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GEOTECHNICAL ENGINEERING INVESTIGATION
BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

For

MARK THOMAS & COMPANY, INC.
90 Archer Street
San Jose, CA 95112

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Job No. 204124.10

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GEOTECHNICAL ENGINEERING INVESTIGATION
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1.0 INTRODUCTION

This report presents the results of our geotechnical engineering investigation for the proposed Bay Trail Slough Bridge project at the western end of Davis Street in the City of San Leandro, California. Our work was performed generally in accordance with the scope of work as per our agreement. The general location of the site and its vicinity are shown on the Project Vicinity Map, Plate 1.

The geotechnical recommendations presented in this report are intended for design input and are not intended to be used as specifications. These recommendations should not be used for bidding purposes or directly for construction cost estimates.

2.0 PURPOSE AND SCOPE

The purpose of this investigation was to evaluate the general soil conditions at the project site, to evaluate their engineering properties and to provide recommendations for foundation support and trail construction of the proposed project.

The scope of work performed for this investigation included a review of the readily available soils and geologic literature pertaining to the site, obtaining representative soil samples and logging soil materials encountered in three exploratory borings, laboratory testing of the collected samples, engineering analysis of the field and laboratory data, and preparation of this report. The basis for

this investigation is a set of preliminary plans provided by Mark Thomas & Company, Inc. We have presented the descriptive log of the borings in Appendix A.

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 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 construction. Our recommendations in this report are based on the above information. Any major deviation should be reported to this office for consideration.

3.0 PROPOSED CONSTRUCTION

The project consists of a new 335-foot pedestrian/bicycle bridge over the San Leandro Slough and a 600-foot Class I bicycle trail connecting the existing trail system adjacent to the Galbraith Golf Course and the Oyster Bay Regional Park. The proposed bridge will be a four-span prefabricated steel truss structure supported on 3 piers. Per discussion with the designer, it is planned to support the bridge abutments on 12-inch square precast/prestressed (PC/PS) concrete piles (or 14-inch diameter closed-end steel pipe piles filled with concrete), and the piers on 48-inch diameter Cast-In-Steel-Shell (CISS) pile-columns. The proposed bicycle trail will be constructed by widening the existing maintenance access road extending from the existing trail system north of the project site to the north abutment of the new bridge. The existing maintenance access road along which the proposed bicycle trail is to be constructed, is a 13.5-foot wide top of a levee separating the Port of Oakland property on the north side and a sedimentation pond on the south

side. Per the designer, widening of the access road will be done along the outboard levee slope on the north side (i.e., Port of Oakland side) by placing lightweight engineered fill which will be contained by a soldier pile and lagging wall system in order to minimize the potential of levee slope failure due to additional surcharge imposed by the fill.

The proposed bridge and trail widening is to be designed by Mark Thomas & Company, Inc.

4.0 SITE CONDITIONS

The existing terrain in the vicinity of the project site is generally level, and elevations range from approximately Elev. 10.5 feet at the northern end of the proposed trail to Elev. 13 feet at the north abutment of the proposed bridge; and to Elev. 18.3 feet at the south abutment of the proposed bridge. High tide water level (HWM) in San Leandro Slough is approximately at Elev. 10 feet, and mudline of San Leandro Slough is approximately 5 to 6 feet below high tide water level (i.e., approximately at Elev. 5 to 4 feet). The outboard levee slope of the existing trail on the north side (i.e., Port of Oakland side) is about 3.3H:1V, the slough bank slope near the north abutment is about 2H:1V, and near the south abutment is about 2.7H:1V. Surface of the slough bank slopes are covered with rip-rap and fill materials with sporadic mid-height plants and trees. Mid-height aquatic plants and dense aquatic grass exist along the waterline of the north slough bank. Overhead power lines exist along the trail of the north slough levee and other underground utility lines along the trail of both north and south slough levees.

5.0 FIELD EXPLORATION

Based on the plans, discussions with design engineer, two borings were drilled on land to a depth

of 80.5 feet and 70.5 feet below the existing ground surface and one boring was drilled from a barge in the middle of San Leandro Slough during high tide to a depth of 80.5 feet below the slough mudline. In addition, there were five Cone Penetration Tests (CPT) performed along the proposed trail alignment to depths ranging from 11.5 to 100 feet, in order to supplement additional subsurface information for the trail widening design. The locations of the borings and CPTs are shown on Site Plan, Plate 2; and description of the materials and CPT results are shown on "Log of Test Borings" presented in Appendix A.

The test borings were advanced with a truck-mounted drill rig using rotary wash drilling and 8-inch diameter hollow stem augers. Boring No. B-1 was originally drilled to the first 30 feet using rotary wash drilling and due to the loss of drilling mud circulation in the fill materials, it was later changed to use 8-inch diameter hollow stem augers for the remainder of this boring and the other two borings. Selected samples were obtained from a 2.5-inch I.D. (Modified California) and a 1.375- inch I.D. (Standard Penetration Test) samplers at various depths. To expedite the drilling and sampling process, only Standard Penetration Test sampling was used in drilling BH-5 on barge in San Leandro Slough. The samplers were driven into subsurface soils under the impact of a 140-pound hammer having a free fall of 30 inches. The blow counts are presented on the "Log of Test Borings". (When correlating standard penetration data in similar soils, the blow counts for the Modified California Sampler can be taken as roughly twice that for the Standard Penetration Test in similar soils). The samples were sealed and transported to our laboratory for further evaluation and testing. The field investigation was conducted under the supervision of our field engineer who logged the test borings and prepared the samples for subsequent laboratory testing and evaluation.

Laboratory tests performed for the study include the following: Laboratory determination of

Moisture-Density (California Test Method T226), Grain Size Analysis (California Test Method T203), and Corrosion Test (California Test Method 643). The laboratory test methods and results are attached in Appendix B. Moisture-Density test results are summarized on the LOTB.

The bore logs presented in Appendix A were prepared from the field logs which were edited after visual re-examination of the soil samples in the laboratory and results of classification tests on selected soil samples as indicated on the logs. The abrupt stratum changes shown on these 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.

6.0 SUBSURFACE CONDITIONS

Based on boring data from available soil report pertaining to the project site and from test borings B-1 and B-5, and subsoils data from CPTs, the subsurface conditions at the project site near the bridge alignment consist of 12 to 25 feet of fill material, which is a mixture of medium stiff sandy clay, and medium dense clayey sand and sandy gravel. This fill layer is underlain by a thick layer (approximately 6 to 12 feet) of soft and medium to high plasticity silty clay of Younger Bay Mud. This soft clay layer of Younger Bay Mud extends across San Leandro Slough as the slough bed, and is in turn underlain by interbedded layers of medium stiff to very stiff silty clay and clayey silt and loose to medium dense clayey and silty sand to the maximum depth of exploration (80.5 feet). Based on test boring B-7 and subsoils data from CPTs, the subsurface conditions along the proposed trail north of the project site consist of medium stiff to very stiff lean clay and gravelly lean clay from the existing ground surface to approximately 70.5 feet of maximum depth of exploration. At a depth of about 28 feet, the subsoil is interbedded with an approximately 25- to

30-ft thick layer of medium dense to very dense silty sand and poorly-graded sand. Groundwater was measured due to the drilling method and *situation*. In our opinion, the groundwater level is anticipated to vary with the passage of time due to seasonal groundwater fluctuation, surface and subsurface flows, ground surface run-off, water elevation in San Leandro Slough and other factors that may not be present at the time of our investigation. For design purposes, the groundwater elevation was considered to be at Elevation 10± feet for areas near the bridge abutments. This groundwater elevation corresponds to the high tide water level (HWM) elevation (provided by the designer). For design of trial widening north of the project site, the groundwater at lower elevation can be considered.

7.0 GEOLOGY

General geologic features pertaining to the site were evaluated by reference to the Quaternary Geology of Alameda County, and Parts of Contra Costa, Santa Clara, San Mateo, San Francisco, Stanislaus, and San Joaquin Counties, California, by E.J. Helley and R. W. Graymer (USGS Map OF97-97, 1997). Based on the publication, the project site is generally underlain by a layer of artificial fill overlying basin, alluvial fan and fluvial deposits of Holocene age. This unit of deposits consists of a layer of Younger Bay Mud underlain by Older Bay Mud. The Younger Bay Mud is consisted of soft and semi-consolidated silty clay deposit and the Older Bay Mud is consisted of medium stiff to very stiff silty clay with varying amount of sand and fine gravel. A geologic map of the general project area is shown on Plate 3.

8.0 EARTHQUAKE CONSIDERATIONS

8.1 *Seismic Sources*

The project site is located in a seismically active part of northern California. Many faults existing in the San Francisco Bay Area are capable of producing earthquakes that may cause strong ground shaking at the site. Faults in the vicinity of the site with a moderate to high potential for surface rupture include the Hayward Fault, San Andreas / North Fault, San Gregorio – Palo Colorado Fault and Calaveras – Pacines – San Benito Fault. The attached Fault Map (Plate 4) presents the locations of the fault systems relative to the project site.

Maximum credible earthquake magnitudes for some of the major faults in the area determined by Mualchin (California Seismic Hazard Map 1996) are summarized below. These maximum credible earthquake magnitudes represent the largest earthquakes that could occur on the given fault based on the current understanding of the regional tectonic structure.

EARTHQUAKE DATA

Fault	Estimated Closest Distance to Site	Maximum Credible Earthquake	Anticipated Peak Bedrock Acceleration (g)
Hayward Fault (strike-slip) (HWD)	5 km	7.5	0.57
San Andreas / North Fault (strike-slip) (SAN)	24 km	8.0	0.29
San Gregorio – Palo Colorado Fault (strike-slip) (SGC)	35 km	7.5	0.16
Calaveras – Pacines – San Benito Fault (strike-slip) (CPS)	19 km	7.5	0.29

Based on the seismic hazard map prepared by Mualchin (1996) and Sadigh et. al. (1997) attenuation relationship, the governing fault for the structure is the Hayward Fault (a strike-slip fault, Mw = 7. 5) located at about 3.1 miles (5 km) from the site. The anticipated Peak Bedrock Acceleration (PBA) is 0.57 g based on Sadigh, et. al. (1997) attenuation relationship for rock site.

The subsoil conditions contain deep cohesive soils that do not fit the assumptions for Caltrans standard ARS curves in the Seismic Design Criteria (Version 1.3). Based on our previous experience in similar subsoil conditions, the site-dependent response spectrum developed at the University of California, Berkeley (Seed and Dickenson, 1994) is recommended for project design. This response spectrum was intended for relatively thick soft cohesive soils (Type E) under strong ground shaking. The recommended ARS Design curve is shown on Plate 5.

8.2 *Seismic Hazards/Liquefaction Potential*

Potential seismic hazards may arise from three sources: surface fault rupture, ground shaking and liquefaction. Since no active faults pass through the site, the potential for fault rupture is relatively low. Based on available geological and seismic data, the possibility of the site to experience strong ground shaking may be considered moderate to high.

Liquefaction is a phenomenon in which 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. Submerged, cohesionless sands and silts of low relative density are the type of soils usually susceptible to liquefaction. Clays are

generally not susceptible to liquefaction.

The current investigation indicates that some loose sand pockets/lenses at approximately Elevation -10 feet near the north abutment area may be subject to liquefaction. However, potential for surface manifestation in the form of ground failure is considered low.

9.0 FINDINGS AND RECOMMENDATIONS

9.1 *General*

Based on the findings of our investigation, it is our opinion that the site is feasible for the planned project provided the recommendations presented in this report are incorporated into the final design and construction.

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

9.2 *Bridge Foundations*

Based on the boring data and the information provided by designer, standard driven 12-inch square PC/PS concrete piles with design capacity of 25 tons (Caltrans Standard, Class 400C, Alt "X", 305 mm sq.) are recommended for abutment support, and 48-inch diameter

CISS pile-columns with design capacity of 100 tons are recommended for piers support. Should there be equipment height restrictions during concrete pile installation due to FAA air requirement, the PC/PS concrete piles for the abutments may be substituted with 14-inch diameter closed-end steel pipe piles filled with concrete (Caltrans Standard, Class 400C, Alt "V", pp360x4.55). Due to the corrosive nature of foundation soils and the marine environment nature at the project site, the Caltrans Standard Class 400C, Alt "X" or "V" piles are recommended and should be designed to resist or mitigate such adverse effects. The closed-end steel pipe piles (Alt "V") may have to be "mandrel driven" or driven in sections with field welding depending upon the height limitations. The recommended minimum pile spacing is 3 times the pile diameter (3D), and group effect may be neglected for vertical load per Caltrans design practice. The estimated specified tip elevations for the anticipated design loading of the piles are shown in the table below.

PILE DATA TABLE

Location	Pile Type	Design Loading (tons)	Nominal Resistance		Bottom of Pile / Pier Cap Elevation (feet)	Design Tip Elev. (feet)	Specified Tip Elev. (feet)
			Compression (tons)	Tension (tons)			
Abut 1	Class 400C Alt "X"	25	50	0	13.5	-29.5 (1); -29.5 (2)	-29.5
Abut 1	Class 400C Alt "V"	25	50	0	13.5	-29.5 (1); -29.5 (2)	-29.5
Pier 2	48-inch dia. CISS	100	200	0	13.2	-37.0 (1); -52.0 (2)	-52.0
Pier 3	48-inch dia. CISS	100	200	0	12.75	-37.0 (1); -52.5 (2)	-52.5

Pier 4	48-inch dia. CISS	100	200	0	12.15	-37.0 (1); -53.0 (2)	-53.0
Abut 5	Class 400C Alt "X"	25	50	0	11.4	-37.5 (1); -37.5 (2)	-37.5
Abut 5	Class 400C Alt "V"	25	50	0	11.4	-39.5 (1); -37.5 (2)	-37.5

Design Tip Elevation is controlled by the following demands: (1) Compression, (2) Lateral Load

Pile capacity estimation was based on procedures outlined in the "Design of Pile Foundations" by US Army Corps of Engineers (January 1991).

Difficult driving condition is anticipated at the abutment areas due to the dense sand, gravel and concrete rubble (fill) in the top 12 to 25 feet. Therefore, it is recommended that the upper 20 feet of the subsoils below the pile caps be predrilled at the abutments in accordance to Caltrans standard specifications (Section 49-1.06) prior to driving the concrete piles or the steel pipe piles.

Moderate driving condition is anticipated for the CISS piles at Piers 2, 3, and 4 across the San Leandro Slough. The inside of the CISS piles should be cleaned out and replaced with concrete and rebars to meet structural design requirements. Caltrans Standard Special Provisions for CISS piles are recommended. The depth of interior cleaning and concrete replacement will depend on the structural demands. It is recommended that a minimum of 10 feet of soil plug be left in the bottom portion of the shell to minimize the need for dewatering. In addition, a 3-foot thick layer of seal course should be used inside the steel shell to facilitate pile construction. The minimum wall thickness of the proposed 14-inch diameter closed-end steel pipe piles should be 0.18 inch and the 48-inch diameter CISS piles should be 0.75 inch.

The contractor should select pile driving hammer and equipment to drive the close-end steel pip piles and the CISS piles.

The pile capacity will derive from both frictional resistance along the pile shaft. It is anticipated that the pile capacity will develop after driving as a result of soil "freeze" and dissipation of excess pore water pressures. The gain of pile capacity after initial driving may be evaluated based on "redriving" after 24-hour (minimum) set-up.

In the event that unanticipated pile driving conditions are encountered, it is recommended that a Pile Driving Analyzer (PDA) be used to evaluate the pile capacity and integrity. Typical applications of the PDA include capacity evaluation (for both during driving and re-striking) and integrity testing for piles experienced hard driving. The Geotechnical Engineer should be consulted for any unanticipated pile driving conditions.

9.3 *Lateral Pile Capacity*

Lateral load analyses using LPILE program were performed under various loading conditions for the 12-inch square PC/PS concrete piles or 14-inch diameter closed-end steel pipe piles for the abutments and 48-inch diameter CISS pile-columns for the piers, considering free-head condition. For the pier piles, the design is governed by the seismic loading conditions. Plots of deflection, moment, shear and soil reaction together with typical input files are attached in Appendix C. Per recent discussion with Caltrans, group effect for lateral pile resistance analyses was accounted for by adopting a p-y reduction factor of 40% (60% effective) for a pile spacing of 3D. In addition, a p-y reduction factor

of 90% (10% effective) was applied to account for potential liquefaction in the loose sand layer at approximately Elev. -6.5 feet for piles at Abutment 5.

9.4 *Lateral Earth Pressure*

Abutment retaining walls and wing walls should be designed to resist the following Applied Lateral Earth Pressures and live load. These values assume no hydrostatic pore pressure buildup behind the wall and are based on well-drained backfill behind the walls supported in native soil.

Active Condition	36 pcf Equivalent Fluid Pressure (EFP) for engineered fill.
At-Rest Condition	55 pcf Equivalent Fluid Pressure (EFP) for engineered fill.
Passive Resistance	300 pcf EFP with a maximum value of 3,000 psf. 5.0 ksf (ultimate) for seismic design of the abutment backwall (5.5 feet high or greater); for activated height less than 5.5 feet modify proportionally, i.e. 5.0 ksf x (H/5.5) kPa per Caltrans SDC v.1.3. A minimum lateral wall movement of 2% of wall height to mobilize the full ultimate passive pressure is required.

Cantilever walls that are free to rotate at least 0.005 radian 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. The effect of any surcharge (dead or live load) should be added to the preceding lateral earth pressures. An active pressure coefficient of 0.3 may be used to determine the additional earth pressure resulting from the surcharge. When traffic is anticipated within a horizontal distance of one half of the wall height, Caltrans design practice is to add an equivalent earth pressure of not less than 2 feet of earth.

9.5 *Soldier Pile and Lagging Wall*

The proposed bicycle trail will be constructed by widening the existing maintenance access road extending from Station 16+38 to Station 22+38. Per the designer, widening of the access road will be done along the outboard levee slope on the north side (i.e., Port of Oakland side) by placing lightweight engineered fill which will be contained by a soldier pile and lagging wall system. Due to the sloping levee (approximately 3H:1V slope), a 10-foot setback to account for no lateral passive resistance is assumed resulting in an additional wall height of 3 feet in the soldier pile and lagging wall design. Based on different topographies and subsoil conditions along the road widening alignment, a 6-foot high wall system (including the additional 3 feet height from the setback) was assumed for areas from Station 16+38 to Station 16+62, an 8-foot high wall system was assumed for areas from Station 16+62 to Station 16+80, an 11-foot high wall system was assumed for areas from Station 16+80 to Station 18+12, and an 8-foot high wall system was assumed for areas from Station 18+12 to Station 22+38.

Per the designer, the embedded soldier piles will be 2-foot diameter Cast-In-Drilled-Hole (CIDH) concrete piles with maximum spacing of 6 feet on-center. Typical cross-sections and lateral pressure distributions for the 6-foot high wall (along Station 16+38 to Station 16+62) are presented on Plates 6A and 6B, respectively, for 11-foot high wall (along Station 16+80 to Station 18+12 on Plates 7A and 7B, and for 8-foot high wall (along Station 18+12 to Station 22+38 on Plates 8A and 8B. Due to the similar subsoil conditions in the vicinity, the 8-foot high wall system (along Station 16+62 to Station 16+80) can be designed by interpolating between the results of the 6-foot high wall and the 11-foot high wall as shown on Plates 6B and 7B.

Equivalent earth pressure resulting from traffic load, as shown on Plates 6B, 7B and 8B, should be added to the design. Other surcharge loads relevant to the project design should also be considered.

For protection of the existing levee and the new bicycle trail, no surcharge load of greater than 250 psf should be allowed during construction of the trail widening.

9.6 *Seismic Design Criteria*

Based on the seismic hazard map prepared by Mualchin (Caltrans, 1996) and Sadigh et. al. (1997) attenuation relationship, the governing fault for the structure is the Hayward Fault (a strike-slip fault, Mw = 7.5) located at about 3.1 miles (5 km) from the site. The recommended Peak Bedrock Acceleration for design is 0.57 g.

The seismic design parameters based on are as follows:

1. Governing Fault	=	Hayward Fault (a strike-slip fault, Mw = 7.5)
2. Distance to Fault	=	3.1 miles (5 km)
3. Peak Bedrock Acceleration	=	0.57 g
4. Soil Profile	=	E
5. ARS Design Curve	=	Site-dependent ARS based on Seed and Dickenson (1994) for thick soft cohesive soils (Type E) with Peak Ground Acceleration of 0.46 g.

A copy of the ARS Design Curve for the project is contained in Plate No. 5 of this report.

9.7 *Grading*

For the proposed trail widening, some grading is anticipated. All grading operations should be performed in accordance with the project specifications and Caltrans standards. A representative from our office or the regulatory agency should observe the grading operation and perform moisture and density tests on prepared subgrade and compacted fill material. Any fill material imported to the site should be non-expansive, relatively granular material and should be reviewed by the Geotechnical Engineer.

Should there be any alterations of the proposed construction that will affect the stated bases of our recommendations, we should be informed so that we can review such changes and amend or submit additional recommendations.

9.8 *Engineered Fill*

Engineered fill for the trail widening should be light-weight aggregate conforming to Caltrans specifications.

9.9 *Compaction of Fill and Subgrade*

The project specific recommendations for required compaction as per Caltrans standards are as follows:

- 90% for subgrade preparation, general fill and backfilling after removing buried utilities and depressions caused due to construction activities, etc.

- 95% for all engineered fill for structural backfill of bridge abutments and for upper 6 inches of pavement subgrade and aggregate base of pavement sections.

9.10 *Corrosion*

Corrosion tests were performed on representative samples collected from Borings B-1 and B-5 to determine the corrosion potential of the subsoil. The test results are summarized below.

Boring No.	Sample No.	pH	Resistivity (Ohm-cm)	Water Soluble Chloride Content (ppm)	Water-Soluble Sulfate Content (ppm)
B-1	#5 @ 31'	7.42	350	860.0	17.6
B-5	#1 @ 15'	8.16	180	2040.3	55.1

Based on the test data, the site is considered corrosive per Caltrans latest corrosion design guidelines. It is therefore recommended that all pile foundations for the pedestrian/bicycle bridge and soldier pile and lagging wall system for trail widening be designed per Caltrans Corrosion Guidelines (January 1996) for corrosion protection of the proposed structures. The effect of corrosion has been considered in foundation design for the closed-end steel pipe piles (Alt "V") as an alternative foundation at the abutments, and the 48-inch diameter CISS piles at the piers

9.11 *Plan Review*

We recommend that final plans for construction be reviewed by this office prior to construction so that the intent of our recommendations is included in the project plans and specifications and to further see that no misunderstandings or misinterpretations have ccurred.

9.12 *Construction Observation*

To a degree, the performance of any structure is dependent upon construction procedures and quality. Hence, observation of pile installation, subgrade preparation and embankment construction should be carried out by the regulating agencies. If the subsurface conditions different from those forming the basis of our recommendations is encountered this office should be informed in order to assess the need for design changes. Therefore, the recommendations presented in this report are contingent upon good quality control and these geotechnical observations during construction.

10.0 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 that 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 assist the engineer in the design of this project. 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 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.

Very Truly Yours,
PARIKH CONSULTANTS, INC.

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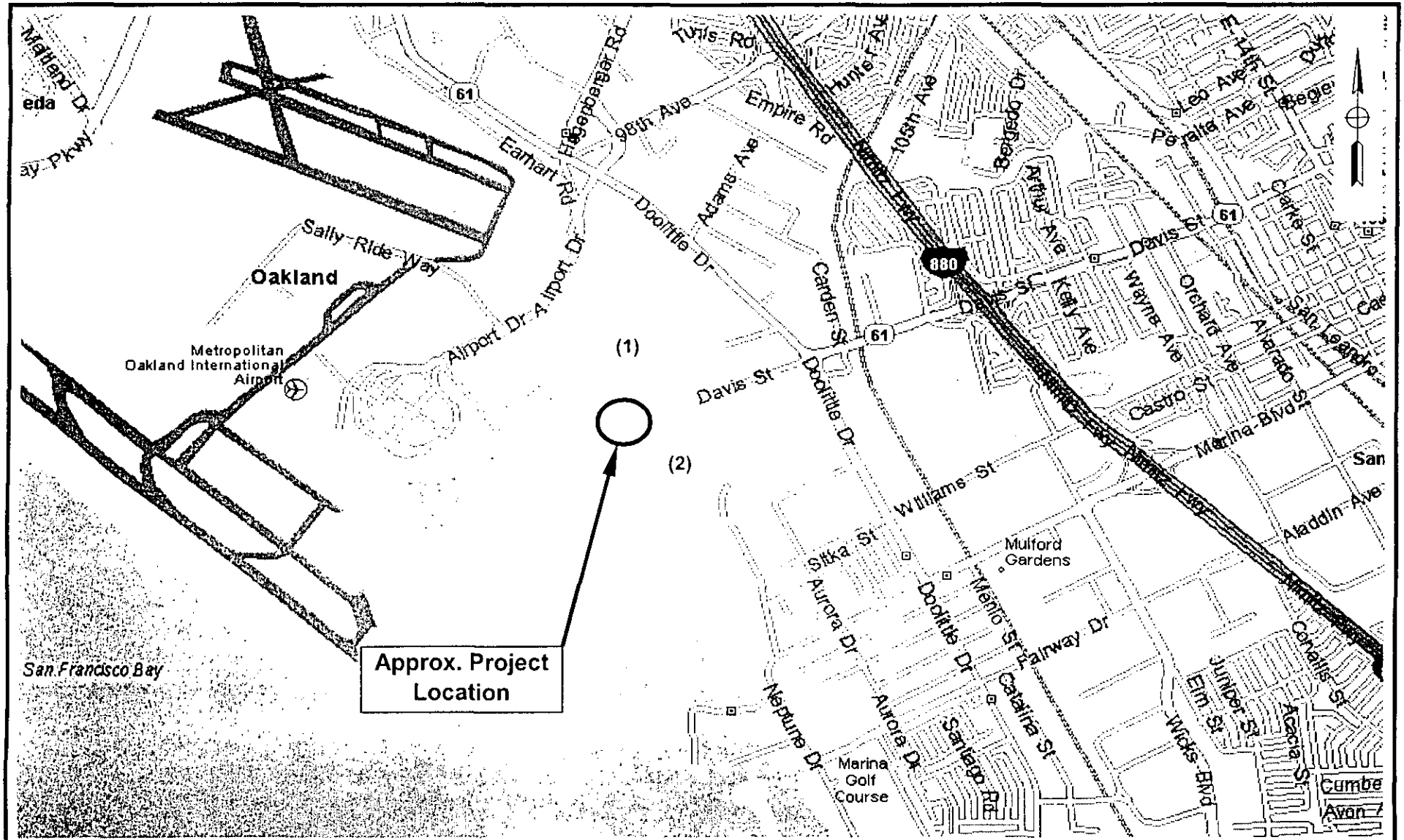


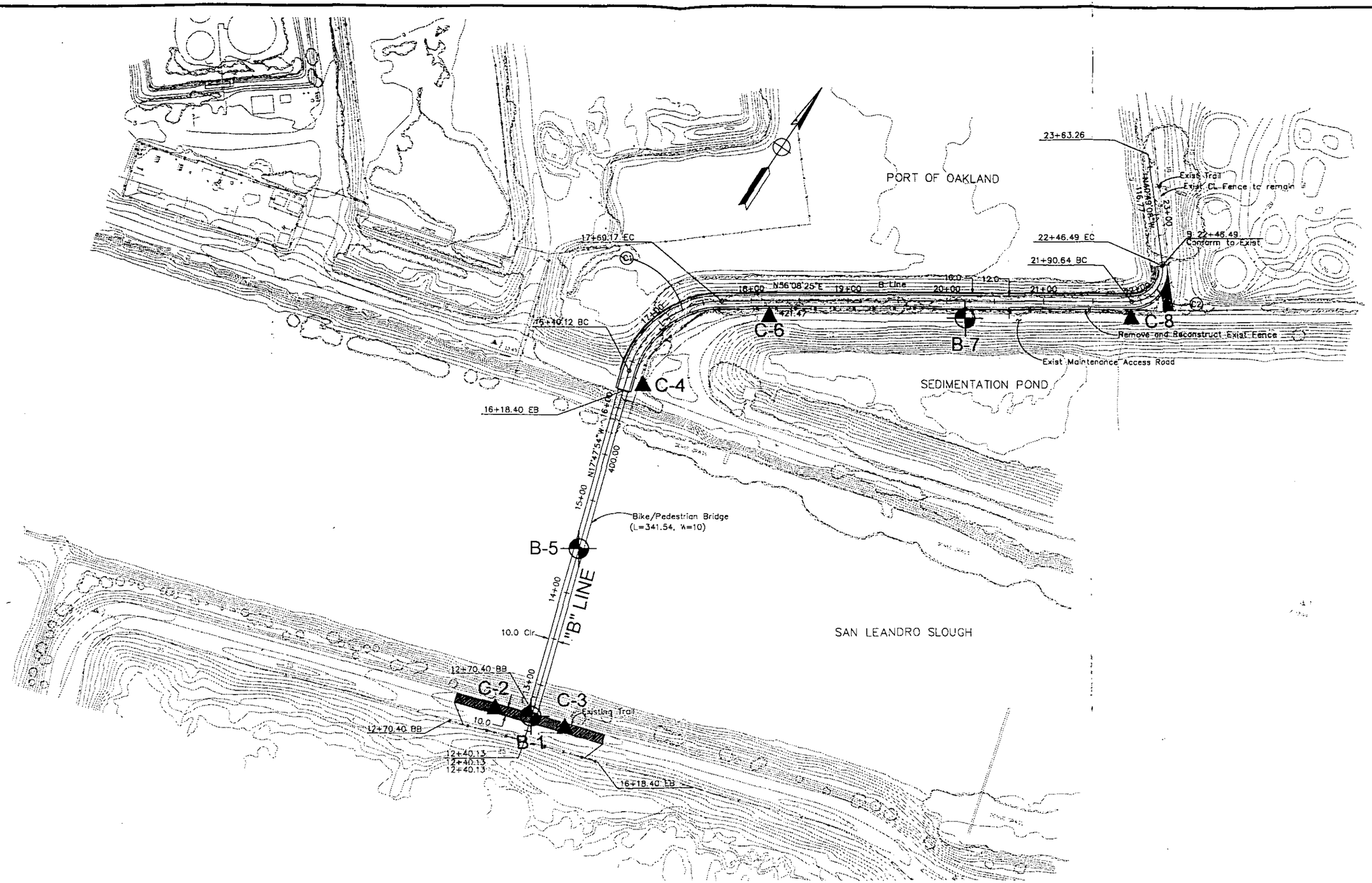
(1) Water Pollution Control Plan (W.P.C.P.)
(2) Oyster Bay Regional Park

PROJECT VICINITY MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

JOB NO.: 204124.10	PLATE NO.: 1



SITE PLAN

LEGEND

B-1 — Approx. Boring Location

C-1 — Approx. CPT Location

SCALE 1 inch = 100 feet

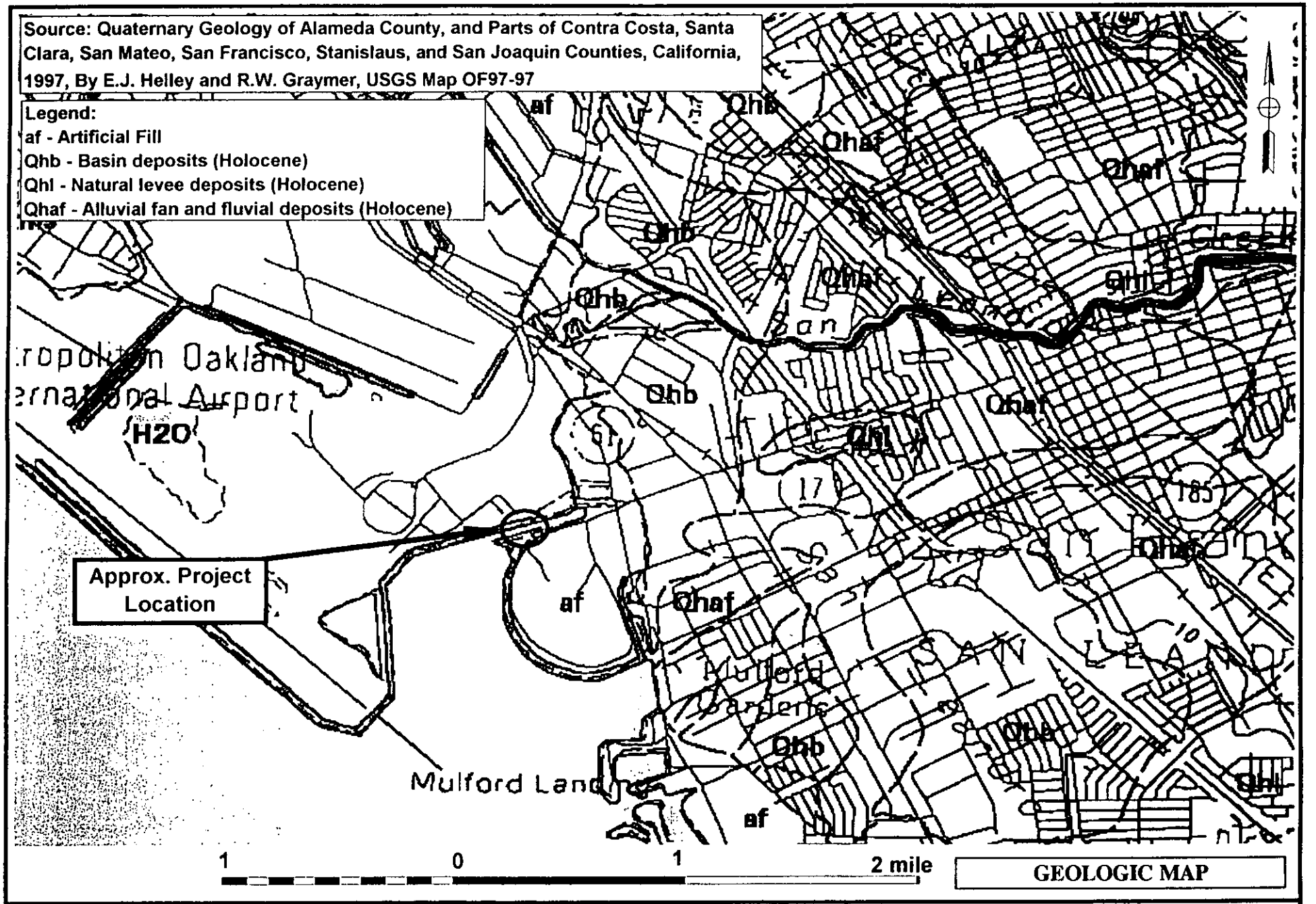
Note: All units are in feet unless otherwise specified
Reference Map was provided by Mark Thomas & Co.

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

JOB NO.:204124.10

PLATE NO: 2



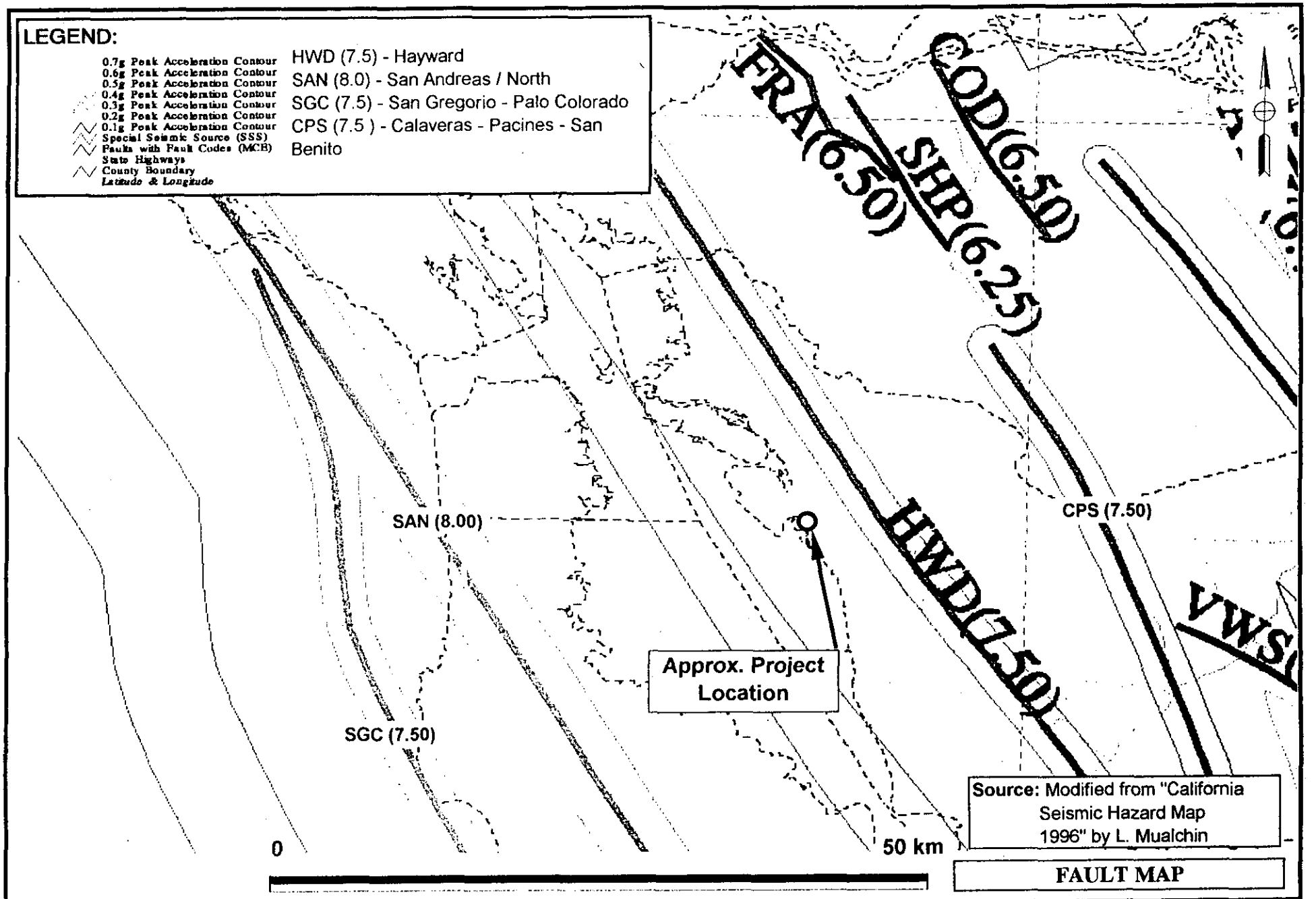
GEOLOGIC MAP

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

JOB NO.: 204124.10

PLATE NO.: 3



FAULT MAP

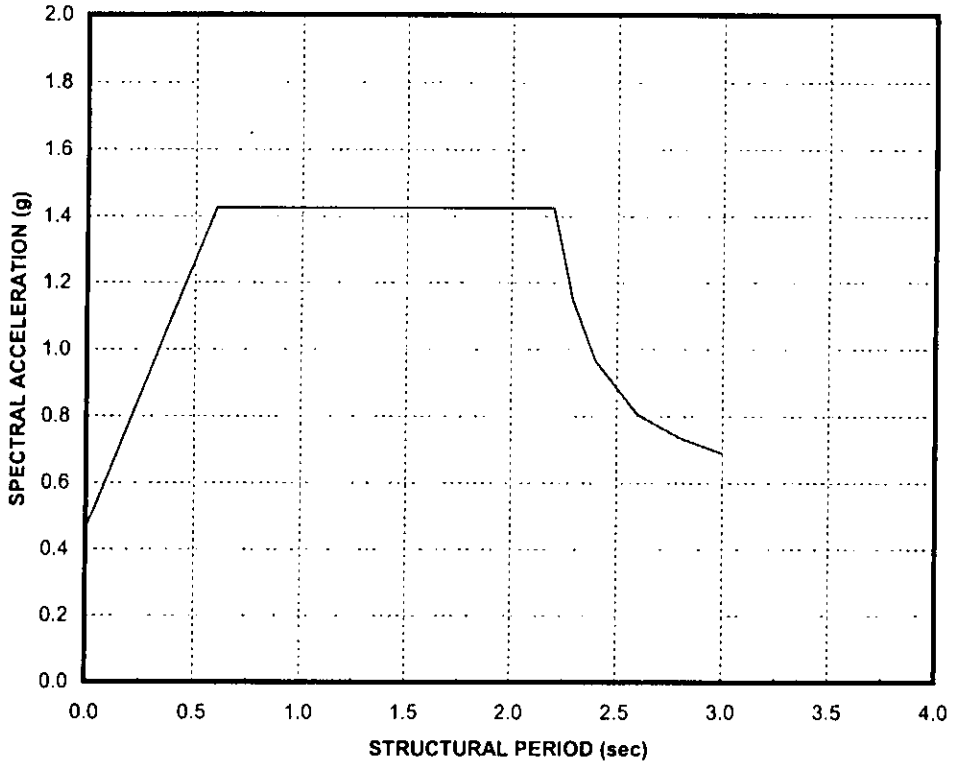
PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

JOB NO.: 204124.10

PLATE NO.: 4

ARS DESIGN CURVE - 5% Damping
BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

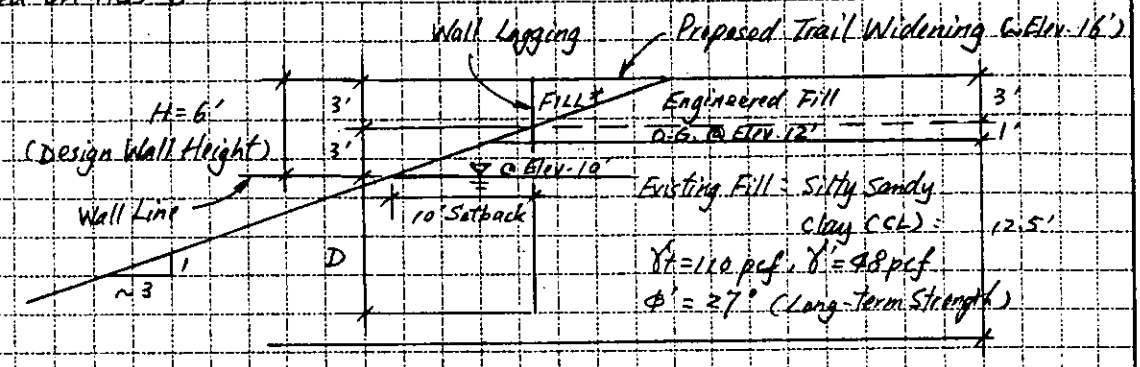


Spectral Data

Period (sec)	Sa/Ap Ratio	Spectral Accel. (g)
0.000	1.000	0.46
0.600	3.100	1.426
2.200	3.100	1.426
2.290	2.500	1.15
2.400	2.100	0.966
2.600	1.750	0.805
2.800	1.600	0.736
3.000	1.500	0.69

Governing Fault: Hayward Fault
(Mw = 7.5, Soil Profile Type E, PBA = 0.57 g, Peak Ground Acceleration = 0.46 g)

Generalized Trail Cross-Section (for 6-ft wall along Sta. 16+38 to Sta. 16+62)
(See p.12)
Based on AGS-B-1



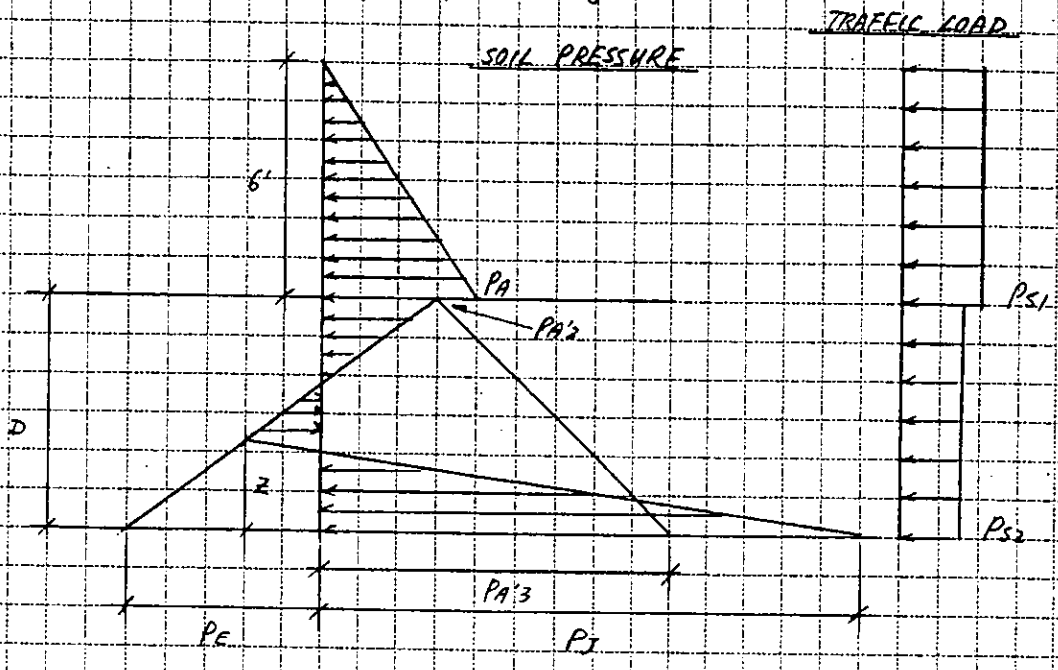
* FILL = Light-Weight engineered fill. Assume granular mat'l w/

$\gamma_t = 65$ pcf, $\phi' = 32°$ $\Rightarrow$ $K_A = \tan^2(45° - \frac{\phi'}{2}) = 0.30$

TYPICAL CROSS SECTION OF 6-FT-HT WALL
ALONG STATION 16+38 TO STATION 16+62

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	BAY TRAIL SLOUGH BRIDGE CITY OF SAN LEANDRO, CALIFORNIA	
	JOB NO.: 204124.10	PLATE NO.: 6A

Simplified Pressure Distribution for 6 ft Wall System:-



$P_A = 150\ psf$ * $P_{A'2} = f \cdot P_A = 0.72 \times 150\ psf = 108\ psf$ *

$P_{A'3} = P_{A'2} + f \cdot \gamma_3' \cdot D \cdot K_{A3} = 108 + 0.72 \times 48 \times 0.38 D = 108 + 13D\ psf$ *

$P_E = f \cdot \gamma_3' \cdot D (K_p' - K_{A3}) - P_{A'2} = 0.72 \times 48 (2.93 - 0.38) D - 108\ psf$

$\Rightarrow P_E = 88D - 108\ psf$ *

$P_J = f \cdot \gamma_3' \cdot D (K_p' - K_{A3}) + f \cdot \gamma \cdot H \cdot K_p = 88D + 0.72 (65 \times 3 + 110 \times 3) 2.93\ psf$

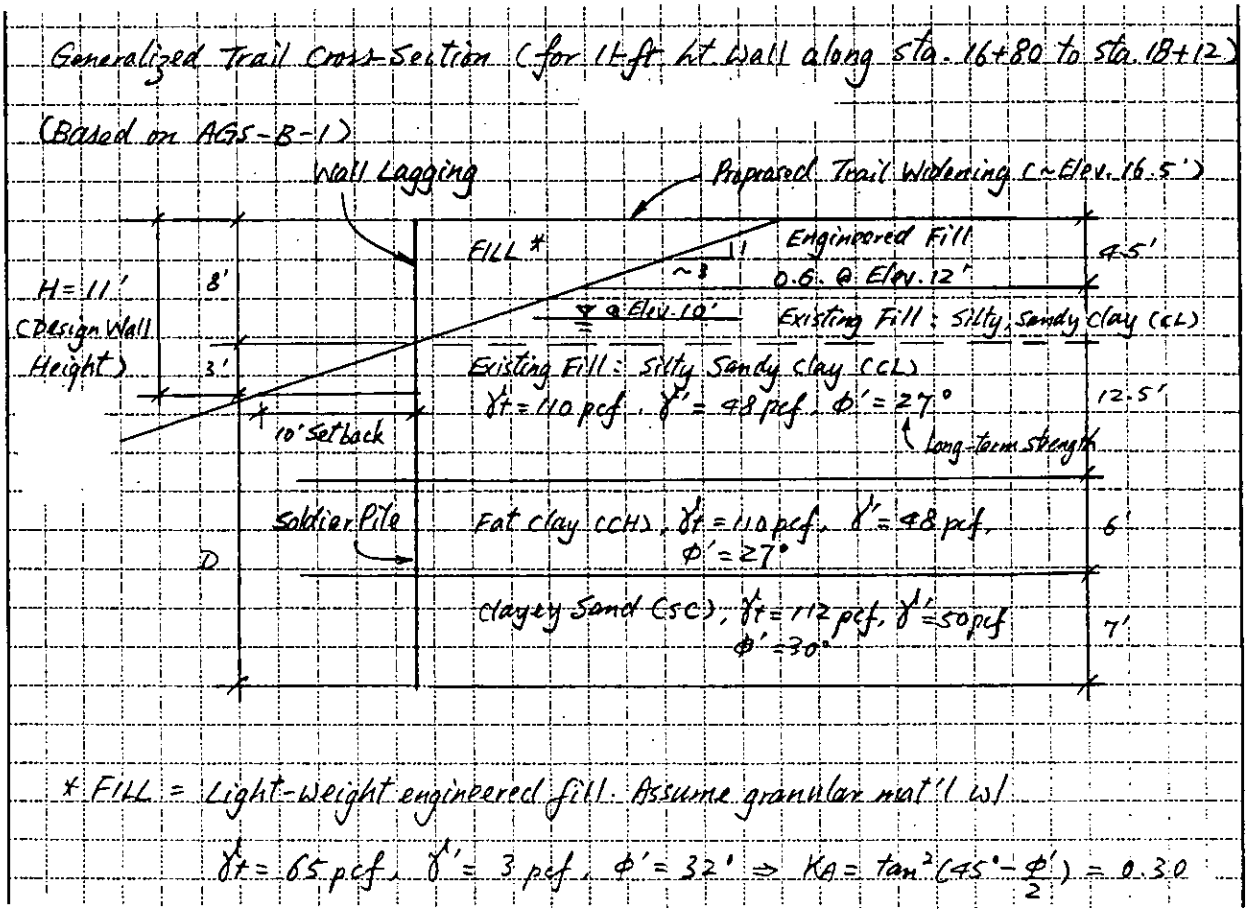
$\Rightarrow P_J = 88D + 1108\ psf$ *

$P_{S1} = 85\ psf$ * , $P_{S2} = 61\ psf$ *

* NOTE: Depth of embedment, D between Sta. 16+62 to Sta. 16+80 can be obtained by interpolating between results of 11' & 6' wall systems.

LATERAL PRESSURE DISTRIBUTION OF 6-FT-HT WALL ALONG STATION 16+38 TO STATION 16+62

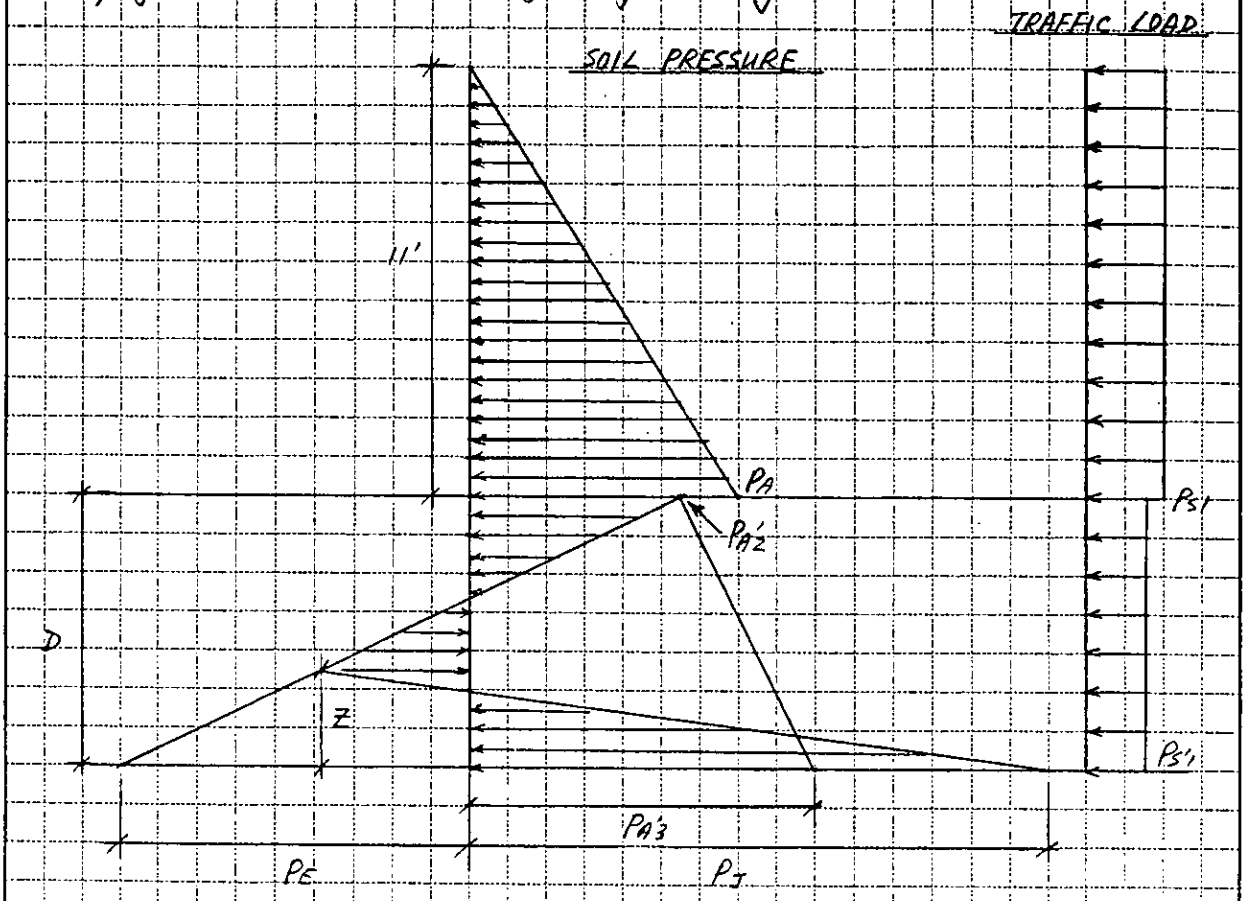
PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	BAY TRAIL SLOUGH BRIDGE CITY OF SAN LEANDRO, CALIFORNIA	
	JOB NO.: 204124.10	PLATE NO.: 6B



TYPICAL CROSS SECTION OF 11-FT-HT WALL ALONG STATION 16+80 TO STATION 18+12

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	**BAY TRAIL SLOUGH BRIDGE** **CITY OF SAN LEANDRO, CALIFORNIA**	
	JOB NO.: 204124.10	PLATE NO.: 7A

Simplified Pressure Distribution for 11 ft Wall System:



$P_A = 194\ psf$ ✱, $P_{A'2} = f \cdot P_A = 0.72 \times 194\ psf = 140\ psf$ ✱

$P_{A'3} = P_{A'2} + f \cdot \gamma_3' \cdot D \cdot K_{A3} = 140 + 0.72 \times 48 \times 0.38\ D = 140 + 13\ D\ psf$ ✱

$P_E = f \cdot \gamma_3' \cdot D\,(K_p' - K_{A3}) - P_{A'2} = 0.72 \times 48\,(2.93 - 0.38)\,D - 140\ psf$
$= 88\,D - 140\ psf$ ✱

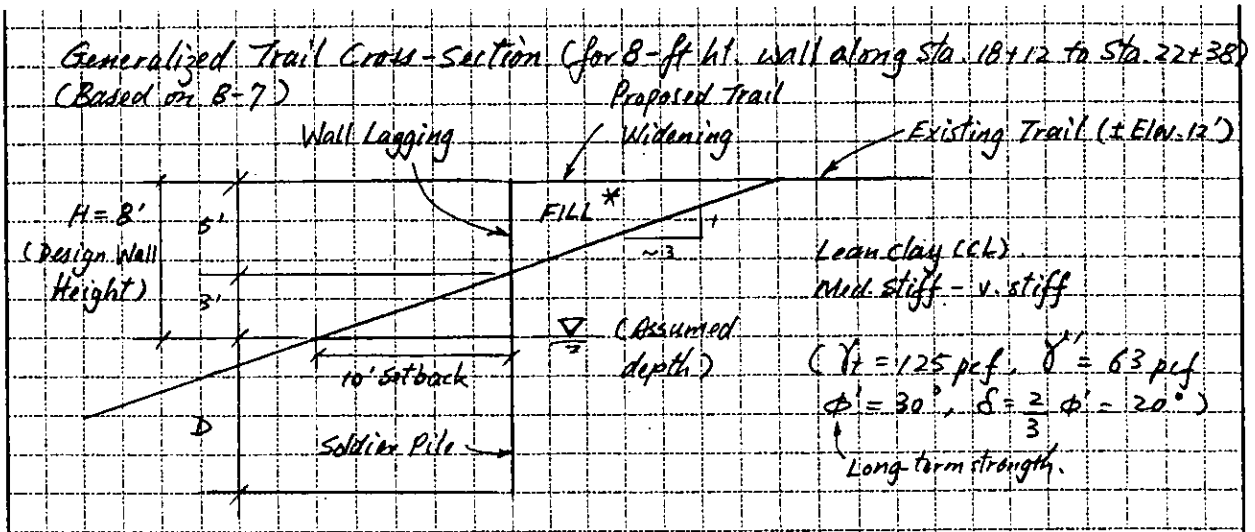
$P_J = f \cdot \gamma_3' \cdot D\,(K_p' - K_{A3}) + f \cdot \gamma \cdot H \cdot K_p = 88\,D + 0.72\,(65 \times 6.5 + 3 \times 1.5 + 48 \times 3)\,2.93\ psf$
$= 88\,D + 1205\ psf$ ✱

$P_{S1} = 80\ psf$ ✱ $P_{S'1} = 58\ psf$ ✱

LATERAL PRESSURE DISTRIBUTION OF 11-FT-HT WALL ALONG STATION 16+80 TO STATION 18+12

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	BAY TRAIL SLOUGH BRIDGE CITY OF SAN LEANDRO, CALIFORNIA
	JOB NO.: 204124.10 — PLATE NO.: 7B

Generalized Trail Cross-Section (for 8-ft ht. wall along Sta. 18+12 to Sta. 22+38)
(Based on B-7)



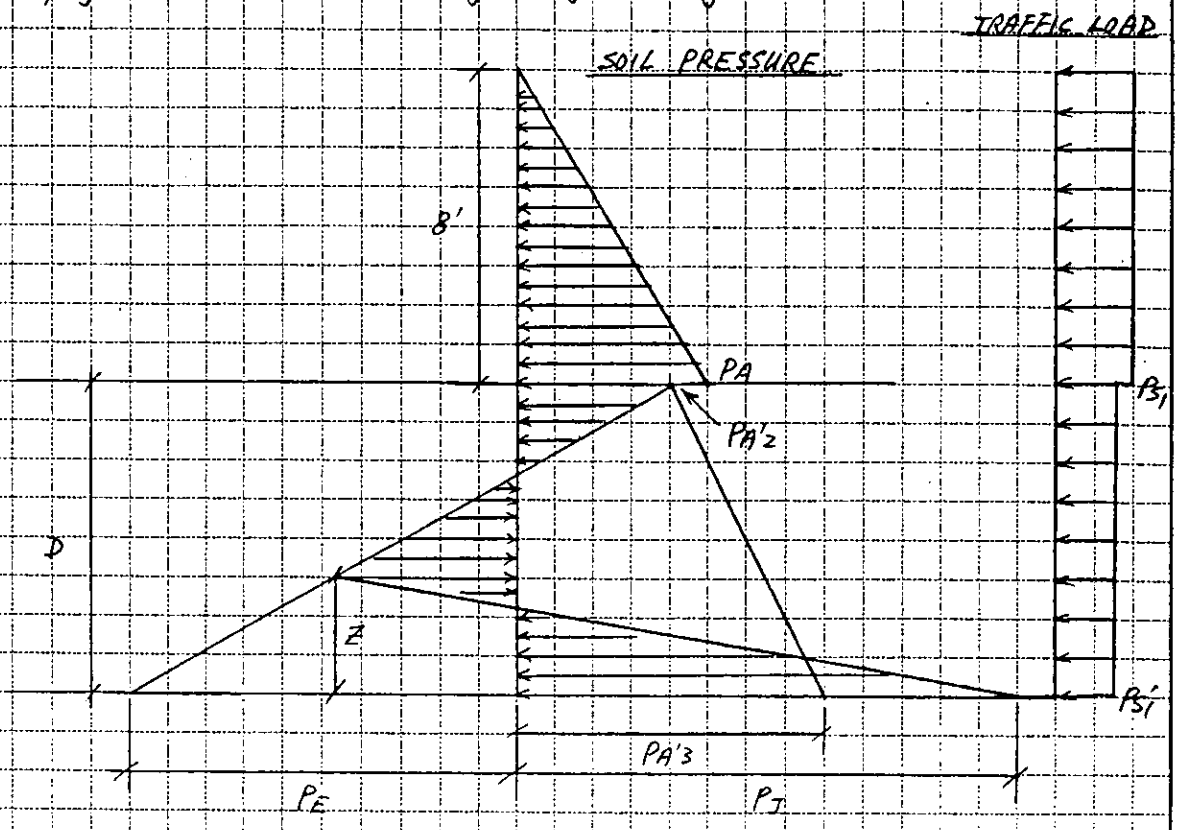
* FILL = Light-weight engineered fill. Assume granular mat'l w/

$\gamma_t = 65$ pcf, $\phi' = 32° \Rightarrow K_A = \tan^2(45° - \frac{\phi'}{2}) = 0.30$

TYPICAL CROSS SECTION OF 8-FT-HT WALL
ALONG STATION 18+12 TO STATION 22+38

PARIKH CONSULTANTS, INC. GEOTECHNICAL CONSULTANTS MATERIALS TESTING	BAY TRAIL SLOUGH BRIDGE CITY OF SAN LEANDRO, CALIFORNIA	
	JOB NO.: 204124.10	PLATE NO.: 8A

Simplified Pressure Distribution for 8 ft Wall System :



$P_A = 180$ psf ; $P_{A'2} = f \cdot P_A = 0.8 \times 180$ psf $= 144$ psf

$P_{A'3} = P_{A'2} + f \cdot \gamma_3' \cdot D \cdot K_{A2} = 144 + 17D$ psf

$P_E = f \cdot \gamma_3' \cdot D (K_P - K_A) - P_{A'2} = 170D - 144$ psf

$P_J = f \cdot \gamma_3' \cdot D (K_P - K_A) + f \cdot \gamma \cdot H \cdot K_P = 170D + 2078$ psf

$P_{S1} = 75$ psf

$P_{S'1} = 60$ psf

LATERAL PRESSURE DISTRIBUTION OF 8-FT-HT WALL ALONG STATION 18+12 TO STATION 22+38

PARIKH CONSULTANTS, INC.

GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

JOB NO.: 204124.10

PLATE NO.: 8B

APPENDIX A

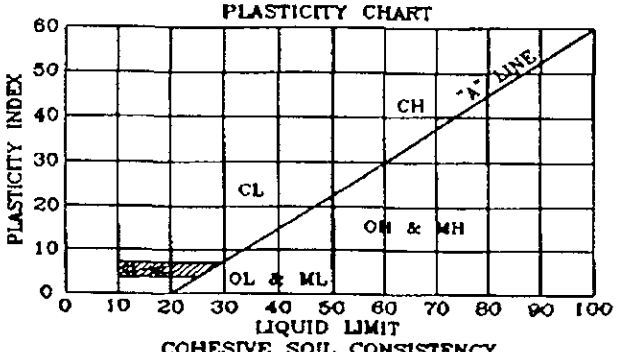
UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	ILLUSTRATIVE GROUP NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS Less than 5% fines	GW	Well graded gravel, Well graded gravel with sand
			GP	Poorly graded gravel, Poorly graded gravel with sand
		GRAVELS WITH FINES More than 12% fines	GM	Silty gravel, Silty gravel with sand
			GC	Clayey gravel, Clayey gravel with sand
	SANDS 50% or more of coarse fraction passing No. 4 sieve	CLEAN SANDS Less than 5% fines	SW	Well graded sand, Well graded sand with gravel
			SP	Poorly graded sand, Poorly graded sand with gravel
		SANDS WITH FINES More than 12% fines	SM	Silty sand, Silty sand with gravel
			SC	Clayey sand, Clayey sand with gravel
FINE-GRAINED SOILS 50% or more passing No. 200 sieve	SILTS AND CLAYS Liquid Limit less than 50%		ML	Silt, Sandy silt with gravel
			CL	Lean clay, Sandy lean clay with gravel
			OL	Organic clay, Sandy organic clay with gravel
	SILTS AND CLAYS Liquid Limit more than 50%		MH	Elastic silt, Sandy elastic silt with gravel
			CH	Fat clay, Sandy fat clay with gravel
			OH	Organic clay, Sandy organic clay with gravel
HIGHLY ORGANIC			PT	Peat, Highly organic silts

NOTE: 1. Coarse-grained soils receive dual symbols if: (a) their fines are CL-ML (e.g. SC-SM or GC-GM) or (b) they contain 5-12% fines (e.g. SW-SM, GP-GC, etc.). Fine-grained soils receive dual symbols if their limits plot in the hatched zone of the Plasticity Chart (CL-ML).

2. The table lists 30 out of a possible 110 Group Names, all of which are assigned to unique proportions of the constituent soils. Flow charts in ASTM D 2487-93 aid assignment of the Group Names.

PLASTICITY CHART



GRAIN SIZE CLASSIFICATION

CLASSIFICATION	US STANDARD SIEVE SIZE
BOULDERS	Above 12"
COBBLES	12" to 3"
GRAVEL Coarse Fine	 3" to 3/4" 3/4" to No. 4
SAND Coarse Medium Fine	 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No.200
SILT & CLAY	Below No. 200

COHESIVE SOIL CONSISTENCY

CLASSIFICATION	UNCONFINED COMP. STRENGTH (psf)
Very Soft	< 500
Soft	500 - 1000
Medium(Firm)	1000 - 2000
Stiff	2000 - 4000
Very Stiff	4000 - 8000
Hard	> 8000

COHESIONLESS SOIL RELATIVE DENSITY

CLASSIFICATION	SPT BLOW COUNTS (Blows/ft)
Very Loose	< 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	> 50

PARIKH CONSULTANTS, INC.
GEOTECHNICAL CONSULTANTS
MATERIALS TESTING

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

JOB NO.: 204124.10 | PLATE NO.: A-1A

Boring Location, Elevation & Date Drilled:

Drilling Method:

Sampling Method:

BORING NUMBER

LEGEND

Sheet 1 of 1

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft) Soil Graph & U.S.C.S.	
					0	
						Compressive strength as measured by Pocket Penetrometer, in tsf. → pp=1.0tsf
C-1			22			2 inch I.D. California Sampler (C).
MC-2	110	12	23	1.2	5	2-1/2 inch I.D. Modified California Sampler (MC).
SH-3	98	28	100 psi	0.8		3.5-inch I.D. Pitcher Tube Sampler (Cored).
					10	
SPT-4	-	10	35	-		1-3/8 inch I.D. Standard Splitspoon Sampler (SPT).
HS-5	95	20		0.7	15	1.9 inch I.D. Hand Sampler driven with a slide hammer.
					▽	Groundwater level first encountered during drilling
					▼ 20	Groundwater level at completion of boring
BULK-6	-	12				Bulk sample stored in plastic bag.
						Liquid Limit (LL), in percent Plasticity Index (PI), in percent → LL=30 PI=10
NX-3	-	-		12.0	25	
						NX Core.
						Consolidation Test — CN
						Percent gravel and coarser in sample,(+#4) Percent fines (silt/clay) in sample, (-#200) → +#4=20% -#200=50%
					30	Triaxial Test — TX

LEGEND FOR LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

This log is part of the report prepared by Parikh Consultants, Inc. for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Plate: A-1B

LEGEND LEGEND.GPJ 12-15-04

Boring Location, Elevation & Date Drilled: See attached site plan for boring locations; Elev. approx. 18.3 ft.; drilled on 10-1-04	Drilling Method: 8-inch dia. First Rotary Wash and then changed to Hollow Stem CME-75 and Ingersoll-Rand A-400	BORING NUMBER B-1
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft) Soil Graph & U.S.C.S.	Description
					0	ASPHALT PAVEMENT
MC-1	-	-	20		5	CLAYEY SAND WITH GRAVEL (SC), loose, greenish black, moist, fine to medium grained (FILL)
SPT-2	-	-	54		10	--very dense, gray, moist to wet, medium to coarse grained, trace concrete chips (FILL)
SPT-3	-	-	3		15	WELL-GRADED SAND WITH GRAVEL (SW), very loose, gray to black, medium to coarse grained, trace gravel up to 0.5" (FILL) (* May be void in fill)
					20	CH
SPT-4	-	-	5		25	FAT CLAY (CH), firm, greenish gray, moist, high plasticity
					30	

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

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Plate: A-2A

LB 204124.10.GPJ 12-15-04

Boring Location, Elevation & Date Drilled: See attached site plan for boring locations; Elev. approx. 18.3 ft.; drilled on 10-1-04	Drilling Method: 8-inch dia. First Rotary Wash and then changed to Hollow Stem CME-75 and Ingersoll-Rand A-400	BORING NUMBER **B-1**
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 2 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.			
					30				
SH-5	109.3	20		0.8			SC	CLAYEY SAND (SC), grayish brown, moist, fine grained	+#4=4% -#200=49%
MC-6	-	11	60		35		SP SM	POORLY-GRADED SAND WITH SILT (SP-SM), medium dense, brown, wet, fine to medium grained	
								--trace of coarse grained, subrounded gravel up to 1/2"	
SPT-7	-	21	10		40		CL	LEAN CLAY (CL), stiff, light brown, moist, low to medium plasticity	LL=37 PI=21
MC-8	99.4	25	15	1	45			--stiff, brown, moist, low plasticity	
MC-9	106.1	21	62		50		SM	SILTY SAND (SM), dense, light brown, moist to wet, fine grained	
SPT-10	-	-	14		55		GW	WELL-GRADED GRAVEL (GW), medium dense, brown to gray, wet, coarse grained	
					60			(No Recovery in SPT, resampled with a catcher)	

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

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Plate: A-2B

LB 204124.10.GPJ 12-15-04

Boring Location, Elevation & Date Drilled: See attached site plan for boring locations; Elev. approx. 18.3 ft.; drilled on 10-1-04	Drilling Method: 8-inch dia. First Rotary Wash and then changed to Hollow Stem CME-75 and Ingersoll-Rand A-400	BORING NUMBER B-1
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 3 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft) Soil Graph & U.S.C.S.		
MC-11	-	-	22		60	CL	LEAN CLAY (CL), stiff, brown, moist to wet, medium plasticity, trace subangular gravel from 1/4" to 1/2"
					65		
					70		(No Recovery in SPT, resampled with a catcher)
MC-12	103.9	24	29				--very stiff
					75		
						SM	
MC-13	-	-	89		80		SILTY SAND (SM), dense, grayish brown, moist to wet, fine grained
					85		Bottom of the hole at 80.5 feet Groundwater was not measured due to rotary wash method
					90		

LOG OF BORING

PARIKH CONSULTANTS, INC.
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BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

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Plate: A-2C

LB 204124.10.GPJ 12-15-04

Boring Location, Elevation & Date Drilled: See attached site plan for boring locations; Elev. approx. 5.0 ft.; drilled on 10-13-04	Drilling Method: 8-inch dia. Hollow Stem	BORING NUMBER B-5
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft) Soil Graph & U.S.C.S.			
					0	CL	6 ft of water above mudline was measured at high tide prior to drilling.	
							Very soft clay within the first 12 ft below mudline (steel casing dropped 12 ft by its own weight)	
					5			
					10			
SPT-1	-	-	18		15		LEAN CLAY (CL), very stiff, grayish brown, moist	
SPT-2	-	27	4		20		--soft, light grayish brown	LL=31 PI=12
						ML		
SPT-3	-	26	16		25		SILT (ML), very stiff, brown, moist	LL=23 PI=2
						SM		
					30		SILTY SAND (SM), medium dense, dark grayish brown,	

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

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Plate: A-3A

LB 204124.10.GPJ 12-15-04

Boring Location, Elevation & Date Drilled: See attached site plan for boring locations; Elev. approx. 5.0 ft.; drilled on 10-13-04	Drilling Method: 8-inch dia. Hollow Stem	BORING NUMBER B-5
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 2 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.			
SPT-4	-	16	27		30			moist, medium to coarse grained sand, trace fine grained gravel up to 1/4 inch	+#4=8% -#200=13%
SPT-5	-	23	26		35			--medium dense, brown	+#4=0%, -#200=43%
							SP	POORLY GRADED SAND (SP), very dense, dark grayish brown, moist, trace gravel up to 3/8 inch	
SPT-6	-	11	66		40				
							CL	LEAN CLAY (CL), very stiff, brown, moist	
SPT-7	-	-	26		45				
SPT-8	-	24	14		50			--stiff, low plasticity	LL=30 PI=14
					55				
					60				

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

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Plate: A-3B

Boring Location, Elevation & Date Drilled: See attached site plan for boring locations; Elev. approx. 5.0 ft.; drilled on 10-13-04	Drilling Method: 8-inch dia. Hollow Stem	BORING NUMBER B-5
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 3 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft) Soil Graph & U.S.C.S.	
SPT-9	-	24	13		60	--stiff
					65	
SPT-10	-	25	28		70	--very stiff, brownish gray
					75	
SPT-11	-	-	30		80	--very stiff, brownish gray to dark gray
					85	
					90	

Bottom of borehole at 80.5 ft below mudline.
Water level was at 6 ft above mudline.

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

This log is part of the report prepared by Parikh Consultants, Inc. for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Plate: A-3C

LB 204124.10.GPJ 12-15-04

Boring Location, Elevation & Date Drilled:	Drilling Method:	BORING NUMBER
See attached site plan for boring locations; Elev. approx. 12.7 ft.; drilled on 10-1-04	8-inch dia. Hollow Stem Ingersoll-Rand A-400	**B-7**
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 1 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.	Description	
					0	GP	6 inches of GRAVEL	
						CL		
MC-1	89.2	32	11		5		LEAN CLAY (CL), firm, dark gray, moist	
MC-2	94.3	29	14		10		--stiff	LL=47 PI=30
MC-3	-	-	21		15		--stiff, dark brownish gray, trace medium to coarse grained sand	
	-	-	11		20		--firm (No Recovery in MC sample at 20 ft)	
MC-4	104.3	22	37	1.15	25		--very stiff, light brown, low plasticity	LL=31 PI=14
						SP		
					30		POORLY GRADED SAND (SP), very dense, brown, moist,	

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

This log is part of the report prepared by Parikh Consultants, Inc. for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Plate: A-4A

LB 204124.10.GPJ 12-15-04

Boring Location, Elevation & Date Drilled: See attached site plan for boring locations; Elev. approx. 12.7 ft.; drilled on 10-1-04	Drilling Method: 8-inch dia. Hollow Stem Ingersoll-Rand A-400	BORING NUMBER B-7
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 2 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.			
MC-5	106.3	19	85/11"		30			fine grained sand	
MC-6	-	19	58		35			–very dense, grayish brown, fine to medium grained sand	
SPT-7	-	21	46		40		SM	SILTY SAND (SM), dense, brown, moist	+#4=0% -#200=31%
SPT-8	-	18	26		45		SP	POORLY GRADED SAND (SP), medium dense, brown, wet, medium to coarse grained sand, trace gravel up to 1/2 inch	+#4=5% -#200=5%
SPT-9	-	11	29		50			–medium dense, grayish brown, coarse grained sand	
					55		CL		
					60			LEAN CLAY (CL), firm, brown, moist	

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

This log is part of the report prepared by Parikh Consultants, Inc. for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Plate: A-4B

LB 204124.10.GPJ 12-15-04

Boring Location, Elevation & Date Drilled: See attached site plan for boring locations; Elev. approx. 12.7 ft.; drilled on 10-1-04	Drilling Method: 8-inch dia. Hollow Stem Ingersoll-Rand A-400	BORING NUMBER B-7
	Sampling Method: 2 1/2" I.D. Mod. Cal. (MC)/2" I.D. Cal. (C)/1 3/8" I.D. Std. Pen., 140 lbs hammer, 30 inch drop.	Sheet 3 of 3

Sample Type & No.	Dry Density (pcf)	Water Content (%)	Blows Per Foot	Compress. Strength (tsf)	Depth (ft)	Soil Graph & U.S.C.S.		
MC-10	103.2	23	9	0.3	60			
					65		CL	GRAVELLY LEAN CLAY WITH SAND (CL), very stiff, brownish gray, moist, angular gravel up to 3/4 inch
SPT-11	-	-	30		70			Bottom of borehole at 70.5 ft Groundwater was not measured during drilling
					75			
					80			
					85			
					90			

LOG OF BORING

PARIKH CONSULTANTS, INC.
Geotechnical & Materials Engineering

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

Date: 10/2004 | Job No.: 204124.10

This log is part of the report prepared by Parikh Consultants, Inc. for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Plate: A-4C

LB 204124.10.GPJ 12-15-04

Interpreted Parameter	Description	Equation	Ref
MSF	Magnitude Scaling Factor	See Reference	10
FofS	Factor of Safety against Liquefaction	$FS = (CRR_{7.5} / CSR)\ MSF$	10
Liquefaction Status	Statement indicating possible liquefaction	Takes into account FofS and limitations based I_c and q_{c1ncs}.	10

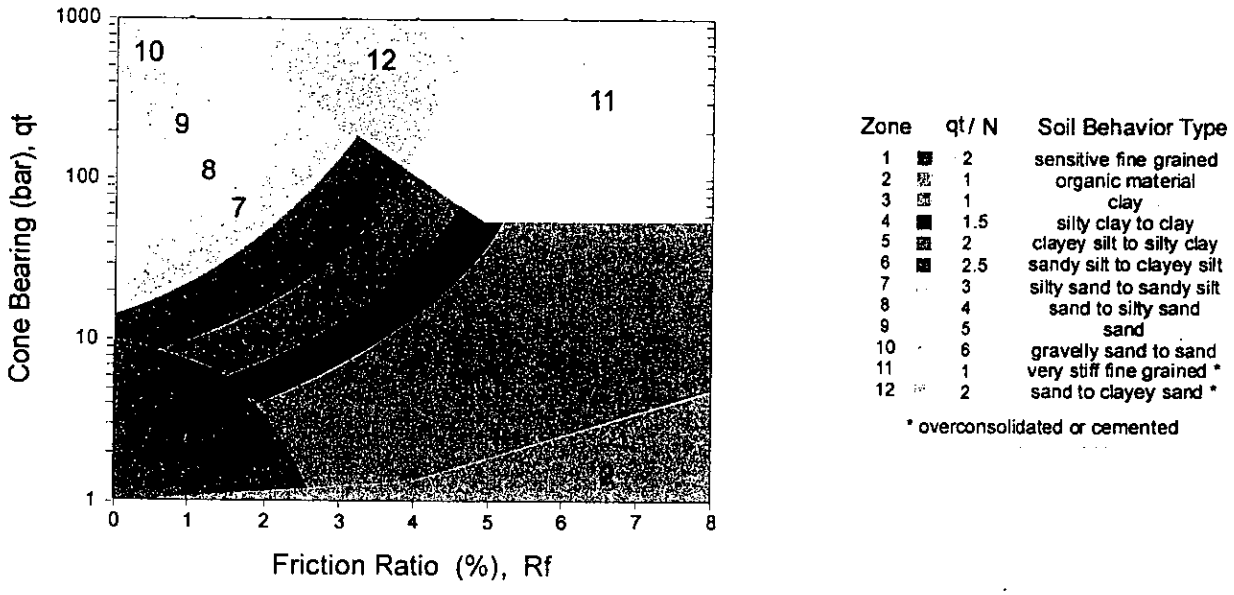
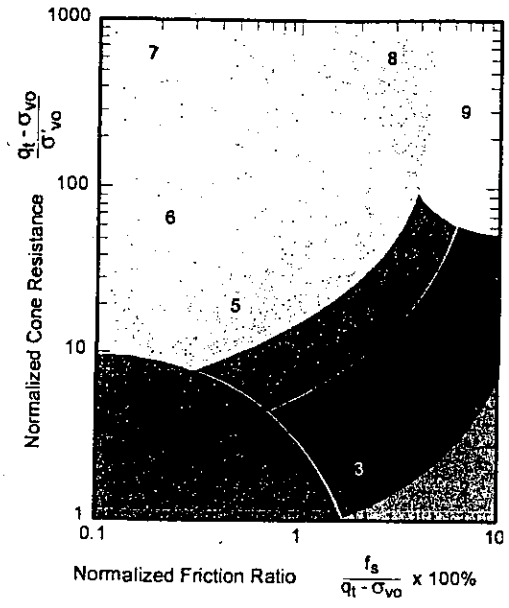


Figure 1 Non-Normalized Behavior Type Classification Chart



Zone	Normalized Soil Behavior Type
1	sensitive fine grained
2	organic material
3	clay to silty clay
4	clayey silt to silty clay
5	silty sand to sandy silt
6	clean sands to silty sands
7	gravelly sand to sand
8	very stiff sand to clayey sand
9	very stiff fine grained

Figure 2 Normalized Behavior Type Classification Chart

Table 2 References

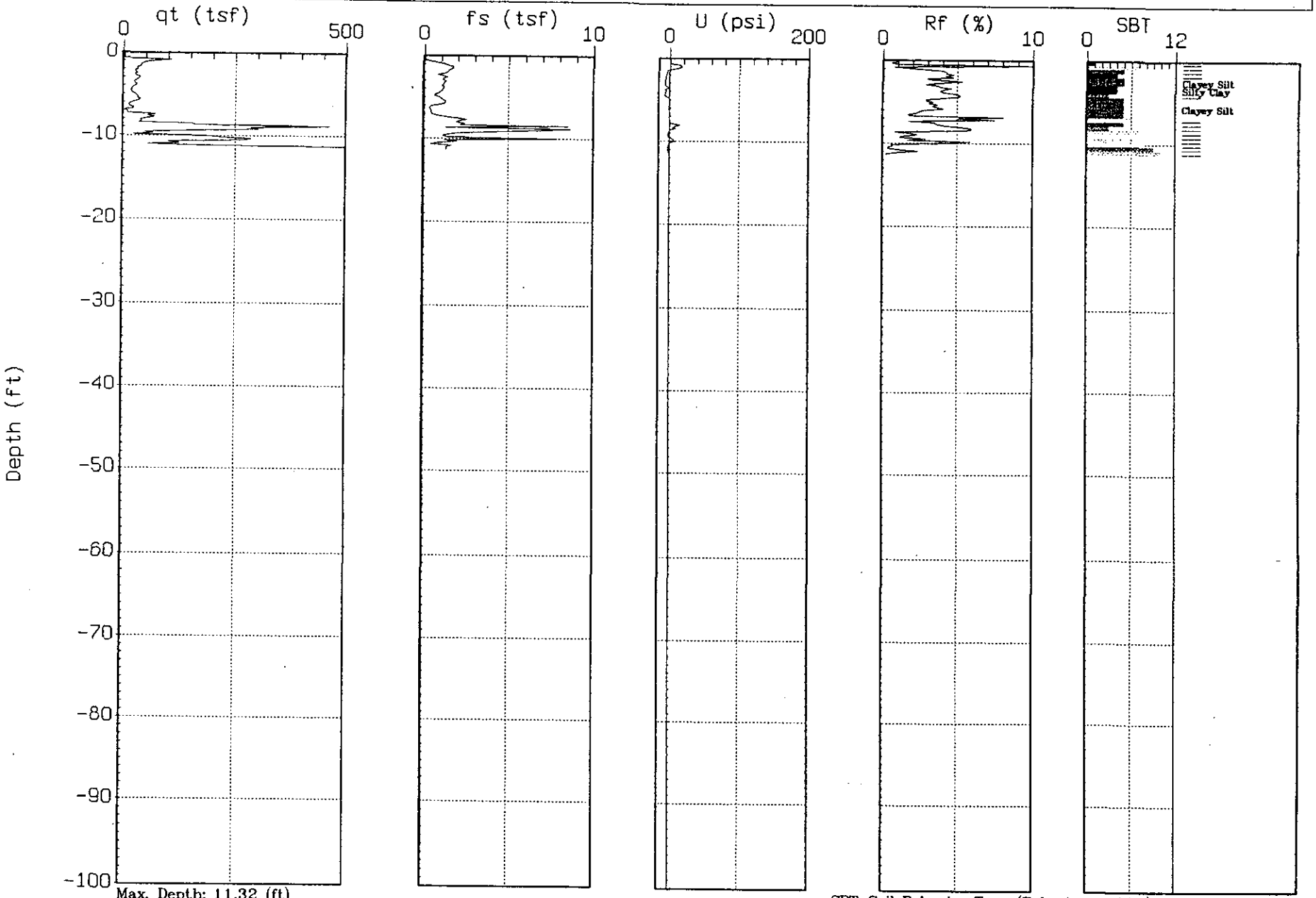
No.	References
1	Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.
2	Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27.
3	Robertson, P.K. and Fear, C.E., 1998, "Evaluating cyclic liquefaction potential using the cone penetration test", Canadian Geotechnical Journal, 35: 442-459.
4	Robertson, P.K. and Wride, C.E., 1998, "Cyclic Liquefaction and its Evaluation Based on SPT and CPT", NCEER Workshop Paper, January 22, 1997
5	Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, " Cone Penetration Testing in Geotechnical Practice," Blackie Academic and Professional.
6	Plewes, H.D., Davies, M.P. and Jefferies, M.G., 1992, "CPT Based Screening Procedure for Evaluating Liquefaction Susceptibility", 45th Canadian Geotechnical Conference, Toronto, Ontario, October 1992.
7	Jefferies, M.G. and Davies, M.P., 1993. "Use of CPTu to Estimate equivalent N_{60}", Geotechnical Testing Journal, 16(4): 458-467.
8	Been, K. and Jefferies, M.P., 1985, "A state parameter for sands", Geotechnique, 35(2), 99-112.
9	Schmertmann, 1977, "Guidelines for Cone Penetration Test Performance and Design", Federal Highway Administration Report FHWA-TS-78-209, U.S. Department of Transportation
10	Proceedings of theNCEER Workshop on Evaluation of Liquefaction Resistance of Soils, Salt LakeCity, 1996. Chaired by Leslie Youd.

GREGG

PARIKH

Site: 3000 DAVIS ST
Location: CPT-02

Engineer: F. LI
Date: 09:22:04 08:02



Max. Depth: 11.32 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

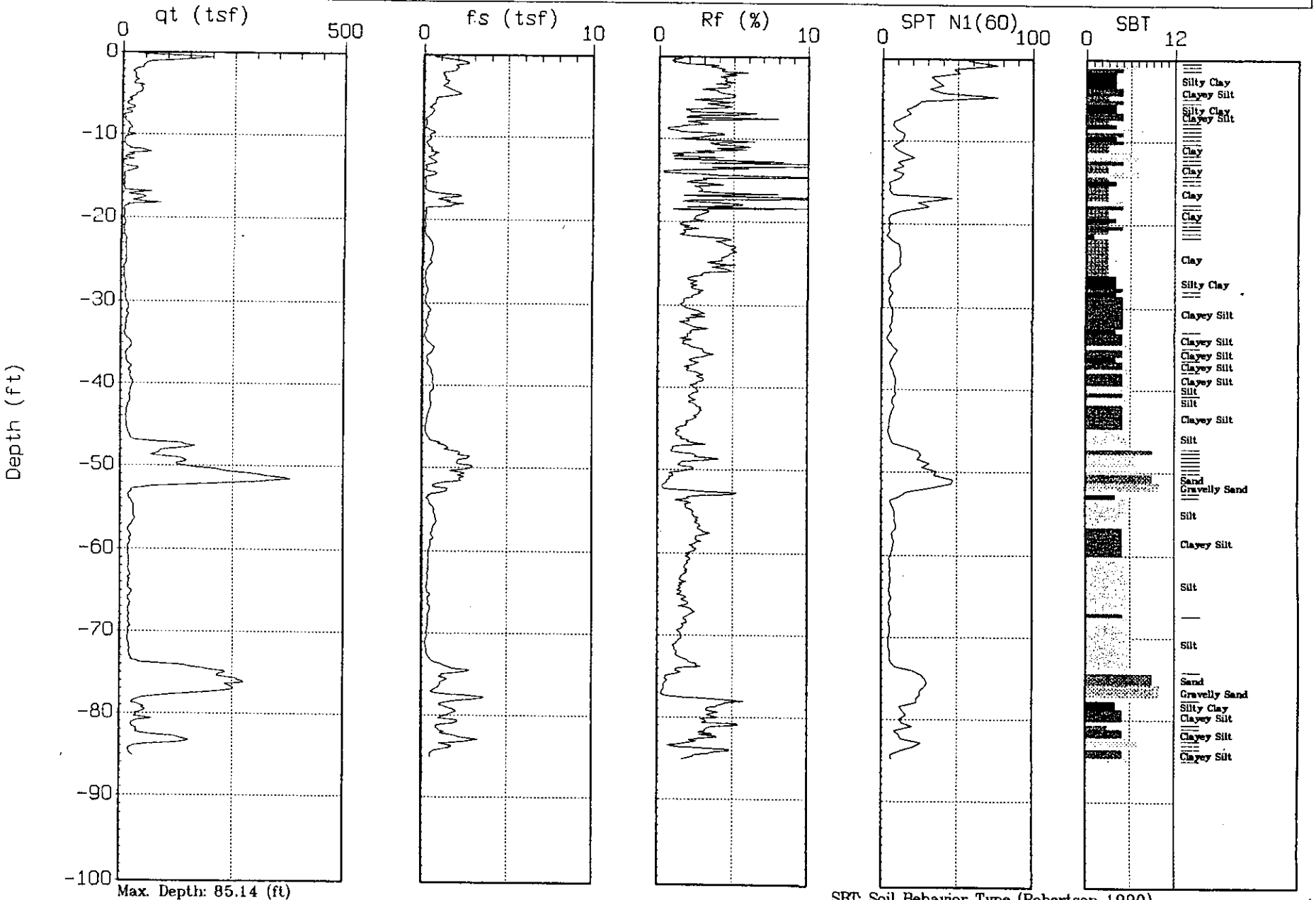
PLATE NO.: A-6

GREGG

PARIKH

Site: 3000 DAVIS ST
Location: CPT-03

Engineer: F. LI
Date: 09:22:04 06:03



Max. Depth: 85.14 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

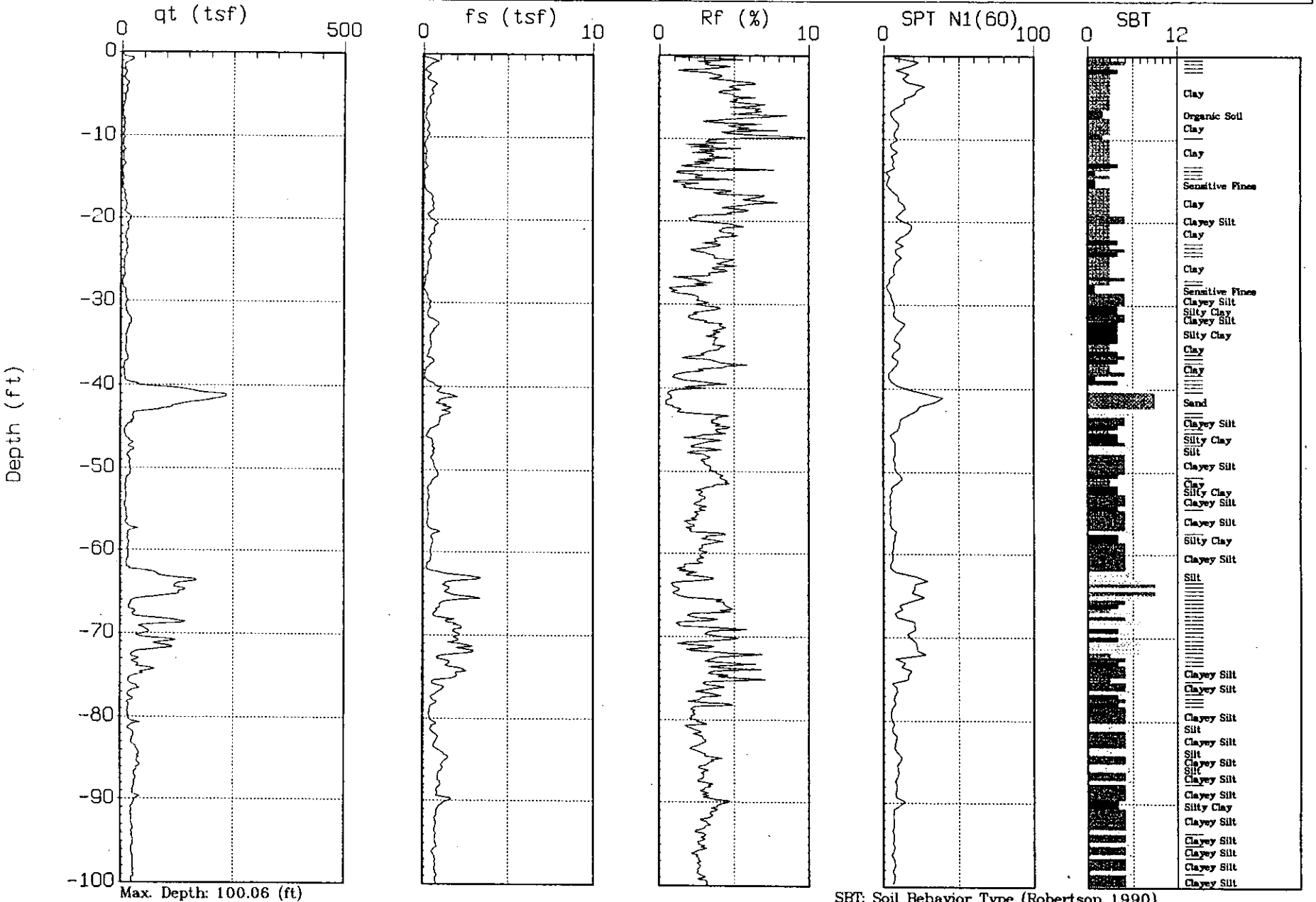
PLATE NO.: A-7

GREGG

PARIKH

Site: 3000 DAVIS ST
Location: CPT-04

Engineer: F. LI
Date: 09:21:04 13:14



Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

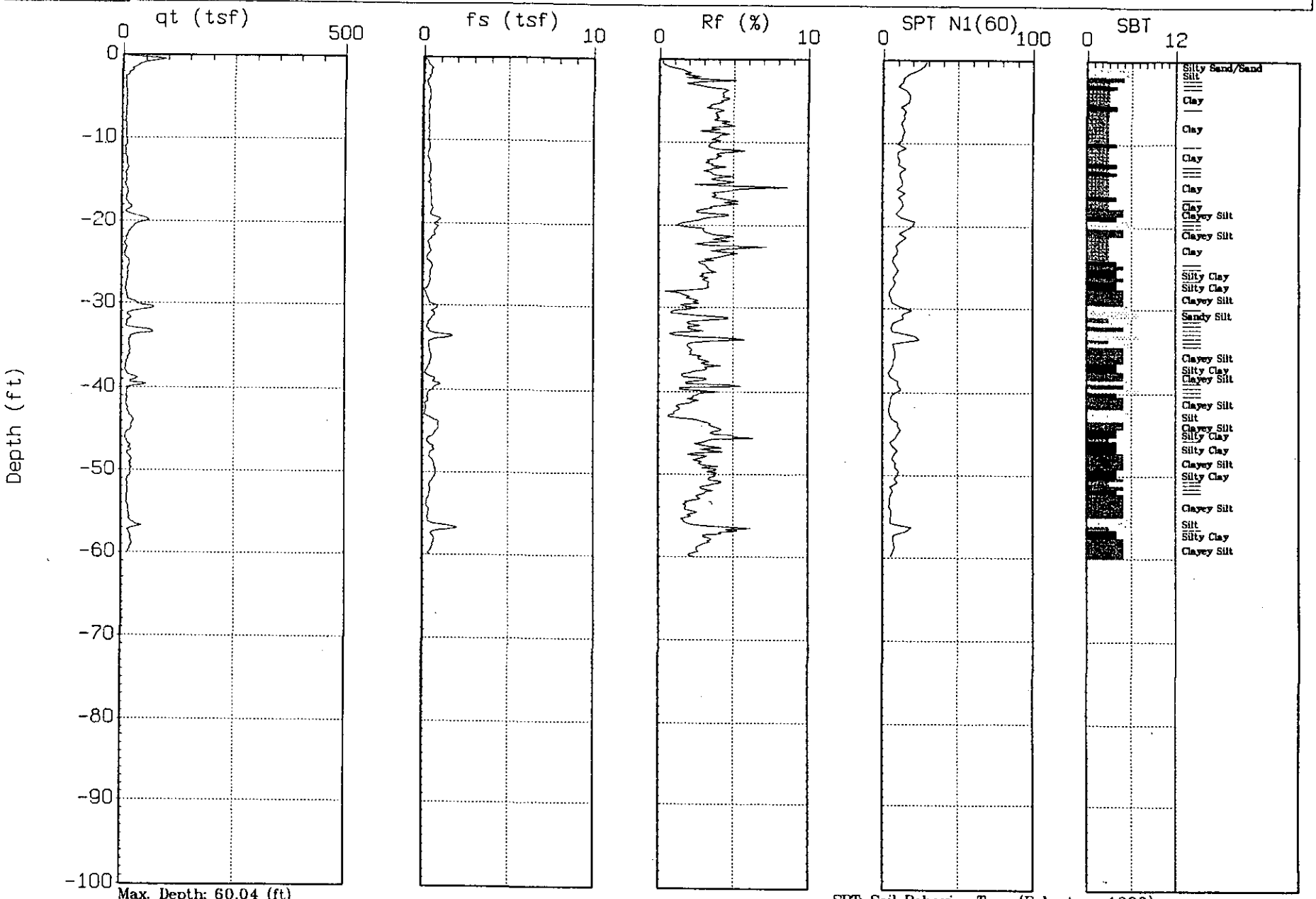
PLATE NO.: A-8

GREGG

PARIKH

Site: 3000 DAVIS ST
Location: CPT-06

Engineer: F. LI
Date: 09:21:04 14:56



Max. Depth: 60.04 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

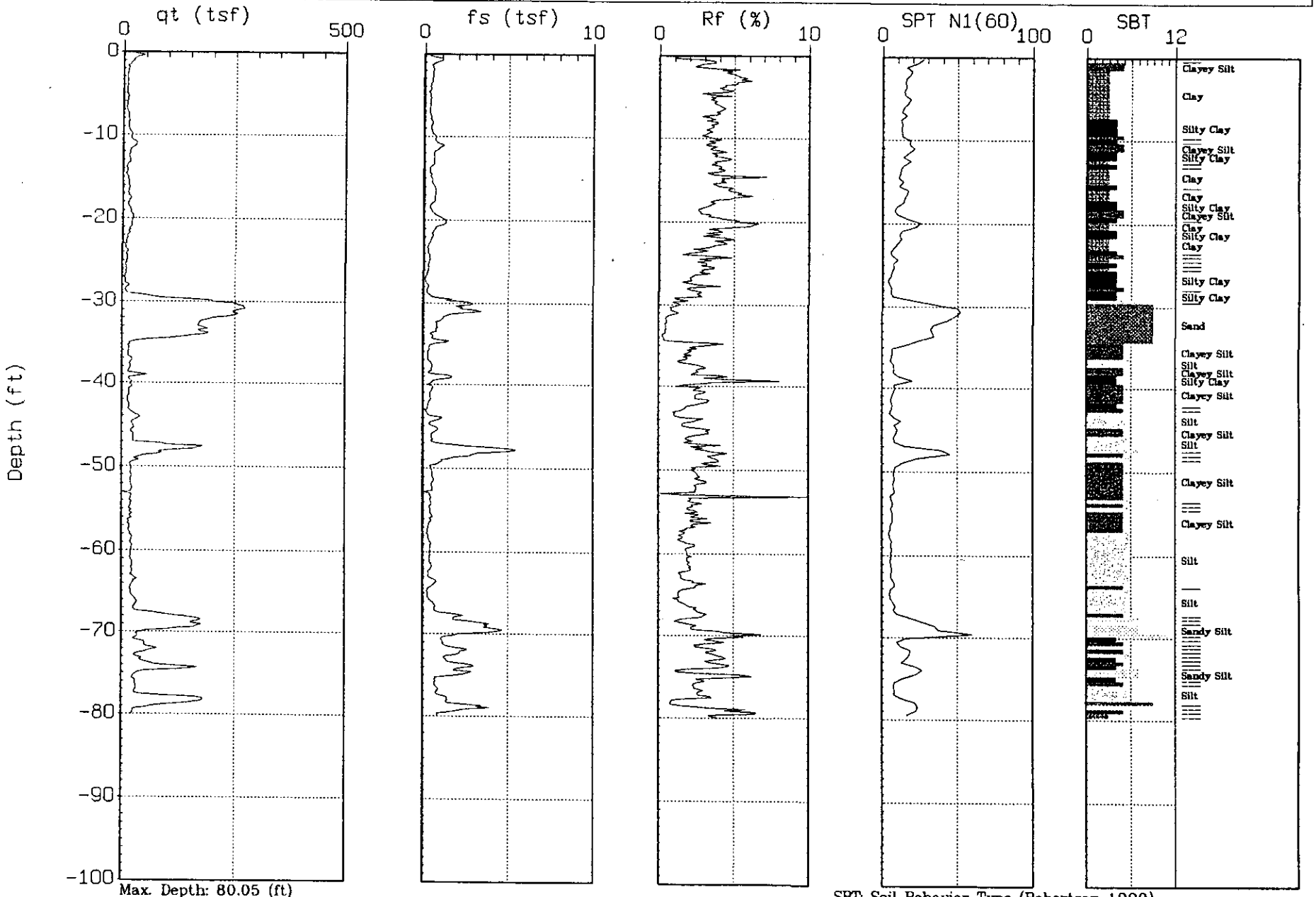
PLATE NO.: A-9

GREGG

PARIKH

Site: 3000 DAVIS ST
Location: CPT-08

Engineer: F. LI
Date: 09:21:04 16:02



Max. Depth: 80.05 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

PLATE NO.: A-10

APPENDIX B

APPENDIX B
LABORATORY TESTS

Classification Tests

The field classification of the samples was visually verified in the laboratory according to the Unified Soil Classification System (ASTM Test Method D 2488, Visual-Manual Procedure). The classification has been verified with laboratory data as necessary. The classification tests are presented on "Log of Test Borings", Appendix A.

Moisture-Density

The natural moisture contents and dry unit weights were determined for selected undisturbed samples of the soils in general accordance with ASTM Test Method D 2216-92. This information was used to classify and correlate the soils. The results are presented at the appropriate depths on the "Log of Test Borings", Appendix A.

Unconfined Compression Tests

Strength tests were performed on selected undisturbed sample using unconfined compression machine. Unconfined compression test was performed in general accordance with California Test Method T 221. The results are presented on "Log of Test Borings".

Atterberg Limits

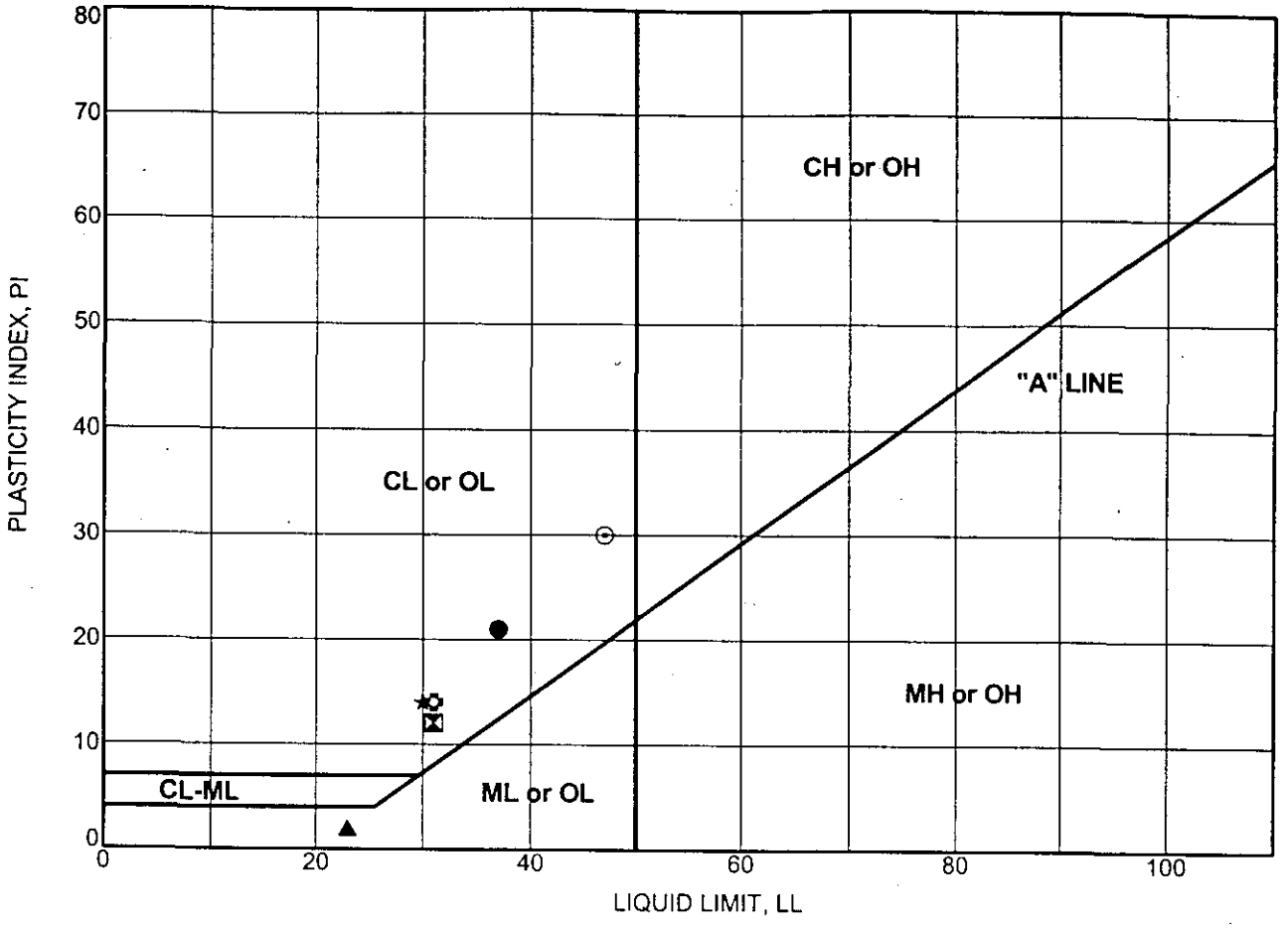
The Atterberg Limits were determined for selected samples of the fine-grained materials. These results were used to classify the soils, as well as to obtain an indication of the effective strength characteristics and expansion potential with variations in moisture content. The Atterberg Limits were determined in general accordance with ASTM Test Method D 4318-93. The results of these tests are presented on Plate B-2, "Plasticity Chart".

Grain Size Classification

Grain size classification tests (ASTM Test Method D 422-63) were performed on selected samples of granular soil to aid in the classification. The results are presented on Plate B-3, "Grain Size Distribution Curves".

Corrosion Tests

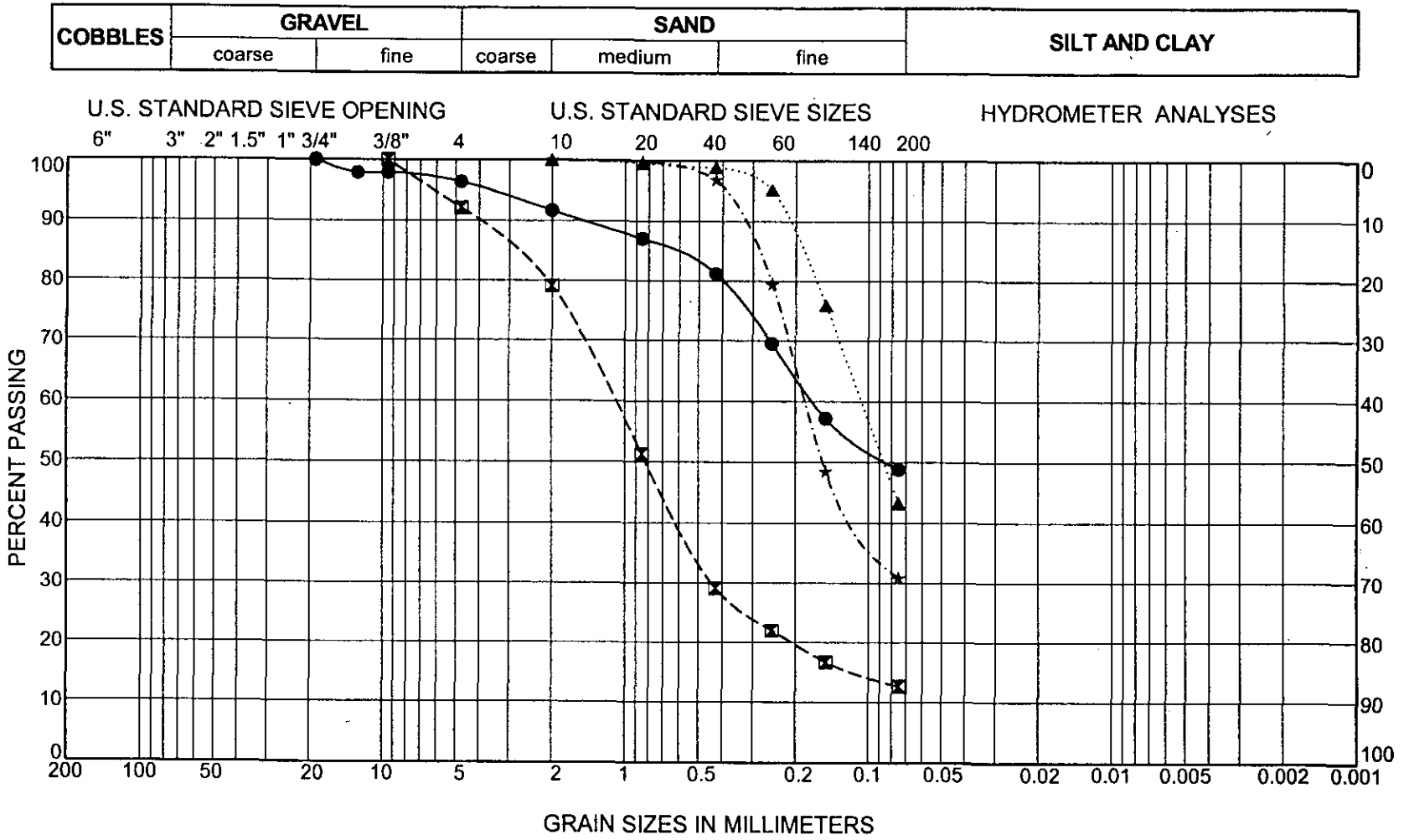
Corrosion tests were performed on selected samples to determine the corrosion potential of the soils. The pH and minimum resistively tests were performed according to California Test Method 643 by Parikh Consultants, Inc. The test results are presented on Plates B-4.



PLASTICITY CHART

Boring Number	Sample Number	Depth (feet)	Test Symbol	Moisture Content (%)	LL	PL	PI	Description
B-1	SPT-7	40.0	●	21	37	16	21	LEAN CLAY (CL)
B-5	SPT-2	20.0	⊠	27	31	19	12	LEAN CLAY (CL)
B-5	SPT-3	25.0	▲	26	23	21	2	SILT (ML)
B-5	SPT-8	50.0	★	24	30	16	14	LEAN CLAY (CL)
B-7	MC-2	10.0	⊙	29	47	17	30	LEAN CLAY (CL)
B-7	MC-4	25.0	✿	22	31	17	14	LEAN CLAY (CL)

GRAIN SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	LL	PI	Description
B-1	SH-5	32.0	●			CLAYEY SAND (SC)
B-5	SPT-4	30.0	⊠			SILTY SAND (SM)
B-5	SPT-5	35.0	▲			SILTY SAND (SM)
B-7	SPT-7	40.0	★			SILTY SAND (SM)

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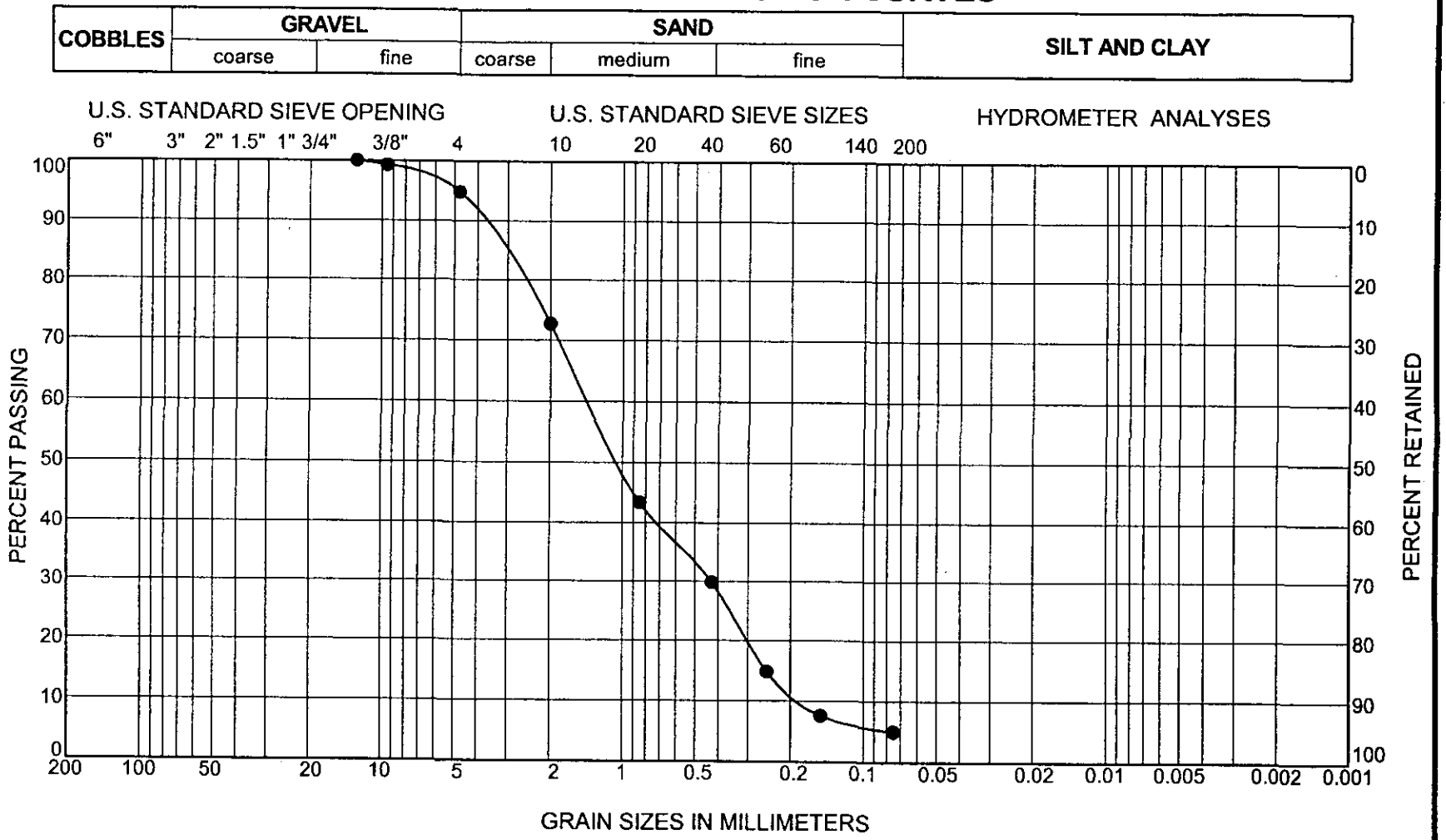
GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

JOB NO: 204124.10

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

PLATE NO: B-3A

GRAIN SIZE DISTRIBUTION CURVES



Boring Number	Sample Number	Depth (feet)	Symbol	LL	PI	Description
B-7	SPT-8	45.0	●			POORLY GRADED SAND (SP)

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GEOTECHNICAL CONSULTANTS
MATERIALS ENGINEERING

JOB NO: 204124.10

BAY TRAIL SLOUGH BRIDGE
CITY OF SAN LEANDRO, CALIFORNIA

PLATE NO: B-3B

Sunland Analytical

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

Date Reported 11/19/2004
Date Submitted 11/16/2004

To: Prav Dayah
Parikh Consultants, Inc.
356 S. Milpitas Blvd.
Milpitas, Ca 95035

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

The reported analysis was requested for the following location:
Location : 204124.10/SAN LEANDRO Site ID : B1 #5 @31'.
Thank you for your business.

* For future reference to this analysis please use SUN # 43447-85335.

EVALUATION FOR SOIL CORROSION

Soil pH	7.42		
Minimum Resistivity	0.35	ohm-cm (x1000)	
Chloride	860.0 ppm	00.08600	%
Sulfate	17.6 ppm	00.00176	%

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

PLATE NO.: B-4A

Sunland Analytical

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

Date Reported 11/19/2004
Date Submitted 11/16/2004

To: Prav Dayah
Parikh Consultants, Inc.
356 S. Milpitas Blvd.
Milpitas, Ca 95035

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

The reported analysis was requested for the following location:
Location : 204124.10/SAN LEANDRO Site ID : B5 # 1 @15'.
Thank you for your business.

* For future reference to this analysis please use SUN # 43447-85336.

EVALUATION FOR SOIL CORROSION

Soil pH	8.16		
Minimum Resistivity	0.18	ohm-cm (x1000)	
Chloride	2040.3 ppm	00.20403	%
Sulfate	55.1 ppm	00.00551	%

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

PLATE NO.: B-4B

APPENDIX C

```
LPILEP4
San Leandro Slough Bridge: Abutment 1- 1'x1' PC/PS Pile, 25 tons, Free Head
1       1       0       0       0       0
100     2       -60     516     0
0       12      1664    142     3000000
516     12      1664    142     3000000
6       12      12      0       2
4       -60     42      25      25
4       42      210     20      20
3       210     330     100     100
4       330     420     60      60
3       420     540     500     500
4       540     672     60      60
-60     0.0637
42      0.0637
42      0.0278
210     0.0278
210     0.0289
330     0.0289
330     0.0394
420     0.0394
420     0.0365
540     0.0365
540     0.0347
672     0.0347
-60     0       30      0       0
42      0       30      0       0
42      0       30      0       0
210     0       30      0       0
210     4.1667  0       0.01    0
330     4.1667  0       0.01    0
330     0       35      0       0
420     0       35      0       0
420     7.6389  0       0.007   0
540     7.6389  0       0.007   0
540     0       32      0       0
672     0       32      0       0
0       0.6     1
672     0.6     1
0       1       1
3
1       10000   0       50000
1       15000   0       50000
1       20000   0       50000
0
1       1       0
100     1E-5    100
```

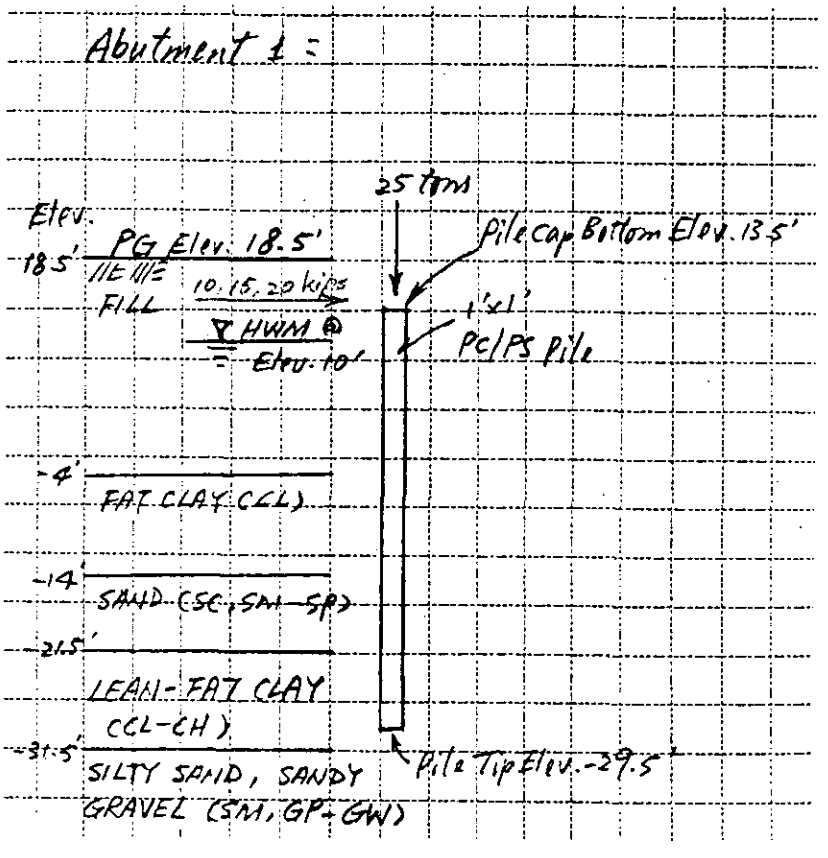
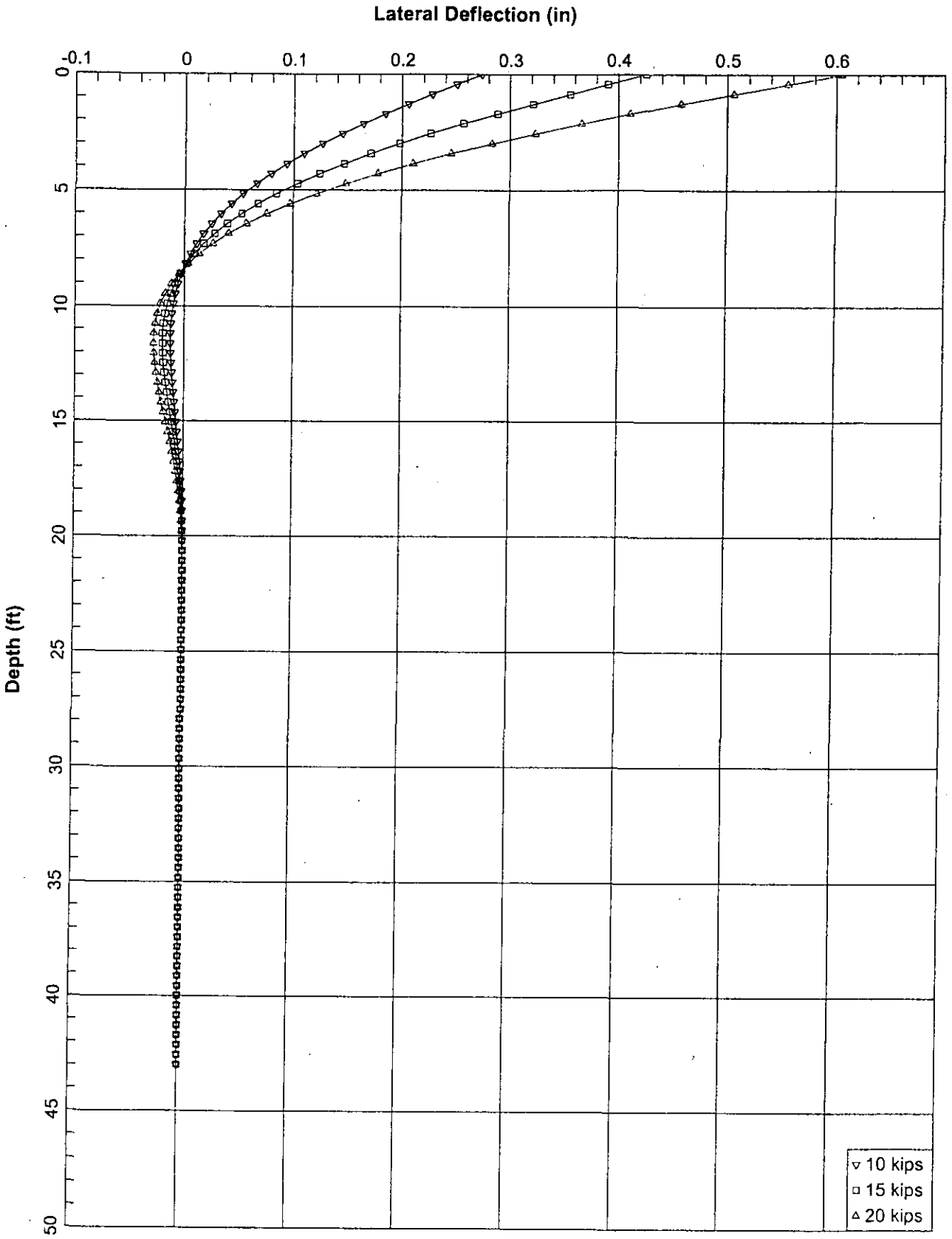
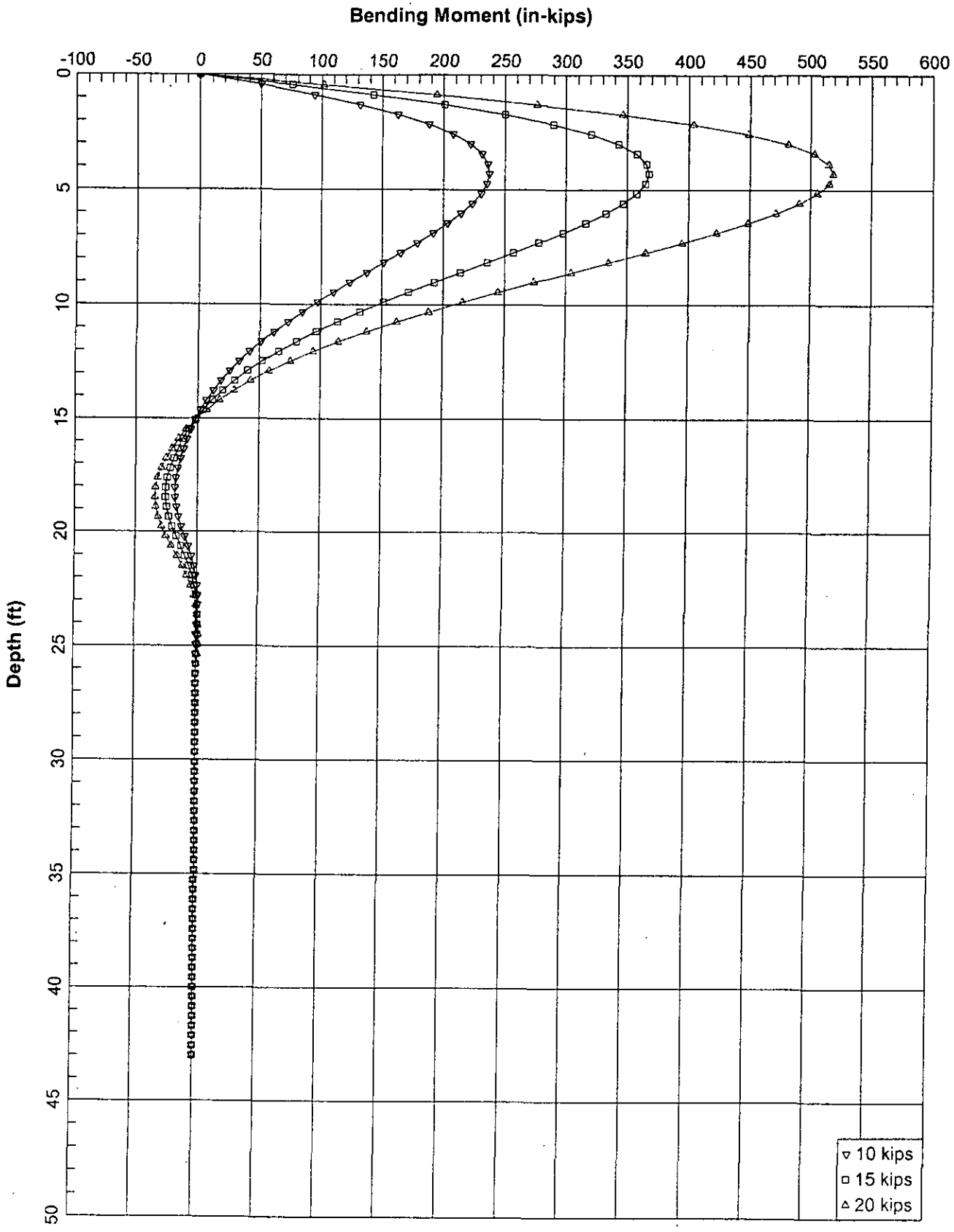


PLATE NO.: C-1



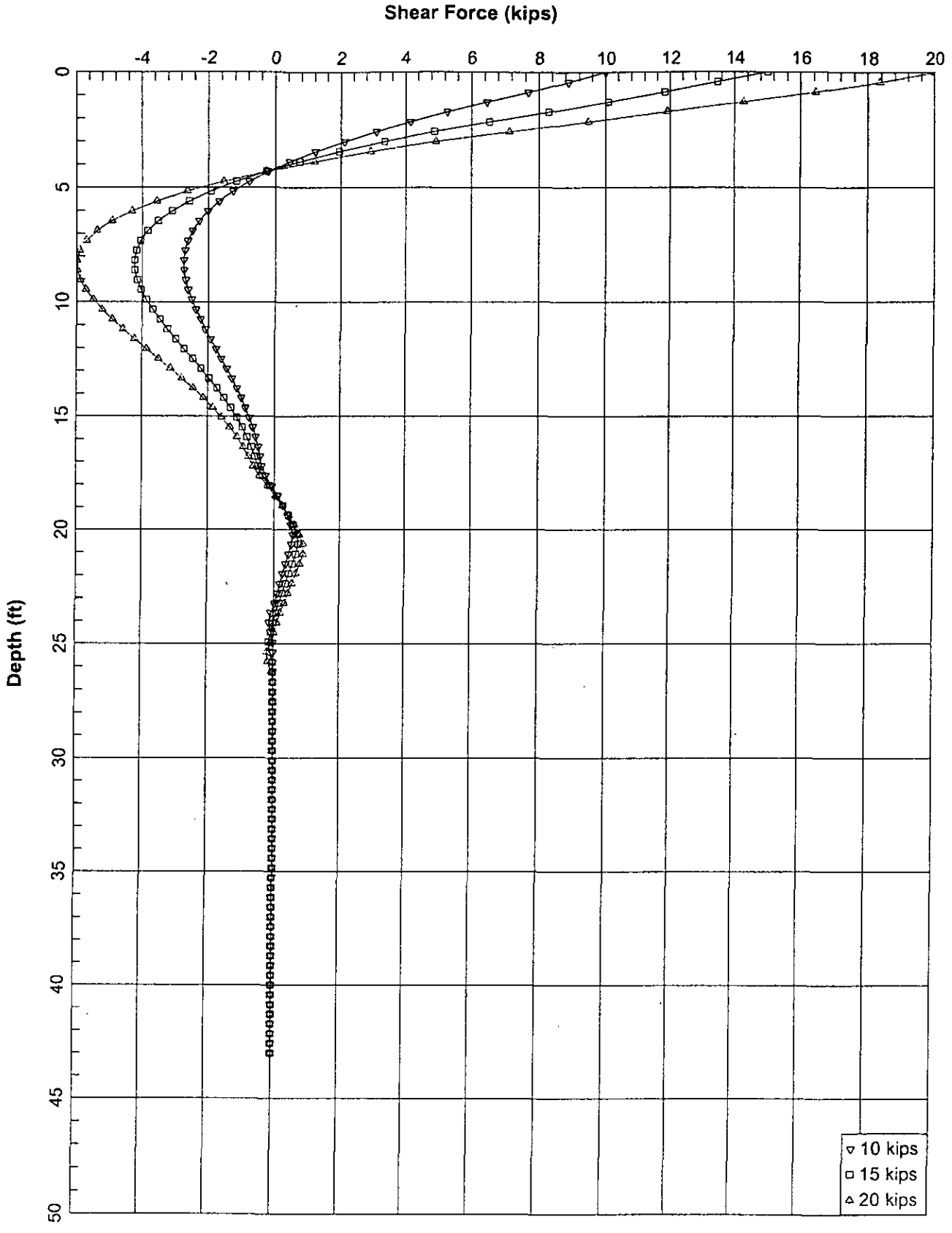
San Leandro Slough Bridge: Abutment 1 - 1'x1' PC/PS Pile, 25 tons, Free Head

PLATE NO.: C-2



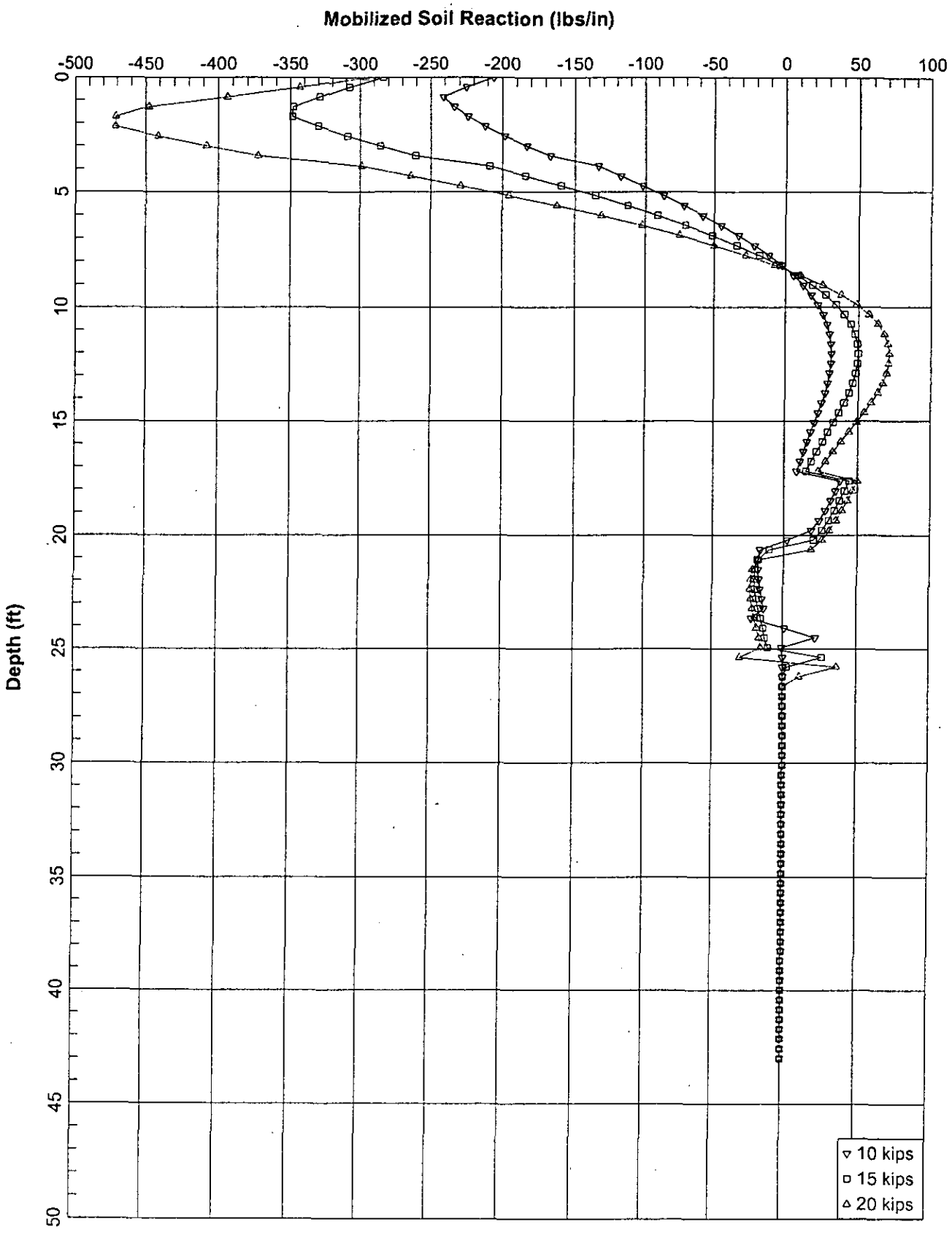
San Leandro Slough Bridge: Abutment 1 - 1'x1' PC/PS Pile, 25 tons, Free Head

PLATE NO.: C-3



San Leandro Slough Bridge: Abutment 1 - 1'x1' PC/PS Pile, 25 tons, Free Head

PLATE NO.: C-4



San Leandro slough Bridge: Abutment 1 - 1'x1' PC/PS Pile, 25 tons, Free Head

PLATE NO.: C-5

```
LPILEP4
San Leandro Slough Bridge: Abutment 1 - 14" Closed-End Pipe, 25 tons, Free Head
1       1       0       0       0       0
100     2       -60     516     0
0       14      2409.4  153.94  3600000
516     14      2749.22 153.94  3600000
6       12      12      0       2
4       -60     42      25      25
4       42      210     20      20
3       210     330     100     100
4       330     420     60      60
3       420     540     500     500
4       540     672     60      60
-60     0.0637
42      0.0637
42      0.0278
210     0.0278
210     0.0289
330     0.0289
330     0.0394
420     0.0394
420     0.0365
540     0.0365
540     0.0347
672     0.0347
-60     0       30      0       0
42      0       30      0       0
42      0       30      0       0
210     0       30      0       0
210     4.1667  0       0.01    0
330     4.1667  0       0.01    0
330     0       35      0       0
420     0       35      0       0
420     7.6389  0       0.007   0
540     7.6389  0       0.007   0
540     0       32      0       0
672     0       32      0       0
0       0.6     1
672     0.6     1
0       1       1
3
1       10000   0       50000
1       15000   0       50000
1       20000   0       50000
0
1       1       0
100     1E-5    100
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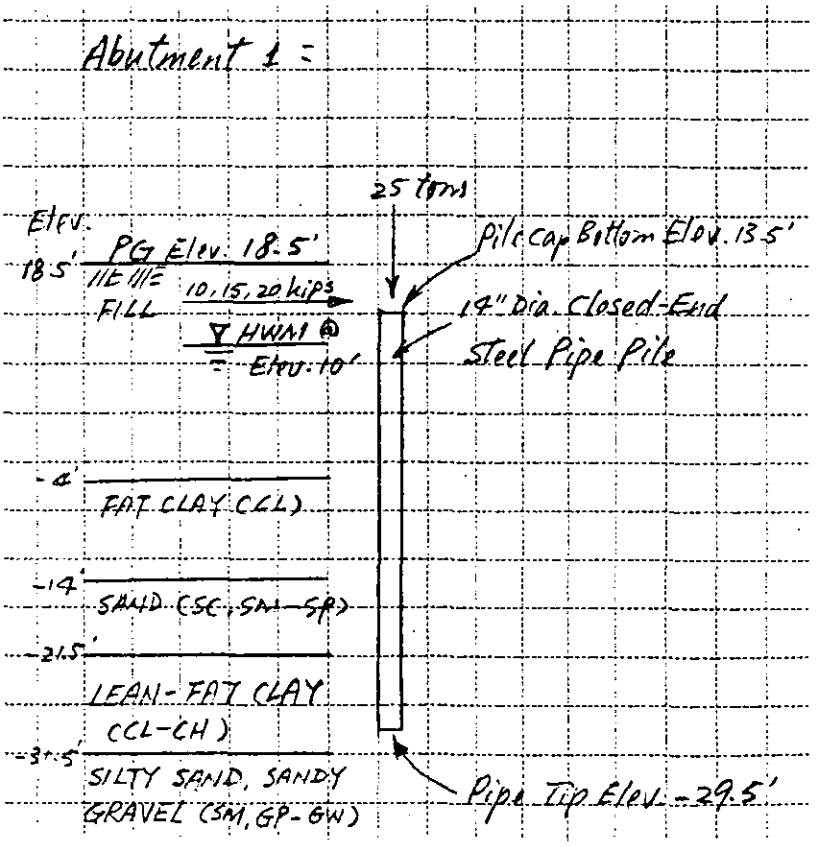
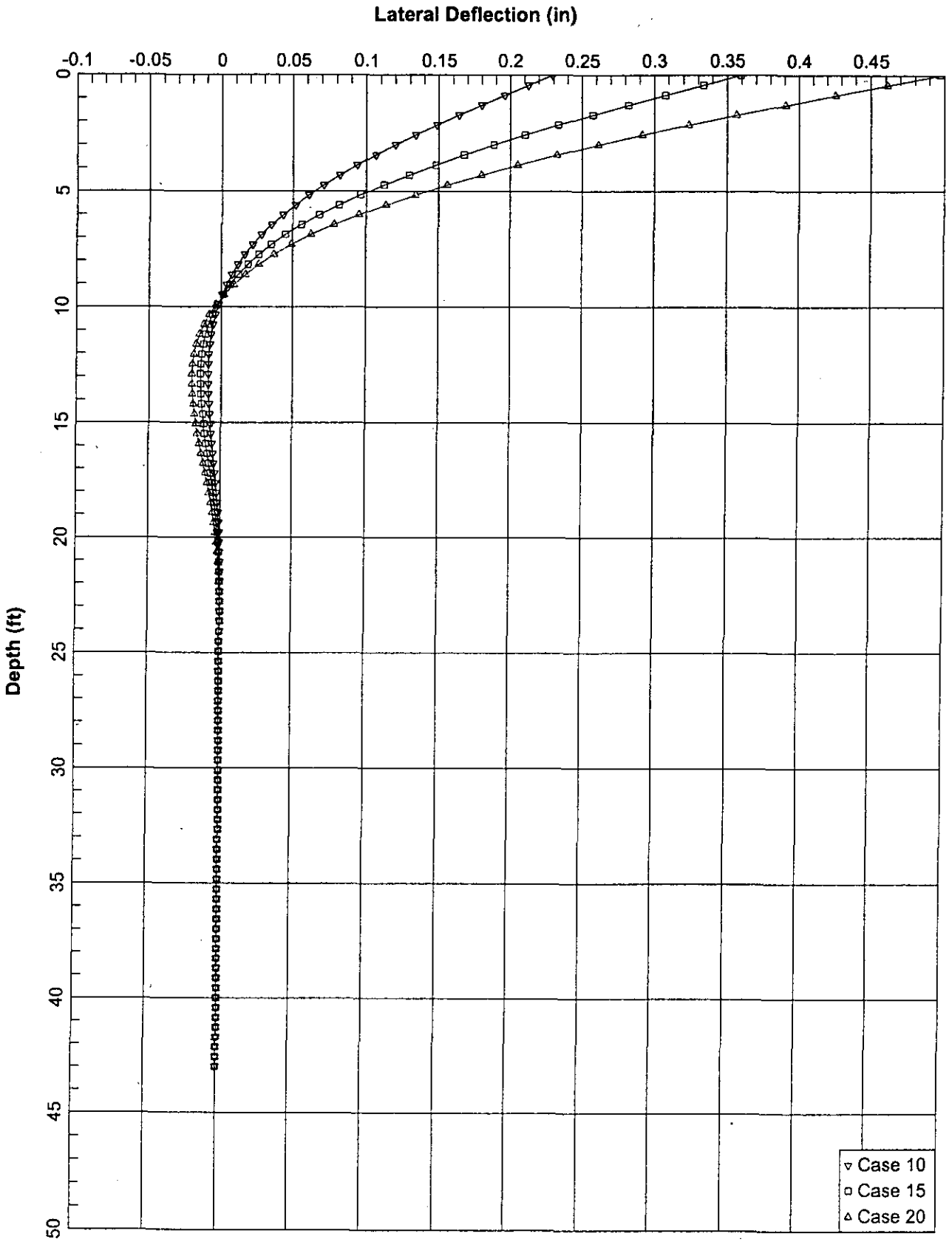
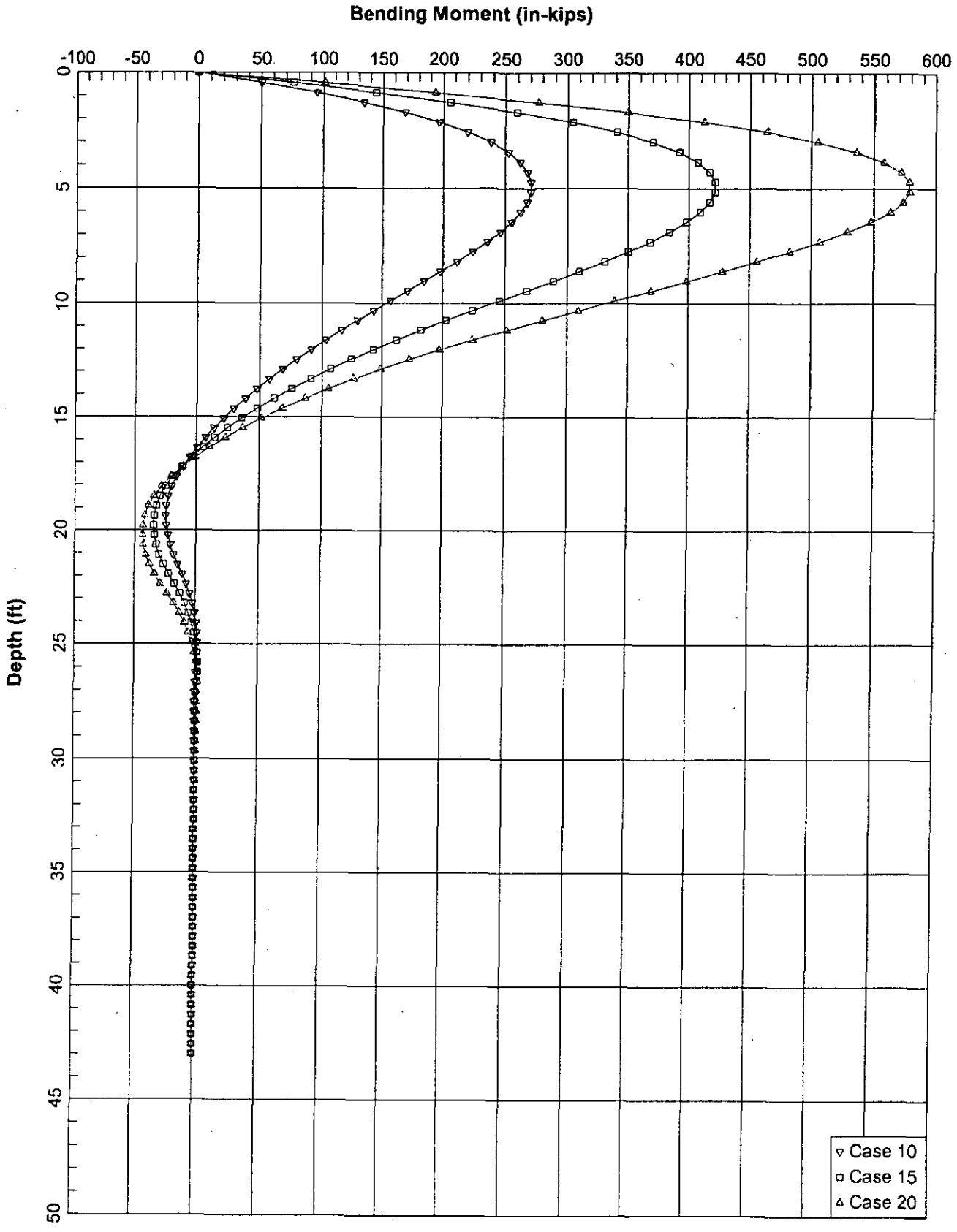


PLATE NO.: C-6



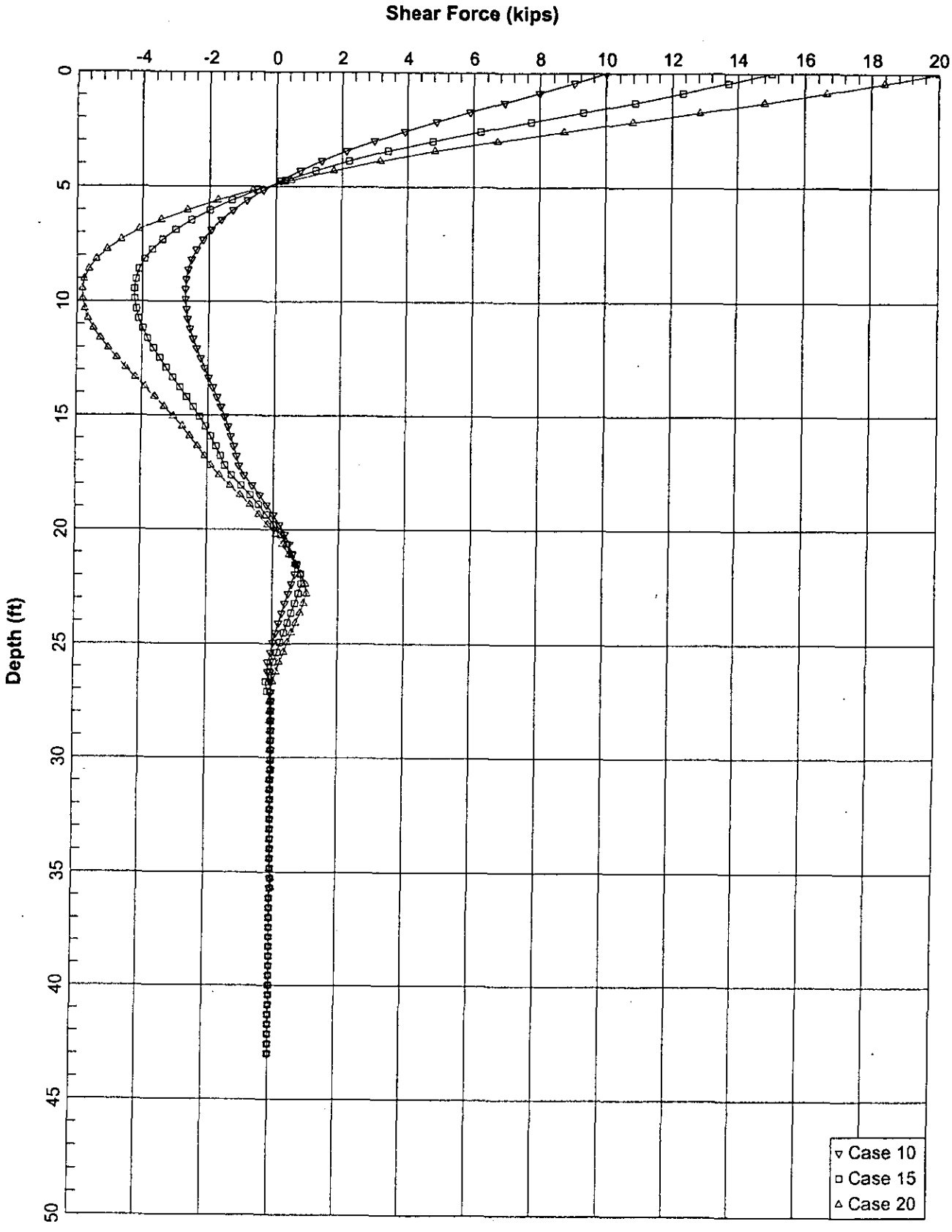
San Leandro Slough Bridge: Abutment 1 - 14" Dia. Closed-End Steel Pipe Pile, 25 tons, Free Head

PLATE NO.: C-7



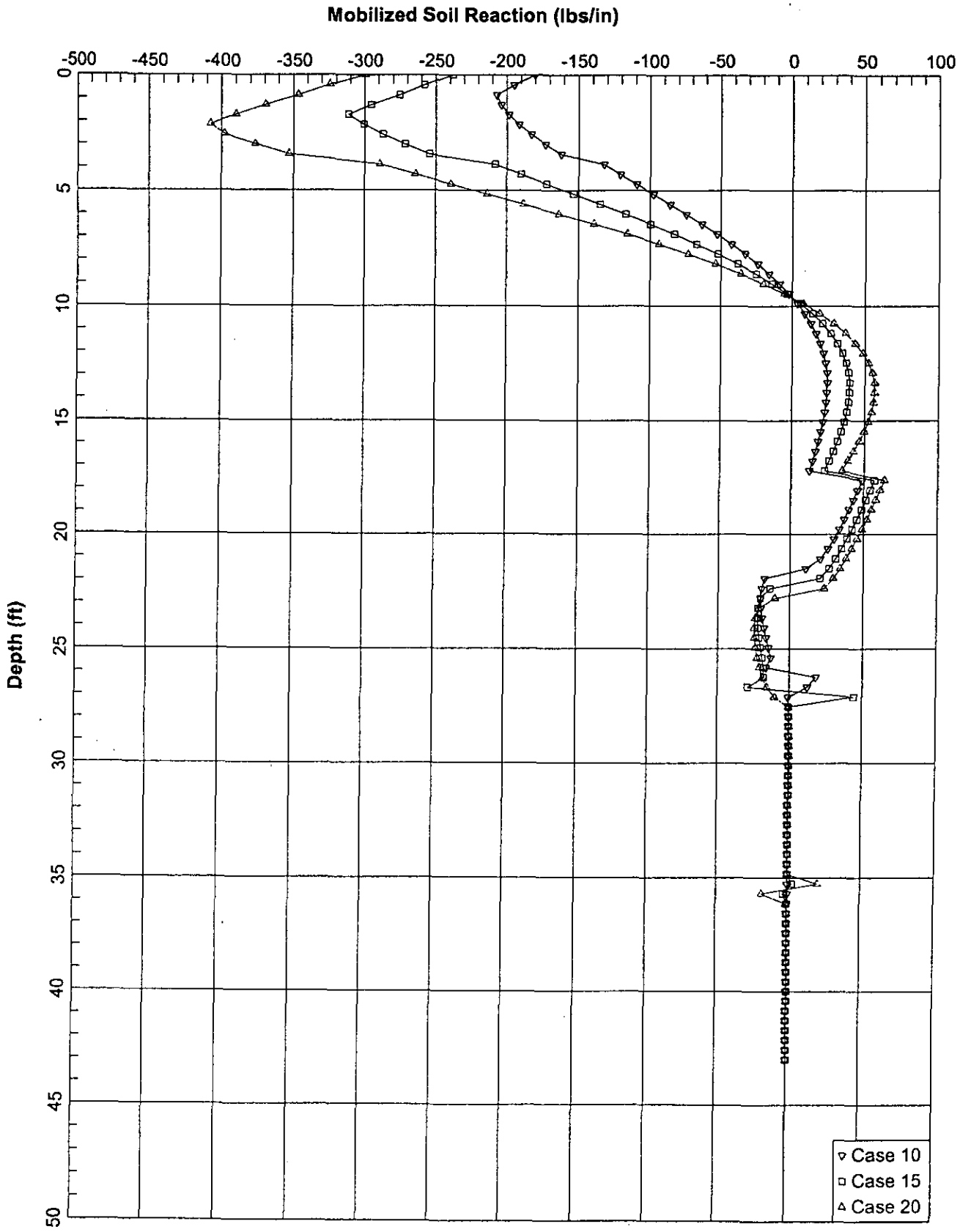
San Leandro Slough Bridge: Abutment 1 - 14" Dia. Closed-End Steel Pipe Pile, 25 tons, Free Head

PLATE NO.: C-8



San Leandro Slough Bridge: Abutment 1 - 14" Dai. Closed-End Steel Pipe Pile, 25 tons, Frre Head

PLATE NO.: C-9



San Leandro Slough Bridge: Abutment 1 - 14" Dai. Closed-End Steel Piipe Pile, 25 tons, Free Head

PLATE NO.: C-10

```
LPILEP4
San Leandro Slough Bridge: Piers 2, 3 & 4 - 4' CISS Pile, 56 tons, Free Head
1       1       0       0       0       0
100     4       96      780     0
0       48      130288  1809.6  3600000
96      48      130288  1809.6  3600000
96      48      372580  1809.6  3600000
780     48      420487  1809.6  3600000
4       8       8       0       2
1       96      240     0       0
3       240     420     707.11  707.11
4       420     600     176.78  176.78
3       600     800     1414.21 1414.21
96      0.0162
240     0.0162
240     0.0365
420     0.0365
420     0.0365
600     0.0365
600     0.0382
800     0.0382
96      0.6944  0       0.0212  0
240     0.6944  0       0.0212  0
240     10.4167 0       0.0049  0
420     10.4167 0       0.0049  0
420     0       38      0       0
600     0       38      0       0
600     15.2778 0       0.0035  0
800     15.2778 0       0.0035  0
96      0.6     1
800     0.6     1
0       1       1
2
1       100000  0       112000
1       120000  0       112000
0
10      1       0
100     1E-5    200
```

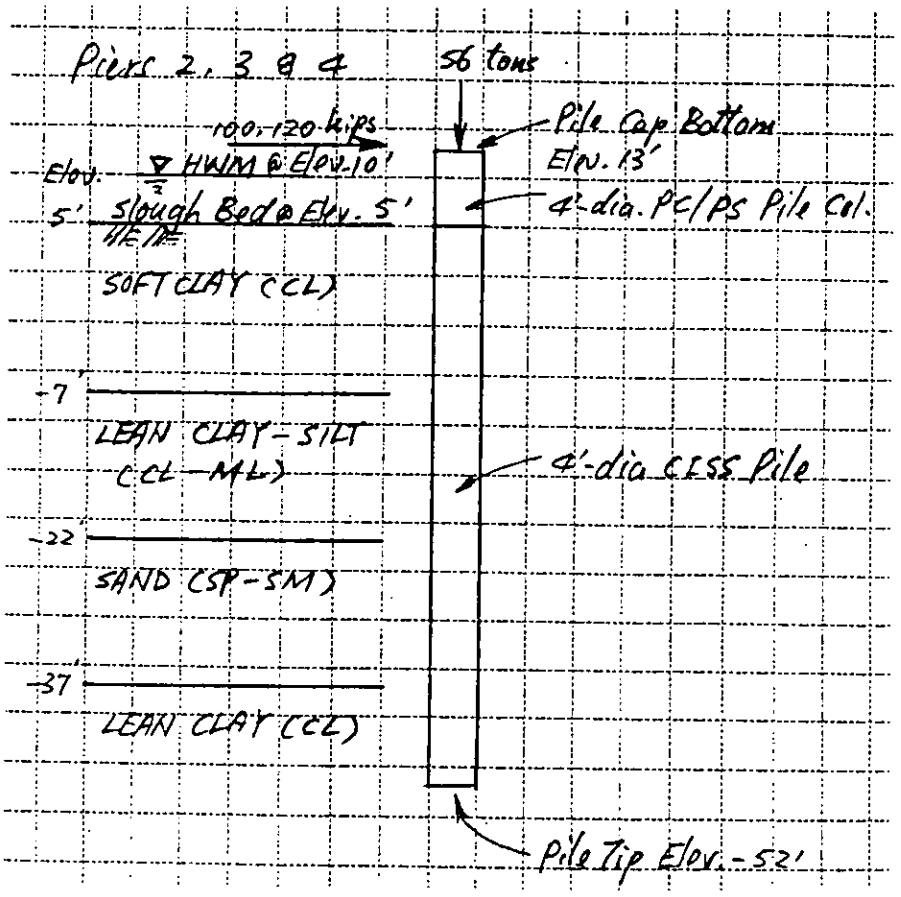
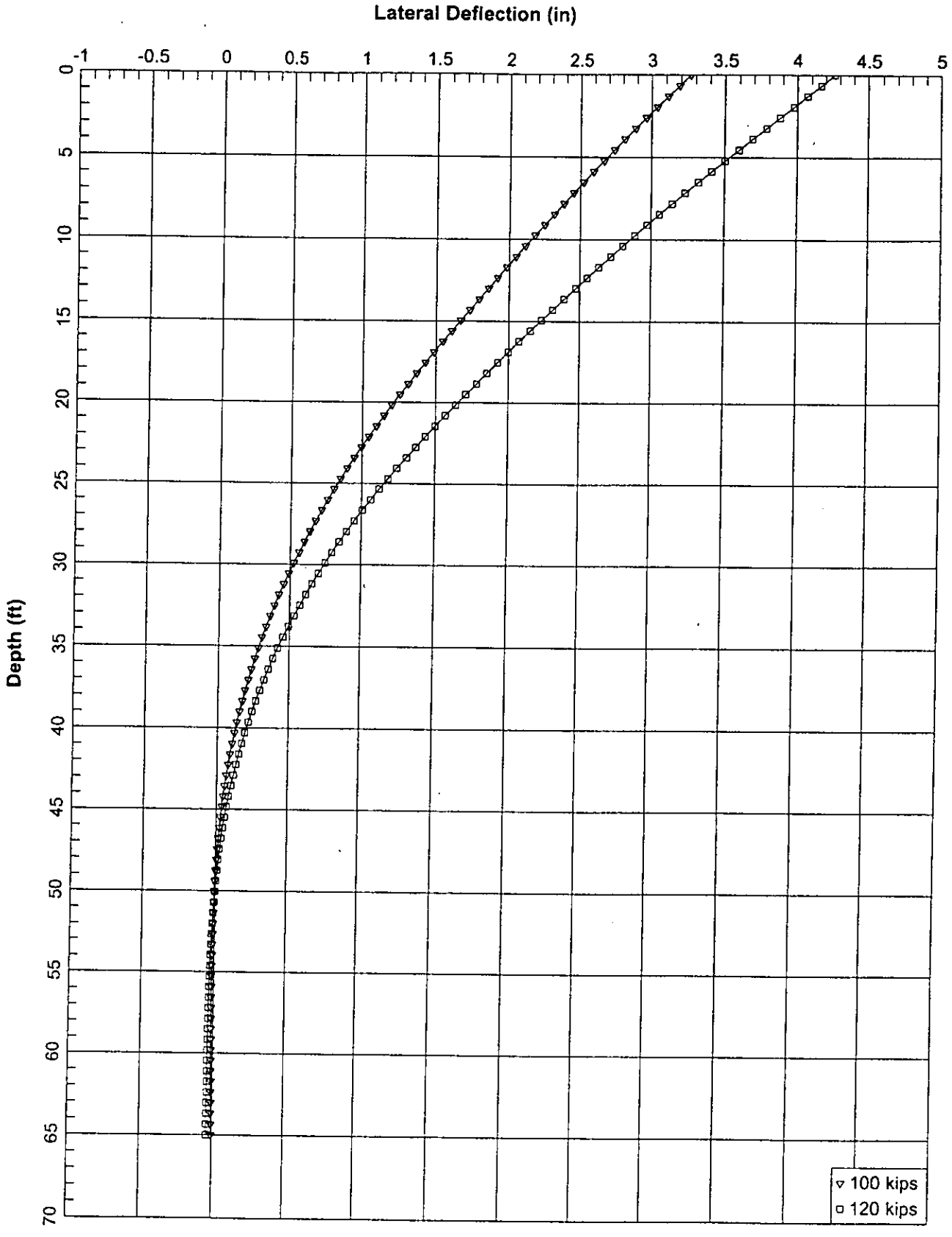
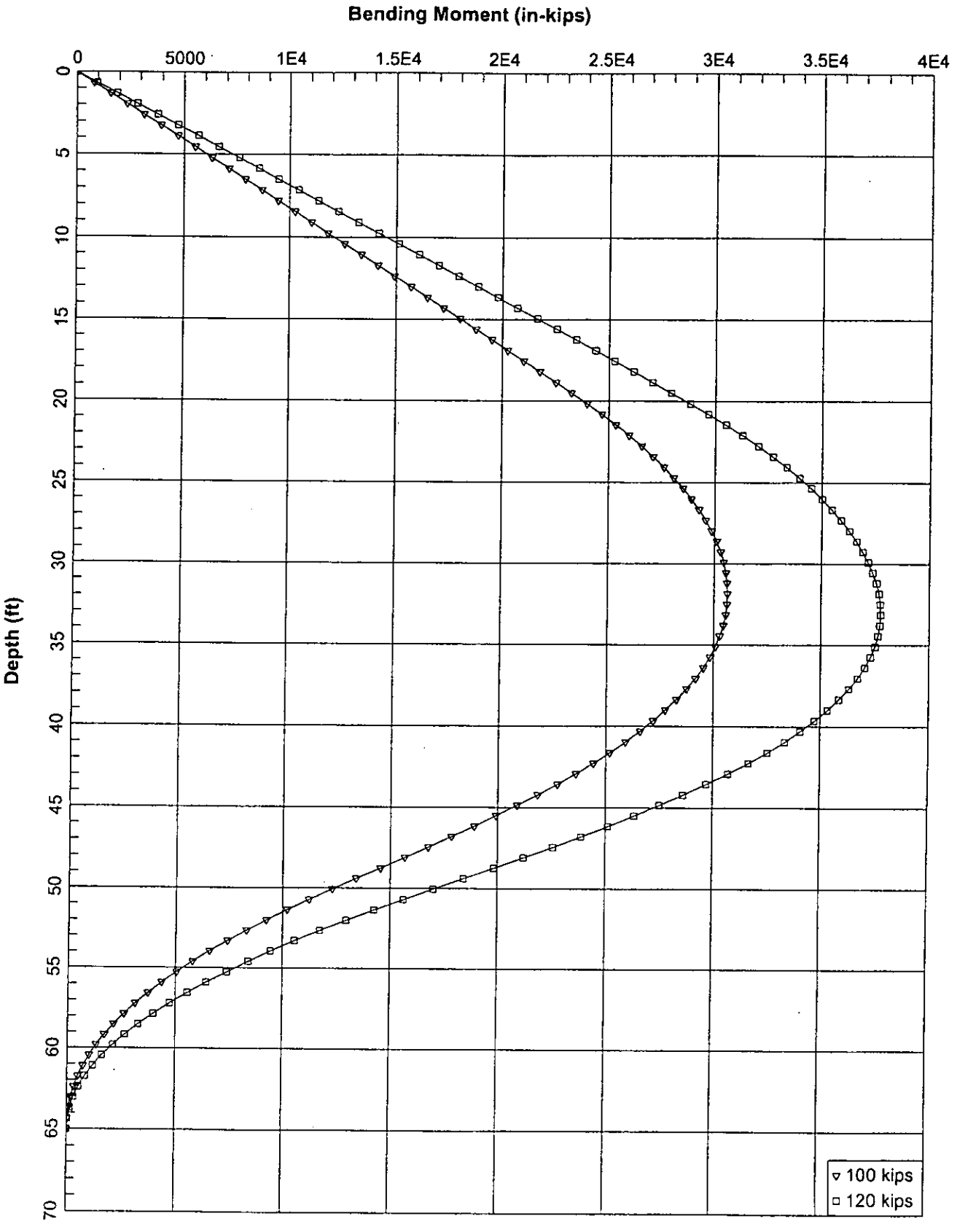


PLATE NO.: C-11



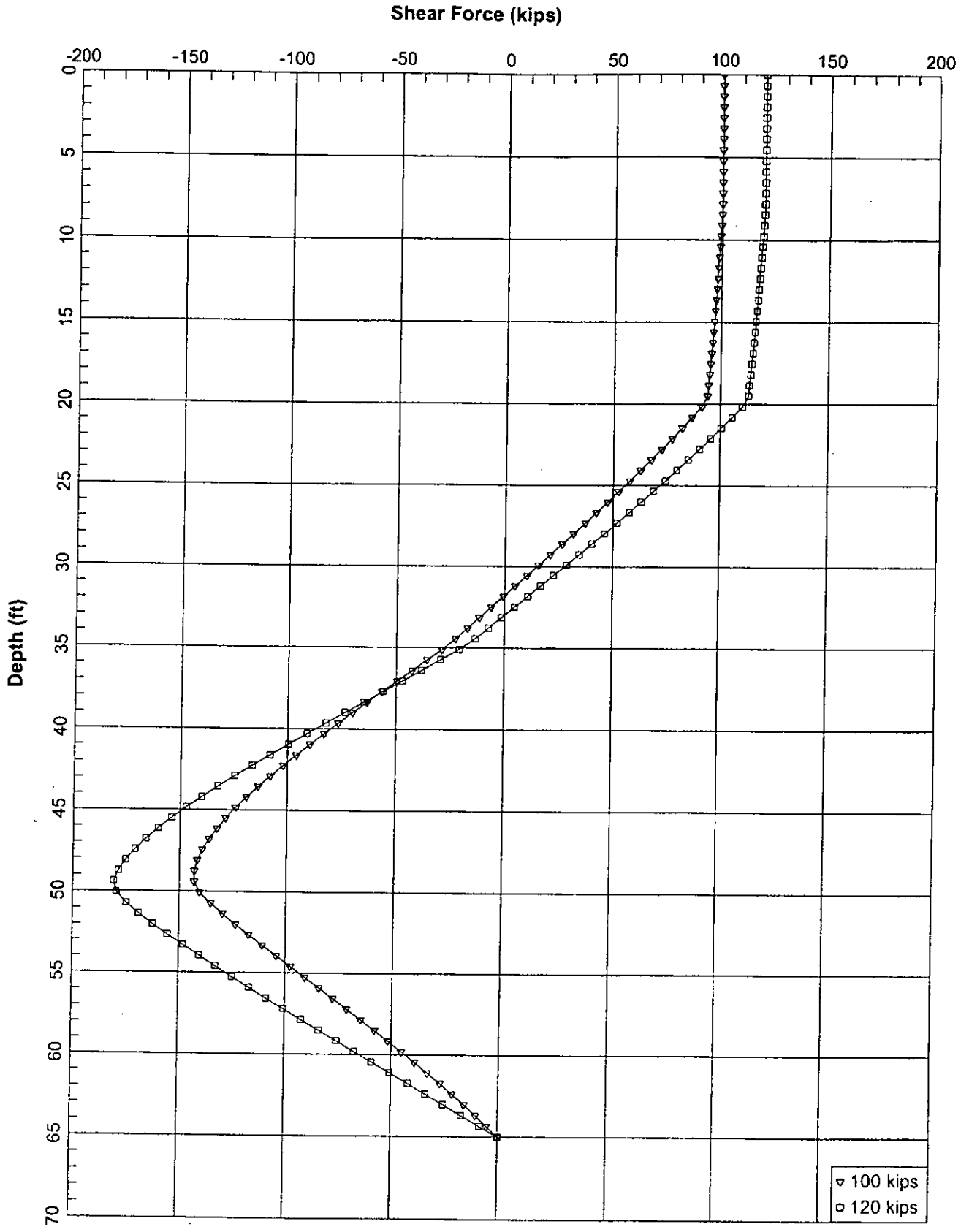
San Leandro Slough Bridge: Piers 2, 3 & 4 - 4' CISS Pile, 56 tons, Free Head

PLATE NO.: C-12



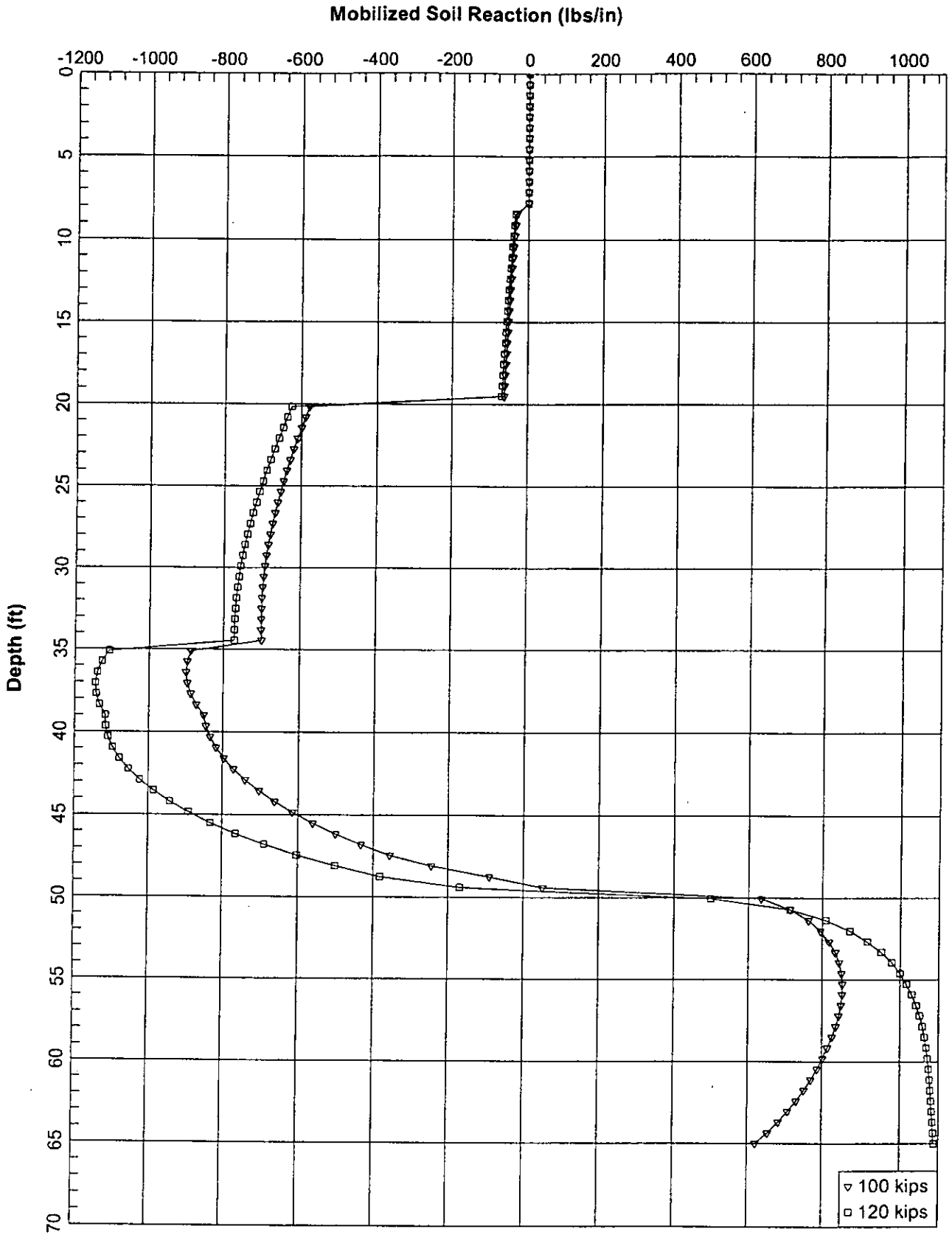
San Leandro Slough Bridge: Piers 2, 3 & 4 - 4' CISS Pile, 56 tons, Free Head

PLATE NO.: C-13



San Leandro Slough Bridge: Piers 2, 3, & 4 - 4' CISS Pile, 56 tons, Free Head

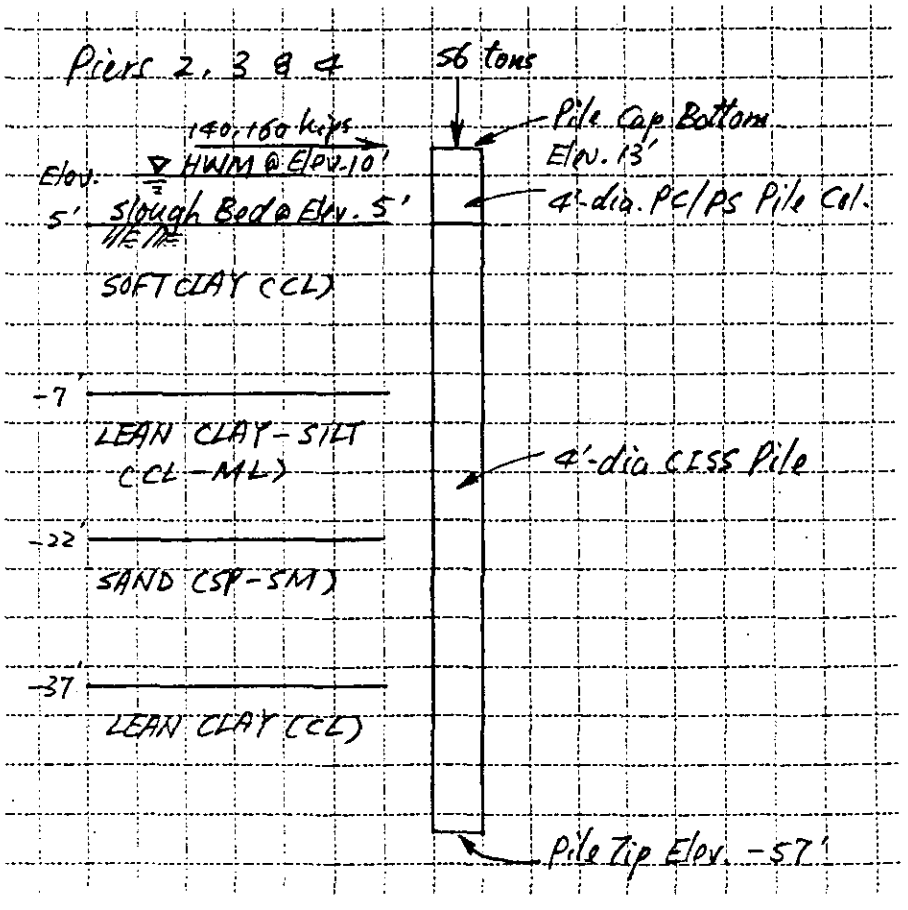
PLATE NO.: C-14

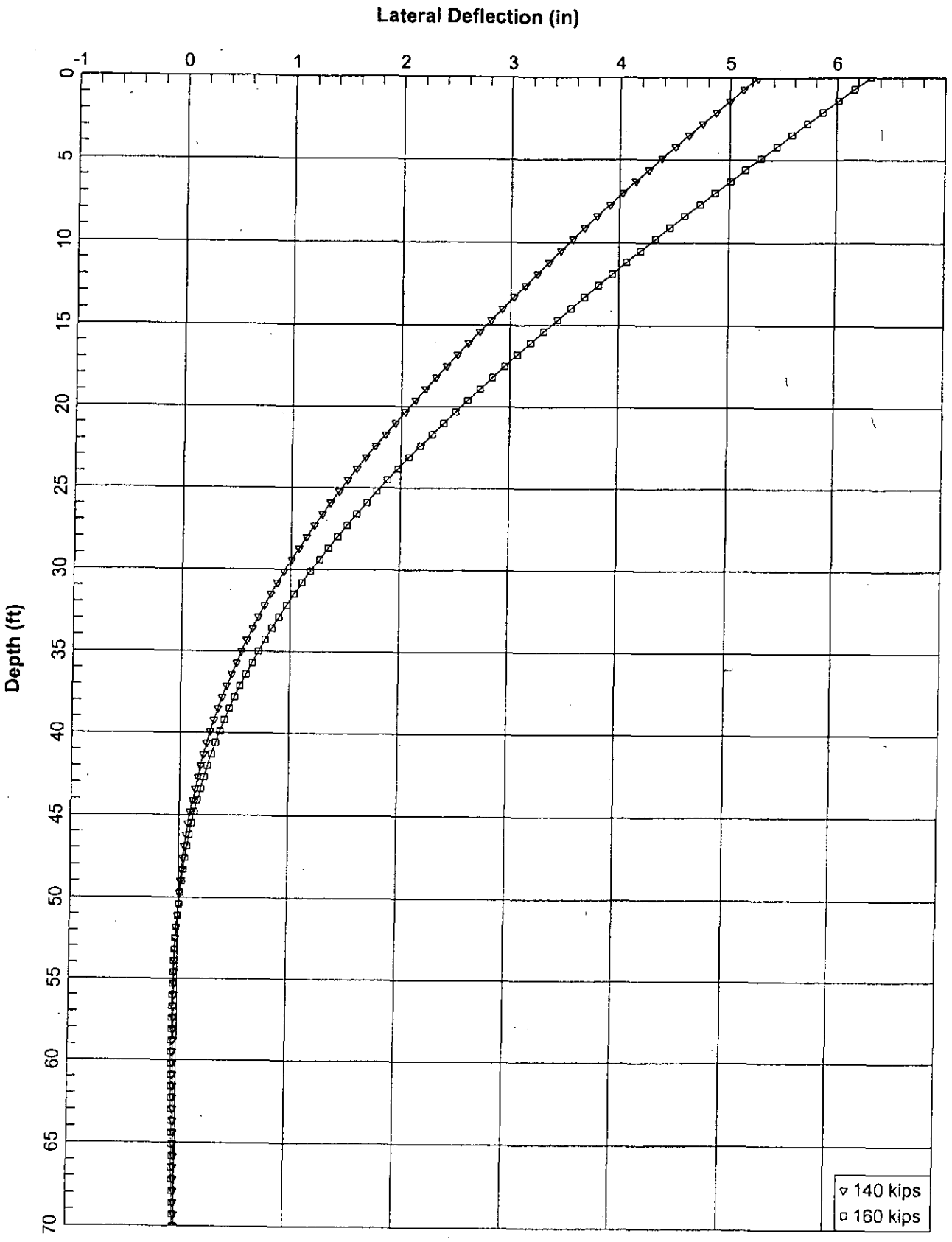


San Leandro Slough Bridge: Piers 2, 3, & 4 - 4' CISS Pile, 56 tons, Free Head

PLATE NO.: C-15

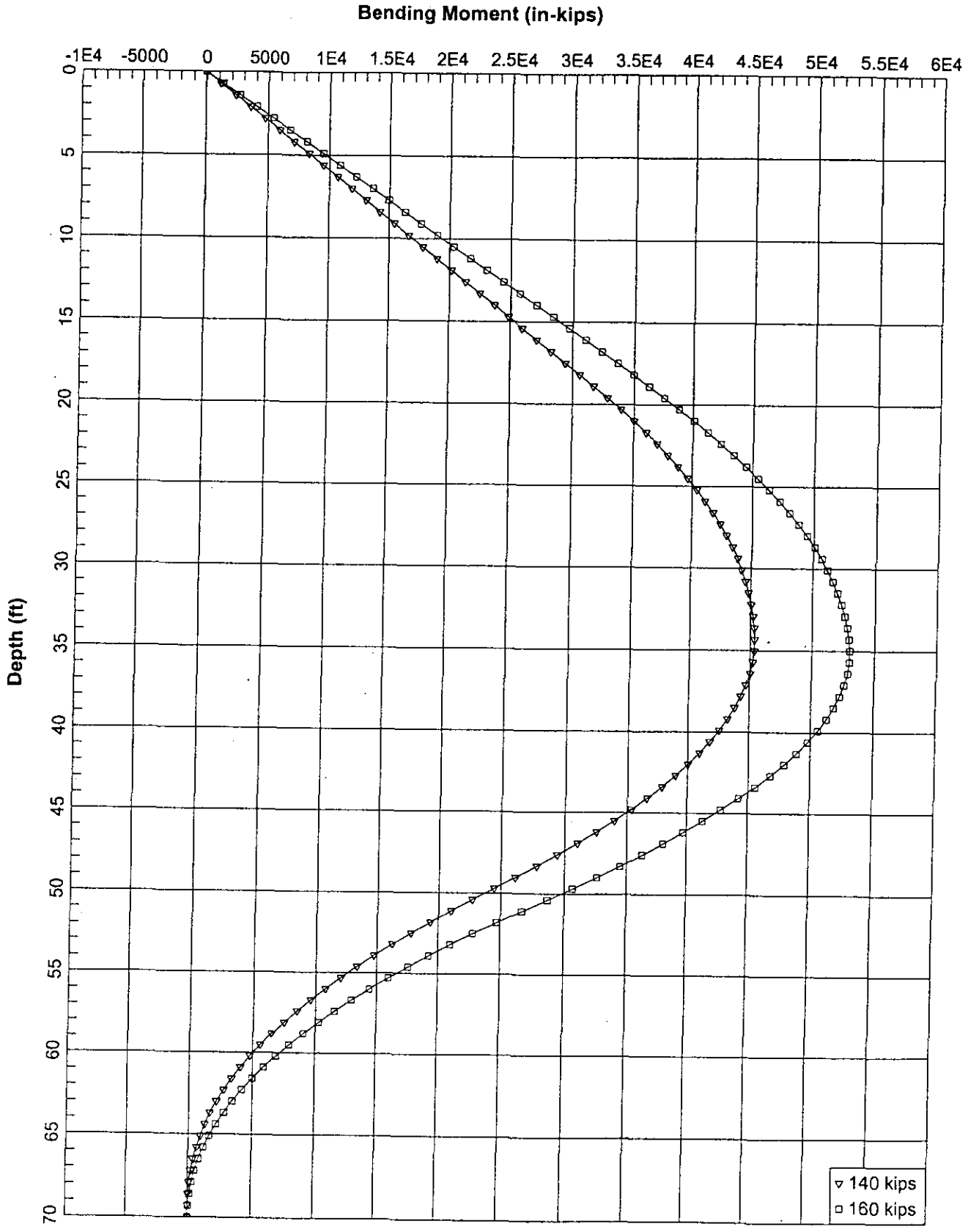
```
LPILEP4
San Leandro Slough Bridge: Piers 2, 3 & 4 - 4' CISS Pile, 56 tons, Free Head
1       1       0       0       0       0
100     4       96      840     0
0       48      130288  1809.6  3600000
96      48      130288  1809.6  3600000
96      48      372580  1809.6  3600000
840     48      420487  1809.6  3600000
4       8       8       0       2
1       96      240     0       0
3       240     420     707.11  707.11
4       420     600     176.78  176.78
3       600     900     1414.21 1414.21
96      0.0162
240     0.0162
240     0.0365
420     0.0365
420     0.0365
600     0.0365
600     0.0382
900     0.0382
96      0.6944  0       0.0212  0
240     0.6944  0       0.0212  0
240     10.4167 0       0.0049  0
420     10.4167 0       0.0049  0
420     0       38      0       0
600     0       38      0       0
600     15.2778 0       0.0035  0
900     15.2778 0       0.0035  0
96      0.6     1
900     0.6     1
0       1       1
2
1       140000  0       112000
1       160000  0       112000
0
10      1       0
100     1E-5    200
```





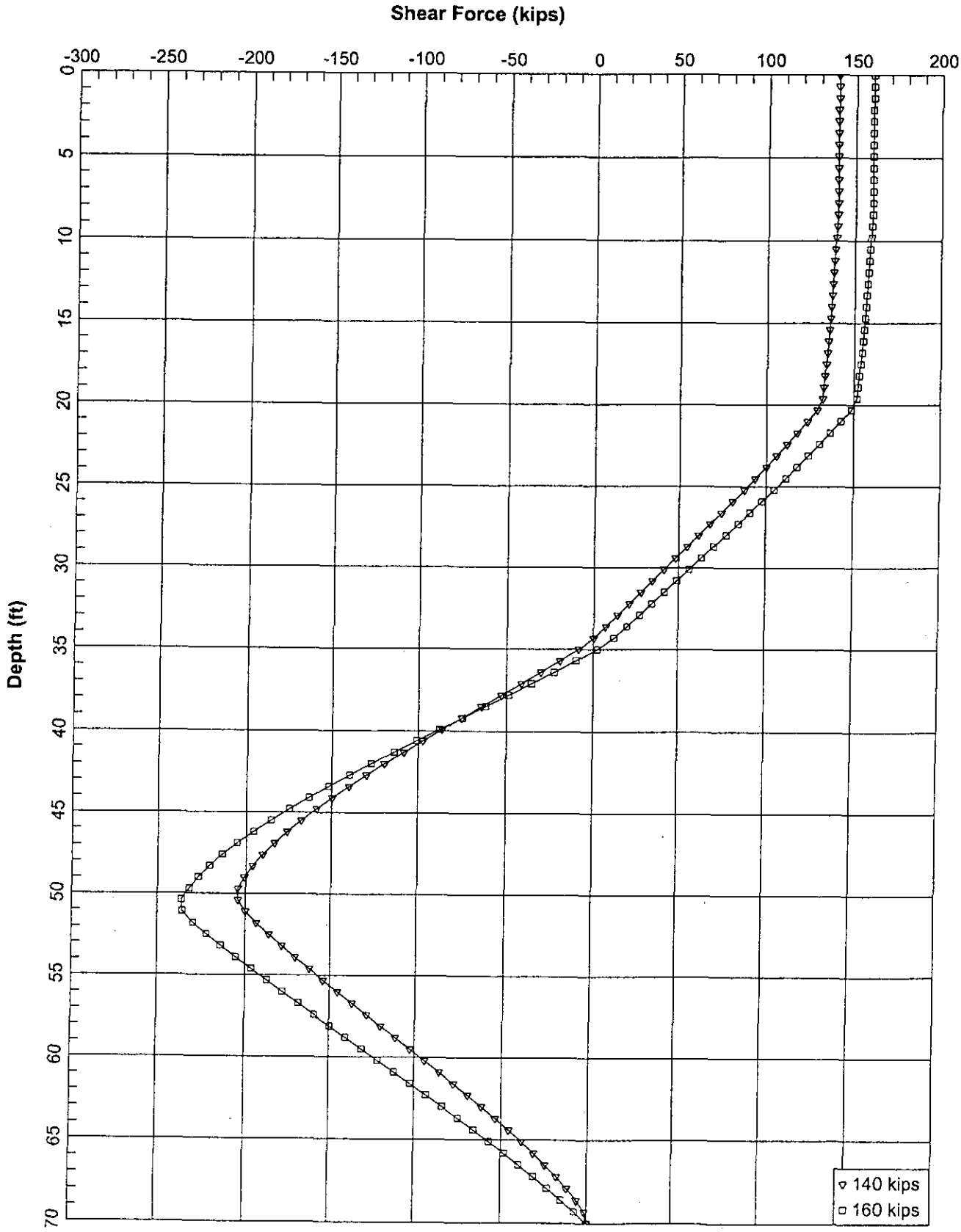
San Leandro Slough Bridge: Piers 2, 3 & 4 - 4' CISS Pile, 56 tons, Free Head

PLATE NO.: C-17



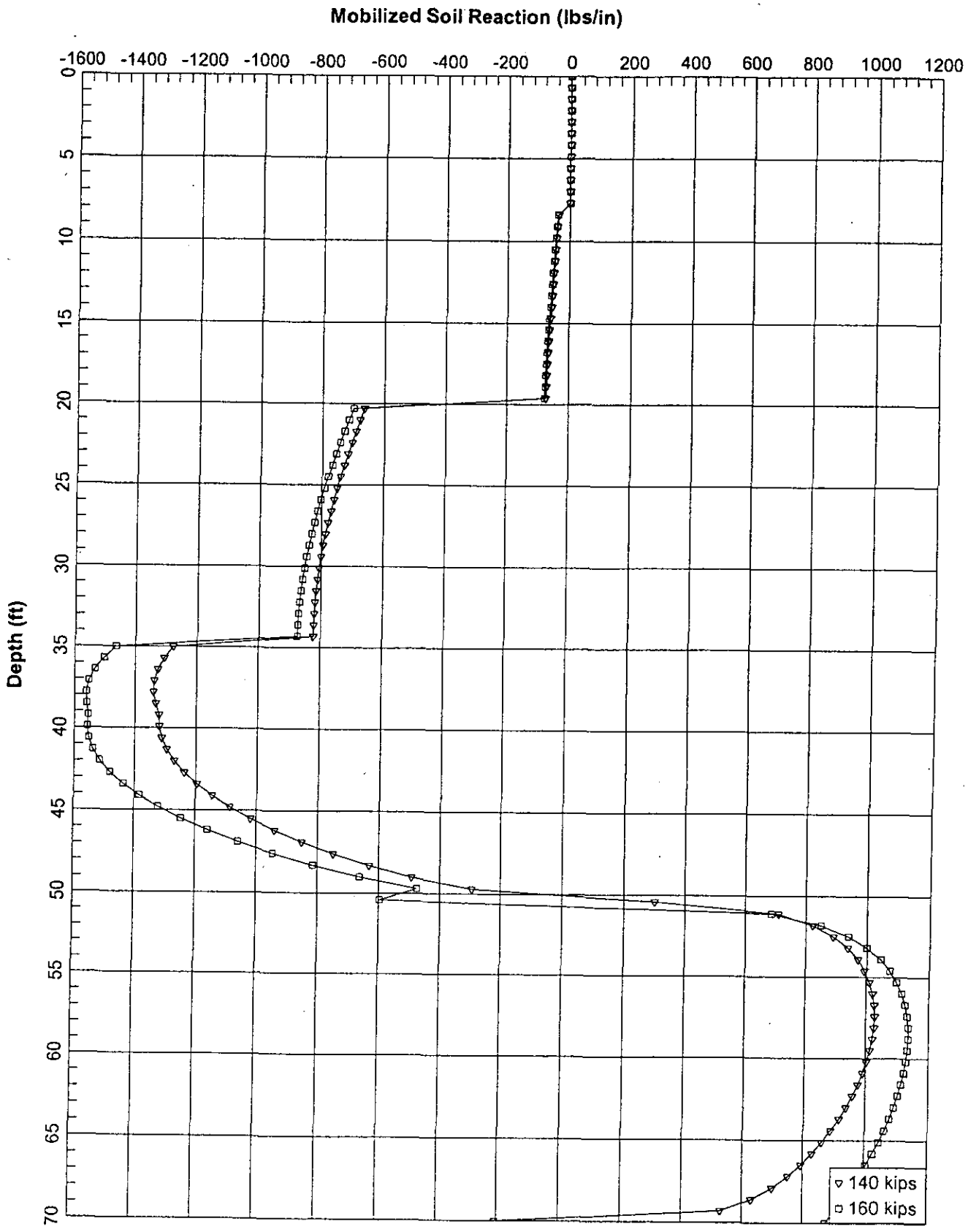
San Leandro Slough Bridge: Piers 2, 3 & 4 - 4' CISS Pile, 56 tons, Free Head

PLATE NO.: C-18



San Leandro Slough Bridge: Piers 2, 3, & 4 - 4' CISS Pile, 56 tons, Free Head

PLATE NO.: C-19



San Leandro Slough Bridge: Piers 2, 3, & 4 - 4' CISS Pile, 56 tons, Free Head

PLATE NO.: C-20

```
LPILEP4
San Leandro Slough Bridge: Abutment 5 - 1'x1' PC/PS Pile, 25 tons, Free Head
1       1       0       0       0       0
100     2       -60     588     0
0       12      1664    142     3000000
588     12      1664    142     3000000
8       16      16      0       6
4       -60     0       225     225
1       0       18      0       0
1       18      144     0       0
1       144     216     0       0
4       216     300     20      20
3       300     444     100     100
4       444     528     60      60
3       528     660     1000    1000
-60     0.0752
0       0.0752
0       0.0637
18      0.0637
18      0.0278
144     0.0278
144     0.0278
216     0.0278
216     0.0289
300     0.0289
300     0.0336
444     0.0336
444     0.0336
528     0.0336
528     0.0382
660     0.0382
-60     0       35      0       0
0       0       35      0       0
0       4.8611  0       0.02    0
18      4.8611  0       0.02    0
18      4.8611  0       0.02    0
144     4.8611  0       0.02    0
144     2.0833  0       0.02    0
216     2.0833  0       0.02    0
216     0       30      0       0
300     0       30      0       0
300     6.9444  0       0.01    0
444     6.9444  0       0.01    0
444     0       32      0       0
528     0       32      0       0
528     12.5    0       0.005   0
660     12.5    0       0.005   0
-60     0.6     1
216     0.6     1
216     0.1     1
300     0.1     1
300     0.6     1
660     0.6     1
0       1       1
3
1       10000   0       50000
1       15000   0       50000
1       20000   0       50000
0
1       1       0
100     1E-5    400
```

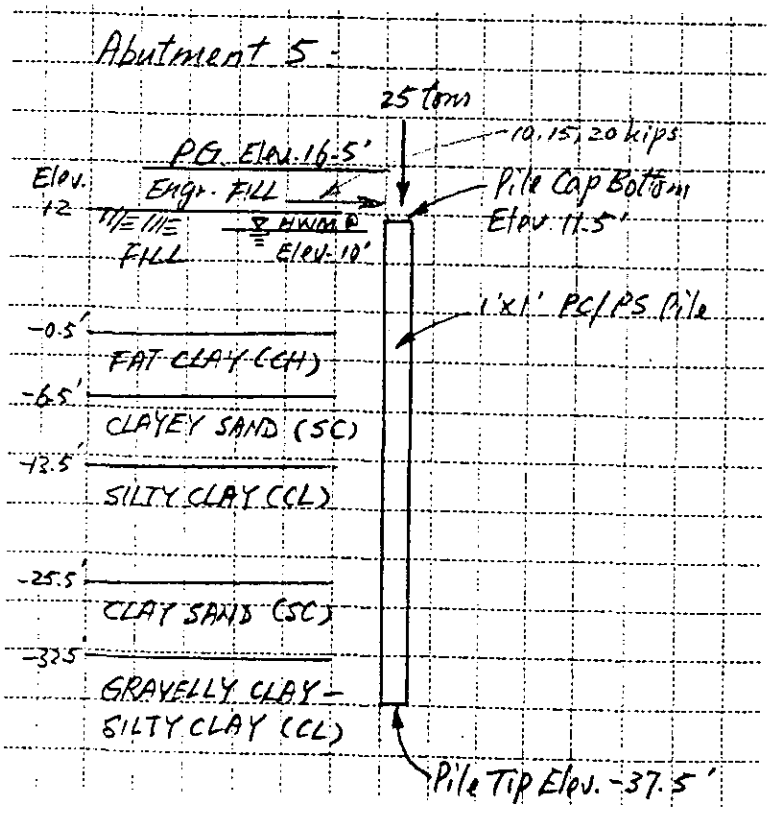
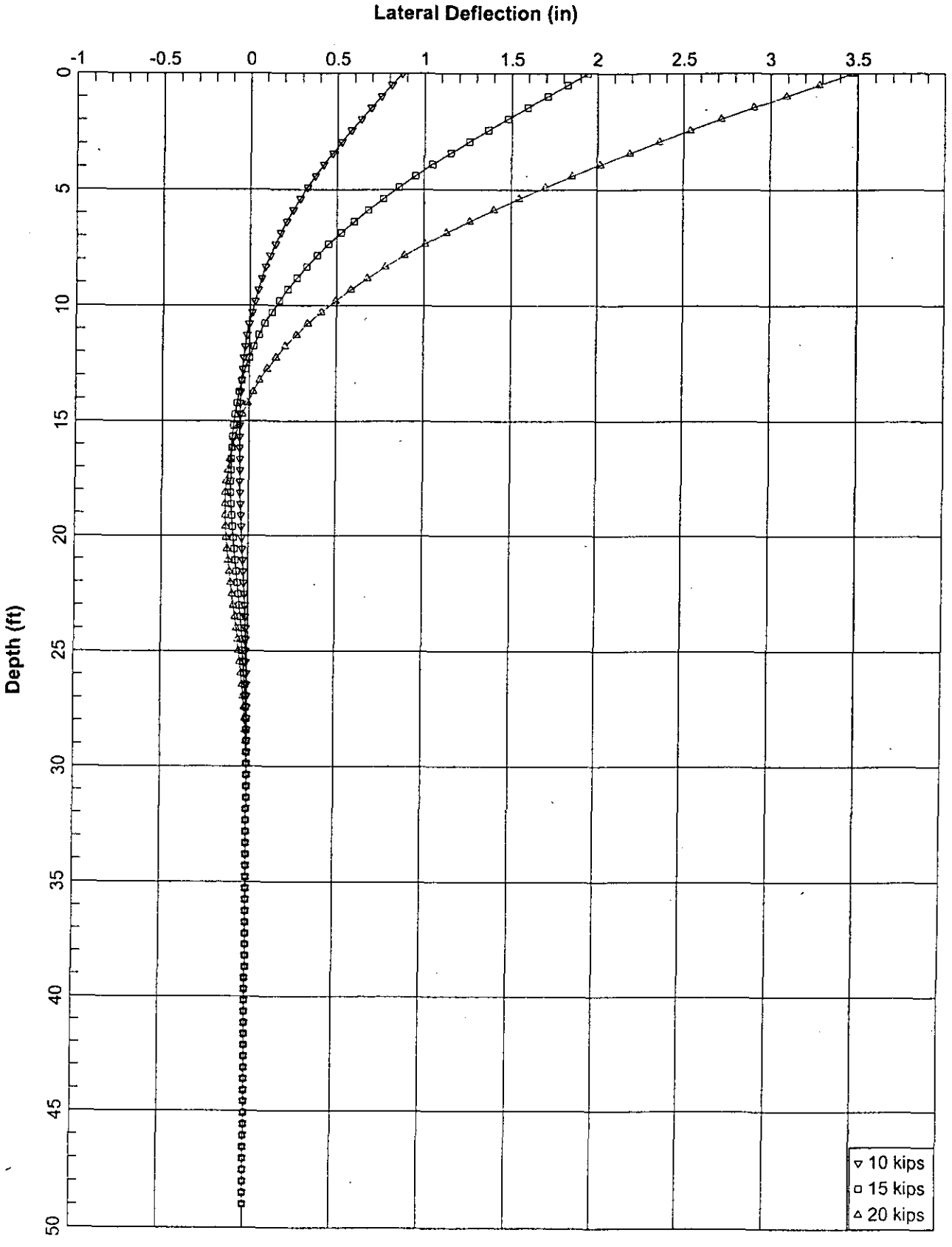
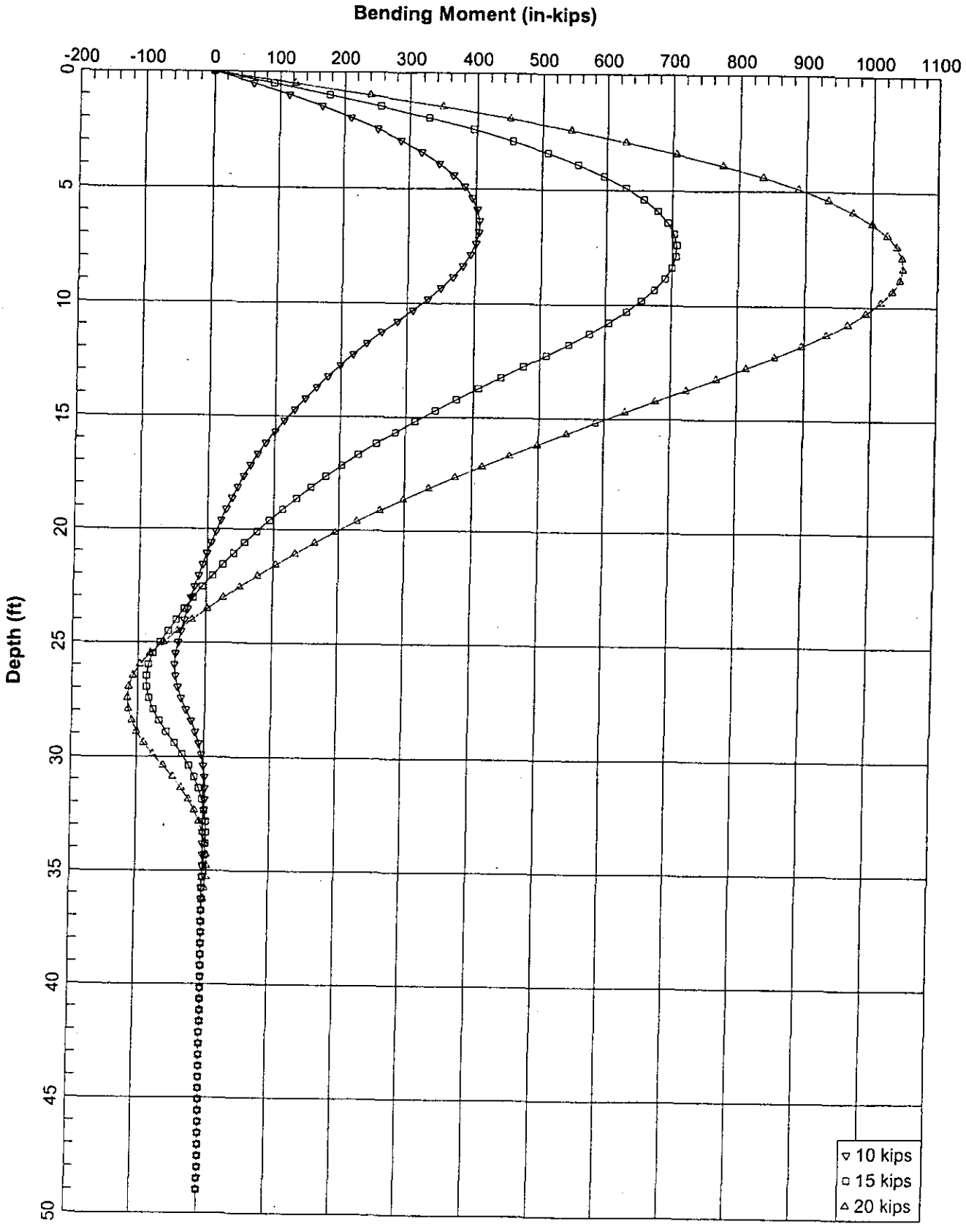


PLATE NO.: C-21



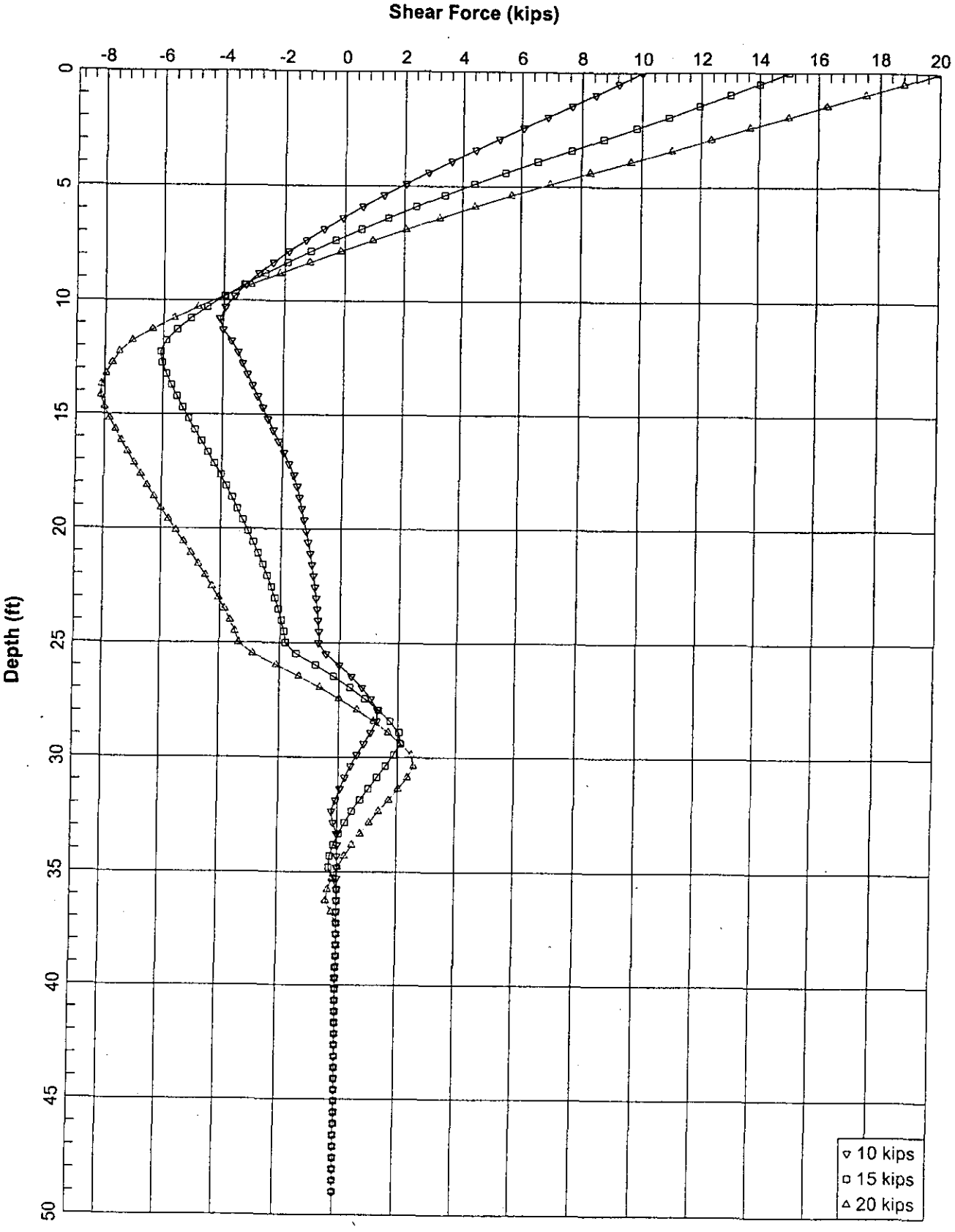
San Leandro Slough Bridge: Abutment 5 - 1'x1' PC/PS Pile, 25 tons, Free Head

PLATE NO.: C-22



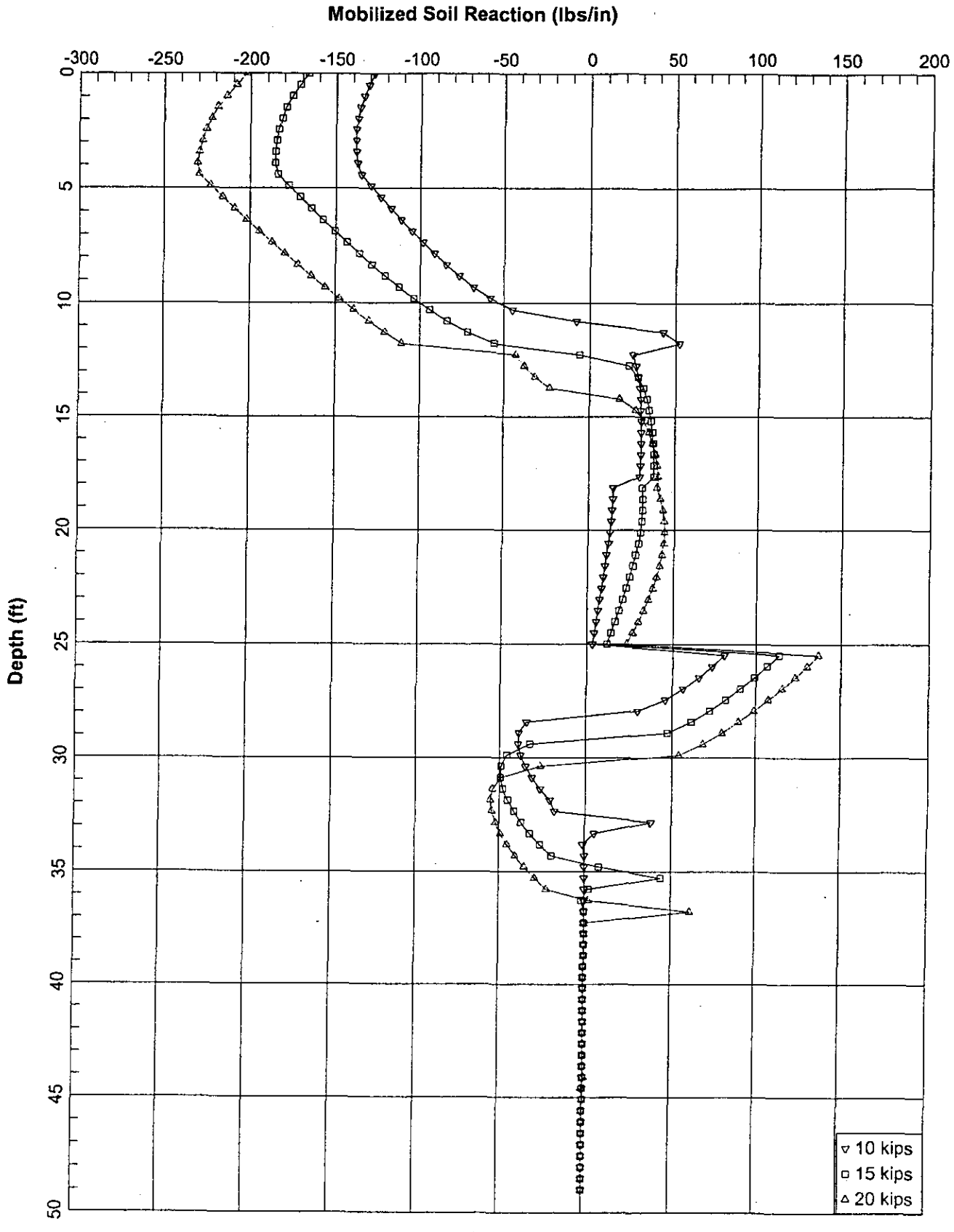
San Leandro Slough Bridge: Abutment 5 - 1'x1' PC/PS Pile, 25 tons, Free Head

PLATE NO.: C-23



San Leandro Slough Bridge: Abutment 5 - 1'x1' PC/PS Pile, 25 tons, Free Head

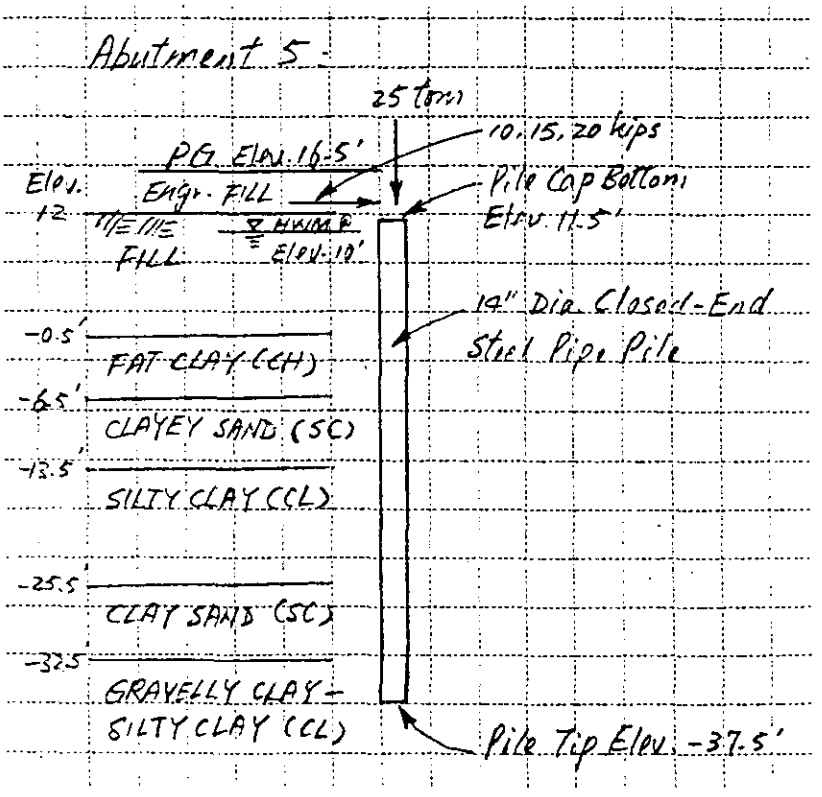
PLATE NO.: C-24

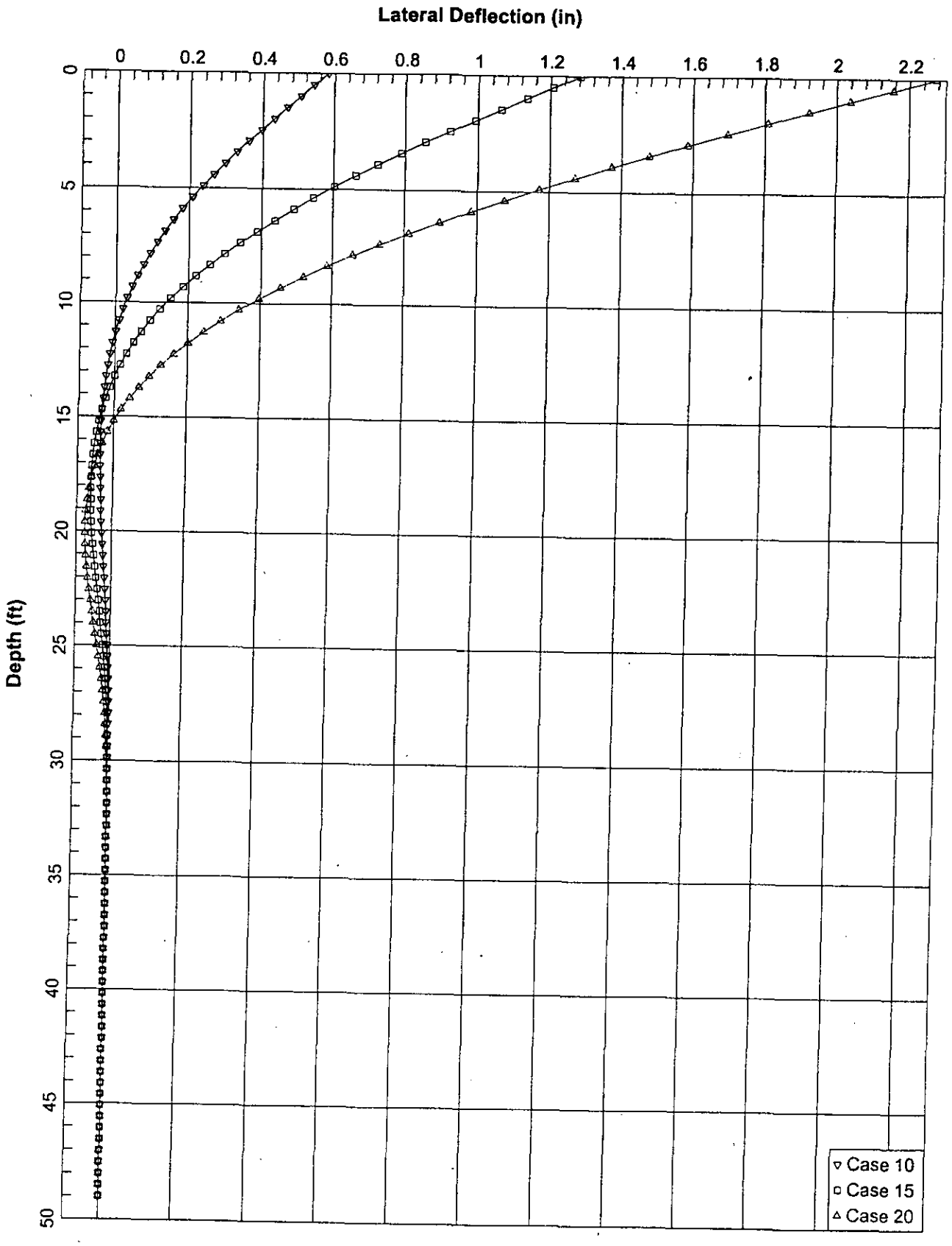


San Leandro slough Bridge: Abutment 5 - 1'x1' PC/PS Pile, 25 tons, Free Head

PLATE NO.: C-25

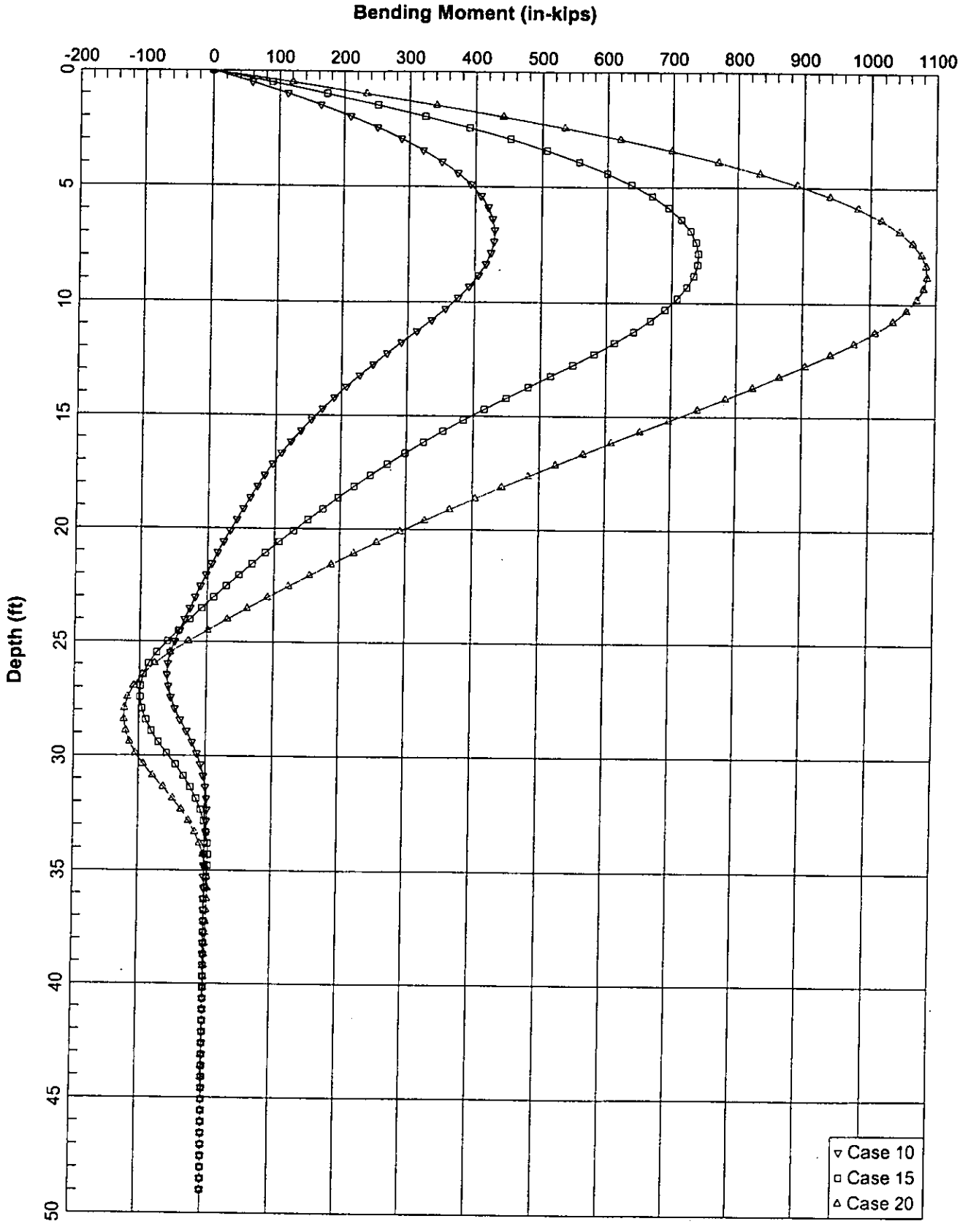
```
LPILEP4
San Leandro Slough Bridge: Abutment 5 - 14" Closed-End Pipe, 25 tons, Free Head
1       1       0       0       0       0
100     2       -60     588     0
0       14      2409.4  153.94  3600000
588     14      2749.22 153.95  3600000
8       16      16      0       6
4       -60     0       225     225
1       0       18      0       0
1       18      144     0       0
1       144     216     0       0
4       216     300     20      20
3       300     444     100     100
4       444     528     60      60
3       528     660     1000    1000
-60     0.0752
0       0.0752
0       0.0637
18      0.0637
18      0.0278
144     0.0278
144     0.0278
216     0.0278
216     0.0289
300     0.0289
300     0.0336
444     0.0336
444     0.0336
528     0.0336
528     0.0382
660     0.0382
-60     0       35      0       0
0       0       35      0       0
0       4.8611  0       0.02    0
18      4.8611  0       0.02    0
18      4.8611  0       0.02    0
144     4.8611  0       0.02    0
144     2.0833  0       0.02    0
216     2.0833  0       0.02    0
216     0       30      0       0
300     0       30      0       0
300     6.9444  0       0.01    0
444     6.9444  0       0.01    0
444     0       32      0       0
528     0       32      0       0
528     12.5    0       0.005   0
660     12.5    0       0.005   0
-60     0.6     1
216     0.6     1
216     0.1     1
300     0.1     1
300     0.6     1
660     0.6     1
0       1       1
3
1       10000   0       50000
1       15000   0       50000
1       20000   0       50000
0
1       1       0
100     1E-5    400
```





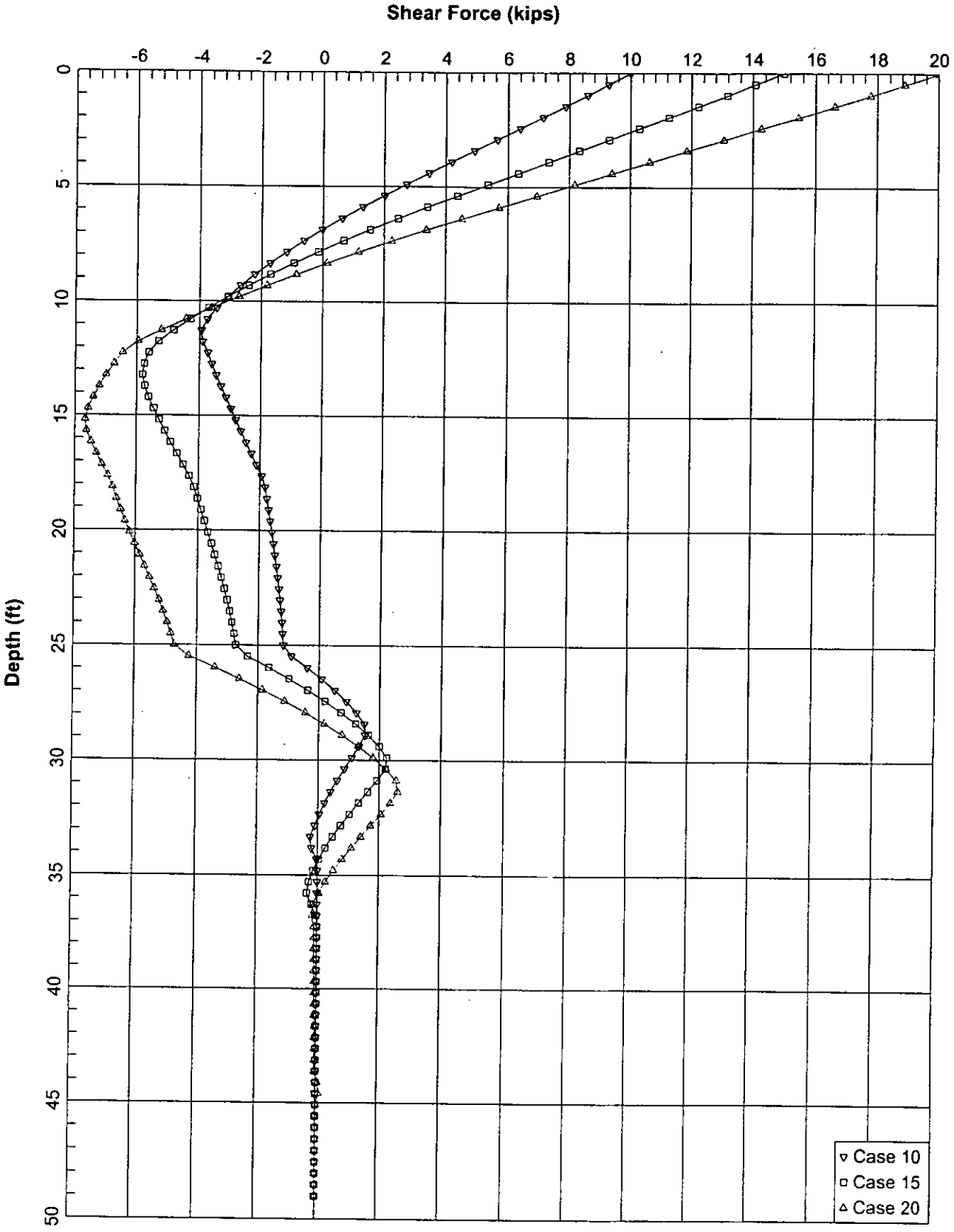
San Leandro Slough Bridge: Abutment 5 - 14" Dia. Closed-End Steel Pipe Pile, 25 tons, Free Head

PLATE NO.: C-27

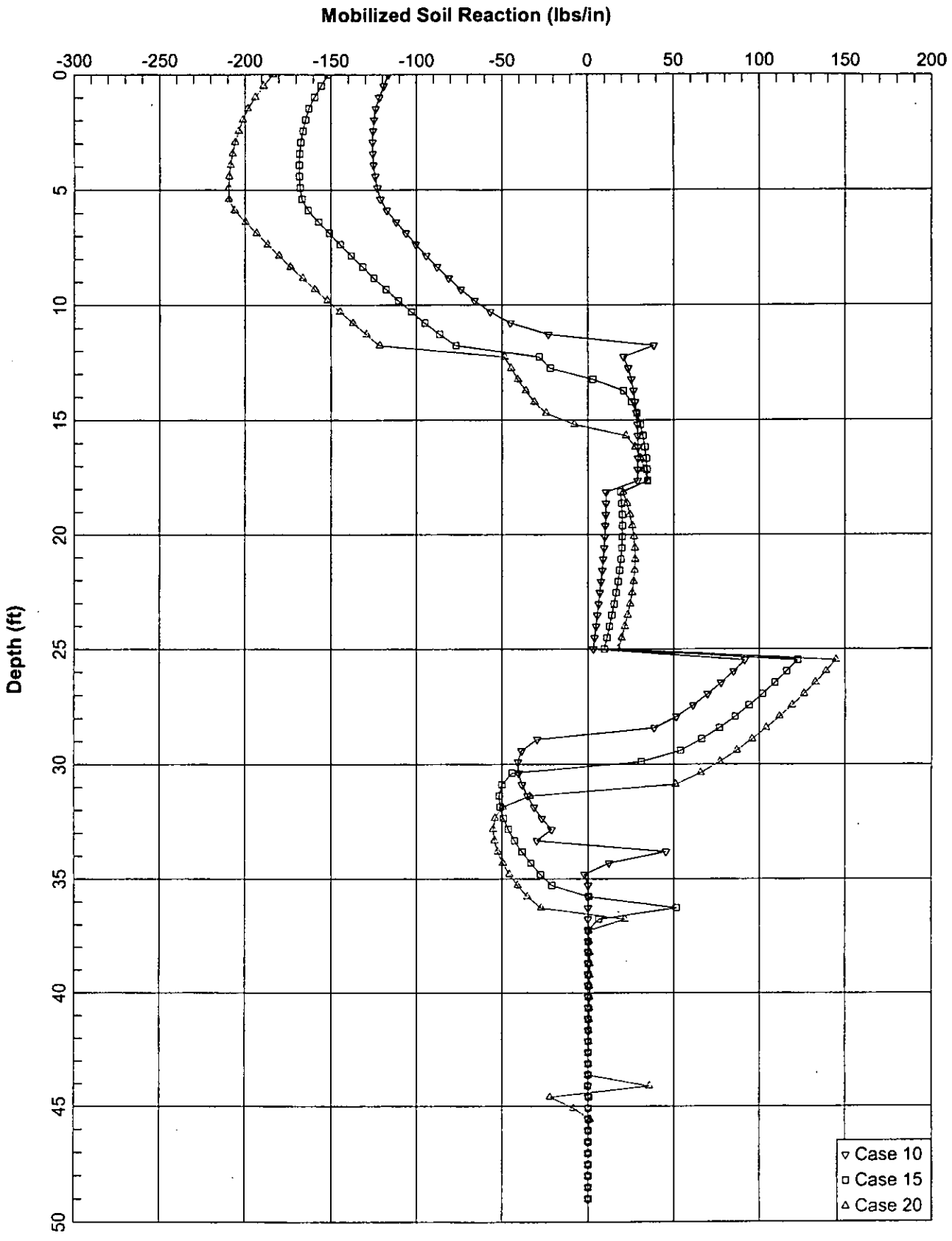


San Leandro Slough Bridge: Abutment 5 - 14" Dia. Closed-End Steel Pipe Pile, 25 tons, Free Head

PLATE NO.: C-28



San Leandro Slough Bridge: Abutment 5 - 14" Dia. Closed-End Steel Pipe Pile, 25 tons, Free Head



San Leandro Slough Bridge: Abutment 5 - 14" Dia. Closed-End Steel Pipe Pile, 25 tons, Free Head