Treadwell&Rollo

7 March 2008
Project No. 4086.21

Ms. Terezia Nemeth
Alexandria Real Estate Equities
1700 Owens Street, Suite 500
San Francisco, California 94158

Subject: Preliminary Geotechnical Evaluation
Blocks 29-32
San Francisco, California

Dear Ms Nemeth:

This letter presents the results of our preliminary geotechnical evaluation for Blocks 29, 30, 31, and 32 (Blocks 29-32) in Mission Bay, San Francisco, California. This evaluation was performed in accordance with our proposal dated 25 January 2008. We previously performed a geotechnical investigation for Blocks 30 and 32 and published the results in reports dated 17 October 2007 and 26 July 2007, respectively. In addition, during the preparation of this preliminary evaluation, we are in the process of performing our geotechnical investigation for the Blocks 29-32 Public Improvements project for Catellus.

The site is located in San Francisco in an area known locally as Mission Bay. The approximate location of the site is shown in Figure 1, attached. Blocks 29-32 are bounded by Third Street to the west, 16th Street to the south, Terry A. Francois Boulevard to the east, and South Street to the north. Currently, Block 30 is occupied by an asphalt-paved parking lot and Blocks 29, 31, and 32 are vacant. An approximately 10-foot-deep excavation is present along the west side of Blocks 30 and 32 and along the east sides of Blocks 29 and 31. This excavation is currently being backfilled as material becomes available.

Existing subsurface information obtained from within the parcels in question and at nearby sites was used during the preparation of this preliminary geotechnical evaluation. Some of this information was obtained during our previous geotechnical investigations and some of the information was obtained from borings performed by others. Approximate locations of these borings relative to Blocks 29-32 are shown on Figure 2, which is attached. Boring and CPT logs from the Public Improvements project have not been attached, as they are still being finalized; however, we have used the information from these points of exploration in our evaluation.

SCOPE OF SERVICES

We performed a preliminary evaluation of subsurface conditions by researching available soil data located within the parcels in question and at nearby sites, both from our own files and from investigations performed by others. Based on our findings, we have developed preliminary conclusions regarding:

- anticipated soil and groundwater conditions at the site
- most appropriate foundation type(s)
- anticipated settlement issues
- issues associated with floor slabs

- site seismicity and seismic hazards (specifically the potential for liquefaction to occur at the site)
- preliminary recommendations for seismic design.

As previously noted, we completed our geotechnical investigations for Blocks 30 and 32 and have presented the results in reports dated 17 October 2007 and 26 July 2007, respectively. We judge the results of these investigations, along with the existing data from previous investigations and the preliminary data from our on-going geotechnical investigation for the Block 29-31 Public Improvements project, provide sufficient data for the purposes of this preliminary evaluation. However, prior to development of Blocks 29 and 31, we recommend detailed site specific investigations that include additional subsurface exploration be performed.

SUBSURFACE CONDITIONS

The results of our preliminary subsurface evaluation indicate that the site is underlain by the following soil and rock units:

Fill Fill is heterogeneous and consists of loose to medium dense and medium stiff to very stiff gravel, sand, silt, and clay mixtures with rock, brick, and other construction debris. Where explored, the fill varies in thickness between 9 and 31 feet. Existing subsurface information indicates the fill is thickest in the northwest corner of the site. Corrosivity testing performed on samples obtained during the investigations at Blocks 30 and 32 indicate the fill ranges from "severely corrosive" to "non-corrosive." Fill deposits in Blocks 29 and 31 will also likely fall within this range.

Recent Bay Deposits The fill is underlain by recent bay deposits that consist of a weak, compressible, silty clay, known locally as Bay Mud. Where encountered, the Bay Mud ranges from 2 to 45 feet thick. In general the Bay Mud increases in thickness to the north and to the west. Based on tests previously performed on samples obtained during our investigations at Blocks 30 and 32, we anticipate the Bay Mud across the site is normally to slightly overconsolidated.[1] In our experience, tests performed on samples of Bay Mud from other sites have shown it to be severely corrosive.

Sand and Clay Based on existing information we anticipate the Bay Mud is underlain by a dense to very dense silty and clayey sand and stiff to hard clay across the proposed site. Where encountered in previous borings, this sand and clay layer is 6 to 17 feet thick.

[1] An overconsolidated clay has not yet achieved equilibrium under the existing load; a normally consolidated clay has completed consolidation under existing load; and an overconsolidated clay has experienced a pressure greater than it current load.

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[1] An overconsolidated clay has not yet achieved equilibrium under the existing load; a normally consolidated clay has completed consolidation under existing load; and an overconsolidated clay has experienced a pressure greater than it current load.

Colma Formation Approximately 5 to 24 feet of dense to very dense sand, silty sand, and clayey sand, geologically referred to as the Colma Formation, were encountered in and around the proposed site. Based on these borings it appears as though the Colma Formation increases in thickness to the north and west. These deposits were not encountered along the eastern or southern portions of Block 32. Based on existing subsurface information, it is anticipated that this deposit is also not present beneath the southern half of Block 31.

Clay, Clay with Gravel, and Gravelly Clay A layer of hard clay with gravel, clay with bedrock fragments, and gravelly clay was encountered above bedrock in several of the borings reviewed. Where encountered, the layer is between 3 and 15 feet thick.

Bedrock Bedrock consists of serpentinite, shale, claystone and sandstone of the Franciscan Complex. The rock encountered is intensely fractured, plastic to weak and deeply to moderately weathered. Existing information from the site indicates top of the bedrock likely ranges from Elevation 63 to -6 feet[2]; however, based on bedrock contours using all nearby data, there is the potential for bedrock to extend up to about 120 feet below existing ground surface (approximate elevation -20 feet) at the northwest corner of Block 29. Based on the existing subsurface information, the surface of the bedrock generally becomes deeper toward the north and west.

Groundwater Groundwater was encountered during previous investigations at elevations ranging between 89 and 93 feet. This level is likely susceptible to seasonal and tidal variations.

The Bay Mud is known to be expansive; however, it is below the zone of moisture change and should have no adverse effect on the proposed development. No other expansive soil is expected at the site.

REGIONAL SEISMICITY AND FAULTING

The major active faults in the area are the San Andreas, San Gregorio, and Hayward Faults. These and other faults of the region are shown on Figure 3. For each of the active faults, the distance from the site and estimated maximum Moment magnitude[3] [Working Group on California Earthquake Probabilities (WGCEP) (2003) and Cao et al (2003)] are summarized in Table 1.

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2 Elevations based on San Francisco City Datum plus 100 feet.

3 Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 1

Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Maximum Magnitude
San Andreas - 1906 Rupture	12.6	West	7.90
San Andreas - Peninsula	12.6	West	7.15
North Hayward	16	East	6.49
Total Hayward	16	East	6.91
Total Hayward-Rodgers Creek	16	East	7.26
San Andreas- North Coast South	17	West	7.45
South Hayward	17	East	6.67
Northern San Gregorio	19	West	7.23
Total San Gregorio	19	West	7.44
Mt Diablo	33	East	6.65
Total Calaveras	34	East	6.93
Rodgers Creek	36	North	6.98
Concord/Green Valley	39	East	6.71
Monte Vista-Shannon	39	Southeast	6.80
Point Reyes	44	West	6.80
West Napa	46	Northeast	6.50

Figure 3 also shows the earthquake epicenters for events with magnitude greater than 5.0 from January 1800 through January 1996. Since 1800, four major earthquakes have been recorded on the San Andreas Fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) scale (Figure 4) occurred east of Monterey Bay on the San Andreas Fault (Toppozada and Borchardt 1998). The estimated Moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas Fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), an M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The most recent earthquake to affect the Bay Area was the Loma Prieta Earthquake of 17 October 1989 with an M_w of 6.9. This earthquake occurred in the Santa Cruz Mountains, approximately 100 km from the site.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward Fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably an M_w of about 6.5) was reported on the Calaveras Fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake (M_w = 6.2).

In 2002, the Working Group on California Earthquake Probabilities (WGCEP 2003) at the U.S. Geologic Survey (USGS) predicted a 62 percent probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area by the year 2031. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 2.

TABLE 2

WGCEP (2003) Estimates of 30-Year Probability (2002 to 2031) of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	27
San Andreas	21
Calaveras	11
San Gregorio	10
Concord-Green Valley	4
Greenville	3

CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

On the basis of the available subsurface information, it is our opinion the site can be developed as planned. Our preliminary conclusions regarding geologic hazards, foundations, excavation, temporary shoring, basement walls, underpinning, and seismic design are presented in the remainder of this letter.

Geologic Hazards

During a major earthquake on a segment of one of the nearby faults, strong to very strong shaking is expected to occur at the project site. Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction,[4] lateral spreading,[5] and seismic densification.[6]

The seismic hazard zone map for the City and County of San Francisco, prepared by the California Division of Mines and Geology (CDMG) and published on 17 November 2001, indicates the site is located in a designated liquefaction hazard zone. Therefore, in order to properly assess the potential for liquefaction and the amount of settlement and lateral spreading that may occur during and after a major seismic event, the final geotechnical investigation for Block 29 and 31 should be performed in accordance with the recommendations presented in 1997 Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, prepared by the Department of Conservation Division of Mines and Geology. The site is flat and the seismic hazard zone map indicates the site is not in an area were the previous occurrence of landslides have been observed after a seismic event, therefore the risk of a landslide at the site following a large seismic event is nil.

Based on nearby data, the fill deposits below the groundwater include loose to medium dense sand to depths ranging from 9 to 31 feet below the existing ground surface. As previously discussed we performed site specific investigations at both Blocks 30 and 32. During these investigations we encountered isolated pockets of loose sandy fill with a high potential to liquefy across both Blocks 30 and 32 with the presence of liquefiable material being more widespread across Block 30. The existing subsurface data located on and around Blocks 29 and 31 indicate similar conditions to those identified at Blocks 30 to 32. The presence of liquefiable fill across Block 29 appears to be more widespread than across Block 31. However, where encountered, we judge the potential for liquefaction in the loose sandy fill located in Blocks 29 and 31 is high. A full geotechnical investigation should be performed at Blocks 29 and 31 to adequately assess the potential for liquefaction of fill below the groundwater table. Any basement or below-grade permanent walls will need to accommodate additional earth pressures due to liquefaction of the surrounding soil.

The site is located outside of the Alquist-Priolo Earthquake Fault Zone and published data indicate neither known active faults nor extensions of active faults exist beneath the site. Therefore, we judge the potential of surface rupture occurring at the site is low.

The site is relatively flat and is several hundred feet from San Francisco Bay. In addition the potentially liquefiable deposits identified in the previous investigations at Blocks 30 and 32 are discontinuous; therefore, we judge the risk of lateral spreading is low. The project site should not be subject to landslides of erosion. No springs or seepages were observed on site.

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4 Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

5 Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

6 Seismic densification is a phenomenon in which non-saturated, cohesionless soil is densified by earthquake vibrations, causing differential settlement.

Settlement

Bay Mud at the site varies greatly in thickness from 2 to 45 feet and is generally still consolidating under the weight of the existing fill, causing ongoing settlement. As previously discussed, a portion of the west sides of Blocks 30 and 32 and the east sides of 29 and 31 was excavated to a depth of approximately 10 feet in the recent past. Estimates of primary and secondary consolidation resulting from the placement of new fill across Blocks 30 and 32 are provided in our geotechnical reports for those sites. Based on available information for the adjacent Blocks 29 and 31, we judge these values, between 0 and 5 inches over the next 50 years depending on the amount of new fill placed across the site, may also be used as preliminary Bay Mud settlement values for Blocks 29 and 31. During an earthquake, additional settlement due to seismic densification and liquefaction will likely occur in some areas of the site. The amount of settlement will depend on the quality and thickness of the loose fill below the groundwater. Analysis preformed during the preparation of the geotechnical reports for Blocks 30 and 32 indicate between 2-1/4 and 6-1/4 inches of additional cyclic densification and liquefaction–induced settlement may occur at these sites. We judge these values are applicable as preliminary estimates for the amount of settlement due to cyclic densification and liquefaction that will occur at Blocks 29 and 31, respectively.

Because of the anticipated settlement, the proposed building will need to be pile supported, as discussed in the later foundations section. We anticipate that up to one inch of building settlement will occur for a properly installed pile foundation. Therefore, abrupt differential settlement should be expected between pile-supported structures and the ground surface.

Settlement could have adverse effects on site drainage, hardscape improvements, transitions between on-grade and pile-supported structures. Settlement will also create a downward frictional load on piles, as discussed in the Foundations section.

Foundations

The fill in its present condition is not capable of providing adequate bearing for a shallow foundation system. Unpredictable and erratic settlement would occur. Furthermore, the Bay Mud will consolidate under the weight of the existing and new fill and proposed building loads; the magnitude of settlement at the project site will be influenced by several factors including the thickness of the fill and Bay Mud. Therefore, shallow foundations are not considered appropriate for any proposed structures at this site. On the basis of the results of our study and our experience with similar projects in Mission Bay, we conclude a deep foundation consisting of driven piles is the most appropriate and economical system for support of the proposed buildings and floor slab. The piles should extend below the fill and Bay Mud and gain support primarily from end bearing in either the very dense sand or bedrock. Alternative types of deep foundations such as Tubex and auger-cast piles may be considered; however, considering the required foundation lengths (up to 130 feet below the existing ground surface), they may not be feasible alternatives.

Piles typically encounter refusal in very dense, relatively clean sand layers, at least 10 feet thick. If significant fines are present, the pile will generally continue driving through the layer. A continuous sand layer was not encountered throughout the site. Furthermore, if silt or clay layers are present below a thin layer of sand, the pile may punch through the sand. Consequently, pile lengths may vary dramatically across the site. If the dense sand layer is not present beneath the Bay Mud or it is not thick enough (at least 10 feet thick), the piles may need to extend to bedrock to achieve refusal. The bedrock surface varies significantly beneath the site and ranges from depths of 32 to 106 feet bgs. As previously discussed, there is the potential that bedrock in the northwest corner of the site may extend to 120 feet

bgs. Further investigation at Blocks 29 and 31 and an indicator pile program performed in all four blocks will help evaluate the presence of a bearing sand layer, the depth to the top of bedrock and the length of piles. Based on existing subsurface data we estimate piles driven to refusal in either bedrock or dense Colma sand will range from about 35 to 130 feet in length.

Based on the results of our geotechnical investigations performed at Blocks 30 and 32, we have provided recommendations regarding the most appropriate pile type for each of these blocks in our previously issued geotechnical reports. Because the subsurface information available for Blocks 29 and 31 is limited, the most appropriate driven pile type (steel H-pile or precast, prestressed concrete) is difficult to establish. In our previously issued geotechnical reports, we recommended steel piles be considered for Block 32 and concrete piles be considered for Block 30. The most appropriate pile type for Blocks 29 and 31 should be determined during the final geotechnical investigation; however, as the existing data appears to indicate the highly variable subsurface conditions that exist at Block 32 are similar to the anticipated conditions at Block 31, we judge steel piles to be more appropriate for Block 31. The subsurface conditions encountered during the investigation of Block 30 appear to be similar to those anticipated at Block 29; therefore, concrete piles will likely be appropriate for Block 29. During the final investigations at Blocks 29 and 30 both pile types should be considered before final recommendations on which pile type is most appropriate is made.

The potential for ongoing settlement of the Bay Mud under the weight of the existing and new fill will subject the piles to significant downdrag[7] loads. Recommended downdrag loads have been provided for pile design at Blocks 30 and 32 in our previously issued geotechnical reports. The downdrag values presented for piles in our geotechnical report for Block 30 may be used as preliminary values for piles driven in Block 29. The downdrag values presented in our geotechnical report for Block 32 may be used as preliminary values for piles driven in Block 31. Downdrag loads should be deducted from the total compressive capacity of the piles to obtain the capacity available for building support.

As previously discussed, piles driven to refusal in bedrock or dense Colma sand will range from about 35 to 130 feet long. We previously provided dead plus live load capacities for both of the driven pile types driven to refusal at Blocks 30 and 32 in our geotechnical reports. The dead plus live load capacity of 280 kips provided for piles driven at Block 32 may be used as a preliminary capacity for piles driven at Block 31. The dead plus live load capacity of between 200 and 250 kips (depending on the amount of new fill to be placed at the site) provided for piles driven at Block 30 may be used as a preliminary capacity for piles driven at Block 29. These capacities account for the downdrag load. The final capacities for piles driven at Blocks 29 and 31 should be evaluated during a final geotechnical investigation at these blocks.

The piles should develop lateral resistance from passive pressures acting on the upper portion of the piles and their structural rigidity. Where liquefiable fill is present it will have the effect of significantly reducing the lateral capacity of the pile during a major seismic event. We previously provided recommended values for the lateral capacities of driven piles at Blocks 30 and 32 based on a lateral deflection of ½ inch at the top of the pile. We judge the values provided for the piles in Block 30, including the values for both liquefiable and non-liquefiable fill conditions, are appropriate for use as preliminary values in Block 29. Furthermore, we judge the values provided for the piles in Block 32 are appropriate for use as

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[7] Downdrag is the load transferred to the pile by the settlement of the soil relative to the pile. The downdrag movement imposes a "negative" skin friction force on the pile.

preliminary values in Block 31. Final lateral capacity values for use in design at Blocks 29 and 31 should be evaluated during the final geotechnical investigation at these blocks.

Although the piles will be driven to refusal, foundation settlement will still occur due to pile and soil compressibility (if piles encounter refusal in the sand layer). We anticipate ½ to 1 inch of settlement may occur below piles driven to refusal in sand or rock. Differential settlement should be less than ½ inch between any adjacent columns. Foundation settlement for Blocks 29 and 31 should be evaluated during the final geotechnical investigation at these blocks.

Because the fill and Bay Mud are likely moderately to severely corrosive, piles will require protection from corrosion. For concrete piles, special concrete design and a minimum concrete cover of two inches will likely be required. The upper portion of steel piles embedded in fill (generally 30 to 40 feet) will be subject to corrosion; to account for corrosion potential, a larger steel section may be needed than is required for the pile design capacity. A dielectric coating of the pile may also be needed to help reduce corrosion. A corrosion subconsultant should evaluate the corrosion test results and develop recommendations during the final geotechnical investigation.

It should be noted that the steel pile recommendations presented in our report for Block 32 include HP 14x73 sections; however, under the new 2006 International Building Code (IBC), thicker piles sections are required. Therefore, all steel piles considered for any of these blocks should be HP14x102 sections, at a minimum.

Floor Slabs

Because of the condition of the existing fill and the potential for settlement, we judge floor slabs should be structurally supported. Although the ground surface will settle away from the slabs, the slabs will initially be in contact with the ground. Moisture is likely to condense on concrete floor slabs. Where moisture is not acceptable, structurally supported slabs should be underlain by a moisture barrier. Because the ground will settle away from the floor slabs, building entrances and utilities should be designed for the predicted settlement.

Seismic Design

On 1 January 2008, the City of San Francisco adopted the new 2006 IBC seismic design criteria as part of the updated 2007 California Building Code (2008 SFBC). Our previous geotechnical reports for Blocks 30 and 32 provided recommendations for the seismic design based on the 2001 San Francisco Building Code (SFBC) which was still appropriate at the time the reports were written. For design in accordance with 2008 SFBC, we recommend Site Class F be used at Blocks 29, 30, and 31 because of the presence of liquefiable fill. A site specific response spectrum is required for sites in this class. We previously performed a probabilistic seismic hazard analysis (PSHA) in accordance with 2001 SFBC as part of our geotechnical investigation at Block 30. A separate PSHA, performed in accordance with the 2008 SFBC, should be performed as part of the final investigation at Blocks 29 and 31.

In our geotechnical report for Block 32 we judged the liquefaction potential was not widespread enough to classify it as an S_F site; therefore, the site could be classified as S_E, in accordance with the 2001 SFBC. Based on the 2008 SFBC, we recommend Site Class E be used for this site. We recommend the following seismic design values be used for the design of Block 32:

- Maximum Considered Earthquake (MCE) spectral acceleration values S_{MS} and S_{M1} of 1.350g and 1.494g, respectively
- Design Earthquake (DE) spectral acceleration values S_{DS} and S_{D1} of 0.900g and 0.996g, respectively.

We recommend that a site-specific geotechnical investigation, including additional exploration, be performed at Block 29 and 31 to further evaluate subsurface conditions and provide conclusions and recommendations regarding the geotechnical aspects of the project.

We appreciate the opportunity to provide services for the proposed development at Blocks 29-32 Mission Bay. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

James P. Heugas, P.E.
Project Engineer

Lori A. Simpson, G.E.
Principal

40862103.OAK

Attachments: Figure 1 – Site Location Map
Figure 2 – Site Plan
Figure 3 – Map of Major Faults and Earthquake Epicenters in the San Francisco Bay Area
Figure 4 – Modified Mercalli Intensity Scale
Appendix A – Boring and CPT Logs

REFERENCES

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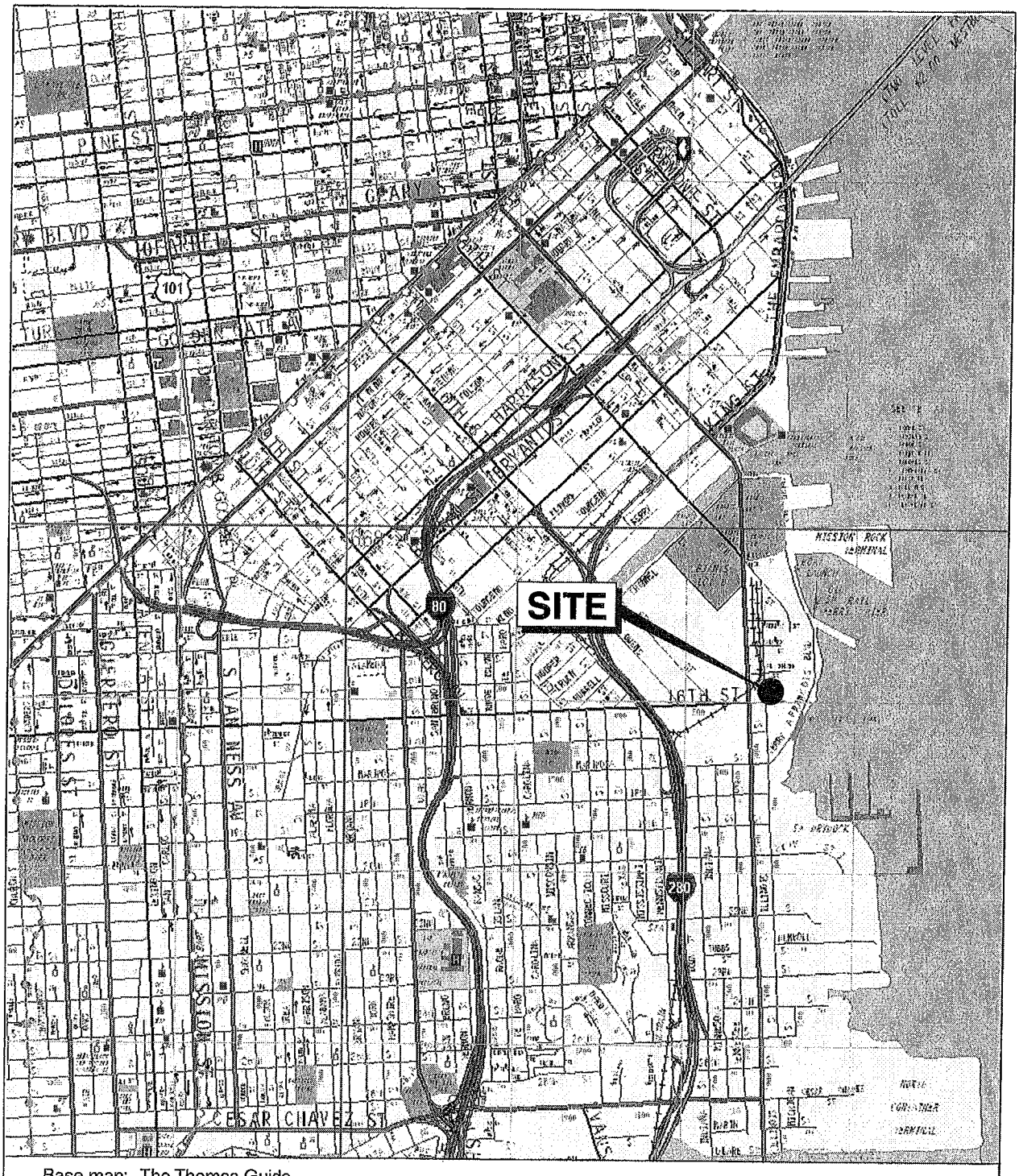
FIGURES



Base map: The Thomas Guide
San Francisco County
2002

0 1/4 1/2 Mile

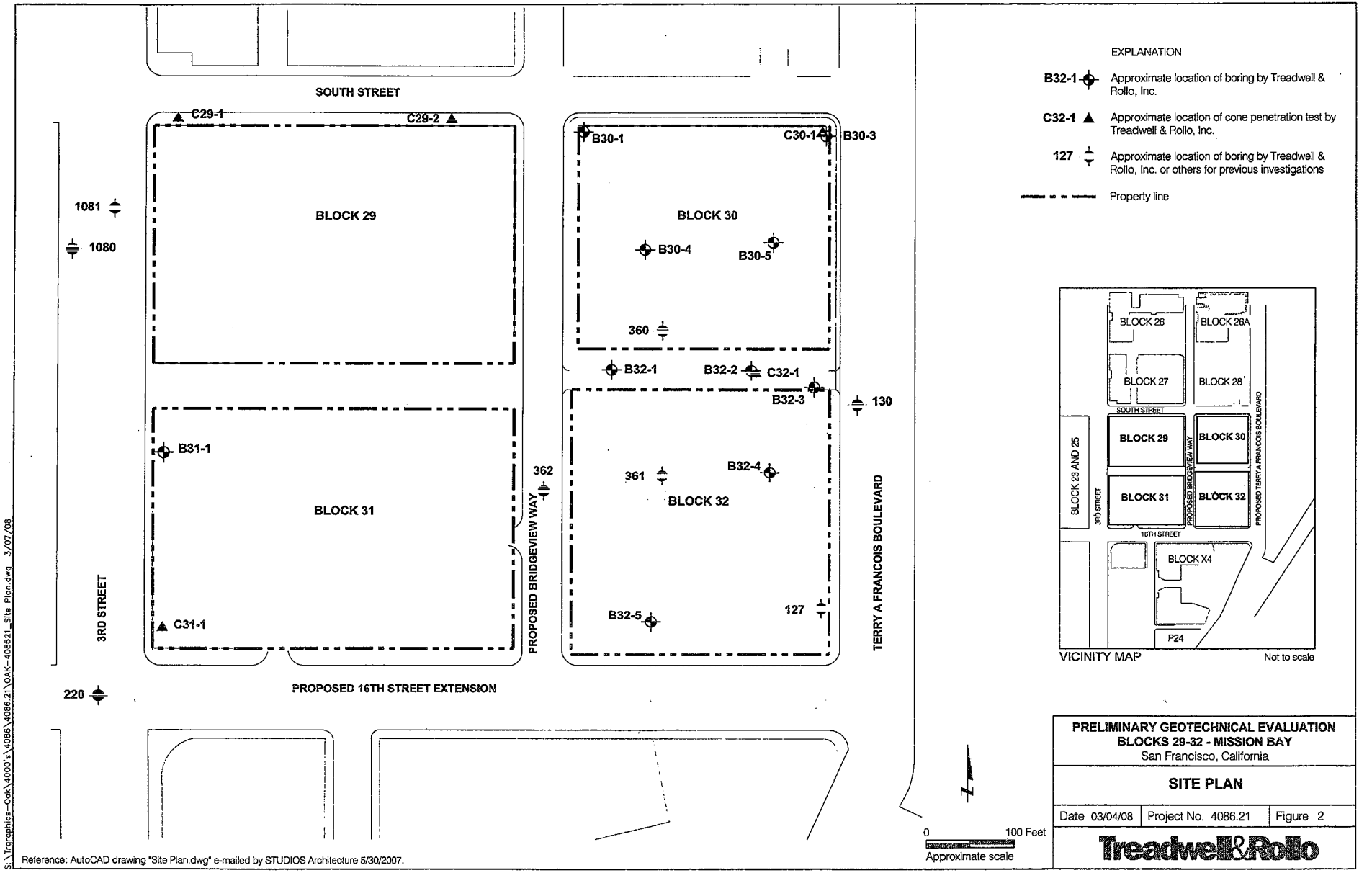
Approximate scale

PRELIMINARY GEOTECHNICAL EVALUATION
BLOCKS 29-31 - MISSION BAY
San Francisco, California

SITE LOCATION MAP

Treadwell&Rollo

Date 03/04/08	Project No. 4086.21	Figure 1



S:\Trgraphics-Oak\4000's\4086\4086.21\OAK-408621_Site Plan.dwg 3/07/08

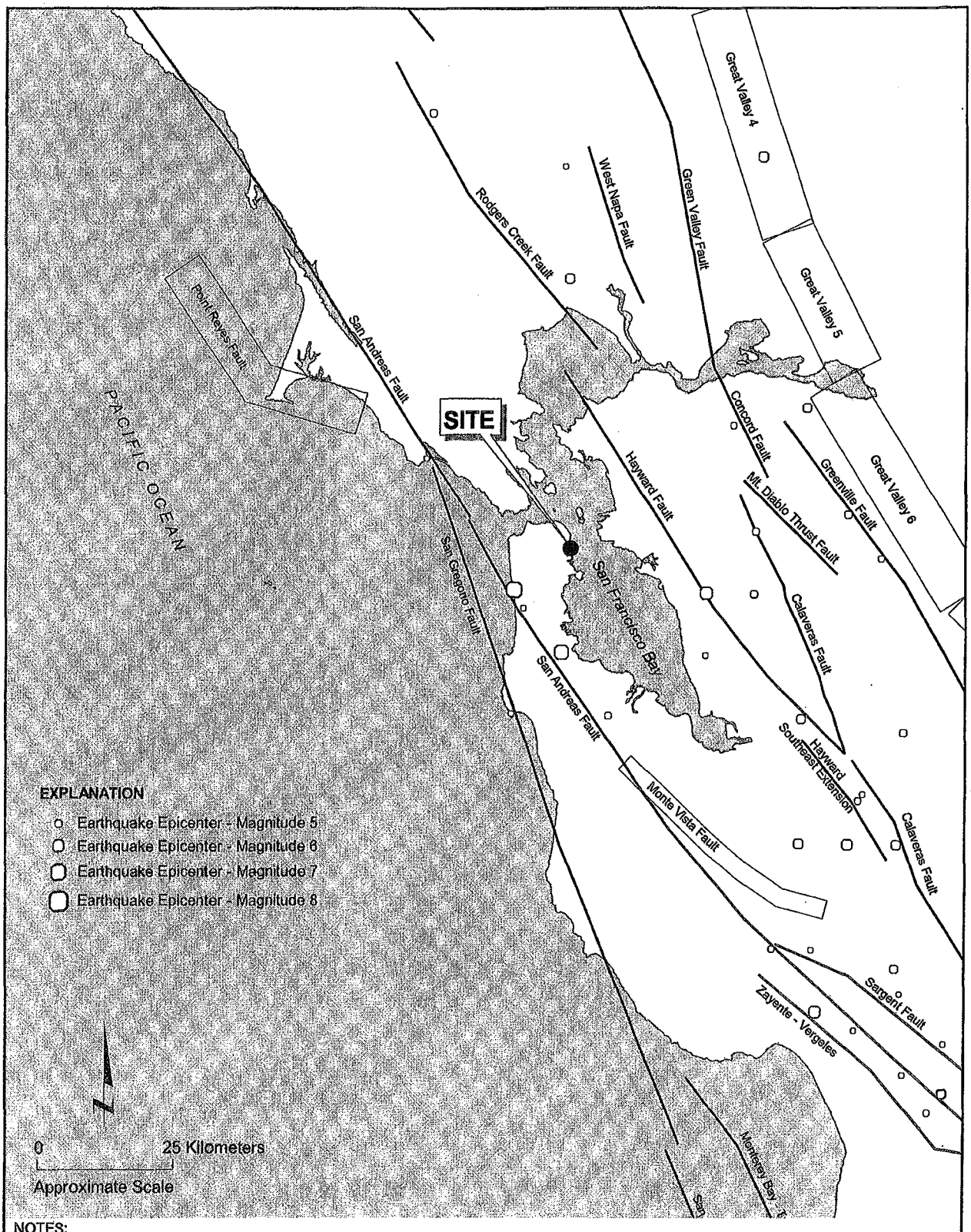
Reference: AutoCAD drawing "Site Plan.dwg" e-mailed by STUDIOS Architecture 5/30/2007.

PRELIMINARY GEOTECHNICAL EVALUATION
BLOCKS 29-32 - MISSION BAY
San Francisco, California

SITE PLAN

Date 03/04/08	Project No. 4086.21	Figure 2

Treadwell&Rollo



NOTES:
Digitized data for fault coordinates and earthquake catalog was developed by the California Department of Conservation Division of Mines and Geology. The historic earthquake catalog includes events from January 1800 to December 2000.

PRELIMINARY GEOTECHNICAL EVALUATION
BLOCKS 29-32 - MISSION BAY
San Francisco, California

Treadwell&Rollo

MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS IN THE SAN FRANCISCO BAY AREA

Date: 03/04/08	Project No. 4086.21	Figure: 3

I **Not felt by people, except under especially favorable circumstances. However, dizziness or nausea may be experienced.**
Sometimes birds and animals are uneasy or disturbed. Trees, structures, liquids, bodies of water may sway gently, and doors may swing very slowly.

II **Felt indoors by a few people, especially on upper floors of multi-story buildings, and by sensitive or nervous persons.**
As in Grade I, birds and animals are disturbed, and trees, structures, liquids and bodies of water may sway. Hanging objects swing, especially if they are delicately suspended.

III **Felt indoors by several people, usually as a rapid vibration that may not be recognized as an earthquake at first. Vibration is similar to that of a light, or lightly loaded trucks, or heavy trucks some distance away. Duration may be estimated in some cases.**
Movements may be appreciable on upper levels of tall structures. Standing motor cars may rock slightly.

IV **Felt indoors by many, outdoors by a few. Awakens a few individuals, particularly light sleepers, but frightens no one except those apprehensive from previous experience. Vibration like that due to passing of heavy, or heavily loaded trucks. Sensation like a heavy body striking building, or the falling of heavy objects inside.**
Dishes, windows and doors rattle; glassware and crockery clink and clash. Walls and house frames creak, especially if intensity is in the upper range of this grade. Hanging objects often swing. Liquids in open vessels are disturbed slightly. Stationary automobiles rock noticeably.

V **Felt indoors by practically everyone, outdoors by most people. Direction can often be estimated by those outdoors. Awakens many, or most sleepers. Frightens a few people, with slight excitement; some persons run outdoors.**
Buildings tremble throughout. Dishes and glassware break to some extent. Windows crack in some cases, but not generally. Vases and small or unstable objects overturn in many instances, and a few fall. Hanging objects and doors swing generally or considerably. Pictures knock against walls, or swing out of place. Doors and shutters open or close abruptly. Pendulum clocks stop, or run fast or slow. Small objects move, and furnishings may shift to a slight extent. Small amounts of liquids spill from well-filled open containers. Trees and bushes shake slightly.

VI **Felt by everyone, indoors and outdoors. Awakens all sleepers. Frightens many people; general excitement, and some persons run outdoors.**
Persons move unsteadily. Trees and bushes shake slightly to moderately. Liquids are set in strong motion. Small bells in churches and schools ring. Poorly built buildings may be damaged. Plaster falls in small amounts. Other plaster cracks somewhat. Many dishes and glasses, and a few windows break. Knickknacks, books and pictures fall. Furniture overturns in many instances. Heavy furnishings move.

VII **Frightens everyone. General alarm, and everyone runs outdoors.**
People find it difficult to stand. Persons driving cars notice shaking. Trees and bushes shake moderately to strongly. Waves form on ponds, lakes and streams. Water is muddied. Gravel or sand stream banks cave in. Large church bells ring. Suspended objects quiver. Damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary buildings; considerable in poorly built or badly designed buildings, adobe houses, old walls (especially where laid up without mortar), spires, etc. Plaster and some stucco fall. Many windows and some furniture break. Loosened brickwork and tiles shake down. Weak chimneys break at the roofline. Cornices fall from towers and high buildings. Bricks and stones are dislodged. Heavy furniture overturns. Concrete irrigation ditches are considerably damaged.

VIII **General fright, and alarm approaches panic.**
Persons driving cars are disturbed. Trees shake strongly, and branches and trunks break off (especially palm trees). Sand and mud erupts in small amounts. Flow of springs and wells is temporarily and sometimes permanently changed. Dry wells renew flow. Temperatures of spring and well waters varies. Damage slight in brick structures built especially to withstand earthquakes; considerable in ordinary substantial buildings, with some partial collapse; heavy in some wooden houses, with some tumbling down. Panel walls break away in frame structures. Decayed pilings break off. Walls fall. Solid stone walls crack and break seriously. Wet grounds and steep slopes crack to some extent. Chimneys, columns, monuments and factory stacks and towers twist and fall. Very heavy furniture moves conspicuously or overturns.

IX **Panic is general.**
Ground cracks conspicuously. Damage is considerable in masonry structures built especially to withstand earthquakes; great in other masonry buildings - some collapse in large part. Some wood frame houses built especially to withstand earthquakes are thrown out of plumb, others are shifted wholly off foundations. Reservoirs are seriously damaged and underground pipes sometimes break.

X **Panic is general.**
Ground, especially when loose and wet, cracks up to widths of several inches; fissures up to a yard in width run parallel to canal and stream banks. Landsliding is considerable from river banks and steep coasts. Sand and mud shifts horizontally on beaches and flat land. Water level changes in wells. Water is thrown on banks of canals, lakes, rivers, etc. Dams, dikes, embankments are seriously damaged. Well-built wooden structures and bridges are severely damaged, and some collapse. Dangerous cracks develop in excellent brick walls. Most masonry and frame structures, and their foundations are destroyed. Railroad rails bend slightly. Pipe lines buried in earth tear apart or are crushed endwise. Open cracks and broad wavy folds open in cement pavements and asphalt road surfaces.

XI **Panic is general.**
Disturbances in ground are many and widespread, varying with the ground material. Broad fissures, earth slumps, and land slips develop in soft, wet ground. Water charged with sand and mud is ejected in large amounts. Sea waves of significant magnitude may develop. Damage is severe to wood frame structures, especially near shock centers, great to dams, dikes and embankments, even at long distances. Few if any masonry structures remain standing. Supporting piers or pillars of large, well-built bridges are wrecked. Wooden bridges that "give" are less affected. Railroad rails bend greatly and some thrust endwise. Pipe lines buried in earth are put completely out of service.

XII **Panic is general.**
Damage is total, and practically all works of construction are damaged greatly or destroyed. Disturbances in the ground are great and varied, and numerous shearing cracks develop. Landslides, rock falls, and slumps in river banks are numerous and extensive. Large rock masses are wrenched loose and torn off. Fault slips develop in firm rock, and horizontal and vertical offset displacements are notable. Water channels, both surface and underground, are disturbed and modified greatly. Lakes are dammed, new waterfalls are produced, rivers are deflected, etc. Surface waves are seen on ground surfaces. Lines of sight and level are distorted. Objects are thrown upward into the air.

PRELIMINARY GEOTECHNICAL EVALUATION
BLOCKS 29-32 - MISSION BAY
San Francisco, California

MODIFIED MERCALLI INTENSITY SCALE

Treadwell&Rollo

Date: 03/04/08 | Project No. 4086.21 | Figure: 4

Treadwell&Rollo

APPENDIX A
Boring and CPT Logs

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-1

Boring location: See Site Plan, Figure 2 | Logged by: L. Splitter

Date started: 5/6/07 | Date finished: 5/6/07

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION (Ground Surface Elevation: 100.6 feet[2])	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1					2 inches concrete over 6 inches aggregate base						
2				SC	CLAYEY SAND (SC) yellow-brown, medium dense, moist, with brick fragments						
3	S&H		19								
4				CL-ML	SANDY SILTY CLAY with GRAVEL (CL-ML) olive-gray, very stiff, moist, with brick fragments LL = 26, PI = 5						
5					FILL						
6	SPT		17								
7				SP	SAND (SP) olive, medium dense, moist, with glass and gravel						
8	SPT		4		gray-brown, very loose, with brick, rock in shoe, blow count low because pushed into clay						
9											
10					CLAY (CH) gray, very soft, wet						
11	S&H		1								
12											
13					gray, trace sand						
14	ST		0 to 75 psi								
15											
16											
17											
18											
19				CH	BAY MUD						
20											
21											
22											
23											
24											
25											
26					shells at 26 feet						
27											
28											
29	ST		0 to 100 psi		blue-gray, soft Consolidation Test, see Figure B-1	TxUU	1,200	360		58.6	63
30											

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-1a

TEST GEOTECH LOG 408616.GPJ TR.GDT 9/18/07

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-1

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31	ST			CH	CLAY (CH) (continued)						
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43					gray, soft						
44	ST		0 to 75 psi								
45											
46											
47											
48											
49											
50											
51											
52											
53					sandy at 54 feet						
54				SC	CLAYEY SAND (SC) mottled olive-gray and olive, dense, wet, fine-grained sand						
55	S&H		35								
56					yellow-brown at 54.75 feet						
57											
58				CL	CLAY (CL) olive, stiff to very stiff, wet,						
59	S&H		8								
60											

BAY MUD

TEST GEOTECH LOG 4086\16.GPJ TR.GDT 6/19/07

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-1b

PROJECT: BLOCK 30
MISSION BAY EAST
San Francisco, California

Log of Boring B30-1

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value¹	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	S&H		8	CL	CLAY (CL) (continued) with gray and yellow-brown mottling at 60.5						
62											
63					SANDY CLAY (CL) yellow-brown with gray mottling, hard, wet, trace fine gravel						
64											
65	S&H		35								
66											
67											
68					SAND with CLAY (SP-SC) orange-brown, medium dense, wet						
69											
70	SPT		20	SP-SC							
71											
72											
73											
74											
75	SPT		52		mottled olive and red-brown, very dense						
76											
77											
78					SAND (SP) olive-brown, very dense, wet						
79											
80	SPT		51	SP							
81											
82											
83											
84											
85	SPT		31	CL	SANDY CLAY (CL) olive, hard, wet						
86											
87					SAND with CLAY (SP-SC) olive-brown, very dense, wet						
88				SP-SC							
89											
90	SPT		86/11"						5.6		

COLMA

TEST GEOTECH.LOG 4086I6.GPJ TR.GDT 6/6/07

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-1c

PROJECT: BLOCK 30
MISSION BAY EAST
San Francisco, California

Log of Boring B30-1

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
91				SP-SC	SAND with CLAY (SP-SC) (continued)							
92												
93					SAND (SP) olive-brown, very dense, wet	COLMA						
94	SPT		50/5"	SP								
95												
96												
97					CLAY (CH) gray, stiff to very stiff, wet	OLD BAY CLAY						
98												
99												
100	SPT		15									
101				CH								
102												
103												
104												
105					rock fragments in cuttings at 106 feet							
106					SERPENTINITE intensely fractured, low hardness, weak, moderately weathered							
107												
108												
109	SPT		50/5"									
110												
111					CLAYSTONE intensely fractured, low hardness, plastic, deeply weathered	BEDROCK						
112												
113												
114												
115	SPT		71									
116												
117												
118												
119												
120												

TEST GEOTECH LOG 408616.GPJ TR.GDT 6/12/07

Treadwell&Rollo

Project No.: 4086.16

Figure: A-1d

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-1

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
121					CLAYSTONE (continued)						
122											
123					SERPENTINITE intensely fractured, low hardness, weak, little weathered						
124											
125	SPT		56								
126											
127					SHALE/SERPENTINITE crushed, soft, plastic						
128											
129	SPT		50/ 2"								
130											
131											
132											
133											
134											
135											
136											
137											
138											
139											
140											
141											
142											
143											
144											
145											
146											
147											
148											
149											
150											

BEDROCK

Boring terminated at a depth of 129.2 feet.
Boring backfilled with cement grout.
Groundwater not measured at time of drilling.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-1e

TEST GEOTECH LOG 408616.GPJ TR.GDT 6/12/07

PROJECT:	BLOCK 30 MISSION BAY EAST San Francisco, California	**Log of Boring B30-2** PAGE 1 OF 4

Boring location: See Site Plan, Figure 2 | Logged by: J. Wong

Date started: 5/3/07 | Date finished: 5/3/07

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION Ground Surface Elevation: 100.4 feet[2]	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1					2 inches asphalt concrete over 12 inches aggregate base						
2					SAND with GRAVEL (SP) olive-brown, medium dense, moist, with angular to subangular gravel, traces of brick and Serpentinite fragments						
3	S&H		17	SP							
4											
5					higher brick content, trace fines						
6	SPT		12								
7					CLAY with SAND and GRAVEL (CH) dark gray, stiff, moist						
8	SPT		9	CH	olive clay was observed from cuttings at 88 feet						
9					▽ (5/3/07 at 7:55 am)						
10					CLAYEY SAND with GRAVEL (SC) green-gray, loose, wet, serpentinite fragments LL = 32, PI = 13						
11	S&H		7						17.6	13.0	
12	SPT		48	SC	gray, dense						
13					FILL						
14											
15					SANDY CLAY with GRAVEL (CH) dark gray, stiff, wet, with angular to subangular gravel, and Shale fragments						
16											
17	SPT		13								
18											
19											
20	SPT		14	CH							
21											
22											
23											
24											
25					CLAY (CH) gray, soft, wet, with shell fragments						
26					BAY MUD						
27											
28				CH							
29	ST		100 psi								
30											

TEST GEOTECH LOG 4086.16.GPJ TR.GDT 9/19/07

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-2a

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-2

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value¹	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31	ST		100 psi	CH	CLAY (CH) (continued)					66.9	59
32–39											
40	ST		100 psi								
41–49											
50	ST		100 to 250 psi		sand lense at 51.5 feet						
51–57											
58				CL	CLAY (CL) olive with orange-brown mottling, very stiff, wet						
59	S&H		24			TxUU	2,200	2,030		25.5	100
60											

BAY MUD

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-2b

TEST GEOTECH LOG 4086I6.GPJ TR.GDT 6/12/07

PROJECT: BLOCK 30
MISSION BAY EAST
San Francisco, California

Log of Boring B30-2

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value	LITHOLOGY	MATERIAL DESCRIPTION
61	S&H		24	CL	CLAY (CL) (continued)
62					
63					SANDY CLAY (CL) yellow-brown with olive mottling, hard, wet
64					
65	SPT		38	CL	
66					
67					
68					SAND with CLAY (SP-SC) orange-brown, dense, wet
69					
70	SPT		34	SP-SC	
71					
72					
73					
74					
75	SPT		85/ 11"		very dense
76					
77					
78					SAND (SP) olive, very dense, wet
79					COLMA
80	SPT		87/ 11.5"		
81					
82					
83				SP	
84					
85	SPT		69		
86					
87					
88					
89	SPT		50/ 3"		SERPENTINITE
90					BEDROCK

LABORATORY TEST DATA

Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft

TEST GEOTECH LOG 4086I6.GPJ TR.GDT 6/12/07

Treadwell&Rollo

Project No.: 4086.16

Figure: A-2c

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-2

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
91					SERPENTINITE intensely fractured, weak, moderately weathered, low hardness BEDROCK						
92											
93											
94	SPT		50/ 1"								
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at a depth of 94.1 feet.
Boring backfilled with cement grout.
Groundwater encountered at 9 feet at 7:55 am on 5/3/07.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.16
Figure: A-2d

TEST GEOTECH LOG 4086I6.GPJ TR.GDT 6/12/07

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-3

Boring location: See Site Plan, Figure 2 | Logged by: J. Wong
Date started: 5/2/07 | Date finished: 5/2/07
Drilling method: Rotary Wash
Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

Ground Surface Elevation: +100.3 feet[2]

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					2 inches asphalt concret over 12 inches aggregate base						
1–4	S&H		26	SC	CLAYEY SAND with GRAVEL (SC) olive-brown, medium dense, moist, with angular to subangular gravel						
5–6	SPT		17		olive-gray, with serpentinite fragments						
7–8	SPT		9	CL	SANDY CLAY with GRAVEL (CL) olive-gray, stiff, moist						
9–11	S&H		18	SP-SC	SAND with CLAY and GRAVEL (SP-SC) gray, medium dense, wet (5/2/07 at 8:15 am)				6.0	11.0	
12–13	SPT		14		FILL						
14–17	SPT		10	GC	CLAYEY GRAVEL with SAND (GC) olive-gray, medium dense, wet				13.6	22.3	
18–20	SPT		19	GP	GRAVEL (GP) dark gray, medium dense, wet						
21–25	ST		75 psi	CH	CLAY (CH) gray, soft, wet, with shell fragments Consolidation Test, see Figure B-2					72.0	57
26–30					BAY MUD						

LABORATORY TEST DATA

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-3a

TEST GEOTECH LOG 4086I6.GPJ TR.GDT 9/18/07

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-3

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31				CH	CLAY (CH) (continued)						
32											
33											
34											
35	ST		75 to 100 psi								
36											
37											
38											
39											
40											
41											
42											
43											
44					Consolidation Test, see Figure B-3					63.4	62
45	ST		75 to 100 psi								
46											
47											
48											
49											
50											
51											
52											
53											
54											
55	ST		150 to 250 psi								
56				CL	CLAY (CL) yellow-brown with olive mottling, hard, wet						
57											
58											
59											
60	SPT		37								

BAY MUD

TEST GEOTECH LOG 408616.GPJ TR.GDT 9/18/07

Treadwell&Rollo

Project No.: 4086.16

Figure: A-3b

PROJECT: BLOCK 30
MISSION BAY EAST
San Francisco, California

Log of Boring B30-3

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	SPT		37	CL	CLAY (CL) (continued)						
62											
63					CLAYEY SAND (SC) orange-brown, medium dense, wet						
64											
65	S&H		18								
66											
67				SC							
68											
69											
70	SPT		46		dense, lower fines content						
71											
72											
73					SAND with CLAY (SP-SC) orange-brown, very dense, wet						
74											
75	SPT		69	SP-SC					7.7	25.0	
76											
77											
78					CLAYEY SAND (SC) olive with orange-brown mottling, dense, wet						
79											
80	SPT		34								
81											
82											
83				SC							
84											
85											
86											
87											
88											
89	SPT		33	CL	SANDY CLAY (CL) olive and yellow-brown with dark brown mottling, hard, wet						
90											

COLMA

Treadwell&Rollo

Project No.: 4086.16

Figure: A-3c

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-3

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
91	SPT		33	CL	SANDY CLAY (CL) (continued)						
92											
93											
94	SPT		50/ 4"		SERPENTINITE intensely fractured, weak, moderately weathered, low hardness BEDROCK						
95											
96											
97											
98											
99	SPT		50/ 0"								
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at a depth of 99 feet.
Boring backfilled with cement grout.
Groundwater encountered at 9.8 feet at 8:15 am on 5/2/07.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-3d

TEST GEOTECH LOG 408616.GPJ TR.GDT 6/12/07

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-4

Boring location: See Site Plan, Figure 2 | Logged by: J. Wong

Date started: 5/5/07 | Date finished: 5/5/07

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

Ground Surface Elevation: 100.4 feet [2]

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value [1]	LITHOLOGY	MATERIAL DESCRIPTION		LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1					3 inches asphalt concret over 12 inches aggregate base							
2				SC	CLAYEY SAND (SC) olive-brown, medium dense, moist							
3	S&H		15									
4				SP	SAND (SP) yellow-brown, medium dense, moist, fine-grained sand							
5												
6	SPT		13		CLAY with GRAVEL (CH) gray, stiff, moist							
7				CH								
8	SPT		6		▽ (5/5/07 at 8:40 am)							
9												
10					green with dark green mottling, medium stiff, wet, with angular Serpentinite gravel							
11	S&H		4	GC	CLAYEY GRAVEL (GC) green-gray, loose, wet, with Serpentinite							
12	SPT		12		CLAYEY SAND with GRAVEL (SC) olive, medium dense, wet	FILL						
13				SC								
14												
15					SAND with CLAY and GRAVEL (SP-SC) gray, medium dense, wet							
16												
17	SPT		13									
18												
19					very loose to loose							
20	SPT		4	SP-SC						6.7	19.9	
21												
22												
23												
24												
25												
26					CLAY (CH) gray, medium stiff, wet, with shell fragments							
27				CH		BAY MUD						
28												
29	ST		75 psi				PP		750			
30												

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-4a

TEST GEOTECH LOG 408616.GPJ TR.GDT 9/18/07

PROJECT: BLOCK 30
MISSION BAY EAST
San Francisco, California

Log of Boring B30-4

DEPTH (feet)	Sampler Type	Sample	SPT N-Value¹	LITHOLOGY	MATERIAL DESCRIPTION	Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
						LABORATORY TEST DATA					
31	ST		75 psi	CH	CLAY (CH) (continued)						
40	ST		75 to 100 psi	CH	Consolidation Test, see Figure B-4	TxUU	1,500	725		74.4	56
50	ST		100 to 250 psi	SP	SAND (SP) gray, wet						
52				CL	CLAY with SAND (CL) olive with orange-brown mottling, very stiff, wet						
55	S&H		18	CL		TxUU	1,700	3,450		22.3	105
59	SPT		26	CL	olive with red-brown mottling, very stiff, wet						

BAY MUD

Treadwell&Rollo

Project No.: 4086.16 | Figure: A-4b

TEST GEOTECH LOG 408616.GPJ TR.GDT 7/3/07

PROJECT: BLOCK 30
MISSION BAY EAST
San Francisco, California

Log of Boring B30-4

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	SPT		26	CL	CLAY with SAND (CL) (continued)						
62											
63					CLAYEY SAND (SC) orange-brown, medium dense, wet, fine-grained sand						
64											
65	SPT		18								
66											
67											
68											
69				SC	very dense, lower fines content						
70	SPT		58						12.4	23.3	
71											
72											
73											
74					olive, higher fines content						
75	SPT		56								
76											
77					SAND with CLAY (SP-SC) orange-brown, very dense, wet						
78				SP-SC							
79											
80	SPT		61								
81					SANDY CLAY (CL) olive, hard, wet						
82											
83				CL							
84											
85	SPT		36		SERPENTINITE intensely fractured, moderately hard, weak, moderately weathered						
86											
87					SHALE intensely fractured, moderately hard, weak, moderately weathered						
88											
89	SPT		50/ 4.5"								
90											

COLMA

BEDROCK

TEST GEOTECH LOG 408616.GPJ TR.GDT 7/3/07

Treadwell&Rollo

Project No.: 4086.16

Figure: A-4c

PROJECT: BLOCK 30
MISSION BAY EAST
San Francisco, California

Log of Boring B30-4

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
91					SHALE (continued)						
92					SERPENTINITE intensely fractured, moderately hard, weak, moderately weathered						
93					BEDROCK						
94	SPT		50/ 5.5"								
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Boring terminated at a depth of 95 feet.
Boring backfilled with cement grout.
Groundwater encountered at 8 feet at 8:40 am.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.16
Figure: A-4d

TEST GEOTECH LOG 408616.GPJ TR.GDT 7/3/07

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-5

Boring location: See Site Plan, Figure 2 | Logged by: J. Wong

Date started: 5/4/07 | Date finished: 5/4/07

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION (Ground Surface Elevation: 100.3 feet[2])	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1					3 inches asphalt concrete over 12 inches aggregate base and 4 inches concrete						
2					CLAYEY SAND with GRAVEL (SC) olive-gray, medium dense, moist						
3	S&H		16	SC							
4											
5					loose to medium dense, with brick fragments						
6	SPT		10								
7											
8	SPT		8		CLAY with SAND (CH) gray, medium stiff to stiff, wet, with brick fragments and Serpentinite (5/4/07 at 8:45 am)						
9				CH							
10					stiff, no brick						
11	S&H		11		SANDY SILTY CLAY (CL-ML) gray, stiff, wet LL = 23, PI = 7						
12	SPT		11	CL-ML							
13											
14											
15					SAND with CLAY and GRAVEL (SP-SC) green-gray, medium dense, wet						
16					FILL						
17	SPT		11						10.8	16.1	
18											
19					loose						
20	SPT		6								
21											
22				SP-SC							
23											
24					green with orange-brown mottling						
25	SPT		6						11.9	24.1	
26											
27											
28											
29											
30	SPT		8								

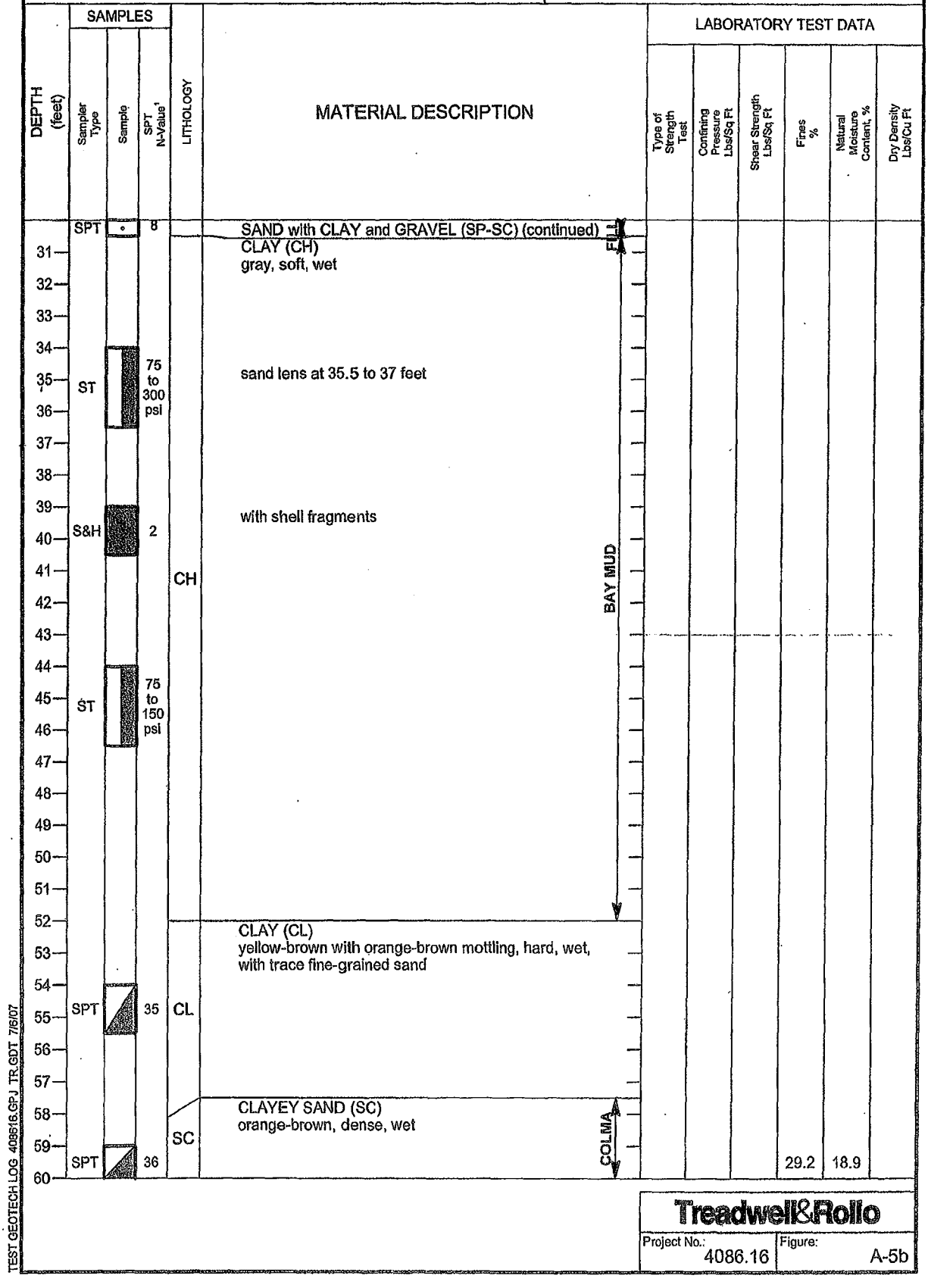
Treadwell&Rollo

Project No.: 4086.16 | Figure: A-5a

TEST GEOTECH LOG 408616.GPJ TR.GDT 9/20/07

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-5



Treadwell&Rollo

Project No.: 4086.16 | Figure: A-5b

TEST GEOTECH LOG 4086I6.GPJ TR.GDT 7/6/07

PROJECT: **BLOCK 30**
MISSION BAY EAST
San Francisco, California

Log of Boring B30-5

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	SPT		36	SC	CLAYEY SAND (SC) (continued)						
62					COLMA						
63					CLAY (CL) olive, very stiff, wet						
64											
65	SPT		22	CL							
66											
67											
68											
69	SPT		50/ 4.5"		SANDSTONE intensely fractured, friable, low hardness						
70											
71											
72											
73					SERPENTINITE intensely fractured, friable, low hardness						
74					BEDROCK						
75	SPT		85/ 10"								
76											
77											
78											
79	SPT		50/ 5.5"								
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											

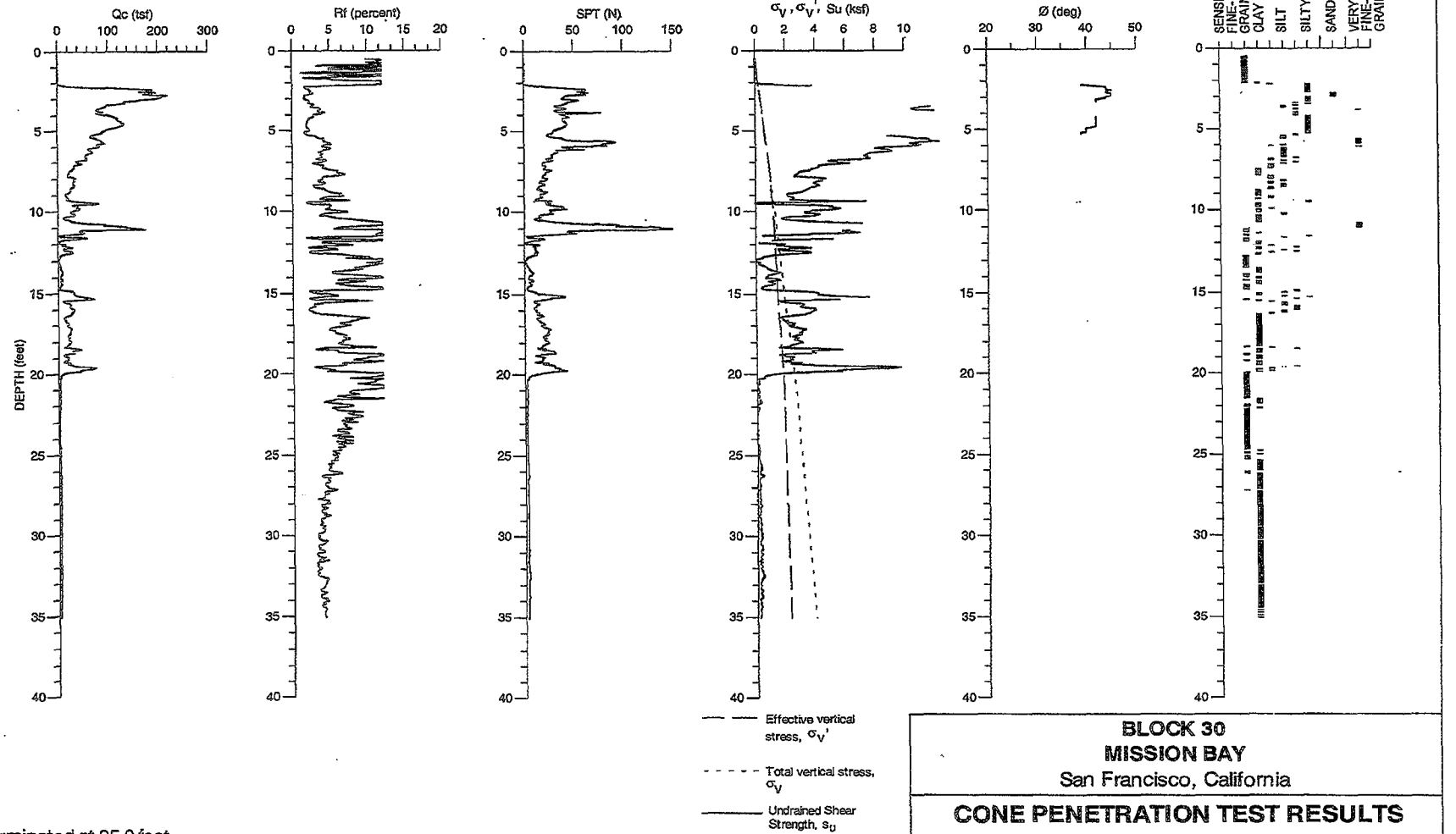
Boring terminated at a depth of 79.5 feet.
Boring backfilled with cement grout.
Groundwater encountered at 8 feet at 8:55 am on 5/4/07.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.16
Figure: A-5c

TEST GEOTECH LOG 408616.GPJ TR.GDT 7/6/07



Terminated at 35.0 feet.
Groundwater assumed to be at a depth of 8.0 feet bgs.
Date performed: 05/04/07.
Elevation: 100.3 feet, Datum: San Francisco City Datum plus 100 feet.

BLOCK 30
MISSION BAY
San Francisco, California

CONE PENETRATION TEST RESULTS
C30-1

Date 09/20/07	Project No. 4086.16	Figure A-8

Treadwell&Rollo

PROJECT:	BLOCK 32 MISSION BAY San Francisco, California	**Log of Boring B32-1** PAGE 1 OF 4

Boring location: See Site Plan, Figure 2 | Logged by: J. Wong

Date started: 4/30/07 | Date finished: 5/1/07

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					Ground Surface Elevation: +105 feet[2]							
1–2					CLAYEY SAND with GRAVEL (SC) olive-brown, medium dense, moist trace brick and subangular gravel	FILL						
3–4	S&H		13		LL = 20, PI = NP							
5–6	SPT		3	SC	very loose							
7–8	SPT		7		loose, with serpentinite fragments					25.9	13.7	
9–10												
11	S&H		5									
12	SPT		5		CLAY (CH) gray, soft, wet, with shell fragments (4/30/07 at 1:40 pm)	BAY MUD						
13–16												
17–18	ST		50 to 75 psi		Consolidation Test, see Figure B-1		TxUU	1,050	275		66.8	60
19–20				CH								
21–24												
25–26	ST		50 to 75 psi		Consolidation Test, see Figure B-2						57.6	66
27–30												

TEST GEOTECH LOG 4086417.GPJ TR.GDT 8/3/07

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-1a

PROJECT: BLOCK 32 MISSION BAY San Francisco, California

Log of Boring B32-1

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value*	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31–42				CH	CLAY (CH) (continued) BAY MUD						
42–47	SPT		26	SC	CLAYEY SAND (SC) yellow-brown, medium dense, wet						
47–54	SPT		16	CL	CLAY (CL) olive, stiff to very stiff, wet, with trace silt						
54–59	S&H		30	SC	CLAYEY SAND (SC) yellow-brown, medium dense to dense, wet						
59–60	SPT		28		SILTY SAND (SM) orange-brown, medium dense, wet COLMA				14.9	24.7	

TEST GEOTECH LOG 408617.GPJ TR.GDT 8/3/07

Treadwell&Rollo

Project No.: 4086.17 Figure: A-1b

PROJECT: **BLOCK 32 MISSION BAY** San Francisco, California

Log of Boring B32-1

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value¹	LITHOLOGY	MATERIAL DESCRIPTION		LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	SPT		28	SM	SILTY SAND (SM) (continued)							
62					SAND with CLAY (SP-SC) orange-brown, very dense, wet, trace fines, medium grained sand							
64												
65	SPT		46/ 5.5"							11.7	22.8	
66												
67												
68												
69												
70	SPT		56							8.8	22.6	
71												
72				SP-SC								
73												
74												
75	SPT		59									
76												
77												
78												
79												
80	SPT		56		olive, fine-grained sand							
81												
82												
83					SERPENTINITE intensely fractured, weak, moderately weathered, moderately hard							
84												
85	SPT		88/ 3"									
86												
87												
88												
89												
90	SPT		56		plastic, soft							

COLMA

BEDROCK

TEST GEOTECH LOG 406617.GPJ TR.GDT 8/3/07

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-1c

PROJECT: **BLOCK 32 MISSION BAY** San Francisco, California

Log of Boring B32-1

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content. %	Dry Density Lbs/Cu Ft
91	SPT		56		SERPENTINITE (continued)						
92											
93											
94	SPT		50/3"		friable, low hardness						
95											
96											
97											
98											
99	SPT		50/3"		weak						
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

BEDROCK

Boring terminated at a depth of 99.25 feet.
Boring backfilled with cement grout.
Groundwater encountered at a depth of 12.5 feet at 1:40 pm on 4/30/07.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-1d

TEST GEOTECH LOG 408617.GPJ TR.GDT 8/3/07

PROJECT: **BLOCK 32 MISSION BAY** San Francisco, California

Log of Boring B32-2

Boring location: See Site Plan, Figure 2 | Logged by: J. Wong

Date started: 4/27/07 | Date finished: 4/30/07

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

Ground Surface Elevation: +101 feet[2]

DEPTH (feet)	Sampler Type	Sample	SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1–4	S&H		12	SC	SAND with CLAY (SP-SC) gray-brown, medium dense, moist, with traces of brick and angular gravel							
5–6	SPT		14	SC	CLAYEY SAND (SC) yellow-brown, medium dense, moist, with fragments of bricks	FILL						
7–8	SPT		4	SC	▽ (4/27/07 at 2:45 pm) olive-brown, very loose to loose, wet							
9–11	SPT		2	SC	very loose							
12–13	ST		0 to 75 psi	CH	CLAY (CH) gray, soft, wet, with shell fragments	BAY MUD						
14–19							TxUU	850	345		59.1	65
20–21	ST		50 to 150 psi	CH								
22–29												
30	ST											

TEST GEOTECH LOG 408617.GPJ TR.GDT 8/3/07

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-2a

PROJECT: BLOCK 32 MISSION BAY San Francisco, California

Log of Boring B32-2

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31	ST		0 to 150 psi	CH	CLAY (CH) (continued) sandy at 30.5 feet						
32											
33											
34											
35	S&H		4		soft to medium stiff						
36											
37											
38											
39					BAY MUD						
40	ST		100 to 300 psi	SP	SAND (SP) gray, wet						
41											
42				CL	CLAY (CL) olive, very stiff, wet						
43											
44											
45	S&H		16			TxUU	1,650	1,540		29.6	94
46											
47											
48											
49					stiff						
50	S&H		13								
51											
52											
53											
54				SC	CLAYEY SAND (SC) yellow-brown, dense, wet						
55	SPT		34						18.7	22.0	
56											
57											
58					COLMA						
59											
60	SPT		31								

TEST GEOTECH LOG 408617.GPJ TR.GDT 8/3/07

Treadwell&Rollo

Project No.: 4086.17

Figure: A-2b

PROJECT: **BLOCK 32**
MISSION BAY
San Francisco, California

Log of Boring B32-2

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	SPT		31	SC	CLAYEY SAND (SC) (continued)						
62					COLMA						
63					SERPENTINITE intensely fractured, friable, moderately weathered, low harness						
64	SPT		50/ 3"		BEDROCK						
65											
66											
67											
68											
69	SPT		50/ 4.5"								
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											

Boring terminated at a depth of 69.4 feet.
Boring backfilled with cement grout.
Groundwater encountered at 8 feet at 2:45 pm on 4/27/07.

S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-2c

TEST GEOTECH LOG 406617.GPJ TR.GDT 8/3/07

PROJECT:	BLOCK 32 MISSION BAY San Francisco, California	**Log of Boring B32-3** PAGE 1 OF 3

Boring location: See Site Plan, Figure 2		Logged by: J. Wong
Date started: 4/25/07	Date finished: 4/26/07	
Drilling method: Rotary Wash		
Hammer weight/drop: 140 lbs./30 inches	Hammer type: Rope and Cathead	
Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)		

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	LABORATORY TEST DATA: Fines %	LABORATORY TEST DATA: Natural Moisture Content, %	LABORATORY TEST DATA: Dry Density Lbs/Cu Ft
					Ground Surface Elevation: +99.5 feet[2]							
1				SC	CLAYEY SAND with GRAVEL (SC) dark gray, loose, moist, with fragments of brick and concrete	FILL						
2												
3	S&H		5									
4												
5					olive-brown, trace gravel							
6	SPT		9									
7					▽ (4/25/07 at 3:30 pm)							
8	SPT		4	CL	CLAY (CL) black, soft to medium stiff, wet, majority of sample is wood							
9												
10				SC	CLAYEY SAND with GRAVEL (SC) dark brown, loose, wet, with fragments of bricks							
11	S&H		6							13.8	23.6	
12	SPT		9									
13					CLAY (CH) gray, soft, wet, with shell fragments	BAY MUD						
14												
15												
16												
17												
18	ST		50 psi									
19												
20												
21				CH								
22												
23												
24												
25	ST		75 psi		Consolidation Test, see Figure B-3						50.9	71
26												
27												
28												
29												
30												

Treadwell&Rollo

Project No.:	Figure:
4086.17	A-3a

TEST GEOTECH LOG 408617.GPJ TR.GDT 8/3/07

PROJECT: **BLOCK 32**
MISSION BAY
San Francisco, California

Log of Boring B32-3

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31–60	ST		100 to 250 psi	CH	CLAY (CH) (continued) — BAY MUD						
35				SP	SAND (SP) gray, wet						
40	SPT		51	CL	CLAY with GRAVEL (CL) yellow-brown with olive mottling, hard, wet						
42					CLAYSTONE intensely fractured, weak, moderately weathered, low hardness						
44	SPT		50/ 3"								
50	SPT		64		plastic — BEDROCK						
52					SHALE intensely fractured, friable, moderately weathered, low hardness						
54	SPT		50/ 5"								
59	SPT		69		plastic						

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-3b

TEST GEOTECH LOG 4086I7.GPJ TR.GDT 8/3/07

PROJECT: BLOCK 32
MISSION BAY
San Francisco, California

Log of Boring B32-3

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
61	SPT		69		SHALE (continued)						
62											
63											
64	SPT		50/3"		friable						
65											
66											
67											
68											
69	SPT		50/3"		BEDROCK						
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											

Boring terminated at a depth of 69.25 feet.
Boring backfilled with cement grout.
Groundwater encountered at 7 feet at 3:30 pm on 4/25/07.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.17
Figure: A-3c

TEST GEOTECH LOG 408617.GPJ TR.GDT 8/3/07

PROJECT: BLOCK 32
MISSION BAY
San Francisco, California

Log of Boring B32-4

Boring location: See Site Plan, Figure 2 | Logged by: J. Wong

Date started: 4/25/07 | Date finished: 4/25/07

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					Ground Surface Elevation: +96 feet[2]						
1–4	S&H		17	SC	CLAYEY SAND with GRAVEL (SC) olive-brown, medium dense, moist, with Serpentinite fragments and subangular gravel						
5–7	SPT		16	SC	CLAYEY SAND (SC) olive-brown, medium dense, moist, with brick and concrete fragments				14.4	10.8	
					▽ (4/25/07 at 8:30 am)						
8–9	S&H		19	SC	wet, with gravel LL = 28, PI = 10						
10–11	SPT		13	SC					13.3	17.0	
12–16					FILL						
17–19	ST		50 psi	CH	CLAY (CH) gray, soft, wet, with shell fragments Consolidation Test, see Figure B-4					71.3	58
20–24					BAY MUD						
25–26	ST		50 to 250 psi	CL	CLAY (CL) yellow-brown, stiff, wet, with trace fine-grained sand	PP		2,500			
27–29	S&H		13	CL							
30											

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-4a

PROJECT: BLOCK 32 MISSION BAY San Francisco, California

Log of Boring B32-4

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31	S&H		13	CL	CLAY (CL) (continued)						
32											
33					CLAYSTONE intensely fractured, plastic, moderately weathered, soft						
34	S&H		50/ 6"								
35											
36											
37											
38					SERPENTINITE intensely fractured, plastic, moderately weathered, soft						
39	SPT		50/ 5.5"								
40											
41											
42											
43					SHALE intensely fractured, friable, moderately weathered, moderately hard						
44	SPT		50/ 4.5"								
45											
46											
47											
48											
49	SPT		50/ 4"								
50											
51											
52											
53											
54	SPT		50/ 0.5"								
55											
56											
57											
58											
59											
60											

BEDROCK

Boring terminated at a depth of 54 feet.
Boring backfilled with cement grout.
Groundwater encountered at 7 feet at 8:30 am on 4/26/07.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-4b

TEST GEOTECH LOG 408617.GPJ TR.GDT 7/17/07

PROJECT: BLOCK 32
MISSION BAY
San Francisco, California

Log of Boring B32-5

Boring location: See Site Plan, Figure 2 | Logged by: J. Wong

Date started: 4/26/07 | Date finished: 4/27/07

Drilling method: Rotary Wash

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Rope and Cathead

Sampler: Sprague & Henwood (S&H), Standard Penetration Test (SPT), Shelby Tube (ST)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					Ground Surface Elevation: +93 feet[2]							
1–4	S&H		15	CL	SANDY CLAY with GRAVEL (CL) olive-brown, stiff, wet, with fragments of concrete and brick, traces angular to subangular gravels ▽ (4/27/07 at 7:00 am)	FILL						
5–6	SPT		7	SC	CLAYEY SAND with GRAVEL (SC) olive-brown, loose, wet, with brick	FILL						
7–8	SPT		18	SC	medium dense	FILL				18.7	12.1	
9–11	S&H		50/3"	SC	concrete obstruction at 10.5 feet	FILL						
12	SPT		4	CH	CLAY (CH) gray, soft to medium stiff, wet, with shell fragments	BAY MUD						
13–14	ST		75 to 100 psi	CH		BAY MUD						
15				SP	SAND (SP) gray, wet	BAY MUD						
16–17				SC	CLAYEY SAND (SC) olive, medium dense, wet	BAY MUD						
18	SPT		21	SC		BAY MUD						
19–20	SPT		9	CL	CLAY with SAND (CL) olive with red-brown mottling, stiff, wet	BAY MUD						
21–23				CL		BAY MUD						
24–25	S&H		26	CL	orange-brown, very stiff	BAY MUD	TxUU	850	4,450		15.7	118
26–27				CL		BAY MUD						
28–29				CL	CLAY (CL) yellow-brown with orange-brown mottling, hard, wet, with bedrock fragments	BAY MUD						
30	SPT		35	CL		BAY MUD						

Treadwell&Rollo

Project No.: 4086.17 | Figure: A-5a

TEST GEOTECH LOG 4086I7.GPJ TR.GDT 7/17/07

PROJECT: BLOCK 32
MISSION BAY
San Francisco, California

Log of Boring B32-5

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
31	SPT		35	CL	CLAY (CL) (continued)						
32					SERPENTINITE intensely fractured, friable, deeply weathered, low hardness						
33					BEDROCK						
34	SPT		50/ 5.5"								
35											
36											
37											
38											
39	SPT		50/ 5"								
40											
41											
42											
43											
44	SPT		50/ 5"								
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											

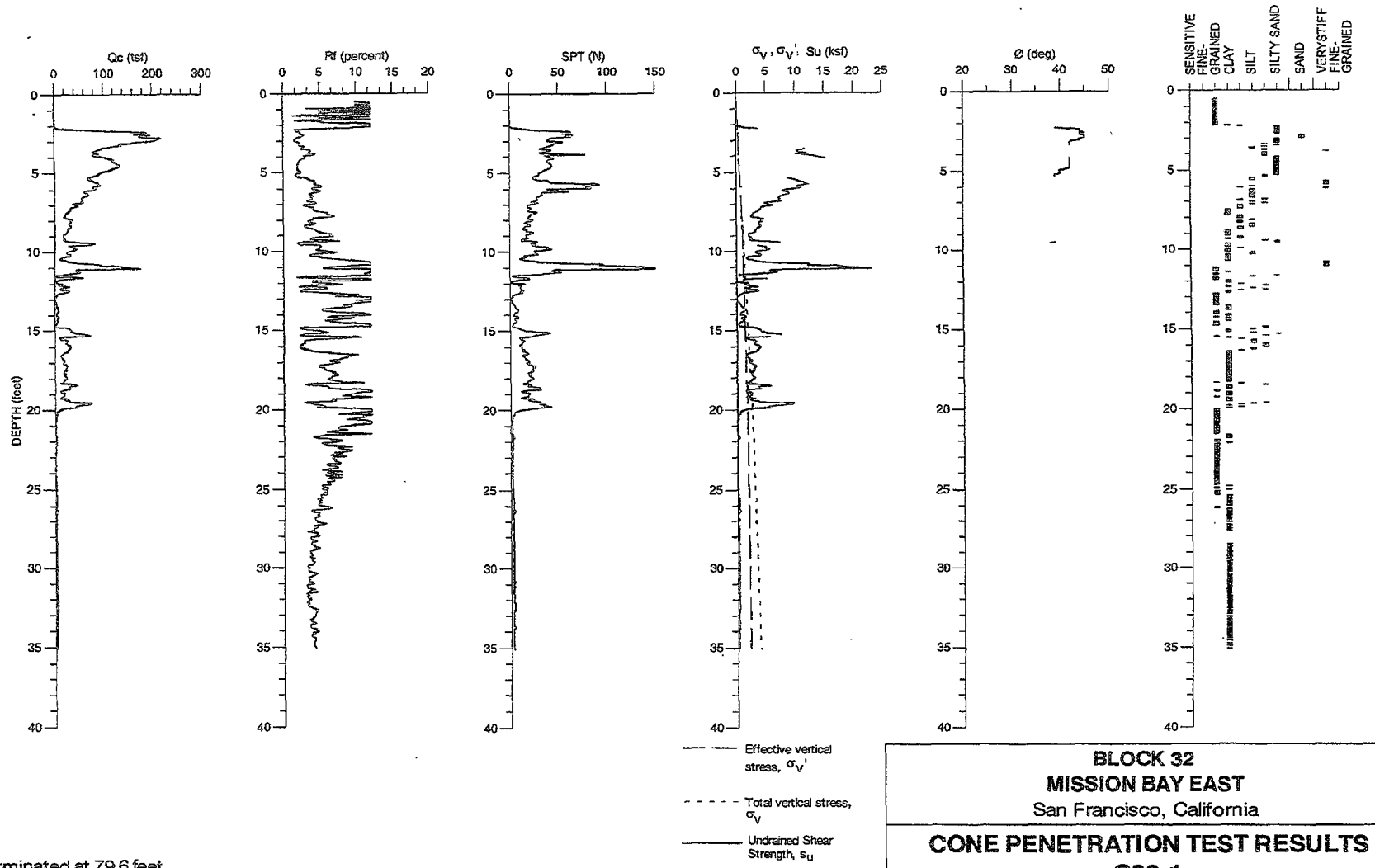
Boring terminated at a depth of 44.4 feet.
Boring backfilled with cement grout.
Groundwater encountered at 2.5 feet at 7:00 am on 4/27/07.

[1] S&H blow counts converted to SPT N-values using a factor of 0.6.
[2] Elevation based on San Francisco City Datum plus 100 feet.

Treadwell&Rollo

Project No.: 4086.17
Figure: A-5b

TEST GEOTECH LOG 4086I7.GPJ TR.GDT 7/17/07



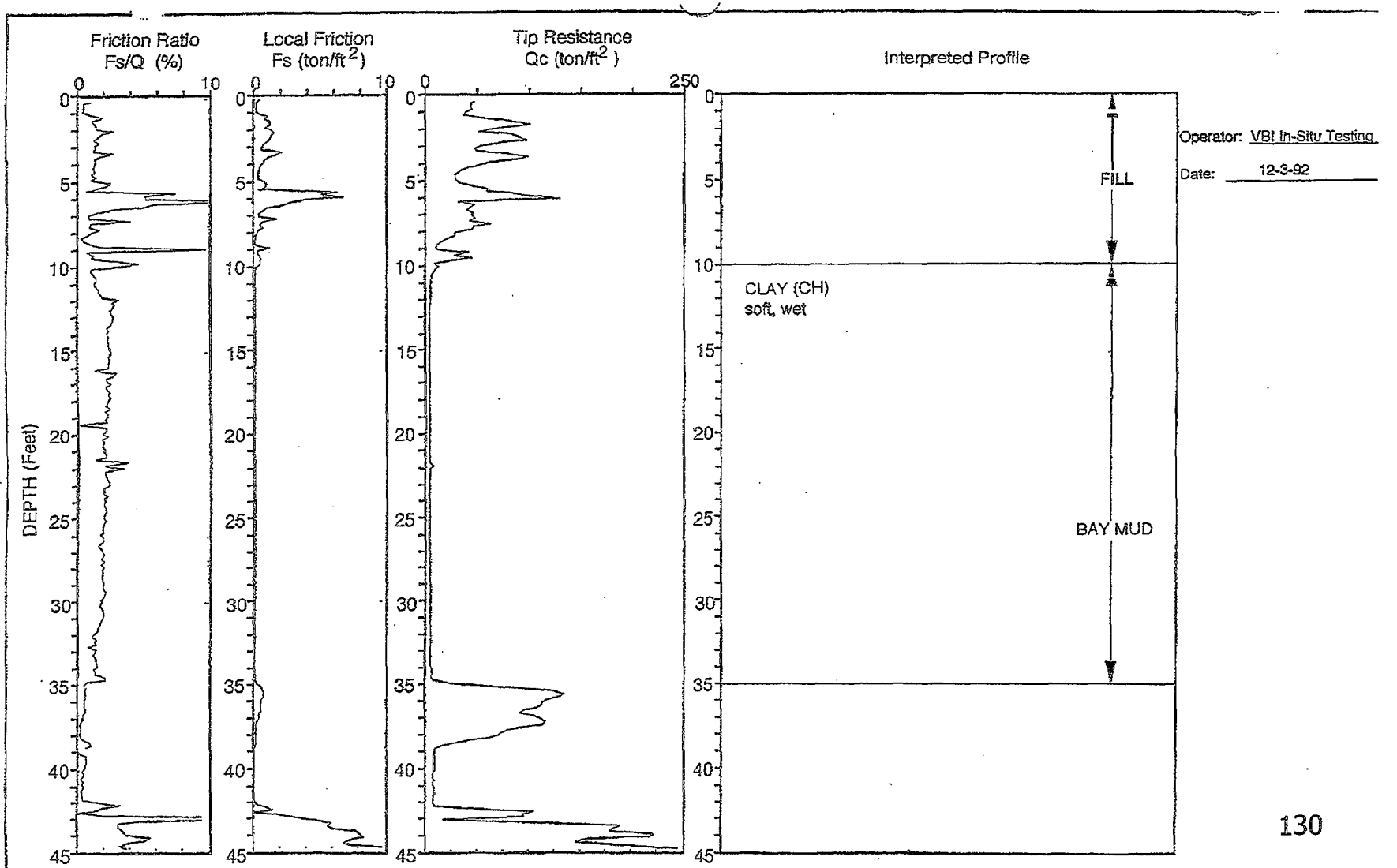
Terminated at 79.6 feet.
Groundwater assumed to be at a depth of 7.0 feet bgs.
Date performed: 08/08/06.
Elevation: 100.6 feet, Datum: San Francisco City Datum +100 feet.

BLOCK 32
MISSION BAY EAST
San Francisco, California

CONE PENETRATION TEST RESULTS
C32-1

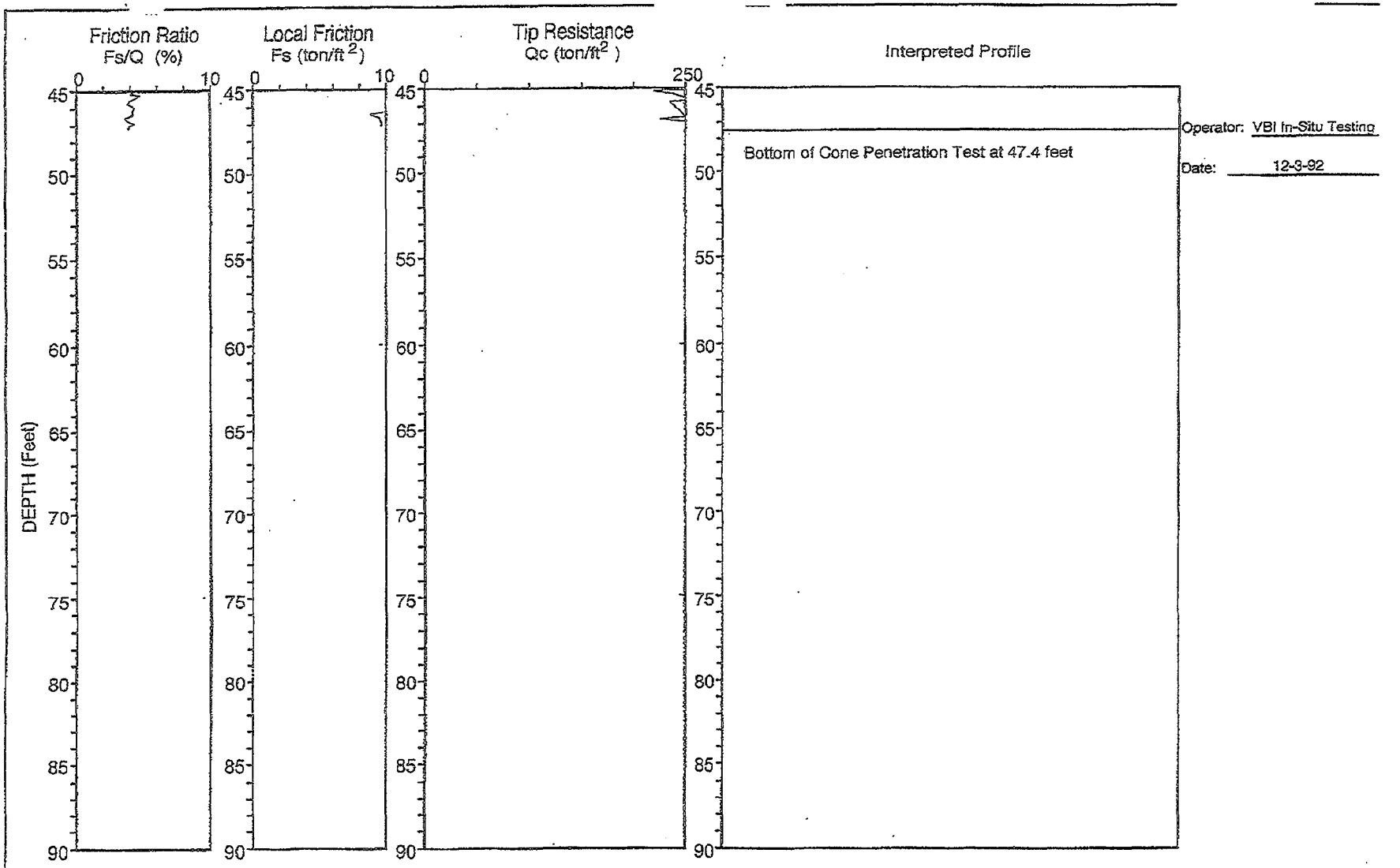
Date 07/18/07	Project No. 4086.17	Figure A-8

Treadwell&Rollo



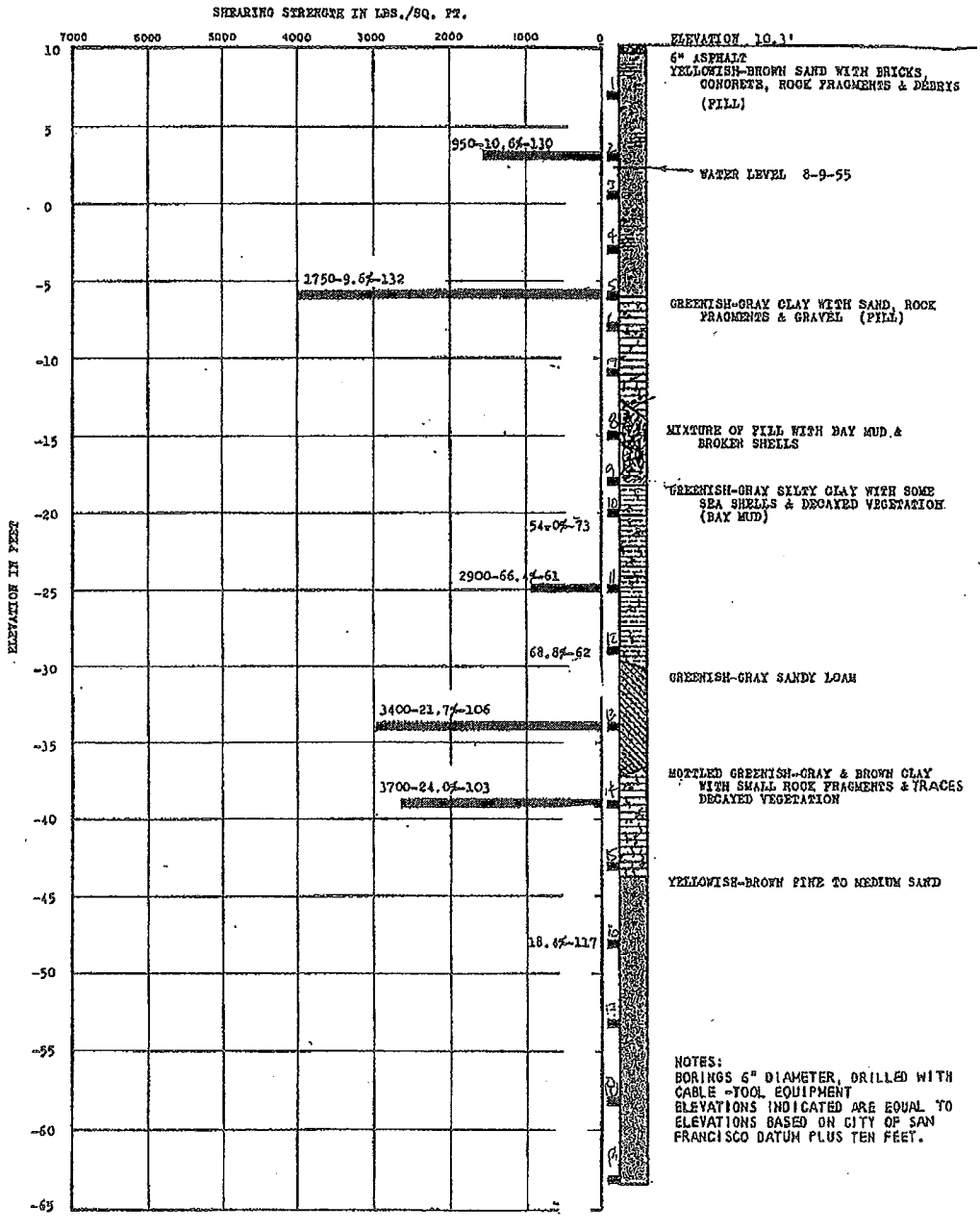
130

TREADWELL & ROLLO, INC. Consulting Engineers and Scientists	LOG OF CPT-M3	
Trans Pacific Geotechnical Consultants, Inc.	Project No. 1273-004	Plate A-18a



MISSION BAY INFRASTRUCTURE San Francisco, California	LOG OF CPT-M3 (continued)
Trans Pacific Geotechnical Consultants, Inc.	Project No. 1273-004 | Plate A-18b

BORING 1
DRILLED 8-5-55 & 8-6-55



LOG OF BORING

DAMES & MOORE
SOIL MECHANICS ENGINEERS

PLATE 2A

BORING M2

DATE DRILLED: 12/7/92

ELEVATION: 100 Feet

DEPTH IN FEET	LAB TEST DATA: STRENGTH TEST DATA – TESTS REPORTED ELSEWHERE	LAB TEST DATA: STRENGTH TEST DATA – LAB VANE SHEAR STRENGTH (PSF)	LAB TEST DATA: MOISTURE CONTENT (%)	LAB TEST DATA: DRY DENSITY (PCF)	SAMPLING: TYPE OF SAMPLER	SAMPLING: SAMPLING RESISTANCE	SAMPLES	SYMBOLS	DESCRIPTION
0			14	114	U	25		GW	Brown sandy GRAVEL, moist
								SP	Brown SAND with some brick fragments, moist
								CL	Dark brown sandy CLAY with brick fragments, moist (dense)
5								SP	Dark brown SAND with trace of fine brick, wet (medium dense)
					SPT	22			Ground water encountered at 6-1/2 feet
10								GW	Green gray sandy GRAVEL consisting of fragmented serpentine, with clay, wet (very dense)
					SPT	4			
15					U	45 / 4"			
20					U	45 / 3.5"			grades dark green gray
25			42	81	U	36		CH	Light brown CLAY with sand, wet (very hard)
30								GC	Olive clayey GRAVEL, wet (very dense)
					U	47 / 11"			
35									

FILL

BAY MUD

DENSE CLAYEY GRAVELS

(continued next page)

(52) Catellus Development Corporation, Mission Bay Infrastructure, San Francisco, California

1273r

LOG OF BORING

Trans Pacific Geotechnical Consultants, Inc.

PLATE A-3a

BORING M2 (continued)

DATE DRILLED: 12/7/92

ELEVATION: 100 Feet

DEPTH IN FEET	LAB TEST DATA: STRENGTH TEST DATA — TESTS REPORTED ELSEWHERE	LAB TEST DATA: STRENGTH TEST DATA — LAB VANE SHEAR STRENGTH (PSF)	LAB TEST DATA: MOISTURE CONTENT (%)	LAB TEST DATA: DRY DENSITY (PCF)	SAMPLING: TYPE OF SAMPLER	SAMPLING: SAMPLING RESISTANCE
35						
			10	134	U	41 / 11"
40						
					U	42
45						
					U	46 / 3"
50						
55						
60						
65						
70						

SAMPLES

SYMBOLS	DESCRIPTION	
GC		DENSE CLAYEY GRAVELS
GC	Dark gray clayey GRAVEL with sand, wet (very dense)	
	grades sandier	
ROCK	Dark green SERPENTINITE, weathered, fractured (hard)	BED-ROCK

NOTES:
1. Boring completed at a depth of 48 1/2 feet on 12/7/92.
2. For other notes, see Boring M1.

(52) Catellus Development Corporation, Mission Bay Infrastructure, San Francisco, California

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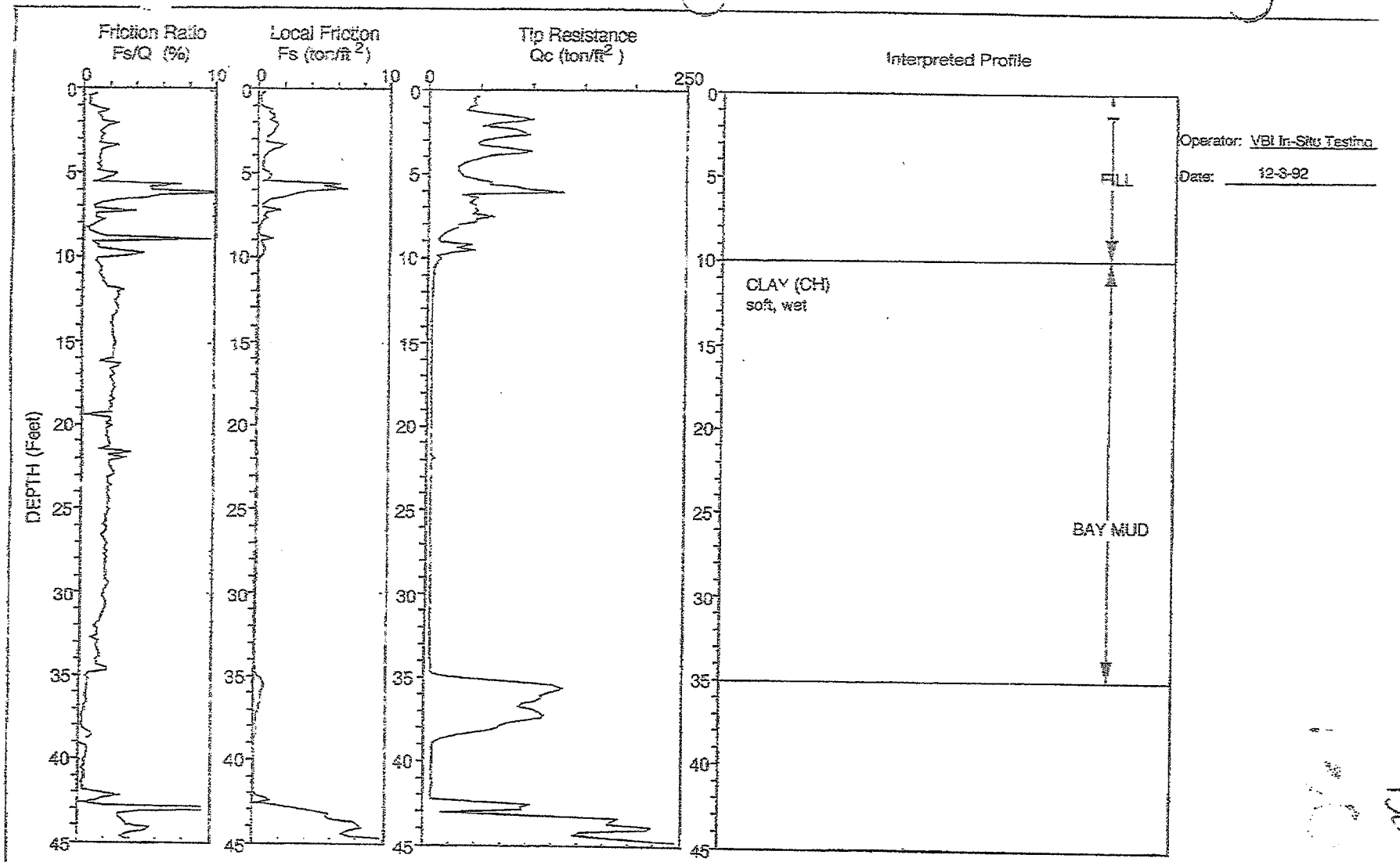
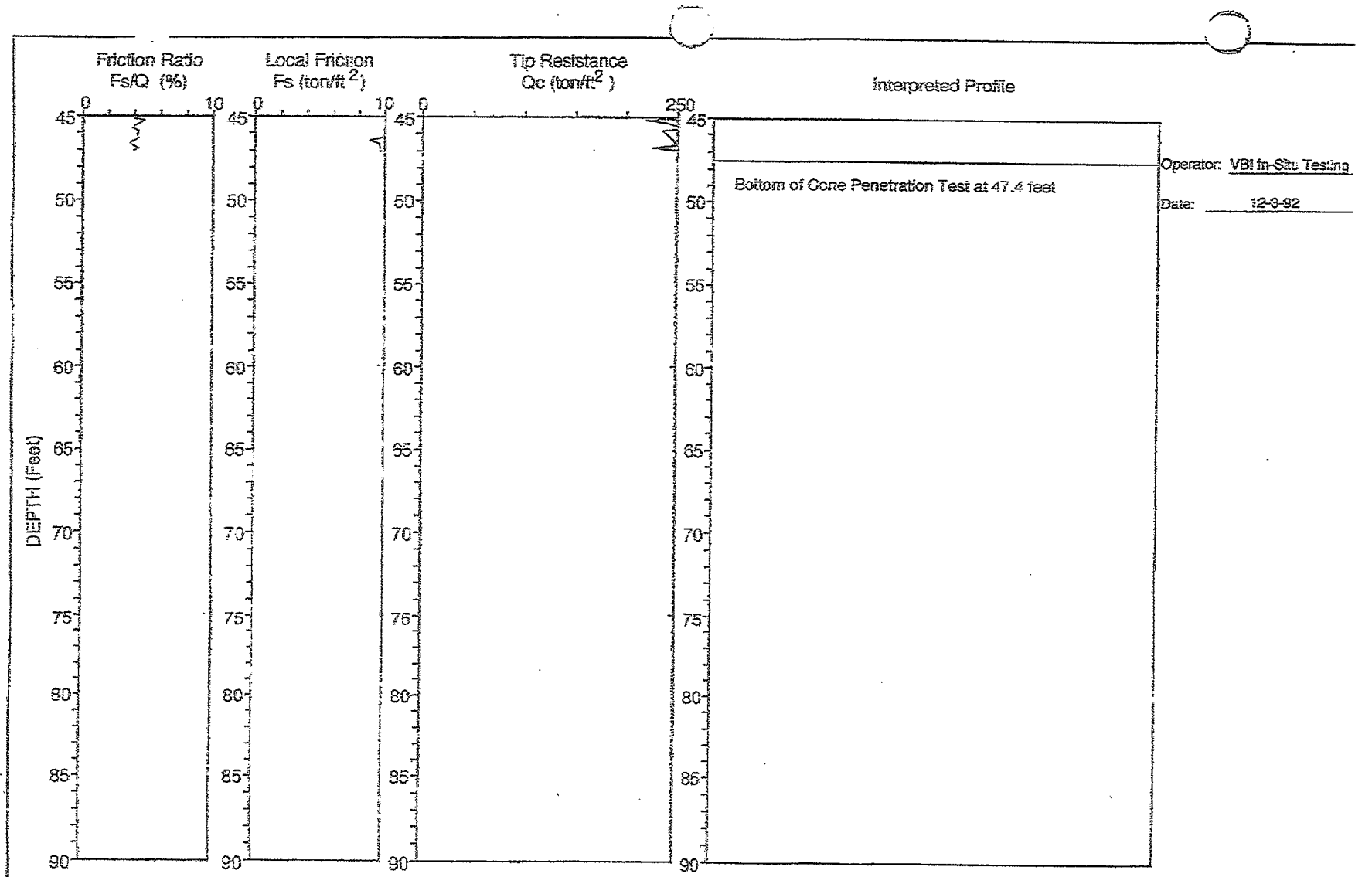
LOG OF BORING

Trans Pacific Geotechnical Consultants, Inc.

PLATE A-3b



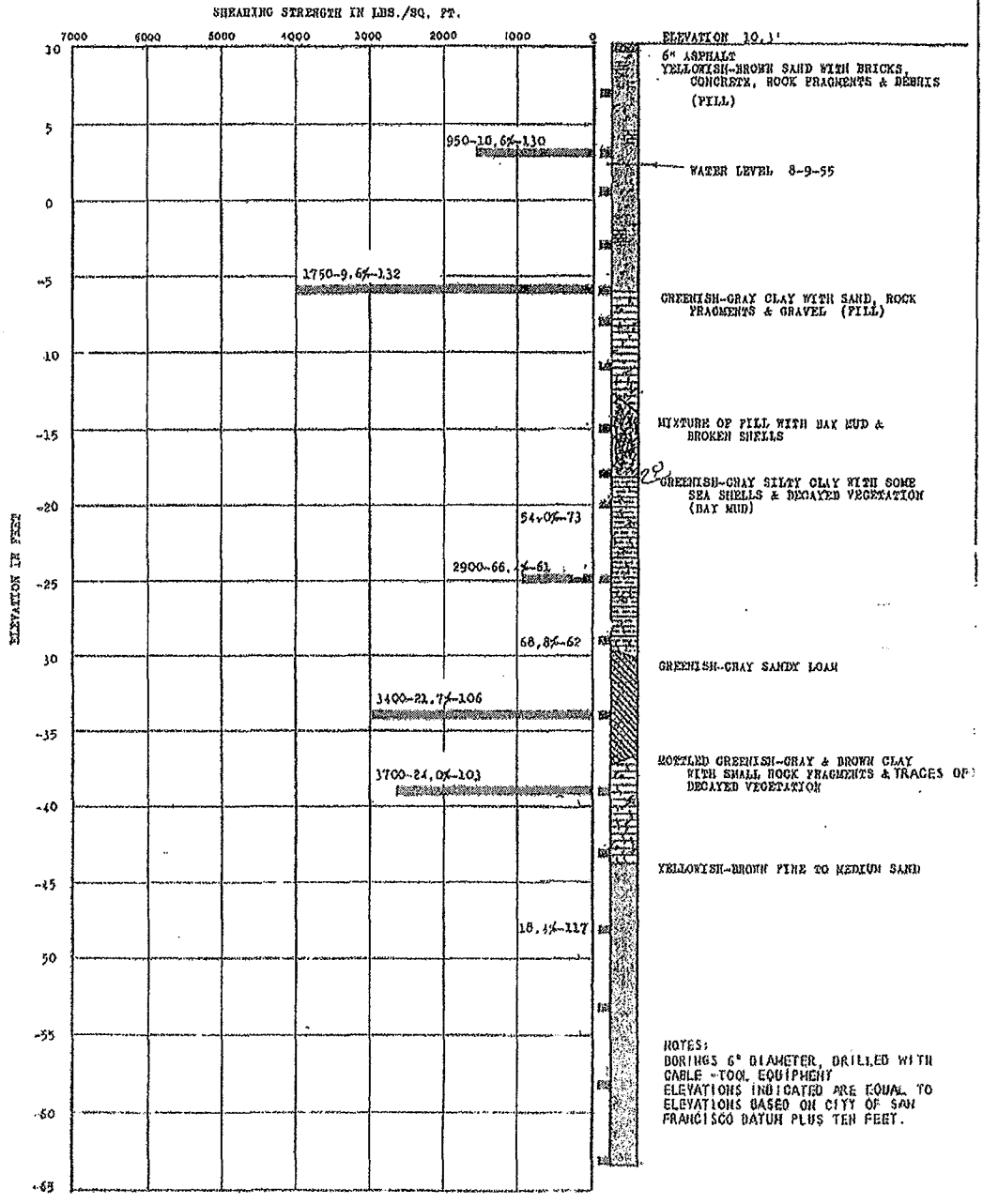
TREADWELL & ROLLO, INC. Consulting Engineers and Scientists	LOG OF CPT-M3
Trans Pacific Geotechnical Consultants, Inc.	Project No. 1273-004 | Plate A-18a



MISSION BAY INFRASTRUCTURE San Francisco, California	LOG OF CPT-M3 (continued)
Trans Pacific Geotechnical Consultants, Inc.	Project No. 1273-004 | Plate A-18b

3600

BORING 1
DRILLED 8-5-55 & 8-6-55



NOTES:
BORINGS 6" DIAMETER, DRILLED WITH CABLE-TOOL EQUIPMENT
ELEVATIONS INDICATED ARE EQUAL TO ELEVATIONS BASED ON CITY OF SAN FRANCISCO DATUM PLUS TEN FEET.

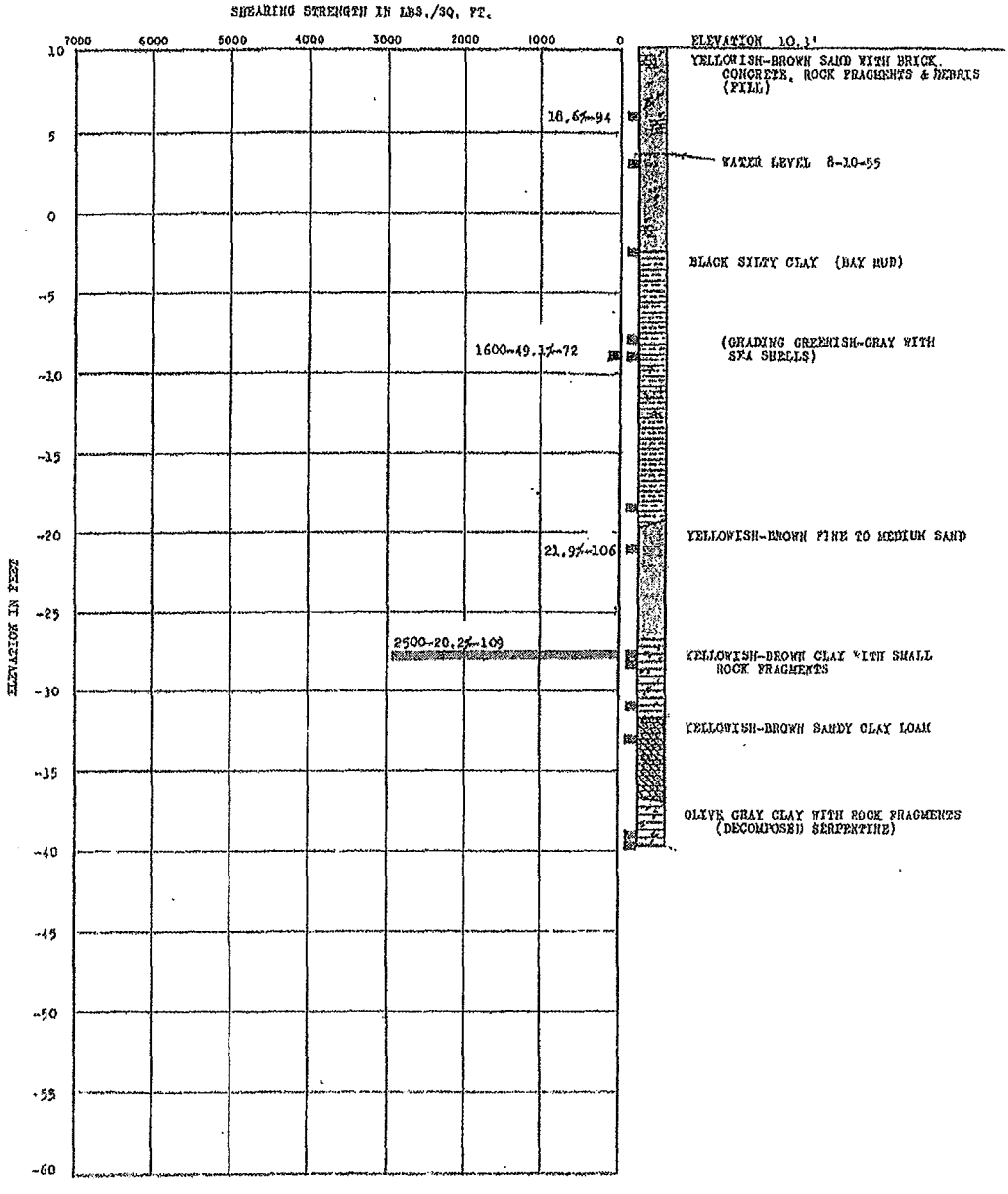
LOG OF BORING

BARRON & MOORE
SOIL MECHANICS ENGINEERS

PLATE 2A

BORING 2

DRILLED 8-9-55



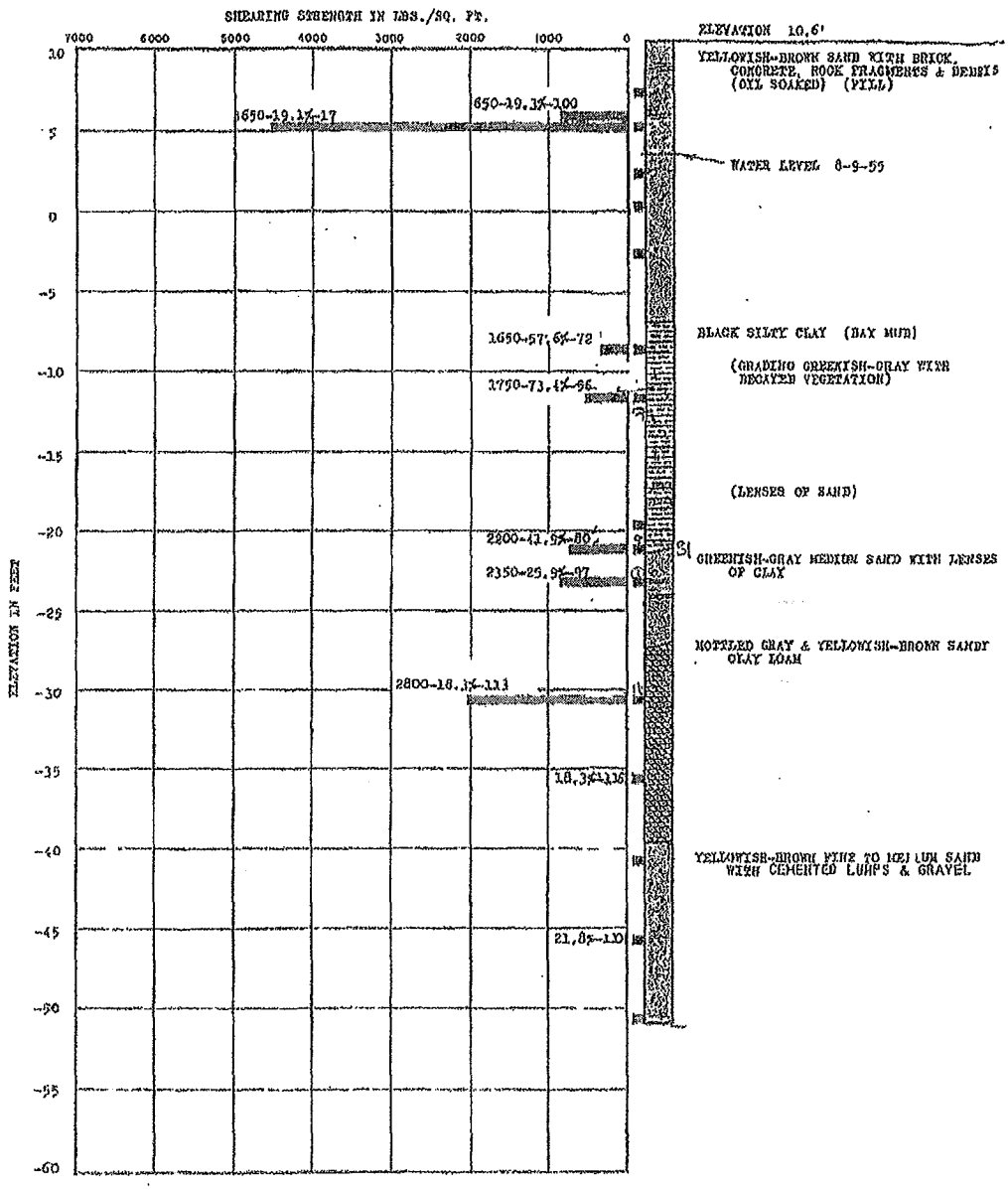
LOG OF BORING

HAMMEN & NICOLL
SOIL MECHANICS ENGINEERS

PLATE 2B

362

BORING 3
DRILLED 8-7-55



LOG OF BORING

BARRET & MOORE
SOIL MECHANICS ENGINEERS

PLATE 2C

LOG OF BORING B- 9

DRILLING DATE: 3/1/00
DRILLING METHOD: Rotary wash - 4 7/8"
DRILL RIG TYPE: Failing 1500
HAMMER TYPE: 140-lb falling 30 inches

SURFACE ELEVATION: ft
DATUM:
LOGGED BY: CL
CHECKED BY: JMMV

1080

AGS, Inc. Consulting Engineers

514230.8511, 6731.3740

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	ADDITIONAL TESTS
					8" - ASPHALT					
					COBBLES AND COARSE GRAVEL					
					SILTY SAND (SM), greenish-gray to dark gray, fine to coarse grained, trace fine to coarse gravel and serpentine rock fragments, trace clay, moist, medium dense. [FILL]					
5		1A 1B	27		change to brown, fine grained	103	10			SA (17)
		2	17		change to greenish-gray to dark gray, fine to coarse grained, trace fine to coarse gravel and serpentine rock fragments, trace clay		16			WA (19)
10		3B	22		SAND WITH SILT AND GRAVEL (SP-SM), greenish-gray to dark gray, fine to coarse grained, fine to coarse gravel and rock fragments, trace clay, wet, medium dense.	110	17			SA (9)
15		4	13							
20		5	22		SAND WITH GRAVEL (SP), greenish-gray to dark gray, fine to coarse grained, fine to coarse gravel and serpentine rock fragments, trace clay, wet, medium dense.	85	15			WA (3)
					CLAY (CH), grayish-green, occasional shell fragments, moist, soft. [BAY MUD]					
25	P	6								
30	P	7				67	57	63	38	WA (96)
35										
40										

7/28/00

LBG LGHTRAIL

JOB NO. 981202 | PROJECT: S. F. MUNI - 3rd Street Light Rail Project | SHEET 1 OF 3 | PLATE A-1.10

LOG OF BORING B- 9

DRILLING DATE: 3/1/00
DRILLING METHOD: Rotary wash - 4 7/8"
DRILL RIG TYPE: Failing 1500
HAMMER TYPE: 140-lb falling 30 inches

SURFACE ELEVATION: ft
DATUM:
LOGGED BY: CL
CHECKED BY: JMMV

1080'

AGS, Inc. Consulting Engineers

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	ADDITIONAL TESTS
45	P	8			CLAY (CH), grayish-green, occasional shell fragments, moist, soft. [BAY MUD]	61	65	77	50	WA (100)
50	P	9			SAND WITH SILT (SP-SM), grayish-green, fine grained, slight cohesion (weakly cemented), moist, very dense.					
55		10A 10B	76		no cohesion	105	23			WA (5)
60		11	11		CLAY (CL), light brownish-gray with reddish-brown mottling, trace fine grained sand, moist, stiff.					
65					SILTY SAND (SM), brown to light brown with reddish-brown mottling, fine grained, moist, very dense.					
70		12A 12B	82			111	19			WA (20)
75										
80										

LBG LGHTRAIL.GF 3/8/00

JOB NO. 981202 | PROJECT: S. F. MUNI - 3rd Street Light Rail Project | SHEET 2 OF 3 | PLATE A-1.10

G OF
RING
8

DRILLING DATE: 2/29/00
DRILLING METHOD: Rotary wash - 4 7/8"
DRILL RIG TYPE: Failing 1500
HAMMER TYPE: 140-lb falling 30 inches

SURFACE ELEVATION: ft
DATUM:
LOGGED BY: CL
CHECKED BY: JMMV

[10081]
AGS, Inc. Consulting Engineers
54261.2774, 63377.5612

SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	ADDITIONAL TESTS
				8" - ASPHALT					
				SAND WITH SILT AND GRAVEL (SP-SM)), grayish-green and brown, fine to medium grained, fine to coarse gravel and serpentine rock fragments, moist, medium dense. [FILL]					
	1A 1B	17			118	10			SA (7)
	2	13		SILTY SAND WITH GRAVEL (SM), grayish-green and brown, fine to medium grained, fine to coarse gravel and serpentine rock fragments, moist, medium dense.		20			WA (20)
	3	36		GRAVEL WITH SAND (GW), grayish-green and brown, fine to coarse gravel and serpentine rock fragments, fine to medium grained sand, wet, dense.		10			SA (3)
	4			CLAY (CH), gray, trace sand, occasional shell fragments, moist, soft. [BAY MUD]					
P	5			area with gravel and sand	87	17	64	38	SA (4)
P	6				51	86	90	62	WA (100)

JOB NO. 981202 | PROJECT: S. F. MUNI - 3rd Street Light Rail Project | SHEET 1 OF 2 | PLATE A-1.9

LOG OF BORING B- 8

DRILLING DATE: 2/29/00
DRILLING METHOD: Rotary wash - 4 7/8"
DRILL RIG TYPE: Failing 1500
HAMMER TYPE: 140-lb falling 30 inches

SURFACE ELEVATION: ft
DATUM:
LOGGED BY: CL
CHECKED BY: JMMV

AGS, Inc. Consulting Engineers

DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	ADDITIONAL TESTS
45	P	7			CLAY (CH), gray, trace sand, occasional shell fragments, moist, soft. [BAY MUD]	62	62	67	40	WA (100)
50										
55		8A 8B	90		SAND WITH SILT (SP-SM), gray, fine grained, wet, very dense.	108	22			SA (9)
60		9A 9B	29		SILTY CLAY WITH SAND (CL-ML), light grayish-brown, fine grained sand, moist, very stiff.	92	31			WA (72)
65		10	27		SILT WITH SAND (ML), light brown and gray with rust-red mottling, fine grained sand, moist, medium dense.					
70		11A 11B	83		SILTY SAND (SM), reddish-brown, fine grained, moist, very dense.	113 111	19 19			WA (31) SA (27)
75		12	79							
80					Boring completed at 76.5 feet. Filled with cement-bentonite grout.					

/28/00

LBG LGHTRAIL

JOB NO. 981202 | PROJECT: S. F. MUNI - 3rd Street Light Rail Project | SHEET 2 OF 2 | PLATE A-1.9