LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

Piezometer Installation Report

Reclamation District 2030

McDonald Island

San Joaquin County, CA

Report No. 2053-1 has been prepared for:

Reclamation District 2030

San Joaquin County, California

July 15, 2004

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PIEZOMETER INSTALLATION REPORT

RECLAMATION DISTRICT 2030

MCDONALD ISLAND

SAN JOAQUIN COUNTY, CA

1.0 INTRODUCTION

In this report we present the results of our piezometer[1] installations in the McDonald Island levee and levee berm embankment and foundation soils along Empire Cut. The piezometers are located on the south side of McDonald Island, across Empire Cut from the recently flooded Lower Jones Tract. The site location is shown on the Vicinity Map, Figure 1. The purpose of installing and monitoring the piezometers is to observe ground water levels and changes associated with the flooding of Lower Jones Tract and the planned removal of the flood waters by pumping.

For our use we received topographic maps of the levee adjacent to Empire Cut from Kjeldsen, Sinnock & Neudeck, Inc., Consulting Engineers and Land Surveyors, and District Engineers for McDonald Island.

2.0 SITE CONDITIONS

Figure 2 is a copy of the topographic map of the general site area. Figures 3A and 3B are photos of the site area. The elevations of the top of the levee and the levee berm are about Elev. 10 feet (NGVD) and Elev. -8 feet, respectively. The top of the levee is covered with a layer of aggregate base. An approximate levee cross section scaled from the topographic map provided to us is shown on Figure 4. The levee slopes down to the north were adjacent farmland is about Elev. –15 feet or about 25 feet below the top of the levee.

3.0 SUBSURFACE CONDITIONS

Subsurface drilling and sampling to install the piezometers was performed on June 23 through 28, 2004, using conventional, truck-mounted rotary wash drilling equipment. Eight borings were drilled to depths ranging from 10 to 55½ feet. The approximate locations of the borings are shown on the Site Plan, Figure 2. At each piezometer location, except Boring EB-3, a deeper boring was initially drilled to install the deepest piezometer; then, another shallower boring was drilled about 5 to 8 feet from the deeper boring to install a shallow piezometer. At Boring EB-3, the more shallow boring (EB-3A) was drilled and completed initially so that it could be completed in the same day; then, a deeper boring was offset from Boring EB-3A to complete the lower portions of the log for Boring EB-3. The piezometer installation and depths are further described in following sections. The borings were permitted and backfilled in accordance with San Joaquin County guidelines. Logs of our borings and details

[1] Piezometers are borings, observation wells or water pressure sensors used to measure ground water depths or pressures. For this project, the piezometers are small pressure sensors installed in drilled holes as described in more detail in this report.

regarding our field investigation are included in Appendix A; our laboratory tests are discussed in Appendix B.

Typical subsurface conditions found in the borings consists of levee and berm fill, over peat and organic soils, over alluvial[2] soils. The levee fill was about 10 feet thick beneath the top of the levee and generally consisted of very loose to stiff sandy silt and very stiff to hard lean clay with sand. The levee berm fill was about 7 feet thick at the piezometer locations on the berm and generally consisted of very stiff lean clay with sand and medium dense clayey sand. Below the levee and berm fill, varying depths of soft peat and organic soils were encountered to approximate elevations ranging from Elev. –17 to –27 feet. Below the peat and organic soils, interbedded layers of medium dense silty to clayey sands, medium dense to very dense poorly graded sands with varying degrees of silts, and very stiff lean clay with sand were encountered to the terminal depths of the borings.

3.1 Hydraulic Conductivities

Hydraulic conductivity is a measure of the capacity of soil to transmit water through its voids. Hydraulic conductivites vary from about 7 centimeters per second (cm/sec) or 20,000 feet per day for a ¾ to $^3/_8$-inch size gravel to less than 1×10^{-7} cm/sec for some high plasticity clays.

We performed eight gradation tests on samples of the alluvial soils beneath the peat and organic soils to estimate the hydraulic conductivity of the silty sand to sand alluvial soils. From correlation relationships we estimate that the hydraulic conductivity of the alluvium ranges from about 2×10^{-2} to 2×10^{-3} cm/sec or about 5 to 53 feet per day from correlation relationships. We estimate that the hydraulic conductivity of the peat and organic soil ranges from about 1×10^{-3} to 1×10^{-5} cm/sec or 3 to 0.03 feet per day.

4.0 PIEZOMETER INSTALLATION

Table 1 is a summary of the piezometer installations. Shallow piezometers were installed near the middle of the peat and organic soil layer. Deeper piezometers were installed in the alluvial soils about 10 to 20 feet below the bottom of the peat and organic soil layer. Each piezometer was installed near the middle of an approximately 5 feet long sanded collection zone. Then a bentonite pellet seal about 3 feet thick was placed above the sand. The boring was then grouted to near the surface with a water-cement grout. Figure 5 provides details for each piezometer.

[2] Alluvial soils are soils that have been transported and deposited by flowing water. In the site area, the alluvial soils may consist of alluvial fan deposits composed of soils eroded from the mountains to the west or river (fluvial) deposits from rivers, streams or sloughs that previously flowed through the area.

Table 1. Piezometer Installation Summary

Piezo-meter	Ground Surface Elevation (ft)	Bottom of Cement Elevation (ft)	Bottom of Bentonite Elevation (ft)	Piezometer Elevation (ft)	Bottom of Sand Elevation (ft)	Total Piezometer Depth (ft)
EB-1	10	-38	-41	-43	-45½	55½
EB-1A	10	-6½	-10	-12	-14	24
EB-2	-8	-25½	-28	-30	-33½	25½
EB-2A	-8	-11	-14	-16	-18	10
EB-3	10	-37	-40	-43	-45½	55½
EB-3A	10	-7	-10	-12	-15½	25½
EB-4	-8	-29½	-32	-36	-39½	31½
EB-4A	-8	-15½	-17½	-20	-22	14

5.0 PIEZOMETER MEASUREMENTS

As mentioned in the previous section, the piezometers were installed as pairs and each piezometer within the pair was installed in different soil layers. The piezometers measure the pore water pressure within the surrounding soil and the measurements are recorded in a data collector, called a minilogger. Two days after all of the piezometers were installed, on June 30th, 2004, an initial set of piezometer measurements was collected from the minilogger to confirm that all of the piezometers were operating properly and collect the data measurements made by the minilogger since the piezometers were installed. Table 2 summarizes the piezometer and groundwater data. The groundwater depth and elevation data is based on the measurements collected on the morning of June 30th, 2004.

Table 3. Piezometer Data Summary

Piezo.	Station	Location	GS Elev. (ft)	Piez. Depth (ft)	Piez. Elev. (ft)	GW Depth[2.] (ft)	GW Elev.[2.] (ft)
EB-1	630+85	Levee	10	53	-43	21	-11
EB-1A	630+91	Levee	10	22	-12	10	0
EB-2	630+82	Berm	-8	22	-30	3	-11
EB-2A	630+77	Berm	-8	8	-16	5	-13
EB-3	624+56	Levee	10	53	-43	19	-9
EB-3A	624+51	Levee	10	22	-12	11	-1
EB-4	624+51	Berm	-8	28	-36	2	-10
EB-4A	624+46	Berm	-8	12	-20	3	-11

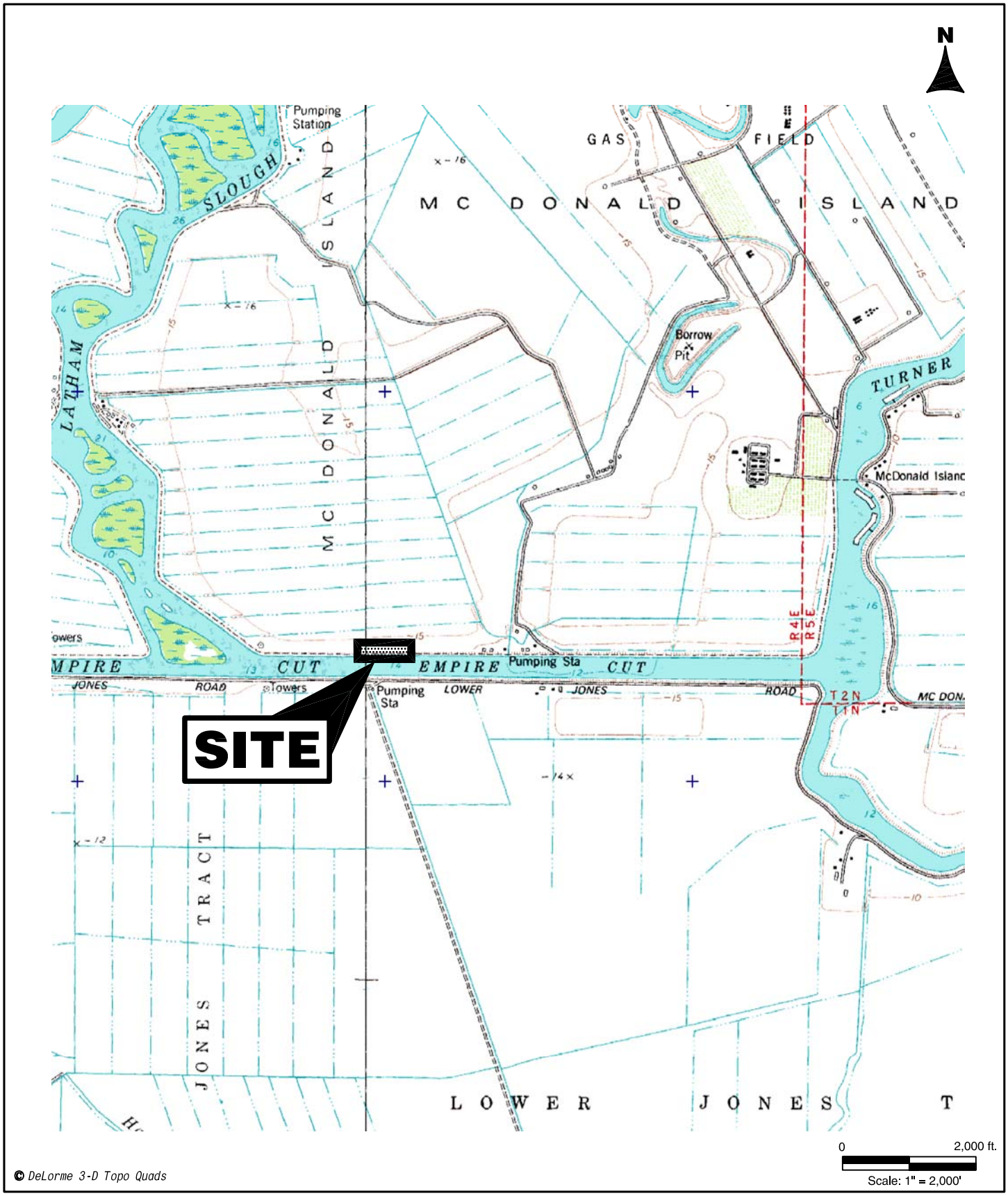
Notes:
1. Piez – piezometer; GS – ground surface; GW – ground water; Elev. – elevation.
2. Depths and elevations are for measurements about 8am on June 30, 2004. Figures 6A to 6D show measurements made through June 30, 2004.

Figures 6A to 6D show piezometer measurements made through June 30, 2004. The piezometers installed within the peat and organic soil layer on the levee (EB-1A & EB-3A) indicate ground water levels that are near the lower range of water surface elevations in Empire Cut. The deeper piezometers beneath the main section of the levee and the shallow and deeper piezometers beneath the levee berm indicate ground water levels within a range of about Elev. –9 to –13 feet. The slight periodic waviness of the data shows the effects of tidal variations.

Beneath the levee berm, the ground water level of the deeper piezometers is about 2 to 3 feet higher than the ground water elevation of the shallow piezometers indicating an upward seepage gradient of about 0.2. The seepage gradient is defined as the loss in hydraulic head over the length of vertical upward seepage.

The piezometer data loggers will continue to record ground water pressures which can be collected periodically as Lower Jones Tract is pumped out and restored. The piezometer data loggers are programmed to record and store the ground water pressures every two hours, which appears to provide satisfactory number of daily measurements.

* * * * * * * * * * * * *



7/04*EB

VICINITY MAP

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Stockton, California

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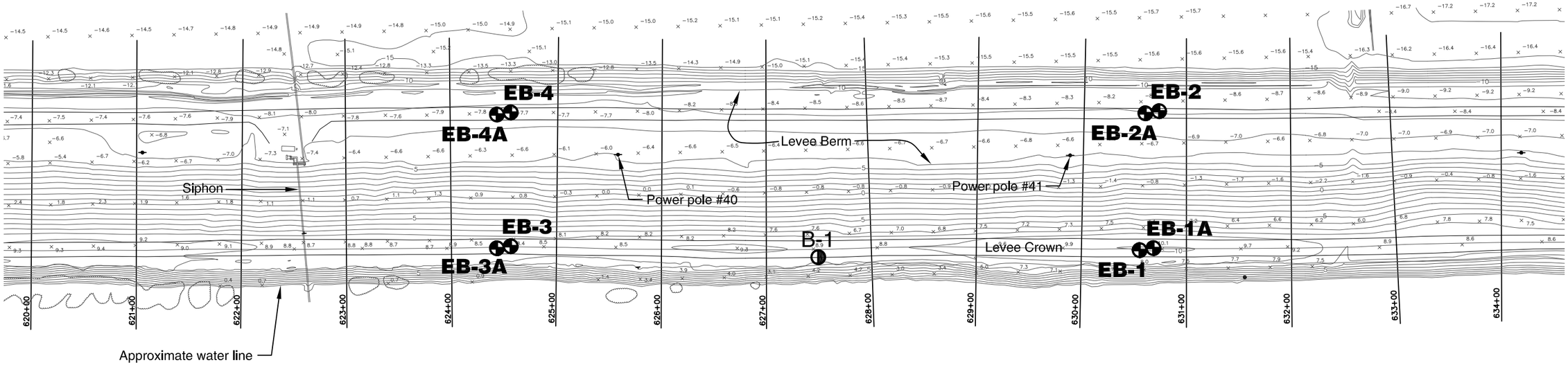
FIGURE 1
2053-1

N

McDonald Island



Empire Cut

0 100 ft.

Scale: 1" = 100'

LEGEND

- ◓ - Approximate location of exploratory boring
- ◑ - Approximate location of previous exploratory boring by Dames & Moore (1984)

Base by Kjeldsen Sinnock Neudeck, dated 8/03.

SITE PLAN

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FIGURE 2

2053-1

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PHOTOGRAPH 1
Aerial view of McDonald Island to the north, Empire Cut in the middle, and the flooded Jones Tract to the south.

PHOTOGRAPH 2
Facing west on the levee. Empire Cut to the left and farmland to the right.

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SITE PHOTOGRAPHS 1 AND 2

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FIGURE 3A
2053-1

PHOTOGRAPH 3
Farmland north of the levee along Empire Cut.

PHOTOGRAPH 4
Saturation of the farmland due to seepage associated with Lower Jones Tract flooding.

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SITE PHOTOGRAPHS 3 AND 4

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Stockton, California

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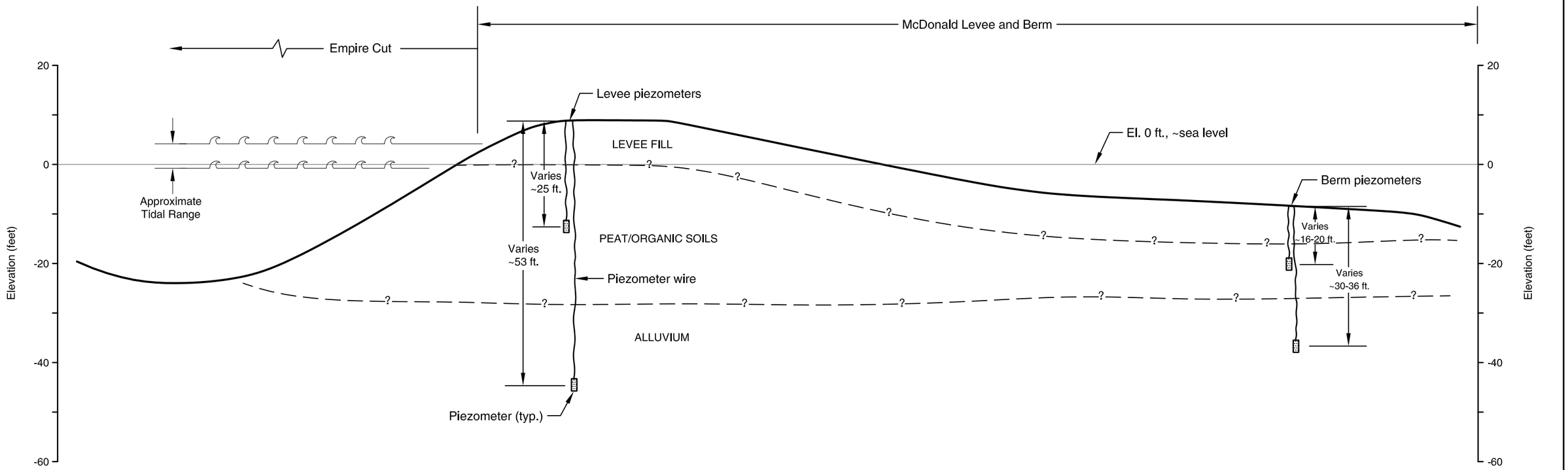
FIGURE 3B
2053-1



Horizontal=Vertical

0 20 ft.

Scale: 1" = 20'

TYPICAL LEVEE SECTION

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FIGURE 4

2053-1

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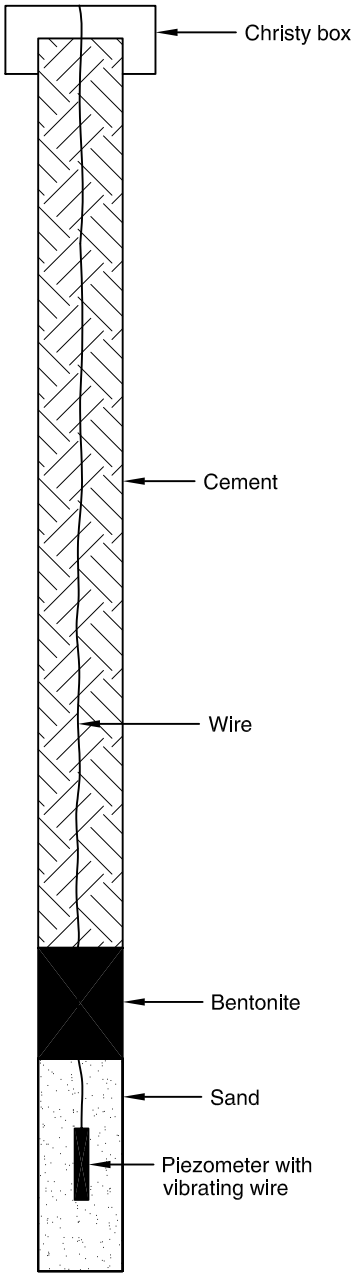
Piezometer	Ground Surface Elevation (ft)	Cement Elevation (ft)	Bentonite Elevation (ft)	Sand Elevation (ft)	Total Piezometer Depth (ft)
EB-1	10	-38	-43	-45.5	55.5
EB-1A	10	-6.5	-12	-14	24
EB-2	-8	-25.5	-30	-33.5	25.5
EB-2A	-8	-11	-16	-18	10
EB-3	10	-37	-43	-45.5	55.5
EB-3A	10	-7	-12	-15.5	25.5
EB-4	-8	-29.5	-36	-39.5	31.5
EB-4A	-8	-15.5	-20	-22	14



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PIEZOMETER DETAIL

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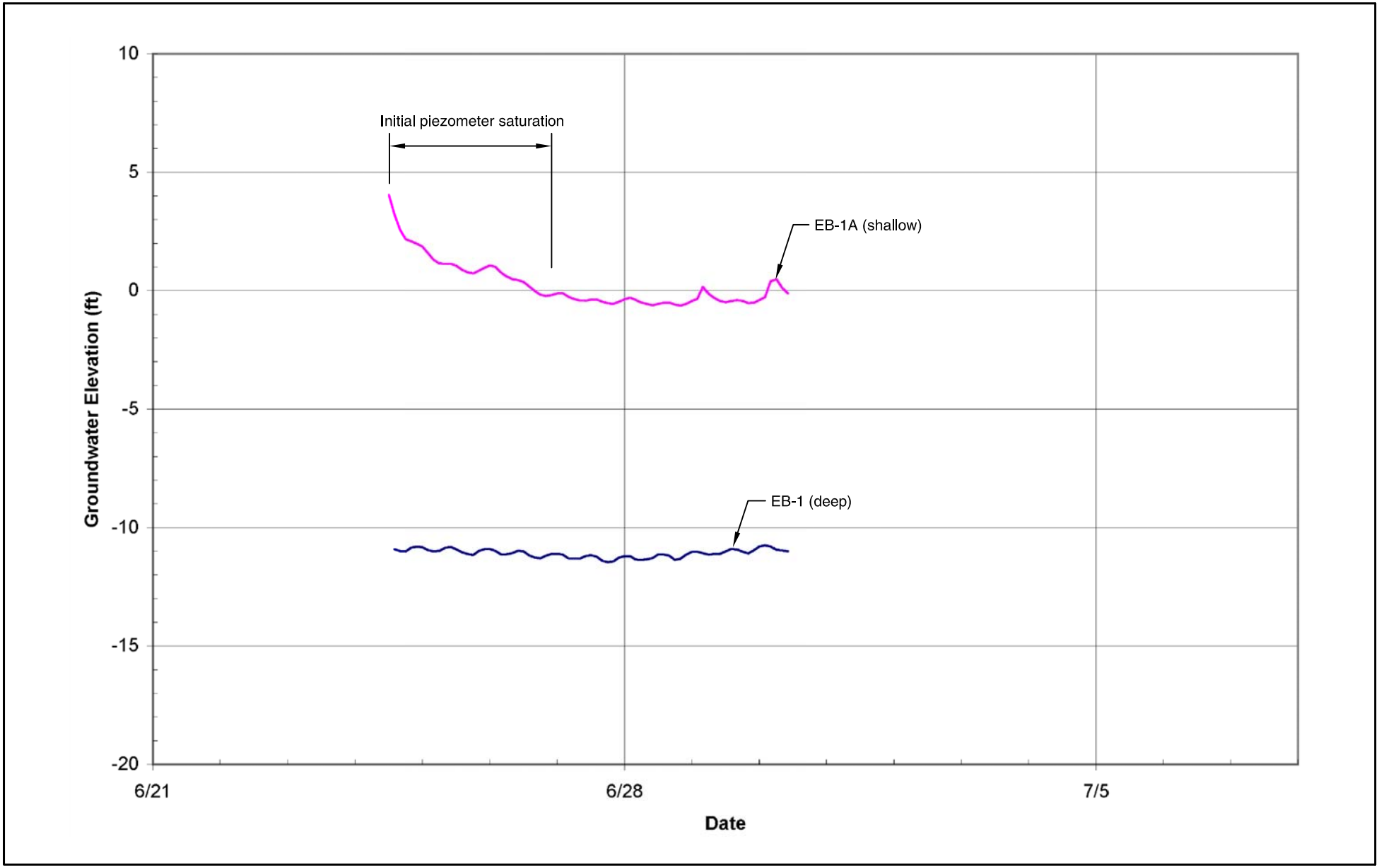
FIGURE 5
2053-1



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GROUND WATER ELEVATION VERSES TIME

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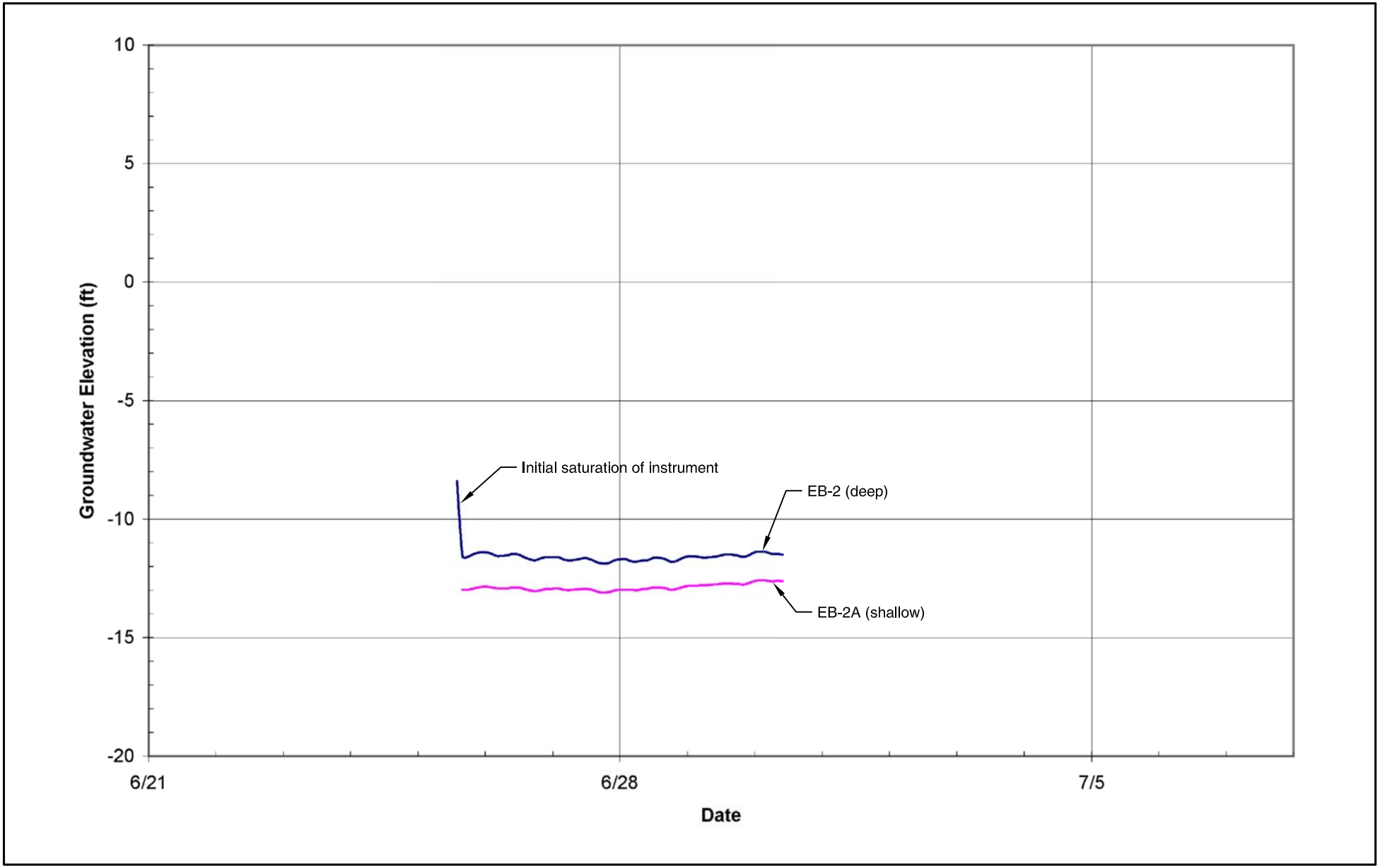
FIGURE 6A
2053-1



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GROUND WATER ELEVATION VERSES TIME

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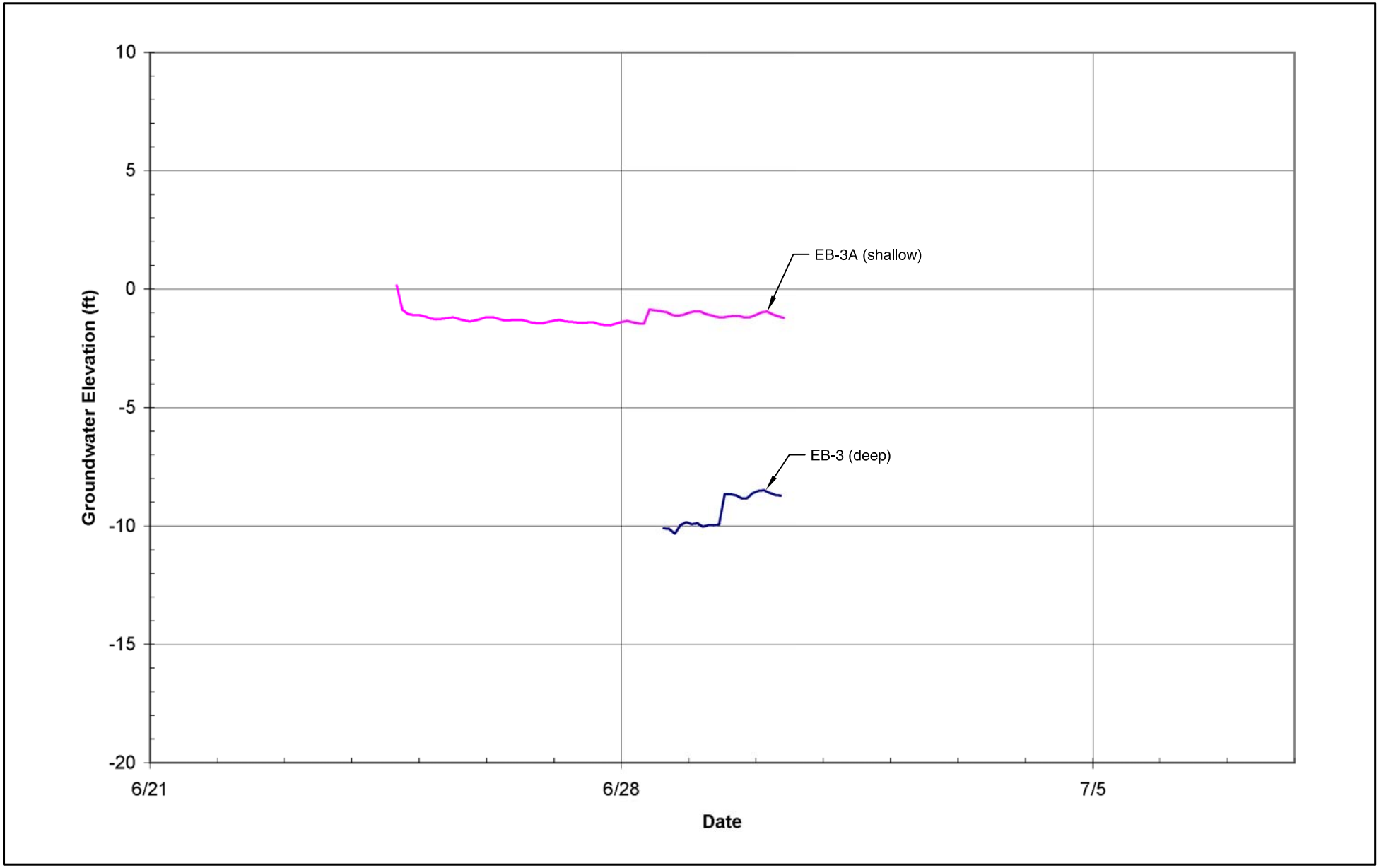
FIGURE 6B
2053-1



7/04*EB

GROUND WATER ELEVATION VERSES TIME

McDONALD ISLAND
Stockton, California

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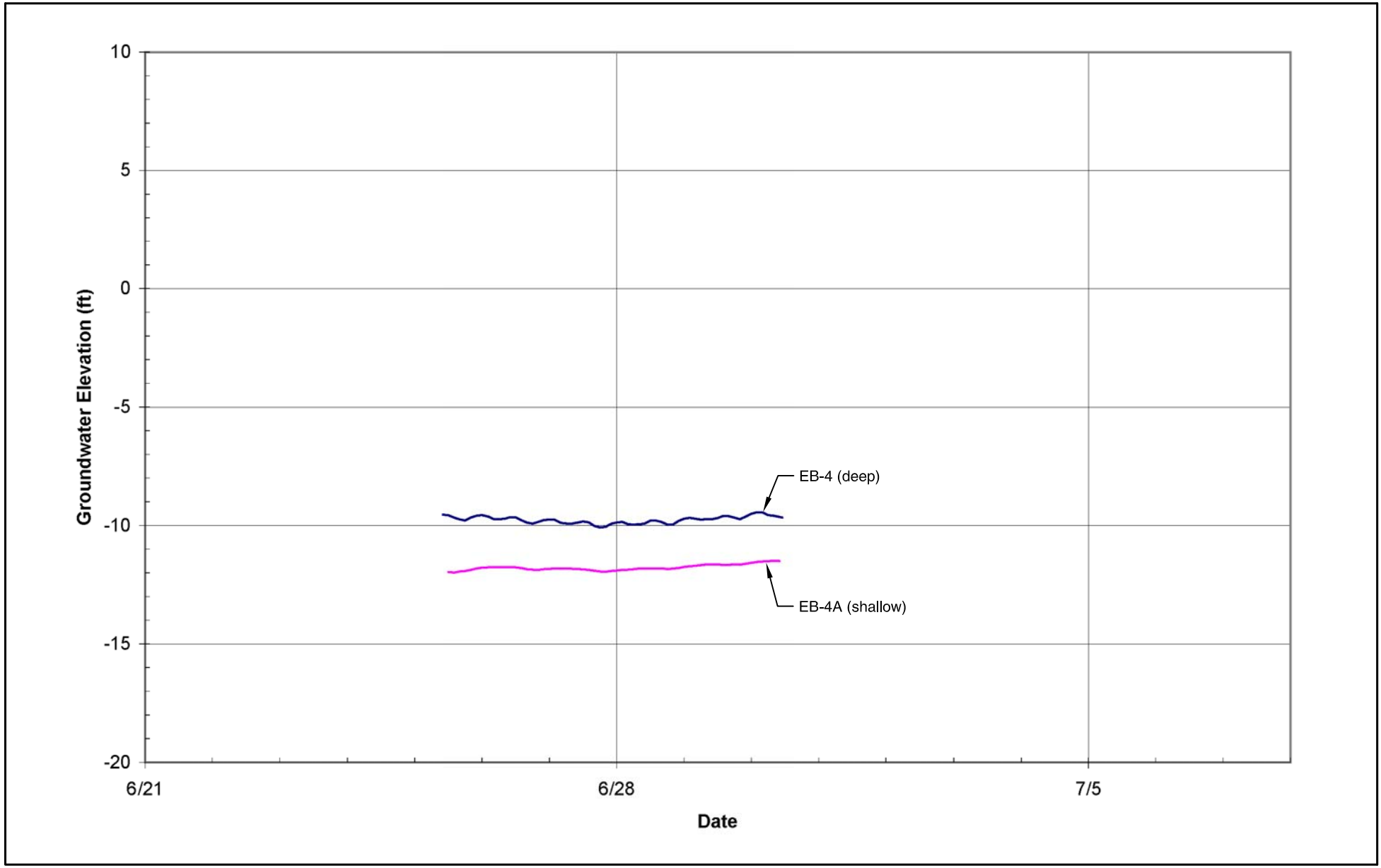
FIGURE 6C
2053-1



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GROUND WATER ELEVATION VERSES TIME

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FIGURE 6D
2053-1

APPENDIX A

FIELD INVESTIGATION

The piezometer installation consisted of installing eight vibrating wire piezometers in borings drilled with truck-mounted, rotary-wash auger drilling equipment. Eight six-inch-diameter exploratory borings were drilled on June 23rd through 28th, 2004, to a maximum depth of 55½ feet. The approximate locations of the borings are shown on the Site Plan, Figure 2. The soils encountered were logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D2488). The logs of the borings, as well as a key to the classification of the soil, are included as part of this appendix.

The locations of borings were approximately determined by portable Global Positioning Systems (GPS) hand-held equipment and a metered wheel from existing site references. Elevations of the borings were determined by interpolation from plan contours. The locations and elevations of the borings should be considered accurate only to the degree implied by the method used.

Representative soil samples were obtained from the borings at selected depths. All samples were returned to our laboratory for evaluation and appropriate testing. Penetration resistance blow counts were obtained by dropping a 140-pound hammer 30 inches. Modified California 2.5-inch I.D. samples and Standard Penetration Test (SPT) 2-inch O.D. samples were obtained by driving the samplers 18 inches and recording the number of hammer blows for each 6 inches of penetration. Unless otherwise indicated, the blows per foot recorded on the boring logs represent the accumulated number of blows required to drive the samplers the last two 6-inch increments. When using the SPT sampler, the last two 6-inch increments is the uncorrected Standard Penetration Test measured blow count. The various samplers are denoted at the appropriate depth on the boring logs and symbolized as shown on Figure A-1.

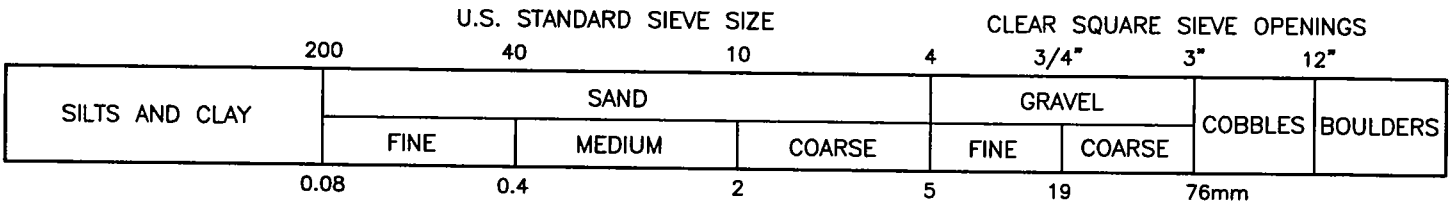
Field tests included an evaluation of the unconfined compressive strength of the soil samples using a pocket penetrometer device. The results of these tests are presented on the individual boring logs at the appropriate sample depths.

The attached boring logs and related information depict subsurface conditions at the locations indicated and on the date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these boring locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on the logs represent the approximate boundary between soil types and the transition may be gradual.

* * * * * * * * * * * * *

PRIMARY DIVISIONS			SOIL TYPE		SECONDARY DIVISIONS
COARSE GRAINED SOILS (MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS (MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE)	CLEAN GRAVELS (Less than 5% Fines)	GW		Well graded gravels, gravel–sand mixtures, little or no fines
			GP		Poorly graded gravels or gravel–sand mixtures, little or no fines
		GRAVEL WITH FINES	GM		Silty gravels, gravel–sand–silt mixtures, plastic fines
			GC		Clayey gravels, gravel–sand–clay mixtures, plastic fines
	SANDS (MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE)	CLEAN SANDS (Less than 5% Fines)	SW		Well graded sands, gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM		Silty sands, sand–silt–mixtures, non–plastic fines
			SC		Clayey sands, sand–clay mixtures, plastic fines
FINE GRAINED SOILS (MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS (LIQUID LIMIT IS LESS THAN 50 %)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS (LIQUID LIMIT IS GREATER THAN 50 %)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT		Peat and other highly organic soils

DEFINITION OF TERMS



GRAIN SIZES

SAMPLERS

SAND AND GRAVEL	BLOWS/FOOT*
VERY LOOSE	0–4
LOOSE	4–10
MEDIUM DENSE	10–30
DENSE	30–50
VERY DENSE	OVER 50

RELATIVE DENSITY

SILTS AND CLAYS	STRENGTH+	BLOWS/FOOT*
VERY SOFT	0–1/4	0–2
SOFT	1/4–1/2	2–4
MEDIUM STIFF	1/2–1	4–8
STIFF	1–2	8–16
VERY STIFF	2–4	16–32
HARD	OVER 4	OVER 32

CONSISTENCY

*Number of blows of 140 pound hammer falling 30 inches to drive a 2–inch O.D. (1–3/8 inch I.D.) split spoon (ASTM D–1586).
+Unconfined compressive strength in tons/sq.ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D–1586), pocket penetrometer, torvane, or visual observation.

KEY TO EXPLORATORY BORING LOGS

Unified Soil Classification System (ASTM D–2487)

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FIGURE A–1

EXPLORATORY BORING: EB-1

DRILL RIG: FAILING 1500
BORING TYPE: ROTARY WASH
LOGGED BY: MQL
START DATE: 6-23-04 FINISH DATE: 6-23-04

PROJECT NO: 2053-1
PROJECT: McDONALD ISLAND
LOCATION: STOCKTON, CA
COMPLETION DEPTH: 55.5 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	SAMPLER	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
		SURFACE ELEVATION: 10 FT. (+/-)						
10.0	0							
9.7		4 inches aggregate base						
		SANDY SILT (ML) [FILL]	ML, FILL					
8.8		stiff, moist, dark brown, fine sand, low plasticity		44		6	107	
8.3		6 inches aggregate base						
		SANDY SILT (ML) [FILL]						
	5	loose, moist, dark gray, fine sand, low plasticity		16		11	113	
			ML, FILL					
0.3				11		33		
	10	**PEAT**						
		very soft, moist to wet, black, some thin clay layers		4		123	40	
	15							
				5		432	12	
	20		PT					
				8		331	15	
	25							
				8		58	56	
-20.0	30							

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

Continued Next Page

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

LA CORP.GDT 7/15/04 MV* FLL

EXPLORATORY BORING: EB-1 Cont'd

DRILL RIG: FAILING 1500
BORING TYPE: ROTARY WASH
LOGGED BY: MQL
START DATE: 6-23-04 FINISH DATE: 6-23-04

PROJECT NO: 2053-1
PROJECT: McDONALD ISLAND
LOCATION: STOCKTON, CA
COMPLETION DEPTH: 55.5 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	SAMPLER	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
-20.0	30	**PEAT** very soft, moist to wet, black, some thin clay layers	PT					
-23.0		**SILTY SAND (SM)** medium dense, moist, gray, fine sand	SM	11				
-27.0	35	**CLAYEY SAND (SC)** medium dense, wet, greenish gray, fine sand	SC	24				
-34.0	40	**POORLY GRADED SAND WITH SILT (SP-SM)** very dense, wet, gray fine to medium sand	SP-SM	50/6"				10
-40.0	45	**POORLY GRADED SAND (SP)** dense, wet, gray, fine to medium sand	SP	40				
-45.5	50	Bottom of Boring at 55½ feet		48				4
	55							
	60							

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

LA CORP.GDT 7/15/04 MV* FLL

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Environmental/Geotechnical/Engineering Services

EXPLORATORY BORING: EB-2

Sheet 1 of 1

DRILL RIG: FAILING 1500
BORING TYPE: ROTARY WASH
LOGGED BY: MQL
START DATE: 6-25-04 FINISH DATE: 6-25-04

PROJECT NO: 2053-1
PROJECT: McDONALD ISLAND
LOCATION: STOCKTON, CA
COMPLETION DEPTH: 25.5 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
		SURFACE ELEVATION: -8 FT. (+/-)					
-8.0	0	**LEAN CLAY WITH SAND (CL) [FILL]** very stiff, moist, dark brown to brown, fine sand, low to moderate plasticity	CL, FILL	17	23	94	
	5			13	19	97	
-14.0		**PEAT** very soft, moist to wet, black, some thin clay layers	PT				
-17.5	10	**POORLY GRADED SAND WITH SILT (SP-SM)** medium dense, wet, gray, fine sand, some organics	SP-SM	10	160	30	
	15			37			10
-26.0	20	**LEAN CLAY WITH SAND (CL)** very stiff, moist, greenish gray, fine sand, low plasticity	CL	26			
-30.0	25	**POORLY GRADED SAND WITH SILT (SP-SM)** medium dense, wet, gray, fine sand	SP-SM	28			12
-34.0	30	Bottom of Boring at 25½ feet					

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

LA CORP.GDT 7/15/04 MV* FLL

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

EXPLORATORY BORING: EB-3

DRILL RIG: FAILING 1500
BORING TYPE: ROTARY WASH
LOGGED BY: MQL
START DATE: 6-24-04 FINISH DATE: 6-28-04

PROJECT NO: 2053-1
PROJECT: McDONALD ISLAND
LOCATION: STOCKTON, CA
COMPLETION DEPTH: 55.5 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	SAMPLER	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
		SURFACE ELEVATION: 10 FT. (+/-)						
10.0	0	6 inches aggregate base						
9.5		**LEAN CLAY WITH SAND (CL) [FILL]** hard, moist, brown, fine sand, low to moderate plasticity		46		11	93	
	5	becomes very stiff	CL, FILL	8		38	79	
1.0		**PEAT** very soft, moist to wet, black, some thin clay layers		4		65	61	
	10							
	15			4		42	75	
	20		PT	7		281	16	
	25			7		490	11	
-20.0	30			7		175	27	

Continued Next Page

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

LA CORP.GDT 7/15/04 MV* FLL

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

EXPLORATORY BORING: EB-3 Cont'd

DRILL RIG: FAILING 1500
BORING TYPE: ROTARY WASH
LOGGED BY: MQL
START DATE: 6-24-04 FINISH DATE: 6-28-04

PROJECT NO: 2053-1
PROJECT: McDONALD ISLAND
LOCATION: STOCKTON, CA
COMPLETION DEPTH: 55.5 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
-20.0	30	**PEAT** very soft, moist to wet, black, some thin clay layers	PT	9	68	59	
-27.0	35	**SILTY SAND (SM)** medium dense, wet, gray, fine sand	SM	15			
	40			28			
-37.0	45	**POORLY GRADED SAND (SP)** dense, wet, gray, fine to medium sand	SP	39			4
-45.5	50			38			4
	55	Bottom of Boring at 55½ feet					
	60						

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

LA_CORP.GDT 7/15/04 MV* FLL

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

EXPLORATORY BORING: EB-4

DRILL RIG: FAILING 1500
BORING TYPE: ROTARY WASH
LOGGED BY: MQL
START DATE: 6-25-04 FINISH DATE: 6-25-04

PROJECT NO: 2053-1
PROJECT: McDONALD ISLAND
LOCATION: STOCKTON, CA
COMPLETION DEPTH: 31.5 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (FT)	DEPTH (FT)	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	SAMPLER	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
		SURFACE ELEVATION: -8 FT. (+/-)						
-8.0	0	**LEAN CLAY WITH SAND (CL) [FILL]** very stiff, moist, dark brown to brown, fine sand, low to moderate plasticity	CL, FILL	40		19	101	
-11.5	5	**CLAYEY SAND (SC) [FILL]** medium dense, moist, brown, fine to medium sand	SC, FILL	36		17	100	
-15.0	10	**PEAT** very soft, moist to wet, black, some thin clay layers	PT	5		151	29	
	15			5		269	18	
-24.0	20	**SILTY SAND (SM)** medium dense, wet, gray, fine sand	SM	17				
	25	dense		43				16
-35.0	30	**POORLY GRADED SAND (SP)** medium dense, wet, gray, fine sand	SP					
-38.0		*Continued Next Page*						

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

LA_CORP.GDT 7/15/04 MV* FLL

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

EXPLORATORY BORING: EB-4 Cont'd

DRILL RIG: FAILING 1500
BORING TYPE: ROTARY WASH
LOGGED BY: MQL
START DATE: 6-25-04 FINISH DATE: 6-25-04

PROJECT NO: 2053-1
PROJECT: McDONALD ISLAND
LOCATION: STOCKTON, CA
COMPLETION DEPTH: 31.5 FT.

This log is a part of a report by Lowney Associates, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

ELEVATION (FT)	DEPTH (FT)	SOIL LEGEND	MATERIAL DESCRIPTION AND REMARKS	SOIL TYPE	PENETRATION RESISTANCE (BLOWS/FT.)	SAMPLER	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	PERCENT PASSING NO. 200 SIEVE
-38.0	30		**POORLY GRADED SAND (SP)**						
			medium dense, wet, gray, fine sand	SP	14				3
-39.5			Bottom of Boring at 31½ feet						
	35								
	40								
	45								
	50								
	55								
	60								

Undrained Shear Strength (ksf)
○ Pocket Penetrometer
△ Torvane
● Unconfined Compression
▲ U-U Triaxial Compression
1.0 2.0 3.0 4.0

GROUND WATER OBSERVATIONS:
NOT APPLICABLE DUE TO ROTARY WASH CIRCULATION

LA CORP.GDT 7/15/04 MV* FLL

LOWNEY ASSOCIATES
Environmental/Geotechnical/Engineering Services

BORING B-1

DATE DRILLED 9-17-84

SURFACE ELEVATION 10.7'

STATION 627+50
COORDINATE N 537586
E 1712042

DEPTH IN FEET	TESTS REPORTED ELSEWHERE	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	STRENGTH TEST DATA: TYPE OF STRENGTH TEST	STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE, PSF	STRENGTH TEST DATA: SHEAR STRENGTH, PSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	SAMPLING: TYPE OF SAMPLER	SAMPLING: SAMPLING RESISTANCE
0				DS/CD	200	100	7 5	91 91	U	18
5				PP TX/UU	500	4500+ 3150	48	53	P	400 PSI
10				TV		720			P	100 PSI
15	OC (10%)			TV TX/UU	600	920 750	260	18	P	175 PSI
20	OC (15%)			TV TX/UU	650	740 640	385	13	P	150 PSI
25				TV		660	400	13	P	150 PSI
30				TV TX/UU	750	980 580	99	44	P	400 PSI
35	SA (34%)						19	110	P	350 PSI
40				DS/CD	1200	850	23	103	P	400 PSI
45							28	94	P U	275 PSI 78
50									SPT	85
55									SPT	71
60										
65										
70										
75										

SAMPLES

SYMBOLS

DESCRIPTION

SM	BROWN SILTY FINE SAND WITH SOME COARSE GRAVEL (1 TO 2 INCH)(LOOSE)
SP	BROWN FINE TO MEDIUM MICACEOUS SAND WITH TRACE OF SILT (LOOSE)
OL	DARK BROWN TO BLACK CLAYEY ORGANIC SILT (VERY STIFF)
PT	DARK BROWN TO BLACK FIBROUS PEAT (VERY STIFF)
	▽ — — — WATER LEVEL 8.4' 9-17-84
OL/CL	DARK GRAY SILTY CLAY TO CLAYEY SILT WITH SOME BROWN PEAT AND ORGANICS (MEDIUM STIFF)
PT/OL	DARK GRAY CLAYEY SILT AND BROWN FIBROUS PEAT (MEDIUM STIFF)
	(GRADING WITH TRACE OF MICA)
	(GRADING WITH MORE PEAT)
	(GRADING WITH MORE PEAT)
SP	GRAY FINE MICACEOUS SAND WITH TRACE OF SILT (DENSE TO VERY DENSE)
	(GRADING MORE MICACEOUS)
	(GRADING WITH LENSES OF MEDIUM TO COARSE SAND AND TRACE OF FINE GRAVEL)
	(GRADING MEDIUM COARSE)

BORING COMPLETED AT A DEPTH OF 56 FEET ON 9-17-84

NOTES:

1. ELEVATIONS ARE EXPRESSED IN FEET AND REFER TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (1976 ADJUSTMENT).
2. SAMPLING RESISTANCE IS MEASURED IN BLOWS PER FOOT REQUIRED TO DRIVE A "U" OR SPT TYPE SAMPLER 12 INCHES WITH 140 POUND HAMMER FALLING 30 INCHES AFTER SAMPLER HAS BEEN SEATED 6 INCHES.
3. BORING LOG INDICATES INTERPRETED SUBSURFACE CONDITIONS ONLY AT THE LOCATION AND TIME THE BORING WAS DRILLED.
4. FOR AN EXPLANATION OF TERMS USED, SEE SOIL CLASSIFACTION AND KEY TO TEST DATA.

LOG OF BORING

Dames & Moore

PLATE H1.1

APPENDIX B

LABORATORY PROGRAM

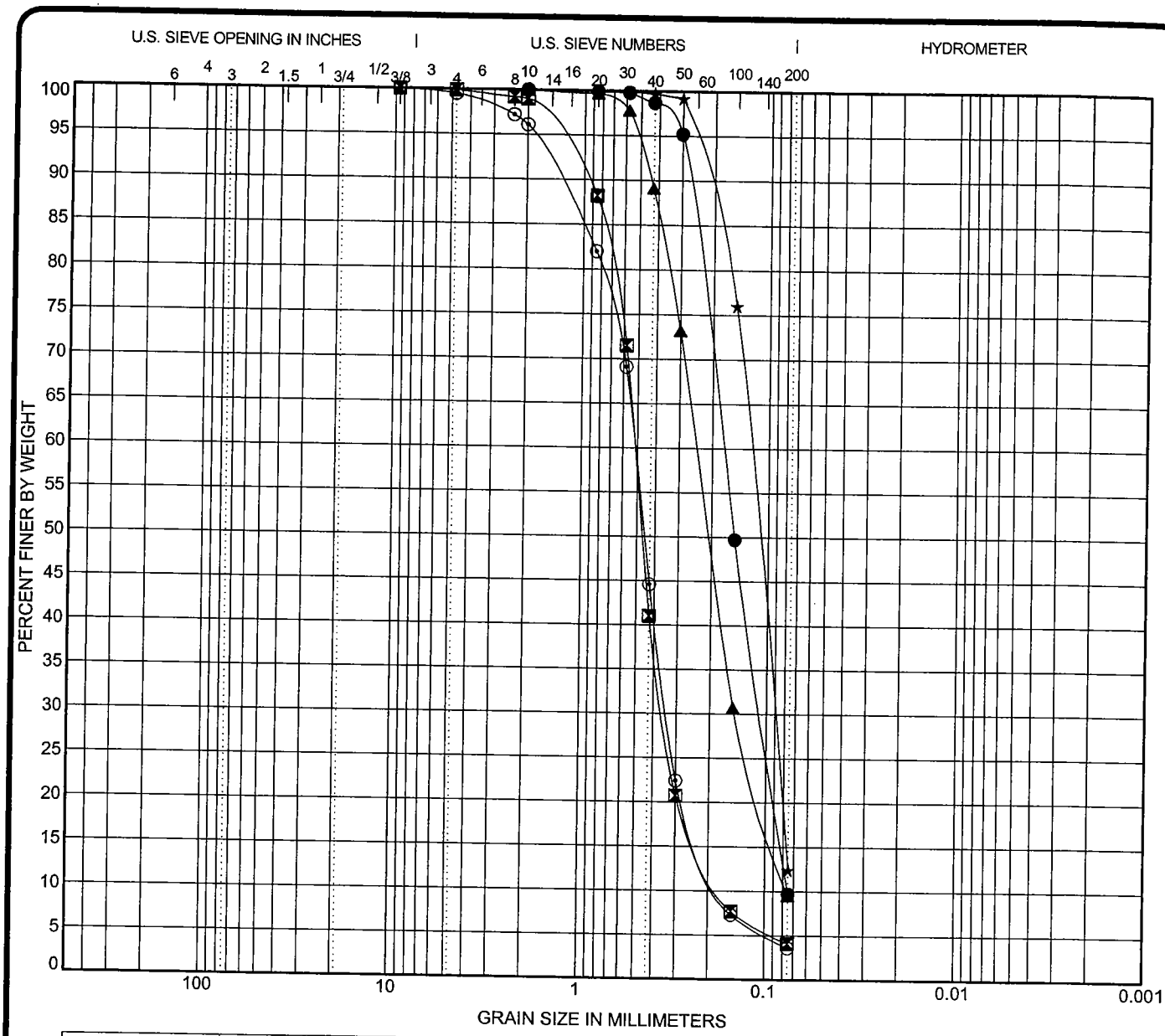
The laboratory testing program was performed to evaluate the physical and mechanical properties of the soils underlying the site and to aid in soil classifications.

Moisture Content: The natural water content was determined (ASTM D2216) on 22 samples of the materials recovered from the borings. These water contents are recorded on the boring logs at the appropriate sample depths.

Dry Densities: In place dry density determinations (ASTM D2937) were performed on 21 samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

Gradations: Gradation tests (ASTM D422) were performed on 8 samples of the subsurface soils. These tests were performed to assist in the classification of the soil and to determine grain size distributions of the soils. Results of these tests are presented on Figures B-2 and B-3.

* * * * * * * * * * * * *



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	EB-1	44.0	POORLY GRADED SAND WITH SILT (SP-SM)				0.86	2.33
⊠	EB-1	55.0	POORLY GRADED SAND (SP)				1.42	3.04
▲	EB-2	14.5	POORLY GRADED SAND WITH SILT (SP-SM)				1.17	3.17
★	EB-2	25.0	POORLY GRADED SAND WITH SILT (SP-SM)				0.90	1.72
⊙	EB-3	49.5	POORLY GRADED SAND (SP)				1.30	3.04

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	EB-1	44.0	2	0.175	0.107	0.075	0.0	90.3	9.7	
⊠	EB-1	55.0	9.5	0.516	0.352	0.17	0.1	95.8	4.1	
▲	EB-2	14.5	2	0.242	0.147	0.076	0.0	90.5	9.5	
★	EB-2	25.0	0.85	0.126	0.091		0.0	87.6	12.4	
⊙	EB-3		9.5	0.517	0.338	0.17	0.5	95.9	3.6	

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Environmental/Geotechnical/Engineering Services

GRAIN SIZE DISTRIBUTION

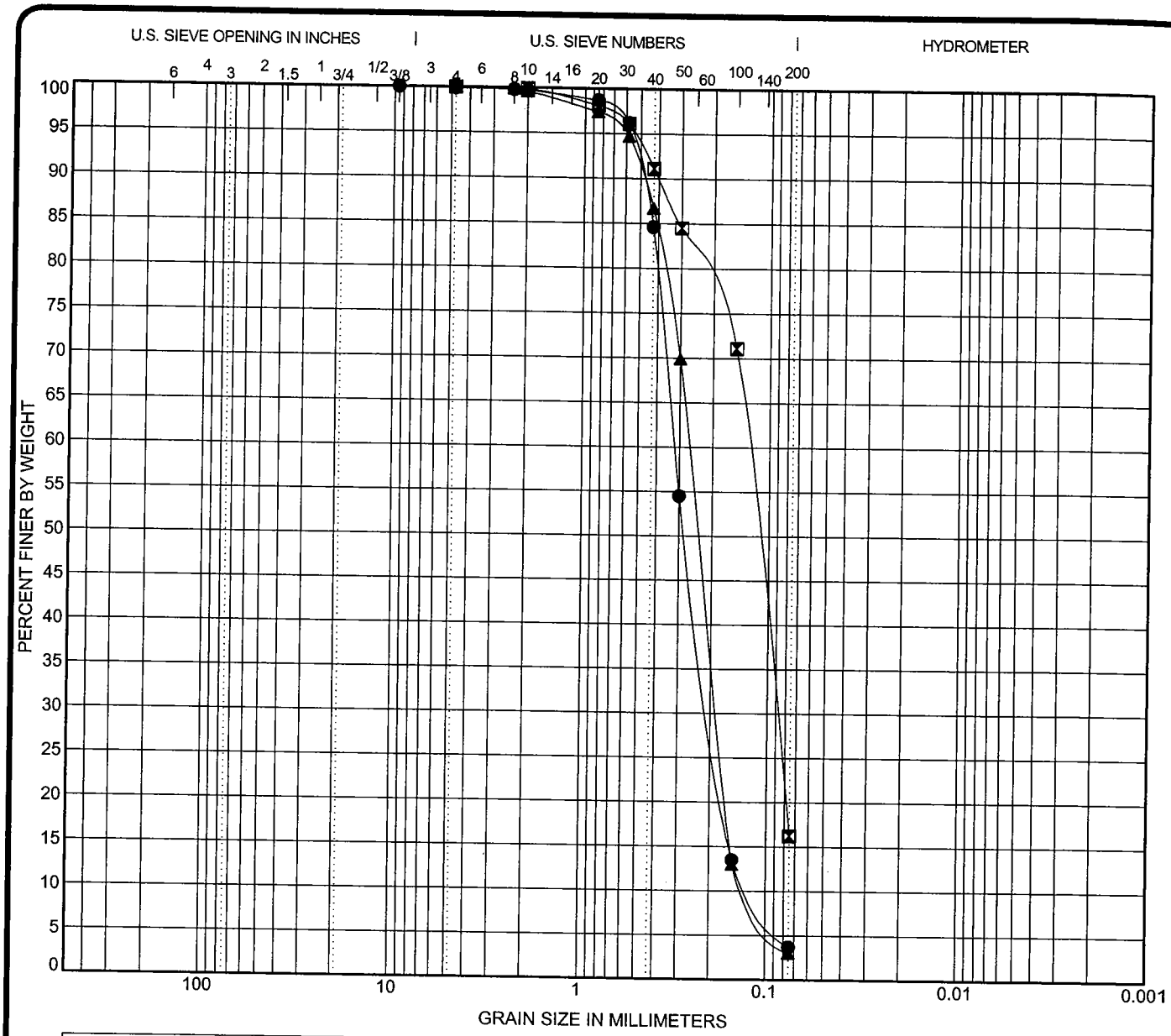
Project: McDONALD ISLAND

Location: STOCKTON, CA

Project No.: 2053-1

FIGURE B-2

LA CORP.GDT 7/15/04 MV* FLL



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	EB-3	55.0	POORLY GRADED SAND (SP)				1.05	2.73
⊠	EB-4	24.5	SILTY SAND (SM)					
▲	EB-4	30.5	POORLY GRADED SAND (SP)				1.05	2.18

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	EB-3	55.0	9.5	0.32	0.198	0.117	0.1	96.2	3.7	
⊠	EB-4	24.5	4.75	0.13	0.089		0.0	83.8	16.2	
▲	EB-4	30.5	4.75	0.266	0.185	0.122	0.0	97.0	3.0	

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GRAIN SIZE DISTRIBUTION

Project: McDONALD ISLAND

Location: STOCKTON, CA

Project No.: 2053-1

FIGURE B-3

LA_CORP.GDT 7/15/04 MV* FLL

APPENDIX C

Piezometer Information

The piezometers used for this project are vibratory wire piezometers. They measure the pore water pressure within the soil. The vibrating wire piezometers operate by converting the pore water pressure to a frequency signal using a diaphragm, a tensioned steel wire, and a magnetic coil within the piezometer. The diaphragm within the piezometer senses the changes in the pore water pressure. When the diaphragm experiences a change in pressure, it in turn causes a change in tension of the wire. The magnetic coil excites the wire, causing it to vibrate at its natural frequency. The vibration of the wire creates a frequency signal, which is then read by the Minilogger data collector.

The Minilogger reads the signal from the piezometer and stores the frequency reading. The minilogger also applies conversion factors to change the frequency reading to any engineering unit. For this project, the units of feet of water was chosen. The data recorded on the Minilogger is retrieved using a lab top computer and is stored as a comma delineated file.

The manufacturer information for the piezometer and data logger are attached.

* * * * * * * * * * * * *

Vibrating Wire Piezometer

Applications

Typical applications for the VW piezometer are:

- Monitoring pore water pressures to determine safe rates of fill or excavation.
- Monitoring pore water pressures to determine slope stability.
- Monitoring the effects of dewatering systems used for excavations.
- Monitoring the effects of ground improvement systems such as vertical drains and sand drains.
- Monitoring pore pressures to check the performance of earth fill dams and embankments.
- Monitoring pore pressures to check containment systems at land fills and tailings dams.

VW Piezometer (top) and VW Push-In Piezometer (bottom).

Operation

The VW piezometer converts water pressure to a frequency signal via a diaphragm, a tensioned steel wire, and an electromagnetic coil.

The piezometer is designed so that a change in pressure on the diaphragm causes a change in tension of the wire. An electro-magnetic coil is used to excite the wire, which then vibrates at its natural frequency. The vibration of the wire in the proximity of the coil generates a frequency signal that is transmitted to the readout device.

The readout or data logger stores the reading in Hz. Calibration factors are then applied to the reading to arrive at a pressure in engineering units.

Installation Overview

Grout-In Method: The piezometer is lowered to the specified depth, and the borehole is simply backfilled with a bentonite-cement grout. Read more about this method at Slope Indicator's website: www.slopeindicator.com.

Sand Filter Method: The borehole is flushed with water or biodegradable drilling mud. A sand filter is placed around the piezometer at the specified depth. A bentonite plug is formed at the top of the sand filter. Then the remainder of the borehole is filled with a bentonite-cement grout.

Push-In: The piezometer is pushed into soft cohesive soil at the bottom of a borehole. The piezometer must be monitored to ensure that it is not overpressured as it is pushed in.

Embankments: The piezometer is embedded in sand and then covered with hand-compacted select fill. Signal cables are routed through trenches and covered with compacted fill. Bentonite water stops are placed at appropriate locations.

Advantages

Groutable: The VW piezometer can be installed without a sand filter or bentonite seal. This greatly simplifies same-hole installation of multiple piezometers or piezometers with inclinometer casing.

High Resolution: VW piezometers provide a resolution of 0.025% of full scale.

High Accuracy: Slope Indicator's automated, precision calibration system ensures that VW piezometers meet or exceed specifications.

Rapid Response: VW piezometers respond very quickly to small changes in pore-water pressure, whether they are grouted in, pushed into cohesive soils, or embedded in a sand filter zone.

Reliable Signal Transmission: With properly shielded cable, signals from the VW piezometer can be transmitted long distances.

VW PIEZOMETER

Sensor Type: Pluck-type vibrating wire sensor with built-in thermistor or RTD.

Range: 3.5, 7, 17, 35 bar (50, 100, 250, 500 psi).

Resolution: 0.025%FS.

Accuracy: ±0.1% FS for 3.5 and 7 bar piezometers, ±0.3% FS for 17 and 35 bar piezometers.

Maximum Pressure: 1.5 x rated range.

Filter: 50-micron sintered stainless steel.

Calibration: Twelve-point calibration referenced to standard atmosphere. Calibration starts at -5 psi (-0.344 bar).

Temperature Coefficient: < 0.04% FS per °C).

Materials: Stainless steel.

Dimensions: 19 x 195 mm (0.75 x 7.75").

Weight: 0.16 kg (0.3 lb).

VW PIEZOMETER ONLY

3.5 bar (50 psi) piezometer 52611020
7 bar (100 psi) piezometer 52611030
17 bar (250 psi) piezometer 52611040
35 bar (500 psi) piezometer 52611050

Part number includes only piezometer. Signal cable is attached to piezometer at factory and must be ordered at same time as piezometers.

PIEZOMETERS WITH CABLE

3.5 bar (50 psi) piezometers
with 30 m (100') cable 52611024
with 40 m (130') cable 52611025
with 60 m (200') cable 52611026

7 bar (100 psi) piezometers
with 45 m (150') cable 52611034
with 60 m (200') cable 52611035
with 90 m (300') cable 52611036

INSTALLATION ACCESSORIES

Small Canvas Bag 06240000
Large Canvas Bag 06240001

Convenient way to create sand filter around piezometer. Not used with grout-in method of installation.

Small bag measures 64 x 457 mm (2.5 x 18").
Large bag measures 114 x 457 mm (4.5 x 18").

VW PUSH-IN PIEZOMETER

Sensor type: Pluck-type vibrating wire sensor with built-in thermistor or RTD.

Range: 3.5, 7, 17, 35 bar (50, 100, 250, 500 psi).

Resolution: 0.025%FS.

Accuracy: ±0.1% FS for 3.5 and 7 bar piezometers, ±0.3% FS for 17 and 35 bar piezometers.

Maximum Pressure: 1.5 x rated range.

Filter: 50-micron sintered stainless steel.

Calibration: Twelve-point calibration referenced to standard atmosphere. Calibration starts at -5 psi (-0.344 bar).

Temperature Coefficient: < 0.04% FS per °C).

Materials: Stainless steel.

Dimensions: 35 x 270 mm (1.375 x 10.5").

Weight: 1.2 kg (2.75 lb).

VW PUSH-IN PIEZOMETER ONLY

3.5 bar (50 psi) piezometer 52621020
7 bar (100 psi) piezometer 52621030
17 bar (250 psi) piezometer 52621040
35 bar (500 psi) piezometer 52621050

Part number includes only piezometer. Signal cable is attached to piezometer at factory and must be ordered at same time as piezometers.

INSTALLATION ACCESSORIES

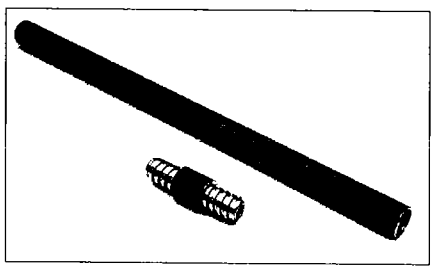
Note: A design change may make the parts below obsolete. Check before ordering.

EW Adapter Rod 50718042

Optional Accessory. EW adapter rod is 0.6 m (2') long. One end has a right-hand thread to connect to piezometer. The other end has a left-hand thread for easy disconnect from drill rod that is used to push the piezometer into the ground. Order one adapter rod per piezometer, since adapter rod is installed with piezometer.

EW Coupling. 50718010

Optional accessory. Coupling (pin) has right-hand thread for drill rod and left-hand thread for easy disconnect from EW adapter rod. Coupling is reused, so only one is required.



SIGNAL CABLE

Polyurethane Jacket 50613524

Shielded cable with four 22-gauge tinned- copper conductors and polyurethane jacket. This is the standard cable used for VW piezometers.

Polyethylene Jacket 50612604

Shielded cable with four 22-gauge tinned-copper conductors and polyethylene jacket. Requires PE seal kit below.

PE Seal Kit. . . . . .PESEALKT

Heavy duty mechanical seal required to connect polyethylene cable to VW piezometer. Connected at factory.

Universal Connector 57705001

Universal Terminal Box 57711600

Provides connections for 12 sensors and an indicator. Sensors selected by rotary switch. Housed in weatherproof fiberglass box. 290 x 345 x 135 mm deep (11.5 x 13.5 x 5.25").

READOUTS

VW Data Recorder. 52613500

This easy to use readout displays and records VW sensor data in Hz or Hz^2, and thermistor or RTD data in degrees C. See separate datasheet for details.

DATA LOGGERS

VW MiniLogger 52613310

The VW MiniLogger is a reliable, low-cost data logger designed to monitor a single vibrating wire sensor. See separate datasheet for details.

CR10X Data Logger

Compatible data loggers include the Campbell Scientific CR10X with VW interface. AM16/32 multiplexer can accommodate 16 piezometers with temperature readings or 32 piezometers without temperature readings. See separate datasheet for details.

Slope Indicator Head Office 12123 Harbour Reach Drive, Mukilteo, WA, 98275 USA
Tel: 425-493-6200 Tel: 800-331-0703 Fax: 425-493-6250 Email: solutions@slope.com

SLOPE INDICATOR
WWW.SLOPEINDICATOR.COM

VW MiniLogger

VW MiniLogger Applications

The VW MiniLogger is a reliable, low-cost data logger designed to monitor a single vibrating wire sensor, such as a VW piezometer or crackmeter. Typical applications include:

- Monitoring small projects, where only a few sensors are installed. Note that one MiniLogger is required for each sensor.
- Monitoring single sensors that are too far away to connect to a centralized data acquisition system.
- Monitoring single sensors in areas where heavy traffic or electrical noise prevents use of long cables.
- Monitoring single sensors during early phase of construction when centralized data acquisition system is not ready.

Overview of Operation

The MiniLogger is simple to use and takes only a few minutes to set up.

Connect the MiniLogger to your computer and use the MiniLogger manager program to specify a start time and reading interval for data logging.

On site, connect the sensor signal cable to the MiniLogger and walk away. The MiniLogger records up to 2000 readings, following the schedule that you set. D-cell batteries provide power for at least six months in temperatures as low as -20° C.

Return to the site to retrieve readings with your PC. Use the MiniLogger Manager program to store the readings in a ASCII file, ready for your spreadsheet.

Finally, import the ASCII file into your spreadsheet for processing and plotting.

MiniLogger Advantages

Economical: Four or five MiniLoggers can be deployed for less than the cost of a full size logger. Also, since MiniLoggers can be placed close to each sensor, it is possible to order shorter signal cables for the sensors.

Simple to Use: Learn how to use the MiniLogger in minutes, not hours. There are no programs to write, no switches to set, and only four wires to connect.

Reliable: The MiniLogger is rated for temperatures from -20 to +50°C, and its encapsulated electronics are impervious to humidity and condensation. Readings are stored in secure, non-volatile memory.

Spreadsheet Friendly: The MiniLogger Manager retrieves readings and stores them in an ASCII file, ready to open with a spreadsheet program. The files contain two values for each reading, a value in Hz (the raw reading) and a value in user-selected engineering units. Thus data can be used immediately in the spreadsheet.

VW MINILOGGER

VW MiniLogger 52613310

Includes interface cable, two D-cell batteries, and a CD containing software and the user manual.

Sensor Compatibility: Reads VW sensors operating in the range of 450 to 6000 Hz. Also reads temperature sensors (RTD and thermistor).

Data Storage: Stores 2,000 records in secure, non-volatile memory. Each record includes a VW reading, a temperature reading, and the time and date. When memory is full, recording either stops or continues by overwriting the earliest readings, according to user preference.

Reading Schedule Starts recording immediately on power up or at specified date and time. Records readings at intervals from one reading every 2 seconds to one reading per week.

Power: Two D-cell batteries provide power for approximately six months at temperatures from -20 to +50°C, assuming readings are taken every half-hour.

Weatherproofing: MiniLogger electronics are completely encapsulated in waterproof resin. Polycarbonate box has O-ring seal and cable gland for signal cable.

Dimensions: 100 x 100 x 90 mm high (4 x 4 x 3.5").

Data Retrieval: Readings are retrieved via RS-232 serial connection to computer running MiniLogger Manager program.

MINILOGGER MANAGER

MiniLogger Manager . . . . . .Download

MiniLogger Manager software is used to set MiniLogger's reading schedule and to retrieve recorded readings. Supplied on CD with purchase of MiniLogger. Also available for free download from www.slopeindicator.com.

System Requirements: Computer with Windows 95 to XP.

Logger Settings: Assign a logger ID, specify whether to stop when memory is full or to overwrite earliest readings.

Sensor Settings: Assign a sensor ID, set sweep range for excitation, store calibration factors, and set temperature sensor to RTD or thermistor.

Logging Schedule: Set logger to start recording on power up or at a specific date and time (to synchronize readings with other MiniLoggers or data loggers). Set reading intervals to day, hour, minute, and second.

Set Clock: Synchronize with PC or set different date and time.

Data Retrieval: Choose all or selected range of readings to retrieve. Store readings in default ASCII format ready for import into a spreadsheet or in format that matches CR10 data logger. VW readings are stored in Hz and also in engineering units when calibration factors have been entered. Temperature readings are stored in degrees C.

Slope Indicator Head Office 12123 Harbour Reach Drive, Mukilteo, WA, 98275 USA
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SLOPE INDICATOR
WWW.SLOPEINDICATOR.COM

VW Piezometer Calibration Report

Customer	Lowney Associates	Serial No.	79547 T
Cust. No.	4230	Part No.	52611020
Order No.	13312	Range	0-50 PSI
Date	18-Jun-04	Cable	50613524
Cal. By.	kb	Length	55 ft
Note			

Conversion Factors for Serial No. 79547 T

Referenced To Standard Atmosphere*

	Manual ABC Factors			IDA ABC Factors		
Units	A	B	C	A	B	C
psi	-0.000011949	-0.042820	241.64	-21.242	-57.093	241.64
ft H2O	-0.000027561	-0.098771	557.38	-48.998	-131.69	557.38
kN/m² (kPa)	-0.000082383	-0.29523	1666.0	-146.46	-393.64	1666.0
m H2O	-0.0000084007	-0.030105	169.89	-14.935	-40.141	169.89
bar	-0.00000082383	-0.0029523	16.660	-1.4646	-3.9364	16.660
kg/cm²	-0.00000084007	-0.0030105	16.989	-1.4935	-4.0141	16.989
				IF Factor = T		

Temp. Coefficents (m = 0.0082 PSI/°C, b = -0.182 PSI) TempOffset: -0.2 °C

Test Data

Referenced To Standard Atmosphere*

PSI	Frequency	% FS Error
-5.0	3091.96	-0.02
0.0	3049.08	0.02
5.0	3005.68	0.02
10.0	2961.86	0.02
15.0	2917.61	0.01
20.0	2872.83	-0.02
25.0	2827.75	-0.02
30.0	2782.42	0.02
35.0	2736.39	0.01
40.0	2689.95	0.01
45.0	2643.00	0.00
50.0	2595.58	0.01

Calibrated at = 23.5 °C Thermistor Reading = 23.3 °C

*Standard Atmosphere = 14.696 psi, 1013 millibar.

Calibration Record

VW MiniLogger

Part Number: 52613310 Serial Number: 20691

Calibration Standard: EDC 4100 Serial Number: 10992

Calibrator Re-Certification Due: May 22nd, 2005

Calibration Standard: SI 20-14 Serial Number: 19506

Calibrator Re-Certification Due: June 14th, 2004

	INPUT FREQUENCY	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
FREQUENCY	1000	1000	999
	2000	2000	1999
	3000	3000	2999
	4000	4000	3999
	5000	5000	4999
	6000	6000	5999
	RESISTANCE	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
TEMPERATURE RTD	1715	- 20 ° C	-19.6
	2076	30 ° C	29.7
	2482	80 ° C	79.9
THERMISTOR	29142	-20 ° C	-20.1
	2416	30 ° C	30.1
	377	80 ° C	79.5

This Certificate confirms that the equipment listed above has been calibrated in accordance with the manufacturer's specifications with calibration standards that are tracable to the National Institute of Standards and Technology (NIST).

Calibrated By: TQL Date: June 11th, 2004

Slope Indicator Co.

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VW Piezometer Calibration Report

Customer	Lowney Associates	Serial No.	79546 T
Cust. No.	4230	Part No.	52611020
Order No.	13312	Range	0-50 PSI
Date	18-Jun-04	Cable	50613524
Cal. By.	kb	Length	35 ft
Note			

Conversion Factors for Serial No. 79546 T

Referenced To Standard Atmosphere*

	Manual ABC Factors			IDA ABC Factors		
Units	A	B	C	A	B	C
psi	-0.000012970	-0.041873	257.77	-23.057	-55.831	257.77
ft H2O	-0.000029917	-0.096587	594.58	-53.185	-128.78	594.58
kN/m² (kPa)	-0.000089423	-0.28871	1777.2	-158.97	-384.94	1777.2
m H2O	-0.0000091186	-0.029440	181.23	-16.211	-39.253	181.23
bar	-0.00000089423	-0.0028871	17.772	-1.5897	-3.8494	17.772
kg/cm²	-0.00000091186	-0.0029440	18.123	-1.6211	-3.9253	18.123
				IF Factor = T		

Temp. Coefficents (m = 0.0038 PSI/°C, b = -0.086 PSI) TempOffset: 0.0 °C

Test Data

Referenced To Standard Atmosphere*

PSI	Frequency	% FS Error
-5.0	3167.49	-0.02
0.0	3127.11	0.01
5.0	3086.33	0.02
10.0	3045.13	0.01
15.0	3003.45	-0.02
20.0	2961.49	-0.02
25.0	2919.19	-0.02
30.0	2876.68	0.03
35.0	2833.38	-0.01
40.0	2789.81	-0.01
45.0	2745.83	-0.01
50.0	2701.47	0.01

Calibrated at = 23.5 °C Thermistor Reading = 23.5 °C

*Standard Atmosphere = 14.696 psi, 1013 millibar.

Calibration Record

VW MiniLogger

Part Number: 52613310 Serial Number: 20689

Calibration Standard: EDC 4100 Serial Number: 10992

Calibrator Re-Certification Due: May 22nd, 2005

Calibration Standard: SI 20-14 Serial Number: 19506

Calibrator Re-Certification Due: June 14th, 2004

	INPUT FREQUENCY	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
FREQUENCY	1000	1000	999
	2000	2000	1999
	3000	3000	2999
	4000	4000	3999
	5000	5000	4999
	6000	6000	5999
	RESISTANCE	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
TEMPERATURE RTD	1715	- 20 ° C	-19.6
	2076	30 ° C	29.7
	2482	80 ° C	79.8
THERMISTOR	29142	-20 ° C	-20.2
	2416	30 ° C	30.1
	377	80 ° C	79.4

This Certificate confirms that the equipment listed above has been calibrated in accordance with the manufacturer's specifications with calibration standards that are tracable to the National Institute of Standards and Technology (NIST).

Calibrated By: TQL Date: June 11th, 2004

Slope Indicator Co.

VW Piezometer Calibration Report

Customer	Lowney Associates	Serial No.	79545 T
Cust. No.	4230	Part No.	52611020
Order No.	13312	Range	0-50 PSI
Date	18-Jun-04	Cable	50613524
Cal. By.	kb	Length	35 ft
Note			

Conversion Factors for Serial No. 79545 T

Referenced To Standard Atmosphere*

	Manual ABC Factors			IDA ABC Factors		
Units	A	B	C	A	B	C
psi	-0.000016935	-0.024330	239.28	-30.106	-32.440	239.28
ft H2O	-0.000039063	-0.056120	551.93	-69.445	-74.827	551.93
kN/m² (kPa)	-0.00011676	-0.16775	1649.8	-207.57	-223.66	1649.8
m H2O	-0.000011906	-0.017106	168.23	-21.167	-22.807	168.23
bar	-0.0000011676	-0.0016775	16.498	-2.0757	-2.2366	16.498
kg/cm²	-0.0000011906	-0.0017106	16.823	-2.1167	-2.2807	16.823
				IF Factor = T		

Temp. Coefficents (m = 0.0105 PSI/°C, b = -0.245 PSI) TempOffset: -0.1 °C

Test Data

Referenced To Standard Atmosphere*

PSI	Frequency	% FS Error
-5.0	3146.98	0.00
0.0	3108.60	0.00
5.0	3069.83	0.01
10.0	3030.62	-0.01
15.0	2990.99	-0.02
20.0	2950.97	-0.02
25.0	2910.48	-0.03
30.0	2869.86	0.04
35.0	2828.37	0.02
40.0	2786.40	-0.01
45.0	2744.03	0.00
50.0	2701.09	-0.01

Calibrated at = 23.5 °C Thermistor Reading = 23.4 °C

*Standard Atmosphere = 14.696 psi, 1013 millibar.

Calibration Record

VW MiniLogger

Part Number: 52613310 Serial Number: 20685

Calibration Standard: EDC 4100 Serial Number: 10992

Calibrator Re-Certification Due: May 22nd, 2005

Calibration Standard: SI 20-14 Serial Number: 19506

Calibrator Re-Certification Due: June 14th, 2004

	INPUT FREQUENCY	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
FREQUENCY	1000	1000	999
	2000	2000	1999
	3000	3000	2999
	4000	4000	3999
	5000	5000	4999
	6000	6000	5999
	RESISTANCE	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
TEMPERATURE RTD	1715	- 20 ° C	-19.6
	2076	30 ° C	29.8
	2482	80 ° C	79.9
THERMISTOR	29142	-20 ° C	-20.3
	2416	30 ° C	30.1
	377	80 ° C	79.6

This Certificate confirms that the equipment listed above has been calibrated in accordance with the manufacturer's specifications with calibration standards that are tracable to the National Institute of Standards and Technology (NIST).

Calibrated By: TQL Date: June 11th, 2004

Slope Indicator Co.

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VW Piezometer Calibration Report

Customer	Lowney Associates	Serial No.	79344 T
Cust. No.	4230	Part No.	52611020
Order No.	13280	Range	0-50 PSI
Date	15-Jun-04	Cable	50613524
Cal. By.	kb	Length	20 ft
Note			

Conversion Factors for Serial No. 79344 T

Referenced To Standard Atmosphere*

	Manual ABC Factors			IDA ABC Factors		
Units	A	B	C	A	B	C
psi	-0.000013039	-0.050994	284.30	-23.180	-67.992	284.30
ft H2O	-0.000030076	-0.11763	655.78	-53.469	-156.83	655.78
kN/m² (kPa)	-0.000089900	-0.35159	1960.2	-159.82	-468.79	1960.2
m H2O	-0.0000091672	-0.035852	199.88	-16.297	-47.803	199.88
bar	-0.00000089900	-0.0035159	19.602	-1.5982	-4.6879	19.602
kg/cm²	-0.00000091672	-0.0035852	19.988	-1.6297	-4.7803	19.988
				IF Factor = T		

Temp. Coefficents (m = 0.0074 PSI/°C, b = -0.169 PSI) TempOffset: -0.2 °C

Test Data

Referenced To Standard Atmosphere*

PSI	Frequency	% FS Error
-5.0	3144.66	0.00
0.0	3106.91	-0.01
5.0	3068.92	0.00
10.0	3030.50	-0.03
15.0	2991.98	-0.01
20.0	2953.18	0.02
25.0	2914.16	0.07
30.0	2874.00	-0.09
35.0	2834.38	-0.03
40.0	2794.50	0.05
45.0	2753.53	-0.05
50.0	2712.93	0.02

Calibrated at = 22.4 °C Thermistor Reading = 22.2 °C

*Standard Atmosphere = 14.696 psi, 1013 millibar.

2A

Calibration Record

VW MiniLogger

Part Number: 52613310 Serial Number: 20746

Calibration Standard: EDC 4503 Serial Number: 16409

Calibrator Re-Certification Due: Nov. 30th, 2004

Calibration Standard: SI 20-14 Serial Number: 19506

Calibrator Re-Certification Due: June 14th, 2004

	INPUT FREQUENCY	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
FREQUENCY	1000	1000	999
	2000	2000	1999
	3000	3000	2999
	4000	4000	3999
	5000	5000	4999
	6000	6000	5999
	RESISTANCE	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
TEMPERATURE RTD	1715	- 20 ° C	-19.9
	2076	30 ° C	30
	2482	80 ° C	79.8
THERMISTOR	29142	-20 ° C	-20.3
	2416	30 ° C	30.1
	377	80 ° C	79.5

This Certificate confirms that the equipment listed above has been calibrated in accordance with the manufacturer's specifications with calibration standards that are tracable to the National Institute of Standards and Technology (NIST).

Calibrated By: TQL Date: May 24th, 2004

Slope Indicator Co.

VW Piezometer Calibration Report

Customer	Lowney Associates	Serial No.	79548 T
Cust. No.	4230	Part No.	52611020
Order No.	13312	Range	0-50 PSI
Date	18-Jun-04	Cable	50613524
Cal. By.	kb	Length	55 ft
Note			

Conversion Factors for Serial No. 79548 T

Referenced To Standard Atmosphere*

	Manual ABC Factors			IDA ABC Factors		
Units	A	B	C	A	B	C
psi	-0.000013506	-0.029349	228.32	-24.011	-39.132	228.32
ft H2O	-0.000031155	-0.067698	526.67	-55.386	-90.264	526.67
kN/m² (kPa)	-0.000093123	-0.20235	1574.2	-165.55	-269.81	1574.2
m H2O	-0.0000094959	-0.020634	160.53	-16.882	-27.512	160.53
bar	-0.00000093123	-0.0020235	15.742	-1.6555	-2.6981	15.742
kg/cm²	-0.00000094959	-0.0020634	16.053	-1.6882	-2.7512	16.053
				IF Factor = T		

Temp. Coefficents (m = 0.0018 PSI/°C, b = -0.034 PSI) TempOffset: -0.2 °C

Test Data

Referenced To Standard Atmosphere*

PSI	Frequency	% FS Error
-5.0	3209.45	-0.01
0.0	3166.27	0.02
5.0	3122.48	0.01
10.0	3078.32	0.02
15.0	3033.52	-0.01
20.0	2988.25	-0.03
25.0	2942.54	-0.03
30.0	2896.65	0.03
35.0	2849.83	0.02
40.0	2802.51	0.02
45.0	2754.52	0.00
50.0	2706.01	-0.01

Calibrated at = 23.5 °C Thermistor Reading = 23.3 °C

*Standard Atmosphere = 14.696 psi, 1013 millibar.

Calibration Record

VW MiniLogger

Part Number: 52613310 Serial Number: 20688

Calibration Standard: EDC 4100 Serial Number: 10992

Calibrator Re-Certification Due: May 22nd, 2005

Calibration Standard: SI 20-14 Serial Number: 19506

Calibrator Re-Certification Due: June 14th, 2004

	INPUT FREQUENCY	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
FREQUENCY	1000	1000	999
	2000	2000	1999
	3000	3000	2999
	4000	4000	3999
	5000	5000	4999
	6000	6000	5999
	RESISTANCE	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
TEMPERATURE RTD	1715	- 20 ° C	-19.6
	2076	30 ° C	29.5
	2482	80 ° C	79.8
THERMISTOR	29142	-20 ° C	-20.3
	2416	30 ° C	30.1
	377	80 ° C	79.5

This Certificate confirms that the equipment listed above has been calibrated in accordance with the manufacturer's specifications with calibration standards that are tracable to the National Institute of Standards and Technology (NIST).

Calibrated By: TQL Date: June 11th, 2004

Slope Indicator Co.

VW Piezometer Calibration Report

Customer	Lowney Associates	Serial No.	79342 T
Cust. No.	4230	Part No.	52611020
Order No.	13312	Range	0-50 PSI
Date	18-Jun-04	Cable	50613524
Cal. By.	kb	Length	35 ft
Note			

Conversion Factors for Serial No. 79342 T

Referenced To Standard Atmosphere*

	Manual ABC Factors			IDA ABC Factors		
Units	A	B	C	A	B	C
psi	-0.000013085	-0.028855	228.22	-23.263	-38.474	228.22
ft H2O	-0.000030183	-0.066559	526.43	-53.659	-88.746	526.43
kN/m² (kPa)	-0.000090220	-0.19895	1573.5	-160.39	-265.27	1573.5
m H2O	-0.0000091999	-0.020287	160.46	-16.355	-27.050	160.46
bar	-0.00000090220	-0.0019895	15.735	-1.6039	-2.6527	15.735
kg/cm²	-0.00000091999	-0.0020287	16.046	-1.6355	-2.7050	16.046
				IF Factor = T		

Temp. Coefficents (m = 0.0041 PSI/°C, b = -0.063 PSI) TempOffset: 0.1 °C

Test Data

Referenced To Standard Atmosphere*

PSI	Frequency	% FS Error
-5.0	3260.69	-0.02
0.0	3216.98	0.04
5.0	3172.29	-0.01
10.0	3127.31	-0.02
15.0	3081.84	-0.03
20.0	3035.98	-0.02
25.0	2989.62	-0.01
30.0	2942.76	0.02
35.0	2895.23	0.01
40.0	2847.17	0.01
45.0	2798.41	0.00
50.0	2749.04	-0.02

Calibrated at = 20.7 °C Thermistor Reading = 20.8 °C

*Standard Atmosphere = 14.696 psi, 1013 millibar.

Calibration Record

VW MiniLogger

Part Number: 52613310 Serial Number: 20690

Calibration Standard: EDC 4100 Serial Number: 10992

Calibrator Re-Certification Due: May 22nd, 2005

Calibration Standard: SI 20-14 Serial Number: 19506

Calibrator Re-Certification Due: June 14th, 2004

	INPUT FREQUENCY	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
FREQUENCY	1000	1000	999
	2000	2000	1999
	3000	3000	2999
	4000	4000	3999
	5000	5000	4999
	6000	6000	5999
	RESISTANCE	***IDEAL RESPONSE***	***ACTUAL RESPONSE***
TEMPERATURE RTD	1715	- 20 ° C	-19.7
	2076	30 ° C	30
	2482	80 ° C	80.2
THERMISTOR	29142	-20 ° C	-20.3
	2416	30 ° C	30.1
	377	80 ° C	79.4

This Certificate confirms that the equipment listed above has been calibrated in accordance with the manufacturer's specifications with calibration standards that are tracable to the National Institute of Standards and Technology (NIST).

Calibrated By: TQL Date: June 11th, 2004

Slope Indicator Co.

VW Piezometer Calibration Report

Customer	Lowney Associates	Serial No.	79343 T
Cust. No.	4230	Part No.	52611020
Order No.	13312	Range	0-50 PSI
Date	18-Jun-04	Cable	50613524
Cal. By.	kb	Length	35 ft
Note			

Conversion Factors for Serial No. 79343 T

Referenced To Standard Atmosphere*

	Manual ABC Factors			IDA ABC Factors		
Units	A	B	C	A	B	C
psi	-0.000013746	-0.023429	207.45	-24.437	-31.238	207.45
ft H2O	-0.000031707	-0.054042	478.51	-56.368	-72.056	478.51
kN/m² (kPa)	-0.000094774	-0.16153	1430.3	-168.49	-215.38	1430.3
m H2O	-0.0000096643	-0.016472	145.85	-17.181	-21.963	145.85
bar	-0.00000094774	-0.0016153	14.303	-1.6849	-2.1538	14.303
kg/cm²	-0.00000096643	-0.0016472	14.585	-1.7181	-2.1963	14.585
				IF Factor = T		

Temp. Coefficents (m = 0.0155 PSI/°C, b = -0.323 PSI) TempOffset: -0.1 °C

Test Data

Referenced To Standard Atmosphere*

PSI	Frequency	% FS Error
-5.0	3170.29	-0.03
0.0	3125.02	0.01
5.0	3079.06	0.02
10.0	3032.53	0.02
15.0	2985.44	0.02
20.0	2937.64	0.00
25.0	2889.32	0.00
30.0	2840.38	-0.01
35.0	2790.73	-0.02
40.0	2740.47	-0.02
45.0	2689.59	0.00
50.0	2637.98	0.02

Calibrated at = 21.3 °C Thermistor Reading = 21.2 °C

*Standard Atmosphere = 14.696 psi, 1013 millibar.

Calibration Record

VW MiniLogger

Part Number: 52613310 Serial Number: 20687

Calibration Standard: EDC 4100 Serial Number: 10992

Calibrator Re-Certification Due: May 22nd, 2005

Calibration Standard: SI 20-14 Serial Number: 19506

Calibrator Re-Certification Due: June 14th, 2004

	INPUT FREQUENCY	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
FREQUENCY	1000	1000	999
	2000	2000	1999
	3000	3000	2999
	4000	4000	3999
	5000	5000	4999
	6000	6000	5999
	RESISTANCE	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
TEMPERATURE RTD	1715	- 20 ° C	-19.6
	2076	30 ° C	30.1
	2482	80 ° C	80
THERMISTOR	29142	-20 ° C	-20.4
	2416	30 ° C	30
	377	80 ° C	79.5

This Certificate confirms that the equipment listed above has been calibrated in accordance with the manufacturer's specifications with calibration standards that are tracable to the National Institute of Standards and Technology (NIST).

Calibrated By: TQL Date: June 11th, 2004

Slope Indicator Co.

VW Piezometer Calibration Report

Customer	Lowney Associates	Serial No.	79341 T
Cust. No.	4230	Part No.	52611020
Order No.	13312	Range	0-50 PSI
Date	18-Jun-04	Cable	50613524
Cal. By.	kb	Length	20 ft
Note			

Conversion Factors for Serial No. 79341 T

Referenced To Standard Atmosphere*

	Manual ABC Factors			IDA ABC Factors		
Units	A	B	C	A	B	C
psi	-0.000014980	-0.020002	214.46	-26.631	-26.669	214.46
ft H2O	-0.000034554	-0.046137	494.69	-61.429	-61.516	494.69
kN/m² (kPa)	-0.00010328	-0.13791	1478.7	-183.62	-183.87	1478.7
m H2O	-0.000010532	-0.014062	150.78	-18.724	-18.750	150.78
bar	-0.0000010328	-0.0013791	14.787	-1.8362	-1.8387	14.787
kg/cm²	-0.0000010532	-0.0014062	15.078	-1.8724	-1.8750	15.078
				IF Factor = T		

Temp. Coefficents (m = 0.0042 PSI/°C, b = -0.076 PSI) TempOffset: -0.1 °C

Test Data

Referenced To Standard Atmosphere*

PSI	Frequency	% FS Error
-5.0	3217.68	-0.01
0.0	3174.62	0.02
5.0	3130.85	0.00
10.0	3086.65	0.00
15.0	3041.96	0.01
20.0	2996.65	0.00
25.0	2950.79	-0.01
30.0	2904.51	0.02
35.0	2857.34	-0.01
40.0	2809.77	0.01
45.0	2761.41	0.00
50.0	2712.37	0.00

Calibrated at = 20.7 °C Thermistor Reading = 20.6 °C

*Standard Atmosphere = 14.696 psi, 1013 millibar.

Calibration Record

VW MiniLogger

Part Number: 52613310 Serial Number: 20686

Calibration Standard: EDC 4100 Serial Number: 10992

Calibrator Re-Certification Due: May 22nd, 2005

Calibration Standard: SI 20-14 Serial Number: 19506

Calibrator Re-Certification Due: June 14th, 2004

	INPUT FREQUENCY	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
FREQUENCY	1000	1000	999
	2000	2000	1999
	3000	3000	2999
	4000	4000	3999
	5000	5000	4999
	6000	6000	5999
	RESISTANCE	*IDEAL RESPONSE*	*ACTUAL RESPONSE*
TEMPERATURE RTD	1715	- 20 ° C	-19.7
	2076	30 ° C	30.1
	2482	80 ° C	80.1
THERMISTOR	29142	-20 ° C	-20.4
	2416	30 ° C	30
	377	80 ° C	79.4

This Certificate confirms that the equipment listed above has been calibrated in accordance with the manufacturer's specifications with calibration standards that are tracable to the National Institute of Standards and Technology (NIST).

Calibrated By: TQL Date: June 11th, 2004

Slope Indicator Co.