FOR CONTRACT No.: 10-0E6114

INFORMATION HANDOUT

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2. REVISED FINAL FOUNDATION REPORT - LONE TREE SLOUGH SB OFF RAMP BRIDGE, DATED JANUARY 6, 2011

3. REVISED FINAL FOUNDATION REPORT - FRENCH CAMP SLOUGH BRIDGE (WIDEN), DATED JANAURY 6, 2011

4. REVISED FINAL FOUNDATION REPORT - LITTLE JOHN CREEK BRIDGE (WIDEN), DATED JANUARY 6, 2011

5. FINAL HYDROLOGY AND HYDRAULICS REPORT
DATED DECEMBER 15, 2010

PERMITS

6. CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
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7. UNITED STATES ARMY CORPS OF ENGINEERS
404 PERMIT, DATED OCTOBER 5, 2010

8. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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9. CENTRAL VALLEY FLOOD PROTECTION BOARD
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DATED JULY 27, 2011

10. CENTRAL VALLEY FLOOD PROTECTION BOARD
NORTH FORK SOUTH LITTLEJOHNS CREEK
DATED DECEMBER 2, 2011

11. CENTRAL VALLEY FLOOD PROTECTION BOARD
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DATED DECEMBER 2, 2011

AGREEMENTS

12. CALIFORNIA DEPARTMENT OF FISH AND GAME
STREAMBED ALTERNATION AGREEMENT
NOTIFICATION NO. 1600-2010-0130-R2

13. FISH AND WILDLIFE SERVICE BIOLOGICAL OPINION
DATED JANUARY 24, 2005

14. APPENDAGE TO FISH AND WILDLIFE SERVICE BIOLOGICAL OPINION
DATED OCTOBER 7, 2009

REVISED FINAL FOUNDATION REPORT

LONE TREE SLOUGH BRIDGE (WIDEN)

BRIDGE NO. 29-0023
10-SJ-99, PM 11.80
EA: 0E6101; CU: 06421

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File No. 1201.7d
January 6, 2011

Mr. John Klemunes
HDR Engineering, Inc.
1325 J Street, Suite 1300
Sacramento, CA 95814

Subject: **REVISED FINAL FOUNDATION REPORT**
Lone Tree Slough Bridge (Widen), Bridge No. 29-0023
10-SJ-99, PM 11.80, CU: 06241, EA: OE6101
San Joaquin County, California

Dear Mr. Klemunes:

Blackburn Consulting (BCI) prepared this Revised Final Foundation Report for the Lone Tree Slough Bridge (Widen) in San Joaquin County, California. This report supercedes our July 28, 2010 Final Foundation Report for this structure. BCI prepared this report in accordance with our November 15, 2008 Agreement between BCI and HDR Engineering, Inc.

Thank you for the opportunity to be part of your design team. Please call if you have questions or require additional information.

Sincerely;

BLACKBURN CONSULTING

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REVISED FINAL FOUNDATION REPORT
Lone Tree Slough Bridge (Widen), Bridge No. 29-0023
10-SJ-99, PM 11.80, CU: 06241, EA: OE6101
San Joaquin County, California

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1 INTRODUCTION

1.1 PURPOSE

Blackburn Consulting (BCI) prepared this Foundation Report for the Lone Tree Slough Bridge (Widen) on State Route (SR) 99 in San Joaquin County, California. It contains our subsurface findings, conclusions and recommendations for bridge design.

This report is for HDR Engineering, Inc. (HDR), San Joaquin Council of Governments (SJCOG), and California Department of Transportation (Caltrans) to use during bridge design and construction. It shall not be used or relied upon by others, or for different locations or improvements without the written consent of BCI.

1.2 Scope of Services

To prepare this report, BCI:

1. Discussed the project with HDR.
2. Attended the September 10, 2009 Type Selection Meeting with the design team and Caltrans.
3. Reviewed HDR's August 5, 2009 Structure Type Selection Report for the structure.
4. Reviewed "As-Built" plans for the existing bridge structures (29-0023R/L).
5. Reviewed preliminary plans for the structure prepared by HDR.
6. Reviewed published maps and literature related to site geologic and seismic conditions.
7. Observed, logged and sampled two exploratory test borings to depths of about 63 feet (ft.).
8. Reviewed Caltrans comments regarding our April 23, 2010 Draft Foundation Report and prepared responses. See Appendix E for Caltrans comments and BCI responses.
9. Performed engineering analysis and calculations to develop our conclusions and recommendations.

1.3 Site Description

The project site is located along SR 99 about 1,650 ft. north of Turner Station OH in San Joaquin County, California. The approximate site coordinates are 37.8645 degrees north latitude, 121.2189 degrees west longitude. We show the project location on Figure 1 in Appendix A.

At this location, Lone Tree Creek flows northwesterly within an improved channel section about 25 ft. wide. The existing ground surface in the median area north and south of the creek is essentially flat at approximate elevation 32 ft. (NGVD 29). Low channel grade is near elevation 23 ft. (NGVD 29), about 9 ft. below the top of banks. The channel banks below and within the median area between the existing SR 99 structures are concrete lined and slope at about 1.5:1 (horizontal:vertical distance).

The existing left (southbound) and right (northbound) bridge structures were constructed in1955 and consist of 3-span, concrete flat-slab bridges, approximately 38 ft. wide and 63 ft. long. The substructure consists of pile supported abutments and bents. A 35-foot wide median area separates the existing structures. Existing bridge approach fills extend 2-3 ft. above the relatively level original grade outside the creek channel.

1.4 Project Description

A new bridge widening structure will be constructed to close the median gap between the existing left/right bridges for the SR99 median widening project. The median widening structure will consist of a 3-span, concrete flat-slab bridge, approximately 35.3 ft. wide and 68.7 ft. long. The right bridge (northbound) will also be widened on the east side to accommodate a northbound onramp along the "FR2" Line. The onramp widening structure will also consist of a 3-span, concrete flat-slab bridge. It will be approximately 68.7 ft. long and vary from 35.9 ft. wide at Abutment 1 (south) to 29.8 ft. at Abutment 4 (north). Bridge substructure will consist of pile supported abutments and pile bents, similar to existing.

To protect abutment piles from scour, the existing concrete slope paving/cutoff wall will be repaired/rehabilitated within the median. New slope paving will be constructed east of the existing right bridge for the new widen structure.

New approach fill heights will vary from about 2 ft. (median area) to 5 ft. (northbound onramp).

2 SUBSURFACE EXPLORATION

BCI retained Precision Drilling, Inc. to drill and sample four exploratory borings (two for the southbound off-ramp and two for the widening) at the site to characterize the subsurface conditions and obtain samples for laboratory testing. The drillers used a CME 75 truck-mounted rig to drill the borings using 6 and 8-inch O.D. hollow stem auger.

For the Lone Tree Slough Bridge (Widen), we observed, logged and sampled Borings A-09-F1 and A-09-F4 on March 18, 2009 and August 4, 2009 to a maximum depth of approximately 62 ft. (elev.-28.5 ft., NGVD 29). For the Lone Tree Slough SB Off Ramp Bridge, BCI observed, logged and sampled Borings A-09-F2 and A-09-F3 on March 24 and 25, 2009 to a maximum depth of approximately 63 ft. (elev.-33 ft.., NGVD 29). BCI determined boring locations and elevations using topography and elevation data provided by HDR.

The drillers obtained drive samples with a Modified California sampler (equipped with 2.4-inch I.D. brass liners) and a Standard Penetration Test sampler (1.4-inch I.D.). The samplers were driven into the ground with a 140 pound automatic trip hammer falling 30 inches. The N-values shown on the Log of Test Borings in Appendix A are uncorrected "field" values. For the Modified California sampler, BCI multiplied the field N-value by a factor of 0.65 to obtain and approximate SPT N-value.

FHWA's Soil and Foundations Reference Manual, Volume 1 (FHWA NHI-06-088, December 2006) indicates that the hammer energy transfer ratio ranges between 80-100% for automatic trip hammers. To be conservative, BCI assumed a hammer energy transfer ratio of 75% in the absence of recent hammer calibration data.

BCI's project geologist, Mr. Aaron Wood, logged the borings consistent with the Unified Soil Classification System (USCS). BCI retained soil samples recovered with the drive samplers in moisture-proof containers for laboratory testing and reference. BCI also obtained bulk samples from auger drill cuttings and made ground water observations in the borings during and at completion of drilling operations.

We provide the existing Log of Test Borings for the original bridge in Appendix A.

3 LABORATORY TESTING

BCI completed the following laboratory tests on representative soil samples obtained from the exploratory borings:

- Moisture Content - Dry Density
- Unconfined Compressive Strength
- Undrained-Unconsolidated Triaxial Compression
- Consolidation
- Grain Size Analysis
- Atterberg Limits
- Sulfate/Chloride Content
- pH/Minimum Resistivity

BCI performed laboratory tests in conformance with current ASTM and Caltrans test procedures. We present the laboratory test results summary and laboratory test results in Appendix B.

4 GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

Literature published by the California Geological Survey (CGS) indicates that the site is located in the San Joaquin Valley within the central portion of the Great Valley Geomorphic Province. This province encompasses the San Joaquin Valley in the south and the Sacramento Valley in the north. The province is bounded by the Sierra Nevada to the east, the Coast Ranges to the west, the Klamath Mountains and Cascade Range to the north.

The Great Valley is a broad, elongated, northwest trending, structural trough that has been filled with a thick sequence of sediments. The eastern margin of the valley is formed by the west sloping Sierran bedrock surface that extends westward beneath the alluvium and older sedimentary bedrock within the valley. The western border is underlain by east dipping rock of the Coast Ranges that form a deeply buried trough.

During the late Mesozoic and through most of Tertiary time (approximately 100 million to 20 million years ago), deposition of thousands of feet of marine sediments occurred within the Great Valley. Continental deposits (generally alluvium) of late Tertiary and Quaternary age (approximately 20 million years ago to the present) overlie these marine deposits. Both the continental deposits and the underlying marine sediments form a wedge of sediments that generally thickens from east to west. The accumulated thickness of the marine and continental sediments is at least several thousand feet at the site.

4.2 Local Geology

BCI evaluated the geology of the area by review of published geologic maps and literature, site review, and subsurface exploration. Mapping by the California Geologic Survey[1] shows the site is underlain by sediments of the Pleistocene-age Modesto Formation. These sediments are alluvium comprised mostly of sand, silt and clay. We present a Geologic Map as Figure 2 in Appendix A.

4.3 Subsurface Conditions

4.3.1 Soil

In general, the soil profile at this site is comprised of medium dense to dense (locally loose), silty and clayey sand, interlayered with medium stiff to hard, sandy clay and silt to a depth of 63 ft. (elev.-33.0 ft., NGVD 29). These soil conditions are similar to those shown on the As-Built Log of Test Borings (LOTB) for the existing northbound Lone Tree Slough Bridge (Bridge No. 29-0023R).

We consider the soils described in the test borings for this study, and those shown on the As-Built LOTB, to be consistent with alluvial sediments of the Modesto Formation.

Based on our laboratory testing, the dry density of the soil units ranged from about 93 pcf to 123 pcf, at moisture contents between 7% and 30%. Triaxial testing (unconsolidated, undrained) of the clay and clay sand soil at depths of about 31 to 36 feet yielded undrained cohesion values ranging from 1,196 psf to 5,216 psf. Unconfined compressive strength testing of the silt/clay soil at depths of about 15 feet and 20 feet yielded unconfined compressive strengths of values of 3.2 tsf and 1.1 tsf, respectively.

Refer to the Log of Test Borings (LOTB) and As-Built Log of Test Borings in Appendix A for more specific soil descriptions, laboratory test results, and blow count data. *We also include the required LOTB Sheet Checklist in Appendix A for the Final Foundation Report*.

4.3.2 Ground Water

Table 1 presents the ground water depth/elevations measured in our borings during drilling.

[1] Geologic Map of the San Francisco-San Jose Quadrangle, 1:250,000, California Division of Mines and Geology, 1990.

Table 1: Ground Water Elevations

Boring Number	Reading Date	Groundwater Depth (ft.)	Ground Water Elevation (ft.*)
A-09-F1	3/18/2009	45.5	-12.5
A-09-F2	3/24/2009	43.0	-13.0
A-09-F3	3/25/2009	46.5	-16.5
A-09-F4	8/4/2009	40.0	-7.5

*NGVD 29 datum

The As-Built LOTB sheet for the existing structures shows ground water within about 10 ft. of ground surface (drilled July, 1954).

According to the San Joaquin County Internal Groundwater Data Center interactive website (http://www.sjmap.org/groundwater/), ground water elevations in the vicinity of the site have dropped 20 ft. or more since the late 1950's. Within the last 20 years ground water level has fluctuated between elev. 3 to -15 ft. in the site vicinity, consistent with our boring data.

BCI used a design ground water level at elev. 0 ft. (NGVD 29) in our geotechnical analysis for this site.

Ground water levels can fluctuate due to changes in precipitation, slough levels, irrigation, pumping of wells, and other factors. Seepage from the slough may cause perched ground water conditions at and below the existing slough water levels adjacent to the slough at any time of year.

5 CORROSION EVALUATION

BCI performed corrosion testing on four samples obtained from the borings completed at this site. Table 2 presents the test results for pH, resistivity, sulfates and chlorides.

Table 2: Soil Corrosion Test Summary

Boring/Sample Number	Depth (ft)	Elevation (ft)	Minimum Resistivity (Ohm-cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
A-09-F1/11b	40.5-41.0	-7.5 to -8.0	1,210	7.66	24.8	26.2
A-09-F2/3c	6.0-6.5	23.5 to 24.0	1,050	7.47	39.0	21.1
A-09-F3/6c	16.0-16.5	13.5 to 14.0	1,800	7.77	21.9	4.6
A-09-F4/1b	5.5-6.0	26.5 to 27.0	1,390	8.04	38.3	29.7

Note: Caltrans considers a site to be corrosive to foundation elements if one or more of the following conditions exist: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less (Caltrans, "Corrosion Guidelines", version 1.0, September 2003).

According to Caltrans Corrosion Guidelines (Version 1.0, September 2003), the site is not considered corrosive to structural elements. Appendix B contains the soil corrosion test results.

6 SEISMIC DATA AND EVALUATION

6.1 Caltrans Seismic Design Criteria

Based on the Caltrans 1996 California Seismic Hazard Map, the peak horizontal rock acceleration for the site is approximately 0.17g. The causative fault is the Midway-San Joaquin/N Fault located about 18 miles to the southwest. According to the 1996 Caltrans Seismic Map (Technical Report), the style of faulting is not known/published and this fault is listed as a new earthquake source. The estimated Maximum Earthquake Moment Magnitude for this fault is 6.75. BCI includes a Regional Fault Map showing peak bedrock accelerations as Figure 3 in Appendix A.

We classify the site soil profile as Type D using Table B.1 of the June 2006 Caltrans Seismic Design Criteria (SDC), Version 1.4, with SPT values ranging from 15 to 50.

Based on the above information, use the 0.2g peak horizontal rock acceleration curve (0.28g peak ground acceleration) from Figure B.7 (Soil Profile Type D, Magnitude: 6.5± 0.25) of the SDC for bridge structure design. We include our recommended ARS curve for bridge design as Figure 4 in Appendix A.

For geotechnical purposes, a peak ground acceleration of 0.24g (interpolated from Figure B.7 between the 0.1g and 0.2g ARS curves for the peak horizontal acceleration of 0.17g at the site) is appropriate for liquefaction and seismic settlement potential evaluations.

6.2 Fault Rupture

The site does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone for fault rupture hazard, and no known active faults cross the existing bridge. We therefore consider the potential for fault rupture and ground displacement to adversely affect the proposed structure as very low to nonexistent.

6.3 Seismic Slope Stability

We consider the potential for seismic slope instability of the existing canal slopes in-place at 1.5:1 (or flatter) at this site to be very low to nonexistent for the design peak ground acceleration of 0.24g and conditions encountered in our borings.

6.4 Liquefaction and Seismic Settlement Potential

Liquefaction can occur when relatively loose, saturated granular soil and specific soft, saturated fine-grained soils are subject to ground shaking sufficient to increase pore pressures to trigger liquefaction. Based on the soil and ground water conditions encountered in our borings, we consider the potential for detrimental liquefaction at the site to be nonexistent for the design peak ground acceleration of 0.24g.

During a seismic event, ground shaking can cause densification of granular soil above the water table that can result in settlement of the ground surface. Based on the soil and ground water conditions encountered in our borings, we consider the potential for detrimental seismic settlement at the site to be nonexistent for the design peak ground acceleration of 0.24g.

7 SCOUR EVALUATION

HDR Inc. performed a hydrology and hydraulics study[2] for structure that included the following scour data for the bridge.

Table 3: Scour Data

Bridge Support	Estimated Contraction Scour (ft.)	Estimated Local Scour (ft.)	Total Scour Depth (ft.)	Total Scour Elevation (ft.)
Abutment 1	0.00	0.00	0.00	N/A
Bent 2	0.85	3.6	4.45	18.9
Bent 3	0.85	3.6	4.45	18.8
Abutment 4	0.00	0.00	0.00	N/A

HDR assumed that no long-term channel aggradation or degradation will occur at the site based on their field observations of the channel in the vicinity of the existing structures.

8 AS-BUILT FOUNDATION DATA

The As-Built Records show the existing left and right bridges are supported on driven 45-ton steel monotube piles filled with unreinforced concrete. The 1954 foundation report recommended specified pile tip at elev.-10 ft. A pile driving letter dated April 22, 1955, indicates that the actual total driven lengths of the piles were about 60% of the recommended total lineal footage, and that pile driving encountered harder soil conditions than expected, causing some of the steel shells to deform/bulge. This appears to be reflected by the As-Built LOTB sheet, which shows the piles driven to about elev. 10 ft. (average) at the abutments and about elev. 5 ft. (average) at the bents. An additional pile was driven at Abutment 1 (left structure) to replace a pile that deformed before reaching bearing.

[2] Final Hydrology & Hydraulics Report, SR99, Littlejohns Creek, French Camp Slough, and Lone Tree Creek Crossings, Post Mile 5.3-15.0, July 2009; revised scour results provided by email on 01/22/10.

9 FOUNDATION RECOMMENDATIONS

9.1 Foundation Data and Loading

The subsurface conditions encountered in our borings indicate that the site is conducive for either driven or cast-in-drilled-hole (CIDH) piles. Since CIDH piles would require temporary casing and slurry drilling due ground water and/or seepage from the slough, we favor the use of driven piles over CIDH piles. Spread footings are not considered feasible for support due to the potential for excessive settlement.

Based on the above information, driven Class 90 (Alt X) precast, prestressed concrete piles were selected for abutment support. Driven 15" precast, prestressed concrete pile extensions (Slab Bridge Pile Details, Section B-B, Sheet xs1-230, 4/4/1997) were selected for bent support.

HDR provided the following foundation design information in Tables 4 and 5.

Table 4: Foundation Design Data Provided By HDR

Foundation Design Data								
Support No.	Design Method	Pile Type	Finish Grade Elev. (ft)*	Pile Cut-off Elevation (ft)*	Pile Cap Size (ft)		Permissible Settlement – Service Load (in)	Number of Piles Per Support
					B	L		
Abut 1	WSD	Class 90 (Alt. X)	30.50**	27.75	N/A	N/A	1	6
Bent 2	LRFD	15" PC/PS Pile Extensions	23.00	32.00	N/A	N/A	1	4
Bent 3	LRFD	15" PC/PS Pile Extensions	23.00	32.00	N/A	N/A	1	4
Abut 4	WSD	Class 90 (Alt. X)	30.50**	27.50	N/A	N/A	1	6

* Finished Grade and Pile Cut-off Elevation are approximate and are subjected to change once more accurate final survey data would become available.
** Finished Grade indicates the ground elevation in front of abut wall/ top of slope.

Table 5: Foundation Design Loads Provided By HDR

Foundation Design Loads											
Support No.	**Service-I Limit State (kips)**			**Strength Limit State (Controlling Group, kips)**				**Extreme Limit State (Controlling Group, kips)**			
	Total Load		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Per Pile	Per Support	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1	290	70	140	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bent 2	400	N/A	225	590	195	0	0	N/A	72	0	0
Bent 3	400	N/A	225	590	195	0	0	N/A	72	0	0
Abut 4	290	70	140	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

9.2 Foundation Recommendations and Pile Data Table

BCI used the above foundation design data and loading conditions to evaluate bent foundations using AASHTO LRFD Bridge Design Specifications-4th Edition with current Caltrans Amendments. We evaluated abutment foundations using Caltrans November 2003 Bridge Design Specifications for foundations using Working Stress Design methods. We present our foundation recommendations in Tables 6, 7 and 8 on the following pages.

Table 6: Foundation Recommendations for Abutments

Abutment Foundation Design Recommendations										
Support	Pile Type	Cut-off Elev. (ft.)	**LRFD Service-I Limit State Load – Compression (kips)**			Required Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
			Per Support		Per Pile	Comp.	Tens.			
			Total	Permanent						
Abut 1	Class 90 (Alt. X)	27.75	290	140	70	140	0	-5.0(a)	-5.0	140
Abut 4	Class 90 (Alt. X)	27.50	290	140	70	140	0	-5.0(a)	-5.0	140

Notes: 1) Design tip elevations for **Abutments** are controlled by (a) Compression.

Table 7: Foundation Recommendations for Bents

Bent Foundation Design Recommendations											
Support	Pile Type	Cut-off Elev. (ft.)	LRFD Service-I Limit State Load Per Support – Compression (kips)	Total Permissible Support Settlement (in.)	Required Factored Nominal Resistance (kips) Per Pile				Design Tip Elevations (ft.)	Specified Tip Elevations (ft.)	Nominal Driving Resistance Required (kips)
					Strength Limit		Extreme Event				
					Comp φ = 0.7	Tens. φ = 0.7	Comp φ = 1.0	Tens φ = 1.0			
Bent 2	15" PC/PS Pile Extensions	32.00	400	1	195	0	72	0	-23.0(a) -23.0(b)	-23.0	310
Bent 3	15" PC/PS Pile Extensions	32.00	400	1	195	0	72	0	-23.0(a) -23.0(b)	-23.0	310

Notes:

1) Design tip elevations for **Bents** are controlled by (a) Compression (Strength Limit), (b) Scour, respectively.
2) The nominal driving resistance (310 kips) required for Bent piles is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

Based on our analysis presented in the following sections, BCI presents our recommended Pile Data Table as Table 8:

Table 8: Pile Data Table

Pile Data Table						
Support	Pile Type	Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut 1	Class 90 (Alt. X)	140	0	-5.0(a)	-5.0	140
Bent 2	15" PC/PS Pile Extensions	280	0	-23.0(a),(b)	-23.0	310
Bent 3	15" PC/PS Pile Extensions	280	0	-23.0(a),(b)	-23.0	310
Abut 4	Class 90 (Alt. X)	140	0	-5.0(a)	-5.0	140

Notes:

1) Design tip elevations for **Abutments** are controlled by (a) Compression.
2) Design tip elevations for **Bents** are controlled by (a) Compression (Strength Limit), (b) Scour, respectively.
3) The nominal driving resistance (310 kips) required for Bent piles is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

9.3 Engineering Parameters

The following engineering parameters are generalized and based on:

- Unit weights represent average values based on our laboratory tests, local experience and published typical values.
- Cohesion was conservatively assumed based on average values from unconfined compressive strength testing, triaxial testing (unconsolidated, undrained), field pocket penetrometer testing, and published blow count correlations.
- Friction angles were based on published blow count correlations.
- Modulus and E_{50} strain values for lateral pile analysis were obtained from the July 2004 LPILE Plus 5.0 Technical Manual for appropriate soil type and consistency.
- Engineering experience and judgment.
- BCI used a ground water elevation of 0 ft. (NGVD29) for design.

9.3.1 Compressive Resistance

We used the generalized soil parameters in Table 9 in our bearing capacity analysis.

Table 9: Generalized Soil Parameters

Elevation (NVGD29)	Soil Type	Unit Weight (lb/ft^3)	Friction Angle (degrees)	Cohesion (psf)
28.0 to 15.0	Clay / Sandy Clay	130	---	2,200
15.0 to 4.0	Clayey Sand / Sand	121	30 (end bearing) / 33 (skin friction)	---
4.0 to 0.0	Clayey Sand	120	28 (end bearing and skin friction)	---
0.0 to -2.0	Clayey Sand	*58	28 (end bearing and skin friction)	---
-2.0 to -10.0	Clay	*64	---	2,000
-10.0 to -17.0	Clayey Sand	*79	36 (end bearing and skin friction)	---
-17.0 to -30.0	Clay	*65	---	3,000

*Buoyant Unit Weight

9.3.2 LPILE Parameters

HDR requested that BCI provide LPILE parameters for use in their equivalent column length and lateral pile analysis. Table 10 provides our recommended LPILE parameters for the abutment and bent piles.

Table 10: LPILE Parameters

Elevation (NGVD29)	L-Pile Soil Type (p-y curve model)	Unit Weight (lb/ft^3)	Friction Angle (degrees)	Cohesion (psf)	Modulus, k (lb/in^3)	E_{50}
28.0 to 15.0	Stiff Clay w/o Free Water	130	---	2,200	**	0.005
15.0 to 4.0	Sand (Reese)	121	30	---	70	---
4.0 to 0.0	Stiff Clay w/o Free Water	120	---	500	**	0.010
0.0 to -2.0	Stiff Clay with Free Water	*58	---	500	300	0.010
-2.0 to -10.0	Stiff Clay with Free Water	*64	---	1,200	500	0.007
-10.0 to -17.0	Sand (Reese)	*79	36	---	100	---
-17.0 to -30.0	Stiff Clay with Free Water	*65	---	2,500	1,000	0.005

*Buoyant Unit Weight
**LPILE 5.0 does not report the k value for the Stiff Clay Without Free Water soil type. The k value is internally computed using the cohesion and E50 input parameters.

Neglect lateral resistance at the bents above the total scour elevation.

9.4 Abut 1 and Abut 4 Piles (Class 90)

In accordance with current Caltrans specifications, we used the Working Stress Design (WSD) for the abutment piles. BCI evaluated Alternative "X" Class 90 piles with a T dimension of 12 inches for the abutments. BCI presents the results of our compressive resistance and settlement analysis below. No tension demand is indicated for abutment piles.

9.4.1 Compressive Resistance

The tips of the Class 90 precast, prestressed concrete (PPC) piles will bear in medium dense to dense silty sand about 27 ft. below the existing channel bottom elevation.

Our calculations indicate that the nominal compressive resistance of the PPC piles can be obtained through about 10% end bearing and 90% skin friction. Actual contributions to end bearing and skin friction could vary depending on how the load is transferred to the piles. We neglected the approach fill in our skin friction and end bearing analysis. We modeled the top of abutment piles at elev. 27.5 ft. (lowest cut-off elevation).

We determined the compressive resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc.

Refer to the Driven output files in Appendix C for the analysis results.

9.4.2 Settlement

We calculated immediate settlement of approximately 0.7 inches for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We do not anticipate significant long-term settlement due to the competent soil conditions above and below the pile tips. We include the pile settlement calculations in Appendix C.

Our calculated pile settlement is less than the permissible settlement of 1-inch specified for the structure foundations. We do not anticipate significant long-term settlement due to the competent soil conditions at and below the specified tip elevations.

9.4.3 Lateral Load Analysis

BCI provided LPILE parameters in Section 9.3.2 for HDR to use in lateral pile analysis.

9.4.4 Negative Skin Friction

We do not anticipate negative skin friction at the abutments given the competent soil conditions and nominal new embankment heights.

9.5 Bent Piles

We used AASHTO LRFD Bridge Design Specifications-4th Edition and current Caltrans Amendments for evaluating driven 15” precast, prestressed concrete pile extensions (Caltrans Slab Bridge Details, Sheet xs1-23) at the Bents. BCI presents the results of our compressive resistance and settlement analysis below. No tension demand is indicated for bent piles.

9.5.1 Compressive Resistance

The tips of the 15” precast, prestressed concrete pile extensions will bear in medium dense to dense silty sand and/or very stiff silt with sand about 45 ft. below the existing channel bottom elevation. Our calculations indicate that the nominal compressive resistance of the piles can be obtained through about 10% end bearing and 90% skin friction. Actual contributions to end bearing and skin friction could vary depending on how the load is transferred to the pile.

We determined the required nominal compressive resistance using the Federal Highway Administration’s Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc.

The Driven 1.2 computer program calculates compressive resistance for piles with square sides (pile width input, not diameter). For bent piles, we performed separate analyses using an equivalent pile width of 11.8 inches for skin friction contributions, and 13.3 inches for end bearing contributions. We modeled the top of bent piles at elev. 23.0 (approximate existing channel surface) with estimated total scour at elev. 18.8 ft. (lowest elevation).

BCI determined the required factored nominal resistance by comparing the Factored Strength Limit Load (Geotechnical Resistance Factor = 0.7) with the Extreme Event Load (Resistance Factor = 1.0). We then used the higher value as the required factored nominal resistance. In this case, the Factored Strength Limit Load (195 kips/0.7 = 278 kips per pile) is controlling over the 72 kips per pile for the Extreme Event. We rounded the Factored Strength Limit Load to 280 kips to estimate the design tip elevation using the Driven software.

Refer to the Driven output files in Appendix D for additional information.

9.5.2 Settlement

We calculated immediate settlement of approximately 0.6 inches for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We do not anticipate significant long-term settlement due to the competent soil conditions above and below the pile tips. We include the pile settlement calculations in Appendix D.

Our calculated pile settlement is at the 1-inch permissible settlement level specified for the structure foundations. We do not anticipate significant long-term settlement due to the competent soil conditions at and below the equivalent footing level.

9.5.3 Lateral Load Analysis

BCI provided LPILE parameters in Section 9.3.2 for HDR to use in lateral pile analysis.

9.5.4 Negative Skin Friction

We do not anticipate negative skin friction at the bents.

10 APPROACH FILLS

10.1 Fill Materials

Embankments will be constructed using imported borrow material, supplemented with material excavated from shallow on-site cuts and existing approach embankment fill. The source(s) of borrow material for construction of approach fills has not been identified. Proposed borrow must be tested and approved for use by the project engineer prior to transporting to the site.

Expansive soil (Expansion Index > 50 and Sand Equivalent < 20) should not be used as fill within 5 ft. of the abutment backwall.

10.2 Slope Geometry and Stability

The existing approach fill and underlying native soil are competent for support of the planned embankments.

10.3 Settlement

We estimate minor (< 1-inch) settlement for fill loads up to 5 ft. high. No waiting period is necessary prior to construction of bridge abutment foundations.

10.4 Lateral Earth Pressures

The following equivalent fluid weights (EFWs) may be used to design the abutment walls and wing walls for Abutments 1 and 4 assuming level backfill conditions:

Condition	EFW Static	EFW Seismic
Active	36 lb/ft^3	42 lb/ft^3
At-Rest	56 lb/ft^3	66 lb/ft^3
Passive	220 lb/ft^3	205 lb/ft^3

To limit wall deflection to acceptable levels, BCI applied a factor of safety of 2.0 to the ultimate passive pressure to generate the allowable passive pressures provided above.

As noted in the Caltrans Seismic Design Criteria (SDC), the maximum passive pressure is 5.0 ksf for longitudinal abutment response, which must be used with the proportionality factor presented in Section 7.8.1 of the SDC.

The EFWs shown above assume embankment fill meeting the requirements of Caltrans standard for Structure Backfill, a soil unit weight of approximately 125 pcf, a minimum angle of internal friction equal to 34 degrees, and that drainage is placed behind the walls in accordance with Caltrans Standard Plans and Specifications.

We estimated the EFWs for seismic loading using the Mononobe-Okabe equation for active and passive lateral coefficients K_a and K_p. We estimated the at-rest coefficient, K_o, for the seismic condition using an increase ratio similar to the active condition. In the Mononobe-Okabe equation, BCI used a horizontal seismic acceleration coefficient (k_h) of 0.12 calculated using the equation in Chapter 11, Section 11.6.5 of the AASHTO LRFD Bridge Design Specifications-4th Edition. This k_h value assumes that the walls displace at least 1-inch during the design seismic event. We calculated the above static EFWs using methods presented in the 1982 Naval Facilities (NAVFAC) Design Manual 7.2.

Apply the resultant of the seismic active and at-rest pressures at a depth 0.5H from the base of the wall, where H equals the wall height in feet. The passive pressures are applicable for concrete placed directly against undisturbed soil or compacted fill.

For surcharge loads, apply an additional uniform lateral load behind the wall equivalent to (0.30)x(surcharge pressure).

Use a coefficient of friction of 0.45 to resist sliding for concrete placed on native undisturbed soil or compacted fill.

11 CONSTRUCTION CONSIDERATIONS

Where referenced below, "Standard Specifications" refers to Caltrans Standard Specifications (May 2006).

11.1 Embankment Waiting Period and Settlement Monitoring

No waiting period is required prior to construction of bridge abutment piling.

11.2 Abutment and Bent Piles

Piles shall conform with Section 49-1 of the Standard Specifications.

Difficult pile installation is anticipated due to the presence of locally dense sand layers above the specified tip elevations. Drilling to assist pile driving may be necessary to achieve the specified tip elevations. Drilling should be performed in accordance with Section 49-1.05 of the Standard Specifications, *except the drill hole should be no greater than 8-inches in diameter and drilling should not extend within 10 ft. of specified tip elevations.*

Jetting or vibratory hammers should not be used to obtain the specified pile penetration.

Verify pile capacity during driving using energy equations in accordance with Caltrans Standard Specification 49-1.08 (Modified Gates Formula). A pile load test is not necessary.

The contractor shall provide a Pile Driving System Submittal in accordance with Caltrans Bridge Reference Specification 49-208 (49HAMR) to verify that the pile driving system is adequate.

Pile driving should not negatively impact the existing bridge structures since they are supported on piles.

11.3 Temporary Shoring

The contractor is responsible for design and construction of excavation sloping and shoring in accordance with CalOSHA Standards.

11.4 Dewatering

Excavations extending below the slough water level will require dewatering and/or diking/diversion methods to construction abutment foundations in the "dry".

12 RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services. For this project, BCI should be retained to:

1. Review and provide written comments on the (civil, structural) plans and specifications prior to construction.
2. Monitor construction to check and document our report assumptions. At a minimum, we should monitor pile installation.
3. Update this report if:
   - design changes occur
   - 2 years or more lapse between this report and construction
   - site conditions change

If BCI is not retained to perform the above applicable services, we are not responsible for any other parties' interpretation of our report, and subsequent addenda, letters, and discussions.

13 LIMITATIONS

BCI performed services in accordance with the generally accepted geotechnical standard of practice currently used in this area. Where referenced, we used ASTM and Caltrans Standards as a general (not strict) *guideline* only. We do not warranty our services.

BCI based this report on the current site and project conditions. We assumed the soil/ground water conditions encountered in our exploratory borings are representative of the subsurface conditions across the site. Actual conditions between borings could be different. Ground water may be higher in other locations than measured in the borings.

The interface between soil types on the logs is approximate. The transition between soil types may be abrupt or gradual. We based our recommendations on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geologic conditions.

Our scope did not include evaluation of flooding or hazardous materials on site.

This report should only be used for design and construction of the Lone Tree Slough Bridge (Widen) as described herein.

Modern design and construction is complex, with many regulatory sources, restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.

APPENDIX A

Figure 1 – Vicinity Map

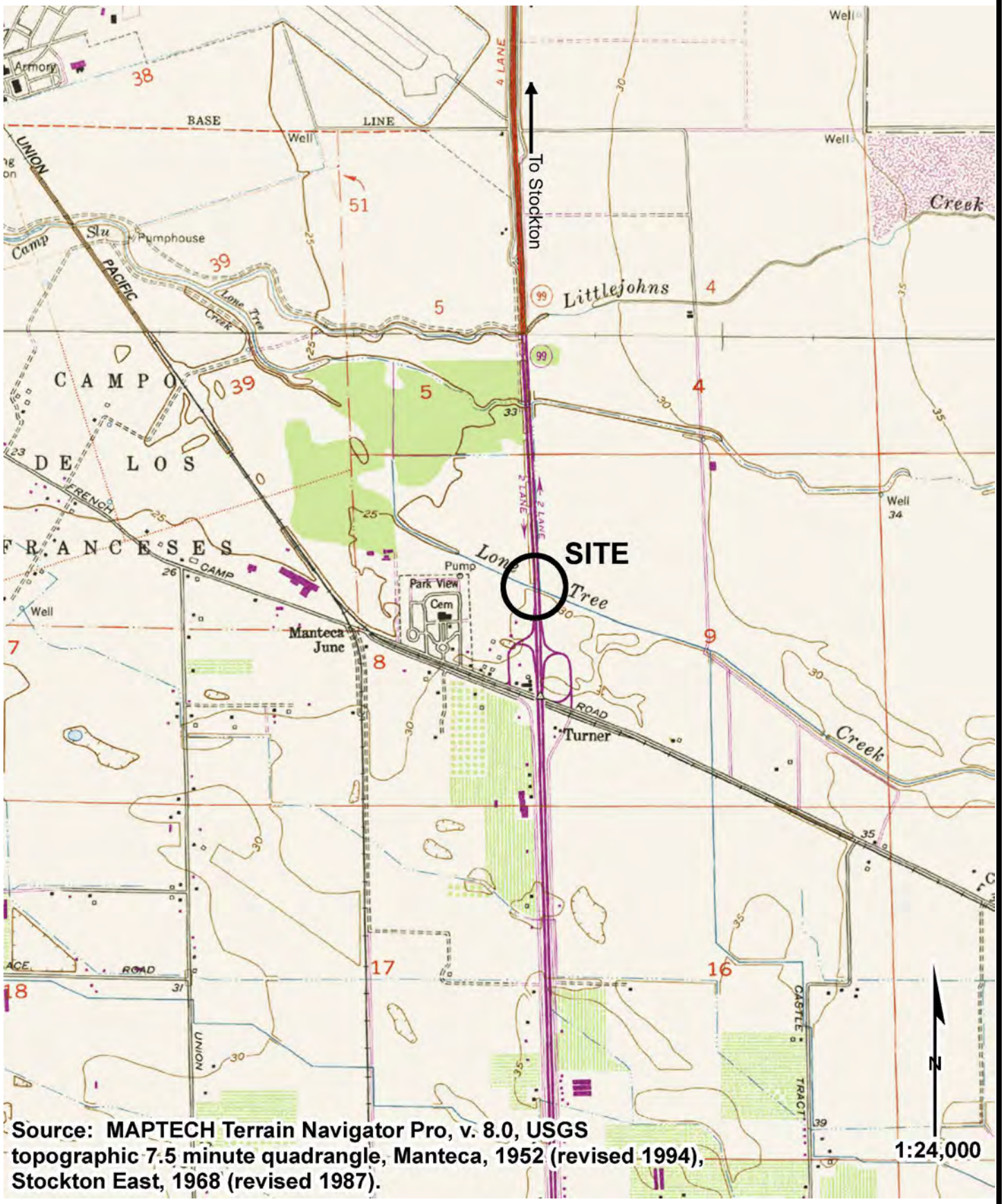
Figure 2 – Geologic Map

Figure 3 – Regional Fault Map

Figure 4 – ARS Curve

Log of Test Borings Sheets 1-6

Log of Test Borings Sheet Checklist



Source: MAPTECH Terrain Navigator Pro, v. 8.0, USGS topographic 7.5 minute quadrangle, Manteca, 1952 (revised 1994), Stockton East, 1968 (revised 1987).

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www.blackburnconsulting.com

□I□INIT□ MAP

Lone Tree Slough Bridge (Widen)
San Joaquin County, California

File No. 1201.7□

January 2011

Figure 1

1/6/2011 1201.7d Lone Tree Slough Bridge (Widen) Figure 1.dwg

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GEOLOGI□ MAP

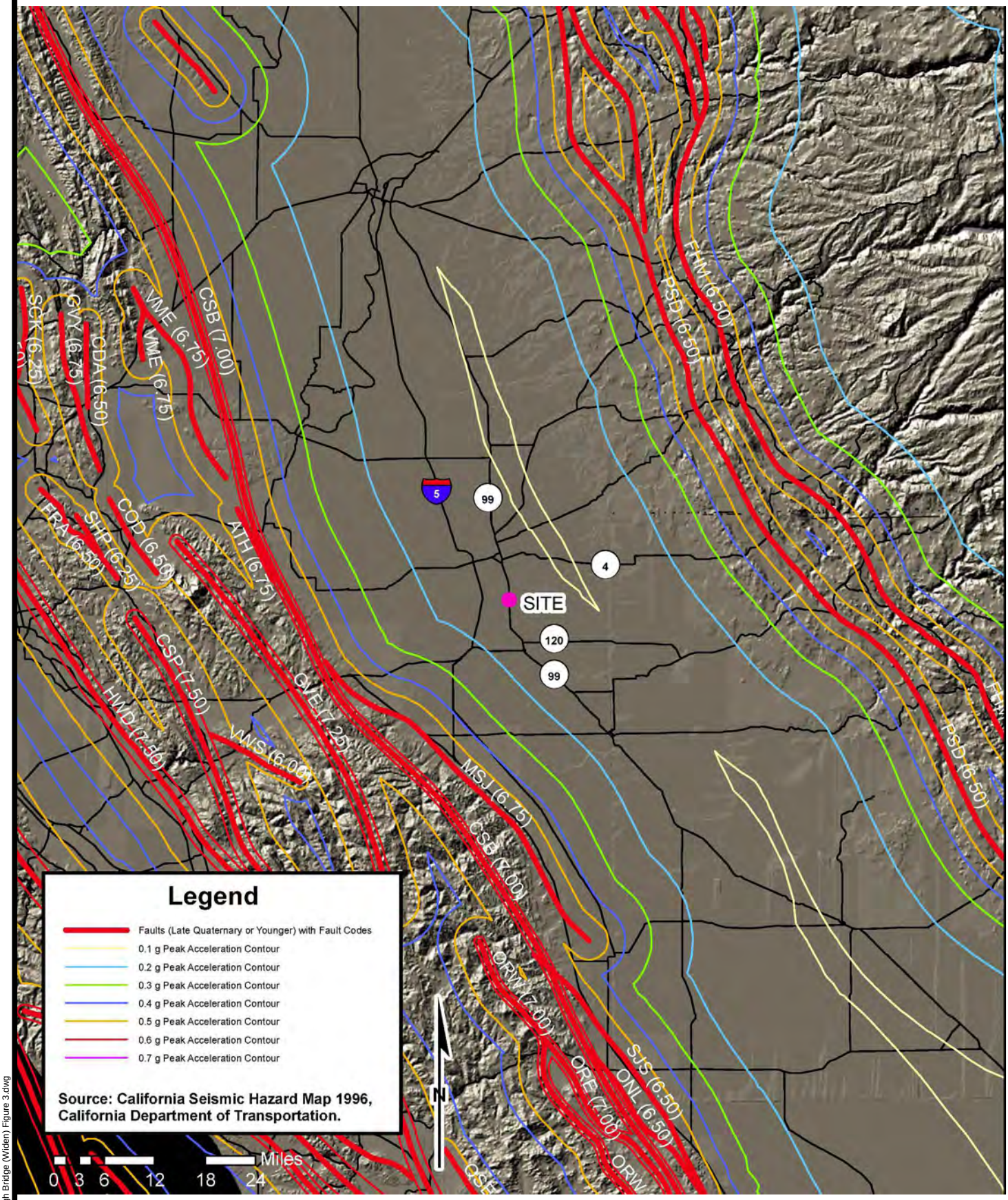
Lone Tree Slough Bridge (Widen)
San Joaquin County, California

File No. 1201.7□

January 2011

Figure 2

1/6/2011 1201.7d Lone Tree Slough Bridge (Widen) Figure 2.dwg



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REGIONAL FAULT MAP

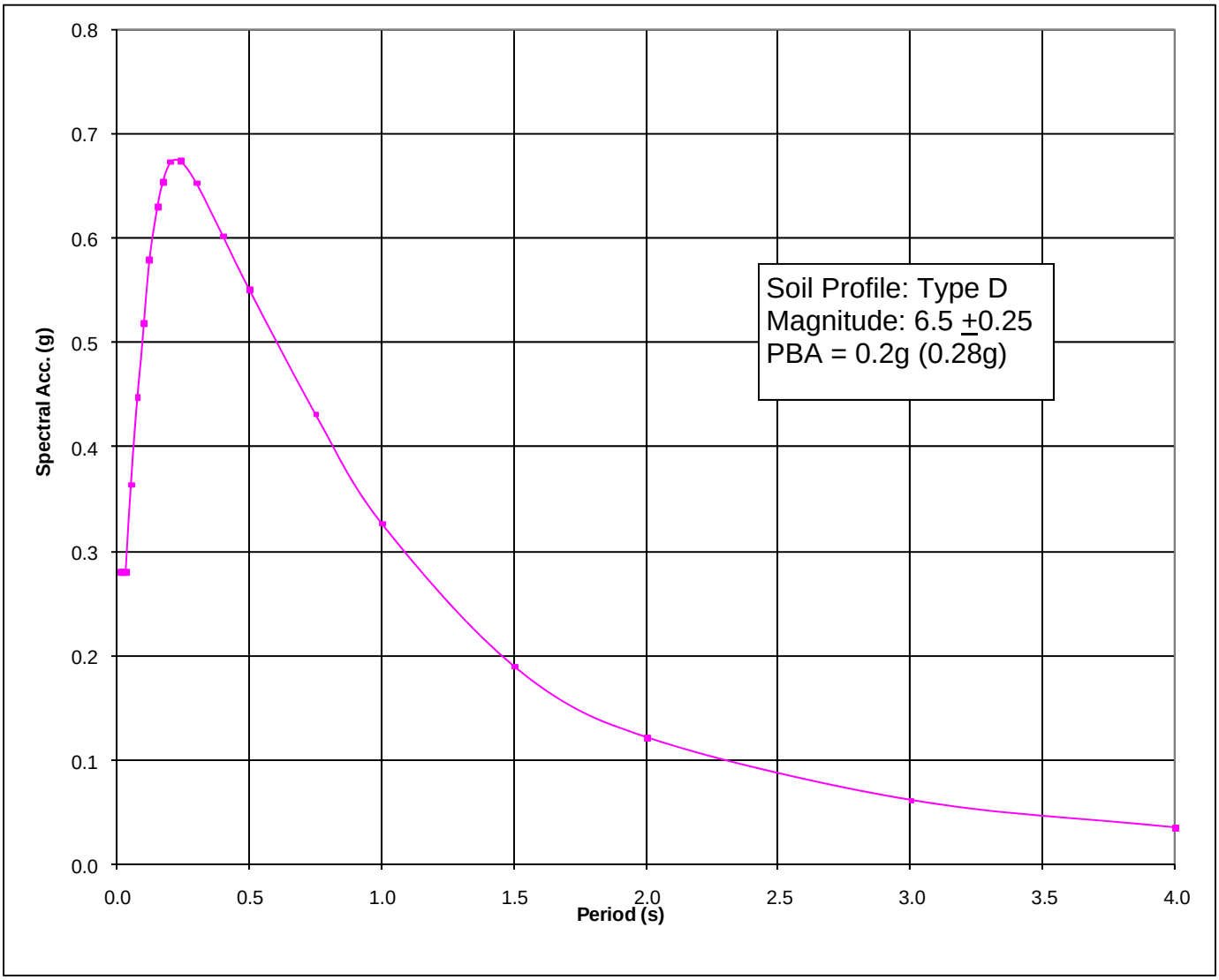
Lone Tree Slough Bridge (Widen)
San Joaquin County, California

File No. 1201.7

January 2011

Figure 3

1/6/2011 1201.7d Lone Tree Slough Bridge (Widen) Figure 3.dwg



Reference: Figure B.7, Caltrans Seismic Design Criteria, Ver. 1.4, June 2006

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ARS CURVE

Lone Tree Slough Bridge (Widen)
San Joaquin County, California

File No. 1201.7d

January 2011

Figure 4

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

CERTIFIED ENGINEERING GEOLOGIST — DATE 01/06/11

PROFESSIONAL GEOLOGIST William E. Nichols No. 2229 Exp. 1-31-12 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

PLANS APPROVAL DATE

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WEST SACRAMENTO, CA 95691 FILE No. 1201.7d

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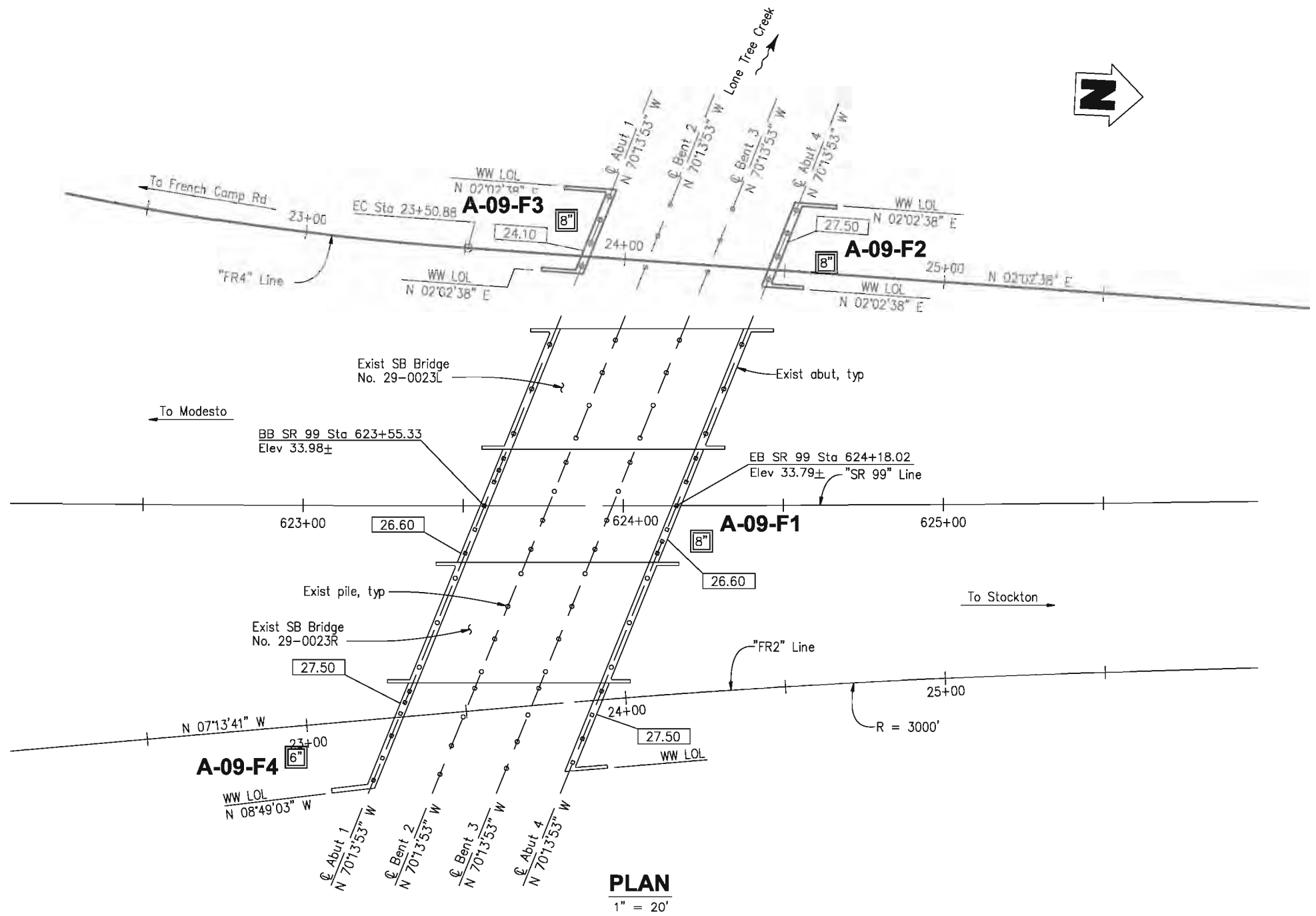
FOLSOM, CA 95630



PLAN
1" = 20'

Legend:

- XX.XX — Indicates bottom of footing elevation.
- Indicates existing structure.
- Indicates driven piles at abutments.
- Indicates driven piles at bents.

DRAWN BY	M. ROBERTSON	A. WOOD FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	JOHN A. KLEMUNES, JR. PROJECT ENGINEER	BRIDGE NO. 29-0023 POST MILE 11.80
CHECKED BY	A. SHINNEFIELD	DATE: MARCH, AUGUST 2009			

LONE TREE SLOUGH BRIDGE (WIDEN)

LOG OF TEST BORINGS 1 OF 6

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271 CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES 03/11/10 04/23/10 11/05/10 SHEET OF

FILE => $REQUEST

1/6/2011 1201.7d Lone Tree Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

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PLANS APPROVAL DATE

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HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

BENCH MARKS

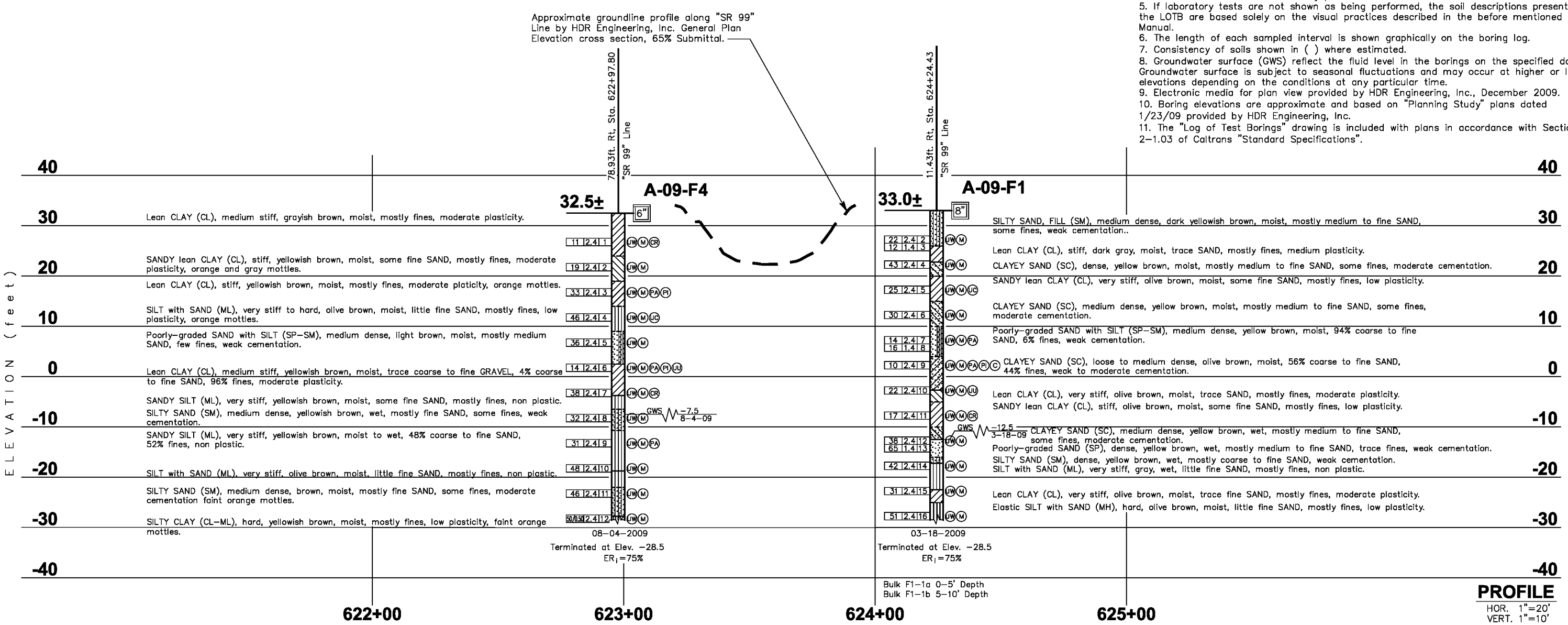
BENCHMARK# 658 — ELEV. 33.00 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED AT APPROXIMATE CENTERLINE STATION 625+67, ON THE NORTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 1' EAST OF THE EDGE OF PAVEMENT, 205' NORTH OF THE END OF THE CENTERLINE OF LONE TREE CREEK.
NGVD 29, N2138213.81, E6354203.76.

BENCHMARK# 699 — ELEV. 31.83 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED APPROXIMATE CENTERLINE STATION 625+50, ON THE SOUTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 3' WEST OF THE EDGE OF PAVEMENT, 140' NORTH OF THE CENTERLINE OF LONE TREE CREEK.
NGVD 29, N2138191.62, E6354088.62.

NOTES:

1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 4 and 5, "Soil Legend".
2. Standard Penetration tests were performed in accordance with ASTM D 1586-99 using a hammer operated with an automated drop system. Drill rods were 1 5/8-inch diameter "A"-rods; sampler was driven with brass liners.
3. "2.4 inch sampler": ID=2.4 inch, OD=2.9 inch. Driven in same manner as SPT ("1.4 inch") sampler.
4. Where less than the 0.5 inches of penetration is achieved, the blow count shown is for that fraction of the interval actually penetrated.
5. If laboratory tests are not shown as being performed, the soil descriptions presented in the LOTB are based solely on the visual practices described in the before mentioned Manual.
6. The length of each sampled interval is shown graphically on the boring log.
7. Consistency of soils shown in ( ) where estimated.
8. Groundwater surface (GWS) reflect the fluid level in the borings on the specified date. Groundwater surface is subject to seasonal fluctuations and may occur at higher or lower elevations depending on the conditions at any particular time.
9. Electronic media for plan view provided by HDR Engineering, Inc., December 2009.
10. Boring elevations are approximate and based on "Planning Study" plans dated 1/23/09 provided by HDR Engineering, Inc.
11. The "Log of Test Borings" drawing is included with plans in accordance with Section 2-1.03 of Caltrans "Standard Specifications".

FOR PLAN VIEW
SEE LOG OF TEST BORINGS 1 OF 6



PROFILE
HOR. 1"=20'
VERT. 1"=10'

DRAWN BY	M. ROBERTSON	A. WOOD	FIELD INVESTIGATION BY:
CHECKED BY	A. SHINNEFIELD	DATE: MARCH, AUGUST 2009	

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29-0023
POST MILE 11.80

LONE TREE SLOUGH BRIDGE (WIDEN)
LOG OF TEST BORINGS 2 OF 6

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES 03/11/10 04/27/10 11/05/10

REVISION DATES — SHEET — OF

FILE => $REQUEST

1/6/2011 1201.7d Lone Tree Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

CERTIFIED ENGINEERING GEOLOGIST — DATE 01/06/11

PLANS APPROVAL DATE

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FOLSOM, CA 95630

BENCH MARKS

BENCHMARK# 658 — ELEV. 33.00 Ft
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NGVD 29, N2138213.81, E6354203.76.

BENCHMARK# 699 — ELEV. 31.83 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED APPROXIMATE CENTERLINE STATION 625+50, ON THE SOUTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 3' WEST OF THE EDGE OF PAVEMENT, 140' NORTH OF THE CENTERLINE OF LONE TREE CREEK.
NGVD 29, N2138191.62, E6354088.62.

FOR PLAN VIEW
SEE LOG OF TEST BORINGS 1 OF 6

NOTES:

1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 4 and 5, "Soil Legend".
2. Standard Penetration tests were performed in accordance with ASTM D 1586-99 using a hammer operated with an automated drop system. Drill rods were 1 5/8-inch diameter "A"-rods; sampler was driven with brass liners.
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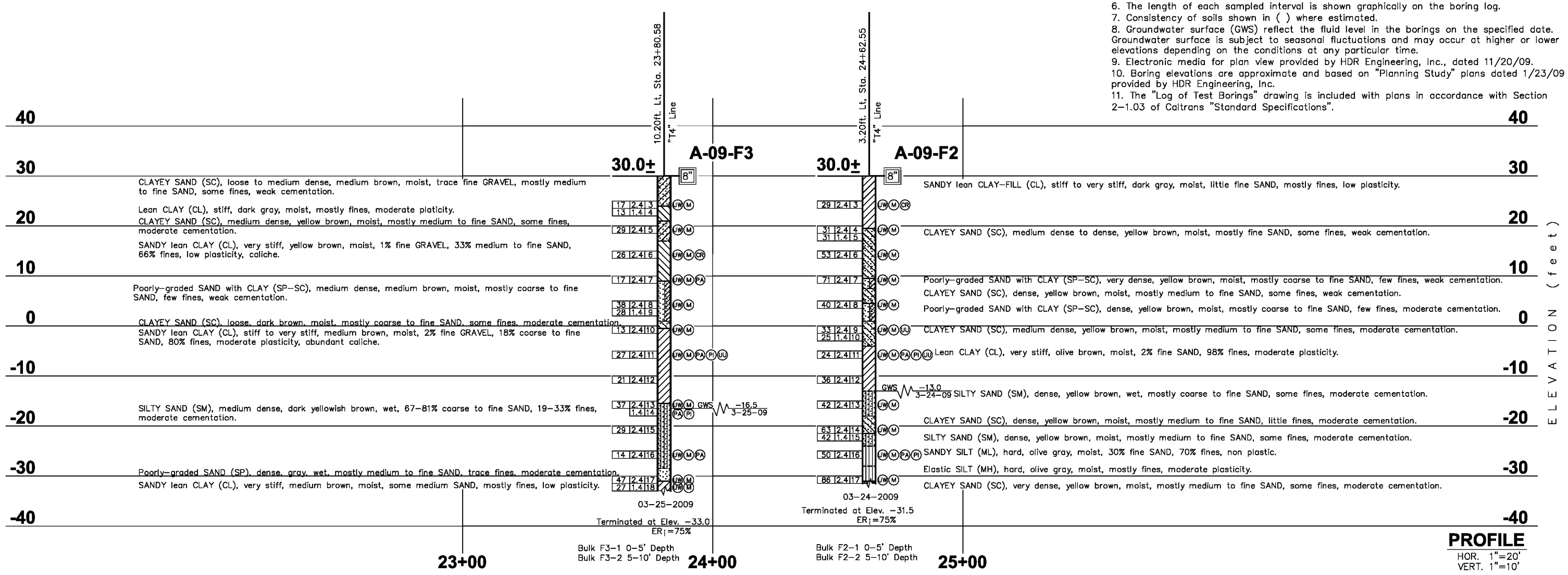
9. Electronic media for plan view provided by HDR Engineering, Inc., dated 11/20/09.
10. Boring elevations are approximate and based on "Planning Study" plans dated 1/23/09 provided by HDR Engineering, Inc.
11. The "Log of Test Borings" drawing is included with plans in accordance with Section 2-1.03 of Caltrans "Standard Specifications".



PROFILE
HOR. 1"=20'
VERT. 1"=10'

DRAWN BY	M. ROBERTSON	A. WOOD FIELD INVESTIGATION BY:	
CHECKED BY	A. SHINNEFIELD	DATE: MARCH, AUGUST 2009	

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR. — PROJECT ENGINEER

BRIDGE NO. 29-0023 — POST MILE 11.80

LONE TREE SLOUGH BRIDGE (WIDEN)
LOG OF TEST BORINGS 3 OF 6

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10-0E6101

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REVISION DATES — SHEET — OF

FILE => $REQUEST

1/6/2011 1201.7d Lone Tree Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER — DATE PLOTTED => $DATE — TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

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WEST SACRAMENTO, CA 95691 FILE No. 1201.7d

HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	<0.25	<0.25	<0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

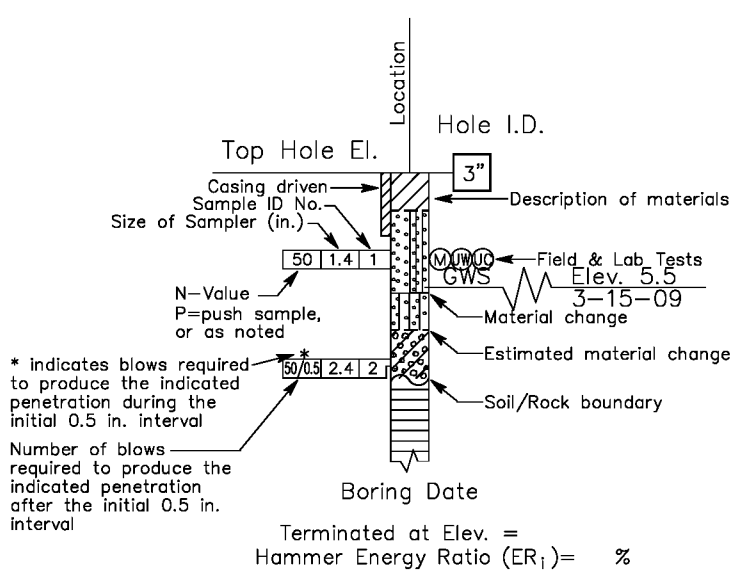
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778)
⬚	O	Other

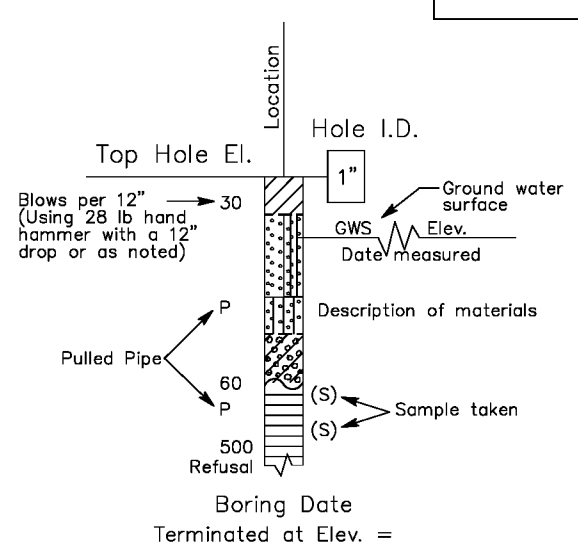
NOTE: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

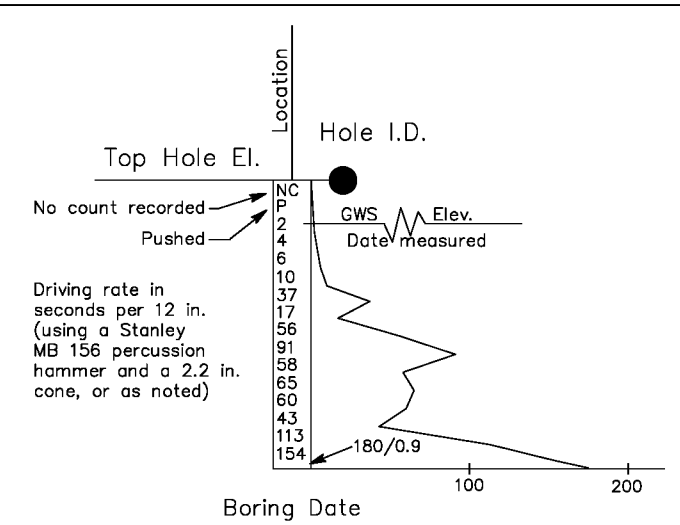
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



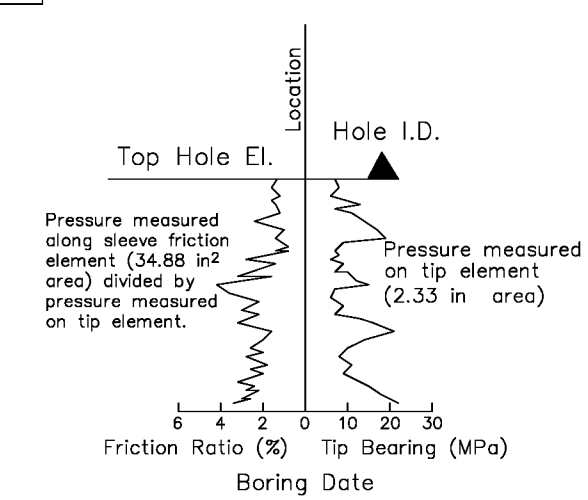
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

LONE TREE SLOUGH BRIDGE (WIDEN)

LOG OF TEST BORINGS 4 OF 6

DESIGN OVERSIGHT

SIGN OFF DATE

DRAWN BY M. ROBERTSON

CHECKED BY A. SHINNEFIELD

A. WOOD
FIELD INVESTIGATION BY:
DATE: MARCH, AUGUST 2009

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29-0023
POST MILE 11.80

GS SOIL LEGEND SHEET 1 (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES 03/11/10 04/29/10 11/05/10

REVISION DATES SHEET OF

FILE => $REQUEST

1/6/2011 1201.7d Lone Tree Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

W. Eric Nichols 01/06/11
CERTIFIED ENGINEERING GEOLOGIST DATE

PLANS APPROVAL DATE

PROFESSIONAL GEOLOGIST William E. Nichols No. 2229 Exp. 1-31-12 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of scanned copies of this plan sheet.

BLACKBURN CONSULTING
2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 FILE No. 1201.7d

HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names	Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND		
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)		
GM	SILTY GRAVEL SILTY GRAVEL with SAND	OL	ORGANIC lean Clay ORGANIC lean Clay with SAND ORGANIC lean Clay with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND		
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL		
SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL		
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL		
SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
SM	SILTY SAND SILTY SAND with GRAVEL		
SC	CLAYEY SAND CLAYEY SAND with GRAVEL	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL		
PT	PEAT	OH/OL	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
	COBBLES COBBLES and BOULDERS BOULDERS		

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 2937)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60}-Value (Blows / 12 inches)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

LONE TREE SLOUGH BRIDGE (WIDEN)

LOG OF TEST BORINGS 5 OF 6

DESIGN OVERSIGHT
SIGN OFF DATE

DRAWN BY M. ROBERTSON
CHECKED BY A. SHINNEFIELD

A. WOOD
FIELD INVESTIGATION BY:
DATE: MARCH, AUGUST 2009

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29-0023
POST MILE 11.80

GS SOIL LEGEND SHEET 2 (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES 03/11/10 04/29/10 11/05/10

SHEET OF

FILE => $REQUEST

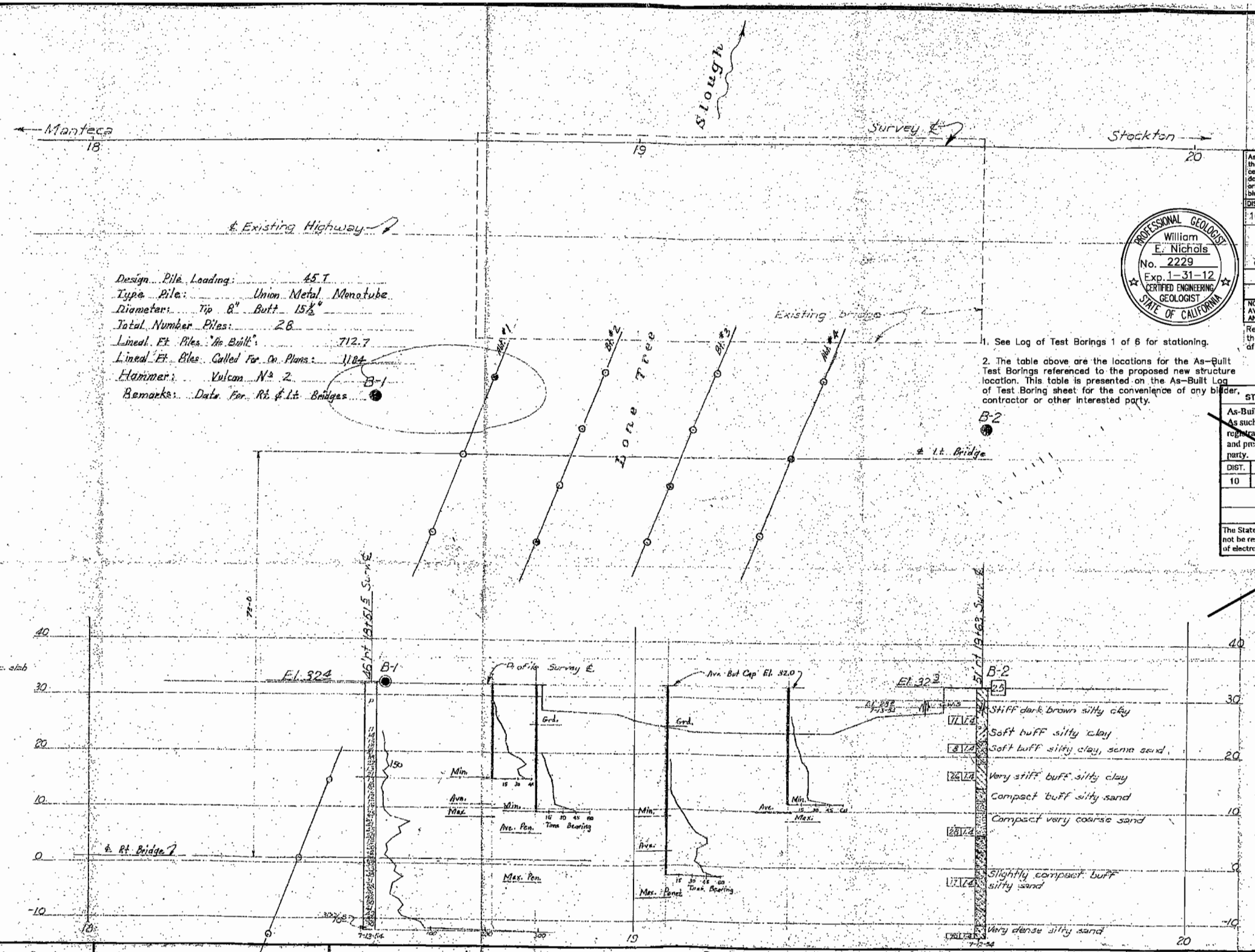
1/6/2011 1201.7d Lone Tree Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST.	COUNTY	ROUTE	SECTION	WBS'Y RD.	TOTAL SHEETS
X	SJ	4	E		

ENGINEER EXHIBITS — CIVIL AND STRUCTURAL ENGINEER — LICENSE 2229

DATE APPROVED



1. See Log of Test Borings 1 of 6 for stationing.

2. The table above are the locations for the As-Built Test Borings referenced to the proposed new structure location. This table is presented on the As-Built Log of Test Boring sheet for the convenience of any bidder, contractor or other interested party.

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
10	SJ	99			

W. Eric Nichols 01/06/11
CERTIFIED ENGINEERING GEOLOGIST — DATE

PROFESSIONAL GEOLOGIST — William E. Nichols — No. 2229 — Exp. 1-31-12 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

LONE TREE SLOUGH BRIDGE (WIDEN)
LOG OF TEST BORINGS 6 of 6

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA.

UNIT: 3455
PROJECT NUMBER & PHASE: 1000000271

Revisions made to this Log of Test Borings from the original Log of Test Borings are the addition of the following table and notes.

BRIDGE No.	SHEET	OF
29-0023		

Boring	Station	Offset from "SR 99" Line
B-1	623+51.55	45.88 ft Lt
B-2	624+63.22	39.57 ft Lt

STRUCTURAL FOUNDATIONS BRANCH - ENGINEERING SERVICE CENTER

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date will not be required. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES - TOTAL PROJECT	Sheet No.	Total Sheets
10	SJ	99			

LONE TREE SLOUGH BRIDGE (WIDEN)
LOG OF TEST BORINGS

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

DU: 10
EA: 401311

BRIDGE No. 29-0023 L/R

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

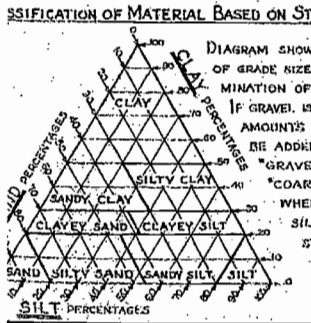


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

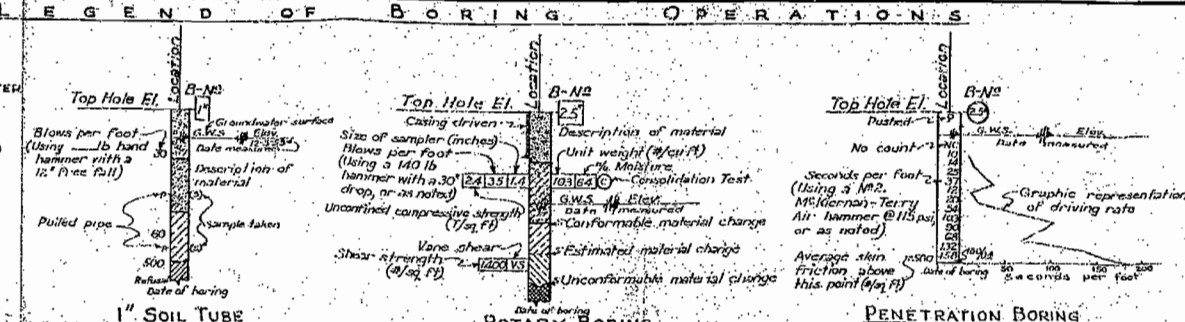
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND." THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

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

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- PENETROMETER
- 2¼" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- CORE BORING
- TEST PIT



NOTES

The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provisions accompanying this set of plans.

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

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BRIDGE ACROSS LONE TREE SLOUGH

LOG OF TEST BORINGS

SCALE 1" = 10'	BRIDGE 29-23	FILE	DRAWING PR-4011-3

AS-BUILT LOG OF TEST BORINGS

Log of Test Boring (LOTB) Sheet Checklist

This checklist shall be used by the *checker* in his/her evaluation of a LOTB sheet's conformance with the Caltrans *Soil & Rock Logging, Classification, and Presentation Manual,* and other applicable standards. To facilitate a quality check, the checker shall be provided with the draft final LOTB sheets, pertinent laboratory test results, copies of approved *Request for Exceptions*, and the field logs. This checklist is not comprehensive and does not attempt to account for all logging and presentation standards. As such, the checker must be familiar with the entire manual in order to successfully perform a quality check. **One checklist shall be completed per LOTB plan sheet. One signature sheet may be used for each structure (Bridge No.).**

Project Information

Dist – EA: OE6101 County: SJ Route: 99 PM: 11.80

Bridge No.: 29-0023

Sheet Title: Lone Tree Slough Bridge (Widen) Sheets 1 - 6

Revision Date: N/A

Are there approved exceptions to the manual? ☐ Yes ☒ No (attach, if yes)

General

	Yes	No	N/A	
1.1	☒	☐	☐	Does the Plan View meet the requirements of Sec 5.2.3.3?
1.2	☒	☐	☐	Does the Border meet the requirements of Sec 5.2.3.1 and Sec 5.2.3.2?
1.3	☒	☐	☐	Are the Notes clear and do they meet the requirements of Sec 5.2.2?
1.4	☒	☐	☐	If As-Built LOTB, does it meet the requirements of Sec 5.2.4?
1.5	☒	☐	☐	Is the soil legend sheet attached and properly labeled?
1.6	☐	☐	☒	If rock is presented, is the rock legend attached and properly labeled?
1.7	☐	☐	☒	If approved "Exception to Policy" form is attached, does the LOTB meet the requirements of the approved exceptions?

Elevation View

2.1	☒	☐	☐	Are the Hole Identifications correct? (Sec 2.3) (Sec. 5.2.3.4)
2.2	☒	☐	☐	Are the location descriptions correct?
2.3	☒	☐	☐	Are the holes located properly on the profile?
2.4	☒	☐	☐	Is the elevation scale correct? (Sec 5.2.3.4)
2.5	☒	☐	☐	Is the top of hole elevation presented and correct? (Sec 5.2.3.4)

Log of Test Boring (LOTB) Sheet Checklist

Bridge No.: 29-0023 Sheet Title: Lone Tree Slough Bridge (Widen)

	Yes	No	N/A	
2.6	☒	☐	☐	Is the correct hole diameter presented in the correct Borehole Symbol? (Sec 5.2.5.6)
2.7	☒	☐	☐	Does the stationing match the profile view?
2.8	☒	☐	☐	Are the Boring Date and Termination Elevation presented at the bottom of each boring log? (Sec 5.2.3.4)
2.9	☒	☐	☐	If SPT tests were performed, is the correct hammer efficiency reported at the bottom of each borehole?
2.10	☒	☐	☐	Are lab tests reported at the correct elevations? (Sec 5.2.5.2)
2.11	☒	☐	☐	Are SPT blow counts reported at the correct elevations? (Sec 5.2.5.2)
2.12	☒	☐	☐	Is the groundwater presented at the correct elevation? (Sec 5.2.5.2)
2.13	☒	☐	☐	Are the soil/rock layers and graphics presented correctly? (Sec 4, Sec 5.2.5.7)
2.14	☒	☐	☐	Are the required descriptors presented and in the correct order? (Sec 2.4.1, Sec 2.5.1)
2.15	☒	☐	☐	Are the descriptors presented consistent with those allowed in the manual?
2.16	☒	☐	☐	Are the soil identifications consistent with the field observations? (Sec 2)
2.17	☒	☐	☐	Are the soil classifications consistent with reported lab test results? (Sec 3)
2.18	☒	☐	☐	Are the consistency descriptors consistent with field observations and/or lab test results? (Sec 2.4.3, Sec 3.2.3)
2.19	☒	☐	☐	Are the apparent density descriptors consistent with the SPT results and hammer efficiency? (Sec 2.4.4)
2.20	☐	☐	☒	Are % recovery (REC) and rock quality designation (RQD) presented at the required elevations?
2.21	☐	☐	☒	Is rock strength presented where lab tests are reported? (Sec 3.3.1)
2.22	☒	☐	☐	Considering the field observations, are lab test results properly applied to the descriptors within a layer per Sec 4.3?
2.23	☒	☐	☐	Are the presentations consistent with the rules presented in Sec 4?
2.24	☒	☐	☐	Are the presentations consistent with the rules presented in Sec 5?

List all variances identified during initial review of the LOTB sheet and steps needed to resolve the discrepancy (include item number). Also note any recommendations for revisions to the manual or procedures that might reduce or eliminate similar errors in the future.

N/A

Log of Test Boring QC/QA Signature Sheet

Dist – EA: OE6101 Bridge No.: 29-0023

Sheet Titles:

Lone Tree Slough Bridge (Widen) Sheets 1 - 6

I, the undersigned on the date following my signature, hereby certify that I have performed a quality check of the referenced LOTB sheets and that the referenced LOTB sheets *substantially* comply with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2007) and related policy and standards.

Eric Nichols	Senior Project Manager
Checker (Print)	Title
W. Eric Nichols	1/6/2011
Checker (Signature)	Date

I, the undersigned on the date following my signature, hereby certify that the referenced LOTB sheets *substantially* comply with Geotechnical Service's Quality Control/Quality Assurance procedures, as described in the memorandum, "Quality Control/Quality Assurance Documentation on LOTB Sheets", dated July 1, 2007.

Dave Morrell	Senior Project Manager
Functional Supervisor (Print)	Title
	1/6/2011
Functional Supervisor (Signature)	Date

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

APPENDIX B

Laboratory Test Results Summary

Laboratory Results

Laboratory Test Summary **1201.7d**
Samples from Exploratory Borings
Lone Tree Slough Widen and SB Off Ramp

Boring	Sample	Depth (feet)	Unified Soil Classification	Dry Density (pcf)	Natural Moisture (%)	Plastic Limit	Liquid Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Consolidation Test	Pocket Pen (tsf)	Unconfined Compressive Strength (tsf)	Triaxial Test Results				Corrosivity Test
															Total		Effective		
															Phi (degrees)	Cohesion (psf)	Phi (degrees)	Cohesion (psf)	
A-09-F1	2c	6.0-6.5	SM	114.6	12.3														
A-09-F1	4c	11.0-11.5	SC	115.8	16.0								4.5+						
A-09-F1	5c	16.0-16.5	CL	102.2	23.2									3.2					
A-09-F1	6c	21.0-21.5	SC	116.5	15.2								4.5+						
A-09-F1	7c	26.0-26.5	SP-SM	101.6	6.7				0	94	6								
A-09-F1	9b	30.5-31.0	SC			13	21	8	0	56	44								
A-09-F1	9c	31.0-31.5	SC	95.4	25.3							Consolidation							
A-09-F1	10b	35.5-36.0	CL	105.0	19.4										0	3292			
A-09-F1	11b	40.5-41.0	CL																Test
A-09-F1	11c	41.0-41.5	CL	103.8	21.3								4.5+						
A-09-F1	12c	46.0-46.5	SC	123.0	14.8								3.5						
A-09-F1	14c	51.0-51.5	ML	101.6	24.1								4.5+						
A-09-F1	15c	56.0-56.5	CL	99.0	26.6								3.5						
A-09-F1	16b	60.5-61.0	ML	105.4	22.5								2.5						
A-09-F2	3b	5.5-6.0	CL	102.7	12.5								4.5+						
A-09-F2	3c	6.0-6.5	CL										4.5+						Test
A-09-F2	4c	11.0-11.5	SC	99.6	13.5								4.5+						
A-09-F2	5	11.5-13.0	CL						0	11	89								
A-09-F2	6c	16.0-16.5	SC	114.7	9.0								4.0						
A-09-F2	7c	21.0-21.5	SC	106.0	11.1								2.8						
A-09-F2	8b	25.5-26.0	SC	102.5	11.8														
A-09-F2	9c	31.0-31.5	SC	105.6	21.3										0	5216			
A-09-F2	11b	35.5-36.0	CL	98.2	24.4										0	2980			
A-09-F2	11c	36.0-36.5	CL			17	41	24	0	2	98								
A-09-F2	13c	46.0-46.5	SM	117.5	15.7								4.5						
A-09-F2	14c	51.0-51.5	SC	117.1	16.0								4.5						
A-09-F2	16c	56.0-56.5	ML	101.7	25.1	Non Plastic			0	30	70		4.5+						
A-09-F2	17b	60.5-61.0	ML	107.1	20.9								4.3						
A-09-F3	3c	6.0-6.5	SC	108.9	15.7								4.3						
A-09-F3	4	6.5-8.0	CH						0	9	91								
A-09-F3	5c	11.0-11.5	SC	105.4	13.7								4.5						
A-09-F3	6c	16.0-16.5	CL																Test
A-09-F3	7b	20.5-21.0	CL						1	33	66								
A-09-F3	7c	21.0-21.5	SC	106.2	7.2														
A-09-F3	8c	26.0-26.5	SP-SC	122.3	11.5								2.0						
A-09-F3	10c	31.0-31.5	CL	93.8	29.5								4.0						
A-09-F3	11b	35.5-36.0	CL			21	43	22	2	18	80								
A-09-F3	11c	36.0-36.5	CL	102.5	21.5										0	3757			
A-09-F3	13c	46.0-46.5	SM	107.3	20.7								4.5						
A-09-F3	14	46.5-48.0	SM			Non Plastic			0	67	33								
A-09-F3	16b	55.5-56.0	SM	104.9	23.9				0	81	19								
A-09-F3	17c	61.0-61.5	CL	111.9	18.6								4.5+						
A-09-F3	18	61.5-63.0	CL	98.3	22.5								3.5						

Laboratory Test Summary **1201.7d**

Samples from Exploratory Borings

Lone Tree Slough Widen and SB Off Ramp

Boring	Sample	Depth (feet)	Unified Soil Classification	Dry Density (pcf)	Natural Moisture (%)	Plastic Limit	Liquid Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Consolidation Test	Pocket Pen (tsf)	Unconfined Compressive Strength (tsf)	Triaxial Test Results				Corrosivity Test
															Total		Effective		
															Phi (degrees)	Cohesion (psf)	Phi (degrees)	Cohesion (psf)	
A-09-F4	1b	5.5-6.0																	Test
A-09-F4	1c	6.0-6.5		101.0	24.1								2.5						
A-09-F4	2c	11.0-11.5		100.5	23.0								4.3						
A-09-F4	3b	15.5-16.0	CL			17	38	21	0	14	86								
A-09-F4	3c	16.0-16.5	ML	98.9	25.0				0	9	91		3.9						
A-09-F4	4c	21.0-21.5		94.0	28.8								4.5	1.09					
A-09-F4	5c	26.0-26.5		107.0	13.5								2.0						
A-09-F4	6b	30.5-31.0	CL			22	39	17	0	4	96		2.0						
A-09-F4	6c	31.0-31.5		84.9	35.1										0	1196			
A-09-F4	7b	35.5-36.0																	
A-09-F4	7c	36.0-36.5		92.8	27.8								4.5						
A-09-F4	8c	41.0-41.5		106.1	17.1								4.0						
A-09-F4	9c	46.0-46.5	ML	98.6	27.0				0	48	52		2.5						
A-09-F4	10c	51.0-51.5		101.5	23.3								3.5						
A-09-F4	11c	56.0-56.5		116.2	17.2								3.5						
A-09-F4	12c	60.5-61.0		108.4	21.1								4.5+						

Project Name: SR99 Median Widening - Lone Tree Slough
BCI File No: 1201.7d
Date: 4/6/2009
Technician: ECH/KLC

blackburn consulting

MOISTURE-DENSITY TESTS

Sample No.	F1-2C	F1-4C	F1-6C	F1-7C	F1-11C	F1-12C	F1-14C
Depth (ft.)	5-6.5	10-11.5	20-21.5	25-26.5	40-41.5	45-46.5	50-51.5
Sample Length (in.)	5.66	6.00	5.92	5.74	5.96	5.79	5.80
Diameter (in.)	2.390	2.410	2.380	2.390	2.400	2.400	2.400
Sample + Tube (g)	1126.8	965.0	928.2	1014.7	891.2	970.9	868.5
Tube (g)	269.4	0.0	0.0	281.5	0.0	0.0	0.0
Wet Weight (g)	857.4	965.0	928.2	733.2	891.2	970.9	868.5
Sample Volume (ft^3)	0.01469	0.01584	0.01524	0.01490	0.01560	0.01516	0.01518
Tare No.	T4	D2	A2	F4	T10	T12	F3
Tare (g)	254.2	154.3	157.3	156.5	253.3	259.1	153.8
Wet Soil + Tare (g)	663.9	748.7	626.5	811.0	848.3	823.8	715.2
Dry Soil + Tare (g)	619.1	666.6	564.5	769.7	743.9	751.0	606.3
Dry Soil Weight (g)	364.9	512.3	407.2	613.2	490.6	491.9	452.5
Water (g)	44.8	82.1	62.0	41.3	104.4	72.8	108.9
Moisture (%)	**12.3**	**16.0**	**15.2**	**6.7**	**21.3**	**14.8**	**24.1**
Wet Density (pcf)	**128.6**	**134.3**	**134.3**	**108.5**	**125.9**	**141.2**	**126.1**
Dry Density (pcf)	**114.6**	**115.8**	**116.5**	**101.6**	**103.8**	**123.0**	**101.6**
Pocket Pen (tsf)	**SAND**	**4.5+**	**4.5+**	**SAND**	**4.5+**	**3.5**	**4.5+**

Sample No.	F1-15C	F1-16B	F2-3B	F2-4C	F2-6C	F2-7C	F2-8B
Depth (ft.)	55-56.5	60-61.5	5-6.5	10-11.5	15-16.5	20-21.5	25-26.5
Sample Length (in.)	5.74	5.83	5.65	5.97	6.00	5.71	5.50
Diameter (in.)	2.390	2.390	2.390	2.360	2.380	2.390	2.390
Sample + Tube (g)	847.0	887.0	769.2	774.7	876.5	792.4	1028.9
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	286.2
Wet Weight (g)	847.0	887.0	769.2	774.7	876.5	792.4	742.7
Sample Volume (ft^3)	0.01490	0.01514	0.01467	0.01511	0.01545	0.01482	0.01428
Tare No.	T3	F	G	N	F5	L	F7
Tare (g)	256.7	153.4	223.6	240.7	195.2	215.2	191.8
Wet Soil + Tare (g)	706.9	748.9	664.2	744.9	642.7	763.8	685.6
Dry Soil + Tare (g)	612.3	639.4	615.2	684.9	605.7	708.9	633.4
Dry Soil Weight (g)	355.6	486.0	391.6	444.2	410.5	493.7	441.6
Water (g)	94.6	109.5	49.0	60.0	37.0	54.9	52.2
Moisture (%)	**26.6**	**22.5**	**12.5**	**13.5**	**9.0**	**11.1**	**11.8**
Wet Density (pcf)	**125.3**	**129.2**	**115.6**	**113.0**	**125.1**	**117.8**	**114.7**
Dry Density (pcf)	**99.0**	**105.4**	**102.7**	**99.6**	**114.7**	**106.0**	**102.5**
Pocket Pen (tsf)	**3.5**	**2.5**	**4.5+**	**4.5+**	**4.5**	**4.0(SAND)**	**2.8**

Diameter = 1.44" for 1.5-inch Tubes
Diameter = 1.938" for 2-inch Tubes
Diameter = 2.438" for 2.5-inch Tubes
Diameter= 2.850" for 3.0-inch Shelby Tubes

Project Name: SR99 Median Widening - Lone Tree Slough

BCI File No: 1201.7d

Date: 4/6/2009

Technician: ECH/KLC

blackburn consulting

MOISTURE-DENSITY TESTS

Sample No.	F2-13C	F2-14C	F2-16	F2-17B	F3-3	F3-5	F3-7
Depth (ft.)	45-46.5	50-51.5	55-56.5	60-61.5	6.0-6.5	11.0-11.5	21.0-21.5
Sample Length (in.)	5.95	5.96	5.99	5.96	5.06	5.99	5.98
Diameter (in.)	2.390	2.400	2.370	2.400	2.370	2.370	2.363
Sample + Tube (g)	952.6	961.5	882.7	916.2	738.4	831.1	784.1
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet Weight (g)	952.6	961.5	882.7	916.2	738.4	831.1	784.1
Sample Volume (ft^3)	0.01545	0.01560	0.01529	0.01560	0.01292	0.01529	0.01518
Tare No.	F6	R	C2	A	J	G-2	B
Tare (g)	192.2	342.7	155.3	162.7	157.7	307.6	225.2
Wet Soil + Tare (g)	768.6	885.9	795.3	716.6	896.1	1138.7	1009.3
Dry Soil + Tare (g)	690.2	810.8	666.9	620.8	795.9	1038.8	956.5
Dry Soil Weight (g)	498.0	468.1	511.6	458.1	638.2	731.2	731.3
Water (g)	78.4	75.1	128.4	95.8	100.2	99.9	52.8
Moisture (%)	**15.7**	**16.0**	**25.1**	**20.9**	**15.7**	**13.7**	**7.2**
Wet Density (pcf)	**135.9**	**135.9**	**127.3**	**129.4**	**126.0**	**119.8**	**113.9**
Dry Density (pcf)	**117.5**	**117.1**	**101.7**	**107.1**	**108.9**	**105.4**	**106.2**
Pocket Pen (tsf)	**4.5(SANDY)**	**4.5**	**4.5+**	**4.3**	**4.3**	**4.5+**	**0 Sand**

Sample No.	F3-8	F3-10	F3-13	F3-16	F3-17	F3-18	
Depth (ft.)	26.0-26.5	31.0-31.5	46.0-46.5	55.5-56.0	61.0-61.5	61.5-63.0	
Sample Length (in.)	6.00	5.97	5.97	4.62	6.00	3.87	
Diameter (in.)	2.362	2.366	2.387	2.344	2.390	1.521	
Sample + Tube (g)	941.5	837.1	908.5	680.0	937.7	222.2	
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	
Wet Weight (g)	941.5	837.1	908.5	680.0	937.7	222.2	
Sample Volume (ft^3)	0.01521	0.01519	0.01546	0.01154	0.01558	0.00407	
Tare No.	I	H	E	XX9	RR	F4	
Tare (g)	223.5	223.2	224.7	246.7	261.7	156.4	
Wet Soil + Tare (g)	1163.7	1059.6	1133.1	927.4	1199.1	378.6	
Dry Soil + Tare (g)	1066.4	868.9	977.2	796.0	1051.8	337.8	
Dry Soil Weight (g)	842.9	645.7	752.5	549.3	790.1	181.4	
Water (g)	97.3	190.7	155.9	131.4	147.3	40.8	
Moisture (%)	**11.5**	**29.5**	**20.7**	**23.9**	**18.6**	**22.5**	
Wet Density (pcf)	**136.4**	**121.5**	**129.5**	**129.9**	**132.7**	**120.4**	
Dry Density (pcf)	**122.3**	**93.8**	**107.3**	**104.9**	**111.9**	**98.3**	
Pocket Pen (tsf)	**2.0**	**4.0**	**4.5+**	**0 Sand**	**4.5+**	**3.5**	

Diameter = 1.44" for 1.5-inch Tubes

Diameter = 1.938" for 2-inch Tubes

Diameter = 2.438" for 2.5-inch Tubes

Diameter= 2.850" for 3.0-inch Shelby Tubes

Project Name: SR-99 Manteca Lone Tree Slough
BCI File No: 1201.7d
Date: 8/13/2009
Technician: KLC/DKB

blackburn consulting

MOISTURE-DENSITY TESTS

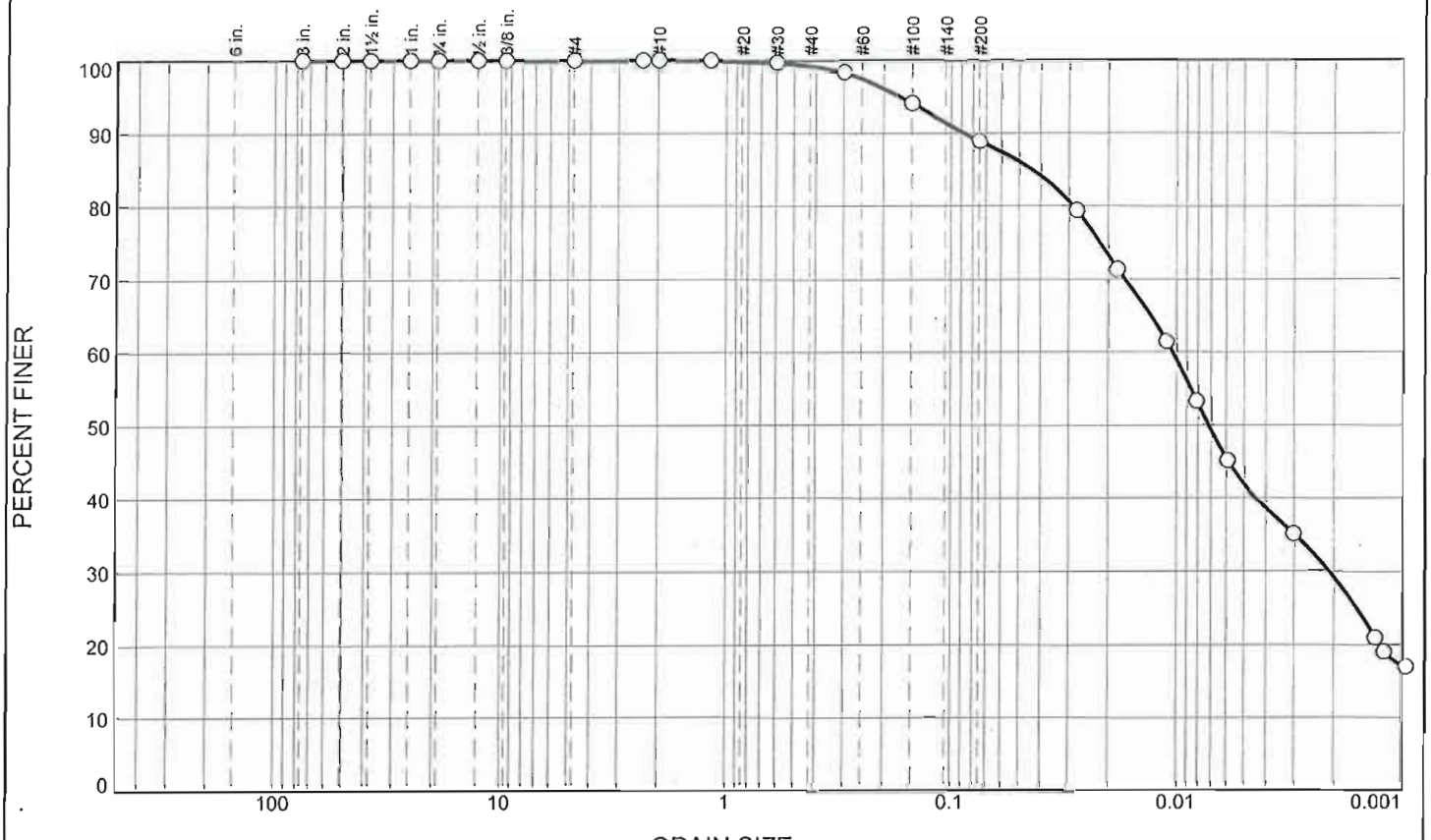
ASTM D 2216 / D 2937

Sample No.	F4-1C	F4-2C	F4-3C	F4-5C	F4-7C	F4-8C	F4-9C
Depth (ft.)	6.0-6.5	11.0-11.5	16.0-16.5	26.0-26.5	36.0-36.5	41.0-41.5	46.0-46.5
Sample Length (in.)	5.85	5.56	5.80	5.80	6.00	6.00	5.60
Diameter (in.)	2.396	2.386	2.396	2.386	2.400	2.418	2.409
Sample + Tube (g)	1140.0	1090.4	1118.1	1113.6	945.8	1099.8	1049.8
Tube (g)	272.5	283.4	269.1	287.0	100.5	201.3	210.7
Wet Weight (g)	867.5	807.0	849.0	826.6	845.3	898.5	839.1
Sample Volume (ft^3)	0.01526	0.01439	0.01513	0.01501	0.01571	0.01594	0.01477
Tare No.	H	F-2.1	RR	F3	T4	F5	T12
Tare (g)	223.4	260.6	261.7	154.0	254.2	195.4	259.9
Wet Soil + Tare (g)	1090.5	1067.1	1109.7	962.9	1098.4	1092.5	1099.0
Dry Soil + Tare (g)	922.2	916.3	940.1	866.7	914.7	961.5	920.7
Dry Soil Weight (g)	698.8	655.7	678.4	712.7	660.5	766.1	660.8
Water (g)	168.3	150.8	169.6	96.2	183.7	131.0	178.3
Moisture (%)	**24.1**	**23.0**	**25.0**	**13.5**	**27.8**	**17.1**	**27.0**
Wet Density (pcf)	**125.3**	**123.7**	**123.7**	**121.4**	**118.6**	**124.2**	**125.2**
Dry Density (pcf)	**101.0**	**100.5**	**98.9**	**107.0**	**92.8**	**106.1**	**98.6**
Pocket Pen (tsf)	**2.5**	**4.3**	**3.9**	**2.0**	**4.5+**	**4.0**	**2.5**

Sample No.	F4-10C	F4-11C	F4-12C				
Depth (ft.)	51.0-51.5	56.0-56.5	60.5-61.0				
Sample Length (in.)	5.85	5.84	6.00				
Diameter (in.)	2.395	2.409	2.400				
Sample + Tube (g)	1151.8	1157.3	1208.6				
Tube (g)	286.0	205.5	273.1				
Wet Weight (g)	865.8	951.8	935.5				
Sample Volume (ft^3)	0.01525	0.01540	0.01571				
Tare No.	XX-9	T5	A2				
Tare (g)	247.3	317.7	157.9				
Wet Soil + Tare (g)	1100.9	1275.3	1092.9				
Dry Soil + Tare (g)	939.8	1134.7	930.1				
Dry Soil Weight (g)	692.5	817.0	772.2				
Water (g)	161.1	140.6	162.8				
Moisture (%)	**23.3**	**17.2**	**21.1**				
Wet Density (pcf)	**125.1**	**136.2**	**131.3**				
Dry Density (pcf)	**101.5**	**116.2**	**108.4**				
Pocket Pen (tsf)	**3.5**	**3.5**	**4.5+**				

Diameter = 1.44" for 1.5-inch Tubes
Diameter = 1.938" for 2-inch Tubes
Diameter = 2.438" for 2.5-inch Tubes
Diameter= 2.850" for 3.0-inch Shelby Tubes

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	10.4	47.1	41.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.50	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#30	99.7		
#50	98.3		
#100	94.1		
#200	88.9		

* (no specification provided)

Material Description

Strong brown Lean CLAY with SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0876 D_{85}= 0.0439 D_{60}= 0.0105
D_{50}= 0.0073 D_{30}= 0.0021 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: F2 Depth: 11.5-13.0
Sample Number: 5

Date: 1/5/2010

Blackburn Consulting

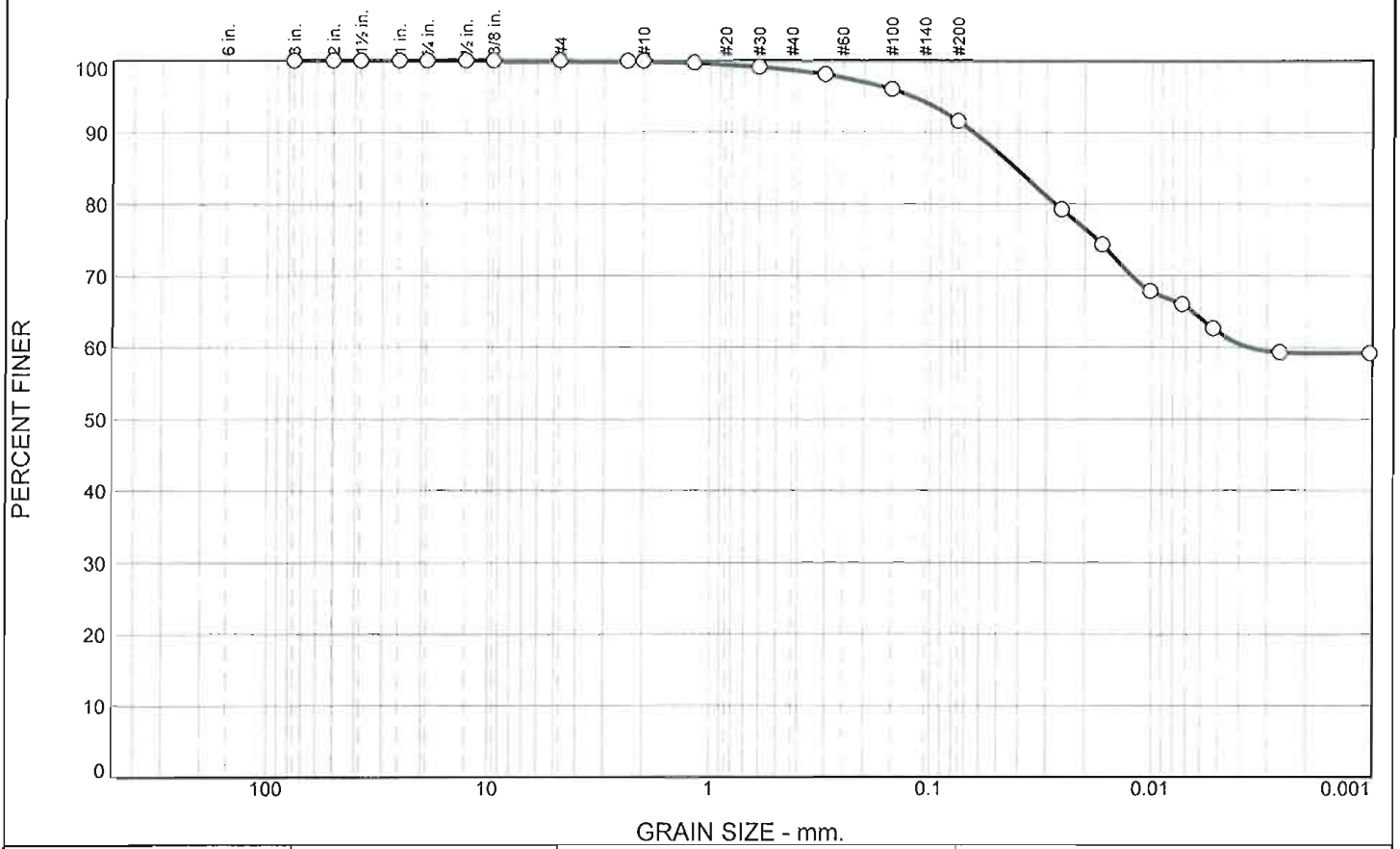
W. Sacramento, CA

Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough

Project No: 1201.7d Figure

Tested By: BWM/MAR Checked By: MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.2	7.2	29.4	62.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.50	100.0		
.375	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.6		
#30	99.1		
#50	98.1		
#100	96.0		
#200	91.5		

* (no specification provided)

Material Description

Black Fat CLAY with SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0640 D_{85}= 0.0414 D_{60}= 0.0036
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

D50 < 0.001

Source of Sample: F3 **Depth:** 6.5-8.0
Sample Number: 4

Date: 1/4/2010

Blackburn Consulting

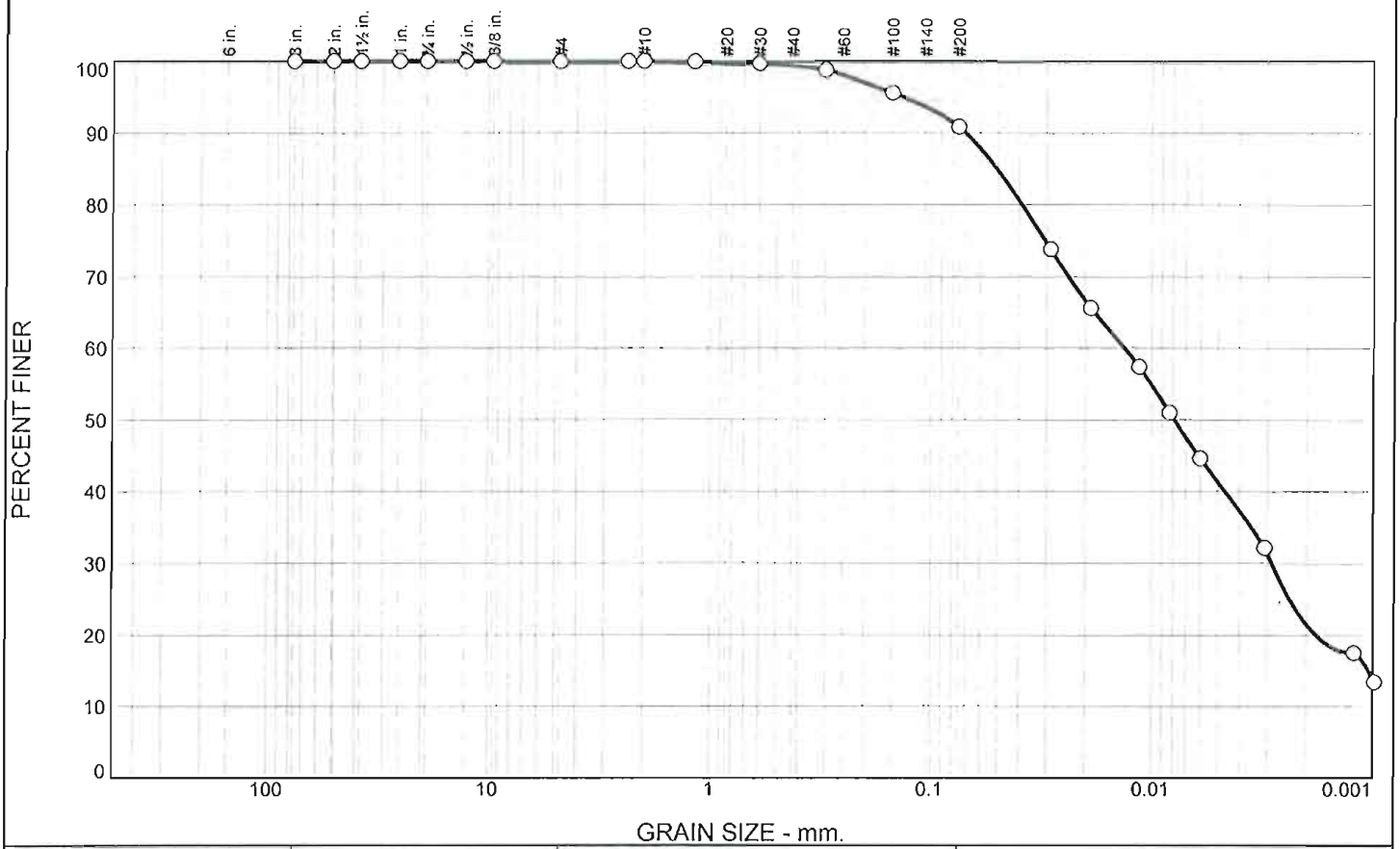
W. Sacramento, CA

Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough

Project No: 1201.7d **Figure**

Tested By: MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	8.7	49.5	41.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.50	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#30	99.7		
#50	98.8		
#100	95.6		
#200	90.8		

* (no specification provided)

Material Description

Yellowish brown SILT with SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0700 D_{85}= 0.0506 D_{60}= 0.0133
D_{50}= 0.0079 D_{30}= 0.0029 D_{15}= 0.0010
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: F4 **Depth:** 16.0-16.5'
Sample Number: 3c

Date: 1/5/2010

Blackburn Consulting

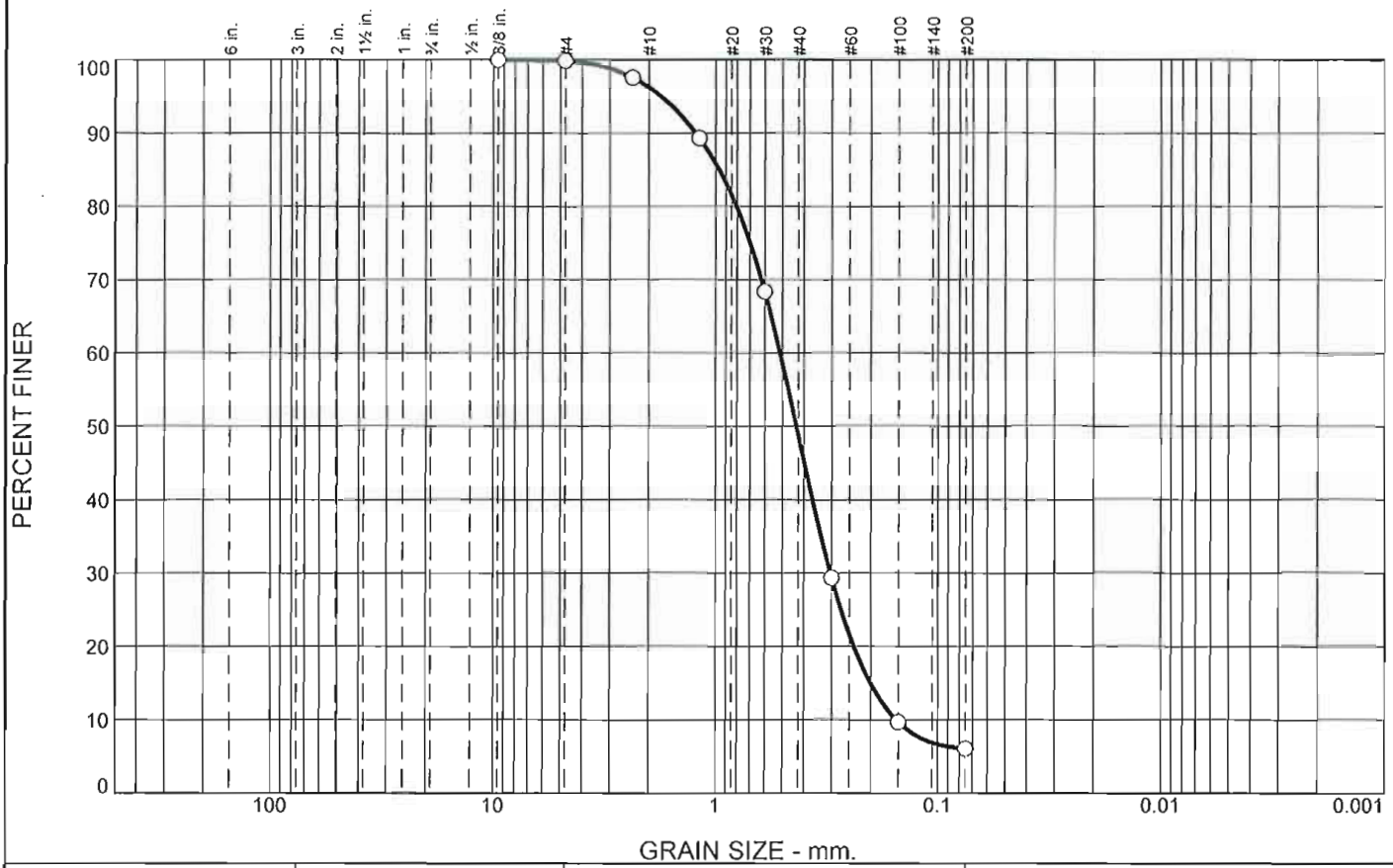
W. Sacramento, CA

Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough

Project No: 1201.7d **Figure**

Tested By: BWM/MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	4	47	43	6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	98		
#16	89		
#30	68		
#50	29		
#100	10		
#200	6.1		

* (no specification provided)

Material Description

Yellowish Brown Poorly Graded SAND with Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.2257 D_{85}= 0.9611 D_{60}= 0.5121
D_{50}= 0.4324 D_{30}= 0.3039 D_{15}= 0.2003
D_{10}= 0.1532 C_u= 3.34 C_c= 1.18

Classification

USCS= SP-SM AASHTO=

Remarks

Sample Number: F1-7 C **Depth:** 26.0'-26.5'

Date: 4-6-09

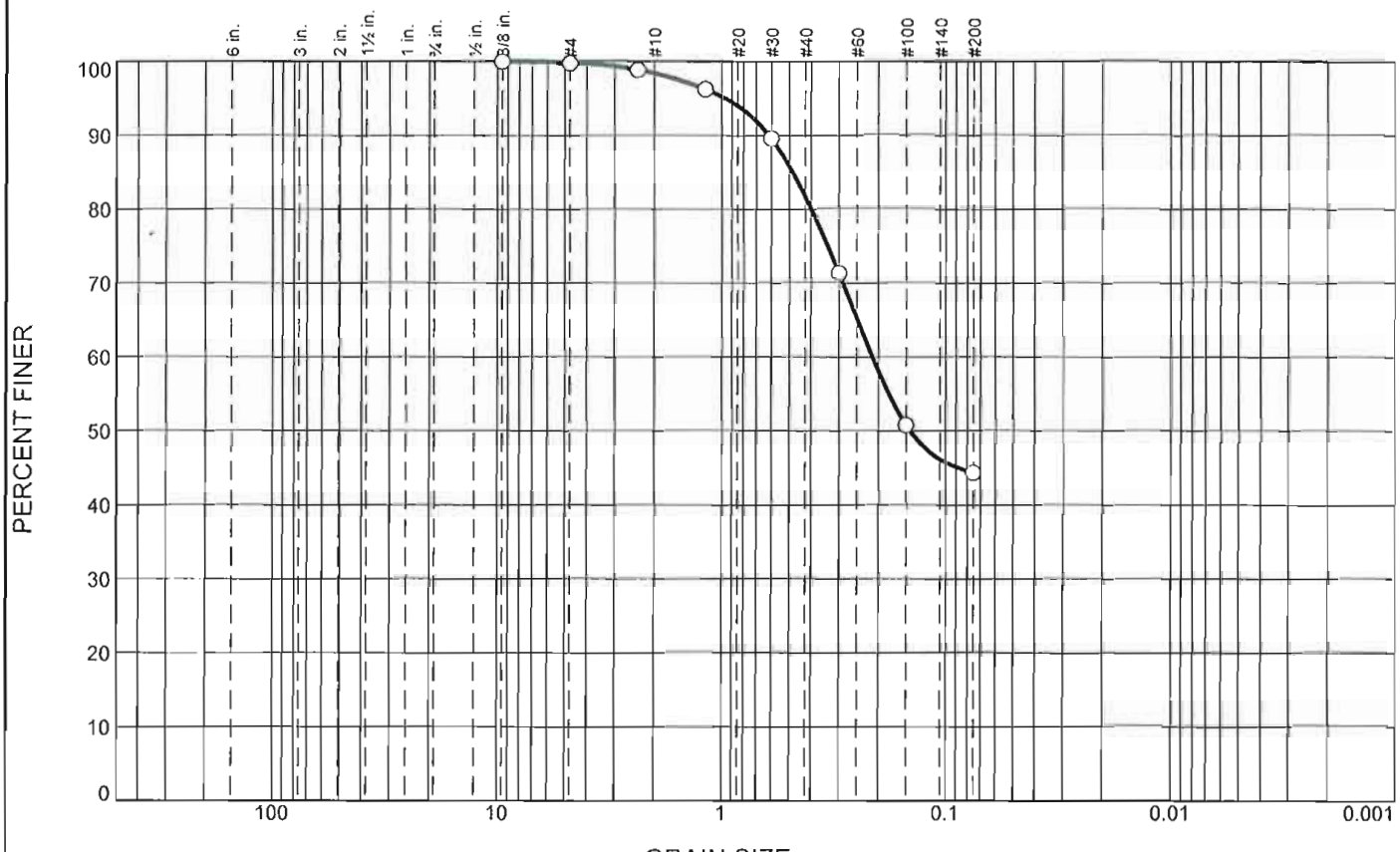
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	16	38	44	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100		
#4	100		
#8	99		
#16	96		
#30	90		
#50	71		
#100	51		
#200	44		

* (no specification provided)

Material Description

Dark Yellowish Brown Clayey SAND

Atterberg Limits

PL= 13 LL= 21 PI= 8

Coefficients

D_{90}= 0.6145 D_{85}= 0.4816 D_{60}= 0.2119
D_{50}= 0.1435 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-4(0)

Remarks

Sample Number: F1-9 B **Depth:** 30.5'-31.0'

Date: 4-7-09

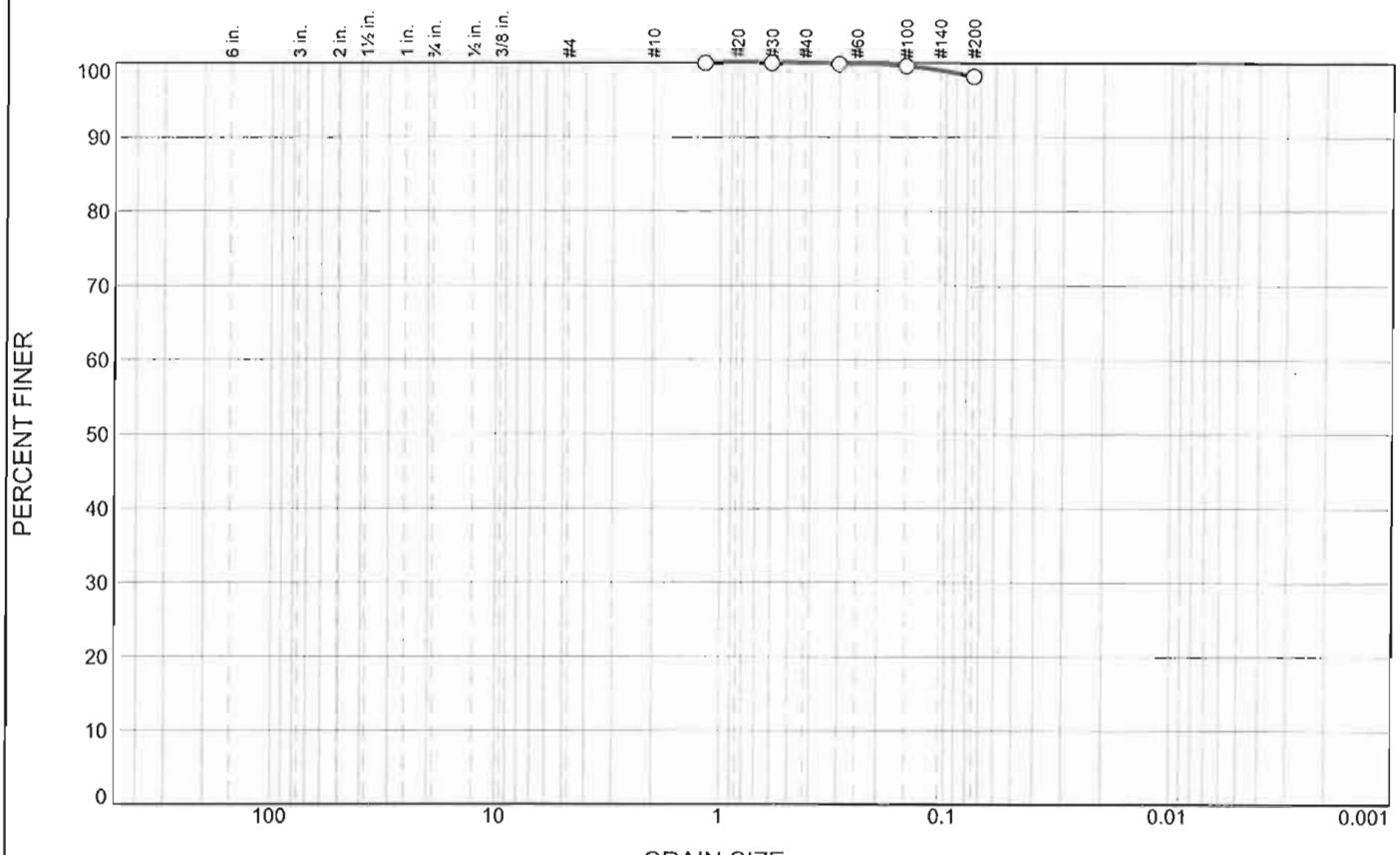
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	2	98	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#16	100		
#30	100		
#50	100		
#100	100		
#200	98		

* (no specification provided)

Material Description

Brown Lean CLAY

Atterberg Limits

PL= 17 LL= 41 PI= 24

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(25)

Remarks

Sample Number: F2-11 C **Depth:** 36.0"-36.5'

Date: 4-15-09

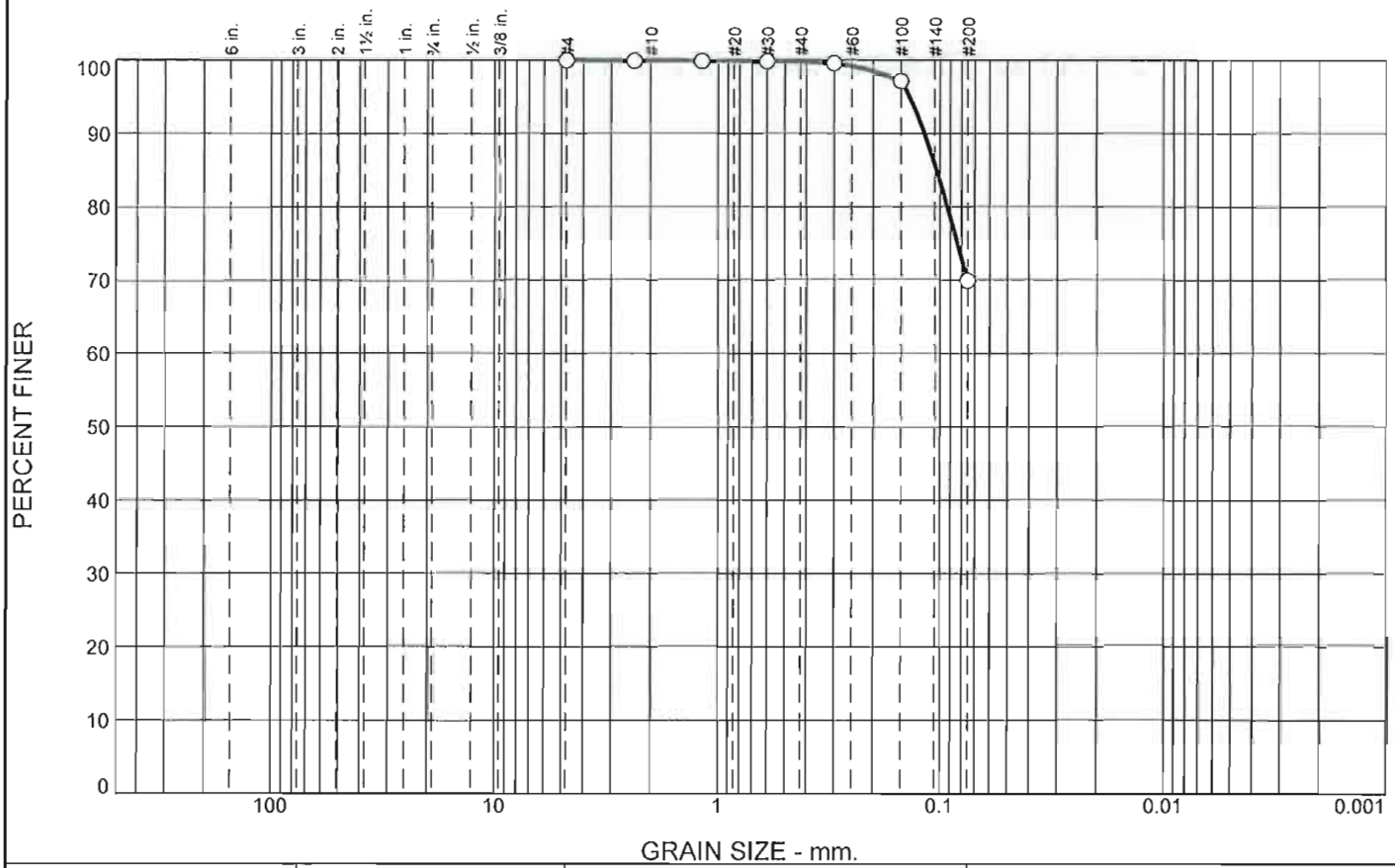
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	30	70	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	100		
#30	100		
#50	100		
#100	97		
#200	70		

* (no specification provided)

Material Description

Dark Grayish Brown Sandy SILT

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.1174 D_{85}= 0.1036 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Sample Number: F2-16 C **Depth:** 56.0'-56.5'

Date: 4-6-09

Blackburn Consulting

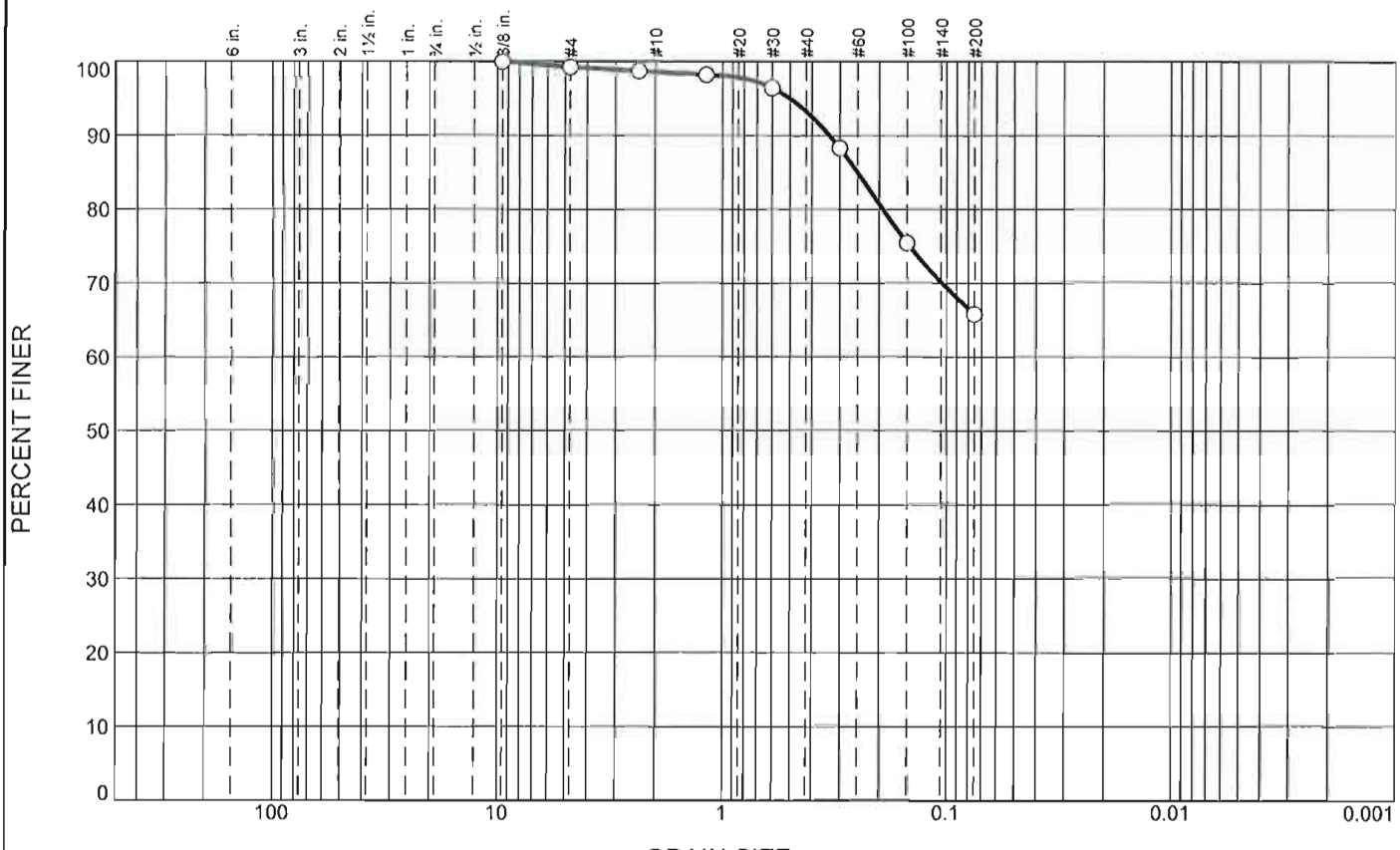
Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough

Project No: 1201.7D **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	0	6	27	66	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	99		
#8	99		
#16	98		
#30	96		
#50	88		
#100	75		
#200	66		

* (no specification provided)

Material Description

Yellowish Brown Sandy Lean CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3334 D_{85}= 0.2495 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample Number: F3-7 B **Depth:** 20.5'-21.0'

Date: 4-15-09

Blackburn Consulting

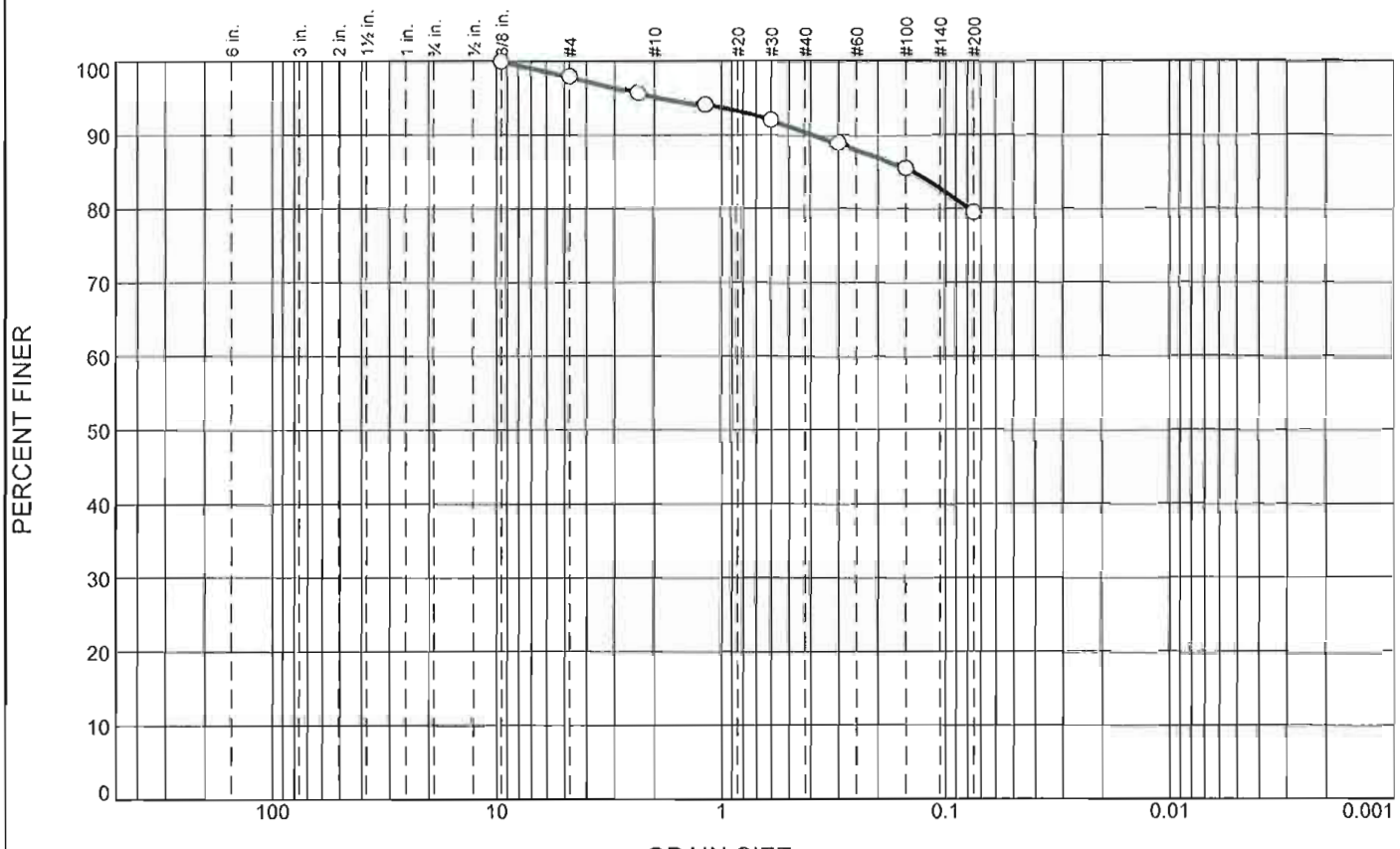
Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough

Project No: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	3	4	11	80	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	98		
#8	96		
#16	94		
#30	92		
#50	89		
#100	85		
#200	80		

* (no specification provided)

Material Description

Yellowish Brown Lean CLAY with Sand

Atterberg Limits

PL= 21 LL= 43 PI= 22

Coefficients

D_{90}= 0.3783 D_{85}= 0.1404 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(17)

Remarks

Sample Number: F3-11 B **Depth:** 35.5'-36.0'

Date: 4-16-09

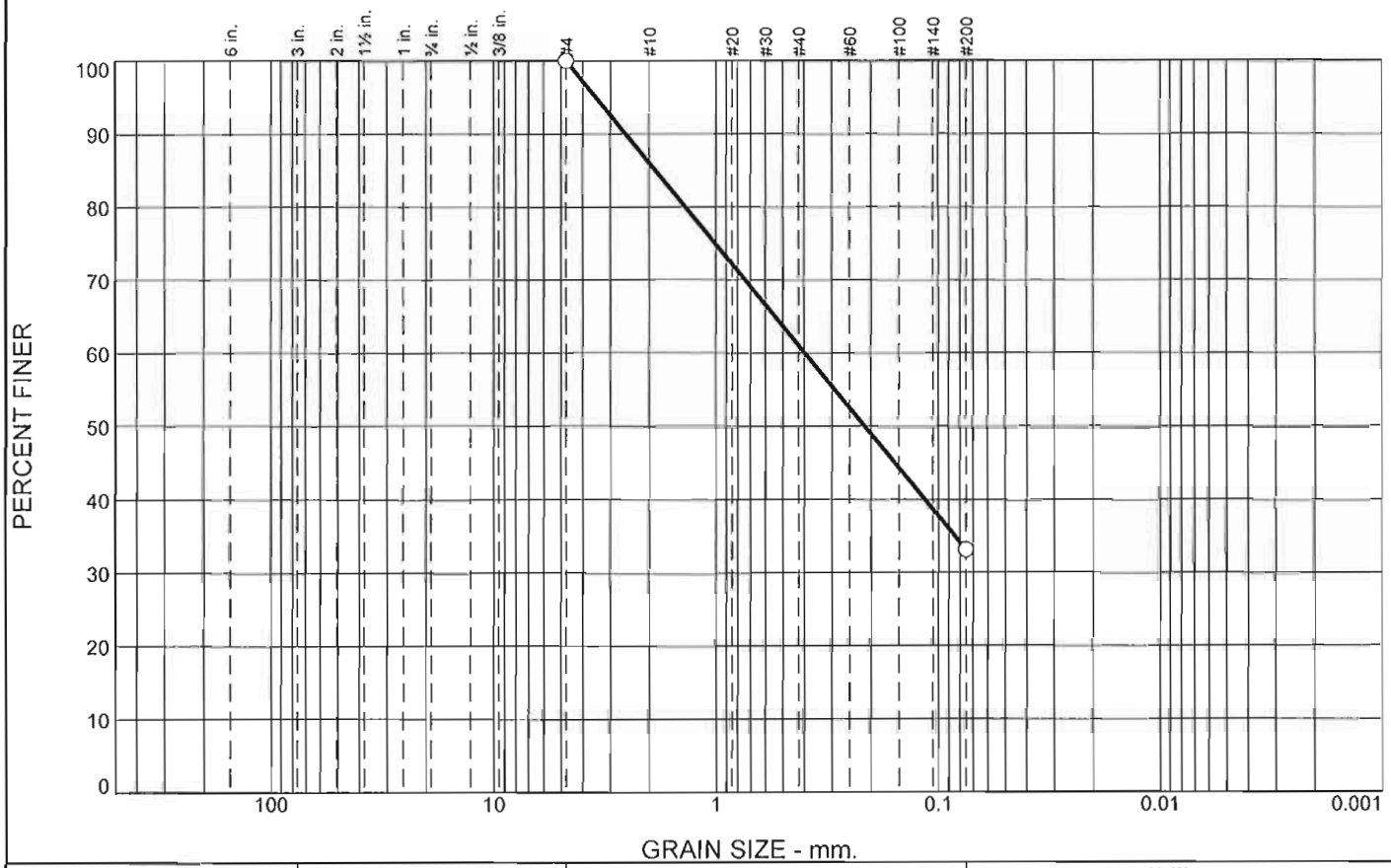
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	14	25	28	33	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#200	33		

* (no specification provided)

Material Description

Light Olive Brown Silty SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.5539 D_{85}= 1.8726 D_{60}= 0.3969
D_{50}= 0.2134 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample Number: F3-14 **Depth:** 46.5'-48.0'

Date: 4-19-09

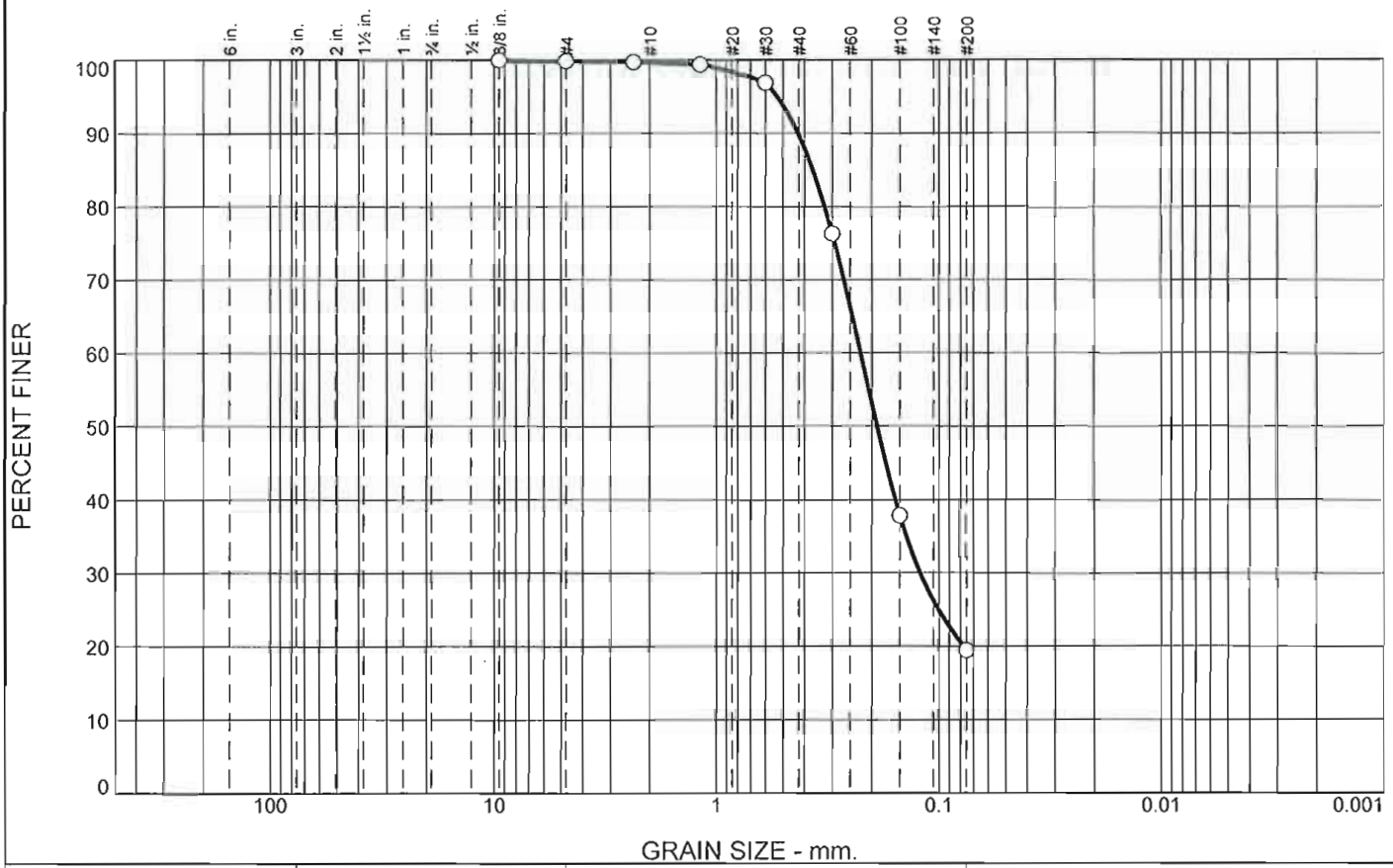
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	10	71	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	100		
#16	99		
#30	97		
#50	76		
#100	38		
#200	19		

* (no specification provided)

Material Description

Yellowish Brown Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4272 D_{85}= 0.3669 D_{60}= 0.2244
D_{50}= 0.1894 D_{30}= 0.1214 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Glass pieces in sample

Sample Number: F3-16 B **Depth:** 55.5'-56.0'

Date: 4-15-09

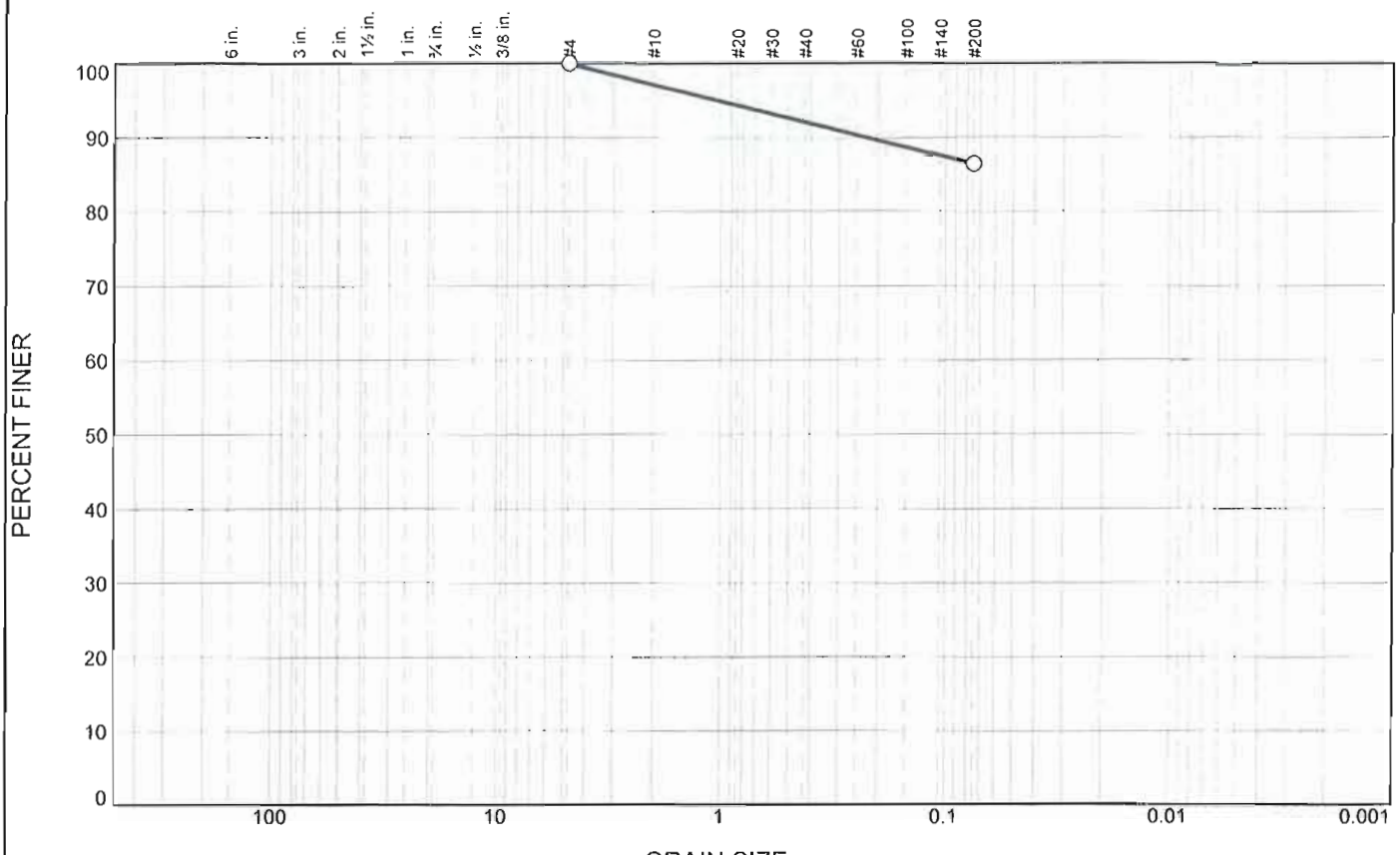
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	3	5	6	86	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#200	86		

* (no specification provided)

Material Description

Dark Grayish Brown Lean CLAY

Atterberg Limits

PL= 17 LL= 38 PI= 21

Coefficients

D_{90}= 0.2236 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

Sample Number: F4-3 B **Depth:** 15.5'-16.0'

Date: 8-24-09

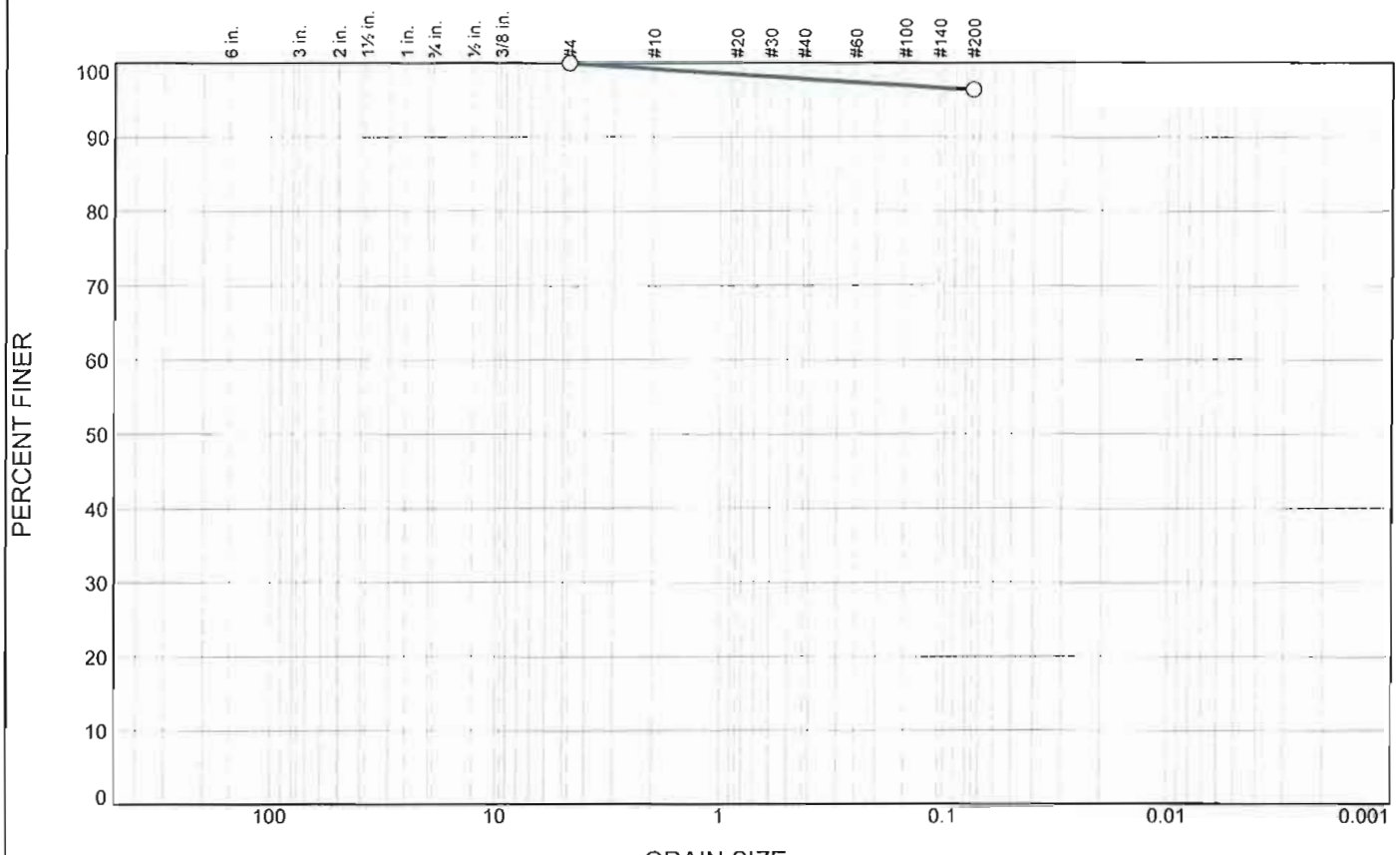
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC/DKB **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	1	2	96	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#200	96		

* (no specification provided)

Material Description

Brown Lean CLAY

Atterberg Limits

PL= 22 LL= 39 PI= 17

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

Sample Number: F4-6 B **Depth:** 30.5'-31.0'

Date: 8.24-09

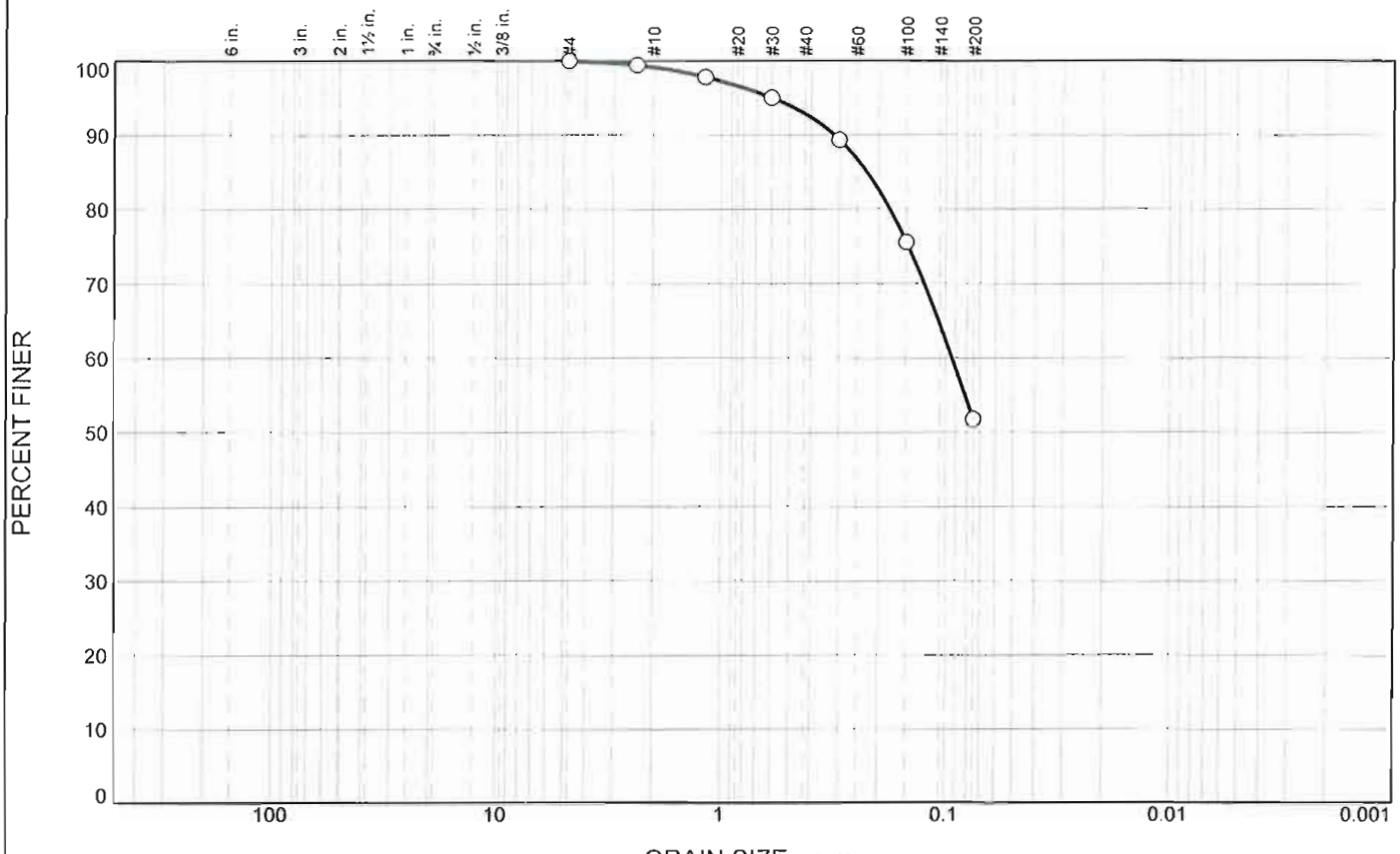
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC/DKB **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	6	41	52	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	99		
#16	98		
#30	95		
#50	89		
#100	76		
#200	52		

* (no specification provided)

Material Description

Light Olive Brown Sandy SILT

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3168 D_{85}= 0.2263 D_{60}= 0.0937
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Sample Number: F4-9 C **Depth:** 46.0'-46.5'

Date: 8-24-09

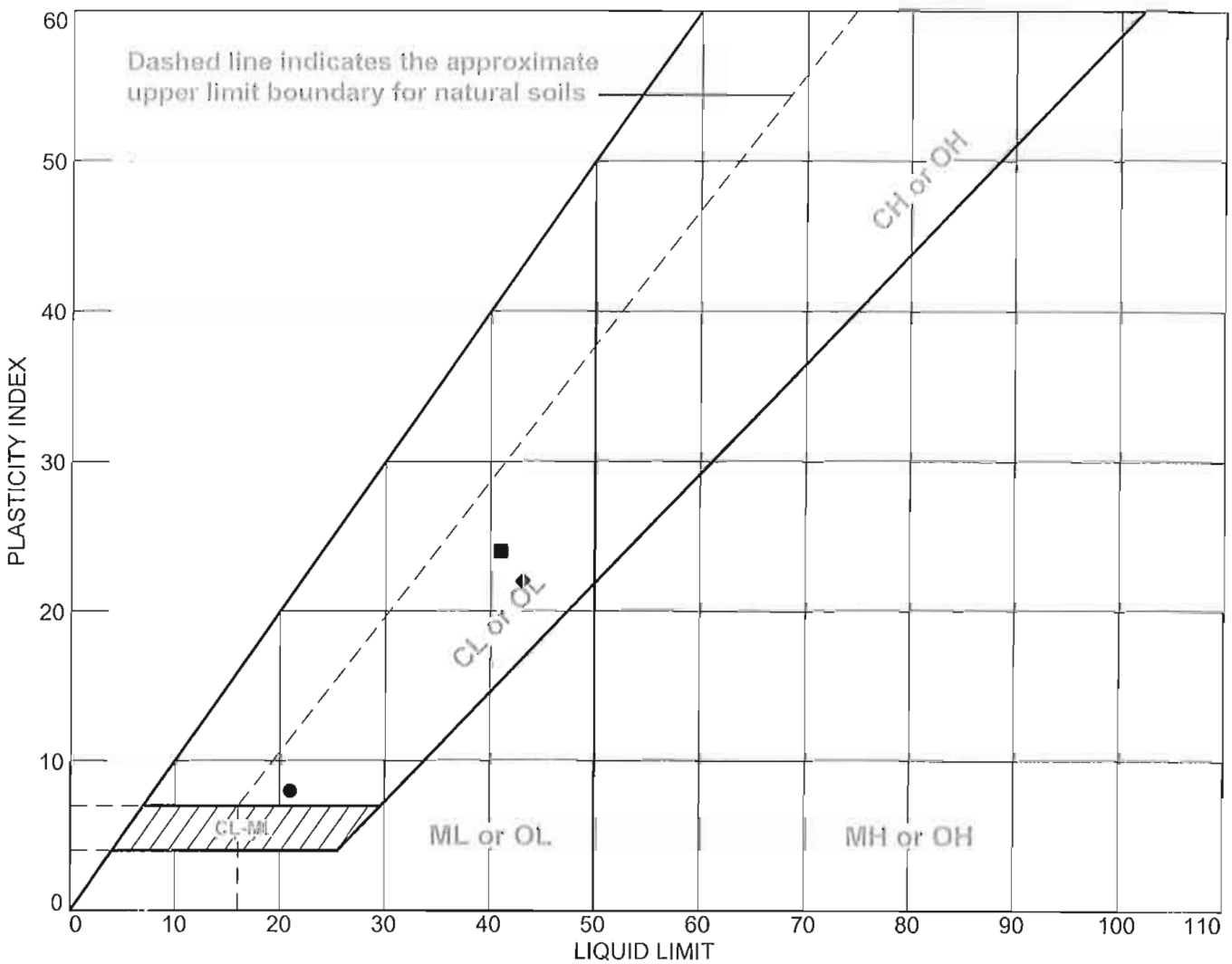
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC/DKB **Checked By:** KLC

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		F1-9 B	30.5'-31.0'		13	21	8	SC
■		F2-11 C	36.0"-36.5'		17	41	24	CL
▲		F2-16 C	56.0'-56.5'		NP	NV	NP	ML
◆		F3-11 B	35.5'-36.0'		21	43	22	CL
▼		F3-14	46.5'-48.0'		NP	NV	NP	SM

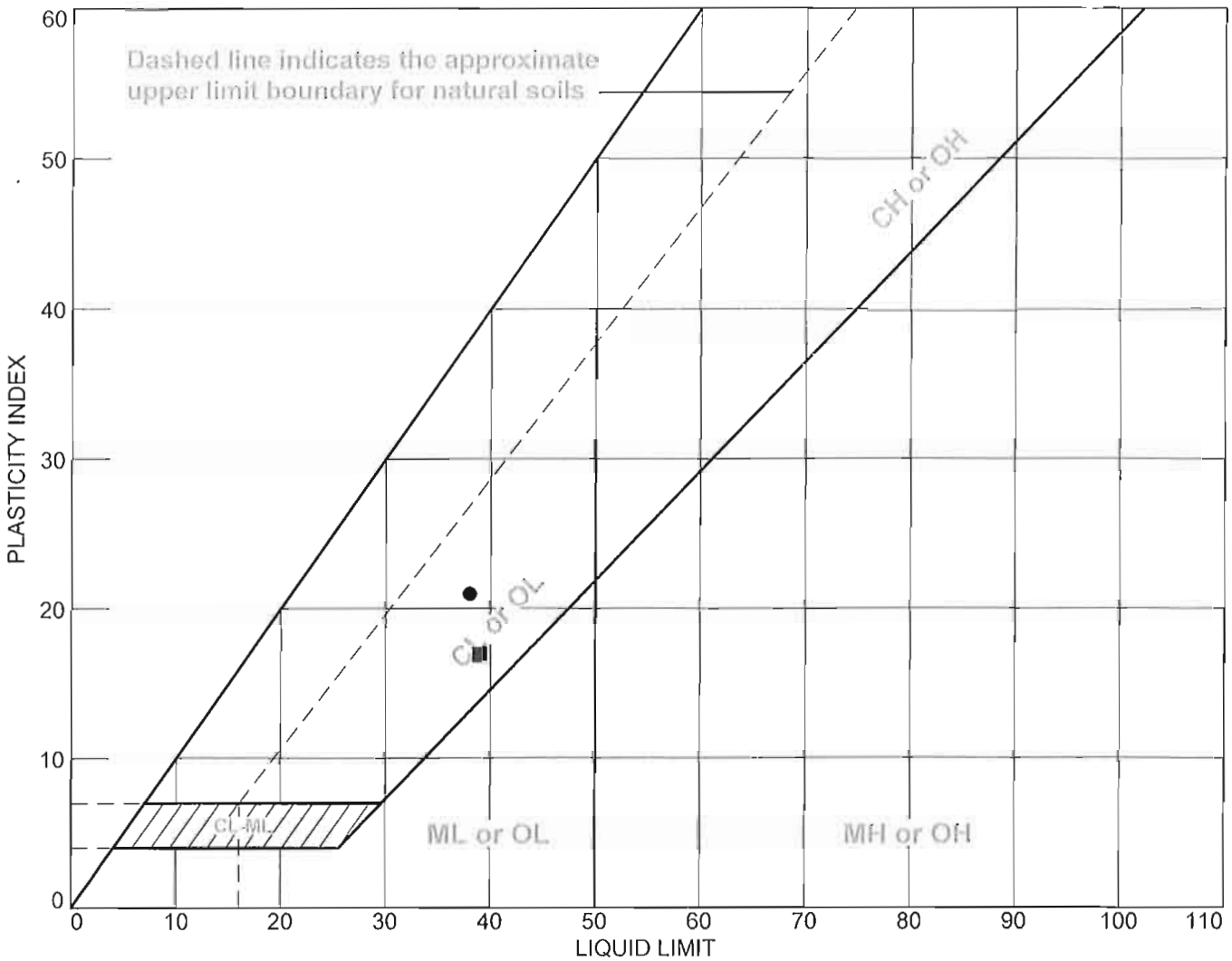
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No.: 1201.7D
Figure

Tested By: KLC **Checked By:** KLC

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		F4-3 B	15.5'-16.0'		17	38	21	CL
■		F4-6 B	30.5'-31.0'		22	39	17	CL

Blackburn Consulting

Auburn, CA

Client: HDR INC.

Project: SR99 Median Widening - Lone Tree Slough

Project No.: 1201.7D

Figure

Tested By: KLC **Checked By:** KLC

Unconfined Compression Test
ASTM D 2166-00

Project Name	SR 99 Widening - Lone Tree Slough
Project Number	1201.7d
Sample	F1-5c Depth 16.0-16.5
Sample Description	SANDY lean CLAY (CL), dark yellowish brown, slightly cemented
Date	6/5/2009
Tested By:	MDR

Original Sample Length	5.66
Original Diameter (in)	2.40
Sample Area (in^2)	4.52

axial strain	**2.4%**
Average cross-sectional area (in^2)	**4.64**
Average cross-sectional area (ft^2)	0.032
Peak Reading	0.136
Maximum Load(lb)	206
Compressive Strength (tsf)	**3.20**

Moisture Density

Wet Sample Weight (g)	951.0
Tare Number	VV
Tare Weight (g)	105.0
Dry Sample Weight (g)	791.6
Dry Weight (g)	686.6
Water Weight (g)	159.4
Percent Moisture (%)*	23.2
Wet Density (pcf)	125.9
Dry Density (pcf)	102.2

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.000

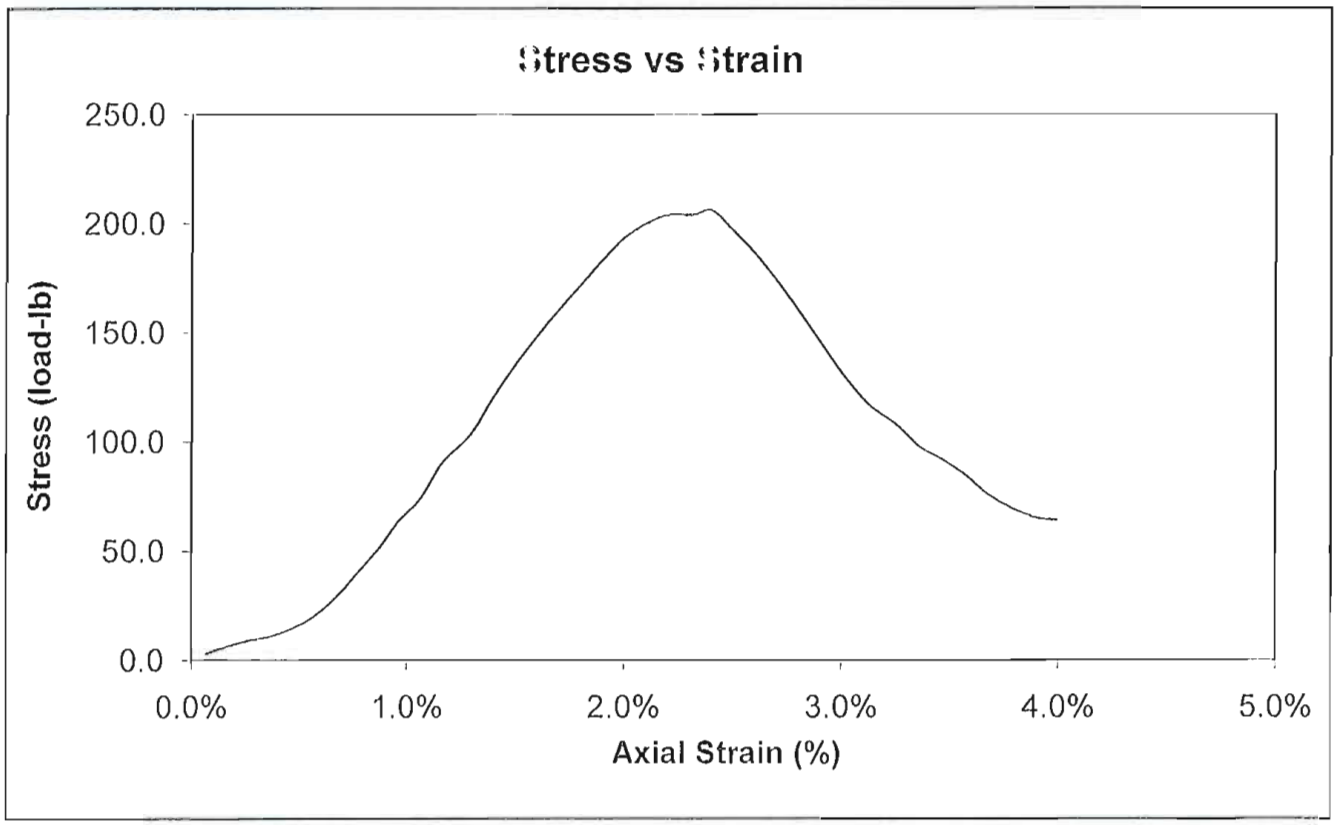
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.004	3.000	0.096	160.000	0.190	98.000		
0.009	6.000	0.102	172.000	0.196	92.000		
0.015	9.000	0.108	184.000	0.202	85.000		
0.021	11.000	0.113	193.000	0.208	76.000		
0.027	15.000	0.119	200.000	0.215	69.000		
0.032	20.000	0.125	204.000	0.221	65.000		
0.038	29.000	0.131	204.000	0.226	64.000		
0.043	39.000	0.136	206.000				
0.049	51.000	0.141	198.000				
0.054	63.000	0.147	187.000				
0.060	74.000	0.153	174.000				
0.066	91.000	0.160	157.000				
0.073	103.000	0.165	144.000				
0.079	120.000	0.171	129.000				
0.084	133.000	0.177	117.000				
0.090	147.000	0.184	108.000				

Project
SR 99 Widening - Lone Tree Slough
Project Number
1201.7d
Sample Number
F1-5c
Material Description
SANDY lean CLAY (CL), dark yellowish brown, slightly cemented
Tested By
MDR

ASTM D 2166-00



Wet Density (pcf)	125.9
Dry Density (pcf)	102.2
% Moisture	23.2

Unconfined Compressive Strength (tsf) 3.2

Unconfined Compression Test Lab Sheet
ASTM D 2166-00

Project Name _____
Project Number 1201.7d
Sample E1-5c Depth 16.0-16.5
Sample Description Dk yellowish brown, sl cemented
Date 6/6/09
Tested By: [illegible]

Original Sample Length 5.060
Original Diameter (in) 2.40
Sample Area (in^2) _____

846.55 wet wt

Moisture Density

Wet Sample Weight (g) 951.01
Tare Number VV
Tare Weight (g) 105.02
Dry Sample Weight (g) 791.62
Dry Weight (g) _____
Water Weight (g) _____
Percent Moisture (%)* _____
Wet Unit Weight (pcf) _____
Dry Unit Weight (pcf) _____

Remarks:
* Moisture taken after test

Compression Test

Maximum Reading _____ at Dial Reading _____

Dial reading @ 0 lb _____

15% strain is = dial reading at start minus dial reading now divided by height

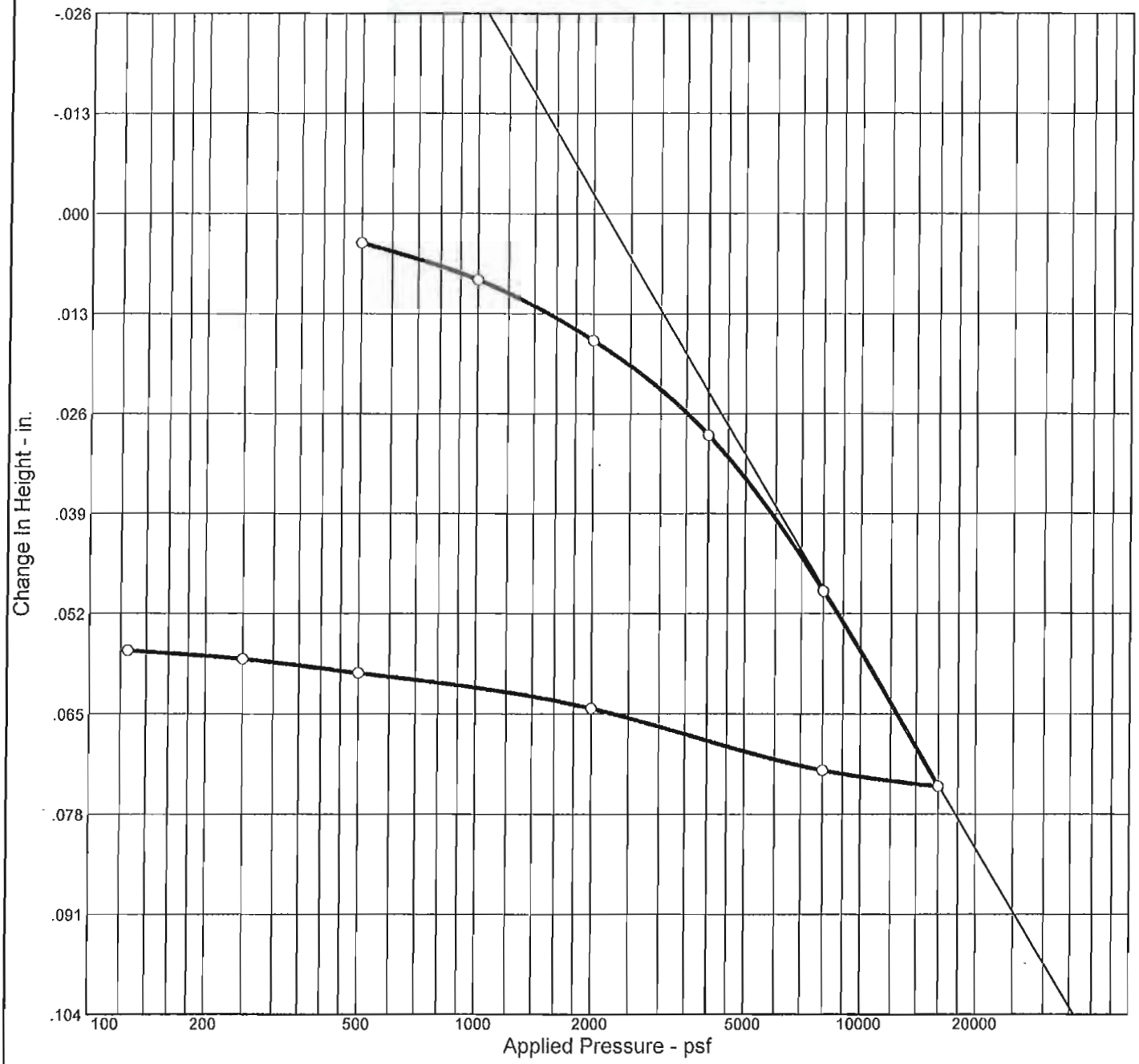
Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb

pproximate Diameters
44" for 1.5-inch Tubes
96" for 2-inch Tubes
4" for 2.5-inch Tubes

MEASURE ALL TUBES WITH CALIPERS

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
90.0 %	25.3 %	95.4			2.7	3750	5002	0.20	0.02	0.759

MATERIAL DESCRIPTION	USCS	AASHTO
Light brown lean Clay	CL	

Project No. 1201.7d **Client:** HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source: F1 **Sample No.:** 9c **Elev./Depth:** 31.0-31.5'

Remarks:

Blackburn Consulting

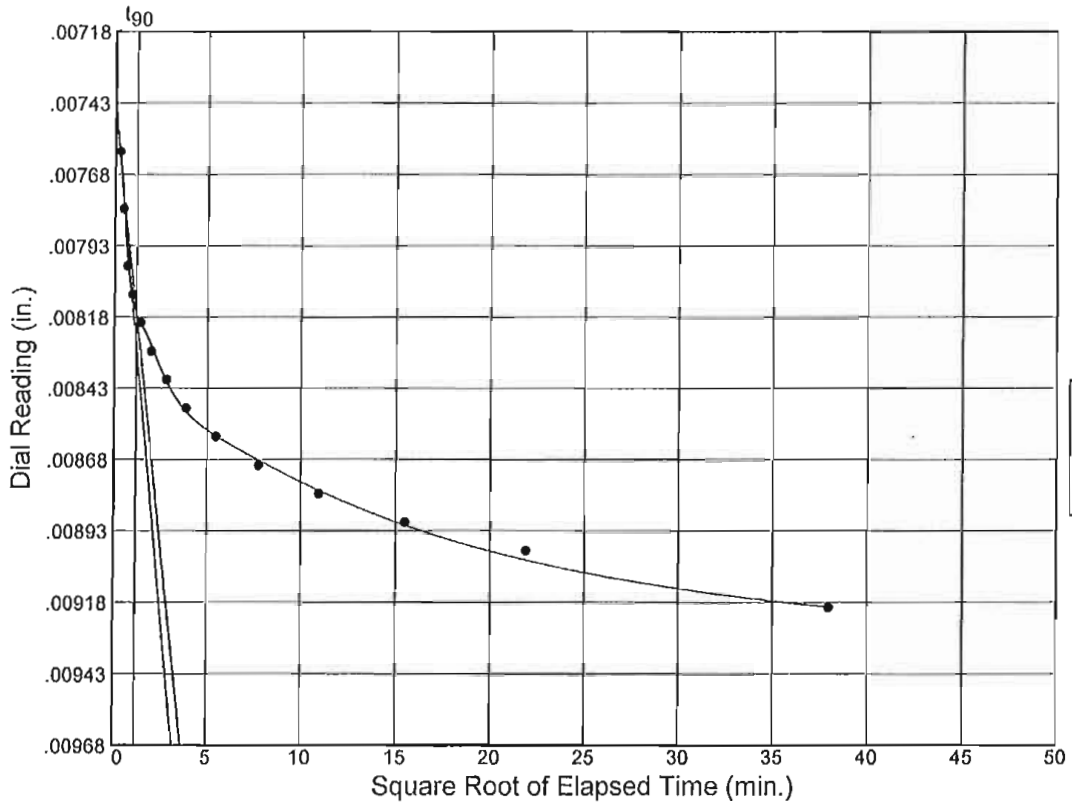
W. Sacramento, CA

Figure

Dial Reading vs. Time

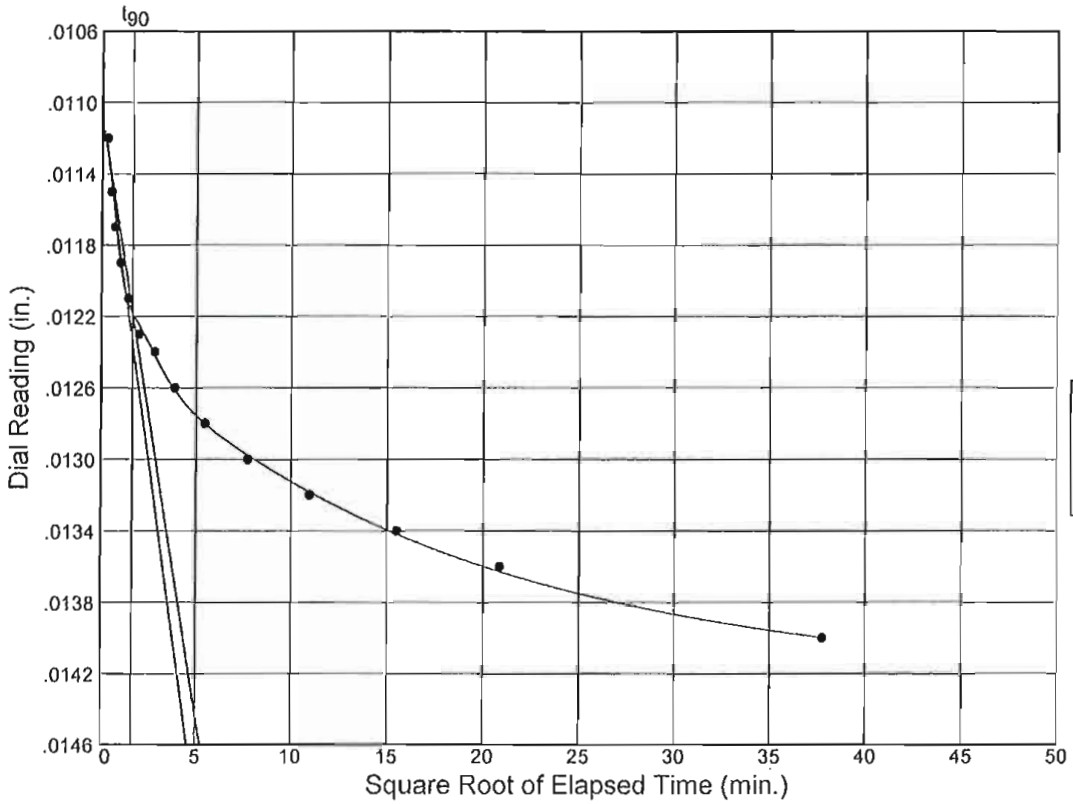
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 1
Load= 500 psf
D_0 = 0.00743
D_{90} = 0.00817
D_{100} = 0.00825
T_{90} = 1.42 min.

C_v @ T_{90}
0.83 ft.^{2}/day



Load No.= 2
Load= 1000 psf
D_0 = 0.01108
D_{90} = 0.01218
D_{100} = 0.01230
T_{90} = 2.71 min.

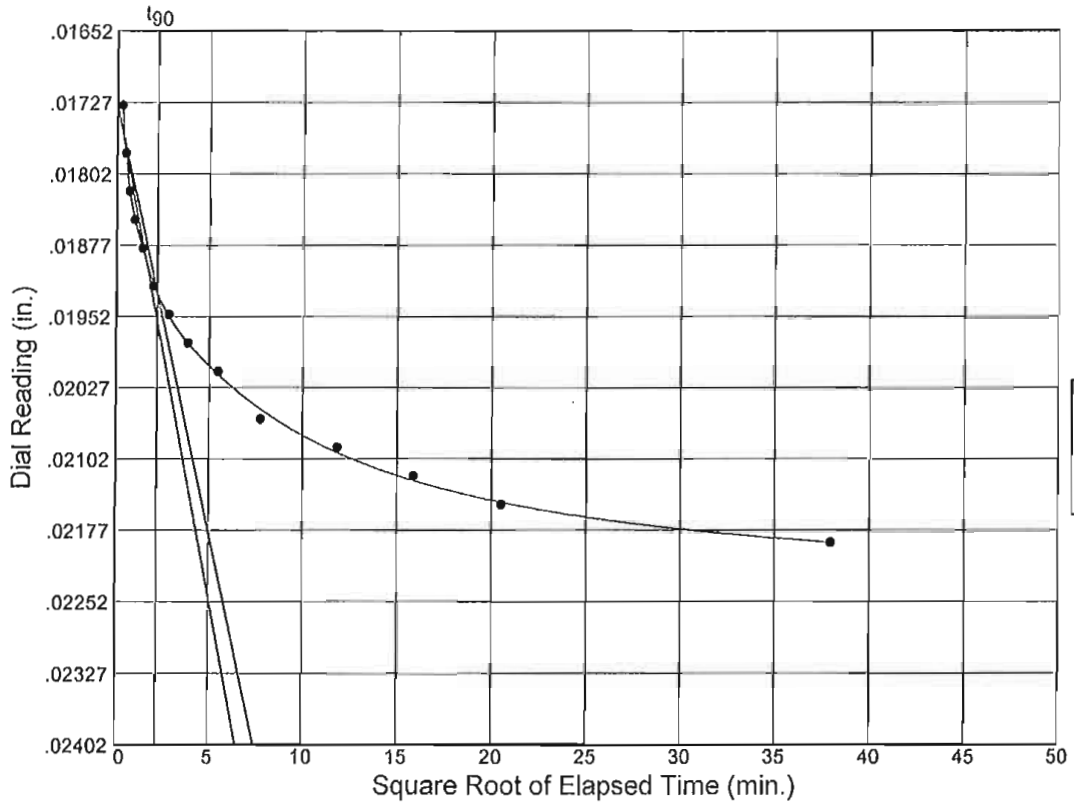
C_v @ T_{90}
0.43 ft.^{2}/day

Figure

Dial Reading vs. Time

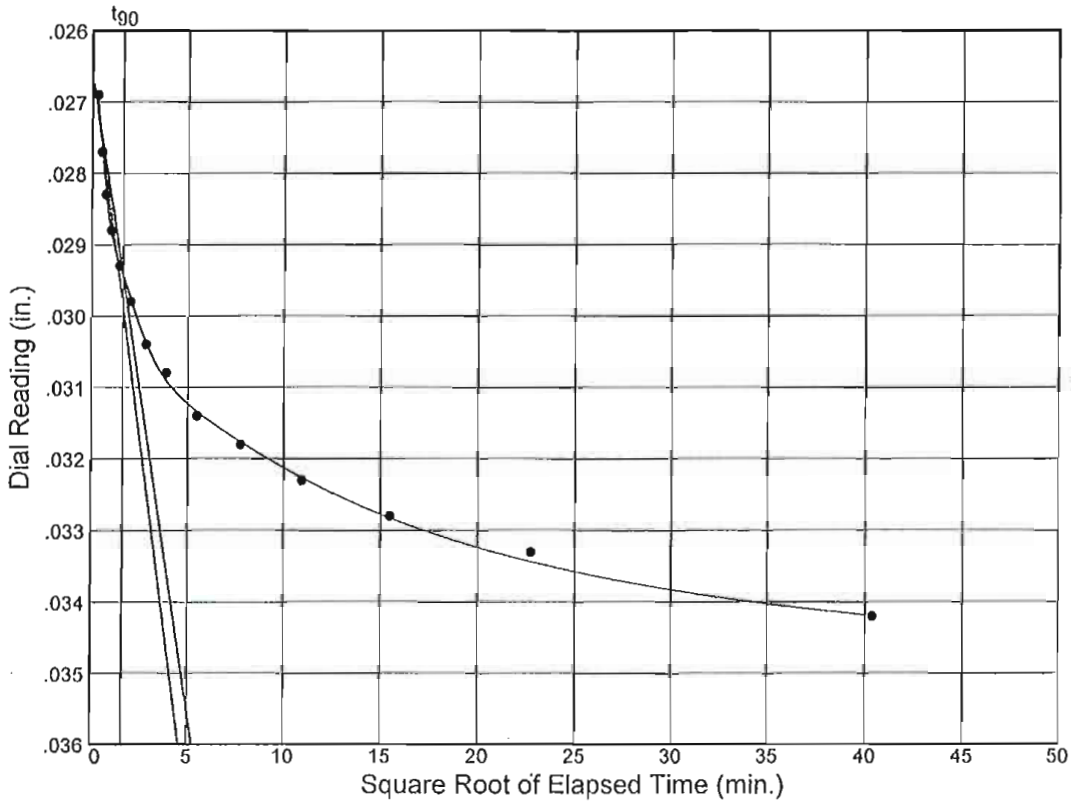
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 3
Load= 2000 psf
D_0 = 0.01728
D_{90} = 0.01928
D_{100} = 0.01950
T_{90} = 4.88 min.

C_v @ T_{90}
0.24 ft.^{2}/day



Load No.= 4
Load= 4000 psf
D_0 = 0.02659
D_{90} = 0.02942
D_{100} = 0.02973
T_{90} = 2.49 min.

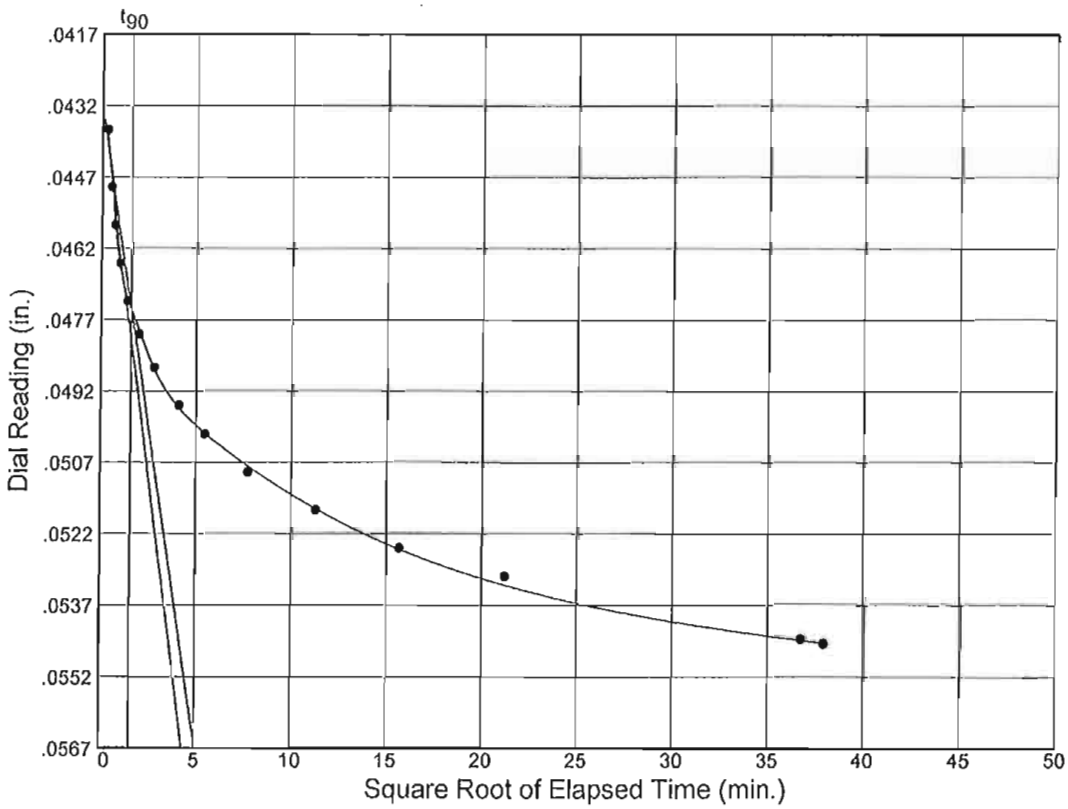
C_v @ T_{90}
0.45 ft.^{2}/day

Figure

Dial Reading vs. Time

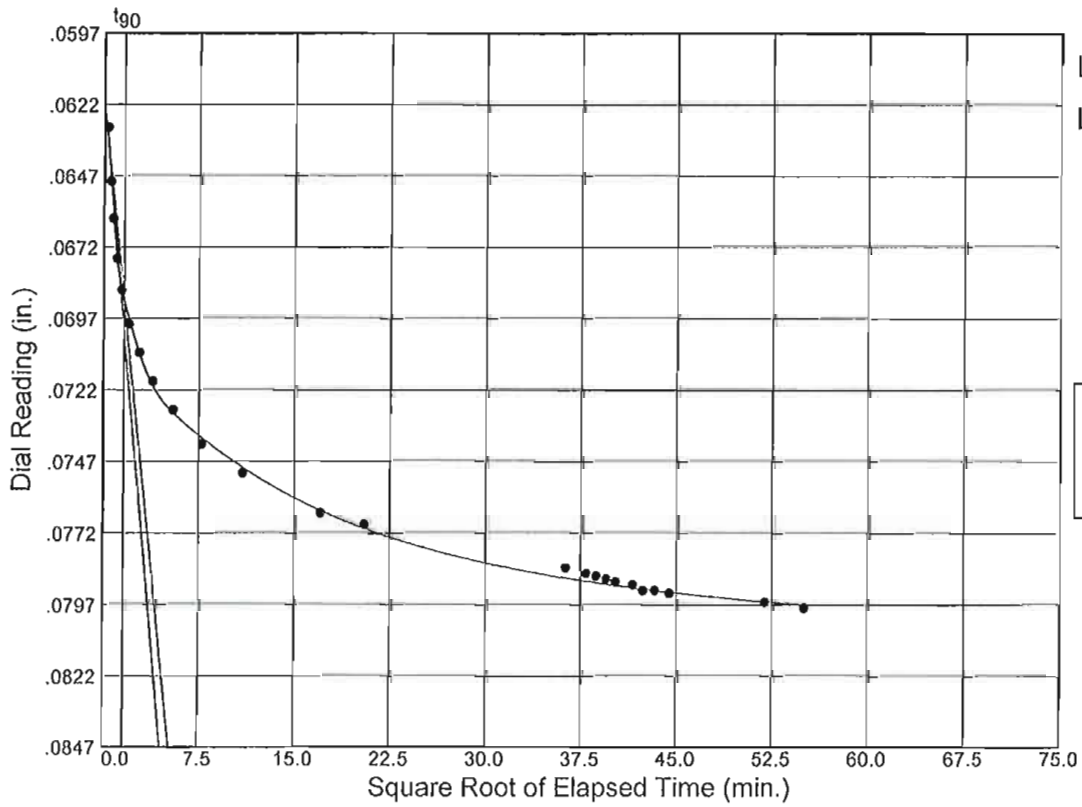
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 5
Load= 8000 psf
D_0 = 0.04321
D_{90} = 0.04747
D_{100} = 0.04795
T_{90} = 2.52 min.

C_v @ T_{90}
0.42 ft.^{2}/day



Load No.= 6
Load= 16000 psf
D_0 = 0.06223
D_{90} = 0.06906
D_{100} = 0.06982
T_{90} = 2.54 min.

C_v @ T_{90}
0.40 ft.^{2}/day

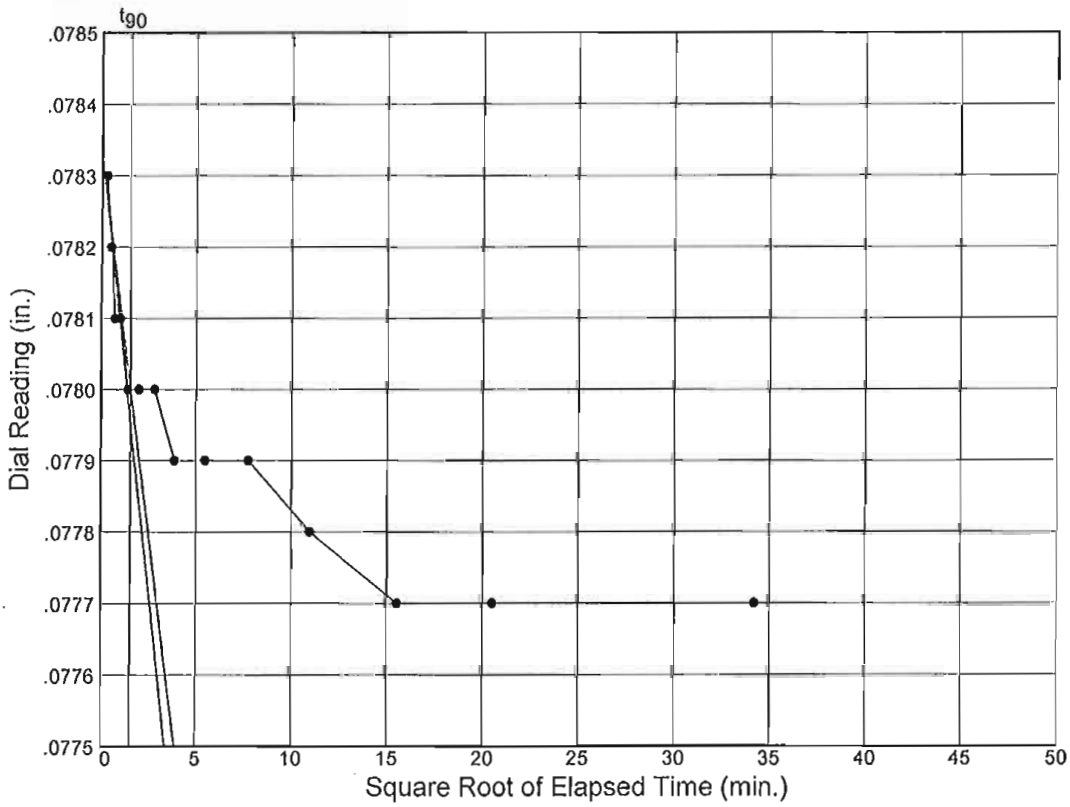
Figure

Blackburn Consulting

Dial Reading vs. Time

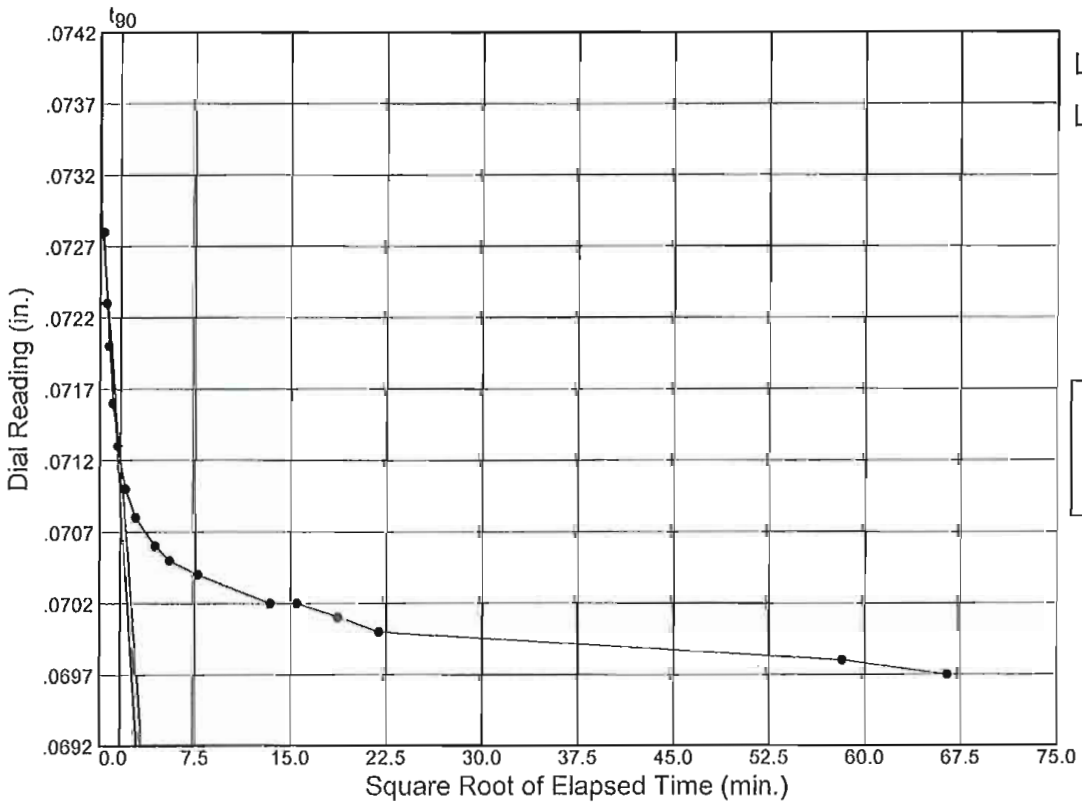
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 7
Load= 8000 psf
D_0 = 0.07833
D_{90} = 0.07800
D_{100} = 0.07796
T_{90} = 2.42 min.

C_v @ T_{90}
0.40 ft.^{2}/day



Load No.= 8
Load= 2000 psf
D_0 = 0.07301
D_{90} = 0.07120
D_{100} = 0.07100
T_{90} = 2.58 min.

C_v @ T_{90}
0.38 ft.^{2}/day

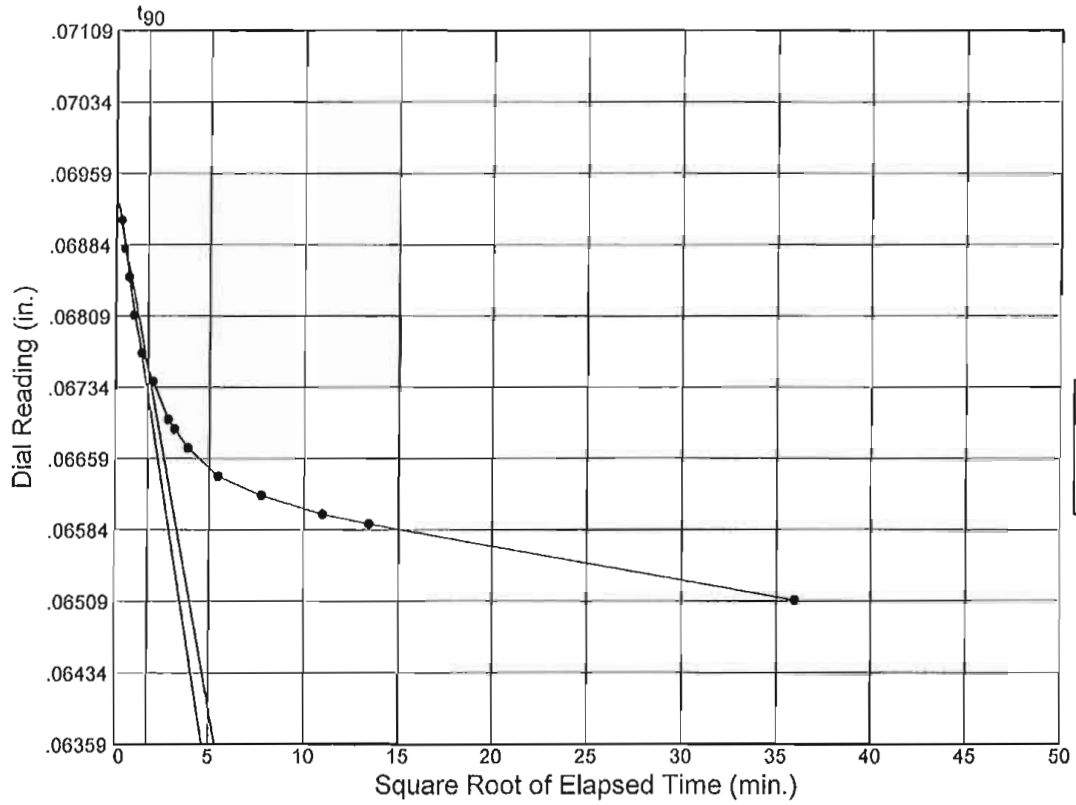
Figure

Blackburn Consulting

Dial Reading vs. Time

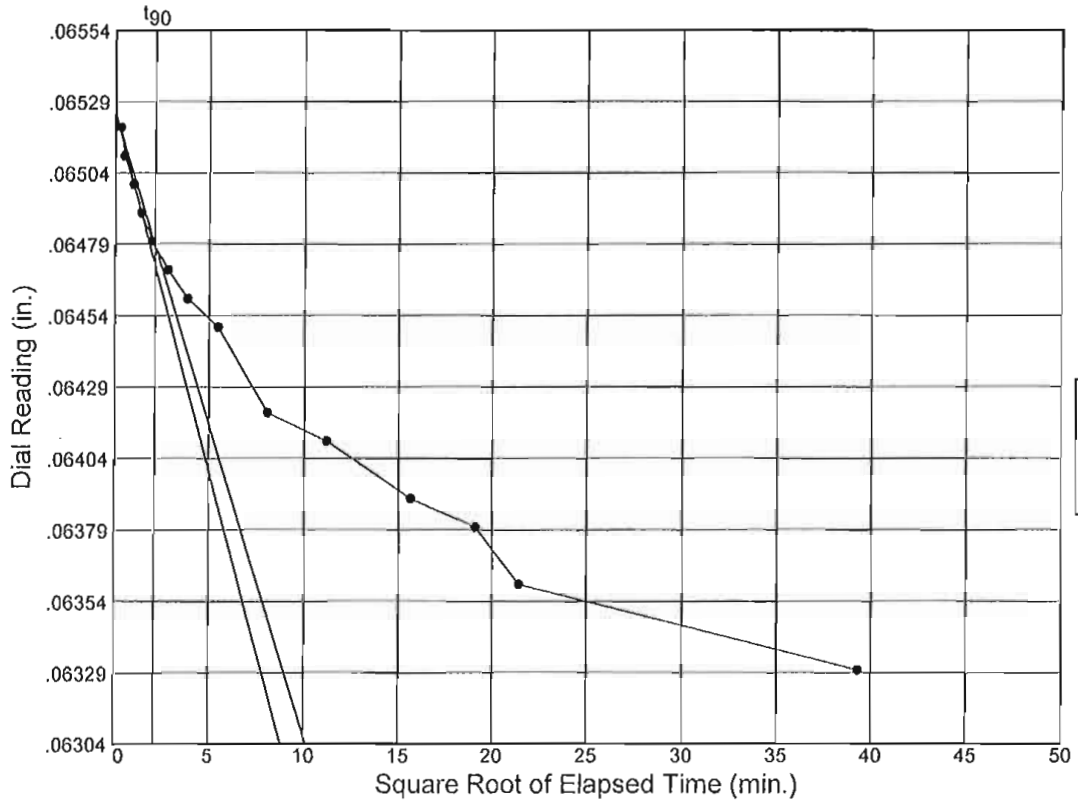
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 9
Load= 500 psf
D_0 = 0.06942
D_{90} = 0.06754
D_{100} = 0.06733
T_{90} = 2.97 min.

C_v @ T_{90}
0.34 ft.^{2}/day



Load No.= 10
Load= 250 psf
D_0 = 0.06525
D_{90} = 0.06478
D_{100} = 0.06473
T_{90} = 4.58 min.

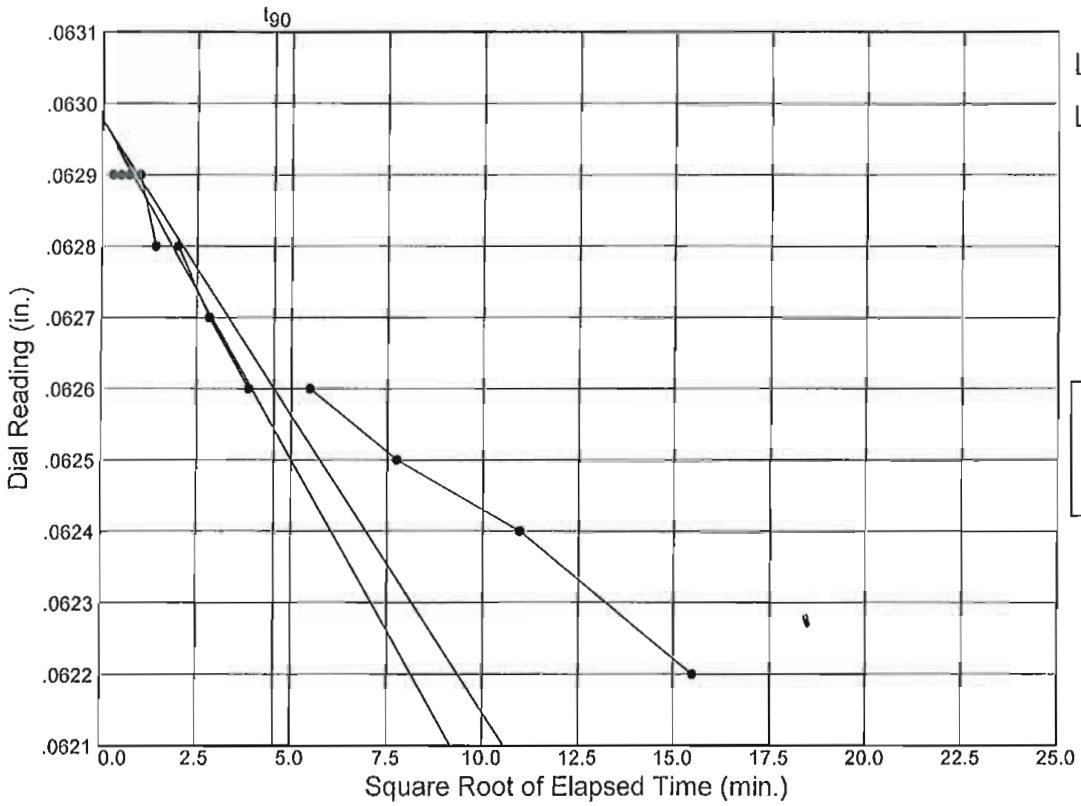
C_v @ T_{90}
0.22 ft.^{2}/day

Figure

Dial Reading vs. Time

Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: FI Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 11

Load= 125 psf

D_0 = 0.06298

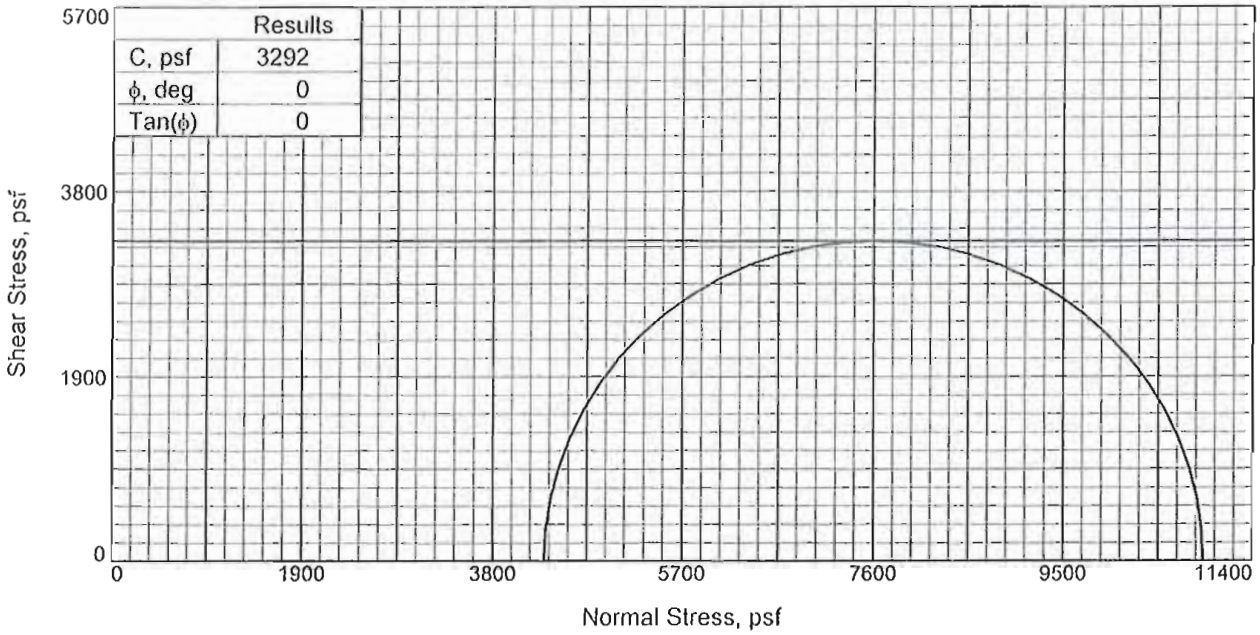
D_{90} = 0.06260

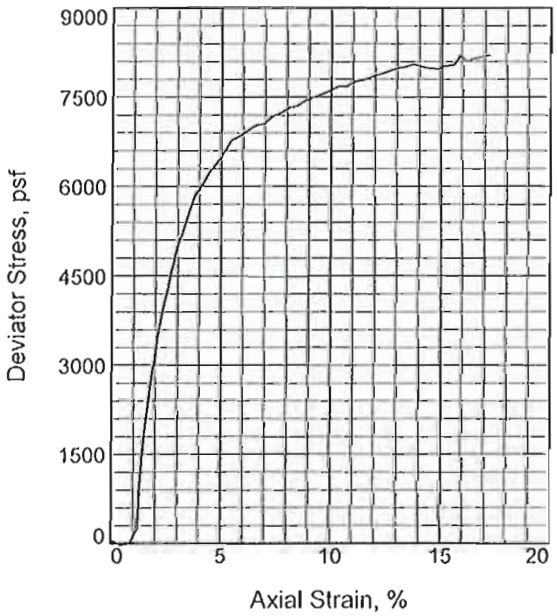
D_{100} = 0.06256

T_{90} = 20.56 min.

C_v @ T_{90}
0.05 ft.^{2}/day

Figure





Specimen No.		1
Initial	Water Content, %	19.4
	Dry Density, pcf	105.0
	Saturation, %	86.5
	Void Ratio	0.6055
	Diameter, in.	2.400
	Height, in.	5.500
At Test	Water Content, %	19.1
	Dry Density, pcf	105.0
	Saturation, %	85.4
	Void Ratio	0.6055
	Diameter, in.	2.400
	Height, in.	5.500
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		4320
Fail. Stress, psf		6583
Strain, %		5.1
Ult. Stress, psf		8009
Strain, %		
σ_1 Failure, psf		10903
σ_3 Failure, psf		4320

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: Lean CLAY (CL), yellowish brown, clayey sand/sandy clay in upper 1/3 of sample.

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 5% strain, Ultimate at 15%.

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F1 **Depth:** 35.5-36.0'

Sample Number: 10b

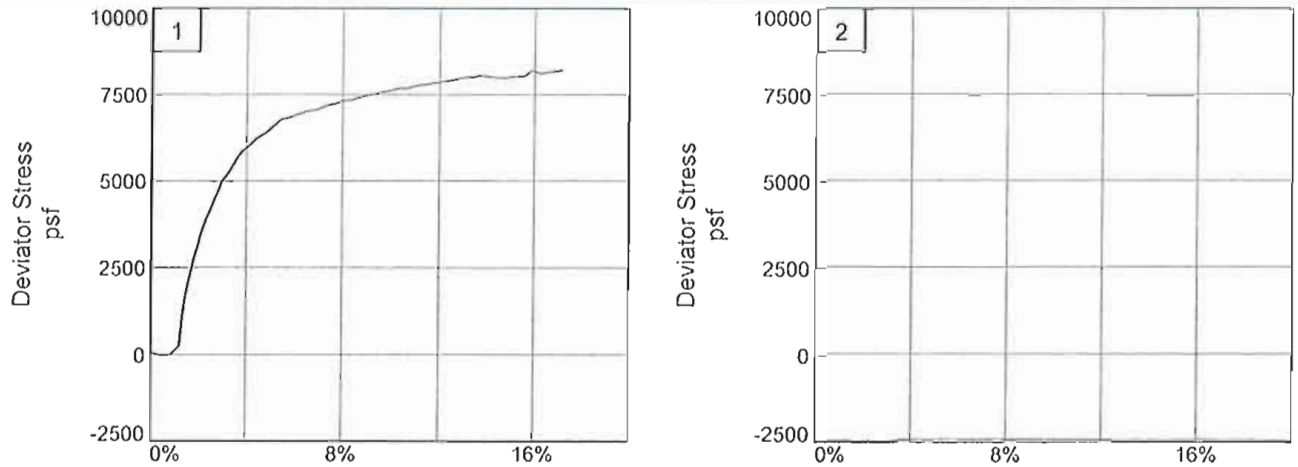
Proj. No.: 1201.7d **Date Sampled:**

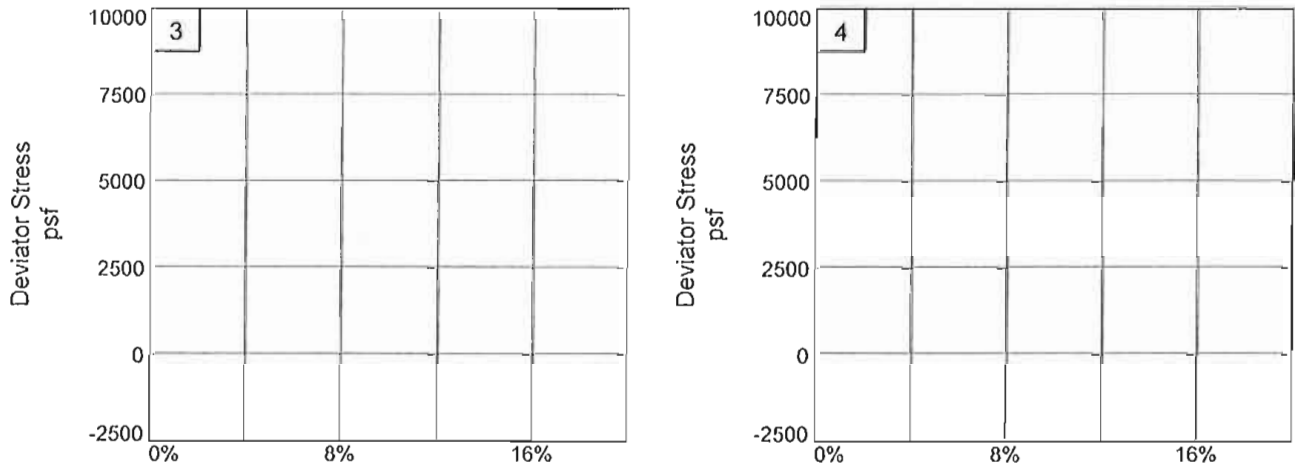
TRIAXIAL SHEAR TEST REPORT

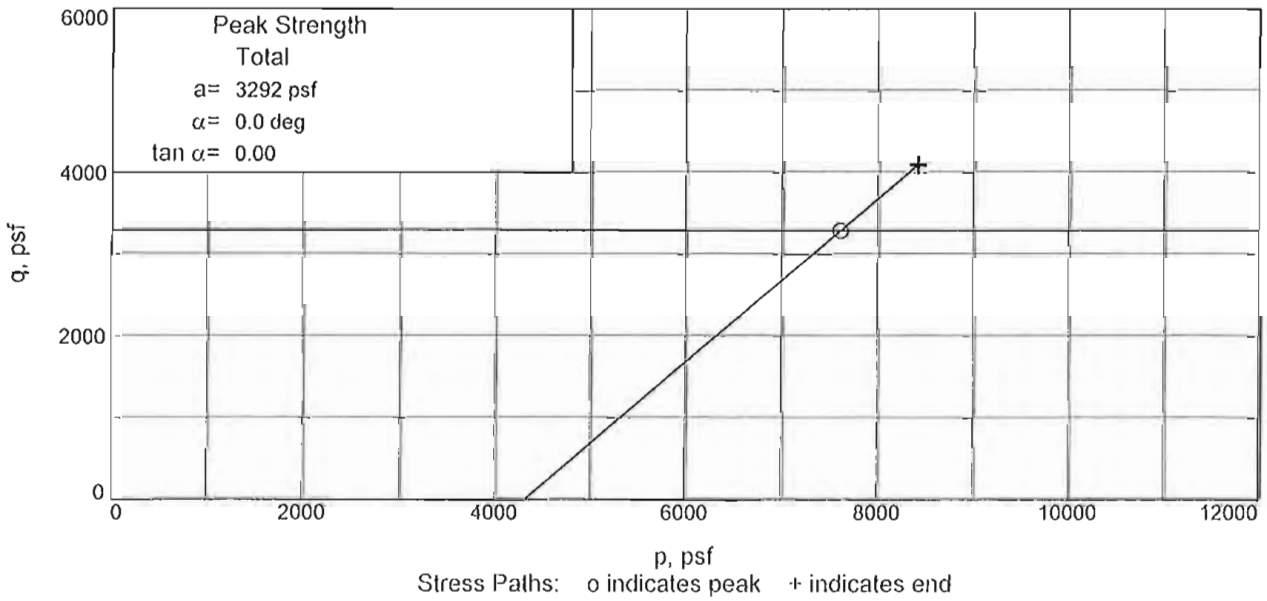
Blackburn Consulting

Figure _____

Tested By: MDR Checked By: RDS







Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough
Source of Sample: F1 **Depth:** 35.5-36.0' **Sample Number:** 10b
Project No.: 1201.7d Figure _____

Blackburn Consulting

Tested By: MDR Checked By: RDS

Triaxial Compression UU no pore pressure
ASTM D 2850

blackburn consulting

Project Name: SR 99 Widening / Lone Tree Slough

Project Number: 1201.7d

Sample ID: F1-10b Depth (ft): 35.5-36.0

Sample Description: Lean CLAY (CL), yellowish brown, clayey sand/sandy clay in upper 1/3 of sample

Date: 5/13/2009 Tested By: MDR

Staged test	
psf	psi
0	0.00
0	0.00
0	0.00

Specimen			
initial moisture		final moisture	
tare #	n/a	tare #	PP
wet + t =	n/a	wet + t =	922.39
dry + t =	n/a	dry + t =	791.12
tare =	n/a	tare =	105.42
Water (g)	#VALUE!		131.27
Dry Weight	#VALUE!		685.70
% Moisture	#VALUE!		19.1
Length of Sample =	5.50	in	
Diameter of Sample =	2.40	in	
moist soil =	818.69	gm	

Test Cell Pressure

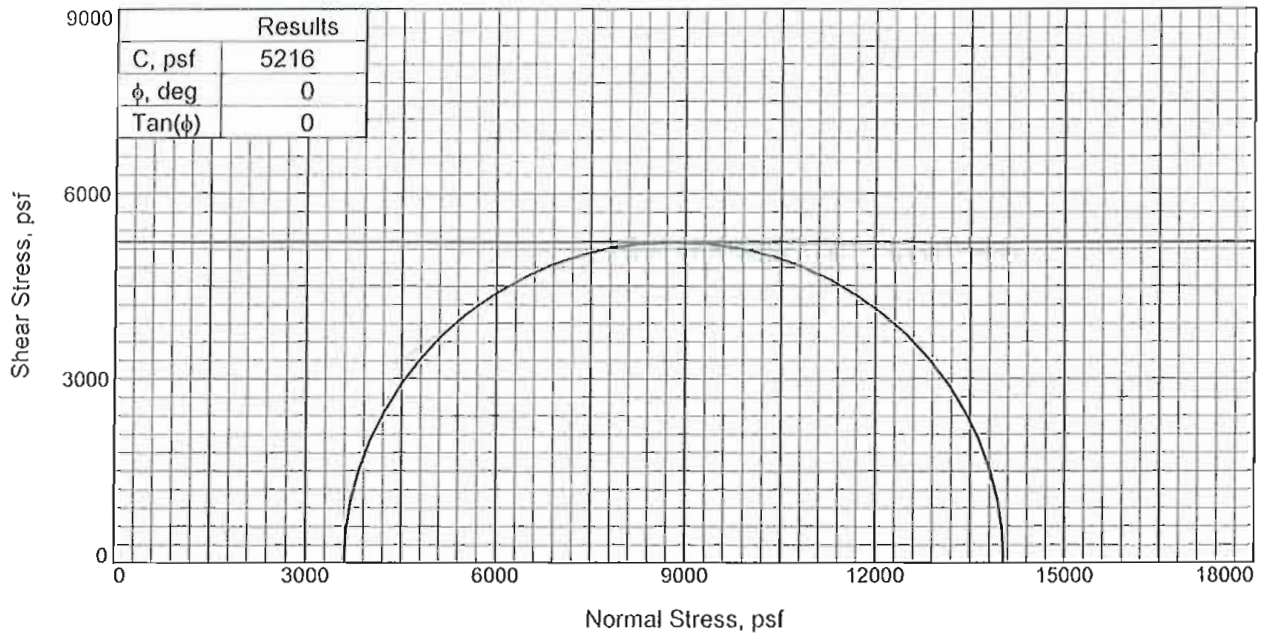
30

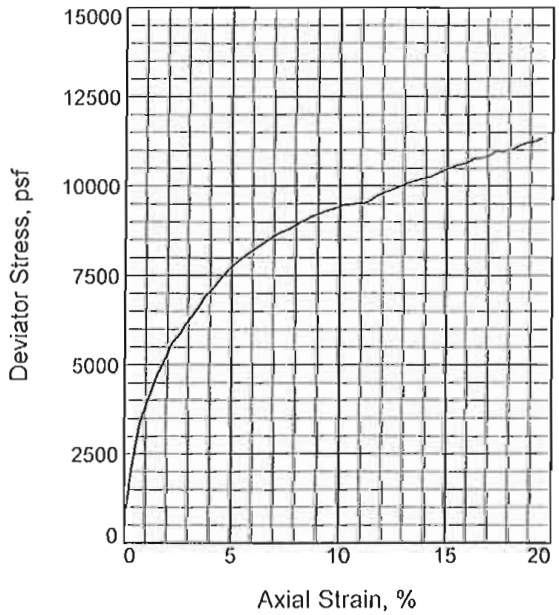
5%	15%
0.275	0.825

NOTES:

USE FOR SOFT SOIL PREPARATION

0	weight of tube, membrane, plastic tops(2) and confining tube
0	weight of confining mold assy.
0	weight of membrane and plastic tops(2)
0	Moist soil weight (g)





Specimen No.		1
Initial	Water Content, %	21.3
	Dry Density, pcf	105.6
	Saturation, %	96.7
	Void Ratio	0.5955
	Diameter, in.	2.400
	Height, in.	5.790
At Test	Water Content, %	21.3
	Dry Density, pcf	105.6
	Saturation, %	96.4
	Void Ratio	0.5955
	Diameter, in.	2.400
	Height, in.	5.790
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		3600
Fail. Stress, psf		10433
Strain, %		14.9
Ult. Stress, psf		10433
Strain, %		
σ_1 Failure, psf		14033
σ_3 Failure, psf		3600

Type of Test: Unconsolidated Undrained

Sample Type: 2.4 Cal Mod

Description: SANDY lean CLAY (CL), yellowish brown

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 5% strain, Ultimate at 15%.

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F2 **Depth:** 31.0-31.5'

Sample Number: 9c

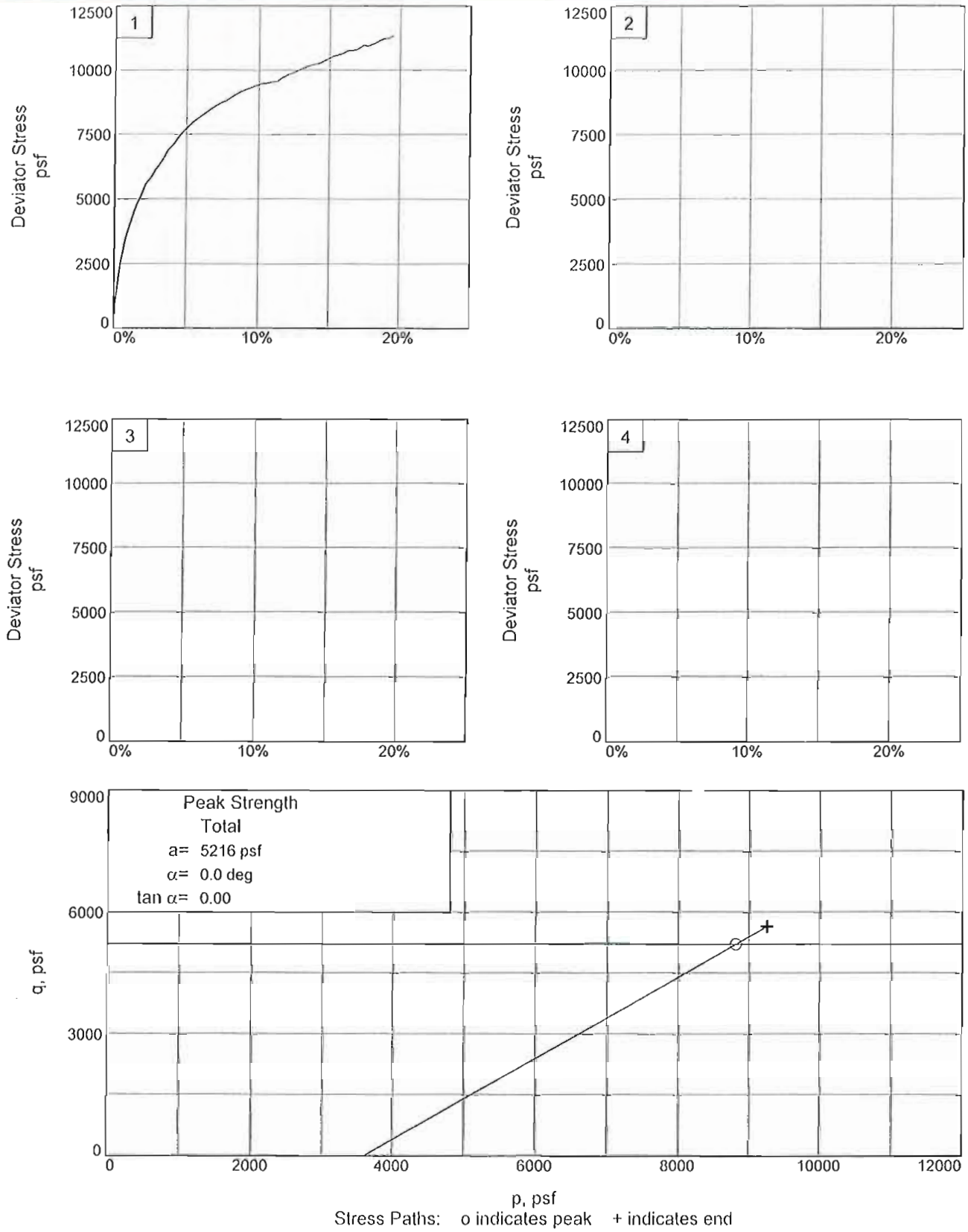
Proj. No.: 1201.7d **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Blackburn Consulting

Figure _____

Tested By: MDR **Checked By:** RDS



Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F2 **Depth:** 31.0-31.5' **Sample Number:** 9c

Project No.: 1201.7d **Figure** _____

Blackburn Consulting

Tested By: MDR Checked By: RDS

Triaxial Compression UU no pore pressure
ASTM D 2850

blackburn consulting

Project Name: SR 99 Widening / Lone Tree Slough

Project Number: 1201.7d

Sample ID: F2-9c Depth (ft): 31.0-31.5

Sample Description: SANDY lean CLAY (CL), yellowish brown

Date: 5/13/2009 Tested By: MDR

Staged test	
psf	psi
0	0.00
0	0.00
0	0.00

Specimen			
initial moisture		final moisture	
tare #	n/a	tare #	UU
wet + t =	n/a	wet + t =	986.69
dry + t =	n/a	dry + t =	832.26
tare =	n/a	tare =	105.87
Water (g)	#VALUE!		154.43
Dry Weight	#VALUE!		726.39
% Moisture	#VALUE!		21.3
Length of Sample =	5.79	in	
Diameter of Sample =	2.40	in	
moist soil =	881.29	gm	

Test Cell Pressure

25

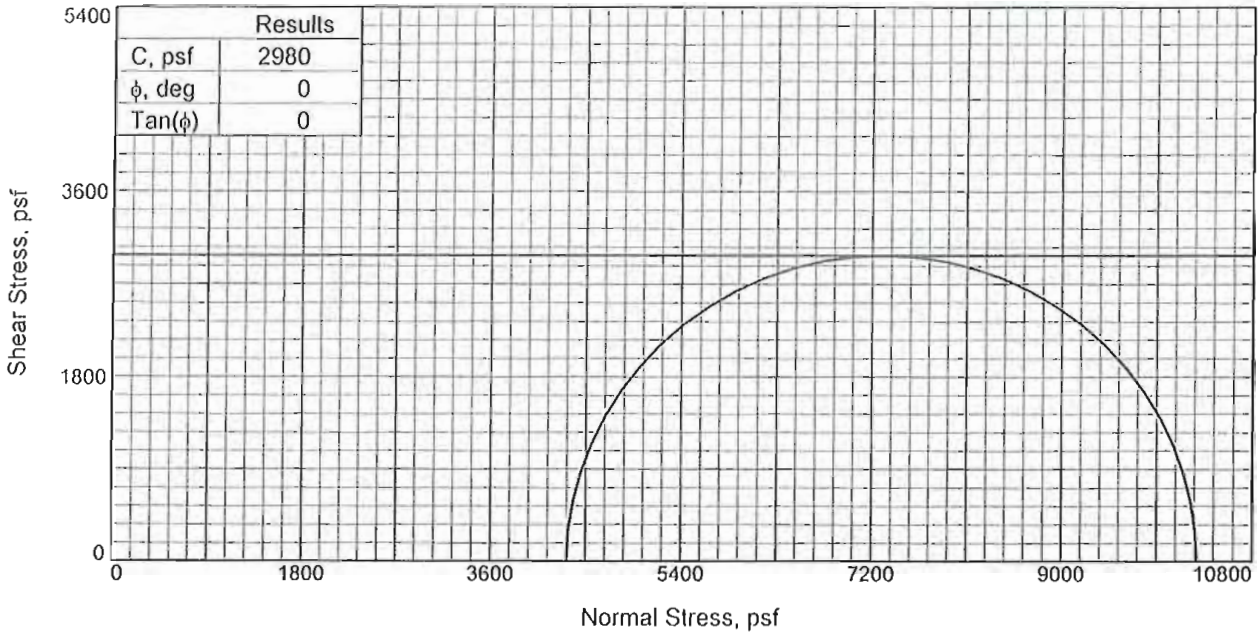
5%	15%
0.290	0.869

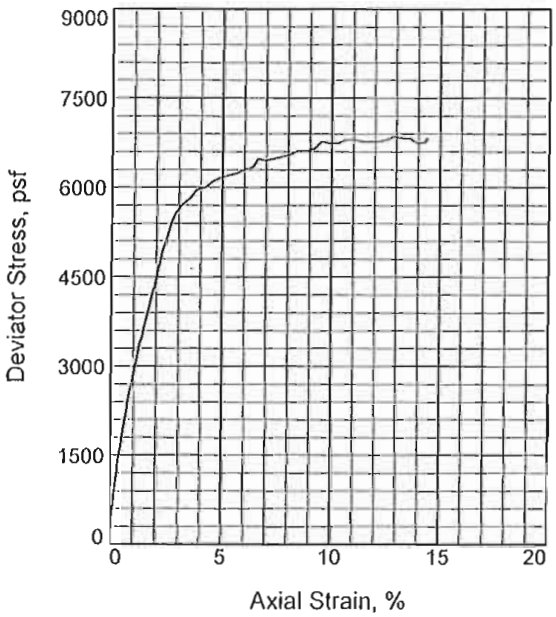
20%
1.158

NOTES:

USE FOR SOFT SOIL PREPARATION

0	weight of lube, membrane, plastic tops(2) and confining lube
0	weight of confining mold assy.
0	weight of membrane and plastic tops(2)
0	Moist soil weight (g)





Specimen No.		1
Initial	Water Content, %	24.4
	Dry Density, pcf	98.2
	Saturation, %	92.1
	Void Ratio	0.7158
	Diameter, in.	2.390
	Height, in.	5.520
At Test	Water Content, %	24.6
	Dry Density, pcf	98.2
	Saturation, %	92.8
	Void Ratio	0.7158
	Diameter, in.	2.390
	Height, in.	5.520
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		4320
Fail. Stress, psf		5959
Strain, %		3.8
Ult. Stress, psf		6738
Strain, %		
σ_1 Failure, psf		10279
σ_3 Failure, psf		4320

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: Lean CLAY (CL), olive brown

Assumed Specific Gravity= 2.70

Remarks: Failure Chosen at 3.8%, Ultimate at 14% strain.

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F2 **Depth:** 35.5-36.0

Sample Number: 11b

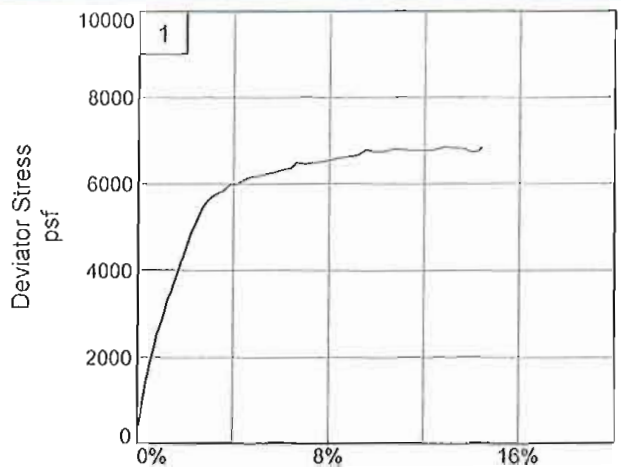
Proj. No.: 1201.7d **Date Sampled:**

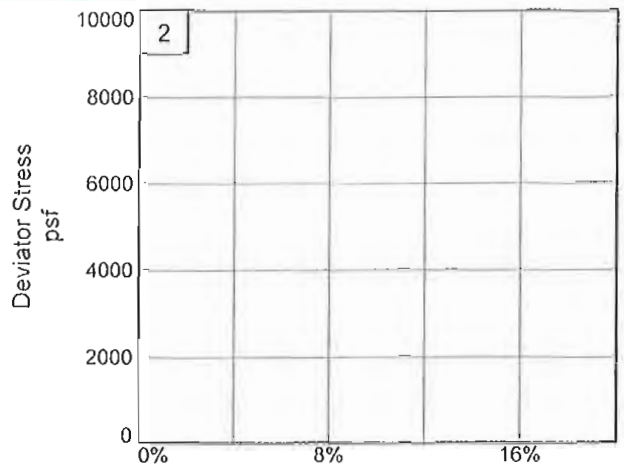
TRIAXIAL SHEAR TEST REPORT

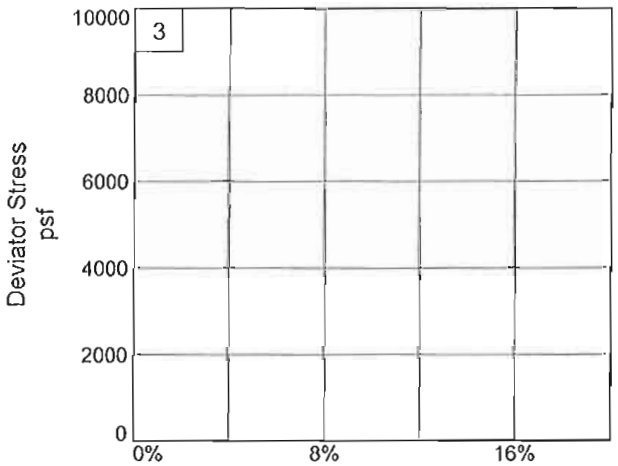
Blackburn Consulting

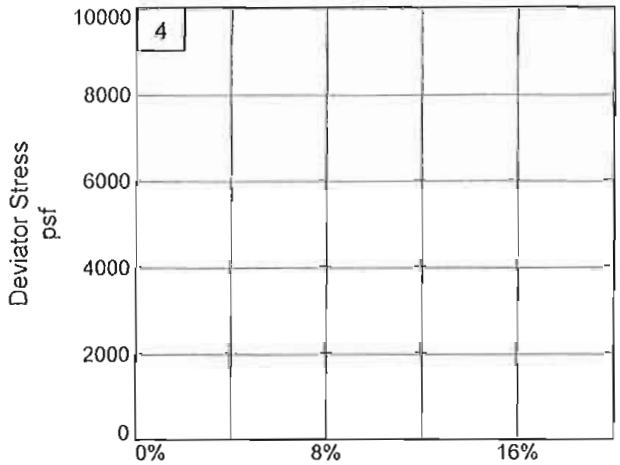
Figure _____

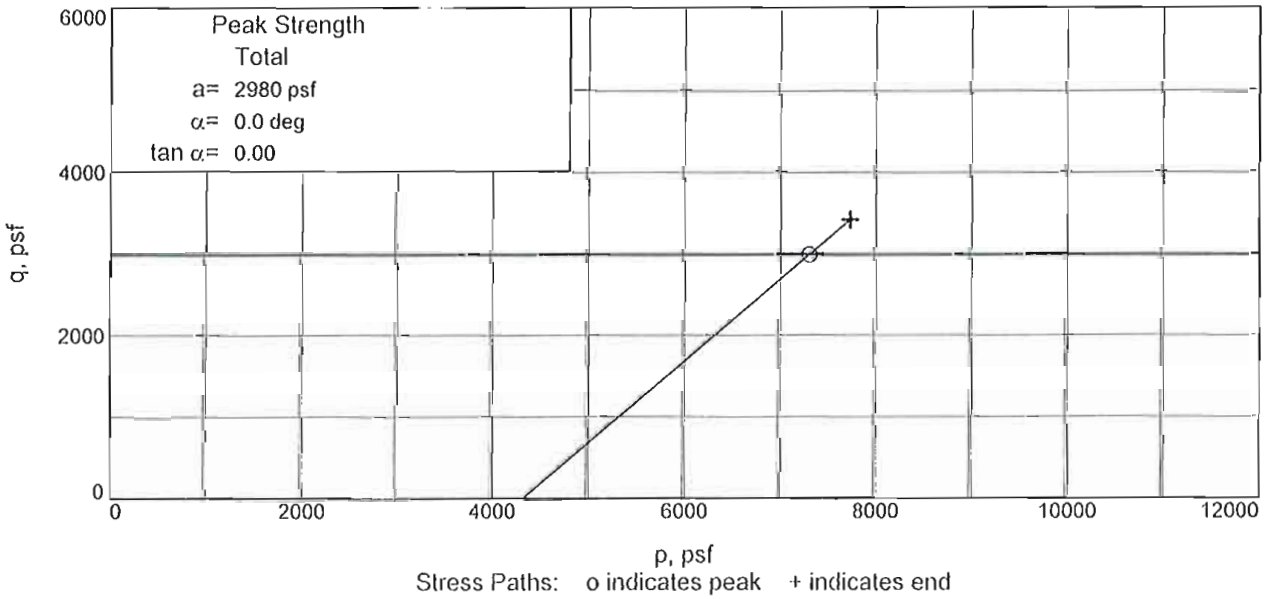
Tested By: MDR Checked By: RDS











Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F2 **Depth:** 35.5-36.0 **Sample Number:** 11b

Project No.: 1201.7d **Figure** _____

Blackburn Consulting

Tested By: MDR **Checked By:** RDS

Triaxial Compression UU no pore pressure
ASTM D 2850

blackburn consulting

Project Name: SR 99 Widening / Lone Tree Slough

Project Number: 1201.7d

Sample ID: F2-11b Depth (ft): 35.5-36.0

Sample Description: Lean CLAY (CL), olive brown

Date: 6/3/2009 Tested By: MDR

Staged test	
psf	psi
0	0.00
0	0.00
0	0.00

Specimen			
initial moisture		final moisture	
tare #	n/a	tare #	RR
wet + t =	n/a	wet + t =	900.74
dry + t =	n/a	dry + t =	743.66
tare =	n/a	tare =	105.06
Water (g)	#VALUE!		157.08
Dry Weight	#VALUE!		638.60
% Moisture	#VALUE!		24.6
Length of Sample =	5.52	in	
Diameter of Sample =	2.39	in	
moist soil =	794.51	gm	

Test Cell Pressure

30

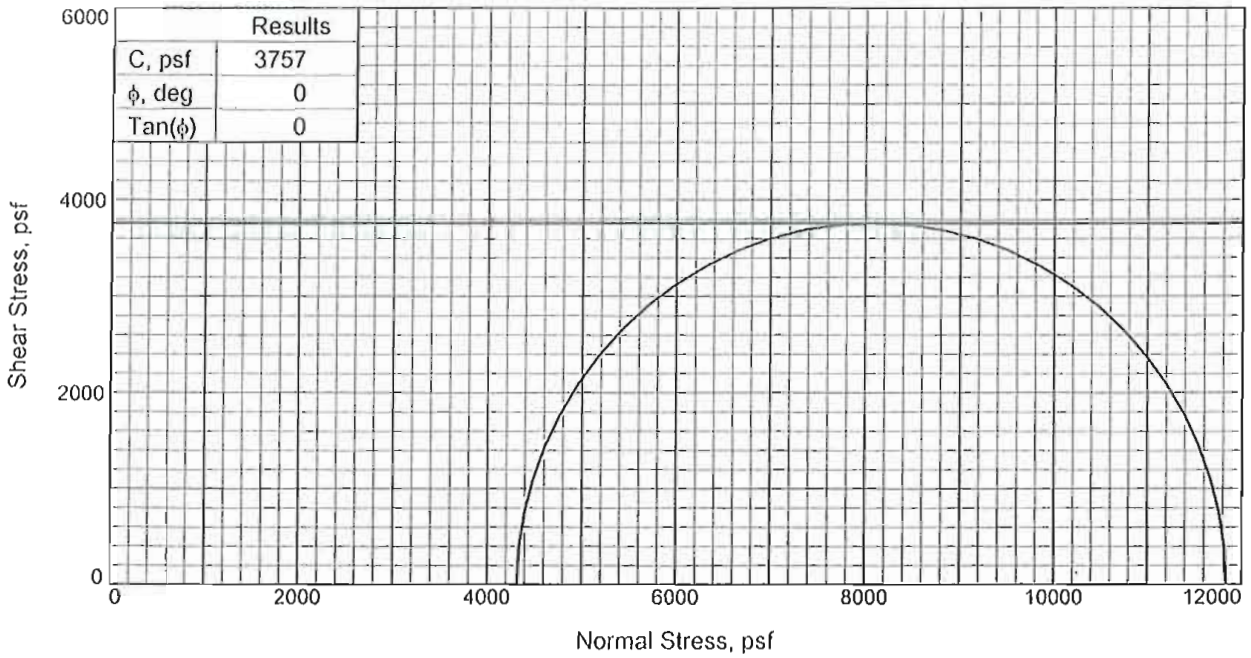
5%	15%
0.276	0.828

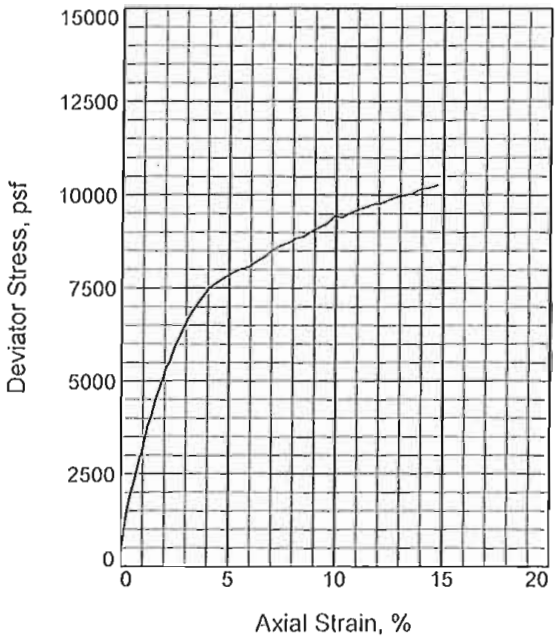
20%
1.104

NOTES:

USE FOR SOFT SOIL PREPARATION

0	weight of tube, membrane, plastic tops(2) and confining tube
0	weight of confining mold assy.
0	weight of membrane and plastic tops(2)
0	Moist soil weight (g)





Specimen No.		1
Initial	Water Content, %	21.5
	Dry Density, pcf	102.5
	Saturation, %	90.2
	Void Ratio	0.6447
	Diameter, in.	2.390
	Height, in.	5.600
At Test	Water Content, %	22.4
	Dry Density, pcf	102.5
	Saturation, %	93.9
	Void Ratio	0.6447
	Diameter, in.	2.390
	Height, in.	5.600
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		4320
Fail. Stress, psf		7514
Strain, %		4.1
Ult. Stress, psf		10263
Strain, %		
σ_1 Failure, psf		11834
σ_3 Failure, psf		4320

Type of Test:
Unconsolidated Undrained

Sample Type:

Description: SANDY lean CLAY (CL), medium brown, slightly cemented, with caliche stringers

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 4.1%, Ultimate at 14.7% strain.

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F3 **Depth:** 36.0-36.5

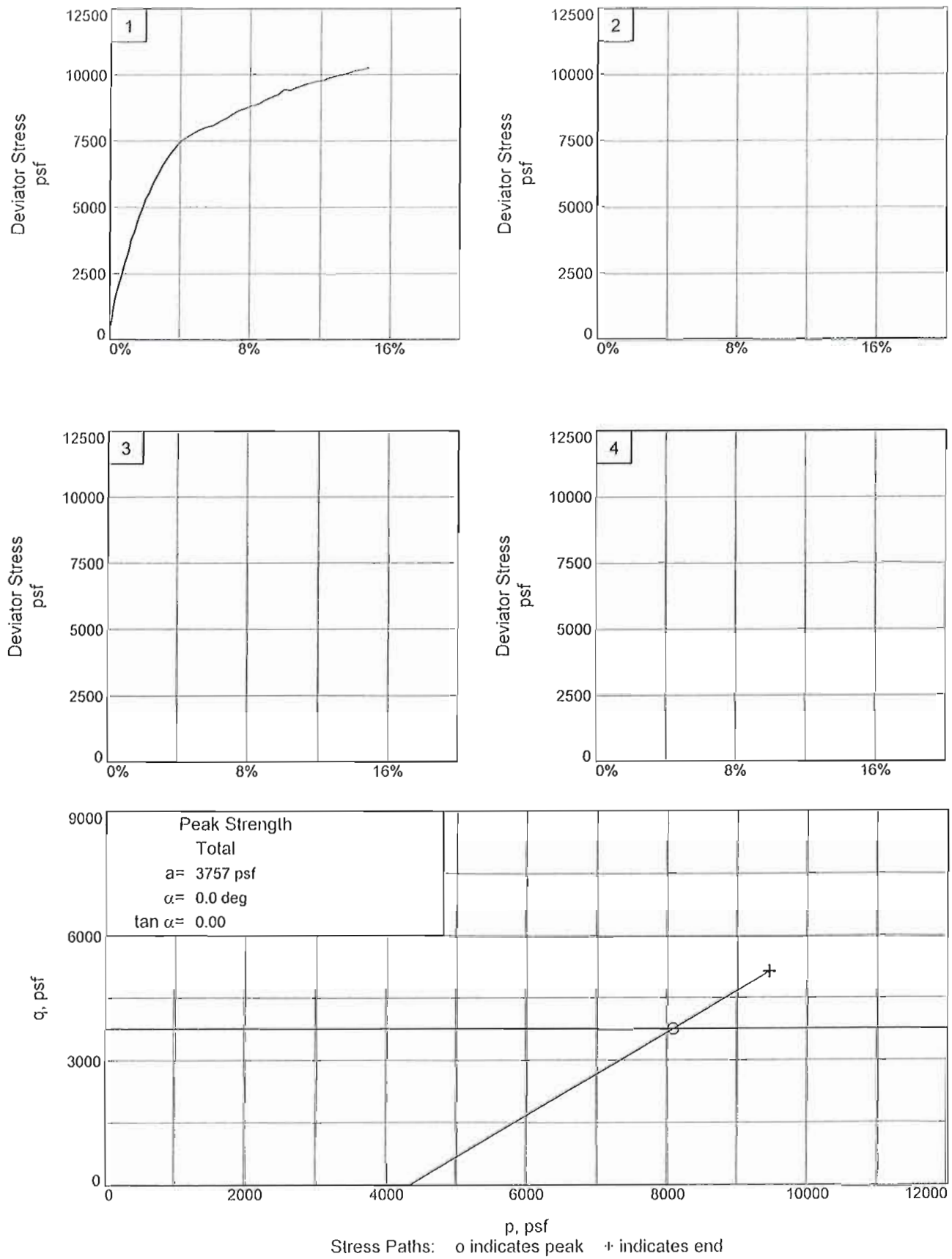
Sample Number: 11c

Proj. No.: 1201.7d **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Blackburn Consulting

Figure _____



Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F3 **Depth:** 36.0-36.5 **Sample Number:** 11c

Project No.: 1201.7d **Figure** _____

Blackburn Consulting

Triaxial Compression UU no pore pressure
ASTM D 2850

blackburn consulting

Project Name: SR 99 Widening / Lone Tree Slough

Project Number: 1201.7d

Sample ID: F3-11c Depth (ft): 36.0-36.5

Sample Description: SANDY lean CLAY (CL), medium brown, slightly cemented, with caliche stringers

Date: 6/3/2009 Tested By: MDR

Staged test	
psf	psi
0	0.00
0	0.00
0	0.00

Specimen			
initial moisture		final moisture	
tare #	n/a	tare #	TT
wet + t =	n/a	wet + t =	932.63
dry + t =	n/a	dry + t =	781.11
tare =	n/a	tare =	105.27
Water (g)	#VALUE!		151.52
Dry Weight	#VALUE!		675.84
% Moisture	#VALUE!		22.4
Length of Sample =	5.60	in	
Diameter of Sample =	2.39	in	
moist soil =	821.39	gm	

Test Cell Pressure

30	
5%	15%
0.280	0.840
20%	
1.120	

NOTES:

USE FOR SOFT SOIL PREPARATION

0	weight of tube, membrane, plastic tops(2) and confining tube
0	weight of confining mold assy.
0	weight of membrane and plastic tops(2)
0	Moist soil weight (g)

Unconfined Compression Test
ASTM D 2166-00

Project Name	SR 99 Manteca - Lone Tree Slough		
Project Number	1201.7d		
Sample	F4-4c	Depth	21.0-21.5
Sample Description	Olive Brown SILT with Sand (ML)		
Date	8/29/2009		
Tested By:	KISB		

Original Sample Length	5.55
Original Diameter (in)	2.41
Sample Area (in^2)	4.54
Sample Weight (g)	801.80

axial strain	**1.7%**
Average cross-sectional area (in^2)	**4.62**
Average cross-sectional area (ft^2)	0.032
Peak Reading	0.096
Maximum Load(lb)	70
Compressive Strength (tsf)	**1.09**

Moisture Density

Wet Sample Weight (g)	905.3
Tare Number	QQ
Tare Weight (g)	105.7
Dry Sample Weight (g)	726.3
Dry Weight (g)	620.6
Water Weight (g)	179.0
Percent Moisture (%)*	28.8
Wet Density (pcf)	121.1
Dry Density (pcf)	94.0

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.003

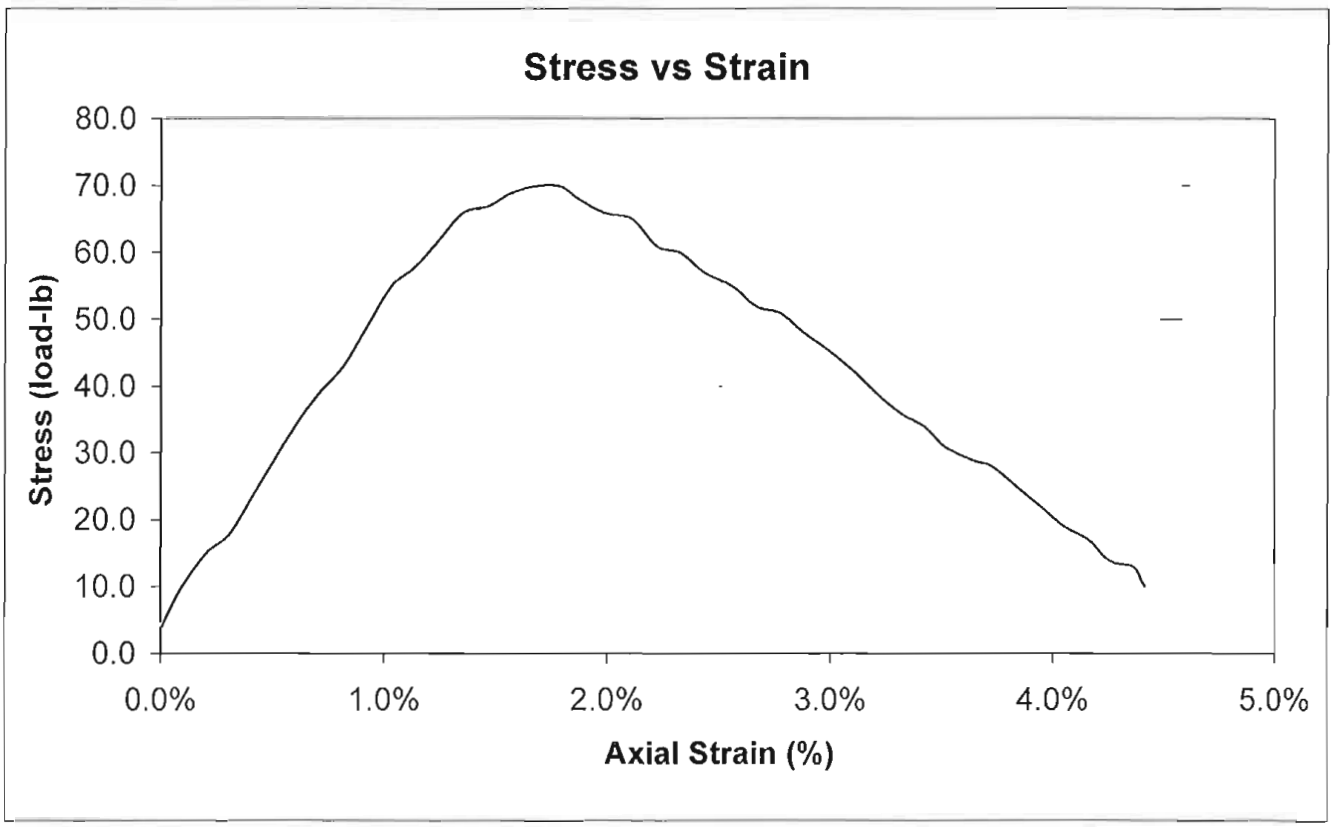
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.003	4.000	0.096	70.000	0.193	34.000		
0.008	10.000	0.102	70.000	0.198	31.000		
0.014	15.000	0.107	68.000	0.205	29.000		
0.020	18.000	0.113	66.000	0.210	28.000		
0.025	23.000	0.120	65.000	0.216	25.000		
0.031	29.000	0.126	61.000	0.222	22.000		
0.036	34.000	0.132	60.000	0.228	19.000		
0.042	39.000	0.138	57.000	0.234	17.000		
0.048	43.000	0.145	55.000	0.239	14.000		
0.054	49.000	0.151	52.000	0.245	13.000		
0.060	55.000	0.157	51.000	0.247	11.000		
0.066	58.000	0.163	48.000	0.247	11.000		
0.072	62.000	0.170	45.000	0.248	10.000		
0.078	66.000	0.176	42.000				
0.084	67.000	0.181	39.000				
0.090	69.000	0.187	36.000				

Project
SR 99 Manteca - Lone Tree Slough
Project Number
1201.7d
Sample Number
F4-4c
Material Description
Olive Brown SILT with Sand (ML)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	121.1
Dry Density (pcf)	94.0
% Moisture	28.8

Unconfined Compressive Strength (tsf) 1.1

Triaxial Compression UU
ASTM D 4767

blackburn consulting

Project Name: SR 99 Manteca - Lone Tree Slough

Project Number: 1201.7d

Sample ID: F4-6c Depth (ft): 31.0-31.5

Sample Description: Yellowish Brown Silty CLAY (CL-ML)

Date: 9/4/09 Tested By: KISB

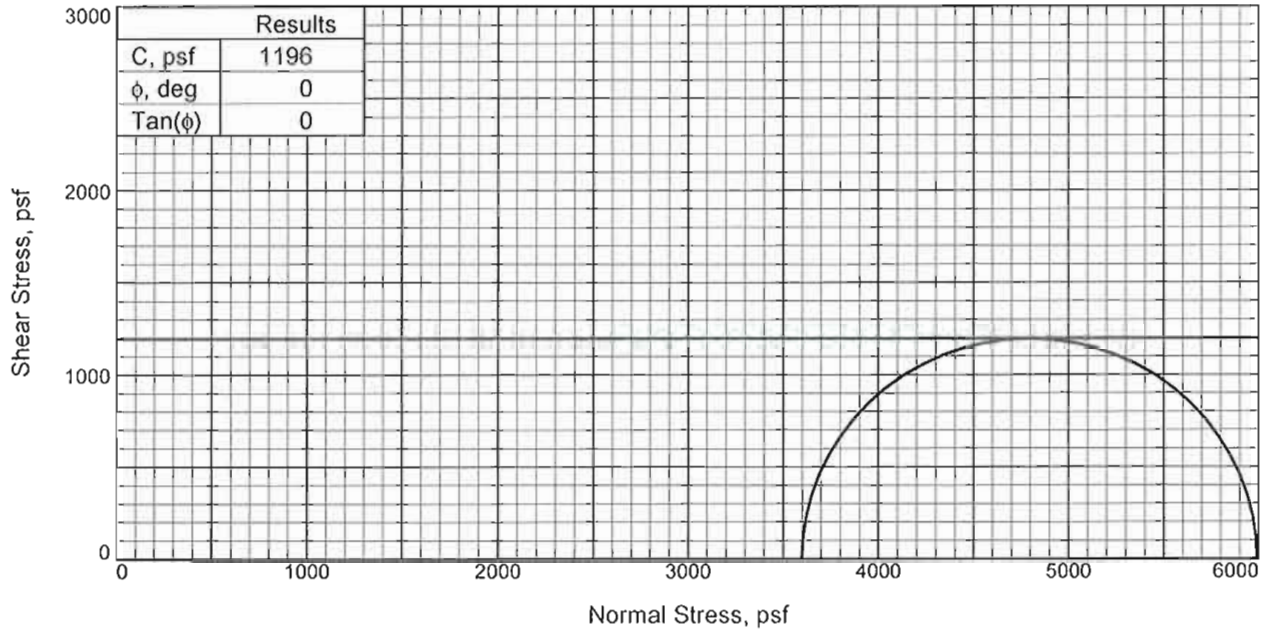
UU	X	
CU		Staged

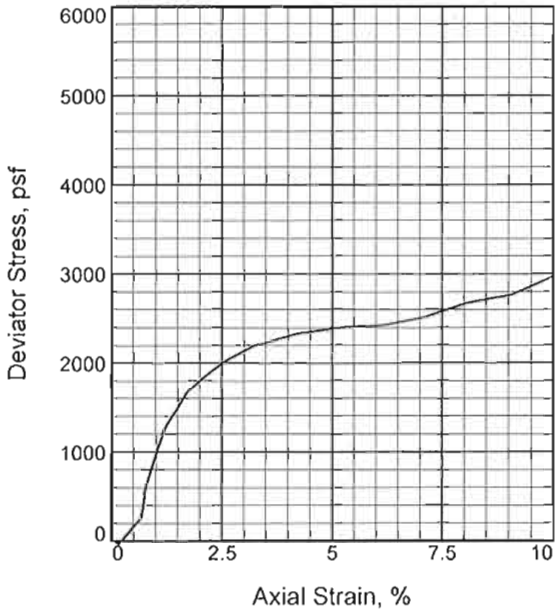
Specimen			
Initial		Final	
Tare No.	B2	Tare No.	SS
Tare =	46.5	Tare =	105.1
Wet Soil + Tare =	88.0	Wet Soil + Tare =	825.1
Dry Soil + Tare =	78.4	Dry Soil + Tare =	637.9
Water Content (%)	30.1%	Water Content (%)	35.1%

Cell	Base	Top	TEST PSI	Actual
25.00	0.00	0.00	25.00	24.99
0.00		0.00		
0.00		0.00		

Length of Sample =	5.258	in	5%	0.26
Diameter of Sample =	2.406	in	10%	0.53
Area=	4.5	in^3	15%	0.79
Weight of Sample =	720.00	gm		
Specific Gravity=	2.70			
Initial Wet Density =	114.5	pcf		
Initial Dry Density =	88.0	pcf		

NOTES:





Specimen No.		1
Initial	Water Content, %	35.1
	Dry Density, pcf	84.9
	Saturation, %	96.3
	Void Ratio	0.9852
	Diameter, in.	2.406
	Height, in.	5.258
At Test	Water Content, %	35.1
	Dry Density, pcf	86.5
	Saturation, %	100.0
	Void Ratio	0.9486
	Diameter, in.	2.395
	Height, in.	5.208
Strain rate, %/min.		0.02
Back Pressure, psf		0
Cell Pressure, psf		3599
Fail. Stress, psf		2393
Strain, %		5.2
Ult. Stress, psf		2963
Strain, %		
σ_1 Failure, psf		5992
σ_3 Failure, psf		3599

Type of Test: Unconsolidated Undrained

Sample Type: 2.4" Mod Cal

Description: Yellowish Brown Silty CLAY (CL-ML)

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 5% Strain
Ultimate at 10% Strain

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F4 **Depth:** 31.0-31.5

Sample Number: 6c

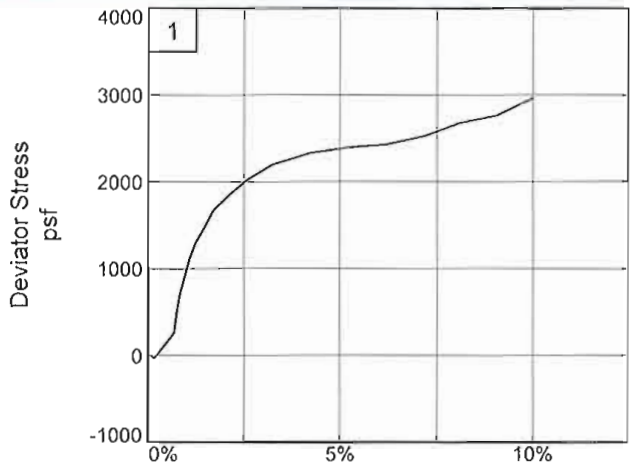
Proj. No.: 1201.7d **Date Sampled:**

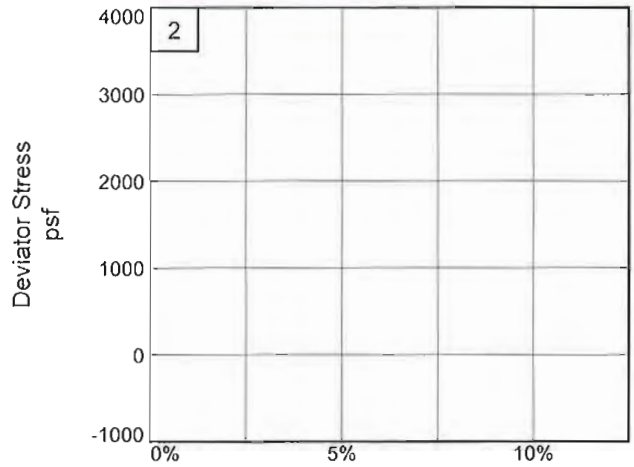
TRIAXIAL SHEAR TEST REPORT

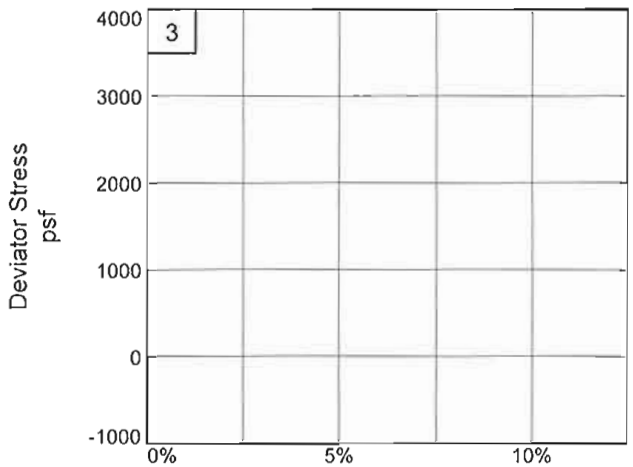
Blackburn Consulting

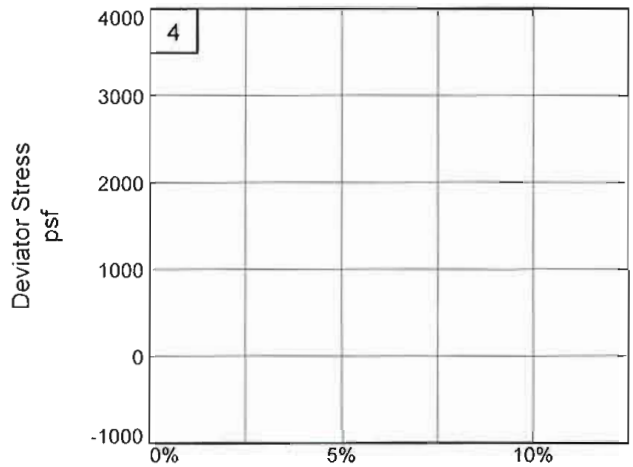
Figure _____

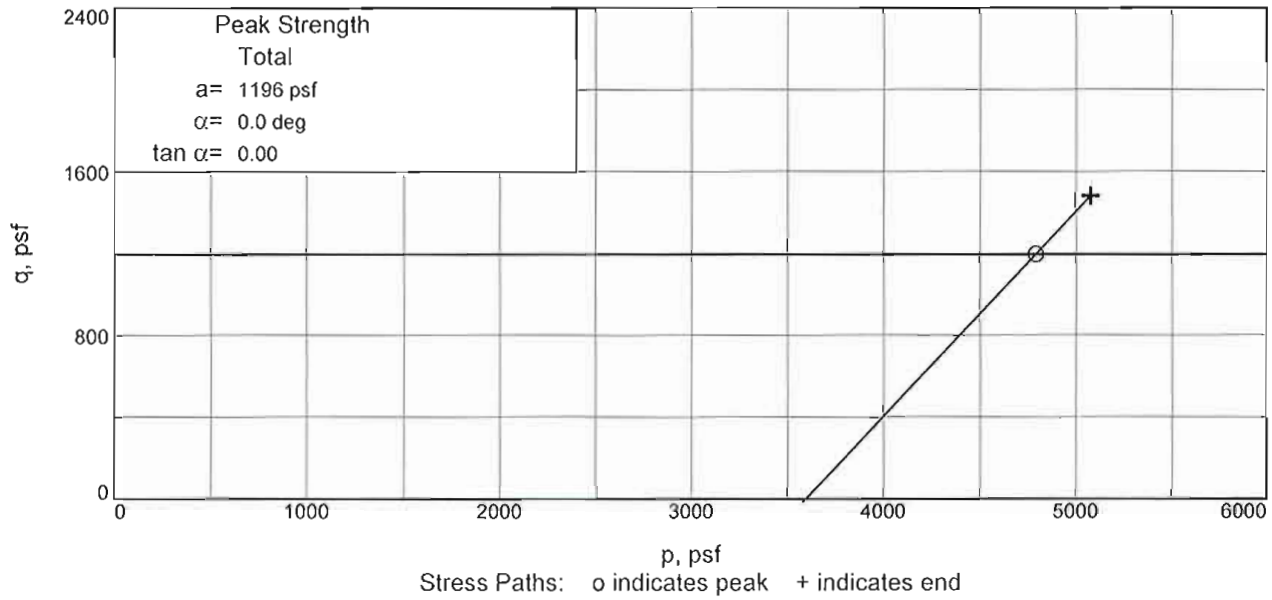
Tested By: KISB











Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F4 **Depth:** 31.0-31.5 **Sample Number:** 6c

Project No.: 1201.7d Figure _____ **Blackburn Consulting**

Tested By: KISB

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LONE TREE SLOUGH Site ID : F1-11B.
Your purchase order number is 1201.7D.
Thank you for your business.

* For future reference to this analysis please use SUN # 56552-114222.

EVALUATION FOR SOIL CORROSION

Soil pH	7.66	
Minimum Resistivity	1.21 ohm-cm (x1000)	
Chloride	24.8 ppm	00.00248 %
Sulfate	26.2 ppm	00.00262 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LONE TREE SLOUGH Site ID : F2-3C.
Your purchase order number is 1201.7D.
Thank you for your business.

* For future reference to this analysis please use SUN # 56552-114223.

EVALUATION FOR SOIL CORROSION

Soil pH	7.47	
Minimum Resistivity	1.05 ohm-cm (x1000)	
Chloride	39.0 ppm	00.00390 %
Sulfate	21.1 ppm	00.00211 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LONE TREE SLOUGH Site ID : F3-6C.
Your purchase order number is 1201.7D.
Thank you for your business.

* For future reference to this analysis please use SUN # 56552-114224.

EVALUATION FOR SOIL CORROSION

Soil pH	7.77		
Minimum Resistivity	1.80 ohm-cm (x1000)		
Chloride	21.9 ppm	00.00219	%
Sulfate	4.6 ppm	00.00046	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LONE TREE SLOUGH Site ID : F4-1B.
Your purchase order number is 1201.7D.
Thank you for your business.

* For future reference to this analysis please use SUN # 56552-114225.

EVALUATION FOR SOIL CORROSION

Soil pH	8.04	
Minimum Resistivity	1.39 ohm-cm (x1000)	
Chloride	38.3 ppm	00.00383 %
Sulfate	29.7 ppm	00.00297 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

APPENDIX C

Abutments 1 & 4: Class 90 Pile Calculations

DRIVEN 1.2

Checked By: DJN
Date: 7/28/10

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7DS\ENGINE~1\DRIVEN~2\LTABUT4.DVN
Project Name: Lone Tree Widen Abts
Project Date: 07/15/2010
Project Client: HDR
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 12.00 in

ULTIMATE CONSIDERATIONS

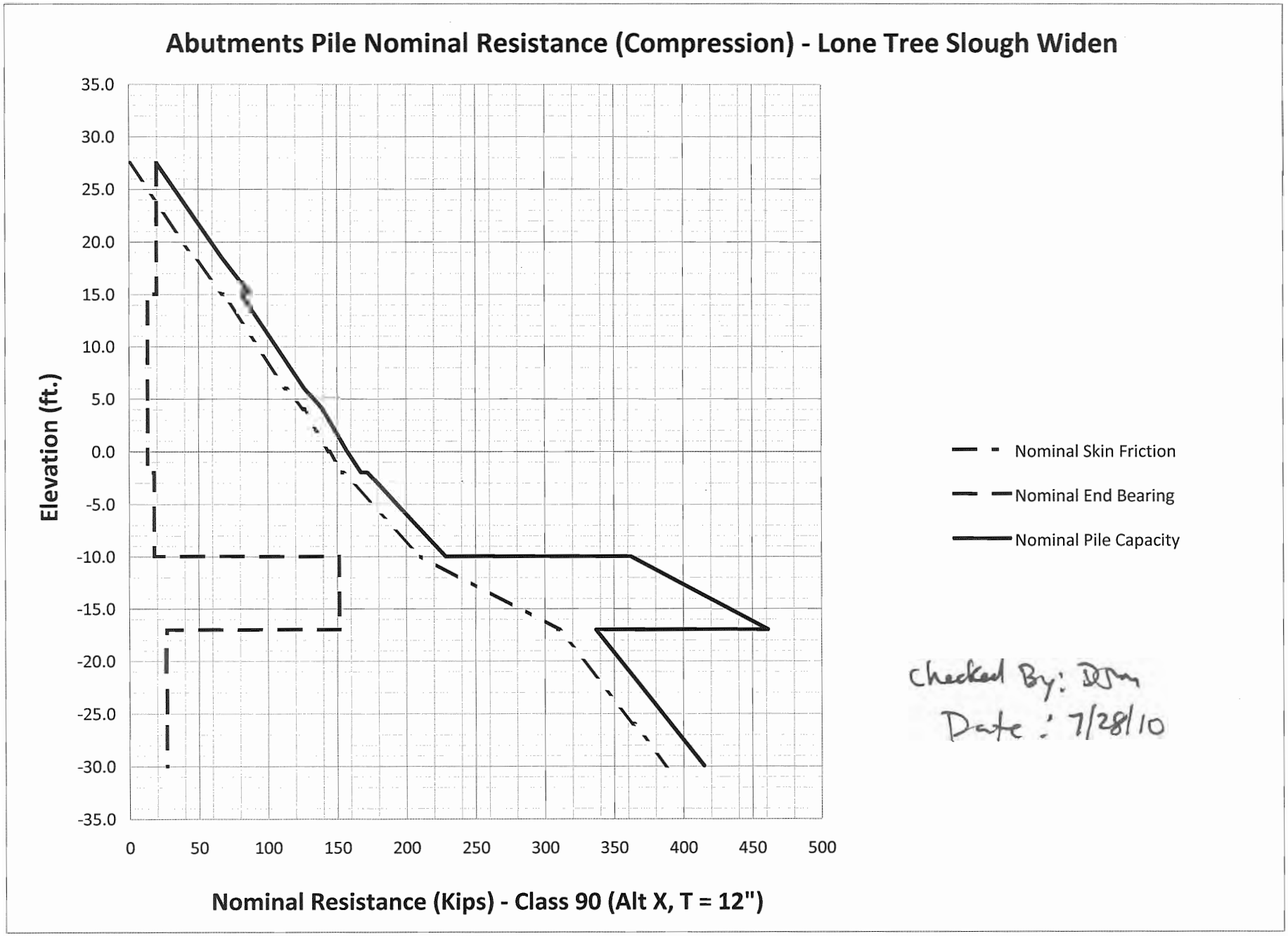
Water Table Depth At Time Of:	- Drilling:	27.50 ft
	- Driving/Restrike	27.50 ft
	- Ultimate:	27.50 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	12.50 ft	0.00%	130.00 pcf	2200.00 psf	T-79 Concrete
2	Cohesionless	11.00 ft	0.00%	121.00 pcf	33.0/30.0	Nordlund
3	Cohesionless	6.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
4	Cohesive	8.00 ft	0.00%	126.00 pcf	2000.00 psf	T-79 Concrete
5	Cohesionless	7.00 ft	0.00%	141.00 pcf	36.0/36.0	Nordlund
6	Cohesive	13.00 ft	0.00%	127.00 pcf	3000.00 psf	T-79 Concrete

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	19.80 Kips	19.85 Kips
9.01 ft	47.21 Kips	19.80 Kips	67.01 Kips
12.49 ft	67.56 Kips	19.80 Kips	87.36 Kips
12.51 ft	67.66 Kips	13.32 Kips	80.98 Kips
21.51 ft	113.14 Kips	13.32 Kips	126.46 Kips
23.49 ft	126.21 Kips	13.32 Kips	139.53 Kips
23.51 ft	126.32 Kips	13.32 Kips	139.64 Kips
27.49 ft	144.10 Kips	13.32 Kips	157.42 Kips
27.51 ft	144.20 Kips	13.32 Kips	157.52 Kips
29.49 ft	153.87 Kips	13.32 Kips	167.19 Kips
29.51 ft	153.98 Kips	18.00 Kips	171.98 Kips
37.49 ft	210.44 Kips	18.00 Kips	228.44 Kips
37.51 ft	210.65 Kips	151.60 Kips	362.25 Kips
44.49 ft	309.70 Kips	151.60 Kips	461.30 Kips
44.51 ft	309.91 Kips	27.00 Kips	336.91 Kips
53.51 ft	364.09 Kips	27.00 Kips	391.09 Kips
57.49 ft	388.05 Kips	27.00 Kips	415.05 Kips



Checked By: DJM
Date: 7/28/10

Lone Tree Slough Widen/OR
BCI No. 1201.7d
02/09/10
By: WEN

Checked By: DJM
Date: 7/16/10

Abutment Pile Settlement Calculations: Class 90 Piles

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

Service-I Limit Per Pile Load (lbs)		80000
A	*Average Axial Load (lbs)	40000
B	Pile Length (in.)	348
C	Tip Area (sq. in.)	144
D	Concrete Modulus of Elasticity (psi)	4415201
Axial Compression (in.)		**0.02**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	555.6
B	Pile Diameter (in.)	12
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	2400
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
Point Settlement (in.)		**0.63**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = **0.65** in.
16.6 mm

APPENDIX D

Bents: 15” PC/PS Concrete Pile Extension Calculations

DRIVEN 1.2

Checked By: DJM
Date : 7/16/10

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7DS\ENGINE~1\DRIVEN~2\LTBNTEND.DVN
Project Name: Lone Tree Widen Bent End Project Date: 07/16/2010
Project Client: HDR
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 13.30 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 ft
Ultimate Considerations:	- Local Scour:	3.35 ft
	- Long Term Scour:	0.85 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	8.00 ft	0.00%	130.00 pcf	2200.00 psf	T-79 Concrete
2	Cohesionless	11.00 ft	0.00%	121.00 pcf	33.0/30.0	Nordlund
3	Cohesionless	6.00 ft	0.00%	121.00 pcf	28.0/28.0	Nordlund
4	Cohesive	8.00 ft	0.00%	127.00 pcf	2000.00 psf	T-79 Concrete
5	Cohesionless	7.00 ft	0.00%	141.00 pcf	36.0/36.0	Nordlund
6	Cohesive	12.00 ft	0.00%	127.00 pcf	3000.00 psf	T-79 Concrete

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.06 Kips	24.32 Kips	24.38 Kips
7.99 ft	46.40 Kips	24.32 Kips	70.73 Kips
8.01 ft	46.49 Kips	16.36 Kips	62.85 Kips
17.01 ft	88.07 Kips	16.36 Kips	104.43 Kips
18.99 ft	101.05 Kips	16.36 Kips	117.41 Kips
19.01 ft	101.16 Kips	16.36 Kips	117.52 Kips
22.99 ft	119.09 Kips	16.36 Kips	135.45 Kips
23.01 ft	119.19 Kips	16.36 Kips	135.55 Kips
24.99 ft	129.14 Kips	16.36 Kips	145.50 Kips
25.01 ft	129.26 Kips	22.11 Kips	151.37 Kips
32.99 ft	187.87 Kips	22.11 Kips	209.98 Kips
33.01 ft	188.09 Kips	186.23 Kips	374.32 Kips
39.99 ft	296.79 Kips	186.23 Kips	483.01 Kips
40.01 ft	297.02 Kips	33.17 Kips	330.18 Kips
49.01 ft	357.07 Kips	33.17 Kips	390.24 Kips
51.99 ft	376.95 Kips	33.17 Kips	410.12 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
4.19 ft	0.00 Kips	0.00 Kips	0.00 Kips
4.20 ft	0.00 Kips	24.32 Kips	24.32 Kips
7.99 ft	22.01 Kips	24.32 Kips	46.33 Kips
8.01 ft	22.10 Kips	16.36 Kips	38.46 Kips
17.01 ft	60.78 Kips	16.36 Kips	77.14 Kips
18.99 ft	73.12 Kips	16.36 Kips	89.48 Kips
19.01 ft	73.22 Kips	16.36 Kips	89.58 Kips
22.99 ft	90.40 Kips	16.36 Kips	106.76 Kips
23.01 ft	90.49 Kips	16.36 Kips	106.85 Kips
24.99 ft	100.06 Kips	16.36 Kips	116.42 Kips
25.01 ft	100.18 Kips	22.11 Kips	122.29 Kips
32.99 ft	158.79 Kips	22.11 Kips	180.90 Kips
33.01 ft	159.01 Kips	186.23 Kips	345.24 Kips
39.99 ft	264.51 Kips	186.23 Kips	450.74 Kips
40.01 ft	264.74 Kips	33.17 Kips	297.91 Kips
49.01 ft	324.79 Kips	33.17 Kips	357.96 Kips
51.99 ft	344.68 Kips	33.17 Kips	377.84 Kips

Checked By: DJM
Date : 7/16/10

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7DS\ENGINE~1\DRIVEN~2\LTBNTSKN.DVN
Project Name: Lone Tree Widen Bent Skin Project Date: 07/16/2010
Project Client: HDR
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 11.80 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	23.00 ft
	- Driving/Restrike	23.00 ft
	- Ultimate:	23.00 ft
Ultimate Considerations:	- Local Scour:	3.35 ft
	- Long Term Scour:	0.85 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	8.00 ft	0.00%	130.00 pcf	2200.00 psf	T-79 Concrete
2	Cohesionless	11.00 ft	0.00%	121.00 pcf	33.0/30.0	Nordlund
3	Cohesionless	6.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
4	Cohesive	8.00 ft	0.00%	126.00 pcf	2000.00 psf	T-79 Concrete
5	Cohesionless	7.00 ft	0.00%	141.00 pcf	36.0/36.0	Nordlund
6	Cohesive	12.00 ft	0.00%	127.00 pcf	3000.00 psf	T-79 Concrete

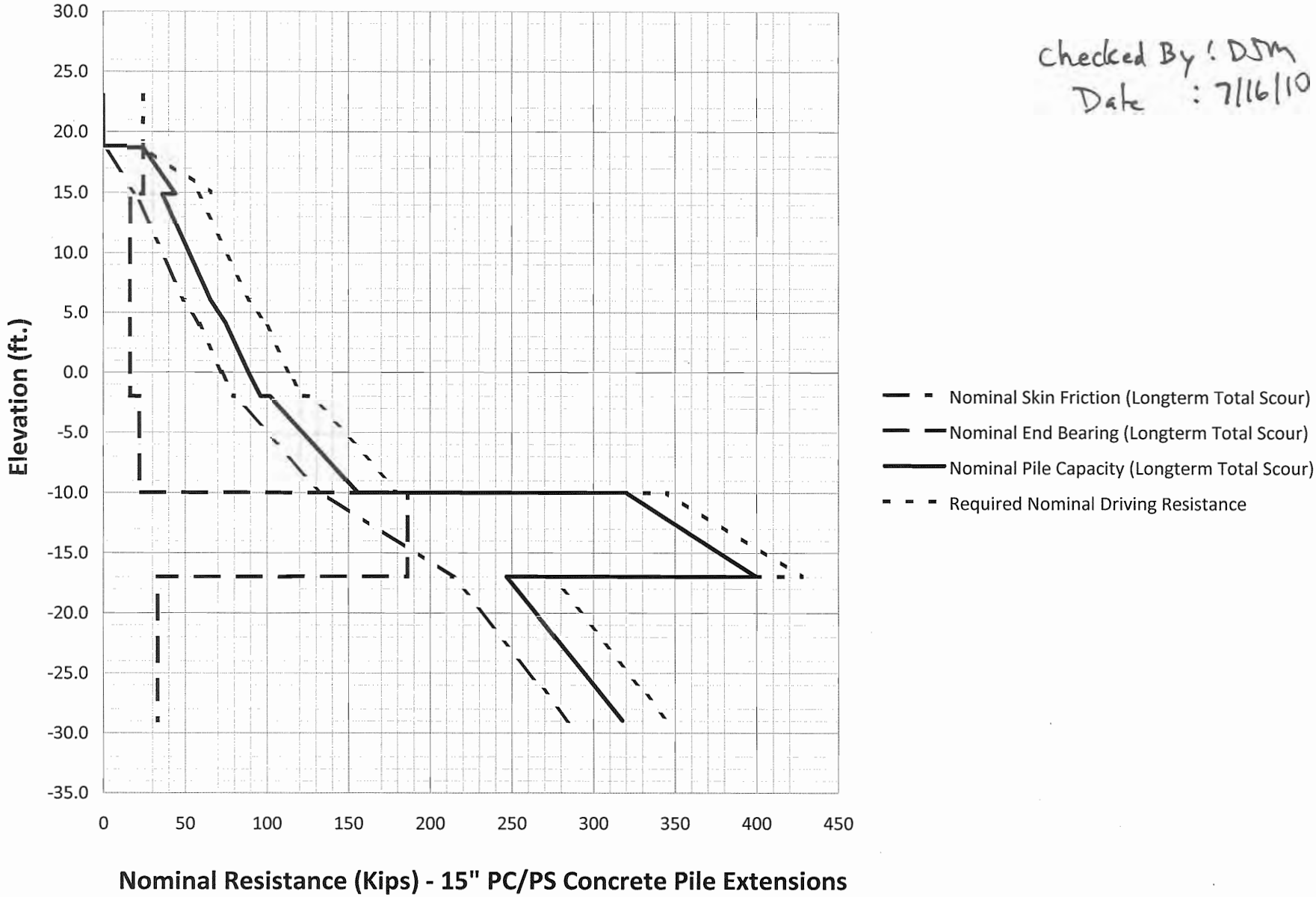
DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	19.15 Kips	19.20 Kips
7.99 ft	41.17 Kips	19.15 Kips	60.32 Kips
8.01 ft	41.24 Kips	12.88 Kips	54.12 Kips
17.01 ft	73.16 Kips	12.88 Kips	86.04 Kips
18.99 ft	83.12 Kips	12.88 Kips	96.00 Kips
19.01 ft	83.21 Kips	12.88 Kips	96.09 Kips
22.99 ft	97.20 Kips	12.88 Kips	110.08 Kips
23.01 ft	97.28 Kips	12.88 Kips	110.16 Kips
24.99 ft	105.04 Kips	12.88 Kips	117.92 Kips
25.01 ft	105.14 Kips	17.41 Kips	122.54 Kips
32.99 ft	158.86 Kips	17.41 Kips	176.27 Kips
33.01 ft	159.04 Kips	146.59 Kips	305.63 Kips
39.99 ft	241.19 Kips	146.59 Kips	387.78 Kips
40.01 ft	241.38 Kips	26.11 Kips	267.48 Kips
49.01 ft	294.65 Kips	26.11 Kips	320.76 Kips
51.99 ft	312.29 Kips	26.11 Kips	338.40 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
4.19 ft	0.00 Kips	0.00 Kips	0.00 Kips
4.20 ft	0.00 Kips	19.15 Kips	19.15 Kips
7.99 ft	19.53 Kips	19.15 Kips	38.67 Kips
8.01 ft	19.60 Kips	12.88 Kips	32.48 Kips
17.01 ft	49.29 Kips	12.88 Kips	62.17 Kips
18.99 ft	58.77 Kips	12.88 Kips	71.64 Kips
19.01 ft	58.85 Kips	12.88 Kips	71.73 Kips
22.99 ft	72.25 Kips	12.88 Kips	85.13 Kips
23.01 ft	72.32 Kips	12.88 Kips	85.20 Kips
24.99 ft	79.79 Kips	12.88 Kips	92.67 Kips
25.01 ft	79.89 Kips	17.41 Kips	97.29 Kips
32.99 ft	133.61 Kips	17.41 Kips	151.02 Kips
33.01 ft	133.79 Kips	146.59 Kips	280.38 Kips
39.99 ft	213.51 Kips	146.59 Kips	360.10 Kips
40.01 ft	213.70 Kips	26.11 Kips	239.80 Kips
49.01 ft	266.97 Kips	26.11 Kips	293.08 Kips
51.99 ft	284.61 Kips	26.11 Kips	310.72 Kips

Bent Pile Nominal Resistance (Compression) - Lone Tree Slough Bridge (Widen)



Checked By: DJM
Date: 7/16/10

Lone Tree Slough Widen/OR
BCI No. 1201.7d
02/09/10
By: WEN

Checked By: DJM
Date : 7/16/10

Bent Pile Settlement Calculations: 15" PC/PS Concrete Pile Extensions

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

Service-I Limit Per Pile Load (lbs)		72000
A	*Average Axial Load (lbs)	36000
B	Pile Length (in.)	645
C	Tip Area (sq. in.)	177
D	Concrete Modulus of Elasticity (psi)	4415201
Axial Compression (in.)		**0.030**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	406.8
B	Pile Diameter (in.)	15
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	2700
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
Point Settlement (in.)		**0.514**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = **0.54** in.
13.8 mm

APPENDIX E

Caltrans Review comments and BCI Response

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 **EA:** 0E6101 **Project Name:** SR99 Manteca Widening **OSFP Liaison:** John Fujimoto **Phone:** 916-227-8757 **e-mail:** john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details __ PS&E (Review No.___) __ Construction X Other: 1st 60% Review	**Reviewer Name:** Ben Barnes **Functional Unit:** Geotechnical Services **Cost Center:** 59-323 **Phone Number:** 916-227-1039 **e-mail:** benjamin_barnes@dot.ca.gov **Date of Review:** 5/24/2010 **Structure Name*:** Lone Tree Slough Bridge (Widen) **Br No*:** 29-0023 (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Eric Nichols	Blackburn Consulting	916-375-8706	ericn@blackburnconsulting.com	July 19, 2010

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	FR	NA	This is the 1st 60% review of the Draft Foundation Report prepared by Blackburn Consulting, dated April 23, 2010, by Caltrans Office of Geotechnical Design – North.	NA	
2	FR	Table of Contents / Appendix A title sheet	Figure 3 listed as Peak Bedrock Acceleration, title on Figure 3 is Regional Fault Map	BCI changed the title in the table of contents and Appendix A sheet to "Regional Fault Map".	
3	FR	TOC, Section 4.3.1, App A sheet	Report mentions LOTB checklist, is this going to be included the final report?	We will include this in the final report.	
4	FR	1.2 Scope of Services, #7	"Feet" listed twice.	We listed "(ft.)" to denote the abbreviation used for "feet" throughout the remainder of the text.	
5	FR	2 Subsurface Exploration	States "8-inch OD hollow stem auger.", LOTB for F4 shows 6"	Both 6 and 8 inch diameter hollow stem auger were used. BCI has edited the report text accordingly.	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

6	FR	2 Subsurface Exploration	Boring dates in report do not match those on LOTB.	The dates on the LOTB are correct. BCI edited the dates in the report to reflect the dates shown on the LOTB.	
7	FR	2 Subsurface Exploration	Hammer efficiency ratio shown as 75% in report, and 80% on LOTB. Also, what is the assumed hammer efficiency ratio based on?	BCI will change the hammer efficiency on the LOTB to 75% and included text in the report regarding estimation of the hammer efficiency.	
8	FR	3 Laboratory Testing	R-Value test results not found in Appendix B.	No R-value tests were completed for this project element. Reference to R-value has been deleted from the text.	
9	FR	6 Seismic Data and Evaluation	Please use current CT seismic design criteria.	Per e-mail from John Fujimoto on June 15, 2010, use of SDC 1.4 Seismic Design Criteria was approved for this project at Type Selection.	
10	FR	Figure 4 ARS Curve	Please use current CT seismic design criteria.	Per e-mail from John Fujimoto on June 15, 2010, use of SDC 1.4 Seismic Design Criteria was approved for this project at Type Selection.	
11	FR	2 Subsurface Exploration / LOTB	SPT sampler listed as 1.5-inch ID in report, shown as 1.4 on LOTB.	The SPT ID shown on the LOTB is correct. BCI has edited the report text accordingly	
12	FR	2 Subsurface Exploration / LOTB	Report states F1 and F4 depth at elevation –29.5, LOTB shows –28.5.	The depth at elevation -28.5 is correct. BCI has edited the report text accordingly.	
13	FR	TOC and Section 9.4	Title should be "Abut 1 and Abut 4 (Class 90)".	The TOC and Section 9.4 have been edited accordingly.	

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

DEC 06 2010
OFFICE OF SPECIAL FUNDED PROJECTS

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 EA: 0E6101 Project Name: SR99 Manteca Widen OSFP Liaison: John Fujimoto Phone: 916-227-8757 e-mail: john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details X PS&E (Review No. 2) __ Construction __ Other:_____	Reviewer Name: Theresa Nedwick Functional Unit: SOE-Specifications Cost Center: _____ Phone Number: 916-227-8193 e-mail: Theresa_nedwick@dot.ca.gov Date of Review: 11/15/10 Structure Name*: _____ Br No*:_____ (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Titus Keng	HDR Engineering Inc	916-817-4876	titus.keng@hdrinc.com	11/29/10

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	FRs	Sect 11	Construction Considerations: For pile driving, geotech engineer refers to a P formula that is not in 2006 Standard Specifications, Section 49-1.08. He also refers to a requirement for blow counts that is not specified in either Standard Specifications or Special Provisions.	In Section 11.2 (11.3 for Lone Tree Slough Ramp Bridge) of the foundation reports, the sentence "However, in no case shall the required blows (N) be less than that obtained using the Engineering News Formula (P=Er/6(s + 2.54)" may be disregarded.	
2	FR		Please check with geotech engineer if a Driving System Submittal required to ensure that pile driving system is adequate. SSP 49-208 needs to be in if required by geotech engineer.	Geotechnical engineer BCI recommends that the contractor provides a Driving System Submittal. SSP 49-208 has been included.	
3	P		Why note "Provide a clean and roughen surface for existing concrete prior to placing new concrete. Roughen to 1/4" amplitude"? Where is the specs? What's about "Prepare Concrete Bridge Deck Surface"?	Note has been deleted. "Roughen to ¼" amplitude" has been called out on specific detail with related specs added to project specifications SSP51-300.	
4	P		Why are epoxy dowels used? FRs didn't specify this is a corrosive environment. This project is not in Climate Area	Epoxy dowels have been revised to ordinary reinf steel dowel.	

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RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant Calcs	

✓= Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ * -if applicable

			III either.		
5	ALL SSPs		Please put your initials and date for ANY EDITS you make in the special provisions. Some SSPs have no page breaks in between.	Initials and date are added. Will have page breaks between SSPs.	
6	SP	S5-250	Please list partial pay items as they appear in "Ready to List": Piling (except CIDH) Bar Reinforcing Steel	Agreed and has been corrected as appear in "Ready to List".	
7	SP	S5-280	Please describe what gets to be inspected at listed address.	Moved "Bridge as-built drawings" to listed address.	
8	SP	S8-W04	We recommend to keep para 19 without striking anything.	Leave para 19 as is shown, revised to keep para 20 without striking anything.	
9	SP	S8-W09	Please remove one. There are 2 of them.	Agreed to remove one.	
10	SP	15-800	Add "s" to brige in para 2.	Agreed and has been corrected.	
11	SP	15-875	Para 5, reinstate "at".	Agreed and has been corrected.	
12	SP	15-880	Para 14. you keep "chip or slurry seal contrast treatments" but strike them in paras 19 and 20?	Strike "chip or slurry seal contrast treatments" in para 14.	
13	SP	15-940	Add description and pay clause for 3/4" saw cut. It's not covered in Standard Specs.	Description and pay clause for 3/4" saw cut has been added at the end of para 11.	
14	SP	19-010	Please specify man-made objects encountered during pile driving-sub structure work. Standard Specs covers it for earthwork.	Man-made objects have been specified in the paragraph.	
15	SP	19-570	Style for pay clause should be normal and should be written as it recommends in Ready to List Guide, Section 6: "Full compensation for … shall be considered as included in the contract …prices paid per …for , and no …therefor.	Agreed and has been corrected.	
16	SP	42-010	The project has grooves on EXISTNG and NEW polyester concrete overlay for BRIDGE DECKS. Please edit accordingly.	Para 1 has been modified to have Existing and NEW polyester concrete overlay.	
17	SP	42-600	The project has no grinding PCC, please strike "grinding".	Agreed and has been corrected.	
18	SP	49-200	The added para "Drilling should be…tip elevations' belongs to 49-210. Added para "Pile driving…supported on piles" is not needed.	Para "Drilling should be…tip elevations" has been moved to 49-210. Para "Pile driving…supported on piles" has been removed.	
19	SP	49-210	Restricted drilling is allowed, see FRs. Please edit accordingly.	Agreed and has been corrected.	
20	SP	51-600	Strike one of the tilte. There are identical.	Agreed and has been corrected.	

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

21	SP	51-806	The project has no "Public Safety plan", so please strike all related info in paras 2,7, and 8.	Agreed the project has no "Public Safety plan" so related information in para 2,4,38 and 39 is strike out. Para 7 & 8 are used since the entire deck is being overlain at French Camp Slough Bridge and Little John Creek Bridge.	
22	SP	72-200	Please have it conforms to 72-6 instead of 72-4. Section 72-6 talks about paving under bridges.	Agreed and has been corrected to conform to 72-6.	
23	SP	83-460	Para 10, added paras for Types 60A(MOD) and 732 are not needed.	Agreed and has been corrected.	

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 **EA:** 0E6101 **Project Name:** SR99 Manteca Widen **OSFP Liaison:** John Fujimoto **Phone:** 916-227-8757 **e-mail:** john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details X PS&E (Review No. 3) __ Construction __ Other:_____	**Reviewer Name:** Theresa Nedwick **Functional Unit:** SOE-Specifications **Cost Center:** _____ **Phone Number:** 916-227-8193 **e-mail:** Theresa_nedwick@dot.ca.gov **Date of Review:** 11/15/10 **Structure Name*:** _____ **Br No*:**_____ (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Titus Keng	HDR Engineering Inc	916-817-4876	titus.keng@hdrinc.com	10/28/10

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	SP	S5-280	Please don't move "Bridge as-built drawing" to different line, it should be next to "Available as specified in the Std Specifications". What is the address 661 San Juan Ave for? Please list the all the info handout. Please check with Geotech engineer if rock cores available for viewing. If they are, please insert the info according to instructions.		
2	SP	19-010	Para 1 is missing a period.		
3	SP	19-570	Style for pay clause should be **normal**, not an item K.		
4	SP	42-010	Para 1, add "This work consists of" at the beginning of the para and "and" before "shall conform". Under "Measurement and Payment": move "of the groove area" to the end of the para, replacing "groove". Delete last para, you already describe the work in para 1.		

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RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

5	SP	42-600	Please replace all "pavement" with overlay throughout this specifications. Please strike "grinding" at various locations.		
6	SP	49-208	Para 2C3, last para, do you have open ended pipe piles?		
7	SP	49-210	Para 2, a period is needed.		
8	SP	51-806	Para 7, delete "Results from airborne… production work". You don't have airborne monitoring. Para 8, delete 8-8, you don't have airborne monitoring.		
9	SP	15-170	Recommend "salvage metal bridge railing post" full-comped into "Bridge removal (portion) as specified in the Std Specs, Section 15-4.03.		
10	FRs		Refer to comments #1 and #2 of Second Review, please have Foundations Reports revised to reflect Consultant's responses.	In Section 11.2 (11.3 for Lone Tree Slough Ramp Bridge), BCI revised the Foundation Report by deleting the sentence regarding use of the Engineering News Formula and adding a sentence requiring a Driving System Submittal	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					

REVISED FINAL FOUNDATION REPORT

LONE TREE SLOUGH SB OFF RAMP BRIDGE

BRIDGE NO. 29-0033
10-SJ-99, PM 11.80
EA: 0E6101; CU: 06241

Prepared by:

BLACKBURN CONSULTING
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Modesto, CA 95354
(209) 522-6273

Prepared for:

HDR, INC.
1325 J Street, Suite 1300
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January 6, 2011

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blackburn consulting

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Geotechnical • Construction Services • Forensics

File No. 1201.7d
January 6, 2011

Mr. John Klemunes
HDR Engineering, Inc.
1325 J Street, Suite 1300
Sacramento, CA 95814

Subject: **REVISED FINAL FOUNDATION REPORT**
Lone Tree Slough SB Off Ramp, Bridge No. 29-0033
10-SJ-99, PM 11.80, CU: 06241, EA: OE6101
San Joaquin County, California

Dear Mr. Klemunes:

Blackburn Consulting (BCI) prepared this Revised Final Foundation Report for the Lone Tree Slough SB Off Ramp Bridge in San Joaquin County, California. This report supercedes our July 28, 2010 Final Foundation Report for this structure. BCI prepared this report in accordance with our November 15, 2008 Agreement between BCI and HDR Engineering, Inc.

Thank you for the opportunity to be part of your design team. Please call if you have questions or require additional information.

Sincerely;

BLACKBURN CONSULTING

PROFESSIONAL GEOLOGIST
WILLIAM E. NICHOLS
NO. 2229
CERTIFIED ENGINEERING GEOLOGIST
EXP 1-31-12
STATE OF CALIFORNIA

W. Eric Nichols, C.E.G.
Senior Project Manager

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER
DAVID J. MORRELL
No. GE 2843
GEOTECHNICAL
STATE OF CALIFORNIA

David J. Morrell, P.E., G.E.
Senior Project Manager

Copies: 7 to Addressee

REVISED FINAL FOUNDATION REPORT
Lone Tree Slough SB Off Ramp, Bridge No. 29-0033
10-SJ-99, PM 11.80, CU: 06241, EA: OE6101
San Joaquin County, California

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Laboratory Results

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APPENDIX E
Caltrans Review comments and BCI Response

1 INTRODUCTION

1.1 Purpose

Blackburn Consulting (BCI) prepared this Foundation Report for the Lone Tree Slough SB Off Ramp Bridge (Bridge No. 29-0033) on State Route (SR) 99 in San Joaquin County, California. It contains our subsurface findings, conclusions and recommendations for bridge design.

This report is for HDR Engineering, Inc. (HDR), San Joaquin Council of Governments (SJCOG), and California Department of Transportation (Caltrans) to use during bridge design and construction. It shall not be used or relied upon by others, or for different locations or improvements without the written consent of BCI.

1.2 Scope Of Services

To prepare this report, BCI:

1. Discussed the project with HDR.
2. Attended the September 10, 2009 Type Selection Meeting with the design team and Caltrans.
3. Reviewed HDR's August 5, 2009 Structure Type Selection Report for the structure.
4. Reviewed "As-Built" plans for the existing bridge structures (29-0023R/L).
5. Reviewed preliminary plans for the structure prepared by HDR.
6. Reviewed published maps and literature related to site geologic and seismic conditions.
7. Observed, logged and sampled two exploratory test borings to depths of about 63 feet (ft.).
8. Reviewed Caltrans comments regarding our April 23, 2010 Draft Foundation Report and prepared responses. See Appendix E for Caltrans comments and BCI responses.
9. Performed engineering analysis and calculations to develop our conclusions and recommendations.

1.3 Site Description

The project site is located along SR 99 (west of the existing Lone Tree Slough Bridge) about 1,650 ft. north of Turner Station OH in San Joaquin County, California. The approximate site coordinates are 37.8645 degrees north latitude, 121.2189 degrees west longitude. We show the project location on Figure 1 in Appendix A.

At this location, Lone Tree Creek flows northwesterly within an improved channel section about 25 ft. wide. The existing ground surface north and south of the slough is essentially flat at approximate elevation 30 ft. above mean sea level. Low channel grade is near elevation 22 ft. above mean sea level, about 8 ft. below the top of banks. The channel banks within the limits of the westbound off-ramp are unpaved and slope at about 1.5:1 (horizontal:vertical distance).

Within about 5 to 15 ft. west of the existing southbound structure (left bridge), BCI observed remnant concrete foundations within the channel and south bank of Lone Tree Creek. These foundations are likely associated with the old highway bridge removed during 1955 construction. *We address potential conflict between existing (pre-1955) and new bridge foundations in Section 11.1.*

1.4 Project Description

The new Lone Tree Slough SB Off Ramp Bridge will be a three-span, cast-in-place/reinforced concrete flat-slab structure, about 61 ft. long and 27 ft. wide. The new bridge deck grade will be at elev. 33.64 ft. at Abutment 1 (BB Sta. 23+86±) and at elev. 33.53 ft. (EB Sta. 24+47±). Bridge substructure will consist of pile supported abutments and pile bents.

Concrete slope paving will be constructed on the channel slopes to mitigate scour at the abutments.

New approach fill heights will be nominal (about 3 to 4 ft. above existing grades).

2 SUBSURFACE EXPLORATION

BCI retained Precision Drilling, Inc. to drill and sample four exploratory borings (two for the southbound off-ramp and two for the widening) at the site to characterize the subsurface conditions and obtain samples for laboratory testing. The drillers used a CME 75 truck-mounted rig to drill the borings using 6 and 8-inch O.D. hollow stem auger.

For the Lone Tree Slough SB Off Ramp Bridge, BCI observed, logged and sampled Borings A-09-F2 and A-09-F3 on March 24 and 25, 2009 to a maximum depth of approximately 63 ft. (elev.-33 ft.., NGVD 29). For the Lone Tree Slough Bridge (Widen), we observed, logged and sampled Borings A-09-F1 and A-09-F4 on March 18, 2009 and August 4, 2009 to a maximum depth of approximately 62 ft. (elev.-28.5 ft., NGVD 29). BCI determined boring locations and elevations using topography and elevation data provided by HDR.

The drillers obtained drive samples with a Modified California sampler (equipped with 2.4-inch I.D. brass liners) and a Standard Penetration Test sampler (1.4-inch I.D.). The samplers were driven into the ground with a 140 pound automatic trip hammer falling 30 inches. The N-values shown on the Log of Test Borings in Appendix A are uncorrected “field” values. For the Modified California sampler, BCI multiplied the field N-value by a factor of 0.65 to obtain and approximate SPT N-value.

FHWA’s Soil and Foundations Reference Manual, Volume 1 (FHWA NHI-06-088, December 2006) indicates that the hammer energy transfer ratio ranges between 80-100% for automatic trip hammers. To be conservative, BCI assumed a hammer energy transfer ratio of 75% in the absence of recent hammer calibration data.

BCI's project geologist, Mr. Aaron Wood, logged the borings consistent with the Unified Soil Classification System (USCS). BCI retained soil samples recovered with the drive samplers in moisture-proof containers for laboratory testing and reference. BCI also obtained bulk samples from auger drill cuttings and made ground water observations in the borings during and at completion of drilling operations.

We provide the existing Log of Test Borings for the original bridge in Appendix A.

3 LABORATORY TESTING

BCI completed the following laboratory tests on representative soil samples obtained from the exploratory borings:

- Moisture Content - Dry Density
- Unconfined Compressive Strength
- Undrained-Unconsolidated Triaxial Compression
- Consolidation
- Grain Size Analysis
- Atterberg Limits
- Sulfate/Chloride Content
- pH/Minimum Resistivity

BCI performed laboratory tests in conformance with current ASTM and Caltrans test procedures. We present the laboratory test results summary and laboratory test results in Appendix B.

4 GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

Literature published by the California Geological Survey (CGS) indicates that the site is located in the San Joaquin Valley within the central portion of the Great Valley Geomorphic Province. This province encompasses the San Joaquin Valley in the south and the Sacramento Valley in the north. The province is bounded by the Sierra Nevada to the east, the Coast Ranges to the west, the Klamath Mountains and Cascade Range to the north.

The Great Valley is a broad, elongated, northwest trending, structural trough that has been filled with a thick sequence of sediments. The eastern margin of the valley is formed by the west sloping Sierran bedrock surface that extends westward beneath the alluvium and older sedimentary bedrock within the valley. The western border is underlain by east dipping rock of the Coast Ranges that form a deeply buried trough.

During the late Mesozoic and through most of Tertiary time (approximately 100 million to 20 million years ago), deposition of thousands of feet of marine sediments occurred within the Great Valley. Continental deposits (generally alluvium) of late Tertiary and Quaternary age (approximately 20 million years ago to the present) overlie these marine deposits. Both the continental deposits and the underlying marine sediments form a wedge of sediments that generally thickens from east to west. The accumulated thickness of the marine and continental sediments is at least several thousand feet at the site.

4.2 Local Geology

BCI evaluated the geology of the area by review of published geologic maps and literature, site review, and subsurface exploration. Mapping by the California Geologic Survey[1] shows the site is underlain by sediments of the Pleistocene-age Modesto Formation. These sediments are alluvium comprised mostly of sand, silt and clay. We present a Geologic Map as Figure 2 in Appendix A.

4.3 Subsurface Conditions

4.3.1 Soil

In general, the soil profile at this site is comprised of medium dense to dense (locally loose), silty and clayey sand, interlayered with medium stiff to hard, sandy clay and silt to a depth of 63 ft. (elev.-33.0 ft., NGVD 29). These soil conditions are similar to those shown on the As-Built Log of Test Borings (LOTB) for the existing northbound Lone Tree Slough Bridge (Bridge No. 29-0023R).

We consider the soils described in the test borings for this study, and those shown on the As-Built LOTB, to be consistent with alluvial sediments of the Modesto Formation.

Based on our laboratory testing, the dry density of the soil units ranged from about 93 pcf to 123 pcf, at moisture contents between 7% and 30%. Triaxial testing (unconsolidated, undrained) of the clay and clay sand soil at depths of about 31 to 36 feet yielded undrained cohesion values ranging from 1,196 psf to 5,216 psf. Unconfined compressive strength testing of the silt/clay soil at depths of about 15 feet and 20 feet yielded unconfined compressive strengths of values of 3.2 tsf and 1.1 tsf, respectively.

Refer to the Log of Test Borings (LOTB) and As-Built Log of Test Borings in Appendix A for more specific soil descriptions, laboratory test results, and blow count data. *We include the required LOTB Sheet Checklist in Appendix A.*

[1] Geologic Map of the San Francisco-San Jose Quadrangle, 1:250,000, California Division of Mines and Geology, 1990.

4.3.2 Ground Water

Table 1 presents the ground water depth/elevations measured in our borings during drilling.

Table 1: Ground Water Elevations

Boring Number	Reading Date	Groundwater Depth (ft.)	Ground Water Elevation (ft.*)
A-09-F1	3/18/2009	45.5	-12.5
A-09-F2	3/24/2009	43.0	-13.0
A-09-F3	3/25/2009	46.5	-16.5
A-09-F4	8/4/2009	40.0	-7.5

*NGVD 29 datum

The As-Built LOTB sheet for the existing structures shows ground water within about 10 ft. of ground surface (drilled July, 1954).

According to the San Joaquin County Internal Groundwater Data Center interactive website (http://www.sjmap.org/groundwater/), ground water elevations in the vicinity of the site have dropped 20 ft. or more since the late 1950's. Within the last 20 years ground water level has fluctuated between elev. 3 to -15 ft. in the site vicinity, consistent with our boring data.

BCI used a design ground water level at elev. 0 ft. (NGVD 29) in our geotechnical analysis for this site.

Ground water levels can fluctuate due to changes in precipitation, slough levels, irrigation, pumping of wells, and other factors. Seepage from the slough may cause perched ground water conditions at and below the existing slough water levels adjacent to the slough at any time of year.

5 CORROSION EVALUATION

BCI performed corrosion testing on four samples obtained from the borings completed at this site. Table 2 presents the test results for pH, resistivity, sulfates and chlorides.

Table 2: Soil Corrosion Test Summary

Boring/Sample Number	Depth (ft)	Elevation (ft)	Minimum Resistivity (Ohm-cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
A-09-F1/11b	40.5-41.0	-7.5 to -8.0	1,210	7.66	24.8	26.2
A-09-F2/3c	6.0-6.5	23.5 to 24.0	1,050	7.47	39.0	21.1
A-09-F3/6c	16.0-16.5	13.5 to 14.0	1,800	7.77	21.9	4.6
A-09-F4/1b	5.5-6.0	26.5 to 27.0	1,390	8.04	38.3	29.7

Note: Caltrans considers a site to be corrosive to foundation elements if one or more of the following conditions exist: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less (Caltrans, "Corrosion Guidelines", version 1.0, September 2003).

According to Caltrans Corrosion Guidelines (Version 1.0, September 2003), the site is not considered corrosive to structural elements. Appendix B contains the soil corrosion test results.

6 SEISMIC DATA AND EVALUATION

6.1 Caltrans Seismic Design Criteria

Based on the Caltrans 1996 California Seismic Hazard Map, the peak horizontal rock acceleration for the site is approximately 0.17g. The causative fault is the Midway-San Joaquin/N Fault located about 18 miles to the southwest. According to the 1996 Caltrans Seismic Map (Technical Report), the style of faulting is not known/published and this fault is listed as a new earthquake source. The estimated Maximum Earthquake Moment Magnitude for this fault is 6.75. BCI includes a Regional Fault Map showing peak bedrock accelerations as Figure 3 in Appendix A.

We classify the site soil profile as Type D using Table B.1 of the June 2006 Caltrans Seismic Design Criteria (SDC), Version 1.4, with SPT values ranging from 15 to 50.

Based on the above information, use the 0.2g peak horizontal rock acceleration curve (0.28g peak ground acceleration) from Figure B.7 (Soil Profile Type D, Magnitude: 6.5± 0.25) of the SDC for bridge structure design. We include our recommended ARS curve for bridge design as Figure 4 in Appendix A.

For geotechnical purposes, a peak ground acceleration of 0.24g (interpolated from Figure B.7 between the 0.1g and 0.2g ARS curves for the peak horizontal acceleration of 0.17g at the site) is appropriate for liquefaction and seismic settlement potential evaluations.

6.2 Fault Rupture

The site does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone for fault rupture hazard, and no known active faults cross the existing bridge. We therefore consider the potential for fault rupture and ground displacement to adversely affect the proposed structure as very low to nonexistent.

6.3 Seismic Slope Stability

We consider the potential for seismic slope instability of the existing canal slopes in-place at 1.5:1 (or flatter) at this site to be very low to nonexistent for the design peak ground acceleration of 0.24g and conditions encountered in our borings.

6.4 Liquefaction And Seismic Settlement Potential

Liquefaction can occur when relatively loose, saturated granular soil and specific soft, saturated fine-grained soils are subject to ground shaking sufficient to increase pore pressures to trigger liquefaction. Based on the soil and ground water conditions encountered in our borings, we consider the potential for detrimental liquefaction at the site to be nonexistent for the design peak ground acceleration of 0.24g.

During a seismic event, ground shaking can cause densification of granular soil above the water table that can result in settlement of the ground surface. Based on the soil and ground water conditions encountered in our borings, we consider the potential for detrimental seismic settlement at the site to be nonexistent for the design peak ground acceleration of 0.24g.

7 SCOUR EVALUATION

HDR Inc. performed a hydrology and hydraulics study[2] for structure that included the following scour data for the bridge.

Table 3: Scour Data

Bridge Support	Estimated Contraction Scour (ft.)	Estimated Local Scour (ft.)	Total Scour Depth (ft.)	Total Scour Elevation (ft.)
Abutment 1	0.00	0.00	0.00	*N/A
Bent 2	0.18	3.12	3.30	19.9
Bent 3	0.18	3.12	3.30	20.2
Abutment 4	0.00	0.52	0.52	*N/A

* Concrete slope paving will be constructed for scour mitigation.

HDR assumed that no long-term channel aggradation or degradation will occur at the site based on their field observations of the channel in the vicinity of the existing structures.

8 AS-BUILT FOUNDATION DATA

The As-Built Records show the existing left and right bridges are supported on driven 45-ton steel monotube piles filled with unreinforced concrete. The 1954 foundation report recommended specified pile tip at elev.-10 ft. A pile driving letter dated April 22, 1955, indicates that the actual total driven lengths of the piles were about 60% of the recommended total lineal footage, and that pile driving encountered harder soil conditions than expected, causing some of the steel shells to deform/bulge. This appears to be reflected by the As-Built LOTB sheet, which shows the piles driven to about elev. 10 ft. (average) at the abutments and about elev. 5 ft. (average) at the bents. An additional pile was driven at Abutment 1 (left structure) to replace a pile that deformed before reaching bearing.

9 FOUNDATION RECOMMENDATIONS

9.1 Foundation Data And Loading

The subsurface conditions encountered in our borings indicate that the site is conducive for either driven or cast-in-drilled-hole (CIDH) piles. Since CIDH piles would require temporary casing and slurry drilling due ground water and/or seepage from the slough, we favor the use of driven piles over CIDH piles. Spread footings are not considered feasible for support due to the potential for excessive settlement.

[2] Final Hydrology & Hydraulics Report, SR99, Littlejohns Creek, French Camp Slough, and Lone Tree Creek Crossings, Post Mile 5.3-15.0, July 2009; revised scour results provided by email on 01/22/10.

Based on the above information, driven Class 90 (Alt X) precast, prestressed concrete piles were selected for abutment support. Driven 15" precast, prestressed concrete pile extensions (Slab Bridge Pile Details, Section B-B, Sheet xs1-230, 4/4/1997) were selected for bent support.

HDR provided the following foundation design information in Tables 4 and 5.

Table 4: Foundation Design Data Provided By HDR

Foundation Design Data								
Support No.	Design Method	Pile Type	Finish Grade Elev. (ft)*	Pile Cut-off Elevation (ft)*	Pile Cap Size (ft)		Permissible Settlement – Service Load (in)	Number of Piles Per Support
					B	L		
Abut 1	WSD	Class 90 (Alt. X)	26.30**	24.30	N/A	N/A	1	4
Bent 2	LRFD	15" PC/PS Pile Extensions	22.00	31.50	N/A	N/A	1	3
Bent 3	LRFD	15" PC/PS Pile Extensions	22.00	31.50	N/A	N/A	1	3
Abut 4	WSD	Class 90 (Alt. X)	29.50**	27.50	N/A	N/A	1	4

* Finished Grade and Pile Cut-off Elevation are approximate and are subjected to change once more accurate final survey data would become available.
** Finished Grade indicates the ground elevation in front of abut wall/ top of slope.

Table 5: Foundation Design Loads Provided By HDR

Foundation Design Loads											
Support No.	**Service-I Limit State (kips)**			**Strength Limit State (Controlling Group, kips)**				**Extreme Limit State (Controlling Group, kips)**			
	Total Load		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Per Pile	Per Support	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1	240	80	140	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bent 2	285	N/A	145	425	195	0	0	N/A	60	0	0
Bent 3	285	N/A	145	425	195	0	0	N/A	60	0	0
Abut 4	200	70	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

9.2 Foundation Recommendations And Pile Data Table

BCI used the above foundation design data and loading conditions to evaluate bent foundations using AASHTO LRFD Bridge Design Specifications-4th Edition with current Caltrans Amendments. We evaluated abutment foundations using Caltrans November 2003 Bridge Design Specifications for foundations using Working Stress Design methods. We present our foundation recommendations in Tables 6, 7 and 8 on the following pages.

Table 6: Foundation Recommendations for Abutments

Abutment Foundation Design Recommendations										
Support	Pile Type	Cut-off Elev. (ft.)	LRFD Service-I Limit State Load – Compression (kips)			Required Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
			Per Support		Per Pile	Comp.	Tens.			
			Total	Permanent						
Abut 1	Class 90 (Alt. X)	24.30	240	140	80	160	0	-10.0(a)	-10.0	160
Abut 4	Class 90 (Alt. X)	27.50	200	100	70	140	0	-7.0(a)	-7.0	140

Notes: 1) Design tip elevations for **Abutments** are controlled by (a) Compression.

Table 7: Foundation Recommendations for Bents

Bent Foundation Design Recommendations											
Support	Pile Type	Cut-off Elev. (ft.)	LRFD Service-I Limit State Load Per Support – Compression (kips)	Total Permissible Support Settlement (in.)	Required Factored Nominal Resistance (kips) Per Pile				Design Tip Elevations (ft.)	Specified Tip Elevations (ft.)	Nominal Driving Resistance Required (kips)
					Strength Limit		Extreme Event				
					Comp $\varphi = 0.7$	Tens. $\varphi = 0.7$	Comp $\varphi = 1.0$	Tens $\varphi = 1.0$			
Bent 2	15" PC/PS Pile Extensions	31.50	285	1	195	0	60	0	-23.0(a) -23.0(b)	-23.0	290
Bent 3	15" PC/PS Pile Extensions	31.50	285	1	195	0	60	0	-23.0(a) -23.0(b)	-23.0	290

Notes:
1) Design tip elevations for **Bents** are controlled by (a) Compression (Strength Limit), (b) Scour, respectively.
2) The nominal driving resistance (290 kips) required for Bent piles is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

Based on our analysis presented in the following sections, BCI presents our recommended Pile Data Table as Table 8:

Table 8: Pile Data Table

Pile Data Table						
Support	Pile Type	Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut 1	Class 90 (Alt. X)	160	0	-10.0(a)	-10.0	160
Bent 2	15" PC/PS Pile Extensions	280	0	-23.0(a),(b)	-23.0	290
Bent 3	15" PC/PS Pile Extensions	280	0	-23.0(a),(b)	-23.0	290
Abut 4	Class 90 (Alt. X)	140	0	-7.0(a)	-7.0	140

Notes:
1) Design tip elevations for **Abutments** are controlled by (a) Compression.
2) Design tip elevations for **Bents** are controlled by (a) Compression (Strength Limit), (b) Scour, respectively.
3) The nominal driving resistance (290 kips) required for Bent piles is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

9.3 ENGNEERING PARAMETERS

The following engineering parameters are generalized and based on:

- Unit weights represent average values based on our laboratory tests, local experience and published typical values.
- Cohesion was conservatively assumed based on average values from unconfined compressive strength testing, triaxial testing (unconsolidated, undrained), field pocket penetrometer testing, and published blow count correlations.
- Friction angles were based on published blow count correlations.
- Modulus and E_{50} strain values for lateral pile analysis were obtained from the July 2004 LPILE Plus 5.0 Technical Manual for appropriate soil type and consistency.
- Engineering experience and judgment.
- BCI used a ground water elevation of 0 ft. (NGVD29) for design.

9.3.1 Compressive Resistance

We used the generalized soil parameters in Table 9 in our bearing capacity analysis.

Table 9: Generalized Soil Parameters

Elevation (NVGD29)	Soil Type	Unit Weight (lb/ft^3)	Friction Angle (degrees)	Cohesion (psf)
28.0 to 15.0	Clay / Sandy Clay	130	---	2,200
15.0 to 4.0	Clayey Sand / Sand	121	30 (end bearing) / 33 (skin friction)	---
4.0 to 0.0	Clayey Sand	120	28 (end bearing and skin friction)	---
0.0 to -2.0	Clayey Sand	*58	28 (end bearing and skin friction)	---
-2.0 to -10.0	Clay	*64	---	2,000
-10.0 to -17.0	Clayey Sand	*79	36 (end bearing and skin friction)	---
-17.0 to -30.0	Clay	*65	---	3,000

*Buoyant Unit Weight.

9.3.2 LPILE Parameters

HDR requested that BCI provide LPILE parameters for use in their equivalent column length and lateral pile analysis. Table 10 provides our recommended LPILE parameters for the abutment and bent piles.

Table 10: LPILE Parameters

Elevation (NGVD29)	L-Pile Soil Type (p-y curve model)	Unit Weight (lb/ft^3)	Friction Angle (degrees)	Cohesion (psf)	Modulus, k (lb/in^3)	E_{50}
28.0 to 15.0	Stiff Clay w/o Free Water	130	---	2,200	**	0.005
15.0 to 4.0	Sand (Reese)	121	30	---	70	---
4.0 to 0.0	Stiff Clay with Free Water	120	---	500	**	0.010
0.0 to -2.0	Stiff Clay with Free Water	*58	---	500	300	0.010
-2.0 to -10.0	Stiff Clay with Free Water	*64	---	1,200	500	0.007
-10.0 to -17.0	Sand (Reese)	*79	36	---	100	---
-17.0 to -30.0	Stiff Clay with Free Water	*65	---	2,500	1,000	0.005

*Buoyant Unit Weight.
**LPILE 5.0 does not report the k value for the Stiff Clay Without Free Water soil type. The k value is internally computed using the cohesion and E_{50} input parameters.

Neglect lateral resistance at the bents above the total scour elevation.

9.4 Abut 1 and Abut 4 Piles (Class 90)

In accordance with current Caltrans specifications, we used the Working Stress Design (WSD) for the abutment piles. BCI evaluated Alternative "X" Class 90 piles with a T dimension of 12 inches for the abutments. BCI presents the results of our compressive resistance and settlement analysis below. No tension demand is indicated for abutment piles.

9.4.1 Compressive Resistance

The tips of the Class 90 precast, prestressed concrete (PPC) piles will bear in medium dense to dense silty sand about 29 to 32 ft. below the existing channel bottom elevation.

Our calculations indicate that the nominal compressive resistance of the PPC piles can be obtained through about 10% end bearing and 90% skin friction. Actual contributions to end bearing and skin friction could vary depending on how the load is transferred to the piles. We neglected the approach fill in our skin friction and end bearing analysis. We modeled the top of abutment piles at elev. 24.3 ft. and elev. 27.5 ft. for Abutment 1 and Abutment 4 respectively.

We determined the compressive resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc.

Refer to the Driven output files in Appendix C for the analysis results.

9.4.2 Settlement

We calculated immediate settlement of approximately 0.7 inches for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We do not anticipate significant long-term settlement due to the competent soil conditions above and below the pile tips. We include the pile settlement calculations in Appendix C.

Our calculated pile settlement is less than the permissible settlement of 1-inch specified for the structure foundations. We do not anticipate significant long-term settlement due to the competent soil conditions at and below the specified tip elevations.

9.4.3 Lateral Load Analysis

BCI provided LPILE parameters in Section 9.3.2 for HDR to use in lateral pile analysis.

9.4.4 Negative Skin Friction

We do not anticipate negative skin friction at the abutments given the competent soil conditions and nominal new embankment heights.

9.5 Bent Piles

We used AASHTO LRFD Bridge Design Specifications-4th Edition and current Caltrans Amendments for evaluating driven 15" precast, prestressed concrete pile extensions (Caltrans Slab Bridge Details, Sheet xs1-23) at the Bents. BCI presents the results of our compressive resistance and settlement analysis below. No tension demand is indicated for bent piles.

9.5.1 Compressive Resistance

The tips of the 15" precast, prestressed concrete pile extensions will bear in medium dense to dense silty sand and/or very stiff silt with sand about 45 ft. below the existing channel bottom elevation. Our calculations indicate that the nominal compressive resistance of the piles can be obtained through about 10% end bearing and 90% skin friction. Actual contributions to end bearing and skin friction could vary depending on how the load is transferred to the pile.

We determined the required nominal compressive resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc.

The Driven 1.2 computer program calculates compressive resistance for piles with square sides (pile width input, not diameter). For bent piles, we performed separate analyses using an equivalent pile width of 11.8 inches for skin friction contributions, and 13.3 inches for end bearing contributions. We modeled the top of bent piles at elev. 22.0 with estimated total scour at elev. 19.9 ft. (lowest elevation).

BCI determined the required factored nominal resistance by comparing the Factored Strength Limit Load (Geotechnical Resistance Factor = 0.7) with the Extreme Event Load (Resistance Factor = 1.0). We then used the higher value as the required factored nominal resistance. In this case, the Factored Strength Limit Load (195 kips/0.7 = 278 kips per pile) is controlling over the 60 kips per pile for the Extreme Event. We rounded the Factored Strength Limit Load to 280 kips to estimate the design tip elevation using the Driven software.

Refer to the Driven output files in Appendix D for additional information.

9.5.2 Settlement

We calculated immediate settlement of approximately 0.6 inches for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We do not anticipate significant long-term settlement due to the competent soil conditions above and below the pile tips. We include the pile settlement calculations in Appendix D.

Our calculated pile settlement is at the 1-inch permissible settlement level specified for the structure foundations. We do not anticipate significant long-term settlement due to the competent soil conditions at and below the equivalent footing level.

9.5.3 Lateral Load Analysis

BCI provided LPILE parameters in Section 9.3.2 for HDR to use in lateral pile analysis.

9.5.4 Negative Skin Friction

We do not anticipate negative skin friction at the bents.

10 APPROACH FILLS

10.1 Fill Materials

Embankments will be constructed using imported borrow material, supplemented with material excavated from shallow on-site cuts and existing approach embankment fill. The source(s) of borrow material for construction of approach fills has not been identified. Proposed borrow must be tested and approved for use by the project engineer prior to transporting to the site.

Expansive soil (Expansion Index > 50 and Sand Equivalent < 20) should not be used as fill within 5 ft. of the abutment backwall.

10.2 Slope Geometry And Stability

The existing approach fill and underlying native soil are competent for support of the planned embankments.

10.3 Settlement

We estimate minor (< 1-inch) settlement for fill loads up to 5 ft. high. No waiting period is necessary prior to construction of bridge abutment foundations.

10.4 Lateral Earth Pressures

The following equivalent fluid weights (EFWs) may be used to design the abutment walls and wing walls for Abutments 1 and 4 assuming level backfill conditions:

Condition	EFW Static	EFW Seismic
Active	36 lb/ft^3	42 lb/ft^3
At-Rest	56 lb/ft^3	66 lb/ft^3
Passive	220 lb/ft^3	205 lb/ft^3

To limit wall deflection to acceptable levels, BCI applied a factor of safety of 2.0 to the ultimate passive pressure to generate the allowable passive pressures provided above.

As noted in the Caltrans Seismic Design Criteria (SDC), the maximum passive pressure is 5.0 ksf for longitudinal abutment response, which must be used with the proportionality factor presented in Section 7.8.1 of the SDC.

The EFWs shown above assume embankment fill meeting the requirements of Caltrans standard for Structure Backfill, a soil unit weight of approximately 125 pcf, a minimum angle of internal friction equal to 34 degrees, and that drainage is placed behind the walls in accordance with Caltrans Standard Plans and Specifications.

We estimated the EFWs for seismic loading using the Mononobe-Okabe equation for active and passive lateral coefficients K_a and K_p. We estimated the at-rest coefficient, K_o, for the seismic condition using an increase ratio similar to the active condition. In the Mononobe-Okabe equation, BCI used a horizontal seismic acceleration coefficient (k_h) of 0.12 calculated using the equation in Chapter 11, Section 11.6.5 of the AASHTO LRFD Bridge Design Specifications-4th Edition. This k_h value assumes that the walls displace at least 1-inch during the design seismic event. We calculated the above static EFWs using methods presented in the 1982 Naval Facilities (NAVFAC) Design Manual 7.2.

Apply the resultant of the seismic active and at-rest pressures at a depth 0.5H from the base of the wall, where H equals the wall height in feet. The passive pressures are applicable for concrete placed directly against undisturbed soil or compacted fill.

For surcharge loads, apply an additional uniform lateral load behind the wall equivalent to (0.30)x(surcharge pressure).

Use a coefficient of friction of 0.45 to resist sliding for concrete placed on native undisturbed soil or compacted fill.

11 CONSTRUCTION CONSIDERATIONS

Where referenced below, “Standard Specifications” refers to Caltrans Standard Specifications (May 2006).

11.1 Existing Foundations

Remnant foundations associated with the bridge removed during 1955 construction are present in the slough and banks west of the existing left (southbound) structure. There is potential for conflict between the new southbound off ramp bridge foundations and existing pre-1955 bridge substructure. Locate new bridge foundations clear of existing (remnant) foundations.

Consistent with Section 15-4 of the Standard Specifications, the type and general dimensions of the existing foundations should be shown on the plans or described in the special provisions. Remove existing piling, piers, abutments or pedestals to at least one foot below ground line or 3 feet below finished grade, whichever is lower.

11.2 Embankment Waiting Period And Settlement Monitoring

No waiting period is required prior to construction of bridge abutment piling.

11.3 Abutment And Bent Piles

Piles shall conform with Section 49-1 of the Standard Specifications.

Difficult pile installation is anticipated due to the presence of locally dense sand layers above the specified tip elevations. Drilling to assist pile driving may be necessary to achieve the specified tip elevations. Drilling should be performed in accordance with Section 49-1.05 of the Standard Specifications, *except the drill hole should be no greater than 8-inches in diameter and drilling should not extend within 10 ft. of specified tip elevations.*

Jetting or vibratory hammers should not be used to obtain the specified pile penetration.

Verify pile capacity during driving using energy equations in accordance with Caltrans Standard Specification 49-1.08 (Modified Gates Formula). A pile load test is not necessary.

The contractor shall provide a Pile Driving System Submittal in accordance with Caltrans Bridge Reference Specification 49-208 (49HAMR) to verify that the pile driving system is adequate.

Pile driving should not negatively impact the existing bridge structures since they are supported on piles.

11.4 Temporary Shoring

The contractor is responsible for design and construction of excavation sloping and shoring in accordance with CalOSHA Standards.

11.5 Dewatering

Excavations extending below the slough water level will require dewatering and/or diking/diversion methods to construct abutment foundations in the “dry”.

12 RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services. For this project, BCI should be retained to:

1. Review and provide written comments on the (civil, structural) plans and specifications prior to construction.
2. Monitor construction to check and document our report assumptions. At a minimum, we should monitor pile installation.
3. Update this report if:
    - design changes occur
    - 2 years or more lapse between this report and construction
    - site conditions change

If BCI is not retained to perform the above applicable services, we are not responsible for any other parties’ interpretation of our report, and subsequent addenda, letters, and discussions.

13 LIMITATIONS

BCI performed services in accordance with the generally accepted geotechnical standard of practice currently used in this area. Where referenced, we used ASTM and Caltrans Standards as a general (not strict) *guideline* only. We do not warranty our services.

BCI based this report on the current site and project conditions. We assumed the soil/ground water conditions encountered in our exploratory borings are representative of the subsurface conditions across the site. Actual conditions between borings could be different. Ground water may be higher in other locations than measured in the borings.

The interface between soil types on the logs is approximate. The transition between soil types may be abrupt or gradual. We based our recommendations on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geologic conditions.

Our scope did not include evaluation of flooding or hazardous materials on site.

This report should only be used for design and construction of the Lone Tree Slough SB Off Ramp as described herein.

Modern design and construction is complex, with many regulatory sources, restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.

APPENDIX A

Figure 1 – Vicinity Map

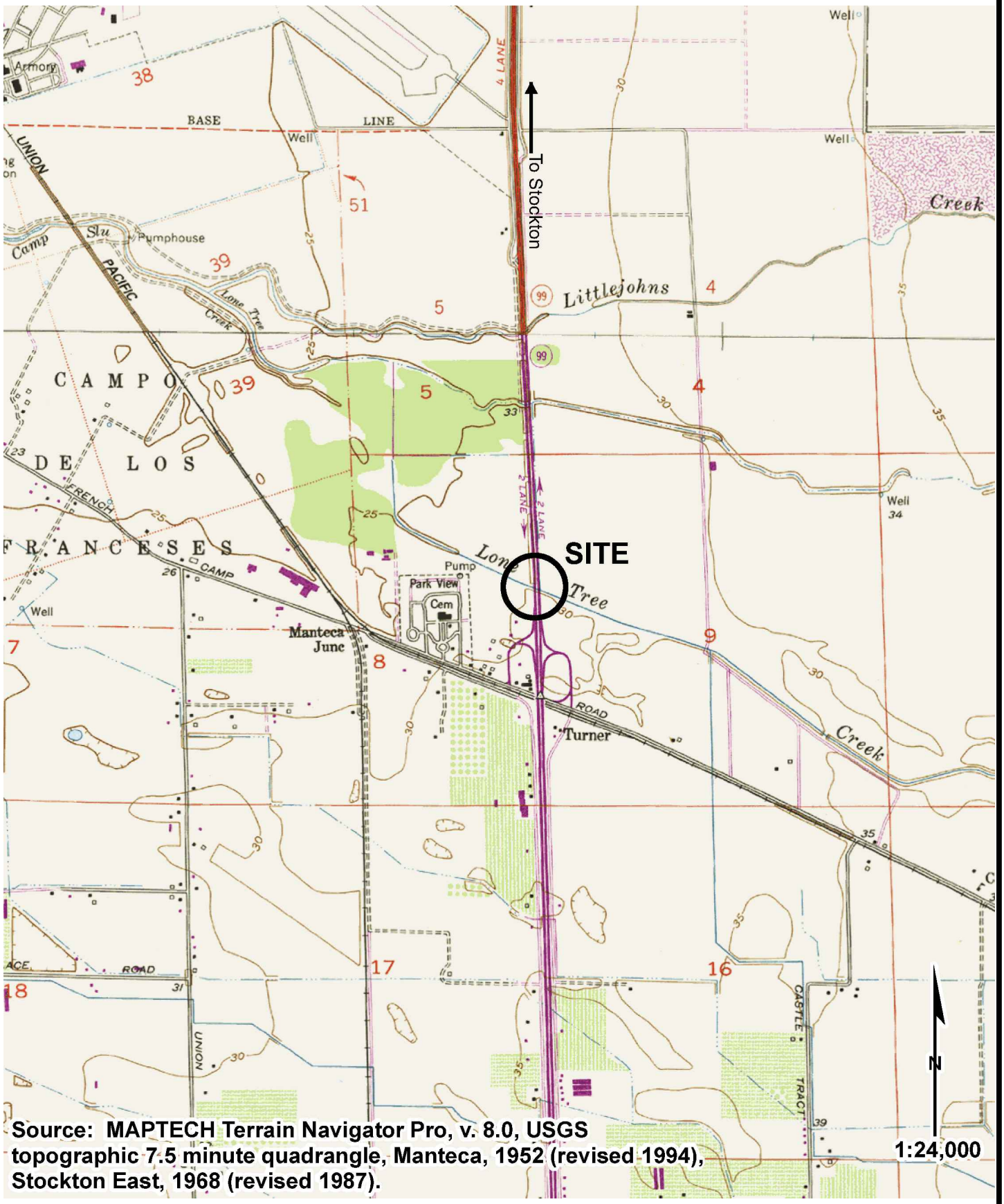
Figure 2 – Geologic Map

Figure 3 – Regional Fault Map

Figure 4 – ARS Curve

Log of Test Borings Sheets 1-6

Log of Test Borings Sheet Checklist



Source: MAPTECH Terrain Navigator Pro, v. 8.0, USGS topographic 7.5 minute quadrangle, Manteca, 1952 (revised 1994), Stockton East, 1968 (revised 1987).

blackburn consulting

11521 Blocker Drive, Ste 110
Auburn, CA 95603
Phone: (530) 887-1494
Fax: (530) 887-1495
www.blackburnconsulting.com

□I□INIT□ MAP

Lone Tree Slough SB Off Ramp
San Joaquin County, California

File No. 1201.7□

January 2011

Figure 1

1/6/2011 1201.7d Lone Tree Slough SB Off Ramp Figure 1.dwg

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GEOLOGI□ MAP

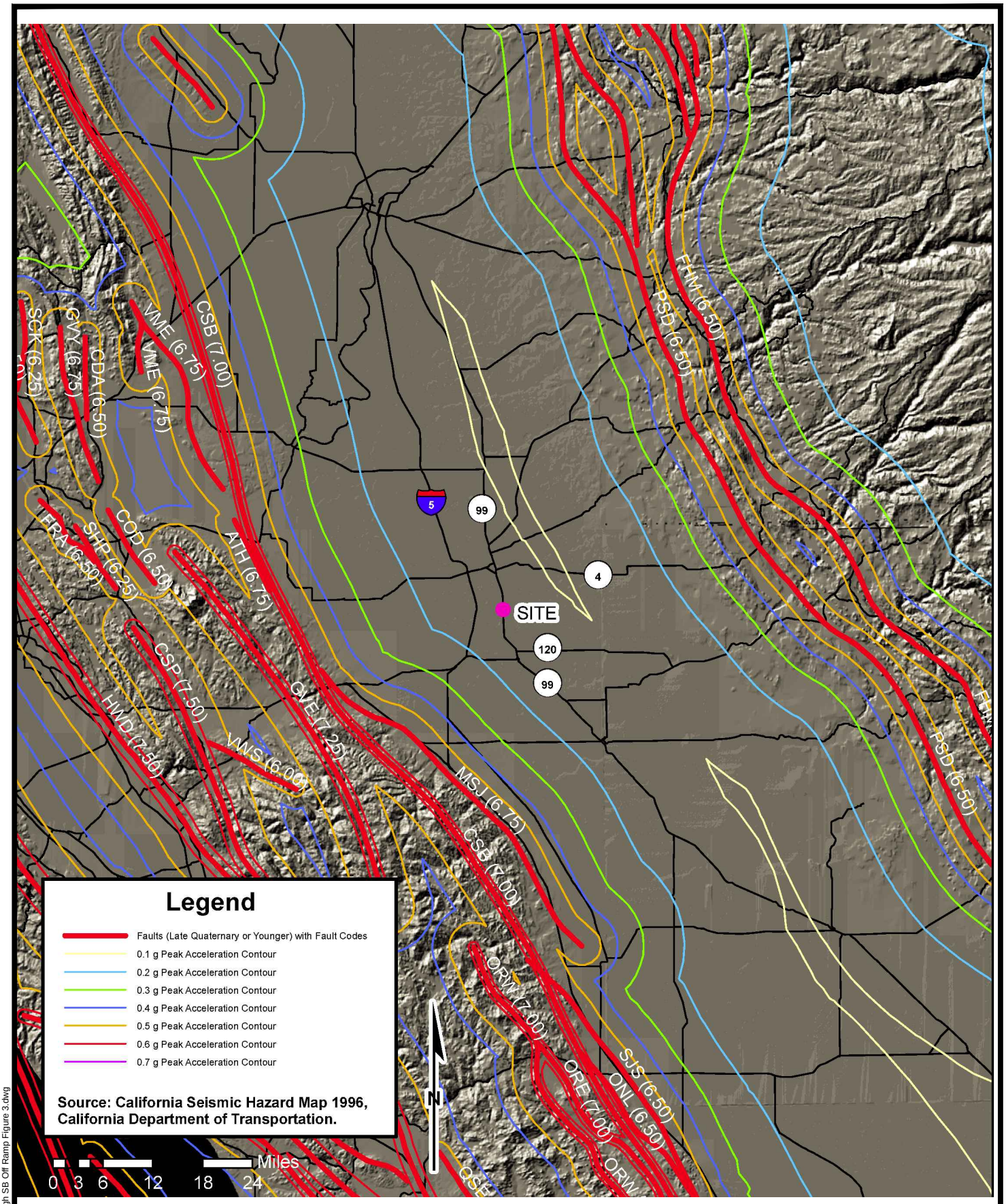
Lone Tree Slough SB Off Ramp
San Joaquin County, California

File No. 1201.7□

January 2011

Figure 2

1/6/2011 1201.7d Lone Tree Slough SB Off Ramp Figure 2.dwg



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REGIONAL FAULT MAP

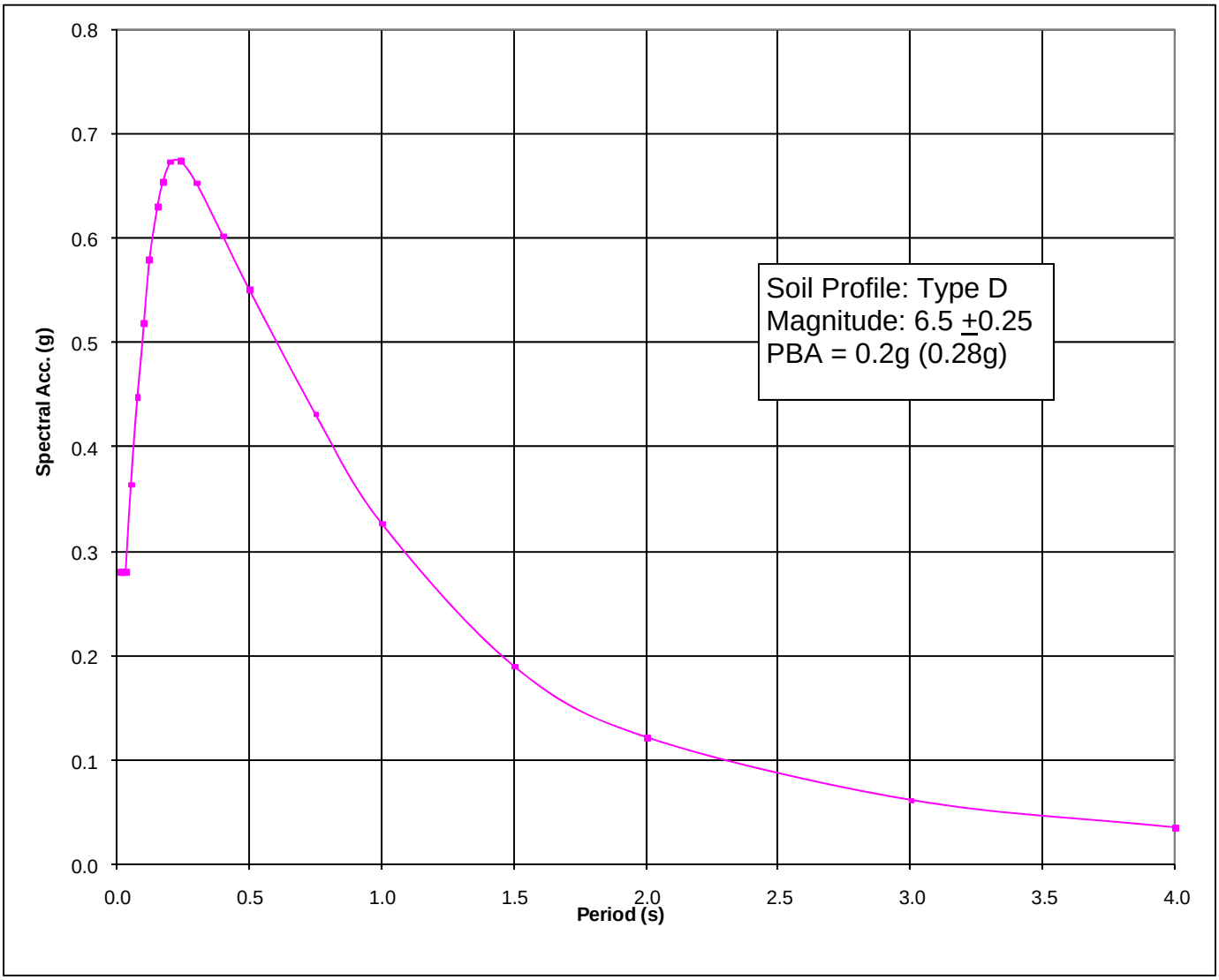
Lone Tree Slough SB Off Ramp
San Joaquin County, California

File No. 1201.7

January 2011

Figure 3

1/6/2011 1201.7d Lone Tree Slough SB Off Ramp Figure 3.dwg



Reference: Figure B.7, Caltrans Seismic Design Criteria, Ver. 1.4, June 2006

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ARS CURVE

Lone Tree Slough SB Off Ramp
San Joaquin County, California

File No. 1201.7d

January 2011

Figure 4

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

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PROFESSIONAL GEOLOGIST William E. Nichols No. 2229 Exp. 1-31-12 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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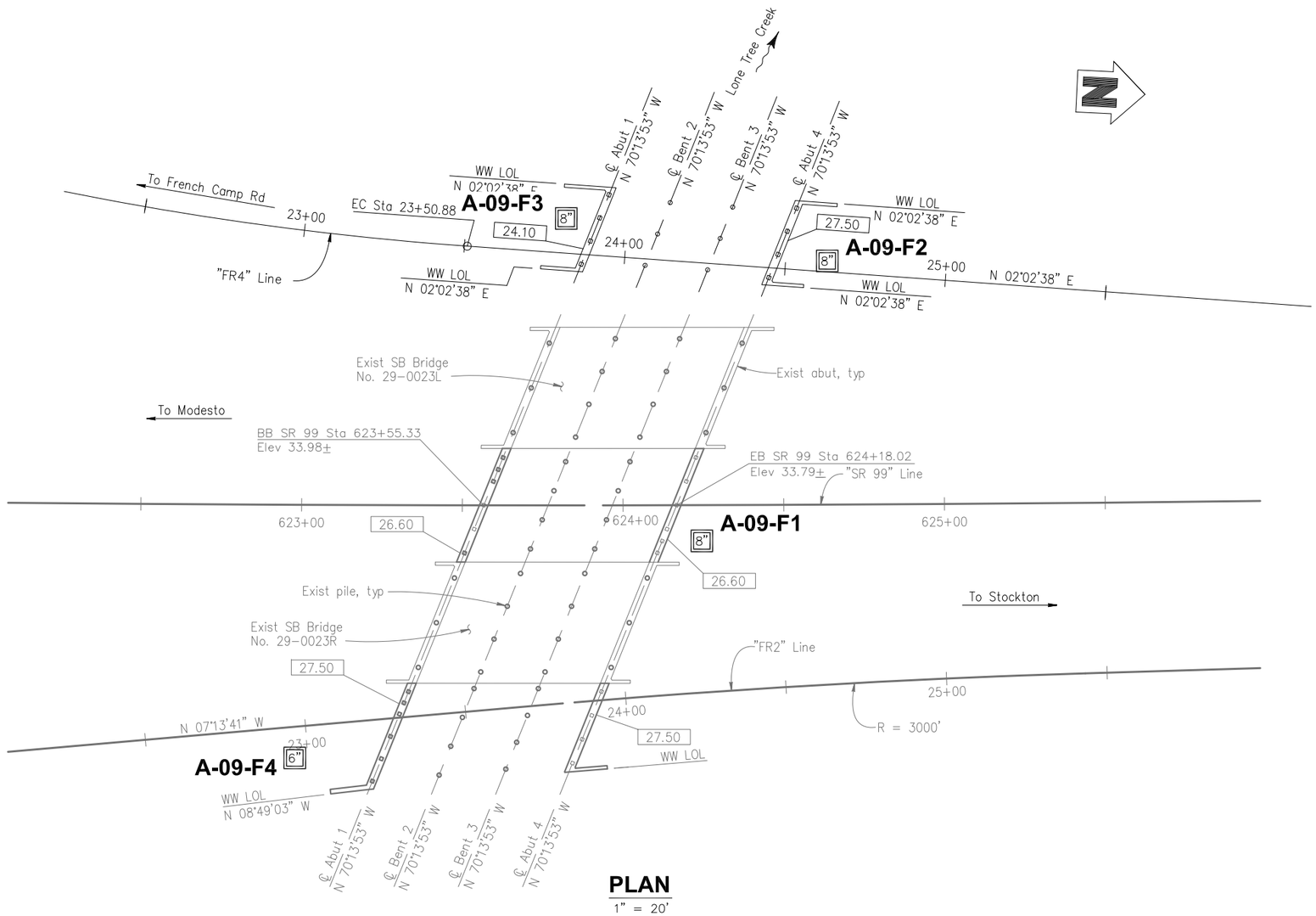

PLAN
1" = 20'

Legend:

- XX.XX — Indicates bottom of footing elevation.
- Indicates existing structure.
- Indicates driven piles at abutments.
- Indicates driven piles at bents.

DRAWN BY	M. ROBERTSON	A. WOOD FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	JOHN A. KLEMUNES, JR. PROJECT ENGINEER	BRIDGE NO. 29-0333
CHECKED BY	A. SHINNEFIELD	DATE: MARCH 2009			POST MILE 11.80

LONE TREE SLOUGH SB OFF RAMP
LOG OF TEST BORINGS 1 OF 6

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271 CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES 03/11/10 04/20/10 11/05/10 SHEET OF

FILE => $REQUEST

1/6/2011 1201.7d Lone Tree Slough SB Off Ramp LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

BENCH MARKS

BENCHMARK# 658 ELEV. 33.00 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED AT APPROXIMATE CENTERLINE STATION 625+67, ON THE NORTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 1' EAST OF THE EDGE OF PAVEMENT, 205' NORTH OF THE END OF THE CENTERLINE OF LONE TREE CREEK.
NGVD 29, N2138213.81, E6354203.76.

BENCHMARK# 699 ELEV. 31.83 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED APPROXIMATE CENTERLINE STATION 625+50, ON THE SOUTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 3' WEST OF THE EDGE OF PAVEMENT, 140' NORTH OF THE CENTERLINE OF LONE TREE CREEK.
NGVD 29, N2138191.62, E6354088.62.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

CERTIFIED ENGINEERING GEOLOGIST — DATE 01/06/11

PROFESSIONAL GEOLOGIST William E. Nichols No. 2229 Exp. 1-31-12 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

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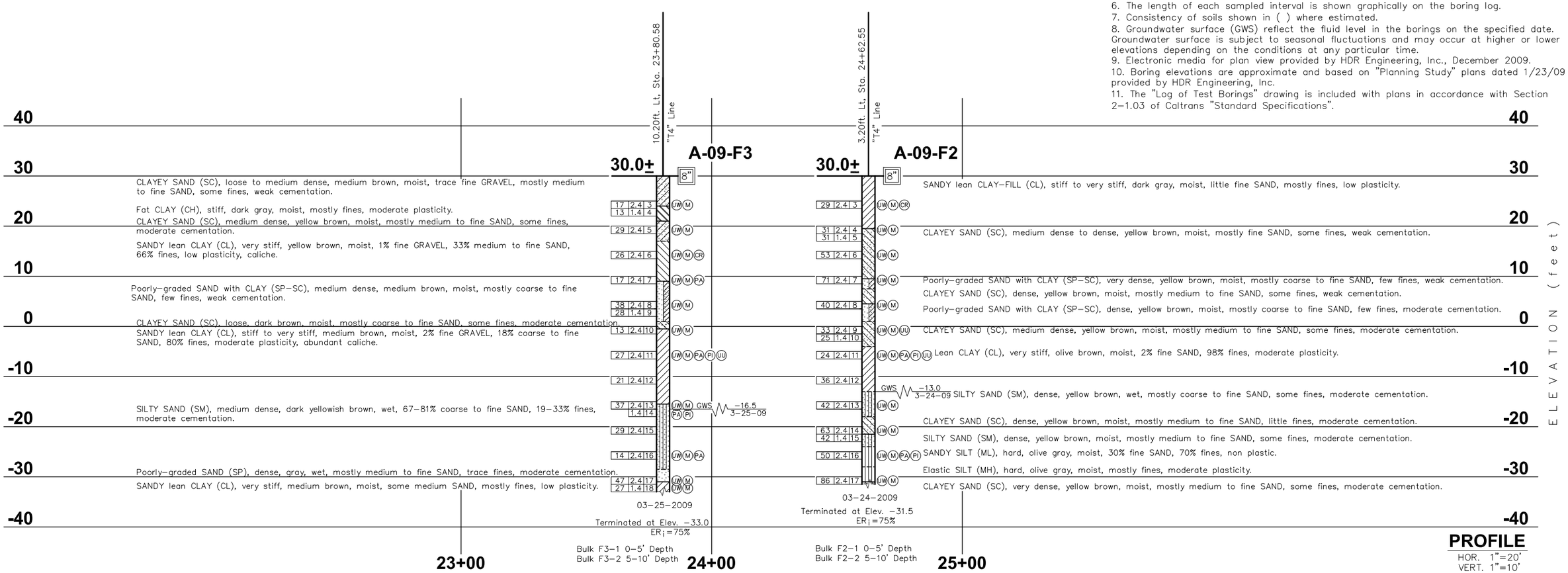
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

FOR PLAN VIEW
SEE LOG OF TEST BORINGS 1 OF 6

NOTES:

1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 4 and 5, "Soil Legend".
2. Standard Penetration tests were performed in accordance with ASTM D 1586-99 using a hammer operated with an automated drop system. Drill rods were 1 5/8-inch diameter "A"-rods; sampler was driven with brass liners.
3. "2.4 inch sampler": ID=2.4 inch, OD=2.9 inch. Driven in same manner as SPT ("1.4 inch") sampler.
4. Where less than the 0.5 inches of penetration is achieved, the blow count shown is for that fraction of the interval actually penetrated.
5. If laboratory tests are not shown as being performed, the soil descriptions presented in the LOTB are based solely on the visual practices described in the before mentioned Manual.
6. The length of each sampled interval is shown graphically on the boring log.
7. Consistency of soils shown in ( ) where estimated.
8. Groundwater surface (GWS) reflect the fluid level in the borings on the specified date. Groundwater surface is subject to seasonal fluctuations and may occur at higher or lower elevations depending on the conditions at any particular time.
9. Electronic media for plan view provided by HDR Engineering, Inc., December 2009.
10. Boring elevations are approximate and based on "Planning Study" plans dated 1/23/09 provided by HDR Engineering, Inc.
11. The "Log of Test Borings" drawing is included with plans in accordance with Section 2-1.03 of Caltrans "Standard Specifications".



PROFILE
HOR. 1"=20'
VERT. 1"=10'

DRAWN BY	M. ROBERTSON	A. WOOD FIELD INVESTIGATION BY:	
CHECKED BY	A. SHINNEFIELD	DATE: MARCH 2009	

PREPARED FOR THE **STATE OF CALIFORNIA** DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR. PROJECT ENGINEER

BRIDGE NO. 29-0333 POST MILE 11.80

LONE TREE SLOUGH SB OFF RAMP
LOG OF TEST BORINGS 2 OF 6

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271 CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES 03/11/10 04/20/10 11/05/10 SHEET OF

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10	SJ	99			

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HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

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NGVD 29, N2138213.81, E6354203.76.

BENCHMARK# 699 ELEV. 31.83 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED APPROXIMATE CENTERLINE STATION 625+50, ON THE SOUTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 3' WEST OF THE EDGE OF PAVEMENT, 140' NORTH OF THE CENTERLINE OF LONE TREE CREEK.
NGVD 29, N2138191.62, E6354088.62.

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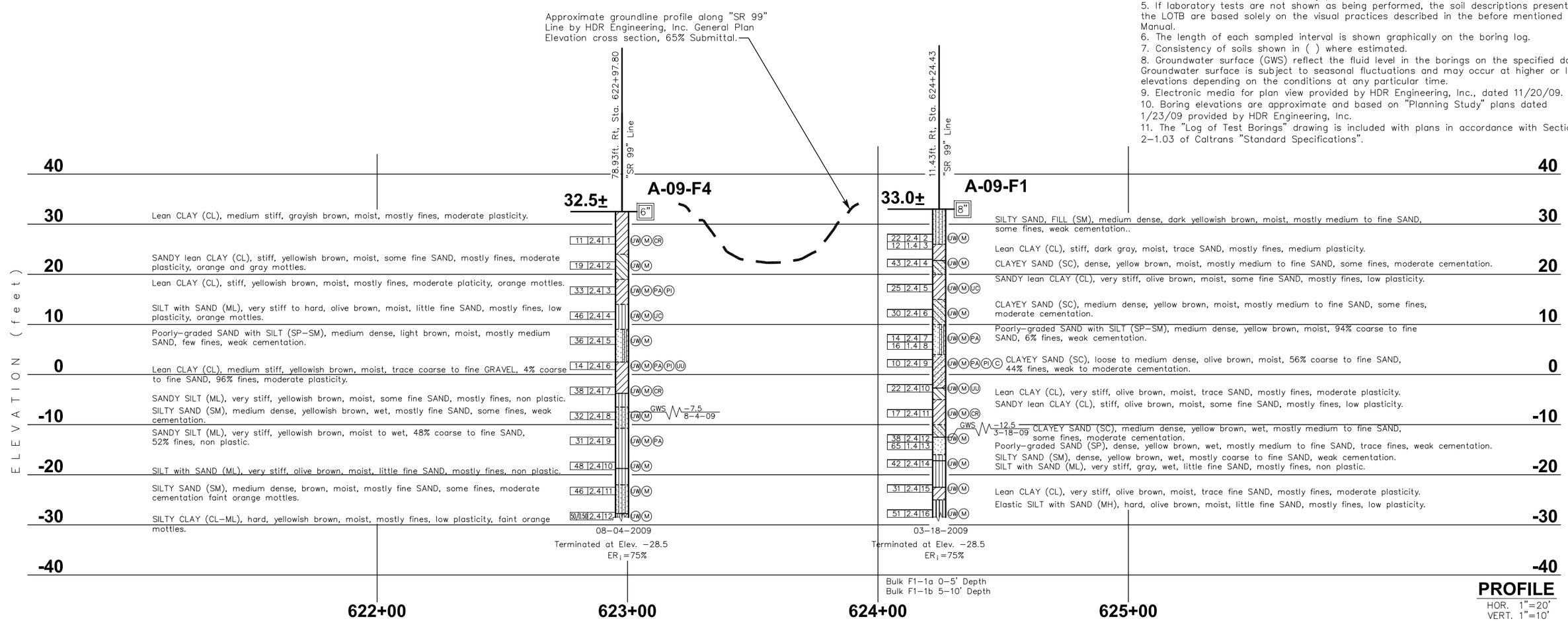
9. Electronic media for plan view provided by HDR Engineering, Inc., dated 11/20/09.
10. Boring elevations are approximate and based on "Planning Study" plans dated 1/23/09 provided by HDR Engineering, Inc.
11. The "Log of Test Borings" drawing is included with plans in accordance with Section 2-1.03 of Caltrans "Standard Specifications".

FOR PLAN VIEW
SEE LOG OF TEST BORINGS 1 OF 6



DRAWN BY	M. ROBERTSON	A. WOOD FIELD INVESTIGATION BY:	
CHECKED BY	A. SHINNEFIELD	DATE: MARCH 2009	

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29-0333
POST MILE 11.80

LONE TREE SLOUGH SB OFF RAMP
LOG OF TEST BORINGS 3 OF 6

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271 CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 03/11/10 04/20/10 11/05/10

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

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HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	<0.25	<0.25	<0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

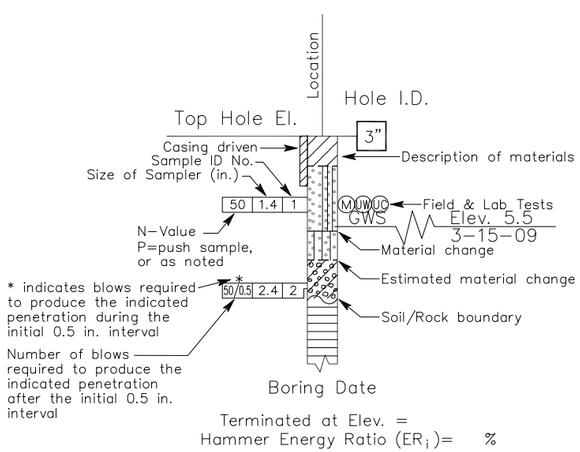
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778)
⬚	O	Other

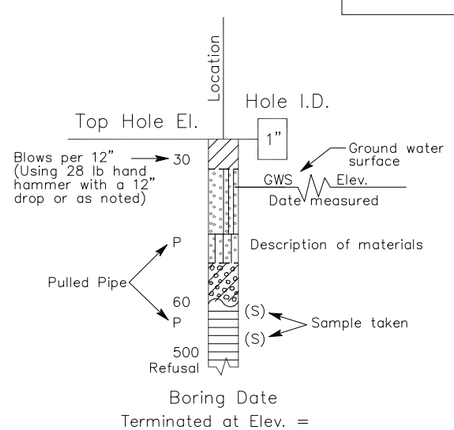
NOTE: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

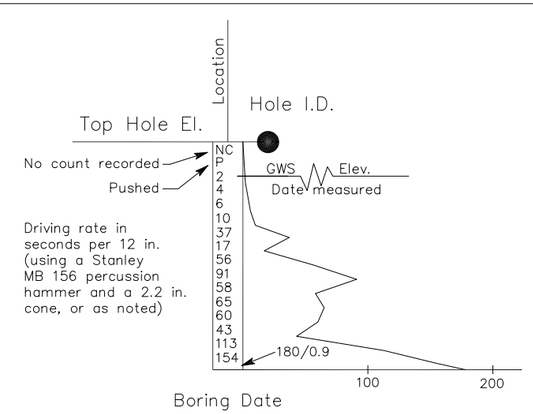
Description	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



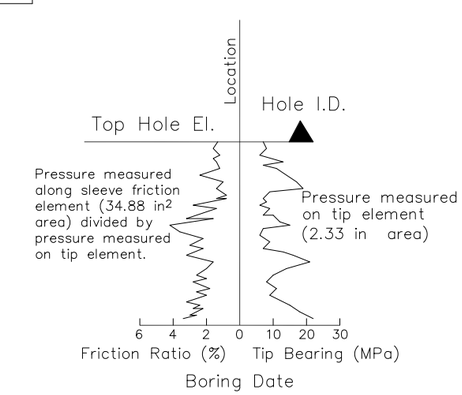
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

LONE TREE SLOUGH SB OFF RAMP

LOG OF TEST BORINGS 4 OF 6

DESIGN OVERSIGHT

SIGN OFF DATE

DRAWN BY M. ROBERTSON

CHECKED BY A. SHINNEFIELD

A. WOOD
FIELD INVESTIGATION BY:
DATE: MARCH 2009

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29-0333
POST MILE 11.80

GS SOIL LEGEND SHEET 1 (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10-0E6101

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REVISION DATES — SHEET — OF

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1/6/2011 1201.7d Lone Tree Slough SB Off Ramp LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

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REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND
GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL
SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean Clay ORGANIC lean Clay with SAND ORGANIC lean Clay with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OH/OL	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 2937)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60}-Value (Blows / 12 inches)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

LONE TREE SLOUGH SB OFF RAMP

LOG OF TEST BORINGS 5 OF 6

DESIGN OVERSIGHT
SIGN OFF DATE

DRAWN BY M. ROBERTSON
CHECKED BY A. SHINNEFIELD

A. WOOD
FIELD INVESTIGATION BY:
DATE: MARCH 2009

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29-0333
POST MILE 11.80

GS SOIL LEGEND SHEET 2 (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES 03/11/10 04/28/10 11/05/10

REVISION DATES SHEET OF

FILE => $REQUEST

1/6/2011 1201.7d Lone Tree Slough SB Off Ramp LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
X	SJ	4	E		

BRIDGE ENGINEER: CIVIL AND STRUCTURAL ENGINEER—LICENSE 5588

DATE APPROVED: _____

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
10	SJ	99			

CERTIFIED ENGINEERING GEOLOGIST — DATE: 01/06/11

PROFESSIONAL GEOLOGIST — William E. Nichols — No. 2229 — Exp. 1-31-12 — CERTIFIED ENGINEERING GEOLOGIST — STATE OF CALIFORNIA

LONE TREE SLOUGH SB OFF RAMP

LOG OF TEST BORINGS 6 of 6

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA.

UNIT: 1455
PROJECT NUMBER & PHASE: 10000D0002 P1

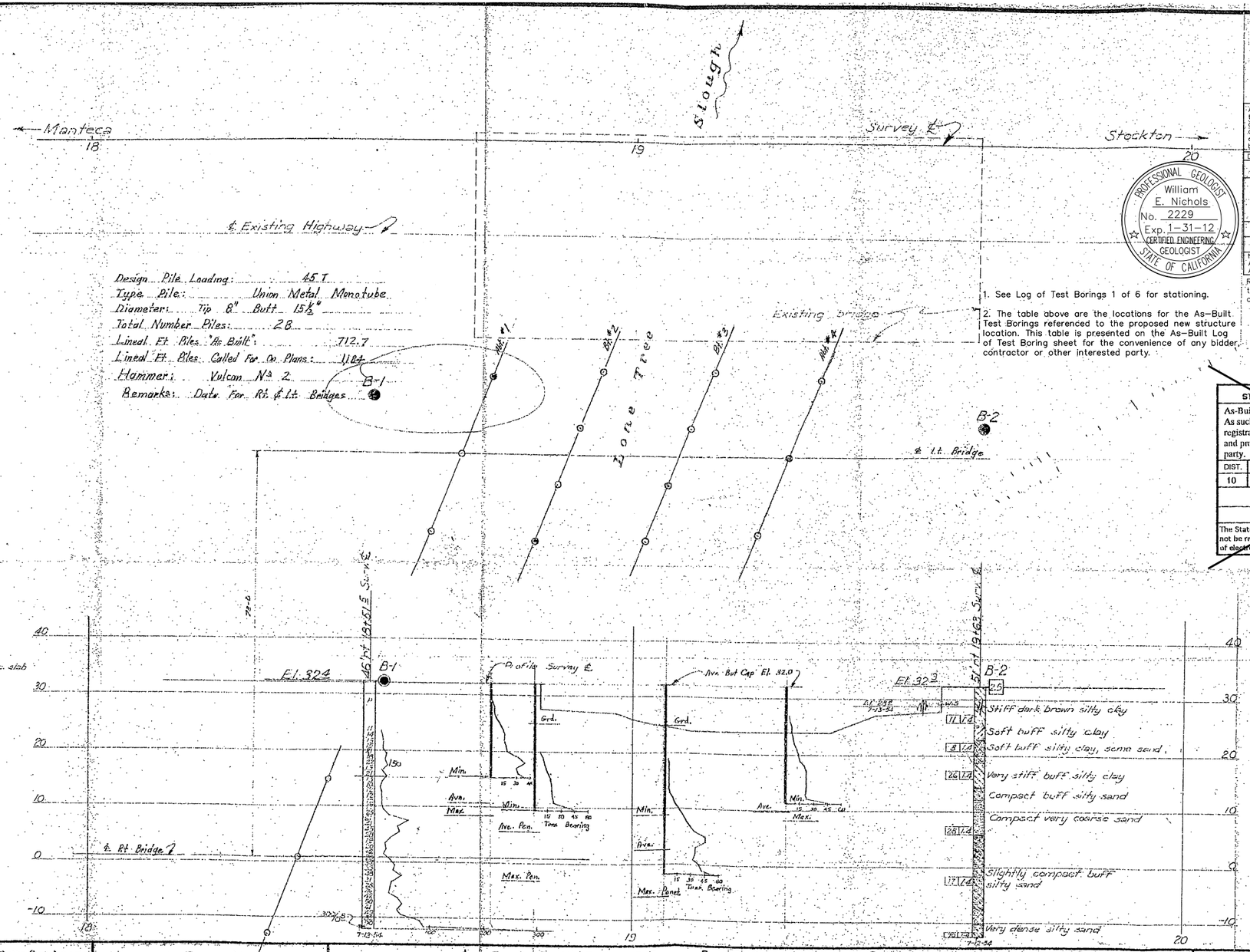
BRIDGE No.	SHEET	OF
29-0333		

Revisions made to this Log of Test Borings from the original Log of Test Borings are the addition of the following table and notes.

Boring	Station	Offset from "SR 99" Line
B-1	623+51.55	45.88 ft Lt
B-2	624+63.22	39.57 ft Lt

1. See Log of Test Borings 1 of 6 for stationing.

2. The table above are the locations for the As-Built Test Borings referenced to the proposed new structure location. This table is presented on the As-Built Log of Test Boring sheet for the convenience of any bidder, contractor or other interested party.



STRUCTURAL FOUNDATIONS BRANCH - ENGINEERING SERVICE CENTER

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date will not be required. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	Sheet No.	Total Sheets
10	SJ	99			

LONE TREE SLOUGH BRIDGE (WIDEN)

LOG OF TEST BORINGS

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

CU: 10
EA: 401311

BRIDGE No. 29-0023 L/R

LONE TREE SLOUGH SB OFF RAMP
"AS-BUILT LOG OF TEST BORINGS"

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

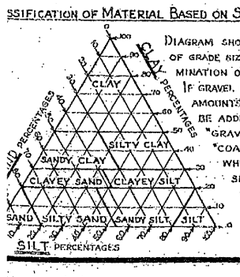


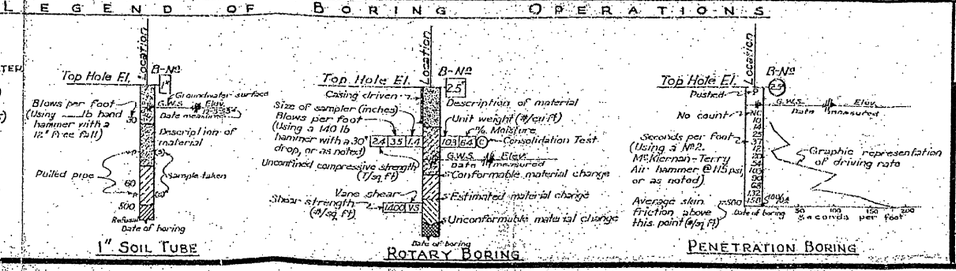
DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES. IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND." THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

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

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- PENETROMETER
- 2¼" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- CORE BORING
- TEST PIT



NOTES

The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provisions accompanying this set of plans.

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

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BRIDGE ACROSS LONE TREE SLOUGH

LOG OF TEST BORINGS

SCALE 1" = 10'	BRIDGE 29-23	FILE	DRAWING PR-4011-3

Log of Test Boring (LOTB) Sheet Checklist

This checklist shall be used by the *checker* in his/her evaluation of a LOTB sheet's conformance with the Caltrans *Soil & Rock Logging, Classification, and Presentation Manual,* and other applicable standards. To facilitate a quality check, the checker shall be provided with the draft final LOTB sheets, pertinent laboratory test results, copies of approved *Request for Exceptions*, and the field logs. This checklist is not comprehensive and does not attempt to account for all logging and presentation standards. As such, the checker must be familiar with the entire manual in order to successfully perform a quality check. **One checklist shall be completed per LOTB plan sheet. One signature sheet may be used for each structure (Bridge No.).**

Project Information

Dist – EA: OE6101 County: SJ Route: 99 PM: 11.80

Bridge No.: 29-0033

Sheet Title: Lone Tree Slough SB Off Ramp Bridge Sheets 1 - 6

Revision Date: N/A

Are there approved exceptions to the manual? ☐ Yes ☒ No (attach, if yes)

General

	Yes	No	N/A	
1.1	☒	☐	☐	Does the Plan View meet the requirements of Sec 5.2.3.3?
1.2	☒	☐	☐	Does the Border meet the requirements of Sec 5.2.3.1 and Sec 5.2.3.2?
1.3	☒	☐	☐	Are the Notes clear and do they meet the requirements of Sec 5.2.2?
1.4	☒	☐	☐	If As-Built LOTB, does it meet the requirements of Sec 5.2.4?
1.5	☒	☐	☐	Is the soil legend sheet attached and properly labeled?
1.6	☐	☐	☒	If rock is presented, is the rock legend attached and properly labeled?
1.7	☐	☐	☒	If approved "Exception to Policy" form is attached, does the LOTB meet the requirements of the approved exceptions?

Elevation View

2.1	☒	☐	☐	Are the Hole Identifications correct? (Sec 2.3) (Sec. 5.2.3.4)
2.2	☒	☐	☐	Are the location descriptions correct?
2.3	☒	☐	☐	Are the holes located properly on the profile?
2.4	☒	☐	☐	Is the elevation scale correct? (Sec 5.2.3.4)
2.5	☒	☐	☐	Is the top of hole elevation presented and correct? (Sec 5.2.3.4)

Log of Test Boring (LOTB) Sheet Checklist

Bridge No.: 29-0033 Sheet Title: Lone Tree Slough SB Off Ramp Br

	Yes	No	N/A	
2.6	☒	☐	☐	Is the correct hole diameter presented in the correct Borehole Symbol? (Sec 5.2.5.6)
2.7	☒	☐	☐	Does the stationing match the profile view?
2.8	☒	☐	☐	Are the Boring Date and Termination Elevation presented at the bottom of each boring log? (Sec 5.2.3.4)
2.9	☒	☐	☐	If SPT tests were performed, is the correct hammer efficiency reported at the bottom of each borehole?
2.10	☒	☐	☐	Are lab tests reported at the correct elevations? (Sec 5.2.5.2)
2.11	☒	☐	☐	Are SPT blow counts reported at the correct elevations? (Sec 5.2.5.2)
2.12	☒	☐	☐	Is the groundwater presented at the correct elevation? (Sec 5.2.5.2)
2.13	☒	☐	☐	Are the soil/rock layers and graphics presented correctly? (Sec 4, Sec 5.2.5.7)
2.14	☒	☐	☐	Are the required descriptors presented and in the correct order? (Sec 2.4.1, Sec 2.5.1)
2.15	☒	☐	☐	Are the descriptors presented consistent with those allowed in the manual?
2.16	☒	☐	☐	Are the soil identifications consistent with the field observations? (Sec 2)
2.17	☒	☐	☐	Are the soil classifications consistent with reported lab test results? (Sec 3)
2.18	☒	☐	☐	Are the consistency descriptors consistent with field observations and/or lab test results? (Sec 2.4.3, Sec 3.2.3)
2.19	☒	☐	☐	Are the apparent density descriptors consistent with the SPT results and hammer efficiency? (Sec 2.4.4)
2.20	☐	☐	☒	Are % recovery (REC) and rock quality designation (RQD) presented at the required elevations?
2.21	☐	☐	☒	Is rock strength presented where lab tests are reported? (Sec 3.3.1)
2.22	☒	☐	☐	Considering the field observations, are lab test results properly applied to the descriptors within a layer per Sec 4.3?
2.23	☒	☐	☐	Are the presentations consistent with the rules presented in Sec 4?
2.24	☒	☐	☐	Are the presentations consistent with the rules presented in Sec 5?

List all variances identified during initial review of the LOTB sheet and steps needed to resolve the discrepancy (include item number). Also note any recommendations for revisions to the manual or procedures that might reduce or eliminate similar errors in the future.

N/A

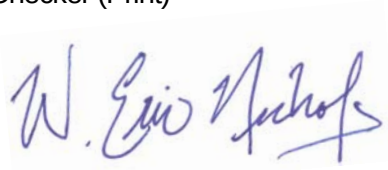
Log of Test Boring QC/QA Signature Sheet

Dist – EA: OE6101 Bridge No.: 29-0033

Sheet Titles:

Lone Tree Slough SB Off Ramp Bridge Sheets 1 - 6

I, the undersigned on the date following my signature, hereby certify that I have performed a quality check of the referenced LOTB sheets and that the referenced LOTB sheets *substantially* comply with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2007) and related policy and standards.

Eric Nichols	Senior Project Manager
Checker (Print)	Title
	1/6/2011
Checker (Signature)	Date

I, the undersigned on the date following my signature, hereby certify that the referenced LOTB sheets *substantially* comply with Geotechnical Service's Quality Control/Quality Assurance procedures, as described in the memorandum, "Quality Control/Quality Assurance Documentation on LOTB Sheets", dated July 1, 2007.

Dave Morrell	Senior Project Manager
Functional Supervisor (Print)	Title
	1/6/2011
Functional Supervisor (Signature)	Date

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

APPENDIX B

Laboratory Test Results Summary

Laboratory Results

Laboratory Test Summary
Samples from Exploratory Borings
Lone Tree Slough Widen and SB Off Ramp

Boring	Sample	Depth (feet)	Unified Soil Classification	Dry Density (pcf)	Natural Moisture (%)	Plastic Limit	Liquid Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Consolidation Test	Pocket Pen (tsf)	Unconfined Compressive Strength (tsf)	Triaxial Test Results				Corrosivity Test
															Total		Effective		
															Phi (degrees)	Cohesion (psf)	Phi (degrees)	Cohesion (psf)	
A-09-F1	2c	6.0-6.5	SM	114.6	12.3														
A-09-F1	4c	11.0-11.5	SC	115.8	16.0								4.5+						
A-09-F1	5c	16.0-16.5	CL	102.2	23.2									3.2					
A-09-F1	6c	21.0-21.5	SC	116.5	15.2								4.5+						
A-09-F1	7c	26.0-26.5	SP-SM	101.6	6.7				0	94	6								
A-09-F1	9b	30.5-31.0	SC			13	21	8	0	56	44								
A-09-F1	9c	31.0-31.5	SC	95.4	25.3							Consolidation							
A-09-F1	10b	35.5-36.0	CL	105.0	19.4										0	3292			
A-09-F1	11b	40.5-41.0	CL																Test
A-09-F1	11c	41.0-41.5	CL	103.8	21.3								4.5+						
A-09-F1	12c	46.0-46.5	SC	123.0	14.8								3.5						
A-09-F1	14c	51.0-51.5	ML	101.6	24.1								4.5+						
A-09-F1	15c	56.0-56.5	CL	99.0	26.6								3.5						
A-09-F1	16b	60.5-61.0	ML	105.4	22.5								2.5						
A-09-F2	3b	5.5-6.0	CL	102.7	12.5								4.5+						
A-09-F2	3c	6.0-6.5	CL										4.5+						Test
A-09-F2	4c	11.0-11.5	SC	99.6	13.5								4.5+						
A-09-F2	5	11.5-13.0	CL						0	11	89								
A-09-F2	6c	16.0-16.5	SC	114.7	9.0								4.0						
A-09-F2	7c	21.0-21.5	SC	106.0	11.1								2.8						
A-09-F2	8b	25.5-26.0	SC	102.5	11.8														
A-09-F2	9c	31.0-31.5	SC	105.6	21.3										0	5216			
A-09-F2	11b	35.5-36.0	CL	98.2	24.4										0	2980			
A-09-F2	11c	36.0-36.5	CL			17	41	24	0	2	98								
A-09-F2	13c	46.0-46.5	SM	117.5	15.7								4.5						
A-09-F2	14c	51.0-51.5	SC	117.1	16.0								4.5						
A-09-F2	16c	56.0-56.5	ML	101.7	25.1	Non Plastic			0	30	70		4.5+						
A-09-F2	17b	60.5-61.0	ML	107.1	20.9								4.3						
A-09-F3	3c	6.0-6.5	SC	108.9	15.7								4.3						
A-09-F3	4	6.5-8.0	CH						0	9	91								
A-09-F3	5c	11.0-11.5	SC	105.4	13.7								4.5						
A-09-F3	6c	16.0-16.5	CL																Test
A-09-F3	7b	20.5-21.0	CL						1	33	66								
A-09-F3	7c	21.0-21.5	SC	106.2	7.2														
A-09-F3	8c	26.0-26.5	SP-SC	122.3	11.5								2.0						
A-09-F3	10c	31.0-31.5	CL	93.8	29.5								4.0						
A-09-F3	11b	35.5-36.0	CL			21	43	22	2	18	80								
A-09-F3	11c	36.0-36.5	CL	102.5	21.5										0	3757			
A-09-F3	13c	46.0-46.5	SM	107.3	20.7								4.5						
A-09-F3	14	46.5-48.0	SM			Non Plastic			0	67	33								
A-09-F3	16b	55.5-56.0	SM	104.9	23.9				0	81	19								
A-09-F3	17c	61.0-61.5	CL	111.9	18.6								4.5+						
A-09-F3	18	61.5-63.0	CL	98.3	22.5								3.5						

Laboratory Test Summary
Samples from Exploratory Borings
Lone Tree Slough Widen and SB Off Ramp

Boring	Sample	Depth (feet)	Unified Soil Classification	Dry Density (pcf)	Natural Moisture (%)	Plastic Limit	Liquid Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Consolidation Test	Pocket Pen (tsf)	Unconfined Compressive Strength (tsf)	Triaxial Test Results				Corrosivity Test
															Total		Effective		
															Phi (degrees)	Cohesion (psf)	Phi (degrees)	Cohesion (psf)	
A-09-F4	1b	5.5-6.0																	Test
A-09-F4	1c	6.0-6.5		101.0	24.1								2.5						
A-09-F4	2c	11.0-11.5		100.5	23.0								4.3						
A-09-F4	3b	15.5-16.0	CL			17	38	21	0	14	86								
A-09-F4	3c	16.0-16.5	ML	98.9	25.0				0	9	91		3.9						
A-09-F4	4c	21.0-21.5		94.0	28.8								4.5	1.09					
A-09-F4	5c	26.0-26.5		107.0	13.5								2.0						
A-09-F4	6b	30.5-31.0	CL			22	39	17	0	4	96		2.0						
A-09-F4	6c	31.0-31.5		84.9	35.1										0	1196			
A-09-F4	7b	35.5-36.0																	
A-09-F4	7c	36.0-36.5		92.8	27.8								4.5						
A-09-F4	8c	41.0-41.5		106.1	17.1								4.0						
A-09-F4	9c	46.0-46.5	ML	98.6	27.0				0	48	52		2.5						
A-09-F4	10c	51.0-51.5		101.5	23.3								3.5						
A-09-F4	11c	56.0-56.5		116.2	17.2								3.5						
A-09-F4	12c	60.5-61.0		108.4	21.1								4.5+						

Project Name: SR99 Median Widening - Lone Tree Slough
BCI File No: 1201.7d
Date: 4/6/2009
Technician: ECH/KLC

blackburn consulting

MOISTURE-DENSITY TESTS

Sample No.	F1-2C	F1-4C	F1-6C	F1-7C	F1-11C	F1-12C	F1-14C
Depth (ft.)	5-6.5	10-11.5	20-21.5	25-26.5	40-41.5	45-46.5	50-51.5
Sample Length (in.)	5.66	6.00	5.92	5.74	5.96	5.79	5.80
Diameter (in.)	2.390	2.410	2.380	2.390	2.400	2.400	2.400
Sample + Tube (g)	1126.8	965.0	928.2	1014.7	891.2	970.9	868.5
Tube (g)	269.4	0.0	0.0	281.5	0.0	0.0	0.0
Wet Weight (g)	857.4	965.0	928.2	733.2	891.2	970.9	868.5
Sample Volume (ft^3)	0.01469	0.01584	0.01524	0.01490	0.01560	0.01516	0.01518
Tare No.	T4	D2	A2	F4	T10	T12	F3
Tare (g)	254.2	154.3	157.3	156.5	253.3	259.1	153.8
Wet Soil + Tare (g)	663.9	748.7	626.5	811.0	848.3	823.8	715.2
Dry Soil + Tare (g)	619.1	666.6	564.5	769.7	743.9	751.0	606.3
Dry Soil Weight (g)	364.9	512.3	407.2	613.2	490.6	491.9	452.5
Water (g)	44.8	82.1	62.0	41.3	104.4	72.8	108.9
Moisture (%)	**12.3**	**16.0**	**15.2**	**6.7**	**21.3**	**14.8**	**24.1**
Wet Density (pcf)	**128.6**	**134.3**	**134.3**	**108.5**	**125.9**	**141.2**	**126.1**
Dry Density (pcf)	**114.6**	**115.8**	**116.5**	**101.6**	**103.8**	**123.0**	**101.6**
Pocket Pen (tsf)	**SAND**	**4.5+**	**4.5+**	**SAND**	**4.5+**	**3.5**	**4.5+**

Sample No.	F1-15C	F1-16B	F2-3B	F2-4C	F2-6C	F2-7C	F2-8B
Depth (ft.)	55-56.5	60-61.5	5-6.5	10-11.5	15-16.5	20-21.5	25-26.5
Sample Length (in.)	5.74	5.83	5.65	5.97	6.00	5.71	5.50
Diameter (in.)	2.390	2.390	2.390	2.360	2.380	2.390	2.390
Sample + Tube (g)	847.0	887.0	769.2	774.7	876.5	792.4	1028.9
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	286.2
Wet Weight (g)	847.0	887.0	769.2	774.7	876.5	792.4	742.7
Sample Volume (ft^3)	0.01490	0.01514	0.01467	0.01511	0.01545	0.01482	0.01428
Tare No.	T3	F	G	N	F5	L	F7
Tare (g)	256.7	153.4	223.6	240.7	195.2	215.2	191.8
Wet Soil + Tare (g)	706.9	748.9	664.2	744.9	642.7	763.8	685.6
Dry Soil + Tare (g)	612.3	639.4	615.2	684.9	605.7	708.9	633.4
Dry Soil Weight (g)	355.6	486.0	391.6	444.2	410.5	493.7	441.6
Water (g)	94.6	109.5	49.0	60.0	37.0	54.9	52.2
Moisture (%)	**26.6**	**22.5**	**12.5**	**13.5**	**9.0**	**11.1**	**11.8**
Wet Density (pcf)	**125.3**	**129.2**	**115.6**	**113.0**	**125.1**	**117.8**	**114.7**
Dry Density (pcf)	**99.0**	**105.4**	**102.7**	**99.6**	**114.7**	**106.0**	**102.5**
Pocket Pen (tsf)	**3.5**	**2.5**	**4.5+**	**4.5+**	**4.5**	**4.0(SAND)**	**2.8**

Diameter = 1.44" for 1.5-inch Tubes
Diameter = 1.938" for 2-inch Tubes
Diameter = 2.438" for 2.5-inch Tubes
Diameter= 2.850" for 3.0-inch Shelby Tubes

Project Name: SR99 Median Widening - Lone Tree Slough

BCI File No: 1201.7d

Date: 4/6/2009

Technician: ECH/KLC

blackburn consulting

MOISTURE-DENSITY TESTS

Sample No.	F2-13C	F2-14C	F2-16	F2-17B	F3-3	F3-5	F3-7
Depth (ft.)	45-46.5	50-51.5	55-56.5	60-61.5	6.0-6.5	11.0-11.5	21.0-21.5
Sample Length (in.)	5.95	5.96	5.99	5.96	5.06	5.99	5.98
Diameter (in.)	2.390	2.400	2.370	2.400	2.370	2.370	2.363
Sample + Tube (g)	952.6	961.5	882.7	916.2	738.4	831.1	784.1
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet Weight (g)	952.6	961.5	882.7	916.2	738.4	831.1	784.1
Sample Volume (ft^3)	0.01545	0.01560	0.01529	0.01560	0.01292	0.01529	0.01518
Tare No.	F6	R	C2	A	J	G-2	B
Tare (g)	192.2	342.7	155.3	162.7	157.7	307.6	225.2
Wet Soil + Tare (g)	768.6	885.9	795.3	716.6	896.1	1138.7	1009.3
Dry Soil + Tare (g)	690.2	810.8	666.9	620.8	795.9	1038.8	956.5
Dry Soil Weight (g)	498.0	468.1	511.6	458.1	638.2	731.2	731.3
Water (g)	78.4	75.1	128.4	95.8	100.2	99.9	52.8
Moisture (%)	**15.7**	**16.0**	**25.1**	**20.9**	**15.7**	**13.7**	**7.2**
Wet Density (pcf)	**135.9**	**135.9**	**127.3**	**129.4**	**126.0**	**119.8**	**113.9**
Dry Density (pcf)	**117.5**	**117.1**	**101.7**	**107.1**	**108.9**	**105.4**	**106.2**
Pocket Pen (tsf)	**4.5(SANDY)**	**4.5**	**4.5+**	**4.3**	**4.3**	**4.5+**	**0 Sand**

Sample No.	F3-8	F3-10	F3-13	F3-16	F3-17	F3-18	
Depth (ft.)	26.0-26.5	31.0-31.5	46.0-46.5	55.5-56.0	61.0-61.5	61.5-63.0	
Sample Length (in.)	6.00	5.97	5.97	4.62	6.00	3.87	
Diameter (in.)	2.362	2.366	2.387	2.344	2.390	1.521	
Sample + Tube (g)	941.5	837.1	908.5	680.0	937.7	222.2	
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	
Wet Weight (g)	941.5	837.1	908.5	680.0	937.7	222.2	
Sample Volume (ft^3)	0.01521	0.01519	0.01546	0.01154	0.01558	0.00407	
Tare No.	I	H	E	XX9	RR	F4	
Tare (g)	223.5	223.2	224.7	246.7	261.7	156.4	
Wet Soil + Tare (g)	1163.7	1059.6	1133.1	927.4	1199.1	378.6	
Dry Soil + Tare (g)	1066.4	868.9	977.2	796.0	1051.8	337.8	
Dry Soil Weight (g)	842.9	645.7	752.5	549.3	790.1	181.4	
Water (g)	97.3	190.7	155.9	131.4	147.3	40.8	
Moisture (%)	**11.5**	**29.5**	**20.7**	**23.9**	**18.6**	**22.5**	
Wet Density (pcf)	**136.4**	**121.5**	**129.5**	**129.9**	**132.7**	**120.4**	
Dry Density (pcf)	**122.3**	**93.8**	**107.3**	**104.9**	**111.9**	**98.3**	
Pocket Pen (tsf)	**2.0**	**4.0**	**4.5+**	**0 Sand**	**4.5+**	**3.5**	

Diameter = 1.44" for 1.5-inch Tubes

Diameter = 1.938" for 2-inch Tubes

Diameter = 2.438" for 2.5-inch Tubes

Diameter= 2.850" for 3.0-inch Shelby Tubes

Project Name: SR-99 Manteca Lone Tree Slough
BCI File No: 1201.7d
Date: 8/13/2009
Technician: KLC/DKB

blackburn consulting

MOISTURE-DENSITY TESTS

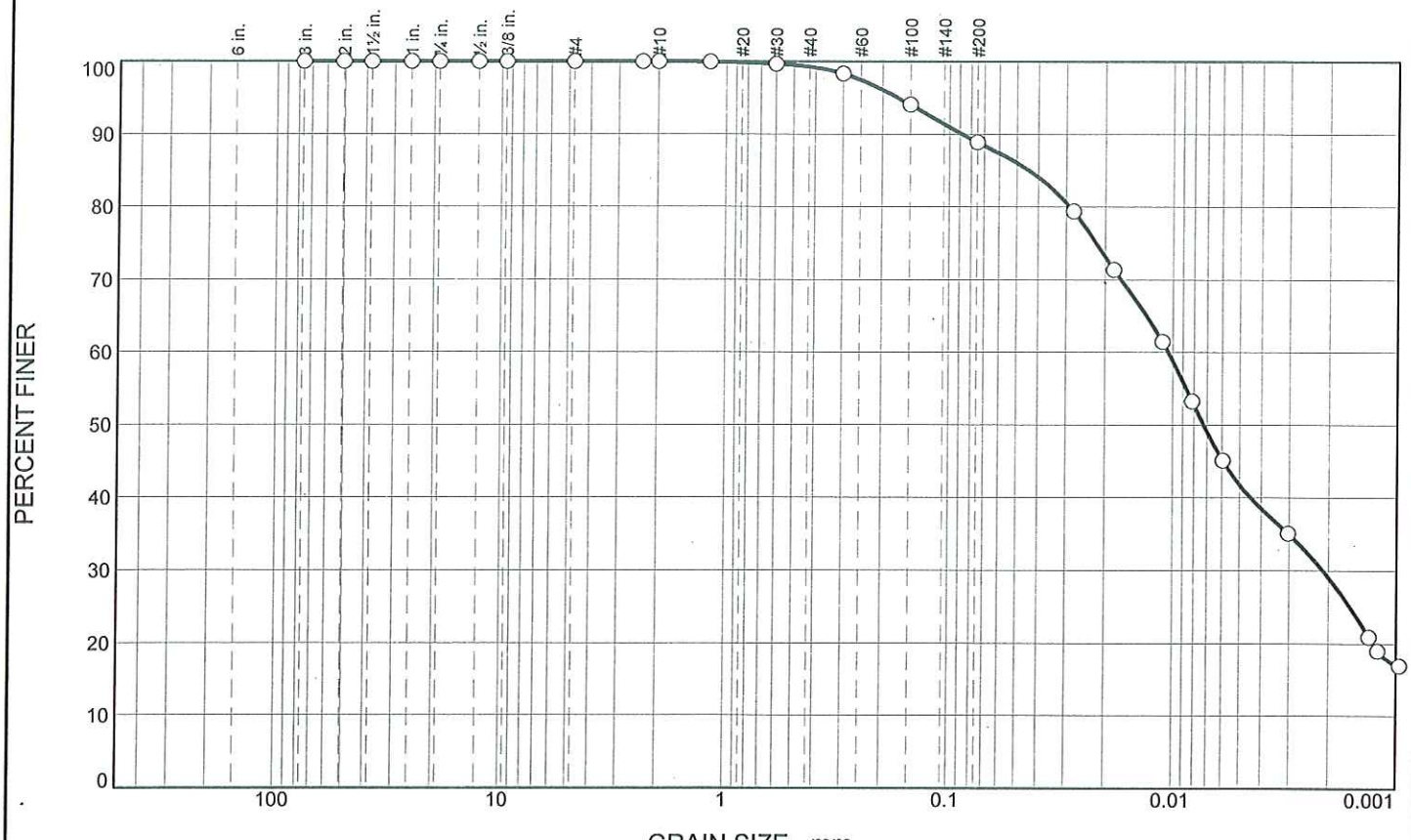
ASTM D 2216 / D 2937

Sample No.	F4-1C	F4-2C	F4-3C	F4-5C	F4-7C	F4-8C	F4-9C
Depth (ft.)	6.0-6.5	11.0-11.5	16.0-16.5	26.0-26.5	36.0-36.5	41.0-41.5	46.0-46.5
Sample Length (in.)	5.85	5.56	5.80	5.80	6.00	6.00	5.60
Diameter (in.)	2.396	2.386	2.396	2.386	2.400	2.418	2.409
Sample + Tube (g)	1140.0	1090.4	1118.1	1113.6	945.8	1099.8	1049.8
Tube (g)	272.5	283.4	269.1	287.0	100.5	201.3	210.7
Wet Weight (g)	867.5	807.0	849.0	826.6	845.3	898.5	839.1
Sample Volume (ft^3)	0.01526	0.01439	0.01513	0.01501	0.01571	0.01594	0.01477
Tare No.	H	F-2.1	RR	F3	T4	F5	T12
Tare (g)	223.4	260.6	261.7	154.0	254.2	195.4	259.9
Wet Soil + Tare (g)	1090.5	1067.1	1109.7	962.9	1098.4	1092.5	1099.0
Dry Soil + Tare (g)	922.2	916.3	940.1	866.7	914.7	961.5	920.7
Dry Soil Weight (g)	698.8	655.7	678.4	712.7	660.5	766.1	660.8
Water (g)	168.3	150.8	169.6	96.2	183.7	131.0	178.3
Moisture (%)	**24.1**	**23.0**	**25.0**	**13.5**	**27.8**	**17.1**	**27.0**
Wet Density (pcf)	**125.3**	**123.7**	**123.7**	**121.4**	**118.6**	**124.2**	**125.2**
Dry Density (pcf)	**101.0**	**100.5**	**98.9**	**107.0**	**92.8**	**106.1**	**98.6**
Pocket Pen (tsf)	**2.5**	**4.3**	**3.9**	**2.0**	**4.5+**	**4.0**	**2.5**

Sample No.	F4-10C	F4-11C	F4-12C				
Depth (ft.)	51.0-51.5	56.0-56.5	60.5-61.0				
Sample Length (in.)	5.85	5.84	6.00				
Diameter (in.)	2.395	2.409	2.400				
Sample + Tube (g)	1151.8	1157.3	1208.6				
Tube (g)	286.0	205.5	273.1				
Wet Weight (g)	865.8	951.8	935.5				
Sample Volume (ft^3)	0.01525	0.01540	0.01571				
Tare No.	XX-9	T5	A2				
Tare (g)	247.3	317.7	157.9				
Wet Soil + Tare (g)	1100.9	1275.3	1092.9				
Dry Soil + Tare (g)	939.8	1134.7	930.1				
Dry Soil Weight (g)	692.5	817.0	772.2				
Water (g)	161.1	140.6	162.8				
Moisture (%)	**23.3**	**17.2**	**21.1**				
Wet Density (pcf)	**125.1**	**136.2**	**131.3**				
Dry Density (pcf)	**101.5**	**116.2**	**108.4**				
Pocket Pen (tsf)	**3.5**	**3.5**	**4.5+**				

Diameter = 1.44" for 1.5-inch Tubes
Diameter = 1.938" for 2-inch Tubes
Diameter = 2.438" for 2.5-inch Tubes
Diameter= 2.850" for 3.0-inch Shelby Tubes

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	10.4	47.1	41.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.50	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	100.0		
#30	99.7		
#50	98.3		
#100	94.1		
#200	88.9		

* (no specification provided)

Material Description

Strong brown Lean CLAY with SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0876 D_{85}= 0.0439 D_{60}= 0.0105
D_{50}= 0.0073 D_{30}= 0.0021 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: F2 **Depth:** 11.5-13.0
Sample Number: 5 **Date:** 1/5/2010

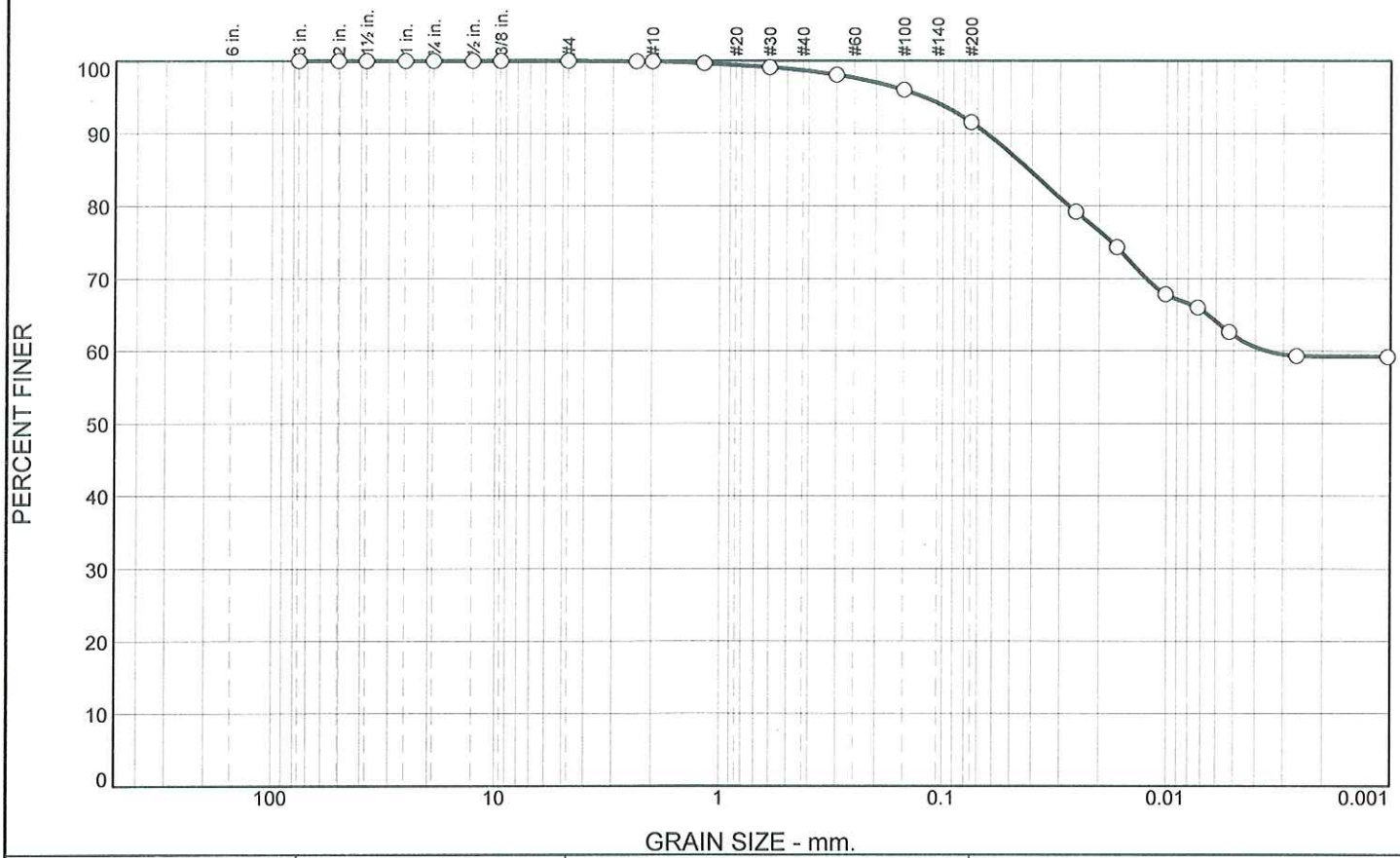
Blackburn Consulting

W. Sacramento, CA

Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough
Project No: 1201.7d **Figure**

Tested By: BWM/MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.2	7.2	29.4	62.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.50	100.0		
.375	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.6		
#30	99.1		
#50	98.1		
#100	96.0		
#200	91.5		

* (no specification provided)

Material Description

Black Fat CLAY with SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0640 D_{85}= 0.0414 D_{60}= 0.0036
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

D50 < 0.001

Source of Sample: F3 **Depth:** 6.5-8.0
Sample Number: 4

Date: 1/4/2010

Blackburn Consulting

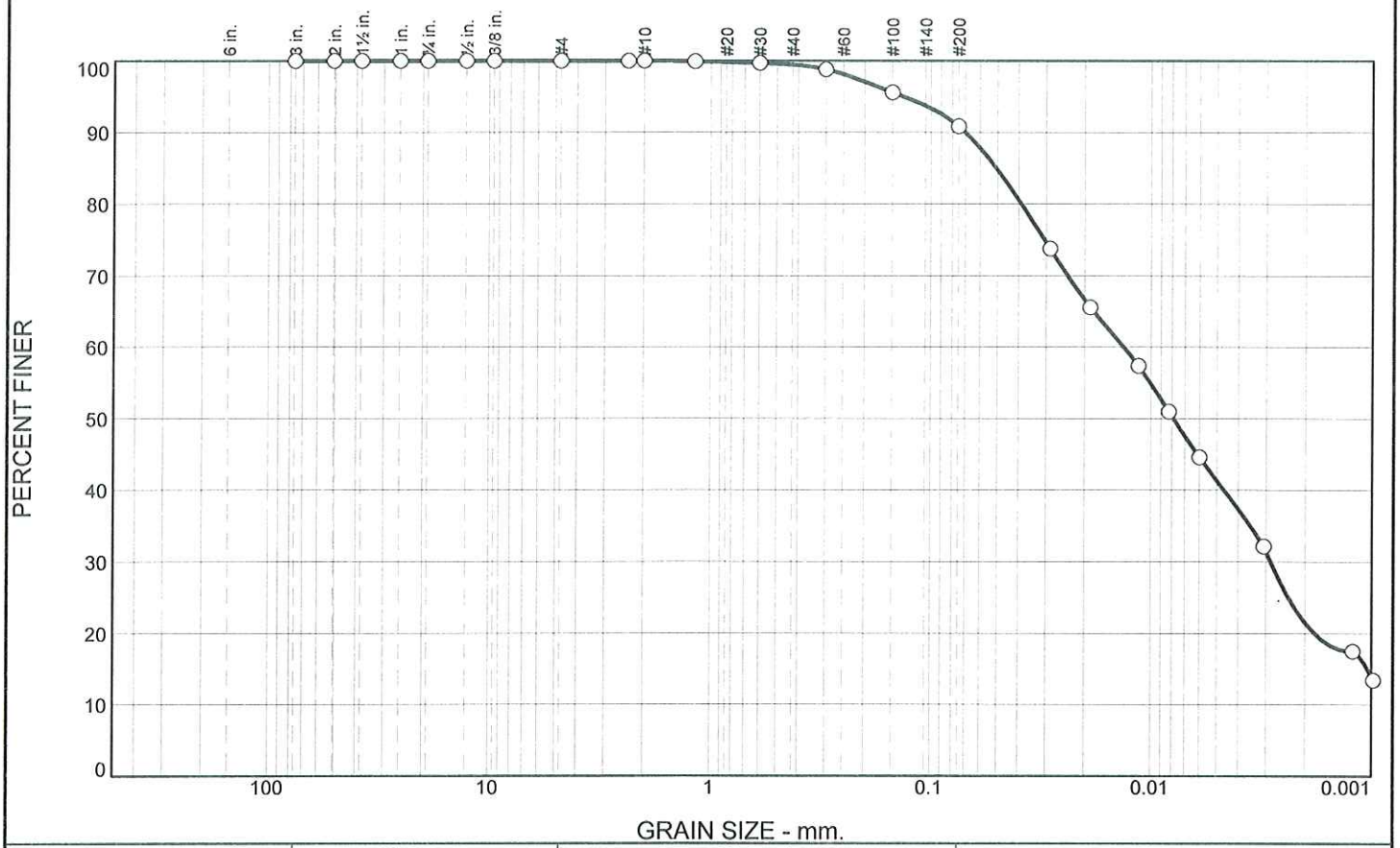
W. Sacramento, CA

Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough

Project No: 1201.7d **Figure**

Tested By: MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.5	8.7	49.5	41.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.50	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.9		
#30	99.7		
#50	98.8		
#100	95.6		
#200	90.8		

* (no specification provided)

Material Description

Yellowish brown SILT with SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0700 D_{85}= 0.0506 D_{60}= 0.0133
D_{50}= 0.0079 D_{30}= 0.0029 D_{15}= 0.0010
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: F4 **Depth:** 16.0-16.5'
Sample Number: 3c

Date: 1/5/2010

Blackburn Consulting

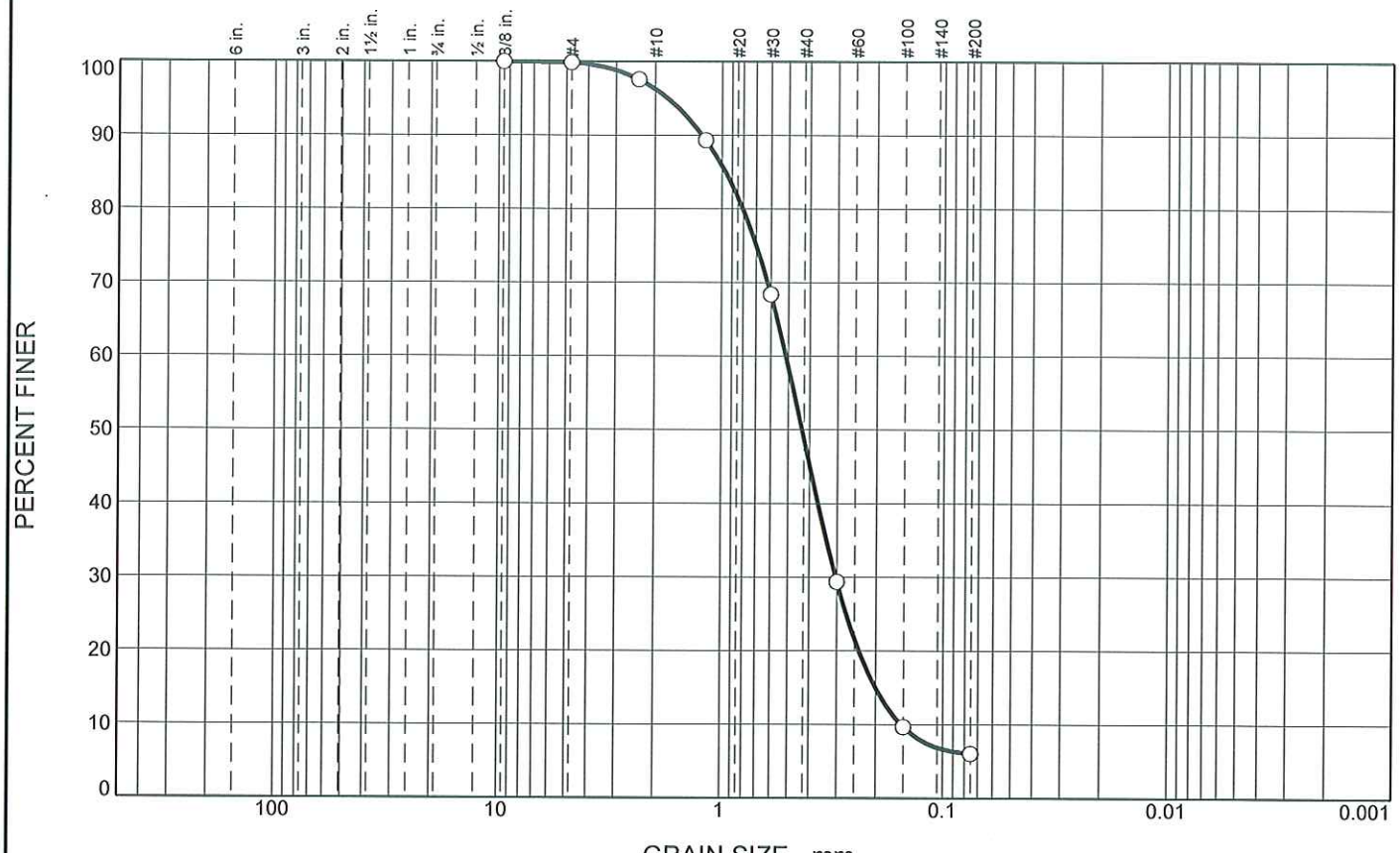
W. Sacramento, CA

Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough

Project No: 1201.7d **Figure**

Tested By: BWM/MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	4	47	43	6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	98		
#16	89		
#30	68		
#50	29		
#100	10		
#200	6.1		

* (no specification provided)

Material Description

Yellowish Brown Poorly Graded SAND with Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.2257 D_{85}= 0.9611 D_{60}= 0.5121
D_{50}= 0.4324 D_{30}= 0.3039 D_{15}= 0.2003
D_{10}= 0.1532 C_u= 3.34 C_c= 1.18

Classification

USCS= SP-SM AASHTO=

Remarks

Sample Number: F1-7 C **Depth:** 26.0'-26.5'

Date: 4-6-09

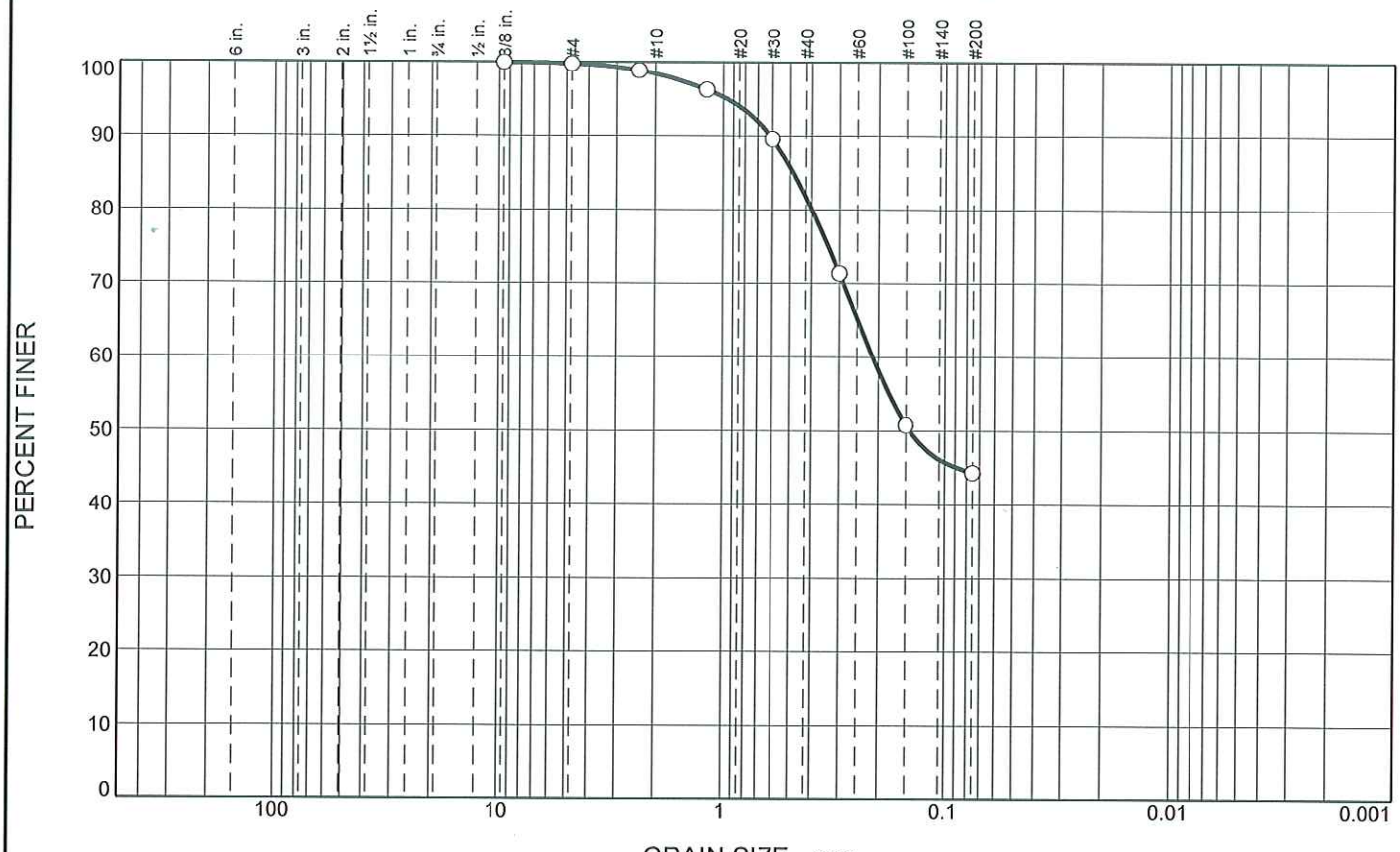
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	16	38	44	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100		
#4	100		
#8	99		
#16	96		
#30	90		
#50	71		
#100	51		
#200	44		

* (no specification provided)

Material Description

Dark Yellowish Brown Clayey SAND

Atterberg Limits

PL= 13 LL= 21 PI= 8

Coefficients

D_{90}= 0.6145 D_{85}= 0.4816 D_{60}= 0.2119
D_{50}= 0.1435 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-4(0)

Remarks

Sample Number: F1-9 B **Depth:** 30.5'-31.0'

Date: 4-7-09

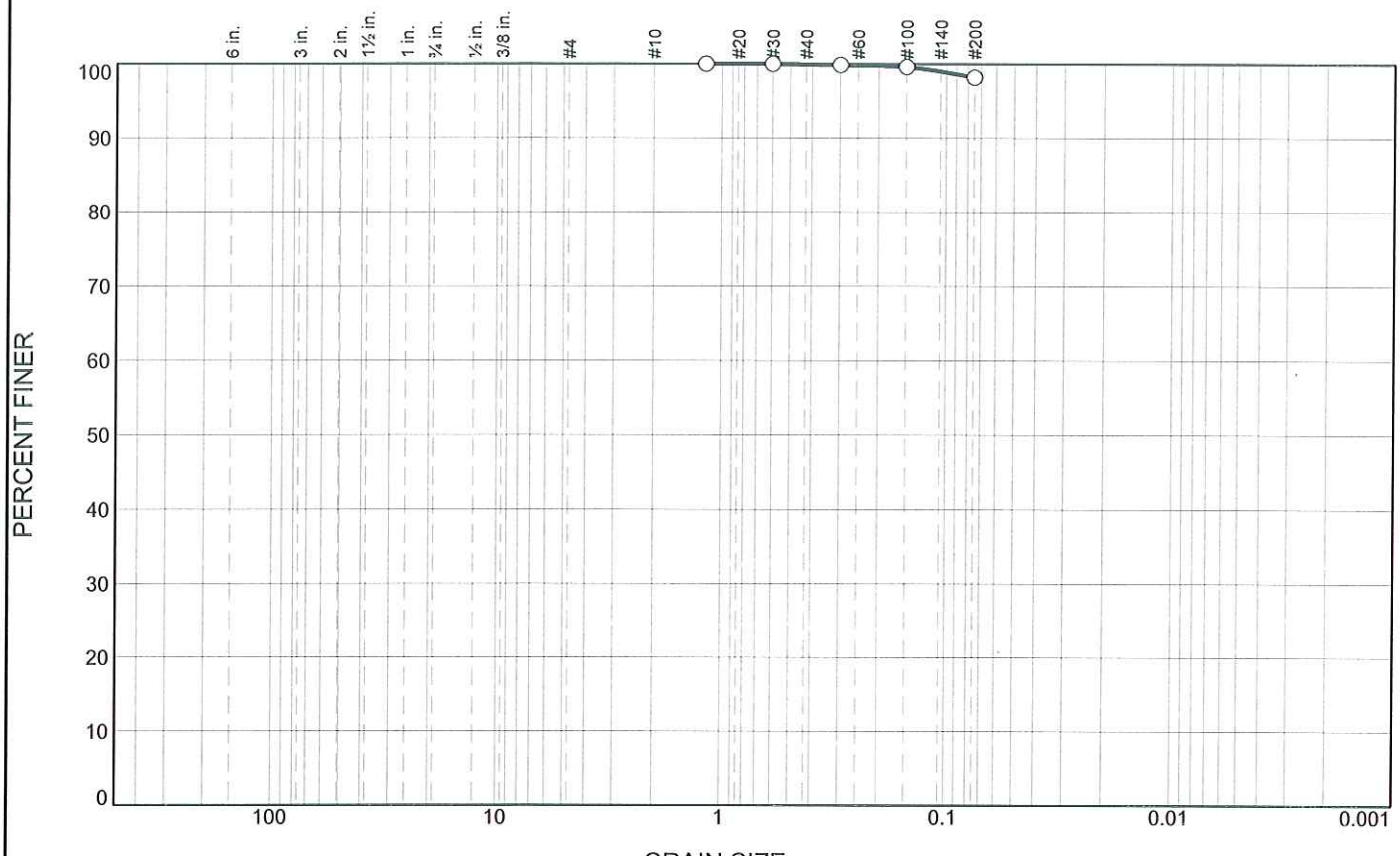
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	2	98	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#16	100		
#30	100		
#50	100		
#100	100		
#200	98		

* (no specification provided)

Material Description

Brown Lean CLAY

Atterberg Limits

PL= 17 LL= 41 PI= 24

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(25)

Remarks

Sample Number: F2-11 C **Depth:** 36.0"-36.5'

Date: 4-15-09

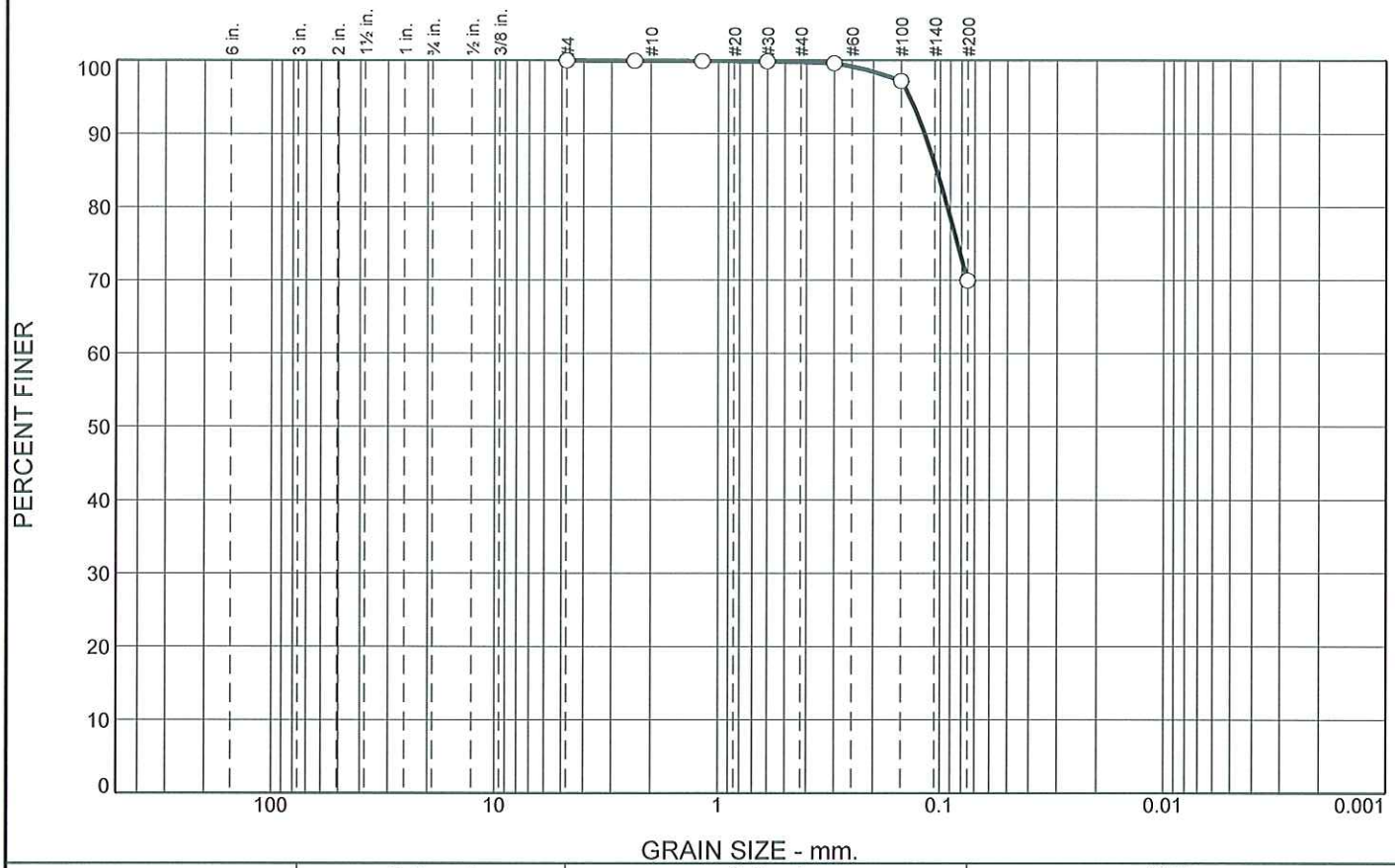
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	30	70	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	100		
#30	100		
#50	100		
#100	97		
#200	70		

* (no specification provided)

Material Description

Dark Grayish Brown Sandy SILT

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.1174 D_{85}= 0.1036 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Sample Number: F2-16 C **Depth:** 56.0'-56.5'

Date: 4-6-09

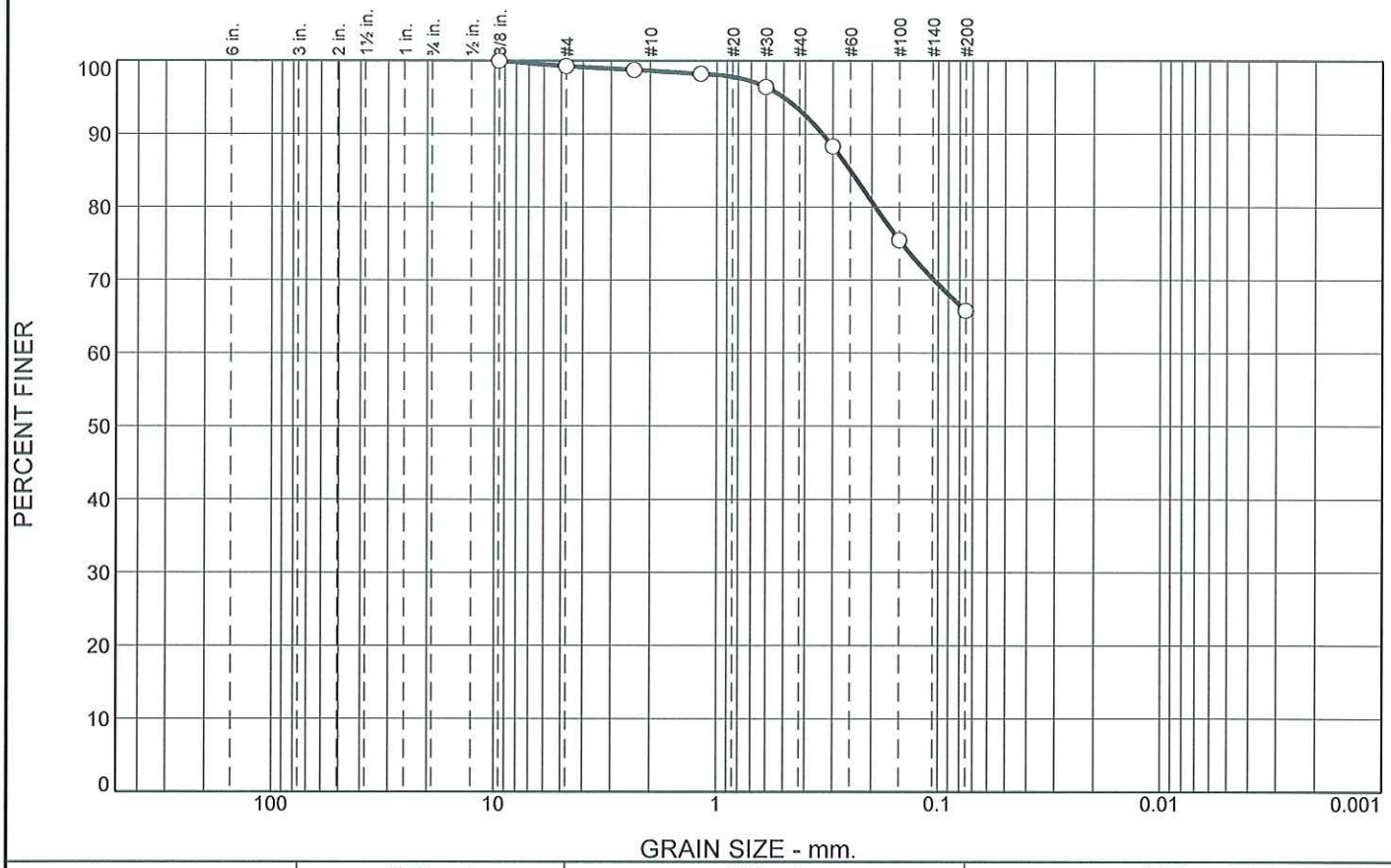
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	0	6	27	66	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	99		
#8	99		
#16	98		
#30	96		
#50	88		
#100	75		
#200	66		

* (no specification provided)

Material Description

Yellowish Brown Sandy Lean CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3334 D_{85}= 0.2495 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample Number: F3-7 B **Depth:** 20.5'-21.0'

Date: 4-15-09

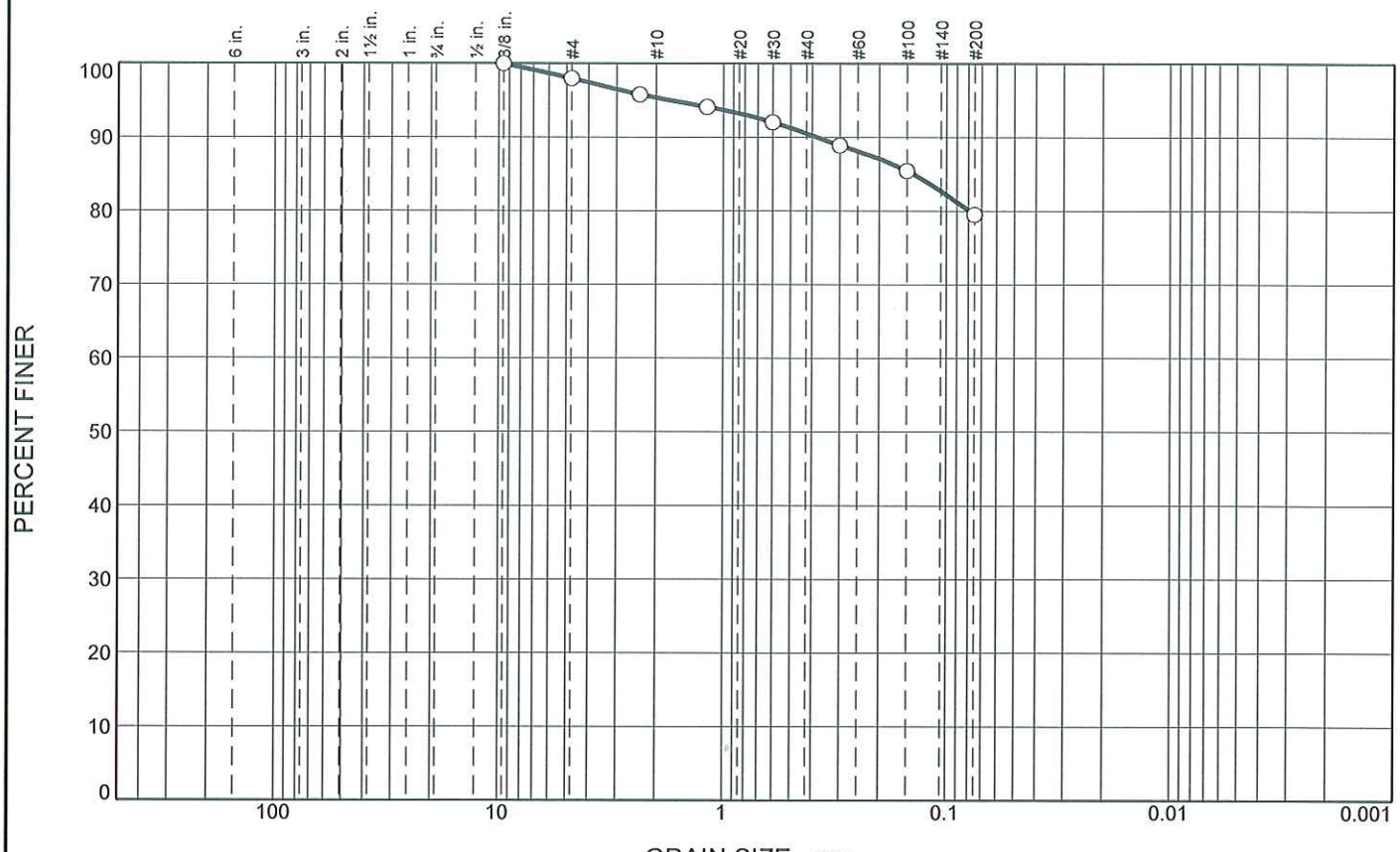
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	3	4	11	80	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	98		
#8	96		
#16	94		
#30	92		
#50	89		
#100	85		
#200	80		

* (no specification provided)

Material Description

Yellowish Brown Lean CLAY with Sand

Atterberg Limits

PL= 21 LL= 43 PI= 22

Coefficients

D_{90}= 0.3783 D_{85}= 0.1404 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(17)

Remarks

Sample Number: F3-11 B **Depth:** 35.5'-36.0'

Date: 4-16-09

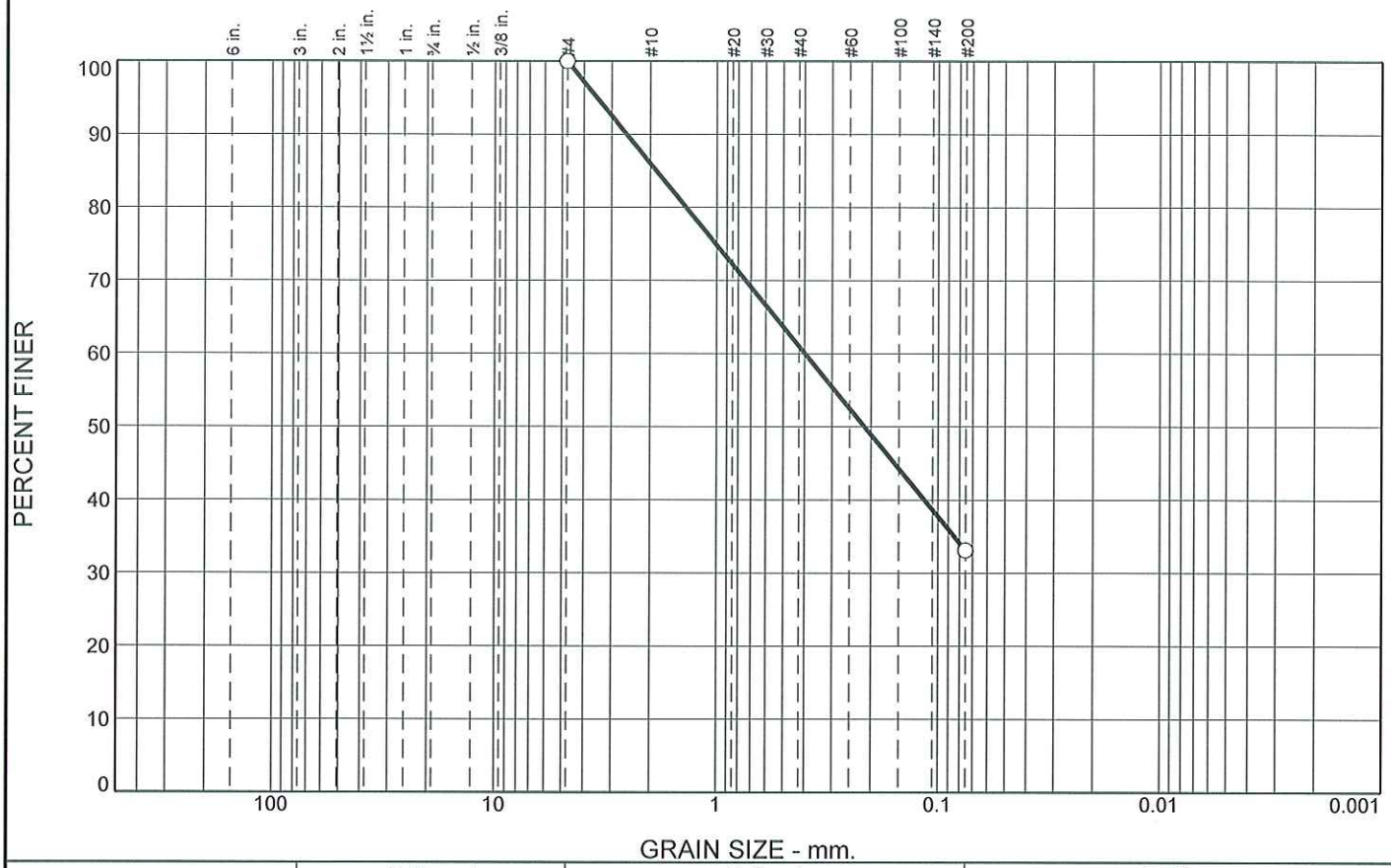
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	14	25	28	33	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#200	33		

* (no specification provided)

Material Description

Light Olive Brown Silty SAND

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.5539 D_{85}= 1.8726 D_{60}= 0.3969
D_{50}= 0.2134 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample Number: F3-14 **Depth:** 46.5'-48.0'

Date: 4-19-09

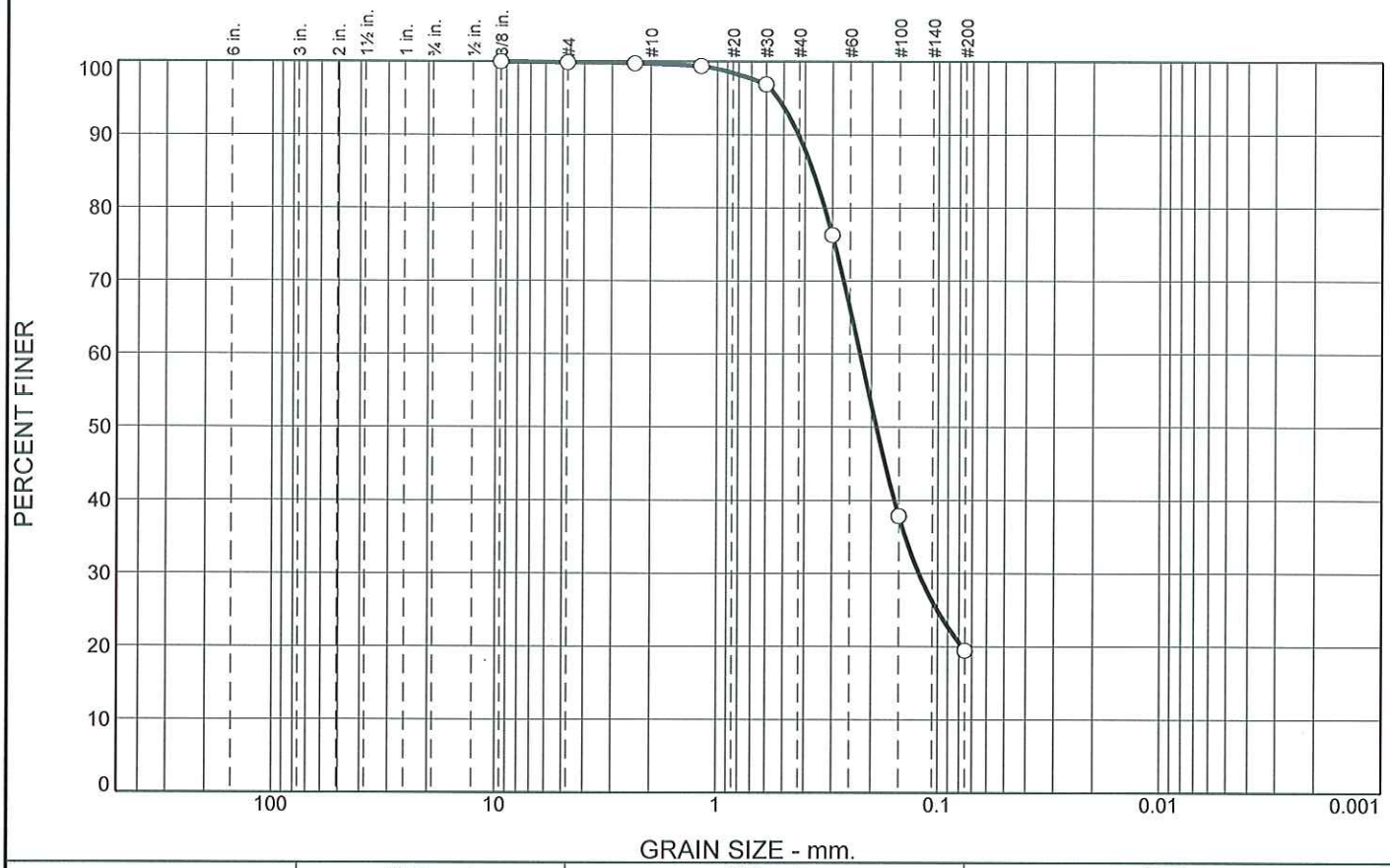
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	10	71	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	100		
#16	99		
#30	97		
#50	76		
#100	38		
#200	19		

* (no specification provided)

Material Description

Yellowish Brown Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4272 D_{85}= 0.3669 D_{60}= 0.2244
D_{50}= 0.1894 D_{30}= 0.1214 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Glass pieces in sample

Sample Number: F3-16 B **Depth:** 55.5'-56.0'

Date: 4-15-09

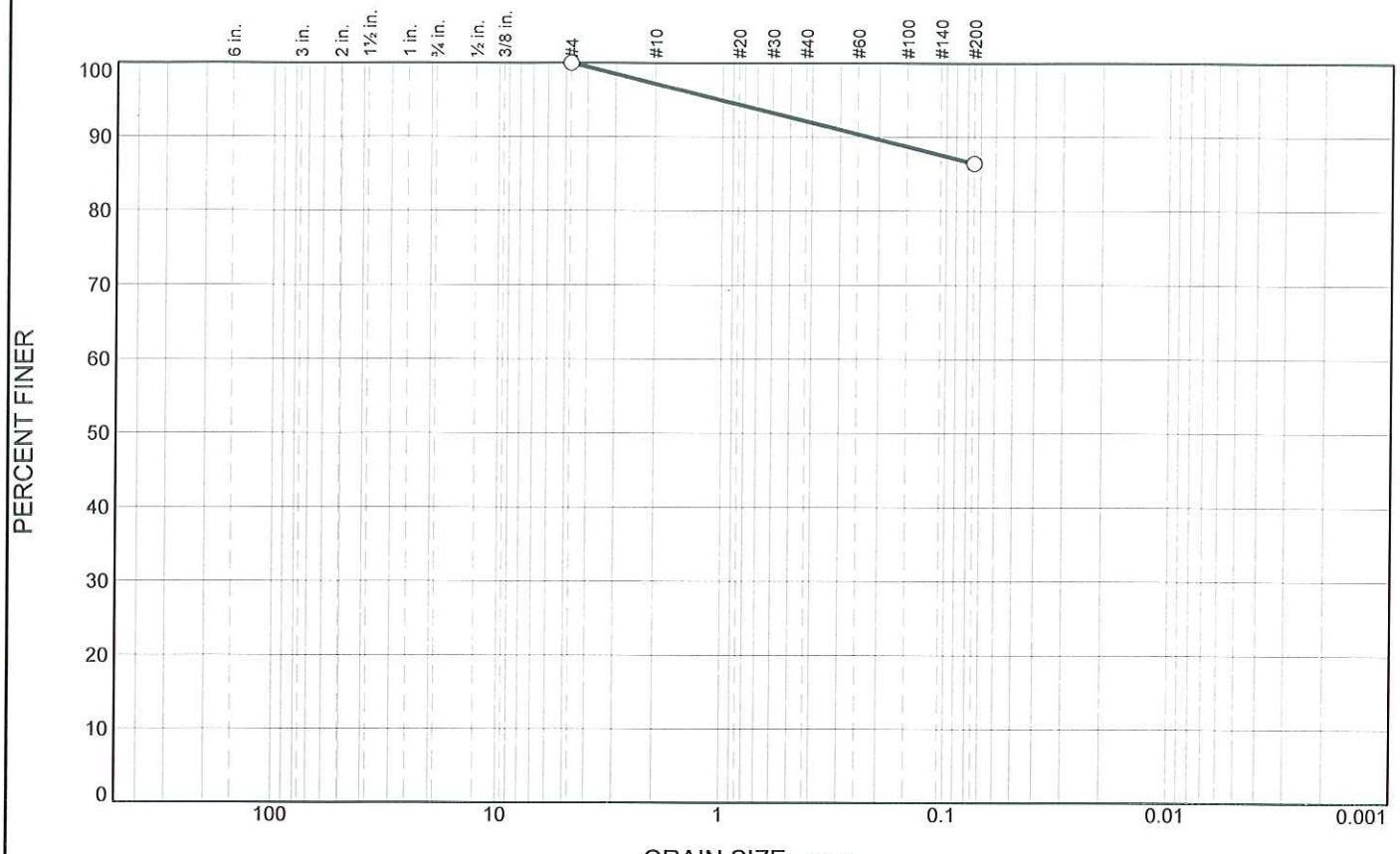
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	3	5	6	86	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#200	86		

* (no specification provided)

Material Description

Dark Grayish Brown Lean CLAY

Atterberg Limits

PL= 17 LL= 38 PI= 21

Coefficients

D_{90}= 0.2236 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

Sample Number: F4-3 B **Depth:** 15.5'-16.0'

Date: 8-24-09

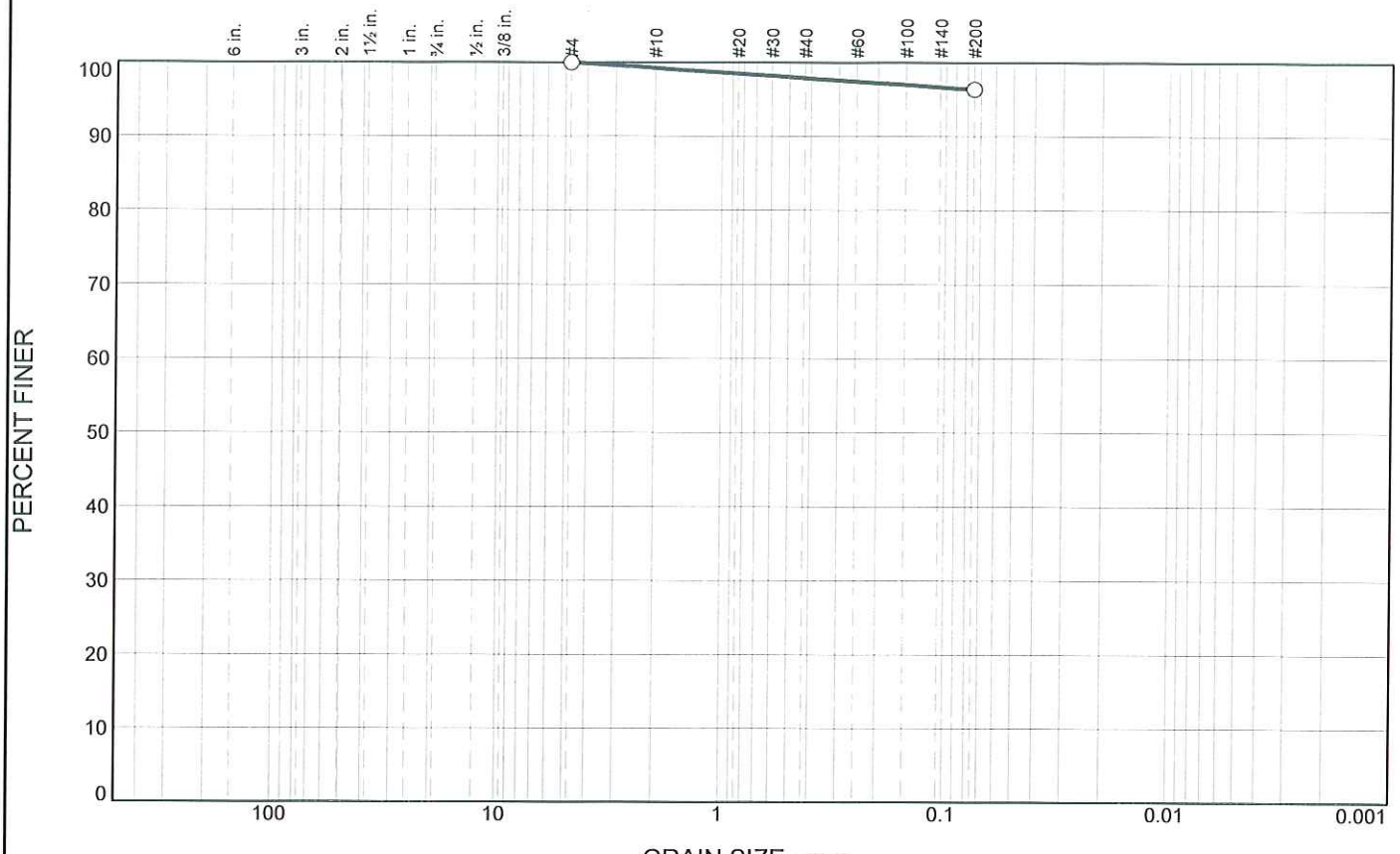
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC/DKB **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	1	2	96	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#200	96		

* (no specification provided)

Material Description

Brown Lean CLAY

Atterberg Limits

PL= 22 LL= 39 PI= 17

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

Sample Number: F4-6 B **Depth:** 30.5'-31.0'

Date: 8.24-09

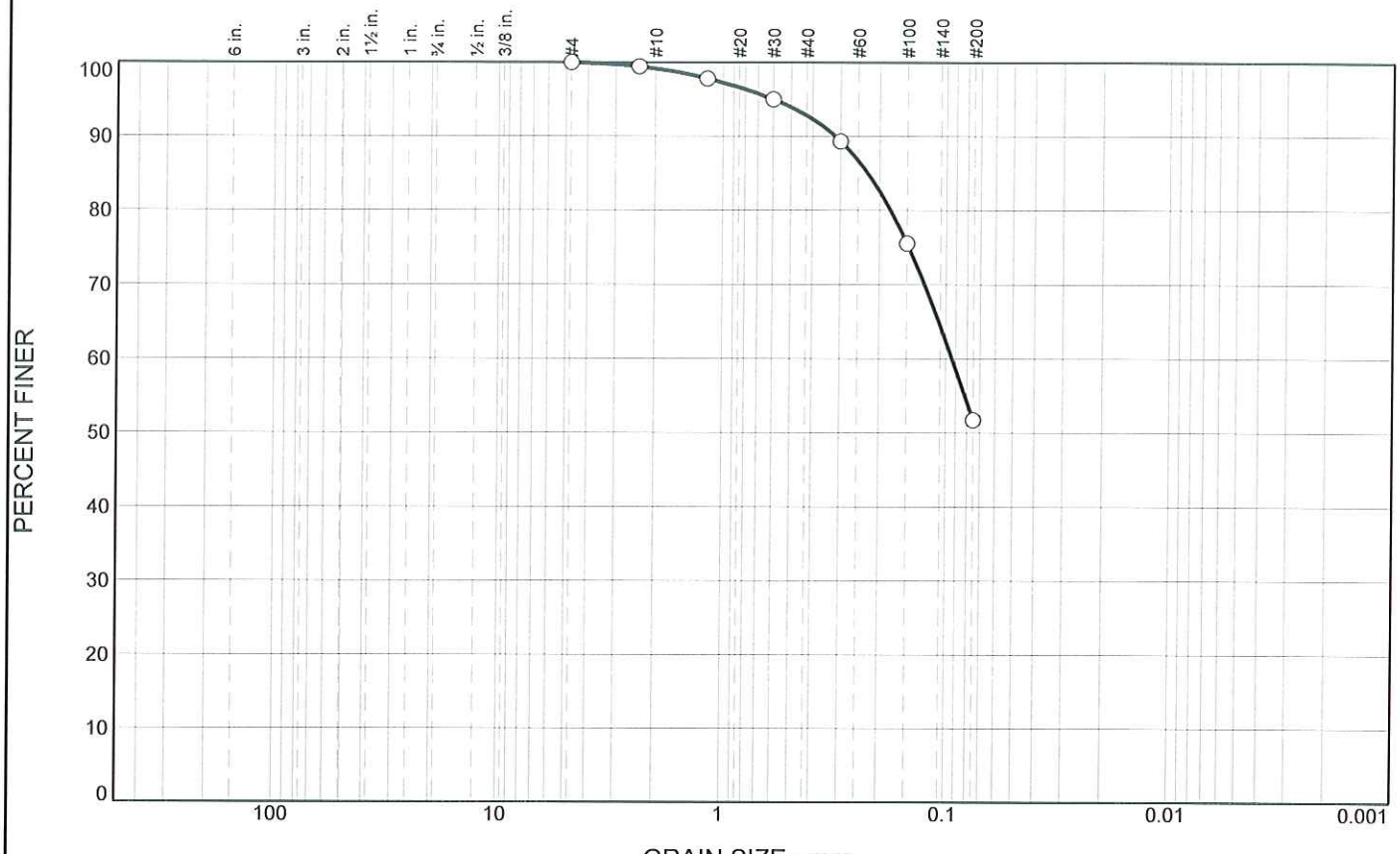
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC/DKB **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	6	41	52	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	99		
#16	98		
#30	95		
#50	89		
#100	76		
#200	52		

* (no specification provided)

Material Description

Light Olive Brown Sandy SILT

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3168 D_{85}= 0.2263 D_{60}= 0.0937
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Sample Number: F4-9 C **Depth:** 46.0'-46.5'

Date: 8-24-09

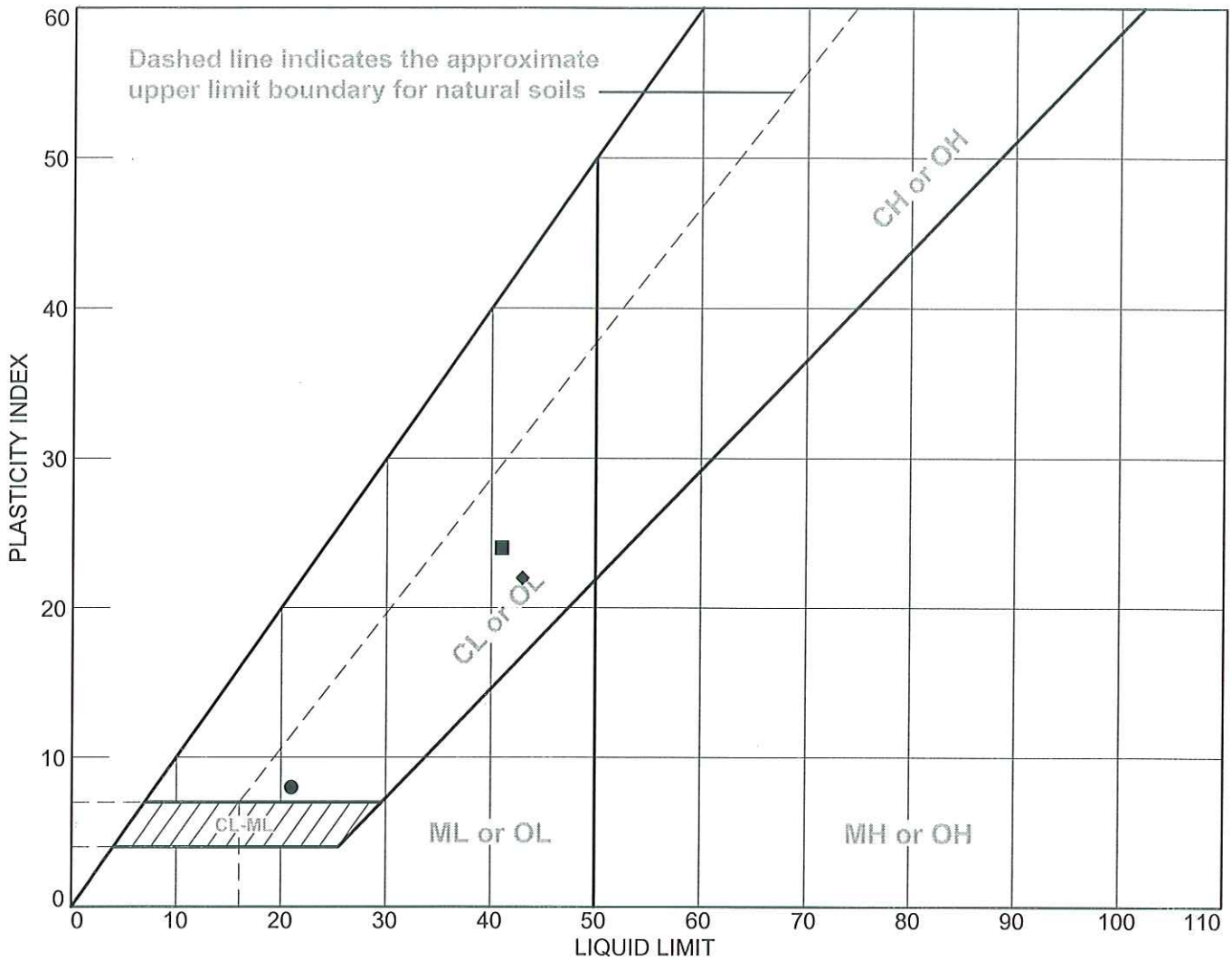
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No: 1201.7D **Figure**

Tested By: KLC/DKB **Checked By:** KLC

LIQUID AND PLASTIC LIMITS TEST REPORT

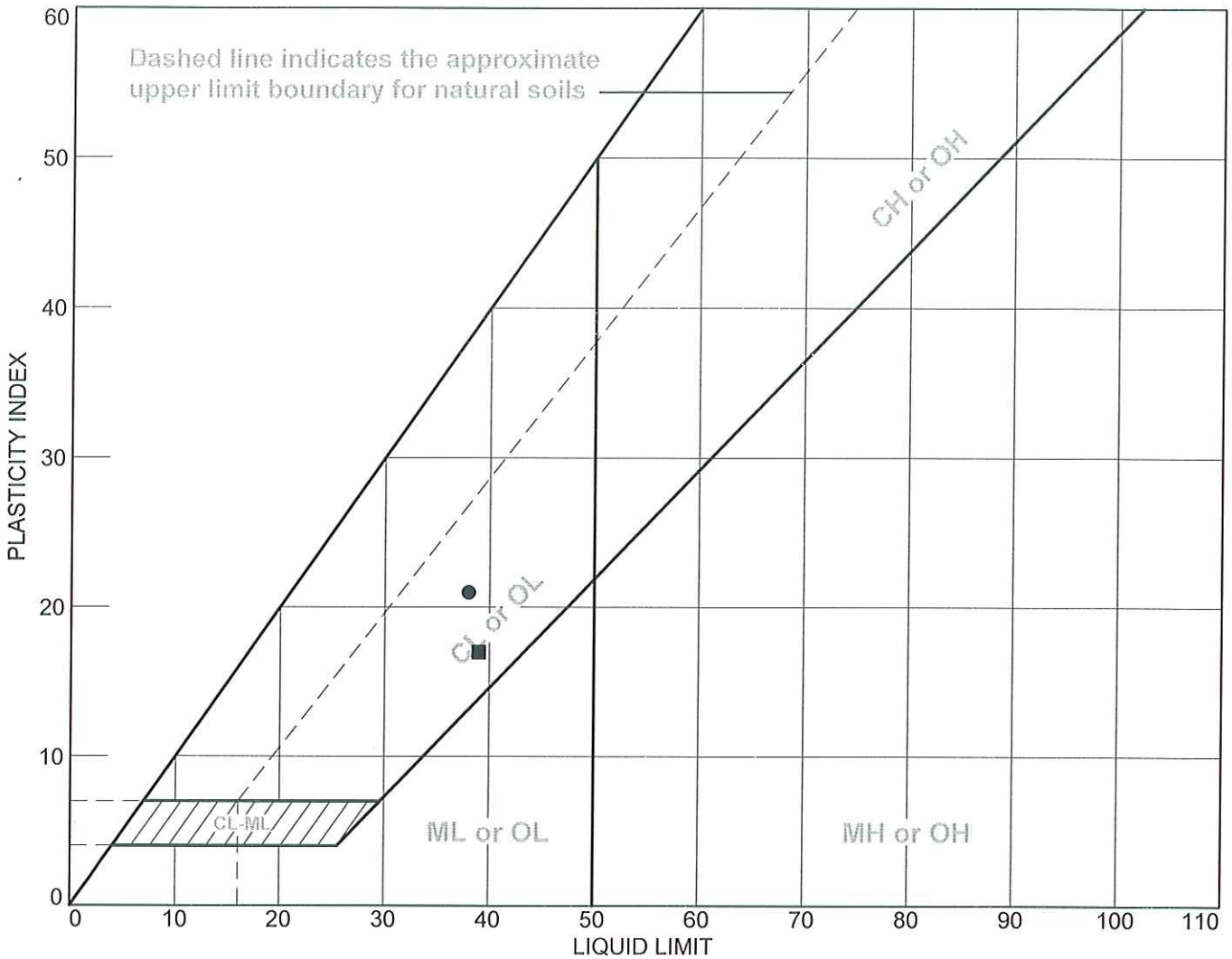


SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		F1-9 B	30.5'-31.0'		13	21	8	SC
■		F2-11 C	36.0"-36.5'		17	41	24	CL
▲		F2-16 C	56.0'-56.5'		NP	NV	NP	ML
◆		F3-11 B	35.5'-36.0'		21	43	22	CL
▼		F3-14	46.5'-48.0'		NP	NV	NP	SM

Blackburn Consulting **Auburn, CA**	**Client:** HDR INC. **Project:** SR99 Median Widening - Lone Tree Slough **Project No.:** 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		F4-3 B	15.5'-16.0'		17	38	21	CL
■		F4-6 B	30.5'-31.0'		22	39	17	CL

Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 Median Widening - Lone Tree Slough
Project No.: 1201.7D **Figure**

Tested By: KLC **Checked By:** KLC

Unconfined Compression Test
ASTM D 2166-00

Project Name	SR 99 Widening - Lone Tree Slough		
Project Number	1201.7d		
Sample	F1-5c	Depth	16.0-16.5
Sample Description	SANDY lean CLAY (CL), dark yellowish brown, slightly cemented		
Date	6/5/2009		
Tested By:	MDR		

Original Sample Length	5.66
Original Diameter (in)	2.40
Sample Area (in^2)	4.52

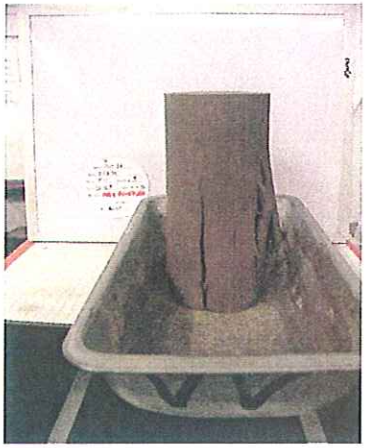
axial strain	**2.4%**
Average cross-sectional area (in^2)	**4.64**
Average cross-sectional area (ft^2)	0.032
Peak Reading	0.136
Maximum Load(lb)	206
Compressive Strength (tsf)	**3.20**

Moisture Density

Wet Sample Weight (g)	951.0
Tare Number	VV
Tare Weight (g)	105.0
Dry Sample Weight (g)	791.6
Dry Weight (g)	686.6
Water Weight (g)	159.4
Percent Moisture (%)*	23.2
Wet Density (pcf)	125.9
Dry Density (pcf)	102.2

Remarks:

* % moisture taken after test.



Compression Tests

Dial reading @ 0 lb	0.000

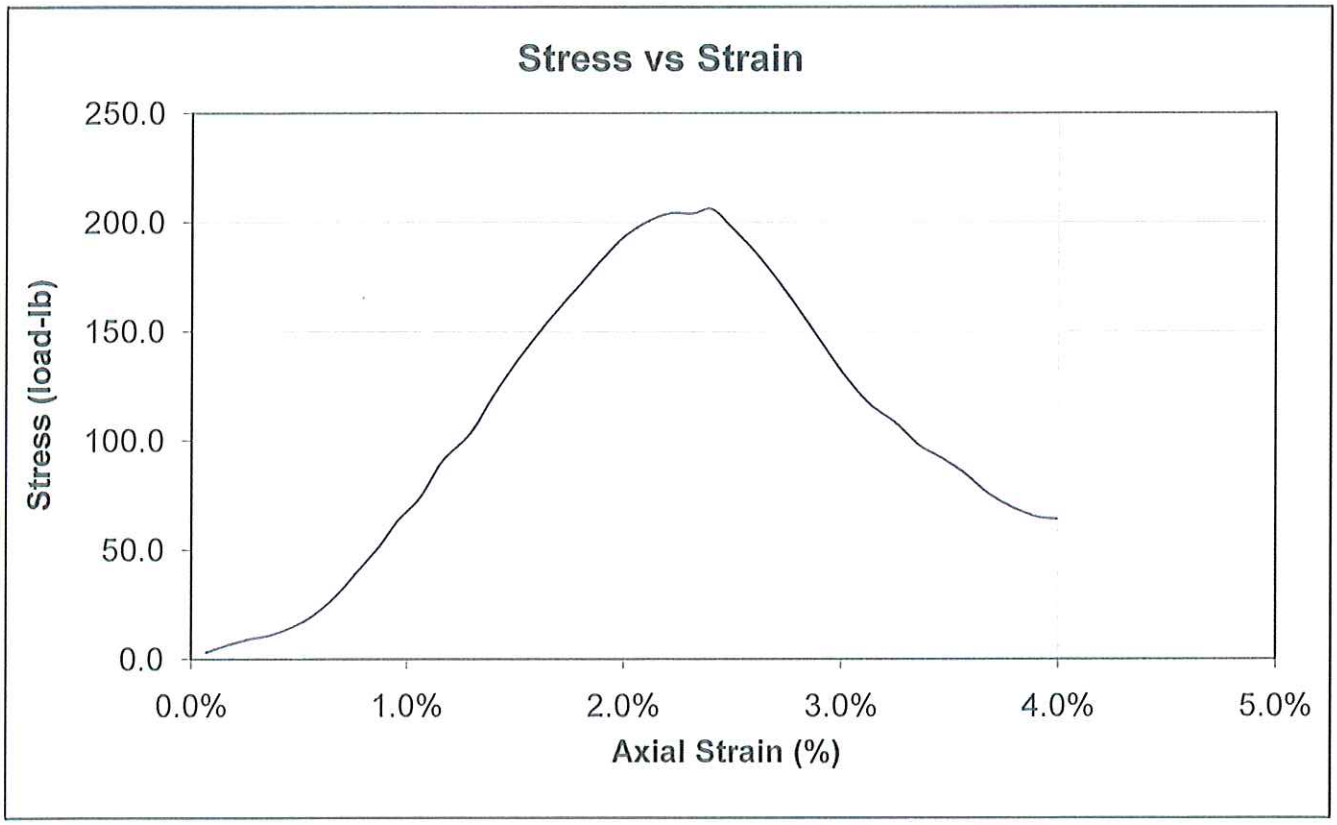
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.004	3.000	0.096	160.000	0.190	98.000		
0.009	6.000	0.102	172.000	0.196	92.000		
0.015	9.000	0.108	184.000	0.202	85.000		
0.021	11.000	0.113	193.000	0.208	76.000		
0.027	15.000	0.119	200.000	0.215	69.000		
0.032	20.000	0.125	204.000	0.221	65.000		
0.038	29.000	0.131	204.000	0.226	64.000		
0.043	39.000	0.136	206.000				
0.049	51.000	0.141	198.000				
0.054	63.000	0.147	187.000				
0.060	74.000	0.153	174.000				
0.066	91.000	0.160	157.000				
0.073	103.000	0.165	144.000				
0.079	120.000	0.171	129.000				
0.084	133.000	0.177	117.000				
0.090	147.000	0.184	108.000				

Project
SR 99 Widening - Lone Tree Slough
Project Number
1201.7d
Sample Number
F1-5c
Material Description
SANDY lean CLAY (CL), dark yellowish brown, slightly cemented
Tested By
MDR

ASTM D 2166-00



Wet Density (pcf)	125.9
Dry Density (pcf)	102.2
% Moisture	23.2

Unconfined Compressive Strength (tsf) 3.2

Unconfined Compression Test Lab Sheet
ASTM D 2166-00

Project Name _____
Project Number 1201.7d
Sample F1-5c Depth 16.0-16.5
Sample Description Dk yellowish-brown, sl cemented
Date 6/4/09
Tested By: MGC

Original Sample Length 5.060
Original Diameter (in) 2.40
Sample Area (in^2) _____

846.55 wet wt

Moisture Density

Wet Sample Weight (g) 951.01
Tare Number VV
Tare Weight (g) 105.02
Dry Sample Weight (g) 791.62
Dry Weight (g) _____
Water Weight (g) _____
Percent Moisture (%)* _____
Wet Unit Weight (pcf) _____
Dry Unit Weight (pcf) _____

Remarks:
* Moisture taken after test

Compression Test

Dial reading @ 0 lb _____

Maximum Reading _____ at Dial Reading _____

15% strain is = dial reading at start minus dial reading now divided by height

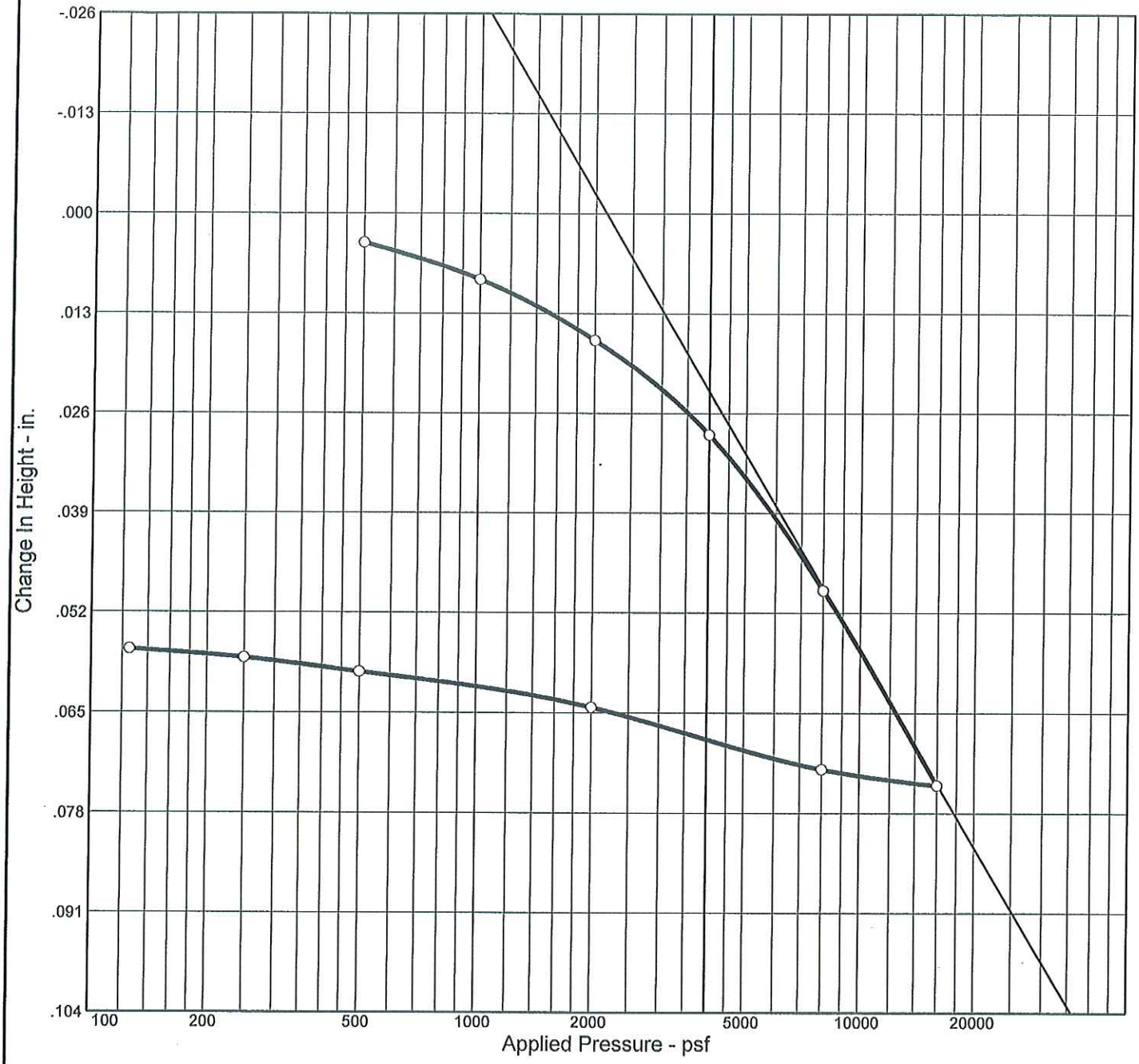
Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb

pproximate Diameters
44" for 1.5-inch Tubes
96" for 2-inch Tubes
4" for 2.5-inch Tubes

MEASURE ALL TUBES WITH CALIPERS

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
90.0 %	25.3 %	95.4			2.7	3750	5002	0.20	0.02	0.759

MATERIAL DESCRIPTION	USCS	AASHTO
Light brown lean Clay	CL	

Project No. 1201.7d **Client:** HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source: F1 **Sample No.:** 9c **Elev./Depth:** 31.0-31.5'

Blackburn Consulting

W. Sacramento, CA

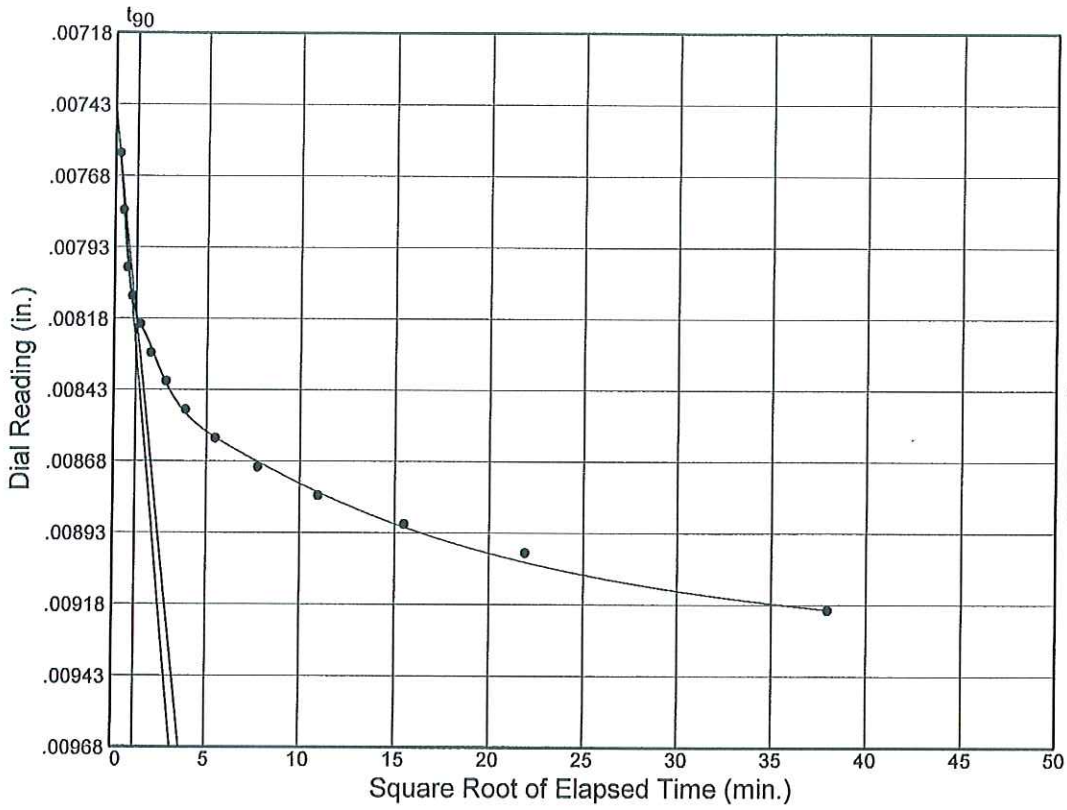
Remarks:

Figure

Dial Reading vs. Time

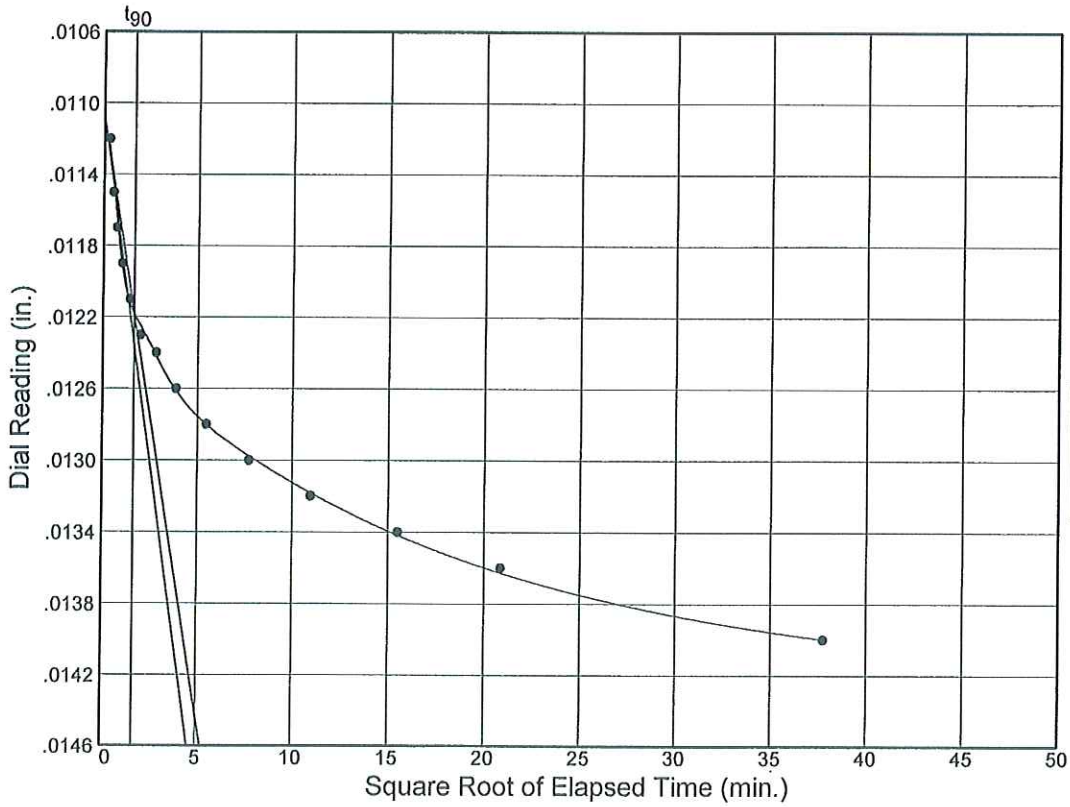
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 1
Load= 500 psf
D_0 = 0.00743
D_{90} = 0.00817
D_{100} = 0.00825
T_{90} = 1.42 min.

C_v @ T_{90}
0.83 ft.^{2}/day



Load No.= 2
Load= 1000 psf
D_0 = 0.01108
D_{90} = 0.01218
D_{100} = 0.01230
T_{90} = 2.71 min.

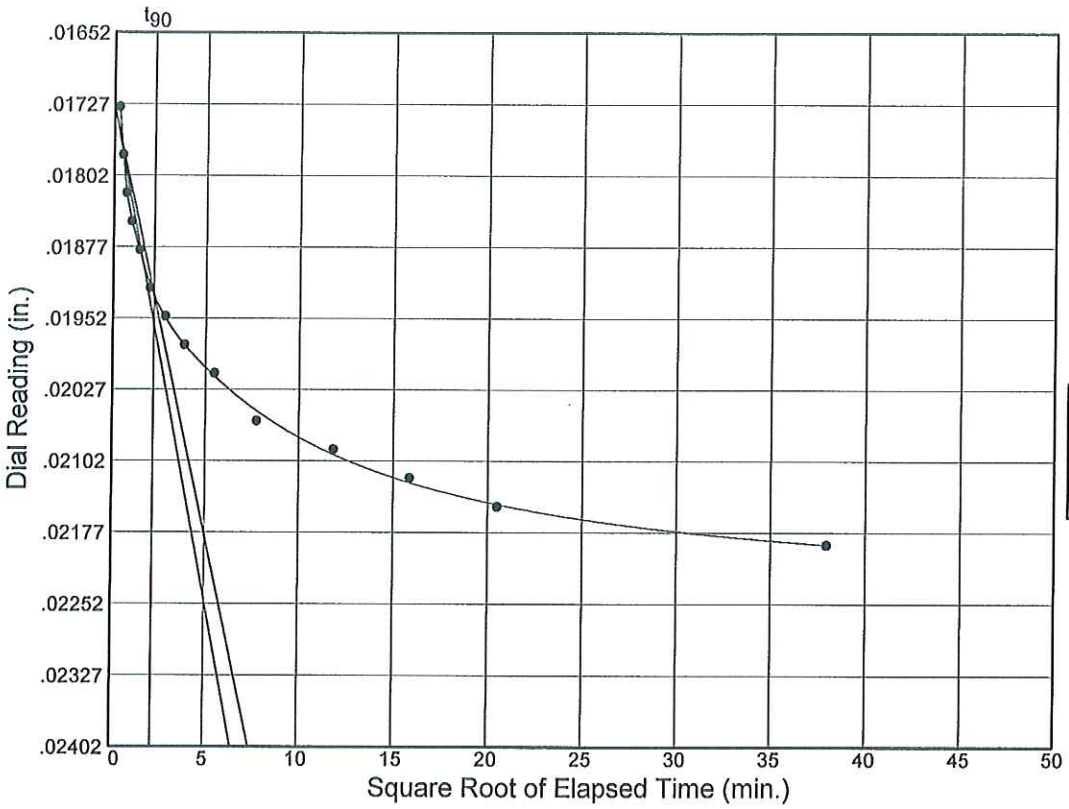
C_v @ T_{90}
0.43 ft.^{2}/day

Figure

Dial Reading vs. Time

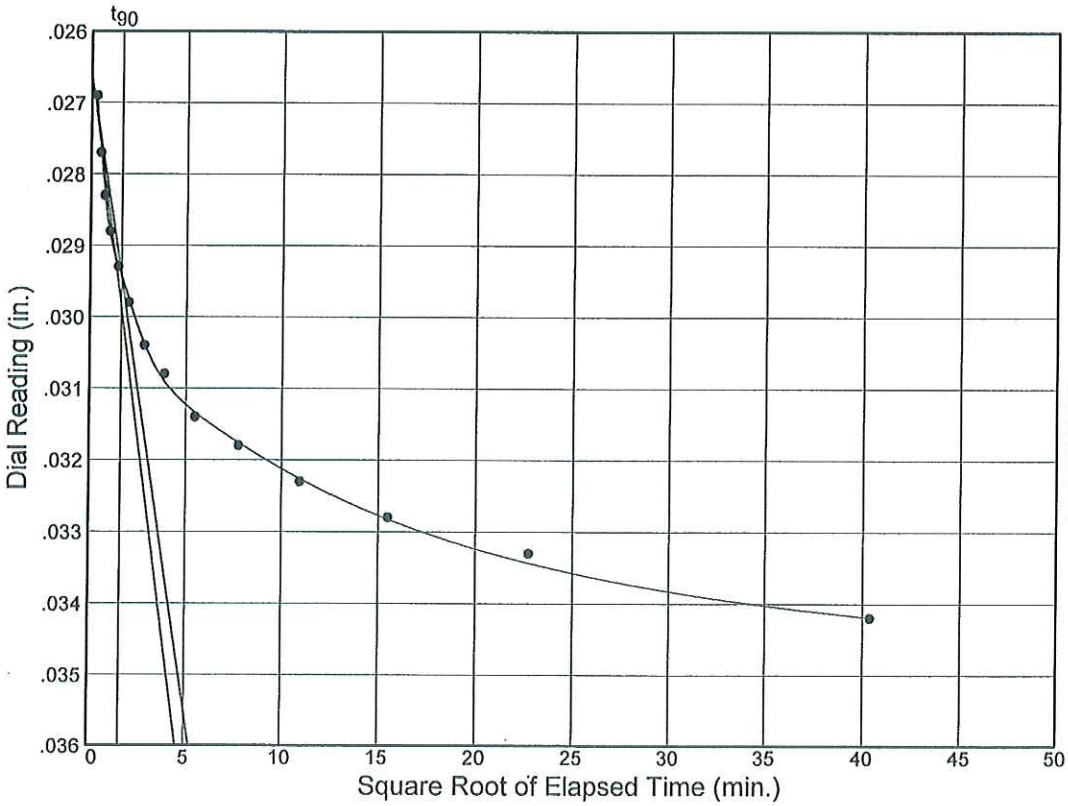
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 3
Load= 2000 psf
D_0 = 0.01728
D_{90} = 0.01928
D_{100} = 0.01950
T_{90} = 4.88 min.

C_v @ T_{90}
0.24 ft.^{2}/day



Load No.= 4
Load= 4000 psf
D_0 = 0.02659
D_{90} = 0.02942
D_{100} = 0.02973
T_{90} = 2.49 min.

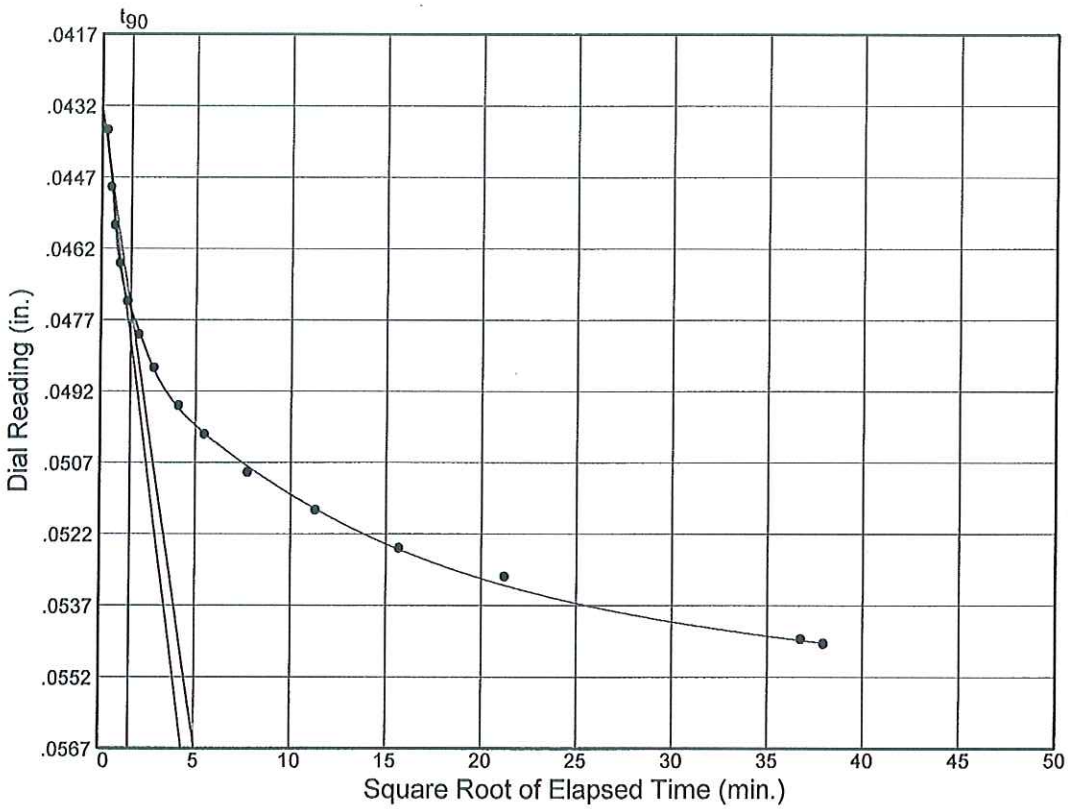
C_v @ T_{90}
0.45 ft.^{2}/day

Figure

Dial Reading vs. Time

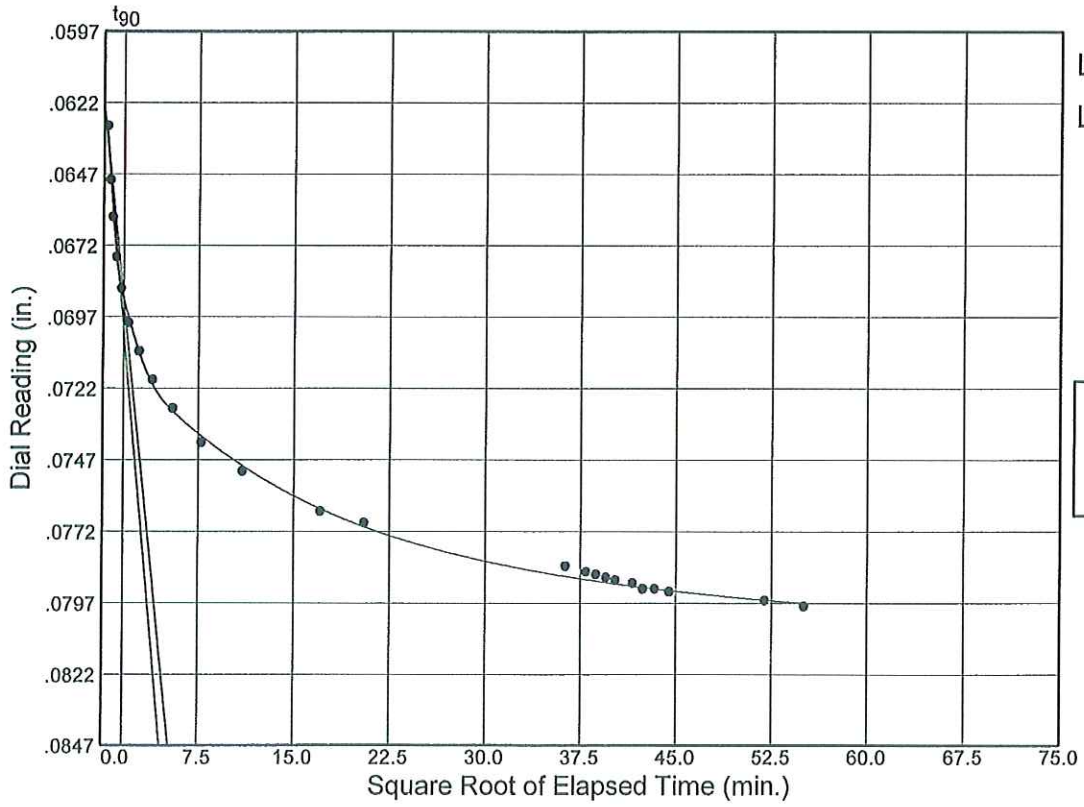
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 5
Load= 8000 psf
D_0 = 0.04321
D_{90} = 0.04747
D_{100} = 0.04795
T_{90} = 2.52 min.

C_v @ T_{90}
0.42 ft.^{2}/day



Load No.= 6
Load= 16000 psf
D_0 = 0.06223
D_{90} = 0.06906
D_{100} = 0.06982
T_{90} = 2.54 min.

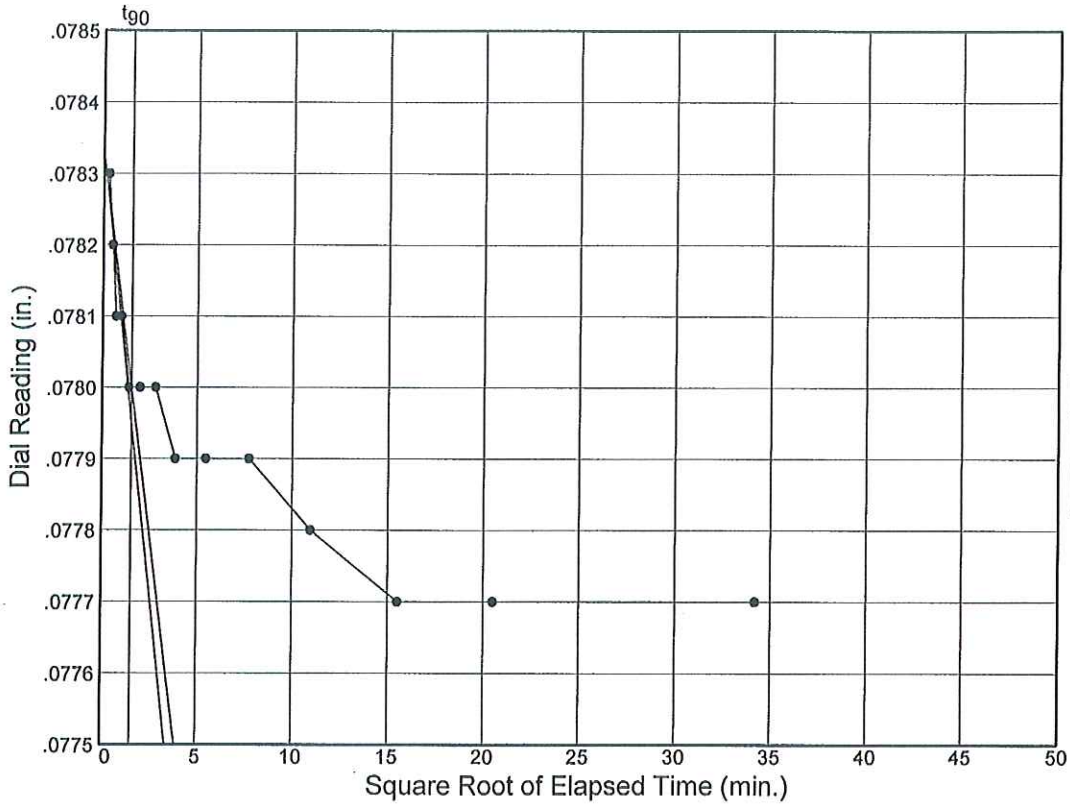
C_v @ T_{90}
0.40 ft.^{2}/day

Figure

Dial Reading vs. Time

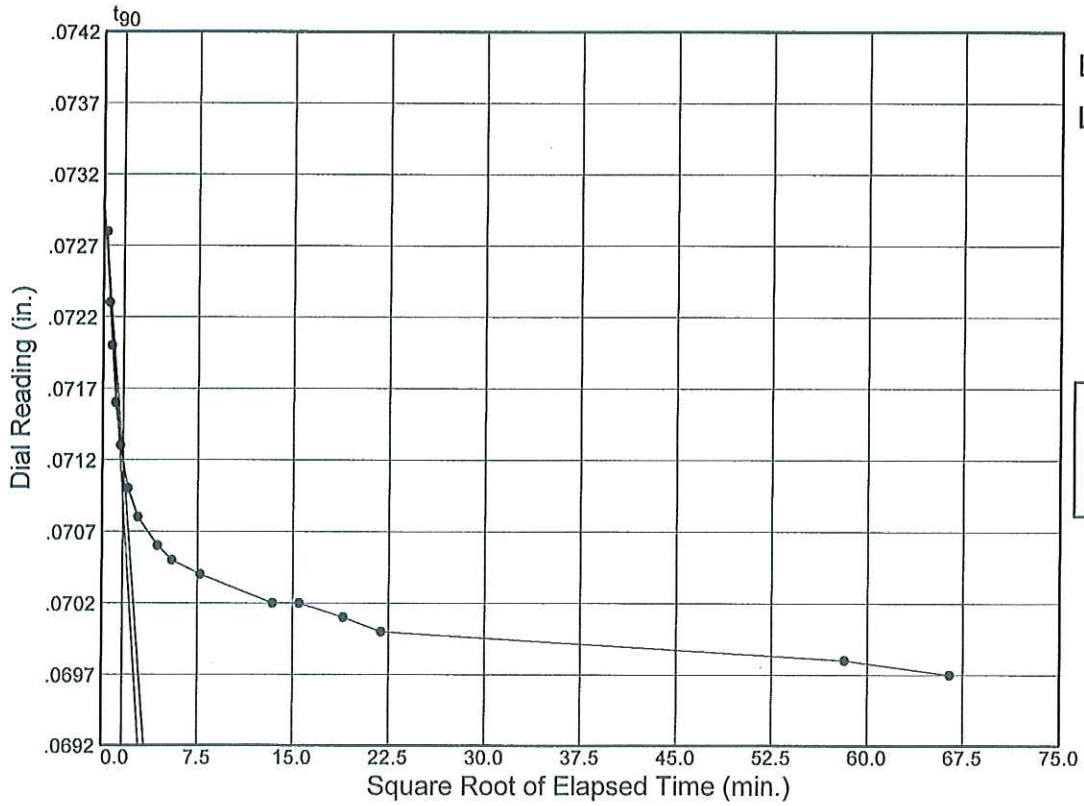
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 7
Load= 8000 psf
D_0 = 0.07833
D_{90} = 0.07800
D_{100} = 0.07796
T_{90} = 2.42 min.

C_v @ T_{90}
0.40 ft.^{2}/day



Load No.= 8
Load= 2000 psf
D_0 = 0.07301
D_{90} = 0.07120
D_{100} = 0.07100
T_{90} = 2.58 min.

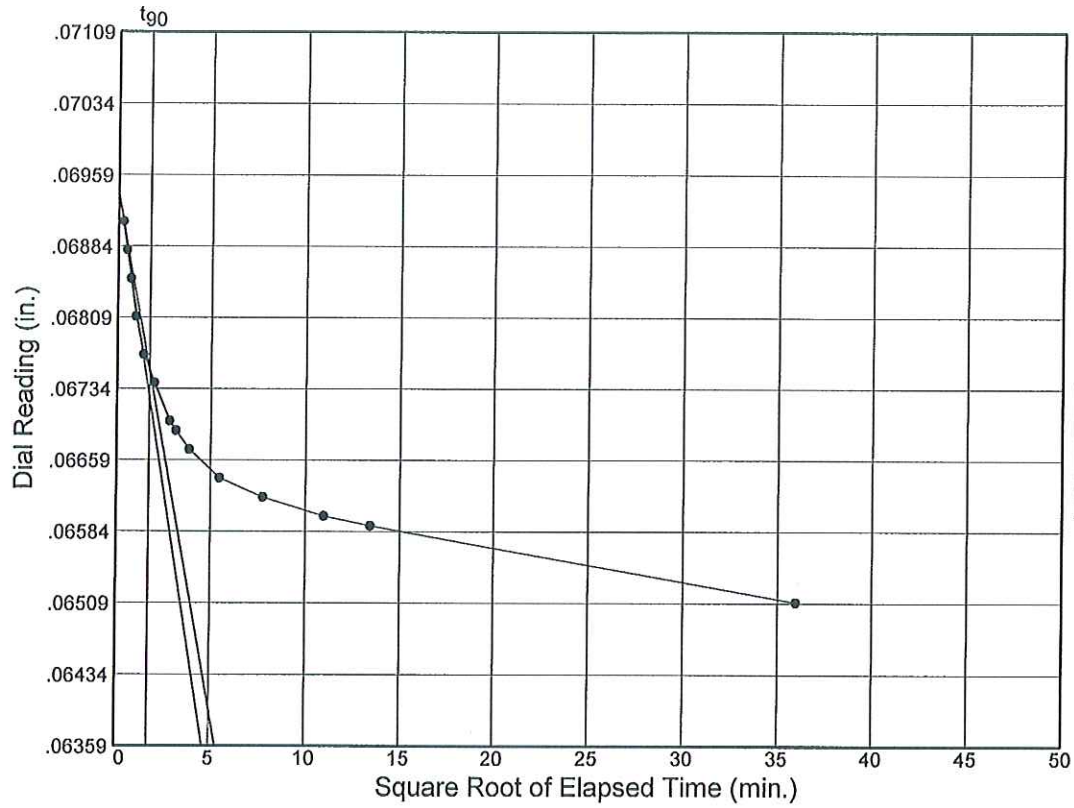
C_v @ T_{90}
0.38 ft.^{2}/day

Figure

Dial Reading vs. Time

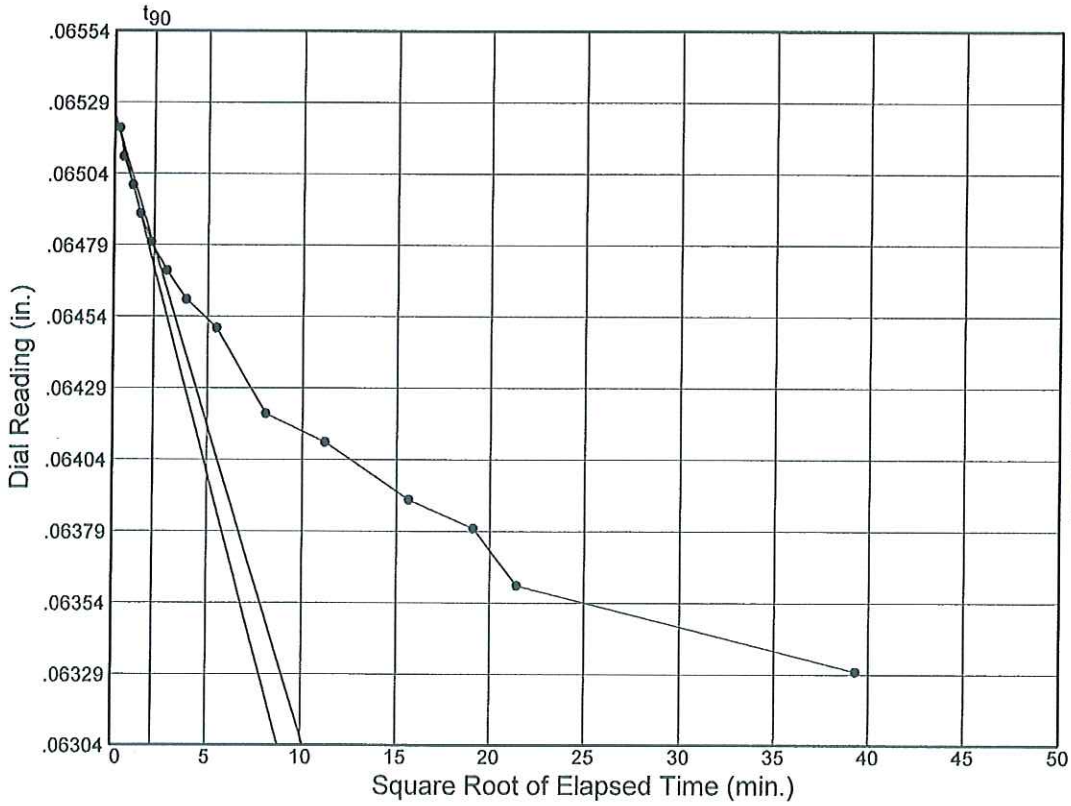
Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 9
Load= 500 psf
D_0 = 0.06942
D_{90} = 0.06754
D_{100} = 0.06733
T_{90} = 2.97 min.

C_v @ T_{90}
0.34 ft.^{2}/day



Load No.= 10
Load= 250 psf
D_0 = 0.06525
D_{90} = 0.06478
D_{100} = 0.06473
T_{90} = 4.58 min.

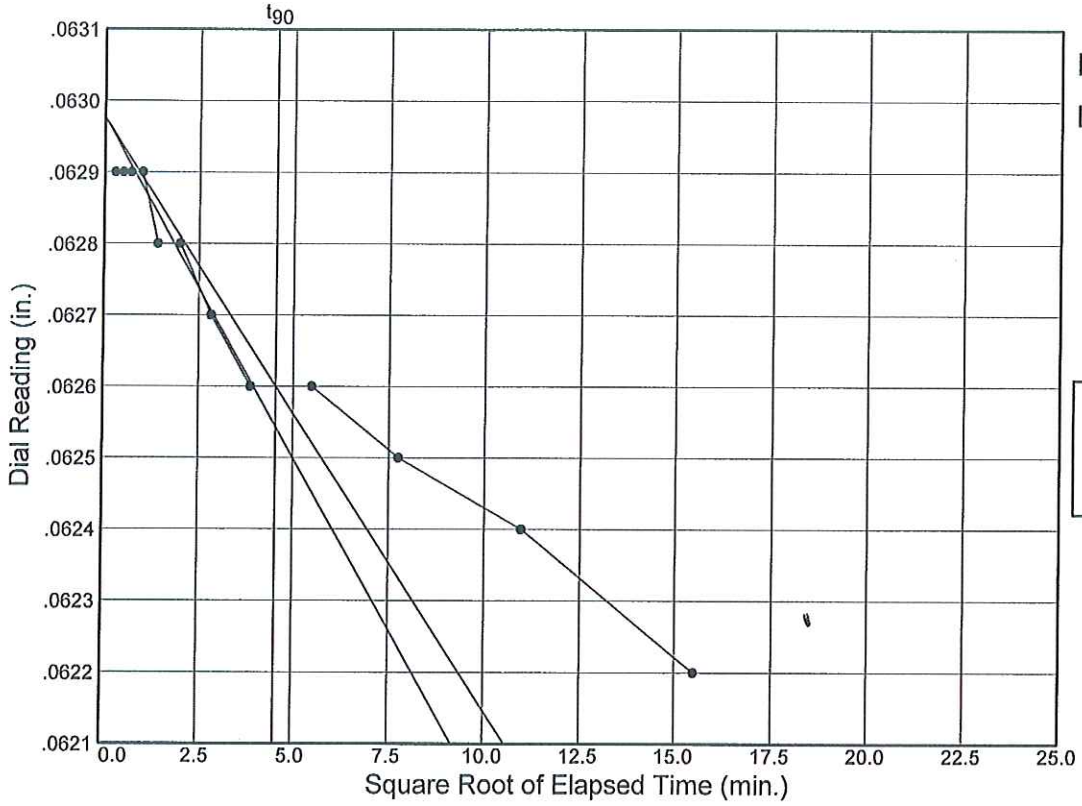
C_v @ T_{90}
0.22 ft.^{2}/day

Figure

Dial Reading vs. Time

Project No.: 1201.7d
Project: SR99 Widening - Lone Tree Slough

Source: F1 Sample No.: 9c Elev./Depth: 31.0-31.5'



Load No.= 11

Load= 125 psf

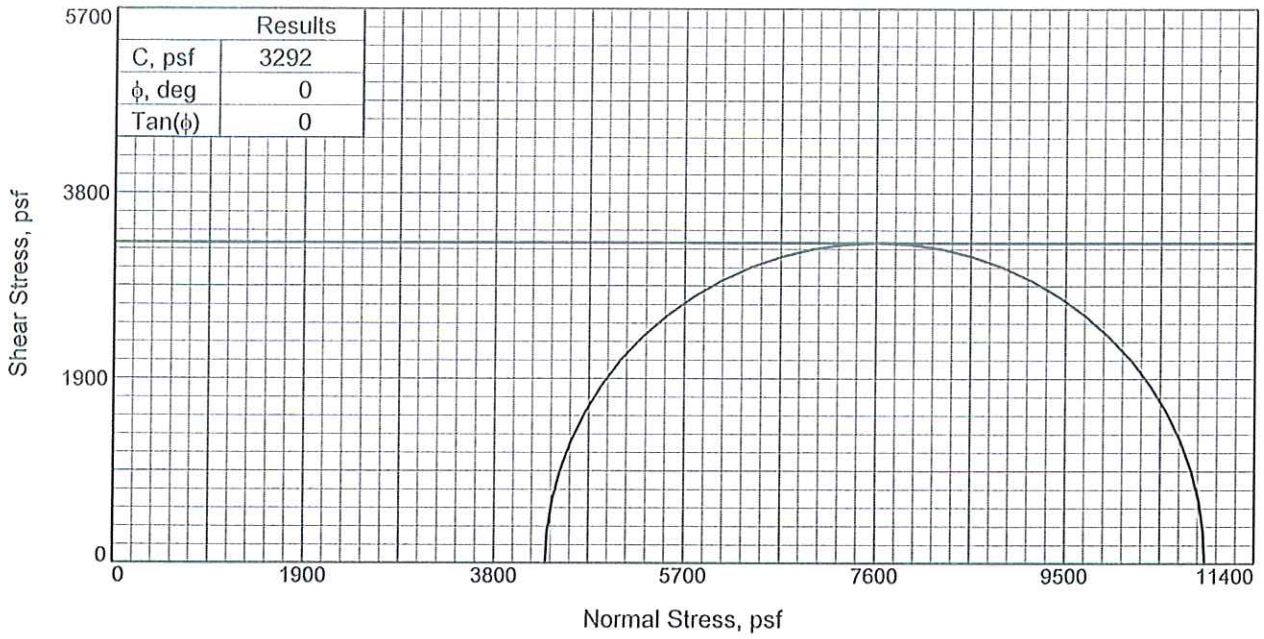
D_0 = 0.06298

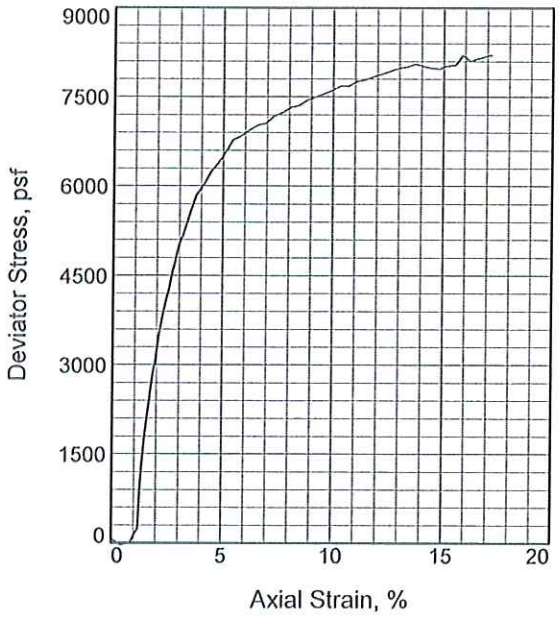
D_{90} = 0.06260

D_{100} = 0.06256

T_{90} = 20.56 min.

C_v @ T_{90}
0.05 ft.^{2}/day





Specimen No.		1
Initial	Water Content, %	19.4
	Dry Density, pcf	105.0
	Saturation, %	86.5
	Void Ratio	0.6055
	Diameter, in.	2.400
	Height, in.	5.500
At Test	Water Content, %	19.1
	Dry Density, pcf	105.0
	Saturation, %	85.4
	Void Ratio	0.6055
	Diameter, in.	2.400
	Height, in.	5.500
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		4320
Fail. Stress, psf		6583
Strain, %		5.1
Ult. Stress, psf		8009
Strain, %		
σ_1 Failure, psf		10903
σ_3 Failure, psf		4320

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: Lean CLAY (CL), yellowish brown, clayey sand/sandy clay in upper 1/3 of sample.

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 5% strain, Ultimate at 15%.

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F1 **Depth:** 35.5-36.0'

Sample Number: 10b

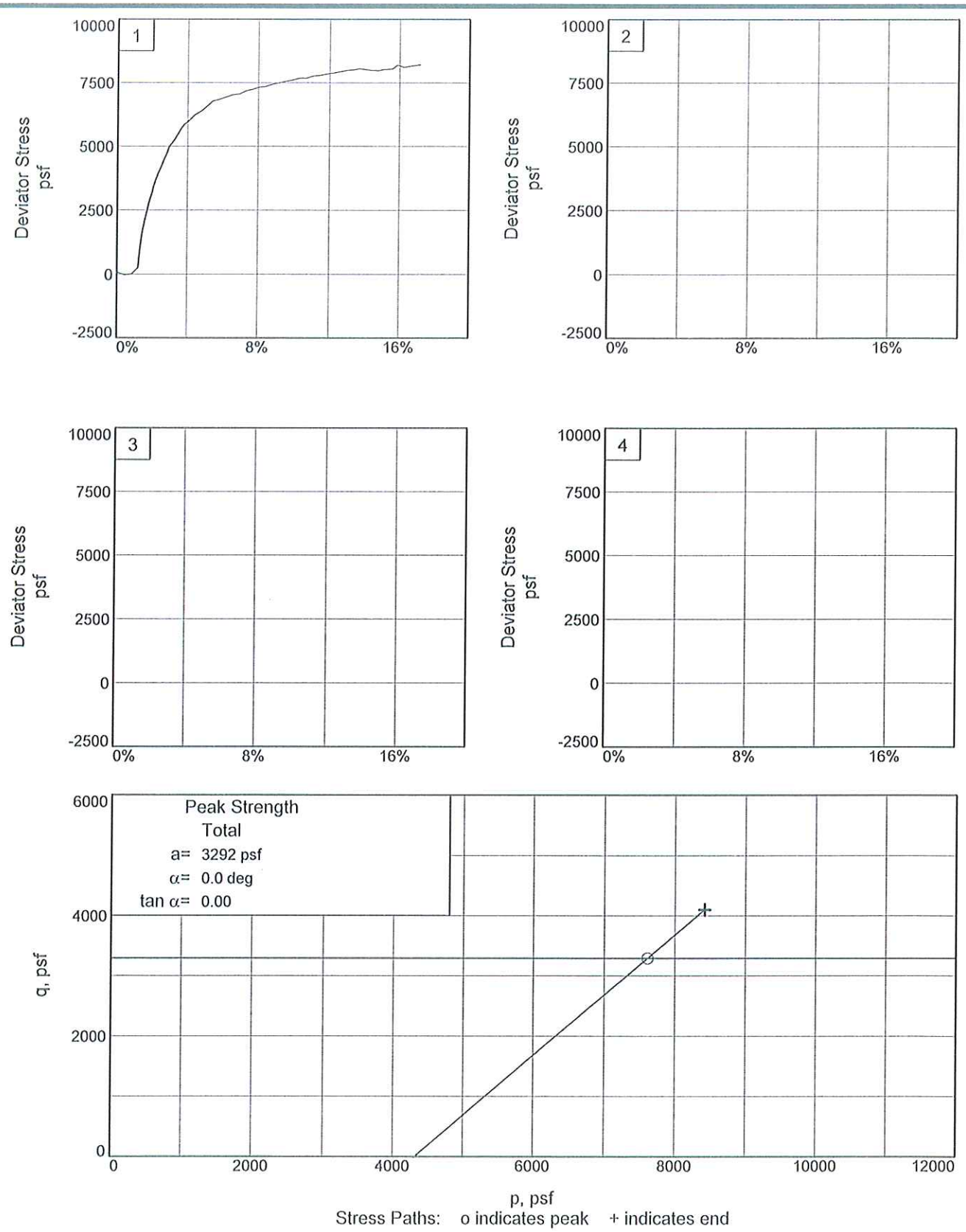
Proj. No.: 1201.7d **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Blackburn Consulting

Figure _____

Tested By: MDR **Checked By:** RDS



Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F1 **Depth:** 35.5-36.0' **Sample Number:** 10b

Project No.: 1201.7d **Figure** _____

Blackburn Consulting

Tested By: MDR **Checked By:** RDS

Triaxial Compression UU no pore pressure
ASTM D 2850

blackburn consulting

Project Name: SR 99 Widening / Lone Tree Slough

Project Number: 1201.7d

Sample ID: F1-10b Depth (ft): 35.5-36.0

Sample Description: Lean CLAY (CL), yellowish brown, clayey sand/sandy clay in upper 1/3 of sample

Date: 5/13/2009 Tested By: MDR

Staged test	
psf	psi
0	0.00
0	0.00
0	0.00

Specimen			
initial moisture		final moisture	
tare #	n/a	tare #	PP
wet + t =	n/a	wet + t =	922.39
dry + t =	n/a	dry + t =	791.12
tare =	n/a	tare =	105.42
Water (g)	#VALUE!		131.27
Dry Weight	#VALUE!		685.70
% Moisture	#VALUE!		19.1
Length of Sample =	5.50	in	
Diameter of Sample =	2.40	in	
moist soil =	818.69	gm	

Test Cell Pressure

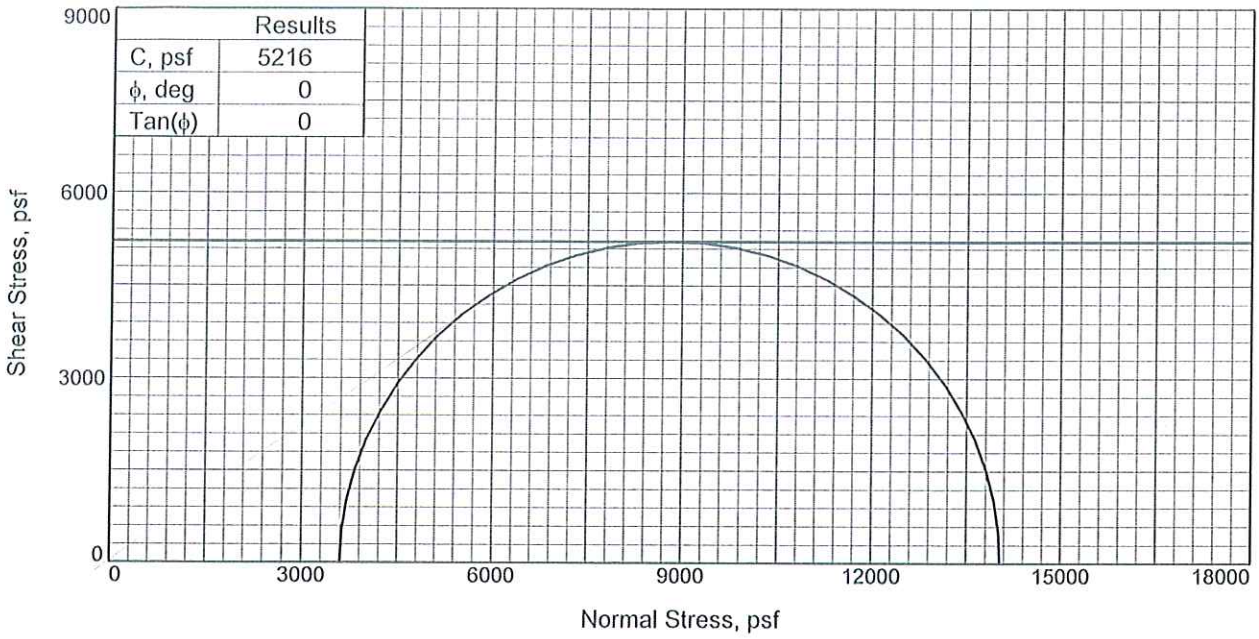
30

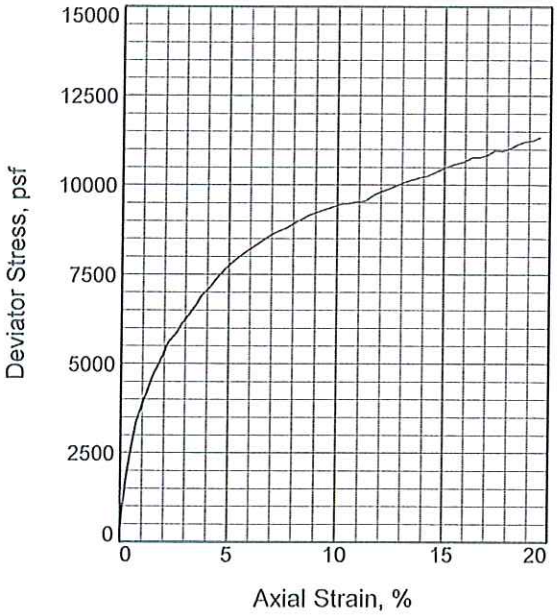
5%	15%
0.275	0.825

NOTES:

USE FOR SOFT SOIL PREPARATION

0	weight of tube, membrane, plastic tops(2) and confining tube
0	weight of confining mold assy.
0	weight of membrane and plastic tops(2)
0	Moist soil weight (g)





Specimen No.		1
Initial	Water Content, %	21.3
	Dry Density, pcf	105.6
	Saturation, %	96.7
	Void Ratio	0.5955
	Diameter, in.	2.400
	Height, in.	5.790
At Test	Water Content, %	21.3
	Dry Density, pcf	105.6
	Saturation, %	96.4
	Void Ratio	0.5955
	Diameter, in.	2.400
	Height, in.	5.790
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		3600
Fail. Stress, psf		10433
Strain, %		14.9
Ult. Stress, psf		10433
Strain, %		
σ_1 Failure, psf		14033
σ_3 Failure, psf		3600

Type of Test: Unconsolidated Undrained

Sample Type: 2.4 Cal Mod

Description: SANDY lean CLAY (CL), yellowish brown

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 5% strain, Ultimate at 15%.

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F2 **Depth:** 31.0-31.5'

Sample Number: 9c

Proj. No.: 1201.7d **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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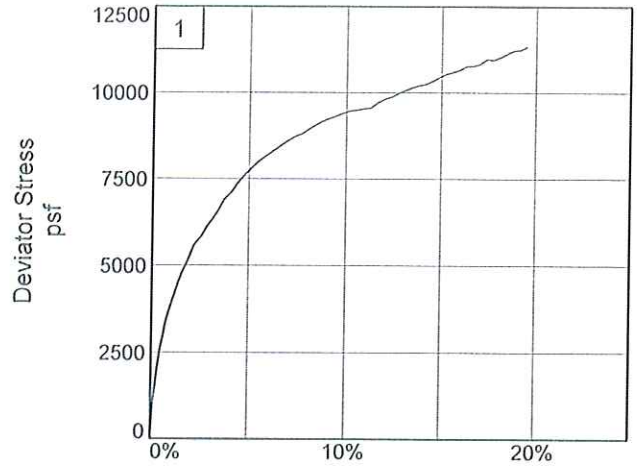
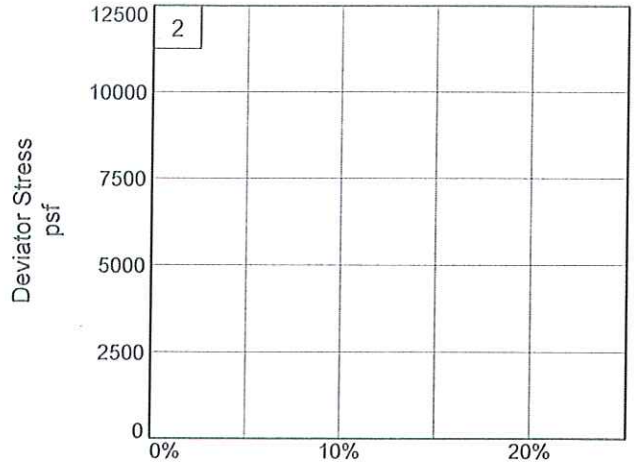
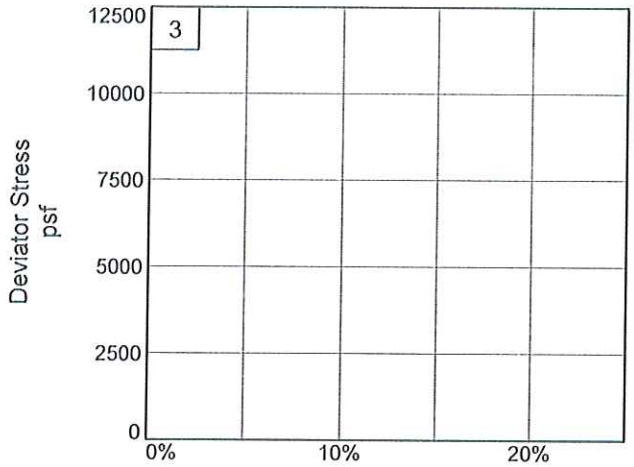
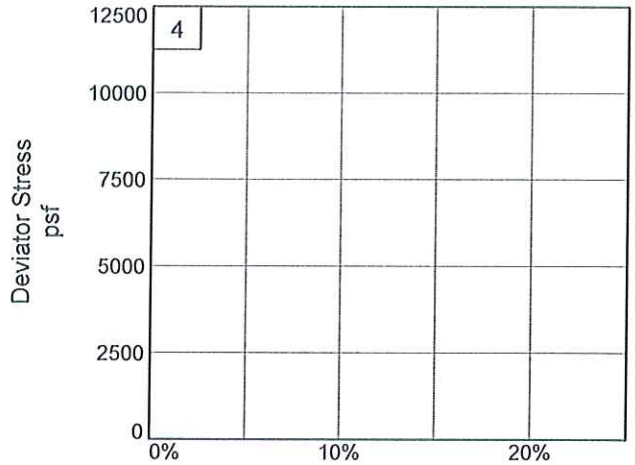
Figure _____

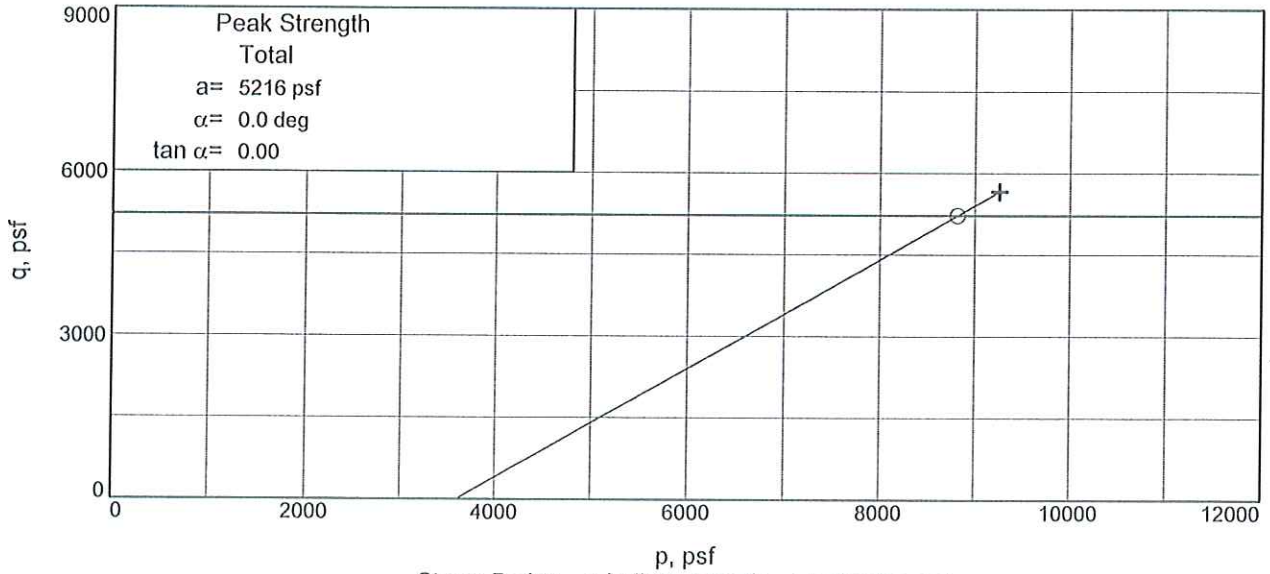
Tested By: MDR Checked By: RDS











Stress Paths: o indicates peak + indicates end

Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough
Source of Sample: F2 **Depth:** 31.0-31.5' **Sample Number:** 9c
Project No.: 1201.7d **Figure** _____

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Tested By: MDR **Checked By:** RDS

Triaxial Compression UU no pore pressure
ASTM D 2850

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Project Name: SR 99 Widening / Lone Tree Slough

Project Number: 1201.7d

Sample ID: F2-9c Depth (ft): 31.0-31.5

Sample Description: SANDY lean CLAY (CL), yellowish brown

Date: 5/13/2009 Tested By: MDR

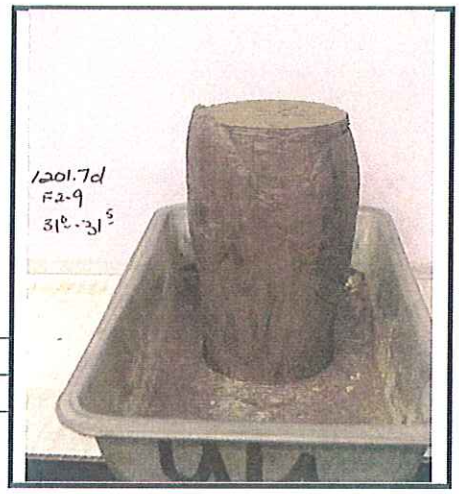
Staged test	
psf	psi
0	0.00
0	0.00
0	0.00

Specimen			
initial moisture		final moisture	
tare #	n/a	tare #	UU
wet + t =	n/a	wet + t =	986.69
dry + t =	n/a	dry + t =	832.26
tare =	n/a	tare =	105.87
Water (g)	#VALUE!		154.43
Dry Weight	#VALUE!		726.39
% Moisture	#VALUE!		21.3
Length of Sample =	5.79	in	
Diameter of Sample =	2.40	in	
moist soil =	881.29	gm	

Test Cell Pressure: 25

5%	15%
0.290	0.869

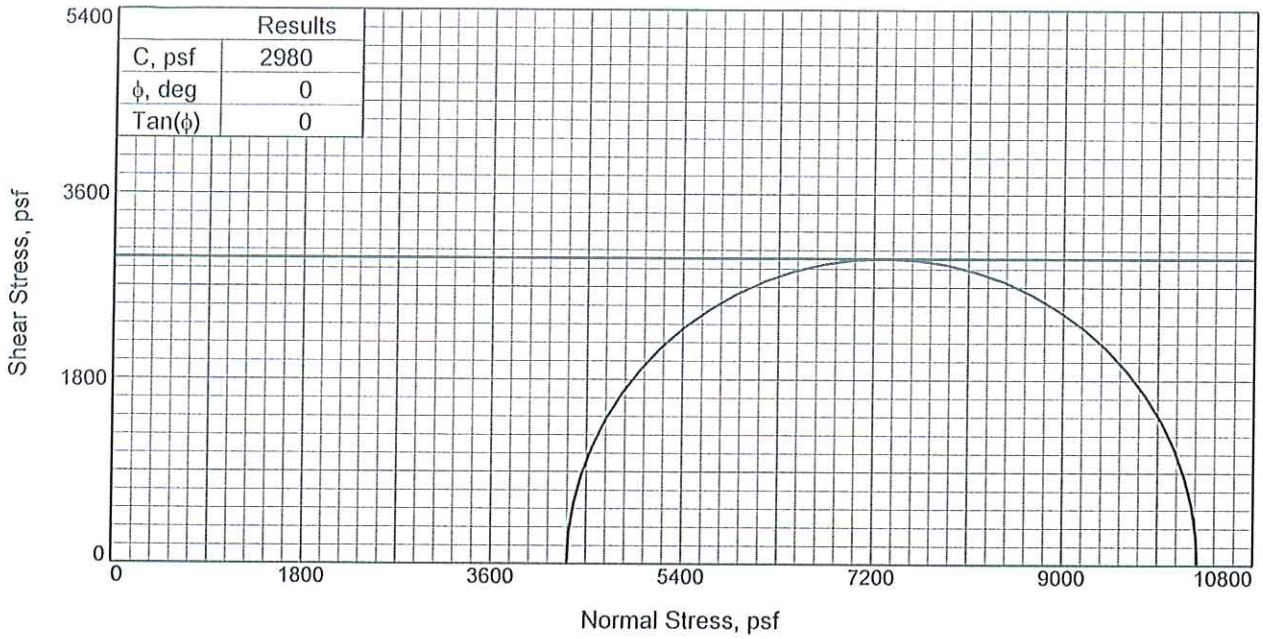
20%
1.158

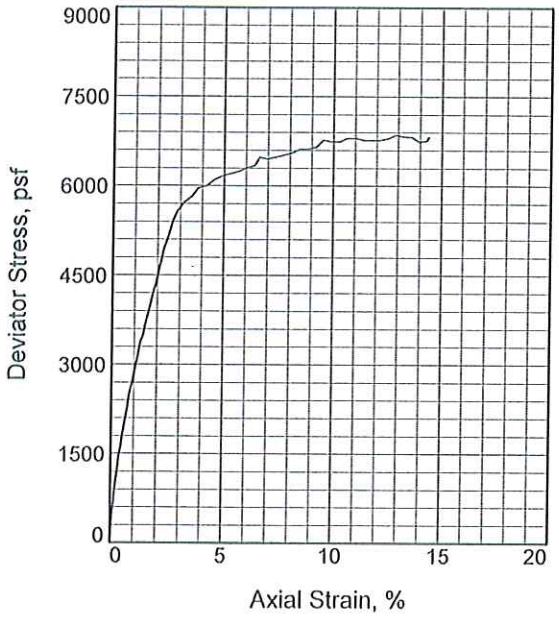


NOTES:

USE FOR SOFT SOIL PREPARATION

0	weight of tube, membrane, plastic tops(2) and confining tube
0	weight of confining mold assy.
0	weight of membrane and plastic tops(2)
0	Moist soil weight (g)





Specimen No.		1
Initial	Water Content, %	24.4
	Dry Density, pcf	98.2
	Saturation, %	92.1
	Void Ratio	0.7158
	Diameter, in.	2.390
	Height, in.	5.520
At Test	Water Content, %	24.6
	Dry Density, pcf	98.2
	Saturation, %	92.8
	Void Ratio	0.7158
	Diameter, in.	2.390
	Height, in.	5.520
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		4320
Fail. Stress, psf		5959
Strain, %		3.8
Ult. Stress, psf		6738
Strain, %		
σ_1 Failure, psf		10279
σ_3 Failure, psf		4320

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: Lean CLAY (CL), olive brown

Assumed Specific Gravity= 2.70

Remarks: Failure Chosen at 3.8%, Ultimate at 14% strain.

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F2 **Depth:** 35.5-36.0

Sample Number: 11b

Proj. No.: 1201.7d **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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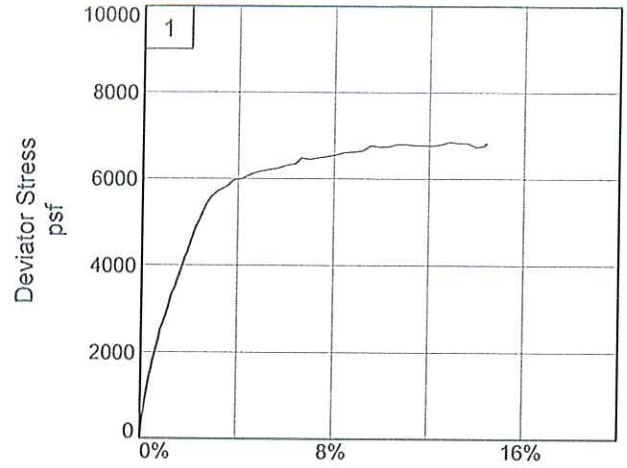
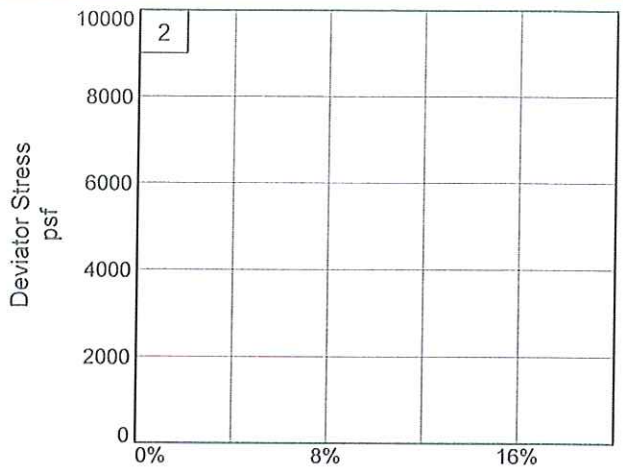
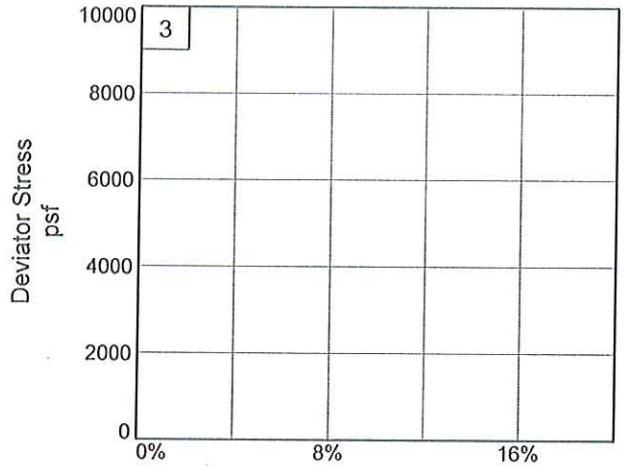
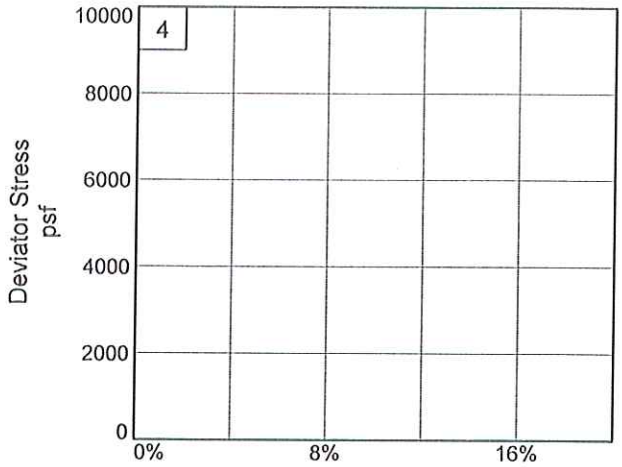
Figure _____

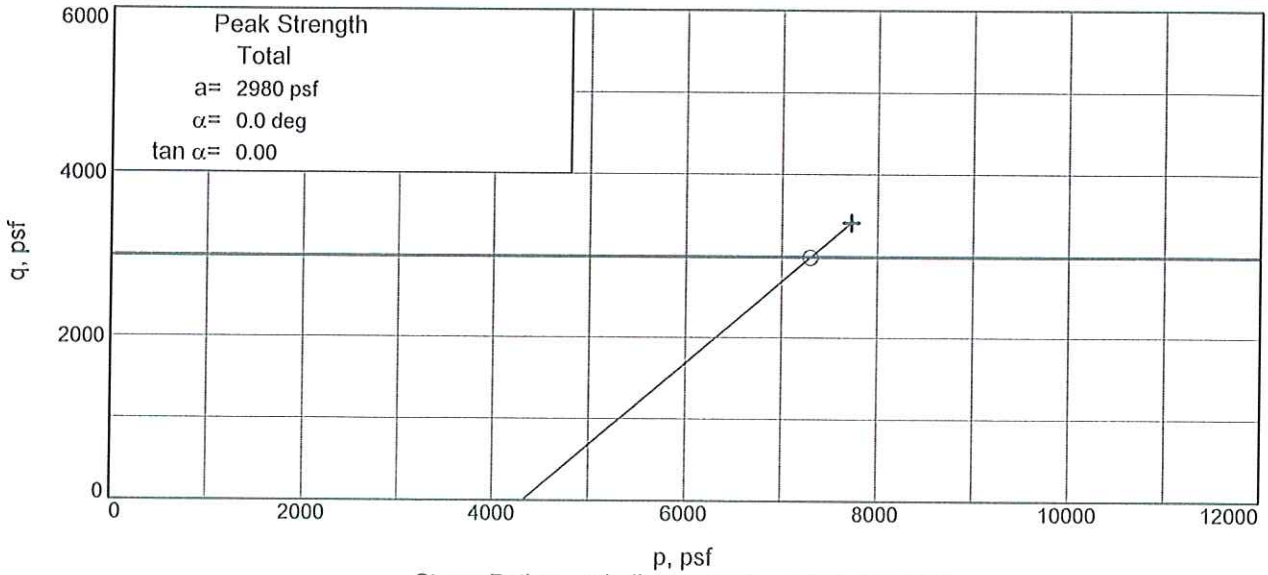
Tested By: MDR **Checked By:** RDS











Stress Paths: o indicates peak + indicates end

Client: HDR Inc.
Project: SR99 Widening - Lone Tree Slough
Source of Sample: F2 **Depth:** 35.5-36.0 **Sample Number:** 11b
Project No.: 1201.7d **Figure** _____

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Tested By: MDR **Checked By:** RDS

Triaxial Compression UU no pore pressure
ASTM D 2850

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Project Name: SR 99 Widening / Lone Tree Slough

Project Number: 1201.7d

Sample ID: F2-11b Depth (ft): 35.5-36.0

Sample Description: Lean CLAY (CL), olive brown

Date: 6/3/2009 Tested By: MDR

Staged test	
psf	psi
0	0.00
0	0.00
0	0.00

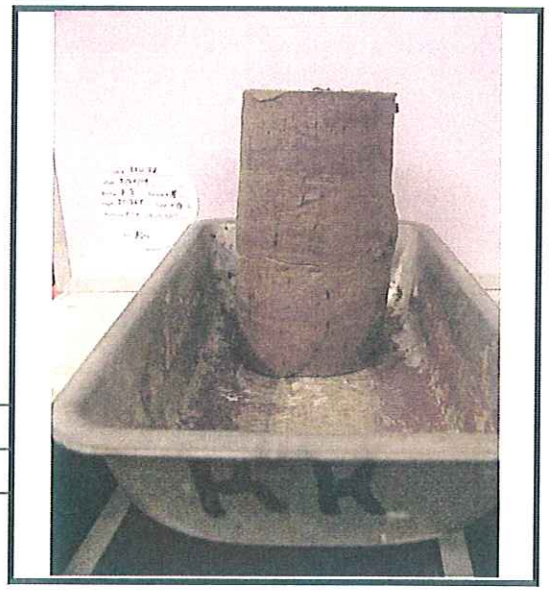
Specimen			
initial moisture		final moisture	
tare #	n/a	tare #	RR
wet + t =	n/a	wet + t =	900.74
dry + t =	n/a	dry + t =	743.66
tare =	n/a	tare =	105.06
Water (g)	#VALUE!		157.08
Dry Weight	#VALUE!		638.60
% Moisture	#VALUE!		24.6
Length of Sample =	5.52	in	
Diameter of Sample =	2.39	in	
moist soil =	794.51	gm	

Test Cell Pressure

30

5%	15%
0.276	0.828

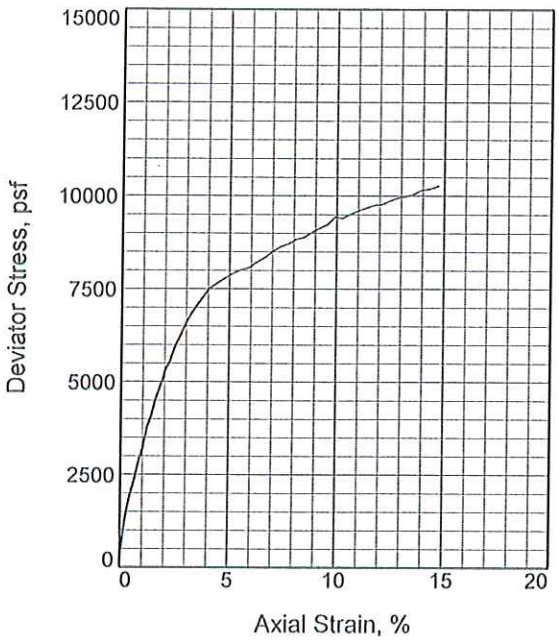
20%
1.104



NOTES:

USE FOR SOFT SOIL PREPARATION

0	weight of tube, membrane, plastic tops(2) and confining tube
0	weight of confining mold assy.
0	weight of membrane and plastic tops(2)
0	Moist soil weight (g)



Specimen No.		1
Initial	Water Content, %	21.5
	Dry Density, pcf	102.5
	Saturation, %	90.2
	Void Ratio	0.6447
	Diameter, in.	2.390
	Height, in.	5.600
At Test	Water Content, %	22.4
	Dry Density, pcf	102.5
	Saturation, %	93.9
	Void Ratio	0.6447
	Diameter, in.	2.390
	Height, in.	5.600
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		4320
Fail. Stress, psf		7514
Strain, %		4.1
Ult. Stress, psf		10263
Strain, %		
σ_1 Failure, psf		11834
σ_3 Failure, psf		4320

Type of Test:
Unconsolidated Undrained

Sample Type:

Description: SANDY lean CLAY (CL), medium brown, slightly cemented, with caliche stringers

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 4.1%, Ultimate at 14.7% strain.

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F3 **Depth:** 36.0-36.5

Sample Number: 11c

Proj. No.: 1201.7d **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

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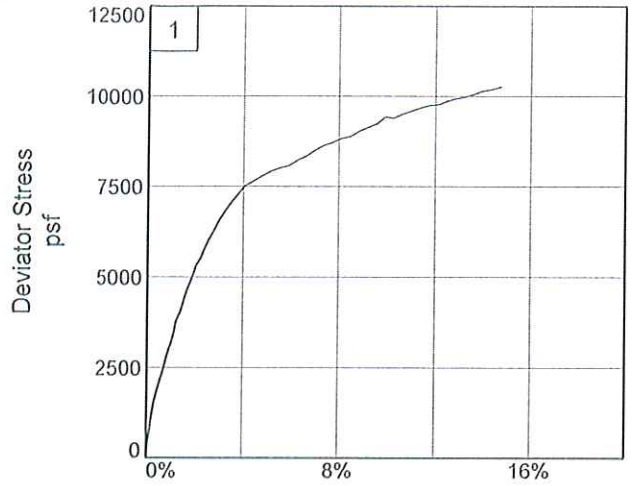
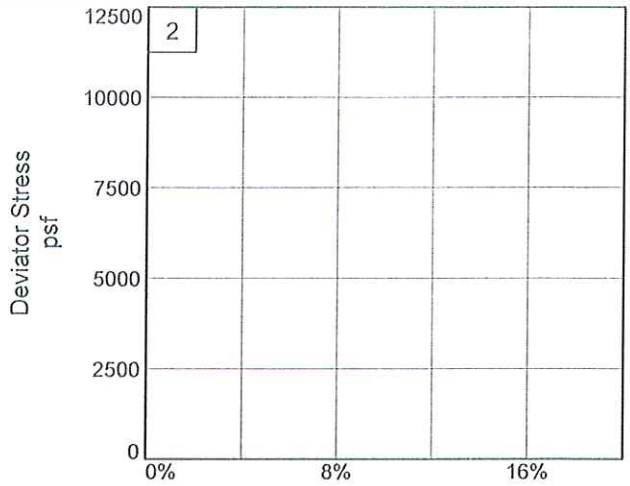
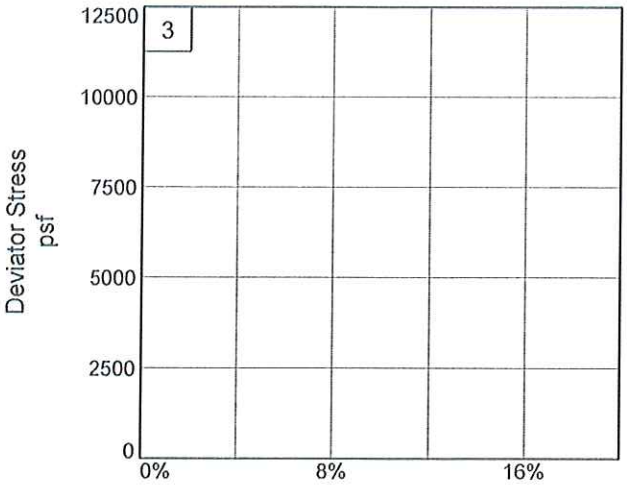
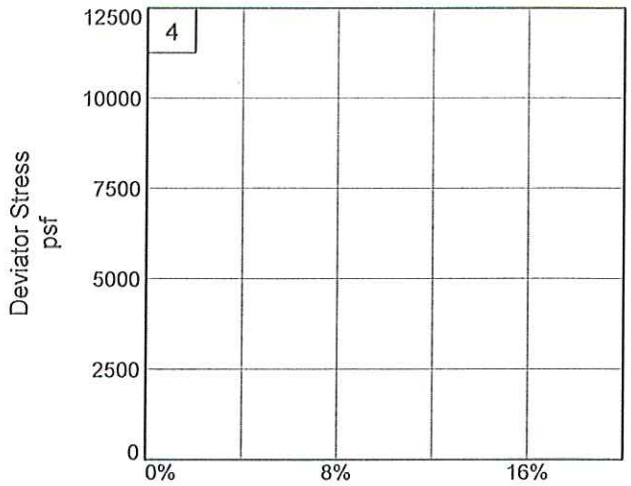
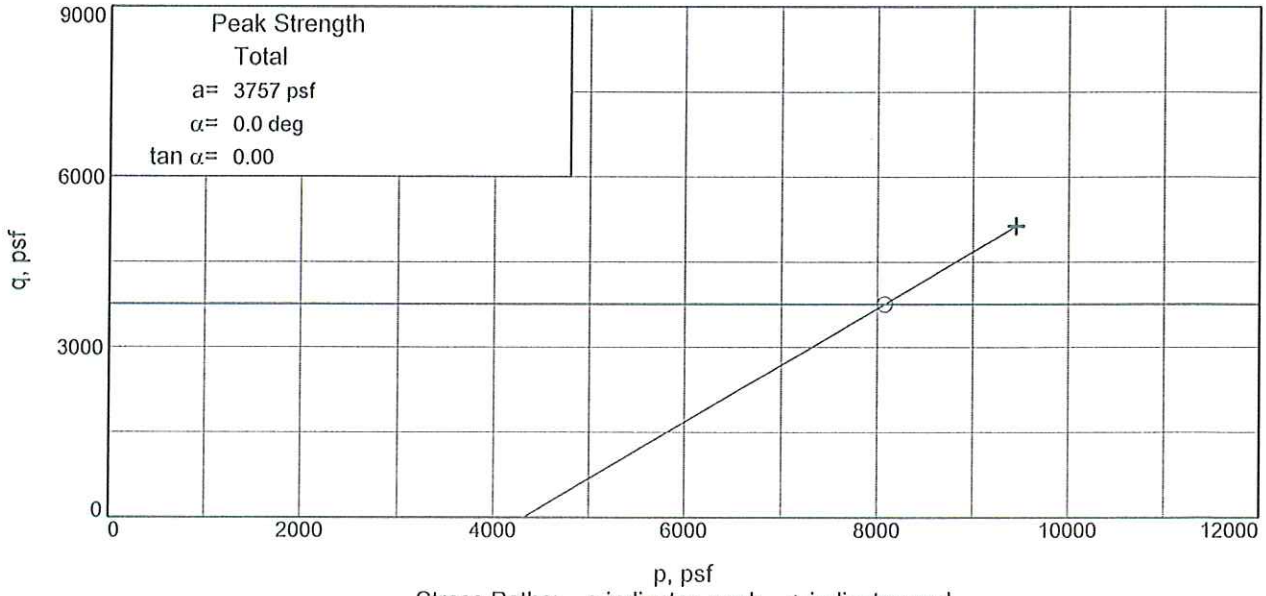
Figure _____











Stress Paths: o indicates peak + indicates end

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F3 **Depth:** 36.0-36.5 **Sample Number:** 11c

Project No.: 1201.7d **Figure** _____

Blackburn Consulting

Triaxial Compression UU no pore pressure
ASTM D 2850

blackburn consulting

Project Name: SR 99 Widening / Lone Tree Slough

Project Number: 1201.7d

Sample ID: F3-11c Depth (ft): 36.0-36.5

Sample Description: SANDY lean CLAY (CL), medium brown, slightly cemented, with caliche stringers

Date: 6/3/2009 Tested By: MDR

Staged test	
psf	psi
0	0.00
0	0.00
0	0.00

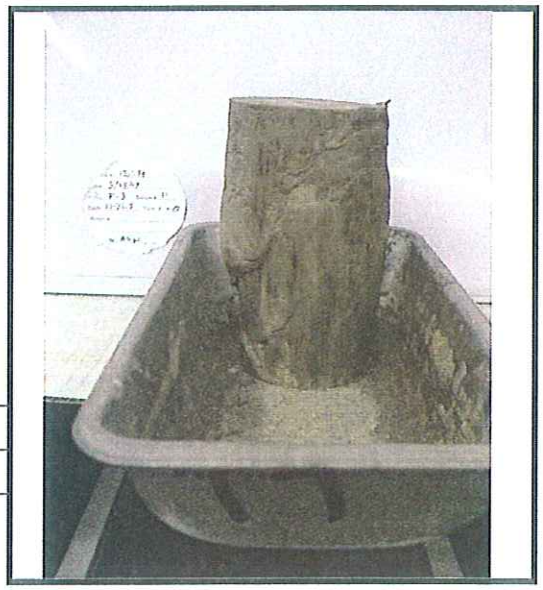
Specimen			
initial moisture		final moisture	
tare #	n/a	tare #	TT
wet + t =	n/a	wet + t =	932.63
dry + t =	n/a	dry + t =	781.11
tare =	n/a	tare =	105.27
Water (g)	#VALUE!		151.52
Dry Weight	#VALUE!		675.84
% Moisture	#VALUE!		22.4
Length of Sample =	5.60	in	
Diameter of Sample =	2.39	in	
moist soil =	821.39	gm	

Test Cell Pressure

30

5%	15%
0.280	0.840

20%
1.120



NOTES:

USE FOR SOFT SOIL PREPARATION

0	weight of tube, membrane, plastic tops(2) and confining tube
0	weight of confining mold assy.
0	weight of membrane and plastic tops(2)
0	Moist soil weight (g)

Unconfined Compression Test
ASTM D 2166-00

Project Name	SR 99 Manteca - Lone Tree Slough		
Project Number	1201.7d		
Sample	F4-4c	Depth	21.0-21.5
Sample Description	Olive Brown SILT with Sand (ML)		
Date	8/29/2009		
Tested By:	KISB		

Original Sample Length	5.55
Original Diameter (in)	2.41
Sample Area (in^2)	4.54
Sample Weight (g)	801.80

axial strain	**1.7%**
Average cross-sectional area (in^2)	**4.62**
Average cross-sectional area (ft^2)	0.032
Peak Reading	0.096
Maximum Load(lb)	70
Compressive Strength (tsf)	**1.09**

Moisture Density

Wet Sample Weight (g)	905.3
Tare Number	QQ
Tare Weight (g)	105.7
Dry Sample Weight (g)	726.3
Dry Weight (g)	620.6
Water Weight (g)	179.0
Percent Moisture (%)*	28.8
Wet Density (pcf)	121.1
Dry Density (pcf)	94.0

Remarks:

* % moisture taken after test.

Compression Tests

Dial reading @ 0 lb	0.003

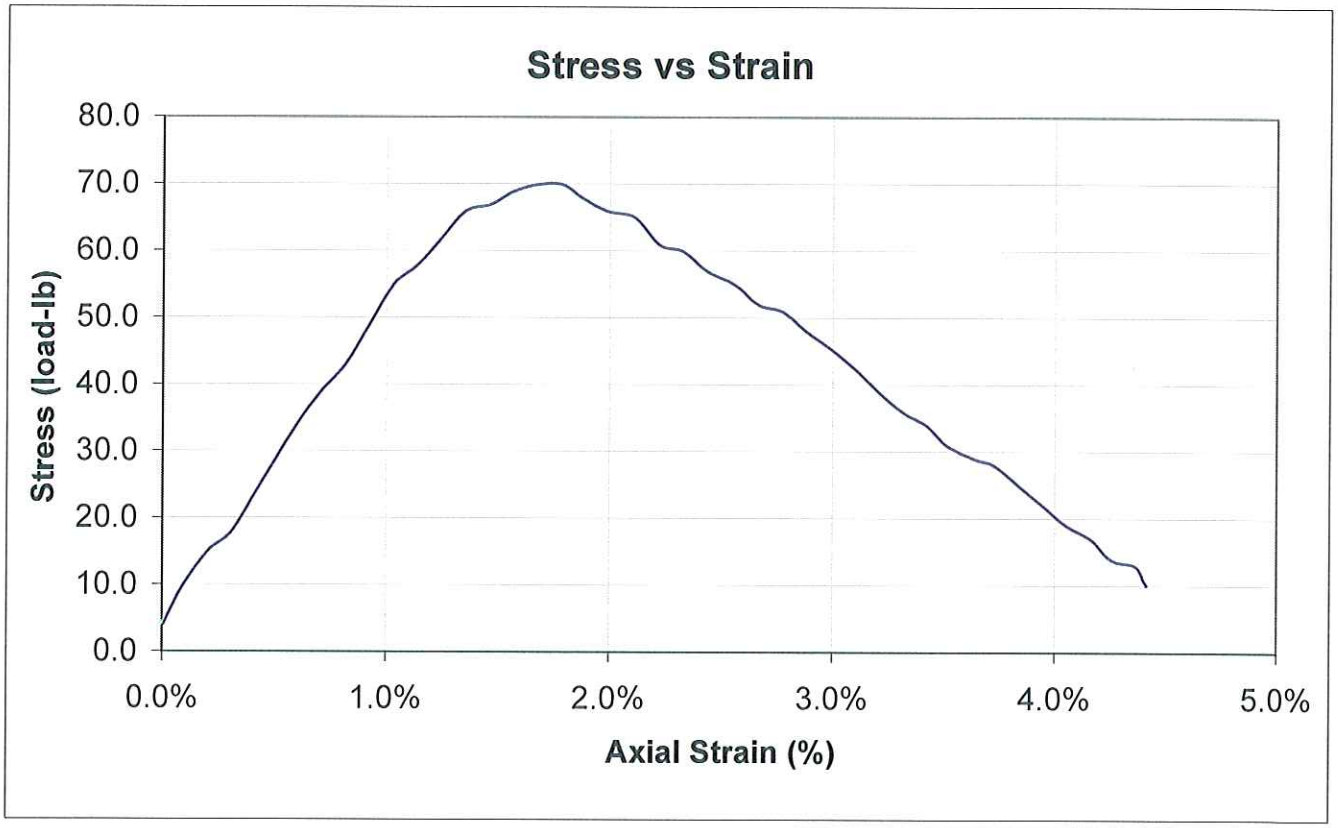
Rate of Strain=0.056in/min

Unconfined Compression Test Readings

Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb	Dial Reading	Lb
0.003	4.000	0.096	70.000	0.193	34.000		
0.008	10.000	0.102	70.000	0.198	31.000		
0.014	15.000	0.107	68.000	0.205	29.000		
0.020	18.000	0.113	66.000	0.210	28.000		
0.025	23.000	0.120	65.000	0.216	25.000		
0.031	29.000	0.126	61.000	0.222	22.000		
0.036	34.000	0.132	60.000	0.228	19.000		
0.042	39.000	0.138	57.000	0.234	17.000		
0.048	43.000	0.145	55.000	0.239	14.000		
0.054	49.000	0.151	52.000	0.245	13.000		
0.060	55.000	0.157	51.000	0.247	11.000		
0.066	58.000	0.163	48.000	0.247	11.000		
0.072	62.000	0.170	45.000	0.248	10.000		
0.078	66.000	0.176	42.000				
0.084	67.000	0.181	39.000				
0.090	69.000	0.187	36.000				

Project
SR 99 Manteca - Lone Tree Slough
Project Number
1201.7d
Sample Number
F4-4c
Material Description
Olive Brown SILT with Sand (ML)
Tested By
KISB

ASTM D 2166-00



Wet Density (pcf)	121.1
Dry Density (pcf)	94.0
% Moisture	28.8

Unconfined Compressive Strength (tsf) 1.1

Triaxial Compression UU
ASTM D 4767

blackburn consulting

Project Name: SR 99 Manteca - Lone Tree Slough

Project Number: 1201.7d

Sample ID: F4-6c **Depth (ft):** 31.0-31.5

Sample Description: Yellowish Brown Silty CLAY (CL-ML)

Date: 9/4/09 **Tested By:** KISB

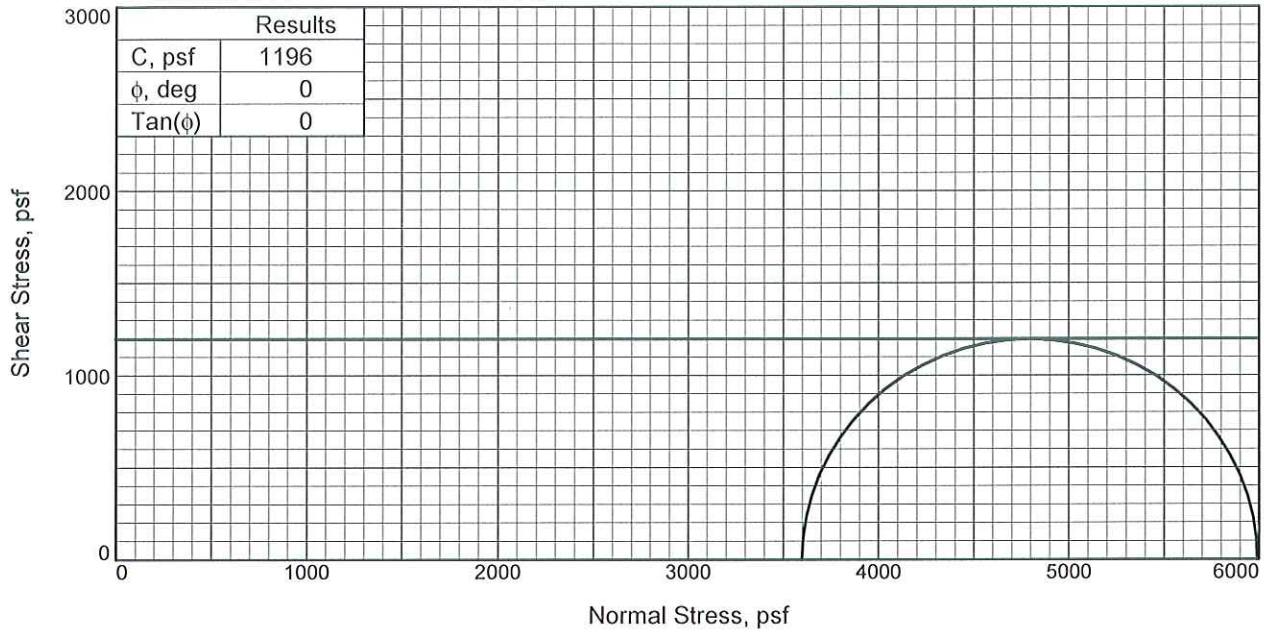
UU	X	
CU		Staged

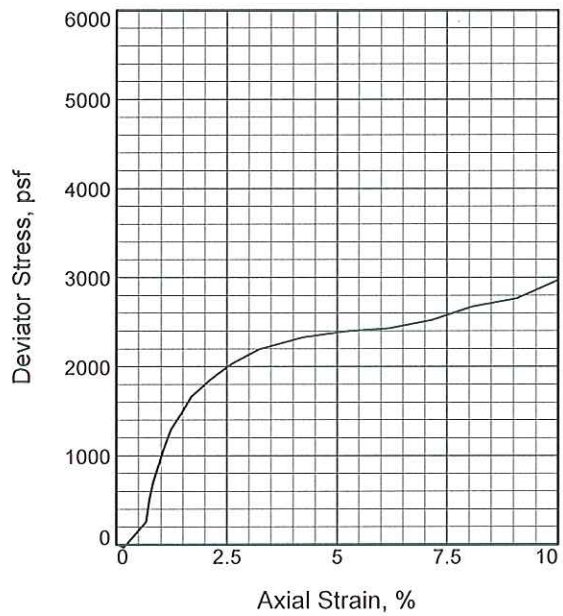
Specimen			
Initial		Final	
Tare No.	B2	Tare No.	SS
Tare =	46.5	Tare =	105.1
Wet Soil + Tare =	88.0	Wet Soil + Tare =	825.1
Dry Soil + Tare =	78.4	Dry Soil + Tare =	637.9
Water Content (%)	30.1%	Water Content (%)	35.1%

Cell	Base	Top	TEST PSI	Actual
25.00	0.00	0.00	25.00	24.99
0.00		0.00		
0.00		0.00		

Length of Sample =	5.258	in	5%	0.26
Diameter of Sample =	2.406	in	10%	0.53
Area=	4.5	in^3	15%	0.79
Weight of Sample =	720.00	gm		
Specific Gravity=	2.70			
Initial Wet Density =	114.5	pcf		
Initial Dry Density =	88.0	pcf		

NOTES:





Specimen No.		1
Initial	Water Content, %	35.1
	Dry Density, pcf	84.9
	Saturation, %	96.3
	Void Ratio	0.9852
	Diameter, in.	2.406
	Height, in.	5.258
At Test	Water Content, %	35.1
	Dry Density, pcf	86.5
	Saturation, %	100.0
	Void Ratio	0.9486
	Diameter, in.	2.395
	Height, in.	5.208
Strain rate, %/min.		0.02
Back Pressure, psf		0
Cell Pressure, psf		3599
Fail. Stress, psf		2393
Strain, %		5.2
Ult. Stress, psf		2963
Strain, %		
σ_1 Failure, psf		5992
σ_3 Failure, psf		3599

Type of Test: Unconsolidated Undrained

Sample Type: 2.4" Mod Cal

Description: Yellowish Brown Silty CLAY (CL-ML)

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 5% Strain
Ultimate at 10% Strain

Figure _____

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F4 **Depth:** 31.0-31.5

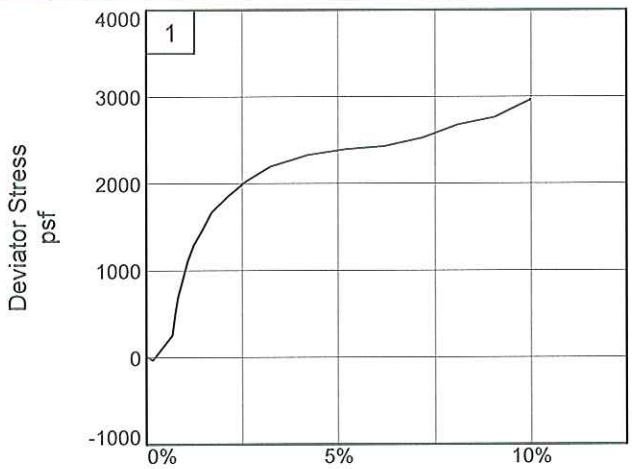
Sample Number: 6c

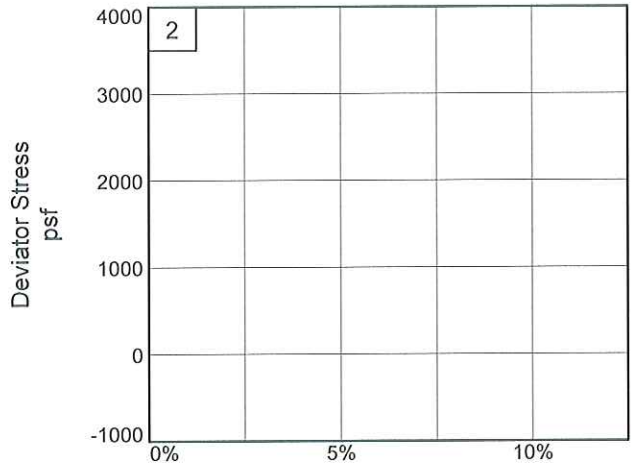
Proj. No.: 1201.7d **Date Sampled:**

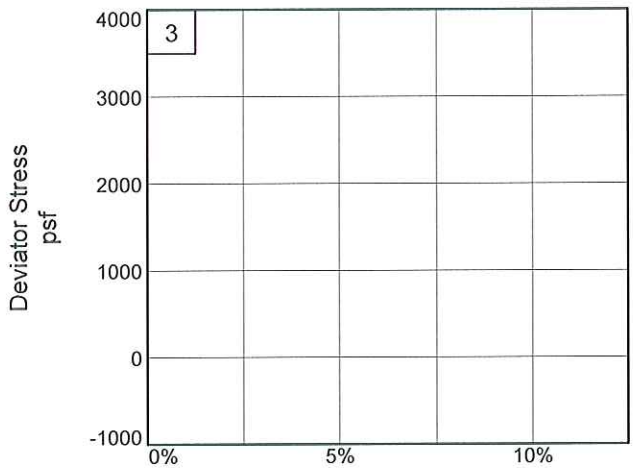
TRIAXIAL SHEAR TEST REPORT

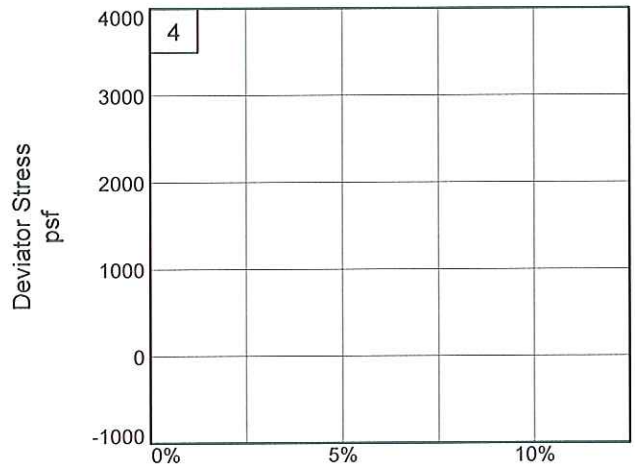
Blackburn Consulting

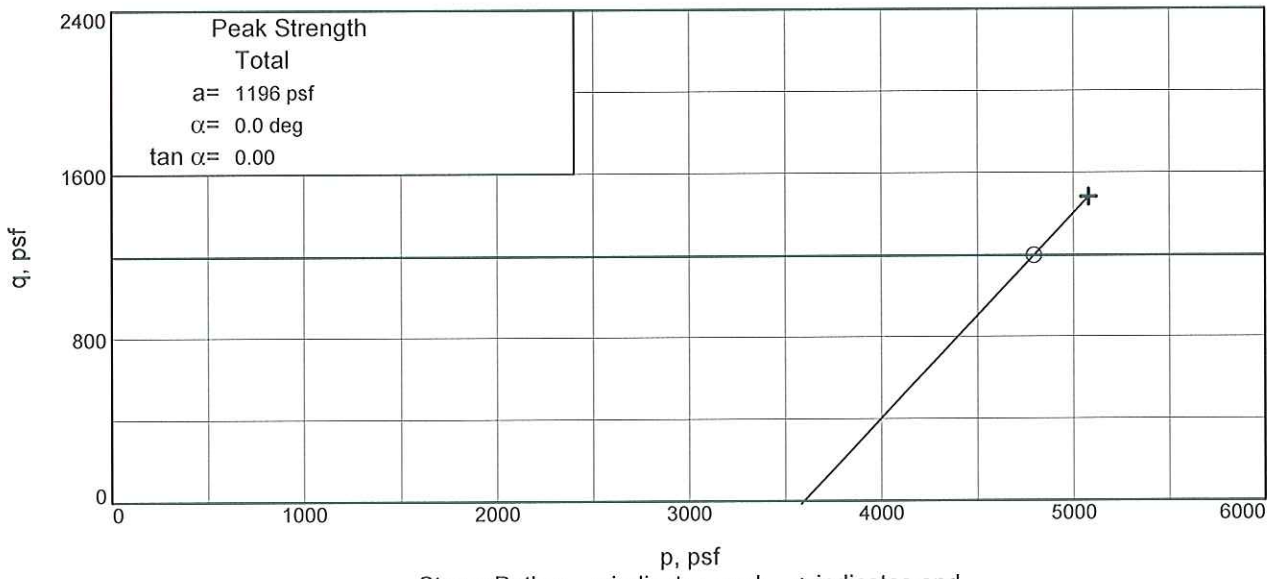
Tested By: KISB











Stress Paths: o indicates peak + indicates end

Client: HDR Inc.

Project: SR99 Widening - Lone Tree Slough

Source of Sample: F4 **Depth:** 31.0-31.5 **Sample Number:** 6c

Project No.: 1201.7d **Figure** _____

Blackburn Consulting

Tested By: KISB

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LONE TREE SLOUGH Site ID : F1-11B.
Your purchase order number is 1201.7D.
Thank you for your business.

* For future reference to this analysis please use SUN # 56552-114222.

EVALUATION FOR SOIL CORROSION

Soil pH	7.66	
Minimum Resistivity	1.21 ohm-cm (x1000)	
Chloride	24.8 ppm	00.00248 %
Sulfate	26.2 ppm	00.00262 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LONE TREE SLOUGH Site ID : F2-3C.
Your purchase order number is 1201.7D.
Thank you for your business.

* For future reference to this analysis please use SUN # 56552-114223.

EVALUATION FOR SOIL CORROSION

Soil pH	7.47	
Minimum Resistivity	1.05 ohm-cm (x1000)	
Chloride	39.0 ppm	00.00390 %
Sulfate	21.1 ppm	00.00211 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LONE TREE SLOUGH Site ID : F3-6C.
Your purchase order number is 1201.7D.
Thank you for your business.

* For future reference to this analysis please use SUN # 56552-114224.

EVALUATION FOR SOIL CORROSION

Soil pH	7.77		
Minimum Resistivity	1.80 ohm-cm (x1000)		
Chloride	21.9 ppm	00.00219	%
Sulfate	4.6 ppm	00.00046	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical

11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LONE TREE SLOUGH Site ID : F4-1B.
Your purchase order number is 1201.7D.
Thank you for your business.

* For future reference to this analysis please use SUN # 56552-114225.

EVALUATION FOR SOIL CORROSION

Soil pH	8.04	
Minimum Resistivity	1.39 ohm-cm (x1000)	
Chloride	38.3 ppm	00.00383 %
Sulfate	29.7 ppm	00.00297 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

APPENDIX C

Abutments 1 & 4: Class 90 Pile Calculations

DRIVEN 1.2

Checked By: DJM
Date: 7/16/10

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7DS\ENGINE~1\DRIVEN~1\ABT1REV.DVN
Project Name: Lone Tree OR Abutment 1 Project Date: 07/15/2010
Project Client: HDR
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	24.30 ft
	- Driving/Restrike	24.30 ft
	- Ultimate:	24.30 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

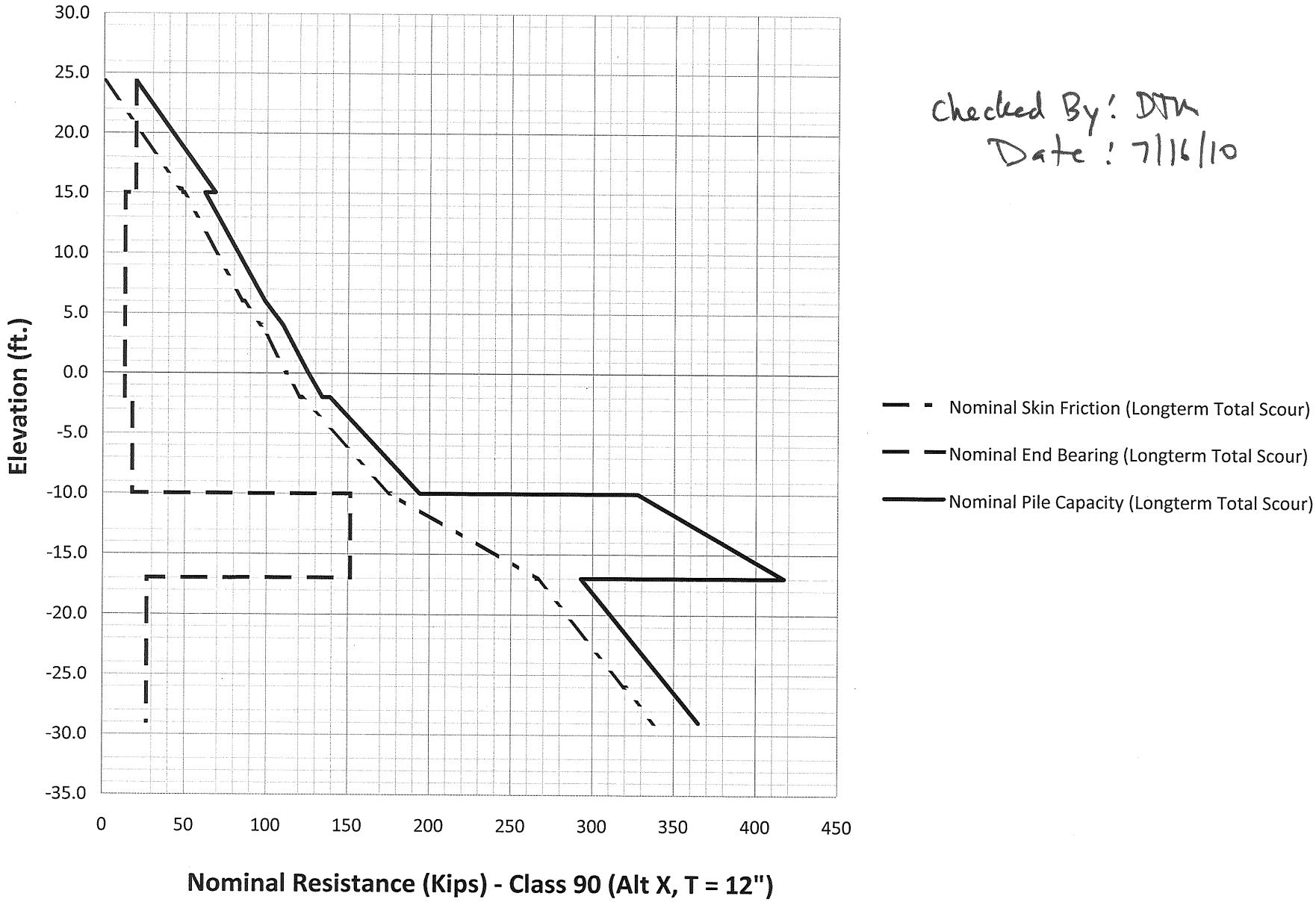
ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	9.30 ft	0.00%	130.00 pcf	2200.00 psf	T-79 Concrete
2	Cohesionless	11.00 ft	0.00%	121.00 pcf	33.0/30.0	Nordlund
3	Cohesionless	6.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
4	Cohesive	8.00 ft	0.00%	126.00 pcf	2000.00 psf	T-79 Concrete
5	Cohesionless	7.00 ft	0.00%	141.00 pcf	36.0/36.0	Nordlund
6	Cohesive	12.00 ft	0.00%	127.00 pcf	3000.00 psf	T-79 Concrete

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	19.80 Kips	19.85 Kips
9.01 ft	47.21 Kips	19.80 Kips	67.01 Kips
9.29 ft	48.68 Kips	19.80 Kips	68.48 Kips
9.31 ft	48.76 Kips	13.32 Kips	62.08 Kips
18.31 ft	85.52 Kips	13.32 Kips	98.84 Kips
20.29 ft	96.67 Kips	13.32 Kips	109.99 Kips
20.31 ft	96.77 Kips	13.32 Kips	110.09 Kips
24.29 ft	112.24 Kips	13.32 Kips	125.56 Kips
24.31 ft	112.32 Kips	13.32 Kips	125.64 Kips
26.29 ft	120.84 Kips	13.32 Kips	134.16 Kips
26.31 ft	120.95 Kips	18.00 Kips	138.95 Kips
34.29 ft	175.93 Kips	18.00 Kips	193.93 Kips
34.31 ft	176.12 Kips	151.60 Kips	327.72 Kips
41.29 ft	265.66 Kips	151.60 Kips	417.26 Kips
41.31 ft	265.85 Kips	27.00 Kips	292.85 Kips
50.31 ft	320.03 Kips	27.00 Kips	347.03 Kips
53.29 ft	337.97 Kips	27.00 Kips	364.97 Kips

Abutment 1 Pile Nominal Resistance (Compression) - Lone Tree Slough SB OR



Checked By: DTM
Date: 7/16/10

Lone Tree Slough SB OR (Bridge No. 29-0033)
10-SJ-99, PM 11.80, EA: OE6101

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Checked By: DJM
Date: 7/16/10

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7DS\ENGINE~1\DRIVEN~1\ABT4REV.DVN
Project Name: Lone Tree OR Abutment 4 Project Date: 07/15/2010
Project Client: HDR
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 12.00 in

ULTIMATE CONSIDERATIONS

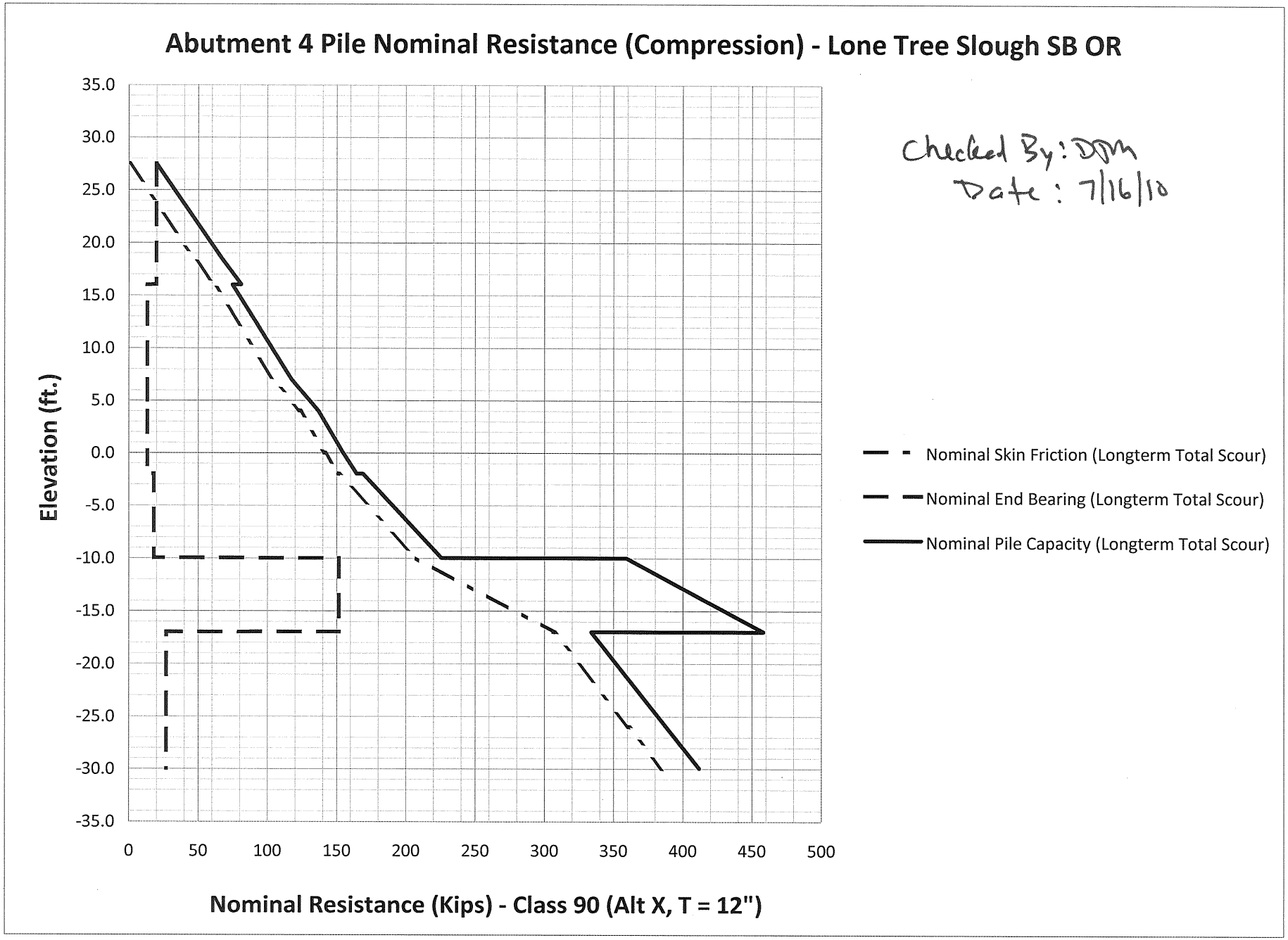
Water Table Depth At Time Of:	- Drilling:	27.50 ft
	- Driving/Restrike	27.50 ft
	- Ultimate:	27.50 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	11.50 ft	0.00%	130.00 pcf	2200.00 psf	T-79 Concrete
2	Cohesionless	12.00 ft	0.00%	121.00 pcf	33.0/30.0	Nordlund
3	Cohesionless	6.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
4	Cohesive	8.00 ft	0.00%	126.00 pcf	2000.00 psf	T-79 Concrete
5	Cohesionless	7.00 ft	0.00%	141.00 pcf	36.0/36.0	Nordlund
6	Cohesive	13.00 ft	0.00%	127.00 pcf	3000.00 psf	T-79 Concrete

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	19.80 Kips	19.85 Kips
9.01 ft	47.21 Kips	19.80 Kips	67.01 Kips
11.49 ft	61.37 Kips	19.80 Kips	81.17 Kips
11.51 ft	61.47 Kips	13.32 Kips	74.79 Kips
20.51 ft	104.22 Kips	13.32 Kips	117.54 Kips
23.49 ft	123.41 Kips	13.32 Kips	136.73 Kips
23.51 ft	123.52 Kips	13.32 Kips	136.84 Kips
27.49 ft	141.25 Kips	13.32 Kips	154.57 Kips
27.51 ft	141.35 Kips	13.32 Kips	154.67 Kips
29.49 ft	150.99 Kips	13.32 Kips	164.31 Kips
29.51 ft	151.11 Kips	18.00 Kips	169.11 Kips
37.49 ft	207.57 Kips	18.00 Kips	225.57 Kips
37.51 ft	207.77 Kips	151.60 Kips	359.37 Kips
44.49 ft	306.61 Kips	151.60 Kips	458.21 Kips
44.51 ft	306.82 Kips	27.00 Kips	333.82 Kips
53.51 ft	361.00 Kips	27.00 Kips	388.00 Kips
57.49 ft	384.96 Kips	27.00 Kips	411.96 Kips



Checked By: DJM
Date: 7/16/10

Lone Tree Slough SB OR (Bridge No. 29-0033)
10-SJ-99, PM 11.80, EA: OE6101

Lone Tree Slough Widen/OR
BCI No. 1201.7d
02/09/10
By: WEN

Checked By: DJM
Date: 7/16/10

Abutment Pile Settlement Calculations: Class 90 Piles

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

Service-I Limit Per Pile Load (lbs)		80000
A	*Average Axial Load (lbs)	40000
B	Pile Length (in.)	348
C	Tip Area (sq. in.)	144
D	Concrete Modulus of Elasticity (psi)	4415201
Axial Compression (in.)		**0.02**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	555.6
B	Pile Diameter (in.)	12
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	2400
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
Point Settlement (in.)		**0.63**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = 0.65 in.
16.6 mm

APPENDIX D

Bents: 15” PC/PS Concrete Pile Extension Calculations

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Checked By: DJM
Date: 7/16/10

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7DS\ENGINE~1\DRIVEN~1\BNTEND.DVN
Project Name: Lone Tree Bents End Brng
Project Date: 07/15/2010
Project Client: HDR
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 13.30 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	22.00 ft
	- Driving/Restrike	22.00 ft
	- Ultimate:	22.00 ft
Ultimate Considerations:	- Local Scour:	2.10 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	7.00 ft	0.00%	130.00 pcf	2200.00 psf	T-79 Concrete
2	Cohesionless	11.00 ft	0.00%	121.00 pcf	33.0/30.0	Nordlund
3	Cohesionless	6.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
4	Cohesive	8.00 ft	0.00%	126.00 pcf	2000.00 psf	T-79 Concrete
5	Cohesionless	7.00 ft	0.00%	141.00 pcf	36.0/36.0	Nordlund
6	Cohesive	11.00 ft	0.00%	127.00 pcf	3000.00 psf	T-79 Concrete

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.06 Kips	24.32 Kips	24.38 Kips
6.99 ft	40.60 Kips	24.32 Kips	64.92 Kips
7.01 ft	40.68 Kips	16.36 Kips	57.04 Kips
16.01 ft	78.85 Kips	16.36 Kips	95.21 Kips
17.99 ft	91.08 Kips	16.36 Kips	107.44 Kips
18.01 ft	91.18 Kips	16.36 Kips	107.54 Kips
21.99 ft	108.21 Kips	16.36 Kips	124.57 Kips
22.01 ft	108.30 Kips	16.36 Kips	124.66 Kips
23.99 ft	117.79 Kips	16.36 Kips	134.15 Kips
24.01 ft	117.91 Kips	22.11 Kips	140.02 Kips
31.99 ft	176.06 Kips	22.11 Kips	198.17 Kips
32.01 ft	176.27 Kips	186.23 Kips	362.50 Kips
38.99 ft	280.81 Kips	186.23 Kips	467.03 Kips
39.01 ft	281.03 Kips	33.17 Kips	314.20 Kips
48.01 ft	341.08 Kips	33.17 Kips	374.25 Kips
49.99 ft	354.30 Kips	33.17 Kips	387.46 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.09 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.10 ft	0.00 Kips	24.32 Kips	24.32 Kips
6.99 ft	28.40 Kips	24.32 Kips	52.72 Kips
7.01 ft	28.48 Kips	16.36 Kips	44.85 Kips
16.01 ft	66.65 Kips	16.36 Kips	83.02 Kips
17.99 ft	78.88 Kips	16.36 Kips	95.24 Kips
18.01 ft	78.99 Kips	16.36 Kips	95.35 Kips
21.99 ft	96.01 Kips	16.36 Kips	112.37 Kips
22.01 ft	96.11 Kips	16.36 Kips	112.47 Kips
23.99 ft	105.59 Kips	16.36 Kips	121.96 Kips
24.01 ft	105.71 Kips	22.11 Kips	127.82 Kips
31.99 ft	163.86 Kips	22.11 Kips	185.97 Kips
32.01 ft	164.08 Kips	186.23 Kips	350.30 Kips
38.99 ft	268.61 Kips	186.23 Kips	454.84 Kips
39.01 ft	268.84 Kips	33.17 Kips	302.00 Kips
48.01 ft	328.89 Kips	33.17 Kips	362.06 Kips
49.99 ft	342.10 Kips	33.17 Kips	375.27 Kips

DRIVEN 1.2

checked By: DJM
Date: 7/16/10

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7DS\ENGINE~1\DRIVEN~1\BNTSIDE.DVN
Project Name: Lone Tree Bents Skin Frctn Project Date: 07/15/2010
Project Client: HDR
Computed By: WEN
Project Manager: WEN

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 11.80 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	22.00 ft
	- Driving/Restrike	22.00 ft
	- Ultimate:	22.00 ft
Ultimate Considerations:	- Local Scour:	2.10 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	7.00 ft	0.00%	130.00 pcf	2200.00 psf	T-79 Concrete
2	Cohesionless	11.00 ft	0.00%	121.00 pcf	33.0/30.0	Nordlund
3	Cohesionless	6.00 ft	0.00%	120.00 pcf	28.0/28.0	Nordlund
4	Cohesive	8.00 ft	0.00%	126.00 pcf	2000.00 psf	T-79 Concrete
5	Cohesionless	7.00 ft	0.00%	141.00 pcf	36.0/36.0	Nordlund
6	Cohesive	11.00 ft	0.00%	127.00 pcf	3000.00 psf	T-79 Concrete

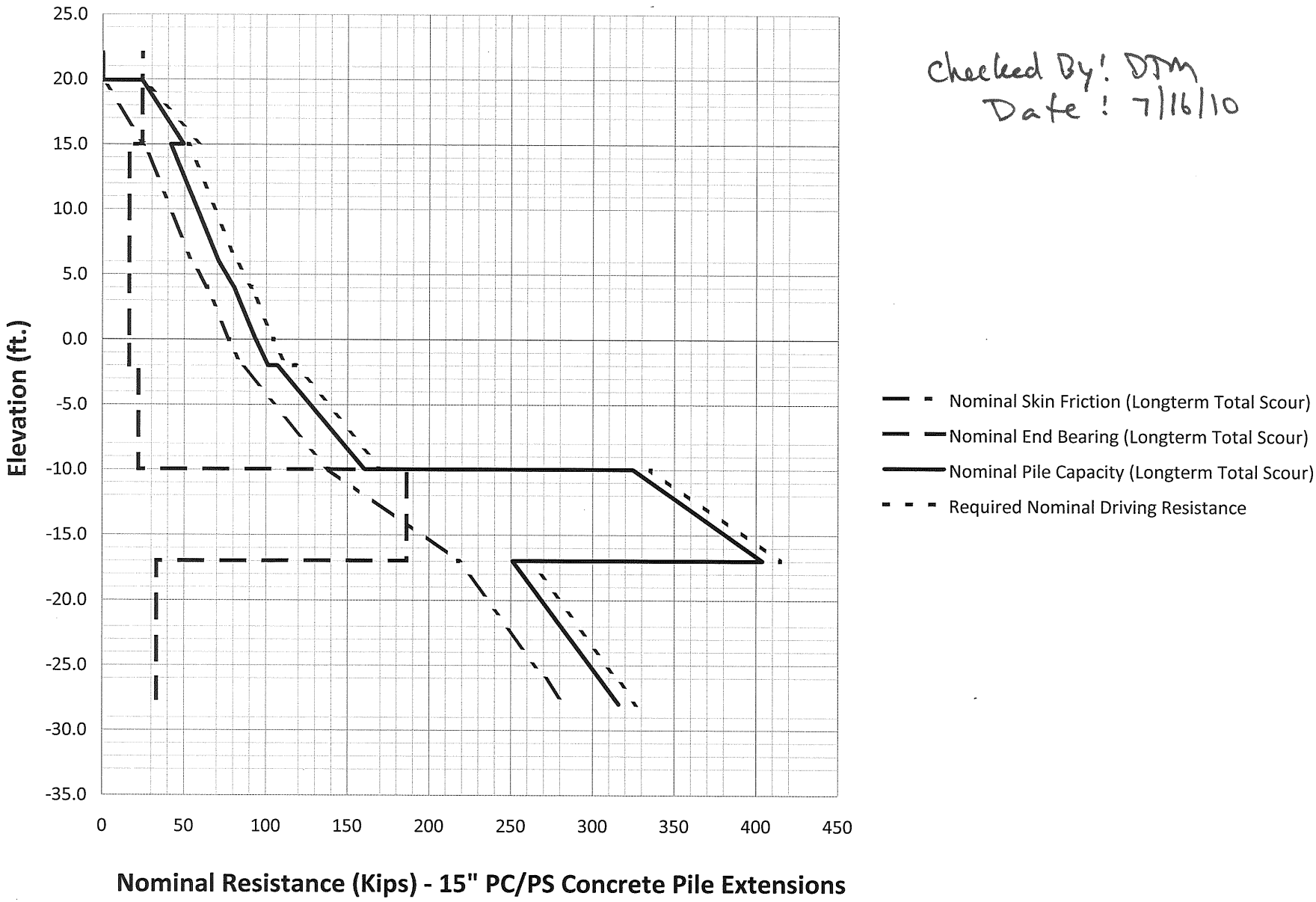
DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	19.15 Kips	19.20 Kips
6.99 ft	36.02 Kips	19.15 Kips	55.16 Kips
7.01 ft	36.09 Kips	12.88 Kips	48.97 Kips
16.01 ft	65.39 Kips	12.88 Kips	78.27 Kips
17.99 ft	74.77 Kips	12.88 Kips	87.65 Kips
18.01 ft	74.85 Kips	12.88 Kips	87.73 Kips
21.99 ft	88.15 Kips	12.88 Kips	101.03 Kips
22.01 ft	88.23 Kips	12.88 Kips	101.11 Kips
23.99 ft	95.64 Kips	12.88 Kips	108.52 Kips
24.01 ft	95.74 Kips	17.41 Kips	113.14 Kips
31.99 ft	149.00 Kips	17.41 Kips	166.40 Kips
32.01 ft	149.18 Kips	146.59 Kips	295.76 Kips
38.99 ft	228.47 Kips	146.59 Kips	375.06 Kips
39.01 ft	228.65 Kips	26.11 Kips	254.76 Kips
48.01 ft	281.93 Kips	26.11 Kips	308.04 Kips
49.99 ft	293.65 Kips	26.11 Kips	319.76 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.09 ft	0.00 Kips	0.00 Kips	0.00 Kips
2.10 ft	0.00 Kips	19.15 Kips	19.15 Kips
6.99 ft	25.20 Kips	19.15 Kips	44.34 Kips
7.01 ft	25.27 Kips	12.88 Kips	38.15 Kips
16.01 ft	54.57 Kips	12.88 Kips	67.45 Kips
17.99 ft	63.95 Kips	12.88 Kips	76.83 Kips
18.01 ft	64.03 Kips	12.88 Kips	76.91 Kips
21.99 ft	77.33 Kips	12.88 Kips	90.21 Kips
22.01 ft	77.41 Kips	12.88 Kips	90.29 Kips
23.99 ft	84.82 Kips	12.88 Kips	97.70 Kips
24.01 ft	84.92 Kips	17.41 Kips	102.32 Kips
31.99 ft	138.18 Kips	17.41 Kips	155.58 Kips
32.01 ft	138.35 Kips	146.59 Kips	284.94 Kips
38.99 ft	217.65 Kips	146.59 Kips	364.24 Kips
39.01 ft	217.83 Kips	26.11 Kips	243.94 Kips
48.01 ft	271.11 Kips	26.11 Kips	297.22 Kips
49.99 ft	282.83 Kips	26.11 Kips	308.94 Kips

Bent Pile Nominal Resistance (Compression) - Lone Tree Slough SB OR



Checked By: DTM
Date: 7/16/10

Lone Tree Slough SB OR (Bridge No. 29-0033)
10-SJ-99, PM 11.80, EA: OE6101

Lone Tree Slough Widen/OR
BCI No. 1201.7d
02/09/10
By: WEN

Checked By: DJM
Date: 7/16/10

Bent Pile Settlement Calculations: 15" PC/PS Concrete Pile Extensions

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

Service-I Limit Per Pile Load (lbs)		72000
A	*Average Axial Load (lbs)	36000
B	Pile Length (in.)	645
C	Tip Area (sq. in.)	177
D	Concrete Modulus of Elasticity (psi)	4415201
Axial Compression (in.)		**0.030**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	406.8
B	Pile Diameter (in.)	15
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	2700
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
Point Settlement (in.)		**0.514**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = 0.54 in.
13.8 mm

APPENDIX E

Caltrans Review comments and BCI Response

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 EA: 0E6101 Project Name: SR99 Manteca Widening OSFP Liaison: John Fujimoto Phone: 916-227-8757 e-mail: john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details __ PS&E (Review No.___) __ Construction X Other: 1st 60% Review	Reviewer Name: Ben Barnes Functional Unit: Geotechnical Services Cost Center: 59-323 Phone Number: 916-227-1039 e-mail: benjamin_barnes@dot.ca.gov Date of Review: 5/24/2010 Structure Name*: Lone Tree Slough SB Off Ramp Bridge Br No*: 29-0033 (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Eric Nichols	Blackburn Consulting	916-375-8706	ericn@blackburnconsulting.com	July 19, 2010

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	FR	NA	This is the 1st 60% review of the Draft Foundation Report prepared by Blackburn Consulting, dated April 23, 2010, by Caltrans Office of Geotechnical Design – North.	NA	
2	FR	Table of Contents / Appendix A sheet	Figure 3 listed as Peak Bedrock Acceleration, title on Figure 3 is Regional Fault Map	BCI changed the title in the table of contents and Appendix A sheet to "Regional Fault Map".	
3	FR	TOC, Section 4.3.1, App A sheet	Report mentions LOTB checklist, is this going to be included the final report?	We will include this in the final report.	
4	FR	1.2 Scope of Services, #7	"Feet" listed twice.	We listed "(ft.)" to denote the abbreviation used for "feet" throughout the remainder of the text.	
5	FR	2 Subsurface Exploration	States "8-inch OD hollow stem auger.", LOTB for F4 shows 6"	Both 6 and 8 inch diameter hollow stem auger were used. BCI has edited the report text accordingly.	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓ = Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

6	FR	2 Subsurface Exploration	Boring dates in report do not match those on LOTB.	The dates on the LOTB are correct. BCI edited the dates in the report to reflect the dates shown on the LOTB.	
7	FR	2 Subsurface Exploration	Hammer efficiency ratio shown as 75% in report, and 80% on LOTB. Also, what is the assumed hammer efficiency ratio based on?	BCI will change the hammer efficiency on the LOTB to 75% and included text in the report regarding estimation of the hammer efficiency.	
8	FR	3 Laboratory Testing	R-Value test results not found in Appendix B.	No R-value tests were completed for this project element. Reference to R-value has been deleted from the text.	
9	FR	6 Seismic Data and Evaluation	Please use current CT seismic design criteria.	Per e-mail from John Fujimoto on June 15, 2010, use of SDC 1.4 Seismic Design Criteria was approved for this project at Type Selection.	
10	FR	Figure 4 ARS Curve	Please use current CT seismic design criteria.	Per e-mail from John Fujimoto on June 15, 2010, use of SDC 1.4 Seismic Design Criteria was approved for this project at Type Selection.	
11	FR	2 Subsurface Exploration / LOTB	SPT sampler listed as 1.5-inch ID in report, shown as 1.4 on LOTB.	The SPT ID shown on the LOTB is correct. BCI has edited the report text accordingly.	
12	FR	2 Subsurface Exploration / LOTB	Report states F1 and F4 depth at elevation –29.5, LOTB shows –28.5.	The depth at elevation -28.5 is correct. BCI has edited the report text accordingly.	
13	FR	TOC and Section 9.4	Title should be "Abut 1 and Abut 4 (Class 90)".	The TOC and Section 9.4 have been edited accordingly.	
14	FR	LOTB Sheet 1	Structure plan shown for widening but not SB off ramp.	The LOTB has been edited to show the SB OR.	

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OFFICE OF SPECIAL FUNDED PROJECTS

Office of Special Funded Projects Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 EA: 0E6101 Project Name: SR99 Manteca Widen OSFP Liaison: John Fujimoto Phone: 916-227-8757 e-mail: john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details X PS&E (Review No. 2) __ Construction __ Other:_____	Reviewer Name: Theresa Nedwick Functional Unit: SOE-Specifications Cost Center: _____ Phone Number: 916-227-8193 e-mail: Theresa_nedwick@dot.ca.gov Date of Review: 11/15/10 Structure Name*: _____ Br No*:_____ (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Titus Keng	HDR Engineering Inc	916-817-4876	titus.keng@hdrinc.com	11/29/10

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	FRs	Sect 11	Construction Considerations: For pile driving, geotech engineer refers to a P formula that is not in 2006 Standard Specifications, Section 49-1.08. He also refers to a requirement for blow counts that is not specified in either Standard Specifications or Special Provisions.	In Section 11.2 (11.3 for Lone Tree Slough Ramp Bridge) of the foundation reports, the sentence "However, in no case shall the required blows (N) be less than that obtained using the Engineering News Formula (P=Er/6(s + 2.54)" may be disregarded.	
2	FR		Please check with geotech engineer if a Driving System Submittal required to ensure that pile driving system is adequate. SSP 49-208 needs to be in if required by geotech engineer.	Geotechnical engineer BCI recommends that the contractor provides a Driving System Submittal. SSP 49-208 has been included.	
3	P		Why note "Provide a clean and roughen surface for existing concrete prior to placing new concrete. Roughen to 1/4" amplitude"? Where is the specs? What's about "Prepare Concrete Bridge Deck Surface"?	Note has been deleted. "Roughen to ¼" amplitude" has been called out on specific detail with related specs added to project specifications SSP51-300.	
4	P		Why are epoxy dowels used? FRs didn't specify this is a corrosive environment. This project is not in Climate Area	Epoxy dowels have been revised to ordinary reinf steel dowel.	

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Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____ *=if applicable

Date of Review:_____ Functional Unit:_____ Br No*._____

			III either.		
5	ALL SSPs		Please put your initials and date for ANY EDITS you make in the special provisions. Some SSPs have no page breaks in between.	Initials and date are added. Will have page breaks between SSPs.	
6	SP	S5-250	Please list partial pay items as they appear in "Ready to List": Piling (except CIDH) Bar Reinforcing Steel	Agreed and has been corrected as appear in "Ready to List".	
7	SP	S5-280	Please describe what gets to be inspected at listed address.	Moved "Bridge as-built drawings" to listed address.	
8	SP	S8-W04	We recommend to keep para 19 without striking anything.	Leave para 19 as is shown, revised to keep para 20 without striking anything.	
9	SP	S8-W09	Please remove one. There are 2 of them.	Agreed to remove one.	
10	SP	15-800	Add "s" to brige in para 2.	Agreed and has been corrected.	
11	SP	15-875	Para 5, reinstate "at".	Agreed and has been corrected.	
12	SP	15-880	Para 14, you keep "chip or slurry seal contrast treatments" but strike them in paras 19 and 20?	Strike "chip or slurry seal contrast treatments" in para 14.	
13	SP	15-940	Add description and pay clause for 3/4" saw cut. It's not covered in Standard Specs.	Description and pay clause for 3/4" saw cut has been added at the end of para 11.	
14	SP	19-010	Please specify man-made objects encountered during pile driving-sub structure work. Standard Specs covers it for earthwork.	Man-made objects have been specified in the paragraph.	
15	SP	19-570	Style for pay clause should be normal and should be written as it recommends in Ready to List Guide, Section 6: "Full compensation for … shall be considered as included in the contract …prices paid per …for , and no …therefor.	Agreed and has been corrected.	
16	SP	42-010	The project has grooves on EXISTNG and NEW polyester concrete overlay for BRIDGE DECKS. Please edit accordingly.	Para 1 has been modified to have Existing and NEW polyester concrete overlay.	
17	SP	42-600	The project has no grinding PCC, please strike "grinding".	Agreed and has been corrected.	
18	SP	49-200	The added para "Drilling should be…tip elevations' belongs to 49-210. Added para "Pile driving…supported on piles" is not needed.	Para "Drilling should be…tip elevations" has been moved to 49-210. Para "Pile driving…supported on piles" has been removed.	
19	SP	49-210	Restricted drilling is allowed, see FRs. Please edit accordingly.	Agreed and has been corrected.	
20	SP	51-600	Strike one of the tilte. There are identical.	Agreed and has been corrected.	

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

21	SP	51-806	The project has no "Public Safety plan", so please strike all related info in paras 2,7, and 8.	Agreed the project has no "Public Safety plan" so related information in para 2,4,38 and 39 is strike out. Para 7 & 8 are used since the entire deck is being overlain at French Camp Slough Bridge and Little John Creek Bridge.	
22	SP	72-200	Please have it conforms to 72-6 instead of 72-4. Section 72-6 talks about paving under bridges.	Agreed and has been corrected to conform to 72-6.	
23	SP	83-460	Para 10, added paras for Types 60A(MOD) and 732 are not needed.	Agreed and has been corrected.	

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 **EA:** 0E6101 **Project Name:** SR99 Manteca Widen **OSFP Liaison:** John Fujimoto **Phone:** 916-227-8757 **e-mail:** john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details X PS&E (Review No. 3) __ Construction __ Other:_____	**Reviewer Name:** Theresa Nedwick **Functional Unit:** SOE-Specifications **Cost Center:** _____ **Phone Number:** 916-227-8193 **e-mail:** Theresa_nedwick@dot.ca.gov **Date of Review:** 11/15/10 **Structure Name*:** _____ **Br No*:**_____ (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Titus Keng	HDR Engineering Inc	916-817-4876	titus.keng@hdrinc.com	10/28/10

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	SP	S5-280	Please don't move "Bridge as-built drawing" to different line, it should be next to "Available as specified in the Std Specifications". What is the address 661 San Juan Ave for? Please list the all the info handout. Please check with Geotech engineer if rock cores available for viewing. If they are, please insert the info according to instructions.		
2	SP	19-010	Para 1 is missing a period.		
3	SP	19-570	Style for pay clause should be **normal**, not an item K.		
4	SP	42-010	Para 1, add "This work consists of" at the beginning of the para and "and" before "shall conform". Under "Measurement and Payment": move "of the groove area" to the end of the para, replacing "groove". Delete last para, you already describe the work in para 1.		

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Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

5	SP	42-600	Please replace all "pavement" with overlay throughout this specifications. Please strike "grinding" at various locations.		
6	SP	49-208	Para 2C3, last para, do you have open ended pipe piles?		
7	SP	49-210	Para 2, a period is needed.		
8	SP	51-806	Para 7, delete "Results from airborne… production work". You don't have airborne monitoring. Para 8, delete 8-8, you don't have airborne monitoring.		
9	SP	15-170	Recommend "salvage metal bridge railing post" full-comped into "Bridge removal (portion) as specified in the Std Specs, Section 15-4.03.		
10	FRs		Refer to comments #1 and #2 of Second Review, please have Foundations Reports revised to reflect Consultant's responses.	In Section 11.2 (11.3 for Lone Tree Slough Ramp Bridge), BCI revised the Foundation Report by deleting the sentence regarding use of the Engineering News Formula and adding a sentence requiring a Driving System Submittal	
11					
12					
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REVISED FINAL FOUNDATION REPORT

FRENCH CAMP SLOUGH BRIDGE (WIDEN)

BRIDGE NO. 29-0019
10-SJ-99, PM 12.33
EA: OE6101; CU: 06241

Prepared by:

BLACKBURN CONSULTING
1720 G Street
Modesto, CA 95354
(209) 522-6273

Prepared for:

HDR, INC.
1325 J Street, Suite 1300
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January 6, 2011

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Geotechnical • Construction Services • Forensics

File No. 1201.7c
January 6, 2011

Mr. John Klemunes
HDR Engineering, Inc.
1325 J Street, Suite 1300
Sacramento, CA 95814

Subject: **REVISED FINAL FOUNDATION REPORT**
French Camp Slough Bridge (Widen), Bridge No. 29-0019
10-SJ-99, PM 12.33, CU: 06241, EA: OE6101
San Joaquin County, California

Dear Mr. Klemunes:

Blackburn Consulting (BCI) submits this Revised Final Foundation Report for the French Camp Slough Bridge (Widen) project on State Route 99 in San Joaquin County, California. This report supercedes our July 28, 2010 Final Foundation Report for this structure. BCI prepared this report in accordance with our November 15, 2008 Agreement.

Thank you for the opportunity to be part of your design team. Please call if you have questions or require additional information.

Sincerely;

BLACKBURN CONSULTING

REGISTERED PROFESSIONAL ENGINEER
DAVID J. MORRELL
No. GE 2843
GEOTECHNICAL
STATE OF CALIFORNIA

David J. Morrell, G.E., C.E.
Senior Project Manager

Reviewed by:

PROFESSIONAL GEOLOGIST
WILLIAM E. NICHOLS
NO. 2229
CERTIFIED ENGINEERING GEOLOGIST
EXP 1-31-12
STATE OF CALIFORNIA

W. Eric Nichols, C.E.G.
Senior Project Manager

Copies: 7 to Addressee

REVISED FINAL FOUNDATION REPORT
French Camp Slough Bridge (Widen), Bridge No. 29-0019
10-SJ-99, PM 12.33, CU: 06241, EA: OE6101
San Joaquin County, California

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Caltrans Review Comments with BCI Responses

1 INTRODUCTION

1.1 Purpose

Blackburn Consulting (BCI) prepared this Foundation Report for the French Camp Slough Bridge (Widen) on State Route 99 in San Joaquin County, California. It contains our subsurface findings, conclusions and recommendations for bridge design.

This report is for HDR Engineering, Inc. (HDR), San Joaquin Council of Governments (SJCOG), and California Department of Transportation (Caltrans) to use during bridge design and construction. It shall not be used or relied upon by others, or for different locations or improvements without the written consent of BCI.

1.2 Scope of Services

To prepare this report, BCI:

1. Discussed the project with HDR.
2. Reviewed HDR's August 5, 2009 Structure Type Selection Report for the structure.
3. Attended the September 10, 2009 Type Selection Meeting with the design team and Caltrans.
4. Reviewed "As-Built" plans for the existing bridge structures (29-0019R and29-0019L).
5. Reviewed preliminary plans for the structure prepared and provided by HDR.
6. Reviewed published maps and literature related to site geologic and seismic conditions.
7. Observed, logged and sampled 2 exploratory test borings to depths of about 61 feet.
8. Reviewed Caltrans comments regarding our April 23, 2010 Draft Foundation Report and prepared responses. See Appendix E for Caltrans comments and BCI responses.
9. Performed engineering analysis and calculations to develop our conclusions and recommendations.

1.3 Site Description

The French Camp Slough Bridge (Widen) site is located in San Joaquin County on State Route 99 (SR99) about 5 miles south of Stockton and 4 miles north of Manteca. The approximate site coordinates are 37.8719 degrees north latitude, 121.2195 degrees west longitude. Turner Station Overhead (Bridge No. 29-0071R/L) is located about 0.8 miles south of the site and Little John Creek Bridge (Bridge No. 29-0017R/L) is located about 0.2 miles north of the site.

The existing left (southbound) and right (northbound) bridge structures were constructed in the Mid 1950's and consist of 4-span, concrete flat-slab bridges, approximately 37.7 feet wide and 79 feet long. A 35-foot wide median area separates the existing structures. Existing bridge approach fills extend 2-3 feet above the relatively level original grade outside the slough channel. Concrete slope paving is present only at Abutment 1 of the left bridge, and extends about halfway into the median area towards the right bridge.

The South Fork of South Little Johns Creek flows westward beneath the existing structures. Evidence of scour at the existing structures includes: several feet of the existing monotube pile shells are exposed at Bent 3 at both bridges; stacked sacks of concrete have been used to repair the Abutment 1 channel slope at the right bridge; and unlined portions of the channel banks at both bridges appear degraded (steepened) due to scour.

Surface elevations range from about 32.5 ft (NGVD 29) in the median area at proposed Abutments 1/5, to about 18.7 ft. (NGVD 29) in the lowest portions of the slough channel area.

1.4 Project Description

The new bridge widening structure will be constructed to close the median gap between the existing left/right bridges for the SR99 median widening project. The widening structure will consist of a 4-span, concrete flat-slab bridge, approximately 35.25 feet wide and 78.5 feet long. Rock Slope Protection (RSP) will be constructed along the Abutment 5 channel slope, and will extend beneath the existing right/left bridges. RSP will not be constructed along the Abutment 1 channel slope.

New approach fill/abutment front slope heights will be nominal (less than 3 feet above existing grades).

2 SUBSURFACE EXPLORATION

BCI retained Precision Drilling to drill and sample 2 exploratory borings at the site to characterize the subsurface conditions and obtain samples for laboratory testing. The drillers used a CME 75 truck-mounted rig to drill the borings using 8-inch O.D. hollow stem auger.

Between March 19-23, 2009, BCI observed, logged and sampled Borings A-09-F1 and A-09-F2 to depths of about 61 feet (-28.5 ft., NGVD 29) at the proposed abutment locations. BCI determined boring locations and elevations using topography and elevation data provided by HDR.

The drillers obtained relatively undisturbed samples using both Modified California Samplers (equipped with 2.4-inch I.D. brass liners), and Standard Penetration Test (SPT) samplers (1.4-inch I.D.). Samplers were driven into the ground with a 140 pound automatic trip hammer falling 30 inches. The N-values shown on the Log of Test Borings in Appendix A are uncorrected “field” values. For the Modified California Sampler, BCI multiplied the field N-value by 0.65 to obtain an approximate SPT N-value.

FHWA’s Soil and Foundations Reference Manual, Volume 1 (FHWA-NHI-06-088, December 2006) indicates that the hammer energy transfer ratio ranges between 80-100% for automatic trip hammers. To be conservative, BCI assumed a hammer energy transfer ratio of 75% in the absence of recent hammer calibration data.

BCI’s project geologist, Mr. Aaron Wood, logged the borings consistent with the Unified Soil Classification System (USCS).

We provide the existing Log of Test Borings for the original bridge in Appendix A.

3 LABORATORY TESTING

To classify the subsurface soil and obtain parameters for analysis, BCI performed laboratory tests on some of the samples obtained from the exploratory borings. Tests included:

- Moisture Content and Unit Weight
- Grain Size Analysis
- Atterberg Limits
- Unconfined Compressive Strength
- Triaxial Shear Strength (Unconsolidated, Undrained)
- Corrosivity (pH, Resistivity, Sulfates and Chlorides)

BCI performed laboratory tests in conformance with current ASTM and/or Caltrans test procedures. We present the laboratory test results summary and laboratory test results in Appendix B.

4 GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

Literature published by the California Geological Survey (CGS) indicates that the site is located in the San Joaquin Valley within the central portion of the Great Valley Geomorphic Province. This province encompasses the San Joaquin Valley in the south and the Sacramento Valley in the north. The province is bound by the Sierra Nevada to the east, the Coast Ranges to the west, the Klamath Mountains and Cascade Range to the north.

The Great Valley is a broad, elongated, northwest trending, structural trough that has been filled with a thick sequence of sediments. The eastern margin of the valley is formed by the west sloping Sierran bedrock surface that extends westward beneath the alluvium and older sedimentary bedrock within the valley. The western border is underlain by east dipping rock of the Coast Ranges that form a deeply buried trough.

During the late Mesozoic and through most of Tertiary time (approximately 100 million to 20 million years ago), deposition of thousands of feet of marine sediments occurred within the Great Valley. Continental deposits (generally alluvium) of late Tertiary and Quaternary age (approximately 20 million years ago to the present) overlie these marine deposits. Both the continental deposits and the underlying marine sediments form a wedge of sediments that generally thickens from east to west. The accumulated thickness of the marine and continental sediments is at least several thousand feet at the site.

4.2 Local Geology

BCI evaluated the geology of the area by review of published geologic maps and literature, site review, and subsurface exploration. Mapping by the California Geologic Survey[1] shows the site is underlain by sediments of the Pleistocene-age Modesto Formation. These sediments are alluvium comprised mostly of sand, silt and clay. We present a Geologic Map as Figure 2 in Appendix A.

4.3 Subsurface Conditions

4.3.1 Soil

In general, BCI encountered medium dense silty sand (fill) to depths of 5.5 to 6.5 feet (26.0 ft. to 27.0 ft., NGVD 29) underlay by stiff lean clay (fill) to a depth of 10 feet (22.5 ft., NGVD 29). Beneath the fill, we generally observed interlayered very stiff lean clay to sandy lean clay, medium dense silty to clayey sand, and a few thin layers of medium dense poorly graded sand/poorly graded sand with silt to depths of 50.5 to 54.0 feet (-18.0 to -21.5 ft., NGVD 29). BCI observed hard sandy lean clay in Boring A-09-F1 from depths of 50.5 feet (-21.5 ft., NGVD 29) to the bottom of this boring (-28.5 ft., NGVD 29), and very dense clayey sand in Boring A-09-F2 from depths of 54.0 feet (-18.0 ft., NGVD 29) to the bottom of this boring (-28.5 ft., NGVD 29).

The above soil conditions are similar to those shown on the As-Built Log of Test Borings (LOTB) for the existing structures (Bridge No's. 29-0019R/L).

Based on our laboratory testing, the dry density of the soil units ranged from 95 pcf to 118 pcf, at moisture contents between 12.0% and 24.7%. Triaxial testing (unconsolidated, undrained) of the lean to fat clay at depths of 26 feet and 41 feet yielded undrained cohesion values of 3,815 psf and 4,080 psf, respectively. Unconfined compressive strength testing of the lean clay at depths of 16 feet and 21 feet yielded unconfined compressive strengths of values of 2.9 tsf and 2.3 tsf, respectively.

Refer to the Log of Test Borings and As-Built Log of Test Borings in Appendix A for more specific soil descriptions, laboratory test results, and blow count data. *We include the required LOTB Sheet Checklist in Appendix A.*

4.3.2 Ground Water

Table 1 presents the ground water depths/elevations measured in our borings during drilling.

[1] Geologic Map of the San Francisco-San Jose Quadrangle, 1:250,000, California Division of Mines and Geology, 1990.

Table 1: Groundwater Elevations

Boring Number	Reading Date	Groundwater Depth (ft)	Groundwater Elevation (ft*)
A-09-F1	3/19/2009	45.0	-12.6
A-09-F2	3/23/2009	43.0	-10.5

* NGVD 29 datum

The As-Built Log of Test Borings for the existing structures show the ground water at a depth of 11 feet (elev. 13.9 ft., datum not provided) in one boring drilled in 1954.
According to the San Joaquin County Internal Groundwater Data Center interactive website (http://www.sjmap.org/groundwater/), groundwater elevations in the vicinity of the site have dropped 20 to 30 feet since the late 1950's. Within the last 20 years, this well data indicates that the ground water elevation has fluctuated between elev. -5.0 to -20.0 ft. in the site vicinity, which is consistent with our boring data.

We used a design ground water elevation of -5.0 (NGVD 29) in our geotechnical analysis for this project.

Ground water levels can fluctuate due to changes in precipitation, slough levels, irrigation, pumping of wells, and other factors. Seepage from the slough may cause perched ground water conditions at and below the existing slough water levels adjacent to the slough at any time of year.

5 CORROSION EVALUATION

We performed corrosion testing on two samples obtained from our borings. Table 2 presents the test results for pH, resistivity, sulfates and chlorides.

Table 2: Soil Corrosion Test Summary

Boring/Sample Number	Depth (ft)	Elevation (ft, NGVD 29)	Minimum Resistivity (ohm-cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
A-09-F1/5b	10.5-11.0	21.4-21.9	670	7.74	36.1	41.5
A-09-F2/8b	25.5-26.0	6.5-7.0	860	7.55	45.0	42.9

Note: Caltrans considers a site to be corrosive to foundation elements if one or more of the following conditions exist: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less (Caltrans, "Corrosion Guidelines", version 1.0, September 2003).

According to Caltrans Corrosion Guidelines (Version 1.0, September 2003), the site is not considered corrosive to structural elements. Appendix B contains the soil corrosion test results.

6 SEISMIC DATA AND EVALUATION

6.1 Caltrans Seismic Design Criteria

Based on the Caltrans 1996 California Seismic Hazard Map, the peak horizontal rock acceleration for the site is approximately 0.17g. The causative fault is the Midway-San Joaquin/N Fault located about 18.0 miles to the southwest. According to the 1996 Caltrans Seismic Map (Technical Report), the style of faulting is not known/published and this fault is listed as a new earthquake source. The estimated Maximum Earthquake Moment Magnitude for this fault is 6.75. BCI includes a Regional Fault Map showing peak bedrock accelerations as Figure 3 in Appendix A.

We classify the site soil profile as Type D using Table B.1 of the June 2006 Caltrans Seismic Design Criteria (SDC), Version 1.4, with SPT values ranging from 15 to 50.
Based on the above information, use the 0.2g peak horizontal rock acceleration curve (0.28g peak ground acceleration) from Figure B.7 (Soil Profile Type D, Magnitude: 6.5± 0.25) of the SDC for bridge structure design. We include our recommended ARS curve for bridge design as Figure 4 in Appendix A.

For geotechnical purposes, the actual peak ground acceleration of 0.24g (interpolated from Figure B.7 between the 0.1g and 0.2g ARS curves for the actual peak horizontal rock acceleration of 0.17g at the site) is appropriate for liquefaction and seismic settlement potential evaluations.

6.2 Fault Rupture

The site does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone for fault rupture hazard, and no known active faults cross the existing bridge. We therefore consider the potential for fault rupture and ground displacement to adversely affect the proposed structure as very low to nonexistent.

6.3 Sesimic Slope Stability

We consider the potential for seismic slope instability of the existing canal slopes in-place at 1.5:1 (or flatter) at this site to be very low to nonexistent for the design peak ground acceleration of 0.24g and conditions encountered in our borings.

6.4 Liquefaction and Seismic Settlement Potential

Liquefaction can occur when relatively loose, saturated granular soil and specific soft, saturated fine-grained soils are subject to sufficient ground shaking to increase pore pressures enough to trigger liquefaction. We consider the potential for detrimental liquefaction at the site to be nonexistent for the design peak ground acceleration of 0.24g and the soil conditions encountered in our borings.

During a seismic event, ground shaking can cause densification of granular soil above the water table that can result in settlement of the ground surface. We consider the potential for detrimental seismic settlement at the site to be nonexistent for the design peak ground acceleration of 0.24g and the soil conditions encountered in our borings.

7 SCOUR EVALUATION

HDR Inc. performed a hydrology and hydraulics study[2] for structure that included the following scour data for the bridge.

Table 3: Scour Data

Bridge Support	Estimated Contraction Scour (ft.)	Estimated Local Scour (ft.)	Estimated Total Scour Depth (ft.)	Estimated Total Scour Elevation (ft.)
Abut 1	0.69	4.26	4.95	24.0
Bent 2	0.54	4.80	5.34	17.7
Bent 3	0.54	4.80	5.34	13.5
Bent 4	0.54	4.80	5.34	14.8
Abut 5	0.62	0.34	*0.96	*26.0

*Rock Slope Protection to be designed by HDR for scour mitigation at Abut 5 only.

HDR assumed that no long-term channel aggradation or degradation will occur at the site based on their field observations of the channel in the vicinity of the existing structures.

8 AS-BUILT FOUNDATION DATA

The As-Built Records show the existing left and right bridges are supported on driven 45-ton steel monotube piles (Alt Y) filled with unreinforced concrete. The 1954 foundation report estimated a pile tip elevation of -10 ft.

A pile driving letter dated April 22, 1955, indicates that the actual total driven lengths of the piles was about 64% of the estimated total lineal footage, and that pile driving encountered much harder soil conditions than expected, causing deformation and collapse in some of the thin steel shells. This appears to be reflected by the As-Built plans, which show the piles driven to between elev. 8.5 to 11.5 at the abutments and to between elev. 6.0 to -9.0 at the bents.

The above pile driving letter also indicates that at Bent 2 (Right Bridge), two additional piles and a pile beam were constructed due to “collapsed piles”.

[2] Final Hydrology & Hydraulics Report, SR99, Littlejohns Creek, French Camp Slough, and Lone Tree Creek Crossings, Post Mile 5.3-15.0, July 2009; revised scour results provided via email on 1/22/10.

9 FOUNDATION RECOMMENDATIONS

9.1 Foundation Data and Loading

The subsurface conditions encountered in our borings indicate that the site is conducive for either driven or cast-in-drilled-hole (CIDH) piles. Since CIDH piles would require temporary casing and slurry drilling due ground water and/or seepage from the slough, we favor the use of driven piles over CIDH piles. Spread footings are not considered feasible for support due to the potential for excessive settlement.

Based on the above information, driven Class 90 (Alt X) precast, prestressed concrete piles were selected for abutment support. Driven 15" precast, prestressed concrete pile extensions (Slab Bridge Pile Details, Section B-B, Sheet xs1-230, 4/4/1997) were selected for bent support.

HDR provided the following foundation design information in Tables 4 and 5.

Table 4: Foundation Design Data Provided By HDR

Foundation Design Data								
Support No.	Design Method	Pile Type	Finish Grade Elev. (ft)*	Pile Cut-off Elevation (ft)*	Pile Cap Size (ft)		Permissible Settlement – Service Load (in)	Number of Piles Per Support
					B	L		
Abut 1	WSD	Class 90 (Alt X)	29.0**	23.5	N/A	N/A	1	5
Bent 2	LRFD	15" PC/PS Concrete Pile Extensions	21.0	30.0	N/A	N/A	1	4
Bent 3	LRFD	15" PC/PS Concrete Pile Extensions	19.0	30.0	N/A	N/A	1	4
Bent 4	LRFD	15" PC/PS Concrete Pile Extensions	22.0	30.0	N/A	N/A	1	4
Abut 5	WSD	Class 90 (Alt X)	27.0**	23.5	N/A	N/A	1	5

* Finished Grade and Pile Cut-off Elevation are approximate and are subjected to change once more accurate final survey data becomes available.
** Finished Grade indicates the ground elevation in front of abut wall/ top of slope.

Table 5: Foundation Design Loads Provided By HDR

Foundation Design Loads											
Support No.	**Service-I Limit State (kips)**			**Strength Limit State (Controlling Group, kips)**				**Extreme Limit State (Controlling Group, kips)**			
	Total Load		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Per Pile	Per Support	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1	300	85	150	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bent 2	395	N/A	220	580	190	0	0	N/A	72	0	0
Bent 3	395	N/A	220	580	190	0	0	N/A	72	0	0
Bent 4	395	N/A	220	580	190	0	0	N/A	72	0	0
Abut 5	300	85	150	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

9.2 Foundation Recommendations and Pile Data Table

BCI used the above foundation design data and loading conditions to evaluate bent foundations using AASHTO LRFD Bridge Design Specifications-4rd Edition with current Caltrans Amendments. We evaluated abutment foundations using Caltrans November 2003 Bridge Design Specifications for foundations using Working Stress Design methods. We present our foundation recommendations in Tables 6, 7 and 8 on the following pages.

Table 6: Foundation Recommendations for Abutments

Abutment Foundation Design Recommendations										
Support	Pile Type	Cut-off Elev. (ft.)	**LRFD Service-I Limit State Load – Compression (kips)**			Required Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
			Per Support		Per Pile	Comp.	Tens.			
			Total	Permanent						
Abut 1	Class 90 (Alt. X)	23.5	300	150	85	170	0	-2.0(a)	-2.0	170
Abut 5	Class 90 (Alt. X)	23.5	300	150	85	170	0	-2.0(a)	-2.0	170

Notes: 1) Design tip elevations for **Abutments** are controlled by (a) Compression.

Table 7: Foundation Recommendations for Bents

Bent Foundation Design Recommendations											
Support	Pile Type	Cut-off Elev. (ft.)	LRFD Service-I Limit State Load Per Support – Compression (kips)	Total Permissible Support Settlement (in.)	Required Factored Nominal Resistance (kips) Per Pile				Design Tip Elevations (ft.)	Specified Tip Elevations (ft.)	Nominal Driving Resistance Required (kips)
					Strength Limit		Extreme Event				
					Comp φ = 0.7	Tens. φ = 0.7	Comp φ = 1.0	Tens φ = 1.0			
Bent 2	15" PC/PS Concrete Pile Extensions	30.0	395	1	190	0	72	0	-13.0(a),(b)	-13.0	315
Bent 3	15" PC/PS Concrete Pile Extensions	30.0	395	1	190	0	72	0	-13.0(a),(b)	-13.0	315
Bent 4	15" PC/PS Concrete Pile Extensions	30.0	395	1	190	0	72	0	-13.0(a),(b)	-13.0	315

Notes:

1) Per support loads are per column (4 columns per bent)
2) Design tip elevations for **Bents** are controlled by (a) Compression (Strength Limit), (b) Scour.
3) The nominal driving resistance (315 kips) required for Bent piles is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

Based on our analysis presented in the following sections, BCI presents our recommended Pile Data Table as Table 8:

Table 8: Pile Data Table

Pile Data Table						
Support	Pile Type	Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut 1	Class 90 (Alt. X)	170	0	-2.0(a)	-2.0	170
Bent 2	15" PC/PS Pile Extensions	280	0	-13.0(a),(b)	-13.0	315
Bent 3	15" PC/PS Pile Extensions	280	0	-13.0(a),(b)	-13.0	315
Bent 4	15" PC/PS Concrete Pile Extensions	280	0	-13.0(a),(b)	-13.0	315
Abut 5	Class 90 (Alt. X)	170	0	-2.0(a)	-2.0	170

Notes:

1) Design tip elevations for **Abutments** are controlled by (a) Compression.
2) Design tip elevations for **Bents** are controlled by (a) Compression (Strength Limit) and (b) Scour, respectively.
3) The nominal driving resistance (315 kips) required for Bent piles is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

9.3 Engineering Parameters

The following engineering parameters are generalized and based on:

- Unit weights represent average values based on our laboratory tests, local experience and published typical values.
- Cohesion was conservatively assumed based on average values from unconfined compressive strength testing, triaxial testing (unconsolidated, undrained), field pocket penetrometer testing, and published blow count correlations.
- Friction angles were based on published blow count correlations.
- Modulus and E_{50} strain values for lateral pile analysis were obtained from the July 2004 LPILE Plus 5.0 Technical Manual for appropriate soil type and consistency.
- Engineering experience and judgment.
- BCI used a ground water elevation of -5.0 ft. (NGVD29) for design.

9.3.1 Compressive Resistance

We used the generalized soil parameters in Table 9 in our bearing capacity analysis.

Table 9: Generalized Soil Parameters

Elevation (NVGD29)	Soil Type	Unit Weight (lb/ft^3)	Friction Angle (degrees)	Cohesion (psf)
25.0 to 2.0	Lean Clay	120	---	2,500
2.0 to -5.0	Silty/Clayey Sand	120	34 (End Bearing) 36 (Skin Friction)	---
-5.0 to -18.0	Silty/Clayey Sand	*63	34 (End Bearing) 36 (Skin Friction)	---
-18.0 to -28.5	Lean Clay	*68	---	4,500

*Buoyant Unit Weight

9.3.2 LPILE Parameters

HDR requested that BCI provide LPILE parameters for use in their equivalent column length and lateral pile analysis. Table 10 provides our recommended LPILE parameters for the abutment and bent piles.

Table 10: LPILE Parameters

Elevation (NGVD29)	**L-Pile Soil Type (p-y curve model)**	**Unit Weight (lb/ft^3)**	**Friction Angle (degrees)**	**Cohesion (psf)**	**Modulus, k (lb/in^3)**	**E_{50}**
25.0 to 10.0	Sand (Reese)	120	34	---	90	---
10.0 to 2.0	Stiff Clay w/o Free Water	120	---	2500	**	0.005
2.0 to -5.0	Sand (Reese)	120	34	---	90	---
-5.0 to -18.0	Sand (Reese)	*63	34	---	60	---
-18 to -28.5	Sand (Reese)	*68	38	---	100	---

*Buoyant Unit Weight
**LPILE 5.0 does not report the k value for the Stiff Clay Without Free Water soil type. The k value is internally computed using the cohesion and E50 input parameters.

Neglect lateral resistance at the bents above the estimated total scour elevation.

9.4 Abut 1 and Abut 5 Piles (Class 90)

In accordance with current Caltrans specifications, we used the Working Stress Design (WSD) for the abutment piles. BCI evaluated Alternative "X" Class 90 piles with a T dimension of 12 inches for the abutments. BCI presents the results of our compressive resistance and settlement analysis below.

9.4.1 Compressive Resistance

The tips of the Class 90 precast, prestressed concrete (PPC) piles will bear in medium dense sand about 21 feet below the existing channel bottom elevation.
Our calculations indicate that the nominal compressive resistance of the PPC piles can be obtained through about 35% end bearing and 65% skin friction. Actual contributions to end bearing and skin friction could vary depending on how the load is transferred to the piles. We neglected the approach fill in our skin friction and end bearing analysis.

We determined the compressive resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc. BCI used a pile cutoff elevation of 23.5 ft in our analysis.

Refer to the Driven output files in Appendix C for the analysis results.

9.4.2 Settlement

We calculated immediate settlement of approximately 0.60 inches for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We do not anticipate significant long-term settlement due to the competent soil conditions above and below the pile tips. We include the pile settlement calculations in Appendix C.

Our calculated pile settlement is less than the permissible settlement of 1-inch specified for the structure foundations.

9.4.3 Lateral Load Analysis

BCI provided LPILE parameters in Section 9.3.2 for HDR to use in lateral pile analysis.

9.4.4 Negative Skin Friction

We do not anticipate negative skin friction at the abutments given the competent soil conditions and nominal new embankment heights.

9.5 Bent Piles

We used AASHTO LRFD Bridge Design Specifications-4rd Edition and current Caltrans Amendments for evaluating driven 15" precast, prestressed concrete pile extensions (Caltrans Slab Bridge Details, Sheet xs1-23) at the Bents. BCI presents the results of our compressive resistance and settlement analysis below.

9.5.1 Compressive Resistance

The tips of the 15" precast, prestressed concrete pile extensions will bear in medium dense sand about 32 feet below the existing channel bottom elevation. Our calculations indicate that the nominal compressive resistance of the piles can be obtained through about 30% end bearing and 70% skin friction. Actual contributions to end bearing and skin friction could vary depending on how the load is transferred to the pile.

We determined the required nominal compressive resistance for long-term total scour conditions and the required nominal driving resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc.

The Driven 1.2 computer program calculates compressive resistance for piles with square sides (pile width input, not diameter). For bent piles, we performed separate analyses using an equivalent pile width of 11.8 inches for skin friction contributions, and 13.3 inches for end bearing contributions. BCI evaluated long-term nominal pile compressive resistance beginning at about elevation 13.5 (deepest scour elevation).

BCI determined the required factored nominal resistance by comparing the Factored Strength Limit Load (Geotechnical Resistance Factor = 0.7) with the Extreme Event Load (Resistance Factor = 1.0). We then used the higher value as the required factored nominal resistance. In this case, the Factored Strength Limit Load (190 kips/0.7 = 271 kips per pile) is controlling over the 72 kips per pile for the Extreme Event. We rounded the Factored Strength Limit Load to 280 kips to estimate the design tip elevation using the Driven software.

Refer to the Driven output files in Appendix D for additional information.

9.5.2 Settlement

We calculated immediate settlement of approximately 0.75 inches for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We do not anticipate significant long-term settlement due to the stiff to very stiff soil conditions above and below the pile tips. We include the pile settlement calculations in Appendix D.

Our calculated pile settlement is at the 1-inch permissible settlement level specified for the structure foundations. We do not anticipate significant long-term settlement due to the competent soil conditions at and below the equivalent footing level.

9.5.3 Lateral Load Analysis

BCI provided LPILE parameters in Section 9.3.2 for HDR to use in lateral pile analysis.

9.5.4 Negative Skin Friction

We do not anticipate negative skin friction at the bents.

10 APPROACH FILLS

10.1 Fill Materials

Embankments will be constructed using imported borrow material, supplemented with material excavated from shallow on-site cuts. The source(s) of borrow material for construction of approach fills has not been identified. Proposed borrow must be tested and approved for use by the project engineer prior to transporting to the site.

Expansive soil (Expansion Index > 50 and Sand Equivalent < 20) should not be used as fill within 5 feet of the abutment backwall.

10.2 Slope Geometry and Stability

The maximum new embankment fill height at the bridge abutments will extend less than 3 feet above existing grades. Approach end slopes (channel area) will have a gradient of 2:1 (horizontal to vertical) or flatter. The Abutment 1 end slope will be un-paved while the Abutment 5 end slope will be faced with Rock Slope Protection.

The existing approach fill and underlying native soil are competent for support of the planned embankments.

10.3 Settlement

We estimate minor (< 1-inch) settlement for new embankment fill loads up to 3 feet high. No waiting period is necessary prior to construction of bridge abutment foundations.

10.4 Lateral Earth Pressures

The following equivalent fluid weights (EFWs) may be used to design the abutment walls and wing walls for Abutments 1 and 4 assuming level backfill conditions:

Condition	EFW Static	EFW Seismic
Active	36 lb/ft^3	42 lb/ft^3
At-Rest	56 lb/ft^3	66 lb/ft^3
Passive	220 lb/ft^3	205 lb/ft^3

To limit wall deflection to acceptable levels, BCI applied a factor of safety of 2.0 to the ultimate passive pressure to generate the allowable passive pressures provided above.

As noted in the Caltrans Seismic Design Criteria (SDC), the maximum passive pressure is 5.0 ksf for longitudinal abutment response, which must be used with the proportionality factor presented in Section 7.8.1 of the SDC.

The EFWs shown above assume embankment fill meeting the requirements of Caltrans standard for Structure Backfill, a soil unit weight of approximately 125 pcf, a minimum angle of internal friction equal to 34 degrees, and that drainage is placed behind the walls in accordance with Caltrans Standard Plans and Specifications.

We estimated the EFWs for seismic loading using the Mononobe-Okabe equation for Active and Passive lateral coefficients K_a and K_p. We estimated the At-Rest coefficient, K_o, for the seismic condition using an increase ratio similar to the Active condition. In the Mononobe-Okabe equation, BCI used a horizontal seismic acceleration coefficient (k_h) of 0.12 calculated using the equation in Chapter 11, Section 11.6.5 of the AASHTO LRFD Bridge Design Specifications-4th Edition. This k_h value assumes that the walls displace at least 1-inch during the design seismic event. We calculated the above static EFW's using methods presented in the 1982 Naval Facilities (NAVFAC) Design Manual 7.2.

Apply the resultant of the seismic active and at-rest pressures at a depth 0.5H from the base of the wall, where H equals the wall height in feet. The passive pressures are applicable for concrete placed directly against undisturbed soil or compacted fill.

For surcharge loads, apply an additional uniform lateral load behind the wall equivalent to (0.30)x(surcharge pressure).

Use a coefficient of friction of 0.45 to resist sliding for concrete placed on native undisturbed soil or compacted fill.

11 CONSTRUCTION CONSIDERATIONS

Where referenced below, "Standard Specifications" refers to Caltrans Standard Specifications (May 2006).

11.1 Embankment Waiting Period

No waiting period is required prior to construction of bridge abutment piling.

11.2 Abutment and Bent Piles

Piles shall conform to Section 49-1 of the Standard Specifications.

Jetting or vibratory hammers should not be used to obtain the specified pile penetration.

Verify pile capacity during driving using energy equations in accordance with Caltrans Standard Specification 49-1.08 (Modified Gates Formula). A pile load test is not necessary.

The Contractor shall provide a Pile Driving System submittal in accordance with Caltrans Bridge Reference Specification 49-208 (49HAMR) to verify that the pile driving system is adequate.

Pile driving should not negatively impact the existing bridge structures since they are supported on piles.

11.3 Temporary Shoring

The contractor is responsible for design and construction of excavation sloping and shoring in accordance with CalOSHA Standards.

11.4 Dewatering

Excavations extending below the slough water level will require dewatering or diking/diversion methods to construct abutment foundations in the "dry".

12 RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services. For this project, BCI should be retained to:

1. Review and provide written comments on the (civil, structural) plans and specifications prior to construction.
2. Monitor construction to check and document our report assumptions. At a minimum, we should monitor pile installation.
3. Update this report if:
   - design changes occur
   - 2 years or more lapse between this report and construction
   - site conditions change

If BCI is not retained to perform the above applicable services, we are not responsible for any other parties' interpretation of our report, and subsequent addenda, letters, and discussions.

13 LIMITATIONS

BCI performed services in accordance with the generally accepted geotechnical standard of practice currently used in this area. Where referenced, we used ASTM and Caltrans Standards as a general (not strict) *guideline* only. We do not warranty our services.

BCI based this report on the current site and project conditions. We assumed the soil and ground water conditions encountered in our exploratory borings are representative of the subsurface conditions across the site. Actual conditions between borings could be different. Groundwater may be higher/lower in other locations than measured in the borings.

The interface between soil types on the logs is approximate. The transition between soil types may be abrupt or gradual. We based our recommendations on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geologic conditions.

Our scope did not include evaluation of flooding or hazardous materials on site.
This report should only be used for design and construction of the French Camp Slough Bridge (Widen) project, as described herein.

Modern design and construction is complex, with many regulatory sources, restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.

APPENDIX A

Figure 1 – Vicinity Map

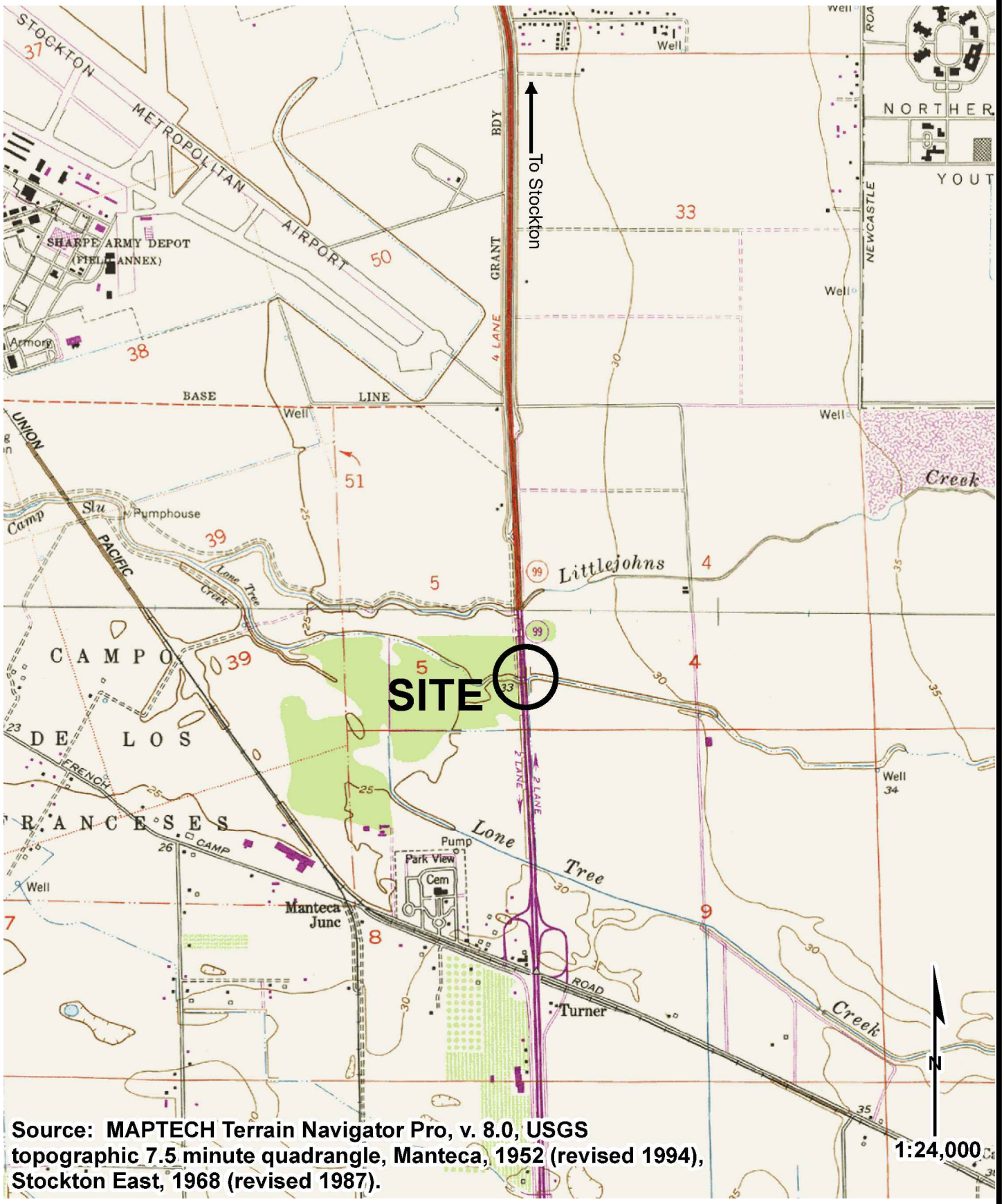
Figure 2 – Geologic Map

Figure 3 – Regional Fault Map

Figure 4 – ARS Curve

Log of Test Borings Sheets 1-5

Log of Test Borings Sheet Checklist



Source: MAPTECH Terrain Navigator Pro, v. 8.0, USGS topographic 7.5 minute quadrangle, Manteca, 1952 (revised 1994), Stockton East, 1968 (revised 1987).

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□I□INIT□ MAP

French Camp Slough Bridge (Widen)
San Joaquin County, California

File No. 1201.7□

January 2011

Figure 1

1/6/2011 1201.7c French Camp Slough Bridge (Widen) Figure 1.dwg

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GEOLOGI□ MAP

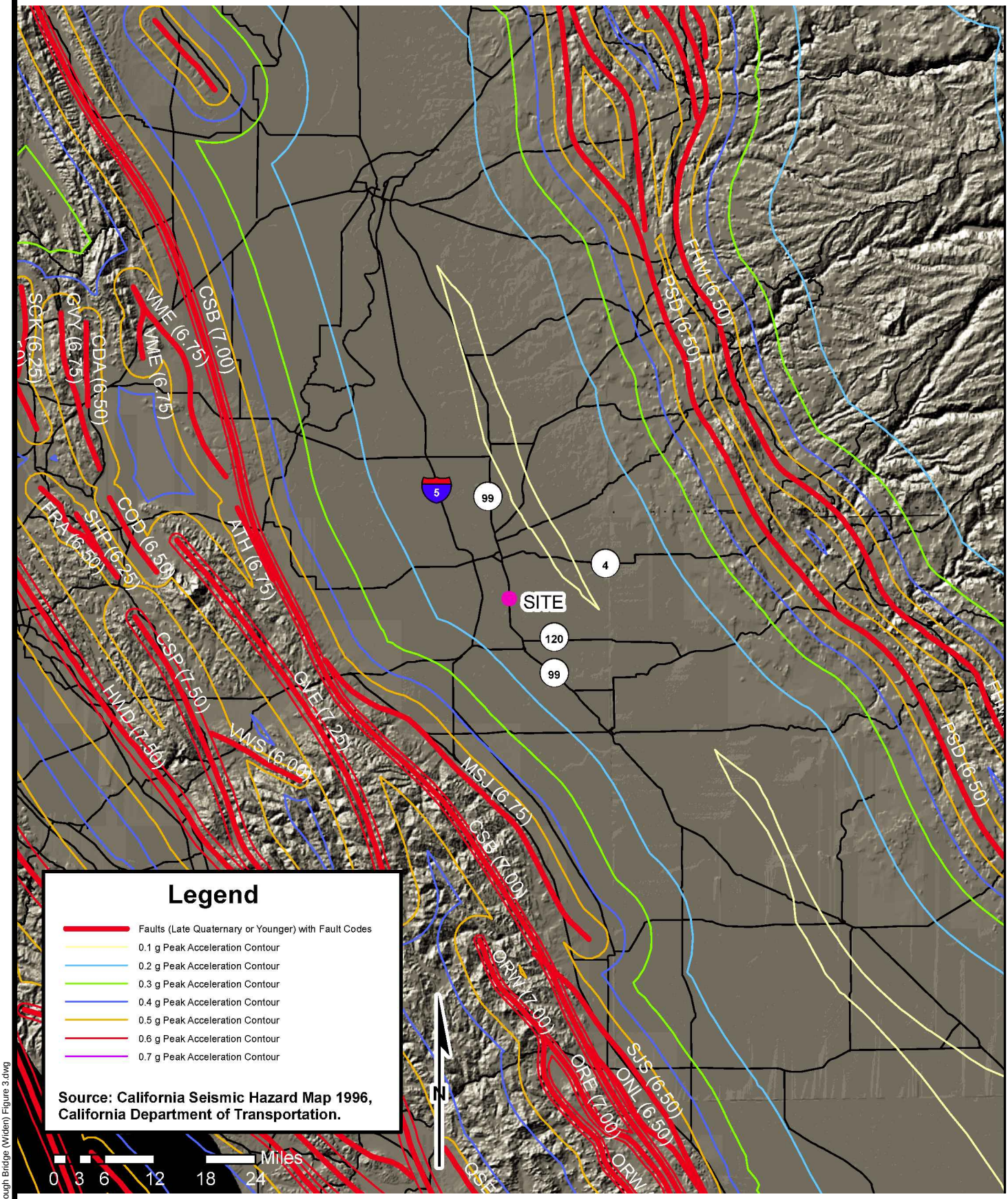
French Camp Slough Bridge (Widen)
San Joaquin County, California

File No. 1201.7□

January 2011

Figure 2

1/6/2011 1201.7c French Camp Slough Bridge (Widen) Figure 2.dwg



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REGIONAL FAULT MAP

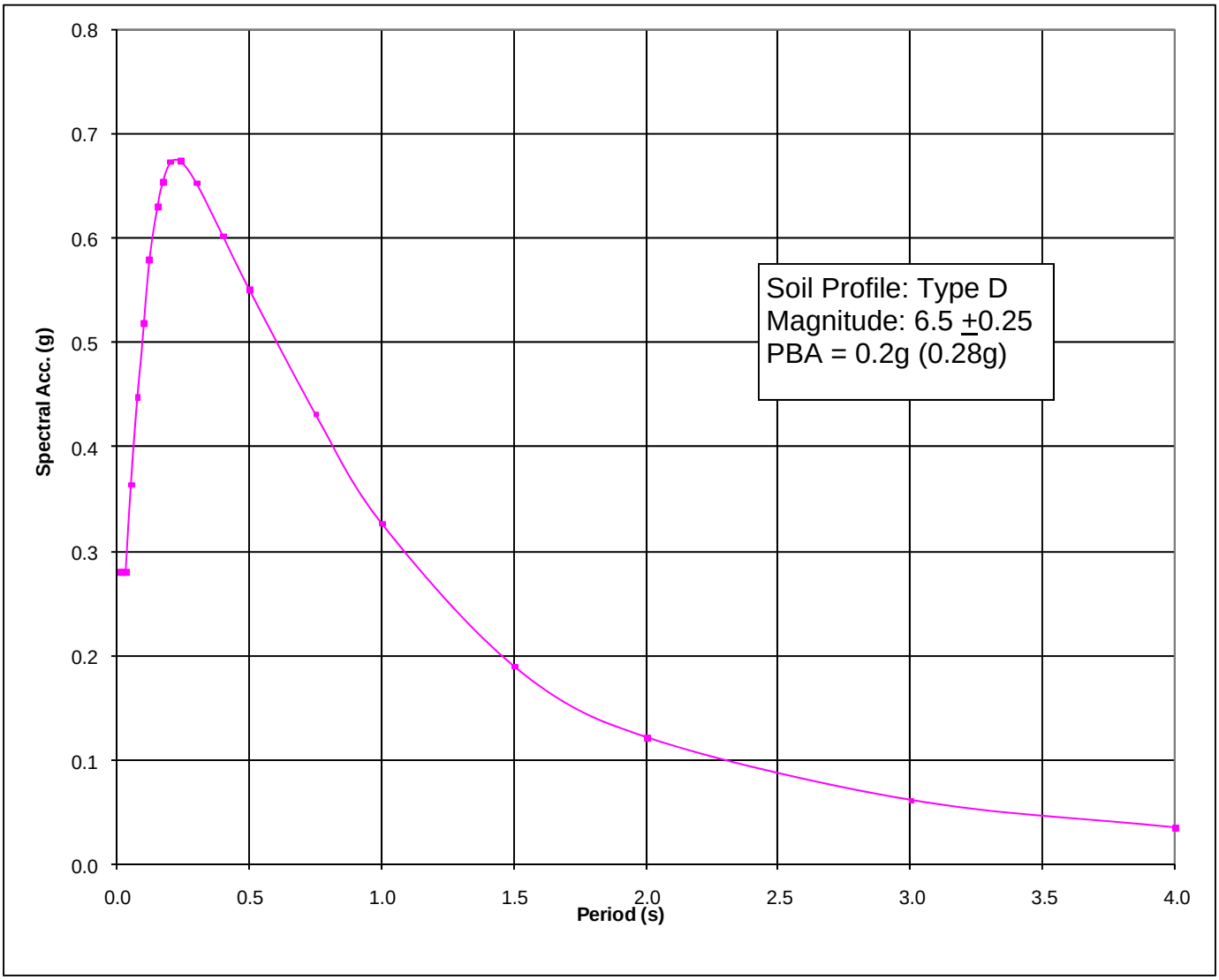
French Camp Slough Bridge (Widen)
San Joaquin County, California

File No. 1201.7

January 2011

Figure 3

1/6/2011 1201.7c French Camp Slough Bridge (Widen) Figure 3.dwg



Reference: Figure B.7, Caltrans Seismic Design Criteria, Ver. 1.4, June 2006

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ARS CURVE

French Camp Slough Bridge (Widen)
San Joaquin County, California

File No. 1201.7c

January 2011

Figure 4

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

David J. Morrell 01/06/11
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER DAVID J. MORRELL No. 60578 Exp. 12/31/12 CIVIL STATE OF CALIFORNIA

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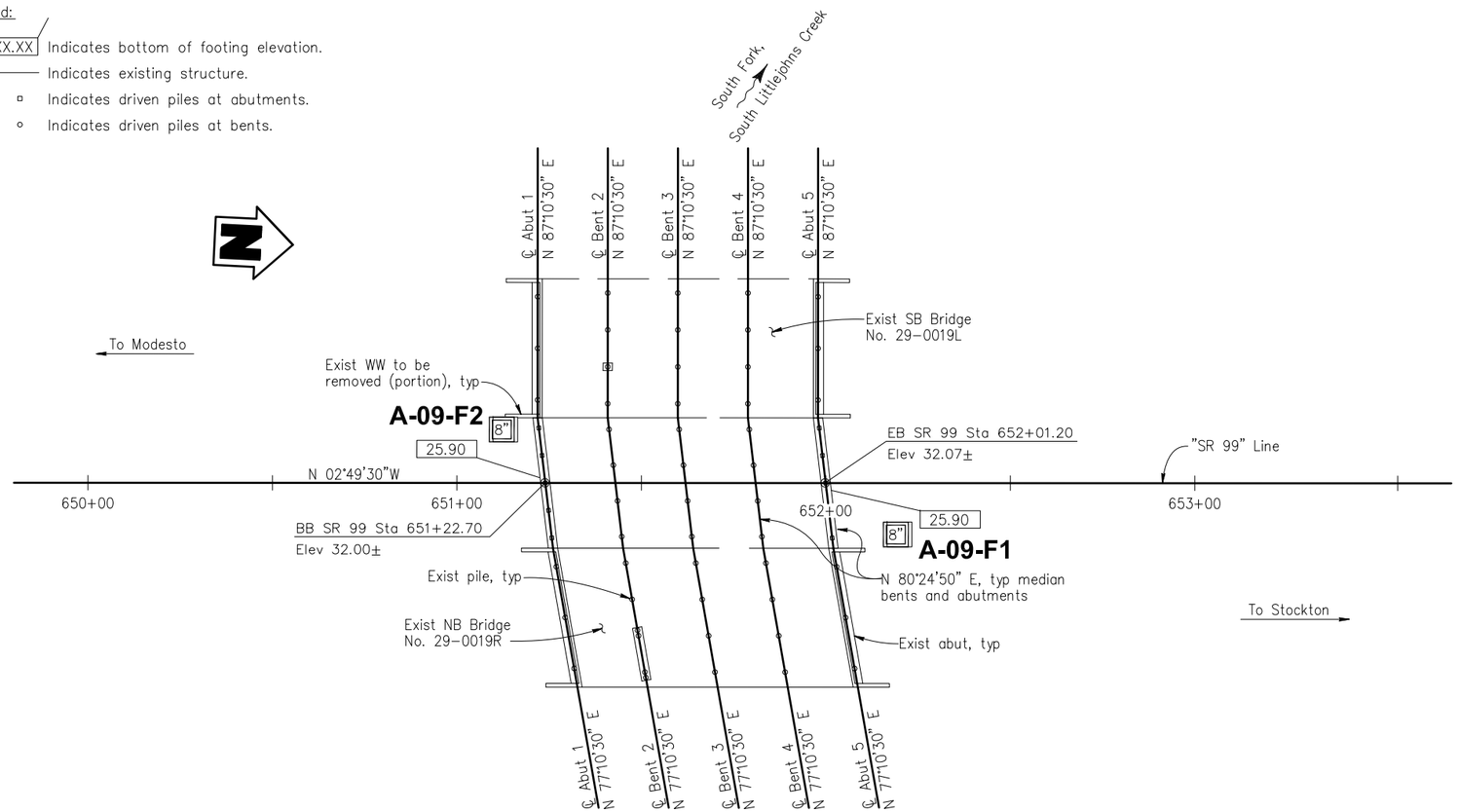
BLACKBURN CONSULTING
2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 FILE No. 1201.7c

HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

gend:

XX.XX Indicates bottom of footing elevation.
Indicates existing structure.
Indicates driven piles at abutments.
Indicates driven piles at bents.



PLAN
1" = 20'

	DRAWN BY	M. ROBERTSON	A. SHINNEFIELD FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	JOHN A. KLEMUNES, JR. PROJECT ENGINEER	BRIDGE NO. 29-0019 POST MILE 12.33	FRENCH CAMP SLOUGH BRIDGE (WIDEN)
	CHECKED BY	B. Crawford	DATE: MARCH 2009				LOG OF TEST BORINGS 1 OF 5

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271 CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES 05/03/10 08/02/10 11/05/10 SHEET OF

FILE => $REQUEST

1/6/2011 1201.7c French Camp Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

REGISTERED CIVIL ENGINEER — DATE 01/06/11

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — DAVID J. MORRELL — No. 60578 — Exp. 12/31/12 — CIVIL — STATE OF CALIFORNIA

BLACKBURN CONSULTING
2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 — FILE No. 1201.7c

HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

BENCH MARKS

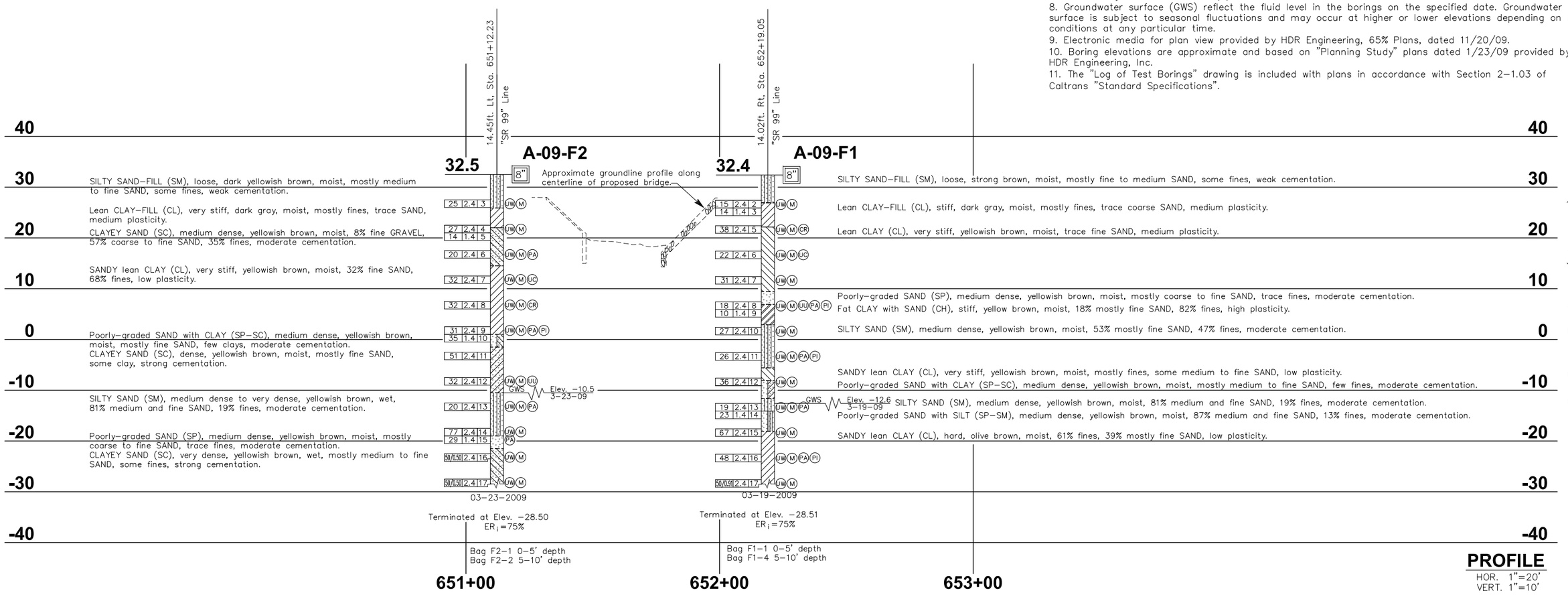
BENCHMARK# 662 — ELEV. 30.80 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED APPROXIMATE CENTERLINE STATION 649+74, ON THE NORTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 1.5' EAST OF THE EDGE OF PAVEMENT, 90' SOUTH OF THE END OF A GUARDRAIL, AND 205' SOUTH OF THE CENTERLINE OF A SLOUGH.
NGVD 29, N2140617.92, E6354085.49.

BENCHMARK# 695 — ELEV. 31.30 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED APPROXIMATE CENTERLINE STATION 649+55, ON THE SOUTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 1.5' WEST OF THE EDGE OF PAVEMENT, 30' SOUTH EAST OF A POWER POLE SUPPLYING POWER TO A WELL PUMP, 210' SOUTH OF THE CENTERLINE OF A SLOUGH.
NGVD 29, N2140593.55, E6353972.04.

FOR PLAN VIEW
SEE LOG OF TEST BORINGS 1 OF 5

NOTES:

1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 3 and 4, "Soil Legend".
2. Standard Penetration tests were performed in accordance with ASTM D 1586–99 using a hammer operated with an automated drop system. Drill rods were 1 5/8–inch diameter "A"–rods; sampler was driven with brass liners.
3. "2.4 inch sampler": ID=2.4 inch, OD=2.9 inch. Driven in same manner as SPT ("1.4 inch") sampler.
4. Where less than the 0.5 inches of penetration is achieved, the blow count shown is for that fraction of the interval actually penetrated.
5. If laboratory tests are not shown as being performed, the soil descriptions presented in the LOTB are based solely on the visual practices described in the before mentioned Manual.
6. The length of each sampled interval is shown graphically on the boring log.
7. Consistency of soils shown in ( ) where estimated.
8. Groundwater surface (GWS) reflect the fluid level in the borings on the specified date. Groundwater surface is subject to seasonal fluctuations and may occur at higher or lower elevations depending on the conditions at any particular time.
9. Electronic media for plan view provided by HDR Engineering, 65% Plans, dated 11/20/09.
10. Boring elevations are approximate and based on "Planning Study" plans dated 1/23/09 provided by HDR Engineering, Inc.
11. The "Log of Test Borings" drawing is included with plans in accordance with Section 2–1.03 of Caltrans "Standard Specifications".



PROFILE
HOR. 1"=20'
VERT. 1"=10'

DRAWN BY	M. ROBERTSON	A. SHINNEFIELD FIELD INVESTIGATION BY:	PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
CHECKED BY	B. Crawford	DATE: MARCH 2009	JOHN A. KLEMUNES, JR. PROJECT ENGINEER

BRIDGE NO. 29–0019 — POST MILE 12.33

FRENCH CAMP SLOUGH BRIDGE (WIDEN)
LOG OF TEST BORINGS 2 OF 5

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271 — CONTRACT NO.: 10–0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES 05/03/10 08/08/10 11/05/10 — SHEET — OF

FILE => $REQUEST

1/6/2011 1201.7c French Camp Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

REGISTERED CIVIL ENGINEER — DATE 01/06/11

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — DAVID J. MORRELL — No. 60578 — Exp. 12/31/12 — CIVIL — STATE OF CALIFORNIA

BLACKBURN CONSULTING
2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 — FILE No. 1201.7c

HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	<0.25	<0.25	<0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

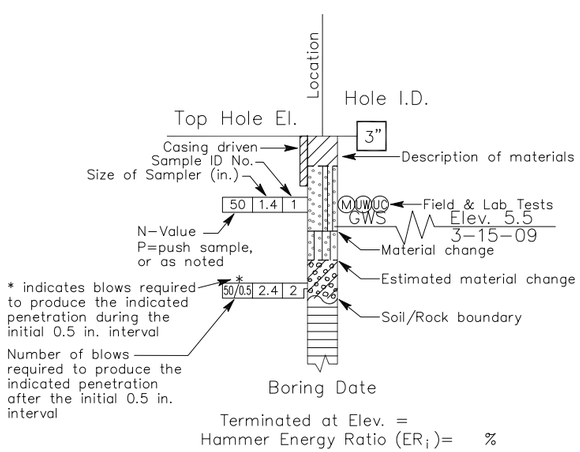
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1–inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778)
⬚	O	Other

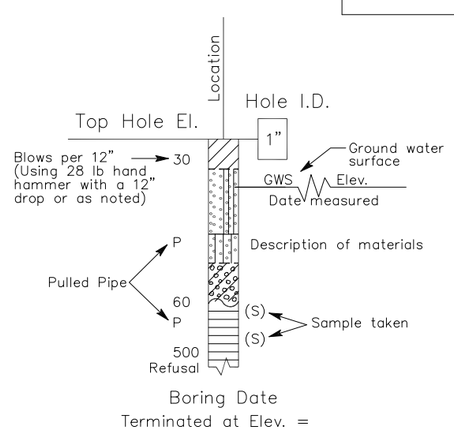
NOTE: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

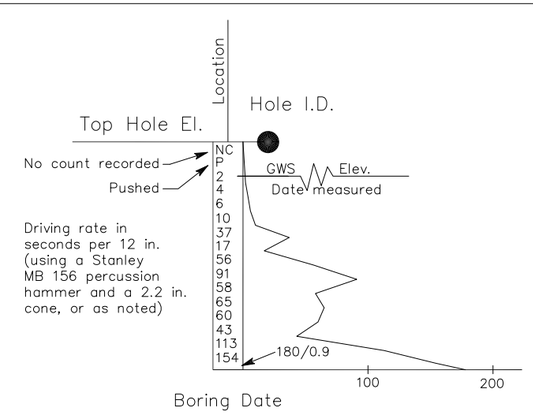
Description	Criteria
Nonplastic	A 1/8–inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



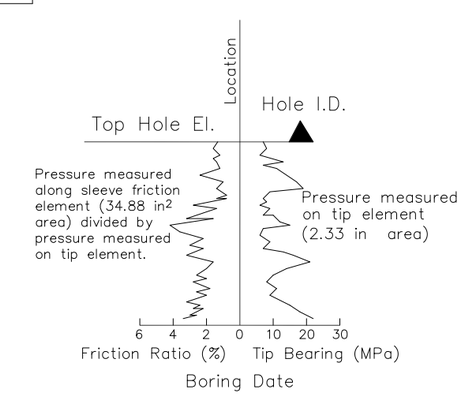
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

FRENCH CAMP SLOUGH BRIDGE (WIDEN)

LOG OF TEST BORINGS 3 OF 5

DESIGN OVERSIGHT
SIGN OFF DATE

DRAWN BY M. ROBERTSON
CHECKED BY B. Crawford

A. SHINNEFIELD
FIELD INVESTIGATION BY:
DATE: MARCH 2009

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29–0019
POST MILE 12.33

GS SOIL LEGEND SHEET 1 (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10–0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES — REVISION DATES 05/03/10 08/02/10 11/05/10 — SHEET — OF

FILE => $REQUEST

1/6/2011 1201.7c French Camp Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

REGISTERED CIVIL ENGINEER — DATE 01/06/11

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — DAVID J. MORRELL No. 60578 Exp. 12/31/12 CIVIL — STATE OF CALIFORNIA

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BLACKBURN CONSULTING
2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 FILE No. 1201.7c

HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND
GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL
SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean Clay ORGANIC lean Clay with SAND ORGANIC lean Clay with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OH/OL	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 2937)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60}-Value (Blows / 12 inches)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

FRENCH CAMP SLOUGH BRIDGE (WIDEN)

LOG OF TEST BORINGS 4 OF 5

DESIGN OVERSIGHT
SIGN OFF DATE

DRAWN BY M. ROBERTSON
CHECKED BY B. Crawford

A. SHINNEFIELD
FIELD INVESTIGATION BY:
DATE: MARCH 2009

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29-0019
POST MILE 12.33

GS SOIL LEGEND SHEET 2 (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES 05/03/10 09/08/10 11/05/10

SHEET OF

FILE => $REQUEST

1/6/2011 1201.7c French Camp Slough Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

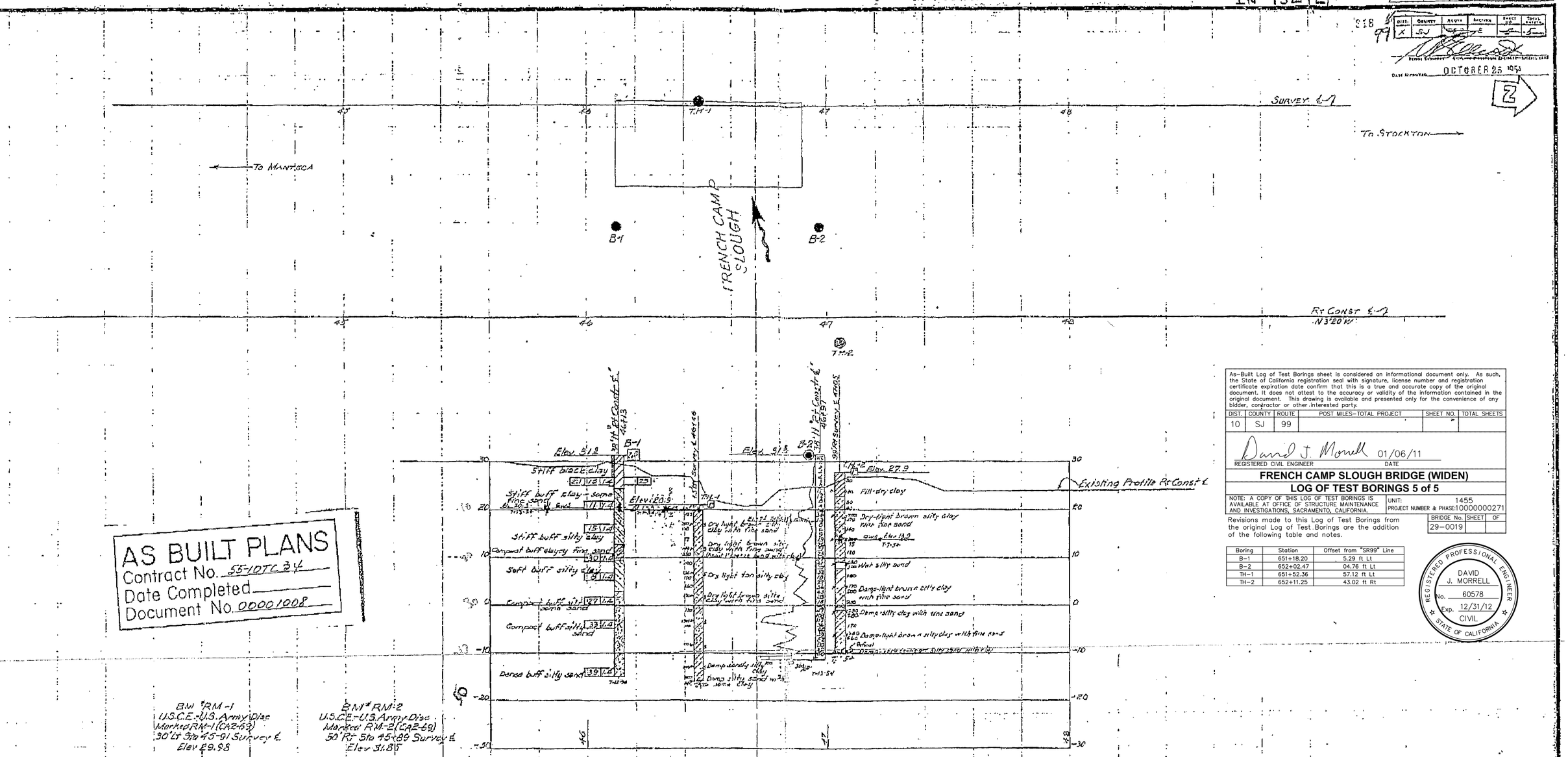
FED. ROAD DIST. NO.	STATE	FEDL. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CAL.			41	45

IN-192 (2)

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
X	SJ		E		

BRIDGE ENGINEER

DATE SUBMITTED OCTOBER 25 1953



AS BUILT PLANS
Contract No. 55-10TC 34
Date Completed
Document No. 00001008

As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES–TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
10	SJ	99			

David J. Morrell 01/06/11
REGISTERED CIVIL ENGINEER DATE

FRENCH CAMP SLOUGH BRIDGE (WIDEN)
LOG OF TEST BORINGS 5 of 5

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA.

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271

BRIDGE No.	SHEET	OF
29-0019		

Revisions made to this Log of Test Borings from the original Log of Test Borings are the addition of the following table and notes.

Boring	Station	Offset from "SR99" Line
B-1	651+18.20	5.29 ft Lt
B-2	652+02.47	04.76 ft Lt
TH-1	651+52.36	57.12 ft Lt
TH-2	652+11.25	43.02 ft Rt

REGISTERED PROFESSIONAL ENGINEER
DAVID J. MORRELL
No. 60578
Exp. 12/31/12
CIVIL
STATE OF CALIFORNIA

As-built No changes D.H.N.

BRIDGE DEPARTMENT

Approved Recommended by: [illegible]

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS.

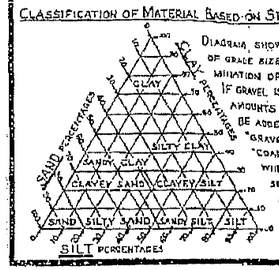


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.

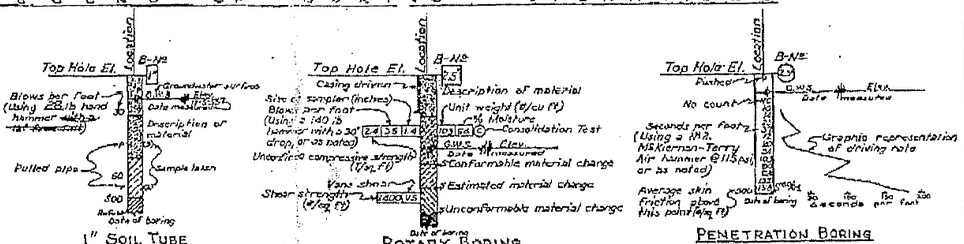
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND". THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

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

LEGEND OF BORING OPERATIONS

- PLAN OF ANY BORING
- PENETROMETER
- 2¼" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- CORE BORING
- TEST PIT



NOTES

The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provisions accompanying this set of plans.

Classification of earth materials shown on this sheet is based upon field inspection and is analytic to be construed to imply mechanical analysis.

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BRIDGE ACROSS FRENCH CAMP SLOUGH

LOG OF TEST BORINGS

SCALE	BRIDGE	FILE	DRAWING
Hor. 1"=20' Vert. 1"=10'	29-19 R.L.		D-3919-5

Log of Test Boring (LOTB) Sheet Checklist

This checklist shall be used by the *checker* in his/her evaluation of a LOTB sheet's conformance with the Caltrans *Soil & Rock Logging, Classification, and Presentation Manual,* and other applicable standards. To facilitate a quality check, the checker shall be provided with the draft final LOTB sheets, pertinent laboratory test results, copies of approved *Request for Exceptions*, and the field logs. This checklist is not comprehensive and does not attempt to account for all logging and presentation standards. As such, the checker must be familiar with the entire manual in order to successfully perform a quality check. **One checklist shall be completed per LOTB plan sheet. One signature sheet may be used for each structure (Bridge No.).**

Project Information

Dist – EA: OE6101 County: SJ Route: 99 PM: 12.53

Bridge No.: 29-0019

Sheet Title: French Camp Slough Bridge (Widen) Sheets 1 - 5

Revision Date: N/A

Are there approved exceptions to the manual? ☐ Yes ☒ No (attach, if yes)

General

	Yes	No	N/A	
1.1	☒	☐	☐	Does the Plan View meet the requirements of Sec 5.2.3.3?
1.2	☒	☐	☐	Does the Border meet the requirements of Sec 5.2.3.1 and Sec 5.2.3.2?
1.3	☒	☐	☐	Are the Notes clear and do they meet the requirements of Sec 5.2.2?
1.4	☒	☐	☐	If As-Built LOTB, does it meet the requirements of Sec 5.2.4?
1.5	☒	☐	☐	Is the soil legend sheet attached and properly labeled?
1.6	☐	☐	☒	If rock is presented, is the rock legend attached and properly labeled?
1.7	☐	☐	☒	If approved "Exception to Policy" form is attached, does the LOTB meet the requirements of the approved exceptions?

Elevation View

2.1	☒	☐	☐	Are the Hole Identifications correct? (Sec 2.3) (Sec. 5.2.3.4)
2.2	☒	☐	☐	Are the location descriptions correct?
2.3	☒	☐	☐	Are the holes located properly on the profile?
2.4	☒	☐	☐	Is the elevation scale correct? (Sec 5.2.3.4)
2.5	☒	☐	☐	Is the top of hole elevation presented and correct? (Sec 5.2.3.4)

Log of Test Boring (LOTB) Sheet Checklist

Bridge No.: 29-0019 Sheet Title: French Camp Slough Br. (Widen) Br

	Yes	No	N/A	
2.6	☒	☐	☐	Is the correct hole diameter presented in the correct Borehole Symbol? (Sec 5.2.5.6)
2.7	☒	☐	☐	Does the stationing match the profile view?
2.8	☒	☐	☐	Are the Boring Date and Termination Elevation presented at the bottom of each boring log? (Sec 5.2.3.4)
2.9	☒	☐	☐	If SPT tests were performed, is the correct hammer efficiency reported at the bottom of each borehole?
2.10	☒	☐	☐	Are lab tests reported at the correct elevations? (Sec 5.2.5.2)
2.11	☒	☐	☐	Are SPT blow counts reported at the correct elevations? (Sec 5.2.5.2)
2.12	☒	☐	☐	Is the groundwater presented at the correct elevation? (Sec 5.2.5.2)
2.13	☒	☐	☐	Are the soil/rock layers and graphics presented correctly? (Sec 4, Sec 5.2.5.7)
2.14	☒	☐	☐	Are the required descriptors presented and in the correct order? (Sec 2.4.1, Sec 2.5.1)
2.15	☒	☐	☐	Are the descriptors presented consistent with those allowed in the manual?
2.16	☒	☐	☐	Are the soil identifications consistent with the field observations? (Sec 2)
2.17	☒	☐	☐	Are the soil classifications consistent with reported lab test results? (Sec 3)
2.18	☒	☐	☐	Are the consistency descriptors consistent with field observations and/or lab test results? (Sec 2.4.3, Sec 3.2.3)
2.19	☒	☐	☐	Are the apparent density descriptors consistent with the SPT results and hammer efficiency? (Sec 2.4.4)
2.20	☐	☐	☒	Are % recovery (REC) and rock quality designation (RQD) presented at the required elevations?
2.21	☐	☐	☒	Is rock strength presented where lab tests are reported? (Sec 3.3.1)
2.22	☒	☐	☐	Considering the field observations, are lab test results properly applied to the descriptors within a layer per Sec 4.3?
2.23	☒	☐	☐	Are the presentations consistent with the rules presented in Sec 4?
2.24	☒	☐	☐	Are the presentations consistent with the rules presented in Sec 5?

List all variances identified during initial review of the LOTB sheet and steps needed to resolve the discrepancy (include item number). Also note any recommendations for revisions to the manual or procedures that might reduce or eliminate similar errors in the future.

N/A

Log of Test Boring QC/QA Signature Sheet

Dist – EA: OE6101 Bridge No.: 29-0019

Sheet Titles:

French Camp Slough Bridge (Widen) Sheets 1 - 5

I, the undersigned on the date following my signature, hereby certify that I have performed a quality check of the referenced LOTB sheets and that the referenced LOTB sheets *substantially* comply with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2007) and related policy and standards.

Ben Crawford	Principal
Checker (Print)	Title
	1/6/11
Checker (Signature)	Date

I, the undersigned on the date following my signature, hereby certify that the referenced LOTB sheets *substantially* comply with Geotechnical Service's Quality Control/Quality Assurance procedures, as described in the memorandum, "Quality Control/Quality Assurance Documentation on LOTB Sheets", dated July 1, 2007.

Eric Nichols	Senior Project Manager
Functional Supervisor (Print)	Title
	1/6/11
Functional Supervisor (Signature)	Date

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

APPENDIX B

Laboratory Test Results Summary

Laboratory Results

Laboratory Test Summary **1201.7c**
Samples from Exploratory Borings
French Camp Slough Bridge (Widen)

Boring	Sample	Depth (feet)	Unified Soil Classification	Dry Density (pcf)	Natural Moisture (%)	Plastic Limit	Liquid Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Consolidation Test	Pocket Pen (tsf)	Unconfined Compressive Strength (tsf)	Triaxial Test Results				Corrosivity Test
															Total		Effective		
															Phi (degrees)	Cohesion (psf)	Phi (degrees)	Cohesion (psf)	
A-09-F1	2c	6.0-6.5	CL	97.5	24.7								4.5+						
A-09-F1	5b	10.5-11.0	CL																Test
A-09-F1	5c	11.0-11.5	CL	96.5	23.2								4.5+						
A-09-F1	6c	16.0-16.5	CL	106.1	18.7									2.9					
A-09-F1	7b	20.5-21.0	CL	98.6	22.2								3.8						
A-09-F1	7c	21.0-21.5	SC						0.0	60.0	40.0								
A-09-F1	8b	25.5-26.0	CH			20	50	30	0.0	18.0	82.0								
A-09-F1	8c	26.0-26.5	CH	95.6	27.6						79.0				0	3815			
A-09-F1	10c	31.0-31.5	SM	104.7	14.7														
A-09-F1	11c	36.0-36.5	SM	95.1	17.9	Non Plastic			0.0	53.0	47.0								
A-09-F1	12c	41.0-41.5	SP-SC	114.3	12.0														
A-09-F1	13c	46.0-46.5	SM	109.9	20.2				0.0	81.0	19.0								
A-09-F1	14	46.5-48.0	SP-SM						0.0	87.0	13.0								
A-09-F1	15b	50.5-51.0	CL	109.8	17.5								4.5+						
A-09-F1	16c	56.0-56.5	CL	112.1	18.0	20	31	11	0.0	39.0	61.0		4.5+						
A-09-F1	17c	61.0-61.5	CL	105.5	21.7								4.5+						
A-09-F2	3c	6.0-6.5	SM	73.7	25.4														
A-09-F2	4b	10.5-11	CL						0.0	9.9	90.1								
A-09-F2	4c	11.0-11.5	SC	87.9	25.4														
A-09-F2	6b	15.5-16.0	SC	110.2	12.5				8.0	57.0	35.0								
A-09-F2	7b	20.5-21.0	CL	103.8	17.3									2.3					
A-09-F2	8b	25.5-26.0	CL																Test
A-09-F2	8c	26.0-26.5	CL	97.3	26.5								4.5+						
A-09-F2	9c	31.0-31.5	CL	109.7	19.4	18	27	9	0.0	32.0	68.0								
A-09-F2	11c	36.0-36.5	SC	99.6	23.3														
A-09-F2	12c	41.0-41.5	SC	108.0	19.9										0	4060			
A-09-F2	13c	46.0-46.5	SM	101.7	22.7				0.0	81.0	19.0								
A-09-F2	14c	51.0-51.5	SM	110.8	17.0														
A-09-F2	15	51.5-53.0	SP						0.0	97.0	3.0								
A-09-F2	16c	56.0-56.5	SC	118.2	15.1														
A-09-F2	17c	61.0-61.5	SC	108.7	19.3														

blackburn consulting

Project Name: SR 99 Median Widening - FRENCH CAMP SLOUGH
BCI File No: 1201.7C
Date: 3/31/2009
Technician: ECH/KC

MOISTURE-DENSITY TESTS

Sample No.	F1-2C	F1-5C	F1-7B	F1-10C	F1-11C	F1-12C	F1-13C
Depth (ft.)	6-6.5	11-11.5	20.5-21.0	31-31.5	36-36.5	41-41.5	46-46.5
Sample Length (in.)	6.00	5.97	4.92	5.99	5.94	5.96	4.82
Diameter (in.)	2.390	2.420	2.400	2.410	2.410	2.420	2.390
Sample + Tube (g)	858.9	856.8	704.6	862.0	798.0	921.6	1001.6
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	251.5
Wet Weight (g)	858.9	856.8	704.6	862.0	798.0	921.6	750.1
Sample Volume (ft^3)	0.01558	0.01589	0.01288	0.01581	0.01568	0.01586	0.01251
Tare No.	F3	T12	C2	F	T10	N	T-5
Tare (g)	154.0	259.3	155.2	153.5	253.2	240.7	317.2
Wet Soil + Tare (g)	585.3	689.1	594.8	704.8	1048.3	855.6	1083.8
Dry Soil + Tare (g)	500.0	608.1	514.8	634.0	927.5	789.5	954.9
Dry Soil Weight (g)	346.0	348.8	359.6	480.5	674.3	548.8	637.7
Water (g)	85.3	81.0	80.0	70.8	120.8	66.1	128.9
Moisture (%)	**24.7**	**23.2**	**22.2**	**14.7**	**17.9**	**12.0**	**20.2**
Wet Density (pcf)	**121.6**	**118.9**	**120.6**	**120.2**	**112.2**	**128.1**	**132.1**
Dry Density (pcf)	**97.5**	**96.5**	**98.6**	**104.7**	**95.1**	**114.3**	**109.9**
Pocket Pen (tsf)	**4.5+**	**4.5+**	**3.8**	**4.5+**	**4.5+**	**4.5+**	**4.5+**

Sample No.	F1-15B	F1-16C	F1-17C	F2-3C	F2-4C	F2-6B	F2-8C
Depth (ft.)	50.5-51.0	56-56.5	61-61.5	6-6.5	11-11.5	15.5-16.0	26-26.5
Sample Length (in.)	6.00	5.96	5.59	5.99	3.21	5.21	5.68
Diameter (in.)	2.390	2.430	2.410	2.390	2.340	2.380	2.390
Sample + Tube (g)	911.7	959.7	859.6	652.2	399.7	960.7	823.9
Tube (g)	0.0	0.0	0.0	0.0	0.0	206.2	0.0
Wet Weight (g)	911.7	959.7	859.6	652.2	399.7	754.5	823.9
Sample Volume (ft^3)	0.01558	0.01600	0.01476	0.01555	0.00799	0.01341	0.01475
Tare No.	F5	G	L	B9	B15	B18	B17
Tare (g)	195.1	223.6	215.2	146.6	167.3	171.3	188.7
Wet Soil + Tare (g)	730.3	896.6	656.5	688.6	406.5	797.5	684.3
Dry Soil + Tare (g)	650.7	793.8	577.8	578.9	358.0	727.7	580.4
Dry Soil Weight (g)	455.6	570.2	362.6	432.3	190.7	556.4	391.7
Water (g)	79.6	102.8	78.7	109.7	48.5	69.8	103.9
Moisture (%)	**17.5**	**18.0**	**21.7**	**25.4**	**25.4**	**12.5**	**26.5**
Wet Density (pcf)	**129.0**	**132.3**	**128.4**	**92.5**	**110.3**	**124.0**	**123.2**
Dry Density (pcf)	**109.8**	**112.1**	**105.5**	**73.7**	**87.9**	**110.2**	**97.3**
Pocket Pen (tsf)	**4.5+**	**4.5+**	**4.5+**	**4.5+**	**N/A**	**4.5+**	**4.5+**

Diameter = 1.44" for 1.5-inch Tubes
Diameter = 1.938" for 2-inch Tubes
Diameter = 2.438" for 2.5-inch Tubes
Diameter= 2.850" for 3.0-inch Shelby Tubes

blackburn consulting

Project Name: SR 99 Median Widening - FRENCH CAMP SLOUGH
BCI File No: 1201.7c
Date: 3/31/2009
Technician: ECH/KC

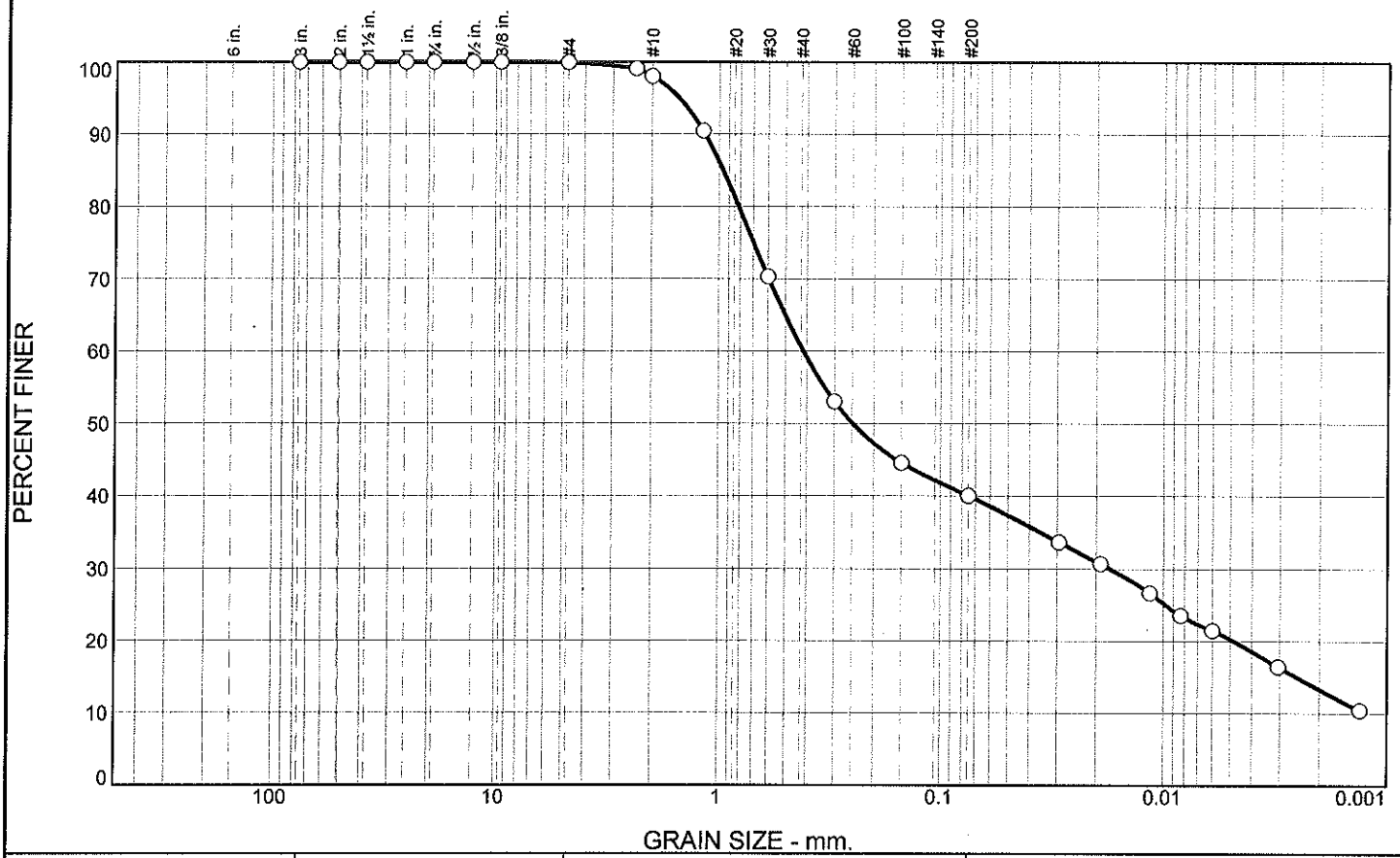
MOISTURE-DENSITY TESTS

Sample No.	F2-9C	F2-11C	F2-13C	F2-14C	F2-16C	F2-17C	
Depth (ft.)	31-31.5	36-36.5	46-46.5	51-51.5	56-56.5	61-61.5	
Sample Length (in.)	5.90	5.65	5.61	5.99	5.92	6.25	
Diameter (in.)	2.380	2.420	2.380	2.390	2.390	2.390	
Sample + Tube (g)	902.8	838.4	817.3	915.0	947.8	954.5	
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	
Wet Weight (g)	902.8	838.4	817.3	915.0	947.8	954.5	
Sample Volume (ft^3)	0.01519	0.01504	0.01444	0.01555	0.01537	0.01623	
Tare No.	A	T3	ZZ1	F7	F6	R	
Tare (g)	162.8	256.7	317.8	191.7	192.2	342.7	
Wet Soil + Tare (g)	804.5	660.3	968.9	764.5	740.2	848.3	
Dry Soil + Tare (g)	700.2	583.9	848.4	681.2	668.5	766.4	
Dry Soil Weight (g)	537.4	327.2	530.6	489.5	476.3	423.7	
Water (g)	104.3	76.4	120.5	83.3	71.7	81.9	
Moisture (%)	**19.4**	**23.3**	**22.7**	**17.0**	**15.1**	**19.3**	
Wet Density (pcf)	**131.0**	**122.9**	**124.8**	**129.7**	**135.9**	**129.7**	
Dry Density (pcf)	**109.7**	**99.6**	**101.7**	**110.8**	**118.2**	**108.7**	
Pocket Pen (tsf)							

Sample No.							
Depth (ft.)							
Sample Length (in.)							
Diameter (in.)							
Sample + Tube (g)							
Tube (g)							
Wet Weight (g)							
Sample Volume (ft^3)							
Tare No.							
Tare (g)							
Wet Soil + Tare (g)							
Dry Soil + Tare (g)							
Dry Soil Weight (g)							
Water (g)							
Moisture (%)							
Wet Density (pcf)							
Dry Density (pcf)							
Pocket Pen (tsf)							

Diameter = 1.44" for 1.5-inch Tubes
Diameter = 1.938" for 2-inch Tubes
Diameter = 2.438" for 2.5-inch Tubes
Diameter= 2.850" for 3.0-inch Shelby Tubes

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.0	37.4	20.6	19.7	20.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.50	100.0		
.375	100.0		
#4	100.0		
#8	99.1		
#10	98.0		
#16	90.4		
#30	70.3		
#50	53.1		
#100	44.6		
#200	40.0		

* (no specification provided)

Material Description

Yellowish brown CLAYEY SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.1580 D_{85}= 0.9584 D_{60}= 0.4143
D_{50}= 0.2485 D_{30}= 0.0173 D_{15}= 0.0025
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Source of Sample: F1 **Depth:** 21.0-21.5'
Sample Number: 7c

Date: 1/4/2010

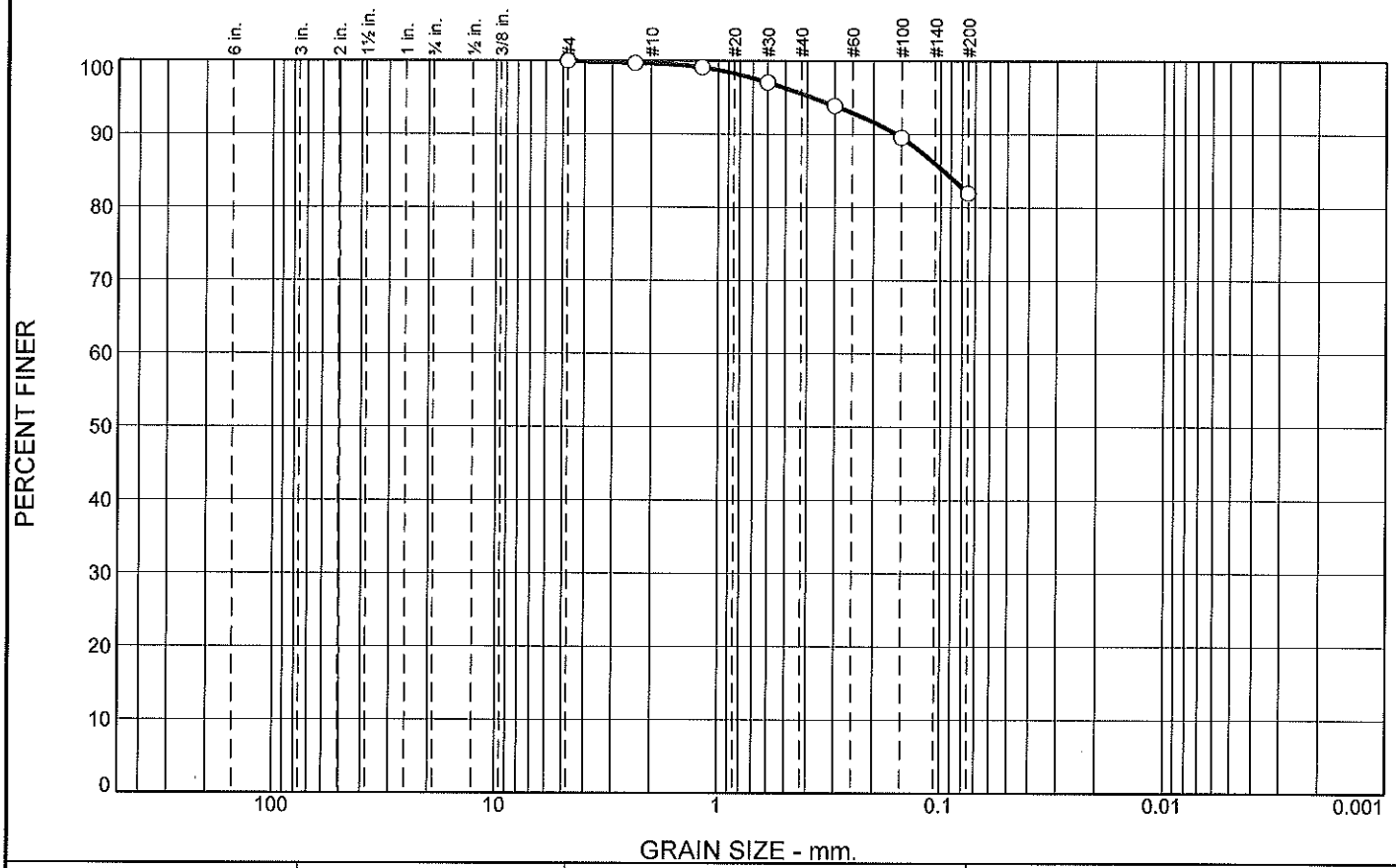
Blackburn Consulting

W. Sacramento, CA

Client: HDR, Inc.
Project: SR 99 Widening - French Camp Slough
Project No: 1201.7c **Figure**

Tested By: MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	4	14	82	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	99		
#30	97		
#50	94		
#100	90		
#200	82		

* (no specification provided)

Material Description

Brown Fat CLAY with Sand

Atterberg Limits

PL= 20 LL= 50 PI= 30

Coefficients

D_{90}= 0.1581 D_{85}= 0.0966 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(25)

Remarks

1/2 of sample was sand, other half was clay. portion used for tests was clay material.

Sample Number: F1-8 B **Depth:** 25.5-26.0

Date: 4-14-09

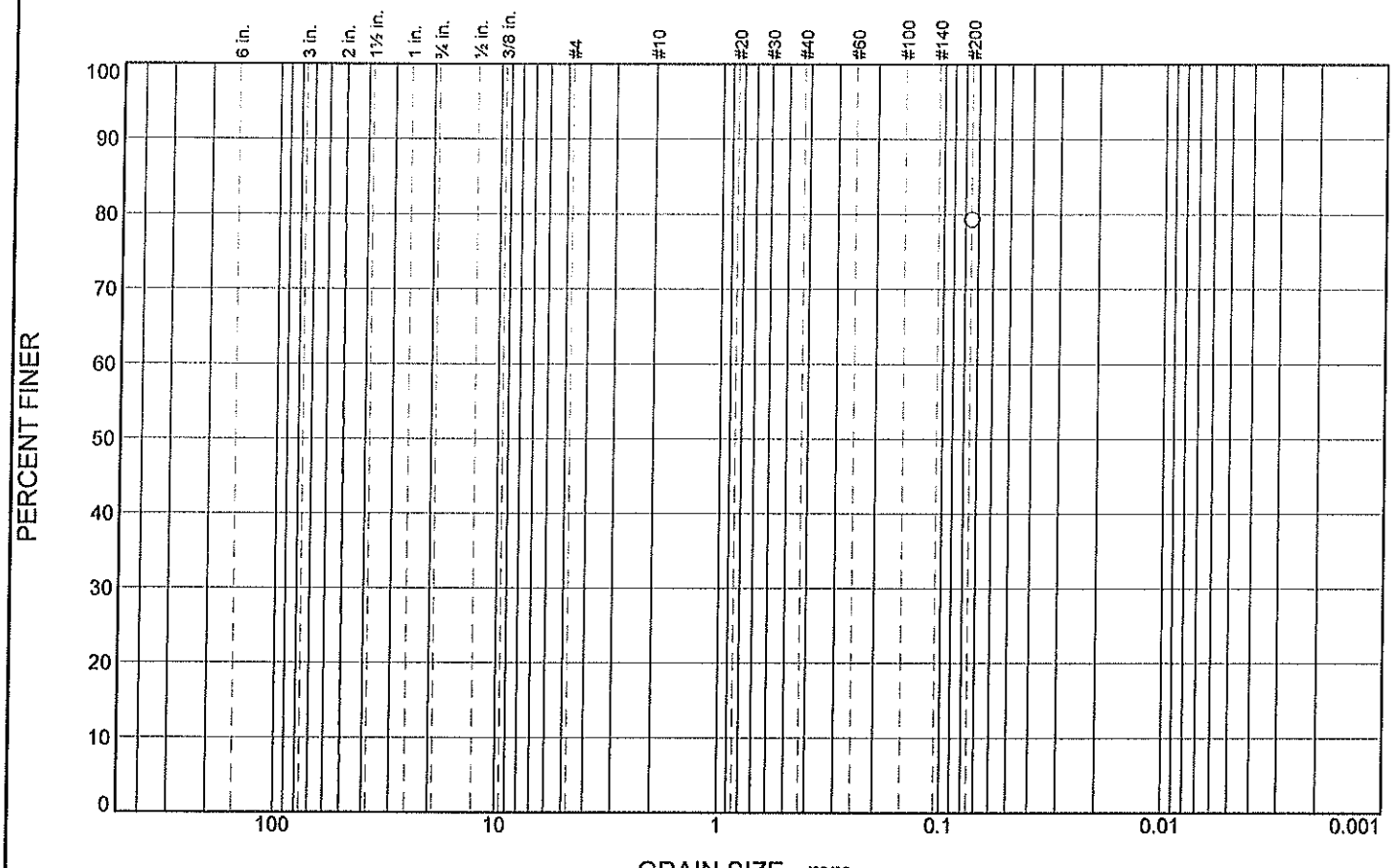
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: ECH/KLC **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						79	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	79		

* (no specification provided)

Soil Description

Fat CLAY with SAND (CH), yellow brown (clayey sand layer at bottom of sample)

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

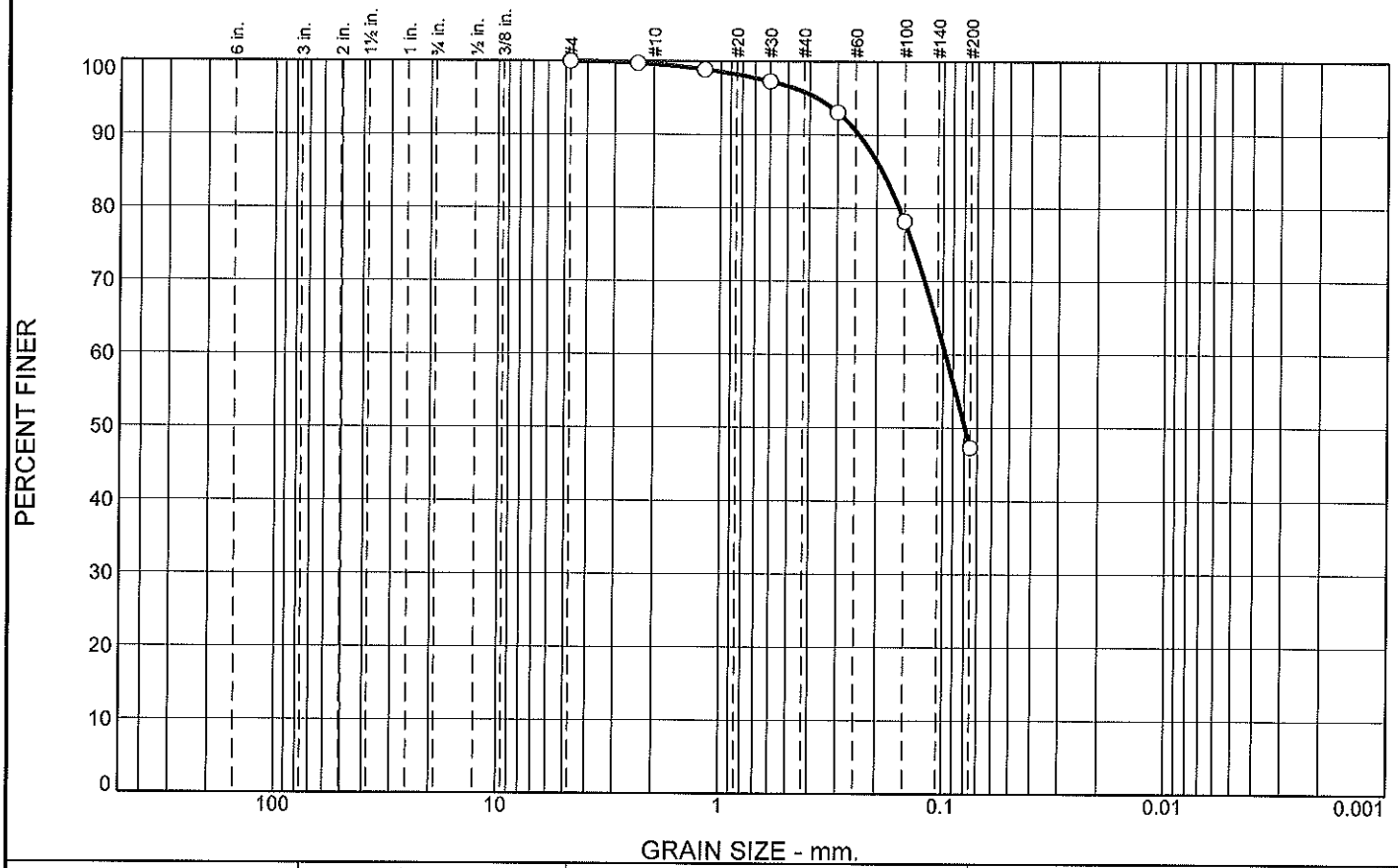
Source of Sample: F1 **Depth:** 26.0-26.5
Sample Number: 8c **Date:** 5-15-09

Blackburn Consulting

W. Sacramento, CA

Client: HDR, Inc.
Project: SR 99 Widening - French Camp Slough
Project No: 1201.7c **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	4	49	47	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	99		
#30	97		
#50	93		
#100	78		
#200	47		

* (no specification provided)

Material Description

Dark Yellowish Brown Silty SAND

Atterberg Limits

PL= NP LL= PI=

Coefficients

D_{90}= 0.2406 D_{85}= 0.1890 D_{60}= 0.0971
D_{50}= 0.0791 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample Number: F1-11 C **Depth:** 36.0'-36.5'

Date: 3-31-09

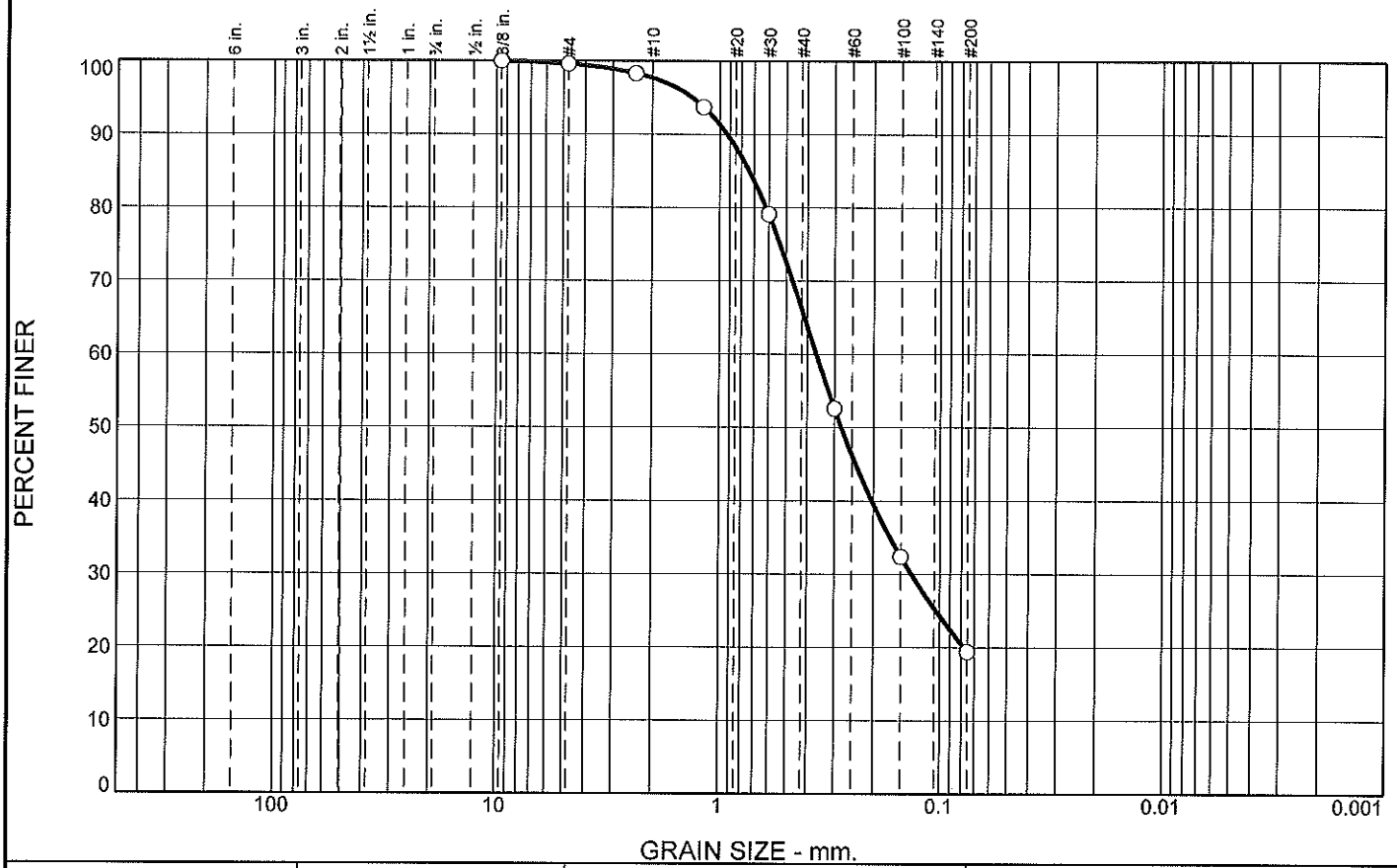
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	2	32	47	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	98		
#16	94		
#30	79		
#50	53		
#100	32		
#200	19		

* (no specification provided)

Material Description

Brown Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.9238 D_{85}= 0.7352 D_{60}= 0.3633
D_{50}= 0.2789 D_{30}= 0.1342 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: F1-13 C **Depth:** 46.0'-46.5'

Date: 3-31-09

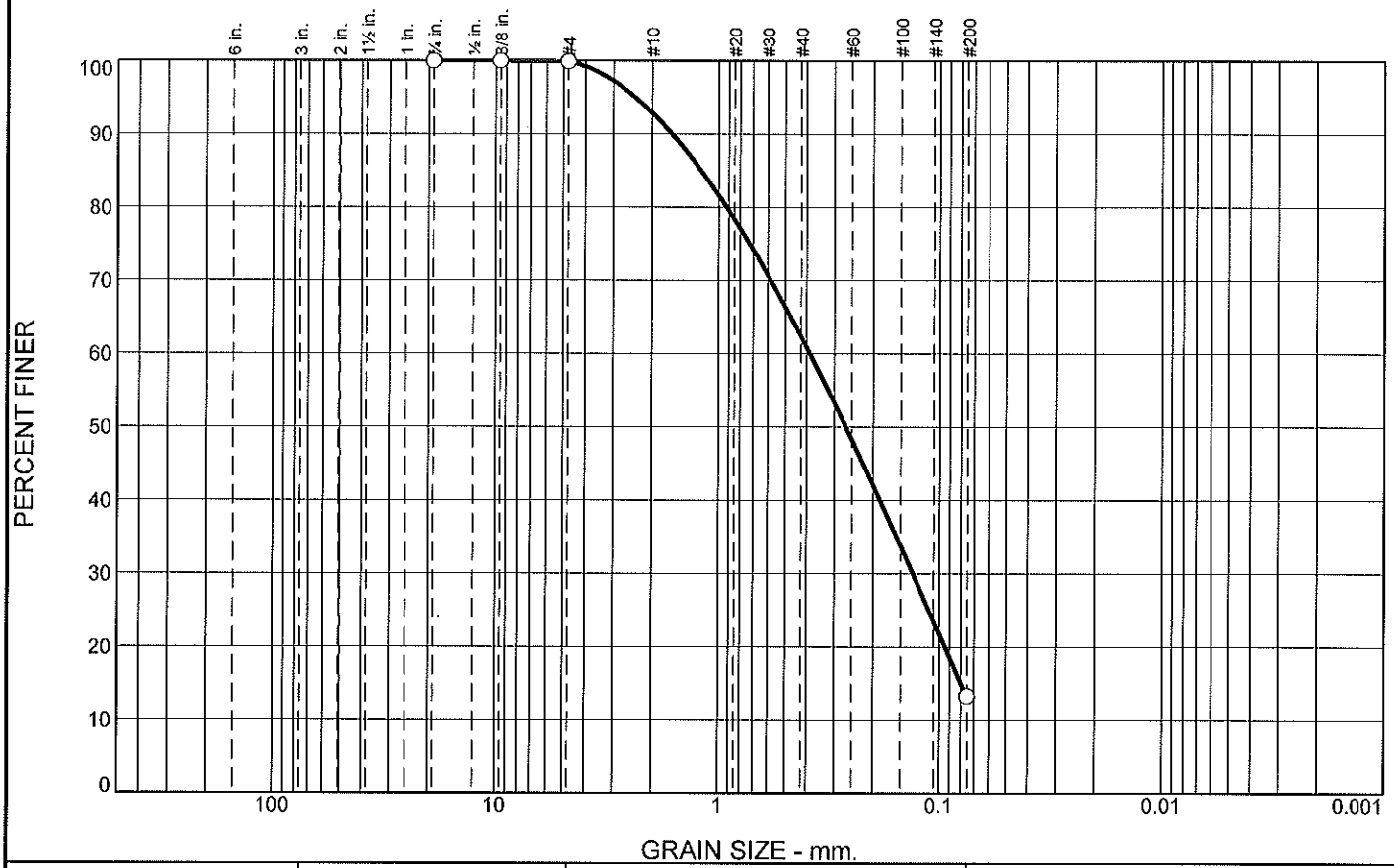
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: Ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	7	31	49	13	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
3/8"	100		
#4	100		
#200	13		

* (no specification provided)

Material Description

Brown SAND With Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 1.6187 D_{85}= 1.1951 D_{60}= 0.3860
D_{50}= 0.2651 D_{30}= 0.1316 D_{15}= 0.0795
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO=

Remarks

Sample Number: F1-14 **Depth:** 46.5'-48.0'

Date: 3-31-09

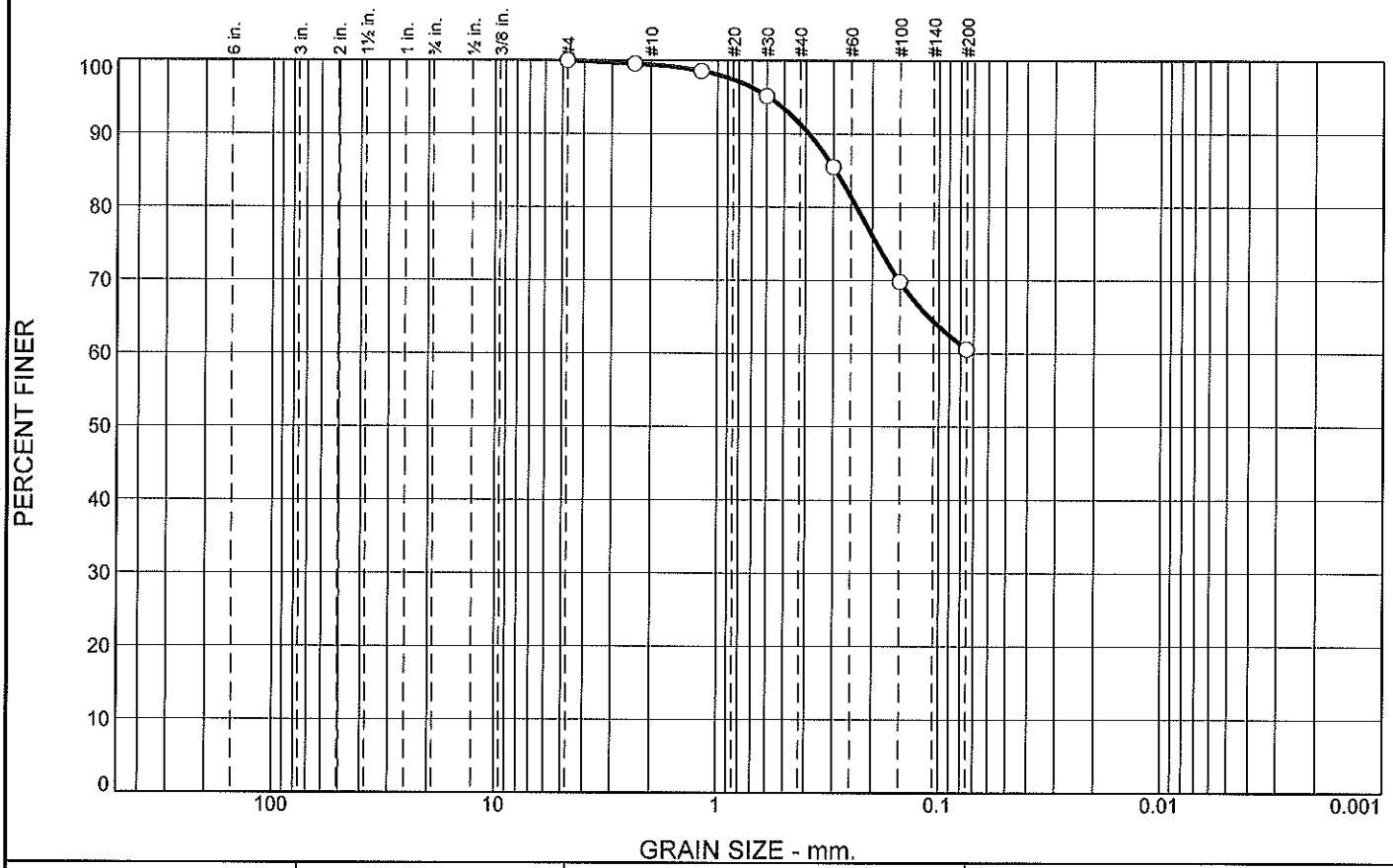
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: ech **Checked By:** klc

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	8	30	61	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	99		
#30	95		
#50	85		
#100	70		
#200	61		

* (no specification provided)

Material Description

Dark Grayish Brown Sandy Lean CLAY

Atterberg Limits

PL= 20 LL= 31 PI= 11

Coefficients

D_{90}= 0.3856 D_{85}= 0.2929 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(4)

Remarks

Sample Number: F1-16 C **Depth:** 56.0'-56.5'

Date: 3-31-09

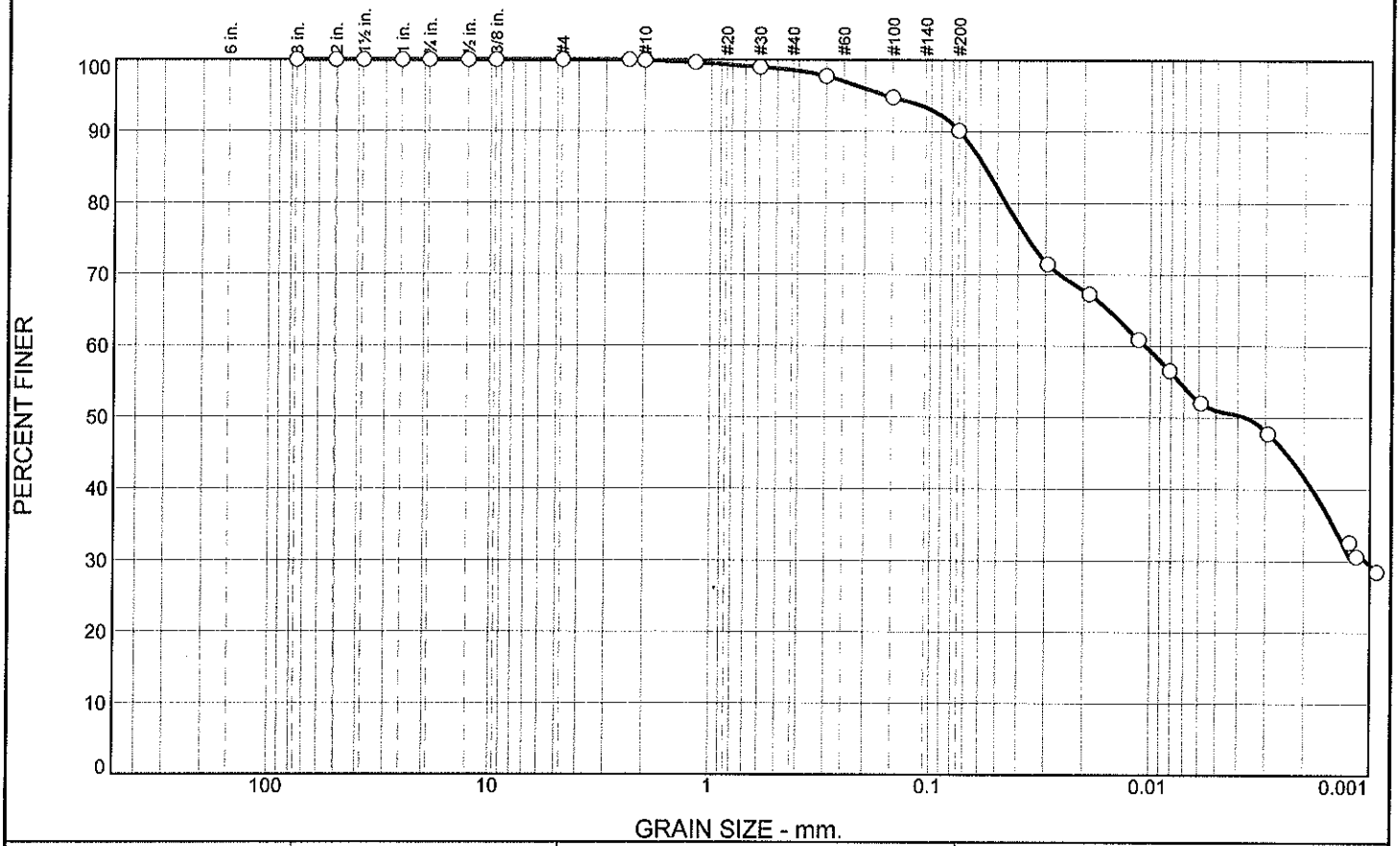
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.4	8.4	39.1	51.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.50	100.0		
.375	100.0		
#4	100.0		
#8	100.0		
#10	99.9		
#16	99.6		
#30	99.0		
#50	97.7		
#100	94.7		
#200	90.1		

* (no specification provided)

Material Description

Very dark grayish brown Lean CLAY

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0743 D_{85}= 0.0568 D_{60}= 0.0105
D_{50}= 0.0037 D_{30}= 0.0010 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: F2 **Depth:** 10.0-11.5'
Sample Number: 4b

Date: 1/5/2010

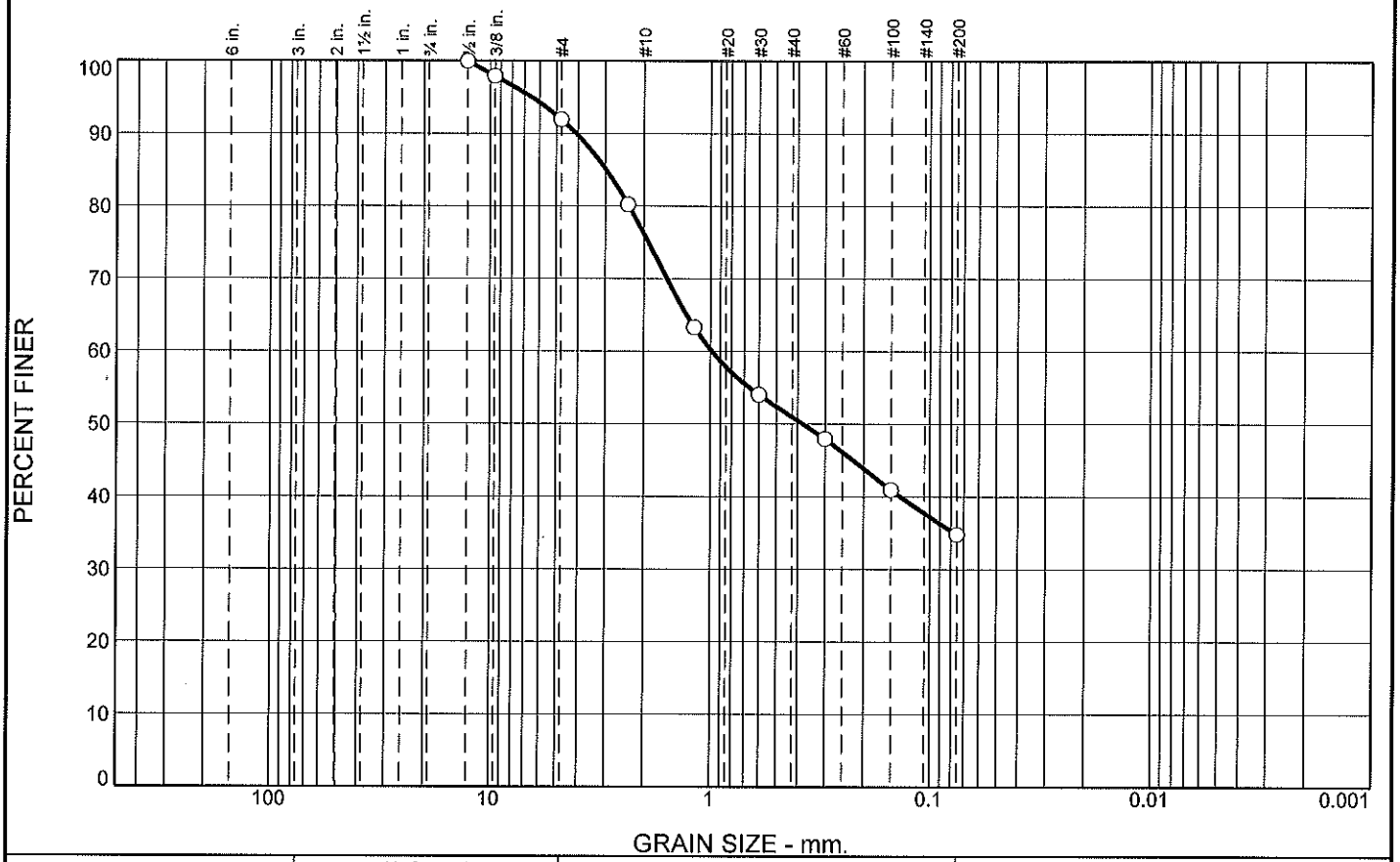
Blackburn Consulting

W. Sacramento, CA

Client: HDR, Inc.
Project: SR 99 Widening - French Camp Slough
Project No: 1201.7c **Figure**

Tested By: BWM/MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	8	16	25	16	35	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	98		
#4	92		
#8	80		
#16	63		
#30	54		
#50	48		
#100	41		
#200	35		

* (no specification provided)

Material Description

Dark Yellowish Brown Clayey SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.0553 D_{85}= 2.9656 D_{60}= 0.9820
D_{50}= 0.3759 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample has a fuel smell - ech

Sample Number: F2-6 B **Depth:** 15.5'-16.0'

Date: 3-31-09

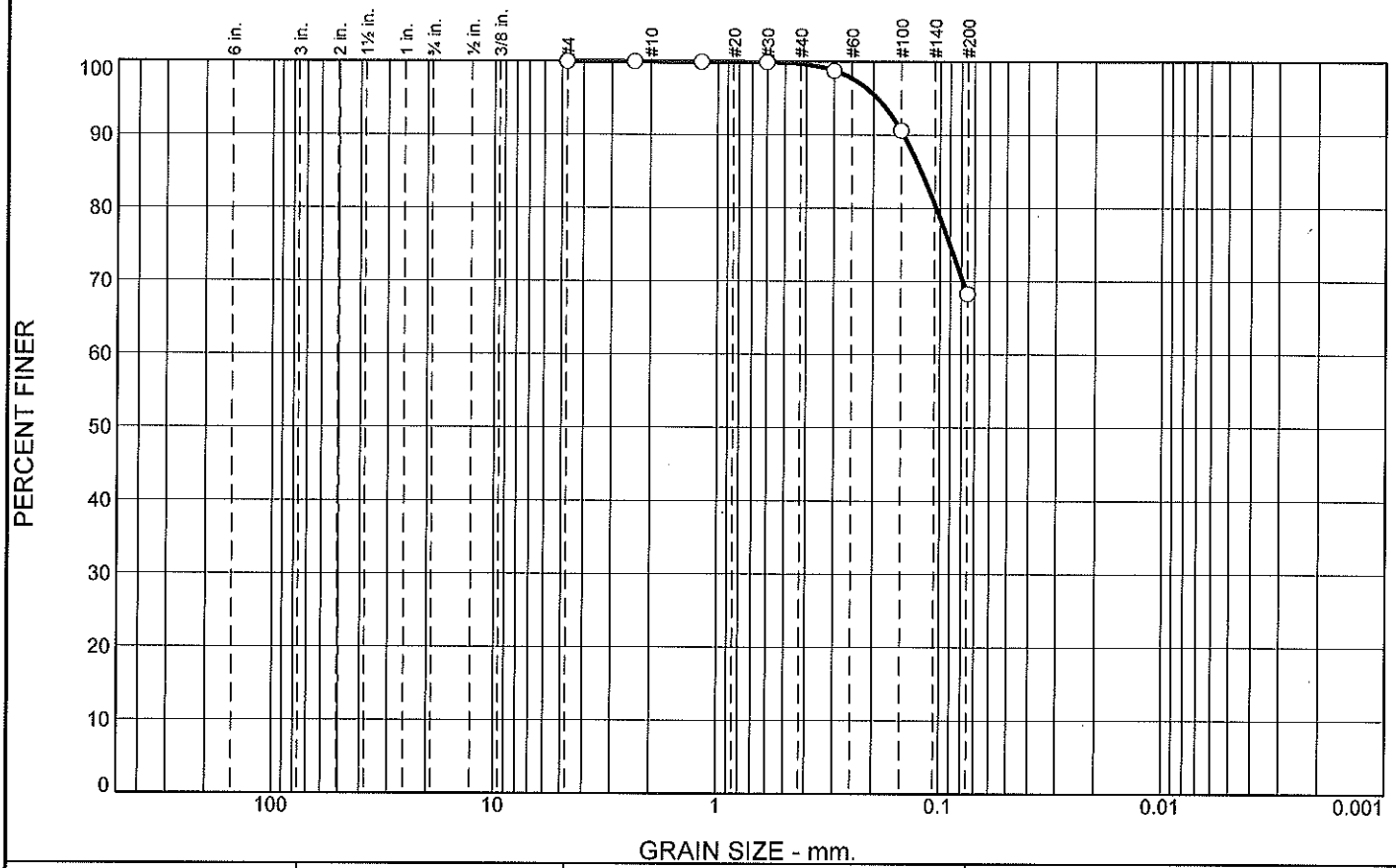
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	32	68	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	100		
#30	100		
#50	99		
#100	91		
#200	68		

* (no specification provided)

Material Description

Dark Yellowish Brown Sandy Lean CLAY

Atterberg Limits

PL= 18 LL= 27 PI= 9

Coefficients

D_{90}= 0.1461 D_{85}= 0.1214 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(4)

Remarks

Sample Number: F2-9 C **Depth:** 31.0'-31.5'

Date: 3-31-09

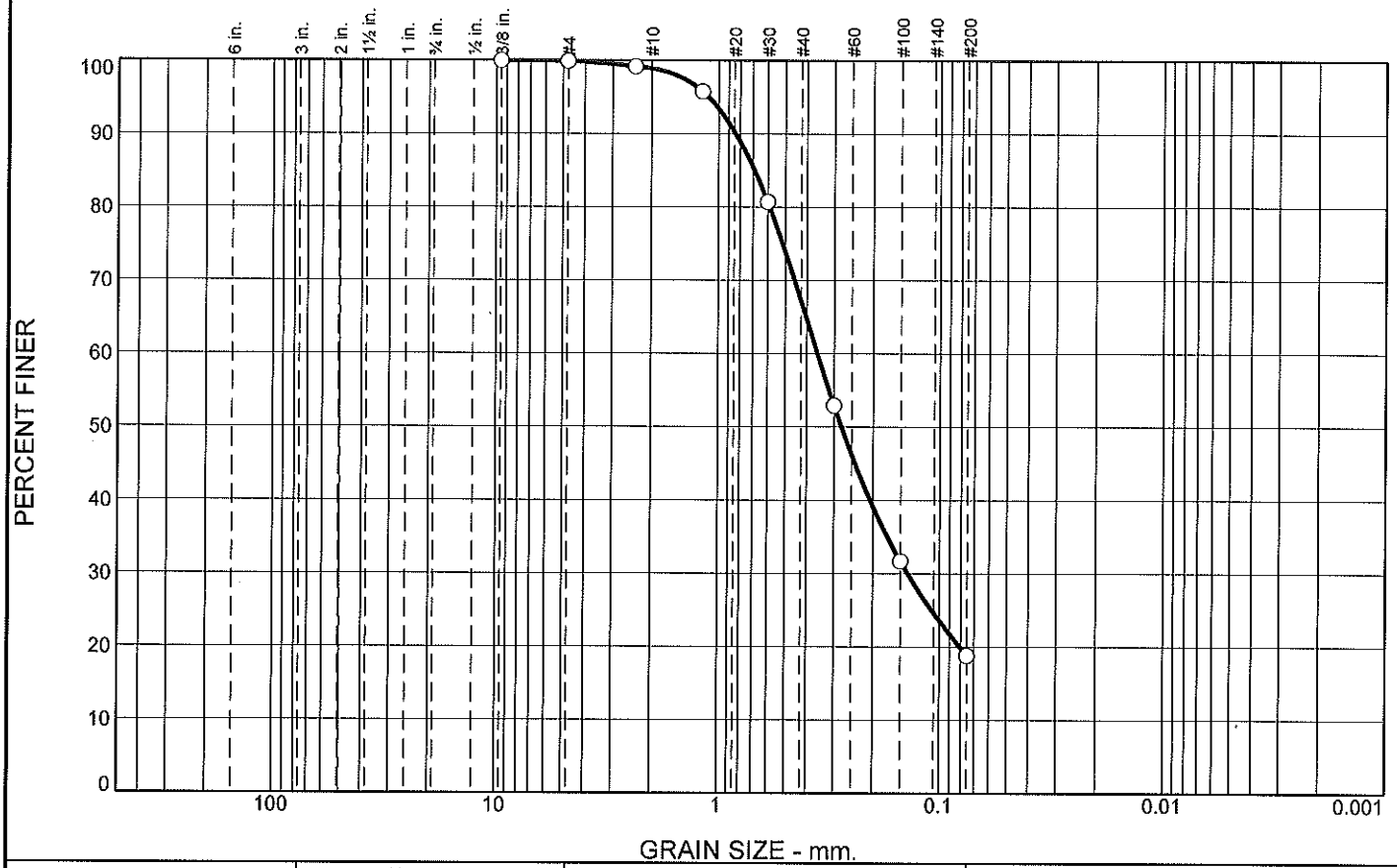
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	32	48	19	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100		
#4	100		
#8	99		
#16	96		
#30	81		
#50	53		
#100	32		
#200	19		

* (no specification provided)

Material Description

Brown Silty Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.8349 D_{85}= 0.6869 D_{60}= 0.3571
D_{50}= 0.2774 D_{30}= 0.1390 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: F2-13 C **Depth:** 46.0'-46.5'

Date: 3-31-09

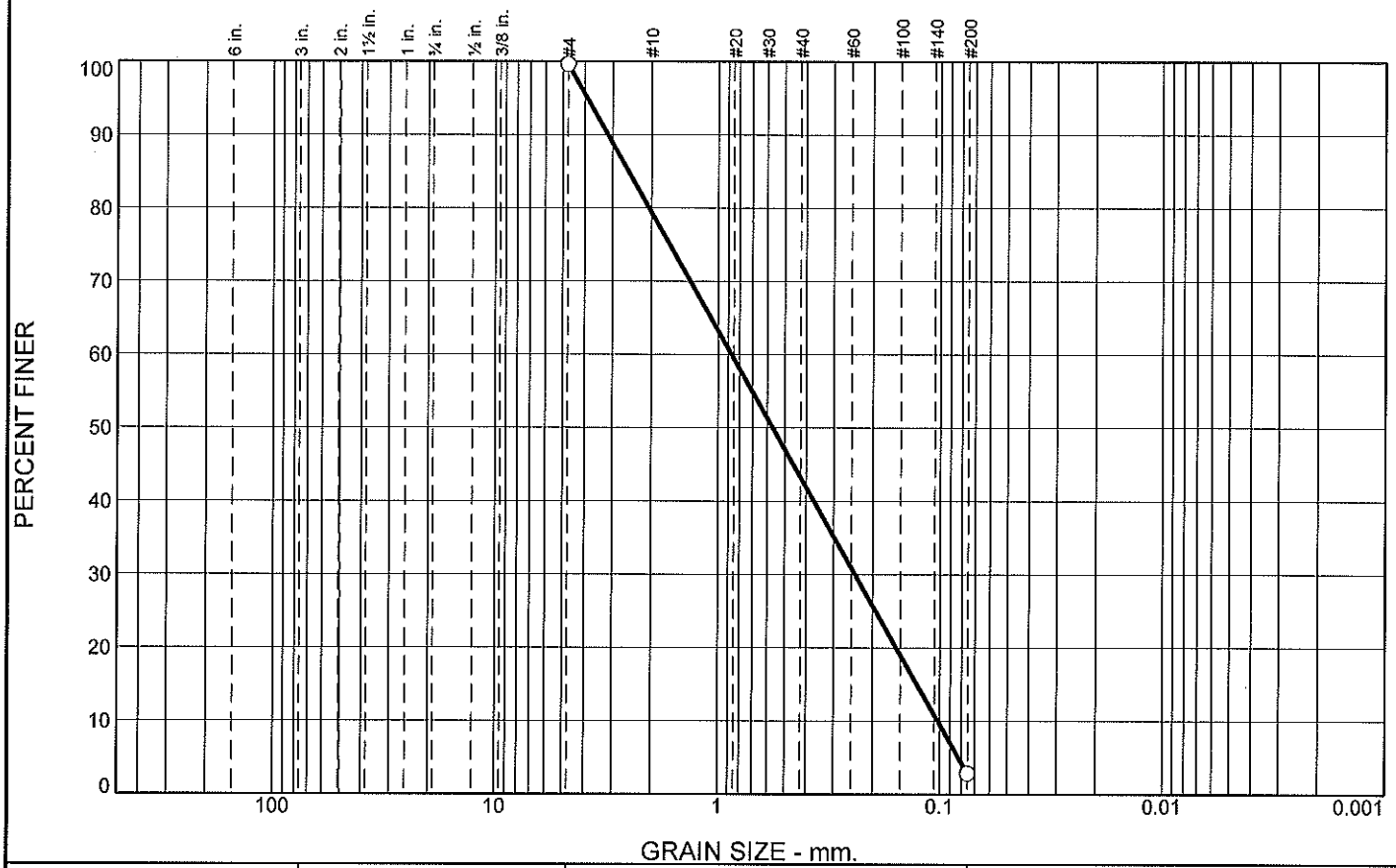
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
			21	36	40	3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#200	2.9		

* (no specification provided)

Material Description

Olive Brown SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.1397 D_{85}= 2.5339 D_{60}= 0.8675
D_{50}= 0.5650 D_{30}= 0.2397 D_{15}= 0.1260
D_{10}= 0.1017 C_u= 8.53 C_c= 0.65

Classification

USCS= SP AASHTO=

Remarks

Sample Number: F2-15 **Depth:** 51.5'-53.0'

Date: 3-31-09

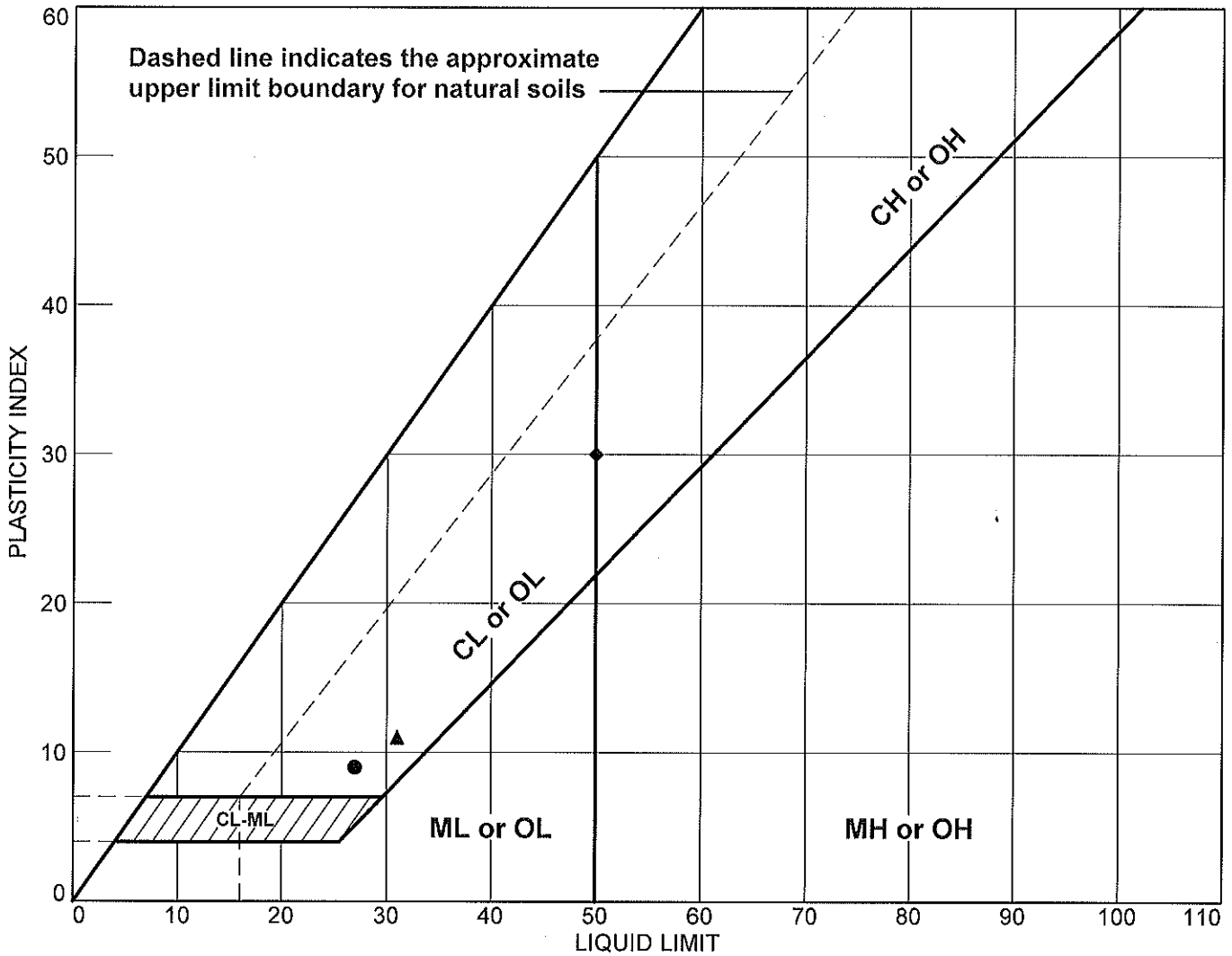
Blackburn Consulting

Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No: 1201.7C **Figure**

Tested By: ech

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		F2-9 C	31.0'-31.5'		18	27	9	CL
■		F1-11 C	36.0'-36.5'		NP			SM
▲		F1-16 C	56.0'-56.5'		20	31	11	CL
◆		F1-8 B	25.5-26.0		20	50	30	CH

Blackburn Consulting

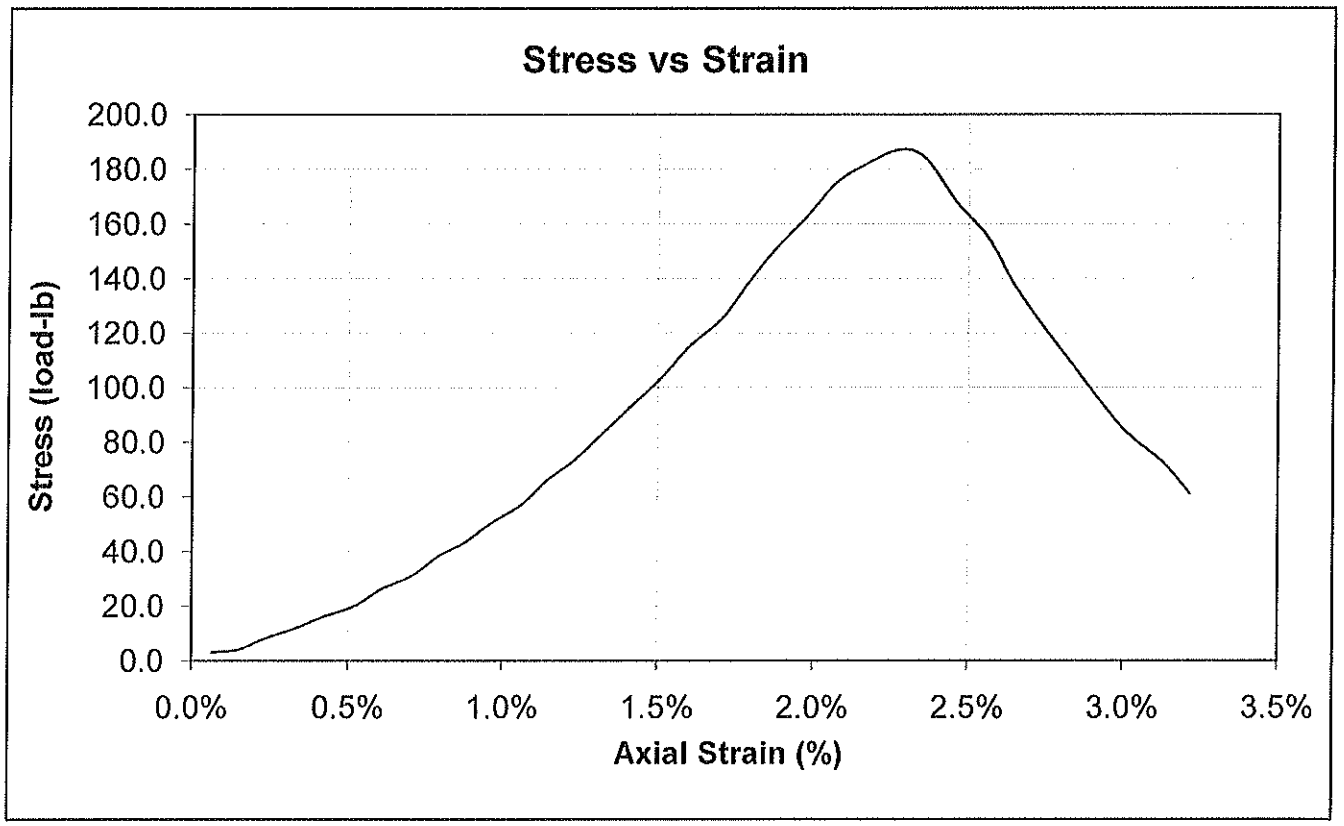
Auburn, CA

Client: HDR INC.
Project: SR99 MEDIAN WIDENING - FRENCH CAMP SLOUGH
Project No.: 1201.7C **Figure**

Tested By: KLC **Checked By:** KLC

Project
SR 99 Widening - French Camp Slough
Project Number
1201.7c
Sample Number
F-1-6c
Material Description
Lean CLAY (CL), yellowish brown
Tested By
MDR

ASTM D 2166-00

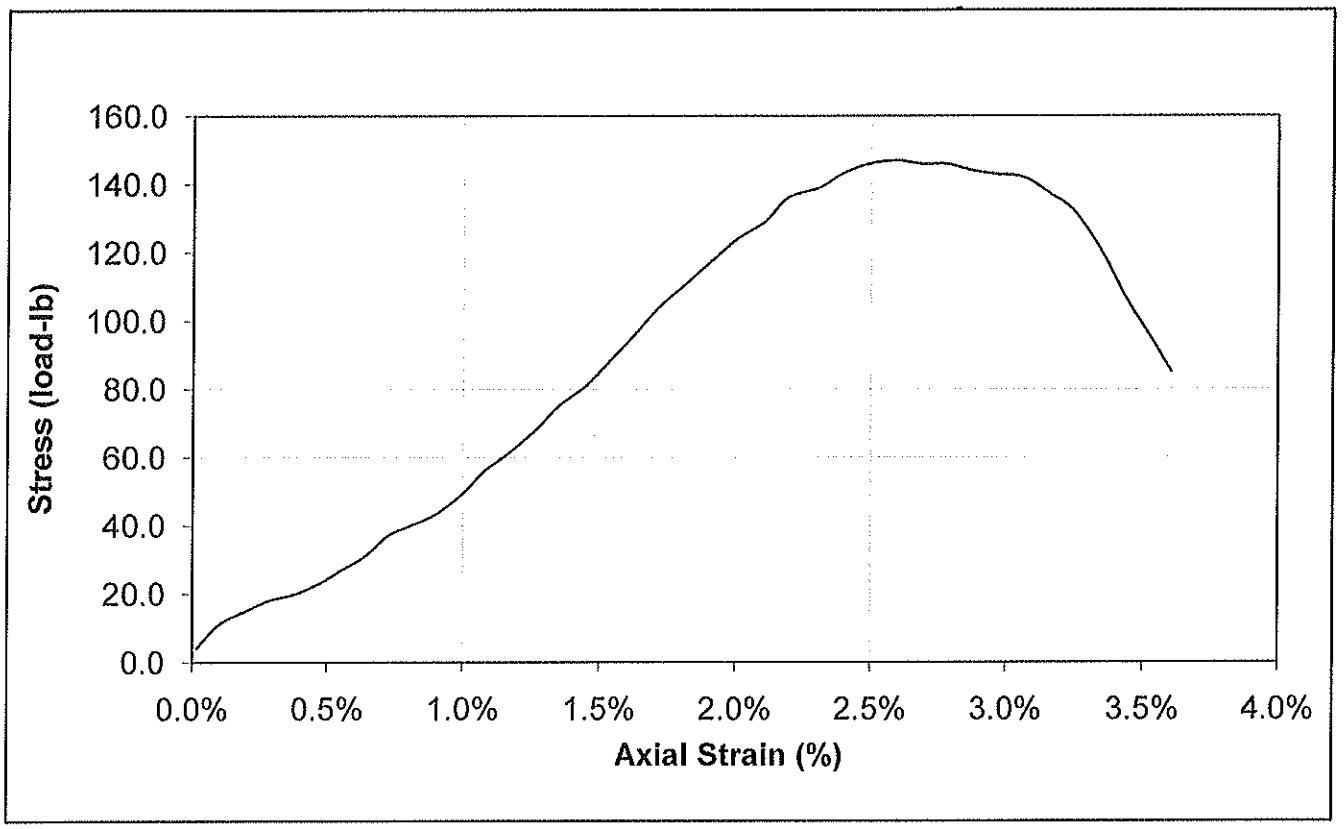


Wet Density (pcf)	125.9
Dry Density (pcf)	106.1
% Moisture	18.7

Unconfined Compressive Strength (tsf) 2.9

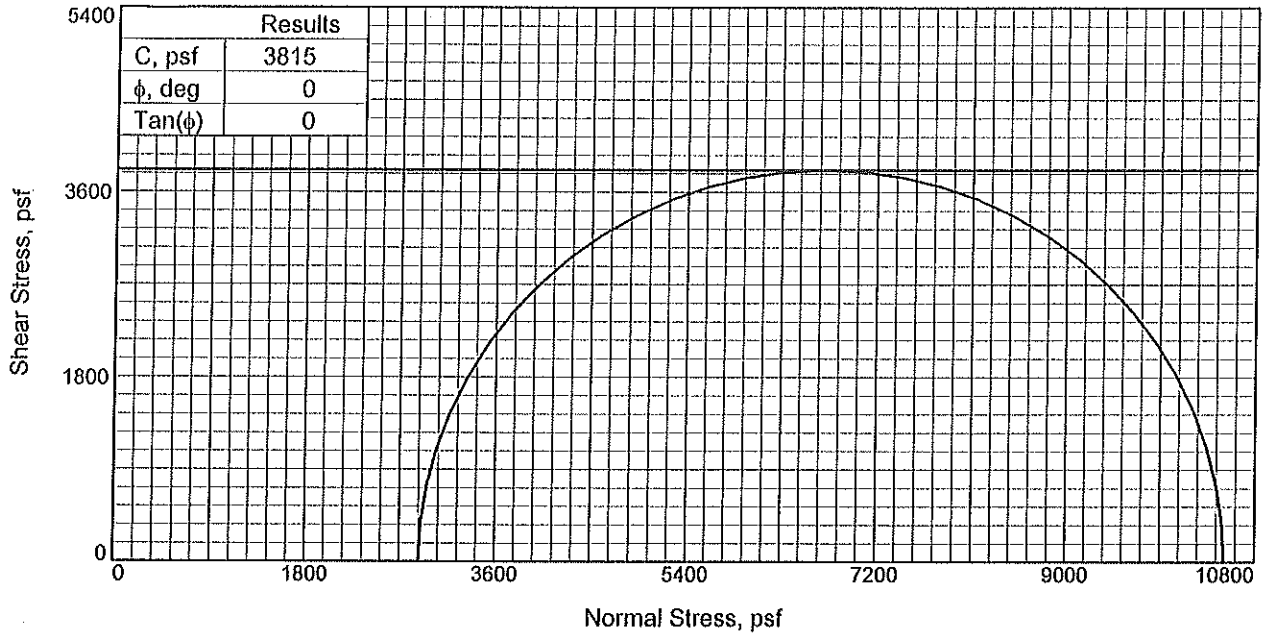
Project
SR 99 Widening - French Camp Slough
Project Number
1201.7c
Sample Number
F-2-7b
Material Description
SANDY lean CLAY (CL), yellowish brown
Tested By
MDR

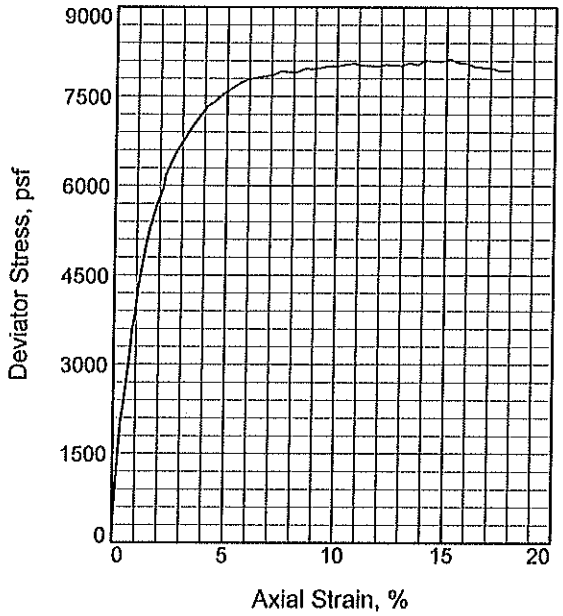
ASTM D 2166-00



Wet Density (pcf)	121.7
Dry Density (pcf)	103.8
% Moisture	17.3

Unconfined Compressive Strength (tsf) 2.3





Specimen No.		1
Initial	Water Content, %	27.6
	Dry Density, pcf	95.6
	Saturation, %	97.5
	Void Ratio	0.7630
	Diameter, in.	2.420
	Height, in.	5.590
At Test	Water Content, %	26.9
	Dry Density, pcf	95.6
	Saturation, %	95.2
	Void Ratio	0.7630
	Diameter, in.	2.420
	Height, in.	5.590
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		2880
Fail. Stress, psf		7630
Strain, %		5.2
Ult. Stress, psf		8130
Strain, %		
σ_1 Failure, psf		10510
σ_3 Failure, psf		2880

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: Fat CLAY with SAND (CH), yellow brown (clayey sand layer at bottom of sample)

Assumed Specific Gravity= 2.7

Remarks: Failure chosen at 5% strain, Ultimate at 15%.

Client: HDR, Inc.

Project: SR 99 Widening - French Camp Slough

Source of Sample: F1 **Depth:** 26.0-26.5

Sample Number: 8c

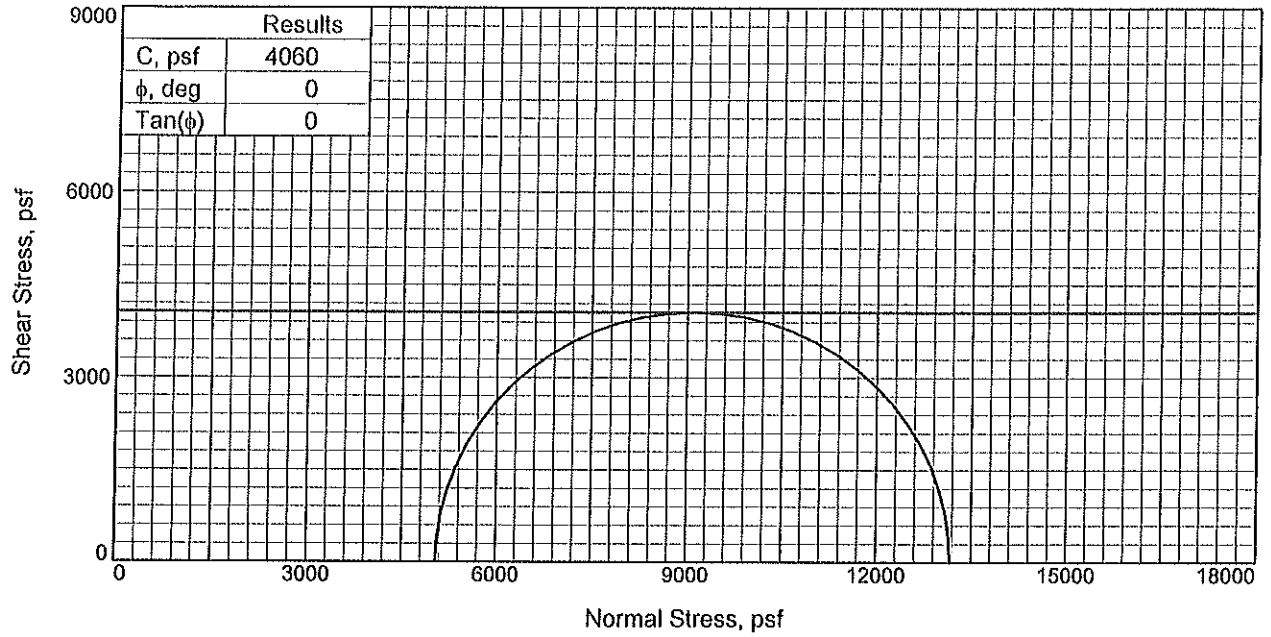
Proj. No.: 1201.7c **Date Sampled:** 5-15-09

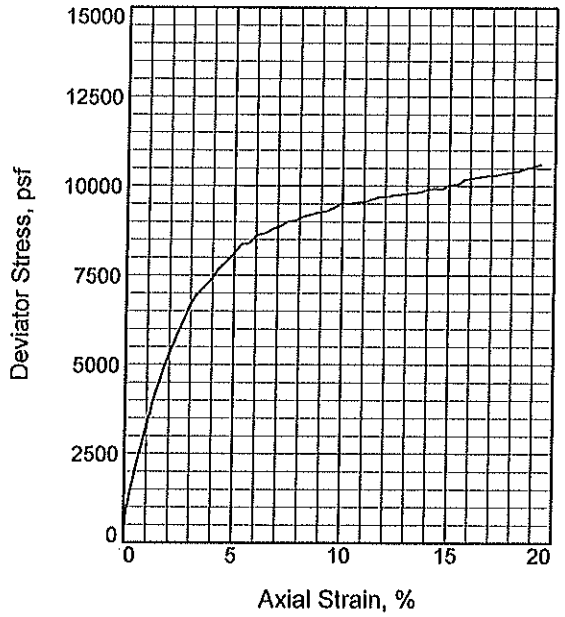
TRIAXIAL SHEAR TEST REPORT

Blackburn Consulting

Figure _____

Tested By: MDR **Checked By:** RDS





Specimen No.		1
Initial	Water Content, %	19.9
	Dry Density, pcf	108.0
	Saturation, %	95.9
	Void Ratio	0.5606
	Diameter, in.	2.420
	Height, in.	5.710
At Test	Water Content, %	20.2
	Dry Density, pcf	108.0
	Saturation, %	97.4
	Void Ratio	0.5606
	Diameter, in.	2.420
	Height, in.	5.710
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		5040
Fail. Stress, psf		8120
Strain, %		5.0
Ult. Stress, psf		10031
Strain, %		
σ_1 Failure, psf		13160
σ_3 Failure, psf		5040

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: CLAY with SAND (CL), yellowish brown

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 5% strain, Ultimate at 15% strain.

Client: HDR, Inc.

Project: SR 99 Widening - French Camp Slough

Source of Sample: F2 **Depth:** 41.0-41.5

Sample Number: 12c

Proj. No.: 1201.7c **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

Blackburn Consulting

Figure _____

Tested By: MDR **Checked By:** RDS

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : FRENCH CAMP SLOUGH Site ID : F1-5B.
Your purchase order number is 1201.7C.
Thank you for your business.

* For future reference to this analysis please use SUN # 56551-114220.

EVALUATION FOR SOIL CORROSION

Soil pH	7.74	
Minimum Resistivity	0.67 ohm-cm (x1000)	
Chloride	36.1 ppm	00.00361 %
Sulfate	41.5 ppm	00.00415 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : FRENCH CAMP SLOUGH Site ID : F2-8B.
Your purchase order number is 1201.7C.
Thank you for your business.

* For future reference to this analysis please use SUN # 56551-114221.

EVALUATION FOR SOIL CORROSION

Soil pH	7.55	
Minimum Resistivity	0.86 ohm-cm (x1000)	
Chloride	45.0 ppm	00.00450 %
Sulfate	42.9 ppm	00.00429 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

APPENDIX C

Abutments 1 & 5: Class 90 Pile Calculations

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7CS\ENGINE~1\REVABUT.DVN
Project Name: Bridge 29-0019 (Abutments) Project Date: 12/15/2009
Project Client: HDR
Computed By: KAC
Project Manager: DJM

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	28.50 ft
	- Driving/Restrike	28.50 ft
	- Ultimate:	28.50 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

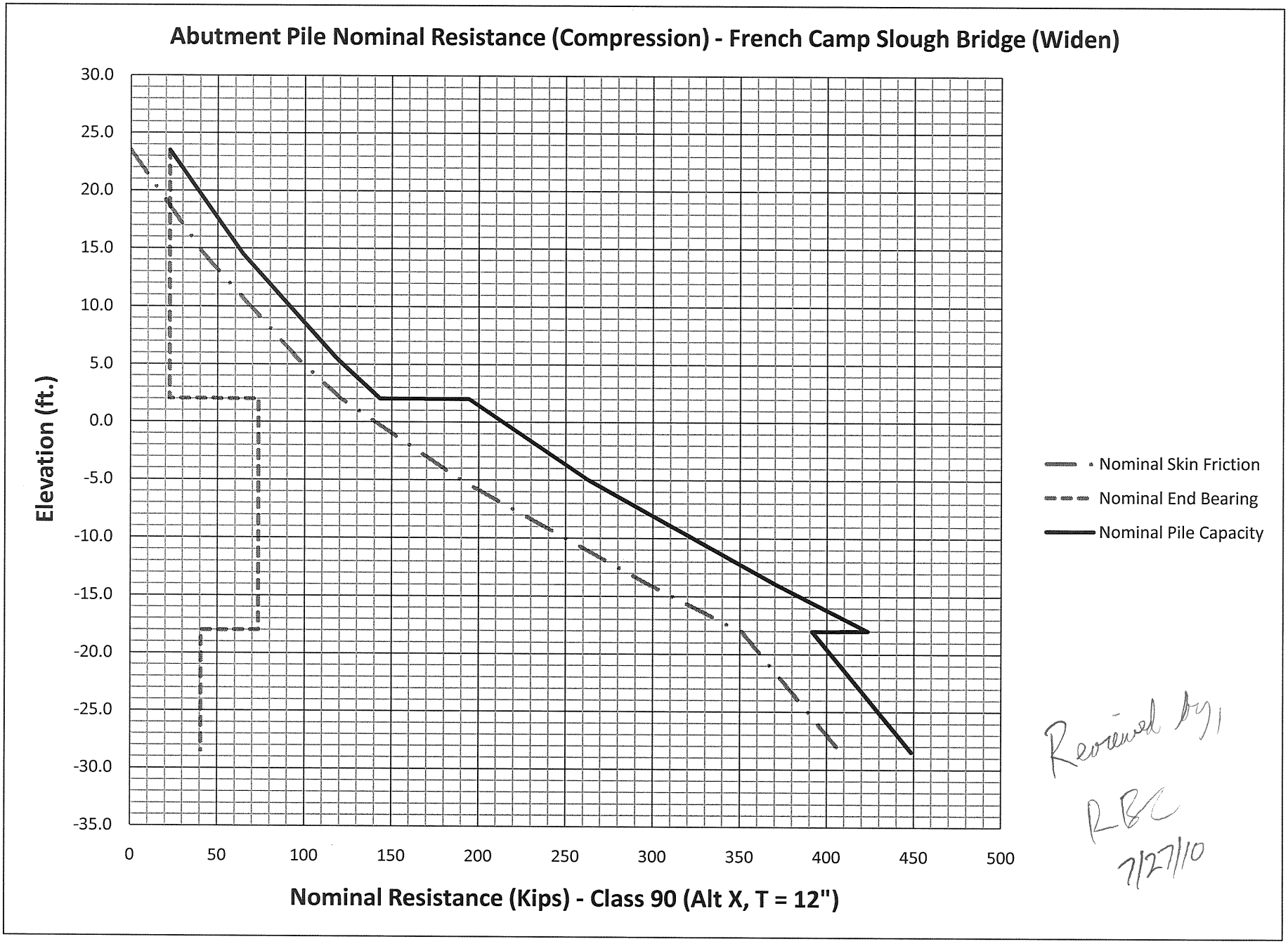
ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	21.50 ft	0.00%	120.00 pcf	2500.00 psf	T-79 Concrete
2	Cohesionless	20.00 ft	0.00%	120.00 pcf	36.0/34.0	Nordlund
3	Cohesive	10.50 ft	0.00%	130.00 pcf	4500.00 psf	T-79 Concrete

Reviewed by:
RBC
7/27/10

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	22.50 Kips	22.55 Kips
9.01 ft	41.99 Kips	22.50 Kips	64.49 Kips
18.01 ft	95.95 Kips	22.50 Kips	118.45 Kips
21.49 ft	120.72 Kips	22.50 Kips	143.22 Kips
21.51 ft	120.88 Kips	73.52 Kips	194.40 Kips
28.49 ft	189.42 Kips	73.52 Kips	262.94 Kips
28.51 ft	189.64 Kips	73.52 Kips	263.16 Kips
37.51 ft	298.05 Kips	73.52 Kips	371.57 Kips
41.49 ft	350.85 Kips	73.52 Kips	424.37 Kips
41.51 ft	351.04 Kips	40.50 Kips	391.54 Kips
50.51 ft	400.00 Kips	40.50 Kips	440.50 Kips
51.99 ft	408.05 Kips	40.50 Kips	448.55 Kips



Reviewed by:
RBC
7/27/10

French Camp Slough Bridge (Widen)
BCI No. 1201.7
2/1/10
By: DJM

Abutment Pile Settlement Calculations: Class 90 Piles

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

	Service-I Limit Per Pile Load (lbs)	85000
A	*Average Axial Load (lbs)	42500
B	Pile Length (in.)	306
C	Tip Area (sq. in.)	144
D	Concrete Modulus of Elasticity (psi)	4415201
	Axial Compression (in.)	**0.02**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	590.3
B	Pile Diameter (in.)	12
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	2800
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
	Point Settlement (in.)	**0.58**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = **0.60** in.
15.1 mm

Checked by
RRR
7/19/10

APPENDIX D

Bents: 15” PC/PS Concrete Pile Extension Calculations

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7CS\ENGINE~1\BENTSKIN.DVN
Project Name: Bridge 29-0019 (Bent-Skin) Project Date: 12/15/2009
Project Client: HDR
Computed By: KAC
Project Manager: DJM

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 11.80 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	24.00 ft
	- Driving/Restrike	24.00 ft
	- Ultimate:	24.00 ft
Ultimate Considerations:	- Local Scour:	4.80 ft
	- Long Term Scour:	0.54 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	17.00 ft	0.00%	120.00 pcf	2500.00 psf	T-79 Concrete
2	Cohesionless	20.00 ft	0.00%	120.00 pcf	36.0/34.0	Nordlund
3	Cohesive	8.00 ft	0.00%	130.00 pcf	4500.00 psf	T-79 Concrete

Checked by:
RPC
7/19/10

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	21.76 Kips	21.80 Kips
9.01 ft	41.29 Kips	21.76 Kips	63.04 Kips
16.99 ft	87.99 Kips	21.76 Kips	109.74 Kips
17.01 ft	88.12 Kips	71.09 Kips	159.21 Kips
23.99 ft	142.00 Kips	71.09 Kips	213.09 Kips
24.01 ft	142.18 Kips	71.09 Kips	213.27 Kips
33.01 ft	230.86 Kips	71.09 Kips	301.95 Kips
36.99 ft	274.75 Kips	71.09 Kips	345.84 Kips
37.01 ft	274.91 Kips	39.16 Kips	314.08 Kips
44.99 ft	317.60 Kips	39.16 Kips	356.76 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.33 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.34 ft	0.00 Kips	21.76 Kips	21.76 Kips
9.01 ft	16.82 Kips	21.76 Kips	38.57 Kips
16.99 ft	60.33 Kips	21.76 Kips	82.09 Kips
17.01 ft	60.46 Kips	70.43 Kips	130.88 Kips
23.99 ft	112.92 Kips	71.09 Kips	184.01 Kips
24.01 ft	113.10 Kips	71.09 Kips	184.19 Kips
33.01 ft	199.95 Kips	71.09 Kips	271.04 Kips
36.99 ft	243.02 Kips	71.09 Kips	314.11 Kips
37.01 ft	243.19 Kips	39.16 Kips	282.35 Kips
44.99 ft	285.88 Kips	39.16 Kips	325.04 Kips

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7CS\ENGINE~1\BENTEND.DVN
Project Name: Bridge 29-0019 (Bent-End) Project Date: 12/15/2009
Project Client: HDR
Computed By: KAC
Project Manager: DJM

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 13.30 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	24.00 ft
	- Driving/Restrike	24.00 ft
	- Ultimate:	24.00 ft
Ultimate Considerations:	- Local Scour:	4.80 ft
	- Long Term Scour:	0.54 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	17.00 ft	0.00%	120.00 pcf	2500.00 psf	T-79 Concrete
2	Cohesionless	20.00 ft	0.00%	120.00 pcf	36.0/34.0	Nordlund
3	Cohesive	8.00 ft	0.00%	130.00 pcf	4500.00 psf	T-79 Concrete

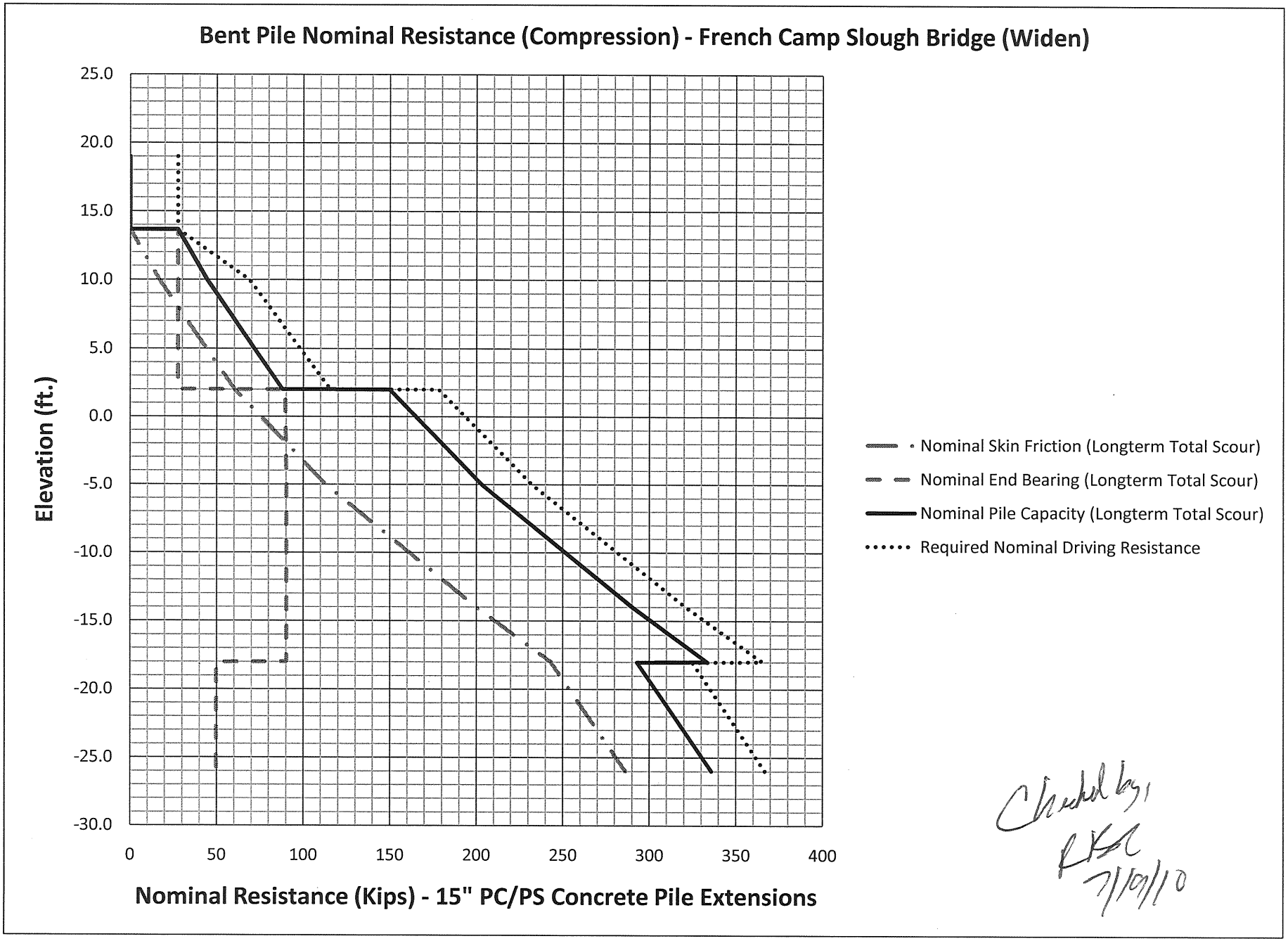
Checked by,
RPC
7/19/10

DRIVING - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	27.64 Kips	27.69 Kips
9.01 ft	46.54 Kips	27.64 Kips	74.17 Kips
16.99 ft	96.11 Kips	27.64 Kips	123.75 Kips
17.01 ft	96.27 Kips	90.31 Kips	186.58 Kips
23.99 ft	167.3[illegible] Kips	90.31 Kips	257.[illegible] Kips
24.01 ft	167.54 Kips	90.31 Kips	257.86 Kips
33.01 ft	284.45 Kips	90.31 Kips	374.76 Kips
36.99 ft	342.30 Kips	90.31 Kips	432.61 Kips
37.01 ft	342.51 Kips	49.75 Kips	392.26 Kips
44.99 ft	390.63 Kips	49.75 Kips	440.38 Kips

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.33 ft	0.00 Kips	0.00 Kips	0.00 Kips
5.34 ft	0.00 Kips	27.64 Kips	27.64 Kips
9.01 ft	18.95 Kips	27.64 Kips	46.59 Kips
16.99 ft	65.90 Kips	27.64 Kips	93.54 Kips
17.01 ft	66.07 Kips	89.47 Kips	155.54 Kips
23.99 ft	135.[illegible] Kips	90.31 Kips	225.[illegible] Kips
24.01 ft	135.45 Kips	90.31 Kips	225.76 Kips
33.01 ft	249.94 Kips	90.31 Kips	340.26 Kips
36.99 ft	306.73 Kips	90.31 Kips	397.04 Kips
37.01 ft	306.93 Kips	49.75 Kips	356.68 Kips
44.99 ft	355.05 Kips	49.75 Kips	404.80 Kips



Checked by
RKC
7/19/10

French Camp Slough Bridge (Widen)
BCI No. 1201.7
2/1/10
By: DJM

Bent Pile Settlement Calculations: 15" PC/PS Concrete Pile Extensions

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

	Service-I Limit Per Pile Load (lbs)	100000
A	*Average Axial Load (lbs)	70000
B	Pile Length (in.)	516
C	Tip Area (sq. in.)	177
D	Concrete Modulus of Elasticity (psi)	4415201
	Axial Compression (in.)	**0.05**

*Allowable Capacity Reduced by 30% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	565.0
B	Pile Diameter (in.)	15
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	2800
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
	Point Settlement (in.)	**0.69**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = **0.73** in.
18.7 mm

Checked by:
RRR
7/19/10

APPENDIX E

Caltrans Review Comments with BCI Responses

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 **EA:** 0E6101 **Project Name:** SR99 Manteca Widening **OSFP Liaison:** John Fujimoto **Phone:** 916-227-8757 **e-mail:** john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details __ PS&E (Review No.___) __ Construction X Other: 1st 60% Review	**Reviewer Name:** Ben Barnes **Functional Unit:** Geotechnical Services **Cost Center:** 59-323 **Phone Number:** 916-227-1039 **e-mail:** benjamin_barnes@dot.ca.gov **Date of Review:** 5/24/2010 **Structure Name*:** French Camp Slough Bridge (Widen) **Br No*:** 29-0019 (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	FR	NA	This is the 1st 60% review of the Draft Foundation Report prepared by Blackburn Consulting, dated April 23, 2010, by Caltrans Office of Geotechnical Design – North.	NA	
2	FR	Table of Contents / Appendix A title sheet	Figure 3 listed as Peak Bedrock Acceleration, title on Figure 3 is Regional Fault Map	BCI changed the title in the table of contents and Appendix A sheet to "Regional Fault Map".	
3	FR	2 Subsurface Exploration	Hammer efficiency ratio shown as 75% in report, and 80% on LOTB. Also, what is the assumed hammer efficiency ratio based on?	BCI changed the hammer efficiency on the LOTB to 75% and included text in the report regarding estimation of the hammer efficiency.	
4	FR	6 Seismic Data and Evaluation	Please use current CT seismic design criteria.	Per e-mail from John Fujimoto on June 15, 2010, use of SDC 1.4 Seismic Design Criteria was approved for this project at Type Selection.	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓ = Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

5	FR	Figure 4 ARS Curve	Please use current CT seismic design criteria.	Per e-mail from John Fujimoto on June 15, 2010, use of SDC 1.4 Seismic Design Criteria was approved for this project at Type Selection.	
6	FR	2 Subsurface Exploration / LOTB	SPT sampler listed as 1.5-inch ID in report, shown as 1.4 on LOTB.	The SPT ID shown on the LOTB is correct. BCI has edited the report text accordingly	

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

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OFFICE OF SPECIAL FUNDED PROJECTS

Office of Special Funded Projects Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 EA: 0E6101 Project Name: SR99 Manteca Widen OSFP Liaison: John Fujimoto Phone: 916-227-8757 e-mail: john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details X PS&E (Review No. 2) __ Construction __ Other:_____	Reviewer Name: Theresa Nedwick Functional Unit: SOE-Specifications Cost Center: _____ Phone Number: 916-227-8193 e-mail: Theresa_nedwick@dot.ca.gov Date of Review: 11/15/10 Structure Name*: _____ Br No*:_____ (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Titus Keng	HDR Engineering Inc	916-817-4876	titus.keng@hdrinc.com	11/29/10

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	FRs	Sect 11	Construction Considerations: For pile driving, geotech engineer refers to a P formula that is not in 2006 Standard Specifications, Section 49-1.08. He also refers to a requirement for blow counts that is not specified in either Standard Specifications or Special Provisions.	In Section 11.2 (11.3 for Lone Tree Slough Ramp Bridge) of the foundation reports, the sentence "However, in no case shall the required blows (N) be less than that obtained using the Engineering News Formula (P=Er/6(s + 2.54)" may be disregarded.	
2	FR		Please check with geotech engineer if a Driving System Submittal required to ensure that pile driving system is adequate. SSP 49-208 needs to be in if required by geotech engineer.	Geotechnical engineer BCI recommends that the contractor provides a Driving System Submittal. SSP 49-208 has been included.	
3	P		Why note "Provide a clean and roughen surface for existing concrete prior to placing new concrete. Roughen to 1/4" amplitude"? Where is the specs? What's about "Prepare Concrete Bridge Deck Surface"?	Note has been deleted. "Roughen to ¼" amplitude" has been called out on specific detail with related specs added to project specifications SSP51-300.	
4	P		Why are epoxy dowels used? FRs didn't specify this is a corrosive environment. This project is not in Climate Area	Epoxy dowels have been revised to ordinary reinf steel dowel.	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓ = Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____ *=if applicable

Date of Review:_____ Functional Unit:_____ Br No*._____

			III either.		
5	ALL SSPs		Please put your initials and date for ANY EDITS you make in the special provisions. Some SSPs have no page breaks in between.	Initials and date are added. Will have page breaks between SSPs.	
6	SP	S5-250	Please list partial pay items as they appear in "Ready to List": Piling (except CIDH) Bar Reinforcing Steel	Agreed and has been corrected as appear in "Ready to List".	
7	SP	S5-280	Please describe what gets to be inspected at listed address.	Moved "Bridge as-built drawings" to listed address.	
8	SP	S8-W04	We recommend to keep para 19 without striking anything.	Leave para 19 as is shown, revised to keep para 20 without striking anything.	
9	SP	S8-W09	Please remove one. There are 2 of them.	Agreed to remove one.	
10	SP	15-800	Add "s" to brige in para 2.	Agreed and has been corrected.	
11	SP	15-875	Para 5, reinstate "at".	Agreed and has been corrected.	
12	SP	15-880	Para 14, you keep "chip or slurry seal contrast treatments" but strike them in paras 19 and 20?	Strike "chip or slurry seal contrast treatments" in para 14.	
13	SP	15-940	Add description and pay clause for 3/4" saw cut. It's not covered in Standard Specs.	Description and pay clause for 3/4" saw cut has been added at the end of para 11.	
14	SP	19-010	Please specify man-made objects encountered during pile driving-sub structure work. Standard Specs covers it for earthwork.	Man-made objects have been specified in the paragraph.	
15	SP	19-570	Style for pay clause should be normal and should be written as it recommends in Ready to List Guide, Section 6: "Full compensation for … shall be considered as included in the contract …prices paid per …for , and no …therefor.	Agreed and has been corrected.	
16	SP	42-010	The project has grooves on EXISTNG and NEW polyester concrete overlay for BRIDGE DECKS. Please edit accordingly.	Para 1 has been modified to have Existing and NEW polyester concrete overlay.	
17	SP	42-600	The project has no grinding PCC, please strike "grinding".	Agreed and has been corrected.	
18	SP	49-200	The added para "Drilling should be…tip elevations' belongs to 49-210. Added para "Pile driving…supported on piles" is not needed.	Para "Drilling should be…tip elevations" has been moved to 49-210. Para "Pile driving…supported on piles" has been removed.	
19	SP	49-210	Restricted drilling is allowed, see FRs. Please edit accordingly.	Agreed and has been corrected.	
20	SP	51-600	Strike one of the tilte. There are identical.	Agreed and has been corrected.	

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

21	SP	51-806	The project has no "Public Safety plan", so please strike all related info in paras 2,7, and 8.	Agreed the project has no "Public Safety plan" so related information in para 2,4,38 and 39 is strike out. Para 7 & 8 are used since the entire deck is being overlain at French Camp Slough Bridge and Little John Creek Bridge.	
22	SP	72-200	Please have it conforms to 72-6 instead of 72-4. Section 72-6 talks about paving under bridges.	Agreed and has been corrected to conform to 72-6.	
23	SP	83-460	Para 10, added paras for Types 60A(MOD) and 732 are not needed.	Agreed and has been corrected.	

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 **EA:** 0E6101 **Project Name:** SR99 Manteca Widen **OSFP Liaison:** John Fujimoto **Phone:** 916-227-8757 **e-mail:** john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details X PS&E (Review No. 3) __ Construction __ Other:_____	**Reviewer Name:** Theresa Nedwick **Functional Unit:** SOE-Specifications **Cost Center:** _____ **Phone Number:** 916-227-8193 **e-mail:** Theresa_nedwick@dot.ca.gov **Date of Review:** 11/15/10 **Structure Name*:** _____ **Br No*:**_____ (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Titus Keng	HDR Engineering Inc	916-817-4876	titus.keng@hdrinc.com	10/28/10

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	SP	S5-280	Please don't move "Bridge as-built drawing" to different line, it should be next to "Available as specified in the Std Specifications". What is the address 661 San Juan Ave for? Please list the all the info handout. Please check with Geotech engineer if rock cores available for viewing. If they are, please insert the info according to instructions.		
2	SP	19-010	Para 1 is missing a period.		
3	SP	19-570	Style for pay clause should be **normal**, not an item K.		
4	SP	42-010	Para 1, add "This work consists of" at the beginning of the para and "and" before "shall conform". Under "Measurement and Payment": move "of the groove area" to the end of the para, replacing "groove". Delete last para, you already describe the work in para 1.		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

5	SP	42-600	Please replace all "pavement" with overlay throughout this specifications. Please strike "grinding" at various locations.		
6	SP	49-208	Para 2C3, last para, do you have open ended pipe piles?		
7	SP	49-210	Para 2, a period is needed.		
8	SP	51-806	Para 7, delete "Results from airborne… production work". You don't have airborne monitoring. Para 8, delete 8-8, you don't have airborne monitoring.		
9	SP	15-170	Recommend "salvage metal bridge railing post" full-comped into "Bridge removal (portion) as specified in the Std Specs, Section 15-4.03.		
10	FRs		Refer to comments #1 and #2 of Second Review, please have Foundations Reports revised to reflect Consultant's responses.	In Section 11.2 (11.3 for Lone Tree Slough Ramp Bridge), BCI revised the Foundation Report by deleting the sentence regarding use of the Engineering News Formula and adding a sentence requiring a Driving System Submittal	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					

REVISED FINAL FOUNDATION REPORT

LITTLE JOHN CREEK BRIDGE (WIDEN)

BRIDGE NO. 29-0017
10-SJ-99, PM 12.53
EA: OE6101; CU: 06241

Prepared by:

BLACKBURN CONSULTING
1720 G Street
Modesto, CA 95354
(209) 522-6273

Prepared for:

HDR, INC.
1325 J Street, Suite 1300
Sacramento, CA 95814

January 6, 2011

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blackburn consulting

Main Office: (530) 887-1494
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West Sacramento Office: (916) 375-8706

Geotechnical • Construction Services • Forensics

File No. 1201.7b
January 6, 2011

Mr. John Klemunes
HDR Engineering, Inc.
1325 J Street, Suite 1300
Sacramento, CA 95814

Subject: **REVISED FINAL FOUNDATION REPORT**
Little John Creek Bridge (Widen), Bridge No. 29-0017
10-SJ-99, PM 12.53, CU: 06241, EA: OE6101
San Joaquin County, California

Dear Mr. Klemunes:

Blackburn Consulting (BCI) submits this Revised Final Foundation Report for the Little John Creek Bridge (Widen) project on State Route 99 in San Joaquin County, California. This report supercedes our July 27, 2010 Final Foundation Report for this structure. BCI prepared this report in accordance with our November 15, 2008 Agreement.

Thank you for the opportunity to be part of your design team. Please call if you have questions or require additional information.

Sincerely;

BLACKBURN CONSULTING

REGISTERED PROFESSIONAL ENGINEER
DAVID J. MORRELL
No. GE 2843
GEOTECHNICAL
STATE OF CALIFORNIA

David J. Morrell, G.E., C.E.
Senior Project Manager

Reviewed by:

PROFESSIONAL GEOLOGIST
WILLIAM E. NICHOLS
NO. 2229
CERTIFIED ENGINEERING GEOLOGIST
EXP 1-31-12
STATE OF CALIFORNIA

W. Eric Nichols, C.E.G.
Senior Project Manager

Copies: 7 to Addressee

REVISED FINAL FOUNDATION REPORT
Little John Creek Bridge (Widen), Bridge No. 29-0017
10-SJ-99, PM 12.53, CU: 06241, EA: OE6101
San Joaquin County, California

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APPENDIX E
Caltrans Review Comments with BCI Responses

1 INTRODUCTION

1.1 Purpose

Blackburn Consulting (BCI) prepared this Foundation Report for the Little John Creek Bridge (Widen) on State Route 99 in San Joaquin County, California. It contains our subsurface findings, conclusions and recommendations for bridge design.

This report is for HDR Engineering, Inc. (HDR), San Joaquin Council of Governments (SJCOG), and California Department of Transportation (Caltrans) to use during bridge design and construction. It shall not be used or relied upon by others, or for different locations or improvements without the written consent of BCI.

1.2 Scope Of Services

To prepare this report, BCI:

1. Discussed the project with HDR.
2. Reviewed HDR's August 5, 2009 Structure Type Selection Report for the structure.
3. Attended the September 10, 2009 Type Selection Meeting with the design team and Caltrans.
4. Reviewed "As-Built" plans for the existing bridge structures (29-0017R and29-0017L).
5. Reviewed preliminary plans for the structure prepared and provided by HDR.
6. Reviewed published maps and literature related to site geologic and seismic conditions.
7. Observed, logged and sampled 2 exploratory test borings to depths of about 61.5 to 62.4 ft.
8. Reviewed Caltrans comments regarding our April 23, 2010 Draft Foundation Report and prepared responses. See Appendix E for Caltrans comments and BCI responses.
9. Performed engineering analysis and calculations to develop our conclusions and recommendations.

1.3 Site Description

The Little John Creek Bridge (Widen) site is located in San Joaquin County on State Route 99 (SR99) about 5 miles south of Stockton and 4 miles north of Manteca. The approximate site coordinates are 37.8750 degrees north latitude, 121.2196 degrees west longitude. Turner Station Overhead (Bridge No. 29-0071R/L) is located about 1 mile south of the site and French Camp Slough Bridge (Bridge No. 29-0019R/L) is located about 0.2 miles south of the site.

The existing left (southbound) and right (northbound) bridge structures were constructed in the Mid 1950's and consist of 3-span, concrete flat-slab bridges, approximately 37.7 ft. wide and 68.6 ft. long. A 35-foot wide median area separates the existing structures. Existing bridge approach fills extend 2-3 ft. above the relatively level original grade outside the creek channel. Concrete slope paving exists on both channel slopes beneath and between the existing structures. Existing bridge bents are located within the slope paving.

The North Fork of South Little Johns Creek flows westward beneath the existing structures. Based on visual observation, several feet of scour has occurred in the unlined portion of the channel beneath and between the existing structures, completely exposing and slightly undermining the existing slope paving cutoff wall.

Surface elevations range from about 31.0 ft. (NGVD 29) in the median area at proposed Abutments 1/4, to about 18.0 ft. (NGVD 29) in the lowest portions of the creek channel area.

1.4 Project Description

The new bridge widening structure will be constructed to close the median gap between the existing left/right bridges for the SR99 median widening project. The widening structure will consist of a 3-span, concrete flat-slab bridge, approximately 35.25 ft. wide and 68.6 ft. long. The existing concrete slope paving/cutoff wall will be repaired/rehabilitated along the new widen structures to protect the new bent and abutment piles from scour.

New approach fill heights will be nominal (less than 3 ft. above existing grades).

2 SUBSURFACE EXPLORATION

BCI retained Precision Drilling to drill and sample 2 exploratory borings at the site to characterize the subsurface conditions and obtain samples for laboratory testing. The drillers used a CME 75 truck-mounted rig to drill the borings using 8-inch O.D. hollow stem auger.

On March 19, 2009, BCI observed, logged and sampled Borings A-09-F1 and A-09-F2 to depths of about 61.5 to 62.4 ft. (-30.5 ft. to -31.4 ft., NGVD 29) at the proposed abutment locations. BCI determined boring locations and elevations using topography and elevation data provided by HDR.

The drillers obtained relatively undisturbed samples using both Modified California Samplers (equipped with 2.4-inch I.D. brass liners), and Standard Penetration Test (SPT) samplers (1.4-inch I.D.). Samplers were driven into the ground with a 140 pound automatic trip hammer falling 30 inches. The N-values shown on the Log of Test Borings in Appendix A are uncorrected “field” values. For the Modified California Sampler, BCI multiplied the field N-value by 0.65 to obtain an approximate SPT N-value.

FHWA’s Soil and Foundations Reference Manual, Volume 1 (FHWA-NHI-06-088, December 2006) indicates that the hammer energy transfer ratio ranges between 80-100% for automatic trip hammers. To be conservative, BCI assumed a hammer energy transfer ratio of 75% in the absence of recent hammer calibration data.

BCI’s project geologist, Mr. Aaron Wood, logged the borings consistent with the Unified Soil Classification System (USCS).

We provide the existing Log of Test Borings for the original bridge in Appendix A.

3 LABORATORY TESTING

To classify the subsurface soil and obtain parameters for analysis, BCI performed laboratory tests on some of the samples obtained from the exploratory borings. Tests included:

- Moisture Content and Unit Weight
- Grain Size Analysis
- Atterberg Limits
- Consolidation
- Unconfined Compressive Strength
- Triaxial Shear Strength (Unconsolidated, Undrained)
- Corrosivity (pH, Resistivity, Sulfates and Chlorides)

BCI performed laboratory tests in conformance with current ASTM and Caltrans test procedures. We present the laboratory test results summary and laboratory test results in Appendix B.

4 GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

Literature published by the California Geological Survey (CGS) indicates that the site is located in the San Joaquin Valley within the central portion of the Great Valley Geomorphic Province. This province encompasses the San Joaquin Valley in the south and the Sacramento Valley in the north. The province is bound by the Sierra Nevada to the east, the Coast Ranges to the west, the Klamath Mountains and Cascade Range to the north.

The Great Valley is a broad, elongated, northwest trending, structural trough that has been filled with a thick sequence of sediments. The eastern margin of the valley is formed by the west sloping Sierran bedrock surface that extends westward beneath the alluvium and older sedimentary bedrock within the valley. The western border is underlain by east dipping rock of the Coast Ranges that form a deeply buried trough.

During the late Mesozoic and through most of Tertiary time (approximately 100 million to 20 million years ago), deposition of thousands of feet of marine sediments occurred within the Great Valley. Continental deposits (generally alluvium) of late Tertiary and Quaternary age (approximately 20 million years ago to the present) overlie these marine deposits. Both the continental deposits and the underlying marine sediments form a wedge of sediments that generally thickens from east to west. The accumulated thickness of the marine and continental sediments is at least several thousand feet at the site.

4.2 Local Geology

BCI evaluated the geology of the area by review of published geologic maps and literature, site review, and subsurface exploration. Mapping by the California Geologic Survey[1] shows the site is underlain by sediments of the Pleistocene-age Modesto Formation. These sediments are alluvium comprised mostly of sand, silt and clay. We present a Geologic Map as Figure 2 in Appendix A.

4.3 Subsurface Conditions

4.3.1 Soil

In general, BCI encountered medium dense silty sand (fill) to depths of 5.5 to 6.0 ft. (25.5 ft. to 25.0 ft., NGVD 29). Beneath the fill, we generally observed interlayered stiff to very stiff lean clay to sandy lean clay to depths of 55 to 56 ft. (-24.0 ft. to -25.0 ft., NGVD 29), which was interlayered with relatively thin layers of medium dense (occasionally loose) silty sand, clayey sand, poorly graded sand with clay, and very stiff silt. Below elev. -24.0 ft. to -25.0 ft., we observed interlayered hard sandy lean clay, hard sandy silt, medium dense to dense clayey sand to silty sand, and well graded sand layers to the maximum depths explored (-30.5 ft. to -31.4 ft., NGVD 29).

The above soil conditions are similar to those shown on the As-Built Log of Test Borings (LOTB) for the existing structures (Bridge No's. 29-0019R/L).

Based on our laboratory testing, the dry density of the soil units ranged from 82 pcf to 109 pcf, at moisture contents between 10.5% and 31.7%. Triaxial testing (unconsolidated, undrained) of the lean clay at depths between 35-36.5 feet yielded undrained cohesion values of 3,837 psf and 7,276 psf.

Refer to the Log of Test Borings and As-Built Log of Test Borings in Appendix A for more specific soil descriptions, laboratory test results, and blow count data. *We include the required LOTB Sheet Checklist in Appendix A.*

4.3.2 Ground Water

Table 1 presents the ground water depths/elevations measured in our borings during drilling.

Table 1: Groundwater Elevations

Boring Number	Reading Date	Groundwater Depth (ft)	Groundwater Elevation (ft*)
A-09-F1	3/19/2009	55.0	-24.0
A-09-F2	3/19/2009	56.0	-25.0

* NGVD 29 datum

[1] Geologic Map of the San Francisco-San Jose Quadrangle, 1:250,000, California Division of Mines and Geology, 1990.

The As-Built Log of Test Borings for the existing structures show the ground water at depths of 6 to 10 ft. (elev. 18.0 ft. to 22.0 ft., datum not provided) in two boring drilled in 1954.

According to the San Joaquin County Internal Groundwater Data Center interactive website (http://www.sjmap.org/groundwater/), groundwater elevations in the vicinity of the site have dropped 20 to 30 ft. since the late 1950's. Within the last 20 years, this well data indicates that the spring ground water elevation has fluctuated between elevation -7.0 to -23.0 ft. in the site vicinity, which is generally consistent with our boring data.

We used a design ground water elevation of -7.0 (NGVD 29) in our geotechnical analysis for this project.

Ground water levels can fluctuate due to changes in precipitation, creek levels, irrigation, pumping of wells, and other factors. Seepage from the creek may cause perched ground water conditions at and below the existing creek water levels adjacent to the creek at any time of year.

5 CORROSION EVALUATION

We performed corrosion testing on two samples obtained from the borings. Table 2 presents the test results for pH, resistivity, sulfates and chlorides.

Table 2: Soil Corrosion Test Summary

Boring/Sample Number	Depth (ft)	Elevation (ft, NGVD 29)	Minimum Resistivity (ohm-cm)	pH	Chloride Content (ppm)	Sulfate Content (ppm)
A-09-F1/4c	11.0-11.5	20.0 to 20.5	1,820	7.85	30.6	30.4
A-09-F2/13	41.5-43.0	-10.5 to -12.0	830	7.75	28.9	26.9

Note: Caltrans considers a site to be corrosive to foundation elements if one or more of the following conditions exist: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 2000 ppm, or the pH is 5.5 or less (Caltrans, "Corrosion Guidelines", version 1.0, September 2003).

According to Caltrans Corrosion Guidelines (Version 1.0, September 2003), the site is not considered corrosive to structural elements. Appendix B contains the soil corrosion test results.

6 SEISMIC DATA AND EVALUATION

6.1 Caltrans Seismic Design Criteria

Based on the Caltrans 1996 California Seismic Hazard Map, the peak horizontal rock acceleration for the site is approximately 0.17g. The causative fault is the Midway-San Joaquin/N Fault located about 18 miles to the southwest. According to the 1996 Caltrans Seismic Map (Technical Report), the style of faulting is not known/published and this fault is listed as a new earthquake source. The estimated Maximum Earthquake Moment Magnitude for this fault is 6.75. BCI includes a Regional Fault Map showing peak bedrock accelerations as Figure 3 in Appendix A.

We classify the site soil profile as Type D using Table B.1 of the June 2006 Caltrans Seismic Design Criteria (SDC), Version 1.4, with SPT values ranging from 15 to 50.

Based on the above information, use the 0.2g peak horizontal rock acceleration curve (0.28g peak ground acceleration) from Figure B.7 (Soil Profile Type D, Magnitude: 6.5± 0.25) of the SDC for bridge structure design. We include our recommended ARS curve for bridge design as Figure 4 in Appendix A.

For geotechnical purposes, the actual peak ground acceleration of 0.24g (interpolated from Figure B.7 between the 0.1g and 0.2g ARS curves for the actual peak horizontal rock acceleration of 0.17g at the site) is appropriate for liquefaction and seismic settlement potential evaluations.

6.2 Fault Rupture

The site does not lie within or adjacent to an Alquist–Priolo Earthquake Fault Zone for fault rupture hazard, and no known active faults cross the existing bridge. We therefore consider the potential for fault rupture and ground displacement to adversely affect the proposed structure as very low to nonexistent.

6.3 Sesimic Slope Stability

We consider the potential for seismic slope instability of the existing canal slopes in-place at 1.5:1 (or flatter) at this site to be very low to nonexistent for the design peak ground acceleration of 0.24g and conditions encountered in our borings.

6.4 Liquefaction And Seismic Settlement Potential

Liquefaction can occur when relatively loose, saturated granular soil and specific soft, saturated fine-grained soils are subject to sufficient ground shaking to increase pore pressures enough to trigger liquefaction. We consider the potential for detrimental liquefaction at the site to be nonexistent for the design peak ground acceleration of 0.24g and the soil conditions encountered in our borings.

During a seismic event, ground shaking can cause densification of granular soil above the water table that can result in settlement of the ground surface. We consider the potential for detrimental seismic settlement at the site to be nonexistent for the design peak ground acceleration of 0.24g and the soil conditions encountered in our borings.

7 SCOUR EVALUATION

HDR Inc. performed a hydrology and hydraulics study[2] for structure that included the following scour data for the bridge.

[2] Final Hydrology & Hydraulics Report, SR99, Littlejohns Creek, French Camp Slough, and Lone Tree Creek Crossings, Post Mile 5.3-15.0, July 2009; revised scour results provided via email on 1/22/10.

Table 3: Scour Data

Bridge Support	Estimated Contraction Scour (ft.)	Estimated Local Scour (ft.)	Estimated Total Scour Depth (ft.)	Estimated Total Scour Elevation (ft.)
Abut 1	0	0	0	N/A
Bent 2	0.32	4.35	4.67	*13.4
Bent 3	0.32	4.35	4.67	*15.0
Abut 4	0	0	0	N/A

*HDR is designing repairs of the existing concrete slope paving and cutoff wall for scour mitigation.

HDR assumed that no long-term channel aggradation or degradation will occur at the site based on their field observations of the channel in the vicinity of the existing structures.

8 AS-BUILT FOUNDATION DATA

The As-Built Records show the existing left and right bridges are supported on driven 45-ton steel monotube piles (Alt Y) filled with unreinforced concrete. The 1954 foundation report estimated a pile tip elevation of -10 ft.

A pile driving letter dated April 22, 1955, indicates that the actual total driven lengths of the piles was about 62.5% of the estimated total lineal footage. The As-Built plans show the abutment piles were driven to elev. 10.0 ft. to 12.5 ft. at the abutments and to between elev. 0.0 to 9.0 at the bents.

9 FOUNDATION RECOMMENDATIONS

9.1 Foundation Data And Loading

The subsurface conditions encountered in our borings indicate that the site is conducive for either driven or cast-in-drilled-hole (CIDH) piles. Since CIDH piles would require temporary casing and slurry drilling due ground water and/or seepage from the creek, we favor the use of driven piles over CIDH piles. Spread footings are not considered feasible for support due to the potential for excessive settlement.

Based on the above information, driven Class 90 (Alt X) precast, prestressed concrete piles were selected for abutment support. Driven 15” precast, prestressed concrete pile extensions (Slab Bridge Pile Details, Section B-B, Sheet xs1-230, 4/4/1997) were selected for bent support.

HDR provided the following foundation design information in Tables 4 and 5.

Table 4: Foundation Design Data Provided By HDR

Foundation Design Data								
Support No.	Design Method	Pile Type	Finish Grade Elev. (ft)*	Pile Cut-off Elevation (ft)*	Pile Cap Size (ft)		Permissible Settlement – Service Load (in)	Number of Piles Per Support
					B	L		
Abut 1	WSD	Class 90 (Alt X)	28.5**	25.9	N/A	N/A	1	5
Bent 2	LRFD	15" PC/PS Concrete Pile Extensions	22.0	30.2	N/A	N/A	1	4
Bent 3	LRFD	15" PC/PS Concrete Pile Extensions	22.0	30.2	N/A	N/A	1	4
Abut 4	WSD	Class 90 (Alt X)	28.5**	26.0	N/A	N/A	1	5

* Finished Grade and Pile Cut-off Elevation are approximate and are subjected to change once more accurate final survey data becomes available.
** Finished Grade indicates the ground elevation in front of abut wall/ top of slope.

Table 5: Foundation Design Loads Provided By HDR

Foundation Design Loads											
Support No.	**Service-I Limit State (kips)**			**Strength Limit State (Controlling Group, kips)**				**Extreme Limit State (Controlling Group, kips)**			
	Total Load		Permanent Loads	Compression		Tension		Compression		Tension	
	Per Support	Per Pile	Per Support	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1	300	85	145	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bent 2	445	N/A	230	670	190	0	0	N/A	78	0	0
Bent 3	445	N/A	230	670	190	0	0	N/A	78	0	0
Abut 4	300	85	145	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

9.2 Foundation Recommendations And Pile Data Table

BCI used the above foundation design data and loading conditions to evaluate bent foundations using AASHTO LRFD Bridge Design Specifications-4th Edition with current Caltrans Amendments. We evaluated abutment foundations using Caltrans November 2003 Bridge Design Specifications for foundations using Working Stress Design methods. We present our foundation recommendations in Tables 6, 7 and 8 on the following pages.

Table 6: Foundation Recommendations for Abutments

Abutment Foundation Design Recommendations										
Support	Pile Type	Cut-off Elev. (ft.)	**LRFD Service-I Limit State Load – Compression (kips)**			Required Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
			Per Support		Per Pile	Comp.	Tens.			
			Total	Permanent						
Abut 1	Class 90 (Alt. X)	25.9	300	145	85	170	0	-5.0(a)	-5.0	170
Abut 4	Class 90 (Alt. X)	26.0	300	145	85	170	0	-5.0(a)	-5.0	170

Notes: 1) Design tip elevations for **Abutments** are controlled by (a) Compression.

Table 7: Foundation Recommendations for Bents

Bent Foundation Design Recommendations											
Support	Pile Type	Cut-off Elev. (ft.)	LRFD Service-I Limit State Load Per Support – Compression (kips)	Total Permissible Support Settlement (in.)	Required Factored Nominal Resistance (kips) Per Pile				Design Tip Elevations (ft.)	Specified Tip Elevations (ft.)	Nominal Driving Resistance Required (kips)
					Strength Limit		Extreme Event				
					Comp $\varphi = 0.7$	Tens. $\varphi = 0.7$	Comp $\varphi = 1.0$	Tens $\varphi = 1.0$			
Bent 2	15" PC/PS Concrete Pile Extensions	30.2	445	1	190	0	78	0	-26.0(a)	-26.0	280
Bent 3	15" PC/PS Concrete Pile Extensions	30.2	445	1	190	0	78	0	-26.0(a)	-26.0	280

Notes:
1) Per support loads are per column (4 columns per bent)
2) Design tip elevations for **Bents** are controlled by (a) Compression (Strength Limit).
3) The nominal driving resistance required for Bent piles is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance.

Based on our analysis presented in the following sections, BCI presents our recommended Pile Data Table as Table 8:

Table 8: Pile Data Table

Pile Data Table						
Support	Pile Type	Nominal Resistance (kips)		Design Tip Elevations (ft.)	Specified Tip Elevation (ft.)	Nominal Driving Resistance (kips)
		Compression	Tension			
Abut 1	Class 90 (Alt. X)	170	0	-5.0(a)	-5.0	170
Bent 2	15" PC/PS Pile Extensions	280	0	-26.0(a)	-26.0(a)	280
Bent 3	15" PC/PS Pile Extensions	280	0	-26.0(a)	-26.0(a)	280
Abut 4	Class 90 (Alt. X)	170	0	-5.0(a)	-5.0	170

Notes:
1) Design tip elevations for **Abutments** are controlled by (a) Compression.
2) Design tip elevations for **Bents** are controlled by (a) Compression (Strength Limit).
3) The nominal driving resistance required for Bent piles is equal to the required nominal resistance needed to support the factored load plus driving resistance from the penetrated soil layers, if any, which do not contribute to the required nominal resistance due to scour.

9.3 Engineering Parameters

The following engineering parameters are generalized and based on:

- Unit weights represent average values based on our laboratory tests, local experience and published typical values.
- Cohesion was conservatively assumed based on average values from unconfined compressive strength testing, triaxial testing (unconsolidated, undrained), field pocket penetrometer testing, and published blow count correlations.
- Friction angles were based on published blow count correlations.
- Modulus and E_{50} strain values for lateral pile analysis were obtained from the July 2004 LPILE Plus 5.0 Technical Manual for appropriate soil type and consistency.
- Engineering experience and judgment.
- BCI used a ground water elevation of -5.0 ft. (NGVD29) for design.

9.3.1 Compressive Resistance

We used the generalized soil parameters in Table 9 in our bearing capacity analysis.

Table 9: Generalized Soil Parameters

Elevation (NVGD29)	Soil Type	Unit Weight (lb/ft^3)	Friction Angle (degrees)	Cohesion (psf)
26.0 to 23.0	Lean Clay	125	---	2,500
23.0 to 15.0	Clayey Sand	117	28	---
15.0 to 7.0	Lean Clay	115	---	1,500
7.0 to 2.0	Silty Sand	120	36	---
2.0 to -7.0	Lean Clay	120	---	3,000
-7.0 to -25.0	Lean Clay	*63	---	3,000
-25.0 to -31	Sand	*68	36	---

*Buoyant Unit Weight

9.3.2 LPILE Parameters

HDR requested that BCI provide LPILE parameters for use in their equivalent column length and lateral pile analysis. Table 10 provides our recommended LPILE parameters for the abutment and bent piles.

Table 10: LPILE Parameters

Elevation (NGVD29)	**L-Pile Soil Type (p-y curve model)**	**Unit Weight (lb/ft^3)**	**Friction Angle (degrees)**	**Cohesion (psf)**	**Modulus, k (lb/in^3)**	**E_{50}**
26.0 to 23.0	Stiff Clay w/o Free Water	125	---	2,500	**	0.007
23.0 to 15.0	Sand (Reese)	117	28	---	60	---
15.0 to 7.0	Stiff Clay w/o Free Water	115	---	1,500	**	0/007
7.0 to 2.0	Sand (Reese)	120	36	---	100	---
2.0 to -7.0	Stiff Clay w/o Free Water	120	---	3,000	**	0.005
-7.0 to -25.0	Stiff Clay with Free Water	*63	---	3,000	800	0.005
-25.0 to -31	Sand (Reese)	*68	36	---	80	---

*Buoyant Unit Weight
**LPILE 5.0 does not report the k value for the Stiff Clay Without Free Water soil type. The k value is internally computed using the cohesion and E50 input parameters.

Neglect lateral resistance at the bents above the existing channel bottom elevation (18.0 ft., NGVD 29).

9.4 Abut 1 And Abut 4 Piles (Class 90)

In accordance with current Caltrans specifications, we used the Working Stress Design (WSD) for the abutment piles. BCI evaluated Alternative "X" Class 90 piles with a T dimension of 12 inches for the abutments. BCI presents the results of our compressive resistance and settlement analysis below.

9.4.1 Compressive Resistance

The tips of the Class 90 precast, prestressed concrete (PPC) piles will bear in very stiff lean clay about 31 ft. below the existing channel bottom elevation.

Our calculations indicate that the nominal compressive resistance of the PPC piles can be obtained through about 10% end bearing and 90% skin friction. Actual contributions to end bearing and skin friction could vary depending on how the load is transferred to the piles. We neglected the approach fill in our skin friction and end bearing analysis.

We determined the compressive resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc. BCI used a pile cutoff elevation of 26.0 ft in our analysis

Refer to the Driven output files in Appendix C for the analysis results.

9.4.2 Settlement

We calculated immediate settlement of approximately 0.30 inches for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We do not anticipate significant long-term settlement due to the competent soil conditions above and below the pile tips. We include the pile settlement calculations in Appendix C.

Our calculated pile settlement is less than the permissible settlement of 1-inch specified for the structure foundations.

9.4.3 Lateral Load Analysis

BCI provided LPILE paramaters in Section 9.3.2 for HDR to use in lateral pile analysis.

9.4.4 Negative Skin Friction

We do not anticipate negative skin friction at the abutments given the competent soil conditions and nominal new embankment heights.

9.5 Bent Piles

We used AASHTO LRFD Bridge Design Specifications-4th Edition and current Caltrans Amendments for evaluating driven 15" precast, prestressed concrete pile extensions (Caltrans Slab Bridge Details, Sheet xs1-23) at the Bents. BCI presents the results of our compressive resistance and settlement analysis below.

9.5.1 Compressive Resistance

The tips of the 15" precast, prestressed concrete pile extensions will bear in medium dense sand about 44 ft. below the existing channel bottom elevation. Our calculations indicate that the nominal compressive resistance of the piles can be obtained through about 50% end bearing and 50% skin friction. Actual contributions to end bearing and skin friction could vary depending on how the load is transferred to the pile.

We determined the required nominal compressive resistance using the Federal Highway Administration's Driven 1.2 (March 20, 2001) computer program developed by Blue-Six Software, Inc.

We did not consider scour in our analysis since the existing concrete slope paving/cutoff wall will be repaired/rehabilitated to mitigate scour potential at the bents.

The Driven 1.2 computer program calculates compressive resistance for piles with square sides (pile width input, not diameter). For bent piles, we performed separate analyses using an equivalent pile width of 11.8 inches for skin friction contributions, and 13.3 inches for end bearing contributions. BCI evaluated long-term nominal pile compressive resistance beginning at about elevation 18.0 (deepest existing channel elevation). BCI neglected scour in our analysis since HDR is designing concrete slope paving and cutoff wall to protect bent pile from scour.

BCI determined the required factored nominal resistance by comparing the Factored Strength Limit Load (Geotechnical Resistance Factor = 0.7) with the Extreme Event Load (Resistance Factor = 1.0). We then used the higher value as the required factored nominal resistance. In this case, the Factored Strength Limit Load (190 kips/0.7 = 271 kips per pile) is controlling over the 78 kips per pile for the Extreme Event. We rounded the Factored Strength Limit Load to 280 kips to estimate the design tip elevation using the Driven software.

Refer to the Driven output files in Appendix D for additional information.

9.5.2 Settlement

We calculated immediate settlement of approximately 0.6 inches for the Service-I Limit State total load (per pile) using the method outlined in Section 16-10 of Foundation Analysis and Design, 5th edition, Joseph E. Bowles, 1996. We do not anticipate significant long-term settlement due to the competent soil conditions above and below the pile tips. We include the pile settlement calculations in Appendix D.

Our calculated pile settlement is at the 1-inch permissible settlement level specified for the structure foundations. We do not anticipate significant long-term settlement due to the competent soil conditions at and below the equivalent footing level.

9.5.3 Lateral Load Analysis

BCI provided LPILE paramaters in Section 9.3.2 for HDR to use in lateral pile analysis.

9.5.4 Negative Skin Friction

We do not anticipate negative skin friction at the bents.

10 APPROACH FILLS

10.1 Fill Materials

Embankments will be constructed using imported borrow material, supplemented with material excavated from shallow on-site cuts. The source(s) of borrow material for construction of approach fills has not been identified. Proposed borrow must be tested and approved for use by the project engineer prior to transporting to the site.

Expansive soil (Expansion Index > 50 and Sand Equivalent < 20) should not be used as fill within 5 ft. of the abutment backwall.

10.2 Slope Geometry And Stability

The maximum new embankment fill height at the bridge abutments will extend less than 3 ft. above existing grades. The existing concrete paving slopes at approximately 1.5:1 (horizontal to vertical) and will be repaired/rehabilited to protect the channel slopes from slumping/stability issues.

The existing approach fill and underlying native soil are competent for support of the planned embankments.

10.3 Settlement

We estimate minor (< 1-inch) settlement for new embankment fill loads up to 3 ft. high. No waiting period is necessary prior to construction of bridge abutment foundations.

10.4 Lateral Earth Pressures

The following equivalent fluid weights (EFWs) may be used to design the abutment walls and wing walls for Abutments 1 and 4 assuming level backfill conditions:

Condition	EFW Static	EFW Seismic
Active	36 lb/ft^3	42 lb/ft^3
At-Rest	56 lb/ft^3	66 lb/ft^3
Passive	220 lb/ft^3	205 lb/ft^3

To limit wall deflection to acceptable levels, BCI applied a factor of safety of 2.0 to the ultimate passive pressure to generate the allowable passive pressures provided above.

As noted in the Caltrans Seismic Design Criteria (SDC), the maximum passive pressure is 5.0 ksf for longitudinal abutment response, which must be used with the proportionality factor presented in Section 7.8.1 of the SDC.

The EFWs shown above assume embankment fill meeting the requirements of Caltrans standard for Structure Backfill, a soil unit weight of approximately 125 pcf, a minimum angle of internal friction equal to 34 degrees, and that drainage is placed behind the walls in accordance with Caltrans Standard Plans and Specifications.

We estimated the EFWs for seismic loading using the Mononobe-Okabe equation for Active and Passive lateral coefficients K_a and K_p. We estimated the At-Rest coefficient, K_o, for the seismic condition using an increase ratio similar to the Active condition. In the Mononobe-Okabe equation, BCI used a horizontal seismic acceleration coefficient (k_h) of 0.12 calculated using the equation in Chapter 11, Section 11.6.5 of the AASHTO LRFD Bridge Design Specifications-4th Edition. This kh value assumes that the walls displace at least 1-inch during the design seismic event. We calculated the above static EFW's using methods presented in the 1982 Naval Facilities (NAVFAC) Design Manual 7.2.

Apply the resultant of the seismic active and at-rest pressures at a depth 0.5H from the base of the wall, where H equals the wall height in feet. The passive pressures are applicable for concrete placed directly against undisturbed soil or compacted fill.

For surcharge loads, apply an additional uniform lateral load behind the wall equivalent to (0.30)x(surcharge pressure).

Use a coefficient of friction of 0.45 to resist sliding for concrete placed on native undisturbed soil or compacted fill.

11 CONSTRUCTION CONSIDERATIONS

Where referenced below, "Standard Specifications" refers to Caltrans Standard Specifications (May 2006).

11.1 Embankment Waiting Period

No waiting period is required prior to construction of bridge abutment piling.

11.2 Abutment And Bent Piles

Piles shall conform to Section 49-1 of the Standard Specifications.

Difficult pile installation is anticipated due to the presence of locally dense sand layers above the specified tip elevations. Drilling to assist pile driving may be necessary to achieve the specified tip elevations. Drilling should be performed in accordance with Section 49-1.05 of the Standard Specifications, *except the drill hole should be no greater than 8-inches in diameter and drilling should not extend within 10 ft. of specified tip elevations.*

Jetting or vibratory hammers should not be used to obtain the specified pile penetration.

Verify pile capacity during driving using energy equations in accordance with Caltrans Standard Specification 49-1.08 (Modified Gates Formula). A pile load test is not necessary.

The Contractor shall provide a Pile Driving System submittal in accordance with Caltrans Bridge Reference Specification 49-208 (49HAMR) to verify that the pile driving system is adequate.

Pile driving should not negatively impact the existing bridge structures since they are supported on piles.

11.3 Temporary Shoring

The contractor is responsible for design and construction of excavation sloping and shoring in accordance with CalOSHA Standards.

11.4 Dewatering

Excavations extending below the creek water level will require dewatering or diking/diversion methods to construct abutment foundations in the “dry”.

12 RISK MANAGEMENT

Our experience and that of our profession clearly indicates that the risks of costly design, construction, and maintenance problems can be significantly lowered by retaining the geotechnical engineer of record to provide additional services. For this project, BCI should be retained to:

1. Review and provide written comments on the (civil, structural) plans and specifications prior to construction.
2. Monitor construction to check and document our report assumptions. At a minimum, we should monitor pile installation.
3. Update this report if:
    - design changes occur
    - 2 years or more lapse between this report and construction
    - site conditions change

If BCI is not retained to perform the above applicable services, we are not responsible for any other parties’ interpretation of our report, and subsequent addenda, letters, and discussions.

13 LIMITATIONS

BCI performed services in accordance with the generally accepted geotechnical standard of practice currently used in this area. Where referenced, we used ASTM and Caltrans Standards as a general (not strict) *guideline* only. We do not warranty our services.

BCI based this report on the current site and project conditions. We assumed the soil and ground water conditions encountered in our exploratory borings were representative of the subsurface conditions across the site. Actual conditions between borings could be different. Groundwater may be higher/lower in other locations than measured in the borings.

The interface between soil types on the logs is approximate. The transition between soil types may be abrupt or gradual. We based our recommendations on the final logs, which represent our interpretation of the field logs and general knowledge of the site and geologic conditions.

Our scope did not include evaluation of flooding or hazardous materials on site.
This report should only be used for design and construction of the Little John Creek Bridge (Widen) project, as described herein.

Modern design and construction is complex, with many regulatory sources, restrictions, involved parties, construction alternatives, etc. It is common to experience changes and delays. The owner should set aside a reasonable contingency fund based on complexities and cost estimates to cover changes and delays.

APPENDIX A

Figure 1 – Vicinity Map

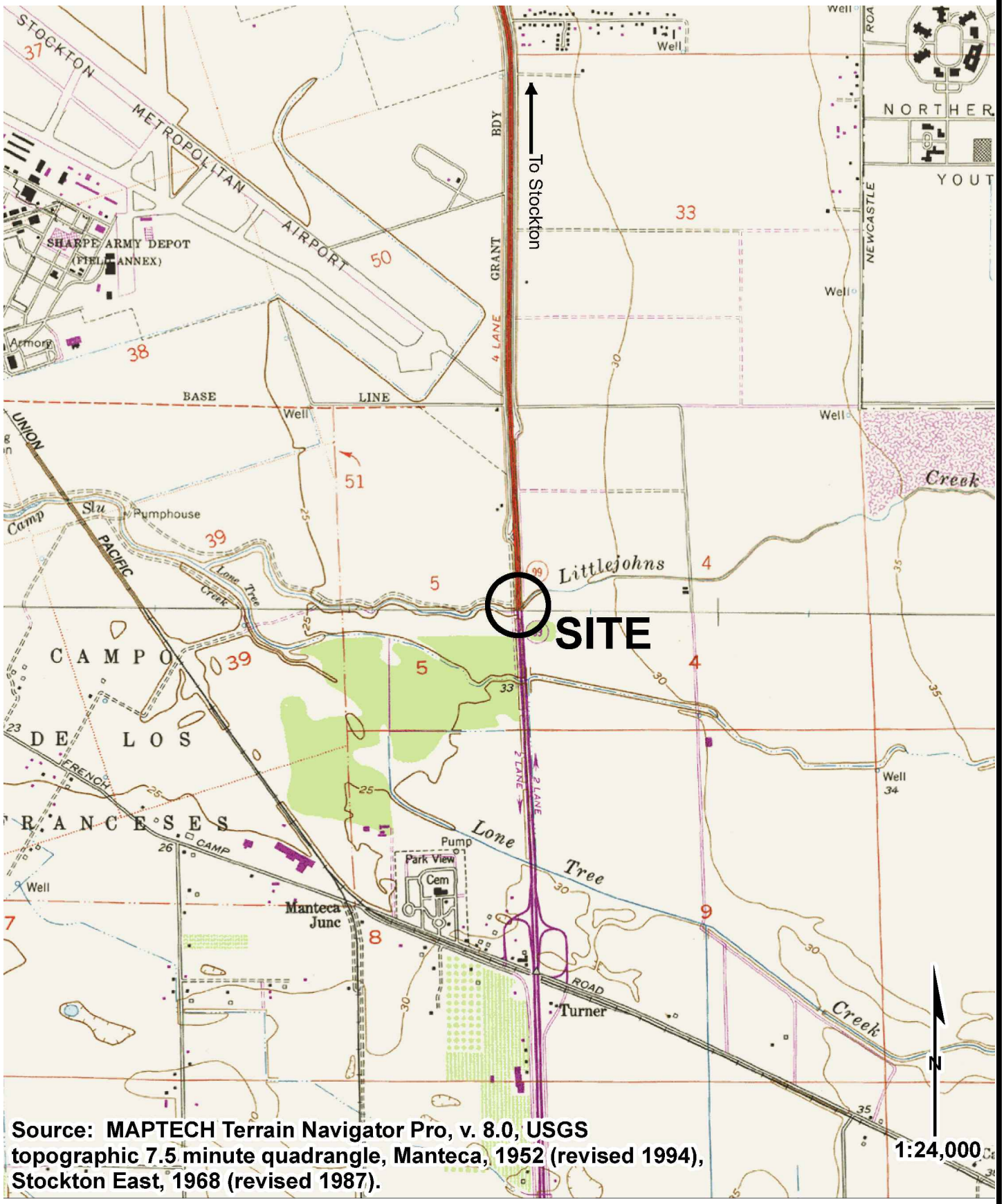
Figure 2 – Geologic Map

Figure 3 – Regional Fault Map

Figure 4 – ARS Curve

Log of Test Borings Sheets 1-4

Log of Test Borings Sheet Checklist



Source: MAPTECH Terrain Navigator Pro, v. 8.0, USGS topographic 7.5 minute quadrangle, Manteca, 1952 (revised 1994), Stockton East, 1968 (revised 1987).

blackburn consulting

11521 Blocker Drive, Ste 110
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Phone: (530) 887-1494
Fax: (530) 887-1495
www.blackburnconsulting.com

□I□INIT□ MAP

Little John Creek Bridge (Widen)
San Joaquin County, California

File No. 1201.7b

January 2011

Figure 1

1/6/2011 1201.7 Little John Creek Bridge (Widen) Figure 1.dwg

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GEOLOGI□ MAP

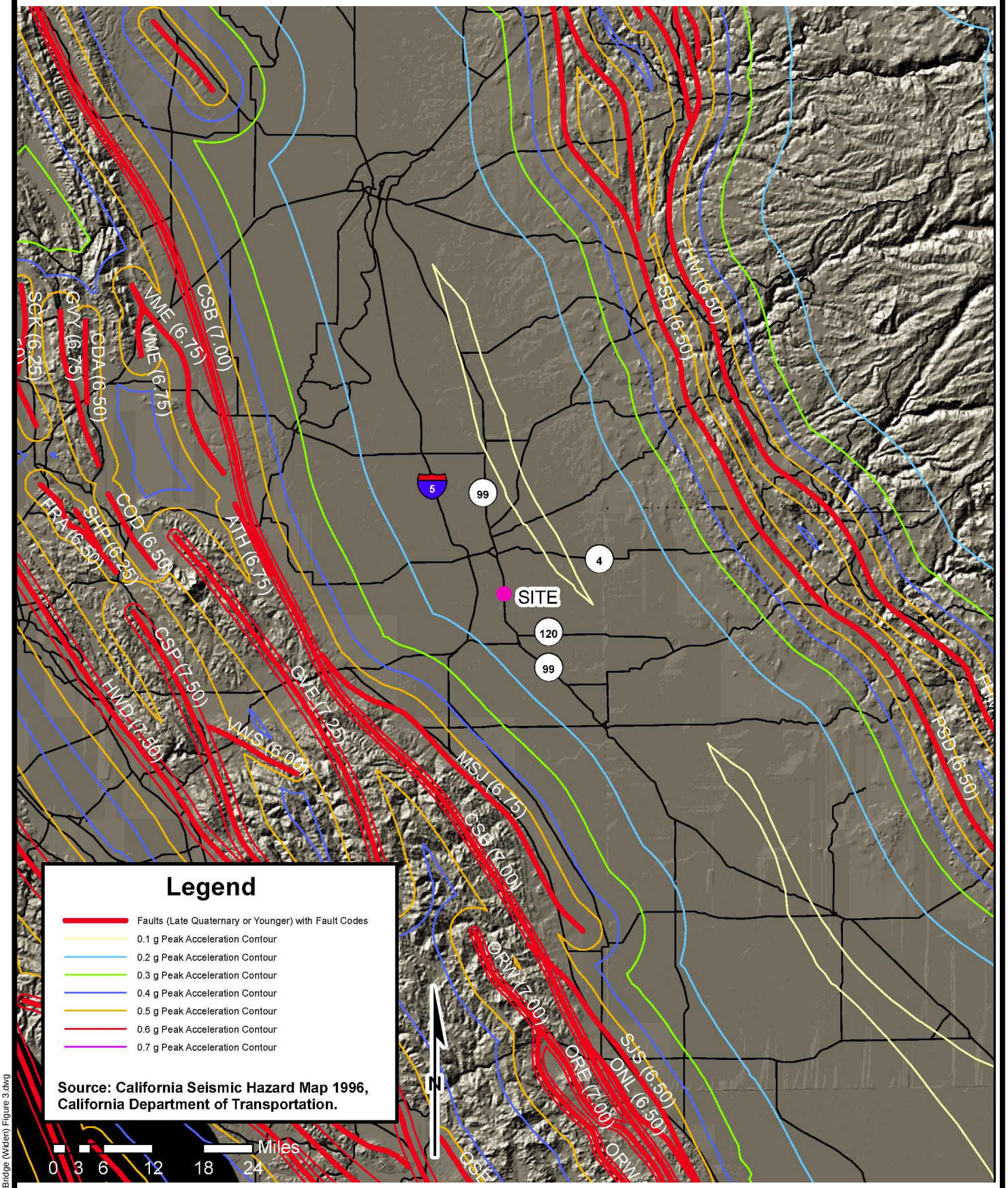
Little John Creek Bridge (Widen)
San Joaquin County, California

File No. 1201.7b

January 2011

Figure 2

1/6/2011 1201.7 Little John Creek Bridge (Widen) Figure 2.dwg



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REGIONAL FAULT MAP

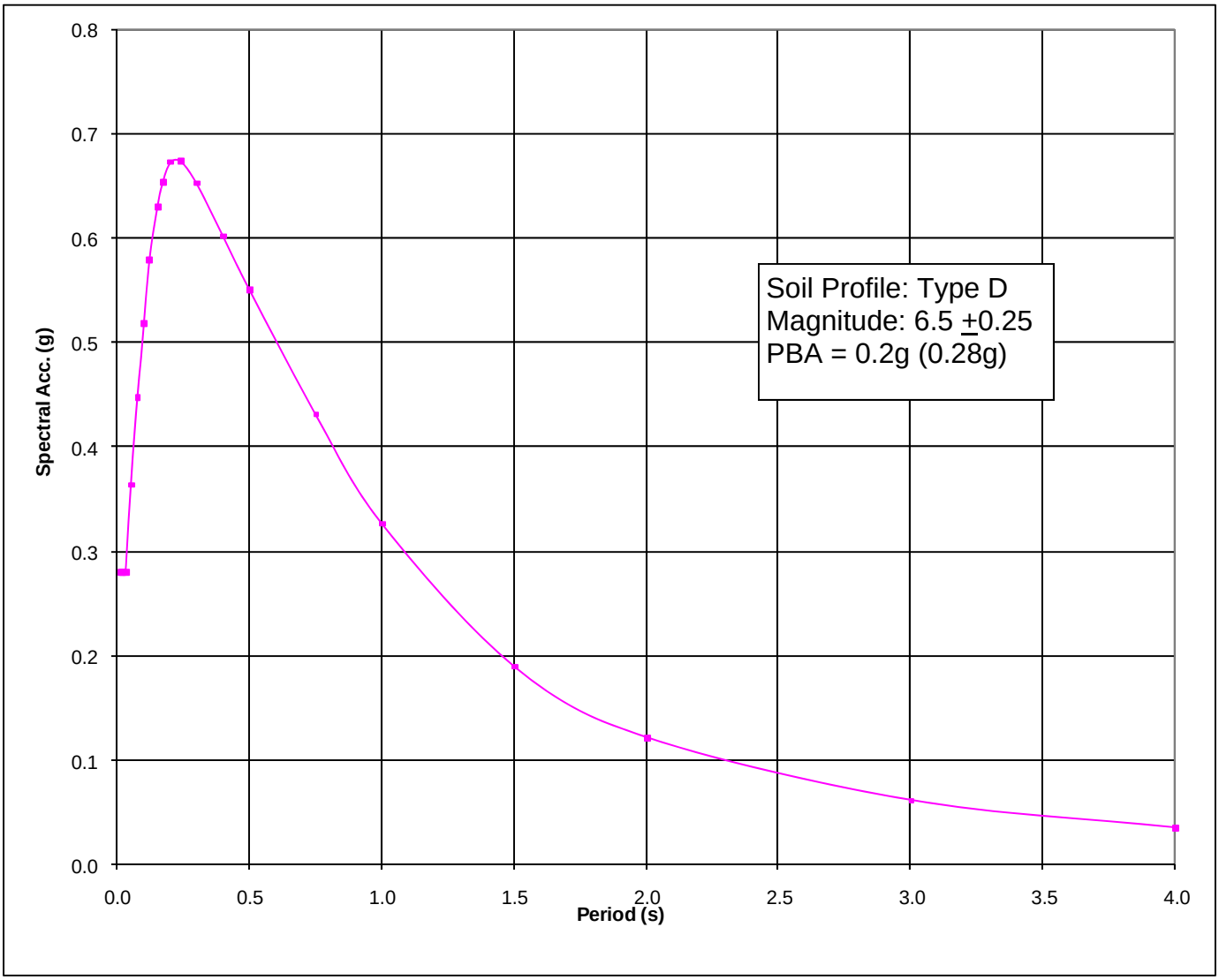
Little John Creek Bridge (Widen)
San Joaquin County, California

File No. 1201.7b

January 2011

Figure 3

1/6/2011 1201.7 Little John Creek Bridge (Widen) Figure 3.dwg



Reference: Figure B.7, Caltrans Seismic Design Criteria, Ver. 1.4, June 2006

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ARS CURVE

Little John Creek Bridge (Widen)
San Joaquin County, California

File No. 1201.7b

January 2011

Figure 4

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

REGISTERED CIVIL ENGINEER — DATE 01/06/11

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER — DAVID J. MORRELL — No. 60578 — Exp. 12/31/12 — CIVIL — STATE OF CALIFORNIA

BLACKBURN CONSULTING
2491 BOATMAN AVENUE
WEST SACRAMENTO, CA 95691 — FILE No. 1201.7b

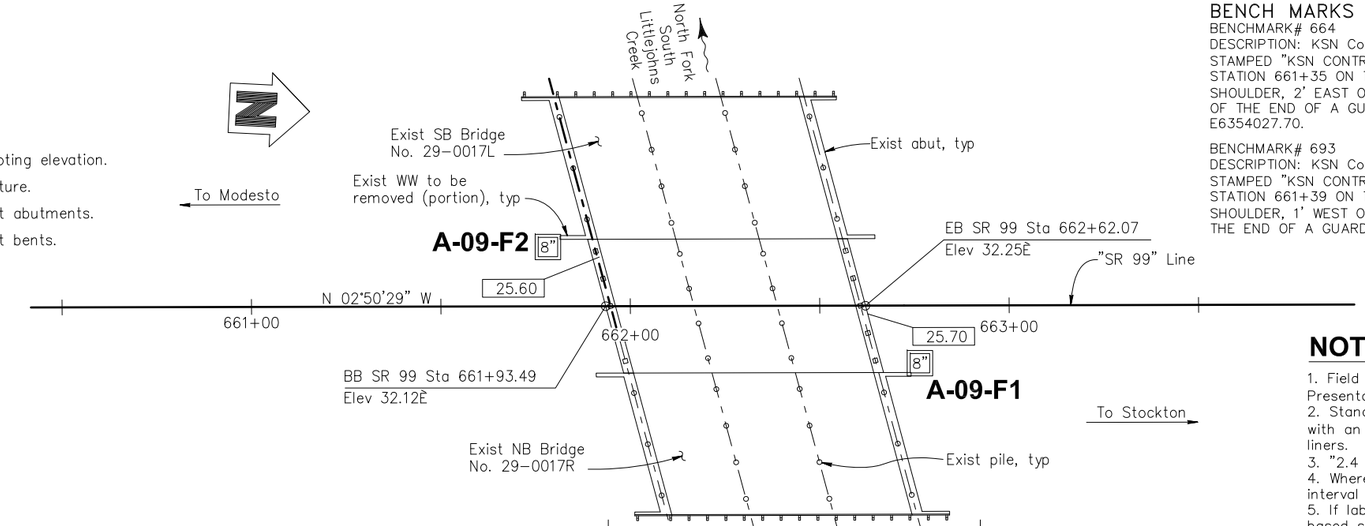
HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

BENCH MARKS

BENCHMARK# 664 — ELEV. 30.98 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED APPROXIMATE CENTERLINE STATION 661+35 ON THE NORTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 2' EAST OF THE EDGE OF PAVEMENT, 3' SOUTH WEST OF THE END OF A GUARDRAIL. NGVD 29, N2141777.22, E6354027.70.

BENCHMARK# 693 — ELEV. 31.15 Ft
DESCRIPTION: KSN Control Point, 1/2" REBAR WITH YELLOW CAP STAMPED "KSN CONTROL", LOCATED APPROXIMATE CENTERLINE STATION 661+39 ON THE SOUTHBOUND MAINLINE, ON THE OUTSIDE SHOULDER, 1' WEST OF THE EDGE OF PAVEMENT, 31' SOUTH OF THE END OF A GUARDRAIL. NGVD 29, N2141776.01, E6353915.30.

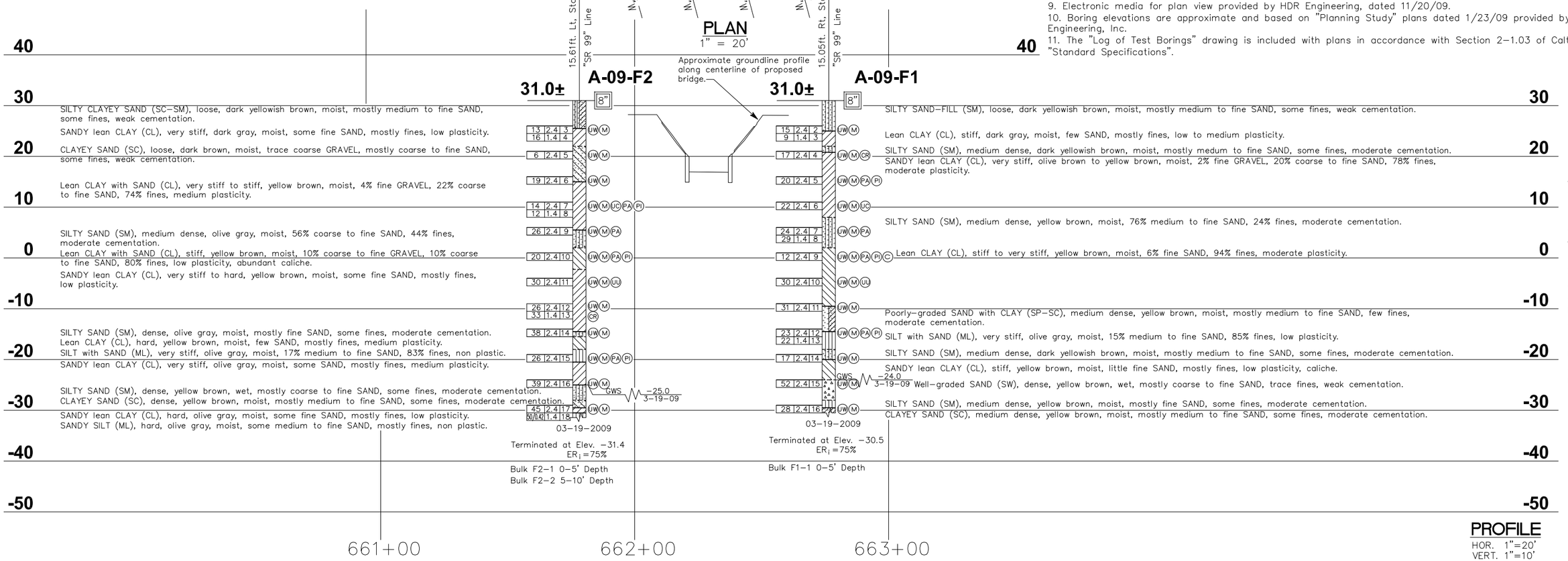
Legend:
- XX.XX — Indicates bottom of footing elevation.
- Indicates existing structure.
- Indicates driven piles at abutments.
- Indicates driven piles at bents.



PLAN
1" = 20'

NOTES:

1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (June 2007). See Log of Test Borings No. 2 and 3, "Soil Legend".
2. Standard Penetration tests were performed in accordance with ASTM D 1586–99 using a hammer operated with an automated drop system. Drill rods were 1 5/8–inch diameter "A"–rods; sampler was driven with brass liners.
3. "2.4 inch sampler": ID=2.4 inch, OD=2.9 inch. Driven in same manner as SPT ("1.4 inch") sampler.
4. Where less than the 0.5 inches of penetration is achieved, the blow count shown is for that fraction of the interval actually penetrated.
5. If laboratory tests are not shown as being performed, the soil descriptions presented in the LOTB are based solely on the visual practices described in the before mentioned Manual.
6. The length of each sampled interval is shown graphically on the boring log.
7. Consistency of soils shown in ( ) where estimated.
8. Groundwater surface (GWS) reflect the fluid level in the borings on the specified date. Groundwater surface is subject to seasonal fluctuations and may occur at higher or lower elevations depending on the conditions at any particular time.
9. Electronic media for plan view provided by HDR Engineering, dated 11/20/09.
10. Boring elevations are approximate and based on "Planning Study" plans dated 1/23/09 provided by HDR Engineering, Inc.
11. The "Log of Test Borings" drawing is included with plans in accordance with Section 2–1.03 of Caltrans "Standard Specifications".



PROFILE
HOR. 1"=20'
VERT. 1"=10'

DESIGN OVERSIGHT	DRAWN BY	M. ROBERTSON	A. WOOD — FIELD INVESTIGATION BY:
SIGN OFF DATE	CHECKED BY	A. SHINNEFIELD	DATE: MARCH 2009

PREPARED FOR THE **STATE OF CALIFORNIA** DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR. — PROJECT ENGINEER

BRIDGE NO. 29–0017 — POST MILE 12.53

LITTLE JOHN CREEK BRIDGE (WIDEN)
LOG OF TEST BORINGS 1 OF 4

GS CIVIL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10–0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES 05/03/10 06/02/10 11/05/10 — SHEET — OF

FILE => $REQUEST

1/6/2011 1201.7 Little John Creek Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

REGISTERED CIVIL ENGINEER — DATE 01/06/11

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — DAVID J. MORRELL — No. 60578 — Exp. 12/31/12 — CIVIL — STATE OF CALIFORNIA

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WEST SACRAMENTO, CA 95691 — FILE No. 1201.7b

HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

CONSISTENCY OF COHESIVE SOILS

Description	Unconfined Compressive Strength (tsf)	Pocket Penetrometer Measurement (tsf)	Torvane Measurement (tsf)	Field Approximation
Very Soft	<0.25	<0.25	<0.12	Easily penetrated several inches by fist
Soft	0.25 to 0.50	0.25 to 0.50	0.12 to 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 to 1.0	0.50 to 1.0	0.25 to 0.50	Penetrated several inches by thumb with moderate effort
Stiff	1 to 2	1 to 2	0.50 to 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2 to 4	2 to 4	1.0 to 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

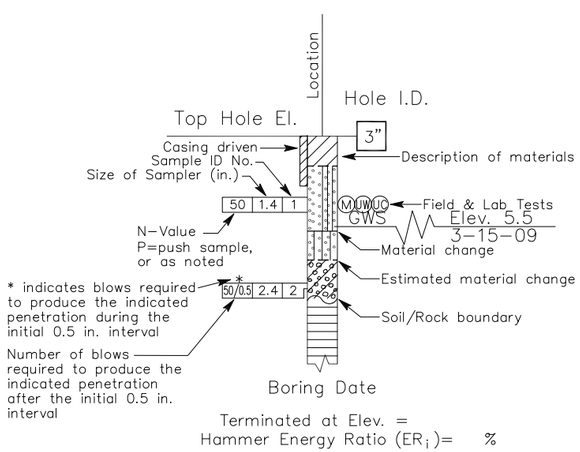
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring
Size	R P	Rotary drilled boring Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1–inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778)
⬚	O	Other

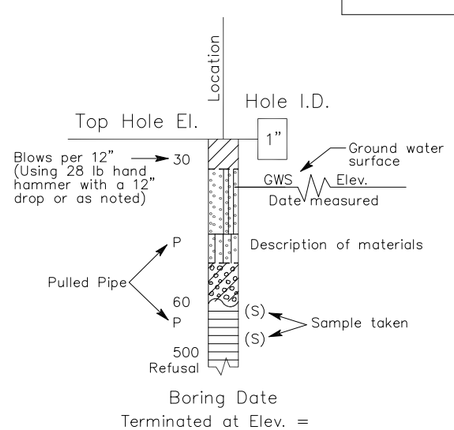
NOTE: Size in inches.

PLASTICITY OF FINE-GRAINED SOILS

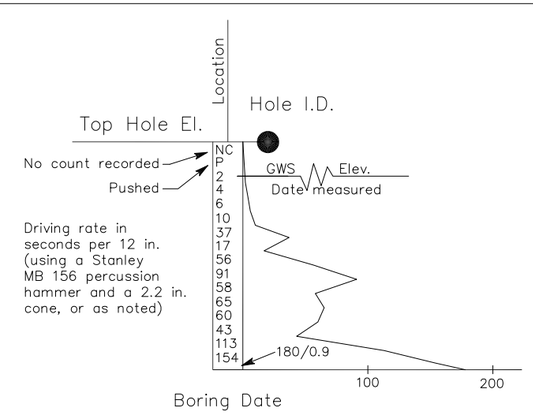
Description	Criteria
Nonplastic	A 1/8–inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.



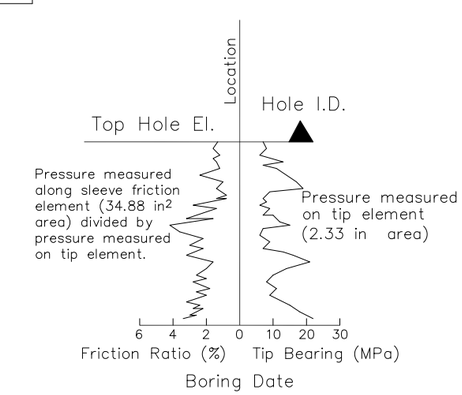
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) SOUNDING

SOIL LEGEND

LITTLE JOHN CREEK BRIDGE (WIDEN)

LOG OF TEST BORINGS 2 OF 4

DESIGN OVERSIGHT

SIGN OFF DATE

DRAWN BY M. ROBERTSON

CHECKED BY A. SHINNEFIELD

A. WOOD
FIELD INVESTIGATION BY:
DATE: MARCH 2009

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29–0017
POST MILE 12.53

GS SOIL LEGEND SHEET 1 (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10–0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 05/03/10 08/03/10 11/05/10 — SHEET — OF

FILE => $REQUEST

1/6/2011 1201.7 Little John Creek Bridge (Widen) LOTB.dwg

USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
10	SJ	99			

REGISTERED CIVIL ENGINEER — DATE 01/06/11

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER — DAVID J. MORRELL No. 60578 Exp. 12/31/12 CIVIL — STATE OF CALIFORNIA

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WEST SACRAMENTO, CA 95691 FILE No. 1201.7b

HDR ENGINEERING, INC.
2365 IRON POINT ROAD, SUITE 300
FOLSOM, CA 95630

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL, (JUNE, 2007)

GROUP SYMBOLS AND NAMES

Graphic/Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND
GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL
SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic/Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean Clay ORGANIC lean Clay with SAND ORGANIC lean Clay with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OH/OL	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTING

- (C) Consolidation (ASTM D 2435)
- (CL) Collapse Potential (ASTM D 5333)
- (CP) Compaction Curve (CTM 216)
- (CR) Corrosivity Testing (CTM 643, CTM 422, CTM 417)
- (CU) Consolidated Undrained Triaxial (ASTM D 4767)
- (DS) Direct Shear (ASTM D 3080)
- (EI) Expansion Index (ASTM D 4829)
- (M) Moisture Content (ASTM D 2216)
- (OC) Organic Content-% (ASTM D 2974)
- (P) Permeability (CTM 220)
- (PA) Particle Size Analysis (ASTM D 422)
- (PI) Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
- (PL) Point Load Index (ASTM D 5731)
- (PM) Pressure Meter
- (PP) Pocket Penetrometer
- (R) R-Value (CTM 301)
- (SE) Sand Equivalent (CTM 217)
- (SG) Specific Gravity (AASHTO T 100)
- (SL) Shrinkage Limit (ASTM D 427)
- (SW) Swell Potential (ASTM D 4546)
- (TV) Pocket Torvane
- (UC) Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
- (UU) Unconsolidated Undrained Triaxial (ASTM D 2850)
- (UW) Unit Weight (ASTM D 2937)
- (VS) Vane Shear (AASHTO T 223)

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60}-Value (Blows / 12 inches)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Description		Size
Boulder		> 12"
Cobble		3" to 12"
Gravel	Coarse	3/4" to 3"
	Fine	No. 4 to 3/4"
Sand	Coarse	No. 10 to No. 4
	Medium	No. 40 to No. 10
	Fine	No. 200 to No. 40

SOIL LEGEND

LITTLE JOHN CREEK BRIDGE (WIDEN)

LOG OF TEST BORINGS 3 OF 4

DESIGN OVERSIGHT

SIGN OFF DATE

DRAWN BY M. ROBERTSON

CHECKED BY A. SHINNEFIELD

A. WOOD
FIELD INVESTIGATION BY:
DATE: MARCH 2009

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

JOHN A. KLEMUNES, JR.
PROJECT ENGINEER

BRIDGE NO. 29-0017
POST MILE 12.53

GS SOIL LEGEND SHEET 2 (ENGLISH) (REV. 7/16/10)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 1455
PROJECT NUMBER & PHASE: 10000000271
CONTRACT NO.: 10-0E6101

DISREGARD PRINTS BEARING EARLIER REVISION DATES 05/03/10 09/08/10 11/05/10

REVISION DATES SHEET OF

FILE => $REQUEST

1/6/2011 1201.7 Little John Creek Bridge (Widen) LOTB.dwg

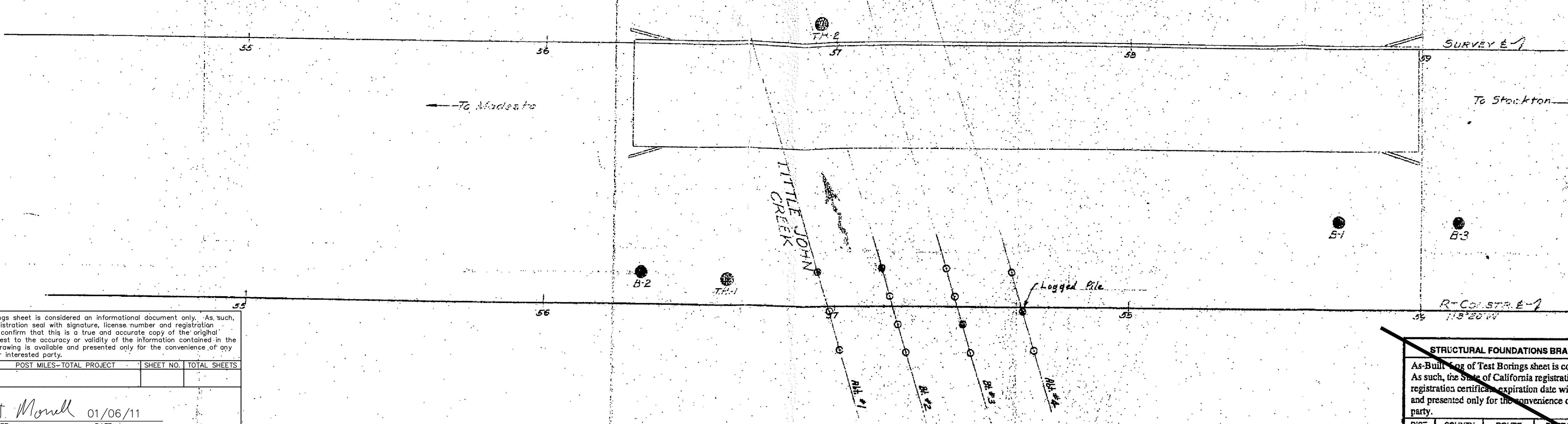
USERNAME => $USER DATE PLOTTED => $DATE TIME PLOTTED => $TIME

FED. ROAD DIV. No.	STATE	PROJ. No.	FISCAL YEAR	SHEET No.	TOTAL SHEETS
7	CAL.				

DIST.	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
X	SJ	4	E		

BRIDGE ENGINEER — CIVIL AND STRUCTURAL ENGINEER—LICENSE

DATE APPROVED



As-Built Log of Test Borings sheet is considered an informational document only. As such, the State of California registration seal with signature, license number and registration certificate expiration date confirm that this is a true and accurate copy of the original document. It does not attest to the accuracy or validity of the information contained in the original document. This drawing is available and presented only for the convenience of any bidder, contractor or other interested party.

DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
10	SJ	99			

David J. Morrell 01/06/11
REGISTERED CIVIL ENGINEER DATE

LATHROP ROAD OVERCROSSING

LOG OF TEST BORINGS 4 of 4

NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA.

UNIT: 1455
PROJECT NUMBER & PHASE: 1000000271

BRIDGE No.	SHEET	OF
29-0017		

Revisions made to this Log of Test Borings from the original 1963 Log of Test Borings are the addition of the following table and notes.

Boring	Station	Offset from "SR99" Line
B-1	663+73.20	04.54 ft Rt
B-2	661+38.58	23.71 ft Rt
B-3	664+13.80	04.24 ft Rt
TH-1	661+67.37	26.05 ft Rt
TH-2	661+98.29	60.35 ft Lt

1. See Log of Test Borings 1 of 4 for stationing.
2. Boring locations are approximate based on proposed new structure location. This table is presented on the As Built Log of Test Boring sheet for the convenience of any bidder, contractor or other interested party.

REGISTERED PROFESSIONAL ENGINEER
DAVID J. MORRELL
No. 60578
Exp. 12/31/12
CIVIL
STATE OF CALIFORNIA

~~STRUCTURAL FOUNDATIONS BRANCH - ENGINEERING SERVICE CENTER~~

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DIST.	COUNTY	ROUTE	POST MILES-TOTAL PROJECT	Sheet No.	Total Sheets
10	SJ	99			

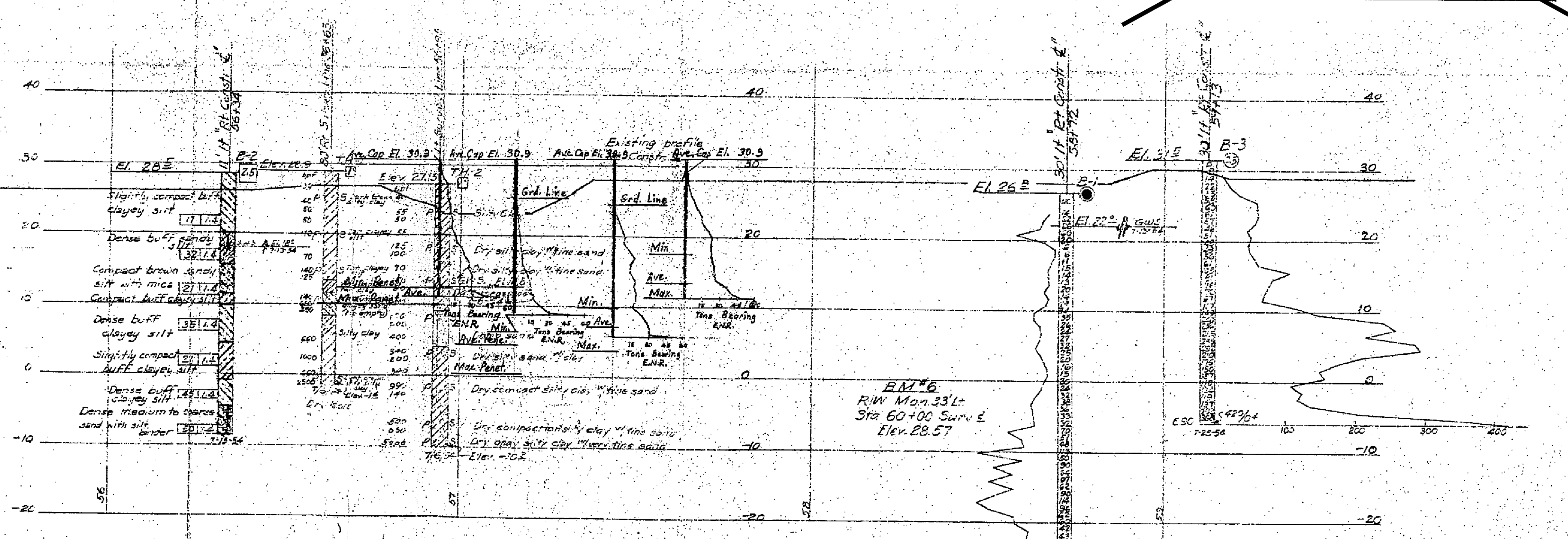
~~LITTLE JOHN CREEK BRIDGE (WIDEN)~~

~~LOG OF TEST BORINGS~~

		BRIDGE No.
The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.	CU: 10 EA: 401311	29-0017 L/R

Design Pile Loading: 45T
Type Pile: Union Metal Monotube
Diameter: Tip 8" Butt 15½"
Total Number Piles: 14
Lineal Ft. Piles "As Built": 314.7
Lineal Ft. Piles Called for on Plans: 504
Hammer: Vulcan No. 2
Remarks: Data is for rt. bridge only.

B.M.#5
R/W Mon. 33' Lt.
Sta 50+00 Surv. ℄
Elev. 28.07



CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

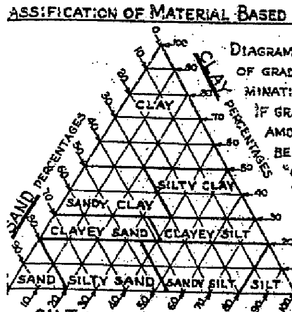


DIAGRAM SHOWING THE BASIS FOR ESTIMATES OF GRADE SIZE DISTRIBUTION USED IN DETERMINATION OF CLASS NAMES.
IF GRAVEL IS PRESENT IN APPRECIABLE AMOUNTS THE TERM "GRAVELLY" MAY BE ADDED TO THE CLASS NAME, VIZ. "GRAVELLY SAND." THE TERMS "COARSE", "MEDIUM" AND "FINE" WHEN USED TO DESCRIBE SAND, SILT AND GRAVEL REFER TO STANDARD GRADE SIZE LIMITS.

LEGEND OF EARTH MATERIALS

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

- PLAN OF ANY BORING
- PENETROMETER
- 2¼" CONE PENETROMETER
- SAMPLER BORING (DRY)
- ROTARY BORING (WET)
- AUGER BORING (DRY)
- JET BORING
- CORE BORING
- TEST PIT

LEGEND OF BORING OPERATIONS

1" SOIL TUBE: Top Hole El.; Location; B-No.; Groundwater surface; G.W.S. Elev.; Date measured; Blows per foot (Using 28 lb hand hammer); Description of material; Pulled pipe; Sample taken; Refusal; Date of boring

ROTARY BORING: Top Hole El.; Location; B-No.; Casing driven; Description of material; Size of sampler (inches); Blows per foot (Using a 140 lb hammer with a 30" drop, or as noted); Unit weight (#/cu ft); % Moisture; Consolidation Test; G.W.S. Elev.; Date measured; Unconfined compressive strength (T/sq ft); Conformable material change; Vane shear; Shear strength (#/sq ft); Estimated material change; Unconformable material change; Date of boring

PENETRATION BORING: Top Hole El.; Location; B-No.; Pushed; G.W.S. Elev.; Date measured; No count; Seconds per foot (Using a No. 2 McKiernan-Terry Air hammer @ 115 psi or as noted); Graphic representation of driving rate; Average skin friction above this point (#/sq ft); Date of boring; Seconds per foot

NOTES

The contractor's attention is directed to Section 2, Article (c) of the Standard Specifications and to the Special Provisions accompanying this set of plans.

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

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BRIDGE ACROSS LITTLE JOHN CREEK

LOG OF TEST BORINGS

SCALE Hor. 1"=20' Vert. 1"=10'	BRIDGE 29-1 - R/L	FILE	DRAWING PR-3918-3-R1

Log of Test Boring (LOTB) Sheet Checklist

This checklist shall be used by the *checker* in his/her evaluation of a LOTB sheet's conformance with the Caltrans *Soil & Rock Logging, Classification, and Presentation Manual,* and other applicable standards. To facilitate a quality check, the checker shall be provided with the draft final LOTB sheets, pertinent laboratory test results, copies of approved *Request for Exceptions*, and the field logs. This checklist is not comprehensive and does not attempt to account for all logging and presentation standards. As such, the checker must be familiar with the entire manual in order to successfully perform a quality check. **One checklist shall be completed per LOTB plan sheet. One signature sheet may be used for each structure (Bridge No.).**

Project Information

Dist – EA: OE6101 County: SJ Route: 99 PM: 12.53

Bridge No.: 29-0017

Sheet Title: Little John Creek Bridge (Widen) Sheets 1 - 4

Revision Date: N/A

Are there approved exceptions to the manual? ☐ Yes ☒ No (attach, if yes)

General

	Yes	No	N/A	
1.1	☒	☐	☐	Does the Plan View meet the requirements of Sec 5.2.3.3?
1.2	☒	☐	☐	Does the Border meet the requirements of Sec 5.2.3.1 and Sec 5.2.3.2?
1.3	☒	☐	☐	Are the Notes clear and do they meet the requirements of Sec 5.2.2?
1.4	☒	☐	☐	If As-Built LOTB, does it meet the requirements of Sec 5.2.4?
1.5	☒	☐	☐	Is the soil legend sheet attached and properly labeled?
1.6	☐	☐	☒	If rock is presented, is the rock legend attached and properly labeled?
1.7	☐	☐	☒	If approved "Exception to Policy" form is attached, does the LOTB meet the requirements of the approved exceptions?

Elevation View

2.1	☒	☐	☐	Are the Hole Identifications correct? (Sec 2.3) (Sec. 5.2.3.4)
2.2	☒	☐	☐	Are the location descriptions correct?
2.3	☒	☐	☐	Are the holes located properly on the profile?
2.4	☒	☐	☐	Is the elevation scale correct? (Sec 5.2.3.4)
2.5	☒	☐	☐	Is the top of hole elevation presented and correct? (Sec 5.2.3.4)

Log of Test Boring (LOTB) Sheet Checklist

Bridge No.: 29-0017 Sheet Title: Little John Creek Br. (Widen)

	Yes	No	N/A	
2.6	☒	☐	☐	Is the correct hole diameter presented in the correct Borehole Symbol? (Sec 5.2.5.6)
2.7	☒	☐	☐	Does the stationing match the profile view?
2.8	☒	☐	☐	Are the Boring Date and Termination Elevation presented at the bottom of each boring log? (Sec 5.2.3.4)
2.9	☒	☐	☐	If SPT tests were performed, is the correct hammer efficiency reported at the bottom of each borehole?
2.10	☒	☐	☐	Are lab tests reported at the correct elevations? (Sec 5.2.5.2)
2.11	☒	☐	☐	Are SPT blow counts reported at the correct elevations? (Sec 5.2.5.2)
2.12	☒	☐	☐	Is the groundwater presented at the correct elevation? (Sec 5.2.5.2)
2.13	☒	☐	☐	Are the soil/rock layers and graphics presented correctly? (Sec 4, Sec 5.2.5.7)
2.14	☒	☐	☐	Are the required descriptors presented and in the correct order? (Sec 2.4.1, Sec 2.5.1)
2.15	☒	☐	☐	Are the descriptors presented consistent with those allowed in the manual?
2.16	☒	☐	☐	Are the soil identifications consistent with the field observations? (Sec 2)
2.17	☒	☐	☐	Are the soil classifications consistent with reported lab test results? (Sec 3)
2.18	☒	☐	☐	Are the consistency descriptors consistent with field observations and/or lab test results? (Sec 2.4.3, Sec 3.2.3)
2.19	☒	☐	☐	Are the apparent density descriptors consistent with the SPT results and hammer efficiency? (Sec 2.4.4)
2.20	☐	☐	☒	Are % recovery (REC) and rock quality designation (RQD) presented at the required elevations?
2.21	☐	☐	☒	Is rock strength presented where lab tests are reported? (Sec 3.3.1)
2.22	☒	☐	☐	Considering the field observations, are lab test results properly applied to the descriptors within a layer per Sec 4.3?
2.23	☒	☐	☐	Are the presentations consistent with the rules presented in Sec 4?
2.24	☒	☐	☐	Are the presentations consistent with the rules presented in Sec 5?

List all variances identified during initial review of the LOTB sheet and steps needed to resolve the discrepancy (include item number). Also note any recommendations for revisions to the manual or procedures that might reduce or eliminate similar errors in the future.

N/A

Log of Test Boring QC/QA Signature Sheet

Dist – EA: OE6101 Bridge No.: 29-0017

Sheet Titles:

Little John Creek Bridge (Widen) Sheets 1 - 4

I, the undersigned on the date following my signature, hereby certify that I have performed a quality check of the referenced LOTB sheets and that the referenced LOTB sheets *substantially* comply with the Caltrans Soil and Rock Logging, Classification and Presentation Manual (June 2007) and related policy and standards.

David Morrell	Senior Project Manager
Checker (Print)	Title
	7/16/10
Checker (Signature)	Date

I, the undersigned on the date following my signature, hereby certify that the referenced LOTB sheets *substantially* comply with Geotechnical Service's Quality Control/Quality Assurance procedures, as described in the memorandum, "Quality Control/Quality Assurance Documentation on LOTB Sheets", dated July 1, 2007.

Eric Nichols	Senior Project Manager
Functional Supervisor (Print)	Title
	7/16/10
Functional Supervisor (Signature)	Date

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

APPENDIX B

Laboratory Test Results Summary
Laboratory Results

Laboratory Test Summary **1201.7b**
Samples from Exploratory Borings
Little John Creek Bridge

Boring	Sample	Depth (feet)	Unified Soil Classification	Dry Density (pcf)	Natural Moisture (%)	Plastic Limit	Liquid Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	Consolidation Test	Pocket Pen (tsf)	Unconfined Compressive Strength (tsf)	Triaxial Test Results				Corrosivity Test
															Total		Effective		
															Phi (degrees)	Cohesion (psf)	Phi (degrees)	Cohesion (psf)	
A-09-F1	2c	6.0-6.5	CL	109.0	16.0								2.3						
A-09-F1	3	6.5-8.0	CL						0	5	95								
A-09-F1	4b	10.5-11.0	CL																Test
A-09-F1	4c	11.0-11.5	CL	86.0	29.6								4.5						Test
A-09-F1	5c	16.0-16.5	CL	102.4	22.4	20	39	19	2	20	78		4.5+						
A-09-F1	6c	21.0-21.5	CL	102.1	23.4									2.50					
A-09-F1	7b	25.5-26.0	SM	100.5	15.0				0	76	24								
A-09-F1	9b	30.5-31.0	CL			18	30	12	0	6	94								
A-09-F1	9c	31.0-31.5	CL	101.4	25.0							Consolidation							
A-09-F1	10c	36.0-36.5	CL	103.7	22.6										0	3837			
A-09-F1	11c	41.0-41.5	SP-SC	107.8	10.5														
A-09-F1	12c	46.0-46.5	ML	82.3	30.0	26	29	3	0	15	85		4.5+						
A-09-F1	14c	51.0-51.5	CL	94.1	29.6														
A-09-F1	15c	56.0-56.5	SW	104.6	20.9														
A-09-F1	16c	61.0-61.5	SC	110.5	19.0														
A-09-F2	3c	6.0-6.5	CL	109.6	15.9								4.5+						
A-09-F2	5c	11.0-11.5	SC	104.0	17.6														
A-09-F2	6b	15.5-16.0	CL						11	26	63								
A-09-F2	6c	16.0-16.5	CL	92.0	24.2								4.5+						
A-09-F2	7b	20.5-21.0	CL			20	36	16	4	22	74								
A-09-F2	7c	21.0-21.5	CL	89.4	29.5									1.00					
A-09-F2	9c	26.0-26.5	SM	102.6	21.9				0	56	44								
A-09-F2	10b	30.5-31.0	CL			17	30	13											
A-09-F2	10c	31.0-31.5	CL	95.1	27.2				10	10	80		4.5						
A-09-F2	11c	36.0-36.5	CL	111.2	17.2										0	7276			
A-09-F2	12c	41.0-41.5	CL	93.3	26.1								4.5+						
A-09-F2	13	41.5-43.0	CL																Test
A-09-F2	14c	46.0-46.5	CL	90.4	30.1														
A-09-F2	15c	51.0-51.5	ML	89.7	31.7	Non Plastic			0	17	83								
A-09-F2	16c	56.0-56.5	SM	106.4	20.8														
A-09-F2	17c	61.0-61.5	CL	103.5	23.4								4.5+						

blackburn consulting

Project Name: SR99 WIDENING

BCI File No: 1201.7B

Date: 3/30/2009

Technician: ECH/KC

MOISTURE-DENSITY TESTS

Sample No.	F1-2C	F1-4C	F1-5C	F1-7B	F1-11C	F1-12C	F1-14C
Depth (ft.)	6-6.5	11-11.5	16-16.5	26-26.5	41-41.5	46-46.5	51-51.5
Sample Length (in.)	5.98	5.98	5.99	4.82	5.80	2.80	5.96
Diameter (in.)	2.400	2.400	2.380	2.390	2.410	2.410	2.400
Sample + Tube (g)	897.7	791.1	877.0	939.1	1076.2	358.8	863.2
Tube (g)	0.0	0.0	0.0	282.9	248.9	0.0	0.0
Wet Weight (g)	897.7	791.1	877.0	656.2	827.3	358.8	863.2
Sample Volume (ft^3)	0.01566	0.01566	0.01542	0.01251	0.01531	0.00739	0.01560
Tare No.	A	X	T1	D	T9	K	J
Tare (g)	163.0	258.6	253.8	167.1	257.3	159.1	157.7
Wet Soil + Tare (g)	642.3	732.9	1125.9	819.2	689.4	718.4	686.8
Dry Soil + Tare (g)	576.3	624.6	966.2	733.9	648.4	589.2	565.9
Dry Soil Weight (g)	413.3	366.0	712.4	566.8	391.1	430.1	408.2
Water (g)	66.0	108.3	159.7	85.3	41.0	129.2	120.9
Moisture (%)	**16.0**	**29.6**	**22.4**	**15.0**	**10.5**	**30.0**	**29.6**
Wet Density (pcf)	**126.4**	**111.4**	**125.4**	**115.6**	**119.1**	**107.0**	**122.0**
Dry Density (pcf)	**109.0**	**86.0**	**102.4**	**100.5**	**107.8**	**82.3**	**94.1**
Pocket Pen (tsf)	**2.3**	**4.5**	**4.5+**	**0.0**	**0.0**	**4.5+**	**0.0**

Sample No.	F1-15C	F1-16C	F2-3C	F2-5C	F2-6C	F2-9C	F2-10C
Depth (ft.)	56-56.5	61-61.5	6-6.5	11-11.5	16-16.5	26-26.5	31-31.5
Sample Length (in.)	5.88	5.99	5.65	3.10	4.50	5.82	5.70
Diameter (in.)	2.400	2.400	2.430	2.400	2.410	2.430	2.420
Sample + Tube (g)	882.9	934.7	874.4	450.2	615.9	886.2	832.5
Tube (g)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet Weight (g)	882.9	934.7	874.4	450.2	615.9	886.2	832.5
Sample Volume (ft^3)	0.01539	0.01568	0.01516	0.00812	0.01188	0.01562	0.01517
Tare No.	T6	H	T7	T8	E	F8	F7
Tare (g)	306.8	223.3	311.2	309.0	224.8	197.8	191.6
Wet Soil + Tare (g)	800.0	704.4	809.9	758.8	555.3	1083.9	1024.1
Dry Soil + Tare (g)	714.7	627.7	741.3	691.6	490.8	924.7	846.2
Dry Soil Weight (g)	407.9	404.4	430.1	382.6	266.0	726.9	654.6
Water (g)	85.3	76.7	68.6	67.2	64.5	159.2	177.9
Moisture (%)	**20.9**	**19.0**	**15.9**	**17.6**	**24.2**	**21.9**	**27.2**
Wet Density (pcf)	**126.4**	**131.4**	**127.1**	**122.3**	**114.3**	**125.1**	**121.0**
Dry Density (pcf)	**104.6**	**110.5**	**109.6**	**104.0**	**92.0**	**102.6**	**95.1**
Pocket Pen (tsf)	**3.0**	**4.3**	**4.5+**	**NA**	**4.5+**	**2.8**	**4.5**

Diameter = 1.44" for 1.5-inch Tubes

Diameter = 1.938" for 2-inch Tubes

Diameter = 2.438" for 2.5-inch Tubes

Diameter= 2.850" for 3.0-inch Shelby Tubes

blackburn consulting

Project Name: SR99 WIDENING

BCI File No: 1201.7B

Date: 3/30/2009

Technician: ECH/KC

MOISTURE-DENSITY TESTS

Sample No.	F2-12C	F2-14C	F2-15C	F2-16C	F2-17C		
Depth (ft.)	41-41.5	46-46.5	51-51.5	56-56.5	61-61.5		
Sample Length (in.)	5.95	5.88	5.75	5.90	5.99		
Diameter (in.)	2.420	2.410	2.430	2.420	2.420		
Sample + Tube (g)	845.7	828.3	827.2	915.9	923.6		
Tube (g)	0.0	0.0	0.0	0.0	0.0		
Wet Weight (g)	845.7	828.3	827.2	915.9	923.6		
Sample Volume (ft^3)	0.01584	0.01552	0.01543	0.01570	0.01594		
Tare No.	T4	A2	T2	D2	F4		
Tare (g)	254.3	157.1	258.8	154.3	156.5		
Wet Soil + Tare (g)	748.3	595.7	1087.1	737.2	676.1		
Dry Soil + Tare (g)	646.0	494.1	887.8	636.8	577.6		
Dry Soil Weight (g)	391.7	337.0	629.0	482.5	421.1		
Water (g)	102.3	101.6	199.3	100.4	98.5		
Moisture (%)	**26.1**	**30.1**	**31.7**	**20.8**	**23.4**		
Wet Density (pcf)	**117.7**	**117.6**	**118.2**	**128.6**	**127.7**		
Dry Density (pcf)	**93.3**	**90.4**	**89.7**	**106.4**	**103.5**		
Pocket Pen (tsf)	**4.5+**	**4.5+**	**4.5+**	**4.5+**	**4.5+**		

Sample No.							
Depth (ft.)							
Sample Length (in.)							
Diameter (in.)							
Sample + Tube (g)							
Tube (g)							
Wet Weight (g)							
Sample Volume (ft^3)							
Tare No.							
Tare (g)							
Wet Soil + Tare (g)							
Dry Soil + Tare (g)							
Dry Soil Weight (g)							
Water (g)							
Moisture (%)							
Wet Density (pcf)							
Dry Density (pcf)							
Pocket Pen (tsf)							

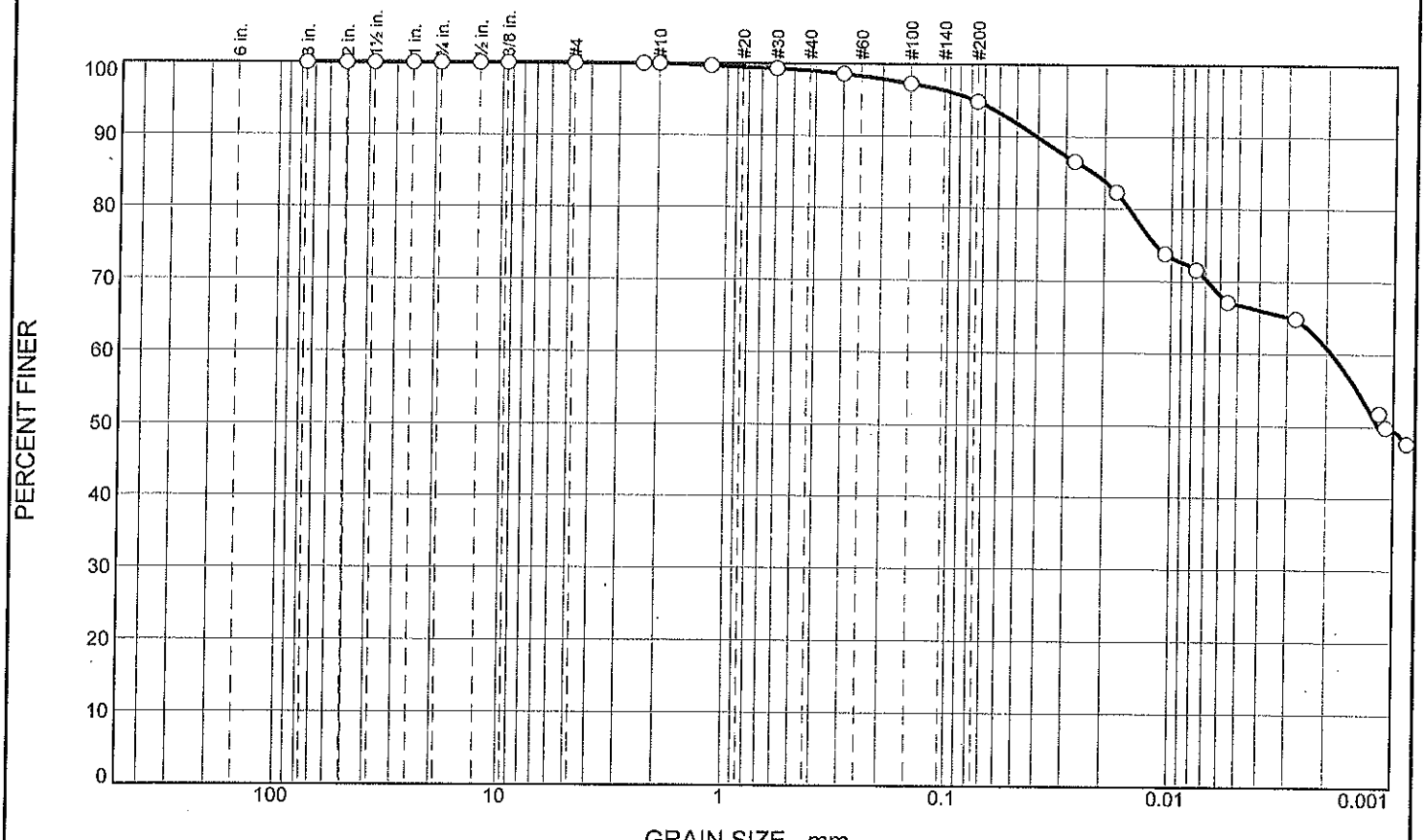
Diameter = 1.44" for 1.5-inch Tubes

Diameter = 1.938" for 2-inch Tubes

Diameter = 2.438" for 2.5-inch Tubes

Diameter= 2.850" for 3.0-inch Shelby Tubes

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	1	4	28	67

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	100		
1.5	100		
1	100		
.75	100		
.50	100		
.375	100		
#4	100		
#8	100		
#10	100		
#16	100		
#30	99		
#50	99		
#100	97		
#200	95		
0.0273 mm.	87		
0.0178 mm.	82		
0.0107 mm.	74		
0.0077 mm.	72		
0.0056 mm.	67		
0.0027 mm.	65		
0.0012 mm.	52		
0.0012 mm.	50		
0.0011 mm.	50		
0.0009 mm.	48		

* (no specification provided)

Soil Description

Black Fat Clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0407 D_{85}= 0.0225 D_{60}= 0.0019
D_{50}= 0.0012 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: F1 **Depth:** 6.5-8.0'
Sample Number: 3

Date: 1/4/2010

Blackburn Consulting

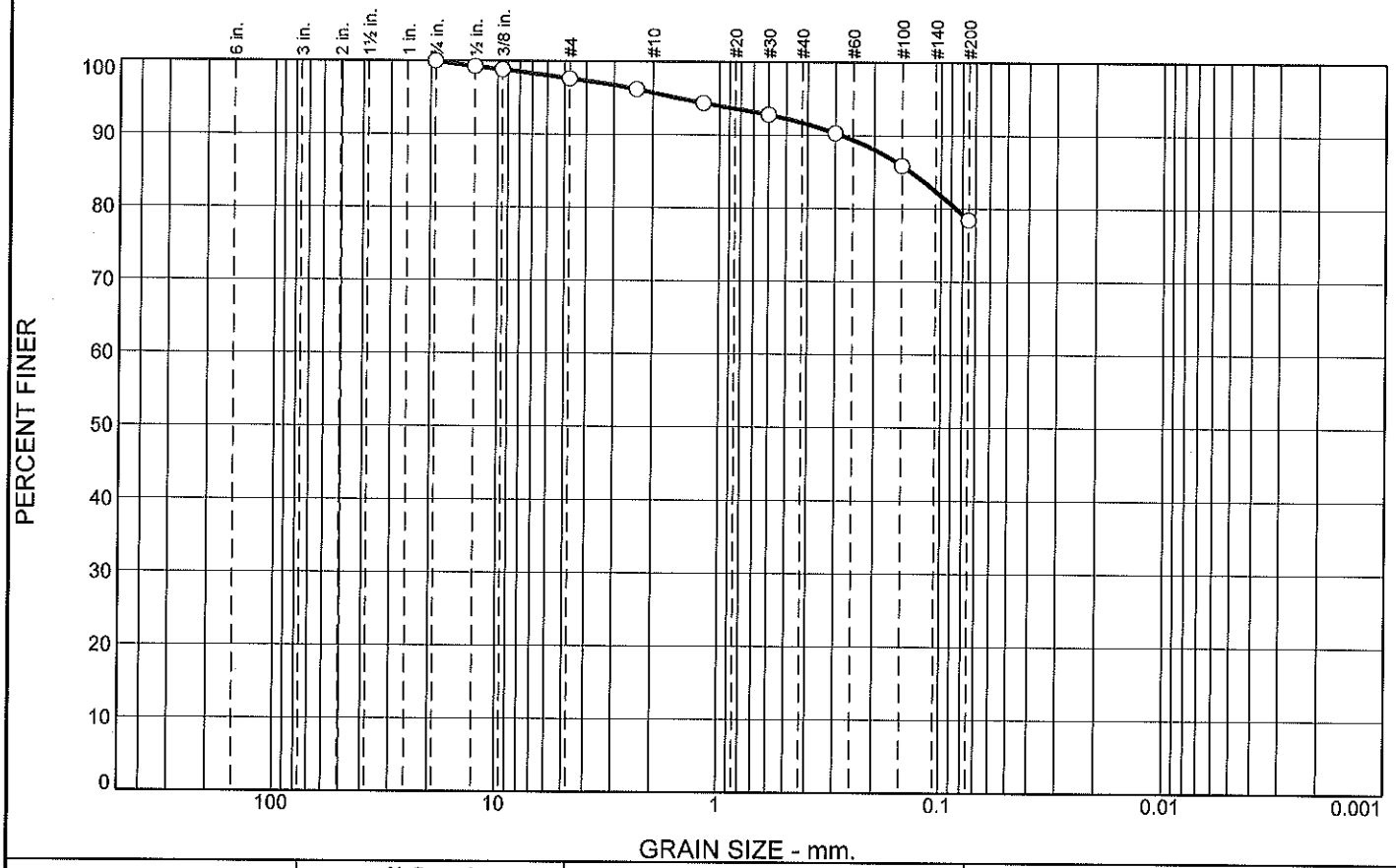
W. Sacramento, CA

Client: HDR Engineering, Inc.
Project: SR 99 Widening - Little John Creek

Project No: 1201.7b **Figure**

Tested By: BWM/MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	2	4	14	78	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
1/2"	99		
3/8"	99		
#4	98		
#8	96		
#16	94		
#30	93		
#50	90		
#100	86		
#200	78		

* (no specification provided)

Material Description

Dark Yellowish Brown Lean CLAY with Sand

Atterberg Limits

PL= 20 LL= 39 PI= 19

Coefficients

D_{90}= 0.2808 D_{85}= 0.1358 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Sample Number: F1-5 C **Depth:** 16.0'-16.5'

Date: 3-31-09

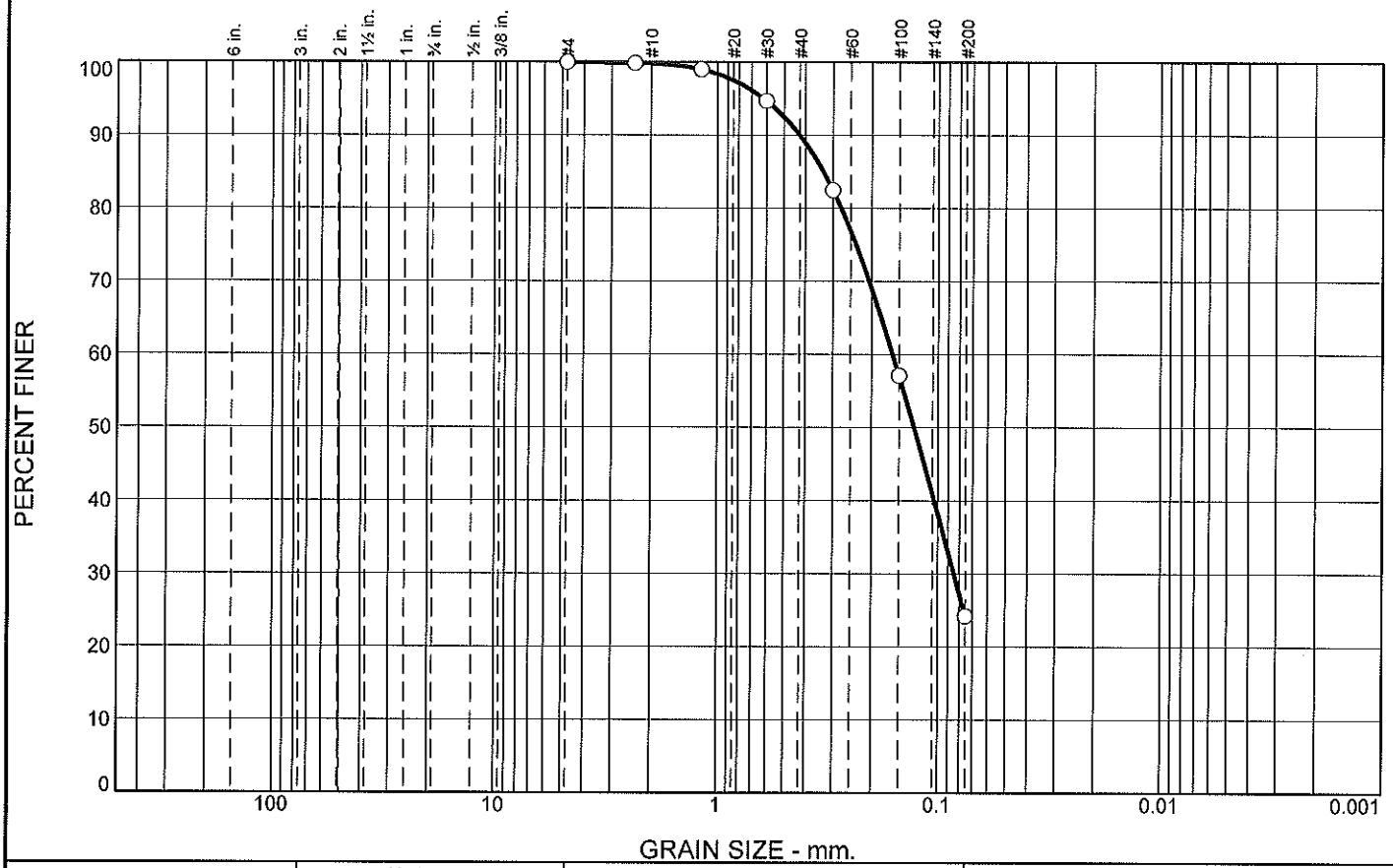
Blackburn Consulting

Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek
Project No: 1201.7B **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	10	66	24	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	99		
#30	95		
#50	82		
#100	57		
#200	24		

* (no specification provided)

Material Description

Olive Brown Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4232 D_{85}= 0.3310 D_{60}= 0.1602
D_{50}= 0.1281 D_{30}= 0.0844 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: FI-7 B **Depth:** 25.5'-26.0'

Date: 3-31-09

Blackburn Consulting

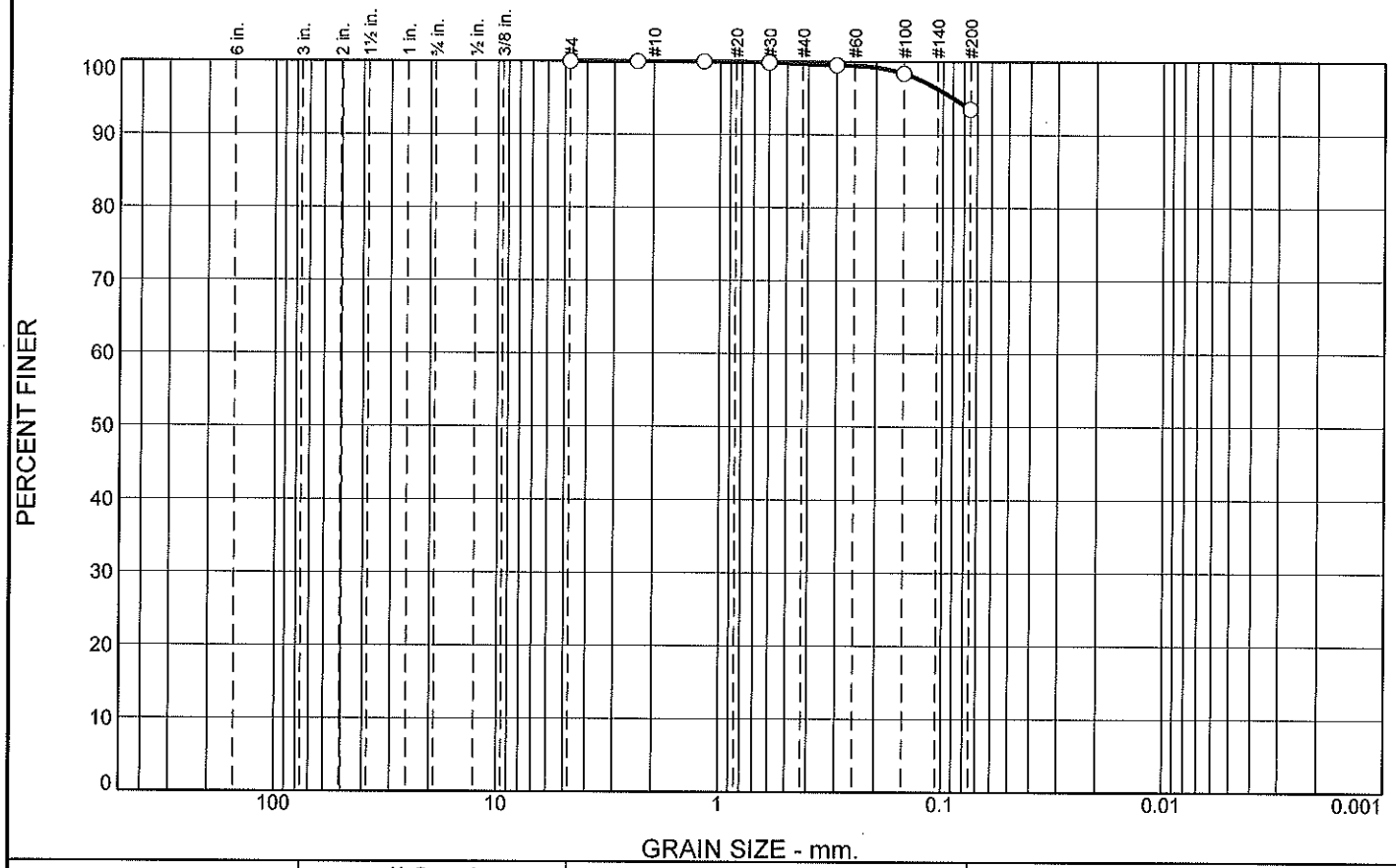
Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek

Project No: 1201.7B **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	0	6	94	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	100		
#30	100		
#50	100		
#100	98		
#200	94		

* (no specification provided)

Material Description

Dark Yellowish Brown Lean CLAY

Atterberg Limits

PL= 18 LL= 30 PI= 12

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

Sample Number: F1-9 B **Depth:** 30.5'-31.0'

Date: 3-31-09

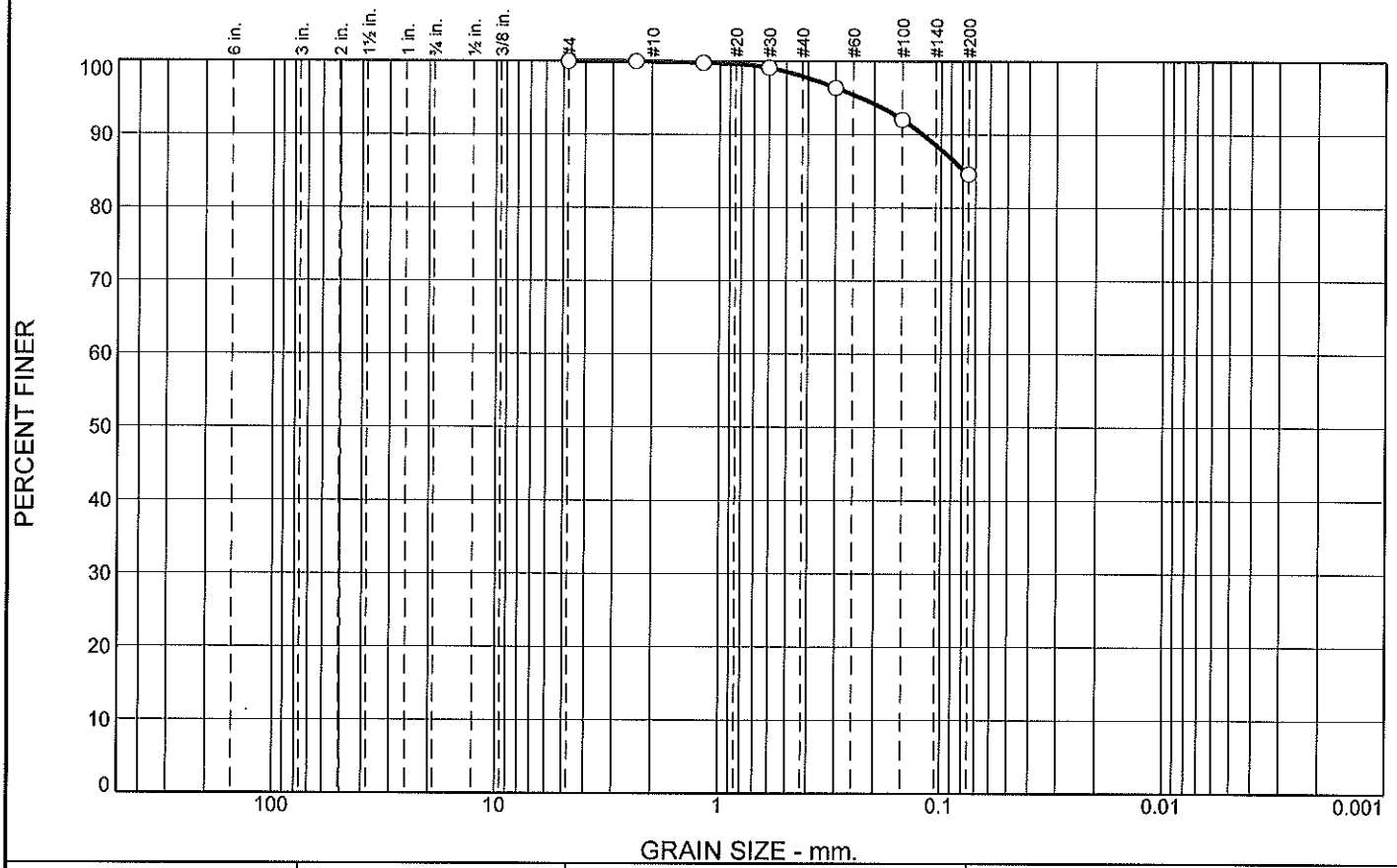
Blackburn Consulting

Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek
Project No: 1201.7B **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	2	13	85	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	100		
#30	99		
#50	96		
#100	92		
#200	85		

* (no specification provided)

Material Description

Olive Brown SILT with Sand

Atterberg Limits

PL= 26 LL= 29 PI=

Coefficients

D_{90}= 0.1206 D_{85}= 0.0775 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(2)

Remarks

Sample Number: F1-12 C **Depth:** 46.0'-46.5'

Date: 3-31-09

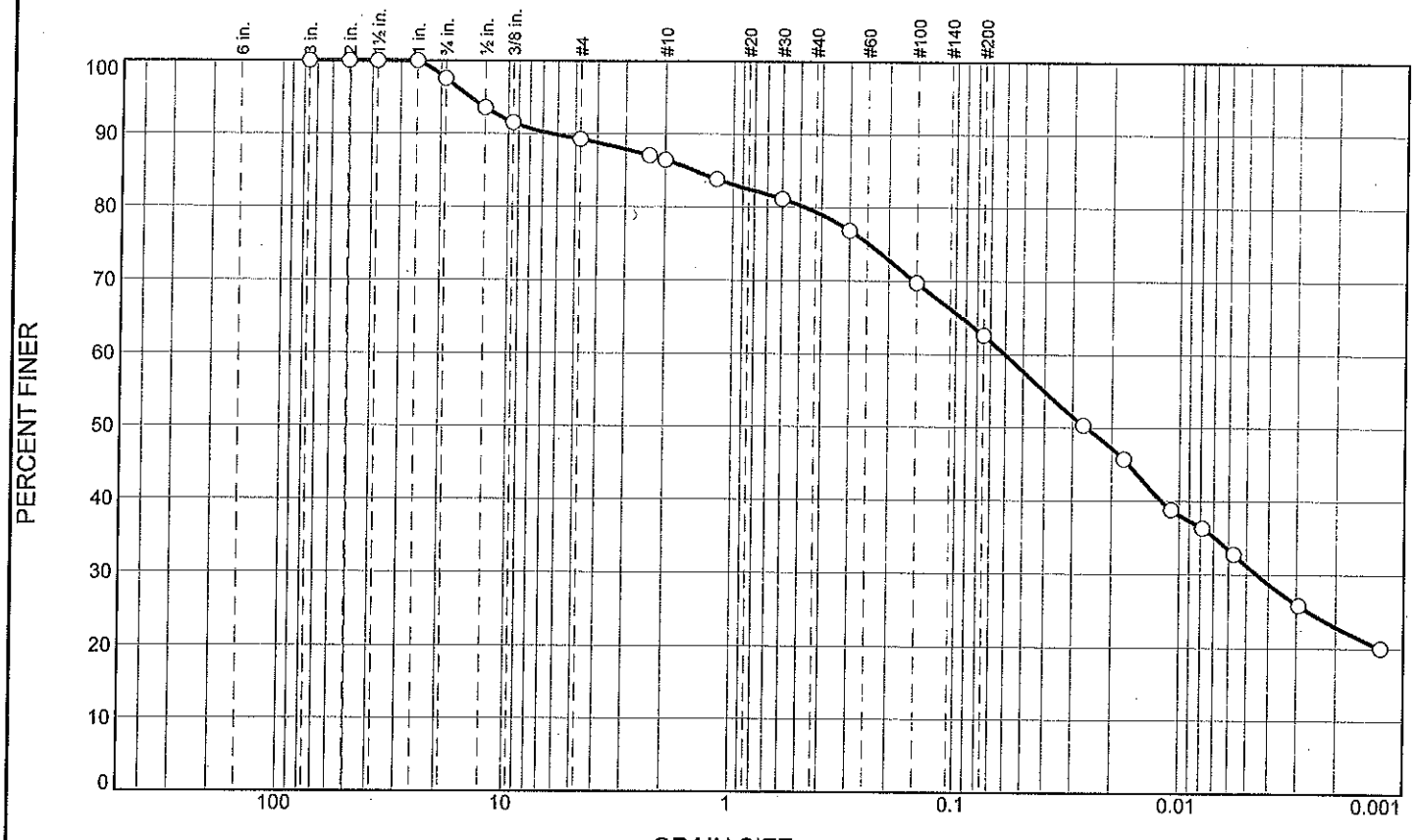
Blackburn Consulting

Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek
Project No: 1201.7B **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	2	9	3	7	16	32	31

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100		
2	100		
1.5	100		
1	100		
.75	98		
.50	94		
.375	92		
#4	89		
#8	87		
#10	86		
#16	84		
#30	81		
#50	77		
#100	70		
#200	63		
0.0269 mm.	50		
0.0177 mm.	46		
0.0108 mm.	39		
0.0079 mm.	36		
0.0057 mm.	33		
0.0029 mm.	26		
0.0013 mm.	20		

* (no specification provided)

Soil Description

Dark grayish brown Lean CLAY with SAND, trace gravel & 2" X 1-1/2"A.C. chunk

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 6.4280 D_{85}= 1.4858 D_{60}= 0.0600
D_{50}= 0.0261 D_{30}= 0.0045 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Source of Sample: F2 **Depth:** 15.5-16.0'
Sample Number: 6b

Date: 1/3/2010

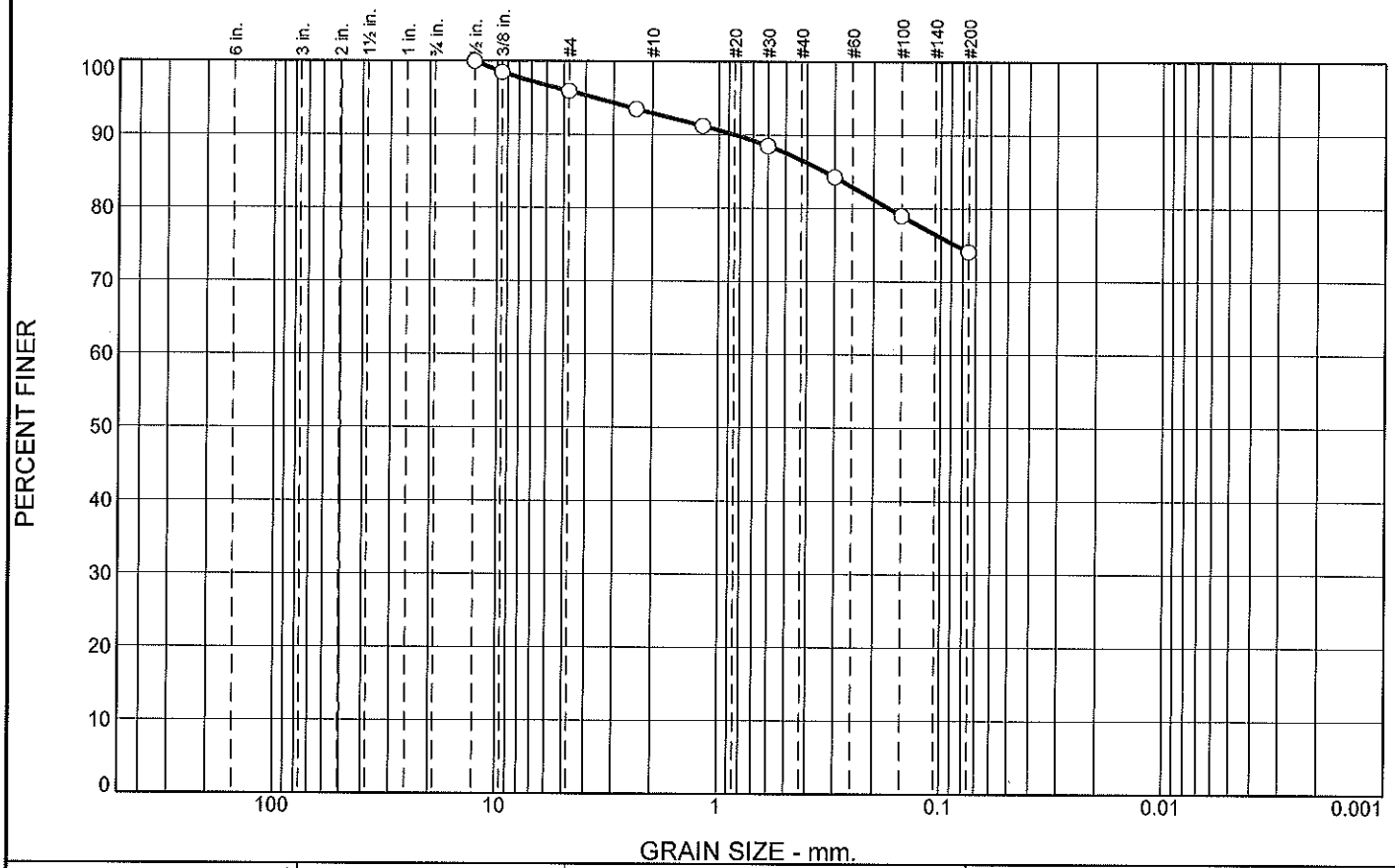
Blackburn Consulting

W. Sacramento, CA

Client: HDR Engineering, Inc.
Project: SR 99 Widening - Little John Creek
Project No: 1201.7b **Figure**

Tested By: MAR **Checked By:** MAR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	4	3	6	13	74	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100		
3/8"	99		
#4	96		
#8	94		
#16	91		
#30	89		
#50	84		
#100	79		
#200	74		

* (no specification provided)

Material Description

Brown Lean CLAY with Sand

Atterberg Limits

PL= 20 LL= 36 PI= 16

Coefficients

D_{90}= 0.8411 D_{85}= 0.3320 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

Sample Number: F2-7 B **Depth:** 20.5'-21.0'

Date: 3-31-09

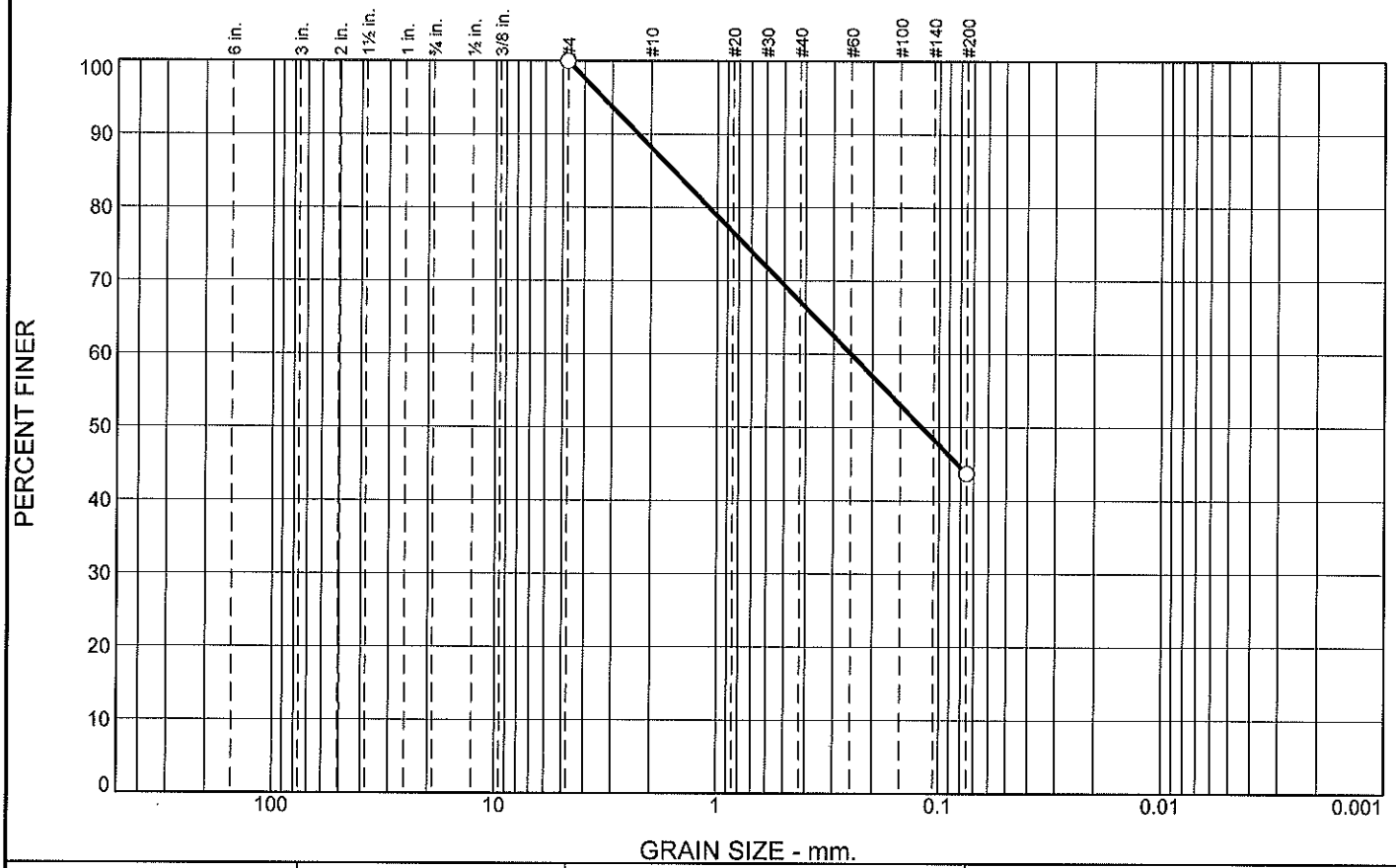
Blackburn Consulting

Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek
Project No: 1201.7B **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	12	21	23	44	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#200	44		

* (no specification provided)

Material Description

Olive Brown Silty SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 2.2721 D_{85}= 1.5714 D_{60}= 0.2487
D_{50}= 0.1189 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Sample Number: F2-9 C **Depth:** 26.0'-26.5'

Date: 3-31-09

Blackburn Consulting

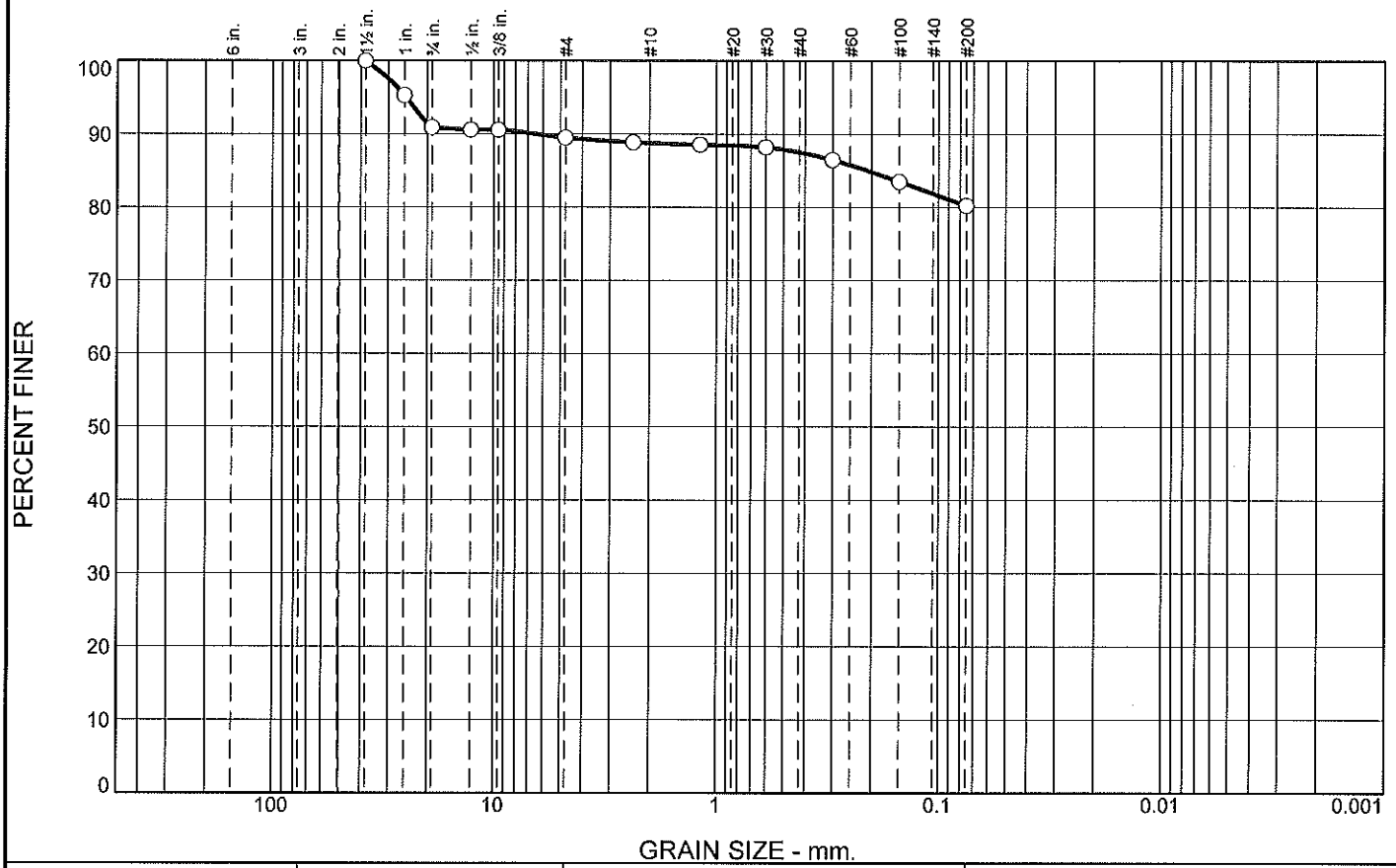
Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek

Project No: 1201.7B **Figure**

Tested By: ech

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	9	1	1	1	8	80	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100		
1	95		
.75	91		
.500	91		
.375	91		
#4	90		
#8	89		
#16	89		
#30	88		
#50	86		
#100	84		
#200	80		

* (no specification provided)

Material Description

Yellow Brown Lean CLAY with Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 6.3923 D_{85}= 0.2070 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: F2-10 C **Depth:** 31.0'-31.5'

Date: 3-31-09

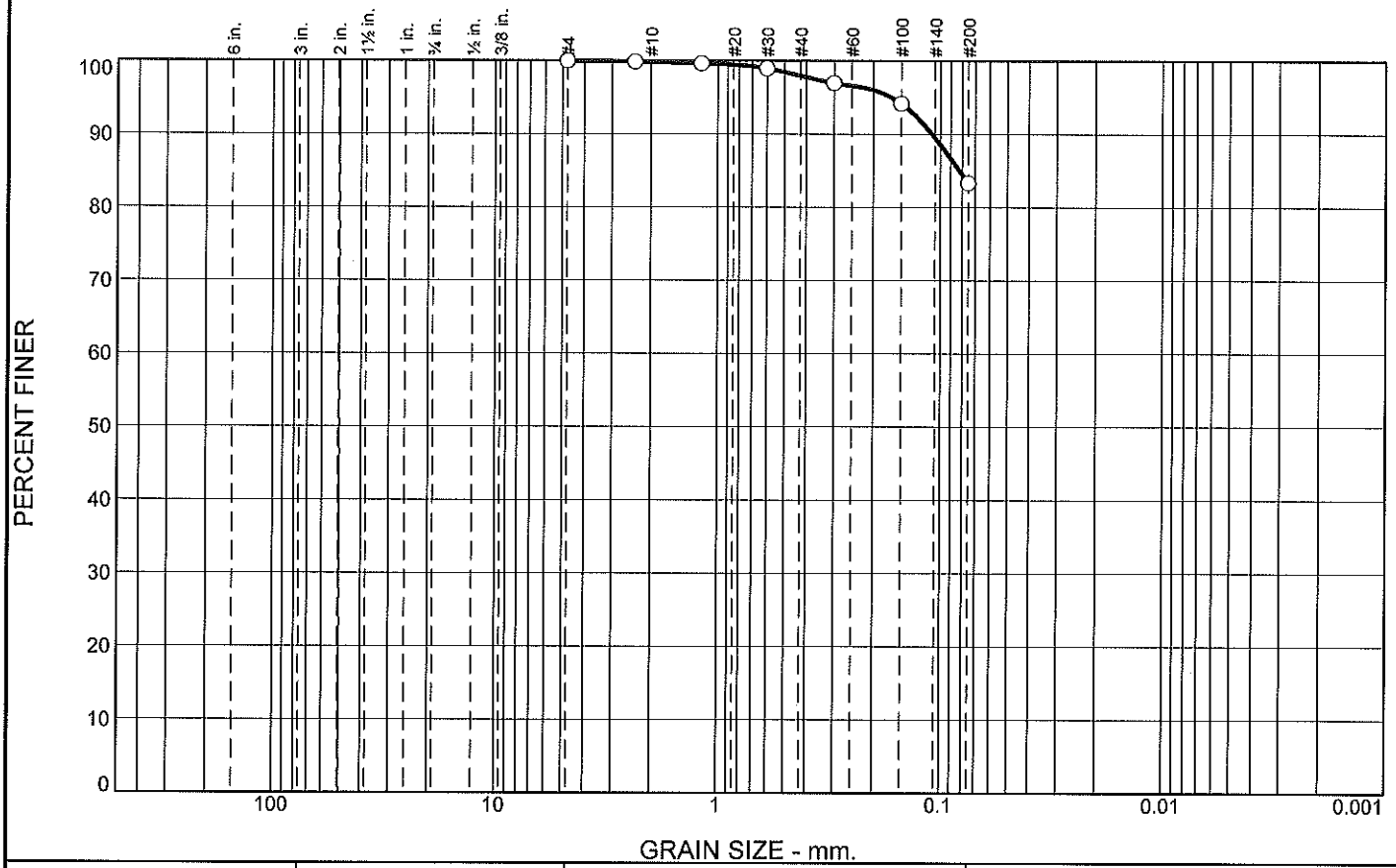
Blackburn Consulting

Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek
Project No: 1201.7B **Figure**

Tested By: ECH **Checked By:** KLC

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	2	15	83	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	100		
#16	100		
#30	99		
#50	97		
#100	94		
#200	83		

* (no specification provided)

Material Description

Dark Grayish Brown SILT with Sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.1088 D_{85}= 0.0819 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Sample Number: F2-15 C **Depth:** 51.0'-51.5'

Date: 3-31-09

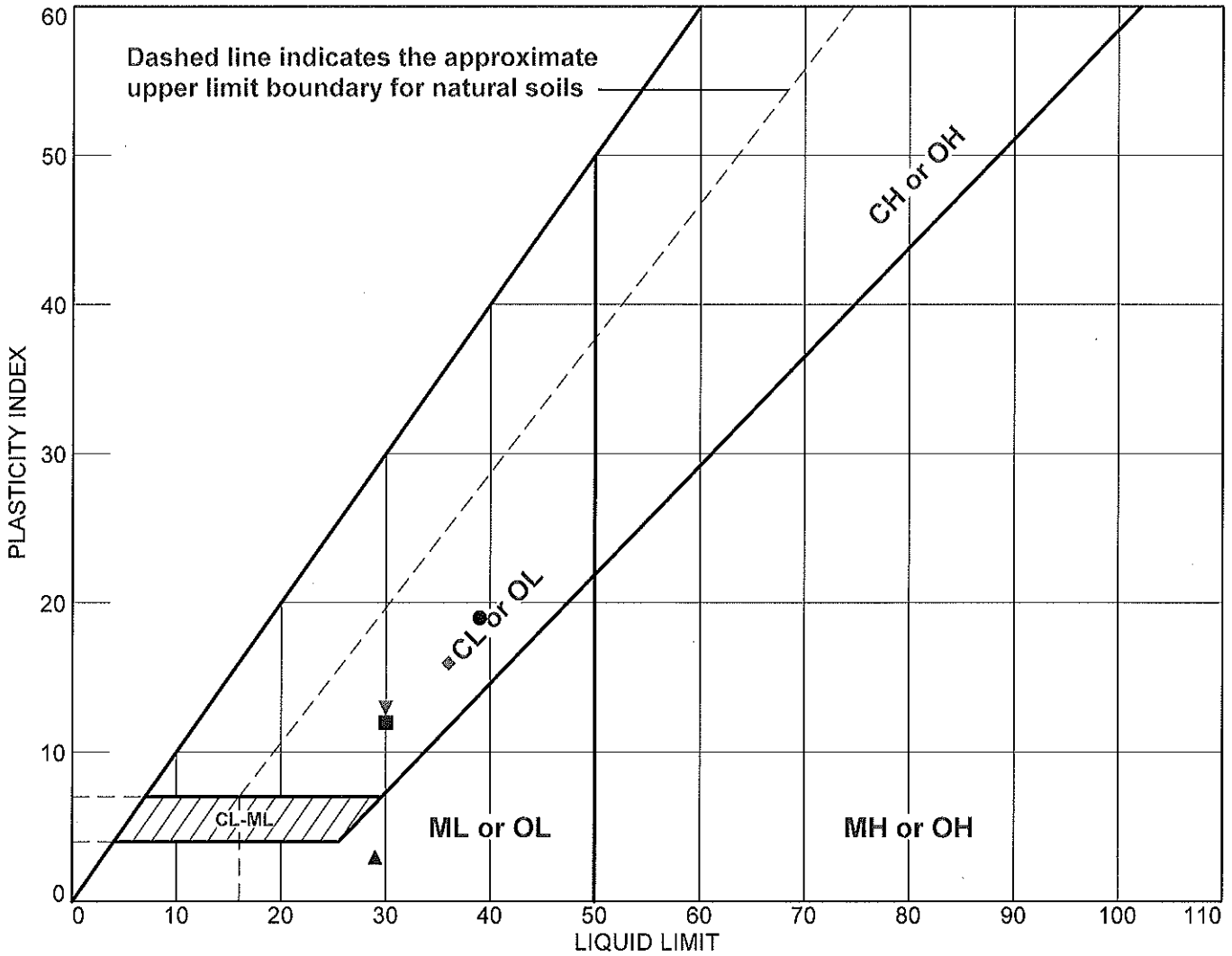
Blackburn Consulting

Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek
Project No: 1201.7B **Figure**

Tested By: ech

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		F1-5 C	16.0'-16.5'		20	39	19	CL
■		F1-9 B	30.5'-31.0'		18	30	12	CL
▲		F1-12 C	46.0'-46.5'		26	29	3	ML
◆		F2-7 B	20.5'-21.0'		20	36	16	CL
▼		F2-10 B	30.5'-31.0'		17	30	13	CL

Blackburn Consulting

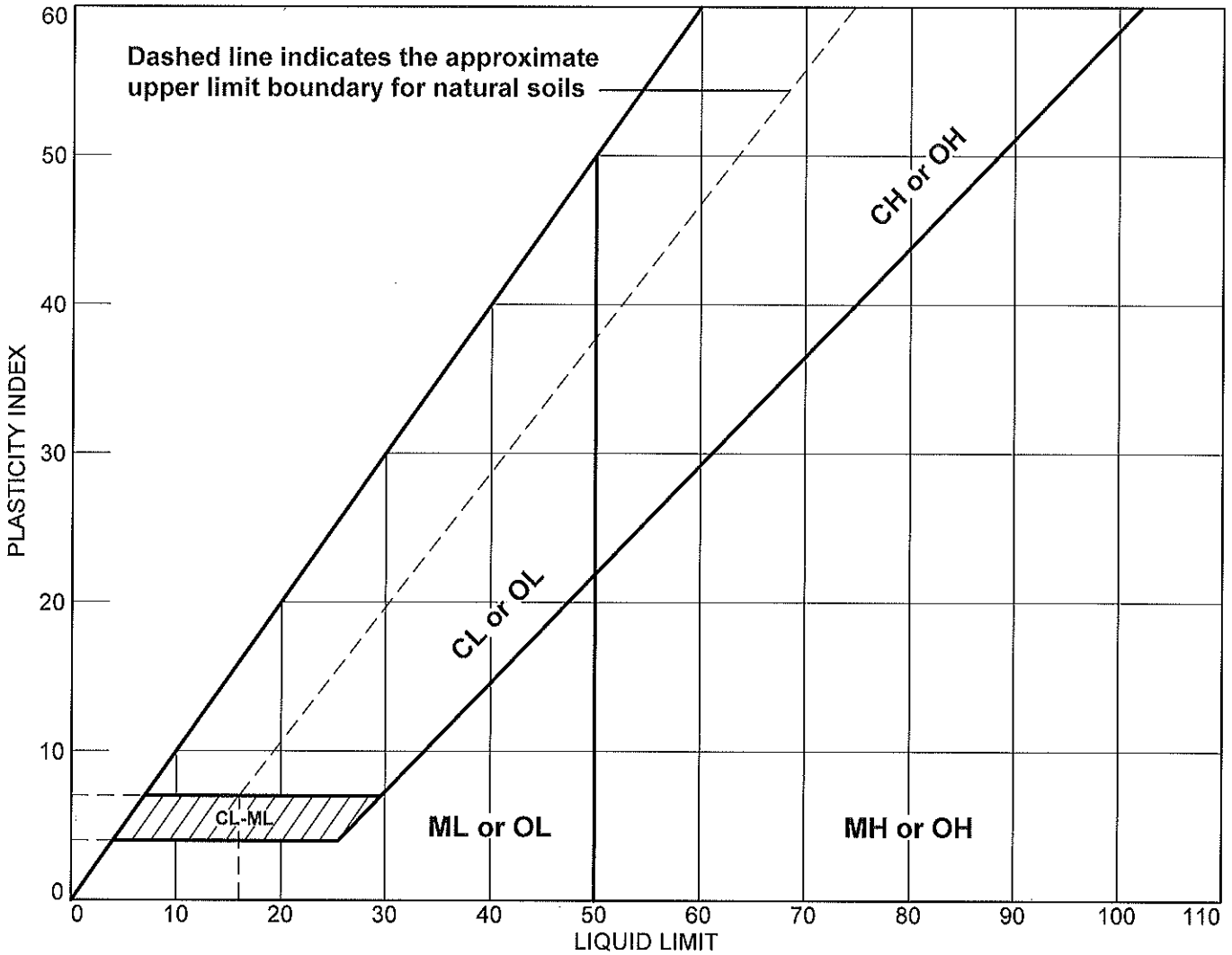
Auburn, CA

Client: HDR Incorporated
Project: SR 99 Median Widening - Little Johns Creek

Project No.: 1201.7B **Figure**

Tested By: KLC **Checked By:** KLC

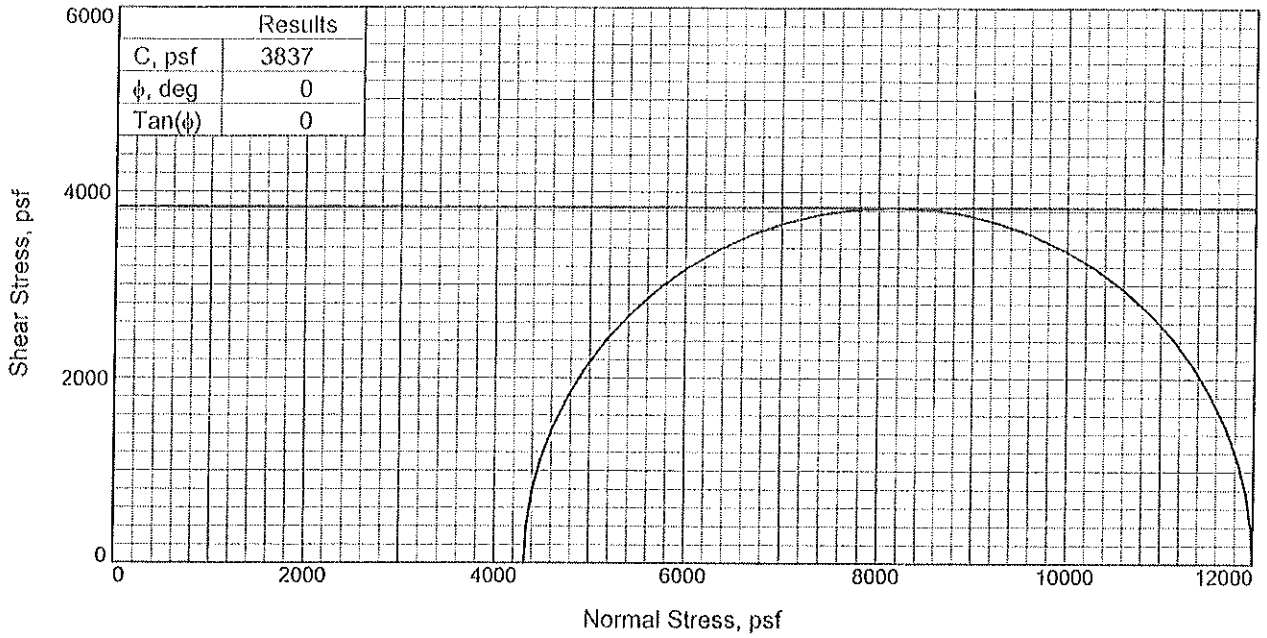
LIQUID AND PLASTIC LIMITS TEST REPORT

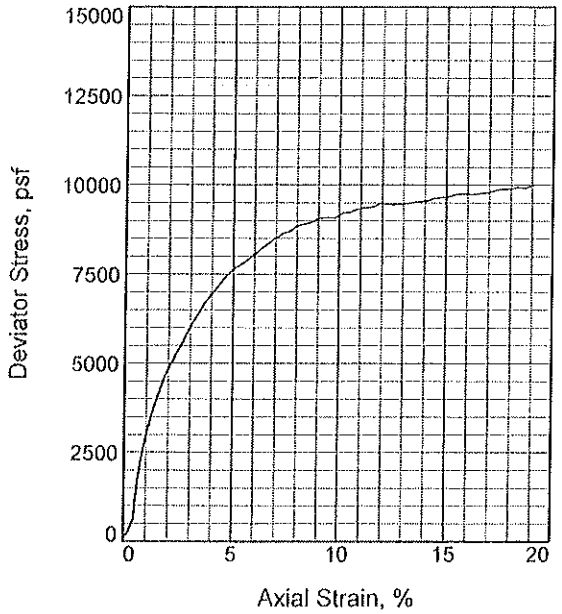


SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		F2-15 B	50.5'-51.0'		NP	NV	NP	
■		F2-15 C	51.0'-51.5'		NP	NV	NP	ML

Blackburn Consulting **Auburn, CA**	**Client:** HDR Incorporated **Project:** SR 99 Median Widening - Little Johns Creek **Project No.:** 1201.7B **Figure**

Tested By: KLC **Checked By:** KLC





Specimen No.		1
Initial	Water Content, %	22.6
	Dry Density, pcf	103.7
	Saturation, %	97.6
	Void Ratio	0.6248
	Diameter, in.	2.400
	Height, in.	5.840
At Test	Water Content, %	22.6
	Dry Density, pcf	103.7
	Saturation, %	97.6
	Void Ratio	0.6248
	Diameter, in.	2.400
	Height, in.	5.840
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		4320
Fail. Stress, psf		7674
Strain, %		5.1
Ult. Stress, psf		9671
Strain, %		
σ_1 Failure, psf		11994
σ_3 Failure, psf		4320

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: Lean CLAY (CL), yellow brown

Assumed Specific Gravity= 2.70

Remarks: Failure chosen at 5% strain, Ultimate at 15%.

Client: HDR Engineering, Inc.

Project: SR 99 Widening - Little John Creek

Source of Sample: F1 **Depth:** 35.0-36.5

Sample Number: 10c

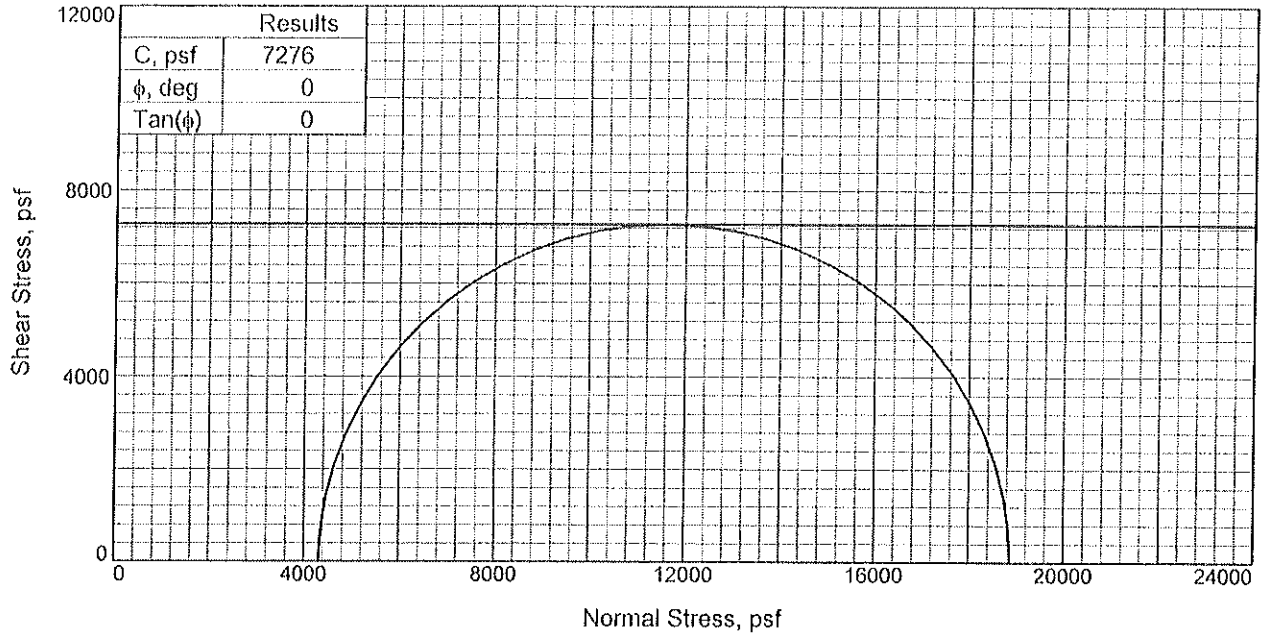
Proj. No.: 1201.7b **Date Sampled:**

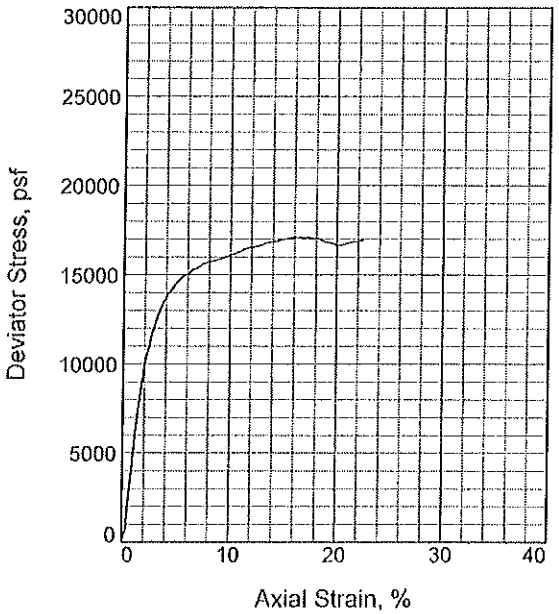
TRIAXIAL SHEAR TEST REPORT

Blackburn Consulting

Figure _____

Tested By: MDR **Checked By:** RDS





Specimen No.		1
Initial	Water Content, %	17.2
	Dry Density, pcf	111.2
	Saturation, %	89.8
	Void Ratio	0.5162
	Diameter, in.	2.420
	Height, in.	5.200
At Test	Water Content, %	17.8
	Dry Density, pcf	111.2
	Saturation, %	92.9
	Void Ratio	0.5162
	Diameter, in.	2.420
	Height, in.	5.200
Strain rate, %/min.		0.30
Back Pressure, psf		0
Cell Pressure, psf		4320
Fail. Stress, psf		14553
Strain, %		4.9
Ult. Stress, psf		16948
Strain, %		
σ_1 Failure, psf		18873
σ_3 Failure, psf		4320

Type of Test:
Unconsolidated Undrained

Sample Type: 2.4" Cal Mod

Description: SANDY lean CLAY (CL), yellow brown, slightly cemented

Assumed Specific Gravity= 2.7

Remarks: Failure chosen at 5% strain, Ultimate at 15%.

Client: HDR Engineering, Inc.

Project: SR 99 Widening - Little John Creek

Source of Sample: F2 **Depth:** 36.0-36.5

Sample Number: 11c

Proj. No.: 1201.7b **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT

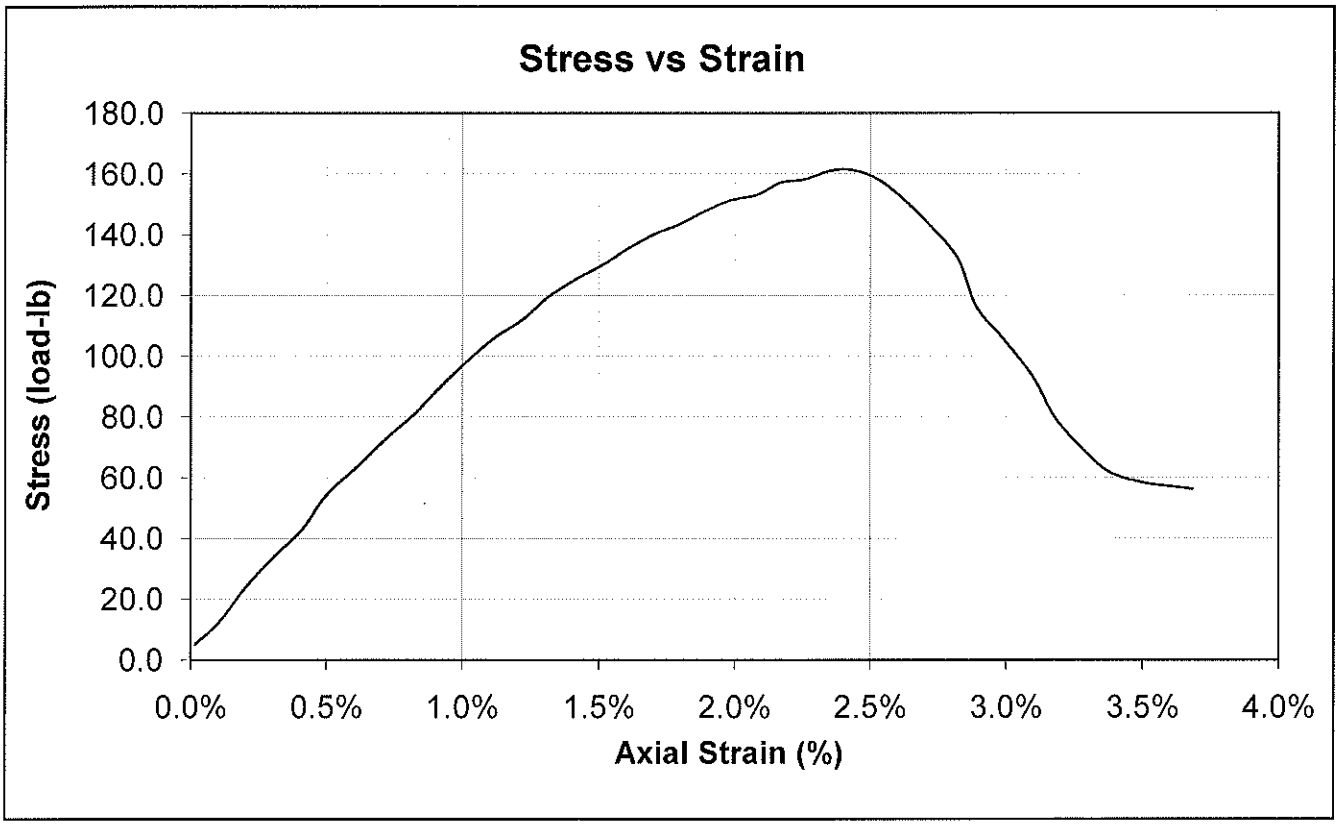
Blackburn Consulting

Figure _____

Tested By: MDR **Checked By:** RDS

Project
SR 99 Widening - Little Johns Creek
Project Number
1201.7b
Sample Number
F-1-6c
Material Description
Yellowish brown silty clay with sand (CL-ML)
Tested By
MDR

ASTM D 2166-00

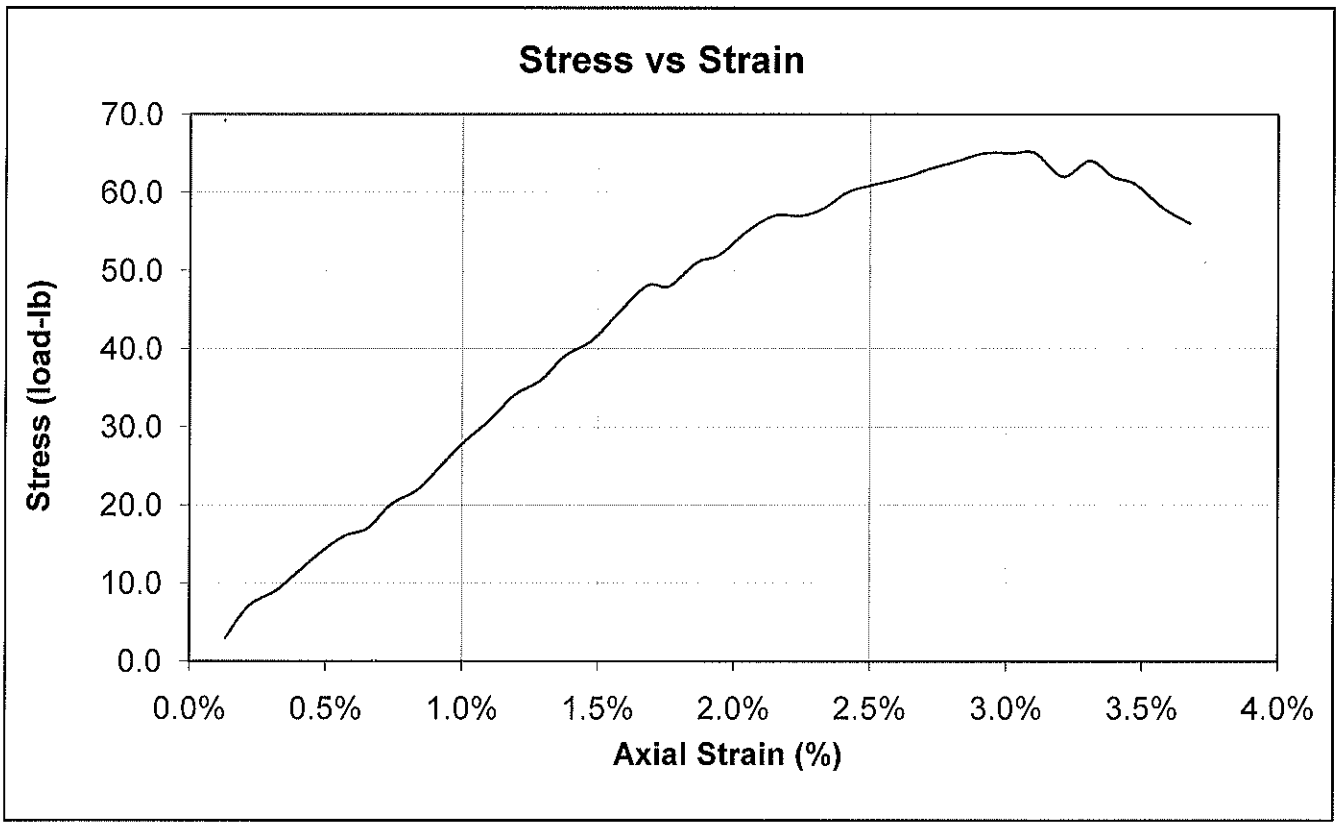


Wet Density (pcf)	126.0
Dry Density (pcf)	102.1
% Moisture	23.4

Unconfined Compressive Strength (tsf) 2.5

Project
SR 99 Widening - Little Johns Creek
Project Number
1201.7b
Sample Number
F-2-7c
Material Description
Yellowish brown silty clay with sand (CL-ML)
Tested By
MDR

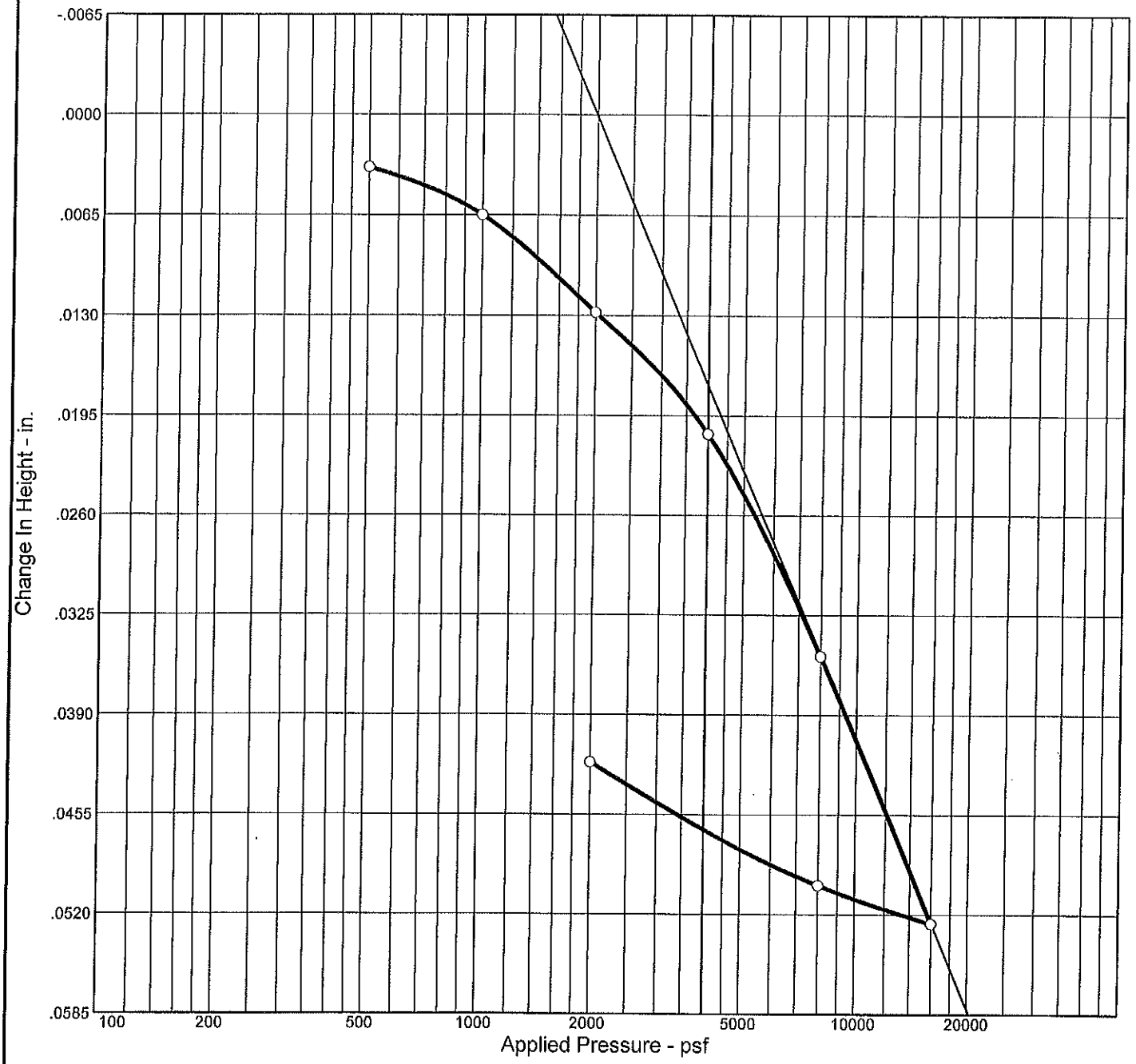
ASTM D 2166-00



Wet Density (pcf)	115.7
Dry Density (pcf)	89.4
% Moisture	29.5

Unconfined Compressive Strength (tsf) 1.0

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (psf)	P_c (psf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
96.8 %	25.0 %	99.2			2.7	3750	4794	0.13	0.02	0.697

MATERIAL DESCRIPTION	USCS	AASHTO
Lean CLAY (CL), yellow brown	CL	

Project No. 1201.7b **Client:** HDR Engineering, Inc.

Project: SR 99 Widening - Little John Creek

Source: F1 **Sample No.:** 9c **Elev./Depth:** 31.0-31.5

Remarks:

Blackburn Consulting

W. Sacramento, CA

Figure

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LITTLE JOHNS CR.SLOU Site ID : F1-4.
Your purchase order number is 1201-7B.
Thank you for your business.

* For future reference to this analysis please use SUN # 56550-114218.

EVALUATION FOR SOIL CORROSION

Soil pH	7.85		
Minimum Resistivity	1.82 ohm-cm (x1000)		
Chloride	30.6 ppm	00.00306	%
Sulfate	30.4 ppm	00.00304	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical
11353 Pyrites Way, Suite 4
Rancho Cordova, CA 95670
(916) 852-8557

Date Reported 08/21/2009
Date Submitted 08/18/2009

To: Ken Colburn
Blackburn Consulting
11521 Blocker Dr. Ste. 110
Auburn, CA 95603

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : LITTLE JOHNS CR.SLOU Site ID : F2-13.
Your purchase order number is 1201-7B.
Thank you for your business.

* For future reference to this analysis please use SUN # 56550-114219.

EVALUATION FOR SOIL CORROSION

Soil pH	7.75	
Minimum Resistivity	0.83 ohm-cm (x1000)	
Chloride	28.9 ppm	00.00289 %
Sulfate	26.9 ppm	00.00269 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

APPENDIX C

Abutments 1 & 4: Class 90 Pile Calculations

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7BS\ENGINE~1\ABUT.DVN
Project Name: Bridge 29-0017 (Abutments) Project Date: 07/15/2010
Project Client: HDR
Computed By: DJM
Project Manager: DJM

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 12.00 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	33.00 ft
	- Driving/Restrike	33.00 ft
	- Ultimate:	33.00 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

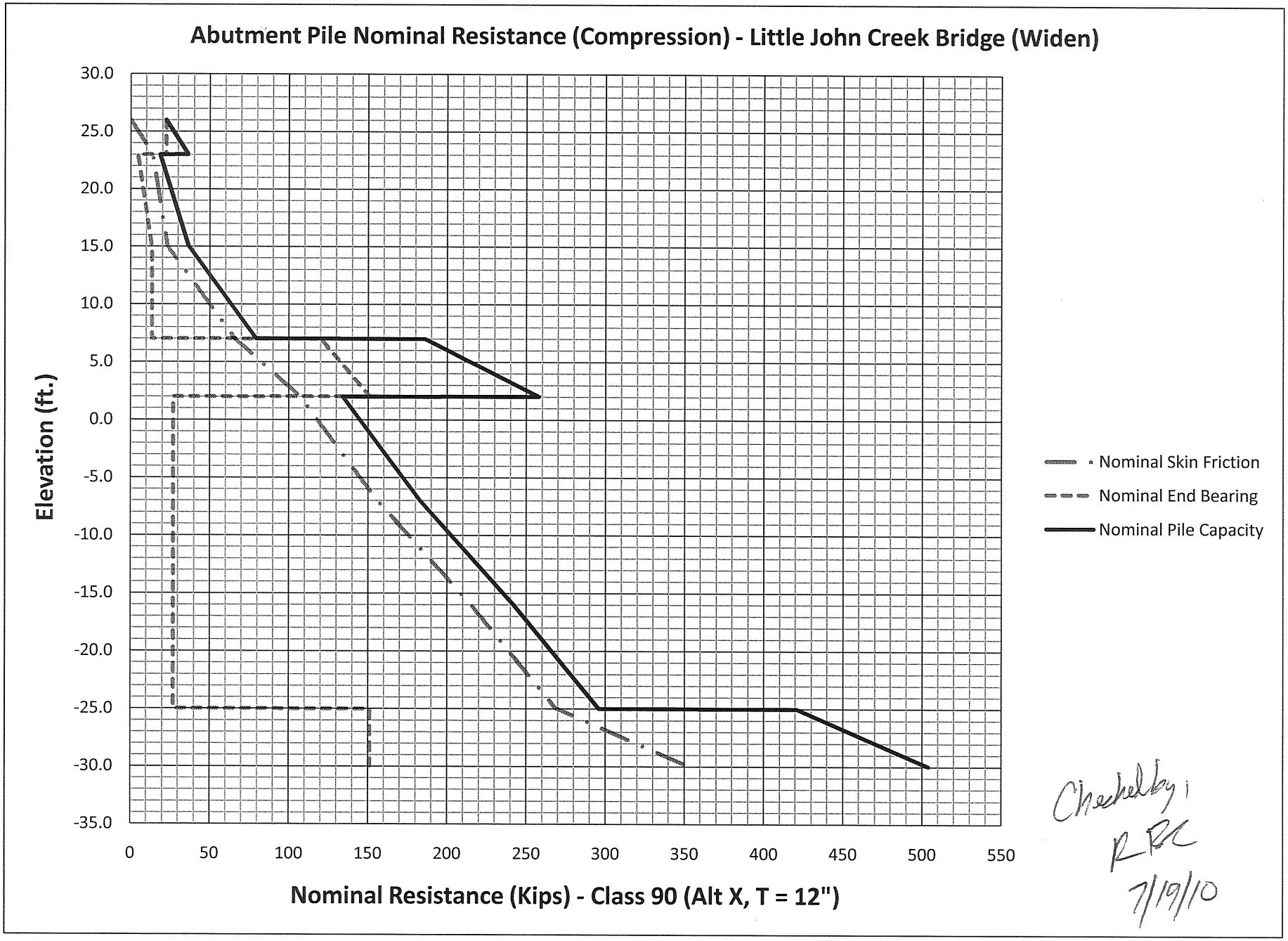
ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesive	3.00 ft	0.00%	125.00 pcf	2500.00 psf	T-79 Concrete
2	Cohesionless	8.00 ft	0.00%	117.00 pcf	28.0/28.0	Nordlund
3	Cohesive	8.00 ft	0.00%	115.00 pcf	1500.00 psf	T-79 Concrete
4	Cohesionless	5.00 ft	0.00%	120.00 pcf	36.0/36.0	Nordlund
5	Cohesive	27.00 ft	0.00%	120.00 pcf	3000.00 psf	T-79 Concrete
6	Cohesionless	5.00 ft	0.00%	125.00 pcf	36.0/36.0	Nordlund

Checked by:
RPR
7/19/10

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.05 Kips	22.50 Kips	22.55 Kips
2.99 ft	13.93 Kips	22.50 Kips	36.43 Kips
3.01 ft	13.99 Kips	4.60 Kips	18.58 Kips
10.99 ft	23.39 Kips	13.32 Kips	36.71 Kips
11.01 ft	23.46 Kips	13.50 Kips	36.96 Kips
18.99 ft	65.75 Kips	13.50 Kips	79.25 Kips
19.01 ft	65.88 Kips	120.10 Kips	185.98 Kips
23.99 ft	107.14 Kips	151.60 Kips	258.74 Kips
24.01 ft	107.28 Kips	27.00 Kips	134.28 Kips
33.01 ft	156.56 Kips	27.00 Kips	183.56 Kips
42.01 ft	215.65 Kips	27.00 Kips	242.65 Kips
50.99 ft	269.71 Kips	27.00 Kips	296.71 Kips
51.01 ft	269.93 Kips	151.60 Kips	421.53 Kips
55.99 ft	353.14 Kips	151.60 Kips	504.74 Kips


Abutment Pile Nominal Resistance (Compression) - Little John Creek Bridge (Widen)
Elevation (ft.)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
0
50
100
150
200
250
300
350
400
450
500
550
Nominal Resistance (Kips) - Class 90 (Alt X, T = 12")
Nominal Skin Friction
Nominal End Bearing
Nominal Pile Capacity
Checked by:
RRC
7/19/10

Little John Creek Bridge (Widen)
BCI No. 1201.7
02/05/10
By: DJM

Abutment Pile Settlement Calculations: Class 90 Piles

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

Service-I Limit Per Pile Load (lbs)		85000
A	*Average Axial Load (lbs)	42500
B	Pile Length (in.)	372
C	Tip Area (sq. in.)	144
D	Concrete Modulus of Elasticity (psi)	4415201
Axial Compression (in.)		**0.02**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	590.3
B	Pile Diameter (in.)	12
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	6900
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.5
Point Settlement (in.)		**0.23**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = **0.26** in.
6.6 mm

Checked by:
RPR
7/19/10

APPENDIX D

Bents: 15” PC/PS Concrete Pile Extension Calculations

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7BS\ENGINE~1\BENTSKIN.DVN
Project Name: Bridge 29-0017 (Bent-Skin) Project Date: 02/04/2010
Project Client: HDR
Computed By: DJM
Project Manager: DJM

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 11.80 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	25.00 ft
	- Driving/Restrike	25.00 ft
	- Ultimate:	25.00 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	2.00 ft	0.00%	117.00 pcf	28.0/28.0	Nordlund
2	Cohesive	8.00 ft	0.00%	115.00 pcf	1500.00 psf	T-79 Concrete
3	Cohesionless	5.00 ft	0.00%	120.00 pcf	36.0/36.0	Nordlund
4	Cohesive	27.00 ft	0.00%	120.00 pcf	3000.00 psf	T-79 Concrete
5	Cohesionless	6.00 ft	0.00%	125.00 pcf	36.0/36.0	Nordlund

Checked by:
RPR
7/19/10

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.01 Kips	0.01 Kips
1.99 ft	0.31 Kips	2.75 Kips	3.06 Kips
2.01 ft	0.36 Kips	13.05 Kips	13.42 Kips
9.99 ft	39.64 Kips	13.05 Kips	52.69 Kips
10.01 ft	39.73 Kips	60.10 Kips	99.83 Kips
14.99 ft	62.45 Kips	91.19 Kips	153.64 Kips
15.01 ft	62.55 Kips	26.11 Kips	88.66 Kips
24.01 ft	105.08 Kips	26.11 Kips	131.18 Kips
33.01 ft	160.24 Kips	26.11 Kips	186.35 Kips
41.99 ft	222.28 Kips	26.11 Kips	248.39 Kips
42.01 ft	222.46 Kips	146.59 Kips	369.05 Kips
47.99 ft	299.80 Kips	146.59 Kips	446.39 Kips

DRIVEN 1.2

GENERAL PROJECT INFORMATION

Filename: Z:\ACTIVE~1\1201~1.XSR\1201~1.7BS\ENGINE~1\BENTEND.DVN
Project Name: Bridge 29-0017 (Bent-End) Project Date: 02/04/2010
Project Client: HDR
Computed By: DJM
Project Manager: DJM

PILE INFORMATION

Pile Type: Concrete Pile
Top of Pile: 0.00 ft
Length of Square Side: 13.30 in

ULTIMATE CONSIDERATIONS

Water Table Depth At Time Of:	- Drilling:	25.00 ft
	- Driving/Restrike	25.00 ft
	- Ultimate:	25.00 ft
Ultimate Considerations:	- Local Scour:	0.00 ft
	- Long Term Scour:	0.00 ft
	- Soft Soil:	0.00 ft

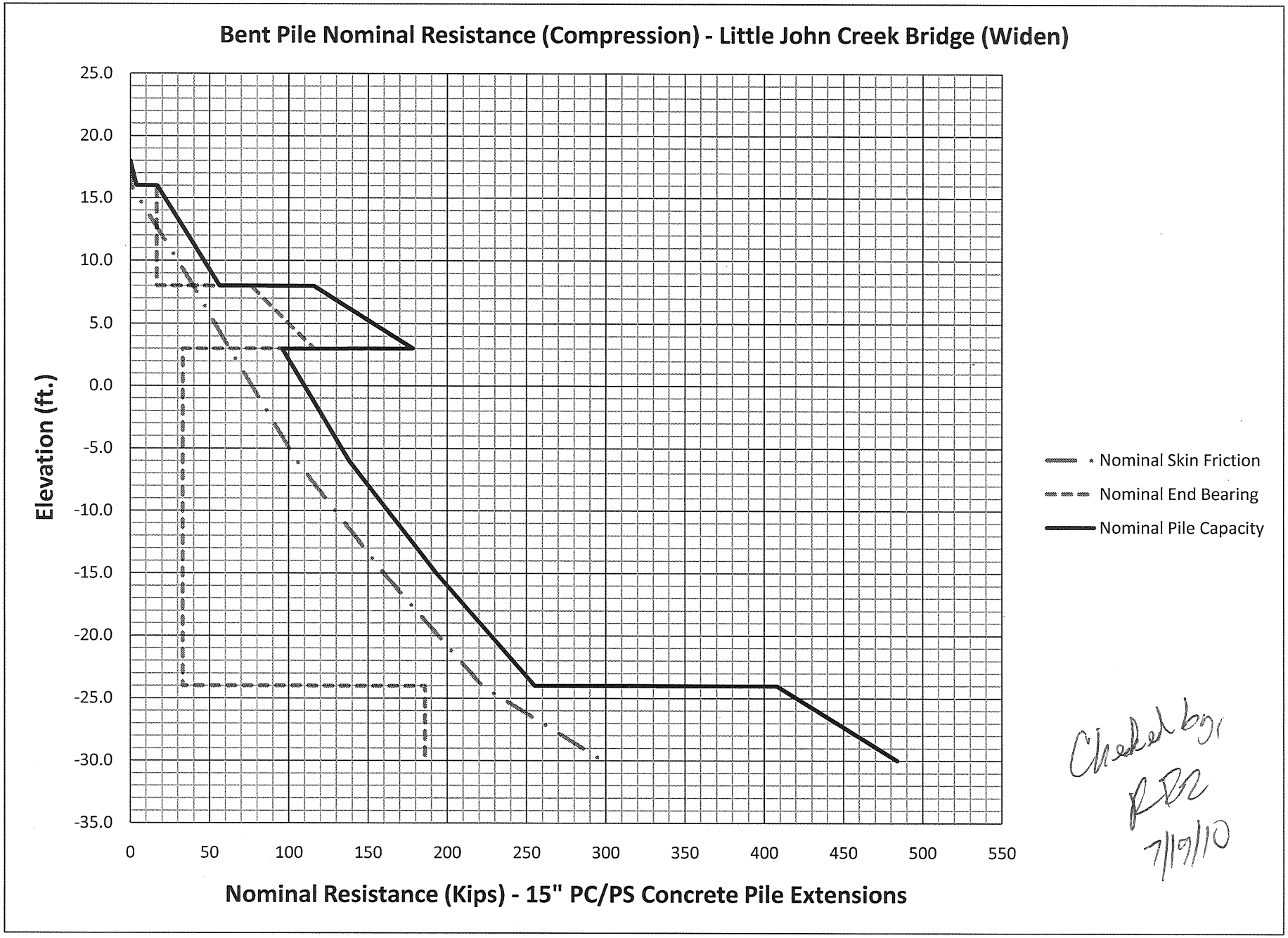
ULTIMATE PROFILE

Layer	Type	Thickness	Driving Loss	Unit Weight	Strength	Ultimate Curve
1	Cohesionless	2.00 ft	0.00%	117.00 pcf	28.0/28.0	Nordlund
2	Cohesive	8.00 ft	0.00%	115.00 pcf	1500.00 psf	T-79 Concrete
3	Cohesionless	5.00 ft	0.00%	120.00 pcf	36.0/36.0	Nordlund
4	Cohesive	27.00 ft	0.00%	120.00 pcf	3000.00 psf	T-79 Concrete
5	Cohesionless	6.00 ft	0.00%	125.00 pcf	36.0/36.0	Nordlund

Checked by:
KBR
7/19/10

ULTIMATE - SUMMARY OF CAPACITIES

Depth	Skin Friction	End Bearing	Total Capacity
0.01 ft	0.00 Kips	0.02 Kips	0.02 Kips
1.99 ft	0.40 Kips	3.50 Kips	3.89 Kips
2.01 ft	0.46 Kips	16.58 Kips	17.04 Kips
9.99 ft	44.68 Kips	16.58 Kips	61.26 Kips
10.01 ft	44.78 Kips	76.35 Kips	121.13 Kips
14.99 ft	74.74 Kips	115.84 Kips	190.59 Kips
15.01 ft	74.86 Kips	33.17 Kips	108.02 Kips
24.01 ft	120.66 Kips	33.17 Kips	153.84 Kips
33.01 ft	179.07 Kips	33.17 Kips	212.24 Kips
41.99 ft	249.96 Kips	33.17 Kips	283.13 Kips
42.01 ft	250.21 Kips	186.23 Kips	436.44 Kips
47.99 ft	352.16 Kips	186.23 Kips	538.39 Kips



Checked by:
RDR
7/19/10

Little John Creek Bridge (Widen)
BCI No. 1201.7
02/05/10
By: DJM

Bent Pile Settlement Calculations: 15" PC/PS Concrete Pile Extensions

(Foundation Analysis and Design, Bowles, 5th edition, 1996)

Axial Pile Compression

Service-I Limit Per Pile Load (lbs)		110000
A	*Average Axial Load (lbs)	55000
B	Pile Length (in.)	660
C	Tip Area (sq. in.)	177
D	Concrete Modulus of Elasticity (psi)	4415201
Axial Compression (in.)		**0.046**

*Allowable Capacity Reduced by 50% Due to Skin Friction

Axial Compression = (A x B)/(C x D)

Point Settlement

A	Point Bearing Pressure (psi)	621.5
B	Pile Diameter (in.)	15
C	Poisson's Ratio	0.3
D	Point Soil Stress-Strain Modulus (psi)	5500
E	Shape Factor	1
F	Fox Embeddment Factor	0.5
G	Reduction Factor for Skin Friction	0.75
Point Settlement (in.)		**0.578**

A = Allowable Pile Capacity x Tip Area

F = 0.55 if L/D >/= to 5, 0.5 if greater than 5

Point Settlement = A x {B x (1-C^2)/D} x E x F x G

Total Pile Settlement = **0.62** in.
15.9 mm

Checked by:
RBR
7/19/10

APPENDIX E

Caltrans Review Comments with BCI Responses

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 **EA:** 0E6101 **Project Name:** SR99 Manteca Widening **OSFP Liaison:** John Fujimoto **Phone:** 916-227-8757 **e-mail:** john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details __ PS&E (Review No.___) __ Construction X Other: 1st 60% Review	**Reviewer Name:** Ben Barnes **Functional Unit:** Geotechnical Services **Cost Center:** 59-323 **Phone Number:** 916-227-1039 **e-mail:** benjamin_barnes@dot.ca.gov **Date of Review:** 5/24/2010 **Structure Name*:** Little John Creek Bridge (Widen) **Br No*:** 29-0017 (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	FR	NA	This is the 1st 60% review of the Draft Foundation Report prepared by Blackburn Consulting, dated April 23, 2010, by Caltrans Office of Geotechnical Design – North.	NA	
2	FR	Table of Contents / Appendix A sheet	Figure 3 listed as Peak Bedrock Acceleration, title on Figure 3 is Regional Fault Map	BCI changed the title in the table of contents and Appendix A sheet to "Regional Fault Map".	
3	FR	2 Subsurface Exploration	Hammer efficiency ratio shown as 75% in report, and 80% on LOTB. Also, what is the assumed hammer efficiency ratio based on?	BCI changed the hammer efficiency on the LOTB to 75% and included text in the report regarding estimation of the hammer efficiency.	
4	FR	6 Seismic Data and Evaluation	Please use current CT seismic design criteria.	Per e-mail from John Fujimoto on June 15, 2010, use of SDC 1.4 Seismic Design Criteria was approved for this project at Type Selection.	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓ = Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

5	FR	Fig 4 ARS Curve	Please use current CT seismic design criteria.	Per e-mail from John Fujimoto on June 15, 2010, use of SDC 1.4 Seismic Design Criteria was approved for this project at Type Selection.	
6	FR	2 Subsurface Exploration / LOTB	SPT sampler listed as 1.5-inch ID in report, shown as 1.4 on LOTB.	The SPT ID shown on the LOTB is correct. BCI has edited the report text accordingly	

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

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OFFICE OF SPECIAL FUNDED PROJECTS

Office of Special Funded Projects Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 EA: 0E6101 Project Name: SR99 Manteca Widen OSFP Liaison: John Fujimoto Phone: 916-227-8757 e-mail: john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details X PS&E (Review No. 2) __ Construction __ Other:_____	Reviewer Name: Theresa Nedwick Functional Unit: SOE-Specifications Cost Center: _____ Phone Number: 916-227-8193 e-mail: Theresa_nedwick@dot.ca.gov Date of Review: 11/15/10 Structure Name*: _____ Br No*:_____ (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Titus Keng	HDR Engineering Inc	916-817-4876	titus.keng@hdrinc.com	11/29/10

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	FRs	Sect 11	Construction Considerations: For pile driving, geotech engineer refers to a P formula that is not in 2006 Standard Specifications, Section 49-1.08. He also refers to a requirement for blow counts that is not specified in either Standard Specifications or Special Provisions.	In Section 11.2 (11.3 for Lone Tree Slough Ramp Bridge) of the foundation reports, the sentence "However, in no case shall the required blows (N) be less than that obtained using the Engineering News Formula (P=Er/6(s + 2.54)" may be disregarded.	
2	FR		Please check with geotech engineer if a Driving System Submittal required to ensure that pile driving system is adequate. SSP 49-208 needs to be in if required by geotech engineer.	Geotechnical engineer BCI recommends that the contractor provides a Driving System Submittal. SSP 49-208 has been included.	
3	P		Why note "Provide a clean and roughen surface for existing concrete prior to placing new concrete. Roughen to 1/4" amplitude"? Where is the specs? What's about "Prepare Concrete Bridge Deck Surface"?	Note has been deleted. "Roughen to ¼" amplitude" has been called out on specific detail with related specs added to project specifications SSP51-300.	
4	P		Why are epoxy dowels used? FRs didn't specify this is a corrosive environment. This project is not in Climate Area	Epoxy dowels have been revised to ordinary reinf steel dowel.	

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓ = Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____ *=if applicable

Date of Review:_____ Functional Unit:_____ Br No*._____

			III either.		
5	ALL SSPs		Please put your initials and date for ANY EDITS you make in the special provisions. Some SSPs have no page breaks in between.	Initials and date are added. Will have page breaks between SSPs.	
6	SP	S5-250	Please list partial pay items as they appear in "Ready to List": Piling (except CIDH) Bar Reinforcing Steel	Agreed and has been corrected as appear in "Ready to List".	
7	SP	S5-280	Please describe what gets to be inspected at listed address.	Moved "Bridge as-built drawings" to listed address.	
8	SP	S8-W04	We recommend to keep para 19 without striking anything.	Leave para 19 as is shown, revised to keep para 20 without striking anything.	
9	SP	S8-W09	Please remove one. There are 2 of them.	Agreed to remove one.	
10	SP	15-800	Add "s" to brige in para 2.	Agreed and has been corrected.	
11	SP	15-875	Para 5, reinstate "at".	Agreed and has been corrected.	
12	SP	15-880	Para 14, you keep "chip or slurry seal contrast treatments" but strike them in paras 19 and 20?	Strike "chip or slurry seal contrast treatments" in para 14.	
13	SP	15-940	Add description and pay clause for 3/4" saw cut. It's not covered in Standard Specs.	Description and pay clause for 3/4" saw cut has been added at the end of para 11.	
14	SP	19-010	Please specify man-made objects encountered during pile driving-sub structure work. Standard Specs covers it for earthwork.	Man-made objects have been specified in the paragraph.	
15	SP	19-570	Style for pay clause should be normal and should be written as it recommends in Ready to List Guide, Section 6: "Full compensation for … shall be considered as included in the contract …prices paid per …for , and no …therefor.	Agreed and has been corrected.	
16	SP	42-010	The project has grooves on EXISTNG and NEW polyester concrete overlay for BRIDGE DECKS. Please edit accordingly.	Para 1 has been modified to have Existing and NEW polyester concrete overlay.	
17	SP	42-600	The project has no grinding PCC, please strike "grinding".	Agreed and has been corrected.	
18	SP	49-200	The added para "Drilling should be…tip elevations' belongs to 49-210. Added para "Pile driving…supported on piles" is not needed.	Para "Drilling should be…tip elevations" has been moved to 49-210. Para "Pile driving…supported on piles" has been removed.	
19	SP	49-210	Restricted drilling is allowed, see FRs. Please edit accordingly.	Agreed and has been corrected.	
20	SP	51-600	Strike one of the tilte. There are identical.	Agreed and has been corrected.	

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

21	SP	51-806	The project has no "Public Safety plan", so please strike all related info in paras 2,7, and 8.	Agreed the project has no "Public Safety plan" so related information in para 2,4,38 and 39 is strike out. Para 7 & 8 are used since the entire deck is being overlain at French Camp Slough Bridge and Little John Creek Bridge.	
22	SP	72-200	Please have it conforms to 72-6 instead of 72-4. Section 72-6 talks about paving under bridges.	Agreed and has been corrected to conform to 72-6.	
23	SP	83-460	Para 10, added paras for Types 60A(MOD) and 732 are not needed.	Agreed and has been corrected.	

Office of Special Funded Projects
Comment & Response Form

(Revised 10/21/09)

General Project Information (OSFP Liaison to complete)	Review Phase (OSFP Liaison to complete)	Reviewer Information (Reviewer Liaison to complete)
Dist: 10 **EA:** 0E6101 **Project Name:** SR99 Manteca Widen **OSFP Liaison:** John Fujimoto **Phone:** 916-227-8757 **e-mail:** john_fujimoto@dot.ca.gov	__ PSR/PDS (Review No.___ __ APS/PSR (Review No.___) __ APS/PR (Review No.___) __ Type Selection __ 65% PS&E Unchecked Details X PS&E (Review No. 3) __ Construction __ Other:_____	**Reviewer Name:** Theresa Nedwick **Functional Unit:** SOE-Specifications **Cost Center:** _____ **Phone Number:** 916-227-8193 **e-mail:** Theresa_nedwick@dot.ca.gov **Date of Review:** 11/15/10 **Structure Name*:** _____ **Br No*:**_____ (*Use if necessary to when comment sheets are by individual structure)

Consultant Information (to be filled in by Consultant)

Consultant Structure Lead (First and Last Name)	Structure Consultant Firm	Phone Number	e-mail	Response Date
Titus Keng	HDR Engineering Inc	916-817-4876	titus.keng@hdrinc.com	10/28/10

#	Doc. (See Note 1)	Page, Section, or SSP	Review Comments	Consultant Responses	✓
1	SP	S5-280	Please don't move "Bridge as-built drawing" to different line, it should be next to "Available as specified in the Std Specifications". What is the address 661 San Juan Ave for? Please list the all the info handout. Please check with Geotech engineer if rock cores available for viewing. If they are, please insert the info according to instructions.		
2	SP	19-010	Para 1 is missing a period.		
3	SP	19-570	Style for pay clause should be **normal**, not an item K.		
4	SP	42-010	Para 1, add "This work consists of" at the beginning of the para and "and" before "shall conform". Under "Measurement and Payment": move "of the groove area" to the end of the para, replacing "groove". Delete last para, you already describe the work in para 1.		

Note 1: Abbreviations for Typical Documents (if Abbr. is not below, type in the document type)					
P=Structure Plans	SP=Special Provisions	FR=Foundation Rpt	DC=Design Calcs	TS=Type Sel. Report	QCC=Quant. Check Calcs
RP=Road Plans	E=Estimate	H=Hydraulics Rpt	CC=Check Calcs	QC=Quant. Calcs	

✓= Comment Resolved (for Reviewer's use)

Submittal Data (Reviewer to complete)

Dist-EA:_____ Reviewer:_____ Str Name*:_____

Date of Review:_____ Functional Unit:_____ Br No*._____ *=if applicable

5	SP	42-600	Please replace all "pavement" with overlay throughout this specifications. Please strike "grinding" at various locations.		
6	SP	49-208	Para 2C3, last para, do you have open ended pipe piles?		
7	SP	49-210	Para 2, a period is needed.		
8	SP	51-806	Para 7, delete "Results from airborne… production work". You don't have airborne monitoring. Para 8, delete 8-8, you don't have airborne monitoring.		
9	SP	15-170	Recommend "salvage metal bridge railing post" full-comped into "Bridge removal (portion) as specified in the Std Specs, Section 15-4.03.		
10	FRs		Refer to comments #1 and #2 of Second Review, please have Foundations Reports revised to reflect Consultant's responses.	In Section 11.2 (11.3 for Lone Tree Slough Ramp Bridge), BCI revised the Foundation Report by deleting the sentence regarding use of the Engineering News Formula and adding a sentence requiring a Driving System Submittal	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					

Final Hydrology & Hydraulics Report

SR-99, North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek Crossings

Post Mile 4.9 to Post Mile 15.0

SAN JOAQUIN COUNCIL OF GOVERNMENTS

December 15, 2010

Revised Submittal – August 2010

Original – July 2009

HDR

Sacramento, California

Final Hydrology & Hydraulics Report SR99, North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek Crossings

SR-99 Improvements, City of Stockton, and San Joaquin County Post Mile 4.9 to Post Mile 15.0

December 15, 2010

Revised Submittal - August 3, 2010

Original - July 2009

2365 Iron Point Road, Suite 300
Folsom, CA 95630

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1.0 Introduction

1.1 Purpose

The purpose of this report is to present three existing and proposed bridge hydraulic models for State Route 99 (SR-99). The bridge structures are located at North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek (naming convention within this report are consistent with Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 0602990465 C and 0602990605B). Design drawings for SR-99 may report the following naming convention:

- North Fork South Littlejohns Creek (Littlejohns Creek)
- South Fork South Littlejohns Creek (French Camp Slough)
- and Lone Tree Creek (Lone Tree Creek)

Figure 1 provides a general location map of the three bridge crossings. **Figure 2,** in **Appendix A**, provides a detailed map of the three crossings along SR-99. This report presents water surface elevation profiles for the 50-and 100-year flood events. The scour analysis was performed for the 100-year flood event at these structures.

1.2 Project Objective

The City of Stockton, City of Manteca, and San Joaquin County (County), in cooperation with the San Joaquin Council of Governments (SJCOG), the California Department of Transportation (Caltrans), and the Federal Highway Administration (FHWA) propose to improve the SR-99 to relieve local and regional circulation problems. Traffic Congestion will be reduced by replacing the median with a travel lane and shoulder to accommodate anticipated travel demand through the year 2025. Completion of this project will result in:

- Improved traffic circulation in the South Stockton Planning Area and access to planned City and County development and the Stockton Metropolitan Airport
- Improve traffic operations on SR-99.

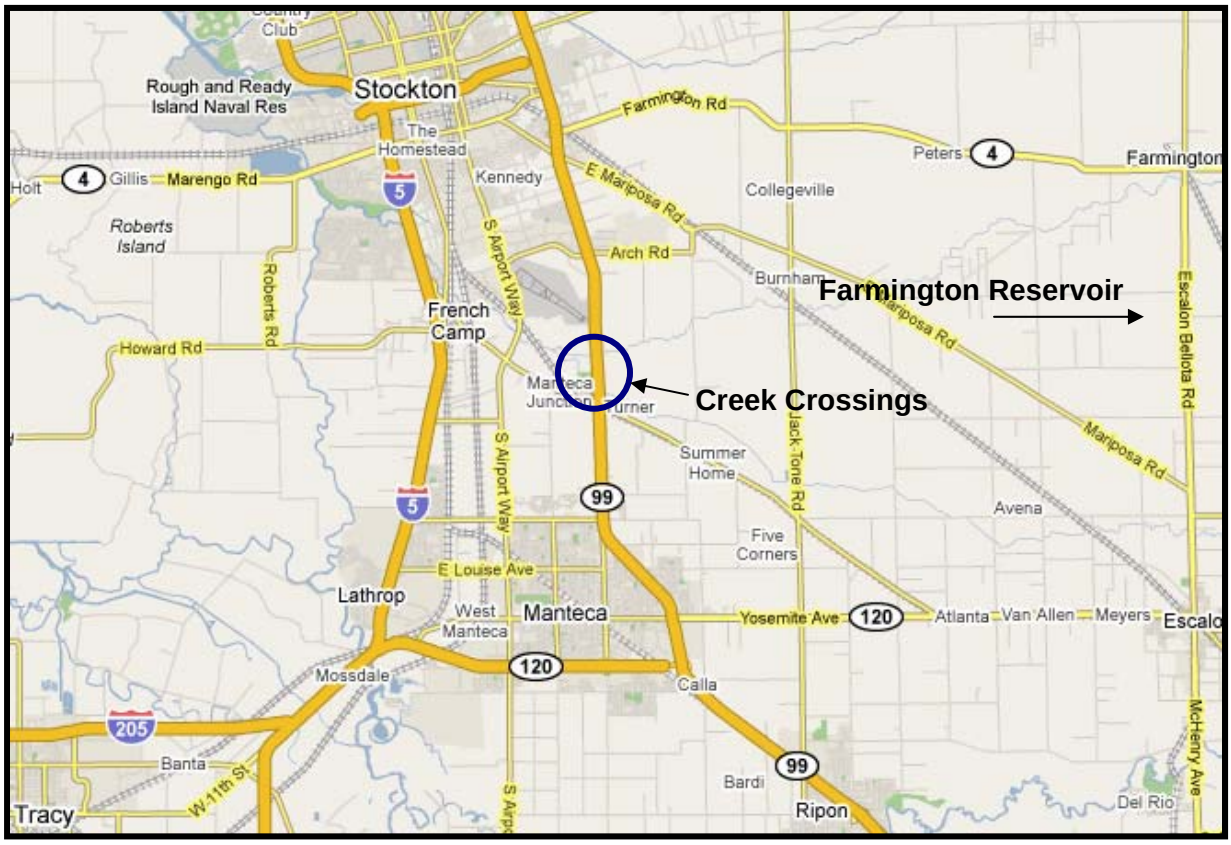
1.3 Project Description

The SR-99 project is located in San Joaquin County, California between Post Mile (PM) 4.9 and PM 15.0. The passage of the San Joaquin County Measure “K” Renewal and the State Infrastructure Bond program in 2006 creates an opportunity for SJCOG to advance delivery for several mainline widening projects, including the widening of SR-99 from Austin Road to Arch Road. The contract for professional services will include the Project Report and Environmental Document for this SR-99 widening project.

This report presents the results of the hydraulic analyses performed for the improvements for SR-99 at North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek crossings only as part of the entire proposed improvements. The SR-99 widening project scope also includes additional improvements which will be addressed in separate report(s) in future. Scope for this report includes:

- Widen SR-99 from 4 to 6 lanes between Austin Road in Manteca and Arch Road in Stockton by adding two lanes in the existing median and constructing a Type 60 concrete barrier.
- Median decking and bridge widening at Lone Tree Creek.
- Median decking at North Fork South Littlejohns Creek and South Fork South Littlejohns Creek.
- Bridge widening and a new off-ramp structure at Lone Tree Creek.

Figure 1 - Location Map



2.0 Setting

2.1 Land Use

SR-99 is the principal north/south highway traversing the major cities within California's Central Valley. SR-99 provides primary access for the movement of people, goods, and services and is considered the main transportation route for agricultural products. It is also a major connector to all east/west routes throughout the Central Valley, providing linkages between the Bay Area and the Sierra Nevada Mountains. State Route 99 is functionally classified as a Principal Arterial in its entirety and is a High Emphasis/Focus Route in the Interregional Road System (IRRS). Within District 10, SR-99 is listed on the National Highway System (NHS), the National Network for STAA Trucks, the California Freeway and Expressway System, and is an Extra Legal Permit Loads (SHELL) route north of SR 4 in Stockton.

2.2 Climate

This project is located in the San Joaquin Valley which has a climate with warm, dry summers and mild winters. Summers can be very warm, with highs averaging 95°F. Winter temperatures are mild to cool with average lows of approximately 37°F. The average annual rainfall is approximately 14 inches, most of which falls between the months of November and March.

2.3 Groundwater

Test boring information was not available at this time; however, this information will be made available in the future.

2.4 FEMA FIRMS

New effective FEMA FIRMs for San Joaquin County were issued on October 16, 2009. The extent of the existing floodplains in the vicinity of the project is shown on the new effective FEMA FIRMs 06077C0490F and 06077C0630F. The extent of the floodplains in the vicinity of the project is also shown in historical FIRM Panels 0602990605B dated December 16, 2005, and 0602990465 C dated April 2, 2002. Some changes to the extents of the floodplains have been incorporated into the new effective FEMA FIRM's that were not mapped in the historical FIRM panels. These changes include the incorporation of new approximate flood hazard designations (Zone A) to a few small areas that were previously mapped outside the 100-year floodplain. Changes to the detailed flood hazard areas for North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek only included a vertical datum conversion for the provided base flood elevations from the National Geodetic Vertical Datum 1929 (NGVD 29) to the North American Vertical Datum 1988 (NAVD 88).

At the time the original analysis presented in this report was conducted, FEMA had not yet issued the FIRMs dated October 16, 2009. Also, the survey conducted for this analysis was conducted in NGVD 29. Therefore, the FIRMs dated December 16, 2005 and April 2, 2002 were used for the hydraulic analysis presented in this report.

Portions of the FIRM Panels that show the project site are included as **Figures 3 and 4 in Appendix B**. The FEMA profile plots in the vicinity of the project for North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek are included as **Figures 5 though 7** in **Appendix B**. Portions of the project between Turner Station and Arch Road are located within the existing FEMA floodplain. The historical FIS indicates that the 100-year floodplain does not overtop SR-99 at the location of the proposed crossings. The proposed improvements will not significantly change the water surface elevations or alter of the existing floodplain.

2.5 Channel Geometry Description

2.5.1 General

Figure 2 in Appendix A shows the location of the waterways in the vicinity of SR-99; these are North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek. The drainage areas upstream of SR-99 for the streams of interest are; North Fork South Littlejohns Creek 234.1 square miles, South Fork South Littlejohns Creek 234.1 square miles, and Lone Tree Creek 86.0 square miles.

Farmington Reservoir is the major control feature within the watershed and is operated by the U.S. Army Corps of Engineers to provide flood protection in the lower watershed. Although it has provided significant flood protection over the years, much of the lower watershed, including portions of this project, still lie within the 100-year floodplain. This is due primarily to the more than 140 square miles of uncontrolled watershed below Farmington Reservoir. According to the FEMA FIS dated December 16, 2005, areas within San Joaquin County, including portions of the study area along SR-99, are subject to shallow overland flooding generally less than 3 feet deep and characterized by unpredictable flow paths. The water surface elevations of flooding in these areas are essentially independent of those along the adjacent streamway, and are affected principally by natural and manmade barriers to flow in the flooded areas.

2.5.2 Survey

The survey for this project was performed by Kjeldsen, Sinnock & Neudeck, Inc. (KSN) (Oct 2005). The vertical datum used is NGVD 29.

The survey performed by KSN included an evaluation of the Benchmarks that were documented in the FEMA FIRM Maps dated April 2, 2002 and December 16, 2005. The results of the evaluation showed that the Benchmarks used in the April 2, 2002 and December 16, 2005 FEMA FIRM Maps were inconsistent with the City of Stockton Benchmark Book, even though both sets of Benchmark elevations were based on NGVD 29. The shift between both data sets was not uniform at all locations and the shift ranged from 0.48 feet to 1.79 feet. Refer to **Appendix C** for additional information of the evaluation performed by KSN

The KSN survey was used for this analysis as the benchmark control to be consistent with the survey control used within the construction documents.

2.5.3 Existing Geometry

At the waterway crossings, SR-99 consists of two northbound lanes and two southbound lanes. The area between the northbound and southbound lanes is currently unpaved, and is open at each bridge structure. The existing structures are simple span reinforced concrete decks on steel girders. Sixteen piles are used for structural support of the span at each creek/slough crossing. These vertical piles traverse through the waterways to the channel beds. These piles are approximately 1.3 feet in diameter by 12 feet high.

North Fork South Littlejohns Creek and South Fork South Littlejohns Creek include one rail car vehicle crossings approximately 50 feet downstream of the SR-99 Bridge.

2.5.4 Proposed Geometry

The proposed project will widen SR-99 from 4 to 6 lanes by paving the existing median to accommodate two additional travel lanes. At each bridge structure, the proposed improvements include median decking. These structural improvements will require the addition of 20 new piles for the SR-99 crossing at Lone Tree Creek, 14 new piles for the Lone Tree Creek offramp, 22 new piles for the SR-99 crossing at Southfork South Littlejohns Creek, and 18 new piles for the SR-99 crossing at Northfork South Littlejohns Creek. **Table 1** summarizes the number of existing piles, number of additional piles, and total number of piles for the proposed structures. Also included is the number of existing and additional piles located within the ordinary high water for each of these streams.

Table 1. Structure Pile Summary for SR-99

Structure Pile Summary for SR-99					
Structure	Existing Piles	Additional Piles	Total Piles	No. of Piles Located within Ordinary High Water (Existing)	No. of Piles Located within Ordinary High Water (Additional)
SR-99 at Lone Tree Creek	28	20	48	16	16[1]
Lone Tree Creek Offramp	0	14	14	0	6
SR-99 at Southfork South Littlejohns Creek (French Camp Slough)	36	22	58	24	12
SR-99 at Northfork South Littlejohns Creek	28	18	46	16	8

[1] Includes piles from Phase 1 and Phase 2

3.0 Hydrologic & Hydraulic Modeling Comparison

3.1 Hydrologic Conditions

The FEMA FIS (060299V003A) 10-, 50-, 100- and 500-year peak flows dated December 16, 2005 were used for developing the project hydraulic models. No additional hydrologic analyses were performed for this project. Copies of the FIS summary tables showing the peak discharges are included in **Appendix D**. **Table 2** summarizes the peak flows used for each channel representing a hydraulic model.

Table 2. Summary of Peak Flows

Stream / Location	Drainage Area (mi^2)	HEC-RAS RS (ft)	Peak Flow (cfs)			
			10-Year	50-Year	100-Year	500-Year
South Fork South Littlejohns Creek						
Upstream of Reach (FEMA State Highway 99)	234.1	198.0	1,095[1]	1,420[1]	2,600	4,010
Combined Flows of North Fork South Littlejohns Creek and South Fork South Littlejohns Creek	234.1	167.0	1,825[2]	2,355[2]	3,565[2]	5,560[2]
North Fork South Littlejohns Creek						
Upstream of Reach (FEMA State Highway 99)	234.1	196.0	730[1]	935[1]	965	1,550
Lone Tree Creek						
Upstream of Reach (FEMA State Highway 99)	86.0	197.5	570	840	955	1,630

[1]Anabranch channel of North Fork South Littlejohns Creek and South Fork South Littlejohns Creek. Flows shown reflect overbank gains and losses

[2] Flow represents the sum of flows for North Fork South Littlejohns Creek (Upstream of Reach location) and South Fork South Littlejohns Creek (Upstream of Reach location)

3.2 Hydraulic Conditions

3.2.1 Effective FEMA Hydraulic Models

HDR requested the effective FEMA hydraulic models for the study area, but the data received from FEMA did not include complete input data or output data. The effective FIS hydraulic data received from FEMA only included HEC-2 model summary output tables for North Fork South Littlejohns Creek. No hydraulic models were received for South Fork South Littlejohns Creek or Lone Tree Creek. HDR will include any additional information received from FEMA in the final version of this report, if received.

3.2.2 Model Peak Flows

A hydraulic model was created using the United States Army Corps HEC-RAS program version 3.1.3 in 2009 and version 4.0 in 2010. An electronic copy of this model on CD can be found inside the back cover of this report. The details of the hydraulic models electronic files are included in Section 4.1 of this report. This model was developed by HDR and includes the existing bridge features and the proposed design features of the bridge improvements. This model incorporates detailed survey cross sections from the topographic survey data performed by KSN (Oct. 2005). The locations of the cross sections used to develop the hydraulic model are shown overlaid on a copy of the FEMA FIRM map for the study area on **Figure 8** included in **Appendix E**. The peak flows used in this model were obtained from the FEMA FIS for the San Joaquin County (December 16, 2005). These peak flows do not account for planned future development upstream or downstream of the project site.

3.2.3 Assumptions

Based on review of the FEMA profiles dated December 16, 2005, the proposed hydraulic models developed by HDR using the updated topographic data within the project location include a notable datum shift. It is assumed that changes in channel geometry have occurred during the time span between the development of this project and the FEMA FIS model. A more detailed topographic data comparison was not possible because topographic data used to develop the FEMA FIS hydraulic models were not available.

It is to be noted that the surveyed bridge low cord elevations are lower than the bridge low cord elevations depicted on the FEMA FIS profile plots (see **Appendix B**); approximately 1.98, 1.16, and 1.26 for North Fork South Littlejohns Creek, South Fork South Littlejohns Creek and Lone Tree Creek respectively. The starting water surface elevations for the HEC-RAS model developed for the analysis presented in this report were determined by taking FEMA's base flood elevations at the downstream boundaries of the South Fork South Littlejohns Creek and Lone Tree Creek river reaches and adjusting them by the corresponding elevation differences that were determined from the comparison of the surveyed low cord of SR-99 bridge and the corresponding elevating reported in the FEMA profiles. The starting water surface elevation for North Fork South Littlejohns Creek was determined from the resultant water surface elevation of South Fork South Littlejohns Creek at the equivalent location; this approach was used because the model water surface elevations at the downstream boundary of North Fork South Littlejohns Creek are influenced by South Fork South Littlejohns Creek during large events.

As stated in a memorandum by KSN, the low cord elevation discrepancy is primarily due to changes in the published NGVD 29 benchmark elevations that have occurred over time. This memorandum is included in **Appendix C**. Similarly, the stream invert elevations used for the hydraulic model are also lower than the stream invert elevations depicted on the FEMA FIS profile plots by up to 5 feet. KSN recommended additional research to determine the reason for the vertical shift that was reveled. At this time no additional research has been conducted.

3.2.4 Starting Water Surface

The starting water surface elevations for the hydraulic model were obtained from the profiles plots included in the December 16, 2005, FIS report. These water surface elevations were corrected to correspond with the current KSN survey information which differs from elevations used in the FEMA FIS. Copies of the profile plots showing the starting water surface elevations and the elevations at the SR-99 bridge crossings are included in **Appendix B**. **Table 3** provides a comparison between the December 16, 2005, FEMA water surface elevations at the downstream boundary of the project model and the downstream boundary condition of the project model. Do to the discrepancy between the FEMA and KSN's elevations and the uncertainty of shift at downstream boundary condition, the downstream boundary was set at a downstream distance that would have minimal impact at the project site.

Table 3: Elevation Comparison at Downstream Boundary

Stream / Location	FEMA RS (mi)	HEC-RAS RS (ft)	Elevation (ft)			
			50-Year FEMA	50-Year HEC-RAS	100-Year FEMA	100-Year HEC-RAS
South Fork South Littlejohns Creek	1.07	148.50	27.6	26.44	28.3	27.14
North Fork South Littlejohns Creek[1]	0.71	167.45	29.0	27.02[1]	29.0	27.82[1]
Lone Tree Creek	0.75	189.98	30.0	28.74	30.5	29.24

[1]Elevations were developed from model at cross section 167.0 of South Fork South Littlejohns Creek reach.

3.2.5 Bridge Skew

Appropriate hydraulic flow skew angles were used in modeling the bridges for this project. The bridge flow skew angles applied in the model are 15°, 10°, and 22° for the North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek respectively for SR-99. A flow skew of 18° was applied to the new off-ramp bridge over Lone Tree Creek. A pier skew, otherwise known as hydraulic skew or angle of attack of flow, of 0° was applied to all crossings for existing and proposed conditions because the existing and proposed piers are aligned parallel to flow within the channels. Copies of the draft design drawings showing the details of the proposed bridge improvements are available upon request. The existing and proposed conditions profile plots and summary output tables are included in **Appendix F**.

3.2.6 Results

The Caltrans Highway Design Manual indicates clearance between the 50-year design flow and the bridge soffit shall be 2-feet and 100-year requires passing. **Table 4** summarizes the bridge low cord elevations, the water surface elevations, the soffit clearance and the freeboard based on existing and proposed conditions model results for the project. Soffit clearance is defined as the distance between the top of water and the low cord of the bridge while freeboard refers to the distance between the top of water to the top of bridge deck. The proposed conditions 50-year water surface elevations are slightly higher than the existing conditions water surface

elevations. Also, all three SR 99 bridges provides the required capacity to pass the 100-year design flow under the existing soffit and pass the 50-year with 2-feet of soffit clearance.

The existing rail car bridges located approximately 50 feet downstream of the mainline crossing at North Fork South Littlejohns Creek and South Fork South Littlejohns Creek do not provide any significant backwater effects to the state bridges.

Table 4 provides a summary of the results that were produced from the project hydraulic model. Elevations are based on the survey developed by KSN. Results also are reflective of the car bridges located approximately 50 feet downstream of the mainline crossing at North Fork South Littlejohns Creek and South Fork South Littlejohns Creek.

Table 4. Hydraulic Summary

100-Year Storm Event										
Channel	Profile	Upstream Soffit (NGVD 29, ft)	Upstream WSEL (NGVD 29, ft)	Upstream Soffit Clearance (ft.)	Upstream Freeboard (ft)	Downstream Soffit (NGVD 29, ft)	Downstream WSEL (NGVD 29, ft)	Downstream Soffit Clearance (ft.)	Downstream Freeboard (ft)	Avg. Velocity Through Bridge (ft/sec)[1]
Lone Tree Creek	Existing	31.74	29.86	1.88	3.03	31.36	29.58	1.78	2.93	4.4
	Proposed		29.98	1.76	2.91		29.71	1.65	2.8	4.3
Lone Tree Creek Off Ramp	Proposed	33.00	29.72	3.28	4.28	32.25	29.57	2.68	3.68	4.1
South Fork South Littlejohns Creek	Existing	29.84	28.72	1.12	2.22	30.10	28.21	1.89	2.99	6.3
	Proposed		28.72	1.12	2.22		28.21	1.89	2.99	6.3
North Fork South Littlejohns Creek	Existing	30.16	28.15	2.01	3.24	29.88	28.04	1.84	3.07	3.4
	Proposed		28.16	2.00	3.23		28.03	1.85	3.08	3.4

50-Year Storm Event										
Channel	Profile	Upstream Soffit (NGVD 29, ft)	Upstream WSEL (NGVD 29, ft)	Upstream Soffit Clearance (ft.)	Upstream Freeboard (ft)	Downstream Soffit (NGVD 29, ft)	Downstream WSEL (NGVD 29, ft)	Downstream Soffit Clearance (ft.)	Downstream Freeboard (ft)	Avg. Velocity Through Bridge (ft/sec)
Lone Tree Creek	Existing	31.74	29.45	2.29	3.44	31.36	29.18	2.18	3.33	4.3
	Proposed		29.56	2.18	3.33		29.31	2.05	3.2	4.1
Lone Tree Creek Off Ramp	Proposed	33.00	29.31	3.69	4.69	32.25	29.17	3.08	4.08	3.9
South Fork South Littlejohns Creek	Existing	29.84	27.37	2.47	3.57	30.10	27.13	2.97	4.07	4.2
	Proposed		27.37	2.47	3.57		27.13	2.97	4.07	4.2
North Fork South Littlejohns Creek	Existing	30.16	27.39	2.77	4	29.88	27.23	2.65	3.88	3.8
	Proposed		27.40	2.76	3.99		27.23	2.65	3.88	3.8

[1]Average velocity was calculated using upstream and downstream velocities at the face of the bridge.

The hydraulic model uses bridge low cord elevations that were obtained from a field survey conducted by KSN. The vertical datum for this survey is NGVD 29. These field survey elevations are consistently lower than the low cord elevations shown in the record drawings received from Caltrans and the FEMA FIS profiles by 1 ft to 2 ft. As stated in a memorandum by KSN, this low cord elevation discrepancy is primarily due to changes in the published NGVD 29 benchmark elevations that have occurred over time. This memorandum is included in **Appendix C**.

3.3 Scour

Total potential scour at a bridge usually consists of long term stream aggradation/degradation, contraction scour, and local scour. Other forms scour such as bend scour, planiform changes, scour due to formation of dunes are assumed to be negligible. Based on field reconnaissance, it was assumed that the three streams in this project are relatively stable. No evidence of stream channel lateral movement, streambed aggradations, or degradation was observed. Therefore, the streambed degradation was assumed to be zero. Contraction scour at a bridge occurs due to constriction of active flow by roadway embankments. Structures placed in a flowing channel may interact with existing forces to contribute to increased local sediment transport that leads to local scour. This analysis predicts the potential contraction at the bridges and local scour at the bridge pier and abutments. Proposed geometry and 100-year flow values were used in the analysis.

Effect of debris on scour depths was not modeled at these bridges. HDR has contacted the San Joaquin County Department of Public Works and has been informed that the existing bridges do not have a history of significant debris potential.

The existing soil conditions were obtained from records obtained by Blackburn Consulting. According to these records, the d_{50} particle size ranges from 0.008mm to 0.015mm. This report used an assumed value of 0.010 mm to be conservative.

Table 5 provides a summary of potential scour based on HEC-RAS hydraulic modeling. Plots showing the anticipated scour depth and the anticipated location of the stream bed after the scouring of the stream bed are included in **Appendix G**. The details of the scour calculations are also included in **Appendix G**. Please note that the model has calculated a conservative local scour depth at each pile. Many of the existing piles for these structures are imbedded in slope paving underneath the structures. Local scour for these piles may be neglected.

The Caltrans Bridge Inspection Records Information System (BIRIS) for South Fork South Littlejohns Creek dated July 23, 2004 recommends the following scour countermeasures:

1. Placing Rock Slope Protection (RSP) on the north channel bank from 20 ft upstream of the bridge to 20 ft downstream of the bridge. Recommended design is Backing No. 1 (W50 = 75lb), RSP fabric Type A, Method B placement, minimum layer thickness 2.0 ft, maximum slope steepness 1.5:1 (H:V). The toe of the rock slope is to be embedded

in the channel bed to elevation 14.0 ft or constructed with a mounded toe 4 ft high x 2 ft thick (refer to "California Bank and Shore Rock Slope Protection Design" , Report No. FHWA-CA-TL-95-10, for additional details regarding the mounded toe design). Estimated quantities are 150 cubic yards and 260 square yards of RSP fabric.

2. Construct a supplemental concrete cutoff wall adjacent to and along the full length of the existing cutoff wall in Bent 2. Bottom of wall to be at elevation 15.0 ft or deeper.

3. Remove the debris under the bridge and remove the tree in the channel upstream of Bent 3.

Implementation of these scour countermeasures will significantly reduce potential scour beneath the SR 99 crossing at South Fork South Littlejohns Creek. HDR recommends that these countermeasures be incorporated into the bridge design documents.

Table 5. Scour Summary

Lone Tree Slough – SR-99								
Sub-Structure	Existing Upstream Channel Elevation (NGVD 29, ft)	Existing Downstream Channel Elevation (NGVD 29, ft)	Final Upstream Channel Elevation (NGVD 29, ft)	Final Downstream Channel Elevation (NGVD 29, ft)	Assumed D_{50} (mm)	Estimated Contraction Scour (ft)	Estimated Local Scour (ft)	Estimated Total Scour (ft)
Left Abutment	30.52	30.38	30.52	30.38	0.01	0.00	0.00	0.00
Pier 1	23.44	23.30	18.99	18.85	0.01	0.85	3.60	4.45
Pier 2	23.36	23.23	18.91	18.78	0.01	0.85	3.60	4.45
Right Abutment	30.39	30.27	30.39	30.27	0.01	0.00	0.00	0.00
Lone Tree Slough – Proposed Off Ramp								
Sub-Structure	Existing Upstream Channel Elevation (NGVD 29, ft)	Existing Downstream Channel Elevation (NGVD 29, ft)	Final Upstream Channel Elevation (NGVD 29, ft)	Final Downstream Channel Elevation (NGVD 29, ft)	Assumed D_{50} (mm)	Estimated Contraction Scour (ft)	Estimated Local Scour (ft)	Estimated Total Scour (ft)
Left Abutment	30.35	29.67	30.35	29.67	0.01	0.00	0.00	0.00
Pier 1	23.31	23.17	20.01	19.87	0.01	0.18	3.12	3.30
Pier 2	23.53	23.88	20.23	20.58	0.01	0.18	3.12	3.30
Right Abutment	29.43	28.90	28.91	28.38	0.01	0.00	0.52	0.52
South Fork South Littlejohns Creek – SR-99								
Sub-Structure	Existing Upstream Channel Elevation (NGVD 29, ft)	Existing Downstream Channel Elevation (NGVD 29, ft)	Final Upstream Channel Elevation (NGVD 29, ft)	Final Downstream Channel Elevation (NGVD 29, ft)	Assumed D_{50} (mm)	Estimated Contraction Scour (ft)	Estimated Local Scour (ft)	Estimated Total Scour (ft)
Left Abutment	28.17	27.01	24.32	23.16	0.01	0.74	3.11	3.85
Pier 1	23.08	24.94	17.90	19.76	0.01	0.38	4.80	5.18
Pier 2	18.83	18.71	13.65	13.53	0.01	0.38	4.80	5.18
Pier 3	20.16	20.46	14.98	15.28	0.01	0.38	4.80	5.18
Right Abutment	28.48	25.57	24.91	22.00	0.01	0.46	3.11	3.57
North Fork South Littlejohns Creek – SR-99								
Sub-Structure	Existing Upstream Channel Elevation (NGVD 29, ft)	Existing Downstream Channel Elevation (NGVD 29, ft)	Final Upstream Channel Elevation (NGVD 29, ft)	Final Downstream Channel Elevation (NGVD 29, ft)	Assumed D_{50} (mm)	Estimated Contraction Scour (ft)	Estimated Local Scour (ft)	Estimated Total Scour (ft)
Left Abutment	29.44	26.33	29.44	26.33	0.01	0.00	0.00	0.00
Pier 1	22.15	18.02	17.48	13.35	0.01	0.32	4.35	4.67
Pier 2	19.66	20.77	14.99	16.10	0.01	0.32	4.35	4.67
Right Abutment	29.04	26.87	29.04	26.87	0.01	0.00	0.00	0.00

4.0 Findings & Conclusion

The purpose of this report is to evaluate the existing and proposed hydraulics at the proposed SR-99 creek crossings located at North Fork South Littlejohns Creek, South Fork South Littlejohns Creek, and Lone Tree Creek. The proposed improvements include median decking, shoulder widening, and a new separate off-ramp bridge at Lone Tree Creek.

A hydraulic model was created using the United States Army Corps HEC-RAS program version 3.1.3 (2009) and version 4.0 in 2010. An electronic copy of this model on CD can be found inside the back cover of this report.

Table 4 summarizes the bridge low cord elevations, the upstream and downstream water surface elevations, and the soffit clearance for existing and proposed conditions model results for the current project model. **Table 4** shows a soffit clearance of 2 ft for the 50-year flood event for the proposed and existing conditions. Also, the HEC-RAS model results show that the 100-year floods are conveyed through the bridges without overtopping. The December 16, 2005 FEMA FIS profile also indicates a soffit clearance of 2 ft or greater over the 50-year water surface elevations for the three existing bridges. The existing bridge low cord elevations (surveyed by KSN) are consistently lower than the low cord elevations shown in the record drawings received from Caltrans and the FEMA FIS profiles by 1.16ft to 1.98 ft. As stated in a memorandum by KSN, this low cord elevation discrepancy is primarily due to changes in the published NGVD 29 benchmark elevations that have occurred over time. This memorandum is included in **Appendix C**. Downstream water surface elevations were lowered by 1.16 and 1.26 for South Fork South Littlejohns Creek and Lone Tree Creek respectively to conform to the 2005 KSN survey benchmarks.

Table 5 provides a summary of potential scour based on HEC-RAS hydraulic modeling. Plots showing the anticipated scour depth and the anticipated location of the stream bed after the scouring of the stream bed are included in **Appendix G**. The model has calculated a conservative local scour depth at each pile. Many of the existing piles for these structures are imbedded in slope paving underneath the structures. Local scour for these piles may be neglected.

HDR recommends placing rock slope protection (RSP) within South Fork South Littlejohns Creek on the north channel bank from 20 ft upstream of the bridge to 20 ft downstream of the bridge and construction of a supplemental concrete cutoff wall adjacent to and along the full length of the existing cutoff wall in Bent 2 in order to eliminate the scour potential that exists at this crossing.

4.1 HEC-RAS Electronic Files

Table 6 lists the HEC-RAS file names and descriptions for the electronic version of the HEC-RAS hydraulic model.

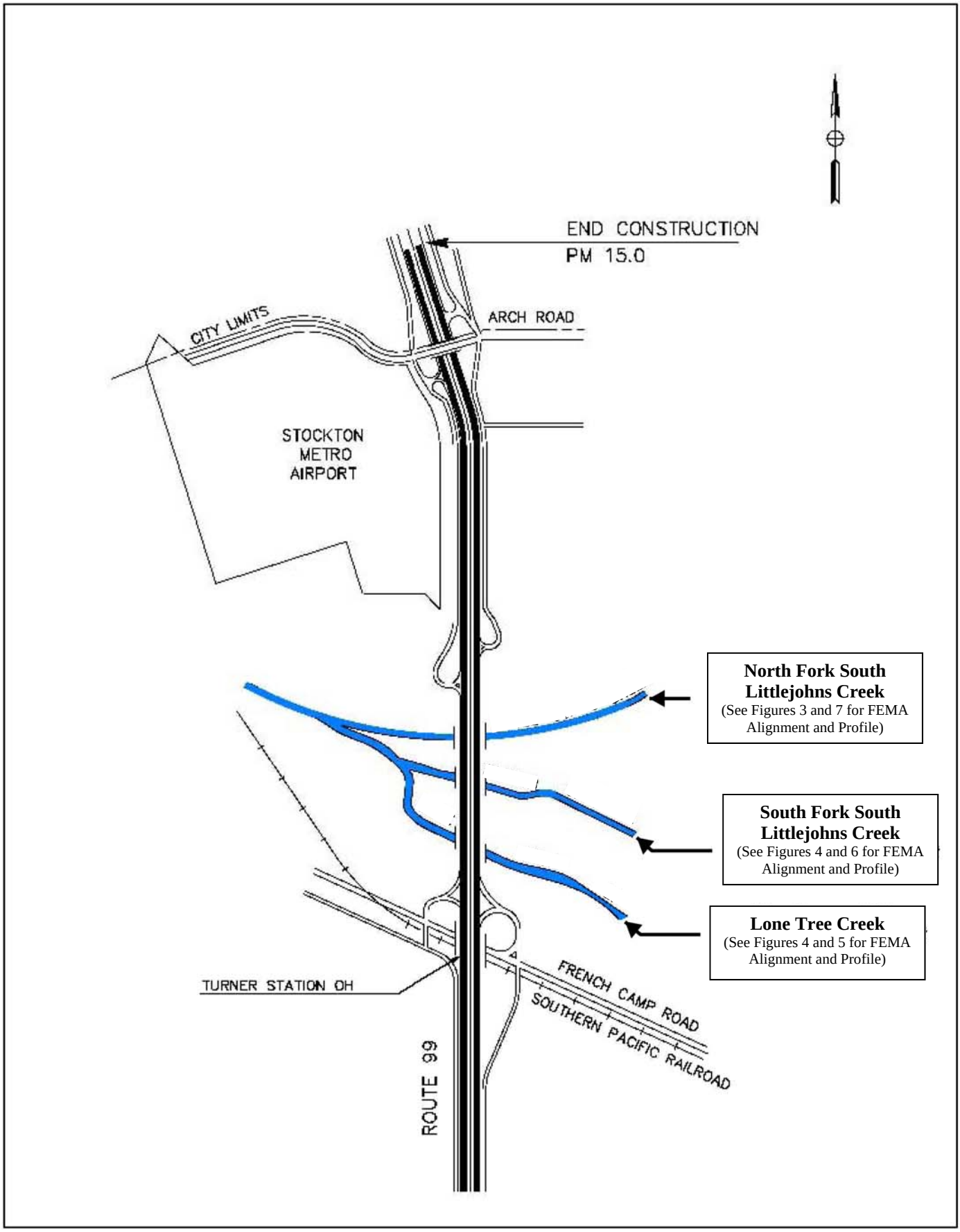
Table 6. HEC-RAS Electronic File Descriptions

Type of File	File Description	File Name
HEC-RAS Project File	SR–99 Widening	SR99_Widening.prj
Floodplain Plan File	Existing Conditions	SR99_Widening.p01
Floodplain Geometry File	Existing Geometry	SR99_Widening.g01
Floodplain Steady Flow File	FEMA December 16, 2005 Flows	SR99_Widening.f02
Floodplain Plan	Proposed SR99 Improvements	SR99_Widening.p02
Floodplain Geometry File	Proposed Geometry	SR99_Widening.g02
Floodplain Steady Flow File	FEMA December 16, 2005 Flows	SR99_Widening.f02
Floodplain Plan	Existing Conditions no RR below SR-99	SR99_Widening.p03
Floodplain Geometry File	Existing Conditions no RR below SR-99	SR99_Widening.g03
Floodplain Steady Flow File	FEMA December 16, 2005 Flows	SR99_Widening.f02
Floodplain Plan	Proposed SR99 Improv. With Domenichelli flows.	SR99_Widening.p04
Floodplain Geometry File	Proposed Geometry	SR99_Widening.g02
Floodplain Steady Flow File	Domenichelli 100 yr flows	SR99_Widening.f01

5.0 References

- Flood Insurance Study: San Joaquin County, California, Unincorporated Areas, dated December 16, 2005 by FEMA.
- FEMA, Guidelines and Specifications for Flood Hazard Mapping Partners, April 2003.
- The U.S. Army Corps of Engineers (USACE) program.
- The FEMA FIRM Panel Number 0602990465 C dated April 2, 2002 for the San Joaquin County, California, Unincorporated Areas.
- The FEMA FIRM Panel Number 0602990605 B dated December 16, 2005 for the San Joaquin County, California, Unincorporated Areas.

Appendix A - Figure 2 Creek Crossings



SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

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Figure 2-Creek Crossings

Appendix B - FEMA FIRM Panels and FIS Profile Plots

FLOOD INSURANCE STUDY

SAN JOAQUIN COUNTY, CALIFORNIA

UNINCORPORATED AREAS

VOLUME 3 OF 3

REVISED:
DECEMBER 16, 2005

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
060299V003A

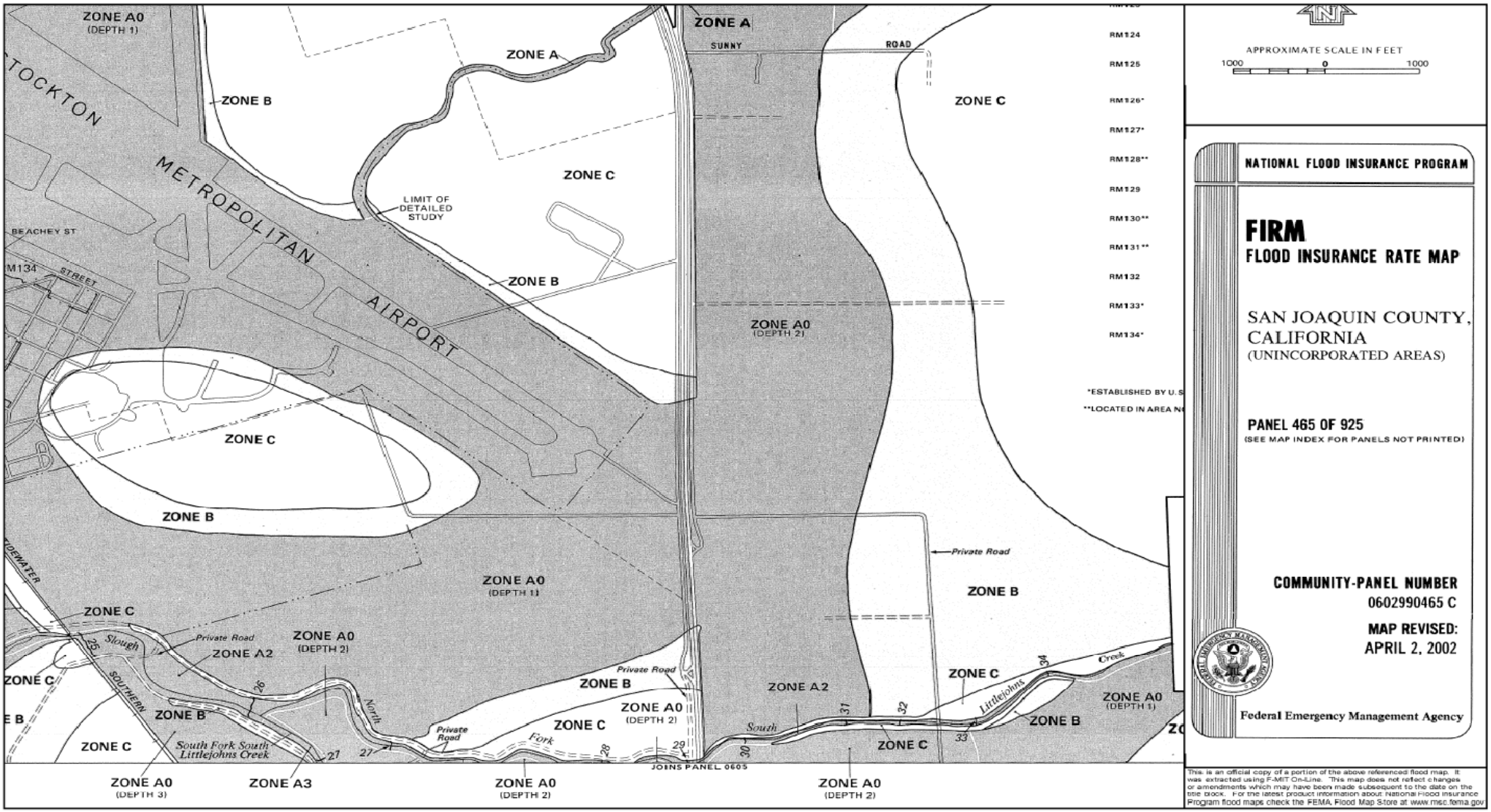

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Figure 3

SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Appendix B

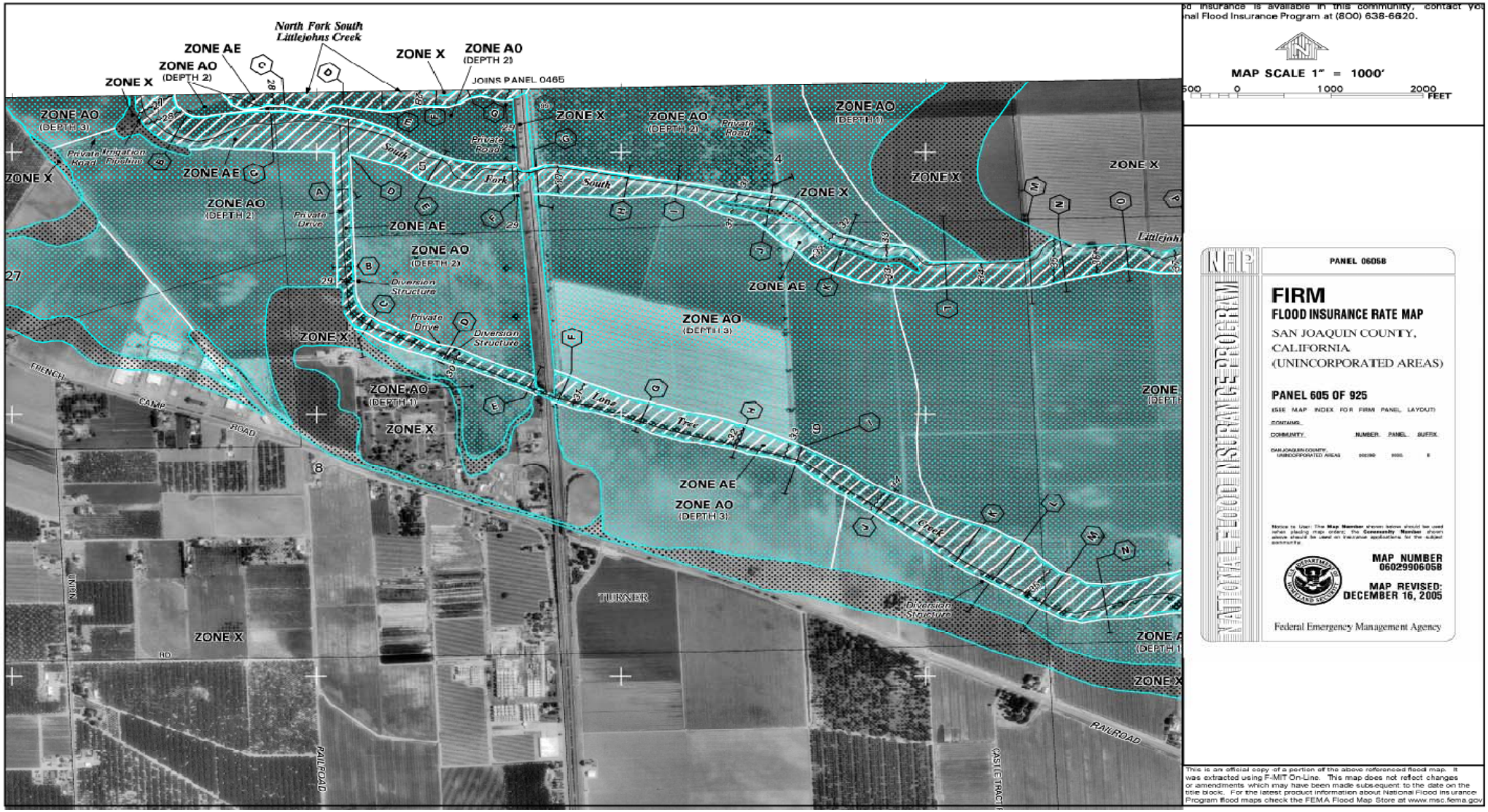
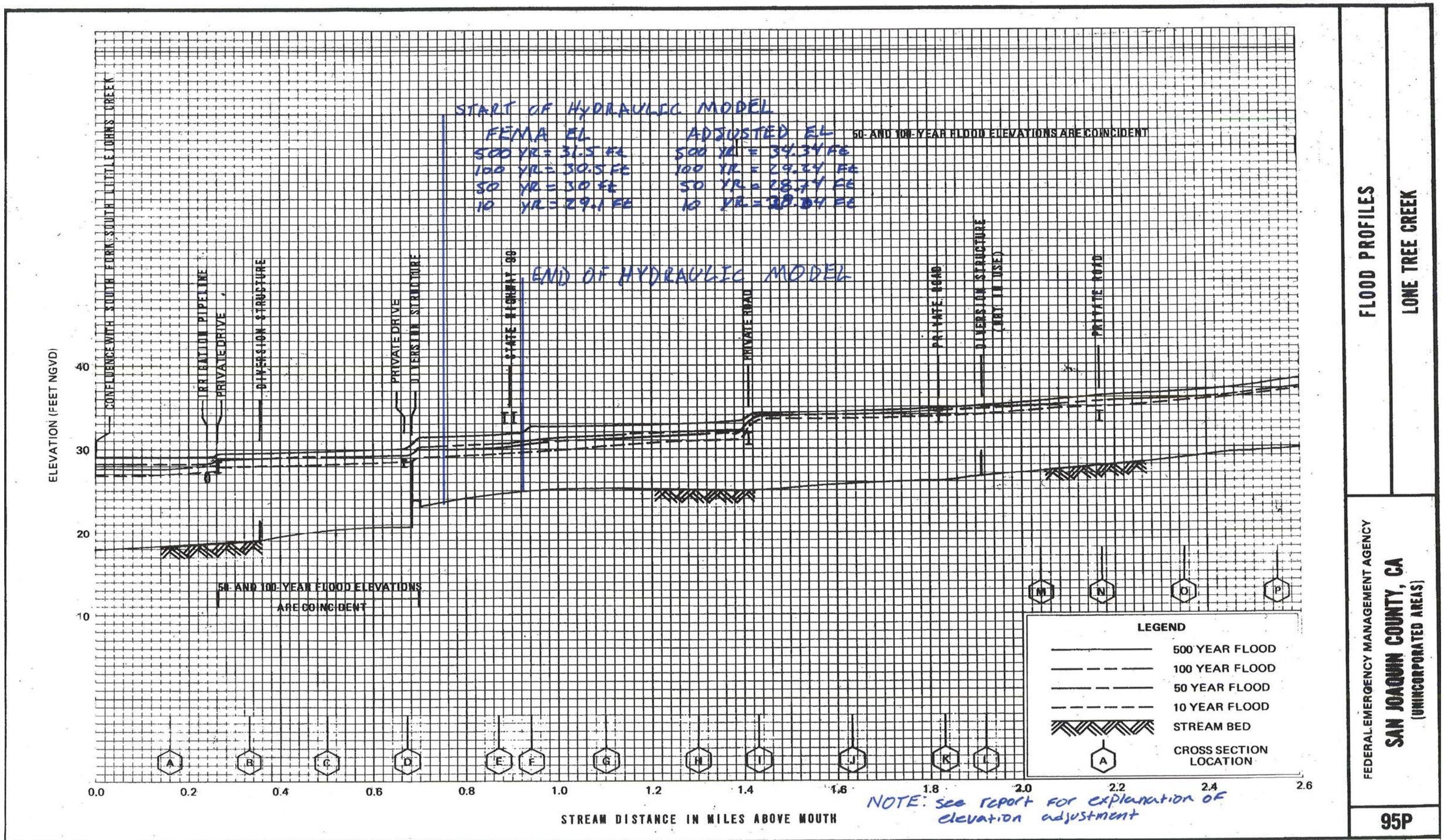

North Fork South Littlejohns Creek
ZONE AE
ZONE AO (DEPTH 2)
ZONE X
ZONE A0 (DEPTH 2)
JOINS PANEL 0465
ZONE AO (DEPTH 3)
ZONE AO (DEPTH 1)
ZONE AO (DEPTH 2)
ZONE AO (DEPTH 3)
Private Road
Irrigation Pipeline
Private Drive
Diversion Structure
South Fork
Long Tree Creek
Littlejohn
FRENCH CAMP ROAD
TURNER
RAILROAD
CASTLE TRACT
MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
PANEL 0605B
FIRM
FLOOD INSURANCE RATE MAP
SAN JOAQUIN COUNTY, CALIFORNIA (UNINCORPORATED AREAS)
PANEL 605 OF 925
MAP NUMBER 06029906058
MAP REVISED: DECEMBER 16, 2005
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM

Figure 4



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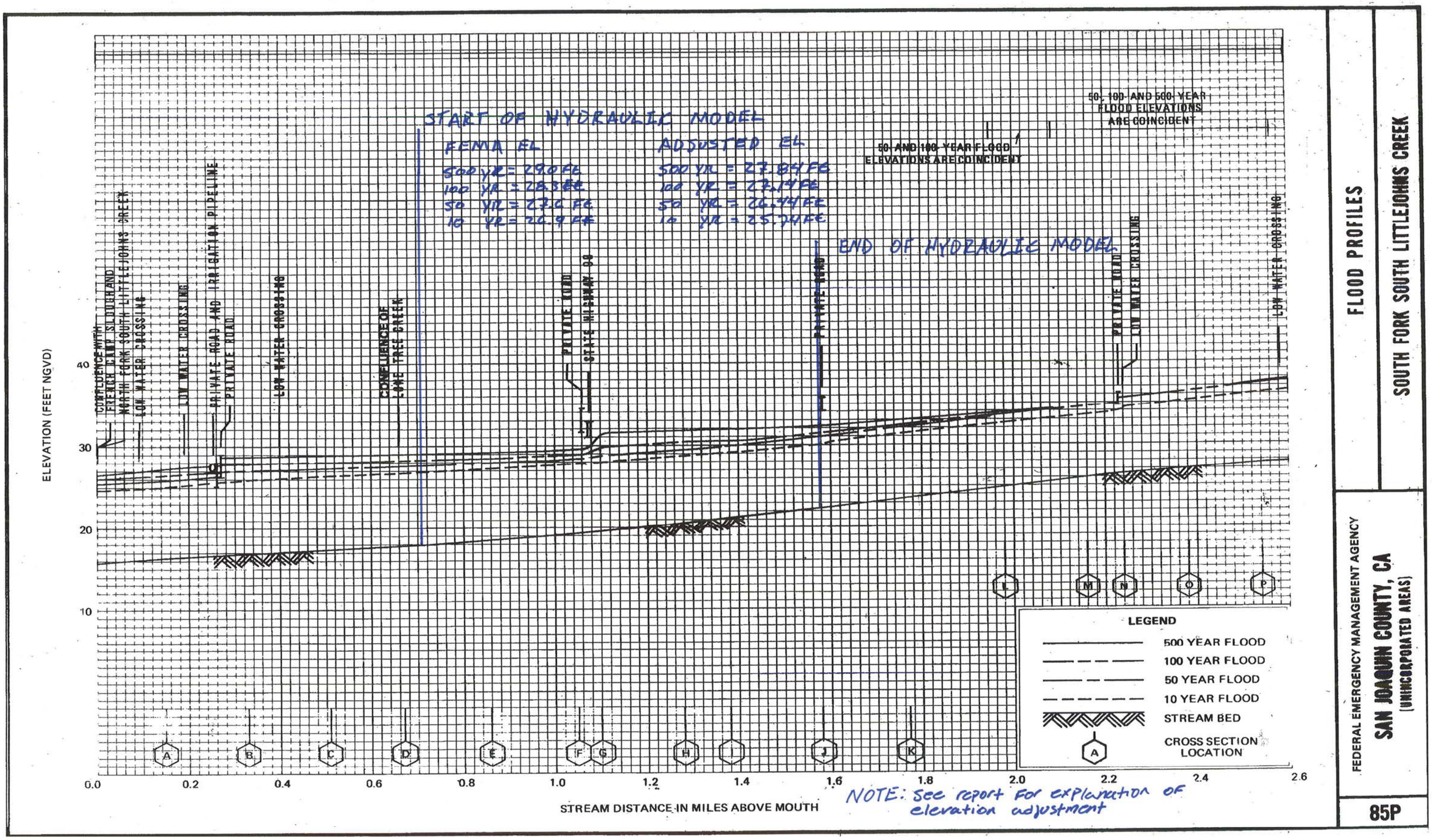
SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Figure 5 – Lone Tree Creek - Appendix B



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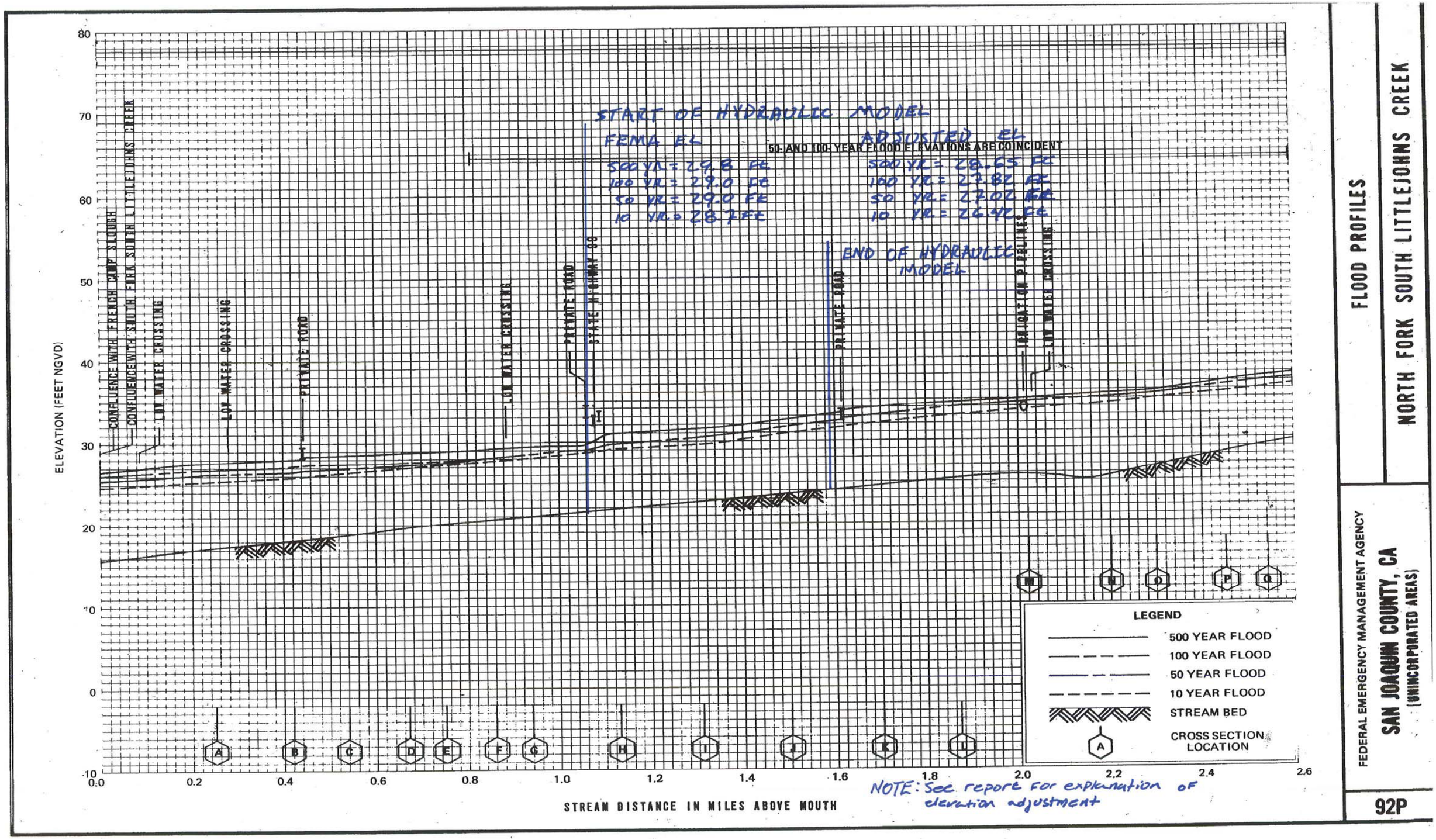
SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Figure 6 – South Fork South Littlejohns Creek - Appendix B



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SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Figure 7 – North Fork South Littlejohns Creek - Appendix B

Appendix C - KSN Survey Memorandum

KJELDSEN, SINNOCK & NEUDECK, INC.
CIVIL ENGINEERS AND LAND SURVEYORS

STEPHEN K. SINNOCK
CHRISTOPHER H. NEUDECK

KENNETH L. KJELDSEN
RETIRED

711 NORTH PERSHING AVENUE
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STOCKTON, CALIFORNIA 95201-0844

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FAX (209) 946-0296
E-MAIL ksn@ksninc.com

2071-0010
04-001

December 4, 2008

Mr. Lance Jones
HDR Engineering
2365 Iron Point Road - Suite 300
Folsom, California 95630

Re: City of Stockton Benchmarks vs. 2002 FEMA FIRM Map Benchmarks
SR99 Widening Project, Stockton

Dear Mr. Jones,

The purpose of this letter is to provide a brief summary of the results of our comparison of the benchmark elevations shown on the 2002 FEMA FIRM Map (Community Panel Number 0602990465 C) with the elevations for the same benchmarks as shown in the City of Stockton Benchmark Book (2003 Revision). The datum for both the FIRM benchmarks and the City of Stockton's benchmarks is clearly defined in the two documents as being NGVD 29. We compared the elevations of six of the benchmarks shown on the FIRM map, with the elevations for the same benchmarks as listed in the City of Stockton Benchmark Book. We would expect the benchmark elevations from the two sources would be very similar as both documents are on the same datum. If there is a difference in the benchmark elevations shown in the two sources, (a datum shift) it should be a uniform difference at each benchmark. Unfortunately, we did not find that a consistent elevation shift could be applied to move between the two versions of the NGVD 29 Datum. The elevation shift between the two versions of the NGVD 29 Datum ranged from as little as 0.48 feet, to as large as 1.79 feet. The table attached to this letter summarizes the elevations for each of the six benchmarks as shown on the two documents.

This variation is larger than we would normally expect when comparing survey control from separate projects on the same vertical datum. We frequently work with the City of Stockton's NGVD 29 benchmark data and have found it to be very reliable and accurate. Our control surveys for the project were tied City of Stockton benchmarks and closed well within acceptable tolerances. Our control closure reports and the benchmarks used as the basis of our control have been reviewed and approved by the CALTRANS District 10 Survey Department. We do not have any information on the control survey or the closure reports that were prepared for the FIRM maps. We recommend a closer examination of the benchmark elevations provided on the FIRM maps as the next logical step in resolving the discrepancies between the benchmark elevations shown in the two documents. This examination might include the following tasks:

- Research to determine the method used to establish the benchmark elevations shown on the FIRM maps in the project area.

- Field surveys to determine if the actual measured elevation differences between the six benchmarks match the calculated elevation differences between the six benchmarks using the elevations shown on the FIRM maps.

However, even if this work is completed, it is possible that we will still be unable to determine the exact cause of the large variation between elevation differences of the six benchmarks, and that no convenient single elevation shift can be applied to translate the elevations from the project vertical datum to the vertical datum used for the FIRM maps.

Please do not hesitate to contact me with any questions about this issue. KSN would be happy to work with HDR on any further tasks that are required to resolve this issue.

Sincerely,
KJELDSEN, SINNOCK & NEUDECK, INC.

Landon Blake
Professional Land Surveyor (PLS 8489)

w/enclosures
Benchmark Elevation Comparison Table

PROFESSIONAL LAND SURVEYOR
SCOTT L. BLAKE
No. 8489
Exp. 12-31-2008
STATE OF CALIFORNIA

2008-12-04

SR-99 Widening Bench Marks
FEMA FIRM 2002 NGVD 29 Versus
City of Stockton NGVD 29 (2003)

FEMA FIRM BM Identifier	City of Stockton BM Identifier	BM Marking/Stamping	2002 FIRM NGVD 29 Elevation	COS NGVD 29 Elevation	Elevation Difference
RM 126	PID HS0757	W 958 1962	33.602	31.81	1.792
RM 127	PID HS0758	X 958 1962	37.897	36.51	1.387
RM 129	COS 331	QP-27.5B	33.256	32.63	0.626
RM 130	COS 330	QP-27.5A	34.631	34.15	0.481
RM 133	PID HS0104	J 745 1945	22.766	21.99	0.776
RM 134	PID HS0103	H 745 1945	22.579	22.00	0.579

November 3, 1982

BENCH MARK RELATIONSHIPS

Before 1958, many agencies used different datum in establishing their vertical controls and bench marks. After 1958, most of the agencies converted their datum to a common plane.

The U.S. Geological Survey and U.S. Coast and Geologic Survey, now N.G.S., use the Mean Sea Level (1929) as their zero (0) vertical datum.

The U.S. Army Corps of Engineers (C.O.E.) uses Mean Lower Low Sea Level datum, 3' below the 1929 zero (0) as their datum.

Since the conversions were made in 1958, some of the older bench marks may not have been converted to the proper datum. If there is a question about a bench mark, you can call the appropriate agency, give them all the information stamped on the B.M., and they will tell you the current elevation as well as correction factor, if any.

U.S. Geological Survey, U.S.C.&G.S. or N.G.S. bench mark information can be obtained from the U.S.G.S. in Menlo Park, California, Control Section, at (415) ~~323-8111,~~ Ext. 2421. Give them the 15 Minute Quad Name, and B.M. information. ~~853-8300~~

U.S.E.D. or C.O.E. bench mark information can be obtained from the C.O.E. Survey Section, in Sacramento, California, at (916) 440-3364.

U.S.G.S. / N.C.I.C.
mail Stop 532
345 Middle field Road
Menlo Park, Ca 94025

U.S.G.S. Bench Marks
Denver Geodetic Control
Ph. 1-303-202-4160

N.G.S.
Silver Springs, Maryland
1-301-713-3242

JANUARY 1967

U.S. DEPARTMENT OF COMMERCE
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
COAST AND GEODETIC SURVEY

VERTICAL CONTROL DATA

by the
Coast and Geodetic Survey
SEA-LEVEL DATUM OF 1929

QUAD 371211 PAGE NO. 5
CALIFORNIA
LATITUDE 37°30' to 38°00'
LONGITUDE 121°00' to 121°30'
DIAGRAM NJ 10-9 SAN JOSE

LINE 103 (Continued) - - ADJUSTED ELEVATIONS

BENCH MARK	201	L-198	L-5481	L-8467	L-8700	L-11271	L-12098 L-12103	L-12303	L-14018 L-14019	L-16351	L-16636	L-17613	L-17977	L-18196	L-18974 L-18977	L-19598	L-20559
	1912 First-order (Feet)	1930 First-order (Feet)	1935 Second-order (Feet)	1939 Second-order (Feet)	1939 First-order (Feet)	1944-45 First-order (Feet)	1946-47 First-order (Feet)	1947 First-order (Feet)	1951 First-order (Feet)	1957 First-order (Feet)	1958 First-order (Feet)	1959 Second-order (Feet)	1960 First-order (Feet)	1961 First-order (Feet)	1963 First-order (Feet)	1963-64 First-order (Feet)	1965-66 First-order (Feet)
D 9 RESET 1936			20.118					19.833	19.554	19.039	19.039	18.944	18.773		18.317	18.218	
E 9=TIDAL BM	23.228		23.127		22.972	22.890		22.844	22.559	21.968	21.952		21.663		21.174	21.070	
C 745						25.338		25.328	25.089	24.564	24.564		24.278		23.907	23.822	
K 943											16.690		16.407				
K 943 RESET 1963															16.047	15.971	
D 745						22.795		22.795	22.516	21.962	21.962		21.680		21.306	21.224	

SPUR LINE TO STOCKTON FIELD

BENCH MARK	201	L-198	L-5481	L-8467	L-8700	L-11271	L-12098 L-12103	L-12303	L-14018 L-14019	L-16351	L-16636	L-17613	L-17977	L-18196	L-18974 L-18977	L-19598	L-20559
T 745						20.568			20.420								
MUELLER 1933						18.360											
E 745						21.450			21.352		21.253						
F 745						20.361			20.285		20.223						
K 745						20.387			20.364								
R 934											20.902						
G 745						21.152			21.037		20.978						
EFS 13 L											22.9						
BM 2						21.765			21.749								
H 745						22.664			22.644		22.579						
J 745						22.766			22.766								
S 934											22.854						
EFS 14 L											26.6						
HIGH POINT											27.5						

END OF THE SPUR LINE

BENCH MARK	201	L-198	L-5481	L-8467	L-8700	L-11271	L-12098 L-12103	L-12303	L-14018 L-14019	L-16351	L-16636	L-17613	L-17977	L-18196	L-18974 L-18977	L-19598	L-20559
A 833								22.152	22.011		21.824				21.421	21.378	
Z 832								18.136	18.045		18.002				17.841	17.841	
EFS 10																19.1	
Y 832								12.654	12.566		12.566				12.425	12.425	
B 9 (USGS)	14.029		14.029														
EFS 11 L											20.8						
X 832 RESET 1948								16.092	15.968		15.922	15.883			15.732	15.732	

Appendix D - FEMA FIS Summary of Discharges Table

FLOOD INSURANCE STUDY

SAN JOAQUIN COUNTY, CALIFORNIA

UNINCORPORATED AREAS

VOLUME 1 OF 3

REVISED:
DECEMBER 16, 2005

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
060299V001A

TABLE 6. SUMMARY OF DISCHARGES (cont.)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Yea
French Camp Slough[1]					
Mouth (San Joaquin River)	474.2	2,380	4,270	4,780	10,17C
Mouth of Walker Slough	474.2	2,380	4,270	4,375	10,17C
El Dorado Street	414.0	2,080	2,380	3,970	6,905
Airport Way	394.8	2,080	2,735	3,565	3,89C
Source	335.1	2,080	2,840	3,855	5,87C
Walker Slough					
Mouth (French Camp Slough)	56.2	385	760	1,240	3,20C
Source (Duck Creek)	52.1	385	760	1,150	1,49C
Duck Creek[2]					
Terminus (Walker Slough)	52.1	385	760	1,150	1,49C
B Street	51.1	285	585	920	1,20C
State Highway 99	50.1	285	585	920	2,045
Atchison, Topeka & Santa Fe Railway	43.3	295	585	785	1,98C
State Highway 4	42.4	320	610	800	1,005
Jack Tone Road	40.0	345	635	825	1,765
Hollenbeck Road	37.0	365	665	840	995
Drais Road	34.0	420	745	915	1,46C
Hewitt Road	32.0	505	885	1,070	2,585
Southern Pacific Railroad	30.0	595	1,000	1,215	2,935
Escalon-Bellota Road	29.2	295	1,000	1,215	1,675
South Fork South Littlejohns Creek[3,4]					
Terminus (French Camp Slough)	321.9	1,250	1,895	2,900	4,37C
State Highway 99	234.1	1,095	1,420	2,600	4,01C
Austin Road	232.0	1,095	1,480	1,550	1,70C
Kaiser Road	230.0	1,095	1,410	1,425	1,67C
Jack Tone Road	228.0	1,095	1,425	1,800	2,035
Source (Bifurcation, North and South Forks	226.7	1,095	1,425	1,810	2,255

[1]Flows for 10-, 50-, 100-, and 500-year floods reflect overbank gains and losses Source of slough is the confluence of the North and South Forks of South Littlejohn Creek.

[2]Decrease in volume of 10-, 50-, and 100-year floodflows in a downstream directio results from channel routing losses. Fluctuation in 500-year floodflow results fro channel routing losses and overbank gains (principally from Mormon Slough) an overbank losses.

[3]Anabranch channel of South Littlejohns Creek

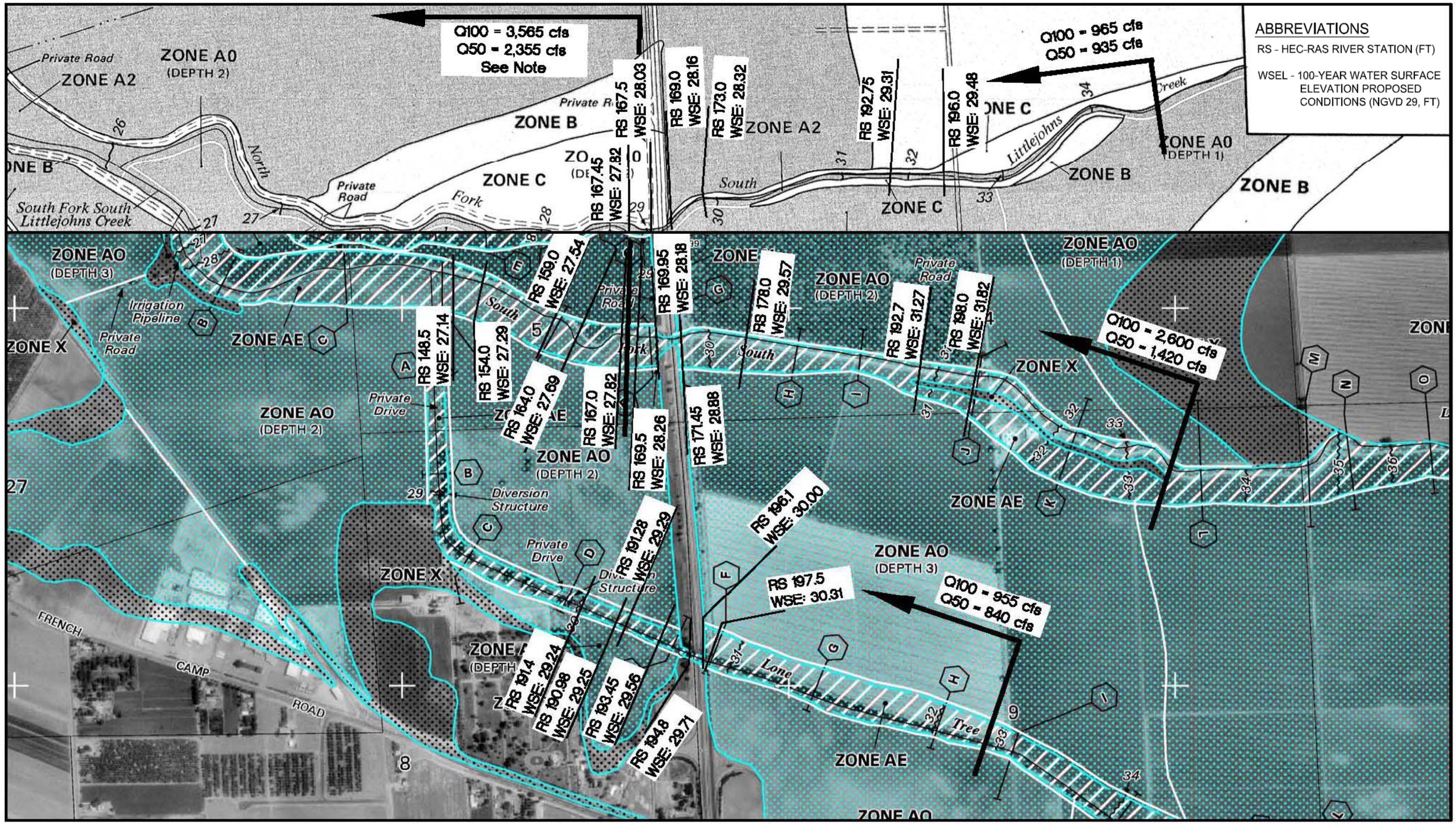
[4]Flows shown reflect overbank gains and losses and (for 500-year flood) tributar inflow.

TABLE 6. SUMMARY OF DISCHARGES (cont.)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
South Littlejohns Creek[1]					
Terminus (bifurcation, North and South Forks)	226.7	1,095	1,425	1,810	2,255
Mariposa Road	224.0	1,800	2,500	2,575	2,725
Van Allen Road	219.0	1,800	2,270	3,675	3,805
Source (bifurcation, North and South Littlejohns Creeks)	217.0	1,890	2,270	4,805	5,235
Littlejohns Creek[2]					
Terminus (bifurcation, North and South Littlejohns Creeks)	217.0	1,890	3,750	4,805	5,235
Escalon-Bellota Road	215.9	1,890	3,750	4,860	5,310
Duck Creek Diversion	213.0	1,890	3,750	6,335	8,620
Farmington Dam	200.0	---[3]	---[3]	---[3]	---[3]
North Fork South Littlejohns Creek[4,5]					
Terminus (French Camp Slough)	321.9	730	815	955	1,520
State Highway 99	234.1	730	935	965	1,550
Austin Road	232.0	730	940	1,025	1,100
Kaiser Road	230.0	730	820	1,115	1,315
Atchison, Topeka & Santa Fe Railway	226.7	720	775	960	1,625
Source (bifurcation, North and South Forks)	226.0	720	775	780	785
Lone Tree Creek[6]					
Terminus (South Fork South Littlejohns Creek)	87.8	455	645	690	825
State Highway 99	86.0	570	840	955	1,630
Austin Road	83.4	345	435	475	525
Jack Tone Road	37.5	270	285	405	485
Murphy Road	33.1	145	150	160	185
Carrolton Road	33.1	395	395	475	545
Atchison, Topeka & Santa Fe Railway	28.7	405	415	450	640
Brennan Road	22.5	695	740	970	2,090
Escalon-Bellota Road	18.9	620	915	1,200	1,680

[1]Decrease in volume of flow in a downstream direction reflects overbank losses and gains.
[2]Decrease in volume of 100- and 500-year floods in a downstream direction results from overbank and channel routing losses.
[3]Outflow will vary according to local conditions affecting project operation.
[4]Anabranch Channel of South Littlejohns Creek
[5]Decrease in 50-year floodflow results from overbank losses. Fluctuation in 100- and 500-year floodflows reflects overbank losses and gains, including overland inflow from South Fork South Littlejohns Creek.
[6]Fluctuations in flows shown result from overbank losses and gains and tributary inflow.

Appendix E - HEC-RAS Cross Section Layouts



Note: Flow is the accumulation of the flows from North Fork South Littlejohns Creek and South Fork South Littlejohns Creek

SCALE = NOT TO SCALE

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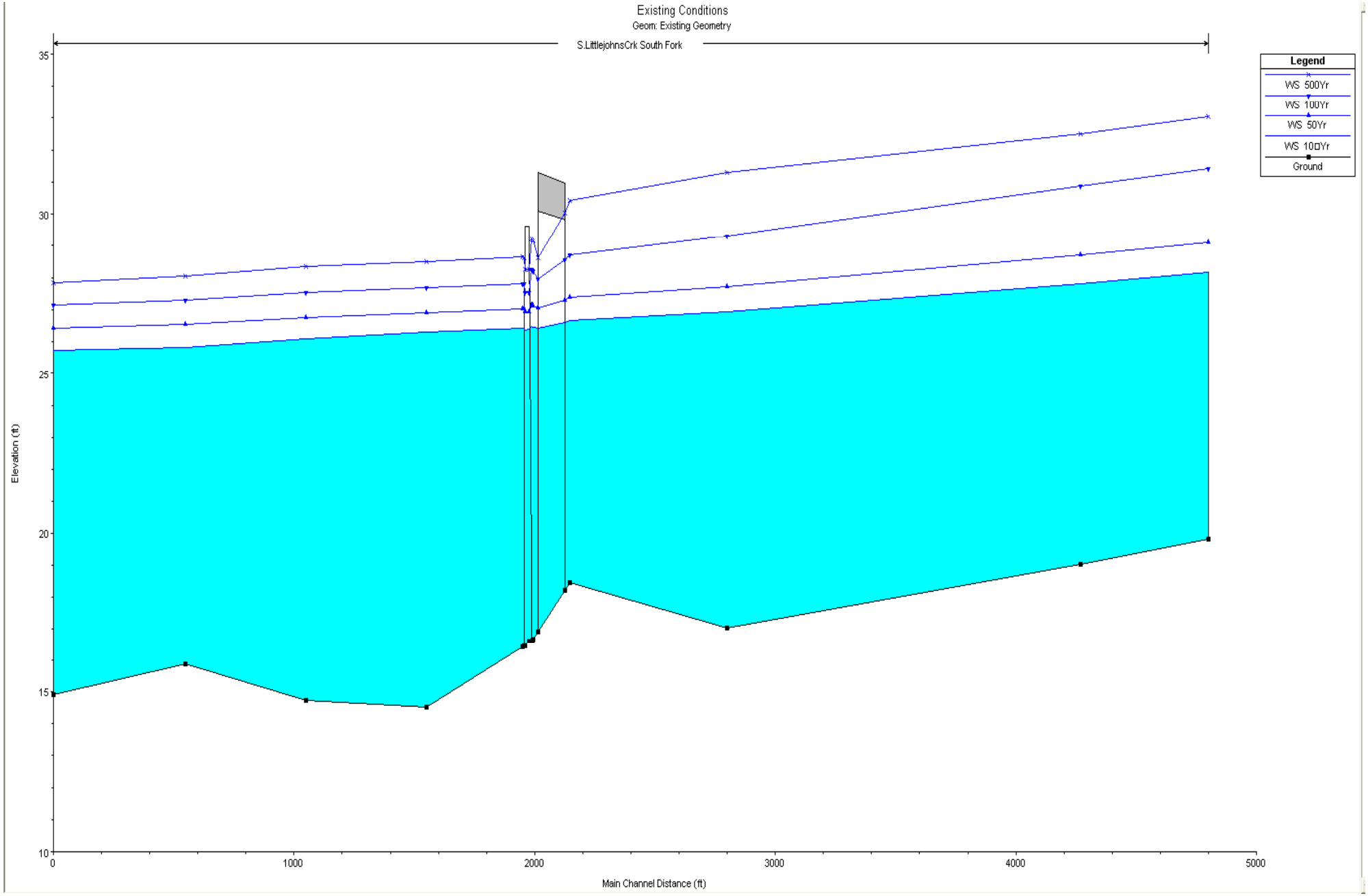
SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Figure 8 - Appendix E

Appendix F - HEC-RAS Profile and Summary Tables



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South Fork South Littlejohns Creek

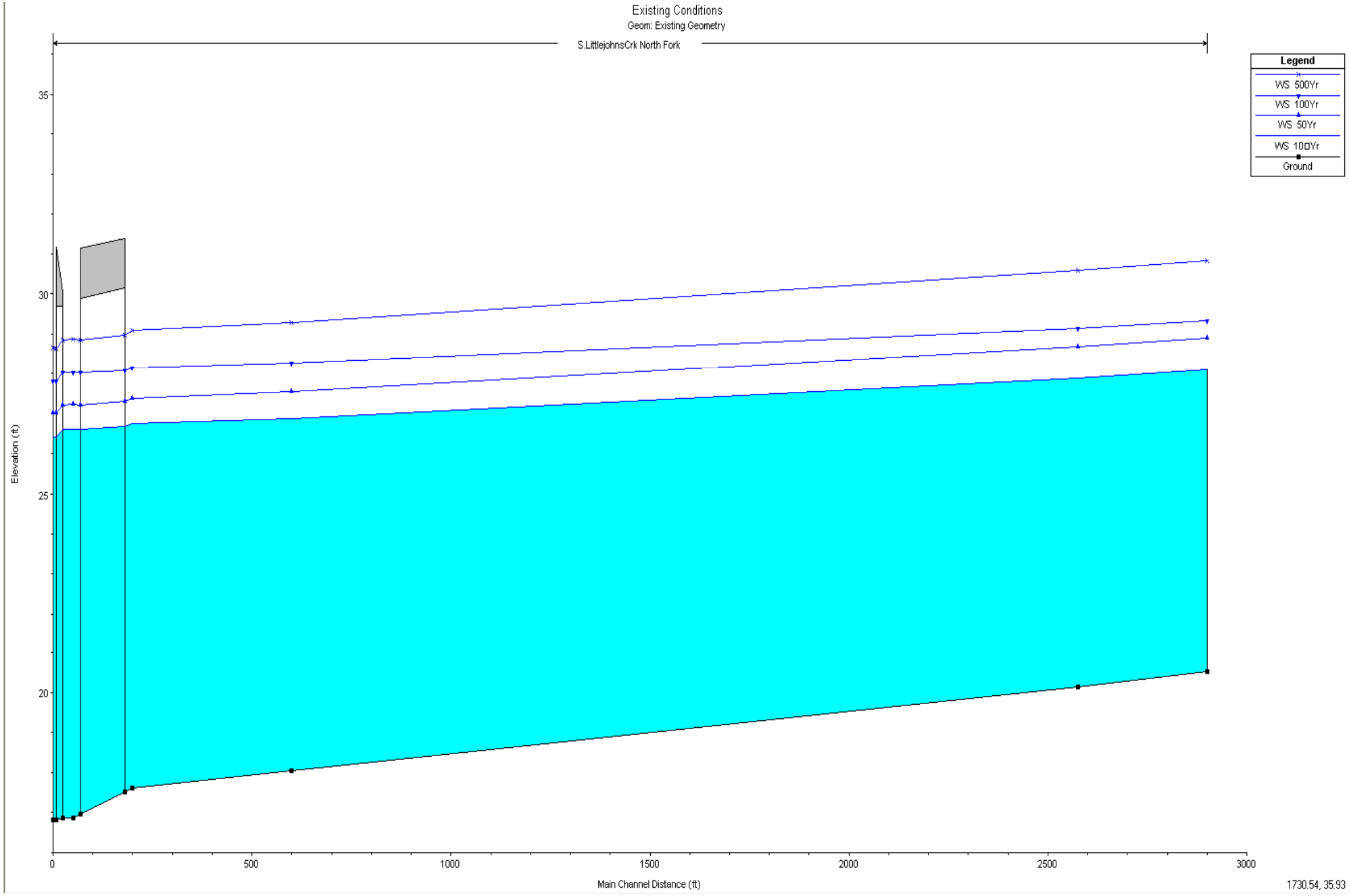
SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Existing Conditions Appendix F

HEC-RAS Plan: Existing River: S.LittlejohnsCrk Reach: South Fork

Reload Data

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
South Fork	148.5	2355.00	14.90	26.44	19.13	26.50	0.000151	2.30	1658.20	716.08	0.13
South Fork	148.5	3565.00	14.90	27.14	20.25	27.22	0.000213	2.86	2167.69	734.33	0.15
South Fork	154	2355.00	15.86	26.54	21.05	26.64	0.000423	3.37	1219.70	651.67	0.21
South Fork	154	3565.00	15.86	27.29	22.40	27.40	0.000490	3.84	1734.92	672.62	0.22
South Fork	159	2355.00	14.72	26.76	21.48	26.84	0.000348	3.03	1476.98	942.62	0.18
South Fork	159	3565.00	14.72	27.54	22.74	27.61	0.000348	3.22	2180.70	965.23	0.19
South Fork	164	2355.00	14.50	26.91	20.53	26.98	0.000213	2.71	1605.36	1268.34	0.15
South Fork	164	3565.00	14.50	27.69	21.69	27.77	0.000256	3.12	2191.38	1288.55	0.17
South Fork	167	2355.00	16.41	27.02	22.11	27.10	0.000421	3.09	1259.32	1098.70	0.20
South Fork	167	3565.00	16.41	27.82	23.33	27.91	0.000479	3.53	1742.57	1109.65	0.22
South Fork	168	1420.00	16.45	27.03	21.92	27.10	0.000200	2.61	851.89	2046.10	0.16
South Fork	168	2600.00	16.45	27.80	23.83	27.94	0.000372	3.79	1066.42	2074.57	0.23
South Fork	168.5	Bridge									
South Fork	169.5	1420.00	16.61	27.16	22.08	27.25	0.000237	2.83	801.51	2045.09	0.18
South Fork	169.5	2600.00	16.61	28.26	23.98	28.41	0.000366	3.85	1086.59	2085.84	0.23
South Fork	169.91	1420.00	16.64	27.15	22.15	27.26	0.000276	3.05	718.29	1988.59	0.19
South Fork	169.91	2600.00	16.64	28.24	24.07	28.43	0.000439	4.19	967.54	2014.92	0.25
South Fork	169.95	1420.00	16.67	27.12	22.18	27.30	0.000380	3.55	512.45	961.33	0.23
South Fork	169.95	2600.00	16.67	28.21	24.10	28.46	0.000541	4.64	829.68	2013.53	0.28
South Fork	171	Bridge									
South Fork	171.45	1420.00	18.46	27.37	22.83	27.59	0.000508	3.73	384.39	1928.74	0.26
South Fork	171.45	2600.00	18.46	28.72	24.46	29.20	0.000909	5.60	483.17	1987.80	0.35
South Fork	178.0	1420.00	17.03	27.71		27.98	0.000640	4.11	345.82	53.06	0.28
South Fork	178.0	2600.00	17.03	29.32		29.87	0.001071	5.95	466.24	169.10	0.38
South Fork	192.7	1420.00	19.04	28.71		28.99	0.000736	4.29	331.08	53.10	0.30
South Fork	192.7	2600.00	19.04	30.88		31.39	0.000998	5.73	464.47	113.96	0.36
South Fork	198.0	1420.00	19.81	29.11	25.29	29.47	0.001002	4.83	294.08	49.65	0.35
South Fork	198.0	2600.00	19.81	31.42	27.20	32.02	0.001298	6.20	419.62	62.59	0.41



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North Fork South Littlejohns Creek

SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

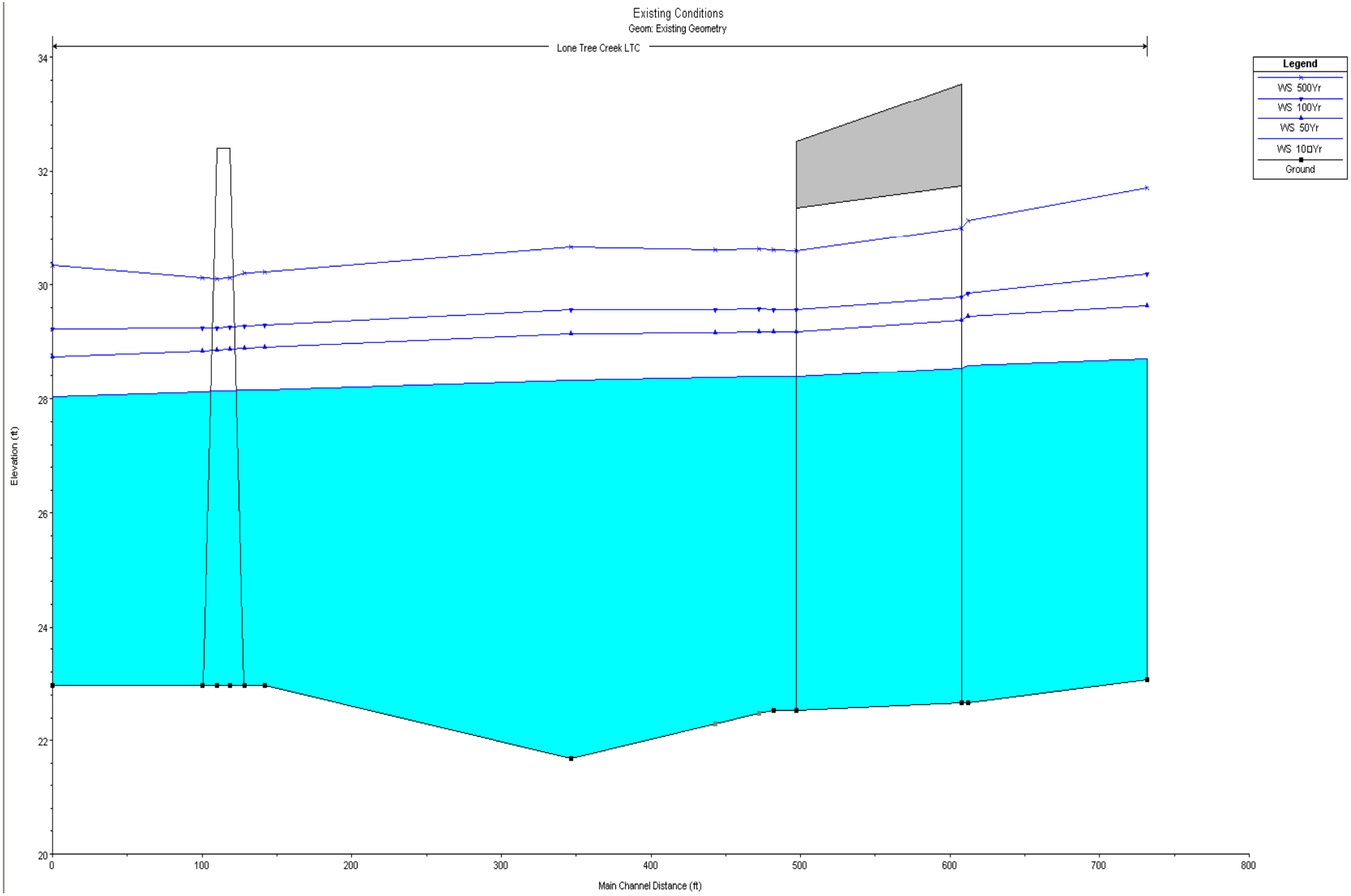
Existing Conditions Appendix F

HEC-RAS Plan: Existing River: S.LittlejohnsCrk Reach: North Fork

Reload Data

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
North Fork	167.45	935.00	16.81	27.02	21.34	27.19	0.000386	3.28	294.09	56.53	0.22
North Fork	167.45	965.00	16.81	27.82	21.42	27.95	0.000275	2.98	355.80	975.01	0.19
North Fork	167.48	Bridge									
North Fork	167.5	935.00	16.86	27.23	21.48	27.40	0.000275	3.28	301.12	934.05	0.21
North Fork	167.5	965.00	16.86	28.04	21.55	28.16	0.000194	2.95	357.18	943.97	0.18
North Fork	168	Bridge									
North Fork	169.0	935.00	17.61	27.39	22.48	27.60	0.000348	3.67	255.73	900.32	0.26
North Fork	169.0	965.00	17.61	28.15	22.57	28.33	0.000253	3.38	290.99	912.86	0.22
North Fork	173.0	935.00	18.04	27.55		27.77	0.000476	3.79	247.92	43.58	0.27
North Fork	173.0	965.00	18.04	28.27		28.45	0.000352	3.48	280.10	46.19	0.24
North Fork	192.75	935.00	20.13	28.68	24.61	28.91	0.000707	3.86	242.26	43.18	0.29
North Fork	192.75	965.00	20.13	29.14	24.69	29.35	0.000603	3.67	262.73	44.70	0.27
North Fork	196.0	935.00	20.52	28.90		29.18	0.000895	4.21	222.34	44.50	0.32
North Fork	196.0	965.00	20.52	29.33		29.58	0.000737	4.02	241.98	47.50	0.30

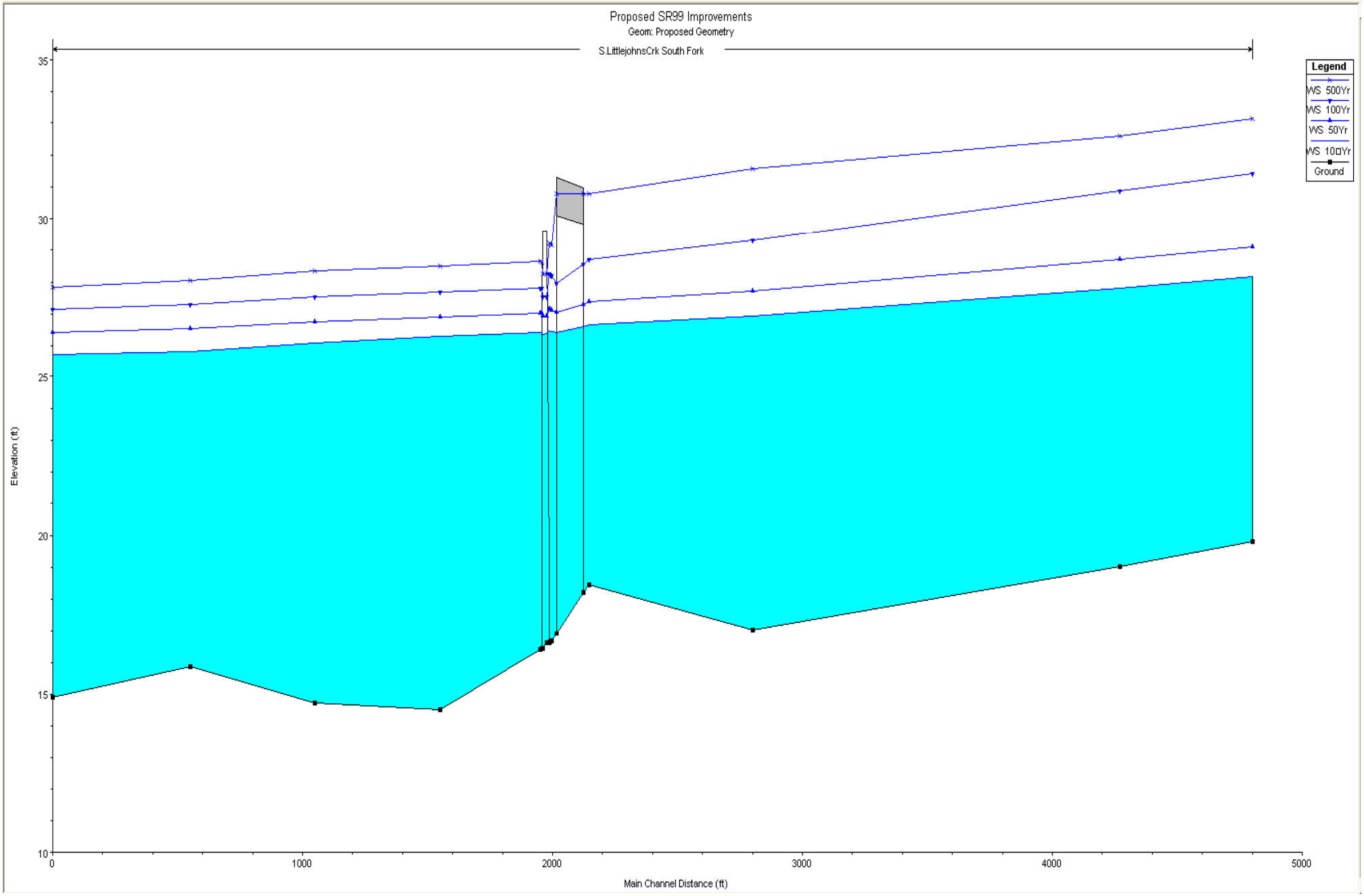
Total flow in cross section.



Lone Tree Creek

HEC-RAS Plan: Existing River: Lone Tree Creek Reach: LTC (Reload Data)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
LTC	189.98	840.00	22.97	28.74	26.23	28.98	0.001039	3.94	213.21	52.96	0.35
LTC	189.98	955.00	22.97	29.24	26.46	29.39	0.000628	3.26	332.69	143.10	0.27
LTC	190.98	840.00	22.97	28.85	26.23	29.08	0.000968	3.85	217.90	52.95	0.33
LTC	190.98	955.00	22.97	29.25	26.47	29.49	0.000928	3.95	247.04	143.19	0.33
LTC	191.12	Bridge									
LTC	191.28	840.00	22.97	28.89	26.23	29.11	0.000915	3.77	228.42	330.12	0.33
LTC	191.28	955.00	22.97	29.29	26.46	29.52	0.000869	3.86	257.23	345.97	0.32
LTC	191.4	840.00	22.97	28.90	26.23	29.12	0.000905	3.75	229.38	330.67	0.32
LTC	191.4	955.00	22.97	29.30	26.46	29.53	0.000861	3.85	258.21	346.49	0.32
LTC	193.45	840.00	21.68	29.15	25.70	29.27	0.000525	2.91	321.41	1105.48	0.25
LTC	193.45	955.00	21.68	29.56	25.96	29.68	0.000535	2.87	367.36	1126.90	0.25
LTC	194.414*	840.00	22.29	29.17	26.07	29.37	0.000749	3.62	232.26	54.87	0.30
LTC	194.414*	955.00	22.29	29.57	26.32	29.79	0.000732	3.78	253.66	65.93	0.30
LTC	194.703*	840.00	22.47	29.18	26.07	29.40	0.000770	3.77	223.60	49.27	0.30
LTC	194.703*	955.00	22.47	29.58	26.32	29.82	0.000768	3.95	243.96	53.53	0.31
LTC	194.8	840.00	22.53	29.18	26.12	29.42	0.000836	3.94	213.94	46.42	0.31
LTC	194.8	955.00	22.53	29.58	26.38	29.84	0.000840	4.13	232.93	49.54	0.32
LTC	195.5	Bridge									
LTC	196.1	840.00	22.66	29.45	26.25	29.68	0.000763	3.82	220.74	47.37	0.30
LTC	196.1	955.00	22.66	29.86	26.51	30.11	0.000760	4.01	240.75	51.31	0.30
LTC	197.5	840.00	23.06	29.64	26.19	29.78	0.000448	3.11	306.03	80.28	0.24
LTC	197.5	955.00	23.06	30.19	26.47	30.19	0.000015	0.60	3199.72	1752.30	0.04



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South Fork South Littlejohns Creek

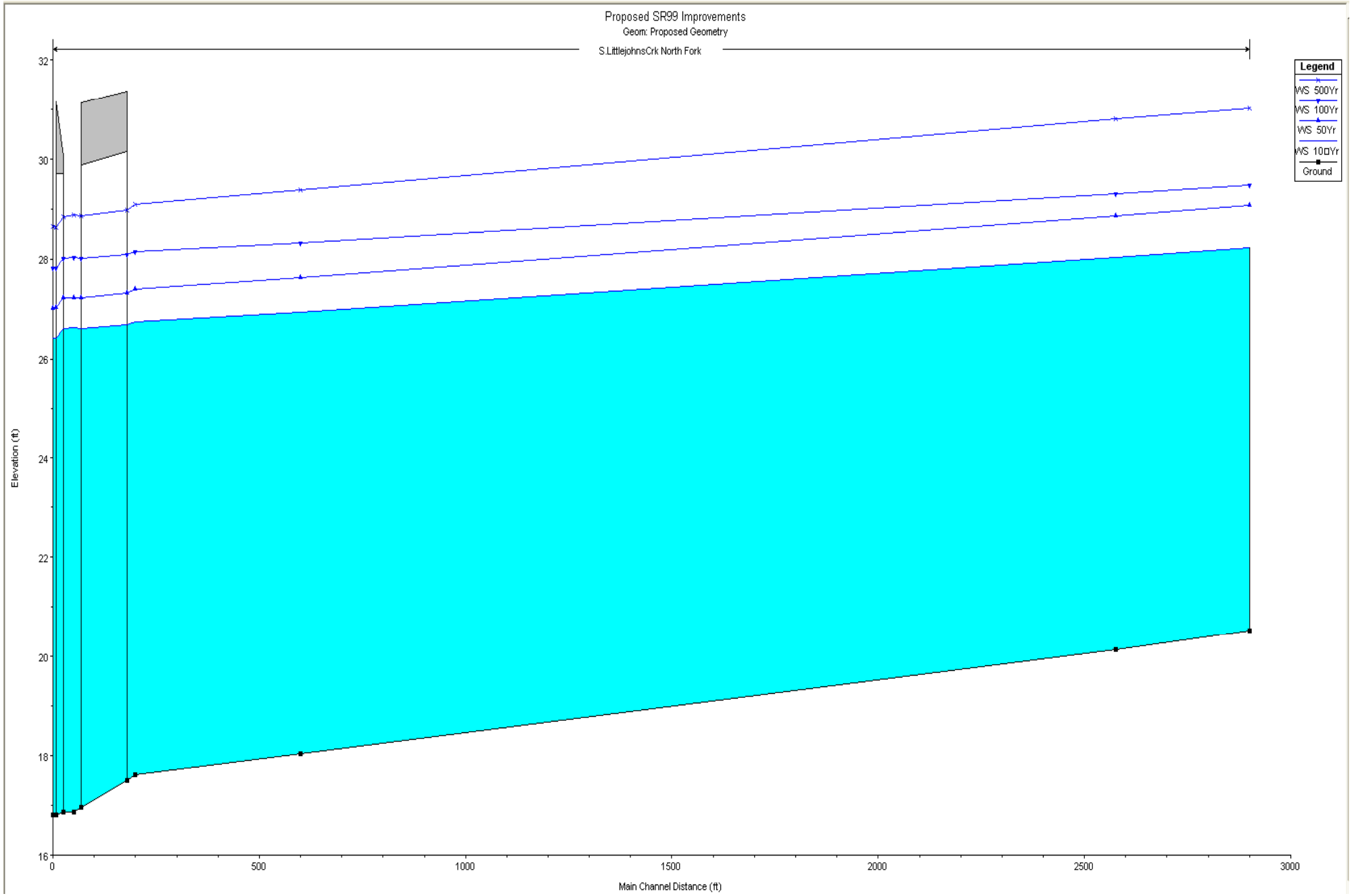
SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Proposed Conditions Appendix F

HEC-RAS Plan: Prop SR99 River: S.LittlejohnsCrk Reach: South Fork

Reload Data

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
South Fork	148.5	2355.00	14.90	26.44	19.13	26.50	0.000151	2.30	1658.20	716.08	0.13
South Fork	148.5	3565.00	14.90	27.14	20.25	27.22	0.000213	2.86	2167.69	734.33	0.15
South Fork	154	2355.00	15.86	26.54	21.05	26.64	0.000423	3.37	1219.70	651.67	0.21
South Fork	154	3565.00	15.86	27.29	22.40	27.40	0.000490	3.84	1734.92	672.62	0.22
South Fork	159	2355.00	14.72	26.76	21.48	26.84	0.000348	3.03	1476.98	942.62	0.18
South Fork	159	3565.00	14.72	27.54	22.74	27.61	0.000348	3.22	2180.70	965.23	0.19
South Fork	164	2355.00	14.50	26.91	20.53	26.98	0.000213	2.71	1605.36	1268.34	0.15
South Fork	164	3565.00	14.50	27.69	21.69	27.77	0.000256	3.12	2191.38	1288.55	0.17
South Fork	167	2355.00	16.41	27.02	22.11	27.10	0.000421	3.09	1259.32	1098.70	0.20
South Fork	167	3565.00	16.41	27.82	23.33	27.91	0.000479	3.53	1742.57	1109.65	0.22
South Fork	168	1420.00	16.45	27.03	21.92	27.10	0.000200	2.61	851.89	2046.10	0.16
South Fork	168	2600.00	16.45	27.80	23.83	27.94	0.000372	3.79	1066.42	2074.57	0.23
South Fork	168.5	Bridge									
South Fork	169.5	1420.00	16.61	27.16	22.08	27.25	0.000237	2.83	801.51	2045.09	0.18
South Fork	169.5	2600.00	16.61	28.26	23.98	28.41	0.000366	3.85	1086.59	2085.84	0.23
South Fork	169.91	1420.00	16.64	27.15	22.15	27.26	0.000276	3.05	718.29	1988.59	0.19
South Fork	169.91	2600.00	16.64	28.24	24.07	28.43	0.000439	4.19	967.54	2014.92	0.25
South Fork	169.95	1420.00	16.67	27.12	22.18	27.30	0.000380	3.55	512.45	961.33	0.23
South Fork	169.95	2600.00	16.67	28.21	24.10	28.46	0.000541	4.64	829.68	2013.53	0.28
South Fork	171	Bridge									
South Fork	171.45	1420.00	18.46	27.37	22.83	27.59	0.000508	3.73	384.39	1928.74	0.26
South Fork	171.45	2600.00	18.46	28.72	24.46	29.20	0.000909	5.60	483.17	1987.80	0.35
South Fork	178.0	1420.00	17.03	27.71		27.98	0.000640	4.11	345.82	53.06	0.28
South Fork	178.0	2600.00	17.03	29.32		29.87	0.001071	5.95	466.24	169.10	0.38
South Fork	192.7	1420.00	19.04	28.71		28.99	0.000736	4.29	331.08	53.10	0.30
South Fork	192.7	2600.00	19.04	30.88		31.39	0.000998	5.73	464.47	113.96	0.36
South Fork	198.0	1420.00	19.81	29.11	25.29	29.47	0.001002	4.83	294.08	49.65	0.35
South Fork	198.0	2600.00	19.81	31.42	27.20	32.02	0.001298	6.20	419.62	62.59	0.41



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North Fork South Littlejohns Creek

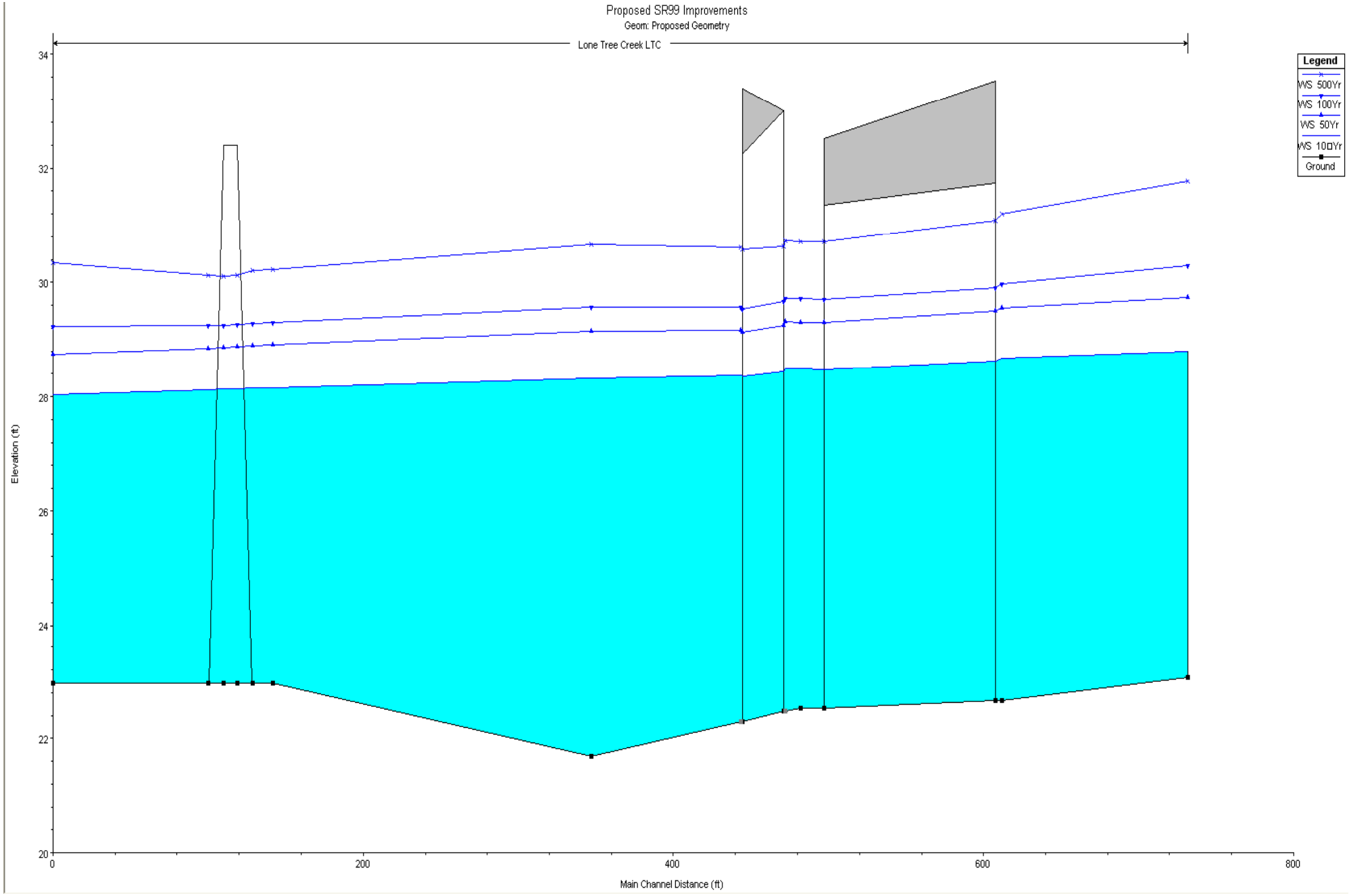
SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Proposed Conditions Appendix F

HEC-RAS Plan: Prop SR99 River: S.LittlejohnsCrk Reach: North Fork

Reload Data

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
North Fork	167.45	935.00	16.81	27.02	21.34	27.19	0.000386	3.28	294.09	56.53	0.22
North Fork	167.45	965.00	16.81	27.82	21.42	27.95	0.000275	2.98	355.80	975.01	0.19
North Fork	167.48	Bridge									
North Fork	167.5	935.00	16.86	27.23	21.48	27.40	0.000383	3.30	301.09	934.04	0.22
North Fork	167.5	965.00	16.86	28.03	21.55	28.17	0.000275	3.00	356.99	943.94	0.19
North Fork	168	Bridge									
North Fork	169.0	935.00	17.61	27.40	22.48	27.61	0.000542	3.67	256.05	900.44	0.26
North Fork	169.0	965.00	17.61	28.16	22.57	28.33	0.000396	3.38	291.21	912.93	0.22
North Fork	173.0	935.00	18.04	27.63		27.84	0.000602	3.74	251.26	43.86	0.27
North Fork	173.0	965.00	18.04	28.32		28.51	0.000456	3.45	282.73	46.40	0.24
North Fork	192.75	935.00	20.13	28.86	24.61	29.08	0.000648	3.74	250.13	43.77	0.28
North Fork	192.75	965.00	20.13	29.31	24.69	29.51	0.000559	3.57	270.12	45.24	0.26
North Fork	196.0	935.00	20.52	29.06		29.32	0.000814	4.09	229.55	45.62	0.31
North Fork	196.0	965.00	20.52	29.48		29.72	0.000675	3.91	249.13	48.73	0.29



Lone Tree Creek

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SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

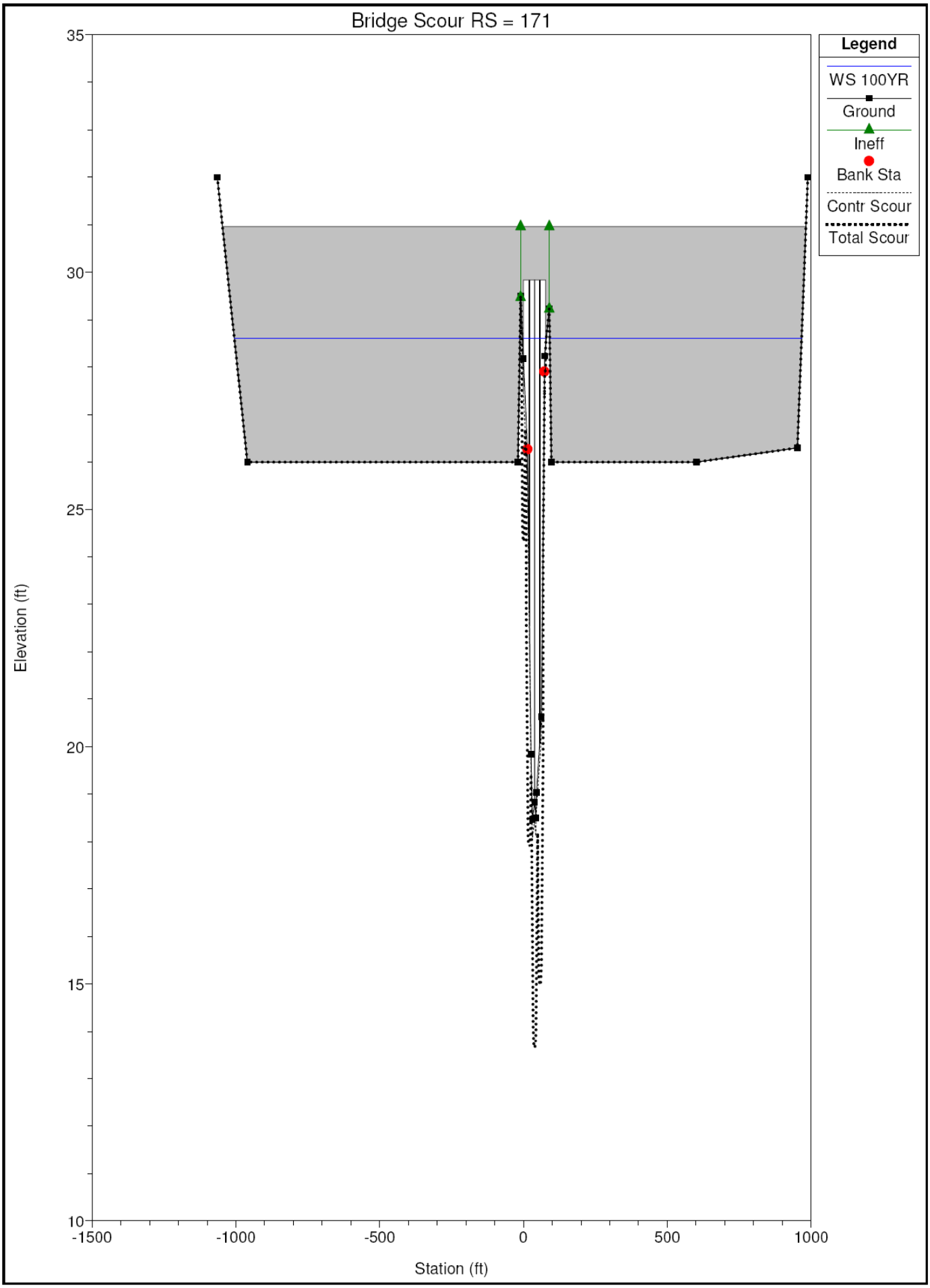
Proposed Conditions Appendix F

HEC-RAS Plan: Prop SR99 River: Lone Tree Creek Reach: LTC

Reload Data

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
LTC	189.98	840.00	22.97	28.74	26.23	28.98	0.001039	3.94	213.21	52.96	0.35
LTC	189.98	955.00	22.97	29.24	26.46	29.39	0.000628	3.26	332.69	143.10	0.27
LTC	190.98	840.00	22.97	28.85	26.23	29.08	0.000968	3.85	217.90	52.95	0.33
LTC	190.98	955.00	22.97	29.25	26.47	29.49	0.000928	3.95	247.04	143.19	0.33
LTC	191.12	Bridge									
LTC	191.28	840.00	22.97	28.89	26.23	29.11	0.000915	3.77	228.42	330.12	0.33
LTC	191.28	955.00	22.97	29.29	26.46	29.52	0.000869	3.86	257.23	345.97	0.32
LTC	191.4	840.00	22.97	28.90	26.23	29.12	0.000905	3.75	229.38	330.67	0.32
LTC	191.4	955.00	22.97	29.30	26.46	29.53	0.000861	3.85	258.21	346.49	0.32
LTC	193.45	840.00	21.68	29.14	25.70	29.27	0.000551	2.98	304.46	956.45	0.25
LTC	193.45	955.00	21.68	29.56	25.96	29.68	0.000535	2.87	367.36	1126.90	0.25
LTC	194.414*	840.00	22.29	29.17	26.07	29.37	0.000749	3.62	232.28	54.88	0.30
LTC	194.414*	955.00	22.29	29.57	26.32	29.79	0.000732	3.78	253.66	65.93	0.30
LTC	194.67	Bridge									
LTC	194.703*	840.00	22.47	29.31	26.07	29.52	0.000710	3.67	229.92	50.28	0.29
LTC	194.703*	955.00	22.47	29.72	26.32	29.95	0.000702	3.84	251.42	55.48	0.29
LTC	194.8	840.00	22.53	29.31	26.12	29.53	0.000771	3.83	219.88	47.25	0.30
LTC	194.8	955.00	22.53	29.71	26.38	29.97	0.000769	4.02	239.89	51.12	0.31
LTC	195.5	Bridge									
LTC	196.1	840.00	22.66	29.56	26.25	29.78	0.000714	3.74	225.82	48.06	0.29
LTC	196.1	955.00	22.66	29.98	26.51	30.21	0.000707	3.92	246.74	52.63	0.29
LTC	197.5	840.00	23.06	29.74	26.19	29.87	0.000425	3.05	313.94	83.50	0.23
LTC	197.5	955.00	23.06	30.29	26.47	30.29	0.000013	0.56	3378.35	1795.00	0.04

Appendix G - Bridge Scour Profiles



South Fork South Littlejohns Creek Scour Plot

SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Appendix G

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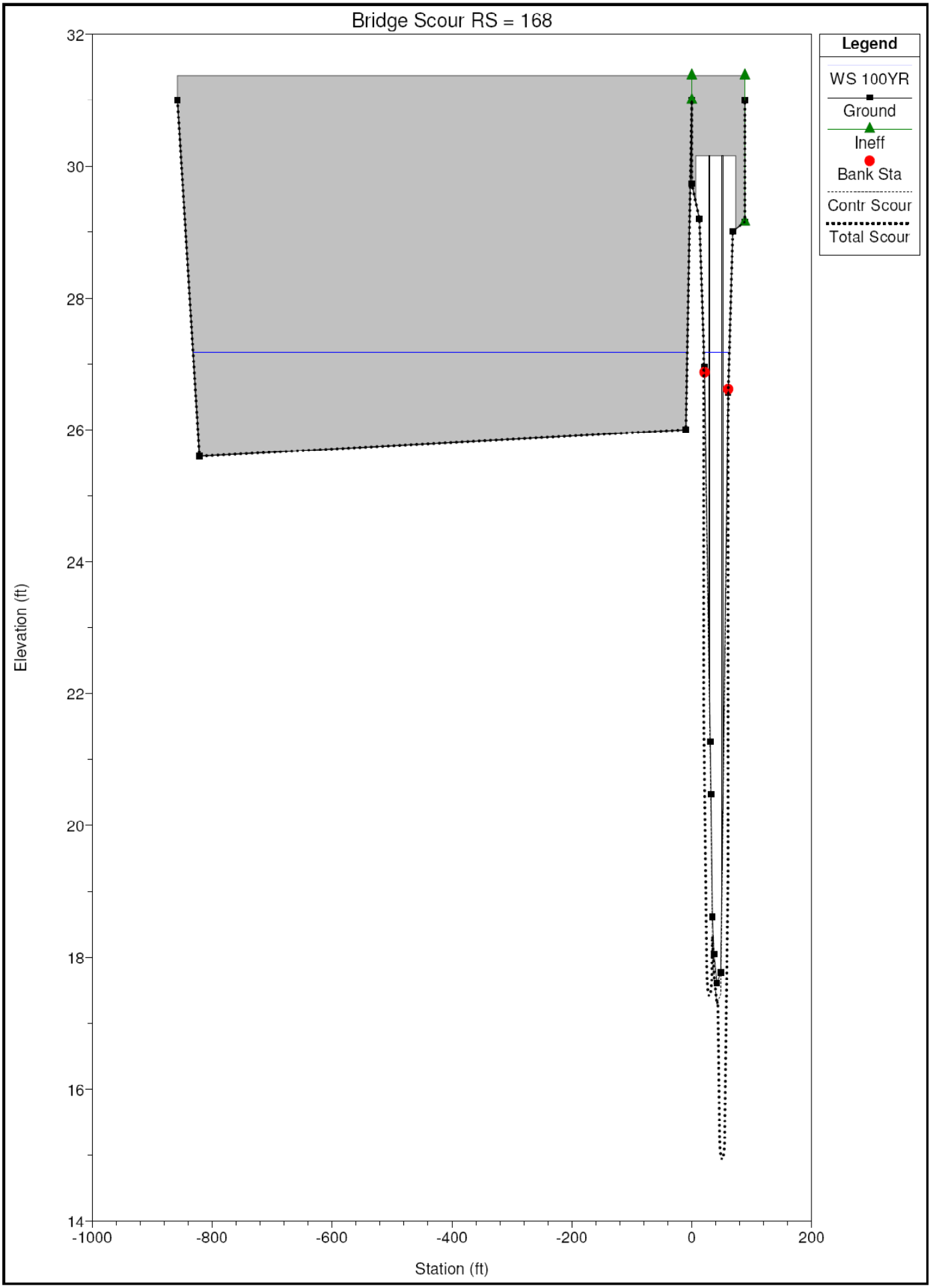

North Fork South Littlejohns Creek Scour Plot

SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Appendix G

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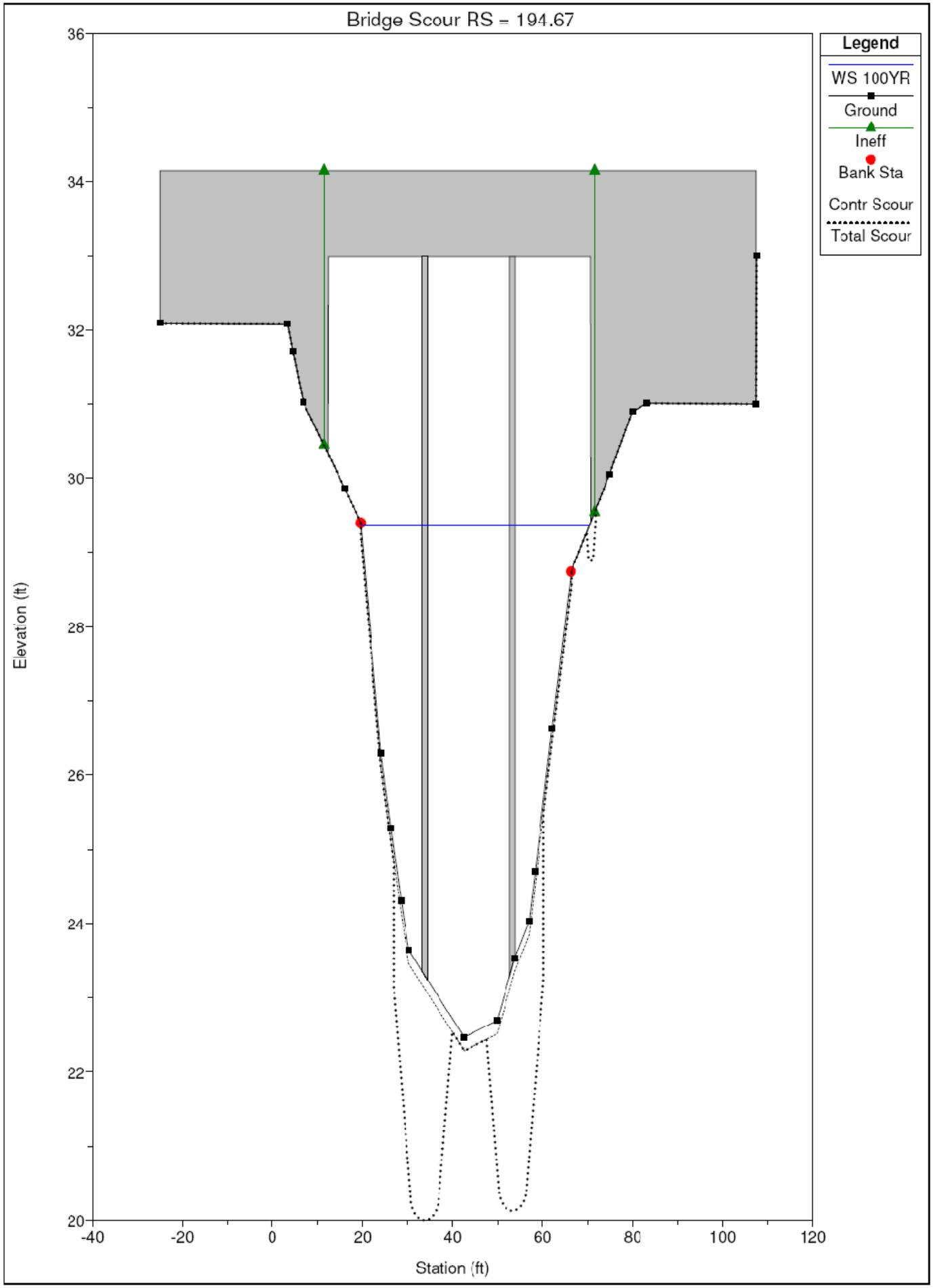

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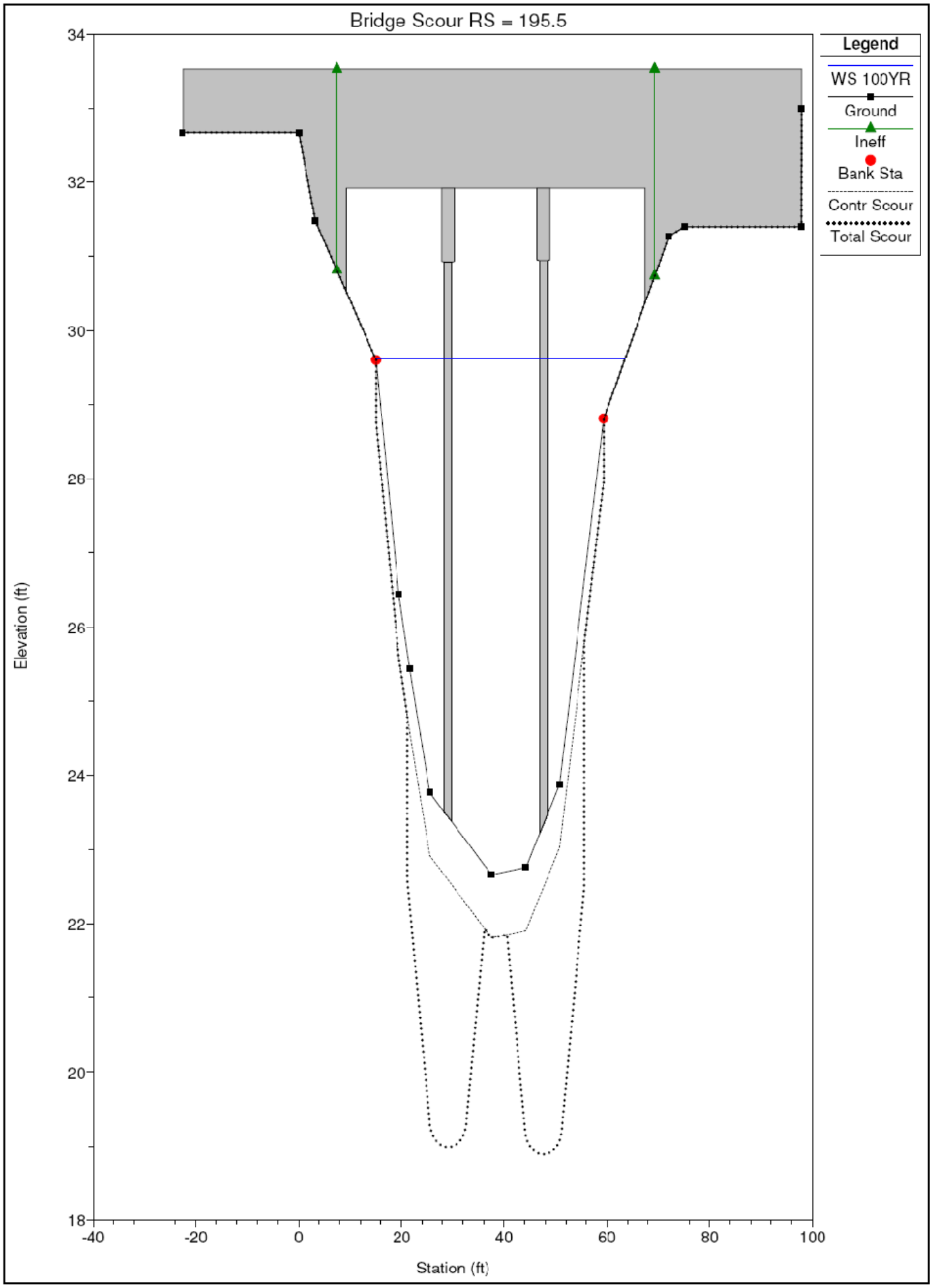
Lone Tree Creek
Off Ramp Scour Plot

SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Appendix G



Lone Tree Creek Scour Plot

SR-99 Widening Post Mile 5.3 to Post Mile 15.0
San Joaquin County

Appendix G

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Scour Calculations – South Fork South Littlejohns Creek

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	0.32	7.83	0.31
	Approach Velocity (ft/s):	0.56	5.88	0.47
	Br Average Depth (ft):	1.39	7.66	0.28
	BR Opening Flow (cfs):	45.25	2553.74	1.01
	BR Top WD (ft):	14.01	52.86	4.43
	Grain Size D50 (mm):	0.01	0.01	0.01
	Approach Flow (cfs):	22.59	2577.30	0.11
	Approach Top WD (ft):	127.28	56.00	0.78
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):	0.74	0.38	0.46
	Critical Velocity (ft/s):	0.30	0.51	0.30
	Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	2.00
	Grain Size D50 (mm):	0.01000
	Depth Upstream (ft):	10.31
	Velocity Upstream (ft/s):	6.36
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	120.80
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	0.02000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	4.80
	Froude #:	0.35
	Equation:	CSU equation
	Pier Scour Limited to Maximum of Ys = 2.4 * a	

Abutment Scour

	Left	Right

Scour Calculations – South Fork South Littlejohns Creek

Input Data

Station at Toe (ft):	0.00	77.31
Toe Sta at appr (ft):	-6.01	68.43
Abutment Length (ft):	113.26	0.00
Depth at Toe (ft):	0.65	0.34
K1 Shape Coef:	1.00 - Vertical abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	113.26	0.00
Avg Depth Obstructed Ya (ft):	0.29	
Flow Obstructed Qe (cfs):	16.89	
Area Obstructed Ae (sq ft):	32.42	

Results

Scour Depth Ys (ft):	3.11	
Froude #:	0.28	
Equation:	HIRE	Default

Combined Scour Depths

Pier Scour + Contraction Scour (ft):		
	Channel:	5.18
Left abutment scour + contraction scour (ft):	3.85	

Scour Calculations – North Fork South Littlejohns Creek

Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):		6.00	0.62
Approach Velocity (ft/s):		3.92	0.65
Br Average Depth (ft):	0.13	6.20	0.28
BR Opening Flow (cfs):	0.05	964.65	0.30
BR Top WD (ft):	0.97	35.60	1.78
Grain Size D50 (mm):	0.01	0.01	0.01
Approach Flow (cfs):		963.96	1.04
Approach Top WD (ft):		40.98	2.57
K1 Coefficient:	0.590	0.590	0.590
Results			
Scour Depth Ys (ft):		0.32	0.00
Critical Velocity (ft/s):		0.48	0.33
Equation:		Live	Live

Pier Scour

All piers have the same scour depth

Input Data	
Pier Shape:	Round nose
Pier Width (ft):	2.00
Grain Size D50 (mm):	0.01000
Depth Upstream (ft):	9.66
Velocity Upstream (ft/s):	4.77
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	120.80
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm):	0.02000
K4 Armouring Coef:	1.00
Results	
Scour Depth Ys (ft):	4.35
Froude #:	0.27
Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Channel: 4.67

Scour Calculations – Lone Tree Creek Off Ramp

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):		5.06	0.37
	Approach Velocity (ft/s):		4.26	1.29
	Br Average Depth (ft):		4.89	0.31
	BR Opening Flow (cfs):		953.81	1.19
	BR Top WD (ft):		44.08	4.01
	Grain Size D50 (mm):	0.01	0.01	0.01
	Approach Flow (cfs):		953.20	1.80
	Approach Top WD (ft):		44.18	3.79
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):		0.18	0.00
	Critical Velocity (ft/s):		0.47	0.30
	Equation:		Live	Live

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	1.30
	Grain Size D50 (mm):	0.01000
	Depth Upstream (ft):	6.93
	Velocity Upstream (ft/s):	4.73
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	26.80
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	0.02000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	3.12
	Froude #:	0.32
	Equation:	CSU equation

Pier Scour Limited to Maximum of Ys = 2.4 * a

Abutment Scour

	Left	Right

Scour Calculations – Lone Tree Creek Off Ramp

Input Data

Station at Toe (ft):	12.27	70.70
Toe Sta at appr (ft):	7.75	63.70
Abutment Length (ft):	0.00	0.12
Depth at Toe (ft):	-0.92	0.01
K1 Shape Coef:	0.55 - Spill-through abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	0.00	0.12
Avg Depth Obstructed Ya (ft):		0.37
Flow Obstructed Qe (cfs):		0.05
Area Obstructed Ae (sq ft):		0.04

Results

Scour Depth Ys (ft):		0.52
Qe/Ae = Ve:		1.25
Froude #:		0.36
Equation:	Default	Froehlich

Combined Scour Depths

Pier Scour + Contraction Scour (ft):		
	Channel:	3.30
Right abutment scour + contraction scour (ft):	0.52	

Scour Calculations – Lone Tree Creek

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):		3.88	
	Approach Velocity (ft/s):		2.92	
	Br Average Depth (ft):	0.01	5.04	0.40
	BR Opening Flow (cfs):	0.00	951.81	3.19
	BR Top WD (ft):	0.07	41.26	4.12
	Grain Size D50 (mm):	0.01	0.01	0.01
	Approach Flow (cfs):		955.00	
	Approach Top WD (ft):		84.15	
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):		0.85	
	Critical Velocity (ft/s):		0.45	
	Equation:		Live	

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	1.50
	Grain Size D50 (mm):	0.01000
	Depth Upstream (ft):	5.63
	Velocity Upstream (ft/s):	6.27
	K1 Nose Shape:	1.00
	Pier Angle:	0.00
	Pier Length (ft):	132.00
	K2 Angle Coef:	1.00
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	0.02000
	K4 Armouring Coef:	1.00
Results		
	Scour Depth Ys (ft):	3.60
	Froude #:	0.47
	Equation:	CSU equation

Pier Scour Limited to Maximum of Ys = 2.4 * a

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Channel: 4.45

Linda S. Adams
Secretary for Environmental Protection

California Regional Water Quality Control Board
Central Valley Region
Katherine Hart, Chair

11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Phone (916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

Arnold Schwarzenegger
Governor

22 November 2010

Zachary Parker
California Department of Transportation (Caltrans)
2015 East Shields Avenue, Suite 100-A
Fresno, CA 93726

CLEAN WATER ACT §401 TECHNICALLY CONDITIONED WATER QUALITY CERTIFICATION FOR DISCHARGE OF DREDGED AND/OR FILL MATERIALS FOR THE STATE ROUTE 99 MANTECA WIDENING PROJECT (WDID#5B39CR00188), SAN JOAQUIN COUNTY

This Order responds to your 4 August 2010 application submittal for the Water Quality Certification of a linear transportation project permanently impacting approximately 0.077 acre of waters of the United States and 0.04 acre of non-federal waters of the State.

WATER QUALITY CERTIFICATION STANDARD CONDITIONS:

1. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to §13330 of the California Water Code and §3867 of Title 23 of the California Code of Regulations (23 CCR).

2. This certification action is not intended and shall not be construed to apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to 23 CCR subsection 3855(b) and the application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

3. The validity of any non-denial certification action shall be conditioned upon total payment of the full fee required under 23 CCR §3833, unless otherwise stated in writing by the certifying agency.

4. Certification is valid for the duration of the described project. This certification is no longer valid if the project (as currently described) is modified, or coverage under Section 404 of the Clean Water Act has expired.

5. All reports, notices, or other documents required by this Water Quality Certification or requested by the Central Valley Regional Water Quality Control Board (Central Valley Water Board) shall be signed by a person described below or by a duly authorized representative of that person.

a. For a corporation: by a responsible corporate officer such as (1) a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function; (2) any other person who performs similar policy or decision-making functions for the corporation; or (3) the manager of one or more manufacturing, production, or operating facilities if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

b. For a partnership or sole proprietorship: by a general partner or the proprietor.

c. For a municipality, State, federal, or other public agency: by either a principal executive officer or ranking elected official.

6. Any person signing a document under Standard Condition number 5 shall make the following certification, whether written or implied:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

ADDITIONAL TECHNICALLY CONDITIONED CERTIFICATION CONDITIONS:

In addition to the above standard conditions, Caltrans shall satisfy the following:

1. Caltrans shall notify the Central Valley Water Board in writing 7 days in advance of the start of any in-water activities.

2. Except for activities permitted by the U.S. Army Corps under §404 of the Clean Water Act, soil, silt, or other organic materials shall not be placed where such materials could pass into surface water or surface water drainage courses.

3. All areas disturbed by project activities shall be protected from washout or erosion.

4. Caltrans shall maintain a copy of this Certification and supporting documentation (Project Information Sheet) at the Project site during construction for review by site personnel and agencies. All personnel (employees, contractors, and subcontractors) performing work on the proposed project shall be adequately informed and trained regarding the conditions of this Certification.

5. All temporarily affected areas will be restored to pre-construction contours and conditions upon completion of construction activities.

6. Caltrans shall perform surface water sampling: 1) When performing any in-water work; 2) In the event that project activities result in any materials reaching surface waters or; 3) When any activities result in the creation of a visible plume in surface waters. The following monitoring shall be conducted immediately upstream out of the influence of the project and 300 feet downstream of the active work area. Sampling results shall be submitted to this office within two weeks of initiation of sampling and every two weeks thereafter. The sampling frequency may be modified for certain projects with written permission from the Central Valley Water Board.

Parameter	Unit	Type of Sample	Frequency of Sample
Turbidity	NTU	Grab	Every 4 hours during in water work
Settleable Material	ml/l	Grab	Same as above.
Visible construction related pollutants	Observations	Visible Inspections	Continuous throughout the construction period

7. Activities shall not cause turbidity increases in surface water to exceed:
   (a) where natural turbidity is less than 1 Nephelometric Turbidity Units (NTUs), controllable factors shall not cause downstream turbidity to exceed 2 NTU;
   (b) where natural turbidity is between 1 and 5 NTUs, increases shall not exceed 1 NTU;
   (c) where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent;
   (d) where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs;
   (e) where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

   Except that these limits will be eased during in-water working periods to allow a turbidity increase of 15 NTU over background turbidity as measured in surface waters 300 feet downstream from the working area. In determining compliance with the above limits, appropriate averaging periods may be applied provided that beneficial uses will be fully protected. Averaging periods may only be assessed by prior permission of the Central Valley Water Board.

8. Activities shall not cause settleable matter to exceed 0.1 ml/l in surface waters as measured in surface waters 300 feet downstream from the project.

9. The discharge of petroleum products or other excavated materials to surface water is prohibited. Activities shall not cause visible oil, grease, or foam in the work area or downstream. Caltrans shall notify the Central Valley Water Board immediately of any spill of petroleum products or other organic or earthen materials.

10. Caltrans shall notify the Central Valley Water Board immediately if the above criteria for turbidity, settleable matter, oil/grease, or foam are exceeded.

11. Caltrans shall comply with all California Department of Fish and Game 1600 requirements for the project.

12. Caltrans must obtain coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities issued by the State Water Resources Control Board for any project disturbing an area of 1 acre or greater.

13. The Conditions in this water quality certification are based on the information in the attached "Project Information." If the information in the attached Project Information is modified or the project changes, this water quality certification is no longer valid until amended by the Central Valley Water Board.

14. The mitigation measures specified in the mitigation monitoring and reporting program for the approved Mitigated Negative Declaration for the project, as they pertain to biology, hydrology and water quality impacts, are included in this Water Quality Certification, as required by California Public Resource Code Section 21081.6 and CEQA Guidelines, California Code of Regulations Section 15097.

15. In the event of any violation or threatened violation of the conditions of this Order, the violation or threatened violation shall be subject to any remedies, penalties, process, or sanctions as provided for under State law and section 401 (d) of the federal Clean Water Act. The applicability of any State law authorizing remedies, penalties, process, or sanctions for the violation or threatened violation constitutes a limitation necessary to ensure compliance with this Order.

    a. If Caltrans or a duly authorized representative of the project fails or refuses to furnish technical or monitoring reports, as required under this Order, or falsifies any information provided in the monitoring reports, the applicant is subject to civil, for each day of violation, or criminal liability.

    b. In response to a suspected violation of any condition of this Order, the Central Valley Water Board may require Caltrans to furnish, under penalty of perjury, any technical or monitoring reports the Central Valley Water Board deems appropriate, provided that the burden, including cost of the reports, shall be in reasonable relationship to the need for the reports and the benefits to be obtained from the reports.

    c. Caltrans shall allow the staff(s) of the Central Valley Water Board, or an authorized representative(s), upon the presentation of credentials and other documents, as may be required by law, to enter the project premises for inspection, including taking photographs and securing copies of project-related records, for the purpose of assuring compliance with this certification and determining the ecological success of the project.

16. Caltrans shall provide a Notice of Completion (NOC) no later than 30 days after the project completion. The NOC shall demonstrate that that the project has been carried out in accordance with the project's description (and any amendments approved). The NOC shall include a map of the project location(s), including final boundaries of any in situ restoration area(s), if appropriate, and representative pre and post construction photographs. Each photograph shall include a descriptive title, date taken, photographic site, and photographic orientation.

17. When work in a flowing stream is unavoidable, the entire stream flow shall be diverted around or through the work area during the excavation and/or construction operations.

Stream flow shall be diverted using gravity flow through temporary culverts/pipes or pumped around the work site with the use of hoses. When any dam or other artificial obstruction is being constructed, maintained, or placed in operation, sufficient water shall at all times be allowed to pass downstream to maintain aquatic life below the dam pursuant to Fish and Game Code section 5937. Any temporary dam or other artificial obstruction constructed shall only be built from clean materials such as sandbags, gravel bags, water dams, or clean/washed gravel which will cause little or no siltation. Construction, dewatering, and removal of the temporary cofferdam shall not create conditions where the above criteria for turbidity, settleable matter, oil/grease, or foam are exceeded. If water quality criteria are exceeded Caltrans shall notify the Central Valley Water Board immediately. All temporary affected areas must be restored to pre-construction contours and conditions upon completion of construction activities.

ADDITIONAL STORM WATER QUALITY CONDITIONS:

Caltrans shall also satisfy the following additional storm water quality conditions:

1. During the construction phase, Caltrans must employ strategies to minimize erosion and the introduction of pollutants into storm water runoff. These strategies must include the following:
   (a) the Storm Water Pollution Prevention Plan (SWPPP) must be prepared during the project planning and design phases and implemented, as appropriate, before construction;
   (b) an effective combination of erosion and sediment control Best Management Practices (BMPs) must be implemented and adequately working prior to the rainy season and during all phases of construction.

2. Caltrans must minimize the short and long-term impacts on receiving water quality from the State Route 99 Manteca Widening Project by implementing the following post-construction storm water management:
   (a) minimize the amount of impervious surface;
   (b) reduce peak runoff flows;
   (c) provide treatment BMPs to reduce pollutants in runoff;
   (d) ensure existing waters of the State (e.g., wetlands, vernal pools, or creeks) are not used as pollutant source controls and/or treatment controls;
   (e) preserve and, where possible, create or restore areas that provide important water quality benefits, such as riparian corridors, wetlands, and buffer zones;
   (f) limit disturbances of natural water bodies and natural drainage systems caused by development (including development of roads, highways, and bridges);
   (g) control post-development peak storm water run-off discharge rates and velocities to prevent or reduce downstream erosion, and to protect stream habitat.

REGIONAL WATER QUALITY CONTROL BOARD CONTACT PERSON:

Daniel Worth, Environmental Scientist
11020 Sun Center Drive #200
Rancho Cordova, California 95670-6114
dworth@waterboards.ca.gov
(916) 464-4709

WATER QUALITY CERTIFICATION:

I hereby issue an order certifying that any discharge from the Caltrans, State Route 99 Manteca Widening Project (WDID# 5B39CR00188) will comply with the applicable provisions of §301 ("Effluent Limitations"), §302 ("Water Quality Related Effluent Limitations"), §303 ("Water Quality Standards and Implementation Plans"), §306 ("National Standards of Performance"), and §307 ("Toxic and Pretreatment Effluent Standards") of the Clean Water Act. This discharge is also regulated under State Water Resources Control Board Water Quality Order No. 2003-0017 DWQ "Statewide General Waste Discharge Requirements For Dredged Or Fill Discharges That Have Received State Water Quality Certification (General WDRs)".

Except insofar as may be modified by any preceding conditions, all certification actions are contingent on (a) the discharge being limited and all proposed mitigation being completed in strict compliance with Caltrans' project description and the attached Project Information Sheet, and (b) compliance with all applicable requirements of the *Water Quality Control Plan for the Sacramento River and San Joaquin River*, Fourth Edition, revised September 2009.

for Pamela C. Creedon
Executive Officer

Enclosure: Project Information

cc: See enclosure, page 10

PROJECT INFORMATION

Application Date: 4 August 2010

Applicant: Zachary Parker
California Department of Transportation (Caltrans)
2015 East Shields Avenue, Suite 100-A
Fresno, CA 93726

Applicant Representatives: Serge Stanich
HDR Engineering, Inc.
1610 Arden Way , Suite 175
Sacramento, CA 95815

Project Name: State Route 99 Manteca Widening Project

Application Number: WDID# 5B39CR00188

Type of Project: Linear Transportation Project

Project Location (Centralized): Section 29, Township 1 South, Range 7 East, MDB&M. Latitude: 37.8391° and Longitude: -121.213°

County: San Joaquin County

Receiving Water(s) (hydrologic unit): Lone Tree Creek, South Fork Littlejohns Creek and North Fork South Littlejohns Creek, San Joaquin Hydrologic Basin, North Valley Floor Hydrologic Unit #531.40, Duck-Littlejohns HA

Water Body Type: Wetlands, Streambed

Designated Beneficial Uses: The *Water Quality Control Plan for the Sacramento River and San Joaquin River*, Fourth Edition, revised September 2009 (Basin Plan) has designated beneficial uses for surface and ground waters within the region. Beneficial uses that could be impacted by the project include, but are not limited to: Municipal and Domestic Water Supply (MUN); Agricultural Supply (AGR); Industrial Supply (IND), Hydropower Generation (POW); Groundwater Recharge, Water Contact Recreation (REC-1); Non-Contact Water Recreation (REC-2); Warm Freshwater Habitat (WARM); Cold Freshwater Habitat (COLD); and Wildlife Habitat (WILD). A comprehensive and specific list of the Beneficial Uses applicable for the project area can be found at:
http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/

303(d) List of Water Quality Limited Segments: The project does not impact an already impaired water body. The most recent list of approved water quality limited segments can be found at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/r5_06_303d_reqtmdls.pdf

Project Description (purpose/goal): The State Route 99 Manteca Widening Project proposes to widen State Route 99 (SR 99) from the existing four-lane configuration to a six lane configuration. The road widening will occur within the median from Austin Road

interchange in the city of Manteca, to Arch Road interchange in the city of Stockton. Widening of the existing bridges at North Fork South Littlejohns Creek, Lone Tree Creek, and South Fork South Littlejohns Creek will result in the permanent loss of waters of the United States due to the construction of new bridge piles. Approximately 8 new bridge piles are required at North Fork South Littlejohns Creek, approximately 12 new bridge piles are required at South Fork South Littlejohns, and approximately 22 new bridge piles are required at Lone Tree Creek. Each new bridge pile will permanently impact 1.23 square feet of aquatic surface, therefore all 42 new bridge piles will impact approximately 52 square feet (0.001 acre) of aquatic surface.

Additionally, permanent impacts will occur in South Fork South Littlejohns Creek due to the placement of rock slope protection to address scour problems. Approximately 2,100 cubic yards or rock slope protection will be placed on the north bank of South Fork South Littlejohns Creek and will occupy approximately 0.013 acre. Additional permanent impacts to Lone Tree Creek will consist of installing a sloped paving area to address scour problems. This paving area will occupy approximately 0.014 acre. Additional impacts to North Fork South Littlejohns Creek are not anticipated. Total permanent impacts to these three creeks (waters of the United States) will be approximately 0.027 acre.

Temporary impacts are expected to occur within the channels of the three above mentioned creeks due to access by construction equipment and personnel. Construction within the creeks will require temporary dewatering to minimize water quality impacts. The contractor will construct cofferdams approximately 30 feet upstream and downstream of the proposed crossings. The cofferdams will be constructed of clean sand bags or sheet metal. Water will be diverted around/through the project site to ensure compliance with Fish and Game Code 5937. The total area of temporary disturbance to waters of the United States is approximately 0.046 acre.

The construction at the Main Street interchange will require an agricultural ditch to be culverted for approximately 171 feet (0.05 acre) due to the realignment of East Frontage Road.

This project will also impact non-federal waters of the State by permanently filling approximately 0.04 acre of wetlands. These wetlands are located within the drainage basins of the on/off hook ramps adjacent to SR 99. Realignment of these ramps will require that these isolated wetland areas are filled with clean dirt and asphalt.

Preliminary Water Quality Concerns: Construction activities may impact surface waters with increased turbidity and settleable matter.

Proposed Mitigation to Address Concerns: Caltrans will implement Best Management Practices (BMPs) to control sedimentation and erosion. All temporary affected areas will be restored to pre-construction contours and conditions upon completion of construction activities. Caltrans will conduct turbidity and settleable matter testing during in-water work, stopping work if the Basin Plan criteria are exceeded or are observed.

Fill/Excavation Area: Approximately 1,364 cubic yards of clean concrete and 2,100 cubic yards of clean rock slope protection will be placed into 0.077 acre of waters of the United States. Approximately 0.05 acre of agricultural ditch (waters of the United States) will be permanently culverted. Additionally, approximately 20 cubic yards of clean earthen fill will be placed in 0.04 acre of non-federal waters of the State.

Dredge Volume: None

U.S. Army Corps File Number: SPK-2009-01109

U.S. Army Corps of Engineers Permit Number: Nationwide Permit #14

Department of Fish and Game Streambed Alteration Agreement: Caltrans applied for a Streambed Alteration Agreement in June 2010.

Possible Listed Species: Giant garter snake, Central Valley steelhead, Swainson's hawk

Status of CEQA Compliance: Caltrans approved the Mitigated Negative Declaration and filed a Notice of Determination on 26 March 2010 (State Clearinghouse Number SCH#2009112045).

As a Responsible Agency under the California Environmental Quality Act (CEQA), the Central Valley Water Board reviewed the Mitigated Negative Declaration and found that impacts to water quality were adequately addressed. With regard to the remaining potential impacts identified in the Mitigated Negative Declaration, such potential impacts and mitigation measures do not relate to water quality or related nuisance, and therefore fall outside of the Central Valley Water Board's jurisdiction.

Compensatory Mitigation: As required by the Army Corps of Engineers, Caltrans must mitigate for the permanent loss of 0.077 acre, by submitting a check to the Army Corps of Engineers in the amount of $11,550.00 payable to the National Fish and Wildlife Foundation. This mitigation requirement must be fulfilled prior to the start of construction.

Application Fee Provided: Total fees of $4,328.00 have been submitted to the Central Valley Water Board as required by 23 CCR §3833b(3)(A) and by 23 CCR §2200(e).

DISTRIBUTION LIST

United States Army Corp of Engineers
Sacramento District Office
Regulatory Section, Room 1480
1325 J Street
Sacramento, CA 95814-2922

United States Fish & Wildlife Service
Sacramento Fish & Wildlife Office
2800 Cottage Way
Sacramento, CA 95825

Jeff Drongesen
Department of Fish and Game
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

Bill Jennings
CA Sportfishing Protection Alliance
3536 Rainier Avenue
Stockton, CA 95204

(Electronic copy only) Bill Orme
State Water Resources Control Board
401 Certification and Wetlands Unit Chief

(Electronic copy only) Dave Smith
Wetlands Section Chief (W-3)
United States Environmental Protection Agency

Serge Stanich
HDR Engineering, Inc.
1610 Arden Way , Suite 175
Sacramento, CA 95815

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO CA 95814-2922

REPLY TO
ATTENTION OF

October 5, 2010

Regulatory Division (SPK-2009-01109)

Mr. Zachary K. Parker
State of California
Department of Transportation, District 6
2015 East Shields Avenue, Suite A-100
Fresno, California 93726-5428

Dear Mr. Parker:

We are responding to your July 29, 2010 request for a Department of the Army permit for the State Route 99/Manteca Widening Project. This approximately 1,052-acre project involves activities, including discharge of dredged or fill material, in waters of the United States to widen bridge structure medians at Lone Tree Creek, South Fork South Littlejohns Creek, and North Fork South Littlejohns Creek, and to install a 36" RCP culvert at East Frontage Road and Agricultural Ditch 2. The project is located on or near Littlejohns Creek, Section 29, Township 1 South, Range 7 East, MDB&M Survey, Latitude 37.839190°, Longitude -121.212373°, San Joaquin County, California.

Based on the information you have provided, the proposed activity, resulting in the permanent loss of approximately 0.077 acres and temporary impacts to approximately 0.46 acres of waters of the United States, is authorized by Nationwide Permit Number 14, Linear Transportation Projects. However, until Section 401 Water Quality Certification for the activity has been issued or waived, our authorization is denied without prejudice. Once you have provided us evidence of water quality certification, the activity is authorized and the work may proceed subject to the conditions of certification and the Nationwide Permit. Your work must comply with the general terms and conditions listed on the enclosed Nationwide Permit information sheets and the following special conditions:

Special Conditions

1. This permit is contingent upon the permittee applying for and being issued a Section 401 Water Quality Certification. Evidence of a water quality certification must be submitted to this office, prior to commencing work in Waters of the U.S. All terms and conditions of the Section 401 Water Quality Certification are expressly incorporated as conditions of this permit

2. We understand the State of California, Department of Transportation (Caltrans) is the National Environmental Policy Act (NEPA) lead federal agency for this project, and as such, will ensure the authorized work complies with the National Environmental Policy Act, the Endangered Species Act, the National Historical Preservation Act and any other applicable federal laws. This authorization is contingent upon the permittee implementing all actions necessary to comply with these requirements.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register.

4. This Corps permit does not authorize you to take an endangered species, in particular the Federally-listed giant garter snake *(Themnophis gigas)*, or their designated critical habitat. In order to legally take a listed species, you must have separate authorization under the Endangered Species Act (e.g., an Endangered Species Act Section 10 permit, or a Biological Opinion under Endangered Species Act Section 7, with "incidental take" provisions with which you must comply). The enclosed Fish and Wildlife Service Biological Opinion (Service File Number 81420-2009-F-0366-3, dated October 7, 2009), contains mandatory terms and conditions to implement the reasonable and prudent measures that are associated with "incidental take" that is also specified in the Biological Opinion. Your authorization under this Corps permit is conditional upon your compliance with all of the mandatory terms and conditions associated with incidental take of the attached Biological Opinion, which terms and conditions are incorporated by reference in this permit. Failure to comply with the terms and conditions associated with incidental take of the Biological Opinion, where a "take" of the listed species occurs, would constitute an unauthorized take, and it would also constitute non-compliance with your Corps permit. The Fish and Wildlife Service is the appropriate authority to determine compliance with the terms and conditions of its Biological Opinion, and with the Endangered Species Act. You must comply with all conditions of this Biological Opinion, including those ascribed to Caltrans and the Corps.

5. This Corps permit does not authorize you to take an endangered species, in particular the Federally-listed Central Valley steelhead *(Oncorhynchus mykiss)*, or their designated critical habitat. To insure your project complies with the Federal Endangered Species Act, you must implement all of the mitigating measures identified in the enclosed National Marine Fisheries letter of concurrence (NMFS File Number 2009/00370, dated April 15, 2009), including those ascribed to Caltrans and the Corps therein. If you are unable to implement any of these measures, you must immediately notify the appropriate Caltrans office, the U.S. Army Corps of Engineers Regulatory office, and the appropriate U.S. Fish and Wildlife office so that Caltrans acting as the lead Federal agency for this project may consult as appropriate, prior to initiating the work, in accordance with Federal law.

6. To mitigate for the permanent loss of 0.077 acres, you shall submit a check to this office in the amount of $11,550.00 payable to the National Fish and Wildlife Foundation (NFWF). The Middle San Joaquin-Lower Merced Hydrologic Unit Code (18040002) must be indicated in the in-lieu fee agreement in order to insure the proper location of future mitigation. Prior to proceeding with any activity otherwise authorized by this permit, we must receive written notification from you that the check has been deposited in NFWF's Sacramento District Wetlands Conservation Fund.

7. To compensate for temporary and/or indirect impacts to waters of the United States and associated aquatic resources, you shall revegetate temporarily disturbed areas with regionally appropriate native vegetation. Removal of native trees and shrubs within temporary impact areas shall be replaced at a 2:1 ratio to insure their long-term survival.

8. Temporary fills, access roads and/or work structures shall be removed in their entirety and the affected areas returned to pre-construction elevations, contours and conditions within 30 days of activity completion. The affected areas must be revegetated with appropriate native trees, shrubs and/or seed mix, using techniques or other methods approved by Caltrans.

9. To ensure avoidance and minimization measures are successful and temporary fills have been removed, you shall take pre-construction, numbered and dated, photographs of the affected Waters of the U.S. no more than one year **prior** to construction impact. You shall take post-construction, numbered and dated, photographs of the affected Waters of the U.S. within 30 days **after** construction impact. You shall submit the photographs within 30 days after construction completion. The camera positions and view angles of pre- and post-photographs shall be identical and taken from designated locations documented on the plan drawing(s).

10. Your responsibility to complete the required compensatory mitigation as set forth in Special Conditions 6, 7, and 8 will not be considered fulfilled until you have demonstrated mitigation success and have received written verification from the U.S. Army Corps of Engineers.

11. All equipment staging, including Temporary Construction Areas (TCA's), shall take place within Caltrans approved areas within the project boundary. Prior to construction implementation, you shall ensure all equipment staging, TCA's, demolition and excavation, off pavement detours, borrow and fill areas, and upland disposal areas have been evaluated under National Environmental Policy Act, Section 401 and 404 of the Clean Water Act, Section 7 of the Endangered Species Act and Section 106 of the National Historical Preservation Act and all required permits have been obtained.

12. Prior to proceeding with any activity otherwise authorized by this permit, you shall install Environmentally Sensitive Area (ESA) fencing and employ appropriate water quality protection measures and/or Best Management Practices (BMP's), in accordance with Caltrans' standards, to ensure unauthorized fills and unforeseen impacts to Waters of the U.S. are avoided. All fencing surrounding avoidance areas shall allow unrestricted visibility of these areas to discourage vandalism, destruction or disturbance. An example of fencing includes high-visibility orange plastic or similar type.

13. You shall follow Caltrans specifications and standards described in the Storm Water Pollution Prevention Plan (SWPPP) and/or Water Pollution Control Plan (WPCP), to prevent erosion and sedimentation during and after construction. Construction work within waters shall be performed when the flows are at their seasonal low or when they have ceased and the areas are dry, typically late summer through early fall. Between construction seasons all equipment and materials, with the exception of ESA fencing, will be removed from the waterways and all disturbed areas will be stabilized to prevent erosion and sedimentation.

14. Culverts placed in streams must be installed to maintain low flow conditions, and must be constructed to withstand expected high flows.

15. You shall notify the Sacramento District, Regulatory Division Office immediately if any of the above conditions are violated or unauthorized activities occur, and shall provide a description of measures taken to remedy the violation.

16. The Permittee (Caltrans) is responsible for all work authorized herein. To ensure that involved contractors are aware of the terms, conditions and limitations of this authorization, the permittee shall post a copy of the permit authorization and associated drawings at the project site during all phases of construction to ensure that contractors are aware of the terms and conditions of the authorization.

17. You shall notify this office of the start of the authorized work within seven (7) calendar days of initiating construction activities. Along with this notification, you shall submit a copy of the project construction/work schedule or similar report.

18. You must allow representatives from the Corps of Engineers to inspect the authorized activity and any mitigation, preservation, or avoidance areas at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

19. You shall notify this office of any proposed modifications to the project, including revisions to any of the work plans or documents cited in this authorization, for review and approval prior to construction work associated with the proposed modification.

You must sign the enclosed Compliance Certification and return it to this office within 30 days after completion of the authorized work.

This verification is valid for two years from the date of this letter or until the Nationwide Permit is modified, reissued, or revoked, whichever comes first. All of the existing NWPs are scheduled to be modified, reissued, or revoked prior to March 18, 2012. It is incumbent upon you to remain informed of changes to the NWPs. We will issue a public notice when the NWPs are reissued. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant NWP is modified or revoked, you will have twelve (12) months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this nationwide permit. Failure to comply with the General Conditions of this Nationwide Permit, or the project-specific Special Conditions of this authorization, may result in the suspension or revocation of your authorization.

We appreciate your feedback. At your earliest convenience, please tell us how we are doing by completing the customer survey on our website under *Customer Service Survey*.

Please refer to identification number SPK-2009-01109 in any correspondence concerning this project. If you have any questions, please contact Ms. Leah Fisher at the Sacramento South Branch, 1325 J Street, Room 1480, Sacramento, California 95814-2922, email *Leah.M.Fisher@usace.army.mil*, or telephone 916-557-6639. For more information regarding our program, please visit our website at *www.spk.usace.army.mil/regulatory.html*.

Sincerely,

Paul M. Maniccia
Chief, California South Branch

Enclosure:

1. Nationwide Permit Summary Sheet, 14 – Linear Transportation Project
2. Figures 7-10 prepared by HDR Engineering for Caltrans, dated May 28, 2010

Copies furnished without enclosure:

Chief, San Joaquin Valley Branch, Endangered Species Division, U.S. Fish and Wildlife Service, 2800 Cottage Way, Suite W2605, Sacramento, California 95825-3901

Jason Brush, Wetlands Regulatory Office, United States Environmental Protection Agency, 75 Hawthorne Street, San Francisco, California 94105

Dan Radulescu, Central Valley Regional Water Quality Control Board, 11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114

COMPLIANCE CERTIFICATION

Permit File Number: SPK-2009-01109

Nationwide Permit Number: 14, Linear Transportation Projects

Permittee: Zachary K. Parker
California Department of Transportation, District 6
2015 East Shields Avenue, Suite A-100
Fresno, California 93726-5428

County: San Joaquin

Date of Verification: October 5, 2010

Within 30 days after completion of the activity authorized by this permit, sign this certification and return it and the items requested in special condition numbers 6, 7, 8 and 9, to the following address:

U.S. Army Corps of Engineers
Regulatory Division
1325 J Street, Room 1480
Sacramento, California 95814-2922
DLLS-CESPK-RD-Compliance@usace.army.mil

Please note that your permitted activity is subject to a compliance inspection by a U.S. Army Corps of Engineers representative. If you fail to comply with the terms and conditions of the permit your authorization may be suspended, modified, or revoked. If you have any questions about this certification, please contact the Corps of Engineers.

* * * * * * * * *

I hereby certify that the work authorized by the above-referenced permit, including all the required mitigation, was completed in accordance with the terms and conditions of the permit verification.

_____ _____
Signature of Permittee Date

Nationwide Permit Summary

U S Army Corps of Engineers
Sacramento District

33 CFR Part 330; Issuance of Nationwide Permits – March 19, 2007 includes corrections of May 8, 2007 and addition of regional conditions December 2007

14. Linear Transportation Projects. Activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the United States. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge cannot cause the loss of greater than 1/3-acre of waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

This NWP also authorizes temporary structures, fills, and work necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) the loss of waters of the United States exceeds 1/10 acre; or (2) there is a discharge in a special aquatic site, including wetlands. (See general condition 27.) (Sections 10 and 404)

Note: Some discharges for the construction of farm roads or forest roads, or temporary roads for moving mining equipment, may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4)

A. Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as appropriate, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/or Coastal Zone Management Act consistency for an NWP.

☐ **1. Navigation.**

☐ (a) No activity may cause more than a minimal adverse effect on navigation.

☐ (b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.

☐ (c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

☐ **2. Aquatic Life Movements**. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions.

☐ **3 Spawning Areas.** Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

☐ **4. Migratory Bird Breeding Areas.** Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

☐ **5. Shellfish Beds**. No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48.

☐ **6. Suitable Material**. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

☐ **7. Water Supply Intakes**. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

☐ **8. Adverse Effects From Impoundments**. If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or

restricting its flow must be minimized to the maximum extent practicable.

☐ **9. Management of Water Flows**. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

☐ **10. Fills Within 100-Year Floodplains**. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

☐ **11. Equipment**. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

☐ **12. Soil Erosion and Sediment Controls**. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

☐ **13. Removal of Temporary Fills**. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

☐ **14. Proper Maintenance**. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety.

☐ **15. Wild and Scenic Rivers**. No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).

☐ **16. Tribal Rights**. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

☐ **17. Endangered Species**.

☐ (a) No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which "may affect" a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

☐ (b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

☐ (c) Non-federal permittees shall notify the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that may be affected by the proposed work or that utilize the designated critical habitat that may be affected by the proposed work. The district engineer will determine whether the proposed activity "may affect" or will have "no effect" to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. In cases where the non-Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the project, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification the proposed activities will have "no effect" on listed species or critical habitat, or until Section 7 consultation has been completed.

☐ (d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific regional endangered species conditions to the NWPs.

☐ (e) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the U.S. FWS or the NMFS, both lethal and non-lethal "takes" of protected species are in violation of the ESA. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. FWS and NMFS or their world wide Web pages at http://www.fws.gov/ and http://www.noaa.gov/fisheries.html respectively.

☐ **18. Historic Properties**.

☐ (a) In cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

☐ (b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

☐ (c) Non-federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties which the activity may have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.

☐ (d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the Corps determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR §800.3(a)). If NHPA section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed.

☐ (e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, explaining the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

☐ **19. Designated Critical Resource Waters.** Critical resource waters include, NOAA-designated marine sanctuaries, National Estuarine Research Reserves, state natural heritage sites, and outstanding national resource waters or other waters officially designated by a state as having particular environmental or ecological significance and identified by the district engineer after notice and opportunity for public comment. The district engineer may also designate additional critical resource waters after notice and opportunity for comment.

☐ (a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, and 50 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.

☐ (b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 27, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

☐ **20 Mitigation.** The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:

☐ (a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).

☐ (b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

☐ (c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10 acre and require pre-construction notification, unless the district engineer determines in writing that some other form of mitigation would be more environmentally appropriate and provides a project-specific waiver of this requirement. For wetland losses of 1/10 acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the

aquatic environment. Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.

☐ (d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream restoration, to ensure that the activity results in minimal adverse effects on the aquatic environment.

☐ (e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2 acre, it cannot be used to authorize any project resulting in the loss of greater than 1/2 acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.

☐ (f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the establishment, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.

☐ (g) Permittees may propose the use of mitigation banks, in-lieu fee arrangements or separate activity-specific compensatory mitigation. In all cases, the mitigation provisions will specify the party responsible for accomplishing and/or complying with the mitigation plan.

☐ (h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

☐ **21. Water Quality.** Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

☐ **22. Coastal Zone Management**. In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

☐ **23. Regional and Case-By-Case Conditions**. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

☐ **24. Use of Multiple Nationwide Permits**. The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

☐ **25. Transfer of Nationwide Permit Verifications**. If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

> "When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."
>
> ---
>
> (Transferee)
>
> ---
>
> (Date)

☐ **26. Compliance Certification**. Each permittee who received an NWP verification from the Corps must submit a signed certification regarding the completed work and any required mitigation. The certification form must be forwarded by the Corps with the NWP verification letter and will include:

☐ (a) A statement that the authorized work was done in accordance with the NWP authorization, including any general or specific conditions;

☐ (b) A statement that any required mitigation was completed in accordance with the permit conditions; and

☐ (c) The signature of the permittee certifying the completion of the work and mitigation.

☐ **27. Pre-Construction Notification.**

☐ (a) **Timing**.. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, as a general rule, will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

☐ (1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

☐ (2) Forty-five calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the Corps pursuant to general condition 17 that listed species or critical habitat might affected or in the vicinity of the project, or to notify the Corps pursuant to general condition 18 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (see 33 CFR 330.4(g)) is completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee cannot begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

☐ (b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

☐ (1) Name, address and telephone numbers of the prospective permittee;

☐ (2) Location of the proposed project;

☐ (3) A description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. The description should be sufficiently detailed to allow the district engineer to determine that the adverse effects of the project will be minimal and to determine the need for compensatory mitigation. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the project and when provided result in a quicker decision.);

☐ (4) The PCN must include a delineation of special aquatic sites and other waters of the United States on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters of the United States, but there may be a delay if the Corps does the delineation, especially if the project site is large or contains many waters of the United States. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, where appropriate;

☐ (5) If the proposed activity will result in the loss of greater than 1/10 acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

☐ (6) If any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, for non-Federal applicants the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work. Federal applicants must provide documentation demonstrating compliance with the Endangered Species Act; and

☐ (7) For an activity that may affect a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, for non-Federal applicants the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic

property. Federal applicants must provide documentation demonstrating compliance with Section 106 of the National Historic Preservation Act.

☐ (c) Form of Pre-Construction Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is a PCN and must include all of the information required in paragraphs (b)(1) through (7) of this general condition. A letter containing the required information may also be used.

☐ (d) Agency Coordination:

☐ (1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level.

☐ (2) For all NWP 48 activities requiring pre-construction notification and for other NWP activities requiring pre-construction notification to the district engineer that result in the loss of greater than 1/2-acre of waters of the United States, the district engineer will immediately provide (e.g., via facsimile transmission, overnight mail, or other expeditious manner) a copy of the PCN to the appropriate Federal or state offices (U.S. FWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Office (THPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will then have 10 calendar days from the date the material is transmitted to telephone or fax the district engineer notice that they intend to provide substantive, site-specific comments. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

☐ (3) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by Section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

☐ (4) Applicants are encouraged to provide the Corps multiple copies of pre-construction notifications to expedite agency coordination.

☐ (5) For NWP 48 activities that require reporting, the district engineer will provide a copy of each report within 10 calendar days of receipt to the appropriate regional office of the NMFS.

☐ (e) In reviewing the PCN for the proposed activity, the district engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. If the proposed activity requires a PCN and will result in a loss of greater than 1/10 acre of wetlands, the prospective permittee should submit a mitigation proposal with the PCN. Applicants may also propose compensatory mitigation for projects with smaller impacts. The district engineer will consider any proposed compensatory mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects to the aquatic environment of the proposed work are minimal. The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects on the aquatic environment are minimal, after considering mitigation, the district engineer will notify the permittee and include any conditions the district engineer deems necessary. The district engineer must approve any compensatory mitigation proposal before the permittee commences work. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the district engineer will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the plan within 45 calendar days of receiving a complete PCN and determine whether the proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after consideration of the compensatory mitigation proposal) are determined by the district engineer to be minimal, the district engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP.

If the district engineer determines that the adverse effects of the proposed work are more than minimal, then the district engineer will notify the applicant either: (1) That the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (2) that the project is authorized under the NWP subject to the applicant's submission of a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level; or (3) that the project is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period. The authorization will include the necessary conceptual or specific mitigation or a requirement that the applicant

submit a mitigation plan that would reduce the adverse effects on the aquatic environment to the minimal level. When mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan.

☐ **(a) 28. Single and Complete Project.** The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

B. Regional Conditions:

I. Sacramento District (All States, except Colorado)

1. When pre-construction notification (PCN) is required, the prospective permittee shall notify the Sacramento District in accordance with General Condition 27 using either the South Pacific Division Preconstruction Notification (PCN) Checklist or a completed application form (ENG Form 4345). In addition, the PCN shall include:

a. A written statement explaining how the activity has been designed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States;

b. Drawings, including plan and cross-section views, clearly depicting the location, size and dimensions of the proposed activity. The drawings shall contain a title block, legend and scale, amount (in cubic yards) and size (in acreage) of fill in Corps jurisdiction, including both permanent and temporary fills/structures. The ordinary high water mark or, if tidal waters, the high tide line should be shown (in feet), based on National Geodetic Vertical Datum (NGVD) or other appropriate referenced elevation; and

c. Pre-project color photographs of the project site taken from designatedlocations documented on the plan drawing.

2. The permittee shall complete compensatory mitigation required by special conditions of the NWP verification before or concurrent with construction of the authorized activity, except when specifically determined to be impracticable by the Sacramento District. When project mitigation involves use of a mitigation bank or in-lieu fee program, payment shall be made before commencing construction.

3. The permittee shall record the NWP verification with the Registrar of Deeds or other appropriate official charged with the responsibility for maintaining records of title to or interest in real property against areas (1) designated to be preserved as part of mitigation for authorized impacts, including any associated covenants or restrictions, or (2) where structures such as boat ramps or docks, marinas, piers, and permanently moored vessels will be constructed in or adjacent to navigable waters (Section 10 and Section 404). The recordation shall also include a map showing the surveyed location of the authorized structure and any associated areas preserved to minimize or compensate for project impacts.

4. The permittee shall place wetlands, other aquatic areas, and any vegetative buffers preserved as part of mitigation for impacts into a separate "preserve" parcel prior to discharging dredged or fill material into waters of the United States, except where specifically determined to be impracticable by the Sacramento District. Permanent legal protection shall be established for all preserve parcels, following Sacramento District approval of the legal instrument.

5. The permittee shall allow Corps representatives to inspect the authorized activity and any mitigation areas at any time deemed necessary to determine compliance with the terms and conditions of the NWP verification. The permittee will be notified in advance of an inspection.

6. For NWPs 29, 39, 40, 42, 43, 44, and 46, requests to waive the 300 linear foot limitation for intermittent or ephemeral waters of the U.S. shall include an evaluation of functions and services provided by the waterbody taking into account the watershed, measures to be implemented to avoid and minimize impacts, other measures to avoid and minimize that were found to be impracticable, and a mitigation plan for offsetting impacts.

7. Road crossings shall be designed to ensure fish passage, especially for anadromous fisheries. Permittees shall employ bridge designs that span the stream or river, utilize pier or pile supported structures, or involve large bottomless culverts with a natural streambed, where the substrate and streamflow conditions approximate existing channel conditions. Approach fills in waters of the United States below the ordinary high water mark are not authorized under the NWPs, except where avoidance has specifically been determined to be impracticable by the Sacramento District.

8. For NWP 12, clay blocks, bentonite, or other suitable material shall be used to seal the trench to prevent the utility line from draining waters of the United States, including wetlands.

9. For NWP 13, bank stabilization shall include the use of vegetation or other biotechnical design to the maximum extent practicable. Activities involving hard-armoring of the bank toe or slope requires submission of a PCN per General Condition 27.

10. For NWP 23, the PCN shall include a copy of the signed Categorical Exclusion document and final agency determinations regarding compliance with Section 7 of the Endangered Species Act, Essential Fish Habitat under the Magnussen-Stevens Act, and Section 106 of the National Historic Preservation Act.

11. For NWP 44, the discharge shall not cause the loss of more than 300 linear feet of streambed. For intermittent and ephemeral streams, the 300 linear foot limit may be waived in writing by the Sacramento District. This NWP does not authorize discharges in waters of the United States supporting anadromous fisheries.

12. For NWPs 29 and 39, channelization or relocation of intermittent or perennial drainage, is not authorized, except when, as determined by the Sacramento District, the relocation would result in a net increase in functions of the aquatic ecosystem within the watershed.

13. For NWP 33, temporary fills for construction access in waters of the United States supporting fisheries shall be accomplished with clean, washed spawning quality gravels where practicable as determined by the Sacramento District, in consultation with appropriate federal and state wildlife agencies.

14. For NWP 46, the discharge shall not cause the loss of greater than 0.5 acres of waters of the United States or the loss of more than 300 linear feet of ditch, unless this 300 foot linear foot limit is waived in writing by the Sacramento District.

15. For NWPs 29, 39, 40, 42, and 43, upland vegetated buffers shall be established and maintained in perpetuity, to the maximum extent practicable, next to all preserved open waters, streams and wetlands including created, restored, enhanced or preserved waters of the U.S., consistent with General Condition 20. Except in unusual circumstances, vegetated buffers shall be at least 50 feet in width.

16. All NWPs except 3, 6, 20, 27, 32, 38, and 47, are revoked for activities in histosols and fens and in wetlands contiguous with fens. Fens are defined as slope wetlands with a histic epipedon that are hydrologically supported by groundwater. Fens are normally saturated throughout the growing season, although they may not be during drought conditions. For NWPs 3, 6, 20, 27, 32, and 38, prospective permittees shall submit a PCN to the Sacramento District in accordance with General Condition 27.

17. For all NWPs, when activities are proposed within 100 feet of the point of groundwater discharge of a natural spring, prospective permittees shall submit a PCN to the Sacramento District in accordance with General Condition 27. A spring source is defined as any location where ground water emanates from a point in the ground. For purposes of this condition, springs do not include seeps or other discharges which lack a defined channel.

II. California Only

1. In the Lake Tahoe Basin, all NWPs are revoked. Activities in this area shall be authorized under Regional General Permit 16 or through an individual permit.

2. In the Primary and Secondary Zones of the Legal Delta, NWPs 29 and 39 are revoked. New development activities in the Legal Delta will be reviewed through the Corps' standard permit process.

III. Nevada Only

1. In the Lake Tahoe Basin, all NWPs are revoked. Activities in this area shall be authorized under Regional General Permit 16 or through an individual permit.

IV. Utah Only

1. For all NWPs, except NWP 47, prospective permittees shall submit a PCN in accordance with General Condition 27 for any activity, in waters of the United States, below 4217 feet mean sea level (msl) adjacent to the Great Salt Lake and below 4500 feet msl adjacent to Utah Lake.

2. A PCN is required for all bank stabilization activities in a perennial stream that would affect more than 100 linear feet of stream

3. For NWP 27, facilities for controlling stormwater runoff, construction of water parks such as kayak courses, and use of grout or concrete to construct in-stream structures are not authorized. A PCN is required for all projects exceeding 1500 linear feet as measured on the stream thalweg, using in stream structures exceeding 50 cubic yards per structure and/or incorporating grade control structures exceeding 1 foot vertical drop. For any stream restoration project, the post project stream sinuosity shall be appropriate to the geomorphology of the surrounding area and shall be equal to, or greater than, pre project sinuosity. Sinuosity is defined as the ratio of stream length to project reach length. Structures shall allow the passage of aquatic organisms, recreational water craft or other navigational activities unless specifically waived in writing by the District Engineer.

V. Colorado Only

1. Final Regional Conditions Applicable to Specific Nationwide Permits within Colorado.

a. Nationwide Permit Nos. 12 and 14, Utility Line Activities and Linear Transportation Projects. In the Colorado River Basin, utility line and road activities crossing perennial water or special aquatic sites require notification to the District Engineer in accordance with General Condition 27 (Pre-Construction Notification).

b. Nationwide Permit No. 13 Bank Stabilization. In Colorado, bank stabilization activities necessary for erosion prevention in streams that average less than 20 feet in width (measured between the ordinary high water marks) are limited to the placement of no more than 1/4 cubic yard of suitable fill* material per running foot below the plane of the ordinary high water mark. Activities greater than 1/4 cubic yard may be authorized if the permittee notifies the District Engineer in accordance with General Condition 27 (Pre-Construction Notification) and the Corps determines the adverse environmental effects are minimal. [* See (g) for definition of Suitable Fill]

c. Nationwide Permit No. 27 Aquatic Habitat Restoration, Establishment, and Enhancement Activities.

(1) For activities that include a fishery enhancement component, the Corps will send the Pre-Construction Notification to the Colorado Division of Wildlife (CDOW) for review. In accordance with General Condition 27 (Pre-Construction Notification), CDOW will have 10 days from the receipt of Corps notification to indicate that they will be commenting on the proposed project. CDOW will then have an additional 15 days after the initial 10-day period to provide those comments. If CDOW raises concerns, the applicant may either modify their plan, in coordination with CDOW, or apply for a standard individual permit.

(2) For activities involving the length of a stream, the post-project stream sinuosity will not be significantly reduced, unless it is demonstrated that the reduction in sinuosity is consistent with the natural morphological evolution of the stream (sinuosity is the ratio of stream length to project reach length).

(3) Structures will allow the upstream and downstream passage of aquatic organisms, including fish native to the reach, as well as recreational water craft or other navigational activities, unless specifically waived in writing by the District Engineer. The use of grout and/or concrete in

building structures is not authorized by this nationwide permit.

(4) The construction of water parks (i.e., kayak courses) and flood control projects are not authorized by this nationwide permit.

d. Nationwide Permits Nos. 29 and 39; Residential Developments and Commercial and Institutional Developments. A copy of the existing FEMA/locally-approved floodplain map must be submitted with the Pre-Construction Notification. When reviewing proposed developments, the Corps will utilize the most accurate and reliable FEMA/locally-approved pre-project floodplain mapping, not post-project floodplain mapping based on a CLOMR or LOMR. However, the Corps will accept revisions to existing floodplain mapping if the revisions resolve inaccuracies in the original floodplain mapping and if the revisions accurately reflect pre-project conditions.

2. Final Regional Conditions Applicable to All Nationwide Permits within Colorado

e. Removal of Temporary Fills. General Condition 13 (Removal of Temporary Fills) is amended by adding the following: When temporary fills are placed in wetlands in Colorado, a horizontal marker (i.e. fabric, certified weed-free straw, etc.) must be used to delineate the existing ground elevation of wetlands that will be temporarily filled during construction.

f. Spawning Areas. General Condition 3 (Spawning Areas) is amended by adding the following: In Colorado, all Designated Critical Resource Waters (see enclosure 1) are considered important spawning areas. Therefore, In accordance with General Condition 19 (Designated Critical Resource Waters), the discharge of dredged or fill material in not authorized by the following nationwide permits in these waters: NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, and 50. In addition, in accordance with General Condition 27 (Pre-Construction Notification), notification to the District Engineer is required for use of the following nationwide permits in these waters: NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37 and 38".

g. Suitable Fill. In Colorado, use of broken concrete as fill material requires notification to the District Engineer in accordance with General Condition 27 (Pre-Construction Notification). Permittees must demonstrate that soft engineering methods utilizing native or non-manmade materials are not practicable (with respect to cost, existing technology, and logistics), before broken concrete is allowed as suitable fill. Use of broken concrete with exposed rebar is prohibited in perennial waters and special aquatic sites.

h. Invasive Aquatic Species. General Condition 11 is amended by adding the following condition for work in perennial or intermittent waters of the United States: If heavy equipment is used for the subject project that was previously working in another stream, river, lake, pond, or wetland within 10 days of initiating work, one the following procedures is necessary to prevent the spread of New Zealand Mud Snails and other aquatic hitchhikers:

(1) Remove all mud and debris from equipment (tracks, turrets, buckets, drags, teeth, etc.) and keep the equipment dry for 10 days. OR

(2) Remove all mud and debris from Equipment (tracks, turrets, buckets, drags, teeth, etc.) and spray/soak equipment with either a 1:1 solution of Formula 409 Household Cleaner and water, or a solution of Sparquat 256 (5 ounces Sparquat per gallon of water). Treated equipment must be kept moist for at least 10 minutes. OR

(3) Remove all mud and debris from equipment (tracks, turrets, buckets, drags, teeth, etc.) and spray/soak equipment with water greater than 120 degrees F for at least 10 minutes.

3. Final Regional Conditions for Revocation/Special Notification Specific to Certain Geographic Areas

i. Fens: All Nationwide permits, except permit Nos. 3, 6, 20, 27, 32, 38 and 47, are revoked in fens and wetlands adjacent to fens. Use of nationwide permit Nos. 3, 20, 27 and 38, requires notification to the District Engineer, in accordance with General Condition 27 (Pre-Construction Notification), and the permittee may not begin the activity until the Corps determines the adverse environmental effects are minimal. The following defines a fen:

Fen soils (histosols) are normally saturated throughout the growing season, although they may not be during drought conditions. The primary source of hydrology for fens is groundwater. Histosols are defined in accordance with the U.S. Department of Agriculture, Natural Resources Conservation Service publications on Keys to Soil Taxonomy and Field Indicators of Hydric Soils in the United States (http://soils.usda.gov/technical/classification/taxonomy).

j. Springs: Within the state of Colorado, all NWPs, except permit 47 (original 'C'), require preconstruction notification pursuant to General Condition 27 for discharges of dredged or fill material within 100 feet of the point of groundwater discharge of natural springs. A spring source is defined as any location where groundwater emanates from a point in the ground. For purposes of this regional condition, springs do not include seeps or other discharges which do not have a defined channel.

4. Additional Information

The following provides additional information regarding minimization of impacts and compliance with existing general Conditions:

a. Permittees are reminded of the existing General Condition No. 6 which prohibits the use of unsuitable material. Organic debris, building waste, asphalt, car bodies, and trash are not suitable material. Also, General Condition 12 requires appropriate erosion and sediment controls (i.e. all fills must be permanently stabilized to

prevent erosion and siltation into waters and wetlands at the earliest practicable date). Streambed material or other small aggregate material placed along a bank as stabilization will not meet General Condition 12. Also, use of erosion control mates that contain plastic netting may not meet General Condition 12 if deemed harmful to wildlife.

b. Designated Critical Resource Waters in Colorado. In Colorado, a list of designated Critical Resource Waters has been published in accordance with General Condition 19 (Designated Critical Resource Waters). This list will be published on the Albuquerque District Regulatory home page (http://www.spa.usace.army.mil/reg/)

c. Federally-Listed Threatened and Endangered Species. General condition 17 requires that nod-federal permittees notify the District Engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project. Information on such species, to include occurrence by county in Colorado, may be found at the following U.S. Fish and Wildlife Service website: http://www.fws.gov/mountain%2Dprairie/endspp/name_county_search.htm

C. Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.

2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.

3. NWPs do not grant any property rights or exclusive privileges.

4. NWPs do not authorize any injury to the property or rights of others.

5. NWPs do not authorize interference with any existing or proposed Federal project.

D. Definitions

Best management practices (BMPs): Policies, practices, procedures, or structures implemented to mitigate the adverse environmental effects on surface water quality resulting from development. BMPs are categorized as structural or non-structural.

Compensatory mitigation: The restoration, establishment (creation), enhancement, or preservation of aquatic resources for the purpose of compensating for unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.

Currently serviceable: Useable as is or with some maintenance, but not so degraded as to essentially require reconstruction.

Discharge: The term "discharge" means any discharge of dredged or fill material.

Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.

Ephemeral stream: An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Establishment (creation): The manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.

Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR part 60).

Independent utility: A test to determine what constitutes a single and complete project in the Corps regulatory program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

Intermittent stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

Loss of waters of the United States: Waters of the United States that are permanently adversely affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent adverse effects include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. The acreage of loss of waters of the United States is a threshold measurement of the impact to jurisdictional waters for determining whether a project may qualify for an NWP; it is not a net threshold that is calculated after considering compensatory mitigation that may be used to offset losses of aquatic functions and services. The loss of stream bed includes the linear feet of stream bed that is filled or excavated. Waters of the United States temporarily filled, flooded, excavated, or drained, but restored to pre-construction contours and elevations after construction, are not included in the measurement of loss of waters of the United States. Impacts resulting from activities eligible for exemptions under Section 404(f) of the Clean Water Act are not considered when calculating the loss of waters of the United States.

Non-tidal wetland: A non-tidal wetland is a wetland that is not subject to the ebb and flow of tidal waters. The definition of a wetland can be found at 33 CFR 328.3(b). Non-tidal wetlands

contiguous to tidal waters are located landward of the high tide line (i.e., spring high tide line).

Open water: For purposes of the NWPs, an open water is any area that in a year with normal patterns of precipitation has water flowing or standing above ground to the extent that an ordinary high water mark can be determined. Aquatic vegetation within the area of standing or flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered to be open waters. Examples of "open waters" include rivers, streams, lakes, and ponds.

Ordinary High Water Mark: An ordinary high water mark is a line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas (see 33 CFR 328.3(e)).

Perennial stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.

Pre-construction notification: A request submitted by the project proponent to the Corps for confirmation that a particular activity is authorized by nationwide permit. The request may be a permit application, letter, or similar document that includes information about the proposed work and its anticipated environmental effects. Pre-construction notification may be required by the terms and conditions of a nationwide permit, or by regional conditions. A pre-construction notification may be voluntarily submitted in cases where pre-construction notification is not required and the project proponent wants confirmation that the activity is authorized by nationwide permit.

Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.

Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Re-establishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area.

Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation.

Riffle and pool complex: Riffle and pool complexes are special aquatic sites under the 404(b)(1) Guidelines. Riffle and pool complexes sometimes characterize steep gradient sections of streams. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a course substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. A slower stream velocity, a streaming flow, a smooth surface, and a finer substrate characterize pools.

Riparian areas: Riparian areas are lands adjacent to streams, lakes, and estuarine-marine shorelines. Riparian areas are transitional between terrestrial and aquatic ecosystems, through which surface and subsurface hydrology connects waterbodies with their adjacent uplands. Riparian areas provide a variety of ecological functions and services and help improve or maintain local water quality. (See general condition 20.)

Shellfish seeding: The placement of shellfish seed and/or suitable substrate to increase shellfish production. Shellfish seed consists of immature individual shellfish or individual shellfish attached to shells or shell fragments (i.e., spat on shell). Suitable substrate may consist of shellfish shells, shell fragments, or other appropriate materials placed into waters for shellfish habitat.

Single and complete project: The term "single and complete project" is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. A single and complete project must have independent utility (see definition). For linear projects, a "single and complete project" is all crossings of a single water of the United States (i.e., a single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately.

Stormwater management: Stormwater management is the mechanism for controlling stormwater runoff for the purposes of reducing downstream erosion, water quality degradation, and flooding and mitigating the adverse effects of changes in land use on the aquatic environment.

Stormwater management facilities: Stormwater management facilities are those facilities, including but not limited to, stormwater retention and detention ponds and best management practices, which retain water for a period of time to control runoff and/or improve the quality (i.e., by reducing the concentration of nutrients, sediments, hazardous substances and other pollutants) of stormwater runoff.

Stream bed: The substrate of the stream channel between the ordinary high water marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the stream bed, but outside of the ordinary high water marks, are not considered part of the stream bed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal

interruption of normal stream processes. A channelized stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Tidal wetland: A tidal wetland is a wetland (i.e., water of the United States) that is inundated by tidal waters. The definitions of a wetland and tidal waters can be found at 33 CFR 328.3(b) and 33 CFR 328.3(f), respectively. Tidal waters rise and fall in a predictable and measurable rhythm or cycle due to the gravitational pulls of the moon and sun. Tidal waters end where the rise and fall of the water surface can no longer be practically measured in a predictable rhythm due to masking by other waters, wind, or other effects. Tidal wetlands are located channelward of the high tide line, which is defined at 33 CFR 328.3(d).

Vegetated shallows: Vegetated shallows are special aquatic sites under the 404(b)(1) Guidelines. They are areas that are permanently inundated and under normal circumstances have rooted aquatic vegetation, such as seagrasses in marine and estuarine systems and a variety of vascular rooted plants in freshwater systems.

Waterbody: For purposes of the NWPs, a waterbody is a jurisdictional water of the United States that, during a year with normal patterns of precipitation, has water flowing or standing above ground to the extent that an ordinary high water mark (OHWM) or other indicators of jurisdiction can be determined, as well as any wetland area (see 33 CFR 328.3(b)). If a jurisdictional wetland is adjacent--meaning bordering, contiguous, or neighboring--to a jurisdictional waterbody displaying an OHWM or other indicators of jurisdiction, that waterbody and its adjacent wetlands are considered together as a single aquatic unit (see 33 CFR 328.4(c)(2)). Examples of "waterbodies" include streams, rivers, lakes, ponds, and wetlands.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

APR 15 2009

In response refer to:
2009/00370

Zachary K. Parker
Chief, Central Region Biology Branch
California Department of Transportation
2015 East Shields Avenue, Suite A-100
Fresno, California 93726-5428

Dear Mr. Parker:

This letter is in response to your January 22, 2009, request for initiation of section 7 consultation with NOAA's National Marine Fisheries Service (NMFS), pursuant to the Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA), concerning the State Route (SR) 99 Manteca 6-Lane project located in San Joaquin County, California. You have determined that the proposed project may affect, but is not likely to adversely affect Central Valley (CV) Steelhead (*Oncorhynchus mykiss*). In addition, the proposed project area has been designated as Essential Fish Habitat (EFH) of Pacific salmon pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA). This letter also serves as consultation under the authority of, and in accordance with, the provisions of the Fish and Wildlife Coordination act of 1934 (FWCA), as amended. NMFS recognizes that the California Department of Transportation (Caltrans) is acting in conjunction with the Federal Highway Administration (FHWA) for this project and has assumed FHWA's responsibilities under Federal environmental laws as allowed by the Memorandum of Understanding between FHWA and Caltrans, which became effective on July 1, 2007.

Caltrans proposes to upgrade bridge rails and minor shoulder widening on SR 99 bridges over Lone Tree Slough, French Camp Slough, and Little John Creek. New bridge decks will be constructed between the existing north and south bound bridges in order to accommodate the addition of two new travel lanes and associated shoulders in the median. New bridge decks will also be constructed to the east of the existing north bound bridges and to the west of the existing south bound bridges. New bridge piers will be constructed within the channels to support the additional bridge decks. The bridge piers are expected to be round concrete columns approximately 18 inches in diameter. Concrete lining that currently exists on the banks of the channels under the existing bridge decks may need to be removed and replaced to accommodate the widening. The bridge abutments will also be widened and new footings will be constructed under the abutments to accommodate the new bridge structures. There will be 16 new bridge piers constructed at Lone Tree Creek, 12 new bridge piers at Little Johns Creek, and 18 at French Camp Slough.

All proposed in-channel work will be conducted from June 15 through October 15. Best Management Practices (BMPs) will be implemented during construction activities. All disturbed soils will undergo erosion treatment (*i.e.* hay bales, filter fences, vegetative buffer strips) prior to October 15th and/or immediately after construction is terminated to reduce siltation and contaminated runoff from the project sites. Environmentally sensitive areas will be fenced off to avoid unnecessary habitat disturbance. If any riparian vegetation should be disturbed, native trees, shrubs, native grasses, and/or forbs will be replanted at the end of construction. Appropriate irrigation, care and monitoring will be conducted to ensure that healthy riparian and shaded riverine aquatic habitat is successfully established. Equipment will be refueled and serviced at designated construction staging areas 100 feet from the wetted width of any stream. All construction materials and fill will be stored and contained in a designated area that is located away from the channels to prevent transport of foreign materials into adjacent streams. In addition, a silt fence will be installed to collect potential discharge, and adequate materials for spill clean-up will be maintained at the project sites at all times. Hazardous or potentially toxic materials such as herbicides and petroleum products will be located outside of the 100 year flood zone and will be bermed to prevent the discharge of pollutants to ground water and runoff water.

ESA Section 7 Consultation

Based on our review of the material provided with your request and the best scientific and commercial information currently available, NMFS concurs that the SR 99 Manteca 6-lane project is not likely to adversely affect CV steelhead. NMFS has reached this determination based on the following reasons:

1. All in-channel work will be conducted during June 15-October 15, when salmonids are not expected to be present in the action area and thus would not be exposed to the effects of the proposed construction activities. During this in-channel work window, water temperatures are generally too warm and other habitat conditions (*i.e.* high turbidity, silty substrates, and high nutrient load) make the action area generally unsuitable for anadromous listed fish to be present during this period.

2. Protective fencing will be placed to keep construction activities and vehicles from impacting riparian vegetation adjacent to the project site. Thus, any vegetation not planned for removal/disturbance will be fenced to provide appropriate protection from construction impacts. If any riparian vegetation needs to be disturbed during construction, native trees, shrubs, native grasses, and/or forbs will be replanted at the completion of construction. Appropriate irrigation, care and monitoring will be conducted to ensure that healthy riparian and shaded riverine aquatic habitat is successfully established. The re-planting and establishment of new riparian vegetation will improve fish habitat and minimized erosion and siltation that could potentially cause harm to anadromous listed fish.

3. The following mitigation measures will be incorporated into the proposed project to minimize the potential for water quality impacts that could potentially harm anadromous listed fish and their habitat:

- BMPs will be implemented throughout the duration of the proposed project activities.
- Equipment will be refueled and serviced at designated construction staging areas 100 feet from the wetted width of the streams. In addition, all construction materials and fill will be stored and contained in a designated area that is located away from the channels to prevent transport of foreign materials into adjacent streams.
- A silt fence will be installed to collect potential discharge, and adequate materials for spill clean-up will be maintained at the project sites at all times..
- Hazardous or potentially toxic materials such as herbicides and petroleum products will be located outside of the 100 year flood zone. An impermeable membrane will be placed between the ground and the hazardous material and the area will be bermed to prevent the discharge of pollutants to ground water or runoff water.
- All disturbed soils will undergo erosion treatment (*i.e.* hay bales, filter fences, vegetative buffer strips) prior to October 15th and/or immediately after construction is terminated to reduce siltation and contaminated runoff from project sites.

This concludes ESA consultation for the SR 99 Manteca 6-lane project. This concurrence does not provide incidental take authorization pursuant to section 7(b)(4) and section 7(o)(2) of the ESA. Re-initiation of the consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law), and if: (1) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered; (2) the action is subsequently modified in a manner that causes adverse effects to listed species or critical habitat; or (3) a new species is listed or critical habitat designated that may be affected by this action.

Essential Fish Habitat (EFH) Consultation

With regards to EFH consultation, the proposed project area has been identified as EFH for Chinook salmon in Amendment 14 of the Pacific Salmon Fishery Management Plan pursuant to the Magnuson Stevens Act (MSA). Federal action agencies are mandated by the MSA (section 305(b)(2)) to consult with NMFS on all actions that may adversely affect EFH and NMFS must provide EFH conservation recommendations to those agencies (section 305(b)(4)(A)). Because the proposed action has incorporated specific measures (described above) to minimize impacts to the habitat of salmonids, NMFS has determined that the proposed project will not adversely affect EFH, and additional EFH Conservation Recommendations are not being provided at this time; however, if there is substantial revision to the action, the lead Federal agency will need to re-initiate EFH consultation.

Fish and Wildlife Coordination Act (FWCA)

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development (16 U.S.C. 661). The FWCA establishes a consultation requirement for Federal departments and agencies that

undertake any action that proposes to modify any stream or other body of water for any purpose, including navigation and drainage (16 U.S.C 662(a)). Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources. The FWCA allows the opportunity to offer recommendations for the conservation of species and habitats beyond those currently managed under the ESA and MSA. Because the proposed project is designed to avoid environmental impacts to aquatic habitat within the action area, NMFS has no additional FWCA comments to provide.

Please contact Monica Gutierrez at (916) 930-3657, or via e-mail at Monica.Gutierrez@noaa.gov if you have any questions or require additional information concerning this project.

Sincerely,

Maria Rea
for Rodney R. McInnis
Regional Administrator

cc: Copy to File ARN # 151422SWR2009SA00410
NMFS-PRD, Long Beach, CA
Bryant Chesney, Long Beach, CA

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY EDMUND G. BROWN JR., GOVERNOR

CENTRAL VALLEY FLOOD PROTECTION BOARD
3310 El Camino Ave., Rm. 151
SACRAMENTO, CA 95821
(916) 574-0609 FAX: (916) 574-0682
PERMITS: (916) 574-0685 FAX: (916) 574-0682

JUL 27 2011

Permit No. 18662 BD

California Department of Transportation
2015 East Shields Avenue, Suite 100-A
Fresno, California 93726-5428

Enclosed is your approved Central Valley Flood Protection Board Encroachment Permit Conditions.

Under the Standard General Condition Four (4) of the permit, you are required to accomplish the work under direction and supervision of the Department of Water Resources; therefore, you must advise the Department at 3310 El Camino Avenue, Sacramento, California 95821, attention Lorraine Pendlebury, telephone (916) 574-0609, at least ten days prior to starting your project. An addressed postcard is enclosed for your convenience.

Please note that the permit grants the work proposed in your application. This permit, in addition to the twelve (12) standard conditions, includes special conditions, which may place limitations on or require modifications to your project. You are advised to read all conditions prior to starting the project. Commencing any work under this permit shall constitute an acceptance of the provisions of the permit and an agreement to perform accordingly. This permit does not relieve you from the responsibility for obtaining authorization from any State, local, or federal agencies for your proposed project.

Please refer to your permit number when communicating with this office. For further information, contact Jon Tice at (916) 574-2380.

Sincerely,

Mitra Emami

Mitra Emami, Chief
Floodway Protection Section
Central Valley Flood Protection Board

Enclosure

STATE OF CALIFORNIA
THE RESOURCES AGENCY

THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18662 BD

This Permit is issued to:

California Department of Transportation
2015 East Shields Avenue, Suite 100-A
Fresno, California 93726-5428

To widen the existing bridge crossing over Lone Tree Creek by 35 foot 4 inch within the median to provide an additional 12 foot lane and 10 foot shoulder in each direction of travel, separated by a concrete barrier. The bridge will also be widened by 30 foot on the east side to accommodate the northbound on-ramp at the French Camp Road Interchange. The new southbound off-ramp bridge will provide a new crossing over Lone Tree Creek, which will consist of a 26 foot 10 inch wide structure with a 12 foot lane and paved shoulders with concrete barriers. The existing concrete slope protection at the abutments will remain undamaged for the median bridge widening. Additional concrete slope protection will be placed within the north and south abutments. Lone Tree Creek and SR99 (Section 29, T1S, R7E, W, San Joaquin County Flood Control and Water Conservation District, Lone Tree Creek, San Joaquin County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: JUL 27 2011

Jay S. Punia
Executive Officer

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any

DWR 3784 (Rev. 9/85)

other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 18662 BD

THIRTEEN: All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Central Valley Flood Protection Board.

FOURTEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

FIFTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

SIXTEEN: The mitigation measures approved by the CEQA lead agency and the permittee are found in the Final Initial Study/Mitigated Negative Declaration adopted by the CEQA lead agency. The permittee shall implement all such mitigation measures.

SEVENTEEN: The Central Valley Flood Protection Board and Department of Water Resources shall not be held liable for damages to the permitted encroachment(s) resulting from releases of water from reservoirs, flood fight, operation, maintenance, inspection, or emergency repair.

EIGHTEEN: No construction work of any kind shall be done during the flood season from November 1 to July 15 without prior approval of the Central Valley Flood Protection Board.

NINETEEN: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

TWENTY: The permittee shall contact the Department of Water Resources by telephone, (916) 574-1206, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do so at least 10 working days prior to start of work may result in delay of the project.

TWENTY-ONE: Temporary staging, formwork, stockpiled material, equipment, and temporary buildings shall not remain in the floodway during the flood season from November 1 to July 15.

TWENTY-TWO: Prior to start of any demolition and/or construction activities within the floodway, the applicant shall provide the Central Valley Flood Protection Board with two sets of layout plans for any and all temporary, in channel cofferdam(s), gravel work pad(s), work trestle(s), scaffolding, piles, and/or other appurtenances that are to remain in the floodway during the flood season from November 1 through July 15.

TWENTY-THREE: Debris that may accumulate on the permitted encroachment(s) and related facilities shall be cleared off and disposed of outside the floodway after each period of high water

TWENTY-FOUR: All debris generated by this project shall be disposed of outside the floodway.

TWENTY-FIVE: Cleared trees and brush shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1 to July 15.

TWENTY-SIX: Fill material shall be placed only within the area indicated on the approved plans.

TWENTY-SEVEN: Backfill material for excavations shall be placed in 4- to 6-inch layers and compacted to at least the density of the adjacent, firm, undisturbed material.

TWENTY-EIGHT: Density tests by a certified materials laboratory will be required to verify compaction of backfill within the regulated channel.

TWENTY-NINE: Except with respect to activities expressly allowed under this permit, the work area shall be restored to the condition that existed prior to start of work.

THIRTY: The permittee shall provide supervision and inspection services acceptable to the Central Valley Flood Protection Board.

THIRTY-ONE: The permittee shall submit as-built drawings to the Department of Water Resources' Flood Project Inspection Section upon completion of the project.

THIRTY-TWO: In the event that levee or bank erosion injurious to the adopted plan of flood control occurs at or adjacent to the permitted encroachment(s), the permittee shall repair the eroded area and propose measures, to be approved by the Central Valley Flood Protection Board, to prevent further erosion.

THIRTY-THREE: The permitted encroachment(s) shall not interfere with operation and maintenance of the present or future flood control project. If the permitted encroachment(s) are determined by any agency responsible for operation or maintenance of the flood control project to interfere, the permittee shall be required, at permittee's cost and expense, to modify or remove the permitted encroachment(s) under direction of the Central Valley Flood Protection Board or Department of Water Resources. If the permittee does not comply, the Central Valley Flood Protection Board may modify or remove the encroachment(s) at the permittee's expense.

THIRTY-FOUR: If the project, or any portion thereof, is to be abandoned in the future, the permittee or successor shall abandon the project under direction of the Central Valley Flood Protection Board and Department of Water Resources, at the permittee's or successor's cost and expense.

THIRTY-FIVE: The permittee shall be responsible for securing any necessary permits incidental to habitat manipulation and restoration work completed in the flood control project, and will provide any biological surveying, monitoring, and reporting needed to satisfy those permits.

THIRTY-SIX: The permittee should contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, 1325 J Street, Sacramento, California 95814, telephone (916) 557-5250, as compliance with Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act may be required.

THIRTY-SEVEN: The abandoned or dismantled bridge shall be completely removed and disposed of outside the limits of the levee section and floodway.

THIRTY-EIGHT: Piers, bents, and abutments being dismantled shall be removed to at least 1 foot below the natural ground line and at least 3 feet below the bottom of the low-water channel.

THIRTY-NINE: The bridge piers and bents shall be constructed parallel to the direction of streamflow.

FORTY: Drainage from the bridge shall not be discharged into the streambank.

FORTY-ONE: Plans showing all construction facilities such as temporary staging, coffer dams, and falsework which shall remain in a floodway during November 1 to July 15, must be submitted to the board for approval prior to installation of these facilities.

FORTY-TWO: All construction facilities such as temporary staging, coffer dams, and falsework must be designed to prevent bank erosion during normal streamflows and maintain maximum channel

capacity during November 1 to July 15.

FORTY-THREE: The soffit of the bridge shall be no lower than that of the replaced bridge.

FORTY-FOUR: Bridge piers and bents placed within the floodway to support a widened portion of the existing bridge shall be constructed in line with the existing bents and piers.

FORTY-FIVE: A letter from the U. S. Army Corps of Engineers dated July 11, 2011 indicating that the project does not impact a federally constructed project is attached to this permit for reference as Exhibit A.

FORTY-SIX: The permittee shall comply with all conditions set forth in the letter from the San Joaquin County Flood Control & Water Conservation District dated January 12, 2011, which is attached to this permit as Exhibit B and is incorporated by reference.

EXHIBIT - A

DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

REPLY TO ATTENTION OF

Flood Protection and Navigation Section (18662)

Mr. Jay Punia, Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

JUL 11 2011

Dear Mr. Punia:

We have reviewed a permit application by the California Department of Transportation (application number 18662). This project includes widening the existing Highway 99 bridge over Lone Tree Creek. The project is located at 37.8645°N 121.2189°W NAD83, San Joaquin County, California.

The District Engineer has no comments or recommendations regarding flood control because the proposed work does not affect a federally constructed project.

A Section 10 and/or Section 404 permit (2009-1109) has been issued for this work.

A copy of this letter is being furnished to Mr. Don Rasmussen, Chief, Flood Project Integrity and Inspection Branch, 3310 El Camino Avenue, Suite LL30, Sacramento, CA 95821.

Sincerely,

Meegan G. Nagy, P.E.
Chief, Flood Protection and Navigation Section

EXHIBIT - B

SAN JOAQUIN COUNTY
FLOOD CONTROL & WATER CONSERVATION DISTRICT
P. O. BOX 1810
1810 EAST HAZELTON AVENUE
STOCKTON, CALIFORNIA 95201
TELEPHONE (209) 468-3000
FAX NO. (209) 468-2999

THOMAS R. FLINN
DIRECTOR OF PUBLIC WORKS
FLOOD CONTROL ENGINEER

January 12, 2011

Central Valley Flood Protection Board
3310 El Camino Avenue
Sacramento, California 95821

Attention: Floodway Protection Section

SUBJECT: CENTRAL VALLEY FLOOD PROTECTION BOARD PERMIT APPLICATION OF CALTRANS AT THE STATE HIGHWAY ROUTE 99 CROSSING OF LONE TREE CREEK

Gentlemen:

Reference is made to the Central Valley Flood Protection Board Permit Application of the California Department of Transportation to widen State Highway Route 99 bridge over Lone Tree Creek. The existing four-lane bridge will be widened within the median to add two lanes, and expanded to the east of the existing structure to add a northbound on-ramp. Twenty-two piles will be placed to support the proposed median and on-ramp. The project is located at the State Highway Route 99 crossing of Lone Tree Creek, 1,700 feet north of French Camp Road, in San Joaquin County, in Section 29, Township 1 South, Range 7 East, Mount Diablo Base and Meridian.

The San Joaquin County Flood Control and Water Conservation District (District) has reviewed the Central Valley Flood Protection Board Permit application of the City of Stockton and endorses the project subject to the following conditions:

1. The District shall not be responsible for the maintenance of the facilities specified in this Permit.

2. The District shall not be held liable for damage(s) to the permitted encroachment(s) due to the District's operation, maintenance, flood fight, inspection, or emergency repairs.

3. The Permittee or the Successors-In-Interest shall be responsible for the modification or possible removal of the facilities, as requested by the District, if required for any future flood control plans at the Permittee's sole cost and expense.

4. The Permittee shall be liable for any damage to Lone Tree Creek that may occur as a result of this project.

5. The project shall be constructed in accordance with the plans, dated June 11, 2010, submitted with the application, dated October 6, 2010. Any revisions to the project will require the submittal of the revised plans to the District for review and approval.

6. No work shall be allowed in the Lone Tree Creek channel between November 1st and April 15th without prior approval of the District.

7. The Permittee or Successors-In-Interest shall keep the encroachments properly maintained in accordance with applicable current or future local, State and Federal standards.

EXHIBIT - B

8. The piles shall be constructed parallel to the direction of flow, and inline with the existing supports.

9. Stockpiled materials, coffer dams, and construction equipment shall be removed from the floodway prior to November 1.

10. The Permittee shall restore the Lone Tree Creek's invert and banks to the condition that existed prior to commencement of work

11. Upon completion of the project, the Permittee shall submit a hard copy and an electronic copy in AutoCAD and PDF format of the as-built drawings to:

    San Joaquin County Flood Control and Water Conservation District
    1810 East Hazelton Avenue
    Stockton, CA 95205

If there are any questions regarding these comments, please contact me at (209) 953-7617.

Sincerely,

BARRY O'REGAN, P.E.
Acting Engineering Division Manager

BO:SS:mk
FM-10L038-M3

STATE OF CALIFORNIA
THE RESOURCES AGENCY

THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18663 BD

This Permit is issued to:

California Department of Transporation
2015 East Shields Avenue, Suite 100-A
Fresno, California 93726-5428

To widen the existing bridge crossing over the North Fork South Littlejohns Creek by 35 foot, 4 inch within the median to provide an additional 12 foot lane and 10 foot shoulder in each direction of travel, separated by a concrete barrier (Type 60A Modified). Existing concrete slope protection within the north and south abutments will be removed and replaced within the same footprint (114 cubic yard total) and will include a cut off wall extended to a depth of 6 foot. Along the north abutment, concrete slope protection will be placed 74 foot west and 68 foot east of the SR 99 centerline. Along the south abutment, the concrete slope protection limits are 63 foot west and 77 foot east of the SR 99 centerline. Vegetation within the project footprint will be cleared and re-vegetated after construction with native grasses.

North Fork South Littlejohns Creek and SR99 (Section 29, T1S, R7E, W, San Joaquin County Flood Control and Water Conservation District, Littlejohns Creek, San Joaquin County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: DEC 2 - 2011

Jay S. Punice
Executive Officer

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

DWR 3784 (Rev. 9/85)

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 18663 BD

THIRTEEN: All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Central Valley Flood Protection Board.

FOURTEEN: There shall be no plantings within the project area under this permit, except that of native grasses, which may be required for slope protection.

FIFTEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion

SIXTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California, including its agencies, departments, boards, commissions, and their

respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

SEVENTEEN: The mitigation measures approved by the CEQA lead agency and the permittee are found in the Final Initial Study/Mitigated Negative Declaration adopted by the CEQA lead agency. The permittee shall implement all such mitigation measures.

EIGHTEEN: The Central Valley Flood Protection Board and Department of Water Resources shall not be held liable for damages to the permitted encroachment(s) resulting from releases of water from reservoirs, flood fight, operation, maintenance, inspection, or emergency repair.

NINETEEN: No construction work of any kind shall be done during the flood season from November 1 to April 15 without prior approval of the Central Valley Flood Protection Board.

TWENTY: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

TWENTY-ONE: The permittee shall contact the Department of Water Resources by telephone, (916) 574-0609, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do so at least 10 working days prior to start of work may result in delay of the project.

TWENTY-TWO: Temporary staging, formwork, stockpiled material, equipment, and temporary buildings shall not remain in the floodway during the flood season from November 1 to April 15.

TWENTY-THREE: Prior to demolition and/or construction activities any and all easements, both temporary and permanent, shall be obtained by the applicant for any areas needed to complete construction that have not already been obtained.

TWENTY-FOUR: Prior to start of any demolition and/or construction activities within the floodway, the applicant shall provide the Central Valley Flood Protection Board with two sets of layout plans for any and all temporary, in channel cofferdam(s), gravel work pad(s), work trestle(s), scaffolding, piles, and/or other appurtenances that are to remain in the floodway during the flood season from November 1 through April 15.

TWENTY-FIVE: Debris that may accumulate on the permitted encroachment(s) and related facilities shall be cleared off and disposed of outside the floodway after each period of high water.

TWENTY-SIX: All debris generated by this project shall be disposed of outside the floodway.

TWENTY-SEVEN: Cleared trees and brush shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1 to April 15.

TWENTY-EIGHT: Fill material shall be placed only within the area indicated on the approved plans.

TWENTY-NINE: Backfill material for excavations shall be placed in 4- to 6-inch layers and compacted to at least the density of the adjacent, firm, undisturbed material.

THIRTY: Density tests by a certified materials laboratory will be required to verify compaction of backfill within the regulated channel.

THIRTY-ONE: Revetment shall be uniformly placed and properly transitioned into the bank, levee slope, or adjacent revetment and in a manner which avoids segregation.

THIRTY-TWO: All revetment on the waterside of the levee or river bank shall be quarry stone and shall meet the design and grading requirements, as specified, in Title 23, Section 121.

THIRTY-THREE: The revetment shall not contain any reinforcing steel, floatable, or objectionable material. Asphalt or other petroleum-based products may not be used as fill or erosion protection on the levee section or within the floodway.

THIRTY-FOUR: The soffit of the bridges shall be no lower than that of the existing bridges.

THIRTY-FIVE: The work area shall be restored to the condition that existed prior to start of work.

THIRTY-SIX: The permittee shall provide supervision and inspection services acceptable to the Central Valley Flood Protection Board.

THIRTY-SEVEN: The permittee shall submit as-built drawings to the Department of Water Resources' Flood Project Inspection Section upon completion of the project.

THIRTY-EIGHT: In the event that levee or bank erosion injurious to the adopted plan of flood control occurs at or adjacent to the permitted encroachment(s), the permittee shall repair the eroded area and propose measures, to be approved by the Central Valley Flood Protection Board, to prevent further erosion.

THIRTY-NINE: If the project result(s) in an adverse hydraulic impact, the permittee shall provide appropriate mitigation measures, to be approved by the Central Valley Flood Protection Board, prior to implementation of mitigation measures.

FORTY: The permitted encroachment(s) shall not interfere with operation and maintenance of the present or future flood control project. If the permitted encroachment(s) are determined by any agency responsible for operation or maintenance of the flood control project to interfere, the permittee shall be required, at permittee's cost and expense, to modify or remove the permitted encroachment(s) under direction of the Central Valley Flood Protection Board or Department of Water Resources. If the permittee does not comply, the Central Valley Flood Protection Board may modify or remove the encroachment(s) at the permittee's expense.

FORTY-ONE: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Central

Valley Flood Protection Board may remove the encroachment(s) at the permittee's expense.

FORTY-TWO: If the project, or any portion thereof, is to be abandoned in the future, the permittee or successor shall abandon the project under direction of the Central Valley Flood Protection Board and Department of Water Resources, at the permittee's or successor's cost and expense.

FORTY-THREE: The permittee shall be responsible for securing any necessary permits incidental to habitat manipulation and restoration work completed in the flood control project, and will provide any biological surveying, monitoring, and reporting needed to satisfy those permits.

FORTY-FOUR: The permittee should contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, 1325 J Street, Sacramento, California 95814, telephone (916) 557-5250, as compliance with Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act may be required.

FORTY-FIVE: The permittee shall comply with all conditions set forth in the letter from the U.S. Army Corps of Engineers dated December 1, 2011, which is attached to this permit as Exhibit A and is incorporated by reference.

FORTY-SIX: The permittee shall comply with all conditions set forth in the San Joaquin County Flood Control and Water Conservation District letter dated January 12, 2011 and the letter dated August 31, 2011 which is attached to this permit as Exhibit B and is incorporated by reference.

FORTY-SEVEN: This permit shall run with the land and all conditions are binding on permittee's successors and assigns.

EXHIBIT - A

DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

REPLY TO
ATTENTION OF

Flood Protection and Navigation Section (18663)

DEC 1 2011

Mr. Jay Punia, Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Mr. Punia:

We have reviewed a permit application by the California Department of Transportation (application number 18663). This project includes widening State Route 99 over the North Fork South Littlejohns Creek by 35 feet, 4 inches within the median. The project also includes installing 8 new piers within the creek, and placing concrete slope protection around the north and south abutment. The project is located south of the Stockton Metropolitan Airport, at 37.8750N 121.2197W NAD83, in San Joaquin County, California.

The District Engineer has no objection to approval of this application by the Board from a flood control standpoint, subject to the following conditions:

a. That no work shall be performed and no stockpiles of materials or equipment shall remain in the floodway during the flood season of November 1 to April 15, unless otherwise approved in writing from your Board.

b. That in the event trees and brush are cleared, they shall be properly disposed of outside the limits of the project right-of-way.

c. That backfill material for any excavations shall be placed in 4 to 6 inch layers and compacted to at least the same density of the adjacent undisturbed embankment.

d. That the proposed bridge widening shall allow for at least the same channel flow capacity, vertical clearance, and waterway area as existed prior to new construction.

e. That the soffit of the widened bridge shall be no lower than the existing bridge.

f. That the proposed work shall not interfere with the integrity or hydraulic capacity of the flood damage reduction project; easement access; or maintenance, inspection, and flood fighting procedures.

g. That the proposed slope protection shall be placed uniformly and properly transitioned into the natural bank.

h. That in the event erosion occurs at the site, adequate revetment shall be placed to repair the eroded areas.

i. That the proposed piers for the bridge shall be aligned parallel to the direction of flow.

j. That drainage for the proposed bridge widening shall not direct water toward the banks without ensuring adequate erosion protection.

k. That the project work areas shall be restored to at least the existing lines and grade.

A file (2009-01109) has been opened because a Section 10 and/or Section 404 permit may be required. Please advise the applicant to contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Division, 650 Capitol Mall, Suite 5-200, Sacramento, California 95814, telephone (916) 557-5250.

A copy of this letter is being furnished to Mr. Don Rasmussen, Chief, Flood Project Integrity and Inspection Branch, 3310 El Camino Avenue, Suite LL30, Sacramento, CA 95821.

Sincerely,

for Rick L. Poeppelman, P.E.
Chief, Engineering Division

EXHIBIT - B

SAN JOAQUIN COUNTY
FLOOD CONTROL & WATER CONSERVATION DISTRICT
P. O. BOX 1810
1810 EAST HAZELTON AVENUE
STOCKTON, CALIFORNIA 95201
TELEPHONE (209) 468-3000
FAX NO. (209) 468-2999

THOMAS R. FLINN
DIRECTOR OF PUBLIC WORKS
FLOOD CONTROL ENGINEER

January 12, 2011

Central Valley Flood Protection Board
3310 El Camino Avenue
Sacramento, California 95821

Attention: Floodway Protection Section

SUBJECT: CENTRAL VALLEY FLOOD PROTECTION BOARD PERMIT APPLICATION OF CALTRANS AT THE STATE HIGHWAY ROUTE 99 CROSSING OF THE NORTH FORK OF SOUTH LITTLEJOHNS CREEK

Gentlemen:

Reference is made to the Central Valley Flood Protection Board Permit Application of the California Department of Transportation to widen State Highway Route 99 bridge over the North Fork of South Littlejohns Creek. The existing four-lane bridge will be widened within the median to add two lanes. Eight piles will be placed to support the proposed median. The project is located at the State Highway Route 99 crossing of the North Fork of South Littlejohns Creek, 2.1 miles south of Arch Road, in San Joaquin County, in Section 29, Township 1 South, Range 7 East, Mount Diablo Base and Meridian.

The San Joaquin County Flood Control and Water Conservation District (District) has reviewed the Central Valley Flood Protection Board Permit application of the City of Stockton and endorses the project subject to the following conditions:

1. The District shall not be responsible for the maintenance of the facilities specified in this Permit.

2. The District shall not be held liable for damage(s) to the permitted encroachment(s) due to the District's operation, maintenance, flood fight, inspection, or emergency repairs.

3. The Permittee or the Successors-In-Interest shall be responsible for the modification or possible removal of the facilities, as requested by the District, if required for any future flood control plans at the Permittee's sole cost and expense.

4. The Permittee shall be liable for any damage to the North Fork of South Littlejohns Creek that may occur as a result of this project.

5. The project shall be constructed in accordance with the plans, dated June 11, 2010, submitted with the application, dated October 6, 2010. Any revisions to the project will require the submittal of the revised plans to the District for review and approval.

6. No work shall be allowed in the North Fork of South Littlejohns Creek channel between November 1st and April 15th without prior approval of the District.

7. The Permittee or Successors-In-Interest shall keep the encroachments properly maintained in accordance with applicable current or future local, State and Federal standards.

EXHIBIT - B

8. The piles shall be constructed parallel to the direction of flow, and inline with the existing supports.

9. Stockpiled materials, coffer dams, and construction equipment shall be removed from the floodway prior to November 1.

10. The Permittee shall restore the North Fork of South Littlejohns Creek's invert and banks to the condition that existed prior to commencement of work.

11. Upon completion of the project, the Permittee shall submit a hard copy and an electronic copy in AutoCAD and PDF format of the as-built drawings to:

    San Joaquin County Flood Control and Water Conservation District
    1810 East Hazelton Avenue
    Stockton, CA 95205

If there are any questions regarding these comments, please contact me at (209) 953-7617.

Sincerely,

BARRY O'REGAN, P.E.
Acting Engineering Division Manager

BO:SS:mk
FM-10L038-M2

STATE OF CALIFORNIA
THE RESOURCES AGENCY

THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18664 BD

This Permit is issued to:

California Department of Transportation
2015 East Shields Avenue, Suite A-100
Fresno, California 93728-5428

To widen the existing bridge crossing over the South Fork South Littlejohns Creek by 35 foot, 4 inch within the median to provide an additional 12 foot lane and 10 foot shoulder in each direction of travel, separated by a concrete barrier (Type 60A Modified). Approximately 14 cubic yard of rock slope protection will be placed within the north abutment, approximately 20 foot beyond the existing bridge edges. The concrete slope protection will have a cut off wall depth of 4 foot.

South Fork South Littlejohns Creek and SR99 (Section 29, T1S, R7E, W, San Joaquin County Flood Control and Water Conservation District, Littlejohns Creek, San Joaquin County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: DEC 2 - 2011

Jay S. Punia
Executive Officer

GENERAL CONDITIONS:

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

DWR 3784 (Rev. 9/85)

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 18664 BD

THIRTEEN: If the construction project extends onto land owned in fee and/or easement by the Sacramento and San Joaquin Drainage District acting by and through the Central Valley Flood Protection Board (Board), the permittee should secure an easement, license, or temporary entry permit from the Board prior to commencement of work. Contact Angelica Aguilar at (916) 653-5782.

FOURTEEN: All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Central Valley Flood Protection Board.

FIFTEEN: Prior to demolition and/or construction activities any and all easements, both temporary and permanent, shall be obtained by the applicant.

SIXTEEN: There shall be no plantings within the project area under this permit, except that of native grasses, which may be required for slope protection.

SEVENTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection Board's approval of this permit, including but not limited to claims related to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its

defense, in its sole discretion.

EIGHTEEN: The mitigation measures approved by the CEQA lead agency and the permittee are found in the Final Initial Study/Mitigated Negative Declaration adopted by the CEQA lead agency. The permittee shall implement all such mitigation measures.

NINETEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend and hold the Central Valley Flood Protection Board and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

TWENTY: The Central Valley Flood Protection Board, Department of Water Resources, and the San Joaquin CountyFlood Control and Water Conservation District shall not be held liable for damages to the permitted encroachment(s) resulting from releases of water from reservoirs, flood fight, operation, maintenance, inspection, or emergency repair.

TWENTY-ONE: No construction work of any kind shall be done during the flood season from November 1 to April 15 without prior approval of the Central Valley Flood Protection Board.

TWENTY-TWO: Prior to start of any demolition and/or construction activities within the floodway, the applicant shall provide the Central Valley Flood Protection Board with two sets of layout plans for any and all temporary, inchannel cofferdam(s), gravel workpad(s), work trestle(s), scaffolding, piles and/or other appurtenances that are to remain in the floodway during the flood season from November 1 through April 15.

TWENTY-THREE: A civil engineer registered in the State of California representing the permittee shall provide periodic reports and records to the Department of Water Resources that are acceptable to the Central Valley Flood Protection Board which certifies that all work accomplished by contract to the permittee was thoroughly inspected and performed in accordance with submitted drawings, specifications, and permit conditions.

TWENTY-FOUR: Debris that may accumulate on the permitted encroachment(s) and/or any temporary falsework within the floodway shall be cleared off and disposed of outside the floodway after each period of high water.

TWENTY-FIVE: The permittee shall contact the Department of Water Resources by telephone, (916) 574-0609, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do so at least 10 working days prior to start of work may result in delay of the project.

TWENTY-SIX: The permittee shall provide supervision and inspection services acceptable to the Central Valley Flood Protection Board.

TWENTY-SEVEN: Temporary staging, formwork, stockpiled material, equipment, and temporary buildings shall not remain in the floodway during the flood season from November 1 to April 15.

TWENTY-EIGHT: Cleared trees and brush shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1 to April 15.

TWENTY-NINE: Fill material shall be placed only within the area indicated on the approved plans.

THIRTY: Backfill material for excavations shall be placed in 4- to 6-inch layers and compacted to at least the density of the adjacent, firm, undisturbed material.

THIRTY-ONE: Density tests by a certified materials laboratory will be required to verify compaction of backfill within the floodway.

THIRTY-TWO: The soffit of the bridges shall be no lower than that of the existing adjacent bridges which is 29.24 feet, NGVD 29.

THIRTY-THREE: Revetment shall be uniformly placed and properly transitioned into the bank, levee slope, or adjacent revetment and in a manner which avoids segregation.

THIRTY-FOUR: Concrete Rock Rip-Rap Revetment shall be quarry stone or cobbles and only 10 percent shall be exposed above the concrete slurry surface. The rock shall at least meet the following grading:

Quarry Stone		Cobbles	
Stone Size	Percent Passing	Stone Size	Percent Passing
15 inches;	100	15 inches;	100
8 inches;	80-95	10 inches;	55-95
6 inches;	45-80	8 inches;	35-65
4 inches;	15-45	6 inches;	10-35
2 inches;	0-15	3 inches;	1-5

THIRTY-FIVE: The revetment shall not contain any reinforcing steel, floatable, or objectionable material. Asphalt or other petroleum-based products may not be used as fill or erosion protection on the levee section or within the floodway.

THIRTY-SIX: Follow Title 23; California Code of Regulations, Section 121 for Rock Rip-Rap requirements.

THIRTY-SEVEN: All debris generated by this project shall be disposed of outside the floodway.

THIRTY-EIGHT: The levee section shall be restored to at least the same condition that existed prior to commencement of work.

THIRTY-NINE: The work area shall be restored to the condition that existed prior to start of work.

FORTY: The permittee shall submit as-built drawings to the Department of Water Resources' Flood Project Inspection Section upon completion of the project.

FORTY-ONE: If the project result(s) in an adverse hydraulic impact, the permittee shall provide appropriate mitigation measures, to be approved by the Central Valley Flood Protection Board, prior to implementation of mitigation measures.

FORTY-TWO: In the event that levee or bank erosion injurious to the adopted plan of flood control occurs at or adjacent to the permitted encroachment(s), the permittee shall repair the eroded area and propose measures, to be approved by the Central Valley Flood Protection Board, to prevent further erosion.

FORTY-THREE: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

FORTY-FOUR: The permitted encroachment(s) shall not interfere with operation and maintenance of the flood control project. If the permitted encroachment(s) are determined by any agency responsible for operation or maintenance of the flood control project to interfere, the permittee shall be required, at permittee's cost and expense, to modify or remove the permitted encroachment(s) under direction of the Central Valley Flood Protection Board or Department of Water Resources. If the permittee does not comply, the Central Valley Flood Protection Board may modify or remove the encroachment(s) at the permittee's expense.

FORTY-FIVE: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Central Valley Flood Protection Board may remove the encroachment(s) at the permittee's expense.

FORTY-SIX: If the project, or any portion thereof, is to be abandoned in the future, the permittee or successor shall abandon the project under direction of the Central Valley Flood Protection Board and Department of Water Resources, at the permittee's or successor's cost and expense.

FORTY-SEVEN: The permittee shall comply with all conditions set forth in the letter from the U.S. Army Corps of Engineers dated December 1, 2011, which is attached to this permit as Exhibit A and incorporated by reference.

FORTY-EIGHT: The permittee shall comply with all conditions set forth in the San Joaquin County Flood Control and Water Conservation District letter dated December 27, 2010 and letter, and letter dated August 31, 2011 which is attached to this permit as Exhibit B and Attachment H and is incorporated by reference.

FORTY-NINE: The permittee should contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, 1325 J Street, Sacramento, California 95814, telephone (916) 557-5250, as compliance with Section 10 of the Rivers and Harbors Act and/or Section 404 of the Clean Water Act may be required.

FIFTY: This permit shall run with the land and all conditions are binding on permittee's successors and assigns.

EXHIBIT - A

DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Sacramento
Corps of Engineers
1325 J Street
Sacramento, California 95814-2922

REPLY TO
ATTENTION OF

Flood Protection and Navigation Section (18664)

DEC 1 2011

Mr. Jay Punia, Executive Officer
Central Valley Flood Protection Board
3310 El Camino Avenue, Room 151
Sacramento, California 95821

Dear Mr. Punia:

We have reviewed a permit application by the California Department of Transportation (application number 18664). This project includes widening State Route 99 over the south fork of South Littlejohns Creek by 35 feet, 4 inches within the median. The project also includes adding 14 cubic yards of rock slope protection on the north abutment, approximately 20 feet beyond the existing bridge edges. The slope protection will be installed with a 4 foot deep cutoff wall. After construction, disturbed soil will be re-vegetated with grasses. The project is located south of the Stockton Metropolitan Airport, at 37.8720°N 121.2194°W NAD83, in San Joaquin County, California.

The District Engineer has no objection to approval of this application by the Board from a flood control standpoint, subject to the following conditions:

a. That no work shall be performed and no stockpiles of materials or equipment shall remain in the floodway during the flood season of November 1 to April 15, unless otherwise approved in writing from your Board.

b. That in the event trees and brush are cleared, they shall be properly disposed of outside the limits of the project right-of-way.

c. That backfill material for any excavations shall be placed in 4 to 6 inch layers and compacted to at least the same density of the adjacent undisturbed embankment.

d. That the proposed bridge widening shall allow for at least the same channel flow capacity, vertical clearance, and waterway area as existed prior to new construction.

e. That the soffit of the widened bridge shall be no lower than the existing bridge.

f. That the proposed work shall not interfere with the integrity or hydraulic capacity of the flood damage reduction project; easement access; or maintenance, inspection, and flood fighting procedures.

g. That the proposed slope protection shall be placed uniformly and properly transitioned into the natural bank.

h. That in the event erosion occurs at the site, adequate revetment shall be placed to repair the eroded areas.

i. That the proposed piers for the bridge shall be aligned parallel to the direction of flow.

j. That drainage for the proposed bridge widening shall not direct water toward the banks without ensuring adequate erosion protection.

k. That the project work areas shall be restored to at least the existing lines and grade.

A file (SPK-2009-01109) has been opened because a Section 10 and/or Section 404 permit may be required. Please advise the applicant to contact the U.S. Army Corps of Engineers, Sacramento District, Regulatory Division, 650 Capitol Mall, Suite 5-200, Sacramento, California 95814, telephone (916) 557-5250.

A copy of this letter is being furnished to Mr. Don Rasmussen, Chief, Flood Project Integrity and Inspection Branch, 3310 El Camino Avenue, Suite LL30, Sacramento, CA 95821.

Sincerely,

For Rick L. Poeppelman, P.E.
Chief, Engineering Division

EXHIBIT - B

SAN JOAQUIN COUNTY
FLOOD CONTROL & WATER CONSERVATION DISTRICT
P. O. BOX 1810
1810 EAST HAZELTON AVENUE
STOCKTON, CALIFORNIA 95201
TELEPHONE (209) 468-3000
FAX NO. (209) 468-2999

THOMAS R. FLINN
DIRECTOR OF PUBLIC WORKS
FLOOD CONTROL ENGINEER

December 27, 2010

Central Valley Flood Protection Board
3310 El Camino Avenue
Sacramento, California 95821

Attention: Floodway Protection Section

SUBJECT: CENTRAL VALLEY FLOOD PROTECTION BOARD PERMIT APPLICATION OF CALTRANS AT THE STATE HIGHWAY ROUTE 99 CROSSING OF THE SOUTH FORK OF SOUTH LITTLEJOHNS CREEK

Gentlemen:

Reference is made to the Central Valley Flood Protection Board Permit Application of the California Department of Transportation to widen the highway bridge over the South Fork of South Littlejohns Creek. The existing four-lane bridge will be widened within the median to add two lanes. Twelve piles will be placed to support the proposed median. The project is located at the State Highway Route 99 crossing of the North Fork of South Littlejohns Creek, 2,800 feet north of Lone Tree Creek, in San Joaquin County, in ection 29, Township 1 South, Range 7 East, Mount Diablo Base and Meridian.

The San Joaquin County Flood Control and Water Conservation District (District) has reviewed the Central Valley Flood Protection Board Permit application of the City of Stockton and endorses the project subject to the following conditions:

1. The District shall not be responsible for the maintenance of the facilities specified in this Permit.

2. The District shall not be held liable for damage(s) to the permitted encroachment(s) due to the District's operation, maintenance, flood fight, inspection, or emergency repairs.

3. The Permittee or the Successors-In-Interest shall be responsible for the modification or possible removal of the facilities, as requested by the District, if required for any future flood control plans at the Permittee's sole cost and expense.

4. The Permittee shall be liable for any damage to the South Fork of South Littlejohns Creek that may occur as a result of this project.

5. The project shall be constructed in accordance with the plans, dated June 11, 2010, submitted with the application, dated October 6, 2010. Any revisions to the project will require the submittal of the revised plans to the District for review and approval.

6. No work shall be allowed in the South Fork of South Littlejohns Creek channel between November 1st and April 15th without prior approval of the District.

7. The Permittee or Successors-In-Interest shall keep the encroachments properly maintained in accordance with applicable current or future local, State and Federal standards.

EXHIBIT - B

8. Bank and channel stabilization material (riprap) shall be placed in a manner such that no reduction in channel cross-section or increase in base flood elevation will result.

9. The piles shall be constructed parallel to the direction of flow, and inline with the existing supports.

10. Stockpiled materials, coffer dams, and construction equipment shall be removed from the floodway prior to November 1.

11. The Permittee shall restore the South Fork of South Littlejohns Creek's invert and banks to the condition that existed prior to commencement of work.

12. Upon completion of the project, the Permittee shall submit a hard copy and an electronic copy in AutoCAD and PDF format of the as-built drawings to:

    San Joaquin County Flood Control and Water Conservation District
    1810 East Hazelton Avenue
    Stockton, California 95205

If there are any questions regarding these comments, please contact me at (209) 953-7617.

Sincerely,

BARRY O'REGAN, P.E.
Acting Engineering Division Manager

BO:SS:mk
FM-10L038-M1

ATTACHMENT - H

SAN JOAQUIN COUNTY
FLOOD CONTROL & WATER CONSERVATION DISTRICT
P. O. BOX 1810
1810 EAST HAZELTON AVENUE
STOCKTON, CALIFORNIA 95201
TELEPHONE (209) 468-3000
FAX NO. (209) 468-2999

THOMAS M. GAU
DIRECTOR OF PUBLIC WORKS
FLOOD CONTROL ENGINEER

August 31, 2011

David R. Williams, R.C.E.
Central Valley Flood Protection Board
Chief Levee Improvement Section
3310 El Camino Avenue, Room 151
Sacramento, California 95821

SUBJECT: SAN JOAQUIN COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT (DISTRICT) ENDORSEMENT FOR ENCROACHMENT APPLICATIONS NO. 18663 AND NO. 18664 FOR THE STATE HIGHWAY ROUTE 99 MANTECA WIDENING PROJECT AT THE SOUTH FORK OF SOUTH LITTLEJOHNS CREEK, AND AT THE NORTH FORK OF SOUTH LITTLEJOHNS CREEK

Dear Mr. Williams:

The District has reviewed the Central Valley Flood Protection Board Encroachment Permit Applications for the State Highway Route 99 Manteca Widening Project at the North Fork of South Littlejohns Creek (Permit No.18663), and the South Fork of South Littljohns Creek (Permit No. 18664), and is not concerned that the project will encounter any debris problems at either of these crossing locations during a high-flow event. The District endorses these project applications.

If there are any questions or concerns regarding these endorsement statements, please contact us at (209) 953-7617.

Sincerely,

JOHN I. MAGUIRE
Engineering Services Manager

JIM:SS:to
FM-11H075-T1

State of California – The Natural Resources Agency
DEPARTMENT OF FISH AND GAME
North Central Region
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670-4599
916-358-2900
http://www.dfg.ca.gov

ARNOLD SCHWARZENEGGER, Governor
JOHN McCAMMON, Director

September 14, 2010

Zachary Parker
California Department of Transporation
2015 East Shields Avenue, Suite A-100
Fresno, California 93726-5428

Subject: Final Lake or Streambed Alteration Agreement
Notification No. 1600-2010-0130 -R2
State Route 99 Manteca Widening Project

Dear Mr. Parker:

Enclosed is the final Streambed Alteration Agreement ("Agreement") for the State Route 99 Manteca Widening ("Project"). Before the Department may issue an Agreement, it must comply with the California Environmental Quality Act ("CEQA"). In this case, the Department, acting as a responsible agency, filed a notice of determination ("NOD") on the same date it signed the Agreement. The NOD was based on information contained in the Mitigated Negative Declaration Caltrans (CEQA lead agency) prepared for the Project.

Under CEQA, filing a NOD starts a 30-day period within which a party may challenge the filing agency's approval of the project. You may begin your project before the 30-day period expires if you have obtained all necessary local, state, and federal permits or other authorizations,. However, if you elect to do so, it will be at your own risk.

If you have any questions regarding this matter, please contact Gary Hobgood, Staff Environmental Scientist at 916-983-6920 or ghobgood@dfg.ca.gov.

Sincerely,

J Dunger

for Kent Smith
Regional Manager

ec: Gary Hobgood

ghobgood@dfg.ca.gov

Charles Walbridge

Charles.Walbridge@dot.ca.gov

CALIFORNIA DEPARTMENT OF FISH AND GAME
NORTH CENTRAL REGION
1701 NIMBUS ROAD, SUITE A
RANCHO CORDOVA, CA 95670

Streambed Alteration Agreement
Notification No. 1600-2010-0130 -R2
Lone Tree Creek Bridge, South Fork South Littlejohns Creek (French Camp Slough), North Fork South Littlejohns Creek
California Department of Transportation
State Route 99 Manteca Widening Project

This Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Game (DFG) and California Department of Transportation (Permittee) as represented by Zachary Parker.

RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified DFG on August 4, 2010 that Permittee intends to complete the project described herein.

WHEREAS, pursuant to FGC section 1603, DFG has determined that the project could substantially adversely affect existing fish or wildlife resources and has included measures in the Agreement necessary to protect those resources.

WHEREAS, Permittee has reviewed the Agreement and accepts its terms and conditions, including the measures to protect fish and wildlife resources.

NOW THEREFORE, Permittee agrees to complete the project in accordance with the Agreement.

PROJECT LOCATION

The project is located at Lone Tree Creek Bridge, South Fork South Littlejohns Creek (French Camp Slough), North Fork South Littlejohns Creek, in the County of San Joaquin, State of California; Latitude 37.8391, Longitude -121.213.

PROJECT DESCRIPTION

Caltrans proposes to widen State Route 99 from the existing four-lane facility to six lanes within the median from the Austin Road interchange in the city of Manteca (Post Mile 4.9) to the Arch Road interchange in the city of Stockton (Post Mile 15.0) by adding two 12-foot lanes in the median and constructing a concrete median barrier. The construction of the project includes the following improvements:

• Widen bridge structure medians at Lone Tree Creek, South Fork South Littlejohns Creek, and North Fork South Littlejohns Creek.

• Close existing hook ramp (North Fork South Littlejohns Creek hook ramps) connections

south of the Stockton Metropolitan Airport.

A detailed project description is provided in the notification materials submitted to DFG. The notification, together with all supporting documents submitted with the notification, are hereby incorporated into this agreement to describe the location, features, avoidance measures and mitigation measures of the proposed project.

PROJECT IMPACTS

Existing fish or wildlife resources the project could substantially adversely affect include: Central Valley Steelhead trout, giant garter snake, cliff swallows, black phoebes, warm water fish species, amphibians, and other aquatic and terrestrial plant and wildlife species.

The adverse effects the project could have on the fish or wildlife resources identified above include: loss of natural bed or bank; change in contour of bed, channel or bank; change in gradient of bed, channel or bank; loss of bank stability during construction; increase of bank erosion during construction; soil compaction or other disturbance to soil layer; increased turbidity; increased sedimentation (chronic or episodic); short-term release of contaminants (e.g., incidental from construction); loss or decline of riparian and/or emergent marsh habitat; loss or decline of instream channel habitat; loss or decline of instream woody material; change to, or loss or decline of natural bed substrate; direct impacts from dredging on benthic organisms; hydroacoustic impacts to fish by pile driving; construction pits and trenches that can capture terrestrial organisms; disruption to nesting birds and other wildlife; direct take of terrestrial species; disturbance from project activity; loss or decline of aquatic species' habitat: migration corridors, spawning or rearing areas; loss of wildlife connectivity to water source; loss or impediment of terrestrial animal species travel routes due to permanent structures; loss or impediment of terrestrial animal species travel routes due to temporary structures (e.g., survey tape, sandbags, erosion protection materials etc.);
and diversion of flow water from, or around, activity site;

STREAM ZONE DEFINED

The Stream Zone comprises all components of a stream, including the channel, bed, banks, and floodplains. The Stream Zone is the land, including vegetation, that bounds a lake or the channel of a stream and that defines the lateral extent of their waters.

MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

1. Administrative Measures

Permittee shall meet each administrative requirement described below.

1.1 Documentation at Project Site. Permittee shall make the Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily

available at the project site at all times and shall be presented to DFG personnel, or personnel from another state, federal, or local agency upon request.

1.2 Providing Agreement to Persons at Project Site. Permittee shall provide copies of the Agreement and any extensions and amendments to the Agreement to all persons who will be working on the project at the project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

1.3 Notification of Conflicting Provisions. Permittee shall notify DFG if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, DFG shall contact Permittee to resolve any conflict.

1.4 Project Site Entry. Permittee agrees that DFG personnel may enter the project site to verify compliance with the Agreement. DFG personnel may only enter the project site when it is safe to do so. When appropriate, DFG personnel shall contact the Permittee prior to entering the construction area.

1.5 Authorized Work. The notification, together with all supporting documents submitted with the notification, is hereby incorporated into this agreement to describe the location and features of the proposed project. The Permittee agrees that all work shall be done as described in the notification and supporting documents, incorporating all project modifications, wildlife resource protection features, mitigation measures, and provisions as described in this agreement. Where apparent conflicts exist between the notification and the provisions listed in this agreement, the Permittee shall comply with the provisions listed in this agreement. The Permittee further agrees to notify DFG of any modifications made to the project plans submitted to DFG. At the discretion of DFG, this agreement will be amended to accommodate modifications to the project plans submitted to DFG and/or new project activities.

2. Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish and wildlife resources identified above, Permittee shall implement each measure listed below.

2.1 Work Period. The time period for completing the work within the stream zone shall be restricted to periods of low stream flow and dry weather and shall be confined to the period of June 15 to October 15. Construction activities shall be timed with awareness of precipitation forecasts and likely increases in stream flow. Construction activities within the stream zone shall cease until all reasonable erosion control measures, inside and outside of the stream zone, have been implemented prior to all storm events. Revegetation, restoration and erosion control work is not confined to this time period. This provision does not apply to work above and outside the stream zone.

2.2 Work Period Extensions. At DFG's discretion, the work period may be extended based on the extent of the work remaining, on site conditions and reasonably anticipated future conditions. If the Permittee finds more time is needed to complete the authorized activity, the Permittee shall submit a written request for a work period time extension to DFG. The work period extension request shall provide the following information: 1) Describe the extent of work already completed; 2) Provide specific detail of the activities that remain to be completed within the stream zone; and 3) Detail the actual time required to complete each of the remaining activities within the stream zone. The work period extension request should consider the effects of increased stream conditions, rain delays, increased erosion control measures, limited access due to saturated soil conditions, and limited growth of erosion control grasses due to cool weather. Photographs of the work completed and the proposed work areas are helpful in assisting DFG in its evaluation. Time extensions are issued at the discretion of DFG. DFG will have ten calendar days to approve the proposed work period extension. DFG reserves the right to require additional measures designed to protect natural resources.

2.3 Stream Diversions / Dewatering. The Dewatering Plans submitted with the notification may be used with the following modification. Temporary culvert(s) of sufficient size to handle anticipated storm events shall be placed on the stream bottom. Gravel or sand bags with plastic sheeting shall be used to divert the flow into the temporary culvert(s). If a temporary equipment crossing is necessary to complete operations, crush rock (gravel or rip rap) shall not be placed directly on the stream bottom. A layer of clean round river cobble (2 to 8 inch diameter in size) shall be placed as the bottom layer of rock. A layer of clean "washed" crushed gravel may be placed on the layer of river cobbles. The top layer may be fill material found at the work site or imported from off site. Crushed gravel and earthen fill material shall not extend beyond the layer of river cobble. Upon completion of the project, the fill material and most of the crushed gravel shall be removed from the stream bottom. The river cobble may remain in the stream. The temporary culvert crossing shall be removed prior to storm events that are likely to wash out the crossing. The dewatering structure and temporary crossing shall be removed upon completion of the project or October 15, which ever comes first.

2.4 Bird Nests. It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird except as otherwise provided by the Fish and Game Code. No trees that contain active nests of birds shall be disturbed until all eggs have hatched and young birds have fledged without prior consultation and approval of a Department representative.

2.5 Cliff Swallows. No active cliff swallow nests shall be disturbed until all eggs have hatched and young birds have fledged without prior consultation and approval of a Department representative and the U.S. Fish and Wildlife Service. This may require the Permittee to use exclusion netting and/or daily removal of nest material with high-pressure water spray.

2.6 Vegetation Removal. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Except for the trees specifically

identified for removal in the notification, no native trees with a trunk diameter at breast height (DBH) in excess of four (4) inches shall be removed or damaged without prior consultation and approval of a Department representative. Using hand tools (clippers, chain saw, etc.), trees may be trimmed to the extent necessary to gain access to the work sites. All cleared material/vegetation shall be removed out of the riparian/stream zone.

2.7 Sediment Control. Precautions to minimize turbidity/siltation shall be taken into account during project planning and implementation. This may require the placement of silt fencing, coir logs, coir rolls, straw bale dikes, or other siltation barriers so that silt and/or other deleterious materials are not allowed to pass to downstream reaches. Passage of sediment beyond the sediment barrier(s) is prohibited. If any sediment barrier fails to retain sediment, corrective measures shall be taken. The sediment barrier(s) shall be maintained in good operating condition throughout the construction period and the following rainy season. Maintenance includes, but is not limited to, removal of accumulated silt and/or replacement of damaged silt fencing, coir logs, coir rolls, and/or straw bale dikes. The Permittee is responsible for the removal of non-biodegradable silt barriers (such as plastic silt fencing) after the disturbed areas have been stabilized with erosion control vegetation (usually after the first growing season). Upon Department determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation shall be halted until effective Department approved control devices are installed or abatement procedures are initiated.

2.8 Pollution Control. Utilize Best Management Practices (BMPs) to prevent spills and leaks into water bodies. If maintenance or refueling of vehicles or equipment must occur on-site, use a designated area and/or a secondary containment, located away from drainage courses to prevent the runoff of storm water and the runoff of spills. Ensure that all vehicles and equipment are in good working order (no leaks). Place drip pans or absorbent materials under vehicles and equipment when not in use. Ensure that all construction areas have proper spill clean up materials (absorbent pads, sealed containers, booms, etc.) to contain the movement of any spilled substances. Any other substances which could be hazardous to aquatic life, resulting from project related activities, shall be prevented from contaminating the soil and/or entering the waters of the state. Any of these materials, placed within or where they may enter a stream or lake by the Applicant or any party working under contract or with the permission of the Permittee, shall be removed immediately. DFG shall be notified immediately by the Permittee of any spills and shall be consulted regarding clean-up procedures.

3. Compensatory Measures

To compensate for adverse impacts to fish and wildlife resources identified above that cannot be avoided or minimized, Permittee shall implement each measure listed below.

3.1 Site Restoration. All exposed/disturbed areas and access points within the stream zone left barren of vegetation as a result of the construction activities shall be

restored using locally native grass seeds, locally native grass plugs and/or a mix of quick growing sterile non-native grass with locally native grass seeds. Seeded areas shall be covered with broadcast straw and/or jut netted (monofilament erosion blankets are not authorized).

4. Reporting Measures

Permittee shall meet each reporting requirement described below.

4.1 The Permittee shall notify DFG within two working days of beginning work within the stream zone of name of waterway(s). Notification shall be submitted as instructed in Contact Information section below. Email notification is preferred.

4.2 Upon completion of the project activities described in this agreement, the work area within the stream zone shall be digitally photographed. Photographs shall be submitted to DFG within two days of completion. Photographs and project commencement notification shall be submitted as instructed in Contact Information section below. Email submittal is preferred.

CONTACT INFORMATION

Any communication that Permittee or DFG submits to the other shall be in writing and any communication or documentation shall be delivered to the address below by U.S. mail, fax, or email, or to such other address as Permittee or DFG specifies by written notice to the other. Refer to the project's Notification Number when submitting documents to DFG.

To Permittee:

Zachary Parker
California Department of Transporation
2015 East Shields Avenue, Suite A-100
Fresno, California 93726-5428

Email: Zachary.Parker@dot.ca.gov

To DFG:

Department of Fish and Game
North Central Region
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670
Attn: Lake and Streambed Alteration Program – Gary L. Hobgood
Notification #1600-2010-0130 R2
Fax: 916-358-2912
ghobgood@dfg.ca.gov

LIABILITY

Permittee shall be solely liable for any violations of the Agreement, whether committed by Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents or contractors and subcontractors, to complete the project or any activity related to it that the Agreement authorizes.

This Agreement does not constitute DFG's endorsement of, or require Permittee to proceed with the project. The decision to proceed with the project is Permittee's alone.

SUSPENSION AND REVOCATION

DFG may suspend or revoke in its entirety the Agreement if it determines that Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, is not in compliance with the Agreement.

Before DFG suspends or revokes the Agreement, it shall provide Permittee written notice by certified or registered mail that it intends to suspend or revoke. The notice shall state the reason(s) for the proposed suspension or revocation, provide Permittee an opportunity to correct any deficiency before DFG suspends or revokes the Agreement, and include instructions to Permittee, if necessary, including but not limited to a directive to immediately cease the specific activity or activities that caused DFG to issue the notice.

ENFORCEMENT

Nothing in the Agreement precludes DFG from pursuing an enforcement action against Permittee instead of, or in addition to, suspending or revoking the Agreement.

Nothing in the Agreement limits or otherwise affects DFG's enforcement authority or that of its enforcement personnel.

OTHER LEGAL OBLIGATIONS

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from obtaining any other permits or authorizations that might be required under other federal, state, or local laws or regulations before beginning the project or an activity related to it.

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from complying with other applicable statutes in the FGC including, but not limited to, FGC sections 2050 et seq. (threatened and endangered species), 3503 (bird nests and eggs), 3503.5 (birds of prey), 5650 (water pollution), 5652 (refuse disposal into water), 5901 (fish passage), 5937 (sufficient water for fish), and 5948 (obstruction of stream).

The Permittee shall notify DFG where conflicts exist between the provisions of this agreement and those imposed by other regulatory agencies. Unless otherwise notified, the Permittee shall comply with the provision that offers the greatest protection to water quality, species of special concern and/or critical habitat.

Nothing in the Agreement authorizes Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, to trespass.

AMENDMENT

DFG may amend the Agreement at any time during its term, provided the amendment is mutually agreed to in writing by Permittee and DFG.

Permittee may amend the Agreement at any time during its term, provided the amendment is mutually agreed to in writing by DFG and Permittee. To request an amendment, Permittee shall submit to DFG a completed DFG "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the corresponding amendment fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

TRANSFER AND ASSIGNMENT

This Agreement may not be transferred or assigned to another entity, and any purported transfer or assignment of the Agreement to another entity shall not be valid or effective, unless the transfer or assignment is requested by Permittee in writing, as specified below, and thereafter DFG approves the transfer or assignment in writing.

The transfer or assignment of the Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to DFG a completed DFG "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the minor amendment fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

EXTENSIONS

In accordance with FGC section 1605(b), Permittee may request one extension of the Agreement, provided the request is made prior to the expiration of the Agreement's term. To request an extension, Permittee shall submit to DFG a completed DFG "Request to Extend Lake or Streambed Alteration" form and include with the completed form payment of the extension fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5). DFG shall process the extension request in accordance with FGC 1605(b) through (e).

If Permittee fails to submit a request to extend the Agreement prior to its expiration, Permittee must submit a new notification and notification fee before beginning or continuing the project the Agreement covers (Fish & G. Code, § 1605, subd. (f)). .

EFFECTIVE DATE

The Agreement becomes effective on the date of DFG's signature, which shall be: 1) after Permittee's signature; 2) after DFG complies with all applicable requirements under the California Environmental Quality Act (CEQA); and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.dfg.ca.gov/habcon/ceqa/ceqa_changes.html.

TERM

This Agreement shall expire on December 31 2014, unless it is terminated or extended before then. All provisions in the Agreement shall remain in force throughout its term. Permittee shall remain responsible for implementing any provisions specified herein to protect fish and wildlife resources after the Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

AUTHORITY

If the person signing the Agreement (signatory) is doing so as a representative of Permittee, the signatory hereby acknowledges that he or she is doing so on Permittee's behalf and represents and warrants that he or she has the authority to legally bind Permittee to the provisions herein.

AUTHORIZATION

This Agreement authorizes only the project described herein. If Permittee begins or completes a project different from the project the Agreement authorizes, Permittee may be subject to civil or criminal prosecution for failing to notify DFG in accordance with FGC section 1602.

CONCURRENCE

The undersigned accepts and agrees to comply with all provisions contained herein.

FOR CALIFORNIA DEPARTMENT OF TRANSPORTATION

ZACHARY E. PARKER
Print Name of Representative

9/7/10
Date

Signature of Representative

FOR DEPARTMENT OF FISH AND GAME

J Thorpe

Kent Smith
for Regional Manager

9/15/10
Date

Prepared by: Gary L. Hobgood
Staff Environmental Scientist

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In reply refer to:
1-1-03-F-0154

January 24, 2005

Mr. Gene Fong
Federal Highway Administration
U. S. Department of Transportation
650 Capitol Mall Suite 4-100
Sacramento, California 95814

Subject: Programmatic Biological Opinion on the Effects of Small Highway Projects on the Threatened Giant Garter Snake in Butte, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, and Yuba Counties, California

Dear Mr. Fong:

This is in response to your April 14, 2003, request for formal consultation with the U. S. Fish and Wildlife Service's (Service) on minor transportation projects that affect the threatened giant garter snake (*Thamnophis gigas*)(snake) within Butte, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, and Yuba counties, California. Your letter was received by the Service on April 16, 2003. This biological opinion was prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(Act).

This biological opinion is based on: (1) letters dated February 20, 2003, and April 14, 2003, from the Federal Highway Administration (FHWA) to the Service; (2) numerous telephone conversations and e- mails between the FHWA on and the Service; (3) a meeting between the California Department of Transportation and the Service on September 22, 2004; and (4) other information available to the Service.

Consultation History

On eight occasions between December 17, 2002, and April 2, 2003, Service and Federal Highway Administration staff engaged in informal consultation via e-mail regarding the proposed programmatic action.

February 20, 2003: The FHWA provided comments and questions regarding the proposed programmatic consultation in a letter to the Service.

TAKE PRIDE IN AMERICA

April 14, 2003: The FHWA formally requested that the Service initiate formal consultation on the proposed action.

On five occasions between August 20 and October 23, 2003, Service and FHWA staff discussed the proposed action via electronic mail.

October 24, 2003: Service staff discussed the proposed action with a representative of the California Department of Transportation.

May 11, 2004: The Service sent a copy of the draft programmatic biological opinion to FHWA and the California Department of Transportation.

September 22, 2004: The Service and the California Department of Transportation met to discuss the draft programmatic biological opinion.

November 11, 2004: Staff from the Service and the California Department of Transportation discussed the proposed project on the telephone.

BIOLOGICAL OPINION

Description of the Proposed Action

The following program design criteria were jointly developed by the Service and FHWA to expedite FHWA-funded projects with relatively small effects on the snake that the Service and FHWA determine to be non-growth inducing or facilitating. Projects that exceed small effects on the snake and/or induce/facilitate growth are not covered by this biological opinion and will require separate consultations. The federally funded actions for which FHWA and the California Department of Transportation are responsible also include the repair, rehabilitation, maintenance, and other routine actions for county and city roads often called "Local Assistance" projects. The Service, with consideration of information from the FHWA and the California Department of Transportation, will review this programmatic action annually to ensure that its application is consistent with the design criteria discussed herein. The term of the proposed action is five years from the date of issuance of this programmatic biological opinion.

The FHWA proposes to append specific projects with relatively small effects on the snake to this programmatic biological opinion including, but not limited to: bridge rehabilitation/replacement, drainage improvements, scour repair, culvert repairs/extensions/replacements, roadway/shoulder widening, curve corrections, interchange improvements/construction, over-crossings, and, in limited circumstances, emergency repair projects. Effects of projects that meet the criteria outlined below under Project Design Criteria will be assigned to Levels 1 through 3 according to the amount of temporary and/or permanent effects. Each level includes a compensation standard that provides for restoration, preservation, and/or creation of affected snake habitat. All restored, preserved, and created habitat will be protected under a Service-approved conservation easement.

Project Design Criteria

Projects that qualify for coverage under this biological opinion through an appended process must meet the following criteria:

1. The effects will not exceed permanent losses of 3 acres of snake habitat. Snake habitat includes either or both upland and aquatic habitat components. The aquatic habitat component of snake habitat will not exceed more than one acre of the total permanent losses.

2. The effects will not exceed 20 acres of temporary disturbance to snake habitat. This total includes either or both upland and aquatic habitat components of snake habitat.

3. The Scope of Work is one or more of the types routinely funded by FHWA programs such as the Federal-Aid Highway Program.

4. Appendage of proposed projects to this programmatic biological opinion includes a written commitment by the FHWA, California Department of Transportation, and if appropriate, the local sponsor, to implement the measures outlined in Appendices A-D.

Project Level Effect and Compensation Criteria

Level 1

Level 1 projects result in minimal environmental effects. Examples include repair, rehabilitation, or replacement of existing structures where implementation of the project including restoration of the temporally disturbed areas, requires one season to complete. The work will not result in any permanent loss of snake habitat, and the temporary disturbance area will not exceed 20 acres of snake habitat.

Compensation for Level 1 projects requires restoration of affected snake habitat to pre-project conditions within the same season or, at most, the same calendar year. It also includes one calendar year of monitoring of the restored habitat and the project site with a photo documentation report containing pre- and post-project area photos due one year from the date that the restoration action was completed.

Level 2

Level 2 projects include activities such as repair, rehabilitation, or replacement of previously authorized structures where implementation of the project, including restoration of the temporally disturbed areas, requires two seasons to complete. The work will not result in any permanent loss of snake habitat and will not exceed 20 acres of temporary disturbance over two seasons.

Compensation for Level 2 projects requires restoration of affected snake habitat to pre-project conditions within one (1) year of completion of construction. Replacement of affected snake habitat will be replaced at a ratio of 1:1. One calendar year of monitoring of the restored habitat will be completed and the project site with a photo documentation report containing pre- and post-project area photos due one year from the date that the restoration action was completed.

Level 3

Level 3 projects include road crossings, and bridge replacements or improvements that will result in the: permanent loss that will not exceed 3 acres of snake aquatic and upland habitats, including no more than 1 acre of aquatic snake habitat and the temporary disturbances that will not exceed 20 acres of snake aquatic and upland habitats. Projects with temporary disturbance to snake habitat that require more than two seasons to complete will be categorized as Level 3.

The permanent loss of snake aquatic and upland habitat will be compensated at a ratio of 3 acres created for every acre lost. Where the loss involves rice habitat, it shall be compensated at a 1:1 ratio, where created habitat consists of aquatic and upland habitat. All created habitat must include both upland and aquatic habitat components with at least 1/3 perennial wetlands and 1/3 uplands. The remainder may be a combination of perennial and seasonal wetlands and uplands, as appropriate for the site.

All areas of snake habitat subject to temporary disturbance shall be restored to pre-project conditions within one (1) year of completion of construction. Compensation also includes one year of monitoring of the restored habitat and the project site with a photo documentation report containing pre- and post-project area photos due one year from the date that the restoration action was completed. The restoration and monitoring shall follow the Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat Appendix C. If the restoration is unsuccessful, as determined by the Service, consultation will be reinitiated by FHWA; reinitiation will include the appropriate actions necessary to fulfill the success criteria for restoration of the temporary disturbance.

Preservation Options

If a project proponent needs to compensate at Level 3 and wishes to secure existing snake habitat by fee title or conservation easement, preservation of the snake habitat may be credited against, but may not exceed, 50 percent of the aquatic habitat acreage that needs to be created.

Implementing Procedures

The following process will be used to append future proposed projects under this biological opinion:

1. The FHWA will submit a letter to the Service requesting that the proposed project (inclusive of appropriate compensation, based on the project level effect and compensation criteria

above) be appended to this programmatic biological opinion and also provide the Service with a brief biological assessment containing the information identified in Appendices A-D.

2. The Service will review the proposed project to determine if the proposed project: (1) may affect the snake; (2) is appropriate to append to this programmatic opinion; or (3) needs an individual biological opinion.

3. For projects that qualify for appending to this biological opinion, the Service will evaluate the adequacy of the proposed compensation and provide formal comments to the FHWA and the California Department of Transportation if the review reveals inadequacies.

4. Upon resolution of the outstanding issue(s), the Service will formally append the project to this biological opinion and specify the amount of incidental take exempted, if any, in a letter to the FHWA, with copies to the appropriate California Department of Transportation office.

5. At the quarterly coordination meetings between the Service and the California Department of Transportation, the California Department of Transportation will provide a list of the projects that have been appended, are currently in review, or are expected to be submitted to the Service for inclusion in this programmatic biological opinion, including the County where the proposed project will be conducted and the anticipated temporary and permanent effects. The California Department of Transportation will include status of the conservation measures, progress on restoration of disturbed areas, and acquisition of compensation lands.

6. In the event of changes to the number of seasons or disturbance area, and associated mitigation required, and provided that all other project conditions stay the same, the California Department of Transportation will submit a letter of clarification documenting these changes with a request to amend the originally appended project, including any additional restoration or compensation requirements.

Scope and Duration of the Proposed Action

The FHWA is proposing to append up to 18 proposed projects per year to this programmatic biological opinion. Each project may permanently affect up to 3 acres (total = 54 acres per year through the action area) and temporarily affect up to 20 acres (total = 360 acres per year throughout the action area) for a grand total of 270 acres of snake habitat permanently affected and 1,800 acres of snake habitat temporarily affected during the 5-year term of this proposed action.

Action Area

The action area for this consultation comprises a significant portion of the geographic range of the snake encompassing all or portions of Butte, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, and Yuba counties in California. Your April 14, 2003, letter requested that a programmatic biological opinion be issued by the Service for the giant garter snake throughout its range. However, this biological opinion does not include Tehama County where

the animal is at the northern periphery of its distribution, or Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern counties where the species is either in low numbers or possibly has been extirpated.

Definition of Terms Used in this Biological Opinion

Giant Garter Snake Habitat. The snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields, and the adjacent uplands. Essential habitat components consist of: (1) adequate water during the snake's active period (i.e., early spring through mid-fall) to provide a prey base and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat; (3) upland habitat for basking, cover, and retreat sites; and (4) higher elevation uplands for cover and refuge from flood waters (Hansen 1980; Hansen 1988; Brode and Hansen 1992; Hansen and Brode 1993). However, not all four of these components are required for an area to be considered potential snake habitat. For example, the lack of higher elevation uplands on a project site does not preclude the snake's use of the area.

Habitat types found within the snake's range that are not suitable snake habitat include: larger rivers and other water bodies; and wetlands with sand, gravel, or rock substrates; and riparian woodlands (Hansen 1980; Rossman and Stewart 1987; Hansen 1988). The Service further considers the following habitat types unsuitable for the snake because they lack adequate cover, and are subject to frequent disturbance, or are otherwise not expected to be associated with the snake: portions of urban areas (e.g., manicured lawns, paved areas), industrial areas (i.e., paved areas, frequently disturbed areas, tank farms), some agricultural areas (i.e., row crops, small grains (except rice), vineyards, orchards), concrete-lined ditches/canals, forested areas, and paved roads. Unpaved disturbed ruderal areas adjacent to roadways may be suitable upland habitat, as they may be used for basking and/or contain rodent burrows suitable for use by the giant garter snake.

The giant garter snake is an aquatic species that requires both aquatic and upland habitat. Potential habitat is identified by the presence of suitable aquatic habitat; without suitable aquatic habitat, an area is not suitable for the snake. Much of the animal's activity takes place in the uplands surrounding the snake's aquatic habitat. Although the species has been observed to use burrows over 800 feet from its aquatic habitat in the winter, the majority of habitat use occurs much closer to the aquatic habitat (< 200 feet)(Wylie *et al.* 1997). Therefore, for the purpose of this consultation, the Service considers appropriate uplands within 200 feet of the snake's aquatic habitat to be potential snake upland habitat. If the Service determines that the snake may be using uplands at a particular site greater than 200 feet from the aquatic habitat or if new information reveals that uplands greater than 200 feet are more important to the snake than previously thought, the Service will notify FHWA in writing why designating uplands greater than 200 feet from the aquatic habitat is appropriate.

Disturbance Area. Primary disturbance acreage will be determined by the proposed project area. However, disturbance area may exceed the proposed project boundaries because a 200-

foot radius from the edge of snake aquatic habitat is incorporated to include essential habitat components and to determine the extent of potential incidental take of the snake. For example, if snake aquatic habitat is converted to habitat that is no longer suitable for the snake, the surrounding uplands within 200 feet also may be considered affected because the aquatic component of the habitat is no longer available (i.e., if there is no aquatic habitat, there is no upland habitat). When determining the disturbance area, the FHWA, California Department of Transportation, or project applicants should consider: (1) opportunities to avoid snake habitat within the project area; (2) areas of dewatering and the period of time they are dewatered; and (3) the location of temporary haul roads, equipment staging areas, parking areas, and fill, borrow, and fuel sites relative to snake habitat. The 200- foot radius also will be used to evaluate aquatic habitat disturbance during temporary alterations (e.g., upstream and downstream from berms placed for temporary dewatering).

Temporary Effects. Temporary effects are project activities that temporarily remove one or more essential snake habitat components, but can be restored to pre-project conditions of equal or greater habitat value. In order for the effects to be considered temporary, the project must be implemented and the snake habitat restored within two seasons.

Permanent Effects. Permanent effects are those in which project activities result in loss of snake habitat and/or permanently remove one or more essential habitat components. Temporary projects that exceed two seasons to complete (including restoration of habitat) will be considered permanent effects and require compensation equal to permanent effects. Temporary projects that exceed two seasons may partially satisfy the permanent effect ratio described below by completing restoration of the affected habitat. The effects of relocating irrigation/drainage canals are considered permanent, as studies have demonstrated that relocated canals may not be inhabited by snakes for at least four years (Hansen and Brode 1993).

Season. A season is defined as the calendar year period between May 1 and October 1, the active period for the snake when mortality is less likely to occur. Project effects and restoration of habitat should be completed within this period or, if necessary and approved by the Service, within the same calendar year.

Monitoring. The following level of monitoring is assumed unless otherwise specified by the Service: (1) photo documentation of the project site and restoration area included in a report issued when the habitat restoration or creation is completed, what materials were used, plantings (if specified) and justification of any substitutions to the Service-recommended guidelines included in Appendix A; (2) photo documentation of the project site and restoration area and a progress report submitted one year from restoration implementation, or years one, two, and five for created habitat; (3) justification for no further monitoring; and (4) recommendations for remedial actions, as appropriate, and a request for approval from the Service.

Replacement Habitat. Projects that result in Level 2 or Level 3 effects require that "replacement habitat" in the form of habitat creation and/or preservation be provided and protected in perpetuity to compensate for the project's effects on the snake.

Examples

Example 1. FHWA awards a grant to replace a bridge over a creek in Colusa County. The new bridge is wider than the old bridge and will result in the permanent loss of 0.01 acre of snake aquatic habitat in the creek and 0.02 acre of ruderal snake upland habitat. The widened bridge will require that the bridge approaches be modified. On one side of the bridge, the new approach will be built in a corn field (0.15 acre). On the other side of the bridge, the new approach will be built in a pasture (0.20 acre). Construction activities will temporarily disturb 0.75 acre of ruderal snake uplands and a 2.5 acre rice field will be fallowed for one year to serve as a staging and parking area. Construction and restoration activities will be completed between May 1 and October 1 in one construction season.

In this case, the total area of Level 3 effects is 0.23 acre (0.01 aquatic habitat + 0.02 acre ruderal uplands + 0.2 acre pasture). The total area of Level 1 effects is 3.25 acres (0.75 acre ruderal uplands + 2.5 acres rice). Corn is not considered suitable snake habitat. In order for the proposed project to be appended to the programmatic consultation, Colusa County will provide 0.69 acre of snake habitat (0.23 acre at 3:1) in order to compensate for permanent effects to snake aquatic and upland habitat. Colusa County will also restore the temporarily affected upland areas within one year of the completion of construction and allow the rice field to be farmed the year following disturbance.

Example 2. FHWA funds the correction of a curve in a rural area of Sutter County. The new curve will result in the permanent loss of 1.5 acres of snake aquatic and upland habitat. In addition, several rice fields totaling 18.0 acres will be temporarily fallowed, and construction activities, staging, and parking will result in 5.3 acres of one-season temporary effects to snake upland habitat.

In this case, the amount of Level 1 effects exceeds that allowed under this programmatic consultation. The project proponent should either redesign their project so that it is consistent with this programmatic consultation or consult under a separate biological opinion.

Example 3. FHWA funds the improvement of a freeway interchange in Yolo County. The new interchange will result in the permanent conversion of 1.2 acres of a rice field and require that an irrigation canal totaling 0.4 acre between the existing freeway and rice field be relocated to outside of the new interchange. A 0.05 acre berm is located between the irrigation canal and the rice field. An additional 3.7 acres of snake habitat (ruderal areas and meadow) will be temporarily affected. Construction activities will take one season to complete; however, restoration of the 3.7 acres of temporarily disturbed habitat will not be performed until the second season.

In this case, Level 3 effects to rice habitat totals 1.2 acres. An additional 0.45 acres of Level 3 effects will result from the relocation of the irrigation canal and berm. Level 2 effects equal 3.7 acres. Permanent loss of rice habitat should be compensated at 1:1 (1.2 acres). Permanent loss of aquatic and upland habitat should be compensated at 3:1 (1.35 acres). Level 2 effects to 3.7 acres should be compensated at 1:1 (3.7 acres). Therefore, the total compensation is 6.25 acres. The relocated canal and berm may be used to offset the 6.25 acres of compensation after the amount of compensation required is calculated. Temporally disturbed habitat should be restored within one year of completion of construction.

Example 4. The California Department of Transportation wishes to improve a 2-mile section of a highway in Glenn County. Project activities include culvert repairs/replacements, scour repair, and other drainage improvements. Snake aquatic habitat in the form of irrigation canals is located along four-0.2 mile sections of the proposed work area. A small ruderal upland area 15 feet in width is located between the highway and the irrigation canals. Project activities will result in the permanent conversion of 0.1 acre of aquatic and upland habitat (the ruderal area), as well as temporary disturbance of 0.75 acre of snake upland habitat (the ruderal area). Project activities and restoration will take one season to complete and will be conducted between May 1 and October 1.

In this case, Level 1 effects total 0.75 acre of upland habitat. Level 3 effects total 0.1 acre and should be compensated at a 3:1 ratio (total compensation = 0.3 acre) at a Service-approved conservation bank. Temporally disturbed habitat should be restored within one year of completion of construction.

STATUS OF THE SPECIES

The Service published a proposal to list the snake as an endangered species on December 27, 1991 (U.S. Fish and Wildlife Service 1991). The Service reevaluated the status of the snake before adopting the final rule. The snake was listed as a threatened species on October 20, 1993 (U.S. Fish and Wildlife Service 2003). The *Draft Recovery Plan for the Giant Garter Snake* was issued by the Service in July 1999. Additional information on the species' biology may be found in those documents.

Description

The giant garter snake is one of the largest garter snakes and may reach a total length of at least 54 inches. Females tend to be slightly longer and proportionately heavier than males. The weight of adult female snakes is typically 1.1-1.5 pounds. Dorsal background coloration varies from brownish to olive with a checkered pattern of black spots, separated by a yellow dorsal stripe and two light-colored lateral stripes. Background coloration and prominence of a black-checkered pattern and the three yellow stripes are geographically and individually variable (Hansen 1980). The ventral surface is cream to olive or brown and sometimes infused with orange, especially in northern populations.

Historical and Current Range

This species formerly occurred throughout the wetlands that were extensive and widely distributed in the Central Valley. Fitch (1941) described the historical range of the snake as extending from the vicinity of Sacramento and Contra Costa Counties southward to Buena Vista Lake, near Bakersfield, in Kern County. Prior to 1970, the snake was recorded historically from 17 localities (Hansen and Brode 1980). Five of these localities were clustered in and around Los Banos, Merced County. The paucity of information makes it difficult to determine precisely the species' former range. Nonetheless, these records coincide with the historical distribution of large flood basins, fresh water marshes, and tributary streams. Destruction of wetlands for agriculture and other purposes apparently extirpated the species from the southern one-third of its range by the 1940s -1950s, including the former Buena Vista Lake and Kern Lake in Kern County, and the historic Tulare Lake and other wetlands in Kings and Tulare Counties (Hansen and Brode 1980; Hansen 1980). Surveys over the last two decades have found the snake as far north as the Butte Basin in the Sacramento Valley. As recently as the 1970s, the range of the snake extended from near Burrell, Fresno County (Hansen and Brode 1980), northward to the vicinity of Chico, Butte County (Rossman and Stewart 1987).

Essential Habitat Components

Endemic to wetlands in the Sacramento and San Joaquin valleys, the snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, and other waterways and agricultural wetlands, such as irrigation and drainage canals and rice fields, and the adjacent uplands. The snake feeds on small fishes, tadpoles, and frogs (Fitch 1941; Hansen 1980; Hansen 1988). Essential habitat components consist of: (1) wetlands with adequate water during the snake's active season (early- spring through mid-fall) to provide food and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season; (3) upland habitat with grassy banks and openings in waterside vegetation for basking; and (4) higher elevation uplands for escape cover (vegetation, burrows) and underground refugia (crevices and small mammal burrows) (Hansen 1980).

Reproductive Ecology

The breeding season extends through March and April, and females give birth to live young from late July through early September (Hansen and Hansen 1990). Brood size is variable, ranging from 10 to 46 young, with a mean of 23 (Hansen and Hansen 1990). At birth, young average about 8.1 inches snout-vent length and 0.10-0.18 ounces. Young immediately scatter into dense cover and absorb their yolk sacs, after which they begin feeding on their own. Although growth rates are variable, young typically more than double in size by one year of age, and sexual maturity averages three years in males and five years for females (U.S. Fish and Wildlife Service 1993).

Movements and Habitat Use

The snake typically inhabits small mammal burrows and other soil crevices throughout its winter dormancy period (November to mid-March). The snake also uses burrows as refuge from extreme heat during their active period. While the snakes usually remain in close proximity to wetland habitats, the Biological Research Division (BRD) of the U.S. Geological Survey has documented snakes using burrows as much as 165 feet away from the marsh edge to escape extreme heat (Wylie *et al.* 1997). Overwintering snakes have been documented to use burrows as far as 820 feet from the edge of marsh habitat. Snakes typically select south- and west-facing burrows as hibernacula (U.S. Fish and Wildlife Service 1993).

In studies of marked snakes in the Natomas Basin, snakes moved about 0.25-0.5 miles per day (Hansen and Brode 1993). However, total activity varies widely between individuals, and individual snakes have been documented moving up to 5 miles over the period of a few days in response to dewatering of habitat (Wylie *et al.* 1997). In agricultural areas, snakes were documented using rice fields in 19-20 percent of the observations, marsh habitat in 20-23 percent of observations, and canal and agricultural waterway habitats in 50-56 percent of the observations (Wylie 1999). Telemetry studies have also shown that active snakes use uplands extensively–more than 31 percent of observations were in uplands (Wylie 1999). Almost all snakes observed in uplands during the active season were near vegetative cover, where cover exceeded 50 percent in the area within 1.6 feet of the snake; less than 1 percent of observations were of snakes in uplands with less than 50 percent cover nearby (Wylie 1999).

Reasons for Decline and Threats to Survival

Ongoing maintenance of aquatic habitats for flood control and agricultural purposes eliminate or prevent the establishment of habitat characteristics required by snakes and can fragment and isolate available habitat, prevent dispersal of snakes among habitat units, and adversely affect the availability of the snake's food items (Hansen 1988; Brode and Hansen 1992). In many areas, the restriction of suitable habitat to water canals bordered by roadways and levee tops renders snakes vulnerable to vehicular mortality. Fluctuation in rice and agricultural production affects stability and availability of habitat. Recreational activities, such as fishing, may disturb snakes and disrupt basking and foraging activities. Nonnative predators, including introduced predatory gamefish, bullfrogs (*Rana catesbeiana*), and domestic cats (*Felis catus*) also threaten snake populations. Although large areas of seemingly suitable snake habitat exist in the form of duck clubs and waterfowl management areas, water management of these areas typically does not provide the summer water needed by snakes. Although snakes on national wildlife refuges are relatively protected from many of the threats to the species, degraded water quality continues to be a threat to the species both on and off refuges. A number of land use practices and other human activities currently threaten the survival of the snake throughout the remainder of its range. Although some snake populations have persisted at low levels in artificial wetlands associated with agricultural and flood control activities, many of these altered wetlands are now threatened with urban development.

Status with Respect to Recovery

The draft recovery plan for the snake subdivided its historic range into four recovery units (U.S. Fish and Wildlife Service 1999). These are: (1) the Sacramento Valley unit, extending from the vicinity of Red Bluff south to the confluence of the Sacramento and Feather Rivers; (2) the Mid-Valley unit, extending from the American and Yolo Basins south to Duck Creek near the City of Stockton; (3) the San Joaquin Valley unit, extending south from Duck Creek to the Kings River; and (4) the South Valley unit, extending south of the Kings River to the Kern River Basin. Portions of Mid-Valley recovery unit are within the action area.

The Sacramento Valley Recovery Unit at the northern end of the species' range is known to support relatively large, stable populations of the snake. This unit contains three populations (Butte Basin, Colusa Basin, and Sutter Basin) and a large amount of suitable habitat, in protected areas on California Department of Fish and Game reserves and refuges of the Sacramento National Wildlife Refuge Complex in the Colusa and Sutter Basins, and along waterways associated with rice farming (U.S. Fish and Wildlife Service 1999).

The Mid-Valley Recovery Unit, directly to the south of the Sacramento Valley Recovery Unit, includes seven populations: American Basin, Yolo Basin–Willow Slough, Yolo Basin–Liberty Farms, Sacramento Area, Badger Creek/Willow Creek, Caldoni Marsh, and East Stockton. The status of the seven snake populations in the Mid-Valley Recovery Unit is uncertain. The East Stockton population may be extirpated, and is not considered recoverable as a result of urban encroachment into habitat (U.S. Fish and Wildlife Service 1999). Five of the remaining six populations within the recovery unit are small, highly fragmented and isolated, and, except for the Badger Creek/Willow Slough population, are also threatened by urbanization. This latter population is within a small isolated area. Within the Mid-Valley unit, only the American Basin population supports a sizeable snake population which is dependent largely upon rice lands.

The remaining two recovery units are located to the south in the San Joaquin Valley, where the best available data indicate that the snake's status is precarious. The San Joaquin Valley Recovery Unit contains three historic snake populations: North and South Grasslands; Mendota Area; and Burrel/Lanare Area (U.S. Fish and Wildlife Service 1999). This recovery unit formerly supported large snake populations, but numbers have declined severely in recent decades, and recent survey efforts indicate numbers are very low compared to Sacramento Valley populations.

No surviving snake populations are known from the fourth recovery unit, the South Valley Recovery Unit, at the southern end of the snake's historic range; this unit includes only extirpated populations, including the historic but lost Tulare and Buena Visa lakes.

The draft recovery criteria require multiple, stable populations within each of the four recovery units, with subpopulations well-connected by corridors of suitable habitat. Currently, only the Sacramento Valley Recovery Unit, at the northern end of the species' range, is known to support relatively large, stable populations. Habitat corridors connecting populations or

subpopulations, even for the Sacramento Valley Recovery Unit, are not present and/or protected.

In 1994, the Biological Research Division (BRD)(then the National Biological Survey) began a study of the life history and habitat requirements of the snake in response to an interagency request from the Service. Since April of 1995, the BRD has further documented occurrences of snakes within some of the known populations. The BRD has studied snake subpopulations at the Sacramento and Colusa NWRs within the Colusa Basin, at Gilsizer Slough within the Sutter Basin, the Badger Creek area of the Cosumnes River Preserve within the Badger Creek-Willow Creek area, and the Natomas area within the American Basin (Wylie *et al.* 1997; Wylie 1999). These subpopulations represent the largest known extant subpopulations. The remaining nine populations identified in the final rule are distributed discontinuously in small isolated patches and are vulnerable to extirpation by stochastic environmental, demographic, and genetic processes. The 13 extant populations are largely isolated from each other, with any dispersal corridors between them limited and not protected. When small populations are extirpated, the recolonization is unlikely in most cases, given the isolation from larger populations and the lack of dispersal corridors between them.

There are numerous recent sightings of the giant garter snake in the action area of this programmatic consultation (California Department of Fish and Game 2004). In addition, suitable habitat exists within the action in the form of marshes, sloughs, ponds, small lakes, low gradient streams, other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields, and the adjacent uplands. Therefore, the Service believes that the giant garter snake is reasonably certain to occur within the action area because of the biology and ecology of the animal, the presence of suitable habitat in and adjacent to the action area, as well as the recent observations of this listed species.

Environmental Baseline

Surveys over the last two decades have located the giant garter snake as far north as the Butte Basin in the Sacramento Valley. Currently, the Service recognizes 13 separate populations of the snake, with each population representing a cluster of discrete locality records (Service 1993). The 13 extant population clusters largely coincide with historical riverine flood basins and tributary streams throughout the Central Valley (Hansen 1980; Brode and Hansen 1992): (1) Butte Basin, (2) Colusa Basin, (3) Sutter Basin, (4) American Basin, (5) Yolo Basin-Willow Slough, (6) Yolo Basin-Liberty Farms, (7) Sacramento Basin, (8) Badger Creek-Willow Creek, (9) Caldoni Marsh, (10) East Stockton-Diverting Canal and Duck Creek, (11) North and South Grasslands, (12) Mendota, and (13) Burrell-Lanare. These populations span the Central Valley from just southwest of Fresno (Burrell-Lanare) north to Chico (Hamilton Slough).

Since April of 1995, the Biological Resources Division (BRD) of U.S. Geological Survey has further documented occurrences of giant garter snakes at the Sacramento, Delevan, and Colusa National Wildlife Refuges within the Colusa Basin, at Gilsizer Slough within the Sutter Basin, at the Badger Creek area of the Cosumnes River Preserve within the Badger Creek-Willow Creek area, and in the Natomas Basin within the American Basin (Wylie 1999, 2001; Wylie *et*

al. 1997, 2000a, 2000b, 2002). These populations of giant garter snakes represent the largest extant populations. The remaining nine population clusters identified in the final rule are distributed discontinuously in small isolated patches and are vulnerable to extirpation by random environmental, demographic, and genetic processes. Until recently, there were no post-1980 sightings of snakes from Stockton and southward, and surveys of historic localities conducted in 1986 did not detect any snakes (U.S. Fish and Wildlife Service 1999). Since 1995, however, surveys conducted by the California Department of Fish and Game in cooperation with BRD in the Grasslands Area in the San Joaquin Valley have detected snakes, but in numbers much lower than those found in the Sacramento Valley populations. These observations indicate that snakes are still extant in at least three locations in the San Joaquin Valley, but probably in extremely low numbers (U.S. Fish and Wildlife Service 1999). All 13 population clusters are isolated from each other with no protected dispersal corridors. Opportunities for recolonization of small populations which may become extirpated is unlikely given the isolation from larger populations and lack of dispersal corridors between them.

A number of State, local, private, and unrelated Federal actions have occurred within the action area and adjacent region affecting the environmental baseline of the species. Some of these projects have been subject to prior section 7 consultation. These actions have resulted in both direct and indirect effects to the giant garter snake and its habitat within the region.
An October 10, 2003, informal review of Service files revealed that the Service has issued biological opinions for 21 projects since 1994 in Butte County (Sacramento Valley Recovery Unit). This review did include many projects such as water transfers/exchanges that often include many species in a large action area; the project types included bridge replacements, highway drainage improvements, fish passage, boat ramp improvements, fiber optic line installations, fire management, habitat enhancement and restoration, irrigation, flood control, a natural gas pipeline, and natural gas exploration.

Twelve biological opinions have been issued for projects in Colusa County (Sacramento Valley Recovery Unit); the project types included flood control, bridge replacements, irrigation, fish passage, road improvements, habitat restoration and enhancement, natural gas exploration, a natural gas pipeline, and a power plant.

Six biological opinions have been issued for Glenn County (Sacramento Valley Recovery Unit); the project types included fish passage, irrigation, habitat restoration and enhancement, and natural gas exploration.

Sixty-six biological opinions have been issued for projects in Sacramento County (Sacramento Valley and Mid-Valley Recovery Units); the project types included flood control, urban development, bridge replacement and repairs, a golf course, flood control, road improvements, interceptor pipelines, a habitat conservation plan, pest management, habitat restoration and enhancement, geotechnical borings, gas pipelines, a cellular communication tower, and a power plant.

Fifteen biological opinions have been issued for projects in San Joaquin County (San Joaquin and Mid-Valley Recovery Units); the project types included: flood control, sewer repair,

railroad, riparian brush rabbit propagation, dredging, gas pipeline, invasive species control, bridge replacements, urban development, and habitat restoration and enhancement.

Five biological opinions have been issued for projects in Solano County (Mid-Valley Recovery Unit); the project types included: habitat restoration and enhancement, flood control, gas pipeline, and invasive species control.

Nineteen biological opinions have been issued for projects in Sutter County Sacramento Valley and Mid-Valley Recovery Units); the project types included: bridge replacements, a power plant, flood control, geotechnical borings, habitat restoration and enhancement, fish passage, road improvements, and a habitat conservation plan.

Twenty-five biological opinions have been issued for projects in Yolo County (Sacramento Valley and Mid-Valley Recovery Units); the project types included: utility lines, flood control, irrigation, road improvements, a gas pipeline, bridge replacements, habitat restoration and enhancement, railway improvements, invasive species control, and fish passage.

Seven biological opinions have been issued for projects in Yuba County (Mid-Valley Recovery Unit); the project types included flood control, road improvements, a sewage pipeline, and habitat restoration and enhancement.

Ongoing agricultural activities also affect the environmental baseline for the snake, and are largely not subject to section 7 consultation. Some agriculture, such as rice farming, can provide valuable seasonal foraging and upland habitat for the snake. Although rice fields and agricultural waterways can provide habitat for the snake, agricultural activities such as waterway maintenance, weed abatement, rodent control, and discharge of contaminants into wetlands and waterways can degrade snake habitat and increase the risk of snake mortality (U.S. Fish and Wildlife Service 1999). Ongoing maintenance of agricultural waterways can also eliminate or prevent establishment of snake habitat, eliminate food resources for the snake, and can fragment existing habitat and prevent dispersal of snakes (U.S. Fish and Wildlife Service 1999). Flood control and maintenance activities which can result in snake mortality and degradation of habitat include levee construction, stream channelization, the riprapping of streams and canals (U.S. Fish and Wildlife Service 1999) and water transfers/ exchanges.

Effects of the Action

Proposed projects appended to this programmatic biological opinion are likely to have a variety of direct effects on the snake. Essential behavior patterns such as breeding, feeding, and sheltering are likely to be disrupted to the point of causing the injury or death of snakes by factors such as vibration (noise), and human disturbance from construction activities in areas of snake-occupied habitat. For example, vibrations produced by construction equipment could cause snakes to flee across roads and be run over and killed by cars. The destruction, disturbance, or conversion of snake aquatic, rice, or upland habitat could cause harm to snakes by interfering with essential behavior patterns. Construction activities could remove vegetative cover and basking sites necessary for thermoregulation, or fill or crush burrows or crevices

necessary for retreat and overwintering sites. Because snakes use small mammal burrows and soil crevices for shelter, snakes could be crushed, buried, or otherwise injured during construction activities. Snakes could also be run over by construction equipment or other vehicles accessing the construction areas. Implementation of certain types of erosion control materials, such as plastic netting, could result in the entanglement and death of giant garter snakes within these materials (Stuart *et al.* 2001). Silting, fill, or spill of petroleum products or other chemicals could cause death or injury to the giant garter snake, or loss of its prey in or adjacent to the project area. Bisecting or directly filling rice fields could result in the loss of foraging habitat for the snake, interrupt movement corridors, and remove basking areas on berms and check levees.

Proposed projects appended to this programmatic biological opinion are also likely to indirectly affect the snake. Disturbance caused by construction activities could cause snakes to disperse into areas of unsuitable habitat, increasing the risk of injury or death from factors such as predation, and interspecific and intraspecific competition. Decreased water quality from run-off associated with project construction and subsequent vehicle use could adversely affect snakes, decrease the snake's prey base, affect the growth of emergent aquatic vegetation, etc. Increased traffic levels could cause snakes to flee the project area for less-disturbed habitats.

Projects contemplated under this programmatic biological opinion are anticipated to take place during the snake's active season, May 1 to October 1. During this period, direct effects are lessened because snakes are actively moving and avoiding danger. Projects occurring outside this period will have greater effects on the snake since the snake is less likely to actively avoid danger, and its essential feeding, reproductive, and sheltering behaviors may be disrupted. Dispersal from wintering sites and breeding occurs from mid-March through April. Snakes are more vulnerable when they first become active. After the winter inactive period, initial successful foraging is critical to reproductive success, particularly for breeding females, and to juvenile survival. Snakes are also seeking mates and breeding at this period. Disturbance during this time may lessen reproductive success. Snakes begin their winter inactive period in October. Snakes are vulnerable during their inactive period when they are occupying burrows and soil crevices because they are unlikely to leave their retreat sites and may be crushed, trapped, or buried during movement of heavy equipment or excavation.

The FHWA is proposing to append up to 18 proposed projects per year to this programmatic biological opinion. Each project may permanently affect up to 3 acres (total = 54 acres per year throughout the action area) and temporarily affect up to 20 acres (total = 360 acres per year throughout the action area) for a grand total of 270 acres of snake habitat permanently affected and 1,800 acres of snake habitat temporarily affected during the 5-year term of this proposed action.

Under the design criteria included as part of the proposed action these adverse effects will be offset by: (1) restoration of temporarily affected snake habitat to pre-project conditions within the same season or, at most, within one season of completion of construction, (2) creation or preservation of functional snake habitat at a 1:1 or greater ratio relative to permanently affected snake habitat; and (3) management of restored, created, or preserved snake habitat in perpetuity.

Based on the beneficial effects to the snake associated with the proposed compensation program, the Service concludes that the anticipated adverse effects associated with the proposed action are likely to be small in magnitude and short in duration, and that the beneficial effects will enhance the snake's ability to persist within the action area.

Based on previous biological opinions, many of the projects that the FHWA is contemplating, such as bridge replacements, often permanently affect less than 1 acre of snake habitat. The FHWA proposes to append specific projects with relatively small effects on the snake to this programmatic biological opinion including, but not limited to: bridge rehabilitation or replacement, drainage improvements, scour repair, culvert repairs or extensions or replacements, roadway and shoulder widening, curve corrections, interchange improvements or construction, over-crossings, and, in limited circumstances, emergency repair projects.

Because the proposed action will expedite projects that do not exceed 3 acres of permanent effects to snake habitat, it may encourage applicants to avoid greater effects that would require a lengthier permit process. Projects that conform to the requirements of the proposed action are likely to contribute to snake recovery through the management of restored, created, or preserved snake habitat. Occupied habitat protected under conservation easements will provide population components that are not threatened by the factors that contributed to the listing of the species. The Service anticipates that habitat restoration and enhancement now will lead to the development of protected snake habitat areas distributed across the landscape. Local communities can use these preserved areas as foundations for future habitat conservation plans.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Because the snake inhabits wetlands and adjacent uplands in highly modified portions of the Central Valley, the Service anticipates that a wide range of activities will affect this species. An undetermined number of future land use conversions and routine agricultural practices are not subject to Federal permitting processes and may convert or otherwise alter habitat or disturb, kill, or injure snakes. These cumulative effects include: (1) fluctuations in acres of aquatic habitat due to water management or acres of ricelands in production; (2) diversion of water; (3) levee repairs; (4) riprapping or lining of canals and stream banks; (5) dredging, clearing, and spraying to remove vegetation from irrigation canals; (6) discing, mowing, clearing and spraying vegetation adjacent to canals and streams; (7) use of burrow fumigants on levees and other potential upland refugia; (8) release of contaminated runoff from agriculture and urbanization; (9) use of plastic erosion control netting; (10) use of herbicides and pesticides in ricelands and other agricultural lands that provide snake habitat, or which are adjacent to and/or drain into snake habitat; (11) increased vehicular traffic on roads and levees; (12) human intrusion into habitat; and (13) predation by feral animals and pets.

Conclusion

After reviewing the current status of the giant garter snake, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the FHWA's action, as proposed, is not likely to jeopardize the continued existence of this species. No critical habitat has been proposed or designated for the snake; therefore, none will be affected.

The Service reached this conclusion because the net effect of the proposed action is compatible with the conservation needs of the snake. Adverse effects associated with the proposed action are likely to be small in magnitude and duration given the snake habitat restoration, creation, and preservation requirements also associated with the proposed action. Projects that conform to the requirements of the proposed action are likely to contribute to snake recovery through the management of restored, created, or preserved snake habitat. Occupied habitat protected under conservation easements will provide population components that are not threatened by the factors that contributed to the listing of the species. The Service anticipates that habitat restoration and enhancement at sites affected by the proposed action will lead to the development of protected snake habitat areas distributed across the landscape.

INCIDENTAL TAKE STATEMENT

Section 9(a)(1) of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened fish and wildlife species without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the FHWA so that they become binding conditions of any grant or permit issued to the applicants, as appropriate, in order for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by this Incidental Take Statement. If the FHWA: (1) fails to require the applicant to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document, and/or (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

Amount or Extent of Take

The Service anticipates incidental take of the snake will occur for the reasons described above in the "Effects of the Action" section. Giant garter snakes are secretive and highly sensitive to human activities. Individual snakes are difficult to detect unless they are observed, undisturbed, at a distance. Most close-range observations represent chance encounters that are difficult to predict. The Service anticipates that up to 18 roadway projects per year will be appended to this programmatic biological opinion. Each project may permanently affect up to 3 acres (total = 54 acres per year throughout the action area) and temporarily affect up to 20 acres (total = 360 acres per year throughout the action area) for a grand total of 270 acres of snake habitat permanently affected and 1,800 acres of snake habitat temporarily affected during the 5-year term of this proposed action. Upon implementation of reasonable and prudent measures, incidental take associated with the Proposed Action on the giant garter snake, in the form of harm and/or harassment from loss of habitat noted above, or direct injury or mortality of two (2) giant garter snakes, will become exempt from the prohibitions described under section 9 of the Act for direct and indirect effects.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the snake; critical habitat ahs not been proposed or designated for this species, therefore, none will be adversely modified or destroyed.

Reasonable and Prudent Measures

The exemption provided herein is effective for specific projects that are developed in accordance with the design criteria set forth in the *Description of the Proposed Action* section above when they are appended to this biological opinion and a specific amount of take is determined. Reasonable and Prudent Measures, Terms and Conditions, can be found in Appendices A-D, and will be implemented as applicable to the work description of the project being appended

Reporting Requirements

A Service-approved biologist, which includes California Department of Transportation staff biologists experienced with giant garter snake natural history, shall notify the Service immediately if a giant garter snake is found on site of a project appended to this biological opinion, and will submit a report including date(s), location(s), habitat description, and any corrective measures taken to protect the snake(s) found. The Service-approved biologist shall submit these locality and ecological information to the Natural Diversity Data Base of the California Department of Fish & Game, using California Native Species Field Survey Forms, no more than 30 calendar days after completing the last field visit of the project site. Each form shall have an accompanying scale map of the site, such as an appropriate 7.5 minute U.S. Geological Survey map, and shall provide at least the following information: township, range, and quarter section; name of the 7.5' or 15' quadrangle; dates (day, month, year) of field work;

number of individuals and life stage (where appropriate) encountered; and a description of the habitat by community-vegetation type. The address of the Natural Diversity Data Base is 1807 13th Street Room 202, Sacramento, California 95814.

The Service Law Enforcement Division is to be notified immediately upon the discovery of an injured or dead snake or unanticipated harm to this species, or the unauthorized take of any other listed species. Injured giant garter snakes should be cared for by a licensed veterinarian or other person(s) approved by the Service; in the case of a dead animal, the individual animal shall be preserved, as appropriate, and held in a secure location until instructions are received from the Service regarding the disposition of the specimen or the Service takes custody of the specimen. Notification must include the date, time, and location of the incident or the finding of a dead or injured animal. The Service contact person is Scott Heard, Resident Agent-in-Charge of the Service's Law Enforcement Division at 916/414-6660. The Chief of the Endangered Species Division (Central Valley) at the Sacramento Fish and Wildlife Office also should be notified at 916/414-6600.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities that can be implemented to further the purposes of the Act, such as preservation of endangered species habitat, implementation of recovery actions, or development of information and databases. The Service has the following recommendations:

1. The FHWA and the California Department of Transportation should incorporate culverts, tunnels, or bridges on highways and other roadways to allow safe passage by the giant garter snake, California tiger salamander, San Joaquin kit fox, other listed animals, and sensitive species.

2. The FHWA and the California Department of Transportation should work with the Service to address significant, unavoidable environmental effects resulting from projects proposed by non-Federal parties.

3. The FHWA and the California Department of Transportation should assist the Service in implementing the draft, and, when completed, the final recovery plan for the snake.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal programmatic consultation on minor transportation projects that affect the threatened giant garter snake within Butte, Colusa, Glenn, Sacramento, San Joaquin,

Solano, Sutter, Yolo, and Yuba counties, California. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions about this programmatic biological opinion on minor transportation projects that affect the threatened giant garter snake within Butte, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, and Yuba counties, California biological opinion, please contact the Chief of our Sacramento Valley Branch, or the Chief of our Endangered Species Division (Central Valley) at the letterhead address or at 916/414-6600.

Sincerely,

for Kenneth D. Sanchez
Acting Field Supervisor

Attachments

1) Information that should be included with Requests for Initiation of Programmatic Formal Consultation on Projects with Effects to Giant Garter Snake Appendix A

2) Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake Habitat Appendix B

3) Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat Appendix C

4) Information to include in a Construction Monitoring Report for Giant Garter Snake Appendix D

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Appendix A – FHWA GGS Programmatic Biological Opinion
Guidelines for Restoration and/or
Replacement of Giant Garter Snake Habitat

Replacement and Restoration Guidelines are provided together, as the two conservation measures may not be mutually exclusive. Replacement of habitat may also require restoration of some areas. Preserved habitat may additionally be improved for giant garter snake by using some of the restoration guidelines.

Reference sites

A nearby reference site should be chosen both for restoration of giant garter snake habitat and for creation of replacement habitat. The reference site will be used to determine the success of conservation efforts. For restoration of habitat, the pre-project condition may be used as a reference site if adequate documentation exists. For creation of replacement habitat or for restoration where pre-project conditions are not documented, the reference site should be nearby or adjacent and should represent high quality giant garter snake habitat.

Restoration of giant garter snake habitat

Restoration may include incorporating some of the Replacement guidelines to enhance habitat value for giant garter snake. Restoration should follow the guidelines outlined below:

1. Restoring giant garter snake habitat includes minimizing impacts of project activities to the existing habitat, including using silt fencing, designating environmentally sensitive areas, using protective mats, preventing runoff, and providing worker awareness training. Measures to minimize impacts include:

    a. Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.

    b. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.

    c. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. This area should be avoided by all construction personnel.

d. Construction personnel should receive Service-approved worker environmental awareness training. The Service approves of this awareness training when given by Caltrans biologists experienced in giant garter snake natural history. This training instructs workers to recognize giant garter snakes and its habitat(s).

e. 24-hours prior to construction activities, the project area should be surveyed for giant garter snakes. Survey of the project area should be repeated if a lapse in construction activity of two weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 414-6600.

f. Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat.

2. Remove all construction debris and stockpiled materials.

2. Regrade area to preexisting contour, or a contour that would improve restoration potential of the site.

3. Replant and hydroseed the restoration area. Recommended plantings consist of a) wetland emergents, b) low-growing cover on or adjacent to banks, and c) upland plantings/hydroseeding mix to encourage use by other wildlife. Riparian plantings are not appropriate because shading may result in lack of basking sites. Native plantings are encouraged except where non-natives will provide additional values to wildlife habitat and will not become invasive in native communities. The applicant should obtain cuttings, plantings, plugs, or seeds, from local sources wherever possible. The applicant should attempt to restore conditions similar to that of adjacent or nearby habitats.

a. Emergent wetland plants recommended for giant garter snake habitat are California bulrush (*Scirpus californicus*), cattail (*Typha* spp.), and water primrose (*Ludwigia peploides*). Additional wetland plantings may include common tule (*Scirpus acutus*), Baltic rush (*Juncus balticus*), or duckweed (*Lemna* spp.).

b. Cover species on or adjacent to the bank may include California blackberry (*Rubus vitifolius*) or wild grape (*Vitis californica*), along with the hydroseeding mix recommended below.

c. Upland plantings/hydroseeding mix: Disturbed soil surfaces such as levee slopes should be hydroseeded to prevent erosion. The Service recommends a mix of at least 20-40 percent native grass seeds [such as annual fescue (*Vulpia* spp.), California brome (*Bromus carinatus*), blue

wildrye (*Elymus glaucus*), and needle grass (*Nassella* spp.)], 2-10 percent native forb seeds, five percent rose clover (*Trifolium hirtum*), and five percent alfalfa (*Medicago sativa*). Approximately 40-68 percent of the mixture may be non-aggressive European annual grasses [such as wild oats (*Avena sativa*), wheat (*Triticum* ssp.), and barley (*Hordeum vulgare*)]. The Corps will not include aggressive non-native grasses, such as perennial ryegrass (*Lolium perenne*), cheatgrass (*Bromus tectorum*), fescue (*Festuca* spp.), giant reed (*Arundo donax*), medusa-head (*Taeniatherum caput-medusae*), or Pampas grass (*Cortaderia selloana*) in the hydroseed mix. The Caltrans will not include endophyte-infected grasses in the mix. Mixes of one-hundred percent native grasses and forbs may also be used, and are encouraged.

Replacement of giant garter snake habitat

Location

Replacement location should be within the same population cluster boundaries (population clusters are defined in 58 **FR** 54053) as the habitat lost. For example: The boundaries of the Sacramento Basin population cluster are approximately, Highway 16 to the north, Sacramento River to the west, Twin Cities Road to the south, and the Folsom Aqueduct to the east. Habitat lost within this area must also be replaced within this area.

Habitat components

Giant Garter Snake Habitat. The giant garter snake inhabits marshes, sloughs, ponds, small lakes, low gradient streams, other waterways and agricultural wetlands such as irrigation and drainage canals and rice fields, and the adjacent uplands. Essential habitat components consist of (1) adequate water during the snake's active period, (early spring through mid-fall) to provide a prey base and cover; (2) emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat; (3) upland habitat for basking, cover, and retreat sites; and (4) higher elevation uplands for cover and refuge from flood waters. For the purposes of this programmatic opinion, a basic giant garter snake habitat unit will incorporate 2.00 acres (0.81 hectares) of surrounding upland for every 1.00 acre (0.40 hectare) of aquatic habitat. The 2.00 acres (0.81 hectares) of upland also may be defined as 218 linear feet (66 meters) of bankside habitat which incorporates adjacent uplands to a width of 200 feet (61 meters) from the edge of the bank.

Replacement habitat must provide the above mentioned essential habitat components and include the following:

1. All replacement habitat must include both upland and aquatic habitat components. Upland and aquatic habitat components must be included in the replacement habitat at a ratio of 2:1 upland acres to aquatic acres

2. A semi-permanent or permanent aquatic habitat which provides water during the active period for giant garter snakes (April through October) with suitable vegetative cover present. Linear or meandering channels with slow flowing water over mud or silt substrate are preferred.

3. Upland basking and retreat sites with low growing vegetation cover adjacent to aquatic habitat, and upland retreats and flood refugia with partially buried broken concrete or animal burrows.

4. Small fish and amphibian larvae for foraging, but predatory "gamefish" (bass, *Micropterus* spp.; sunfish, *Lepomis* spp.; catfish, *Ictalurus* spp. and *Ameiurus* spp.) absent or controlled.

5. An adequate buffer (at least 200 feet) from roadways to reduce vehicular mortality.

6. Follow planting recommendation provided above under restoration guidelines.

Monitoring

Habitat restoration

Restoration of habitat should be monitored for one year following implementation. Monitoring reports documenting the restoration effort should be submitted to the Service: (1) upon completion of the restoration implementation; and (2) one year from restoration implementation. Monitoring reports should include photodocumentation, when restoration was completed, what materials were used, plantings (if specified) and justification of any substitutions to the Service recommended guidelines. Monitoring reports should also include recommendations for remedial actions and approval from the Service, if necessary, and justification from release of any further monitoring, if requested.

Creation of replacement habitat

Replacement habitat should be monitored for 5 years following implementation. Hydrology should be monitored for the first two years after creation of wetlands. The monitoring effort should continue for three additional years to ensure success criteria are met. Monitoring reports documenting implementation of conservation measures should be submitted to the Service: (1) upon completion of wetland creation; (2) yearly for the first two years of monitoring; and (3) 5 years from implementation. Monitoring reports should include photodocumentation, when restoration was completed, what materials were used, plantings (if specified) and justification of any substitutions to the Service recommended guidelines. Monitoring reports should also include recommendations for remedial actions and approval from the Service, if necessary, and justification from release of any further monitoring, if requested.

Success criteria for replacement habitat:

1. At completion of monitoring, the cover measured on the habitat area should be 90 percent of cover measured on the reference site.

2. At completion of monitoring, the species composition measured on the habitat area should be 90 percent of that measured on the reference site.

3. At completion of monitoring, wetlands created on the site should meetU.S. Fish and Wildlife Service wetlands criteria.

Maintenance and management of replacement giant garter snake habitat

1. A final management plan of replacement habitat must be approved by the Service.

2. All maintenance activities should follow Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake Habitat.

3. Additional guidance includes:

    a. Canal Maintenance - Hand clearing of canals is preferred for removal of excessive vegetation or debris. Any equipment should be operated from the bank top. Excavate from only one side of the canal during a given year. Avoid excavating the banks above the high water level. Preferably, one side of the canal should be left undisturbed indefinitely (the preferred side would be the west or north side) so that emergent vegetation and bank side cover is left in place.

    b. Place the spoils from canal clearing in a designated location, rather than along bank tops. This will prevent burying or crushing snakes basking on the banks, or trapping snakes taking cover in burrows or bank-top soil crevices.

    c. Vegetation control - Uplands should not be disced. Leave vegetation on levees and canal sides wherever possible. Mowing to control vegetation should take place July through September and mower blades should be raised at least six inches to avoid injuring snakes and to leave some grassy cover.

    d. Traffic - Control vehicle access to avoid vehicular mortality of giant garter snakes.

4. Use a water maintenance regime that will maintain some open water to provide vegetated edge for giant garter snake to forage along.

5. Eradicate/control non-natives and invasive exotics.

Compatible uses of giant garter snake replacement habitat:

Rice farming is a compatible land use for adjacent properties.

Uses of giant garter snake replacement habitat that are incompatible with the habitat of giant garter snake, or represent threats to giant garter snakes include row cropping on uplands, orchards on uplands, OHV (off-highway vehicle) use, and combining with riparian habitat creation which requires dense cover or SRA (shaded riverine aquatic) habitat.

Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service, 2800 Cottage Way Room W-2605, Sacramento, California 95825

12-04

Appendix B – FHWA GGS Programmatic Biological Opinion

Items Necessary for the Service to Complete Formal Consultation on Projects with Impacts to Giant Garter Snake

1. A description of the specific area that may be affected by the action, including:

    a. Precise location of the project site clearly delineated on either an original or high quality copy of a U.S. Geological Survey topographic map (exact scale, 7.5 minute, 1" = 2,000 ft.). The map should include quad name(s), county name(s), legal location, and project name.

    b. Area (in acres) affected by the proposed project, including total area of the project, estimated area of giant garter snake habitat filled/destroyed, and estimated area of habitat temporarily disturbed. Also include linear feet of bank habitat disturbed and linear feet of aquatic habitat (canal, waterway, marsh) dewatered, filled, excavated, or cleared of vegetation. Giant garter snake habitat includes both aquatic and upland habitats. Aquatic habitat may be seasonal or perennial marshes, sloughs, ponds, small lakes, low gradient streams, and irrigation and drainage canals.

    c. Detailed map of proposed project site in addition to the location map specified above. This map should include the following items: potential habitat of giant garter snake on-site, and on adjacent property where habitat crosses property boundary, location and type of potential impacts (i.e., buildings, other structures, roads, riprap, staging areas, haul roads, stockpiling areas, borrow sites) on proposed site, and other listed or proposed species locations/habitats.

    d. Detailed map of the location of any proposed habitat restoration and/or replacement, including distance from the project site and proximity to existing habitat.

2. A description of the action to be considered, including:

    a. Any dewatering and time period of dewatering.

    b. Project schedule/timing of project.

    c. Type of project by category (development, conservation banking, utilities or infrastructure project).

    d. Any grading, dredging, excavation, or clearing of vegetation required.

3. A description of all listed species or critical habitat that may be affected by the action. Projects may affect more than one federally listed or proposed species, and may require consultation on more than one species. Including an evaluation of the potential effects of the action on listed and proposed species will give the Service the opportunity to concur with the Federal Highway Administration's and Caltrans' determination, or to recommend formal consultation. If the action may

affect a listed or proposed species, but is not likely to adversely affect the species, the Service will include this determination with completion of the formal consultation on giant garter snake. If formal consultation is required on other species in addition to giant garter snake, the Service will work with Caltrans to include all necessary species into the formal consultation process.

4. A description of the manner in which the action may affect any listed species or critical habitat and an analysis of any cumulative effects:

    a. Analysis of direct and indirect effects.

    b. Analysis of cumulative effects will include:

        i. A list of non-Federal actions reasonably certain to occur in the project area, quantifying permanent and temporary impacts to giant garter snake habitat.

        ii. A brief synopsis of list of non-Federal actions as noted above.

        iii. Sources of information would be city and county planners, general plans, various environmental documents, website reviews, and state agency contacts.

    c. Include any conservation measures, including restoration and/or replacement of habitat and other measures, that the applicant proposes to avoid and minimize the effects of take on the snake. Proposed conservation measures should include monitoring and management plans for restored and replacement habitat. **To expedite consultation, such plans and measures should be developed during the informal consultation process with the Service.**

5. Relevant reports, including any environmental impact statement, environmental assessment, or biological assessment.

6. Any other relevant available information.

Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Office, 2800 Cottage Way Room W-2605, Sacramento, California 95825

Appendix C – FHWA GGS Programmatic Biological Opinion

Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake (*Thamnophis gigas*) Habitat

HABITAT TYPE:

Marshes, sloughs, ponds, small lakes, low gradient streams, irrigation and drainage canals, and rice fields. Permanent aquatic habitat, or seasonally flooded during the snake's active season (early-spring through mid-fall), with herbaceous wetland vegetation, such as cattails and bulrushes, grassy banks (often salt grass), and uplands for cover and retreat sites during the snake's active season and for refuge from flood waters during the dormant season (winter). Giant garter snakes are typically absent from larger rivers because of lack of suitable habitat, and from wetlands with sand, gravel, or rock substrates. Some riparian woodlands may not provide suitable habitat because of excessive shade, lack of basking sites, and absence of giant garter snake prey.

AVOIDANCE AND MINIMIZATION MEASURES:

1. Avoid construction activities within 200 feet from the banks of giant garter snake aquatic habitat. Confine movement of heavy equipment to existing roadways to minimize habitat disturbance.

2. Construction activity within habitat should be conducted between May 1 and October 1. This is the active period for giant garter snakes and direct mortality is lessened, because snakes are expected to actively move and avoid danger. Between October 2 and April 30 contact the Service's Sacramento Fish and Wildlife Office to determine if additional measures are necessary to minimize and avoid take.

3. Confine clearing to the minimal area necessary to facilitate construction activities. Flag and designate avoided giant garter snake habitat within or adjacent to the project area as Environmentally Sensitive Areas. This area should be avoided by all construction personnel.

4. Construction personnel should receive Service-approved worker environmental awareness training. Awareness training may be given by Caltrans biologists who have experience in giant garter snake natural history. This training instructs workers to recognize giant garter snakes and their habitat(s).

5. 24-hours prior to construction activities, the project area should be surveyed for giant garter snakes. Survey of the project area should be repeated if a lapse in construction activity of two weeks or greater has occurred. If a snake is encountered during construction, activities shall cease until appropriate corrective measures have been completed or it has been determined that the snake will not be harmed. Report any sightings and any incidental take to the Service immediately by telephone at (916) 414-6600.

6. Any dewatered habitat should remain dry for at least 15 consecutive days after April 15 and prior to excavating or filling of the dewatered habitat.
7. After completion of construction activities, remove any temporary fill and construction debris and, wherever feasible, restore disturbed areas to pre-project conditions. Restoration work may include such activities as replanting species removed from banks or replanting emergent vegetation in the active channel.
8. Follow the conservation measures in Table 1 to minimize the effects of loss and disturbance of habitat on giant garter snakes. Replacement ratios are based on the acreage and on the duration of disturbance.

TABLE 1 - SUMMARY OF GIANT GARTER SNAKE CONSERVATION MEASURES

	EFFECTS: DURATION	**EFFECTS:** ACRES	**CONSERVATION MEASURE:** COMPENSATION
LEVEL 1	1 season	Will not exceed 20 and temporary	Restoration
LEVEL 2	2 seasons	Will not exceed 20 and temporary	Restoration plus 1:1 replacement
LEVEL 3	More than 2 seasons and temporary	Will not exceed 20 and temporary	3:1 Replacement (or restoration plus 2:1 replacement)
	Permanent loss	Will not exceed 3 acres total giant garter snake habitat AND Less than 1 acre aquatic habitat	3:1 Replacement

Giant garter snake habitat includes 2.0 acres of surrounding upland habitat for every 1.0 acre of aquatic habitat. The 2.0 acres of upland habitat also may be defined as 218 linear feet of bankside habitat which incorporates adjacent uplands to a width of 200 feet from the edge of each bank. Each acre of created aquatic habitat should be supported by two acres of surrounding upland habitat. Compensation may include creating upland refuges and hibernacula for the giant garter snake that are above the 100-year flood plain.

A season is defined as the calendar year period between May 1 and October 1, the active period for giant garter snake when mortality is less likely to occur.

Sacramento Fish and Wildlife Office, U.S. Fish and Wildlife Service, 2800 Cottage Way Room W-2605, Sacramento, California 95825

12-04

Appendix D: FHWA GGS Programmatic Biological Opinion

Information to Include in Monitoring Reports for the Giant Garter Snake

1. Date

2. Surveyor

3. Project information (Please include the following):
    a. Project name
    b. Location
    c. Project effects and acres affected

4. Survey information (should include the following):
    a. Time of day
    b. Temperature at start and end of survey. Include ambient temperature, temperature at ground level, and at approximately 3 inches above ground level.
    c. Weather conditions (include wind conditions and cloud cover)
    d. Acres/area surveyed

5. Site description (may include the following):
    a. Habitat types present, substrate/soils, etc.
    b. Topography/elevation
    c. Surrounding land-use/activity
    d. Description of project features

6. Habitat characteristics:
    a. Burrows/potential hibernacula present? (Y/N)
    b. Amount and type of cover present, including upland and emergent vegetation
    c. Prey species present? (Y/N)
    d. Distance to nearest available habitat
    e. Other species observed

7. Giant garter snakes present? (Y/N) If observed provide the following information:
    a. Number of individuals, and if possible to determine, whether juveniles or adults
    b. Location(s)

c. Describe behavior and activity
d. Describe protective measures implemented

8. Describe on site minimization and avoidance measures implemented (fencing, dewatering, worker awareness training, etc.). Include any difficulties implementing measures and corrective measures taken.

Please report all sightings to the US Fish and Wildlife Service, Sacramento Fish and Wildlife Office at 916/414-6600, and to the California Department of Fish and Game. The monitoring biologist also should submit all sightings to California Department of Fish and Game Natural Diversity Data Base using a California Native Species Field Survey Form.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

IN REPLY REFER TO:
81420-2009-F-0366-3

OCT 07 2009

Mr. Walter C. Waidelich, Jr.
Division Administrator
Federal Highway Administration
U.S. Department of Transportation
650 Capitol Mall, Suite 4-100
Sacramento, California 95814

Subject: Appendage of the State Route 99 Manteca Widening Project, San Joaquin County, California (Caltrans EA 10-0E610, 10-SJ-99-PM 5.1/15.0), to the *Programmatic Biological Opinion on the Effects of Small Highway Projects on the Threatened Giant Garter Snake in Butte, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, and Yuba Counties, California* (Service File number 1-1-03-F-0154)

Dear Mr. Waidelich, Jr.:

This is the U.S. Fish and Wildlife Service's (Service) response to the Federal Highway Administration's (FHWA) request for formal consultation on the proposed State Route 99 Manteca Widening Project (project) in San Joaquin County, California. Your original request for concurrence, dated January 16, 2009, and subsequent request for formal consultation, dated April 30, 2009, was received in this office on January 21, 2009, and on May 4, 2009, respectively. FHWA requests that this project be considered for inclusion within the Service's January 24, 2005, *Programmatic Biological Opinion on the Effects of Small Highway Projects on the Threatened Giant Garter Snake in Butte, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, Yolo, and Yuba Counties, California* (Programmatic). At issue are the effects of this proposed project on the federally-threatened giant garter snake (*Thamnophis gigas*; GGS). This response was prepared in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act).

The findings and recommendations in this formal consultation are based on: (1) your letter, dated April 30, 2009, requesting initiation of section 7 consultation, (2) the *Biological Assessment for the State Route 99 Manteca Widening Project*, dated December 2008, and revised April, 2009 (BA), (3) site visits made by Rocky Montgomery, Ellen McBride, Susan Jones (Service) and Steven Stringer (HDR, Inc.), (4) electronic-mail (e-mail) and telephone correspondence between

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the Service and the California Department of Transportation (Caltrans), and (5) other information available to the Service.

Consultation History

August 30, 2007: A preliminary site visit was made by Rocky Montgomery (Service) and Steven Stringer (HDR, Inc.) for the purpose of an informal review of the future project site. No formal recommendations were made as the visit was conducted prior to the development of the biological assessment.

January 21, 2009: The Service received a request from Caltrans asking for concurrence with the determination that the project was not likely to adversely affect the giant garter snake. The BA, dated December 2008, was also included in the initiation package.

February 11, 2009: Ellen McBride and Susan Jones (both of the Service) conducted a site visit of the project area to examine GGS habitat conditions and to observe the presence of potential habitat for other listed species at the site.

February 18, 2009: A 30-day response letter sent by the Service to Caltrans stated that the Service did not concur with Caltrans' determination that the project was not likely to adversely affect the GGS.

March 3, 2009: A general quarterly meeting was held in which Christine Cox and Jennifer Taylor (Caltrans), and Kenneth Sanchez, Peter Cross, Susan Jones, and Ellen McBride (all of the Service), met to discuss the status of Caltrans projects; Caltrans specifically expressed concerns with the Service's 30-day response letter regarding the Manteca project. Confirmation from the Service asserted that GGS impacts were likely to occur and section 7 consultation under the Act would be prudent.

May 5, 2009: The Service received a letter from FHWA requesting initiation of formal consultation for the GGS and a further request to append the project to the Programmatic. A revised April 2009 BA was also included in the initiation package.

May 12, 2009: Jen Schofield (Service) received an e-mail from Charles Walbridge (Caltrans) requesting a two week extension to the work window for the GGS.

May 20, 2009: Ms. Schofield e-mailed Mr. Walbridge providing some recommended guidelines for the allowance of construction activity outside of the Service-recommended GGS work window periods.

June 5, 2009: Ms. Schofield e-mailed Mr. Walbridge with an insufficient information request for further clarification concerning the revised BA.

June 24-25, 2009: Ms. Schofield and Mr. Walbridge continued to exchange e-mail correspondence regarding the issue of extending the project's work period.

June 29, 2009: Zach Parker (Caltrans) telephoned Ms. Schofield, who confirmed that the Service would require additional minimization to offset the effects of the proposed work window extension beyond the October 1 deadline.

July 7, 2009: Ms. Schofield spoke with Mr. Parker via telephone to discuss the specifics of the extra minimization measures for the GGS and the responses to Ms. Schofield's previous inquiries concerning information in the BA.

July 16, 2009: Mr. Walbridge sent an e-mail forwarded from the consultant, HDR, Inc., recommending a design change in French Camp Slough in order to fix scour and erosion problems and involving the addition of Rock Slope Protection (RSP) on the north bank.

July 22, 2009: Mr. Parker e-mailed responses from the consultant, HDR, Inc., answering Ms. Schofield's queries on the disparate calculations for permanent and temporary effects to habitat provided at different times during the consultation process.

July 27, 2009: Mr. Walbridge forwarded an e-mail from the consultant, restating the revised calculations for permanent and temporary effects to GGS habitat. He also sent responses, made in conjunction with HDR, Inc., to Ms. Schofield's questions and comments from the June 5, 2009 electronic mail.

Project Description

FHWA and Caltrans, in cooperation with the City of Manteca, San Joaquin County, and the San Joaquin Council of Governments (SJCOG), propose to widen and upgrade a portion of State Route (SR) 99 highway from four lanes to six lanes using the existing median and State right-of-way (ROW). This is the principal north/south highway through California's Central Valley which also acts as a major link to all east/west routes in the region. The 9.9 mile (mi) segment extends from the Austin Road interchange (post mile (PM) 5.1) in Manteca to Arch Road (PM 15.0) in Stockton, San Joaquin County, California.

The overall purpose of the project is to provide increased traffic capacity on SR 99 and to alleviate congestion for the benefit of local and through traffic. The addition of one extra 12 foot (ft) lane in each direction plus a new concrete barrier along with the planned supplementary improvements would help create a safer, more effective highway corridor, and more closely

conform to current Caltrans design standards. The project proposes to undertake several additional roadway activities to address these concerns, including:

- Upgrade bridge rails at Lone Tree Creek, French Camp Slough, and Littlejohns Creek.
- Widen shoulders to accommodate minor shoulder improvements at Lone Tree Creek, French Camp Slough, and Littlejohns Creek.
- Construct the Turner Station overhead replacement at French Camp Road, including ramp realignments with new acceleration and deceleration lanes, mainline SR 99 profile grade correction, frontage road realignment to accommodate the increased road width, and the addition of RSP on the north bank of the slough extending 20 ft and parallel to the waterway from each bridge exterior, to combat scour and erosion problems.
- Acquire new state ROW: 15.2 acres (ac) at French Camp Road, 28.5 ac at Main Street/Lathrop Interchange, and 2.8 ac at various spots on mainline SR 99.
- Refine existing hook ramp connections at Littlejohns Creek, located south of Stockton Airport, by implementing acceleration and deceleration lanes.
- Evaluate traffic operation and make potential modifications at the Main Street/North Manteca and French Camp Road interchanges, including frontage road relocations. Note, these improvements are not discussed in additional detail in the biological assessment and therefore not included in the current consultation. Although the biological assessment states that these modifications have no bearing on the species involved, the Service has determined that this is inaccurate and thus more appropriately concludes that these modifications are not likely to adversely affect the species at issue.

FHWA and Caltrans anticipate that construction will begin in July, 2012 and will be completed in July, 2015.

Action Area

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The action area for the proposed project spans approximately 1,050 ac, including the 9.9 mi north-south linear segment of highway encompassing those portions within the ROW (the north and southbound lanes, the medians and shoulders), segments of the three waterways and associated bank habitat within the ROW in which suitable GGS habitat is present and which will be directly affected by construction activities, and new ROW acquisition of a total of 46.5 ac at French Camp Road, at Main Street/Lathrop Interchange, and at several locales along mainline SR 99, as ascertained by

further discussion with the Caltrans biologist and the consultant. It also includes indirectly affected segments of the three waterway channels in which work will occur, upstream and downstream of the ROW, and portions of mixed urban/ruderal/agricultural lands, also outside of the Caltrans ROW but contained within the construction footprint. The action area is located within the Stockton East and Manteca United States Geological Survey (USGS) 7.5- minute quadrangles. The UTM coordinates marking the approximate center of the linear project area are 10S, 656766.94m E and 4189328.47m N, WGS 84.

Appending to the Programmatic Biological Opinion

The Service has determined that this project is consistent with the criteria of the Programmatic. This letter is an agreement by the Service to append the project to the Programmatic and represents the Service's biological opinion on the effects of the proposed action. The FHWA proposed to append up to 18 projects per year to the Programmatic, each of which may permanently affect up to three acres (=54 ac/year) and temporarily affect up to 20 ac (=360 ac/year) throughout the action area of the Programmatic over its five year term. Thus far, according to the Service file, 22 projects have been appended to the Programmatic and two additional projects are proposed for appendage during 2009-2010, inclusive of the project in this biological opinion and the Interstate-5 North Stockton Corridor Improvements Project in San Joaquin County, California.

According to the BA and further discussion with Caltrans biologists and the consultant, a total of 0.069 ac of GGS habitat will be permanently lost through the current project while 0.540 ac will be temporarily affected due to proposed construction activities.

Conservation measures for projects appended to the Programmatic involve following the *FHWA Giant Garter Snake Programmatic Biological Opinion Guidelines for Restoration and/or Replacement of Giant Garter Snake Habitat (*Guidelines), the *Standard Avoidance and Minimization Measures During Construction Activities in Giant Garter Snake Habitat* (Avoidance Measures), and all the *Terms and Conditions* of the Programmatic, except as approved by request to the Service. It is the Service's intent that following these Guidelines and Avoidance Measures will reduce habitat degradation while increasing the protected habitat areas across the species' range. It is anticipated that these protected areas may serve as the foundation upon which local communities can develop future habitat conservation plans. A copy of the Guidelines and Avoidance Measures are found as appendices to the Programmatic and are available from the Service upon request.

The Service is tracking losses of habitat within the range of the GGS permitted under the Programmatic, and minimization for those losses, in each County under the jurisdiction of the Sacramento Fish and Wildlife Service Field Office. The Service reevaluates the effectiveness of this Programmatic annually to ensure that continued implementation will not result in

unacceptable impacts to GGS populations or to the quality and quantity of habitats upon which they depend.

Conservation Measures

Conservation measures for projects appended to the Programmatic shall be in accordance with the Guidelines and Avoidance Measures unless otherwise provided by the Service. The Programmatic identifies three levels of seasonal project duration, the maximum extent of affected acreage allowed, and the appropriate conservation measure response (pp. 3-9). These measures include the following:

1. Avoidance of take and disturbance of habitat (Levels 1, 2, and 3);

2. Minimization of disturbance and habitat loss (Levels 1, 2, and 3);

3. Restoration of temporary habitat disturbance and associated impacts to GGS habitat (Levels 1 and 2);

4. Replacement of permanent and temporary habitat loss (Levels 2 and 3);

5. Management and monitoring of restored and replacement habitat (Levels 1, 2, and 3);

6. A management plan for the long-term protection of the restored and replaced habitat area(s) to protect the area(s) in perpetuity as habitat for the GGS (Levels 2 and 3)

Effects of the Proposed Action

The project area features hydrological connectivity through which GGS may disperse, suitable aquatic habitat providing water during the snake's active period as well as associated bank habitat for basking and cover. According to the California Natural Diversity Database (CNDDB), there are two documented occurrences of GGS, one within five miles and one within 10 miles of the northern boundary of the project site. Considering that GGS have been reported to move approximately five miles within several days (Wylie et al., 1997), in addition to the proximity of the CNDDB observation records, the presence of suitable habitat in and/or around the waterways of French Camp Slough, Lone Tree Creek, and Littlejohns Creek, and the biology and ecology of the species, the Service has determined that the GGS is reasonably certain to occur within the action area. Therefore, implementation of the proposed project is likely to adversely affect the GGS through permanent loss and temporary disturbance to habitat.

Construction activities associated with the proposed project that are likely to adversely affect the GGS through permanent loss of habitat and the disturbance of aquatic and bank habitat in the slough and creek locations include: pile driving, the assembly of new bridge piers at all three creek/slough locations, bridge extension and abutment widening at all three waterway locations, and the addition of RSP and a new cutoff wall (at French Camp Slough only). Such activities are likely to remove vegetative cover in the waterways and on the banks, habitat features that GGS require for cover and basking. Temporary effects are expected to occur in the median and along the upstream and downstream sides of the existing bridges at Lone Tree Creek and French Camp Slough due to construction of both new bridge decks and on- and off-ramps (at Lone Tree Creek), equipment and vehicle access and movement, increased worker foot- traffic, and pile driving vibration and noise disruption. These activities could have the direct effect of potentially harassing the GGS and causing individuals to flee from the protective waterways or bank habitat, thereby increasing the likelihood of strikes by vehicles and equipment in the project area and/or exposure to predation. Some project activities, such as pile driving, in which specialized driving and boring equipment are used in-water could temporarily inhibit usual GGS dispersal and movement through the channels by temporarily altering GGS behaviors. If equipment fully or partially physically blocks the waterways and/or creates vibratory noise disturbance, GGS could be harassed enough by these construction effects to fail to disperse to their up- or downstream destinations. Lastly, implementation of the project will result in the permanent loss of 0.069 ac of GGS habitat (Level 3), and the temporary loss of 0.540 ac of GGS habitat (Level 1) for one season (the calendar year period between May 1 and October 1). Note, with the proposed work window extension, the season will be defined as June 15 to October 15 for this project.

In cooperation with the City of Manteca, San Joaquin County, and the San Joaquin Council of Governments (SJCOG), FHWA and Caltrans agreed upon the following:

1. FHWA and Caltrans, in cooperation with the City of Manteca, San Joaquin County, and the SJCOG, shall implement all *Conservation Measures*, *Reasonable and Prudent Measures,* and *Terms and Conditions* as found in the Programmatic.

2. FHWA and Caltrans, in cooperation with the City of Manteca, San Joaquin County, and the SJCOG, shall implement the proposed conservation measures for Level 1 and Level 3 effects.

    a. **Level 1 effects**: No replacement minimization is proposed for temporary effects to 0.540 ac of habitat, as it is expected that all work potentially affecting GGS will only take one season to complete. Thus, Level 1 restoration measures to re-vegetate the areas with native grasses and forbs shall be undertaken to create higher habitat quality than that of pre-project conditions. The waterways shall also be restored to pre-construction conditions after project completion.

b. **Level 3 effects**: The proposed project will result in the permanent loss of a total of 0.069 ac of giant garter snake aquatic and bank habitat. Prior to groundbreaking, Caltrans shall minimize for permanent habitat loss and adverse effects to the GGS by using a 3:1 ratio to purchase a total of 0.207 credits at the closest Service-approved conservation bank. The Service generally requires that the conservation bank's service area appropriately covers the project area, but since no GGS banks currently exist within San Joaquin County or the wider valley, in this instance, the Service is making an exception to allow Caltrans to use the closest approved bank for its minimization efforts (Service, 2009).

As described in the Guidelines (p.1), if there are plans for construction activity to proceed outside of the GGS active season, the Service will be contacted as soon as possible to determine if additional measures may be necessary to minimize take of GGS. On May 12, 2009, Caltrans requested a two week work period extension beyond October 1, the approximate end date of the GGS active period, in order to complete construction in one season, rather than extend work into multiple seasons. This will result in an extra two weeks of project activities and encroach upon the GGS inactive period. Following discussion with Caltrans biologists, the Service grants this request, provided Caltrans adheres to the following measures:

1. Caltrans assumes that work will be distributed evenly throughout the four month work window, thus leaving one eighth of the work remaining during the two week extension period. The Service shall require extra minimization measures applied at a 3:1 ratio (three acres of habitat replaced for every one acre disturbed after October 1 through October 15) and Level 1 temporary effects shall be treated as Level 3 permanent effects. This ratio shall be applied to one eighth of the total acreage of both permanently and temporarily affected habitat (= (0.069 ac permanent x 0.125) + (0.540 ac temporary x 0.125)). Additional effects to 0.077 ac of habitat shall be minimized through the purchase of 0.231 credits at the closest Service-approved conservation bank, which shall be finalized before construction activities continue into the extended work window.

    a. Caltrans shall provide the Service with written assurance that the project will be completed prior to expiration of the requested extension period. A letter, specifically outlining the activities occurring during this period, along with any encountered problems and/or instances of take, shall be sent to the Service within 30 days of project completion.

    b. A Service-approved biologist shall be on-site to monitor all ground or habitat disturbing activities between October 1 and October 15.

INCIDENTAL TAKE STATEMENT

Section 9 of the Endangered Species Act and Federal regulations pursuant to section 4(d) of the Act, prohibit take of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. The Service defines harassment as an intentional or negligent act or omission that creates the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. The Service defines harm to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), take that is incidental to and not intended as part of the agency action is not considered to be prohibited, provided such taking is in compliance with this Incidental Take Statement.

Amount or Extent of Take

The Service anticipates that incidental take of the GGS will be difficult to detect because they are cryptically colored, secretive, and aversive to human activities, and often retreat into burrows, soil crevices, or vegetative cover. Thus, it is not possible to quantify an exact number of GGS individuals that are anticipated to be taken as a result of the proposed action. In instances when take calculations are infeasible to accurately calculate, the Service may estimate take in numbers of individuals per acre of permanently lost or degraded habitat as a result of the project action, as these effects reflect a significant biological effect to the species. Therefore, the Service anticipates take incidental to this project as all GGS inhabiting, using, or moving through the 0.069 ac of suitable aquatic and bank habitat. Upon implementation of the Programmatic's *Reasonable and Prudent Measures* and *Terms and Conditions*, and the *Conservation Measures* considered herein, incidental take for this project within this acreage in the forms of harm and/or harassment to GGS from habitat modification and loss due to bridge pier assembly and abutment extension activities, and the addition of bank rip-rap, are hereby exempt from the prohibitions described under section 9 of the Act. Direct injury to or mortality of two GGS individuals over the course of the Programmatic's term, stemming from vehicle/project equipment strikes and increased predation in this project's case, are also hereby exempt from the prohibitions described under section 9 of the Act.

Effect of Take

As the effects of this project fall within the parameters established within the Programmatic, the Service has determined that this level of anticipated take is not likely to jeopardize the continued existence of the GGS.

RE-INITIATION--CONCLUSION

This concludes the Service's review of the proposed State Route 99 Manteca Widening Project as submitted in your January 16, 2009 and April 30, 2009 letters. As provided in 50 CFR § 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or an extant not considered in this biological opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Please contact Jen Schofield or Susan P. Jones at the letterhead address or at (916) 414-6600 if you have any questions regarding this letter on the State Route 99 Manteca Widening Project. The Service wishes to thank you for your continued efforts and dedication to the conservation of America's wildlife resources.

Sincerely,

Peter A. Gross

for Susan K. Moore
Field Supervisor

cc:
Mr. Zachary Parker, Caltrans District 6, Fresno, California
Mr. Dan Gifford, California Department of Fish and Game, Rancho Cordova, California