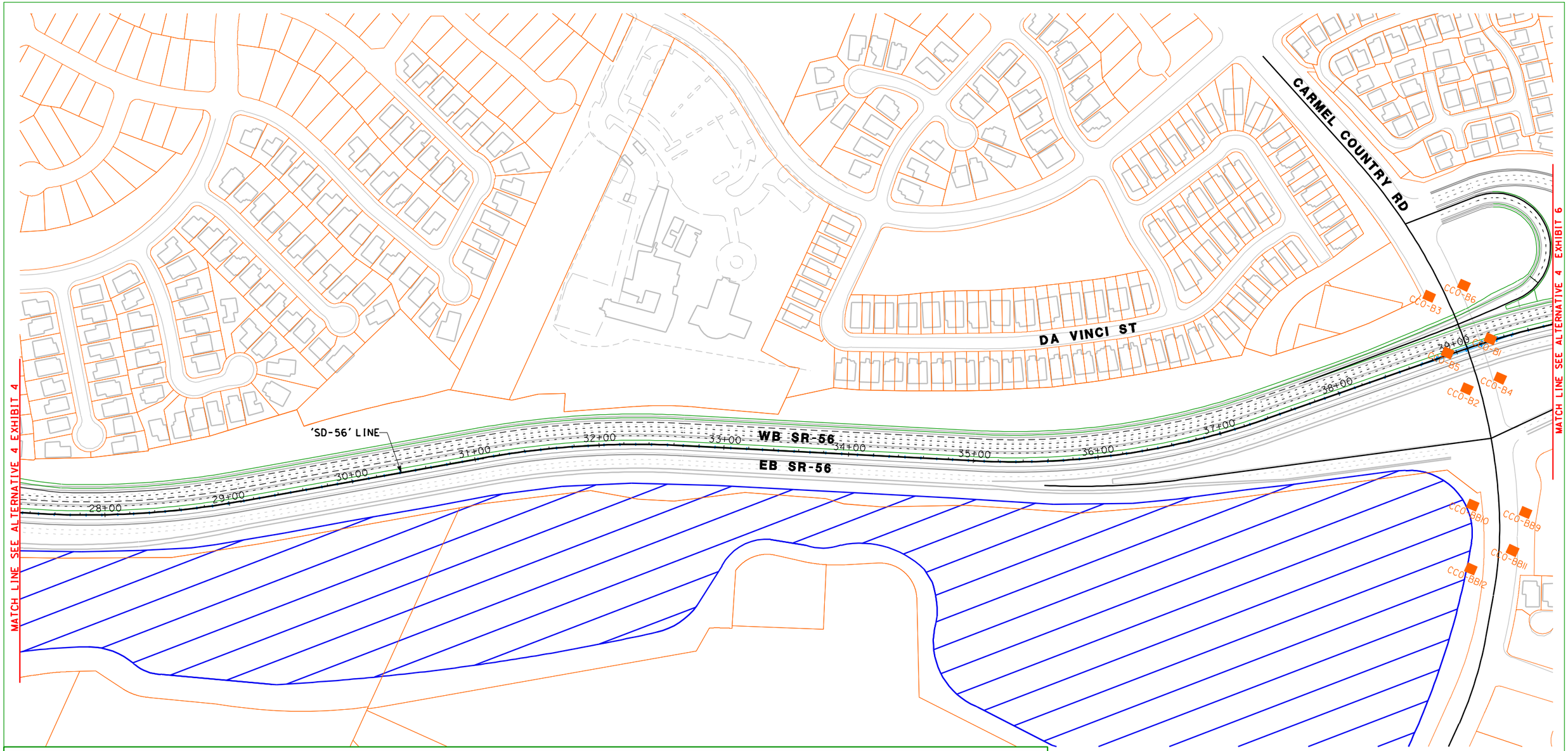

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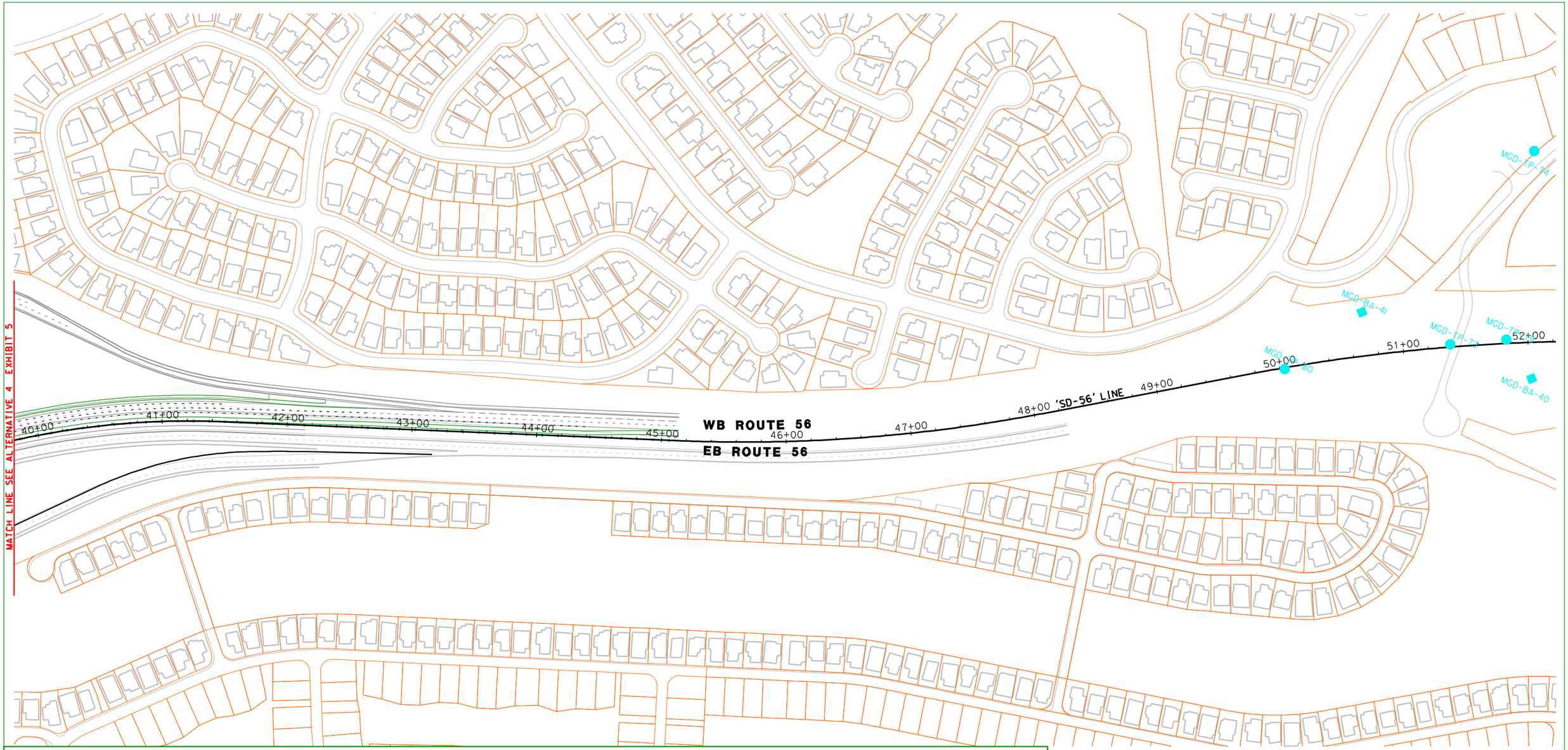

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PORTOFINO DR

SB ROUTE 5

NB ROUTE 5

'SD-5' LINE

537+00 538+00 539+00 540+00 541+00 542+00 543+00 544+00 545+00 546+00 547+00 548+00

OLD EL CAMINO REAL

CARMEL VALLEY RD

VALLEY CENTRE DR

EL CAMINO REAL

MATCH LINE SEE ALTERNATIVE 2 EXHIBIT 2

SCALE 1:3000

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I-5/ SR-56 INTERCHANGE

HYBRID WITH FLYOVER ALT & EXISTING BORINGS

Exhibit 1 of 6

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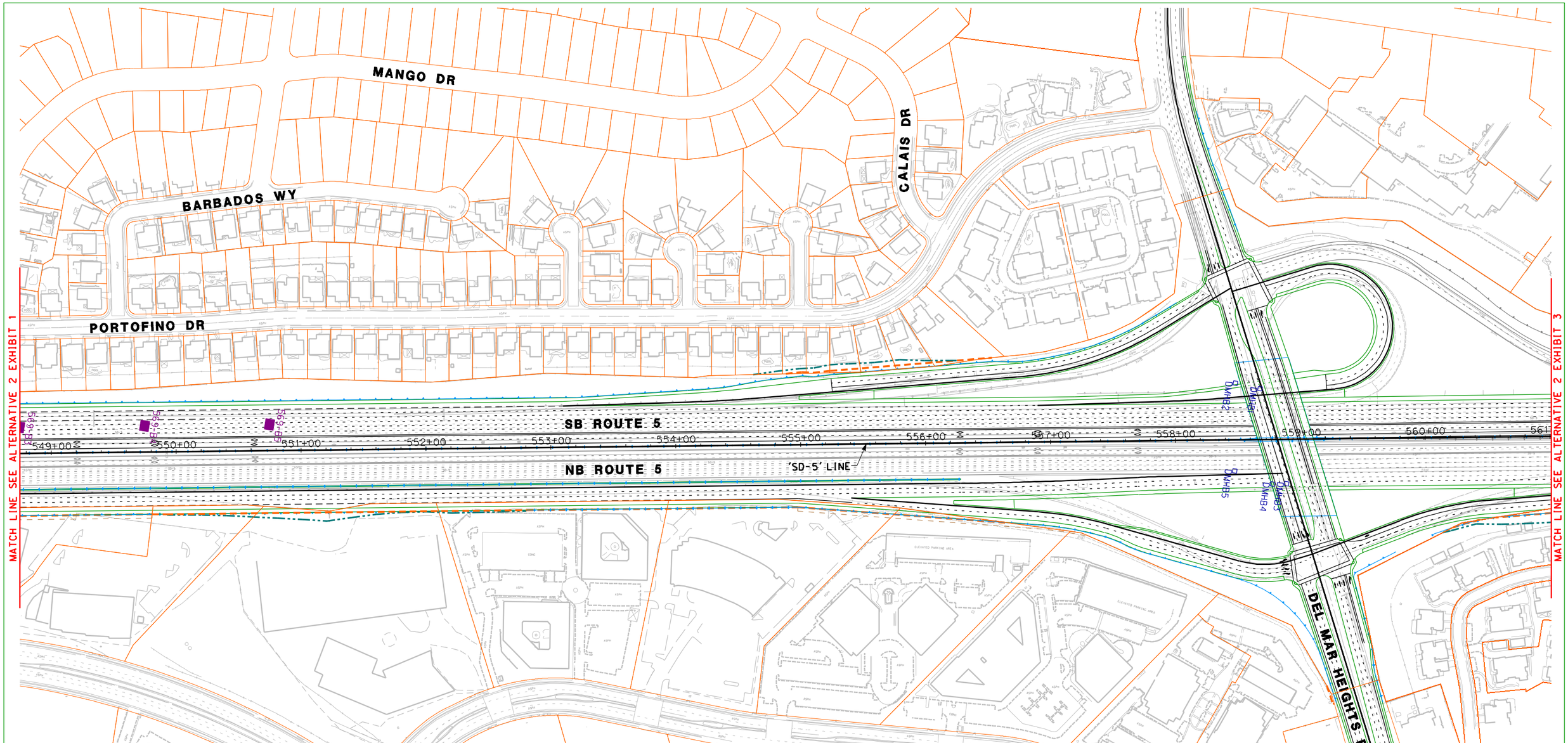
SEPTEMBER 2009



LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST
- ROTARY SAMPLE BORING (L.A.)
- ELECTRONIC CONE PENETROMETER TEST (L.A.)

56 BRIDGE BORING LOCATIONS FROM LOG INFO - 1992

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I-5 / I-805 RW BORING LOCATIONS FROM LOG INFO - 2001

- MUD ROTARY SAMPLE BORING (WET)
- FLIGHT AUGER SAMPLE BORING (DRY)

SR-56 BORING LOCATIONS FROM LOG INFO - 1999

- TEST PIT (TP) SAMPLE BORING
- BUCKET AUGER (BA) SAMPLE BORING

DEL MAR HEIGHTS RD BORING LOCATIONS FROM LOG INFO - 1986

- ROTARY SAMPLE BORING

- EXISTING FEATURES
- PROPOSED CENTERLINE
- PROPOSED PAVEMENT DELINEATION
- PROPOSED ROADWAY IMPROVEMENTS
- PROPOSED STRUCTURE
- PROPOSED RETAINING WALL
- PROPOSED CONCRETE BARRIER
- EXISTING RIGHT-OF-WAY
- PROPOSED RIGHT-OF-WAY
- PROPOSED SUBSURFACE EASEMENT
- PROPOSED CONSTRUCTION EASEMENT
- PROPOSED AERIAL EASEMENT

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I-5/SR-56 INTERCHANGE
HYBRID WITH FLYOVER ALT & EXISTING BORINGS
Exhibit 2 of 6

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LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

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I-5/SR-56 INTERCHANGE
HYBRID WITH FLYOVER ALT & EXISTING BORINGS
Exhibit 3 of 6

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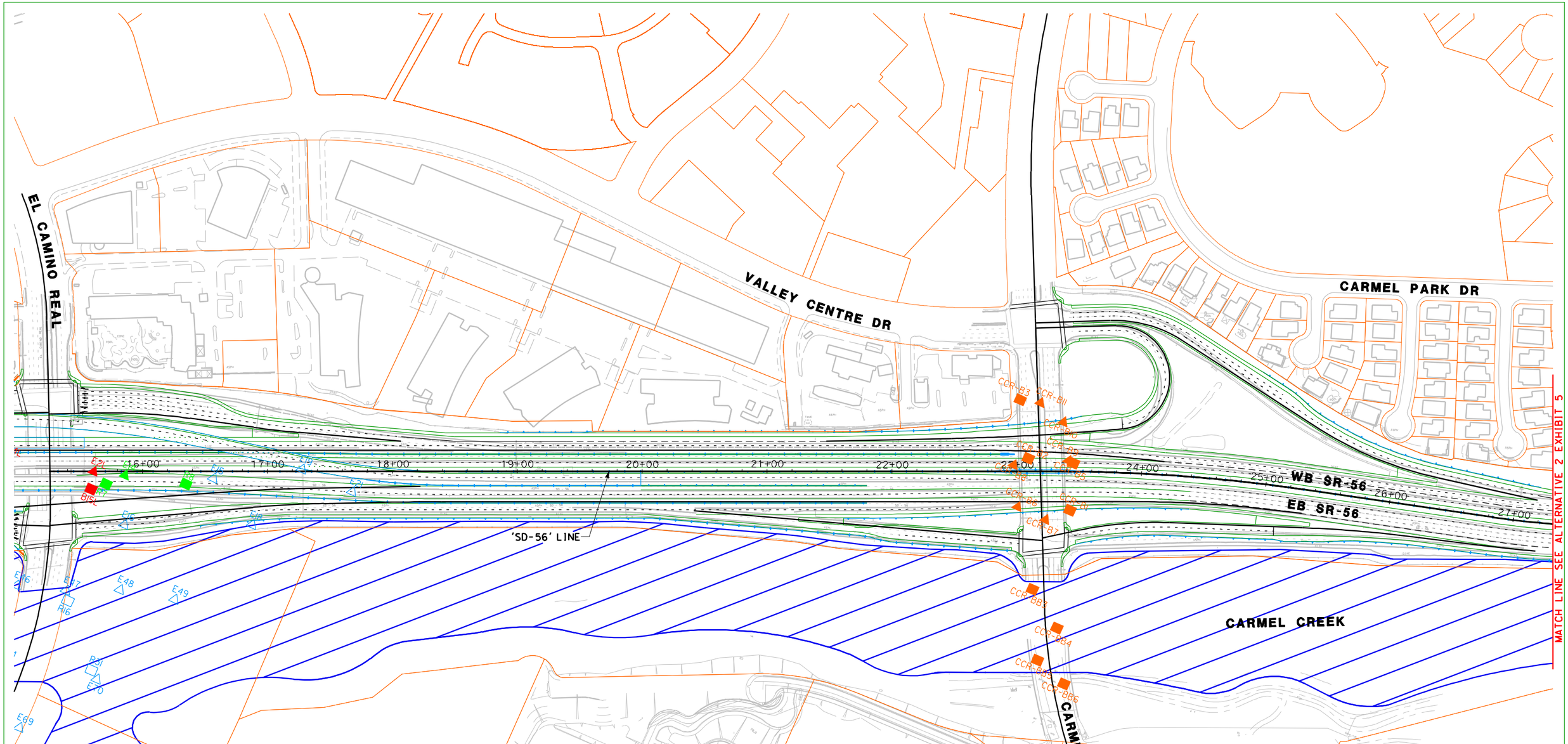

LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

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- ELECTRONIC CONE PENETROMETER TEST
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I-5/ SR-56 INTERCHANGE
HYBRID WITH FLYOVER ALT & EXISTING BORINGS
Exhibit 4 of 6

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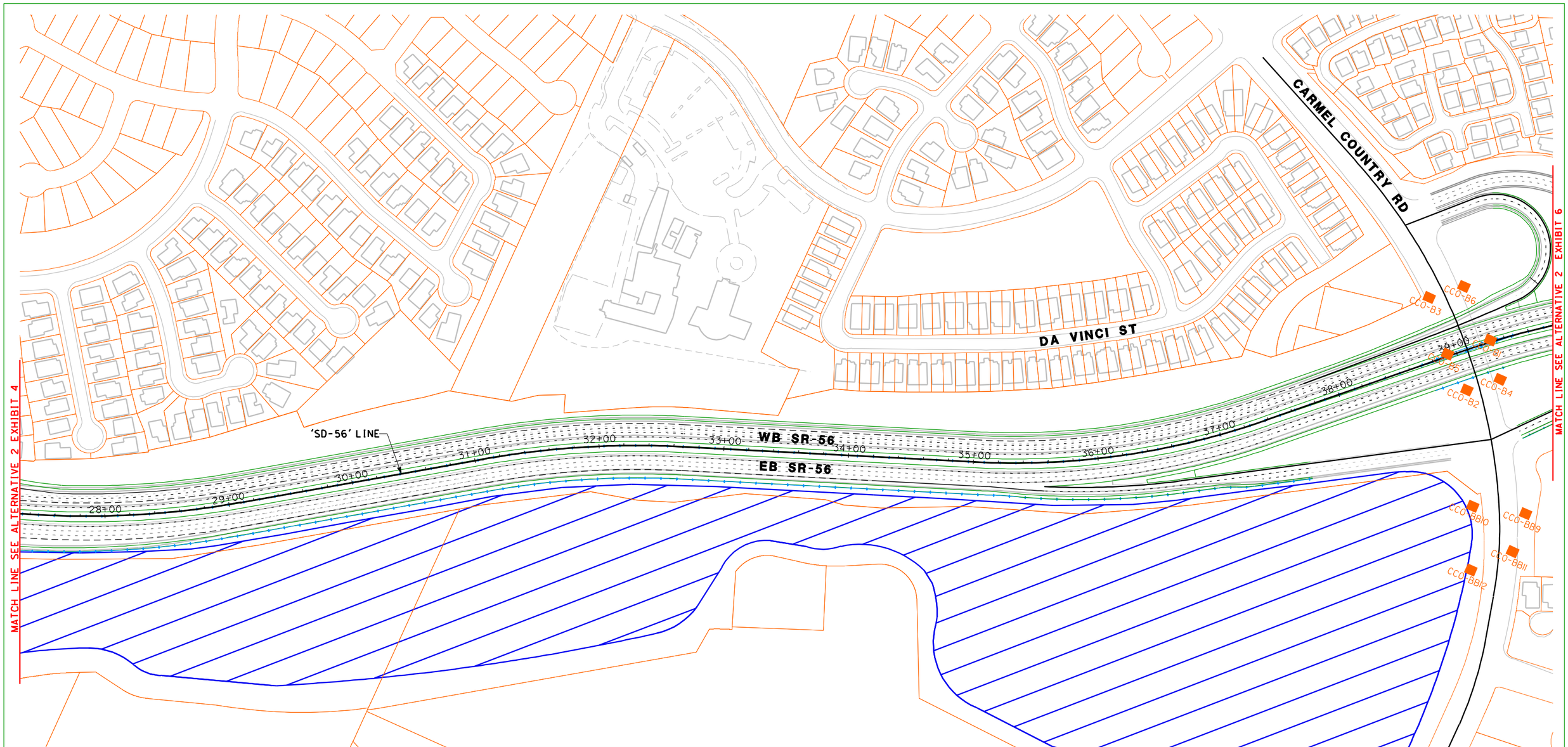

LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

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- ELECTRONIC CONE PENETROMETER TEST
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56 BRIDGE BORING LOCATIONS FROM LOG INFO - 1992

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I-5 / I-805 RW BORING LOCATIONS FROM LOG INFO - 2001

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DEL MAR HEIGHTS RD BORING LOCATIONS FROM LOG INFO - 1986

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I-5/ SR-56 INTERCHANGE
HYBRID WITH FLYOVER ALT & EXISTING BORINGS
Exhibit 5 of 6

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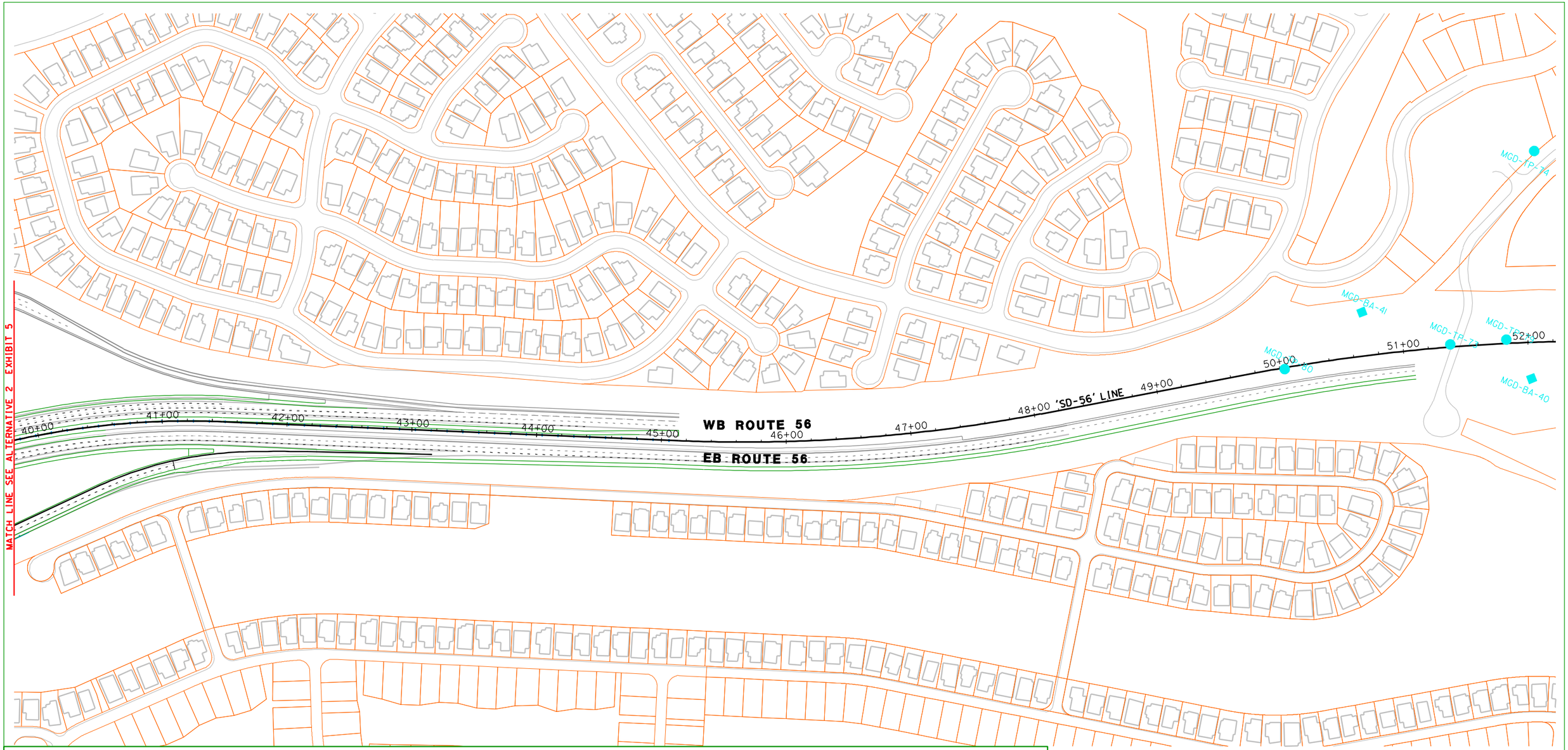

LEGEND

5-56 BORING LOCATIONS FROM SCAN - 1994

- ROTARY SAMPLE BORING
- ELECTRONIC CONE PENETROMETER TEST

5-56 BORING LOCATIONS FROM LOG INFO - 1994

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- ELECTRONIC CONE PENETROMETER TEST
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SR-56 BORING LOCATIONS FROM LOG INFO - 1999

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I-5/ SR-56 INTERCHANGE
HYBRID WITH FLYOVER ALT & EXISTING BORINGS
Exhibit 6 of 6

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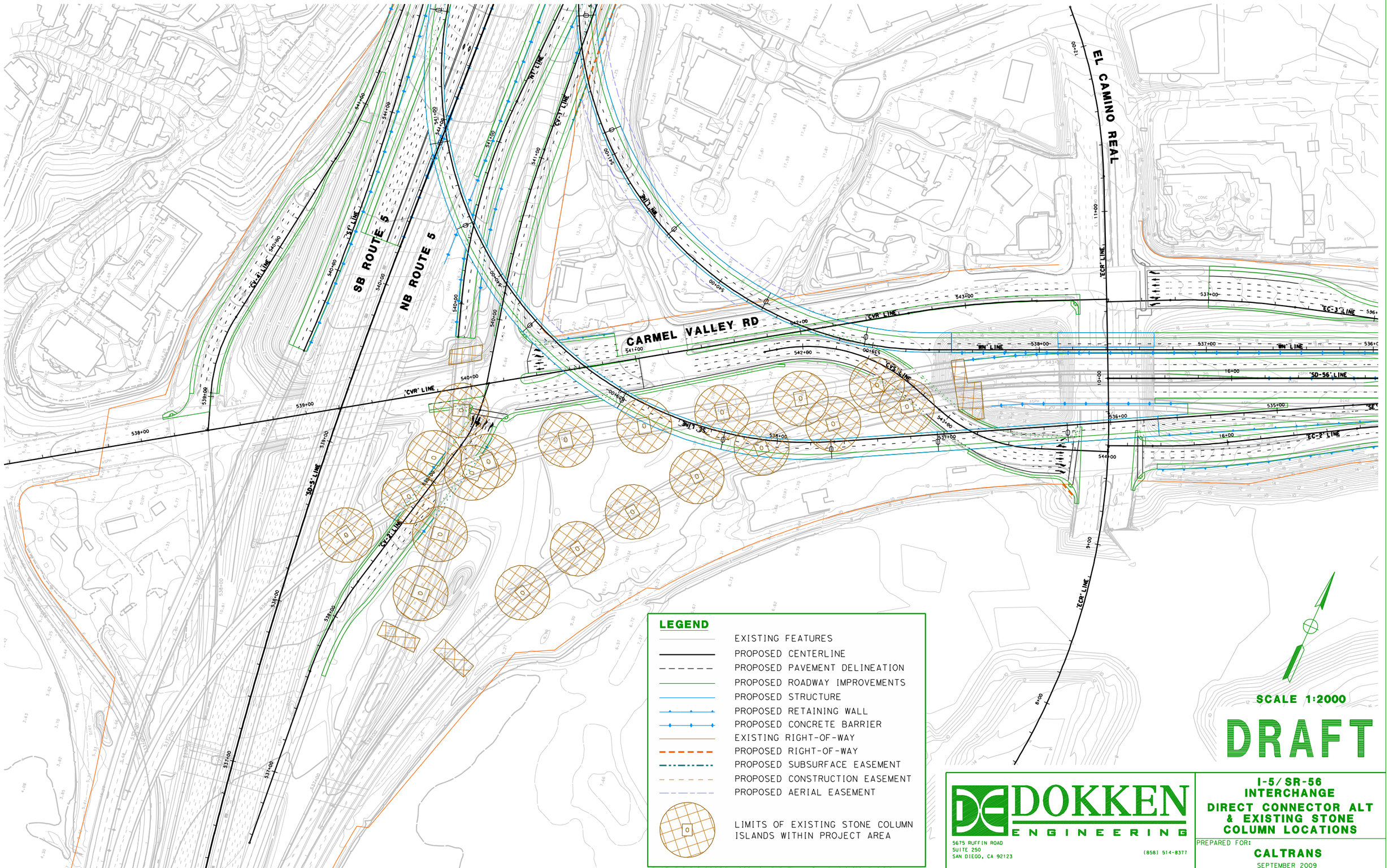
APPENDIX D

Existing Stone Column Locations



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I-5/ SR-56 INTERCHANGE
DIRECT CONNECTOR ALT & EXISTING STONE COLUMN LOCATIONS

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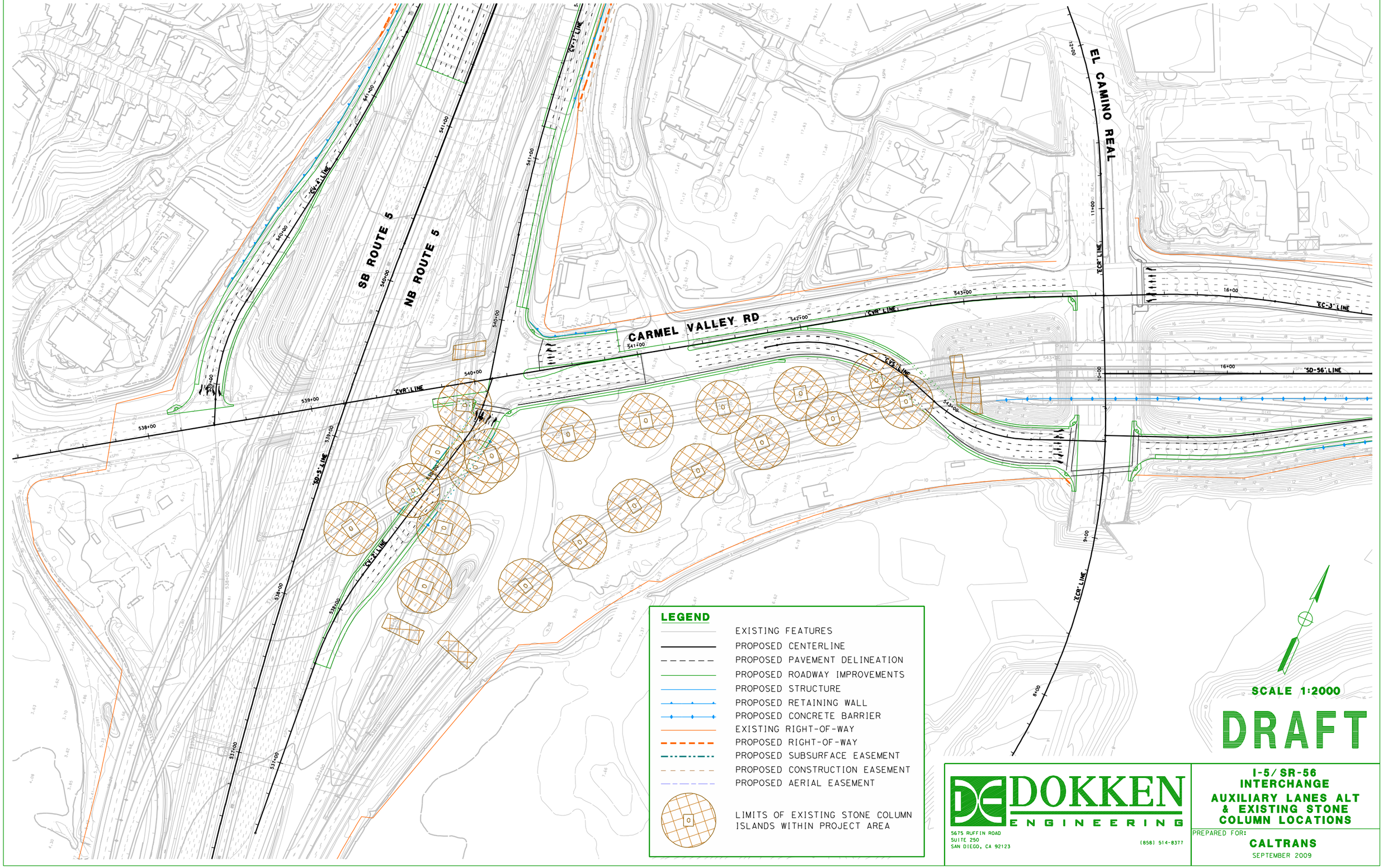

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I-5/SR-56 INTERCHANGE

AUXILIARY LANES ALT & EXISTING STONE COLUMN LOCATIONS

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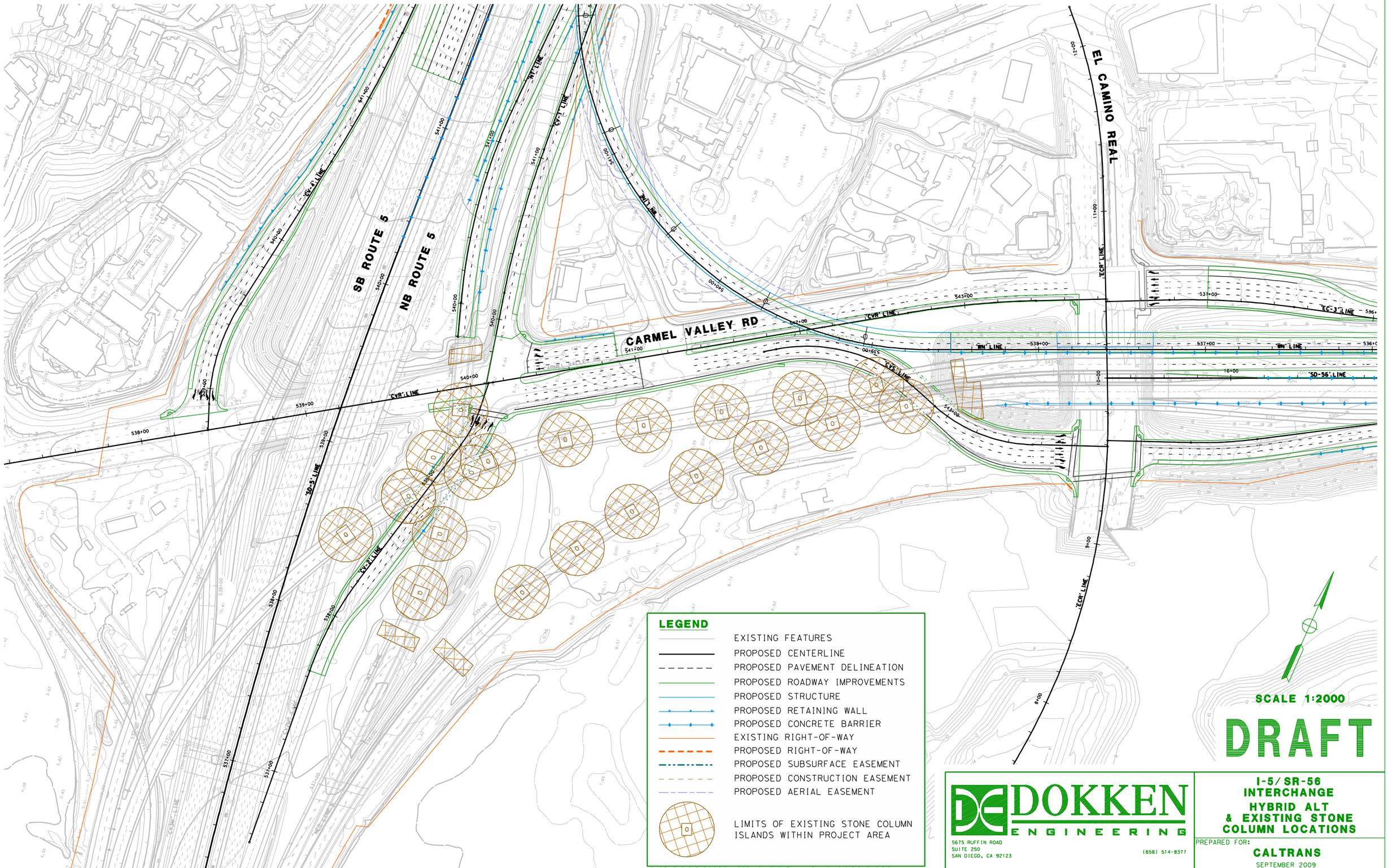

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I-5/SR-56 INTERCHANGE
HYBRID ALT & EXISTING STONE COLUMN LOCATIONS

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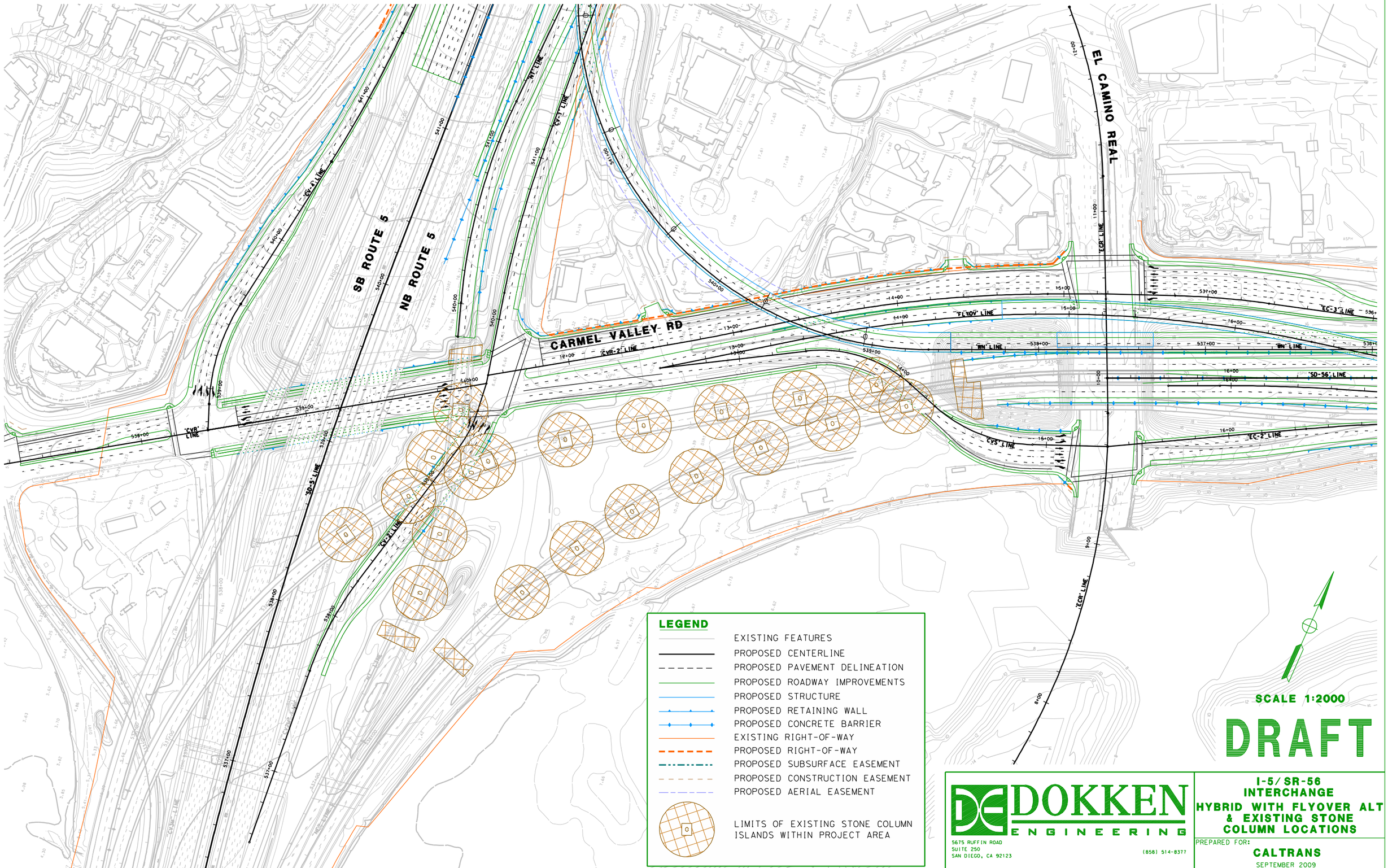

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HYBRID WITH FLYOVER ALT & EXISTING STONE COLUMN LOCATIONS

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