DOCUMENT 00 9113

ADDENDA

SPECIFICATION NO. 23-11567-C

CITY OF BERKELEY

BERKELEY MARINA SELECTIVE TIMBER PILE REPLACEMENT

201 UNIVERSITY AVE., BERKELEY, CA 94710

This Addendum was issued on **February 17, 2023** with the following clarifications are hereby made to the subject documents:

Project Plans

Replace the plan sheets with updated sheets as attached to this Addendum.

1. Sheets G-002, C-005: Revise two piles for replacement on O Dock.
2. Sheet C-006: Prestressing values in Note 3.3 have been revised
   Note 7 includes additional information on the polymer cover
   Prestressed strands were modified in Detail B
   Details 4 and 5 were added for methods of pile guide installation at deteriorated docks

Project Manual – Technical Specification

1. Replace pages from SECTION 316213 – CONCRETE PILES with the following, as attached to this Addendum:
   A) Pages from SECTION 316213– CONCRETE PILES, dated February 14, 2023

Project Manual – Front End Specification

1. Replace SECTION 00 4113 – BID FORM with the following, as attached to this Addendum:
   A) SECTION 00 4113– BID FORM
2. Replace pages from SECTION 01 1100 – SUMMARY OF WORK with the following, as attached to this Addendum:
   A) Pages from SECTION 01 1100 – SUMMARY OF WORK.

Additional Documents

These additional documents are provided as information only and are not a part of the contract documents.

1. Berkeley Marina Hydrographic Survey – September 20, 2022
2. Geotechnical Investigation Berkeley Marina Rehabilitation – December 16, 2004

Questions and Responses:

Q1: Bid Items B5 and B9 have a quantity of "0", please confirm this is not a typo and whether the contractor is required to enter a unit price?

A1: This is correct, there are no pile removals and no pile repairs scope within Schedule B. Items have been struck out.

Q2: **The Additive Bid schedule contains a Mob/Demob item. Should the contractor assume that the additive items will be exercised in the same barge mobilization as the base bid or as a stand-alone mobilization effort?**

A2: The mob/demob item should only include mobilization for the additional piles within the additive scope. The intent of the additive bid scope is for it to be completed while equipment for the base bid scope is onsite.

Q3: Due to long lead times for piles, will the City exercise the additive bid items at the same time as the base bid to avoid additional procurement delay?

A3: Award of the additive item is up to the City's discretion. If elected to include the additive bid items after base bid award, the contract time will be extended to allow for material procurement.

Q4: **Bid Item AL1 does not seem to come with much info on the required grade, color, or thickness of the polymer covers. Please provide more information, including whether any of the subframe needs to be addressed or just the covers.**

A4: Additional information has been provided in Note 7 on Sheet C-06. Subframe condition varies throughout the marina. The contractor can expect minor modifications to the subframe will be required in few locations (removing and replacing some framing to facilitate installation of covers).

Q5: **Due to the tight dimensions in some of the fairways, would the contractor be allowed to temporarily remove fingers to facilitate barge access?**

A5: No dock removal is permitted at this time.

Q6: Please extend the eligible period to 5 years for project experience in Section 00 45 13 1.01 C.

A6: This is a City standard and cannot be changed. However, it is encouraged to include relevant previous project information even if outside of three years.

Q7: Please confirm the city of Berkeley or others will sign disposal manifests as the waste generator for disposed materials.

A7: The City of Berkeley will sign the disposal manifests as the waste generator for the disposed materials. A Waste Management Plan will be required per Section 01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

Q8: Please confirm that the Contractor will not be responsible for moving/handling vessels in the Marina.

A8: An additional bid item has been added to the Additive Bid scope for relocating vessels. Marina staff will work closely with the contractor to establish areas vessels can be stored while work occurs. Only vessels in active work areas may be moved. If the additive bid scope is not awarded, the City will be responsible for vessel relocation in coordination with the contractor’s scheduling.

Q9: Impact hammers may emit soot which may travel downwind onto boats. Please confirm the contractor is not liable for covering docks and vessels, or for cleaning/restoration of docks and vessels.

A9: Relocation of vessels for piling installation should include vessels that may be impacted from soot. Contractor is responsible for leaving work area, including docks, in clean, pre-project condition.

Q10: Contractor barges may entirely block access to fairways and slips for periods of time. Will the contractor be required to relocate the barge outside the fairways at the end of shift?

A10: The barges may stay in fairways overnight in-between working days. Barges must be moved to the main channel over weekends.

Q11: Can the contractor moor a material storage barge in the central marina basin for the working duration?

A11: Yes. Marina staff will work with the contractor on the exact location and it will need to be equipped with the appropriate lights and signage.

Q12: Please confirm that the working days period does not start prior to materials being delivered.

A12: The intent of the 50 working days is time for construction. Material procurement is not included in the 50 working days. The Notice to Proceed will be issued with a date the contract time will commence, whether or not materials have been procured by that date. It is understood there is a significant timeline required for material procurement.

Q13: Are there any submarine utilities within the marina basin that would be affected by contractor barge spuds or anchors?

A13: None the City is aware of.

Q14: Sheet C-006 Detail 3 provides detail for exterior pile guides to be installed. Please provide details of the extent of repair if needed due to damaged finger.

A14: Details 4 and 5 have been added to Sheet C-006 to show other installation methods for deteriorated finger ends. Two additional items have been added to the bid table to capture the alternative methods.

Q15: Section 31 62 13 3.2.G discusses a retapping process. Please consider deleting this paragraph because it typically applies to bearing piles.

A15: Section has been revised and no longer includes retapping process. Revised section is induced in this addendum.

Q16: Section 31 62 13 3.2.c.2 details a ½" vertical tolerance which is overly tight for a guide pile.

A16: Vertical tolerance has been increased to 2". Revised section is induced in this addendum. Pile cutoff requirement and bid item will remain in the contract.

Q17: Please confirm project start date and work window.

A17: Start date will depend on contracting time and material procurement, but the in-water work window specified in the permits is from June 1st through November 30th.

Q18: Please confirm working hours.

A18: Work may begin at 7:00am each day, and pile driving/noise making activities may begin at 8:00am. The work day concludes at 5:00pm.

Q18: Is a geotechnical report available or any data on the existing soil conditions?

A18: A 2004 geotechnical investigation report performed by Treadwell & Rollo is attached to this addendum.

Q19: Is a bathymetric survey available?

A19: A bathymetric survey was performed in September 2022 and is attached to this addendum.

Q20: Per Note 3.3 of Drawing C-006, the piles are specified to an effective prestress of 2,070 psi., with the calculated prestress loss given as 63.7 ksi, the working force per strands as 48.2 kips and the jacking force of 385.8 kips.

- a. **Please assist to reconcile the numbers and working force.**
- b. **Most marina piles effective prestress is around the vicinity of 1,000 psi. Specifying an uncommon effective prestress of 2,070 psi adds too much prestress, making the pile difficult to fabricate and thus increasing cost drastically. Please consider lowering the prestress to 1,000 psi range.**

A20: Prestressing values have been revised on Sheet C-006

Q21: Most San Francisco Bay Area marina piles use 0.5” or 0.6” strands. However, this project call for a larger 0.7” strands, this will drive up the cost of the pile, please reconsider the use of 0.5” or 0.6” strands.

A21: Strands have been revised on Sheet C-006.

END OF DOCUMENT

GENERAL

1. ALL FEATURES SHOWN ON DRAWINGS C-002 TO C-005 ARE EXISTING, UNLESS OTHERWISE NOTED.
2. EXISTING SITE FEATURES BASED UPON SITE VISITS CONDUCTED BY MOFFATT & NICHOL ON JULY 22, JULY 23, AND SEPTEMBER 2, 2020. ALL EXISTING CONCRETE PILES WERE OBSERVED TO BE IN GOOD CONDITION WITH 0% SECTION LOSS.
3. PROJECT VERTICAL DATUM IS MEAN LOWER LOW WATER, BASED ON "SAN FRANCISCO BAY TIDAL DATUMS AND EXTREME TIDES STUDY", DATED FEBRUARY 2016. TIDAL RANGE AT BERKELEY MARINA IS AS FOLLOWS:

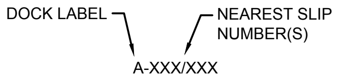
WATER LEVEL	ELEVATION (FT)
MEAN HIGHER HIGH WATER (MHHW)	+6.27
MEAN HIGH WATER (MHW)	+5.70
MEAN TIDE LEVEL (MTL)	+3.39
MEAN LOW WATER (MLW)	+1.08
NORTH AMERICAN VERTICAL DATUM 1988 (NAVD88)	+0.07
MEAN LOWER LOW WATER (MLLW)	±0.00

4. PROTECT ALL EXISTING SITE FEATURES NOT CALLED OUT TO BE DEMOLISHED. REPAIR ANY DAMAGE DONE TO EXISTING FEATURES TO REMAIN.
5. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR JOBSITE SAFETY AND CLEANLINESS.
6. DIMENSIONS NOTED AS PLUS OR MINUS (±) OR "VIF" INDICATE UNVERIFIED DIMENSIONS AND ARE APPROXIMATE. THEY ARE TO BE FIELD VERIFIED BY THE CONTRACTOR.
7. VERIFY ALL LEVELS, DIMENSIONS, AND EXISTING CONDITIONS IN THE FIELD BEFORE PROCEEDING. NOTIFY OWNER OF ANY DISCREPANCIES OR FIELD CHANGES PRIOR TO INSTALLATION OR FABRICATION. IN CASE OF DISCREPANCIES BETWEEN THE EXISTING CONDITIONS AND THE DRAWINGS THE CONTRACTOR SHALL OBTAIN WRITTEN DIRECTION FROM OWNER BEFORE PROCEEDING. NOTED DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS - DO NOT SCALE DRAWINGS.
8. ALL BMPS SHALL BE IN PLACE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AS WELL AS AT THE END OF EACH WORK DAY.
9. PROVIDE CATCHMENT BOOM TO PREVENT ANY MATERIAL FROM FALLING INTO THE WATER DURING DEMOLITION AND CONSTRUCTION. ALL CAUGHT MATERIAL SHALL BE REMOVED IMMEDIATELY OR BY THE END OF THE WORK DAY.
10. FOREIGN MATERIALS (E.G. DEMOLITION DEBRIS, WOOD PRESERVATIVES, OTHER CHEMICALS, ETC.) SHALL BE PREVENTED FROM ENTERING THE MARINA AND SAN FRANCISCO BAY.
11. MAINTAIN GOOD CONSTRUCTION SITE HOUSEKEEPING: KEEP ALL MATERIALS COVERED AND OUT OF RAIN, PLACE TRASH RECEPTACLES ON SITE AND DISPOSE OF WASTE PROPERLY. COVER TRASH RECEPTACLES IN WET WEATHER.
12. INSPECT PROJECT AREA AT COMPLETION OF WORK TO ENSURE NO DEBRIS, TRASH, OR CONSTRUCTION MATERIALS ARE LEFT AT THE SITE OR IN ADJACENT COASTAL WATERS.
13. REMOVAL ACTIVITIES ARE PROHIBITED OUTSIDE OF THE LIMITS OF THE DESIGNATED CONSTRUCTION AND DEMOLITION.
14. ALL ADVERSELY AFFECTED ACCESS POINTS SHALL BE RESTORED TO THEIR PRE-CONSTRUCTION CONDITION OR BETTER WITHIN 3 DAYS OF COMPLETION OF CONSTRUCTION.
15. EQUIPMENT WASHING, FUELING, AND/OR SERVICING SHALL NOT TAKE PLACE ON THE DOCKS. WORK VEHICLES WILL BE MAINTAINED AND WASHED IN CONFINED AREAS DESIGNED TO CONTROL RUNOFF AND LOCATED MORE THAN 100 FEET AWAY FROM THE MEAN HIGH TIDE LINE.

PERMITS

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE REGULATORY WORK WINDOWS AND PERMIT CONDITIONS PER PERMITS FROM THE FOLLOWING AGENCIES:
   - US ARMY CORPS OF ENGINEERS (USACE)
   - REGIONAL WATER QUALITY CONTROL BOARD (RWQCB)
   - BAY CONSERVATION AND DEVELOPMENT COMMISSION (BCDC)

PILE LABEL NOTATION



-INT	INTERNAL GUIDE PILE
-SEP	SEPARATOR GUIDE PILE

HARDWARE

1. ALL STEEL PLATES, ANGLES, BOLTS, LAG BOLTS, NUTS AND WASHERS SHALL BE HOT DIP GALVANIZED. BOLTS SHALL HAVE FLAT WASHERS AT THE NUT AND HEAD, UNLESS NOTED OTHERWISE.
2. BOLTS SHALL CONFORM TO ASTM A307A.
3. DECK SCREWS SHALL BE 8" STRONG-DRIVE SDWS TIMBER STAINLESS STEEL SCREWS.
4. DRIFT PIN MATERIAL SHALL BE STAINLESS STEEL, DIAMETER TO MATCH EXISTING.

REINFORCEMENT

1. REINFORCEMENT SHALL CONFIRM TO ASTM A615.
2. REINFORCING BARS SHALL NOT BE WELDED WITHOUT THE ENGINEER'S APPROVAL.

GROUT

1. CEMENTITIOUS UNDERWATER GROUT SHALL BE SIMPSON FX-225 NON-SHRINK CEMENTITIOUS UNDERWATER GROUT OR ENGINEER APPROVED EQUAL.
2. MARINE EPOXY GROUT SHALL BE SIMPSON FX-70-6MP MULTI-PURPOSE MARINE EPOXY GROUT OR ENGINEER APPROVED EQUAL.
3. TOP SEAL EPOXY SHALL BE FX-763 TROWEL-GRADE EPOXY MIXED WITH FX-702 SILICA FILLER OR ENGINEER APPROVED EQAUL.
4. ALL GROUT SHALL BE PLACED TO OBTAIN UNIFORM COVERAGE WITHOUT VOIDS. THE CONTRACTOR SHALL SUBMIT A GROUTING PROCEDURE FOR APPROVAL BY THE ENGINEER.

CONSTRUCTION PHASING

1. CONSTRUCTION WILL BE DONE IN 5 PHASES AS SHOWN IN THE TABLES TO THE RIGHT, IN THE PRIORITY ORDER SPECIFIED.
2. IF THE COST TO ADDRESS ALL PILES INDICATED ON THE DRAWINGS EXCEEDS THE PROJECT BUDGET, PILES WILL BE SELECTED IN THE PRIORITY ORDER INDICATED.

PILE REPLACEMENT

1. EXISTING TIMBER PILINGS (ACZA OR CREOSOTE TREATED) INDICATED FOR REPLACEMENT ON THE DRAWINGS SHALL BE COMPLETELY REMOVED, DISPOSED OF, AND REPLACED WITH A NEW CONCRETE PILE. SEE SHEET C-006 FOR CONCRETE PILE DETAILS.
2. REMOVED TIMBER PILINGS (CREOSOTE OR ACZA TREATED) WILL BE PROPERLY DISPOSED OFF-SITE IN ACCORDANCE WITH STATE AND LOCAL LAWS AND ORDINANCES.

PILE INSTALLATION

1. WHERE INDICATED ON THE DRAWINGS, INSTALL NEW CONCRETE PILE. SEE SHEET C-006 FOR CONCRETE PILE DETAILS.
2. VERIFY IN FIELD THAT THERE ARE NO EXISTING TIMBER PILE REMAINS AT LOCATIONS INDICATED FOR PILE INSTALLATION. IF A TIMBER PILE REMAIN IS FOUND, REMOVE AND PROPERLY DISPOSE THE REMAINING PILE IN ACCORDANCE WITH STATE AND LOCAL LAWS AND ORDINANCES.

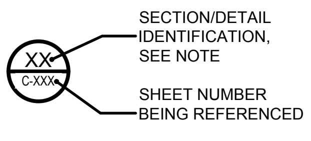
PILE REMOVAL

1. WHERE INDICATED ON THE DRAWINGS, COMPLETELY REMOVE AND DISPOSE EXISTING TIMBER PILE (ACZA OR CREOSOTE TREATED). REMOVED PILES WILL BE PROPERLY DISPOSED IN ACCORDANCE WITH STATE AND LOCAL LAWS AND ORDINANCES.

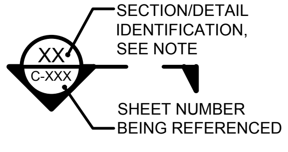
PILE REPAIR

1. TIMBER PILINGS INDICATED FOR REPAIR SHALL BE REPAIRED WITH A FIBERGLASS JACKET ENCASING A STEEL REINFORCED EPOXY GROUT FILL, SIMPSON FX-70 SYSTEM OR ENGINEER APPROVED EQUAL. SEE SHEET C-007 FOR PILE REPAIR DETAILS.
2. FIBERGLASS JACKET AND GROUT PORTS SHALL BE INSTALLED PER MANUFACTURERS SPECIFICATIONS.
3. MONITOR PRESSURE-INJECTION OR GRAVITY-FEED GROUT APPLICATION TO ENSURE MATERIAL DOES NOT LEAK INTO WATER.
4. EXCESS GROUT PUMPED OUT THROUGH PORTS OR JACKET OPENINGS SHALL BE COLLECTED AND REMOVED FROM WATER.

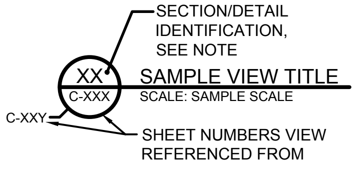
CROSS-REFERENCE LEGEND



DETAIL CALLOUT



SECTION CALLOUT



VIEW TITLE

PILE	PILE LOCATION	REPAIR METHOD	SCHED
1	RR-1	REPAIR	A
2	J-106/108	REMOVE	A
3	J-298 SEP	REMOVE	A
4	J-301/303	REMOVE	A
5	J-325/327	REMOVE	A
6	J-354/356	REMOVE	A
7	J-399 SEP	REMOVE	A
8	J-398 SEP	REMOVE	A
9	K-101/103	REPLACEMENT	A
10	K-102/104	REPLACEMENT	A
11	K-103/105 INT	REPLACEMENT	A
12	K-109/111	REPLACEMENT	A
13	K-110/112	REPLACEMENT	A
14	K-111/113	REPLACEMENT	A
15	K-113/115	REPLACEMENT	A
16	K-115/117 INT	REPLACEMENT	A
17	K-117/119	REPLACEMENT	A
18	K-122/124	REPLACEMENT	A
19	K-127/129	REPLACEMENT	A
20	K-127/129 INT	REPLACEMENT	A
21	K-129/131	REPLACEMENT	A
22	K-134/136	REPLACEMENT	A
23	K-137/139	REPLACEMENT	A
24	K-143/144	REPLACEMENT	A
25	K-144/145	REPLACEMENT	A
26	K-146/149	REPLACEMENT	A
27	K-147 INT	REPLACEMENT	A
28	L-001/102	REPLACEMENT	A
29	L-108/110	REPLACEMENT	A
30	L-110/112 SEP	REMOVE	A
31	L-118/120 SEP	REMOVE	A
32	L-120/122	REPLACEMENT	A
33	L-121/123	REPLACEMENT	B
34	L-124/126	REPLACEMENT	A
35	L-126/128 SEP	REMOVE	A
36	L-132/134	REPLACEMENT	A
37	L-134/136 SEP	REMOVE	A
38	L-221/223 INT	REPLACEMENT	A
39	L-223/225	REPLACEMENT	A
40	L-233/235 INT	REPLACEMENT	A
41	L-245/247 INT	REPLACEMENT	A
42	M-GATE	REPLACEMENT	A
43	M-002/201 INT	REPLACEMENT	B
44	M-132/134	REMOVE	A
45	M-133/135 INT	REPLACEMENT	A
46	M-145/147 INT	REPLACEMENT	A
47	M-148/198	REPLACEMENT	A
48	M-220/222	REMOVE	A
49	M-223/225 INT	REPLACEMENT	B
50	M-228/230	REPLACEMENT	A
51	M-229/231	REPLACEMENT	A
52	M-249/299	REPLACEMENT	B
53	N-101/102	REPLACEMENT	A
54	N-103/104	REPLACEMENT	B
55	N-111/112	REPLACEMENT	B
56	N-112/113 SEP	REMOVE	A
57	N-119/120 INT	INSTALL	B
58	N-111/112 INT	INSTALL	B
59	N-104/105 INT	INSTALL	B
60	O-004/006	REPLACEMENT	A
61	O-117/119 INT	REPLACEMENT	A
62	O-214/216 INT	REPLACEMENT	A
63	O-306/308	REPLACEMENT	A
64	O-310/312	REPLACEMENT	A
65	O-313/315	REPLACEMENT	A
66	O-314/316	REPLACEMENT	A
67	O-318/320 E	REPLACEMENT	A
68	O-403/405 INT	REPLACEMENT	A
69	O-405/407	REPLACEMENT	A
70	O-412/414	REPLACEMENT	A
71	O-415/417 INT	REPLACEMENT	A
72	O-419/499	REPLACEMENT	A
73	O-503/505	REPLACEMENT	A
74	O-512/514	REPLACEMENT	A
75	O-516/520 E	REPLACEMENT	A
76	O-603/605 INT	REPLACEMENT	A
77	O-620/698	REPLACEMENT	A
78	O-709/711	REPLACEMENT	A
79	O-815/817	REPLACEMENT	A
80	O-906/908 INT	REPLACEMENT	A
81	O-912/914	INSTALL	A
82	O-916/918 INT	REPLACEMENT	A
83	O-922/924	REPLACEMENT	A

A

NOTE: LETTER INDICATES SECTION; NUMBER INDICATES DETAIL. WHERE THERE IS NO REFERENCE SHEET INDICATED, IT MEANS THE DETAIL OR SECTION IS TAKEN AND SHOWN ON THE SAME SHEET.

ISSUED: JANUARY 11, 2023
100% CONSTRUCTION DRAWINGS

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

BERKELEY

Mark	Description	Date	Appr.
A	REORDER PILE INDEX	2/10/2023	BP

BERKELEY MARINA SELECTIVE TIMBER PILE REPLACEMENT

GENERAL NOTES

Date: 2/14/2023
Rev.
Designed by: JE
Dwn by: JE
Ckd by: BP
M&N Project No. 11016-01
Reviewed by: BP
Drawing code:
Submitted by: BRAD PORTER MOFFATT & NICHOL
Drawing Scale:
Plot scale: 1:2 (B SHEET)

moffatt & nichol
2185 N. CALIFORNIA BLVD.
SUITE 500
WALNUT CREEK, CA
(925) 944 -5411

CITY OF BERKELEY

DEPARTMENT OF PARKS, RECREATION, AND WATERFRONT

REGISTERED PROFESSIONAL ENGINEER BRADFORD A. PORTER No. 042795 Exp. 3-31-24 CIVIL STATE OF CALIFORNIA
SEAL

Sheet Reference No.
G-002
INDEX: 2 OF 9

File: Q:\WC\11016-01 berkeley marina piles\4_CADD_Active_sheets - const\G-002 ; Plotted: 2/14/2023 11:09 AM by ESTRADA, JUSTIN ; Saved: 2/14/2023 10:51 AM by JESTRADA

EXISTING CONDITIONS LEGEND

FOR INFORMATIONAL PURPOSES ONLY

- ● TIMBER PILE
- ⊙ CONCRETE PILE
- ○ STUB (100% SECTION LOSS)
- ○ SEVERE (> 75% SECTION LOSS OR BAD FOUNDATION)
- ○ MAJOR (BETWEEN 50% AND 75% SECTION LOSS)
- ○ MODERATE (BETWEEN 25% AND 50% SECTION LOSS)
- ○ MINOR (<25% SECTION LOSS)
- ○ GOOD (0% SECTION LOSS)
- ○ HDPE JACKETED TIMBER PILE
- ● CONCRETE ENCASED HDPE JACKETED TIMBER PILE

SCHEDULE LEGEND

COLOR INDICATES SCHEDULE - REFER TO SHEET G-002 FOR PILE SCHEDULE.

- 🟥 SCHEDULE A
- 🟦 SCHEDULE B

REPAIR METHOD LEGEND

SHAPE INDICATES REPAIR METHOD

- □ REPLACEMENT
- ○ REPAIR - SEE 1 C-007
- △ INSTALL
- ✕ REMOVE

KEY PLAN

O DOCK

30' 0' 30' 60'

SCALE: 1"=30'

ISSUED: JANUARY 11, 2023
100% CONSTRUCTION DRAWINGS

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

CITY OF BERKELEY

Mark	Description	Date	Appr.
A	ADJUST PILES TO REPLACE	2/14/2023	BP

BERKELEY MARINA SELECTIVE TIMBER PILE REPLACEMENT

RESTROOM AND O DOCK CONDITION & REPAIR PLAN

Date: 01/11/2023
Rev. 1
Designed by: JE
Dwn by: JE
Ckd by: BP
M&N Project No. 11016-01
Reviewed by: BP
Drawing code:
Submitted by: BRAD PORTER MOFFATT & NICHOL
Drawing Scale: 1" = 30'
Plot scale: 1:2 (B SHEET)

moffatt & nichol
2185 N. CALIFORNIA BLVD.
SUITE 500
WALNUT CREEK, CA
(925) 944 -5411

CITY OF BERKELEY

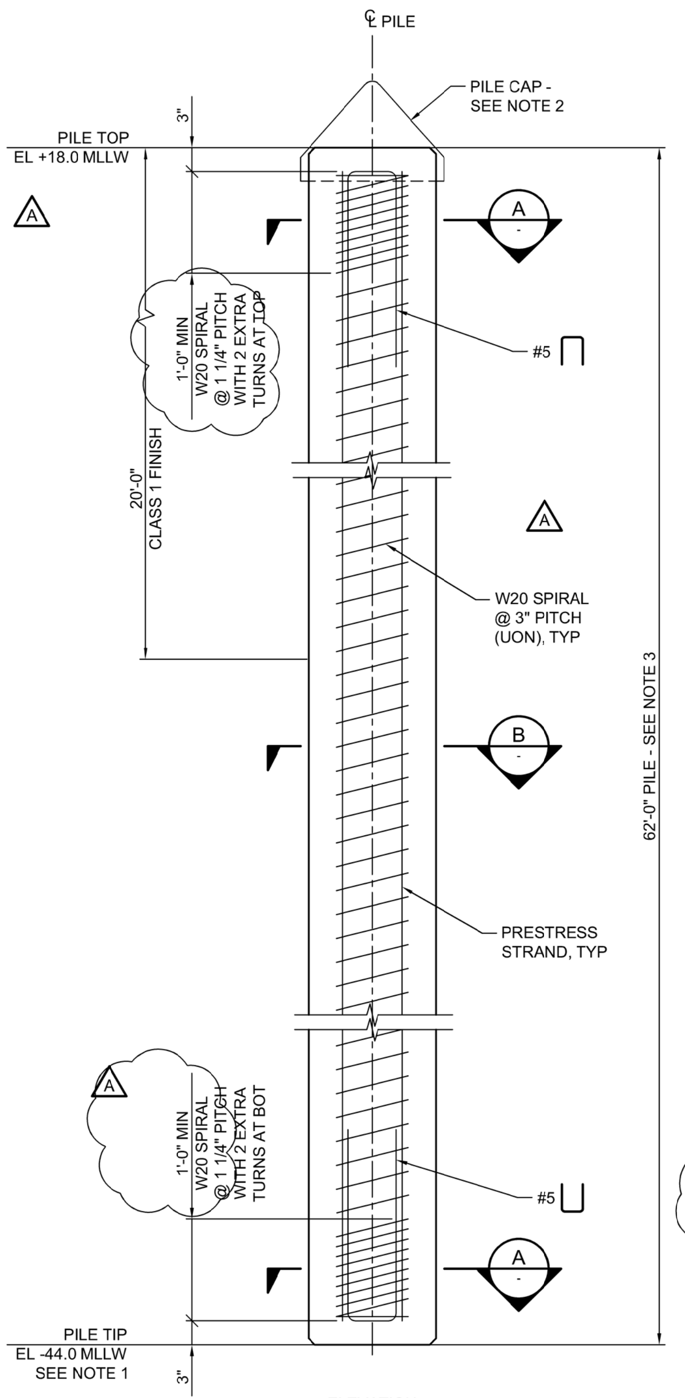
DEPARTMENT OF PARKS, RECREATION, AND WATERFRONT

No. 042795
Exp. 3-31-24

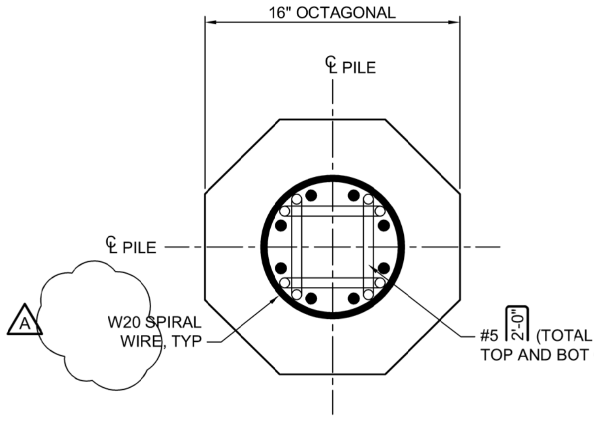
SEAL

Sheet
Reference No.
C-005
INDEX: 7 OF 9

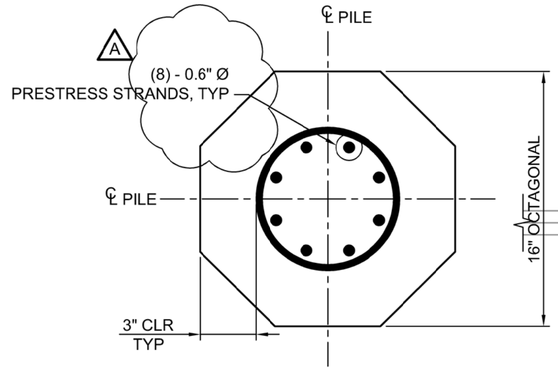
File: Q:\WC\11016-01 berkeley marina piles\4_CADD_Active_sheets - const\C-005 ; Plotted: 2/14/2023 11:10 AM by ESTRADA, JUSTIN ; Saved: 2/14/2023 10:51 AM by JESTRADA



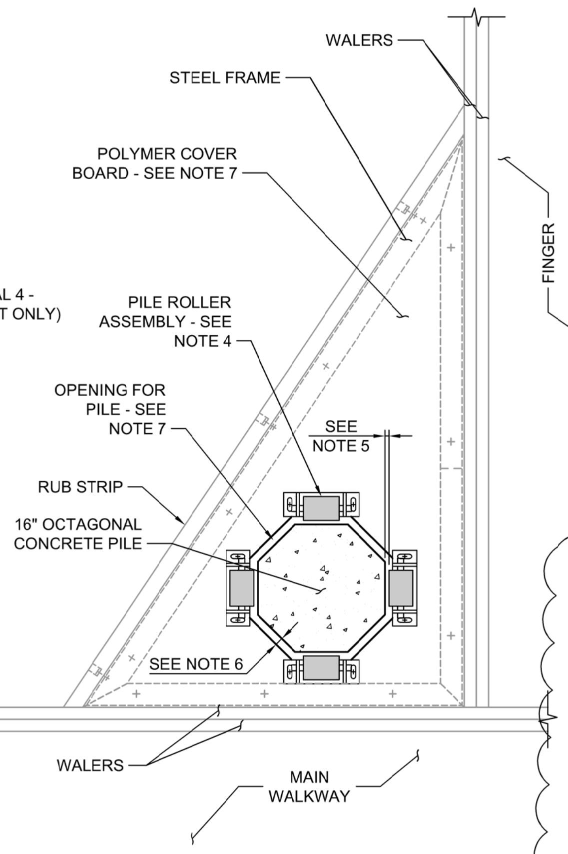
1 CONCRETE PILE ELEVATION
SCALE: 1" = 1'



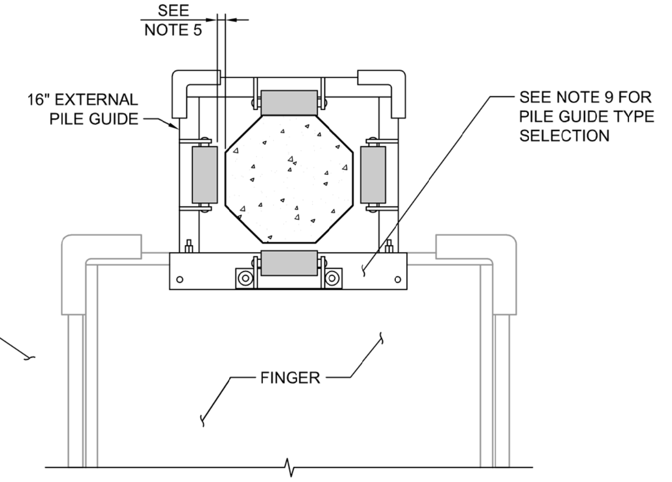
A CONCRETE PILE END SECTION
SCALE: 1" = 0'-6"



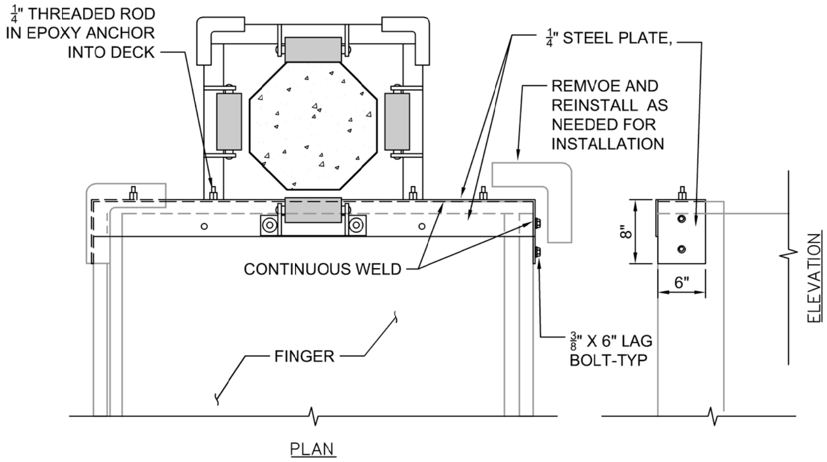
B CONCRETE PILE MID SECTION
SCALE: 1" = 0'-6"



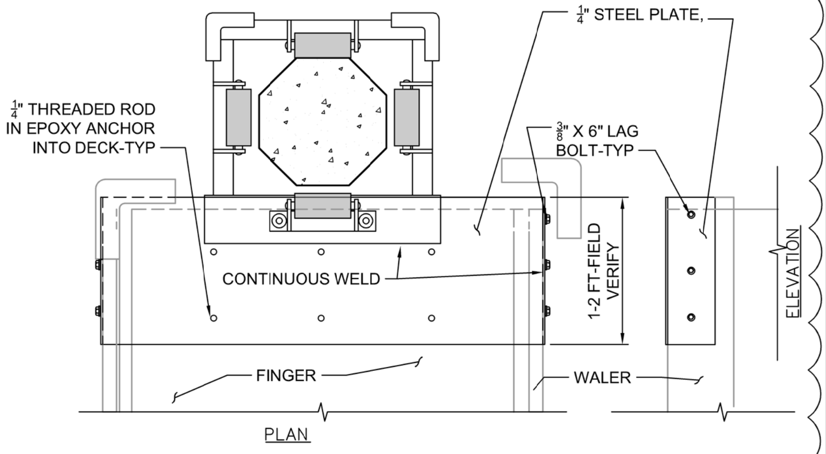
2 INTERIOR PILE GUIDE DETAIL
SCALE: 1" = 1'



3 EXTERIOR PILE GUIDE DETAIL-TYPE 1
SCALE: 1" = 1'



A 4 EXTERIOR PILE GUIDE DETAIL-TYPE 2
SCALE: 1" = 1'



A 5 EXTERIOR PILE GUIDE DETAIL-TYPE 3
SCALE: 1" = 1'

NOTES

1. PILE TIP TO PENETRATE AT LEAST 15'-0" BELOW THE BOTTOM OF THE SOFT TO MEDIUM STIFF BAY MUD. IF PILE IS UNABLE TO BE DRIVEN TO INDICATED TIP ELEVATION, NOTIFY THE ENGINEER AND PERFORM CORRECTIVE MEASURES AS DIRECTED. CUT OFF ALL PILE SECTIONS WHICH PROTRUDE ABOVE THE INDICATED PILE TOP ELEVATION.

2. PILE CAP SHALL BE HIGH GLOSS FIBERGLASS WITH A MINIMUM WALL THICKNESS OF 1/8 INCH. PROVIDE A LAYER OF GEL-COTE PROTECTION. USE EPOXY ADHESIVE TO ATTACH THE FIBERGLASS PILE CAP ON TOP OF THE PILE.

3. PILE DETAILS:

   3.1. CONCRETE STRENGTH:
   f'c = 6,000 PSI @ 28 DAYS
   f'ci = 4,500 PSI @ TRANSFER

   3.2. STEEL:

PRESTRESSING STEEL:	ASTM A416 GRADE 270 (LOW-RELAXATION STRAND)
MILD STEEL:	ASTM A706 (DEFORMED)
MILD STEEL SPIRALS:	ASTM A82

   3.3. PRESTRESSING:
   JACKING FORCE PER STRAND SHALL BE 64% OF ULTIMATE
   CALCULATED LOSSES = 31.6 KSI
   WORKING FORCE PER STRAND = 30.6 KIPS
   JACKING FORCE = 300 KIPS
   FINAL EFFECTIVE PRESTRESS IN CONCRETE AFTER ALL LOSSES = 1154 PSI
   A

   3.4. LAPPED SPLICES IN SPIRAL REINFORCEMENT SHALL BE LAPPED AT LEAST 80 WIRE DIAMETERS. SPIRAL REINFORCEMENT AT SPLICE ENDS SHALL BE TERMINATED WITH A 135° HOOK WITH A 6" TAIL HOOKED AROUND A LONGITUDINAL STRAND.

   3.5. CONCRETE COVER FOR ALL REINFORCEMENT SHALL BE 3 INCHES MIN.

   3.6. MOMENT CAPACITY: PILES SHALL HAVE A NOMINAL MOMENT CAPACITY OF 102 KIP-FEET. A

4. PILE ROLLER ASSEMBLY MOUNT SHALL BE COMPATIBLE WITH A 16"Ø OCTAGONAL PILE.

5. LATERAL CLEARANCE FOR PILE ROLLER IS 0'-1/2" MINIMUM AND 1" MAXIMUM AT ALL WATER LEVELS.

6. LATERAL CLEARANCE FOR PILE OPENING IS 1.5". A

7. IF EXISTING COVER BOARD IS DAMAGED, MISALIGNED WITH CONCRETE PILE, OR IN POOR CONDITION REPLACE WITH A NEW POLYMER COVER BOARD CONSTRUCTED OF ANTI-SKID MARINE BUILDING SHEET WITH A HIGH FRICTION POLYMER SURFACE DOT PATTERN, OF 1 IN THICKNESS. STARBOARD-AS AS MANUFACTURED BY KING PLASTIC, COLOR: GRAY, OR APPROVED EQUAL. ATTACH COVER BOARD WITH 316L STAINLESS STEEL SCREWS. SAWCUT OPENING FOR PILE IN POLYMER COVER BOARD - VIF LOCATION OF OPENING.

8. IF CONTRACTOR IS TO USE CITY OF BERKELEY MONUMENTS AS CONTROL POINTS, CITY OF BERKELEY HAS THEIR OWN DATUM THAT NEEDS A CONVERSION TO MLLW. CONVERSION FACTOR CAN BE PROVIDED TO CONTRACTOR.

9. TYPE 1 PILE GUIDE SHALL BE USED AT ALL LOCATIONS WITH SOLID FINGER MATERIAL. TYPE 2 SHALL BE USED AT FINGERS WITH DETERIORATED FINGER ENDS (12 LOCATIONS), TYPE 3 SHALL BE USED AT FINGERS WHOSE ENDS HAVE BROKEN OFF CONCRETE (3 LOCATIONS). FIELD VERIFY LOCATIONS FOR EACH TYPE.

0'-6" 0' 0'-6" 1'-0"
SCALE: 1" = 0'-6"

1' 0' 1' 2'
SCALE: 1"=1'

ISSUED: JANUARY 11, 2023
100% CONSTRUCTION DRAWINGS

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

CITY OF BERKELEY

Mark	Description	Date	Appr.
A	REVISE PRESTRESSING, PILE GUIDES	1/25/2023	BP

BERKELEY MARINA SELECTIVE
TIMBER PILE REPLACEMENT

CONCRETE PILE DETAILS

Date: 2/17/2023
Rev.
M&N Project No. 11016-01
Drawing code:
Drawing Scale: VARIES
Plot scale: 1:2 (B SHEET)
Designed by: JE
Dwn by: JE
Ckd by: BP
Reviewed by: BP
Submitted by: BRAD PORTER
MOFFATT & NICHOL

moffatt & nichol
2185 N. CALIFORNIA BLVD.
SUITE 500
WALNUT CREEK, CA
(925) 944 -5411

CITY OF BERKELEY
DEPARTMENT OF PARKS,
RECREATION, AND WATERFRONT

BRADFORD A. PORTER
No. 042795
Exp. 3-31-24
SEAL

Sheet
Reference No.
C-006
INDEX: 8 OF 9

File: Q:\WC\11016-01 Berkeley Marina Piles\4_CADD_Active_SHEETS - Const\C-006 ; Plotted: 2/17/2023 12:46 PM by PORTER, BRAD ; Saved: 2/17/2023 12:43 PM by BPORTER

4. Compressive Strength Test Results: Evaluate compressive strength test results at 28 days in accordance with ACI 214 using a coefficient of variation of 10 percent. Evaluate strength of concrete by averaging test results of each set of standard cylinders tested at 28 days. Not more than 10 percent of individual cylinders tested shall have a compressive strength less than specified compressive strength and no individual strength shall fall below the specified strength by more than 500 pounds per square inch.

2.5 PILE DRIVING EQUIPMENT

A. The Contractor shall be responsible for selecting a hammer and driving system, which can drive the piles to the design tip elevation without overstressing the piles in either tension or compression.

B. Any special equipment and methods necessary to drive the piling to the required penetration and within specified tolerances shall be provided by the Contractor.

C. The Contractor shall anticipate and allow for the presence of surface and subsurface debris. This allowance shall include provisions for the possibility of removing through excavation, debris that obstructs the installation of piling.

2.6 PILE CAPS

A. Guide piles shall be furnished with compatible pile caps to protect exposed surfaces and prevent the roosting of birds. Pile caps should be made of UV rated fiberglass of a minimum 1/8” thickness (as manufactured by Henderson Marine Supply, Richmond, CA or equivalent) and should be fastened to piles with an epoxy adhesive.

2.7 EXTERNAL PILE GUIDES

A. External pile guides shall be the following or equivalent. External pile guides shall be of a size compatible with ~~15”~~ octagonal concrete piles shown:

   1. External Square Pile Guide by NW Marine Supply

2.8 INTERNAL PILE GUIDES

A. Internal pile guides shall be one the following or equivalent. Internal pile guides shall be of a size compatible with ~~15~~” octagonal concrete piles shown:

   1. Pile Roller Assembly by Henderson Marina Supply – 4 required per pile

PART 3 EXECUTION

Rev A 14 Feb 2023

3.1 EQUIPMENT

A. Pile Hammers:

   1. Furnish a hammer capable of driving piles to indicated tip elevation considering hammer impact velocity; ram weight; stiffness of hammer and pile cushions; cross section, length, and total weight of pile; and character of subsurface material to be encountered.

B. Driving Helmets and Cushion Blocks:

   1. Hammer Cushion or Capblock: Use a steel driving helmet or cap including a pile cushion between top of pile and driving helmet or cap to prevent impact damage to pile. Use a driving helmet or cap and pile cushion combination capable of protecting pile head, minimizing energy absorption and dissipation, and transmitting hammer energy uniformly over top of

pile. Use pile cushion of solid wood or of laminated construction using plywood, softwood, or hardwood boards with grain parallel to end of pile. Provide pile cushion with thickness of 6 inches minimum and 12 inches maximum. Replace pile cushion for each new pile, and when it becomes highly compressed, charred or burned, or has become spongy or deteriorated in any manner.

3.2 DRIVING PILES

A. Driving Piles: Drive piles to indicated tip elevation. If a pile fails to reach indicated tip elevation, notify the Engineer and perform corrective measures as directed.

B. Protection of Piles: Take care to avoid damage to piles during handling, placing pile in leads, and during pile driving operations. Support piles laterally during driving. Maintain axial alignment of pile hammer with that of the pile.

C. Tolerances in Driving

Rev A Feb 14, 2023

1. Horizontal: within 2 inches of the required butt location shown on the plans.
2. Vertical: within ~~1/2~~ 2 inches of the required cut-off elevation shown on the plans.
3. Plumbness: not more than 1.0 percent from plumb.
4. Rotation: not more than 5° rotation from axes parallel and perpendicular to the structure supported by the piles.

D. Always maintain and check axial alignment and rotational alignment of pile. If subsurface conditions cause pile drifting or rotation beyond allowable alignment tolerance, notify the City and perform corrective measures. The City may direct the Contractor to remove the pile that is installed beyond the tolerances indicated and require the Contractor to reinstall the pile.

E. Jetting of Piles will not be permitted.

F. Splicing of piles will not be permitted.

Rev A Feb 14, 2023

~~G. Final Tapping: Leave the pile high by 2 feet to 4 feet if the pile driving rate is not meeting the criteria approved by the City. Leave the pile high for a minimum of 8 hours prior to driving to final grade. Drive beyond final grade to increase capacity only if approved by the City. Final tapping shall not be the basis of a claim for additional compensation by the Contractor.~~

~~H.~~G. Build-Ups: Pile section may be extended to cut-off elevation by means of a cast-in-place reinforced concrete build-up if driving beyond the final grade is approved per Paragraph FINAL TAPPING. Make build-up in accordance with PCI STD-112. Contractor shall submit detail for buildup for approval.

~~I.~~H. Pile Cut-Off: Cut-off piles with a smooth level cut using pneumatic tools, sawing, or other suitable methods approved by City. Cut-off sections of piles shall be removed from the site upon completion of the work.

3.3 FIELD QUALITY CONTROL

A. Pile Records: For each pile, keep a record of the number of blows required for each foot of penetration and number of blows for the last 6 inches of penetration. Include in the record the beginning and ending times of each operation during driving of pile, type and size of hammer used, rate of operation, stroke or equivalent stroke for diesel hammer, type of driving helmet, and type and dimension of hammer cushion (capblock) and pile cushion used. Record retap data and unusual occurrences during pile driving. Notify the City two weeks prior to start of pile driving.

B. No pile driving shall occur during the night on weekdays (7:00 p.m. to 8~~7~~:00 a.m.) and no pile driving on weekends or federal holidays.

Rev A Feb 14, 2023

C. The Contractor is responsible for protecting nearby structures from damage during construction. Any damages that occur will be repaired or replaced by the contractor at no additional cost to the City.

3.4 BROKEN AND DAMAGED PILES

A. Piles damaged during handling or driving shall, at the discretion of the City, be repaired in an acceptable manner or be replaced.

B. The Contractor shall submit for the City's review his proposed method of repairing piles, which are damaged.

C. Pile repair or replacement shall be at no cost to the City nor cause any delay in the construction schedule.

3.5 ON-SITE CASTING

A. On-site casting of guide piles is specifically prohibited.

END OF SECTION

DOCUMENT 00 4113

BID FORM

TO **CITY OF BERKELEY**

THIS BID IS SUBMITTED BY:

____
(Firm/Company Name)

Re:Berkeley Marina Selective Timber Pile Replacement at 201 University Ave., Berkeley, CA 94710, Specification No. 23-11567-C

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with City of Berkeley in the form included in the Contract Documents, Document 00 5200 (Agreement), to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Sum and within the Contract Time indicated in this Bid and in accordance with all other terms and conditions of the Contract Documents.
2. Bidder accepts all of the terms and conditions of the Contract Documents, Document 00 1113 (Notice Inviting Bids), and Document 00 2113 (Instructions to Bidders), including, without limitation, those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for 60 calendar days after the day of Bid opening, unless there is a bid protest, then 90 calendar days after the day of bid opening. Bidder will sign and submit Document 00 5200 (Agreement) and other documents required by Document 002113, paragraph 5.02 (Required Contract Documents and Proof of Insurance) within 20 calendar days after receipt of City's Notice of Intent to Award.
3. In submitting this Bid, Bidder represents that Bidder has examined all of the Contract Documents, performed all necessary Pre-Bid investigations as set forth in Document 00 5200 (Agreement) Article 6 (Contractor's Representation), received the Pre-Bid conference minutes (if any), and received the following Addenda:

Addendum Number	**ADDENDUM DATE**	**Signature of Bidder**

4. Based on the foregoing, Bidder proposes and agrees to fully perform the Work within the time stated and in strict accordance with the Contract Documents for the following sums of money listed in the following Schedule of Bid Prices:

SCHEDULE OF BID PRICES

All Bid items, including lump sums and unit prices, must be filled in completely. All Bids shall include all labor, materials, services, and equipment necessary for the completion of all Work shown on the plans, specifications, and other Contract Documents, including connections to existing systems, to provide a complete and finished project. Each Bid item shall include work as described, except for work separately requested under other Bid Items. Bid items are described in Section 01 1100 (Summary of Work). Quote in figures only, unless words are specifically requested.

Base Bid – Schedule A

ITEM	DESCRIPTION	Quantity	Unit	Unit Cost	Total Cost
A1	Mobilization & Demobilization	1	LS		
A2	Traffic & Pedestrian Control	1	LS		
A3	Best Management Practices	1	LS		
A4	Pile Disposal	73	EA		
A5	Pile Removal	14	EA		
A6	Pile Top Cutoff	59	EA		
A7	Pile Replacement with Removal of Existing Pile	58	EA		
A8	Pile Installation with Removal of Existing Stub Near or Below Mudline	1	EA		
A9	Pile Repair	1	EA		
A10	Pile Guide Removal	59	EA		
A11	Pile Guide Installation Type 1	44	EA		
A12	Pile Guide Installation Type 2	12	EA		
A13	Pile Guide Installation Type 3	3	EA		
A14	Pile Cap Installation	59	EA		
	Total Base Bid Price: Bid Items A1 through A14				

Total Base Bid Price (Bid Items A1 Through A14):

____

(Words)

Additive Bid – Schedule B

ITEM	DESCRIPTION	Quantity	Unit	Unit Cost	Total Cost
B1	Mobilization & Demobilization	1	LS		
B2	Traffic & Pedestrian Control	1	LS		
B3	Best Management Practices	1	LS		
B4	Pile Disposal	9	EA		
~~B5~~	~~Pile Removal~~	~~0~~	~~EA~~		
B6	Pile Top Cutoff	9	EA		
B7	Pile Replacement with Removal of Existing Pile	6	EA		
B8	Pile Installation with Removal of Existing Stub Near or Below mudline	3	EA		
~~B9~~	~~Pile Repair~~	~~0~~	EA		
B10	Pile Guide Removal	9	EA		
B11	Pile Guide Installation	9	EA		
B12	Pile Cap Installation	9	EA		
B13	Vessel Relocation	1	LS		
	Total Additive Bid Price: Bid Items B1 through B13				

Total Additive Bid Price (Bid Items B1 Through B13):

____
(Words)

Allowances

ITEM	DESCRIPTION	Estimated Quantity	Unit	Unit Cost	Total Cost
AL1	Replacement of Polymer Cover Board	20	EA		
	Total Allowances Bid Price: Bid Item AL1				

Total Allowance Bid Price (Bid Items AL1):

____
(Words)

5. Subcontractors for work included in all Bid items are listed on Document 00 4330 (Subcontractors List) submitted herewith.

6. The undersigned Bidder understands that City reserves the right to reject this Bid, but that this Bid shall remain open and shall not be withdrawn for a period of sixty (60) calendar days from the date prescribed for its opening.

7. If written notice of the acceptance of this Bid, hereinafter referred to as Notice of Intent to Award, is mailed or delivered to the undersigned Bidder within the time described in Paragraph 2 of this Document 00 4113 or at any other time thereafter before it is withdrawn, the undersigned Bidder will execute and deliver the documents required by Document 00 2113 (Instructions to Bidders) within the times specified therein.

8. Notice of Award or request for additional information may be addressed to the undersigned Bidder at the address set forth below.

9. The undersigned Bidder herewith encloses cash, a cashier's check, or certified check of or on a responsible bank in the United States, or a corporate surety bond furnished by a surety authorized to do a surety business in the State of California, in form specified in Document 00 2113 (Instructions to Bidders), in the amount of ten percent (10%) of the Total Bid Price and made payable to City of Berkeley.

10. The undersigned Bidder agrees to commence Work under the Contract Documents on the date established in Document 00 7200 (General Conditions) and to complete all Work within the time specified in Document 00 5200 (Agreement).

11. The undersigned Bidder agrees that, in accordance with Document 00 7200 (General Conditions), liquidated damages for failure to complete all Work in the Contract within the time specified in Document 00 5200 (Agreement) shall be as set forth in Document 00 5200.

12. The names of all persons interested in the foregoing Bid as principals are:

IMPORTANT NOTICE: If Bidder or other interested person is a corporation, give the legal name of corporation, state where incorporated, and names of president and secretary thereof; if a partnership, give name of the firm and names of all individual co-partners composing the firm; if Bidder or other interested person is an individual, give first and last names in full.

NAME OF BIDDER: ____

licensed in accordance with an act for the registration of Contractors, and with license number:______________________________ Expiration: ______________.

____
(Place of Incorporation, if Applicable) (Principal)

____
(Principal)

____
(Principal)

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

____
(Signature of Bidder)

NOTE: If Bidder is a corporation, set forth the legal name of the corporation together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation. If Bidder is a partnership, set forth the name of the firm together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership.

Business Address: ____
____
____

Contractor’s Representative(s): ____
(Name/Title)
____
(Name/Title)
____
(Name/Title)

Officers Authorized to Sign Contracts ____
(Name/Title)
____
(Name/Title)
____
(Name/Title)

Telephone Number(s): ____
(Area Code) (Number)
____
(Area Code) (Number)

Fax Number(s): ____
(Area Code) (Number)
____
(Area Code) (Number)

Date of Bid: ____

END OF SECTION

(Modification Procedures). Identify Allowance Items (See Document 00 4113 [Bid Form]) work on the Progress Schedules and on Applications for Payment. The Amount given on Document 00 4113 (Bid Form) under each Allowance Item is the sum of money set aside for each Allowance Item. These amounts shall be included in the Contract Sum on the Bid Form. If the cost of Work done under any Allowance Item is less than the amount given on the Bid Form under that Allowance Item, the Contract Sum shall be reduced by the difference between the amount given in the Bid Form and the cost of Work actually done.

1.05 BID ITEMS, ALLOWANCES AND ALTERNATES

D. Descriptions of Lump Sum Items (listed by Bid item numbers):

All bid items below (1 to 3) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as described.

12. Mobilization and Demobilization - Staging the workzone, final site cleaning, demobilization, and other contract requirements including all regulatory requirements in Appendix B. Mobilization and demobilization not to exceed 10% of total bid price.

13. Traffic & Pedestrian Control – Provide marker buoys and warning signs in the water to keep vessels out of the barge and work area where piles are being driven, and provide barricades, signs, and an active spotter on the docks to prevent pedestrian access during pile driving. Wok also includes implementing Section 015200 “Temporary Facilities”, Section 01 5526 “Traffic Control” of the General Requirements, and other contract requirements including all regulatory requirements in Appendix B.

14. Best Management Practices – Implementing Section 01 5700 “Temporary Controls”, Section 01 7329 “Cutting and Patching”, Section 01 7413 “Project Cleaning” of the General Requirements, and other contract requirements including all regulatory requirements in Appendix B.

E. Descriptions of Unit Price Items and Basis of Measurement for Payment (listed by Bid item numbers):

All bid items below (4 to 12) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all work involved as described.

4. Pile Disposal – Off-hauling and disposing (including paying all associated disposal fees) of removed treated timber piles to a landfill licensed to receive treated wood waste for disposal, as the result of Bid Item #5 “Pile Removal”, bid item #7” Pile Replacement with Removal of Existing Pile” and Bid Item #8 “Pile Installation with Removal of Existing Stub Near or Below Mudline” at Contractor’s designated site, as specified in Section 024000 “Demolition” and other contract requirements including all regulatory requirements in Appendix B.

5. Pile Removal – Demolishing and removing existing treated timber piles as specified in Section 024000 “Demolition” and other contract requirements including all regulatory requirements in Appendix B.

6. Pile Top Cutoff – Removing sections of new piles which protrude above the pile top elevation per Plans and as specified in Section 316213 “Concrete Piles”, and other contract requirements including all regulatory requirements in Appendix B.

7. Pile Replacement with Removal of Existing Pile – Removing existing treated timber pile, furnishing and installing precast concrete piles as specified in Section 024000 “Demolition”, Section 310162 Section 316213 “Concrete Piles”, and other contract requirements including all regulatory requirements in Appendix B.

8. Pile Installation with Removal of Existing Stub Near or Below Mudline – Removing remnants of existing treated timber pile and/or its stub from broken off piles, furnishing and installing precast concrete piles as specified in Section 024000 “Demolition”, Section 310162, Section 316213 “Concrete Piles”, and other contract requirements including all

regulatory requirements in Appendix B.

9. Pile Repair – Furnishing and installing fiberglass jacket system including grout and reinforcement complete in place for the repair of existing treated timber pile as specified in Section 024000 “Demolition”, Section 310162 “Pile Repair”, and other contract requirements including all regulatory requirements in Appendix B.

10. Pile Guide Removal – Removing and offsite disposal of existing pile guides (both internally and externally mounted) as the result of Bid Item #5 “Pile Removal”, Bid Item #7 “Pile Replacement with Removal of Existing Pile” and Bid Item #8 “Pile Installation with Removal of Existing Stub Near or Below Mudline” at Contractor’s designated site, as specified in Section 024000 “Demolition” and other contract requirements including all regulatory requirements in Appendix B.

11. Pile Guide Installation Type 1 – Furnishing and installing pile guides (both internally and externally mounted) as specified in Section 316213 “Concrete Piles”, and other contract requirements including all regulatory requirements in Appendix B.

12. Pile Guide Installation Type 2 – Furnishing and installing exterior pile guides as specified in Section 316213 “Concrete Piles” and shown in Detail 4 on Sheet C-006, and other contract requirements including all regulatory requirements in Appendix B.

13. Pile Guide Installation Type 3 – Furnishing and installing exterior pile guides as specified in Section 316213 “Concrete Piles”, and other contract requirements including all regulatory requirements in Appendix B.

14. Pile Cap Installation - Furnishing and installing fiberglass pile caps on top of installed piles, as specified in Section 316213 “Concrete Piles” and shown in Detail 5 on Sheet C-006, and other contract requirements including all regulatory requirements in Appendix B.

F. Allowances:

AL1. Replacement of Polymer Cover Board – Where applicable, removing and offsite disposal of existing damaged or misaligned polymer cover board, furnishing and installing new marine grade polymer cover board to match existing, as specified in Sheet C-006, Detail 2, Note 7, and other contract requirements including all regulatory requirements in Appendix B. Includes modification of dock where internal piles are removed.

G. Bid Alternates: **Additive Bid – Schedule B – See 1.03A & 1.03B.**

13. Vessel Relocation -Relocating vessels that will be impacted by pile driving operations. City staff will supply temporary locations for moved vessels and manage the outreach to slipholders. Contractor is responsible for providing at least 5 working days notification to the City of vessels that need to be relocated and duration of temporary storage. Bid item includes replacing vessels after operations no longer impacts their slips.

1.06 CONTRACT DOCUMENT ORGANIZATION

D. The Drawings illustrate locations, arrangements, dimensions, and details to determine the general character of the Work. Parts not detailed shall be subject to the Architect’s approval. Where reasonably inferable that a Drawing illustrates only part of a given work on a number of items, the remainder shall be deemed repetitious and so construed. Drawings of greater scale take precedence over Drawings of lesser scale. Do not scale documents.

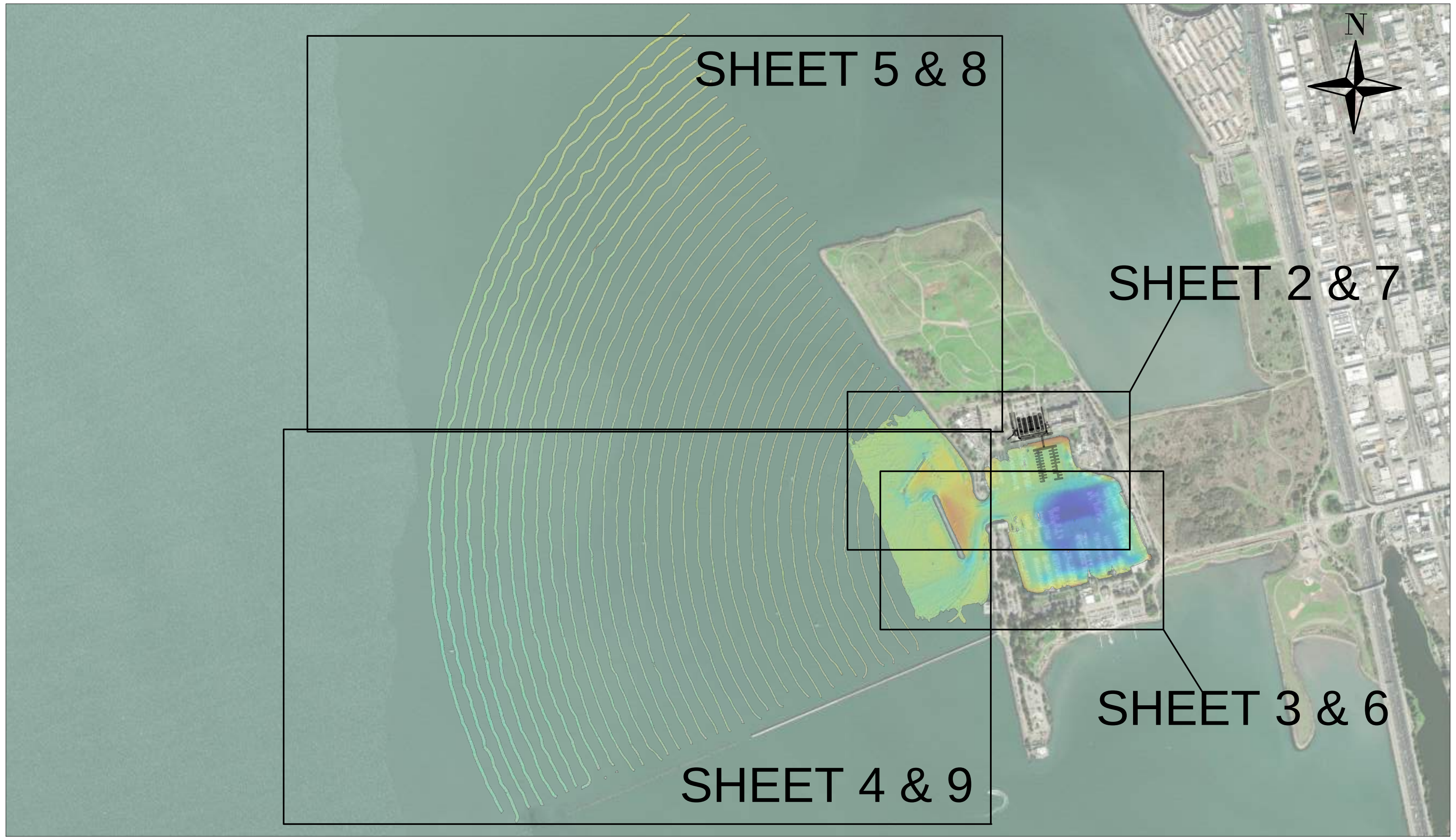
E. Drawings indicate general arrangement and location of such items as piping, conduit, apparatus, and equipment. Drawings and Specifications are for guidance of the Contractor and exact locations, distances, and levels will be governed by building site and actual building conditions. The Contractor shall make minor changes, as directed, to arrangements or locations shown in order to meet Structural or Architectural conditions.

BERKELEY MARINA

COWI

HYDROGRAPHIC SURVEY

Overview



not to scale

SHEET INDEX:

SHEET 1 - PROJECT INFORMATION
SHEET 2 - SOUNDINGS
SHEET 3 - SOUNDINGS
SHEET 4 - SOUNDINGS
SHEET 5 - SOUNDINGS
SHEET 6 - COLORED DEM
SHEET 7 - COLORED DEM
SHEET 8 - COLORED DEM
SHEET 9 - COLORED DEM

GENERAL NOTES:

1. SURVEY DATA COLLECTED ON SEPTEMBER 12TH-15TH, 2022
2. HORIZONTAL DATUM/PROJECTION: NAD83 (2011), SPCS CALIFORNIA ZONE 03 - U.S. SURVEY FEET
3. HORIZONTAL CONTROL: ETRAC ACTUAL REFERENCE STATION: WESTAR, N 37° 46' 27.45 W 122° 22' 56.66"
4. VERTICAL DATUM: MLLW, U.S. SURVEY FEET
5. VERTICAL CONTROL: NOAA TIDE BENCH MARK PID HT2935, ELEVATION 11.05'
6. CONVERSION BETWEEN NAVD88 AND MLLW BASED ON NOAA TIDE BENCH MARK PID HT2935 YACHT 1947 SHIFT OF +0.13'
7. THIS SURVEY REPRESENTS GENERAL CONDITIONS AT THE TIME OF THE SURVEY.
8. POSITIONING AND MOTION DATA WAS COLLECTED USING AN APPLANIX POS MV V5.
9. SOUNDINGS WERE COLLECTED USING AN R2SONIC 2022 AND 2024 OPERATING AT 200 KHZ.

COWI

COWI
555 12TH STREET
SUITE 1700
OAKLAND, CA 94607
510.839.8972
COWI.COM

eTrac

eTrac Inc.
637 LINDARO STREET
SUITE 100
SAN RAFAEL, CA 94901
415.462.0421
eTracInc.com

SURVEY DATE: SEPTEMBER 12-15, 2022	PLOT DATE: SEPTEMBER 20, 2022
DESIGNED BY: TMD	CHECKED BY: GCC
REVISION #	
FILE NAME: COWI_20220913_14_15_BerkeleyMarina.dwg	

BERKELEY MARINA
HYDROGRAPHIC SURVEY

PROJECT INFORMATION

Reference Number:

S1

SURVEY
STAMPS/SIGNATURES

COWI

COWI
555 12TH STREET
SUITE 1700
OAKLAND, CA 94607
510.839.8972
COWI.COM

eTrac

eTrac Inc.
637 LINDARO STREET
SUITE 100
SAN RAFAEL, CA 94901
415.462.0421
eTracInc.com

SURVEY DATE: SEPTEMBER 12-15, 2022
PLOT DATE: SEPTEMBER 20, 2022
DESIGNED BY: TMD
CHECKED BY: GCC
REVISION #
FILE NAME:
COWI_20220913_14_15_BerkeleyMarina.dwg

BERKELEY MARINA
HYDROGRAPHIC SURVEY

SOUNDINGS

Reference
Number:

S2

IF SHEET IS LESS THAN 11"X17"
IT IS A REDUCED PRINT,
SCALE ACCORDINGLY

SURVEY
STAMPS/SIGNATURES

COWI
555 12TH STREET
SUITE 1700
OAKLAND, CA 94607
510.839.8972
COWI.COM

eTrac Inc.
637 LINDARO STREET
SUITE 100
SAN RAFAEL, CA 94901
415.462.0421
eTracInc.com

SURVEY DATE:
SEPTEMBER 12-15, 2022

PLOT DATE:
SEPTEMBER 20, 2022

DESIGNED BY: TMD

CHECKED BY: GCC

REVISION #

FILE NAME:
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BERKELEY MARINA
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SOUNDINGS

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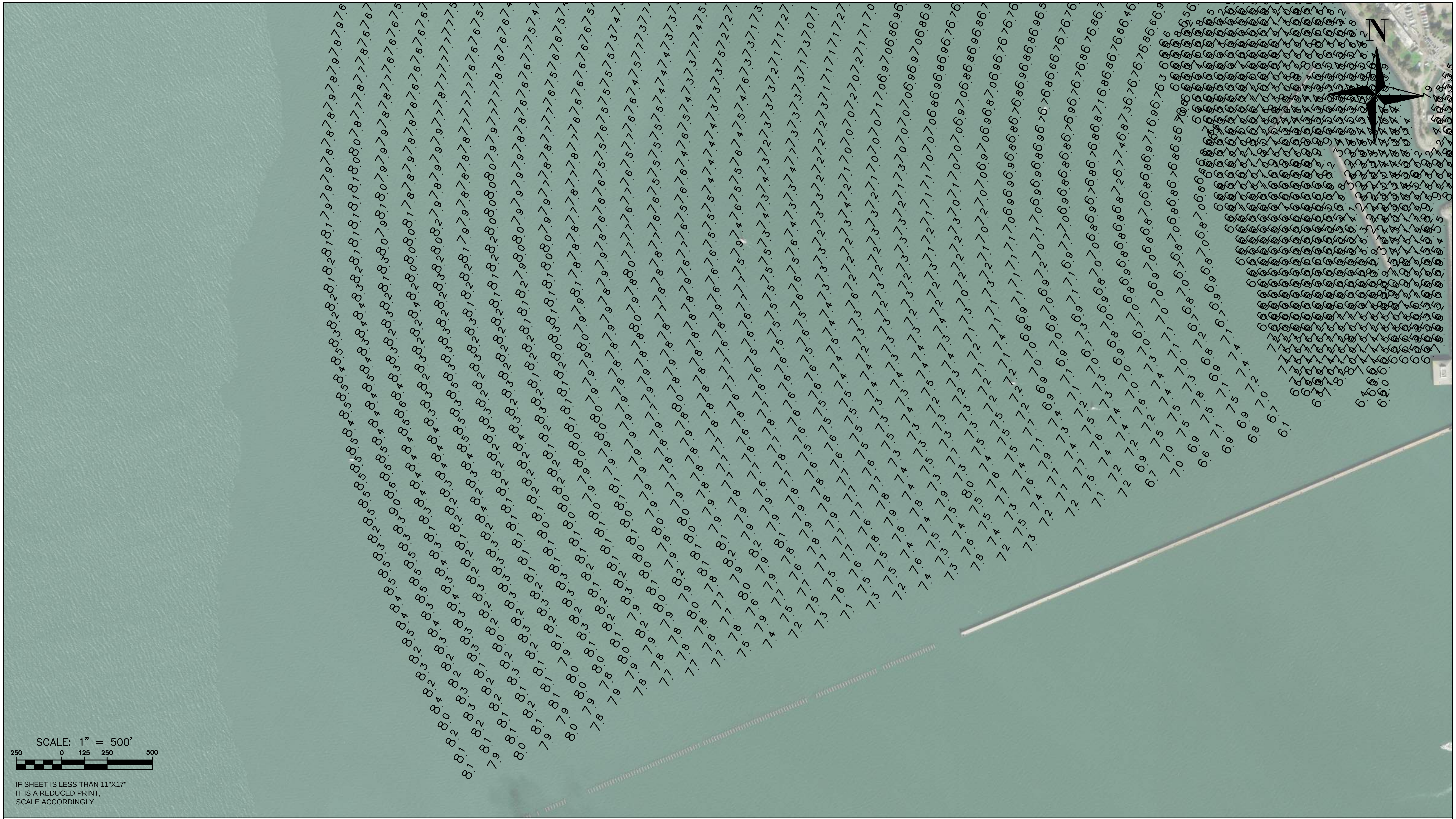

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BERKELEY MARINA HYDROGRAPHIC SURVEY

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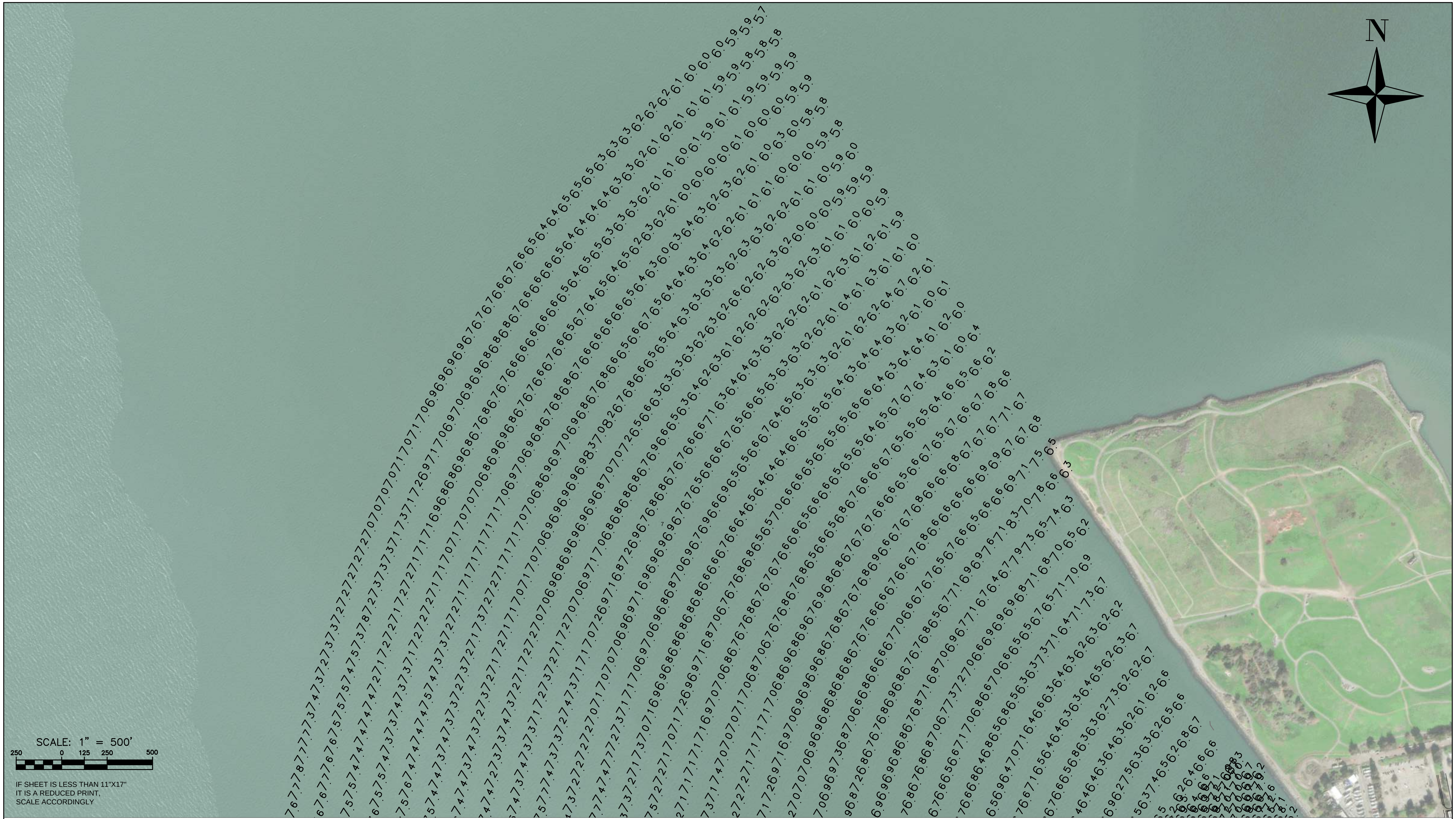

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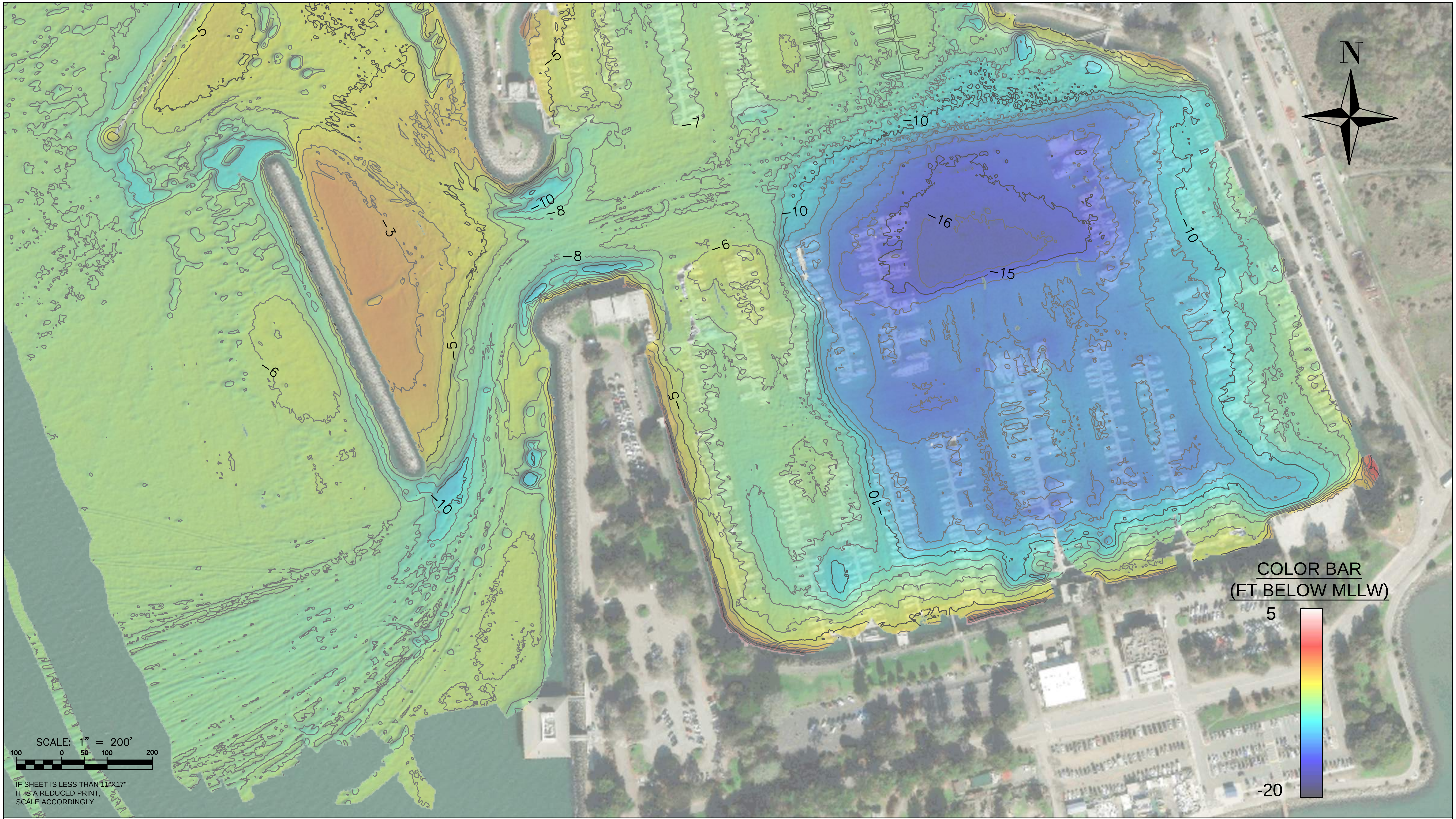

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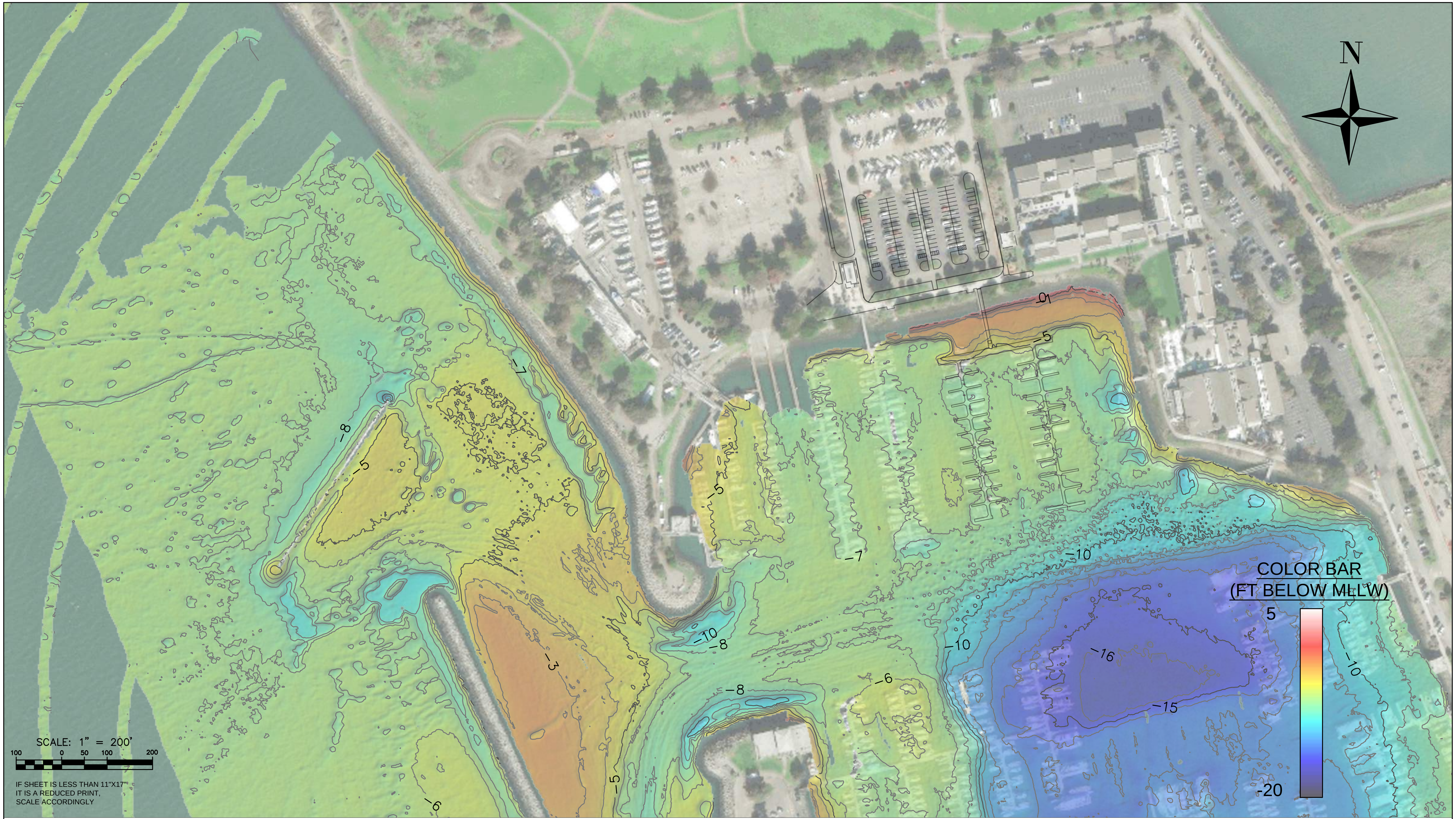

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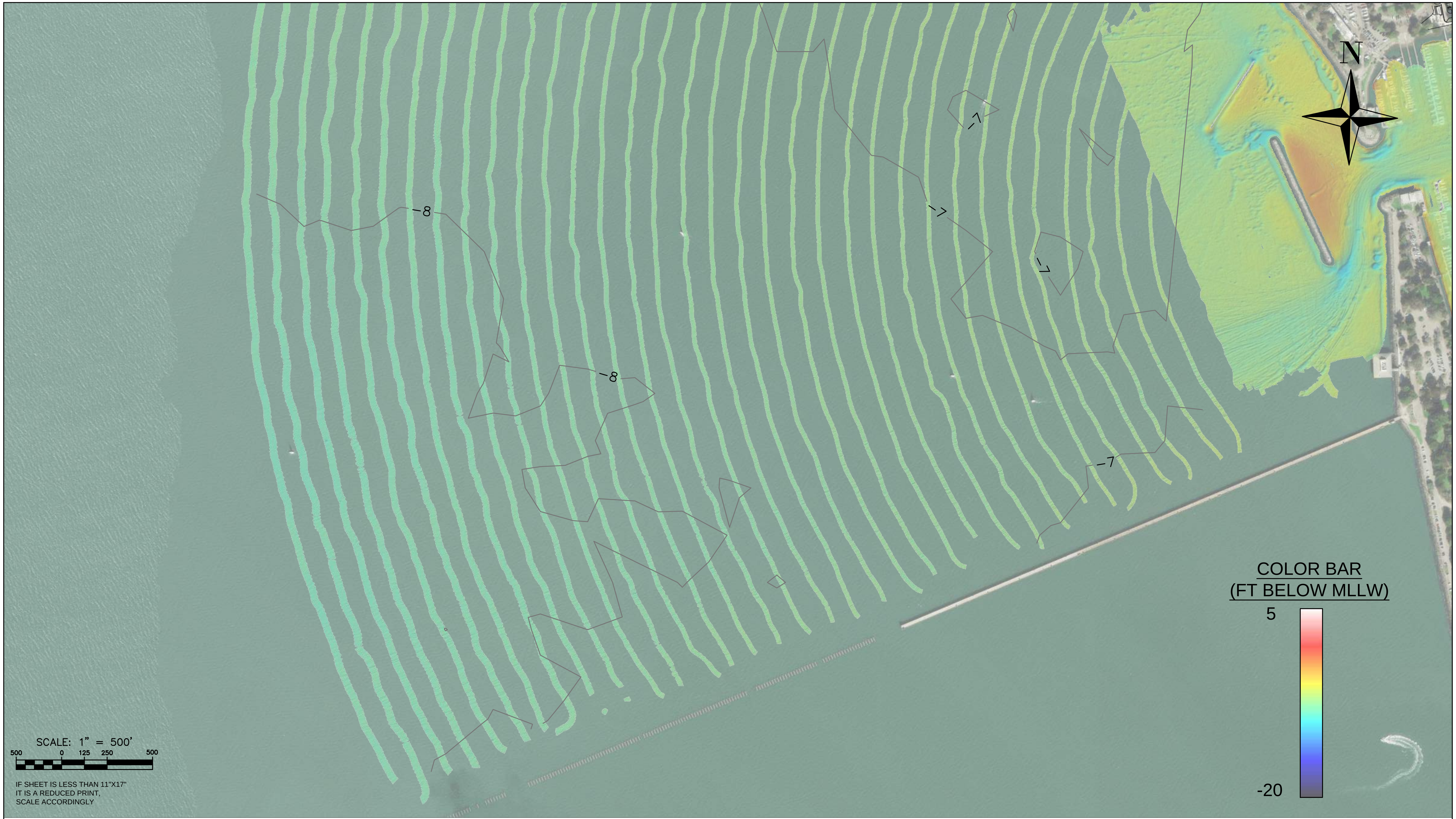

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BERKELEY MARINA HYDROGRAPHIC SURVEY

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Reference Number:

S9

GEOTECHNICAL INVESTIGATION
BERKELEY MARINA REHABILITATION
Berkeley, California

Concept Marine Associates
Oakland, California

16 December 2004
Project No. 3737.01

Treadwell&Rollo
Environmental and Geotechnical Consultants

Treadwell&Rollo

16 December 2004
Project No. 3737.01

Mr. Greg Reid
Concept Marine Associates
1853 Embarcadero
Oakland, California 94606

Subject: Geotechnical Investigation
Berkeley Marina Rehabilitation
Berkeley, California

Dear Mr. Reid:

Treadwell & Rollo is pleased to present our geotechnical investigation report for the proposed rehabilitation of the Berkeley Marina in Berkeley, California, in accordance with our proposal, dated 5 November 2002.

The site consists of docks A through E (A-E) along the northern side of the marina basin and docks H and I (H-I) along the eastern side of the marina basin. Plans are to demolish the existing wood docks and replace them with new concrete docks and new utilities. In addition, the slope of the shoreline adjacent to docks A-E will be regraded to a steeper inclination. Our field investigation indicate the shoreline adjacent to docks A-E is blanketed by 12 to 13 feet of fill underlain by 15 to 53 feet of soft to stiff clay (Bay Mud). The Bay Mud is underlain by stiff to very stiff clay (Old Bay Mud) and dense sand and/or very stiff clay (Alameda Formation). Offshore borings indicate the mudline is underlain by 9 to 21.5 feet of Bay Mud. Beneath the Bay Mud is Old Bay Mud and Alameda Formation.

Based on our geotechnical analyses, we conclude the shoreline adjacent to docks A-E may be regraded to slope at an inclination of 2:1 (horizontal: vertical). The new concrete docks may be supported on driven, square or octagonal, precast, prestressed, concrete piles founded in at least 15 feet of stiff clay or dense sand. Due to variations in thickness of the soft to medium stiff Bay Mud across the site, we recommend installation of indicator piles prior to casting production piles. The indicator pile program will provide data for estimating the length of production piles.

This report presents our recommendations for foundation, slope, and pavement design and other geotechnical aspects of the project. The recommendations are based on limited subsurface exploration and laboratory testing programs. Consequently, variations between expected and actual soil conditions may be found in localized areas during construction. Therefore, we should be engaged to check compaction of fill and observe installation of pile foundations, during which time we may make changes in our recommendations, if deemed necessary.

We appreciate the opportunity to provide our services to you. If you have any questions, please call.

Sincerely yours,
TREADWELL & ROLLO, INC.

Hui Jun

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Civil Engineer

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GEOTECHNICAL INVESTIGATION
BERKELEY MARINA REHABILITATION
Berkeley, California

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GEOTECHNICAL INVESTIGATION
BERKELEY MARINA REHABILITATION
Berkeley, California

1.0 INTRODUCTION

This report presents the results of the geotechnical investigation performed by Treadwell & Rollo, Inc. for the proposed Berkeley Marina rehabilitation in Berkeley, California. Our services were provided in accordance with our proposal dated 5 November 2002.

The site consists of docks A through E (A-E) along the northern portion of the marina basin and docks H and I (H-I) along the eastern portion of the marina basin, as shown on the Site Location Map, Figure 1 and Site Plan, Figure 2. The existing docks A-E and H-I are 30- to 40-year-old wood docks. The shoreline slopes adjacent to docks A-E and H-I are protected by rock rip-rap. The shoreline slopes adjacent to docks A-E and H-I have inclinations of about 5:1 (horizontal: vertical) and 2:1, respectively. A hydrographic survey of the Berkeley Marina, performed by Sea Surveyor, Inc., dated April 2000, indicates the mudline of beneath docks A-E and H-I vary from about Elevation –8 to –11 feet[1] and –7.5 to –15 feet, respectively.

2.0 PROJECT DESCRIPTION

Plans are to demolish the existing wood docks and replace them with new concrete docks and new utilities. We understand the new docks will be supported on driven, prestressed, precast, concrete piles with approximately 25 feet of stick-up (i.e., the length between top of pile and mudline) above the mudline. The basin of the docks will be dredged to Elevation –12 feet. In addition, the shoreline slope adjacent to docks A-E will be cut back to a maximum inclination of 2:1. Other site improvements will include construction of new gangways and landscaping.

---

[1] All elevation in this report is referenced to Mean Lower Low Water datum.

3.0 SCOPE OF SERVICES

Our scope of services was outlined in our proposal dated 5 November 2002 and consisted of exploring the subsurface conditions at the site and performing laboratory tests and engineering analyses to develop conclusions and recommendations regarding:

- soil and groundwater conditions at the site
- site seismicity and seismic hazards
- design criteria for concrete piles, including vertical (compression and uplift) and lateral capacities
- allowable inclinations for shoreline slopes
- stability of shoreline slopes under static and seismic conditions
- flexible (asphalt concrete) and rigid (Portland cement concrete) pavement design
- subgrade preparation for pavement areas
- site grading and excavation, including criteria for fill quality and compaction
- 2001 California Building Code soil profile type and near-source factors
- construction considerations.

4.0 FIELD INVESTIGATION

Subsurface conditions at the site were explored by drilling eight borings, designated as B-1 through B-8. Borings B-1 through B-4 are located onshore and borings B-5 through B-8 are located over the water, as shown on Figure 2.

Prior to performing our field investigation onshore, we applied for a drilling permit from the City of Berkeley (City) and coordinated grouting inspections with the City. Prior to performing our field investigation over the water, we applied for drilling permits from the City, Regional Water Quality Control Board (RWQCB), and the Corp of Engineers. In addition, we notified

Underground Services Alert and retained a private underground utility locating service to check that the locations of exploratory points were clear of underground utilities.

Borings B-1 through B-4 were drilled on 31 July 2003 and 1 August 2003 by Pitcher Drilling Company using truck-mounted, rotary-wash drilling equipment. Borings B-2, B-3, and B-4 were drilled to 81.5, 50, and 41.5 feet below ground surface (bgs), respectively, and terminated at least 15 feet into very stiff clays (Old Bay Mud) and/or very dense sand and very stiff clay (Alameda Formation). Boring B-1 met refusal at 21.5 feet bgs in fill consisting of a mixture of sandy clay, clayey sand, gravel, and boulders.

Offshore borings B-5 through B-8 were drilled on 27 and 28 August 2003 by Taber Consultants using closed-circulation, rotary-wash drilling equipment mounted on a small barge. The closed-circulation drilling system prevented release of drilling fluids and soil cuttings into the marina. Borings B-5, B-6, B-7, and B-8 were drilled to 36.5, 31.5, 39.5, and 31.5 feet below mudline, respectively, and terminated in very stiff Old Bay Mud or Alameda Formation.

During drilling, our field engineer logged the soil encountered and obtained representative samples for visual classification and laboratory testing. The logs of the borings are presented on Figures A-1 through A-8 in Appendix A. The soil encountered in the borings was classified in accordance with the classification chart shown on Figure A-9.

Soil samples were obtained using the following samplers:

- Standard Penetration Test (SPT) sampler with a 2.0-inch-outside diameter and a 1.38-inch-inside diameter, without liners
- Sprague and Henwood (S&H) split-barrel sampler with a 3.0-inch-outside diameter, 2.5-inch-inside diameter, lined with brass tubes with an inside diameter of 2.43 inches
- thin-walled Shelby tube (ST) with 3.0-inch-outside diameter.

The SPT and S&H samplers were driven with a 140-pound, above-ground, safety hammer falling approximately 30 inches. The blow counts required to drive the S&H sampler the final 12 inches of an 18-inch drive were converted to approximate SPT N-values using a conversion factor of 0.6 and are shown on the boring logs. Where the SPT sampler was used, the actual blow counts are shown on the boring logs. The Shelby tubes were advanced into the soil using hydraulic pressure. The hydraulic pressure required to advance the Shelby tubes is shown on the boring logs. After completion, the borings were backfilled with cement grout. The drilling fluid and soil cuttings generated from the borings were placed into 55-gallon drums. Contents of the drums were sampled and tested for disposal.

5.0 LABORATORY TESTING

We re-examined soil samples from the borings in our office to confirm field classifications and selected representative soil samples for testing. Selected samples were tested to measure moisture content, dry density, plasticity index, strength, and resistance value (R-value). The laboratory test results are presented on the boring logs and in Appendix B on Figures B-1 through B-16.

6.0 SUBSURFACE CONDITIONS

Ground surface elevations along the shoreline and mudline within the marina basin are described below for docks A-E and H-I. Ground surface elevations at the top of the shoreline adjacent to docks A-E vary from approximately +10.5 to +12 feet. The existing inclination of the shoreline slope adjacent to docks A-E is approximately 5:1. The mudline elevation below docks A-E varies from about –8 to –11 feet. The ground surface elevations at the top of the shoreline adjacent to docks H-I is approximately +10 feet. The existing inclination of the shoreline slope adjacent to docks H-I is approximately 2:1. The mudline elevation below docks H-I varies from –7.5 to –15 feet.

6.1 Onshore Subsurface Conditions

Subsurface information from our field investigation indicates the shoreline adjacent to docks A-E is blanketed by 12 to 13 feet of fill consisting of a heterogeneous mixture of gravel, sand, and clay with rock, brick, wood, and concrete fragments. The fill is underlain by soft to stiff clay, locally known as Bay Mud. Abundant shell fragments and occasional sand seams were encountered within the Bay Mud layer. The thickness of the Bay Mud varies from 15 feet at boring B-4 (dock A-B) to 53 feet at boring B-2 (dock E). The Bay Mud is generally underlain by very stiff, overconsolidated clay, locally known as Old Bay Mud, in borings B-2 and B-3. In general, the Old Bay Mud is underlain by very dense sand or very stiff clay of the Alameda Formation. In boring B-4, the Old Bay Mud layer was not encountered and the Bay Mud was underlain by the Alameda Formation.

The shoreline adjacent to docks H-I is blanketed by fill consisting of a mixture of sandy clay, clayey sand, and boulders to the maximum depth explored of 21.5 feet in boring B-1. Because our boring encountered refusal within the fill; however, and we could not extend our exploration below the fill, we anticipate the fill is underlain by Bay Mud that is underlain by Old Bay Mud or Alameda Formation.

Groundwater was encountered at 5 to 10 feet bgs (approximate Elevation +5 to 0 feet, respectively) in borings B-1 through B-4. Due to the close proximity to the water, however, we anticipate the groundwater table changes several feet in response to tidal and seasonal fluctuations.

6.2 Offshore Subsurface Conditions

The mudline is underlain by very soft to stiff Bay Mud to depths of 9 to 12.5 feet below mudline in docks A-E and 20 to 21.5 feet below mudline in docks H-I. Lenses of medium dense to dense silty or clayey sand was encountered at the bottom of the Bay Mud layer in borings B-5 and B-6 in docks A-E. The Bay Mud is underlain by very stiff Old Bay Mud to the maximum depths explored of 31.5 to 39.5 feet below mudline.

7.0 REGIONAL SEISMICITY

The major active faults in the area are the Hayward, Calaveras, Rodgers Creek, and San Andreas Faults. These and other faults of the region are shown on Figure 3. For each of the active faults within 50 kilometer (km) of the site, the distance from the site and estimated maximum Moment magnitude[2,3] event are summarized in Table 1.

---

[2] 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.

[3] California Division of Mines and Geology, 1996, *Probabilistic Seismic Hazard Assessment for the State of California*, CDMG Open-File Report 96-08.

TABLE 1
Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Maximum Magnitude
Hayward - Total	5	Northeast	7.1
Northern Hayward	5	Northeast	6.6
Southern Hayward	14.5	Southeast	6.9
Mount Diablo Thrust	24	East	6.7
San Andreas - 1906 Rupture	24.5	Southwest	7.9
San Andreas - Peninsula	24.5	Southwest	7.2
Rodgers Creek	25	North	7.1
San Andreas - North Coast South	25.5	West	7.5
Northern Calaveras	27.5	East	7.0
Concord	27.5	Northeast	6.5
San Gregorio North	28.5	West	7.3
Southern Green Valley	29	Northeast	6.5
West Napa	33.5	North	6.5
Northern Greenville	34.5	East	6.6
Great Valley - 6	40.5	Northeast	6.7
Central Greenville	45	East	6.7
Great Valley - 5	45.5	Northeast	6.5
Point Reyes	46	West	6.8
Northern Green Valley	47	North	6.3
Monte Vista	48	South	6.8

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[4]. The estimated Moment magnitude, M_w, for this earthquake is about 6-1/4. In 1838, an earthquake occurred with an estimated intensity of about VIII-IX (MM), corresponding to a M_w of about 7-1/2. 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 430 kilometers in length. It had a maximum intensity of XI (MM), a 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 a M_w of 6.9. The epicenter of the earthquake was 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 a 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 1999, the Working Group on California Earthquake Probabilities at the U.S. Geologic Survey (USGS) predicted a 70 percent probability of a magnitude 6.7 or greater earthquake occurring in the San Francisco Bay Area by the year 2030[5]. More specific estimates of the probabilities for different faults in the Bay Area are presented in Table 2.

---

[4] Toppozada, T.R. and Borchardt G., 1998, Re-Evaluation of the 1836 "Hayward Fault" and the 1838 San Andreas Fault earthquakes, Bulletin of Seismological Society of America, 88(1), 140-159.

[5] Working Group on California Earthquake Probabilities (WGCEP), 1999, *Earthquake Probabilities in the San Francisco Bay region; 2000 to 2030 – A Summary of Findings*, Open File Report 99-517.

TABLE 2
WGCEP (1999) Estimates of 30-Year Probability (2000 to 2030) of a Magnitude 6.7 or Greater Earthquake

Fault	Probability (percent)
Hayward-Rodgers Creek	32
San Andreas	21
Calaveras	18
San Gregorio	10
Concord-Green Valley	6
Greenville	6

8.0 DISCUSSION AND CONCLUSIONS

From a geotechnical standpoint, we conclude the site can be developed as planned. The primary geotechnical concerns at the project site are:

- the presence of weak compressible Bay Mud at relatively shallow depths
- strong ground shaking and the potential for localized liquefaction, sand boils, and lateral spreading
- stability of shoreline slopes.

These and other geotechnical issues are addressed in the following sections.

8.1 Seismic 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 site. Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction, lateral spreading[6], and cyclic densification[7]. We used data from the test borings to evaluate the potential for these phenomena to occur at the site. The results of our evaluation are presented below.

8.1.1 Soil Liquefaction and Associated Hazards

Liquefaction is a transformation of soil from a solid to a liquefied state during which 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. Flow failure, lateral spreading, differential settlement, loss of bearing strength, ground fissures, lurch cracking and sand boils are caused by liquefaction.

We evaluated the liquefaction potential of soil layers encountered in our borings and concluded that there are relatively thin medium dense sand layers or lenses in the Bay Mud that could liquefy during a major earthquake. A 1.5-foot-thick layer of medium dense sand with silt was encountered in boring B-2 at 36 feet bgs and a 2.5-foot-thick layer of loose to medium dense silty sand was encountered in boring B-3 at 31 feet bgs. We estimate that liquefaction-induced ground settlement will be less than 1/2 inch.

Considering that the liquefiable soil is non-continuous, located at least 30 feet bgs, and is confined by clay above and below, we judge that liquefaction, if it occurs, would not cause ground fissures, lurch cracking, sand boils, flow failure, or lateral spreading.

---

[6] 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.

[7] Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is compacted by earthquake vibrations, causing differential settlement.

8.1.2 Cyclic Densification

Seismically induced compaction or cyclic densification of non-saturated sand (sand above the groundwater table) due to earthquake vibrations can result in settlement of the ground surface. Considering the high groundwater table and the relatively dense sand and gravel encountered above the groundwater table, we estimate the potential for ground surface settlement due to cyclic densification is low.

8.1.3 Fault Rupture

Historically, ground surface displacements closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no known active or potentially active faults exist on the site. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, we conclude the risk of surface faulting and consequent secondary ground failure at the site is very low.

8.2 Stability of Shoreline Slopes

We performed slope stability analysis on a representative cross section of the shoreline slope between docks A and E based on hydrographic survey data by Sea Surveyor, Inc. dated April 2000, and results from our field investigation and laboratory tests. For our analysis, we selected a cross section perpendicular to the shoreline slope between docks D and E where the Bay Mud layer is the thickest at the site. The generalized subsurface profile analyzed consisted of five feet of dense sand and very stiff clay fill underlain by seven feet of loose sand and soft clay fill. Beneath the fill is 53 feet of Bay Mud. The upper 16 feet of Bay Mud was modeled as a soft clay and the bottom 37 feet of the Bay Mud was modeled as a medium stiff to stiff clay. The Old Bay Mud and the Alameda Formation underlying the Bay Mud were both modeled as very stiff clay. Onshore groundwater levels measured during our investigation ranged from Elevation 0 to +5 feet. For our stability analyses, the groundwater table onshore was assumed at

Elevation +5 feet (i.e., approximately five feet bgs). The water level offshore was assumed at the Mean Lower Low Water, corresponding to Elevation 0 feet.

The top of the shoreline was modeled at Elevation +10 feet and the toe of the shoreline slope or mudline within the marina basin was modeled at Elevation –12 feet. We used the computer program SLOPE/W version 4.0, by Geo-Slope International to perform slope stability analyses to determine the steepest stable shoreline slope inclination. This program uses the limit equilibrium theory to solve for factors of safety of potential slip surfaces. For our analyses, we used the Bishop Simplified Method to define the inter-slice forces. The critical slip surface (the surface with the lowest factor of safety) is a circular failure surface from the top of the slope extending through the soft to medium stiff Bay Mud to the toe of the slope. Based on our analyses, a shoreline slope inclination of 2:1 has a static factor of safety of 1.5 against slope failure. In general, a factor of safety of 1.5 against slope failure is considered acceptable for static conditions. Results of our slope stability analyses are included in Appendix C. Based on the results of our analysis, we conclude the shoreline adjacent to docks A-E may be cut back to a 2:1 slope while still maintaining an acceptable factor of safety.

We performed a pseudo-static analysis on the 2:1 slope to evaluate the yield acceleration of the critical failure surface. The computed yield acceleration is 0.15 times gravity (0.15g). The peak ground acceleration (PGA), as determined in accordance with the 2001 California Building Code, is 0.51g. Based on an inertial slope deformation model developed by Makdisi and Seed (1978), we estimated total displacement of the shoreline slope during a seismic event generating a PGA of 0.51g to be on the order of 1 to 12 inches.

Slope stability analyses were not performed for the shoreline slope adjacent to docks H-I since no modification was proposed for this slope.

8.3 Foundations

We conclude the new docks can be supported on square or octagonal, prestressed, precast concrete piles. The piles will gain support primarily through skin friction in stiff or dense soil underlying the Bay Mud. Axial, uplift, and lateral capacities for pile foundations are presented in Section 9.2.

8.4 Construction Considerations

The shoreline adjacent to docks A-E is underlain by about 12 to 13 feet of fill. The slope of the shoreline is protected by a rock riprap. When cutting back the slope of the shoreline adjacent to docks A-E, Bay Mud and boulders may be encountered. In addition, we understand the site is located near an old landfill. We understand the Radisson Hotel, adjacent to the northeast corner of the Marina Basin, encountered methane gas during construction. Therefore, we judge there is a possibility of encountering methane gas at the site during construction.

As previously discussed in this report, the results of our field investigation indicate the thickness of Bay Mud varies from 15 to 53 feet. We conclude that prior to casting production piles, an indicator pile program should be performed. Indicator piles should be installed across the site to aid in estimating the length of production piles.

9.0 RECOMMENDATIONS

Our recommendations regarding foundation, pavement, and seismic design and other geotechnical aspects of this project are presented in this section.

9.1 Site Preparation and Fill Placement

In areas to receive improvements, site demolition should include the removal of wood docks, foundations, utility lines, pavements, and other below-grade improvements, if any. The asphalt concrete should be taken to an asphalt recycler. The concrete can be reused as select fill, provided it is crushed into pieces smaller than three inches in greatest dimension, with no more than 80 percent of the particles (by dry weight) being larger than one inch. These material should be mixed with sufficient fine-grained material to minimize the presence of voids.

Existing timber piles may be abandoned in-place, provided the piles are cut-off at or below the finished mudline elevation, and they will not impact new foundations. Where utilities to be removed extend off site, they should be capped or plugged with grout at the property line. It may be feasible to abandon utilities in-place provided they will not impact future utilities or improvements. The utility lines, if encountered, should be addressed on a case-by-case basis. Abandonment of utilities should consist of filling the utilities with grout.

We anticipate fill placement at the site will consist primarily of backfill for utility trenches. Fill should consist of soil that is free of organic matter or other deleterious or hazardous material, contains no rocks or lumps larger than four inches in greatest dimension, has a liquid limit of less than 40 and a plasticity index lower than 12, and is approved by the Geotechnical Engineer.

Fill should be placed in horizontal lifts not exceeding eight inches in uncompacted thickness, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction[8] for fill thickness equal to or less than five feet and 95 percent compaction for fill thickness greater than five feet. In pavement areas that will receive vehicular traffic, the upper six inches of the subgrade should be compacted to at least 95 percent relative compaction to achieve a firm, unyielding subgrade. The soil subgrade should be kept moist until it is covered by aggregate base.

Backfill for utility trenches and other excavations is also considered fill, and it should be compacted according to the recommendations presented in this section. However, if imported clean sand and gravel (sand and gravel with less than 10 percent fines) is used as backfill, it should be compacted to at least 95 percent relative compaction. Jetting of trench backfill should

---

[8] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557-00 laboratory compaction procedure.

not be permitted. Special care should be taken when backfilling utility trenches within the pavement areas. Poor compaction may result in excessive settlements and damage to the pavement section.

9.2 Pile Foundations

9.2.1 Axial Capacity

We conclude the proposed docks can be supported on driven 16- or 18-inch-square or 18- or 24-inch-octagonal, prestressed, precast concrete piles. Piles should be designed to gain support through skin friction in the stiff and dense soil underlying the soft to medium stiff Bay Mud. For compressive, dead-plus-live load conditions, we recommend using an allowable skin friction of 375 pounds per square feet (psf) starting at a depth of 15 feet to 35 feet below the current mudline; and an allowable skin friction of 650 psf below 35 feet below the current mudline. The piles should be embedded at least 15 feet into stiff and dense soil underlying the soft to medium stiff Bay Mud. Skin friction derived from soft to medium stiff Bay Mud should be ignored. The skin friction value recommended above includes a factor of safety of at least two; this value may be increased by one-third for total loads that include wind and/or seismic. Support from end bearing should be ignored. For temporary uplift loads, we recommend designing the piles using an allowable skin friction value equal to the allowable value for compressive, dead-plus-live loads.

9.2.2 Lateral Capacity

Piles will develop lateral resistance from passive pressure acting on the embedded portion of the piles and from their structural rigidity. Lateral resistance of piles will depend on the pile size, pile head condition (restrained or unrestrained), length of pile above mudline (stick-up), allowable deflection of the pile top, and the bending moment resistance of the pile. We have performed lateral load analyses for isolated, unrestrained, 16- and 24-inch-square and 18- and 24-inch octagonal concrete piles, with 25 feet of stick-up above the mudline and at least 60 feet long. The allowable lateral load to limit the pile-head deflection to one inch for 16- and

24-inch-square piles is 0.4 and 1.9 kips, respectively. The allowable lateral load to limit the pile head deflection to one inch for 18- and 24-inch-octagonal piles is 0.4 and 1.4 kips, respectively. The results of our analyses are summarized in Table 3.

TABLE 3
Unrestrained Concrete Piles with 25 Feet of Stick-Up and at Least 60 Feet Long

Pile Dimension	Lateral Load	Deflection at Pile Head	Maximum Moment
16-inch-square	0.4 kips	1.0 inch	196 kip-inch
24-inch-square	1.9 kips	1.0 inch	769 kip-inch
18-inch-octagonal	0.4 kips	1.0 inch	215 kip-inch
24-inch-octagonal	1.4 kips	1.0 inch	547 kip-inch

Plots of deflection and bending moment profiles are presented on Figures 5 and 6, respectively.

For pile groups where the center-to-center spacing is three diameters in the direction of loading, the single–pile lateral capacities should be reduced. Reduction factors, corresponding to the number of piles in a group, are given in Table 4.

TABLE 4
Pile Group Reduction Factors

Numbers of Piles in Pile Group	Reduction Factor
2	0.89
3	0.88
4	0.84
5	0.82
6	0.79
7	0.77
8	0.76

Where piles are spaced at least six pile widths in the direction of loading, no group reduction need be applied. Reduction for other pile group spacing can be provided once the number and arrangement of piles are known.

9.2.3 Pile Installation and Indicator Piles

Selection of driving equipment for this project should address "matching" of the pile hammer with the pile size and length. Special consideration should be given to selecting a hammer that can deliver enough energy to the tip of the piles to drive them efficiently without damaging them. We recommend using a hammer with a rated energy between 40,000 and 60,000 foot-pounds per blow. Each pile should be driven continuously to design tip elevation without interruptions, unless it meets practical refusal. For planning purposes, practical refusal for 16- and 24-inch-square and 18- and 24-inch-octagonal piles can be defined as 50 blows per foot; however, the piles should penetrate at least 15 feet below the bottom of soft to medium stiff Bay Mud. This refusal blow count may be modified depending on the results of the indicator pile program.

To reduce the potential of damaging the piles, the hammer should be throttled down or otherwise prevented from striking with full energy while driving through the Bay Mud. The cushion blocks should be replaced or additional cushion blocks placed as necessary to reduce stress waves in the piles that may damage the piles. If pile locations are to be predrilled, the predrill auger should have a diameter no greater than the pile width (i.e., 16 or 24 inches for 16- or 24-inch-square piles, respectively).

We recommend that before production piles are cast, 10 indicator piles be driven across docks A-E and H-I to: 1) provide blow count data to correlate with information obtained from the test borings, 2) aid in evaluating predrilling requirements, and 3) aid in estimating production pile lengths. They should be driven with the same equipment that will be used to drive the production piles. We expect the indicator piles can be used for support of the structure if installed in the proper location and do not break during driving. Installation of two indicator piles should be monitored using a Pile Driving Analyzer (PDA) to check stresses in the pile during driving.

9.3 Pavement Design

9.3.1 Asphalt Concrete Pavement

The State of California flexible pavement design method was used to develop the recommended asphalt concrete pavement sections. We expect the final soil subgrade in asphalt-paved areas will generally consist of gravel with silt and sand and/or sand with silt and gravel. On the basis of the laboratory test results on this soil, we selected an R-value of 40 for design. If the existing subgrade will be raised beneath the paved areas, the fill material should have the same or higher R-value than the on-site fill. Therefore, additional tests should be performed on the proposed fill to measure its R-value. Depending on the results of the tests, the pavement design may need to be revised.

For our calculations, we assumed a Traffic Index (TI) of 4.5 for automobile parking areas with occasional trucks, and 5.5 for driveways and truck-use areas; these TIs should be confirmed by the project civil engineer. Table 5 presents our recommendations for asphalt pavement sections.

TABLE 5
Pavement Section Design

TI	Asphaltic Concrete (inches)	Class 2 Aggregate Base R = 78 (inches)
4.5	2.5	6
5.5	3.0	6

Pavement components should conform to the current Caltrans Standard Specifications. The upper six inches of the soil subgrade in pavement areas should be moisture-conditioned to above optimum and compacted to at least 95 percent relative compaction and rolled to provide a smooth non-yielding surface. Aggregate base should be compacted to at least 95 percent relative compaction.

9.3.2 Portland Cement Concrete Pavement

Concrete pavement design is based on a maximum single-axle load of 20,000 pounds and a maximum tandem axle of 32,000 pounds. The recommended rigid pavement section for these axle loads is six inches of Portland cement concrete over six inches of Class 2 aggregate base.

The modulus of rupture of the concrete should be at least 500 psi at 28 days. Contraction joints should be constructed at 15-foot spacing. Where the outer edge of a concrete pavement meets asphalt pavement, the concrete slab should be thickened by 50 percent at a taper not to exceed a slope of 1 in 10. Recommendations for subgrade preparation and aggregate base compaction for concrete pavement are the same as those we have described for asphalt pavement.

Exterior concrete slabs (such as sidewalks and walkways) should be supported on compacted subgrade and at least four inches of Class 2 aggregate base. The subgrade and baserock should be compacted to at least 90 percent relative compaction and provide a smooth, non-yielding surface for support of the concrete slabs.

9.4 Seismic Design

The closest active fault is the Hayward Fault, which is 2.7 km to the northeast of the site. This fault is classified as a Type A fault. For seismic design in accordance with the 2001 California Building Code, we recommend using the following parameters:

- Seismic Zone Factor 4
- Soil Profile Type S_E
- Near Source Factors N_a and N_v of 1.43 and 1.91, respectively.

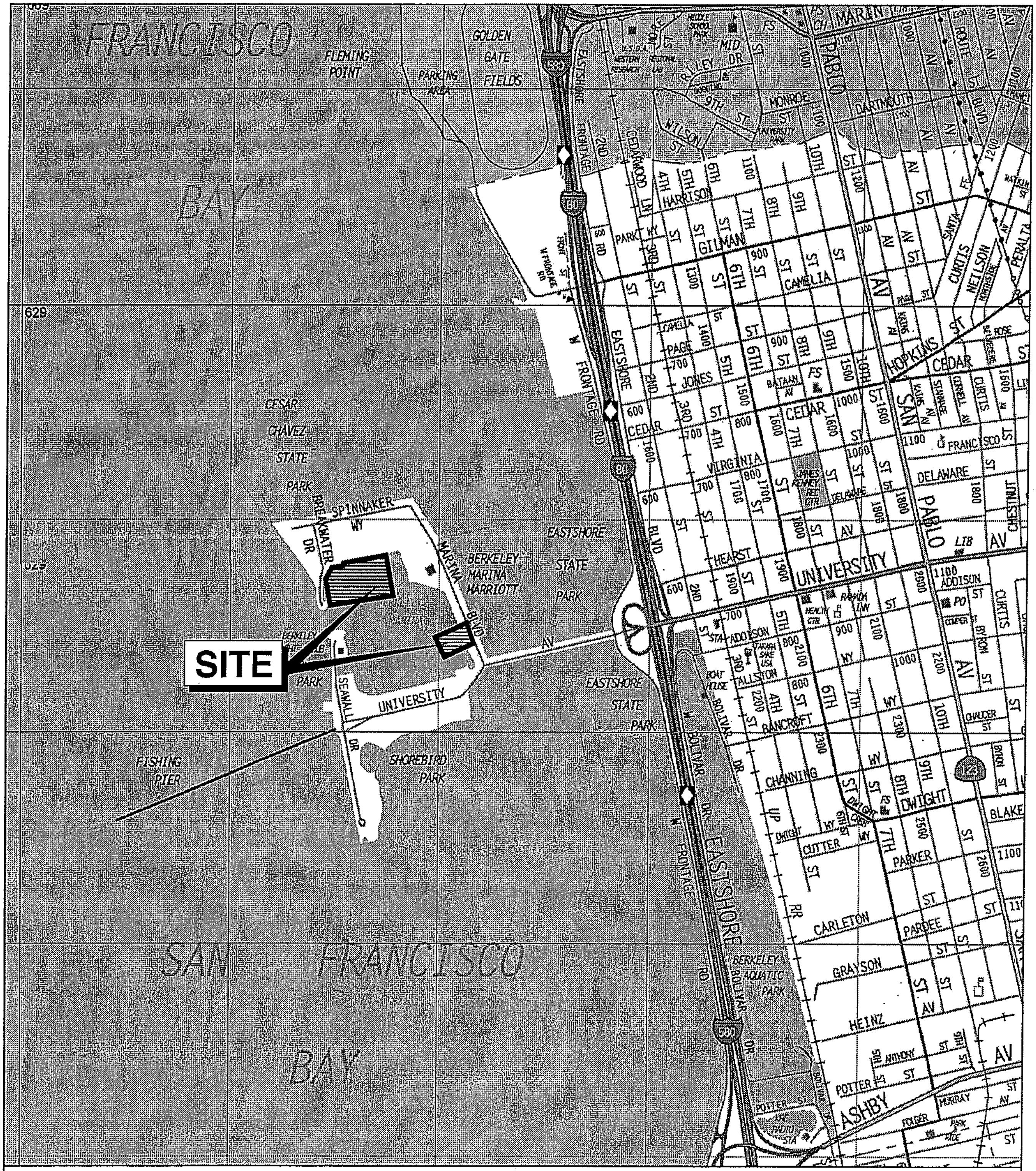
10.0 ADDITIONAL GEOTECHNICAL SERVICES

Prior to construction, Treadwell & Rollo should review the project plans and specifications to check their conformance with the intent of our recommendations. During construction, our field engineer should provide on-site observation during installation of indicator piles and excavation and installation and testing of production piles and pavement sections. These observations will allow us to compare the actual with the anticipated soil conditions and to check that the contractor's work conforms with the geotechnical aspects of the plans and specifications.

11.0 LIMITATIONS

The conclusions and recommendations presented in this report result from limited engineering studies based on our interpretation of the geotechnical conditions existing at the time of the investigation. Actual subsurface conditions may vary. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that described in this report, Treadwell & Rollo, Inc. should be notified to make supplemental recommendations, if necessary.

FIGURES



Base map: The Thomas Guide
San Mateo County
1999

0 1/4 1/2 Mile

Approximate scale

BERKELEY MARINA REHABILITATION
Berkeley, California

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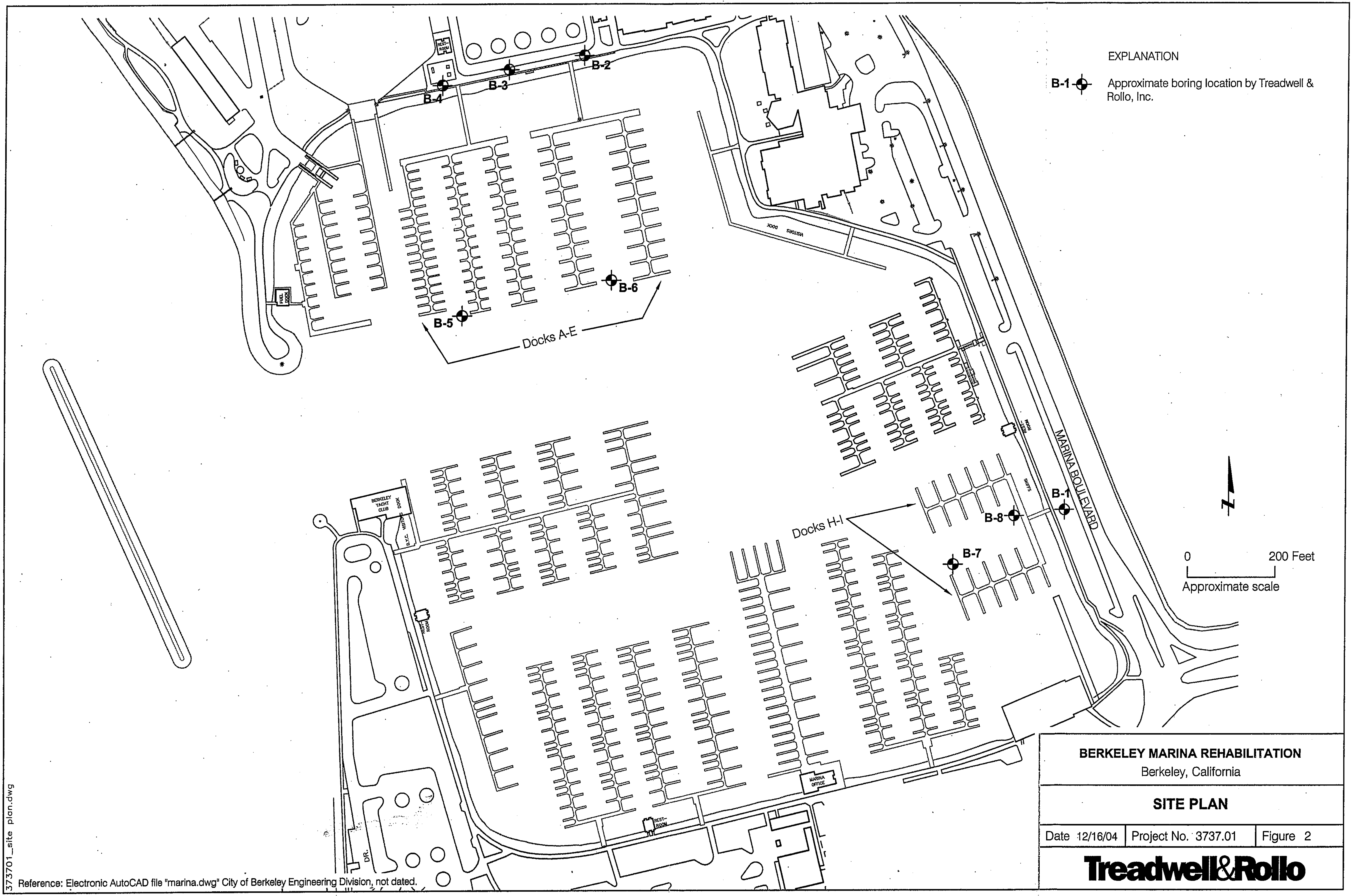
SITE LOCATION MAP

Date 12/09/04	Project No. 3737.01	Figure 1



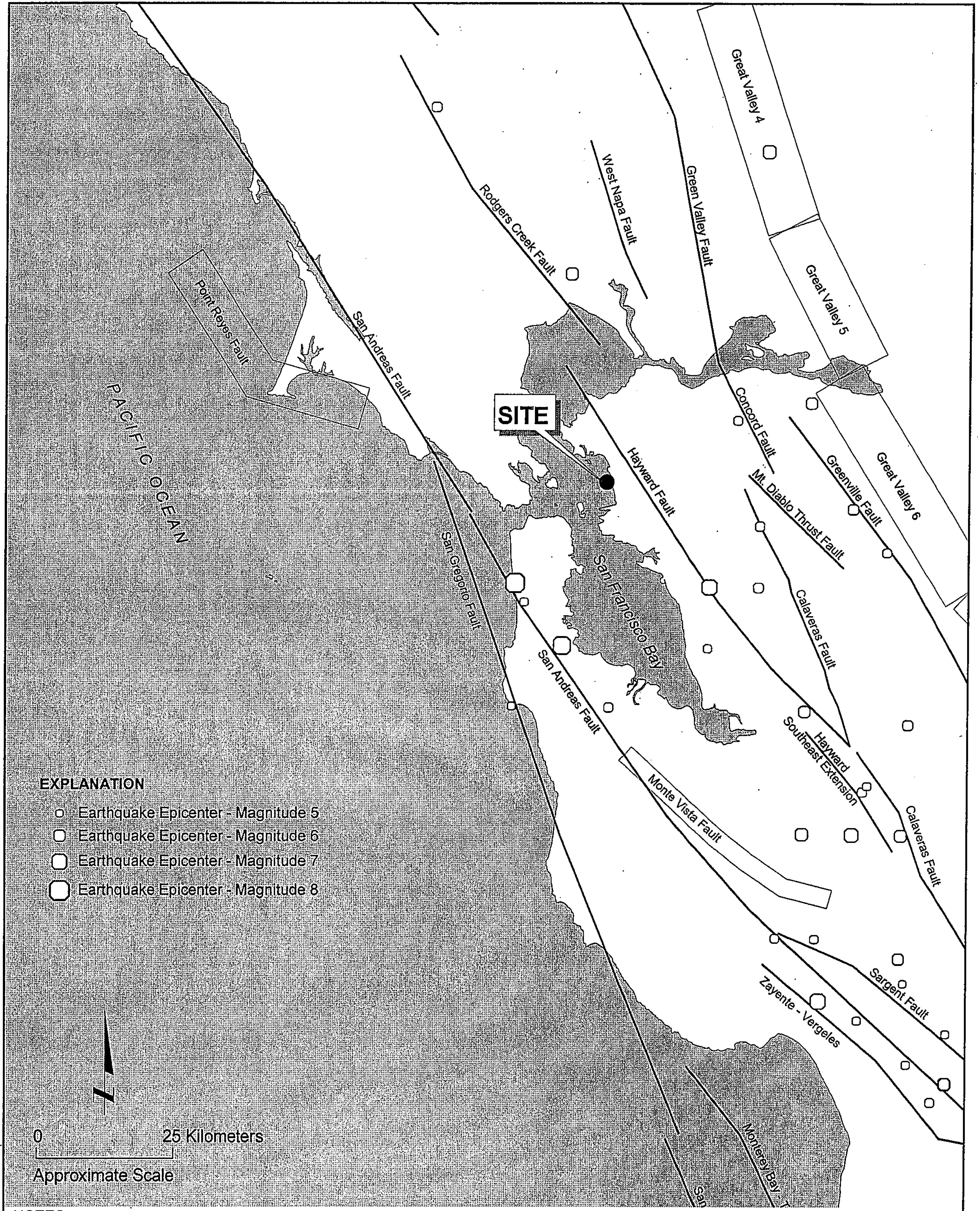
Reference: Electronic AutoCAD file "marina.dwg" City of Berkeley Engineering Division, not dated.

BERKELEY MARINA REHABILITATION
Berkeley, California

SITE PLAN

Date 12/16/04	Project No. 3737.01	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 January 1996.

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

Date: 12/09/04 | Project No. 3737.01 | 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.

BERKELEY MARINA REHABILITATION
Berkeley, California

MODIFIED MERCALLI INTENSITY SCALE

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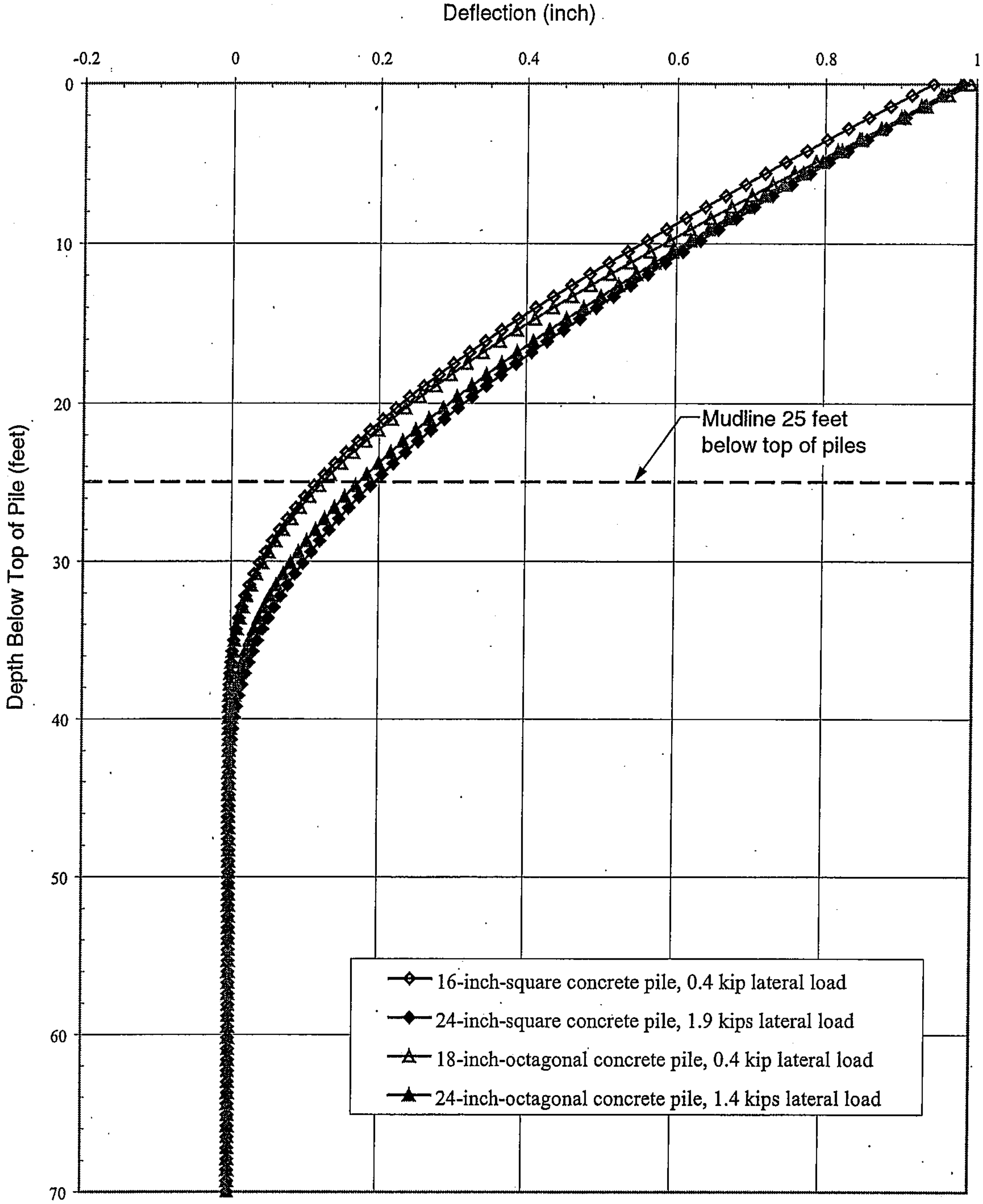
Date: 12/09/04 | Project No. 3737.01 | Figure: 4



Notes: 1. The deflection profiles are for concrete piles at least 60 feet long.

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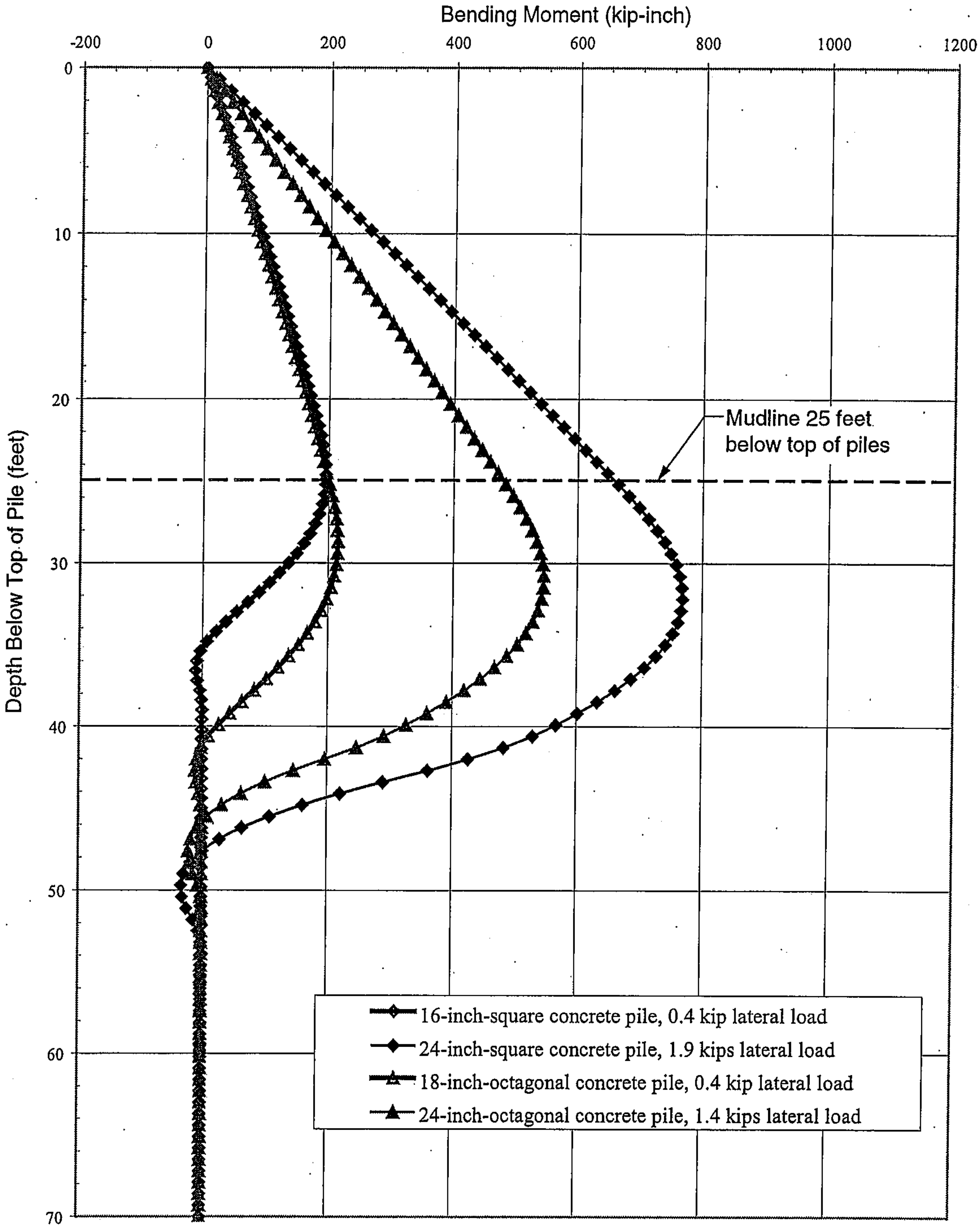
PILE DEFLECTION PROFILES

Date 12/16/04 | Project No. 3737.01 | Figure 5



Notes: 1. The moment profiles are for concrete piles at least 60 feet long.

BERKELEY MARINA REHABILITATION
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BENDING MOMENT PROFILES

Date 12/16/04	Project No. 3737.01	Figure 6

APPENDIX A
Logs of Borings

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-1

PAGE 1 OF 1

Boring location: See Site Plan, Figure 2
Logged by: L. Liang
Date started: 8/1/03
Date finished: 8/1/03
Drilling method: Rotary wash
Hammer weight/drop: 140 lbs./30-inch
Hammer type: Safety
Sampler: Standard Penetration Test (SPT)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value	LITHOLOGY	MATERIAL DESCRIPTION Ground Surface Elevation: 10 feet[1]		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
0					Aggregate base	FILL (0 to 21.5 feet)						
2	SPT	▨	50/3"		R-value Test, see Figure B-2 Three inches asphalt concrete over three inches Portland cement							
3				SC	CLAYEY SAND with GRAVEL (SC) brown, moist, with cobbles							
5				CL	▽ SANDY CLAY (CL) olive brown, soft, wet, with cobbles							
6	SPT	◩	3									
7				CL-SC	SANDY CLAY (CL)/CLAYEY SAND (SC) with gravel and boulders							
11	SPT	▣	17									
16	SPT	▣	33									
21.5					Drillers encountered refusal at 21.5 feet							
30												

Boring terminated at 21.5 feet below ground surface (bgs) due to refusal.
Boring backfilled with soil cuttings.
Groundwater encountered at 5 feet bgs during drilling.

[1] Approximate elevation based on Mean Lower Low Water.

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Project No.: 3737.01
Figure: A-1

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-2

PAGE 1 OF 3

Boring location: See Site Plan, Figure 2

Logged by: L. Liang

Date started: 8/1/03

Date finished: 8/1/03

Drilling method: Rotary wash

Hammer weight/drop: 140 lbs./30-inch

Hammer type: Safety

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

DEPTH (feet)	SAMPLES			LITHOLOGY	MATERIAL DESCRIPTION		LABORATORY TEST DATA					
	Sampler Type	Sample	SPT N-Value[1]		Ground Surface Elevation: 10.5 feet[2]		Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1					Four inches asphalt concrete over aggregate base							
2												
3	SPT		21	SC	CLAYEY SAND (SC) brown and black, dense, moist, with occasional gravel							
4												
5					∇ CLAY with SAND (CL) olive-brown, medium stiff, wet, brick fragments at 4.5 to 5 feet, bgs							
6	SPT		4			FILL						
7				CL								
8												
9												
10				CL	SANDY CLAY with GRAVEL (CL) gray, soft, wet							
11	S&H		6	SC	CLAYEY SAND with GRAVEL (SC) gray, loose, wet							
12												
13					CLAY (CL) gray, medium stiff, wet, with shell fragments and sand seams							
14												
15					TxUU Test, see Figure B-4		TxUU	1,600	580		66.9	59
16	ST		50 psi									
17					Torvane test (Tv)		TV		300-360 psf			
18												
19												
20				CL	TxUU Test, see Figure B-5		TxUU	2,100	320		34.5	90
21	ST		75 psi			BAY MUD						
22							TV		280-320 psf			
23												
24												
25												
26	ST		75 psi									
27					increased in fine sand content		TV		360 psf			
28												
29				CL								
30												

TEST GEOTECH LOG 373701_LOGS.GPJ TR.GDT 12/16/04

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Figure: A-2a

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-2

PAGE 2 OF 3

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION		LABORATORY TEST DATA: Type of Strength Test	LABORATORY TEST DATA: Confining Pressure Lbs/Sq Ft	LABORATORY TEST DATA: Shear Strength Lbs/Sq Ft	LABORATORY TEST DATA: Fines %	LABORATORY TEST DATA: Natural Moisture Content, %	LABORATORY TEST DATA: Dry Density Lbs/Cu Ft
		▨			SANDY CLAY (CL) gray, stiff, wet, slight organic odor, fine sand and shell fragments TxUU Test, see Figure B-6		TxUU	3,100	730		34.5	90
31	ST	▨	75 psi									
32		▨					TV		340-520 psf			
33				CL								
34												
35		▨	75 psi/12";		no organic odor							
36	ST	▨	225 psi/18"	SP-SM	SAND with SILT (SP-SM) gray, medium dense, wet							
37		▨										
38					CLAY (CL) mottled gray and brown, stiff, wet, with some organics							
39												
40		▨			TxUU Test, see Figure B-7		TxUU	4,100	1,190		73.1	57
41	ST	▨	100 psi									
42		▨										
43												
44												
45		▨				BAY MUD						
46	ST	▨	125 psi									
47		▨										
48												
49				CL								
50		▨			TxUU Test, see Figure B-8		TxUU	5,100	1,100		63.6	62
51	ST	▨	125 psi									
52		▨										
53												
54												
55												
56												
57												
58												
59												
60												

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Project No.: 3737.01

Figure: A-2b

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-2

PAGE 3 OF 3

DEPTH (feet)	SAMPLES Sampler Type	Sample	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	ST	▨	125 psi		CLAY (CL) continue TxUU Test, see Figure B-9	TxUU	6,100	1,250		72.7	56
62		▨			BAY MUD						
63											
64											
65					SANDY CLAY (CL) olive-gray, very stiff, wet						
66											
67											
68					increase in fine sand content						
69				CL	OLD BAY MUD						
70											
71											
72											
73					CLAYEY SAND with GRAVEL (SC) olive-brown, very dense, wet, coarse sand						
74											
75		▨									
76	S&H	▨	49/ 10"	SC	cobble at bottom of sampler						
77											
78					ALAMEDA FORMATION						
79											
80		▨			CLAY (CL)						
81	S&H	▨	19	CL	mottled brown and olive, very stiff, wet						
82											
83											
84											
85											
86											
87											
88											
89											
90											

Boring terminated at 81.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater encountered at 5 feet during drilling.

[1] S&H blow counts have been converted to SPT N-values with a factor of 0.6.

[2] Approximate elevation based on Mean Lower Low Water.

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Project No.: 3737.01

Figure: A-2c

TEST GEOTECH LOG 373701_LOGS.GPJ TR.GDT 12/16/04

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-3

PAGE 1 OF 2

Boring location: See Site Plan, Figure 2

Logged by: L. Liang

Date started: 7/31/03

Date finished: 7/31/03

Drilling method: Rotary wash

Hammer weight/drop: 140 lbs./30-inch

Hammer type: Safety

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

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION (Ground Surface Elevation: 11 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
					Two inches asphalt concrete							
1					GRAVEL with SAND (GP) brown, dense, moist							
2												
3	SPT		50									
4					fragments of concrete and rebar							
5												
6	SPT		33/6"	GP	sampler battered at 6 feet, stopped sampling	FILL						
7												
8												
9												
10					∇							
11												
12					CLAY with SAND (CL) gray, medium stiff, wet, with shells and fine sand							
13												
14												
15												
16	ST											
17												
18												
19	ST		50 psi	CL								
20												
21						BAY MUD						
22							TxUU	2,400	390		35.2	89
23												
24	ST		50 psi		slight organic odor TxUU Test, see Figure B-10 PI = 16, LL = 37, see Figure B-1							
25												
26					SANDY CLAY (CL) gray, stiff, wet, fine sand							
27												
28				CL								
29	ST		100 psi		Torvane test (Tv)		TV		280-300 psf			
30												

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Project No.: 3737.01

Figure: A-3a

TEST GEOTECH LOG 373701 LOGS.GPJ TR.GDT 12/16/04

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-3

PAGE 2 OF 2

DEPTH (feet)	SAMPLES Sampler Type	Sample	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
30				CL	SANDY CLAY (CL) continue	BAY MUD						
31				SM	SILTY SAND (SM) gray, loose to medium dense, wet, medium grain sand							
33.5	ST		125 psi	CL	SANDY CLAY (CL) gray, stiff, wet, slight organic odor							
37				CH	CLAY (CH) olive-brown, very stiff, wet, organic odor	OLD BAY MUD						
39	ST		150 psi									
41				CL	CLAY with SAND (CL) blue-gray, very stiff, wet							
43	S&H		29		Pocket penetrometer test (PP)		PP TV		2,000 psf 2,900 psf			
47				CL	CLAY (CL) mottled brown and black, very stiff, wet, with clayey sand lens.							
49	S&H		25									
50							PP		2,750 psf			
51–60												

Boring terminated at 50 feet below ground surface.
Boring backfilled with cement grout.
Groundwater encountered at 10 feet during drilling.

[1] S&H blow counts have been converted to SPT N-values with a factor of 0.6.
[2] Approximate elevation based on Mean Lower Low Water.

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Project No.: 3737.01
Figure: A-3b

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-4

PAGE 1 OF 2

Boring location: See Site Plan, Figure 2
Logged by: L. Liang
Date started: 7/31/03
Date finished: 7/31/03
Drilling method: Rotary wash
Hammer weight/drop: 140 lbs./30-inch
Hammer type: Safety
Sampler: Standard Penetration Test (SPT), Sprague & Henwood (S&H), Shelby Tube (ST)

DEPTH (feet)	SAMPLES Sampler Type	SAMPLES Sample	SAMPLES SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION Ground Surface Elevation: 11.5 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
					Three inches asphalt concrete	FILL						
1					SAND with SILT and GRAVEL (SP-SM) brown and gray, dense, moist							
2	SPT		46	SP-SM	R-value Test, see Figure B-3 concrete fragments							
3												
4	SPT		6		SANDY CLAY (CL) mottled blue, gray, and brown; medium stiff; moist							
5												
6	S&H		4	CL	Torvane test (Tv)		TV		740 psf			
7												
8												
9												
10					CLAY with SAND and GRAVEL (CL) ∇ mottled blue, gray, and brown; medium stiff; wet							
11	S&H		8	CL								
12					wood at top of sample							
13	S&H		4		SANDY CLAY (CL) gray, soft, wet, with shell fragments	BAY MUD						
14												
15											41.7	86
16	ST		50 psi									
17												
18												
19												
20					TxUU Test, see Figure B-11		TxUU	2,100	570		31.0	95
21	ST		50 psi	CL	medium stiff							
22												
23												
24												
25												
26	ST		75 psi		with clayey sand lenses							
27							TV		600 psf			
28												
29				CL	CLAY with SAND (CL)	ALAMEDA FORMATION						
30												

TEST GEOTECH LOG 373701_LOGS.GPJ TR.GDT 12/16/04

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Project No.: 3737.01
Figure: A-4a

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-4

PAGE 2 OF 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	S&H	▨	31		CLAY with SAND (CL) brown, very stiff, wet, with lenses of clayey sand TxUU Test, see Figure B-12 Pocket penetrometer test (PP) ALAMEDA FORMATION	TxUU PP TV	3,100	2,810 3,300 psf 2,000 psf		20.2	110
36	S&H	▨	20								
41	S&H	▨	19								

Boring terminated at 41.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater encountered at 10 feet during drilling.

---

[1] S&H blow counts have been converted to SPT N-values with a factor of 0.6.

[2] Approximate elevation based on Mean Lower Low Water.

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Project No.: 3737.01

Figure: A-4b

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-5

PAGE 1 OF 2

Boring location: See Site Plan, Figure 2
Date started: 8/27/03
Date finished: 8/27/03
Drilling method: Rotary wash
Hammer weight/drop: 140 lbs./30-inch
Hammer type: Safety
Sampler: Sprague & Henwood (S&H), Shelby Tube (ST)
Logged by: L. Liang

LABORATORY TEST DATA

Mudline Elevation: -10 feet ²

DEPTH (feet)	SAMPLES 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
					CLAY (CL) gray, soft to medium stiff, wet							
1												
2												
3												
4												
5												
6				CL								
7												
8	S&H	▢	1			BAY MUD						
9												
10												
11												
12												
13					SILTY SAND (SM) gray, dense, wet							
14				SM								
15					CLAY with SAND (CL) brown, stiff, wet TxUU Test, see Figure B-13		TxUU	1,450	1,600		24.9	103
16	ST	▧										
17												
18												
19												
20				CL								
21	S&H	▧	14									
22						ALAMEDA FORMATION						
23												
24												
25					SANDY CLAY (CL) olive-brown, very stiff, wet							
26	S&H	▧	17									
27				CL								
28												
29												
30												

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Figure: A-5a

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-5

PAGE 2 OF 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
					SANDY CLAY (CL) (continued)						
31				CL							
32					CLAY (CL) olive-brown, very stiff, wet						
33											
34											
35											
36	S&H	▨	33		TxUU Test, see Figure B-14	TxUU	3,800	2,080		29.6	95
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											

ALAMEDA FORMATION

Boring terminated at 36.5 feet below mudline.
Boring backfilled with cement grout.

[1] S&H blow counts have been converted to SPT N-values with a factor of 0.6.

[2] Approximate elevation based on Mean Lower Low Water.

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Figure: A-5b

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-6

PAGE 1 OF 2

Boring location: See Site Plan, Figure 2

Date started: 8/27/03 | Date finished: 8/27/03

Drilling method: Rotary wash

Hammer weight/drop: 140 lbs./30-inch | Hammer type: Safety

Sampler: Sprague & Henwood (S&H)

Logged by: L. Liang

LABORATORY TEST DATA

MATERIAL DESCRIPTION

Mudline Elevation: -10.5 feet [2]

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	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
					CLAY (CL) gray, very soft to soft, wet	BAY MUD						
1												
2												
3												
4				CL								
5												
6												
7					CLAYEY SAND (SC) blue-gray, medium dense to dense, wet							
8				SC								
9					CLAY with SAND (CL) brown, very stiff, wet	ALAMEDA FORMATION						
10	S&H	▨	37									
11												
12												
13												
14												
15	S&H	▨	22									
16												
17												
18												
19												
20	S&H	▨	22	CL	mottled dark brown and brown							
21												
22												
23												
24												
25												
26												
27												
28												
29												
30					sand seam at 30 feet							

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Project No.:	Figure:
3737.01	A-6a

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-6

DEPTH (feet)	SAMPLES			LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA					
	Sampler Type	Sample	SPT N-Value[1]			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	▨	24	CL	CLAY with SAND (CL) (continued)						
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											

Boring terminated at 31.5 feet below mudline.
Boring backfilled with cement grout.

[1] S&H blow counts have been converted to SPT N-values with a factor of 0.6.
[2] Approximate elevation based on Mean Lower Low Water.

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Project No.: 3737.01

Figure: A-6b

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-7

Boring location: See Site Plan, Figure 2
Logged by: L. Liang
Date started: 8/28/03
Date finished: 8/28/03
Drilling method: Rotary wash
Hammer weight/drop: 140 lbs./30-inch
Hammer type: Safety
Sampler: Sprague & Henwood (S&H), Shelby Tube (ST)

DEPTH (feet)	SAMPLES Sampler Type	SAMPLES Sample	SAMPLES SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION Mudline Elevation: -13 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					CLAY (CL) dark gray, very soft, wet, with organic odor							
2												
3												
4												
5												
6	ST				Lab vane test (LV)		LV		53		135.4	36
7												
8												
9				CL								
10						BAY MUD						
11												
12												
13	ST						LV		48		113.5	43
14												
15												
16												
17												
18					CLAY with SAND (CL) gray, stiff, wet, no organic odor							
19				CL								
20	ST				SANDY CLAY (CL) gray, very stiff, wet							
21												
22												
23												
24												
25				CL		OLD BAY MUD						
26	S&H		14		varying sand content		LV		940		34.7	90
27												
28												
29												
30												

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Figure: A-7a

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-7

PAGE 2 OF 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
					SANDY CLAY (CL) (continued)							
31				CL								
32					CLAY with SAND (CL) mottled white and gray, very stiff, wet							
33	S&H	▨	18									
34												
35						OLD BAY MUD						
36												
37												
38												
39	S&H	▨	17		TxUU Test, see Figure B-15		TxUU	4,200	980		30.1	96
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												
56												
57												
58												
59												
60												

Boring terminated at 39.5 feet below mudline.
Boring backfilled with cement grout.

[1] S&H blow counts have been converted to SPT N-values with a factor of 0.6.
[2] Approximate elevation based on Mean Lower Low Water.

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Project No.: 3737.01

Figure: A-7b

TEST GEOTECH LOG 373701_LOGS.GPJ TR.GDT 12/16/04

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-8

Boring location: See Site Plan, Figure 2
Logged by: L. Liang
Date started: 8/28/03
Date finished: 8/28/03
Drilling method: Rotary wash
Hammer weight/drop: 140 lbs./30-inch
Hammer type: Safety
Sampler: Sprague & Henwood (S&H), Shelby Tube (ST)

LABORATORY TEST DATA

Mudline Elevation: -9 feet ^{2}

DEPTH (feet)	SAMPLES 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
					CLAY (CL) gray, soft, wet	BAY MUD						
1												
2												
3												
4												
5				CL								
6												
7												
8												
9												
10												
11					SANDY CLAY (CL) gray, medium stiff, wet harder drilling at 11 feet							
12	S&H	●	6									
13												
14												
15												
16												
17												
18												
19												
20												
21												
22	ST	▨			CLAY with SAND (CL) brown, very stiff, wet	OLD BAY MUD					40.1	82
23												
24												
25				CL								
26												
27												
28					SANDY CLAY (CL) olive-gray, very stiff, wet, with seams of sand							
29				CL								
30												

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Figure: A-8a

PROJECT: **BERKELEY MARINA REHABILITATION**
Berkeley, California

Log of Boring B-8

PAGE 2 OF 2

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	LABORATORY TEST DATA: Confining Pressure Lbs/Sq Ft	LABORATORY TEST DATA: Shear Strength Lbs/Sq Ft	LABORATORY TEST DATA: Fines %	LABORATORY TEST DATA: Natural Moisture Content, %	LABORATORY TEST DATA: Dry Density Lbs/Cu Ft
31	S&H	▨	21	CL	SANDY CLAY (CL) (continued) TxUU Test, see Figure B-16	TxUU	3,100	1,070		28.7	96
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											

Boring terminated at 31.5 feet below mudline.
Boring backfilled with cement grout.

---

[1] S&H blow counts have been converted to SPT N-values with a factor of 0.6.

[2] Approximate elevation based on Mean Lower Low Water.

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Project No.: 3737.01

Figure: A-8b

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
Silt and Clay	Below No. 200	Below 0.074

▽	Unstabilized groundwater level
▼	Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

▤	Sample taken with split-barrel sampler other than Standard Penetration Test sampler. Darkened area indicates soil recovered
◩	Classification sample taken with Standard Penetration Test sampler
▥	Undisturbed sample taken with thin-walled tube
☒	Disturbed sample
◎	Sampling attempted with no recovery
◫	Core sample
◉	Analytical laboratory sample
▥	Sample taken with Direct Push sampler

SAMPLER TYPE

C	Core barrel
CA	California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter
D&M	Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube
O	Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube
PT	Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube
S&H	Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter
SPT	Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter
ST	Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

BERKELEY MARINA REHABILITATION
Berkeley, California

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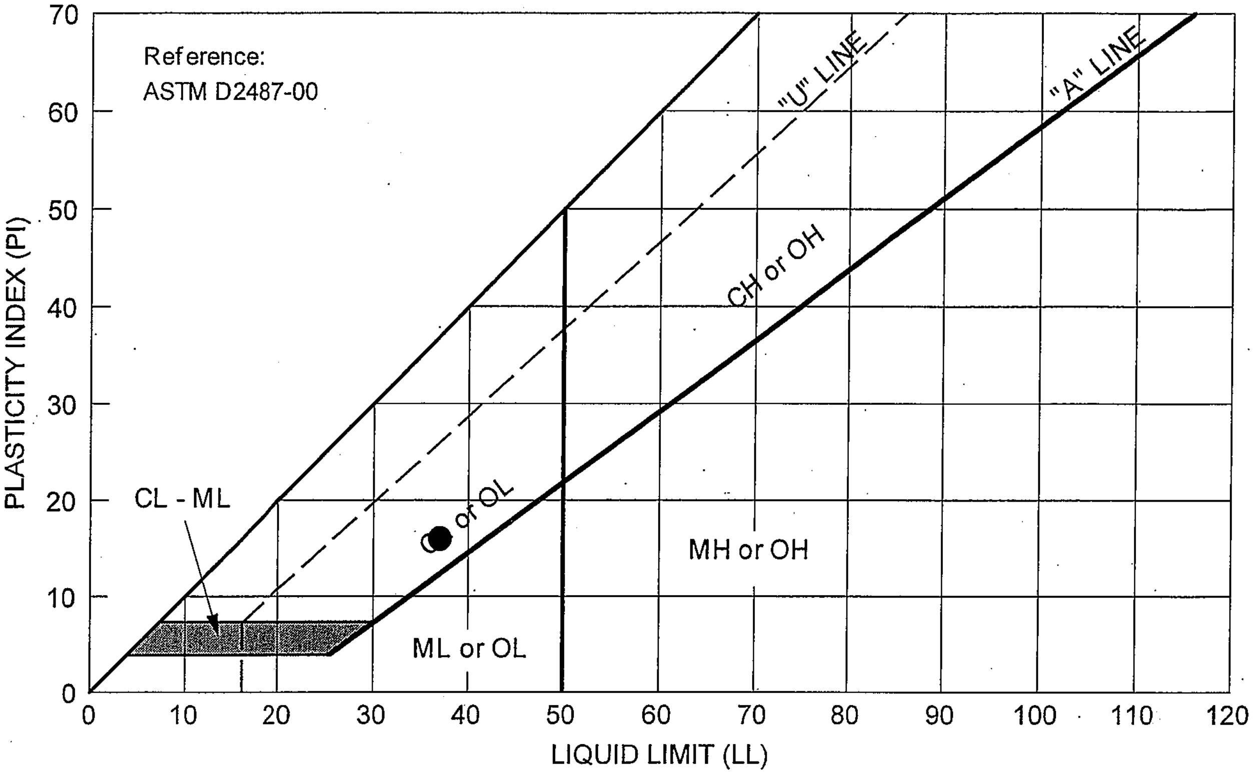
CLASSIFICATION CHART

Date 12/09/04 | Project No. 3737.01 | Figure A-9

APPENDIX B
Laboratory Test Results



Symbol	Source	Description and Classification	Natural M.C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
●	B-3 at 22.5 feet	CLAY with SAND (CL), gray	35.2	37	16	---

BERKELEY MARINA REHABILITATION
Berkeley, California

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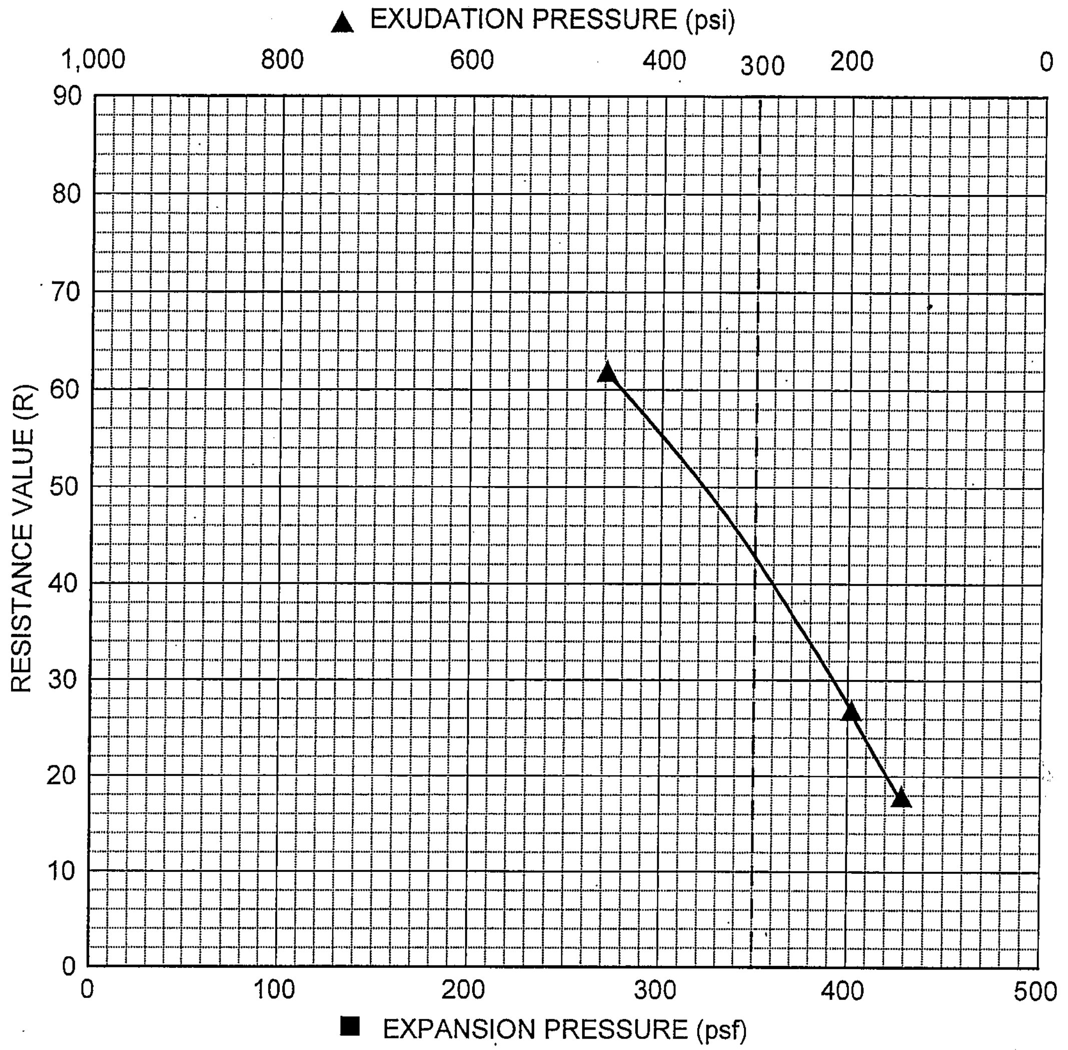
PLASTICITY CHART

Date 12/09/04 | Project No. 3737.01 | Figure B-1



Specimen ID:	A	B	C	D
Water Content (%)	9.6	9.2	8.0	–
Dry Density (pcf)	131	182	133	–
Exudation Pressure (psi)	143	196	458	–
Expansion Pressure (psf)				–
Resistance Value (R)	18	27	62	–

Sample Source	Sample Description	Sand Equivalent	Expansion Pressure	R value
B-1 at 0 to 2 feet	GRAVEL with SILT and SAND (GP-GM)	–	—	43

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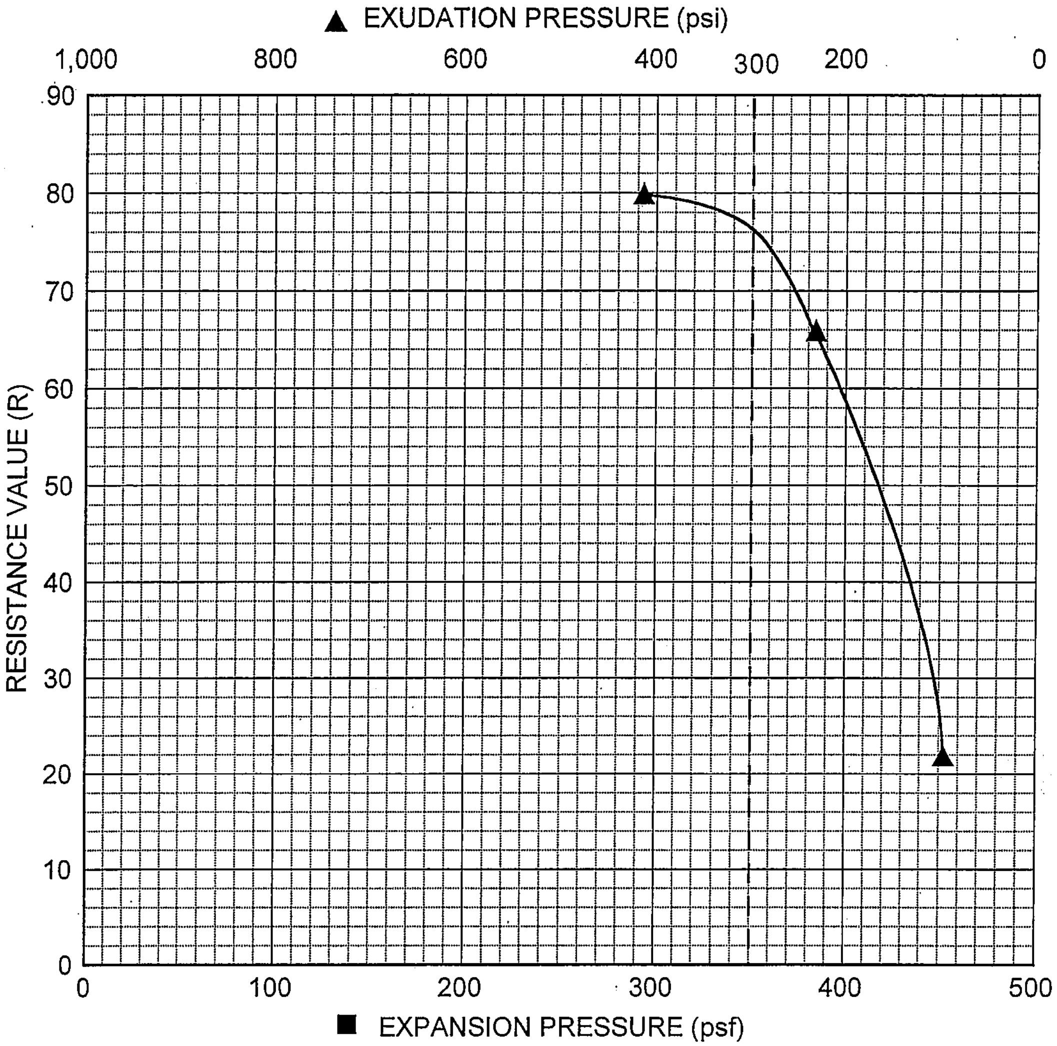
RESISTANCE VALUE TEST DATA

Date 12/09/04	Project No. 3737.01	Figure B-2



Specimen ID:	A	B	C	D
Water Content (%)	12.2	10.8	9.9	–
Dry Density (pcf)	125	125	127	–
Exudation Pressure (psi)	95	232	414	–
Expansion Pressure (psf)				–
Resistance Value (R)	22	66	80	–

Sample Source	Sample Description	Sand Equivalent	Expansion Pressure	R value
B-4 at 0 to 2 feet	SAND with SILT and GRAVEL (SP-SM), brown	–	—	76

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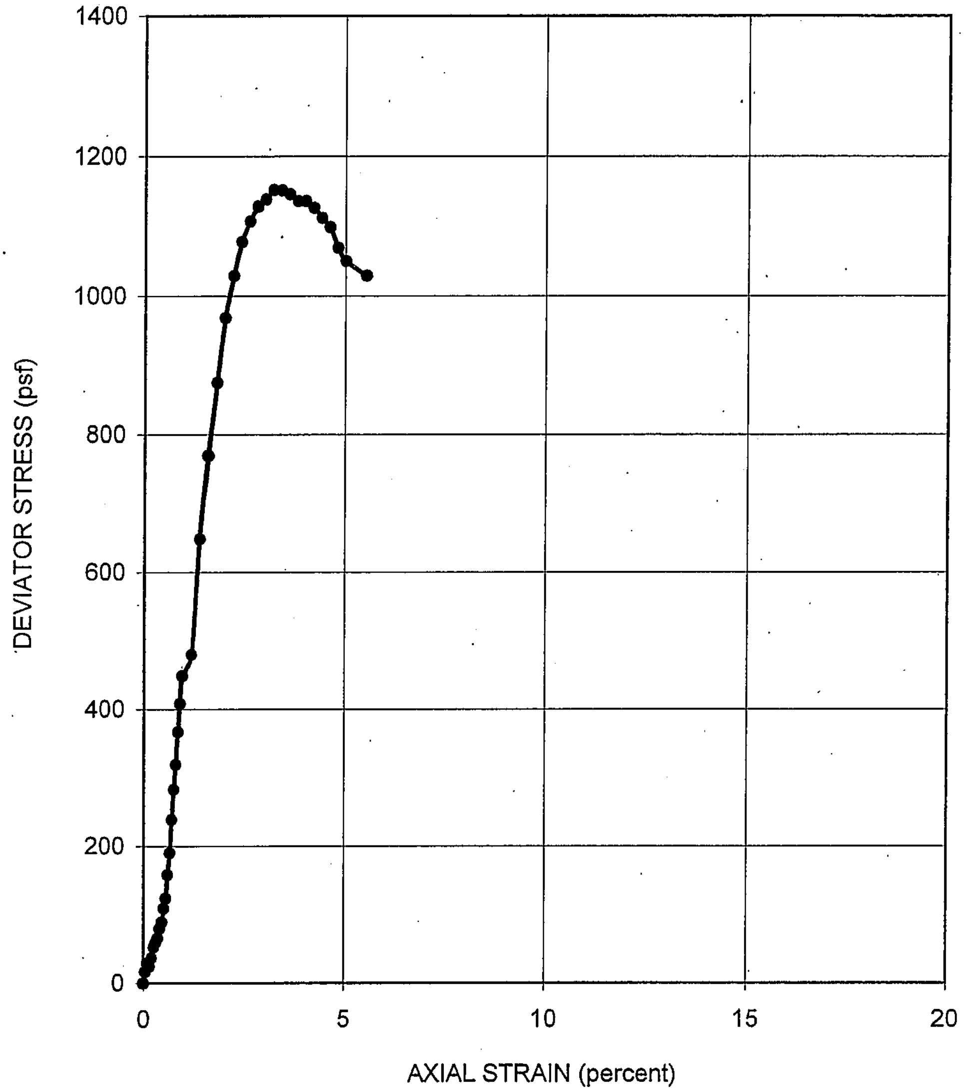
RESISTANCE VALUE TEST DATA

Date 12/09/04 | Project No. 3737.01 | Figure B-3



SAMPLER TYPE	Shelby Tube			SHEAR STRENGTH	580	psf
DIAMETER (in.)	2.86	HEIGHT (in.)	6.00	STRAIN AT FAILURE	3.2	%
MOISTURE CONTENT		66.9	%	CONFINING PRESSURE	1,600	psf
DRY DENSITY		59	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	CLAY (CL), gray				SOURCE	B-2 at 15 feet

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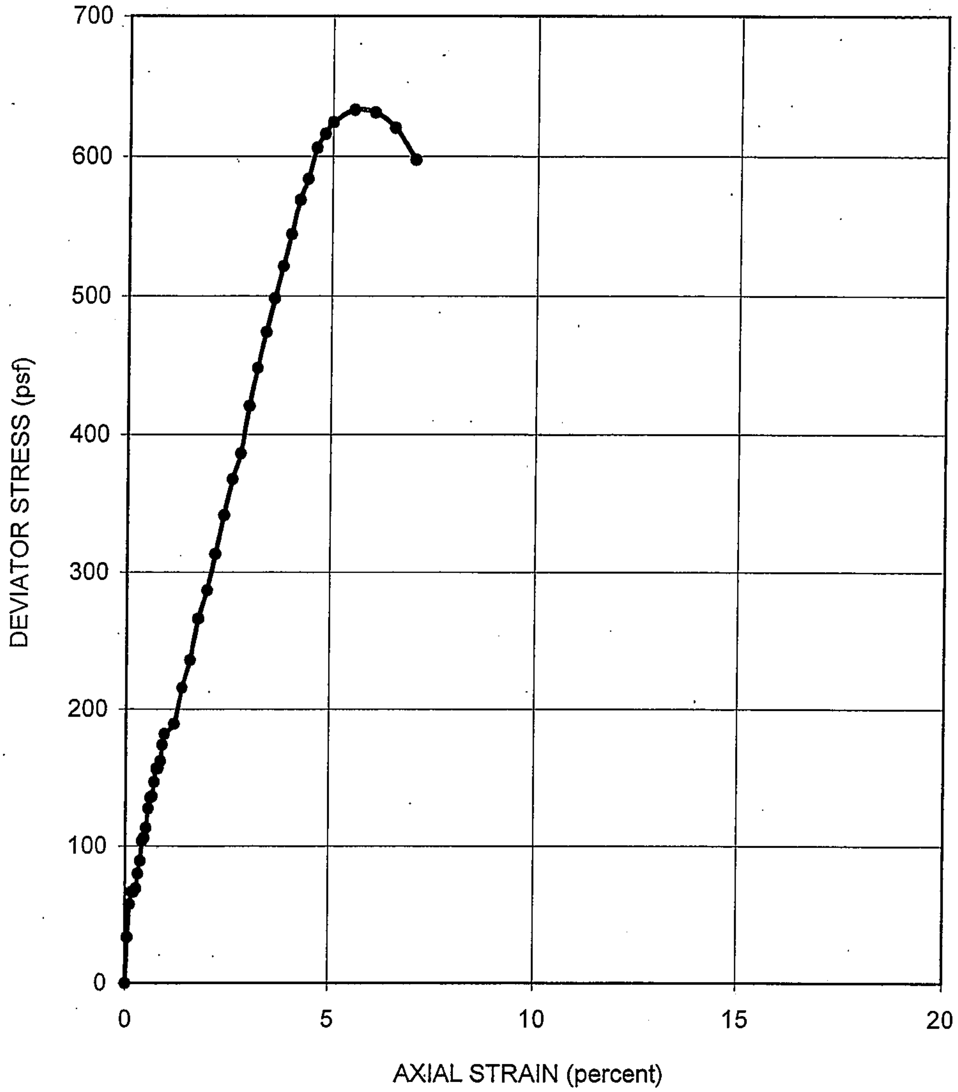
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 12/09/04 | Project No. 3737.01 | Figure B-4



SAMPLER TYPE	Shelby Tube			SHEAR STRENGTH	320	psf
DIAMETER (in.)	2.86	HEIGHT (in.)	6.00	STRAIN AT FAILURE	5.5	%
MOISTURE CONTENT		34.5	%	CONFINING PRESSURE	2,100	psf
DRY DENSITY		90	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	CLAY (CL), gray			SOURCE	B-2 at 20 feet	

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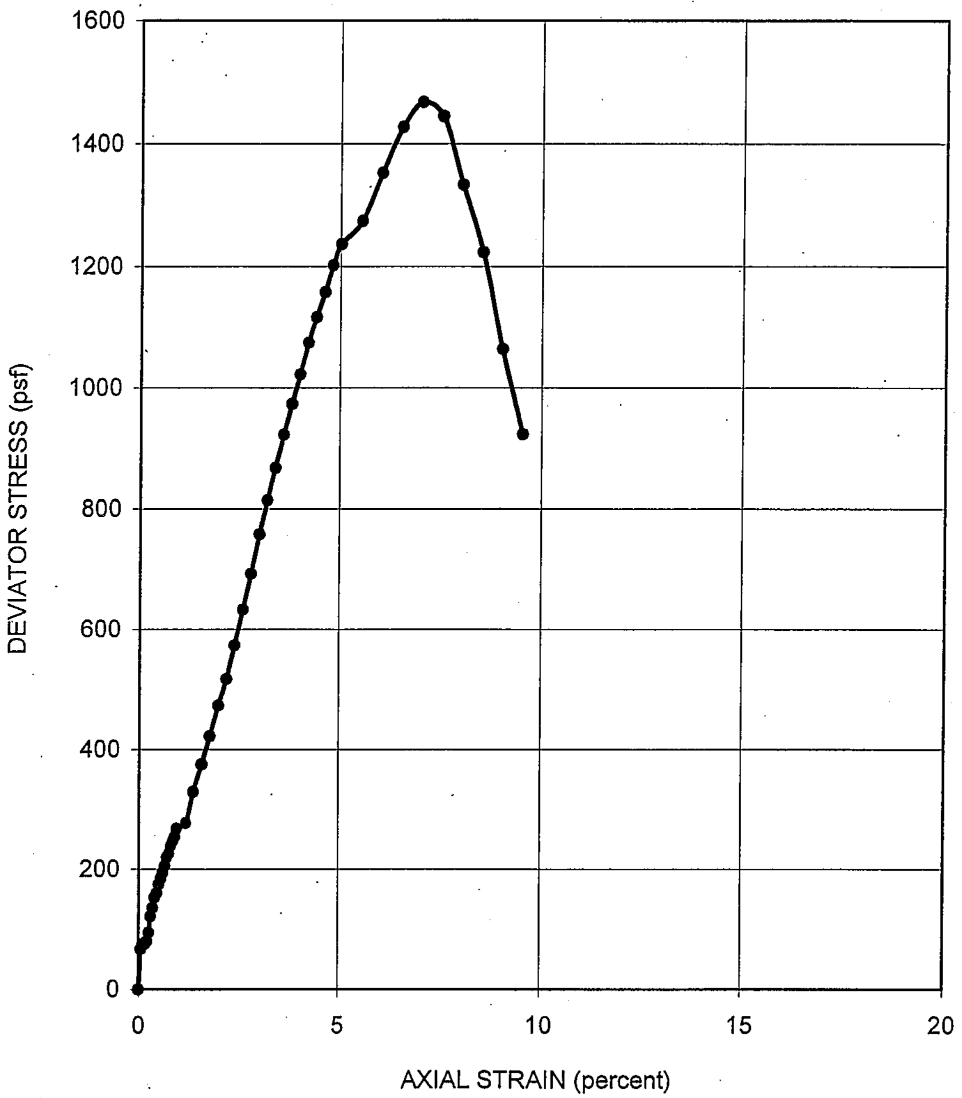
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 12/09/04 Project No. 3737.01 Figure B-5



SAMPLER TYPE	Shelby Tube		SHEAR STRENGTH	730	psf
DIAMETER (in.) 2.84	HEIGHT (in.) 5.74		STRAIN AT FAILURE	7.0	%
MOISTURE CONTENT	34.5	%	CONFINING PRESSURE	3,100	psf
DRY DENSITY	90	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	SANDY CLAY (CL), gray			SOURCE	B-2 at 30 feet

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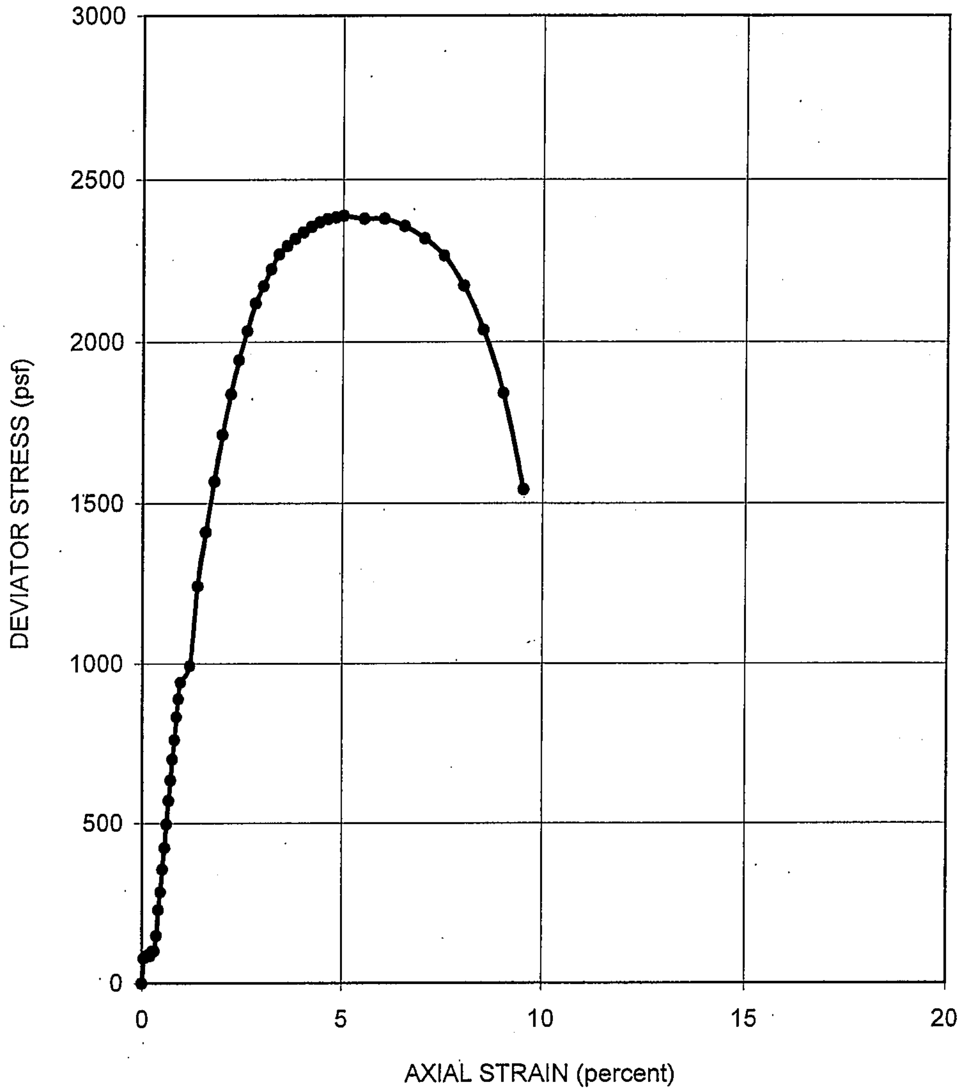
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 12/09/04 | Project No. 3737.01 | Figure B-6



SAMPLER TYPE	Shelby Tube			SHEAR STRENGTH	1,190	psf
DIAMETER (in.)	2.85	HEIGHT (in.)	6.00	STRAIN AT FAILURE	5.0	%
MOISTURE CONTENT		73.1	%	CONFINING PRESSURE	4,100	psf
DRY DENSITY		57	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	CLAY (CL), motted gray and brown			SOURCE	B-2 at 40 feet	

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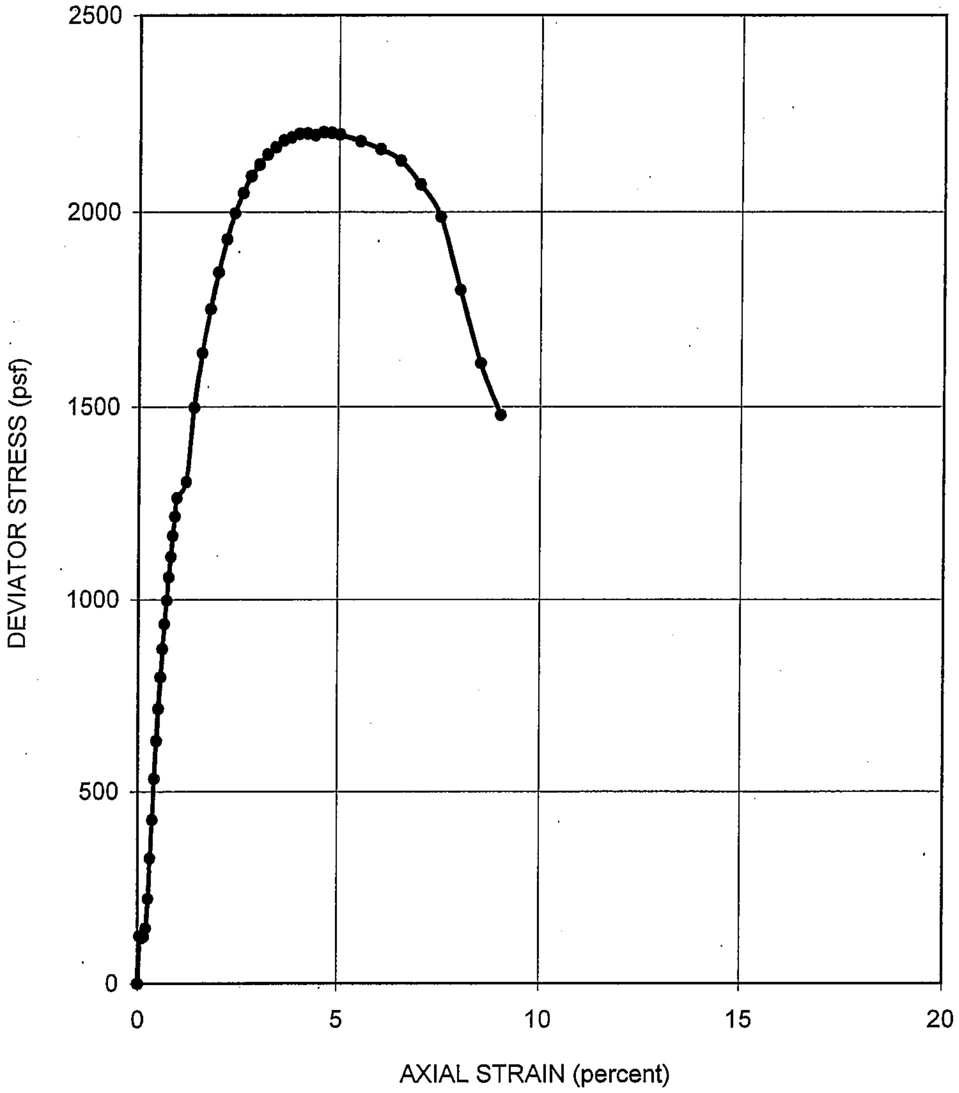
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date	12/09/04	Project No.	3737.01	Figure	B-7



SAMPLER TYPE	Shelby Tube			SHEAR STRENGTH	1,100	psf
DIAMETER (in.)	2.85	HEIGHT (in.)	6.00	STRAIN AT FAILURE	4.6	%
MOISTURE CONTENT		63.6	%	CONFINING PRESSURE	5,100	psf
DRY DENSITY		62	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	CLAY (CL), mottled gray and brown				SOURCE	B-2 at 50 feet

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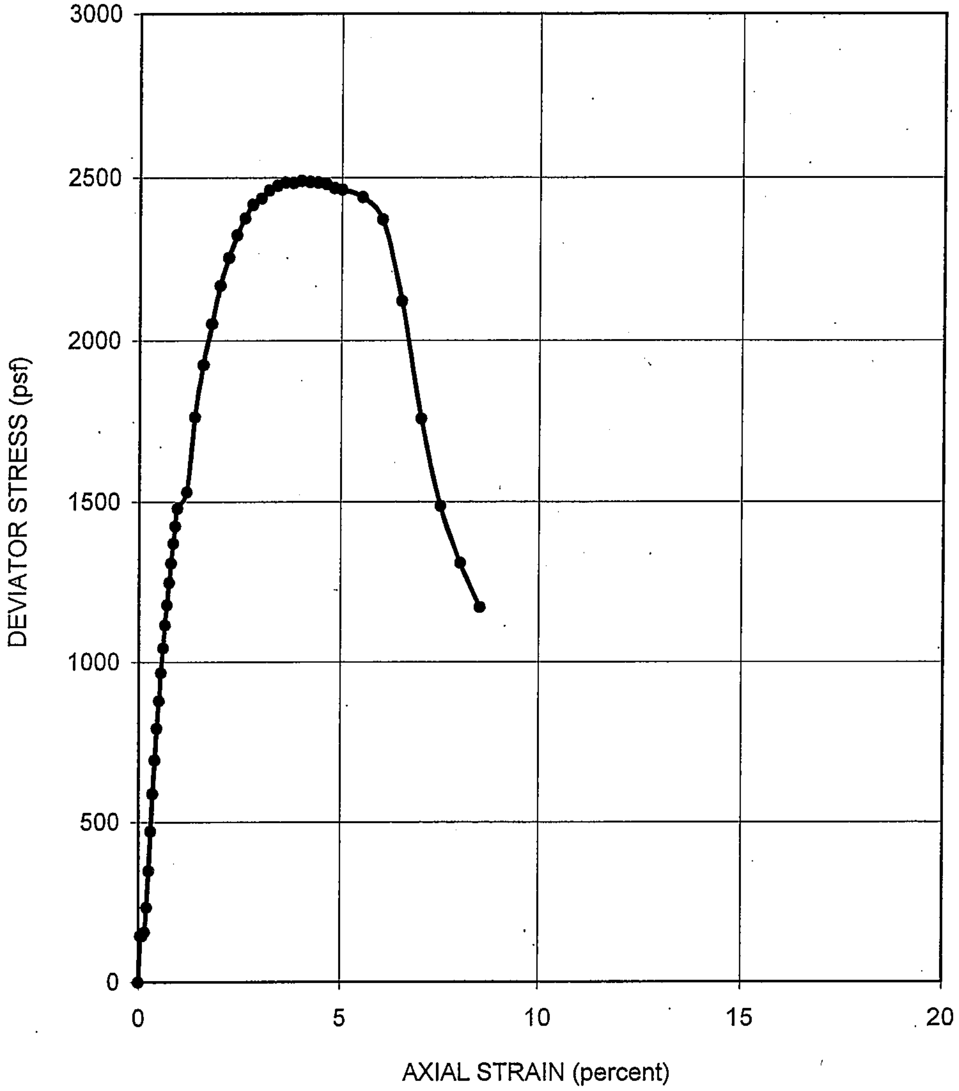
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date	12/09/04	Project No.	3737.01	Figure	B-8



SAMPLER TYPE	Shelby Tube			SHEAR STRENGTH	1,250	psf
DIAMETER (in.)	2.87	HEIGHT (in.)	6.00	STRAIN AT FAILURE	4.0	%
MOISTURE CONTENT		72.7	%	CONFINING PRESSURE	6,100	psf
DRY DENSITY		56	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	CLAY (CL), mottled gray and brown				SOURCE	B-2 at 60 feet

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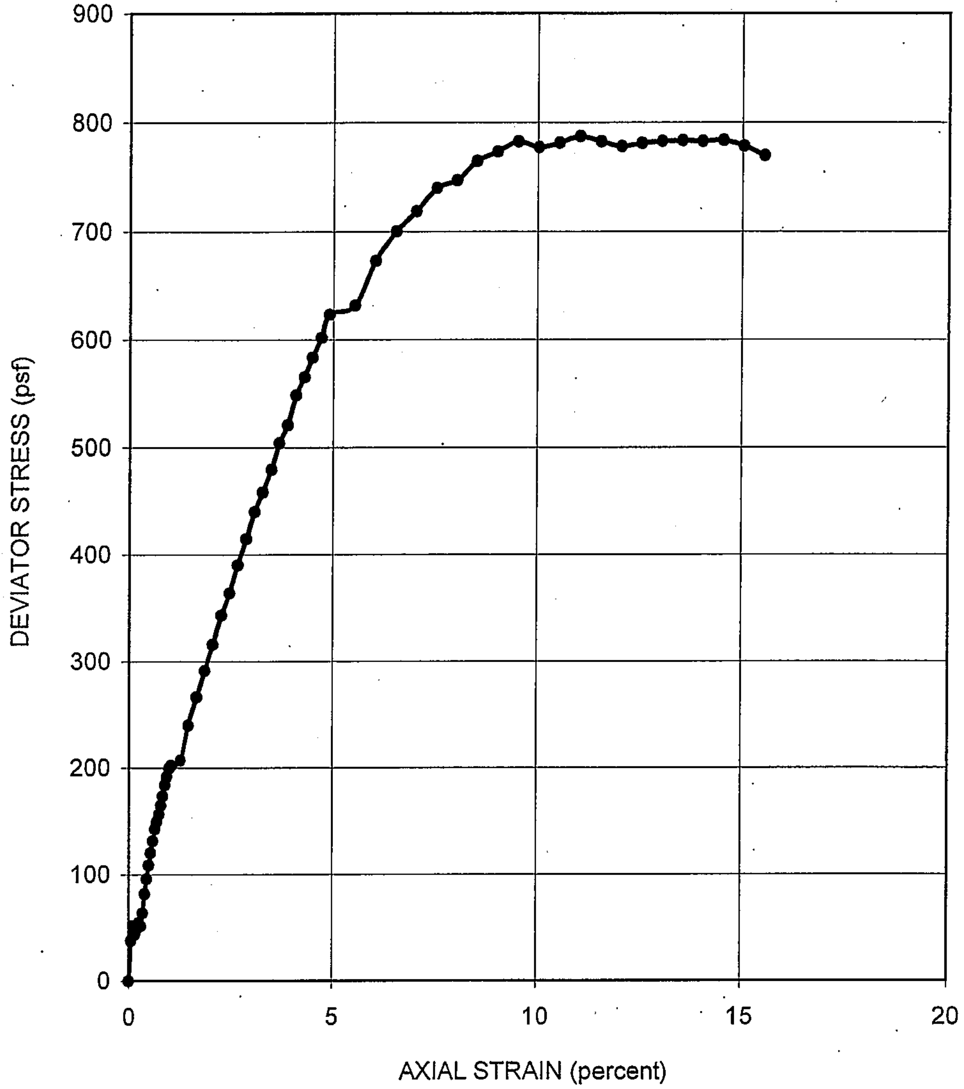
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date	12/09/04	Project No.	3737.01	Figure	B-9



SAMPLER TYPE	Shelby Tube			SHEAR STRENGTH	390	psf
DIAMETER (in.)	2.86	HEIGHT (in.)	5.86	STRAIN AT FAILURE	11.0	%
MOISTURE CONTENT		35.2	%	CONFINING PRESSURE	2,400	psf
DRY DENSITY		89	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	CLAY with SAND (CL), gray			SOURCE	B-3 at 22.5 feet	

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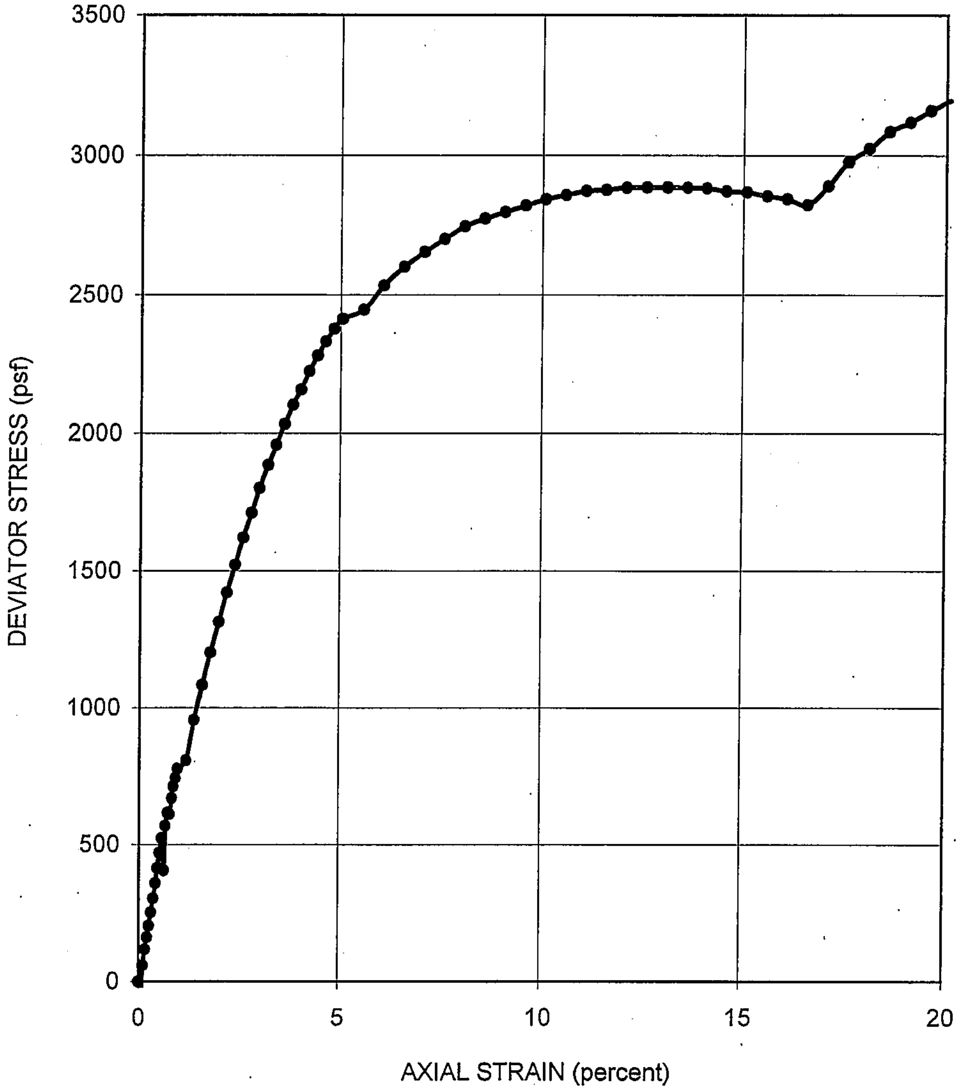
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 12/09/04 | Project No. 3737.01 | Figure B-10



SAMPLER TYPE	Shelby Tube		SHEAR STRENGTH	1,600	psf
DIAMETER (in.) 2.87	HEIGHT (in.) 6.02		STRAIN AT FAILURE	20.1	%
MOISTURE CONTENT	24.9	%	CONFINING PRESSURE	1,450	psf
DRY DENSITY	103	pcf	STRAIN RATE	1.00	% / min
DESCRIPTION	CLAY with SAND (CL), brown			SOURCE	B-5 at 15 feet

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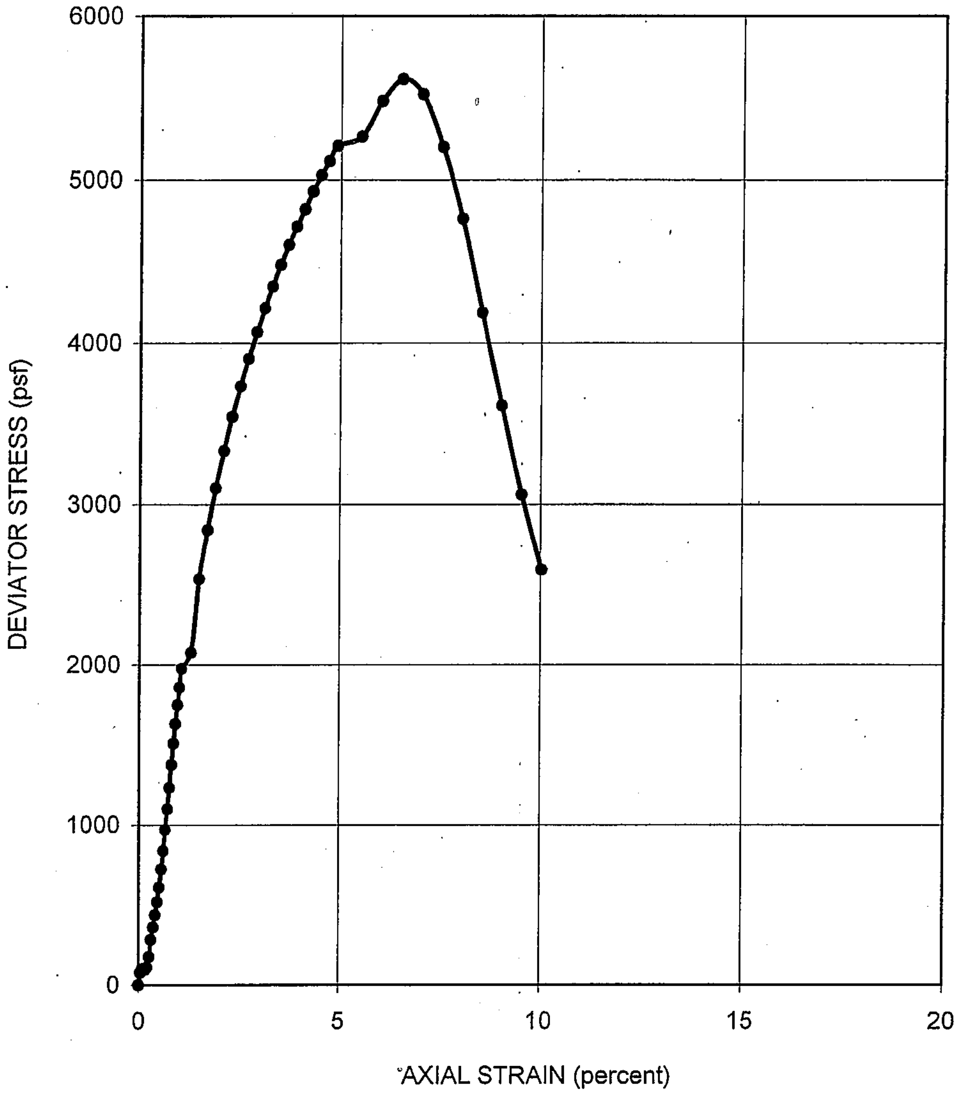
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 12/09/04 | Project No. 3737.01 | Figure B-13



SAMPLER TYPE	Sprague and Henwood			SHEAR STRENGTH	2,810	psf
DIAMETER (in.) 2.43	HEIGHT (in.) 5.95			STRAIN AT FAILURE	6.5	%
MOISTURE CONTENT		20.2	%	CONFINING PRESSURE	3,100	psf
DRY DENSITY		110	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	CLAY with SAND (CL), brown			SOURCE	B-4 at 30 feet	

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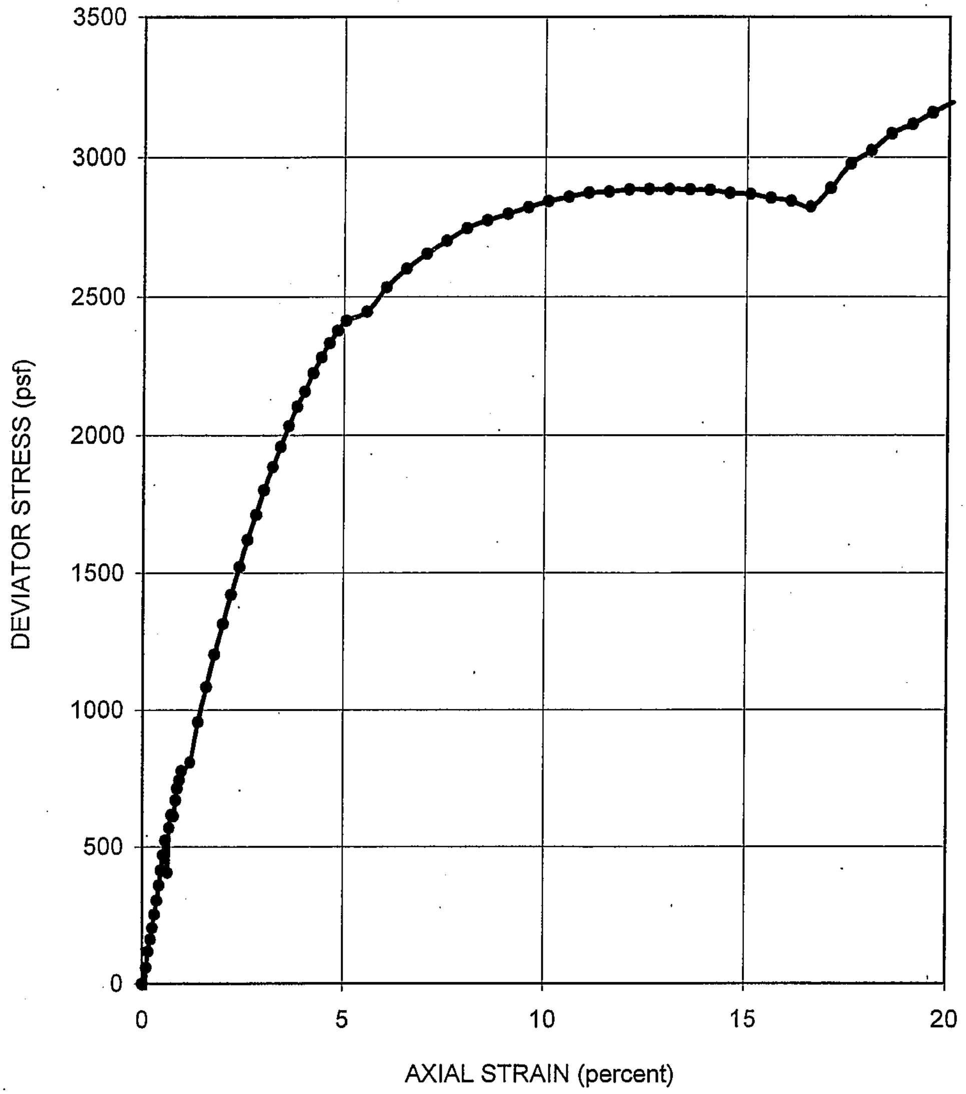
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 12/09/04 | Project No. 3737.01 | Figure B-12



SAMPLER TYPE	Shelby Tube		SHEAR STRENGTH	1,600	psf
DIAMETER (in.) 2.87	HEIGHT (in.) 6.02		STRAIN AT FAILURE	20.1	%
MOISTURE CONTENT	24.9	%	CONFINING PRESSURE	1,450	psf
DRY DENSITY	103	pcf	STRAIN RATE	1.00	% / min
DESCRIPTION	CLAY with SAND (CL), brown			SOURCE	B-5 at 15 feet

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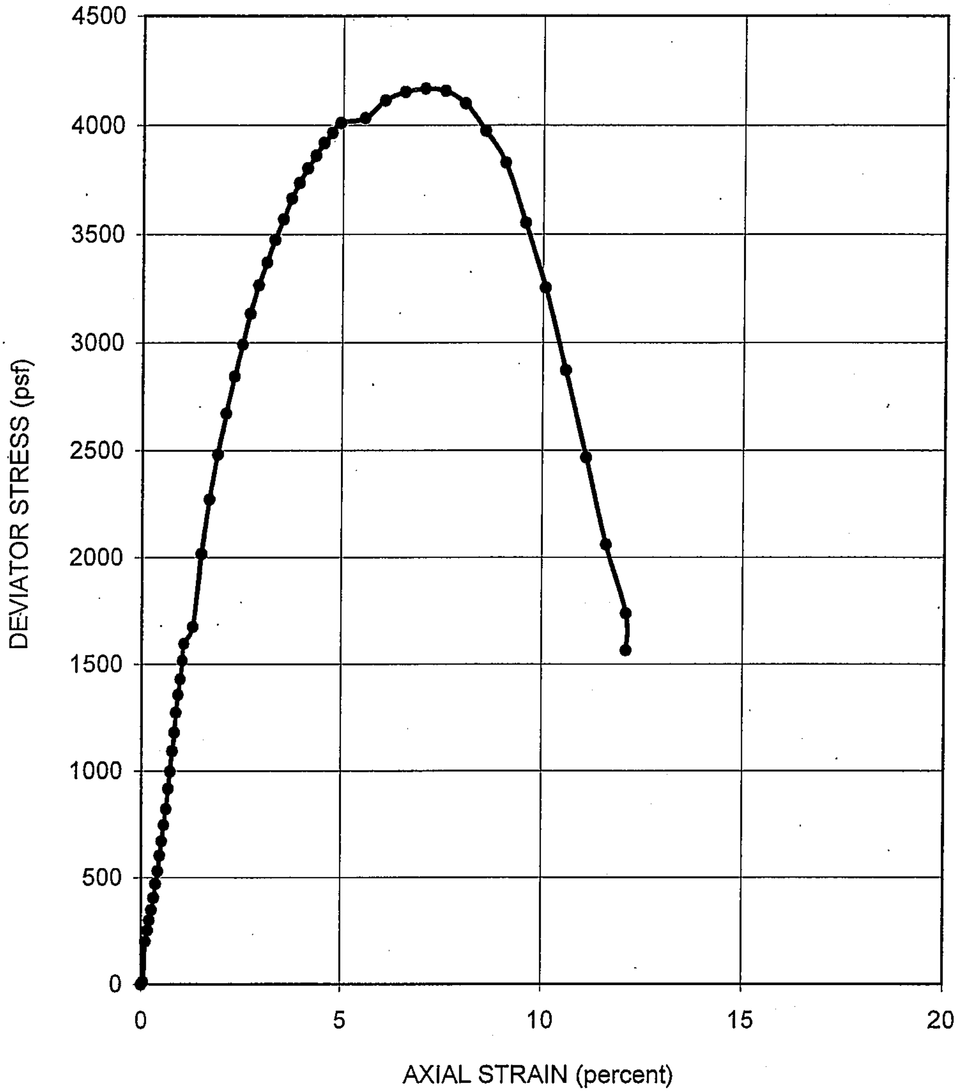
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date	12/09/04	Project No.	3737.01	Figure	B-13



SAMPLER TYPE	Sprague and Henwood		SHEAR STRENGTH	2,080	psf
DIAMETER (in.) 2.42	HEIGHT (in.) 5.97		STRAIN AT FAILURE	7.1	%
MOISTURE CONTENT	29.6	%	CONFINING PRESSURE	3,800	psf
DRY DENSITY	95	pcf	STRAIN RATE	1.00	% / min
DESCRIPTION	CLAY (CL), olive-brown			SOURCE	B-5 at 36 feet

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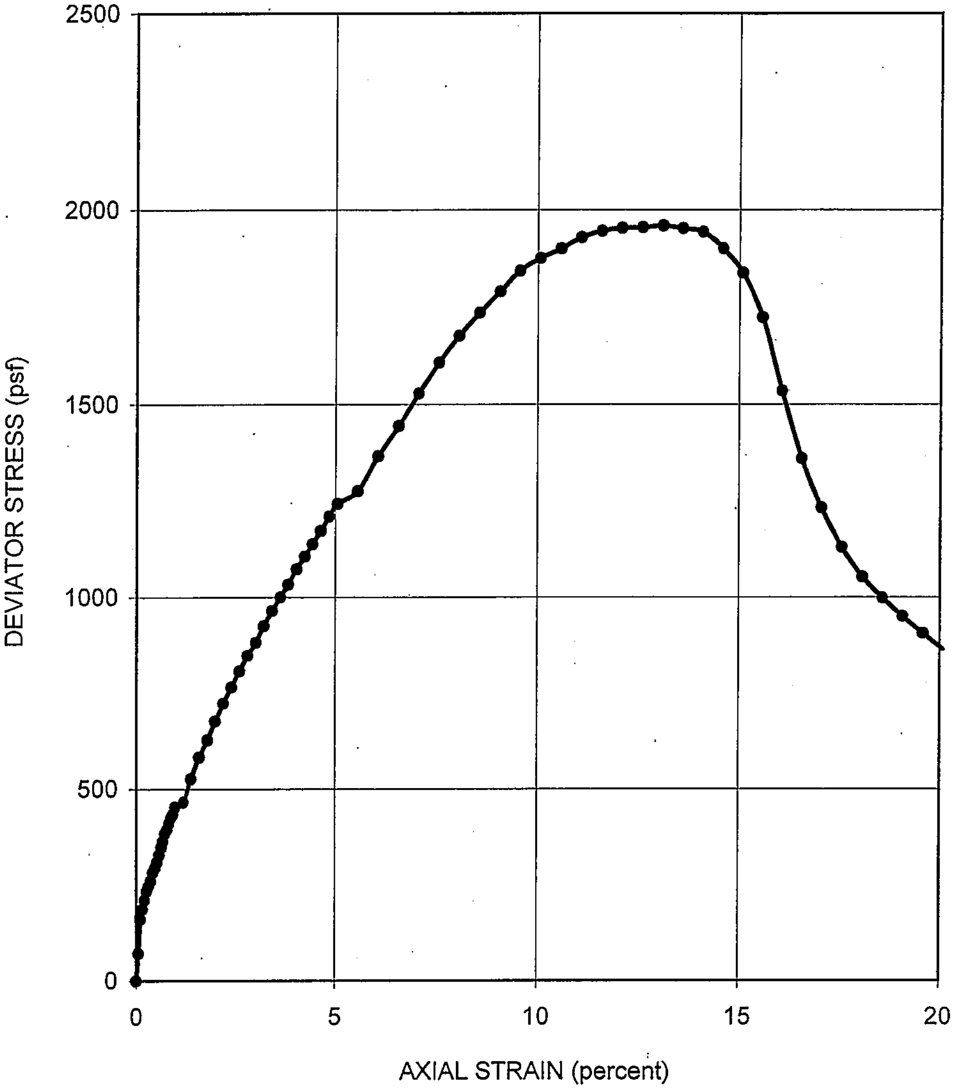
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date 12/09/04 | Project No. 3737.01 | Figure B-14



SAMPLER TYPE	Sprague and Henwood			SHEAR STRENGTH	980	psf
DIAMETER (in.)	2.39	HEIGHT (in.)	5.78	STRAIN AT FAILURE	13.1	%
MOISTURE CONTENT		30.1	%	CONFINING PRESSURE	4,200	psf
DRY DENSITY		96	pcf	STRAIN RATE	1.00	% / min
DESCRIPTION	CLAY with SAND (CL), mottled white and gray			SOURCE	B-7 at 39 feet	

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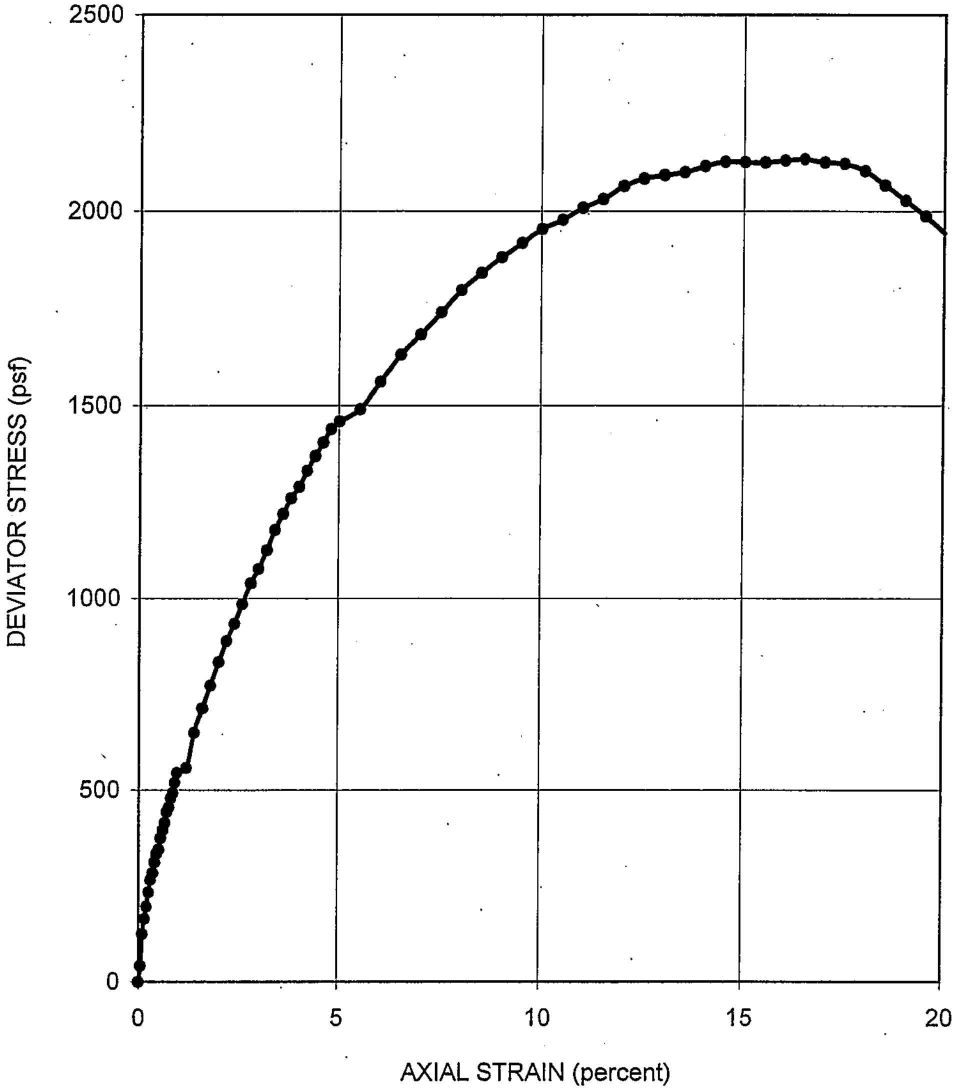
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

Date	12/09/04	Project No.	3737.01	Figure	B-15



SAMPLER TYPE	Sprague and Henwood			SHEAR STRENGTH	1,070	psf
DIAMETER (in.)	2.42	HEIGHT (in.)	5.96	STRAIN AT FAILURE	16.5	%
MOISTURE CONTENT		28.7	%	CONFINING PRESSURE	3,100	psf
DRY DENSITY		96	pcf	STRAIN RATE	0.50	% / min
DESCRIPTION	SANDY CLAY (CL), olive-gray			SOURCE	B-8 at 30.5 feet	

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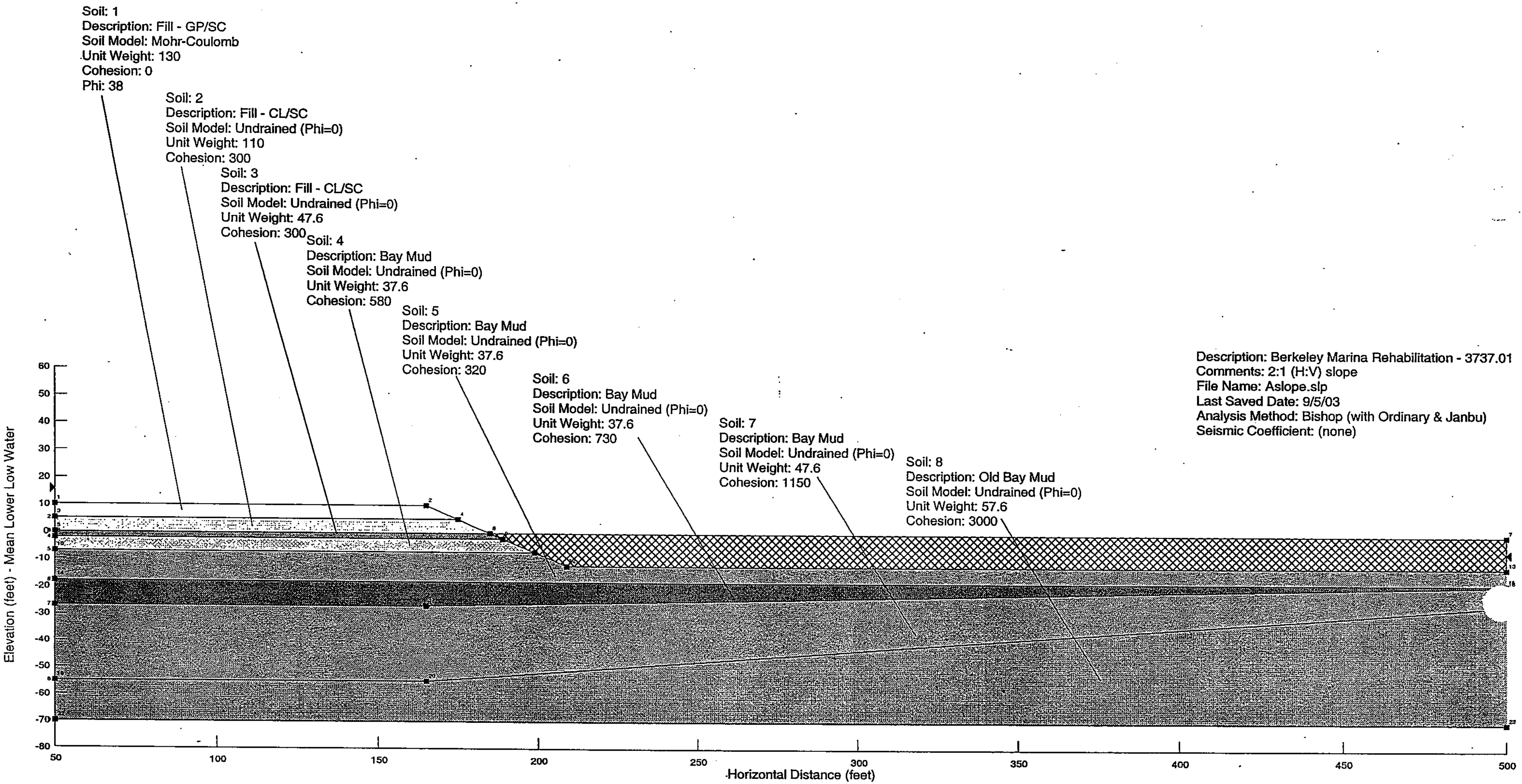
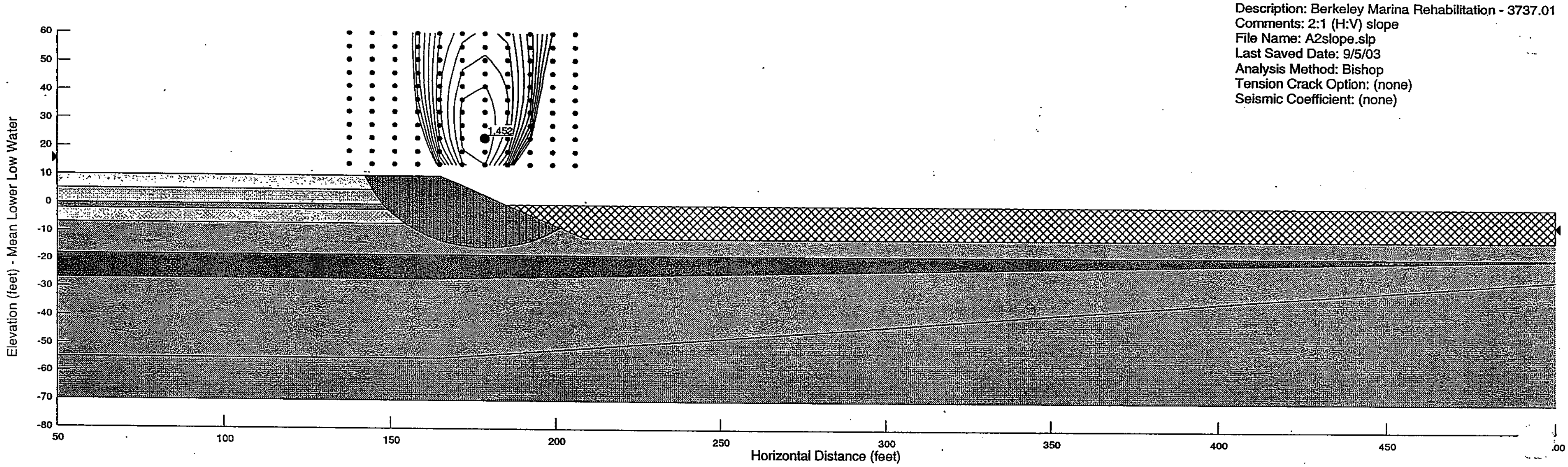
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

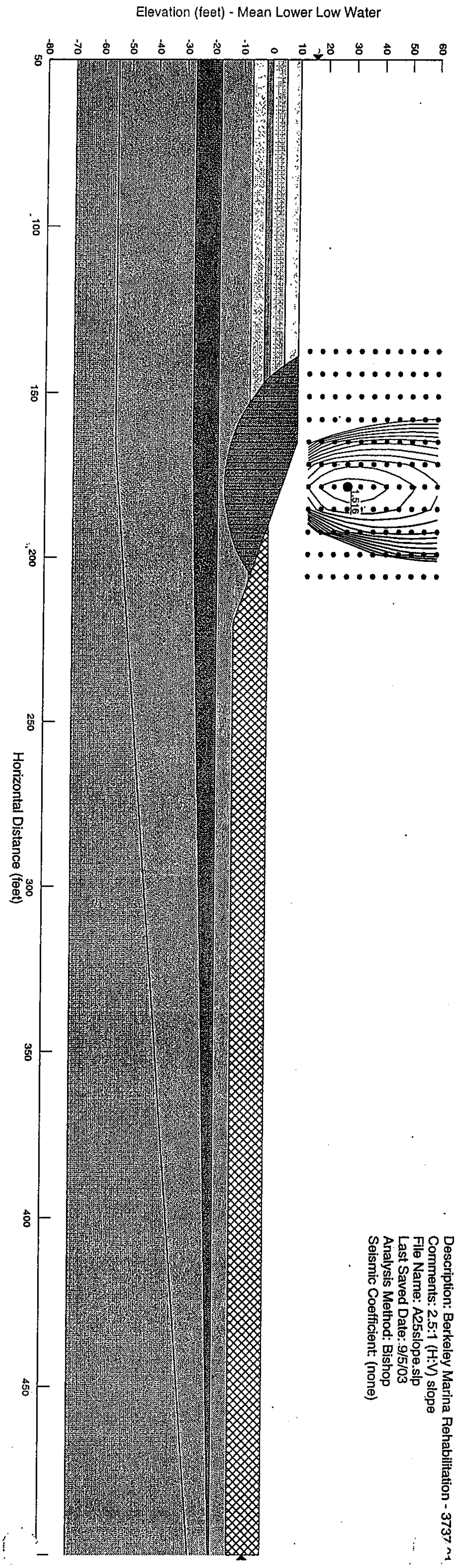
Date	12/09/04	Project No.	3737.01	Figure	B-16

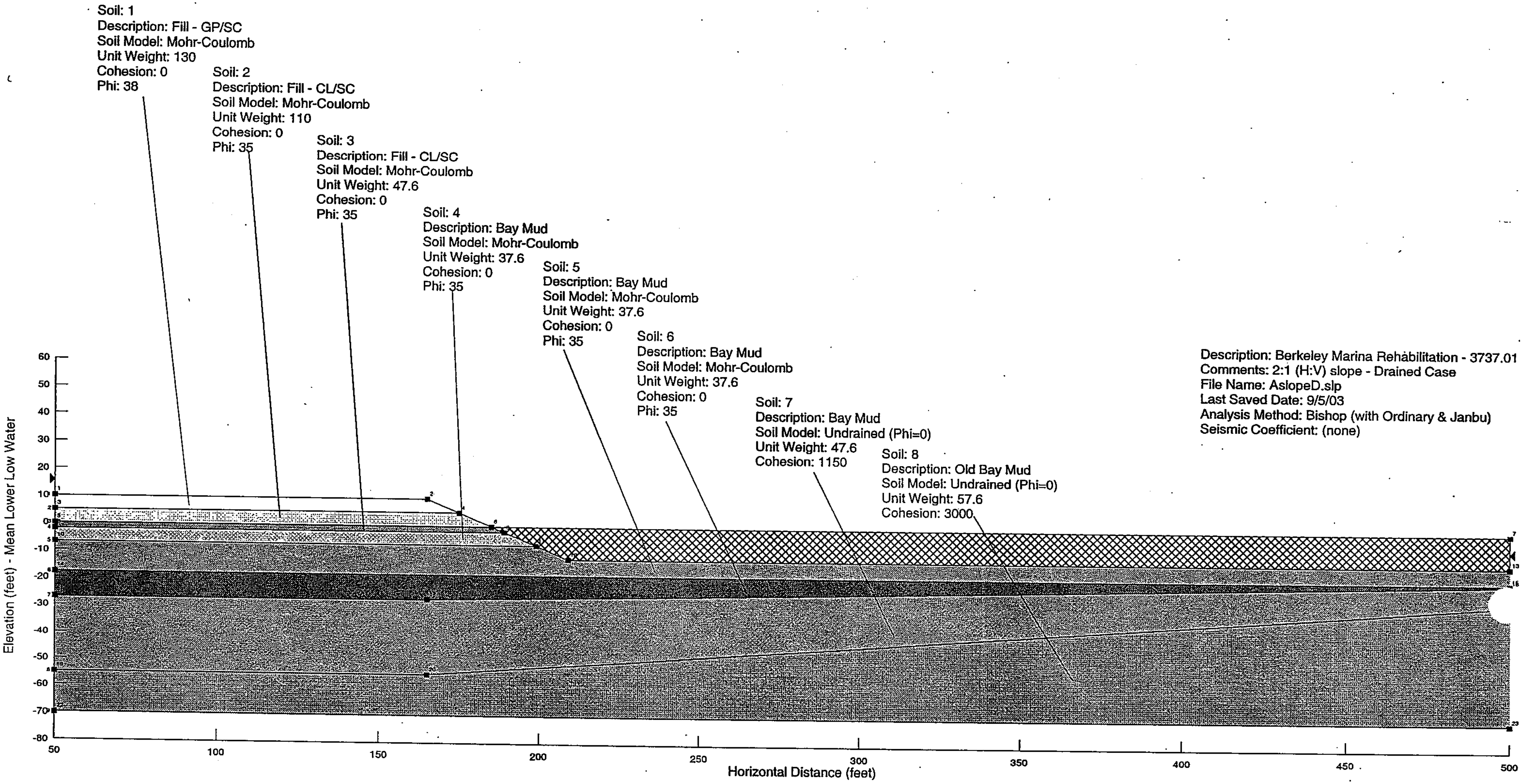
APPENDIX C
Slope Stability Analyses Results


Soil: 1
Description: Fill - GP/SC
Soil Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38
Soil: 2
Description: Fill - CL/SC
Soil Model: Undrained (Phi=0)
Unit Weight: 110
Cohesion: 300
Soil: 3
Description: Fill - CL/SC
Soil Model: Undrained (Phi=0)
Unit Weight: 47.6
Cohesion: 300
Soil: 4
Description: Bay Mud
Soil Model: Undrained (Phi=0)
Unit Weight: 37.6
Cohesion: 580
Soil: 5
Description: Bay Mud
Soil Model: Undrained (Phi=0)
Unit Weight: 37.6
Cohesion: 320
Soil: 6
Description: Bay Mud
Soil Model: Undrained (Phi=0)
Unit Weight: 37.6
Cohesion: 730
Soil: 7
Description: Bay Mud
Soil Model: Undrained (Phi=0)
Unit Weight: 47.6
Cohesion: 1150
Soil: 8
Description: Old Bay Mud
Soil Model: Undrained (Phi=0)
Unit Weight: 57.6
Cohesion: 3000
Description: Berkeley Marina Rehabilitation - 3737.01
Comments: 2:1 (H:V) slope
File Name: Aslope.slp
Last Saved Date: 9/5/03
Analysis Method: Bishop (with Ordinary & Janbu)
Seismic Coefficient: (none)
Elevation (feet) - Mean Lower Low Water
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
50
100
150
200
250
300
350
400
450
500
Horizontal Distance (feet)



Description: Berkeley Marina Rehabilitation - 3737.01
Comments: 2:1 (H:V) slope
File Name: A2slope.slp
Last Saved Date: 9/5/03
Analysis Method: Bishop
Tension Crack Option: (none)
Seismic Coefficient: (none)


Elevation (feet) - Mean Lower Low Water
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
50
100
150
200
250
300
350
400
450
Horizontal Distance (feet)
1.516
Description: Berkeley Marina Rehabilitation - 3737
Comments: 2.5:1 (H:V) slope
File Name: A25slope.slp
Last Saved Date: 9/5/03
Analysis Method: Bishop
Seismic Coefficient: (none)



Soil: 1
Description: Fill - GP/SC
Soil Model: Mohr-Coulomb
Unit Weight: 130
Cohesion: 0
Phi: 38

Soil: 2
Description: Fill - CL/SC
Soil Model: Mohr-Coulomb
Unit Weight: 110
Cohesion: 0
Phi: 35

Soil: 3
Description: Fill - CL/SC
Soil Model: Mohr-Coulomb
Unit Weight: 47.6
Cohesion: 0
Phi: 35

Soil: 4
Description: Bay Mud
Soil Model: Mohr-Coulomb
Unit Weight: 37.6
Cohesion: 0
Phi: 35

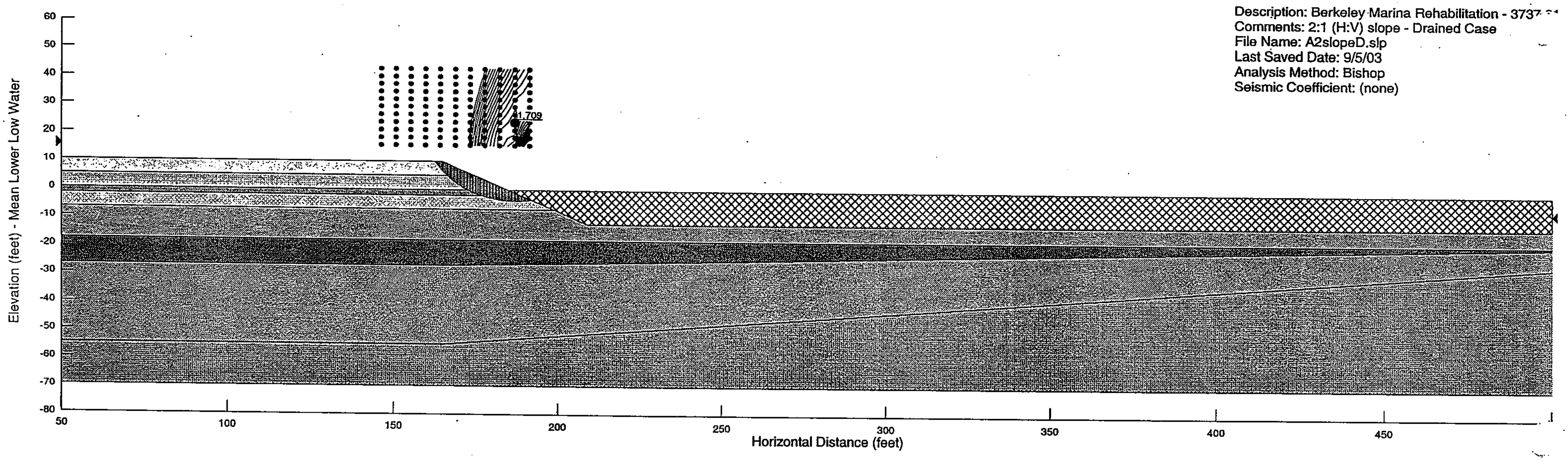
Soil: 5
Description: Bay Mud
Soil Model: Mohr-Coulomb
Unit Weight: 37.6
Cohesion: 0
Phi: 35

Soil: 6
Description: Bay Mud
Soil Model: Mohr-Coulomb
Unit Weight: 37.6
Cohesion: 0
Phi: 35

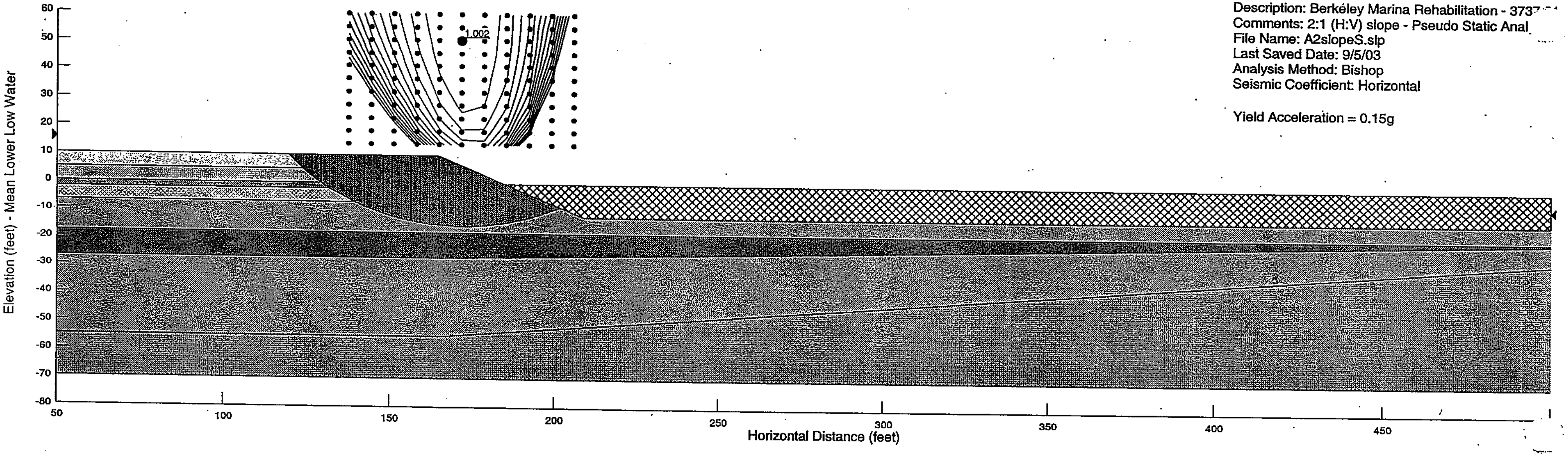
Soil: 7
Description: Bay Mud
Soil Model: Undrained (Phi=0)
Unit Weight: 47.6
Cohesion: 1150

Soil: 8
Description: Old Bay Mud
Soil Model: Undrained (Phi=0)
Unit Weight: 57.6
Cohesion: 3000

Description: Berkeley Marina Rehabilitation - 3737.01
Comments: 2:1 (H:V) slope - Drained Case
File Name: AslopeD.slp
Last Saved Date: 9/5/03
Analysis Method: Bishop (with Ordinary & Janbu)
Seismic Coefficient: (none)



Description: Berkeley Marina Rehabilitation - 3737
Comments: 2:1 (H:V) slope - Drained Case
File Name: A2slopeD.slp
Last Saved Date: 9/5/03
Analysis Method: Bishop
Seismic Coefficient: (none)



Description: Berkeley Marina Rehabilitation - 3737
Comments: 2:1 (H:V) slope - Pseudo Static Anal
File Name: A2slopeS.slp
Last Saved Date: 9/5/03
Analysis Method: Bishop
Seismic Coefficient: Horizontal

Yield Acceleration = 0.15g

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Geotechnical Engineer