FOUNDATION REPORT

JACALITOS CREEK BRIDGE REPLACEMENT PROJECT ON LOST HILLS ROAD
(BR. NO. 42C0078)
FRESNO COUNTY, CALIFORNIA

For

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1.0 INTRODUCTION

This Foundation Report (FR) is prepared for the proposed Jacalitos Creek Bridge Replacement Project (Project) in Fresno County (County), California. The approximate location of the Project site is shown on Plate 1 in Appendix I. The work was performed in general accordance with the scope of work outlined in our proposal to Consor (Designer/Structure Designer).

The scope of work performed for this investigation included a review of the readily available soils and geologic literature pertaining to the Project site and the information from the draft Foundation Report prepared by Wreco (dated May 2016). During the current design phase, PARIKH conducted supplemental geotechnical explorations and laboratory testing, performed engineering analyses, and prepared this report. Our geotechnical recommendations are based on the available boring data (PARIKH, 2024, Wreco, 2016, and Moore & Taber, 1969) and the design input provided by the Designer.

The purpose of this report is to evaluate the general subsurface soil conditions at the Project site, evaluate their engineering properties, and provide foundation design recommendations for the proposed Project.

2.0 PROJECT DESCRIPTION

The bridge is located in a rural area of the County (at approx. 36°06'07.2"N/120°18'38.8"W). The existing Jacalitos Creek Bridge is a five-span structure that is about 97 feet long and 28 feet wide. The bridge is supported on various foundation types, including spread footings (Abutment 1, Bent 2, and Bent 3) and driven steel H piles (10BP42, at Bent 4, Bent 5, and Abutment 6).

The proposed bridge will be a three-span structure that is about 140 feet long and 32 feet wide. It is planned to use Cast-In-Drilled-Hole (CIDH) piles for foundation support.

3.0 GEOTECHNICAL INVESTIGATION

PARIKH reviewed the draft Foundation Report prepared by Wreco (2016), which includes four borings (A-16-001 to A-16-004) from about 50.8 to 51.5 feet deep. Four borings (Borings B-1, B-2, B-3, and P-1) were drilled by More & Taber in 1969 from about 15 to 45 feet deep; however, these borings can not be accurately located since the site plan lacks scale and reference points.

Since the pile tip elevations are expected to be lower than the available boring data per the preliminary analyses according to the draft Foundation Report (Wreco, 2016), PARIKH

conducted a supplemental boring in 2024 to 90.5 feet below the ground surface. The boring by PARIKH was advanced by using a truck-mounted drill rig with 5½-inch solid-stem augers and the rotary wash method. Soils encountered in the borings were sampled using a 1.4-inch I.D. Standard Penetration Test (SPT) sampler under the impact of a 140 lb automatic hammer falling 30 inches. Based on the information provided by the driller, the hammer efficiency is approximately 82%.

The boring was drilled under the technical supervision of our field geologist, who classified and logged the soils encountered during drilling and supervised the collection of soil samples at various depths for visual examination and laboratory testing. The blow counts required to drive the sampler for the last 12 inches, or portion thereof are presented on the "Log of Test Borings" (LOTB), Appendix II. After visual examination, the collected samples were sealed and transported to our laboratory for further evaluation and testing.

The logs of the test borings were prepared from the field logs which were edited based on a visual re-examination of the soil samples in the laboratory and results of classification tests performed on selected soil and rock samples as indicated on the logs. Abrupt stratum changes shown on the logs may be gradual and relatively minor changes in soil types within a stratum may not be noted on the logs due to field limitations.

The approximate boring locations are shown on Plate 2 in Appendix I. The table below summarizes the field exploration information.

Table 1 – Summary of Field Explorations

Exploration ID.	Approximate Ground Surface Elevation (ft) [4]	Total Exploration Depth (ft)	Hammer Energy	Completion Date
R-24-001 [1]	667.0	90.5	82%	2/01/2024
A-16-001A & A-16-001B [2]	669.5	51.5	87%	3/22/2016
A-16-002 [2]	669.5	51.5	87%	3/22/2016
A-16-003 [2]	660.0	50.8	87%	3/21/2016
A-16-004 [2]	670.0	50.5±	87%	3/22/2016
B-1 [3]	690.9	45.5±	n.a.	3/7/1969
B-2 [3]	669.8	29.5±	n.a.	3/10/1969
B-3 [3]	669.1	44.5±	n.a.	3/13/1969
P-1 [3]	688.9	15±	n.a.	n.a.

Notes:
(1) Parikh, 2024
(2) Draft LOTB by Wreco, 2016.
(3) Moore & Taber, 1969. However, the locations of the borings cannot be determined.
(4) The location of the current boring by Parikh was not surveyed. The ground surface elevation for R-24-001 was estimated based on the topography data provided by the designer.

It should be noted that the descriptions of the soils encountered and relevant soil boring information presented on the LOTBs depict subsurface conditions only at the locations indicated on the plan and on the date noted on the LOTBs. Because of the variability from place to place within the soil in general, subsurface conditions at other locations may differ from conditions occurring at the soil boring locations explored. The abrupt stratum changes shown on the logs may be gradational, and relatively minor changes in soil types within a stratum may not be noted on the logs due to field limitations. Also, the passage of time may result in a change in the soil conditions at these locations due to environmental or anthropogenic changes.

4.0 LABORATORY TESTING PROGRAM

Laboratory tests were performed on selected soil samples recovered from Boring R-24-001 to evaluate the physical and engineering properties of the subsoil, including Moisture Contents (ASTM D2216), Particle Size Analysis (ASTM D422), Atterberg Limits (ASTM D4318), and Corrosivity Testing (CTM 643, 422, and 417). The laboratory test results are attached in Appendix III.

5.0 GEOTECHNICAL CONDITIONS

5.1 Geology

The Project site is located at the transition between the Coast Ranges and the Great Central Valley Geomorphic Provinces. Geologic unit extents and descriptions have been derived from “Dibblee and Minch, (2006), “Geologic map of the Kreyenhagen Hills quadrangle, Fresno County, California”, Dibblee Foundation Map DF-277. Project site geology is shown in Plate 3.

The Project is mapped to be underlain by Holocene surficial sediments (Qa) composed of alluvial gravel, sand, silt, and clay. This unit correlates well with the units described in the LOTB included in Appendix II.

Pleistocene older surficial sediments (Qoa) are mapped as occurring to the southeast of the project and are composed of alluvial gravel, sand, and clay.

Depth to bedrock was not revealed during this investigation. Given this, the Tulare Formation (QTt) occupies the hills to the northwest and southwest of the project. The unit dips slightly to moderately to the northeast and possibly underlies the project at depths greater than about 100 feet. The unit is described as being poorly indurated and composed of pebble to cobble conglomerate, sand, and clay. The unit would likely not be amenable to rock coring.

5.2 Surface Conditions

The site is contained in the bed and floodplain of Jacalitos Creek which flows from southwest to northeast through the site. Site topography slopes gently to the northeast.

Historical aerial photographs suggest the location of the bed and main channel of Jacalitos Creek has changed significantly over the last 95 years or so. The main channel of the creek upstream of the current bridge appears to have swept to the northwest and is currently abutting against and flowing along West Lost Hills Road from about 300 feet northeast of the bridge.

Geologic and elevation data relative to the Project site do not indicate the presence of geologic hazards such as landslides, slope failure, or rockfalls.

5.3 Subsurface Conditions

Based on the available boring data, the site is generally underlain by medium dense to very dense granular materials, including silty sand, well-graded sand, and poorly-graded sand. A layer of sandy lean clay was encountered at about Elev. 660 feet in Boring R-24-001, A-16-004, and A-16-001A, which is above the planned foundations. The approximate borehole locations are shown in Plate 2, and the soil/rock descriptions encountered are presented on the Log of Test Borings in Appendix III.

Due to limitations inherent in geotechnical investigations, it is neither uncommon to encounter unforeseen variations in the soil conditions during construction nor is it practical to determine all such variations during an acceptable program of drilling and sampling for a project of this scope. Such variations, when encountered, generally require additional engineering services to attain a properly constructed project. We, therefore, recommend that a contingency fund be provided to accommodate any additional charges resulting from technical services that may be required during Project construction.

6.0 GROUNDWATER

Boring B-3 (1969) encountered groundwater at Elev. 655.6 feet, which is about 13.5 feet deep. However, groundwater was not encountered in the auger borings conducted in the previous investigation phase (Wreco, 2016) to the maximum boring depth of 51.5 feet at about Elev. 609.5 feet. Groundwater was not encountered before the field explorations switched to rotary wash drilling in Boring R-24-001.

We have reviewed the groundwater data from the SGMA Data Viewer website (California Department of Water Resources, DWR), the groundwater is reported at about Elev. 280 feet according to the Spring 2023 data. Therefore, the groundwater table is expected to be relatively deep due to the groundwater pumping in the Central Valley in the past few decades.

Based on the above, natural groundwater may not exist within the exploration depths. Perched water may exist, which could also be affected by the seasonal water level in the creek and underground seepage. Therefore, it is recommended that a reduced soil unit weight be considered to about 10 feet below the bottom of the pile caps to account for the saturation condition due to the water in the creek for design purposes under the Service and Strength Limit States.

Please note that groundwater may vary with the passage of time due to seasonal groundwater fluctuation, surface and subsurface flows, seepage, ground surface run-off, and other factors that may not be present at the time of the investigation.

7.0 AS-BUILT FOUNDATION DATA

According to the Bridge Inspection Report (dated October 30, 2023) provided by the County, the existing spans 1 to 3, i.e., Abutment 1, Bent 2, and Bent 3, were part of the original structure constructed in 1940. Spread footings were used at these supports, but the actual footing dimensions and the design bearing capacities are not known.

Spans 4 and 5, i.e., Bent 4, Bent 5, and Abutment 6, were re-built in 1970, and steel driven H-piles (10BP42) were used for foundation support. The design pile tip were at Elev. 634 feet for the bents and Elev. 640 feet for Abutment 6; however, the design capacities are not available.

8.0 SCOUR DATA

The designer provided the following scour information that was considered for the foundation design.

Table 2 – Scour Information

Support No.	Long-Term Scour Elevation (Degradation and Contraction) (ft)	Short Term (Local) (ft)
Abutment 1	652	6.3
Bent 2	652	10.8
Bent 3	652	11.9
Abutment 4	652	11.6

According to Table 3.7.5-1 of the AASHTO Load and Resistant Factor Design (LRFD) Bridge Design Specifications, 8th Edition (AASHTO LRFD BDS 2017) with California Amendments, the effects due to 100% channel degradation/aggradation and contraction scour plus 100% local scour shall be considered at the Service limit state; 100% channel degradation/aggradation and contraction scour plus 50% local scour shall be considered in Strength limit state load combinations. For the Extreme Event I limit state, 100% degradation/aggradation and 100%

contraction scour should be considered, but local scour should not be included in structural or geotechnical design.

9.0 CORROSION EVALUATION

One corrosion test result was available from the 2016 report. Two more tests were conducted during this design phase from the samples collected in Boring R-24-001, and the test results are presented in Appendix III.

The test results are summarized below in Table 3. Based on Caltrans' standards, the site is considered non-corrosive.

Table 3 – Corrosion Test Results

Exploration ID.	Approximate Sample Depth (ft)	Minimum Resistivity (ohm-cm)	pH	Chloride (ppm)	Sulfate (ppm)	Corrosive?
R-24-001	11	1420	7.99	21.6	51.3	No
R-24-001	20	910	8.03	36.6	75.3	No
A-15-003	30.0 - 31.5	3,480	8.50	3.4	18.6	No

Note: Caltrans currently defines a corrosive environment as an area where the soil has either a chloride concentration of 500 ppm or greater, a sulfate concentration of 1,500 ppm or greater, or has a pH of 5.5 or less. With the exception of MSE walls, soil and water are not tested for chlorides and sulfates if the minimum resistivity is greater than 1,500 ohm-cm.

10.0 SEISMIC INFORMATION

The Project lays within one of the most seismically active areas of North America and is influenced mostly by the San Andreas fault system which spans the Coast Ranges from the Pacific Ocean to the San Joaquin Valley. The bridge is located at coordinates of approximately 36.10196°N and 120.31078°W. Plate 4 shows active faults in relation to the Project.

The closest active faults to the Project are the Great Valley thrust fault system, the Nunez, and the San Andreas.

The closest surface trace of the historically aged (<150 years) Kettleman Hills-North Dome (Great Valley 14) section of the Great Valley thrust fault system lays about 9.7 miles at a bearing of 80° from the project. The location of this section is poorly constrained and has a thrust displacement. The fault section is approximately 18 miles long, strikes approximately 300°, and dips 22° to the west.

The closest surface trace of the historically aged Coalinga (Great Valley 13) section of the Great Valley thrust fault system lays about 10.2 miles at a bearing of 45° from the project. The location of this section is poorly constrained and has a thrust displacement. The fault section is approximately 24 miles long, strikes approximately 300°, and dips 10° to 15° the south-west.

The closest surface trace of the historically aged Nunez fault lays about 10.3 miles at a bearing of 359° from the project. The location of this section is inferred and right-lateral strike-slip displacement. The fault section is approximately 4 miles long and strikes approximately 359°.

The closest surface trace of the historically aged San Andreas fault zone lays about 14.6 miles at a bearing of 225° from the project. The location of this section is well-constrained and has a right-lateral strike-slip displacement. The fault strikes approximately 317° and dips vertically.

10.1 Ground Motion Hazard

The site is susceptible to earthquake-induced ground motions during the design life of the bridge. According to the draft foundation report by Wreco (2016), the time-average shear wave velocity (V_{S30m}) for the upper 100 feet of soil at the site was estimated to be 283 m/sec.

We have re-evaluated the V_{S30m} based on the available data according to the current guidelines per the Caltrans Geotechnical Manual, "Design Acceleration Response Spectrum" module, dated January 2021. The V_{S30m} from the borings near the bridge (Borings A-16-002, A-16-003, A-16-004, and R-24-001) range from about 277 to 315 m/s. To develop the design ARS curve, a V_{S30m} of 280 m/s is assumed.

The Horizontal Peak Ground Acceleration (PGA) Is the ground motion at the site with a 5% probability of exceedance in 50 years (return period = 975 years). The USGS's 2014 NSHM is used as the basis to determine the ground motion. Adjustments for near-fault and basin effects were implemented, when applicable, as per Appendix B of the SDC v2.0. Caltrans web-based tool ARS Online v3.1.0 was utilized to determine the design ground motion parameters, including the ARS, for the subject structure site. Based on the ARS Online v3.1.0 tool, the design PGA = 0.66g, the deaggregated mean earthquake moment magnitude for PGA, M = 6.45, and the mean site-to-source distance for 1.0 second period spectral acceleration, R = 18.8 km (11.7 mi). The soil at the site is "Class S2" per SDC v2.0.

The site location and the relevant parameters are summarized in the table below, and the recommended design ARS curve and the Caltrans ARS Online tool output in Appendix I.

Table 4 – Recommended Ground Motion Parameters for Geotechnical Design

Site Parameters			Design Ground Motion Parameters (Return Period = 975 years)	
Locations (1)		Shear-Wave Velocity v_{S30}, m/sec	Horizontal Peak Ground Acceleration (HPGA) (1), g	Mean Earthquake (1) M, Moment Magnitude
Latitude, degrees	Longitude, degrees			
36.101998°N	120.310775°W	280	0.66	6.45

Note: (1) Based on the Caltrans web tool ARS Online (Version 3.1.0).

10.2 Other Seismic Hazards

Primary seismic hazards include ground shaking and surface fault rupture. Secondary seismic effects resulting from soil responses to ground shaking include liquefaction and landslides. These hazards may cause deformation of man-made structures and are discussed in the following sections. Earthquake-induced ground-shaking is a seismic hazard that can result in liquefaction, lurching, lateral spreading of soils, and landslide of soil and rock as well as the dynamic oscillation of man-made structures.

Differential settlements can occur at the ground surface if subsurface liquefaction and densification occur due to strong ground shaking.

The Project site has been determined to not have the potential for surface fault rupture, liquefaction, seismic-induced slope failure, or tsunami.

10.2.1 Surface Fault Rupture Potential

An Earthquake Zones of Required Investigation map and Seismic Hazard Zone Report have not been prepared for the site enclosing Kreyenhagen Hills 7.5-Minute Quadrangle. Hence, the Project does not lay within an Alquist-Priolo Earthquake Fault Zone or Seismic Hazard Zone.

The USGS Quaternary Fault and Fold Database shows the Project is not located within 1,000 feet of an unzoned fault that is Holocene/Latest Pleistocene (15,000 years) or younger.

In assessing seismic risks, we consider that surface fault rupture does not contribute to the seismic hazards at the site during the useful life of the Project. The preceding statements do not make inferences on the potential for secondary surface cracking.

10.2.2 Liquefaction Potential

Liquefaction is a phenomenon that saturated cohesionless soils are subject to a temporary but essentially total loss of shear strength under the reversing, cyclic shear stresses associated with earthquake shaking. According to the Caltrans Geotechnical Manual, "*Liquefaction Evaluation*" module, dated January 2020, soil types that are susceptible to liquefaction are sand, silty sand, low plasticity (PI<7) silt, and in unusual cases, gravel. Rock and most clay soils are not liquefiable.

Since the soils are predominantly dense granular soils and the natural groundwater table is expected to be relatively deep, the liquefaction potential does not exist. We have evaluated the soil densification (i.e., volumetric compression) due to earthquake-induced ground shaking for the dry cohesionless soil layers present at

the site location per procedures outlined by Tokimatsu and Seed (1987) based on the boring data. The soil densification analysis summary is tabulated below.

Table 5 – Dry Sand Settlement Summary

Boring No.	Estimated Dry Sand Settlement (in)
R-24-001	0.1±
A-16-001	5.0±
A-16-002	0.2±
A-16-003	0.1±
A-16-004	0.1±

The estimated soil densification is generally insignificant within the project limits. However, the results from boring A-16-001 indicate a much greater dry sand settlement due to a low blow count that appears to be localized. Since Boring A-16-001 is located about 85 feet from the proposed bridge abutment and the sample was relatively shallow, the impact due to soil densification is considered insignificant for the proposed bridge.

10.2.3 Seismic Slope Stability / Lateral Spreading Potential

Both static and seismic slope stability analyses were performed for the proposed abutments. The seismic slope stability analyses were performed with a horizontal seismic coefficient (kh) equal to 0.33g (1/2 × PGA) because the abutments will be supported on deep foundations. The analyses yielded factors of safety greater than 1.5 and 1.1 for the static and seismic conditions, respectively. The results of the slope stability analyses are shown in Appendix IV.

In conclusion, seismic slope instability and lateral spreading potential of the proposed abutments seem not to be a design issue due to the results of the slope stability analyses and the non-existing liquefaction potential at the Project site.

11.0 GEOTECHNICAL RECOMMENDATIONS

11.1 General

This report was prepared specifically for the proposed bridge structure as described earlier. Normal procedures were assumed for the construction of the bridge structure throughout our analysis and represent one of the bases of recommendations presented herein. Our design criteria have been based on the materials encountered at the site. Therefore, we should be notified in the event that these conditions are changed, so as to modify or amend our recommendations.

The following recommendations are for the proposed Project as shown on the loads (Appendix IV) and general and foundation plans (Appendix VI) provided by the structure designer.

11.2 Soil Profile

Based on the subsurface soil conditions described in Section 6.3, we have developed the generalized soil profile shown in the table below.

Table 6 – Generalized Soil Profile and LPILE Parameters

Elevation (ft)	Soil Type (L-PILE Soil Type)	Probable Soil Strength (1)	Total Unit Weight (pcf) (2)
660 to 645	Sand (Reese)	$\phi = 36°$	120
645 to 630	Sand (Reese)	$\phi = 40°$	125
630 to 610	Sand (Reese)	$\phi = 36°$	125
610 to 580	Sand (Reese)	$\phi = 40°$	130

Notes:
(1) The default values for K and ε_{50} in LPILE are recommended for analyses.
(2) Groundwater is relatively deep according to the boring data and the DWR groundwater contours. However, it is recommended that the effective unit weight (γ_T-γ_w, γ_w=62.4 pcf) be considered in the upper 10 feet below the creek bottom to account for seasonal saturation due to the flow in the creek for the Service and Strength Limit States.

11.3 Deep Foundations

Per discussion with the structure designer, the proposed bridge structure will be supported on 30-inch and 36-inch diameter CIDH piles at the abutments and the bents, respectively.

Consistent with the Caltrans requirements, the design of the abutment foundations followed the Load and Resistance Factor Design (LRFD) approach. For the proposed structure, pertinent foundation design information provided by the structure designer, the recommended specified pile tip elevations are shown in the Pile Data Tables in Appendix IV per Memo-To-Designers 3-1.

Please note that the design tip elevations and specified tip elevations shown in this report are based on the elevations, the demands, and the scour information provided by the structure designer. If the above design assumptions change, the design pile tip elevations must be verified.

11.3.1 Axial Pile Capacity

The estimation of the capacity of CIDH concrete piles is based on procedures proposed by O'Neill and Reese (1999; FHWA-IF-99-025). We have utilized the computer program “SHAFT” (ENSOFT, ver. 2023) for calculation purposes. The

program utilizes α factors for "Clay" and β factors for "Sand" where β is a function of depths below the ground surface. The pile capacity will be derived primarily from frictional resistance along the pile shafts, and end bearing contribution is not counted. The SHAFT output files are provided in Appendix IV.

Design Considerations:

1. We neglected the skin friction above the scour depth for each case analyzed (i.e., Service-I Limit State, Strength Limit State, and Extreme Event Limit State) as discussed in Section 8.0 of the report.

2. Per discussion in Section 11.2.2, liquefaction potential is not considered in our geotechnical design for the Project.

3. No tension demands based on the design input provided by the structural engineer.

4. Group Effect: Per Table 10.8.3.6.3-1 of the California Amendments to the AASHTO Load and Resistant Factor Design (LRFD) Bridge Design Specifications (AASHTO LRFD BDS), 8th Edition, no reduction due to the group effect is considered for the single row of piles at the bents with center-to-center spacing of 18 feet, which is six times the pile diameter (6D).

   For the abutment, a Reduction Factor for Group Effects (η) of 0.8 was considered when estimating the pile lengths at the abutment where the minimum center-to-center pile spacing is 7.5 feet, which is three times the pile diameter (3D).

11.3.2 Lateral Pile Capacity

Lateral pile analyses were performed by the structure designer based on the geotechnical parameters presented in Table 4. The design considerations are summarized below:

Design Considerations:

1. Group Effect: Per the California Amendments to AASHTO LRFD BDS – 8th Edition (Table 10.7.2.4-1), "p-y Curve Modification Factors" should be adopted for the loading in the transverse and longitudinal directions to account for pile group effect. Based on the plans provided by the structural engineer, the recommended p-multipliers are summarized in the tables below.

Table 7 – P-Multiplier for LPILE Analyses in Longitudinal Direction

Supports	Pile Type	Longitudinal			
		Pile Spacing	Pile Spacing	No. of Rows	p-multiplier
Abut 1	30" dia. CIDH	7.5'	3D	2	0.650
Bent 2	36" dia. CIDH	18'	6D	1	1.000
Bent 3	36" dia. CIDH	18'	6D	1	1.000
Abut 4	30" dia. CIDH	7.5'	3D	2	0.650

Table 8 – P-Multiplier for LPILE Analyses in Transverse Direction

Supports	Pile Type	Transverse			
		Pile Spacing	Pile Spacing	No. of Rows	p-multiplier
Abut 1	30" dia. CIDH	7.5'	3D	5	0.500
Bent 2	36" dia. CIDH	18'	6D	2	0.963
Bent 3	36" dia. CIDH	18'	6D	2	0.963
Abut 4	30" dia. CIDH	7.5'	3D	5	0.500

2. There is no impact on the lateral pile capacity due to liquefaction potential. However, scour should be considered when performing the lateral pile design for the abutments as discussed in Section 8.0.

11.4 Lateral Earth Pressure Capacity

The walls that are free to rotate at least 0.004 radians may be assumed flexible for the active condition. Walls that are not capable of this movement should be assumed rigid and designed for the at-rest condition.

For the proposed seat-type abutments with compacted structural backfill, the active earth pressure can be estimated based on an active earth pressure coefficient, Ka, of 0.283 (based on level backslope and a friction angle of 34 degrees for the compacted Structure Backfill) and a unit weight of 125 pcf. The recommendations are based on the assumption that no hydrostatic pore pressure buildup with well-drained structure backfill behind the walls.

A total seismic active earth pressure coefficient, Kae of 0.54, is recommended based on a kh of 0.33 (=½×PGA of 0.66g) for the pile-supported abutment with a level backslope per Appendix A11 of the AASTO LRFD BDS, 8th Edition.

For the longitudinal stiffness and passive resistance, the abutment walls should be designed based on the bilinear model per Section 6.3.1 of the Caltrans Seismic Design Criteria (SDC, version 2.0, dated April 2019). The bilinear model is based on experimental and calibrated analytical models using engineered structural backfill to relative compaction of at least 95%.

12.0 NOTES FOR SPECIFICATIONS

Caltrans standard specifications for "Cast-in-Place Concrete Piling" (Section 49-3) should be used for the construction of CIDH piles, which include necessary quality assurance and quality control (QA/QC) procedures.

Before using the information provided below in this section, please review the report to comprehend the contents and intent of the geotechnical design.

19-3.03B(1) Surface Water or Groundwater is Expected during Structure Excavation

Water may be expected during excavation and pile installation due to precipitations, surface water, leakage from underground utilities, irrigation of the landscape, seepage, or seasonal flow in the creek at the proposed bridge site. Therefore, this Standard Special Provision (SSP) should be included, and Type D structure excavation is recommended where excavation is expected.

49-1.03 Expected Difficult Pile Installation

The expected difficult pile installation conditions are summarized in the following table.

Table 9 – Expected Difficult Pile Installation

Pile Location		**Conditions**
Structure Number	**Support Location**	
42C0078	All Supports	- Groundwater or perched water should be expected during pile construction. - The pile construction is expected to encounter loose to very dense sand. - The contractor should expect hard drilling due to the presence of very dense sand and gravel. Larger particles, such as cobbles or boulders, may exist that can not be revealed in soil borings of 5 to 7 inches in diameter. However, the boreholes were advanced without rock coring.

49-3.02C(1) Drilling Sequence for CIDH Piling Center-to-Center Spacing less than 4 Pile Diameters

Unless the holes are supported by full-length casing, pile installation should be alternated, i.e. two adjacent piles should not be left open at the same time for pile spacing less than 4 pile diameters.

13.0 NOTES FOR CONSTRUCTION

13.1 General

To a degree, the performance of any structure is dependent upon construction procedures and quality. Hence, observation of grading operations and foundation construction should be carried out by the geotechnical engineer or the responsible agency. If the encountered subsurface conditions differ from those forming the basis of our recommendations, this office should be informed in order to assess the need for design changes.

The recommendations presented in this report are contingent upon good quality control and these geotechnical observations during construction.

Unless otherwise stated in the special provisions, all materials specifications should conform to Caltrans Standard Specifications (2023) including but not limited to the following: Earthwork, Structure Backfill, Reinforcing Geosynthetics, Hot Mix Asphalt, Aggregate Base, Aggregate Subbase, etc.

It is not unusual that unknown old buried utilities or abandoned structures, concrete rubble, etc., exist within the Project limit. It might require special equipment and additional efforts to remove these buried objects. The contractor should verify the utility lines, be aware of the existing conditions, and plan the construction activities accordingly.

In our opinion, conventional equipment may be used to excavate the on-site materials, which primarily consist of dense sand and gravels. Prospective contractors for the Project must evaluate construction-related issues on the basis of their knowledge and experience in the local area, similar projects in other localities, or additional field investigation on the site performed by them, taking into account their proposed construction methods and procedures. In addition, construction activities related to excavation and lateral earth support must conform to the safety requirements of OSHA and other applicable municipal and State regulatory agencies.

It is recommended that the excavations be supported as quickly as practical to maintain the integrity of the cut and prevent surficial sloughing. Generally, if the excavated slope appears loose or unstable, the area of excavation should be limited to that for which excavation, placement of laggings or anchored, mesh, rebar, and shotcrete can be completed in a day. Leaving cuts unsupported for a longer duration may result in instability. Localized subgrade pumping may be encountered during footing excavation depending on the weather, moisture condition of the subsurface soils, and surface drainage conditions.

According to the Caltrans Geotechnical Manual, "Soil Cut Slopes" module, dated January 2020, temporary cuts at 1H:1V are common on Caltrans construction projects and can be considered for this project. However, cuts greater than 25 feet in height are likely to experience problems if they exist for long periods or are exposed to extreme weather events. The design of all temporary cut slopes must follow Cal/OSHA requirements and the Caltrans Trenching and Shoring Manual

Water may be expected during excavation and pile installation due to precipitations, surface water, leakage from underground utilities, irrigation of the landscape, seepage, or seasonal flow in the creek at the proposed bridge site. Equipment mobility may also be difficult if the subgrade is wet. The subgrade soils may require reworking, aeration, or over-excavation and replacement with dry granular fill, and potentially with geotextile or geogrid to facilitate earthwork construction.

Backfill could be required for the narrow voids between the different improvements depending on the construction sequence and the distance between the Project elements. If traditional compaction is not practical or achievable due to the access limitation, self-setting flowable backfill materials, such as slurry cement backfill or controlled low-strength material should be used to fill the voids.

13.2 CIDH Concrete Piles

The calculated "Nominal Resistance" of the CIDH concrete piles was based on side resistance only. Tip resistance was not used. The zones used to calculate the side resistance of the CIDH concrete piles are shown in the table below.

Table 10 – Zones Used to Calculate Side Resistance

Support Location	Top of Side Resistance Zone Elevation (feet)	Bottom of Side Resistance Zone Elevation (feet)	Specified Tip Elevation (feet)
Abutment 1	649	607	605
Bent 2	646	585	583
Bent 3	646	585	583
Abutment 4	646	605	603

Note:
(1) The slurry displacement method may be used for concrete placement of the CIDH piles. Therefore, the specified pile tip elevations are two feet below the design tip elevations to account for the zone of untested concrete due to the limitations of the gamma-gamma logging (GGL) equipment (Caltrans Geotechnical Manual, "CIDH Concrete Pile Design Considerations" Module, dated March 2021.

Due to limitations inherent in the geotechnical investigation, it is neither uncommon to encounter unforeseen variations in the subsurface conditions during construction, nor is it practical to determine all such variations in an acceptable exploration program. Therefore, the contractor should expect the following conditions for the pile construction:

- The contractor should expect hard drilling due to the presence of very dense sand and gravel. Larger particles, such as cobbles or boulders, may exist that can not be revealed in soil borings of 5 to 7 inches in diameter. In addition, caving should be expected within the granular materials. Such caving conditions may require additional drilling and cleaning effort and may increase the concrete volume for the piles. The contractors should be aware of these conditions so that they can take appropriate steps to comply with the standards and maintain the integrity of the piles. The use of temporary casing and/or slurry construction for the pile installation should be anticipated to minimize the construction difficulty due to potential raveling or caving.

- Although the groundwater appears to be relatively deep according to the discussion in Section 6.0, water could be present during the CIDH pile construction. Such a condition may necessitate the use of the slurry displacement method and temporary casings.

- Pile excavations should not be allowed to stand open overnight without full-length casing, and excavations should be poured as soon as practical. Access tubes should be provided to allow for pile integrity testing and construction QA/QC (gamma-gamma logging or cross-hole sonic logging) procedures except for piles constructed in dry holes or holes dewatered without the use of temporary casing to control groundwater.

- The bottom of the abutment excavations should be free of debris and loose materials and properly cleaned.

- All pile excavations should be observed by the Project geotechnical engineer or the owner's representatives during drilling and prior to the placement of reinforcement and concrete so that if conditions differ from those anticipated, appropriate recommendations can be made.

14.0 REPORT COPY LIST

This report will be transmitted to the prime designer, Consor, for further distribution.

15.0 INVESTIGATION LIMITATIONS

Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices and are based on our site reconnaissance and the assumption that the subsurface conditions do not deviate from observed conditions.

All work done is in accordance with generally accepted geotechnical engineering principles and practices. No warranty, expressed or implied, of merchantability or fitness, is made or intended in connection with our work or by the furnishing of oral or written reports or findings.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in structures, soil, surface water, groundwater, or air, below or around this site.

Unanticipated soil conditions are commonly encountered and cannot be fully determined by taking soil samples and excavating test borings; different soil conditions may require additional expenditures be made during construction to attain a properly constructed project. Some contingency fund is thus recommended to accommodate these possible extra costs.

This report has been prepared for the proposed Project as described earlier to support the structural design of the Project elements.

In the event, any changes in the design or location of the facilities are planned, or if any variations or undesirable conditions are encountered during construction, our conclusions and recommendations shall not be considered valid unless the changes or variations are reviewed, and our recommendations modified or approved by us in writing.

This report is issued with the understanding that it is the structure designer's responsibility to ensure that the information and recommendations contained herein are incorporated into the Project and that necessary steps are also taken to see that the recommendations are carried out in the field.

The findings in this report are valid as of the present date. However, changes in the subsurface conditions can occur with the passage of time, whether they are due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur, whether they result from legislation or from the broadening of

knowledge. Accordingly, the findings in this report might be invalidated, wholly or partially, by changes outside of our control.

Respectfully submitted,
PARIKH CONSULTANTS, INC.

Frank Y. Wang, P.E., G.E. 2862
Senior Project Engineer

Craig Langbein, P.G. 9447
Project Geologist

Y. David Wang, Ph.D., P.E.52911
Project Manager

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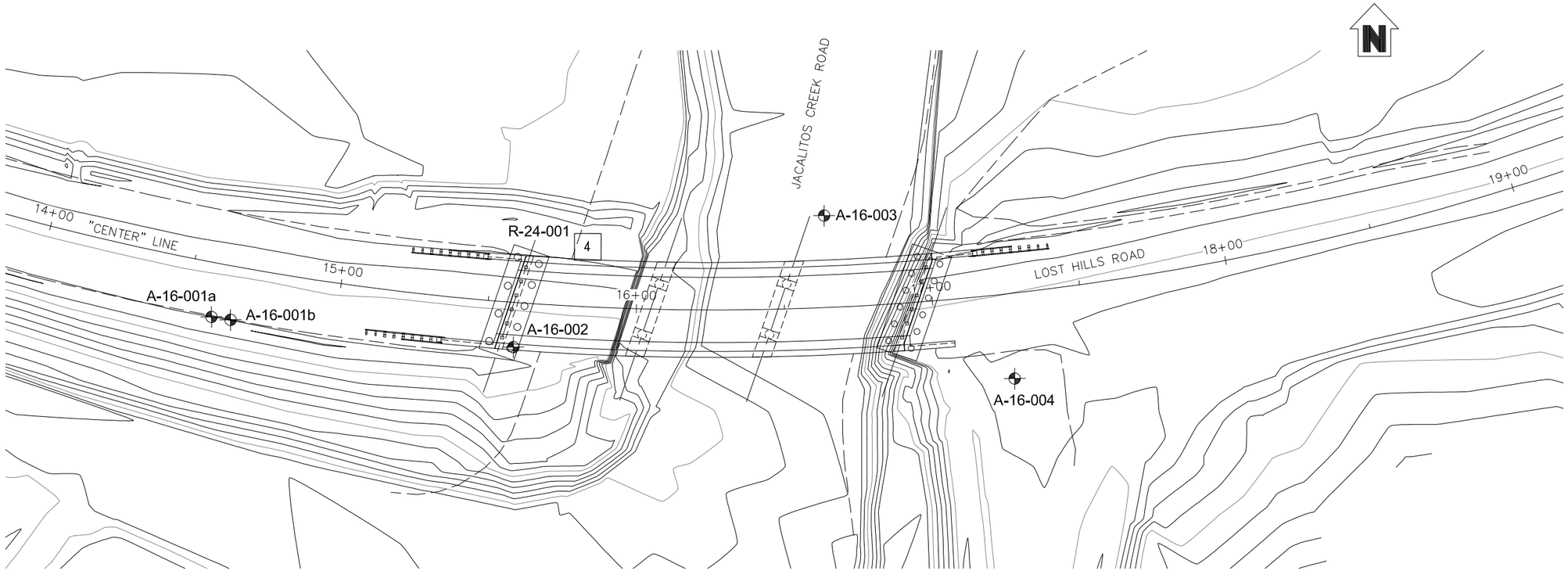
PARIKH
Practicing in the Geosciences

JACALITOS CREEK BRIDGE REPLACEMENT PROJECT ON LOST HILLS ROAD
(BR. NO. 42C0078)
FRESNO COUNTY, CALIFORNIA

Project No.: 2024-102-GEO

Plate 1



LEGEND

4 Approx. Boring Locations by PARIKH (2024)
(See Appendix II)

Approx. Boring Locations by WRECO (2016)
(See Appendix V)
The locations of the 1969 borings by Moore & Taber cannot be determined according to the as-built log of test borings.

SCALE 1 inch = 40 feet

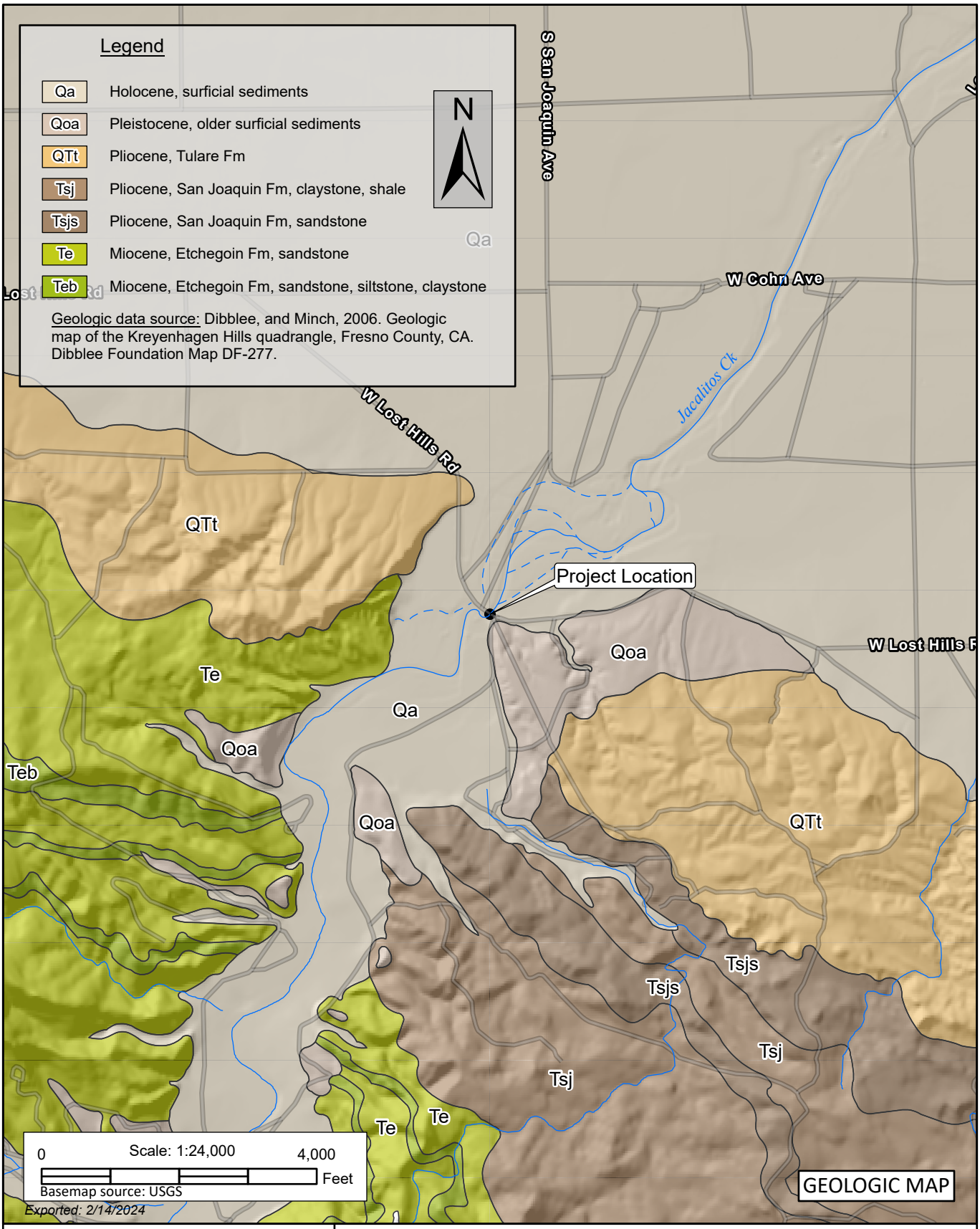
Note: All units are in feet unless otherwise specified
Reference Map was provided by Consor

SITE PLAN

PARIKH
Practicing in the Geosciences

JACALITOS CREEK BRIDGE PROJECT
COALINGA, CALIFORNIA

JOB NO.: 2024-102-GEO | PLATE 2



PARIKH
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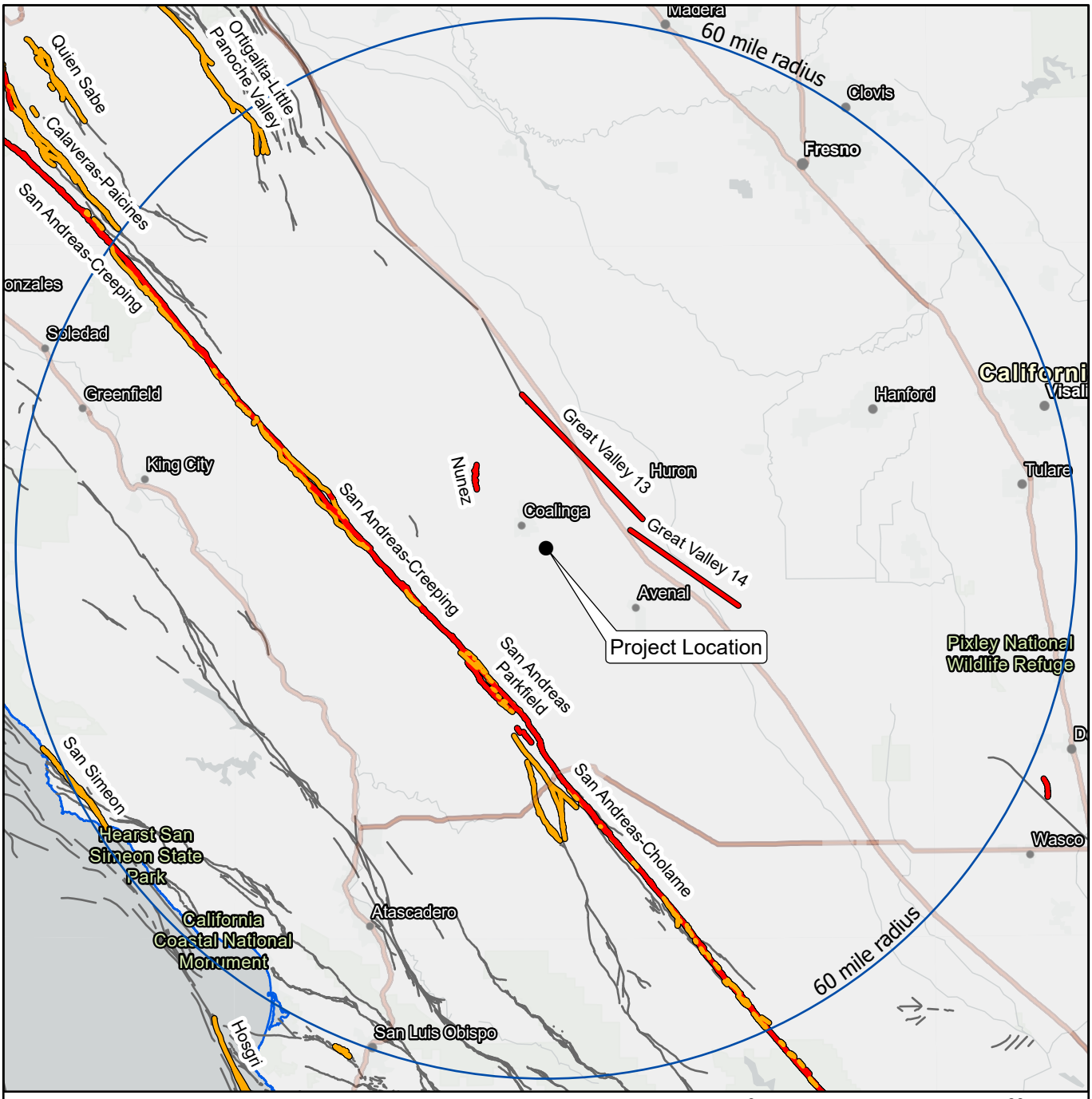
JACALITOS CREEK BRIDGE REPLACEMENT PROJECT ON LOST HILLS ROAD
(BRIDGE NO. 42C0078)
FRESNO COUNTY, CALIFORNIA

Project No.: 2024-102-GEO | Plate 3



Legend

Fault trace

Fault name

Cascade

Historic <150 yrs

Latest Quaternary <15,000 yrs

Quaternary <1.6 million yrs

Exported: 2/14/2024

MAP LOCATION

N

0 Scale: 1:1,100,000 30 Miles

Fault data source:

USGS & CGS. Quaternary Fault and Fold Database for the United States.

Basemap source:

ESRI and Partners

FAULT MAP

PARIKH

Practicing in the Geosciences

JACALITOS CREEK BRIDGE REPLACEMENT PROJECT ON LOST HILLS ROAD
(BRIDGE NO. 42C0078)
FRESNO COUNTY, CALIFORNIA

Project No.: 2024-102-GEO

Plate 4

Appendix I GROUND MOTION DATA SHEET

ARS Online V3.1.0

Using the tool: Specify latitude and longitude in decimal degrees in the input boxes below. Specify the time-averaged shear-wave velocity in the upper 30m (Vs30) in the input box. After submitting the data, the USGS 2014 hazard data for a 975-year return period will be reported along with adjustment factors required by Caltrans Seismic Design Criteria (SDC) V2.0.

Latitude: 36.101998 **Longitude:** -120.310775 **Vs30 (m/s):** 280 Submit

Caltrans Design Spectrum (5% damping)

Period(s)	Sa_{2014}(g)	$Basin_{2014}$	Near Fault Amp	Design Sa_{2014}(g)
PGA	0.66	1	1	0.66
0.10	1.18	1	1	1.18
0.20	1.55	1	1	1.55
0.30	1.62	1	1	1.62
0.50	1.42	1	1	1.42
0.75	1.08	1	1.06	1.15
1.0	0.85	1	1.12	0.96
2.0	0.41	1	1.12	0.47
3.0	0.26	1	1.12	0.3
4.0	0.19	1	1.12	0.21
5.0	0.14	1	1.12	0.16

Copy table

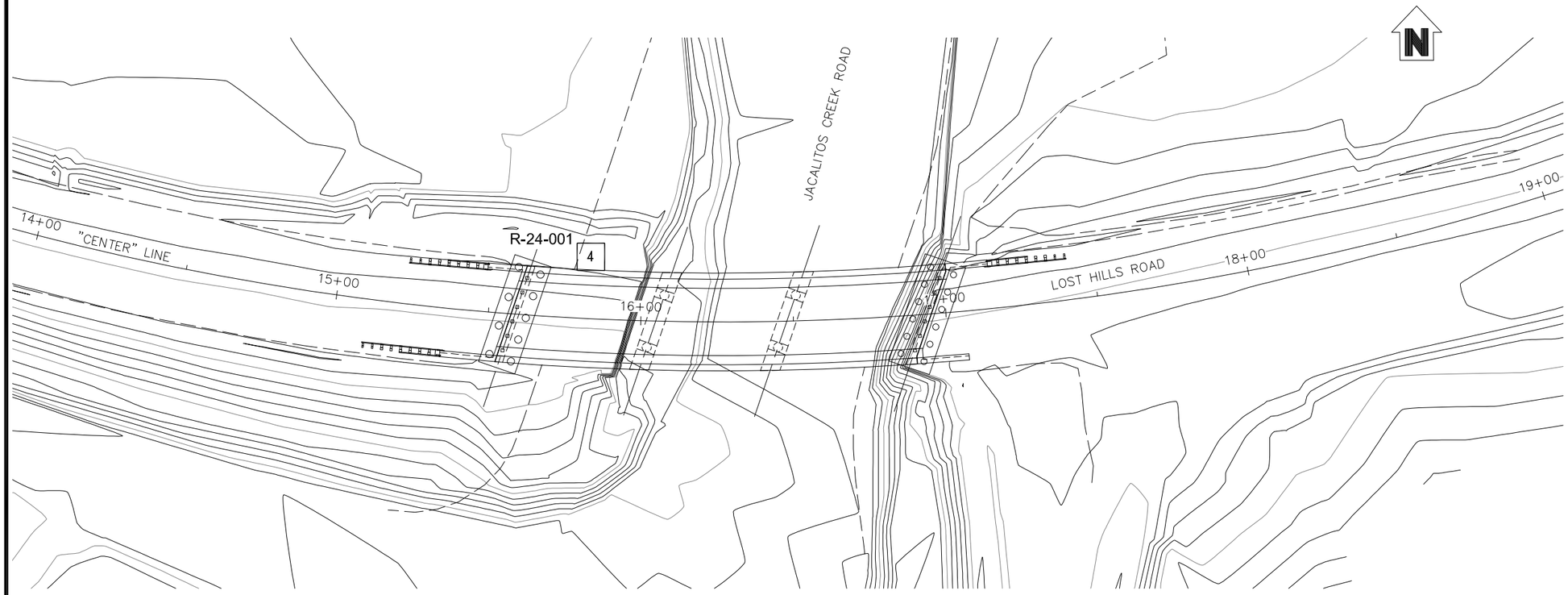
Deaggregation (based on 2014 hazard)

Mean moment magnitude (for PGA)	6.45
Mean site-source distance, km (for Sa at 1s)	18.8

Option: recalculate Near Fault amplification with user specified distance

Site-source distance, km: 18.8 Update

Appendix II **LOG OF TEST BORINGS**



PLAN
1" = 20'

LEGEND

4	Approx. Boring Locations by PARIKH (2024)

NOTES:

1. Additional boring data (Wreco, 2016) can be found in Appendix V of the foundation report.
2. The locations of the 1969 borings by Moore & Taber cannot be determined according to the as-built log of test borings.

BOREHOLE LOCATION TABLE			
Hole ID	"CENTER" Line		
	Station	Offset (ft)	Rt/Lt
R-24-001	15+82	20	Lt

60% SUBMITTAL, NOT FOR CONSTRUCTION

	DATE	RECORD DRAWING	
DESIGNED: F. WANG	8/8/24	RESIDENT ENGINEER	DATE
DRAWN: K. OUYANG	8/8/24		
CHECKED: F. WANG	8/8/24		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE
HORIZ 0 10' 20'
VERT 0 1' 2'

PROJECT ENGINEER — 8/8/24 DATE

REGISTERED PROFESSIONAL ENGINEER YUAN-KAI WANG 2862 GEOTECHNICAL STATE OF CALIFORNIA

PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

DEPARTMENT OF PUBLIC WORKS AND PLANNING
LOG OF TEST BORINGS 1 OF 3
DRAWING NO. LOTB-1 SHEET NO. XX TOTAL XX

S:\ACAD\2024-102-GEO\LOTB\LOTB.DWG 8/8/2024 3:09 PM - KIM OUYANG

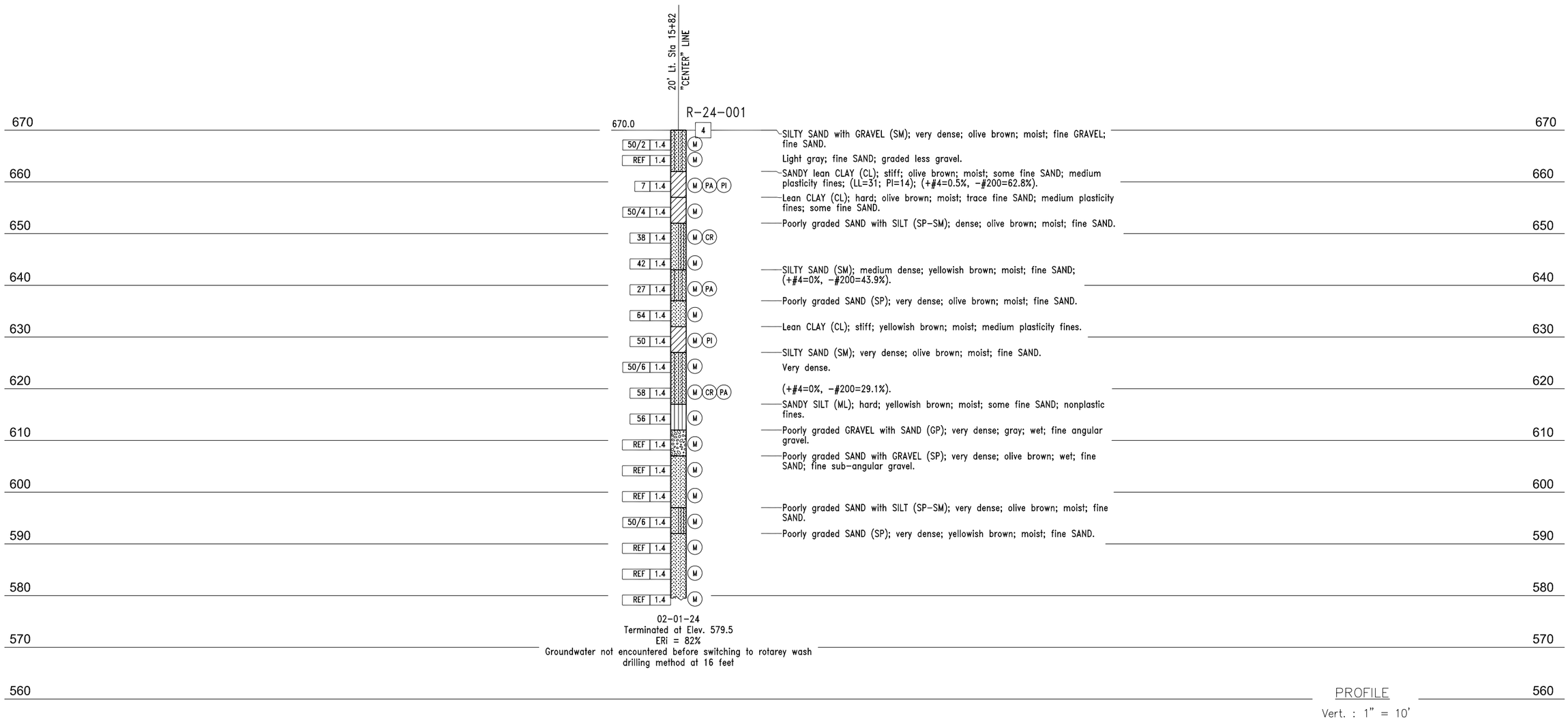
NOTES:

STANDARD PENETRATION TEST SAMPLER: I.D. = 1.4"; O.D. = 2"
MODIFIED CALIFORNIA SAMPLER: I.D. = 2.5"; O.D. = 3"
HAMMER ASSEMBLY: A 140 LB HAMMER WITH
A 30" DROP (AUTOMATIC HAMMER)

THIS LOTB SHEET WAS PREPARED IN ACCORDANCE WITH
THE CALTRANS SOIL & ROCK, LOGGING, CLASSIFICATION,
AND PRESENTATION MANUAL (2022)

SEE CALTRANS 2023 STANDARD PLANS A10F, A10G FOR SOIL
LEGEND.

ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN



PROFILE
Vert. : 1" = 10'

60% SUBMITTAL, NOT FOR CONSTRUCTION

S:\ACAD\2024-102-GEO\LOTB\LOTB.DWG 8/8/2024 3:10 PM - KIM OUYANG

	DATE	RECORD DRAWING	
DESIGNED: F. WANG	8/8/24	RESIDENT ENGINEER	DATE
DRAWN: K. OUYANG	8/8/24		
CHECKED: F. WANG	8/8/24		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE
HORIZ 0 10' 20'
VERT 0 1' 2'

PROJECT ENGINEER — 8/8/24 DATE

REGISTERED PROFESSIONAL ENGINEER YUAN-KAI WANG 2862 GEOTECHNICAL STATE OF CALIFORNIA

PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO 1856

DEPARTMENT OF PUBLIC WORKS AND PLANNING
LOG OF TEST BORINGS 2 OF 3
DRAWING NO. LOTB-2 SHEET NO. XX TOTAL XX

GEOTECHNICAL SERVICES – DIVISION OF ENGINEERING SERVICES

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 is this 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
06	FRE				

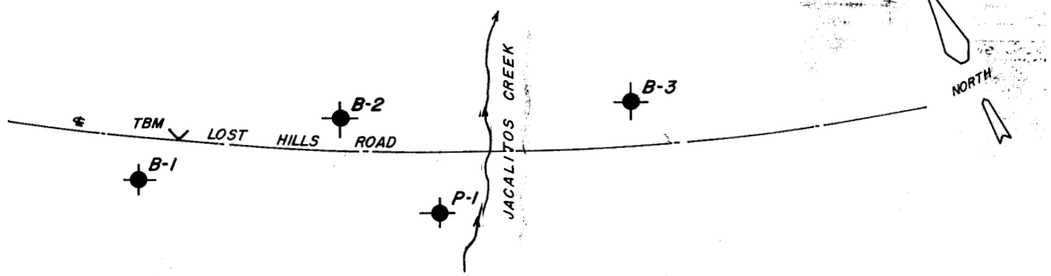
REGISTERED ENGINEER – CIVIL DATE

JACALITOS CREEK BRIDGE REPLACEMENT (PROJECT ON LOST HILLS ROAD)

LOG OF TEST BORINGS 3 OF 3

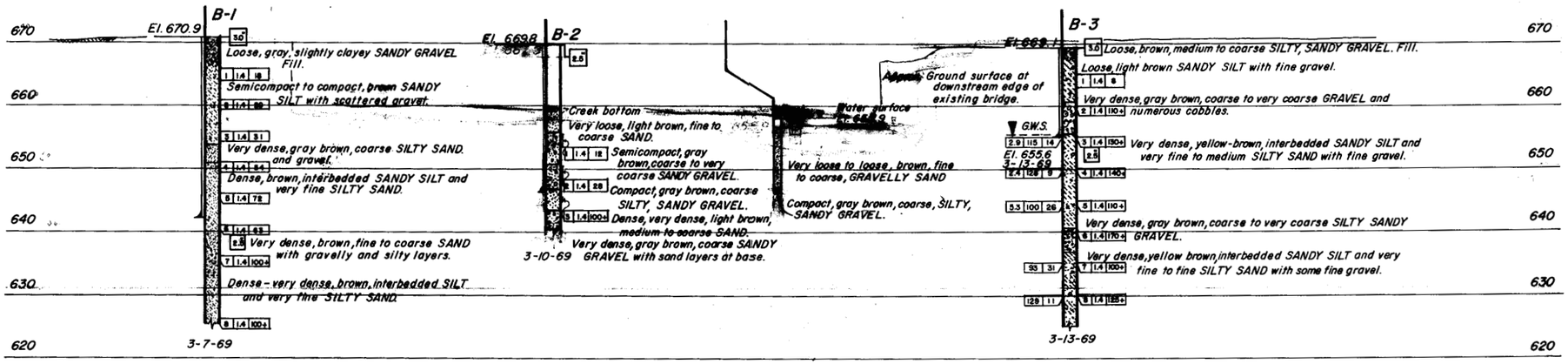
As-Built Vertical Datum:	Datum Conversion: TBD	
NOTE: A COPY OF THIS LOG OF TEST BORINGS IS AVAILABLE AT OFFICE OF STRUCTURE MAINTENANCE AND INVESTIGATIONS, SACRAMENTO, CALIFORNIA	CU: TBD EA: TBD	BRIDGE NO. 42C0078

REGISTERED PROFESSIONAL ENGINEER — CHAN-KAI WANG — 2862 — GEOTECHNICAL — STATE OF CALIFORNIA



—PLAN—
Scale 1"=20'

—NOTE—
TBM – Panel point at ℄ Lost Hills Road and west abutment line. Elevation 670 (assumed).



—PROFILE—
Scale 1"=10' Horiz. & Vert.

AS BUILT PLANS
Corrections by ...
Date ... 11-9-70

LEGEND OF EARTH MATERIALS

UNIFIED SOIL CLASSIFICATION

Pt	OH	CH	MH	OL	CL	ML	SC	SM	SP	SW	GC	GM	GP	GW
Highly organic soils	Silts and clays Liquid limit greater than 50			Silts and clays Liquid limit less than 50			Sands with fines >12% fines		Clean sands <5% fines		Gravels with fines >12% fines		Clean gravels <5% fines	
							Sands - more than 50% of coarse fraction is smaller than #4 sieve.				Gravels - more than 50% of coarse fraction is larger than #4 sieve.			
	Fine grained soils (More than 50 % is smaller than #200 sieve)						Coarse grained soils (More than 50% is larger than #200 sieve)							

LABORATORY CLASSIFICATION CRITERIA

GW and SW - $C_u = \frac{D_{60}}{D_{10}}$ greater than 4 for GW & 6 for SW; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 & 3.

GP and SP - Clean gravel or sand not meeting requirements for GW and SW.

GM and SM - Atterberg limits below "A" line or P.I. less than 4.

GC and SC - Atterberg limits above "A" line with P.I. greater than 7.

Fines (silt or clay)		Fine sand		Medium sand		Coarse sand	Fine gravel		Coarse gravel		Cobbles	Boulders
Sieve sizes	#200	#40	#10	#4	3/8"	3/4"	3"	12"				

Classification of earth materials shown on this sheet is based on field inspection and should not be construed to imply laboratory analysis unless so stated.

MATERIAL SYMBOLS

Gravel; Sand; Silt; Clay; Sandy clay or clayey sand; Sandy silt or silty sand; Silty clay or clayey silt; Peat or organic matter; Fill material; Shale; Sandstone; Limestone; Metamorphic rock; Igneous rock

CONSISTENCY CLASSIFICATION FOR SOILS

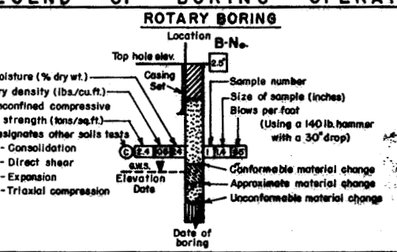
According to the Standard Penetration Test

Nº of blows	Granular	Cohesive
0-5	Very loose	Very soft
6-10	Loose	Soft
11-20	Semicompact	Stiff
21-35	Compact	Very stiff
36-70	Dense	Hard
>70	Very dense	Very hard

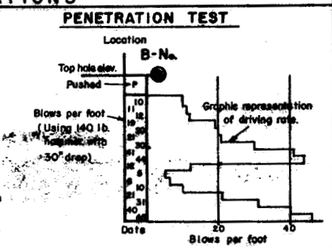
LEGEND OF BORING OPERATIONS

Plan of any boring; Rotary boring; Diamond core boring; Auger boring; Sample boring; Jet boring; Test pit; 2½" Cone penetrometer; 2½" Cone penetrometer

ROTARY BORING



PENETRATION TEST



MOORE & TAYLOR · Engineers · Geologists

APPROVED H. R. Taylor 4-21-69 REGISTERED CIVIL ENGINEER No. 9165 JOB No. 369 17 F-3

COUNTY OF FRESNO

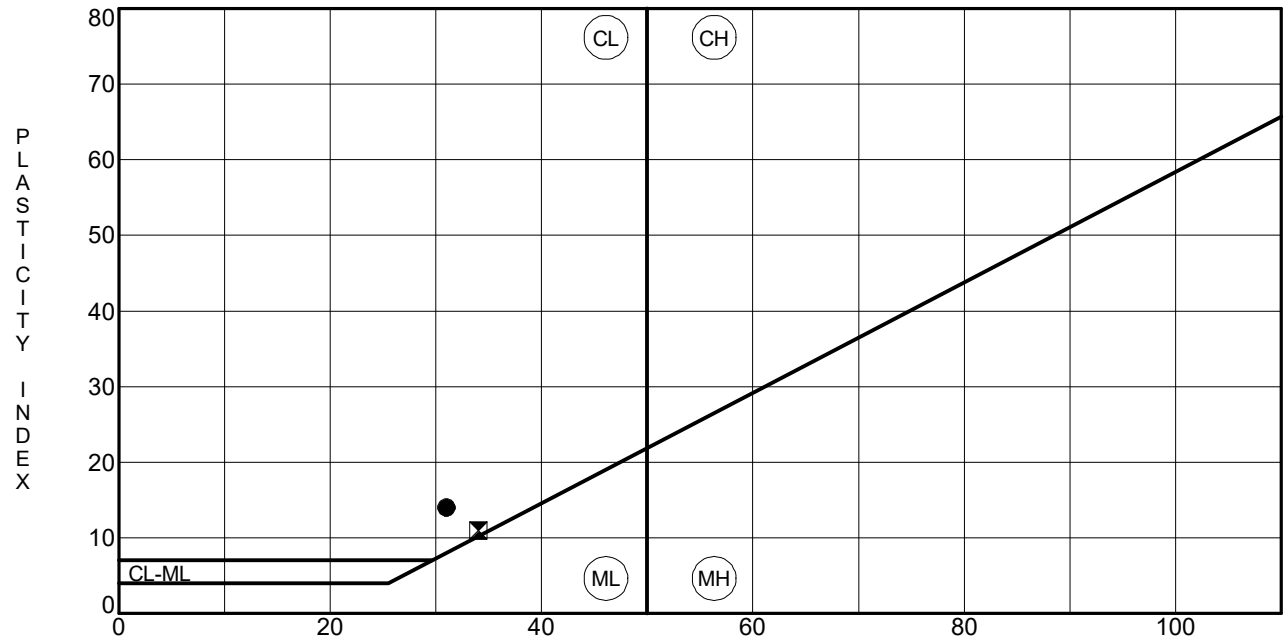
LOST HILLS ROAD AT JACALITOS CREEK

LOG OF TEST BORINGS

Scale As Shown Date Mar. 21, 1969 By A.K.S. Checked ... Drawing 5251-12

Appendix III **LABORATORY TEST RESULTS**

Borehole	Sample Number	Depth	Classi-fication	Water Content	Dry Density	Liquid Limit	Plastic Limit	Plasticity Index	% > Sieve 4	% < Sieve 200	Compressive Strength (tsf)
R-24-001	S-1	0.0	SM	-	-						
R-24-001	1	2.0	SM	4.6	-						
R-24-001	2	5.0	SM	7.6	-						
R-24-001	3	10.0	CL	12.0	-	31	17	14	0.5	62.8	
R-24-001	4	15.0	CL	5.2	-						
R-24-001	5	20.0	SP-SM	18.6	-						
R-24-001	6	25.0	SP-SM	17.8	-						
R-24-001	7	30.0	SM	24.3	-				0.0	43.9	
R-24-001	8	35.0	SP	16.7	-						
R-24-001	9	40.0	CL	32.9	-	34	23	11			
R-24-001	10	45.0	SP-SM	19.6	-						
R-24-001	11	50.0	SM	20.1	-				0.0	29.1	
R-24-001	12	55.0	ML	23.9	-						
R-24-001	13	60.0	GP	15.7	-						
R-24-001	14	65.0	SP	15.4	-						
R-24-001	15	70.0	SP	17.4	-						
R-24-001	16	75.0	SP-SM	19.2	-						
R-24-001	17	80.0	SP	18.8	-						
R-24-001	18	85.0	SP	16.5	-						
R-24-001	19	90.0	SP	15.6	-						



PLASTICITY

	BOREHOLE	SAMPLE #	DEPTH	LL	PL	PI	Fines	Classification
●	**R-24-001**	**3**	**10.0**	**31**	**17**	**14**	**63**	**SANDY lean CLAY**
⧓	**R-24-001**	**9**	**40.0**	**34**	**23**	**11**		**Lean CLAY**

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Practicing in the Geosciences

JACALITOS CREEK BRIDGE REPLACEMENT PROJECT
COALINGA, FRESNO COUNTY, CALIFORNIA

JOB NO: 2024-102-GEO | **PLATE NO:** III-2

Appendix IV **CALCULATION PACKAGES**

Appendix IV-1 Soil Parameters and Vs Calculations

SOIL PARAMETERS & Vs30

Calc By: Ocean
Date: 02/15/24

PROJECT NAME: Fresno On-Call - Jacalitos Creek
PROJECT NO.: PR 5316
STRUCTURE: Jacalitos Creek Bridge
BORING NO.: R-24-001
BORING ELEV. (ft): 670
BOREHOLE DIA (in)= 4
GW DEPTH (ft)= 100

MAJOR CUT(-)/FILL(+) (ft) 0
DESIGN GW DEPTH (ft) 100
HAMMER ENERGY = 82.0%
DRILLING RODS (Y/N)= Y

Soil Groups
1. Cohesionless Materials (SC, SM, SP, SW, GP, & GW, ML)
2. Cohesive Materials (CL, CH, ML, MH, OL, & OH, SC, GC)
3. Liquefiable Soils (Residual Shear Strength, Sr)
4. Young Sedimentary Rocks (Cohesionless)
5. Young Sedimentary Rocks (Cohesive)

Age Scaling Factor (ASF, Dimensionless)
H: Holocene
Q: Quaternary
P: Pleistocene

N_d	68.4	V_{sd} (m/s)	305
N_{30}	70.6	V_{s30} (m/s)	315

Sample No	Layer Thickness (ft) from	to	Sample Depth (ft)	USCS Type	Soil Type	ASF (H/Q/P)	Field Blow Count	Sampler Type	Unit Weight (pcf)	σ_v (psf)	σ_v' (psf)	SPT-N eq.	C_E	N_{60} C_E Corr.	C_N	$(N_1)_{60}$	C_R	C_S	C_B	N_{60} (C_N, C_B & C_S Corr.)	$(N_1)_{60}$ (C_N, C_B & C_S Corr.)	F.C.	$(N_1)_{60,CS}$	Correlated Strength Parameters ϕ (°)	Su (psf)	Sr (psf)	Lab Su (psf)	Vs (m/s)
1	0	4	2	SM	1	Q	100	SPT	125	250	250	100.0	1.37	136.7	1.70	232.3	0.75	1.20	1.00	123.0	209.1	10%	214.5	43.0				161
2	4	8	5	SM	1	Q	100	SPT	125	625	625	100.0	1.37	136.7	1.70	232.3	0.75	1.20	1.00	123.0	209.1	10%	214.5	43.0				198
3	8	13	10	CL	2	Q	7	SPT	125	1,250	1,250	7.0	1.37	9.6	1.30	12.4	0.85	1.20	1.00	9.8	12.7	63%			1,196			142
4	13	18	15	CL	2	Q	100	SPT	125	1,875	1,875	100.0	1.37	136.7	1.06	145.2	0.85	1.20	1.00	139.4	148.1				17,083			254
5	18	23	20	SP-SM	1	Q	38	SPT	125	2,500	2,500	38.0	1.37	51.9	0.92	47.8	0.95	1.20	1.00	59.2	54.5	5%	54.5	37.7				231
6	23	28	25	SP-SM	1	Q	42	SPT	125	3,125	3,125	42.0	1.37	57.4	0.82	47.2	0.95	1.20	1.00	65.4	53.8	5%	53.8	37.6				248
7	28	33	30	SM	1	Q	27	SPT	125	3,750	3,750	27.0	1.37	36.9	0.75	27.7	1.00	1.20	1.00	44.3	33.3	44%	44.9	34.5				237
8	33	38	35	SP	1	Q	64	SPT	125	4,375	4,375	64.0	1.37	87.5	0.70	60.8	1.00	1.20	1.00	105.0	73.0	5%	73.0	41.7				299
9	38	43	40	CL	2	Q	50	SPT	125	5,000	5,000	50.0	1.37	68.3	0.65	44.5	1.00	1.20	1.00	82.0	53.3				8,542			317
10	43	48	45	SP-SM	1	Q	100	SPT	125	5,625	5,625	100.0	1.37	136.7	0.61	83.8	1.00	1.20	1.00	164.0	100.6	5%	100.6	40.2				351
11	48	53	50	SM	1	Q	58	SPT	125	6,250	6,250	58.0	1.37	79.3	0.58	46.1	1.00	1.20	1.00	95.1	55.3	29%	68.1	37.5				317
12	53	58	55	ML	1	Q	56	SPT	125	6,875	6,875	56.0	1.37	76.5	0.55	42.5	1.00	1.20	1.00	91.8	51.0		51.0	37.4				358
13	58	63	60	GP	4	Q	100	SPT	125	7,500	7,500	100.0	1.37	136.7	0.53	72.6	1.00	1.20	1.00	164.0	87.1			43.9				555
14	63	68	65	SP	4	Q	100	SPT	125	8,125	8,125	100.0	1.37	136.7	0.51	69.7	1.00	1.20	1.00	164.0	83.7			42.3				555
15	68	73	70	SP	4	Q	100	SPT	125	8,750	8,750	100.0	1.37	136.7	0.49	67.2	1.00	1.20	1.00	164.0	80.7			42.2				555
16	73	78	75	SP-SM	4	Q	100	SPT	125	9,375	9,375	100.0	1.37	136.7	0.48	64.9	1.00	1.20	1.00	164.0	77.9			39.5				555
17	78	83	80	SP	4	Q	100	SPT	125	10,000	10,000	100.0	1.37	136.7	0.46	62.9	1.00	1.20	1.00	164.0	75.4			41.8				555
18	83	88	85	SP	4	Q	100	SPT	125	10,625	10,625	100.0	1.37	136.7	0.45	61.0	1.00	1.20	1.00	164.0	73.2			41.7				555
19	88	91.5	90	SP	4	Q	100	SPT	125	11,250	11,250	100.0	1.37	136.7	0.43	59.3	1.00	1.20	1.00	164.0	71.1			41.5				555

Version 3.5 Notes:
1. The correction factors CE (Energy Ratio), CB (Borehole Diameter), CR (Rod Length) and CS (Sampling Method-liner), CN (Overburden) are per Youd 2001
2. The conversion factors from Modified California Sampler (MC)-N or California Sampler (C)-N to SPT-N are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021):
   MC Cohesive: 0.65 MC Cohesionless: 0.41 C Cohesive: 0.85 C Cohesionless: 0.63
3. For fine-grained materials, the correlated undrained shear strengths are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
4. The friction angles were estimated based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
5. Residual Strength (Sr) is based on Kramer and Wang (2015) as suggested in the Caltrans Geotechnical Manual, "Liquefaction-Induced Lateral Spreading" module (January 2020).
6. The estimated Vs were correlated based on Caltrans Geotechnical Manual, "Design Acceleration Response Spectrum" module (January 2021).

SOIL PARAMETERS & Vs30

Calc By:
Date:

PROJECT NAME:	Fresno On-Call - Jacalitos Creek	**MAJOR CUT(-)/FILL(+) (ft)**	0	**Soil Groups**	**Age Scaling Factor (ASF, Dimensionless)**
PROJECT NO.:	PR 5316	**DESIGN GW DEPTH (ft)**	100	1. Cohesionless Materials (SC, SM, SP, SW, GP, & GW, ML)	H: Holocene
STRUCTURE:	Jacalitos Creek Bridge			2. Cohesive Materials (CL, CH, ML, MH, OL, & OH, SC, GC)	Q: Quaternary
BORING NO.:	A-16-001			3. Liquefiable Soils (Residual Shear Strength, Sr)	P: Pleistocene
BORING ELEV. (ft):	669.5			4. Young Sedimentary Rocks (Cohesionless)	
BOREHOLE DIA (in)=	6.8	**HAMMER ENERGY =**	87.0%	5. Young Sedimentary Rocks (Cohesive)	
GW DEPTH (ft)=	100	**DRILLING RODS (Y/N)=**	Y		

N_d	19.2	V_{sd} (m/s)	196
N_{30}	23.3	V_{s30} (m/s)	238

Sample No	Layer Thickness (ft)		Sample Depth (ft)	USCS Type	Soil Type	ASF (H/Q/P)	Field Blow Count	Sampler Type	Unit Weight (pcf)	σ_v (psf)	σ_v' (psf)	SPT-N eq.	C_E	N_{60} C_E Corr.	C_N	$(N_1)_{60}$	C_R	C_S	C_B	N_{60} (C_B, C_B & C_S Corr.)	$(N_1)_{60}$ (C_B, C_B & C_S Corr.)	F.C.	$(N_1)_{60,CS}$	Correlated Strength Parameters			Lab Su (psf)	Vs (m/s)
	from	to																					ϕ (°)	Su (psf)	Sr (psf)		
1	0	8.3	5	SM	1	Q	3	SPT	120	600	600	3.0	1.45	4.4	1.70	7.4	0.75	1.20	1.15	4.5	7.7		7.7	28.9				92
2	8.3	13	10	CL	2	Q	7	SPT	120	1,200	1,200	7.0	1.45	10.2	1.33	13.5	0.85	1.20	1.15	11.9	15.8				1,269			145
3	13	18	15	SM	1	Q	30	SPT	120	1,800	1,800	30.0	1.45	43.5	1.08	47.2	0.85	1.20	1.15	51.0	55.3		55.3	37.6				207
4	18	23.5	20	SM	1	Q	37	SPT	120	2,400	2,400	37.0	1.45	53.7	0.94	50.4	0.95	1.20	1.15	70.3	66.0		66.0	38.0				238
5	23.5	26.5	25	SP-SM	1	Q	88	MC	120	3,000	3,000	36.1	1.45	52.3	0.84	43.9	0.95	1.00	1.15	57.2	48.0		48.0	37.2				238
6	26.5	28.5	26.5	SP-SM	1	Q	44	SPT	120	3,180	3,180	44.0	1.45	63.8	0.82	52.0	1.00	1.20	1.15	88.0	71.8		71.8	38.2				267
7	28.5	33.5	30	SW-SM	1	Q	68	SPT	120	3,600	3,600	68.0	1.45	98.6	0.77	75.6	1.00	1.20	1.15	136.1	104.3		104.3	40.1				304
8	33.5	36.5	35	SW-SM	1	Q	100	MC	120	4,200	4,200	41.0	1.45	59.5	0.71	42.2	1.00	1.00	1.15	68.4	48.5		48.5	36.9				268
9	36.5	38.5	36.5	SW-SM	1	Q	49	SPT	120	4,380	4,380	49.0	1.45	71.1	0.70	49.4	1.00	1.20	1.15	98.0	68.2		68.2	37.9				295
10	38.5	43.5	40	SP-SM	1	Q	73	SPT	120	4,800	4,800	73.0	1.45	105.9	0.66	70.3	1.00	1.20	1.15	146.1	97.0		97.0	39.8				330
11	43.5	48	45	SW	1	Q	100	SPT	120	5,400	5,400	100.0	1.45	145.0	0.63	90.8	1.00	1.20	1.15	200.1	125.3		125.3	43.7				364
12	48	51.5	50	SW-SM	1	Q	52	SPT	120	6,000	6,000	52.0	1.45	75.4	0.59	44.8	1.00	1.20	1.15	104.1	61.8		61.8	37.3				321

Version 3.5 Notes:
1. The correction factors CE (Energy Ratio), CB (Borehole Diameter), CR (Rod Length) and CS (Sampling Method-liner), CN (Overburden) are per Youd 2001
2. The conversion factors from Modified California Sampler (MC)-N or California Sampler (C)-N to SPT-N are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021):
   MC Cohesive: 0.65 MC Cohesionless: 0.41 C Cohesive: 0.85 C Cohesionless: 0.63
3. For fine-grained materials, the correlated undrained shear strengths are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
4. The friction angles were estimated based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
5. Residual Strength (Sr) is based on Kramer and Wang (2015) as suggested in the Caltrans Geotechnical Manual, "Liquefaction-Induced Lateral Spreading" module (January 2020).
6. The estimated Vs were correlated based on Caltrans Geotechnical Manual, "Design Acceleration Response Spectrum" module (January 2021).

SOIL PARAMETERS & Vs30

Calc By:
Date:

PROJECT NAME:	Fresno On-Call - Jacalitos Creek	**MAJOR CUT(-)/FILL(+) (ft)**	0	**Soil Groups**	**Age Scaling Factor (ASF, Dimensionless)**
PROJECT NO.:	PR 5316	**DESIGN GW DEPTH (ft)**	100	1. Cohesionless Materials (SC, SM, SP, SW, GP, & GW, ML)	H: Holocene
STRUCTURE:	Jacalitos Creek Bridge			2. Cohesive Materials (CL, CH, ML, MH, OL, & OH, SC, GC)	Q: Quaternary
BORING NO.:	A-16-002			3. Liquefiable Soils (Residual Shear Strength, Sr)	P: Pleistocene
BORING ELEV. (ft):	669.5			4. Young Sedimentary Rocks (Cohesionless)	
BOREHOLE DIA (in)=	6.8	**HAMMER ENERGY =**	87.0%	5. Young Sedimentary Rocks (Cohesive)	
GW DEPTH (ft)=	100	**DRILLING RODS (Y/N)=**	Y		

N_d	60.8	V_{sd} (m/s)	228
N_{30}	73.9	V_{s30} (m/s)	277

Sample No	Layer Thickness (ft)		Sample Depth (ft)	USCS Type	Soil Type	ASF (H/Q/P)	Field Blow Count	Sampler Type	Unit Weight (pcf)	σ_v (psf)	σ_v' (psf)	SPT-N eq.	C_E	N_{60} C_E Corr.	C_N	$(N_1)_{60}$	C_R	C_S	C_B	N_{60} (C_B, C_B & C_S Corr.)	$(N_1)_{60}$ (C_B, C_B & C_S Corr.)	F.C.	$(N_1)_{60,CS}$	Correlated Strength Parameters			Lab Su (psf)	Vs (m/s)
	from	to																						ϕ (°)	Su (psf)	Sr (psf)		
1	0	8.5	5	SM	1	Q	18	SPT	120	600	600	18.0	1.45	26.1	1.70	44.4	0.75	1.20	1.15	27.0	45.9		45.9	37.2				139
2	8.5	13.5	10	SC	1	Q	25	SPT	120	1,200	1,200	25.0	1.45	36.3	1.33	48.1	0.85	1.20	1.15	42.5	56.5		56.5	37.7				180
3	13.5	18	15	SC	1	Q	30	SPT	120	1,800	1,800	30.0	1.45	43.5	1.08	47.2	0.85	1.20	1.15	51.0	55.3		55.3	37.6				207
4	18	23	20	SM	1	Q	36	SPT	120	2,400	2,400	36.0	1.45	52.2	0.94	49.0	0.95	1.20	1.15	68.4	64.3		64.3	37.8				236
5	23	28.5	25	SP	1	Q	48	SPT	120	3,000	3,000	48.0	1.45	69.6	0.84	58.5	0.95	1.20	1.15	91.2	76.6		76.6	41.4				266
6	28.5	33.5	30	SM	1	Q	76	SPT	120	3,600	3,600	76.0	1.45	110.2	0.77	84.5	1.00	1.20	1.15	152.1	116.6		116.6	40.2				311
7	33.5	38.5	35	SP	1	Q	50	SPT	120	4,200	4,200	50.0	1.45	72.5	0.71	51.5	1.00	1.20	1.15	100.1	71.0		71.0	40.7				293
8	38.5	43.5	40	SC	1	Q	82	SPT	120	4,800	4,800	82.0	1.45	118.9	0.66	78.9	1.00	1.20	1.15	164.1	108.9		108.9	40.1				339
9	43.5	48.5	45	SP-SM	1	Q	42	SPT	120	5,400	5,400	42.0	1.45	60.9	0.63	38.1	1.00	1.20	1.15	84.0	52.6		52.6	36.3				298
10	48.5	51.5	50	SP-SM	1	Q	75	SPT	120	6,000	6,000	75.0	1.45	108.8	0.59	64.6	1.00	1.20	1.15	150.1	89.1		89.1	39.5				349

Version 3.5 Notes:
1. The correction factors CE (Energy Ratio), CB (Borehole Diameter), CR (Rod Length) and CS (Sampling Method-liner), CN (Overburden) are per Youd 2001
2. The conversion factors from Modified California Sampler (MC)-N or California Sampler (C)-N to SPT-N are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021):
   MC Cohesive: 0.65 MC Cohesionless: 0.41 C Cohesive: 0.85 C Cohesionless: 0.63
3. For fine-grained materials, the correlated undrained shear strengths are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
4. The friction angles were estimated based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
5. Residual Strength (Sr) is based on Kramer and Wang (2015) as suggested in the Caltrans Geotechnical Manual, "Liquefaction-Induced Lateral Spreading" module (January 2020).
6. The estimated Vs were correlated based on Caltrans Geotechnical Manual, "Design Acceleration Response Spectrum" module (January 2021).

SOIL PARAMETERS & Vs30

Calc By:
Date:

PROJECT NAME:	Fresno On-Call - Jacalitos Creek	**MAJOR CUT(-)/FILL(+) (ft)**	0
PROJECT NO.:	PR 5316	**DESIGN GW DEPTH (ft)**	100
STRUCTURE:	Jacalitos Creek Bridge		
BORING NO.:	A-16-003		
BORING ELEV. (ft):	660		
BOREHOLE DIA (in)=	6.8	**HAMMER ENERGY =**	87.0%
GW DEPTH (ft)=	100	**DRILLING RODS (Y/N)=**	Y

Soil Groups
1. Cohesionless Materials (SC, SM, SP, SW, GP, & GW, ML)
2. Cohesive Materials (CL, CH, ML, MH, OL, & OH, SC, GC)
3. Liquefiable Soils (Residual Shear Strength, Sr)
4. Young Sedimentary Rocks (Cohesionless)
5. Young Sedimentary Rocks (Cohesive)

Age Scaling Factor (ASF, Dimensionless)
H: Holocene
Q: Quaternary
P: Pleistocene

N_d	60.3	V_{sd} (m/s)	252
N_{30}	73.4	V_{s30} (m/s)	307

Sample No	Layer Thickness (ft) from	to	Sample Depth (ft)	USCS Type	Soil Type	ASF (H/Q/P)	Field Blow Count	Sampler Type	Unit Weight (pcf)	σ_v (psf)	σ_v' (psf)	SPT-N eq.	C_E	N_{60} C_E Corr.	C_N	$(N_1)_{60}$	C_R	C_S	C_B	N_{60} (C_B, C_B & C_S Corr.)	$(N_1)_{60}$ (C_B, C_B & C_S Corr.)	F.C.	$(N_1)_{60,CS}$	Correlated Strength Parameters ϕ (°)	Su (psf)	Sr (psf)	Lab Su (psf)	Vs (m/s)
1	0	8	5	GW-GM	1	Q	22	SPT	120	600	600	22.0	1.45	31.9	1.70	54.2	0.75	1.20	1.15	33.0	56.1		56.1	38.5				189
2	8	13	10	GW-GM	1	Q	16	SPT	120	1,200	1,200	16.0	1.45	23.2	1.33	30.8	0.85	1.20	1.15	27.2	36.1		36.1	35.1				206
3	13	18	15	ML	2	Q	31	SPT	120	1,800	1,800	31.0	1.45	45.0	1.08	48.7	0.85	1.20	1.15	52.7	57.2				5,619			212
4	18	20	17.5	SP-SM	1	Q	100	MC	120	2,100	2,100	41.0	1.45	59.5	1.00	59.7	0.95	1.00	1.15	64.9	65.2		65.2	39.1				226
5	20	23	20	SW-SM	1	Q	63	SPT	120	2,400	2,400	63.0	1.45	91.4	0.94	85.8	0.95	1.20	1.15	119.8	112.5		112.5	40.2				269
6	23	28.5	25	ML	2	Q	37	SPT	120	3,000	3,000	37.0	1.45	53.7	0.84	45.1	0.95	1.20	1.15	70.3	59.1				6,706			263
7	28.5	31.5	30	SP-SM	1	Q	84	MC	120	3,600	3,600	34.4	1.45	49.9	0.77	38.3	1.00	1.00	1.15	57.4	44.0		44.0	36.3				249
8	31.5	33.5	31.5	SP-SM	1	Q	100	SPT	120	3,780	3,780	100.0	1.45	145.0	0.75	108.5	1.00	1.20	1.15	200.1	149.7		149.7	43.0				335
9	33.5	38.5	35	SW-SM	1	Q	75	SPT	120	4,200	4,200	75.0	1.45	108.8	0.71	77.2	1.00	1.20	1.15	150.1	106.5		106.5	40.1				322
10	38.5	43.5	40	SM	1	Q	43	SPT	120	4,800	4,800	43.0	1.45	62.4	0.66	41.4	1.00	1.20	1.15	86.0	57.1		57.1	36.8				292
11	43.5	48.5	45	SM	1	Q	100	SPT	120	5,400	5,400	100.0	1.45	145.0	0.63	90.8	1.00	1.20	1.15	200.1	125.3		125.3	40.2				364
12	48.5	51	50	SW-SM	1	Q	100	SPT	120	6,000	6,000	100.0	1.45	145.0	0.59	86.1	1.00	1.20	1.15	200.1	118.8		118.8	40.2				373

Version 3.5 Notes:
1. The correction factors CE (Energy Ratio), CB (Borehole Diameter), CR (Rod Length) and CS (Sampling Method-liner), CN (Overburden) are per Youd 2001
2. The conversion factors from Modified California Sampler (MC)-N or California Sampler (C)-N to SPT-N are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021):
   MC Cohesive: 0.65 MC Cohesionless: 0.41 C Cohesive: 0.85 C Cohesionless: 0.63
3. For fine-grained materials, the correlated undrained shear strengths are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
4. The friction angles were estimated based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
5. Residual Strength (Sr) is based on Kramer and Wang (2015) as suggested in the Caltrans Geotechnical Manual, "Liquefaction-Induced Lateral Spreading" module (January 2020).
6. The estimated Vs were correlated based on Caltrans Geotechnical Manual, "Design Acceleration Response Spectrum" module (January 2021).

SOIL PARAMETERS & Vs30

Calc By:
Date:

PROJECT NAME:	Fresno On-Call - Jacalitos Creek	**MAJOR CUT(-)/FILL(+) (ft)**	0	**Soil Groups**	**Age Scaling Factor (ASF, Dimensionless)**
PROJECT NO.:	PR 5316	**DESIGN GW DEPTH (ft)**	100	1. Cohesionless Materials (SC, SM, SP, SW, GP, & GW, ML)	H: Holocene
STRUCTURE:	Jacalitos Creek Bridge			2. Cohesive Materials (CL, CH, ML, MH, OL, & OH, SC, GC)	Q: Quaternary
BORING NO.:	A-16-004			3. Liquefiable Soils (Residual Shear Strength, Sr)	P: Pleistocene
BORING ELEV. (ft):	670			4. Young Sedimentary Rocks (Cohesionless)	
BOREHOLE DIA (in)=	6.8	**HAMMER ENERGY =**	87.0%	5. Young Sedimentary Rocks (Cohesive)	
GW DEPTH (ft)=	100	**DRILLING RODS (Y/N)=**	Y		

N_d	59.3		V_{sd} (m/s)	228
N_{30}	72.2		V_{s30} (m/s)	277

Sample No	Layer Thickness (ft)		Sample Depth (ft)	USCS Type	Soil Type	ASF (H/Q/P)	Field Blow Count	Sampler Type	Unit Weight (pcf)	σ_v (psf)	σ_v' (psf)	SPT-N eq.	C_E	N_{60} C_E Corr.	C_N	$(N_1)_{60}$	C_R	C_S	C_B	N_{60} (C_B, C_B & C_S Corr.)	$(N_1)_{60}$ (C_B, C_B & C_S Corr.)	F.C.	$(N_1)_{60,CS}$	Correlated Strength Parameters			Lab Su (psf)	Vs (m/s)
	from	to																						ϕ (°)	Su (psf)	Sr (psf)		
1	0	6.5	5	CL	2	Q	32	MC	120	600	600	20.8	1.45	30.2	1.70	51.3	0.75	1.00	1.15	26.0	44.2				3,770			132
2	6.5	9	6.5	CL	2	Q	25	SPT	120	780	780	25.0	1.45	36.3	1.65	59.7	0.80	1.20	1.15	40.0	65.9				4,531			155
3	9	13.5	10	SM	1	Q	12	SPT	120	1,200	1,200	12.0	1.45	17.4	1.33	23.1	0.85	1.20	1.15	20.4	27.1		27.1	33.6				152
4	13.5	18.5	15	SM	1	Q	46	SPT	120	1,800	1,800	46.0	1.45	66.7	1.08	72.3	0.85	1.20	1.15	78.2	84.8		84.8	39.9				228
5	18.5	24.5	20	SW-SM	1	Q	56	SPT	120	2,400	2,400	56.0	1.45	81.2	0.94	76.2	0.95	1.20	1.15	106.5	100.0		100.0	40.1				261
6	24.5	28.5	25	SP	1	Q	51	SPT	120	3,000	3,000	51.0	1.45	74.0	0.84	62.1	0.95	1.20	1.15	96.9	81.4		81.4	41.8				269
7	28.5	33	30	SP-SM	1	Q	62	SPT	120	3,600	3,600	62.0	1.45	89.9	0.77	68.9	1.00	1.20	1.15	124.1	95.1		95.1	39.8				297
8	33	38.5	35	SP-SM	1	Q	100	SPT	120	4,200	4,200	100.0	1.45	145.0	0.71	102.9	1.00	1.20	1.15	200.1	142.0		142.0	43.0				344
9	38.5	43.5	40	SW-SM	1	Q	48	SPT	120	4,800	4,800	48.0	1.45	69.6	0.66	46.2	1.00	1.20	1.15	96.0	63.8		63.8	37.5				299
10	43.5	48.5	45	SW-SM	1	Q	68	SPT	120	5,400	5,400	68.0	1.45	98.6	0.63	61.7	1.00	1.20	1.15	136.1	85.2		85.2	39.2				333
11	48.5	51	50	SW-SM	1	Q	100	SPT	120	6,000	6,000	100.0	1.45	145.0	0.59	86.1	1.00	1.20	1.15	200.1	118.8		118.8	40.2				373

Version 3.5 Notes:
1. The correction factors CE (Energy Ratio), CB (Borehole Diameter), CR (Rod Length) and CS (Sampling Method-liner), CN (Overburden) are per Youd 2001
2. The conversion factors from Modified California Sampler (MC)-N or California Sampler (C)-N to SPT-N are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021):
   MC Cohesive: 0.65 MC Cohesionless: 0.41 C Cohesive: 0.85 C Cohesionless: 0.63
3. For fine-grained materials, the correlated undrained shear strengths are based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
4. The friction angles were estimated based on Caltrans Geotechnical Manual, "Soil Correlations" module (March 2021).
5. Residual Strength (Sr) is based on Kramer and Wang (2015) as suggested in the Caltrans Geotechnical Manual, "Liquefaction-Induced Lateral Spreading" module (January 2020).
6. The estimated Vs were correlated based on Caltrans Geotechnical Manual, "Design Acceleration Response Spectrum" module (January 2021).

Appendix IV-2 Liquefaction Evaluations and Soil Densification

SEISMIC-INDUCED SETTLEMENT (SOIL DENSIFICATION)

- Method by Tokimatsu and Seed (1987)

Project Name: **JACALITOS**
Project No.: **2024-102-GEO**
Boring No.: **R-24-001**

INPUT PARAMETERS

Peak Ground Accel., PGA (g)=	0.66			
Earthquake Magnitude, M =	6.45			
Water Table Depth =	100.00	(ft)	30.48	(m)
Average γ above water table =	120.0	(pcf)	18.9	(kN/m^3)
Average γ below water table =	62.6	(pcf)	9.8	(kN/m^3)
Borehole diameter (mm) =	2.5	(in)	63.5	(mm)
Hammer Energy (%) =	82			

EQUATIONS

$G_{max} = 20{,}000(N_1)_{60}{}^{0.333}(\sigma'_{ol})^{0.50}$ where $\sigma'_m = 0.67 \times \sigma'_{vc}$

$\gamma_{eff} \times (G_{eff}/G_{max}) = 0.65_{rd}(\sigma_{vo}/G_{max})\,(a_{max}/g)$ where $r_d = 1 - 0.012z$ (z = depth in meters)

Volumetric Strain Ratio = 1

Settlement = volumetric strain x layer thickness

Approximate Total Settlement of Dry Sand = 0.1 in

Sample Number	Layer From	Layer To	Sample Depth (ft)	Sample Depth (m)	RAW Field Blow Count	Sampler Type	Liner Correction (YES/NO)	Measured N (Equi. SPT-N)	Soil Type (USCS)	Flag "Unsaturated" "Clay" "Unreliable"	Fines Content (%)	C_r	C_B	C_E	C_S	N_{60}	σ_{vc} (kPa)	σ_{vc}' (kPa)	C_N	$(N_1)_{60}$	σ'_m (tsf)	G_{max} (ksf)	$\gamma_{eff} \times (G_{eff}/G_{max})$	γ_{eff} (approx)	$\%\gamma_{eff} = 100\,\gamma_{eff}$	ε_v (approx)	$2\varepsilon_v$	Volumetric Strain, $2\varepsilon_v \times$ VSR	Sett (in)
1	0	4	2.0	0.6	100	SPT	YES	100.0	SM	Unsaturated	10	1.37	1	0.75	1.30	133.3	11.5	11.5	1.70	226.5	0.1	1543	6.6E-05	0.00012	0.012	0.001	0.002	0.002	0.0
2	4	8	5.0	1.5	100	SPT	YES	100.0	SM	Unsaturated	10	1.37	1	0.8	1.30	142.1	28.7	28.7	1.39	197.9	0.2	2332	1.1E-04	0.00019	0.019	0.001	0.002	0.002	0.0
3	8	13	10.0	3.0	7	SPT	YES	7.0	CL	Clay	62.8	1.37	1	0.85	1.30	10.6	57.5	57.5	1.16	n.a.	0.4	n.a.	n.a.		n.a.		n.a.	n.a.	n.a.
4	13	18	15.0	4.6	100	SPT	YES	100.0	CL	Clay		1.37	1	0.95	1.30	168.8	86.2	86.2	1.04	n.a.	0.6	n.a.	n.a.		n.a.		n.a.	n.a.	n.a.
5	18	23	20.0	6.1	38	SPT	YES	38.0	SP-SM	Unsaturated	5	1.37	1	0.95	1.30	64.1	114.9	114.9	0.97	62.0	0.8	3169	3.0E-04	0.0009	0.09	0.015	0.03	0.03	0.0
6	23	28	25.0	7.6	42	SPT	YES	42.0	SP-SM	Unsaturated	5	1.37	1	0.95	1.30	70.9	143.7	143.7	0.91	64.6	1.0	3593	3.3E-04	0.00089	0.089	0.014	0.028	0.028	0.0
7	28	33	30.0	9.1	27	SPT	YES	27.0	SM	Unsaturated	43.9	1.37	1	1	1.30	48.0	172.4	172.4	0.87	41.7	1.2	3401	4.0E-04	0.0013	0.13	0.06	0.12	0.12	0.1
8	33	38	35.0	10.7	64	SPT	YES	64.0	SP	Unsaturated	5	1.37	1	1	1.30	113.7	201.1	201.1	0.83	94.9	1.4	4831	3.3E-04	0.00075	0.075	0.002	0.004	0.004	0.0
9	38	43	40.0	12.2	50	SPT	YES	50.0	CL	Clay		1.37	1	1	1.30	88.8	229.8	229.8	0.81	n.a.	1.6	n.a.	n.a.		n.a.		n.a.	n.a.	n.a.
10	43	48	45.0	13.7	100	SPT	YES	100.0	SP-SM	Unsaturated	5	1.37	1	1	1.30	177.7	258.6	258.6	0.78	138.7	1.8	6217	3.1E-04	0.0006	0.06	0.001	0.002	0.002	0.0
11	48	53	50.0	15.2	58	SPT	YES	58.0	SM	Unsaturated	29.1	1.37	1	1	1.30	103.0	287.3	287.3	0.76	78.3	2.0	5416	3.9E-04	0.00084	0.084	0.0085	0.017	0.017	0.0
12	53	58	55.0	16.8	56	SPT	YES	56.0	ML	Unsaturated		1.37	1	1	1.30	99.5	316.0	316.0	0.74	73.7	2.2	5567	4.1E-04	0.0008	0.08	0.009	0.018	0.018	0.0
13	58	63	60.0	18.3	100	SPT	YES	100.0	GP	Unsaturated	5	1.37	1	1	1.30	177.7	344.8	344.8	0.72	128.6	2.4	7000	3.4E-04	0.00076	0.076	0.001	0.002	0.002	0.0
14	63	68	65.0	19.8	100	SPT	YES	100.0	SP	Unsaturated	5	1.37	1	1	1.30	177.7	373.5	373.5	0.71	125.9	2.6	7235	3.5E-04	0.00072	0.072	0.001	0.002	0.002	0.0
15	68	73	70.0	21.3	100	SPT	YES	100.0	SP	Unsaturated	5	1.37	1	1	1.30	177.7	402.2	402.2	0.70	123.5	2.8	7459	3.6E-04	0.00068	0.068	0.001	0.002	0.002	0.0
16	73	78	75.0	22.9	100	SPT	YES	100.0	SP-SM	Unsaturated	5	1.37	1	1	1.30	177.7	431.0	431.0	0.68	121.3	3.0	7675	3.7E-04	0.00064	0.064	0.001	0.002	0.002	0.0
17	78	83	80.0	24.4	100	SPT	YES	100.0	SP	Unsaturated	5	1.37	1	1	1.30	177.7	459.7	459.7	0.67	119.2	3.2	7882	3.7E-04	0.0006	0.06	0.001	0.002	0.002	0.0
18	83	88	85.0	25.9	100	SPT	YES	100.0	SP	Unsaturated	5	1.37	1	1	1.30	177.7	488.4	488.4	0.66	117.4	3.4	8081	3.7E-04	0.00056	0.056	0.001	0.002	0.002	0.0
19	88	91.5	90.0	27.4	100	SPT	YES	100.0	SP	Unsaturated	5	1.37	1	1	1.30	177.7	517.1	517.1	0.65	115.6	3.6	8274	3.8E-04	0.00052	0.052	0.001	0.002	0.002	0.0

SEISMIC-INDUCED SETTLEMENT (SOIL DENSIFICATION)

- Method by Tokimatsu and Seed (1987)

Project Name: **JACALITOS**
Project No.: **2024-102-GEO**
Boring No.: **A-16-001**

INPUT PARAMETERS

Peak Ground Accel., PGA (g)=	0.66			
Earthquake Magnitude, M =	6.45			
Water Table Depth =	100.00	(ft)	30.48	(m)
Average γ above water table =	120.0	(pcf)	18.9	(kN/m^3)
Average γ below water table =	62.6	(pcf)	9.8	(kN/m^3)
Borehole diameter (mm) =	2.5	(in)	63.5	(mm)
Hammer Energy (%) =	87			

EQUATIONS

$G_{max} = 20{,}000(N_1)_{60}{}^{0.333}(\sigma'_{ol})^{0.50}$ where $\sigma'_m = 0.67 \times \sigma'_{vc}$

$\gamma_{eff} \times (G_{eff}/G_{max}) = 0.65_{rd}(\sigma_{vo}/G_{max})\,(a_{max}/g)$ where $r_d = 1 - 0.012z$ (z = depth in meters)

Volumetric Strain Ratio = 1

Settlement = volumetric strain x layer thickness

Approximate Total Settlement of Dry Sand = 5.0 in

Sample Number	Layer From	Layer To	Sample Depth (ft)	Sample Depth (m)	RAW Field Blow Count	Sampler Type	Liner Correction (YES/NO)	Measured N (Equi. SPT-N)	Soil Type (USCS)	Flag "Unsaturated" "Clay" "Unreliable"	Fines Content (%)	C_r	C_B	C_E	C_S	N_{60}	σ_{vc} (kPa)	σ_{vc}' (kPa)	C_N	$(N_1)_{60}$	σ'_m (tsf)	G_{max} (ksf)	$\gamma_{eff} \times (G_{eff}/G_{max})$	γ_{eff} (approx)	$\%\gamma_{eff} = 100\,\gamma_{eff}$	ε_v (approx)	$2\varepsilon_v$	Volumetric Strain, $2\varepsilon_v \times$ VSR	Sett (in)
1	0	8.3	5.0	1.5	3	SPT	YES	3.0	SM	Unsaturated	10	1.45	1	0.8	1.10	3.8	28.7	28.7	1.70	6.5	0.2	748	3.4E-04	0.01	1	2.5	5	5	5.0
2	8.3	13	10.0	3.0	7	SPT	YES	7.0	CL	Clay		1.45	1	0.85	1.30	11.2	57.5	57.5	1.16	n.a.	0.4	n.a.	n.a.		n.a.		n.a.	n.a.	n.a.
3	13	18	15.0	4.6	30	SPT	YES	30.0	SM	Unsaturated	10	1.45	1	0.95	1.30	53.7	86.2	86.2	1.04	56.0	0.6	2654	2.7E-04	0.0007	0.07	0.008	0.016	0.016	0.0
4	18	23.5	20.0	6.1	37	SPT	YES	37.0	SM	Unsaturated	10	1.45	1	0.95	1.30	66.3	114.9	114.9	0.97	64.0	0.8	3204	3.0E-04	0.00068	0.068	0.007	0.014	0.014	0.0
5	23.5	26.5	25.0	7.6	88	MC	NO	57.2	SP-SM	Unsaturated	5	1.45	1	0.95	1.00	78.8	143.7	143.7	0.91	71.8	1.0	3721	3.1E-04	0.00064	0.064	0.006	0.012	0.012	0.0
6	26.5	28.5	26.5	8.1	44	SPT	YES	44.0	SP-SM	Unsaturated	5	1.45	1	0.95	1.30	78.8	152.3	152.3	0.90	70.7	1.1	3812	3.2E-04	0.00067	0.067	0.0065	0.013	0.013	0.0
7	28.5	33.5	30.0	9.1	68	SPT	YES	68.0	SW-SM	Unsaturated	5	1.45	1	1	1.30	128.2	172.4	172.4	0.87	111.4	1.2	4718	2.9E-04	0.00054	0.054	0.001	0.002	0.002	0.0
8	33.5	36.5	35.0	10.7	100	MC	NO	65.0	SW-SM	Unsaturated	5	1.45	1	1	1.00	94.3	201.1	201.1	0.83	78.6	1.4	4538	3.5E-04	0.0007	0.07	0.0013	0.0026	0.0026	0.0
9	36.5	38.5	36.5	11.1	49	SPT	YES	49.0	SW-SM	Unsaturated	5	1.45	1	1	1.30	92.4	209.7	209.7	0.83	76.2	1.5	4586	3.5E-04	0.0007	0.07	0.0014	0.0028	0.0028	0.0
10	38.5	43.5	40.0	12.2	73	SPT	YES	73.0	SP-SM	Unsaturated	5	1.45	1	1	1.30	137.6	229.8	229.8	0.81	110.8	1.6	5439	3.2E-04	0.00063	0.063	0.001	0.002	0.002	0.0
11	43.5	48	45.0	13.7	100	SPT	YES	100.0	SW	Unsaturated	5	1.45	1	1	1.30	188.5	258.6	258.6	0.78	147.2	1.8	6341	3.1E-04	0.0005	0.05	0.001	0.002	0.002	0.0
12	48	51.5	50.0	15.2	52	SPT	YES	52.0	SW-SM	Unsaturated	5	1.45	1	1	1.30	98.0	287.3	287.3	0.76	74.4	2.0	5326	3.9E-04	0.00079	0.079	0.0015	0.003	0.003	0.0

SEISMIC-INDUCED SETTLEMENT (SOIL DENSIFICATION)

- Method by Tokimatsu and Seed (1987)

Project Name **JACALITOS**
Project No. **2024-102-GEO**
Boring No. **A-16-002**

INPUT PARAMETERS

Peak Ground Accel., PGA (g)=	0.66			
Earthquake Magnitude, M =	6.45			
Water Table Depth =	100.00	(ft)	30.48	(m)
Average γ above water table =	120.0	(pcf)	18.9	(kN/m^3)
Average γ below water table =	62.6	(pcf)	9.8	(kN/m^3)
Borehole diameter (mm) =	2.5	(in)	63.5	(mm)
Hammer Energy (%) =	87			

EQUATIONS

$G_{max} = 20{,}000(N_1)_{60}{}^{0.333}(\sigma'_{ol})^{0.50}$ where $\sigma'_m = 0.67 \times \sigma'_{vc}$

$\gamma_{eff} \times (G_{eff}/G_{max}) = 0.65_{ol}(\sigma_{vo}/G_{max})\,(a_{max}/g)$ where $rd = 1 - 0.012z$ (z = depth in meters)

Volumetric Strain Ratio = 1

Settlement = volumetric strain x layer thickness

Approximate Total Settlement of Dry Sand = 0.2 in

Sample Number	Layer From	Layer To	Sample Depth (ft)	Sample Depth (m)	RAW Field Blow Count	Sampler Type	Liner Correction (YES/NO)	Measured N (Equi. SPT-N)	Soil Type (USCS)	Flag "Unsaturated" "Clay" "Unreliable"	Fines Content (%)	C_r	C_B	C_E	C_S	N_{60}	σ_{vc} (kPa)	σ_{vc}' (kPa)	C_N	$(N_1)_{60}$	σ'_m (tsf)	G_{max} (ksf)	$\gamma_{eff} \times (G_{eff}/G_{max})$	γ_{eff} (approx)	$\%\gamma_{eff} = 100\,\gamma_{eff}$	ε_v (approx)	$2\varepsilon_v$	Volumetric Strain, $2\varepsilon_v \times$ VSR	Sett (in)
1	0	8.5	5.0	1.5	18	SPT	YES	18.0	SM	Unsaturated	10	1.45	1	0.8	1.30	27.1	28.7	28.7	1.45	39.3	0.2	1362	1.9E-04	0.0005	0.05	0.09	0.18	0.18	0.2
2	8.5	13.5	10.0	3.0	25	SPT	YES	25.0	SC	Unsaturated	15	1.45	1	0.85	1.30	40.1	57.5	57.5	1.16	46.5	0.4	2036	2.4E-04	0.0007	0.07	0.015	0.03	0.03	0.0
3	13.5	18	15.0	4.6	30	SPT	YES	30.0	SC	Unsaturated	15	1.45	1	0.95	1.30	53.7	86.2	86.2	1.04	56.0	0.6	2654	2.7E-04	0.0007	0.07	0.008	0.016	0.016	0.0
4	18	23	20.0	6.1	36	SPT	YES	36.0	SM	Unsaturated	10	1.45	1	0.95	1.30	64.5	114.9	114.9	0.97	62.3	0.8	3175	3.0E-04	0.0007	0.07	0.004	0.008	0.008	0.0
5	23	28.5	25.0	7.6	48	SPT	YES	48.0	SP	Unsaturated	5	1.45	1	0.95	1.30	86.0	143.7	143.7	0.91	78.3	1.0	3831	3.1E-04	0.00065	0.065	0.002	0.004	0.004	0.0
6	28.5	33.5	30.0	9.1	76	SPT	YES	76.0	SM	Unsaturated	10	1.45	1	1	1.30	143.3	172.4	172.4	0.87	124.5	1.2	4896	2.8E-04	0.00053	0.053	0.001	0.002	0.002	0.0
7	33.5	38.5	35.0	10.7	50	SPT	YES	50.0	SP	Unsaturated	5	1.45	1	1	1.30	94.3	201.1	201.1	0.83	78.6	1.4	4538	3.5E-04	0.00075	0.075	0.0022	0.0044	0.0044	0.0
8	38.5	43.5	40.0	12.2	82	SPT	YES	82.0	SC	Unsaturated	15	1.45	1	1	1.30	154.6	229.8	229.8	0.81	124.5	1.6	5654	3.1E-04	0.00058	0.058	0.001	0.002	0.002	0.0
9	43.5	48.5	45.0	13.7	42	SPT	YES	42.0	SP-SM	Unsaturated	5	1.45	1	1	1.30	79.2	258.6	258.6	0.78	61.8	1.8	4750	4.1E-04	0.0009	0.09	0.0049	0.0098	0.0098	0.0
10	48.5	51.5	50.0	15.2	75	SPT	YES	75.0	SP-SM	Unsaturated	5	1.45	1	1	1.30	141.4	287.3	287.3	0.76	107.4	2.0	6017	3.5E-04	0.00064	0.064	0.001	0.002	0.002	0.0

SEISMIC-INDUCED SETTLEMENT (SOIL DENSIFICATION)

- Method by Tokimatsu and Seed (1987)

Project Name **JACALITOS**
Project No. **2024-102-GEO**
Boring No. **A-16-003**

INPUT PARAMETERS

Peak Ground Accel., PGA (g)=	0.66			
Earthquake Magnitude, M =	6.45			
Water Table Depth =	100.00	(ft)	30.48	(m)
Average γ above water table =	120.0	(pcf)	18.9	(kN/m^3)
Average γ below water table =	62.6	(pcf)	9.8	(kN/m^3)
Borehole diameter (mm) =	2.5	(in)	63.5	(mm)
Hammer Energy (%) =	87			

EQUATIONS

$G_{max} = 20{,}000(N_1)_{60}{}^{0.333}(\sigma'_{ol})^{0.50}$ where $\sigma'_m = 0.67 \times \sigma'_{vc}$

$\gamma_{eff} \times (G_{eff}/G_{max}) = 0.65_{ol}(\sigma_{vo}/G_{max})\,(a_{max}/g)$ where $rd = 1 - 0.012z$ (z = depth in meters)

Volumetric Strain Ratio = 1

Settlement = volumetric strain x layer thickness

Approximate Total Settlement of Dry Sand = 0.1 in

Sample Number	Layer From	Layer To	Sample Depth (ft)	Sample Depth (m)	RAW Field Blow Count	Sampler Type	Liner Correction (YES/NO)	Measured N (Equi. SPT-N)	Soil Type (USCS)	Flag "Unsaturated" "Clay" "Unreliable"	Fines Content (%)	C_r	C_B	C_E	C_S	N_{60}	σ_{vc} (kPa)	σ_{vc}' (kPa)	C_N	$(N_1)_{60}$	σ'_m (tsf)	G_{max} (ksf)	$\gamma_{eff} \times (G_{eff}/G_{max})$	γ_{eff} (approx)	$\%\gamma_{eff} = 100\,\gamma_{eff}$	ε_v (approx)	$2\varepsilon_v$	Volumetric Strain, $2\varepsilon_v \times$ VSR	Sett (in)
1	0	8	5.0	1.5	22	SPT	YES	22.0	GW-GM	Unsaturated	5	1.45	1	0.8	1.30	33.2	28.7	28.7	1.39	46.2	0.2	1437	1.8E-04	0.00044	0.044	0.009	0.018	0.018	0.0
2	8	13	10.0	3.0	16	SPT	YES	16.0	GW-GM	Unsaturated	5	1.45	1	0.85	1.30	25.6	57.5	57.5	1.22	31.3	0.4	1785	2.8E-04	0.0011	0.11	0.06	0.12	0.12	0.1
3	13	18	15.0	4.6	31	SPT	YES	31.0	ML	Unsaturated	10	1.45	1	0.95	1.30	55.5	86.2	86.2	1.04	57.9	0.6	2683	2.7E-04	0.0007	0.07	0.007	0.014	0.014	0.0
4	18	20	17.5	5.3	100	MC	NO	65.0	SP-SM	Unsaturated	5	1.45	1	0.95	1.00	89.5	100.6	100.6	1.00	89.6	0.7	3352	2.5E-04	0.00055	0.055	0.001	0.002	0.002	0.0
5	20	23	20.0	6.1	63	SPT	YES	63.0	SW-SM	Unsaturated	10	1.45	1	0.95	1.30	112.8	114.9	114.9	0.97	109.0	0.8	3825	2.5E-04	0.00048	0.048	0.001	0.002	0.002	0.0
6	23	28.5	25.0	7.6	37	SPT	YES	37.0	ML	Unsaturated	10	1.45	1	0.95	1.30	66.3	143.7	143.7	0.91	60.4	1.0	3513	3.3E-04	0.0008	0.08	0.007	0.014	0.014	0.0
7	28.5	31.5	30.0	9.1	84	MC	NO	54.6	SP-SM	Unsaturated	5	1.45	1	1	1.00	79.2	172.4	172.4	0.87	68.8	1.2	4018	3.4E-04	0.00074	0.074	0.005	0.01	0.01	0.0
8	31.5	33.5	31.5	9.6	100	SPT	YES	100.0	SP-SM	Unsaturated	5	1.45	1	1	1.30	188.5	181.0	181.0	0.86	161.7	1.3	5473	2.6E-04	0.00045	0.045	0.001	0.002	0.002	0.0
9	33.5	38.5	35.0	10.7	75	SPT	YES	75.0	SW-SM	Unsaturated	5	1.45	1	1	1.30	141.4	201.1	201.1	0.83	117.9	1.4	5194	3.0E-04	0.00055	0.055	0.001	0.002	0.002	0.0
10	38.5	43.5	40.0	12.2	43	SPT	YES	43.0	SM	Unsaturated	10	1.45	1	1	1.30	81.1	229.8	229.8	0.81	65.3	1.6	4560	3.9E-04	0.00087	0.087	0.0045	0.009	0.009	0.0
11	43.5	48.5	45.0	13.7	100	SPT	YES	100.0	SM	Unsaturated	10	1.45	1	1	1.30	188.5	258.6	258.6	0.78	147.2	1.8	6341	3.1E-04	0.0005	0.05	0.001	0.002	0.002	0.0
12	48.5	51	50.0	15.2	100	SPT	YES	100.0	SW-SM	Unsaturated	5	1.45	1	1	1.30	188.5	287.3	287.3	0.76	143.2	2.0	6622	3.2E-04	0.0005	0.05	0.001	0.002	0.002	0.0

SEISMIC-INDUCED SETTLEMENT (SOIL DENSIFICATION)

- Method by Tokimatsu and Seed (1987)

Project Name **JACALITOS**
Project No. **2024-102-GEO**
Boring No. **A-16-004**

INPUT PARAMETERS

Peak Ground Accel., PGA (g)=	0.66			
Earthquake Magnitude, M =	6.45			
Water Table Depth =	100.00	(ft)	30.48	(m)
Average γ above water table =	120.0	(pcf)	18.9	(kN/m^3)
Average γ below water table =	62.6	(pcf)	9.8	(kN/m^3)
Borehole diameter (mm) =	2.5	(in)	63.5	(mm)
Hammer Energy (%) =	87			

EQUATIONS

$G_{max} = 20{,}000(N_1)_{60}^{0.333}(\sigma'_{ol})^{0.50}$ where $\sigma'_m = 0.67 \times \sigma'_{vc}$

$\gamma_{eff} \times (G_{eff}/G_{max}) = 0.65\sigma_{vo}(\sigma_{vo}/G_{max})\,(a_{max}/g)$ where $rd = 1 - 0.012z$ (z = depth in meters)

Volumetric Strain Ratio = 1

Settlement = volumetric strain x layer thickness

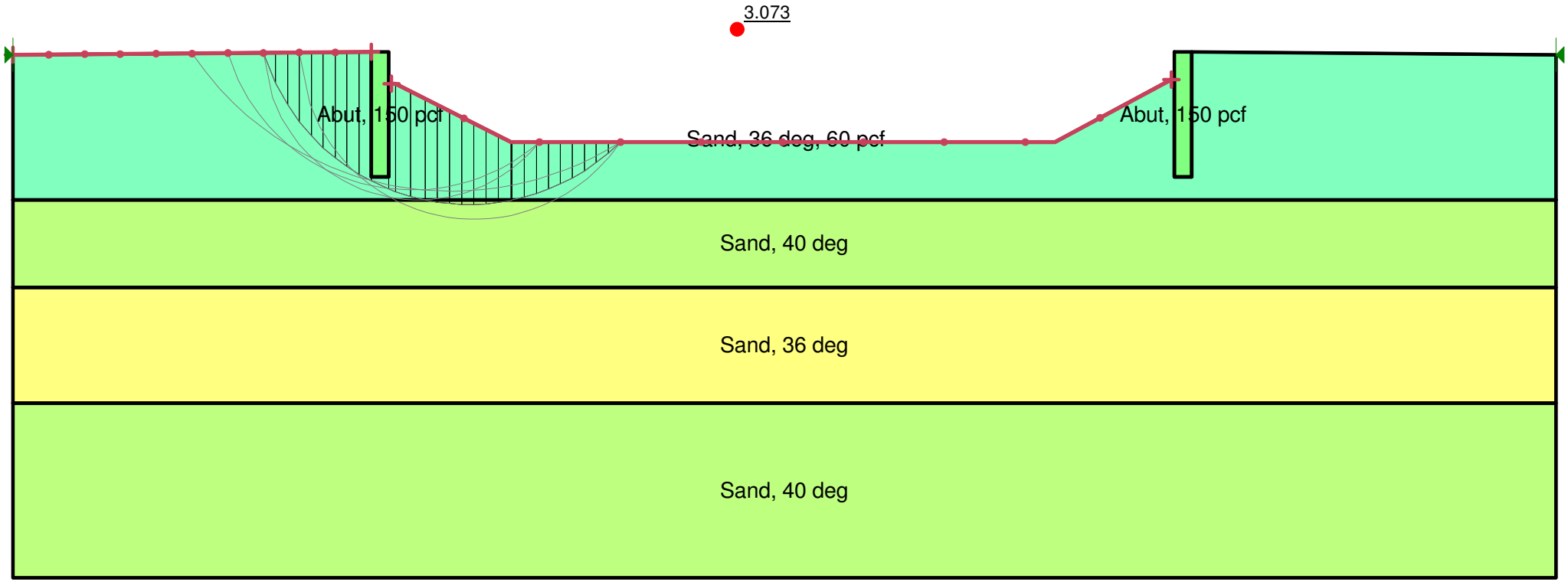
Approximate Total Settlement of Dry Sand = 0.1 in

Sample Number	Layer From	Layer To	Sample Depth (ft)	Sample Depth (m)	RAW Field Blow Count	Sampler Type	Liner Correction (YES/NO)	Measured N (Equ. SPT-N)	Soil Type (USCS)	Flag "Unsaturated" "Clay" "Unreliable"	Fines Content (%)	C_r	C_b	C_e	C_s	N_{60}	σ_{vc} (kPa)	σ_{vc}' (kPa)	C_n	$(N_1)_{60}$	σ'_m (tsf)	G_{max} (ksf)	$\gamma_{eff} \times (G_{eff}/G_{max})$	γ_{eff} (approx)	$\%\gamma_{eff} = 100\,\gamma_{eff}$	ε_v (approx)	$2\varepsilon_v$	Volumetric Strain, $2\varepsilon_v \times$ VSR	Sett (in)
1	0	8	5.0	1.5	22	SPT	YES	22.0	GW-GM	Unsaturated	5	1.45	1	0.8	1.30	33.2	28.7	28.7	1.39	46.2	0.2	1437	1.8E-04	0.00044	0.044	0.008	0.016	0.016	0.0
2	8	13	10.0	3.0	16	SPT	YES	16.0	GW-GM	Unsaturated	5	1.45	1	0.85	1.30	25.6	57.5	57.5	1.22	31.3	0.4	1785	2.8E-04	0.001	0.1	0.05	0.1	0.1	0.1
3	13	18	15.0	4.6	31	SPT	YES	31.0	ML	Unsaturated	10	1.45	1	0.95	1.30	55.5	86.2	86.2	1.04	57.9	0.6	2683	2.7E-04	0.0007	0.07	0.008	0.016	0.016	0.0
4	18	20	17.5	5.3	100	MC	NO	65.0	SP-SM	Unsaturated	5	1.45	1	0.95	1.00	89.5	100.6	100.6	1.00	89.6	0.7	3352	2.5E-04	0.00055	0.055	0.001	0.002	0.002	0.0
5	20	23	20.0	6.1	63	SPT	YES	63.0	SW-SM	Unsaturated	5	1.45	1	0.95	1.30	112.8	114.9	114.9	0.97	109.0	0.8	3825	2.5E-04	0.0005	0.05	0.001	0.002	0.002	0.0
6	23	28.5	25.0	7.6	37	SPT	YES	37.0	ML	Unsaturated	10	1.45	1	0.95	1.30	66.3	143.7	143.7	0.91	60.4	1.0	3513	3.3E-04	0.00078	0.078	0.008	0.016	0.016	0.0
7	28.5	31.5	30.0	9.1	84	MC	NO	54.6	SP-SM	Unsaturated	5	1.45	1	1	1.00	79.2	172.4	172.4	0.87	68.8	1.2	4018	3.4E-04	0.00075	0.075	0.005	0.01	0.01	0.0
8	31.5	33.5	31.5	9.6	100	SPT	YES	100.0	SP-SM	Unsaturated	5	1.45	1	1	1.30	188.5	181.0	181.0	0.86	161.7	1.3	5473	2.6E-04	0.00045	0.045	0.001	0.002	0.002	0.0
9	33.5	38.5	35.0	10.7	75	SPT	YES	75.0	SW-SM	Unsaturated	10	1.45	1	1	1.30	141.4	201.1	201.1	0.83	117.9	1.4	5194	3.0E-04	0.00055	0.055	0.001	0.002	0.002	0.0
10	38.5	43.5	40.0	12.2	43	SPT	YES	43.0	SM	Unsaturated	10	1.45	1	1	1.30	81.1	229.8	229.8	0.81	65.3	1.6	4560	3.9E-04	0.00088	0.088	0.006	0.012	0.012	0.0
11	43.5	48.5	45.0	13.7	100	SPT	YES	100.0	SM	Unsaturated	10	1.45	1	1	1.30	188.5	258.6	258.6	0.78	147.2	1.8	6341	3.1E-04	0.0005	0.05	0.001	0.002	0.002	0.0
12	48.5	51	50.0	15.2	100	SPT	YES	100.0	SW-SM	Unsaturated	5	1.45	1	1	1.30	188.5	287.3	287.3	0.76	143.2	2.0	6622	3.2E-04	0.00051	0.051	0.001	0.002	0.002	0.0

Appendix IV-3 Slope Stability Analyses

Jacalitos Creek Bridge
Abut 1
Static Analysis

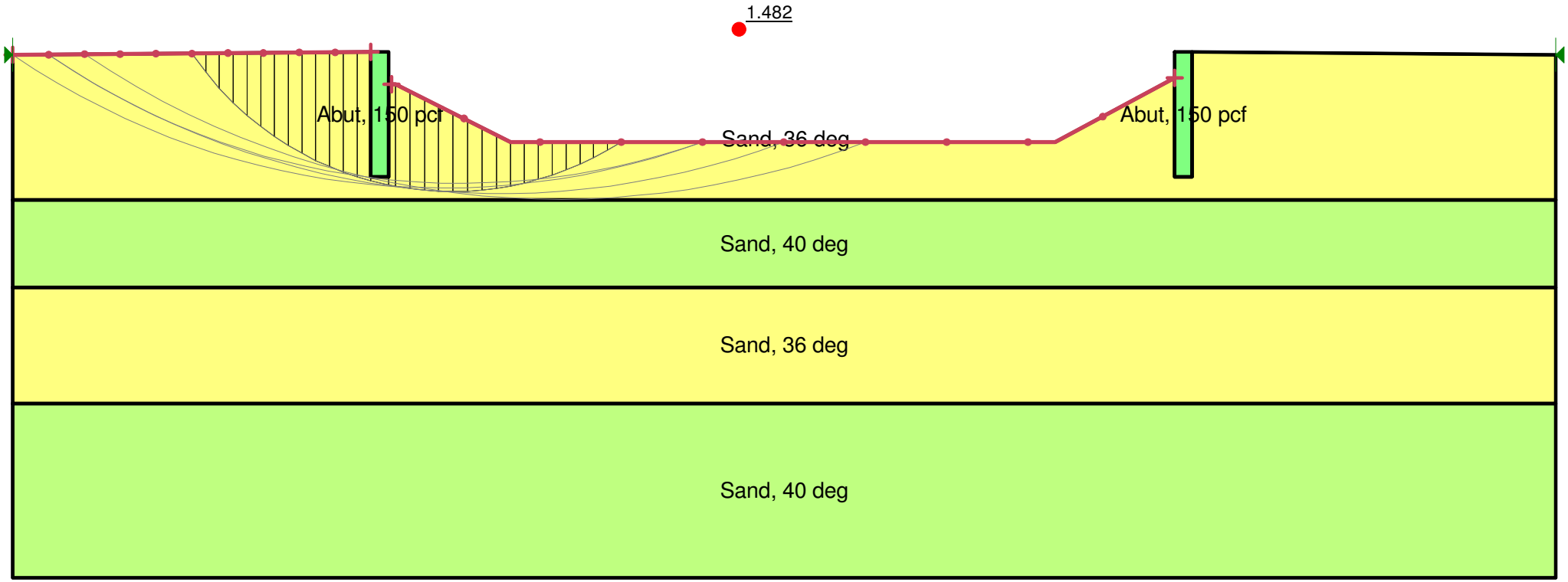
Name: Sand, 36 deg Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 36 °
Name: Sand, 40 deg Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 40 °
Name: Abut, 150 pcf Model: High Strength Unit Weight: 150 pcf
Name: Sand, 36 deg, 60 pcf Model: Mohr-Coulomb Unit Weight: 60 pcf Cohesion': 0 psf Phi': 36 °



Jacalitos Creek Bridge
Abut 1
Pseudo-Static Analysis

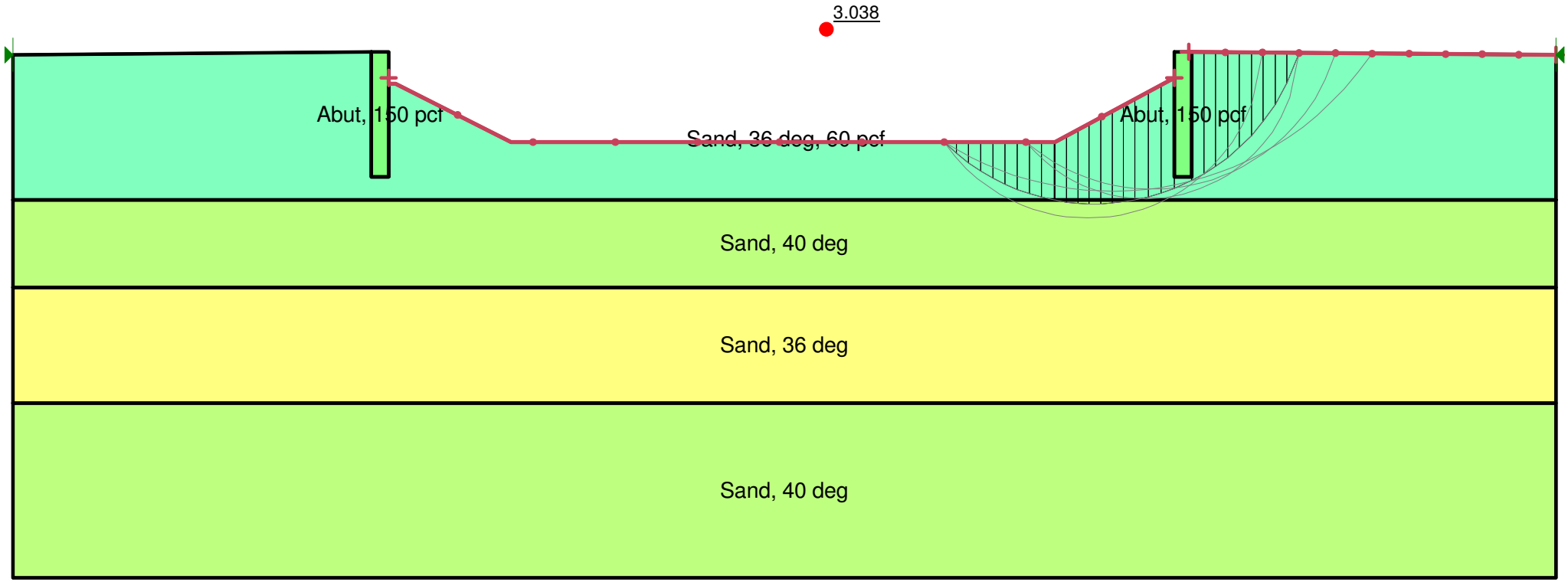
Name: Sand, 36 deg	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 36 °
Name: Sand, 40 deg	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 40 °
Name: Abut, 150 pcf	Model: High Strength	Unit Weight: 150 pcf		

kh.: 0.33



Jacalitos Creek Bridge
Abut 4
Static Analysis

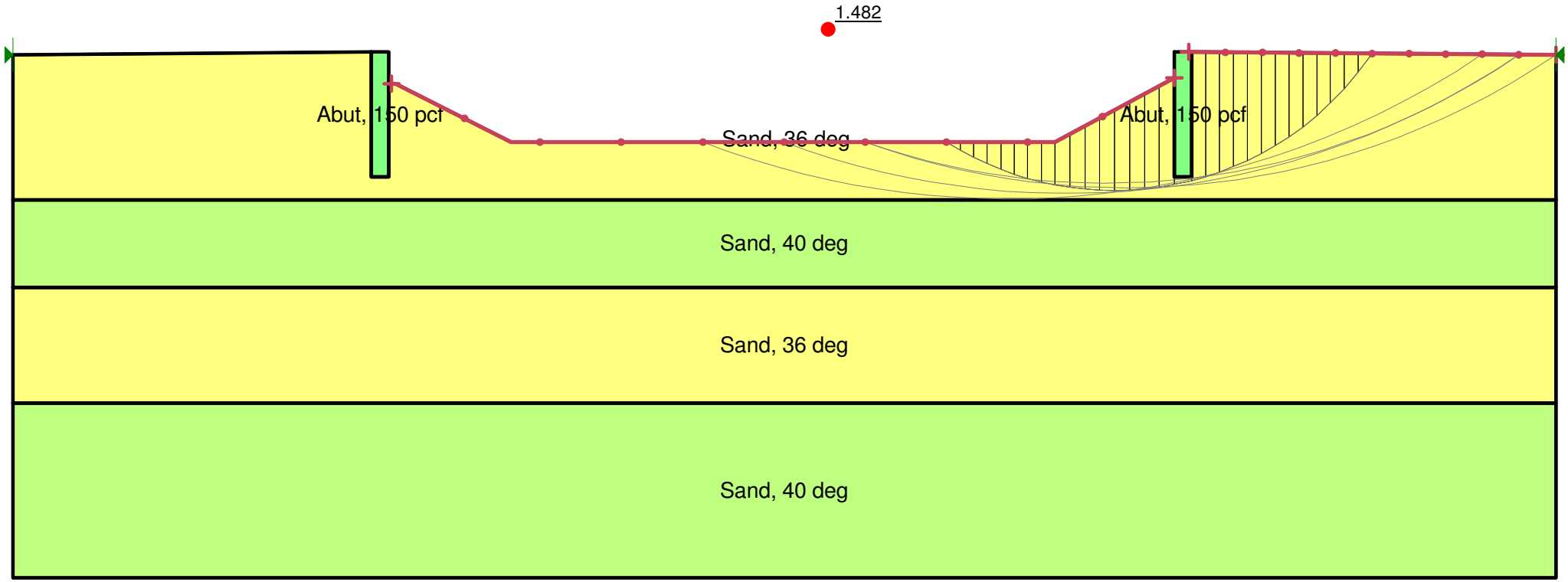
Name: Sand, 36 deg Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 36 °
Name: Sand, 40 deg Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 40 °
Name: Abut, 150 pcf Model: High Strength Unit Weight: 150 pcf
Name: Sand, 36 deg, 60 pcf Model: Mohr-Coulomb Unit Weight: 60 pcf Cohesion': 0 psf Phi': 36 °



Jacalitos Creek Bridge
Abut 4
Pseudo-Static Analysis

Name: Sand, 36 deg	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 36 °
Name: Sand, 40 deg	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 40 °
Name: Abut, 150 pcf	Model: High Strength	Unit Weight: 150 pcf		

kh.: 0.33



Appendix IV-4 Pile Capacity Analyses

Foundation Design Recommendations & Pile Data Table

Structure: Jacalitos Creek Bridge 5/27/2024
Project No.: 2024-102-GEO

Foundation Design Data (MTD 3-1, Attachment 1, Table 3-4)

Support No	Design Method	Pile Type	Finish Grade Elev. (ft)	Pile Cut-off Elev. (ft)	Pile Cap Size (ft)		Permissible Settlement (in)	No. of Piles per Support	Long Term Scour Elevation	Short Term Scour Elevation
					B	L				
Abut 1	LRFD	30" dia. CIDH	670.96	649.25	12.5	37	1	9	652	6.3
Bent 2	LRFD	36" dia. CIDH	658.00	652.0	6	31.5	1	2	652	10.8
Bent 3	LRFD	36" dia. CIDH	658.00	652.0	6	31.5	1	2	652	11.9
Abut 4	LRFD	30" dia. CIDH	671.26	649.25	12.5	37	1	9	652	11.6

Foundation Design Loads (MTD 3-1, Attachment 1, Table 3-5)

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 (kips)	Max. Per Pile Support (kips)	Per Support (kips)	Per Support	Max. Per Pile.	Per Support	Max. Per Pile.	Per Support	Max. Per Pile.	Per Support	Max. Per Pile.
Abut 1	1,510	-	1,250	2,010	250	-	-	1,250	145	-	-
Bent 2	1,110	-	730	1,600	940	-	-	1,110	730	-	-
Bent 3	1,110	-	730	1,600	940	-	-	1,110	730	-	-
Abut 4	1,510	-	1,280	2,050	280	-	-	1,280	150	-	-

Foundation Design Recommendations (after MTD 3-1, Attachment 1, Table 3-6)

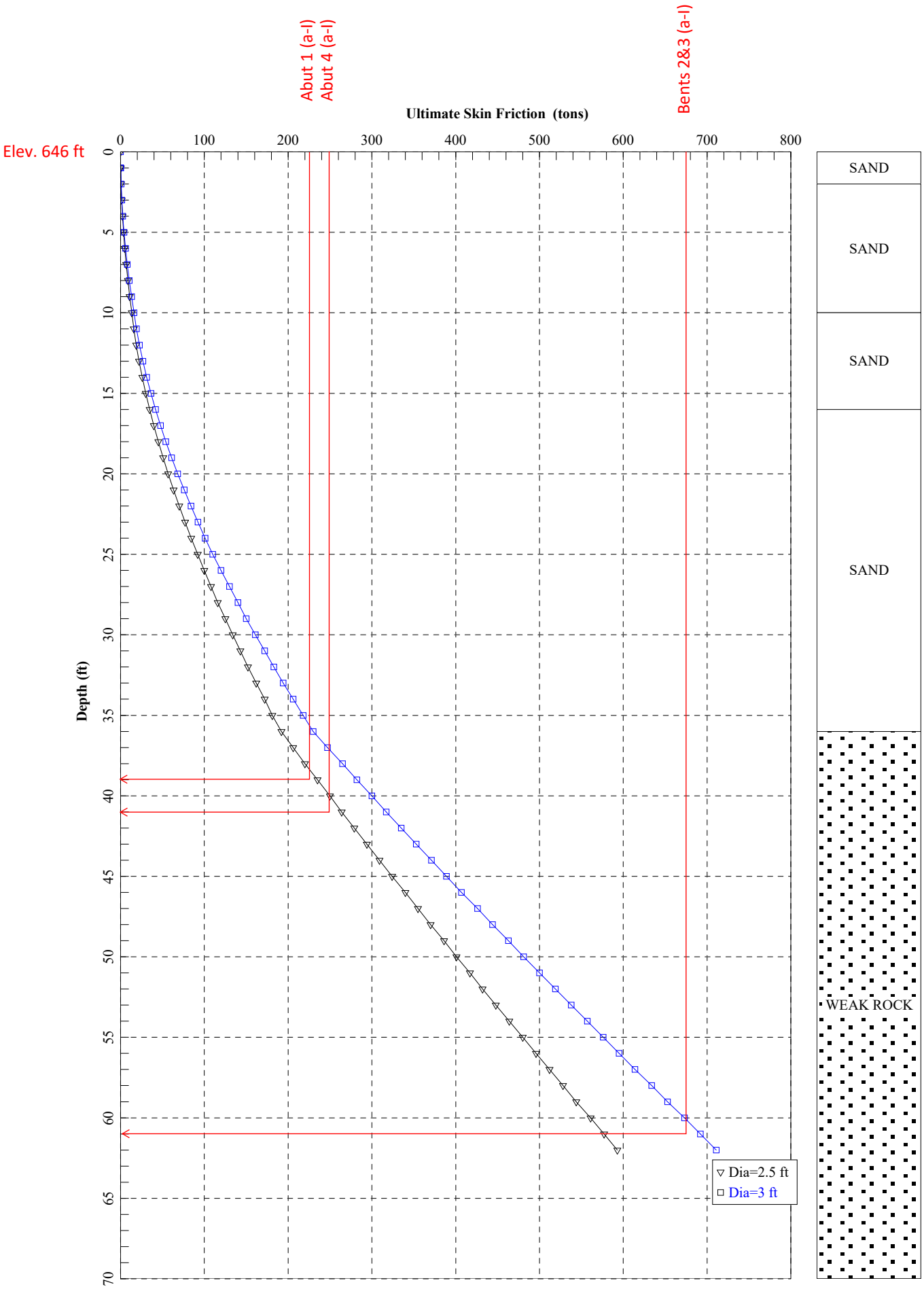
Location	Pile Type	Cut-off Elevation (ft)	Service-I Limit State (kips) per support		Total Permissible Support Settlement (in)	Required Nominal Resistance (kips)				Design Tip Elev. (ft)	Specified Tip Elevation (ft)
						Strength Limit		Extreme Event			
			Total	Permanent		Comp. (qs=0.7) (qp=0.7)	Tension (qs=0.7)	Comp. (qs=1.0)	Tension (qs=1.0)		
Abut 1	30" dia. CIDH	649.25	1,510	1,250	1	360	-	150	-	607 (a-I) 629 (a-II) 630 (c)	605
Bent 2	36" dia. CIDH	652	1,110	730	1	1,350	-	730	-	585 (a-I) 609 (a-II) 610 (c)	583
Bent 3	36" dia. CIDH	652	1,110	730	1	1,350	-	730	-	585 (a-I) 609 (a-II) 610 (c)	583
Abut 4	30" dia. CIDH	649.25	1,510	1,280	1	400	-	150	-	605 (a-I) 629 (a-II) 630 (c)	603

Notes:
(1) Design tip elevations are controlled by (a-I) Compression (Strength Limit), (b-I) Tension (Strength Limit), (c) Settlement
(2) The specified tip elevations shall not be raised above the design tip elevations for Tension, Settlement, and Lateral Load.
(3) Slurry displacement method may be used for concrete placement of the CIDH piles. Therefore, the specified pile tip elevations are two feet below the design tip elevations to account for the zone of untested concrete due to the limitations of the gamma-gamma logging (GGL) equipment (Caltrans Geotechnical Manual, "CIDH Concrete Pile Design Considerations" Module, dated March 2021.

Pile Data Table

Location	Design Method	Pile Type	Nominal Resistance (kips)		Design Tip Elev. (ft)	Specified Tip Elevation (ft)
			Compression	Tension		
Abut 1	LRFD	30" dia. CIDH	360	-	607 (a); 630 (c)	605.0
Bent 2	LRFD	36" dia. CIDH	1,350	-	585 (a); 610 (c)	583.0
Bent 3	LRFD	36" dia. CIDH	1,350	-	585 (a); 610 (c)	583.0
Abut 4	LRFD	30" dia. CIDH	400	-	605 (a); 630 (c)	603.0

Notes:
(1) Design tip elevations are controlled by: (a) Compression, (c) Settlement
(2) The specified tip elevations shall not be raised above the design tip elevations for Tension, Settlement, and Lateral Load.
(3) Slurry displacement method may be used for concrete placement of the CIDH piles. Therefore, the specified pile tip elevations are two feet below the design tip elevations to account for the zone of untested concrete due to the limitations of the gamma-gamma logging (GGL) equipment (Caltrans Geotechnical Manual, "CIDH Concrete Pile Design Considerations" Module, dated March 2021.


Abut 1 (a-l)
Abut 4 (a-l)
Bents 2&3 (a-l)
Ultimate Skin Friction (tons)
Elev. 646 ft
Depth (ft)
0
100
200
300
400
500
600
700
800
5
10
15
20
25
30
35
40
45
50
55
60
65
70
SAND
SAND
SAND
SAND
WEAK ROCK
Dia=2.5 ft
Dia=3 ft

```
     ========================================================================

                     SHAFT for Windows, Version 2023.9.03

                      Serial Number :  291911540

                    VERTICALLY LOADED DRILLED SHAFT ANALYSIS
                     (c) Copyright ENSOFT, Inc., 1987-2023
                           All Rights Reserved

     ========================================================================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Consor Fresno On-call Jacalitos Creek Br\Calc\CIDH\
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     Name of output file         : Jacalitos - Strength Limit.sf9o
     Name of plot output file    : Jacalitos - Strength Limit.sf9p
     Name of runtime file        : Jacalitos - Strength Limit.sf9r


     ------------------------------------------------------------------------
                          Time and Date of Analysis
     ------------------------------------------------------------------------

               Date:  May 27, 2024     Time:  15:03:06

     New Pile


     PROPOSED DEPTH =      62.0 FT
     ----------------


     NUMBER OF LAYERS =    5
     ------------------


     WATER TABLE DEPTH =     100.0 FT.
     -------------------



     FACTOR OF SAFETY APPLIED TO THE ULTIMATE SIDE FRICTION CAPACITY = 2.50
     ------------------------------------------------------------
     FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 3.00
     ------------------------------------------------------------


     SOIL INFORMATION
     ---------------

     LAYER NO  1----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 1.200E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 3.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 6.000E+01
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 0.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 1.200E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 3.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 6.000E+01
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 2.000E+00

     LAYER NO  2----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 1.200E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 4.000E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 4.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 6.000E+01
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 2.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 1.073E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 4.000E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 4.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 6.000E+01
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 1.000E+01

     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 1.073E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 4.000E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 4.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 1.000E+01

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 9.600E-01  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 4.000E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 4.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 1.600E+01

     LAYER NO  4----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 9.600E-01  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 5.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 1.600E+01

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 6.900E-01  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 5.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 3.600E+01

     LAYER NO  5----DECOMPOSED ROCK

       AT THE TOP
```

Strength - Abut 1

- Nominal Resistance = 360 kips
- Skin friction required=360 kips / 2 (to tons) / 0.8 (group effect) = 225 tons

Strength - Abut 4

- Nominal Resistance = 400 kips
- Skin friction required=400 kips / 2 (to tons) / 0.8 (group effect) = 250 tons

```
  ELASTIC MODULUS OF GRAVEL, LB/SQ IN              = 0.000E+00
  POISSION RATIO OF GRAVEL                         = 0.000E+00
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 8.000E+01
  SOIL UNIT WEIGHT, LB/CU FT                       = 1.250E+02
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 1.000E+10
  DEPTH, FT                                        = 3.600E+01

  AT THE BOTTOM

  ELASTIC MODULUS OF GRAVEL, LB/SQ IN              = 0.000E+00
  POISSION RATIO OF GRAVEL                         = 0.000E+00
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST    = 8.000E+01
  SOIL UNIT WEIGHT, LB/CU FT                       = 1.250E+02
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT         = 1.000E+10
  DEPTH, FT                                        = 7.000E+01


(*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS


INPUT DRILLED SHAFT INFORMATION
-------------------------------

 MINIMUM SHAFT DIAMETER    =    2.500  FT.
 MAXIMUM SHAFT DIAMETER    =    3.000  FT.
 RATIO BASE/SHAFT DIAMETER =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 ELASTIC MODULUS, Ec       = 3.000E+06 LB/SQ IN




COMPUTATION RESULTS
-------------------


- CASE ANALYZED      :     1
  VARIATION LENGTH   :     1
  VARIATION DIAMETER :     1


DRILLED SHAFT INFORMATION

-------------------------

 DIAMETER OF STEM          =    2.500  FT.
 DIAMETER OF BASE          =    2.500  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    0.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =    7.069  SQ.IN.
 ELASTIC MODULUS, Ec       = 3.000E+06 LB/SQ IN
 VOLUME OF UNDERREAM       =    0.000  CU.YDS.
 SHAFT LENGTH              =   62.000  FT.


PREDICTED RESULTS
-----------------

QS     = ULTIMATE SIDE RESISTANCE;
QB     = ULTIMATE BASE RESISTANCE;
```

```
WT     = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU     = TOTAL ULTIMATE RESISTANCE;
QBD    = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY
         APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN    = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY
         APPLIED TO THE ULTIMATE SIDE RESISTANCE AND
         THE ULTIMATE BASE RESISTANCE.
```

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
1.0	0.18	0.14	22.28	22.42	7.57	7.48	123.31
2.0	0.36	0.57	26.99	27.56	9.56	9.22	75.78
3.0	0.55	1.27	31.71	32.98	11.84	11.08	60.46
4.0	0.73	2.26	36.42	38.68	14.40	13.04	53.18
5.0	0.91	3.53	41.13	44.66	17.24	15.12	49.13
6.0	1.09	5.05	45.84	50.89	20.33	17.30	46.65
7.0	1.27	6.80	50.56	57.36	23.65	19.57	45.06
8.0	1.45	8.77	55.27	64.05	27.20	21.93	44.03
9.0	1.64	10.97	59.98	70.95	30.96	24.38	43.36
10.0	1.82	13.37	64.70	78.07	34.94	26.91	42.93
11.0	2.00	15.84	69.41	85.25	38.98	29.47	42.62
12.0	2.18	18.77	79.59	98.35	45.30	34.04	45.08
13.0	2.36	22.14	90.99	113.14	52.47	39.19	47.86
14.0	2.55	25.94	101.87	127.81	59.90	44.33	50.21
15.0	2.73	30.15	110.33	140.48	66.93	48.84	51.51
16.0	2.91	34.76	116.22	150.98	73.50	52.64	51.90
17.0	3.09	39.76	122.11	161.87	80.46	56.61	52.37
18.0	3.27	45.12	128.00	173.12	87.79	60.71	52.89
19.0	3.45	50.84	133.89	184.73	95.47	64.97	53.47
20.0	3.64	56.90	139.78	196.68	103.50	69.35	54.09
21.0	3.82	63.30	144.07	207.36	111.32	73.34	54.31
22.0	4.00	70.01	146.48	216.49	118.84	76.83	54.12
23.0	4.18	77.03	147.28	224.32	126.13	79.91	53.64
24.0	4.36	84.35	147.28	231.64	133.45	82.84	53.08
25.0	4.55	91.96	147.28	239.24	141.05	85.88	52.63
26.0	4.73	99.84	147.28	247.12	148.94	89.03	52.27
27.0	4.91	107.99	147.28	255.27	157.08	92.29	52.00
28.0	5.09	116.39	147.28	263.67	165.48	95.65	51.79
29.0	5.27	125.03	147.28	272.32	174.13	99.11	51.64
30.0	5.45	133.91	147.28	281.19	183.01	102.66	51.55
31.0	5.64	143.02	147.28	290.30	192.11	106.30	51.50
32.0	5.82	152.34	138.69	291.03	198.57	107.17	50.02
33.0	6.00	161.86	128.87	290.73	204.82	107.70	48.45
34.0	6.18	171.58	120.70	292.29	211.82	108.87	47.28
35.0	6.36	181.49	117.03	298.52	220.50	111.61	46.91
36.0	6.55	191.58	117.73	309.31	230.82	115.87	47.25
37.0	6.73	205.96	118.41	324.38	245.43	121.86	48.22
38.0	6.91	220.44	119.08	339.52	260.14	127.87	49.14
39.0	7.09	235.01	119.74	354.75	274.93	133.92	50.03
40.0	7.27	249.68	120.38	370.05	289.80	140.00	50.88
41.0	7.45	264.43	121.00	385.44	304.77	146.11	51.70
42.0	7.64	279.28	121.62	400.89	319.82	152.25	52.49
43.0	7.82	294.21	122.22	416.43	334.95	158.42	53.26
44.0	8.00	309.23	122.81	432.04	350.16	164.63	54.00
45.0	8.18	324.33	123.39	447.72	365.46	170.86	54.72
46.0	8.36	339.52	123.96	463.48	380.84	177.13	55.41
47.0	8.55	354.79	124.52	479.31	396.30	183.42	56.09
48.0	8.73	370.14	125.07	495.21	411.83	189.75	56.74
49.0	8.91	385.58	125.61	511.18	427.45	196.10	57.37
50.0	9.09	401.10	126.14	527.23	443.14	202.48	57.99
51.0	9.27	416.69	126.66	543.35	458.91	208.90	58.59
52.0	9.46	432.37	127.17	559.54	474.76	215.34	59.18
53.0	9.64	448.12	127.67	575.80	490.68	221.81	59.75
54.0	9.82	463.95	128.17	592.12	506.68	228.30	60.31
55.0	10.00	479.86	128.66	608.52	522.75	234.83	60.85
56.0	10.18	495.84	129.14	624.98	538.89	241.38	61.38
57.0	10.36	511.90	128.48	640.38	554.73	247.59	61.79
58.0	10.55	528.03	127.49	655.52	570.53	253.71	62.16
59.0	10.73	544.24	126.54	670.78	586.42	259.88	62.53
60.0	10.91	560.52	126.03	686.55	602.53	266.22	62.93
61.0	11.09	576.88	126.03	702.91	618.89	272.76	63.37
62.0	11.27	592.67	126.03	718.70	634.68	279.08	63.75

Abut 1 (a-I)

Abut 4 (a-I)

Strength - Bents 2 & 3

- Nominal Resistance = 1350 kips
- Skin friction required=1350 kips / 2 (to tons) = 675 tons

AXIAL LOAD VS SETTLEMENT CURVES

LOAD SETTLEMENT RELATIONSHIP

TOP LOAD TONS	TOP MOVEMENT IN.
6.1068E+01	3.1197E-02
1.2214E+02	6.2394E-02
1.8320E+02	9.3590E-02
2.4427E+02	1.2479E-01
3.0534E+02	1.5598E-01
3.6641E+02	1.8718E-01
4.2748E+02	2.1838E-01
4.8855E+02	2.4957E-01
5.4961E+02	2.8077E-01
6.1068E+02	3.1197E-01
6.3769E+02	6.3372E-01
6.6469E+02	9.5548E-01
6.9170E+02	1.2772E+00
7.1870E+02	1.5990E+00
7.1870E+02	1.9188E+00

- CASE ANALYZED : 2
  VARIATION LENGTH : 1
  VARIATION DIAMETER : 2

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	=	3.000	FT.
DIAMETER OF BASE	=	3.000	FT.
END OF STEM TO BASE	=	0.000	FT.
ANGLE OF BELL	=	0.000	DEG.
IGNORED TOP PORTION	=	0.000	FT.
IGNORED BOTTOM PORTION	=	0.000	FT.
AREA OF ONE PERCENT STEEL	=	10.180	SQ.IN.
ELASTIC MODULUS, Ec	=	3.000E+06	LB/SQ IN
VOLUME OF UNDERREAM	=	0.000	CU.YDS.
SHAFT LENGTH	=	62.000	FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
1.0	0.26	0.17	29.99	30.16	10.17	10.07	115.19
2.0	0.52	0.68	35.65	36.33	12.56	12.15	69.37
3.0	0.79	1.53	41.30	42.83	15.29	14.38	54.53
4.0	1.05	2.71	46.96	49.67	18.37	16.74	47.43
5.0	1.31	4.24	52.61	56.85	21.78	19.23	43.43
6.0	1.57	6.06	58.27	64.33	25.48	21.85	40.95
7.0	1.83	8.16	63.93	72.08	29.47	24.57	39.33
8.0	2.09	10.53	69.58	80.11	33.72	27.41	38.25
9.0	2.36	13.16	75.24	88.40	38.24	30.34	37.51
10.0	2.62	16.04	80.89	96.94	43.01	33.38	37.02
11.0	2.88	19.01	91.65	110.65	49.56	38.15	38.42
12.0	3.14	22.52	103.43	125.95	57.00	43.49	40.09
13.0	3.40	26.57	116.28	142.85	65.33	49.39	41.97
14.0	3.67	31.13	127.34	158.47	73.58	54.90	43.23
15.0	3.93	36.18	136.46	172.65	81.67	59.96	43.96
16.0	4.19	41.72	143.53	185.25	89.56	64.53	44.22
17.0	4.45	47.71	150.60	198.31	97.91	69.28	44.55
18.0	4.71	54.14	157.67	211.81	106.70	74.21	44.94
19.0	4.97	61.01	164.74	225.75	115.92	79.32	45.38
20.0	5.24	68.28	171.81	240.09	125.55	84.58	45.85
21.0	5.50	75.96	178.88	254.83	135.58	90.01	46.35
22.0	5.76	84.01	185.95	269.96	146.00	95.59	46.87
23.0	6.02	92.44	193.02	285.46	156.78	101.32	47.40
24.0	6.28	101.23	200.09	301.31	167.92	107.19	47.95
25.0	6.55	110.35	205.66	316.01	178.91	112.69	48.28
26.0	6.81	119.81	209.51	329.33	189.65	117.76	48.38
27.0	7.07	129.59	211.44	341.03	200.07	122.32	48.24
28.0	7.33	139.67	212.08	351.75	210.36	126.56	47.98
29.0	7.59	150.04	212.08	362.13	220.74	130.71	47.69
30.0	7.85	160.70	212.08	372.78	231.39	134.97	47.46
31.0	8.12	171.62	191.66	363.28	235.51	132.53	44.76
32.0	8.38	182.80	168.47	351.27	238.96	129.28	41.92
33.0	8.64	194.23	142.53	336.77	241.74	125.20	38.98
34.0	8.90	205.90	125.54	331.44	247.75	124.21	37.23
35.0	9.16	217.79	117.43	335.22	256.93	126.26	36.58
36.0	9.43	229.90	118.12	348.02	269.27	131.33	36.92
37.0	9.69	247.16	118.79	365.95	286.76	138.46	37.77
38.0	9.95	264.53	119.46	383.99	304.35	145.63	38.59
39.0	10.21	282.02	120.10	402.12	322.05	152.84	39.38
40.0	10.47	299.61	120.74	420.35	339.86	160.09	40.14
41.0	10.74	317.32	121.36	438.67	357.77	167.38	40.86
42.0	11.00	335.13	121.96	457.09	375.79	174.71	41.57
43.0	11.26	353.05	122.56	475.61	393.90	182.07	42.24
44.0	11.52	371.07	123.14	494.21	412.12	189.48	42.90
45.0	11.78	389.20	123.72	512.91	430.43	196.92	43.53
46.0	12.04	407.42	124.28	531.70	448.85	204.39	44.15
47.0	12.31	425.75	124.83	550.58	467.36	211.91	44.74
48.0	12.57	444.17	125.38	569.55	485.96	219.46	45.32
49.0	12.83	462.70	125.91	588.60	504.66	227.05	45.88
50.0	13.09	481.31	126.43	607.75	523.46	234.67	46.42
51.0	13.35	500.03	126.95	626.98	542.35	242.33	46.95
52.0	13.62	518.84	127.46	646.30	561.33	250.02	47.47
53.0	13.88	537.74	127.96	665.70	580.40	257.75	47.97
54.0	14.14	556.74	128.45	685.19	599.56	265.51	48.46
55.0	14.40	575.83	128.94	704.77	618.81	273.31	48.94
56.0	14.66	595.01	128.53	723.54	637.85	280.85	49.35
57.0	14.92	614.28	127.89	742.17	656.91	288.34	49.73
58.0	15.19	633.64	127.00	760.64	675.98	295.79	50.09
59.0	15.45	653.09	126.37	779.46	695.21	303.36	50.46
60.0	15.71	672.63	126.03	798.66	714.64	311.06	50.84
61.0	15.97	692.25	126.03	818.28	734.26	318.91	51.23
62.0	16.23	711.20	126.03	837.24	753.21	326.49	51.57

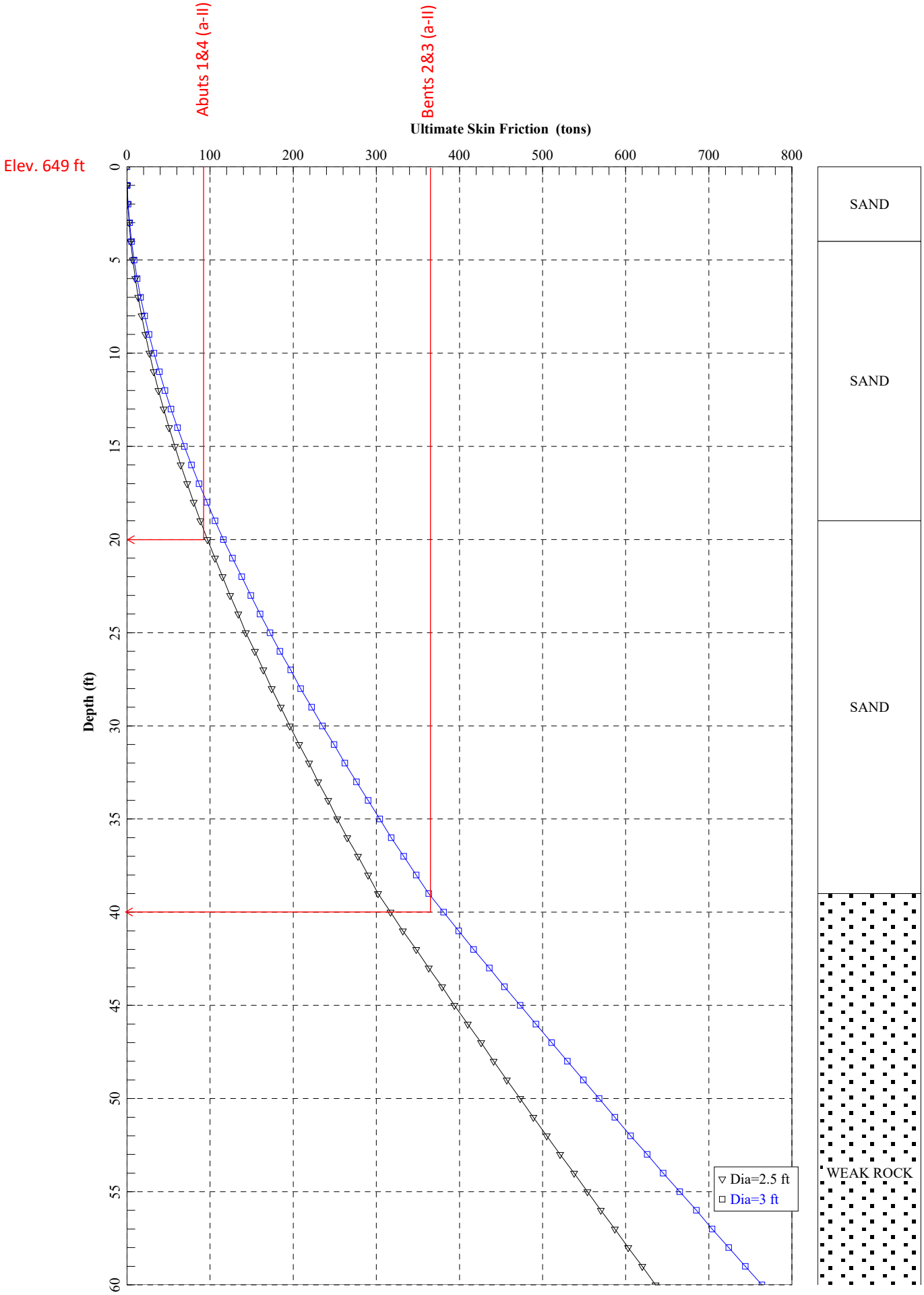
Bents 2&3 (a-II)

AXIAL LOAD VS SETTLEMENT CURVES

LOAD SETTLEMENT RELATIONSHIP

TOP LOAD TONS	TOP MOVEMENT IN.

7.3282E+01	3.7436E-02
1.4656E+02	7.4872E-02
2.1985E+02	1.1231E-01
2.9313E+02	1.4974E-01
3.6641E+02	1.8718E-01
4.3969E+02	2.2462E-01
5.1297E+02	2.6205E-01
5.8625E+02	2.9949E-01
6.5954E+02	3.3692E-01
7.3282E+02	3.7436E-01
7.5892E+02	6.8539E-01
7.8503E+02	9.9641E-01
8.1113E+02	1.3074E+00
8.3724E+02	1.6185E+00
8.3724E+02	1.9422E+00


Abuts 1&4 (a-II)
Bents 2&3 (a-II)
Ultimate Skin Friction (tons)
Elev. 649 ft
Depth (ft)
0
100
200
300
400
500
600
700
800
0
5
10
15
20
25
30
35
40
45
50
55
60
SAND
SAND
SAND
WEAK ROCK
Dia=2.5 ft
Dia=3 ft

```
     ========================================================================

                     SHAFT for Windows, Version 2023.9.03

                      Serial Number :  291911540

                    VERTICALLY LOADED DRILLED SHAFT ANALYSIS
                     (c) Copyright ENSOFT, Inc., 1987-2023
                           All Rights Reserved

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     Path to file locations      : C:\Users\fwang\Parikh Consultants Inc\Projects - Ongoing_Projects\2024\2024-102-GEO
Consor Fresno On-call Jacalitos Creek Br\Calc\CIDH\
     Name of input data file     : Jacalitos - Extreme Limit.sf9d
     Name of output file         : Jacalitos - Extreme Limit.sf9o
     Name of plot output file    : Jacalitos - Extreme Limit.sf9p
     Name of runtime file        : Jacalitos - Extreme Limit.sf9r


     ------------------------------------------------------------------------
                          Time and Date of Analysis
     ------------------------------------------------------------------------

               Date:  May 27, 2024     Time:  14:32:56

     New Pile


     PROPOSED DEPTH =      60.0 FT
     ----------------


     NUMBER OF LAYERS =    4
     ------------------


     WATER TABLE DEPTH =     100.0 FT.
     -------------------



     FACTOR OF SAFETY APPLIED TO THE ULTIMATE SIDE FRICTION CAPACITY = 2.50
     ------------------------------------------------------------
     FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 3.00
     ------------------------------------------------------------


     SOIL INFORMATION
     ---------------

     LAYER NO  1----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 1.200E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 3.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.200E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 0.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 1.200E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 3.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.200E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 4.000E+00

     LAYER NO  2----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 1.200E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 4.000E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 4.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 4.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 9.115E-01  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 4.000E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 4.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 1.900E+01

     LAYER NO  3----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 9.115E-01  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 5.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 1.900E+01

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                    = 6.569E-01  (*)
       INTERNAL FRICTION ANGLE, DEG.                      = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 5.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 3.900E+01

    LAYER NO  4----DECOMPOSED ROCK

       AT THE TOP

       ELASTIC MODULUS OF GRAVEL, LB/SQ IN                = 0.000E+00
       POISSION RATIO OF GRAVEL                           = 0.000E+00
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 8.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 3.900E+01


       AT THE BOTTOM

       ELASTIC MODULUS OF GRAVEL, LB/SQ IN                = 0.000E+00
       POISSION RATIO OF GRAVEL                           = 0.000E+00
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST      = 8.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                         = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT           = 1.000E+10
       DEPTH, FT                                          = 6.900E+01



     (*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS
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Extreme - Both Abuts

- Nominal Resistance = 150 kips
- Skin friction required=150 kips / 2 (to tons) / 0.8 (group effect) = 93.75 tons

Abut 1&4 (a-II)

INPUT DRILLED SHAFT INFORMATION

MINIMUM SHAFT DIAMETER	=	2.500 FT.
MAXIMUM SHAFT DIAMETER	=	3.000 FT.
RATIO BASE/SHAFT DIAMETER	=	0.000 FT.
ANGLE OF BELL	=	0.000 DEG.
IGNORED TOP PORTION	=	0.000 FT.
IGNORED BOTTOM PORTION	=	0.000 FT.
ELASTIC MODULUS, Ec	=	3.000E+06 LB/SQ IN

COMPUTATION RESULTS

- CASE ANALYZED : 1
  VARIATION LENGTH : 1
  VARIATION DIAMETER : 1

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	=	2.500 FT.
DIAMETER OF BASE	=	2.500 FT.
END OF STEM TO BASE	=	0.000 FT.
ANGLE OF BELL	=	0.000 DEG.
IGNORED TOP PORTION	=	0.000 FT.
IGNORED BOTTOM PORTION	=	0.000 FT.
AREA OF ONE PERCENT STEEL	=	7.069 SQ.IN.
ELASTIC MODULUS, Ec	=	3.000E+06 LB/SQ IN
VOLUME OF UNDERREAM	=	0.000 CU.YDS.
SHAFT LENGTH	=	60.000 FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
1.0	0.18	0.28	20.51	20.80	7.12	6.95	114.37
2.0	0.36	1.13	26.35	27.48	9.91	9.24	75.57
3.0	0.55	2.55	31.71	34.25	13.11	11.59	62.79
4.0	0.73	4.52	36.42	40.94	16.66	13.95	56.29
5.0	0.91	7.05	41.13	48.19	20.76	16.53	53.00
6.0	1.09	10.10	45.84	55.94	25.38	19.32	51.28
7.0	1.27	13.63	50.56	64.19	30.48	22.30	50.43
8.0	1.45	17.64	55.27	72.91	36.06	25.48	50.12
9.0	1.64	22.10	59.98	82.08	42.09	28.83	50.16
10.0	1.82	27.00	64.70	91.70	48.57	32.37	50.43
11.0	2.00	32.32	69.41	101.73	55.46	36.06	50.86
12.0	2.18	38.05	74.12	112.17	62.76	39.93	51.41
13.0	2.36	44.17	78.84	123.00	70.44	43.94	52.04
14.0	2.55	50.66	83.55	134.21	78.51	48.11	52.72
15.0	2.73	57.52	94.69	152.21	89.08	54.57	55.81
16.0	2.91	64.73	107.22	171.95	100.47	61.63	59.11
17.0	3.09	72.28	119.06	191.34	111.97	68.60	61.90
18.0	3.27	80.16	128.00	208.16	122.82	74.73	63.60
19.0	3.45	88.35	133.89	222.24	132.98	79.97	64.33
20.0	3.64	96.84	139.78	236.62	143.43	85.33	65.07
21.0	3.82	105.62	144.07	249.69	153.65	90.27	65.39
22.0	4.00	114.69	146.48	261.16	163.51	94.70	65.29
23.0	4.18	124.02	147.28	271.30	173.11	98.70	64.87
24.0	4.36	133.61	147.28	280.89	182.71	102.54	64.37
25.0	4.55	143.46	147.28	290.74	192.55	106.48	63.96
26.0	4.73	153.54	147.28	300.82	202.63	110.51	63.63
27.0	4.91	163.85	147.28	311.13	212.94	114.63	63.37
28.0	5.09	174.38	147.28	321.66	223.47	118.84	63.18
29.0	5.27	185.12	147.28	332.40	234.21	123.14	63.04
30.0	5.45	196.06	147.28	343.34	245.15	127.52	62.94
31.0	5.64	207.19	147.28	354.47	256.28	131.97	62.89
32.0	5.82	218.50	147.28	365.78	267.60	136.50	62.87
33.0	6.00	229.99	147.28	377.27	279.09	141.09	62.88
34.0	6.18	241.65	147.28	388.93	290.74	145.75	62.91
35.0	6.36	253.45	140.25	393.70	300.20	148.13	61.86
36.0	6.55	265.41	132.21	397.62	309.48	150.24	60.74
37.0	6.73	277.51	125.53	403.04	319.35	152.85	59.91
38.0	6.91	289.74	122.53	412.27	330.58	156.74	59.67
39.0	7.09	302.09	123.11	425.20	343.13	161.87	59.96
40.0	7.27	317.24	123.69	440.93	358.47	168.12	60.62
41.0	7.45	332.47	124.25	456.72	373.89	174.41	61.26
42.0	7.64	347.79	124.80	472.59	389.39	180.72	61.88
43.0	7.82	363.18	125.35	488.53	404.96	187.06	62.48
44.0	8.00	378.66	125.88	504.54	420.62	193.42	63.06
45.0	8.18	394.22	126.41	520.63	436.35	199.82	63.63
46.0	8.36	409.86	126.92	536.78	452.16	206.25	64.18
47.0	8.55	425.57	127.43	553.00	468.05	212.71	64.71
48.0	8.73	441.36	127.93	569.30	484.01	219.19	65.23
49.0	8.91	457.24	128.43	585.66	500.04	225.70	65.73
50.0	9.09	473.18	128.91	602.09	516.15	232.24	66.23
51.0	9.27	489.21	129.39	618.60	532.34	238.81	66.71
52.0	9.46	505.30	129.86	635.16	548.59	245.41	67.18
53.0	9.64	521.48	130.33	651.80	564.92	252.03	67.64
54.0	9.82	537.72	130.78	668.51	581.32	258.68	68.08
55.0	10.00	554.04	130.49	684.53	597.54	265.11	68.45
56.0	10.18	570.43	129.94	700.38	613.75	271.49	68.78
57.0	10.36	586.90	129.38	716.27	630.02	277.88	69.11
58.0	10.55	603.43	129.07	732.50	646.45	284.39	69.46
59.0	10.73	620.04	129.07	749.10	663.06	291.04	69.83
60.0	10.91	636.28	129.07	765.35	679.31	297.54	70.15

AXIAL LOAD VS SETTLEMENT CURVES

LOAD SETTLEMENT RELATIONSHIP

TOP LOAD TONS	TOP MOVEMENT IN.
6.5753E+01	3.4539E-02
1.3151E+02	6.9078E-02
1.9726E+02	1.0362E-01
2.6301E+02	1.3816E-01
3.2876E+02	1.7269E-01
3.9452E+02	2.0723E-01
4.6027E+02	2.4177E-01
5.2602E+02	2.7631E-01
5.9178E+02	3.1085E-01
6.5753E+02	3.4539E-01
6.8448E+02	6.6655E-01

Extreme - Bents 2 & 3
- Nominal Resistance = 730 kips
- Skin friction required = 730 kips / 2 (to tons) = 365 tons

Bents 2&3 (a-II)

28.0	7.33	209.25	212.08	421.34	279.95	154.40	57.47
29.0	7.59	222.14	212.08	434.22	292.83	159.55	57.19
30.0	7.85	235.27	212.08	447.35	305.96	164.80	56.95
31.0	8.12	248.63	212.08	460.71	319.32	170.15	56.76
32.0	8.38	262.20	212.08	474.29	332.90	175.58	56.61
33.0	8.64	275.99	212.08	488.08	346.69	181.09	56.49
34.0	8.90	289.97	192.87	482.84	354.26	180.28	54.24
35.0	9.16	304.15	171.04	475.18	361.16	178.67	51.85
36.0	9.43	318.50	146.60	465.10	367.36	176.27	49.34
37.0	9.69	333.01	130.57	463.58	376.53	176.73	47.85
38.0	9.95	347.69	122.86	470.55	388.64	180.03	47.29
39.0	10.21	362.51	123.44	485.95	403.66	186.15	47.59
40.0	10.47	380.69	124.01	504.70	422.02	193.61	48.19
41.0	10.74	398.96	124.57	523.53	440.49	201.11	48.77
42.0	11.00	417.34	125.12	542.46	459.05	208.64	49.33
43.0	11.26	435.82	125.65	561.47	477.70	216.21	49.87
44.0	11.52	454.39	126.18	580.58	496.45	223.82	50.39
45.0	11.78	473.06	126.70	599.77	515.30	231.46	50.90
46.0	12.04	491.83	127.22	619.04	534.23	239.14	51.40
47.0	12.31	510.69	127.72	638.41	553.26	246.85	51.88
48.0	12.57	529.64	128.22	657.85	572.38	254.59	52.34
49.0	12.83	548.68	128.71	677.39	591.58	262.37	52.80
50.0	13.09	567.82	129.19	697.01	610.88	270.19	53.24
51.0	13.35	587.05	129.66	716.71	630.27	278.04	53.67
52.0	13.62	606.36	130.13	736.49	649.74	285.92	54.09
53.0	13.88	625.77	130.59	756.36	669.30	293.84	54.50
54.0	14.14	645.27	130.46	775.73	688.75	301.59	54.86
55.0	14.40	664.85	130.15	795.00	708.23	309.32	55.21
56.0	14.66	684.52	129.65	814.17	727.73	317.02	55.53
57.0	14.92	704.27	129.27	833.55	747.37	324.80	55.85
58.0	15.19	724.12	129.07	853.18	767.14	332.67	56.18
59.0	15.45	744.04	129.07	873.11	787.07	340.64	56.52
60.0	15.71	763.54	129.07	892.61	806.56	348.44	56.82

AXIAL LOAD VS SETTLEMENT CURVES

LOAD SETTLEMENT RELATIONSHIP

TOP LOAD TONS	TOP MOVEMENT IN.
7.8903E+01	4.1447E-02
1.5781E+02	8.2893E-02
2.3671E+02	1.2434E-01
3.1561E+02	1.6579E-01
3.9452E+02	2.0723E-01
4.7342E+02	2.4868E-01
5.5232E+02	2.9013E-01
6.3123E+02	3.3157E-01
7.1013E+02	3.7302E-01
7.8903E+02	4.1447E-01
8.1493E+02	7.2298E-01
8.4082E+02	1.0315E+00
8.6671E+02	1.3400E+00
8.9261E+02	1.6485E+00
8.9261E+02	1.9782E+00

7.1144E+02	9.8772E-01
7.3840E+02	1.3089E+00
7.6535E+02	1.6300E+00
7.6535E+02	1.9561E+00

- CASE ANALYZED : 2
  VARIATION LENGTH : 1
  VARIATION DIAMETER : 2

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	= 3.000	FT.
DIAMETER OF BASE	= 3.000	FT.
END OF STEM TO BASE	= 0.000	FT.
ANGLE OF BELL	= 0.000	DEG.
IGNORED TOP PORTION	= 0.000	FT.
IGNORED BOTTOM PORTION	= 0.000	FT.
AREA OF ONE PERCENT STEEL	= 10.180	SQ.IN.
ELASTIC MODULUS, Ec	= 3.000E+06	LB/SQ IN
VOLUME OF UNDERREAM	= 0.000	CU.YDS.
SHAFT LENGTH	= 60.000	FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY APPLIED TO THE ULTIMATE SIDE RESISTANCE AND THE ULTIMATE BASE RESISTANCE.

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
1.0	0.26	0.34	28.58	28.92	9.87	9.66	110.44
2.0	0.52	1.36	35.13	36.49	13.07	12.25	69.68
3.0	0.79	3.05	41.30	44.36	16.82	14.99	56.47
4.0	1.05	5.43	46.96	52.39	21.08	17.82	50.02
5.0	1.31	8.46	52.61	61.08	26.00	20.92	46.65
6.0	1.57	12.12	58.27	70.39	31.54	24.27	44.80
7.0	1.83	16.36	63.93	80.28	37.67	27.85	43.80
8.0	2.09	21.17	69.58	90.75	44.36	31.66	43.32
9.0	2.36	26.52	75.24	101.76	51.60	35.69	43.18
10.0	2.62	32.40	80.89	113.29	59.36	39.92	43.27
11.0	2.88	38.78	86.55	125.33	67.63	44.36	43.52
12.0	3.14	45.66	92.20	137.86	76.39	49.00	43.88
13.0	3.40	53.00	97.86	150.86	85.62	53.82	44.32
14.0	3.67	60.79	109.51	170.31	97.30	60.82	46.46
15.0	3.93	69.03	122.32	191.35	109.80	68.39	48.72
16.0	4.19	77.68	136.33	214.01	123.12	76.52	51.09
17.0	4.45	86.74	148.16	234.90	136.13	84.08	52.77
18.0	4.71	96.19	157.67	253.86	148.75	91.03	53.86
19.0	4.97	106.02	164.74	270.76	160.93	97.32	54.43
20.0	5.24	116.21	171.81	288.02	173.48	103.75	55.00
21.0	5.50	126.75	178.88	305.63	186.37	110.33	55.58
22.0	5.76	137.62	185.95	323.57	199.61	117.03	56.17
23.0	6.02	148.82	193.02	341.84	213.16	123.87	56.76
24.0	6.28	160.34	200.09	360.42	227.03	130.83	57.36
25.0	6.55	172.15	205.66	377.80	240.70	137.41	57.72
26.0	6.81	184.24	209.51	393.76	254.08	143.54	57.84
27.0	7.07	196.62	211.44	408.06	267.10	149.13	57.72

PILE GROUP SETTLEMENT ANALYSIS

PROJECT NAME	***Jacalitos Creek Bridge***	*Finish Grade Elev. (ft) =*	640
PROJECT NO.	***2024-102-GEO***	*Pile Cut-off Elev. (ft) =*	640
STRUCTURE	***Abutment 1***	*Footing Depth (ft) =*	0
REFERENCE BORING	***R-24-001***	*Pile Length (ft)=*	10
Hammer Energy =	70%	*Width of Pile Group, B (ft)=*	12.5
GW Level (ft)=	60	*Length of Pile Group, L (ft)=*	37
		Permanent Load Pressure (kip)=	1280
		Pile Tip Ele (ft)=	630.00

Eq. Footing Depth (ft) 6.7
Settlement Limit (in) 1.0

Cr/Cc= 15.0%

GROUPS
1. SANDS, GRAVELS AND NON-PLASTIC SILT
2. SATURATED CLAYS AND PLASTIC SILTS
3. OC CLAYS, NON-SATURATED CLAYS, AND NON-SATURATED PLASTIC SILTS

Depth from FG From	Depth from FG To	Soil Type	BLOW COUNT	SAMPLER TYPE	AVG $SPT\text{-}N_{60}$	γ_T (pcf)	γ' (pcf)	ω	σ_v' (psf)	σ_v' (psf)	$\Delta\sigma_v'$ (psf)	Su (psf)	Lab Su (psf)	Pp (psf)	OCR	E (psf)	$Cr/1+e_0$	$Cc/1+e_0$	C' (Hough Method)	Settlements (in) Elastic	OC	NC	SAND	Sum
0	3	1	27	SPT	32	60.0	60.0		180															
4	8	1	64	SPT	75	60.0	60.0		240	380	1892.1								350				0.036	0.036
8.5	13	1	50	SPT	58	60.0	60.0		270	555	1446.9								249				0.121	0.121
13.5	18	1	100	SPT	117	120.0	120.0		540	960	1039.6								547				0.031	0.031
18.5	23	1	58	SPT	68	120.0	120.0		540	1500	786.3								186				0.053	0.053
23.5	28	1	56	SPT	65	120.0	120.0		540	2040	617.0								151				0.041	0.041
28.5	33	1	100	SPT	117	120.0	120.0		540	2580	497.8								260				0.016	0.016
36	38	1	100	SPT	117	120.0	120.0		240	2970	392.3								238				0.005	0.005
38.5	43	1	100	SPT	117	120.0	120.0		540	3360	344.6								220				0.010	0.010
43.5	48	1	100	SPT	117	120.0	120.0		540	3900	293.5								201				0.008	0.008
48.5	53	1	100	SPT	117	120.0	120.0		540	4440	253.1								186				0.007	0.007
56	58	1	100	SPT	117	120.0	120.0		240	4830	213.4								178				0.003	0.003
58.5	61.5	1	100	SPT	117	120.0	88.8		266	5083	197.6								172				0.003	0.003
																			Estimated Settlement (in)=	*0.0*	*0.0*	*0.0*	*0.3*	*0.34*

PILE GROUP SETTLEMENT ANALYSIS

PROJECT NAME	***Jacalitos Creek Bridge***	*Finish Grade Elev. (ft) =*	640	Eq. Footing Depth (ft)	6.7
PROJECT NO.	***2024-102-GEO***	*Pile Cut-off Elev. (ft) =*	640	Settlement Limit (in)	1.0
STRUCTURE	***Abutment 1***	*Footing Depth (ft) =*	0		
REFERENCE BORING	***A-16-002***	*Pile Length (ft)=*	10		
Hammer Energy =	87%	*Width of Pile Group, B (ft)=*	12.5		
GW Level (ft)=	100	*Length of Pile Group, L (ft)=*	37		
		Permanent Load Pressure (kip)=	1280		
		Pile Tip Ele (ft)=	630.00	*Cr/Cc=*	15.0%

GROUPS

1. SANDS, GRAVELS AND NON-PLASTIC SILT
2. SATURATED CLAYS AND PLASTIC SILTS
3. OC CLAYS, NON-SATURATED CLAYS, AND NON-SATURATED PLASTIC SILTS

Depth from FG From	Depth from FG To	Soil Type	BLOW COUNT	SAMPLER TYPE	AVG $SPT\text{-}N_{60}$	γ_T (pcf)	γ' (pcf)	ω	σ_v' (psf)	σ_v' (psf)	$\Delta\sigma_v'$ (psf)	Su (psf)	Lab Su (psf)	Pp (psf)	OCR	E (psf)	$Cr/1+e_0$	$Cc/1+e_0$	C' (Hough Method)	Settlements (in) Elastic	OC	NC	SAND	Sum
0	5	1	76	SPT	110	60.0	60.0		300															
5	10	1	50	SPT	73	60.0	60.0		300	500	1741.5								335				0.078	0.078
10	15	1	82	SPT	119	120.0	120.0		600	900	1279.6								597				0.039	0.039
15	20	1	42	SPT	61	120.0	120.0		600	1500	938.1								165				0.077	0.077
20	25	1	75	SPT	109	120.0	120.0		600	2100	719.7								272				0.028	0.028
25	30	1	76	SPT	110	120.0	120.0		600	2700	570.7								235				0.021	0.021
30	35	1	77	SPT	112	120.0	120.0		600	3300	464.3								211				0.016	0.016
35	40	1	78	SPT	113	120.0	120.0		600	3900	385.4								194				0.013	0.013
40	45	1	79	SPT	115	120.0	120.0		600	4500	325.3								181				0.010	0.010
45	50	1	80	SPT	116	120.0	120.0		600	5100	278.3								171				0.008	0.008
50	55	1	81	SPT	117	120.0	120.0		600	5700	240.9								163				0.007	0.007
55	60	1	82	SPT	119	120.0	120.0		600	6300	210.6								157				0.005	0.005
60	65	1	83	SPT	120	120.0	120.0		600	6900	185.7								151				0.005	0.005
65	70	1	84	SPT	122	120.0	120.0		600	7500	165.0								147				0.004	0.004
																			Estimated Settlement (in)=	*0.0*	*0.0*	*0.0*	*0.3*	*0.31*

PILE GROUP SETTLEMENT ANALYSIS

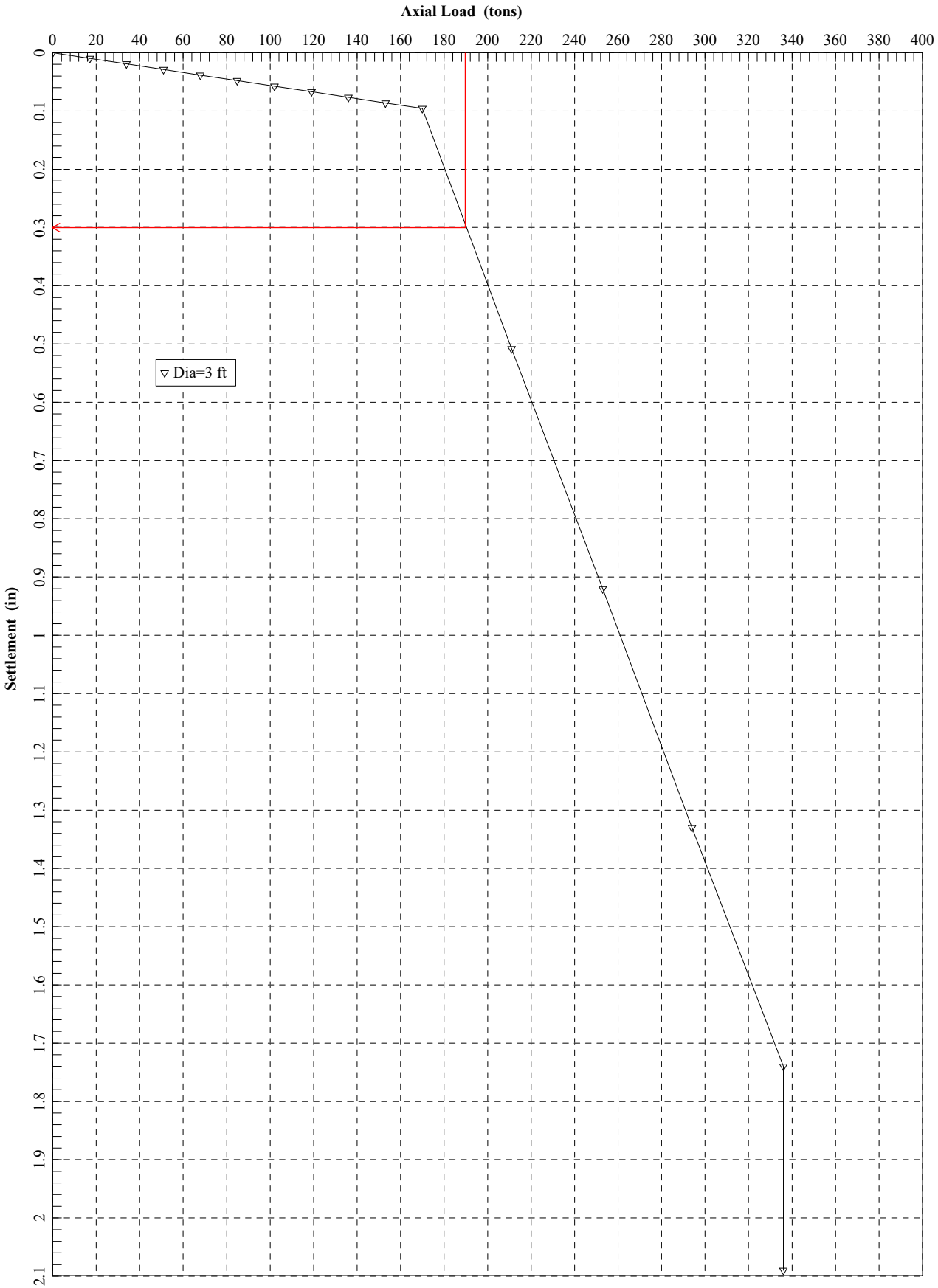
PROJECT NAME	***Jacalitos Creek Bridge***	*Finish Grade Elev. (ft) =*	640
PROJECT NO.	***2024-102-GEO***	*Pile Cut-off Elev. (ft) =*	640
STRUCTURE	***Abutment 4***	*Footing Depth (ft) =*	0
REFERENCE BORING	***A-16-004***	*Pile Length (ft)=*	10
Hammer Energy =	87%	*Width of Pile Group, B (ft)=*	12.5
GW Level (ft)=	100	*Length of Pile Group, L (ft)=*	37
		Permanent Load Pressure (kip)=	1280
		Pile Tip Ele (ft)=	630.00

Eq. Footing Depth (ft) 6.7
Settlement Limit (in) 1.0

Cr/Cc= 15.0%

GROUPS
1. SANDS, GRAVELS AND NON-PLASTIC SILT
2. SATURATED CLAYS AND PLASTIC SILTS
3. OC CLAYS, NON-SATURATED CLAYS, AND NON-SATURATED PLASTIC SILTS

Depth from FG		Soil	BLOW	SAMPLER	AVG	γ_T	γ'	ω	σ_v'	σ_v'	$\Delta\sigma_v'$	Su	Lab Su	Pp	OCR	E	$Cr/1+e_0$	$Cc/1+e_0$	C'	Settlements (in)				
From	To	Type	COUNT	TYPE	SPT-N_{60}	(pcf)	(pcf)		(psf)	(psf)	(psf)	(psf)	(psf)	(psf)		(psf)			(Hough Method)	Elastic	OC	NC	SAND	Sum
0	5	1	51	SPT	74	60.0	60.0		300															
5	10	1	62	SPT	90	60.0	60.0		300	500	1741.5								466				0.056	0.056
10	15	1	100	SPT	145	120.0	120.0		600	900	1279.6								858				0.027	0.027
15	20	1	48	SPT	70	120.0	120.0		600	1500	938.1								192				0.066	0.066
20	25	1	68	SPT	99	120.0	120.0		600	2100	719.7								239				0.032	0.032
25	30	1	100	SPT	145	120.0	120.0		600	2700	570.7								341				0.015	0.015
30	35	1	100	SPT	145	120.0	120.0		600	3300	464.3								296				0.012	0.012
35	40	1	100	SPT	145	120.0	120.0		600	3900	385.4								264				0.009	0.009
40	45	1	100	SPT	145	120.0	120.0		600	4500	325.3								241				0.008	0.008
45	50	1	100	SPT	145	120.0	120.0		600	5100	278.3								222				0.006	0.006
50	55	1	100	SPT	145	120.0	120.0		600	5700	240.9								208				0.005	0.005
55	60	1	100	SPT	145	120.0	120.0		600	6300	210.6								196				0.004	0.004
60	65	1	100	SPT	145	120.0	120.0		600	6900	185.7								186				0.004	0.004
65	70	1	100	SPT	145	120.0	120.0		600	7500	165.0								177				0.003	0.003
																			Estimated Settlement (in)=	*0.0*	*0.0*	*0.0*	*0.2*	*0.25*


Axial Load (tons)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
Settlement (in)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
Dia=3 ft

```
=========================================================================

                 SHAFT for Windows, Version 2023.9.03

                  Serial Number :  291911540

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
                (c) Copyright ENSOFT, Inc., 1987-2023
                      All Rights Reserved

=========================================================================

     Path to file locations      : C:\Users\fwang\Parikh Consultants Inc\Projects - Ongoing_Projects\2024\2024-102-GEO
Consor Fresno On-call Jacalitos Creek Br\Calc\CIDH\
     Name of input data file     : Jacalitos - Service Limit - 640 feet - Bents.sf9d
     Name of output file         : Jacalitos - Service Limit - 640 feet - Bents.sf9o
     Name of plot output file    : Jacalitos - Service Limit - 640 feet - Bents.sf9p
     Name of runtime file        : Jacalitos - Service Limit - 640 feet - Bents.sf9r


     -------------------------------------------------------------------------
                         Time and Date of Analysis
     -------------------------------------------------------------------------

               Date:  May 27, 2024     Time:  19:16:37

     New Pile


     PROPOSED DEPTH =      30.0 FT
     ----------------


     NUMBER OF LAYERS =    3
     ------------------


     WATER TABLE DEPTH =     100.0 FT.
     -------------------



     FACTOR OF SAFETY APPLIED TO THE ULTIMATE SIDE FRICTION CAPACITY = 2.50
     ------------------------------------------------------------
     FACTOR OF SAFETY APPLIED TO THE ULTIMATE BASE CAPACITY = 3.00
     ------------------------------------------------------------


     SOIL INFORMATION
     ---------------

     LAYER NO  1----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 1.200E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 4.000E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 4.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                        = 6.000E+01
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 1.000E+10
       DEPTH, FT                                         = 0.000E+00

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 1.073E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 4.000E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 4.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                        = 6.000E+01
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 1.000E+10
       DEPTH, FT                                         = 1.000E+01

     LAYER NO  2----SAND

       AT THE TOP

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 1.073E+00  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 5.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                        = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 1.000E+10
       DEPTH, FT                                         = 1.000E+01

       AT THE BOTTOM

       SIDE FRICTION PROCEDURE, BETA METHOD
       SKIN FRICTION COEFFICIENT- BETA                   = 7.606E-01  (*)
       INTERNAL FRICTION ANGLE, DEG.                     = 3.600E+01
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 5.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                        = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 1.000E+10
       DEPTH, FT                                         = 3.000E+01

    LAYER NO  3----DECOMPOSED ROCK

       AT THE TOP

       ELASTIC MODULUS OF GRAVEL, LB/SQ IN               = 0.000E+00
       POISSION RATIO OF GRAVEL                          = 0.000E+00
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 8.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                        = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 1.000E+10
       DEPTH, FT                                         = 3.000E+01


       AT THE BOTTOM

       ELASTIC MODULUS OF GRAVEL, LB/SQ IN               = 0.000E+00
       POISSION RATIO OF GRAVEL                          = 0.000E+00
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 8.000E+01
       SOIL UNIT WEIGHT, LB/CU FT                        = 1.250E+02
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 1.000E+10
       DEPTH, FT                                         = 6.000E+01


     (*) ESTIMATED BY THE PROGRAM BASED ON OTHER PARAMETERS


     INPUT DRILLED SHAFT INFORMATION
     -------------------------------

      MINIMUM SHAFT DIAMETER    =    3.000  FT.
      MAXIMUM SHAFT DIAMETER    =    3.000  FT.
      RATIO BASE/SHAFT DIAMETER =    0.000  FT.
      ANGLE OF BELL             =    0.000  DEG.
      IGNORED TOP PORTION       =    0.000  FT.
      IGNORED BOTTOM PORTION    =    0.000  FT.
      ELASTIC MODULUS, Ec       = 3.000E+06 LB/SQ IN



     COMPUTATION RESULTS
     -------------------
```

- CASE ANALYZED : 1
  VARIATION LENGTH : 1
  VARIATION DIAMETER : 1

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	=	3.000	FT.
DIAMETER OF BASE	=	3.000	FT.
END OF STEM TO BASE	=	0.000	FT.
ANGLE OF BELL	=	0.000	DEG.
IGNORED TOP PORTION	=	0.000	FT.
IGNORED BOTTOM PORTION	=	0.000	FT.
AREA OF ONE PERCENT STEEL	=	10.180	SQ.IN.
ELASTIC MODULUS, Ec	=	3.000E+06	LB/SQ IN
VOLUME OF UNDERREAM	=	0.000	CU.YDS.
SHAFT LENGTH	=	30.000	FT.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (FOR UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
QBD = TOTAL ALLOWABLE LOAD USING A FACTOR OF SAFETY
APPLIED TO THE ULTIMATE BASE RESISTANCE;
QDN = TOTAL ALLOWABLE LOAD USING FACTORS OF SAFETY
APPLIED TO THE ULTIMATE SIDE RESISTANCE AND
THE ULTIMATE BASE RESISTANCE.

LENGTH (FT)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	QBD (TONS)	QDN (TONS)	QU/VOLUME (TONS/CU.YDS)
1.0	0.26	0.17	0.00	0.17	0.17	0.07	0.65
2.0	0.52	0.68	0.00	0.68	0.68	0.27	1.30
3.0	0.79	1.53	0.00	1.53	1.53	0.61	1.94
4.0	1.05	2.71	0.00	2.71	2.71	1.09	2.59
5.0	1.31	4.24	0.00	4.24	4.24	1.70	3.24
6.0	1.57	6.06	0.00	6.06	6.06	2.42	3.86
7.0	1.83	8.16	0.00	8.16	8.16	3.26	4.45
8.0	2.09	10.53	0.00	10.53	10.53	4.21	5.03
9.0	2.36	13.16	0.00	13.16	13.16	5.26	5.59
10.0	2.62	16.04	0.00	16.04	16.04	6.42	6.13
11.0	2.88	19.01	0.00	19.01	19.01	7.60	6.60
12.0	3.14	22.52	0.00	22.52	22.52	9.01	7.17
13.0	3.40	26.57	0.00	26.57	26.57	10.63	7.81
14.0	3.67	31.13	0.00	31.13	31.13	12.45	8.49
15.0	3.93	36.18	0.00	36.18	36.18	14.47	9.21
16.0	4.19	41.72	0.00	41.72	41.72	16.69	9.96
17.0	4.45	47.71	0.00	47.71	47.71	19.08	10.72
18.0	4.71	54.14	0.00	54.14	54.14	21.66	11.49
19.0	4.97	61.01	0.00	61.01	61.01	24.40	12.26
20.0	5.24	68.28	0.00	68.28	68.28	27.31	13.04
21.0	5.50	75.96	0.00	75.96	75.96	30.38	13.81
22.0	5.76	84.01	0.00	84.01	84.01	33.61	14.58
23.0	6.02	92.44	0.00	92.44	92.44	36.98	15.35
24.0	6.28	101.23	0.00	101.23	101.23	40.49	16.11
25.0	6.55	110.35	0.00	110.35	110.35	44.14	16.86
26.0	6.81	119.81	0.00	119.81	119.81	47.92	17.60
27.0	7.07	129.59	0.00	129.59	129.59	51.83	18.33
28.0	7.33	139.67	0.00	139.67	139.67	55.87	19.05
29.0	7.59	150.04	0.00	150.04	150.04	60.02	19.76
30.0	7.85	160.70	0.00	160.70	160.70	64.28	20.46

AXIAL LOAD VS SETTLEMENT CURVES

LOAD SETTLEMENT RELATIONSHIP

TOP LOAD TONS	TOP MOVEMENT IN.
1.6970E+01	9.5735E-03
3.3940E+01	1.9147E-02
5.0909E+01	2.8720E-02
6.7879E+01	3.8294E-02
8.4849E+01	4.7867E-02
1.0182E+02	5.7441E-02
1.1879E+02	6.7014E-02
1.3576E+02	7.6588E-02
1.5273E+02	8.6161E-02
1.6970E+02	9.5735E-02
2.1119E+02	5.0767E-01
2.5268E+02	9.1961E-01
2.9416E+02	1.3315E+00
3.3565E+02	1.7435E+00
3.3565E+02	2.0922E+00

Appendix V PREVIOUS STUDY (WRECO, 2016)

DRAFT FOUNDATION REPORT
JACALITOS CREEK BRIDGE REPLACEMENT PROJECT
BRIDGE NO. 42C-0078
FRESNO COUNTY, CALIFORNIA/DISTRICT 6
FEDERAL PROJECT NO. : BRLO-033(082)

Prepared for:

T·Y·LIN INTERNATIONAL

1601 Response Road, Suite 260
Sacramento, CA 95815
(916) 349-4250

Prepared by:

8331 Sierra College Boulevard, Suite 208
Roseville, California 95661
Tel. (916) 757-6150
Fax (916) 787-6191

WRECO Project No. P15033
May 2016

May 24, 2016

T.Y. Lin International Group
1601 Response Road, Suite 260
Sacramento, CA 95815
(916) 349-4250

Attention: Craig Chatelain, PE
Project Manager

Subject: Draft Foundation Report
Jacalitos Creek Bridge Replacement Project on Lost Hills Road
Bridge No. 42C-0078
Fresno County, California/District 6
Federal Project No. BRLO-033(082)
WRECO Project No. 15033

WRECO is pleased to submit our Draft Foundation Report for the Jacalitos Creek Bridge Replacement Project on Lost Hills Road. This report was conducted and prepared in general conformance with the scope of work prepared by WRECO for the subject project.

We would like to thank T.Y. Lin International Group and Fresno County for the opportunity to prepare this draft foundation report.

If you have any questions or wish to discuss this report in greater detail, please contact us at (916) 757-6150.

Sincerely,
WRECO

David Kitzmann, CEG, PE
Senior Engineering Geologist

Robert Lawrence, PE, GE
Associate

Distribution: Addressee, T.Y. Lin International Group, P15033-file

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DRAFT FOUNDATION REPORT
JACALITOS CREEK BRIDGE REPLACEMENT PROJECT
FRESNO COUNTY

1 INTRODUCTION

The purpose of the Jacalitos Creek Bridge Replacement Project on Lost Hills Road is to replace the structurally deficient existing Jacalitos Creek Bridge in Fresno County, California. This Bridge Replacement project is funded by the Federal Highway Bridge Program (HBP).

1.1 Scope of Work

WRECO's Scope of Work for the proposed Jacalitos Creek Bridge Replacement Project on Lost Hills Road Draft Foundations Report consisted of the following:

- Visited the site and marked out in white paint the proposed boring locations and called USA North Dig Alert a minimum of 72-hours prior to the start of the field investigation work to identify potential underground utility conflicts.
- Paid all fees and obtain a well construction/destruction (boring) permit from the Fresno County Department of Environmental Health to perform borings at the project site.
- Obtained an encroachment permit to perform work within the County's right-of-way (at no cost). Obtained (by others) permission to enter the property adjacent to the Project to perform the soil boring work with minimal traffic control.
- Performed a literature search for readily available published geologic and geohazards information at and in the near vicinity of the project site.
- Obtained copies of readily available previous studies performed at or in the near vicinity of the project site.
- Obtained available copies of the as-built bridge plans for the subject bridge.
- Performed a field investigation to better characterize the subsurface conditions at the proposed bridge site. As part of the field investigation program, the following was performed:
    - Drilled four (4) soil borings to completion depths 50.8 to 51.5 feet below existing road grade. These borings were located adjacent to the existing bridge and road alignment. The drilling was used to obtain disturbed and relatively undisturbed representative soil samples for use in better characterizing the soil conditions at the proposed foundation locations. A WRECO technician was onsite during drilling and logged the recovered soil samples as drilling progressed. The soils and rock will be classified using the *2010 Caltrans Soil and Rock Logging, Classification, and Presentation Manual*.

  - The borings were backfilled with lean cement grout in accordance with the State Water Quality Control Board requirements. Drill cuttings were drummed and disposed of offsite.
  - Tested representative soil samples in a laboratory to better determine their engineering parameters. Laboratory testing consisted of moisture/density testing, gradation determination, corrosive potential, and R-value testing.

- Prepared a Draft Bridge Foundation Report in general accordance with the Caltrans *Foundation Report Preparation for Bridge Foundations, December 2009*. This report provides the following information:
  - A description of the geotechnical work performed.
  - A project summary and description of the proposed improvements.
  - An overview of the field investigation and laboratory testing performed as part of this study.
  - A discussion of the regional and site geology as it pertains to the proposed improvements.
  - A summary of the identified site soils, summary of the laboratory testing results and a Log of Test Borings (LOTB) for the borings drilled.
  - A discussion of the regional seismology and assumed preliminary seismic design parameters for the proposed Project site in accordance with the Caltrans *2009 ARS Online Design Tool and the Caltrans Seismic Design Criteria, Version 1.7, November 2013*.
  - A liquefaction evaluation of the identified soils based on the site-soils encountered.
  - A summary and discussion of the available as-built information as it pertains to the proposed foundation selection.
  - A discussion of the results of the grain-size determination of the site soils for use in determining predicted scour at the site based upon the proposed bridge configurations and its potential impacts on the proposed foundations.
  - A slope stability analysis for the completely saturated case when the canal is full flowing and the seismic case when the water is at the annual mean elevation.
  - A discussion of the preliminary foundation recommendations for the proposed bridges taking into account the preliminary loading demands, site soil and rock conditions, environmental constraints, scour, and cost.
  - Approach grading recommendations to aid in the temporary construction staging and any profile correction work.
  - New flexible structural pavement section recommendations for the reconstructed roadway and approaches.

- A discussion of the additional field work and laboratory testing, if any, which would be required for final design.
- Contract Standard Special Provisions (SSP) language for inclusion in the Contract Documents to better identify and quantify the foundation construction risk during bidding.

2 PROJECT DESCRIPTION

Jacalitos Creek Bridge on Lost Hills Road serves as an overcrossing for Jacalitos Creek, a dry wash, which flows from west to east underneath the existing bridge. The subject Bridge Replacement Project includes the replacement of the existing structurally deficient bridge and reconstruction of the bridge approaches, scour protection within the wash and improvements to Lost Hills Road. The proposed bridge replacement is required to improve public safety.

2.1 Project Location

The project site is located in Fresno County, California on Lost Hills Road immediately west and north of the intersection with Jacalitos Creek Road, approximately 1.7 mile west of California State Route 33. The project is located were Jacalitos Creek flows out of the Jacalitos Hills and Kreyenhagen Hills into the gently sloping floor of Pleasant Valley. The land adjacent to the project is generally open rural area which can be seen on Figure 1, Vicinity Map, included in Appendix I of this report. The approximate center of the project area is at Latitude 36.10198055 East and Longitude 120.31078577 West.

2.2 Existing and Proposed Bridges

The existing Jacalitos Creek Bridge is a five span, approximately 115-foot long, 28.6-foot wide, (with two 13-foot wide lanes) bridge which was lengthened in 1970. The existing structure consists of two structure types with the original three spans of simply supported untreated Douglas Fir Stringers with a cast-in-place concrete deck on reinforced concrete five column bent type piers and reinforced concrete strutted abutment. The remaining two spans consist of a continuous cast-in-place flat slab deck supported on reinforced concrete three column pile extension bents with a reinforced concrete diaphragm abutment. Bridge supports include driven steel H-piles at Abutment 1, driven concrete piles at Bents 2 and 3, and spread footings at Bents 4, 5, and 6.

According to the information provided by T.Y. Lin International Group (TYL), the new Jacalitos Creek Bridge is proposed to be a three span bridge on approximately the existing alignment of either 105 ft (Alternative 1) or 140 ft (Alternative 2) length. The location of the bridge is shown in relation to the existing features in Figure 2 of Appendix I.

The approximate surface elevations shown on the site plans provided by TYL were used to reference elevations in this draft foundation report.

3 EXCEPTIONS TO POLICY

No exceptions to policy were taken in preparation of this draft foundation report.

4 FIELD INVESTIGATION AND TESTING PROGRAM

The subsurface conditions in the vicinity of the proposed bridge abutments were characterized by means of four borings (A-16-001B to A-16-004) of 50.8 to 51.5 foot depth. Boring A-16-001A was completed to a depth of 12.0 feet below existing grade before auger refusal. This boring was backfilled with neat cement grout then relocated 2 feet to the east. Boring A-16-001B was then completed to a depth of 50.8 feet. The borings are located along the existing road alignment, adjacent to the existing abutments, and one boring (A-16-003) was located within the dry wash of Jacalitos Creek. The borings were drilled by Taber Drilling on October 22-23, 2016 with a CME-55 track-mounted drill rig while complying with permits received from Fresno County.

The boreholes were advanced by utilizing hollow stem auger (HSA) drilling methods, with 8-inch augers. The soil samplers' were advanced/driven using a 140-pound auto-trip hammer, free falling 30-inches, in general conformance with conducting the California Modified Sampler (ASTM D-3550) and the Standard Penetration Test (ASTM D1586). Relatively undisturbed soil samples of the subsurface materials were obtained using a California Modified Sampler (Cal-Mod) fitted with three 6-inch brass or stainless steel sleeve liners. Disturbed subsurface samples were obtained from the boreholes at selected intervals using a Standard Penetration Test (SPT) Sampler without liners. The field blow counts were recorded as the number of hammer blows required to drive the sampler the final 12-inches of an 18-inch drive. The uncorrected field blow counts are shown on the LOTB drawing. A bulk sample of the channel materials below the existing bridge deck was collected during WRECO's preliminary site visit on April 30, 2015.

The recovered soils samples were logged by an on-site WRECO technician as drilling progressed using the procedures in the *2010 Caltrans Soil and Rock Logging, Classification, and Presentation Manual*.

A summary table of the boring locations, ground surface elevations, drilled depths, and hammer efficiency ratios are provided in the following table.

Table 1. Summary of Boring Locations

Boring ID	Alignment	Approximate Stationing, offset (feet)	Approximate Surface Elevation (feet)	Drilled Depth (feet)	Groundwater Elevation during Drilling (feet)	Equipment/Exploration method/Hammer Efficiency Ratio
A-16-001A	Lost Hills Road Centerline	STA. 11+85, 15' Lt	669.5	12.0	--	CME-55/HSA/87%
A-16-001B	Lost Hills Road Centerline	STA. 11+75, 15' Lt	669.5	51.5	--	CME-55/HSA/87%
A-16-002	Lost Hills Road Centerline	STA. 10+85, 15' Lt	669.5	51.5	--	CME-55/HSA/87%
A-16-003	Lost Hills Road Centerline	STA. 9+75, 20' Rt	660	50.8	--	CME-55/HSA/87%
A-16-004	Lost Hills Road Centerline	STA. 9+20 30' Lt	670	50.5	--	CME-55/HSA/87%

Note:
1. Field testing consisted of performing the Standard Penetration Test (ASTM D1586) and Modified California (ASTM D-3550) sampling at 5 foot intervals up to maximum explored depth.
2. Groundwater was not identified in the borings either during or immediately after drilling was completed.

The borings were located in the field with respect to existing site features and then referenced to project stationing. The boring elevations are referenced to project datum provided by TYL. Detailed soil descriptions, unit breaks and boring information is presented on the LOTB in Appendix II. Raymond Downes was the field technician for this study.

5 LABORATORY TESTING PROGRAM

Laboratory soil testing for this study consisted of grain size determination, plasticity, corrosive potential (i.e. sulfate content, pH, resistivity, and chloride content testing), moisture content, and R-value testing. A summary of the laboratory testing is provided in Table 2.

Table 2. Laboratory Test Summary

Boring ID	Sampled Interval (feet)	Test	Standard (ASTM/CTM)
A-16-001A	0.0 - 5.0	R-value	CTM 301
	10.0 – 11.5	Atterberg Limits, Grain Size	ASTM D4318, ASTM D422
A-16-001B	25.0 – 26.5	Grain Size, Moisture Content	ASTM D422, D2216
	30.0 – 31.5	Grain Size	ASTM D422
	50.0 – 51.5	Grain Size	ASTM D422
A-16-002	10.0 – 11.5	Atterberg Limits, Grain Size	ASTM D4318, ASTM D422
	20.0 – 21.5	Grain Size	ASTM D422
	40.0 – 41.5	Atterberg Limits, Grain Size	ASTM D4318, ASTM D422
A-16-003	5.0 – 6.5	Atterberg Limits	ASTM D4318
	25.0 – 26.5	Atterberg Limits	ASTM D4318
	30.0 – 31.5	Corrosive Potential	CTM 643, CTM 417, CTM 422
A-16-004	5.0 – 6.5	Atterberg Limits, Moisture Content	ASTM D4318, ASTM D2216

Notes:
ASTM: American Society for Testing and Materials
CTM: California Test Methods

The samples tested are shown on the LOTB which is included in Appendix II. Copies of the laboratory test results can be found in Appendix IV. Results of the corrosive potential to buried steel and concrete testing are further discussed in Section 8 of this report.

6 SITE GEOLOGY AND SUBSURFACE CONDITIONS

6.1 Geology

The project site is just south of Coalinga in an unincorporated portion of western Fresno County, California. Physiographically, the subject site is located at the western edge of the Great Valley Geomorphic Province and borders the Coast Ranges Geomorphic Province located immediately to the west of the site. The province encompasses the San Joaquin and Sacramento valleys' and is bounded by the Sierra Nevada Mountains to the east, the Coast Ranges to the west, the Transverse Range (Tehachapi Mountains) to the south, and the Klamath Mountains to the north.

The San Joaquin Valley is a structural trough that covers 2,374 square miles, which makes up the southern two-thirds of the Great Valley Geomorphic Province. The San Joaquin Valley extends from the Stockton-Tracy area on the north to the Transverse Ranges on the south. The southern San Joaquin Valley basin is bounded by the Temblor Ranges on the west, the Sierra Nevada Mountains on the east, and the San Emigdio and Tehachapi mountains to the south. The west side of the basin consists of a tightly folded anticlinorium, which is sub-parallel to the San Andreas Fault. The east side of the valley is a broad homocline. The valley surface is relatively flat and is underlain by thousands of feet of alluvial (river), lacustrine (lake), and marine (ocean) deposits that have accumulated in an elongate, asymmetrical sedimentary basin to form the structural trough as the adjacent mountain ranges elevated. The main axis of the San Joaquin basin is north-northwestern trending along the valley's main drainage axis.

During the late Mesozoic and to the early and middle Cenozoic eras (approximately 20 to 100 million years before present), 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 present) overlie these marine sediments. A total of 32,000 feet of continental deposits and underlying marine sediments were deposited into the San Joaquin Valley trough (or subbasin) during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains.

Based on the Geologic Map of the Kreyenhagen Hills Quadrangle (Dibbley and Minch, 2006), the Project site is underlain by Quaternary Age Surficial Sediments (Qa). The Surficial Sediments are described as "alluvial gravel, sand and clay of valley areas; includes gravel and and of stream channels" (Dibblee and Minch, 2006). Quaternary Age Older Surficial Sediments (Qoa) border the project site along the edges of the Jacalitos Creek valley to the southeast and are described as "alluvial gravel, sand and clay of dissected terraces." The hills adjacent to Jacalitos Creek valley are mapped as underlain by older formational materials. Quaternary age Tulare Formation (QTt) is mapped approximately 0.25 miles to the northwest and southeast of the site and is described as "pebble gravel/conglomerate, sand and clay." Pliocene to uppermost Miocene age Etchegoin Formation (Te) is mapped approximately 0.25 miles west of the project site and is described as sandstone.

The project site can be seen in relation to the published geology on Figure 2, Geologic Map that is included in Appendix I.

6.2 Subsurface Conditions

The earth materials encountered in the borings are considered consistent with the published geologic mapping. Two units were identified in the borings that are considered significant to the proposed project (summarized below). The LOTB drawing provides more specific soil descriptions, layer breaks, and boring details.

The borings performed at the project site are in general agreement with the published literature, closely resembling that of the mapped units at and adjacent to the site. It appears that there is some locally derived fill material behind the approaches which appear to be placed directly on native soils. The major strata identified primarily consists of dense to very dense interbedded silty and clayey sands with lesser amounts of silt and lean clay to full depth explored (lowest elevation 609.5). Poorly-graded sand and well-graded gravel were found in the upper 14 ft of the soil column in boring A-16-003, which likely represents recent channel bedload.

For the boring locations and the actual descriptions of the soils encountered, as well as an illustration of the soil strata breaks refer to the LOTB attched to this report in Appendix II.

6.3 Groundwater

No groundwater was encountered in the borings conducted for this investigation. The nearest location monitored by the California Department of Water Resources is located approximately 0.75 miles to the northeast (indicates groundwater depth generally remains below 354 ft below

ground surface. No water was observed in the channel, notable as rain had fallen within the watershed several days before the site investigation.

For design purposes, the groundwater elevation was set at an elevation of 609.5 feet, 51.5 feet below existing ground surface, which is the deepest elevation explored during subsurface exploration completed for this study.

7 SCOUR EVALUATION

The site has a history of scour damage, most notably the partial collapse of the original structure in 1958 after a high flow event in March and early April of that year. Damage was recorded at one of the overflow bridge structures in 1969. The subject bridge location was damaged again in 1983 when the approach embankment leading to Abutment 6 was washed out and scour exposed two steel piles. Channel protection measures including gabions and slope paving have also been noted to have been damaged or undermined. Channel sections reported in available Bridge Inspection Reports prepared by Caltrans indicate little change in the average channel bottom elevation with approximately 3 ft of maximum vertical change between 1978 and 2005. The portions of the channel near Abutment 1 to Bent 3 generally increased in elevation while the portion of the channel near existing Bents 4 and 5 have lowered in elevation during that time. The Final Hydraulic Report (Caltrans, 2013) indicates the potential for up to four feet of long-term degradation during the life of a replacement bridge.

A bulk sample of the channel bedload was obtained during the field investigation and a grain size determination was made in the laboratory. This sample consisted of poorly graded sand with gravel (SP) and are therefore considered prone to scour. The underlying soils as observed in the borings consist of silty and clayey sands and are therefore also considered prone to scour.

Based on the above, the channel appears susceptible to scour, but long term trends do not indicate appreciable changes in average channel elevation. For this draft report it is therefore assumed that long term scour will result in up to 5 ft of channel degradation (approximate elevation 665). The recommendations of this draft report should be reviewed once a design scour depth is determined.

8 CORROSION EVALUATION

The Caltrans has the following definition of corrosive soils:

"For structural elements, the Department considers a site to be corrosive if one or more of the following conditions exists for the representative soil and/or water samples taken at the site:

- *Chloride concentration is 500 ppm or greater,*
- *Sulfate Concentration is 2000 ppm or greater,*
- *pH is 5.5 or less."*

In addition to the conditions listed above, The California Amendments to AASHTO LRFD Bridge Design Specifications, 6th Edition Section 10.7.5 considers a site corrosive if the additional condition listed below exists for the representative soil and/or water samples taken at the site:

- Minimum resistivity of 1000 ohm-cm or less

WRECO performed corrosive potential testing for this study on one recovered representative soil samples. The results are presented in Table 3 below:

Table 3. Soil Corrosion Data

Location	Depth (feet)	Minimum Resistivity (ohm-cm)	Soil pH	Chloride Content (ppm)	Sulfate Content (ppm)
A-15-003	30.0 – 31.5	3,480	8.50	3.4	18.6

Based on the corrosive potential testing results the site soils are considered non-corrosive to buried metal and concrete as defined by Caltrans Corrosion Guidelines.

Even though the site was determined to be non-corrosive in nature, the following mitigation measures may be employed as prudent engineering practice but are not required. For concrete, the use of mineral admixtures (such as fly ash, silica fume, metakolin, etc.), along with reduced water content, and increased cementitious material content, generally result in a high-density durable concrete that is more resistant to corrosion. According to the California Amendments to the Load and Resistance Factor Design (LRFD) Bridge Design Specifications Fourth Edition *Table 5.12.3-1 Minimum Concrete Cover (inches) for 75 year Design Life*, the maximum water-to-cementitious material ratio shall not exceed 0.40, and a minimum of 3 inches of clear cover shall be provided for all reinforcing bars where the concrete is cast against the surrounding soils. We also recommend the use of a minimum of 675 pounds per cubic yard of cementitious material, and Type II Modified or Type V cement with 25 percent mineral admixtures be used on all locations where the concrete is to remain in permanent contact with the surrounding soils. Using *Figure 854.3B, "Minimum Thickness of Metal Pipe for 50 Years of Maintenance Free Service Life"* from the Caltrans Highway Design Manual, the minimum corrugated metal pipe thickness should be 16-gauge and should be constructed of galvanized steel. This minimum thickness is based upon corrosion assessment only and the pipe section should be checked structurally to determine the minimum thickness based upon the proposed loading requirements. For additional guidance to help mitigate the corrosion of reinforced concrete due to chlorides, sulfates, and acids, refer to the Caltrans Bridge Memo to Designers 10-5.

9 SEISMIC RECOMMENDATIONS

9.1 Potential Seismic Hazards

The project is located in a low to moderately seismically active area of California. Potential geologic and potential seismic hazards for the site include seismic shaking (ground motion), subsidence, and seismically induced settlement.

9.2 Ground Surface Rupture

The project site does not lie within or adjacent to an Alquist-Priolo Earthquake Fault Zone. Active faulting has not been mapped as occurring across or adjacent to the project site. The closest active fault is the Great Valley 13 (Coalinga) Fault (Fault ID No.205), which is located at a distance of about 8 miles northeast of the project site. Surface rupture due to faulting within the project site is not anticipated expected to occur unless an unknown or previously unmapped fault were to rupture within the project limits.

9.3 Ground Motion

A seismic study was performed to develop seismic design parameters for the proposed bridge design. Following the Caltrans Seismic Design Criteria (SDC) Version 1.7, (Caltrans, 2013), Memos to Designer (MTD) Section 20, and design tools outlined in the Caltrans *Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendation, November 2012*, a seismic analysis was performed for this structure to develop seismic design parameters and to identify potential seismic hazards such as liquefaction or lateral spreading. Both the deterministic and probabilistic (5% probability of exceedance in 50 years [975 year average return period]) methodologies were evaluated for use in developing the site seismic design parameters. The site is not located in a deep sedimentary basin, and no basin amplification was necessary. Based on the deterministic analysis, the controlling faults of the project site are the Great Valley 13 (Coalinga) Fault (Fault ID No.205) in the short period, and the San Andreas (Creeping Section) Fault (Fault ID No. 182) in the long period. The fault data is listed below:

Table 4. Fault Data

Fault Name	Great Valley 13 (Coalinga) Fault	San Andreas (Creeping Section) 2011 CFM Fault	Great Valley 14 (Kettleman Hills) Fault
Fault Identification Number (FID)	205	182	210
Fault Rupture Distance from site (R_{RUP})	8 miles (13 kilometers)	15 miles (24 kilometers)	10 miles (16 kilometers)
Fault Rupture Direction from site	Northeast	Southwest	East
Maximum Moment Magnitude (M_{max})	7.0	7.9	7.1
Fault Type	Reverse	Right-lateral strike-slip	Reverse
Dip Angle (degree)	15	90	22
Dip Direction	West	Vertical	West

The site average shear wave velocity (Vs_{30}) is conservatively estimated to be 283 meters per second (m/s) based on the logged soils and site specific Standard Penetration Test (SPT) blow counts presented in the LOTB.

The PGA for the site is estimated at 0.59g ("g" is the acceleration due to gravity). The associated peak spectral acceleration at the site is estimated at about 1.29g at an approximately 0.25 second period. The seismic results should be considered a good estimate but may be subject to change

based on additional site-specific shear wave velocity data obtained during later design stages. The design response spectrum (i.e. ARS curve) is the result of the Probabilistic Response Spectrum.

Table 5. Seismic Analyses Site Data

Site Location: Centroid of the Jacalitos Creek Bridge	Latitude: 36.10198055
	Longitude: -120.31078577
Controlling Fault	Great Valley 13 (Coalinga)
Style of Fault	Reverse
Approximate Distance from Fault to Site	8.1 mi. (13.0 km)
Maximum Credible Earthquake Magnitude	7.0
Estimated Site Shear Wave Velocity (Vs_{30})	283 meters/ second
Peak Ground Acceleration (PGA)	0.59 g

The project site is shown in relation to the Great Valley 13 (Coalinga), Great Valley 14 (Kettleman Hills), and the San Andreas Fault on Figure 3 - Late Quaternary Fault Map, and the ARS curve is presented as Figure 4, located in Appendix I. The seismic analysis is located in Appendix V.1.

9.4 Other Seismic Hazards

The site has no known history of subsidence, rock falls/landslides, or embankment failures due to seismic activity and none were observed during our limited field observations and our review of available published seismic hazards for the project area.
The site has no known history of rock falls/landslides, embankment failures, tsunami, slope instability due to seismic activity and none were observed during our limited field observations and our review of available published seismic hazards for the project area.

9.4.1 Rockfalls / Landslides

The site is generally flat, therefore rockfalls and landslides do not appear to be an issue within the project limits.

9.4.2 Embankment Failures

Our limited site review did not identify any features consistent with embankment failures.

9.4.3 Tsunami / Seiche

The site is located inland approximately 60 miles away from the nearest coast, therefore tsunamis do not appear to be a hazard within the project limits.

9.4.4 Seismically Induced Slope Instability

Our limited site review did not identify any features consistent with seismically induced slope instability. The site is generally level therefore seismically induced slope instability does not appear to be an issue within the project limits.

9.5 Liquefaction Evaluation

Liquefaction is the process in which the seismic shear waves cause an increase in the pore water pressure in a cohesionless (sand and some non-cohesive silts) soil strata. This increase in pore water pressure reduces the effective stress confining the soil. The reduction in effective stress causes a reduction in the shear modulus of the soil, which in turn, results in increased soil deformation. Also associated with liquefaction is a loss in bearing strength. In the case of full liquefaction, when the increase in pore water pressure reduces the confining stress to zero, the soil experiences a full loss of strength and undergoes large viscous deformations. Lateral spreading (large lateral deformations) are possible when liquefaction occurs in ground having even minimal slope. Cohesionless soils which are in a loose to medium dense state when subjected to seismic shear waves compact in place, similar to being compacted with a vibratory roller. The energy of the seismic event reorganizes the grains to a more dense state and subsequently causes a reduction in the overall volume resulting in a settlement of the soils. Primary factors that can trigger liquefaction are moderate to strong ground shaking, relative clean and loose granular soils, and saturated soil conditions. Liquefaction is generally limited to the upper 50 feet of ground surface due to the increasing overburden pressure with depth.

The liquefaction evaluation was performed for the proposed structure using the subsurface soil and groundwater conditions discussed in Sections 6.2 and 6.3. As discussed previously, the project site is generally underlain by silty sand and silt and no groundwater was encountered during the subsurface investigation. Regionally, groundwater is typically deeper than 350 feet below ground surface, therefore the upper 350 feet of material may only be saturated during rain events. Due to the general lack of groundwater within the upper 50 ft of the site the liquefaction potential was determined to be negligible at the project site under the extreme seismic event discussed in section 9.4.

A dry dynamic settlement analysis was performed to better quantify the potential of settlement of the unsaturated granular soils. The results of the dry dynamic settlement analysis indicates the site soils will settle up to approximately 0.25 inches when subjected to the design earthquake event. Copies of the dry dynamic settlement are included in Appendix V.2.

10 AS-BUILT FOUNDATION DATA

The available Bridge Inspection Reports and as-builts for the existing Jacalitos Creek Bridge on Lost Hills Road were reviewed as part of this study. The existing bridge is a five span structure consisting of two structure types. The original three spans consist of simply supported untreated Douglas Fir stringers with a cast in place reinforced concrete deck supported by reinforced concrete five-column bents and a reinforced concrete strutted abutment. The bridge was lengthened by means of an additional two span cast-in-place reinforced concrete flat slab deck supported on reinforced three-column pile extension bents with a reinforced concrete diaphragm

abutment. Abutment 1 is founded on driven steel H-section piles, Bent 2 and 3 on precast-prestressed concrete piles, Bents 4 and 5 on spread footings, and Abutment 6 on spread footings.

Support	Foundation Type	Bottom of Footing Elev. (feet)	Min Pile Tip Elev. (feet)
Abutment 1	Spread Footing	660 (estimate)	
Bent 2	Spread Footing	660 (estimate)	
Bent 3	Spread Footing	660 (estimate)	
Bent 4	10x84 HS Pile		634.00 (estimate)
Bent 5	10x84 HS Pile		633.70
Abutment 6	10x84 HS Pile		639.59

Note: Abutment 1, and Bents 2 through 3 footing elevations not provided on as-built plans. Bent 4 elevations are blurred on available as-built drawing and minimum embedment value is assumed.

From our geotechnical soil exploration, it appears that all current substructure foundations are bearing directly on the native dense silty to clayey sands.

Copies of the available plans of the existing bridge are attached to this report in Appendix II.

11 FOUNDATION RECOMMENDATIONS

The soils encountered in the four soils borings performed within the proposed structure limits dictate that the proposed substructures should be supported on deep foundations. The site-specific field investigation generally encountered medium dense to very dense silty sand (SM) to clayey sand (SC) with layers of gravel (GW-GM) and clay (CL). Typically in these types of soils cast in drilled hole (CIDH) piles are the most cost effective pile type. Heavy section driven steel piles are an acceptable alternative, but difficult driving conditions are likely. Based upon discussions with TYL, the preferred pile type is Cast-In-Drilled-Hole (CIDH) piling.

Foundation design recommendations for the Jacalitos Creek Bridge were determined using the 2012 AASHTO LRFD Bridge Design Specification (BDS) with Caltrans Amendments as required by the current Caltrans design policy. The recommendations are presented in the following discussions.

11.1 Foundation Data and Loading

Based upon the information provided by T.Y. Lin and the previous phase work, all supports will be supported on deep foundations. Foundation data and loading were provided by T.Y. Lin electronically on May 10, 2016 and are reproduced in Tables 6, 7, 8, and 9. Two alternative bridge designs are being considered at this time, and the analysis for each is presented in Sections 11.2.1 and 11.2.2.

Table 6. Pile Foundation Design Data – Alternative 1

Support No.	Design Method	Pile Type	FG Elev (ft)	Cut-off Elev (ft)	Pile Cap Size (ft)		Allowable Settlement under Service Load (in)	Number of Piles per Support
					Width	Length		
Abut1	LRFD	24” CIDH	658	654.75	12	36	1	10
Bent 2	LRFD	72” CIDH	658	656	-	-	1	2
Bent 3	LRFD	72” CIDH	658	656	-	-	1	2
Abut 3	LRFD	24” CIDH	658	654.75	12	36	1	10
Notes: Foundation data and loading for the piled abutment foundations provided by T.Y. Lin International electronically on May 10, 2016.								

Table 7. Pile Foundation Design Loads – Alternative 1

Support No.	Service I - Limit State (kip)		Strength Limit State (Controlling Group) (kip)				Extreme Event Limit State (kip) (Controlling Group, Kips)			
	Total Load	Perm Load	Compression		Tension		Compression		Tension	
	Per Support	Per Support	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Abut1	805	653	1321	195	N/A	N/A	-	-	-	-
Bent 2	803	492	1154	612	N/A	N/A	N/A	706	N/A	-214
Bent 3	802	494	1151	609	N/A	N/A	N/A	696	N/A	-204
Abut 3	819	668	1339	197	N/A	N/A	-	-	-	-
Notes: Foundation data and loading for the piled abutment foundations provided by T.Y. Lin International electronically on May 10, 2016.										

Table 8. Pile Foundation Design Data – Alternative 2

Support No.	Design Method	Pile Type	FG Elev (ft)	Cut-off Elev (ft)	Pile Cap Size (ft)		Allowable Settlement under Service Load (in)	Number of Piles per Support
					Width	Length		
Abut1	LRFD	24” CIDH	658	654.75	12	36	1	10
Bent 2	LRFD	72” CIDH	658	656	-	-	1	2
Bent 3	LRFD	72” CIDH	658	656	-	-	1	2
Abut 3	LRFD	24” CIDH	658	654.75	12	36	1	10
Notes: Foundation data and loading for the piled abutment foundations provided by T.Y. Lin International electronically on May 10, 2016.								

Table 9. Pile Foundation Design Loads – Alternative 2

Support No.	Service I - Limit State (kip)		Strength Limit State (Controlling Group) (kip)				Extreme Event Limit State (kip) (Controlling Group, Kips)			
	Total Load	Perm Load	Compression		Tension		Compression		Tension	
	Per Support	Per Support	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile	Per Support	Max Per Pile
Abut1	763	607	1270	187	N/A	N/A	-	-	-	-
Bent 2	1018	668	1484	757	N/A	N/A	N/A	706	N/A	-220
Bent 3	1020	667	1483	756	N/A	N/A	N/A	696	N/A	-220
Abut 3	810	653	1332	194	N/A	N/A	-	-	-	-

Notes: Foundation data and loading for the piled abutment foundations provided by T.Y. Lin International electronically on May 10, 2016.

11.2 Deep Foundations

11.2.1 Alternative 1

Full pile capacity analyses were performed for two alternative designs proposed by T.Y. Lin. Design Alternative 2 represents a larger structure, with longer spans between the abutments and bents, than Design Alternative 1.

The CIDH axial pile capacity analyses were performed using the pile analysis software, SHAFT 2012 by Ensoft, Inc., following the Federal Highway Administration (FHWA) Drilled Shafts Construction Procedures and LRFD Design Methods Manual. The design groundwater elevation for the static design capacity was set at the historic groundwater depth of Elevation 354 feet, as stated in Section 6.3.

The following table provides the required pile loadings and specified tip elevations for service limit, strength limit, and extreme event states:

Table 10. Foundation Design Recommendations – Alternative 1

Location	Pile Type	Cutoff Elevation (ft)	Service-I Limit State Load per Support (kips)		Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance (kips)				Design Tip Elevation (ft)	Specified Tip Elevation (ft)
						Strength/Construction		Extreme Event			
			Total	Permanent		Comp. (φ=0.70)	Tension (φ=0.70)	Comp. (φ=1.0)	Tension (φ=1.0)		
Abutment 1	24" Diameter CIDH Pile	654.75	195	N/A	1	187	N/A	--	--	613.75 (a-I) 647.75 (c) 624.75 (d)	613.75
Bent 2	72" Diameter CIDH Pile	656	612	N/A	1	757	N/A	706	-220	614 (a-I) 619 (a-II) 637 (b-II) 637 (c) 586 (d)	586
Bent 3	72" Diameter CIDH Pile	656	609	N/A	1	756	N/A	696	-220	614 (a-I) 619 (a-II) 637 (b-II) 637 (c) 586 (d)	586
Abutment 4	24" Diameter CIDH Pile	654.75	197	N/A	1	194	N/A	--	--	613.75 (a-I), 647.75 (c) 624.75 (d)	613.75

Notes:
1. Design tip elevations are controlled by (a-I) Compression (Strength Limit), (b-I) Tension (Strength Limit), (a-II) Compression (Extreme Event), (b-II) Tension (Extreme Event) (c) Settlement, (d) Lateral Load.
2. The CIDH Specified Tip Elevation shall not be raised.

The CIDH pile lateral capacity analysis was performed using Ensoft's computer program LPile version 2013.7.07 to predict how the foundation soils at the bridge site deform and deflect in response to lateral load. The soil is modeled using lateral load-transfer and deformation curves (p-y curves) for the proposed project site.

The following table provide the lateral forces required to induce ¼-inch, ½-inch, ¾-inch and 1-inch of lateral movement at the pile head as well as the depth to and magnitude of the maximum bending moment.

Table 11. Free Head Lateral Pile Data Table for Alternative 1

Abut 1		**Lateral Load at Pile Head Deflection (kips)**			
		0.25 in	0.5 in	0.75 in	1 in
Free Head	Lateral Load (kips)	30	40	47	54
	Maximum Bending Moment (kips-in)	1400	2000	2400	2700
	Depth to Maximum Bending Moment from Pile Head (feet)	6	6	6	6
Bent 2		**Lateral Load at Pile Head Deflection (kips)**			
		0.25 in	0.5 in	0.75 in	1 in
Free Head	Lateral Load (kips)	254	365	456	527
	Maximum Bending Moment (kips-in)	23100	33900	44000	52900
	Depth to Maximum Bending Moment from Pile Head (feet)	13	12	12	13
Bent 3		**Lateral Load at Pile Head Deflection (kips)**			
		0.25 in	0.5 in	0.75 in	1 in
Free Head	Lateral Load (kips)	254	365	456	527
	Maximum Bending Moment (kips-in)	23100	33900	44000	52900
	Depth to Maximum Bending Moment from Pile Head (feet)	13	12	12	13
Abut 4		**Lateral Load at Pile Head Deflection (kips)**			
		0.25 in	0.5 in	0.75 in	1 in
Free Head	Lateral Load (kips)	30	40	47	54
	Maximum Bending Moment (kips-in)	1400	2000	2400	2700
	Depth to Maximum Bending Moment from Pile Head (feet)	6	6	6	6

Notes:
1. The maximum bending moments is based off of the governing maximum bending moment pertaining to the leading row.
2. Free head loading condition was used to calculate the lateral capacities.

The lateral resistance values published in Table 11 should only be applied to the leading edge pile in a footing, where the piles are spaced a minimum of five pile diameters (5D) perpendicular to the direction of the loading at the abutments. A reduction value for all trailing piles has been determined from the P-Multiplier Coefficients, P_m, from LRFD Caltrans Amendments Section 10.7.2.4 for determination of the total resistance of the piled footing. The reduction factors for longitudinal and transverse loading are included in Table 12. Copies of the lateral pile analyses, which include sample calculations and a schematic of the load orientation, are included in Appendix V.3 of this report.

Table 12. Calculated P-Multipliers for Alternative 1

Support Location	Pile Type/Size	Transverse Pile Spacing	Group Reduction Factor Transverse Loading	Longitudinal Pile Spacing	Group Reduction Factor Longitudinal Loading
Abut 1	24" CIDH	3.75B	0.55	3.00B	0.63
Bent 2	72" CIDH	3.58B	0.82	-	0.96
Bent 3	72" CIDH	3.67B	0.83	-	0.97
Abut 4	24" CIDH	3.75B	0.55	3.00B	0.63

Notes:
1. Group Reduction Factors are based on pile center-to-center (CTC) and number of pile rows (LRFD Caltrans Amendments Section 10.7.2.4).

In addition to the lateral resistance provided by the piles, passive earth pressure over the leading edge of the footing at the abutments may also be counted on to resist lateral demands. Based upon the borings, the soils in which the footings are to be placed are dense silty sands. In order to mobilize this passive resistance concurrently with the lateral pile resistances, the footing must be either cast neat against undisturbed soil or the disturbed soil from the bottom of the footing up to finished grade compacted to a minimum of 95-percent of the total unit weight as determined by CTM 216 or ASTM D1557.

Using the information obtained from the subsurface investigation and the loading demands provided by T.Y. Lin, the following table provides the design pile tip elevations for the abutment and bent foundations.

Table 13. Pile Data Table for Alternative 1

Location	Pile Type	Pile Cutoff Elevation (ft)	Nominal Resistance (kips)		Design Tip Elevation (ft)	Specified Tip Elevation (ft)
			Compression	Tension		
Abut 1	24" Diameter CIDH	654.75	270	N/A	613.75 (a) 647.75 (c) 624.75 (d)	613.75
Bent 2	72" Diameter CIDH	656	1090	-220	614 (a) 637 (b) 637 (c) 586 (d)	586
Bent 3	72" Diameter CIDH	656	1080	-220	614 (a) 637 (c) 586 (d)	586
Abut 4	24" Diameter CIDH	654.75	280	N/A	613.75 (a) 647.75 (c) 624.75 (d)	613.75

Notes:
1. Design tip elevations are controlled by (a) Compression, (b) Tension, (c) Settlement, (d) Lateral Load.
2. The CIDH Specified Tip Elevation shall not be raised.

11.2.2 Alternative 2

The following table provides the required pile loadings and specified tip elevations for service limit, strength limit, and extreme event states:

Table 14. Foundation Design Recommendations – Alternative 2

Foundation Design Recommendations											
Support Location	Pile Type	Cut-off Elevation (ft)	Service-I Limit State Loads per Support (kips)		Total Permissible Support Settlement (inches)	Required Factored Nominal Resistance per Pile (kips)				Design Tip Elevation (ft)	Specified Tip Elevation (ft)
						Strength/Construction		Extreme Event			
			Total	Permanent		Comp (φ = 0.7)	Tension (φ = 0.7)	Comp (φ = 1.0)	Tension (φ = 1.0)		
Abut 1	24" CIDH	654.75	763	607	1	187	N/A	-	-	614 (a-I), 648 (c), 625 (d)	614
Bent 2	72" CIDH	656	1018	668	1	757	N/A	896	-220	608 (a-I), 613 (a-II), 637 (b-II), 633 (c), 586 (d)	586
Bent 3	72" CIDH	656	1020	667	1	756	N/A	896	-220	608 (a-I), 613 (a-II), 637 (b-II), 633 (c), 586 (d)	586
Abut 4	24" CIDH	654.75	810	653	1	194	N/A	-	-	614 (a-I), 648 (c), 625 (d)	614

Notes:
1. Design tip elevations are controlled by (a-I) Compression (Strength Limit), (b-I) Tension (Strength Limit), (a-II) Compression (Extreme Event), (b-II) Tension (Extreme Event) (c) Settlement, (d) Lateral Load.
2. The CIDH Specified Tip Elevation shall not be raised.

The following table provide the lateral forces required to induce ¼-inch, ½-inch, ¾-inch and 1-inch of lateral movement at the pile head as well as the depth to and magnitude of the maximum bending moment.

Table 15. Free Head Lateral Pile Data Table for Alternative 2

Abut 1		Lateral Load at Pile Head Deflection (kips)			
		0.25 in	0.5 in	0.75 in	1 in
Free Head	Lateral Load (kips)	30	40	47	54
	Maximum Bending Moment (kips-in)	1400	2000	2400	2700
	Depth to Maximum Bending Moment from Pile Head (feet)	6	6	6	6
Bent 2		Lateral Load at Pile Head Deflection (kips)			
		0.25 in	0.5 in	0.75 in	1 in
Free Head	Lateral Load (kips)	267	382	469	543
	Maximum Bending Moment (kips-in)	24700	35900	46300	55300
	Depth to Maximum Bending Moment from Pile Head (feet)	13	12	12	13
Bent 3		Lateral Load at Pile Head Deflection (kips)			
		0.25 in	0.5 in	0.75 in	1 in
Free Head	Lateral Load (kips)	267	382	469	543
	Maximum Bending Moment (kips-in)	24700	35900	46300	55300
	Depth to Maximum Bending Moment from Pile Head (feet)	13	12	12	13
Abut 4		Lateral Load at Pile Head Deflection (kips)			
		0.25 in	0.5 in	0.75 in	1 in
Free Head	Lateral Load (kips)	30	40	47	54
	Maximum Bending Moment (kips-in)	1400	2000	2400	2700
	Depth to Maximum Bending Moment from Pile Head (feet)	6	6	6	6

Notes:
1. The maximum bending moments is based off of the governing maximum bending moment pertaining to the leading row.
2. Free head loading condition was used to calculate the lateral capacities.

The lateral resistance values published in Table 15 should only be applied to the leading edge pile in a footing, where the piles are spaced a minimum of five pile diameters (5D) perpendicular to the direction of the loading at the abutments. A reduction value for all trailing piles has been determined from the P-Multiplier Coefficients, P_m, from LRFD Caltrans Amendments Section 10.7.2.4 for determination of the total resistance of the piled footing. The reduction factors for longitudinal and transverse loading are included in Table 16. Copies of the lateral pile analyses, which include sample calculations and a schematic of the load orientation, are included in Appendix V.3 of this report.

Table 16. Calculated P-Multipliers for Alternative 2

Support Location	Pile Type/Size	Transverse Pile Spacing	Group Reduction Factor Transverse Loading	Longitudinal Pile Spacing	Group Reduction Factor Longitudinal Loading
Abut 1	24" CIDH	3.75B	0.55	3.00B	0.63
Bent 2	72" CIDH	3.00B	0.75	-	0.90
Bent 3	72" CIDH	3.00B	0.75	-	0.90
Abut 4	24" CIDH	3.75B	0.55	3.00B	0.63

Notes:
1. Group Reduction Factors are based on pile center-to-center (CTC) and number of pile rows (LRFD Caltrans Amendments Section 10.7.2.4).

In addition to the lateral resistance provided by the piles, passive earth pressure over the leading edge of the footing at the abutments may also be counted on to resist lateral demands. Based upon the borings, the soils in which the footings are to be placed are dense silty sands. In order to mobilize this passive resistance concurrently with the lateral pile resistances, the footing must be either cast neat against undisturbed soil or the disturbed soil from the bottom of the footing up to finished grade compacted to a minimum of 95-percent of the total unit weight as determined by CTM 216 or ASTM D1557.

Using the information obtained from the subsurface investigation and the loading demands provided by T.Y. Lin, the following table provides the design pile tip elevations for the abutment and bent foundations.

Table 17. Pile Data Table for Alternative 2

Location	**Pile Type**	**Pile Cutoff Elevation (ft)**	**Nominal Resistance (kips)**		**Design Tip Elevation (ft)**	**Specified Tip Elevation (ft)**
			Compression	**Tension**		
Abut 1	24" Diameter CIDH	654.75	270	N/A	614 (a-I), 648 (c), 625 (d)	614
Bent 2	72" Diameter CIDH	656	1080	-220	608 (a-I), 613 (a-II), 637 (b-II), 633 (c), 586 (d)	586
Bent 3	72" Diameter CIDH	656	1080	-220	608 (a-I), 613 (a-II), 637 (b-II), 633 (c), 586 (d)	586
Abut 4	24" Diameter CIDH	654.75	280	N/A	614 (a-I), 648 (c), 625 (d)	614

11.3 Approach Fill Earthwork

The approaches are not anticipated to be significantly raised above existing profile. No appreciable settlement will result from the placement of this minor additional fill material.

In order to place this new approach fill material for work associated with the bridge replacement, all asphalt concrete pavement should be either completely removed or pulverized in place and compacted prior to the placement of the new fill material. The existing roadway fill slopes should be completely cleared and grubbed of all plant and organic matter and have keyways cut into the existing slope faces in accordance with Section 19 Earthwork of the Caltrans Standard Specifications 2015 Edition (or latest edition).

Prior to grading for the planned approach fill, trash, debris, and vegetation should be removed from the work areas to receive new fill material. Depressions left by any such removal should be backfilled in accordance with the Standard Specifications or recommendations made in this report. Loose or soft soil identified during grading operations should be removed from within the embankment footprint and a firm subgrade should be exposed prior to placing new fill material. It is not expected that materials generated from new cuts and/or excavations will meet the requirements for structure backfill for the project and therefore, imported fill material will be required.

12 PAVEMENT RECOMMENDATIONS

12.1 Subgrade Values

The R-value testing results show the native subgrade soils are competent with a tested R-value equal to 66 which is reasonable for the description of the fill material identified in the borings. Caltrans recommends limiting design to R-value of 50. Based on the testing and the Caltrans guidance the design R-value was set to 50 to determine the new pavement sections.

12.2 Recommended New Structural Pavement Sections

New structural pavement sections will be constructed for the Bridge and its approaches. The following table, Table 9, provides the design Traffic Indices' (TI) design R-value, and structural pavement Hot Mix Asphalt (HMA) and Class 2 Aggregate Base (AB) thicknesses.

Table 18. New HMA-AB Flexible Structural Pavement Sections (R=50)

Design TI	Design R-value	HMA Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
5.5	50	3"	5"
6.0	50	4"	5"

Design TI	Design R-value	HMA Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
6.5	50	5”	5”
7.0	50	5”	5”
Notes: TI = Traffic Index; HMA = Hot Mix Asphalt;			

Pavement design and construction should conform to the requirements of the Caltrans *Standard Specifications, 2015 edition*. All import fill used below the new pavement sections should possess an R-value equivalent or greater than the design R-value (minimum R-Value of 50). All trench backfill for utilities and pipes underlying paved areas should be properly placed and compacted to at least 95 percent compaction (ASTM D1557 or ASTM D1557 or CTM 216) to provide a stable pavement subgrade. The upper 30 inches of all pavement subgrades should be moisture conditioned and compacted to at least 95 percent relative compaction (ASTM D1557 or CTM 216), per Caltrans Standard Specifications.

Copies of the structural pavement calculations are included in Appendix V.4.

13 CONSTRUCTION CONSIDERATIONS

All excavation and backfill work shall be performed in accordance with Section 19, Earthwork, of Caltrans’ Standard Specifications (2015 or latest edition).

13.1 Existing Structures

The proposed bridge will replace an existing bridge on the same basic alignment. Removal of the existing bridge may cause disturbance to site soils. Disturbed soils should be excavated and replaced with compacted fill (minimum 95% relative compaction per CTM 216). The proposed may affect the Jacalitos Creek Drive which is located immediately south of the existing bridge. Construction activities could potentially affect this roadway and the contractor should be aware of and implement protections this roadway.

13.2 Existing Utilities

The only identified utility at the project site is an underground AT&T communication line that runs diagonally across Lost Hills Road at the intersection with Jacalitos Creek Road. Other underground existing utilities may be present within the project area that may need to be temporarily moved or relocated.

13.3 Excavation and Shoring

All of the borings were advanced to their completion depths through the alluvial soils and existing fills without difficulty, except for Boring A-15-112 where cobbles were observed in the drill cuttings at approximately elevation 341. The contractor should be aware that cobbles could be present at shallower and deeper elevations and mobilize equipment capable of excavating cobbles during site construction activities.

The existing site soils can be classified as Cal OSHA Type C and may be prone to cave-in during construction activities. The site excavations will need benching, shoring, or laying back during construction. Design and construction of excavation sloping and shoring is the responsibility of the contractor and should be in accordance with Cal OSHA requirements.

If temporary excavations are required for construction, temporary slopes may be cut at a maximum inclination of 1.5H:1V or be supported in accordance with Cal OSHA recommendations for a Type C soil. Cuts below groundwater are not anticipated.

Due to the granular nature of the near-surface soils and possible fill materials, raveling of temporary cut slopes should be anticipated. Temporary erosion control measures, such as a flash coating, may be required for excavations open for extended periods. It is also the contractor's responsibility to assess the actual conditions in the field at the time of construction and to make its own interpretation of the Cal OSHA soil/rock type for design of the excavation and trench slopes or the need for excavation shoring.

13.4 Groundwater and Seepage

Groundwater was not encountered in the borings drilled at the site. However, the contractor should be prepared to dewater the excavations for the abutment and bent footings that may be due to any surface water infiltration. Measures such as berms and diversion ditches should be incorporated to prevent surface water from irrigation and storm water runoff from entering the excavations.

If needed, to provide a good working platform in which to place the footing concrete, the bottom of footings can be over excavated a minimum of 12-inches and Class 2 aggregate base (AB) placed up to the bottom of footing elevation, moisture conditioned, and compacted to minimum of 95-percent of the maximum dry density as determined by CTM 216. This base material will provide a clean, dry working platform in which to place the footing concrete.

13.5 Drilled Foundations

Difficulties in cast-in-drilled-hole foundation excavations are anticipated due to the following:

- Presence of dense granular soils including cobbles;
- Presence of caving granular soils; and
- Presence of utilities, potentially disturbed soil and/or construction debris from removal of existing structure.

Based upon the boring information, the borings were generally advanced through the encountered soils without difficulty using hollow-stem auger drilling equipment, though cobbles

were encountered. Boring A-16-01 encountered refusal on cobbles (boring A-16-01A) and was moved and redrilled (A-16-01B) without difficulty. The as-built LOTB for the existing bridge reported numerous cobbles in boring B-3. Generally, if the soils can be drilled with hollow-stem augers the excavations for substructures can be performed with standard heavy hydraulic excavation equipment. All excavation and backfill work shall be performed in accordance with *Section 19, Earthwork, of the State of California Department of Transportation Standard Specifications (2015).*

For the CIDH pile construction methods and means, the drilling contractor should review the boring logs to assess the excavation methods and equipment required to complete the excavation at this site. The CIDH pile excavation should be observed by an experienced geotechnical engineer to evaluate the suitability of the bearing material. Adjacent CIDH piles should not be constructed on the same day.

Based on the subsurface conditions encountered at the site, water seepage is likely to not be encountered during dry season (May to November) or to be restricted to isolated perched groundwater zones. Therefore, "wet" excavation methods will likely not be required to control seepage. Loose/medium dense sands which have the high probability of caving were encountered and may require the use of a full length segmental temporary casing to maintain a stable hole.

In order to perform the CIDH pile excavations using dry methods, the excavations should meet the following requirements:

- Have less than 6 inches of water accumulation over a one-hour period when no pumping is performed
- The sides and bottom of the excavation should remain stable during and after excavation.
- All loose material and water can be satisfactorily removed from the bottom of the excavation before inspection and concrete placement.

All shafts completed in the dry should be observed by the geotechnical engineer to evaluate the suitability of the bearing materials. The contractor should use the "wet" construction method if the above criteria cannot be satisfied.

If the CIDH piles are installed using wet methods (i.e., using drilling slurry to maintain excavation stability), we recommend that a minimum of 4 inspection tubes be installed within each of the CIDH piles to facilitate gamma-gamma and cross-hole sonic logging at completion of the pile. The contractor should also prevent the slurry from "setting up", control the sand content of the slurry to less than 4 percent by volume at any point in the excavation and maintain the slurry level a minimum of 10 feet above the highest expected piezometric head surface or tremie bottom, whichever is greater. At no time shall a CIDH pile excavation be left open or with slurry overnight. All piles excavated within one 8 hour work shift shall have concrete placed within that same 8 hour work shift.

To minimize disturbance to the bearing surfaces caused by ponding of water, it is recommended that concrete be placed the same day that the drilled shafts are completed. The bottom of the

drilled shaft excavation should be cleaned of water and loose material before placing reinforcing steel and concrete. Concrete placement should be continuous from the bottom to the top elevation of the shaft. For dry excavations, concrete can be placed by either tremie or free fall methods, however we recommend tremie placement for both wet and dry to prevent concrete aggregate separation. Wet excavated CIDH piles however will require concrete placement using tremie methods. The tremie pipe should be clean and have a suitable inside diameter for use with the specific concrete mix, but not less than 10 inches. The discharge end of the tremie should allow free radial flow of the concrete and be immersed at least 10 feet in concrete and maintain a positive pressure differential at all times during placement to prevent water or slurry intrusion.

If a full length segmental temporary casing is used, the bottom of the casing should have a minimum of 10 feet of concrete head at all times when removing the temporary segmental casing to help prevent the formation of a soil intrusion or other defect in the CIDH pile concrete.

Any materials which are generated from the grading operations and not used for fill within the project limits will need to be disposed of off-site. The Contractor shall make arrangements for disposing of the materials outside the highway right of way and shall pay all costs involved.

As no significant hazardous wastes have been identified at the time of this report and there is no reason to expect the site soils to be contaminated. One way to dispose of excess materials is to use it as daily landfill cover. Another is to use the organic materials as landscaping or farm field cover. Agreements should be in place with the receiving location/entity prior to using these methods of material disposal.

The site soils identified in the borings are most similar to Type C soils as defined by CalOSHA and temporary excavations can be made with 1.5:1 (H:V) or flatter side slopes.

Even though a permanent groundwater was not identified in the upper 50 feet of the soil column, it can be expected that transient and perched water may be encountered in the abutment excavations. We anticipate that this perched or transient water can be controlled by using a sump in the corner of the excavation to maintain a dry working area for concrete placement. Any water removed from the excavation will have to be temporarily stored and tested prior to being discharged to a permitted receiving facility.

14 LIMITATIONS

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

This Draft Foundation Report is intended for use with the Jacalitos Creek Bridge Replacement Project on Lost Hills Road located in the Fresno County, California, and all recommendations are solely for use for this project. Any changes in the design or location of the proposed new improvements, however slight, should be brought to our attention so that we may determine how they may affect our conclusions and recommendations. The conclusions and

recommendations contained in this report are based upon the data relating only to this specific project and locations discussed herein.

15 REPORT COPY LIST

This Draft Foundation Report was prepared for T.Y. Lin International for use in planning and design of the proposed Jacalitos Creek Bridge Replacement Project on Lost Hills Road.

16 REFERENCES

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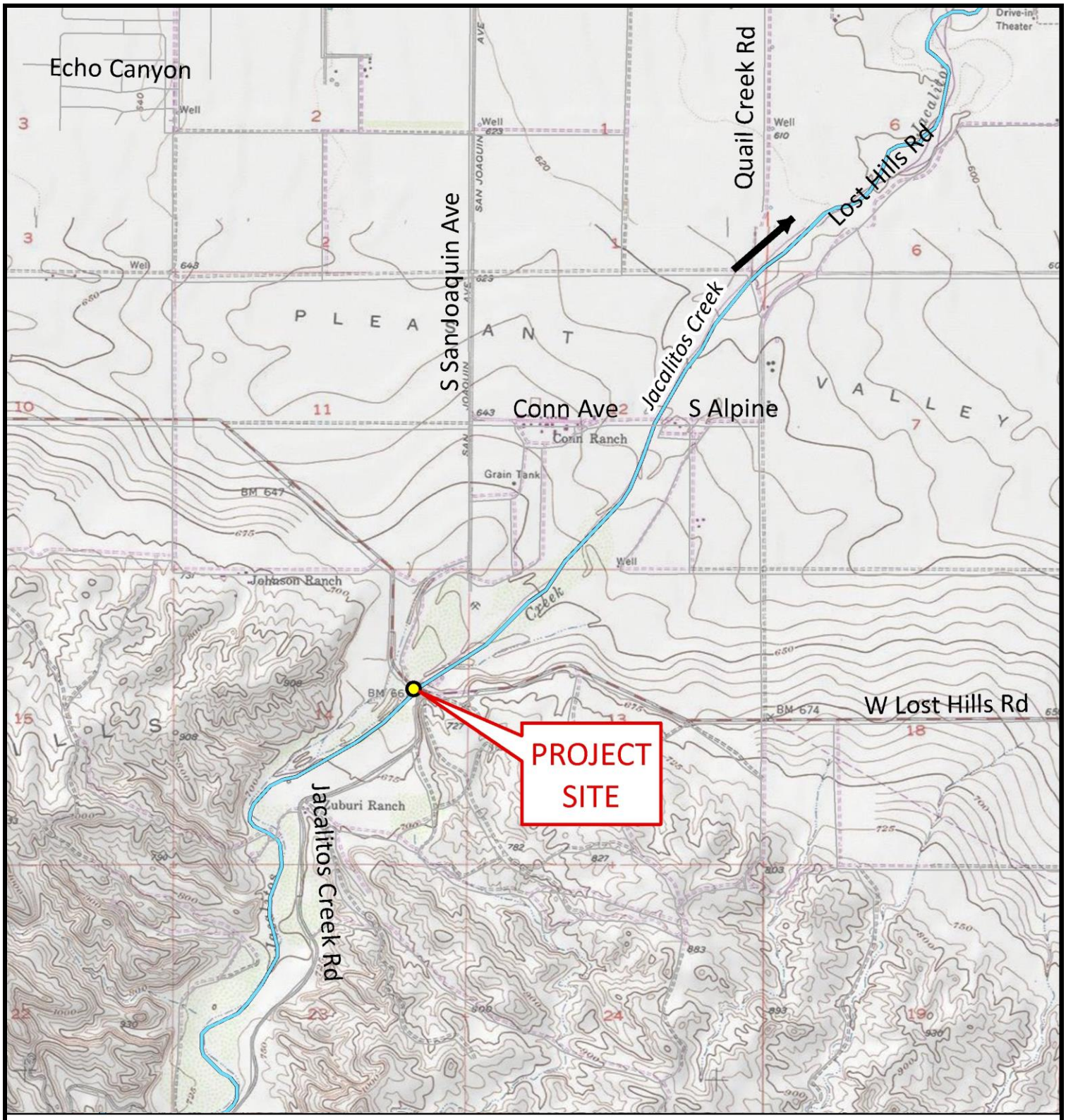
Appendix I. Site Maps



Legend

- Project Location
- Stream

0 0.15 0.3 0.6 0.9 1.2 Miles

N

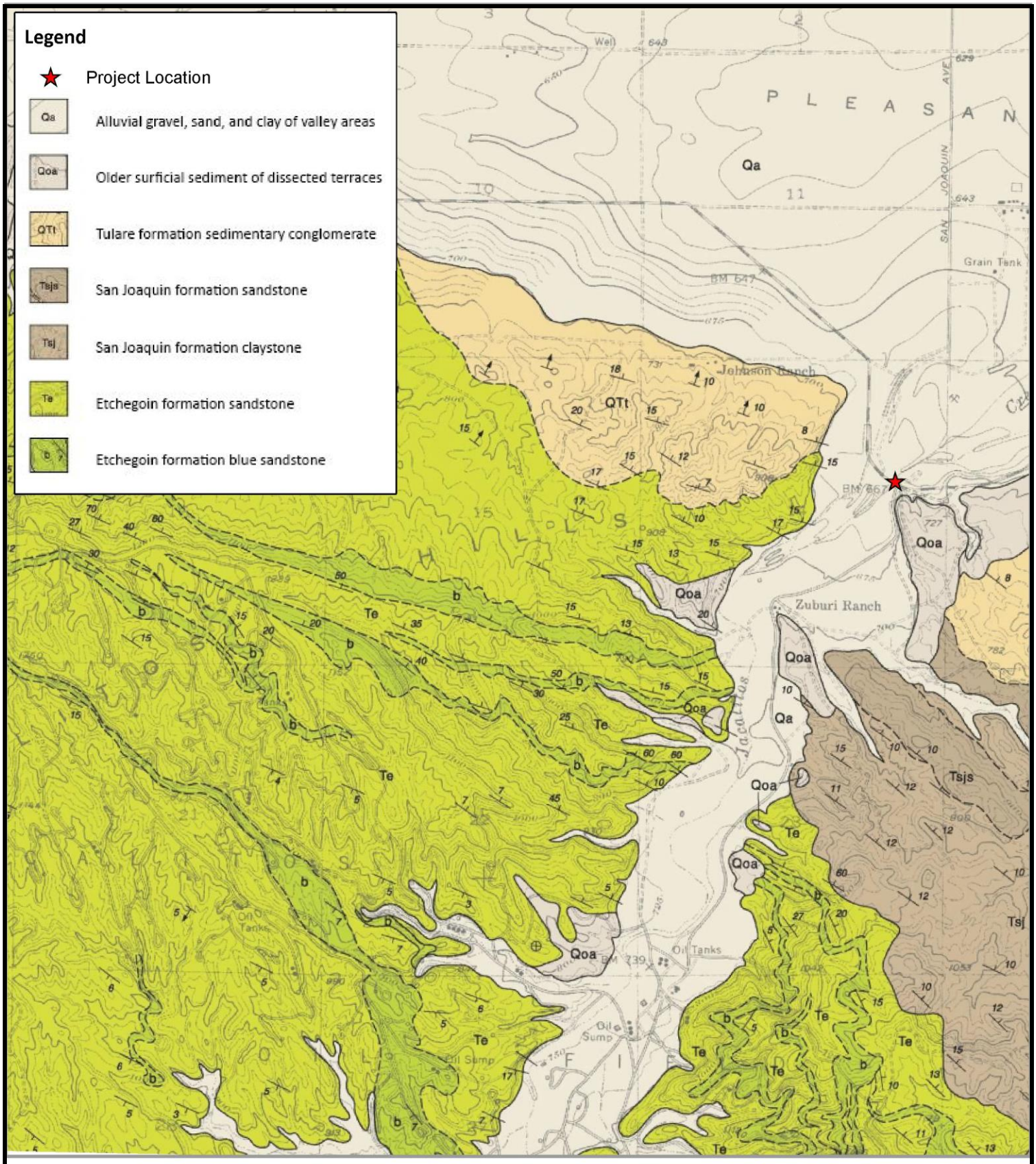
Figure 1
Vicinity Map

Jacalitos Creek Bridge Replacement on Lost Hills Road

Fresno County, California

WRECO Project No. P15033

WRECO



Geology Map

Jacalitos Creek Bridge Replacement on Lost Hills Road

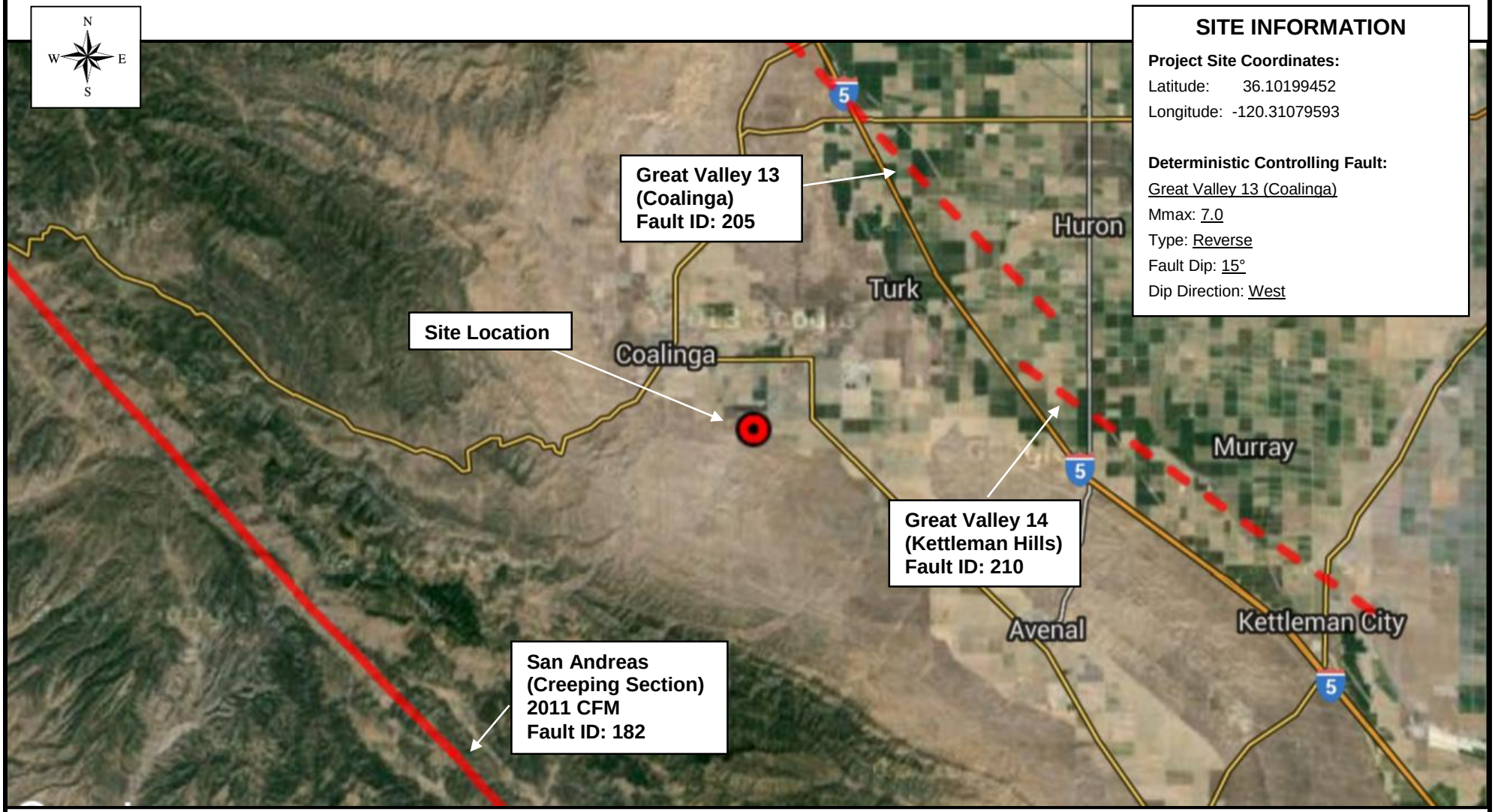
Fresno County, California

N

0 0.1 0.2 0.4 Miles

Data Sources: Basemap (c) 2010 Microsoft Corporation and its data suppliers, http//www.bing.com/maps.

WRECO



SITE INFORMATION

Project Site Coordinates:

Latitude: 36.10199452

Longitude: -120.31079593

Deterministic Controlling Fault:

Great Valley 13 (Coalinga)

Mmax: 7.0

Type: Reverse

Fault Dip: 15°

Dip Direction: West

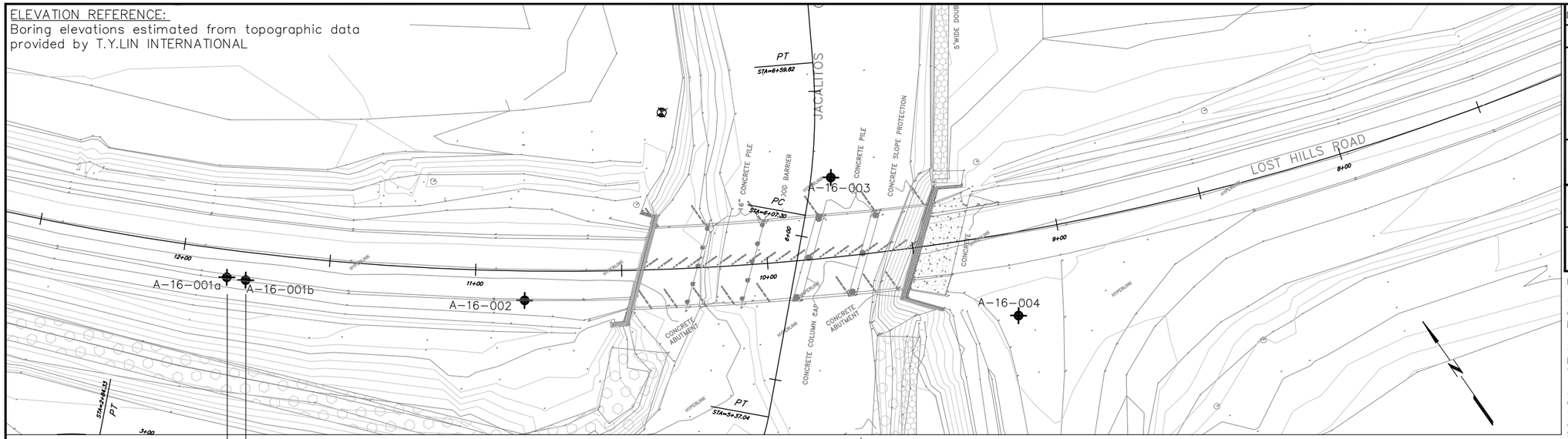
Figure 3
Quaternary Fault Map
Jacalitos Creek Bridge Replacement on Lost Hills Road
Fresno County, California
WRECO Project No. P15033

WRECO

Reference:
Caltrans, 2013, Caltrans ARS Online Version 2.3.0, Division of Engineering Services & Geotechnical Services, Division of Research & Innovations GeoResearch Group.
Accessed March 15, 2016.

Appendix II. Log of Test Borings (LOTB) & As-Built Plans

ELEVATION REFERENCE:
Boring elevations estimated from topographic data provided by T.Y.LIN INTERNATIONAL



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
06	FRE	XX			

CERTIFIELD ENGINEERING GEOLOGIST DATE

PLANS APPROVAL DATE

REGISTERED GEOLOGIST
DAVID A. KITZMANN
No. 2412
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

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ROSEVILLE, CALIFORNIA 95661 WRECO JOB NO: P15033

T.Y.LIN INTERNATIONAL
1601 RESPONSE ROAD, SUITE 260
SACRAMENTO, CA 95815

Notes:

1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010 Edition).

2. 1.4" samples were taken using a 1.375" split barrel sampler per Standard Penetration Test (SPT) performed in accordance with ASTM D 1586–11.

3. 2.5" samples (ID = 2.5", OD = 2.9") were taken using a California Modified Sampler with liners. Samples were driven in the same manner as SPT sampler. A factor of 0.67 may be applied to California Modified Sampler blow counts to estimate SPT equivalent blow count.

4. 1.4" and 2.5" samples were taken with an automated hammer system consisting of a hammer weight of 140 lbs. free falling a distance of 30". Autohammer energy ratio (ETR) measurements indicate an ETR=87%. The last 12" of an 18" drive were recovered as the blow count number required to drive the sampler.

5. The length of each sampled interval is shown graphically on the boring log. Whole number blow counts ("N") represent the "standard penetration resistance" interval in accordance with ASTM D1586–11. Where less than 1 foot of penetration is achieved, the blow count shown is for that fraction of the "standard penetration resistance" interval actually penetrated. Where indicated by an asterisk (*) the number of blows shown is for only that fraction of the initial 6" "seating drive" interval penetration. Material characteristics shown in ( ) where estimated.

6. The blow counts shown on the logs are the raw blow counts which have not been corrected for hammer energy, sample size, overburden, or any other correction factor.

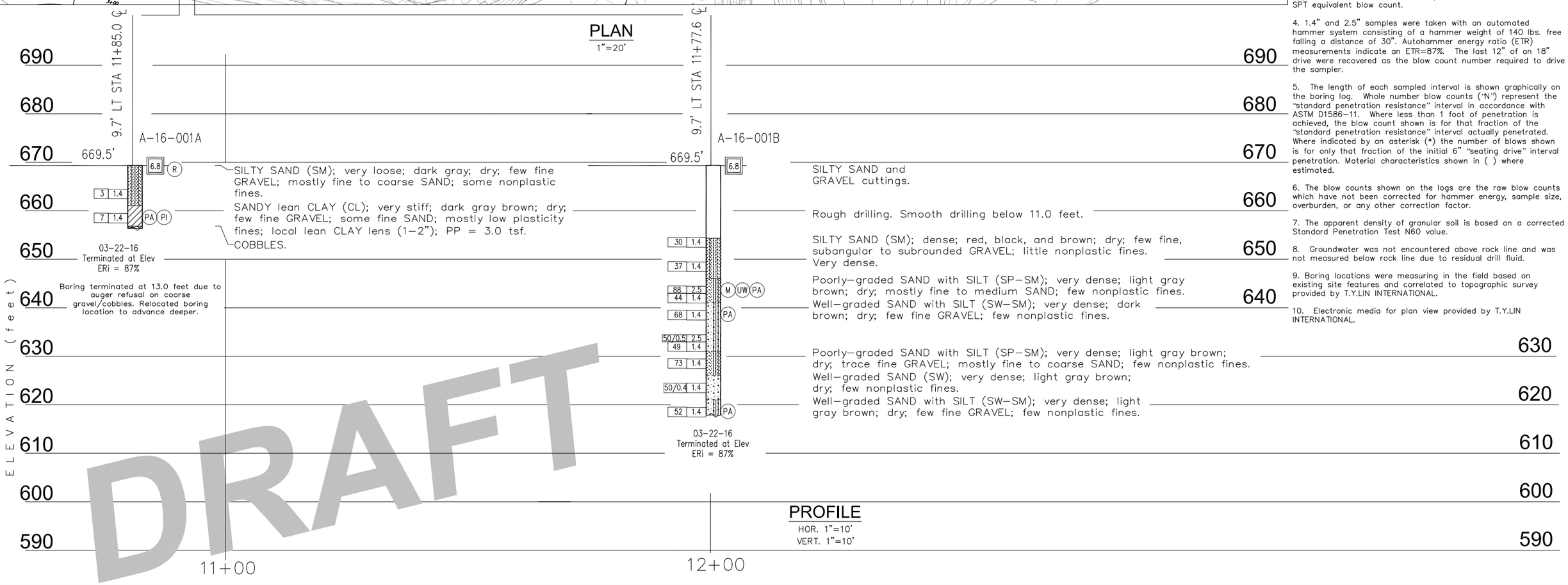
7. The apparent density of granular soil is based on a corrected Standard Penetration Test N60 value.

8. Groundwater was not encountered above rock line and was not measured below rock line due to residual drill fluid.

9. Boring locations were measuring in the field based on existing site features and correlated to topographic survey provided by T.Y.LIN INTERNATIONAL.

10. Electronic media for plan view provided by T.Y.LIN INTERNATIONAL.

PLAN
1"=20'



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

ENGINEERING SERVICES		GEOTECHNICAL SERVICES			
FUNCTIONAL SUPERVISOR: Name	DRAWN BY: D. LUKASHOV	FIELD INVESTIGATION BY: R. DOWNES	DATE: 3/22/16	PREPARED FOR THE FRESNO COUNTY DEPARTMENT OF TRANSPORTATION	XX PROJECT ENGINEER
	CHECKED BY: Name				

BRIDGE NO.	JACALITOS CREEK BRIDGE PROJECT
42C–0078	**LOG OF TEST BORINGS**
POST MILE XX.XX	

CU XXXXXX
EA XXXXXX

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES (PRELIMINARY STAGE ONLY)	SHEET	OF
	XX	XX

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

FILE => $REQUEST

P15033 LOTB.dwg 11/2/2015

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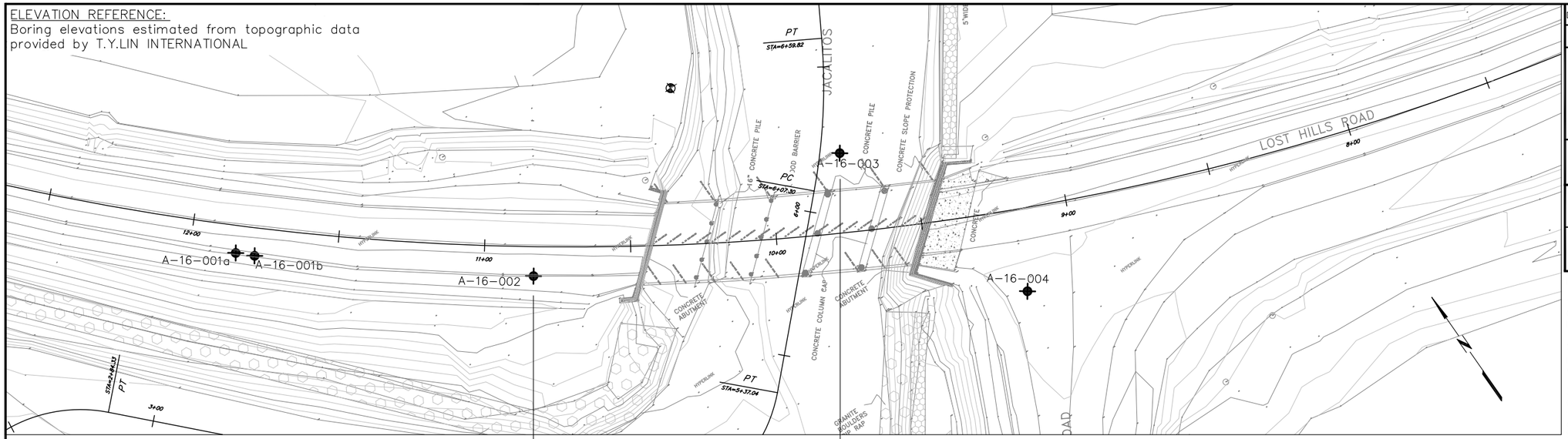
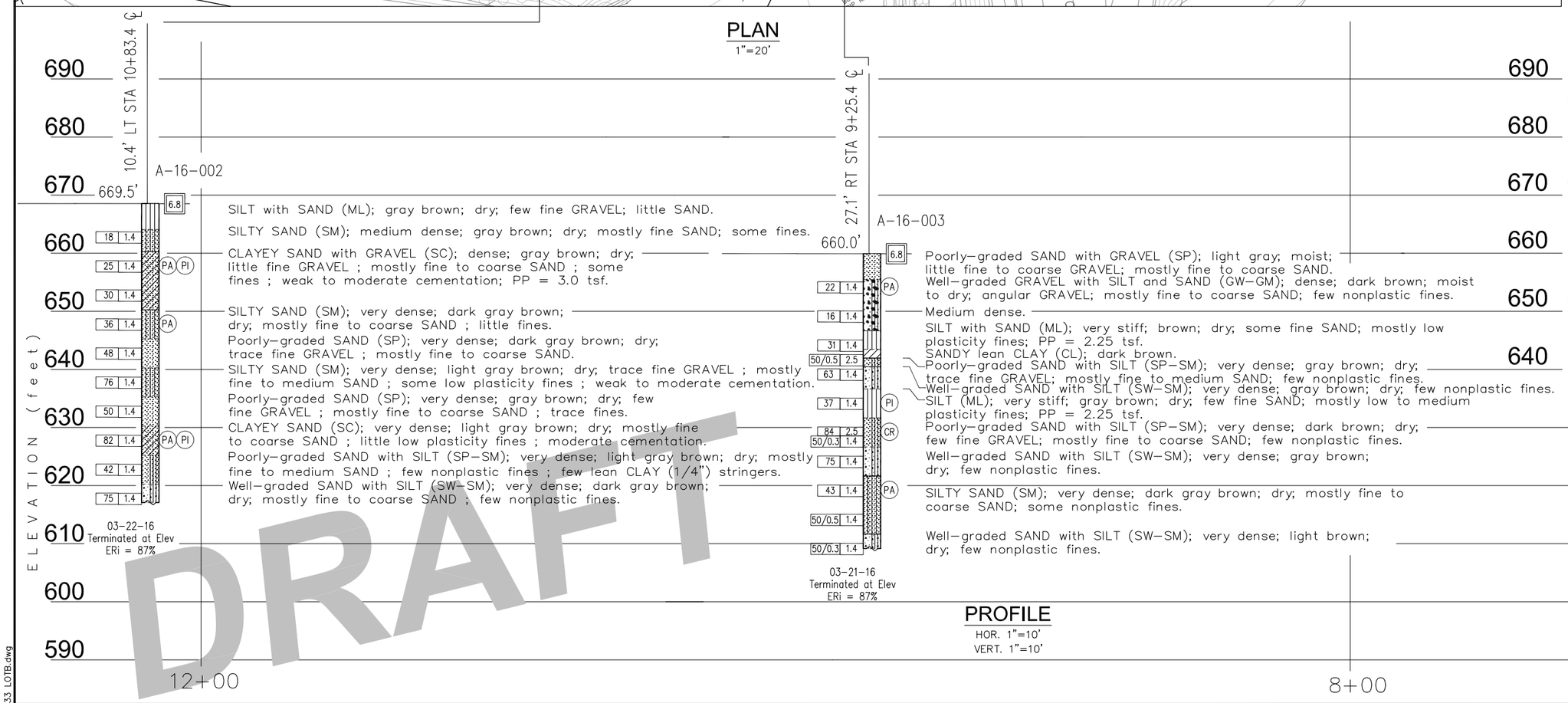
ELEVATION REFERENCE:
Boring elevations estimated from topographic data provided by T.Y.LIN INTERNATIONAL



PLAN
1"=20'



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

DRAFT

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
06	FRE	XX			

CERTIFIELD ENGINEERING GEOLOGIST DATE

PLANS APPROVAL DATE

REGISTERED GEOLOGIST
DAVID A. KITZMANN
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CERTIFIED ENGINEERING GEOLOGIST
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T.Y.LIN INTERNATIONAL
1601 RESPONSE ROAD, SUITE 260
SACRAMENTO, CA 95815

Notes:

1. Field classification of soils was in accordance with the Caltrans Soil & Rock Logging, Classification, and Presentation Manual (2010 Edition).

2. 1.4" samples were taken using a 1.375" split barrel sampler per Standard Penetration Test (SPT) performed in accordance with ASTM D 1586-11.

3. 2.5" samples (ID = 2.5", OD = 2.9") were taken using a California Modified Sampler with liners. Samples were driven in the same manner as SPT sampler. A factor of 0.67 may be applied to California Modified Sampler blow counts to estimate SPT equivalent blow count.

4. 1.4" and 2.5" samples were taken with an automated hammer system consisting of a hammer weight of 140 lbs. free falling a distance of 30". Autohammer energy ratio (ETR) measurements indicate an ETR=87%. The last 12" of an 18" drive were recovered as the blow count number required to drive the sampler.

5. The length of each sampled interval is shown graphically on the boring log. Whole number blow counts ("N") represent the "standard penetration resistance" interval in accordance with ASTM D1586-11. Where less than 1 foot of penetration is achieved, the blow count shown is for that fraction of the "standard penetration resistance" interval actually penetrated. Where indicated by an asterisk (*) the number of blows shown is for only that fraction of the initial 6" "seating drive" interval penetration. Material characteristics shown in ( ) where estimated.

6. The blow counts shown on the logs are the raw blow counts which have not been corrected for hammer energy, sample size, overburden, or any other correction factor.

7. The apparent density of granular soil is based on a corrected Standard Penetration Test N60 value.

8. Groundwater was not encountered above rock line and was not measured below rock line due to residual drill fluid.

9. Boring locations were measuring in the field based on existing site features and correlated to topographic survey provided by T.Y.LIN INTERNATIONAL.

10. Electronic media for plan view provided by T.Y.LIN INTERNATIONAL.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		PREPARED FOR THE FRESNO COUNTY DEPARTMENT OF TRANSPORTATION	XX PROJECT ENGINEER	BRIDGE NO. 42C-0078	JACALITOS CREEK BRIDGE PROJECT
FUNCTIONAL SUPERVISOR Name	DRAWN BY: D. LUKASHOV CHECKED BY: Name	FIELD INVESTIGATION BY: R. DOWNES	DATE: 3/21-22/16			POST MILE XX.XX	**LOG OF TEST BORINGS**

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU XXXXXX
EA XXXXXX

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

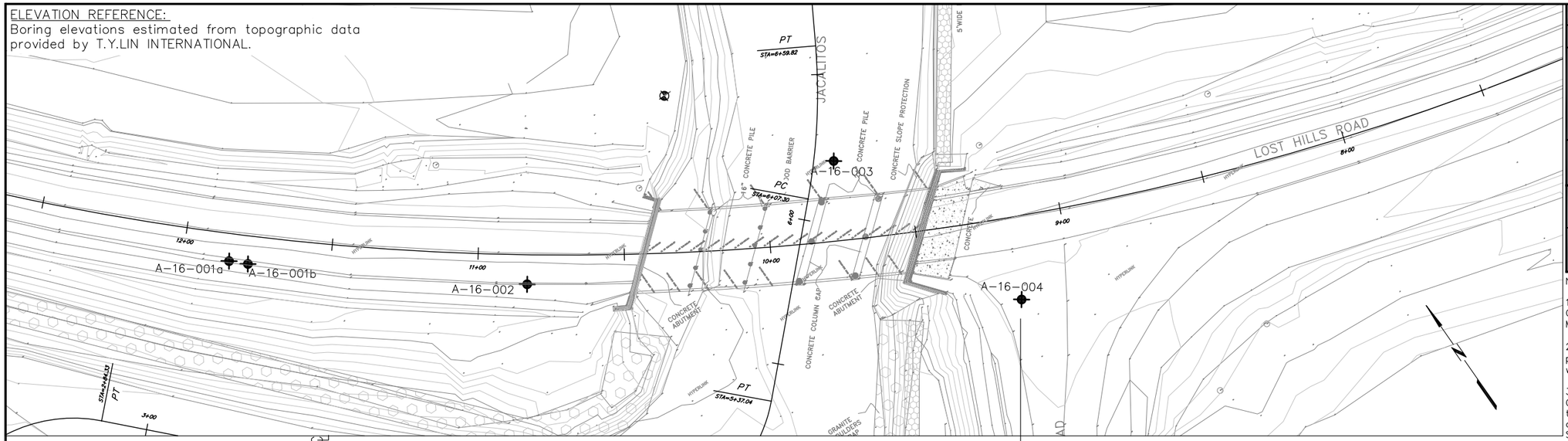
REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET XX OF XX

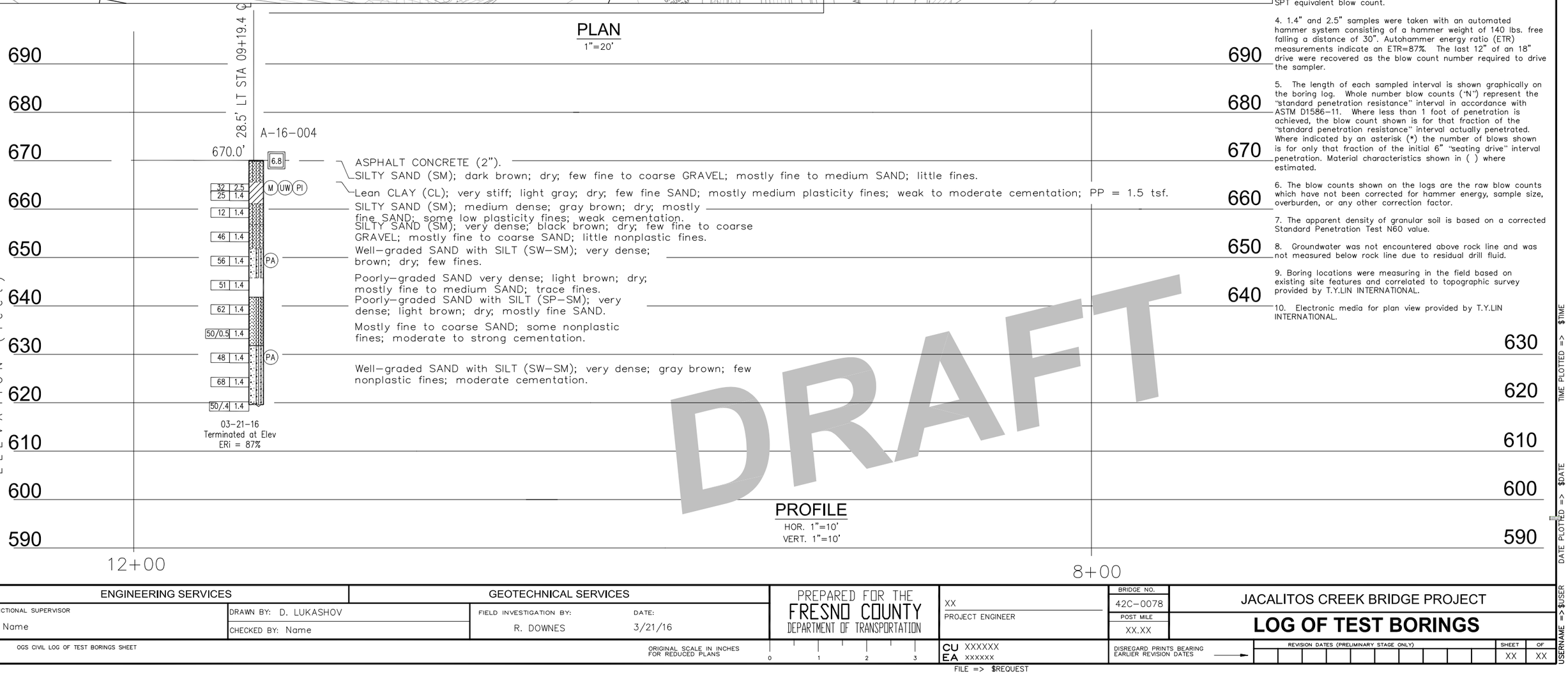
FILE => $REQUEST

P15033 LOTB.dwg
11/2/2015
DATE PLOTTED => $DATE
TIME PLOTTED => $TIME
USERNAME => $USER

ELEVATION REFERENCE:
Boring elevations estimated from topographic data provided by T.Y.LIN INTERNATIONAL.



PLAN
1"=20'



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

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
06	FRE	XX			

CERTIFIELD ENGINEERING GEOLOGIST DATE

PLANS APPROVAL DATE

REGISTERED GEOLOGIST
DAVID A. KITZMANN
No. 2412
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.

WRECO
8331 SIERRA COLLEGE BLVD.
ROSEVILLE, CALIFORNIA 95661 WRECO JOB NO: P15033

T.Y.LIN INTERNATIONAL
1601 RESPONSE ROAD, SUITE 260
SACRAMENTO, CA 95815

Notes:

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9. Boring locations were measuring in the field based on existing site features and correlated to topographic survey provided by T.Y.LIN INTERNATIONAL.

10. Electronic media for plan view provided by T.Y.LIN INTERNATIONAL.

ENGINEERING SERVICES		GEOTECHNICAL SERVICES		PREPARED FOR THE FRESNO COUNTY DEPARTMENT OF TRANSPORTATION		BRIDGE NO.	JACALITOS CREEK BRIDGE PROJECT
FUNCTIONAL SUPERVISOR: Name	DRAWN BY: D. LUKASHOV	FIELD INVESTIGATION BY: R. DOWNES	DATE: 3/21/16		XX PROJECT ENGINEER	42C-0078	**LOG OF TEST BORINGS**
	CHECKED BY: Name					POST MILE XX.XX	

OGS CIVIL LOG OF TEST BORINGS SHEET

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU XXXXXX
EA XXXXXX

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES (PRELIMINARY STAGE ONLY)

SHEET XX OF XX

FILE => $REQUEST

P15033 LOTB.dwg
11/2/2015
TIME PLOTTED => $TIME
DATE PLOTTED => $DATE
USERNAME => $USER

ROAD NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
W-270	69	1	12

DEPARTMENT OF PUBLIC WORKS
COUNTY OF FRESNO

PLANS FOR CONSTRUCTION

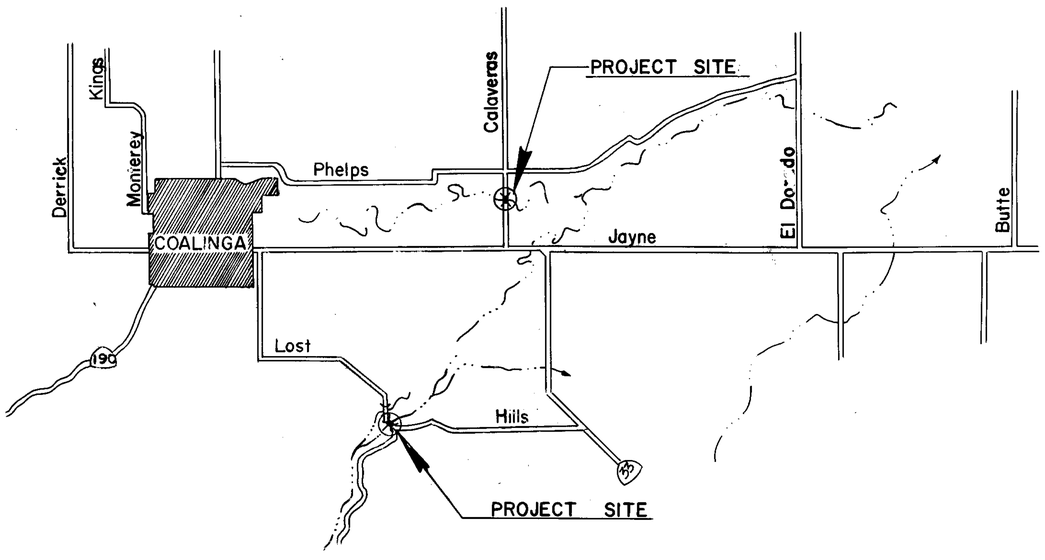
LOS GATOS CREEK BRIDGE

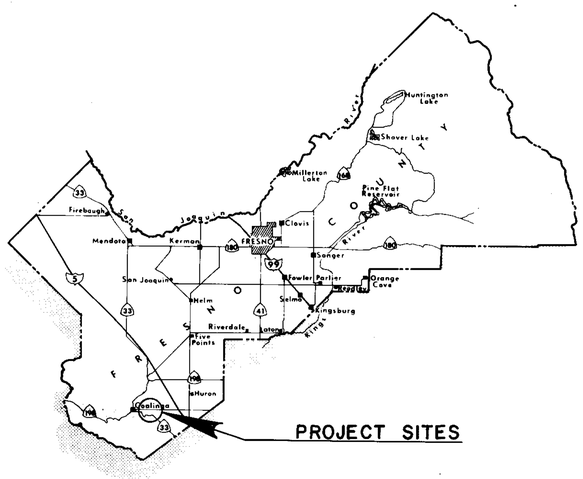
Calaveras Avenue 0.64 miles n/o Jayne Avenue

JACALITOS CREEK BRIDGE

Lost Hills Road 2.28 miles e/o Merced Avenue

INDEX OF SHEETS





APPROVAL RECOMMENDED *Lawrence H. Forder*
Civil Engineer License No. 14725

APPROVED *Clinton D. Beery*
Director of Public Works
Civil Engineer License No. 9345

APPROVED _____
Chairman, Board of Supervisors

APPROVAL DATE June 2, 1970

69-29-C
W-270 Jacalitos Bridge
1-23

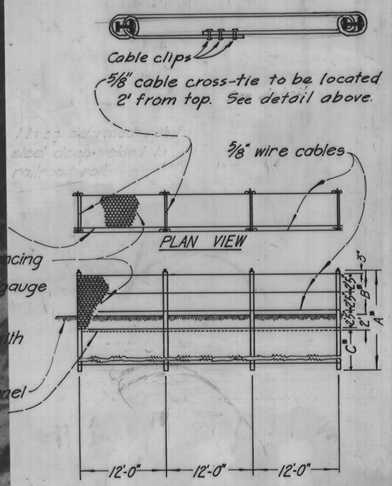
DRAWING NO.	5251-1
REVISION	

COUNTY ROAD No.	SHEET No.	TOTAL SHEETS
5424	8	12

FRESNO COUNTY
APPROVED
ASSISTANT DIRECTOR OF PUBLIC WORKS
CIVIL ENGINEER LICENSE NO. 9078

DOUBLE RAIL WIRE FENCE DETAILS

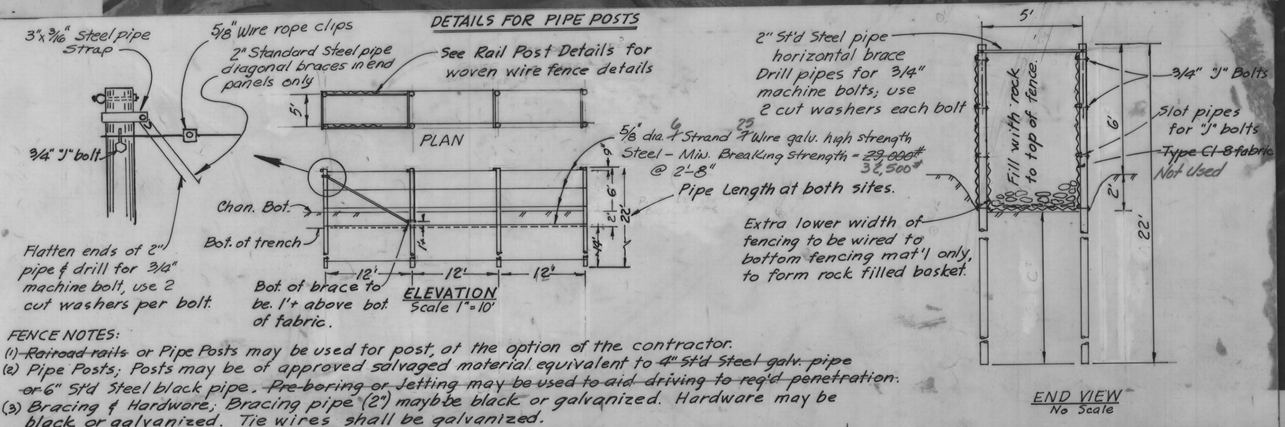
State of California Maintenance Manual, Plate 14-5.



DETAILS FOR RAIL POSTS

AS BUILT PLANS
Corrections by R.J. Bolugian
Date 11-9-70

DETAILS FOR PIPE POSTS



FENCE NOTES:
(1) ~~Railroad rails~~ or Pipe Posts may be used for post, at the option of the contractor.
(2) Pipe Posts; Posts may be of approved salvaged material equivalent to ~~4" Std Steel galv. pipe or 6" Std Steel black pipe. Pre-boring or jetting may be used to aid driving to req'd penetration.~~
(3) Bracing & Hardware; Bracing pipe (2") may be black or galvanized. Hardware may be black or galvanized. Tie wires shall be galvanized.

*Key to Dimensions (Rail Posts)

	A	B	C
LOS GATOS CREEK BR. on Calaveras	30'	9'	19'
JACALITOS CREEK BR. on Lost Hills Rd.	15½	6'	7'

COUNTY OF FRESNO – CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
HIGHWAYS AND BRIDGES

JACALITOS CREEK BRIDGE
on Lost Hills Rd, 2.28 Mi. e/o Merced Ave.
Site Plan

DESIGNED: CMB	DATE: 8-69	SCALE	DRAWING NO.
DRAWN: C.M.B.	8-69	As Noted	5251-8
CHECKED: J.H.	5-70	BK. PG.	

APPROVAL RECOMMENDED _____ DESIGN ENGINEER
C. E. LICENSE NO. 14725

REVISION

ROAD NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
5424	1969	9	12

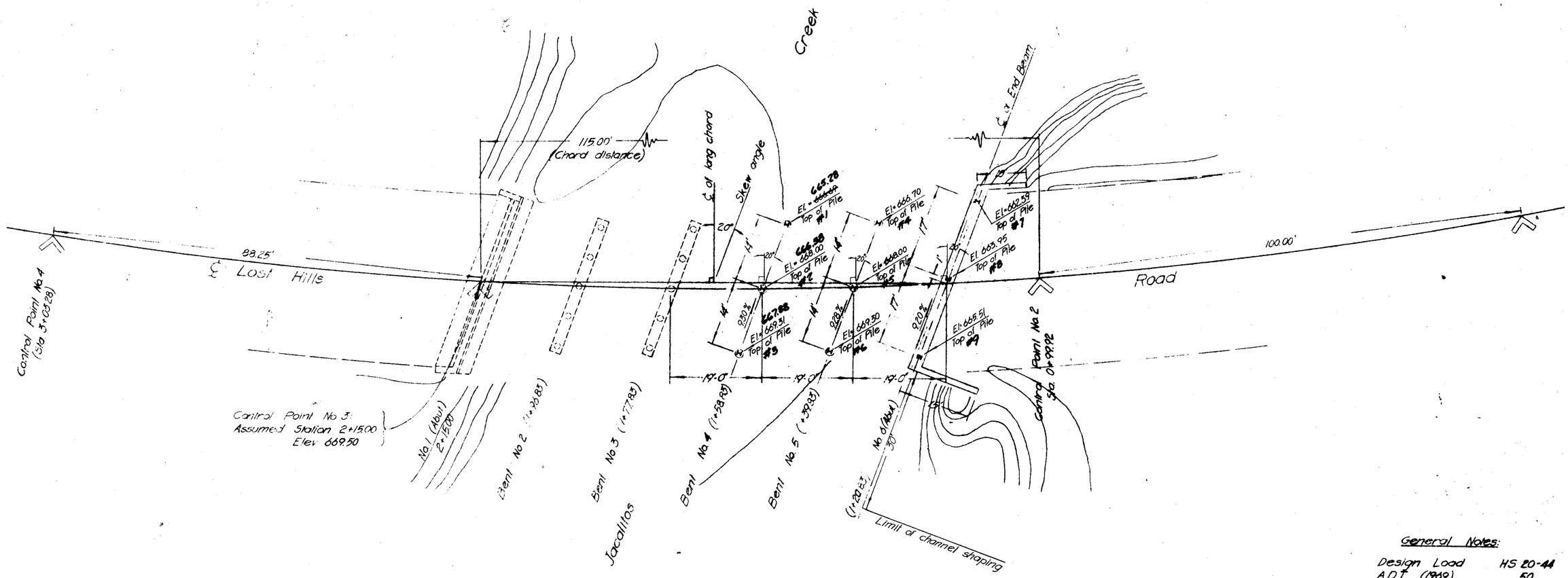
APPROVED: [illegible]
FRESNO COUNTY ASSISTANT DIRECTOR OF PUBLIC WORKS
CIVIL ENGINEER IN CHARGE [illegible]

Contours as of April 10, 1969

Pile Elevations

[illegible]	1	[illegible]	[illegible]
"	2	[illegible]	[illegible]
"	3	[illegible]	[illegible]
Bent #5	4	633.70	[illegible]
"	5	634.15	668.[illegible]
"	6	632.85	669.30
Abut #6	7	633.59	662.39
"	8	636.50	663.35
"	9	637.91	665.51

10 BP42 Piles, total of 9
Pile tip elevation at minimum penetration
Bents ~~None~~ 634.00
Abutment 640.00



General Notes:

Design Load	HS 20-44
ADT (1969)	50
ADT (1989)	195

[illegible] AS BUILT PLANS
Corrections by A. Kateian
Date 11-9-70

COUNTY OF FRESNO - CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
HIGHWAYS AND BRIDGES

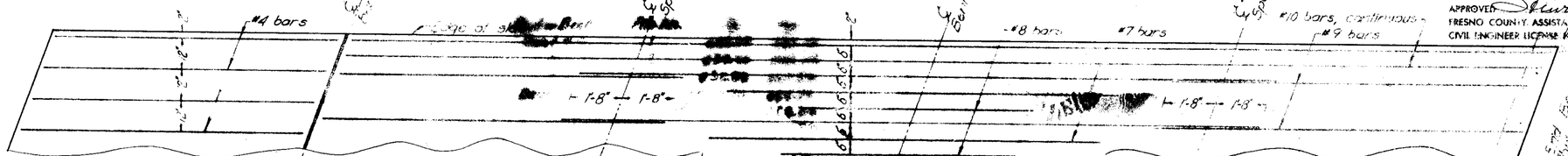
JACALITOS CREEK BRIDGE
on Lost Hills Rd., 2.28 Mi. e/o Merced Ave.
Foundation Plan

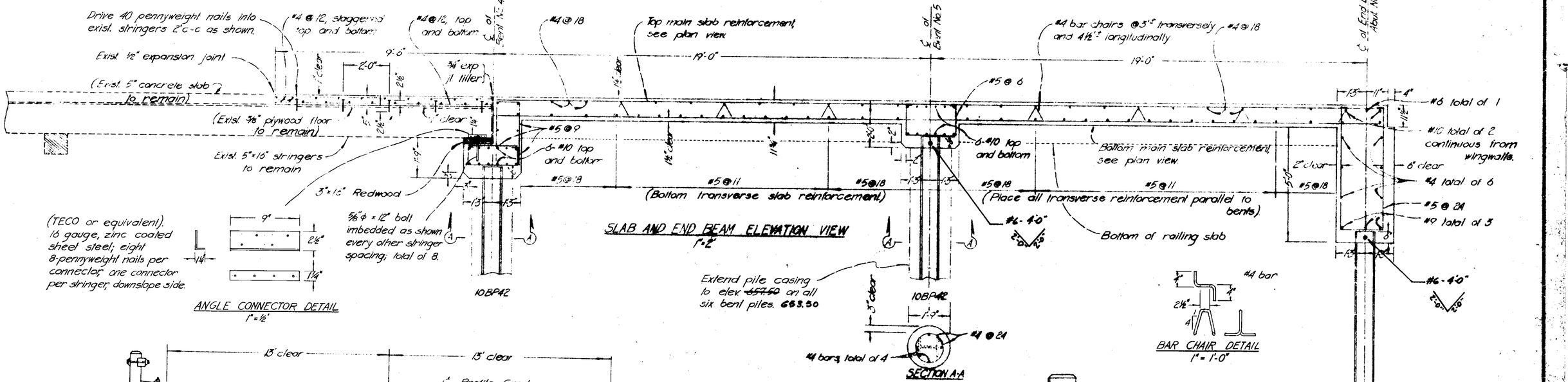
Designed: C.M.B.	Date: 8-68	SCALE 1"=10'	DRAWING NO. 5251-9
Drawn: C.M.B.	8-68		
Checked: J.H.	8-70		
APPROVAL RECOMMENDED [illegible]			
REVISION			

ROAD NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
S 424	1969	10	12

APPROVED Harry Olsen
FRESNO COUNTY ASSISTANT DIRECTOR OF PUBLIC WORKS
CIVIL ENGINEER LICENSE NO 2076

PILE ELEVATION





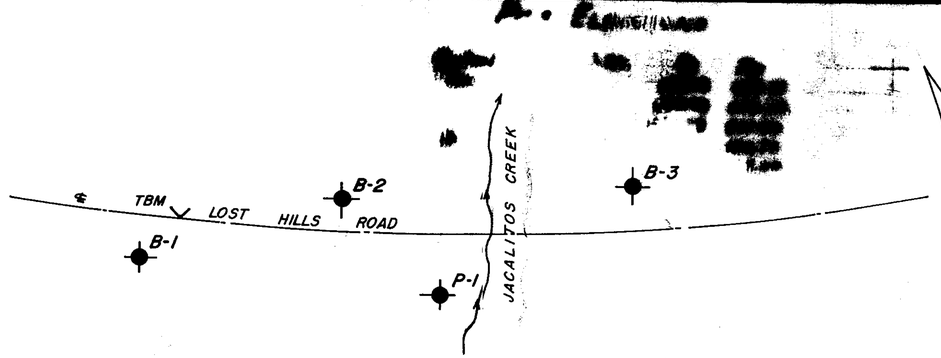
AS BUILT PLANS
Corrections by A. Kalein
Date 11-9-70

COUNTY OF FRESNO - CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
HIGHWAYS AND BRIDGES

JACALITOS CREEK BRIDGE
on Lost Hills Rd, 2.28 Mi. e/o Mercedes Ave.
Slab Details

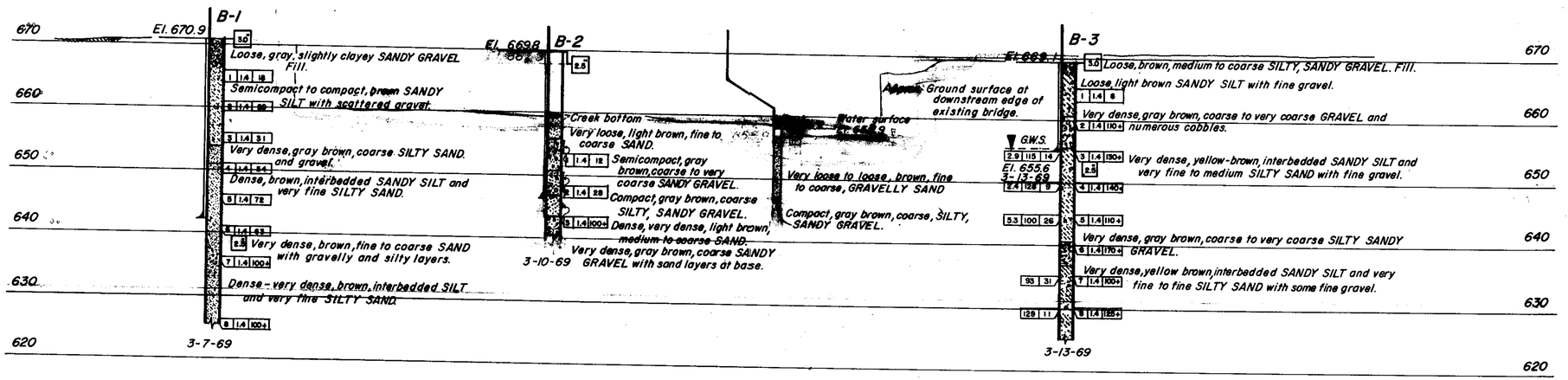
Designed: C.M.B.	Date: 2-69	SCALE	DRAWING NO.
Drawn: C.M.B.	2-69	As Noted	5251-10
Checked: J.H.	5-70		


ROAD NUMBER
1969
12
APPROVED
FRESNO COUNTY DIRECTOR OF PUBLIC WORKS
SECTION A-A
4" = 1'
17'
21'
Profile
669.50
9.2 %
1'
3'
17'
17'
3'
Double fence to be embedded in slope protection.
Adjust spacing between last two posts so that last post attached to slab may be placed in front of end beam face.
6'-0"
10'-0"
1'-0"
1½" clear
#4 @ 18
6'-0"
#6 @ 9
#4 @ 18
6'-3"
(Regular spacing)
Relocate clearance marker
21'-0"
2-#10 top reinforcement continuous through wingwalls and end beam
4"
13'-0" clear
15'-0" clear
19'-0"
Salvage and reinstall existing end posts, guard rail, wheel guard, spacer blocks, and clearance marker as shown.
10'-0"
#4 @ 18
1½" clear
15'-0"
#4 @ 18
10'-0"
Existing double fence to be embedded in slope protection.
℄ of Abutment End Bent Layout Line
SECTION B-B
½" = 1'
2-#10 continuous @ top edge, extend full length of wingwall.
#4 @ 18 both ways, outside face
#4 ⊔ @ 18
Elev 667.58
#4 × 2' dowels @ 12" c-c
3'-11¾"
4'-6"
1'
Elev 663.85
6'(min)
#4 @ 18
#6 @ 9, inside face
Elev 657.85
C.C.O. #1
#4 ⊔ @ 18
SECTION C-C
½" = 1'
Elev 671.25
2-#10 continuous @ top edge of deck, extend full length of wingwall.
#4 @ 18 both ways, outside face
#4 × 2' dowels @ 12" c-c
3'-11¾"
4'-6"
Elev 667.52
10'(max)
#6 @ 9 inside face
#4 @ 18, inside face
6×6 - 10/10 wire mesh reinforcement
Elev 657.52
SECTION D-D
½" = 1'
#10
1½" clear
#6 @ 9
#4 @ 18
1½" clear
#4
1½" clear
AS BUILT PLANS
Corrections by A. Kalaian
Date 11-9-70
COUNTY OF FRESNO - CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
HIGHWAYS AND BRIDGES
JACALITOS CREEK BRIDGE
on Lost Hills Rd, 2.28 Mi e/o Merced Ave
Wingwall and Railing Details
As noted



—PLAN—
Scale 1"=20'

—NOTE—
TBM – Panel point at ℄ Lost Hills Road and west abutment line. Elevation 670 (assumed).



—PROFILE—
Scale 1"=10' Horiz. & Vert.

AS BUILT PLANS
Corrections by Rodriguez
Date 11-9-70

LEGEND OF EARTH MATERIALS

UNIFIED SOIL CLASSIFICATION

Pt	OH	CH	MH	OL	CL	ML	SC	SM	SP	SW	GC	GM	GP	GW
Highly organic soils	Silts and clays Liquid limit greater than 50			Silts and clays Liquid limit less than 50			Sands with fines – more than 50% coarse fraction is smaller than #4 sieve		Clean sands – more than 50% coarse fraction is smaller than #4 sieve		Gravels with fines – more than 50% of coarse fraction is larger than #4 sieve		Clean gravels – more than 50% of coarse fraction is larger than #4 sieve	
							>12% fines	<5% fines			>12% fines	<5% fines		
							Fine grained soils (More than 50 % is smaller than #200 sieve)		Coarse grained soils (More than 50% is larger than #200 sieve)					

LABORATORY CLASSIFICATION CRITERIA

GW and SW – $C_u = \frac{D_{60}}{D_{10}}$ greater than 4 for GW & 6 for SW; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 & 3.

GP and SP – Clean gravel or sand not meeting requirements for GW and SW.

GM and SM – Atterberg limits below "A" line or P.I. less than 4.

SC and GC – Atterberg limits above "A" line with P.I. greater than 7.

Fines (silt w-clay)	Fine sand	Medium sand	Coarse sand	Fine gravel	Coarse gravel	Cobbles	Boulders
Sieve sizes	#200	#40	#10	#4	¾"	3"	12"

Classification of earth materials shown on this sheet is based on field inspection and should not be construed to imply laboratory analysis unless so stated.

MATERIAL SYMBOLS

- Gravel
- Sand
- Silt
- Clay
- Sandy clay or clayey sand
- Sandy silt or silty sand
- Silty clay or clayey silt
- Peat or organic matter
- Fill material
- Shale
- Sandstone
- Limestone
- Metamorphic rock
- Igneous rock

CONSISTENCY CLASSIFICATION FOR SOILS

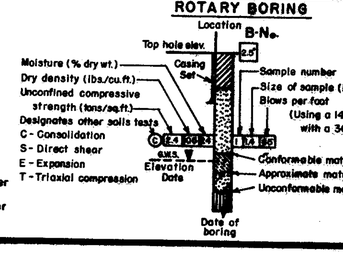
According to the Standard Penetration Test

Nº of blows	Granular	Cohesive
0-5	Very loose	Very soft
6-10	Loose	Soft
11-20	Semicompact	Stiff
21-35	Compact	Very stiff
36-70	Dense	Hard
>70	Very dense	Very hard

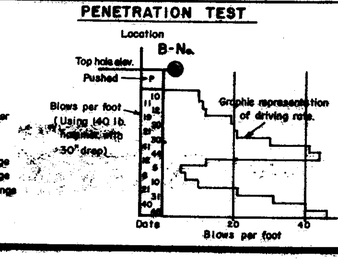
LEGEND OF BORING OPERATIONS

- Plan of any boring
- Rotary boring
- Diamond core boring
- Auger boring
- Sample boring
- Jet boring
- Test pit
- 2½" Cone penetrometer
- 2½" Cone penetrometer

ROTARY BORING



PENETRATION TEST



MOORE & TAYLOR · Engineers · Geologists

APPROVED H. R. Taylor 4-21-69
REGISTERED CIVIL ENGINEER No. 9165

JOB No. 3697 F-3

COUNTY OF FRESNO

LOST HILLS ROAD AT JACALITOS CREEK

LOG OF TEST BORINGS

Scale As Shown | Date Mar. 21, 1969 | By AJS | Ch. | Drawing 5251-12

Appendix III. Field Exploration and Testing

No Field Exploration and Testing Data

Appendix IV. Laboratory Test Results

Borehole	Sample ID	Depth (ft)	Gravel (%)	Sand (%)	Fines (%)	Plasticity Index (PI)	Liquid Limit (LL)	Dry Density, γ_d (pcf)	Moisture Content (%)	Specific Gravity (G_s)	USCS Group Symbol	USCS Group Name
A-16-001A	S-3	10.0	10	34	56	13	29				CL	SANDY LEAN CLAY
A-16-001B	S-3	25.0	0	92	8			100	5			
A-16-001B	S-5	30.0	13	78	9							
A-16-001B	S-10	50.0	10	82	9							
A-16-002	S-3	10.0	22	42	35	17	34				SC	CLAYEY SAND with GRAVEL
A-16-002	S-5	20.0	2	81	17							
A-16-002	S-9	40.0	11	57	32	10	29				SC	CLAYEY SAND
A-16-003	S-2	5.0	49	43	8							
A-16-003	S-7	25.0				10	34					
A-16-003	S-11	40.0	7	69	24							
A-16-004	S-2	5.0				15	31	113	10			
A-16-004	S-6	20.0	8	82	10							
A-16-004	S-10	40.0	11	79	11							

CLASSIFICATION TEST SUMMARY P15033 JACALITOS_03292016.GPJ WRECO.GLB 4/4/16

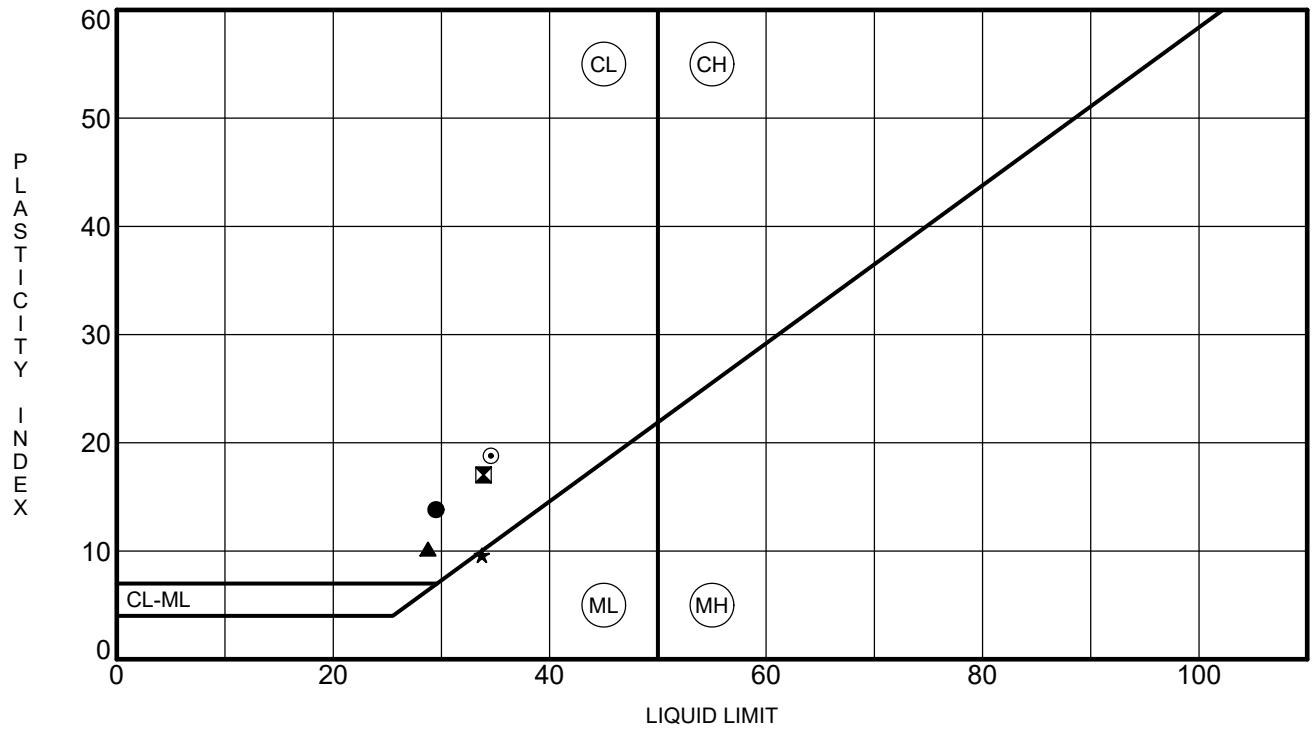
WRECO
8331 Sierra College Blvd.
Suite 208
Roseville, CA 95661
(916) 757-6150

CLASSIFICATION TEST SUMMARY

DIST.	COUNTY	ROUTE	POSTMILE	EA
06	**Fresno**			**06-P15033**

PROJECT OR BRIDGE NAME: **Jacalitos Creek Bridge**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
		3-28-16	**1 of 1**



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**A-16-001A**	**10.0**	**29**	**16**	**13**	**56**	**SANDY LEAN CLAY (CL)**
⊠	**A-16-002**	**10.0**	**34**	**17**	**17**	**35**	**CLAYEY SAND with GRAVEL (SC)**
▲	**A-16-002**	**40.0**	**29**	**19**	**10**	**32**	**CLAYEY SAND (SC)**
★	**A-16-003**	**25.0**	**34**	**24**	**10**		
⊙	**A-16-004**	**5.0**	**35**	**16**	**19**		

WRECO
8331 Sierra College Blvd.
Suite 208
Roseville, CA 95661
(916) 757-6150

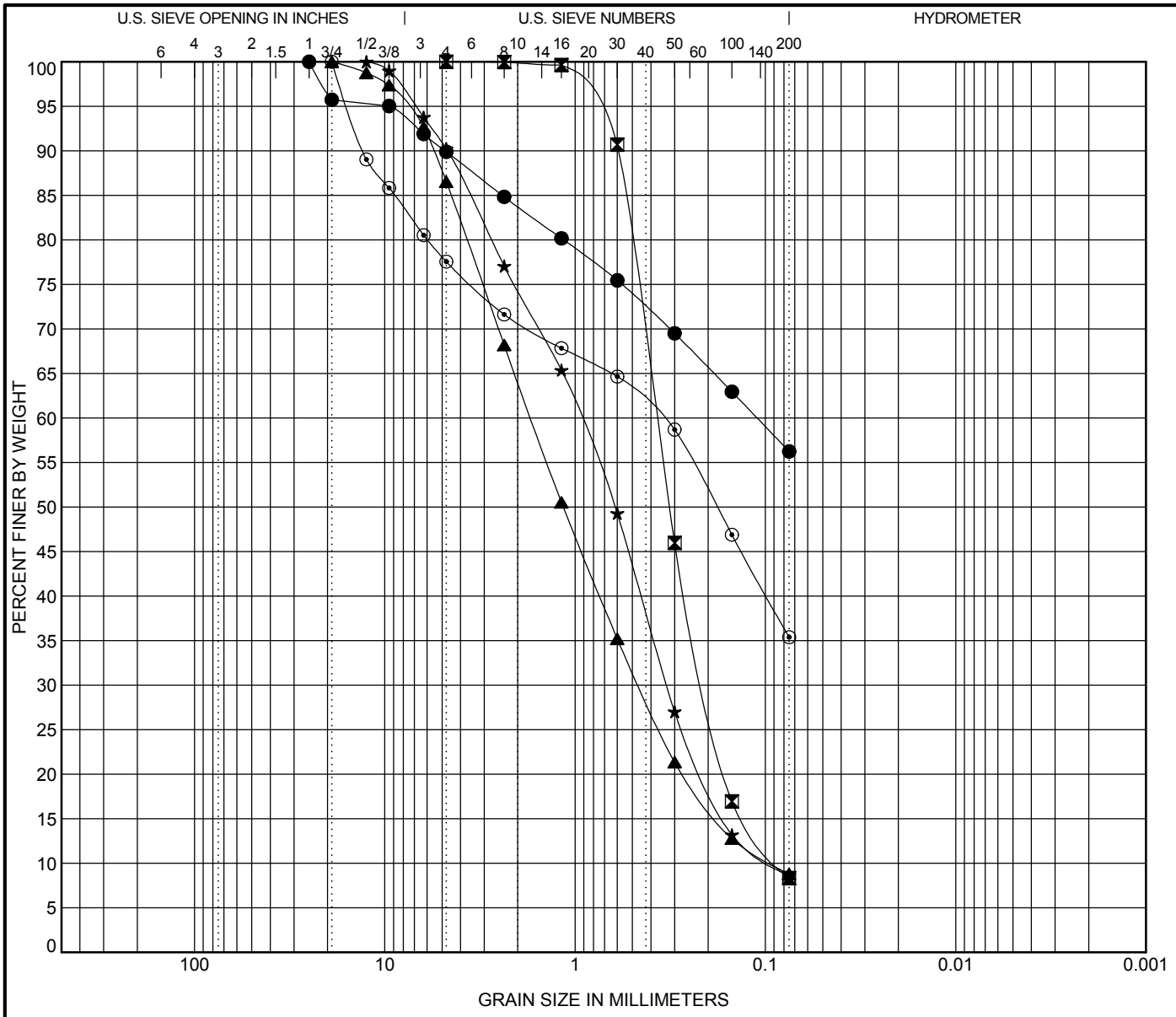
ATTERBERG LIMITS RESULTS

DIST.	COUNTY	ROUTE	POSTMILE	EA
06	**Fresno**			**06-P15033**

PROJECT OR BRIDGE NAME: **Jacalitos Creek Bridge**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
	A. Kahn	**3-28-16**	**1 of 1**

CALTRANS ATTERBERG P15033 JACALITOS_03292016.GPJ WRECO.GLB 4/5/16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	A-16-001A	10.0	SANDY LEAN CLAY (CL)	29	16	13		
⊠	A-16-001B	25.0					1.31	4.35
▲	A-16-001B	30.0					1.35	18.50
★	A-16-001B	50.0					1.25	10.19
⊙	A-16-002	10.0	CLAYEY SAND with GRAVEL (SC)	34	17	17		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	A-16-001A	10.0	25	0.111			10.1	33.6	56.2	
⊠	A-16-001B	25.0	4.75	0.373	0.205	0.086	0.0	91.7	8.3	
▲	A-16-001B	30.0	19	1.711	0.463	0.092	13.5	77.7	8.8	
★	A-16-001B	50.0	12.5	0.941	0.329	0.092	9.8	81.6	8.6	
⊙	A-16-002	10.0	19	0.349			22.4	42.2	35.4	

WRECO
8331 Sierra College Blvd.
Suite 208
Roseville, CA 95661
(916) 757-6150

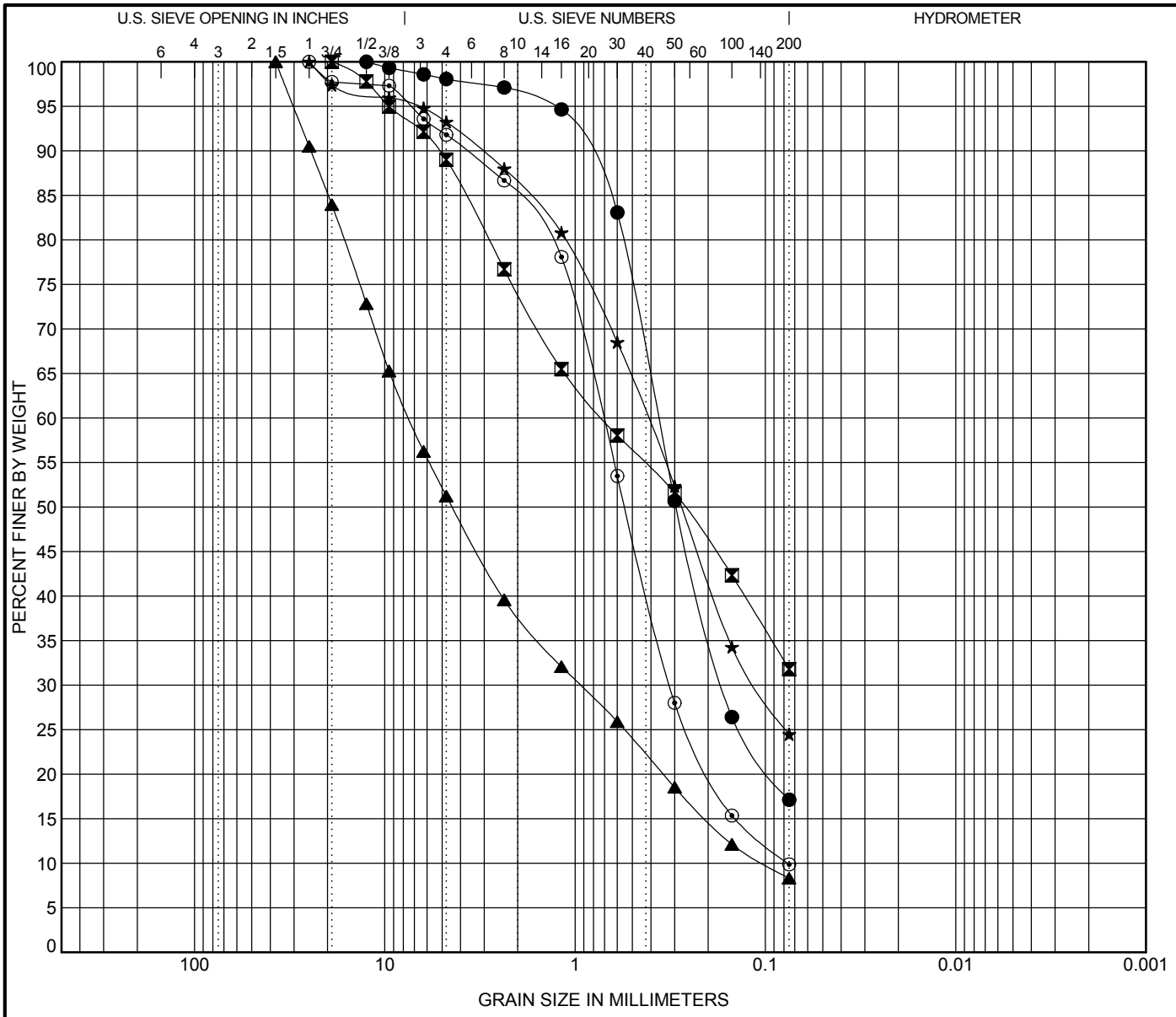
GRAIN SIZE DISTRIBUTION

DIST.	COUNTY	ROUTE	POSTMILE	EA
06	Fresno			06-P15033

PROJECT OR BRIDGE NAME: **Jacalitos Creek Bridge**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
		3-28-16	1 of 3

CALTRANS GRAIN SIZE P15033 JACALITOS_03292016.GPJ WRECO.GLB 4/4/16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	A-16-002	20.0						
⊠	A-16-002	40.0	**CLAYEY SAND (SC)**	**29**	**19**	**10**		
▲	A-16-003	5.0					**1.17**	**73.05**
★	A-16-003	40.0						
⊙	A-16-004	20.0					**1.83**	**9.42**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	A-16-002	20.0	**12.5**	**0.366**	**0.166**		**1.9**	**80.9**	**17.1**	
⊠	A-16-002	40.0	**19**	**0.717**			**11.0**	**57.2**	**31.8**	
▲	A-16-003	5.0	**37.5**	**7.437**	**0.94**	**0.102**	**48.8**	**42.9**	**8.3**	
★	A-16-003	40.0	**25**	**0.417**	**0.111**		**6.7**	**68.8**	**24.5**	
⊙	A-16-004	20.0	**25**	**0.718**	**0.317**	**0.076**	**8.2**	**81.9**	**9.9**	

CALTRANS GRAIN SIZE P15033 JACALITOS_03292016.GPJ WRECO.GLB 4/4/16

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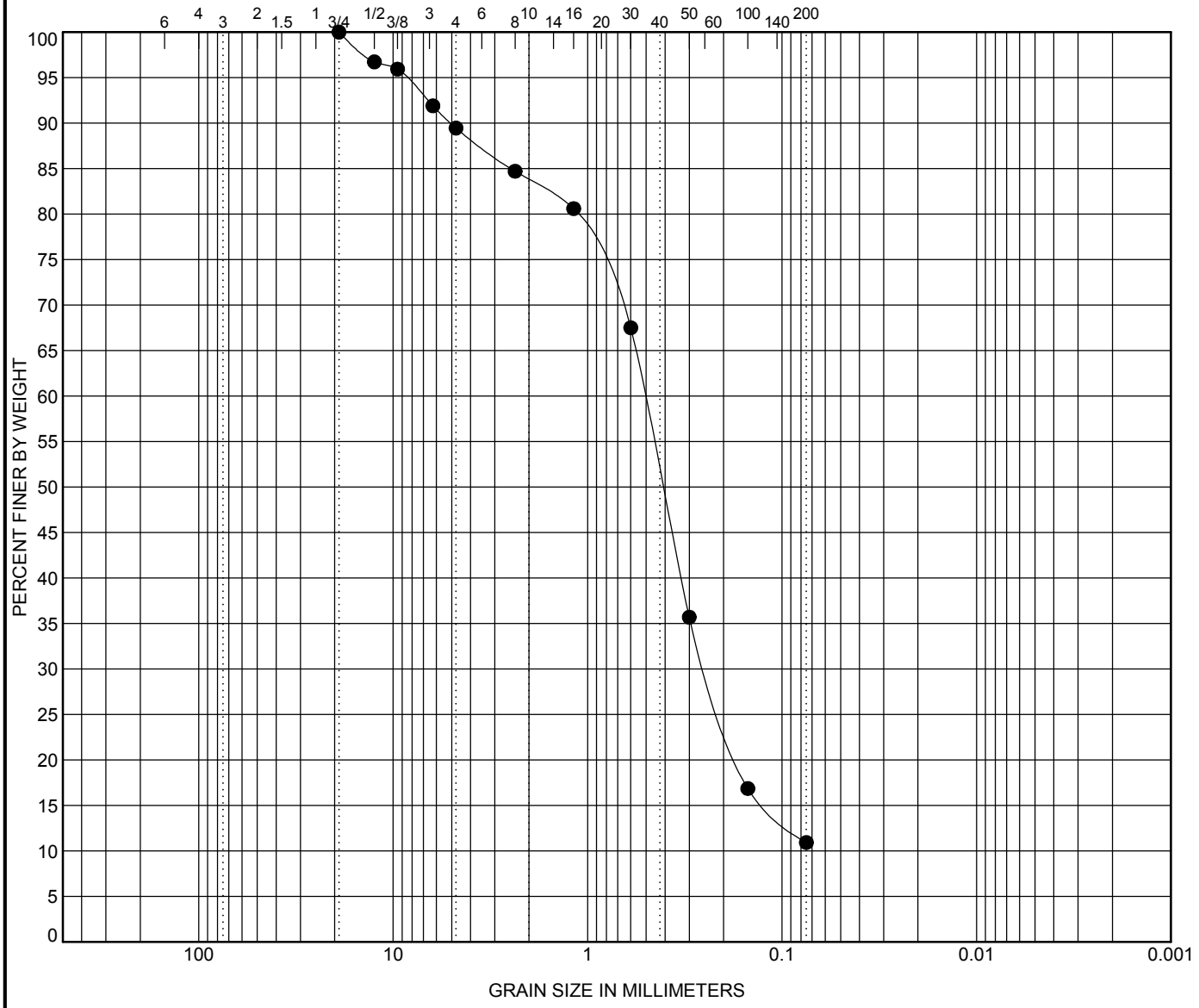
GRAIN SIZE DISTRIBUTION

DIST.	COUNTY	ROUTE	POSTMILE	EA
06	**Fresno**			**06-P15033**

PROJECT OR BRIDGE NAME: **Jacalitos Creek Bridge**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
		3-28-16	**2 of 3**



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**A-16-004**	**40.0**					**1.73**	**7.56**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**A-16-004**	**40.0**	**19**	**0.51**	**0.243**		**10.5**	**78.5**	**10.9**	

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GRAIN SIZE DISTRIBUTION

DIST.	COUNTY	ROUTE	POSTMILE	EA
06	**Fresno**			**06-P15033**

PROJECT OR BRIDGE NAME: **Jacalitos Creek Bridge**

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
		3-28-16	**3 of 3**

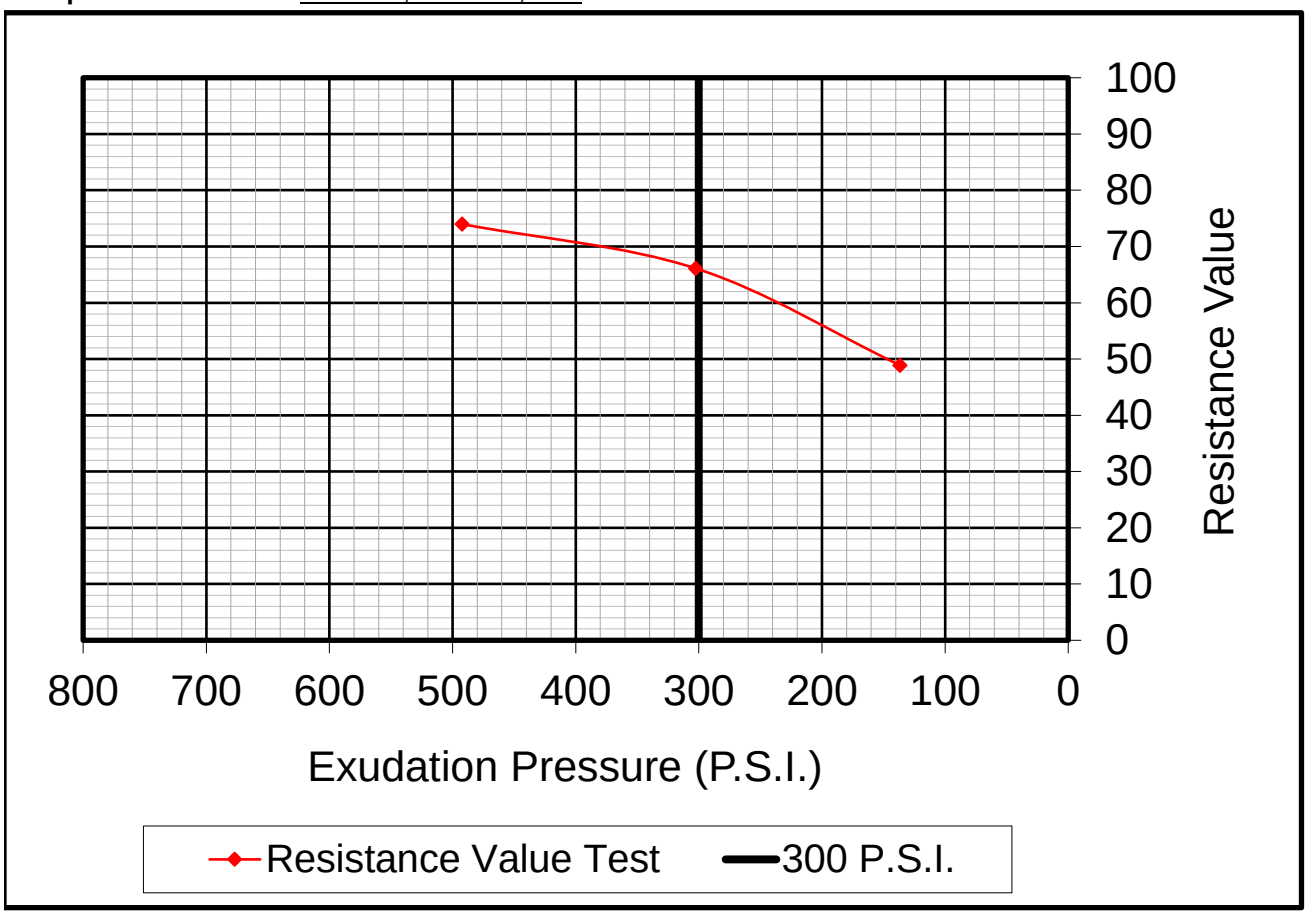
CALTRANS GRAIN SIZE P15033 JACALITOS_03292016.GPJ WRECO.GLB 4/4/16

Pavement Engineering Inc.
Redding • San Luis Obispo
Caltrans® / AMRL / QC • QA

RESISTANCE (R) VALUE TEST

California Test 301

Laboratory No.: L160328
Project No.: 160028 (WRECO Project: P15033, A-16-001)
Sample Date: n/a
Report Date: April 8, 2016
Client: WRECO
Project Name: 2016 Laboratory Testing
Sample Description: Brown Sand
Sample Location: Jacalitos, Bulk S-1, 0'-5'



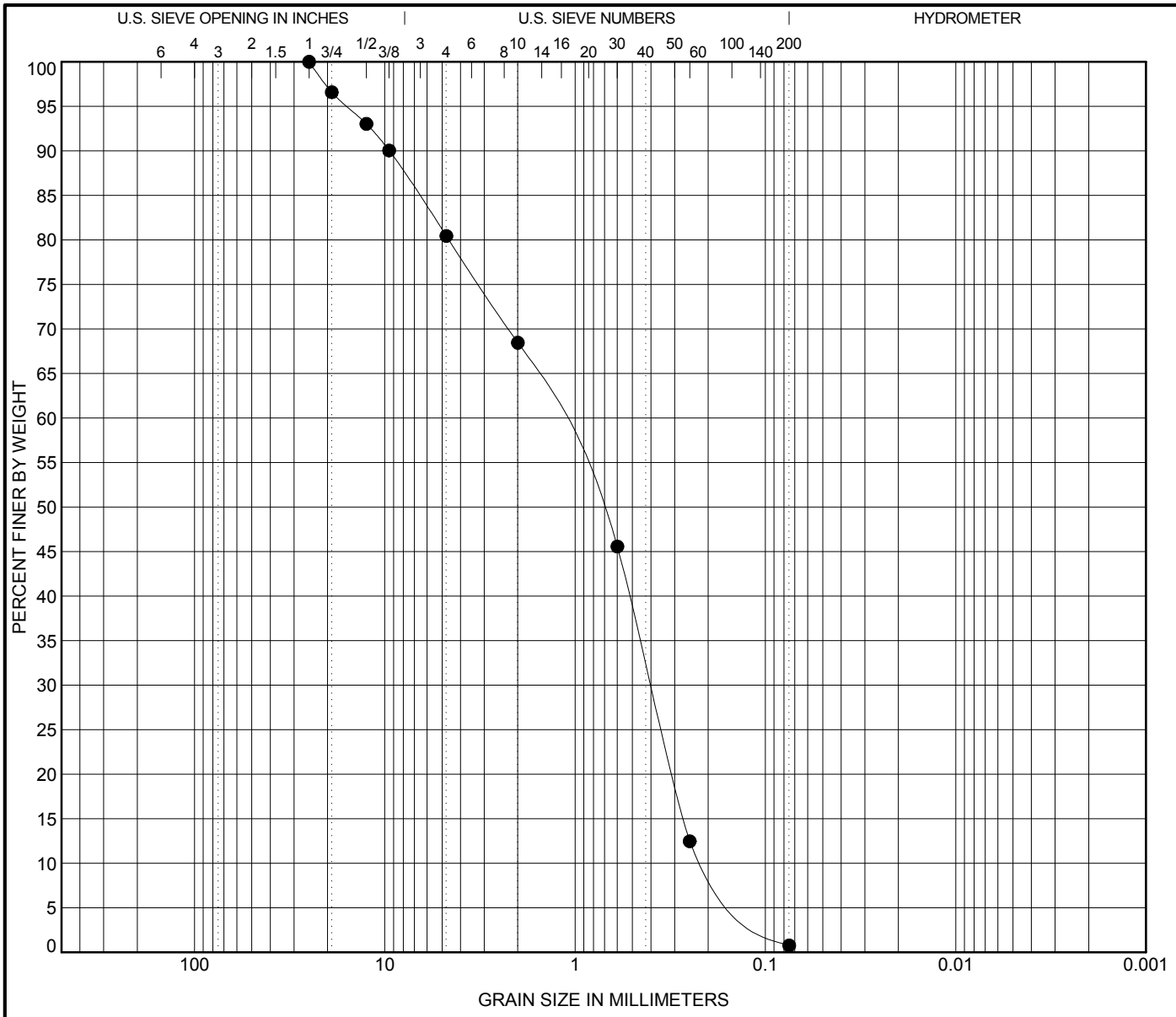
Specimen No.	10	11	12
Moisture Content (%)	9.3	10.2	9.8
Dry Density (PCF)	136.8	134.7	135.0
Resistance Value (R)	74	49	66
Exudation Pressure (PSI)	492	137	303
Expansion Pressure	0	0	0
As Received Moisture Content (%)	3.8		

RESISTANCE VALUE AT 300 P.S.I. **66**

AASHTO R18

Reviewed By: Craig Long

Craig W. Long
Laboratory Operations Manager



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**Grab-1**	**1.0**	**POORLY GRADED SAND with GRAVEL (SP)**				**0.64**	**6.61**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**Grab-1**	**1.0**	**25**	**1.282**	**0.397**	**0.194**	**19.6**	**79.7**	**0.8**	

WRECO
8331 Sierra College Blvd. St. 208
Roseville, CA 95661

GRAIN SIZE DISTRIBUTION

DIST.	COUNTY	ROUTE	POSTMILE	EA
06	**Fresno**			**06**

PROJECT OR BRIDGE NAME

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
		11-20-14	**1 of 1**

Sunland Analytical
11419 Sunrise Gold Cir.#10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 04/01/16
Date Submitted 03/29/16

To: Ray Downes
WRECO
8331 Sierra College Blvd. 208
Roseville, CA, 95661

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

The reported analysis was requested for the following:
Location : P15033 A-16-003 Site ID: S-8@30-31.5FT (Jacalitos Creek Bridge)
Thank you for your business.

* For future reference to this analysis please use SUN # 71502 - 149073

EVALUATION FOR SOIL CORROSION

Soil pH	8.50	
Minimum Resistivity	3.48	ohm-cm (x1000)
Chloride	3.4 ppm	0.0003 %
Sulfate-S	18.6 ppm	0.0019 %

METHODS:
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Appendix V. Analyses and Calculations

Appendix V.1 Seismic Analysis

CALIFORNIA DEPARTMENT OF
TRANSPORTATION

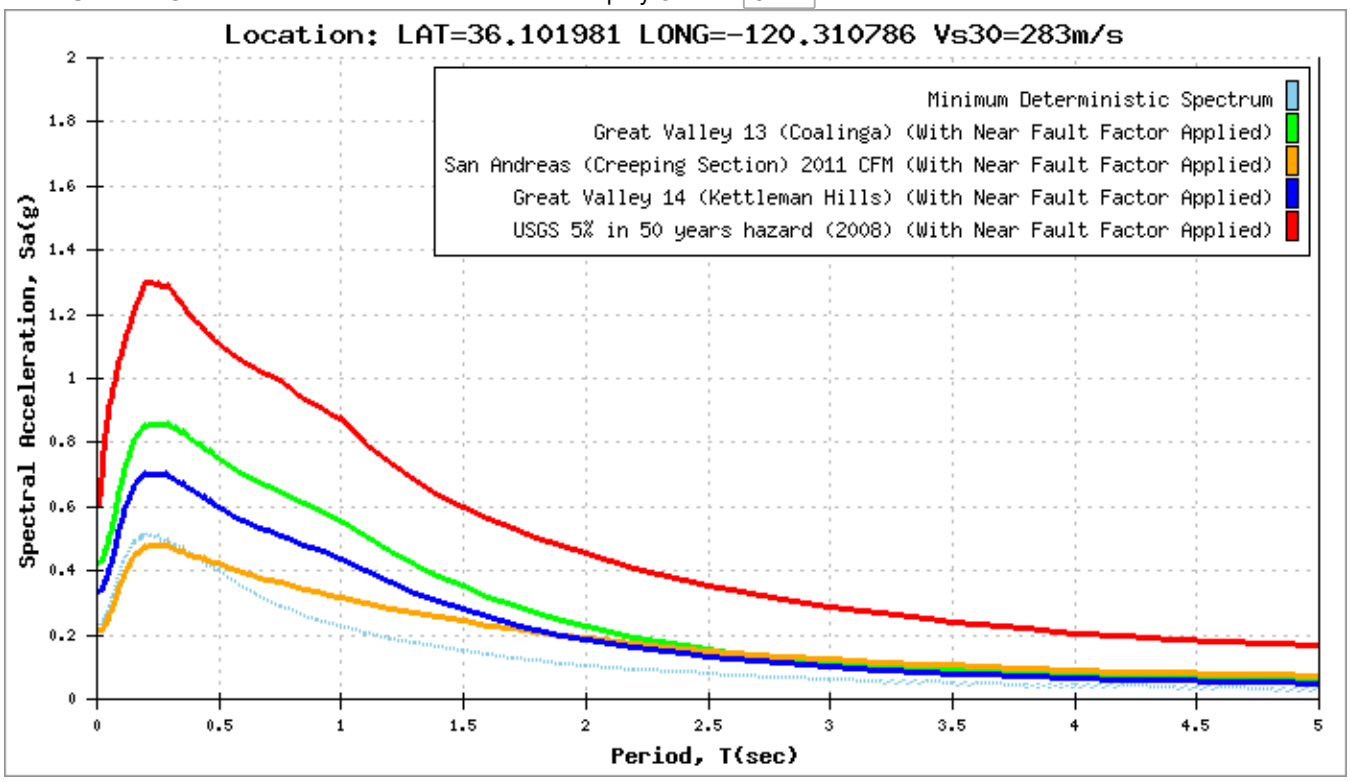
Caltrans ARS Online (v2.3.07)

This web-based tool calculates both deterministic and probabilistic acceleration response spectra for any location in California based on criteria provided in *Appendix B of Caltrans Seismic Design Criteria*. More...

SELECT SITE LOCATION

Latitude: 36.10198055 **Longitude:** -120.31078577 ***V*S30:** 283 m/s Calculate

CALCULATED SPECTRA Display Curves: 3



Tabular Data | Envelope Only | Hide Near Fault | Axis Scale | Show Basin

Apply Near Fault Adjustment To:
NOTE: Caltrans SDC requires application of a Near Fault Adjustment factor for sites less than 25 km (Rrup) from the causative fault.

☑ Deterministic Spectrum Using

13.02 Km Great Valley 13 (Coalinga)
23.81 Km San Andreas (Creeping Section) 2011 CFM
15.98 Km Great Valley 14 (Kettleman Hills)

☑ Probabilistic Spectrum Using

13.02 Km (Recommend Performing Deaggregation To Verify)

◉ Show Spectrum with Adjustment Only
○ Show Spectrum with and without near fault Adjustment

OK

Probabilistic

T(Sec)	SA(Base Spectrum	Basin Factor	Near Fault Factor(Applied)	SA(Final Spectrum)
0.01	0.605	1	1	0.605
0.05	0.905	1	1	0.905
0.1	1.076	1	1	1.076
0.15	1.202	1	1	1.202
0.2	1.301	1	1	1.301
0.25	1.291	1	1	1.291
0.3	1.283	1	1	1.283
0.4	1.182	1	1	1.182
0.5	1.109	1	1	1.109
0.6	1.011	1	1.04	1.051
0.7	0.935	1	1.08	1.01
0.85	0.822	1	1.14	0.937
1	0.728	1	1.2	0.873
1.2	0.613	1	1.2	0.736
1.5	0.497	1	1.2	0.597
2	0.38	1	1.2	0.455
3	0.241	1	1.2	0.289
4	0.172	1	1.2	0.206
5	0.139	1	1.2	0.167

Minimum Deterministic

T(Sec)	Spectral Accelerations
0.01	0.227
0.05	0.277
0.1	0.404
0.15	0.486
0.2	0.51
0.25	0.501
0.3	0.487
0.4	0.445
0.5	0.397
0.6	0.346
0.7	0.307
0.85	0.26
1	0.225
1.2	0.187
1.5	0.147
2	0.104
3	0.061
4	0.042
5	0.031

PSH Deaggregation on NEHRP D soil
Unnamed 120.311º W, 36.102 N.

Peak Horiz. Ground Accel.>=0.5860 g

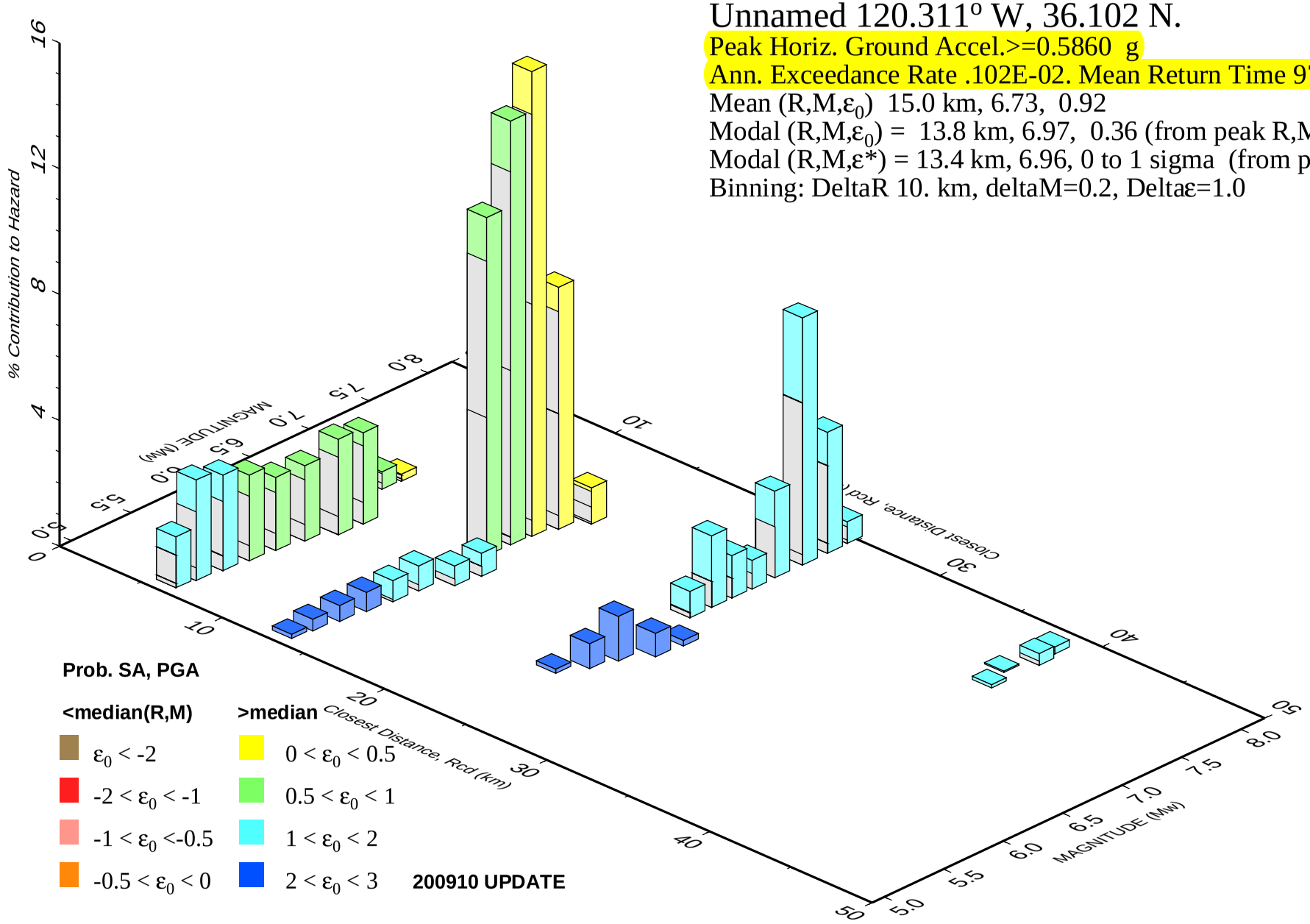
Ann. Exceedance Rate .102E-02. Mean Return Time 975 years

Mean (R,M,ε_0) 15.0 km, 6.73, 0.92

Modal (R,M,ε_0) = 13.8 km, 6.97, 0.36 (from peak R,M bin)

Modal (R,M,ε*) = 13.4 km, 6.96, 0 to 1 sigma (from peak R,M,ε bin)

Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0



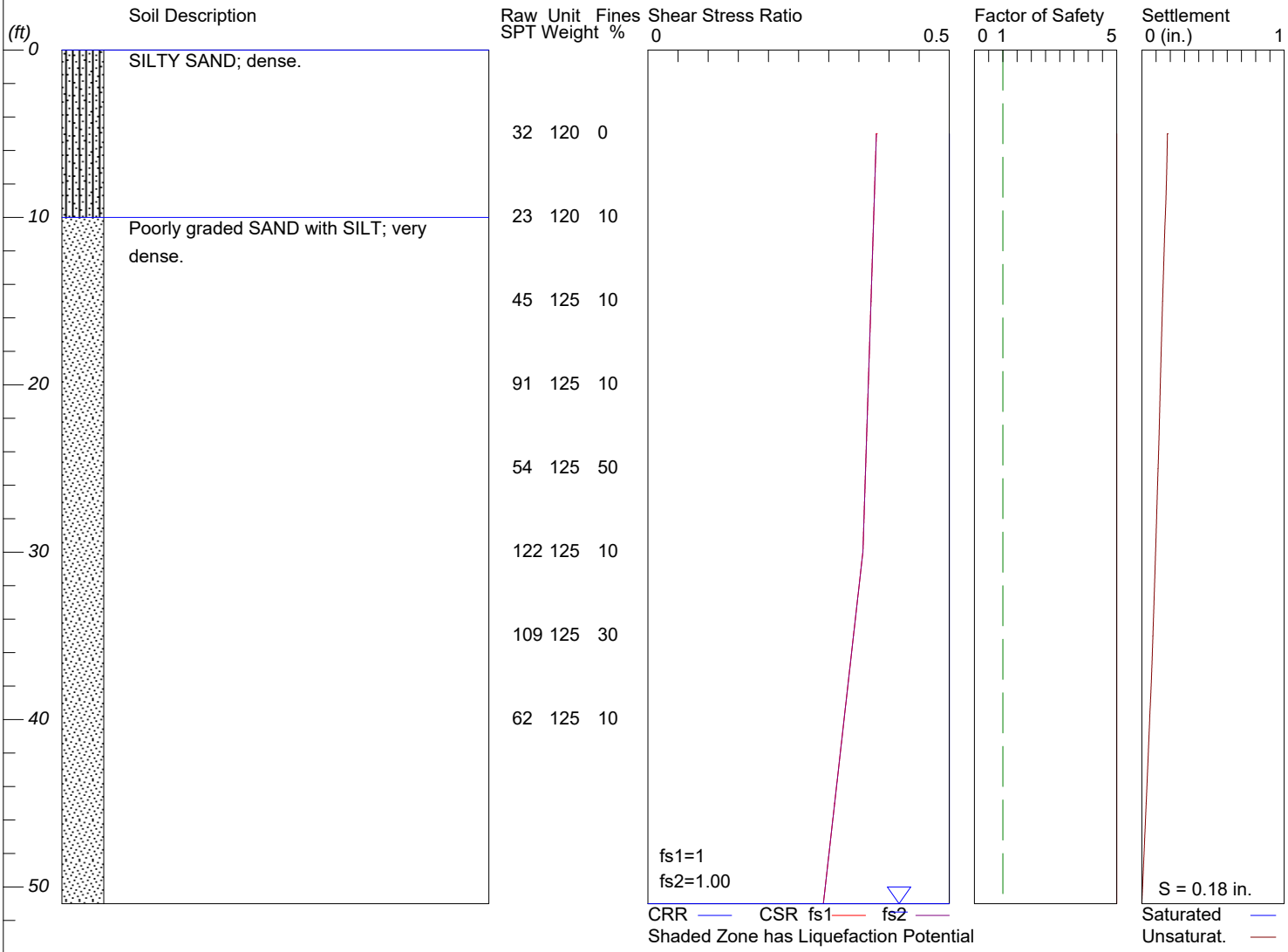
Appendix V.2 Dry Dynamic Analysis

LIQUEFACTION ANALYSIS

Jacalitos Creek Bridge Replacement Project on Lost Creek Road

Hole No.=A-16-003 Water Depth=51 ft Surface Elev.=660.0

Magnitude=7.0
Acceleration=0.59g



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LIQUEFACTION ANALYSIS SUMMARY

****
Font: Courier New, Regular, Size 8 is recommended for this report.
Licensed to , 5/20/2016 9:08:14 AM

Input File Name: G:\Projects\Y2015\P15033 Jacalitos Creek Bridge\Calculations\Seismic\A-16-003 log.liq
Title: Jacalitos Creek Bridge Replacement Project on Lost Creek Road
Subtitle: Dry Dynamic Analysis

Surface Elev.=660.0
Hole No.=A-16-003
Depth of Hole= 51.00 ft
Water Table during Earthquake= 51.00 ft
Water Table during In-Situ Testing= 51.00 ft
Max. Acceleration= 0.59 g
Earthquake Magnitude= 7.00

Input Data:
Surface Elev.=660.0
Hole No.=A-16-003
Depth of Hole=51.00 ft
Water Table during Earthquake= 51.00 ft
Water Table during In-Situ Testing= 51.00 ft
Max. Acceleration=0.59 g
Earthquake Magnitude=7.00
No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Ishihara / Yoshimine
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1.25
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1
9. User request factor of safety (apply to CSR) , User= 1
Plot two CSR (fs1=1, fs2=User)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth ft	SPT	gamma pcf	Fines %
5.00	32.00	120.00	0.00
10.00	23.00	120.00	10.00
15.00	45.00	125.00	10.00
20.00	91.00	125.00	10.00
25.00	54.00	125.00	50.00
30.00	122.00	125.00	10.00
35.00	109.00	125.00	30.00
40.00	62.00	125.00	10.00

Output Results:
Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.18 in.
Total Settlement of Saturated and Unsaturated Sands=0.18 in.
Differential Settlement=0.090 to 0.119 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
5.00	0.60	0.38	5.00	0.00	0.18	0.18
5.05	0.60	0.38	5.00	0.00	0.18	0.18
5.10	0.60	0.38	5.00	0.00	0.18	0.18
5.15	0.60	0.38	5.00	0.00	0.18	0.18
5.20	0.60	0.38	5.00	0.00	0.18	0.18
5.25	0.60	0.38	5.00	0.00	0.18	0.18
5.30	0.60	0.38	5.00	0.00	0.18	0.18
5.35	0.60	0.38	5.00	0.00	0.18	0.18
5.40	0.60	0.38	5.00	0.00	0.18	0.18
5.45	0.60	0.38	5.00	0.00	0.18	0.18
5.50	0.60	0.38	5.00	0.00	0.18	0.18
5.55	0.60	0.38	5.00	0.00	0.18	0.18
5.60	0.60	0.38	5.00	0.00	0.18	0.18
5.65	0.60	0.38	5.00	0.00	0.18	0.18
5.70	0.60	0.38	5.00	0.00	0.18	0.18
5.75	0.60	0.38	5.00	0.00	0.18	0.18
5.80	0.60	0.38	5.00	0.00	0.18	0.18
5.85	0.60	0.38	5.00	0.00	0.18	0.18
5.90	0.60	0.38	5.00	0.00	0.18	0.18
5.95	0.60	0.38	5.00	0.00	0.18	0.18
6.00	0.60	0.38	5.00	0.00	0.18	0.18
6.05	0.60	0.38	5.00	0.00	0.18	0.18
6.10	0.60	0.38	5.00	0.00	0.18	0.18
6.15	0.60	0.38	5.00	0.00	0.18	0.18

6.20	0.60	0.38	5.00	0.00	0.18	0.18
6.25	0.60	0.38	5.00	0.00	0.18	0.18
6.30	0.60	0.38	5.00	0.00	0.18	0.18
6.35	0.60	0.38	5.00	0.00	0.18	0.18
6.40	0.60	0.38	5.00	0.00	0.18	0.18
6.45	0.60	0.38	5.00	0.00	0.18	0.18
6.50	0.60	0.38	5.00	0.00	0.18	0.18
6.55	0.60	0.38	5.00	0.00	0.18	0.18
6.60	0.60	0.38	5.00	0.00	0.18	0.18
6.65	0.60	0.38	5.00	0.00	0.18	0.18
6.70	0.60	0.38	5.00	0.00	0.18	0.18
6.75	0.60	0.38	5.00	0.00	0.18	0.18
6.80	0.60	0.38	5.00	0.00	0.18	0.18
6.85	0.60	0.38	5.00	0.00	0.18	0.18
6.90	0.60	0.38	5.00	0.00	0.18	0.18
6.95	0.60	0.38	5.00	0.00	0.18	0.18
7.00	0.60	0.38	5.00	0.00	0.18	0.18
7.05	0.60	0.38	5.00	0.00	0.18	0.18
7.10	0.60	0.38	5.00	0.00	0.18	0.18
7.15	0.60	0.38	5.00	0.00	0.17	0.17
7.20	0.60	0.38	5.00	0.00	0.17	0.17
7.25	0.60	0.38	5.00	0.00	0.17	0.17
7.30	0.60	0.38	5.00	0.00	0.17	0.17
7.35	0.60	0.38	5.00	0.00	0.17	0.17
7.40	0.60	0.38	5.00	0.00	0.17	0.17
7.45	0.60	0.38	5.00	0.00	0.17	0.17
7.50	0.60	0.38	5.00	0.00	0.17	0.17
7.55	0.60	0.38	5.00	0.00	0.17	0.17
7.60	0.60	0.38	5.00	0.00	0.17	0.17
7.65	0.60	0.38	5.00	0.00	0.17	0.17
7.70	0.60	0.38	5.00	0.00	0.17	0.17
7.75	0.60	0.38	5.00	0.00	0.17	0.17
7.80	0.60	0.38	5.00	0.00	0.17	0.17
7.85	0.60	0.38	5.00	0.00	0.17	0.17
7.90	0.60	0.38	5.00	0.00	0.17	0.17
7.95	0.60	0.38	5.00	0.00	0.17	0.17
8.00	0.60	0.38	5.00	0.00	0.17	0.17
8.05	0.60	0.38	5.00	0.00	0.17	0.17
8.10	0.60	0.38	5.00	0.00	0.17	0.17
8.15	0.60	0.38	5.00	0.00	0.17	0.17
8.20	0.60	0.38	5.00	0.00	0.17	0.17
8.25	0.60	0.38	5.00	0.00	0.17	0.17
8.30	0.60	0.38	5.00	0.00	0.17	0.17
8.35	0.60	0.38	5.00	0.00	0.17	0.17
8.40	0.60	0.38	5.00	0.00	0.17	0.17
8.45	0.60	0.38	5.00	0.00	0.17	0.17
8.50	0.60	0.38	5.00	0.00	0.17	0.17
8.55	0.60	0.38	5.00	0.00	0.17	0.17

8.60	0.60	0.38	5.00	0.00	0.17	0.17
8.65	0.60	0.38	5.00	0.00	0.17	0.17
8.70	0.60	0.38	5.00	0.00	0.17	0.17
8.75	0.60	0.38	5.00	0.00	0.17	0.17
8.80	0.60	0.38	5.00	0.00	0.17	0.17
8.85	0.60	0.38	5.00	0.00	0.17	0.17
8.90	0.60	0.38	5.00	0.00	0.17	0.17
8.95	0.60	0.38	5.00	0.00	0.17	0.17
9.00	0.60	0.38	5.00	0.00	0.17	0.17
9.05	0.60	0.38	5.00	0.00	0.17	0.17
9.10	0.60	0.38	5.00	0.00	0.17	0.17
9.15	0.60	0.38	5.00	0.00	0.17	0.17
9.20	0.60	0.38	5.00	0.00	0.17	0.17
9.25	0.60	0.38	5.00	0.00	0.17	0.17
9.30	0.60	0.38	5.00	0.00	0.17	0.17
9.35	0.60	0.38	5.00	0.00	0.17	0.17
9.40	0.60	0.38	5.00	0.00	0.17	0.17
9.45	0.60	0.38	5.00	0.00	0.17	0.17
9.50	0.60	0.38	5.00	0.00	0.17	0.17
9.55	0.60	0.37	5.00	0.00	0.17	0.17
9.60	0.60	0.37	5.00	0.00	0.17	0.17
9.65	0.60	0.37	5.00	0.00	0.17	0.17
9.70	0.60	0.37	5.00	0.00	0.17	0.17
9.75	0.60	0.37	5.00	0.00	0.17	0.17
9.80	0.60	0.37	5.00	0.00	0.17	0.17
9.85	0.60	0.37	5.00	0.00	0.17	0.17
9.90	0.60	0.37	5.00	0.00	0.17	0.17
9.95	0.60	0.37	5.00	0.00	0.16	0.16
10.00	0.60	0.37	5.00	0.00	0.16	0.16
10.05	0.60	0.37	5.00	0.00	0.16	0.16
10.10	0.60	0.37	5.00	0.00	0.16	0.16
10.15	0.60	0.37	5.00	0.00	0.16	0.16
10.20	0.60	0.37	5.00	0.00	0.16	0.16
10.25	0.60	0.37	5.00	0.00	0.16	0.16
10.30	0.60	0.37	5.00	0.00	0.16	0.16
10.35	0.60	0.37	5.00	0.00	0.16	0.16
10.40	0.60	0.37	5.00	0.00	0.16	0.16
10.45	0.60	0.37	5.00	0.00	0.16	0.16
10.50	0.60	0.37	5.00	0.00	0.16	0.16
10.55	0.60	0.37	5.00	0.00	0.16	0.16
10.60	0.60	0.37	5.00	0.00	0.16	0.16
10.65	0.60	0.37	5.00	0.00	0.16	0.16
10.70	0.60	0.37	5.00	0.00	0.16	0.16
10.75	0.60	0.37	5.00	0.00	0.16	0.16
10.80	0.60	0.37	5.00	0.00	0.16	0.16
10.85	0.60	0.37	5.00	0.00	0.16	0.16
10.90	0.60	0.37	5.00	0.00	0.16	0.16
10.95	0.60	0.37	5.00	0.00	0.16	0.16

11.00	0.60	0.37	5.00	0.00	0.16	0.16
11.05	0.60	0.37	5.00	0.00	0.16	0.16
11.10	0.60	0.37	5.00	0.00	0.16	0.16
11.15	0.60	0.37	5.00	0.00	0.16	0.16
11.20	0.60	0.37	5.00	0.00	0.16	0.16
11.25	0.60	0.37	5.00	0.00	0.16	0.16
11.30	0.60	0.37	5.00	0.00	0.16	0.16
11.35	0.60	0.37	5.00	0.00	0.16	0.16
11.40	0.60	0.37	5.00	0.00	0.16	0.16
11.45	0.60	0.37	5.00	0.00	0.16	0.16
11.50	0.60	0.37	5.00	0.00	0.16	0.16
11.55	0.60	0.37	5.00	0.00	0.16	0.16
11.60	0.60	0.37	5.00	0.00	0.16	0.16
11.65	0.60	0.37	5.00	0.00	0.16	0.16
11.70	0.60	0.37	5.00	0.00	0.16	0.16
11.75	0.60	0.37	5.00	0.00	0.16	0.16
11.80	0.60	0.37	5.00	0.00	0.16	0.16
11.85	0.60	0.37	5.00	0.00	0.16	0.16
11.90	0.60	0.37	5.00	0.00	0.16	0.16
11.95	0.60	0.37	5.00	0.00	0.16	0.16
12.00	0.60	0.37	5.00	0.00	0.16	0.16
12.05	0.60	0.37	5.00	0.00	0.16	0.16
12.10	0.60	0.37	5.00	0.00	0.16	0.16
12.15	0.60	0.37	5.00	0.00	0.16	0.16
12.20	0.60	0.37	5.00	0.00	0.16	0.16
12.25	0.60	0.37	5.00	0.00	0.16	0.16
12.30	0.60	0.37	5.00	0.00	0.16	0.16
12.35	0.60	0.37	5.00	0.00	0.16	0.16
12.40	0.60	0.37	5.00	0.00	0.16	0.16
12.45	0.60	0.37	5.00	0.00	0.16	0.16
12.50	0.60	0.37	5.00	0.00	0.15	0.15
12.55	0.60	0.37	5.00	0.00	0.15	0.15
12.60	0.60	0.37	5.00	0.00	0.15	0.15
12.65	0.60	0.37	5.00	0.00	0.15	0.15
12.70	0.60	0.37	5.00	0.00	0.15	0.15
12.75	0.60	0.37	5.00	0.00	0.15	0.15
12.80	0.60	0.37	5.00	0.00	0.15	0.15
12.85	0.60	0.37	5.00	0.00	0.15	0.15
12.90	0.60	0.37	5.00	0.00	0.15	0.15
12.95	0.60	0.37	5.00	0.00	0.15	0.15
13.00	0.60	0.37	5.00	0.00	0.15	0.15
13.05	0.60	0.37	5.00	0.00	0.15	0.15
13.10	0.60	0.37	5.00	0.00	0.15	0.15
13.15	0.60	0.37	5.00	0.00	0.15	0.15
13.20	0.60	0.37	5.00	0.00	0.15	0.15
13.25	0.60	0.37	5.00	0.00	0.15	0.15
13.30	0.60	0.37	5.00	0.00	0.15	0.15
13.35	0.60	0.37	5.00	0.00	0.15	0.15

13.40	0.60	0.37	5.00	0.00	0.15	0.15
13.45	0.60	0.37	5.00	0.00	0.15	0.15
13.50	0.60	0.37	5.00	0.00	0.15	0.15
13.55	0.60	0.37	5.00	0.00	0.15	0.15
13.60	0.60	0.37	5.00	0.00	0.15	0.15
13.65	0.60	0.37	5.00	0.00	0.15	0.15
13.70	0.60	0.37	5.00	0.00	0.15	0.15
13.75	0.60	0.37	5.00	0.00	0.15	0.15
13.80	0.60	0.37	5.00	0.00	0.15	0.15
13.85	0.60	0.37	5.00	0.00	0.15	0.15
13.90	0.60	0.37	5.00	0.00	0.15	0.15
13.95	0.60	0.37	5.00	0.00	0.15	0.15
14.00	0.60	0.37	5.00	0.00	0.15	0.15
14.05	0.60	0.37	5.00	0.00	0.15	0.15
14.10	0.60	0.37	5.00	0.00	0.15	0.15
14.15	0.60	0.37	5.00	0.00	0.15	0.15
14.20	0.60	0.37	5.00	0.00	0.15	0.15
14.25	0.60	0.37	5.00	0.00	0.15	0.15
14.30	0.60	0.37	5.00	0.00	0.15	0.15
14.35	0.60	0.37	5.00	0.00	0.15	0.15
14.40	0.60	0.37	5.00	0.00	0.15	0.15
14.45	0.60	0.37	5.00	0.00	0.15	0.15
14.50	0.60	0.37	5.00	0.00	0.15	0.15
14.55	0.60	0.37	5.00	0.00	0.15	0.15
14.60	0.60	0.37	5.00	0.00	0.15	0.15
14.65	0.60	0.37	5.00	0.00	0.15	0.15
14.70	0.60	0.37	5.00	0.00	0.15	0.15
14.75	0.60	0.37	5.00	0.00	0.15	0.15
14.80	0.60	0.37	5.00	0.00	0.15	0.15
14.85	0.60	0.37	5.00	0.00	0.15	0.15
14.90	0.60	0.37	5.00	0.00	0.15	0.15
14.95	0.60	0.37	5.00	0.00	0.15	0.15
15.00	0.60	0.37	5.00	0.00	0.15	0.15
15.05	0.60	0.37	5.00	0.00	0.15	0.15
15.10	0.60	0.37	5.00	0.00	0.15	0.15
15.15	0.60	0.37	5.00	0.00	0.15	0.15
15.20	0.60	0.37	5.00	0.00	0.15	0.15
15.25	0.60	0.37	5.00	0.00	0.14	0.14
15.30	0.60	0.37	5.00	0.00	0.14	0.14
15.35	0.60	0.37	5.00	0.00	0.14	0.14
15.40	0.60	0.37	5.00	0.00	0.14	0.14
15.45	0.60	0.37	5.00	0.00	0.14	0.14
15.50	0.60	0.37	5.00	0.00	0.14	0.14
15.55	0.60	0.37	5.00	0.00	0.14	0.14
15.60	0.60	0.37	5.00	0.00	0.14	0.14
15.65	0.60	0.37	5.00	0.00	0.14	0.14
15.70	0.60	0.37	5.00	0.00	0.14	0.14
15.75	0.60	0.37	5.00	0.00	0.14	0.14

15.80	0.60	0.37	5.00	0.00	0.14	0.14
15.85	0.60	0.37	5.00	0.00	0.14	0.14
15.90	0.60	0.37	5.00	0.00	0.14	0.14
15.95	0.60	0.37	5.00	0.00	0.14	0.14
16.00	0.60	0.37	5.00	0.00	0.14	0.14
16.05	0.60	0.37	5.00	0.00	0.14	0.14
16.10	0.60	0.37	5.00	0.00	0.14	0.14
16.15	0.60	0.37	5.00	0.00	0.14	0.14
16.20	0.60	0.37	5.00	0.00	0.14	0.14
16.25	0.60	0.37	5.00	0.00	0.14	0.14
16.30	0.60	0.37	5.00	0.00	0.14	0.14
16.35	0.60	0.37	5.00	0.00	0.14	0.14
16.40	0.60	0.37	5.00	0.00	0.14	0.14
16.45	0.60	0.37	5.00	0.00	0.14	0.14
16.50	0.60	0.37	5.00	0.00	0.14	0.14
16.55	0.60	0.37	5.00	0.00	0.14	0.14
16.60	0.60	0.37	5.00	0.00	0.14	0.14
16.65	0.60	0.37	5.00	0.00	0.14	0.14
16.70	0.60	0.37	5.00	0.00	0.14	0.14
16.75	0.60	0.37	5.00	0.00	0.14	0.14
16.80	0.60	0.37	5.00	0.00	0.14	0.14
16.85	0.60	0.37	5.00	0.00	0.14	0.14
16.90	0.60	0.37	5.00	0.00	0.14	0.14
16.95	0.60	0.37	5.00	0.00	0.14	0.14
17.00	0.60	0.37	5.00	0.00	0.14	0.14
17.05	0.60	0.37	5.00	0.00	0.14	0.14
17.10	0.60	0.37	5.00	0.00	0.14	0.14
17.15	0.60	0.37	5.00	0.00	0.14	0.14
17.20	0.60	0.37	5.00	0.00	0.14	0.14
17.25	0.60	0.37	5.00	0.00	0.14	0.14
17.30	0.60	0.37	5.00	0.00	0.14	0.14
17.35	0.60	0.37	5.00	0.00	0.14	0.14
17.40	0.60	0.37	5.00	0.00	0.14	0.14
17.45	0.60	0.37	5.00	0.00	0.14	0.14
17.50	0.60	0.37	5.00	0.00	0.14	0.14
17.55	0.60	0.37	5.00	0.00	0.14	0.14
17.60	0.60	0.37	5.00	0.00	0.14	0.14
17.65	0.60	0.37	5.00	0.00	0.14	0.14
17.70	0.60	0.37	5.00	0.00	0.14	0.14
17.75	0.60	0.37	5.00	0.00	0.14	0.14
17.80	0.60	0.37	5.00	0.00	0.14	0.14
17.85	0.60	0.37	5.00	0.00	0.14	0.14
17.90	0.60	0.37	5.00	0.00	0.14	0.14
17.95	0.60	0.37	5.00	0.00	0.14	0.14
18.00	0.60	0.37	5.00	0.00	0.14	0.14
18.05	0.60	0.37	5.00	0.00	0.14	0.14
18.10	0.60	0.37	5.00	0.00	0.14	0.14
18.15	0.60	0.37	5.00	0.00	0.14	0.14

18.20	0.60	0.37	5.00	0.00	0.14	0.14
18.25	0.60	0.37	5.00	0.00	0.14	0.14
18.30	0.60	0.37	5.00	0.00	0.13	0.13
18.35	0.60	0.37	5.00	0.00	0.13	0.13
18.40	0.60	0.37	5.00	0.00	0.13	0.13
18.45	0.60	0.37	5.00	0.00	0.13	0.13
18.50	0.60	0.37	5.00	0.00	0.13	0.13
18.55	0.60	0.37	5.00	0.00	0.13	0.13
18.60	0.60	0.37	5.00	0.00	0.13	0.13
18.65	0.60	0.37	5.00	0.00	0.13	0.13
18.70	0.60	0.37	5.00	0.00	0.13	0.13
18.75	0.60	0.37	5.00	0.00	0.13	0.13
18.80	0.60	0.37	5.00	0.00	0.13	0.13
18.85	0.60	0.37	5.00	0.00	0.13	0.13
18.90	0.60	0.37	5.00	0.00	0.13	0.13
18.95	0.60	0.37	5.00	0.00	0.13	0.13
19.00	0.60	0.37	5.00	0.00	0.13	0.13
19.05	0.60	0.37	5.00	0.00	0.13	0.13
19.10	0.60	0.37	5.00	0.00	0.13	0.13
19.15	0.60	0.37	5.00	0.00	0.13	0.13
19.20	0.60	0.37	5.00	0.00	0.13	0.13
19.25	0.60	0.37	5.00	0.00	0.13	0.13
19.30	0.60	0.37	5.00	0.00	0.13	0.13
19.35	0.60	0.37	5.00	0.00	0.13	0.13
19.40	0.60	0.37	5.00	0.00	0.13	0.13
19.45	0.60	0.37	5.00	0.00	0.13	0.13
19.50	0.60	0.37	5.00	0.00	0.13	0.13
19.55	0.60	0.37	5.00	0.00	0.13	0.13
19.60	0.60	0.37	5.00	0.00	0.13	0.13
19.65	0.60	0.37	5.00	0.00	0.13	0.13
19.70	0.60	0.37	5.00	0.00	0.13	0.13
19.75	0.60	0.37	5.00	0.00	0.13	0.13
19.80	0.60	0.37	5.00	0.00	0.13	0.13
19.85	0.60	0.37	5.00	0.00	0.13	0.13
19.90	0.60	0.37	5.00	0.00	0.13	0.13
19.95	0.60	0.37	5.00	0.00	0.13	0.13
20.00	0.60	0.37	5.00	0.00	0.13	0.13
20.05	0.60	0.37	5.00	0.00	0.13	0.13
20.10	0.60	0.37	5.00	0.00	0.13	0.13
20.15	0.60	0.37	5.00	0.00	0.13	0.13
20.20	0.60	0.37	5.00	0.00	0.13	0.13
20.25	0.60	0.37	5.00	0.00	0.13	0.13
20.30	0.60	0.37	5.00	0.00	0.13	0.13
20.35	0.60	0.37	5.00	0.00	0.13	0.13
20.40	0.60	0.37	5.00	0.00	0.13	0.13
20.45	0.60	0.37	5.00	0.00	0.13	0.13
20.50	0.60	0.37	5.00	0.00	0.13	0.13
20.55	0.60	0.37	5.00	0.00	0.13	0.13

20.60	0.60	0.37	5.00	0.00	0.13	0.13
20.65	0.60	0.37	5.00	0.00	0.13	0.13
20.70	0.60	0.36	5.00	0.00	0.13	0.13
20.75	0.60	0.36	5.00	0.00	0.13	0.13
20.80	0.60	0.36	5.00	0.00	0.13	0.13
20.85	0.60	0.36	5.00	0.00	0.13	0.13
20.90	0.60	0.36	5.00	0.00	0.13	0.13
20.95	0.60	0.36	5.00	0.00	0.13	0.13
21.00	0.60	0.36	5.00	0.00	0.13	0.13
21.05	0.60	0.36	5.00	0.00	0.13	0.13
21.10	0.60	0.36	5.00	0.00	0.13	0.13
21.15	0.60	0.36	5.00	0.00	0.13	0.13
21.20	0.60	0.36	5.00	0.00	0.13	0.13
21.25	0.60	0.36	5.00	0.00	0.13	0.13
21.30	0.60	0.36	5.00	0.00	0.13	0.13
21.35	0.60	0.36	5.00	0.00	0.13	0.13
21.40	0.60	0.36	5.00	0.00	0.13	0.13
21.45	0.60	0.36	5.00	0.00	0.13	0.13
21.50	0.60	0.36	5.00	0.00	0.13	0.13
21.55	0.60	0.36	5.00	0.00	0.13	0.13
21.60	0.60	0.36	5.00	0.00	0.13	0.13
21.65	0.60	0.36	5.00	0.00	0.13	0.13
21.70	0.60	0.36	5.00	0.00	0.12	0.12
21.75	0.60	0.36	5.00	0.00	0.12	0.12
21.80	0.60	0.36	5.00	0.00	0.12	0.12
21.85	0.60	0.36	5.00	0.00	0.12	0.12
21.90	0.60	0.36	5.00	0.00	0.12	0.12
21.95	0.60	0.36	5.00	0.00	0.12	0.12
22.00	0.60	0.36	5.00	0.00	0.12	0.12
22.05	0.60	0.36	5.00	0.00	0.12	0.12
22.10	0.60	0.36	5.00	0.00	0.12	0.12
22.15	0.60	0.36	5.00	0.00	0.12	0.12
22.20	0.60	0.36	5.00	0.00	0.12	0.12
22.25	0.60	0.36	5.00	0.00	0.12	0.12
22.30	0.60	0.36	5.00	0.00	0.12	0.12
22.35	0.60	0.36	5.00	0.00	0.12	0.12
22.40	0.60	0.36	5.00	0.00	0.12	0.12
22.45	0.60	0.36	5.00	0.00	0.12	0.12
22.50	0.60	0.36	5.00	0.00	0.12	0.12
22.55	0.60	0.36	5.00	0.00	0.12	0.12
22.60	0.60	0.36	5.00	0.00	0.12	0.12
22.65	0.60	0.36	5.00	0.00	0.12	0.12
22.70	0.60	0.36	5.00	0.00	0.12	0.12
22.75	0.60	0.36	5.00	0.00	0.12	0.12
22.80	0.60	0.36	5.00	0.00	0.12	0.12
22.85	0.60	0.36	5.00	0.00	0.12	0.12
22.90	0.60	0.36	5.00	0.00	0.12	0.12
22.95	0.60	0.36	5.00	0.00	0.12	0.12

23.00	0.60	0.36	5.00	0.00	0.12	0.12
23.05	0.60	0.36	5.00	0.00	0.12	0.12
23.10	0.60	0.36	5.00	0.00	0.12	0.12
23.15	0.60	0.36	5.00	0.00	0.12	0.12
23.20	0.60	0.36	5.00	0.00	0.12	0.12
23.25	0.60	0.36	5.00	0.00	0.12	0.12
23.30	0.60	0.36	5.00	0.00	0.12	0.12
23.35	0.60	0.36	5.00	0.00	0.12	0.12
23.40	0.60	0.36	5.00	0.00	0.12	0.12
23.45	0.60	0.36	5.00	0.00	0.12	0.12
23.50	0.60	0.36	5.00	0.00	0.12	0.12
23.55	0.60	0.36	5.00	0.00	0.12	0.12
23.60	0.60	0.36	5.00	0.00	0.12	0.12
23.65	0.60	0.36	5.00	0.00	0.12	0.12
23.70	0.60	0.36	5.00	0.00	0.12	0.12
23.75	0.60	0.36	5.00	0.00	0.12	0.12
23.80	0.60	0.36	5.00	0.00	0.12	0.12
23.85	0.60	0.36	5.00	0.00	0.12	0.12
23.90	0.60	0.36	5.00	0.00	0.12	0.12
23.95	0.60	0.36	5.00	0.00	0.12	0.12
24.00	0.60	0.36	5.00	0.00	0.12	0.12
24.05	0.60	0.36	5.00	0.00	0.12	0.12
24.10	0.60	0.36	5.00	0.00	0.12	0.12
24.15	0.60	0.36	5.00	0.00	0.12	0.12
24.20	0.60	0.36	5.00	0.00	0.12	0.12
24.25	0.60	0.36	5.00	0.00	0.12	0.12
24.30	0.60	0.36	5.00	0.00	0.12	0.12
24.35	0.60	0.36	5.00	0.00	0.12	0.12
24.40	0.60	0.36	5.00	0.00	0.12	0.12
24.45	0.60	0.36	5.00	0.00	0.12	0.12
24.50	0.60	0.36	5.00	0.00	0.12	0.12
24.55	0.60	0.36	5.00	0.00	0.12	0.12
24.60	0.60	0.36	5.00	0.00	0.12	0.12
24.65	0.60	0.36	5.00	0.00	0.12	0.12
24.70	0.60	0.36	5.00	0.00	0.12	0.12
24.75	0.60	0.36	5.00	0.00	0.12	0.12
24.80	0.60	0.36	5.00	0.00	0.11	0.11
24.85	0.60	0.36	5.00	0.00	0.11	0.11
24.90	0.60	0.36	5.00	0.00	0.11	0.11
24.95	0.60	0.36	5.00	0.00	0.11	0.11
25.00	0.60	0.36	5.00	0.00	0.11	0.11
25.05	0.60	0.36	5.00	0.00	0.11	0.11
25.10	0.60	0.36	5.00	0.00	0.11	0.11
25.15	0.60	0.36	5.00	0.00	0.11	0.11
25.20	0.60	0.36	5.00	0.00	0.11	0.11
25.25	0.60	0.36	5.00	0.00	0.11	0.11
25.30	0.60	0.36	5.00	0.00	0.11	0.11
25.35	0.60	0.36	5.00	0.00	0.11	0.11

25.40	0.60	0.36	5.00	0.00	0.11	0.11
25.45	0.60	0.36	5.00	0.00	0.11	0.11
25.50	0.60	0.36	5.00	0.00	0.11	0.11
25.55	0.60	0.36	5.00	0.00	0.11	0.11
25.60	0.60	0.36	5.00	0.00	0.11	0.11
25.65	0.60	0.36	5.00	0.00	0.11	0.11
25.70	0.60	0.36	5.00	0.00	0.11	0.11
25.75	0.60	0.36	5.00	0.00	0.11	0.11
25.80	0.60	0.36	5.00	0.00	0.11	0.11
25.85	0.60	0.36	5.00	0.00	0.11	0.11
25.90	0.60	0.36	5.00	0.00	0.11	0.11
25.95	0.60	0.36	5.00	0.00	0.11	0.11
26.00	0.60	0.36	5.00	0.00	0.11	0.11
26.05	0.60	0.36	5.00	0.00	0.11	0.11
26.10	0.60	0.36	5.00	0.00	0.11	0.11
26.15	0.60	0.36	5.00	0.00	0.11	0.11
26.20	0.60	0.36	5.00	0.00	0.11	0.11
26.25	0.60	0.36	5.00	0.00	0.11	0.11
26.30	0.60	0.36	5.00	0.00	0.11	0.11
26.35	0.60	0.36	5.00	0.00	0.11	0.11
26.40	0.60	0.36	5.00	0.00	0.11	0.11
26.45	0.60	0.36	5.00	0.00	0.11	0.11
26.50	0.60	0.36	5.00	0.00	0.11	0.11
26.55	0.60	0.36	5.00	0.00	0.11	0.11
26.60	0.60	0.36	5.00	0.00	0.11	0.11
26.65	0.60	0.36	5.00	0.00	0.11	0.11
26.70	0.60	0.36	5.00	0.00	0.11	0.11
26.75	0.60	0.36	5.00	0.00	0.11	0.11
26.80	0.60	0.36	5.00	0.00	0.11	0.11
26.85	0.60	0.36	5.00	0.00	0.11	0.11
26.90	0.60	0.36	5.00	0.00	0.11	0.11
26.95	0.60	0.36	5.00	0.00	0.11	0.11
27.00	0.60	0.36	5.00	0.00	0.11	0.11
27.05	0.60	0.36	5.00	0.00	0.11	0.11
27.10	0.60	0.36	5.00	0.00	0.11	0.11
27.15	0.60	0.36	5.00	0.00	0.11	0.11
27.20	0.60	0.36	5.00	0.00	0.11	0.11
27.25	0.60	0.36	5.00	0.00	0.11	0.11
27.30	0.60	0.36	5.00	0.00	0.11	0.11
27.35	0.60	0.36	5.00	0.00	0.11	0.11
27.40	0.60	0.36	5.00	0.00	0.11	0.11
27.45	0.60	0.36	5.00	0.00	0.11	0.11
27.50	0.60	0.36	5.00	0.00	0.11	0.11
27.55	0.60	0.36	5.00	0.00	0.11	0.11
27.60	0.60	0.36	5.00	0.00	0.10	0.10
27.65	0.60	0.36	5.00	0.00	0.10	0.10
27.70	0.60	0.36	5.00	0.00	0.10	0.10
27.75	0.60	0.36	5.00	0.00	0.10	0.10

27.80	0.60	0.36	5.00	0.00	0.10	0.10
27.85	0.60	0.36	5.00	0.00	0.10	0.10
27.90	0.60	0.36	5.00	0.00	0.10	0.10
27.95	0.59	0.36	5.00	0.00	0.10	0.10
28.00	0.59	0.36	5.00	0.00	0.10	0.10
28.05	0.59	0.36	5.00	0.00	0.10	0.10
28.10	0.59	0.36	5.00	0.00	0.10	0.10
28.15	0.59	0.36	5.00	0.00	0.10	0.10
28.20	0.59	0.36	5.00	0.00	0.10	0.10
28.25	0.59	0.36	5.00	0.00	0.10	0.10
28.30	0.59	0.36	5.00	0.00	0.10	0.10
28.35	0.59	0.36	5.00	0.00	0.10	0.10
28.40	0.59	0.36	5.00	0.00	0.10	0.10
28.45	0.59	0.36	5.00	0.00	0.10	0.10
28.50	0.59	0.36	5.00	0.00	0.10	0.10
28.55	0.59	0.36	5.00	0.00	0.10	0.10
28.60	0.59	0.36	5.00	0.00	0.10	0.10
28.65	0.59	0.36	5.00	0.00	0.10	0.10
28.70	0.59	0.36	5.00	0.00	0.10	0.10
28.75	0.59	0.36	5.00	0.00	0.10	0.10
28.80	0.59	0.36	5.00	0.00	0.10	0.10
28.85	0.59	0.36	5.00	0.00	0.10	0.10
28.90	0.59	0.36	5.00	0.00	0.10	0.10
28.95	0.59	0.36	5.00	0.00	0.10	0.10
29.00	0.59	0.36	5.00	0.00	0.10	0.10
29.05	0.59	0.36	5.00	0.00	0.10	0.10
29.10	0.59	0.36	5.00	0.00	0.10	0.10
29.15	0.59	0.36	5.00	0.00	0.10	0.10
29.20	0.59	0.36	5.00	0.00	0.10	0.10
29.25	0.59	0.36	5.00	0.00	0.10	0.10
29.30	0.59	0.36	5.00	0.00	0.10	0.10
29.35	0.59	0.36	5.00	0.00	0.10	0.10
29.40	0.59	0.36	5.00	0.00	0.10	0.10
29.45	0.59	0.36	5.00	0.00	0.10	0.10
29.50	0.59	0.36	5.00	0.00	0.10	0.10
29.55	0.59	0.36	5.00	0.00	0.10	0.10
29.60	0.59	0.36	5.00	0.00	0.10	0.10
29.65	0.59	0.36	5.00	0.00	0.10	0.10
29.70	0.59	0.36	5.00	0.00	0.10	0.10
29.75	0.59	0.36	5.00	0.00	0.10	0.10
29.80	0.59	0.36	5.00	0.00	0.10	0.10
29.85	0.59	0.36	5.00	0.00	0.10	0.10
29.90	0.59	0.36	5.00	0.00	0.10	0.10
29.95	0.59	0.36	5.00	0.00	0.10	0.10
30.00	0.59	0.36	5.00	0.00	0.10	0.10
30.05	0.59	0.36	5.00	0.00	0.10	0.10
30.10	0.59	0.36	5.00	0.00	0.10	0.10
30.15	0.59	0.36	5.00	0.00	0.10	0.10

30.20	0.59	0.36	5.00	0.00	0.10	0.10
30.25	0.59	0.36	5.00	0.00	0.10	0.10
30.30	0.59	0.36	5.00	0.00	0.10	0.10
30.35	0.59	0.36	5.00	0.00	0.10	0.10
30.40	0.59	0.36	5.00	0.00	0.10	0.10
30.45	0.59	0.36	5.00	0.00	0.09	0.09
30.50	0.59	0.36	5.00	0.00	0.09	0.09
30.55	0.59	0.35	5.00	0.00	0.09	0.09
30.60	0.59	0.35	5.00	0.00	0.09	0.09
30.65	0.59	0.35	5.00	0.00	0.09	0.09
30.70	0.59	0.35	5.00	0.00	0.09	0.09
30.75	0.59	0.35	5.00	0.00	0.09	0.09
30.80	0.58	0.35	5.00	0.00	0.09	0.09
30.85	0.58	0.35	5.00	0.00	0.09	0.09
30.90	0.58	0.35	5.00	0.00	0.09	0.09
30.95	0.58	0.35	5.00	0.00	0.09	0.09
31.00	0.58	0.35	5.00	0.00	0.09	0.09
31.05	0.58	0.35	5.00	0.00	0.09	0.09
31.10	0.58	0.35	5.00	0.00	0.09	0.09
31.15	0.58	0.35	5.00	0.00	0.09	0.09
31.20	0.58	0.35	5.00	0.00	0.09	0.09
31.25	0.58	0.35	5.00	0.00	0.09	0.09
31.30	0.58	0.35	5.00	0.00	0.09	0.09
31.35	0.58	0.35	5.00	0.00	0.09	0.09
31.40	0.58	0.35	5.00	0.00	0.09	0.09
31.45	0.58	0.35	5.00	0.00	0.09	0.09
31.50	0.58	0.35	5.00	0.00	0.09	0.09
31.55	0.58	0.35	5.00	0.00	0.09	0.09
31.60	0.58	0.35	5.00	0.00	0.09	0.09
31.65	0.58	0.35	5.00	0.00	0.09	0.09
31.70	0.58	0.35	5.00	0.00	0.09	0.09
31.75	0.58	0.35	5.00	0.00	0.09	0.09
31.80	0.58	0.35	5.00	0.00	0.09	0.09
31.85	0.58	0.35	5.00	0.00	0.09	0.09
31.90	0.58	0.35	5.00	0.00	0.09	0.09
31.95	0.58	0.35	5.00	0.00	0.09	0.09
32.00	0.58	0.35	5.00	0.00	0.09	0.09
32.05	0.58	0.35	5.00	0.00	0.09	0.09
32.10	0.58	0.35	5.00	0.00	0.09	0.09
32.15	0.58	0.35	5.00	0.00	0.09	0.09
32.20	0.58	0.35	5.00	0.00	0.09	0.09
32.25	0.58	0.35	5.00	0.00	0.09	0.09
32.30	0.58	0.35	5.00	0.00	0.09	0.09
32.35	0.58	0.35	5.00	0.00	0.09	0.09
32.40	0.58	0.35	5.00	0.00	0.09	0.09
32.45	0.58	0.35	5.00	0.00	0.09	0.09
32.50	0.58	0.35	5.00	0.00	0.09	0.09
32.55	0.58	0.35	5.00	0.00	0.09	0.09

32.60	0.58	0.35	5.00	0.00	0.09	0.09
32.65	0.58	0.35	5.00	0.00	0.09	0.09
32.70	0.58	0.35	5.00	0.00	0.09	0.09
32.75	0.58	0.35	5.00	0.00	0.09	0.09
32.80	0.58	0.35	5.00	0.00	0.09	0.09
32.85	0.58	0.35	5.00	0.00	0.09	0.09
32.90	0.58	0.35	5.00	0.00	0.09	0.09
32.95	0.58	0.35	5.00	0.00	0.09	0.09
33.00	0.58	0.35	5.00	0.00	0.09	0.09
33.05	0.58	0.35	5.00	0.00	0.09	0.09
33.10	0.58	0.35	5.00	0.00	0.09	0.09
33.15	0.58	0.35	5.00	0.00	0.08	0.08
33.20	0.58	0.35	5.00	0.00	0.08	0.08
33.25	0.58	0.35	5.00	0.00	0.08	0.08
33.30	0.58	0.35	5.00	0.00	0.08	0.08
33.35	0.58	0.35	5.00	0.00	0.08	0.08
33.40	0.58	0.35	5.00	0.00	0.08	0.08
33.45	0.58	0.35	5.00	0.00	0.08	0.08
33.50	0.58	0.35	5.00	0.00	0.08	0.08
33.55	0.58	0.35	5.00	0.00	0.08	0.08
33.60	0.58	0.35	5.00	0.00	0.08	0.08
33.65	0.58	0.35	5.00	0.00	0.08	0.08
33.70	0.58	0.35	5.00	0.00	0.08	0.08
33.75	0.57	0.34	5.00	0.00	0.08	0.08
33.80	0.57	0.34	5.00	0.00	0.08	0.08
33.85	0.57	0.34	5.00	0.00	0.08	0.08
33.90	0.57	0.34	5.00	0.00	0.08	0.08
33.95	0.57	0.34	5.00	0.00	0.08	0.08
34.00	0.57	0.34	5.00	0.00	0.08	0.08
34.05	0.57	0.34	5.00	0.00	0.08	0.08
34.10	0.57	0.34	5.00	0.00	0.08	0.08
34.15	0.57	0.34	5.00	0.00	0.08	0.08
34.20	0.57	0.34	5.00	0.00	0.08	0.08
34.25	0.57	0.34	5.00	0.00	0.08	0.08
34.30	0.57	0.34	5.00	0.00	0.08	0.08
34.35	0.57	0.34	5.00	0.00	0.08	0.08
34.40	0.57	0.34	5.00	0.00	0.08	0.08
34.45	0.57	0.34	5.00	0.00	0.08	0.08
34.50	0.57	0.34	5.00	0.00	0.08	0.08
34.55	0.57	0.34	5.00	0.00	0.08	0.08
34.60	0.57	0.34	5.00	0.00	0.08	0.08
34.65	0.57	0.34	5.00	0.00	0.08	0.08
34.70	0.57	0.34	5.00	0.00	0.08	0.08
34.75	0.57	0.34	5.00	0.00	0.08	0.08
34.80	0.57	0.34	5.00	0.00	0.08	0.08
34.85	0.57	0.34	5.00	0.00	0.08	0.08
34.90	0.57	0.34	5.00	0.00	0.08	0.08
34.95	0.57	0.34	5.00	0.00	0.08	0.08

35.00	0.57	0.34	5.00	0.00	0.08	0.08
35.05	0.57	0.34	5.00	0.00	0.08	0.08
35.10	0.57	0.34	5.00	0.00	0.08	0.08
35.15	0.57	0.34	5.00	0.00	0.08	0.08
35.20	0.57	0.34	5.00	0.00	0.08	0.08
35.25	0.57	0.34	5.00	0.00	0.08	0.08
35.30	0.57	0.34	5.00	0.00	0.08	0.08
35.35	0.57	0.34	5.00	0.00	0.08	0.08
35.40	0.57	0.34	5.00	0.00	0.08	0.08
35.45	0.57	0.34	5.00	0.00	0.08	0.08
35.50	0.57	0.34	5.00	0.00	0.08	0.08
35.55	0.57	0.34	5.00	0.00	0.08	0.08
35.60	0.57	0.34	5.00	0.00	0.08	0.08
35.65	0.57	0.34	5.00	0.00	0.08	0.08
35.70	0.57	0.34	5.00	0.00	0.08	0.08
35.75	0.57	0.34	5.00	0.00	0.07	0.07
35.80	0.57	0.34	5.00	0.00	0.07	0.07
35.85	0.57	0.34	5.00	0.00	0.07	0.07
35.90	0.57	0.34	5.00	0.00	0.07	0.07
35.95	0.57	0.34	5.00	0.00	0.07	0.07
36.00	0.57	0.34	5.00	0.00	0.07	0.07
36.05	0.57	0.34	5.00	0.00	0.07	0.07
36.10	0.57	0.34	5.00	0.00	0.07	0.07
36.15	0.57	0.34	5.00	0.00	0.07	0.07
36.20	0.57	0.34	5.00	0.00	0.07	0.07
36.25	0.57	0.34	5.00	0.00	0.07	0.07
36.30	0.57	0.34	5.00	0.00	0.07	0.07
36.35	0.57	0.34	5.00	0.00	0.07	0.07
36.40	0.57	0.34	5.00	0.00	0.07	0.07
36.45	0.57	0.34	5.00	0.00	0.07	0.07
36.50	0.57	0.34	5.00	0.00	0.07	0.07
36.55	0.57	0.34	5.00	0.00	0.07	0.07
36.60	0.57	0.34	5.00	0.00	0.07	0.07
36.65	0.57	0.34	5.00	0.00	0.07	0.07
36.70	0.57	0.34	5.00	0.00	0.07	0.07
36.75	0.57	0.34	5.00	0.00	0.07	0.07
36.80	0.56	0.34	5.00	0.00	0.07	0.07
36.85	0.56	0.34	5.00	0.00	0.07	0.07
36.90	0.56	0.34	5.00	0.00	0.07	0.07
36.95	0.56	0.33	5.00	0.00	0.07	0.07
37.00	0.56	0.33	5.00	0.00	0.07	0.07
37.05	0.56	0.33	5.00	0.00	0.07	0.07
37.10	0.56	0.33	5.00	0.00	0.07	0.07
37.15	0.56	0.33	5.00	0.00	0.07	0.07
37.20	0.56	0.33	5.00	0.00	0.07	0.07
37.25	0.56	0.33	5.00	0.00	0.07	0.07
37.30	0.56	0.33	5.00	0.00	0.07	0.07
37.35	0.56	0.33	5.00	0.00	0.07	0.07

37.40	0.56	0.33	5.00	0.00	0.07	0.07
37.45	0.56	0.33	5.00	0.00	0.07	0.07
37.50	0.56	0.33	5.00	0.00	0.07	0.07
37.55	0.56	0.33	5.00	0.00	0.07	0.07
37.60	0.56	0.33	5.00	0.00	0.07	0.07
37.65	0.56	0.33	5.00	0.00	0.07	0.07
37.70	0.56	0.33	5.00	0.00	0.07	0.07
37.75	0.56	0.33	5.00	0.00	0.07	0.07
37.80	0.56	0.33	5.00	0.00	0.07	0.07
37.85	0.56	0.33	5.00	0.00	0.07	0.07
37.90	0.56	0.33	5.00	0.00	0.07	0.07
37.95	0.56	0.33	5.00	0.00	0.07	0.07
38.00	0.56	0.33	5.00	0.00	0.07	0.07
38.05	0.56	0.33	5.00	0.00	0.07	0.07
38.10	0.56	0.33	5.00	0.00	0.06	0.06
38.15	0.56	0.33	5.00	0.00	0.06	0.06
38.20	0.56	0.33	5.00	0.00	0.06	0.06
38.25	0.56	0.33	5.00	0.00	0.06	0.06
38.30	0.56	0.33	5.00	0.00	0.06	0.06
38.35	0.56	0.33	5.00	0.00	0.06	0.06
38.40	0.56	0.33	5.00	0.00	0.06	0.06
38.45	0.56	0.33	5.00	0.00	0.06	0.06
38.50	0.56	0.33	5.00	0.00	0.06	0.06
38.55	0.56	0.33	5.00	0.00	0.06	0.06
38.60	0.56	0.33	5.00	0.00	0.06	0.06
38.65	0.56	0.33	5.00	0.00	0.06	0.06
38.70	0.56	0.33	5.00	0.00	0.06	0.06
38.75	0.56	0.33	5.00	0.00	0.06	0.06
38.80	0.56	0.33	5.00	0.00	0.06	0.06
38.85	0.56	0.33	5.00	0.00	0.06	0.06
38.90	0.56	0.33	5.00	0.00	0.06	0.06
38.95	0.56	0.33	5.00	0.00	0.06	0.06
39.00	0.56	0.33	5.00	0.00	0.06	0.06
39.05	0.56	0.33	5.00	0.00	0.06	0.06
39.10	0.56	0.33	5.00	0.00	0.06	0.06
39.15	0.56	0.33	5.00	0.00	0.06	0.06
39.20	0.56	0.33	5.00	0.00	0.06	0.06
39.25	0.56	0.33	5.00	0.00	0.06	0.06
39.30	0.56	0.33	5.00	0.00	0.06	0.06
39.35	0.56	0.33	5.00	0.00	0.06	0.06
39.40	0.56	0.33	5.00	0.00	0.06	0.06
39.45	0.56	0.33	5.00	0.00	0.06	0.06
39.50	0.56	0.33	5.00	0.00	0.06	0.06
39.55	0.56	0.33	5.00	0.00	0.06	0.06
39.60	0.56	0.33	5.00	0.00	0.06	0.06
39.65	0.56	0.33	5.00	0.00	0.06	0.06
39.70	0.56	0.33	5.00	0.00	0.06	0.06
39.75	0.56	0.33	5.00	0.00	0.06	0.06

39.80	0.56	0.33	5.00	0.00	0.06	0.06
39.85	0.56	0.33	5.00	0.00	0.06	0.06
39.90	0.56	0.33	5.00	0.00	0.06	0.06
39.95	0.56	0.33	5.00	0.00	0.06	0.06
40.00	0.55	0.33	5.00	0.00	0.05	0.05
40.05	0.55	0.33	5.00	0.00	0.05	0.05
40.10	0.55	0.33	5.00	0.00	0.05	0.05
40.15	0.55	0.32	5.00	0.00	0.05	0.05
40.20	0.55	0.32	5.00	0.00	0.05	0.05
40.25	0.55	0.32	5.00	0.00	0.05	0.05
40.30	0.55	0.32	5.00	0.00	0.05	0.05
40.35	0.55	0.32	5.00	0.00	0.05	0.05
40.40	0.55	0.32	5.00	0.00	0.05	0.05
40.45	0.55	0.32	5.00	0.00	0.05	0.05
40.50	0.55	0.32	5.00	0.00	0.05	0.05
40.55	0.55	0.32	5.00	0.00	0.05	0.05
40.60	0.55	0.32	5.00	0.00	0.05	0.05
40.65	0.55	0.32	5.00	0.00	0.05	0.05
40.70	0.55	0.32	5.00	0.00	0.05	0.05
40.75	0.55	0.32	5.00	0.00	0.05	0.05
40.80	0.55	0.32	5.00	0.00	0.05	0.05
40.85	0.55	0.32	5.00	0.00	0.05	0.05
40.90	0.55	0.32	5.00	0.00	0.05	0.05
40.95	0.55	0.32	5.00	0.00	0.05	0.05
41.00	0.55	0.32	5.00	0.00	0.05	0.05
41.05	0.55	0.32	5.00	0.00	0.05	0.05
41.10	0.55	0.32	5.00	0.00	0.05	0.05
41.15	0.55	0.32	5.00	0.00	0.05	0.05
41.20	0.55	0.32	5.00	0.00	0.05	0.05
41.25	0.55	0.32	5.00	0.00	0.05	0.05
41.30	0.55	0.32	5.00	0.00	0.05	0.05
41.35	0.55	0.32	5.00	0.00	0.05	0.05
41.40	0.55	0.32	5.00	0.00	0.05	0.05
41.45	0.55	0.32	5.00	0.00	0.05	0.05
41.50	0.55	0.32	5.00	0.00	0.05	0.05
41.55	0.55	0.32	5.00	0.00	0.05	0.05
41.60	0.55	0.32	5.00	0.00	0.05	0.05
41.65	0.55	0.32	5.00	0.00	0.05	0.05
41.70	0.55	0.32	5.00	0.00	0.05	0.05
41.75	0.55	0.32	5.00	0.00	0.05	0.05
41.80	0.55	0.32	5.00	0.00	0.05	0.05
41.85	0.55	0.32	5.00	0.00	0.05	0.05
41.90	0.55	0.32	5.00	0.00	0.05	0.05
41.95	0.55	0.32	5.00	0.00	0.05	0.05
42.00	0.55	0.32	5.00	0.00	0.05	0.05
42.05	0.55	0.32	5.00	0.00	0.05	0.05
42.10	0.55	0.32	5.00	0.00	0.04	0.04
42.15	0.55	0.32	5.00	0.00	0.04	0.04

42.20	0.55	0.32	5.00	0.00	0.04	0.04
42.25	0.55	0.32	5.00	0.00	0.04	0.04
42.30	0.55	0.32	5.00	0.00	0.04	0.04
42.35	0.55	0.32	5.00	0.00	0.04	0.04
42.40	0.55	0.32	5.00	0.00	0.04	0.04
42.45	0.55	0.32	5.00	0.00	0.04	0.04
42.50	0.55	0.32	5.00	0.00	0.04	0.04
42.55	0.55	0.32	5.00	0.00	0.04	0.04
42.60	0.55	0.32	5.00	0.00	0.04	0.04
42.65	0.55	0.32	5.00	0.00	0.04	0.04
42.70	0.55	0.32	5.00	0.00	0.04	0.04
42.75	0.55	0.32	5.00	0.00	0.04	0.04
42.80	0.55	0.32	5.00	0.00	0.04	0.04
42.85	0.55	0.32	5.00	0.00	0.04	0.04
42.90	0.55	0.32	5.00	0.00	0.04	0.04
42.95	0.55	0.32	5.00	0.00	0.04	0.04
43.00	0.55	0.32	5.00	0.00	0.04	0.04
43.05	0.55	0.32	5.00	0.00	0.04	0.04
43.10	0.55	0.32	5.00	0.00	0.04	0.04
43.15	0.55	0.32	5.00	0.00	0.04	0.04
43.20	0.55	0.32	5.00	0.00	0.04	0.04
43.25	0.55	0.32	5.00	0.00	0.04	0.04
43.30	0.55	0.32	5.00	0.00	0.04	0.04
43.35	0.55	0.31	5.00	0.00	0.04	0.04
43.40	0.54	0.31	5.00	0.00	0.04	0.04
43.45	0.54	0.31	5.00	0.00	0.04	0.04
43.50	0.54	0.31	5.00	0.00	0.04	0.04
43.55	0.54	0.31	5.00	0.00	0.04	0.04
43.60	0.54	0.31	5.00	0.00	0.04	0.04
43.65	0.54	0.31	5.00	0.00	0.04	0.04
43.70	0.54	0.31	5.00	0.00	0.04	0.04
43.75	0.54	0.31	5.00	0.00	0.04	0.04
43.80	0.54	0.31	5.00	0.00	0.04	0.04
43.85	0.54	0.31	5.00	0.00	0.04	0.04
43.90	0.54	0.31	5.00	0.00	0.04	0.04
43.95	0.54	0.31	5.00	0.00	0.04	0.04
44.00	0.54	0.31	5.00	0.00	0.04	0.04
44.05	0.54	0.31	5.00	0.00	0.04	0.04
44.10	0.54	0.31	5.00	0.00	0.04	0.04
44.15	0.54	0.31	5.00	0.00	0.03	0.03
44.20	0.54	0.31	5.00	0.00	0.03	0.03
44.25	0.54	0.31	5.00	0.00	0.03	0.03
44.30	0.54	0.31	5.00	0.00	0.03	0.03
44.35	0.54	0.31	5.00	0.00	0.03	0.03
44.40	0.54	0.31	5.00	0.00	0.03	0.03
44.45	0.54	0.31	5.00	0.00	0.03	0.03
44.50	0.54	0.31	5.00	0.00	0.03	0.03
44.55	0.54	0.31	5.00	0.00	0.03	0.03

44.60	0.54	0.31	5.00	0.00	0.03	0.03
44.65	0.54	0.31	5.00	0.00	0.03	0.03
44.70	0.54	0.31	5.00	0.00	0.03	0.03
44.75	0.54	0.31	5.00	0.00	0.03	0.03
44.80	0.54	0.31	5.00	0.00	0.03	0.03
44.85	0.54	0.31	5.00	0.00	0.03	0.03
44.90	0.54	0.31	5.00	0.00	0.03	0.03
44.95	0.54	0.31	5.00	0.00	0.03	0.03
45.00	0.54	0.31	5.00	0.00	0.03	0.03
45.05	0.54	0.31	5.00	0.00	0.03	0.03
45.10	0.54	0.31	5.00	0.00	0.03	0.03
45.15	0.54	0.31	5.00	0.00	0.03	0.03
45.20	0.54	0.31	5.00	0.00	0.03	0.03
45.25	0.54	0.31	5.00	0.00	0.03	0.03
45.30	0.54	0.31	5.00	0.00	0.03	0.03
45.35	0.54	0.31	5.00	0.00	0.03	0.03
45.40	0.54	0.31	5.00	0.00	0.03	0.03
45.45	0.54	0.31	5.00	0.00	0.03	0.03
45.50	0.54	0.31	5.00	0.00	0.03	0.03
45.55	0.54	0.31	5.00	0.00	0.03	0.03
45.60	0.54	0.31	5.00	0.00	0.03	0.03
45.65	0.54	0.31	5.00	0.00	0.03	0.03
45.70	0.54	0.31	5.00	0.00	0.03	0.03
45.75	0.54	0.31	5.00	0.00	0.03	0.03
45.80	0.54	0.31	5.00	0.00	0.03	0.03
45.85	0.54	0.31	5.00	0.00	0.03	0.03
45.90	0.54	0.31	5.00	0.00	0.03	0.03
45.95	0.54	0.31	5.00	0.00	0.03	0.03
46.00	0.54	0.31	5.00	0.00	0.03	0.03
46.05	0.54	0.31	5.00	0.00	0.03	0.03
46.10	0.54	0.31	5.00	0.00	0.03	0.03
46.15	0.54	0.31	5.00	0.00	0.02	0.02
46.20	0.54	0.31	5.00	0.00	0.02	0.02
46.25	0.54	0.31	5.00	0.00	0.02	0.02
46.30	0.54	0.31	5.00	0.00	0.02	0.02
46.35	0.54	0.31	5.00	0.00	0.02	0.02
46.40	0.54	0.31	5.00	0.00	0.02	0.02
46.45	0.54	0.31	5.00	0.00	0.02	0.02
46.50	0.54	0.31	5.00	0.00	0.02	0.02
46.55	0.54	0.30	5.00	0.00	0.02	0.02
46.60	0.54	0.30	5.00	0.00	0.02	0.02
46.65	0.54	0.30	5.00	0.00	0.02	0.02
46.70	0.54	0.30	5.00	0.00	0.02	0.02
46.75	0.54	0.30	5.00	0.00	0.02	0.02
46.80	0.54	0.30	5.00	0.00	0.02	0.02
46.85	0.54	0.30	5.00	0.00	0.02	0.02
46.90	0.53	0.30	5.00	0.00	0.02	0.02
46.95	0.53	0.30	5.00	0.00	0.02	0.02

47.00	0.53	0.30	5.00	0.00	0.02	0.02
47.05	0.53	0.30	5.00	0.00	0.02	0.02
47.10	0.53	0.30	5.00	0.00	0.02	0.02
47.15	0.53	0.30	5.00	0.00	0.02	0.02
47.20	0.53	0.30	5.00	0.00	0.02	0.02
47.25	0.53	0.30	5.00	0.00	0.02	0.02
47.30	0.53	0.30	5.00	0.00	0.02	0.02
47.35	0.53	0.30	5.00	0.00	0.02	0.02
47.40	0.53	0.30	5.00	0.00	0.02	0.02
47.45	0.53	0.30	5.00	0.00	0.02	0.02
47.50	0.53	0.30	5.00	0.00	0.02	0.02
47.55	0.53	0.30	5.00	0.00	0.02	0.02
47.60	0.53	0.30	5.00	0.00	0.02	0.02
47.65	0.53	0.30	5.00	0.00	0.02	0.02
47.70	0.53	0.30	5.00	0.00	0.02	0.02
47.75	0.53	0.30	5.00	0.00	0.02	0.02
47.80	0.53	0.30	5.00	0.00	0.02	0.02
47.85	0.53	0.30	5.00	0.00	0.02	0.02
47.90	0.53	0.30	5.00	0.00	0.02	0.02
47.95	0.53	0.30	5.00	0.00	0.02	0.02
48.00	0.53	0.30	5.00	0.00	0.02	0.02
48.05	0.53	0.30	5.00	0.00	0.02	0.02
48.10	0.53	0.30	5.00	0.00	0.01	0.01
48.15	0.53	0.30	5.00	0.00	0.01	0.01
48.20	0.53	0.30	5.00	0.00	0.01	0.01
48.25	0.53	0.30	5.00	0.00	0.01	0.01
48.30	0.53	0.30	5.00	0.00	0.01	0.01
48.35	0.53	0.30	5.00	0.00	0.01	0.01
48.40	0.53	0.30	5.00	0.00	0.01	0.01
48.45	0.53	0.30	5.00	0.00	0.01	0.01
48.50	0.53	0.30	5.00	0.00	0.01	0.01
48.55	0.53	0.30	5.00	0.00	0.01	0.01
48.60	0.53	0.30	5.00	0.00	0.01	0.01
48.65	0.53	0.30	5.00	0.00	0.01	0.01
48.70	0.53	0.30	5.00	0.00	0.01	0.01
48.75	0.53	0.30	5.00	0.00	0.01	0.01
48.80	0.53	0.30	5.00	0.00	0.01	0.01
48.85	0.53	0.30	5.00	0.00	0.01	0.01
48.90	0.53	0.30	5.00	0.00	0.01	0.01
48.95	0.53	0.30	5.00	0.00	0.01	0.01
49.00	0.53	0.30	5.00	0.00	0.01	0.01
49.05	0.53	0.30	5.00	0.00	0.01	0.01
49.10	0.53	0.30	5.00	0.00	0.01	0.01
49.15	0.53	0.30	5.00	0.00	0.01	0.01
49.20	0.53	0.30	5.00	0.00	0.01	0.01
49.25	0.53	0.30	5.00	0.00	0.01	0.01
49.30	0.53	0.30	5.00	0.00	0.01	0.01
49.35	0.53	0.30	5.00	0.00	0.01	0.01

49.40	0.53	0.30	5.00	0.00	0.01	0.01
49.45	0.53	0.30	5.00	0.00	0.01	0.01
49.50	0.53	0.30	5.00	0.00	0.01	0.01
49.55	0.53	0.30	5.00	0.00	0.01	0.01
49.60	0.53	0.30	5.00	0.00	0.01	0.01
49.65	0.53	0.30	5.00	0.00	0.01	0.01
49.70	0.53	0.30	5.00	0.00	0.01	0.01
49.75	0.53	0.29	5.00	0.00	0.01	0.01
49.80	0.53	0.29	5.00	0.00	0.01	0.01
49.85	0.53	0.29	5.00	0.00	0.01	0.01
49.90	0.53	0.29	5.00	0.00	0.01	0.01
49.95	0.53	0.29	5.00	0.00	0.01	0.01
50.00	0.53	0.29	5.00	0.00	0.01	0.01
50.05	0.53	0.29	5.00	0.00	0.00	0.00
50.10	0.53	0.29	5.00	0.00	0.00	0.00
50.15	0.53	0.29	5.00	0.00	0.00	0.00
50.20	0.53	0.29	5.00	0.00	0.00	0.00
50.25	0.53	0.29	5.00	0.00	0.00	0.00
50.30	0.53	0.29	5.00	0.00	0.00	0.00
50.35	0.53	0.29	5.00	0.00	0.00	0.00
50.40	0.53	0.29	5.00	0.00	0.00	0.00
50.45	0.53	0.29	5.00	0.00	0.00	0.00
50.50	0.53	0.29	5.00	0.00	0.00	0.00
50.55	0.53	0.29	5.00	0.00	0.00	0.00
50.60	0.53	0.29	5.00	0.00	0.00	0.00
50.65	0.52	0.29	5.00	0.00	0.00	0.00
50.70	0.52	0.29	5.00	0.00	0.00	0.00
50.75	0.52	0.29	5.00	0.00	0.00	0.00
50.80	0.52	0.29	5.00	0.00	0.00	0.00
50.85	0.52	0.29	5.00	0.00	0.00	0.00
50.90	0.52	0.29	5.00	0.00	0.00	0.00
50.95	0.52	0.29	5.00	0.00	0.00	0.00
51.00	0.52	0.29	5.00	0.00	0.00	0.00

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* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Unit: qc, fs, Stress or Pressure = atm (1.0581tsf); Unit Weight = pcf; Depth = ft; Settlement = in.

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1 atm (atmosphere) = 1 tsf (ton/ft2)
CRRm Cyclic resistance ratio from soils
CSRsf Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat Settlement from saturated sands

S_dry Settlement from Unsaturated Sands
S_all Total Settlement from Saturated and Unsaturated Sands
NoLiq No-Liquefy Soils

Appendix V.3 Pile Capacity Analysis

At the early stages of design, the SD provides preliminary foundation information to the GD using the Preliminary Foundation Design Data Sheet, shown in Table 3-2, as part of the request for a Preliminary Foundation Report

Table 3-2.

Preliminary Foundation Design Data Sheet				Estimated Max Factored Load (kips)	
Support	Foundation Type(s) Considered	Estimate of Maximum Factored Compression Loads (kips)			
Abut 1	24" CIDH Concrete Pile Group	280	per pile	195	per pile
Bent 2	72" CIDH Pile Shaft	612	per column		
Bent 3	72" CIDH Pile Shaft	609	per column		
Abut 4	24" CIDH Concrete Pile Group	280	per pile	197	per pile

Notes:

1 Estimate of maximum factored loads is not required for standard piles, rather provide Factored Nominal Structural Resistance (only at preliminary stage).
(assuming Φ=0.7 and a 400 kip nominal axial structural resistance for 24" CIDH standard pile)
(Estimated Max Factored Load for standard piles provided to right of table)

2 Maximum factored loads are estimated based on Strength Limit State load combinations.

Table 3-4. General Foundation Information to be sent from the SD to the GD

Foundation Design Data Sheet							
Support No.	Pile Type	Finished Grade Elevation (ft)	Cut-off Elevation (ft)	Pile Cap Size (ft) B	Pile Cap Size (ft) L	Permissible Settlement under Service Load (in)*	Number of Piles per Support
Abut 1	24"CIDH	658	654.75	12	36	1	10
Bent 2	72"CIDH	658	656	-	-	1	2
Bent 3	72"CIDH	658	656	-	-	1	2
Abut 4	24"CIDH	658	654.75	12	36	1	10

* Based on CALTRANS' current practice, the total permissible settlement is one inch for multispan structures with continuous spans or multi-column bents, one inch for single span structures with diaphragm abutments, and two inches for single span structures with seat abutments. Different permissible settlement under service loads may be allowed if a structural analysis verifies that required level of serviceability is met.

Table 3-5. Design Loads to be sent from the SD to the GD

Foundation Factored Design Loads										
	Service-I Limit State (kips)		Strength Limit State (Controlling Group, kips)				Extreme Event Limit State (Controlling Group, kips)			
	Total Load	Permanent Loads	Compression (+)		Tension (-)		Compression (+)		Tension (-)	
Support No.	Per Support	Per Support	Per Support	Max. Per Pile	Per Support	Min. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1	805	653	1,321	195	N/A	N/A	-	-	-	-
Bent 2	803	492	1,154	612	N/A	N/A	N/A	706	N/A	-214
Bent 3	802	494	1,151	609	N/A	N/A	N/A	696	N/A	-204
Abut 4	819	668	1,339	197	N/A	N/A	-	-	-	-

At the early stages of design, the SD provides preliminary foundation information to the GD using the Preliminary Foundation Design Data Sheet, shown in Table 3-2, as part of the request for a Preliminary Foundation Report

Table 3-2.

Preliminary Foundation Design Data Sheet				Estimated Max Factored Load (kips)	
Support	Foundation Type(s) Considered	Estimate of Maximum Factored Compression Loads (kips)			
Abut 1	24" CIDH Concrete Pile Group	280	per pile	187	per pile
Bent 2	72" CIDH Pile Shaft	757	per column		
Bent 3	72" CIDH Pile Shaft	756	per column		
Abut 4	24" CIDH Concrete Pile Group	280	per pile	194	per pile

Notes:

1 Estimate of maximum factored loads is not required for standard piles, rather provide Factored Nominal Structural Resistance (only at preliminary stage).
(assuming Φ=0.7 and a 400 kip nominal axial structural resistance for 24" CIDH standard pile)
(Estimated Max Factored Load for standard piles provided to right of table)

2 Maximum factored loads are estimated based on Strength Limit State load combinations.

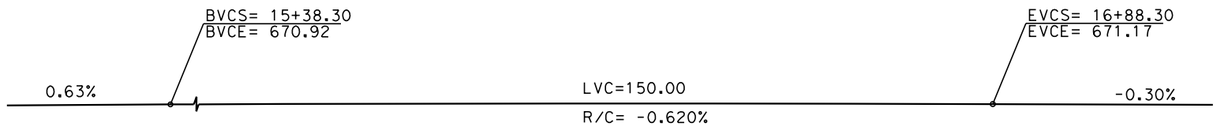
Table 3-4. General Foundation Information to be sent from the SD to the GD

Foundation Design Data Sheet							
Support No.	Pile Type	Finished Grade Elevation (ft)	Cut-off Elevation (ft)	Pile Cap Size (ft) B	Pile Cap Size (ft) L	Permissible Settlement under Service Load (in)*	Number of Piles per Support
Abut 1	24"CIDH	658	654.75	12	36	1	10
Bent 2	72"CIDH	658	656	-	-	1	2
Bent 3	72"CIDH	658	656	-	-	1	2
Abut 4	24"CIDH	658	654.75	12	36	1	10

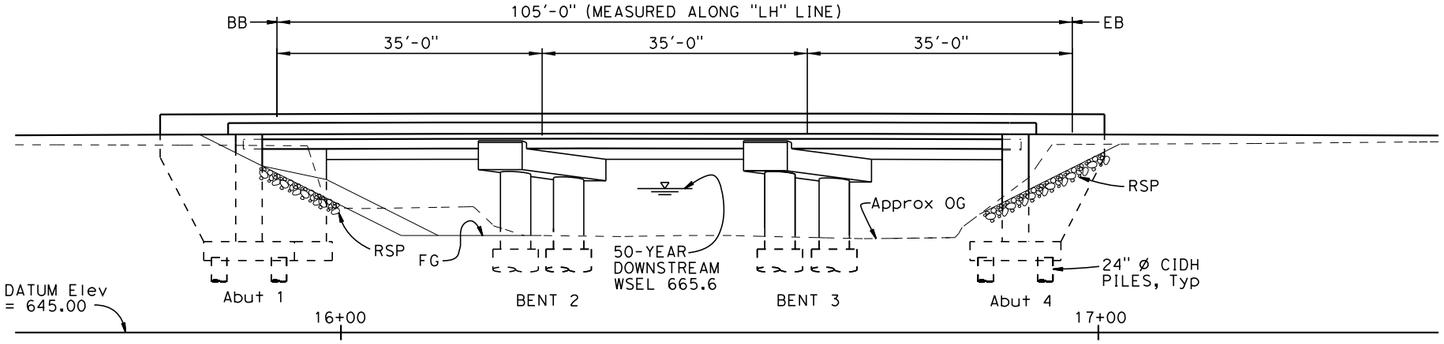
* Based on CALTRANS' current practice, the total permissible settlement is one inch for multispan structures with continuous spans or multi-column bents, one inch for single span structures with diaphragm abutments, and two inches for single span structures with seat abutments. Different permissible settlement under service loads may be allowed if a structural analysis verifies that required level of serviceability is met.

Table 3-5. Design Loads to be sent from the SD to the GD

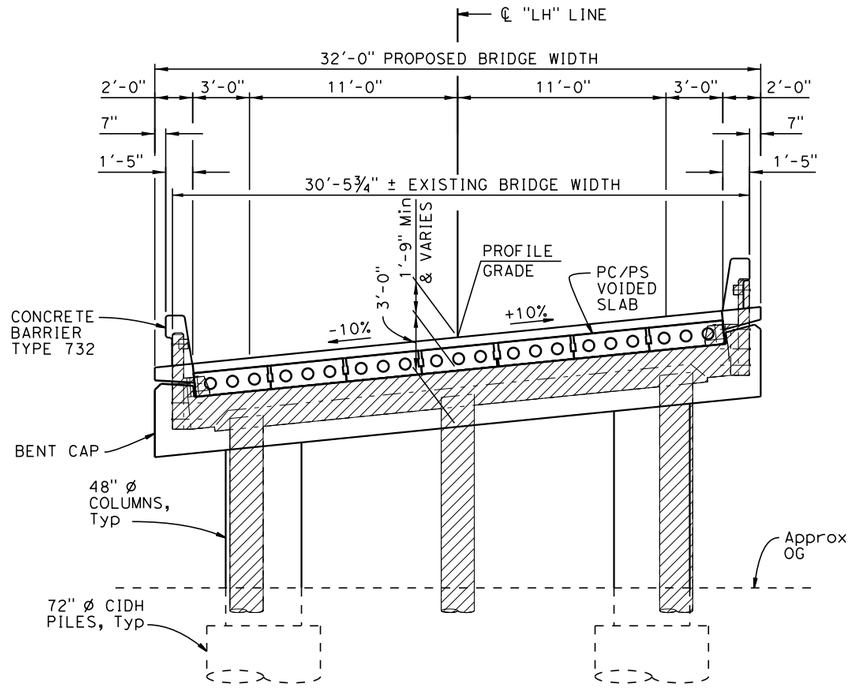
Foundation Factored Design Loads										
	Service-I Limit State (kips)		Strength Limit State (Controlling Group, kips)				Extreme Event Limit State (Controlling Group, kips)			
	Total Load	Permanent Loads	Compression (+)		Tension (-)		Compression (+)		Tension (-)	
Support No.	Per Support	Per Support	Per Support	Max. Per Pile	Per Support	Min. Per Pile	Per Support	Max. Per Pile	Per Support	Max. Per Pile
Abut 1	763	607	1,270	187	N/A	N/A	-	-	-	-
Bent 2	1,018	668	1,484	757	N/A	N/A	N/A	896	N/A	-220
Bent 3	1,020	667	1,483	756	N/A	N/A	N/A	896	N/A	-220
Abut 4	810	653	1,332	194	N/A	N/A	-	-	-	-



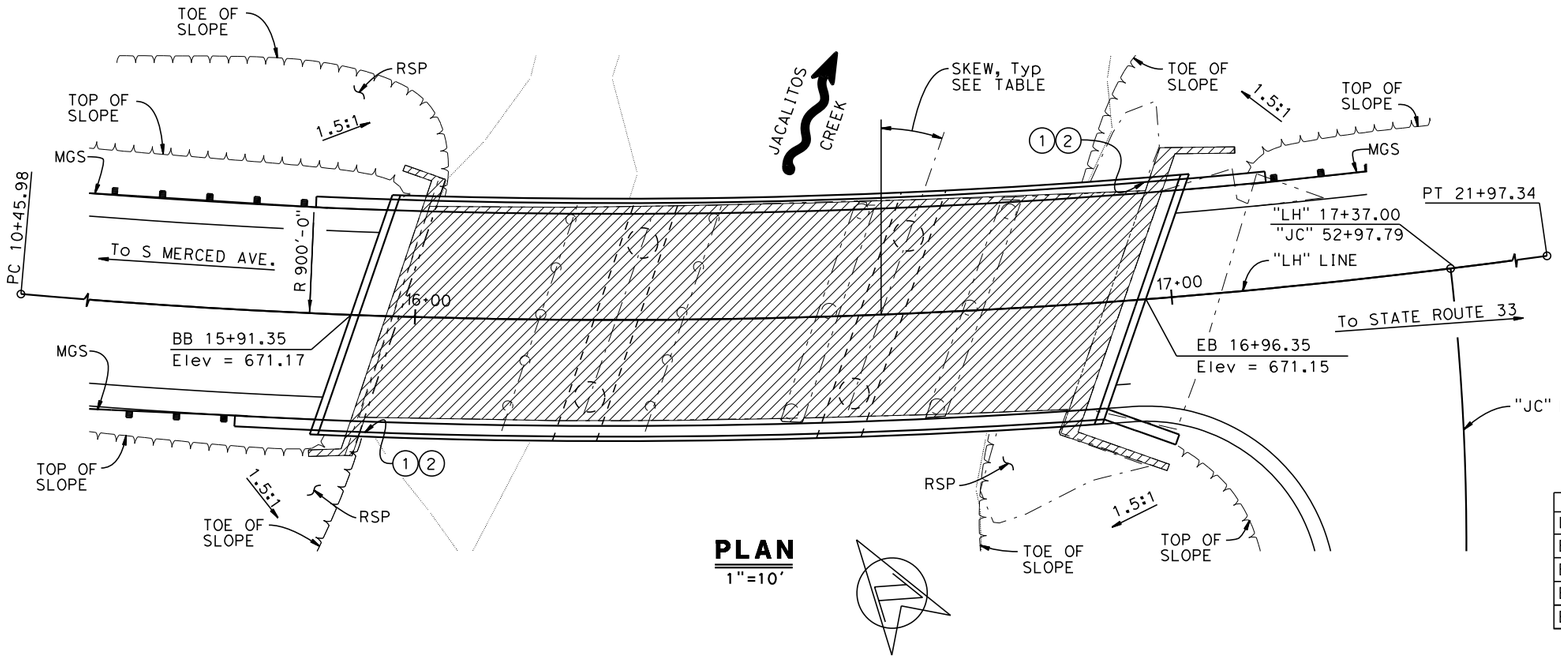
PROFILE GRADE
NO SCALE



ELEVATION
1"=10'



TYPICAL SECTION
¼"=1'-0"



PLAN
1"=10'

SKEW TABLE	
LOCATION	SKEW
BB	16°49'14"
BENT 2	19°02'55"
BENT 3	21°16'36"
EB	23°30'18"

Legend:

① Paint "BRIDGE NO. "

② Paint "LOST HILLS ROAD AT JACALITOS CREEK"

— - Indicates Existing Structure

—— Indicates New Structure

▨ Indicates Existing Structure, to be removed

TY·LIN INTERNATIONAL	DATE	RECORD DRAWING	
DESIGNED: MARK PHILIPPS	02/01/2016	RESIDENT ENGINEER	DATE
DRAWN: HENRY HIDALGO	02/01/2016		
CHECKED: MIKE WOLOHAN	02/01/2016		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE: PLAN 0 1" 2"

35% PLANS NOT FOR CONSTRUCTION
SUPERVISING ENGINEER DATE

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT
ON LOST HILLS ROAD

ROAD NO. •••• BRIDGE NO. XXXXXXX

THE COUNTY OF FRESNO 1856

DEPARTMENT OF PUBLIC WORKS AND PLANNING

ADVANCED PLANNING STUDY
ALTERNATIVE 1

DRAWING NO. •••• SHEET NO. •••• TOTAL 1

USERNAME => bhidalgo DATE PLOTTED => 5/16/2016 TIME PLOTTED => 12:39:01 PM

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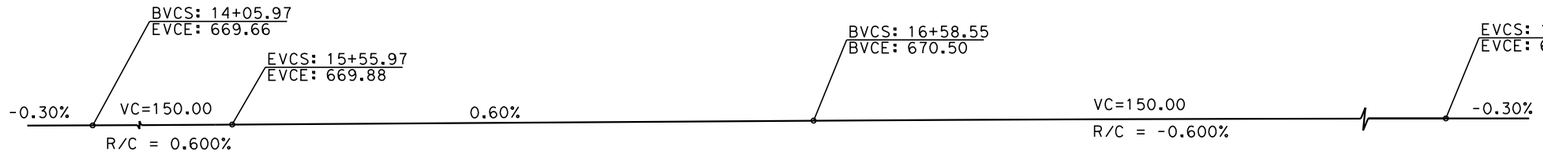
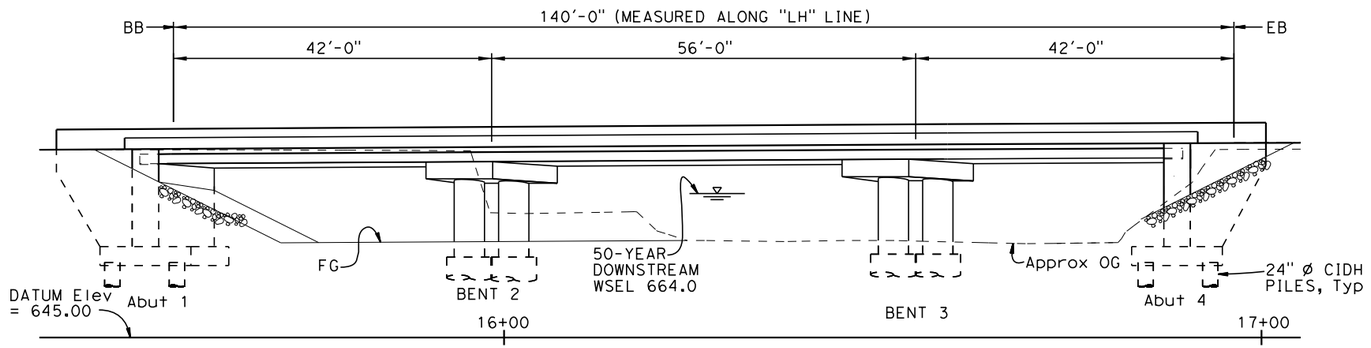


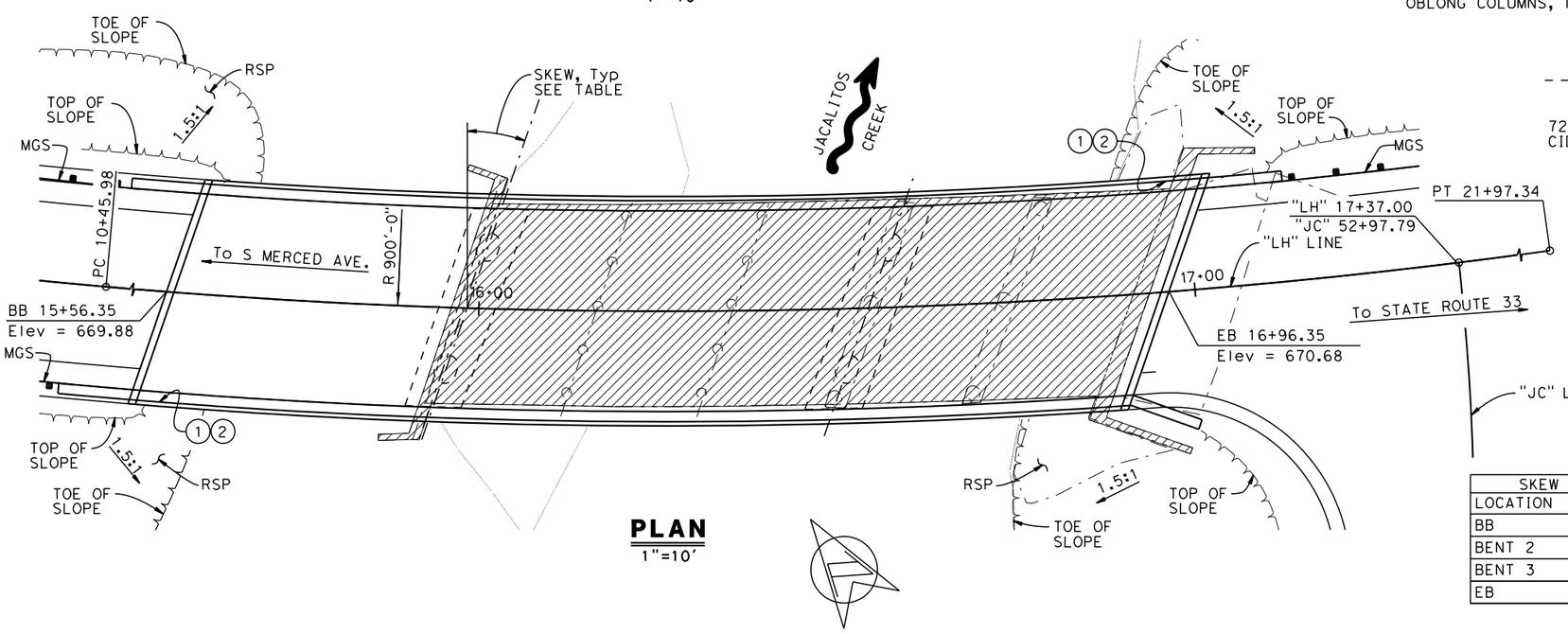
PROFILE GRADE

NO SCALE



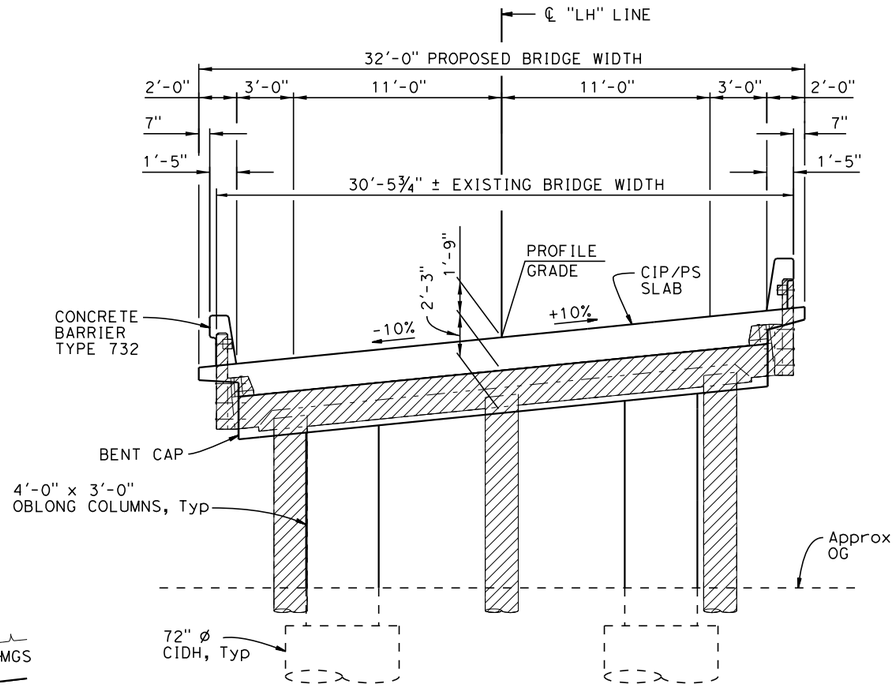
ELEVATION

1"=10'



PLAN

1"=10'



TYPICAL SECTION

¼"=1'-0"

SKEW TABLE	
LOCATION	SKEW
BB	14°35'32"
BENT 2	17°15'58"
BENT 3	20°49'52"
EB	23°30'18"

Legend:

(1) Paint "BRIDGE NO. "

(2) Paint "LOST HILLS ROAD AT JACALITOS CREEK"

— - Indicates Existing Structure

—— Indicates New Structure

▨ Indicates Existing Structure, to be removed

TYLIN INTERNATIONAL	DATE	RECORD DRAWING		SCALE	
DESIGNED: MARK PHILIPPS	02/01/2016	RESIDENT ENGINEER	DATE	PLAN 0 1" 2"	
DRAWN: HENRY HIDALGO	02/01/2016				
CHECKED: MIKE WOLOHAN	02/01/2016				

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

350 PLANS NOT FOR CONSTRUCTION — SUPERVISING ENGINEER — DATE

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT

ON LOST HILLS ROAD

ROAD NO. •••• BRIDGE NO. XXXXXXX

DEPARTMENT OF PUBLIC WORKS AND PLANNING

ADVANCED PLANNING STUDY
ALTERNATIVE 2

DRAWING NO. •••• SHEET NO. •••• TOTAL 1

USERNAME => hhidalgo DATE PLOTTED => 5/16/2016 TIME PLOTTED => 12:39:02 PM

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WRECO Job No. P15010 **Job Name:** Jacalitos Bridge **Project Structure Name:** Alternative 1: PC/PS 3-span Bridge

Analysis: CIDH Pile Analysis **Date:** May 19, 2016 **By:** J. Newgard **Check By:** _____ on _____.

Sample Calculations for Reduction Factors for Lateral Capacity for Alternative 1.

REFER TO AASHTO 10.7.2.4
W/ CA AMENDMENTS

Leading row, 3.00xB; Same direction Single row, 3.75xB; 2nd row, 3.00xB; Same direction Single row, 3.75xB

$$R_F^{LONGITUDINAL}(abut) = \frac{(5)(0.75)(0.975) + (5)(0.55)(0.975)}{10} = 0.63$$

Perp Direction Leading row, 3.75xB; Same direction Single row, 3.00xB; Perp Direction 2nd row, 3.75xB; Same direction Single row, 3.00xB; Perp Direction subsequent rows, 3.75xB; Same direction Single row, 3.00xB

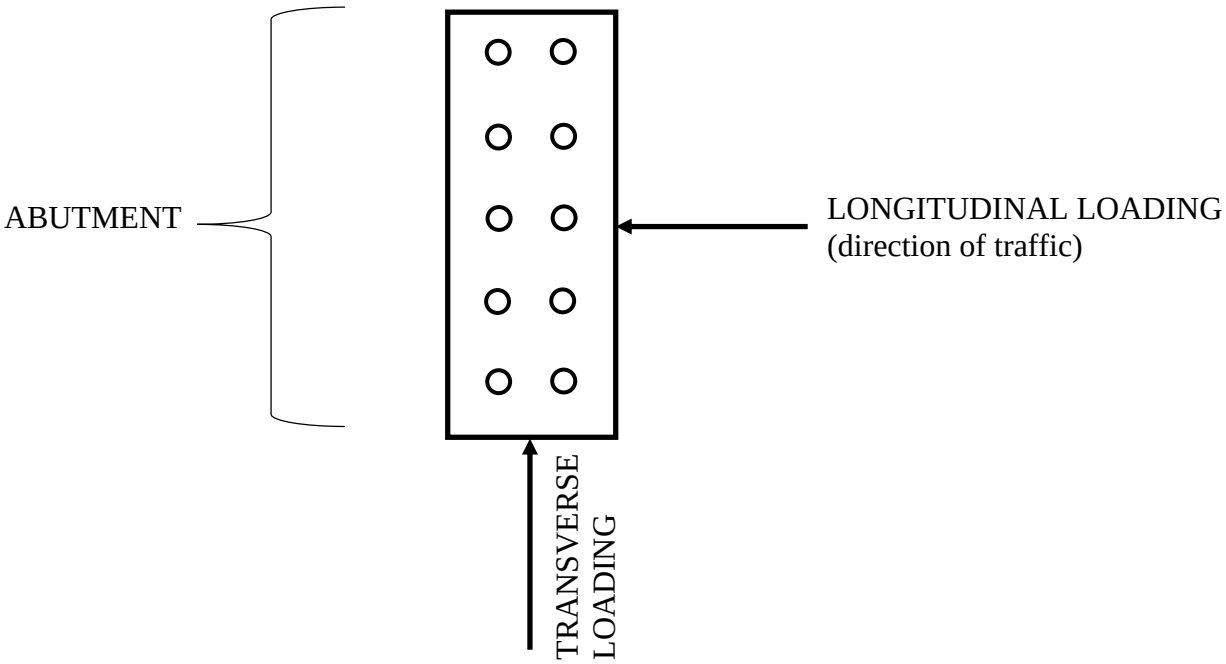
$$R_F^{TRANSVERSE}(abut) = \frac{(2)(0.84)(0.90) + (2)(0.66)(0.90) + (6)(0.51)(0.90)}{10} = 0.55$$

$$R_F^{LONGITUDINAL}(bent\ 2) = \frac{(1)(0.96)(1)}{1} = 0.96$$

$$R_F^{TRANSVERSE}(bent\ 2) = \frac{(1)(0.82)(1)}{1} = 0.82$$

$$R_F^{LONGITUDINAL}(bent\ 3) = \frac{(1)(0.97)(1)}{1} = 0.97$$

$$R_F^{TRANSVERSE}(bent\ 3) = \frac{(1)(0.83)(1)}{1} = 0.83$$


ABUTMENT
LONGITUDINAL LOADING
(direction of traffic)
TRANSVERSE
LOADING

WRECO Job No. P15010 **Job Name:** Jacalitos Bridge **Project Structure Name:** Alternative 2: CIP/PS 3-span Bridge

Analysis: CIDH Pile Analysis **Date:** May 19, 2016 **By:** J. Newgard **Check By:** _____ on _____.

Sample Calculations for Reduction Factors for Lateral Capacity for Alternative 2.

$$R_F^{LONGITUDINAL}(abut) = \frac{(5)(0.75)(0.975) + (5)(0.55)(0.975)}{10} = 0.63$$

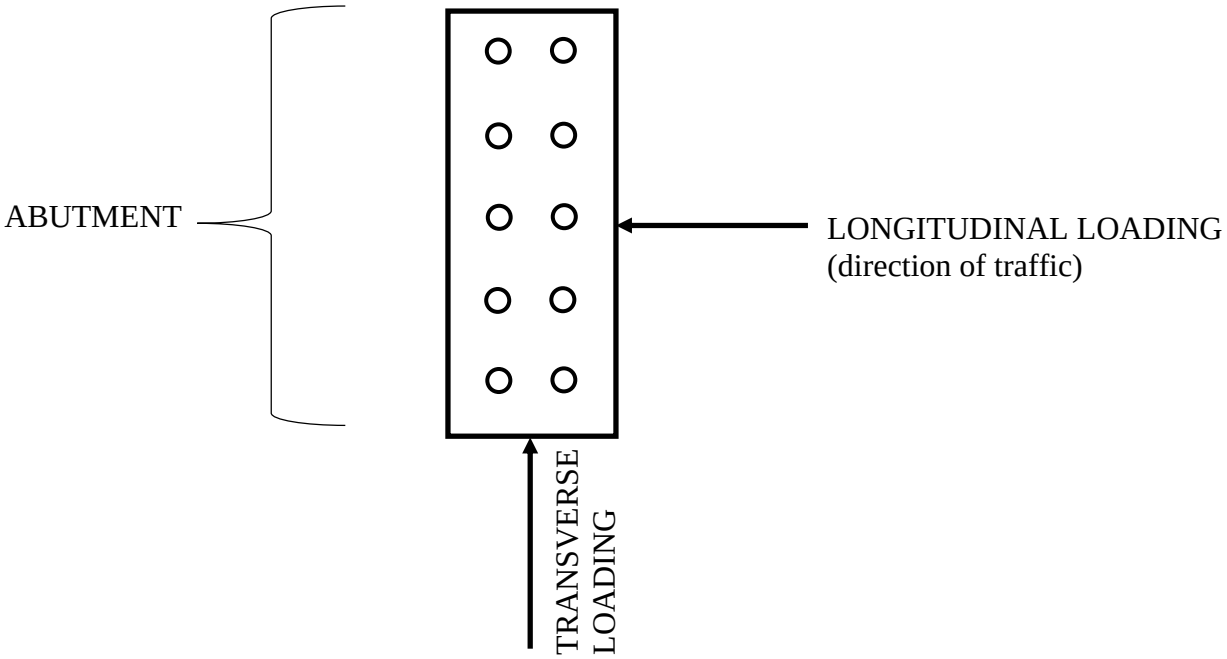
$$R_F^{TRANSVERSE}(abut) = \frac{(2)(0.84)(0.90) + (2)(0.66)(0.90) + (6)(0.51)(0.90)}{10} = 0.55$$

$$R_F^{LONGITUDINAL}(bent\ 2) = \frac{(1)(0.90)(1)}{1} = 0.90$$

$$R_F^{TRANSVERSE}(bent\ 2) = \frac{(1)(0.75)(1)}{1} = 0.75$$

$$R_F^{LONGITUDINAL}(bent\ 3) = \frac{(1)(0.90)(1)}{1} = 0.90$$

$$R_F^{TRANSVERSE}(bent\ 3) = \frac{(1)(0.75)(1)}{1} = 0.75$$


ABUTMENT
LONGITUDINAL LOADING
(direction of traffic)
TRANSVERSE
LOADING

SOIL PROFILE (applies to Abut 1, Bent 2, Bent 3, & Bent 4)

658' FG ↓

656' BOF BENT

654.75' BOF ABUT

SILTY SAND (SM)
$\gamma = 120$ pcf
$\phi = 36°$
$c = 0$ psf
$k = 200$ pci
$\bar{N}_{60} = 33$

646'

Poorly graded SAND with SILT (SP-SM)
$\gamma = 125$ pcf
$\phi = 40°$
$c = 0$ psf
$k = 225$ pci
$\bar{N}_{60} > 50$

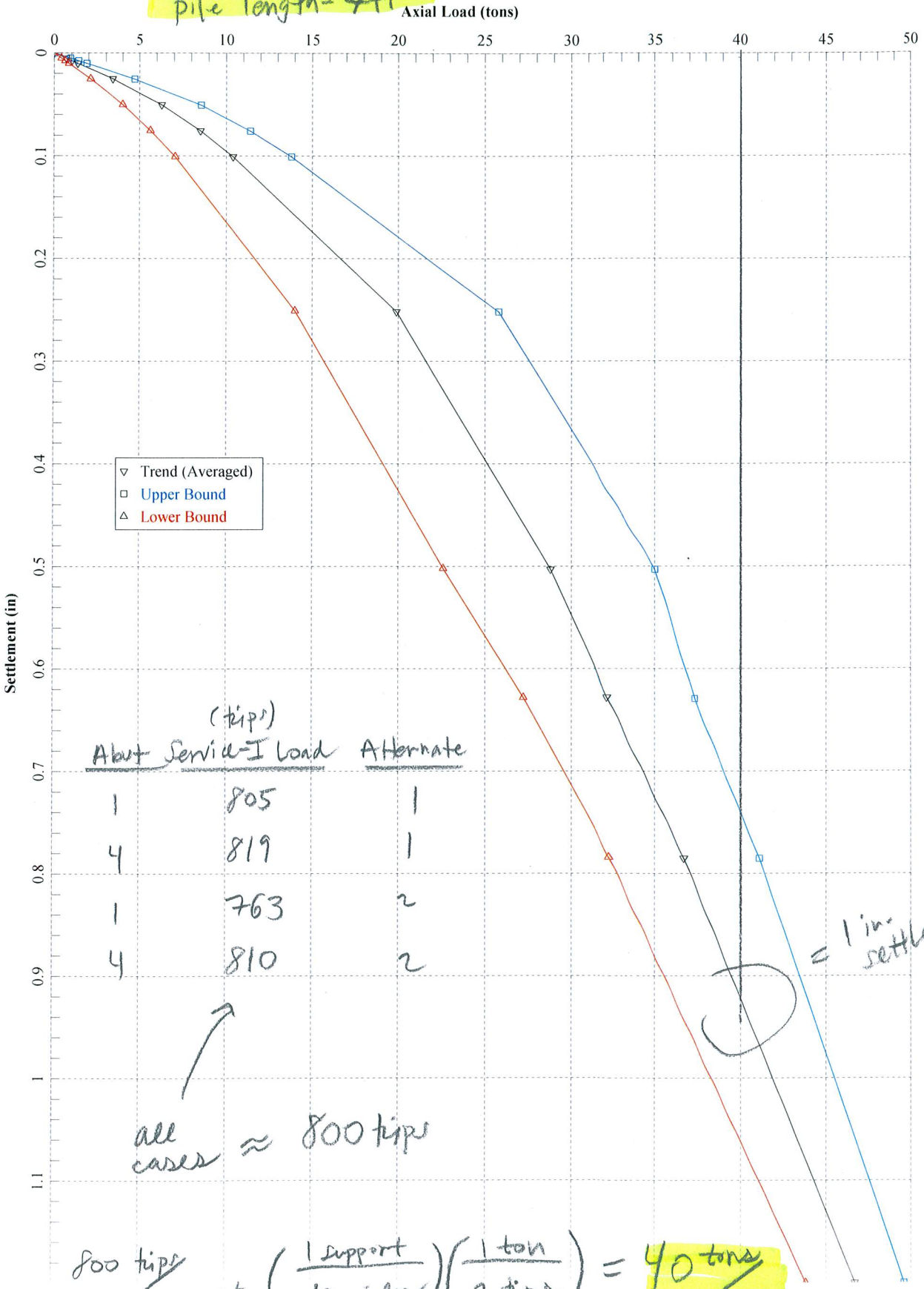
609'

Alternate 1 & Alternate 2

Abut 1 & 4

Service-I State

pile length = 7ft



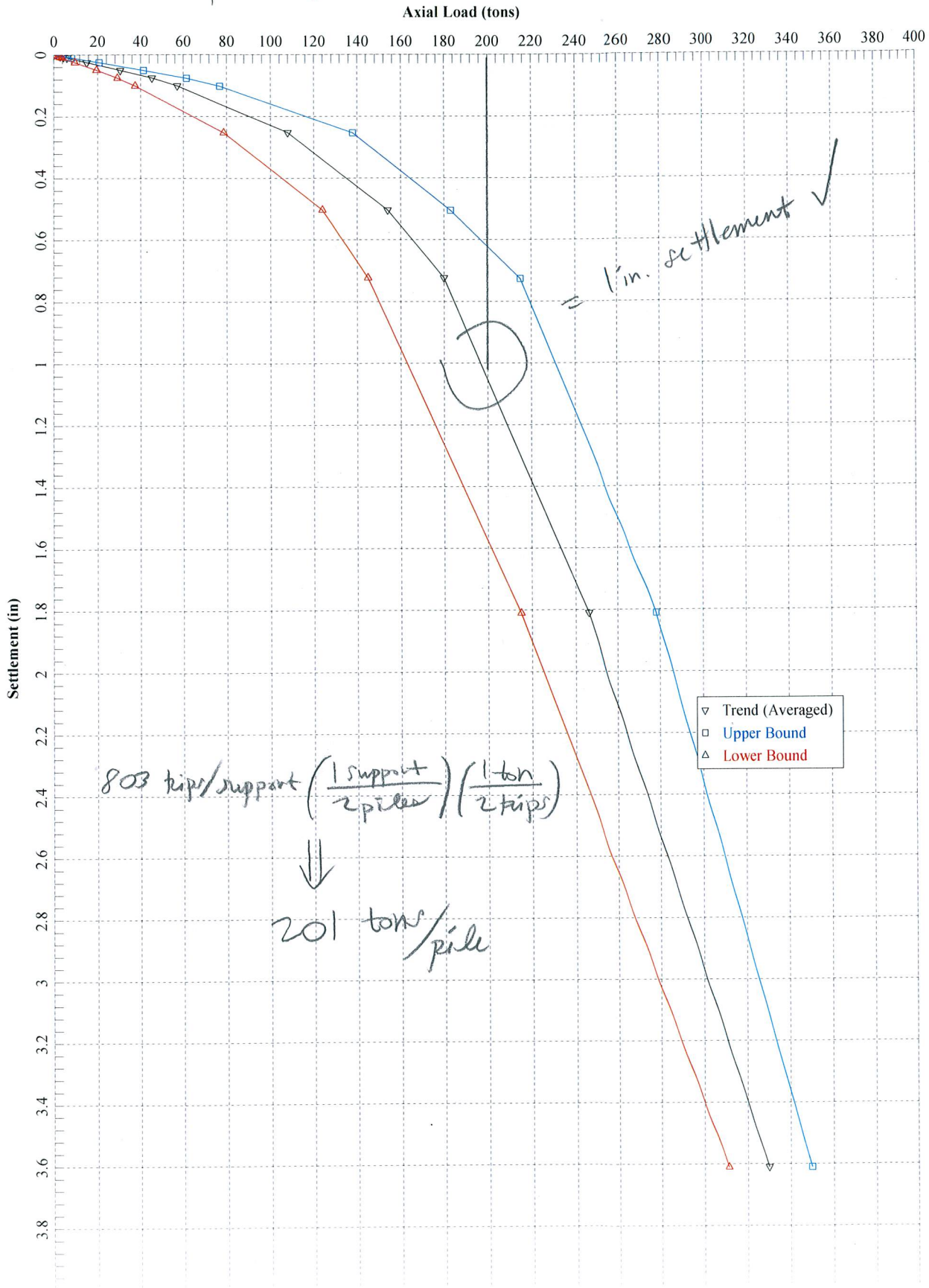
Abut	Service-I Load (tips)	Alternate
1	805	1
4	819	1
1	763	2
4	810	2

all cases ≈ 800 tips

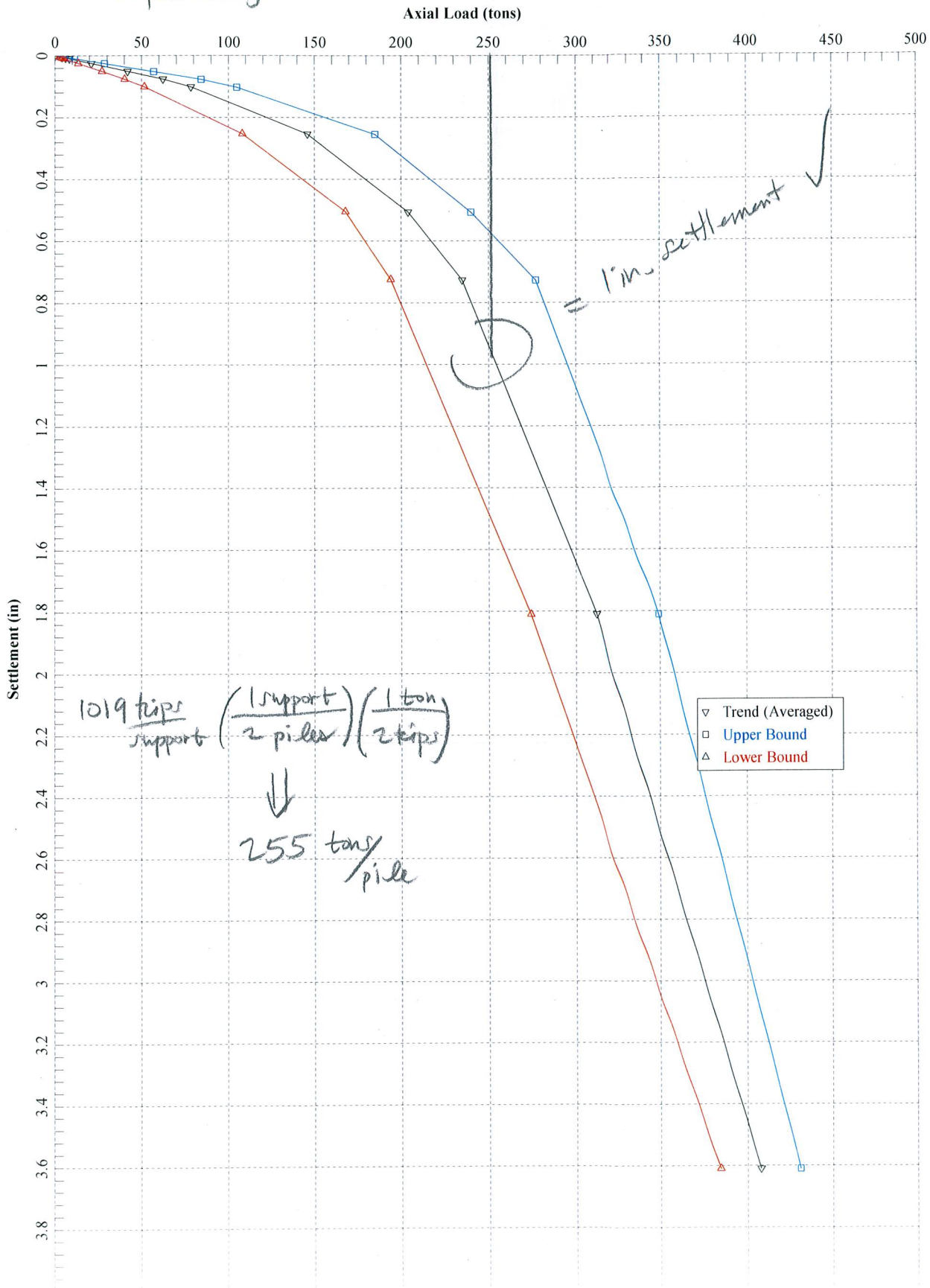
= 1 in. settlement ✓

$$\frac{800 \text{ tips}}{\text{support}} \left(\frac{1 \text{ support}}{10 \text{ piles}}\right)\left(\frac{1 \text{ ton}}{2 \text{ tips}}\right) = \frac{40 \text{ tons}}{\text{pile}}$$

Alternate 1
Bent 2 & 3
Service-I State
pile length = 19 ft



Alternate 2
Bent 2 & 3
Service - I State
pile length = 23 ft



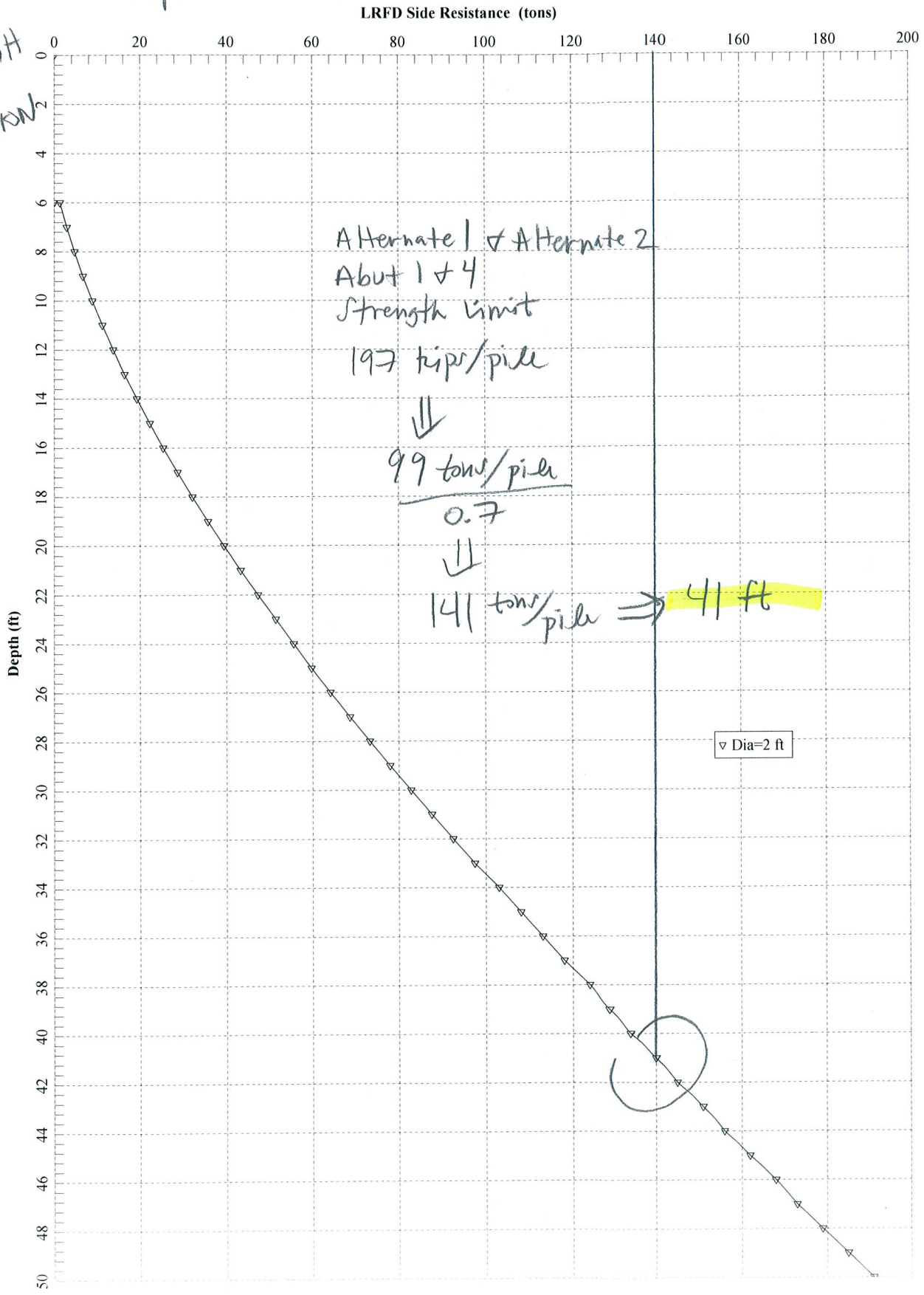
$$\frac{1019 \text{ kips}}{\text{support}} \left(\frac{1 \text{ support}}{2 \text{ piles}}\right)\left(\frac{1 \text{ ton}}{2 \text{ kips}}\right)$$

$$\Downarrow$$

255 tons/pile

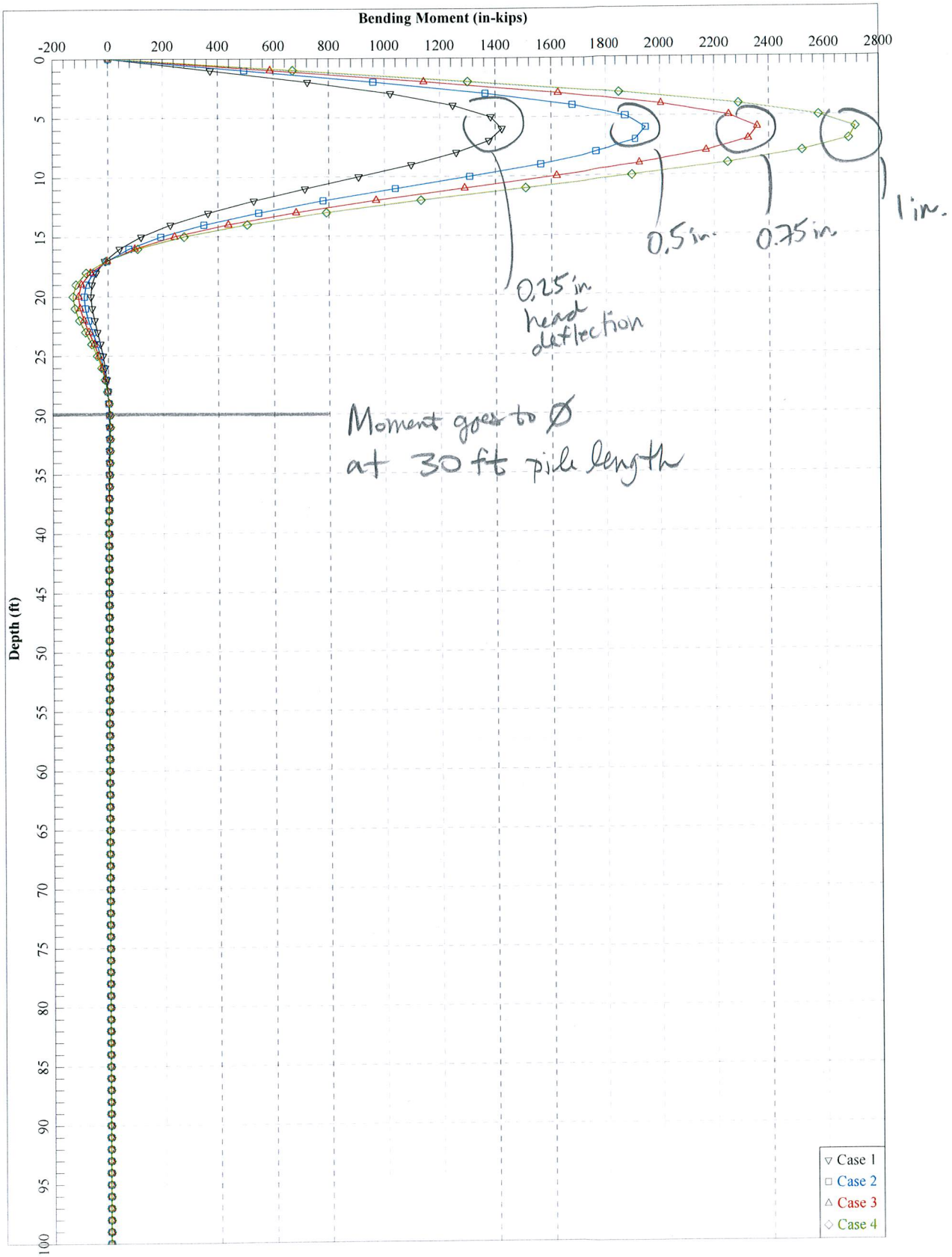
all pile lengths determined by skin friction because pile movement required to mobilize friction much less than that required to mobilize tip resistance

24 in. CIDH in COMPRESSION



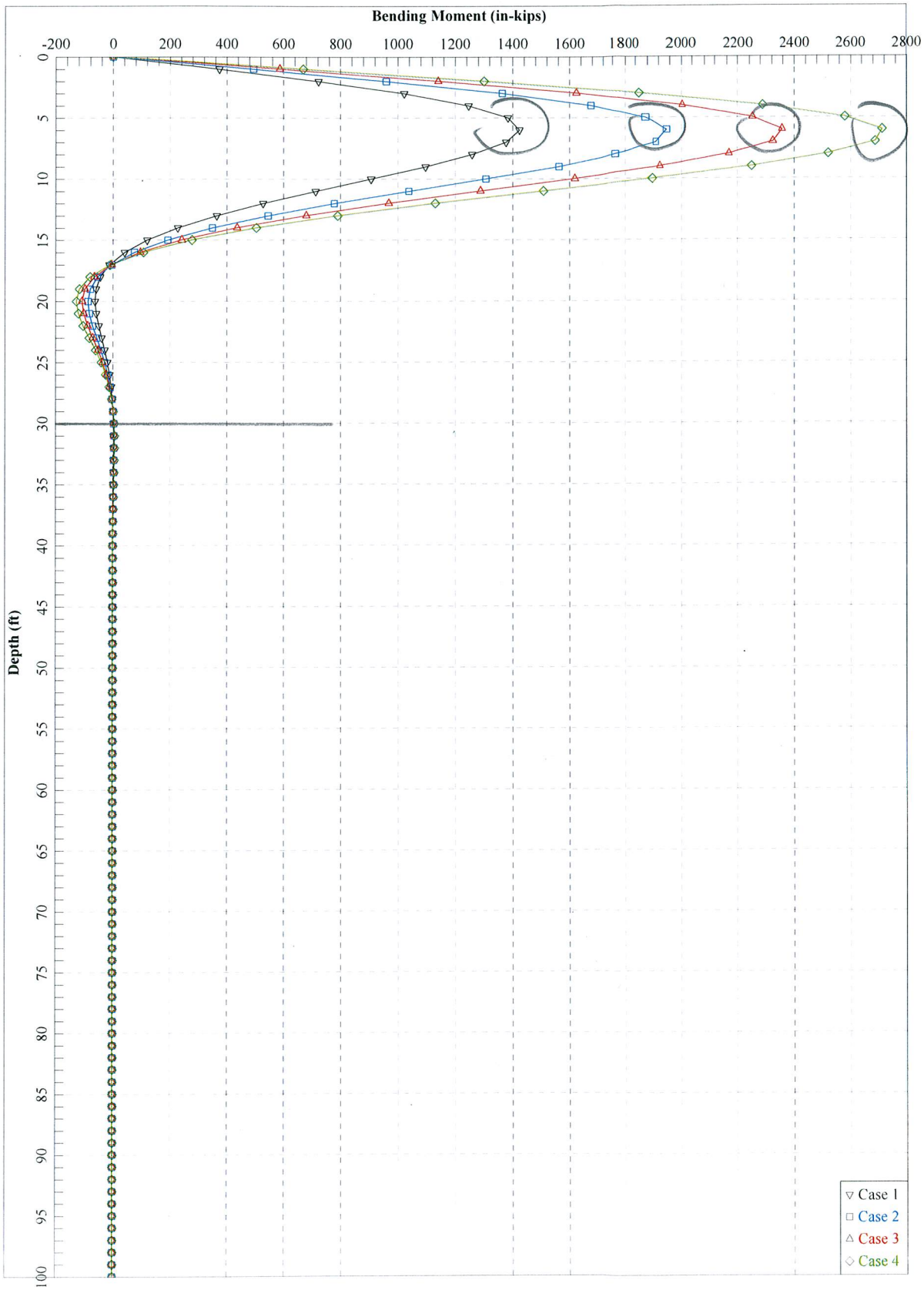
24 in. CIDH Bending Moment

ALTERNATE 1



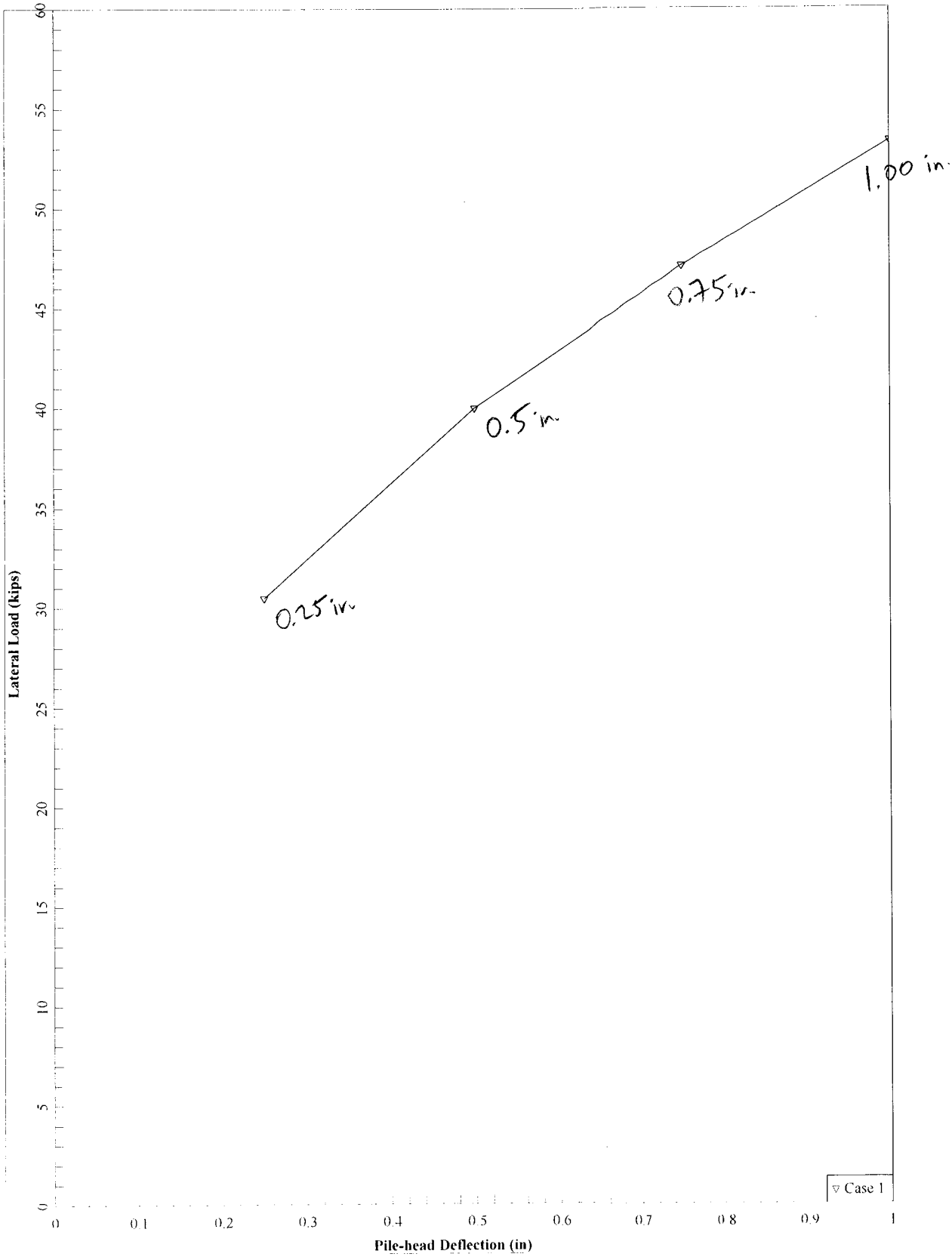
24 in. CIDH Bending Moment

ALTERNATE 2



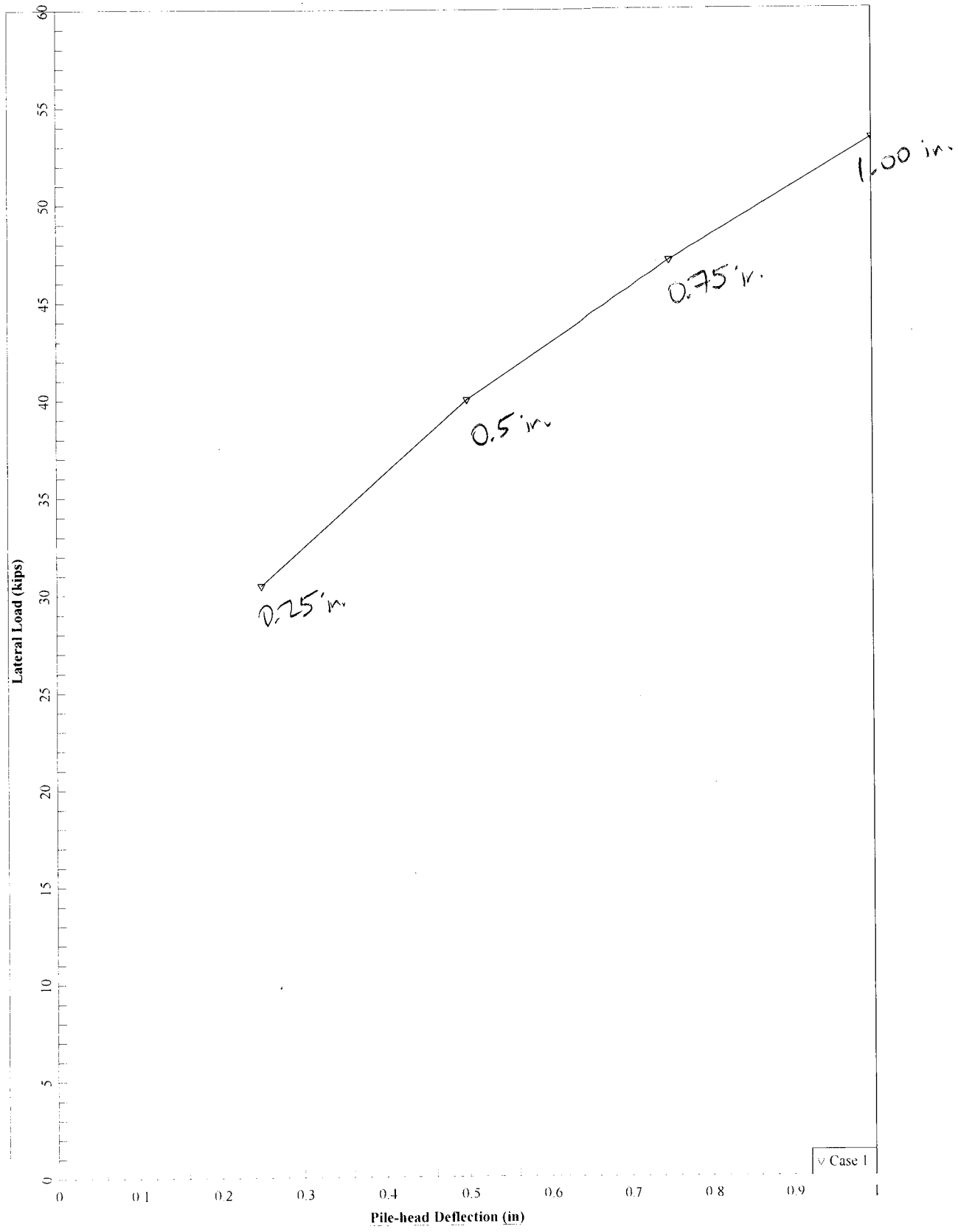
24 in. head deflection

ALTERNATE 1

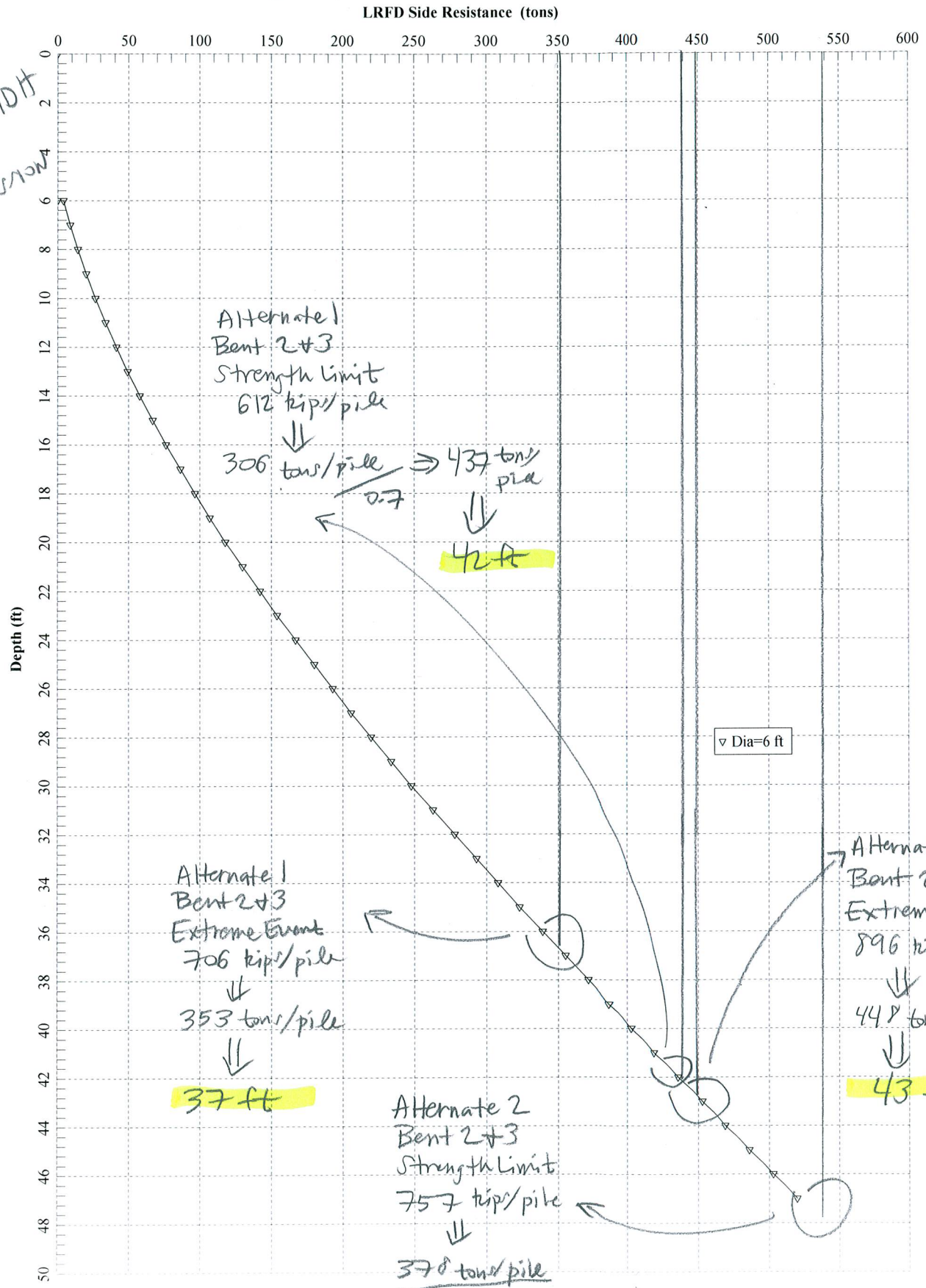


24 in. head deflection

ALTERNATE 2



all pile lengths determined by skin friction because pile movement required to mobilize friction much less than that required to mobilize tip resistance



72-in. CIDH in COMPRESSION

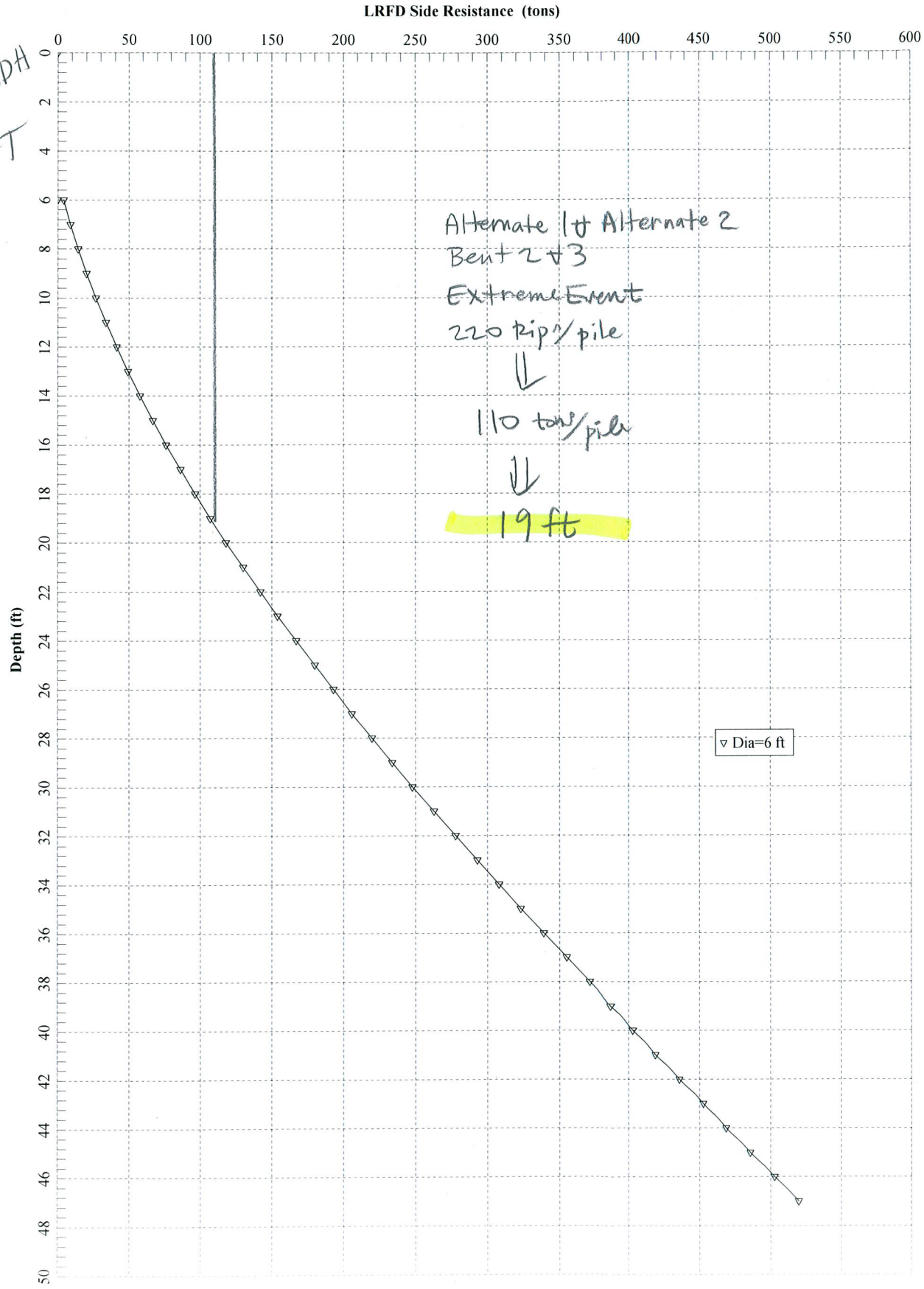
Alternate 1
Bent 2 & 3
Strength Limit
612 kips/pile
⇓
306 tons/pile / 0.7 ⇒ 437 tons/pile
⇓
42 ft

Alternate 1
Bent 2 & 3
Extreme Event
706 kips/pile
⇓
353 tons/pile
⇓
37 ft

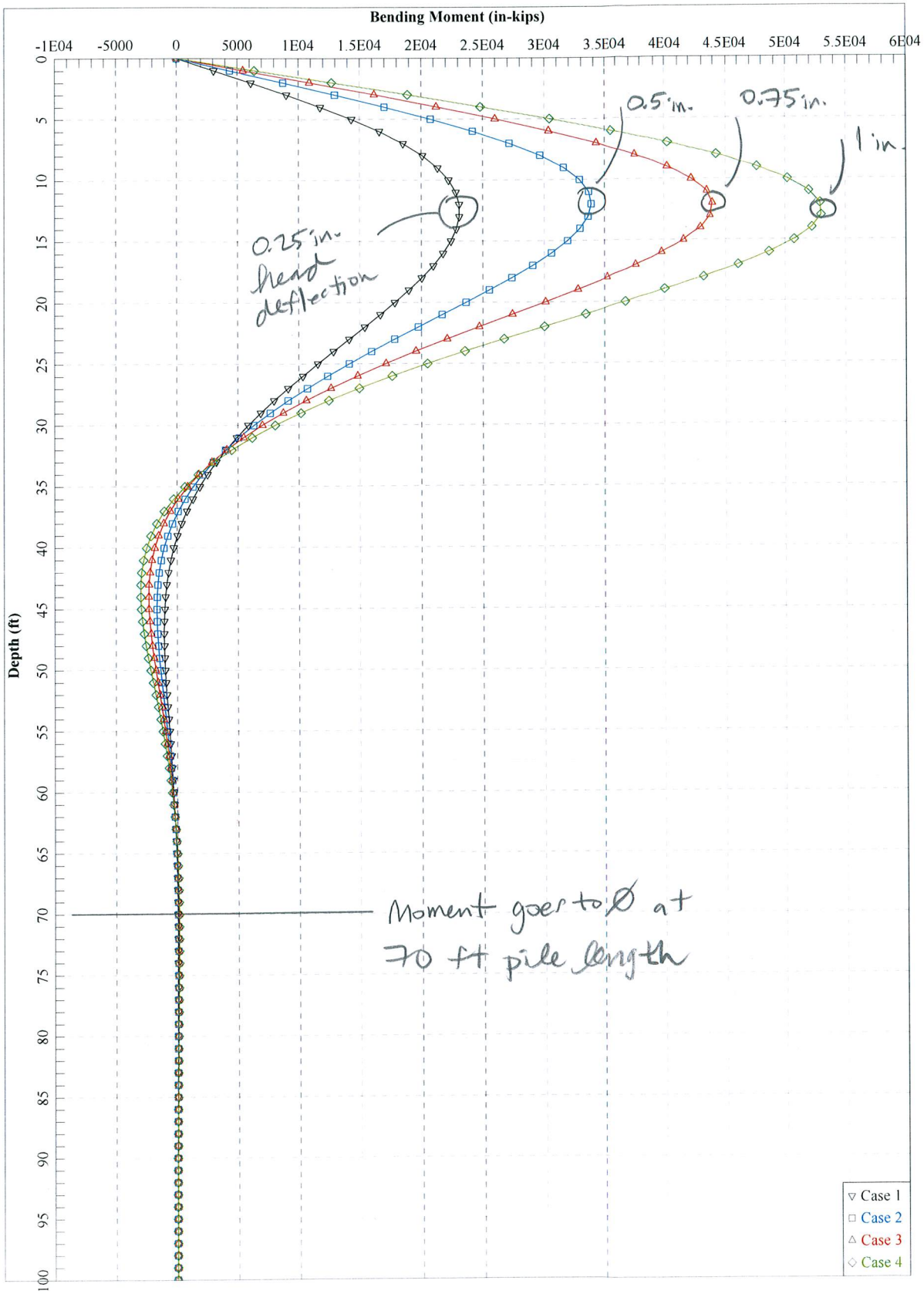
Alternate 2
Bent 2 & 3
Extreme Event
896 kips/pile
⇓
448 tons/pile
⇓
43 ft

Alternate 2
Bent 2 & 3
Strength Limit
757 kips/pile
⇓
378 tons/pile / 0.7
⇓
540 tons/pile ⇒ 48 ft

72 in. CIDH in UPLIFT

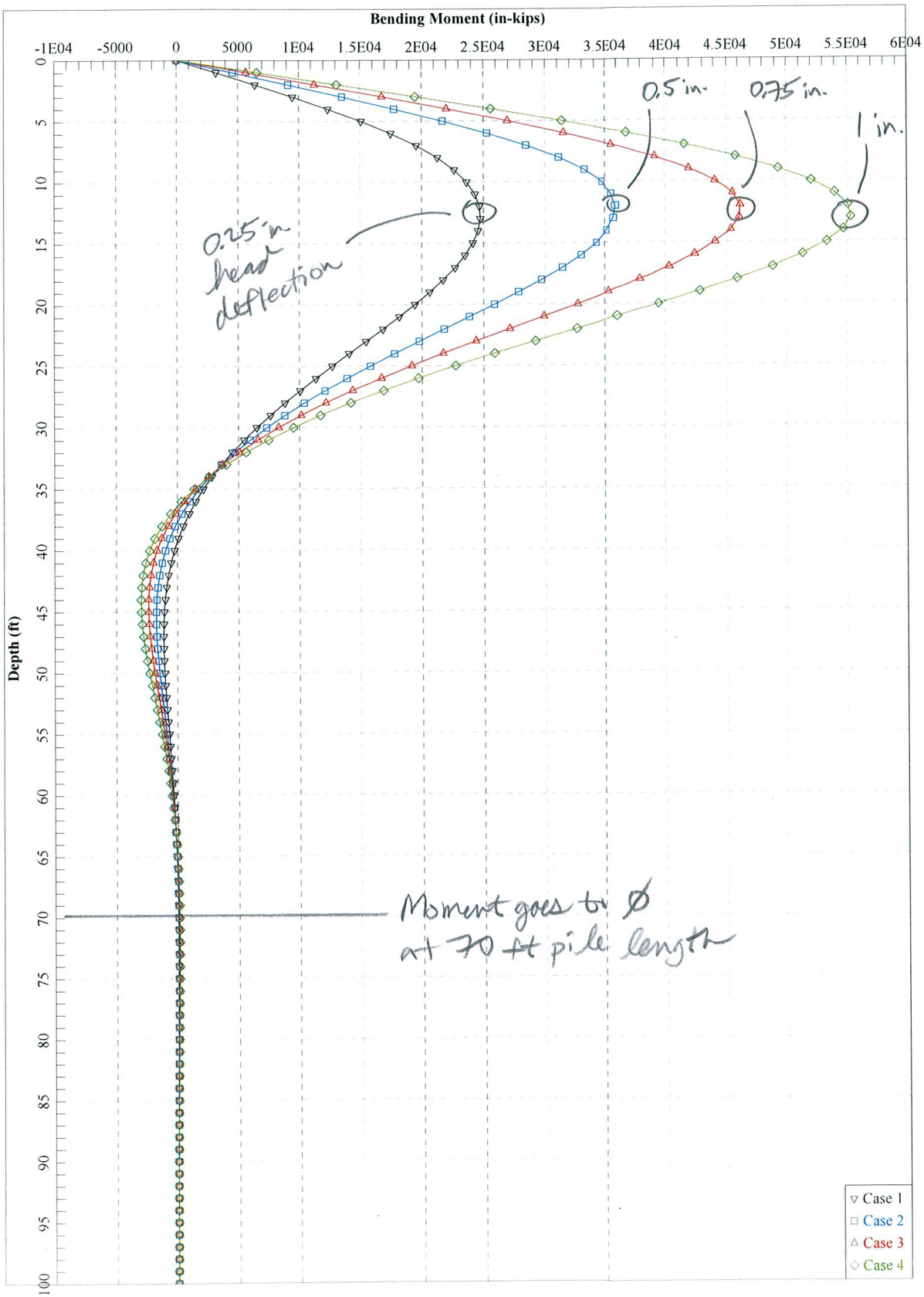


72 in. CIDH Bending Moment
ALTERNATE 1



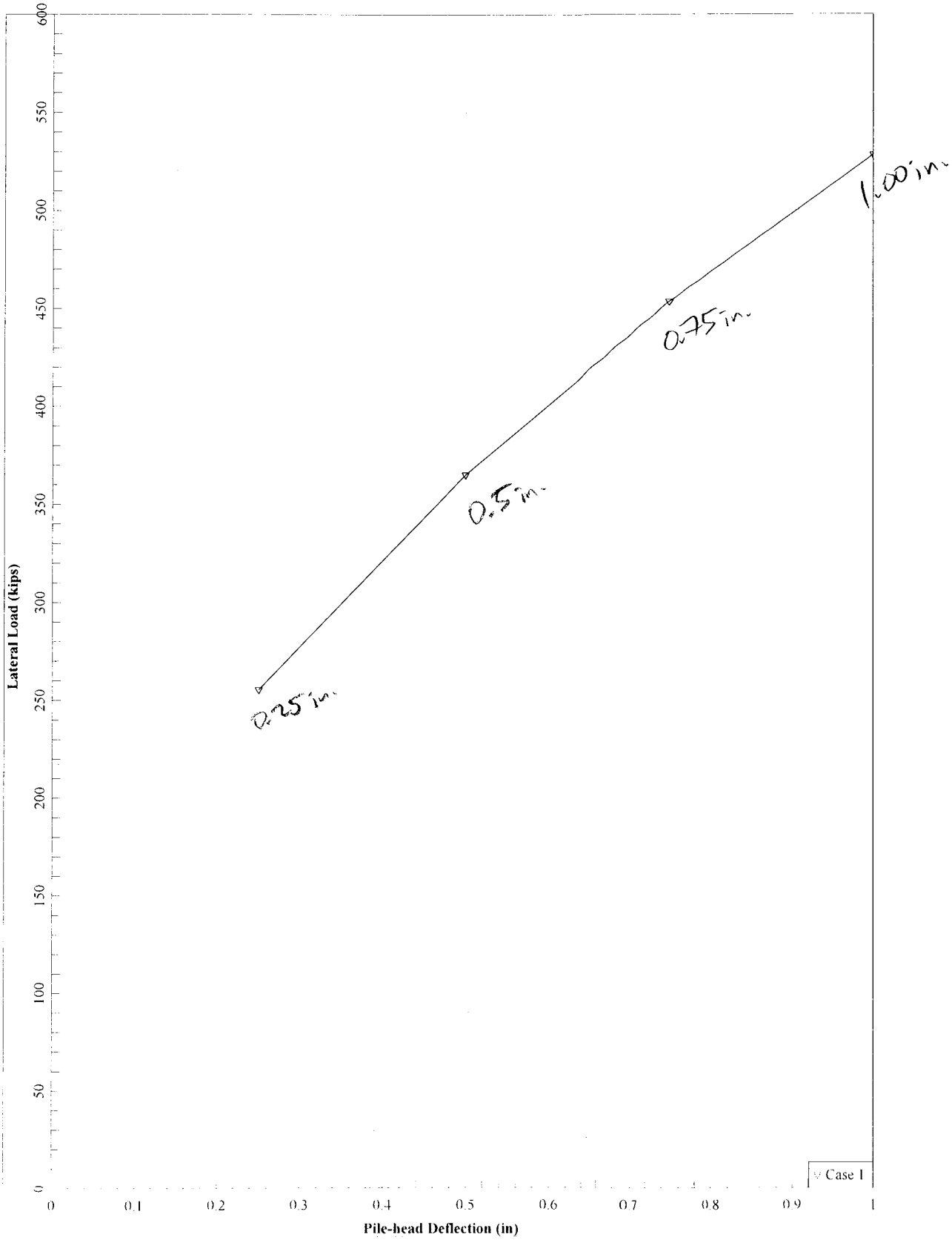
72 in. CIDH Bending Moment

ALTERNATE 2

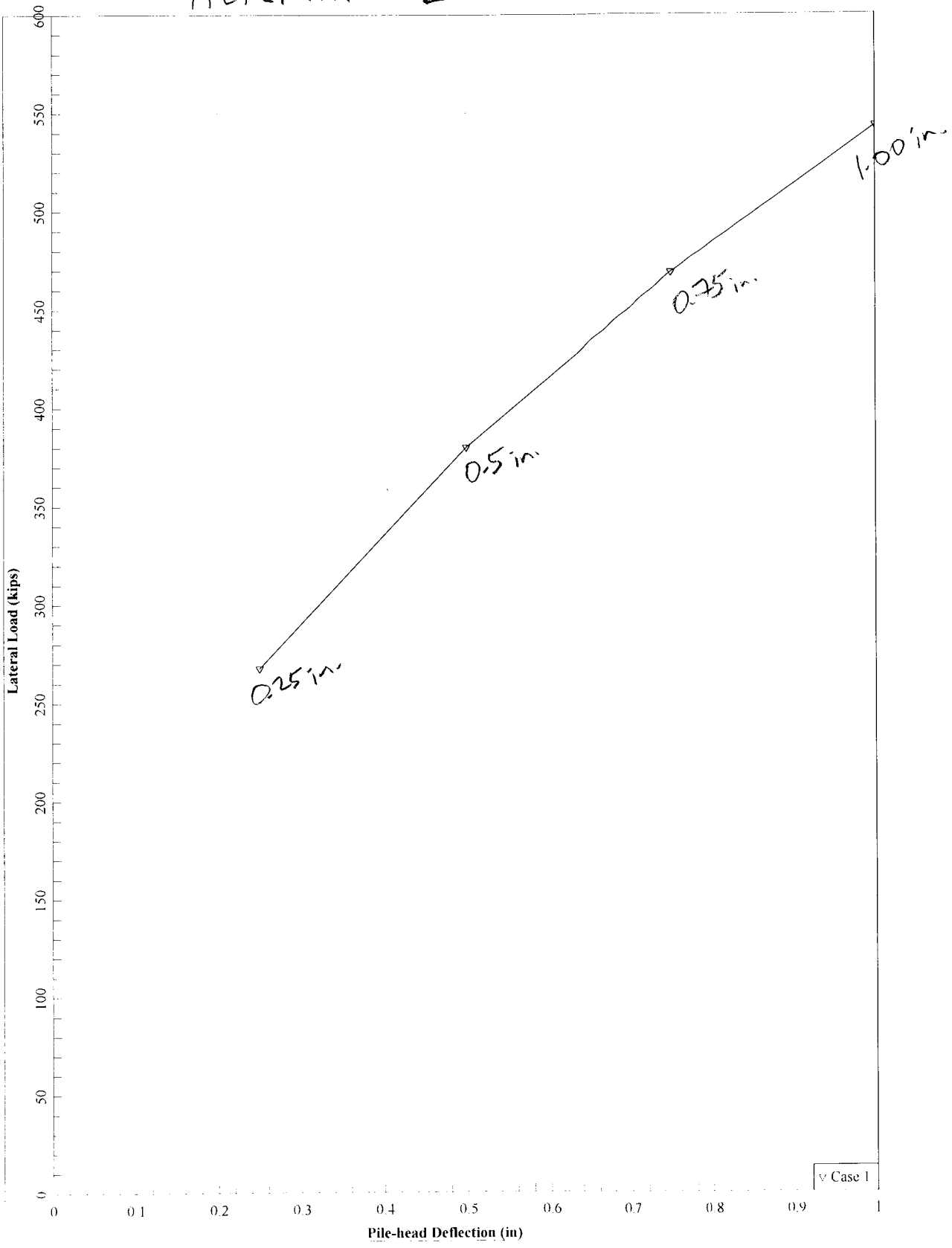


72 in. CIDH head deflection

ALTERNATE 1



72 in. CIDH head deflection
ALTERNATE 2



SHAFT for Windows, Version 2012.7.11

Serial Number : 158117577

VERTICALLY LOADED DRILLED SHAFT ANALYSIS

Path to file locations : C:\Users\Jeffrey_Newgard\Desktop\
Name of input data file : Abuts 24inch.sfd
Name of output file : Abuts 24inch.sfo
Name of plot output file : Abuts 24inch.sfp
Name of runtime file : Abuts 24inch.sfr

Time and Date of Analysis

Date: May 20, 2016 Time: 16:18:07

New Pile

PROPOSED DEPTH = 50.0 FT

NUMBER OF LAYERS = 1

WATER TABLE DEPTH = 0.0 FT.

SOIL INFORMATION

LAYER NO 1----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.120E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.380E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.130E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.400E+04
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.454E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.380E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.130E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.400E+04
DEPTH, FT	= 0.600E+02

LRFD RESISTANCE FACTOR (SIDE FRICTION)	= 0.100E+01
LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 0.100E+01

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	= 2.000	FT.
DIAMETER OF BASE	= 2.000	FT.
END OF STEM TO BASE	= 0.000	FT.
ANGLE OF BELL	= 0.000	DEG.
IGNORED TOP PORTION	= 5.000	FT.
IGNORED BOTTOM PORTION	= 0.000	FT.
AREA OF ONE PERCENT STEEL	= 4.524	SQ.IN.
ELASTIC MODULUS, Ec	= 0.360E+07	LB/SQ IN
VOLUME OF UNDERREAM	= 0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;

QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
6.0	0.70	1.37	36.77	38.14	1.37	36.77	38.14
7.0	0.81	2.94	40.79	43.74	2.94	40.79	43.74
8.0	0.93	4.72	44.81	49.54	4.72	44.81	49.54
9.0	1.05	6.70	48.84	55.54	6.70	48.84	55.54
10.0	1.16	8.87	52.86	61.72	8.87	52.86	61.72
11.0	1.28	11.21	56.88	68.09	11.21	56.88	68.09
12.0	1.40	13.74	60.90	74.64	13.74	60.90	74.64
13.0	1.51	16.43	64.92	81.35	16.43	64.92	81.35
14.0	1.63	19.28	68.94	88.22	19.28	68.94	88.22
15.0	1.75	22.29	72.97	95.25	22.29	72.97	95.25
16.0	1.86	25.45	76.99	102.44	25.45	76.99	102.44
17.0	1.98	28.75	79.57	108.33	28.75	79.57	108.33
18.0	2.09	32.20	80.44	112.64	32.20	80.44	112.64
19.0	2.21	35.78	80.44	116.22	35.78	80.44	116.22
20.0	2.33	39.49	80.44	119.93	39.49	80.44	119.93
21.0	2.44	43.33	80.44	123.77	43.33	80.44	123.77
22.0	2.56	47.29	80.44	127.73	47.29	80.44	127.73
23.0	2.68	51.37	80.44	131.80	51.37	80.44	131.80
24.0	2.79	55.55	80.44	135.99	55.55	80.44	135.99
25.0	2.91	59.84	80.44	140.28	59.84	80.44	140.28
26.0	3.03	64.24	80.44	144.68	64.24	80.44	144.68
27.0	3.14	68.73	80.44	149.17	68.73	80.44	149.17
28.0	3.26	73.32	80.44	153.76	73.32	80.44	153.76
29.0	3.37	78.00	80.44	158.44	78.00	80.44	158.44
30.0	3.49	82.77	80.44	163.20	82.77	80.44	163.20
31.0	3.61	87.62	80.44	168.05	87.62	80.44	168.05
32.0	3.72	92.54	80.44	172.98	92.54	80.44	172.98
33.0	3.84	97.54	80.44	177.98	97.54	80.44	177.98
34.0	3.96	102.62	80.44	183.05	102.62	80.44	183.05
35.0	4.07	107.76	80.44	188.19	107.76	80.44	188.19
36.0	4.19	112.96	80.44	193.39	112.96	80.44	193.39
37.0	4.31	118.22	80.44	198.66	118.22	80.44	198.66
38.0	4.42	123.54	80.44	203.97	123.54	80.44	203.97
39.0	4.54	128.91	80.44	209.35	128.91	80.44	209.35
40.0	4.65	134.33	80.44	214.77	134.33	80.44	214.77
41.0	4.77	139.80	80.44	220.24	139.80	80.44	220.24
42.0	4.89	145.31	80.44	225.75	145.31	80.44	225.75

43.0	5.00	150.86	80.44	231.29	150.86	80.44	231.29
44.0	5.12	156.44	80.44	236.88	156.44	80.44	236.88
45.0	5.24	162.06	80.44	242.50	162.06	80.44	242.50
46.0	5.35	167.71	80.44	248.15	167.71	80.44	248.15
47.0	5.47	173.38	80.44	253.82	173.38	80.44	253.82
48.0	5.59	179.08	80.44	259.52	179.08	80.44	259.52
49.0	5.70	184.80	80.44	265.23	184.80	80.44	265.23
50.0	5.82	190.53	80.44	270.97	190.53	80.44	270.97

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.3576E-01	0.2524E-04	0.1173E-02	0.1000E-04
0.1788E+00	0.1262E-03	0.5865E-02	0.5000E-04
0.3576E+00	0.2524E-03	0.1173E-01	0.1000E-03
0.1796E+02	0.1263E-01	0.5865E+00	0.5000E-02
0.2702E+02	0.1898E-01	0.8798E+00	0.7500E-02
0.3607E+02	0.2533E-01	0.1173E+01	0.1000E-01
0.8300E+02	0.6130E-01	0.2933E+01	0.2500E-01
0.1305E+03	0.1095E+00	0.5865E+01	0.5000E-01
0.1550E+03	0.1471E+00	0.8798E+01	0.7500E-01
0.1716E+03	0.1807E+00	0.1173E+02	0.1000E+00
0.2097E+03	0.3542E+00	0.2869E+02	0.2500E+00
0.2267E+03	0.6170E+00	0.4628E+02	0.5000E+00
0.2333E+03	0.7469E+00	0.5299E+02	0.6250E+00
0.2420E+03	0.9095E+00	0.6180E+02	0.7812E+00
0.2614E+03	0.1343E+01	0.8164E+02	0.1200E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.5252E-01	0.3174E-04	0.1676E-02	0.1000E-04
0.2626E+00	0.1587E-03	0.8379E-02	0.5000E-04
0.5252E+00	0.3174E-03	0.1676E-01	0.1000E-03
0.2649E+02	0.1593E-01	0.8379E+00	0.5000E-02
0.3986E+02	0.2394E-01	0.1257E+01	0.7500E-02
0.5301E+02	0.3193E-01	0.1676E+01	0.1000E-01
0.1161E+03	0.7538E-01	0.4189E+01	0.2500E-01
0.1687E+03	0.1277E+00	0.8379E+01	0.5000E-01
0.1891E+03	0.1643E+00	0.1257E+02	0.7500E-01
0.2000E+03	0.1959E+00	0.1676E+02	0.1000E+00
0.2280E+03	0.3658E+00	0.3988E+02	0.2500E+00

Abuts 24inch.sfo

0.2462E+03	0.6292E+00	0.5811E+02	0.5000E+00
0.2506E+03	0.7574E+00	0.6247E+02	0.6250E+00
0.2581E+03	0.9192E+00	0.7003E+02	0.7812E+00
0.2750E+03	0.1350E+01	0.8687E+02	0.1200E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.2136E-01	0.1937E-04	0.6703E-03	0.1000E-04
0.1068E+00	0.9687E-04	0.3351E-02	0.5000E-04
0.2136E+00	0.1937E-03	0.6703E-02	0.1000E-03
0.1068E+02	0.9687E-02	0.3351E+00	0.5000E-02
0.1605E+02	0.1454E-01	0.5027E+00	0.7500E-02
0.2144E+02	0.1940E-01	0.6703E+00	0.1000E-01
0.5167E+02	0.4792E-01	0.1676E+01	0.2500E-01
0.9071E+02	0.9089E-01	0.3351E+01	0.5000E-01
0.1187E+03	0.1292E+00	0.5027E+01	0.7500E-01
0.1412E+03	0.1649E+00	0.6703E+01	0.1000E+00
0.1912E+03	0.3426E+00	0.1749E+02	0.2500E+00
0.2073E+03	0.6048E+00	0.3445E+02	0.5000E+00
0.2161E+03	0.7363E+00	0.4350E+02	0.6250E+00
0.2258E+03	0.8998E+00	0.5356E+02	0.7812E+00
0.2479E+03	0.1335E+01	0.7641E+02	0.1200E+01

SHAFT for Windows, Version 2012.7.11

Serial Number : 158117577

VERTICALLY LOADED DRILLED SHAFT ANALYSIS

Path to file locations : G:\Projects\Y2015\P15033 Jacalitos Creek Bridge\Calculations\Shaft and LPILE\
Name of input data file : Bents 72inch.sfd
Name of output file : Bents 72inch.sfo
Name of plot output file : Bents 72inch.sfp
Name of runtime file : Bents 72inch.sfr

Time and Date of Analysis

Date: May 20, 2016 Time: 16:20:25

New Pile

PROPOSED DEPTH = 50.0 FT

NUMBER OF LAYERS = 1

WATER TABLE DEPTH = 0.0 FT.

SOIL INFORMATION

LAYER NO 1----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.120E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.380E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.130E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.400E+04
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.454E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.380E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.130E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.400E+04
DEPTH, FT	= 0.600E+02

LRFD RESISTANCE FACTOR (SIDE FRICTION)	= 0.100E+01
LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 0.100E+01

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	= 6.000	FT.
DIAMETER OF BASE	= 6.000	FT.
END OF STEM TO BASE	= 0.000	FT.
ANGLE OF BELL	= 0.000	DEG.
IGNORED TOP PORTION	= 5.000	FT.
IGNORED BOTTOM PORTION	= 0.000	FT.
AREA OF ONE PERCENT STEEL	= 40.720	SQ.IN.
ELASTIC MODULUS, Ec	= 0.360E+07	LB/SQ IN
VOLUME OF UNDERREAM	= 0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	QB (TONS)	QU (TONS)	LRFD QS (TONS)	LRFD QB (TONS)	LRFD QU (TONS)
6.0	6.28	4.10	115.60	119.70	4.10	115.60	119.70
7.0	7.33	8.83	123.98	132.81	8.83	123.98	132.81
8.0	8.38	14.17	132.36	146.53	14.17	132.36	146.53
9.0	9.43	20.11	140.74	160.84	20.11	140.74	160.84
10.0	10.47	26.60	149.12	175.72	26.60	149.12	175.72
11.0	11.52	33.64	157.49	191.14	33.64	157.49	191.14
12.0	12.57	41.21	165.87	207.08	41.21	165.87	207.08
13.0	13.62	49.28	174.25	223.53	49.28	174.25	223.53
14.0	14.66	57.84	182.63	240.47	57.84	182.63	240.47
15.0	15.71	66.86	191.01	257.87	66.86	191.01	257.87
16.0	16.76	76.34	199.39	275.73	76.34	199.39	275.73
17.0	17.80	86.26	207.77	294.03	86.26	207.77	294.03
18.0	18.85	96.60	216.15	312.75	96.60	216.15	312.75
19.0	19.90	107.35	224.52	331.87	107.35	224.52	331.87
20.0	20.95	118.48	232.90	351.39	118.48	232.90	351.39
21.0	21.99	130.00	241.28	371.28	130.00	241.28	371.28
22.0	23.04	141.87	249.66	391.53	141.87	249.66	391.53
23.0	24.09	154.10	258.04	412.13	154.10	258.04	412.13
24.0	25.14	166.65	266.42	433.07	166.65	266.42	433.07
25.0	26.18	179.53	274.80	454.33	179.53	274.80	454.33
26.0	27.23	192.72	283.17	475.90	192.72	283.17	475.90
27.0	28.28	206.20	291.55	497.76	206.20	291.55	497.76
28.0	29.33	219.97	299.93	519.90	219.97	299.93	519.90
29.0	30.37	234.01	308.31	542.32	234.01	308.31	542.32
30.0	31.42	248.31	316.69	564.99	248.31	316.69	564.99
31.0	32.47	262.85	325.07	587.92	262.85	325.07	587.92
32.0	33.51	277.63	333.45	611.08	277.63	333.45	611.08
33.0	34.56	292.63	341.83	634.46	292.63	341.83	634.46
34.0	35.61	307.85	350.20	658.05	307.85	350.20	658.05
35.0	36.66	323.27	358.58	681.85	323.27	358.58	681.85
36.0	37.70	338.87	366.96	705.84	338.87	366.96	705.84
37.0	38.75	354.66	375.34	730.00	354.66	375.34	730.00
38.0	39.80	370.62	383.72	754.34	370.62	383.72	754.34
39.0	40.85	386.73	392.10	778.83	386.73	392.10	778.83
40.0	41.89	403.00	400.48	803.47	403.00	400.48	803.47
41.0	42.94	419.40	408.85	828.26	419.40	408.85	828.26

42.0	43.99	435.93	417.23	853.16	435.93	417.23	853.16
43.0	45.04	452.58	425.61	878.19	452.58	425.61	878.19
44.0	46.08	469.33	433.99	903.33	469.33	433.99	903.33
45.0	47.13	486.19	442.37	928.56	486.19	442.37	928.56
46.0	48.18	503.13	450.75	953.88	503.13	450.75	953.88
47.0	49.22	520.15	459.13	979.28	520.15	459.13	979.28

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.2686E-01	0.1135E-04	0.2232E-02	0.1000E-04
0.1343E+00	0.5673E-04	0.1116E-01	0.5000E-04
0.2686E+00	0.1135E-03	0.2232E-01	0.1000E-03
0.1343E+02	0.5673E-02	0.1116E+01	0.5000E-02
0.2014E+02	0.8509E-02	0.1674E+01	0.7500E-02
0.2686E+02	0.1135E-01	0.2232E+01	0.1000E-01
0.6715E+02	0.2836E-01	0.5580E+01	0.2500E-01
0.1343E+03	0.5673E-01	0.1116E+02	0.5000E-01
0.1981E+03	0.8496E-01	0.1674E+02	0.7500E-01
0.2485E+03	0.1125E+00	0.2232E+02	0.1000E+00
0.4452E+03	0.2730E+00	0.5580E+02	0.2500E+00
0.5887E+03	0.5315E+00	0.1107E+03	0.5000E+00
0.6502E+03	0.7559E+00	0.1584E+03	0.7200E+00
0.7861E+03	0.1846E+01	0.2938E+03	0.1800E+01
0.9567E+03	0.3660E+01	0.4660E+03	0.3600E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.3663E-01	0.1183E-04	0.3188E-02	0.1000E-04
0.1832E+00	0.5917E-04	0.1594E-01	0.5000E-04
0.3663E+00	0.1183E-03	0.3188E-01	0.1000E-03
0.1832E+02	0.5917E-02	0.1594E+01	0.5000E-02
0.2747E+02	0.8875E-02	0.2391E+01	0.7500E-02
0.3663E+02	0.1183E-01	0.3188E+01	0.1000E-01
0.9158E+02	0.2958E-01	0.7971E+01	0.2500E-01
0.1833E+03	0.5917E-01	0.1594E+02	0.5000E-01
0.2687E+03	0.8852E-01	0.2391E+02	0.7500E-01
0.3338E+03	0.1169E+00	0.3188E+02	0.1000E+00
0.5535E+03	0.2789E+00	0.7971E+02	0.2500E+00
0.6692E+03	0.5367E+00	0.1558E+03	0.5000E+00
0.7337E+03	0.7617E+00	0.2204E+03	0.7200E+00

0.8623E+03	0.1852E+01	0.3489E+03	0.1800E+01
0.1009E+04	0.3663E+01	0.4959E+03	0.3600E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.1727E-01	0.1086E-04	0.1275E-02	0.1000E-04
0.8636E-01	0.5432E-04	0.6377E-02	0.5000E-04
0.1727E+00	0.1086E-03	0.1275E-01	0.1000E-03
0.8636E+01	0.5432E-02	0.6377E+00	0.5000E-02
0.1295E+02	0.8148E-02	0.9565E+00	0.7500E-02
0.1727E+02	0.1086E-01	0.1275E+01	0.1000E-01
0.4318E+02	0.2716E-01	0.3188E+01	0.2500E-01
0.8636E+02	0.5432E-01	0.6377E+01	0.5000E-01
0.1283E+03	0.8142E-01	0.9565E+01	0.7500E-01
0.1641E+03	0.1082E+00	0.1275E+02	0.1000E+00
0.3363E+03	0.2671E+00	0.3188E+02	0.2500E+00
0.5078E+03	0.5263E+00	0.6555E+02	0.5000E+00
0.5665E+03	0.7501E+00	0.9642E+02	0.7200E+00
0.7099E+03	0.1841E+01	0.2387E+03	0.1800E+01
0.9043E+03	0.3656E+01	0.4362E+03	0.3600E+01

SHAFT for Windows, Version 2012.7.11

Serial Number : 158117577

VERTICALLY LOADED DRILLED SHAFT ANALYSIS

Path to file locations : G:\Projects\Y2015\P15033 Jacalitos Creek Bridge\Calculations\Shaft and LPILE\
Name of input data file : Bents 72inch.sfd
Name of output file : Bents 72inch.sfo
Name of plot output file : Bents 72inch.sfp
Name of runtime file : Bents 72inch.sfr

Time and Date of Analysis

Date: May 20, 2016 Time: 16:21:25

New Pile

PROPOSED DEPTH = 50.0 FT

REDUCTION FACTOR APPLIED FOR UPLIFT FRICTION = 1.000

NUMBER OF LAYERS = 1

WATER TABLE DEPTH = 0.0 FT.

SOIL INFORMATION

LAYER NO 1----SAND

AT THE TOP

SKIN FRICTION COEFFICIENT- BETA	= 0.120E+01
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.380E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.130E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.400E+04
DEPTH, FT	= 0.000E+00

AT THE BOTTOM

SKIN FRICTION COEFFICIENT- BETA	= 0.454E+00
UNDRAINED SHEAR STRENGTH, LB/SQ FT	= 0.000E+00
INTERNAL FRICTION ANGLE, DEG.	= 0.380E+02
BLOWS PER FOOT FROM STANDARD PENETRATION TEST	= 0.000E+00
SOIL UNIT WEIGHT, LB/CU FT	= 0.130E+03
MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT	= 0.400E+04
DEPTH, FT	= 0.600E+02

LRFD RESISTANCE FACTOR (SIDE FRICTION)	= 0.100E+01
LRFD RESISTANCE FACTOR (TIP RESISTANCE)	= 0.100E+01

DRILLED SHAFT INFORMATION

DIAMETER OF STEM	= 6.000	FT.
DIAMETER OF BASE	= 6.000	FT.
END OF STEM TO BASE	= 0.000	FT.
ANGLE OF BELL	= 0.000	DEG.
IGNORED TOP PORTION	= 5.000	FT.
IGNORED BOTTOM PORTION	= 0.000	FT.
AREA OF ONE PERCENT STEEL	= 40.720	SQ.IN.
ELASTIC MODULUS, Ec	= 0.360E+07	LB/SQ IN
VOLUME OF UNDERREAM	= 0.000	CU.YDS.

PREDICTED RESULTS

QS = ULTIMATE SIDE RESISTANCE;
QB = ULTIMATE BASE RESISTANCE;
WT = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH (FEET)	VOLUME (CU.YDS)	QS (TONS)	WT (TONS)	QU (TONS)	LRFD QS (TONS)	WT (TONS)	LRFD QU (TONS)
6.0	6.28	4.10	7.43	11.53	4.10	7.43	11.53
7.0	7.33	8.83	8.67	17.50	8.83	8.67	17.50
8.0	8.38	14.17	9.91	24.08	14.17	9.91	24.08
9.0	9.43	20.11	11.15	31.25	20.11	11.15	31.25
10.0	10.47	26.60	12.39	38.99	26.60	12.39	38.99
11.0	11.52	33.64	13.63	47.27	33.64	13.63	47.27
12.0	12.57	41.21	14.86	56.07	41.21	14.86	56.07
13.0	13.62	49.28	16.10	65.38	49.28	16.10	65.38
14.0	14.66	57.84	17.34	75.18	57.84	17.34	75.18
15.0	15.71	66.86	18.58	85.44	66.86	18.58	85.44
16.0	16.76	76.34	19.82	96.16	76.34	19.82	96.16
17.0	17.80	86.26	21.06	107.32	86.26	21.06	107.32
18.0	18.85	96.60	22.30	118.90	96.60	22.30	118.90
19.0	19.90	107.35	23.54	130.88	107.35	23.54	130.88
20.0	20.95	118.48	24.77	143.26	118.48	24.77	143.26
21.0	21.99	130.00	26.01	156.01	130.00	26.01	156.01
22.0	23.04	141.87	27.25	169.12	141.87	27.25	169.12
23.0	24.09	154.10	28.49	182.59	154.10	28.49	182.59
24.0	25.14	166.65	29.73	196.38	166.65	29.73	196.38
25.0	26.18	179.53	30.97	210.50	179.53	30.97	210.50
26.0	27.23	192.72	32.21	224.93	192.72	32.21	224.93
27.0	28.28	206.20	33.44	239.65	206.20	33.44	239.65
28.0	29.33	219.97	34.68	254.65	219.97	34.68	254.65
29.0	30.37	234.01	35.92	269.93	234.01	35.92	269.93
30.0	31.42	248.31	37.16	285.47	248.31	37.16	285.47
31.0	32.47	262.85	38.40	301.25	262.85	38.40	301.25
32.0	33.51	277.63	39.64	317.27	277.63	39.64	317.27
33.0	34.56	292.63	40.88	333.51	292.63	40.88	333.51
34.0	35.61	307.85	42.12	349.96	307.85	42.12	349.96
35.0	36.66	323.27	43.35	366.62	323.27	43.35	366.62
36.0	37.70	338.87	44.59	383.47	338.87	44.59	383.47
37.0	38.75	354.66	45.83	400.49	354.66	45.83	400.49

38.0	39.80	370.62	47.07	417.69	370.62	47.07	417.69
39.0	40.85	386.73	48.31	435.04	386.73	48.31	435.04
40.0	41.89	403.00	49.55	452.55	403.00	49.55	452.55
41.0	42.94	419.40	50.79	470.19	419.40	50.79	470.19
42.0	43.99	435.93	52.02	487.96	435.93	52.02	487.96
43.0	45.04	452.58	53.26	505.84	452.58	53.26	505.84
44.0	46.08	469.33	54.50	523.84	469.33	54.50	523.84
45.0	47.13	486.19	55.74	541.93	486.19	55.74	541.93
46.0	48.18	503.13	56.98	560.11	503.13	56.98	560.11
47.0	49.22	520.15	58.22	578.37	520.15	58.22	578.37

RESULT FROM TREND (AVERAGED) LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.2478E-01	0.1119E-04	0.2830E-03	0.1000E-04
0.1239E+00	0.5596E-04	0.1415E-02	0.5000E-04
0.2478E+00	0.1119E-03	0.2830E-02	0.1000E-03
0.1239E+02	0.5596E-02	0.1415E+00	0.5000E-02
0.1858E+02	0.8393E-02	0.2123E+00	0.7500E-02
0.2478E+02	0.1119E-01	0.2830E+00	0.1000E-01
0.6195E+02	0.2798E-01	0.7075E+00	0.2500E-01
0.1239E+03	0.5596E-01	0.1415E+01	0.5000E-01
0.1827E+03	0.8381E-01	0.2123E+01	0.7500E-01
0.2280E+03	0.1110E+00	0.2830E+01	0.1000E+00
0.3958E+03	0.2692E+00	0.7075E+01	0.2500E+00
0.4917E+03	0.5241E+00	0.1404E+02	0.5000E+00
0.5118E+03	0.7452E+00	0.2009E+02	0.7200E+00
0.5295E+03	0.1827E+01	0.3726E+02	0.1800E+01
0.5498E+03	0.3628E+01	0.5909E+02	0.3600E+01

RESULT FROM UPPER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.3360E-01	0.1161E-04	0.4043E-03	0.1000E-04
0.1680E+00	0.5805E-04	0.2021E-02	0.5000E-04
0.3360E+00	0.1161E-03	0.4043E-02	0.1000E-03
0.1680E+02	0.5805E-02	0.2021E+00	0.5000E-02
0.2520E+02	0.8708E-02	0.3032E+00	0.7500E-02
0.3360E+02	0.1161E-01	0.4043E+00	0.1000E-01
0.8399E+02	0.2903E-01	0.1011E+01	0.2500E-01
0.1681E+03	0.5805E-01	0.2021E+01	0.5000E-01
0.2465E+03	0.8686E-01	0.3032E+01	0.7500E-01

Bents 72inch.sfo

0.3042E+03	0.1146E+00	0.4043E+01	0.1000E+00
0.4833E+03	0.2736E+00	0.1011E+02	0.2500E+00
0.5331E+03	0.5263E+00	0.1976E+02	0.5000E+00
0.5413E+03	0.7469E+00	0.2794E+02	0.7200E+00
0.5576E+03	0.1828E+01	0.4425E+02	0.1800E+01
0.5762E+03	0.3630E+01	0.6288E+02	0.3600E+01

RESULT FROM LOWER-BOUND LINE

TOP LOAD ton	TOP MOVEMENT IN.	TIP LOAD ton	TIP MOVEMENT IN.
0.1611E-01	0.1078E-04	0.1617E-03	0.1000E-04
0.8054E-01	0.5388E-04	0.8086E-03	0.5000E-04
0.1611E+00	0.1078E-03	0.1617E-02	0.1000E-03
0.8054E+01	0.5388E-02	0.8086E-01	0.5000E-02
0.1208E+02	0.8082E-02	0.1213E+00	0.7500E-02
0.1611E+02	0.1078E-01	0.1617E+00	0.1000E-01
0.4027E+02	0.2694E-01	0.4043E+00	0.2500E-01
0.8054E+02	0.5388E-01	0.8086E+00	0.5000E-01
0.1196E+03	0.8077E-01	0.1213E+01	0.7500E-01
0.1526E+03	0.1074E+00	0.1617E+01	0.1000E+00
0.3079E+03	0.2649E+00	0.4043E+01	0.2500E+00
0.4501E+03	0.5219E+00	0.8312E+01	0.5000E+00
0.4822E+03	0.7436E+00	0.1223E+02	0.7200E+00
0.5014E+03	0.1825E+01	0.3027E+02	0.1800E+01
0.5234E+03	0.3627E+01	0.5531E+02	0.3600E+01

LPile Plus for Windows, Version 2013-07.007

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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Files Used for Analysis

Path to file locations: G:\Projects\Y2015\P15033 Jacalitos Creek Bridge\Calculations\Shaft and LPILE\
Name of input data file: 24-in CIDH.lp7d
Name of output report file: 24-in CIDH.lp7o
Name of plot output file: 24-in CIDH.lp7p
Name of runtime messeage file: 24-in CIDH.lp7r

Date and Time of Analysis

Date: May 20, 2016 Time: 16:25:59

Problem Title

Project Name: Jacalitos Creek Bridge Replacement on Lost Hills Avenue

Bridge Number: 42C0078

Client: Fresno County

Engineer: J NEWGARD

Description: Lateral capacity of CIDH piles

Program Options and Settings

Engineering Units of Input Data and Computations:
- Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

Computational Options:
- Use unfactored loads in computations (conventional analysis)
- Compute pile response under loading and nonlinear bending properties of pile (only if nonlinear pile properties are input)
- Use of p-y modification factors for p-y curves not selected
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total number of pile sections = 1

Total length of pile = 100.00 ft

Depth of ground surface below top of pile = 0.00 ft

Pile diameter values used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over
the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	24.0000000
2	100.000000	24.0000000

Input Structural Properties:

Pile Section No. 1:

   Section Type = Drilled Shaft (Bored Pile)
   Section Length = 100.00000 ft
   Section Diameter = 24.00000 in

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 0.0000 ft
   Distance from top of pile to bottom of layer = 10.00000 ft
   Effective unit weight at top of layer = 120.00000 pcf
   Effective unit weight at bottom of layer = 125.00000 pcf
   Friction angle at top of layer = 36.00000 deg.
   Friction angle at bottom of layer = 40.00000 deg.
   Subgrade k at top of layer = 200.00000 pci
   Subgrade k at bottom of layer = 225.00000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

   Distance from top of pile to top of layer = 10.00000 ft
   Distance from top of pile to bottom of layer = 100.00000 ft
   Effective unit weight at top of layer = 125.00000 pcf
   Effective unit weight at bottom of layer = 125.00000 pcf
   Friction angle at top of layer = 40.00000 deg.
   Friction angle at bottom of layer = 40.00000 deg.
   Subgrade k at top of layer = 225.00000 pci
   Subgrade k at bottom of layer = 225.00000 pci

   (Depth of lowest soil layer extends 0.00 ft below pile tip)

Summary of Soil Properties

Layer Num.	Soil Type (p-y Curve Criteria)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	kpy pci

1	Sand (Reese, et al.)	0.00	120.000	36.000
200.000				
		10.000	125.000	40.000
225.000				
2	Sand (Reese, et al.)	10.000	125.000	40.000
225.000				
		100.000	125.000	40.000
225.000				

Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 4

Load No.	Load Compute Type	Condition 1	Condition 2	Axial Thrust Force, lbs
Top y vs. Pile Length				
1	4 No	y = 0.25000 in	M = 0.0000 in-lbs	194000.
2	4 No	y = 0.50000 in	M = 0.0000 in-lbs	194000.
3	4 No	y = 0.75000 in	M = 0.0000 in-lbs	194000.
4	4 No	y = 1.00000 in	M = 0.0000 in-lbs	194000.

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head
y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	100.00000 ft
Shaft Diameter	=	24.00000 in
Concrete Cover Thickness	=	3.00000 in
Number of Reinforcing Bars	=	6 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	452.38934 sq. in.
Total Area of Reinforcing Steel	=	4.74000 sq. in.
Area Ratio of Steel Reinforcement	=	1.05 percent
Edge-to-Edge Bar Spacing	=	7.50000 in
Maximum Concrete Aggregate Size	=	0.75000 in
Ratio of Bar Spacing to Aggregate Size	=	10.00
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	1425.906 kips
Tensile Load for Cracking of Concrete	=	-177.999 kips
Nominal Axial Tensile Capacity	=	-284.400 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.00000	0.79000	8.50000	0.00000
2	1.00000	0.79000	4.25000	7.36122
3	1.00000	0.79000	-4.25000	7.36122
4	1.00000	0.79000	-8.50000	0.00000
5	1.00000	0.79000	-4.25000	-7.36122

6	1.00000	0.79000	4.25000	-7.36122

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 7.50000 inches
between Bars 4 and 5

Spacing to aggregate size ratio = 10.00000

Concrete Properties:

Compressive Strength of Concrete	=	3000.00000 psi
Modulus of Elasticity of Concrete	=	3122019. psi
Modulus of Rupture of Concrete	=	-410.79191 psi
Compression Strain at Peak Stress	=	0.00163
Tensile Strain at Fracture of Concrete	=	-0.0001160
Maximum Coarse Aggregate Size	=	0.75000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	194.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 194.000 kips

Bending Max Concrete Curvature rad/in.	Bending Max Steel Stress ksi	Bending Run Moment in-kip	Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	
0.000001250	75.0984953	60078796.		101.9813924	0.0001275		
0.0000975	0.4494404	3.6924755					
0.000002500	150.2124079	60084963.		57.0111116	0.0001425		
0.0000825	0.4996558	4.1246056					
0.000003750	225.3170762	60084554.		42.0300686	0.0001576		
0.0000676	0.5494846	4.5577200					
0.000005000	300.4078870	60081577.		34.5463361	0.0001727		
0.0000527	0.5989234	4.9918187					
0.000006250	375.4802262	60076836.		30.0615289	0.0001879		
0.0000379	0.6479688	5.4269021					
0.000007500	450.5294775	60070597.		27.0761856	0.0002031		
0.0000231	0.6966174	5.8629704					
0.000008750	525.5510221	60062974.		24.9476803	0.0002183		
0.000008292	0.7448659	6.3000239					
0.0000100	600.5393842	60053938.		23.3546955	0.0002335		
-0.000006453	0.7927105	6.7380617					
0.0000113	675.4496675	60039970.		22.1185325	0.0002488		
-0.0000212	0.8401413	7.1770212					
0.0000125	750.1812795	60014502.		21.1317015	0.0002641		
-0.0000359	0.8871378	7.6167418					
0.0000138	824.6503023	59974567.		20.3258299	0.0002795		
-0.0000505	0.9336817	8.0570747					
0.0000150	898.7982485	59919883.		19.6554150	0.0002948		
-0.0000652	0.9797590	8.4979056					
0.0000163	972.5858894	59851439.		19.0890203	0.0003102		
-0.0000798	1.0253593	8.9391508					
0.0000175	1045.9876588	59770723.		18.6042400	0.0003256		
-0.0000944	1.0704752	9.3807519					
0.0000188	1118.9847336	59679186.		18.1846658	0.0003410		
-0.0001090	1.1151008	9.8226621					
0.0000200	1118.9847336	55949237.		17.1787809	0.0003436		
-0.0001364	1.1222651	9.8940930	C				
0.0000213	1118.9847336	52658105.		16.7558237	0.0003561		
-0.0001539	1.1579395	10.2518262	C				
0.0000225	1118.9847336	49732655.		16.3709891	0.0003683		
-0.0001717	1.1927028	10.6037704	C				
0.0000238	1118.9847336	47115147.		16.0187767	0.0003804		
-0.0001896	1.2266059	10.9502825	C				
0.0000250	1134.2897159	45371589.		15.6950442	0.0003924		

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-0.0002076     1.2597166    11.2919070  C
     0.0000263  1162.6637531     44291952.    15.3956421     0.0004041
-0.0002259     1.2920423    11.6285826  C
     0.0000275  1189.9178962     43269742.    15.1183417     0.0004158
-0.0002442     1.3236787    11.9611775  C
     0.0000288  1216.1515819     42300925.    14.8605025     0.0004272
-0.0002628     1.3546556    12.2898940  C
     0.0000300  1241.4621291     41382071.    14.6199538     0.0004386
-0.0002814     1.3850044    12.6149599  C
     0.0000313  1265.9444276     40510222.    14.3949020     0.0004498
-0.0003002     1.4147580    12.9366300  C
     0.0000325  1289.6906285     39682789.    14.1838605     0.0004610
-0.0003190     1.4439512    13.2551886  C
     0.0000338  1312.7898405     38897477.    13.9855952     0.0004720
-0.0003380     1.4726204    13.5709514  C
     0.0000350  1335.3278317     38152224.    13.7990813     0.0004830
-0.0003570     1.5008040    13.8842676  C
     0.0000363  1357.1510034     37438648.    13.6221116     0.0004938
-0.0003762     1.5284158    14.1940950  C
     0.0000375  1378.5290414     36760774.    13.4550360     0.0005046
-0.0003954     1.5555889    14.5018517  C
     0.0000388  1399.5430246     36117239.    13.2972971     0.0005153
-0.0004147     1.5823676    14.8079878  C
     0.0000400  1420.0017821     35500045.    13.1468874     0.0005259
-0.0004341     1.6086428    15.1111895  C
     0.0000413  1440.1185082     34911964.    13.0041819     0.0005364
-0.0004536     1.6345278    15.4127027  C
     0.0000425  1459.9320673     34351343.    12.8687033     0.0005469
-0.0004731     1.6600481    15.7127770  C
     0.0000438  1479.2927926     33812407.    12.7388990     0.0005573
-0.0004927     1.6851076    16.0102281  C
     0.0000450  1498.4989325     33299976.    12.6159240     0.0005677
-0.0005123     1.7098892    16.3071810  C
     0.0000463  1517.2386237     32805159.    12.4974134     0.0005780
-0.0005320     1.7341942    16.6012057  C
     0.0000475  1535.8752734     32334216.    12.3850134     0.0005883
-0.0005517     1.7582538    16.8950561  C
     0.0000488  1554.1403495     31879802.    12.2766905     0.0005985
-0.0005715     1.7818902    17.1865213  C
     0.0000513  1590.1820960     31027943.    12.0744058     0.0006188
-0.0006112     1.8283060    17.7672358  C
     0.0000538  1625.4803991     30241496.    11.8884129     0.0006390
-0.0006510     1.8735147   -18.6918862  C
     0.0000563  1659.9560734     29510330.    11.7158375     0.0006590
-0.0006910     1.9174475   -19.8427902  C
     0.0000588  1693.9044066     28832415.    11.5564055     0.0006789
-0.0007311     1.9603103   -20.9963241  C
     0.0000613  1727.4015580     28202474.    11.4088982     0.0006988
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-0.0007712     2.0021659   -22.1517943  C
     0.0000638  1760.1613790     27610375.    11.2700936     0.0007185
-0.0008115     2.0427825   -23.3125646  C
     0.0000663  1792.6647803     27059091.    11.1416465     0.0007381
-0.0008519     2.0825393   -24.4735615  C
     0.0000688  1824.5406379     26538773.    11.0202126     0.0007576
-0.0008924     2.1211347   -25.6392009  C
     0.0000713  1856.2294077     26052343.    10.9075124     0.0007772
-0.0009328     2.1589300   -26.8044023  C
     0.0000738  1887.3294747     25590908.    10.8002403     0.0007965
-0.0009735     2.1955844   -27.9743358  C
     0.0000763  1918.3031688     25158074.    10.7005312     0.0008159
-0.0010141     2.2314972   -29.1431002  C
     0.0000788  1948.7908280     24746550.    10.6054446     0.0008352
-0.0010548     2.2663455   -30.3157658  C
     0.0000813  1979.0560922     24357613.    10.5161127     0.0008544
-0.0010956     2.3003714   -31.4886593  C
     0.0000838  2009.1599097     23989969.    10.4323604     0.0008737
-0.0011363     2.3336251   -32.6609544  C
     0.0000863  2038.7781202     23638007.    10.3516603     0.0008928
-0.0011772     2.3658066   -33.8377595  C
     0.0000888  2068.2740297     23304496.    10.2759595     0.0009120
-0.0012180     2.3972578   -35.0133989  C
     0.0000913  2097.6463513     22987905.    10.2048507     0.0009312
-0.0012588     2.4279741   -36.1878635  C
     0.0000938  2126.5796392     22683516.    10.1359166     0.0009502
-0.0012998     2.4576504   -37.3667268  C
     0.0000963  2155.3679974     22393434.    10.0708333     0.0009693
-0.0013407     2.4865757   -38.5448362  C
     0.0000988  2184.0340959     22116801.    10.0094596     0.0009884
-0.0013816     2.5147688   -39.7217598  C
     0.0001013  2212.5343201     21852191.     9.9512328     0.0010076
-0.0014224     2.5421826   -40.8983424  C
     0.0001038  2240.6723997     21596842.     9.8945986     0.0010266
-0.0014634     2.5686241   -42.0785762  C
     0.0001063  2268.6894597     21352371.     9.8410203     0.0010456
-0.0015044     2.5943352   -43.2576058  C
     0.0001088  2296.5842392     21118016.     9.7902907     0.0010647
-0.0015453     2.6193112   -44.4354204  C
     0.0001113  2324.3554576     20893083.     9.7422212     0.0010838
-0.0015862     2.6435473   -45.6120085  C
     0.0001138  2351.8848776     20675911.     9.6957980     0.0011029
-0.0016271     2.6669213   -46.7901362  C
     0.0001163  2379.1835051     20466095.     9.6509772     0.0011219
-0.0016681     2.6894486   -47.9695928  C
     0.0001188  2406.3595358     20264080.     9.6084079     0.0011410
-0.0017090     2.7112365   -49.1477948  C
     0.0001213  2433.4116738     20069375.     9.5679545     0.0011601
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-0.0017499     2.7322799   -50.3247297  C
     0.0001238  2460.3385954     19881524.     9.5294922     0.0011793
-0.0017907     2.7525739   -51.5003845  C
     0.0001263  2487.1389538     19700111.     9.4929064     0.0011985
-0.0018315     2.7721133   -52.6747460  C
     0.0001288  2513.7040136     19523915.     9.4572584     0.0012176
-0.0018724     2.7907888   -53.8509113  C
     0.0001313  2540.0818727     19353005.     9.4228458     0.0012367
-0.0019133     2.8086510   -55.0275429  C
     0.0001338  2566.3336846     19187542.     9.3900640     0.0012559
-0.0019541     2.8257571   -56.2028387  C
     0.0001363  2592.4580630     19027215.     9.3588272     0.0012751
-0.0019949     2.8421016   -57.3767837  C
     0.0001388  2618.4535876     18871738.     9.3290554     0.0012944
-0.0020356     2.8576790   -58.5493627  C
     0.0001413  2644.3188109     18720841.     9.3006749     0.0013137
-0.0020763     2.8724837   -59.7205600  C
     0.0001438  2670.0522576     18574277.     9.2736168     0.0013331
-0.0021169     2.8865100   -60.0000000  CY
     0.0001463  2695.6524234     18431811.     9.2478172     0.0013525
-0.0021575     2.8997520   -60.0000000  CY
     0.0001488  2721.0403594     18292708.     9.2225351     0.0013719
-0.0021981     2.9121401   -60.0000000  CY
     0.0001588  2821.1123976     17770787.     9.1314216     0.0014496
-0.0023604     2.9536741   -60.0000000  CY
     0.0001688  2918.9677247     17297587.     9.0561390     0.0015282
-0.0025218     2.9822692   -60.0000000  CY
     0.0001788  3014.4715422     16864176.     8.9940403     0.0016077
-0.0026823     2.9974823   -60.0000000  CY
     0.0001888  3107.3270907     16462660.     8.9415272     0.0016877
-0.0028423     2.9997860   -60.0000000  CY
     0.0001988  3182.3886423     16012018.     8.8846533     0.0017658
-0.0030042     2.9986476   -60.0000000  CY
     0.0002088  3214.9322226     15400873.     8.7978730     0.0018366
-0.0031734     2.9994333   -60.0000000  CY
     0.0002188  3237.5737974     14800337.     8.7115833     0.0019057
-0.0033443     2.9996883   -60.0000000  CY
     0.0002288  3258.9310207     14246693.     8.6338038     0.0019750
-0.0035150     2.9997325   -60.0000000  CY
     0.0002388  3279.3903183     13735666.     8.5651695     0.0020449
-0.0036851     2.9996204   -60.0000000  CY
     0.0002488  3298.9077412     13261941.     8.5034970     0.0021152
-0.0038548     2.9992538    60.0000000  CY
     0.0002588  3317.3785083     12820787.     8.4462579     0.0021855
-0.0040245     2.9983733    60.0000000  CY
     0.0002688  3335.2146225     12410101.     8.3952660     0.0022562
-0.0041938     2.9979396    60.0000000  CY
     0.0002788  3352.4515940     12026732.     8.3497956     0.0023275
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-0.0043625     2.9999187    60.0000000  CY
     0.0002888  3369.1224470     11667957.     8.3092298     0.0023993
-0.0045307     2.9989043    60.0000000  CY
     0.0002988  3385.2710033     11331451.     8.2723867     0.0024714
-0.0046986     2.9972443    60.0000000  CY
     0.0003088  3400.7803485     11014673.     8.2375286     0.0025433
-0.0048667     2.9996950    60.0000000  CY
     0.0003188  3415.8784577     10716481.     8.2062464     0.0026157
-0.0050343     2.9971253    60.0000000  CY
     0.0003288  3430.6312143     10435380.     8.1780591     0.0026885
-0.0052015     2.9998837    60.0000000  CY
     0.0003388  3445.0030737     10169751.     8.1528081     0.0027618
-0.0053682     2.9971165    60.0000000  CY
     0.0003488  3459.0918338      9918543.     8.1300008     0.0028353
-0.0055347     2.9998416    60.0000000  CY
     0.0003588  3472.8479315      9680412.     8.1095817     0.0029093
-0.0057007     2.9961136    60.0000000  CY
     0.0003688  3486.3511584      9454512.     8.0911588     0.0029836
-0.0058664     2.9994709    60.0000000  CY
     0.0003788  3499.5895041      9239840.     8.0746223     0.0030583
-0.0060317     2.9967275    60.0000000  CYT
     0.0003888  3512.5717377      9035554.     8.0598127     0.0031333
-0.0061967     2.9982231    60.0000000  CYT
     0.0003988  3525.3710312      8841056.     8.0464182     0.0032085
-0.0063615     2.9999811    60.0000000  CYT
     0.0004088  3537.8747990      8655351.     8.0341137     0.0032839
-0.0065261     2.9950486    60.0000000  CYT
     0.0004188  3550.1944246      8478076.     8.0225016     0.0033594
-0.0066906     2.9987842    60.0000000  CYT
     0.0004288  3562.3632430      8308719.     8.0120399     0.0034352
-0.0068548     2.9998227    60.0000000  CYT
     0.0004388  3574.3000622      8146553.     8.0029028     0.0035113
-0.0070187     2.9944385    60.0000000  CYT
     0.0004488  3586.1152080      7991343.     7.9946832     0.0035876
-0.0071824     2.9983428    60.0000000  CYT
     0.0004588  3597.7430639      7842492.     7.9872100     0.0036641
-0.0073459     2.9999557    60.0000000  CYT
     0.0004688  3609.1786287      7699581.     7.9807581     0.0037410
-0.0075090     2.9945637    60.0000000  CYT
     0.0004788  3619.1232802      7559526.     7.9721228     0.0038167
-0.0076733     2.9962889    60.0000000  CYT


-------------------------------------------------------------------------------
   Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1
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Moment values interpolated at maximum compressive strain = 0.003
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or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	194.000	3489.257	0.00300000

Note note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Moment Capacity in-kip	Bending Stiffness at Ult. Mom. Cap. kip-in^2
1	0.65	3489.257	126.100	2268.017	21358239.660
1	0.70	3489.257	135.800	2442.480	20006112.346
1	0.75	3489.257	145.500	2616.943	18880773.982

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head = 0.250000 inches

Moment at pile head = 0.0 in-lbs
Axial load at pile head = 194000.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness lb-in^2	Soil Res. Es*h lb/in	Soil Spr. Lat. Load lb/inch	Distrib. p lb/inch
0.00	0.2500	0.000	30462.	-0.003267	0.000	6.008E+10	0.000	0.000	0.000
1.000	0.2108	373151.	29482.	-0.003230	0.000	6.008E+10	-163.3786	9300.8177	0.000
2.000	0.1725	722601.	26413.	-0.003121	0.000	6.002E+10	-348.0311	24214.	0.000
3.000	0.1359	1021599.	21285.	-0.002946	0.000	5.980E+10	-506.6424	44737.	0.000
4.000	0.1018	1247163.	14559.	-0.002662	0.000	4.117E+10	-614.4571	72445.	0.000
5.000	0.0720	1383399.	6929.8739	-0.002253	0.000	3.661E+10	-657.0069	109466.	0.000
6.000	0.0477	1423970.	-609.0715	-0.001785	0.000	3.539E+10	-599.4840	150793.	0.000
7.000	0.0292	1377092.	-7129.6601	-0.001319	0.000	3.681E+10	-487.2808	200357.	0.000
8.000	0.0161	1259000.	-11893.	-0.000909	0.000	4.075E+10	-306.6184	229245.	0.000
9.000	0.007364	1095892.	-14795.	-0.000614	0.000	5.971E+10	-176.9571	288360.	0.000
10.000	0.001321	906789.	-16059.	-0.000413	0.000	5.991E+10	-33.7647	306738.	0.000
11.000	-0.002543	712401.	-15830.	-0.000251	0.000	6.003E+10	71.8596	339138.	0.000
12.000	-0.004697	528030.	-14527.	-0.000127	0.000	6.006E+10	145.4340	371538.	0.000
13.000	-0.005586	364355.	-12526.	-3.766E-05	0.000	6.008E+10	188.0294	403938.	0.000
14.000	-0.005601	227588.	-10176.	2.145E-05	0.000	6.008E+10	203.6680	436338.	0.000
15.000	-0.005071	120042.	-7765.0369	5.617E-05	0.000	6.008E+10	198.0834	468738.	0.000
16.000	-0.004253	40965.	-5510.8094	7.224E-05	0.000	6.008E+10	177.6212	501138.	0.000
17.000	-0.003337	-12553.	-3554.8192	7.508E-05	0.000	6.008E+10	148.3771	533538.	0.000
18.000	-0.002451	-44700.	-1970.9228	6.936E-05	0.000	6.008E+10			

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115.6056    565938.      0.000
    19.000  -0.001672    -60178.  -776.9370  5.889E-05      0.000  6.008E+10
83.3921    598338.      0.000
    20.000  -0.001038    -63621.    50.7421  4.653E-05      0.000  6.008E+10
54.5545    630738.      0.000
    21.000  -0.000556    -59177.   562.3710  3.426E-05      0.000  6.008E+10
30.7170    663138.      0.000
    22.000  -0.000216    -50283.   821.6588  2.333E-05      0.000  6.008E+10
12.4976    695538.      0.000
    23.000  4.089E-06    -39566.   895.1562  1.436E-05      0.000  6.008E+10
-0.2480    727938.      0.000
    24.000   0.000129    -28866.   844.6405  7.523E-06      0.000  6.008E+10
-8.1713    760338.      0.000
    25.000   0.000185    -19330.   722.4240  2.710E-06      0.000  6.008E+10
-12.1982    792738.      0.000
    26.000   0.000194    -11541.   569.1951 -3.729E-07      0.000  6.008E+10
-13.3400    825138.      0.000
    27.000   0.000176 -5667.2928   413.8215 -2.091E-06      0.000  6.008E+10
-12.5556    857538.      0.000
    28.000   0.000144 -1599.2525   274.4977 -2.817E-06      0.000  6.008E+10
-10.6650    889938.      0.000
    29.000   0.000108   933.7700   160.6622 -2.884E-06      0.000  6.008E+10
-8.3076    922338.      0.000
    30.000  7.460E-05  2270.0674    75.2049 -2.564E-06      0.000  6.008E+10
-5.9353    954738.      0.000
    31.000  4.656E-05  2750.6253    16.6143 -2.062E-06      0.000  6.008E+10
-3.8298    987138.      0.000
    32.000  2.511E-05  2678.4128   -19.1625 -1.520E-06      0.000  6.008E+10
-2.1330   1019538.      0.000
    33.000  1.007E-05  2297.8028   -37.2593 -1.023E-06      0.000  6.008E+10
-0.8831   1051938.      0.000
    34.000  5.506E-07  1788.9538   -42.8566 -6.150E-07      0.000  6.008E+10
-0.0498   1084338.      0.000
    35.000 -4.685E-06  1272.1081   -40.5390 -3.093E-07      0.000  6.008E+10
0.4360   1116738.      0.000
    36.000 -6.872E-06   817.4567   -33.9746 -1.006E-07      0.000  6.008E+10
0.6581   1149138.      0.000
    37.000 -7.099E-06   457.1872   -25.8320  2.670E-08      0.000  6.008E+10
0.6990   1181538.      0.000
    38.000 -6.231E-06   197.3641   -17.8558  9.207E-08      0.000  6.008E+10
0.6303   1213938.      0.000
    39.000 -4.890E-06    28.2186   -11.0267  1.146E-07      0.000  6.008E+10
0.5078   1246338.      0.000
    40.000 -3.481E-06   -67.8101    -5.7542  1.106E-07      0.000  6.008E+10
0.3709   1278738.      0.000
    41.000 -2.234E-06  -110.3980    -2.0642  9.285E-08      0.000  6.008E+10
0.2441   1311138.      0.000
    42.000 -1.252E-06  -117.7843     0.2415  7.006E-08      0.000  6.008E+10
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0.1402   1343538.      0.000
    43.000 -5.526E-07  -104.9278     1.4628  4.782E-08      0.000  6.008E+10
0.0634   1375938.      0.000
    44.000 -1.045E-07   -82.8988     1.9166  2.906E-08      0.000  6.008E+10
0.0123   1408338.      0.000
    45.000  1.449E-07   -59.0658     1.8857  1.489E-08      0.000  6.008E+10
-0.0174   1440738.      0.000
    46.000  2.528E-07   -37.7111     1.5951  5.220E-09      0.000  6.008E+10
-0.0310   1473138.      0.000
    47.000  2.702E-07   -20.8072     1.2055 -6.241E-10      0.000  6.008E+10
-0.0339   1505538.      0.000
    48.000  2.378E-07    -8.7756     0.8193 -3.579E-09      0.000  6.008E+10
-0.0305   1537938.      0.000
    49.000  1.843E-07    -1.1283     0.4917 -4.568E-09      0.000  6.008E+10
-0.0241   1570338.      0.000
    50.000  1.282E-07     3.0458     0.2442 -4.376E-09      0.000  6.008E+10
-0.0171   1602738.      0.000
    51.000  7.931E-08     4.7536     0.0767 -3.597E-09      0.000  6.008E+10
-0.0108   1635138.      0.000
    52.000  4.184E-08     4.9030    -0.0230 -2.633E-09      0.000  6.008E+10
-0.005813   1667538.      0.000
    53.000  1.612E-08     4.2130    -0.0716 -1.722E-09      0.000  6.008E+10
-0.002283   1699938.      0.000
    54.000  4.967E-10     3.1922    -0.0857 -9.829E-10      0.000  6.008E+10
-7.170E-05   1732338.      0.000
    55.000 -7.472E-09     2.1596    -0.0796 -4.484E-10      0.000  6.008E+10
0.001099   1764738.      0.000
    56.000 -1.027E-08     1.2843    -0.0638 -1.045E-10      0.000  6.008E+10
0.001537   1797138.      0.000
    57.000 -9.980E-09     0.6298    -0.0454  8.670E-11      0.000  6.008E+10
0.001522   1829538.      0.000
    58.000 -8.185E-09     0.1941    -0.0287  1.690E-10      0.000  6.008E+10
0.001270   1861938.      0.000
    59.000 -5.924E-09    -0.0589    -0.0154  1.825E-10      0.000  6.008E+10
0.000935   1894338.      0.000
    60.000 -3.805E-09    -0.1772  -0.006155  1.589E-10      0.000  6.008E+10
0.000611   1926738.      0.000
    61.000 -2.111E-09    -0.2074  -0.000421  1.205E-10      0.000  6.008E+10
0.000345   1959138.      0.000
    62.000 -9.134E-10    -0.1878   0.002556  8.102E-11      0.000  6.008E+10
0.000152   1991538.      0.000
    63.000 -1.663E-10    -0.1464   0.003634  4.765E-11      0.000  6.008E+10
2.804E-05   2023938.      0.000
    64.000  2.301E-10    -0.1008   0.003566  2.295E-11      0.000  6.008E+10
-3.942E-05   2056338.      0.000
    65.000  3.847E-10    -0.0609   0.002927  6.799E-12      0.000  6.008E+10
-6.695E-05   2088738.      0.000
    66.000  3.932E-10    -0.0306   0.002109 -2.343E-12      0.000  6.008E+10
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-6.951E-05   2121138.      0.000
    67.000  3.284E-10    -0.0103   0.001338 -6.431E-12      0.000  6.008E+10
-5.894E-05   2153538.      0.000
    68.000  2.389E-10   0.001518   0.000723 -7.309E-12      0.000  6.008E+10
-4.352E-05   2185938.      0.000
    69.000  1.530E-10   0.007079   0.000292 -6.450E-12      0.000  6.008E+10
-2.828E-05   2218338.      0.000
    70.000  8.408E-11   0.008563  2.796E-05 -4.888E-12      0.000  6.008E+10
-1.577E-05   2250738.      0.000
    71.000  3.569E-11   0.007773  -0.000107 -3.257E-12      0.000  6.008E+10
-6.790E-06   2283138.      0.000
    72.000  5.925E-12   0.006001  -0.000155 -1.881E-12      0.000  6.008E+10
-1.143E-06   2315538.      0.000
    73.000 -9.457E-12   0.004061  -0.000151      0.000      0.000  6.008E+10
1.850E-06   2347938.      0.000
    74.000 -1.510E-11   0.002386  -0.000122      0.000      0.000  6.008E+10
2.996E-06   2380338.      0.000
    75.000 -1.503E-11   0.001142 -8.558E-05      0.000      0.000  6.008E+10
3.022E-06   2412738.      0.000
    76.000 -1.222E-11   0.000332 -5.250E-05      0.000      0.000  6.008E+10
2.491E-06   2445138.      0.000
    77.000 -8.618E-12  -0.000119 -2.688E-05      0.000      0.000  6.008E+10
1.779E-06   2477538.      0.000
    78.000 -5.299E-12  -0.000314 -9.551E-06      0.000      0.000  6.008E+10
1.108E-06   2509938.      0.000
    79.000 -2.734E-12  -0.000350  5.737E-07      0.000      0.000  6.008E+10
5.791E-07   2542338.      0.000
    80.000 -1.006E-12  -0.000301  5.344E-06      0.000      0.000  6.008E+10
2.159E-07   2574738.      0.000
    81.000      0.000  -0.000222  6.641E-06      0.000      0.000  6.008E+10
2.655E-10   2607138.      0.000
    82.000      0.000  -0.000142  6.020E-06      0.000      0.000  6.008E+10
-1.038E-07   2639538.      0.000
    83.000      0.000 -7.760E-05  4.591E-06      0.000      0.000  6.008E+10
-1.344E-07   2671938.      0.000
    84.000      0.000 -3.217E-05  3.042E-06      0.000      0.000  6.008E+10
-1.238E-07   2704338.      0.000
    85.000      0.000 -4.553E-06  1.728E-06      0.000      0.000  6.008E+10
-9.530E-08   2736738.      0.000
    86.000      0.000  9.346E-06  7.743E-07      0.000      0.000  6.008E+10
-6.360E-08   2769138.      0.000
    87.000      0.000  1.408E-05  1.745E-07      0.000      0.000  6.008E+10
-3.636E-08   2801538.      0.000
    88.000      0.000  1.357E-05 -1.423E-07      0.000      0.000  6.008E+10
-1.645E-08   2833938.      0.000
    89.000      0.000  1.069E-05 -2.640E-07      0.000      0.000  6.008E+10
-3.837E-09   2866338.      0.000
    90.000      0.000  7.254E-06 -2.698E-07      0.000      0.000  6.008E+10
```



```
2.871E-09   2898738.      0.000
    91.000      0.000  4.225E-06 -2.197E-07      0.000      0.000  6.008E+10
5.482E-09   2931138.      0.000
    92.000      0.000  1.984E-06 -1.529E-07      0.000      0.000  6.008E+10
5.649E-09   2963538.      0.000
    93.000      0.000  5.546E-07 -9.123E-08      0.000      0.000  6.008E+10
4.631E-09   2995938.      0.000
    94.000      0.000 -2.077E-07 -4.391E-08      0.000      0.000  6.008E+10
3.255E-09   3028338.      0.000
    95.000      0.000 -5.013E-07 -1.253E-08      0.000      0.000  6.008E+10
1.975E-09   3060738.      0.000
    96.000      0.000 -5.102E-07  5.184E-09      0.000      0.000  6.008E+10
9.771E-10   3093138.      0.000
    97.000      0.000 -3.782E-07  1.270E-08      0.000      0.000  6.008E+10
2.762E-10   3125538.      0.000
    98.000      0.000 -2.062E-07  1.316E-08      0.000      0.000  6.008E+10
-2.009E-10   3157938.      0.000
    99.000      0.000 -6.303E-08  8.611E-09      0.000      0.000  6.008E+10
-5.565E-10   3190338.      0.000
   100.000      0.000      0.000      0.000      0.000      0.000  6.008E+10
-8.787E-10   1611369.      0.000
```

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

```
Pile-head deflection             =      0.2500000 inches
Computed slope at pile head      =     -0.0032673 radians
Maximum bending moment           =       1423970. inch-lbs
Maximum shear force              =         30462. lbs
Depth of maximum bending moment  =      6.0000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             14
Number of zero deflection points =             10
```

Computed Values of Pile Loading and Deflection

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head = 0.500000 inches
Moment at pile head = 0.0 in-lbs
Axial load at pile head = 194000.0 lbs

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. Es*h	Soil Spr. Distrib. p Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/in	lb/inch
0.00	0.5000	0.000	39961.	-0.006402	0.000	6.008E+10	0.000	0.000
1.000	0.4232	494433.	38765.	-0.006352	0.000	6.008E+10	-199.2247	5649.3842
2.000	0.3475	959947.	35000.	-0.006207	0.000	5.986E+10	-428.2723	14787.
3.000	0.2742	1363342.	28655.	-0.005891	0.000	3.721E+10	-629.2389	27536.
4.000	0.2062	1675103.	20234.	-0.005327	0.000	2.919E+10	-774.3511	45072.
5.000	0.1464	1873755.	10556.	-0.004546	0.000	2.579E+10	-838.6793	68756.
6.000	0.0970	1949607.	763.9164	-0.003638	0.000	2.474E+10	-793.2753	98089.
7.000	0.0591	1909026.	-8052.6011	-0.002712	0.000	2.529E+10	-676.1443	137360.
8.000	0.0320	1768971.	-14812.	-0.001873	0.000	2.746E+10	-450.4967	169144.
9.000	0.0141	1562246.	-19485.	-0.001190	0.000	3.168E+10	-328.2515	278800.
10.000	0.003397	1306874.	-21975.	-0.000694	0.000	3.908E+10	-86.8421	306738.
11.000	-0.002518	1038063.	-22070.	-0.000389	0.000	5.978E+10	71.1673	339138.
12.000	-0.005933	779015.	-20540.	-0.000207	0.000	6.000E+10	183.6993	371538.
13.000	-0.007478	546057.	-17928.	-7.422E-05	0.000	6.006E+10	251.7354	403938.
14.000	-0.007715	349095.	-14734.	1.519E-05	0.000	6.008E+10	280.5108	436338.
15.000	-0.007114	192364.	-11384.	6.927E-05	0.000	6.008E+10	277.8768	468738.

16.000	-0.006052	75558.	-8200.1975	9.602E-05	0.000	6.008E+10	252.7461	501138.
17.000	-0.004809	-4887.5917	-5400.7403	0.000103	0.000	6.008E+10	213.8301	533538.
18.000	-0.003578	-54540.	-3105.2258	9.714E-05	0.000	6.008E+10	168.7556	565938.
19.000	-0.002478	-79865.	-1351.3846	8.372E-05	0.000	6.008E+10	123.5513	598338.
20.000	-0.001569	-87363.	-115.2783	6.702E-05	0.000	6.008E+10	82.4665	630738.
21.000	-0.000869	-82944.	667.7877	5.001E-05	0.000	6.008E+10	48.0445	663138.
22.000	-0.000369	-71569.	1084.2621	3.458E-05	0.000	6.008E+10	21.3679	695538.
23.000	-3.945E-05	-57083.	1226.8271	2.173E-05	0.000	6.008E+10	2.3930	727938.
24.000	0.000153	-42226.	1183.0413	1.182E-05	0.000	6.008E+10	-9.6906	760338.
25.000	0.000244	-28745.	1028.1355	4.728E-06	0.000	6.008E+10	-16.1270	792738.
26.000	0.000266	-17573.	821.4629	1.020E-07	0.000	6.008E+10	-18.3184	825138.
27.000	0.000247	-9030.1444	605.8314	-2.555E-06	0.000	6.008E+10	-17.6202	857538.
28.000	0.000205	-3020.7741	408.8519	-3.758E-06	0.000	6.008E+10	-15.2097	889938.
29.000	0.000156	799.8000	245.4809	-3.980E-06	0.000	6.008E+10	-12.0188	922338.
30.000	0.000110	2889.2991	121.0648	-3.612E-06	0.000	6.008E+10	-8.7172	954738.
31.000	6.969E-05	3722.1712	34.3653	-2.951E-06	0.000	6.008E+10	-5.7327	987138.
32.000	3.873E-05	3727.8088	-19.7750	-2.207E-06	0.000	6.008E+10	-3.2907	1019538.
33.000	1.671E-05	3257.8487	-48.3086	-1.510E-06	0.000	6.008E+10	-1.4649	1051938.
34.000	2.498E-06	2575.4313	-58.4521	-9.272E-07	0.000	6.008E+10	-0.2257	1084338.
35.000	-5.542E-06	1859.3141	-56.7119	-4.843E-07	0.000	6.008E+10	0.5157	1116738.
36.000	-9.125E-06	1216.5995	-48.3744	-1.771E-07	0.000	6.008E+10	0.8739	1149138.
37.000	-9.793E-06	699.1540	-37.3461	1.421E-08	0.000	6.008E+10	0.9642	1181538.
38.000	-8.784E-06	320.2277	-26.2292	1.160E-07	0.000	6.008E+10	0.8886	1213938.
39.000	-7.008E-06	69.1139	-16.5302	1.549E-07	0.000	6.008E+10	0.7279	1246338.

```
    40.000 -5.067E-06   -77.2173    -8.9235  1.541E-07      0.000  6.008E+10
0.5399   1278738.      0.000
    41.000 -3.310E-06  -145.7671    -3.5142  1.318E-07      0.000  6.008E+10
0.3617   1311138.      0.000
    42.000 -1.903E-06  -162.1711    -0.0660  1.011E-07      0.000  6.008E+10
0.2130   1343538.      0.000
    43.000 -8.843E-07  -147.8219     1.8206  7.011E-08      0.000  6.008E+10
0.1014   1375938.      0.000
    44.000 -2.201E-07  -118.8027     2.5840  4.348E-08      0.000  6.008E+10
0.0258   1408338.      0.000
    45.000  1.593E-07   -86.0080     2.6243  2.303E-08      0.000  6.008E+10
-0.0191   1440738.      0.000
    46.000  3.326E-07   -55.9270     2.2646  8.854E-09      0.000  6.008E+10
-0.0408   1473138.      0.000
    47.000  3.718E-07   -31.6988     1.7398  1.031E-10      0.000  6.008E+10
-0.0466   1505538.      0.000
    48.000  3.350E-07   -14.1727     1.2023 -4.478E-09      0.000  6.008E+10
-0.0429   1537938.      0.000
    49.000  2.643E-07    -2.8230     0.7371 -6.175E-09      0.000  6.008E+10
-0.0346   1570338.      0.000
    50.000  1.868E-07     3.5474     0.3799 -6.103E-09      0.000  6.008E+10
-0.0250   1602738.      0.000
    51.000  1.178E-07     6.3231     0.1339 -5.117E-09      0.000  6.008E+10
-0.0161   1635138.      0.000
    52.000  6.400E-08     6.7838    -0.0158 -3.808E-09      0.000  6.008E+10
-0.008894   1667538.      0.000
    53.000  2.643E-08     5.9606    -0.0917 -2.536E-09      0.000  6.008E+10
-0.003745   1699938.      0.000
    54.000  3.150E-09     4.5954    -0.1169 -1.481E-09      0.000  6.008E+10
-0.000455   1732338.      0.000
    55.000 -9.119E-09     3.1625    -0.1116 -7.066E-10      0.000  6.008E+10
0.001341   1764738.      0.000
    56.000 -1.381E-08     1.9213    -0.0911 -1.989E-10      0.000  6.008E+10
0.002068   1797138.      0.000
    57.000 -1.389E-08     0.9770    -0.0660  9.058E-11      0.000  6.008E+10
0.002118   1829538.      0.000
    58.000 -1.163E-08     0.3373    -0.0424  2.218E-10      0.000  6.008E+10
0.001805   1861938.      0.000
    59.000 -8.568E-09    -0.0427    -0.0235  2.513E-10      0.000  6.008E+10
0.001353   1894338.      0.000
    60.000 -5.604E-09    -0.2279  -0.009986  2.242E-10      0.000  6.008E+10
0.000900   1926738.      0.000
    61.000 -3.187E-09    -0.2834  -0.001466  1.732E-10      0.000  6.008E+10
0.000520   1959138.      0.000
    62.000 -1.448E-09    -0.2639   0.003098  1.185E-10      0.000  6.008E+10
0.000240   1991538.      0.000
    63.000 -3.428E-10    -0.2096   0.004887  7.119E-11      0.000  6.008E+10
5.782E-05   2023938.      0.000
```



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    64.000  2.603E-10    -0.1470   0.004966  3.558E-11      0.000  6.008E+10
-4.460E-05   2056338.      0.000
    65.000  5.111E-10    -0.0906   0.004165  1.185E-11      0.000  6.008E+10
-8.896E-05   2088738.      0.000
    66.000  5.447E-10    -0.0471   0.003053 -1.898E-12      0.000  6.008E+10
-9.628E-05   2121138.      0.000
    67.000  4.655E-10    -0.0173   0.001974 -8.329E-12      0.000  6.008E+10
-8.355E-05   2153538.      0.000
    68.000  3.448E-10   0.000366   0.001096 -1.002E-11      0.000  6.008E+10
-6.281E-05   2185938.      0.000
    69.000  2.250E-10   0.009022   0.000470 -9.086E-12      0.000  6.008E+10
-4.159E-05   2218338.      0.000
    70.000  1.268E-10     0.0117  7.763E-05 -7.018E-12      0.000  6.008E+10
-2.378E-05   2250738.      0.000
    71.000  5.655E-11     0.0109  -0.000130 -4.761E-12      0.000  6.008E+10
-1.076E-05   2283138.      0.000
    72.000  1.250E-11   0.008597  -0.000209 -2.812E-12      0.000  6.008E+10
-2.413E-06   2315538.      0.000
    73.000 -1.094E-11   0.005924  -0.000210 -1.362E-12      0.000  6.008E+10
2.140E-06   2347938.      0.000
    74.000 -2.018E-11   0.003557  -0.000173      0.000      0.000  6.008E+10
4.003E-06   2380338.      0.000
    75.000 -2.089E-11   0.001765  -0.000124      0.000      0.000  6.008E+10
4.201E-06   2412738.      0.000
    76.000 -1.738E-11   0.000577 -7.772E-05      0.000      0.000  6.008E+10
3.541E-06   2445138.      0.000
    77.000 -1.248E-11  -0.000102 -4.101E-05      0.000      0.000  6.008E+10
2.577E-06   2477538.      0.000
    78.000 -7.827E-12  -0.000410 -1.573E-05      0.000      0.000  6.008E+10
1.637E-06   2509938.      0.000
    79.000 -4.156E-12  -0.000481 -6.275E-07      0.000      0.000  6.008E+10
8.804E-07   2542338.      0.000
    80.000 -1.638E-12  -0.000426  6.763E-06      0.000      0.000  6.008E+10
3.514E-07   2574738.      0.000
    81.000      0.000  -0.000320  9.055E-06      0.000      0.000  6.008E+10
3.054E-08   2607138.      0.000
    82.000      0.000  -0.000209  8.459E-06      0.000      0.000  6.008E+10
-1.299E-07   2639538.      0.000
    83.000      0.000  -0.000117  6.584E-06      0.000      0.000  6.008E+10
-1.827E-07   2671938.      0.000
    84.000      0.000 -5.098E-05  4.445E-06      0.000      0.000  6.008E+10
-1.737E-07   2704338.      0.000
    85.000      0.000 -1.011E-05  2.584E-06      0.000      0.000  6.008E+10
-1.365E-07   2736738.      0.000
    86.000      0.000  1.110E-05  1.208E-06      0.000      0.000  6.008E+10
-9.285E-08   2769138.      0.000
    87.000      0.000  1.894E-05  3.245E-07      0.000      0.000  6.008E+10
-5.432E-08   2801538.      0.000
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    88.000      0.000  1.895E-05 -1.550E-07      0.000      0.000  6.008E+10
-2.560E-08   2833938.      0.000
    89.000      0.000  1.526E-05 -3.508E-07      0.000      0.000  6.008E+10
-7.048E-09   2866338.      0.000
    90.000      0.000  1.055E-05 -3.746E-07      0.000      0.000  6.008E+10
3.091E-09   2898738.      0.000
    91.000      0.000  6.282E-06 -3.124E-07      0.000      0.000  6.008E+10
7.280E-09   2931138.      0.000
    92.000      0.000  3.058E-06 -2.216E-07      0.000      0.000  6.008E+10
7.843E-09   2963538.      0.000
    93.000      0.000  9.620E-07 -1.350E-07      0.000      0.000  6.008E+10
6.587E-09   2995938.      0.000
    94.000      0.000 -1.857E-07 -6.720E-08      0.000      0.000  6.008E+10
4.720E-09   3028338.      0.000
    95.000      0.000 -6.536E-07 -2.133E-08      0.000      0.000  6.008E+10
2.925E-09   3060738.      0.000
    96.000      0.000 -7.001E-07  5.190E-09      0.000      0.000  6.008E+10
1.495E-09   3093138.      0.000
    97.000      0.000 -5.310E-07  1.698E-08      0.000      0.000  6.008E+10
4.709E-10   3125538.      0.000
    98.000      0.000 -2.938E-07  1.837E-08      0.000      0.000  6.008E+10
-2.395E-10   3157938.      0.000
    99.000      0.000 -9.093E-08  1.227E-08      0.000      0.000  6.008E+10
-7.774E-10   3190338.      0.000
   100.000      0.000      0.000      0.000      0.000      0.000  6.008E+10
-1.268E-09   1611369.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are computed
only
  for elastic sections only and do not equal the actual stresses in concrete and
steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the
pile.


Output Summary for Load Case No. 2:

Pile-head deflection             =      0.5000000 inches
Computed slope at pile head      =     -0.0064018 radians
Maximum bending moment           =       1949607. inch-lbs
Maximum shear force              =          39961. lbs
Depth of maximum bending moment  =      6.0000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             11
Number of zero deflection points =             10
```



```
---------------------------------------------------------------------------
                Computed Values of Pile Loading and Deflection
                  for Lateral Loading for Load Case Number 3
---------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                              =     0.750000 inches
Moment at pile head                                    =          0.0 in-lbs
Axial load at pile head                                =     194000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending   Soil
Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness      p
       Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
----------  ---------- ----------
      0.00     0.7500      0.000     47086.  -0.009500      0.000  6.008E+10
0.000      0.000      0.000
     1.000     0.6360    587142.     45712.  -0.009442      0.000  6.008E+10
-228.8563  4318.0595      0.000
     2.000     0.5234   1141057.     41416.  -0.009231      0.000  4.508E+10
-487.2619     11171.      0.000
     3.000     0.4145   1624098.     34203.  -0.008757      0.000  3.026E+10
-714.8967     20699.      0.000
     4.000     0.3132   2002695.     24585.  -0.007936      0.000  2.407E+10
-888.0810     34023.      0.000
     5.000     0.2240   2251083.     13431.  -0.006808      0.000  2.150E+10
-970.9502     52017.      0.000
     6.000     0.1498   2356730.  1955.9877  -0.005495      0.000  2.064E+10
-941.4934     75406.      0.000
     7.000     0.0921   2323613. -8679.8714  -0.004143      0.000  2.090E+10
-831.1498    108285.      0.000
     8.000     0.0504   2167703.    -17153.  -0.002892      0.000  2.227E+10
-580.9947    138343.      0.000
     9.000     0.0227   1925412.    -23235.  -0.001847      0.000  2.506E+10
-432.6906    228748.      0.000
    10.000   0.006065   1618667.    -26761.  -0.001067      0.000  3.039E+10
-155.0230    306738.      0.000
    11.000  -0.002899   1288111.    -27200.  -0.000552      0.000  3.973E+10
81.9171    339138.      0.000
    12.000  -0.007193    968445.    -25372.  -0.000261      0.000  5.986E+10
222.7043    371538.      0.000
    13.000  -0.009157    680396.    -22186. -9.571E-05      0.000  6.004E+10
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308.2534    403938.      0.000
    14.000  -0.009490    436419.    -18266.  1.587E-05      0.000  6.007E+10
345.0720    436338.      0.000
    15.000  -0.008776    241930.    -14139.  8.362E-05      0.000  6.008E+10
342.8221    468738.      0.000
    16.000  -0.007483     96695.    -10207.   0.000117      0.000  6.008E+10
312.5046    501138.      0.000
    17.000  -0.005958 -3584.9872 -6742.5951   0.000127      0.000  6.008E+10
264.8987    533538.      0.000
    18.000  -0.004441    -65718. -3896.4284   0.000120      0.000  6.008E+10
209.4624    565938.      0.000
    19.000  -0.003082    -97657. -1717.5108   0.000104      0.000  6.008E+10
153.6906    598338.      0.000
    20.000  -0.001957   -107420.  -178.0726  8.302E-05      0.000  6.008E+10
102.8825    630738.      0.000
    21.000  -0.001090   -102317.   800.5824  6.208E-05      0.000  6.008E+10
60.2267    663138.      0.000
    22.000  -0.000468    -88495.  1324.5430  4.302E-05      0.000  6.008E+10
27.1001    695538.      0.000
    23.000 -5.736E-05    -70729.  1508.0199  2.712E-05      0.000  6.008E+10
3.4794    727938.      0.000
    24.000   0.000183    -52429.  1459.2077  1.482E-05      0.000  6.008E+10
-11.6148    760338.      0.000
    25.000   0.000298    -35777.  1271.2761  6.011E-06      0.000  6.008E+10
-19.7071    792738.      0.000
    26.000   0.000328    -21946.  1017.8891  2.460E-07      0.000  6.008E+10
-22.5241    825138.      0.000
    27.000   0.000304    -11349.   752.3047 -3.079E-06      0.000  6.008E+10
-21.7400    857538.      0.000
    28.000   0.000254 -3876.3332   508.9891 -4.600E-06      0.000  6.008E+10
-18.8126    889938.      0.000
    29.000   0.000194   888.6363   306.7245 -4.898E-06      0.000  6.008E+10
-14.8981    922338.      0.000
    30.000   0.000136  3507.8601   152.3557 -4.459E-06      0.000  6.008E+10
-10.8300    954738.      0.000
    31.000  8.682E-05  4565.9331    44.5245 -3.653E-06      0.000  6.008E+10
-7.1419    987138.      0.000
    32.000  4.846E-05  4593.4552   -23.0304 -2.738E-06      0.000  6.008E+10
-4.1173   1019538.      0.000
    33.000  2.111E-05  4025.9507   -58.8386 -1.877E-06      0.000  6.008E+10
-1.8507   1051938.      0.000
    34.000  3.414E-06  3190.0677   -71.7938 -1.156E-06      0.000  6.008E+10
-0.3085   1084338.      0.000
    35.000 -6.639E-06  2308.2842   -69.9374 -6.072E-07      0.000  6.008E+10
0.6178   1116738.      0.000
    36.000 -1.116E-05  1514.3977   -59.8186 -2.254E-07      0.000  6.008E+10
1.0686   1149138.      0.000
    37.000 -1.205E-05   873.6885   -46.2884  1.306E-08      0.000  6.008E+10
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1.1864   1181538.      0.000
    38.000 -1.085E-05   403.4160   -32.5869  1.406E-07      0.000  6.008E+10
1.0972   1213938.      0.000
    39.000 -8.675E-06    90.9473   -20.5980  1.900E-07      0.000  6.008E+10
0.9010   1246338.      0.000
    40.000 -6.286E-06   -91.8216   -11.1730  1.899E-07      0.000  6.008E+10
0.6699   1278738.      0.000
    41.000 -4.117E-06  -178.0878    -4.4545  1.629E-07      0.000  6.008E+10
0.4499   1311138.      0.000
    42.000 -2.376E-06  -199.4880    -0.1593  1.252E-07      0.000  6.008E+10
0.2660   1343538.      0.000
    43.000 -1.112E-06  -182.4938     2.2016  8.708E-08      0.000  6.008E+10
0.1275   1375938.      0.000
    44.000 -2.857E-07  -147.0541     3.1679  5.417E-08      0.000  6.008E+10
0.0335   1408338.      0.000
    45.000  1.880E-07  -106.7168     3.2336  2.882E-08      0.000  6.008E+10
-0.0226   1440738.      0.000
    46.000  4.060E-07   -69.5810     2.7991  1.122E-08      0.000  6.008E+10
-0.0498   1473138.      0.000
    47.000  4.573E-07   -39.5907     2.1558  3.153E-10      0.000  6.008E+10
-0.0574   1505538.      0.000
    48.000  4.136E-07   -17.8435     1.4935 -5.421E-09      0.000  6.008E+10
-0.0530   1537938.      0.000
    49.000  3.272E-07    -3.7213     0.9186 -7.574E-09      0.000  6.008E+10
-0.0428   1570338.      0.000
    50.000  2.318E-07     4.2371     0.4759 -7.523E-09      0.000  6.008E+10
-0.0310   1602738.      0.000
    51.000  1.466E-07     7.7347     0.1702 -6.327E-09      0.000  6.008E+10
-0.0200   1635138.      0.000
    52.000  7.999E-08     8.3513    -0.0164 -4.721E-09      0.000  6.008E+10
-0.0111   1667538.      0.000
    53.000  3.335E-08     7.3635    -0.1114 -3.151E-09      0.000  6.008E+10
-0.004724   1699938.      0.000
    54.000  4.358E-09     5.6920    -0.1435 -1.847E-09      0.000  6.008E+10
-0.000629   1732338.      0.000
    55.000 -1.099E-08     3.9273    -0.1376 -8.867E-10      0.000  6.008E+10
0.001616   1764738.      0.000
    56.000 -1.692E-08     2.3934    -0.1127 -2.554E-10      0.000  6.008E+10
0.002534   1797138.      0.000
    57.000 -1.712E-08     1.2234    -0.0818  1.058E-10      0.000  6.008E+10
0.002610   1829538.      0.000
    58.000 -1.438E-08     0.4286    -0.0528  2.708E-10      0.000  6.008E+10
0.002232   1861938.      0.000
    59.000 -1.062E-08    -0.0450    -0.0293  3.091E-10      0.000  6.008E+10
0.001676   1894338.      0.000
    60.000 -6.965E-09    -0.2772    -0.0126  2.769E-10      0.000  6.008E+10
0.001118   1926738.      0.000
    61.000 -3.975E-09    -0.3483  -0.001977  2.144E-10      0.000  6.008E+10
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0.000649   1959138.      0.000
    62.000 -1.819E-09    -0.3257   0.003728  1.471E-10      0.000  6.008E+10
0.000302   1991538.      0.000
    63.000 -4.440E-10    -0.2595   0.005989  8.867E-11      0.000  6.008E+10
7.489E-05   2023938.      0.000
    64.000  3.091E-10    -0.1824   0.006120  4.455E-11      0.000  6.008E+10
-5.296E-05   2056338.      0.000
    65.000  6.251E-10    -0.1128   0.005150  1.507E-11      0.000  6.008E+10
-0.000109   2088738.      0.000
    66.000  6.707E-10    -0.0588   0.003785 -2.074E-12      0.000  6.008E+10
-0.000119   2121138.      0.000
    67.000  5.753E-10    -0.0219   0.002455 -1.014E-11      0.000  6.008E+10
-0.000103   2153538.      0.000
    68.000  4.273E-10   0.000113   0.001368 -1.232E-11      0.000  6.008E+10
-7.784E-05   2185938.      0.000
    69.000  2.796E-10     0.0110   0.000591 -1.122E-11      0.000  6.008E+10
-5.168E-05   2218338.      0.000
    70.000  1.581E-10     0.0144   0.000103 -8.689E-12      0.000  6.008E+10
-2.965E-05   2250738.      0.000
    71.000  7.101E-11     0.0135  -0.000156 -5.911E-12      0.000  6.008E+10
-1.351E-05   2283138.      0.000
    72.000  1.623E-11     0.0106  -0.000256 -3.502E-12      0.000  6.008E+10
-3.132E-06   2315538.      0.000
    73.000 -1.305E-11   0.007353  -0.000259 -1.705E-12      0.000  6.008E+10
2.552E-06   2347938.      0.000
    74.000 -2.470E-11   0.004429  -0.000214      0.000      0.000  6.008E+10
4.899E-06   2380338.      0.000
    75.000 -2.574E-11   0.002209  -0.000154      0.000      0.000  6.008E+10
5.175E-06   2412738.      0.000
    76.000 -2.148E-11   0.000733 -9.667E-05      0.000      0.000  6.008E+10
4.377E-06   2445138.      0.000
    77.000 -1.547E-11  -0.000113 -5.124E-05      0.000      0.000  6.008E+10
3.194E-06   2477538.      0.000
    78.000 -9.732E-12  -0.000499 -1.986E-05      0.000      0.000  6.008E+10
2.036E-06   2509938.      0.000
    79.000 -5.189E-12  -0.000592 -1.050E-06      0.000      0.000  6.008E+10
1.099E-06   2542338.      0.000
    80.000 -2.064E-12  -0.000526  8.203E-06      0.000      0.000  6.008E+10
4.429E-07   2574738.      0.000
    81.000      0.000  -0.000396  1.112E-05      0.000      0.000  6.008E+10
4.348E-08   2607138.      0.000
    82.000      0.000  -0.000260  1.044E-05      0.000      0.000  6.008E+10
-1.572E-07   2639538.      0.000
    83.000  1.007E-12  -0.000146  8.150E-06      0.000      0.000  6.008E+10
-2.243E-07   2671938.      0.000
    84.000      0.000 -6.402E-05  5.518E-06      0.000      0.000  6.008E+10
-2.143E-07   2704338.      0.000
    85.000      0.000 -1.319E-05  3.218E-06      0.000      0.000  6.008E+10
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-1.690E-07   2736738.      0.000
    86.000      0.000  1.331E-05  1.513E-06      0.000      0.000  6.008E+10
-1.152E-07   2769138.      0.000
    87.000      0.000  2.321E-05  4.157E-07      0.000      0.000  6.008E+10
-6.765E-08   2801538.      0.000
    88.000      0.000  2.336E-05 -1.826E-07      0.000      0.000  6.008E+10
-3.206E-08   2833938.      0.000
    89.000      0.000  1.888E-05 -4.291E-07      0.000      0.000  6.008E+10
-9.015E-09   2866338.      0.000
    90.000      0.000  1.309E-05 -4.614E-07      0.000      0.000  6.008E+10
3.633E-09   2898738.      0.000
    91.000      0.000  7.818E-06 -3.862E-07      0.000      0.000  6.008E+10
8.903E-09   2931138.      0.000
    92.000      0.000  3.825E-06 -2.748E-07      0.000      0.000  6.008E+10
9.661E-09   2963538.      0.000
    93.000      0.000  1.222E-06 -1.680E-07      0.000      0.000  6.008E+10
8.144E-09   2995938.      0.000
    94.000      0.000 -2.088E-07 -8.398E-08      0.000      0.000  6.008E+10
5.853E-09   3028338.      0.000
    95.000      0.000 -7.969E-07 -2.704E-08      0.000      0.000  6.008E+10
3.638E-09   3060738.      0.000
    96.000      0.000 -8.607E-07  6.003E-09      0.000      0.000  6.008E+10
1.868E-09   3093138.      0.000
    97.000      0.000 -6.551E-07  2.079E-08      0.000      0.000  6.008E+10
5.971E-10   3125538.      0.000
    98.000      0.000 -3.633E-07  2.265E-08      0.000      0.000  6.008E+10
-2.873E-10   3157938.      0.000
    99.000      0.000 -1.127E-07  1.518E-08      0.000      0.000  6.008E+10
-9.585E-10   3190338.      0.000
   100.000      0.000      0.000      0.000      0.000      0.000  6.008E+10
-1.571E-09   1611369.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are computed
only
  for elastic sections only and do not equal the actual stresses in concrete and
steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the
pile.


Output Summary for Load Case No. 3:

Pile-head deflection             =      0.7500000 inches
Computed slope at pile head      =     -0.0095002 radians
Maximum bending moment           =       2356730. inch-lbs
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Maximum shear force = 47086. lbs
Depth of maximum bending moment = 6.0000000 feet below pile head
Depth of maximum shear force = 0.000000 feet below pile head
Number of iterations = 12
Number of zero deflection points = 10

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 4

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head = 1.000000 inches
Moment at pile head = 0.0 in-lbs
Axial load at pile head = 194000.0 lbs

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. Spr. Es*h	Distrib. p Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/in	lb/inch
0.00	1.0000	0.000	53319.	-0.0125	0.000	6.008E+10	0.000	0.000
1.000	0.8494	669039.	51767.	-0.0125	0.000	6.008E+10	-258.5724	3652.9034
2.000	0.7005	1300532.	46941.	-0.0122	0.000	3.927E+10	-545.7787	9350.1346
3.000	0.5563	1852508.	38913.	-0.0116	0.000	2.610E+10	-792.2564	17091.
4.000	0.4223	2288416.	28281.	-0.0105	0.000	2.118E+10	-979.7013	27841.
5.000	0.3038	2580229.	15933.	-0.009058	0.000	1.910E+10	-1078.3800	42590.
6.000	0.2049	2712983.	3071.8821	-0.007360	0.000	1.834E+10	-1065.1310	62389.
7.000	0.1272	2688224.	-9112.4982	-0.005599	0.000	1.847E+10	-965.5990	91096.
8.000	0.0705	2520353.	-19110.	-0.003950	0.000	1.948E+10	-700.7040	119298.
9.000	0.0324	2247968.	-26508.	-0.002547	0.000	2.153E+10	-532.3227	197173.
10.000	0.009344	1896011.	-31136.	-0.001474	0.000	2.547E+10	-238.8587	306738.

11.000	-0.002988	1507579.	-32062.	-0.000754	0.000	3.306E+10	84.4554	339138.
0.000								
12.000	-0.008754	1130034.	-29929.	-0.000332	0.000	4.575E+10	271.0268	371538.
0.000								
13.000	-0.0110	790828.	-26089.	-0.000105	0.000	5.999E+10	369.0156	403938.
0.000								
14.000	-0.0113	504391.	-21415.	2.450E-05	0.000	6.006E+10	409.9093	436338.
0.000								
15.000	-0.0104	276747.	-16524.	0.000103	0.000	6.008E+10	405.2460	468738.
0.000								
16.000	-0.008813	107329.	-11885.	0.000141	0.000	6.008E+10	368.0306	501138.
0.000								
17.000	-0.006994	-9141.9409	-7810.8488	0.000151	0.000	6.008E+10	310.9439	533538.
0.000								
18.000	-0.005196	-80833.	-4474.7814	0.000142	0.000	6.008E+10	245.0673	565938.
0.000								
19.000	-0.003593	-117196.	-1929.5010	0.000122	0.000	6.008E+10	179.1461	598338.
0.000								
20.000	-0.002270	-127709.	-138.6468	9.746E-05	0.000	6.008E+10	119.3296	630738.
0.000								
21.000	-0.001254	-120978.	993.0425	7.263E-05	0.000	6.008E+10	69.2853	663138.
0.000								
22.000	-0.000527	-104214.	1592.0974	5.014E-05	0.000	6.008E+10	30.5572	695538.
0.000								
23.000	-5.040E-05	-83001.	1793.7837	3.144E-05	0.000	6.008E+10	3.0572	727938.
0.000								
24.000	0.000227	-61309.	1725.6505	1.703E-05	0.000	6.008E+10	-14.4127	760338.
0.000								
25.000	0.000358	-41665.	1497.1223	6.749E-06	0.000	6.008E+10	-23.6753	792738.
0.000								
26.000	0.000389	-25410.	1194.4014	5.001E-08	0.000	6.008E+10	-26.7781	825138.
0.000								
27.000	0.000360	-12999.	879.5542	-3.786E-06	0.000	6.008E+10	-25.6964	857538.
0.000								
28.000	0.000299	-4282.7980	592.5192	-5.512E-06	0.000	6.008E+10	-22.1428	889938.
0.000								
29.000	0.000227	1246.9801	354.8383	-5.815E-06	0.000	6.008E+10	-17.4707	922338.
0.000								
30.000	0.000159	4260.3950	174.1045	-5.265E-06	0.000	6.008E+10	-12.6516	954738.
0.000								
31.000	0.000101	5450.0014	48.3727	-4.295E-06	0.000	6.008E+10	-8.3037	987138.
0.000								
32.000	5.593E-05	5441.3385	-29.9622	-3.207E-06	0.000	6.008E+10	-4.7521	1019538.
0.000								
33.000	2.396E-05	4745.8435	-71.0790	-2.190E-06	0.000	6.008E+10	-2.1007	1051938.
0.000								
34.000	3.370E-06	3745.6397	-85.5106	-1.342E-06	0.000	6.008E+10	-0.3046	1084338.
0.000								

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    35.000 -8.245E-06  2699.8375   -82.7341 -6.983E-07      0.000  6.008E+10
0.7673   1116738.      0.000
    36.000 -1.339E-05  1763.2724   -70.4369 -2.526E-07      0.000  6.008E+10
1.2822   1149138.      0.000
    37.000 -1.431E-05  1010.5273   -54.2909  2.440E-08      0.000  6.008E+10
1.4088   1181538.      0.000
    38.000 -1.280E-05   460.1772   -38.0665  1.713E-07      0.000  6.008E+10
1.2953   1213938.      0.000
    39.000 -1.020E-05    96.1341   -23.9401  2.268E-07      0.000  6.008E+10
1.0591   1246338.      0.000
    40.000 -7.360E-06  -115.4421   -12.8797  2.249E-07      0.000  6.008E+10
0.7843   1278738.      0.000
    41.000 -4.800E-06  -214.0254    -5.0275  1.920E-07      0.000  6.008E+10
0.5244   1311138.      0.000
    42.000 -2.752E-06  -236.9951    -0.0323  1.470E-07      0.000  6.008E+10
0.3081   1343538.      0.000
    43.000 -1.272E-06  -215.4860     2.6918  1.018E-07      0.000  6.008E+10
0.1459   1375938.      0.000
    44.000 -3.094E-07  -172.8668     3.7851  6.299E-08      0.000  6.008E+10
0.0363   1408338.      0.000
    45.000  2.393E-07  -124.9377     3.8306  3.325E-08      0.000  6.008E+10
-0.0287   1440738.      0.000
    46.000  4.885E-07   -81.0869     3.2985  1.267E-08      0.000  6.008E+10
-0.0600   1473138.      0.000
    47.000  5.434E-07   -45.8336     2.5296 -4.222E-12      0.000  6.008E+10
-0.0682   1505538.      0.000
    48.000  4.884E-07   -20.3756     1.7451 -6.616E-09      0.000  6.008E+10
-0.0626   1537938.      0.000
    49.000  3.846E-07    -3.9212     1.0676 -9.043E-09      0.000  6.008E+10
-0.0503   1570338.      0.000
    50.000  2.713E-07     5.2881     0.5482 -8.906E-09      0.000  6.008E+10
-0.0362   1602738.      0.000
    51.000  1.708E-07     9.2762     0.1911 -7.452E-09      0.000  6.008E+10
-0.0233   1635138.      0.000
    52.000  9.250E-08     9.9084    -0.0257 -5.536E-09      0.000  6.008E+10
-0.0129   1667538.      0.000
    53.000  3.795E-08     8.6850    -0.1351 -3.679E-09      0.000  6.008E+10
-0.005376   1699938.      0.000
    54.000  4.207E-09     6.6834    -0.1710 -2.144E-09      0.000  6.008E+10
-0.000607   1732338.      0.000
    55.000 -1.351E-08     4.5913    -0.1627 -1.018E-09      0.000  6.008E+10
0.001987   1764738.      0.000
    56.000 -2.023E-08     2.7832    -0.1326 -2.818E-10      0.000  6.008E+10
0.003030   1797138.      0.000
    57.000 -2.028E-08     1.4101    -0.0959  1.370E-10      0.000  6.008E+10
0.003091   1829538.      0.000
    58.000 -1.694E-08     0.4816    -0.0616  3.259E-10      0.000  6.008E+10
0.002629   1861938.      0.000
```



```
    59.000 -1.245E-08    -0.0686    -0.0340  3.672E-10      0.000  6.008E+10
0.001966   1894338.      0.000
    60.000 -8.131E-09    -0.3357    -0.0144  3.268E-10      0.000  6.008E+10
0.001306   1926738.      0.000
    61.000 -4.612E-09    -0.4146  -0.002000  2.519E-10      0.000  6.008E+10
0.000753   1959138.      0.000
    62.000 -2.086E-09    -0.3848   0.004595  1.720E-10      0.000  6.008E+10
0.000346   1991538.      0.000
    63.000 -4.827E-10    -0.3051   0.007160  1.031E-10      0.000  6.008E+10
8.141E-05   2023938.      0.000
    64.000  3.894E-10    -0.2135   0.007248  5.136E-11      0.000  6.008E+10
-6.673E-05   2056338.      0.000
    65.000  7.499E-10    -0.1314   0.006065  1.692E-11      0.000  6.008E+10
-0.000131   2088738.      0.000
    66.000  7.955E-10    -0.0680   0.004438 -2.987E-12      0.000  6.008E+10
-0.000141   2121138.      0.000
    67.000  6.782E-10    -0.0248   0.002864 -1.226E-11      0.000  6.008E+10
-0.000122   2153538.      0.000
    68.000  5.014E-10   0.000812   0.001586 -1.465E-11      0.000  6.008E+10
-9.133E-05   2185938.      0.000
    69.000  3.265E-10     0.0133   0.000676 -1.325E-11      0.000  6.008E+10
-6.035E-05   2218338.      0.000
    70.000  1.835E-10     0.0171   0.000107 -1.021E-11      0.000  6.008E+10
-3.441E-05   2250738.      0.000
    71.000  8.145E-11     0.0159  -0.000192 -6.913E-12      0.000  6.008E+10
-1.550E-05   2283138.      0.000
    72.000  1.757E-11     0.0125  -0.000306 -4.074E-12      0.000  6.008E+10
-3.391E-06   2315538.      0.000
    73.000 -1.632E-11   0.008604  -0.000307 -1.965E-12      0.000  6.008E+10
3.193E-06   2347938.      0.000
    74.000 -2.959E-11   0.005155  -0.000252      0.000      0.000  6.008E+10
5.869E-06   2380338.      0.000
    75.000 -3.050E-11   0.002548  -0.000180      0.000      0.000  6.008E+10
6.133E-06   2412738.      0.000
    76.000 -2.531E-11   0.000823  -0.000113      0.000      0.000  6.008E+10
5.157E-06   2445138.      0.000
    77.000 -1.814E-11  -0.000159 -5.929E-05      0.000      0.000  6.008E+10
3.745E-06   2477538.      0.000
    78.000 -1.135E-11  -0.000602 -2.258E-05      0.000      0.000  6.008E+10
2.375E-06   2509938.      0.000
    79.000 -6.010E-12  -0.000703 -6.890E-07      0.000      0.000  6.008E+10
1.273E-06   2542338.      0.000
    80.000 -2.353E-12  -0.000621  9.980E-06      0.000      0.000  6.008E+10
5.048E-07   2574738.      0.000
    81.000      0.000  -0.000465  1.325E-05      0.000      0.000  6.008E+10
3.978E-08   2607138.      0.000
    82.000      0.000  -0.000303  1.233E-05      0.000      0.000  6.008E+10
-1.919E-07   2639538.      0.000
```

```
    83.000  1.201E-12  -0.000169  9.579E-06      0.000      0.000  6.008E+10
-2.674E-07   2671938.      0.000
    84.000  1.124E-12 -7.343E-05  6.455E-06      0.000      0.000  6.008E+10
-2.533E-07   2704338.      0.000
    85.000      0.000 -1.416E-05  3.743E-06      0.000      0.000  6.008E+10
-1.987E-07   2736738.      0.000
    86.000      0.000  1.651E-05  1.742E-06      0.000      0.000  6.008E+10
-1.348E-07   2769138.      0.000
    87.000      0.000  2.775E-05  4.607E-07      0.000      0.000  6.008E+10
-7.870E-08   2801538.      0.000
    88.000      0.000  2.765E-05 -2.331E-07      0.000      0.000  6.008E+10
-3.693E-08   2833938.      0.000
    89.000      0.000  2.221E-05 -5.148E-07      0.000      0.000  6.008E+10
-1.002E-08   2866338.      0.000
    90.000      0.000  1.533E-05 -5.469E-07      0.000      0.000  6.008E+10
4.655E-09   2898738.      0.000
    91.000      0.000  9.105E-06 -4.549E-07      0.000      0.000  6.008E+10
1.068E-08   2931138.      0.000
    92.000      0.000  4.416E-06 -3.221E-07      0.000      0.000  6.008E+10
1.145E-08   2963538.      0.000
    93.000      0.000  1.374E-06 -1.958E-07      0.000      0.000  6.008E+10
9.592E-09   2995938.      0.000
    94.000      0.000 -2.875E-07 -9.712E-08      0.000      0.000  6.008E+10
6.859E-09   3028338.      0.000
    95.000      0.000 -9.611E-07 -3.051E-08      0.000      0.000  6.008E+10
4.241E-09   3060738.      0.000
    96.000      0.000 -1.023E-06  7.898E-09      0.000      0.000  6.008E+10
2.160E-09   3093138.      0.000
    97.000      0.000 -7.743E-07  2.490E-08      0.000      0.000  6.008E+10
6.736E-10   3125538.      0.000
    98.000      0.000 -4.277E-07  2.681E-08      0.000      0.000  6.008E+10
-3.560E-10   3157938.      0.000
    99.000      0.000 -1.322E-07  1.787E-08      0.000      0.000  6.008E+10
-1.134E-09   3190338.      0.000
   100.000      0.000      0.000      0.000      0.000      0.000  6.008E+10
-1.843E-09   1611369.      0.000
```

* This analysis computed pile response using nonlinear moment-curvature relationships.
  Values of total stress due to combined axial and bending stresses are computed only
  for elastic sections only and do not equal the actual stresses in concrete and steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the pile.


```
Output Summary for Load Case No. 4:

Pile-head deflection             =      1.0000000 inches
Computed slope at pile head      =     -0.0125479 radians
Maximum bending moment           =       2712983. inch-lbs
Maximum shear force              =         53319. lbs
Depth of maximum bending moment  =      6.0000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             12
Number of zero deflection points =             10
```

Summary of Pile Response(s)

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

Load Case	Load Type	Pile-head Condition 1 V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Maximum Axial Loading lbs	Maximum Pile-head Deflection inches	Moment in Pile No. in-lbs	Shear in Pile No. lbs	Rotation radians
1	4	y = 0.2500	M = 0.000	194000.	0.25000000	1423970.	30462.	-0.00326729
2	4	y = 0.5000	M = 0.000	194000.	0.50000000	1949607.	39961.	-0.00640182
3	4	y = 0.7500	M = 0.000	194000.	0.75000000	2356730.	47086.	-0.00950021
4	4	y = 1.0000	M = 0.000	194000.	1.00000000	2712983.	53319.	-0.01254788

The analysis ended normally.

LPile Plus for Windows, Version 2013-07.007

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

This copy of LPile is used by:

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Files Used for Analysis

Path to file locations: G:\Projects\Y2015\P15033 Jacalitos Creek Bridge\Calculations\Shaft and LPILE\
Name of input data file: 72-in CIDH DAK.lp7d
Name of output report file: 72-in CIDH DAK.lp7o
Name of plot output file: 72-in CIDH DAK.lp7p
Name of runtime messeage file: 72-in CIDH DAK.lp7r

Date and Time of Analysis

Date: May 20, 2016 Time: 16:26:53

Problem Title

Project Name: Jacalitos Creek Bridge Replacement on Lost Hills Avenue

Bridge Number: 42C0078

Client: Fresno County

Engineer: J NEWGARD

Description: Lateral capacity of CIDH piles

Program Options and Settings

Engineering Units of Input Data and Computations:
- Engineering units are US Customary Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed	=	500
- Deflection tolerance for convergence	=	1.0000E-05 in
- Maximum allowable deflection	=	100.0000 in
- Number of pile increments	=	100

Loading Type and Number of Cycles of Loading:
- Static loading specified

Computational Options:
- Use unfactored loads in computations (conventional analysis)
- Compute pile response under loading and nonlinear bending properties of pile (only if nonlinear pile properties are input)
- Use of p-y modification factors for p-y curves not selected
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
 - No p-y curves to be computed and reported for user-specified depths
 - Values of pile-head deflection, bending moment, shear force, and
   soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1

Pile Structural Properties and Geometry

Total number of pile sections = 1

Total length of pile = 100.00 ft

Depth of ground surface below top of pile = 0.00 ft

Pile diameter values used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile.

Point	Depth X ft	Pile Diameter in
1	0.00000	72.0000000
2	100.000000	72.0000000

Input Structural Properties:

Pile Section No. 1:

Section Type = Drilled Shaft (Bored Pile)
Section Length = 100.00000 ft
Section Diameter = 72.00000 in

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 0.0000 ft
Distance from top of pile to bottom of layer = 10.00000 ft
Effective unit weight at top of layer = 120.00000 pcf
Effective unit weight at bottom of layer = 125.00000 pcf
Friction angle at top of layer = 36.00000 deg.
Friction angle at bottom of layer = 40.00000 deg.
Subgrade k at top of layer = 0.0000 pci
Subgrade k at bottom of layer = 0.0000 pci

NOTE: Internal default values for subgrade k will be computed for this soil layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 10.00000 ft
Distance from top of pile to bottom of layer = 100.00000 ft
Effective unit weight at top of layer = 125.00000 pcf
Effective unit weight at bottom of layer = 125.00000 pcf
Friction angle at top of layer = 40.00000 deg.
Friction angle at bottom of layer = 40.00000 deg.
Subgrade k at top of layer = 0.0000 pci
Subgrade k at bottom of layer = 0.0000 pci

NOTE: Internal default values for subgrade k will be computed for this soil layer.

(Depth of lowest soil layer extends 0.00 ft below pile tip)

Summary of Soil Properties

Layer Layer Effective Angle of

Layer Num.	Soil Type (p-y Curve Criteria)	Depth ft	Unit Wt. pcf	Friction deg.	kpy pci
1	Sand (Reese, et al.)	0.00	120.000	36.000	default
		10.000	125.000	40.000	default
2	Sand (Reese, et al.)	10.000	125.000	40.000	default
		100.000	125.000	40.000	default

Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 4

Load No.	Load Compute Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Top y vs. Pile Length
1	4 No	y = 0.25000 in	M = 0.0000 in-lbs	706000.	
2	4 No	y = 0.50000 in	M = 0.0000 in-lbs	706000.	
3	4 No	y = 0.75000 in	M = 0.0000 in-lbs	706000.	
4	4 No	y = 1.00000 in	M = 0.0000 in-lbs	706000.	

V = perpendicular shear force applied to pile head
M = bending moment applied to pile head

y = lateral deflection relative to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applie to pile head
Axial thrust is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

---

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	100.00000 ft
Shaft Diameter	=	72.00000 in
Concrete Cover Thickness	=	5.00000 in
Number of Reinforcing Bars	=	16 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	4071.50408 sq. in.
Total Area of Reinforcing Steel	=	64.00000 sq. in.
Area Ratio of Steel Reinforcement	=	1.57 percent
Edge-to-Edge Bar Spacing	=	9.39828 in
Maximum Concrete Aggregate Size	=	0.75000 in
Ratio of Bar Spacing to Aggregate Size	=	12.53
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As	=	14059.136 kips
Tensile Load for Cracking of Concrete	=	-1666.023 kips
Nominal Axial Tensile Capacity	=	-3840.000 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	2.25700	4.00000	29.87150	0.00000

2	2.25700	4.00000	27.59767	11.43133
3	2.25700	4.00000	21.12234	21.12234
4	2.25700	4.00000	11.43133	27.59767
5	2.25700	4.00000	0.00000	29.87150
6	2.25700	4.00000	-11.43133	27.59767
7	2.25700	4.00000	-21.12234	21.12234
8	2.25700	4.00000	-27.59767	11.43133
9	2.25700	4.00000	-29.87150	0.00000
10	2.25700	4.00000	-27.59767	-11.43133
11	2.25700	4.00000	-21.12234	-21.12234
12	2.25700	4.00000	-11.43133	-27.59767
13	2.25700	4.00000	0.00000	-29.87150
14	2.25700	4.00000	11.43133	-27.59767
15	2.25700	4.00000	21.12234	-21.12234
16	2.25700	4.00000	27.59767	-11.43133

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 9.39828 inches
between Bars 15 and 16

Spacing to aggregate size ratio = 12.53104

Concrete Properties:

Compressive Strength of Concrete	=	3000.00000 psi
Modulus of Elasticity of Concrete	=	3122019. psi
Modulus of Rupture of Concrete	=	-410.79191 psi
Compression Strain at Peak Stress	=	0.00163
Tensile Strain at Fracture of Concrete	=	-0.0001160
Maximum Coarse Aggregate Size	=	0.75000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	706.000

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.

Y = stress in reinforcing steel has reached yield stress.
T = ACI 318-08 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than than 0.003. See ACI 318-08, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 706.000 kips

Bending Max Concrete Curvature Stress rad/in. ksi	Bending Max Steel Moment Stress in-kip ksi	Bending Run Stiffness Msg kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in
0.000000417	2268.5868333	5444608400.	139.4727126	0.0000581	
0.0000281	0.2091211	1.6809453			
0.000000833	4537.0523132	5444462776.	87.7923792	0.0000732	
0.0000132	0.2616452	2.1129492			
0.000001250	6805.2908544	5444232684.	70.5905038	0.0000882	
-0.000001762	0.3137784	2.5458558			
0.000001667	9071.5931297	5442955878.	62.0064208	0.0001033	
-0.0000167	0.3655074	2.9795770			
0.000002083	11331.	5438767585.	56.8643018	0.0001185	
-0.0000315	0.4167925	3.4138016			
0.000002500	13580.	5431969843.	53.4402496	0.0001336	
-0.0000464	0.4676075	3.8483181			
0.000002917	15818.	5423284075.	50.9967088	0.0001487	
-0.0000613	0.5179393	4.2830216			
0.000003333	18044.	5413261120.	49.1654033	0.0001639	
-0.0000761	0.5677808	4.7178557			
0.000003750	20259.	5402277593.	47.7419577	0.0001790	
-0.0000910	0.6171278	5.1527879			
0.000004167	22461.	5390589045.	46.6038557	0.0001942	
-0.0001058	0.6659780	5.5877992			
0.000004583	22461.	4900535496.	40.7875360	0.0001869	
-0.0001431	0.6419755	5.3734933 C			
0.000005000	22461.	4492157538.	39.5310807	0.0001977	
-0.0001623	0.6762452	5.6798066 C			
0.000005417	22461.	4146606958.	38.4372178	0.0002082	

```
-0.0001818     0.7097304     5.9812963  C
   0.000005833        22461.   3850420747.    37.4719982     0.0002186
-0.0002014     0.7424592     6.2781130  C
   0.000006250        22461.   3593726030.    36.6160698     0.0002289
-0.0002211     0.7745688     6.5714127  C
   0.000006667        22461.   3369118153.    35.8511867     0.0002390
-0.0002410     0.8061145    -6.9191706  C
   0.000007083        22461.   3170934733.    35.1631926     0.0002491
-0.0002609     0.8371457    -7.4929442  C
   0.000007500        22461.   2994771692.    34.5406440     0.0002591
-0.0002809     0.8677004    -8.0691099  C
   0.000007917        22599.   2854594107.    33.9747734     0.0002690
-0.0003010     0.8978223    -8.6473083  C
   0.000008333        23304.   2796467946.    33.4589110     0.0002788
-0.0003212     0.9275626    -9.2270965  C
   0.000008750        24001.   2742925587.    32.9825082     0.0002886
-0.0003414     0.9568345    -9.8093385  C
   0.000009167        24693.   2693778641.    32.5452137     0.0002983
-0.0003617     0.9857824   -10.3926974  C
   0.000009583        25381.   2648451251.    32.1418550     0.0003080
-0.0003820     1.0144066   -10.9771928  C
     0.0000100        26064.   2606363600.    31.7662552     0.0003177
-0.0004023     1.0426522   -11.5633860  C
     0.0000104        26744.   2567405129.    31.4191375     0.0003273
-0.0004227     1.0706475   -12.1500522  C
     0.0000108        27419.   2531016982.    31.0938163     0.0003368
-0.0004432     1.0982857   -12.7382594  C
     0.0000113        28092.   2497107075.    30.7909504     0.0003464
-0.0004636     1.1256709   -13.3270024  C
     0.0000117        28763.   2465417883.    30.5080460     0.0003559
-0.0004841     1.1528013   -13.9163111  C
     0.0000121        29430.   2435586108.    30.2406429     0.0003654
-0.0005046     1.1795953   -14.5070247  C
     0.0000125        30096.   2407680347.    29.9916944     0.0003749
-0.0005251     1.2062158   -15.0975107  C
     0.0000129        30759.   2381349390.    29.7561659     0.0003844
-0.0005456     1.2325440   -15.6889862  C
     0.0000133        31420.   2356463470.    29.5331248     0.0003938
-0.0005662     1.2585943   -16.2813250  C
     0.0000138        32079.   2333029808.    29.3241695     0.0004032
-0.0005868     1.2844729   -16.8734374  C
     0.0000142        32737.   2310880193.    29.1271747     0.0004126
-0.0006074     1.3101448   -17.4656857  C
     0.0000146        33392.   2289751140.    28.9376935     0.0004220
-0.0006280     1.3354739   -18.0595171  C
     0.0000150        34046.   2269745553.    28.7592595     0.0004314
-0.0006486     1.3606329   -18.6531221  C
     0.0000154        34699.   2250772147.    28.5909788     0.0004408
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-0.0006692     1.3856214   -19.2464998  C
     0.0000158        35352.   2232740298.    28.4318252     0.0004502
-0.0006898     1.4104294   -19.8397535  C
     0.0000163        36001.   2215425857.    28.2772433     0.0004595
-0.0007105     1.4348906   -20.4346991  C
     0.0000171        37296.   2183199721.    27.9920841     0.0004782
-0.0007518     1.4833056   -21.6239050  C
     0.0000179        38589.   2153803638.    27.7352205     0.0004969
-0.0007931     1.5310415   -22.8121916  C
     0.0000188        39875.   2126643636.    27.4964910     0.0005156
-0.0008344     1.5777913   -24.0030331  C
     0.0000196        41157.   2101629615.    27.2793095     0.0005342
-0.0008758     1.6238451   -25.1931754  C
     0.0000204        42436.   2078510934.    27.0814424     0.0005529
-0.0009171     1.6692200   -26.3823792  C
     0.0000213        43711.   2056978313.    26.8976034     0.0005716
-0.0009584     1.7137582   -27.5725019  C
     0.0000221        44981.   2036871511.    26.7268483     0.0005902
-0.0009998     1.7574970   -28.7631308  C
     0.0000229        46248.   2018096590.    26.5699632     0.0006089
-0.0010411     1.8005565   -29.9527952  C
     0.0000238        47512.   2000512338.    26.4255001     0.0006276
-0.0010824     1.8429332   -31.1414867  C
     0.0000246        48773.   1983996668.    26.2922075     0.0006464
-0.0011236     1.8846235   -32.3291970  C
     0.0000254        50029.   1968365206.    26.1654790     0.0006650
-0.0011650     1.9254273   -33.5185115  C
     0.0000263        51282.   1953603043.    26.0477588     0.0006838
-0.0012062     1.9655253   -34.7070935  C
     0.0000271        52532.   1939636875.    25.9385772     0.0007025
-0.0012475     2.0049350   -35.8946591  C
     0.0000279        53779.   1926394503.    25.8371812     0.0007213
-0.0012887     2.0436527   -37.0811986  C
     0.0000288        55022.   1913812080.    25.7429053     0.0007401
-0.0013299     2.0816747   -38.2667026  C
     0.0000296        56263.   1901832939.    25.6551593     0.0007590
-0.0013710     2.1189973   -39.4511612  C
     0.0000304        57500.   1890406610.    25.5734177     0.0007779
-0.0014121     2.1556165   -40.6345644  C
     0.0000313        58733.   1879455509.    25.4951788     0.0007967
-0.0014533     2.1914073   -41.8187441  C
     0.0000321        59963.   1868968434.    25.4217685     0.0008156
-0.0014944     2.2264689   -43.0022128  C
     0.0000329        61189.   1858915786.    25.3532314     0.0008345
-0.0015355     2.2608227   -44.1845777  C
     0.0000338        62413.   1849264534.    25.2892181     0.0008535
-0.0015765     2.2944648   -45.3658277  C
     0.0000346        63633.   1839984816.    25.2294131     0.0008725
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-0.0016175     2.3273909   -46.5459510  C
     0.0000354        64850.   1831049568.    25.1735307     0.0008916
-0.0016584     2.3595968   -47.7249361  C
     0.0000363        66063.   1822434196.    25.1213118     0.0009106
-0.0016994     2.3910783   -48.9027709  C
     0.0000371        67273.   1814116307.    25.0725209     0.0009298
-0.0017402     2.4218310   -50.0794431  C
     0.0000379        68480.   1806075457.    25.0269432     0.0009489
-0.0017811     2.4518506   -51.2549402  C
     0.0000387        69684.   1798292952.    24.9843829     0.0009681
-0.0018219     2.4811324   -52.4292496  C
     0.0000396        70884.   1790751652.    24.9446606     0.0009874
-0.0018626     2.5096720   -53.6023582  C
     0.0000404        72081.   1783435818.    24.9076122     0.0010067
-0.0019033     2.5374648   -54.7742527  C
     0.0000412        73274.   1776330969.    24.8730869     0.0010260
-0.0019440     2.5645059   -55.9449196  C
     0.0000421        74463.   1769423755.    24.8409462     0.0010454
-0.0019846     2.5907907   -57.1143451  C
     0.0000429        75649.   1762694171.    24.8100892     0.0010648
-0.0020252     2.6162594   -58.2837263  C
     0.0000437        76831.   1756139323.    24.7814035     0.0010842
-0.0020658     2.6409652   -59.4518442  C
     0.0000446        78010.   1749748828.    24.7548092     0.0011037
-0.0021063     2.6649048   -60.0000000  CY
     0.0000454        79185.   1743512807.    24.7302034     0.0011232
-0.0021468     2.6880730   -60.0000000  CY
     0.0000462        80356.   1737422079.    24.7074908     0.0011427
-0.0021873     2.7104645   -60.0000000  CY
     0.0000471        81523.   1731468094.    24.6865831     0.0011623
-0.0022277     2.7320738   -60.0000000  CY
     0.0000479        82687.   1725642881.    24.6673985     0.0011820
-0.0022680     2.7528954   -60.0000000  CY
     0.0000487        83847.   1719934401.    24.6498396     0.0012017
-0.0023083     2.7729227   -60.0000000  CY
     0.0000496        84985.   1713980782.    24.6321401     0.0012213
-0.0023487     2.7920687   -60.0000000  CY
     0.0000529        88890.   1679813942.    24.5187610     0.0012975
-0.0025125     2.8581943   -60.0000000  CY
     0.0000562        91516.   1626959226.    24.3159940     0.0013678
-0.0026822     2.9080214   -60.0000000  CY
     0.0000596        93977.   1577238204.    24.1340495     0.0014380
-0.0028520     2.9470511   -60.0000000  CY
     0.0000629        96168.   1528494991.    23.9510476     0.0015069
-0.0030231     2.9749444   -60.0000000  CY
     0.0000662        97575.   1472835555.    23.7170121     0.0015713
-0.0031987     2.9916550   -60.0000000  CY
     0.0000696        98883.   1421076879.    23.5051151     0.0016356
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-0.0033744     2.9994030   -60.0000000  CY
     0.0000729        100161.   1373637891.    23.3159429     0.0017001
-0.0035499     2.9998330   -60.0000000  CY
     0.0000762        101407.   1329932173.    23.1460610     0.0017649
-0.0037251     2.9999606   -60.0000000  CY
     0.0000796        102628.   1289565183.    22.9975302     0.0018302
-0.0038998     2.9999830   -60.0000000  CY
     0.0000829        103773.   1251539421.    22.8613891     0.0018956
-0.0040744     2.9999508   -60.0000000  CY
     0.0000862        104562.   1212313562.    22.7003751     0.0019579
-0.0042521     2.9996674   -60.0000000  CY
     0.0000896        105107.   1173286788.    22.5201310     0.0020174
-0.0044326     2.9985928   -60.0000000  CY
     0.0000929        105617.   1136684597.    22.3525626     0.0020769
-0.0046131     2.9982309   -60.0000000  CY
     0.0000963        106117.   1102514245.    22.2003066     0.0021368
-0.0047932     2.9996929    60.0000000  CY
     0.0000996        106608.   1070543665.    22.0615518     0.0021970
-0.0049730     2.9976164    60.0000000  CY
     0.0001029        107090.   1040554426.    21.9329639     0.0022573
-0.0051527     2.9999576    60.0000000  CY
     0.0001063        107558.   1012306130.    21.8092667     0.0023172
-0.0053328     2.9979142    60.0000000  CY
     0.0001096        108019.    985727759.    21.6953517     0.0023774
-0.0055126     2.9999640    60.0000000  CY
     0.0001129        108474.    960657897.    21.5908329     0.0024380
-0.0056920     2.9972738    60.0000000  CY
     0.0001163        108925.    936986719.    21.4942363     0.0024987
-0.0058713     2.9997889    60.0000000  CY
     0.0001196        109370.    914588862.    21.4052229     0.0025597
-0.0060503     2.9954097    60.0000000  CY
     0.0001229        109810.    893369771.    21.3228569     0.0026209
-0.0062291     2.9989628    60.0000000  CY
     0.0001263        110247.    873240346.    21.2464611     0.0026824
-0.0064076     2.9992819    60.0000000  CY
     0.0001296        110674.    854073561.    21.1711635     0.0027434
-0.0065866     2.9964266    60.0000000  CY
     0.0001329        111060.    835563962.    21.0971950     0.0028042
-0.0067658     2.9992609    60.0000000  CY
     0.0001363        111397.    817591223.    21.0243955     0.0028646
-0.0069454     2.9990102    60.0000000  CY
     0.0001396        111664.    799980820.    20.9448451     0.0029236
-0.0071264     2.9949899    60.0000000  CY
     0.0001429        111842.    782571102.    20.8631768     0.0029817
-0.0073083     2.9981090    60.0000000  CY
     0.0001462        111991.    765751238.    20.7806764     0.0030392
-0.0074908     2.9997145    60.0000000  CYT
     0.0001496        112107.    749463514.    20.6975870     0.0030960
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-0.0076740     2.9982333    60.0000000  CYT
     0.0001529       112210.    733800134.    20.6227194     0.0031536
-0.0078564     2.9934292    60.0000000  CYT
     0.0001562       112312.    718799875.    20.5516921     0.0032112
-0.0080388     2.9967694    60.0000000  CYT
     0.0001596       112410.    704399490.    20.4806190     0.0032684
-0.0082216     2.9989026    60.0000000  CYT
     0.0001629       112491.    690483468.    20.4151273     0.0033260
-0.0084040     2.9999198    60.0000000  CYT
     0.0001662       112567.    677092688.    20.3547696     0.0033840
-0.0085860     2.9969317    60.0000000  CYT
     0.0001696       112641.    664221917.    20.2975472     0.0034421
-0.0087679     2.9920825    60.0000000  CYT
     0.0001729       112715.    651843712.    20.2430455     0.0035004
-0.0089496     2.9955452    60.0000000  CYT
     0.0001762       112760.    639774613.    20.2017607     0.0035606
-0.0091294     2.9982059    60.0000000  CYT
     0.0001796       112805.    628146586.    20.1627958     0.0036209
-0.0093091     2.9996825    60.0000000  CYT
     0.0001829       112848.    616935292.    20.1260997     0.0036814
-0.0094886     2.9986518    60.0000000  CYT
     0.0002029       112848.    556128528.    20.1760960     0.0040941
-0.0105159     2.9896439    60.0000000  CYT
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Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	706.000	111889.797	0.00300000

Note note that the values of moment capacity in the table above are not
factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding

bending stiffnesses computed for common resistance factor values used for
reinforced concrete sections.

Load No.	Axial Resistance Factor for Moment	Nominal Moment Capacity in-kip	Ultimate (Factored) Axial Thrust kips	Ultimate (Factored) Bending Stiffness Moment Capacity at Ult. Mom. Cap. in-kip kip-in^2
1	0.65	111889.797	458.900	72728.365 1779578068.051
1	0.70	111889.797	494.200	78322.856 1748086349.133
1	0.75	111889.797	529.500	83917.348 1719565356.398

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head = 0.250000 inches
Moment at pile head = 0.0 in-lbs
Axial load at pile head = 706000.0 lbs

Depth X	Deflect. y	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. Soil Spr. Es*h	Distrib. p Lat. Load
feet	inches	in-lbs	lbs	radians	psi*	lb-in^2	lb/in	lb/inch lb/inch
0.00	0.2500	0.000	268399.	-0.001504	0.000	5.445E+12	0.000	0.000 0.000
1.000	0.2319	3233532.	266394.	-0.001501	0.000	5.445E+12	-334.1726	17289. 0.000
2.000	0.2140	6418882.	260124.	-0.001490	0.000	5.444E+12	-710.7546	39858. 0.000
3.000	0.1962	9501765.	249185.	-0.001472	0.000	5.442E+12		

-1112.4146	68042.	0.000				
4.000	0.1786	12424281.	233230.	-0.001448	0.000	5.435E+12
-1546.8029	103903.	0.000				
5.000	0.1614	15123826.	212025.	-0.001418	0.000	5.426E+12
-1987.4346	147738.	0.000				
6.000	0.1446	17536897.	186423.	-0.001382	0.000	5.415E+12
-2279.4436	189145.	0.000				
7.000	0.1283	19621399.	157972.	-0.001340	0.000	5.405E+12
-2462.4001	230366.	0.000				
8.000	0.1124	21350946.	127764.	-0.001295	0.000	5.396E+12
-2572.2803	274512.	0.000				
9.000	0.0972	22709683.	96700.	-0.001223	0.000	2.845E+12
-2605.0111	321640.	0.000				
10.000	0.0831	23692486.	66365.	-0.001124	0.000	2.766E+12
-2450.9426	353993.	0.000				
11.000	0.0702	24321483.	37926.	-0.001019	0.000	2.720E+12
-2288.7734	391174.	0.000				
12.000	0.0586	24619988.	11637.	-0.000911	0.000	2.699E+12
-2092.8075	428355.	0.000				
13.000	0.0484	24616200.	-12176.	-0.000801	0.000	2.699E+12
-1876.0185	465536.	0.000				
14.000	0.0394	24341339.	-33336.	-0.000693	0.000	2.718E+12
-1650.6027	502717.	0.000				
15.000	0.0317	23827881.	-51805.	-0.000587	0.000	2.756E+12
-1427.6953	539897.	0.000				
16.000	0.0253	23107956.	-67675.	-0.000486	0.000	2.812E+12
-1217.1463	577078.	0.000				
17.000	0.0201	22211926.	-81142.	-0.000412	0.000	5.392E+12
-1027.3647	614259.	0.000				
18.000	0.0154	21167537.	-92330.	-0.000364	0.000	5.397E+12
-837.3190	651440.	0.000				
19.000	0.0113	20002175.	-101259.	-0.000318	0.000	5.403E+12
-650.8903	688621.	0.000				
20.000	0.007794	18742708.	-107993.	-0.000275	0.000	5.410E+12
-471.4101	725801.	0.000				
21.000	0.004744	17415007.	-112631.	-0.000235	0.000	5.416E+12
-301.6634	762982.	0.000				
22.000	0.002158	16043539.	-115305.	-0.000198	0.000	5.422E+12
-143.8952	800163.	0.000				
23.000	-2.432E-06	14651049.	-116167.	-0.000164	0.000	5.427E+12
0.1697	837344.	0.000				
24.000	-0.001774	13258309.	-115390.	-0.000133	0.000	5.433E+12
129.2938	874525.	0.000				
25.000	-0.003194	11883940.	-113158.	-0.000105	0.000	5.437E+12
242.6974	911705.	0.000				
26.000	-0.004300	10544296.	-109662.	-8.050E-05	0.000	5.440E+12
340.0132	948886.	0.000				
27.000	-0.005126	9253418.	-105094.	-5.867E-05	0.000	5.443E+12

421.2444	986067.	0.000				
28.000	-0.005708	8023025.	-99647.	-3.962E-05	0.000	5.443E+12
486.7199	1023248.	0.000				
29.000	-0.006077	6862571.	-93504.	-2.322E-05	0.000	5.444E+12
537.0441	1060429.	0.000				
30.000	-0.006265	5779323.	-86843.	-9.283E-06	0.000	5.444E+12
573.0541	1097609.	0.000				
31.000	-0.006300	4778486.	-79830.	2.352E-06	0.000	5.444E+12
595.7727	1134790.	0.000				
32.000	-0.006209	3863352.	-72618.	1.188E-05	0.000	5.444E+12
606.3645	1171971.	0.000				
33.000	-0.006015	3035462.	-65343.	1.948E-05	0.000	5.445E+12
606.0938	1209152.	0.000				
34.000	-0.005741	2294793.	-58129.	2.535E-05	0.000	5.445E+12
596.2851	1246333.	0.000				
35.000	-0.005407	1639946.	-51081.	2.969E-05	0.000	5.445E+12
578.2874	1283513.	0.000				
36.000	-0.005029	1068342.	-44291.	3.267E-05	0.000	5.445E+12
553.4429	1320694.	0.000				
37.000	-0.004622	576414.	-37832.	3.449E-05	0.000	5.445E+12
523.0589	1357875.	0.000				
38.000	-0.004201	159795.	-31763.	3.530E-05	0.000	5.445E+12
488.3855	1395056.	0.000				
39.000	-0.003775	-186499.	-26129.	3.527E-05	0.000	5.445E+12
450.5960	1432237.	0.000				
40.000	-0.003355	-467904.	-20961.	3.455E-05	0.000	5.445E+12
410.7726	1469417.	0.000				
41.000	-0.002946	-690148.	-16277.	3.327E-05	0.000	5.445E+12
369.8957	1506598.	0.000				
42.000	-0.002556	-859115.	-12085.	3.156E-05	0.000	5.445E+12
328.8365	1543779.	0.000				
43.000	-0.002189	-980714.	-8381.4647	2.954E-05	0.000	5.445E+12
288.3533	1580960.	0.000				
44.000	-0.001847	-1060771.	-5156.7982	2.729E-05	0.000	5.445E+12
249.0911	1618141.	0.000				
45.000	-0.001534	-1104939.	-2392.7536	2.490E-05	0.000	5.445E+12
211.5830	1655321.	0.000				
46.000	-0.001250	-1118619.	-65.7280	2.245E-05	0.000	5.445E+12
176.2546	1692502.	0.000				
47.000	-0.000995	-1106897.	1852.3775	2.000E-05	0.000	5.445E+12
143.4297	1729683.	0.000				
48.000	-0.000770	-1074501.	3392.9806	1.759E-05	0.000	5.445E+12
113.3375	1766864.	0.000				
49.000	-0.000573	-1025764.	4589.7349	1.528E-05	0.000	5.445E+12
86.1215	1804045.	0.000				
50.000	-0.000403	-964606.	5477.5522	1.308E-05	0.000	5.445E+12
61.8480	1841225.	0.000				
51.000	-0.000259	-894524.	6091.7364	1.104E-05	0.000	5.445E+12

```
40.5160   1878406.      0.000
    52.000  -0.000138   -818591.  6467.2329  9.148E-06      0.000  5.445E+12
22.0667   1915587.      0.000
    53.000 -3.929E-05   -739465.  6637.9933  7.431E-06      0.000  5.445E+12
6.3933   1952768.      0.000
    54.000  4.010E-05   -659405.  6636.4527  5.889E-06      0.000  5.445E+12
-6.6501   1989949.      0.000
    55.000   0.000102   -580290.  6493.1164  4.523E-06      0.000  5.445E+12
-17.2393   2027129.      0.000
    56.000   0.000149   -503647.  6236.2471  3.328E-06      0.000  5.445E+12
-25.5722   2064310.      0.000
    57.000   0.000182   -430677.  5891.6463  2.299E-06      0.000  5.445E+12
-31.8612   2101491.      0.000
    58.000   0.000204   -362287.  5482.5209  1.425E-06      0.000  5.445E+12
-36.3264   2138672.      0.000
    59.000   0.000216   -299120.  5029.4241  6.961E-07      0.000  5.445E+12
-39.1898   2175853.      0.000
    60.000   0.000221   -241592.  4550.2627  1.002E-07      0.000  5.445E+12
-40.6705   2213033.      0.000
    61.000   0.000219   -189916.  4060.3583 -3.753E-07      0.000  5.445E+12
-40.9803   2250214.      0.000
    62.000   0.000212   -144137.  3572.5553 -7.434E-07      0.000  5.445E+12
-40.3202   2287395.      0.000
    63.000   0.000201   -104162.  3097.3641 -1.017E-06      0.000  5.445E+12
-38.8783   2324576.      0.000
    64.000   0.000187    -69783.  2643.1321 -1.209E-06      0.000  5.445E+12
-36.8270   2361757.      0.000
    65.000   0.000172    -40706.  2216.2339 -1.330E-06      0.000  5.445E+12
-34.3227   2398937.      0.000
    66.000   0.000155    -16571.  1821.2731 -1.394E-06      0.000  5.445E+12
-31.5041   2436118.      0.000
    67.000   0.000138   3027.8875  1461.2905 -1.409E-06      0.000  5.445E+12
-28.4930   2473299.      0.000
    68.000   0.000121     18524.  1137.9709 -1.385E-06      0.000  5.445E+12
-25.3936   2510480.      0.000
    69.000   0.000105     30363.   851.8468 -1.331E-06      0.000  5.445E+12
-22.2937   2547661.      0.000
    70.000  8.944E-05     38991.   602.4919 -1.254E-06      0.000  5.445E+12
-19.2654   2584841.      0.000
    71.000  7.490E-05     44844.   388.7040 -1.162E-06      0.000  5.445E+12
-16.3659   2622022.      0.000
    72.000  6.155E-05     48339.   208.6735 -1.059E-06      0.000  5.445E+12
-13.6392   2659203.      0.000
    73.000  4.947E-05     49870.    60.1370 -9.512E-07      0.000  5.445E+12
-11.1169   2696384.      0.000
    74.000  3.872E-05     49799.   -59.4868 -8.413E-07      0.000  5.445E+12
-8.8204   2733565.      0.000
    75.000  2.928E-05     48456.  -152.9763 -7.331E-07      0.000  5.445E+12
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-6.7612   2770745.      0.000
    76.000  2.113E-05     46140.  -223.2048 -6.288E-07      0.000  5.445E+12
-4.9435   2807926.      0.000
    77.000  1.419E-05     43110.  -273.0533 -5.305E-07      0.000  5.445E+12
-3.3646   2845107.      0.000
    78.000  8.396E-06     39595.  -305.3399 -4.393E-07      0.000  5.445E+12
-2.0165   2882288.      0.000
    79.000  3.647E-06     35789.  -322.7631 -3.562E-07      0.000  5.445E+12
-0.8873   2919469.      0.000
    80.000 -1.544E-07     31855.  -327.8589 -2.817E-07      0.000  5.445E+12
0.0380   2956649.      0.000
    81.000 -3.114E-06     27926.  -322.9697 -2.158E-07      0.000  5.445E+12
0.7768   2993830.      0.000
    82.000 -5.334E-06     24107.  -310.2249 -1.585E-07      0.000  5.445E+12
1.3473   3031011.      0.000
    83.000 -6.917E-06     20483.  -291.5291 -1.093E-07      0.000  5.445E+12
1.7686   3068192.      0.000
    84.000 -7.959E-06     17113.  -268.5604 -6.791E-08      0.000  5.445E+12
2.0595   3105373.      0.000
    85.000 -8.547E-06     14039.  -242.7734 -3.359E-08      0.000  5.445E+12
2.2383   3142553.      0.000
    86.000 -8.765E-06     11287.  -215.4089 -5.677E-09      0.000  5.445E+12
2.3224   3179734.      0.000
    87.000 -8.683E-06  8868.8626  -187.5075  1.653E-08      0.000  5.445E+12
2.3278   3216915.      0.000
    88.000 -8.368E-06  6786.1525  -159.9259  3.379E-08      0.000  5.445E+12
2.2691   3254096.      0.000
    89.000 -7.873E-06  5030.0684  -133.3558  4.681E-08      0.000  5.445E+12
2.1592   3291277.      0.000
    90.000 -7.244E-06  3584.8192  -108.3442  5.630E-08      0.000  5.445E+12
2.0094   3328457.      0.000
    91.000 -6.521E-06  2428.8526   -85.3138  6.293E-08      0.000  5.445E+12
1.8290   3365638.      0.000
    92.000 -5.734E-06  1536.2211   -64.5837  6.730E-08      0.000  5.445E+12
1.6260   3402819.      0.000
    93.000 -4.906E-06   877.7039   -46.3891  6.996E-08      0.000  5.445E+12
1.4064   3440000.      0.000
    94.000 -4.055E-06   421.6962   -30.9005  7.139E-08      0.000  5.445E+12
1.1750   3477181.      0.000
    95.000 -3.193E-06   134.8819   -18.2402  7.200E-08      0.000  5.445E+12
0.9350   3514361.      0.000
    96.000 -2.327E-06   -17.2878    -8.4977  7.213E-08      0.000  5.445E+12
0.6887   3551542.      0.000
    97.000 -1.462E-06   -70.2860    -1.7430  7.204E-08      0.000  5.445E+12
0.4371   3588723.      0.000
    98.000 -5.981E-07   -60.3405     1.9639  7.189E-08      0.000  5.445E+12
0.1807   3625904.      0.000
    99.000  2.639E-07   -24.3714     2.5649  7.180E-08      0.000  5.445E+12
```

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-0.0805   3663085.      0.000
   100.000  1.125E-06      0.000      0.000  7.177E-08      0.000  5.445E+12
-0.3469   1850133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are computed
only
  for elastic sections only and do not equal the actual stresses in concrete and
steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the
pile.


Output Summary for Load Case No. 1:

Pile-head deflection             =      0.2500000 inches
Computed slope at pile head      =     -0.0015042 radians
Maximum bending moment           =      24619988. inch-lbs
Maximum shear force              =        268399. lbs
Depth of maximum bending moment  =     12.0000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             34
Number of zero deflection points =              4



--------------------------------------------------------------------------------
                Computed Values of Pile Loading and Deflection
                  for Lateral Loading for Load Case Number 2
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                          =     0.500000 inches
Moment at pile head                                =          0.0 in-lbs
Axial load at pile head                            =     706000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending   Soil
Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness      p
       Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
---------- ---------- ----------
      0.00     0.5000      0.000    392187.  -0.003119      0.000  5.445E+12
0.000      0.000      0.000
```



```
     1.000     0.4626   4732664.    389778.  -0.003114      0.000  5.445E+12
-401.4703     10415.      0.000
     2.000     0.4253   9407427.    382220.  -0.003098      0.000  5.442E+12
-858.2144     24217.      0.000
     3.000     0.3882  13958432.    368967.  -0.003072      0.000  5.430E+12
-1350.4972    41745.      0.000
     4.000     0.3515  18314704.    349588.  -0.003037      0.000  5.412E+12
-1879.3843    64155.      0.000
     5.000     0.3153  22400001.    323815.  -0.002979      0.000  3.634E+12
-2416.0742    91943.      0.000
     6.000     0.2800  26136756.    291686.  -0.002882      0.000  2.602E+12
-2938.8732   125940.      0.000
     7.000     0.2462  29449292.    253359.  -0.002749      0.000  2.435E+12
-3448.8669   168126.      0.000
     8.000     0.2140  32263962.    209201.  -0.002594      0.000  2.327E+12
-3910.7800   219252.      0.000
     9.000     0.1839  34514070.    159921.  -0.002419      0.000  2.256E+12
-4302.6436   280731.      0.000
    10.000     0.1560  36143042.    107351.  -0.002229      0.000  2.212E+12
-4458.9305   342999.      0.000
    11.000     0.1304  37128266.     55087.  -0.002029      0.000  2.187E+12
-4251.7414   391174.      0.000
    12.000     0.1073  37499514.  6594.2277  -0.001824      0.000  2.178E+12
-3830.4465   428355.      0.000
    13.000     0.0867  37317428.    -36561.  -0.001618      0.000  2.183E+12
-3362.0259   465536.      0.000
    14.000     0.0685  36649472.    -73946.  -0.001415      0.000  2.199E+12
-2868.8128   502717.      0.000
    15.000     0.0527  35566712.   -105384.  -0.001219      0.000  2.227E+12
-2370.9076   539897.      0.000
    16.000     0.0392  34140918.   -130924.  -0.001033      0.000  2.267E+12
-1885.7997   577078.      0.000
    17.000     0.0279  32442038.   -150808.  -0.000859      0.000  2.321E+12
-1428.1515   614259.      0.000
    18.000     0.0186  30536083.   -165435.  -0.000698      0.000  2.390E+12
-1009.6718   651440.      0.000
    19.000     0.0111  28483436.   -175328.  -0.000553      0.000  2.479E+12
-639.1287    688621.      0.000
    20.000   0.005331  26337586.   -181097.  -0.000423      0.000  2.591E+12
-322.4413    725801.      0.000
    21.000   0.000989  24144271.   -183409.  -0.000309      0.000  2.733E+12
-62.8578     762982.      0.000
    22.000  -0.002082  21941006.   -182953.  -0.000231      0.000  5.393E+12
138.8000     800163.      0.000
    23.000  -0.004566  19757315.   -180209.  -0.000185      0.000  5.405E+12
318.6038     837344.      0.000
    24.000  -0.006524  17619132.   -175445.  -0.000144      0.000  5.415E+12
475.4387     874525.      0.000
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    25.000  -0.008013  15549080.   -168939.  -0.000107      0.000  5.424E+12
608.8086    911705.      0.000
    26.000  -0.009090  13566406.   -160974. -7.473E-05      0.000  5.432E+12
718.7667    948886.      0.000
    27.000  -0.009807  11686980.   -151826. -4.685E-05      0.000  5.438E+12
805.8439    986067.      0.000
    28.000    -0.0102   9923377.   -141765. -2.301E-05      0.000  5.441E+12
870.9723   1023248.      0.000
    29.000    -0.0104   8285009.   -131047. -2.936E-06      0.000  5.443E+12
915.4179   1060429.      0.000
    30.000    -0.0103   6778306.   -119910.  1.367E-05      0.000  5.444E+12
940.7136   1097609.      0.000
    31.000    -0.0100   5406940.   -108574.  2.710E-05      0.000  5.444E+12
948.5941   1134790.      0.000
    32.000  -0.009634   4172070.    -97237.  3.765E-05      0.000  5.444E+12
940.9359   1171971.      0.000
    33.000  -0.009127   3072616.    -86073.  4.564E-05      0.000  5.445E+12
919.7009   1209152.      0.000
    34.000  -0.008539   2105543.    -75234.  5.134E-05      0.000  5.445E+12
886.8838   1246333.      0.000
    35.000  -0.007895   1266141.    -64845.  5.506E-05      0.000  5.445E+12
844.4651   1283513.      0.000
    36.000  -0.007218    548319.    -55012.  5.706E-05      0.000  5.445E+12
794.3704   1320694.      0.000
    37.000  -0.006526    -55124.    -45816.  5.760E-05      0.000  5.445E+12
738.4367   1357875.      0.000
    38.000  -0.005835   -552232.    -37315.  5.693E-05      0.000  5.445E+12
678.3848   1395056.      0.000
    39.000  -0.005159   -951641.    -29550.  5.527E-05      0.000  5.445E+12
615.7972   1432237.      0.000
    40.000  -0.004509  -1262358.    -22542.  5.283E-05      0.000  5.445E+12
552.1035   1469417.      0.000
    41.000  -0.003891  -1493549.    -16298.  4.980E-05      0.000  5.445E+12
488.5692   1506598.      0.000
    42.000  -0.003314  -1654357.    -10809.  4.633E-05      0.000  5.445E+12
426.2913   1543779.      0.000
    43.000  -0.002780  -1753749. -6054.0506  4.257E-05      0.000  5.445E+12
366.1973   1580960.      0.000
    44.000  -0.002292  -1800376. -2002.5764  3.866E-05      0.000  5.445E+12
309.0484   1618141.      0.000
    45.000  -0.001852  -1802466.  1384.3895  3.469E-05      0.000  5.445E+12
255.4459   1655321.      0.000
    46.000  -0.001459  -1767738.  4152.1059  3.075E-05      0.000  5.445E+12
205.8402   1692502.      0.000
    47.000  -0.001114  -1703337.  6350.3984  2.693E-05      0.000  5.445E+12
160.5419   1729683.      0.000
    48.000  -0.000813  -1615785.  8032.0596  2.327E-05      0.000  5.445E+12
119.7350   1766864.      0.000
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    49.000  -0.000555  -1510961.  9251.4087  1.982E-05      0.000  5.445E+12
83.4899   1804045.      0.000
    50.000  -0.000337  -1394087.     10063.  1.662E-05      0.000  5.445E+12
51.7786   1841225.      0.000
    51.000  -0.000156  -1269731.     10521.  1.369E-05      0.000  5.445E+12
24.4887   1878406.      0.000
    52.000 -9.007E-06  -1141824.     10676.  1.103E-05      0.000  5.445E+12
1.4378   1915587.      0.000
    53.000   0.000108  -1013689.     10579.  8.653E-06      0.000  5.445E+12
-17.6124   1952768.      0.000
    54.000   0.000199   -888071.     10276.  6.557E-06      0.000  5.445E+12
-32.9432   1989949.      0.000
    55.000   0.000266   -767181.  9808.9430  4.733E-06      0.000  5.445E+12
-44.8666   2027129.      0.000
    56.000   0.000312   -652737.  9217.4581  3.168E-06      0.000  5.445E+12
-53.7143   2064310.      0.000
    57.000   0.000342   -546016.  8536.2062  1.847E-06      0.000  5.445E+12
-59.8277   2101491.      0.000
    58.000   0.000357   -447899.  7795.9425  7.517E-07      0.000  5.445E+12
-63.5496   2138672.      0.000
    59.000   0.000360   -358926.  7023.3489 -1.374E-07      0.000  5.445E+12
-65.2160   2175853.      0.000
    60.000   0.000353   -279337.  6241.1463 -8.408E-07      0.000  5.445E+12
-65.1510   2213033.      0.000
    61.000   0.000339   -209124.  5468.2738 -1.379E-06      0.000  5.445E+12
-63.6610   2250214.      0.000
    62.000   0.000320   -148075.  4720.1196 -1.773E-06      0.000  5.445E+12
-61.0313   2287395.      0.000
    63.000   0.000297    -95811.  4008.7917 -2.041E-06      0.000  5.445E+12
-57.5233   2324576.      0.000
    64.000   0.000271    -51829.  3343.4164 -2.204E-06      0.000  5.445E+12
-53.3726   2361757.      0.000
    65.000   0.000244    -15532.  2730.4519 -2.278E-06      0.000  5.445E+12
-48.7882   2398937.      0.000
    66.000   0.000217     13740.  2174.0096 -2.280E-06      0.000  5.445E+12
-43.9522   2436118.      0.000
    67.000   0.000189     36683.  1676.1736 -2.225E-06      0.000  5.445E+12
-39.0205   2473299.      0.000
    68.000   0.000163     54006.  1237.3115 -2.125E-06      0.000  5.445E+12
-34.1232   2510480.      0.000
    69.000   0.000138     66415.   856.3712 -1.992E-06      0.000  5.445E+12
-29.3668   2547661.      0.000
    70.000   0.000115     74593.   531.1591 -1.837E-06      0.000  5.445E+12
-24.8352   2584841.      0.000
    71.000  9.424E-05     79194.   258.5963 -1.667E-06      0.000  5.445E+12
-20.5919   2622022.      0.000
    72.000  7.528E-05     80827.    34.9505 -1.491E-06      0.000  5.445E+12
-16.6824   2659203.      0.000
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    73.000  5.846E-05     80058.  -143.9575 -1.314E-06      0.000  5.445E+12
-13.1356   2696384.      0.000
    74.000  4.375E-05     77395.  -282.5734 -1.140E-06      0.000  5.445E+12
-9.9670   2733565.      0.000
    75.000  3.110E-05     73295.  -385.4547 -9.741E-07      0.000  5.445E+12
-7.1799   2770745.      0.000
    76.000  2.038E-05     68160.  -457.1415 -8.182E-07      0.000  5.445E+12
-4.7679   2807926.      0.000
    77.000  1.146E-05     62338.  -502.0506 -6.744E-07      0.000  5.445E+12
-2.7169   2845107.      0.000
    78.000  4.191E-06     56123.  -524.3924 -5.438E-07      0.000  5.445E+12
-1.0067   2882288.      0.000
    79.000 -1.593E-06     49761.  -528.1080 -4.271E-07      0.000  5.445E+12
0.3874   2919469.      0.000
    80.000 -6.060E-06     43455.  -516.8244 -3.244E-07      0.000  5.445E+12
1.4932   2956649.      0.000
    81.000 -9.379E-06     37363.  -493.8265 -2.354E-07      0.000  5.445E+12
2.3398   2993830.      0.000
    82.000 -1.171E-05     31607.  -462.0429 -1.594E-07      0.000  5.445E+12
2.9575   3031011.      0.000
    83.000 -1.320E-05     26277.  -424.0435 -9.556E-08      0.000  5.445E+12
3.3758   3068192.      0.000
    84.000 -1.400E-05     21432.  -382.0477 -4.299E-08      0.000  5.445E+12
3.6235   3105373.      0.000
    85.000 -1.423E-05     17108.  -337.9400 -5.148E-10      0.000  5.445E+12
3.7278   3142553.      0.000
    86.000 -1.401E-05     13321.  -293.2920  3.302E-08      0.000  5.445E+12
3.7136   3179734.      0.000
    87.000 -1.344E-05     10069.  -249.3894  5.880E-08      0.000  5.445E+12
3.6035   3216915.      0.000
    88.000 -1.260E-05  7335.0340  -207.2616  7.797E-08      0.000  5.445E+12
3.4178   3254096.      0.000
    89.000 -1.157E-05  5093.2440  -167.7137  9.167E-08      0.000  5.445E+12
3.1736   3291277.      0.000
    90.000 -1.040E-05  3308.3528  -131.3586  1.009E-07      0.000  5.445E+12
2.8856   3328457.      0.000
    91.000 -9.149E-06  1938.9285   -98.6495  1.067E-07      0.000  5.445E+12
2.5659   3365638.      0.000
    92.000 -7.842E-06   938.9559   -69.9111  1.099E-07      0.000  5.445E+12
2.2238   3402819.      0.000
    93.000 -6.511E-06   259.1992   -45.3686  1.112E-07      0.000  5.445E+12
1.8666   3440000.      0.000
    94.000 -5.173E-06  -151.7741   -25.1745  1.113E-07      0.000  5.445E+12
1.4991   3477181.      0.000
    95.000 -3.840E-06  -346.8755    -9.4331  1.108E-07      0.000  5.445E+12
1.1245   3514361.      0.000
    96.000 -2.515E-06  -380.0448     1.7798  1.100E-07      0.000  5.445E+12
0.7443   3551542.      0.000
```



```
    97.000 -1.200E-06  -306.0241     8.3995  1.092E-07      0.000  5.445E+12
0.3590   3588723.      0.000
    98.000  1.062E-07  -180.3068    10.3607  1.087E-07      0.000  5.445E+12
-0.0321   3625904.      0.000
    99.000  1.408E-06   -59.2083     7.5893  1.084E-07      0.000  5.445E+12
-0.4298   3663085.      0.000
   100.000  2.708E-06      0.000      0.000  1.084E-07      0.000  5.445E+12
-0.8351   1850133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are computed
only
  for elastic sections only and do not equal the actual stresses in concrete and
steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the
pile.


Output Summary for Load Case No. 2:

Pile-head deflection             =      0.5000000 inches
Computed slope at pile head      =     -0.0031190 radians
Maximum bending moment           =      37499514. inch-lbs
Maximum shear force              =        392187. lbs
Depth of maximum bending moment  =     12.0000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             23
Number of zero deflection points =              4



--------------------------------------------------------------------------------
                Computed Values of Pile Loading and Deflection
                  for Lateral Loading for Load Case Number 3
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                              =     0.750000 inches
Moment at pile head                                    =          0.0 in-lbs
Axial load at pile head                                =     706000.0 lbs

   Depth    Deflect.    Bending    Shear       Slope      Total    Bending   Soil
Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness      p
       Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
```

lb/in	lb/inch	lb/inch				
0.00	0.7500	0.000	487523.	-0.004641	0.000	5.445E+12
0.000	0.000	0.000				
1.000	0.6943	5889595.	484840.	-0.004634	0.000	5.445E+12
-447.2303	7729.6417	0.000				
2.000	0.6388	11714679.	476399.	-0.004615	0.000	5.437E+12
-959.5991	18027.	0.000				
3.000	0.5836	17401362.	461543.	-0.004583	0.000	5.416E+12
-1516.3036	31181.	0.000				
4.000	0.5288	22869371.	439764.	-0.004515	0.000	2.832E+12
-2113.5979	47965.	0.000				
5.000	0.4752	28032200.	410745.	-0.004399	0.000	2.500E+12
-2722.9709	68763.	0.000				
6.000	0.4232	32801781.	374480.	-0.004247	0.000	2.309E+12
-3321.0782	94169.	0.000				
7.000	0.3733	37091683.	331111.	-0.004060	0.000	2.188E+12
-3907.1902	125611.	0.000				
8.000	0.3258	40817226.	281009.	-0.003842	0.000	2.108E+12
-4443.1641	163668.	0.000				
9.000	0.2811	43900986.	224924.	-0.003598	0.000	2.054E+12
-4904.2540	209389.	0.000				
10.000	0.2394	46276359.	164927.	-0.003332	0.000	2.018E+12
-5095.3240	255373.	0.000				
11.000	0.2011	47915674.	102562.	-0.003050	0.000	1.995E+12
-5298.7716	316186.	0.000				
12.000	0.1662	48789525.	38556.	-0.002758	0.000	1.984E+12
-5368.8076	387568.	0.000				
13.000	0.1349	48887766.	-25057.	-0.002463	0.000	1.983E+12
-5233.4664	465536.	0.000				
14.000	0.1071	48229882.	-83384.	-0.002169	0.000	1.991E+12
-4487.7484	502717.	0.000				
15.000	0.0828	46923299.	-132672.	-0.001884	0.000	2.009E+12
-3726.8379	539897.	0.000				
16.000	0.0619	45077677.	-172896.	-0.001611	0.000	2.035E+12
-2977.1858	577078.	0.000				
17.000	0.0442	42801088.	-204326.	-0.001354	0.000	2.072E+12
-2261.1063	614259.	0.000				
18.000	0.0294	40196801.	-227472.	-0.001116	0.000	2.120E+12
-1596.5804	651440.	0.000				
19.000	0.0174	37360678.	-243035.	-0.000900	0.000	2.182E+12
-997.2405	688621.	0.000				
20.000	0.007812	34379212.	-251853.	-0.000706	0.000	2.260E+12
-472.4831	725801.	0.000				
21.000	0.000436	31328161.	-254854.	-0.000535	0.000	2.360E+12
-27.7179	762982.	0.000				
22.000	-0.005028	28271770.	-253009.	-0.000387	0.000	2.489E+12

335.2929	800163.	0.000				
23.000	-0.008857	25262506.	-247289.	-0.000262	0.000	2.656E+12
618.0189	837344.	0.000				
24.000	-0.0113	22341270.	-238633.	-0.000169	0.000	3.744E+12
824.6696	874525.	0.000				
25.000	-0.0129	19538180.	-227797.	-0.000112	0.000	5.406E+12
981.2755	911705.	0.000				
26.000	-0.0140	16876026.	-215270.	-7.125E-05	0.000	5.418E+12
1106.6387	948886.	0.000				
27.000	-0.0146	14372911.	-201419.	-3.668E-05	0.000	5.429E+12
1201.8347	986067.	0.000				
28.000	-0.0149	12042591.	-186597.	-7.504E-06	0.000	5.436E+12
1268.4294	1023248.	0.000				
29.000	-0.0148	9894700.	-171137.	1.670E-05	0.000	5.441E+12
1308.3818	1060429.	0.000				
30.000	-0.0145	7935031.	-155343.	3.636E-05	0.000	5.444E+12
1323.9521	1097609.	0.000				
31.000	-0.0139	6165863.	-139493.	5.190E-05	0.000	5.444E+12
1317.6191	1134790.	0.000				
32.000	-0.0132	4586317.	-123835.	6.375E-05	0.000	5.444E+12
1292.0046	1171971.	0.000				
33.000	-0.0124	3192734.	-108585.	7.232E-05	0.000	5.445E+12
1249.8028	1209152.	0.000				
34.000	-0.0115	1979063.	-93923.	7.802E-05	0.000	5.445E+12
1193.7146	1246333.	0.000				
35.000	-0.0105	937250.	-80003.	8.123E-05	0.000	5.445E+12
1126.3883	1283513.	0.000				
36.000	-0.009544	57619.	-66942.	8.233E-05	0.000	5.445E+12
1050.3701	1320694.	0.000				
37.000	-0.008555	-670759.	-54832.	8.165E-05	0.000	5.445E+12
968.0621	1357875.	0.000				
38.000	-0.007584	-1259724.	-43733.	7.953E-05	0.000	5.445E+12
881.6897	1395056.	0.000				
39.000	-0.006646	-1721702.	-33683.	7.624E-05	0.000	5.445E+12
793.2769	1432237.	0.000				
40.000	-0.005754	-2069416.	-24696.	7.206E-05	0.000	5.445E+12
704.6296	1469417.	0.000				
41.000	-0.004917	-2315625.	-16764.	6.723E-05	0.000	5.445E+12
617.3256	1506598.	0.000				
42.000	-0.004141	-2472896.	-9863.9595	6.195E-05	0.000	5.445E+12
532.7116	1543779.	0.000				
43.000	-0.003430	-2553410.	-3956.2620	5.641E-05	0.000	5.445E+12
451.9047	1580960.	0.000				
44.000	-0.002787	-2568802.	1009.9665	5.077E-05	0.000	5.445E+12
375.8001	1618141.	0.000				
45.000	-0.002212	-2530031.	5095.2566	4.515E-05	0.000	5.445E+12
305.0816	1655321.	0.000				
46.000	-0.001703	-2447281.	8367.1636	3.967E-05	0.000	5.445E+12

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240.2362   1692502.      0.000
    47.000  -0.001260  -2329891.     10898.  3.440E-05      0.000  5.445E+12
181.5704   1729683.      0.000
    48.000  -0.000878  -2186312.     12763.  2.942E-05      0.000  5.445E+12
129.2286   1766864.      0.000
    49.000  -0.000554  -2024083.     14037.  2.478E-05      0.000  5.445E+12
83.2128   1804045.      0.000
    50.000  -0.000283  -1849833.     14797.  2.051E-05      0.000  5.445E+12
43.4020   1841225.      0.000
    51.000 -6.115E-05  -1669299.     15115.  1.664E-05      0.000  5.445E+12
9.5724   1878406.      0.000
    52.000   0.000116  -1487355.     15061.  1.316E-05      0.000  5.445E+12
-18.5832   1915587.      0.000
    53.000   0.000255  -1308060.     14701.  1.008E-05      0.000  5.445E+12
-41.4378   1952768.      0.000
    54.000   0.000358  -1134707.     14096.  7.386E-06      0.000  5.445E+12
-59.4119   1989949.      0.000
    55.000   0.000432   -969889.     13301.  5.066E-06      0.000  5.445E+12
-72.9586   2027129.      0.000
    56.000   0.000480   -815558.     12368.  3.099E-06      0.000  5.445E+12
-82.5487   2064310.      0.000
    57.000   0.000506   -673099.     11341.  1.458E-06      0.000  5.445E+12
-88.6586   2101491.      0.000
    58.000   0.000515   -543394.     10259.  1.176E-07      0.000  5.445E+12
-91.7593   2138672.      0.000
    59.000   0.000509   -426893.  9154.2737 -9.517E-07      0.000  5.445E+12
-92.3074   2175853.      0.000
    60.000   0.000492   -323675.  8056.0041 -1.779E-06      0.000  5.445E+12
-90.7375   2213033.      0.000
    61.000   0.000466   -233518.  6986.8393 -2.393E-06      0.000  5.445E+12
-87.4566   2250214.      0.000
    62.000   0.000435   -155951.  5965.0617 -2.822E-06      0.000  5.445E+12
-82.8396   2287395.      0.000
    63.000   0.000399    -90309.  5004.6642 -3.093E-06      0.000  5.445E+12
-77.2266   2324576.      0.000
    64.000   0.000360    -35786.  4115.7796 -3.232E-06      0.000  5.445E+12
-70.9208   2361757.      0.000
    65.000   0.000321  8524.3719  3305.1242 -3.262E-06      0.000  5.445E+12
-64.1884   2398937.      0.000
    66.000   0.000282     43592.  2576.4429 -3.205E-06      0.000  5.445E+12
-57.2585   2436118.      0.000
    67.000   0.000244     70413.  1930.9466 -3.079E-06      0.000  5.445E+12
-50.3243   2473299.      0.000
    68.000   0.000208     89987.  1367.7318 -2.903E-06      0.000  5.445E+12
-43.5449   2510480.      0.000
    69.000   0.000175    103288.   884.1770 -2.690E-06      0.000  5.445E+12
-37.0476   2547661.      0.000
    70.000   0.000144    111253.   476.3101 -2.453E-06      0.000  5.445E+12
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-30.9302   2584841.      0.000
    71.000   0.000116    114761.   139.1429 -2.204E-06      0.000  5.445E+12
-25.2643   2622022.      0.000
    72.000  9.069E-05    114629.  -133.0287 -1.951E-06      0.000  5.445E+12
-20.0976   2659203.      0.000
    73.000  6.879E-05    111601.  -346.3609 -1.702E-06      0.000  5.445E+12
-15.4577   2696384.      0.000
    74.000  4.984E-05    106346.  -507.2341 -1.462E-06      0.000  5.445E+12
-11.3545   2733565.      0.000
    75.000  3.371E-05     99453.  -622.0602 -1.235E-06      0.000  5.445E+12
-7.7832   2770745.      0.000
    76.000  2.020E-05     91437.  -697.1244 -1.025E-06      0.000  5.445E+12
-4.7275   2807926.      0.000
    77.000  9.116E-06     82739.  -738.4577 -8.327E-07      0.000  5.445E+12
-2.1614   2845107.      0.000
    78.000  2.175E-07     73728.  -751.7395 -6.603E-07      0.000  5.445E+12
-0.0522   2882288.      0.000
    79.000 -6.731E-06     64708.  -742.2268 -5.078E-07      0.000  5.445E+12
1.6377   2919469.      0.000
    80.000 -1.197E-05     55923.  -714.7070 -3.748E-07      0.000  5.445E+12
2.9490   2956649.      0.000
    81.000 -1.573E-05     47562.  -673.4709 -2.608E-07      0.000  5.445E+12
3.9237   2993830.      0.000
    82.000 -1.823E-05     39764.  -622.3046 -1.645E-07      0.000  5.445E+12
4.6040   3031011.      0.000
    83.000 -1.968E-05     32629.  -564.4951 -8.477E-08      0.000  5.445E+12
5.0309   3068192.      0.000
    84.000 -2.026E-05     26218.  -502.8489 -1.992E-08      0.000  5.445E+12
5.2435   3105373.      0.000
    85.000 -2.015E-05     20561.  -439.7199  3.163E-08      0.000  5.445E+12
5.2780   3142553.      0.000
    86.000 -1.950E-05     15664.  -377.0445  7.155E-08      0.000  5.445E+12
5.1679   3179734.      0.000
    87.000 -1.844E-05     11511.  -316.3818  1.015E-07      0.000  5.445E+12
4.9426   3216915.      0.000
    88.000 -1.707E-05  8069.2656  -258.9574  1.231E-07      0.000  5.445E+12
4.6282   3254096.      0.000
    89.000 -1.548E-05  5293.8858  -205.7084  1.378E-07      0.000  5.445E+12
4.2467   3291277.      0.000
    90.000 -1.376E-05  3129.9302  -157.3288  1.471E-07      0.000  5.445E+12
3.8166   3328457.      0.000
    91.000 -1.195E-05  1515.5031  -114.3139  1.522E-07      0.000  5.445E+12
3.3526   3365638.      0.000
    92.000 -1.011E-05   383.8172   -77.0026  1.543E-07      0.000  5.445E+12
2.8660   3402819.      0.000
    93.000 -8.250E-06  -335.1726   -45.6161  1.544E-07      0.000  5.445E+12
2.3651   3440000.      0.000
    94.000 -6.402E-06  -713.5856   -20.2944  1.532E-07      0.000  5.445E+12
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1.8552   3477181.      0.000
    95.000 -4.574E-06  -824.8345    -1.1266  1.515E-07      0.000  5.445E+12
1.3394   3514361.      0.000
    96.000 -2.766E-06  -743.1899    11.8227  1.498E-07      0.000  5.445E+12
0.8188   3551542.      0.000
    97.000 -9.790E-07  -543.6284    18.4920  1.484E-07      0.000  5.445E+12
0.2928   3588723.      0.000
    98.000  7.940E-07  -301.8945    18.8093  1.474E-07      0.000  5.445E+12
-0.2399   3625904.      0.000
    99.000  2.559E-06   -94.7032    12.6827  1.470E-07      0.000  5.445E+12
-0.7812   3663085.      0.000
   100.000  4.322E-06      0.000      0.000  1.469E-07      0.000  5.445E+12
-1.3326   1850133.      0.000

* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are computed
only
  for elastic sections only and do not equal the actual stresses in concrete and
steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the
pile.


Output Summary for Load Case No. 3:

Pile-head deflection             =      0.7500000 inches
Computed slope at pile head      =     -0.0046409 radians
Maximum bending moment           =       48887766. inch-lbs
Maximum shear force              =         487523. lbs
Depth of maximum bending moment  =     13.0000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             30
Number of zero deflection points =              4



--------------------------------------------------------------------------------
                Computed Values of Pile Loading and Deflection
                  for Lateral Loading for Load Case Number 4
--------------------------------------------------------------------------------

Pile-head conditions are Displacement and Moment (Loading Type 4)
Displacement of pile head                          =     1.000000 inches
Moment at pile head                                =          0.0 in-lbs
Axial load at pile head                            =     706000.0 lbs
```



```
   Depth    Deflect.    Bending    Shear       Slope      Total    Bending   Soil
Res.  Soil Spr.   Distrib.
     X         y        Moment     Force         S       Stress   Stiffness      p
       Es*h    Lat. Load
   feet      inches     in-lbs      lbs       radians     psi*      lb-in^2
lb/in      lb/inch    lb/inch
---------- ---------- ---------- ---------- ---------- ---------- ----------
----------
      0.00     1.0000      0.000    568916.  -0.006067      0.000  5.445E+12
0.000      0.000      0.000
     1.000     0.9272   6878388.    566018.  -0.006059      0.000  5.445E+12
-482.9704  6250.6875      0.000
     2.000     0.8546  13687099.    556884.  -0.006036      0.000  5.431E+12
-1039.4093     14595.      0.000
     3.000     0.7823  20345880.    540759.  -0.005999      0.000  5.402E+12
-1648.0202     25279.      0.000
     4.000     0.7106  26766963.    517064.  -0.005913      0.000  2.566E+12
-2301.1740     38859.      0.000
     5.000     0.6404  32855616.    485434.  -0.005765      0.000  2.307E+12
-2970.5624     55662.      0.000
     6.000     0.5723  38515060.    445822.  -0.005573      0.000  2.155E+12
-3631.4485     76151.      0.000
     7.000     0.5067  43649759.    398341.  -0.005338      0.000  2.058E+12
-4281.9883    101416.      0.000
     8.000     0.4441  48165696.    343357.  -0.005066      0.000  1.992E+12
-4882.0525    131908.      0.000
     9.000     0.3851  51976159.    281635.  -0.004760      0.000  1.946E+12
-5404.8789    168427.      0.000
    10.000     0.3299  55005603.    215425.  -0.004428      0.000  1.914E+12
-5630.2049    204808.      0.000
    11.000     0.2788  57221376.    146377.  -0.004074      0.000  1.893E+12
-5877.8006    252974.      0.000
    12.000     0.2321  58587673.     75216.  -0.003706      0.000  1.881E+12
-5982.2410    309285.      0.000
    13.000     0.1899  59089359.  3425.9869  -0.003330      0.000  1.876E+12
-5982.8319    378101.      0.000
    14.000     0.1522  58726317.    -67780.  -0.002953      0.000  1.880E+12
-5884.7743    464008.      0.000
    15.000     0.1190  57512690.   -135212.  -0.002583      0.000  1.890E+12
-5353.9192    539897.      0.000
    16.000     0.0902  55525006.   -193358.  -0.002226      0.000  1.909E+12
-4337.1547    577078.      0.000
    17.000     0.0656  52909815.   -239519.  -0.001888      0.000  1.936E+12
-3356.2709    614259.      0.000
    18.000     0.0449  49808541.   -274275.  -0.001572      0.000  1.971E+12
-2436.5076    651440.      0.000
    19.000     0.0278  46353841.   -298479.  -0.001283      0.000  2.017E+12
-1597.3839    688621.      0.000
```

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    20.000     0.0141  42666781.   -313180.  -0.001021      0.000  2.075E+12
-852.8324    725801.      0.000
    21.000   0.003326  38854823.   -319566.  -0.000789      0.000  2.148E+12
-211.4710    762982.      0.000
    22.000  -0.004844  35010573.   -318897.  -0.000587      0.000  2.242E+12
322.9712    800163.      0.000
    23.000    -0.0108  31211244.   -312452.  -0.000414      0.000  2.364E+12
751.1414    837344.      0.000
    24.000    -0.0148  27518737.   -301481.  -0.000270      0.000  2.526E+12
1077.4751    874525.      0.000
    25.000    -0.0172  23980279.   -287158.  -0.000152      0.000  2.746E+12
1309.5549    911705.      0.000
    26.000    -0.0184  20629510.   -270557. -7.658E-05      0.000  5.400E+12
1457.3763    948886.      0.000
    27.000    -0.0191  17488214.   -252408. -3.428E-05      0.000  5.415E+12
1567.3919    986067.      0.000
    28.000    -0.0193  14572294.   -233153.  1.202E-06      0.000  5.428E+12
1641.7453   1023248.      0.000
    29.000    -0.0190  11892512.   -213205.  3.044E-05      0.000  5.437E+12
1683.0430   1060429.      0.000
    30.000    -0.0185   9454867.   -192941.  5.398E-05      0.000  5.442E+12
1694.2425   1097609.      0.000
    31.000    -0.0178   7261015.   -172704.  7.241E-05      0.000  5.444E+12
1678.5444   1134790.      0.000
    32.000    -0.0168   5308739.   -152797.  8.626E-05      0.000  5.444E+12
1639.2989   1171971.      0.000
    33.000    -0.0157   3592422.   -133482.  9.607E-05      0.000  5.445E+12
1579.9253   1209152.      0.000
    34.000    -0.0145   2103548.   -114979.   0.000102      0.000  5.445E+12
1503.8336   1246333.      0.000
    35.000    -0.0132    831186.    -97470.   0.000106      0.000  5.445E+12
1414.3527   1283513.      0.000
    36.000    -0.0119   -237525.    -81096.   0.000106      0.000  5.445E+12
1314.6690   1320694.      0.000
    37.000    -0.0107  -1116918.    -65961.   0.000105      0.000  5.445E+12
1207.7766   1357875.      0.000
    38.000  -0.009431  -1822371.    -52136.   0.000102      0.000  5.445E+12
1096.4378   1395056.      0.000
    39.000  -0.008237  -2369903.    -39658.  9.689E-05      0.000  5.445E+12
983.1540   1432237.      0.000
    40.000  -0.007106  -2775817.    -28539.  9.122E-05      0.000  5.445E+12
870.1466   1469417.      0.000
    41.000  -0.006048  -3056377.    -18762.  8.479E-05      0.000  5.445E+12
759.3461   1506598.      0.000
    42.000  -0.005071  -3227535.    -10291.  7.786E-05      0.000  5.445E+12
652.3895   1543779.      0.000
    43.000  -0.004179  -3304688. -3073.2323  7.067E-05      0.000  5.445E+12
550.6248   1580960.      0.000
```



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    44.000  -0.003375  -3302490.  2961.2394  6.338E-05      0.000  5.445E+12
455.1205   1618141.      0.000
    45.000  -0.002658  -3234693.  7892.0485  5.618E-05      0.000  5.445E+12
366.6810   1655321.      0.000
    46.000  -0.002027  -3114033.     11807.  4.918E-05      0.000  5.445E+12
285.8654   1692502.      0.000
    47.000  -0.001478  -2952150.     14801.  4.250E-05      0.000  5.445E+12
213.0089   1729683.      0.000
    48.000  -0.001007  -2759539.     16968.  3.620E-05      0.000  5.445E+12
148.2465   1766864.      0.000
    49.000  -0.000609  -2545529.     18407.  3.036E-05      0.000  5.445E+12
91.5383   1804045.      0.000
    50.000  -0.000278  -2318290.     19212.  2.500E-05      0.000  5.445E+12
42.6940   1841225.      0.000
    51.000 -8.935E-06  -2084860.     19477.  2.015E-05      0.000  5.445E+12
1.3987   1878406.      0.000
    52.000   0.000205  -1851189.     19289.  1.581E-05      0.000  5.445E+12
-32.7634   1915587.      0.000
    53.000   0.000370  -1622202.     18730.  1.198E-05      0.000  5.445E+12
-60.2852   1952768.      0.000
    54.000   0.000493  -1401865.     17878.  8.648E-06      0.000  5.445E+12
-81.7161   1989949.      0.000
    55.000   0.000578  -1193269.     16802.  5.788E-06      0.000  5.445E+12
-97.6416   2027129.      0.000
    56.000   0.000632   -998712.     15564.  3.372E-06      0.000  5.445E+12
-108.6663   2064310.      0.000
    57.000   0.000659   -819784.     14220.  1.368E-06      0.000  5.445E+12
-115.3978   2101491.      0.000
    58.000   0.000665   -657458.     12817. -2.595E-07      0.000  5.445E+12
-118.4340   2138672.      0.000
    59.000   0.000653   -512174.     11396. -1.548E-06      0.000  5.445E+12
-118.3520   2175853.      0.000
    60.000   0.000627   -383923.  9991.8889 -2.536E-06      0.000  5.445E+12
-115.6986   2213033.      0.000
    61.000   0.000592   -272325.  8631.7934 -3.259E-06      0.000  5.445E+12
-110.9840   2250214.      0.000
    62.000   0.000549   -176704.  7337.8307 -3.754E-06      0.000  5.445E+12
-104.6765   2287395.      0.000
    63.000   0.000502    -96154.  6126.5783 -4.055E-06      0.000  5.445E+12
-97.1989   2324576.      0.000
    64.000   0.000452    -29598.  5009.8210 -4.193E-06      0.000  5.445E+12
-88.9273   2361757.      0.000
    65.000   0.000401     24153.  3995.1192 -4.199E-06      0.000  5.445E+12
-80.1897   2398937.      0.000
    66.000   0.000351     66356.  3086.3753 -4.099E-06      0.000  5.445E+12
-71.2676   2436118.      0.000
    67.000   0.000303     98296.  2284.3881 -3.918E-06      0.000  5.445E+12
-62.3969   2473299.      0.000
```

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    68.000   0.000257    121248.  1587.3821 -3.676E-06      0.000  5.445E+12
-53.7707   2510480.      0.000
    69.000   0.000215    136455.   991.5054 -3.392E-06      0.000  5.445E+12
-45.5421   2547661.      0.000
    70.000   0.000176    145101.   491.2889 -3.082E-06      0.000  5.445E+12
-37.8273   2584841.      0.000
    71.000   0.000141    148298.    80.0641 -2.758E-06      0.000  5.445E+12
-30.7101   2622022.      0.000
    72.000   0.000109    147070.  -249.6652 -2.433E-06      0.000  5.445E+12
-24.2448   2659203.      0.000
    73.000  8.216E-05    142347.  -505.8966 -2.114E-06      0.000  5.445E+12
-18.4605   2696384.      0.000
    74.000  5.867E-05    134964.  -696.8488 -1.808E-06      0.000  5.445E+12
-13.3649   2733565.      0.000
    75.000  3.875E-05    125654.  -830.7262 -1.521E-06      0.000  5.445E+12
-8.9480   2770745.      0.000
    76.000  2.216E-05    115052.  -915.5260 -1.256E-06      0.000  5.445E+12
-5.1853   2807926.      0.000
    77.000  8.610E-06    103702.  -958.8854 -1.015E-06      0.000  5.445E+12
-2.0412   2845107.      0.000
    78.000 -2.198E-06     92056.  -967.9649 -7.992E-07      0.000  5.445E+12
0.5280   2882288.      0.000
    79.000 -1.057E-05     80485.  -949.3655 -6.091E-07      0.000  5.445E+12
2.5719   2919469.      0.000
    80.000 -1.682E-05     69282.  -909.0752 -4.440E-07      0.000  5.445E+12
4.1432   2956649.      0.000
    81.000 -2.123E-05     58674.  -852.4400 -3.030E-07      0.000  5.445E+12
5.2960   2993830.      0.000
    82.000 -2.409E-05     48828.  -784.1587 -1.845E-07      0.000  5.445E+12
6.0842   3031011.      0.000
    83.000 -2.566E-05     39858.  -708.2936 -8.681E-08      0.000  5.445E+12
6.5600   3068192.      0.000
    84.000 -2.617E-05     31831.  -628.2983 -7.804E-09      0.000  5.445E+12
6.7726   3105373.      0.000
    85.000 -2.584E-05     24779.  -547.0547  5.458E-08      0.000  5.445E+12
6.7680   3142553.      0.000
    86.000 -2.486E-05     18701.  -466.9207  1.025E-07      0.000  5.445E+12
6.5877   3179734.      0.000
    87.000 -2.338E-05     13571.  -389.7824  1.381E-07      0.000  5.445E+12
6.2687   3216915.      0.000
    88.000 -2.155E-05  9343.5421  -317.1107  1.633E-07      0.000  5.445E+12
5.8432   3254096.      0.000
    89.000 -1.946E-05  5957.4551  -250.0197  1.802E-07      0.000  5.445E+12
5.3386   3291277.      0.000
    90.000 -1.722E-05  3340.0165  -189.3238  1.904E-07      0.000  5.445E+12
4.7774   3328457.      0.000
    91.000 -1.489E-05  1410.4567  -135.5948  1.957E-07      0.000  5.445E+12
4.1775   3365638.      0.000
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    92.000 -1.253E-05    82.4261   -89.2146  1.973E-07      0.000  5.445E+12
3.5526   3402819.      0.000
    93.000 -1.016E-05  -734.0378   -50.4252  1.966E-07      0.000  5.445E+12
2.9124   3440000.      0.000
    94.000 -7.810E-06 -1131.1089   -19.3724  1.945E-07      0.000  5.445E+12
2.2631   3477181.      0.000
    95.000 -5.491E-06 -1202.2724     3.8545  1.920E-07      0.000  5.445E+12
1.6080   3514361.      0.000
    96.000 -3.203E-06 -1041.8544    19.1910  1.895E-07      0.000  5.445E+12
0.9480   3551542.      0.000
    97.000 -9.433E-07  -744.8996    26.5717  1.875E-07      0.000  5.445E+12
0.2821   3588723.      0.000
    98.000  1.297E-06  -407.3101    25.9128  1.862E-07      0.000  5.445E+12
-0.3919   3625904.      0.000
    99.000  3.527E-06  -126.1480    17.1023  1.857E-07      0.000  5.445E+12
-1.0765   3663085.      0.000
   100.000  5.753E-06     0.000      0.000  1.855E-07      0.000  5.445E+12
-1.7739   1850133.      0.000
```

```
* This analysis computed pile response using nonlinear moment-curvature
relationships.
  Values of total stress due to combined axial and bending stresses are computed
only
  for elastic sections only and do not equal the actual stresses in concrete and
steel.
  Stresses in concrete and steel may be interpolated from the output for nonlinear
  bending properties relative to the magnitude of bending moment developed in the
pile.


Output Summary for Load Case No. 4:

Pile-head deflection             =      1.0000000 inches
Computed slope at pile head      =     -0.0060666 radians
Maximum bending moment           =      59089359. inch-lbs
Maximum shear force              =        568916. lbs
Depth of maximum bending moment  =     13.0000000 feet below pile head
Depth of maximum shear force     =       0.000000 feet below pile head
Number of iterations             =             11
Number of zero deflection points =              4



--------------------------------------------------------------------------------
                           Summary of Pile Response(s)
--------------------------------------------------------------------------------
```

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs
Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians
Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian
Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

Maximum Load Case No.	Load Type No.	Pile-head Condition 1 Shear V(lbs) or y(inches)	Pile-head Condition 2 in-lb, rad., or in-lb/rad.	Maximum Axial Loading lbs	Maximum Pile-head Deflection inches	Moment in Pile in-lbs
1	4	y = 0.2500	M = 0.000	706000.	0.25000000	24619988.
2	4	y = 0.5000	M = 0.000	706000.	0.50000000	37499514.
3	4	y = 0.7500	M = 0.000	706000.	0.75000000	48887766.
4	4	y = 1.0000	M = 0.000	706000.	1.00000000	59089359.
		268399.	-0.00150423			
		392187.	-0.00311900			
		487523.	-0.00464088			
		568916.	-0.00606656			

The analysis ended normally.

Appendix V.4 Pavement Calculations

CALFP Version 1.5

Unit System = E

Title: Jacalitos

Traffic Index (TI) = 05.5

R.Value of Subgrade (Native Soil) = 50

Required GE = 0000.88 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10

Base R.Value = 0078.00

0.0032*TI*(100-R.VALUE) = 0000.39 ft

Base MAX. depth = 0002.00 ft

Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.42	00.24	00.15	02.42	00.36
00.20	02.42	00.48	00.25	02.42	00.61
00.30	02.42	00.73	00.35	02.42	00.85
00.40	02.42	00.97	00.45	02.42	01.09
00.50	02.42	01.21	00.55	02.45	01.35
00.60	02.52	01.51	00.65	02.59	01.68
00.70	02.65	01.86	00.75	02.71	02.03

HMA Safety Factor (GE) = 0000.20 ft

HMA Ultimate Depth = 0000.75 ft

(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.

Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.25	00.00	00.35	00.00	00.00	00.11	0000.00	02.42
00.30	00.00	00.35	00.00	00.00	00.23	0000.00	02.42
00.35	00.00	00.35	00.00	00.00	00.35	0000.00	02.42
00.40	00.00	00.35	00.00	00.00	00.47	0000.00	02.42
00.45	00.00	00.35	00.00	00.00	00.59	0000.00	02.42

***** FINISH *****

CALFP Version 1.5

Unit System = E

Title: Jacalitos

Traffic Index (TI) = 06.0

R.Value of Subgrade (Native Soil) = 50

Required GE = 0000.96 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10

Base R.Value = 0078.00

0.0032*TI*(100-R.VALUE) = 0000.42 ft

Base MAX. depth = 0002.00 ft

Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.31	00.23	00.15	02.31	00.35
00.20	02.31	00.46	00.25	02.31	00.58
00.30	02.31	00.69	00.35	02.31	00.81
00.40	02.31	00.92	00.45	02.31	01.04
00.50	02.31	01.16	00.55	02.34	01.29
00.60	02.41	01.45	00.65	02.48	01.61
00.70	02.54	01.78	00.75	02.60	01.95
00.80	02.65	02.12	00.85	02.71	02.30

HMA Safety Factor (GE) = 0000.20 ft

HMA Ultimate Depth = 0000.80 ft

(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.

Note: Negative Safety Factor in Base

HMA	TPB	T-Base	B-Base	Subbase	Res-GE	Cost	HMA-GF
ft	ft	ft	ft	ft	ft	$/y^2	
00.25	00.00	00.35	00.00	00.00	00.00	0000.00	02.31
00.30	00.00	00.35	00.00	00.00	00.12	0000.00	02.31
00.35	00.00	00.35	00.00	00.00	00.23	0000.00	02.31
00.40	00.00	00.35	00.00	00.00	00.35	0000.00	02.31
00.45	00.00	00.35	00.00	00.00	00.46	0000.00	02.31
00.50	00.00	00.35	00.00	00.00	00.58	0000.00	02.31

***** FINISH *****

CALFP Version 1.5

Unit System = E

CALFP Version 1.5

Unit System = E

Title: Jacalitos

Traffic Index (TI) = 06.5

R.Value of Subgrade (Native Soil) = 50

Required GE = 0001.04 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10

Base R.Value = 0078.00

0.0032*TI*(100-R.VALUE) = 0000.46 ft

Base MAX. depth = 0002.00 ft

Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.22	00.22	00.15	02.22	00.33
00.20	02.22	00.44	00.25	02.22	00.56
00.30	02.22	00.67	00.35	02.22	00.78
00.40	02.22	00.89	00.45	02.22	01.00
00.50	02.22	01.11	00.55	02.25	01.24
00.60	02.32	01.39	00.65	02.38	01.55
00.70	02.44	01.71	00.75	02.49	01.87

00.80 02.55 02.04 00.85 02.60 02.21

HMA Safety Factor (GE) = 0000.20 ft

HMA Ultimate Depth = 0000.85 ft

(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.

Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.30	00.00	00.35	00.00	00.00	00.01	0000.00	02.22
00.35	00.00	00.35	00.00	00.00	00.12	0000.00	02.22
00.40	00.00	00.35	00.00	00.00	00.23	0000.00	02.22
00.45	00.00	00.35	00.00	00.00	00.34	0000.00	02.22
00.50	00.00	00.35	00.00	00.00	00.46	0000.00	02.22
00.55	00.00	00.35	00.00	00.00	00.58	0000.00	02.25

***** FINISH *****

CALFP Version 1.5

Unit System = E

Title: Jacalitos

Traffic Index (TI) = 07.0

R.Value of Subgrade (Native Soil) = 50

Required GE = 0001.12 ft

Base Type = AB-Class 2

Base Gravel Factor = 0001.10

Base R.Value = 0078.00

0.0032*TI*(100-R.VALUE) = 0000.49 ft

Base MAX. depth = 0002.00 ft

Base MIN. depth = 0000.35 ft

Depth (ft)	GF	GE (ft)	Depth (ft)	GF	GE (ft)
00.10	02.14	00.21	00.15	02.14	00.32
00.20	02.14	00.43	00.25	02.14	00.54
00.30	02.14	00.64	00.35	02.14	00.75
00.40	02.14	00.86	00.45	02.14	00.96
00.50	02.14	01.07	00.55	02.17	01.19
00.60	02.23	01.34	00.65	02.29	01.49
00.70	02.35	01.65	00.75	02.40	01.80
00.80	02.46	01.97	00.85	02.51	02.13

00.90 02.55 02.30 00.95 02.60 02.47

HMA Safety Factor (GE) = 0000.20 ft

HMA Ultimate Depth = 0000.95 ft

(HMA MAX. Depth shown in Table)

HMA MIN. Depth (from Base) = 0000.20 ft

HMA MIN. Depth (selected) = 0000.20 ft

Note: Positive Residual GE indicates over-design.

Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.35	00.00	00.35	00.00	00.00	00.01	0000.00	02.14
00.40	00.00	00.35	00.00	00.00	00.12	0000.00	02.14
00.45	00.00	00.35	00.00	00.00	00.23	0000.00	02.14
00.50	00.00	00.35	00.00	00.00	00.34	0000.00	02.14
00.55	00.00	00.35	00.00	00.00	00.46	0000.00	02.17
00.60	00.00	00.35	00.00	00.00	00.60	0000.00	02.23

***** FINISH *****

Note: Positive Residual GE indicates over-design.

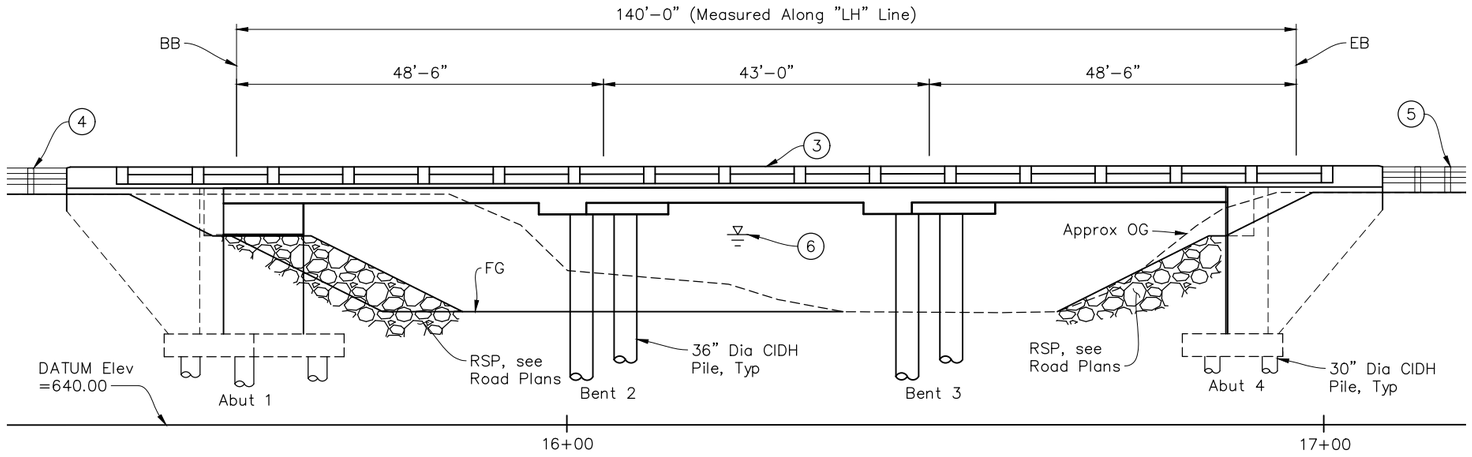
Note: Negative Safety Factor in Base

HMA ft	TPB ft	T-Base ft	B-Base ft	Subbase ft	Res-GE ft	Cost $/y^2	HMA-GF
00.30	00.00	00.35	00.00	00.00	00.01	0000.00	02.22
00.35	00.00	00.35	00.00	00.00	00.12	0000.00	02.22
00.40	00.00	00.35	00.00	00.00	00.23	0000.00	02.22
00.45	00.00	00.35	00.00	00.00	00.34	0000.00	02.22
00.50	00.00	00.35	00.00	00.00	00.46	0000.00	02.22
00.55	00.00	00.35	00.00	00.00	00.58	0000.00	02.25

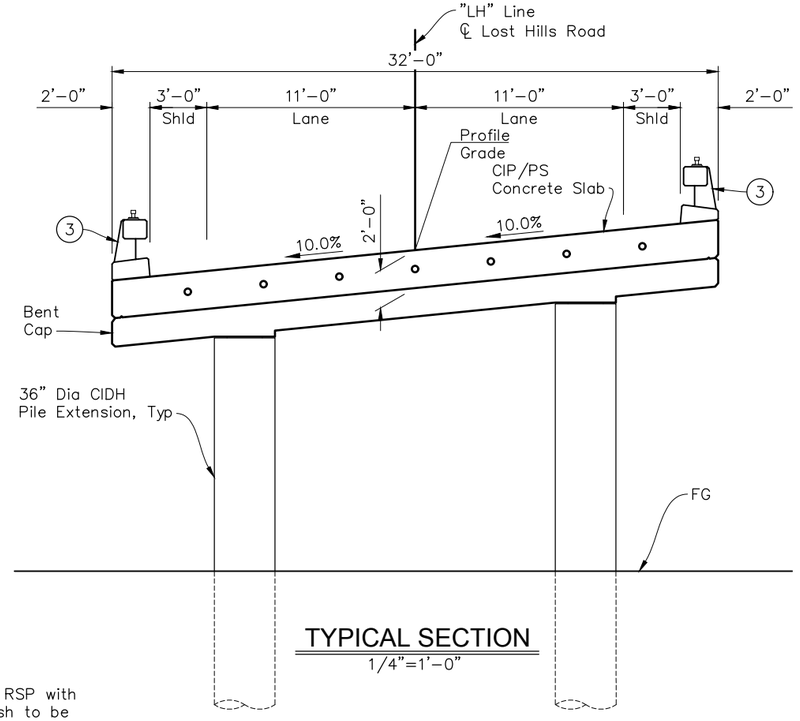
***** FINISH *****

Appendix VI **STRUCTURAL PLANS**

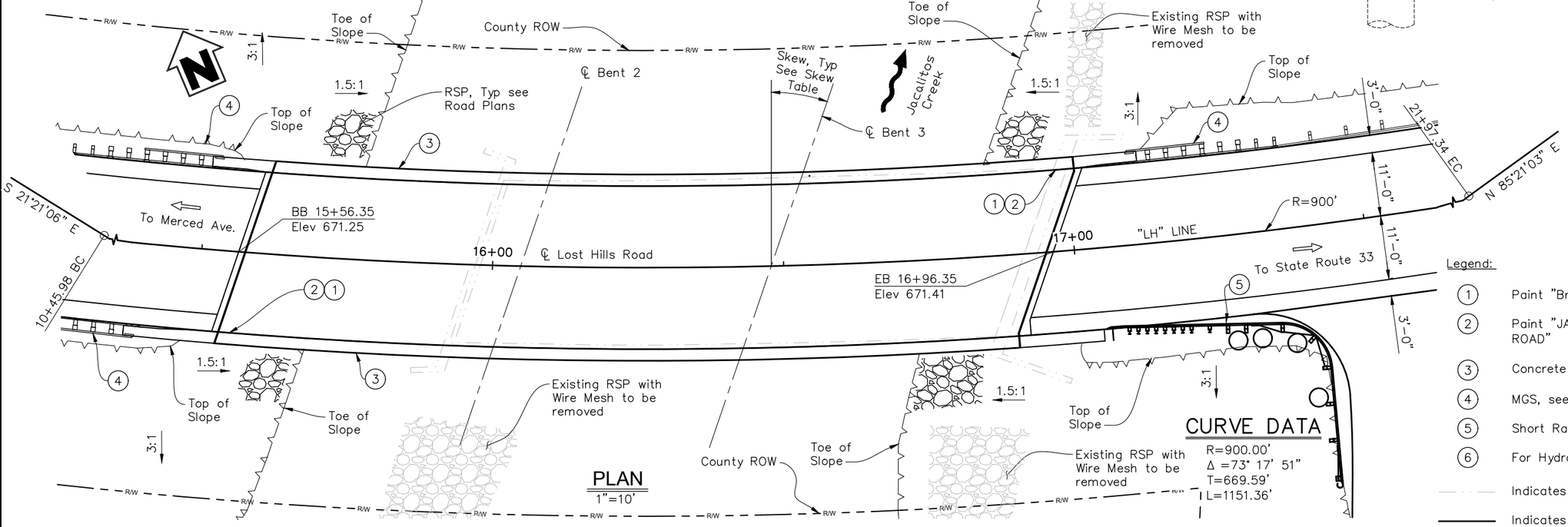
PROFILE GRADE
NO SCALE



ELEVATION
1"=10'



TYPICAL SECTION
1/4"=1'−0"



PLAN
1"=10'

CURVE DATA
R=900.00'
Δ =73° 17' 51"
T=669.59'
L=1151.36'

Skew Table	
Location	Skew
BB	14°20'34"
Bent 2	17°25'50"
Bent 3	20°10'04"
EB	23°15'20"

Legend:

1. Paint "Bridge No. 42C−0688 & FCBN 03−038"
2. Paint "JACALITOS CREEK BRIDGE AT LOST HILLS ROAD"
3. Concrete Barrier Type 85
4. MGS, see "Road Plans"
5. Short Radius Guardrail System, see "Road Plans"
6. For Hydrology Summary, see "Foundation Plan"

Indicates Existing Structure to be removed

Indicates New Structure

60% SUBMITTAL, NOT FOR CONSTRUCTION

	DATE	RECORD DRAWING	DATE
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	
DRAWN: P.KENNEY	3/15/24		
CHECKED:			

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE
HORIZ 0 10' 20'
VERT 0 1' 2'

PROJECT ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER
JUAN C CRUZ
No. 88803
CIVIL
STATE OF CALIFORNIA

PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

DEPARTMENT OF PUBLIC WORKS AND PLANNING
GENERAL PLAN
DRAWING NO. BR-1 SHEET NO. 30 TOTAL 44

\\CONSOR.LOCAL\FILES_V-TPD\PROJECTS\CA\FRESNO COUNTY\2020\D207820CA.01\500-DESIGN\505 - CADD FILES\BRIDGE\D207820A-A-GP01.DWG 5/14/2024 2:42 PM - JACOB ITEN

GENERAL NOTES
LOAD AND RESISTANCE FACTOR DESIGN

DESIGN: AASHTO LRFD Bridge Design Specifications, 8th edition and the Caltrans Amendments, preface dated April 2019.

SEISMIC DESIGN:
Caltrans Seismic Design Criteria (SDC), version 2.0, dated April 2019.

DEAD LOAD:
Includes 35 psf for future wearing surface and utilities.

LIVE LOADING:
HL93 and permit design load.

SEISMIC LOADING:
Soil profile V_{30} = 280 m/sec
Moment Magnitude M_{max} = 6.7
Peak Ground Acceleration = 0.66g

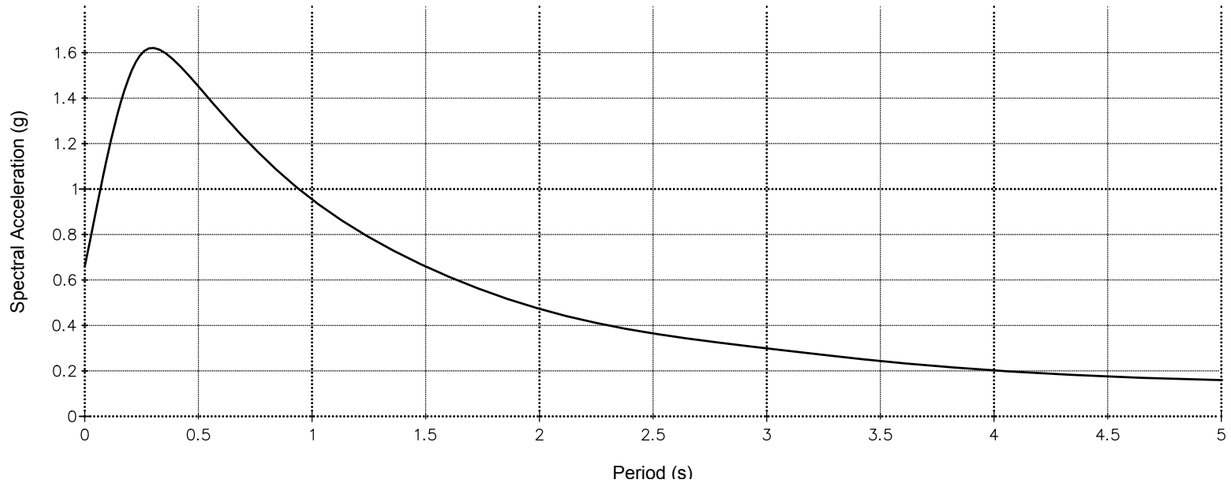
REINFORCED CONCRETE:
f_y = 60,000 psi

f'_c = See "CONCRETE STRENGTHS AND TYPE LIMITS" on "DECK CONTOURS" sheet.
n = varies

PRESTRESSED CONCRETE:

See "PRESTRESSING NOTES" on "LONGITUDINAL SECTION" sheet.

Steel Pipe Pin:
ASTM A53 Grade B



ACCELERATION RESPONSE SPECTRA CURVE
No Scale

STANDARD PLANS 2023 EDITION

A3A	Abbreviations (Sheet 1 of 3)
A3B	Abbreviations (Sheet 2 of 3)
A3C	Abbreviations (Sheet 3 of 3)
A10A	Legend – Lines and Symbols (Sheet 1 of 5)
A10B	Legend – Lines and Symbols (Sheet 2 of 5)
A10C	Legend – Lines and Symbols (Sheet 3 of 5)
A10D	Legend – Lines and Symbols (Sheet 4 of 5)
A10E	Legend – Lines and Symbols (Sheet 5 of 5)
A62C	Limits of Payment for Excavation and Backfill – Bridge
B0–1	Bridge Details
B0–3	Bridge Details
B0–5	Bridge Details
B0–13	Bridge Details
B6–21	Joint Seals (Maximum Movement Rating = 2")
B8–5	Cast–In–Place Prestressed Girder Details
B11–83	Concrete Barrier Type 85 (Sheet 1 of 3)
B11–84	Concrete Barrier Type 85 (Sheet 2 of 3)
B11–85	Concrete Barrier Type 85 (Sheet 3 of 3)

CALTRANS STANDARD PLAN SHEET NO.
DETAIL NO.

INDEX TO PLANS

QUANTITIES

Structure Excavation (Bridge)	749	CY
Structure Backfill (Bridge)	430	CY
30" Cast–In–Drilled–Hole Concrete Piling	635	LF
36" Cast–In–Drilled–Hole Concrete Piling	160	LF
Prestressing Cast–In–Place Concrete	LUMP	SUM
Structural Concrete, Bridge Footing	109	CY
Structural Concrete, Bridge	180	CY
Structural Concrete, Bridge (Polymer Fiber)	363	CY
Joint Seal (MR = 2")	66	LF
Bar Reinforcing Steel (Bridge)	195,297	LB
Bridge Removal	LUMP	SUM
Miscellaneous Metal (Bridge)	534	LB
Concrete Barrier (Type 85)	327	LF

60% SUBMITTAL, NOT FOR CONSTRUCTION

	DATE	RECORD DRAWING	DATE
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	
DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE
HORIZ 0 10' 20'
VERT 0 1' 2'

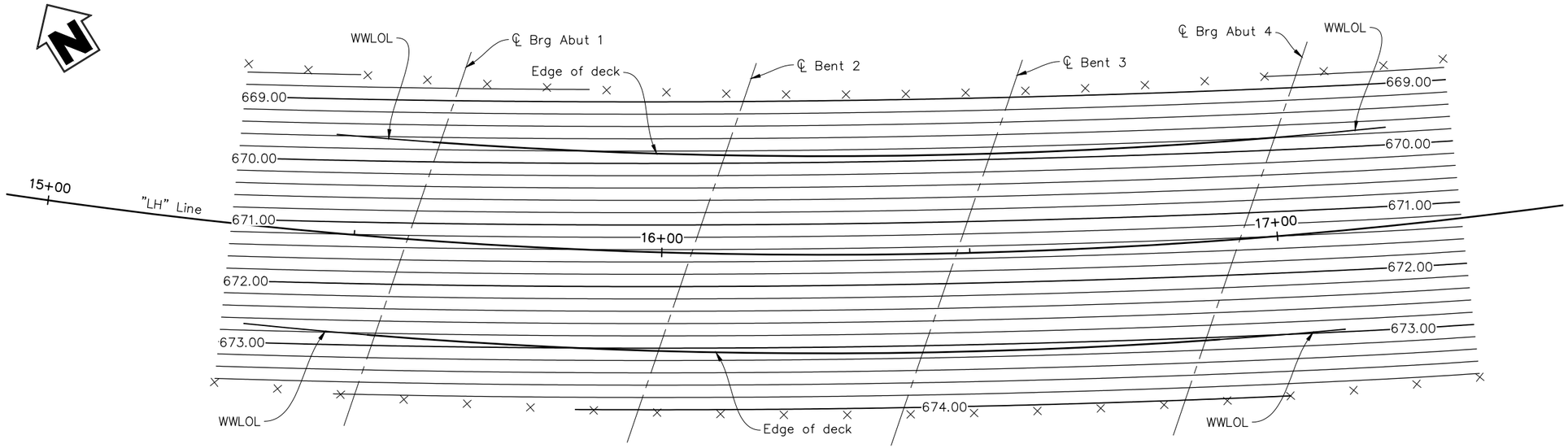
PROJECT ENGINEER ____ DATE

REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

DEPARTMENT OF PUBLIC WORKS AND PLANNING
GENERAL NOTES
DRAWING NO. BR-2 SHEET NO. 31 TOTAL 44



Notes:

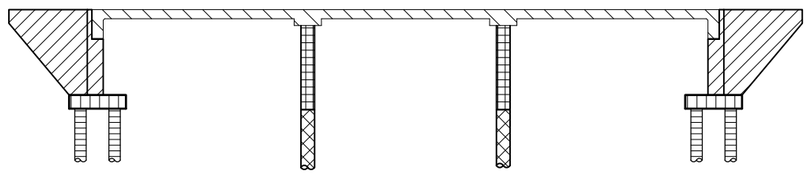
X = 10' intervals along station line

Contours Intervals = 0.20'

Contours do not include camber

DECK CONTOURS

1" = 10'



- STRUCTURAL CONCRETE, BRIDGE (POLYMER FIBER) (4.0 KSI @ 28 DAYS)
- STRUCTURAL CONCRETE, BRIDGE (3.6 KSI @ 28 DAYS)
- STRUCTURAL CONCRETE, BRIDGE (5.0 KSI @ 28 DAYS)
- 36" Cast-In-Drilled-Hole Concrete Piling (5.0 KSI @ 28 DAYS)
- 30" Cast-In-Drilled-Hole Concrete Piling (4.0 KSI @ 28 DAYS)
- STRUCTURAL CONCRETE, BRIDGE FOOTING (3.6 KSI @ 28 Days)

CONCRETE STRENGTH AND TYPE LIMITS

No Scale

	DATE	RECORD DRAWING	
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	DATE
DRAWN: P.KENNEY	3/15/24		
CHECKED:	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE

HORIZ 0 10' 20'

VERT 0 1' 2'

PROJECT ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT

PROJECT ON LOST HILLS ROAD

ROAD NO. M2820 BRIDGE NO. 42C0078

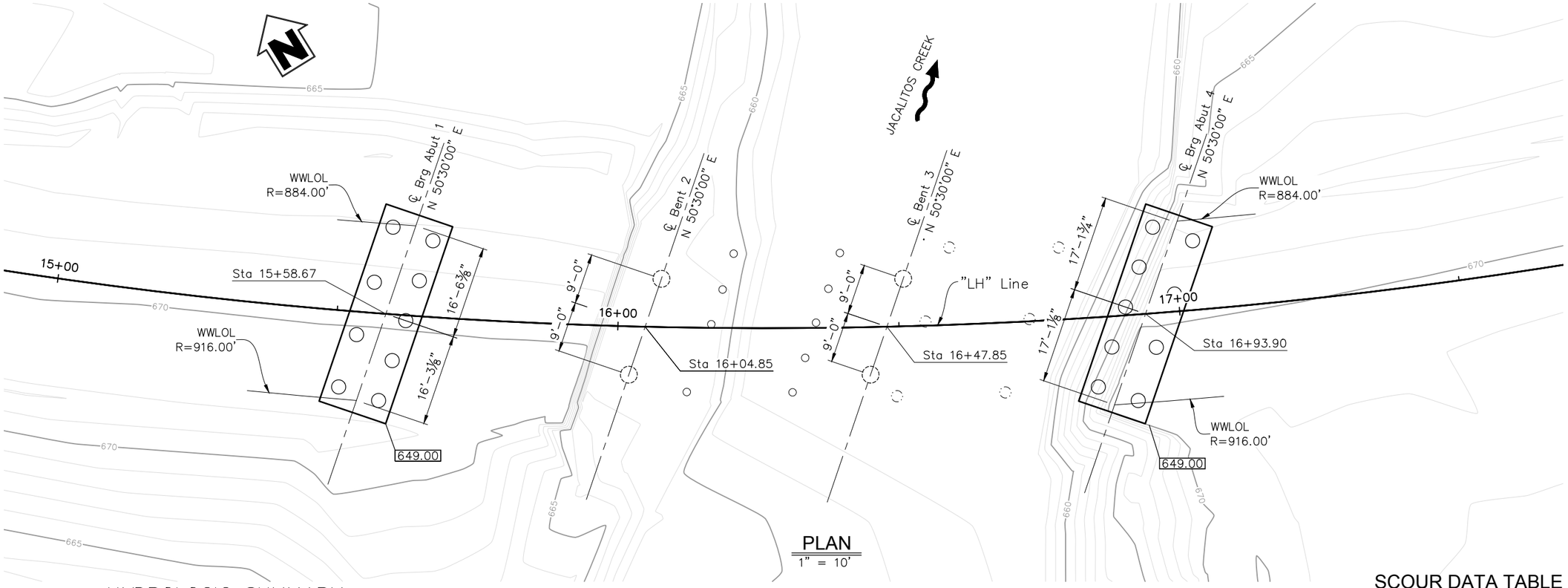
THE COUNTY OF FRESNO

DEPARTMENT OF PUBLIC WORKS AND PLANNING

DECK CONTOURS

DRAWING NO. BR-3 SHEET NO. 32 TOTAL 44

60% SUBMITTAL, NOT FOR CONSTRUCTION



PLAN
1" = 10'

HYDROLOGIC SUMMARY

Drainage area: 62.3 Square Miles

	Design Flood	Base Flood
Frequency (years)	50	100
Discharge (cubic feet per second)	5,710	7,430
Water Surface Elev at Bridge (ft)	665.68	666.69

Flood plain data based upon information available when the plans were prepared and are shown to meet Federal requirements. The accuracy of said information is not warranted by the County and interested or affected parties should make their own investigations.

Legend:

X.X — Indicates bottom of footing elevation

Existing columns to be removed

SCOUR DATA TABLE

SUPPORT NO.	LONG TERM (DEGRADATION AND CONTRACTION) SCOUR ELEVATION (ft)	SHORT TERM (LOCAL) SCOUR DEPTH (ft)
Abut 1	652.00	6.3
Bent 2	652.00	10.8
Bent 3	652.00	11.9
Abut 4	652.00	11.6

PILE DATA TABLE

LOCATION	PILE TYPE	CUT-OFF ELEVATION (Ft)	NOMINAL RESISTANCE		DESIGN TIP ELEVATION	SPECIFIED TIP ELEVATION
			COMPRESSION	TENSION		
Abut 1	30"ø CIDH	649.25	330	N/A	614(a)	612.0
Bent 2	36"ø CIDH	652	1,360	N/A	587 (a)	585.0
Bent 3	36"ø CIDH	652	1,360	N/A	587 (a)	585.0
Abut 4	30"ø CIDH	649.25	345	N/A	614 (a)	612.0

(1) Design Tip Elevation is controlled by (a) Compression (Strength Limit).
(2) The Specified Tip Elevation shall not be raised above the design tip elevations for tension load, lateral load, and tolerable settlement.
(3) Slurry Displacement method may be used for concrete placement of the CIDH piles. Therefore, the specified pile tip elevationsare two feet below the design tip elevations to account for the zone of untested concrete due to the limitation of the gamma-gamma logging equipment

60% SUBMITTAL, NOT FOR CONSTRUCTION

	DATE	RECORD DRAWING	
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	DATE
DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE
HORIZ 0 10' 20'
VERT 0 1' 2'

PROJECT ENGINEER DATE

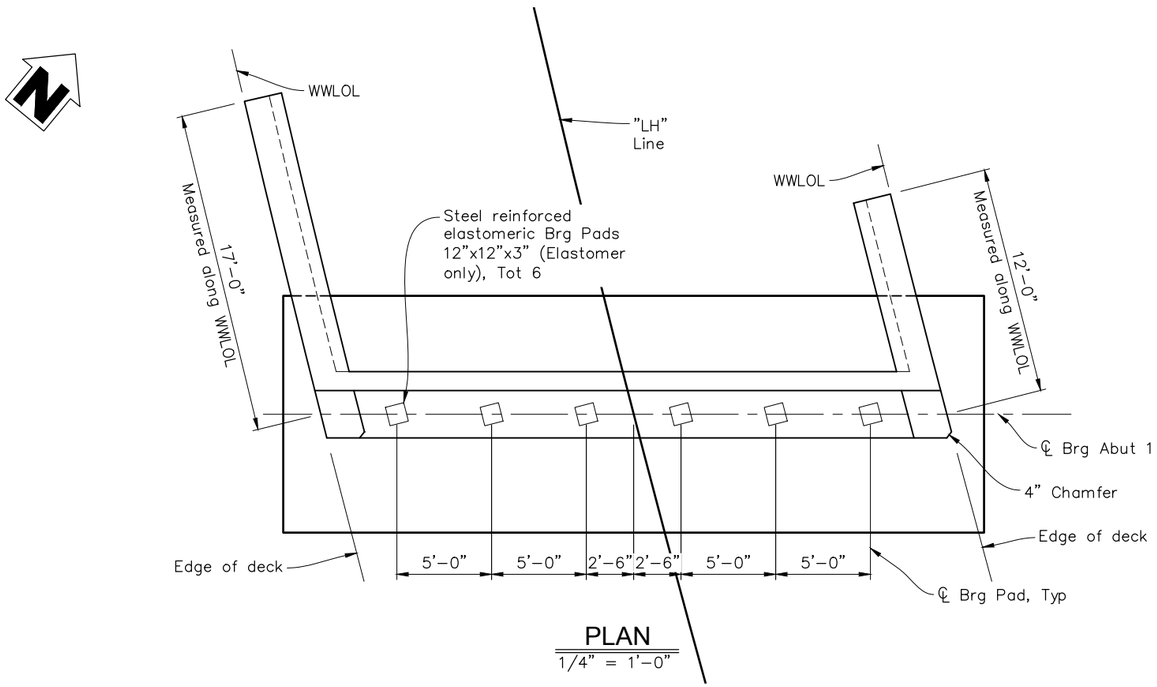
REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

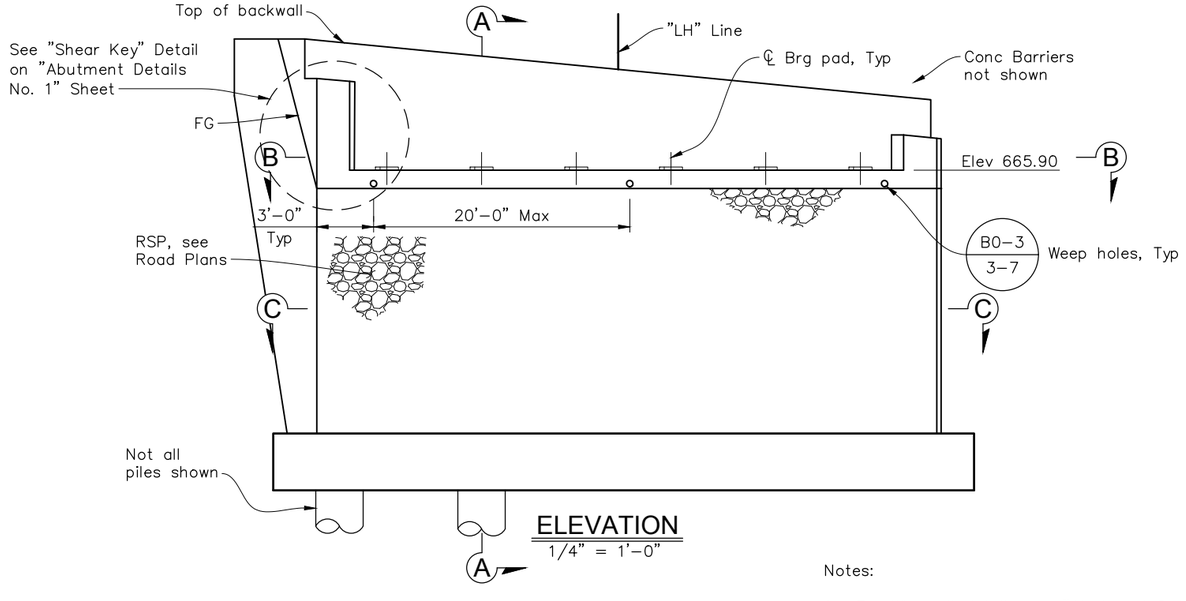
THE COUNTY OF FRESNO

DEPARTMENT OF PUBLIC WORKS AND PLANNING
FOUNDATION PLAN
DRAWING NO. BR-4 SHEET NO. 33 TOTAL 44

\\CONSOR.LOCAL\FILES_V-TPD\PROJECTS\CA\FRESNO COUNTY\2020\D207820CA.01\500-DESIGN\505 - CADD FILES\BRIDGE\D207820A-E-FPL01.DWG 5/14/2024 2:43 PM - JACOB ITEN



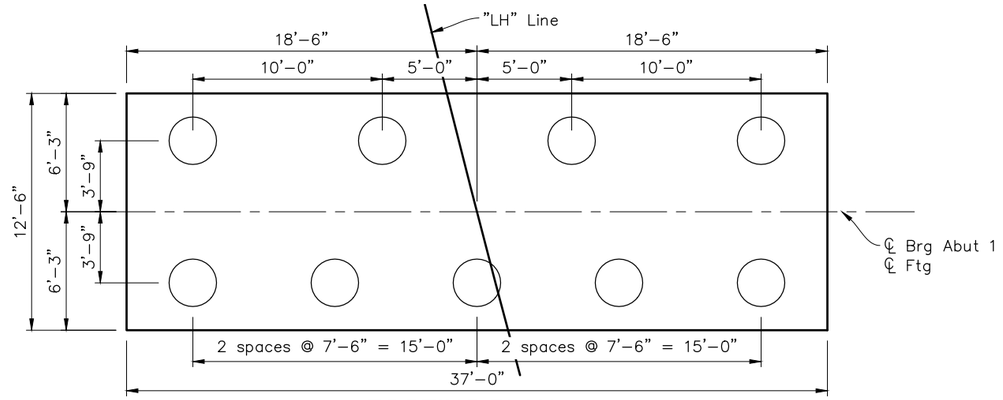
PLAN
1/4" = 1'-0"



ELEVATION
1/4" = 1'-0"

Notes:

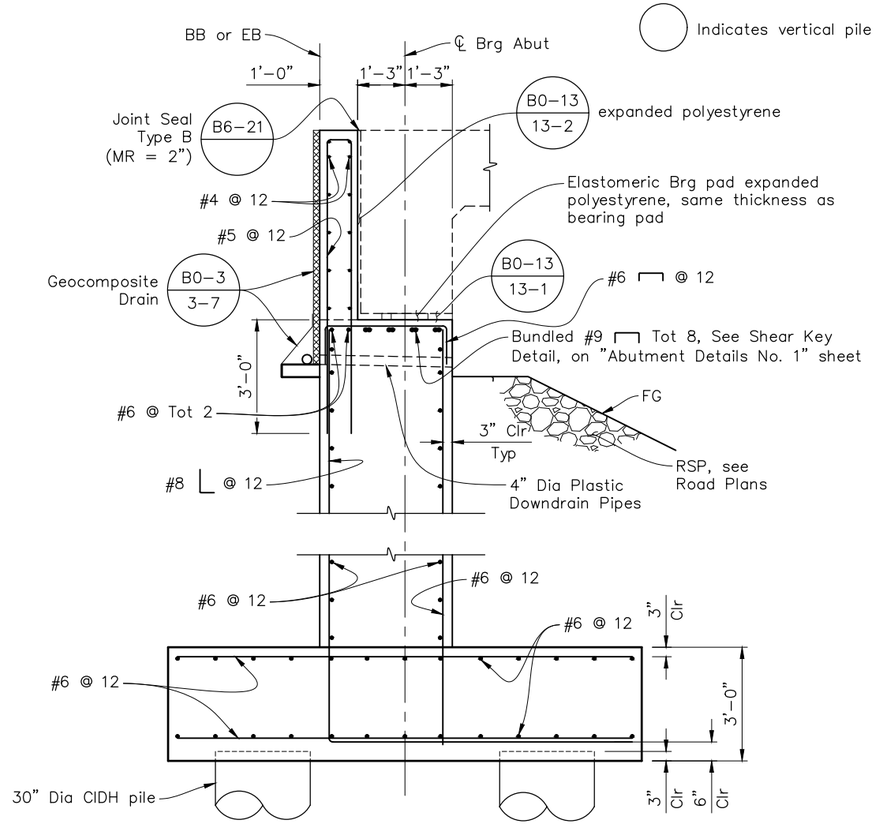
1. For Wingwall details see "Abutment Details No. 1" sheet.



FOOTING PLAN
1/4" = 1'-0"

Legend:

Indicates vertical pile



SECTION A-A
1/2" = 1'-0"

60% SUBMITTAL, NOT FOR CONSTRUCTION

	DATE	RECORD DRAWING		SCALE
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	DATE	HORIZ 0 10' 20'
DRAWN: P.KENNEY	3/15/24			VERT 0 1' 2'
CHECKED: .	.			

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

PROJECT ENGINEER _____ DATE _____

REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD

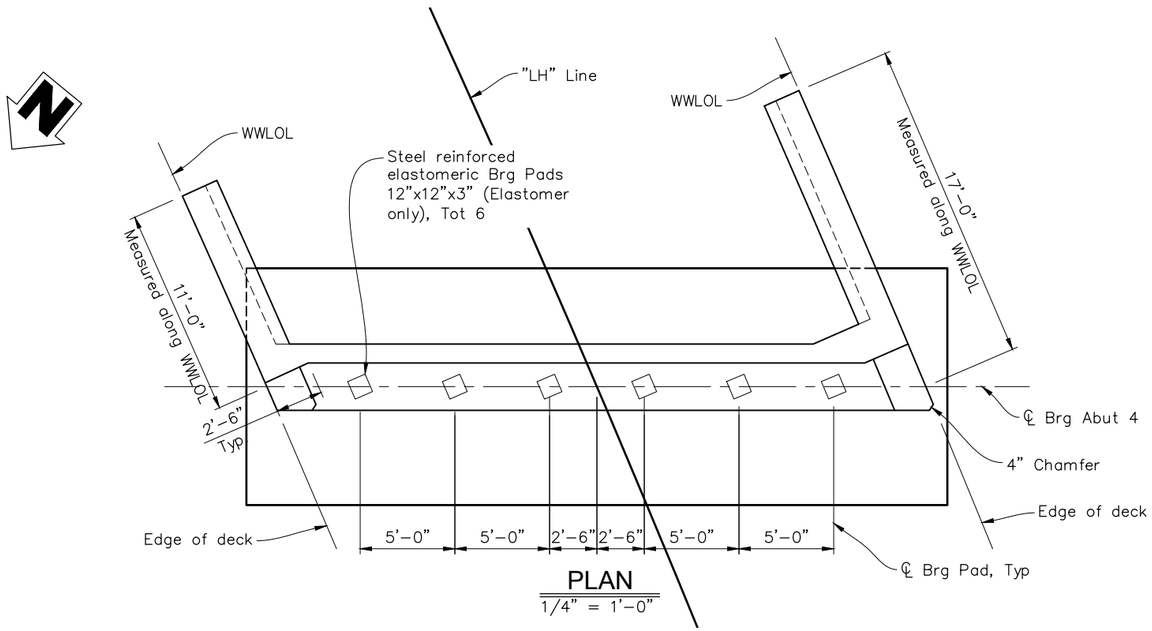
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

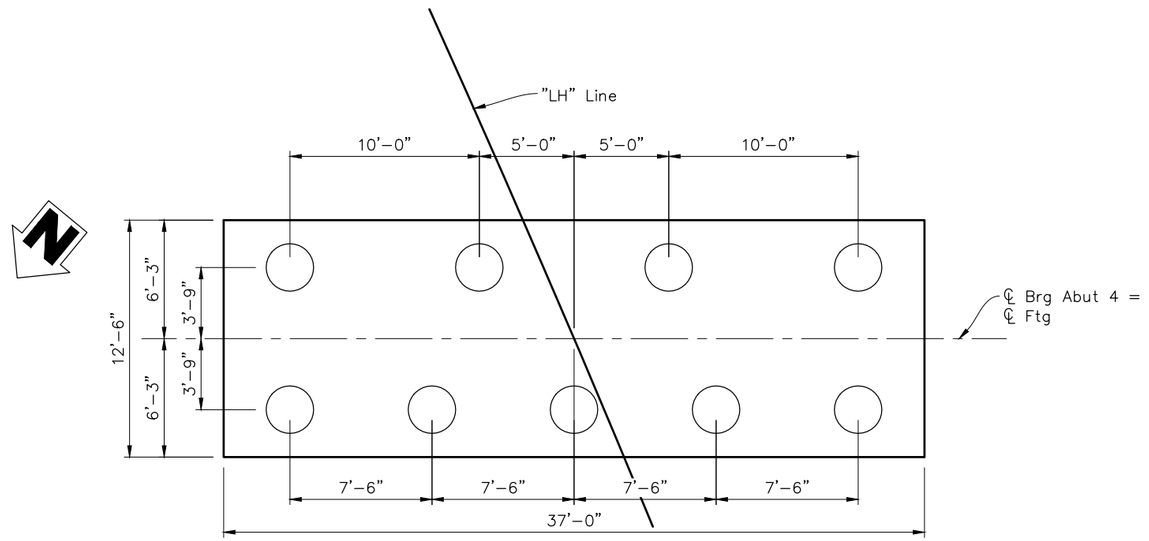
DEPARTMENT OF PUBLIC WORKS AND PLANNING

ABUTMENT 1 LAYOUT

DRAWING NO. BR-5 SHEET NO. 34 TOTAL 44



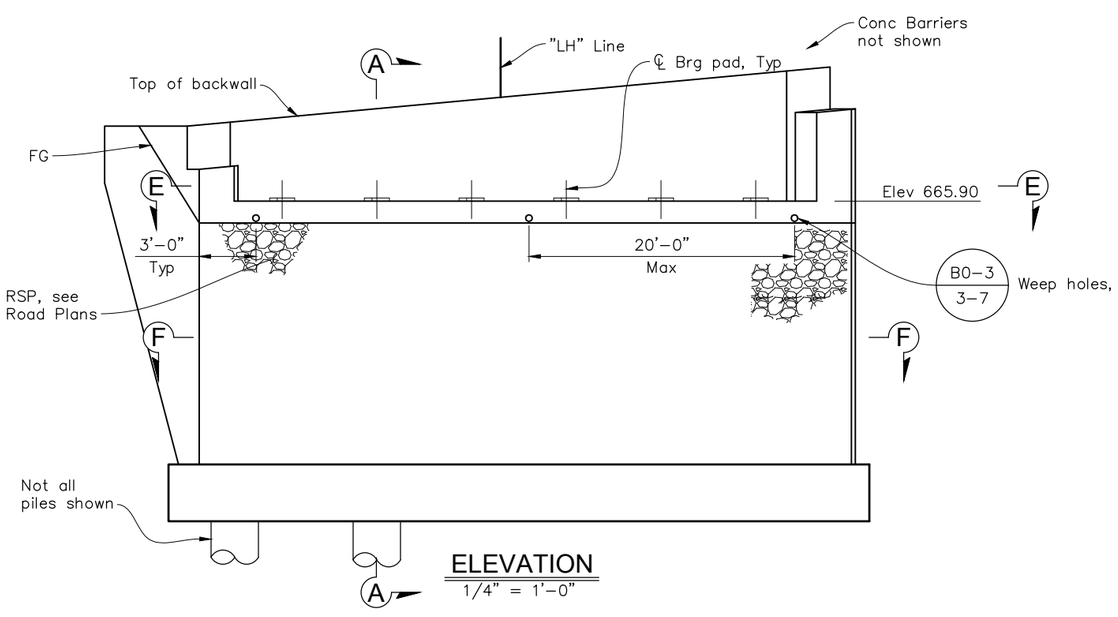
PLAN
1/4" = 1'-0"



FOOTING PLAN
1/4" = 1'-0"

Legend:

Indicates vertical pile



ELEVATION
1/4" = 1'-0"

Notes:
1. For Section A-A, see "ABUTMENT 1 LAYOUT" sheet.

60% SUBMITTAL, NOT FOR CONSTRUCTION

\\CONSOR.LOCAL\FILES_V-TPD\PROJECTS\CA\FRESNO COUNTY\2020\D207820CA.01\500-DESIGN\505 - CADD FILES\BRIDGE\D207820A-F-A04_L001.DWG 5/14/2024 2:44 PM - JACOB ITEN

	DATE	RECORD DRAWING	DATE
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	
DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE: HORIZ 0 10' 20' / VERT 0 1' 2'

PROJECT ENGINEER ____ DATE ____

REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

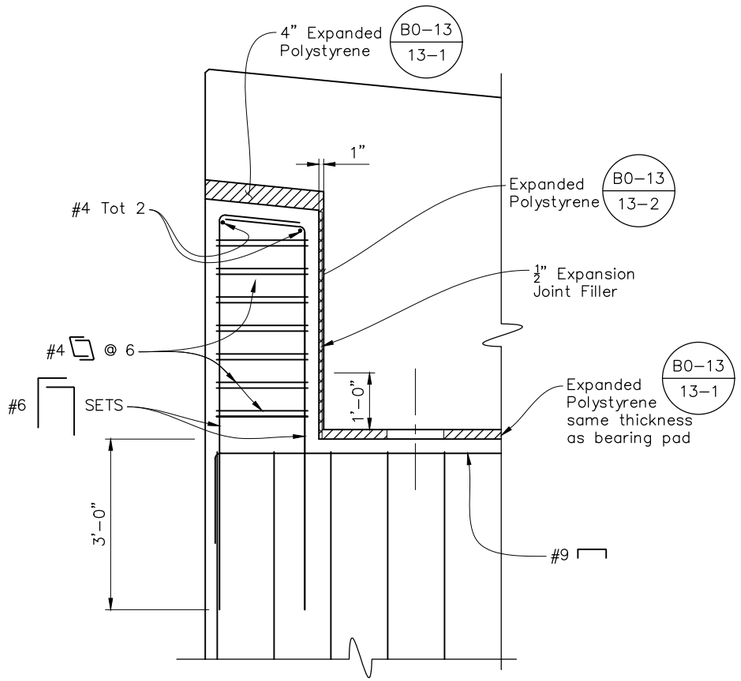
PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

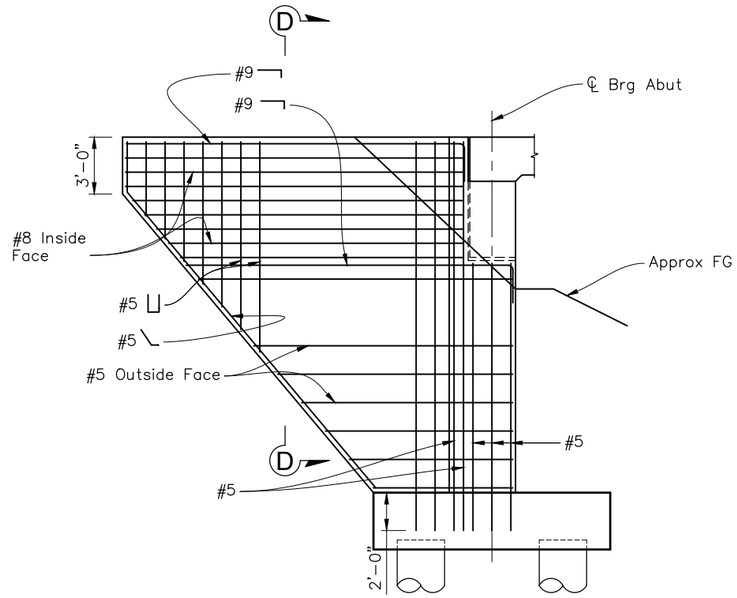
DEPARTMENT OF PUBLIC WORKS AND PLANNING

ABUTMENT 4 LAYOUT

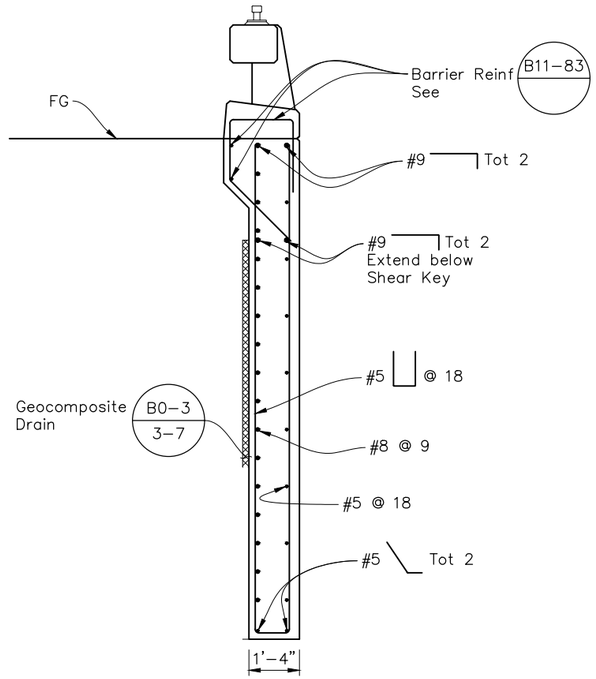
DRAWING NO. BR-6 SHEET NO. 35 TOTAL 44



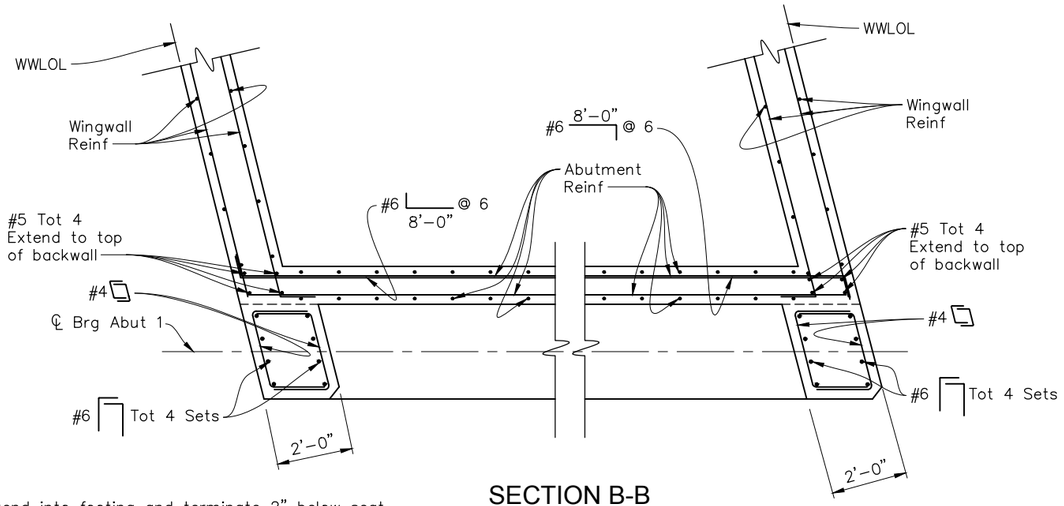
SHEAR KEY
3/4" = 1'–0"



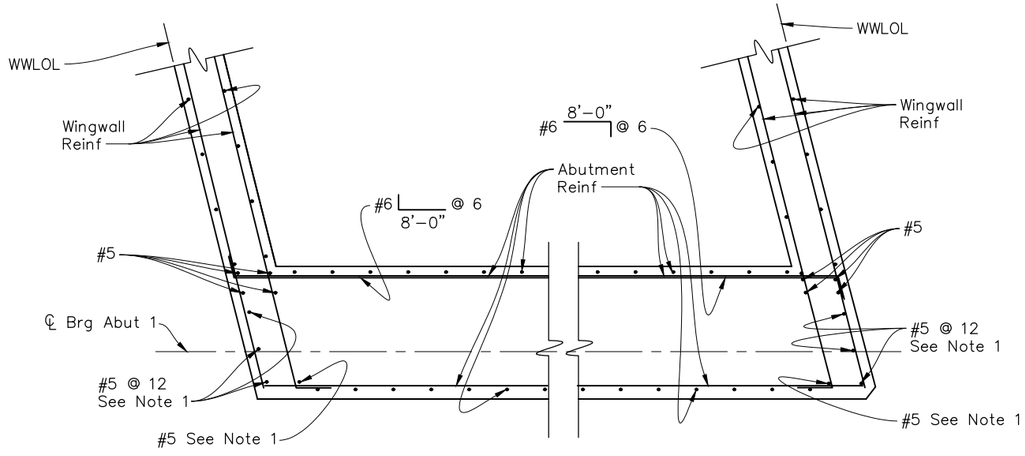
WINGWALL ELEVATION
1/4"=1'–0"



SECTION D-D
1/2" = 1'–0"



SECTION B-B
1/2" = 1'–0"



SECTION C-C
1/2" = 1'–0"

Notes:

1. Extend into footing and terminate 2" below seat elevation unless otherwise noted.

60% SUBMITTAL, NOT FOR CONSTRUCTION

	DATE	RECORD DRAWING	DATE
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	
DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE: HORIZ 0 10' 20' / VERT 0 1' 2'

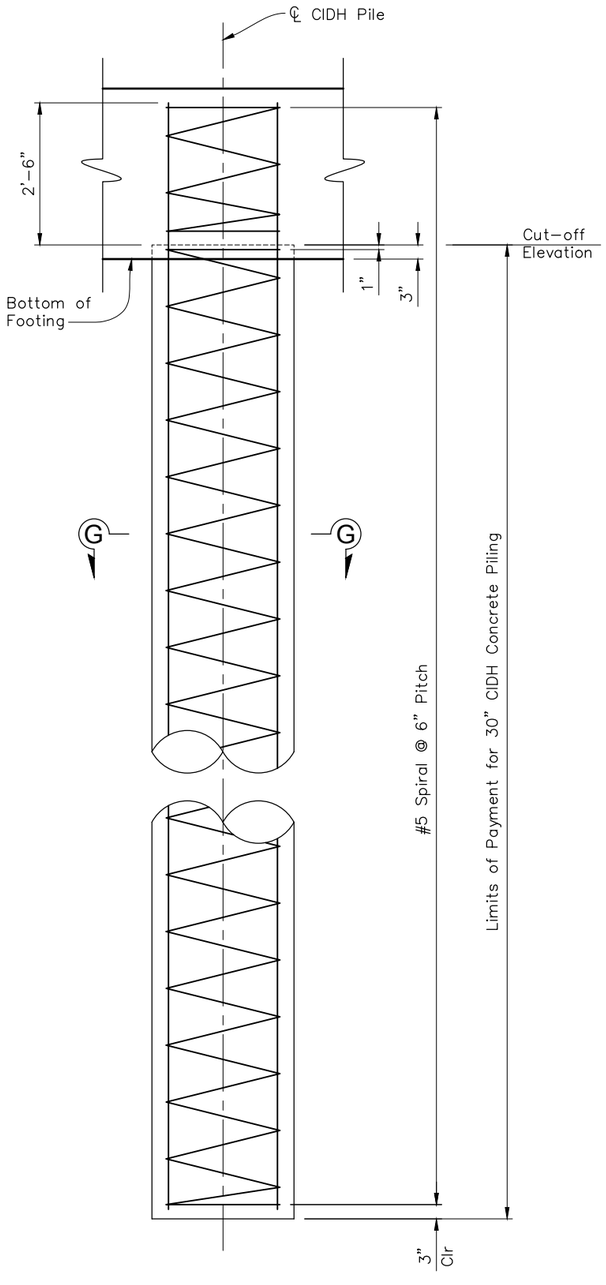
PROJECT ENGINEER _____ DATE _____

REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

DEPARTMENT OF PUBLIC WORKS AND PLANNING
ABUTMENT DETAILS NO. 1
DRAWING NO. BR-7 SHEET NO. 36 TOTAL 44

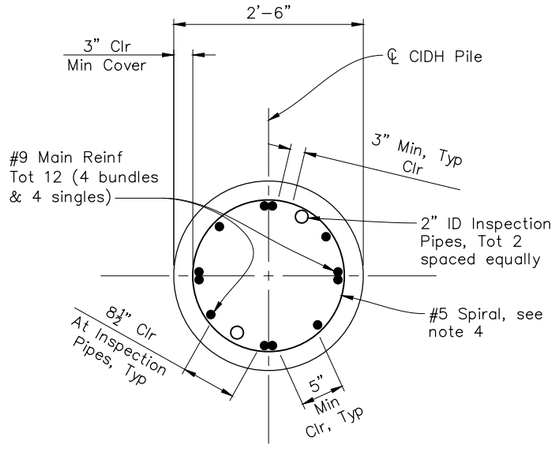


30" DIA CIDH PILE ELEVATION

3/4" = 1'-0"

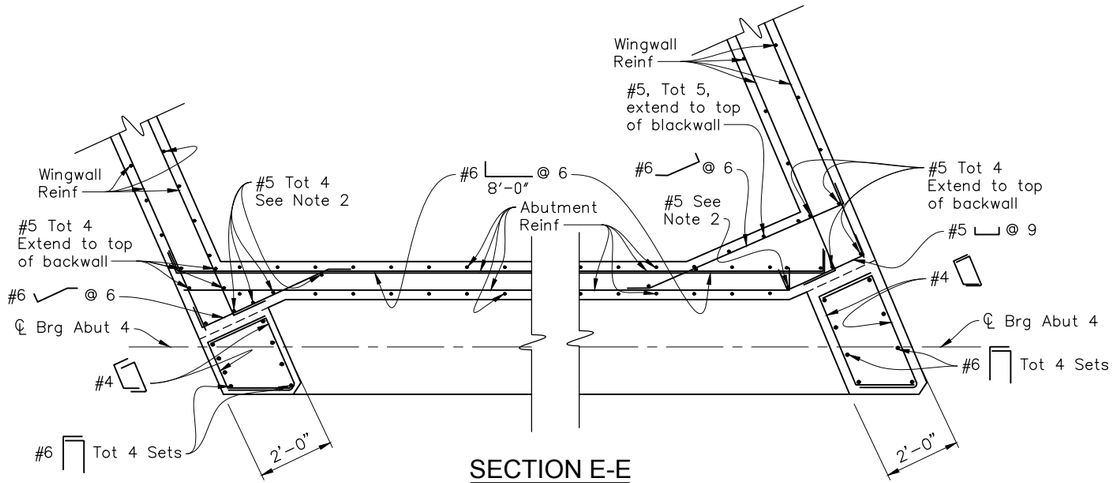
Notes:

1. For location of Section E–E and F–F, see "Abutment 4 Layout" sheet.
2. Extend from top of backwall to 2'–0" below abutment seat elevation.
3. Extend into footing and terminate 2" below seat elevation unless otherwise noted.
4. Spiral Termination to have an extra with $\frac{1}{2}$ the pitch in addition to a 90 degree hook extended through the column core.
5. No splices allowed in a main pile reinforcement.



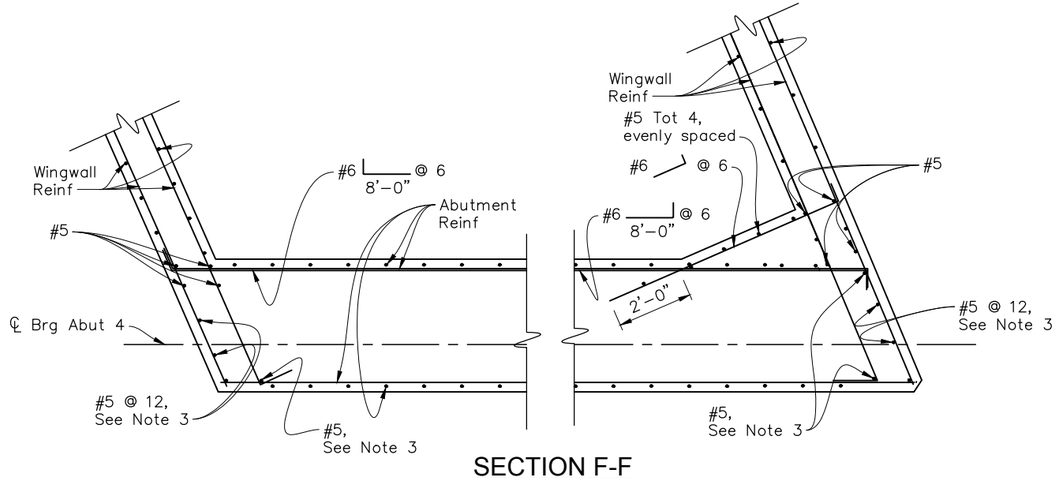
SECTION G-G

1" = 1'-0"



SECTION E-E

1/2" = 1'-0"



SECTION F-F

1/2" = 1'-0"

60% SUBMITTAL, NOT FOR CONSTRUCTION

\\CONSOR.LOCAL\FILES_V-TPD\PROJECTS\CA\FRESNO COUNTY\2020\D2078820CA.01\500-DESIGN\505 - CADD FILES\BRIDGE\D2078820A-F-A01DT02.DWG 5/14/2024 2:44 PM - JACOB ITEN

	DATE	RECORD DRAWING	
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	DATE
DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE: HORIZ 0 10' 20' / VERT 0 1' 2'

PROJECT ENGINEER _____ DATE _____

REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD

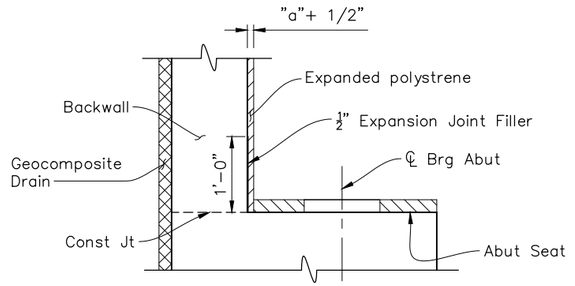
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

DEPARTMENT OF PUBLIC WORKS AND PLANNING

ABUTMENT DETAILS NO. 2

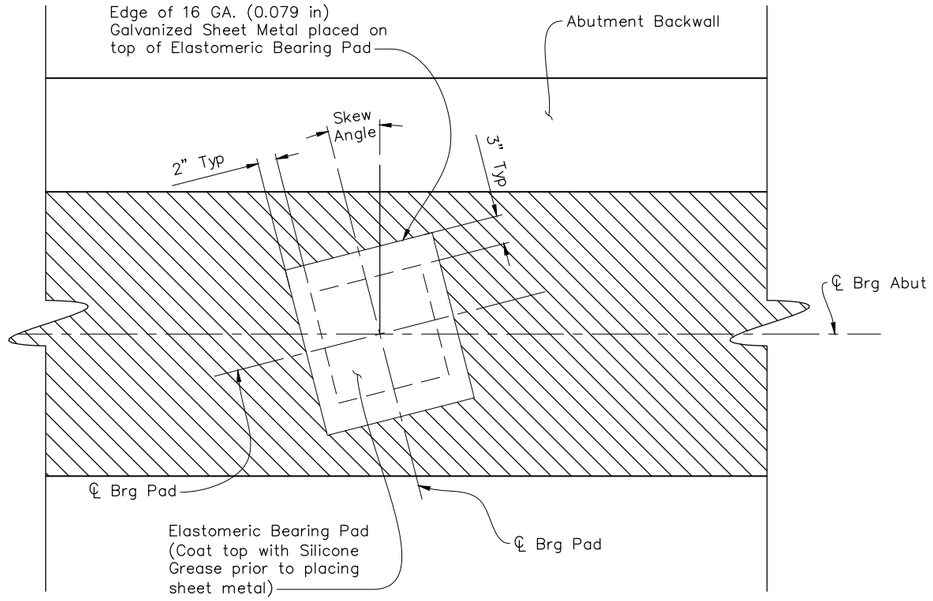
DRAWING NO. BR-8 SHEET NO. 37 TOTAL 44



BACKWALL BASE DETAIL

B6-21

No Scale



BEARING PAD DETAIL

No Scale

60% SUBMITTAL, NOT FOR CONSTRUCTION

	DATE	RECORD DRAWING	
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	DATE
DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE

HORIZ 0 10' 20'

VERT 0 1' 2'

PROJECT ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT

PROJECT ON LOST HILLS ROAD

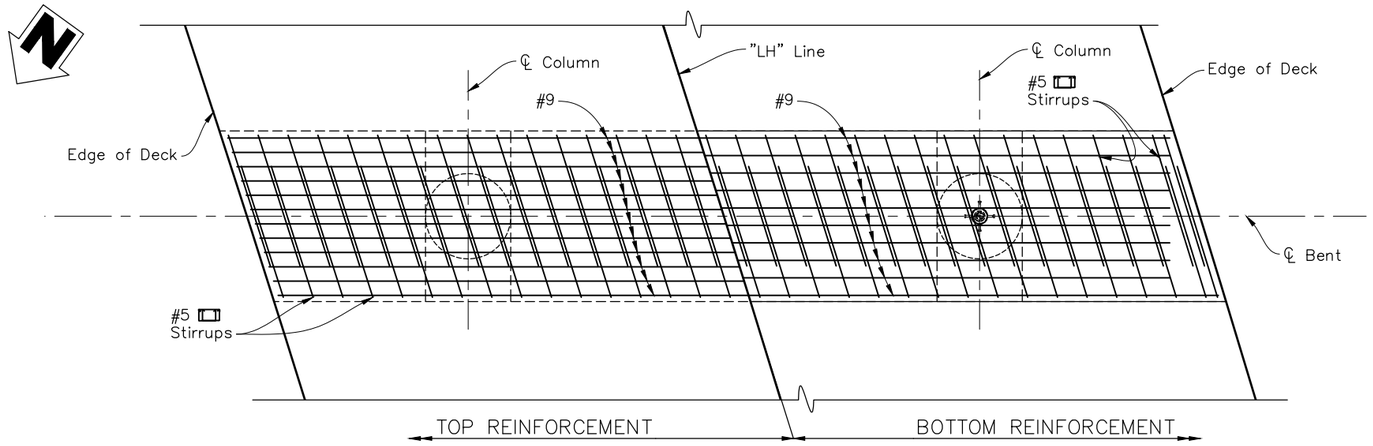
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

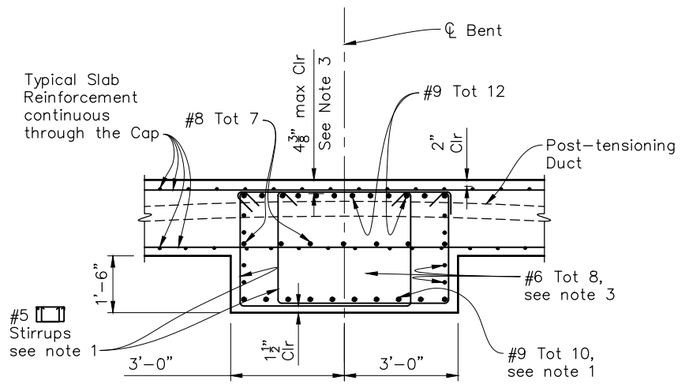
DEPARTMENT OF PUBLIC WORKS AND PLANNING

ABUTMENT DETAILS NO. 3

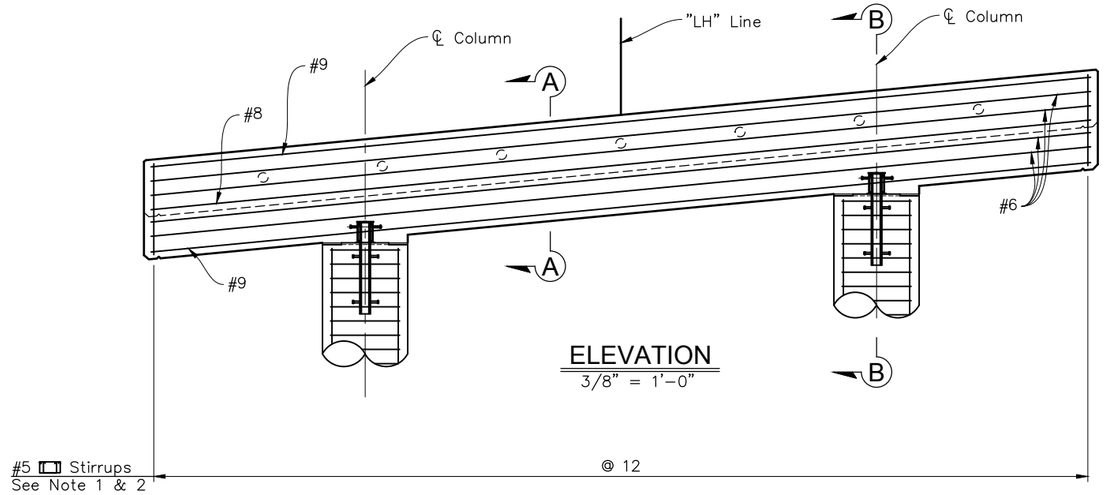
DRAWING NO. BR-9 SHEET NO. 38 TOTAL 44



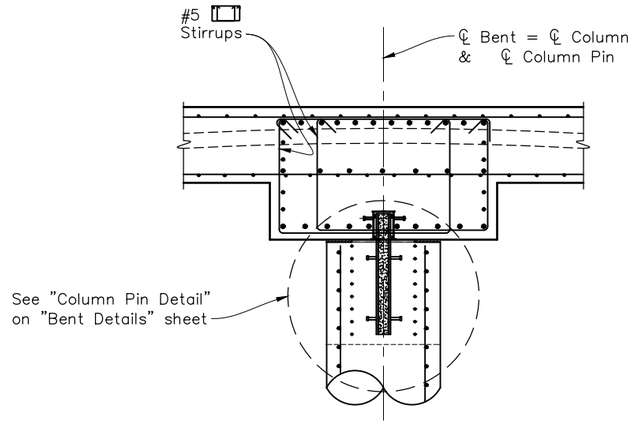
PLAN
3/8" = 1'–0"



SECTION A-A
1/2" = 1'–0"



ELEVATION
3/8" = 1'–0"



SECTION B-B
1/2" = 1'–0"
See Note 1 & 2

Notes:

1. Adjust location of Bent Cap reinforcement to allow placement of Column Pin.
2. Section details drawn showing level Bent Cap. Cap bearing surface shall protrude below cap soffit due to non–level cap, as shown in elevation view.
3. Adjust location of side and top main bent cap reinf to avoid conflicts with P/S ducts as needed, but maintain clear cover as shown.
4. No splices allowed in any main bent cap reinforcement.

Notes:

For details not shown, see Section A–A.

60% SUBMITTAL, NOT FOR CONSTRUCTION

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DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE
HORIZ 0 10' 20'
VERT 0 1' 2'

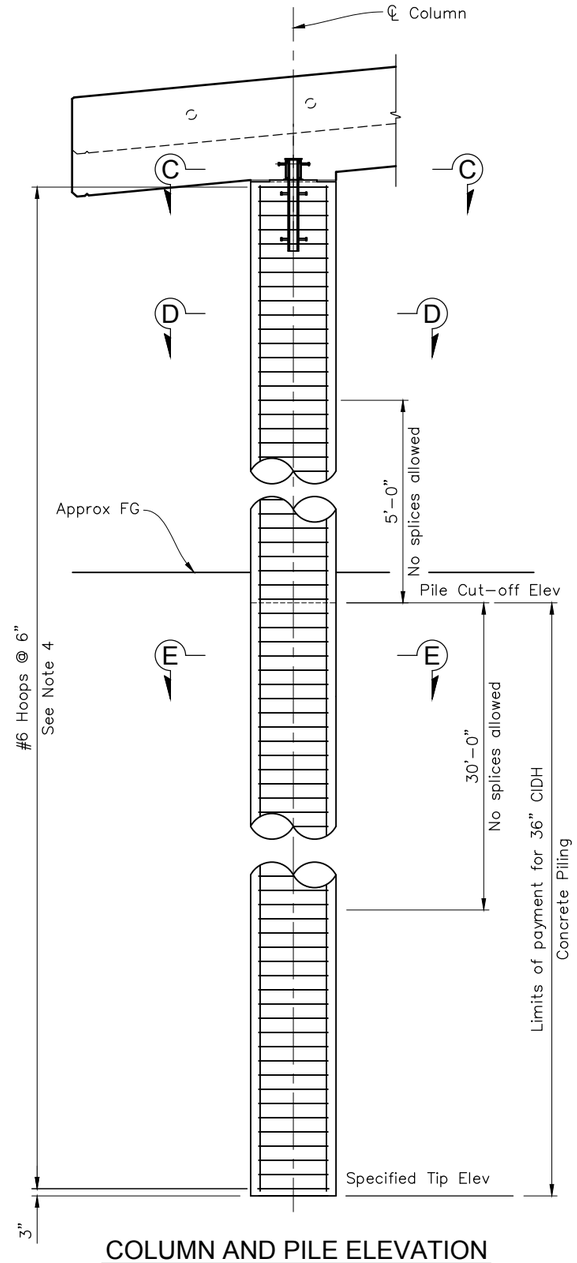
PROJECT ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER JUAN C CRUZ No. 88803 CIVIL STATE OF CALIFORNIA

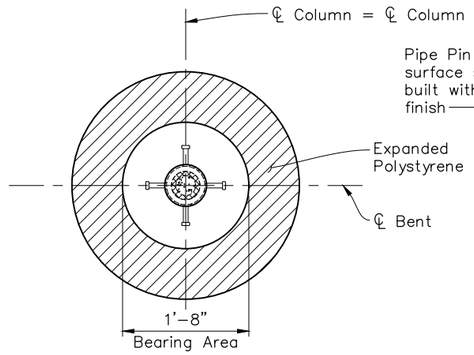
PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO 1856

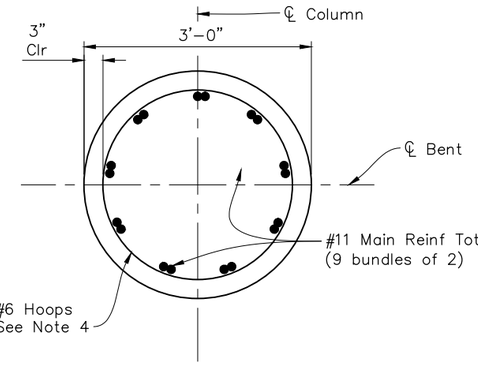
DEPARTMENT OF PUBLIC WORKS AND PLANNING
BENT LAYOUT
DRAWING NO. BR-10 SHEET NO. 39 TOTAL 44



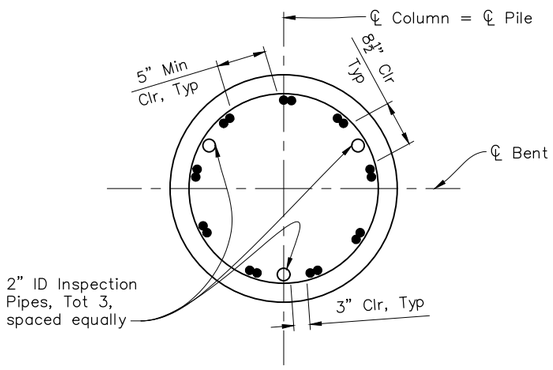
COLUMN AND PILE ELEVATION
3/8" = 1'–0"



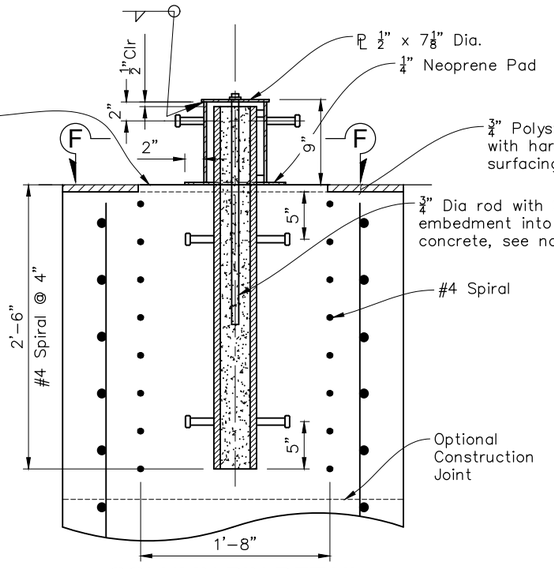
SECTION C-C
1" = 1'–0"



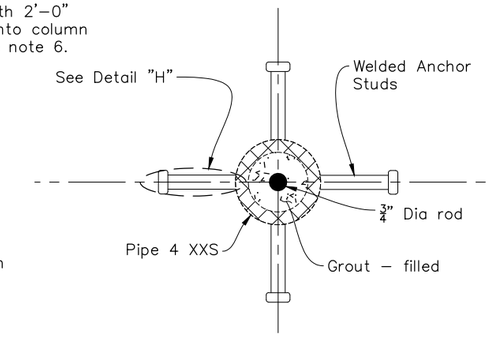
SECTION D-D
1" = 1'–0"



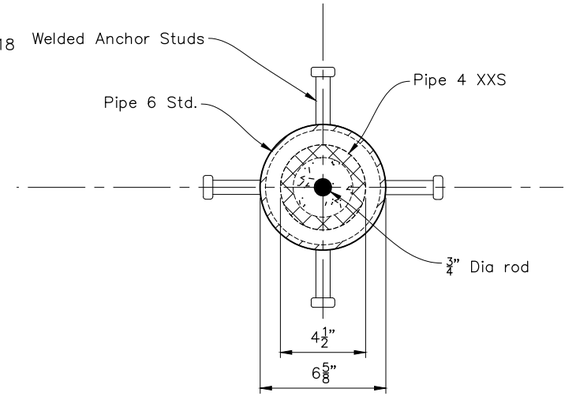
SECTION E-E
1" = 1'–0"



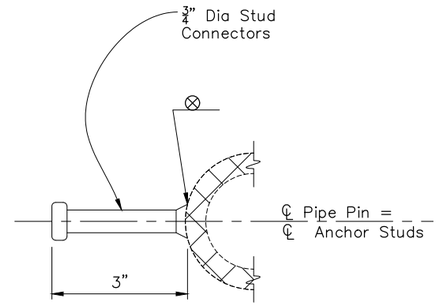
COLUMN PIN DETAIL
1 1/2" = 1'–0"



PLAN
3" = 1'–0"



SECTION F-F
3" = 1'–0"



DETAIL "H"
No Scale

Notes:

1. Galvanized pipe pin components, excluding inner spiral in column after fabrication.
2. Outer pipe to seat tightly against ¼" thick neoprene gasket placed on concrete around pin.
3. Typical Column and CIDH Pile reinforcement shown.
4. All Hoops shall be "ULTIMATE" Butt spliced continuous.
5. Splices in main column and pile reinforcement where allowed must be "ULTIMATE" Butt splices.
6. ¾" nut to be hand tightened

60% SUBMITTAL, NOT FOR CONSTRUCTION

	DATE	RECORD DRAWING	DATE
DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	
DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE
HORIZ 0 10' 20'
VERT 0 1' 2'

PROJECT ENGINEER ____ DATE

REGISTERED PROFESSIONAL ENGINEER JUAN C CRUZ No. 88803 CIVIL STATE OF CALIFORNIA

PROJECT
JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO 1856

DEPARTMENT OF PUBLIC WORKS AND PLANNING
BENT DETAILS
DRAWING NO. BR-11 SHEET NO. 40 TOTAL 44

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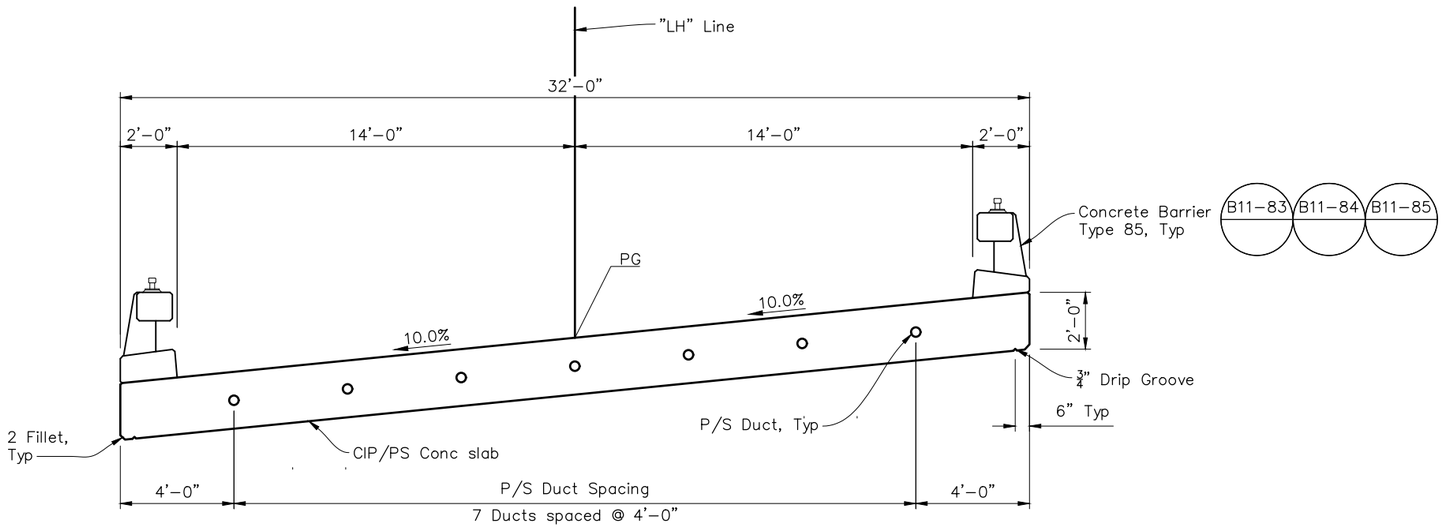
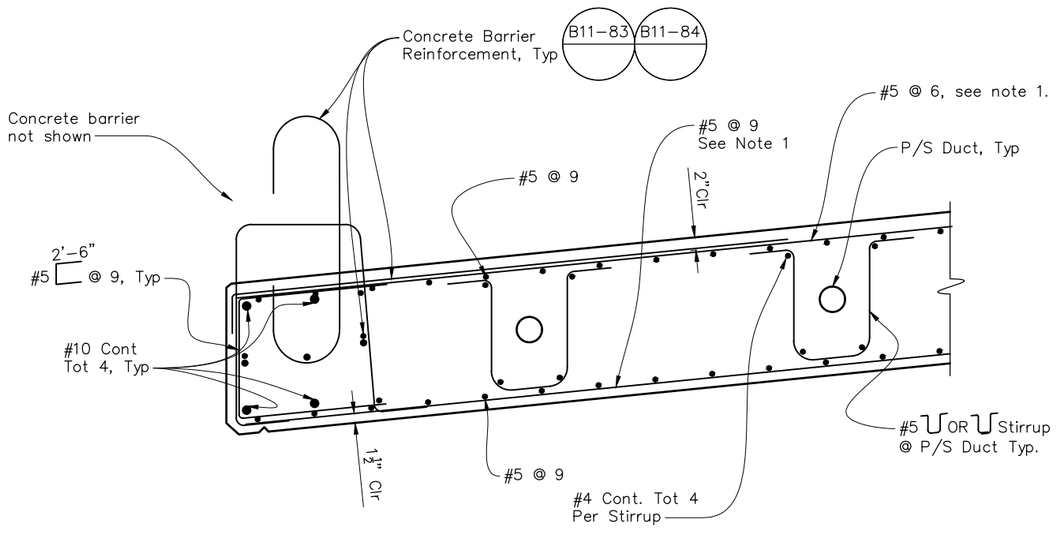


TYPICAL SECTION

3/8" = 1'-0"



PART TYPICAL SECTION

1" = 1'-0"

Notes:

1. Place transverse top and bottom reinforcement normal to and spaced along "LH" Line.

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CHECKED: .	.		

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SCALE

HORIZ 0 10' 20'

VERT 0 1' 2'

PROJECT ENGINEER _____ DATE _____

REGISTERED PROFESSIONAL ENGINEER
JUAN C CRUZ
No. 88803
CIVIL
STATE OF CALIFORNIA

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT
PROJECT ON LOST HILLS ROAD

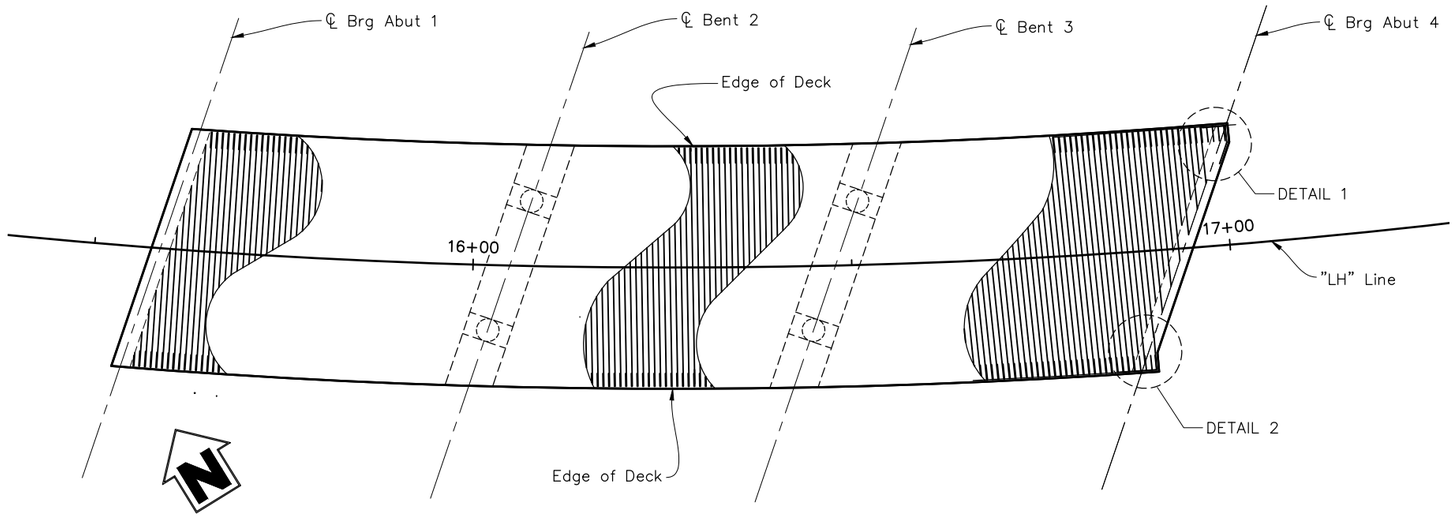
ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

DEPARTMENT OF PUBLIC WORKS AND PLANNING

TYPICAL SECTION

DRAWING NO. BR-12 SHEET NO. 41 TOTAL 44



SLAB TRANSVERSE REINFORCEMENT

No Scale

Notes:

For "Detail 1" and "Detail 2" see "Concrete Slab Details" sheet.

PRESTRESSING NOTES

270 KSI Low Relaxation Strand:

P_{jack}	= 4650 kips
Anchor set	= $\frac{3}{8}$ in
Total Number of P/S Ducts	= 7

Distribution of prestress force (P_{jack}) between girders shall not exceed the ratio of 10:9.

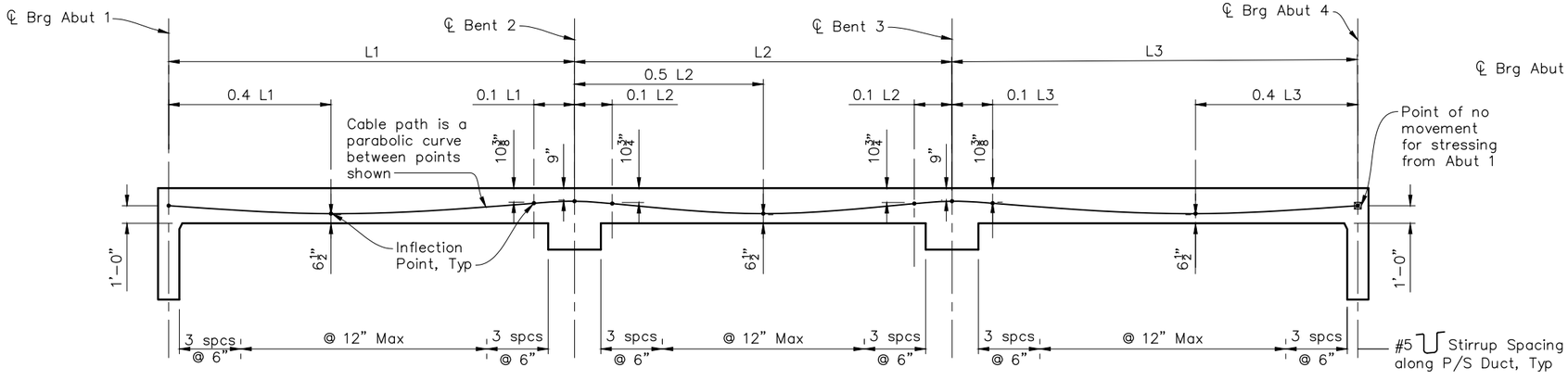
Concrete: f'_c =4.0 psi @ 28 days

f'_{ci} =3.5 psi @ time of stressing

Contractor shall submit elongation calculations based on initial stress at

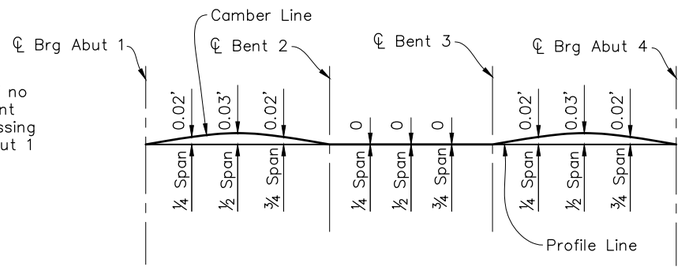
☒ =0.894 times jacking stress.

One end stressing shall be performed from either end.



LONGITUDINAL ELEVATION

No Scale



CAMBER DIAGRAM

No Scale

DOES NOT INCLUDE ALLOWANCE FOR FALSEWORK SETTLEMENT.

60% SUBMITTAL, NOT FOR CONSTRUCTION

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DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

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SCALE

HORIZ 0 10' 20'

VERT 0 1' 2'

PROJECT ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER — JUAN C CRUZ — No. 88803 — CIVIL — STATE OF CALIFORNIA

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT

PROJECT ON LOST HILLS ROAD

ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO

DEPARTMENT OF PUBLIC WORKS AND PLANNING

LONGITUDINAL SECTION

DRAWING NO. BR-13 SHEET NO. 42 TOTAL 44

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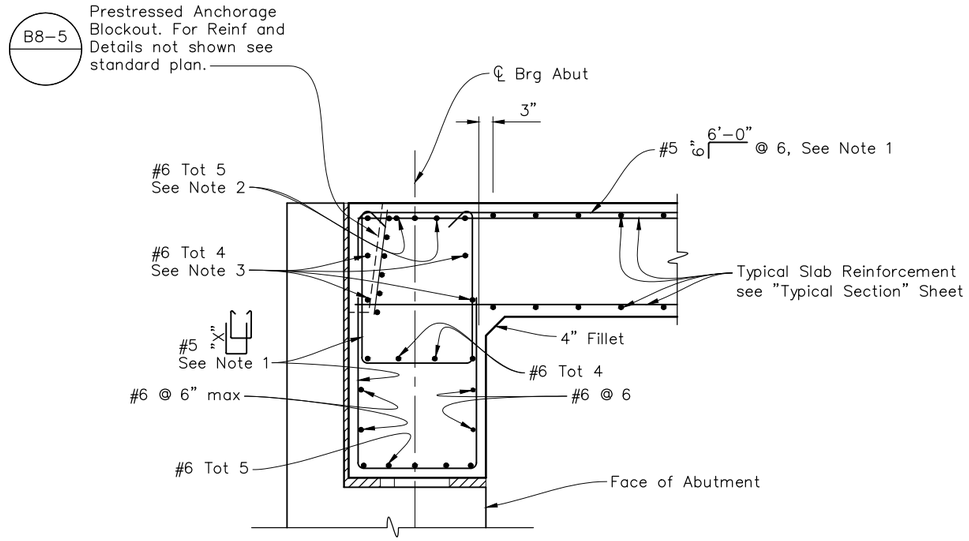


TYPICAL END DIAPHRAGM SECTION

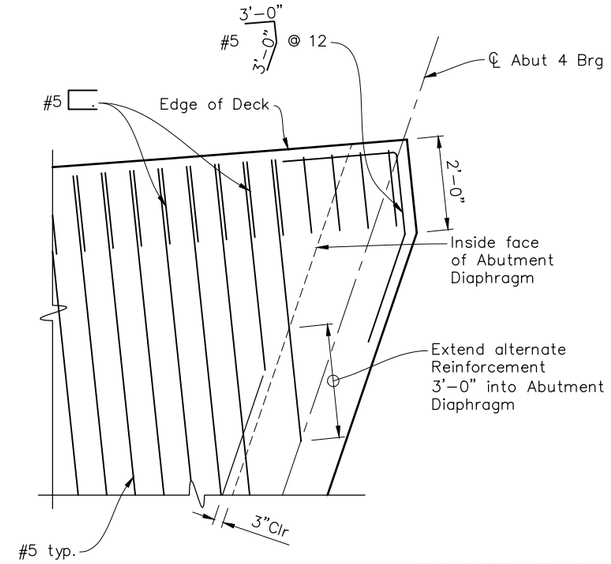
3/4" = 1'–0"

Notes:

1. Place parallel to main slab reinforcement and space along abutment centerline.

2. Extend bars to edge of deck, placing parallel to abutment centerline and below typical slab transverse top reinforcement.

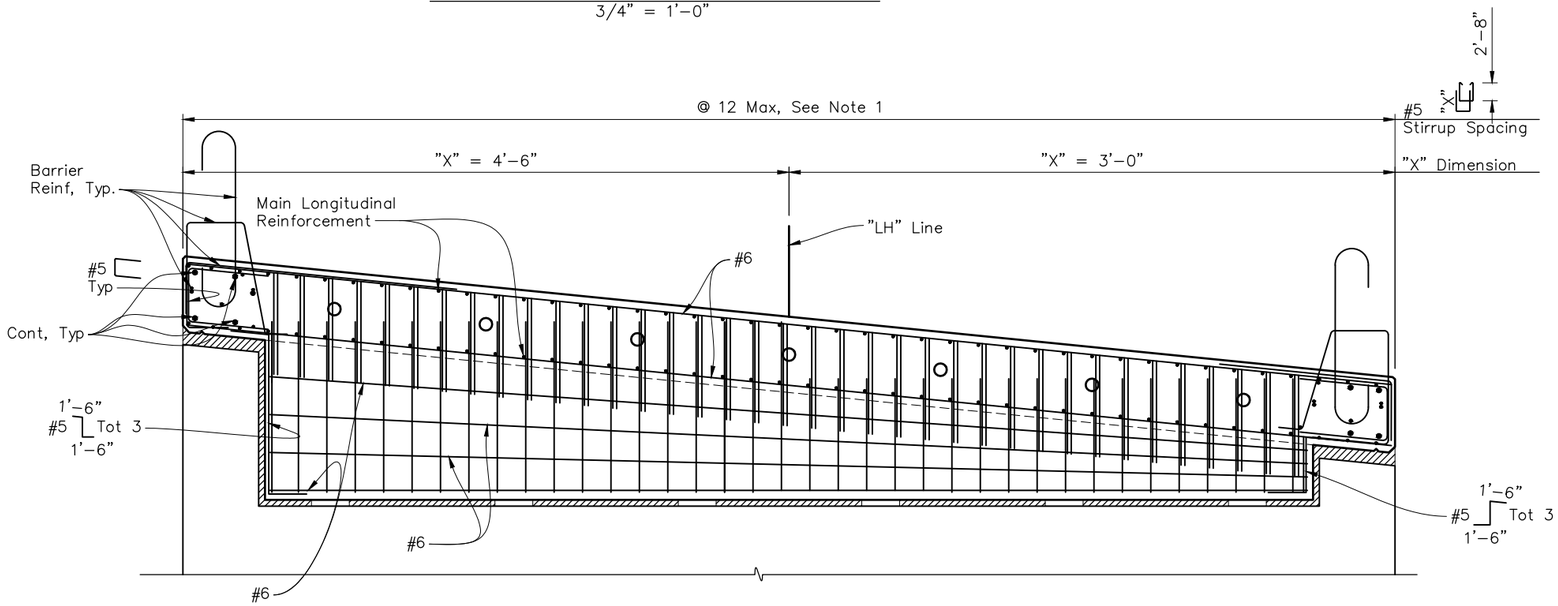
3. Extend bars to edge of deck, placing parallel to abutment centerline and above typical slab transverse bottom reinforcement.



DETAIL 1

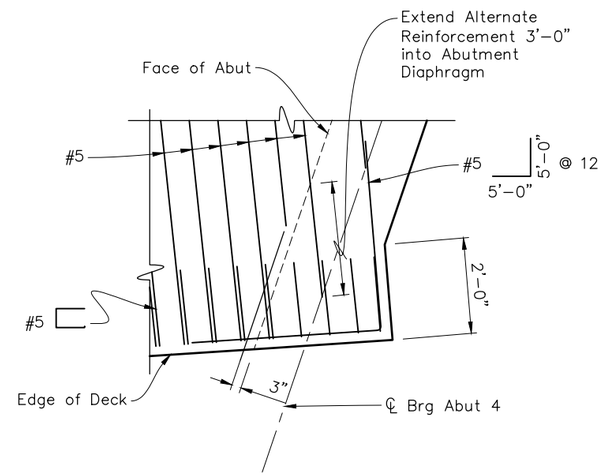
No Scale

Note: Additional barrier reinforcement in slab not shown for clarity.



END DIAPHRAGM ELEVATION

1/2" = 1'–0"



DETAIL 2

No Scale

Note: Additional barrier reinforcement in slab not shown for clarity.

60% SUBMITTAL, NOT FOR CONSTRUCTION

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DESIGNED: J.ITEN/J.CRUZ	3/15/24	RESIDENT ENGINEER	DATE
DRAWN: P.KENNEY	3/15/24		
CHECKED: .	.		

FOR RIGHT OF WAY DATA AND ACCURATE ACCESS DETERMINATION, SEE DOCUMENTS IN THE DEPARTMENT OF PUBLIC WORKS AND PLANNING.

SCALE

HORIZ 0 10' 20'

VERT 0 1' 2'

PROJECT ENGINEER _____ DATE _____

REGISTERED PROFESSIONAL ENGINEER JUAN C CRUZ No. 88803 CIVIL STATE OF CALIFORNIA

PROJECT

JACALITOS CREEK BRIDGE REPLACEMENT

PROJECT ON LOST HILLS ROAD

ROAD NO. M2820 BRIDGE NO. 42C0078

THE COUNTY OF FRESNO 1856

DEPARTMENT OF PUBLIC WORKS AND PLANNING

CONCRETE SLAB DETAILS

DRAWING NO. BR-14 SHEET NO. 43 TOTAL 44

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