Report of Geotechnical Studies
Geotechnical Engineering and Engineering
Geology Data and Analysis

Volume 2
Appendix A-D

Volume 2

Report of Geotechnical Studies
Geotechnical Engineering and Engineering Geology Data and Analysis
Appendix A through Appendix D
Proposed Newport Banning Ranch Development
City of Newport Beach/County of Orange

Prepared for:

Newport Banning Ranch LLC

Prepared By:

GMU Geotechnical, Inc.
July 2011

APPENDIX A

Boring and CPT Sounding Logs

GMU
GEOTECHNICAL, INC.

APPENDIX A-1

Boring and CPT Soundings
Performed by
Goffman, McCormick & Urban, Inc.

APPENDIX A-1

GEOTECHNICAL EXPLORATION PROCEDURES, BORING LOGS, AND CPT SOUNDING LOGS

GMU's exploration at the subject sit consisted of excavating 11 drill holes and 6 test pits. The locations of the holes are shown on Plate 7 -- Geology Map. The drilling for the borings was accomplished using a truck-mounted bucket auger drill.

Our drill holes were logged, and "undisturbed" samples were taken from the drill holes using a 3.375-inch outside-diameter drive sampler which contains a 2.625-inch diameter brass sample sleeve 8 inches in length. Bulk samples of representative soil types were also taken. In addition, standard penetration tests (SPT) were also performed at selected depths at GB-1 and GB-2. Uncorrected SPT blowcounts are shown on the drill logs of GB-1 and GB-2.

Our logs of each drill holes are presented in Plates A-2.1 through A-2.11 -- Log of Drill Hole. Our logs of test pits are presented as Plates A-2.12 through A-2.17 -- Log of Test Pit. In addition, cone penetration tests (CPT) were also performed at selected locations. The CPT soundings were performed and logged by Gregg In-Situ, Inc. and their logs are presented in un-numbered plates following the boring logs.

The geologic and engineering field descriptions and classifications which appear on these logs are prepared according to Corps of Engineers and Bureau of Reclamation Standards. Major soil classifications are prepared according to the United Soil Classification System as modified by ASTM Standard No. 2487. Since the description and classification which appear on the Log of Drill Hole are intended to be that which most accurately describe a given interval of drill hole (frequently an interval of several feet), discrepancies do occur in the Unified Soil Classification System nomenclature between that interval and a particular sample in that interval. For example, an 8-foot-thick interval and a particular sample in the Log of Drill Hole may be identified as a silty sand (SM) while one sample taken within the interval may have individually been identified as a sandy silt (ML). This discrepancy is frequently allowed to remain to emphasize the occurrence of local textural variations in the interval.

The descriptive terminology of the logs is modified from current ASTM Standards to suit the purposes of this study and is summarized as follows:

a. Soil Type - per Legend to Logs

b. Color - at field moisture

c. Moisture - (as estimated during drilling)

"dry"	
"damp"	- some moisture but less than optimum for compaction
"moist"	- near optimum
"wet"	- above optimum
"saturated"	- containing free moisture

d. Grain size - "fine," "medium," and "dense"

e. Density (granular soils) - "loose" and "dense"

f. Consistency (cohesive soils)

"very soft"	Thumb will penetrate soil more than 1 inch (25 mm).
"soft"	Thumb will penetrate soil about 1 inch (25 mm).
"firm"	Thumb will indent soil about ¼ inch (5 mm).
"hard"	Thumb will not indent soil but readily indented with thumbnail.
"very hard"	Thumbnail will not indent soil.

MAJOR DIVISIONS			Group Letter	Symbol	TYPICAL NAMES
COARSE-GRAINED SOILS More Than 50% Retained On No.200 Sieve (Based on The Material Passing The 3-Inch(75mm) Sieve. Reference; ASTM Standard D2487)	GRAVELS 50% or More of Coarse Fraction Retained On No.4 Sieve	Clean Gravels	GW		Well Graded Gravels and Gravel-Sand Mixtures, Little or No Fines.
			GP		Poorly Graded Gravels and Gravel-Sand Mixtures, Little or No Fines.
		Gravels With Fines	GM		Silty Gravels, Gravel-Sand-Silt Mixtures.
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures.
	SANDS More Than 50% of Coarse Fraction Passes No.4 Sieve	Clean Sands	SW		Well Graded Sands and Gravelly Sands, Little or No Fines.
			SP		Poorly Graded Sands and Gravelly Sands, Little or No Fines.
		Sands With Fines	SM		Silty Sands, Sand-Silt Mixtures.
			SC		Clayey Sands, Sand-Clay Mixtures.
FINE-GRAINED SOILS 50% or More Passes The No.200 Sieve (Based on The Material Passing The 3-Inch(75mm) Sieve. Reference; ASTM Standard D2487)	SILTS AND CLAYS Liquid Limit Less Than 50%		ML		Inorganic Silts, 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 50% or Greater		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.

ADDITIONAL TESTS

DS = Direct Shear
HY = Hydrometer Test
TC = Tiaxial Compression Test
CN = Consolidation Test
(T) = Time Rate
EX = Expansion Test
CP = Compaction test
PS = Particle Size Distribution
EI = Expansion Index
SE = Sand Equivalent Test
AL = Atterberg Limits
CH = Chemical Tests
RV = Resistance Value
(N) = Natural Undisturbed Sample
(R) = Remolded Sample

SAMPLE SYMBOLS

Undisturbed Sample

Bulk Sample

Unsuccessful Sampling Attempt

10: 10 Blows for 12-Inches Penetration
6/4: 6 Blows Per 4-Inches Penetration
P: Push

GEOLOGIC STRUCTURE

B = Bedding S = Shear
C = Contact F = Fault
J = Joint

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 4 ± feet
DATUM MSL
GROUNDWATER DEPTH 3.5 ELEVATION 0.5
DRILLING METHOD Rotary Wash
CONTRACTOR C&L
TOTAL DEPTH OF HOLE 45 feet DIAMETER(S) OF HOLE 8 inches
SAMPLER(S) SPT Sampler
DRIVING METHOD 140 lb. Safety Hammer DROP 12 inches

LOGGED BY DRA
DATE DRILLED 06/01/98

REMARKS

End boring at 45 feet.
No caving.
Hole bailed, water at 3.5 feet.
Hole backfilled with tailings.

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	ALLUVIUM (Qal)	SILTY SAND (SM), fine grained, black (5YR 2.1/1), moist, dense, strong petroleum odor.					29	140				
							32	140				
		SANDY SILT (ML), fine grained, black (5YR 2.5/1), moist, dense, odor.					5	140				
5		SILTY SAND (SM), fine to medium grained, dark olive gray (5Y 3/2), moist, dense, odor.	0	5			2	140				
		CLAYEY SILT (ML), dark gray (5Y 3/1), wet, moderately firm, with traces of brown organic peat.					1	140				
		FAT CLAY (CH), dark olive gray (5Y 3/2), wet, moderately firm, with brown organic peat, odor.					2	140				
10			-5	10			1	140				
							2	140				
		SANDY SILT (ML), fine grained sand, dark gray (2.5Y N3), wet, moderately firm.					6	140				
			-10				12	140				
15		SILTY SAND (SM), fine grained, dark gray (5Y3/1), wet, moderately dense.		15			13	140				
							14	140				
		POORLY GRADED SAND (SP), fine to medium grained, dark gray (5Y 3/1), wet, moderately dense with shell fragments.					17	140				
20			-15	20			13	140				
		SILTY SAND (SM), fine grained, dark gray (5Y 3/1), wet, dense with shell fragments.					20	140				
							24	140				
25		POORLY GRADED SAND (SP), fine to coarse grained, dark gray (2.5Y N3), wet, dense with scattered gravel to 1" in diameter and shell fragments.	-20	25			18	140				
							35	140				
							31	140				
30			-25	30			27	140				
							30	140				
		Scattered gravel to ½" in diameter, very dense.					52	140				
							82	140				
35		Fine to medium grained, no gravel.	-30	35			90	140				
							97	140				
		Fine to coarse grained with scattered gravel to 1" in diameter.					68	140				
			-35				78	140				

LEGEND ON PLATE A-1

LOG OF DRILL HOLE

GB 1

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	TEST DATA: ADDITIONAL TESTS
		± 20% gravel to 1" in diameter.					130	140				
							148	140				
			-40				107	140				
-45				45								

LEGEND ON PLATE A-1

SHEET 2 OF 2

LOG OF DRILL HOLE

GB 1

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.1

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 4 ± feet
DATUM MSL
GROUNDWATER DEPTH 4.0 ELEVATION 0.0
DRILLING METHOD Rotary Wash
CONTRACTOR C&L
TOTAL DEPTH OF HOLE 51 feet DIAMETER(S) OF HOLE 8 inches
SAMPLER(S) SPT Sampler
DRIVING METHOD 140 lb. Safety Hammer DROP 12 inches

LOGGED BY DRA
DATE DRILLED 06/01/98

REMARKS

End boring at 51 feet.
No caving.
Hole balled, water at 4 feet.
Hole backfilled with tailings.

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	ALLUVIUM (Qal)	SILTY SAND (SM), fine grained, black (5Y 2.5/2), moist, dense, petroleum odor.					21	140				
		CLAYEY SILT (ML), dark gray (10YR 3/1), moist, firm, odor.					34	140				
		SANDY SILT (ML), fine grained sand, dark grayish brown (10YR 3/2), moist, firm.	0				44	140				
5		CLAYEY SILT (ML), dark gray (10YR 3/1), moist, firm.		5			2	140				
							5	140				
		FAT CLAY (CH), dark olive gray (5Y 3/2), wet, moderately firm, with brown peat lenses.					10	140				
10		SILTY SAND (SM), fine grained, dark gray (5Y 2.5/1), moderately dense. Brown fibrous peat.	-5	10			11	140				
							11	140				
		Shell fragments.					12	140				
5		SANDY SILT (ML), fine grained, dark gray (5Y3/1), wet, moderately firm, with scattered shell fragments and faint petroleum odor.	-10	15			12	140				
							12	140				
							18	140				
20		SILTY SAND (SM), fine to medium grained, dark gray (2.5Y N3), wet, dense, with shell fragments.	-15	20			24	140				
							29	140				
		No shell fragments.					55	140				
							58	140				
25			-20	25			70	140				
		Fine to coarse sand, with shell fragments.					42	140				
							16	140				
		Coarse sand, dark gray (2.5Y N4), large amount of shell fragments, few scattered gravel to ¾" in diameter.	-25				41	140				
30		SANDY CLAY (CL), fine grained sand, black (2.5Y N2), wet, firm.		30			13	140				
							16	140				
							57	140				
35		POORLY GRADED SAND (SP), fine to coarse grained, black (5Y 2.5/1), wet, very dense.	-30	35			75	140				
		Dark gray (5Y3/1).					76	140				
							73	140				
			-35				75	140				

LEGEND ON PLATE A-1

LOG OF DRILL HOLE

GB 2

GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	TEST DATA: ADDITIONAL TESTS
	Scattered gravel to ½" in diameter. NO RECOVERY					100 /4"	140				
						91	140				
	Slightly cemented.	-40				117	140				
-45	± 20% gravel to 1" in diameter.		-45			135	140				
						125	140				
						123	140				
		-45									
-50			-50			132	140				

LEGEND ON PLATE A-1

SHEET 2 OF 2

LOG OF DRILL HOLE

GB 2

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.2

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 56 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Bucket Auger
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 45 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY RGT
DATE DRILLED 08/12/98

REMARKS

End boring at 45 feet
Seepage at 40 feet, caving at 45 feet
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	MARINE TERRACE (Qtm)	SANDY CLAY (CL), fine grained sand, dark brown, loose to medium dense, dry to slightly moist.	55									
5			50	5		X	2	1590	15	112		CN, DS
		POORLY GRADED SAND (SP), fine grained, dark brown, some mica, moist, loose;	45									CP, PS, HY, AL, EI, CH
10				10		X	2	1590	18	100		
15		becoming medium to coarse grained.	40	15		X	4	1590	6	94		DS
	SAN PEDRO FM (Qsp) contact approximate	SILTY SAND (SM), fine to coarse, grayish brown, medium dense to firm, some mica, moist to very moist;										
20			35	20			5	1590	12	112		CN
25		becoming coarse grained, reddish-orange, loose, some gypsum and mica;	30	25			14	1590	4	94		
30			25	30			7	795	4	96		
35		becoming fine grained, light gray, mica rich.	20	35			14	795	6	85		CN, DS

LEGEND ON PLATE A-1

SHEET 1 OF 2

LOG OF DRILL HOLE

GB 3

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.3

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	TEST DATA: ADDITIONAL TESTS
			15				14	795				
45				45								

LEGEND ON PLATE A-1

SHEET 2 OF 2

LOG OF DRILL HOLE

GB 3

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.3

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 58 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Bucket Auger
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 40 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY RGT
DATE DRILLED 08/12/98

REMARKS

End boring at 40 feet
Seepage at 40 feet, caving at 40 feet
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	MARINE TERRACE (Qtm)	SANDY CLAY(CL), fine grained, dark brown, loose to medium dense, dry.	55									
5				5			3	1590	22	100		CN
		SANDY SILT (MH), fine grained, some clays, light brown to dark brown, some mica, loose, moist.	50									
10				10			5	1590	6	104		CN
			45									
15				15			3	1590	20	98		
			40									
20	SAN PEDRO FM (Qsp) contact approximate	POORLY GRADED SAND (SP), medium to coarse grained, grayish brown, medium dense to firm, very moist.		20			9	1590	7	104		
			35									
25				25			9	1590	8	82		
			30									
30		SILTY SAND (SM), fine grained, grayish brown, mica rich, moist;		30			10	795	5	80		
			25									
35		very moist.		35			11	795	24	91		
			20				14	795	26	94		

LEGEND ON PLATE A-1

SHEET 1 OF 1

LOG OF DRILL HOLE

GB 4

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.4

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 16 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Bucket Auger
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 30 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY RGT
DATE DRILLED 08/13/98

REMARKS

End boring at 30 feet
Seepage at 15 feet, no caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	NON-ENGINEERED FILL (Qafu)	SANDY CLAY (CL), dark brown to black, loose to medium dense, dry;	15									
5			10	5		X	3	1590	25	99		CN, CP, AL, PS, HY, EI, CH
		ASPHALT 6" inches thick across hole.										
10	SAN PEDRO FM (Qsp)	SANDY SILT (MH), dark brown, some clumps of fines;	5	10		X	2	1590	20	105		CN
15		seepage noted;	0	15			2	1590	28	94		
20			-5	20			2	1590	32	93		
25		becoming light gray, loose, wet.	-10	25		X	3	1590	29	95		
30				30			4	795	25	97		

LEGEND ON PLATE A-1

SHEET 1 OF 1

LOG OF DRILL HOLE

GB 5

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.5

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 48 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Rotary Bucket
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 37 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY RGT
DATE DRILLED 08/13/98

REMARKS

End boring at 37 feet
Seepage at 37 feet, caving at 36 feet
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	NON-ENGINEERED FILL (Qafu)	SANDY CLAY (CL), fine grained, medium dense to dense.	45									
5				5		X	11	1590	11	121		
	SAN PEDRO FM (Qsp) contact approximate	POORLY GRADED SAND (SP), some silts, light brown, loose, medium dense;	40									
10				10		X	1	1590	18	96		
			35									
15				15			2	1590				
			30									
20				20			2	1590	12	105		
			25									
25		becoming subrounded gravel, moist, loose, light brown with some orange.		25		X	8	1590	2	99		
			20									
30		SILTY SAND (SM), some fines, grayish brown, mica rich.		30								
			15									
35				35			10	795				

LEGEND ON PLATE A-1

SHEET 1 OF 1

LOG OF DRILL HOLE

GB 6

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.6

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 50 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Bucket Auger
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 40 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY BE
DATE DRILLED 08/14/98

REMARKS

End boring at 40 feet
Seepage at 32 feet, no caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	NON-ENGINEERED FILL (Qafu)	POORLY GRADED SAND (SP), pebbles, medium brown, coarse grained.	50									
5	SAN PEDRO FM (Qsp)?	SANDY SILT (MH), light gray;	45	5			4	1590	2			
10			40	10			3	1590	22	98		CN
15			35	15			3	1590	12	109		
20		becoming mica rich	30	20			5	1590	23	99		
25			25	25			5	1590	25	98		
30		becoming light brown.	20	30			6	795	26	94		
35			15	35			6	795	27	98		
			10				6	795	27	96		

LEGEND ON PLATE A-1

SHEET 1 OF 1

LOG OF DRILL HOLE

GB 7

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.7

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 57 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Bucket Auger
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 50 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY BE
DATE DRILLED 08/14/98

REMARKS

End boring at 50 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	MARINE TERRACE (Qtm)	SANDY CLAY (CL), dark brown.	55									
5				5		X	3	1590	12	110		CN
			50									
10		SANDY SILT (ML), fine to medium grained sand, light brown;		10			1	1590	15	103		CN, PS
			45									
15				15		X	3	1590	5	95		
	SAN PEDRO FM (Qsp)	SILTY SAND (SM), fine to medium grained, light brown.	40									
20				20			3	1590	12	115		
			35									
25				25			11	1590	3	97		
			30									
30				30			12	795	2	94		
			25									
35				35			10	795	3	110		
			20									

LEGEND ON PLATE A-1

SHEET 1 OF 2

LOG OF DRILL HOLE

GB 8

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.8

D.	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
		becoming fine grained, mica rich.					11	795	6	90		
			15									
45				45			12	795	19	99		
			10									
50				50			9	795	22	101		

LEGEND ON PLATE A-1

SHEET 2 OF 2

LOG OF DRILL HOLE

GB 8

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.8

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 52 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Bucket Auger
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 45 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY RGT
DATE DRILLED 08/17/98

REMARKS

End boring at 45 feet
No water, caving at 7 feet
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	MARINE TERRACE (Qtm)	SANDY CLAY (CL), medium to dark brown, dry, loose to medium dense.	50									
		SANDY SILT (ML), light brown with some fines, dry, loose;										
5				5		X	5	1590	11	102		CN
			45									
10				10								
	SAN PEDRO FM (Qsp)	SILTY SAND (SM), light grayish brown, loose, dry to slightly moist;	40									
15				15			6	1590	9	115		CN
			35									
20				20								
			30									
25				25			12	1590				
			25									
30				30								
			20									
35				35								
			15									

SAMPLE DATA TEST DATA

LEGEND ON PLATE A-1

SHEET 1 OF 2

LOG OF DRILL HOLE

GB 9

GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
					SAMPLE DATA			TEST DATA			
	becoming light gray.				X	20	795	6	100		
		10									
45			45								

LEGEND ON PLATE A-1

SHEET 2 OF 2

LOG OF DRILL HOLE

GB 9

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.9

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 56 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Bucket Auger
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 45 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY RGT
DATE DRILLED 08/17/98

REMARKS

End boring at 45 feet
No water, caving at 19 feet
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	NON-ENGINEERED FILL (Qafu)	SANDY CLAY (CL), fine grained sand, dark brown, firm, dry.	55									
5	MARINE TERRACE (Qtm)	SANDY SILT (ML), light grayish brown, loose.	50	5		X	3	1590	11	113		CN, CP, PS, HY, AL, EI, CH
10			45	10								
15			40	15								
20			35	20								
25			30	25			14	1590	3	90		
	SAN PEDRO FM (Qsp)?	SILTY SAND (SM), fine grained, gray, wet, mica rich.										
30			25	30								
35			20	35								

LEGEND ON PLATE A-1

SHEET 1 OF 2

LOG OF DRILL HOLE

GB 10

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.10

H	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	ADDITIONAL TESTS
			15									
45				45		X	11	795	4	95		

LEGEND ON PLATE A-1

SHEET 2 OF 2

LOG OF DRILL HOLE

GB 10

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.10

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 68 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
DRILLING METHOD Bucket auger
CONTRACTOR A+W
TOTAL DEPTH OF HOLE 45 feet DIAMETER(S) OF HOLE 24 inches
SAMPLER(S) Open drive sampler with 8-inch sleeve
DRIVING METHOD Kelly DROP 12 inches

LOGGED BY Rgt
DATE DRILLED 08/17/98

REMARKS

End boring at 45 feet
No water or caving
Hole backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT (pounds)	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	MARINE TERRACE (Qtm)	SANDY CLAY (CL), fine grained, dark brown, dry.	65									
5				5			5	1590	12	120		DS
		SANDY SILT (MH), fine to medium grained, light grayish brown, dry, loose, some mica.	60									
10				10			9	1590	13	102		CN
			55									
15				15								
			50									
20				20								
			45									
25				25								
	SAN PEDRO FM (Qsp)	POORLY GRADED SAND (SP), coarse grained, reddish-brown, wet;	40									
30		return to sandy silt		30								
			35									
35		return to coarse sand;		35								
			30									

LEGEND ON PLATE A-1

SHEET 1 OF 2

LOG OF DRILL HOLE

GB 11

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT (pounds)	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY DENSITY (pcf)	TEST DATA: RELATIVE COMPACT.	TEST DATA: ADDITIONAL TESTS
		becoming coarse tot medium grained.					11	795	4	96		DS
			25									
45				45								

LEGEND ON PLATE A-1

SHEET 2 OF 2

LOG OF DRILL HOLE

GB 11

PROJECT 98-08

Goffman, McCormick & Urban, Inc.

PLATE A-2.11

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 33 ± feet
DATUM MSL
GROUNDWATER DEPTH 8.0 ELEVATION 25.0
EXCAVATION METHOD Backhoe
CONTRACTOR RJ LaLonde
TEST PIT DIMENSIONS W 2" L 9" D 10'

LOGGED BY EDL
DATE EXCAVATED 09/02/98

REMARKS

End trench at 9.5 feet
Water at 8 feet, slight caving at 7.5 feet
Trench backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	COLLUVIUM (Qcol),	SILT (ML) with fine sand and some gravel, light brown, dry to damp, soft to firm, rounded large gravel in upper 8 inches, rootlets to 2 feet								
		SILTY SAND (SM), fine grained, reddish brown, damp, firm.								
	SAN PEDRO FM (Qsp), fine grained sands with horizontal iron banded staining	POORLY GRADED SAND (SP), light gray to reddish brown, damp, medium dense;	30							
5				5						
		becoming moist with silt below 6 feet.								
	slight caving at 7.5 feet seepage at 8 feet		25 ▽							

LEGEND ON PLATE A-1

LOG OF TEST PIT

TP 1

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 56 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
EXCAVATION METHOD Backhoe
CONTRACTOR RJ LaLonde
TEST PIT DIMENSIONS W 2" L 12" D 13'

LOGGED BY EDL
DATE EXCAVATED 09/02/98

REMARKS

End trench at 13 feet
No water or caving
Trench backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	NON ENGINEERED FILL (Qafu),	SILTY SAND (SM), fine to coarse grained with some gravel, light brown, dry, rootlets to 5 feet.	55							
	2" diameter asphalt chunk at 3 feet nylon cord at 4 feet									
5				5						
	MARINE TERRACE (Qtm), fine grained sands with iron staining	POORLY GRADED SAND (SP) with some silt, light brown to gray, damp to moist, medium dense.	50							
10				10						
			45							

LEGEND ON PLATE A-1

LOG OF TEST PIT

TP 2

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 67 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
EXCAVATION METHOD Backhoe
CONTRACTOR RJ LaLonde
TEST PIT DIMENSIONS W 2" L 9" D 8'

LOGGED BY EDL
DATE EXCAVATED 09/02/98

REMARKS

End trench at 7.5 feet
No water or caving
Trenched backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	TOPSOIL / COLLUVIUM with fine sands	SILT (ML) with fine sand, brown, dry to damp, firm.								
	MARINE TERRACE (Qtm), fine grained sands, massively bedded with pyrite and mica	POORLY GRADED SAND (SP), fine grained, damp, medium dense.	65							
5				5						
			60							

LEGEND ON PLATE A-1

LOG OF TEST PIT

TP 3

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 50 ± feet
DATUM MSL
GROUNDWATER DEPTH _____ ELEVATION _____
EXCAVATION METHOD Backhoe
CONTRACTOR RJ LaLonde
TEST PIT DIMENSIONS W 2" L 14" D 14'

LOGGED BY EDL
DATE EXCAVATED 09/02/98

REMARKS

Backhoe extended
End trench at 14 feet
No water or caving
Trench backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	NON-ENGINEERED FILL (Qafu), silt in the upper 9", sands with silt below 1 foot	SILT (ML) with fine sand, brown, dry, soft.	50							
		SILTY SAND (SM), very fine grained, light brown, damp, loose, porous to 3 feet;								
5	very porous layer at 5 feet	rootlets at 5 feet.	45	5						
	gray shale layer 2" thick at top of (Qcol) contact									
	COLLUVIUM (Qcol), silts with fine sands, rootlet structure throughout soil matrix	SILT (ML) with fine sand, light brown, moist, soft;								
10		increase in sand below 10 feet.	40	10						

LEGEND ON PLATE A-1

LOG OF TEST PIT

TP 4

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 68 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
EXCAVATION METHOD Backhoe
CONTRACTOR RJ LaLonde
TEST PIT DIMENSIONS W 2" L 13" D 15'

LOGGED BY EDL
DATE EXCAVATED 09/02/98

REMARKS

Backhoe extended
End trench at 15 feet
No water, slight caving at 2 feet
Trench backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	NON-ENGINEREED FILL (Qafu), sands and silts, small amount of wood and metal pipe debris caving at 2 feet	POORLY GRADED SAND (SP), fine grained, off white, dry, loose.								
		SILT (ML) with fine sand, light brown, damp, soft.	65							
5				5						
	3" diameter pipe at 7 feet	SILTY SAND (SM), fine grained, tan to brown, damp, loose to firm.								
	COLLUVIUM (Qcol)	SILT (ML) with fine sand, light brown, damp, firm; some clay at 9 feet;	60							
10				10						
		becoming moist at 12 feet.	55							
15				15						

LEGEND ON PLATE A-1

LOG OF TEST PIT

TP 5

PROJECT TAYLOR WOODROW
LOCATION BANNING RANCH
GROUND SURFACE ELEVATION 78 ± feet
DATUM MSL
GROUNDWATER DEPTH ELEVATION
EXCAVATION METHOD Backhoe
CONTRACTOR RJ LaLonde
TEST PIT DIMENSIONS W 2" L 13" D 15'

LOGGED BY EDL
DATE EXCAVATED 09/02/98

REMARKS

End trench at 15 feet
No water or caving
Trench backfilled

DEPTH	GEOLOGICAL CLASSIFICATION DESCRIPTION	ENGINEERING CLASSIFICATION AND DESCRIPTION	ELEVATION	DEPTH	SOIL SYMBOL	SAMPLE	MOISTURE CONTENT	DRY DENSITY (pcf)	RELATIVE COMPACT.	ADDITIONAL TESTS
	COLLUVIUM (Qcol)	SILT (ML), brown, dry, soft to firm, damp below 1 foot, moderately porous;	75							
5				5						
		with fine sand below 8 feet.	70							
10		SILTY SAND (SM), fine grained, light brown, damp to moist, loose to medium dense;		10						
		with some clay below 12 feet.	65							
	MARINE TERRACE (Qtm)	POORLY GRADED SAND (SP), fine grained, with some silt, light brown to gray, moist, medium dense.								
15				15						

LEGEND ON PLATE A-1

LOG OF TEST PIT

TP 6

PRESENTATION OF CONE PENETRATION TEST DATA

NEWPORT OIL FIELD

NEWPORT BEACH, CALIFORNIA

Prepared for:

GOFFMAN, McCORMICK & URBAN
Rancho Santa Margarita, California

Prepared by:

GREGG IN SITU, INC.
Signal Hill, California

Prepared on:

June 16, 1998

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- Interpretation Chart
- Interpretation Output
- Pore Pressure Dissipation Plots
- References
- Computer Diskette with ASCII Files

PRESENTATION OF CONE PENETRATION TEST DATA

1.0 INTRODUCTION

This report presents the results of a Cone Penetration Testing (CPT) program carried out at the Newport Oil Field site located in Newport Beach, CA. The work was performed on May 27 & 28, 1998. The scope of work was performed as directed by GOFFMAN, McCORMICK & URBAN personnel.

2.0 FIELD EQUIPMENT & PROCEDURES

The Cone Penetration Tests (CPT) were carried out by GREGG IN SITU, INC. of Signal Hill, CA using an integrated electronic cone system. The CPT soundings were performed in accordance with ASTM standards (D3441). A 10 ton capacity cone was used for all of the soundings. This cone has a tip area of 10 sq.cm. and friction sleeve area of 150 sq.cm. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85.

The cones used during the program recorded the following parameters at 5 cm depth intervals:

- Tip Resistance (Qc)
- Sleeve Friction (Fs)
- Dynamic Pore Pressure (Ut)

The above parameters were printed simultaneously on a printer and stored on a computer diskette for future analysis and reference.

The pore water pressure element was located directly behind the cone tip. The pore water pressure element was 5.0 mm thick and consisted of porous plastic. Each of the elements were saturated in glycerin under vacuum pressure prior to penetration. Pore pressure dissipations were recorded at 5 second intervals when appropriate during pauses in the penetration.

A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

The cones were pushed using GREGG IN SITU's CPT rig, having a down pressure capacity of approximately 25 tons. Twenty-one CPT soundings were performed to depths of approximately 30 to 50 feet below ground surface. Test locations and depths were determined in the field by GOFFMAN, McCORMICK & URBAN personnel.

3.0 CONE PENETRATION TEST DATA & INTERPRETATION

The cone penetration test data is presented in graphical form in the attached Appendix. Penetration depths are referenced to existing ground surface. This data includes CPT logs of measured soil parameters and a computer tabulation of interpreted soil types along with additional geotechnical parameters and pore pressure dissipation data.

The stratigraphic interpretation is based on relationships between cone bearing (Qc), sleeve friction (Fs), and penetration pore pressure (Ut). The friction ratio (Rf), which is sleeve friction divided by cone bearing, is a calculated parameter which is used to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone bearing and generate large excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little in the way of excess pore water pressures.

The interpretation of soils encountered on this project was carried out using recent correlations developed by Robertson et al, 1988. It should be noted that it is not always possible to clearly identify a soil type based on Qc, Fs and Ut. In these situations, experience and judgement and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type. The soil classification chart used to interpret soil types based on Qc and Rf is provided in the Appendix.

We hope the information presented is sufficient for your purposes. If you have any questions, please do not hesitate to contact our office at (562) 427-6899.

Sincerely,
GREGG IN SITU, INC.

Brian Savela
Operations Manager

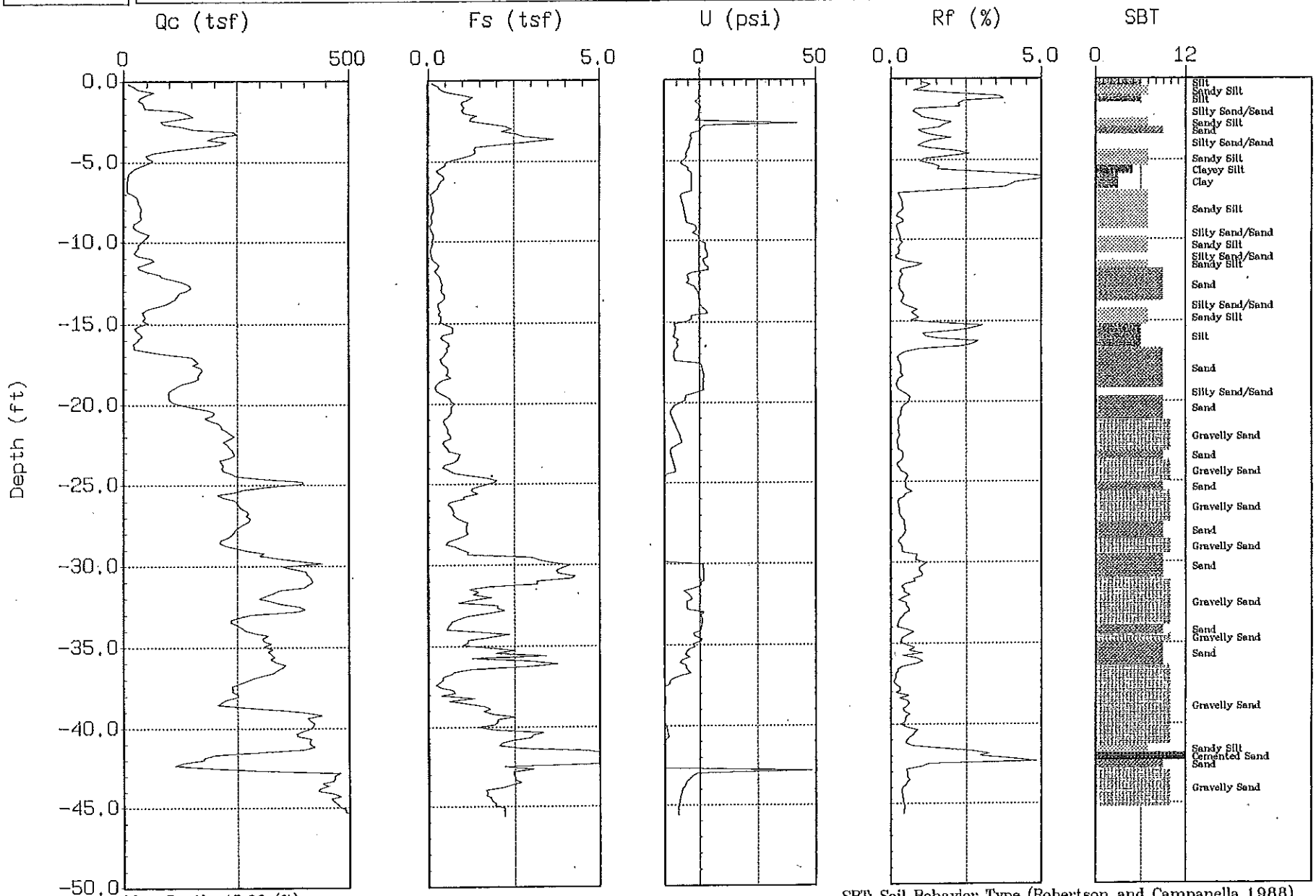
APPENDIX

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-1

Engineer : G.SILVER
Date : 05:27:98 08:34



Max. Depth: 45.60 (ft)

Depth Inc.: 0.164 (ft)

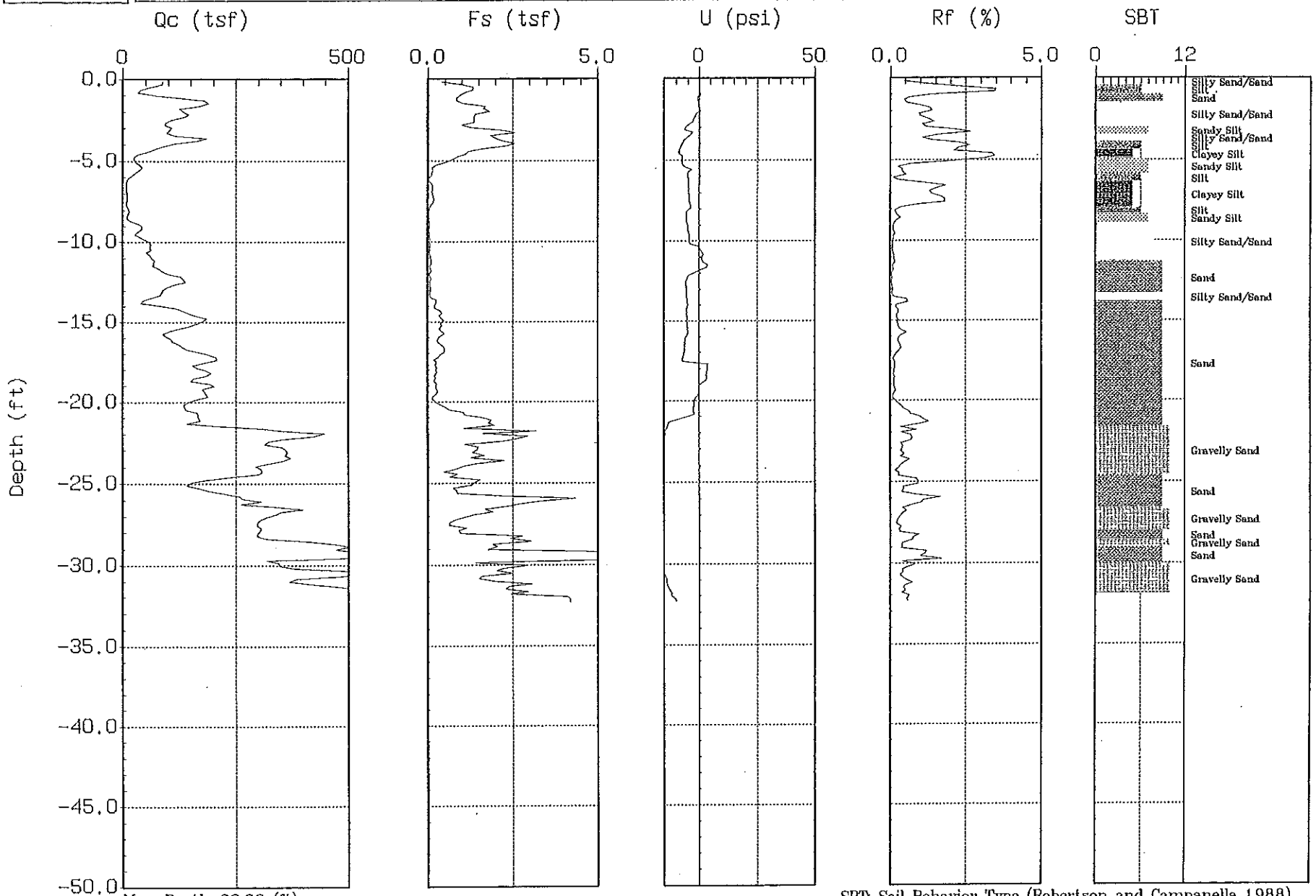
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-2

Engineer : G.SILVER
Date : 05:27:98 09:25



Max. Depth: 32.32 (ft)

Depth Inc.: 0.164 (ft)

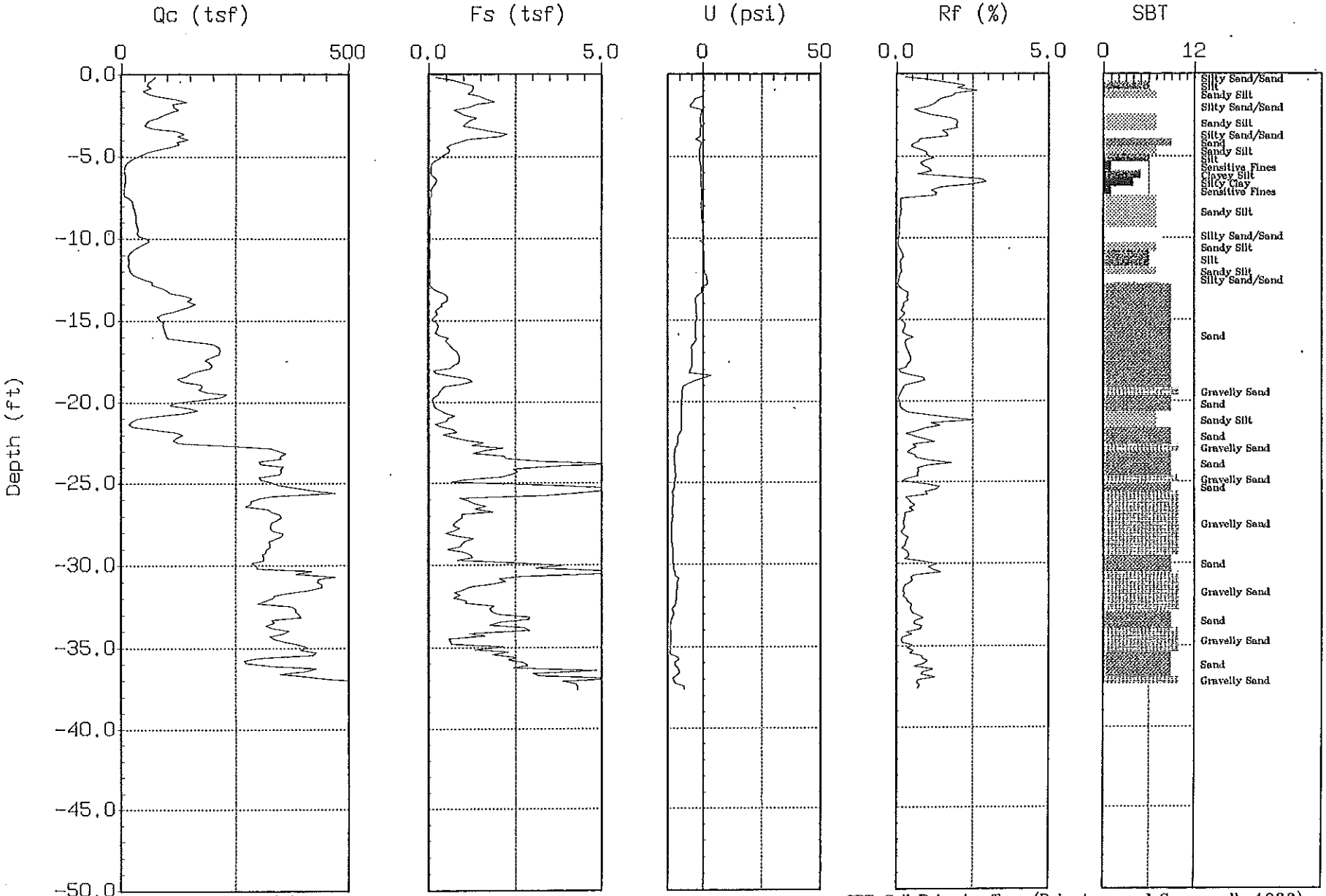
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-3

Engineer : G.SILVER
Date : 05:27:98 09:59



Max. Depth: 37.57 (ft)

Depth Inc.: 0.164 (ft)

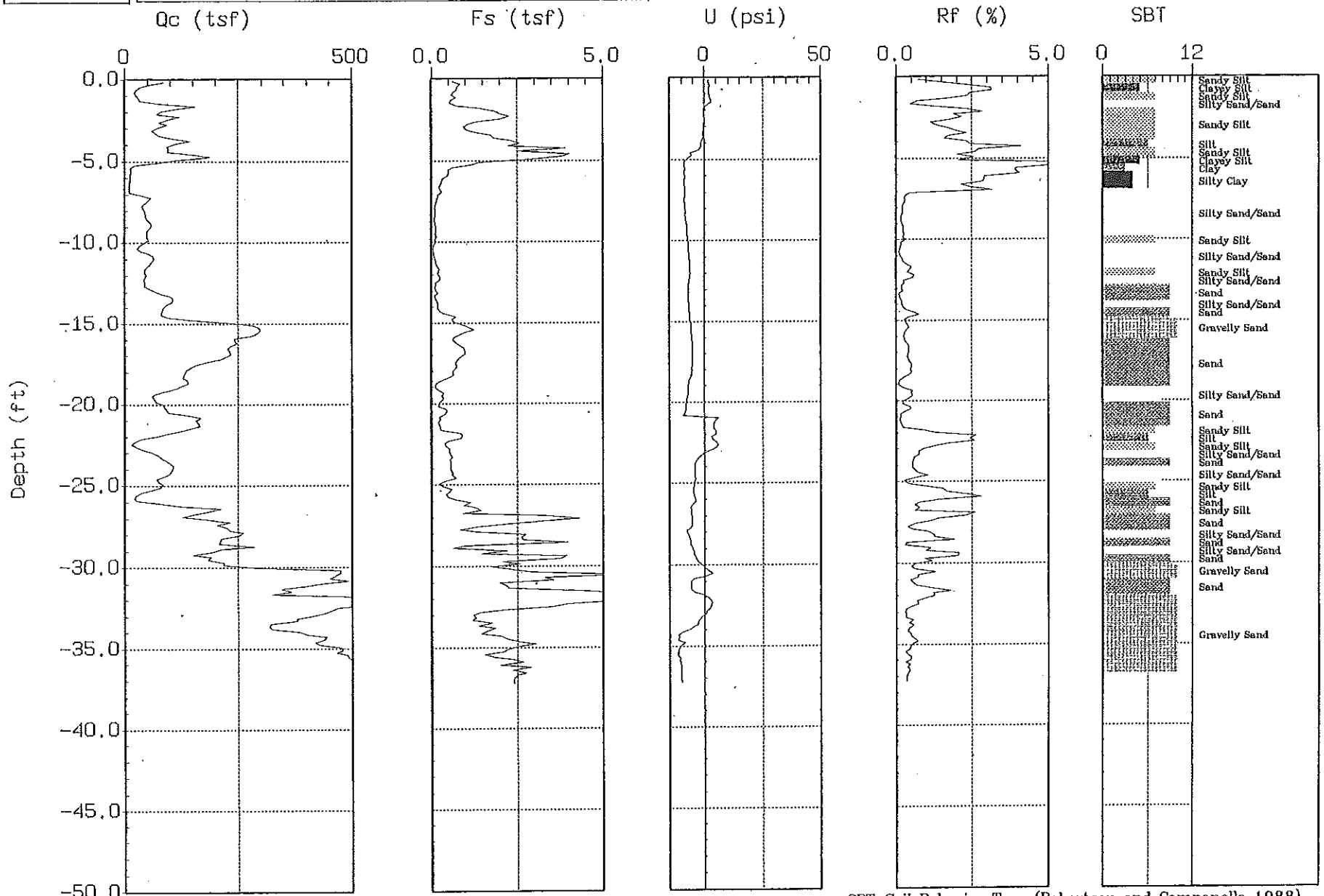
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-4

Engineer : G.SILVER
Date : 05:27:98 10:44



Max. Depth: 37.24 (ft)

Depth Inc.: 0.164 (ft)

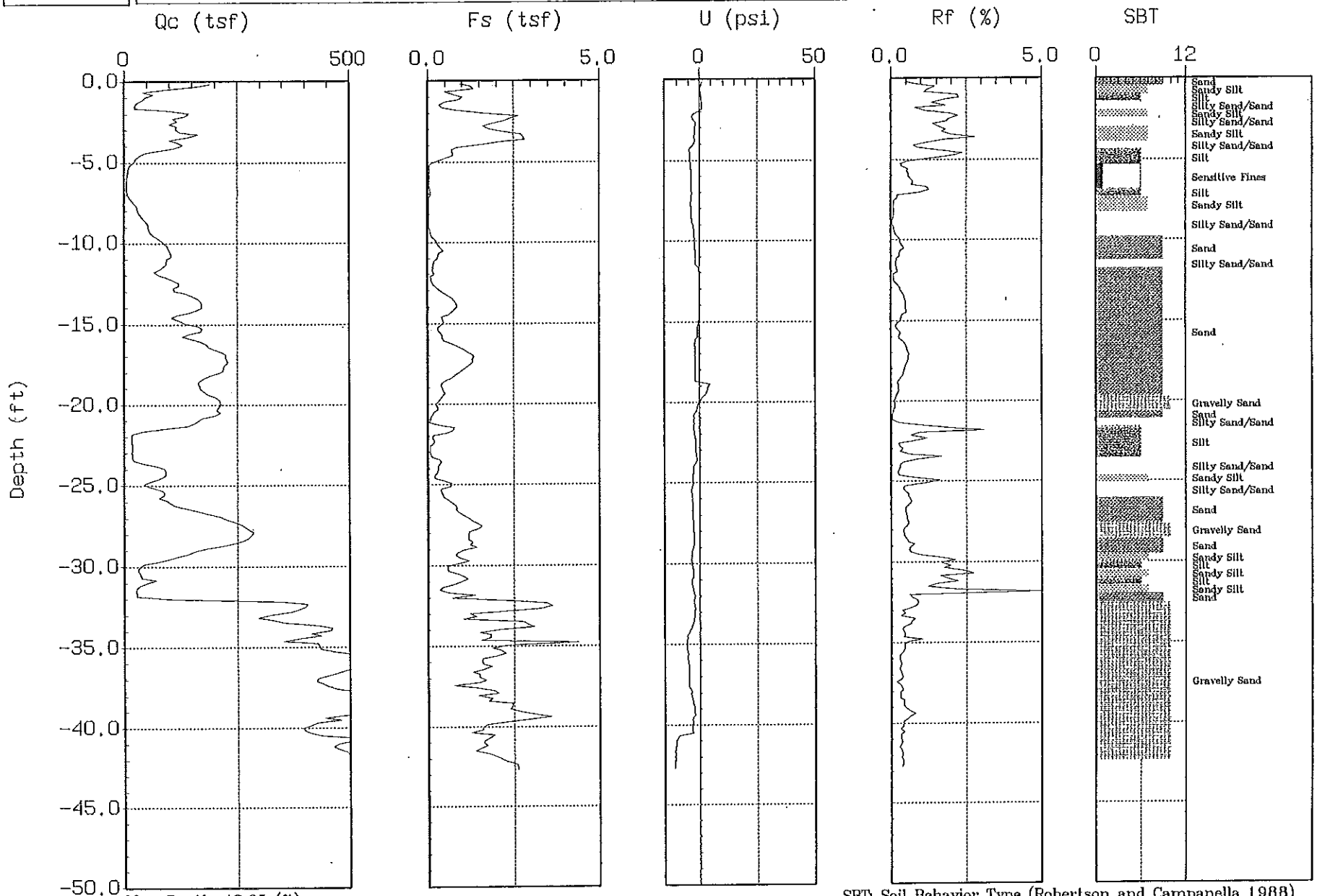
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-5

Engineer : G.SILVER
Date : 05:27:98 11:17



Max. Depth: 42.65 (ft)

Depth Inc.: 0.164 (ft)

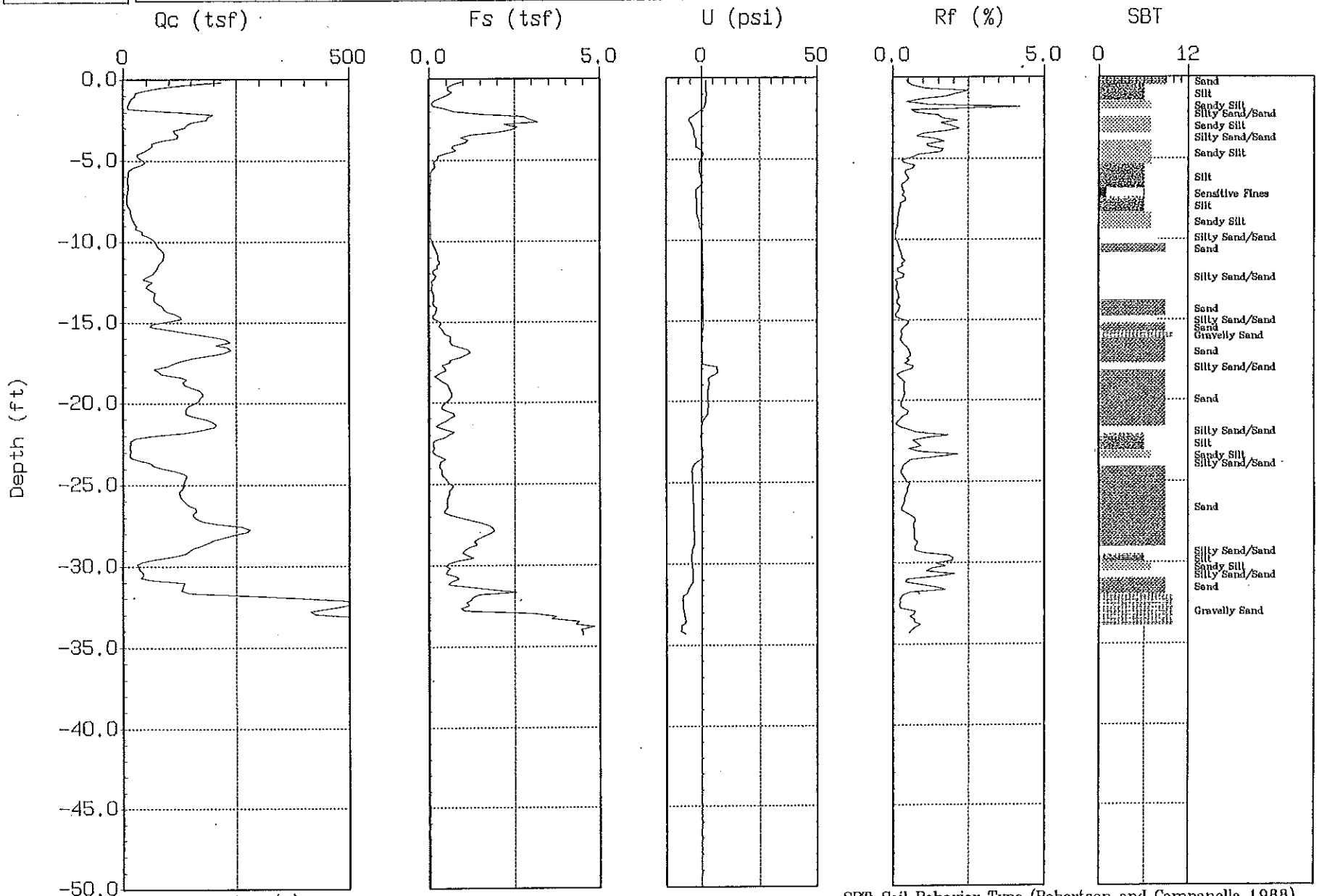
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-6

Engineer : G.SILVER
Date : 05:27:98 12:03



Max. Depth: 34.28 (ft)

Depth Inc.: 0.164 (ft)

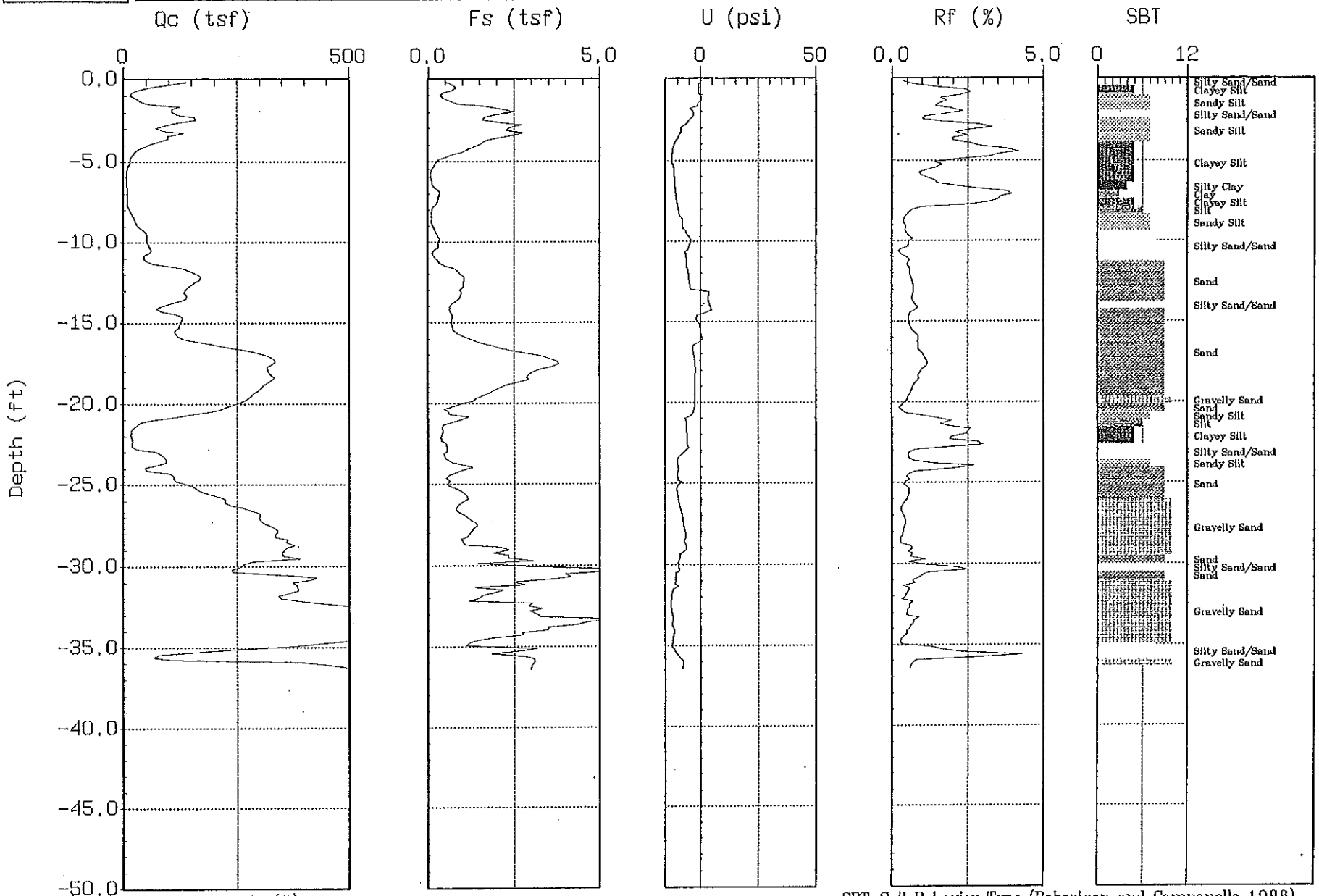
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-7

Engineer : G.SILVER
Date : 05:27:98 13:38



Max. Depth: 36.42 (ft)

Depth Inc.: 0.164 (ft)

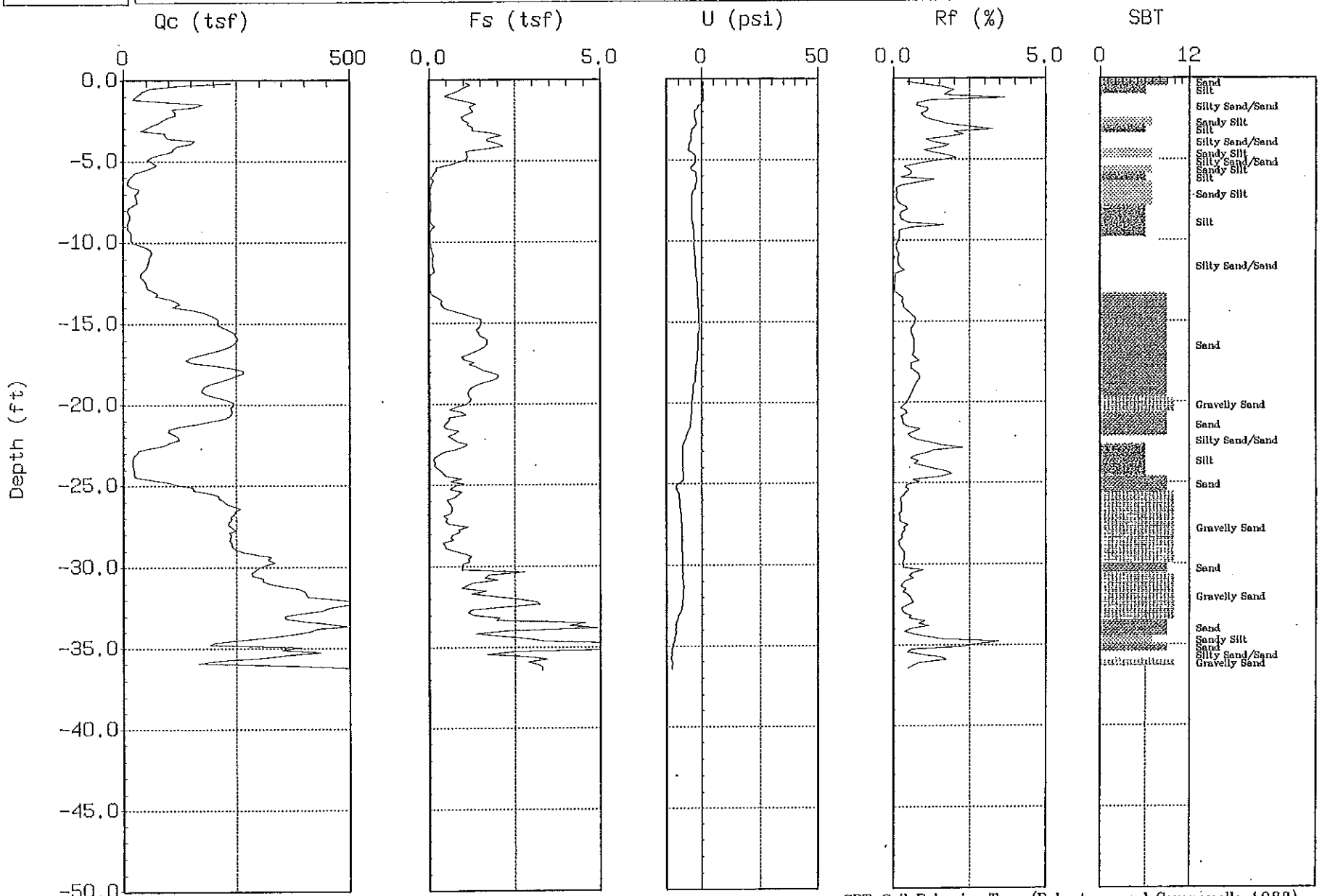
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-8

Engineer : G.SILVER
Date : 05:27:98 14:12



Max. Depth: 36.42 (ft)

Depth Inc.: 0.164 (ft)

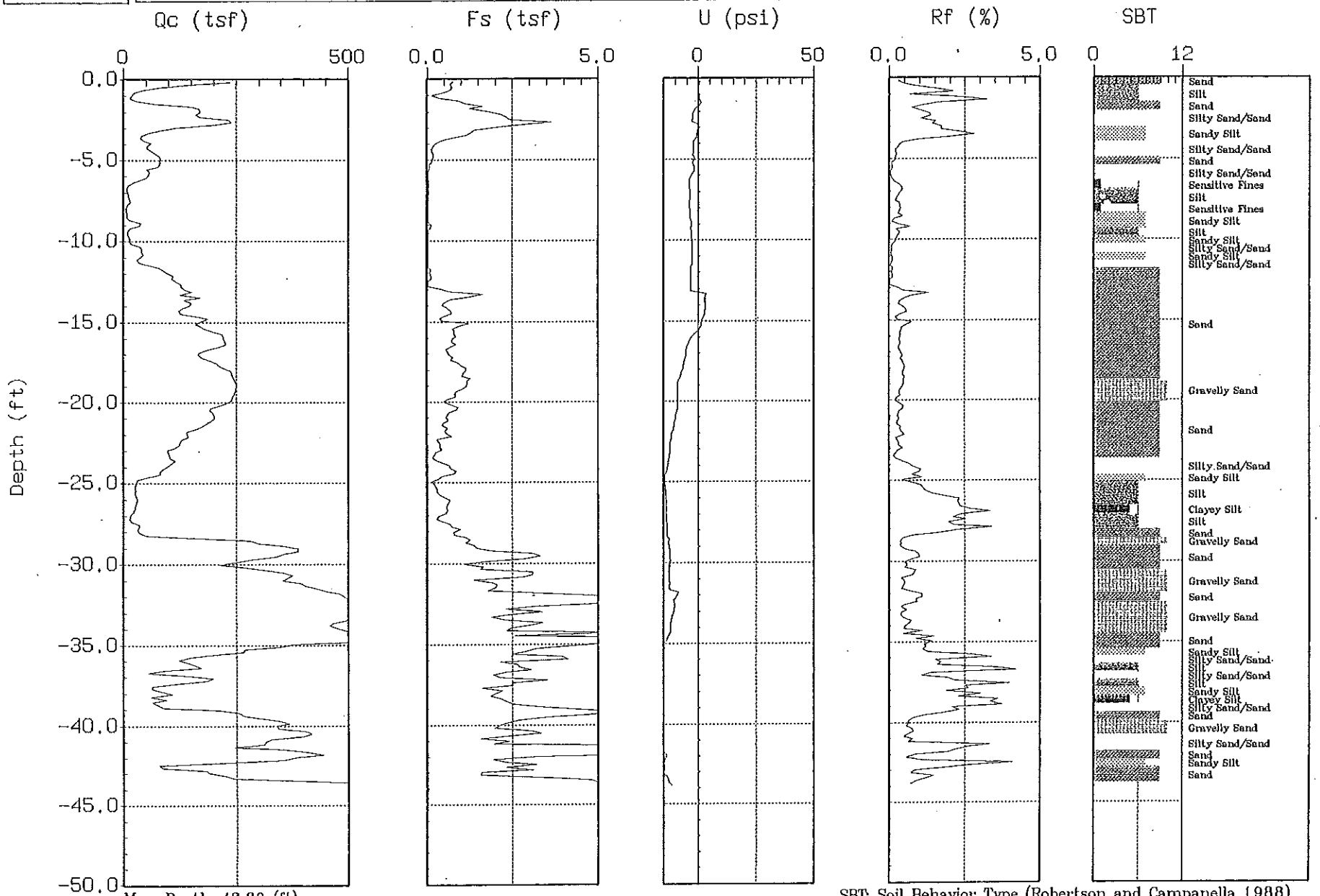
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-9

Engineer : G.SILVER
Date : 05:27:98 14:32



Max. Depth: 43.80 (ft)

Depth Inc.: 0.164 (ft)

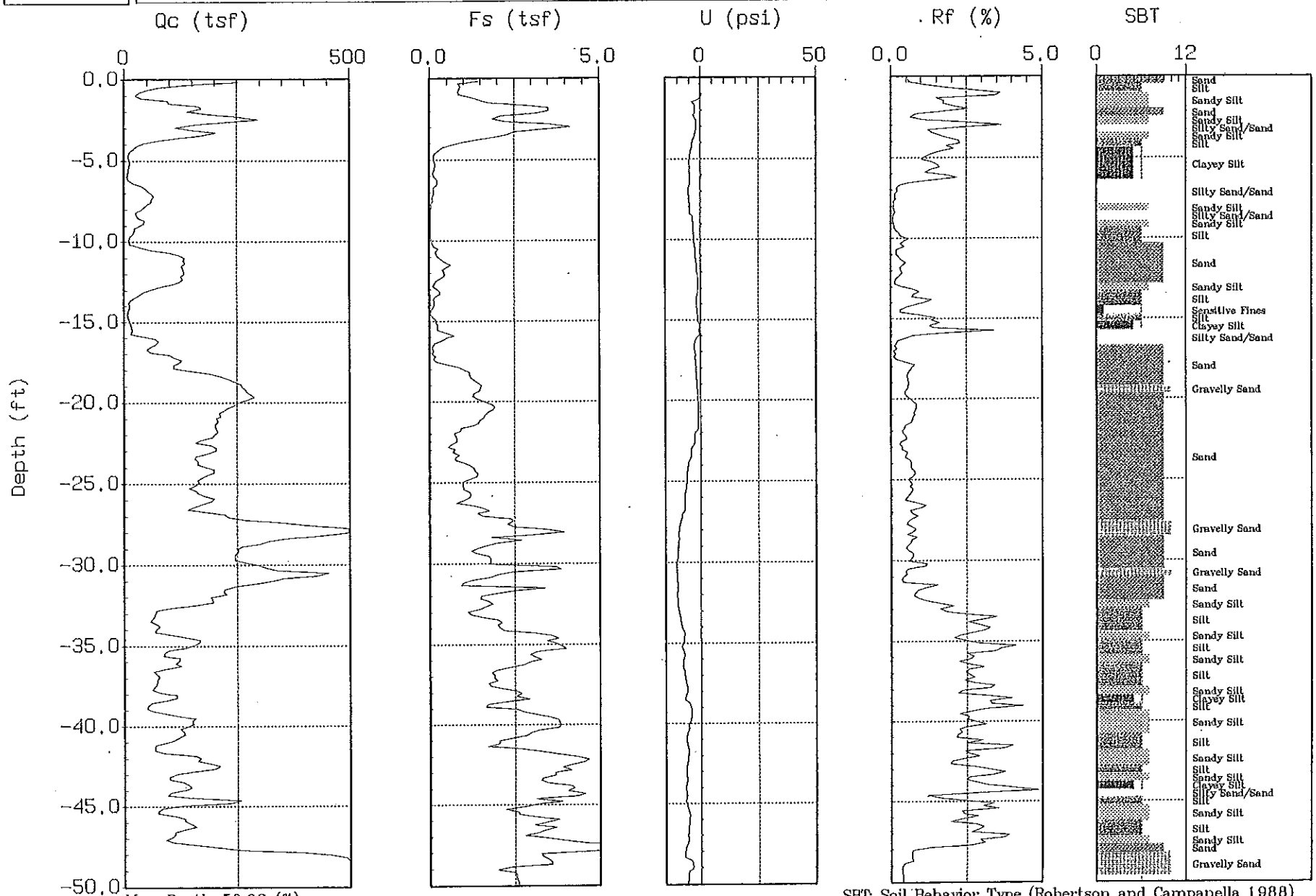
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-10

Engineer : G.SILVER
Date : 05:27:98 15:28



Max. Depth: 50.03 (ft)

Depth Inc.: 0.164 (ft)

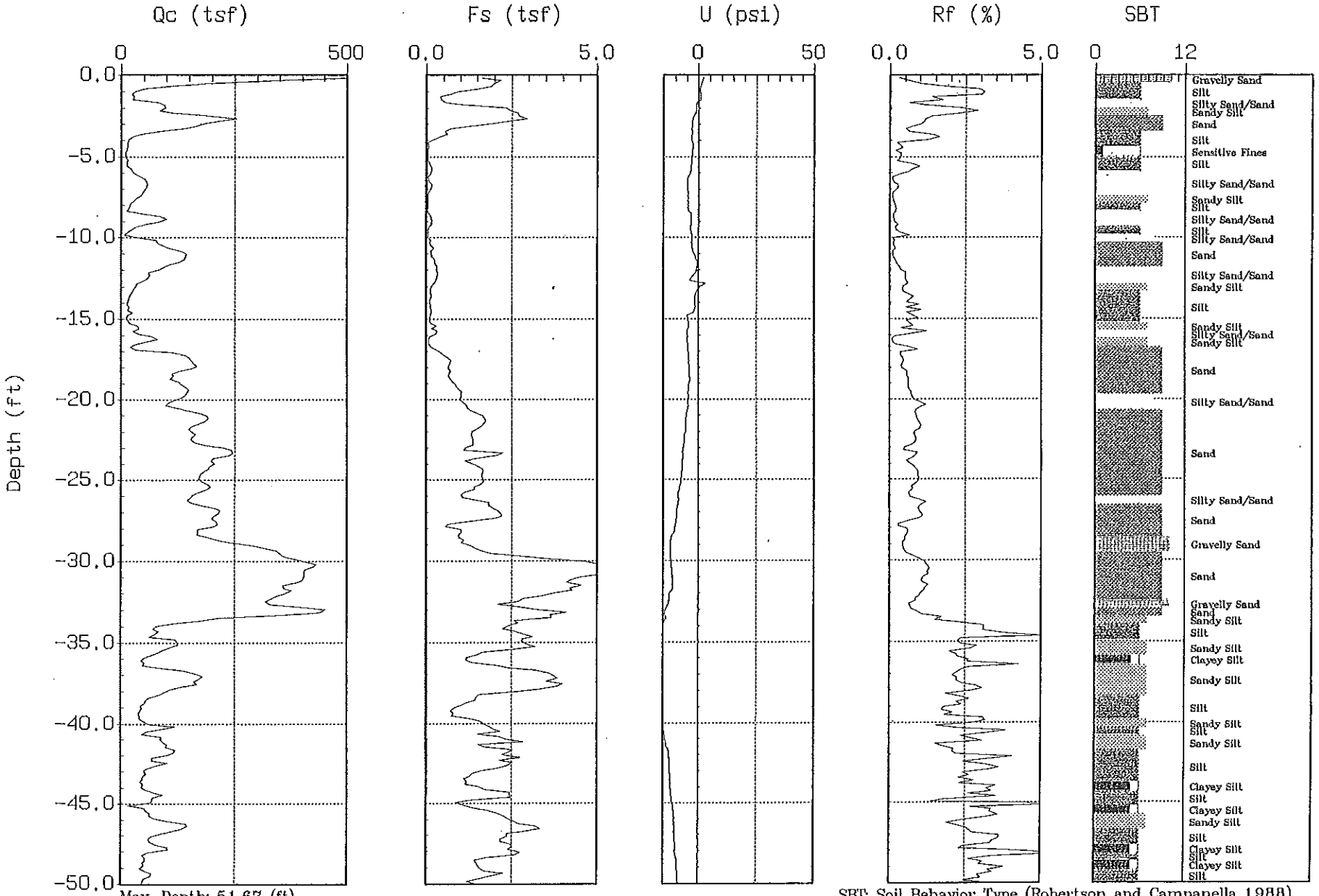
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-11

Engineer : G.SILVER
Date : 05:27:98 15:53



Max. Depth: 51.67 (ft)

Depth Inc.: 0.164 (ft)

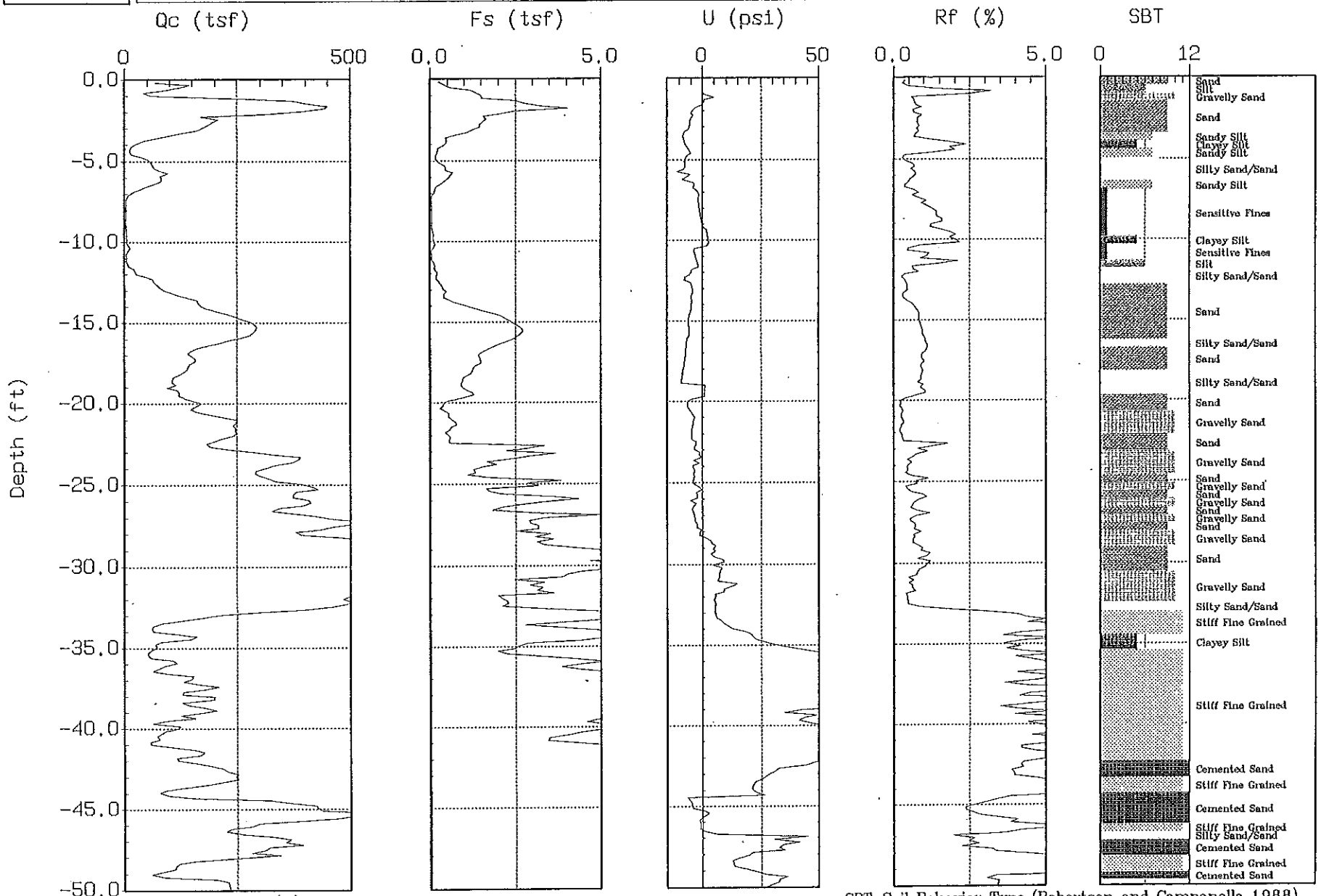
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-12

Engineer : G.SILVER
Date : 05:28:98 07:02



Max. Depth: 50.03 (ft)

Depth Inc.: 0.164 (ft)

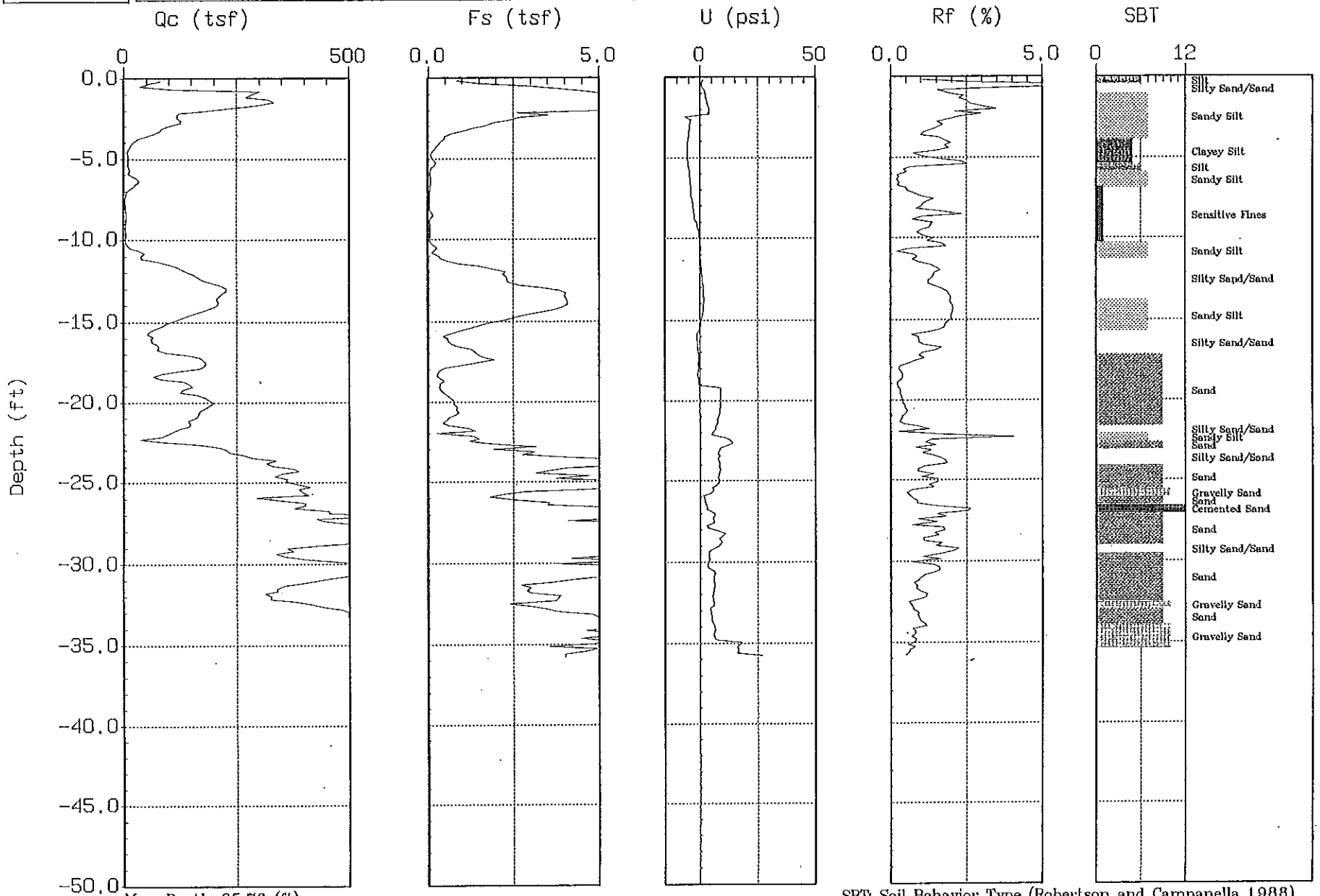
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-13

Engineer : G.SILVER
Date : 05:28:98 07:50



Max. Depth: 35.76 (ft)

Depth Inc.: 0.164 (ft)

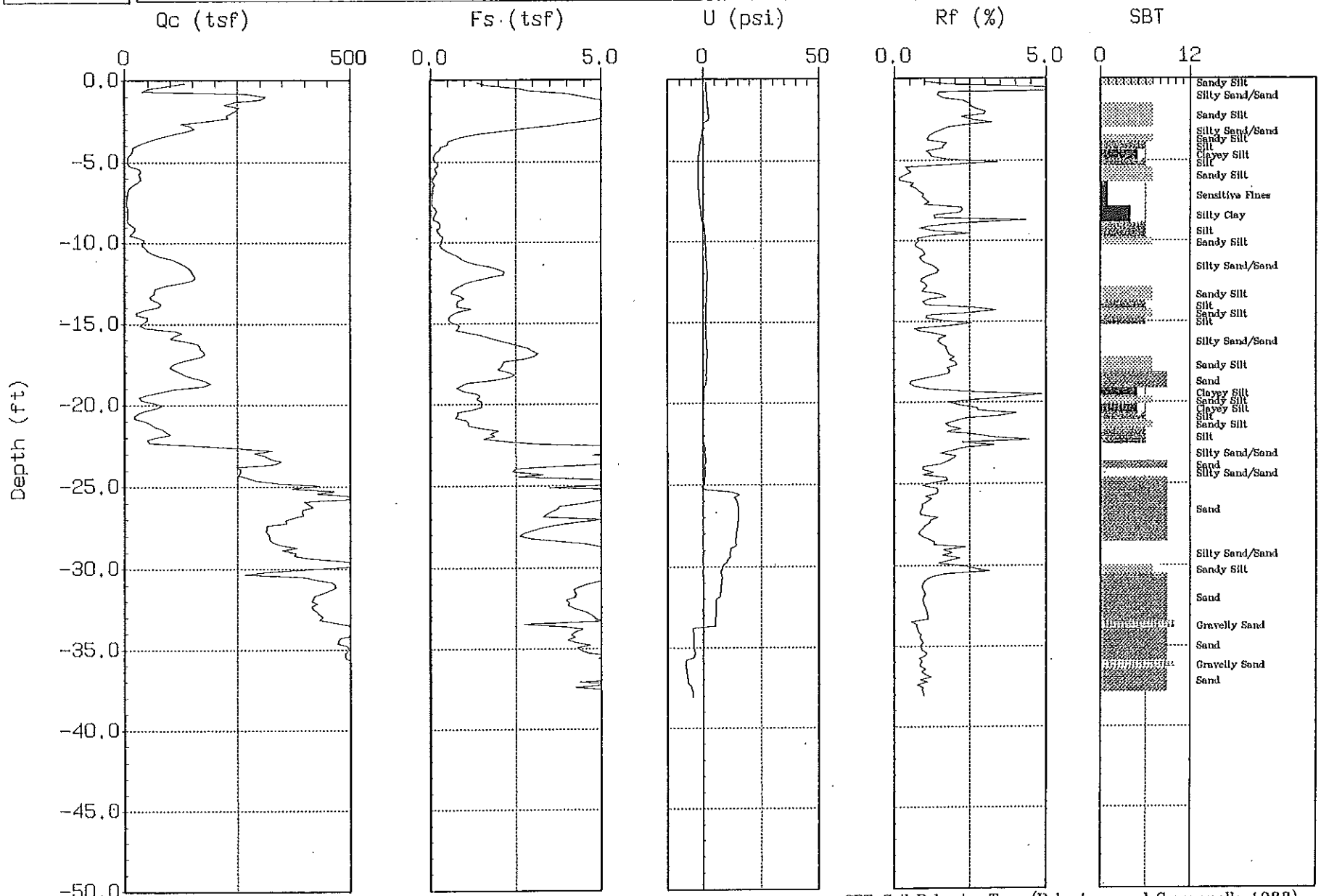
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEEPORT OIL FIELD
Location : CPT-14

Engineer : G.SILVER
Date : 05:28:98 08:33



Max. Depth: 38.06 (ft)

Depth Inc.: 0.164 (ft)

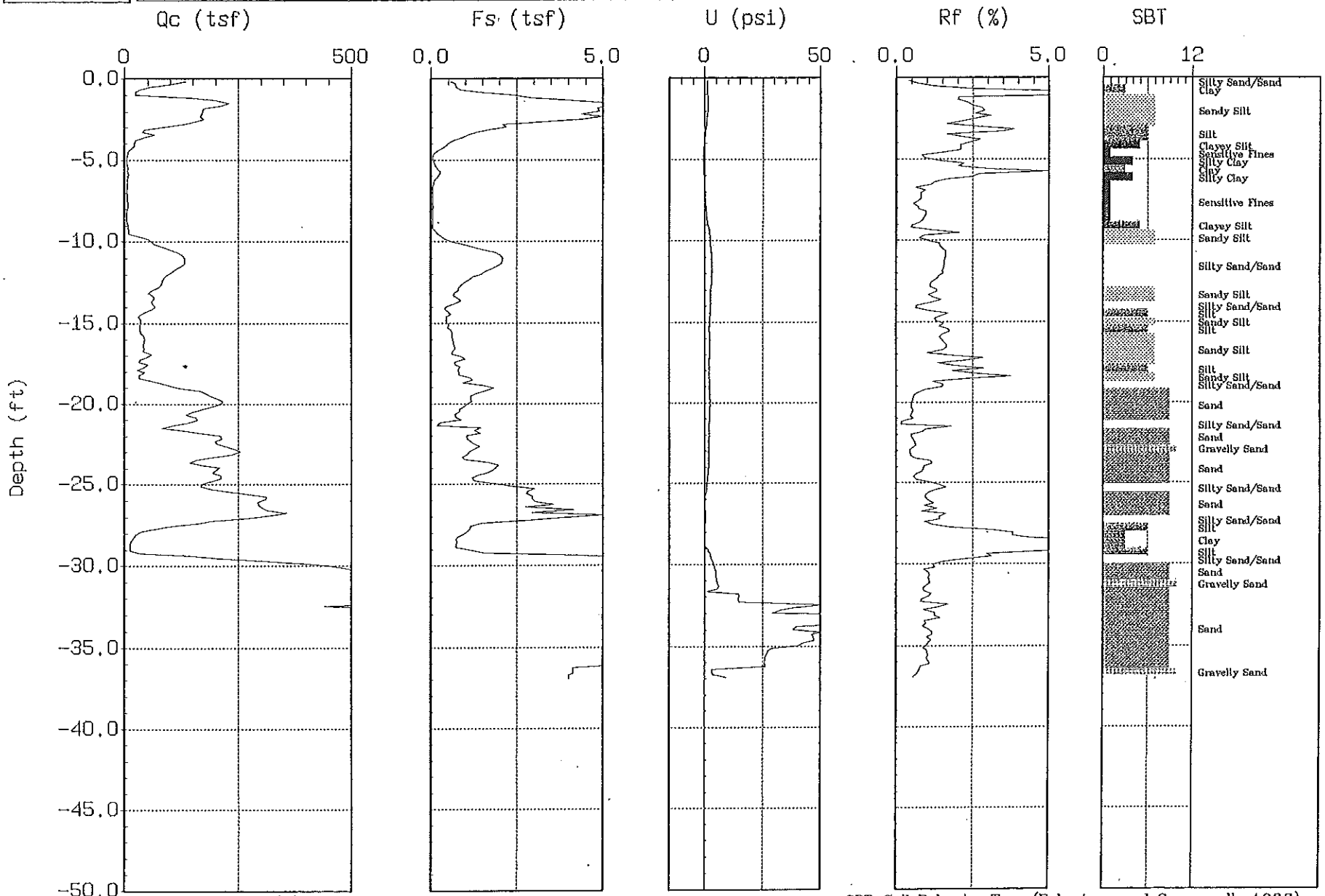
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FILD
Location : CPT-15

Engineer : G.SILVER
Date : 05:28:98 09:23



Max. Depth: 36.91 (ft)

Depth Inc.: 0.164 (ft)

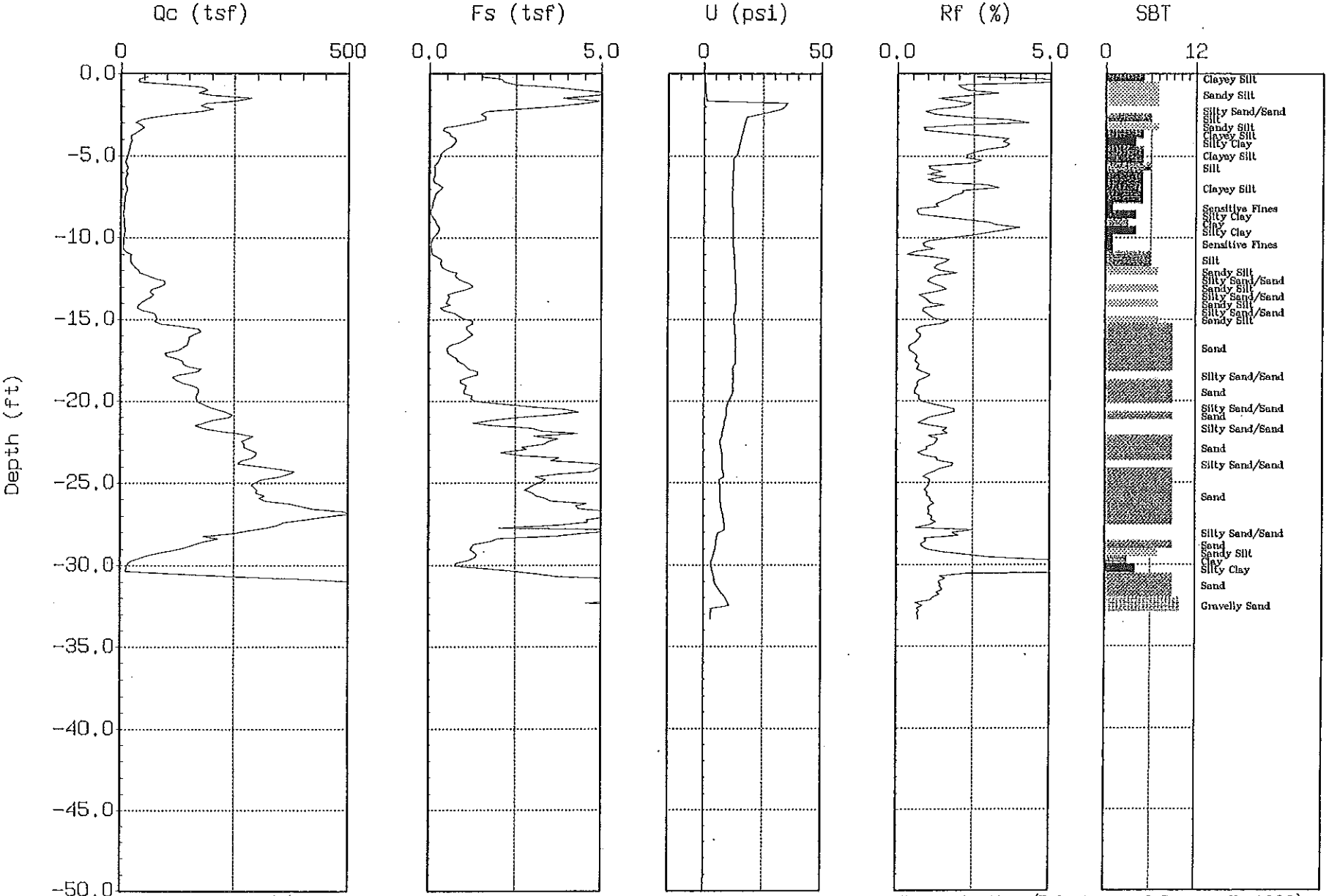
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-16

Engineer : G.SILVER
Date : 05:28:98 09:54



Max. Depth: 33.30 (ft)

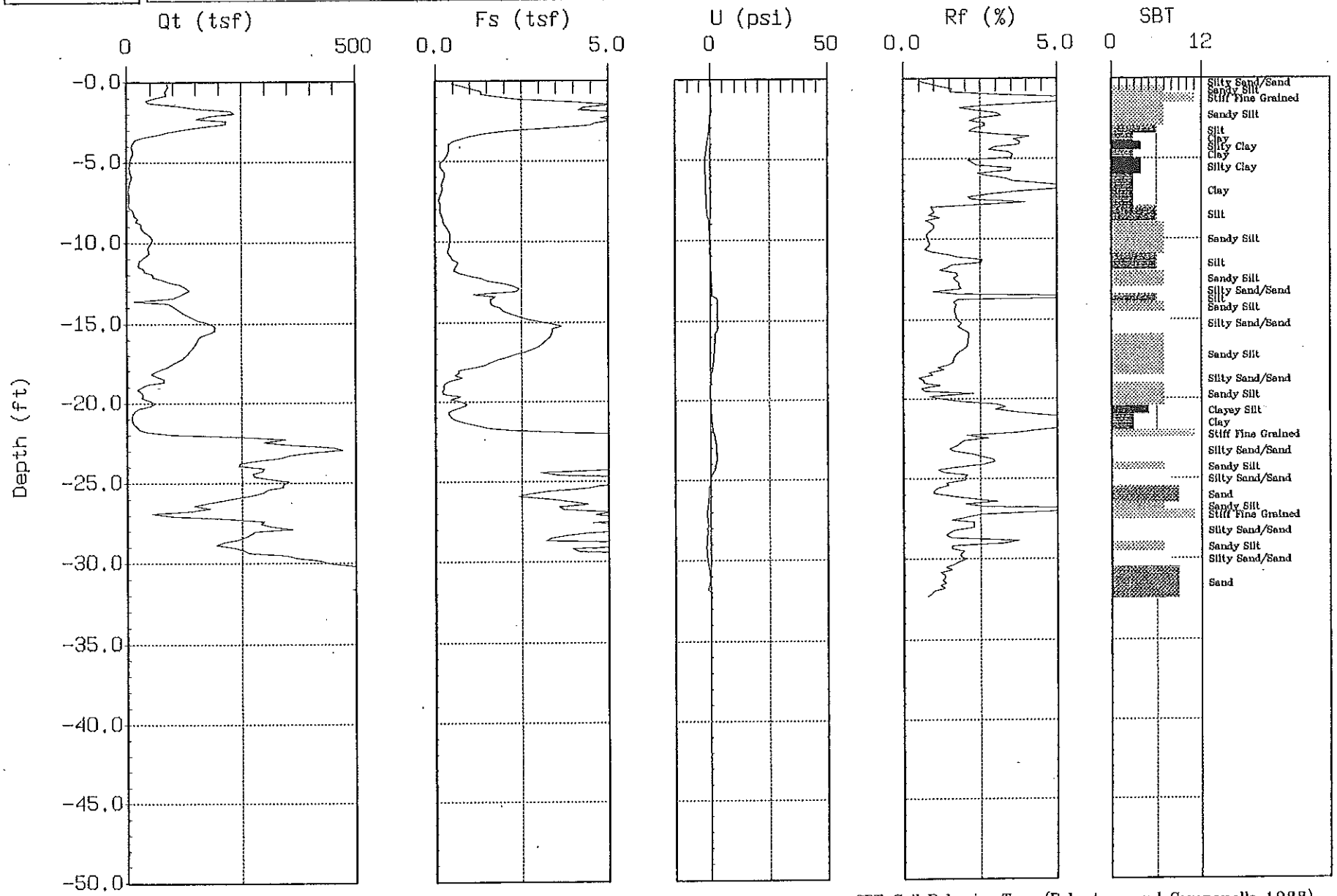
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U

Site : NEWPORT OIL FIELD Engineer : G.SILVER
Location : CPT-17 Date : 05:28:98 10:19



Max. Depth: 32.32 (ft)

Depth Inc.: 0.164 (ft)

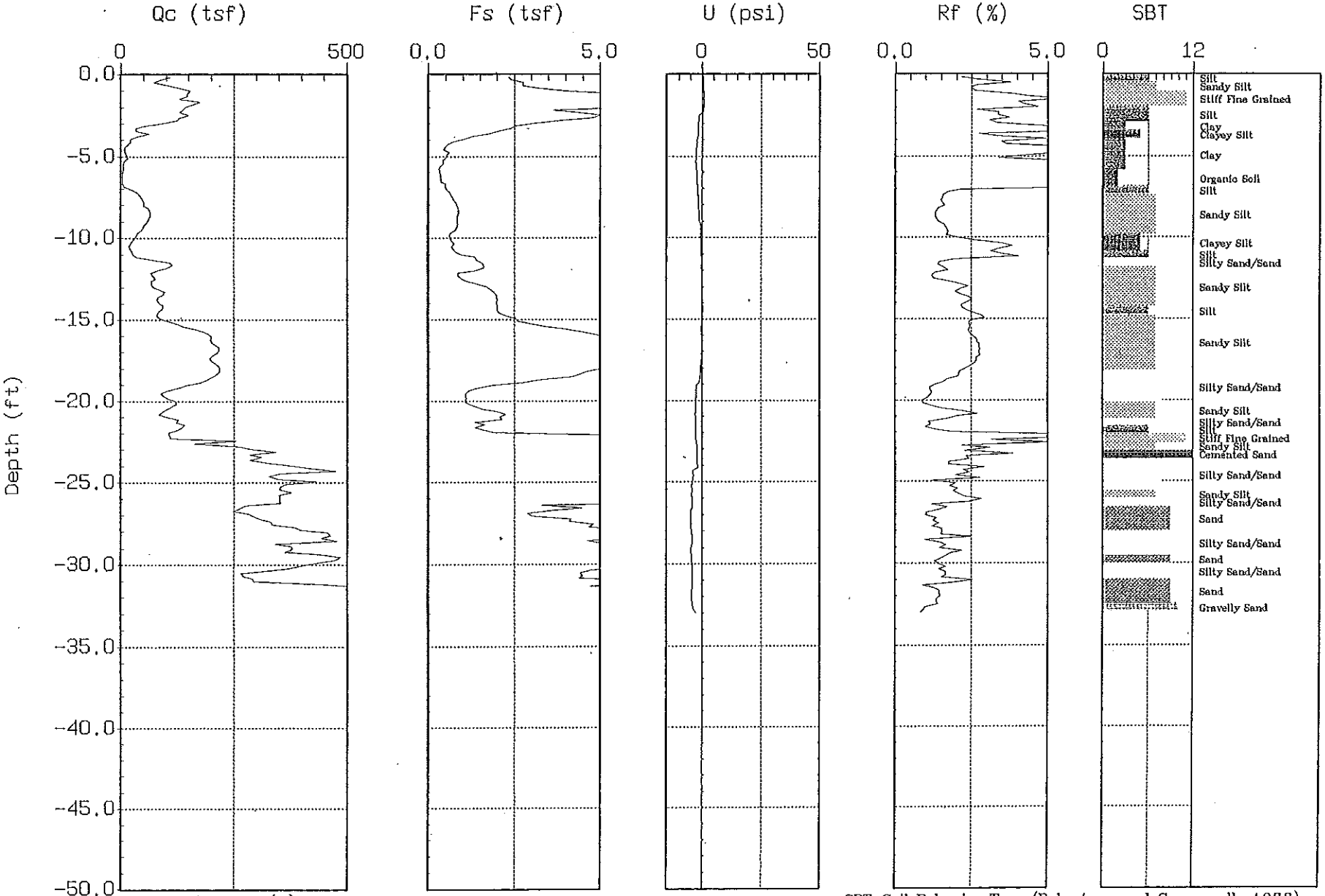
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-18

Engineer : G.SILVER
Date : 05:28:98 11:16



Max. Depth: 32.97 (ft)

Depth Inc.: 0.164 (ft)

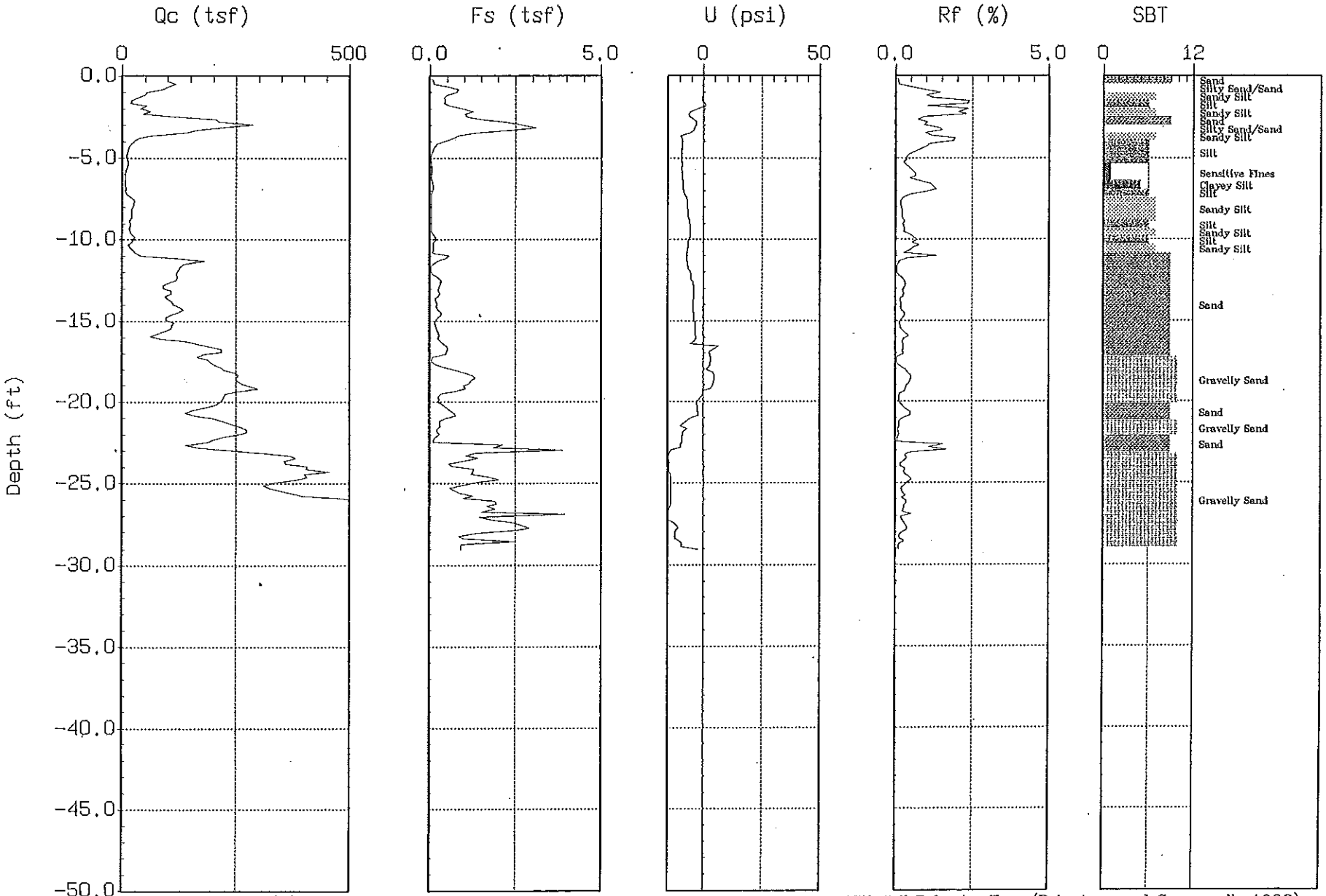
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-19

Engineer : G.SILVER
Date : 05:28:98 12:52



Max. Depth: 29.04 (ft)

Depth Inc.: 0.164 (ft)

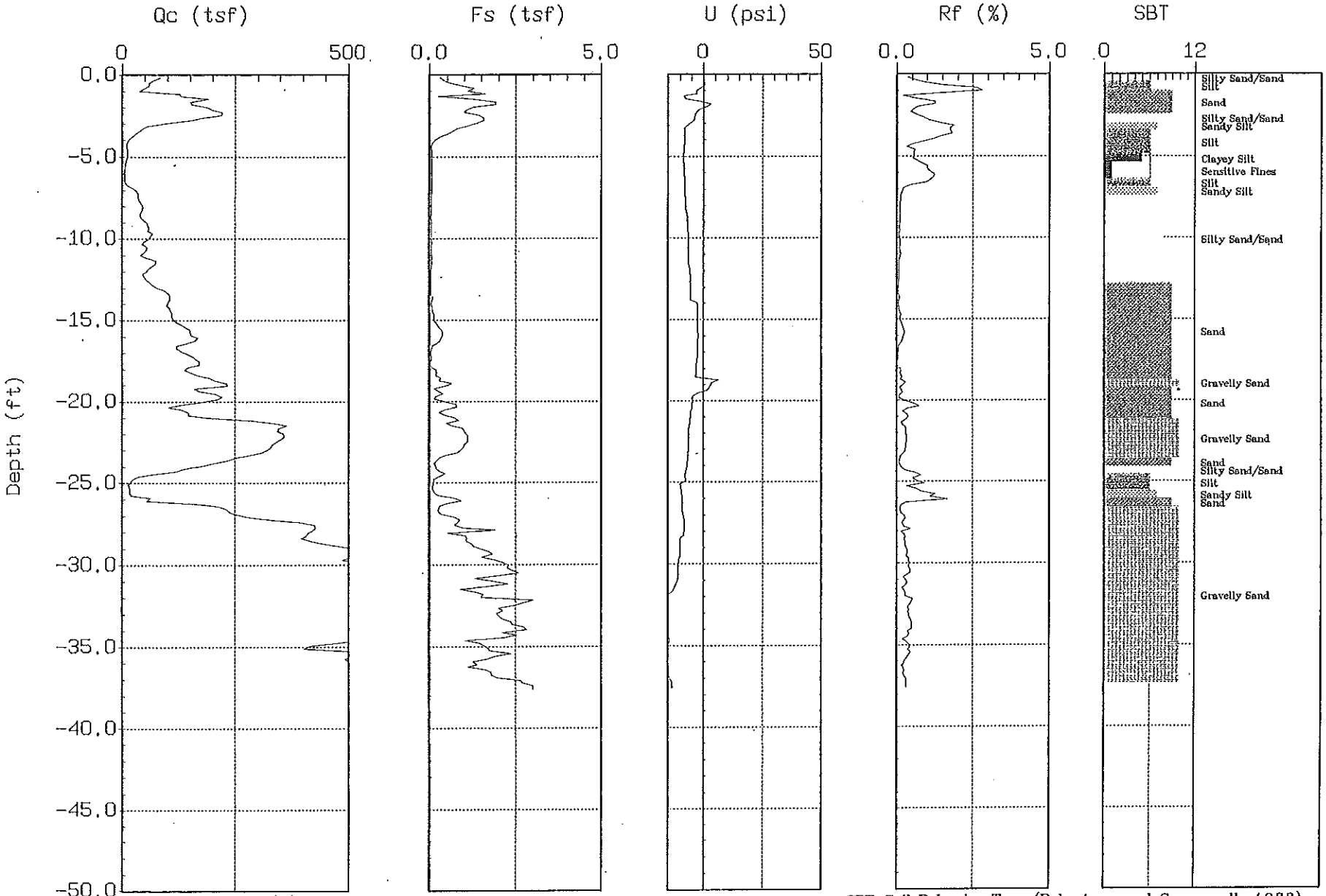
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-20

Engineer : G.SILVER
Date : 05:28:98 13:24



Max. Depth: 37.57 (ft)

Depth Inc.: 0.164 (ft)

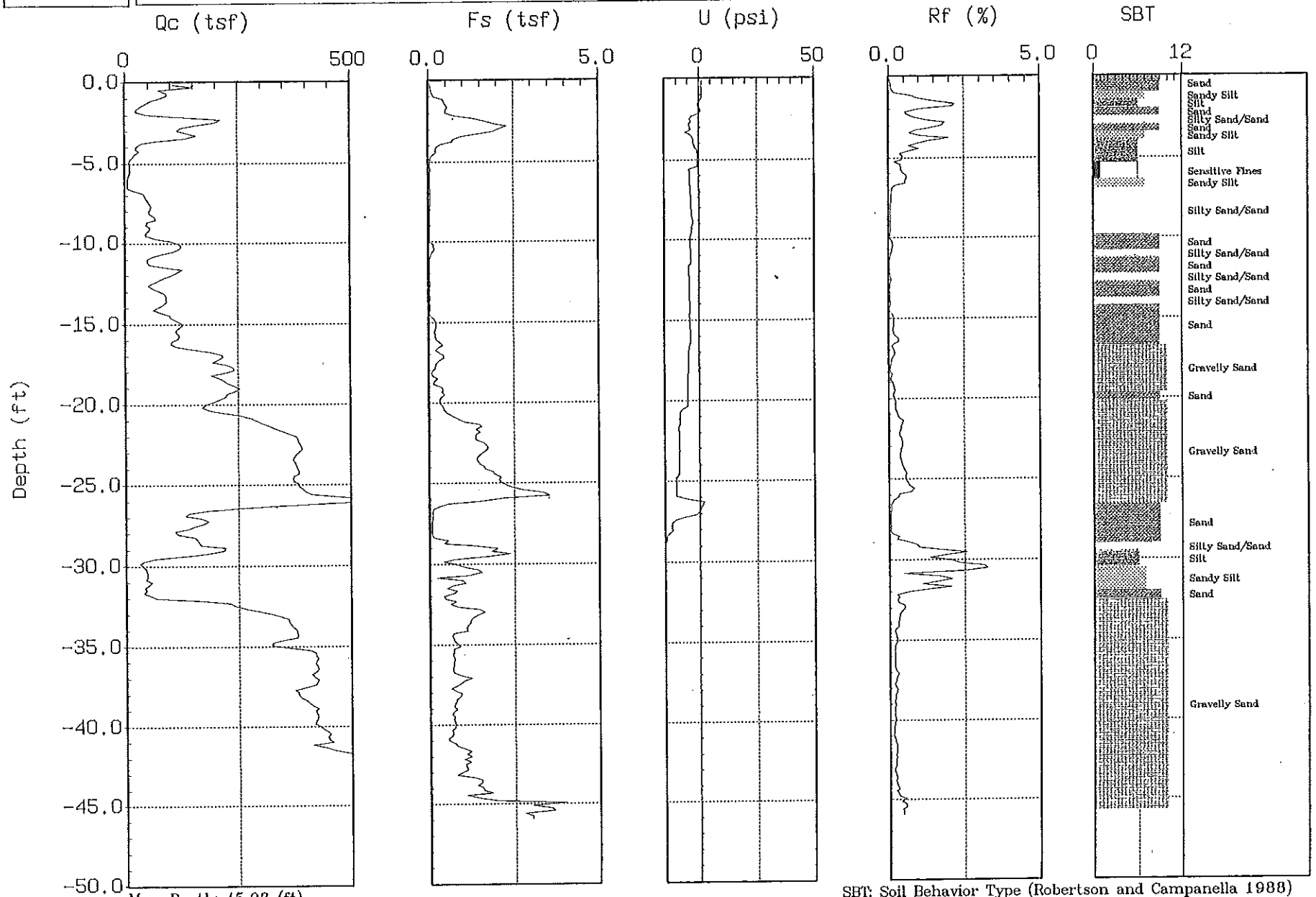
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

G.M.U.

Site : NEWPORT OIL FIELD
Location : CPT-21

Engineer : G.SILVER
Date : 05:28:98 14:03

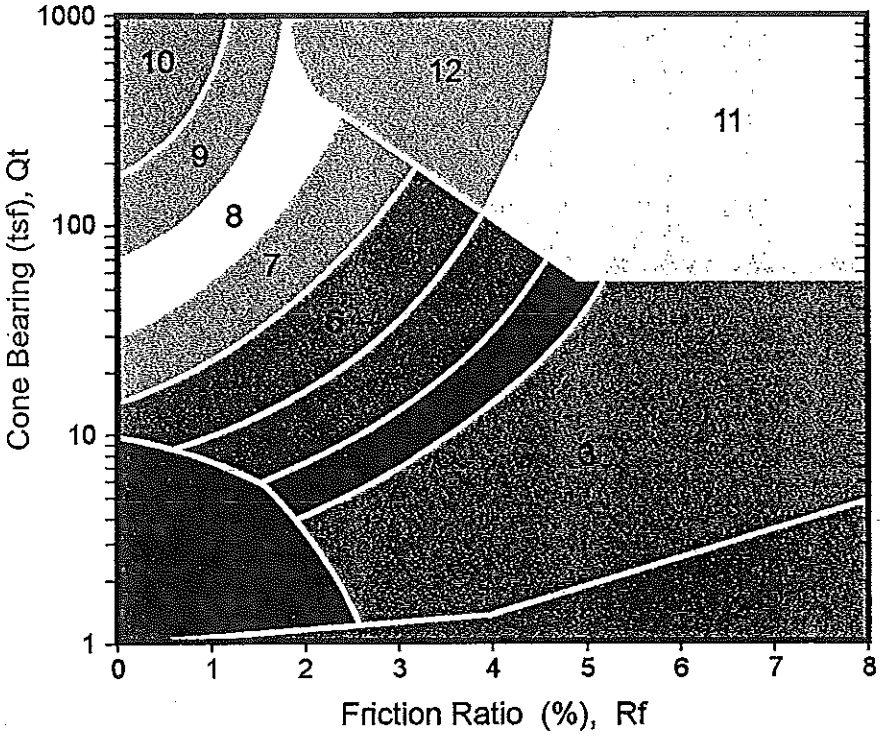


Max. Depth: 45.93 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

CPT Classification Chart
(after Robertson and Campanella, 1988)



Zone	Q_t / N	Soil Behaviour Type
1	2	sensitive fine grained
2	1	organic material
3	1	clay
4	1.5	silty clay to clay
5	2	clayey silt to silty clay
6	2.5	sandy silt to clayey silt
7	3	silty sand to sandy silt
8	4	sand to silty sand
9	5	sand
10	6	gravelly sand to sand
11	1	very stiff fine grained *
12	2	sand to clayey sand *

* overconsolidated or cemented

GREGG

Gregg In Situ, Inc.

APPENDIX A-2

Boring and CPT Sounding Logs
Performed by
Woodward-Clyde Consultants

DATE OF BORING 11 February 1985 WATER DEPTH 4 feet DATE MEASURED 12 February 1985
TYPE OF DRILL RIG Failing 1500 Rotary Wash HOLE DIAMETER 9 inches
WEIGHT OF HAMMER 140 pounds FALLING 30 inches SAMPLES Standard Penetration Test

DEPTH, FT.	SAMPLES	BLOWS/FOOT	DESCRIPTION	UNC. COMP. STRENGTH, ksf	MOISTURE CONTENT, %	DRY DENSITY pcf	OTHER TESTS
			SURFACE ELEVATION: Approximately 3 feet				
			Damp, loose, light brown SAND (SP) with roots				
			Soft, wet, gray SANDY CLAY (CH) with some organic debris		33		ORG (3.1)
5	1	1			75		LL=62 PI=33 MA (94)
	2	10	Loose to medium dense, brownish gray, CLAYEY SAND (SP–SC)		36		LL=27 PI=9 MA (10) ORG (2.4)
10	3	27	Medium dense with some some shells				
			Becomes grayish brown, no shells				
15	4	28					MA (6)
			Lens of sandy clay				
20	5	24					MA (9)
25	6	30	Becomes dense with some shell fragments				
30							

Project: WEST NEWPORT OIL
Project No. 41890A

LOG OF BORING A-1

Fig. A-2

WOODWARD-CLYDE CONSULTANTS

DATE OF BORING 11 February 1985 WATER DEPTH 4 feet DATE MEASURED 12 Feb.1985

TYPE OF DRILL RIG Failing 1500 Rotary Wash HOLE DIAMETER 9 inches

WEIGHT OF HAMMER 140 pounds FALLING 30 inches SAMPLES Standard Penetration Test

DEPTH, FT.	SAMPLES	BLOWS/FOOT	DESCRIPTION	UNC. COMP. STRENGTH, ksf	MOISTURE CONTENT, %	DRY DENSITY pcf	OTHER TESTS
			SURFACE ELEVATION: Approximately 3 feet				
	7	39	Dense, grayish brown CLAYEY SAND (SP–SC) (continued)				
35	8	40					
40	9	33	Becomes SAND (SP)				MA (5)
45	10	45					
50	11	57	Becomes very dense				
			Bottom of Boring at 51.5 feet				
55							
60							

Project: WEST NEWPORT OIL
Project No. 41890A

CONT. LOG OF BORING A-1

Fig. A-3

WOODWARD – CLYDE CONSULTANTS

DATE OF BORING 8 February 1985 WATER DEPTH 4.5 feet DATE MEASURED 20 Feb. 1985
TYPE OF DRILL RIG Failing 1500 Rotary Wash HOLE DIAMETER 9 inches
WEIGHT OF HAMMER 140 pounds FALLING 30 inches SAMPLES Modified California, Standard Penetration Test and Sack

DEPTH, FT.	SAMPLES	BLOWS/FOOT	DESCRIPTION	UNC. COMP. STRENGTH, ksf	MOISTURE CONTENT, %	DRY DENSITY pcf	OTHER TESTS
			SURFACE ELEVATION: Approximately 5 feet				
			Loose, damp CLAYEY SAND (SC) (oil saturated)				
	SK-1		Wet, gray SILTY CLAY (CH)		38		MA (99) LL=62 PI=31
5	1	5	Loose, grayish brown SILTY fine SAND (SM)		39		MA (13)
			Loose, gray CLAYEY SAND (SC)				
10	2	16	Becomes medium dense		41		MA (37) LL=27 PI=11 ORG (1.8)
	3	24					
			Dense, gray SAND (SP) (sulfur odor)				
15	4	41					
20	5	36					
25	6	40					
30							

Project: WEST NEWPORT OIL
Project No. 41890A

LOG OF BORING B-1

Fig. A-4

WOODWARD-CLYDE CONSULTANTS

DATE OF BORING 8 February 1985 WATER DEPTH 4.5 feet DATE MEASURED 20 Feb. 1985

TYPE OF DRILL RIG Failing 1500 Rotary Wash HOLE DIAMETER 9 inches

WEIGHT OF HAMMER 140 pounds FALLING 30 inches SAMPLES Modified California, Standard Penetration Test and Sack

DEPTH, FT.	SAMPLES	BLOWS/FOOT	DESCRIPTION	UNC. COMP. STRENGTH, ksf	MOISTURE CONTENT, %	DRY DENSITY pcf	OTHER TESTS
			SURFACE ELEVATION: Approximately 5 feet				
	7	43	Dense, gray SAND (SP) (sulfur odor) (continued)				
			Dense, gray SILTY fine SAND (SM)				
35	8	39					MA (18)
40	9	44					
45	10	51	Becomes very dense, no sulfur odor				
50	11	72					
			Bottom of Boring at 51.5 feet				
55							
60							

Project: WEST NEWPORT OIL
Project No. 41890A

CONT. LOG OF BORING B-1

Fig. A-5

WOODWARD - CLYDE CONSULTANTS

DATE OF BORING 11 February 1985 WATER DEPTH 4.5 feet DATE MEASURED 20 Feb. 1985
TYPE OF DRILL RIG Failing 1500 Rotary Wash HOLE DIAMETER 9 inches
EIGHT OF HAMMER 140 pounds FALLING 30 inches SAMPLES Standard Penetration Test and Sack

DEPTH, FT.	SAMPLES	BLOWS/FOOT	DESCRIPTION	UNC. COMP. STRENGTH, ksf	MOISTURE CONTENT, %	DRY DENSITY pcf	OTHER TESTS
			SURFACE ELEVATION: Approximately 3.5 feet				
	SK-1		Loose, damp, brown CLAYEY SAND (SC) (FILL)				
			Loose, damp, light brown SILTY SAND (SM) (FILL)				
			Medium stiff, wet, gray SANDY CLAY (CL)				
5	1	9	Loose, grayish brown CLAYEY fine SAND (SP–SC) with shell fragments		47		MA (9) LL=41 PI=24
10	2	16	Becomes dark gray, medium dense				MA (10)
15	3	22	Becomes CLAYEY fine SAND (SC)				MA (13)
20	4	54	(Blow count unreliable)				
25	5	27	Becomes CLAYEY fine SAND (SP–SC)				MA (11)
30							

Project: WEST NEWPORT OIL
Project No. 41890A

LOG OF BORING C-1

Fig. A-6

WOODWARD-CLYDE CONSULTANTS

DATE OF BORING 12 February 1985 WATER DEPTH 4.5 feet DATE MEASURED 20 Feb. 1985

TYPE OF DRILL RIG Failing 1500 Rotary Wash HOLE DIAMETER 9 inches

WEIGHT OF HAMMER 140 pounds FALLING 30 inches SAMPLES Standard Penetration Test and Sack

DEPTH, FT.	SAMPLES	BLOWS/FOOT	DESCRIPTION	UNC. COMP. STRENGTH, ksf	MOISTURE CONTENT, %	DRY DENSITY pcf	OTHER TESTS
			SURFACE ELEVATION: Approximately 3.5 feet				
	6	92	Medium dense, gray CLAYEY fine SAND (SC) (continued)				
			Very dense				
35	7	63					
40	8	67					
45	9	30	25% shell fragments				MA (12)
50	10	19	Lens of very stiff, gray SANDY CLAY (CH)	4.3*	32		MA (82)
			Bottom of Boring at 51.5 feet				
55							
60							

Project: WEST NEWPORT OIL
Project No. 41890A

CONT. LOG OF BORING C-1

Fig. A-7

WOODWARD - CLYDE CONSULTANTS

DATE OF BORING 12 February 1985 WATER DEPTH 4 feet DATE MEASURED 20 Feb. 1985
TYPE OF DRILL RIG Failing 1500 Rotary Wash HOLE DIAMETER 9 inches
WEIGHT OF HAMMER 140 pounds FALLING 30 inches SAMPLES Modified California, Standard Penetration Test and Sack

DEPTH, FT.	SAMPLES	BLOWS/FOOT	DESCRIPTION	UNC. COMP. STRENGTH, ksf	MOISTURE CONTENT, %	DRY DENSITY pcf	OTHER TESTS
			SURFACE ELEVATION: Approximately 6 feet				
			Loose, wet SANDY CLAY (CL) with roots, oil soaked				
			Medium stiff, wet, gray SILTY CLAY (CH)				
	SK-1				39		
5	1	5			57		
	2	4		2.5*	58		MA (99)
					51		LL=75 PI=44
10	3	15	Medium dense, gray SILTY SAND (SM) with shell fragments				MA (33)
15	4	28					ORG (1.6)
20	5	28	Becomes SILTY SAND (SP–SM)				MA (10)
25	6	43	Becomes medium dense to dense				

Project: WEST NEWPORT OIL
Project No. 41890A

LOG OF BORING D-1

Fig. A-8

WOODWARD-CLYDE CONSULTANTS

DATE OF BORING 12 February 1985 WATER DEPTH 4 feet DATE MEASURED 20 Feb. 1985

TYPE OF DRILL RIG Failing 1500 Rotary Wash HOLE DIAMETER 9 inches

WEIGHT OF HAMMER 140 pounds FALLING 30 inches SAMPLES Modified California, Standard Penetration Test and Sack

DEPTH, FT.	SAMPLES	BLOWS/FOOT	DESCRIPTION	UNC. COMP. STRENGTH, ksf	MOISTURE CONTENT, %	DRY DENSITY pcf	OTHER TESTS
			SURFACE ELEVATION: Approximately 6 feet				
	7	25	Medium dense to dense, gray SILTY SAND (SP–SM) (continued)				MA (10)
35	8	41					
40	9	42					
45	10	58	Becomes dense to very dense				
50	11	49					
			Bottom of Boring at 51.5 feet				
55							
60							

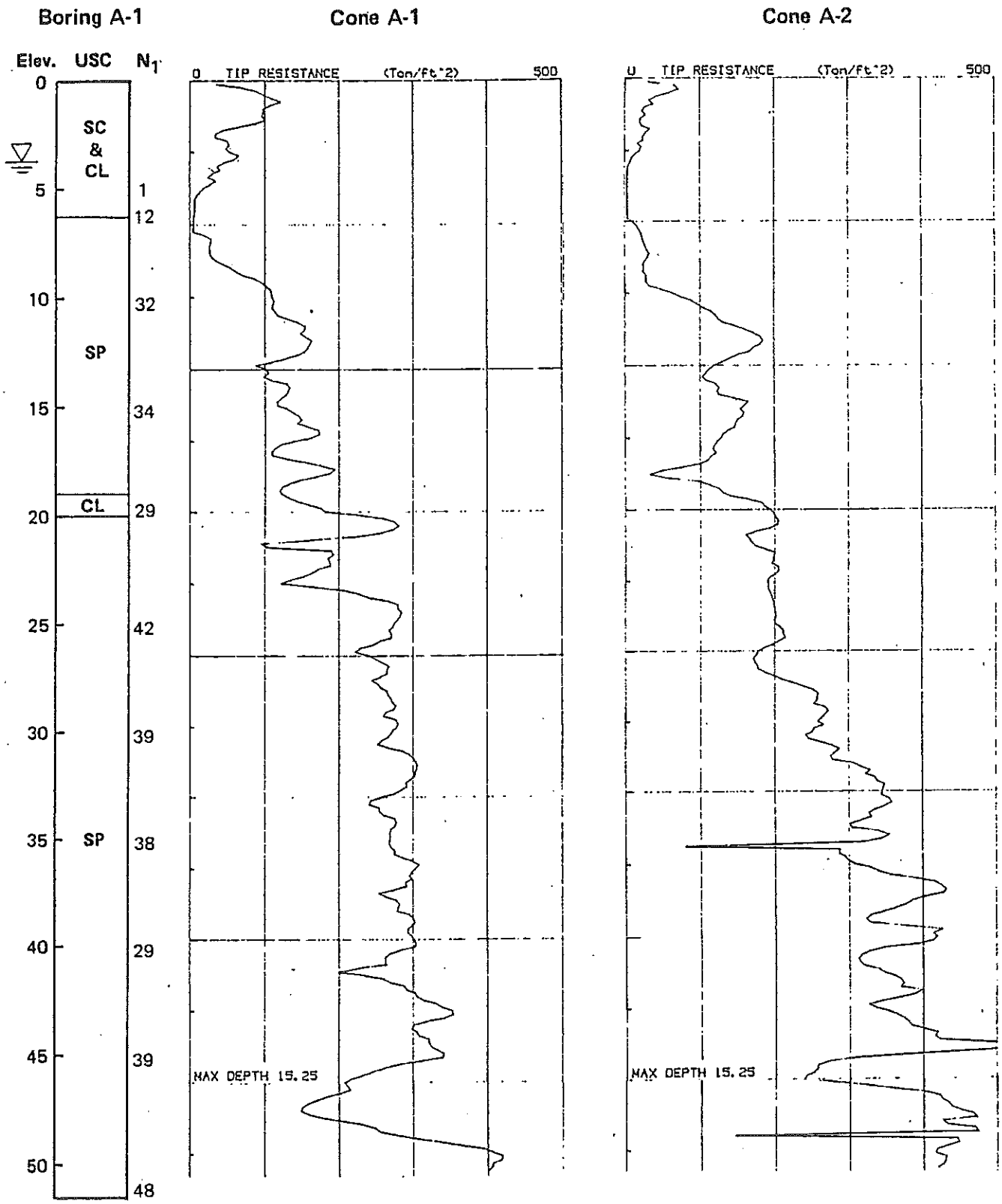
Project: WEST NEWPORT OIL

Project No. 41890A

CONT. LOG OF BORING D-1

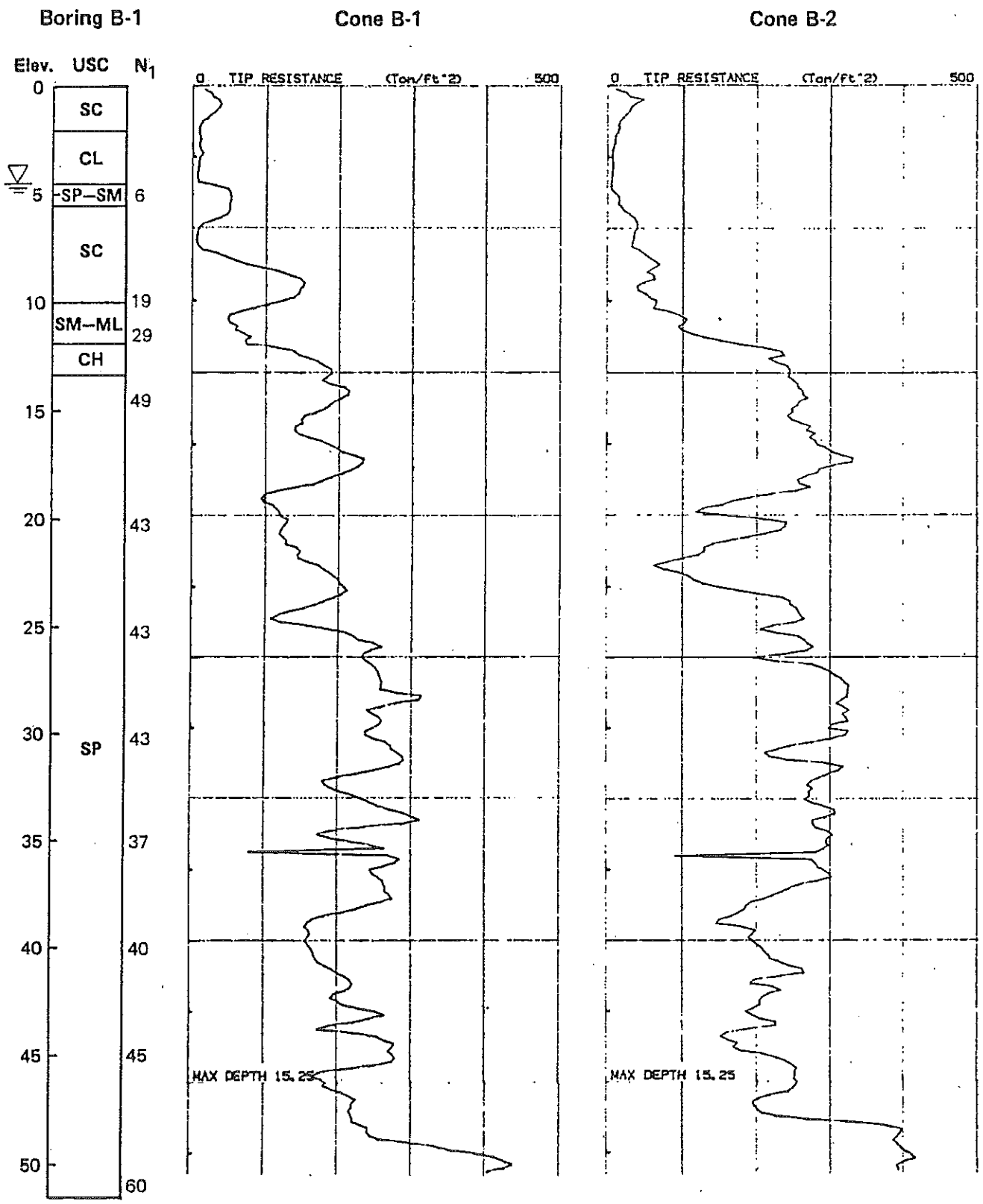
Fig. A-9

WOODWARD – CLYDE CONSULTANTS



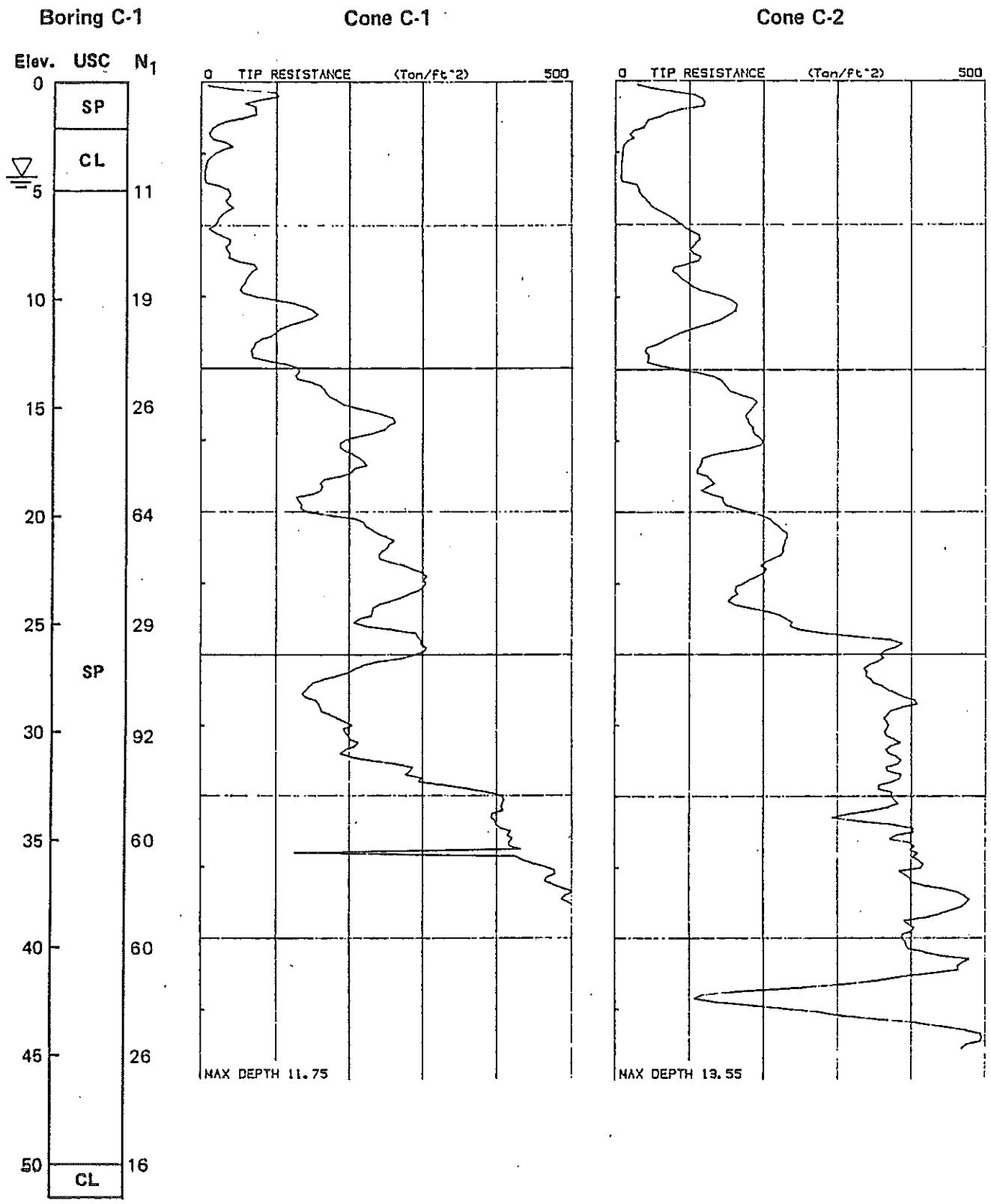
Project: WEST NEWPORT OIL Project No. 41890A	STICK AND CPT LOGS FOR AREA A	Fig. 4

WOODWARD–CLYDE CONSULTANTS



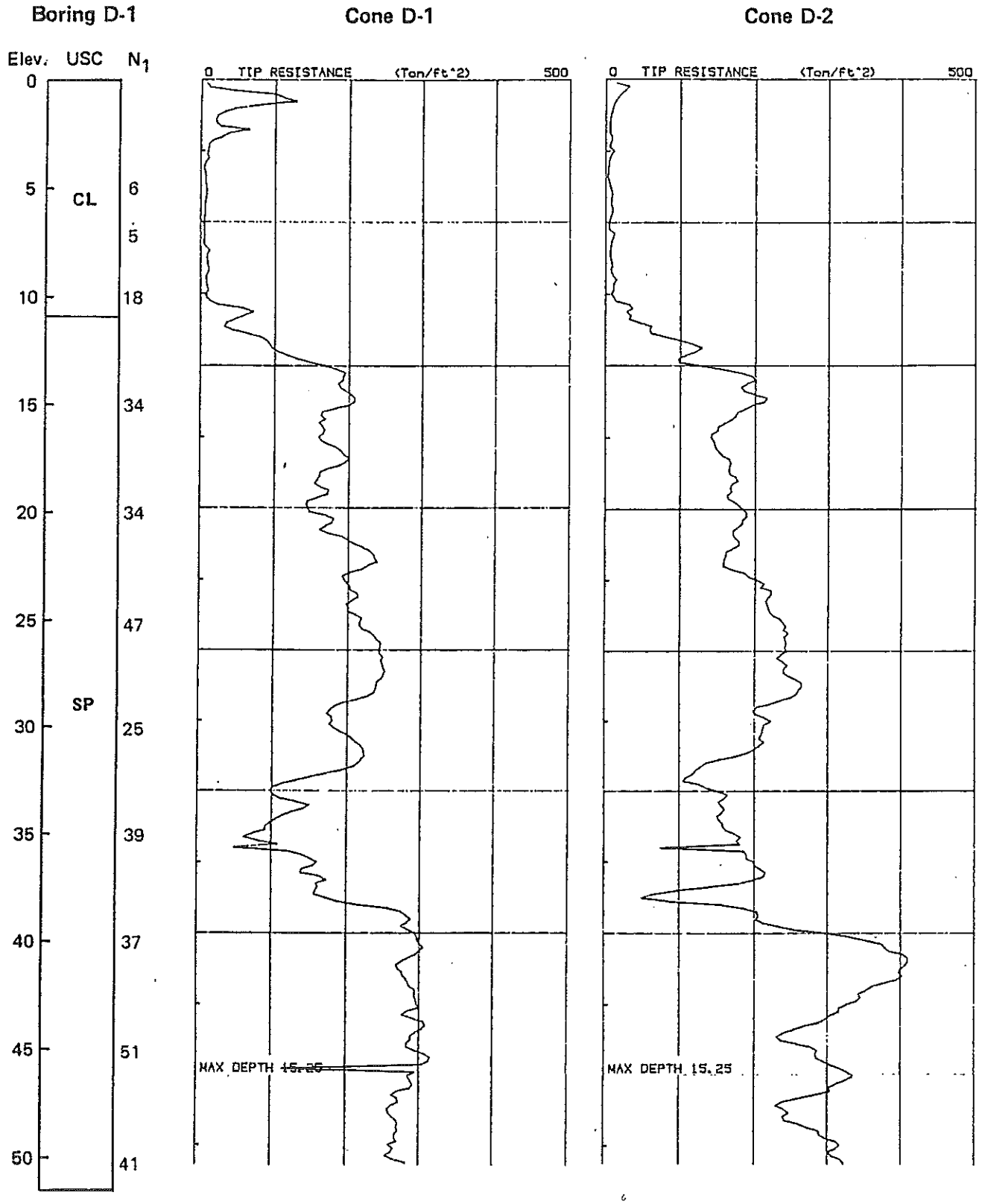
Project: WEST NEWPORT OIL Project No. 41890A	STICK AND CPT LOGS FOR AREA B	Fig. 5

WOODWARD–CLYDE CONSULTANTS



Project: WEST NEWPORT OIL Project No. 41890A	STICK AND CPT LOGS FOR AREA C	Fig. 6

WOODWARD–CLYDE CONSULTANTS



Project: WEST NEWPORT OIL Project No. 41890A	STICK AND CPT LOGS FOR AREA D	Fig. 7

WOODWARD–CLYDE CONSULTANTS

APPENDIX A-3

Boring and CPT Sounding Logs
Performed by
Pacific Soils Engineering, Inc.

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil		
DATE STARTED	6/9/93	GROUND ELEV.	85.0	BORING DESIG.	B-1
DATE FINISHED	6/9/93	GW DEPTH (FT)		LOGGED BY	TMC
DRILLER	LEDEZMA	DRIVE WT.	varies		
TYPE OF DRILL RIG	30" BUCKET AUGER	DROP	12"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	85			3548lbs			SOIL reddish brown silty sand with some clay, damp, dense, porous, roots				
							TERRACE DEPOSIT (Qtm): yellow tan micaceous fine- to medium-grained sand, damp, dense, massive, roots				
5	80	D/B		PUSH			gray white micaceous medium grained sand, damp, moderately dense to dense, minor sloughing, very friable, massive gradational color change to reddish brown	5.3	104	23	
						B:N70E,2NW	greenish tan, very fine-grained micaceous sandy silt, damp, dense, sharp contact with sand above				
10	75	D		1			gradational change to silty micaceous very fine-grained sand, damp, dense, moderately well stratified/lensing, occasional charcoal streaks, discontinuous biotite laminations	3.3	92	11	DS
						B:N36W,5SW B:N15W,4SW	sharp contact with red brown micaceous very fine-grained sandy silt, damp to moist, dense sharp contact with greenish gray micaceous silt, moist, dense, 1/4-1/2" thick carbonate layer at contact, occasional red oxidation streaks, moderately well stratified				
15	70						interstratified light gray-white fine- to medium-grained micaceous sand, moist, dense, friable, no cement, undulatory continuous contacts, near horizontal, occasional near vertical worm burrows, occasional thin +1 1/2" interbeds of dark gray silty mud				
						B:N55W,8NE	SAN PEDRO SAND (Qsp?): sharp contact with gray micaceous silt, moist, dense, occasional shell fragments, occasional streaks of light yellow tan micaceous sand discontinuous shell wash horizon, moderately bioturbated zone, worm burrows, continuous lithology since @ 19 feet above				
20	65	D		2				8.6	123	64	
				2577lbs			gradational change to gray tan micaceous fine-grained sand, moist, dense, occasional gravel (subround) pebbles, massive, occasional red oxidation streaks gradational change to medium-grained sand				
25	60					B:N75E,4SE	gradational change to medium- to coarse-grained sand, with abundant subrounded gravel with pebbles, moist, dense, friable sharp contact with fine- to medium-grained sand, horizontal				
30	55	D		4			red brown micaceous very fine-grained sand lens alternating fining upward sequences of coarse- to fine-grained sand, cross bedded, near horizontal contacts bioturbated sand approximately 6 to 8 inches thick a 1-foot thick shell wash horizon within medium- to coarse-grained sand with subround to round gravel at base, horizontal	6.7	97	24	DS
35	50						gray-tan very fine-grained micaceous sand, moist, dense, friable, bioturbated, cross-bedded, laminated shell wash horizon as above at 32.5 feet gray-white medium- to coarse-grained sand, near horizontal cross-bedded				
	45										

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER
SEEPAGE
B BEDDING PLANE
J JOINTING
C CONTACT
F FAULT
S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-1

GEOTECHNICAL BORING LOG

PROJECT NO. 500236
DATE STARTED 6/9/93
DATE FINISHED 6/9/93
DRILLER LEDEZMA
TYPE OF DRILL RIG 30" BUCKET AUGER

PROJECT NAME Newport Oil
GROUND ELEV. 85.0
GW DEPTH (FT)
DRIVE WT. varies
DROP 12"

BORING DESIG. B-1
LOGGED BY TMC

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	45	D		5			gradational change to very coarse-grained sand with gravel	13.2	105	60	
						B:N75W,22SW	erosional/undulatory contact with gray silt and interstratified very fine-grained micaceous sand, bioturbated, predominately silt				
45	40					B:N65W,19SW	continuous lithology to total depth as above at 41 feet				
				1648lbs							
		D		9			Total Depth 50 ft. No Water, No Caving	1.8	105	8	

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-1

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil		
DATE STARTED	6/9/93	GROUND ELEV.	82.0	BORING DESIG.	B-2
DATE FINISHED	6/9/93	GW DEPTH (FT)		LOGGED BY	TMC
DRILLER	LEDEZMA	DRIVE WT.	varies		
TYPE OF DRILL RIG	30" BUCKET AUGER	DROP	12"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
				3548lbs			ARTIFICIAL FILL brown silty fine-grained sand, moist, dense, scattered roots and occasional pebbles, massive				
	80						TERRACE DEPOSIT (Qtm): reddish brown silty very fine-grained sand , moist, dense, occasional pockets of yellow tan very fine-grained sand, massive				
5		D		PUSH			gradational change to yellow tan very fine-grained micaceous sand, damp, moderately dense, massive	3.3	101	13	
	75						gray-white very fine- to fine grained sand, damp, dense, very friable, caving approximate 1 foot deep				
10		D		1			gradational change to very fine grained micaceous sandy silt, moist, dense, occasional streaks of biotite, lenses of pure silt, occasional carbonates	30.5	90	94	
	70						predominately silt with some clay, moist, dense, occasional lenses of very fine-grained micaceous sand				
15						approx. B:N50E,8NW	gray-white very fine- to fine-grained micaceous sand, damp, dense, uncemented, very friable, boring is belled, massive				
	65										
		B		1							MAX DS EI CHEM
20							continuous lithology since above at 14 feet				
	60						approximately 2-inch thick discontinuous shell wash horizon				
				2577lbs							
25											
	55										
30						approx. B:N20E,4SE	continuous lithology since above at 14 feet continuous clay seam, light gray brown approximately 3 to 4 inches thick, bedded, within sand as above at 14 feet				
		D		3				3.5	91	11	
	50						undulatory 1 to 1-1/2 inch thick shell wash horizon in sand as above at 14 feet, occasional subround pebbles				
35											
	45						discontinuous shellwash horizons in medium-to coarse-grained sand, occasional subround pebbles, horizontal				
							SAN PEDRO SAND (Qsp?): horizontal contacts with gray-white, medium- to coarse-grained sand with abundant scattered shell				

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER
SEEPAGE
B BEDDING PLANE
J JOINTING
C CONTACT
F FAULT
S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-2

GEOTECHNICAL BORING LOG

PROJECT NO. 500236
DATE STARTED 6/9/93
DATE FINISHED 6/9/93
DRILLER LEDEZMA
TYPE OF DRILL RIG 30" BUCKET AUGER

PROJECT NAME Newport Oil
GROUND ELEV. 82.0
GW DEPTH (FT)
DRIVE WT. varies
DROP 12"

BORING DESIG. B-2
LOGGED BY TMC

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		D		4			fragments, occasional gravel and pebbles horizontal contacts with sand as above at 14 feet	4.7	92	15	
	40										
							occasional shell wash horizons, worm burrows, bioturbated sand as above at 14 feet, near horizontal contacts				
45											
	35			1648lbs			gradational change to very fine-grained micaceous sand, light tan-gray, laminated with biotite, occasional red oxidation streaks				
							gray-tan very fine-grained micaceous sandy silt, damp, dense, occasional shell fragments at contact, horizontal contact				
50		D		4				20.1	102	84	DS
	30										
						B:N35W,19SW	predominately gray, tan gray, green gray micaceous silt, moist dense, moderately well stratified with thin beds of light tan very fine-grained micaceous sand				
55							continuous lithology since above at 53 feet				
	25										
60		D/B		3		B:N25W,19SW		21.6	100	85	
	20										
65						B:N20W,21SW					
	15										
70		D		4			continuous lithology as above at 53 feet to total depth at 70 feet	16.3	96	59	

Total Depth 70 feet
No Water
Caving from 6 to 10 feet, 14 to 29 feet and 39 to 47 feet

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil		
DATE STARTED	6/10/93	GROUND ELEV.	99.0	BORING DESIG.	B-3
DATE FINISHED	6/10/93	GW DEPTH (FT)		LOGGED BY	TMC
DRILLER	LEDEZMA	DRIVE WT.	varies		
TYPE OF DRILL RIG	30" BUCKET AUGER	DROP	12"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
				3548lbs			ARTIFICIAL FILL red-brown sandy clayey silt, damp, moderately dense, porous, pinsize air voids, massive				
	95										
5		D/B		1				14.1	114	79	
							TERRACE DEPOSIT (Qtm): light red tan fine-grained micaceous sand, damp, dense, massive gradational change to reddish yellow tan silty very fine-grained micaceous sand				
	90										
10		D		2		approx. B:N5W,8NE	+2-inch thick gray-brown clayey silt lens with occasional carbonates below is gray-tan to orange-tan very fine-grained micaceous sand, damp, dense, massive	13.8	90	42	
	85						gray-green clayey silt, damp, dense, horizontal, contact, interstratified dark gray clay lenses, near horizontal cuts, red-brown oxidation, some carbonates				
15						approx. B:NS,4E					
	80					approx. C:N40W,16NE	light gray-white very fine-grained micaceous sand, damp, dense, very friable, no cement, massive				
20							weakly cross-bedded minor caving within sand as above at 18 feet				
	75			2577lbs			light gray fine- to medium-grained micaceous sand, damp, dense, interstratified/lenses of shell wash horizons, undulatory/continuous contact with sand above				
25		D		3				2.6	100	10	
	70						undulatory contact with light gray medium-grained micaceous sand, damp, dense, massive continuous lithology to total depth at 32 feet				
30											
							Total Depth 32 feet No Water Caving from 21 to 23 feet NOTE: Soil Contaminated to Total Depth				
		D		4				2.7	96	10	

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil	BORING DESIG.	B-4
DATE STARTED	6/10/93	GROUND ELEV.	72.0	LOGGED BY	TMC
DATE FINISHED	6/10/93	GW DEPTH (FT)			
DRILLER	LEDEZMA	DRIVE WT.	varies		
TYPE OF DRILL RIG	30" BUCKET AUGER	DROP	12"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
				8548lbs			ARTIFICIAL FILL brown silty sand, damp, dense, asphalt				
	70						SOIL reddish brown silty fine-grained sand with some clay, damp, dense to very dense, slight magnesium development, slightly porous, moderately well-cemented				
5		D		4				6.9	115	40	
	65						TERRACE DEPOSIT (Qtm): light yellowish gray-tan very fine- to fine-grained micaceous sand, damp, dense, loose/friable, no cohesion				
10		D		1				0.7	93	2	
	60						light yellow-tan silty very fine-grained micaceous sand, dry to damp, dense, loose/friable, uncemented				
15											
	55						continuous lithology since above at 12 feet Total Depth 17 feet No Water Caving from 12 to 17 feet				

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil	BORING DESIG.	B-5
DATE STARTED	6/10/93	GROUND ELEV.	65.0	LOGGED BY	TMC
DATE FINISHED	6/10/93	GW DEPTH (FT)			
DRILLER	LEDEZMA	DRIVE WT.	varies		
TYPE OF DRILL RIG	30" BUCKET AUGER	DROP	12"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	65			3548lbs			ARTIFICIAL FILL mottled brown-tan and dark brown silty sand, damp, dense, scattered rock fragments, brick fragments				
							TERRACE DEPOSIT (Qtm): yellow-tan very fine-grained sandy silt, damp to moist, dense, massive				
5	60	D		PUSH/6" TAP/6"		B:N50W,9NE	red-brown, yellow-tan, blue-gray silt, moist, dense, moderately well stratified, thinly stratified	20.9	103	88	
						approx. B:N35W,5NE	light gray-white fine-grained sand, damp, dense, scattered carbonate occasional roots				
10	55						gradational change to light gray-white very fine-grained micaceous sand, damp, dense, massive, roots				
		D/B		1				5.5	93	18	MAX DS EI CHEM
15	50						undulatory/near horizontal contact with yellowish gray silty fine- to medium-grained sand, damp to moist, dense, massive, scattered carbonates, orange-red oxidation staining, occasional rip up clasts of brown silt undulatory/near horizontal cut with blue-gray clayey silt, moist, dense, common carbonate pods, interstratified gray-brown fine-grained sand				
							SAN PEDRO SAND (Qsp?): undulatory/near horizontal contact with gray-white fine-grained micaceous sand, damp, dense, occasional subround pebbles and abundant carbonates at contact				
20	45	D		2			undulatory horizontal bed of subround pebbles and scattered shell fragments approximately 6 inches thick, below light gray-white, fine- to medium-grained micaceous sand (beach), moist, dense, friable, uncemented,	3.7	98	14	
						B:N15W,15SW	moderately well stratified with coarse-grained sand, laminated with biotite, occasionally cross-bedded				
				2577lbs			gradational change to fine-grained sand				
25	40						gradational change to medium-grained sand, repeating fining upwards sequences occasional yellow-red oxidation staining				
							approximately 2 inches thick bed of interstratified silt and very fine grained sand, horizontal contact				
30	35	D		5			sand as above at 20 feet	6.8	99	26	
							cross-bedded horizontal lens of unoxidized sand, color change to blue-gray 1/2-inch thick gray clay bed at base of sand, (fining upwards sequences) undulatory/continuous near horizontal				
35	30						light blue-gray medium-grained sand, damp, dense, moderately well stratified gradational change to fine- to very fine-grained sand (fining upwards sequences)				
							gray-brown very fine-grained sandy silt, moist, dense, undulatory/near horizontal contact; interstratified thin beds of very fine-grained blue-gray micaceous sand and gray silty clay, occasional gravel/pebbles				
	25										

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO. 500236
DATE STARTED 6/10/93
DATE FINISHED 6/10/93
DRILLER LEDEZMA
TYPE OF DRILL RIG 30" BUCKET AUGER

PROJECT NAME Newport Oil
GROUND ELEV. 65.0
GW DEPTH (FT)
DRIVE WT. varies
DROP 12"

BORING DESIG. B-5
LOGGED BY TMC

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	25	D		4				6.0	106	28	
						B:N70E,3NW	4-inch thick dark blue-gray silty clay bed, moist, stiff, below is a dark gray very fine-grained sandy silt, moist, dense				
45	20										
				1648lbs.			scattered well cemented clasts of bioturbated (worm burrows) sand, very hard, very dense, localized pods and lenses of shell fragments in dark gray very fine-grained sandy silt continuous lithology since above at 42 feet to total depth at 50 feet				
50	15	D		4			Total Depth 50 feet No Water Caving from 9.5 to 13.5 feet	28.6	93	95	

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil	BORING DESIG.	B-6
DATE STARTED	6/11/93	GROUND ELEV.	55.0	LOGGED BY	TMC
DATE FINISHED	6/11/93	GW DEPTH (FT)	45.00		
DRILLER	LEDEZMA	DRIVE WT.	varies		
TYPE OF DRILL RIG	30" BUCKET AUGER	DROP	12"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	55			3548lbs			ARTIFICIAL FILL silty sand and asphalt on native soils				
5	50	D		3				12.7	120	86	CON
							SOIL red-brown very fine-grained sandy silt with some clay, moist, dense, massive, scattered coarse-grained lithic fragments				
10	45	D		2			TERRACE DEPOSIT (Qtm): yellow-tan fine-grained micaceous sand, moist, dense, massive interstratified gray-tan very fine-grained micaceous sand and brown to gray-tan silt, damp, moderately dense to dense, friable, no cement	8.4	110	42	CON
						approx. C:N40E,7NW	gray-tan very fine- to fine-grained micaceous sand, damp, dense, friable, no cement, gravel and subround pebbles at contact with interstratified silt and sand above, common carbonates at contact near horizontal				
15	40										
						C:N25W,19SW	SAND PEDRO SAND (Qsp?): sharp contact with tan-gray very fine-grained micaceous sandy silt, moist, dense, scattered gravel, occasional shell fragments, red oxidation, massive				
20	35										
		D		2			undulatory/near horizontal 6-inch thick bed of gray fine-grained micaceous sand	16.2	105	73	
							silt as above at 17 feet				
				2577lbs			gray-tan fine- to coarse-grained sand, damp, dense, orange-red oxidation staining, undulatory near horizontal contact, clean (no fines, little mica) noncemented, very friable very well stratified, color banded 1/2 to 2-inch thick with gray, red-orange, yellow-tan, light brown, numerous fining upwards sequences				
25	30					approx. 8:NS,7E	very well stratified - alternating 1/2 to 2-inch thick beds of very fine-, fine-, medium-, to coarse-grained sand, no fines, clean, shell fragments at base				
30	25										
		D		5			tan-gray clayey silt, moist, dense, approximately 8 inches thick	3.1	103	13	CON
							fine- to medium-grained sand, moist, dense, common shell fragments, occasional gravel, subround pebbles, coarse-grained at base				
35	20						gray very fine-grained micaceous sandy silt, moist, dense, slight caving, friable, no cement, color banded along stratification by oxidation staining, very thinly stratified, unoxidized sandy silt is gray blue continuous lithology since 33 feet above				
	15										

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-6

GEOTECHNICAL BORING LOG

PROJECT NO. 500236
DATE STARTED 6/11/93
DATE FINISHED 6/11/93
DRILLER LEDEZMA
TYPE OF DRILL RIG 30" BUCKET AUGER

PROJECT NAME Newport Oil
GROUND ELEV. 55.0
GW DEPTH (FT) 45.00
DRIVE WT. varies
DROP 12"

BORING DESIG. B-6
LOGGED BY TMC

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	15	D		5			continuous lithology since 33 feet above	4.9	92	16	
45	10			1648lbs			continuous lithology since 33 feet above, water seepage (moderate) into boring, severe caving continuous lithology since at 33 feet above to total depth at 50 feet				
50	5	D		3			Total Depth 50 feet Water at 45 feet Caving from 33 to 40 feet	29.6	92	96	

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-6

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil		
DATE STARTED	6/11/93	GROUND ELEV.	95.0	BORING DESIG.	B-7
DATE FINISHED	6/11/93	GW DEPTH (FT)		LOGGED BY	TMC
DRILLER	LEDEZMA	DRIVE WT.	varies		
TYPE OF DRILL RIG	30" BUCKET AUGER	DROP	12"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	ATTITUDES	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	95			3548lbs			SOIL dark red-brown sandy silt with some clay, damp to moist, moderately dense, roots, voids, porous, massive				
5	90	D		2			TERRACE DEPOSIT (Qtm): orange-tan silty fine-grained sand, damp, dense, massive	11.0	116	66	
							light yellow-tan very fine-grained micaceous sandy silt, damp, dense, massive moderately well stratified, carbonates along bedding				
10	85	D		1				4.0	96	14	CON
						C:N30W,8SW	light gray-white very fine-grained micaceous sand, damp, dense, friable, no cement, boring is belled interstratified thin beds of gray silt and yellow-tan very fine- to fine-grained micaceous sand, moist, dense, moderately well stratified				
15	80					B:N25W,7SW					
20	75	D		1			light gray-white very fine- to fine-grained micaceous sand, damp, dense, friable, no cement, presaturated, occasional shell fragments, orange-red oxidation, scattered very coarse-grained quartz/lithics continuous lithology to total depth at 30 feet	1.6	90	5	
				2577lbs							
25	70										
30	65	D		2			Total Depth 30 feet No water Minor Caving from 19 feet to Total Depth	3.3	99	13	

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

- GROUNDWATER
- SEEPAGE
- B BEDDING PLANE
- J JOINTING
- C CONTACT
- F FAULT
- S SHEAR

PACIFIC SOILS ENGINEERING, INC.

PLATE A-7

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil	BORING DESIG.	HB-1
DATE STARTED	6/15/93	GROUND ELEV.	12.0	LOGGED BY	TMC
DATE FINISHED	6/15/93	GW DEPTH (FT)	6.00		
DRILLER	Discovery	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	Hollowstem	DROP	30"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
							ALLUVIUM (Qal):				
	10										
5		S		20		SM	brown silty fine to medium grained sand				SA
							water				
	5	D		16				20.4	106	94	
10		S		10		SP-SM	brown silty medium grained sand				SA
	0										
15		S		7		ML	brown silty medium grained sand and gray brown fine grained sandy silt				SA
	-5	D		15				18.9	113	99	
							medium coarse grained sand, falling out of tube add sand trap and sample again				
20		S		7		SM	yellow brown very fine grained silt				SA
	-10	D		15			lost sample, re-obtain with sand trap	21.4	108	99	
25		S		14		SM	gray brown very fine grained sandy silt				
	-15	D		not recorded				19.1	111	99	
30		S		14		SM	SAN PEDRO SAND (Qsp?): yellow brown fine to medium grained silty sand				SA
	-20										
35		S		17		SM	yellow brown and gray brown silty fine to medium grained sand				SA
	-25	D		30			NON RETURNS				

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil	BORING DESIG.	HB-1
DATE STARTED	6/15/93	GROUND ELEV.	12.0	LOGGED BY	TMC
DATE FINISHED	6/15/93	GW DEPTH (FT)	6.00		
DRILLER	Discovery	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	Hollowstem	DROP	30"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
		S		14		SP-SM	yellow gray brown silty fine to medium grained sand				SA
	-30										
45		S		45		ML	green gray very fine grained sandy clayey silt				SA
	-35										
		D		35				23.5	104	99	
50		S		61		ML	green gray clayey silt, dry				SA
	-40	D		63			Total Depth 52 feet Water at 6 feet	31.9	92	101	

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil		
DATE STARTED	6/15/93	GROUND ELEV.	6.0	BORING DESIG.	HB-2
DATE FINISHED	6/15/93	GW DEPTH (FT)	6.00	LOGGED BY	TMC
DRILLER	Discovery	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	Hollowstem	DROP	30"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
							ALLUVIUM (Qal):				
	5										
5		S		7		ML	green gray, very fine grained micaceous sandy silt				SA
	0						water				
		D		9				35.3	90	109	
10		S		8		ML	dark green gray very fine grained micaceous sandy silt and medium grained sand with abundant shell fragments				SA
	-5										
15		S		25		SM	a little gravel at tip dark green gray very fine grained micaceous sandy silt and medium grained sand with abundant shell fragments				SA
	-10										
		D		28				17.3	110	88	
20		S		32		SP-SM	dark green gray medium to coarse grained sand with gravel				SA
	-15										
25		S		39		SP	dark green gray medium to coarse grained sand with gravel				
	-20										
		D		79/11"				23.6	103	100	
30		S		46		SP-SM	green gray medium to coarse grained sand				SA
	-25										
35		S		35		SM	dark green gray micaceous silt				SA
	-30										
		D		76/6"				19.4	112	99	

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER

PACIFIC SOILS ENGINEERING, INC.

GEOTECHNICAL BORING LOG

PROJECT NO.	500236	PROJECT NAME	Newport Oil		
DATE STARTED	6/15/93	GROUND ELEV.	6.0	BORING DESIG.	HB-2
DATE FINISHED	6/15/93	GW DEPTH (FT)	6.00	LOGGED BY	TMC
DRILLER	Discovery	DRIVE WT.	140 lbs.		
TYPE OF DRILL RIG	Hollowstem	DROP	30"		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	-35	S		61		SP-SM	green gray medium to coarse grained sand				SA
45	-40	S		84/11"		SP	gray medium to coarse grained sand				SA
		D		70			gray medium grained sand	22.8	105	100	
50	-45	S		83		SP	gray medium to coarse grained sand				SA
55	-50	S		66		SP-SM	gray medium coarse grained sand				SA
		D		82			gray coarse grained sand with abundant gravel at tip	19.1	112	98	
60		S		38		SP-SM	gray fine to medium grained sand				SA

Total Depth 60 feet
Water at 6 feet

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

GROUNDWATER

PACIFIC SOILS ENGINEERING, INC.

APPENDIX A-4

Boring and CPT Sounding Logs
Performed by
Leighton and Associates, Inc.

GEOTECHNICAL BORING LOG B-1

Date 11-4-96 | Sheet 1 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	0			Bag #1					SILTY CLAY with sand and gravel, medium stiff, grey, slightly moist	
				R-1	17			SP	2': SAND, loose, yellowish brown, slightly moist, fine grained sand	
0	5			S-1	3			CH	5': SILTY CLAY, soft, greyish blue, very moist, high plasticity	AL
									7': Ground water encountered	
-5	10			R-2	11			SM	10': SILTY SAND, medium dense, bluish grey, saturated, fine to coarse grained sand, shell at tip, trace gravel	
-10	15			S-2	24			SM	15': Same material, layers of sea shell and pea gravel	SA
-15	20			R-3	13				20': Coarser sand	
-20	25			S-3	17				25': Fine grained sand, no sea shell	
-25	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-1

Date 11-4-96 | Sheet 2 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	30			R-4	59			SM	30': SILTY SAND, medium dense to dense, grey, very moist, fine to coarse grained sand, silt (20 %), trace gravel	
-30	35			S-4	33			SP-SM	35': SAND, dense, grey, saturated, rounded and some angular gravel pieces, pea gravel	
-35	40			S-5	49			SW-SM	40': SAND with silt and gravel, more pea gravel, rounded and angular gravel pieces	SA
-40	45			S-6	64				45': Same material	
-45	50			S-7	44				50': Same material	
-50	55								NOTES: Total depth = 51'6" Ground water encountered at 7' Backfilled with native and bentonite chips upto 20'	
-55	60									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-2

Date 11-4-96 | Sheet 1 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	0			Bag #1					SAND, loose, brown, moist, fine to coarse grained sand with some gravel	
				R-1	6			SP	2': Same material	
0	5			R-2	9			CL	5': Top 1', silty clay, soft, grey, very moist, high plasticity; followed by SILTY SAND, loose, grey, saturated 6': Ground water encountered	
-5	10			S-1	11			SM	10': Same material	SA
-10	15			S-2	20			SM	15': medium dense, grey, saturated, fine grained sand	
-15	20			S-3	12				20': Some mica, rounded gravel	
-20	25			S-4	21				25': Same material, shell, and pea gravel	
-25	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-2

Date 11-4-96 | Sheet 2 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	30			S-5	25			SP-SM	30': SAND, medium dense, grey, saturated, fine to coarse grained sand, trace gravel, some shell, black specks	SA
-30	35			S-6	51				35': Same material, very dense, a lot of shell, mica, pea gravel, coarser sand	
-35	40			S-7	28				40': finer sand, medium dense	
-40	45			S-8	36				45': Same material, dense	
-45	50			S-9	27				50': Same material	
-50	55								NOTES: Total depth = 51'6" Ground water encountered at 6' Backfilled with native and bentonite chips upto 20'	
-55	60									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-3

Date 11-4-96 | Sheet 1 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	0			Bag #1					GRAVELLY SAND, loose, brown, moist, fine to coarse grained sand with some clay	
				R-1	47			SC	2': CLAYEY SAND, medium dense, dark grey, moist, fine to coarse grained, some oil smell	
0	5			R-2	6	79.4	40.2	CL	5': SILTY CLAY, soft, grey, very moist, high plasticity; 6': Ground water encountered	AL,CN
-5	10			S-1	5			SC	10': CLAYEY SAND, loose, grey, very moist, fine to coarse grained sand	
-10	15			S-2	17			ML	15': SILT with sand, very stiff, grey, saturated, fine grained sand	SA
-15	20			S-3	24			SP-SM	20': SAND, medium dense, grey, saturated, mica, shell, rounded gravel	
-20	25			S-4	29				25': Same material	
-25	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-3

Date 11-4-96 | Sheet 2 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	30			S-5	83			SP-SM	30': SAND, very dense, dark grey, saturated, coarse grained sand, rounded and angular gravel pieces, some shell, black specks, and pea gravel	SA
-30	35			S-6	69				35': Same material, a lot of rounded and angular gravel	
-35	40			S-7	55				40': GRAVELLY SAND, very dense, grey, saturated, coarse sand, rounded and angular gravel pieces, pea gravel	
-40	45			S-8	95/11.5"			SP-SM	45': Same material	SA
-45	50			S-9	94/11.5"				50': Same material	
-50	55								NOTES: Total depth = 51'6" Ground water encountered at 6' Backfilled with native and bentonite chips upto 20'	
-55	60									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-4

Date 11-4-96 | Sheet 1 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	0			Bag #1					SILTY CLAY, stiff, grey, moist, high plasticity	
				R-1	5	73.3	46.7	CL	2': SILTY CLAY, medium stiff, grey, very moist, high plasticity, bottom rings consist of SILTY SAND, loose, bluish, very moist, fine grained	CN
0	5			R-2	12			SP	5': SAND with some silt, loose, brownish grey, very moist	
									7': Ground water encountered	
-5	10			S-1	10			SP-SM	10': SAND with silt, loose, grey, saturated, fine grained	SA
-10	15			S-2	21				15': Same material	
-15	20			S-3	25			SP-SM	20': medium dense, mica, shell, rounded gravel	
-20	25			S-4	41				25': Same material, dense, a lot of shell, pea gravel	
-25	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-4

Date 11-4-96 | Sheet 2 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	30			S-5	44			SP-SM	30': SAND, dense, grey, saturated, fine to coarse grained sand (20 to 30 % silt)	SA
-30	35			S-6	43				35': Same material	
-35	40			S-7	16				40': Same material, medium dense, mica, rounded and angular gravel pieces, pea gravel	
-40	45			S-8	31			SM	45': SILTY SAND, medium dense to dense, grey, saturated, mica, pea gravel	SA
-45	50			S-9	51				50': SAND with gravel, very dense, saturated, angular and rounded gravel pieces, pea gravel	
-50	55								NOTES: Total depth = 51'6" Ground water encountered at 7' Backfilled with native and bentonite chips upto 20'	
-55	60									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-5

Date 11-4-96 | Sheet 1 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 10' | Location See Plate 1

Logged By DXS

Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
10	0			Bag #1					SAND, loose, brown, slightly moist, fine to coarse grained sand.	
				R-1	16			SP	2': Same material	
5	5			R-2	23			SM	5': SILTY SAND, medium dense, brownish grey, moist, fine to coarse grained sand.	
0	10			S-1	10			SM	10': Ground water encountered 10': SILTY SAND to SANDY SILT, loose, grey, saturated, fine grained	SA
-5	15			S-2	13				15': Same material, medium dense, 30% silt	
-10	20			S-3	25				20': Same material 21': SANDY CLAY, very stiff, yellowish, brown, moist, low to medium plasticity	
-15	25			S-4	26			CL	25': Same material	SA
-20	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-5

Date 11-4-96 | Sheet 2 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 10' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
-20	30			S-5	19			CL	30': SANDY CLAY, very stiff, yellowish brown, moist	
-25	35			S-6	17				35': Same material	
-30	40			R-3	63				40': hard, brownish grey, very moist, fine grained sand, medium plasticity	
-35	45			S-7	29			CL	45': CLAY with sand	SA
-40	50			S-8	46				50': Same material	
-45	55								NOTES: Total depth = 51'6" Ground water encountered at 10' Backfilled with native and bentonite chips upto 20'	
-50	60									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-6

Date 11-4-96 | Sheet 1 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 9' | Location See Plate 1

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION (Logged By DXS; Sampled By DXS)	Type of Tests
	0			Bag #1					CLAYEY SAND, loose, brown, moist, fine to coarse grained sand	
				R-1	5			CL	2': SILTY CLAY, medium stiff, brownish grey, moist, high plasticity, white caliche	AL
5	5			R-2	5	76.6	42.5		5': Same material	CN
									7': Ground water encountered	
0	10			S-1	2			CL	10': CLAY with sand, very soft, grey, saturated, fine grained sand, sea shell, medium to high plasticity	SA
-5	15			S-2	10			SP-SM	15': SILTY SAND, loose, grey, saturated, a lot of sea shell, fine grained sand	
-10	20			S-3	15				20': medium dense, mica, shell, pea gravel and rounded gravel pieces	
-15	25			S-4	29				25': Same material	
-20	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-6

Date 11-4-96 | Sheet 2 of 2
Project TW Homes/Banning Lowland | Project No. 1970011-01
Drilling Co. 2R DRILLING | Type of Rig CME-55
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"
Elevation Top of Hole 9' | Location See Plate 1

Logged By DXS
Sampled By DXS

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION	Type of Tests
	30			S-5	24			SP	30': SAND with silt, medium dense, grey, saturated, coarse grained sand, pea gravel, a lot of sea shell	SA
-25										
	35			S-6	14				35': Same material	
-30										
	40			S-7	69				40': SAND with some gravel, very dense, saturated, coarse sand, mica, rounded and angular gravel pieces, pea gravel	
-35										
	45			S-8	49				45': Same material with a clay lense of 6 inch thick	
-40										
	50			S-9	74				50': Same material	
-45									NOTES:	
	55								Total depth = 51'6" Ground water encountered at 7' Backfilled with native and bentonite chips upto 20'	
-50										
	60									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

GEOTECHNICAL BORING LOG B-1-97

Date 10-28-97 | Sheet 1 of 2
Project NEWPORT BANNING RANCH | Project No. 970011-001
Drilling Co. 2R DRILLING | Type of Rig HOLLOW STEM
Hole Diameter 8" | Drive Weight 140 LB | Drop 30"
Elevation Top of Hole 5' | Location SEE PLATE 1

Logged By ATG/LRC
Sampled By LRC

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0							SM	FILL: Light Brown SILTY SAND, moist, medium dense.	
									ALLUVIUM:	
				R-1	5	79.4	38.6	SM	SILTY SAND: Dark brown, moist, loose.	
0	5									
									CLAY: Dark gray, wet	
				Bag 1 R-2	9	87.1	19.7	SM SM	SILTY SAND: dark gray to 7.5'; very wet, loose.	CN MD,SA
									Encountered groundwater while drilling at 8.5' Standing water at 5.5' after 15 min. Standing water at 4.9' after 25 min. FINE SILTY SAND: dark gray; very wet, loose. Bag Sample #1 (3.5 to 10')	
-5	10									
				R-3	9	91.7	30.7	SM	SILTY FINE SAND: Medium gray (N-4); with scattered white/off-white shell fragments (one 1/4" clam), loose.	
-10	15									
				S-1	17			SM	SAND: Medium to dark gray (N-4) slightly silty fine to medium; medium dense, medium graded with some mica and minor scattered shell fragments; wet - free water.	SA
-15	20									
				R-4	57	96.8	27.0	SP	Sand becomes poorly graded.	
-20	25									
				S-2	33			SP	BEDROCK(?) SAND and gravel with silty interbeds. SAND: Very coarse, and pebble gravel; medium gray (N-4), locally dark gray (N-5); moderately well graded; pebble to 1" dia; surrounding wet - free water; dense.	
-25	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-1-97

Date 10-28-97 | Sheet 2 of 2
Project NEWPORT BANNING RANCH | Project No. 970011-001
Drilling Co. 2R DRILLING | Type of Rig HOLLOW STEM
Hole Diameter 8" | Drive Weight 140 LB | Drop 30"
Elevation Top of Hole 5' | Location SEE PLATE 1

Logged By ATG/LRC
Sampled By LRC

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30									
				R-5	34	93.8	32.9	ML	CLAYEY SILT: Grayish olive, stiff to very stiff, (104 4/2); micaceous, scattered dark gray organics, very moist/wet. Note: The above clayey silt is probably an interbed with the coarse sand and gravel.	
-30	35									
				S-3	19			ML	CLAYEY SILT: Grayish olive (104 4/2) micaceous; scattered organics; very stiff, very moist/wet.	
-35	40									
				R-6	38	98.0	24.4	SM	SAND: Silty fine with gravel; medium gray, scattered pebbles surrounding up to 1/4" dia., wet - free water, medium dense.	
-40	45									
				S-4	88/11"			SP	SAND: Very coarse; medium to dark gray; moderately well graded; wet - free water; very dense.	
-45	50									
				R-7	77/9"			SP	SAND: Very coarse with some gravel, medium gray, very dense	SA
				S-5	83/11"			SP	SAND: Very coarse, and GRAVEL; medium gray; medium graded, very dense.	
-50	55			S-6	50/6"			SP	As above, no shell fragments.	
-55	60								TOTAL DEPTH = 56'. BACKFILLED WITH BENTONITIC PELLETS. STARTED DRILLING 8:37AM; COMPLETED 10:10AM. GROUNDWATER DEPTH = 4.9'	

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-2-97

Date 10-28-97 | Sheet 1 of 2
Project NEWPORT BANNING RANCH | Project No. 970011-001
Drilling Co. 2R DRILLING | Type of Rig HOLLOW STEM
Hole Diameter 8" | Drive Weight 140 LB | Drop 30"
Elevation Top of Hole 7' | Location SEE PLATE 1

Logged By LRC
Sampled By LRC

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								FILL:	
5				R-1	22	101.8	10.1	SM	SAND: Medium, silty; moderate yellowish-brown with oil stains; moist, loose to medium dense.	SA,CN
	5								ALLUVIUM	
0				R-2 Bag 2	28			SM	SAND: Medium silty, moderate yellowish brown. Standing water @ 7' 6" after 25 min.	SA
	10									
-5				R-3	22	99.8	23.9	SP	SAND: Fine to medium grained; medium gray (N-4) with scattered shells; poorly graded; wet - free water; loose to medium dense.	CN
	15									
-10				S-1	42			SP	SAND: Fine to medium; medium gray; wet - free H2O; dense.	
	20									
-15				R-4	57	99.8	23.9	SP	SAND; Fine to medium as above; medium dense.	SA
	25									
-20				S-2	17			SM	SAND: Fine, silty; medium gray (N-4); scattered shell fragments; wet - free water; medium dense.	
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

GEOTECHNICAL BORING LOG B-2-97

Date 10-28-97 | Sheet 2 of 2
Project NEWPORT BANNING RANCH | Project No. 970011-001
Drilling Co. 2R DRILLING | Type of Rig HOLLOW STEM
Hole Diameter 8" | Drive Weight 140 LB | Drop 30"
Elevation Top of Hole 7' | Location SEE PLATE 1

Logged By LRC
Sampled By LRC

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30									
-25				R-5	53	98.3	25.8	SM	SILTY SAND: Fine, moderate grey, moist to wet, medium dense. Shoe of sampler contains yellow-brown silt	
									BEDROCK(?)	
	35									
-30				S-3	26			ML	SILT: Sandy, clayey; grayish olive (104 4/2); micaceous; moderate reddish brown iron oxide bands; very moist; very stiff.	
	40									
-35				R-6	29	97.8	25.9	ML	SILT: Brown, sandy; clayey silty fine SAND; grayish olive; very moist; stiff.	
	45									
-40				S-4	27			ML	SILT: Clayey sandy; grayish olive; sample as above.	
	50									
-45				R-7	55	103.6	24.3	ML	As above; very stiff.	
	55			R-8	83			ML	As above; clayey sandy SILT to sandy SILT; hard.	
-50									TOTAL DEPTH = 56'5. BACKFILLED WITH BENTONITIC PELLETS. STARTED DRILLING 10:52AM; COMPLETED 12:25PM. GROUNDWATER DEPTH = 7.5'.	
	60									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-3-97

Date 10-28-97 | Sheet 1 of 2
Project NEWPORT BANNING RANCH | Project No. 970011-001
Drilling Co. 2R DRILLING | Type of Rig HOLLOW STEM
Hole Diameter 8" | Drive Weight 140 LB | Drop 30"
Elevation Top of Hole 3' | Location SEE PLATE 1

Logged By LRC
Sampled By LRC

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								SAND: Fine to medium; yellow brown (FILL?).	
0									ALLUVIUM @3' SAND: fine to medium; dark gray. Petroleum odor - slight sheen on water.	
	5									
-5									Encountered groundwater while drilling at 8'. Standing water at 6.7' after 15 minutes. Standing water at 3.5' after 30 minutes. Slight black oil on water and mud @4' to 25' below ground surface; soil probed without sampling.	
	10									
-10										
	15									
-15										
	20									
-20										
	25			R-1	60			SM	SAND: Fine, silty; medium gray (N-4); scattered white/off-white shell fragments; wet - free water; medium dense.	
-25									SAND; coarse; with some gravel; medium gray	
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-3-97

Date 10-28-97 | Sheet 2 of 2
Project NEWPORT BANNING RANCH | Project No. 970011-001
Drilling Co. 2R DRILLING | Type of Rig HOLLOW STEM
Hole Diameter 8" | Drive Weight 140 LB | Drop 30"
Elevation Top of Hole 3' | Location SEE PLATE 1

Logged By LRC
Sampled By LRC

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	30			S-1	24			SP	@30' SAND: Coarse, with gravel, medium gray, wet - free water (BEDROCK?)	
									SAND: Coarse; and gravel, as above.	
-30										
	35			R-2	50/6"	121.5	12.8	SP	SAND: As previous, very dense	SA
-35										
	40			S-2	81			SP	SAND: Coarse; with gravel; very dense.	
-40										
	45			R-3	50/6"				@45' No recovery.	
-45										
	50			S-3	85			SP	SAND: Very coarse; and gravel; medium gray; wet - free water; very dense.	
-50										
	55			S-4	50/5"			SP	SAND: Very coarse; and gravel; as above; very dense.	
									TOTAL DEPTH = 56.5'. BACKFILLED WITH BENTONITIC PELLETS. GROUNDWATER DEPTH = 3.5'.	
-55										
	60									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON & ASSOCIATES

GEOTECHNICAL BORING LOG B-4-97

Date 10-28-97 | Sheet 1 of 1
Project NEWPORT BANNING RANCH | Project No. 970011-001
Drilling Co. 2R DRILLING | Type of Rig HOLLOW STEM
Hole Diameter 8" | Drive Weight 140 LB | Drop 30"
Elevation Top of Hole 23' | Location SEE PLATE 1

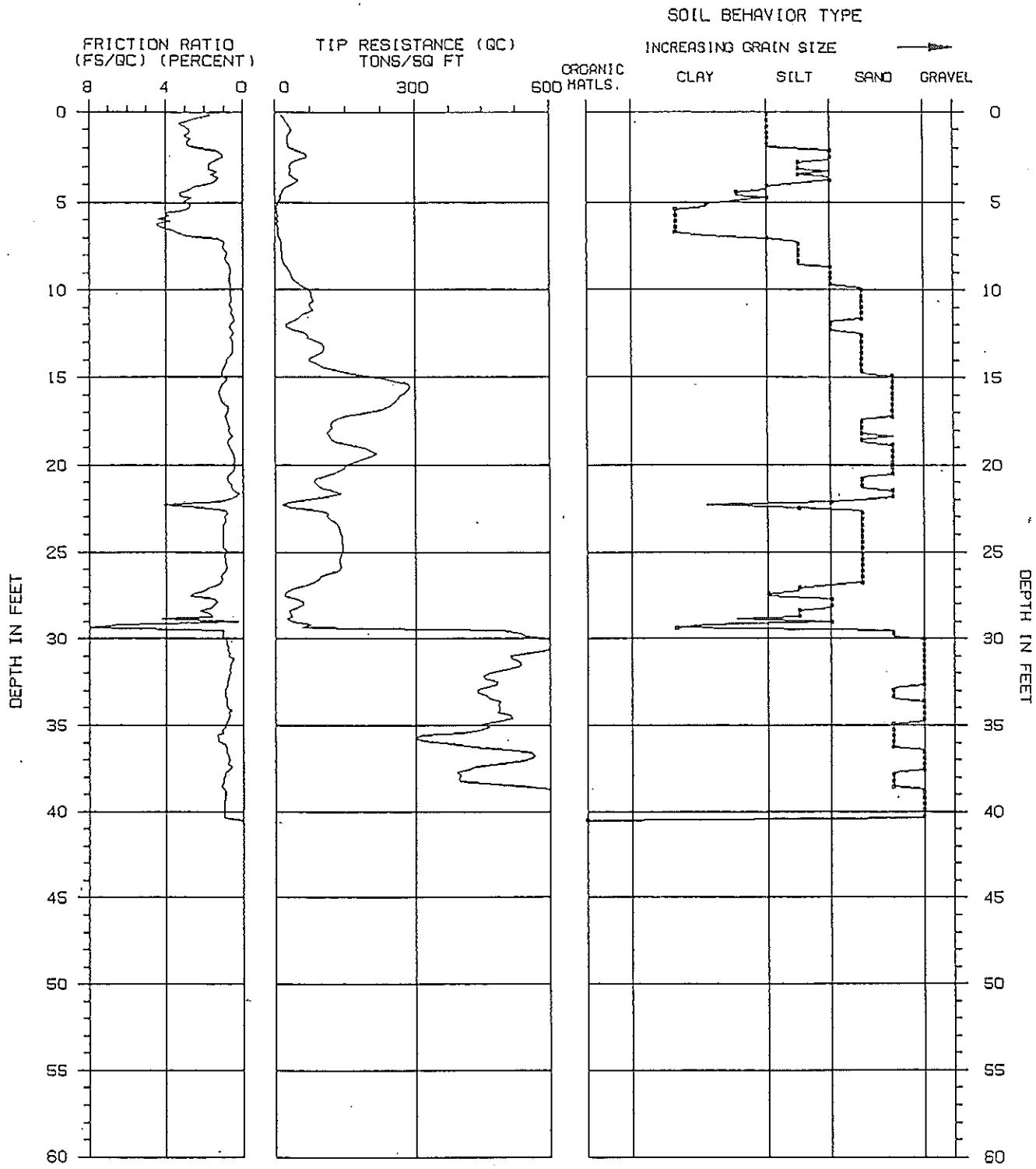
Logged By LRC
Sampled By LRC

Elevation Feet	Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	DESCRIPTION	Type of Tests
	0								COLLUVIUM:	
20								SC	SAND: Clayey; moderately reddish brown (10R 4/6); moist; medium dense.	
	5			R-1 Bag 1	25	116.7	8.7	SC	Medium dense.	MD
15										
	10			R-2	28	113.7	9.3	SM	SAND: Silty; moderately brown (5YR 4/4); moist; medium dense.	CN
10										
	15			R-3	52	117.3	8.0	SM	@15 to 16.5' SAND; silty; moderately yellowish brown (10YR 5/4) (Colluvium - transition - bedrock)	
5									TOTAL DEPTH = 16.5'. NO GROUNDWATER (NO WATER ADDED FOR DRILLING). BACKFILLED WITH NATIVE MATERIAL. NO FILL ENCOUNTERED.	
	20									
0										
	25									
-5										
	30									

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- RV R-VALUE

LEIGHTON & ASSOCIATES



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-01

PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 12:49

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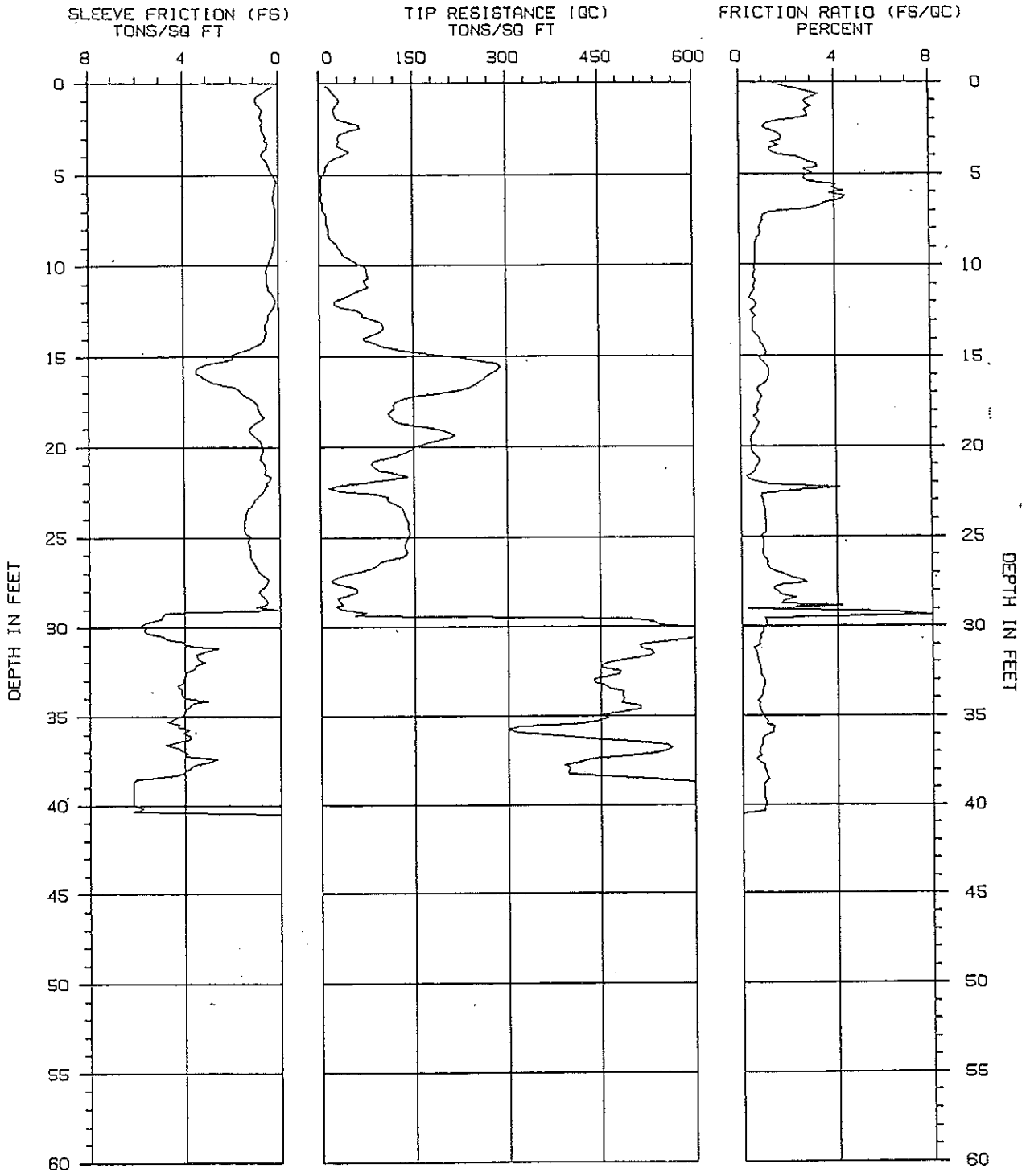


TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-01

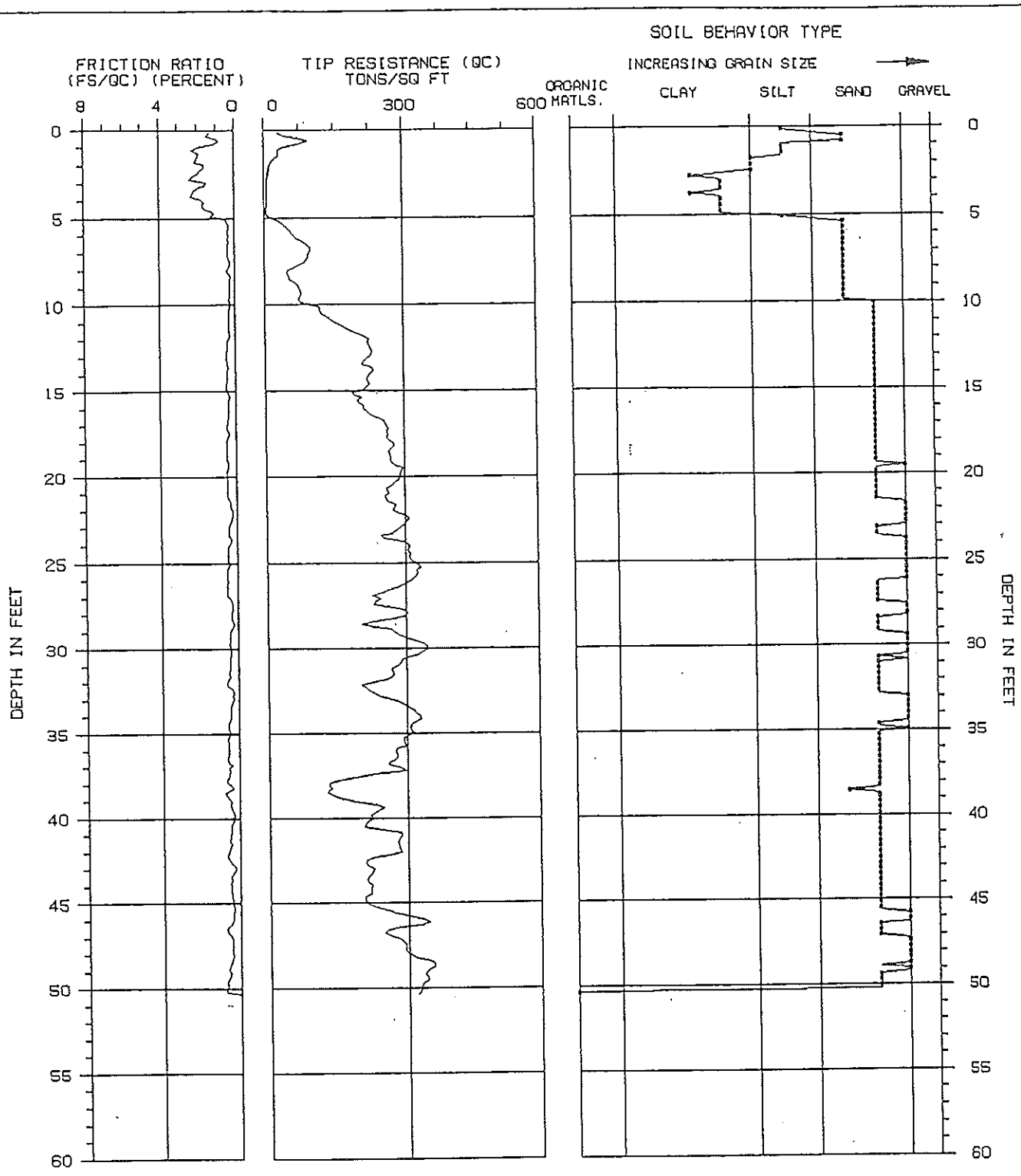
PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 12:49

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-02

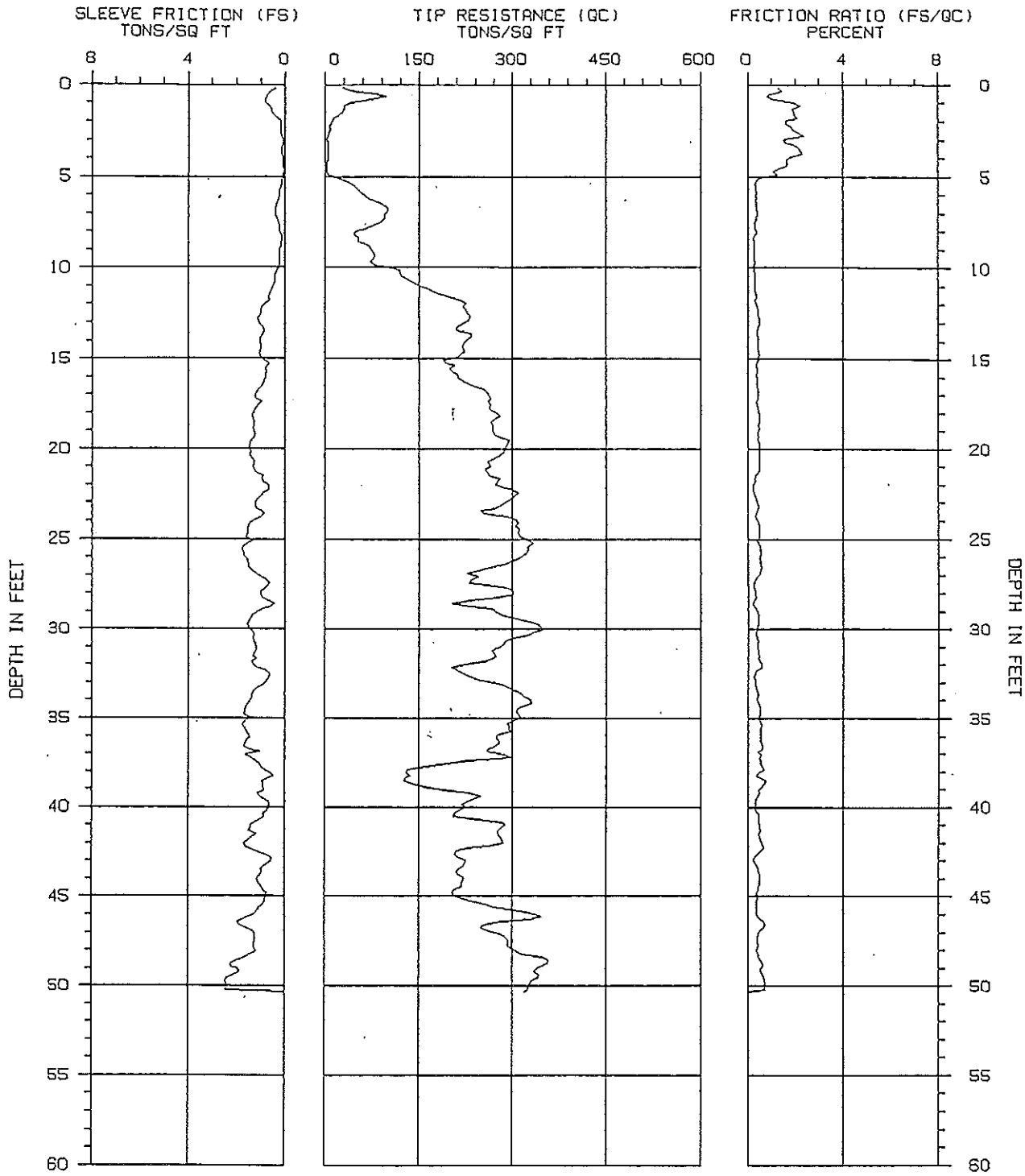
PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 08:42

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-02

PROJECT NAME : L&A\TYLR-WOODROW

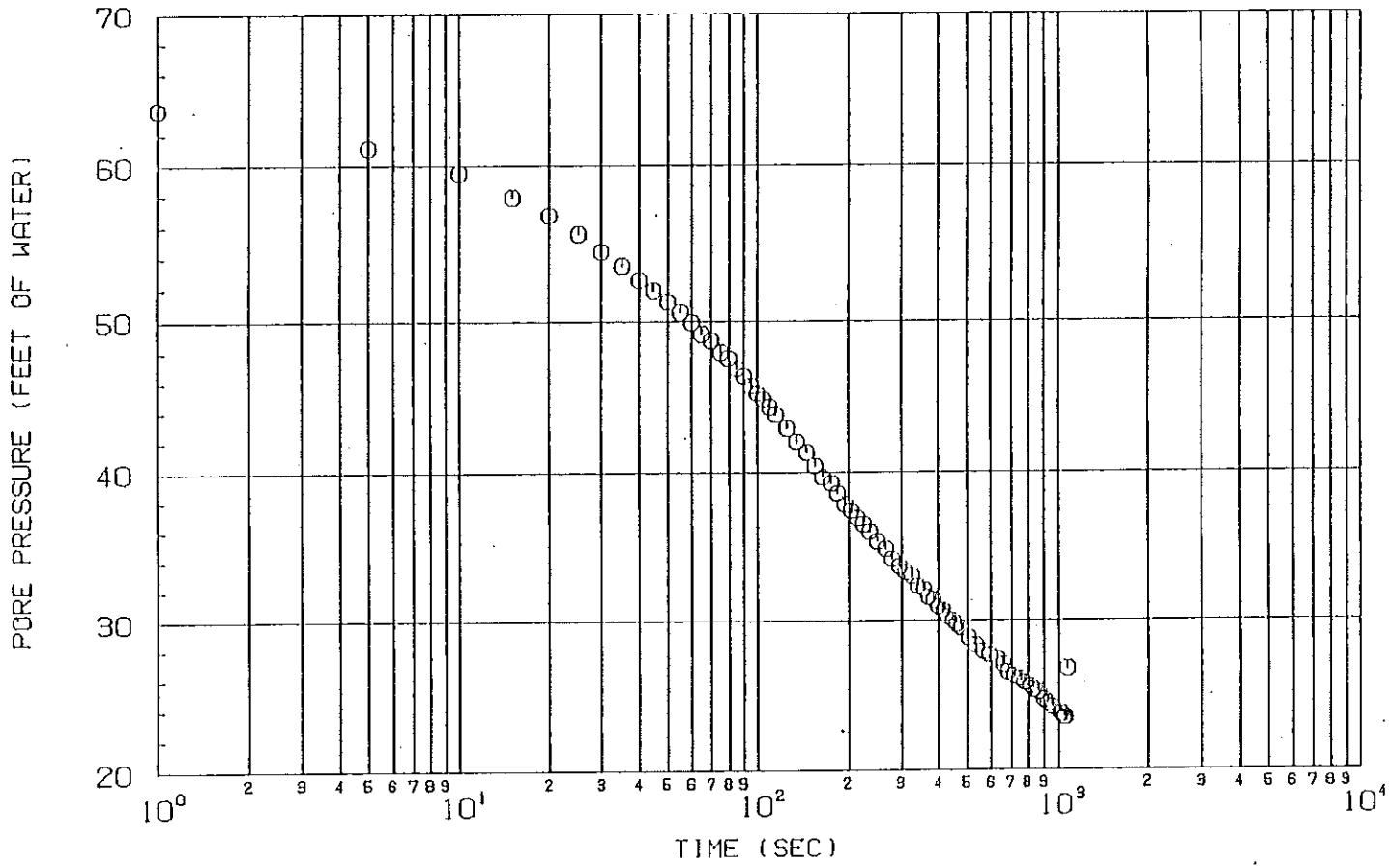
CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 08:42

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 17.6 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-02

PROJECT NAME : L&A\TYLR-WOODROW

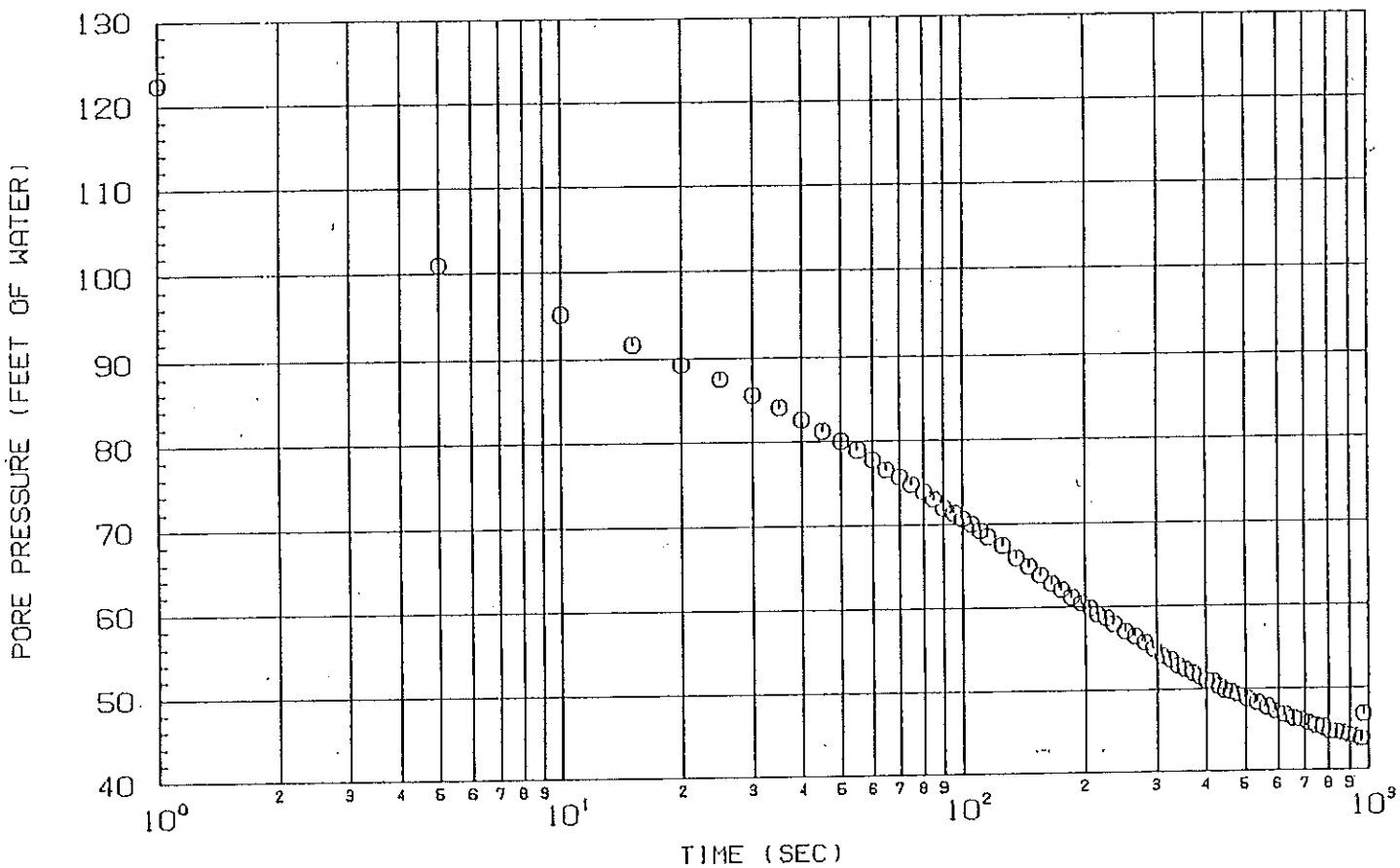
PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 08:42

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 38.4 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-02

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 08:42

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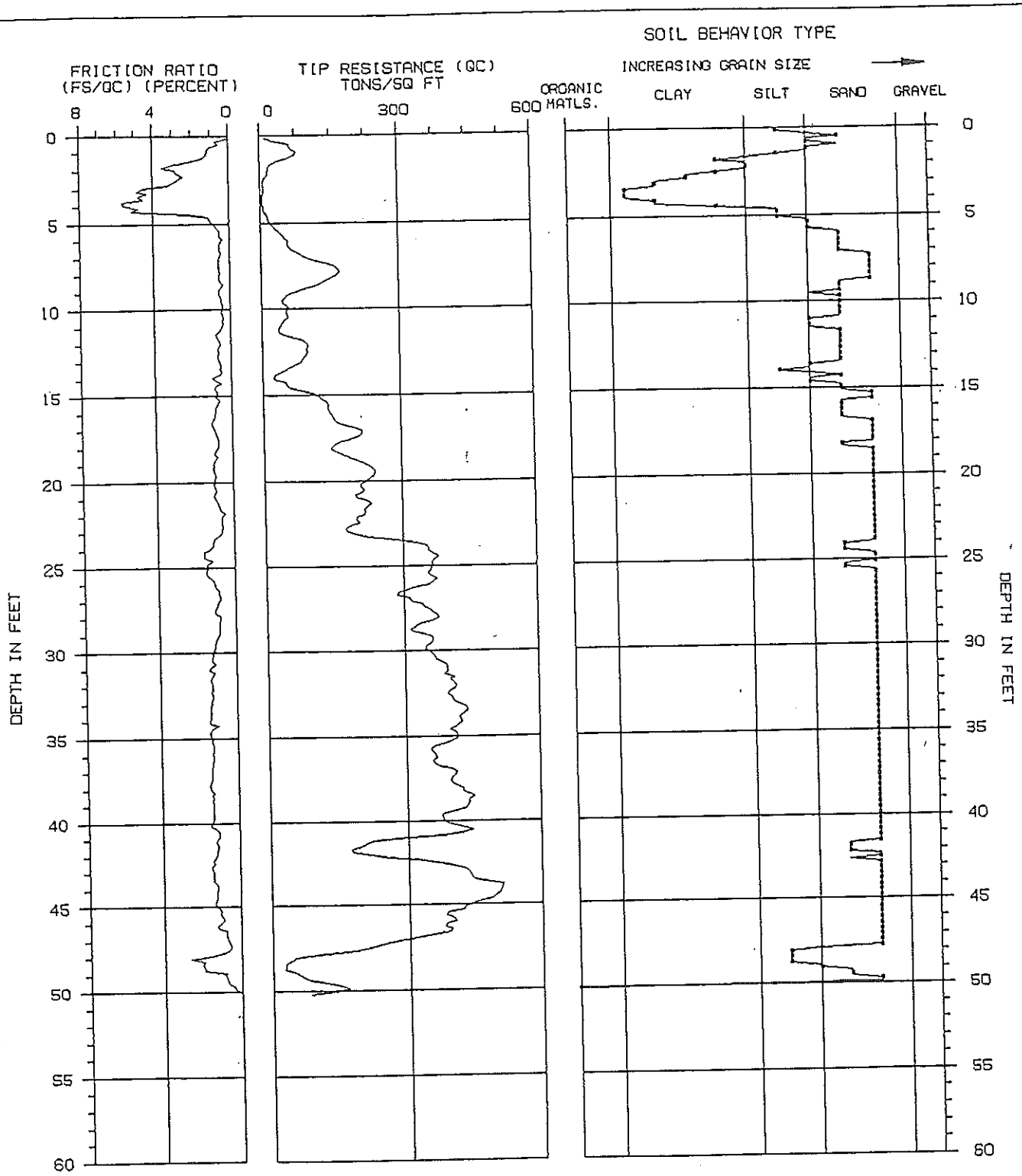

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-03

PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 12:00

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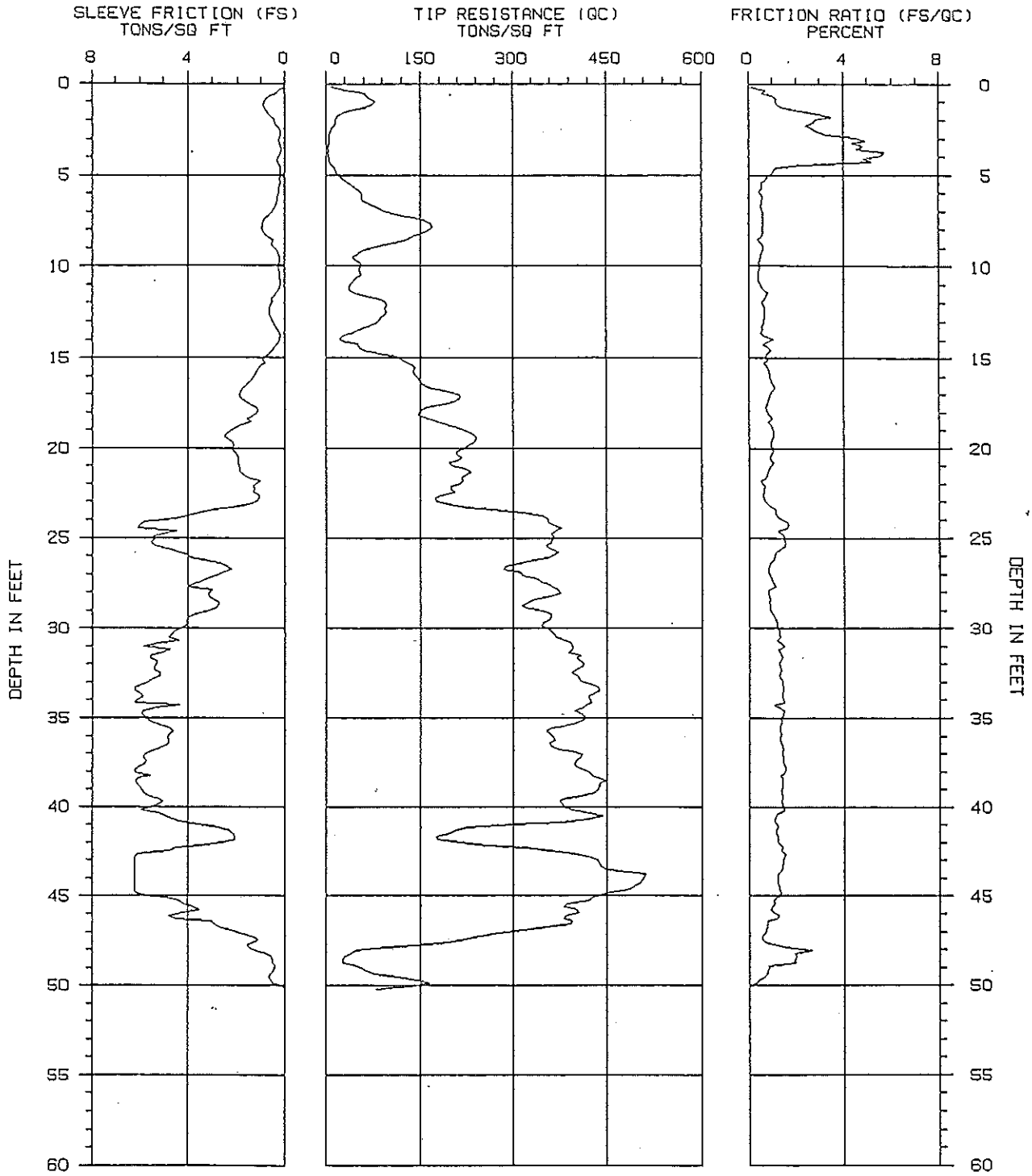

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-03

PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 12:00

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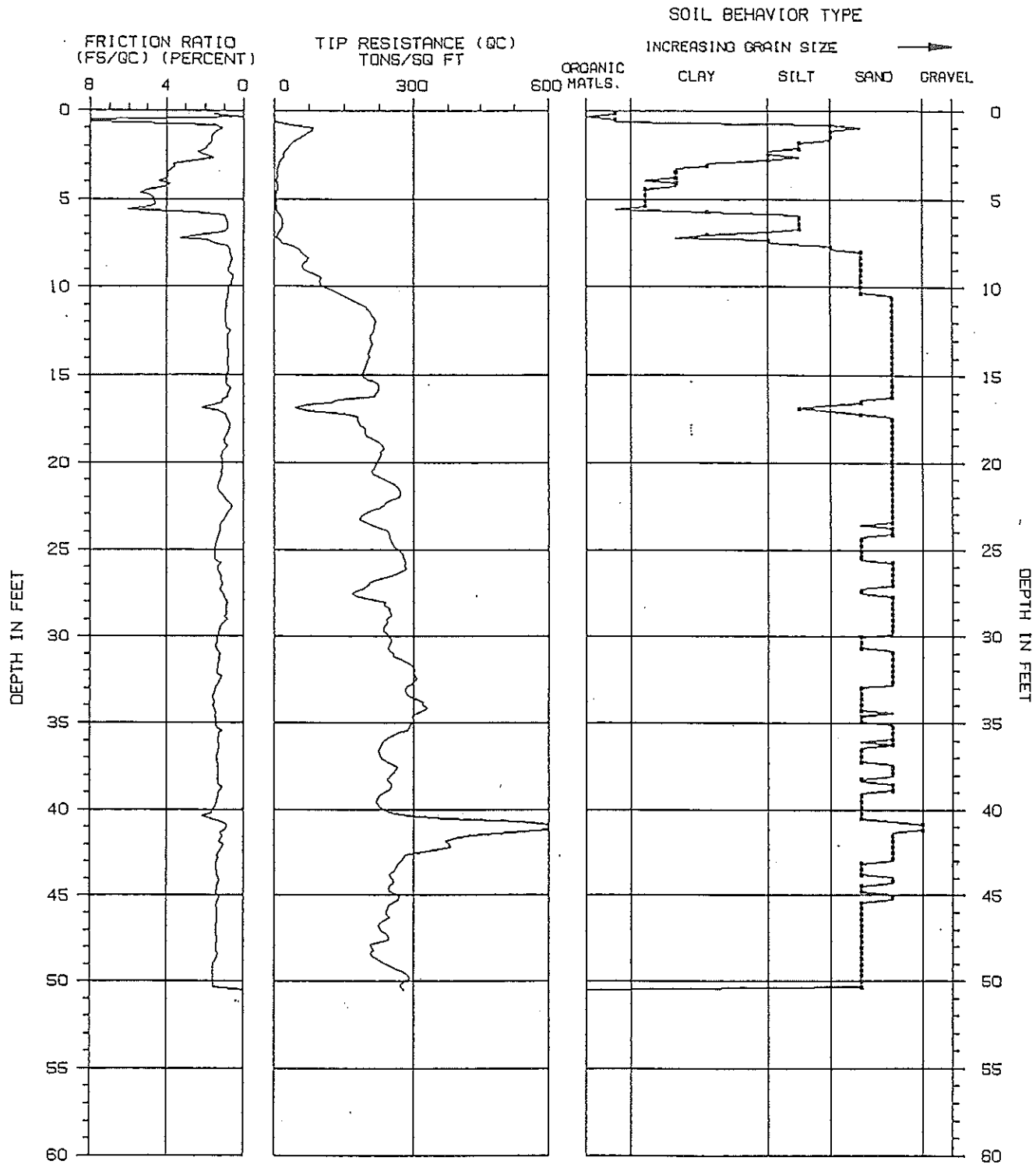

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-04

PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 11:19

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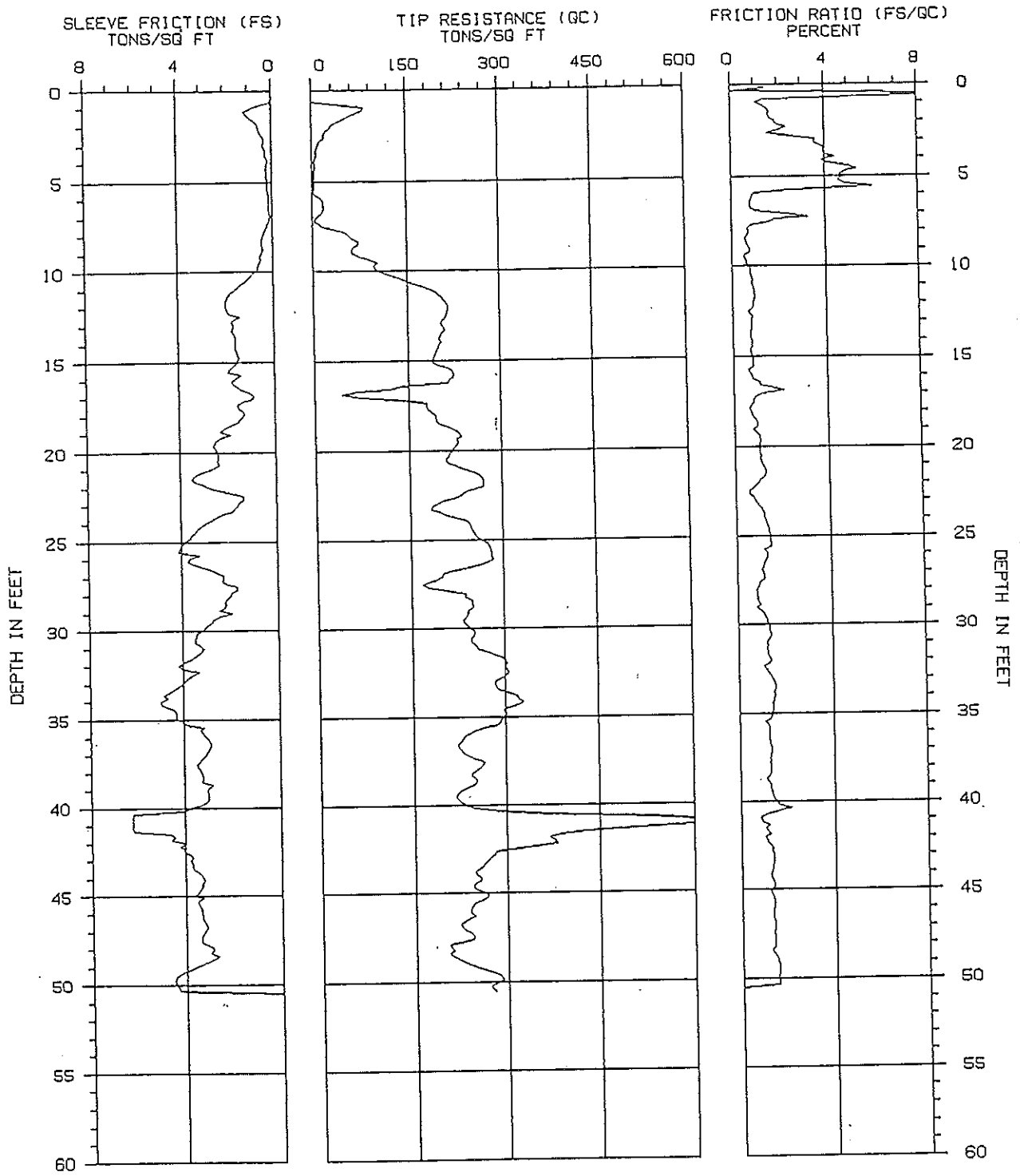

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-04

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 11:19

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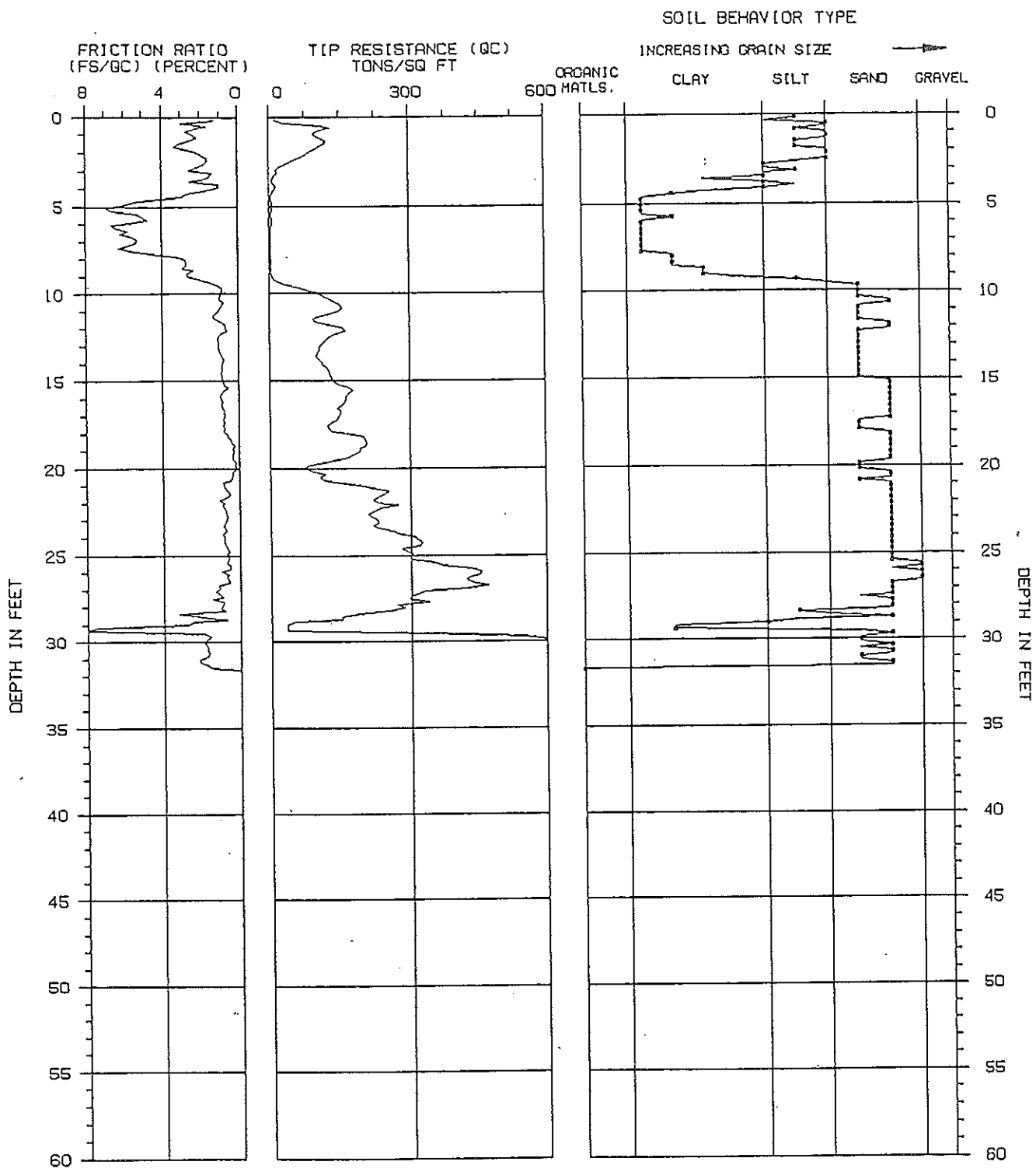

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-05

PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 14:38

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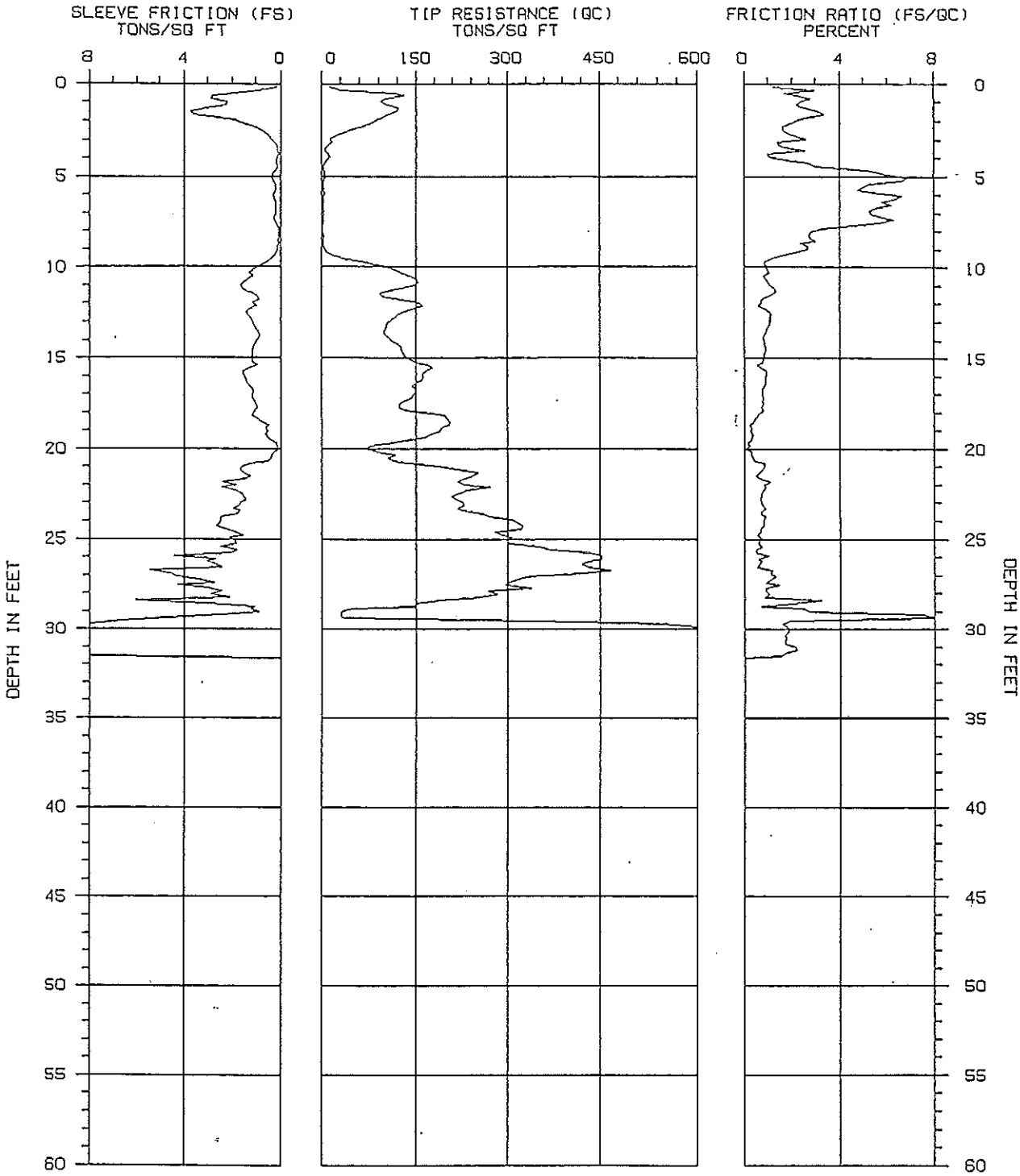

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST SOUNDING NUMBER: CPT-05

PROJECT NAME : L&A\TYLR-WOODROW CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001 DATE/TIME: 11-04-96 14:38

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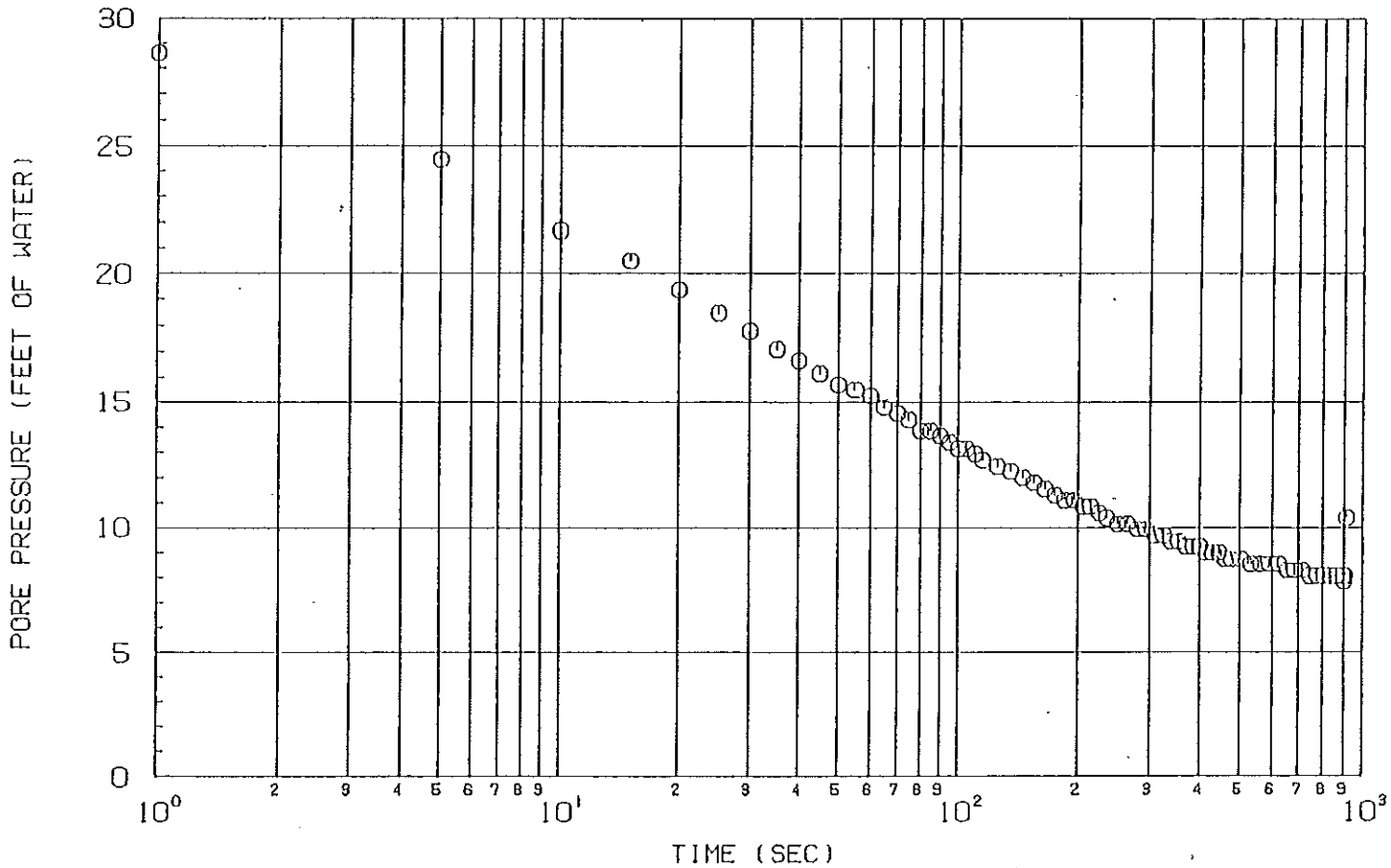
PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 10.7 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-05

PROJECT NAME : L&A\TYLR-WOODROW

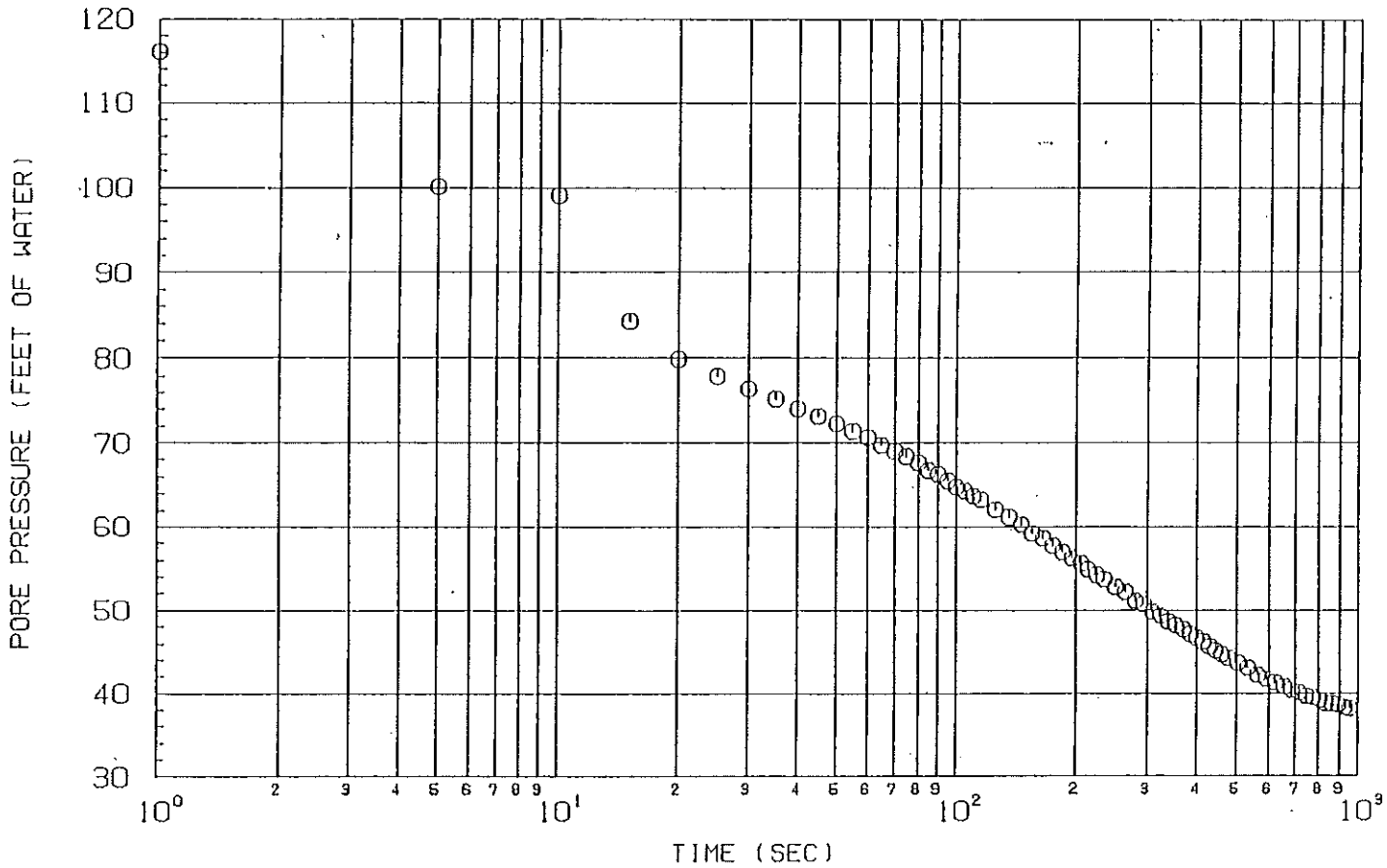
PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 14:38

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 91.8 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-05

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96-14:38

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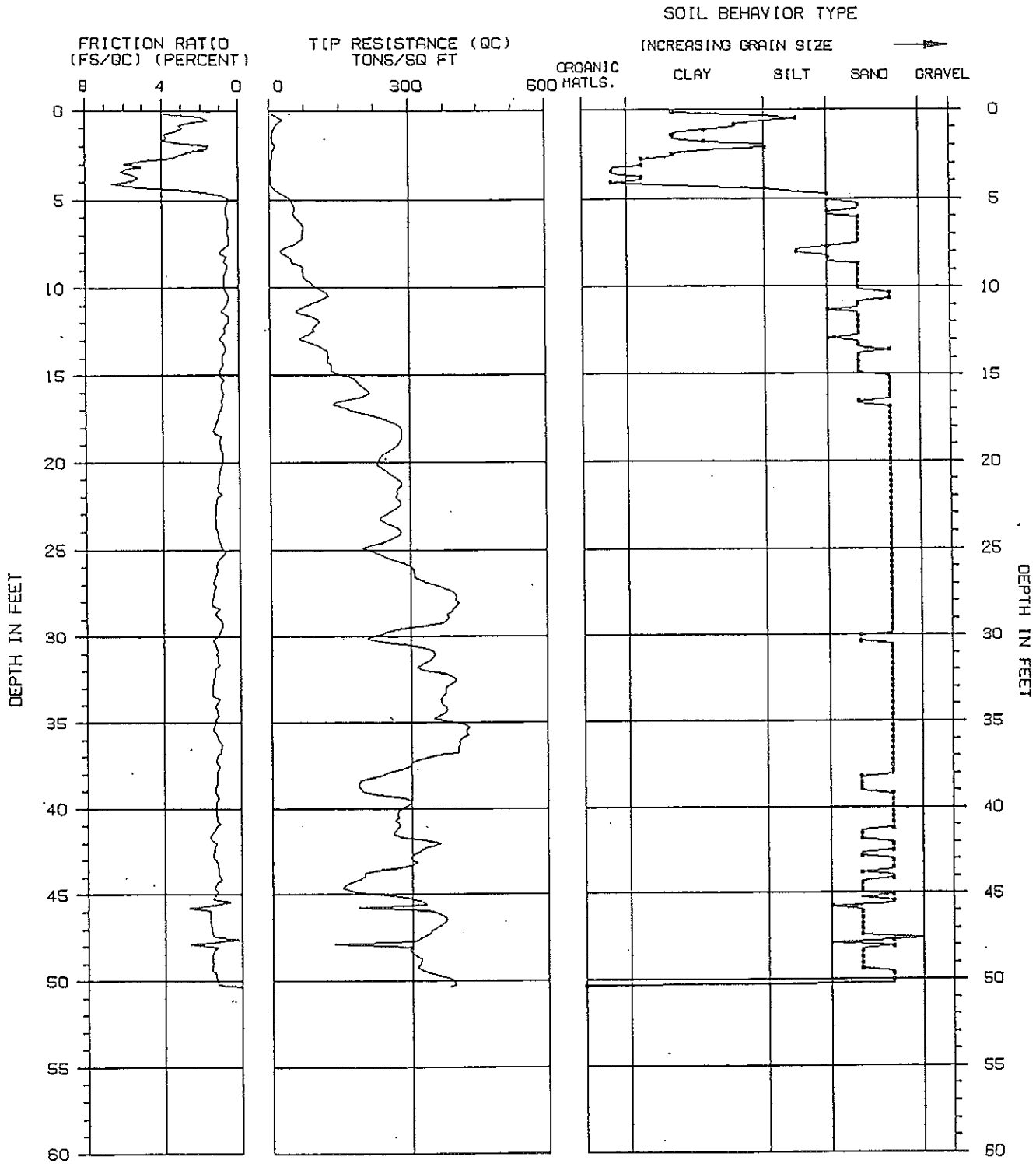


TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-06

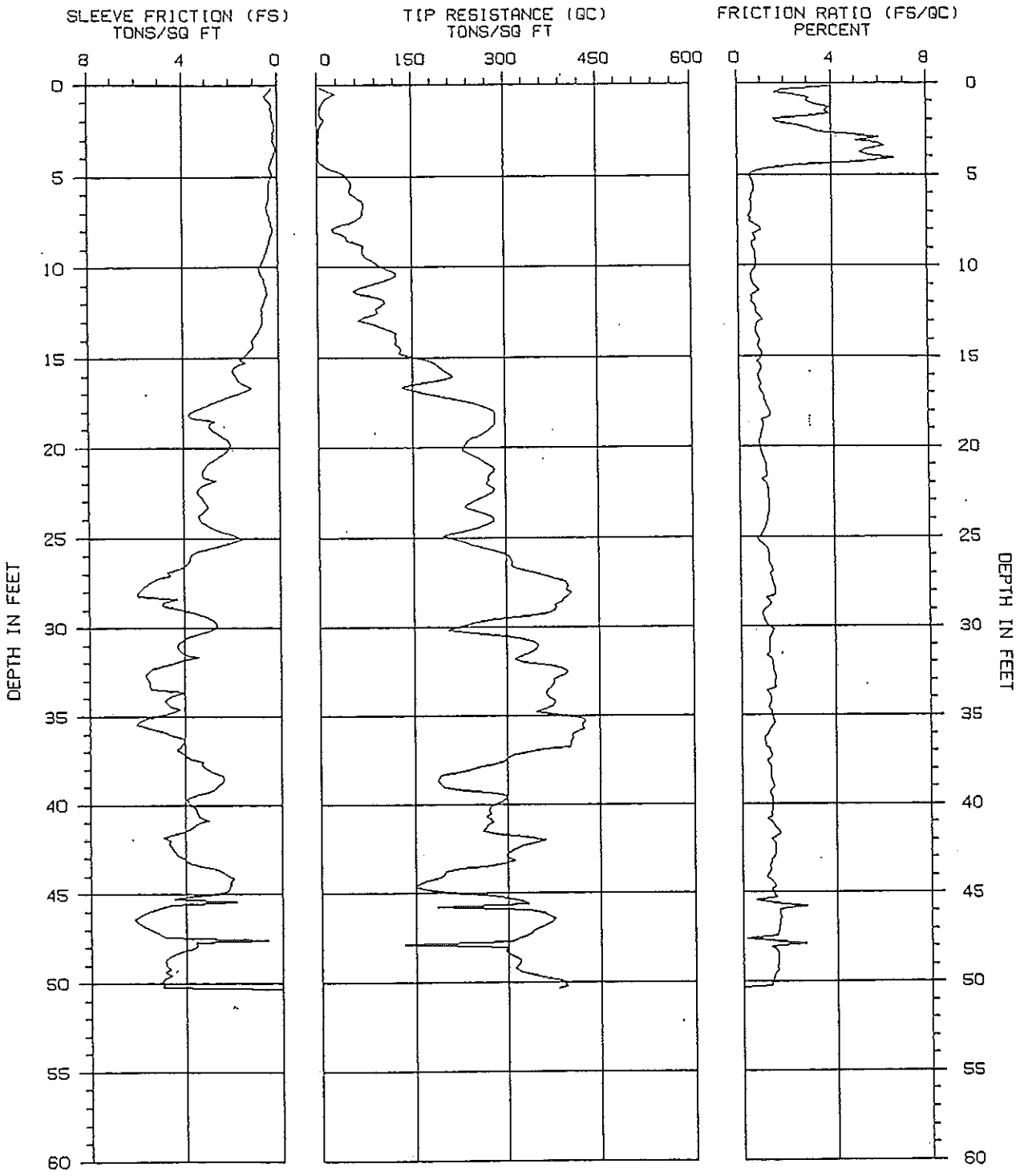
PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 10:32

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-06

PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 10:32

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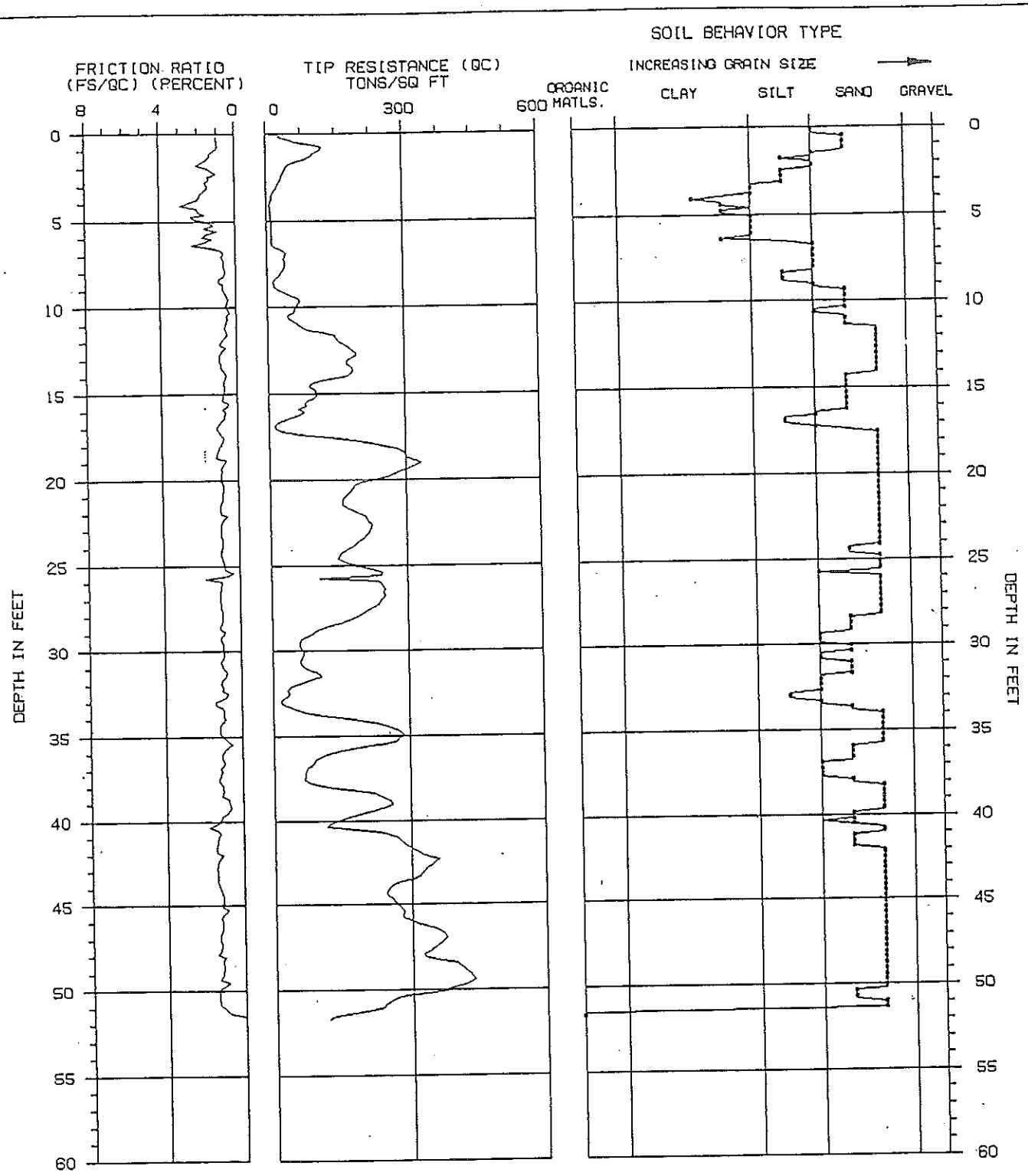

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-07

PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-05-96 10:46

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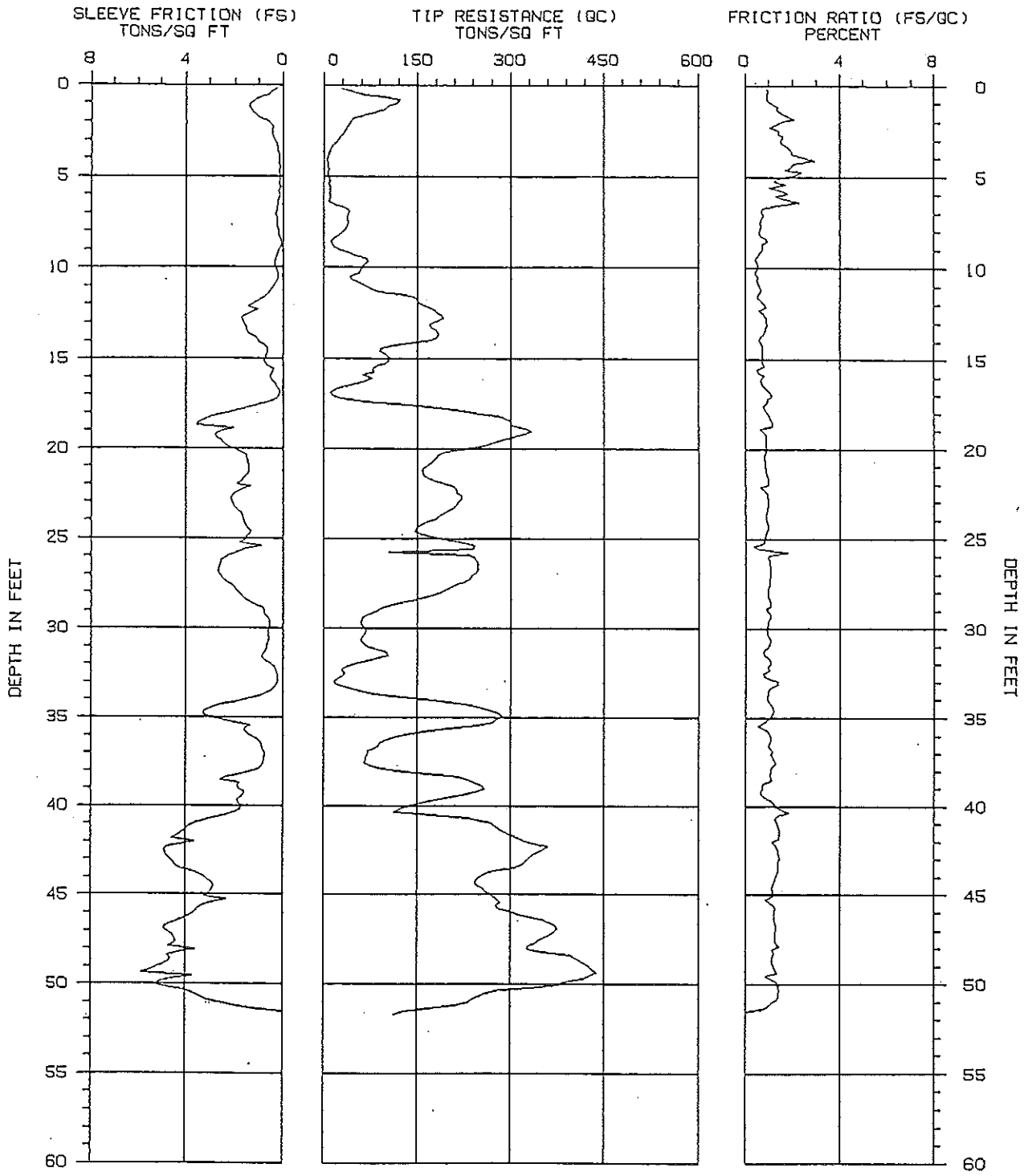


TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-07

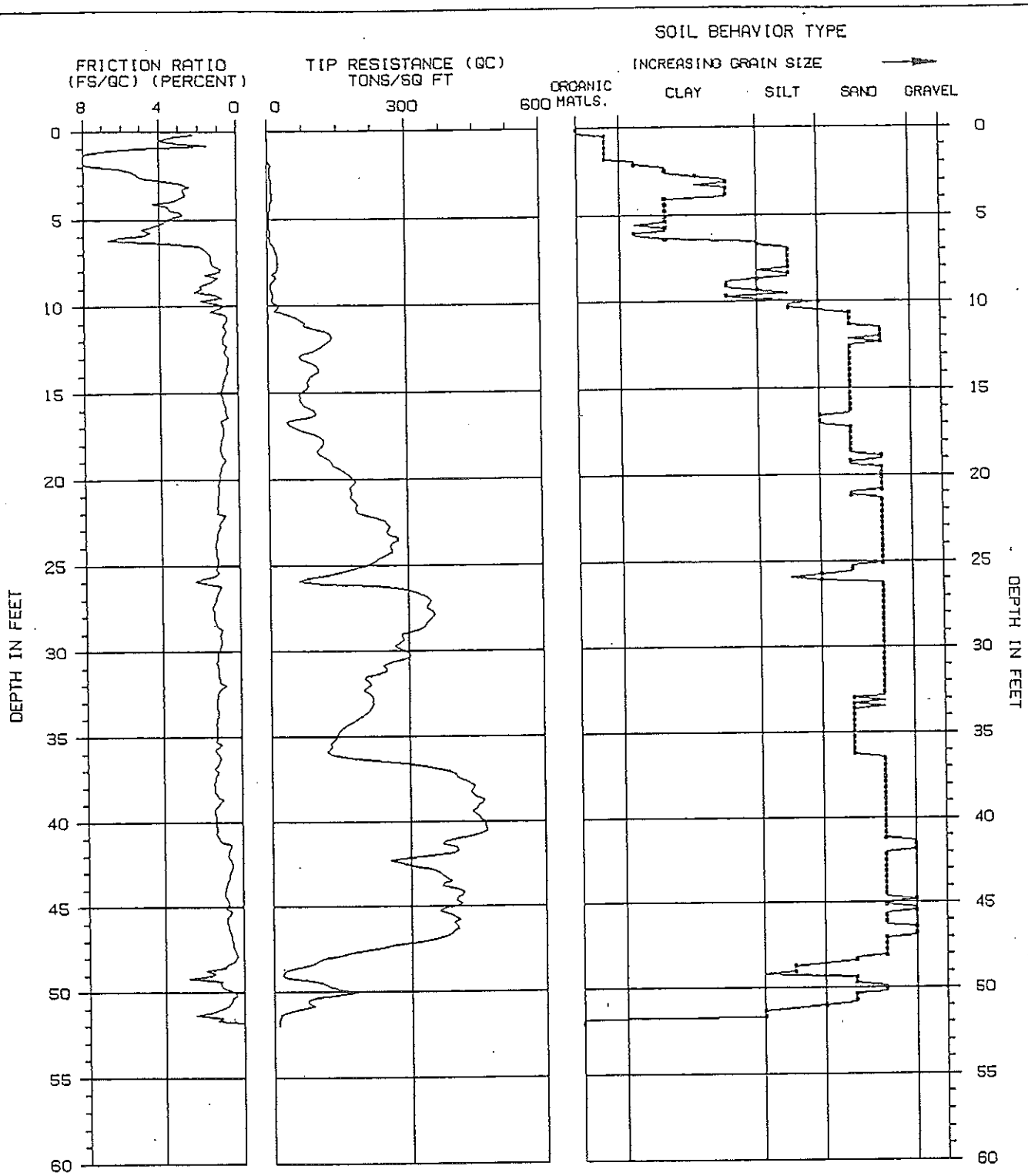
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-05-96 10:46

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-08

PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-05-96 10:03

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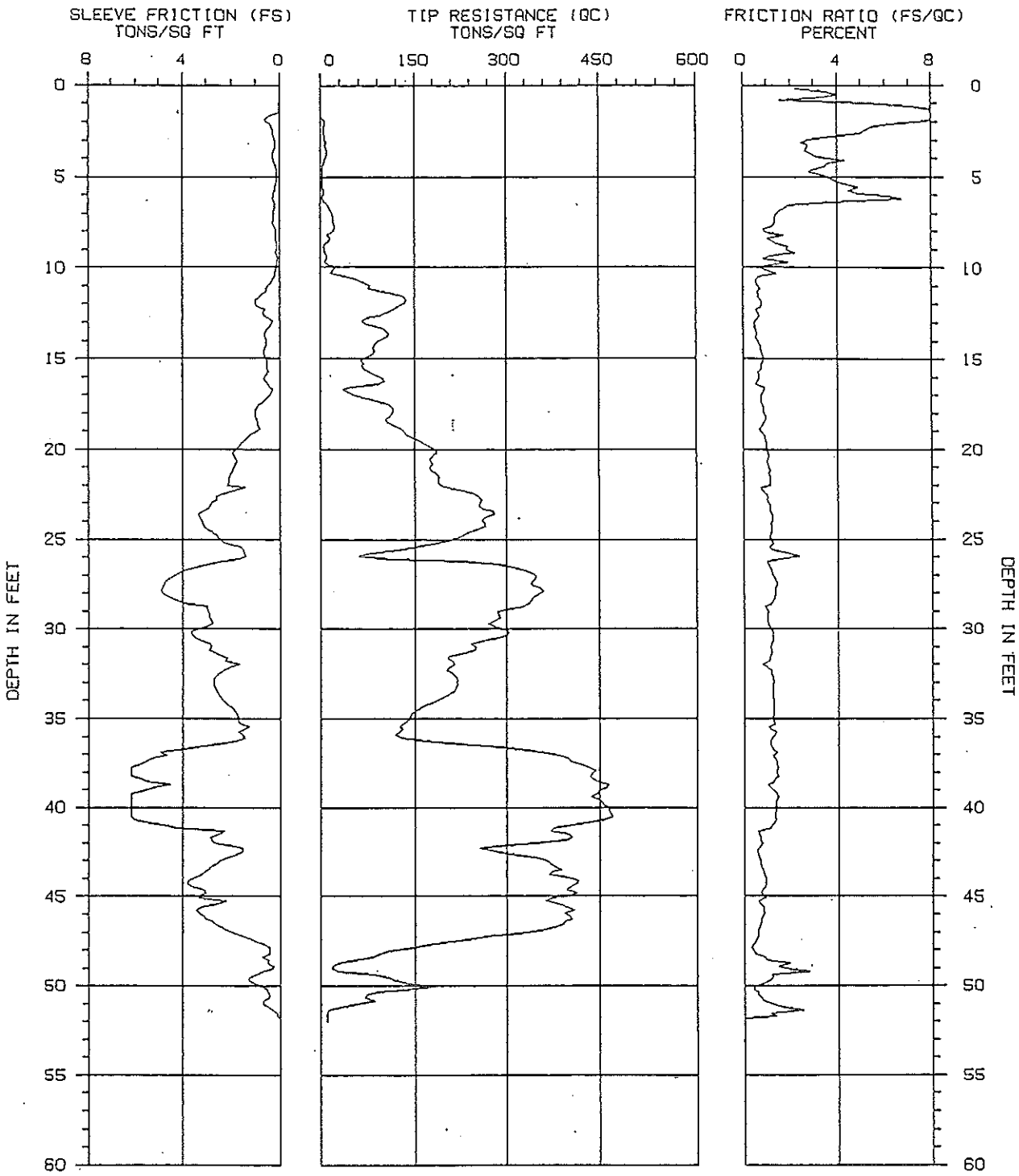


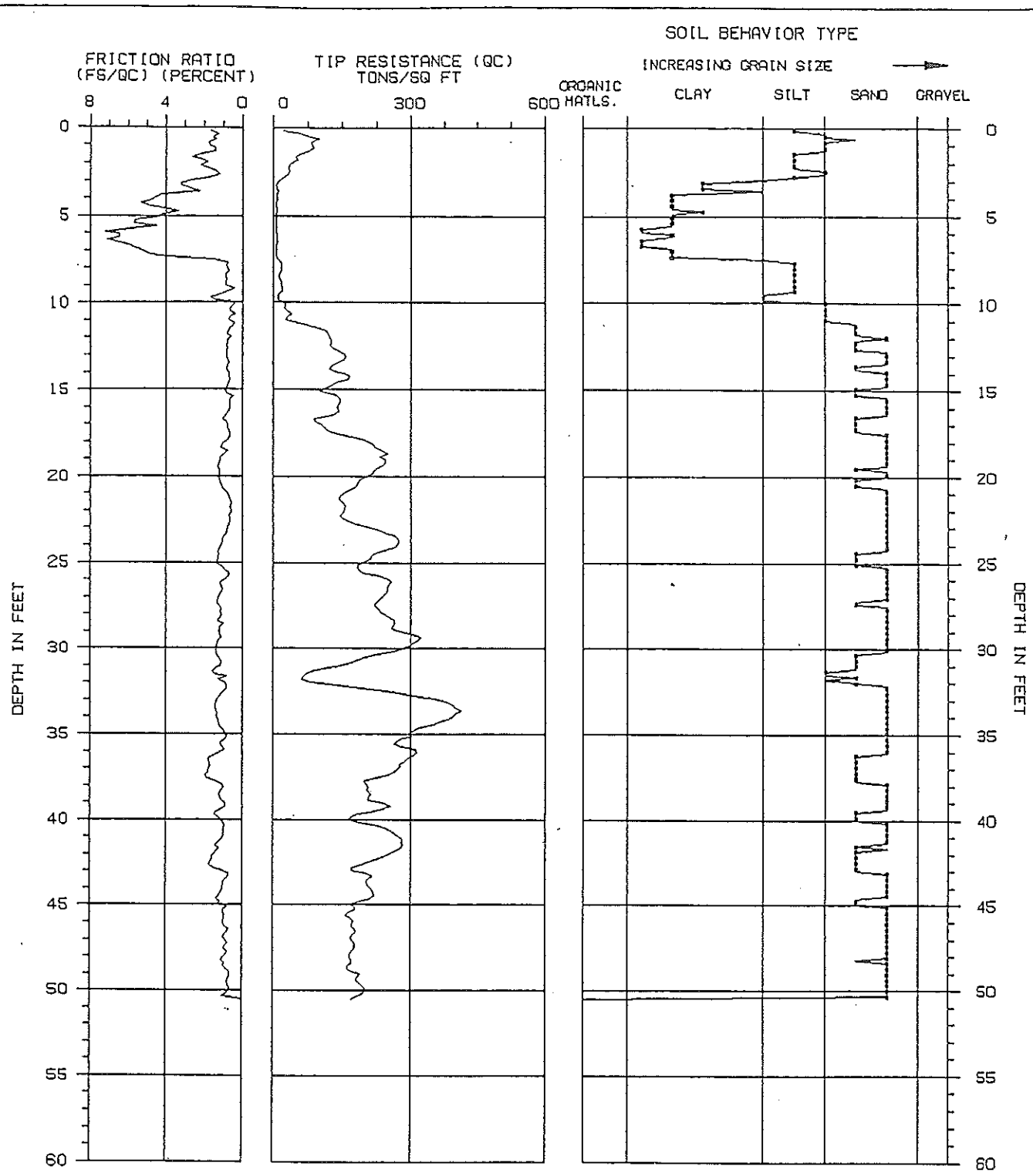
TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST SOUNDING NUMBER: CPT-08

PROJECT NAME : L&A\TYLR-WOOOROW CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001 DATE/TIME: 11-05-96 10:03

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-09

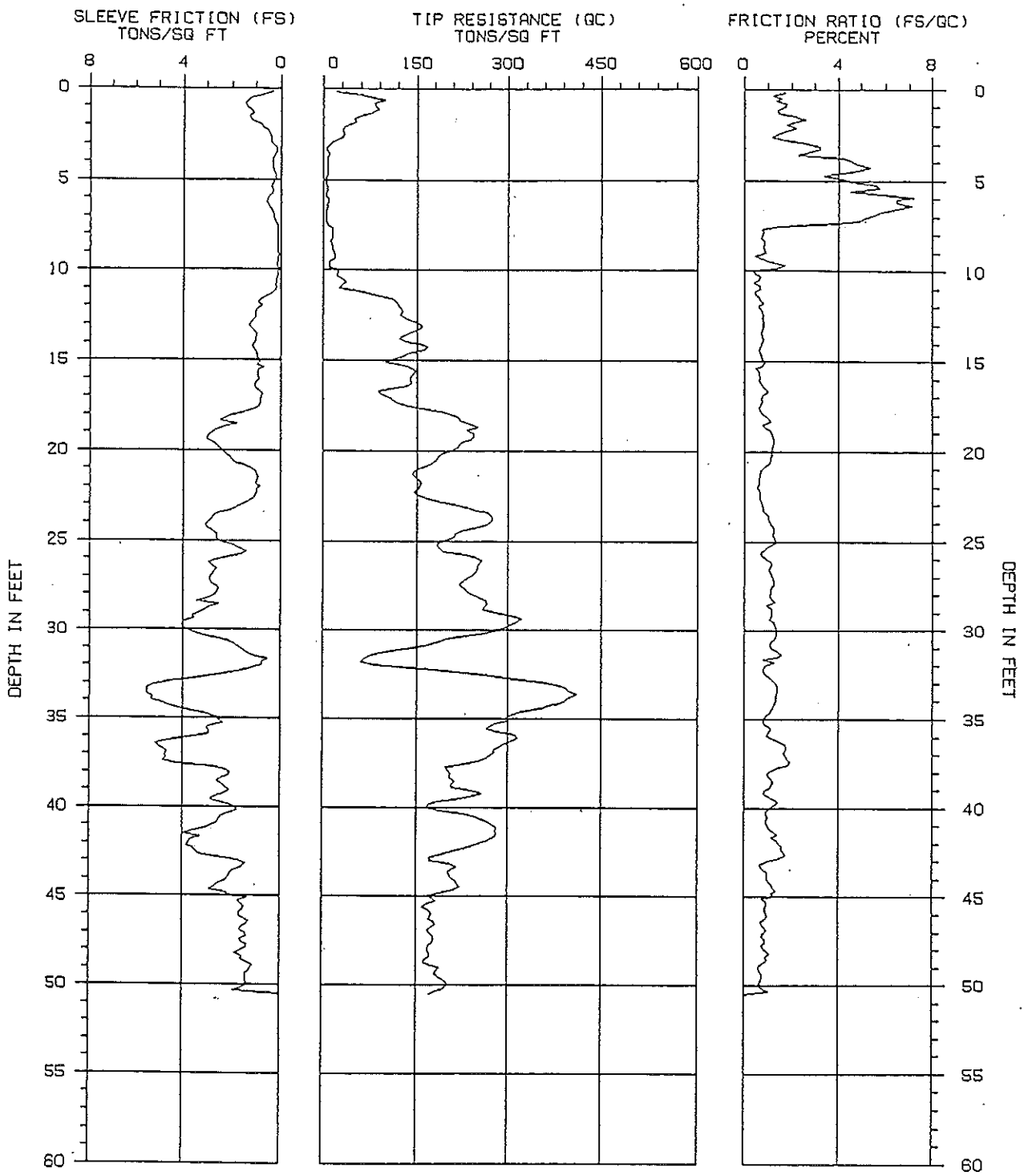
PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 495\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 16:02

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-09

PROJECT NAME : L&A\TYLR-WOODROW

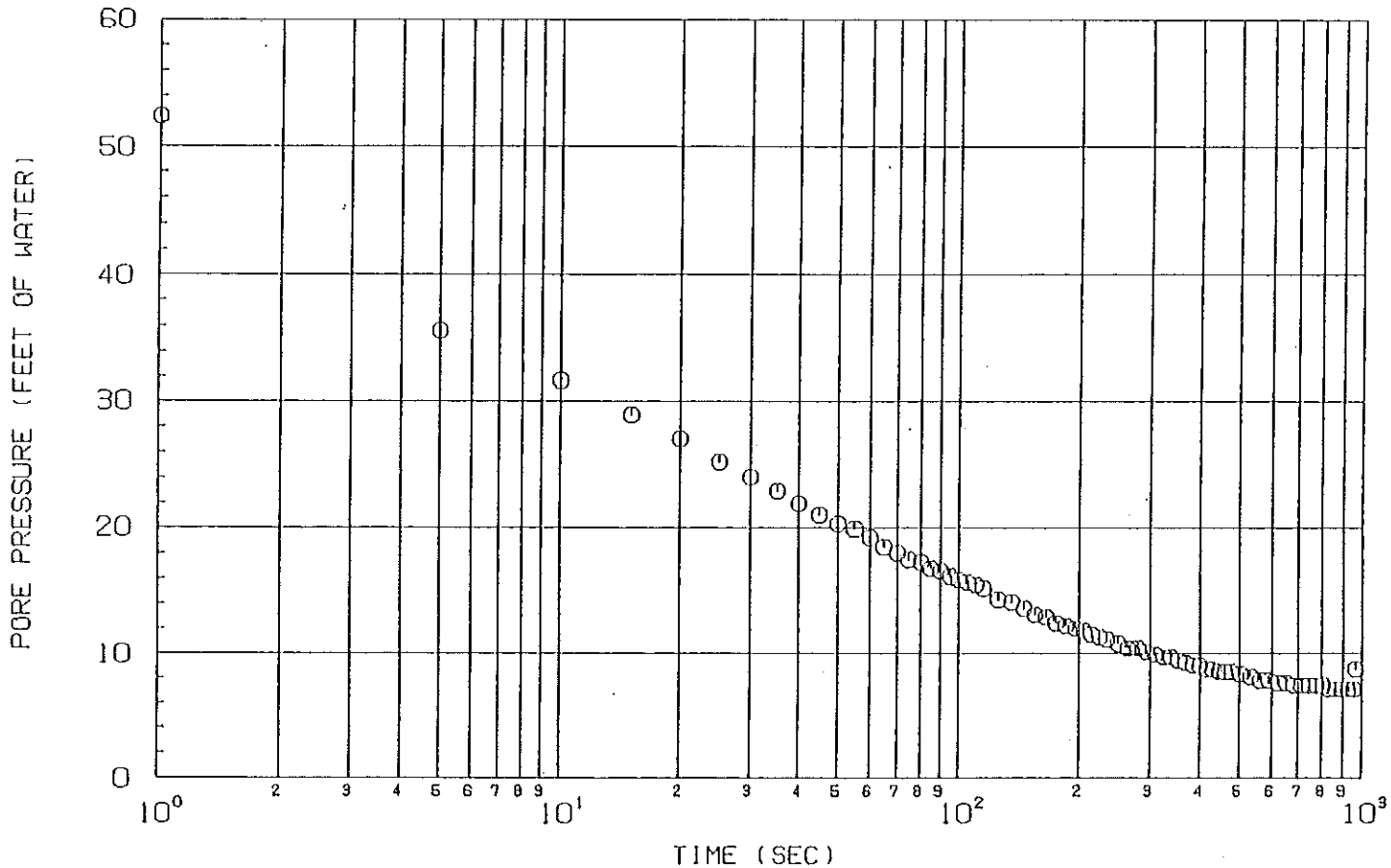
PROJECT NUMBER : 970011-001

CONE/RIG : 495\#1

DATE/TIME: 11-04-96 16:02

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 12.1 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-09

PROJECT NAME : L&A\TYLR-WOODROW

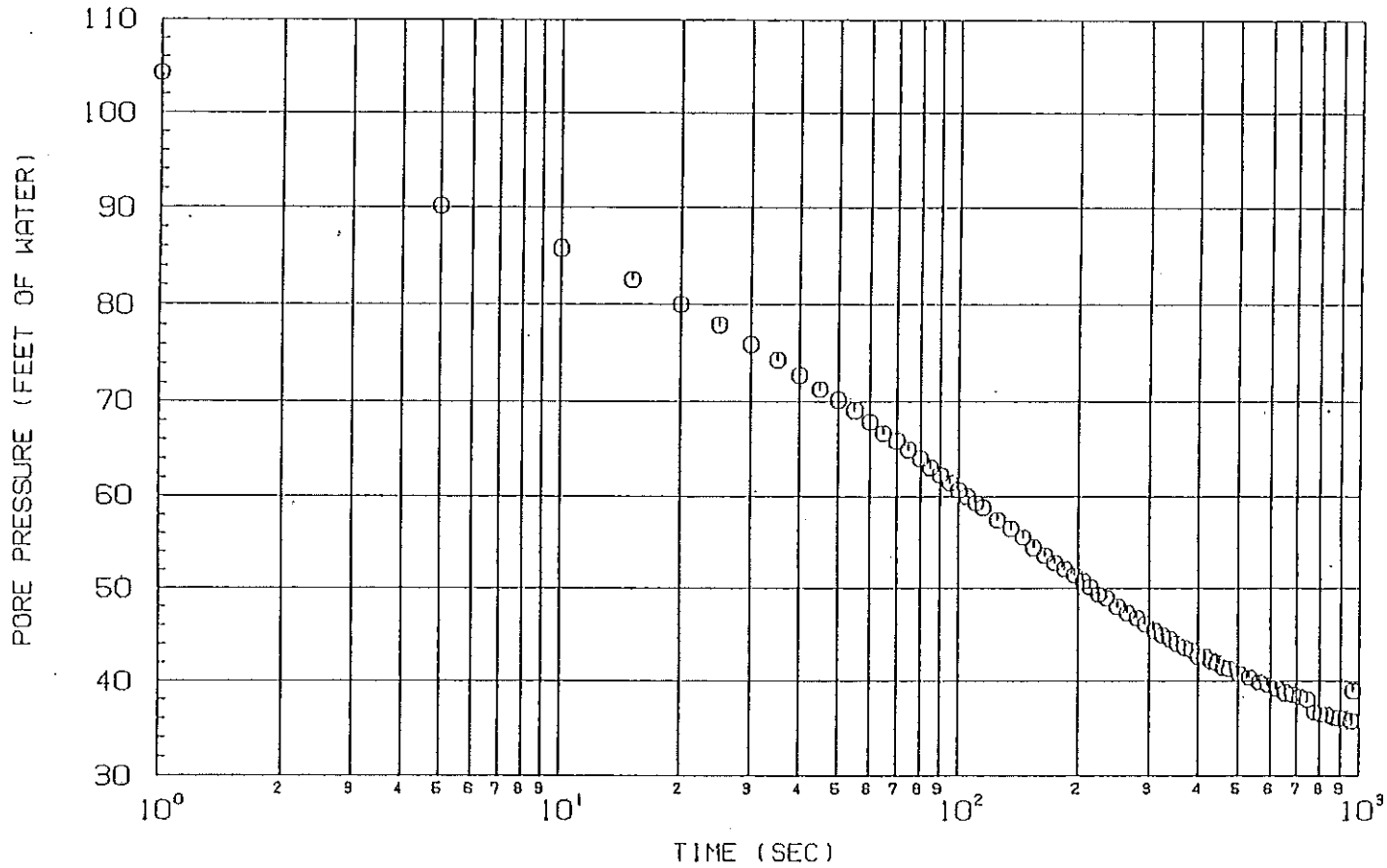
PROJECT NUMBER : 970011-001

CONE/RIG : 495\#1

DATE/TIME: 11-04-96 16:02

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 97.9 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-09

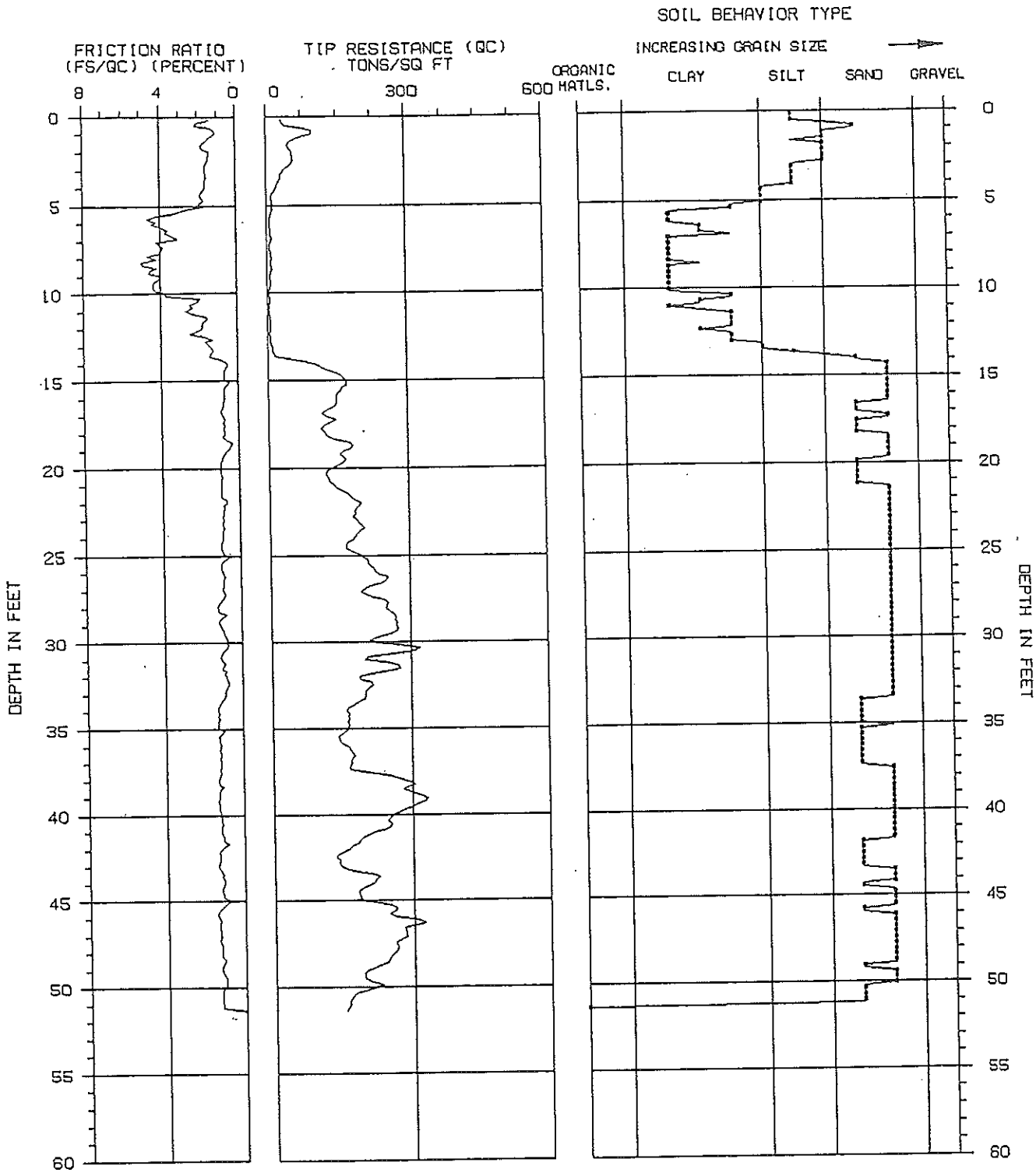
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 495\#1

DATE/TIME: 11-04-96 16:02

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-10

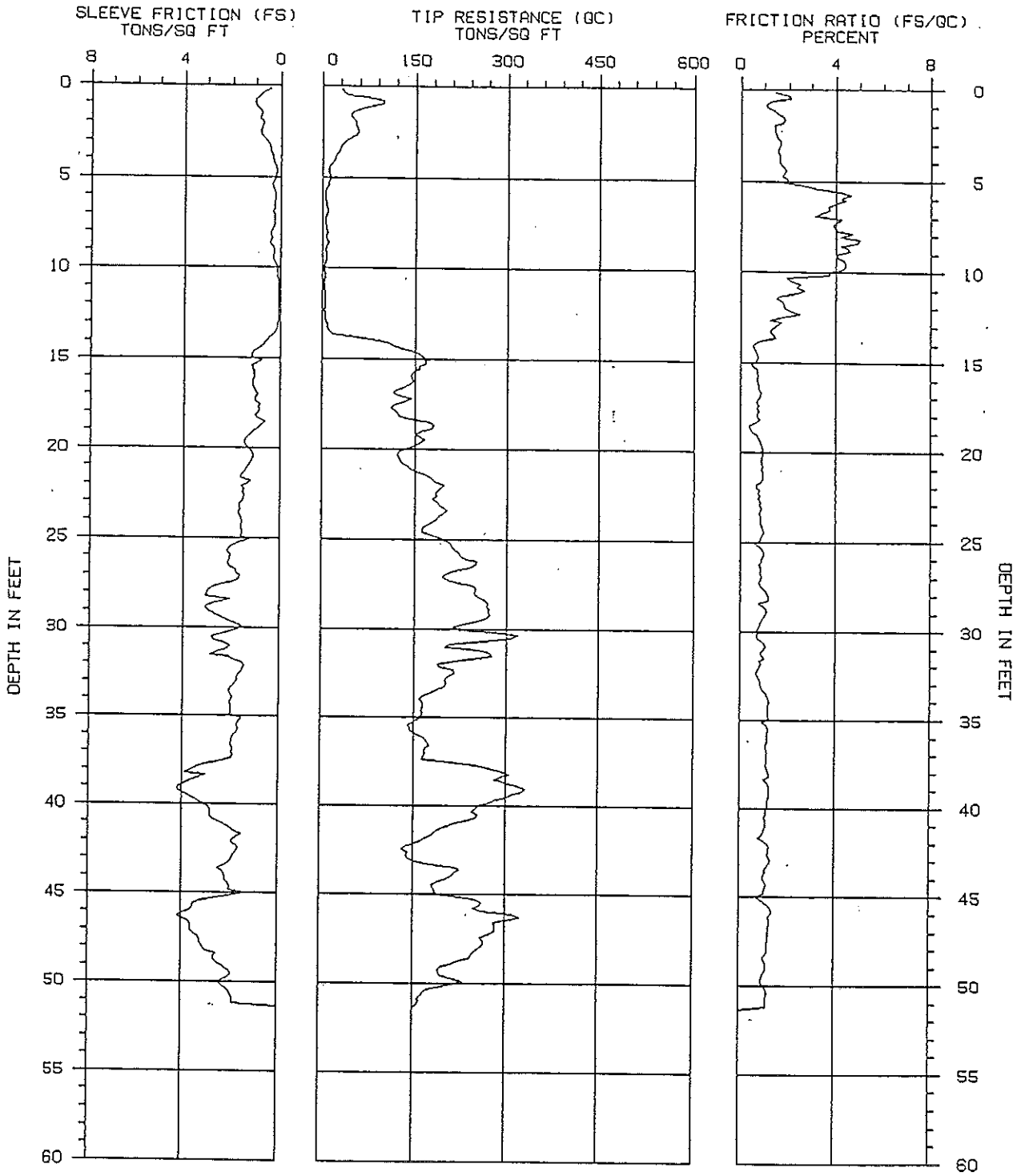
PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-05-96 11:36

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-10

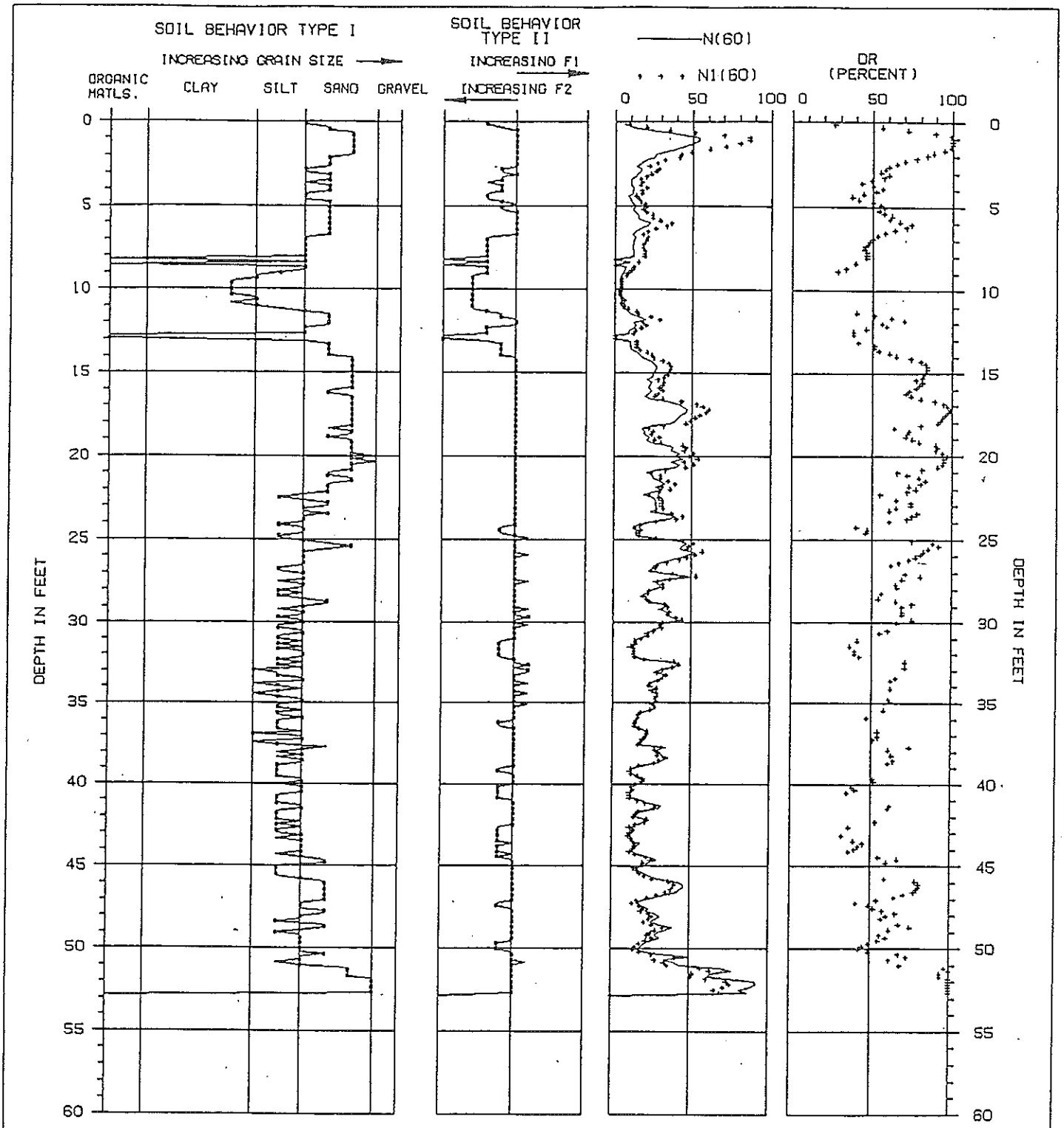
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-05-96 11:36

HFA



ASSUMED TOTAL UNIT WT = 115 PCF
N(60) = EQUIVALENT SPT VALUE (60% ENERGY)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% ENERGY)

ASSUMED DEPTH OF WATER TABLE = 5.0 FT
DR = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION
F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

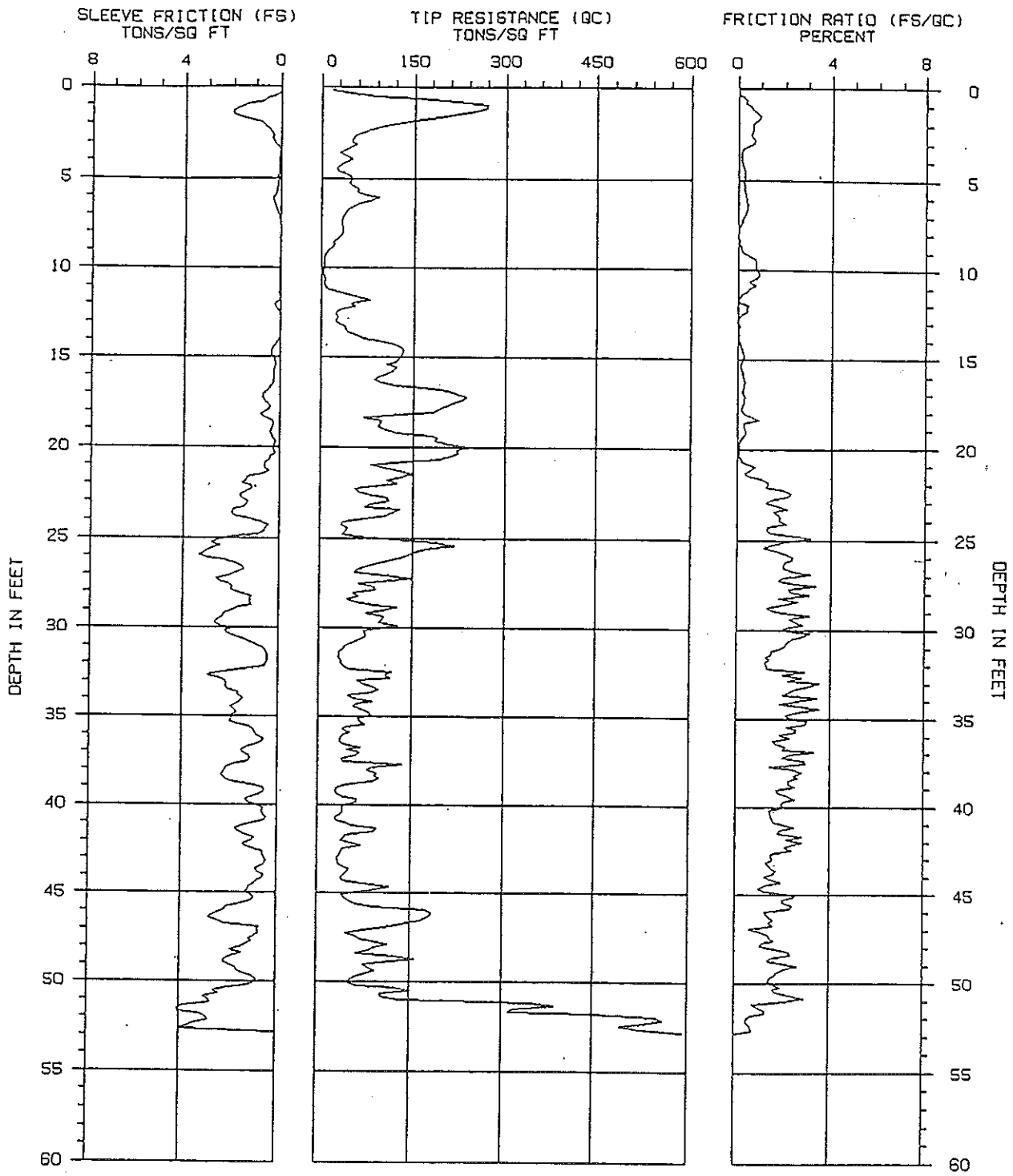
CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-01-97

PROJECT NAME : NEWPORT/BANNING
PROJECT NUMBER : 1970011-02

CONE/RIG : 491/#1 JH
DATE/TIME: 10-24-97 07:27

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-01-97

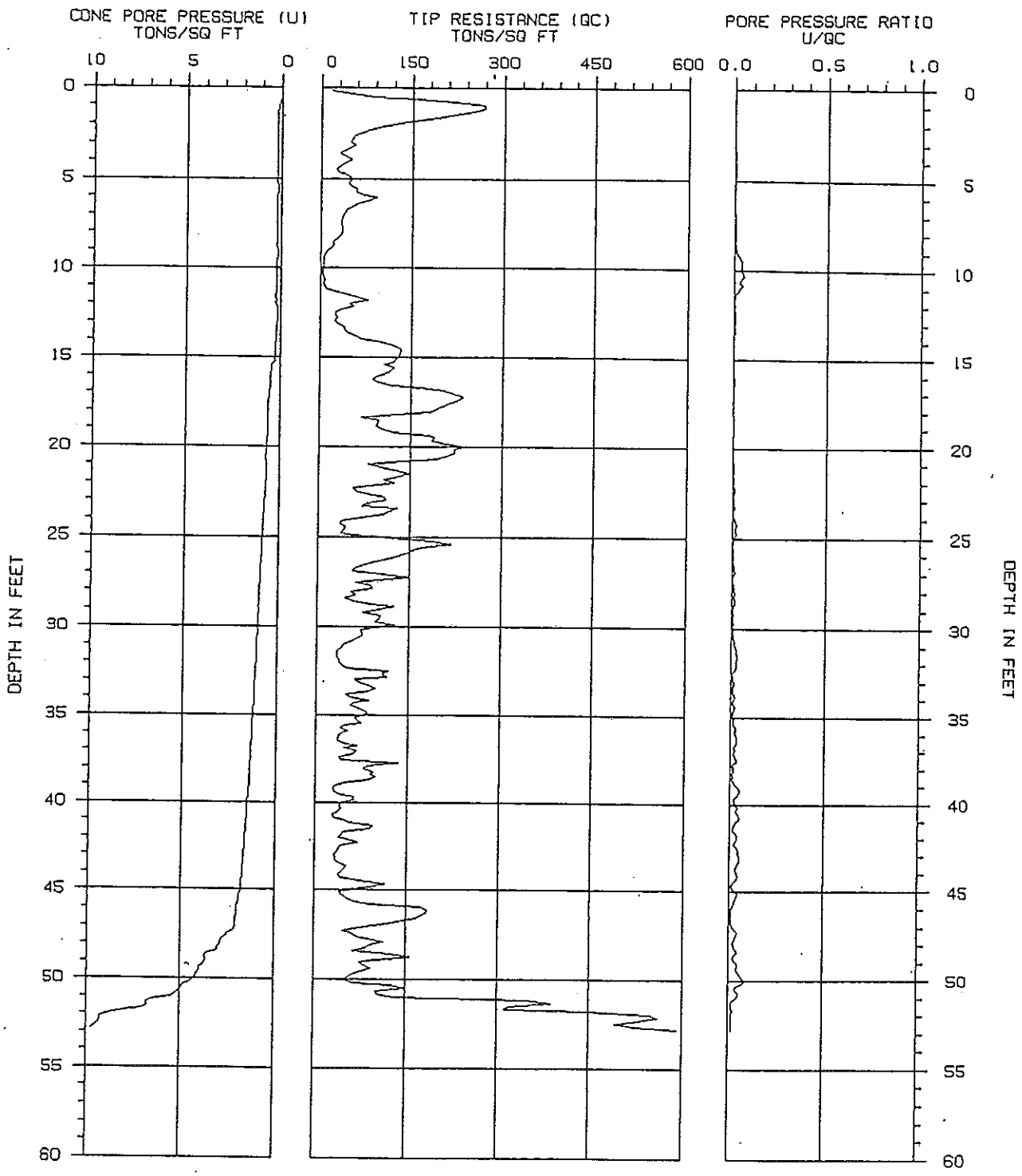
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 491/#1 JH

DATE/TIME: 10-24-97 07:27

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-01-97

PROJECT NAME : NEWPORT/BANNING

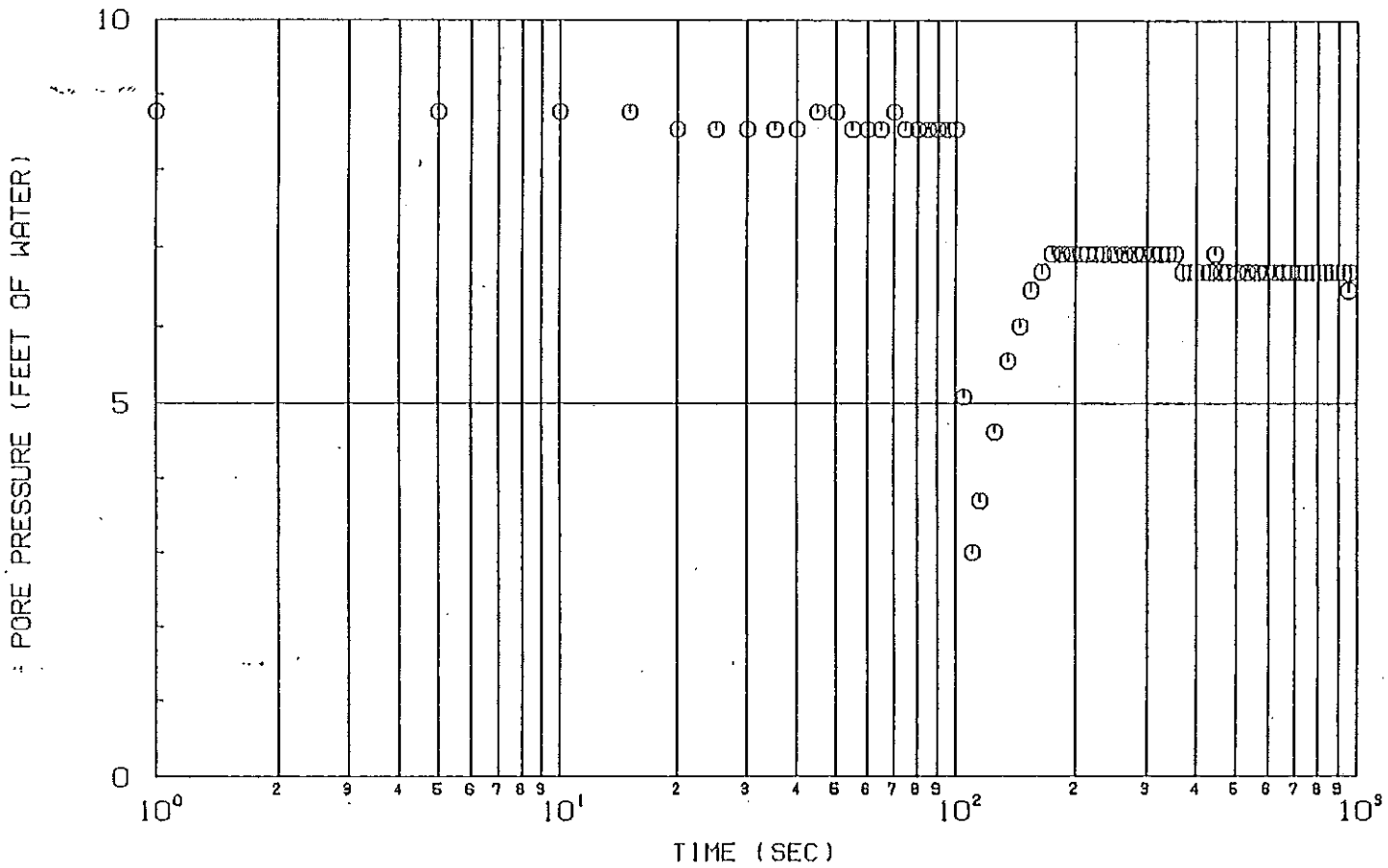
PROJECT NUMBER: : 1970011-02

CONE/RIG : 491/#1 JH

DATE/TIME: 10-24-97 07:27

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 15.3 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-01-97

PROJECT NAME : NEWPORT/BANNING

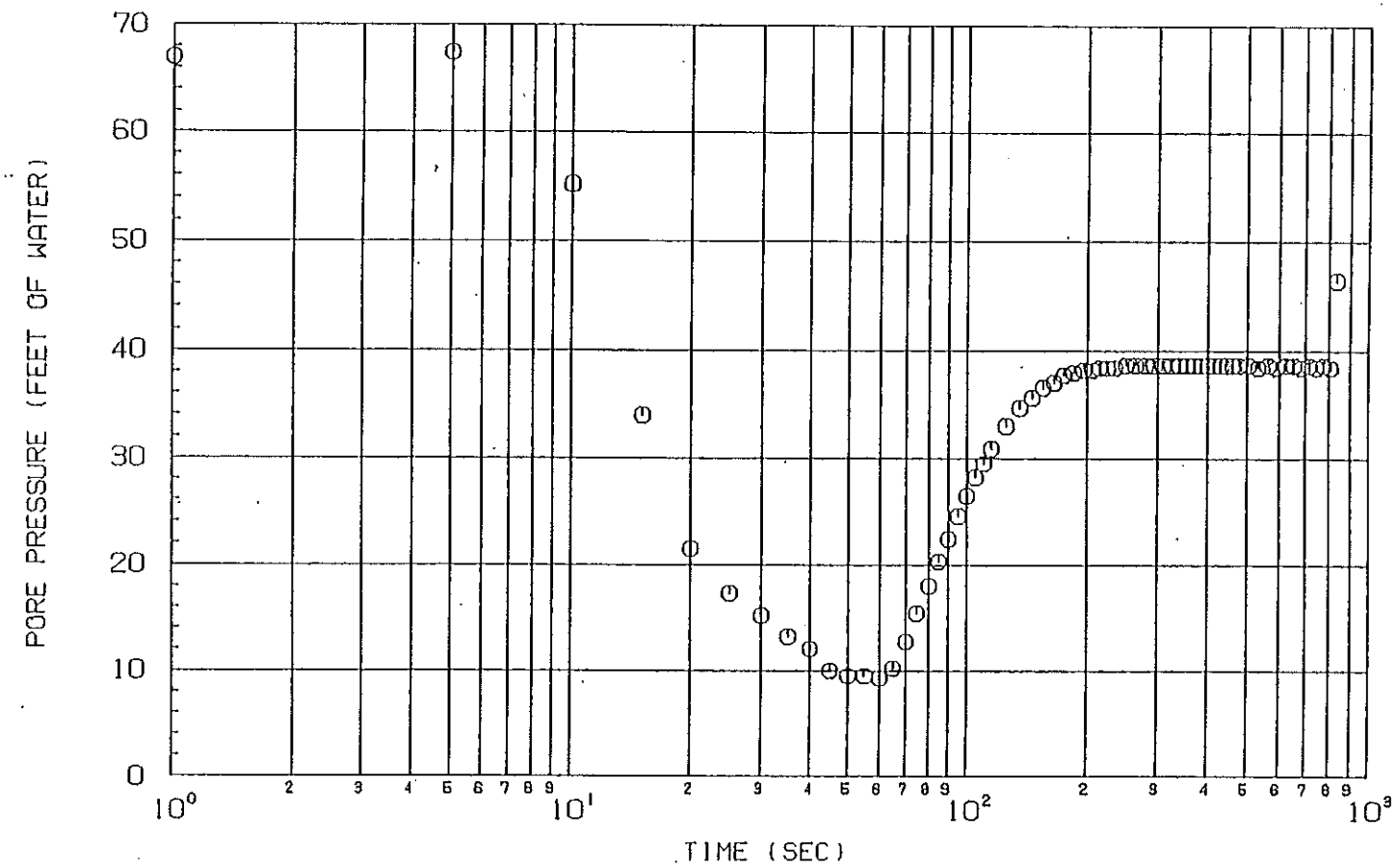
PROJECT NUMBER : 1970011-02

CONE/RIG : 491/#1 JH

DATE/TIME: 10-24-97 07:27

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 47.1 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-01-97

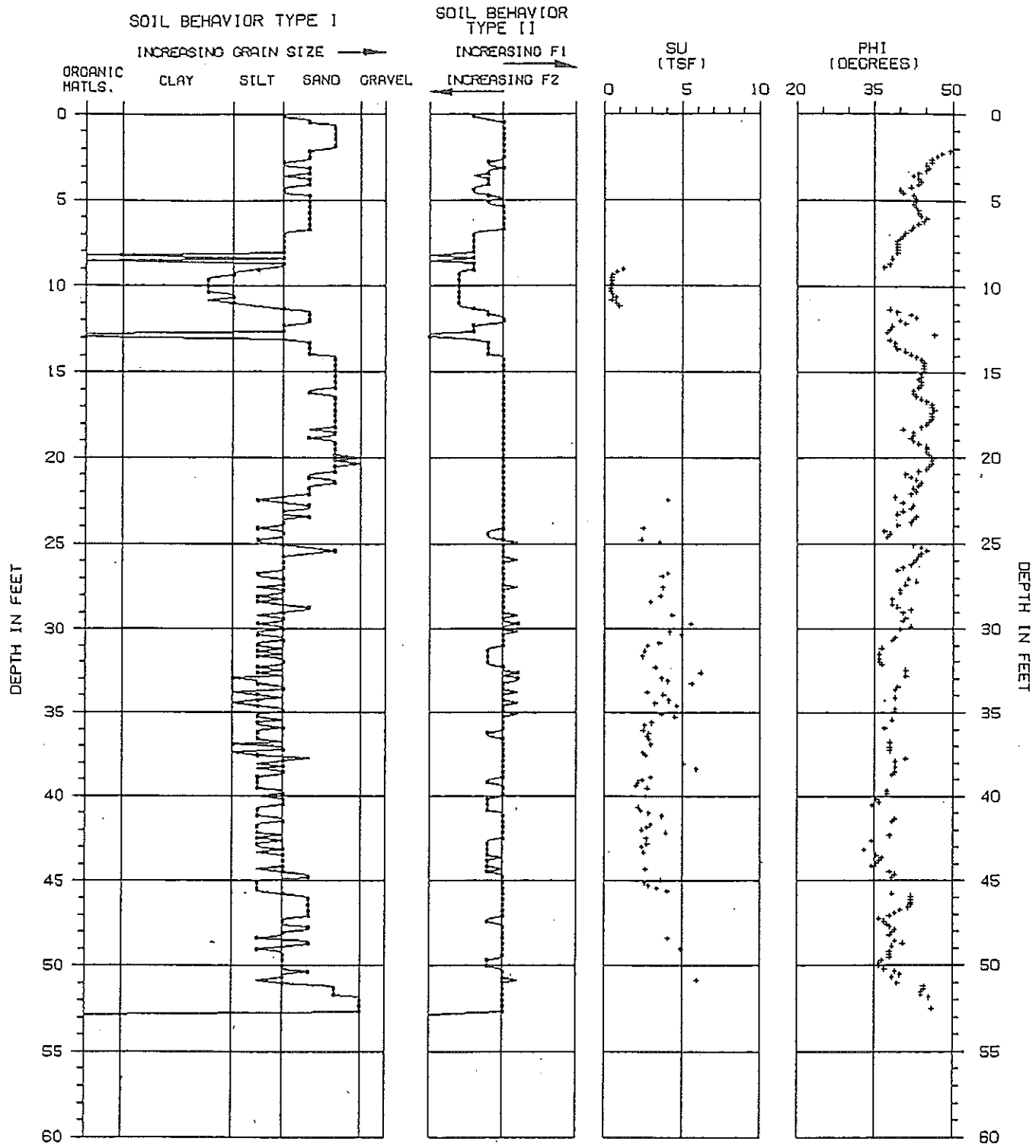
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 491/#1 JH

DATE/TIME: 10-24-97 07:27

HFA



ASSUMED TOTAL UNIT WT = 115 PCF
SU = UNDRAINED SHEAR STRENGTH
F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

ASSUMED DEPTH OF WATER TABLE = 5.0 FT
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE
F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-01-97

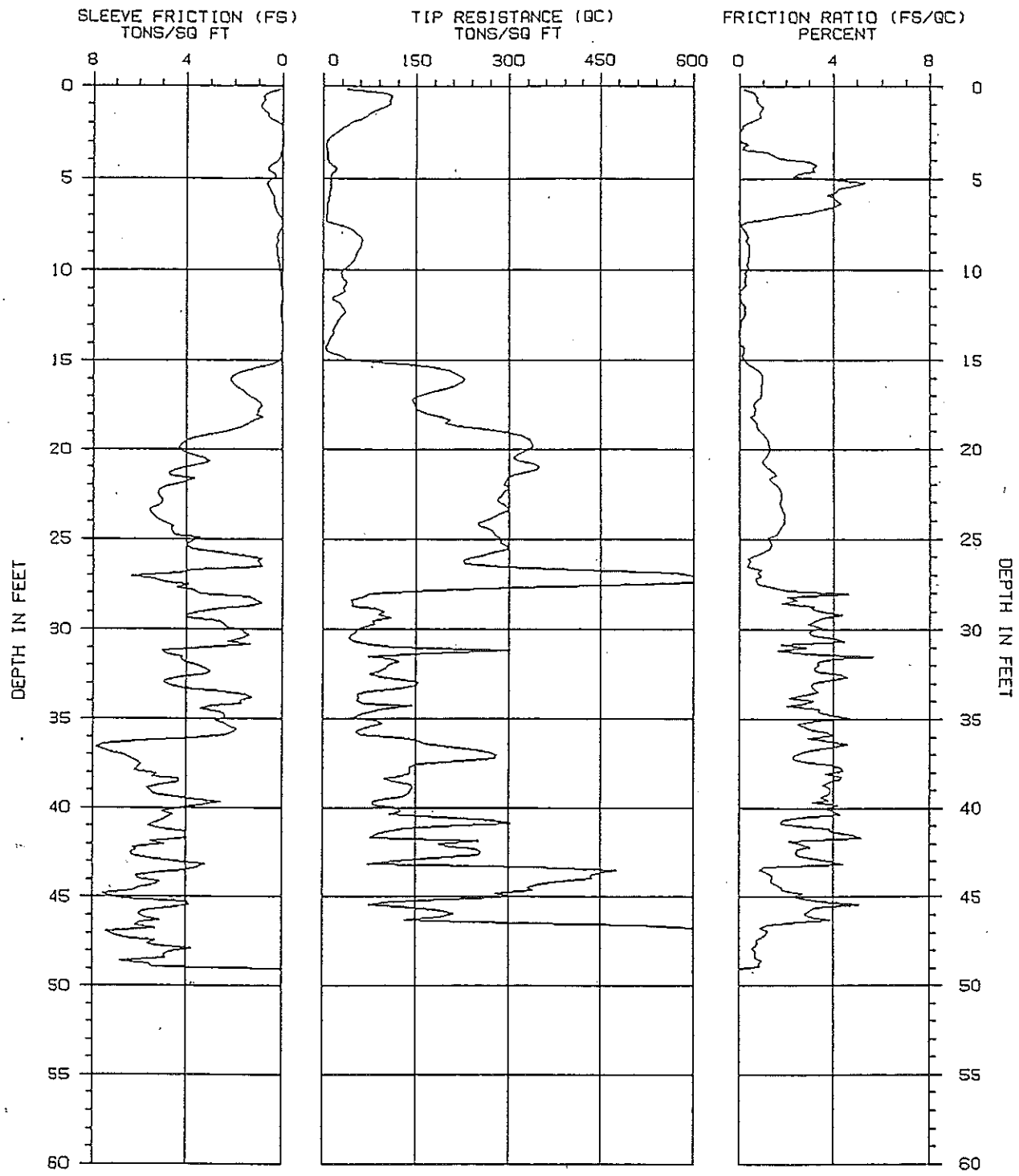
PROJECT NAME : NEWPORT/BANNING

CONE/RIG : 491/#1 JH

PROJECT NUMBER : 1970011-02

DATE/TIME: 10-24-97 07:27

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-02-97

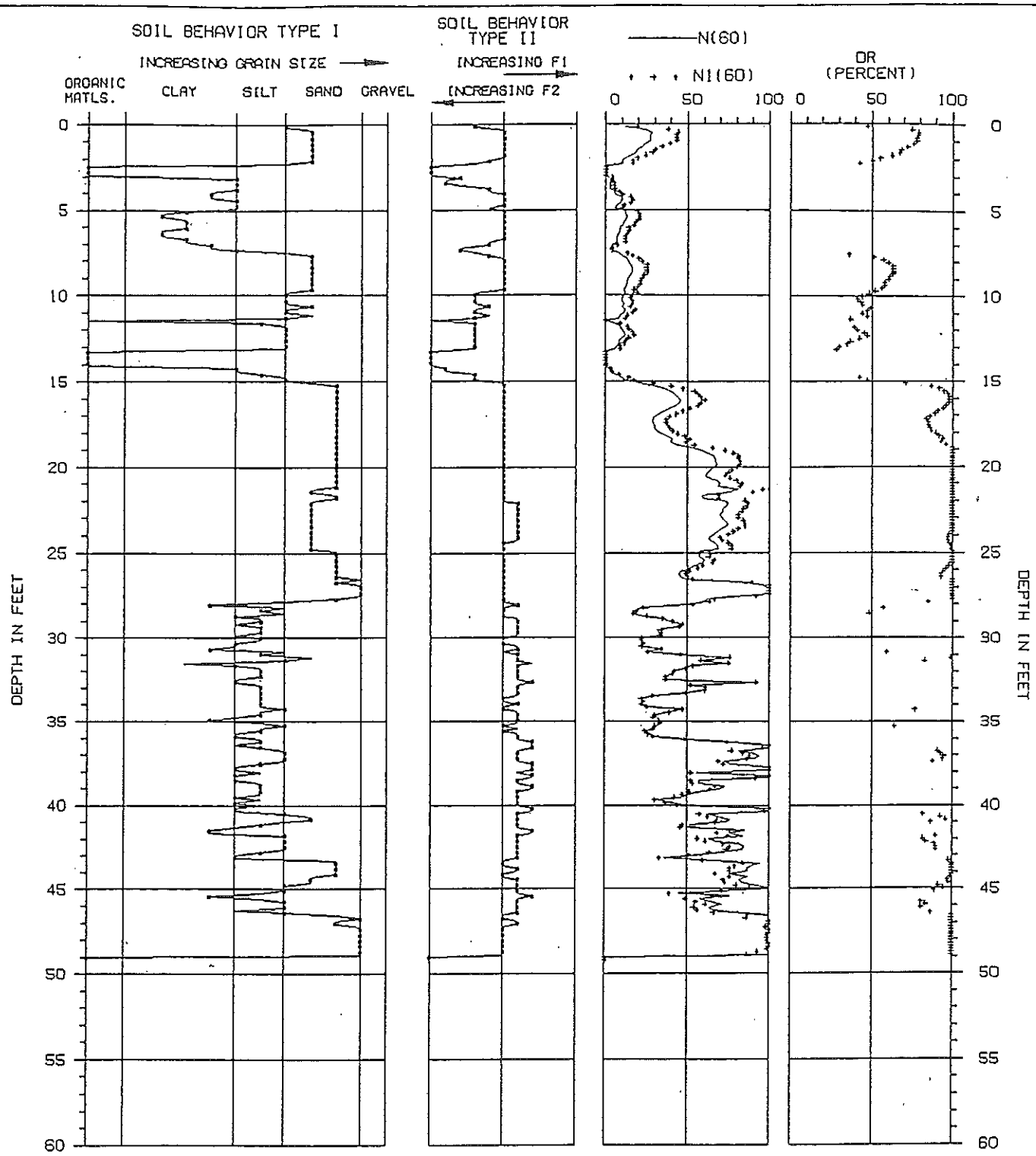
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH,JZ

DATE/TIME: 10-24-97 13:34

HFA



ASSUMED TOTAL UNIT WT = 115 PCF

N(60) = EQUIVALENT SPT VALUE (60% ENERGY)

N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% ENERGY)

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

DR = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-02-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 13:34

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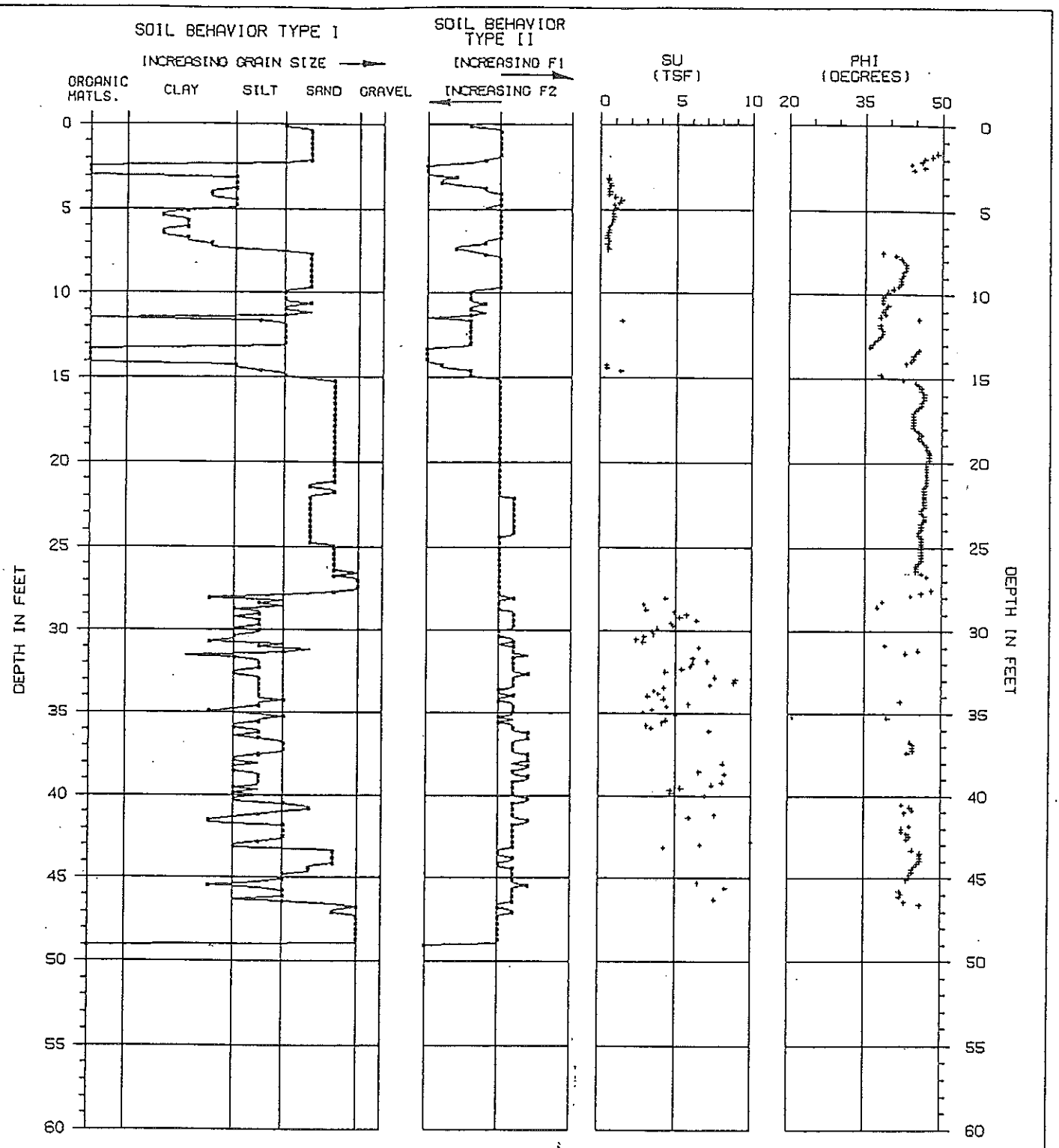


ASSUMED TOTAL UNIT WT = 115 PCF
SU = UNDRAINED SHEAR STRENGTH
F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

ASSUMED DEPTH OF WATER TABLE = 5.0 FT
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE
F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-02-97

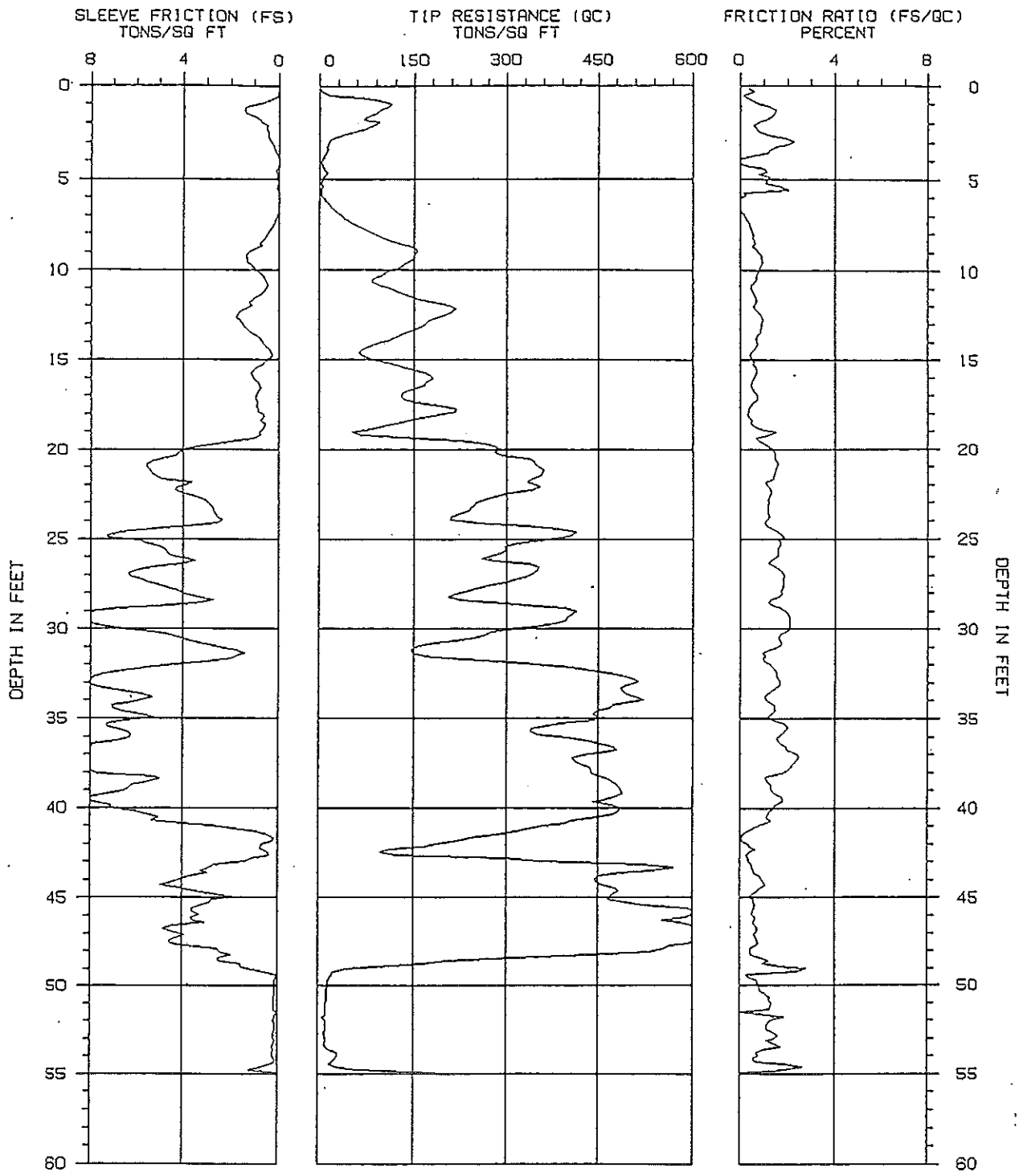
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME : 10-24-97 13:34

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-03-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 11:57

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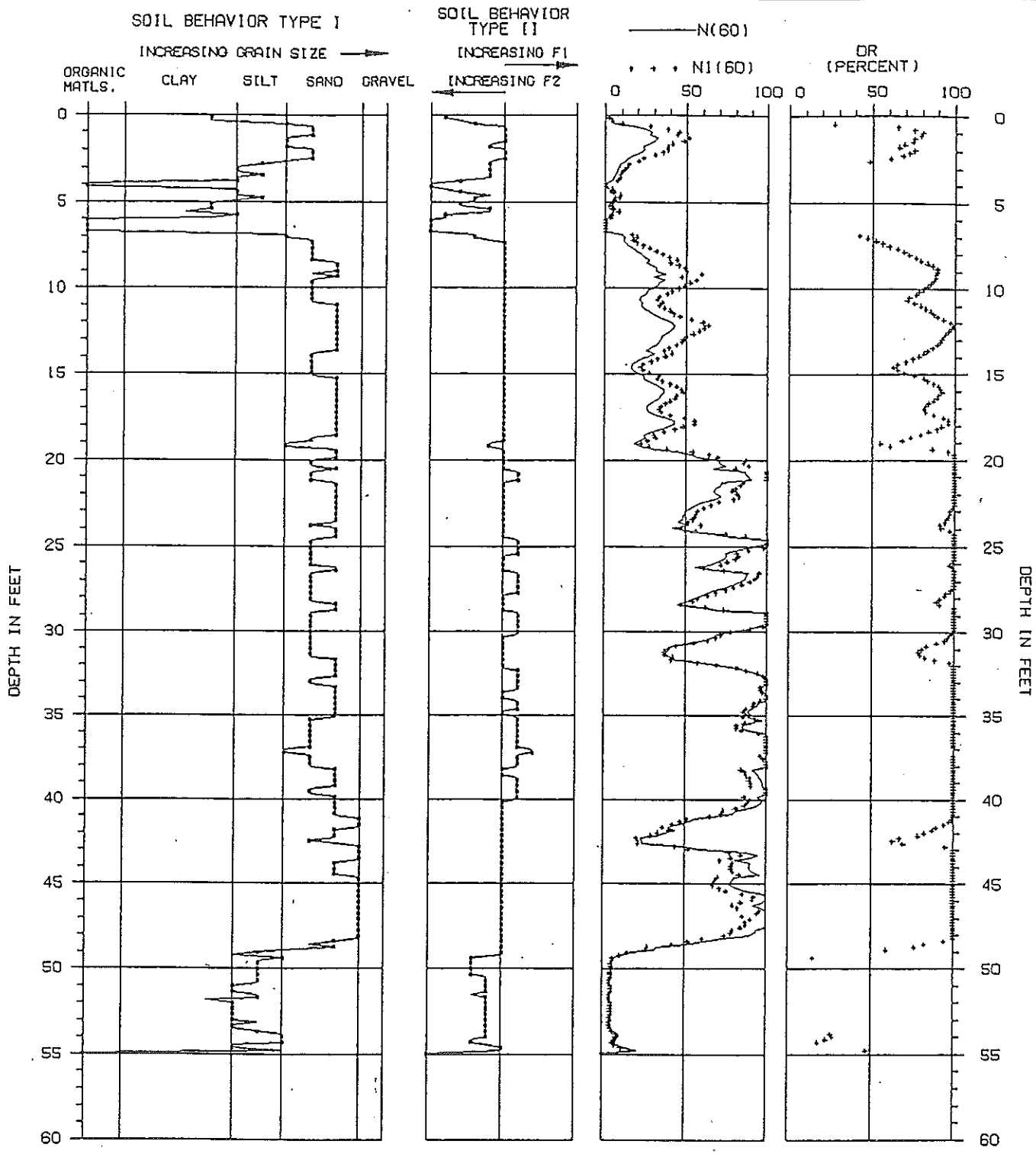

ASSUMED TOTAL UNIT WT = 115 PCF

N(60) = EQUIVALENT SPT VALUE (60% ENERGY)

N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% ENERGY)

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

DR = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-03-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH,JZ

DATE/TIME: 10-24-97 11:57

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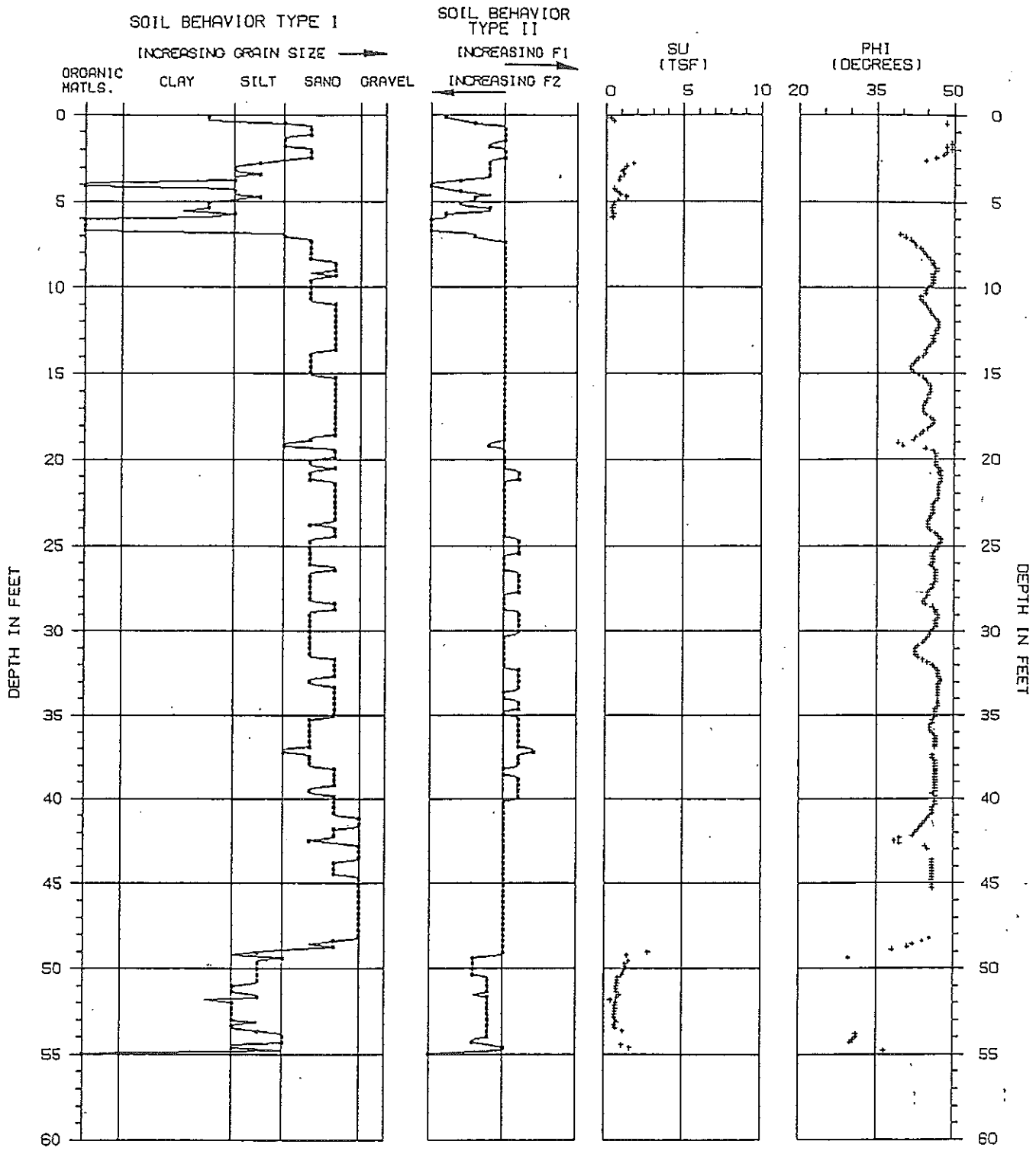

ASSUMED TOTAL UNIT WT = 115 PCF
SU = UNDRAINED SHEAR STRENGTH
F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

ASSUMED DEPTH OF WATER TABLE = 5.0 FT
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE
F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-03-97

PROJECT NAME : NEWPORT/BANNING

CONE/RIG : 471/#1 JH.JZ

PROJECT NUMBER : 1970011-02

DATE/TIME: 10-24-97 11:57

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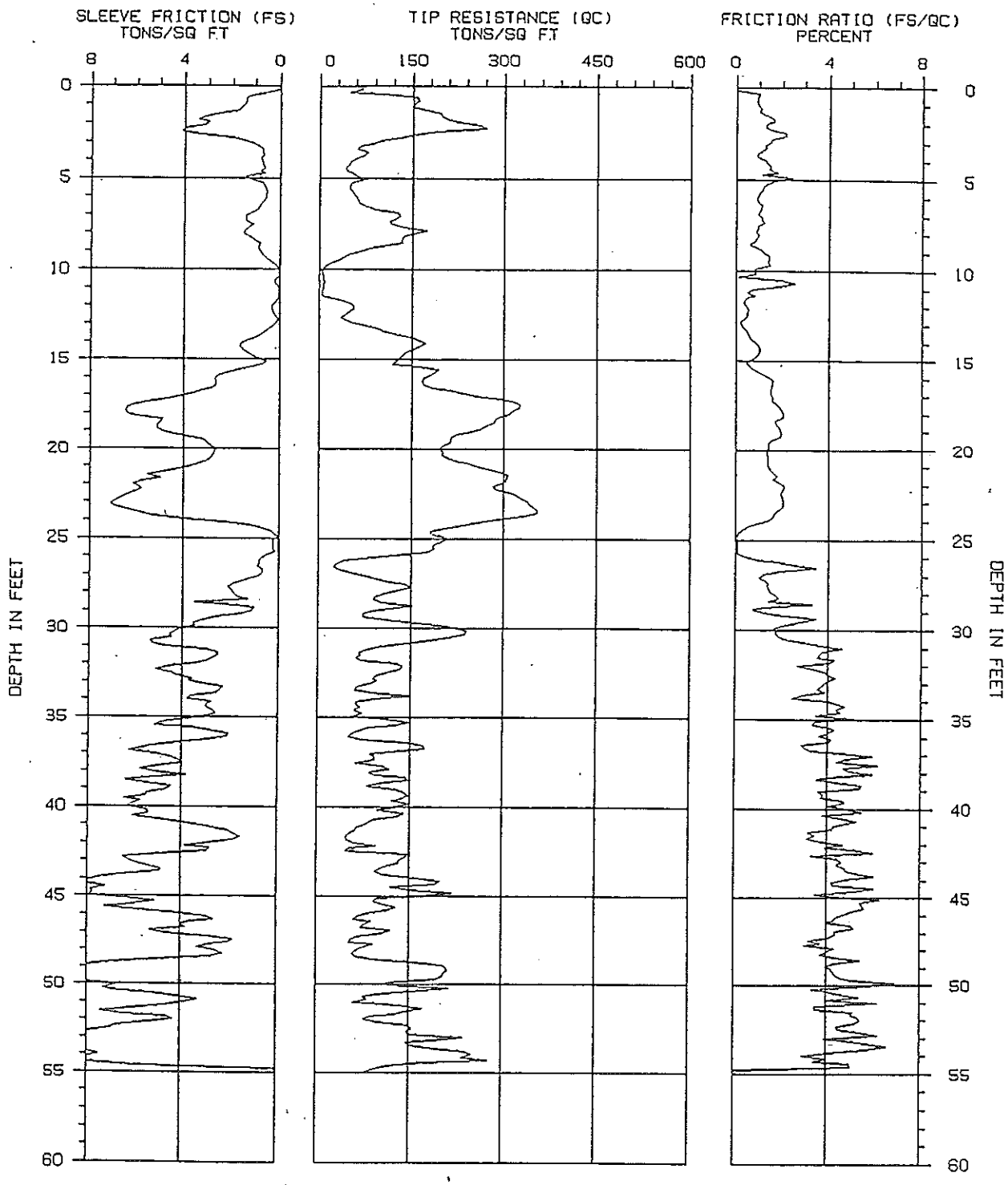


TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-04-97

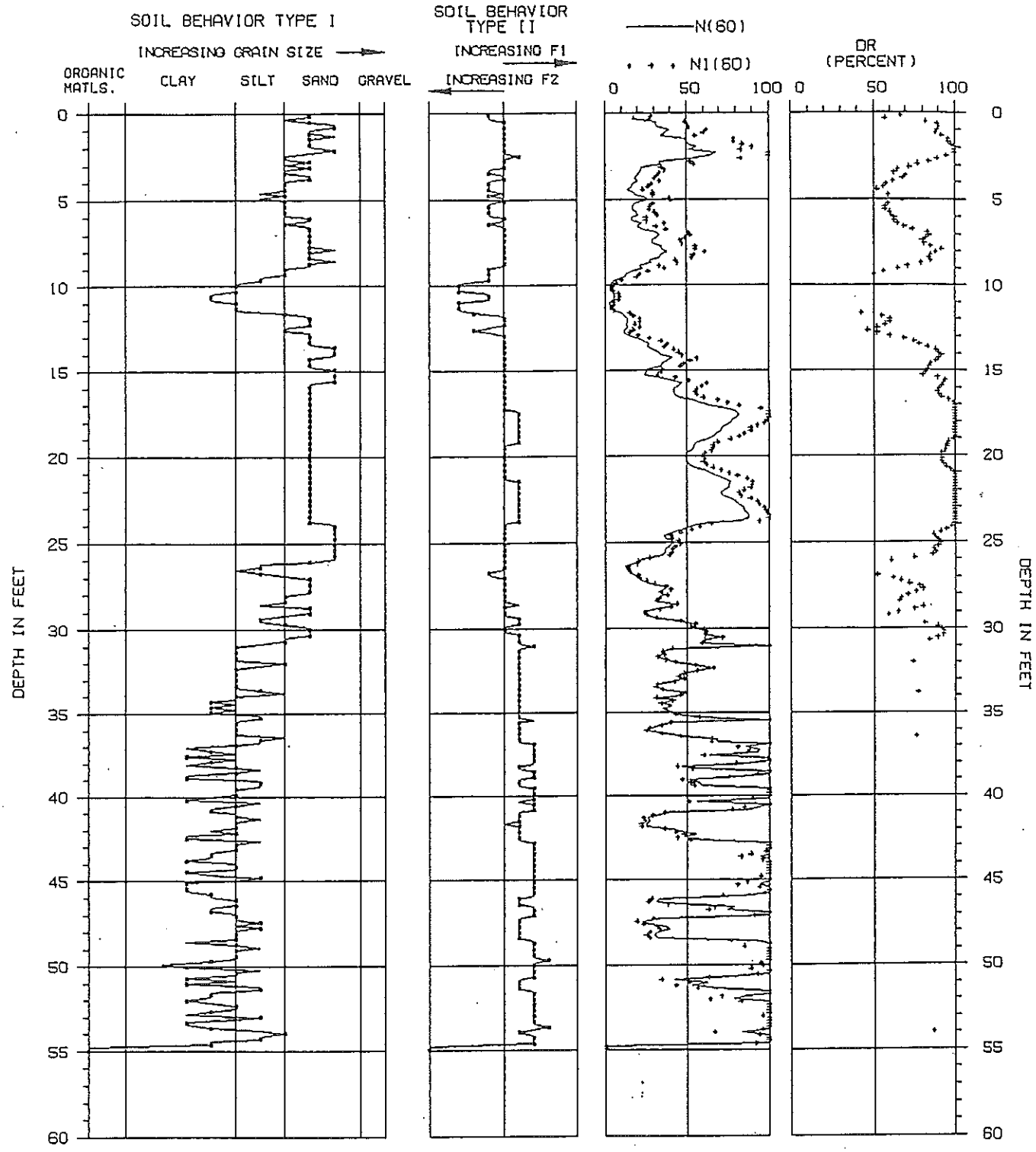
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 15:42

HFA



ASSUMED TOTAL UNIT WT = 115 PCF

N(60) = EQUIVALENT SPT VALUE (60% ENERGY)

N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% ENERGY)

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

DR = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.D. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-04-97

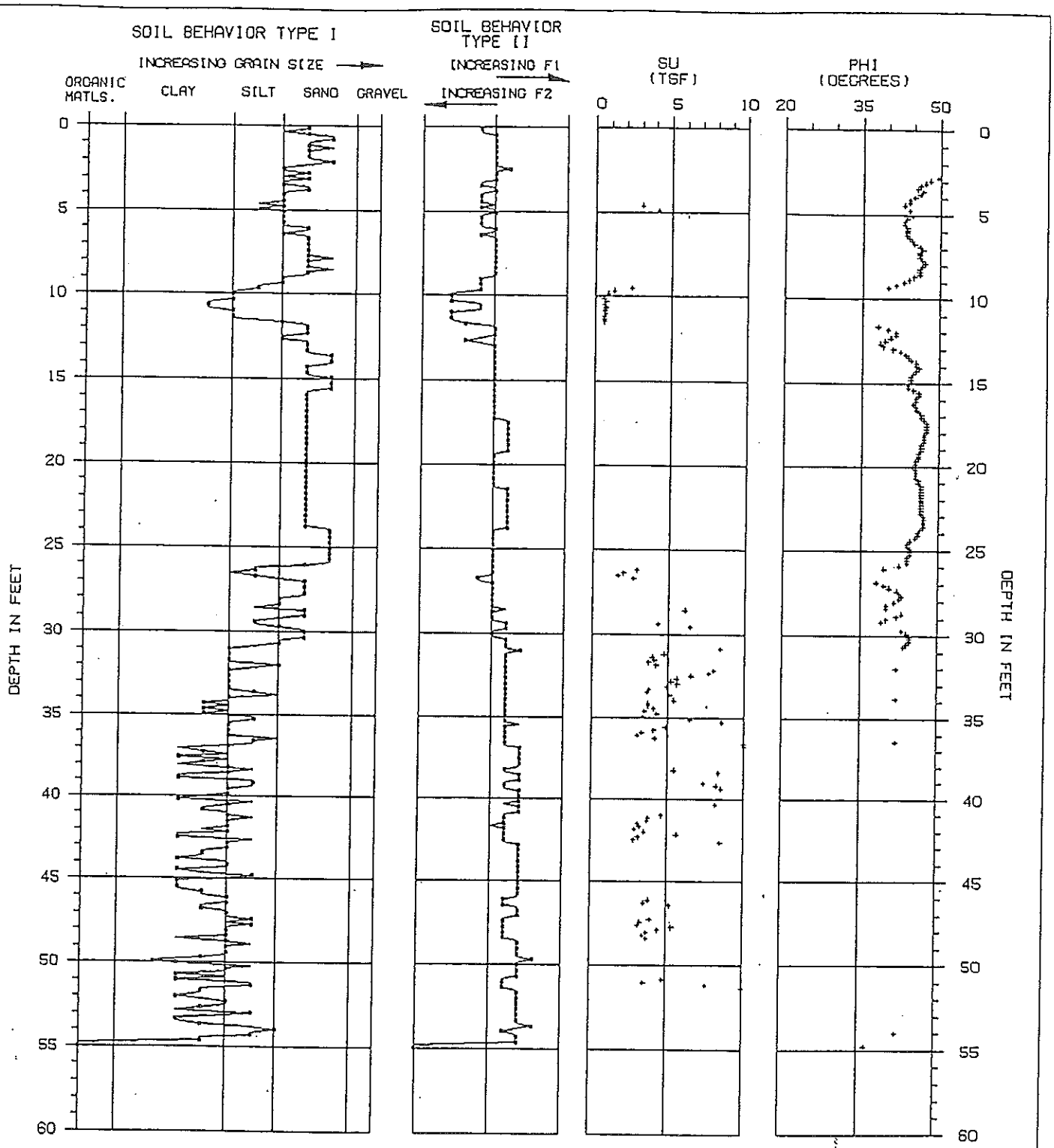
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 15:42

HFA



ASSUMED TOTAL UNIT WT = 115 PCF
SU = UNDRAINED SHEAR STRENGTH
F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

ASSUMED DEPTH OF WATER TABLE = 5.0 FT
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE
F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-04-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 15:42

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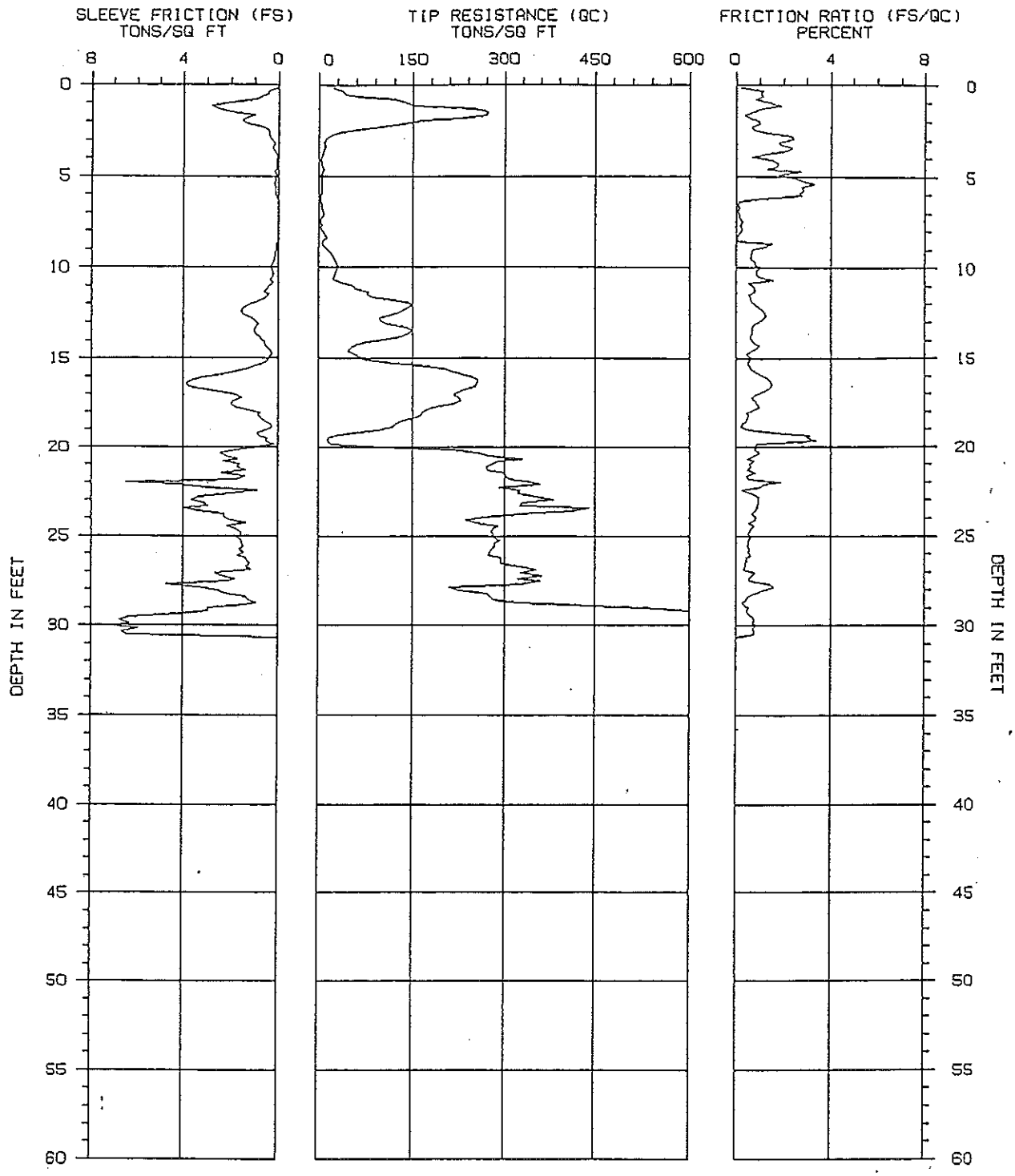

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-05-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH,JZ

DATE/TIME: 10-24-97 14:15

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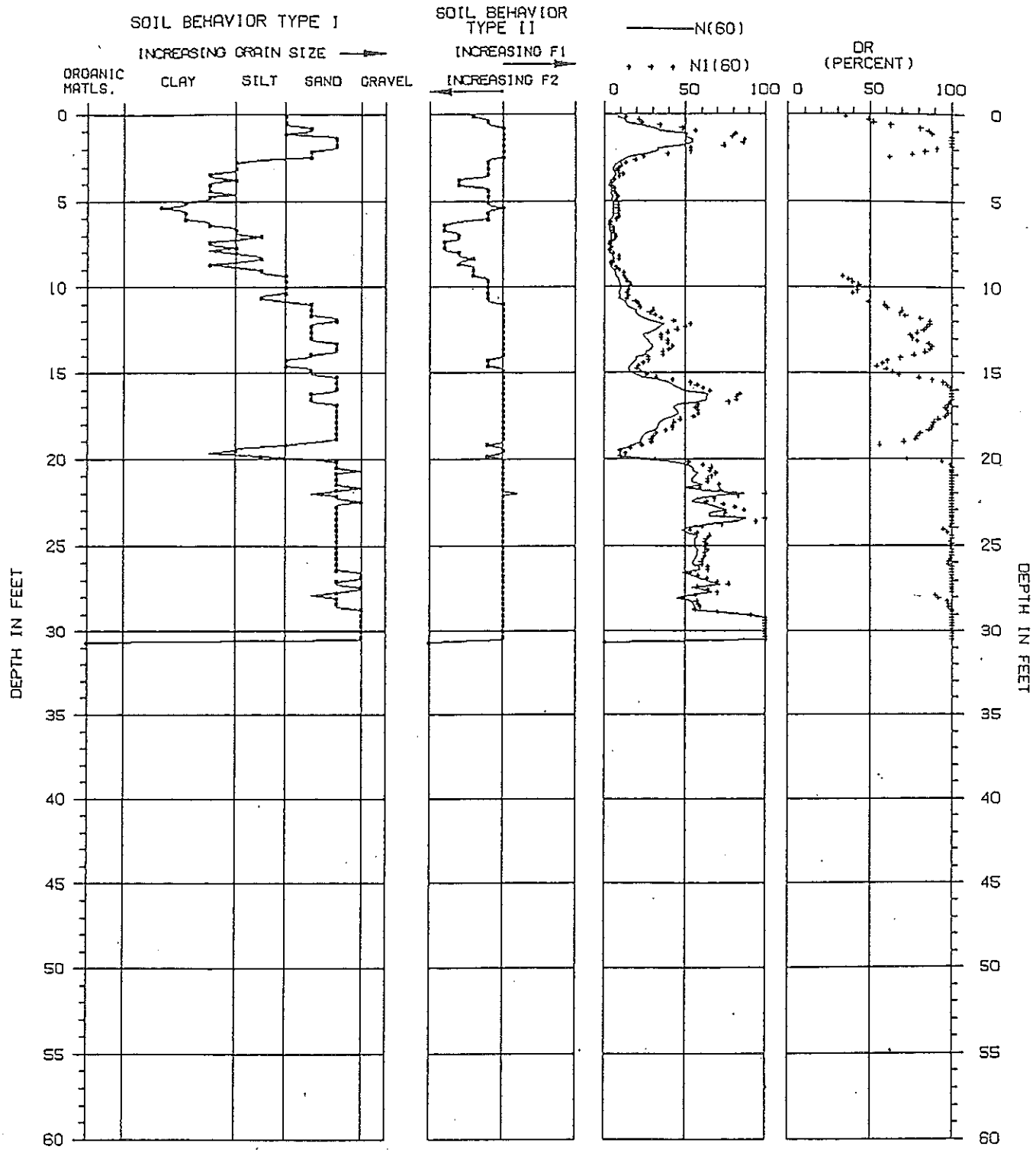

ASSUMED TOTAL UNIT WT = 115 PCF

N(60) = EQUIVALENT SPT VALUE (60% ENERGY)

N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% ENERGY)

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

DR = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-05-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH,JZ

DATE/TIME: 10-24-97 14:15

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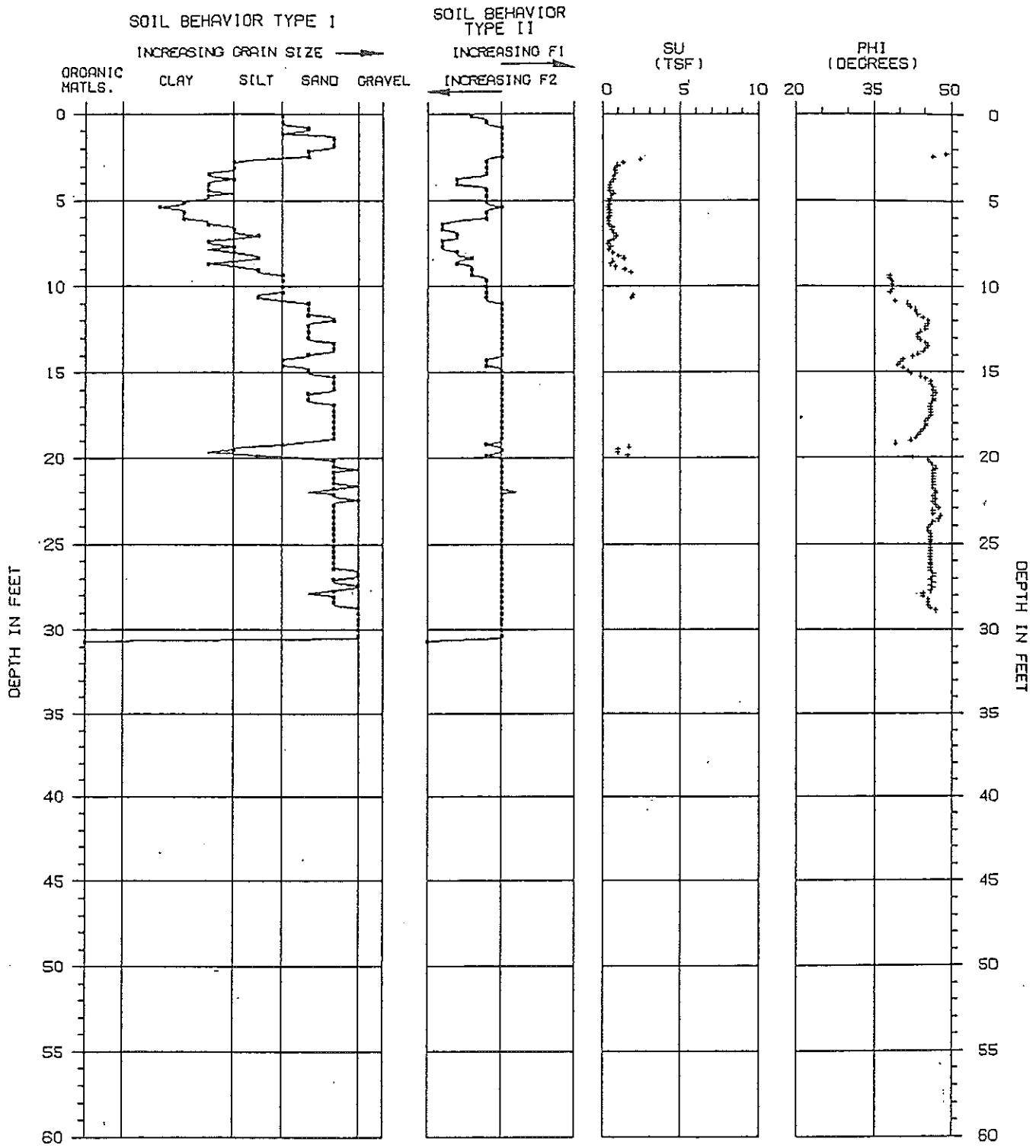


ASSUMED TOTAL UNIT WT = 115 PCF

SU = UNDRAINED SHEAR STRENGTH

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-05-97

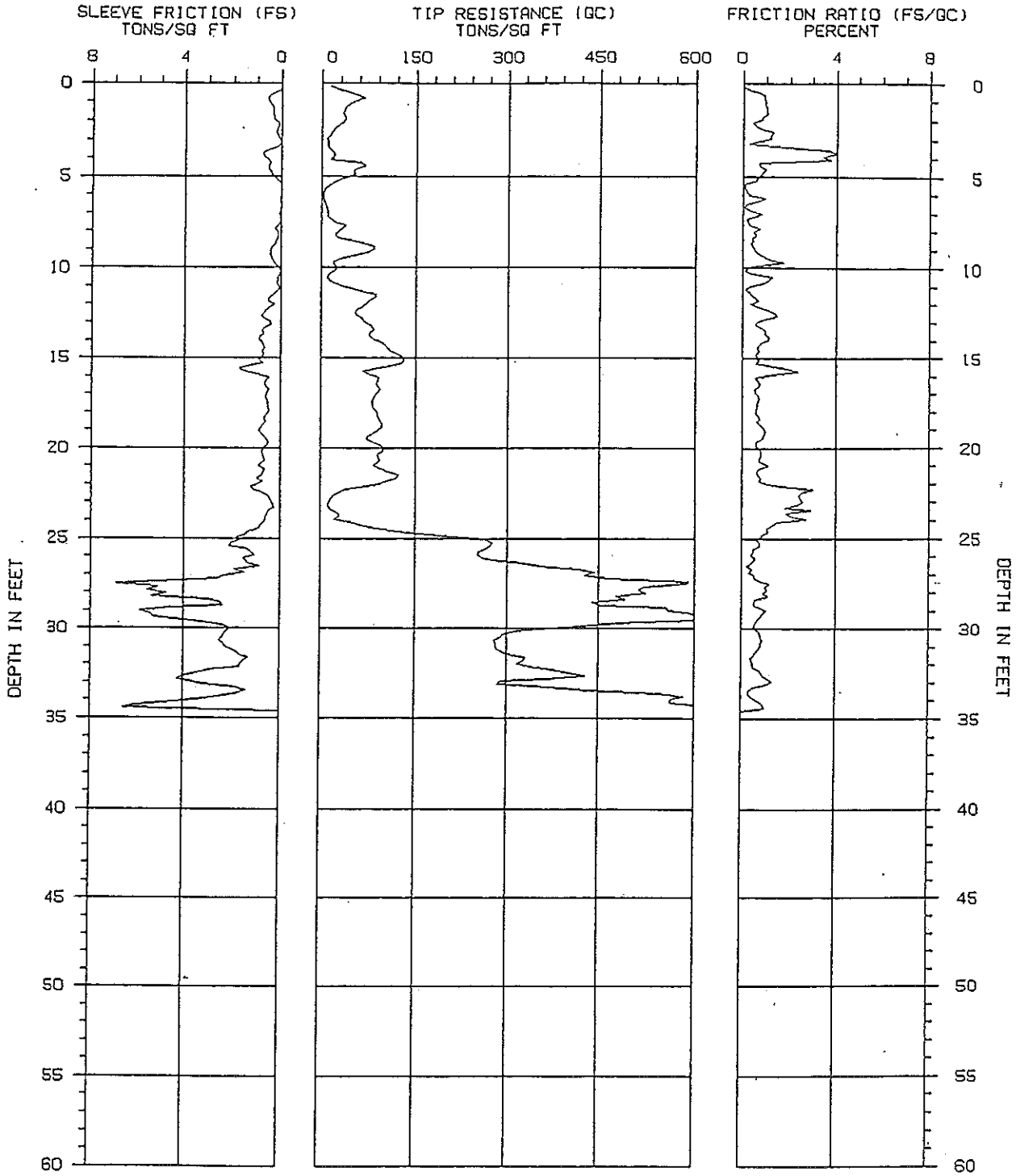
PROJECT NAME : NEWPORT/BANNING

CONE/RIG : 471/#1 JH.JZ

PROJECT NUMBER : 1970011-02

DATE/TIME: 10-24-97 14:15

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-06-97

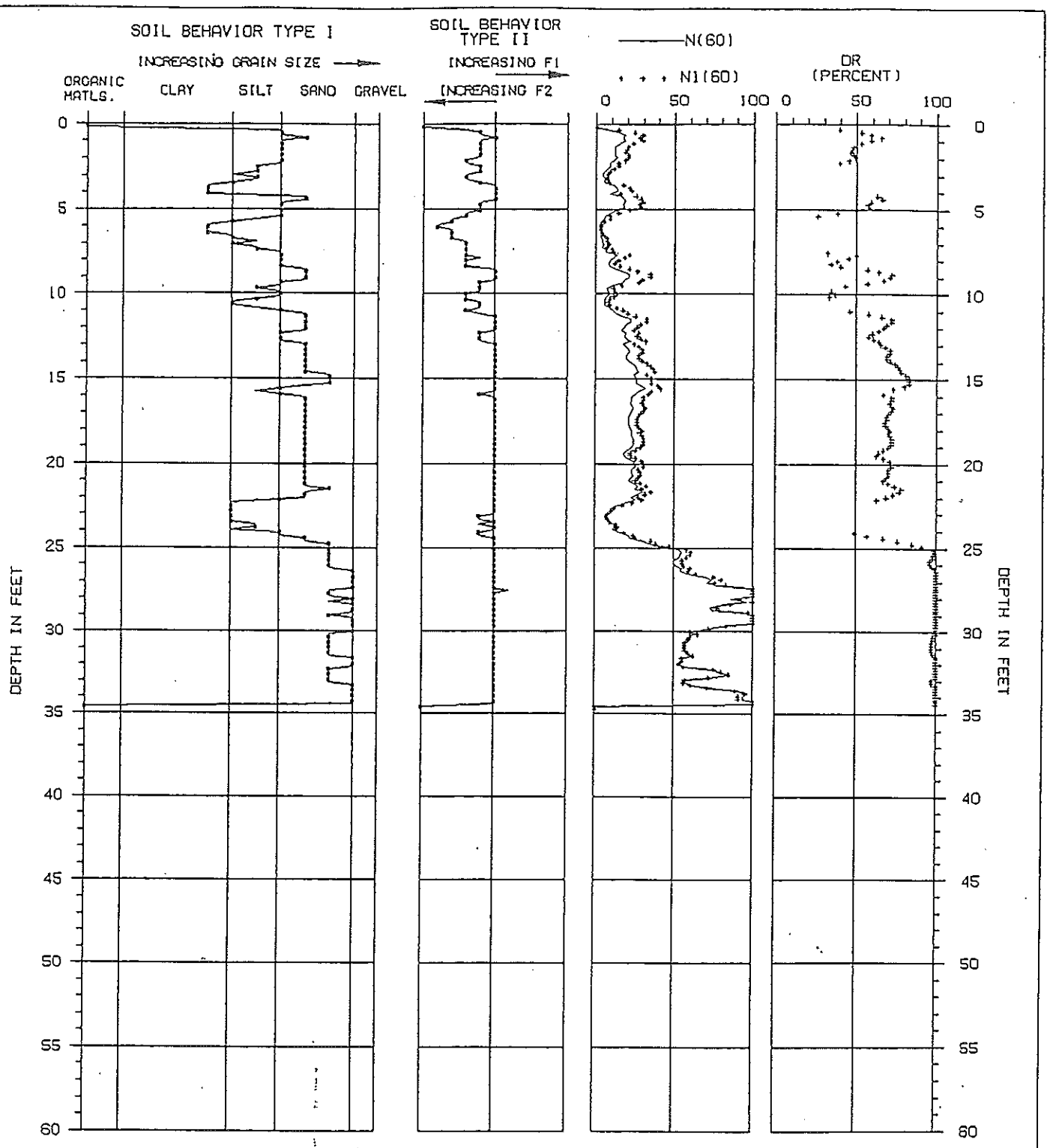
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 11:21

HFA



ASSUMED TOTAL UNIT WT = 115 PCF

N(60) = EQUIVALENT SPT VALUE (60% ENERGY)

N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% ENERGY)

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

DR = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-06-97

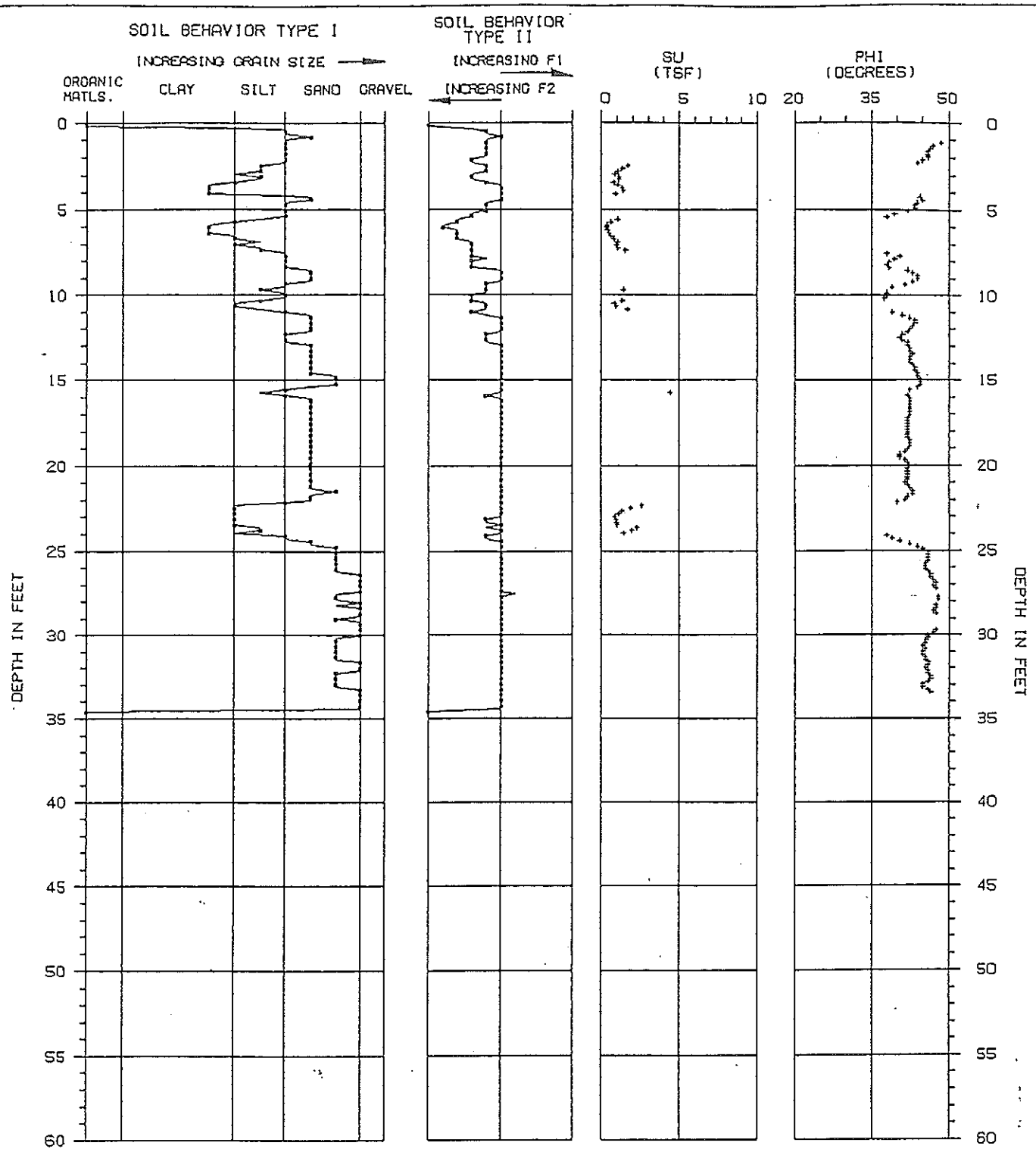
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 11:21

HFA



ASSUMED TOTAL UNIT WT = 115 PCF

SU = UNDRAINED SHEAR STRENGTH

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-06-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 11:21

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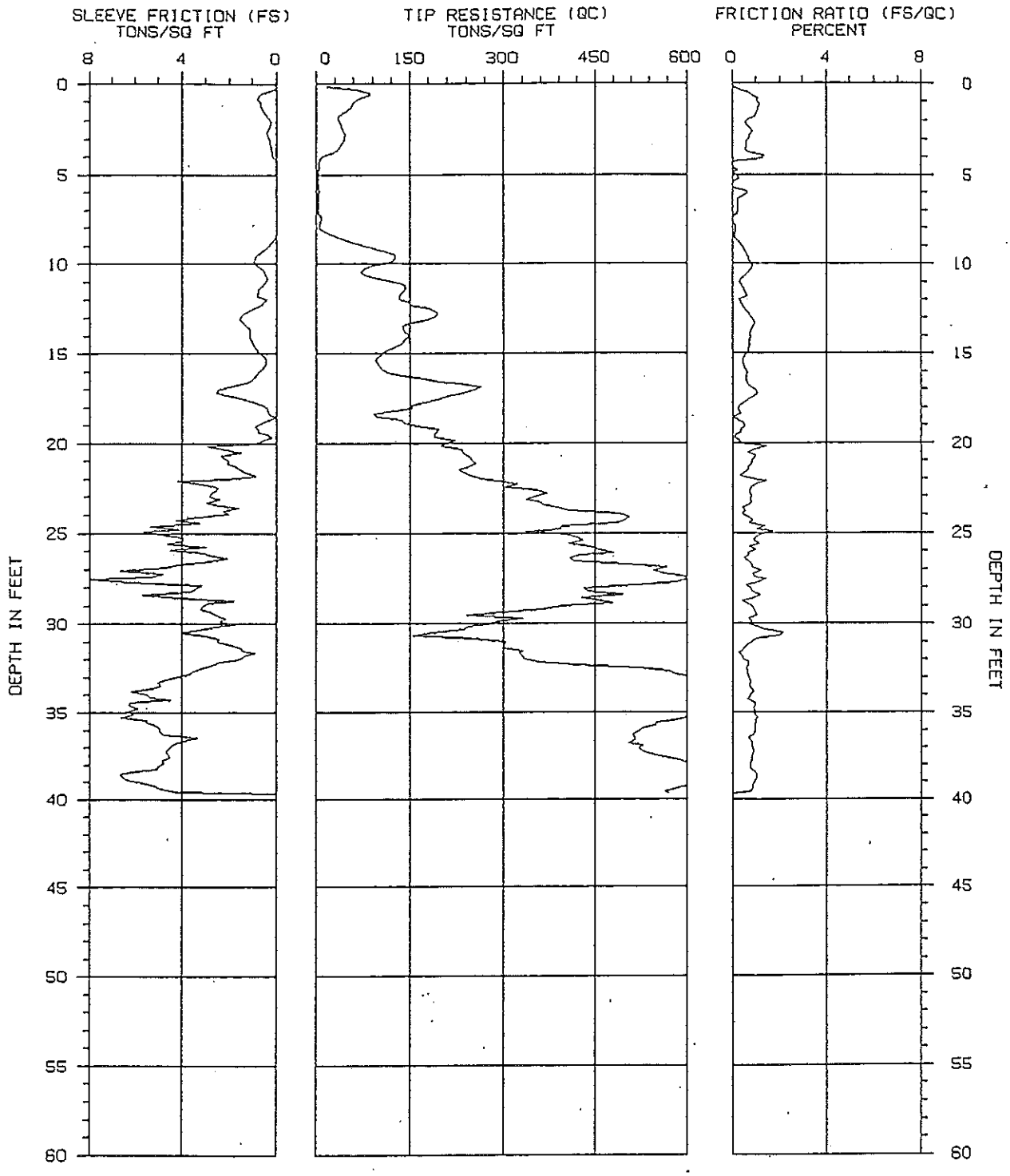

TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-07-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 09:12

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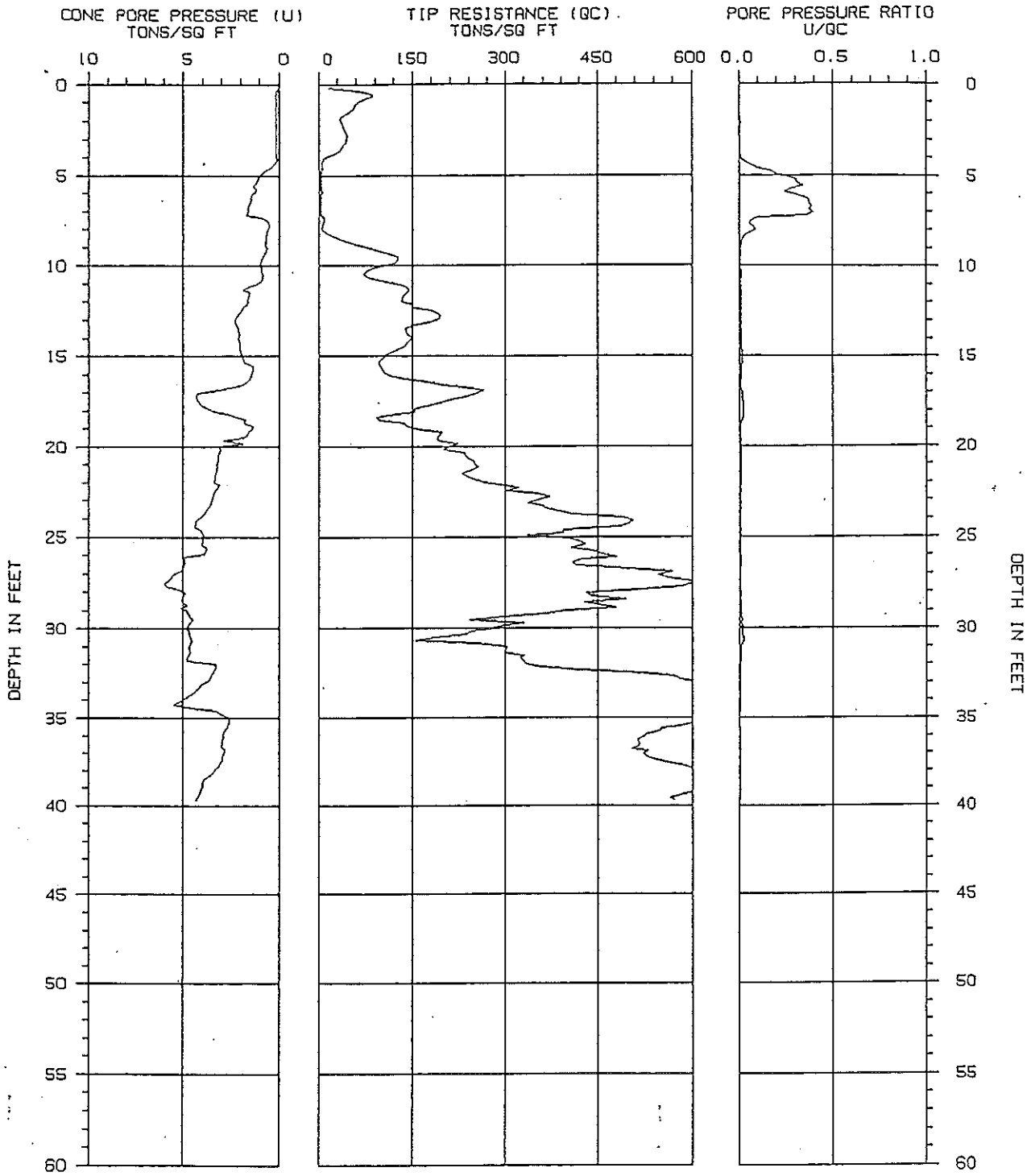


TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-07-97

PROJECT NAME : NEWPORT/BANNING

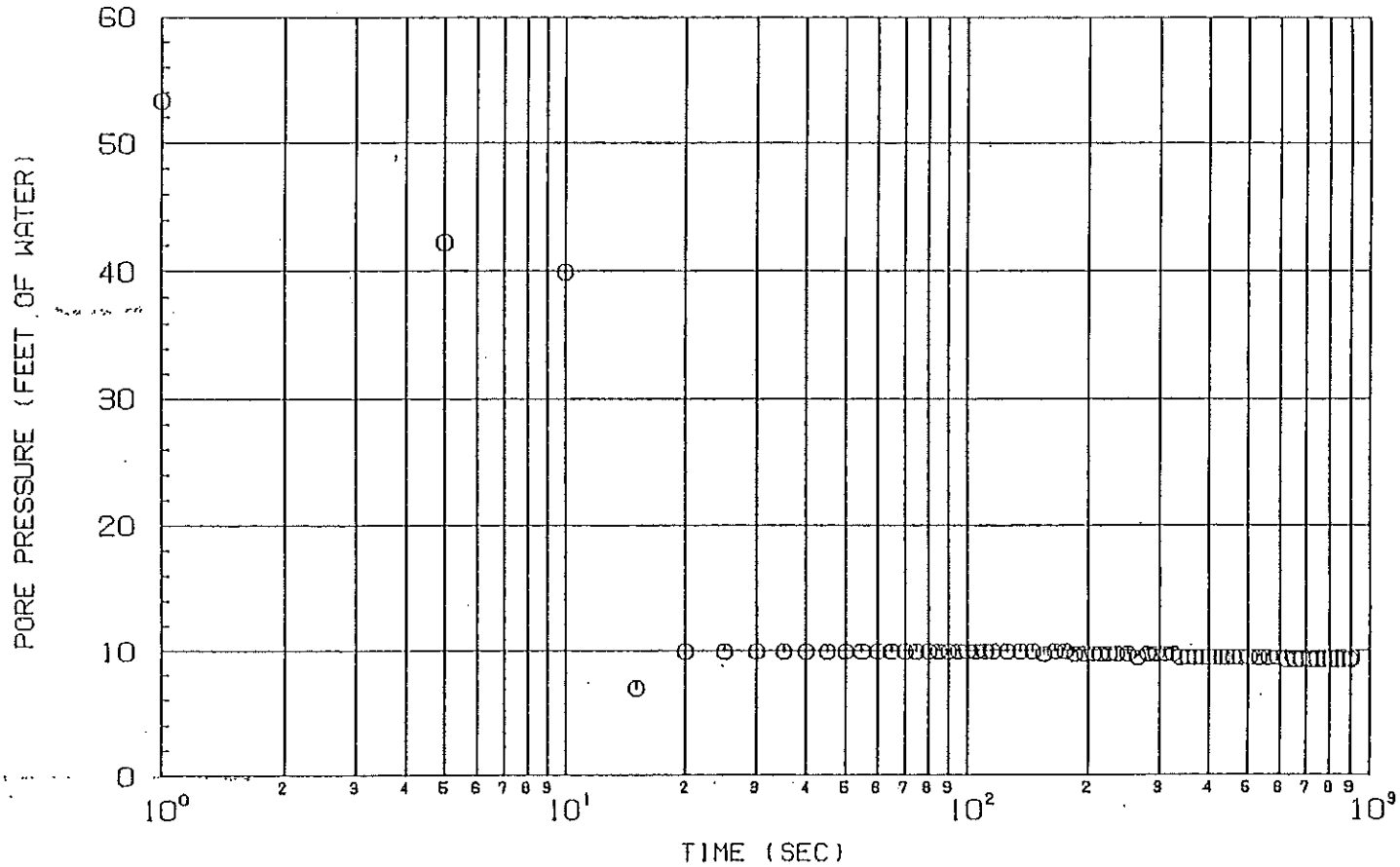
PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 09:12

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊕ 12.1 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-07-97

PROJECT NAME : NEWPORT/BANNING

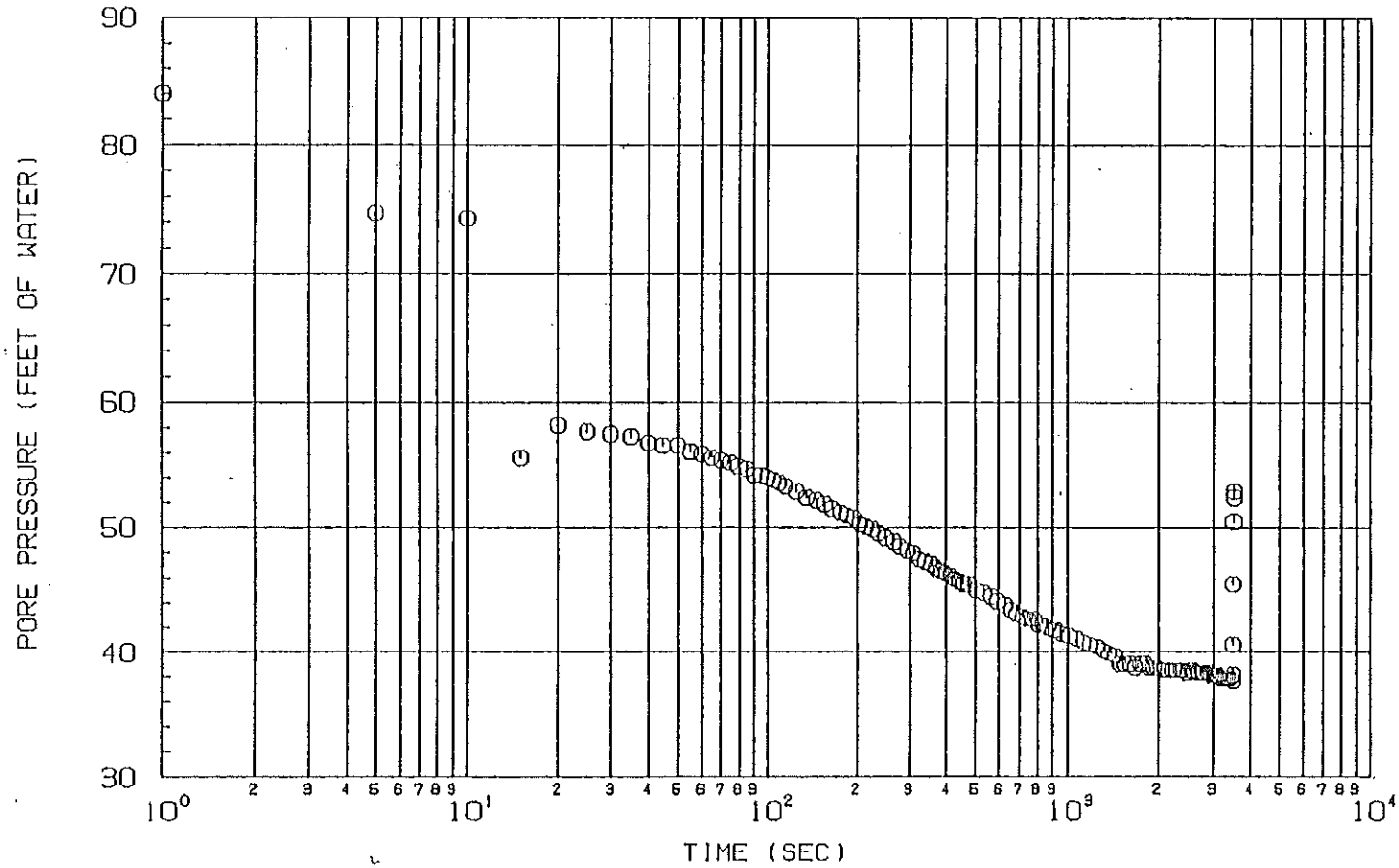
PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH,JZ

DATE/TIME: 10-24-97 09:12

HFA

PORE PRESSURE DISSIPATION CURVES



DEPTH: ⊙ 40.3 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-07-97

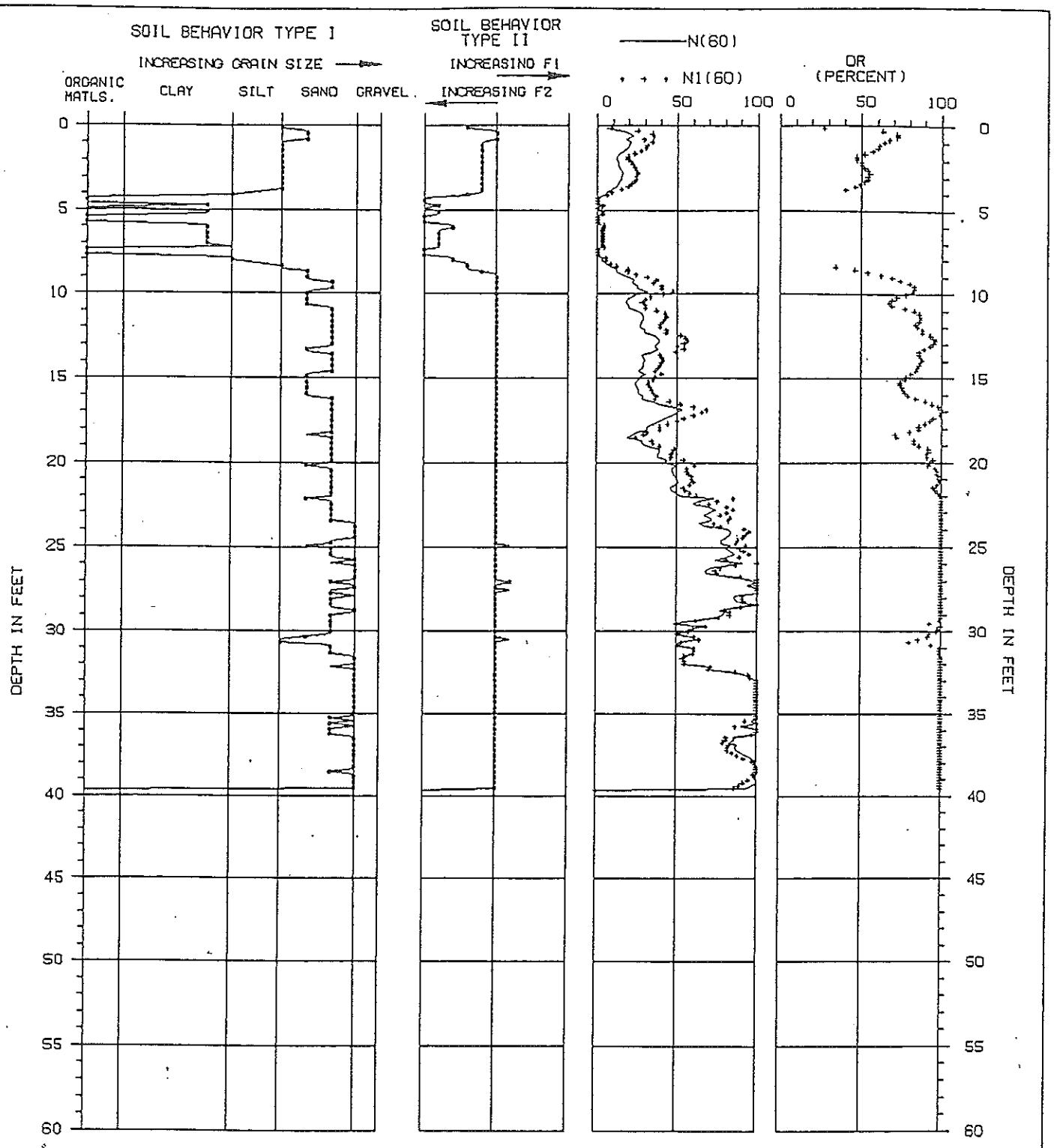
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH,JZ

DATE/TIME: 10-24-97 09:12

HFA



ASSUMED TOTAL UNIT WT = 115 PCF

N(60) = EQUIVALENT SPT VALUE (60% ENERGY)

N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% ENERGY)

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

DR = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-07-97

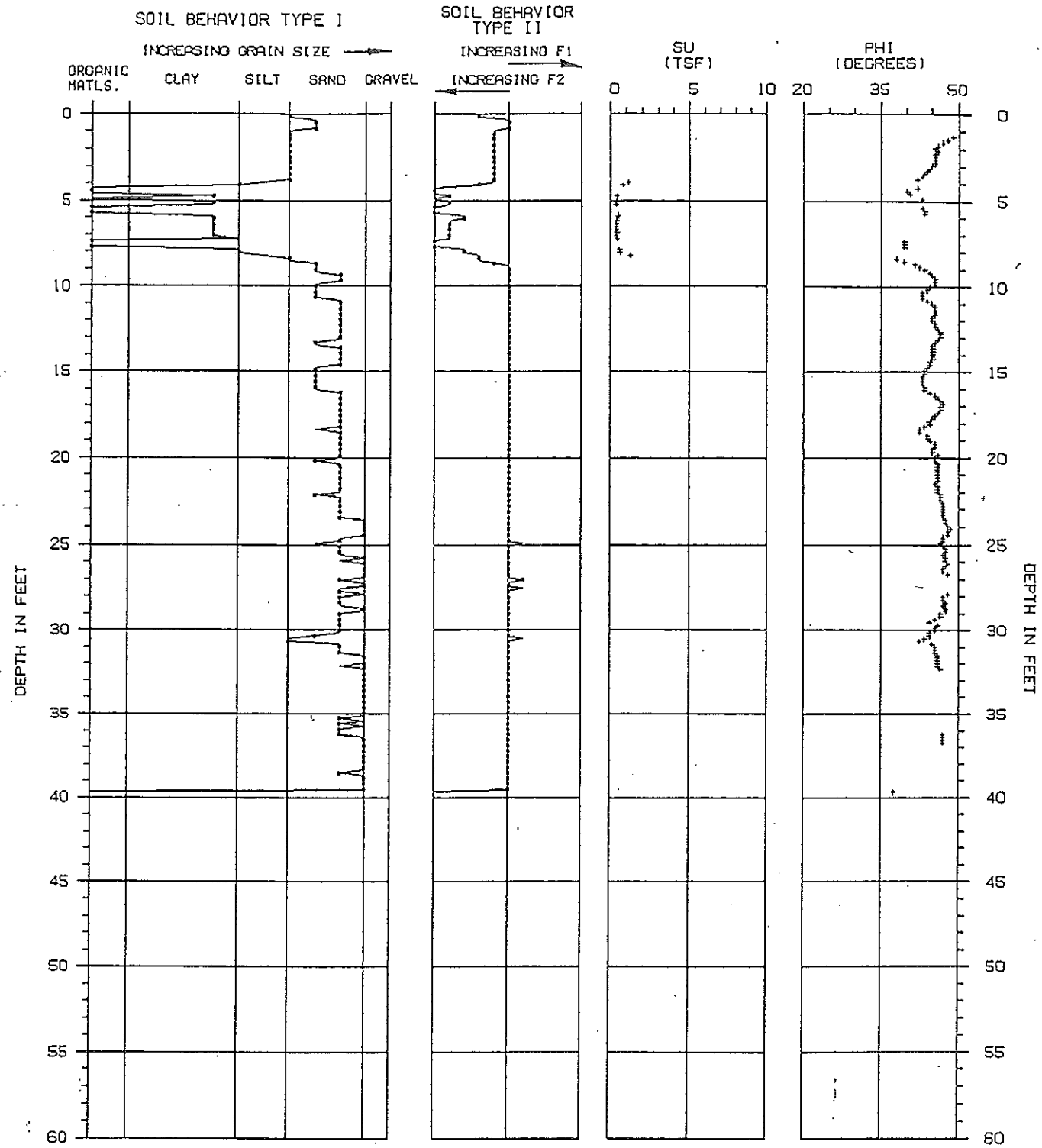
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH,JZ

DATE/TIME: 10-24-97 09:12

HFA



ASSUMED TOTAL UNIT WT = 115 PCF
SU = UNDRAINED SHEAR STRENGTH
F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

ASSUMED DEPTH OF WATER TABLE = 5.0 FT
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE
F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-07-97

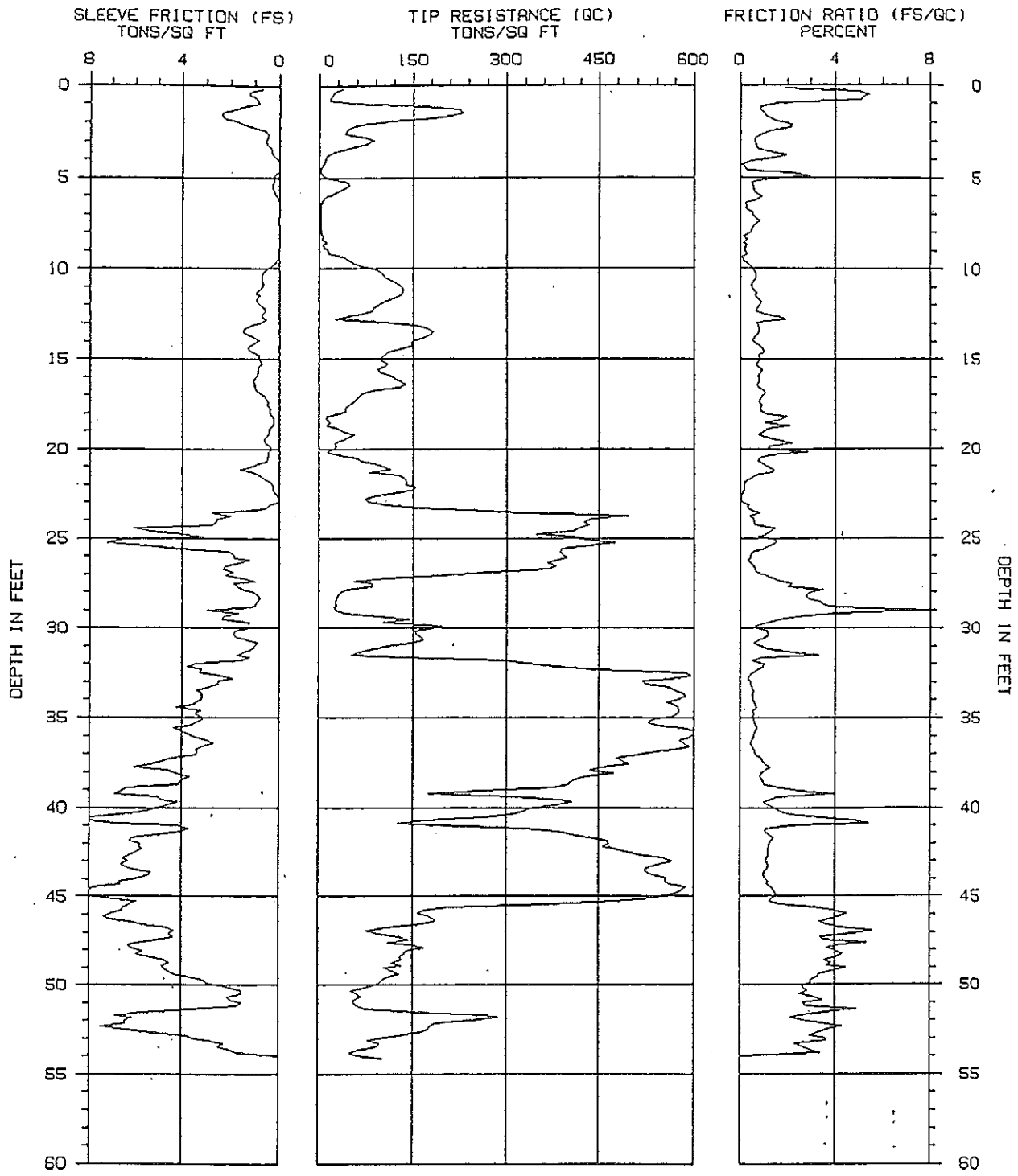
PROJECT NAME : NEWPORT/BANNING

CONE/RIG : 471/#1 JH,JZ

PROJECT NUMBER : 1970011-02

DATE/TIME: 10-24-97 09:12

HFA



TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-08-97

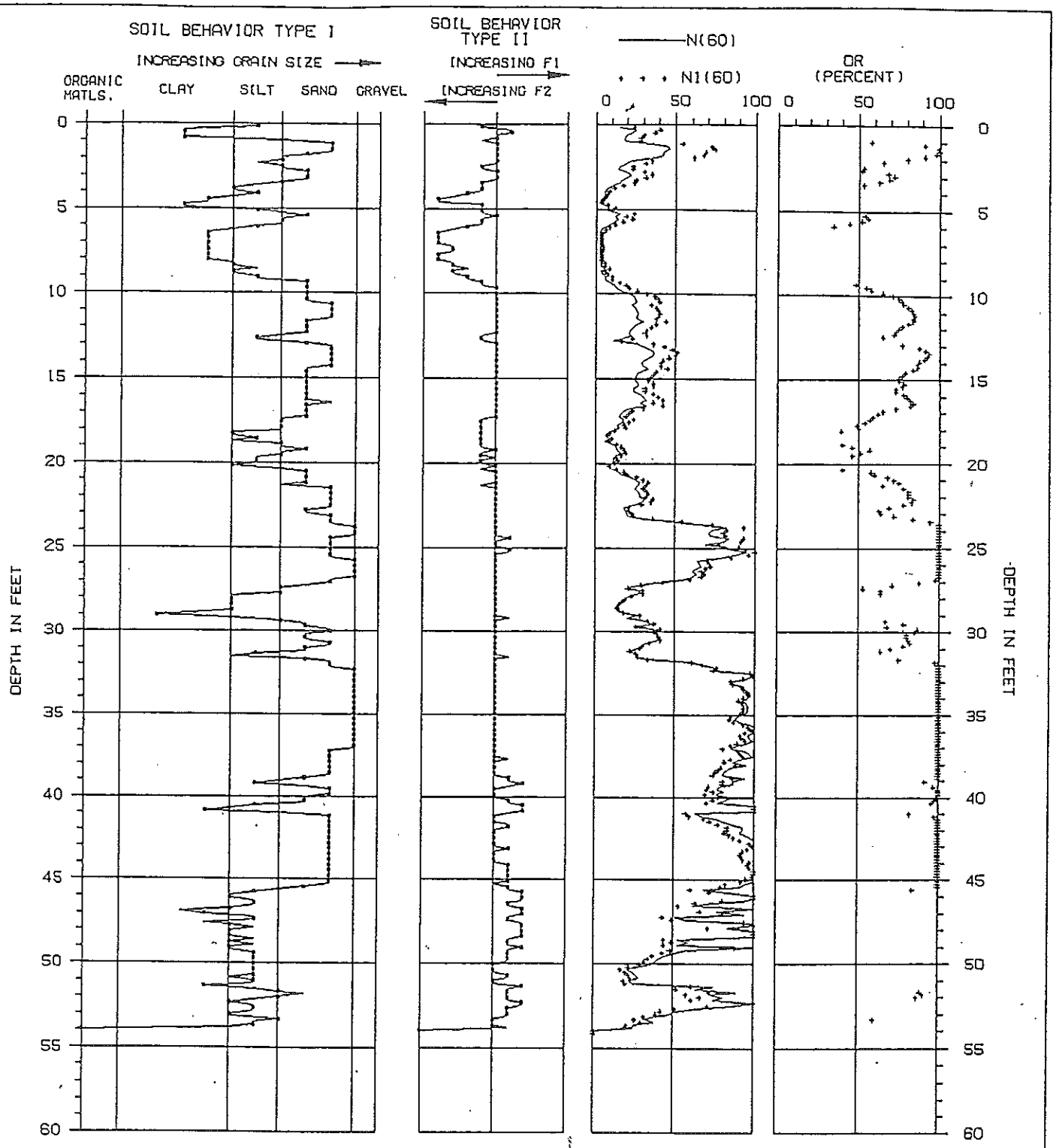
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 14:45

HFA



ASSUMED TOTAL UNIT WT = 115 PCF

N(60) = EQUIVALENT SPT VALUE (60% ENERGY)

N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% ENERGY)

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

DR = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY

F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-08-97

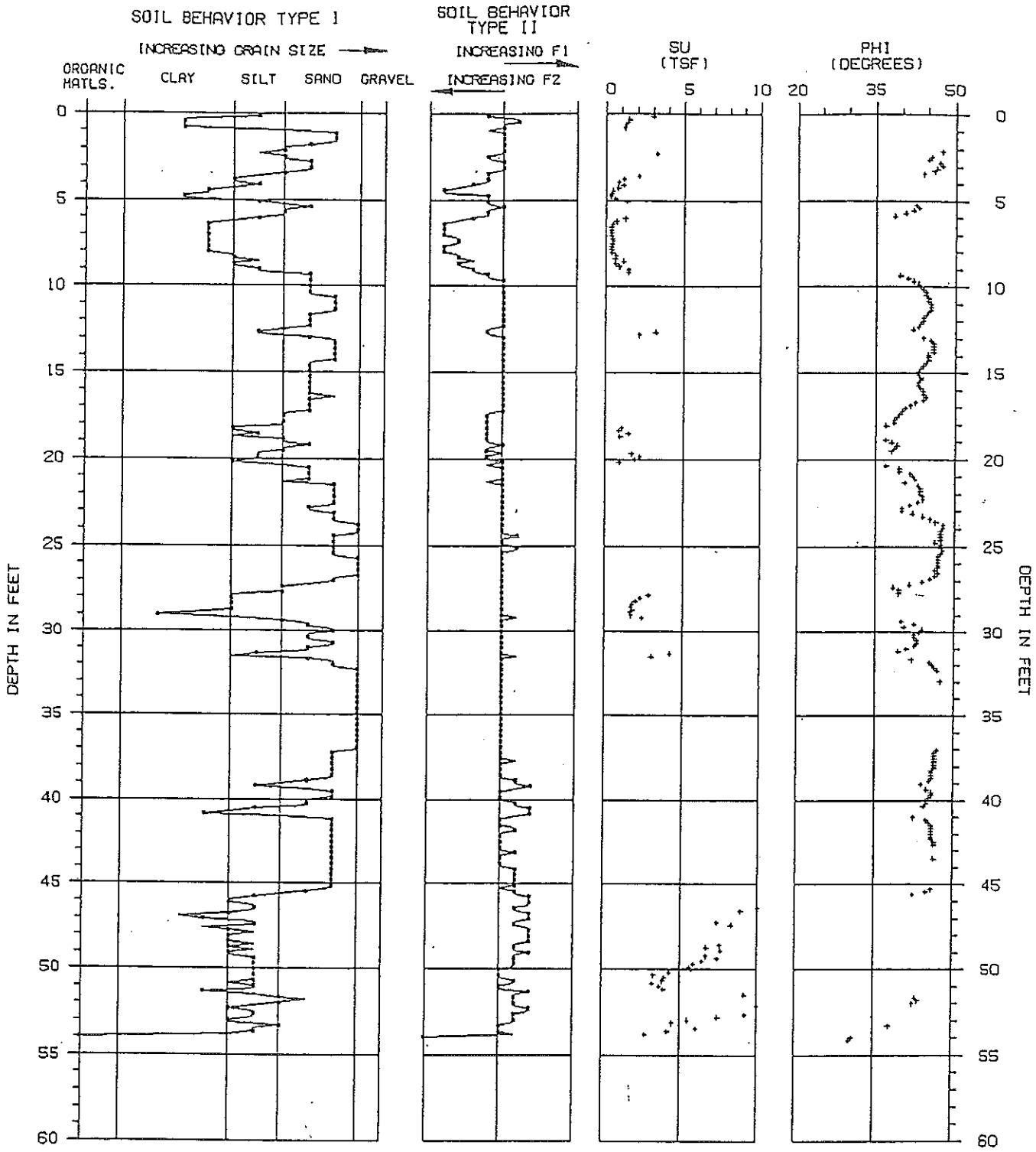
PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 14:45

HFA



ASSUMED TOTAL UNIT WT = 115 PCF
SU = UNDRAINED SHEAR STRENGTH
F1 = DENSITY/OVERCONSOLIDATION RATIO/CEMENTATION

ASSUMED DEPTH OF WATER TABLE = 5.0 FT
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE
F2 = SENSITIVITY

SOIL BEHAVIOR TYPE AND OTHER INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CPT INTERPRETATIONS

SOUNDING NUMBER: CPT-08-97

PROJECT NAME : NEWPORT/BANNING

PROJECT NUMBER : 1970011-02

CONE/RIG : 471/#1 JH.JZ

DATE/TIME: 10-24-97 14:45

HFA

APPENDIX B

Geotechnical Laboratory Data

GMU
GEOTECHNICAL, INC.

APPENDIX B-1

Geotechnical Laboratory Procedures and Test Results
Performed by
Goffman, McCormick & Urban, Inc.

APPENDIX B-1

GEOTECHNICAL LABORATORY PROCEDURES AND TEST RESULTS

Moisture Density

Field moisture content and in-place density were determined for each 8-inch sample sleeve of undisturbed soil material obtained. The field moisture content was determined according to ASTM Test Method D 2216 by obtaining one-half the moisture sample from each end of the sample. The in place dry density of the sample was determined by using the wet weight of the entire sample.

At the same time the field moisture content and in-place density were determined, the soil material at each end of the sleeve was classified according to the Unified Soil Classification System. The results of the field moisture content and in-place density determinations are present on the right-hand column of Plates A-2.1 through A-2.11 -- Log of Drill Hole. The results of the visual classifications were used for general reference.

Compaction Tests

Bulk samples representative of the typical soils that will be utilized during grading were tested to determine the maximum dry density and optimum moisture content of the soil. These compactive characteristics were determined according to ASTM Testing Method D 1557. The results are summarized on Plates B-1.1 through B-1.3 -- Compaction Test Data.

Particle Size Distribution

As part of the engineering classification of the materials underlying the site, samples were tested to determine the distribution of the particle sizes. The distribution was determined in general accord with ASTM Test Method D 422; particle size was determined by using U.S. Standard Sieve Nos. ¾", 4, 10, 20, 30, 40, 60, 100, and 200. For selected samples, a standard hydrometer test was also performed. The results of the tests are summarized on Plates B-2.1 through B-2.4 -- Particle Size Distribution.

Atterberg Limits

As part of the engineering classification of the soil underlying the site, samples of the on-site soils were tested to determine relative plasticity. This relative plasticity is based on the Atterberg Limits using ASTM Test Method D-4318. The results of this test are summarized on Plate B-3 -- Atterberg Limits.

Direct Shear Strength Tests

Direct shear tests were performed on insitu samples representative of the on-site alluvial deposits to determine shearing resistance. The general philosophy and procedure of the tests are in accordance with ASTM Test Method D 3080 - "Direct Shear Test for Soils Under Consolidated Drained Conditions."

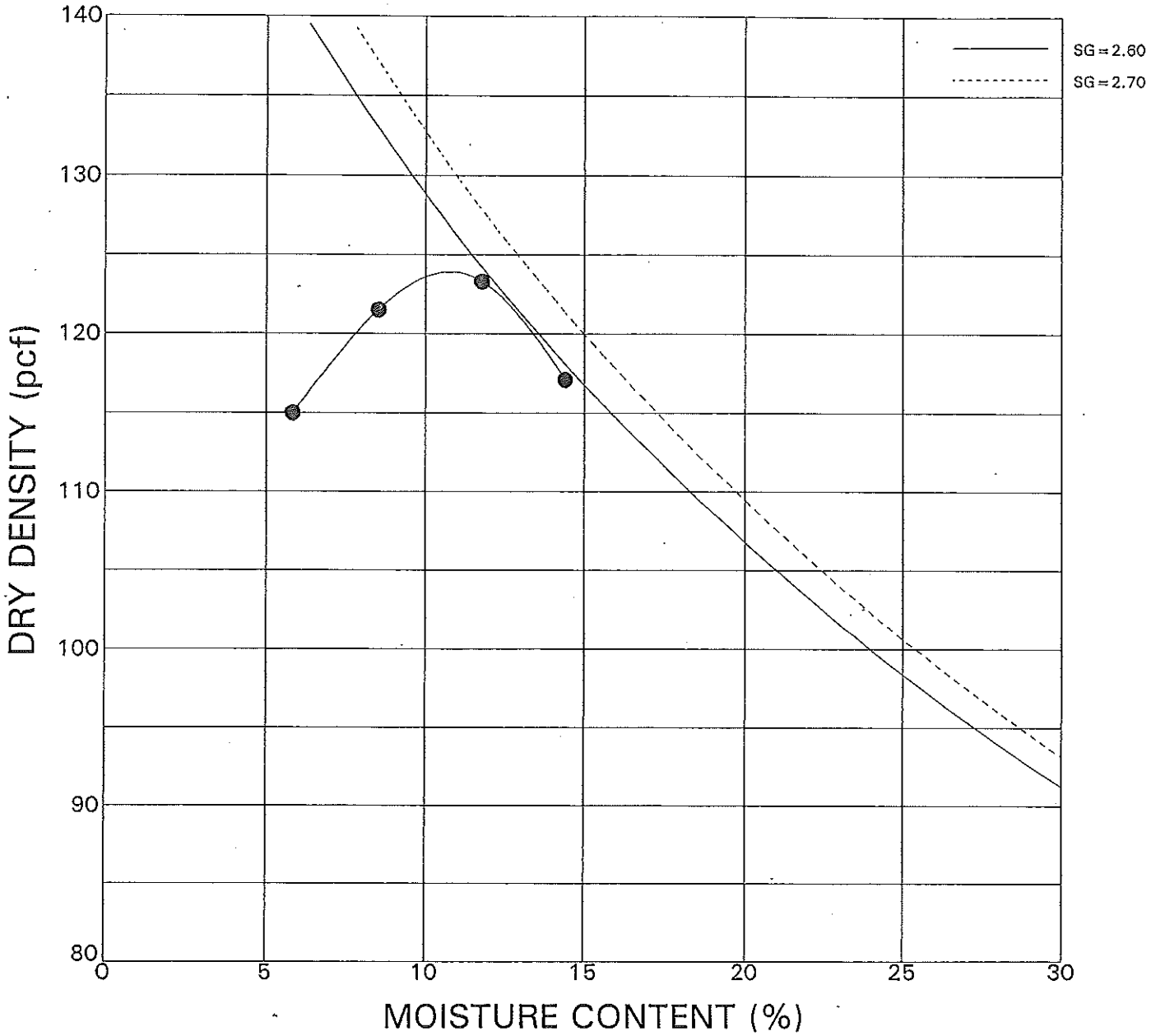
The tests are single shear tests and are performed using a sample diameter of 2.625 inches and a height of 1.00 inch. The normal load is applied by a loaded lever arm. A constant rate of strain is applied to the upper one-half of the sample until failure occurs. Shear stress is monitored by a load cell and deflection is measured with a strain-pickup (lineal potentiometer). This data was transferred electronically to an X-Y recorder and plotted automatically. The results of these tests are shown on Plates B-4.1 through B-4.12 -- Shear Test Data.

Consolidation Tests

The one-dimensional properties of "undisturbed" samples of the alluvial terrace deposits were evaluated according to the provisions of ASTM Test Method D 2435. Sample diameter was 2.625 inches and sample height was 1.00 inch. Water was added during the test to produce saturation and to evaluate the potential for hydro-collapse. Consolidation readings were taken regularly during each load increment until the change in sample height was less than 0.0001 inch over a two-hour period. The graphic presentation of consolidation data is a representation of volume change in change in axial load. As a result, both expansion and consolidation are illustrated. The results of the consolidation load tests are summarized on Plates B-5.1 through B-5.7 -- Consolidation Test Data.

Chemical Tests

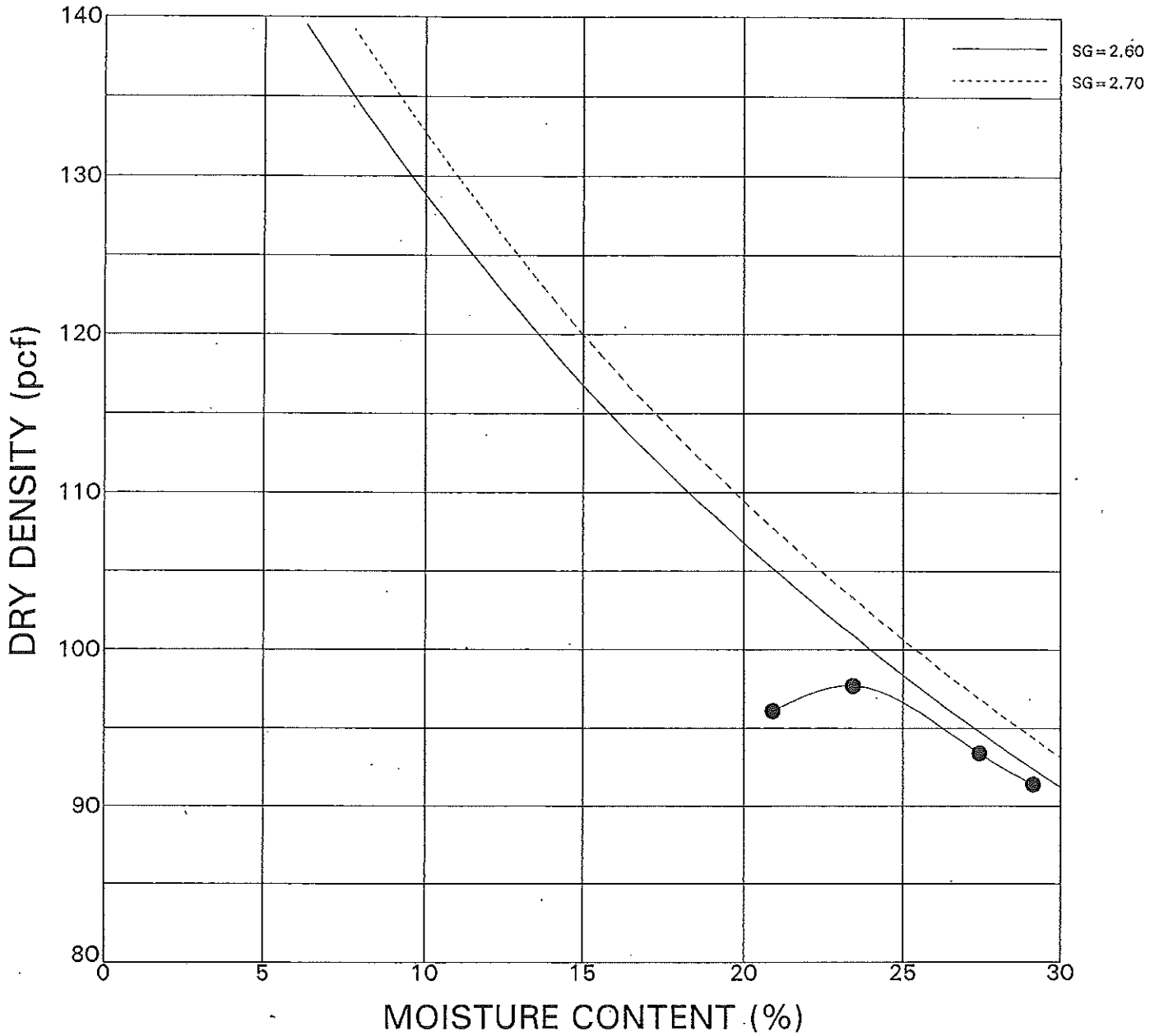
The corrosion potential of typical on-site materials under long-term contact with both metal and concrete was determined by chemical and electrical resistance tests. The soluble sulfate tests for potential concrete corrosion were performed in accordance with California Test Method 417. The minimum resistivity tests for potential metal corrosion were performed in accordance with California Test Method 632 and the concentration of soluble chlorides was determined by California Test Method 422. These tests were performed by Anaheim Test Labs. The results are summarized on Plate B-6 - Table 1.



SAMPLE LOCATION	SOURCE	MAXIMUM DRY DENSITY, pcf	OPTIMIUM MOISTURE CONTENT %
● GB 3 @ 8.0'	Qtm	124	11

COMPACTION TEST DATA

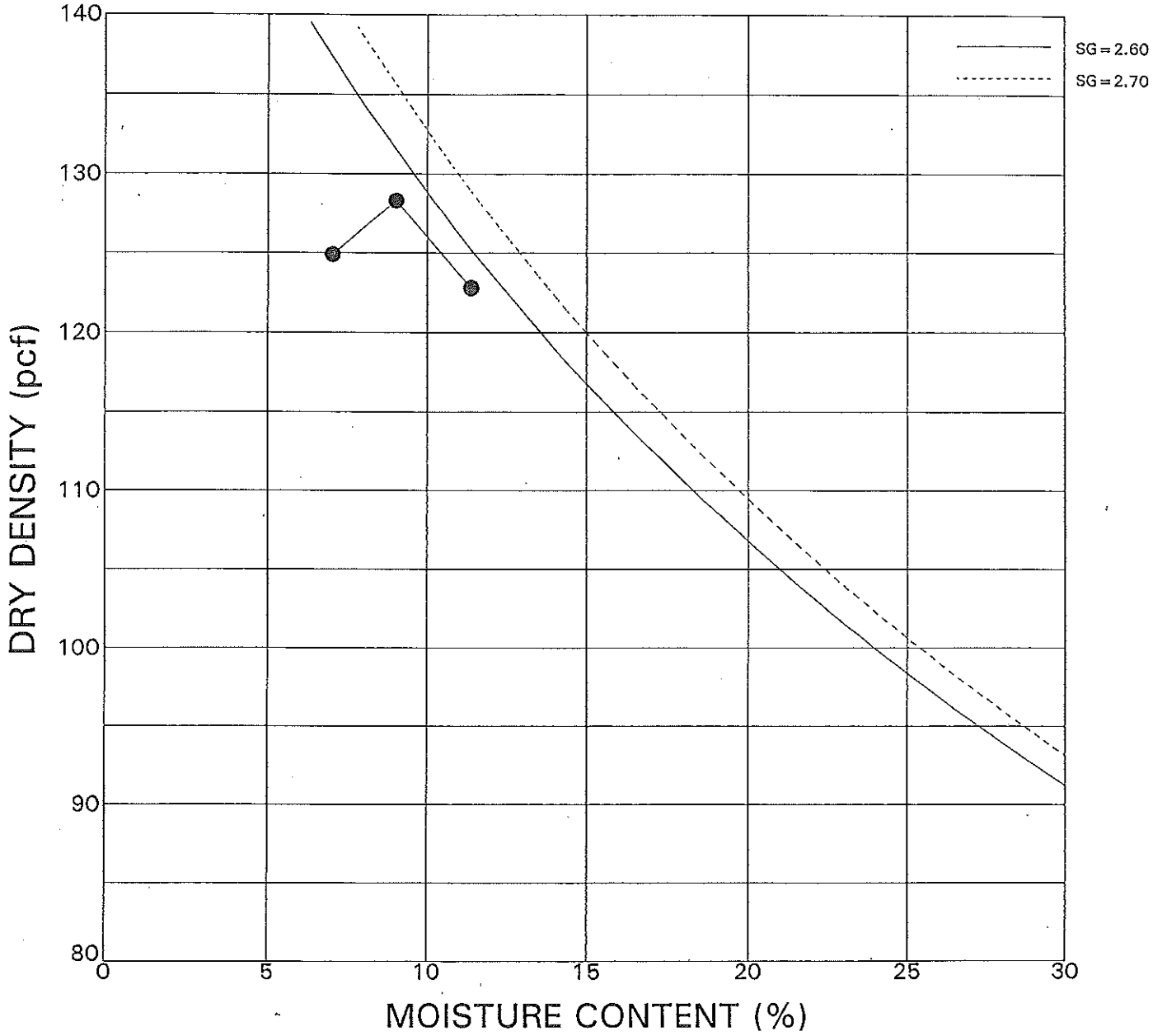
ASTM D1557-91 METHOD B



SAMPLE LOCATION	SOURCE	MAXIMUM DRY DENSITY, pcf	OPTIMIUM MOISTURE CONTENT %
● GB 5 @ 5.0'	Qafu	98	23

COMPACTION TEST DATA

ASTM D1557-91 METHOD B

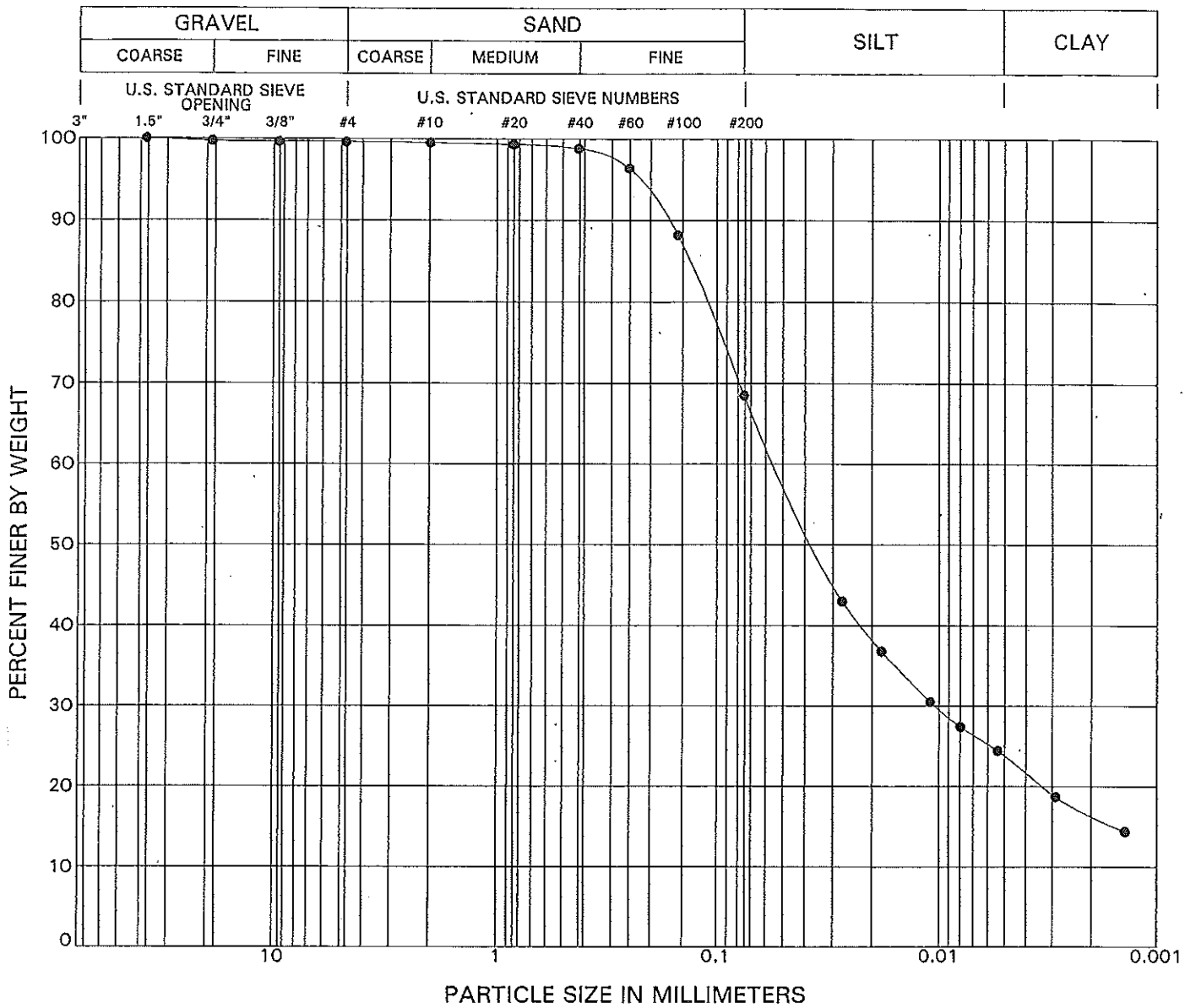


SAMPLE LOCATION	SOURCE	MAXIMUM DRY DENSITY, pcf	OPTIMIUM MOISTURE CONTENT %
● GB 10 @ 5.0'	Qtm	128	9

COMPACTION TEST DATA

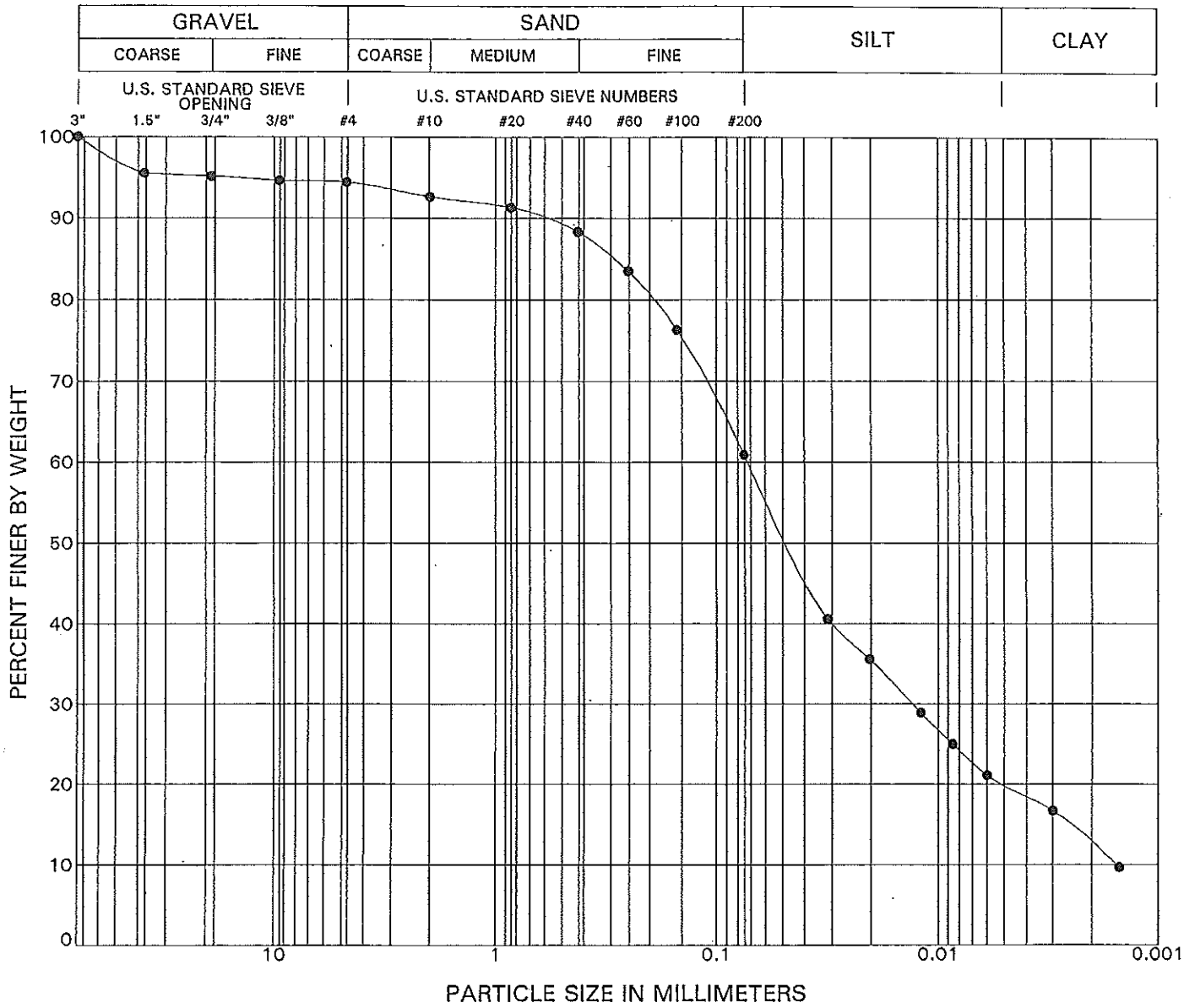
ASTM D1557-91 METHOD B

PROJECT 98-08 | Goffman, McCormick & Urban, Inc. | PLATE B-1.3



SAMPLE LOCATION	SOURCE	CLASSIFICATION
● GB 3 @ 8.0'	Qtm	SANDY LEAN CLAY(CL) low plasticity, fine

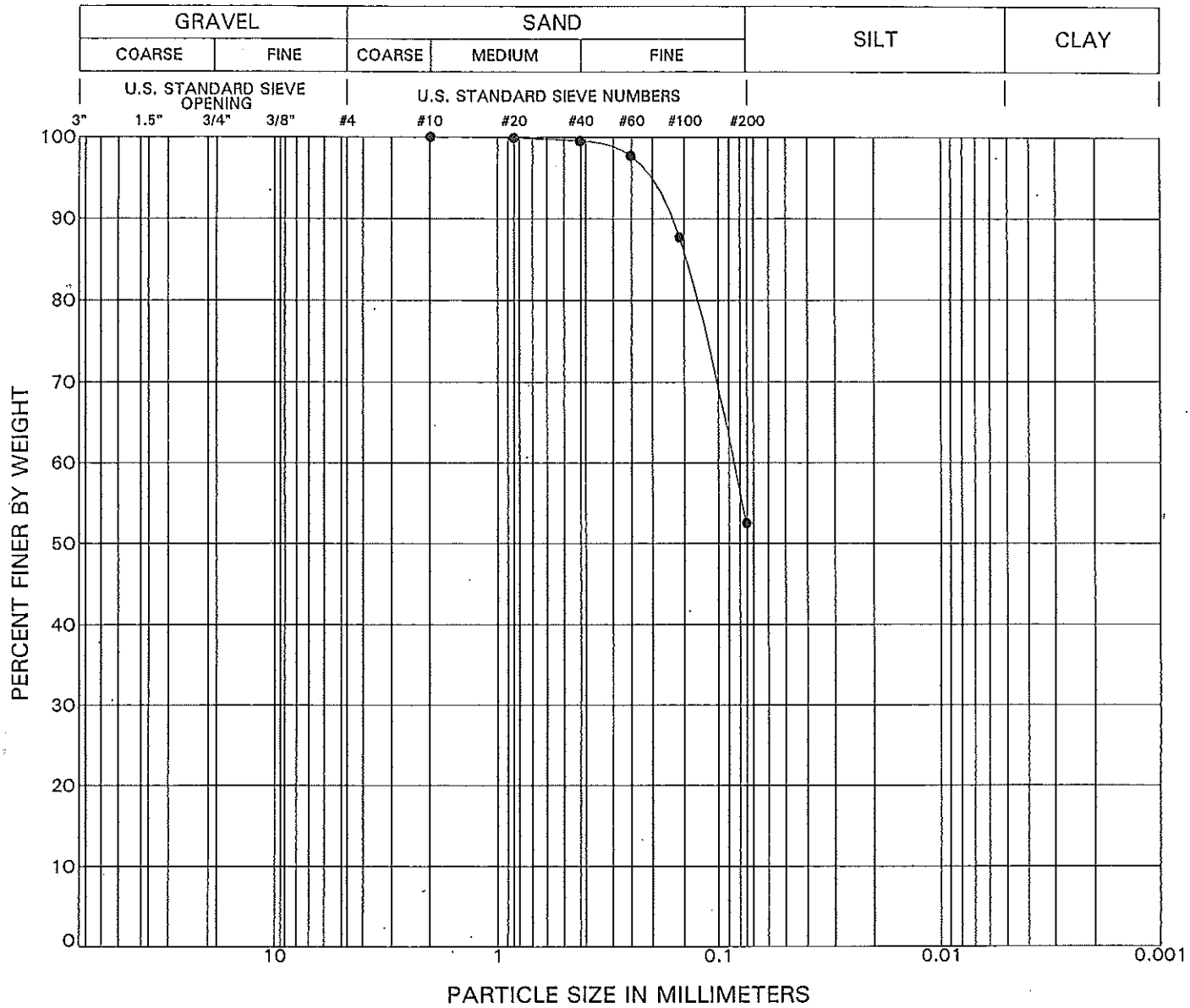
PARTICLE SIZE DISTRIBUTION



SAMPLE LOCATION	SOURCE	CLASSIFICATION
● GB 5 @ 5.0'	Qafu	SANDY LEAN CLAY(CL) moderate plasticity, fine

PARTICLE SIZE DISTRIBUTION

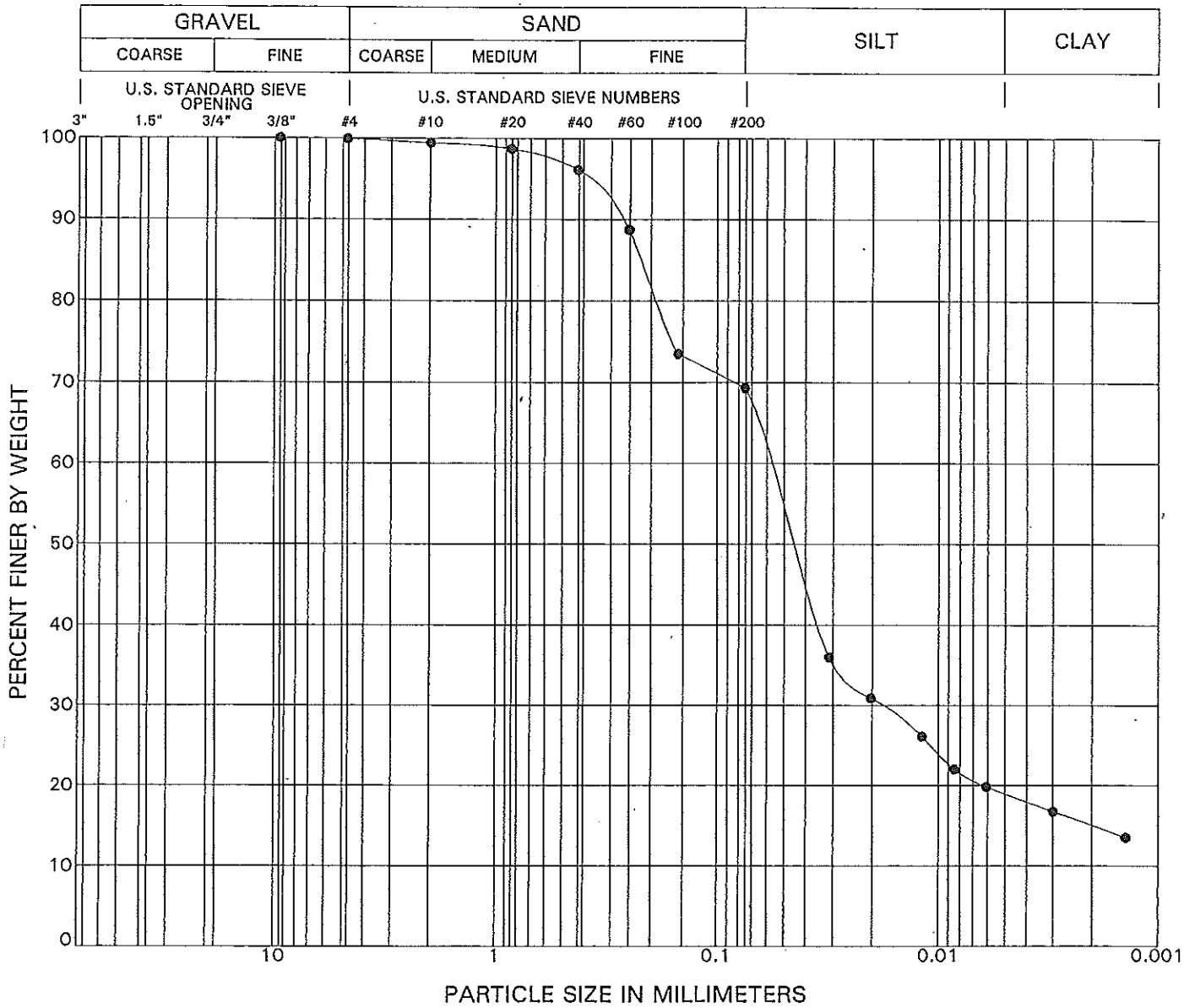
PROJECT 98-08 | Goffman, McCormick & Urban, Inc. | PLATE B-2.2



SAMPLE LOCATION	SOURCE	CLASSIFICATION
● GB 8 @ 10.0'	Qtm	**SANDY LEAN CLAY(CL)** **fine**

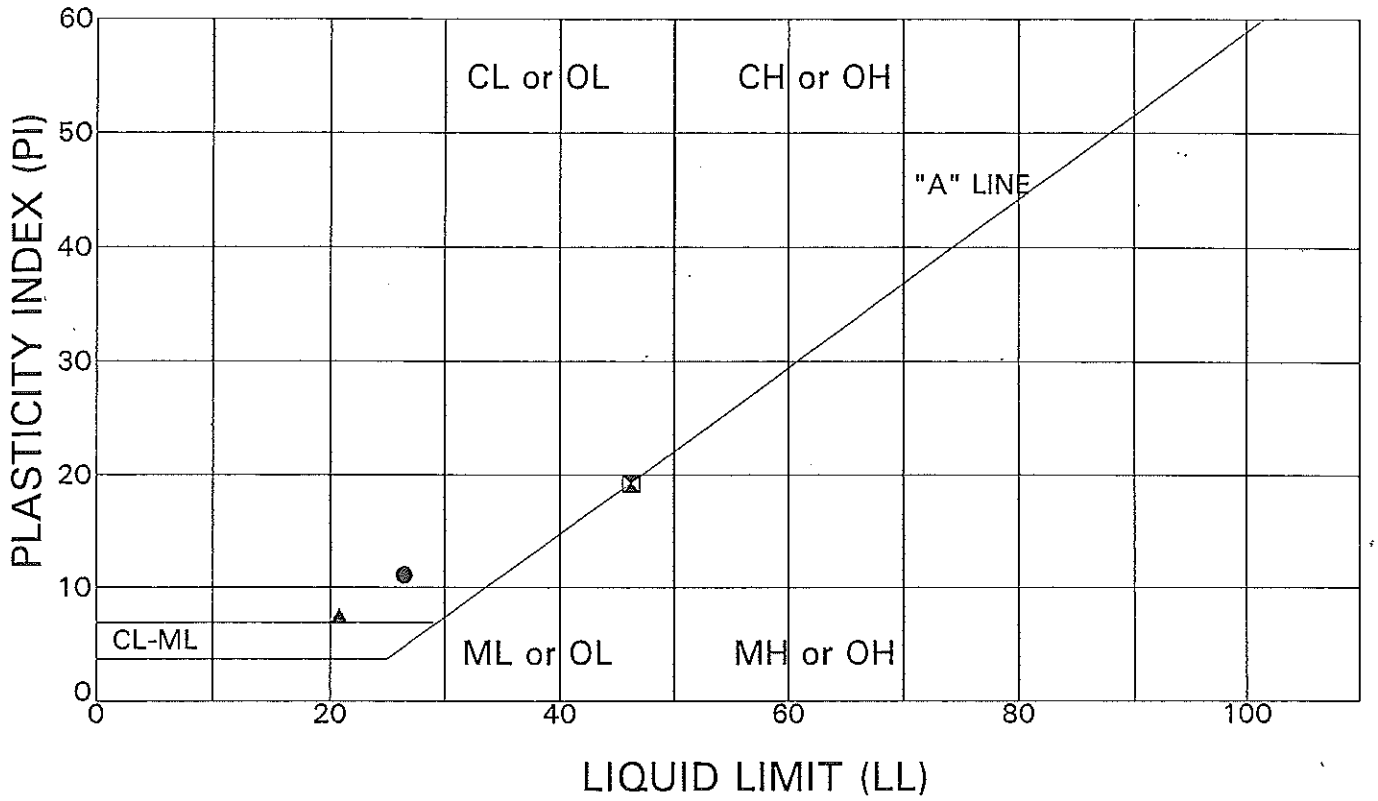
PARTICLE SIZE DISTRIBUTION

PROJECT 98-08 | Goffman, McCormick & Urban, Inc. | PLATE B-2.3



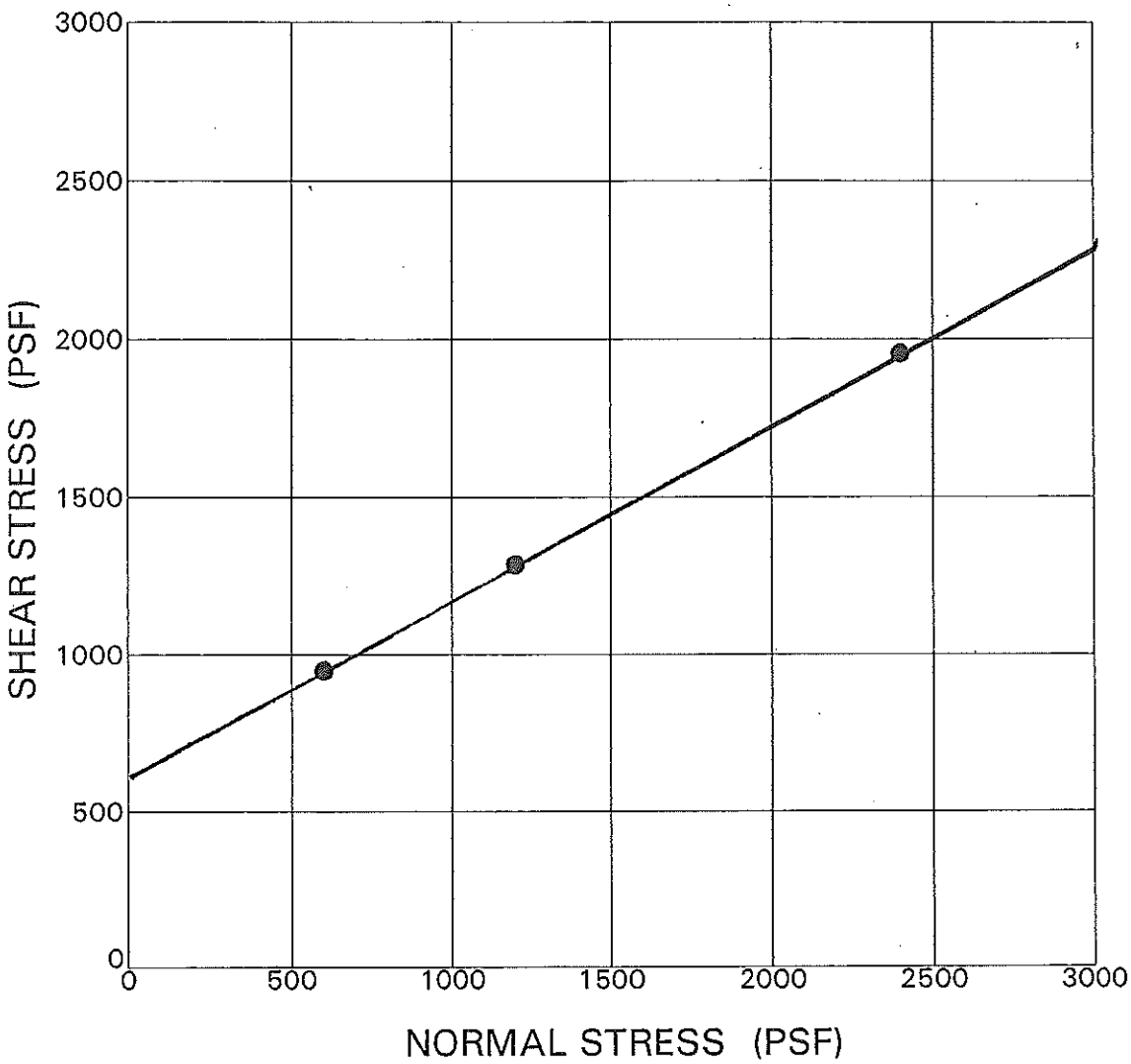
SAMPLE LOCATION	SOURCE	CLASSIFICATION
● GB 10 @ 5.0'	Qtm	SANDY LEAN CLAY(CL) low plasticity, fine

PARTICLE SIZE DISTRIBUTION



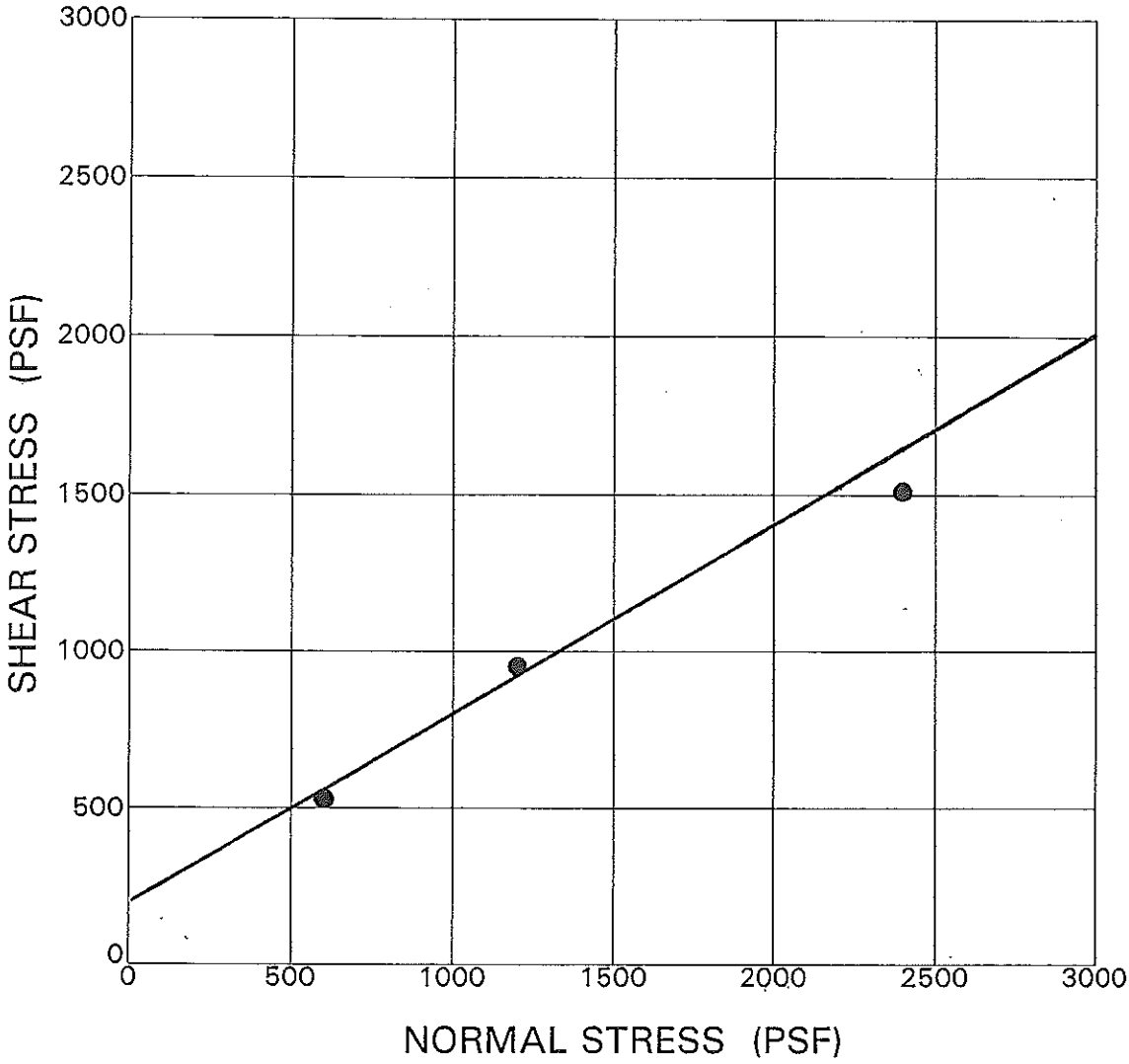
SAMPLE LOCATION	SOURCE	LL	PL	PI
● GB 3 @ 8.0'	Qtm	27	15	11
⊠ GB 5 @ 5.0'	Qafu	46	27	19
▲ GB 10 @ 5.0'	Qtm	21	13	8

ATTERBERG LIMITS



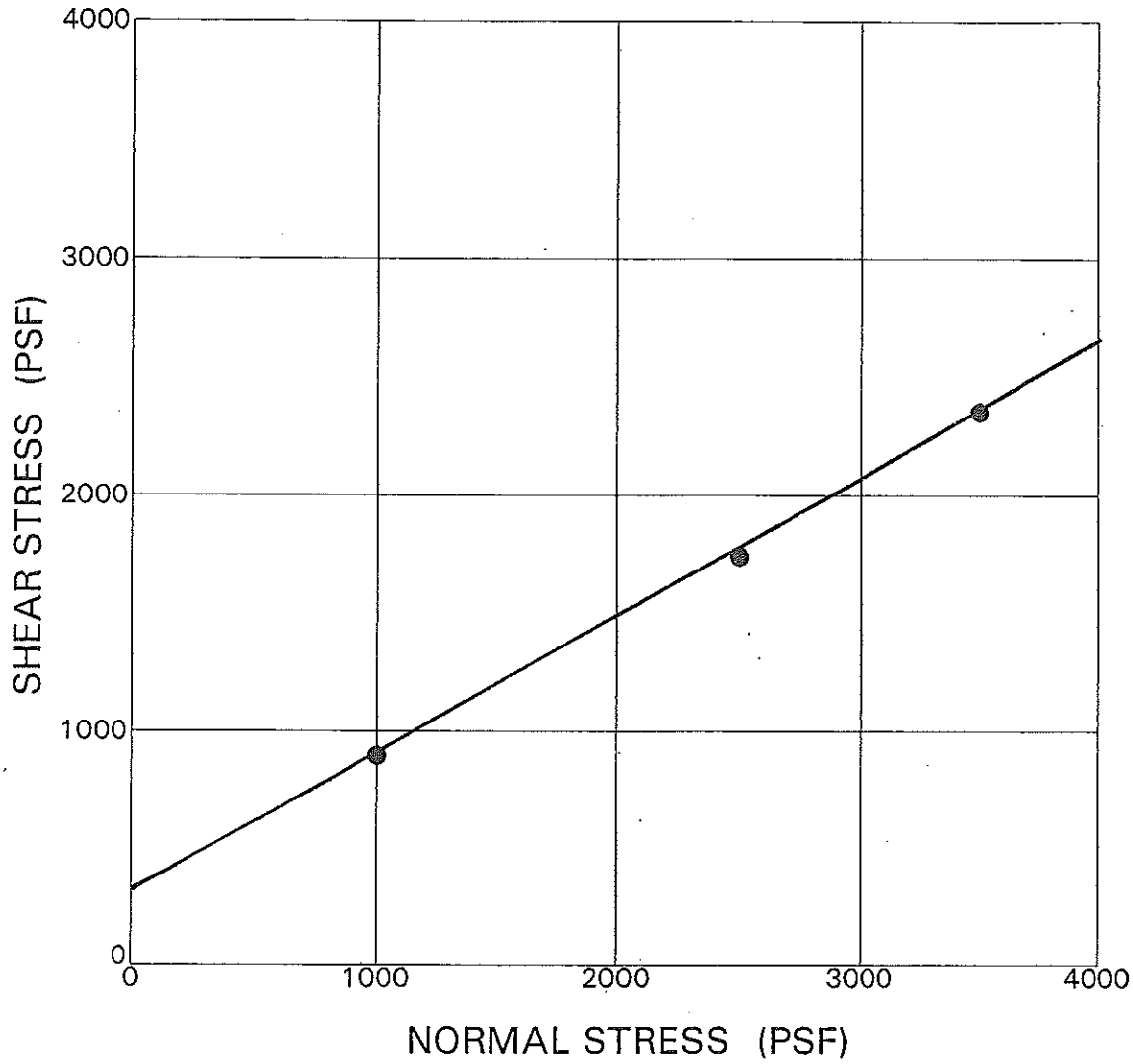
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 3 @ 5.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.005"/min., PEAK	
AVG.DRY DENSITY (PCF): 112	AVG.MOISTURE CONTENT (%): 15
AVG.SATURATION (%): 84	AVG.VOID RATIO:
COHESION (PSF): 600	FRICTION ANGLE (DEG): 29

SHEAR TEST DATA



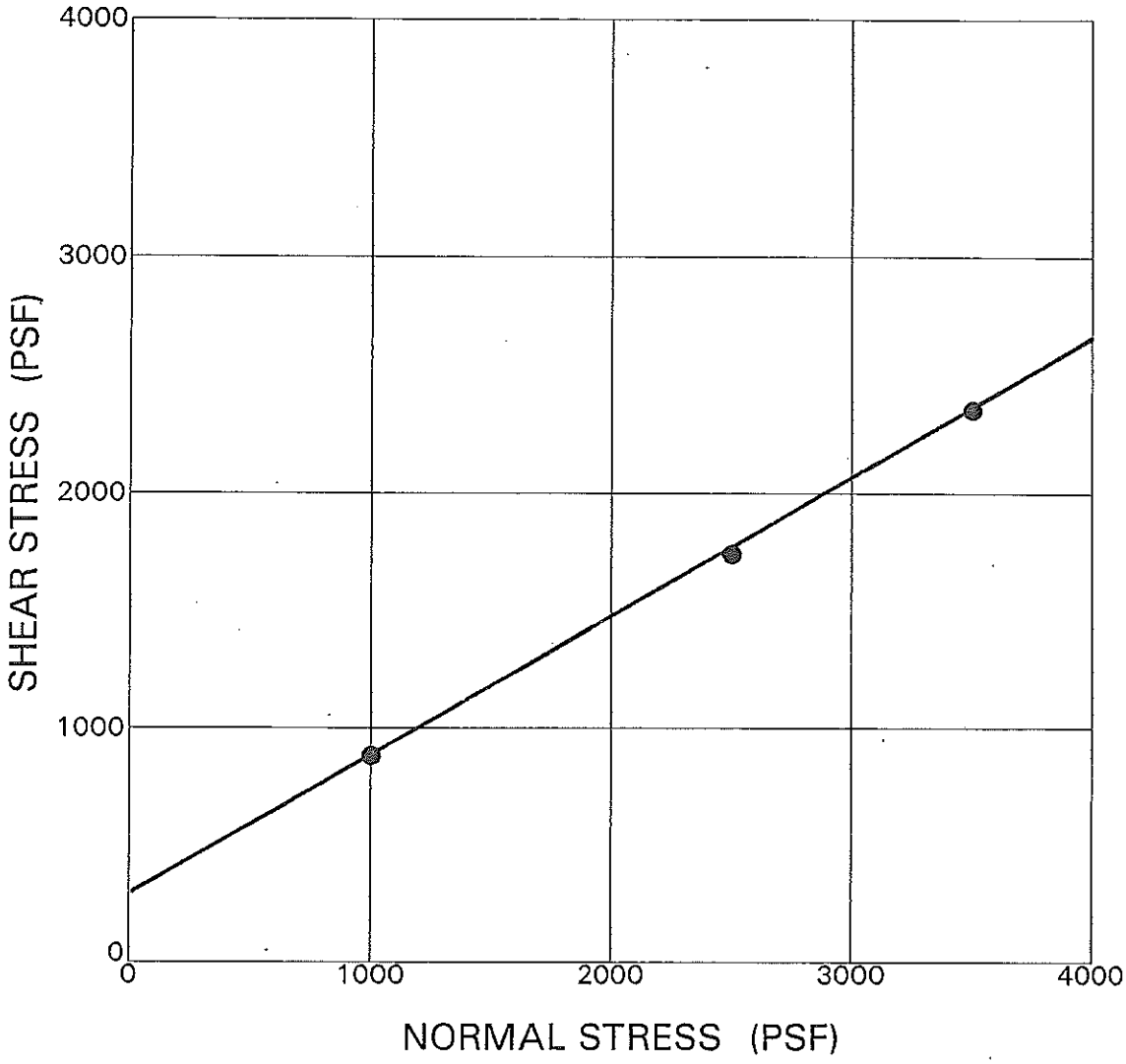
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 3 @ 5.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.005"/min., ULT.	
AVG.DRY DENSITY (PCF): 112	AVG.MOISTURE CONTENT (%): 15
AVG.SATURATION (%): 84	AVG.VOID RATIO:
COHESION (PSF): 200	FRICTION ANGLE (DEG): 30

SHEAR TEST DATA



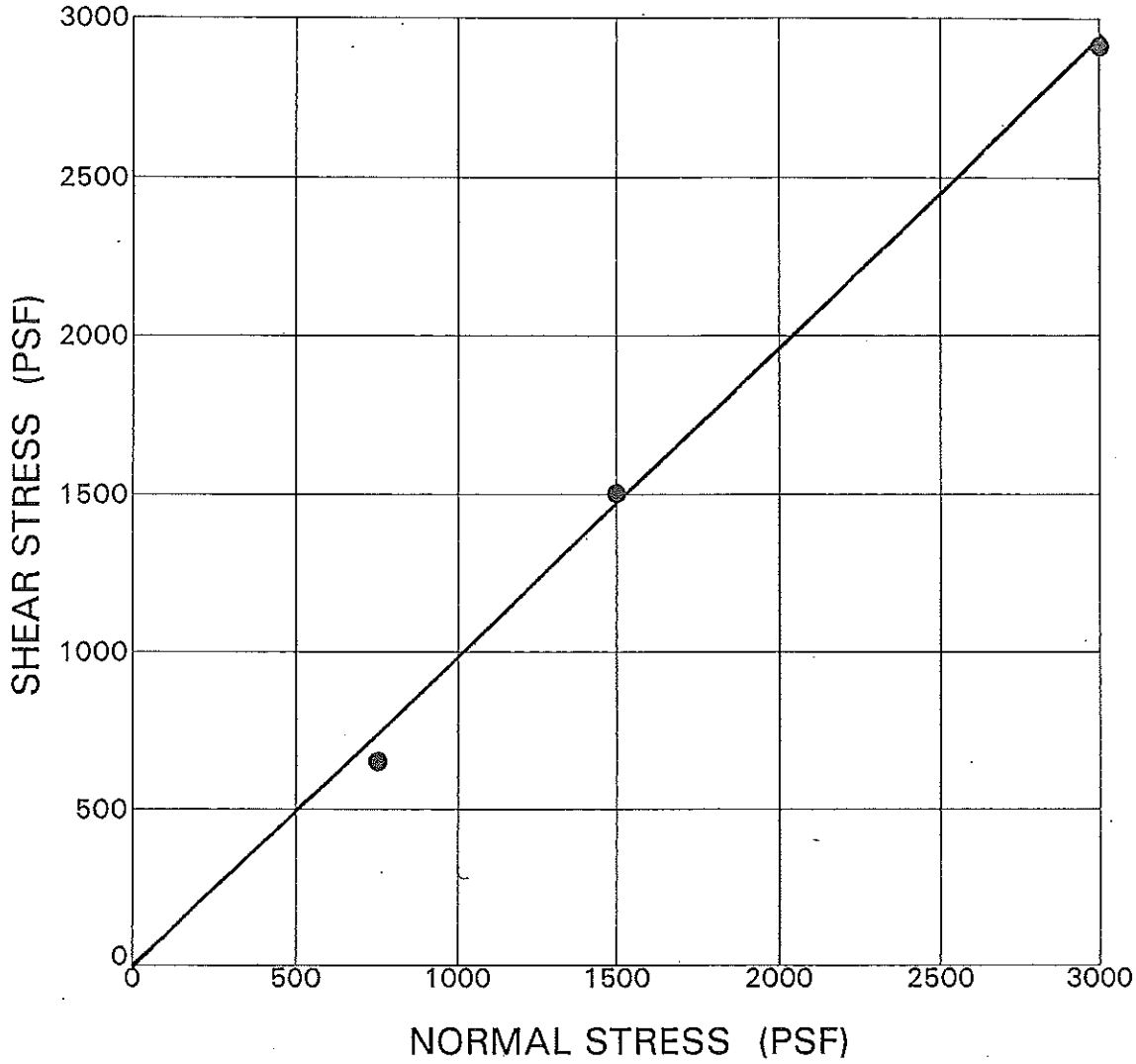
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 3 @ 8.0'	
SOURCE: Qtm (R)	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.005"/min. ULT.	
AVG.DRY DENSITY (PCF): 112	AVG.MOISTURE CONTENT (%): 13
AVG.SATURATION (%): 69	AVG.VOID RATIO:
COHESION (PSF): **300**	FRICTION ANGLE (DEG): **30**

SHEAR TEST DATA



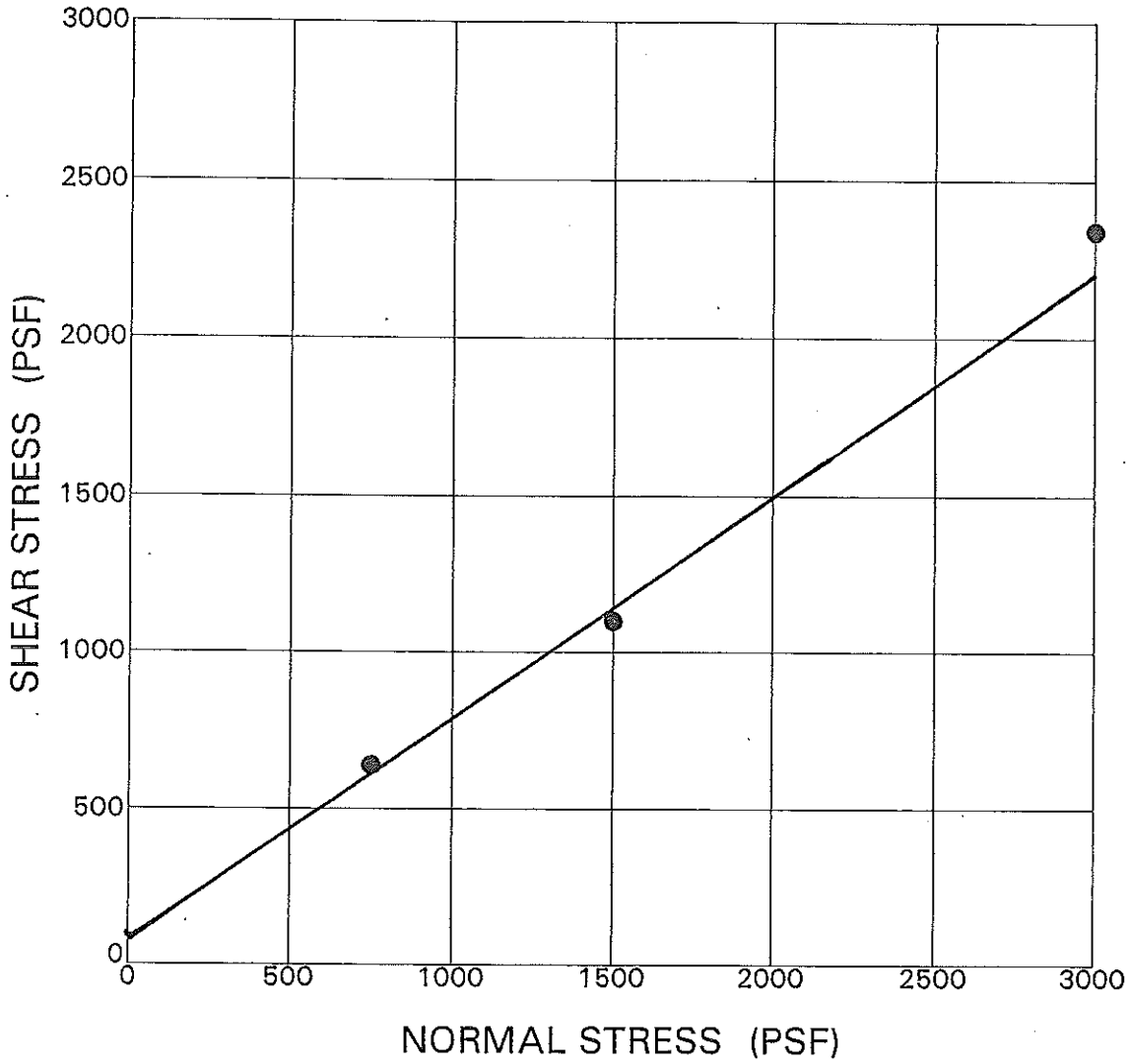
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 3 @ 8.0'	
SOURCE: Qtm **(R)**	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.005"/min. PEAK	
AVG.DRY DENSITY (PCF): 112	AVG.MOISTURE CONTENT (%): 13
AVG.SATURATION (%): 69	AVG.VOID RATIO:
COHESION (PSF): **300**	FRICTION ANGLE (DEG): **30**

SHEAR TEST DATA



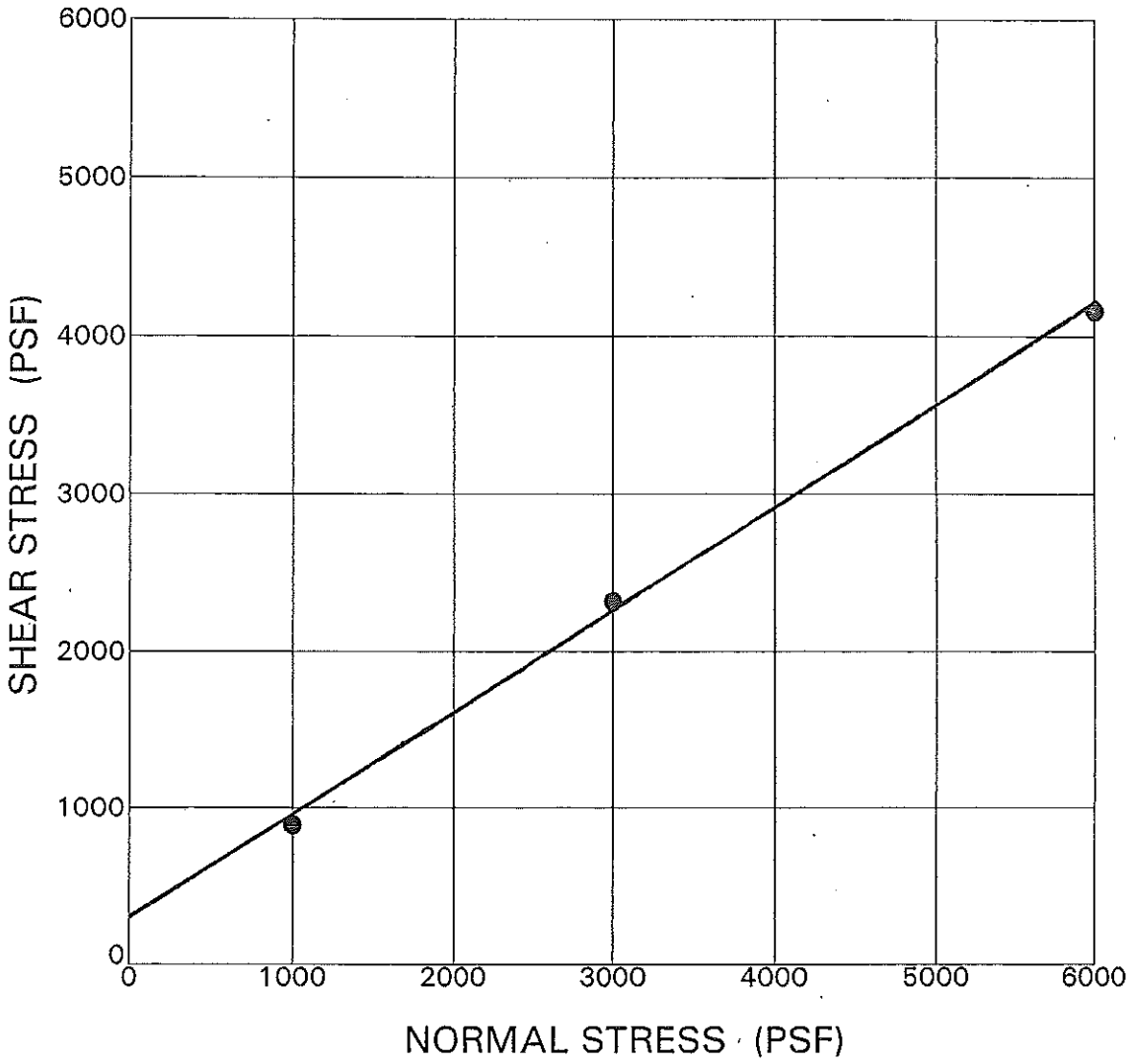
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 3 @ 15.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.01"/min. PEAK	
AVG.DRY DENSITY (PCF): 93	AVG.MOISTURE CONTENT (%): 3
AVG.SATURATION (%): 11	AVG.VOID RATIO:
COHESION (PSF): 0	FRICTION ANGLE (DEG): 44

SHEAR TEST DATA



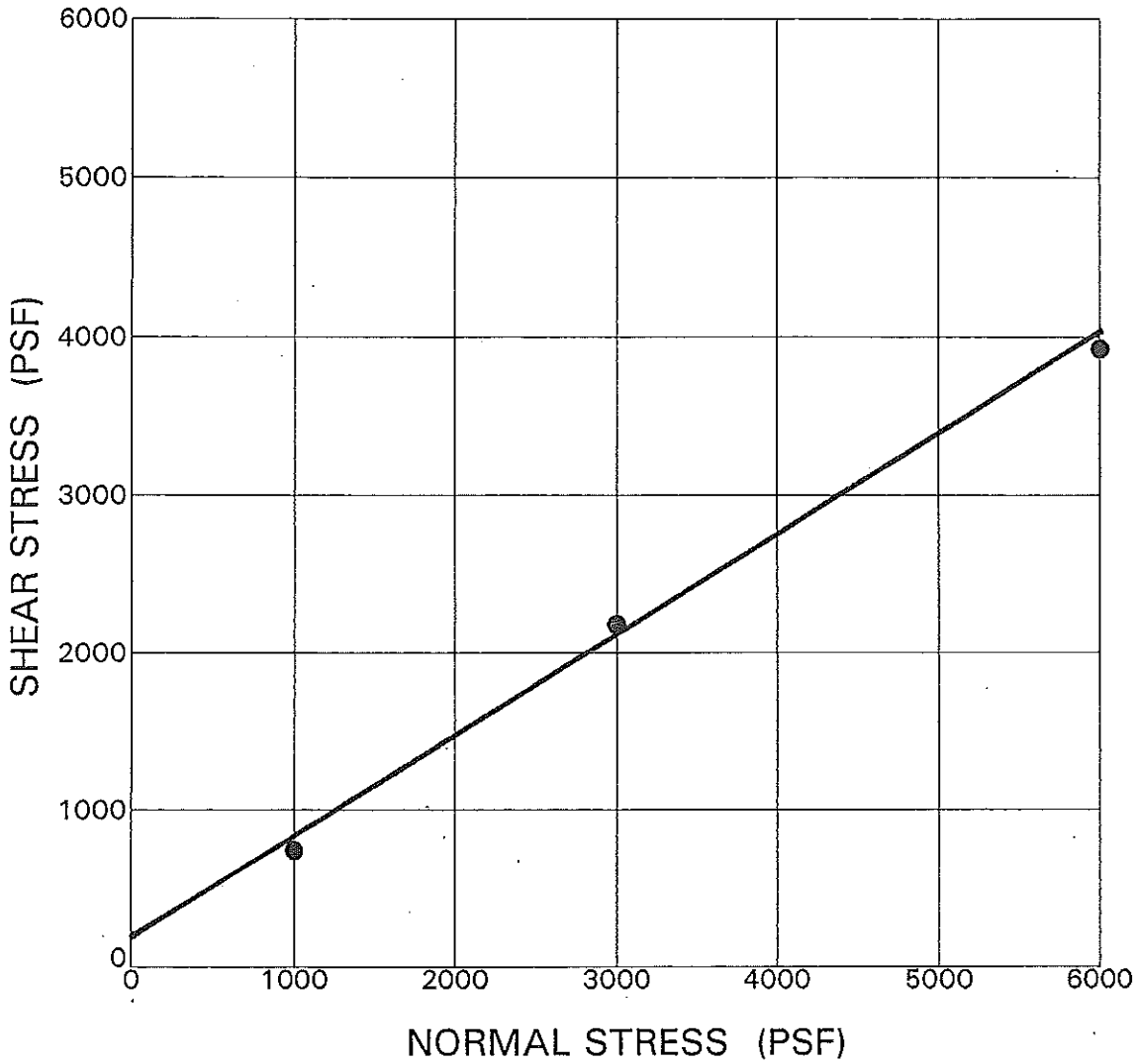
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 3 @ 15.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.01"/min. ULT.	
AVG.DRY DENSITY (PCF): 93	AVG.MOISTURE CONTENT (%): 3
AVG.SATURATION (%): 11	AVG.VOID RATIO:
COHESION (PSF): 50	FRICTION ANGLE (DEG): 35

SHEAR TEST DATA



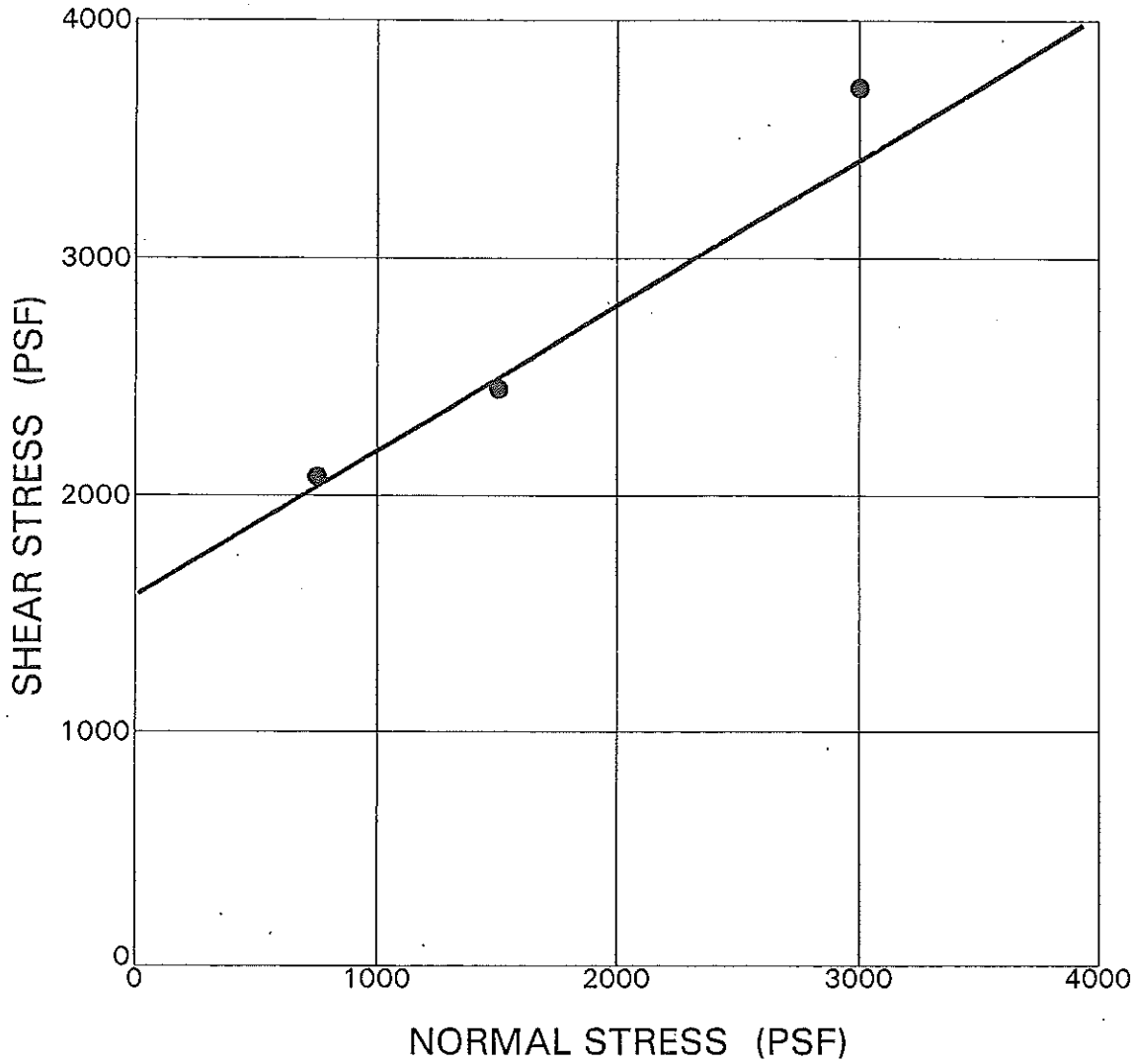
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 3 @ 35.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.01"/min. PEAK	
AVG.DRY DENSITY (PCF): 85	AVG.MOISTURE CONTENT (%): 4
AVG.SATURATION (%): 12	AVG.VOID RATIO:
COHESION (PSF): 150	FRICTION ANGLE (DEG): 32

SHEAR TEST DATA



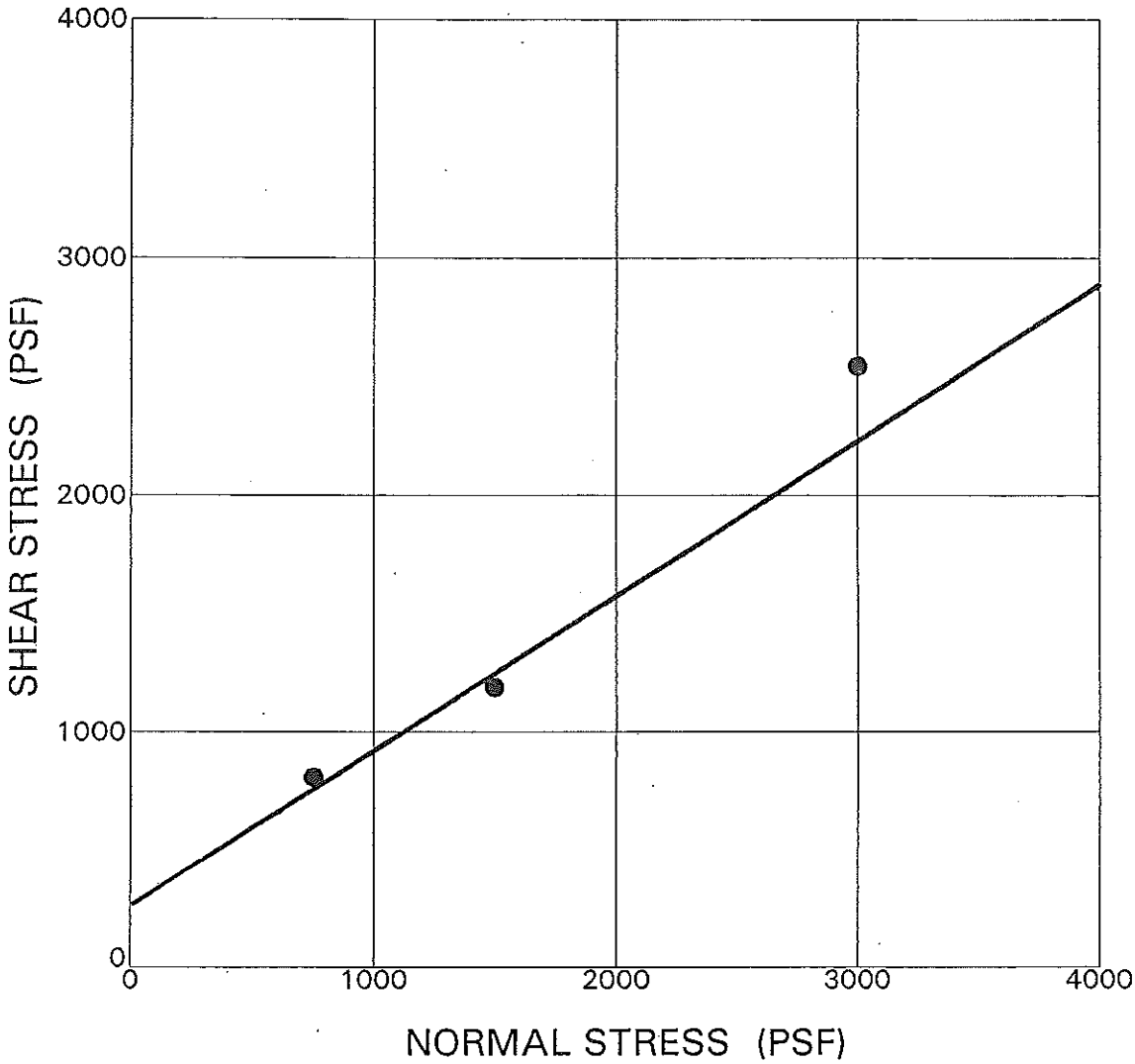
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 3 @ 35.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.01"/min. ULT.	
AVG.DRY DENSITY (PCF): 85	AVG.MOISTURE CONTENT (%): 4
AVG.SATURATION (%): 12	AVG.VOID RATIO:
COHESION (PSF): 100	FRICTION ANGLE (DEG): 32

SHEAR TEST DATA



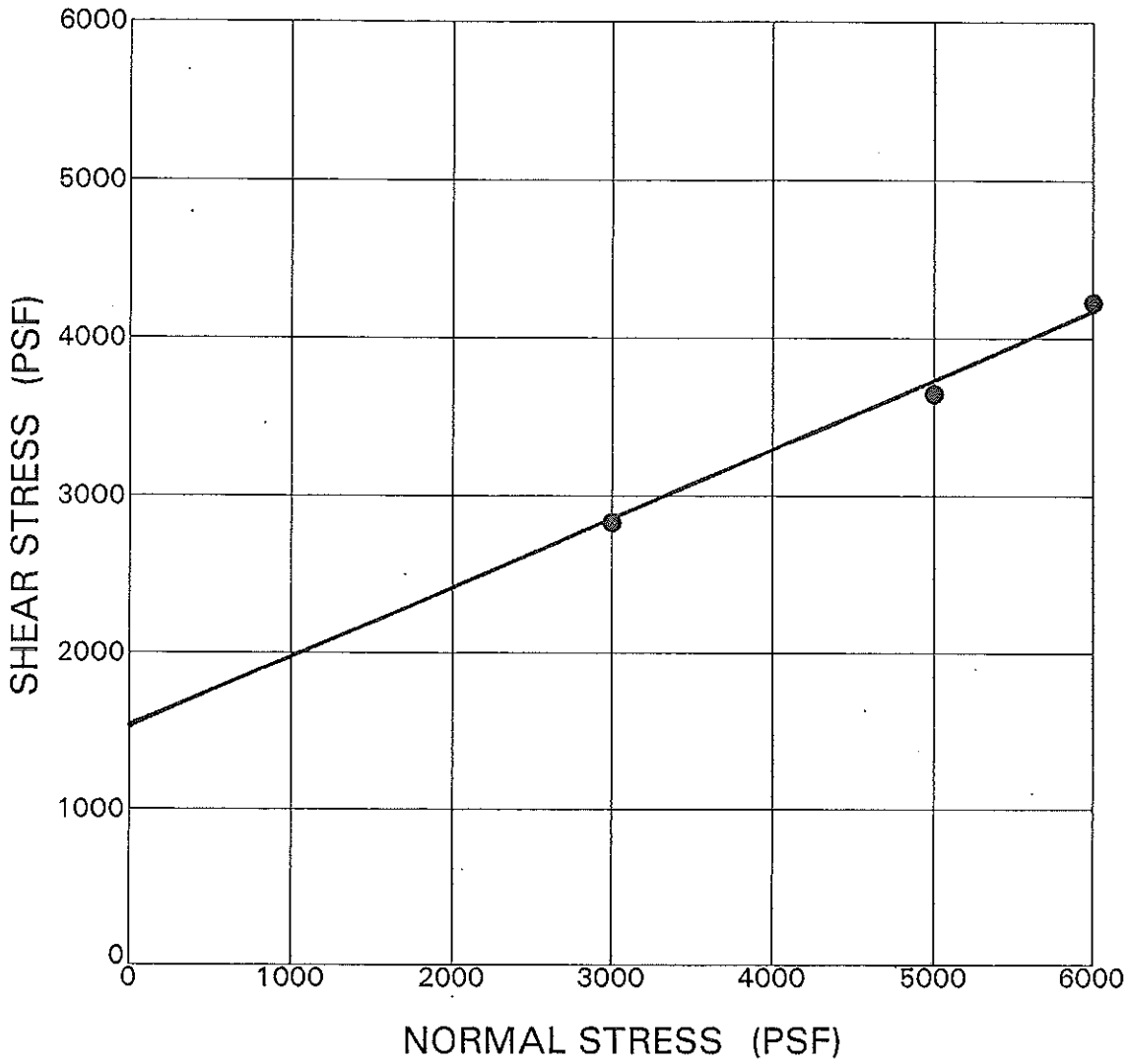
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 11 @ 5.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.005"/min. PEAK	
AVG.DRY DENSITY (PCF): 122	AVG.MOISTURE CONTENT (%): 12
AVG.SATURATION (%): 85	AVG.VOID RATIO:
COHESION (PSF): 1550	FRICTION ANGLE (DEG): 32

SHEAR TEST DATA



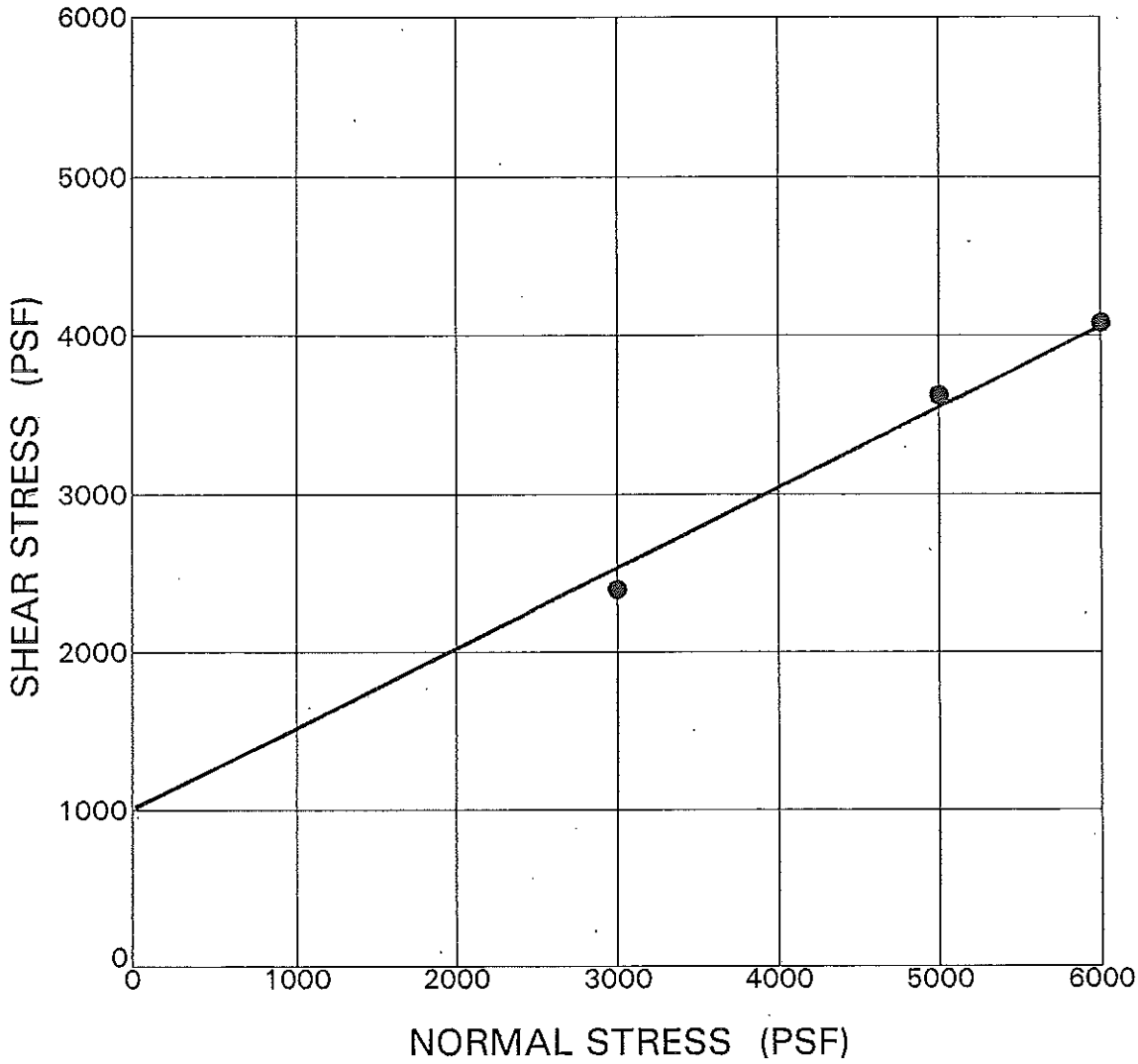
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 11 @ 5.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.005"/min. ULT.	
AVG.DRY DENSITY (PCF): 122	AVG.MOISTURE CONTENT (%): 12
AVG.SATURATION (%): 85	AVG.VOID RATIO:
COHESION (PSF): 250	FRICTION ANGLE (DEG): 32

SHEAR TEST DATA



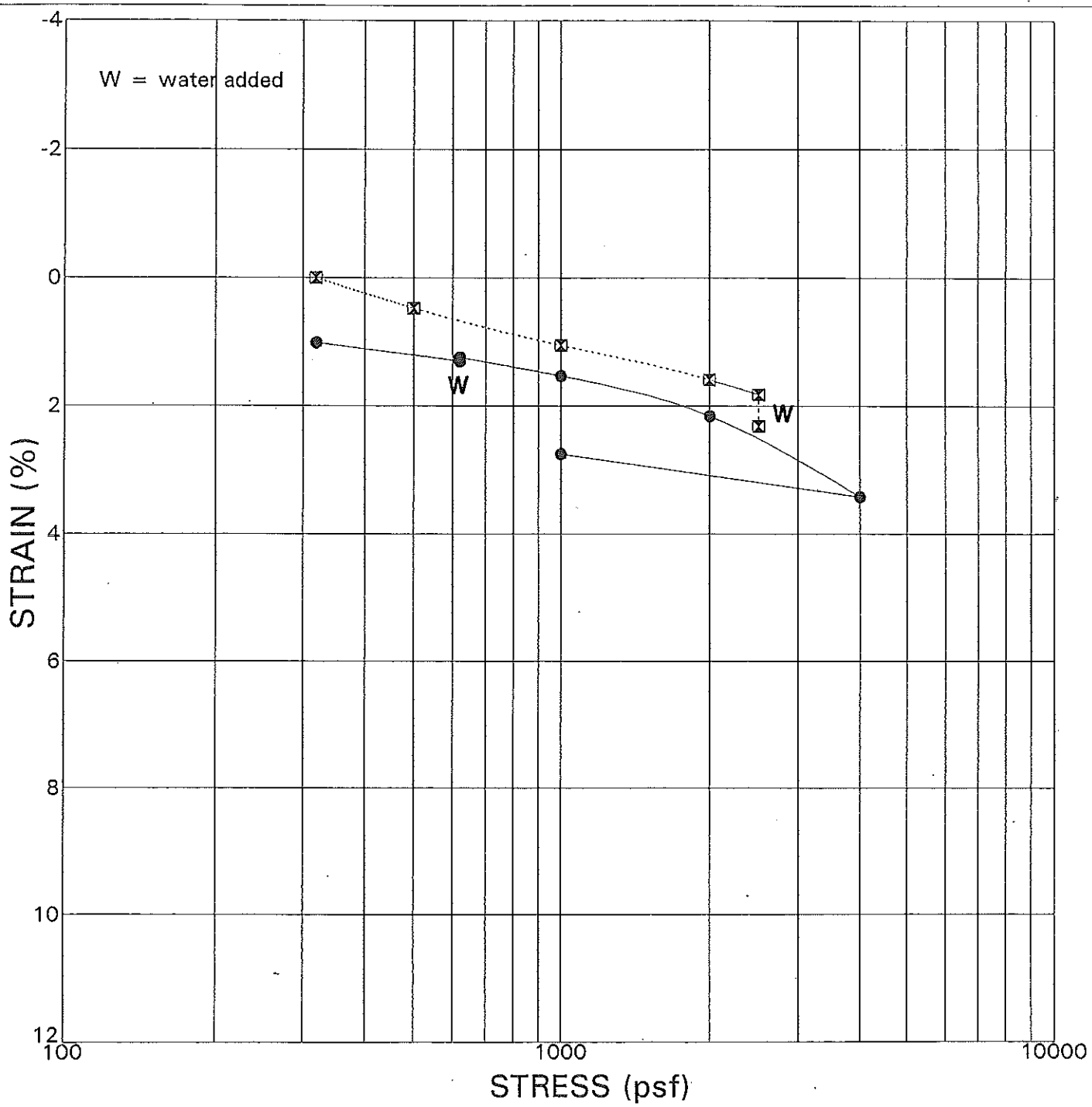
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 11 @ 40.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.01"/min. PEAK	
AVG.DRY DENSITY (PCF): 90	AVG.MOISTURE CONTENT (%): 3
AVG.SATURATION (%): 10	AVG.VOID RATIO:
COHESION (PSF): 1500	FRICTION ANGLE (DEG): 23

SHEAR TEST DATA



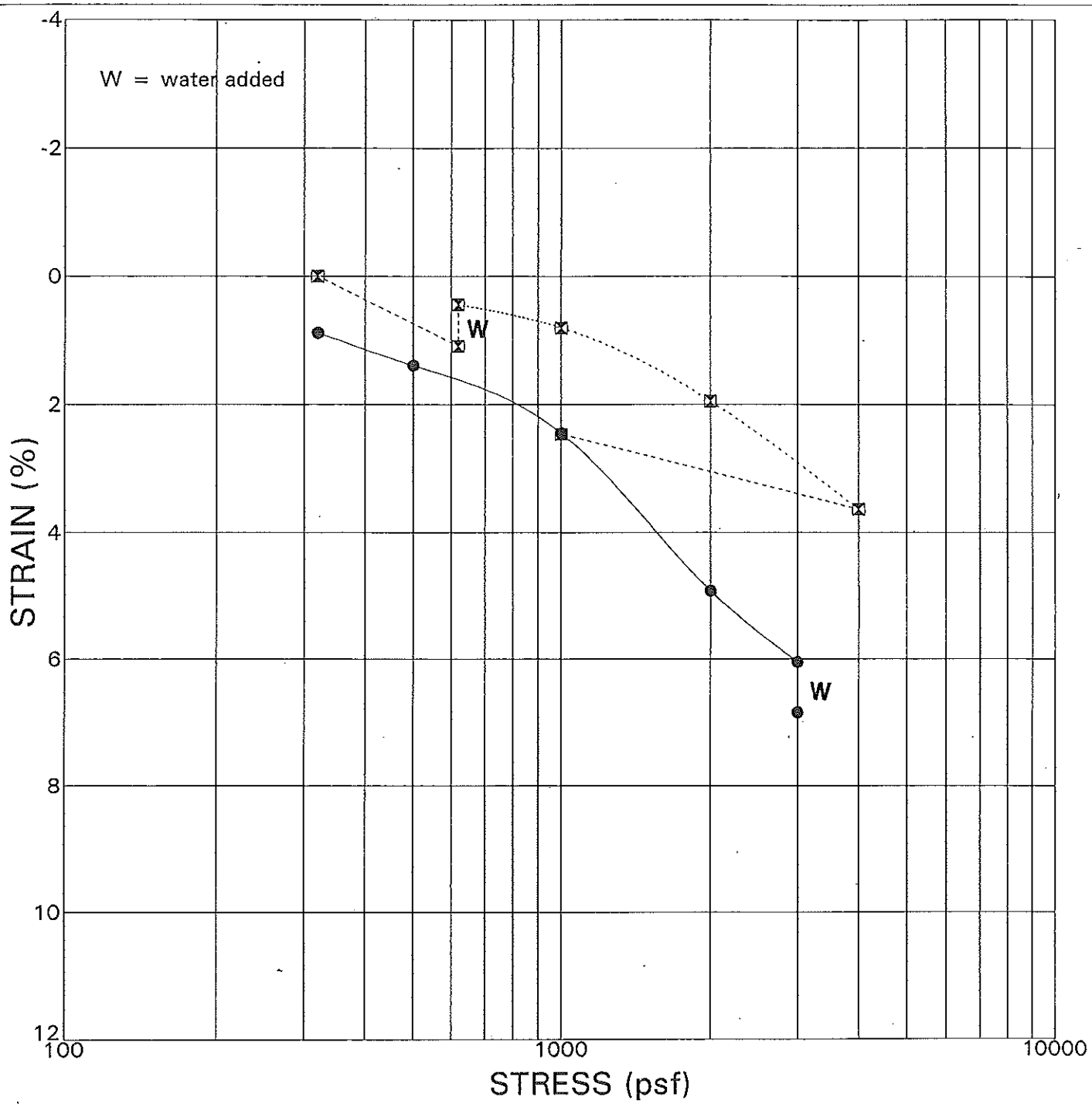
SAMPLE AND TEST DESCRIPTION	
SAMPLE LOCATION: GB 11 @ 40.0'	
SOURCE: Qtm	
TEST DESCRIPTION: DIRECT SHEAR, STRAIN RATE: 0.01"/min. ULT.	
AVG.DRY DENSITY (PCF): 90	AVG.MOISTURE CONTENT (%): 3
AVG.SATURATION (%): 10	AVG.VOID RATIO:
COHESION (PSF): 1000	FRICTION ANGLE (DEG): 26

SHEAR TEST DATA



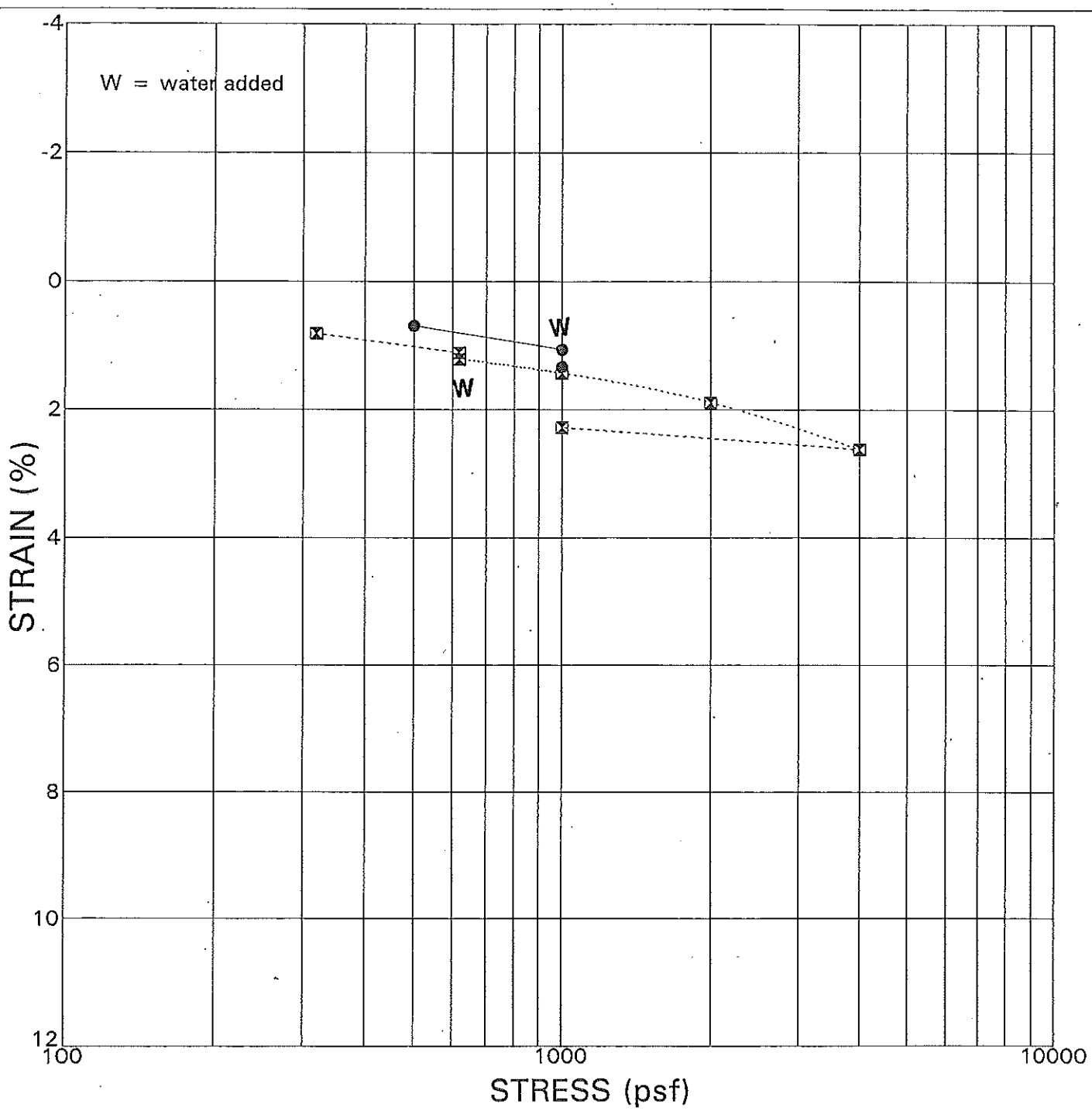
SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
● GB 3 @ 5.0'	Qtm	0.4550	14	114	
⊠ GB 3 @ 20.0'	Qtm	0.4068	11	118	

CONSOLIDATION TEST DATA



SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
● GB 3 @ 35.0'	Qtm	1.0941	5	79	
⊠ GB 4 @ 5.0'	Qtm	0.6046	18	103	

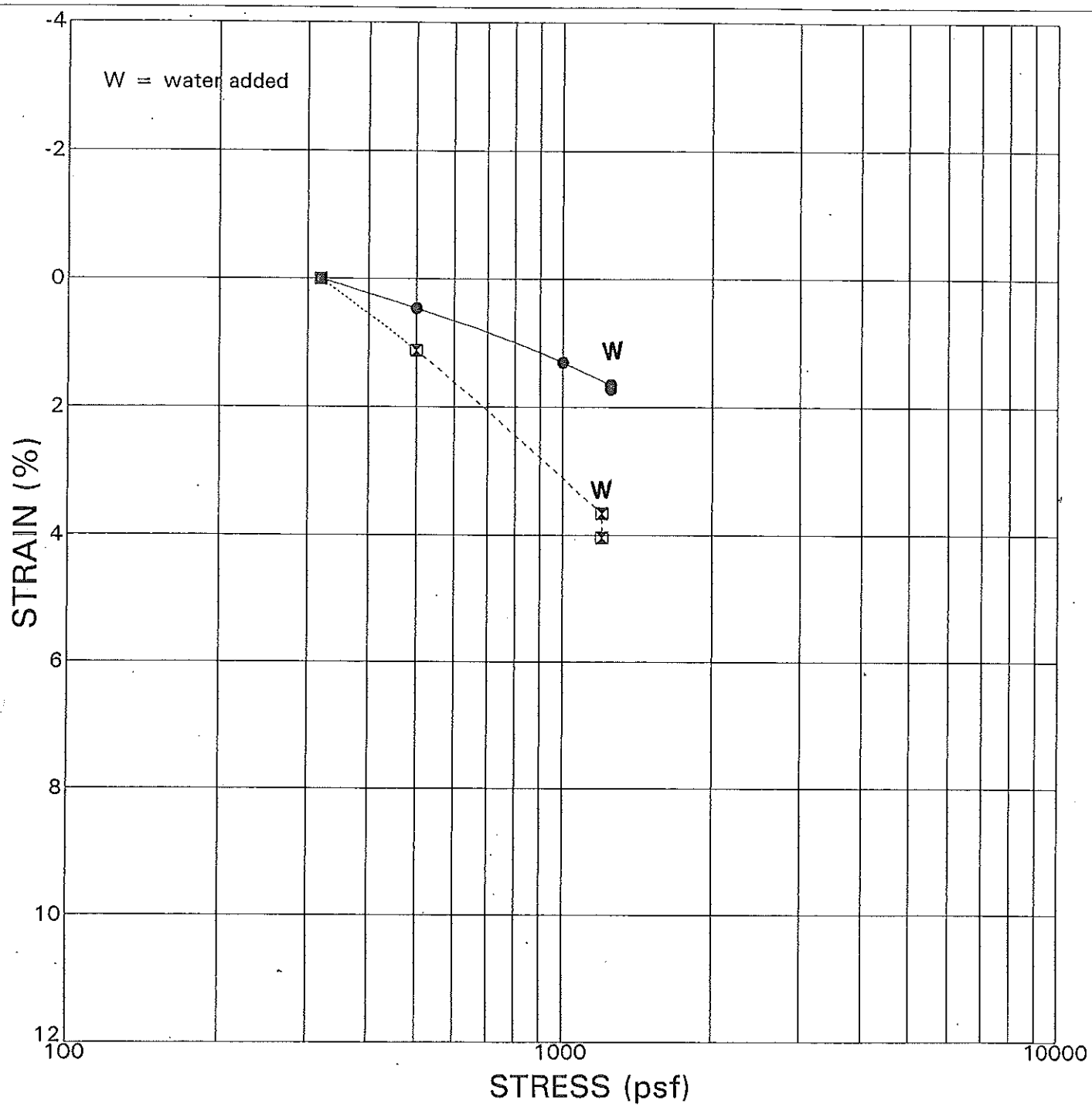
CONSOLIDATION TEST DATA



SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
● GB 4 @ 10.0'	Qtm	0.4550	9	114	
⊠ GB 5 @ 5.0'	Qafu	0.4692	13	113	

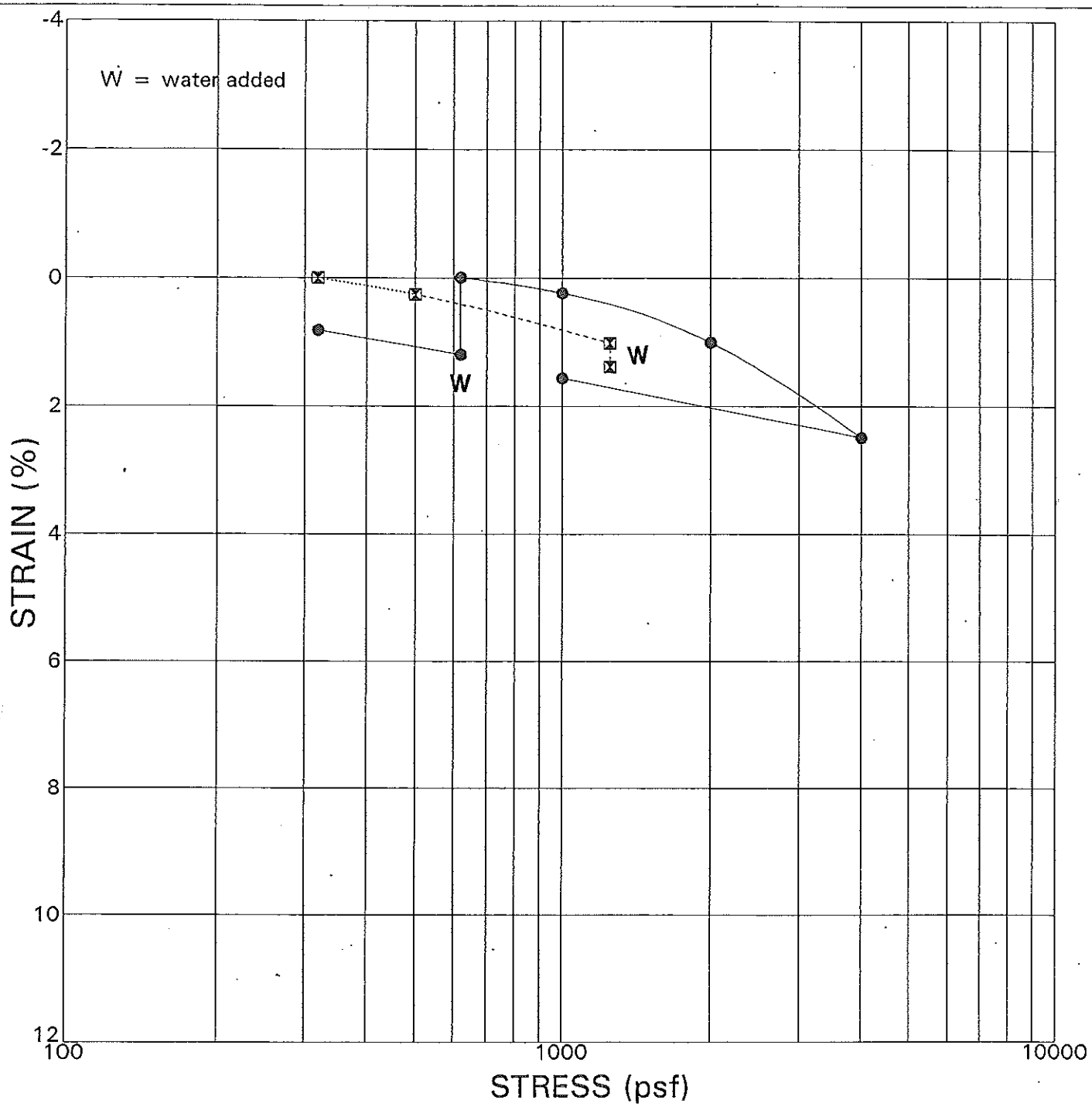
CONSOLIDATION TEST DATA

PROJECT 98-08 | Goffman, McCormick & Urban, Inc. | PLATE B-5.3



SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
● GB 5 @ 10.0'	Qtm	0.5505	19	107	
⊠ GB 7 @ 10.0'	Qtm	0.7562	24	94	

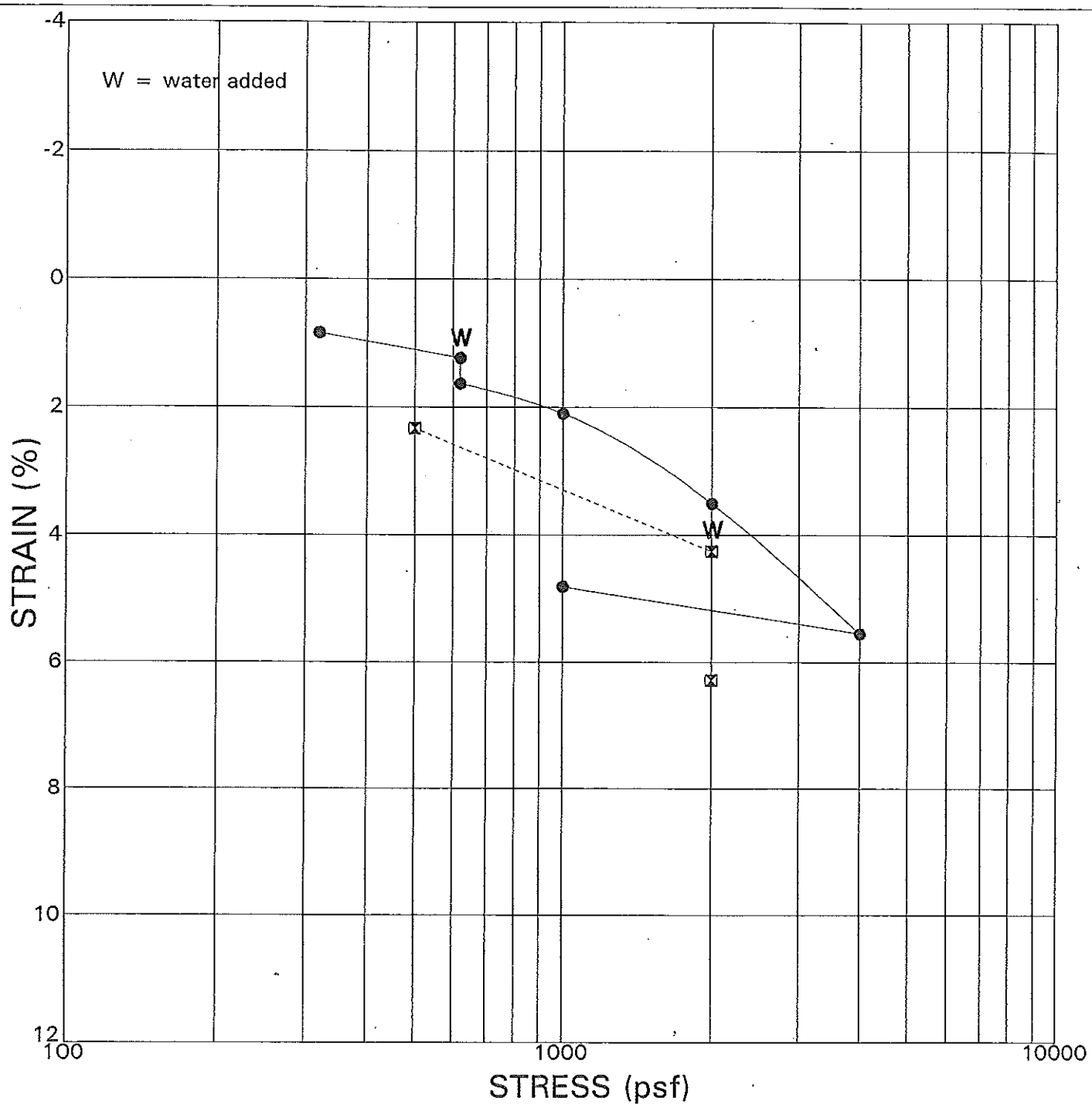
CONSOLIDATION TEST DATA



SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
● GB 8 @ 5.0'	Qtm	0.4958	14	111	
⊠ GB 8 @ 10.0'	Qtm	0.6711	14	99	

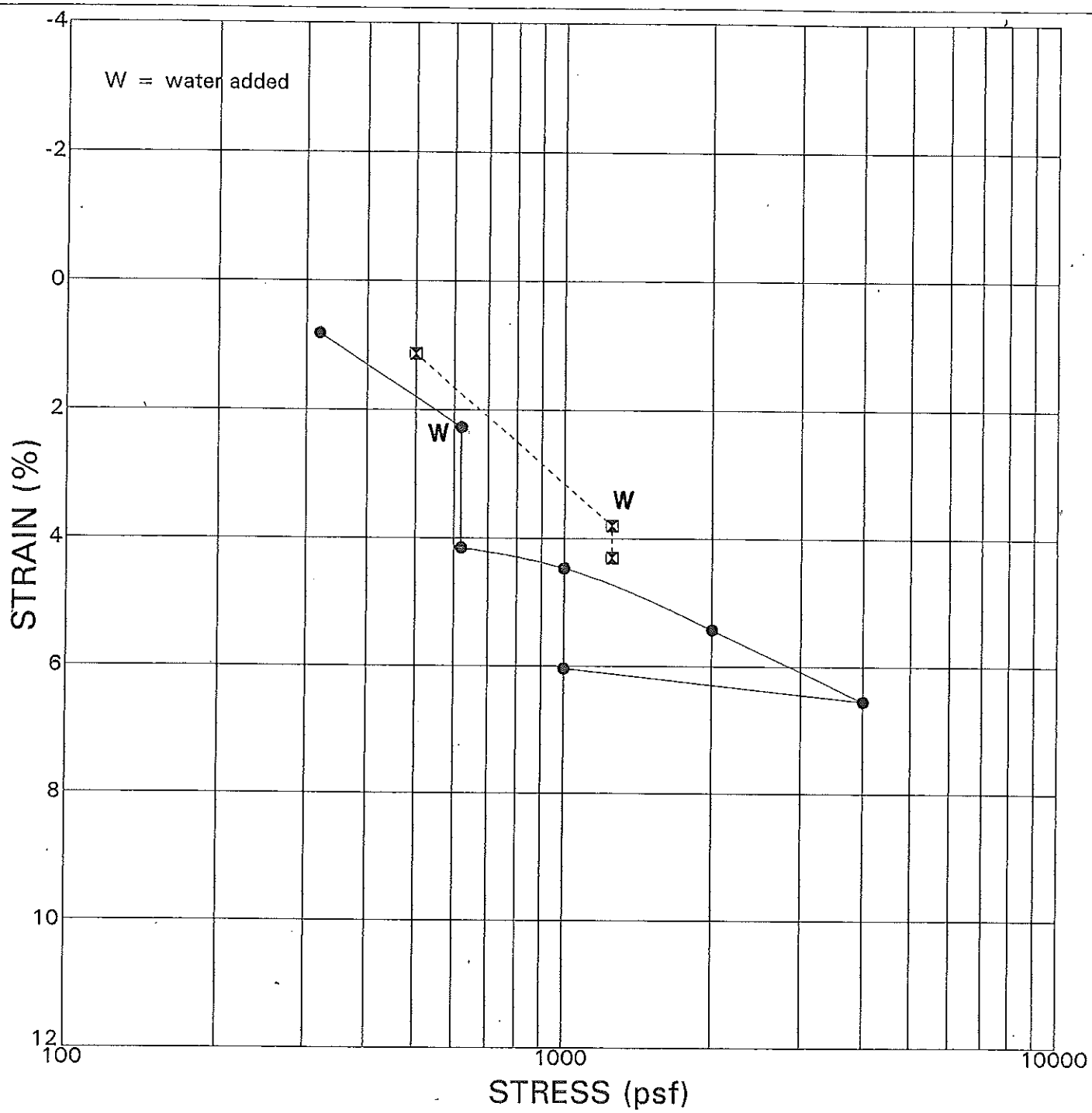
CONSOLIDATION TEST DATA

PROJECT 98-08 | Goffman, McCormick & Urban, Inc. | PLATE B-5.5



SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
● GB 9 @ 5.0'	Qtm	0.5461	11	107	
⊠ GB 9 @ 15.0'	Qtm	0.5053	9	110	

CONSOLIDATION TEST DATA



SAMPLE LOCATION	SOURCE	INITIAL VOID RATIO	MOIST. (%)	D.D. (pcf)	R.C. (%)
● GB 10 @ 5.0'	Qtm	0.4474	13	114	
⊠ GB 11 @ 10.0'	Qtm	0.6363	17	101	

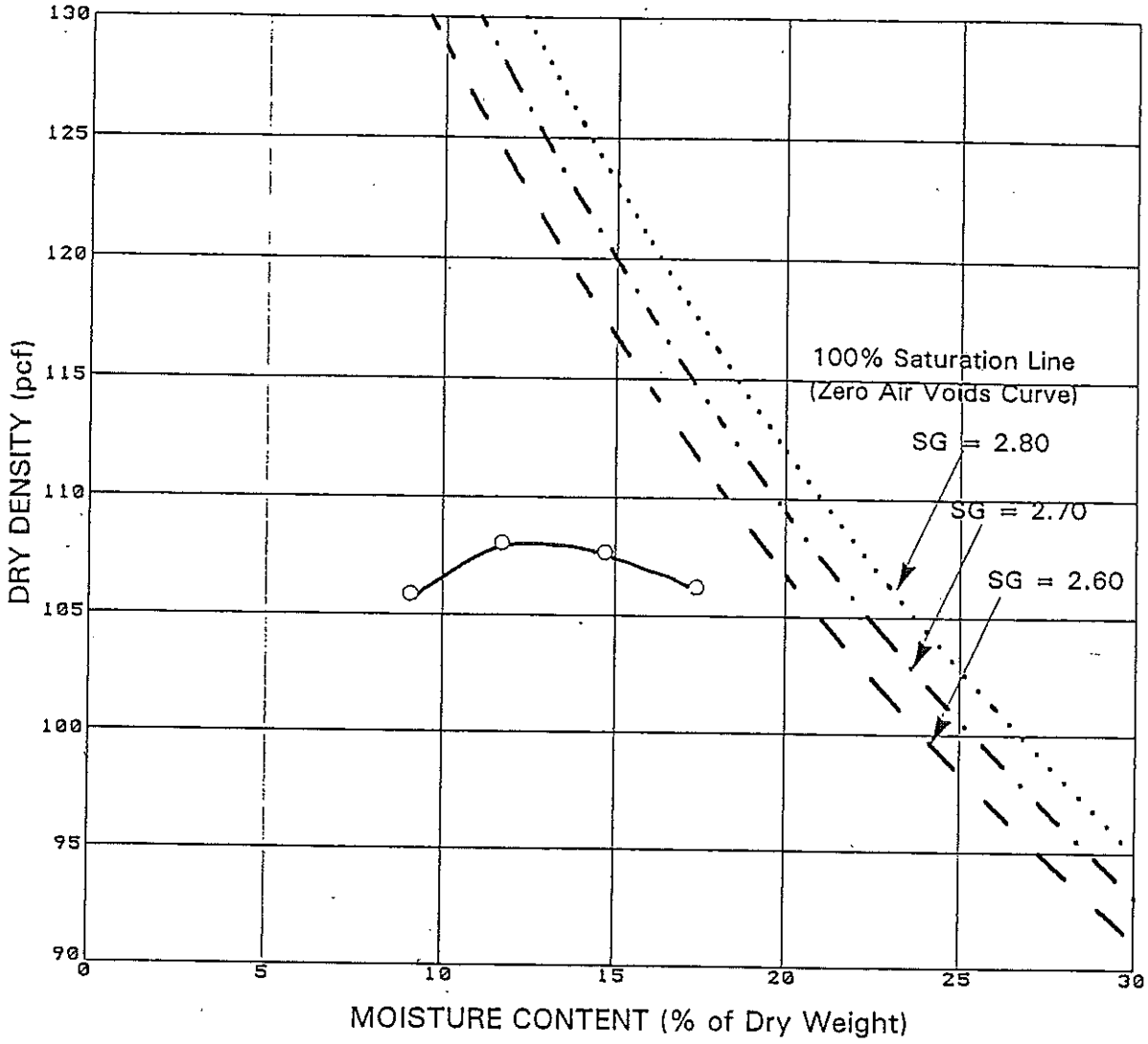
CONSOLIDATION TEST DATA

TABLE 1
RESULTS OF CHEMICAL TESTING

Location/ Depth	Soil Type	pH	Minimum Resistivity (ohm-cm)	Soluble Chlorides (ppm)	Soluble Sulfate (percent)
GB-3 @ 0-8'	CL	8.8	600	470	0.0148
GB-5 @ 0-9'	CL	3.8	600	380	0.1350
GB-10 @ 0-5'	CL	6.0	600	480	0.0181

APPENDIX B-2

Geotechnical Laboratory Procedures and Test Results
Performed by Others



Test Method : ASTM D1557-78(90)		Test of Fraction < No 4 ☒ < 3/4 in ☐	Percent > 3/4 in = 0	Rock Correction : Yes☐ No ☒	
Boring No.	Sample No.	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Dry Density (pcf)
B-1-97	Bag 1	6.5	Brown Silty Sand (SM)	13.0	108.5

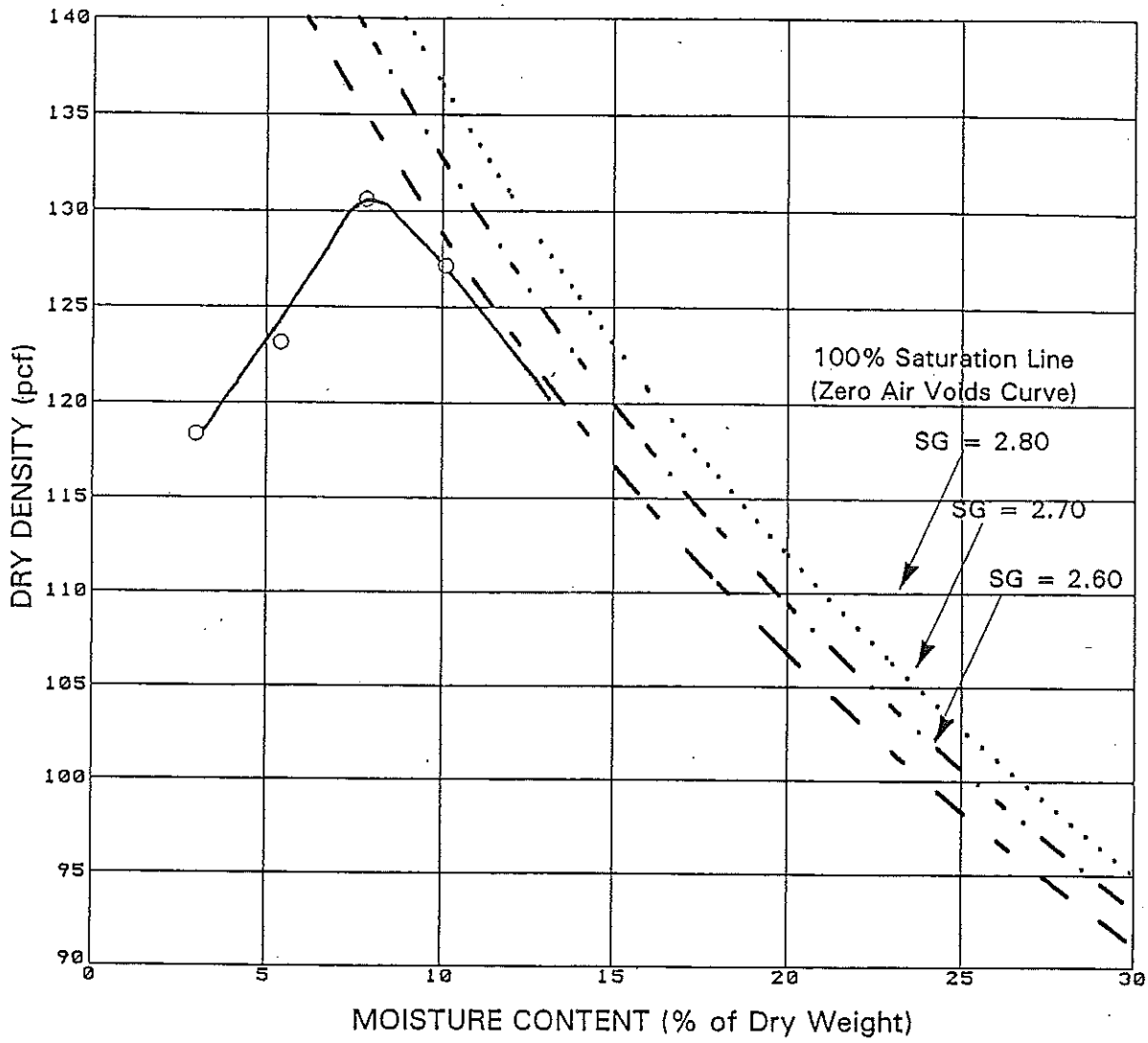
Remark :

MAXIMUM DENSITY TEST RESULTS

Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____



Test Method : ASTM D1557-78(90)		Test of Fraction < No 4 ☒ < 3/4 in ☐	Percent > 3/4 in = 0	Rock Correction : Yes☐ No ☒	
Boring No.	Sample No.	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Dry Density (pcf)
B-4-97	Bag 1	5.1	Brown Clayey Sand (SC)	8.5	130.5

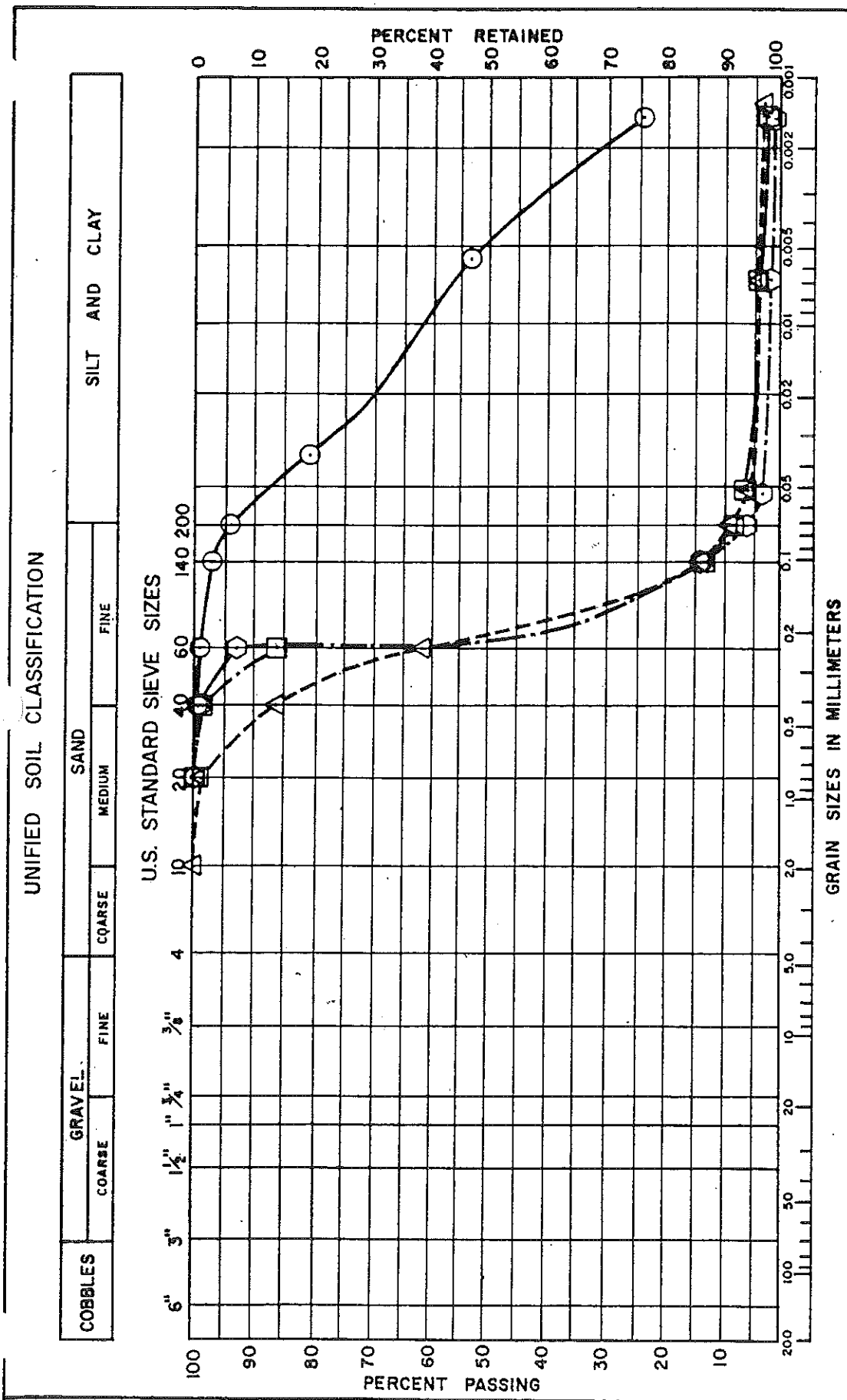
Remark :

MAXIMUM DENSITY TEST RESULTS

Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. ____



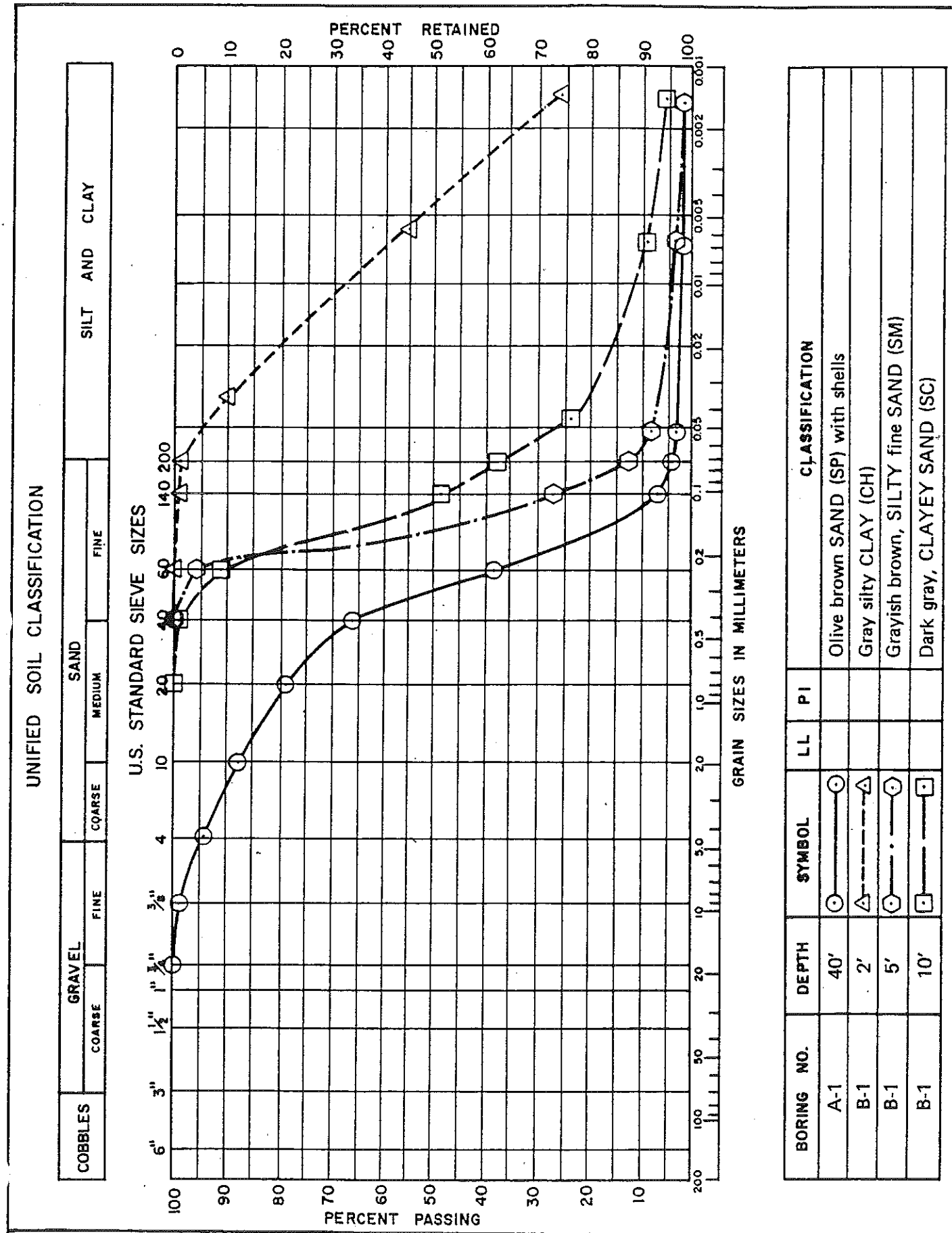
BORING NO.	DEPTH	SYMBOL	LL	PI	CLASSIFICATION
A-1	5'	⊙——⊙			Grayish SANDY CLAY (CH)
A-1	6.5'	△- - - -△			Brownish gray, CLAYEY SAND (SP–SC)
A-1	15'	⬡—·—⬡			Grayish brown, CLAYEY SAND (SP–SC)
A-1	20'	⊡——⊡			Grayish brown, CLAYEY SAND (SP–SC)

Project: WEST NEWPORT OIL
Project No. 41890A

GRAIN SIZE DISTRIBUTION CURVES

Fig. B-1

WOODWARD-CLYDE CONSULTANTS



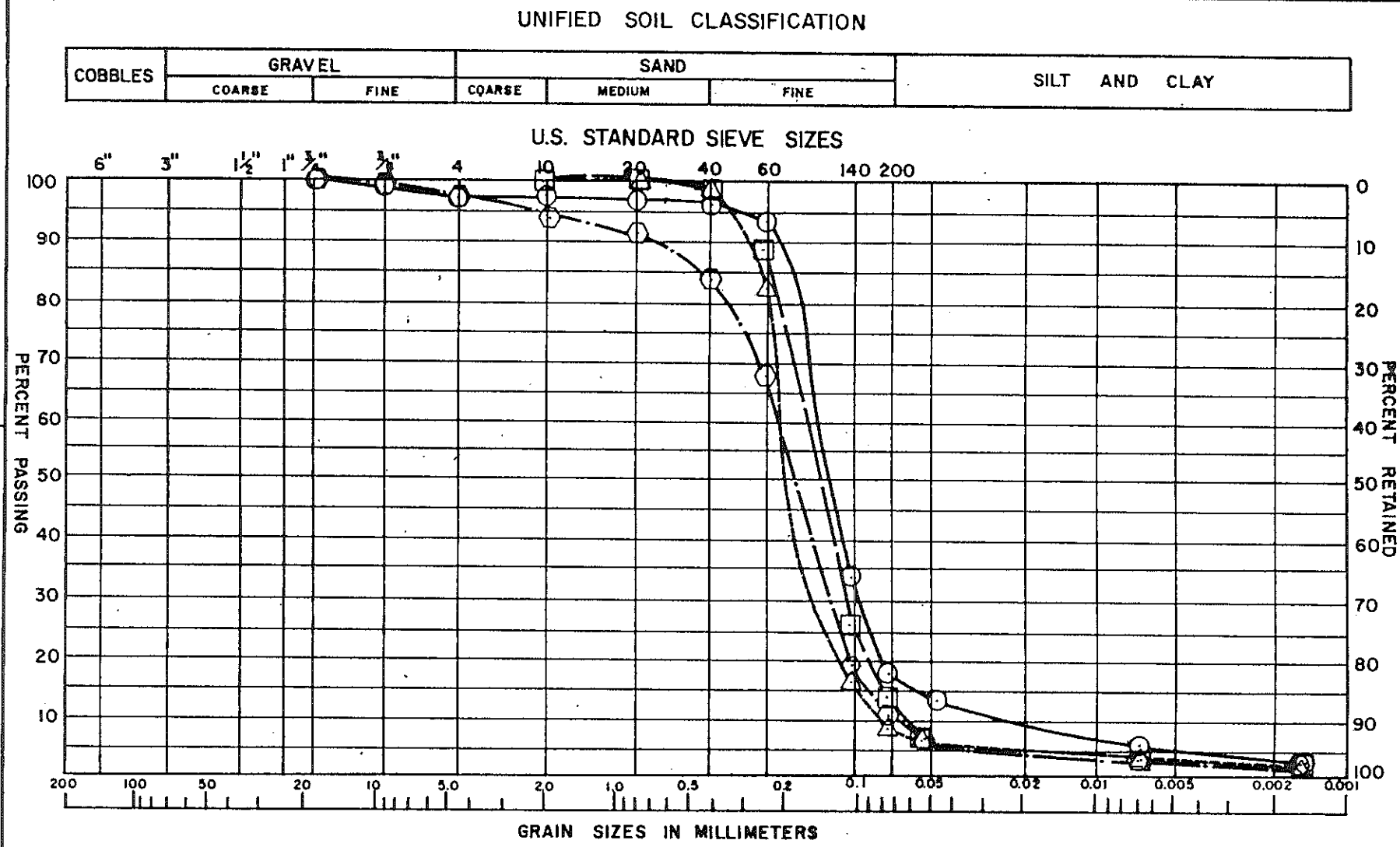
Project:	WEST NEWPORT OIL	GRAIN SIZE DISTRIBUTION CURVES	Fig. B-2
Project No.	41890A		

WOODWARD-CLYDE CONSULTANTS

Project: WEST NEWPORT OIL
Project No. 41890A

GRAIN SIZE DISTRIBUTION CURVES

Fig. B-3



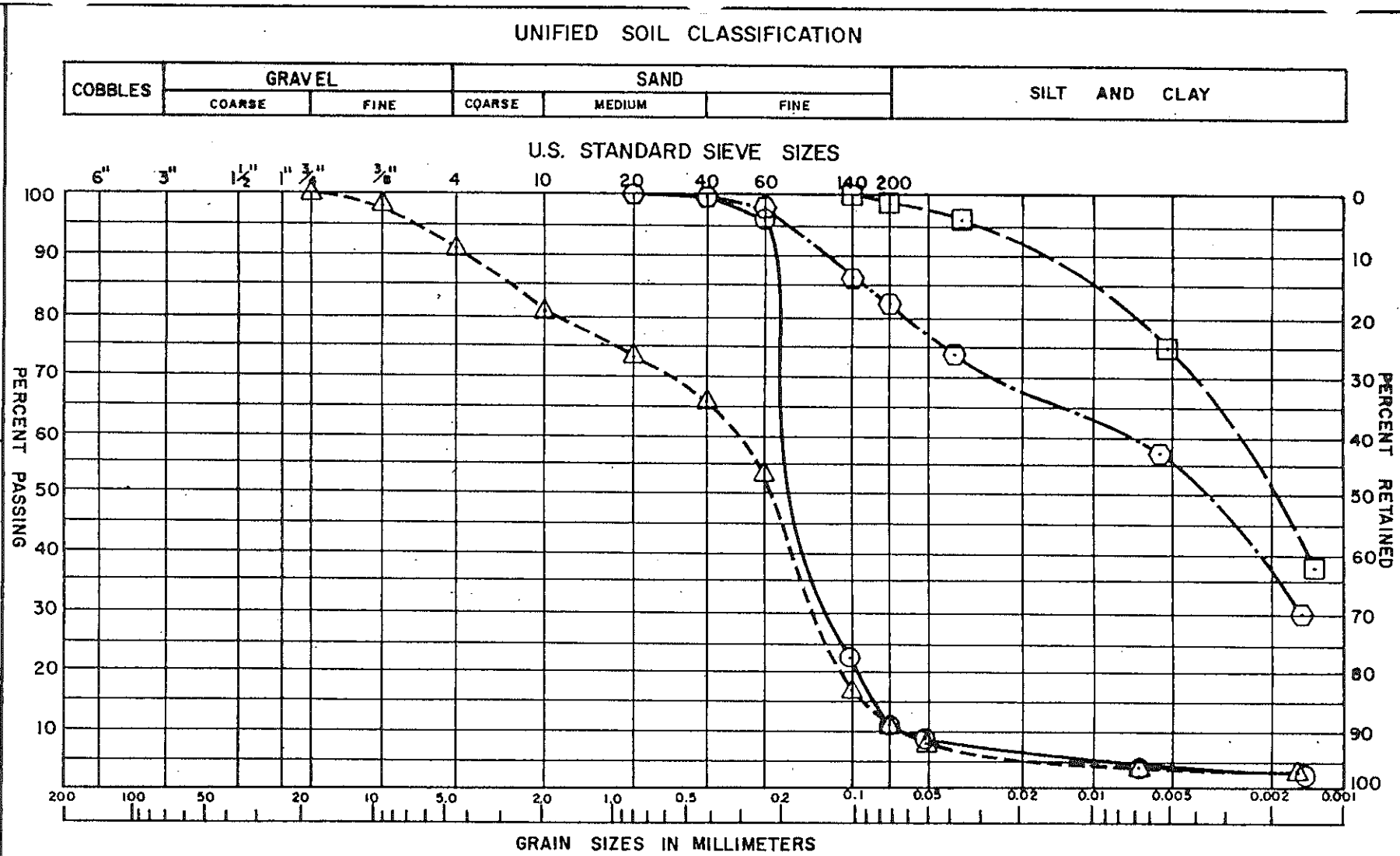
BORING NO.	DEPTH	SYMBOL	LL	PI	CLASSIFICATION
B-1	35′	⊙——⊙			Dark gray SILTY fine SAND (SM)
C-1	5′	△- - - -△			Grayish brown CLAYEY SAND, little silt (SP–SM)
C-1	10′	⬡—·—⬡			Dark grayish brown CLAYEY fine SAND (SP–SC)
C-1	15′	⊡——⊡			Dark gray CLAYEY fine SAND (SC)

WOODWARD–CLYDE CONSULTANTS

Project: WEST NEWPORT OIL
Project No. 41890A

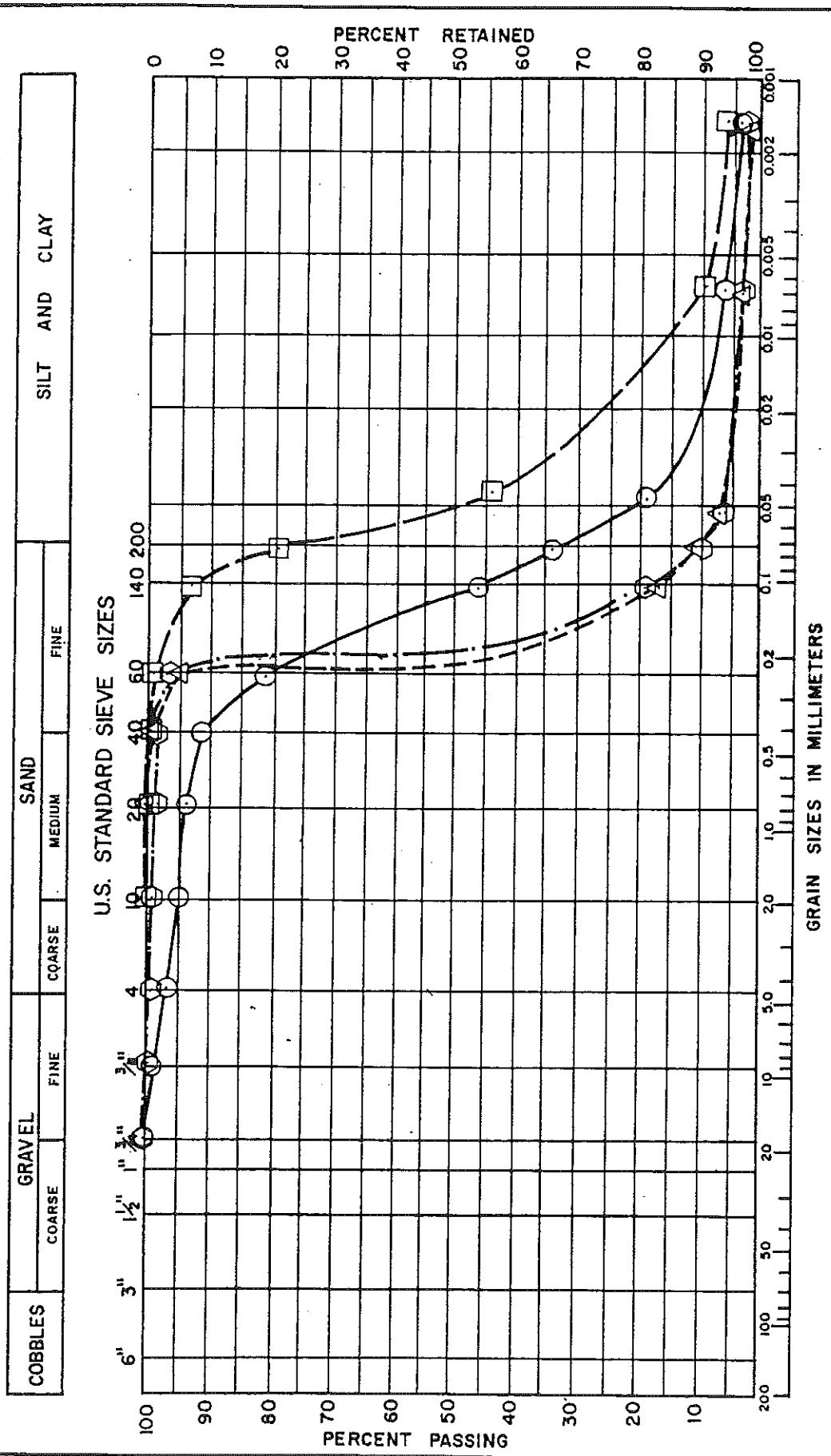
GRAIN SIZE DISTRIBUTION CURVES

Fig. B-4



BORING NO.	DEPTH	SYMBOL	LL	PI	CLASSIFICATION
C-1	25′	⊙——⊙			Dark gray CLAYEY SAND (SP–SC)
C-1	45′	△- - -△			Dark gray SILTY SAND (SP–SM) with some shells
C-1	50′	⬡—·—⬡			Gray SANDY CLAY (CH)
D-1	6.5′	⊡——⊡			Gray SILTY CLAY (CH)

WOODWARD–CLYDE CONSULTANTS



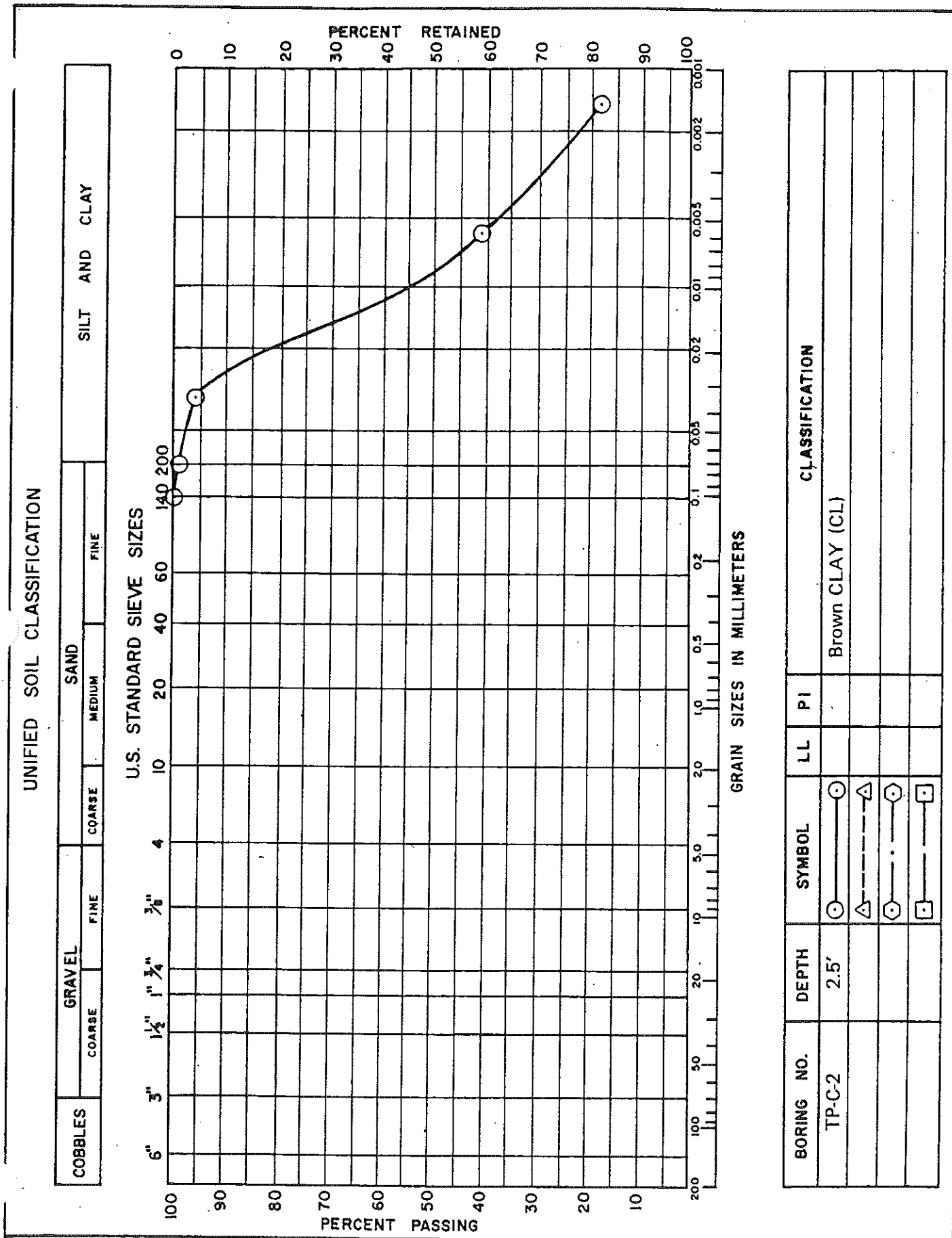
BORING NO.	DEPTH	SYMBOL	LL	PI	CLASSIFICATION
D-1	10'	⊙			Gray SILTY fine SAND (SM), with some shells
D-1	20'	△			Dark gray SILTY fine SAND (SP–SM)
D-1	30'	⊙			Gray SILTY fine SAND (SP–SM) with some shells
TP-A-2	3'	⊡			Grayish brown, fine SAND CLAY (CL)

Project: WEST NEWPORT OIL
Project No. 41890A

GRAIN SIZE DISTRIBUTION CURVES

Fig. B-5

WOODWARD–CLYDE CONSULTANTS



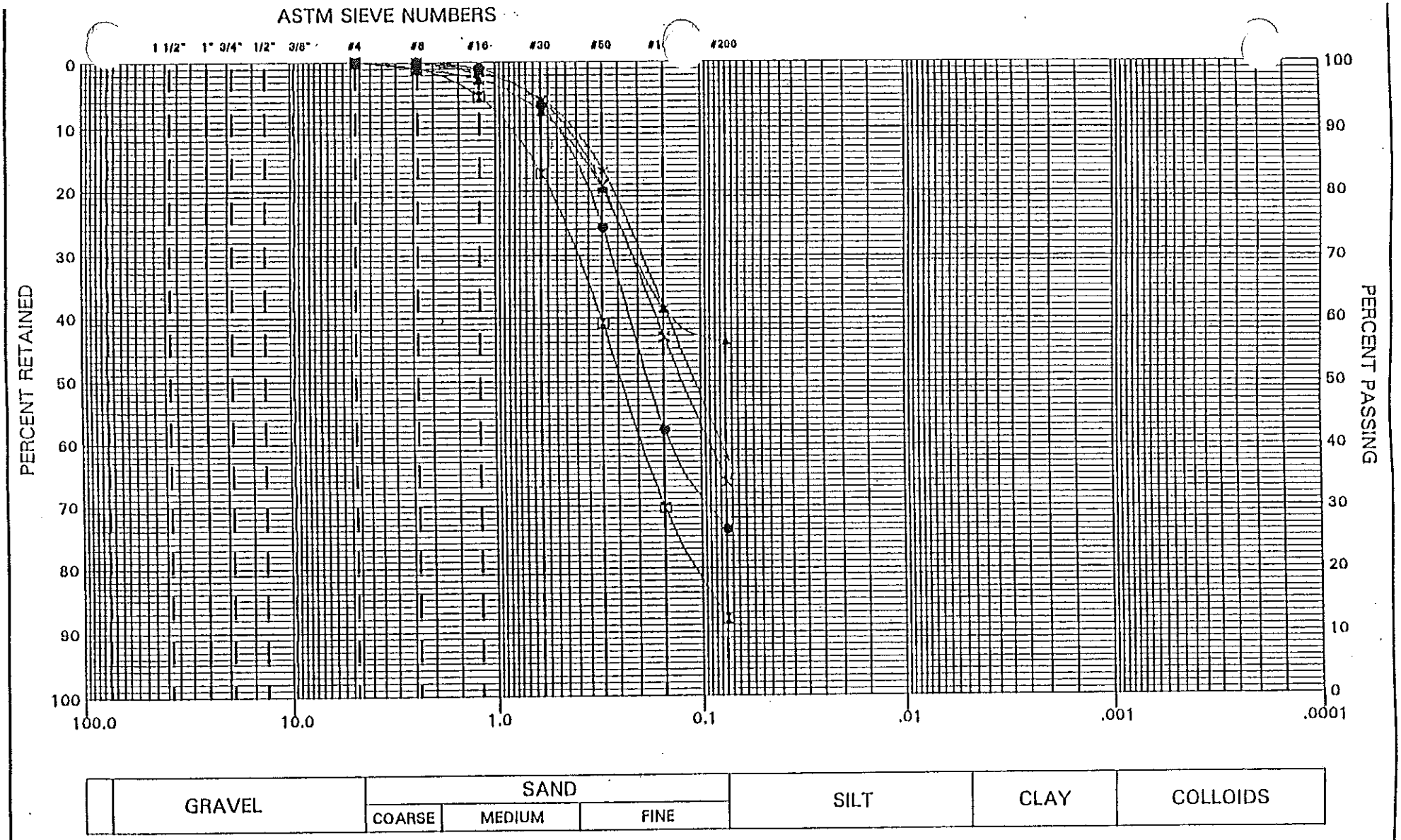
Project: WEST NEWPORT OIL

Project No. 41890A

GRAIN SIZE DISTRIBUTION CURVES

Fig. B-6

WOODWARD-CLYDE CONSULTANTS

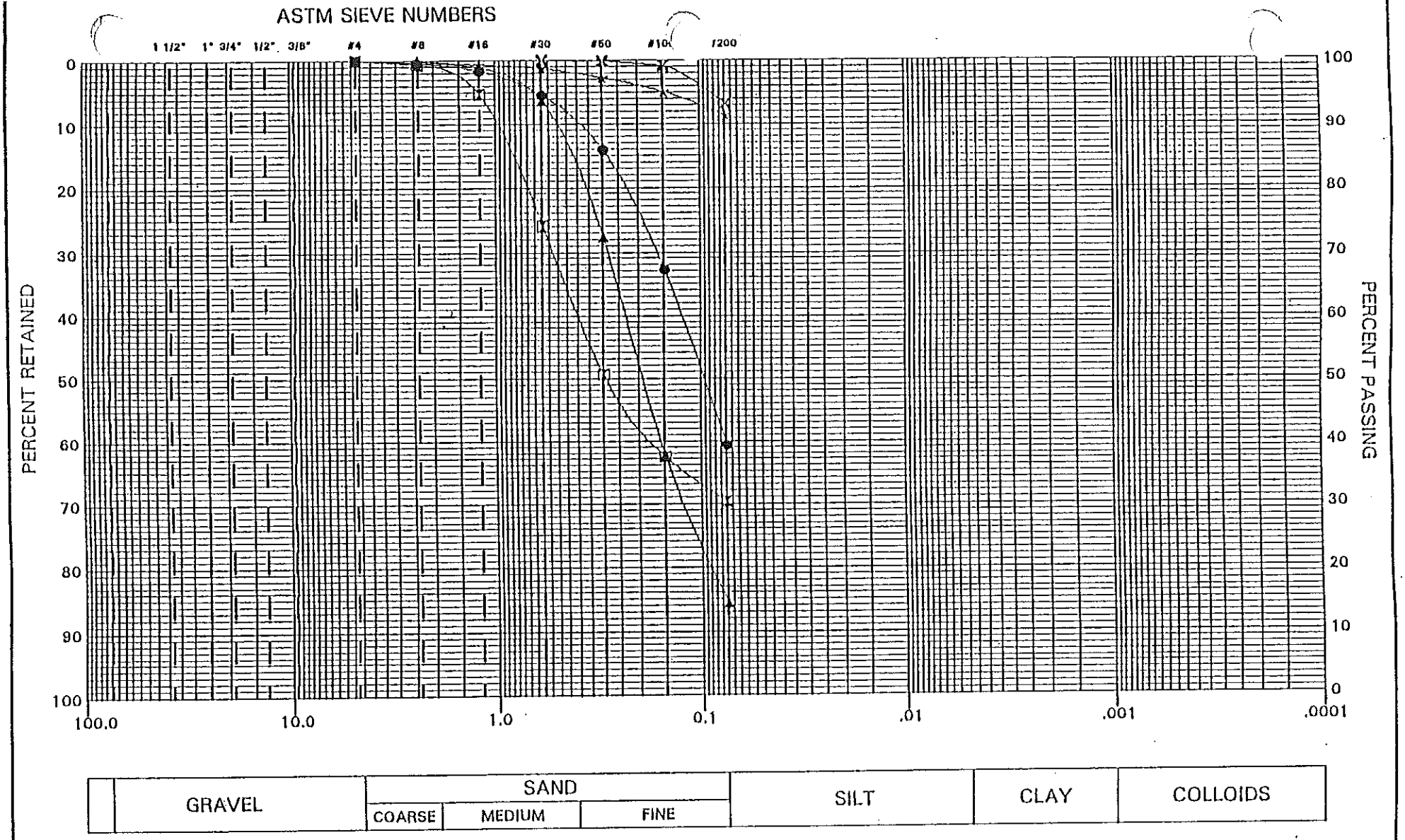


symbol	boring or trench	depth(ft.)	L.L.	P.L.	sand equiv.	% passing #200 sieve	group symbol	typical names
●	HB-1	5.00				26.5	SM	Silty Sand (Qal)
⊠	HB-1	10.00				12.3	SP-SM	Sand with Silt (Qal)
▲	HB-1	15.00				56.3	ML	Sandy Silt (Qal)
✶	HB-1	20.00				38.3	SM	Silty Sand (Qal)
✕	HB-1	25.00				34.1	SM	Silty Sand (Qal)

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE, STE 514 TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-10

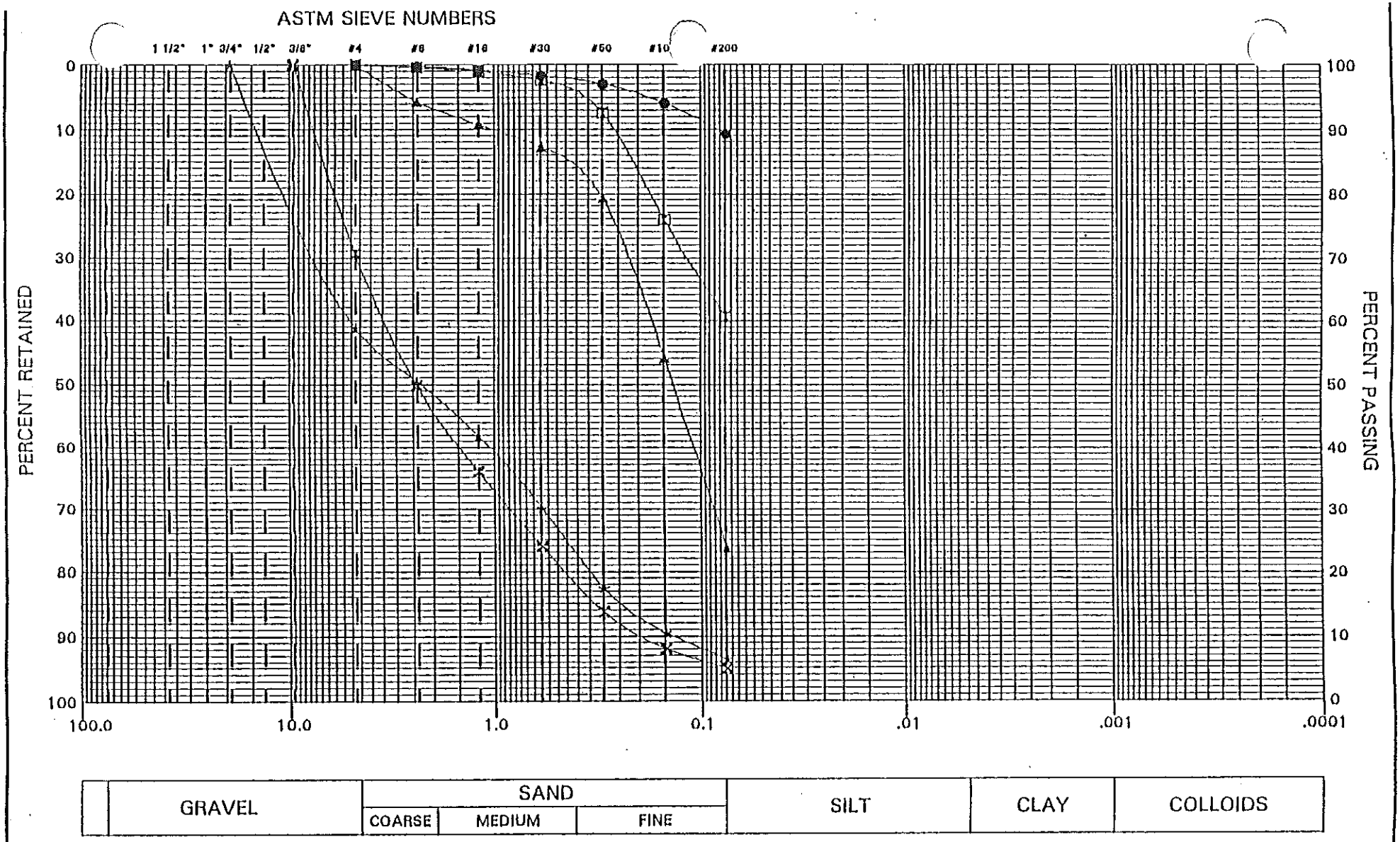


symbol	boring or trench	depth(ft.)	L.L.	P.L.	sand equiv.	% passing #200 sieve	group symbol	typical names
●	HB-1	30.00				39.8	SM	Silty Sand (Qsp)
⊠	HB-1	35.00				30.3	SM	Silty Sand (Qsp)
▲	HB-1	40.00				14.7	SP-SM	Sand with Silt (Qsp)
✳	HB-1	45.00				91.4	ML	Silt (Qsp)
✕	HB-1	50.00				93.2	ML	Silt (Qspm)

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE. STE 514 TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-11



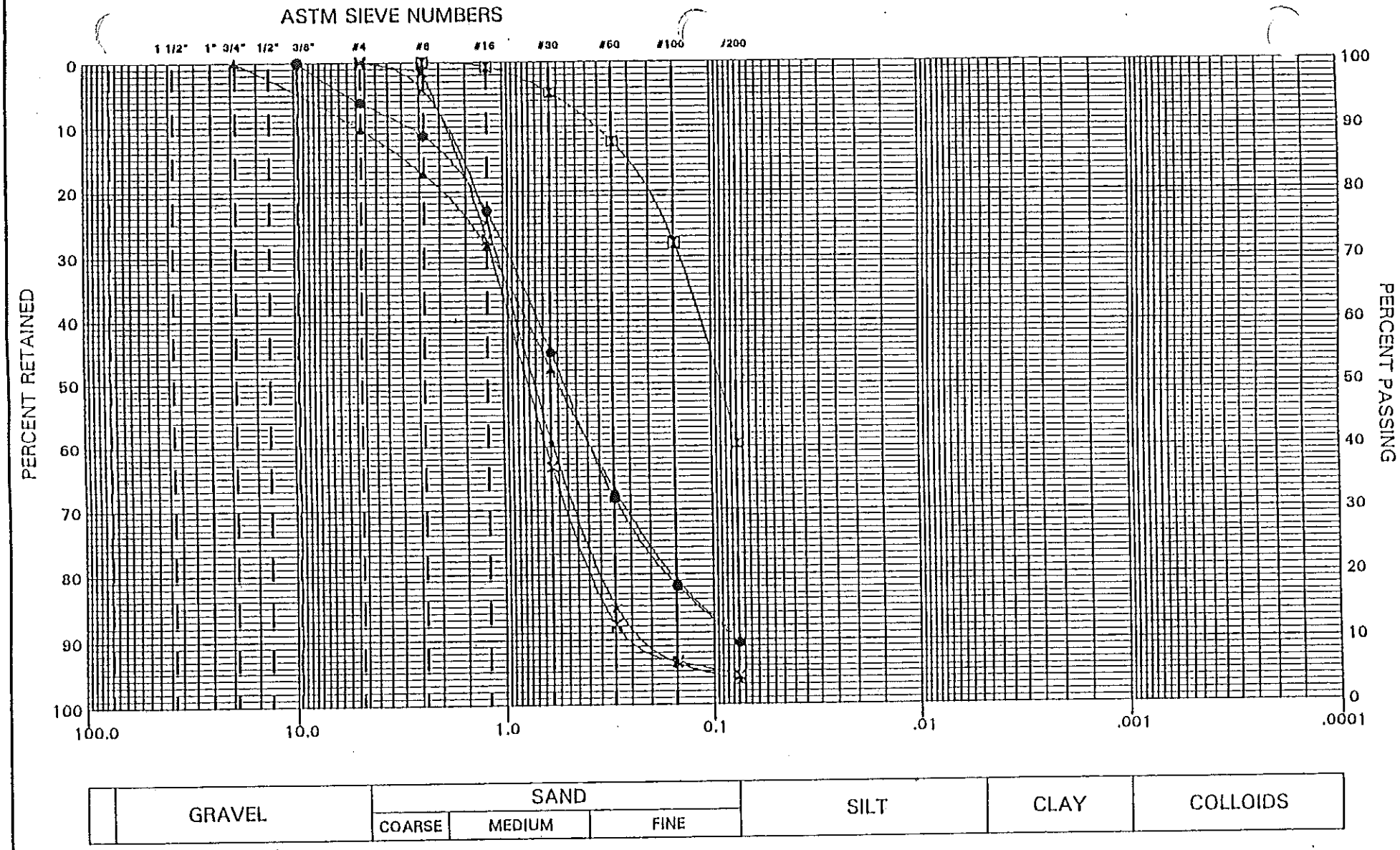
symbol	boring or trench	depth(ft.)	L.L.	P.L.	sand equiv.	% passing #200 sieve	group symbol	typical names
●	HB-2	5.00				89.4	ML	Silt (Qal)
⊠	HB-2	10.00				60.8	ML	Silt (Qal)
▲	HB-2	15.00				24.3	SM	Silty Sand (Qal)
✳	HB-2	20.00				6.5	SP-SM	Sand with Silt (Qal)
✕	HB-2	25.00				5.1	SP	Sand (Qal)

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.

3002 DOW AVE. STE 514 TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-12

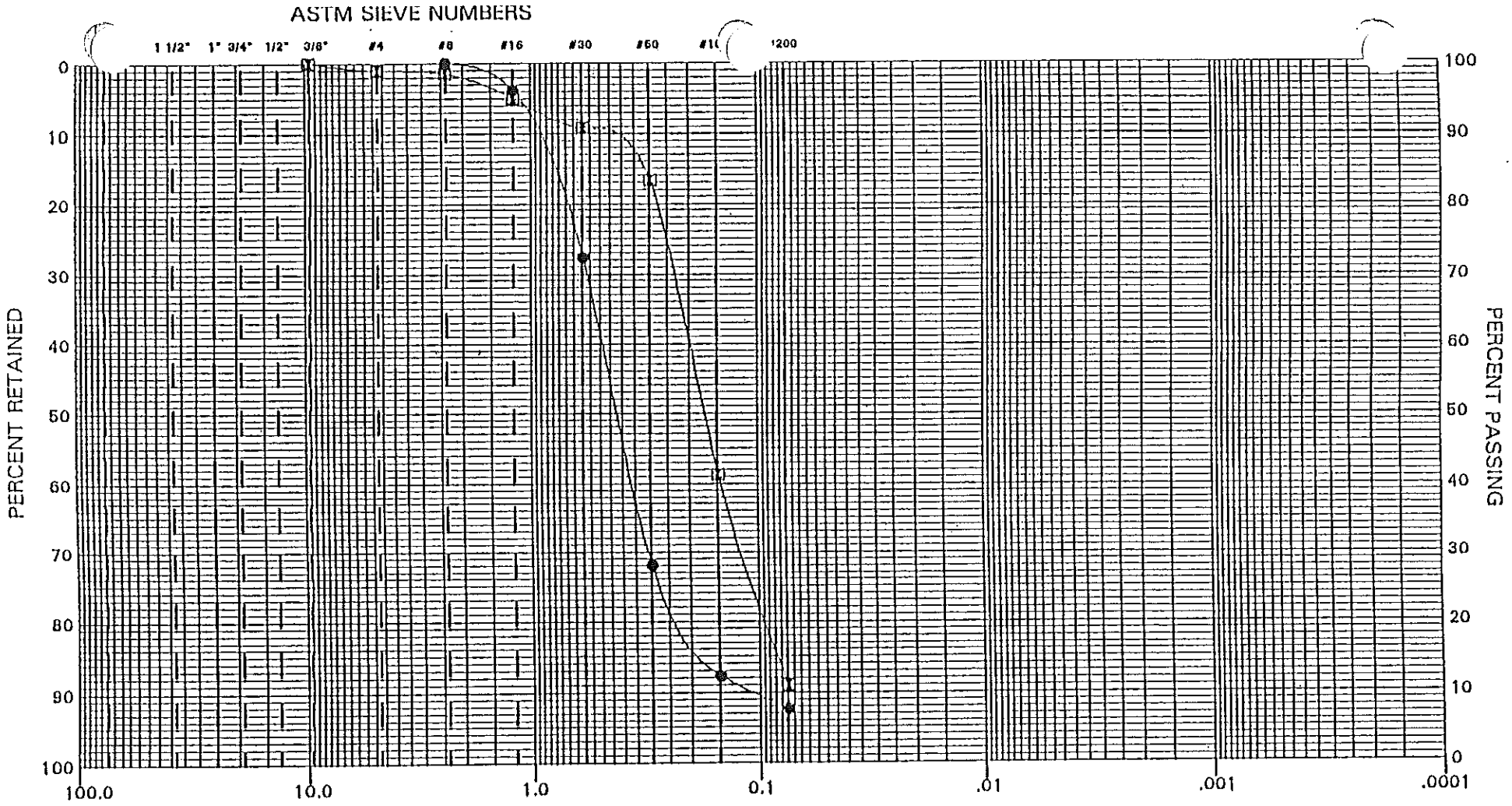


symbol	boring or trench	depth(ft.)	L.L.	P.L.	sand equiv.	% passing #200 sieve	group symbol	typical names
●	HB-2	30.00				9.7	SP-SM	Sand with Silt (Qal)
⊠	HB-2	35.00				40.8	SM	Silty Sand (Qal)
▲	HB-2	40.00				10.2	SP-SM	Sand with Silt (Qal)
✶	HB-2	45.00				3.7	SP	Sand (Qal)
✕	HB-2	50.00				4.3	SP	Sand (Qal)

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE. STE 514 TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-13



symbol	boring or trench	depth(ft.)	L.L.	P.L.	sand equiv.	% passing #200 sieve	group symbol	typical names
●	HB-2	55.00				7.8	SP-SM	Sand with Silt (Qal)
⊠	HB-2	60.00				11.6	SP-SM	Sand with Silt (Qal)

GRAIN SIZE DISTRIBUTION

PACIFIC SOILS ENGINEERING, INC.
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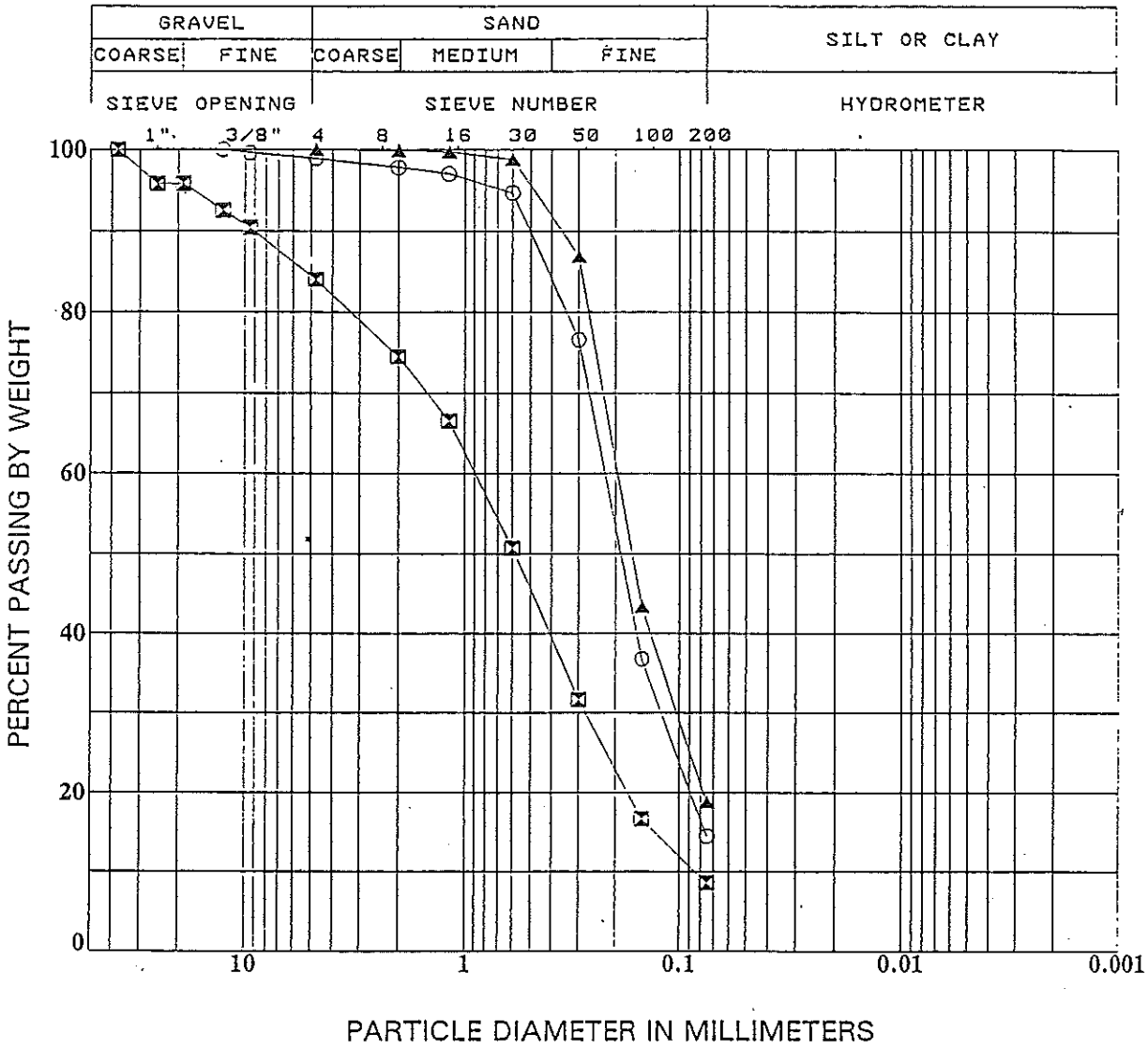
W.O. 500236 PLATE B-14



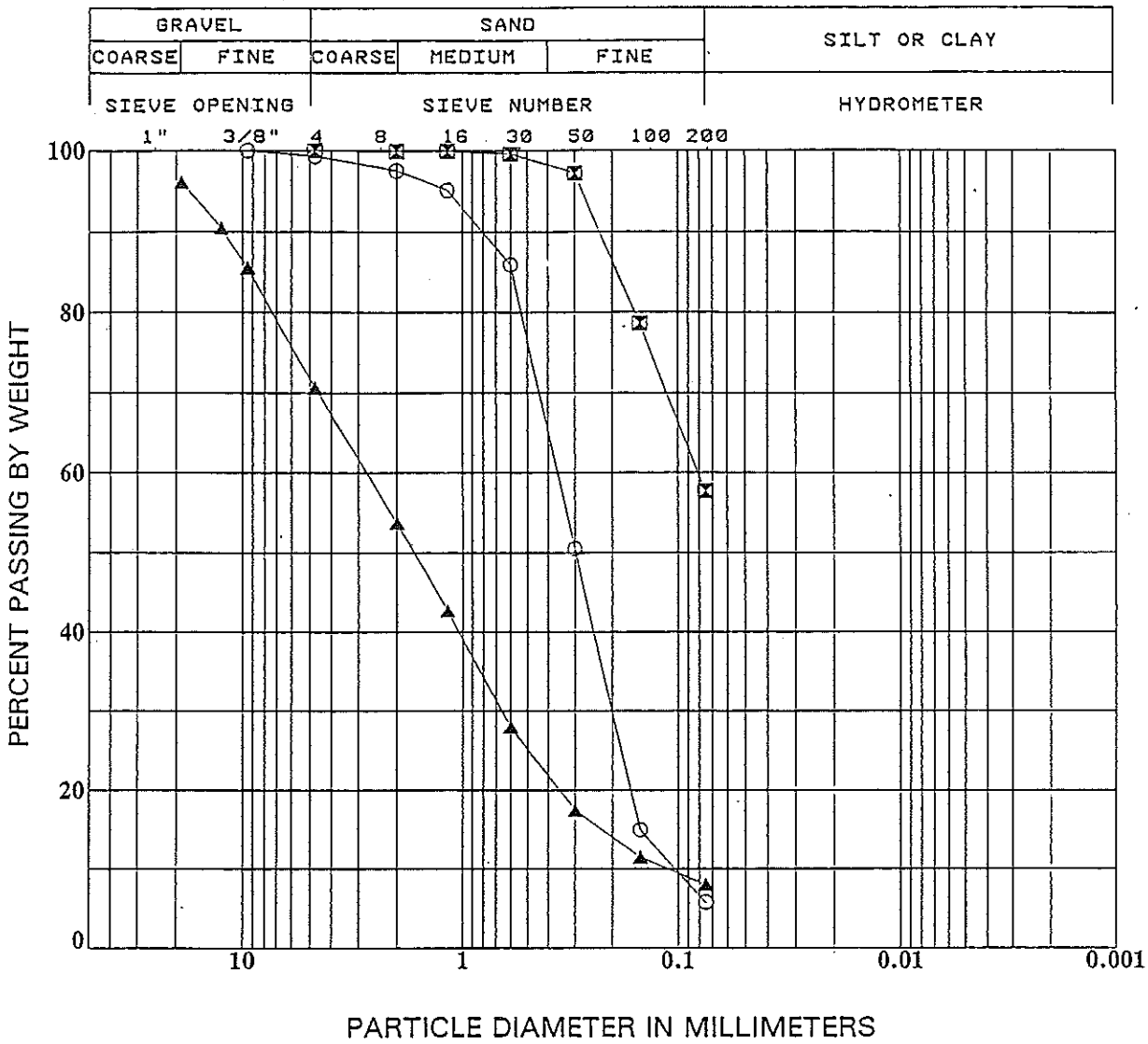
Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-1	S-2	15.0	15	SM
⊠	B-1	S-5	40.0	9	SW-SM
▲	B-2	S-1	10.0	19	SM

GRAIN SIZE DISTRIBUTION CURVE
ASTM D422

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-1



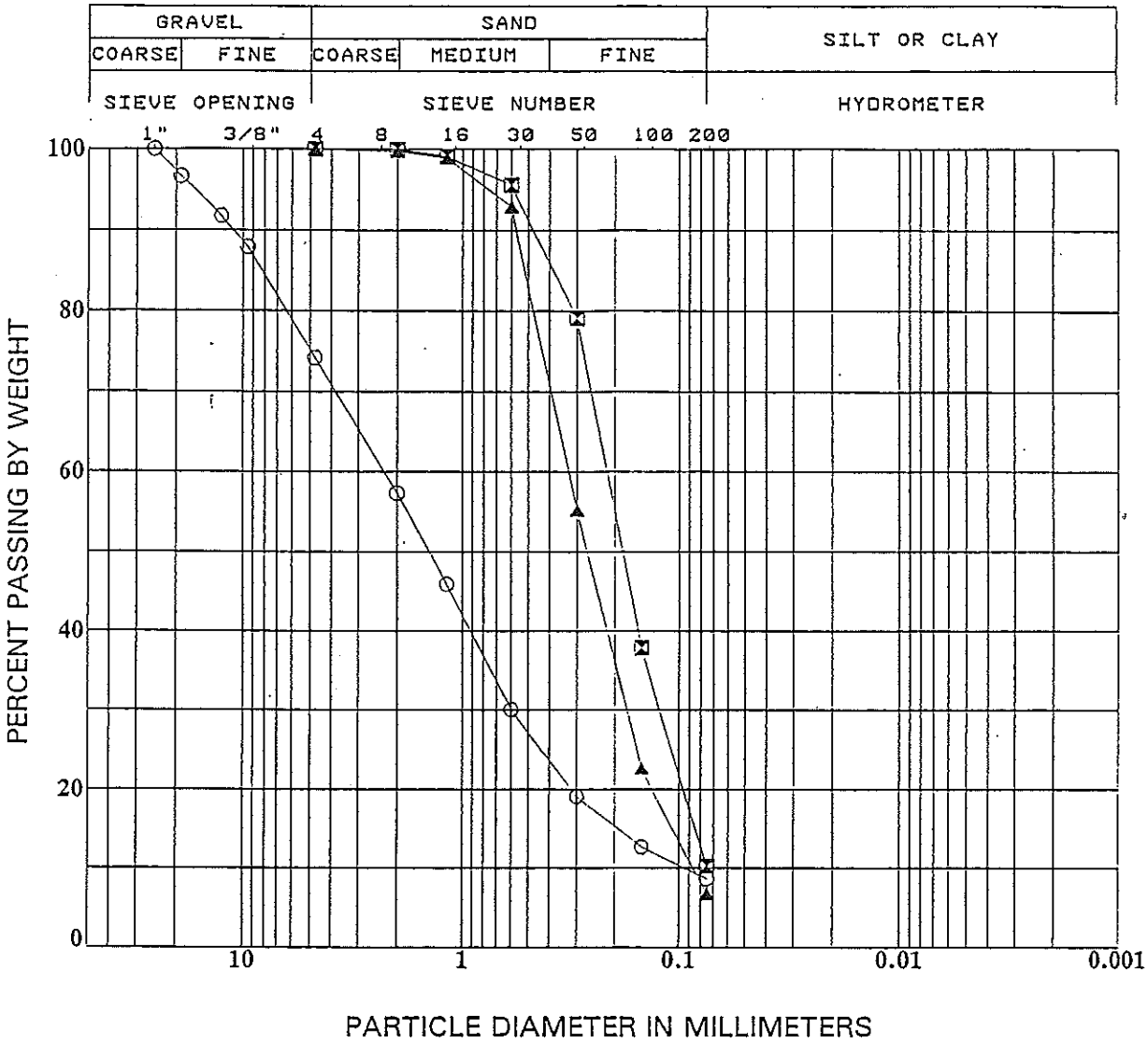
Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-2	S-5	30.0	6	SP-SM
⊠	B-3	S-2	15.0	58	ML
▲	B-3	S-5	30.0	8	SP-SM

GRAIN SIZE DISTRIBUTION CURVE
ASTM D422

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-2



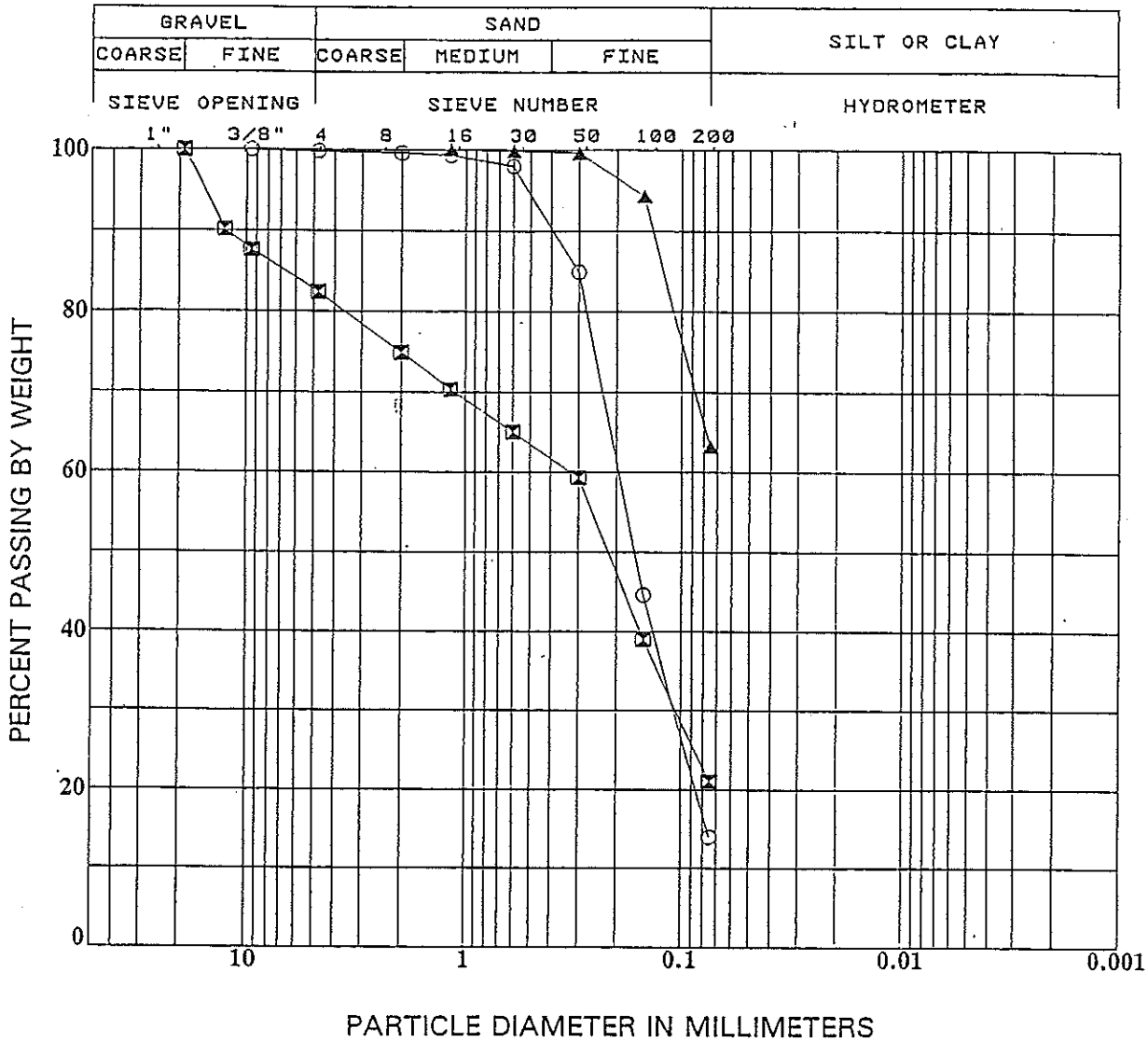
Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-3	S-8	45.0	9	SP-SM
⊠	B-4	S-1	10.0	10	SP-SM
▲	B-4	S-5	30.0	7	SP-SM

GRAIN SIZE DISTRIBUTION CURVE
ASTM D422

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-3



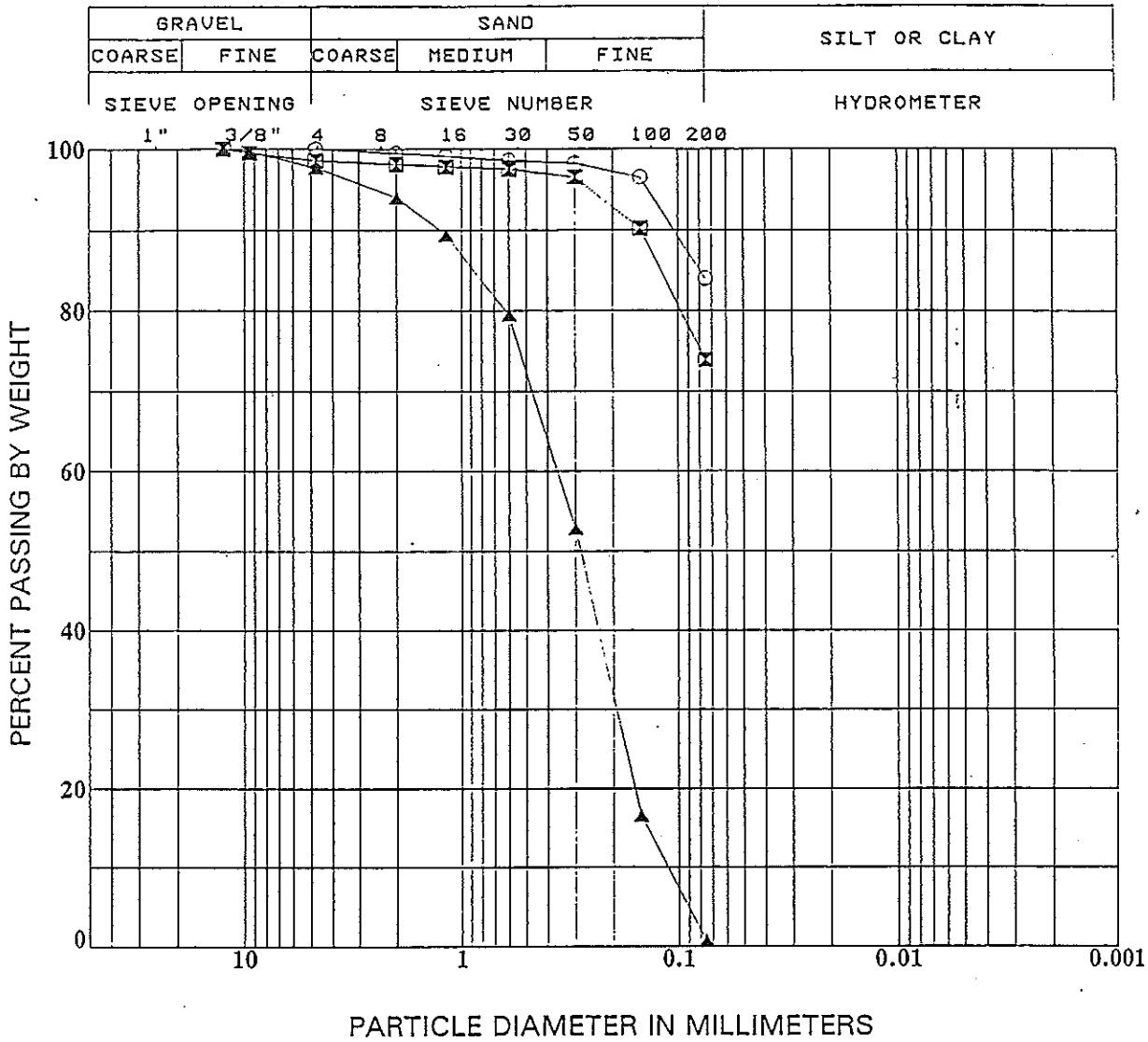
Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-4	S-8	45.0	14	SM
⊠	B-5	S-1	10.0	21	SM
▲	B-5	S-4	25.0	63	CL

GRAIN SIZE DISTRIBUTION CURVE
ASTM D422

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-4



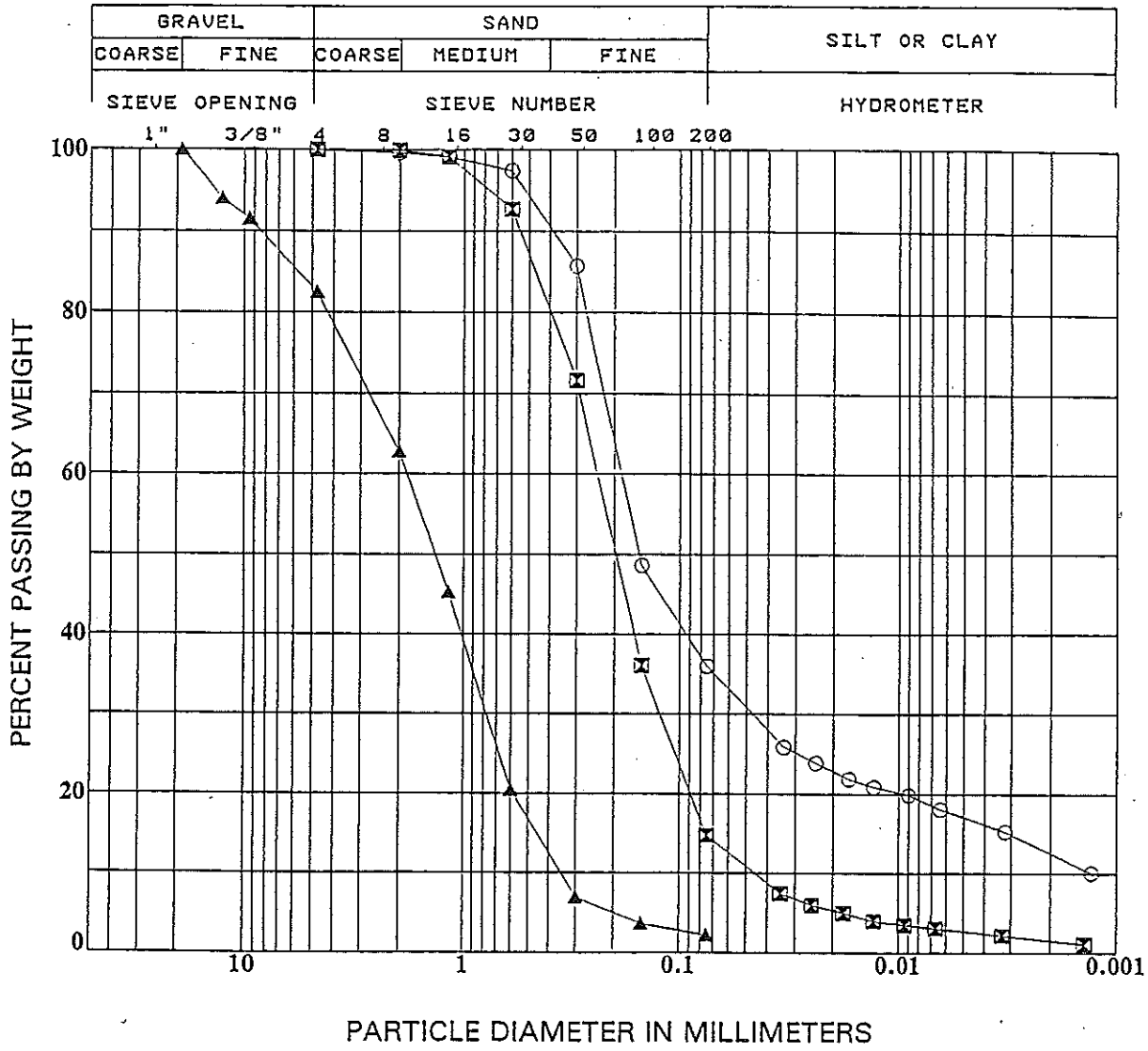
Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-5	S-7	45.0	84	CL
⊠	B-6	S-1	10.0	74	CL
▲	B-6	S-5	30.0	1	SP

GRAIN SIZE DISTRIBUTION CURVE
ASTM D422

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-5



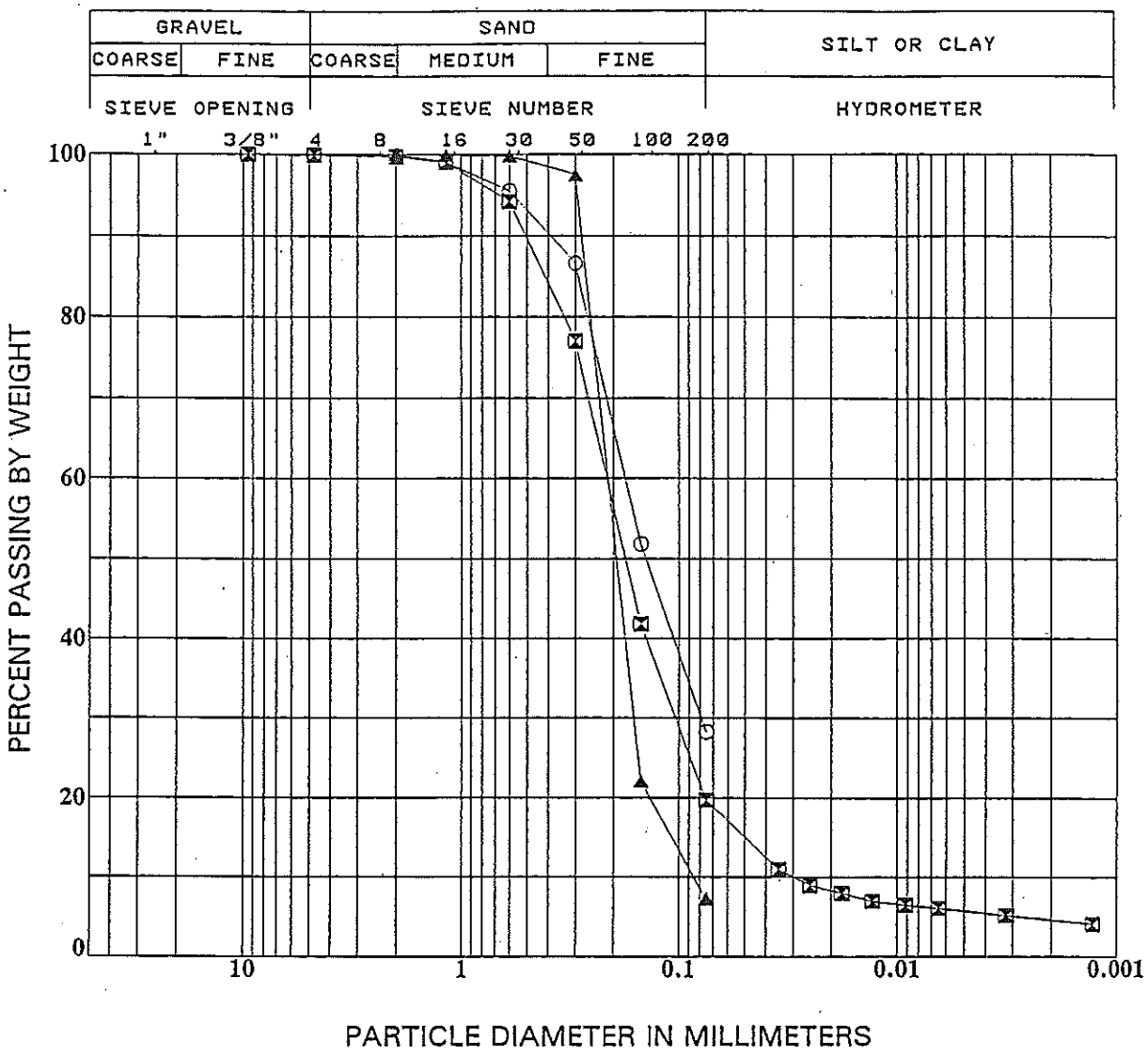
Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-1-97	R-2	7.0	36	SM
⊠	B-1-97	S-1	17.0	15	SM
▲	B-1-97	R-7	52.0	2	SP

GRAIN SIZE DISTRIBUTION CURVE
ASTM D422

Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____



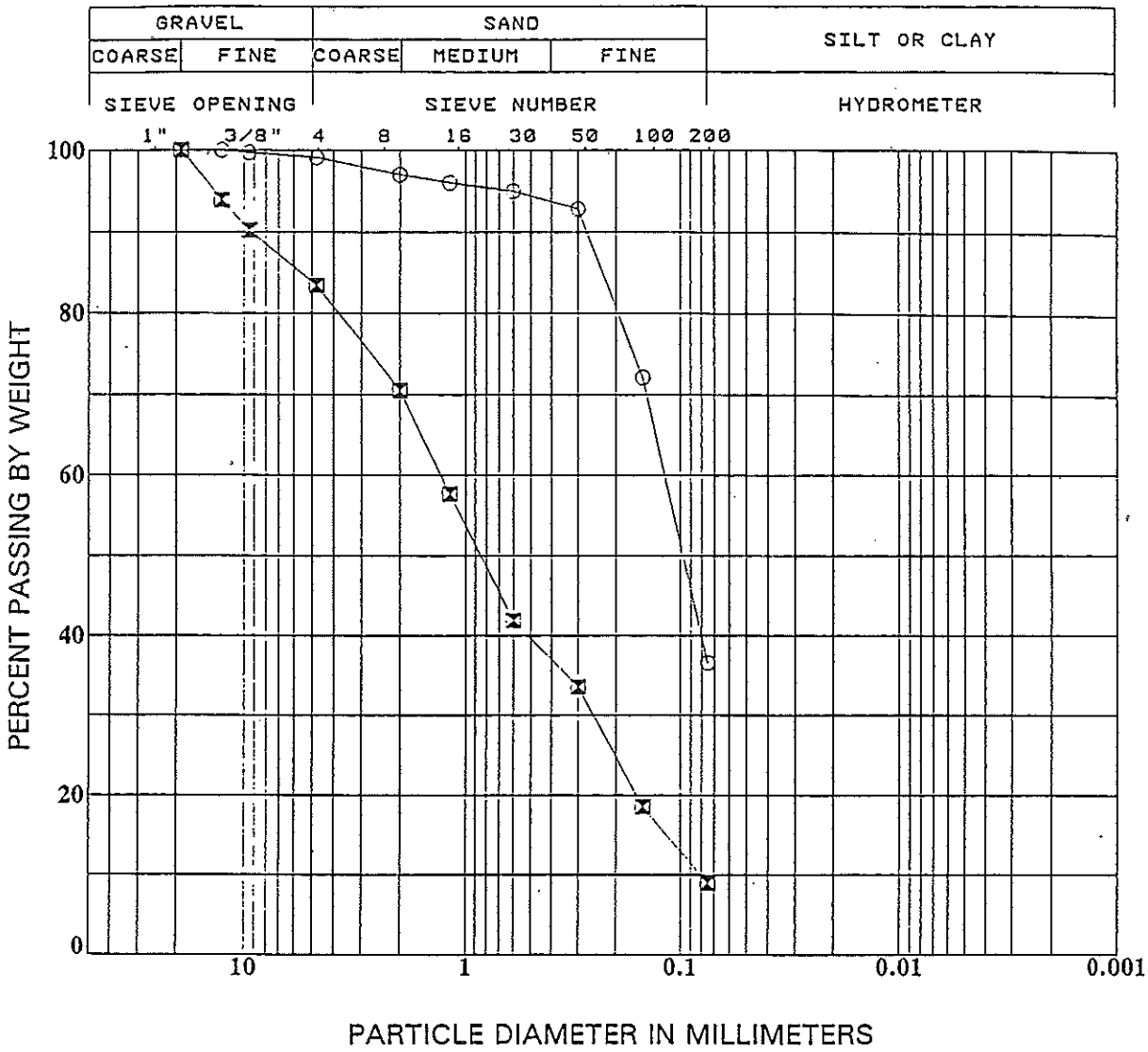
Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-2-97	R-1	2.5	28	SM
⊠	B-2-97	R-2	7.5	20	SM
▲	B-2-97	R-4	22.5	7	SP

GRAIN SIZE DISTRIBUTION CURVE
ASTM D422

Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. ____



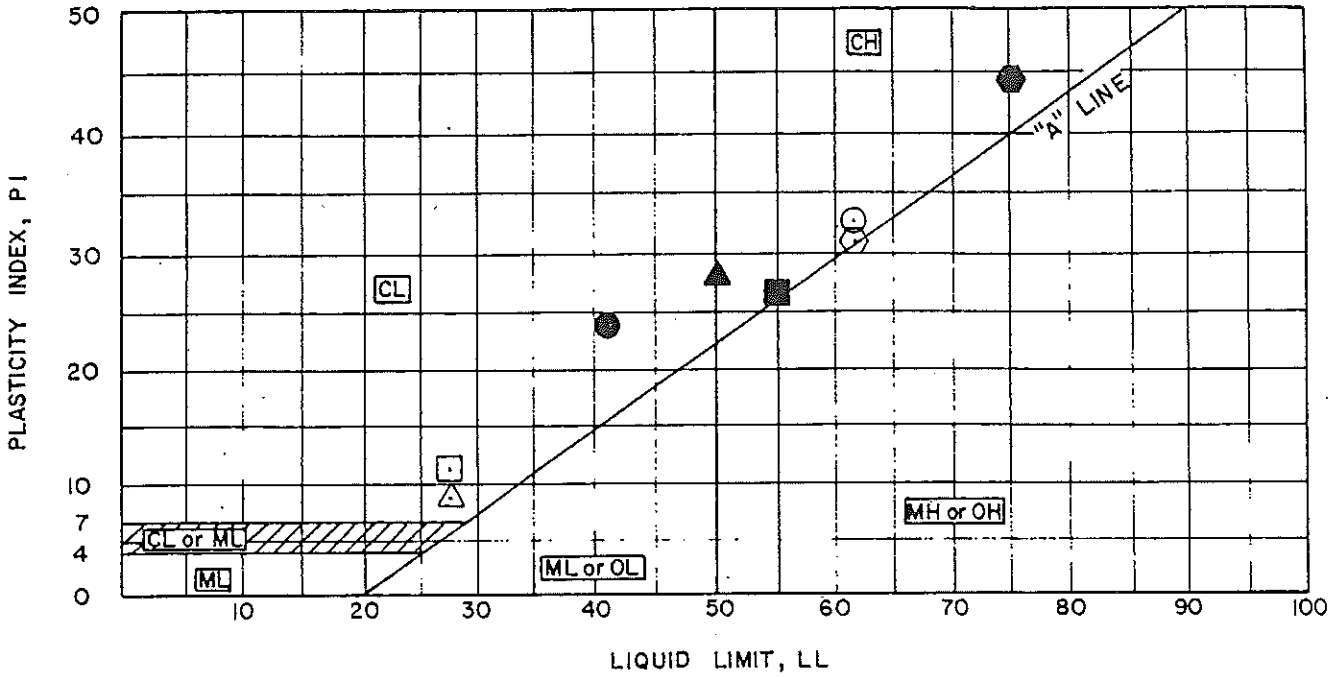
Symbol	Boring Number	Sample Number	Sample Depth (feet)	Percent Passing No. 200 Sieve	Soil Type
○	B-2-97	S-2	27.0	37	SM
⊠	B-3-97	R-2	35.0	9	SP

GRAIN SIZE DISTRIBUTION CURVE
ASTM D422

Project No. 970011-001

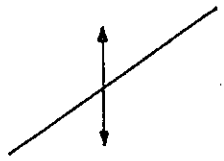
Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____



GROUP SYM.	UNIFIED SOIL CLASSIFICATION FINE GRAINED SOIL GROUPS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.
ML	INORGANIC CLAYEY SILTS TO VERY FINE SANDS OF SLIGHT PLASTICITY
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
MH	INORGANIC SILTS AND CLAYEY SILTS.
CH	INORGANIC CLAYS OF HIGH PLASTICITY.

TOUGHNESS AND DRY STRENGTH INCREASE.
PERMEABILITY AND RATE OF VOLUME CHANGE DECREASE

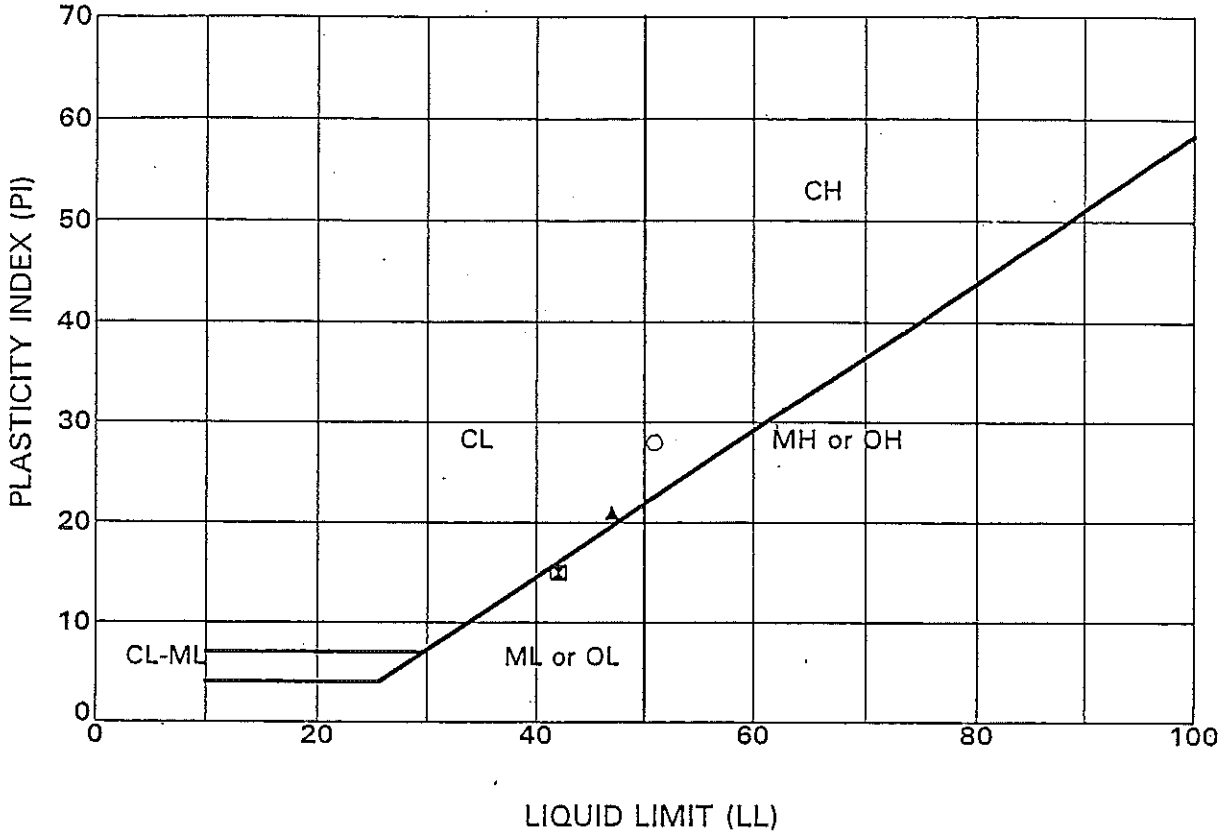


TOUGHNESS AND DRY STRENGTH DECREASE
PERMEABILITY AND RATE OF VOLUME CHANGE INCREASE.

COMPARING SOILS AT EQUAL LL.

TEST SYMBOL	BORING NUMBER	SAMPLE DEPTH	DESCRIPTION
⊙	A-1	5	Gray SANDY CLAY (CH)
△	A-1	6.5	Brownish gray CLAYEY SAND (SP–SC)
⬡	B-1	2	Gray SILTY CLAY (CH)
⊡	B-1	10	Gray CLAYEY SAND (SC)
●	C-1	5	Gray SANDY CLAY (CL)
▲	C-1	50	Gray SANDY CLAY (CH)
⬢	D-1	6.5	Gray SILTY CLAY (CH)
■	TP-C-2	2.5	Gray SILTY CLAY (CH)

Project: WEST NEWPORT OIL Project No. 41890A	PLASTICITY CHART	Fig. B-7



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	U.S.C.S. Symbol
○	B-1	S-1	5.0		51	28	CH
⊠	B-3	R-2	5.0	40.2	42	15	ML
▲	B-6	R-1	2.0		47	21	CL

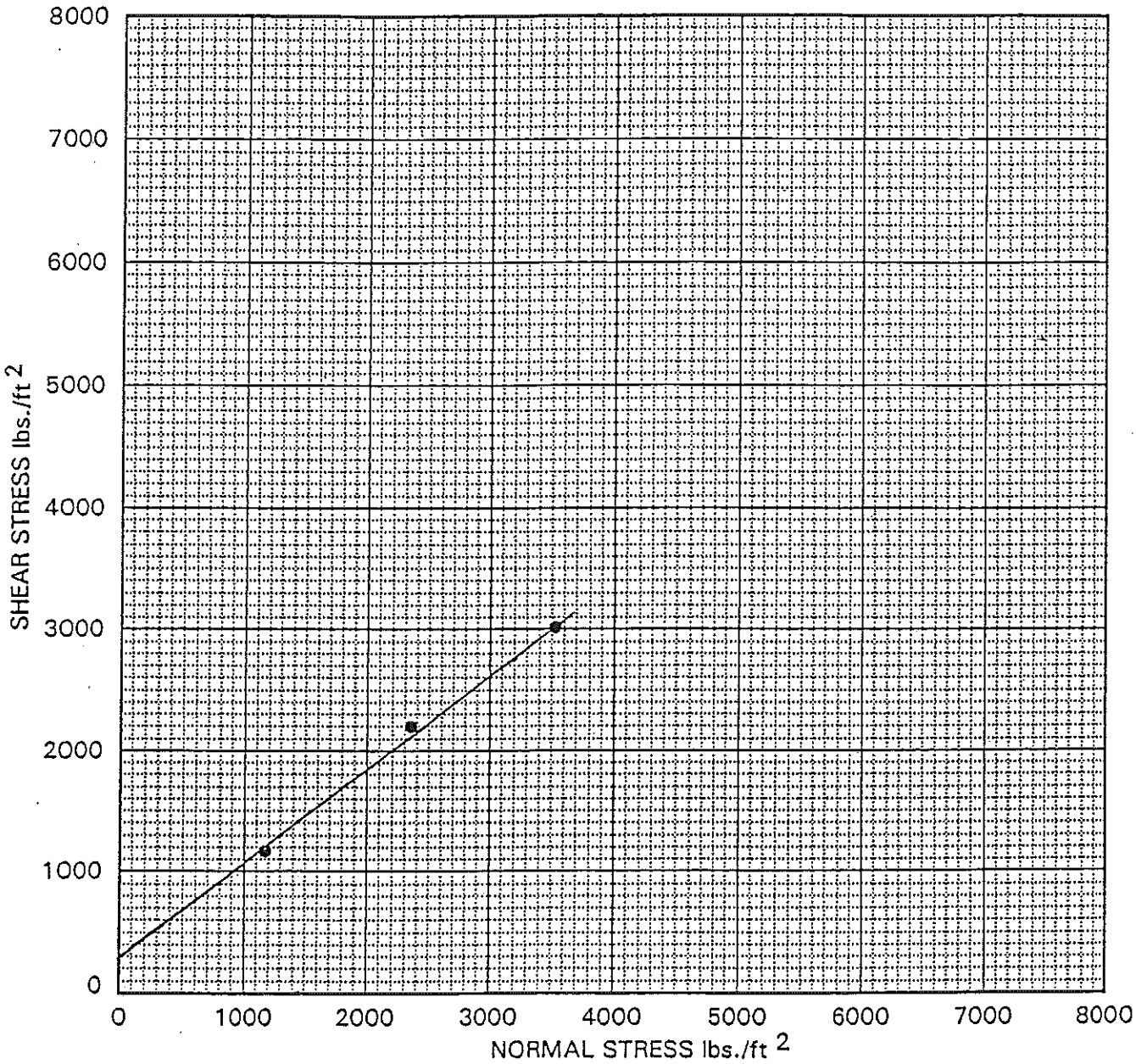
ATTERBERG LIMITS
ASTM D4318

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-6

DIRECT SHEAR TESTS
UNDISTURBED



Silty Sand (Qtm)	COHESION 300 psf.
SM	FRICTION ANGLE 37.0 degrees

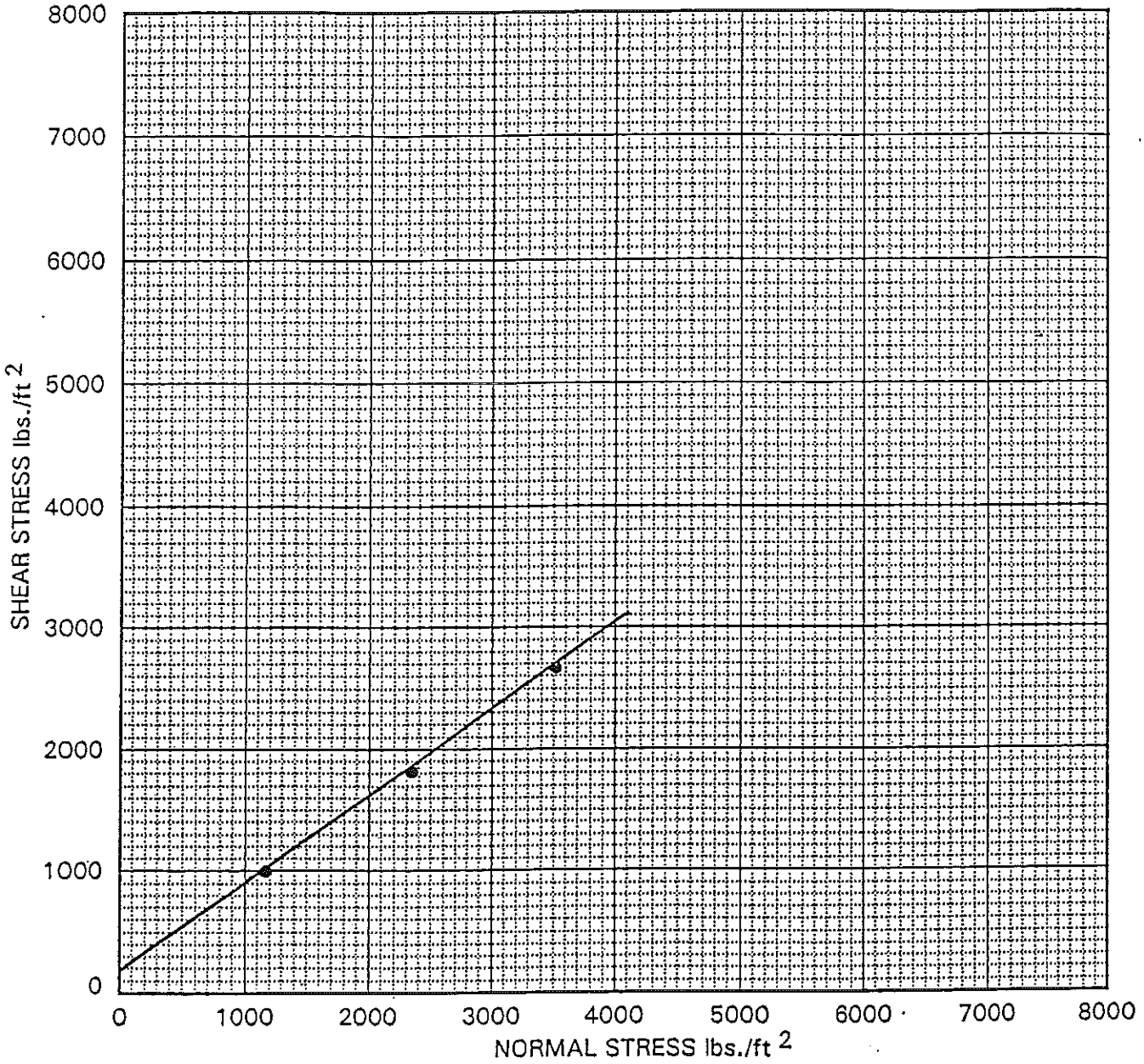
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	B-1	10.00			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-1

DIRECT SHEAR TESTS
UNDISTURBED



Silty Sand (Qsp)	COHESION 200 psf.
SM	FRICTION ANGLE 35.0 degrees

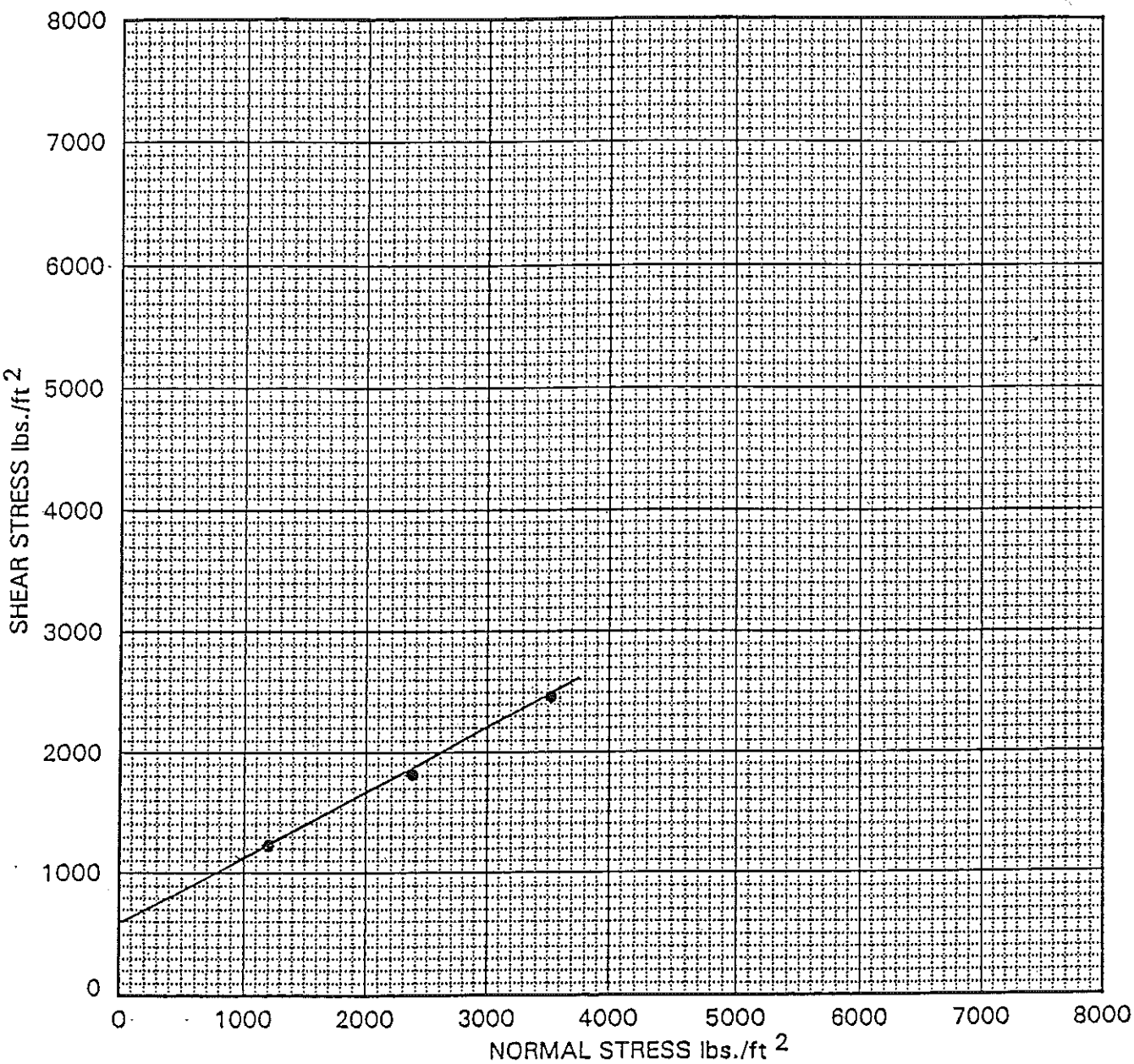
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	B-1	30.00			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-2

DIRECT SHEAR TESTS
REMOLDED



Silty Sand (Qtm)	COHESION 600 psf.
SM	FRICTION ANGLE 28.0 degrees

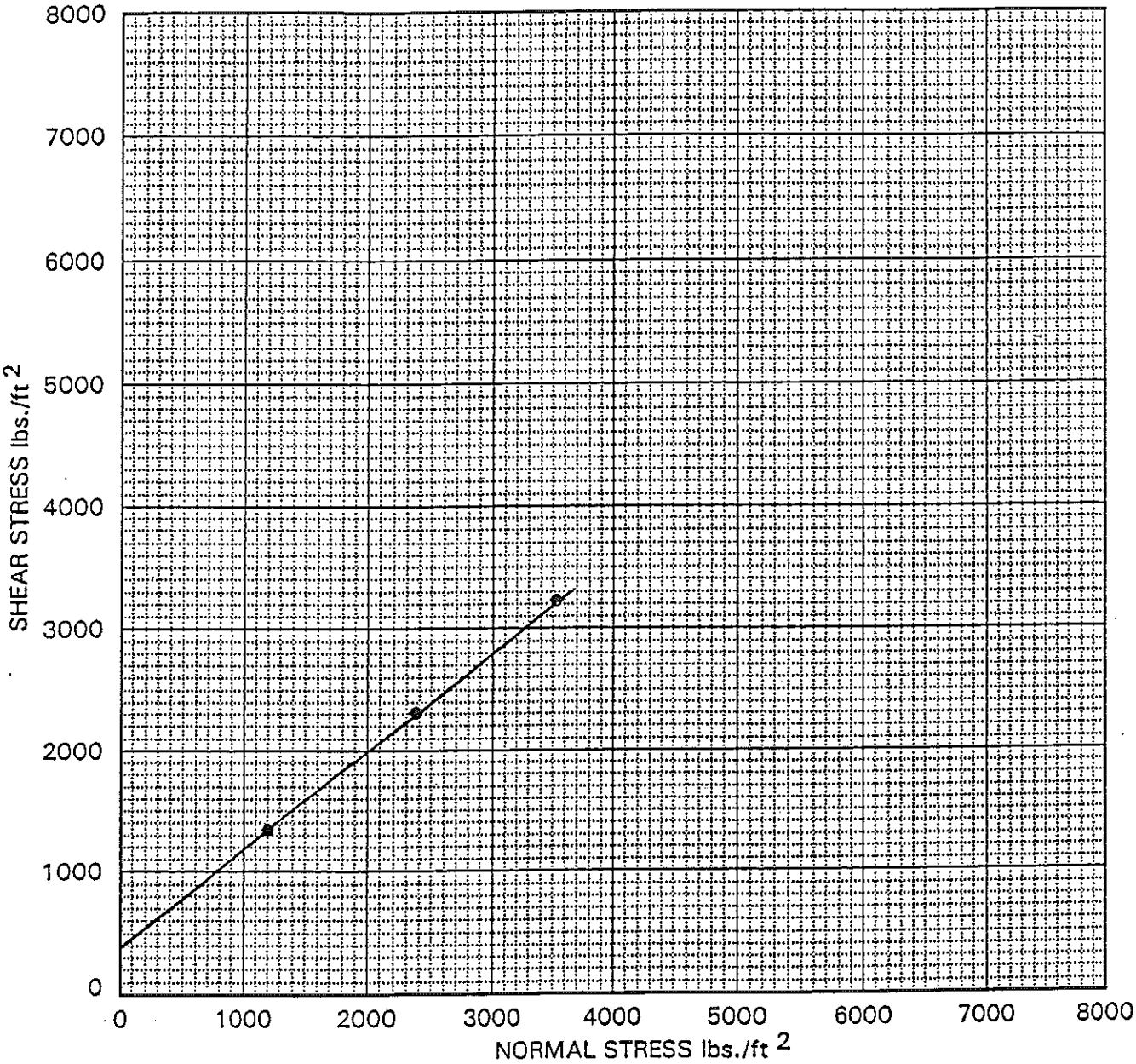
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	B-2	18.00			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-3

DIRECT SHEAR TESTS
UNDISTURBED



Sandy Silt (Qsp)	COHESION 400 psf.
ML	FRICTION ANGLE 38.0 degrees

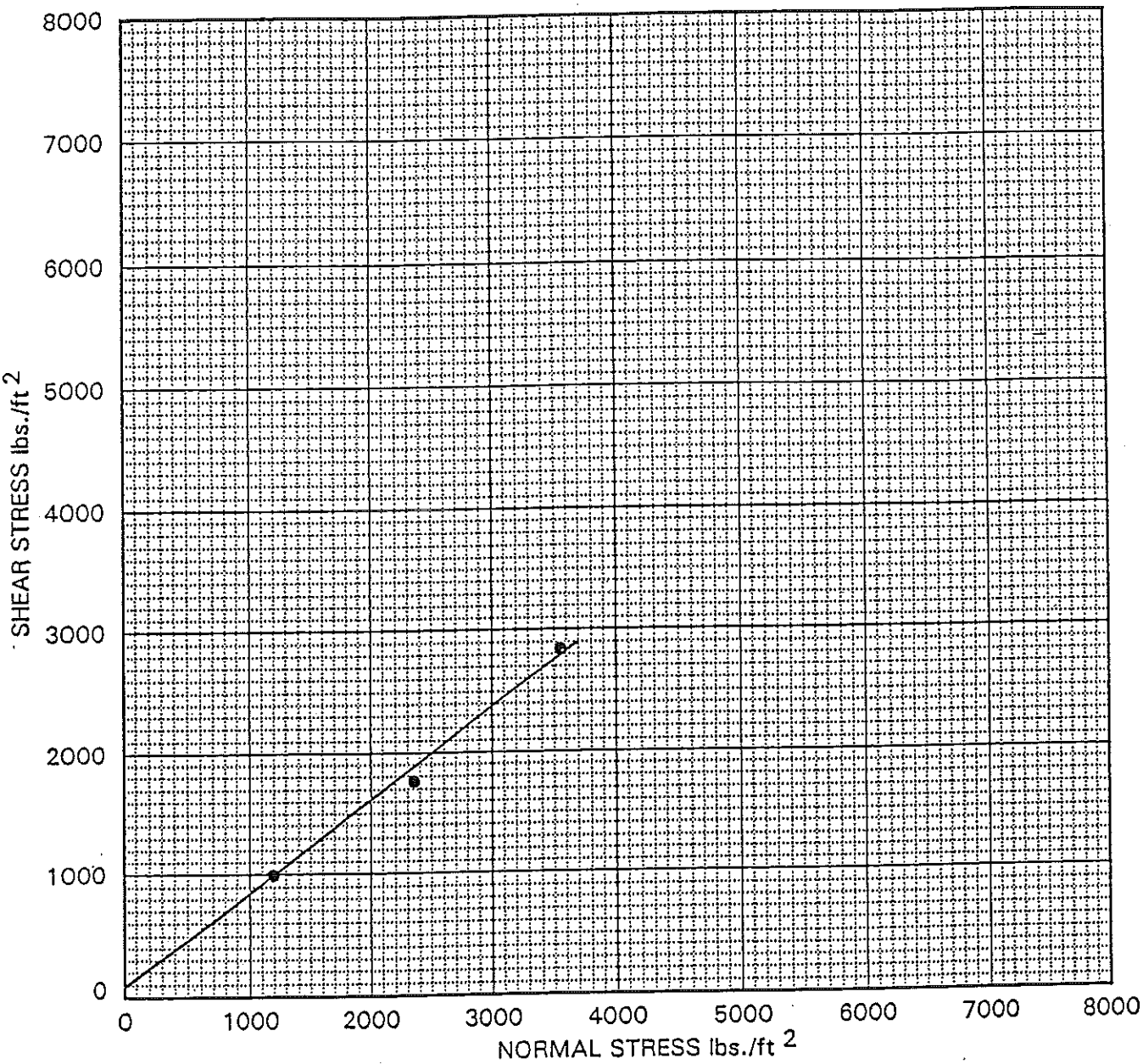
symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	B-2	50.00			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-4

DIRECT SHEAR TESTS
REMOLDED



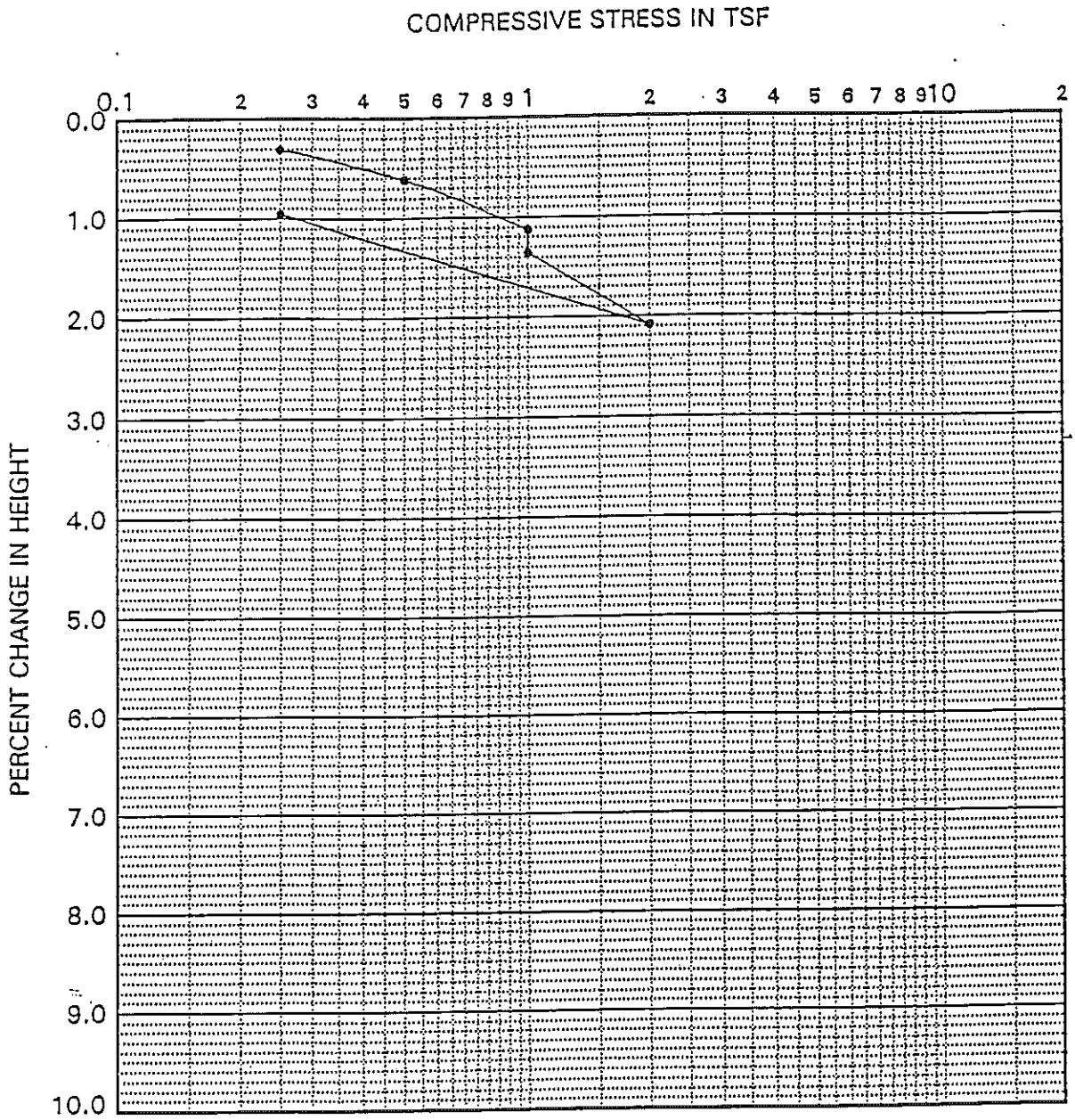
Sand (Qtm)	COHESION 100 psf.
SP	FRICTION ANGLE 37.0 degrees

symbol	boring	depth (ft.)	symbol	boring	depth (ft.)
●	B-5	12.00			

DIRECT SHEAR TEST

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 500236 PLATE B-5

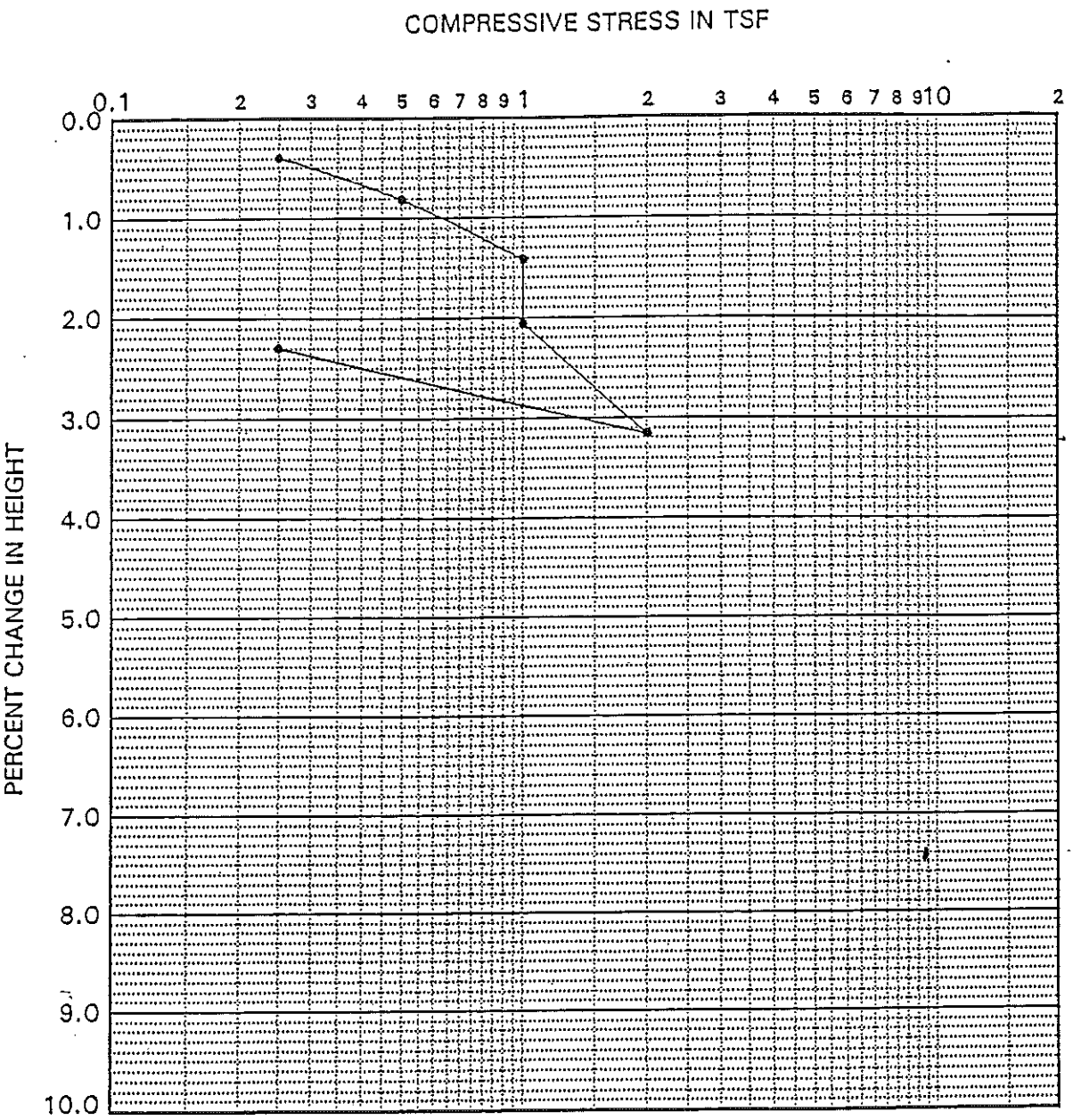


boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-6	5.00	120.40	12.70	63.0	ML	Silt (Soil)

REMARKS: Water added at 1 tsf.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122
W.O. 500236 PLATE B-6

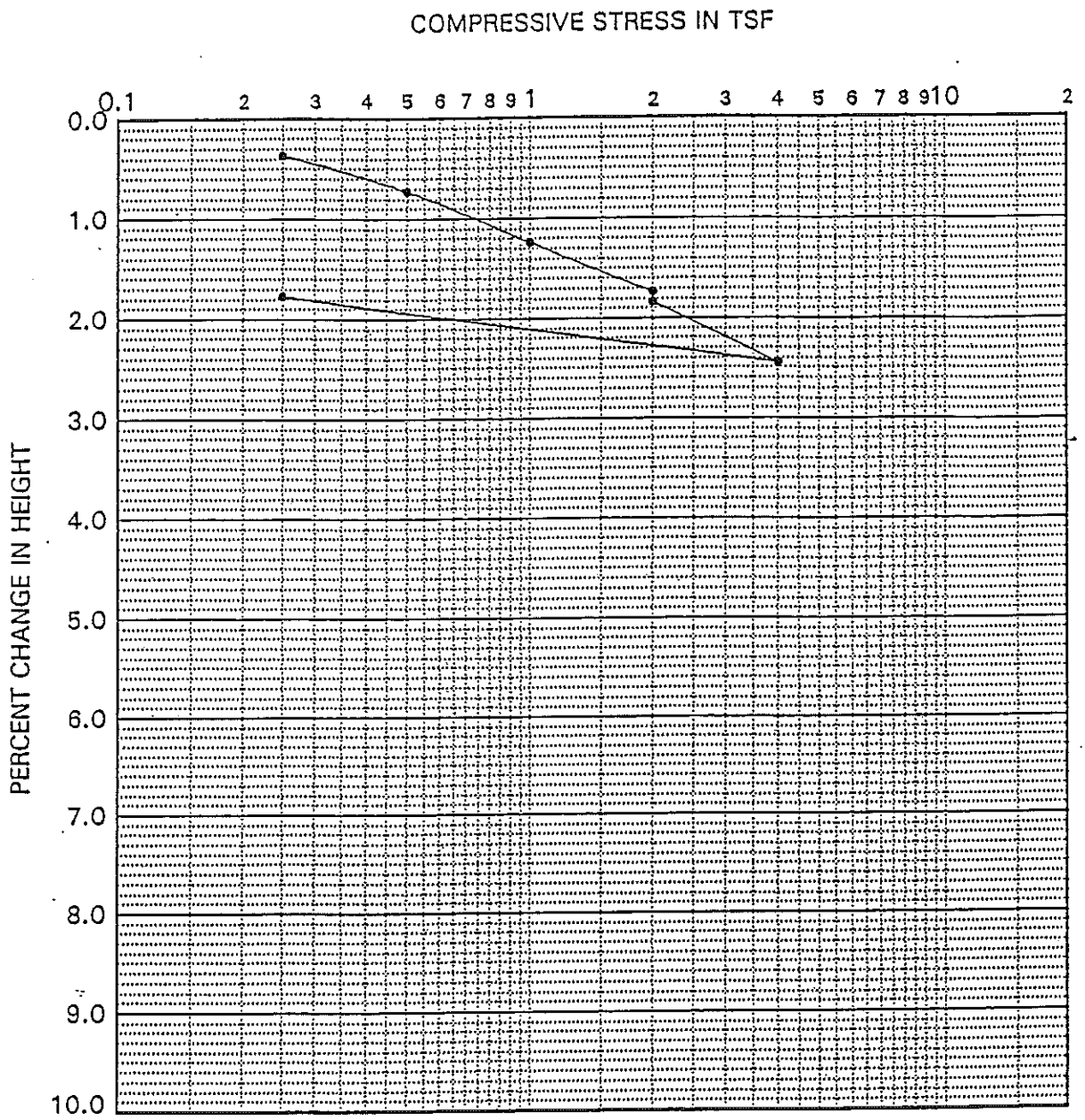


boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-6	10.00	109.70	8.40	37.0	SM	Silty Sand (Qtm)

REMARKS: Water added at 1 tsf.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122
W.O. 500236 PLATE B-7

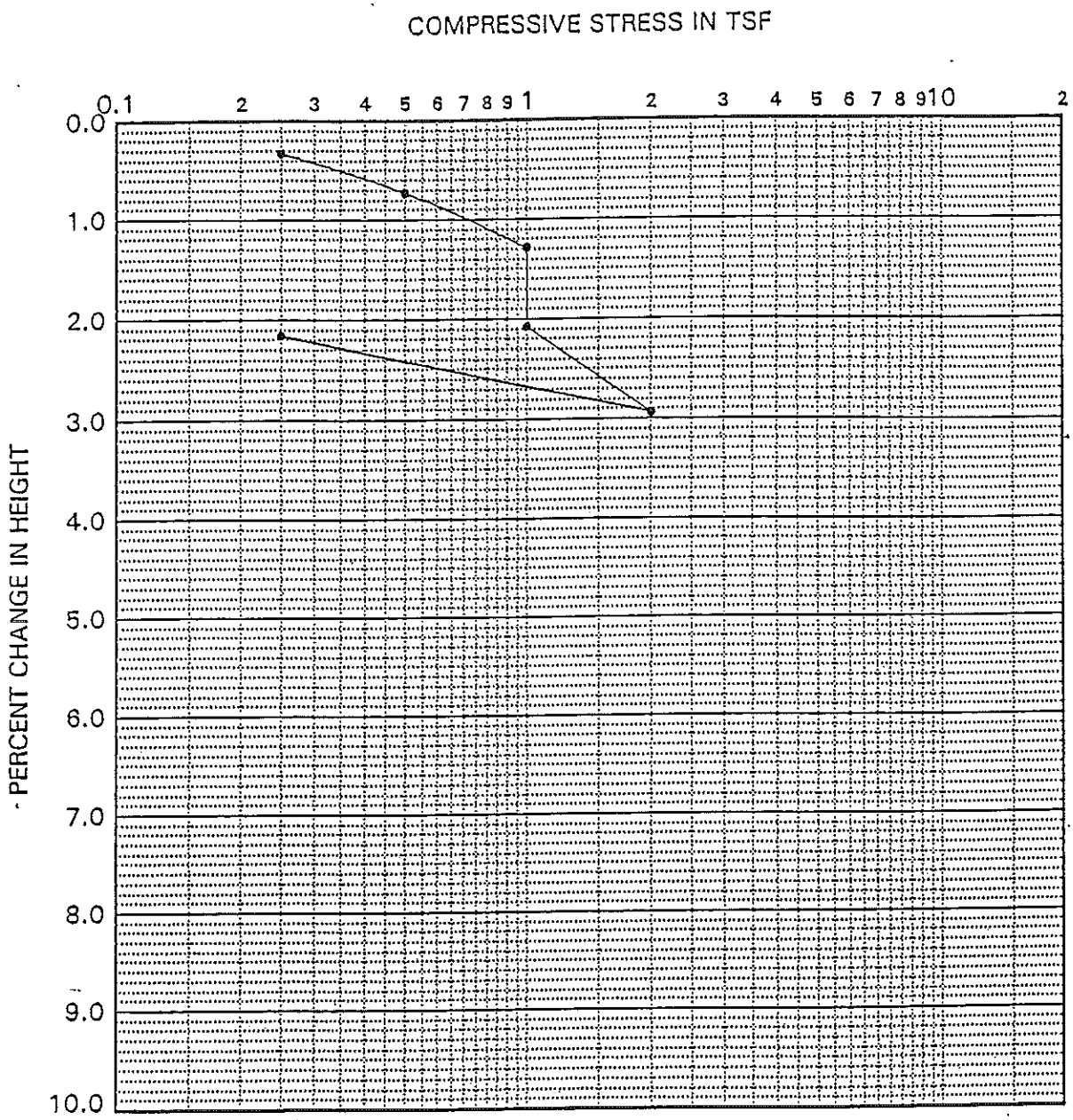


boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-6	31.50	103.00	3.10	12.0	SP-SM	Sand with Silt (Qsp)

REMARKS: Water added at 2 tsf.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122
W.O. 500236 PLATE B-8

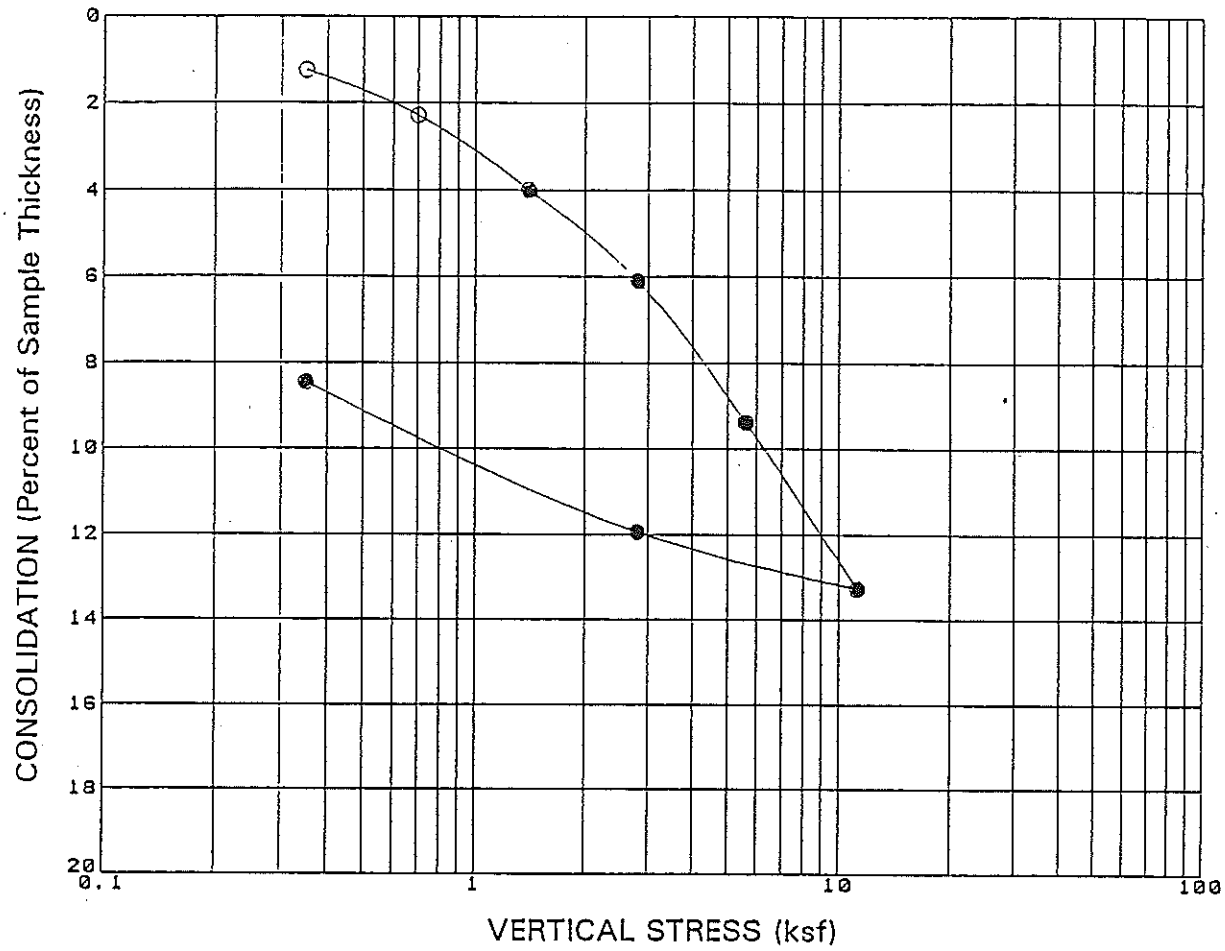


boring	depth (ft.)	dry density	in situ moist.	-200 sieve	group symbol	typical names
B-7	10.00	96.40	4.00	60.0	ML	Silt (Qtm)

REMARKS: Water added at 1 tsf.

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122
W.O. 500236 PLATE B-9



LEGEND: ○ At Field Moisture
● After Addition of Water

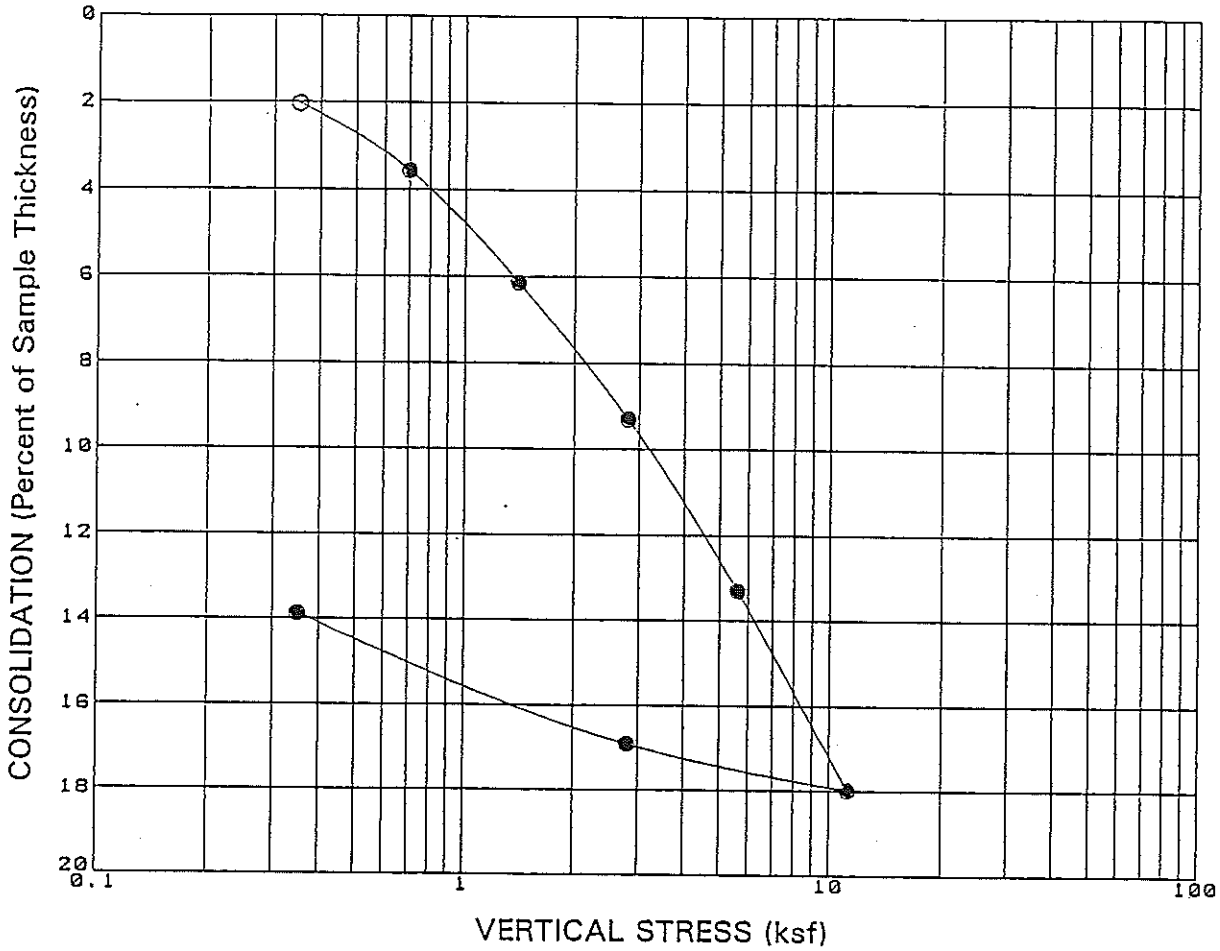
Boring No.	B-3	Dry Density (psf)	79.4
Sample No.	R-2	Moisture Content (%):	
Depth (ft)	5.0	Before	40.2
Soil Type	CL	After	35.7
Sample Description	Silty Clay		

CONSOLIDATION CURVE
ASTM D2435

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-7



LEGEND: ○ At Field Moisture
● After Addition of Water

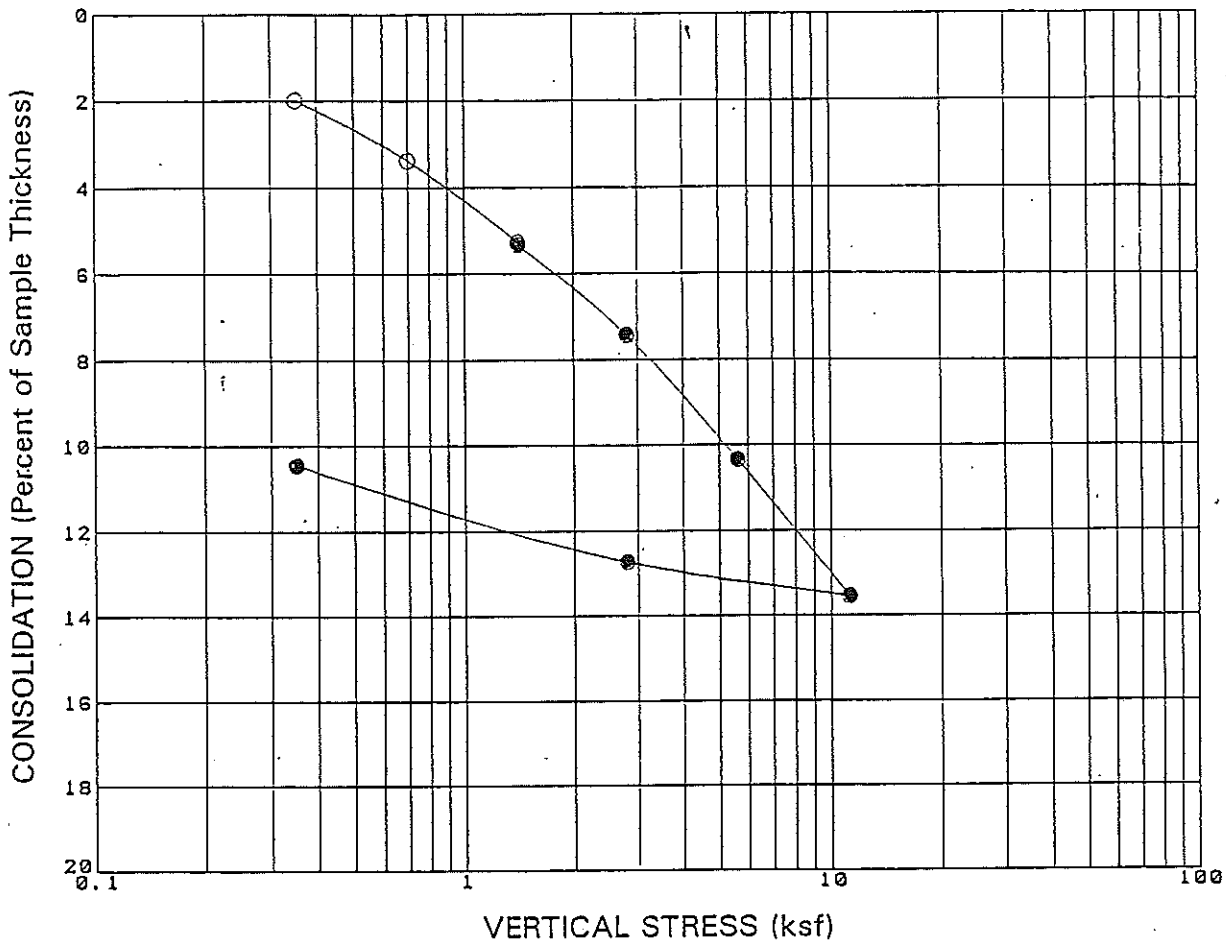
Boring No.	B-4	Dry Density (psf)	73.3
Sample No.	R-1	Moisture Content (%):	
Depth (ft)	2.0	Before	46.7
Soil Type	CL	After	37.9
Sample Description	Silty Clay		

CONSOLIDATION CURVE
ASTM D2435

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-8



LEGEND: ○ At Field Moisture
● After Addition of Water

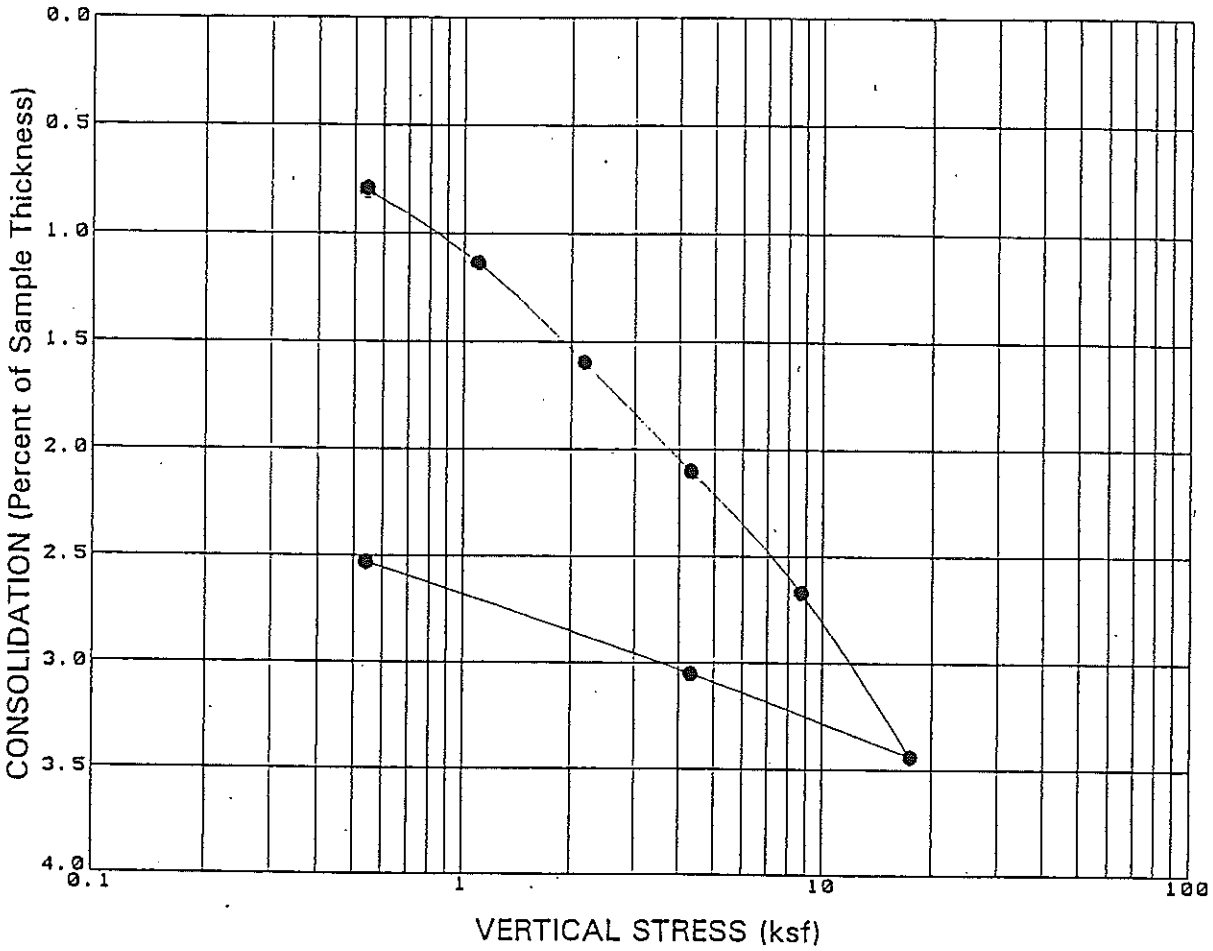
Boring No.	B-6	Dry Density (psf)	76.6
Sample No.	R-2	Moisture Content (%):	
Depth (ft)	5.0	Before	42.5
Soil Type	CL	After	36.9
Sample Description	Silty Clay		

CONSOLIDATION CURVE
ASTM D2435

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-9



LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	B-2-97	Dry Density (psf)	99.8
Sample No.	R-3	Moisture Content (%):	
Depth (ft)	12.5	Before	23.9
Soil Type	SP	After	23.5

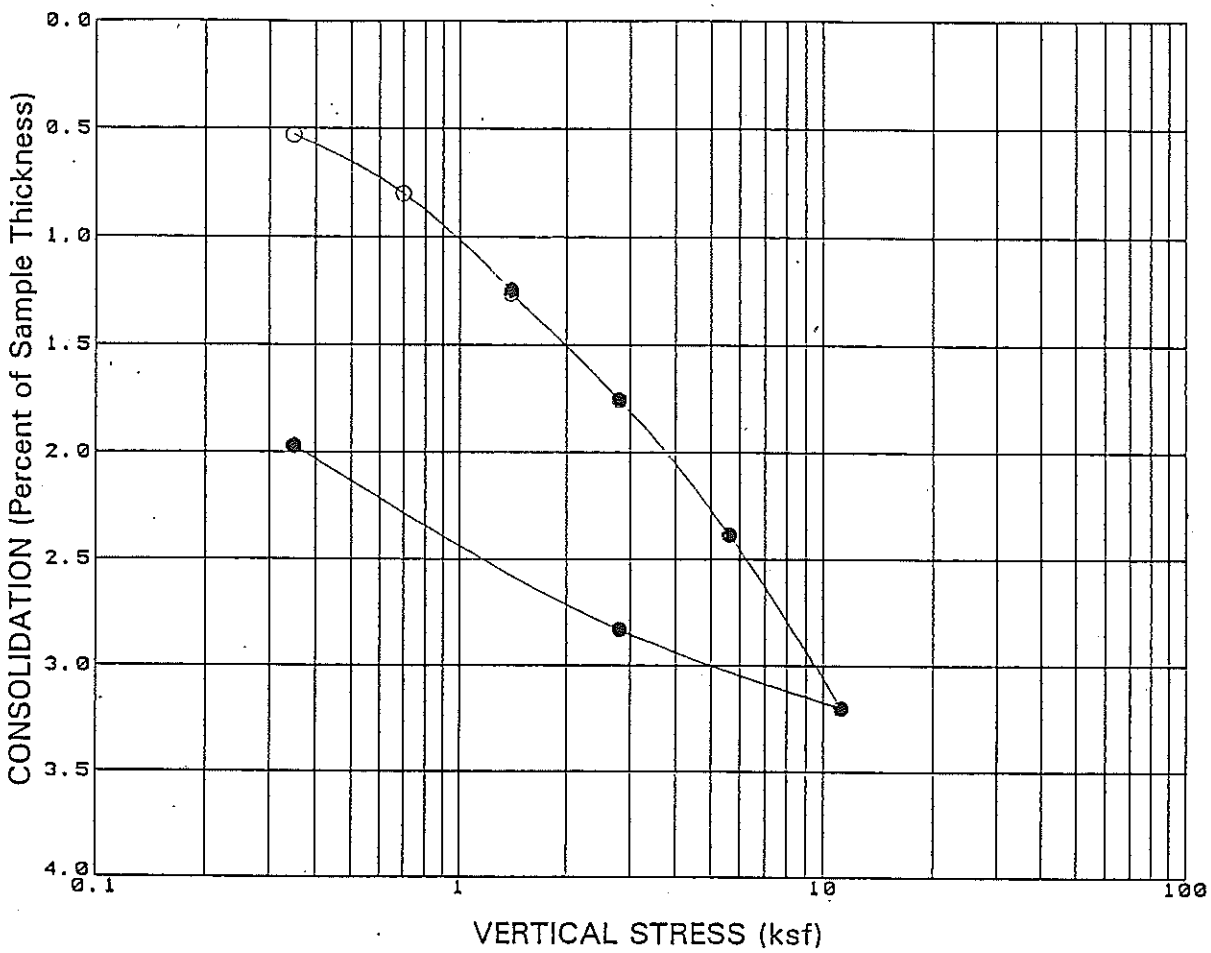
Sample Description Poorly Graded Sand

CONSOLIDATION CURVE
ASTM D2435

Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____

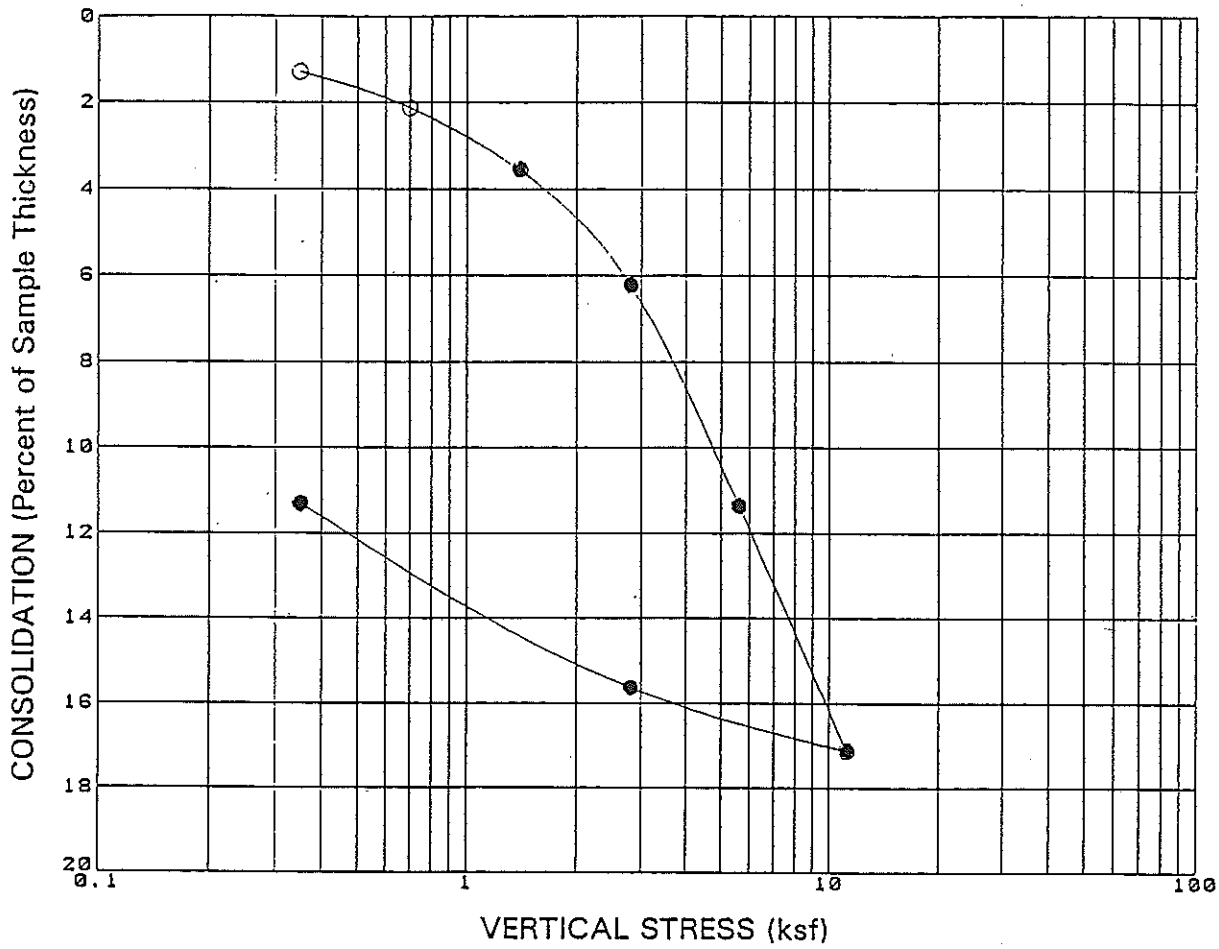


LEGEND: ○ At Field Moisture
● After Addition of Water

Boring No.	B-2-97	Dry Density (psf)	106.5
Sample No.	R-1	Moisture Content (%):	
Depth (ft)	2.5	Before	11.6
Soil Type	SM	After	17.1
Sample Description	Silty Sand		

CONSOLIDATION CURVE
ASTM D2435

Project No. 970011-001
Project Name NEWPORT BANNING RANCH
Date 1/6/98 Figure No. _____



LEGEND: ○ At Field Moisture
● After Addition of Water

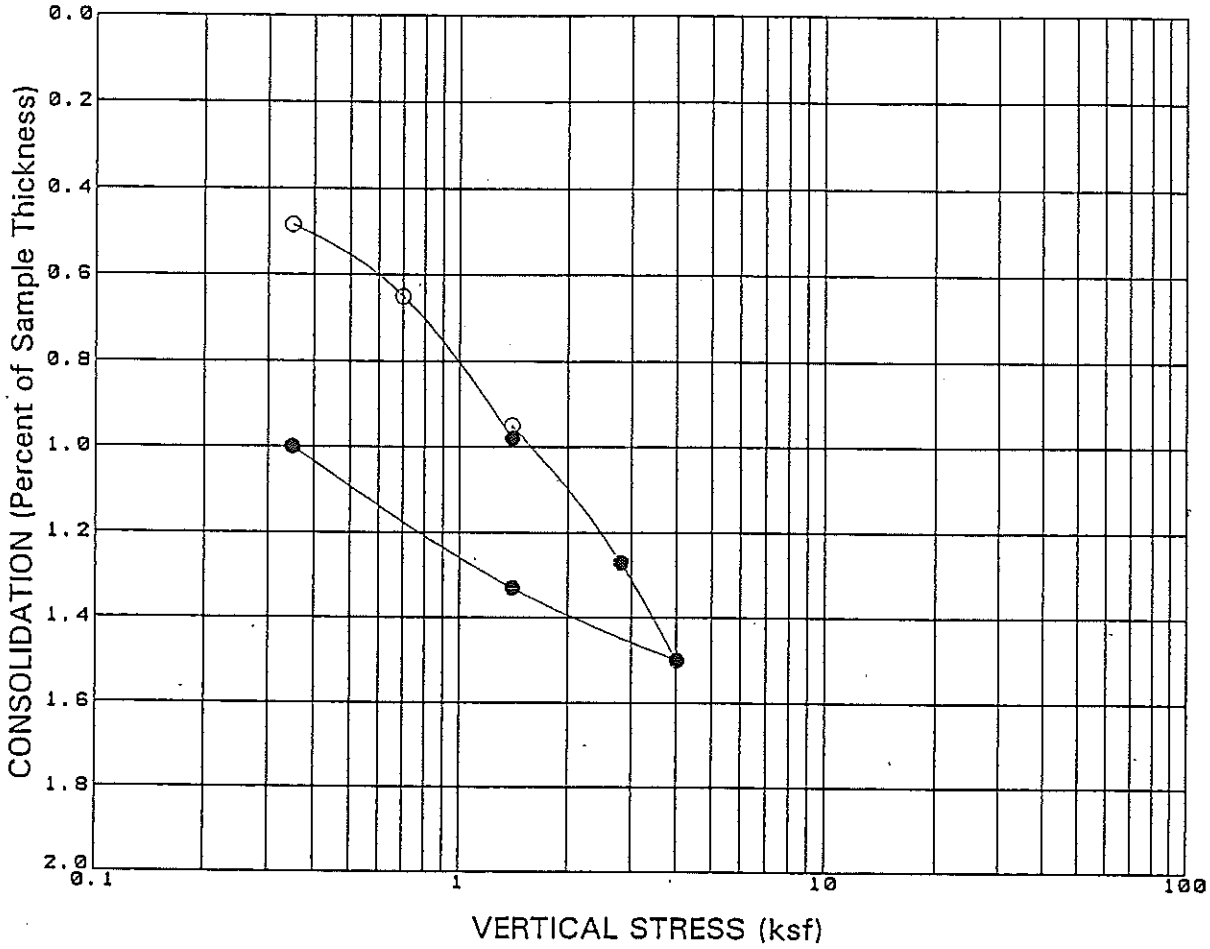
Boring No.	B-1-97	Dry Density (psf)	68.5
Sample No.	R-2	Moisture Content (%):	
Depth (ft)	7.0	Before	49.6
Soil Type	SM	After	41.9
Sample Description	Silty Sand		

CONSOLIDATION CURVE
ASTM D2435

Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____



LEGEND: ○ At Field Moisture
● After Addition of Water

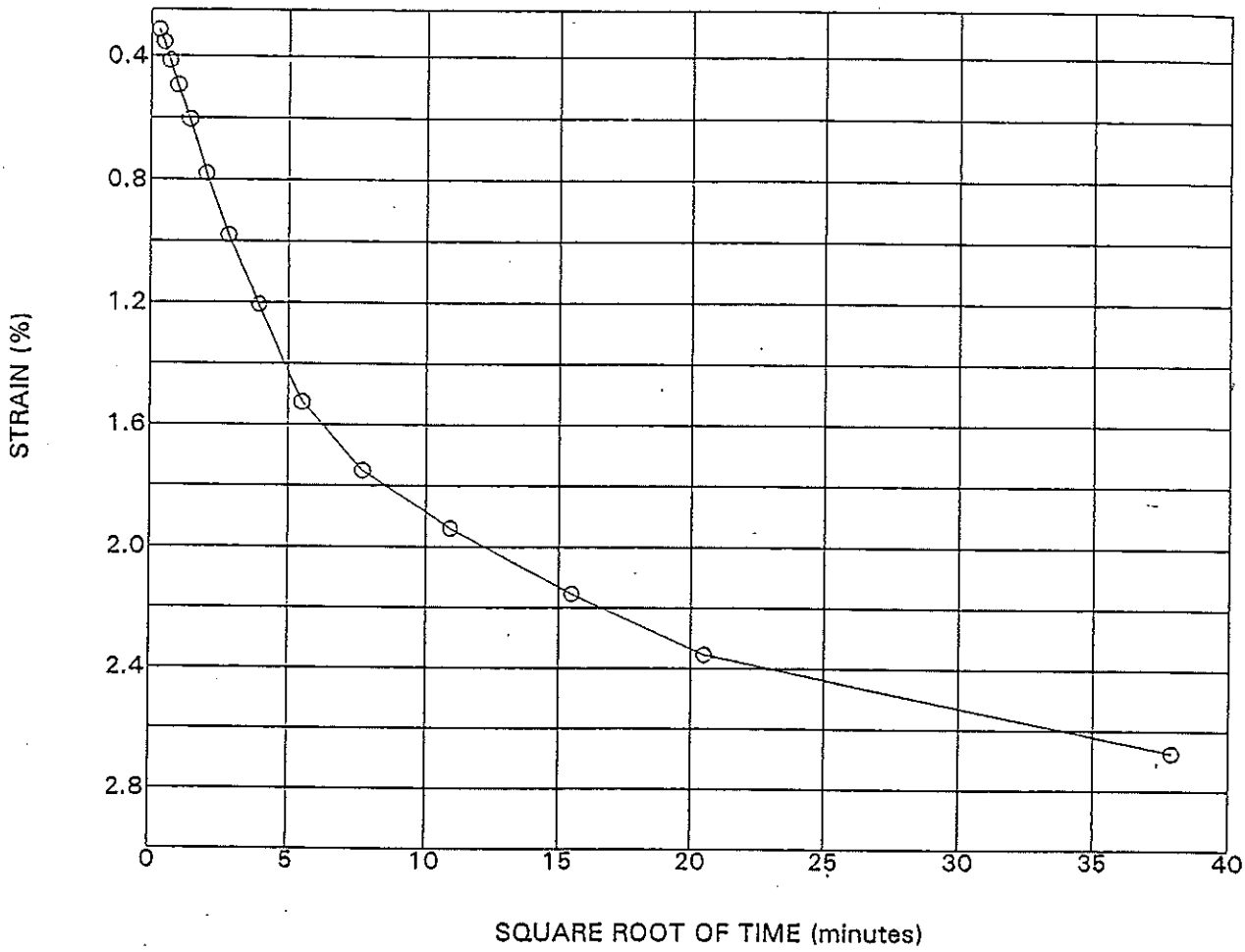
Boring No.	B-4-97	Dry Density (psf)	118.8
Sample No.	R-2	Moisture Content (%):	
Depth (ft)	10.0	Before	8.5
Soil Type	SM	After	12.5
Sample Description	Silty Sand		

CONSOLIDATION CURVE
ASTM D2435

Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____



Boring Number	Sample Number	Sample Depth (ft)	USCS	Symbol	Load(ksf)
B-1-97	R-2	7.0	SM	○	2.8 ksf

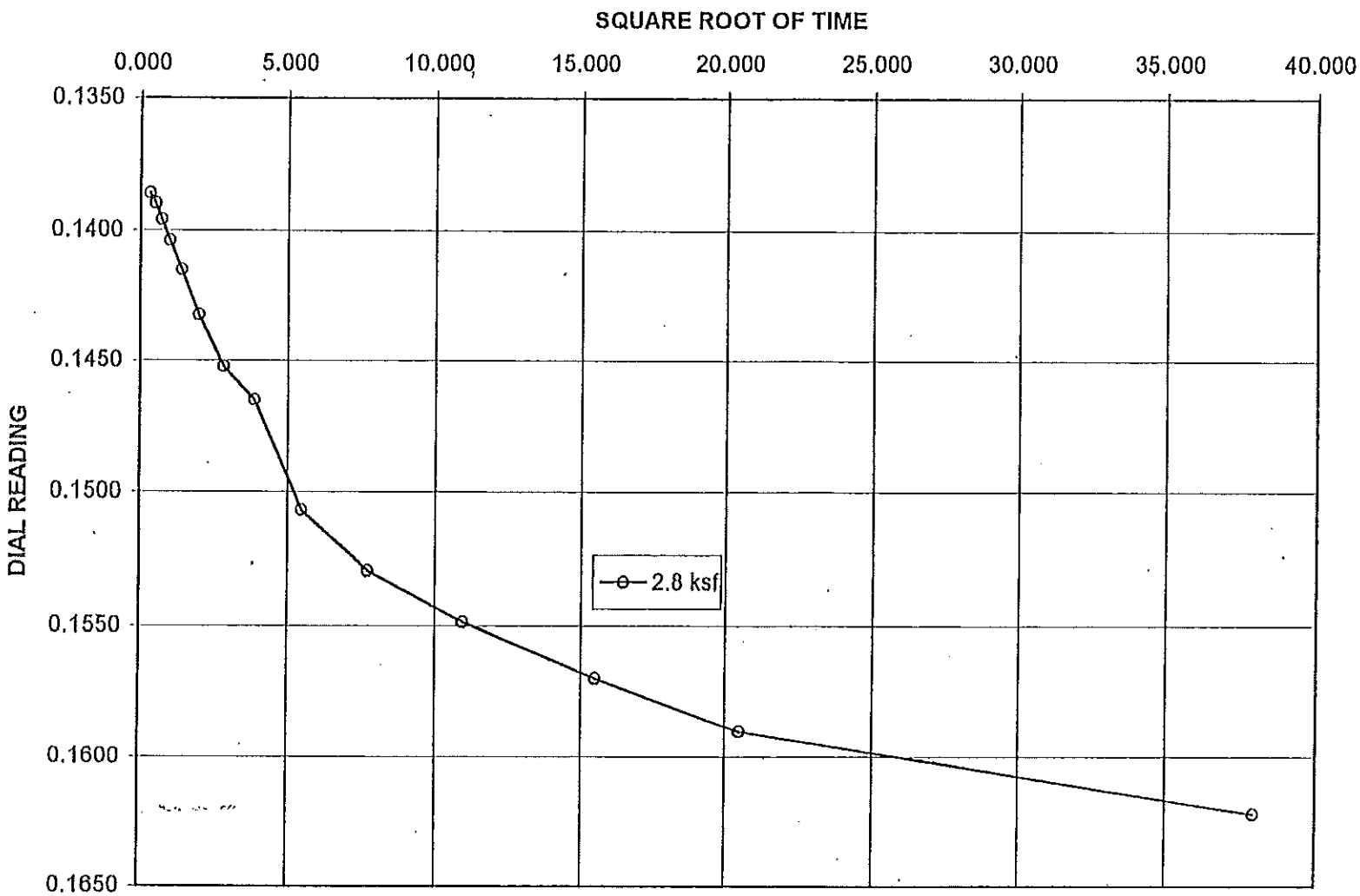
TIME RATE CONSOLIDATION CURVE

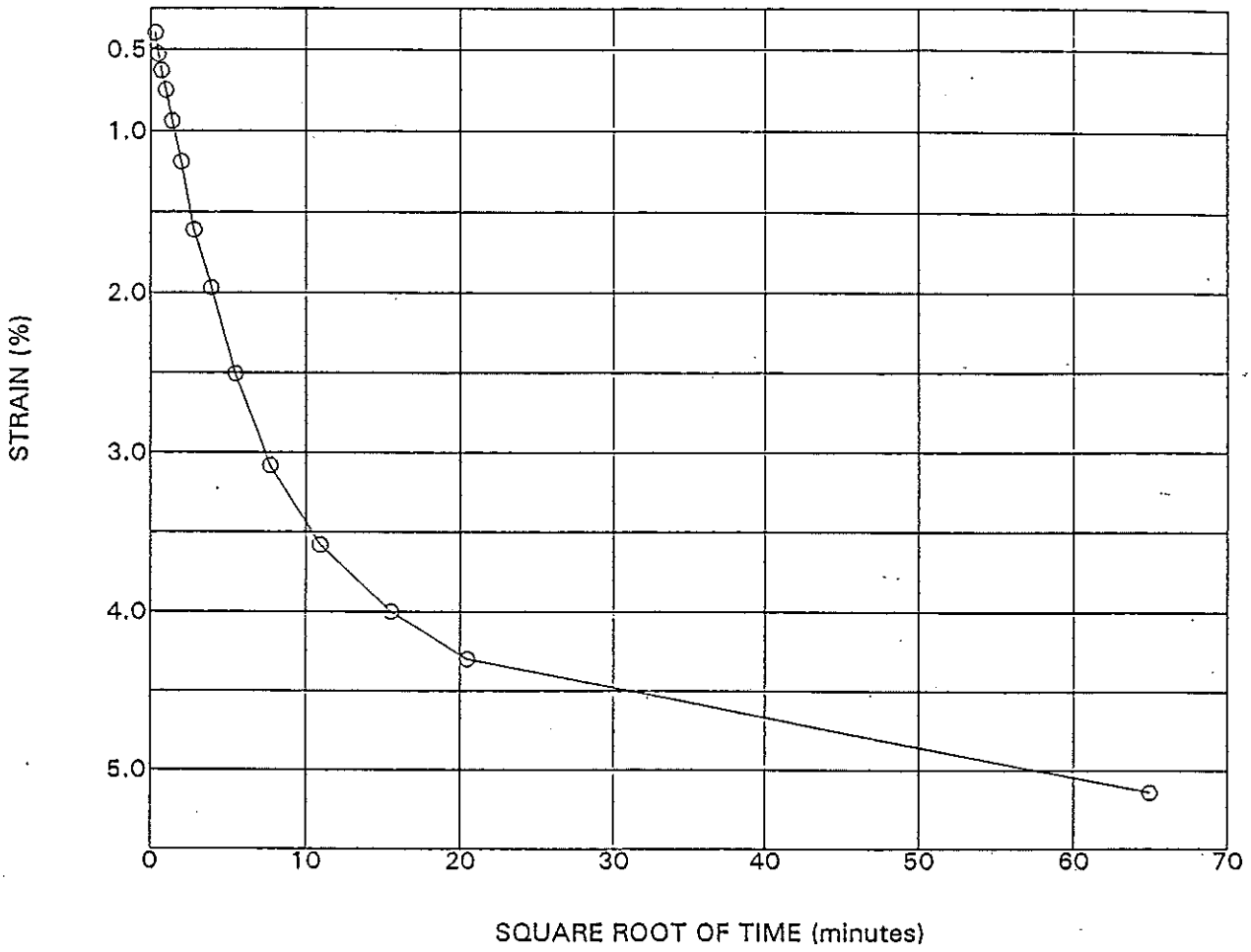
Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____

NEWPORT BANNING RANCH / TAYLOR WOODROW
BORING B-1-97 @ 7 FT, SAMPLE R-2 (SM)





Boring Number	Sample Number	Sample Depth (ft)	USCS	Symbol	Load(ksf)
B-1-97	R-2	7.0	SM	○	5.6 ksf

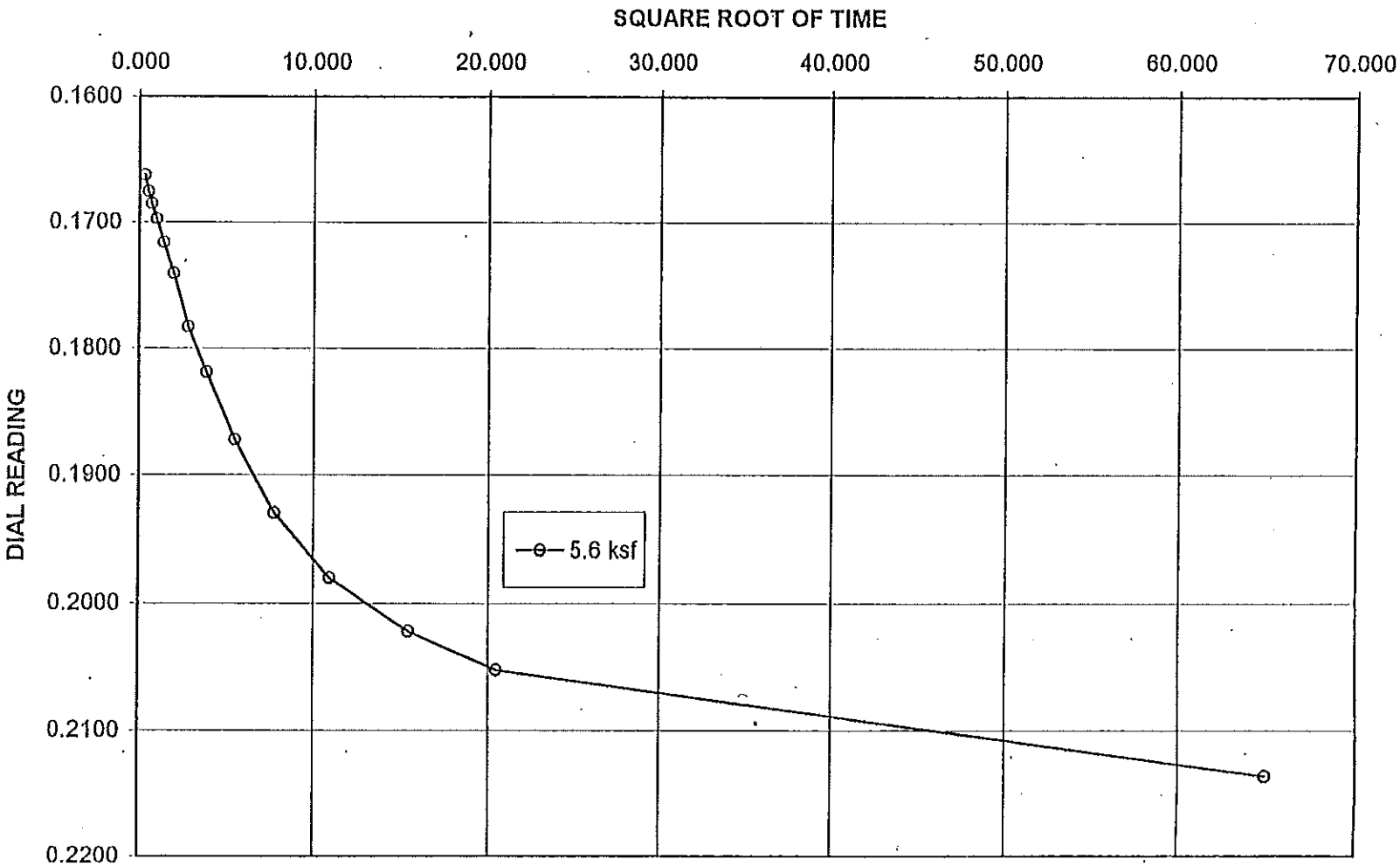
TIME RATE CONSOLIDATION CURVE

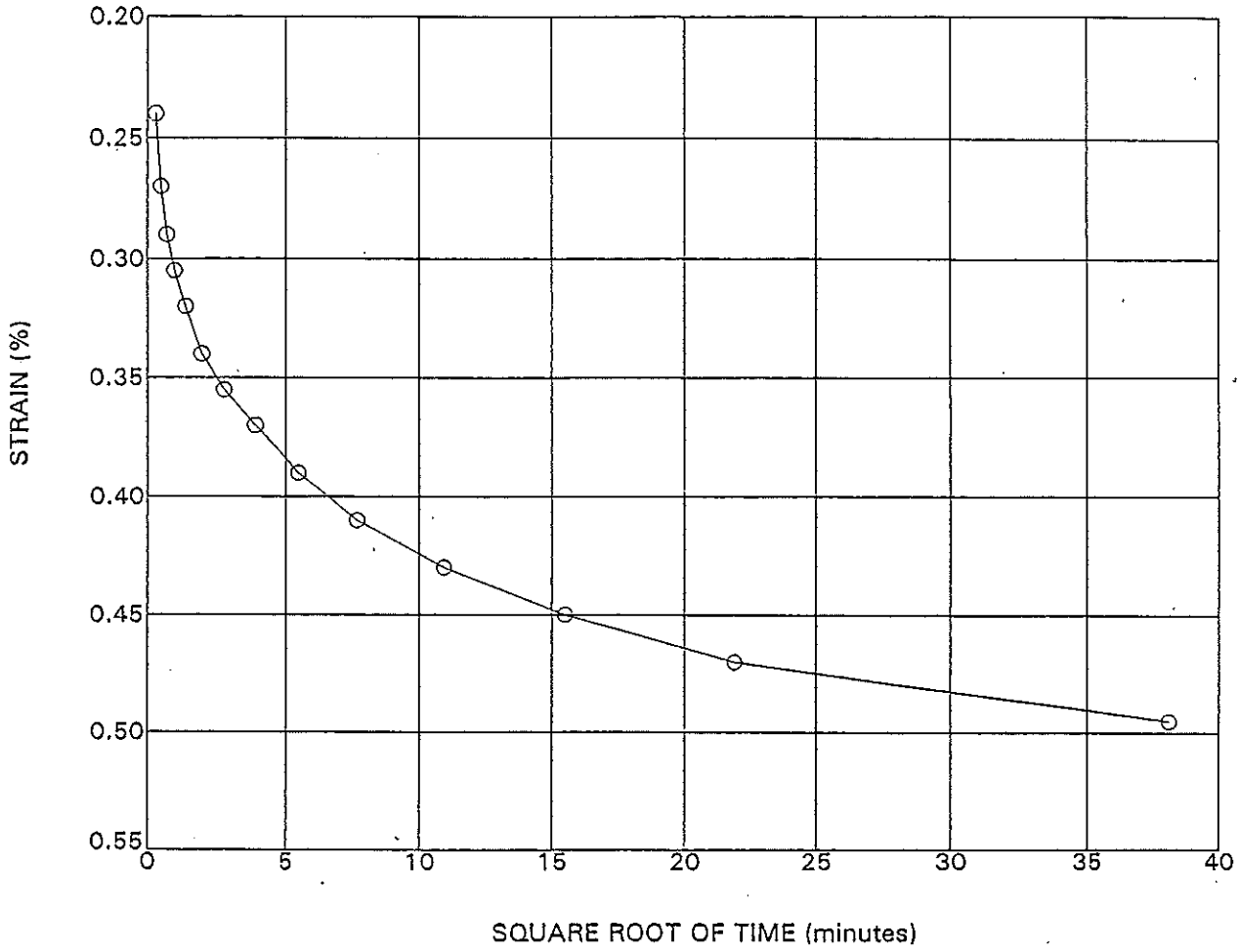
Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____

NEWPORT BANNING RANCH / TAYLOR WOODROW
BORING B-1-97 @ 7 FT, SAMPLE R-2 (SM)





Boring Number	Sample Number	Sample Depth (ft)	USCS	Symbol	Load(ksf)
B-2-97	R-1	2.5	SM	○	2.8 ksf

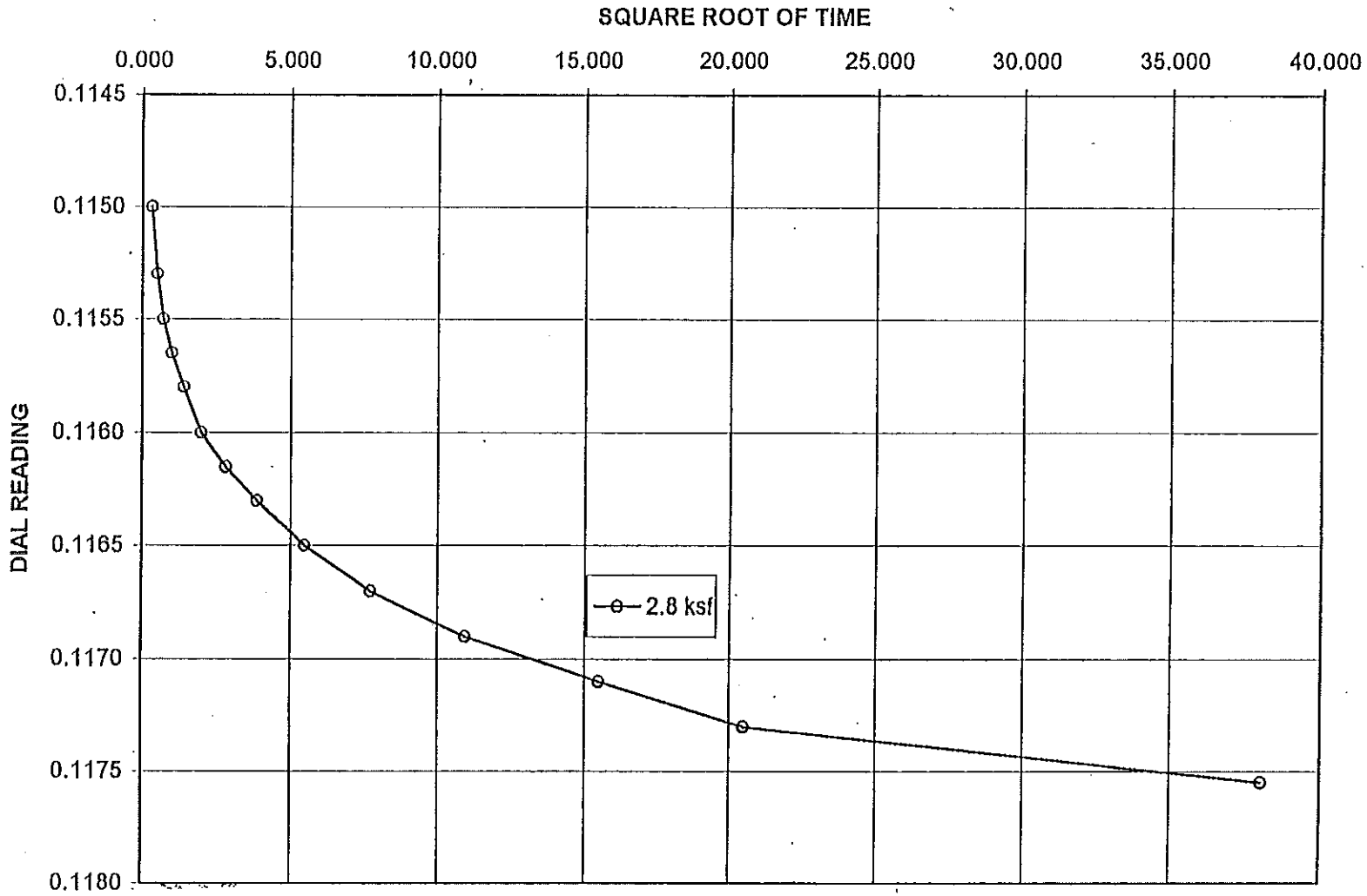
TIME RATE CONSOLIDATION CURVE

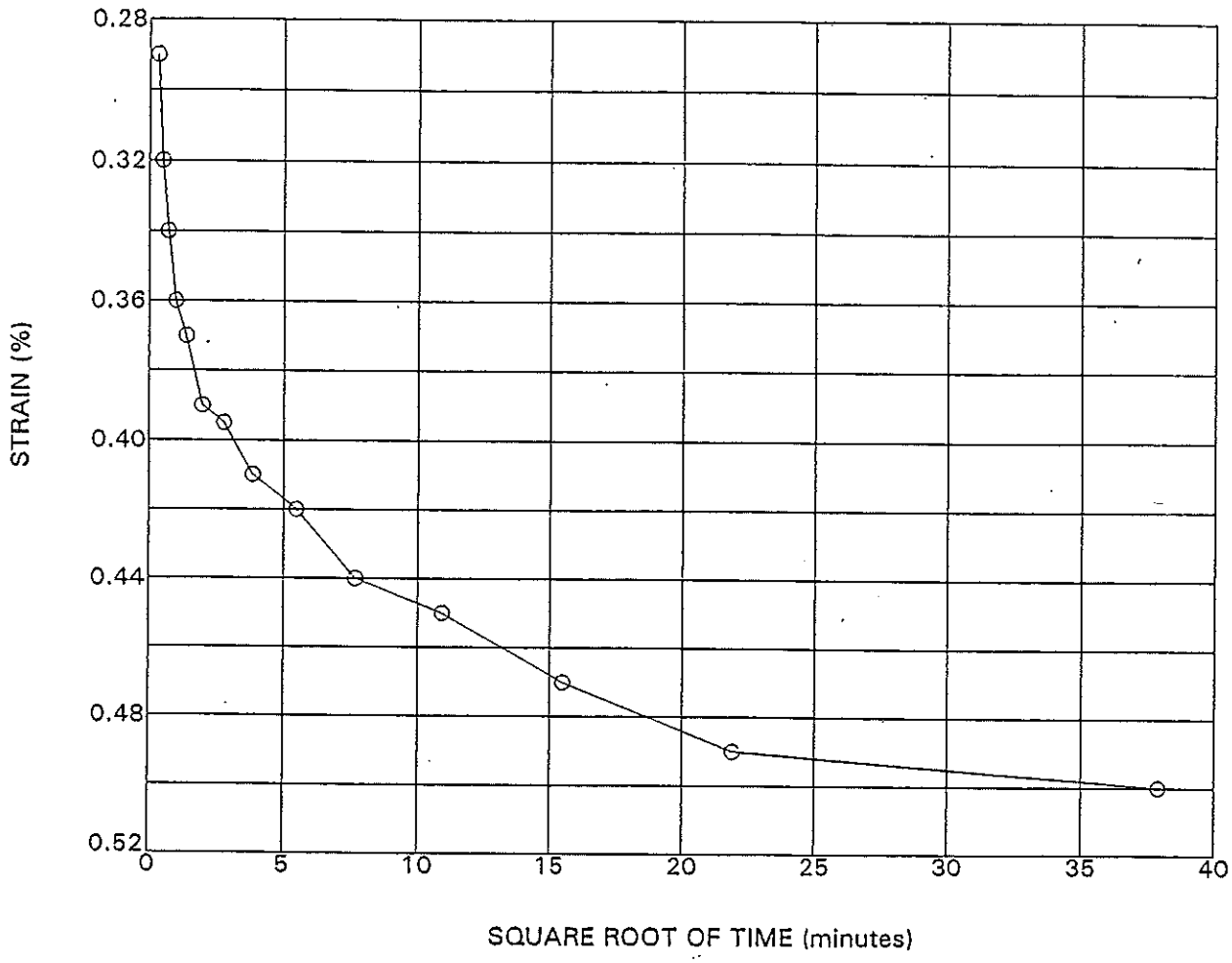
Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____

NEWPORT BANNING RANCH / TAYLOR WOODROW
BORING B-2-97 @ 2.5 FT, SAMPLE R-1 (SM)





Boring Number	Sample Number	Sample Depth (ft)	USCS	Symbol	Load(ksf)
B-2-97	R-3	12.5	SP	○	4.3 ksf

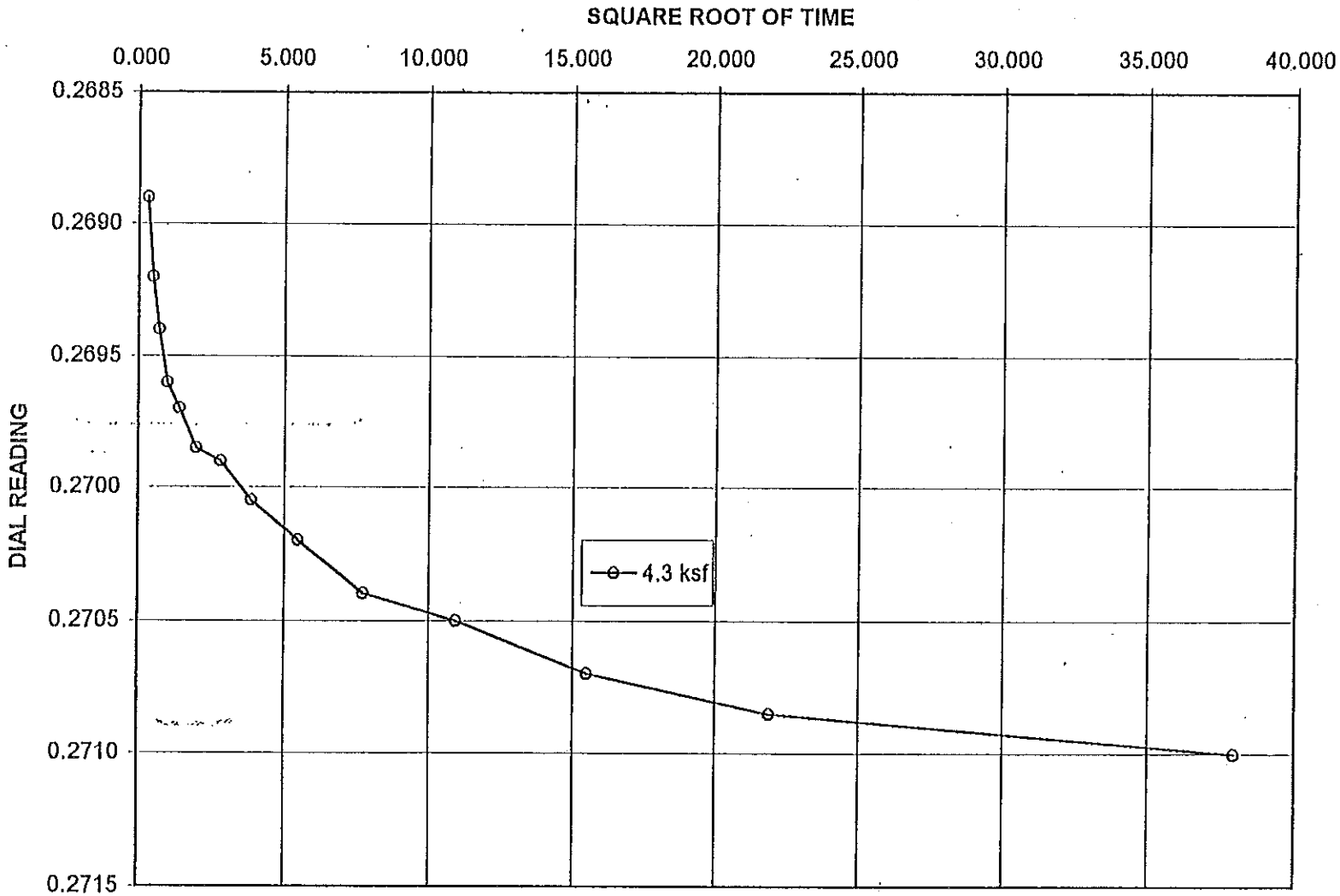
TIME RATE CONSOLIDATION CURVE

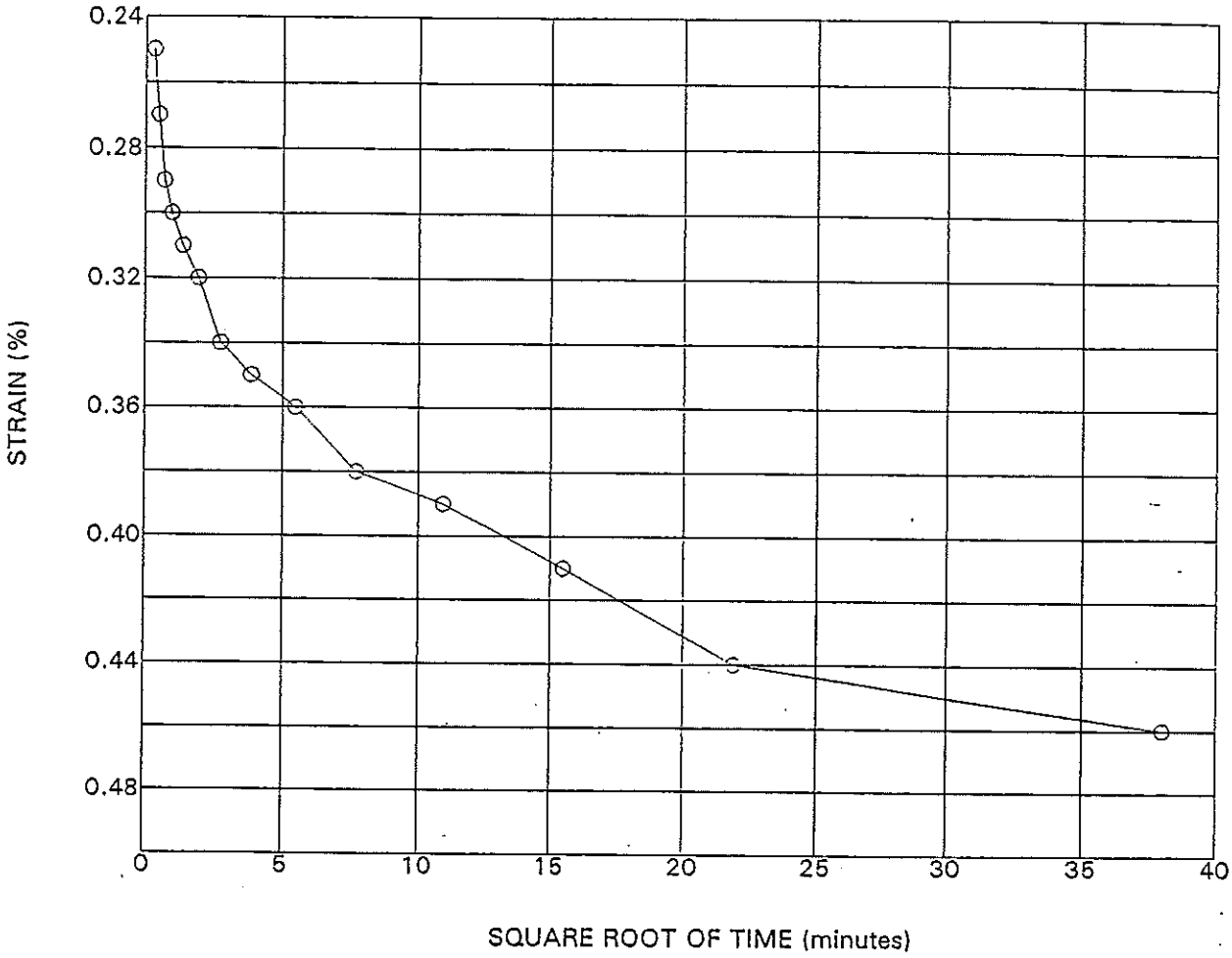
Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____

NEWPORT BANNING RANCH / TAYLOR WOODROW
BORING B-2-97 @ 12.5 FT, SAMPLE R-3 (SP)





Boring Number	Sample Number	Sample Depth (ft)	USCS	Symbol	Load(ksf)
B-2-97	R-3	12.5	SP	○	2.17 ksf

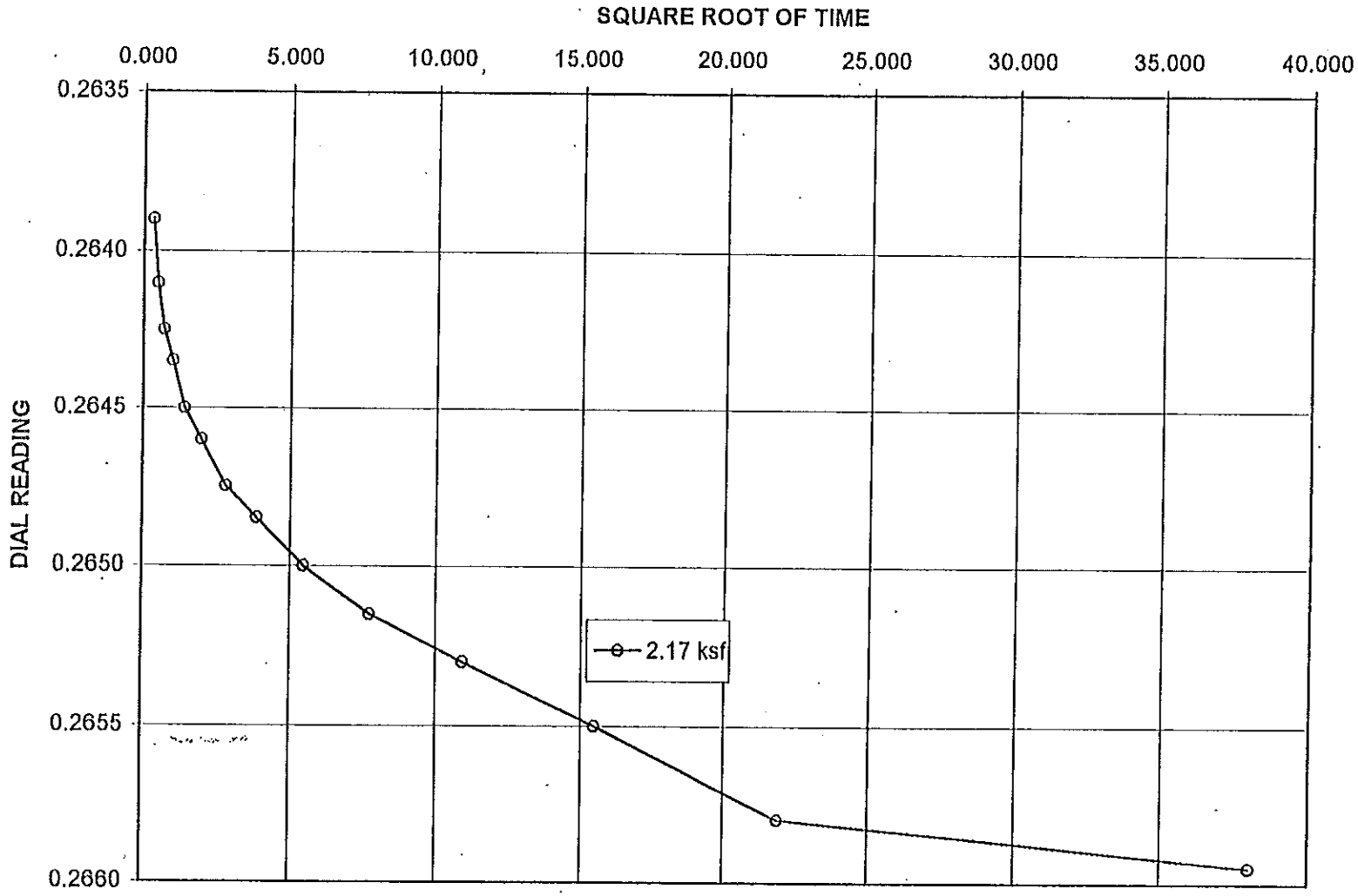
TIME RATE CONSOLIDATION CURVE

Project No. 970011-001

Project Name NEWPORT BANNING RANCH

Date 1/6/98 Figure No. _____

NEWPORT BANNING RANCH / TAYLOR WOODROW
BORING B-2-97 @ 12.5 FT, SAMPLE R-3 (SP)



ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92668 - 714/771-6900

CLIENT
Woodward-Clyde Consultants
203 North Golden Circle Drive
Santa Ana, CA 92705

LAB NO. F02802
REPORTED 2/26/85

SAMPLE Soil
RECEIVED 2/25/85

IDENTIFICATION Project No. 41890A, Project Name: West Newport Oil Field - As Below
BASED ON SAMPLE As Submitted

	Organic Content*
Boring No. A-1, Sample No. PB-1, Depth 5'	3.08 %
Boring No. A-1, Sample No. PB-2, Depth 6.5'	2.42 %
Boring No. B-1, Sample No. PB-2, Depth 10'	1.81 %
Boring No. D-1, Sample No. PB-4, Depth 15'	1.65 %

ASSOCIATED LABORATORIES

Tito L. Parola

TLP/dsv

*By Combustion.

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TESTING & CONSULTING
Chemical •
Microbiological •
Environmental •

C-1 10M

Project: WEST NEWPORT OIL Project No. 41890A	ORGANIC CONTENT TESTS	Fig. B-8

APPENDIX C

Slope Stability Methodology and Results

GMU
GEOTECHNICAL, INC.

APPENDIX C

SLOPE STABILITY METHODOLOGY AND RESULTS

GENERAL

Slope stability analyses were performed utilizing the computer program GSTABL7 Version 2 to evaluate the stability of the natural bluffs at the site and to preliminarily evaluate stability of proposed fill slopes. The GSTABL7 computer program was written for the general solution of slope stability problems by a two-dimensional limiting equilibrium method. The results of our analyses indicate that the site will have acceptable safety factors under anticipated static and dynamic conditions.

STRENGTH MODEL

Direct shear testing performed on samples obtained during this investigation and prior investigations were evaluated to determine the most applicable strength envelope for use in the stability analyses. Results of direct shear testing are summarized on Table C-1 below. Average shear strength values for both peak and ultimate strain conditions were adopted for analysis. Ultimate shear strength values were used to evaluate static stability while peak strengths were utilized for dynamic condition modeling.

Remolded Samples (Table C-1)

SAMPLE	STRAIN RATE	PEAK STRENGTH	ULTIMATE STRENGTH
GB 3 @ 8' (Qtm)	0.005"/min	300 psf, 30°	300 psf, 30°
PS B-3 @ 18' (Qtm)	0.05"/min	600 psf, 28°	
PS B-5 @ 12' (Qtm)	0.05"/min	100 psf, 37°	
	Adopted Values:	**333, 31.7°**	**300 psf, 30°**

Undisturbed Samples (Table C-1)

SAMPLE	STRAIN RATE	PEAK STRENGTH	ULTIMATE STRENGTH
GB 3 @ 5' (Qtm)	0.005"/min	600 psf, 29°	200 psf, 30°
GB 3 @ 15' (Qtm)	0.005"/min	0 psf, 44°	50 psf, 35°
GB 3 @ 35' (Qtm)	0.005"/min	150 psf, 32°	100 psf, 32°
GB 11 @ 5' (Qtm)	0.005"/min	1550 psf, 32°	250 psf, 32°
GB 11 @ 40' (Qtm)	0.005"/min	1500 psf, 23°	1000 psf, 26°
PS B-1 @ 10' (Qtm)	0.05"/min	300 psf, 37°	
PS B-2 @ 30' (Qtm)	0.05"/min	200 psf, 35°	
PS B-4 @ 50' (Qtm)	0.05"/min	400 psf, 38°	
	Adopted Values:	**587.5 psf, 33.8°**	**320 psf, 31°**

GROUNDWATER

Based on observations and data discussed in the text portion of the report, groundwater was assumed to be at MSL for the slope stability analyses.

ANALYSIS SECTIONS

The following sections were analyzed:

Section 4-4' was analyzed assuming a rotational failure mode and utilizing a critical failure search routine. The analysis indicates a critical static safety factor of 1.59 and a critical pseudo-static safety factor of 1.19 (see Table C-2 below).

Section 6-6' was analyzed assuming a rotational failure mode and utilizing a critical failure search routine. The analysis indicates a critical static safety factor of 1.61 and a critical pseudo-static safety factor of 1.44 (see Table C-2 below). To further evaluate slope stability during dynamic conditions, a parametric pseudo-static analyses was performed. The results of the analyses are contained on Table C-4 and indicate that the slope safety factor reaches 1.0 or unity with a horizontal ground acceleration of approximately .51g.

Section 9-9' was also analyzed for a critical rotational failure. Safety factors of 1.69 and 1.48 were obtained for static and pseudo-static conditions, respectively (see Table C-2 below).

Fill Slopes. A typical 65-foot-high 2:1 fill slope was analyzed using the remolded fill strengths outlined in this Appendix. The results of the fill slope stability analysis are included below in Table C-3 - Global Stability for Fill Slopes.

Global Stability for Bluffs (Table C-2)

SECTION	STATIC F.S.	PSEUDO-STATIC F.S.
4-4'	1.59	1.19
6-6'	1.61	1.44
9-9'	1.69	1.48

Global Stability for Fill Slopes (Table C-3)

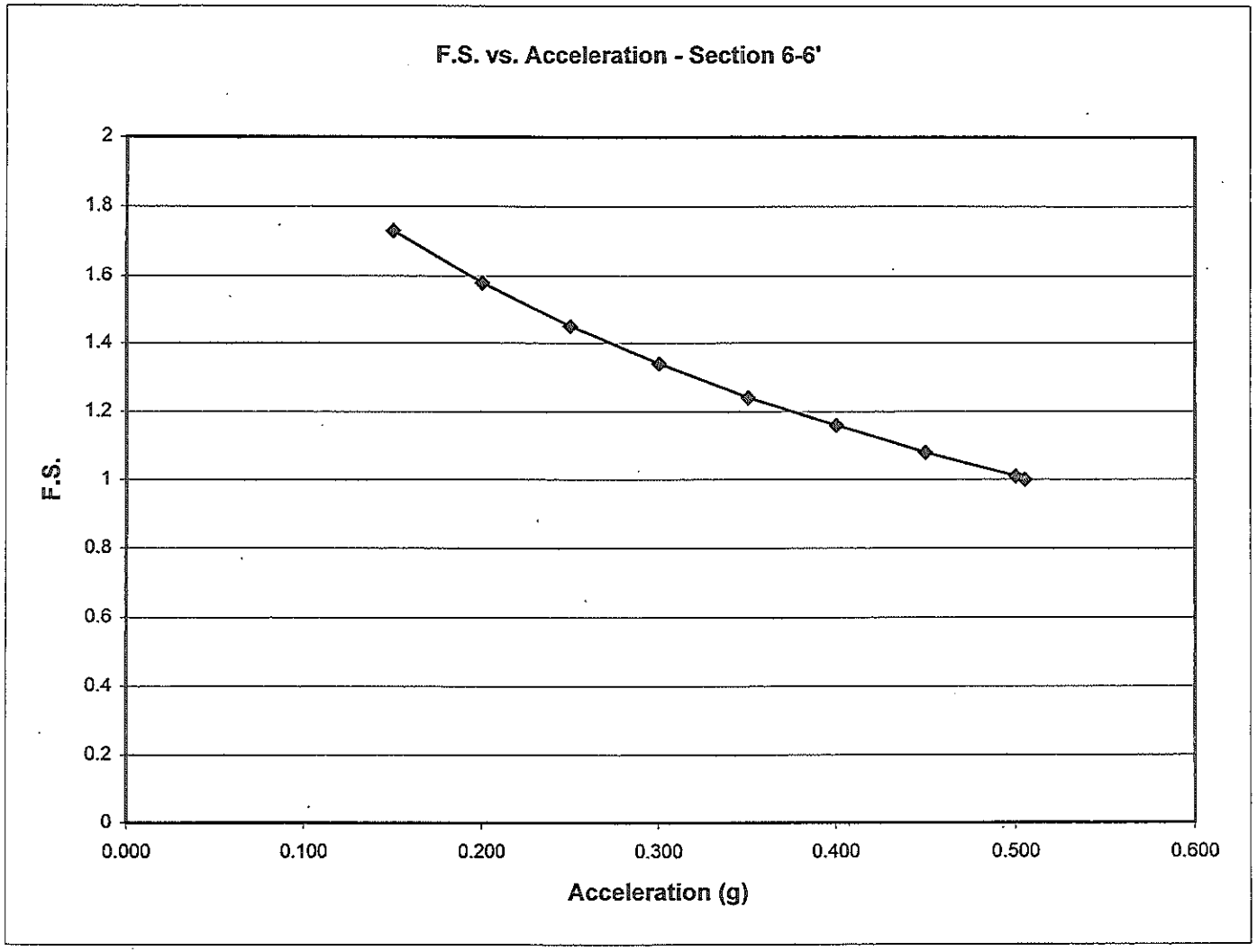
DESCRIPTION	STATIC F.S.	PSEUDO-STATIC F.S.
65-ft high fill slope	1.88	1.46

SURFICIAL STABILITY

Surficial slope stability for the proposed fill slopes was evaluated utilizing a formula recognized by the County of Orange. Results of this analysis are summarized on a plate at the end of this Appendix. The results indicate factors of safety in excess of 1.5 for saturation depths of up to 5 feet.

Search for Acceleration value for F.S. = 1.0
Banning Ranch - Table C-4
Section 6-6'

Accel.	F.S.
0.150	1.73
0.200	1.58
0.250	1.45
0.300	1.34
0.350	1.24
0.400	1.16
0.450	1.08
0.500	1.01
0.505	1.00

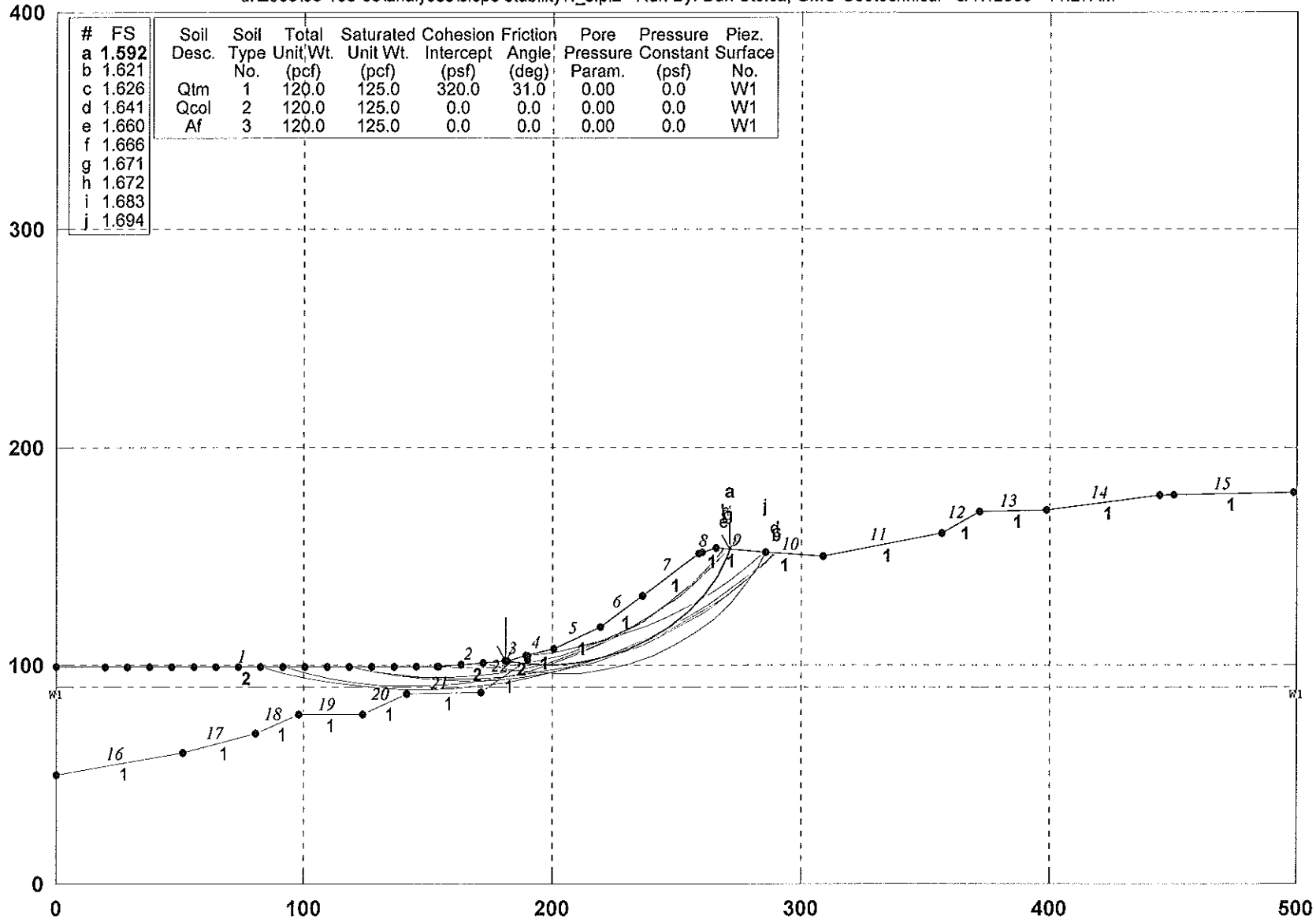


Banning Ranch, Sect 4-4', Static

u:\2006\06-163-03\analyses\slope stability\4_s.pl2 Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:27AM

#	FS
a	1.592
b	1.621
c	1.626
d	1.641
e	1.660
f	1.666
g	1.671
h	1.672
i	1.683
j	1.694

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Qtm	1	120.0	125.0	320.0	31.0	0.00	0.0	W1
Qcol	2	120.0	125.0	0.0	0.0	0.00	0.0	W1
Af	3	120.0	125.0	0.0	0.0	0.00	0.0	W1



GSTABL7 v.2 FSmin=1.592

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Banning Ranch, Sect 4-4', Static

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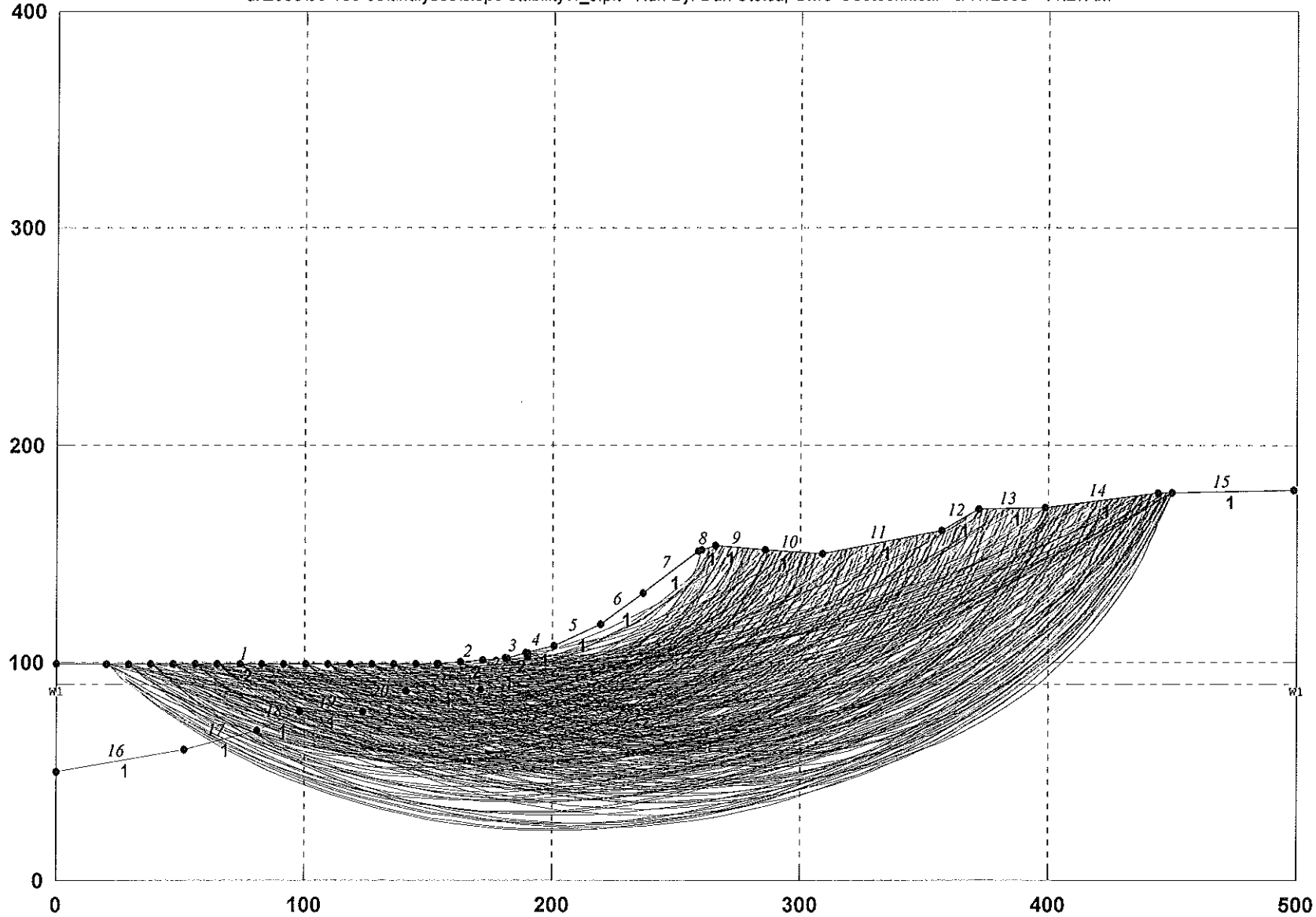


GSTABL7

```
                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        6/17/2009
Time of Run:              11:27AM
Run By:                   Dan Stoica, GMU Geotechnical
Input Data Filename:      U:\2006\06-163-03\Analyses\Slope Stability\4_s.in
Output Filename:          U:\2006\06-163-03\Analyses\Slope Stability\4_s.OUT
Unit System:              English
Plotted Output Filename:  U:\2006\06-163-03\Analyses\Slope Stability\4_s.PLT
PROBLEM DESCRIPTION:  Banning Ranch, Sect 4-4',
                      Static
BOUNDARY COORDINATES
   15 Top   Boundaries
   22 Total Boundaries
```

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	99.10	153.50	99.30	2
2	153.50	99.30	181.70	102.00	2
3	181.70	102.00	189.20	104.10	2
4	189.20	104.10	200.50	107.30	1
5	200.50	107.30	219.20	117.70	1
6	219.20	117.70	236.10	132.00	1
7	236.10	132.00	258.70	151.20	1
8	258.70	151.20	265.70	153.70	1
9	265.70	153.70	285.60	152.00	1
10	285.60	152.00	308.80	150.10	1
11	308.80	150.10	357.00	160.60	1
12	357.00	160.60	372.10	170.40	1
13	372.10	170.40	398.60	171.50	1
14	398.60	171.50	444.20	178.10	1
15	444.20	178.10	499.00	179.30	1
16	0.00	50.20	51.00	60.30	1
17	51.00	60.30	80.70	68.80	1
18	80.70	68.80	98.10	77.40	1
19	98.10	77.40	123.90	77.40	1
20	123.90	77.40	141.10	86.80	1
21	141.10	86.80	171.20	87.40	1
22	171.20	87.40	189.90	102.80	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	320.0	31.0	0.00	0.0	1
2	120.0	125.0	0.0	0.0	0.00	0.0	1
3	120.0	125.0	0.0	0.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 2 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	90.00
2	500.00	90.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
400 Trial Surfaces Have Been Generated.
20 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 20.00(ft)
and X = 190.00(ft)
Each Surface Terminates Between X = 260.00(ft)
and X = 450.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 400
Number of Trial Surfaces With Valid FS = 400
Statistical Data On All Valid FS Values:
FS Max = 4.039 FS Min = 1.592 FS Ave = 2.550
Standard Deviation = 0.414 Coefficient of Variation = 16.24 %
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	181.053	101.938
2	190.936	100.412

3	200.933	100.169
4	210.878	101.215
5	220.606	103.531
6	229.955	107.080
7	238.770	111.801
8	246.905	117.618
9	254.223	124.432
10	260.605	132.131
11	265.942	140.588
12	270.148	149.660
13	271.270	153.224

Circle Center At X = 197.811 ; Y = 177.682 ; and Radius = 77.575

Factor of Safety

*** 1.592 ***

Individual data on the 21 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.6	6.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	5.9	1029.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	1.6	583.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	0.7	300.2	0.0	0.0	0.	0.	0.0	0.0	0.0
5	1.0	491.2	0.0	0.0	0.	0.	0.0	0.0	0.0
6	9.6	6484.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	0.4	376.1	0.0	0.0	0.	0.	0.0	0.0	0.0
8	9.9	11473.6	0.0	0.0	0.	0.	0.0	0.0	0.0
9	8.3	13162.6	0.0	0.0	0.	0.	0.0	0.0	0.0
10	1.4	2518.8	0.0	0.0	0.	0.	0.0	0.0	0.0
11	9.3	19677.8	0.0	0.0	0.	0.	0.0	0.0	0.0
12	6.1	15245.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	2.7	7064.6	0.0	0.0	0.	0.	0.0	0.0	0.0
14	8.1	22465.2	0.0	0.0	0.	0.	0.0	0.0	0.0
15	7.3	20430.6	0.0	0.0	0.	0.	0.0	0.0	0.0
16	4.5	11907.5	0.0	0.0	0.	0.	0.0	0.0	0.0
17	1.9	4698.4	0.0	0.0	0.	0.	0.0	0.0	0.0
18	5.1	10164.0	0.0	0.0	0.	0.	0.0	0.0	0.0
19	0.2	386.7	0.0	0.0	0.	0.	0.0	0.0	0.0
20	4.2	4227.0	0.0	0.0	0.	0.	0.0	0.0	0.0
21	1.1	246.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.421	99.254
2	128.151	96.947
3	138.001	95.219
4	147.935	94.075
5	157.920	93.520
6	167.920	93.555
7	177.900	94.181
8	187.826	95.395
9	197.663	97.193
10	207.377	99.569
11	216.933	102.514
12	226.299	106.018
13	235.442	110.070
14	244.329	114.654
15	252.930	119.754
16	261.215	125.354
17	269.155	131.434
18	276.722	137.971
19	283.890	144.944
20	290.004	151.639

Circle Center At X = 162.322 ; Y = 262.657 ; and Radius = 169.197

Factor of Safety

*** 1.621 ***

Failure Surface Specified By 20 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	118.421	99.254
2	128.102	96.749
3	137.918	94.840
4	147.833	93.535
5	157.808	92.838
6	167.808	92.753
7	177.794	93.279
8	187.729	94.415
9	197.577	96.156
10	207.299	98.496
11	216.860	101.427
12	226.224	104.936
13	235.356	109.011
14	244.222	113.637
15	252.788	118.796
16	261.023	124.470
17	268.895	130.636
18	276.376	137.272
19	283.437	144.354
20	289.873	151.650

Circle Center At X = 164.201 ; Y = 256.164 ; and Radius = 163.452

Factor of Safety

*** 1.626 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.632	99.208
2	92.183	96.246
3	101.873	93.775
4	111.676	91.800
5	121.567	90.328
6	131.520	89.362
7	141.510	88.905
8	151.510	88.957
9	161.494	89.518
10	171.436	90.588
11	181.312	92.163
12	191.094	94.240
13	200.757	96.812
14	210.277	99.873
15	219.629	103.416
16	228.787	107.430
17	237.730	111.906
18	246.432	116.832
19	254.873	122.195
20	263.029	127.981
21	270.879	134.176
22	278.404	140.762
23	285.583	147.724
24	289.284	151.698

Circle Center At X = 145.478 ; Y = 284.820 ; and Radius = 195.963

Factor of Safety

*** 1.641 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.421	99.254
2	128.153	96.953
3	138.025	95.357
4	147.986	94.475
5	157.984	94.311
6	167.969	94.866
7	177.888	96.137
8	187.690	98.118
9	197.324	100.798
10	206.741	104.163
11	215.891	108.197

12	224.728	112.877
13	233.206	118.181
14	241.280	124.080
15	248.910	130.545
16	256.055	137.540
17	262.680	145.032
18	268.748	152.980
19	269.034	153.415

Circle Center At X = 155.265 ; Y = 233.340 ; and Radius = 139.055

Factor of Safety

*** 1.660 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.211	99.368
2	164.192	98.763
3	174.190	98.973
4	184.138	99.996
5	193.969	101.824
6	203.619	104.447
7	213.024	107.846
8	222.121	111.998
9	230.849	116.878
10	239.152	122.451
11	246.974	128.682
12	254.263	135.528
13	260.970	142.945
14	267.052	150.883
15	268.702	153.444

Circle Center At X = 166.619 ; Y = 221.534 ; and Radius = 122.794

Factor of Safety

*** 1.666 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.579	99.219
2	101.120	96.225
3	110.831	93.836
4	120.672	92.063
5	130.606	90.912
6	140.592	90.389
7	150.592	90.494
8	160.565	91.227
9	170.472	92.587
10	180.274	94.566
11	189.932	97.159
12	199.408	100.353
13	208.665	104.137
14	217.665	108.495
15	226.373	113.411
16	234.755	118.865
17	242.778	124.835
18	250.409	131.297
19	257.619	138.227
20	264.378	145.596
21	270.586	153.283

Circle Center At X = 143.922 ; Y = 249.303 ; and Radius = 158.950

Factor of Safety

*** 1.671 ***

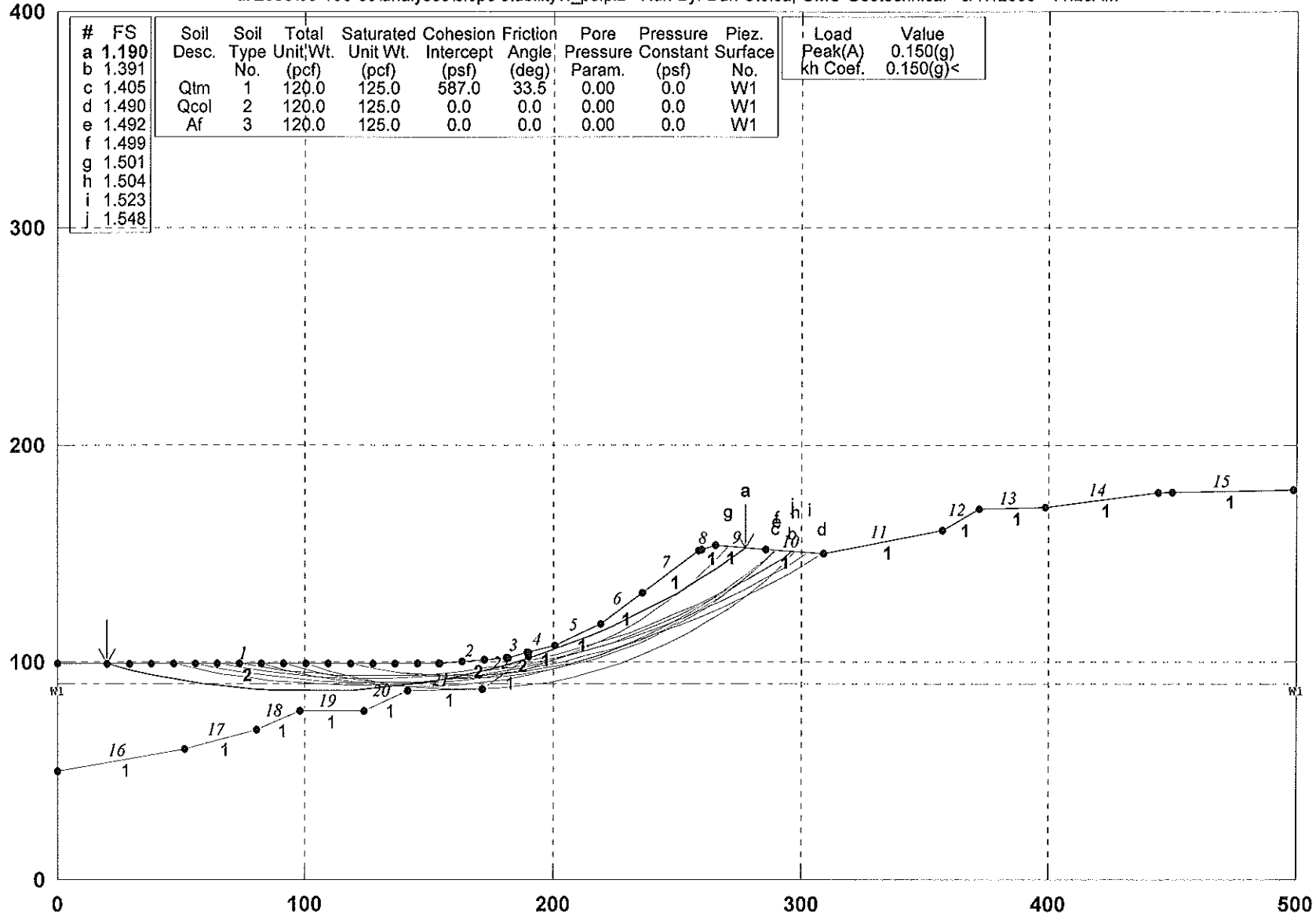
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	190.000	104.327
2	199.917	105.614
3	209.660	107.866
4	219.136	111.061
5	228.253	115.168
6	236.925	120.148

```
     7        245.068      125.953
     8        252.603      132.527
     9        259.459      139.808
    10        265.569      147.724
    11        269.126      153.407
Circle Center At X =   181.837 ; Y =   206.035 ; and Radius =   102.035
       Factor of Safety
      ***    1.672   ***
Failure Surface Specified By 12 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
     1        190.000      104.327
     2        199.883      105.853
     3        209.650      108.001
     4        219.261      110.761
     5        228.679      114.123
     6        237.866      118.073
     7        246.784      122.596
     8        255.400      127.673
     9        263.677      133.285
    10        271.583      139.408
    11        279.087      146.018
    12        285.111      152.042
Circle Center At X =   170.894 ; Y =   261.059 ; and Radius =   157.893
       Factor of Safety
      ***    1.683   ***
Failure Surface Specified By 15 Coordinate Points
  Point       X-Surf      Y-Surf
   No.         (ft)        (ft)
     1        172.105      101.081
     2        181.708       98.291
     3        191.560       96.576
     4        201.541       95.958
     5        211.529       96.444
     6        221.403       98.027
     7        231.042      100.689
     8        240.329      104.398
     9        249.151      109.107
    10        257.399      114.761
    11        264.975      121.289
    12        271.784      128.612
    13        277.745      136.641
    14        282.785      145.278
    15        285.762      151.987
Circle Center At X =   202.143 ; Y =   186.541 ; and Radius =    90.585
       Factor of Safety
      ***    1.694   ***
          **** END OF GSTABL7 OUTPUT ****
```

Banning Ranch, Sect 4-4', Pseudostatic

u:\2006\06-163-03\analyses\slope stability\4_ps.pl2 Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:28AM



#	FS
a	1.190
b	1.391
c	1.405
d	1.490
e	1.492
f	1.499
g	1.501
h	1.504
i	1.523
j	1.548

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Qtm	1	120.0	125.0	587.0	33.5	0.00	0.0	W1
Qcol	2	120.0	125.0	0.0	0.0	0.00	0.0	W1
Af	3	120.0	125.0	0.0	0.0	0.00	0.0	W1

Load	Value
Peak(A)	0.150(g)
kh Coef.	0.150(g)<

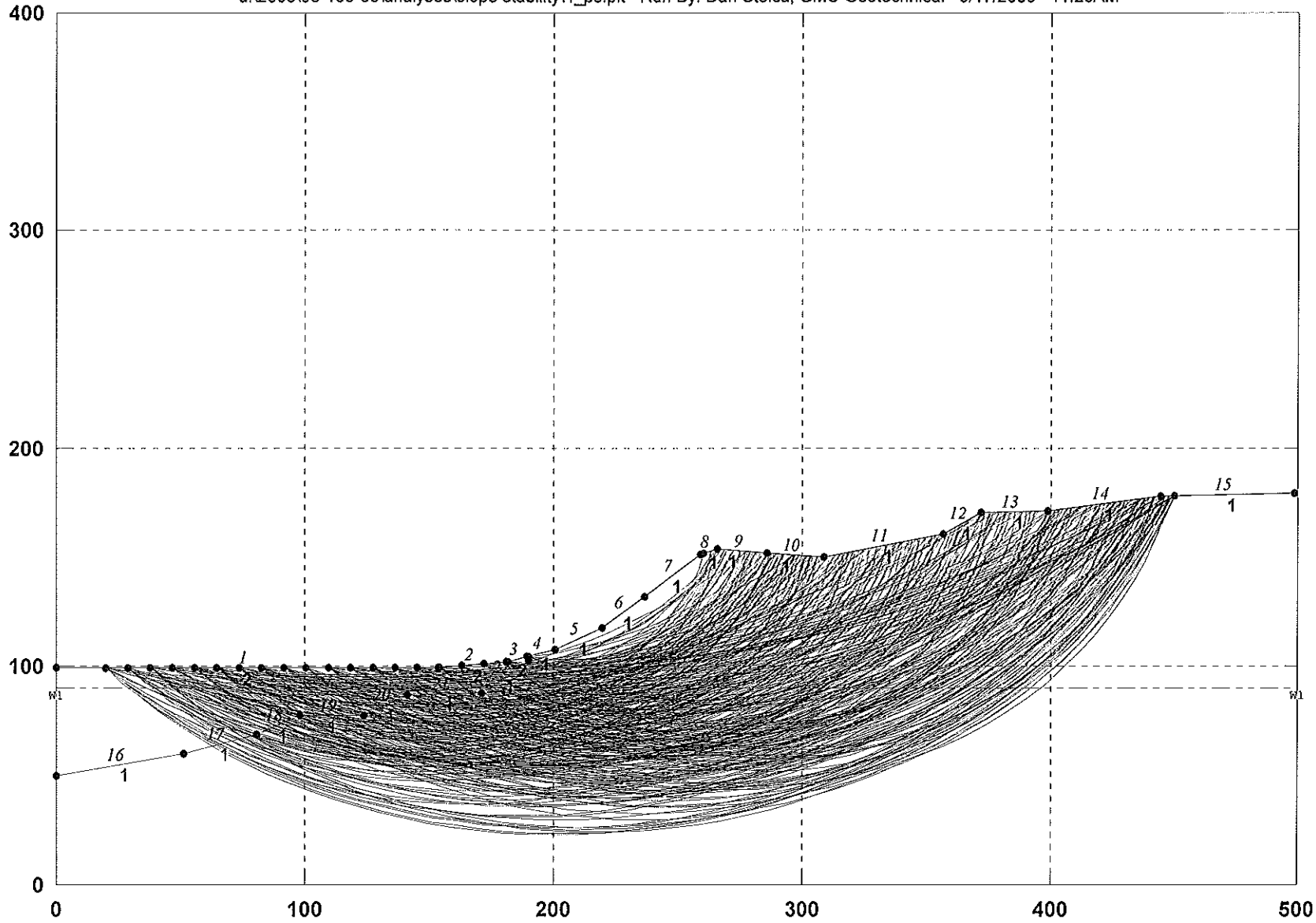
GSTABL7 v.2 FSmin=1.190

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Banning Ranch, Sect 4-4', Pseudostatic

u:\2006\06-163-03\analyses\slope stability\4_ps.plt Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:28AM



GSTABL7

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                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        6/17/2009
Time of Run:              11:28AM
Run By:                   Dan Stoica, GMU Geotechnical
Input Data Filename:      U:\2006\06-163-03\Analyses\Slope Stability\4_ps.in
Output Filename:          U:\2006\06-163-03\Analyses\Slope Stability\4_ps.OUT
Unit System:              English
Plotted Output Filename:  U:\2006\06-163-03\Analyses\Slope Stability\4_ps.PLT
PROBLEM DESCRIPTION:  Banning Ranch, Sect 4-4',
                      Pseudostatic
BOUNDARY COORDINATES
   15 Top   Boundaries
   22 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00      99.10     153.50      99.30        2
    2       153.50      99.30     181.70     102.00        2
    3       181.70     102.00     189.20     104.10        2
    4       189.20     104.10     200.50     107.30        1
    5       200.50     107.30     219.20     117.70        1
    6       219.20     117.70     236.10     132.00        1
    7       236.10     132.00     258.70     151.20        1
    8       258.70     151.20     265.70     153.70        1
    9       265.70     153.70     285.60     152.00        1
   10       285.60     152.00     308.80     150.10        1
   11       308.80     150.10     357.00     160.60        1
   12       357.00     160.60     372.10     170.40        1
   13       372.10     170.40     398.60     171.50        1
   14       398.60     171.50     444.20     178.10        1
   15       444.20     178.10     499.00     179.30        1
   16         0.00      50.20      51.00      60.30        1
   17        51.00      60.30      80.70      68.80        1
   18        80.70      68.80      98.10      77.40        1
   19        98.10      77.40     123.90      77.40        1
   20       123.90      77.40     141.10      86.80        1
   21       141.10      86.80     171.20      87.40        1
   22       171.20      87.40     189.90     102.80        1
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 3 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    125.0     587.0     33.5    0.00       0.0      1
  2   120.0    125.0       0.0      0.0    0.00       0.0      1
  3   120.0    125.0       0.0      0.0    0.00       0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.        (ft)        (ft)
    1         0.00       90.00
    2       500.00       90.00
```

Specified Peak Ground Acceleration Coefficient (A) = 0.150(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
400 Trial Surfaces Have Been Generated.
20 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 20.00(ft)
and X = 190.00(ft)
Each Surface Terminates Between X = 260.00(ft)
and X = 450.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 400
Number of Trial Surfaces With Valid FS = 400
Statistical Data On All Valid FS Values:
FS Max = 2.842 FS Min = 1.190 FS Ave = 1.967
Standard Deviation = 0.239 Coefficient of Variation = 12.16 %
Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.000	99.126
2	29.586	96.279
3	39.272	93.791
4	49.043	91.667
5	58.887	89.907
6	68.790	88.516
7	78.738	87.495
8	88.717	86.845
9	98.713	86.568
10	108.713	86.663
11	118.702	87.131
12	128.666	87.971
13	138.593	89.182
14	148.467	90.762
15	158.276	92.709
16	168.005	95.020
17	177.641	97.692
18	187.172	100.721
19	196.582	104.104
20	205.860	107.834
21	214.993	111.908
22	223.967	116.320
23	232.771	121.063
24	241.391	126.130
25	249.817	131.516
26	258.037	137.212
27	266.038	143.210
28	273.810	149.502
29	277.467	152.695

Circle Center At X = 101.154 ; Y = 354.825 ; and Radius = 268.268
Factor of Safety
*** 1.190 ***
Individual data on the 40 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.6	1644.6	0.0	0.0	0.	0.	246.7	0.0	0.0
2	9.7	4776.4	0.0	0.0	0.	0.	716.5	0.0	0.0
3	9.8	7538.1	0.0	0.0	0.	0.	1130.7	0.0	0.0
4	9.3	9328.7	0.0	0.0	0.	0.	1399.3	0.0	0.0

5	0.5	574.6	0.0	1.5	0.	0.	86.2	0.0	0.0
6	9.9	11888.5	0.0	491.9	0.	0.	1783.3	0.0	0.0
7	9.9	13457.8	0.0	1244.6	0.	0.	2018.7	0.0	0.0
8	10.0	14557.5	0.0	1765.9	0.	0.	2183.6	0.0	0.0
9	10.0	15177.5	0.0	2055.1	0.	0.	2276.6	0.0	0.0
10	10.0	15312.0	0.0	2111.9	0.	0.	2296.8	0.0	0.0
11	10.0	14959.8	0.0	1936.1	0.	0.	2244.0	0.0	0.0
12	10.0	14124.2	0.0	1528.0	0.	0.	2118.6	0.0	0.0
13	9.9	12813.1	0.0	888.1	0.	0.	1922.0	0.0	0.0
14	5.1	5956.5	0.0	132.1	0.	0.	893.5	0.0	0.0
15	4.8	5091.5	0.0	0.0	0.	0.	763.7	0.0	0.0
16	5.0	4852.9	0.0	0.0	0.	0.	727.9	0.0	0.0
17	4.8	4180.0	0.0	0.0	0.	0.	627.0	0.0	0.0
18	9.7	7423.9	0.0	0.0	0.	0.	1113.6	0.0	0.0
19	9.6	5543.9	0.0	0.0	0.	0.	831.6	0.0	0.0
20	4.1	1689.4	0.0	0.0	0.	0.	253.4	0.0	0.0
21	5.5	1913.6	0.0	0.0	0.	0.	287.0	0.0	0.0
22	0.4	121.6	0.0	0.0	0.	0.	18.2	0.0	0.0
23	1.7	543.0	0.0	0.0	0.	0.	81.5	0.0	0.0
24	0.7	220.3	0.0	0.0	0.	0.	33.1	0.0	0.0
25	6.7	1877.7	0.0	0.0	0.	0.	281.7	0.0	0.0
26	3.9	871.7	0.0	0.0	0.	0.	130.7	0.0	0.0
27	5.4	1308.2	0.0	0.0	0.	0.	196.2	0.0	0.0
28	9.1	3232.1	0.0	0.0	0.	0.	484.8	0.0	0.0
29	4.2	1811.3	0.0	0.0	0.	0.	271.7	0.0	0.0
30	4.8	2613.4	0.0	0.0	0.	0.	392.0	0.0	0.0
31	8.8	7148.9	0.0	0.0	0.	0.	1072.3	0.0	0.0
32	3.3	3416.0	0.0	0.0	0.	0.	512.4	0.0	0.0
33	5.3	6141.8	0.0	0.0	0.	0.	921.3	0.0	0.0
34	8.4	11376.4	0.0	0.0	0.	0.	1706.5	0.0	0.0
35	8.2	12606.5	0.0	0.0	0.	0.	1891.0	0.0	0.0
36	0.7	1071.1	0.0	0.0	0.	0.	160.7	0.0	0.0
37	7.0	10178.6	0.0	0.0	0.	0.	1526.8	0.0	0.0
38	0.3	430.2	0.0	0.0	0.	0.	64.5	0.0	0.0
39	7.8	6513.0	0.0	0.0	0.	0.	976.9	0.0	0.0
40	3.7	768.9	0.0	0.0	0.	0.	115.3	0.0	0.0

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.842	99.161
2	56.543	96.734
3	66.324	94.651
4	76.172	92.916
5	86.076	91.530
6	96.022	90.495
7	105.999	89.812
8	115.993	89.483
9	125.993	89.508
10	135.986	89.886
11	145.959	90.617
12	155.900	91.701
13	165.797	93.136
14	175.636	94.919
15	185.407	97.050
16	195.096	99.525
17	204.691	102.341
18	214.181	105.495
19	223.553	108.982
20	232.796	112.798
21	241.898	116.939
22	250.848	121.400
23	259.635	126.174
24	268.248	131.256
25	276.675	136.640
26	284.906	142.318
27	292.932	148.283
28	296.466	151.110

Circle Center At X = 120.293 ; Y = 371.938 ; and Radius = 282.493

Factor of Safety
*** 1.391 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.632	99.208
2	92.183	96.246
3	101.873	93.775
4	111.676	91.800
5	121.567	90.328
6	131.520	89.362
7	141.510	88.905
8	151.510	88.957
9	161.494	89.518
10	171.436	90.588
11	181.312	92.163
12	191.094	94.240
13	200.757	96.812
14	210.277	99.873
15	219.629	103.416
16	228.787	107.430
17	237.730	111.906
18	246.432	116.832
19	254.873	122.195
20	263.029	127.981
21	270.879	134.176
22	278.404	140.762
23	285.583	147.724
24	289.284	151.698

Circle Center At X = 145.478 ; Y = 284.820 ; and Radius = 195.963

Factor of Safety
*** 1.405 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	55.789	99.173
2	65.538	96.943
3	75.354	95.037
4	85.229	93.457
5	95.150	92.205
6	105.107	91.281
7	115.090	90.688
8	125.086	90.426
9	135.086	90.495
10	145.078	90.895
11	155.051	91.625
12	164.995	92.685
13	174.898	94.074
14	184.750	95.790
15	194.539	97.831
16	204.256	100.195
17	213.889	102.879
18	223.428	105.880
19	232.862	109.196
20	242.181	112.822
21	251.376	116.755
22	260.435	120.990
23	269.348	125.523
24	278.107	130.348
25	286.702	135.460
26	295.122	140.854
27	303.359	146.524
28	308.263	150.144

Circle Center At X = 128.002 ; Y = 392.252 ; and Radius = 301.845

Factor of Safety
*** 1.490 ***

Failure Surface Specified By 20 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	118.421	99.254
2	128.102	96.749
3	137.918	94.840
4	147.833	93.535
5	157.808	92.838
6	167.808	92.753
7	177.794	93.279
8	187.729	94.415
9	197.577	96.156
10	207.299	98.496
11	216.860	101.427
12	226.224	104.936
13	235.356	109.011
14	244.222	113.637
15	252.788	118.796
16	261.023	124.470
17	268.895	130.636
18	276.376	137.272
19	283.437	144.354
20	289.873	151.650

Circle Center At X = 164.201 ; Y = 256.164 ; and Radius = 163.452

Factor of Safety

*** 1.492 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.421	99.254
2	128.151	96.947
3	138.001	95.219
4	147.935	94.075
5	157.920	93.520
6	167.920	93.555
7	177.900	94.181
8	187.826	95.395
9	197.663	97.193
10	207.377	99.569
11	216.933	102.514
12	226.299	106.018
13	235.442	110.070
14	244.329	114.654
15	252.930	119.754
16	261.215	125.354
17	269.155	131.434
18	276.722	137.971
19	283.890	144.944
20	290.004	151.639

Circle Center At X = 162.322 ; Y = 262.657 ; and Radius = 169.197

Factor of Safety

*** 1.499 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	91.579	99.219
2	101.120	96.225
3	110.831	93.836
4	120.672	92.063
5	130.606	90.912
6	140.592	90.389
7	150.592	90.494
8	160.565	91.227
9	170.472	92.587
10	180.274	94.566
11	189.932	97.159
12	199.408	100.353
13	208.665	104.137
14	217.665	108.495
15	226.373	113.411

16	234.755	118.865
17	242.778	124.835
18	250.409	131.297
19	257.619	138.227
20	264.378	145.596
21	270.586	153.283

Circle Center At X = 143.922 ; Y = 249.303 ; and Radius = 158.950

Factor of Safety

*** 1.501 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.526	99.231
2	109.933	95.838
3	119.521	92.996
4	129.257	90.715
5	139.109	89.003
6	149.045	87.865
7	159.029	87.306
8	169.029	87.327
9	179.011	87.928
10	188.941	89.107
11	198.786	90.860
12	208.513	93.181
13	218.089	96.063
14	227.481	99.495
15	236.659	103.467
16	245.590	107.964
17	254.246	112.972
18	262.597	118.474
19	270.614	124.450
20	278.271	130.882
21	285.542	137.747
22	292.403	145.023
23	297.442	151.030

Circle Center At X = 163.670 ; Y = 259.540 ; and Radius = 172.297

Factor of Safety

*** 1.504 ***

Failure Surface Specified By 27 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	64.737	99.184
2	74.538	97.202
3	84.402	95.556
4	94.316	94.248
5	104.269	93.279
6	114.249	92.651
7	124.245	92.364
8	134.245	92.419
9	144.237	92.816
10	154.210	93.553
11	164.152	94.631
12	174.051	96.048
13	183.896	97.802
14	193.675	99.891
15	203.377	102.313
16	212.991	105.066
17	222.505	108.145
18	231.909	111.547
19	241.190	115.269
20	250.339	119.305
21	259.345	123.652
22	268.197	128.304
23	276.886	133.255
24	285.399	138.501
25	293.729	144.034
26	301.865	149.848
27	302.830	150.589

Circle Center At X = 127.641 ; Y = 385.026 ; and Radius = 292.681
Factor of Safety
*** 1.523 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.684	99.196
2	83.512	97.350
3	93.402	95.866
4	103.339	94.747
5	113.310	93.994
6	123.303	93.608
7	133.303	93.590
8	143.297	93.940
9	153.271	94.657
10	163.212	95.740
11	173.107	97.188
12	182.942	98.999
13	192.703	101.170
14	202.378	103.699
15	211.953	106.582
16	221.417	109.814
17	230.754	113.393
18	239.954	117.313
19	249.004	121.568
20	257.890	126.153
21	266.603	131.062
22	275.129	136.288
23	283.457	141.823
24	291.576	147.662
25	296.060	151.143

Circle Center At X = 128.793 ; Y = 365.467 ; and Radius = 271.914
Factor of Safety
*** 1.548 ***

**** END OF GSTABL7 OUTPUT ****

Banning Ranch, Sect 6-6', Static

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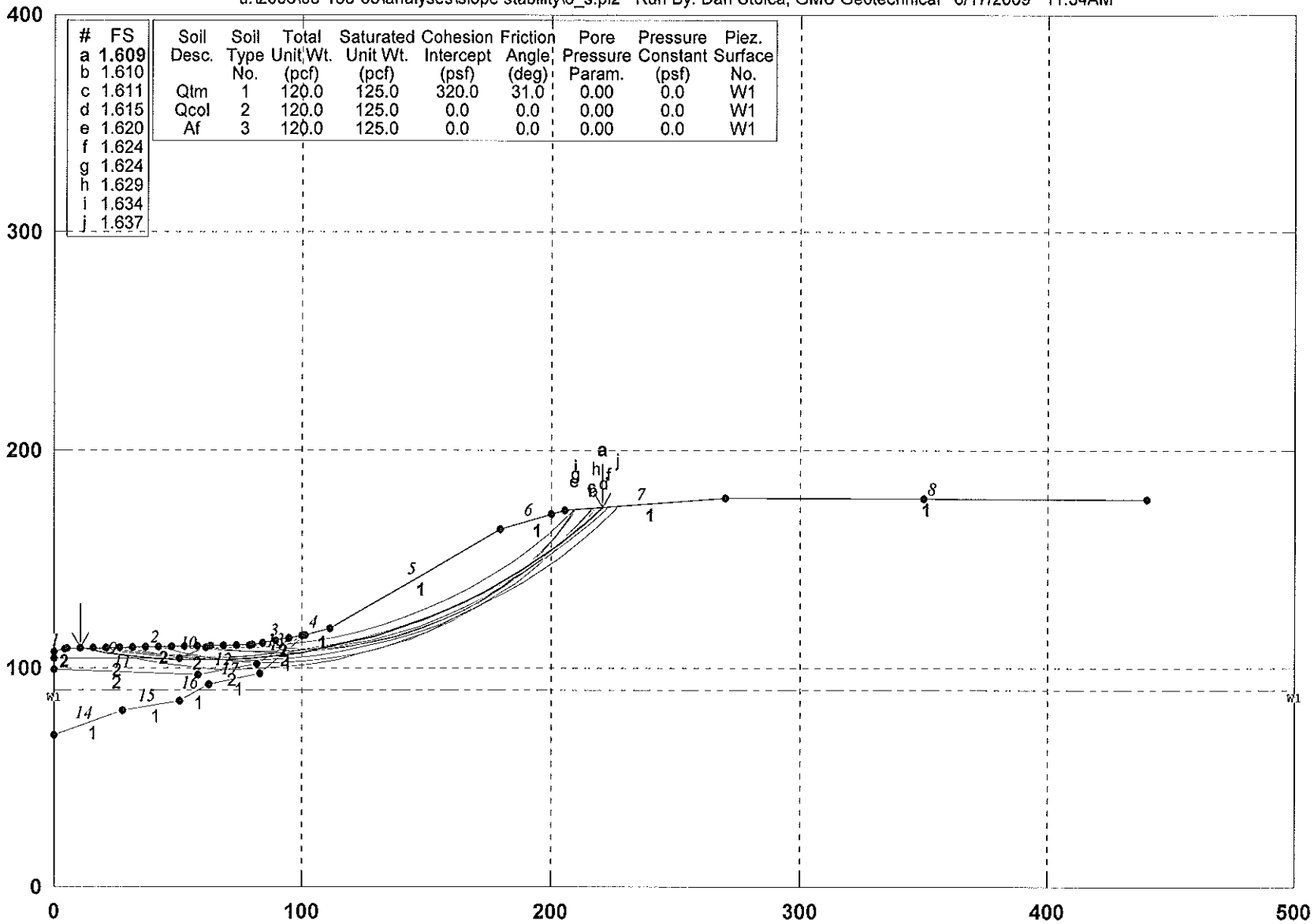


#	FS
a	1.609
b	1.610
c	1.611
d	1.615
e	1.620
f	1.624
g	1.624
h	1.629
i	1.634
j	1.637

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Qtm	1	120.0	125.0	320.0	31.0	0.00	0.0	W1
Qcol	2	120.0	125.0	0.0	0.0	0.00	0.0	W1
Af	3	120.0	125.0	0.0	0.0	0.00	0.0	W1

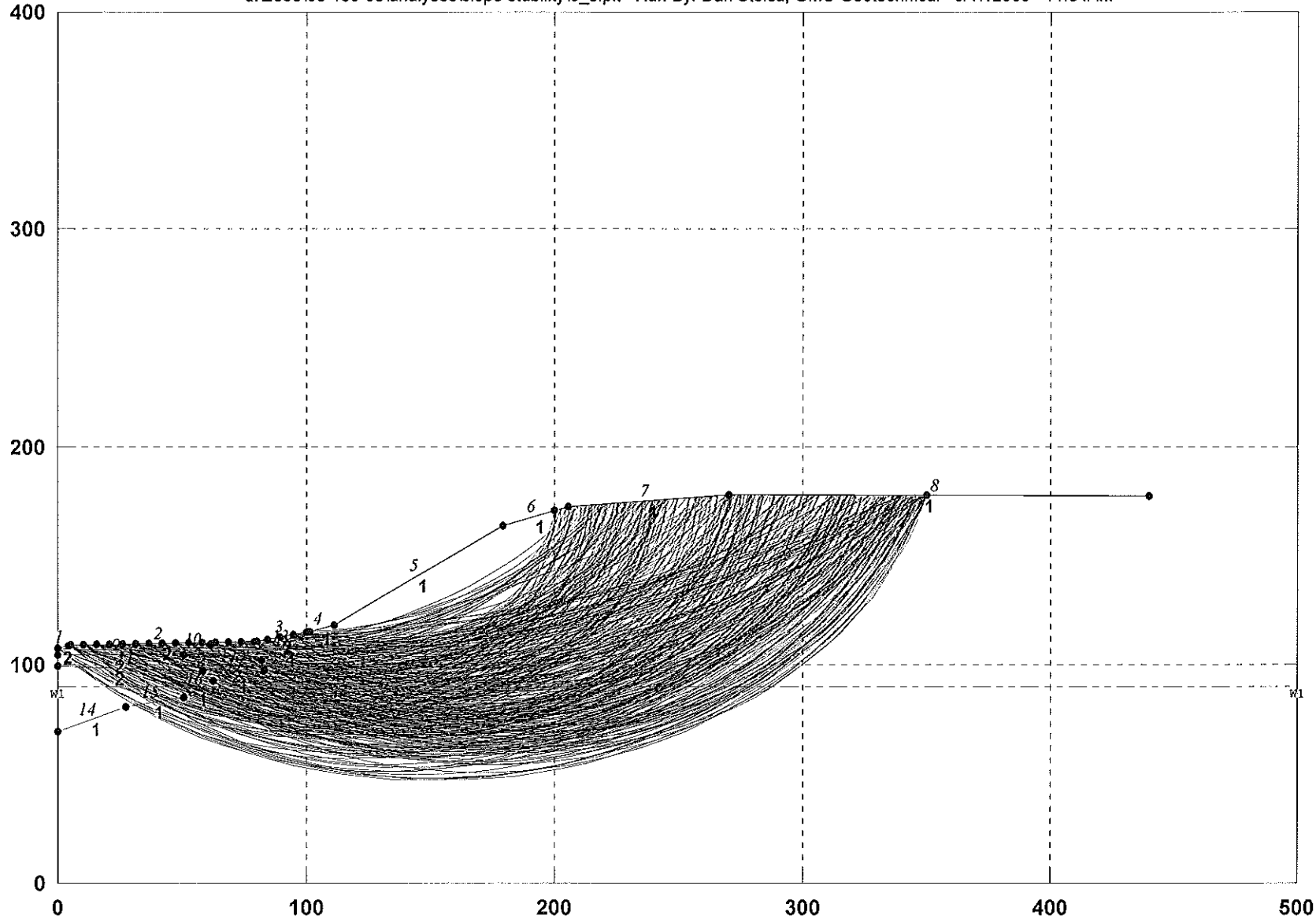
GSTABL7 v.2 FSmin=1.609

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Banning Ranch, Sect 6-6', Static

u:\2006\06-163-03\analyses\slope stability\6_s.plt Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:34AM



GSTABL7

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                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        6/17/2009
Time of Run:              11:34AM
Run By:                   Dan Stoica, GMU Geotechnical
Input Data Filename:      U:\2006\06-163-03\Analyses\Slope Stability\6_s.in
Output Filename:          U:\2006\06-163-03\Analyses\Slope Stability\6_s.OUT
Unit System:              English
Plotted Output Filename:  U:\2006\06-163-03\Analyses\Slope Stability\6_s.PLT
PROBLEM DESCRIPTION:  Banning Ranch, Sect 6-6',
                      Static
BOUNDARY COORDINATES
    8 Top   Boundaries
   18 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00     107.30       4.10     109.00        2
    2         4.10     109.00      79.70     110.50        2
    3        79.70     110.50     101.20     115.10        2
    4       101.20     115.10     111.50     118.40        1
    5       111.50     118.40     179.40     163.80        1
    6       179.40     163.80     205.60     172.70        1
    7       205.60     172.70     269.70     178.10        1
    8       269.70     178.10     440.30     177.40        1
    9         0.00     104.20      50.50     104.10        2
   10        50.50     104.10      61.10     109.50        2
   11         0.00      99.50      58.10      96.60        2
   12        58.10      96.60      81.70     101.80        2
   13        81.70     101.80     100.60     115.30        2
   14         0.00      69.60      27.20      80.90        1
   15        27.20      80.90      50.40      85.00        1
   16        50.40      85.00      62.80      92.80        1
   17        62.80      92.80      83.40      97.80        1
   18        83.40      97.80     101.20     115.10        1
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
User Specified Y-Plus Value =   50.00(ft)
ISOTROPIC SOIL PARAMETERS
 3 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    125.0     320.0     31.0     0.00      0.0      1
  2   120.0    125.0       0.0      0.0     0.00      0.0      1
  3   120.0    125.0       0.0      0.0     0.00      0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1         0.00       90.00
    2       500.00       90.00
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 400 Trial Surfaces Have Been Generated.
  20 Surface(s) Initiate(s) From Each Of    20 Points Equally Spaced
```

Along The Ground Surface Between X = 0.00(ft)
and X = 100.00(ft)
Each Surface Terminates Between X = 200.00(ft)
and X = 350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 400
Number of Trial Surfaces With Valid FS = 400
Statistical Data On All Valid FS Values:
FS Max = 4.307 FS Min = 1.609 FS Ave = 2.555
Standard Deviation = 0.529 Coefficient of Variation = 20.72 %
Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	10.526	109.128
2	20.317	107.092
3	30.190	105.506
4	40.126	104.372
5	50.103	103.694
6	60.100	103.472
7	70.098	103.708
8	80.074	104.399
9	90.008	105.546
10	99.879	107.146
11	109.667	109.195
12	119.351	111.689
13	128.911	114.622
14	138.327	117.990
15	147.579	121.784
16	156.648	125.997
17	165.516	130.620
18	174.162	135.643
19	182.571	141.056
20	190.723	146.847
21	198.602	153.005
22	206.191	159.517
23	213.476	166.368
24	220.439	173.545
25	220.826	173.983

Circle Center At X = 59.952 ; Y = 322.288 ; and Radius = 218.816
Factor of Safety
*** 1.609 ***
Individual data on the 35 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.8	1309.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	9.9	3697.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	9.9	5576.5	0.0	0.0	0.	0.	0.0	0.0	0.0
4	3.8	2522.5	0.0	0.0	0.	0.	0.0	0.0	0.0
5	6.2	4398.3	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.4	296.7	0.0	0.0	0.	0.	0.0	0.0	0.0
7	9.6	7415.8	0.0	0.0	0.	0.	0.0	0.0	0.0
8	1.0	796.1	0.0	0.0	0.	0.	0.0	0.0	0.0
9	9.0	7146.1	0.0	0.0	0.	0.	0.0	0.0	0.0
10	9.6	7333.4	0.0	0.0	0.	0.	0.0	0.0	0.0
11	0.4	275.9	0.0	0.0	0.	0.	0.0	0.0	0.0
12	6.3	4891.2	0.0	0.0	0.	0.	0.0	0.0	0.0
13	3.7	3059.8	0.0	0.0	0.	0.	0.0	0.0	0.0
14	1.6	1412.9	0.0	0.0	0.	0.	0.0	0.0	0.0
15	8.2	7370.9	0.0	0.0	0.	0.	0.0	0.0	0.0
16	0.7	663.9	0.0	0.0	0.	0.	0.0	0.0	0.0

17	0.6	552.7	0.0	0.0	0.	0.	0.0	0.0	0.0
18	8.5	8278.4	0.0	0.0	0.	0.	0.0	0.0	0.0
19	1.8	1908.5	0.0	0.0	0.	0.	0.0	0.0	0.0
20	7.9	9748.0	0.0	0.0	0.	0.	0.0	0.0	0.0
21	9.6	15705.1	0.0	0.0	0.	0.	0.0	0.0	0.0
22	9.4	19076.7	0.0	0.0	0.	0.	0.0	0.0	0.0
23	9.3	21698.6	0.0	0.0	0.	0.	0.0	0.0	0.0
24	9.1	23578.4	0.0	0.0	0.	0.	0.0	0.0	0.0
25	8.9	24733.1	0.0	0.0	0.	0.	0.0	0.0	0.0
26	8.6	25189.2	0.0	0.0	0.	0.	0.0	0.0	0.0
27	5.2	15536.9	0.0	0.0	0.	0.	0.0	0.0	0.0
28	3.2	9247.0	0.0	0.0	0.	0.	0.0	0.0	0.0
29	8.2	21825.2	0.0	0.0	0.	0.	0.0	0.0	0.0
30	7.9	18019.4	0.0	0.0	0.	0.	0.0	0.0	0.0
31	7.0	13019.7	0.0	0.0	0.	0.	0.0	0.0	0.0
32	0.6	955.5	0.0	0.0	0.	0.	0.0	0.0	0.0
33	7.3	8840.7	0.0	0.0	0.	0.	0.0	0.0	0.0
34	7.0	3091.8	0.0	0.0	0.	0.	0.0	0.0	0.0
35	0.4	9.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.895	110.067
2	67.786	108.594
3	77.749	107.737
4	87.746	107.498
5	97.739	107.879
6	107.689	108.879
7	117.557	110.493
8	127.307	112.715
9	136.901	115.538
10	146.301	118.949
11	155.472	122.936
12	164.378	127.484
13	172.985	132.574
14	181.260	138.189
15	189.172	144.305
16	196.689	150.899
17	203.784	157.947
18	210.428	165.421
19	216.596	173.292
20	216.841	173.647

Circle Center At X = 86.600 ; Y = 268.774 ; and Radius = 161.282

Factor of Safety

*** 1.610 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.895	110.067
2	67.750	108.374
3	77.695	107.320
4	87.686	106.910
5	97.683	107.144
6	107.645	108.023
7	117.529	109.542
8	127.294	111.696
9	136.900	114.474
10	146.307	117.867
11	155.476	121.859
12	164.368	126.434
13	172.947	131.572
14	181.176	137.253
15	189.022	143.454
16	196.452	150.147
17	203.435	157.305
18	209.941	164.899
19	215.945	172.896
20	216.413	173.611

Circle Center At X = 89.058 ; Y = 261.821 ; and Radius = 154.920
Factor of Safety
*** 1.611 ***
Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.789	109.232
2	25.622	107.409
3	35.527	106.034
4	45.484	105.112
5	55.473	104.644
6	65.473	104.631
7	75.464	105.073
8	85.423	105.968
9	95.332	107.316
10	105.169	109.114
11	114.915	111.357
12	124.548	114.041
13	134.049	117.160
14	143.398	120.708
15	152.576	124.679
16	161.564	129.062
17	170.343	133.850
18	178.896	139.032
19	187.203	144.599
20	195.249	150.537
21	203.017	156.835
22	210.490	163.480
23	217.652	170.458
24	220.967	173.995

Circle Center At X = 60.774 ; Y = 324.110 ; and Radius = 219.537
Factor of Safety
*** 1.615 ***
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	78.947	110.485
2	88.864	109.193
3	98.851	108.694
4	108.847	108.992
5	118.787	110.085
6	128.608	111.965
7	138.249	114.621
8	147.648	118.036
9	156.745	122.189
10	165.483	127.052
11	173.806	132.595
12	181.661	138.783
13	188.999	145.577
14	195.773	152.933
15	201.940	160.806
16	207.461	169.144
17	209.614	173.038

Circle Center At X = 100.112 ; Y = 234.223 ; and Radius = 125.535
Factor of Safety
*** 1.620 ***
Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.053	109.336
2	30.900	107.599
3	40.818	106.313
4	50.783	105.482
5	60.776	105.108
6	70.776	105.192
7	80.761	105.733
8	90.711	106.729
9	100.605	108.180

10	110.423	110.082
11	120.143	112.431
12	129.746	115.222
13	139.211	118.449
14	148.518	122.106
15	157.649	126.184
16	166.583	130.676
17	175.302	135.572
18	183.789	140.862
19	192.025	146.534
20	199.992	152.577
21	207.675	158.978
22	215.058	165.723
23	222.124	172.799
24	223.399	174.199

Circle Center At X = 63.960 ; Y = 323.534 ; and Radius = 218.453
Factor of Safety
*** 1.624 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.105	109.754
2	51.684	106.882
3	61.441	104.693
4	71.329	103.198
5	81.298	102.406
6	91.297	102.319
7	101.278	102.939
8	111.190	104.262
9	120.984	106.282
10	130.611	108.988
11	140.023	112.367
12	149.172	116.403
13	158.014	121.074
14	166.504	126.359
15	174.599	132.229
16	182.260	138.657
17	189.448	145.609
18	196.127	153.052
19	202.263	160.948
20	207.827	169.257
21	210.007	173.071

Circle Center At X = 87.521 ; Y = 243.793 ; and Radius = 141.524
Factor of Safety
*** 1.624 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.789	109.232
2	25.321	106.208
3	35.009	103.728
4	44.821	101.800
5	54.727	100.430
6	64.694	99.622
7	74.691	99.380
8	84.686	99.703
9	94.647	100.592
10	104.541	102.042
11	114.337	104.050
12	124.004	106.609
13	133.511	109.710
14	142.828	113.344
15	151.923	117.499
16	160.770	122.162
17	169.338	127.319
18	177.601	132.951
19	185.532	139.042
20	193.106	145.572

21	200.298	152.519
22	207.086	159.863
23	213.447	167.578
24	217.969	173.742

Circle Center At X = 73.971 ; Y = 275.965 ; and Radius = 176.593
Factor of Safety
*** 1.629 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	52.632	109.963
2	62.608	109.274
3	72.607	109.128
4	82.599	109.524
5	92.555	110.462
6	102.445	111.938
7	112.241	113.949
8	121.913	116.488
9	131.434	119.548
10	140.774	123.120
11	149.907	127.193
12	158.805	131.756
13	167.443	136.794
14	175.795	142.294
15	183.836	148.239
16	191.542	154.611
17	198.892	161.392
18	205.863	168.562
19	209.778	173.052

Circle Center At X = 70.305 ; Y = 293.392 ; and Radius = 184.279
Factor of Safety
*** 1.634 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.316	109.441
2	36.070	107.237
3	45.923	105.527
4	55.849	104.316
5	65.824	103.607
6	75.822	103.401
7	85.817	103.699
8	95.785	104.500
9	105.700	105.802
10	115.537	107.601
11	125.270	109.895
12	134.876	112.675
13	144.329	115.936
14	153.606	119.669
15	162.684	123.865
16	171.538	128.512
17	180.147	133.600
18	188.489	139.115
19	196.542	145.043
20	204.287	151.369
21	211.703	158.078
22	218.772	165.151
23	225.475	172.572
24	227.054	174.507

Circle Center At X = 74.916 ; Y = 301.686 ; and Radius = 198.293
Factor of Safety
*** 1.637 ***

**** END OF GSTABL7 OUTPUT ****

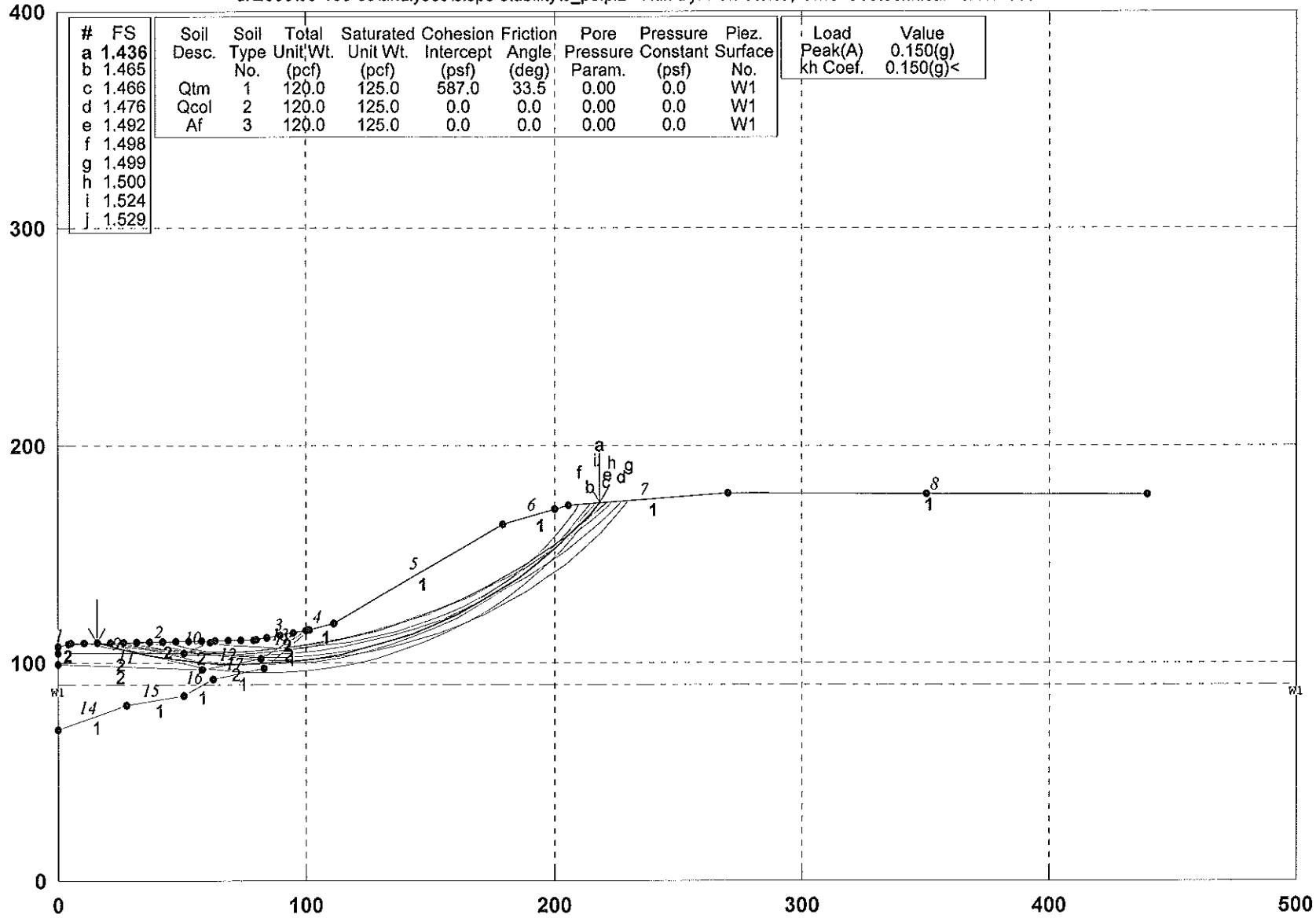
Banning Ranch, Sect 6-6', Pseudostatic

u:\2006\06-163-03\analyses\slope stability\6_ps.pl2 Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:35AM

#	FS
a	1.436
b	1.465
c	1.466
d	1.476
e	1.492
f	1.498
g	1.499
h	1.500
i	1.524
j	1.529

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Qtm	1	120.0	125.0	587.0	33.5	0.00	0.0	W1
Qcol	2	120.0	125.0	0.0	0.0	0.00	0.0	W1
Af	3	120.0	125.0	0.0	0.0	0.00	0.0	W1

Load	Value
Peak(A)	0.150(g)
kh Coef.	0.150(g)<



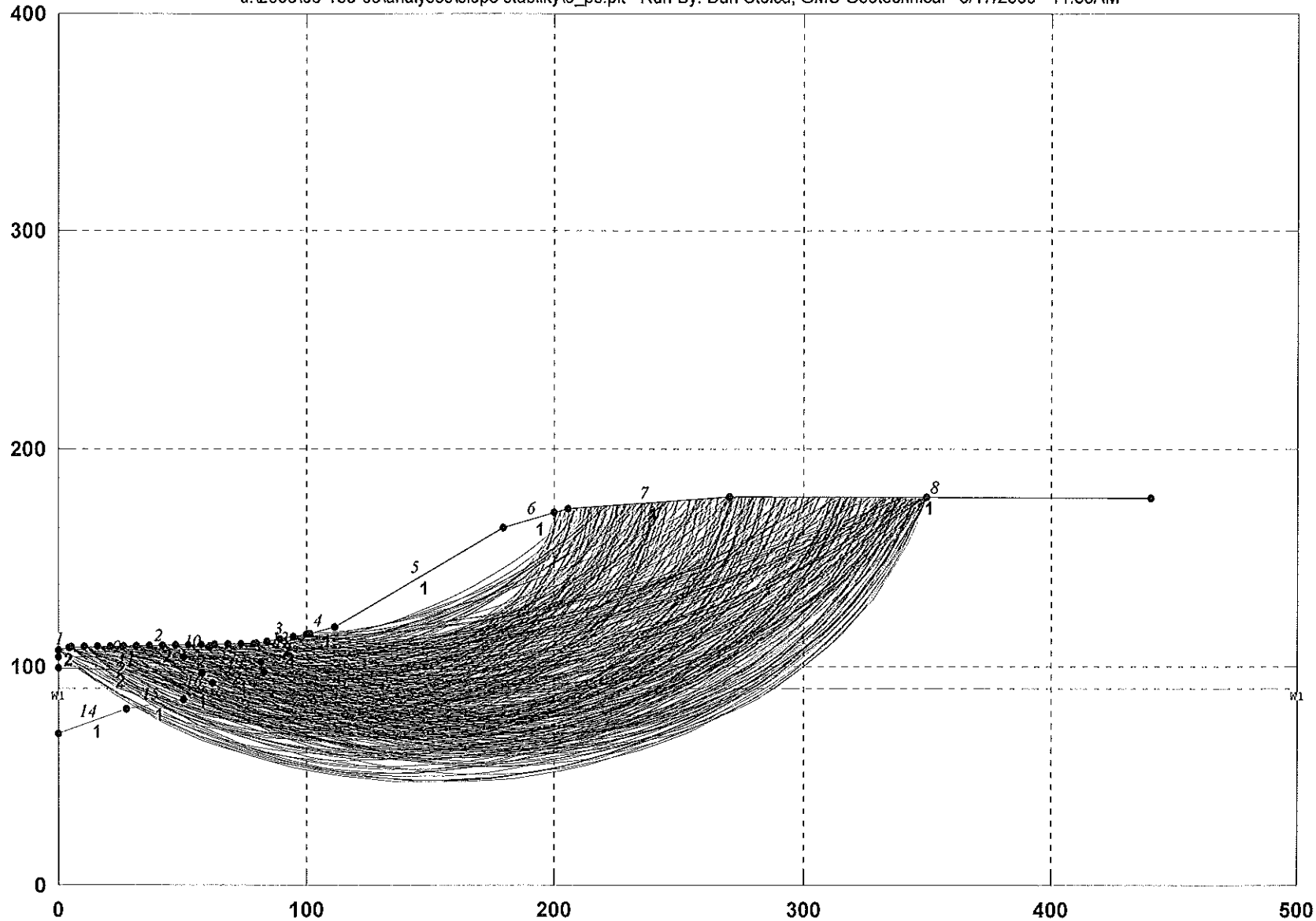
GSTABL7 v.2 FSmin=1.436

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Banning Ranch, Sect 6-6', Pseudostatic

u:\2006\06-163-03\analyses\slope stability\6_ps.plt Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:35AM



GSTABL7

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                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        6/17/2009
Time of Run:              11:35AM
Run By:                   Dan Stoica, GMU Geotechnical
Input Data Filename:      U:\2006\06-163-03\Analyses\Slope Stability\6_ps.in
Output Filename:          U:\2006\06-163-03\Analyses\Slope Stability\6_ps.OUT
Unit System:              English
Plotted Output Filename:  U:\2006\06-163-03\Analyses\Slope Stability\6_ps.PLT
PROBLEM DESCRIPTION:  Banning Ranch, Sect 6-6',
                      Pseudostatic
BOUNDARY COORDINATES
    8 Top   Boundaries
   18 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00     107.30       4.10     109.00        2
    2         4.10     109.00      79.70     110.50        2
    3        79.70     110.50     101.20     115.10        2
    4       101.20     115.10     111.50     118.40        1
    5       111.50     118.40     179.40     163.80        1
    6       179.40     163.80     205.60     172.70        1
    7       205.60     172.70     269.70     178.10        1
    8       269.70     178.10     440.30     177.40        1
    9         0.00     104.20      50.50     104.10        2
   10        50.50     104.10      61.10     109.50        2
   11         0.00      99.50      58.10      96.60        2
   12        58.10      96.60      81.70     101.80        2
   13        81.70     101.80     100.60     115.30        2
   14         0.00      69.60      27.20      80.90        1
   15        27.20      80.90      50.40      85.00        1
   16        50.40      85.00      62.80      92.80        1
   17        62.80      92.80      83.40      97.80        1
   18        83.40      97.80     101.20     115.10        1
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
User Specified Y-Plus Value =   50.00(ft)
ISOTROPIC SOIL PARAMETERS
 3 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.    (psf)     No.
  1   120.0    125.0     587.0     33.5    0.00       0.0       1
  2   120.0    125.0       0.0      0.0    0.00       0.0       1
  3   120.0    125.0       0.0      0.0    0.00       0.0       1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1         0.00       90.00
    2       500.00       90.00
Specified Peak Ground Acceleration Coefficient (A) =   0.150(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
```

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
400 Trial Surfaces Have Been Generated.
20 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 0.00(ft)
and X = 100.00(ft)
Each Surface Terminates Between X = 200.00(ft)
and X = 350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 400
Number of Trial Surfaces With Valid FS = 400
Statistical Data On All Valid FS Values:
FS Max = 3.085 FS Min = 1.436 FS Ave = 2.032
Standard Deviation = 0.316 Coefficient of Variation = 15.57 %
Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.789	109.232
2	25.321	106.208
3	35.009	103.728
4	44.821	101.800
5	54.727	100.430
6	64.694	99.622
7	74.691	99.380
8	84.686	99.703
9	94.647	100.592
10	104.541	102.042
11	114.337	104.050
12	124.004	106.609
13	133.511	109.710
14	142.828	113.344
15	151.923	117.499
16	160.770	122.162
17	169.338	127.319
18	177.601	132.951
19	185.532	139.042
20	193.106	145.572
21	200.298	152.519
22	207.086	159.863
23	213.447	167.578
24	217.969	173.742

Circle Center At X = 73.971 ; Y = 275.965 ; and Radius = 176.593
Factor of Safety
*** 1.436 ***
Individual data on the 35 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.5	1837.6	0.0	0.0	0.	0.	275.6	0.0	0.0
2	8.1	4210.3	0.0	0.0	0.	0.	631.5	0.0	0.0
3	1.6	1078.4	0.0	0.0	0.	0.	161.8	0.0	0.0
4	9.8	8179.8	0.0	0.0	0.	0.	1227.0	0.0	0.0
5	5.7	5763.2	0.0	0.0	0.	0.	864.5	0.0	0.0
6	4.2	4687.1	0.0	0.0	0.	0.	703.1	0.0	0.0
7	6.4	7568.2	0.0	0.0	0.	0.	1135.2	0.0	0.0
8	3.6	4485.1	0.0	0.0	0.	0.	672.8	0.0	0.0
9	6.4	8255.2	0.0	0.0	0.	0.	1238.3	0.0	0.0
10	3.6	4701.3	0.0	0.0	0.	0.	705.2	0.0	0.0
11	5.0	6605.0	0.0	0.0	0.	0.	990.7	0.0	0.0
12	2.0	2673.5	0.0	0.0	0.	0.	401.0	0.0	0.0
13	3.0	4153.9	0.0	0.0	0.	0.	623.1	0.0	0.0

14	0.7	1058.0	0.0	0.0	0.	0.	158.7	0.0	0.0
15	9.2	13864.3	0.0	0.0	0.	0.	2079.6	0.0	0.0
16	6.0	9506.3	0.0	0.0	0.	0.	1426.0	0.0	0.0
17	0.6	974.0	0.0	0.0	0.	0.	146.1	0.0	0.0
18	3.3	5547.6	0.0	0.0	0.	0.	832.1	0.0	0.0
19	7.0	12133.9	0.0	0.0	0.	0.	1820.1	0.0	0.0
20	2.8	5307.7	0.0	0.0	0.	0.	796.1	0.0	0.0
21	9.7	21112.7	0.0	0.0	0.	0.	3166.9	0.0	0.0
22	9.5	24847.2	0.0	0.0	0.	0.	3727.1	0.0	0.0
23	9.3	27619.0	0.0	0.0	0.	0.	4142.9	0.0	0.0
24	9.1	29433.0	0.0	0.0	0.	0.	4414.9	0.0	0.0
25	8.8	30312.1	0.0	0.0	0.	0.	4546.8	0.0	0.0
26	8.6	30297.8	0.0	0.0	0.	0.	4544.7	0.0	0.0
27	8.3	29448.6	0.0	0.0	0.	0.	4417.3	0.0	0.0
28	1.8	6381.8	0.0	0.0	0.	0.	957.3	0.0	0.0
29	6.1	20715.9	0.0	0.0	0.	0.	3107.4	0.0	0.0
30	7.6	22596.5	0.0	0.0	0.	0.	3389.5	0.0	0.0
31	7.2	17806.9	0.0	0.0	0.	0.	2671.0	0.0	0.0
32	5.3	10442.3	0.0	0.0	0.	0.	1566.3	0.0	0.0
33	1.5	2443.1	0.0	0.0	0.	0.	366.5	0.0	0.0
34	6.4	7154.9	0.0	0.0	0.	0.	1073.2	0.0	0.0
35	4.5	1568.8	0.0	0.0	0.	0.	235.3	0.0	0.0

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.316	109.441
2	35.763	106.162
3	45.402	103.499
4	55.192	101.462
5	65.093	100.059
6	75.064	99.296
7	85.063	99.177
8	95.050	99.702
9	104.981	100.869
10	114.817	102.672
11	124.517	105.105
12	134.040	108.158
13	143.346	111.817
14	152.398	116.067
15	161.157	120.892
16	169.588	126.270
17	177.654	132.180
18	185.324	138.597
19	192.565	145.494
20	199.346	152.843
21	205.641	160.614
22	211.422	168.773
23	214.291	173.432

Circle Center At X = 81.912 ; Y = 254.405 ; and Radius = 155.259

Factor of Safety

*** 1.465 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	10.526	109.128
2	20.317	107.092
3	30.190	105.506
4	40.126	104.372
5	50.103	103.694
6	60.100	103.472
7	70.098	103.708
8	80.074	104.399
9	90.008	105.546
10	99.879	107.146
11	109.667	109.195
12	119.351	111.689
13	128.911	114.622
14	138.327	117.990

15	147.579	121.784
16	156.648	125.997
17	165.516	130.620
18	174.162	135.643
19	182.571	141.056
20	190.723	146.847
21	198.602	153.005
22	206.191	159.517
23	213.476	166.368
24	220.439	173.545
25	220.826	173.983

Circle Center At X = 59.952 ; Y = 322.288 ; and Radius = 218.816

Factor of Safety

*** 1.466 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.316	109.441
2	36.070	107.237
3	45.923	105.527
4	55.849	104.316
5	65.824	103.607
6	75.822	103.401
7	85.817	103.699
8	95.785	104.500
9	105.700	105.802
10	115.537	107.601
11	125.270	109.895
12	134.876	112.675
13	144.329	115.936
14	153.606	119.669
15	162.684	123.865
16	171.538	128.512
17	180.147	133.600
18	188.489	139.115
19	196.542	145.043
20	204.287	151.369
21	211.703	158.078
22	218.772	165.151
23	225.475	172.572
24	227.054	174.507

Circle Center At X = 74.916 ; Y = 301.686 ; and Radius = 198.293

Factor of Safety

*** 1.476 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.789	109.232
2	25.622	107.409
3	35.527	106.034
4	45.484	105.112
5	55.473	104.644
6	65.473	104.631
7	75.464	105.073
8	85.423	105.968
9	95.332	107.316
10	105.169	109.114
11	114.915	111.357
12	124.548	114.041
13	134.049	117.160
14	143.398	120.708
15	152.576	124.679
16	161.564	129.062
17	170.343	133.850
18	178.896	139.032
19	187.203	144.599
20	195.249	150.537
21	203.017	156.835

```
   22        210.490      163.480
   23        217.652      170.458
   24        220.967      173.995
Circle Center At X =    60.774 ; Y =   324.110 ; and Radius =   219.537
       Factor of Safety
      ***    1.492   ***
Failure Surface Specified By 21 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        42.105      109.754
    2        51.684      106.882
    3        61.441      104.693
    4        71.329      103.198
    5        81.298      102.406
    6        91.297      102.319
    7       101.278      102.939
    8       111.190      104.262
    9       120.984      106.282
   10       130.611      108.988
   11       140.023      112.367
   12       149.172      116.403
   13       158.014      121.074
   14       166.504      126.359
   15       174.599      132.229
   16       182.260      138.657
   17       189.448      145.609
   18       196.127      153.052
   19       202.263      160.948
   20       207.827      169.257
   21       210.007      173.071
Circle Center At X =    87.521 ; Y =   243.793 ; and Radius =   141.524
       Factor of Safety
      ***    1.498   ***
Failure Surface Specified By 23 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        36.842      109.650
    2        46.431      106.811
    3        56.170      104.540
    4        66.025      102.846
    5        75.963      101.734
    6        85.949      101.209
    7        95.949      101.271
    8       105.928      101.921
    9       115.851      103.156
   10       125.685      104.973
   11       135.395      107.364
   12       144.947      110.322
   13       154.309      113.836
   14       163.449      117.895
   15       172.334      122.484
   16       180.934      127.587
   17       189.219      133.187
   18       197.160      139.264
   19       204.731      145.797
   20       211.904      152.764
   21       218.656      160.141
   22       224.962      167.902
   23       229.885      174.746
Circle Center At X =    89.892 ; Y =   271.214 ; and Radius =   170.051
       Factor of Safety
      ***    1.499   ***
Failure Surface Specified By 24 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        21.053      109.336
    2        30.900      107.599
    3        40.818      106.313
```

4	50.783	105.482
5	60.776	105.108
6	70.776	105.192
7	80.761	105.733
8	90.711	106.729
9	100.605	108.180
10	110.423	110.082
11	120.143	112.431
12	129.746	115.222
13	139.211	118.449
14	148.518	122.106
15	157.649	126.184
16	166.583	130.676
17	175.302	135.572
18	183.789	140.862
19	192.025	146.534
20	199.992	152.577
21	207.675	158.978
22	215.058	165.723
23	222.124	172.799
24	223.399	174.199

Circle Center At X = 63.960 ; Y = 323.534 ; and Radius = 218.453

Factor of Safety

*** 1.500 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.895	110.067
2	67.750	108.374
3	77.695	107.320
4	87.686	106.910
5	97.683	107.144
6	107.645	108.023
7	117.529	109.542
8	127.294	111.696
9	136.900	114.474
10	146.307	117.867
11	155.476	121.859
12	164.368	126.434
13	172.947	131.572
14	181.176	137.253
15	189.022	143.454
16	196.452	150.147
17	203.435	157.305
18	209.941	164.899
19	215.945	172.896
20	216.413	173.611

Circle Center At X = 89.058 ; Y = 261.821 ; and Radius = 154.920

Factor of Safety

*** 1.524 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.053	109.336
2	30.292	105.511
3	39.761	102.295
4	49.419	99.703
5	59.225	97.745
6	69.139	96.431
7	79.116	95.764
8	89.116	95.749
9	99.096	96.386
10	109.013	97.671
11	118.826	99.599
12	128.491	102.163
13	137.970	105.350
14	147.220	109.148
15	156.204	113.541

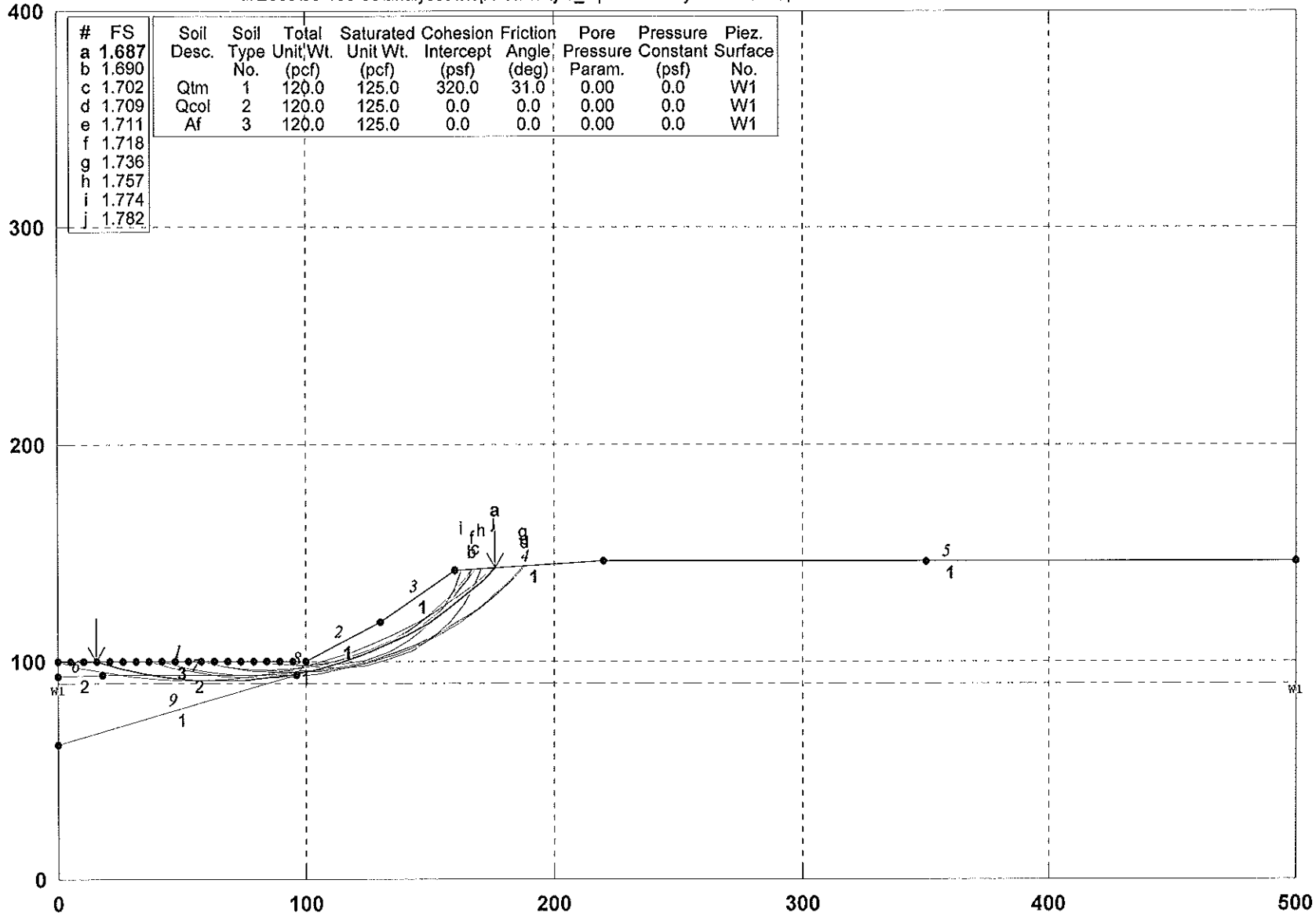
```
   16        164.883      118.509
   17        173.219      124.032
   18        181.178      130.087
   19        188.726      136.647
   20        195.830      143.684
   21        202.461      151.170
   22        208.590      159.071
   23        214.192      167.355
   24        217.927      173.738
Circle Center At X =    84.337 ; Y =   248.999 ; and Radius =   153.331
       Factor of Safety
      ***    1.529   ***
          **** END OF GSTABL7 OUTPUT ****
```

Banning Ranch, Sect 9-9', Static

u:\2006\06-163-03\analyses\slope stability\9_s.pl2 Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:36AM

#	FS
a	1.687
b	1.690
c	1.702
d	1.709
e	1.711
f	1.718
g	1.736
h	1.757
i	1.774
j	1.782

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Qtm	1	120.0	125.0	320.0	31.0	0.00	0.0	W1
Qcol	2	120.0	125.0	0.0	0.0	0.00	0.0	W1
Af	3	120.0	125.0	0.0	0.0	0.00	0.0	W1



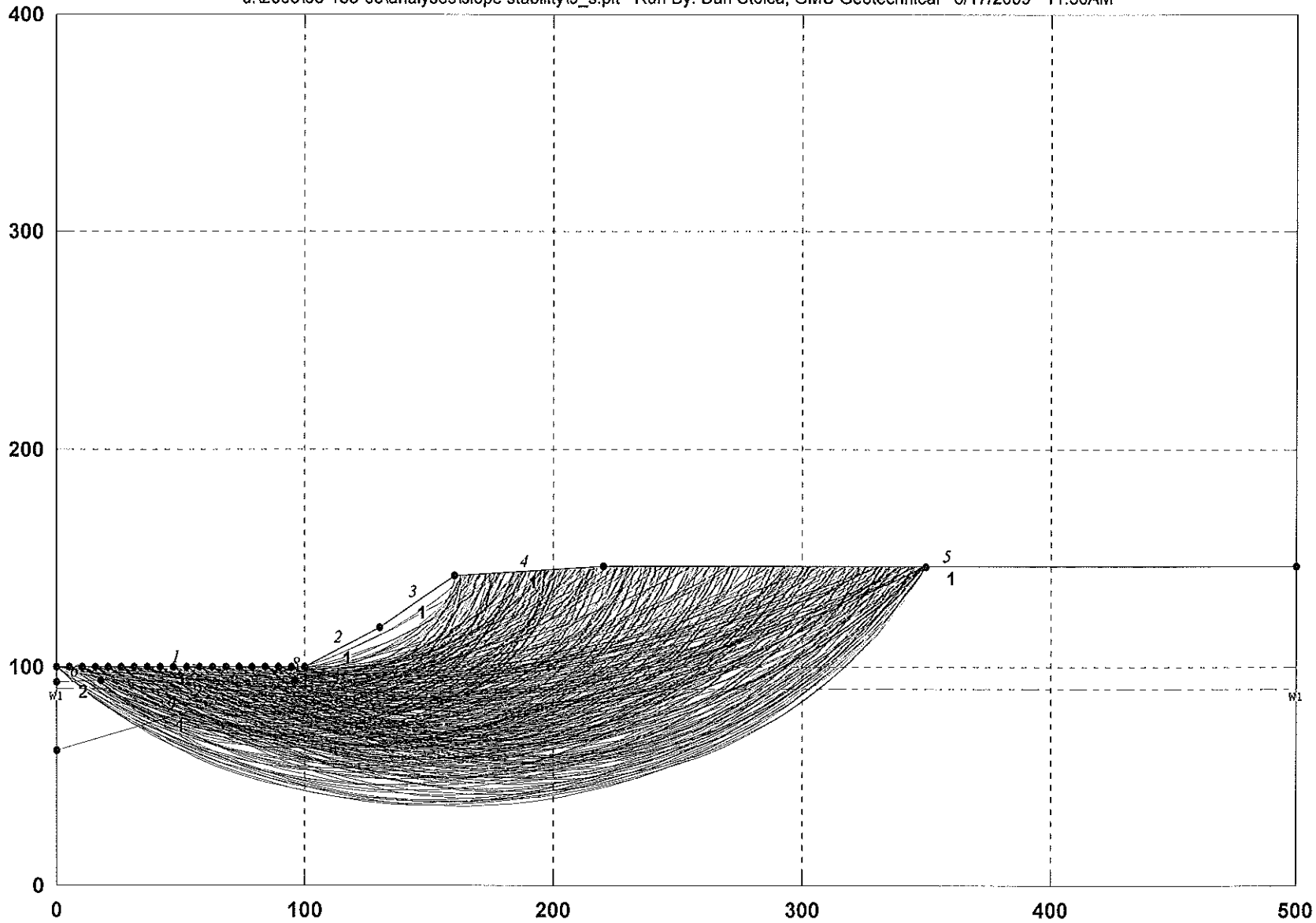
GSTABL7 v.2 FSmin=1.687

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Banning Ranch, Sect 9-9', Static

u:\2006\06-163-03\analyses\slope stability\9_s.plt Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:36AM



GSTABL7

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                    *** GSTABL7 ***
            ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
            (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        6/17/2009
Time of Run:              11:36AM
Run By:                   Dan Stoica, GMU Geotechnical
Input Data Filename:      U:\2006\06-163-03\Analyses\Slope Stability\9_s.in
Output Filename:          U:\2006\06-163-03\Analyses\Slope Stability\9_s.OUT
Unit System:              English
Plotted Output Filename:  U:\2006\06-163-03\Analyses\Slope Stability\9_s.PLT
PROBLEM DESCRIPTION:  Banning Ranch, Sect 9-9',
                      Static
BOUNDARY COORDINATES
    5 Top   Boundaries
    9 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00     100.00     100.00     100.00        3
    2       100.00     100.00     130.00     118.00        1
    3       130.00     118.00     160.00     142.00        1
    4       160.00     142.00     220.00     146.00        1
    5       220.00     146.00     500.00     146.00        1
    6         0.00      93.00      18.00      94.00        2
    7        18.00      94.00      96.00      94.00        2
    8        96.00      94.00     100.00     100.00        1
    9         0.00      62.00      96.00      94.00        1
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
User Specified Y-Plus Value =   50.00(ft)
ISOTROPIC SOIL PARAMETERS
 3 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    125.0     320.0     31.0    0.00       0.0      1
  2   120.0    125.0       0.0      0.0    0.00       0.0      1
  3   120.0    125.0       0.0      0.0    0.00       0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.        (ft)        (ft)
    1         0.00       90.00
    2       500.00       90.00
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 400 Trial Surfaces Have Been Generated.
  20 Surface(s) Initiate(s) From Each Of    20 Points Equally Spaced
Along The Ground Surface Between  X =   0.00(ft)
                                and  X = 100.00(ft)
Each Surface Terminates Between   X = 160.00(ft)
                                and  X = 350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
```

Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 400
Number of Trial Surfaces With Valid FS = 400
Statistical Data On All Valid FS Values:
FS Max = 5.993 FS Min = 1.687 FS Ave = 3.042
Standard Deviation = 0.867 Coefficient of Variation = 28.51 %
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.789	100.000
2	25.280	96.850
3	34.967	94.367
4	44.803	92.564
5	54.741	91.447
6	64.732	91.024
7	74.728	91.296
8	84.681	92.262
9	94.544	93.916
10	104.267	96.252
11	113.805	99.258
12	123.110	102.918
13	132.139	107.217
14	140.848	112.132
15	149.194	117.641
16	157.137	123.716
17	164.639	130.328
18	171.664	137.445
19	176.520	143.101

Circle Center At X = 65.822 ; Y = 234.886 ; and Radius = 143.866
Factor of Safety
*** 1.687 ***
Individual data on the 24 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.5	1793.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	9.7	5104.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	2.0	1398.5	0.0	0.0	0.	0.	0.0	0.0	0.0
4	7.8	6314.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	9.9	9533.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	10.0	10507.7	0.0	0.0	0.	0.	0.0	0.0	0.0
7	10.0	10604.1	0.0	0.0	0.	0.	0.0	0.0	0.0
8	10.0	9819.4	0.0	0.0	0.	0.	0.0	0.0	0.0
9	9.9	8179.0	0.0	0.0	0.	0.	0.0	0.0	0.0
10	0.3	252.9	0.0	0.0	0.	0.	0.0	0.0	0.0
11	1.3	924.5	0.0	0.0	0.	0.	0.0	0.0	0.0
12	3.8	2377.0	0.0	0.0	0.	0.	0.0	0.0	0.0
13	4.3	2837.0	0.0	0.0	0.	0.	0.0	0.0	0.0
14	9.5	8774.6	0.0	0.0	0.	0.	0.0	0.0	0.0
15	9.3	11151.8	0.0	0.0	0.	0.	0.0	0.0	0.0
16	6.9	9404.0	0.0	0.0	0.	0.	0.0	0.0	0.0
17	2.1	3118.7	0.0	0.0	0.	0.	0.0	0.0	0.0
18	8.7	14129.1	0.0	0.0	0.	0.	0.0	0.0	0.0
19	8.3	15153.5	0.0	0.0	0.	0.	0.0	0.0	0.0
20	7.9	15112.3	0.0	0.0	0.	0.	0.0	0.0	0.0
21	2.9	5454.3	0.0	0.0	0.	0.	0.0	0.0	0.0
22	4.6	7722.8	0.0	0.0	0.	0.	0.0	0.0	0.0
23	7.0	7297.7	0.0	0.0	0.	0.	0.0	0.0	0.0
24	4.9	1553.6	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	78.947	100.000
2	88.839	98.529
3	98.836	98.301
4	108.784	99.320

```
    5        118.527      101.570
    6        127.915      105.017
    7        136.799      109.606
    8        145.043      115.267
    9        152.518      121.910
   10        159.107      129.432
   11        164.707      137.717
   12        167.121      142.475
Circle Center At X =    95.698 ; Y =   177.986 ; and Radius =    79.764
       Factor of Safety
      ***    1.690   ***
Failure Surface Specified By 16 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         42.105      100.000
    2         51.644       96.997
    3         61.422       94.902
    4         71.353       93.735
    5         81.351       93.504
    6         91.326       94.213
    7        101.190       95.854
    8        110.857       98.414
    9        120.241      101.870
   10        129.259      106.191
   11        137.832      111.339
   12        145.884      117.269
   13        153.344      123.928
   14        160.146      131.258
   15        166.230      139.194
   16        168.338      142.556
Circle Center At X =    78.799 ; Y =   199.657 ; and Radius =   106.198
       Factor of Safety
      ***    1.702   ***
Failure Surface Specified By 16 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         57.895      100.000
    2         67.573       97.485
    3         77.430       95.798
    4         87.394       94.953
    5         97.394       94.954
    6        107.358       95.802
    7        117.215       97.490
    8        126.893      100.008
    9        136.323      103.335
   10        145.437      107.450
   11        154.170      112.321
   12        162.460      117.914
   13        170.246      124.190
   14        177.472      131.102
   15        184.087      138.601
   16        187.992      143.866
Circle Center At X =    92.381 ; Y =   212.573 ; and Radius =   117.737
       Factor of Safety
      ***    1.709   ***
Failure Surface Specified By 16 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         57.895      100.000
    2         67.623       97.683
    3         77.507       96.170
    4         87.483       95.471
    5         97.482       95.591
    6        107.438       96.530
    7        117.284       98.280
    8        126.953      100.830
    9        136.381      104.163
   10        145.505      108.256
```

```
   11        154.263      113.083
   12        162.597      118.610
   13        170.450      124.801
   14        177.770      131.614
   15        184.508      139.004
   16        188.275      143.885
Circle Center At X =    91.021 ; Y =   217.204 ; and Radius =   121.795
       Factor of Safety
      ***    1.711   ***
Failure Surface Specified By 14 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         57.895      100.000
    2         67.624       97.689
    3         77.541       96.402
    4         87.538       96.155
    5         97.506       96.949
    6        107.338       98.775
    7        116.926      101.615
    8        126.167      105.437
    9        134.960      110.199
   10        143.210      115.851
   11        150.827      122.330
   12        157.729      129.566
   13        163.840      137.482
   14        166.916      142.461
Circle Center At X =    84.921 ; Y =   191.797 ; and Radius =    95.693
       Factor of Safety
      ***    1.718   ***
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         36.842      100.000
    2         46.391       97.029
    3         56.133       94.774
    4         66.016       93.246
    5         75.984       92.454
    6         85.984       92.403
    7         95.960       93.092
    8        105.858       94.517
    9        115.623       96.672
   10        125.202       99.544
   11        134.542      103.117
   12        143.592      107.372
   13        152.301      112.285
   14        160.624      117.829
   15        168.512      123.975
   16        175.924      130.688
   17        182.819      137.931
   18        187.666      143.844
Circle Center At X =    81.673 ; Y =   227.121 ; and Radius =   134.795
       Factor of Safety
      ***    1.736   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         94.737      100.000
    2        104.475       97.727
    3        114.457       97.129
    4        124.397       98.222
    5        134.011      100.975
    6        143.023      105.309
    7        151.175      111.101
    8        158.234      118.184
    9        163.998      126.356
   10        168.301      135.382
   11        170.368      142.691
Circle Center At X =   112.991 ; Y =   156.215 ; and Radius =    59.104
```

```
       Factor of Safety
      ***    1.757   ***
Failure Surface Specified By 10 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         94.737      100.000
    2        104.622       98.487
    3        114.618       98.771
    4        124.400      100.845
    5        133.652      104.640
    6        142.073      110.034
    7        149.389      116.851
    8        155.364      124.870
    9        159.803      133.831
   10        162.190      142.146
Circle Center At X =   108.066 ; Y =   153.719 ; and Radius =    55.348
       Factor of Safety
      ***    1.774   ***
Failure Surface Specified By 21 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1          0.000      100.000
    2          9.584       97.144
    3         19.318       94.855
    4         29.170       93.140
    5         39.105       92.005
    6         49.090       91.455
    7         59.090       91.491
    8         69.071       92.112
    9         78.998       93.317
   10         88.837       95.102
   11         98.555       97.461
   12        108.118      100.385
   13        117.493      103.864
   14        126.648      107.887
   15        135.552      112.439
   16        144.174      117.506
   17        152.484      123.068
   18        160.453      129.109
   19        168.056      135.605
   20        175.264      142.537
   21        175.738      143.049
Circle Center At X =    53.483 ; Y =   261.972 ; and Radius =   170.574
       Factor of Safety
      ***    1.782   ***
          **** END OF GSTABL7 OUTPUT ****
```

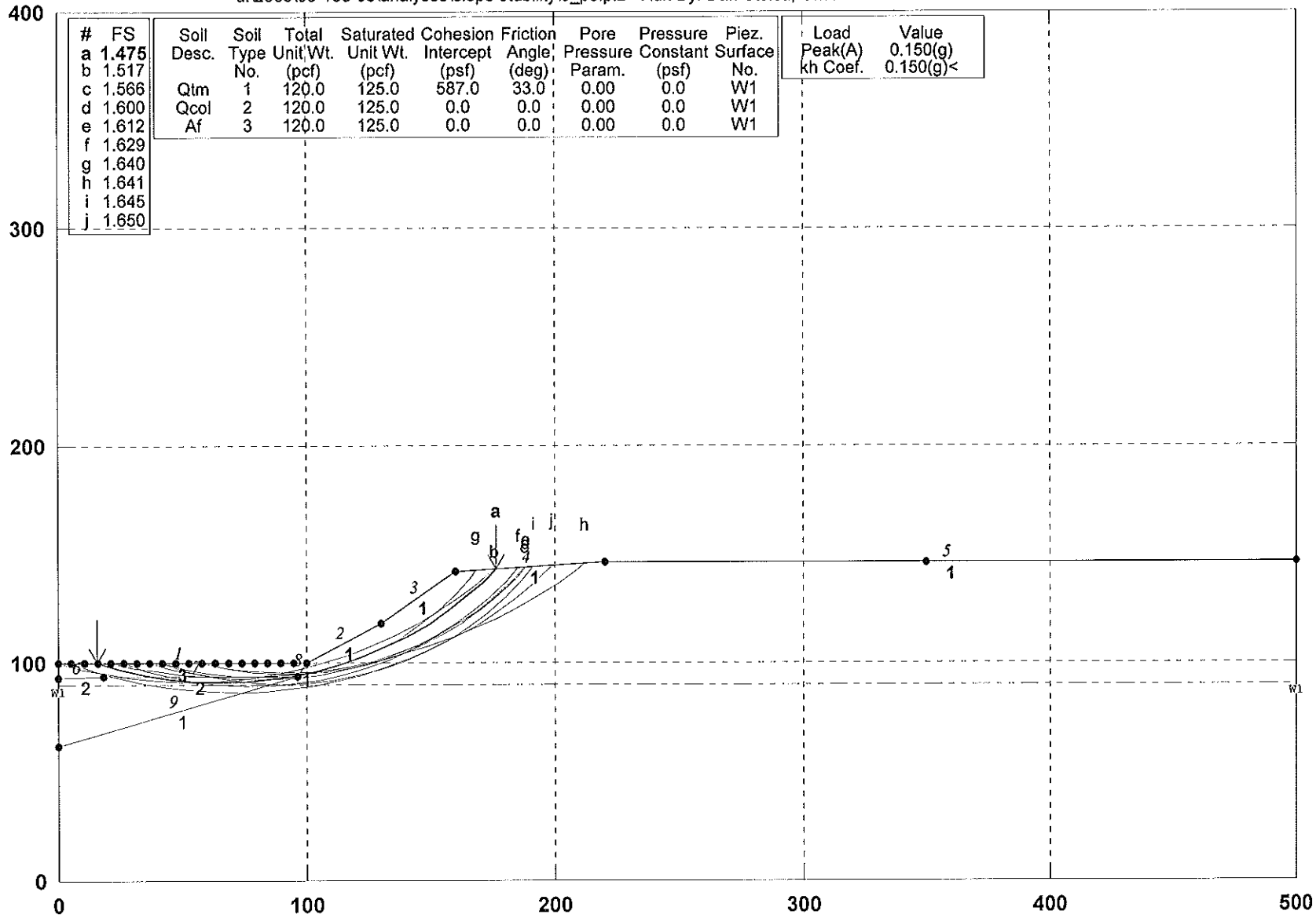
Banning Ranch, Sect 9-9', Pseudostatic

u:\2006\06-163-03\analyses\slope stability\9_ps.pl2 Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:38AM

#	FS
a	1.475
b	1.517
c	1.566
d	1.600
e	1.612
f	1.629
g	1.640
h	1.641
i	1.645
j	1.650

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
Qtm	1	120.0	125.0	587.0	33.0	0.00	0.0	W1
Qcol	2	120.0	125.0	0.0	0.0	0.00	0.0	W1
Af	3	120.0	125.0	0.0	0.0	0.00	0.0	W1

Load	Value
Peak(A)	0.150(g)
kh Coef.	0.150(g)<



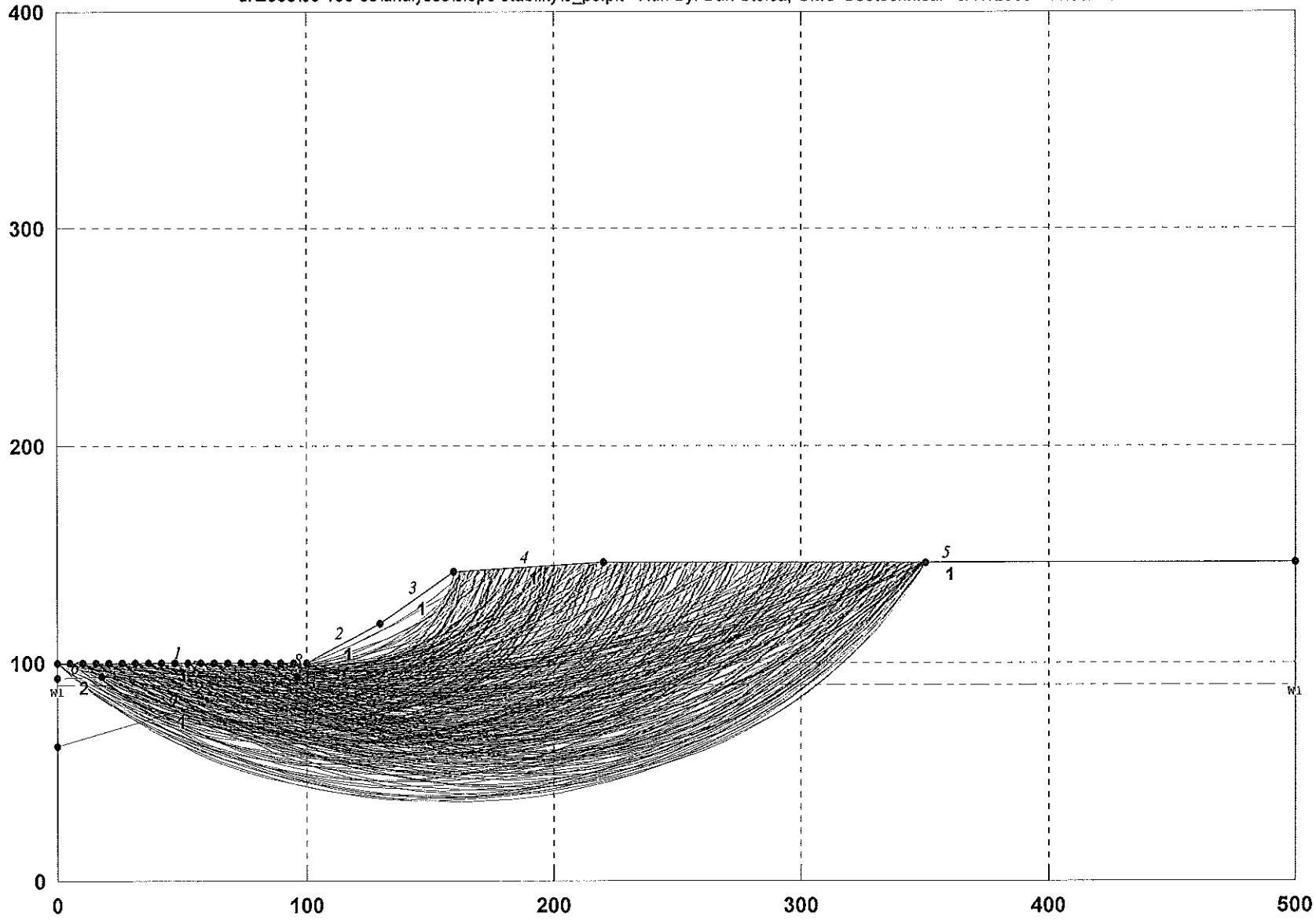
GSTABL7 v.2 FSmin=1.475

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Banning Ranch, Sect 9-9', Pseudostatic

u:\2006\06-163-03\analyses\slope stability\9_ps.plt Run By: Dan Stoica, GMU Geotechnical 6/17/2009 11:38AM



GSTABL7

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                    *** GSTABL7 ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        6/17/2009
Time of Run:              11:38AM
Run By:                   Dan Stoica, GMU Geotechnical
Input Data Filename:      U:\2006\06-163-03\Analyses\Slope Stability\9_ps.in
Output Filename:          U:\2006\06-163-03\Analyses\Slope Stability\9_ps.OUT
Unit System:              English
Plotted Output Filename:  U:\2006\06-163-03\Analyses\Slope Stability\9_ps.PLT
PROBLEM DESCRIPTION:  Banning Ranch, Sect 9-9',
                      Pseudostatic
BOUNDARY COORDINATES
    5 Top   Boundaries
    9 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
    1         0.00     100.00     100.00     100.00        3
    2       100.00     100.00     130.00     118.00        1
    3       130.00     118.00     160.00     142.00        1
    4       160.00     142.00     220.00     146.00        1
    5       220.00     146.00     500.00     146.00        1
    6         0.00      93.00      18.00      94.00        2
    7        18.00      94.00      96.00      94.00        2
    8        96.00      94.00     100.00     100.00        1
    9         0.00      62.00      96.00      94.00        1
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
User Specified Y-Plus Value =   50.00(ft)
ISOTROPIC SOIL PARAMETERS
 3 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    125.0     587.0     33.0    0.00       0.0      1
  2   120.0    125.0       0.0      0.0    0.00       0.0      1
  3   120.0    125.0       0.0      0.0    0.00       0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  2 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.        (ft)        (ft)
    1         0.00       90.00
    2       500.00       90.00
Specified Peak Ground Acceleration Coefficient (A) =   0.150(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
 400 Trial Surfaces Have Been Generated.
  20 Surface(s) Initiate(s) From Each Of    20 Points Equally Spaced
Along The Ground Surface Between  X =   0.00(ft)
                                and  X = 100.00(ft)
Each Surface Terminates Between   X = 160.00(ft)
                                and  X = 350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
```

At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 400
Number of Trial Surfaces With Valid FS = 400
Statistical Data On All Valid FS Values:
FS Max = 3.465 FS Min = 1.475 FS Ave = 2.201
Standard Deviation = 0.363 Coefficient of Variation = 16.50 %
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.789	100.000
2	25.280	96.850
3	34.967	94.367
4	44.803	92.564
5	54.741	91.447
6	64.732	91.024
7	74.728	91.296
8	84.681	92.262
9	94.544	93.916
10	104.267	96.252
11	113.805	99.258
12	123.110	102.918
13	132.139	107.217
14	140.848	112.132
15	149.194	117.641
16	157.137	123.716
17	164.639	130.328
18	171.664	137.445
19	176.520	143.101

Circle Center At X = 65.822 ; Y = 234.886 ; and Radius = 143.866
Factor of Safety
*** 1.475 ***
Individual data on the 24 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.5	1793.6	0.0	0.0	0.	0.	269.0	0.0	0.0
2	9.7	5104.4	0.0	0.0	0.	0.	765.7	0.0	0.0
3	2.0	1398.5	0.0	0.0	0.	0.	209.8	0.0	0.0
4	7.8	6314.3	0.0	0.0	0.	0.	947.1	0.0	0.0
5	9.9	9533.5	0.0	0.0	0.	0.	1430.0	0.0	0.0
6	10.0	10507.7	0.0	0.0	0.	0.	1576.2	0.0	0.0
7	10.0	10604.1	0.0	0.0	0.	0.	1590.6	0.0	0.0
8	10.0	9819.4	0.0	0.0	0.	0.	1472.9	0.0	0.0
9	9.9	8179.0	0.0	0.0	0.	0.	1226.9	0.0	0.0
10	0.3	252.9	0.0	0.0	0.	0.	37.9	0.0	0.0
11	1.3	924.5	0.0	0.0	0.	0.	138.7	0.0	0.0
12	3.8	2377.0	0.0	0.0	0.	0.	356.5	0.0	0.0
13	4.3	2837.0	0.0	0.0	0.	0.	425.5	0.0	0.0
14	9.5	8774.6	0.0	0.0	0.	0.	1316.2	0.0	0.0
15	9.3	11151.8	0.0	0.0	0.	0.	1672.8	0.0	0.0
16	6.9	9404.0	0.0	0.0	0.	0.	1410.6	0.0	0.0
17	2.1	3118.7	0.0	0.0	0.	0.	467.8	0.0	0.0
18	8.7	14129.1	0.0	0.0	0.	0.	2119.4	0.0	0.0
19	8.3	15153.5	0.0	0.0	0.	0.	2273.0	0.0	0.0
20	7.9	15112.3	0.0	0.0	0.	0.	2266.9	0.0	0.0
21	2.9	5454.3	0.0	0.0	0.	0.	818.1	0.0	0.0
22	4.6	7722.8	0.0	0.0	0.	0.	1158.4	0.0	0.0
23	7.0	7297.7	0.0	0.0	0.	0.	1094.7	0.0	0.0
24	4.9	1553.6	0.0	0.0	0.	0.	233.0	0.0	0.0

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	0.000	100.000
2	9.584	97.144
3	19.318	94.855
4	29.170	93.140
5	39.105	92.005
6	49.090	91.455
7	59.090	91.491
8	69.071	92.112
9	78.998	93.317
10	88.837	95.102
11	98.555	97.461
12	108.118	100.385
13	117.493	103.864
14	126.648	107.887
15	135.552	112.439
16	144.174	117.506
17	152.484	123.068
18	160.453	129.109
19	168.056	135.605
20	175.264	142.537
21	175.738	143.049

Circle Center At X = 53.483 ; Y = 261.972 ; and Radius = 170.574

Factor of Safety

*** 1.517 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.842	100.000
2	46.391	97.029
3	56.133	94.774
4	66.016	93.246
5	75.984	92.454
6	85.984	92.403
7	95.960	93.092
8	105.858	94.517
9	115.623	96.672
10	125.202	99.544
11	134.542	103.117
12	143.592	107.372
13	152.301	112.285
14	160.624	117.829
15	168.512	123.975
16	175.924	130.688
17	182.819	137.931
18	187.666	143.844

Circle Center At X = 81.673 ; Y = 227.121 ; and Radius = 134.795

Factor of Safety

*** 1.566 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.895	100.000
2	67.573	97.485
3	77.430	95.798
4	87.394	94.953
5	97.394	94.954
6	107.358	95.802
7	117.215	97.490
8	126.893	100.008
9	136.323	103.335
10	145.437	107.450
11	154.170	112.321
12	162.460	117.914
13	170.246	124.190
14	177.472	131.102
15	184.087	138.601
16	187.992	143.866

Circle Center At X = 92.381 ; Y = 212.573 ; and Radius = 117.737

Factor of Safety
*** 1.600 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.895	100.000
2	67.623	97.683
3	77.507	96.170
4	87.483	95.471
5	97.482	95.591
6	107.438	96.530
7	117.284	98.280
8	126.953	100.830
9	136.381	104.163
10	145.505	108.256
11	154.263	113.083
12	162.597	118.610
13	170.450	124.801
14	177.770	131.614
15	184.508	139.004
16	188.275	143.885

Circle Center At X = 91.021 ; Y = 217.204 ; and Radius = 121.795

Factor of Safety
*** 1.612 ***
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.316	100.000
2	35.657	96.431
3	45.242	93.578
4	55.014	91.457
5	64.919	90.081
6	74.899	89.456
7	84.899	89.587
8	94.859	90.473
9	104.724	92.109
10	114.438	94.486
11	123.944	97.589
12	133.189	101.402
13	142.119	105.902
14	150.684	111.064
15	158.834	116.858
16	166.524	123.251
17	173.708	130.207
18	180.347	137.685
19	184.892	143.659

Circle Center At X = 78.165 ; Y = 221.705 ; and Radius = 132.289

Factor of Safety
*** 1.629 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.105	100.000
2	51.644	96.997
3	61.422	94.902
4	71.353	93.735
5	81.351	93.504
6	91.326	94.213
7	101.190	95.854
8	110.857	98.414
9	120.241	101.870
10	129.259	106.191
11	137.832	111.339
12	145.884	117.269
13	153.344	123.928
14	160.146	131.258
15	166.230	139.194
16	168.338	142.556

Circle Center At X = 78.799 ; Y = 199.657 ; and Radius = 106.198
Factor of Safety
*** 1.640 ***
Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.053	100.000
2	30.799	97.760
3	40.639	95.983
4	50.553	94.675
5	60.518	93.836
6	70.512	93.470
7	80.511	93.578
8	90.494	94.158
9	100.439	95.210
10	110.322	96.731
11	120.123	98.719
12	129.818	101.168
13	139.387	104.072
14	148.808	107.427
15	158.059	111.223
16	167.121	115.452
17	175.972	120.106
18	184.593	125.173
19	192.965	130.643
20	201.068	136.502
21	208.885	142.739
22	211.991	145.466

Circle Center At X = 73.241 ; Y = 304.495 ; and Radius = 211.049
Factor of Safety
*** 1.641 ***
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	42.105	100.000
2	51.459	96.463
3	61.071	93.705
4	70.877	91.743
5	80.810	90.591
6	90.804	90.256
7	100.793	90.742
8	110.708	92.044
9	120.482	94.154
10	130.052	97.057
11	139.351	100.735
12	148.318	105.162
13	156.892	110.308
14	165.015	116.140
15	172.633	122.618
16	179.696	129.697
17	186.154	137.332
18	190.962	144.064

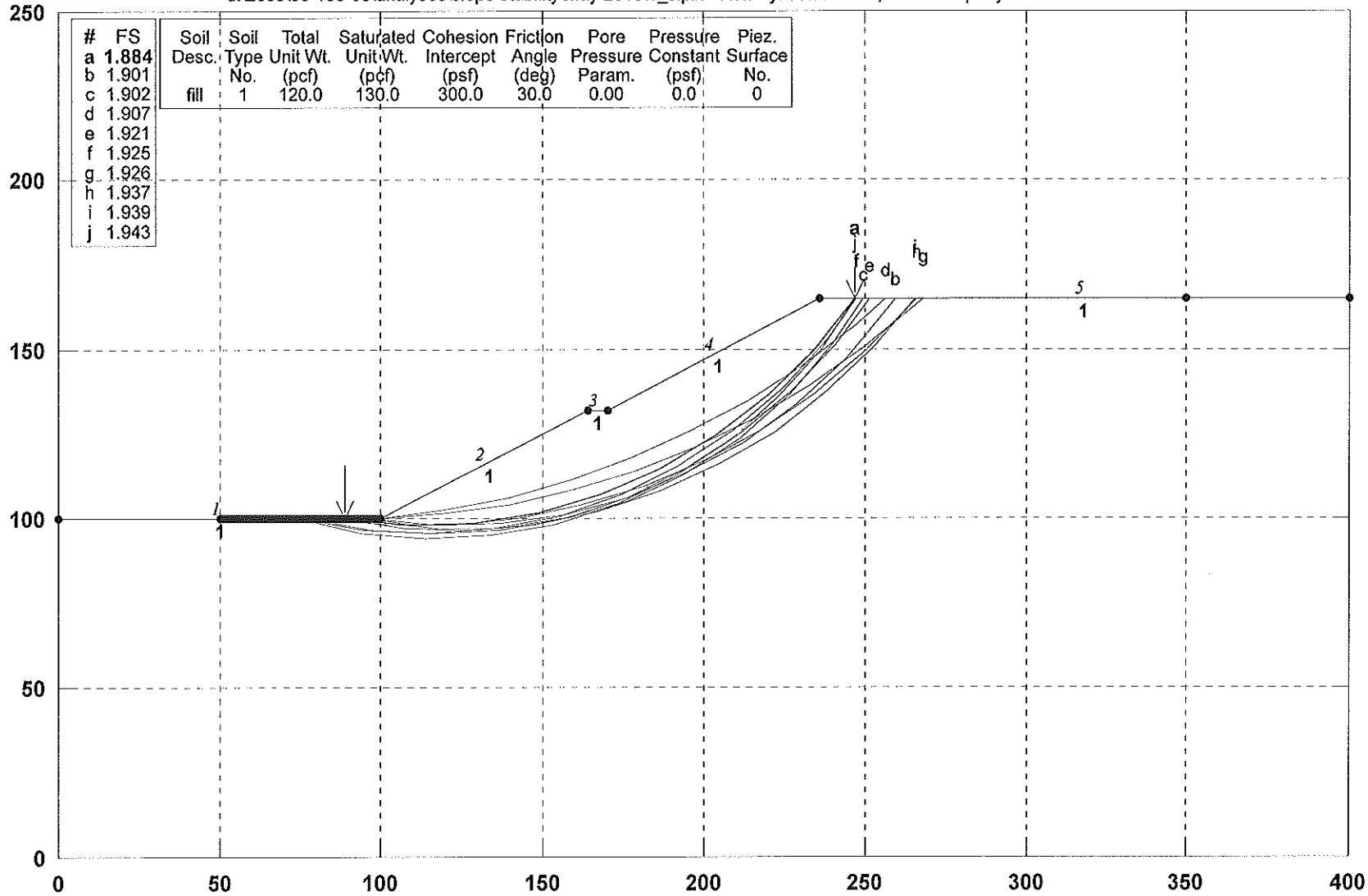
Circle Center At X = 89.873 ; Y = 212.095 ; and Radius = 121.849
Factor of Safety
*** 1.645 ***
Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	5.263	100.000
2	14.578	96.362
3	24.092	93.283
4	33.772	90.771
5	43.583	88.838
6	53.491	87.489
7	63.462	86.728
8	73.461	86.560
9	83.452	86.983
10	93.400	87.998

```
   11        103.271       89.600
   12        113.030       91.783
   13        122.642       94.540
   14        132.075       97.862
   15        141.294      101.736
   16        150.267      106.149
   17        158.964      111.086
   18        167.353      116.529
   19        175.405      122.459
   20        183.091      128.855
   21        190.386      135.696
   22        197.263      142.956
   23        198.624      144.575
Circle Center At X =    71.307 ; Y =   255.372 ; and Radius =   168.826
       Factor of Safety
      ***    1.650   ***
          **** END OF GSTABL7 OUTPUT ****
```

Typical Fill Slope, 65 ft High, Static analysis

u:\2006\06-163-00\analyses\slope stability\may 2010\1_s.pl2 Run By: John Smith, XYZ Company 5/21/2010 04:45PM



#	FS
a	1.884
b	1.901
c	1.902
d	1.907
e	1.921
f	1.925
g	1.926
h	1.937
i	1.939
j	1.943

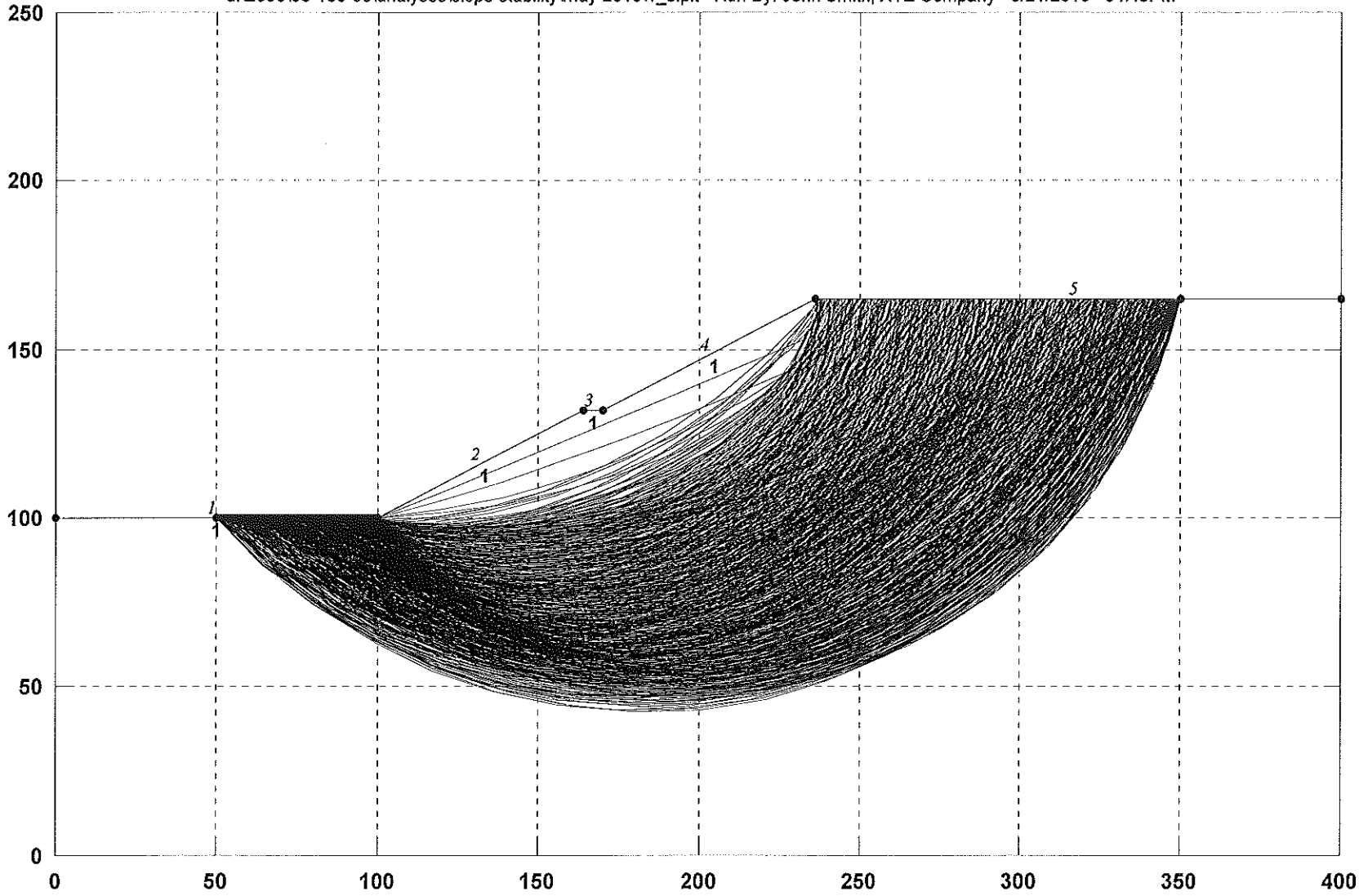
Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
fill	1	120.0	130.0	300.0	30.0	0.00	0.0	0

GSTABL7 v.2 FSmin=1.884

Safety Factors Are Calculated By The Modified Bishop Method

Typical Fill Slope, 65 ft High, Static analysis

u:\2006\06-163-00\analyses\slope stability\may 2010\1_s.plt Run By: John Smith, XYZ Company 5/21/2010 04:45PM



```
                    ***  GSTABL7  ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                  SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        5/21/2010
Time of Run:              04:45PM
Run By:                   John Smith, XYZ Company
Input Data Filename:      U:\2006\06-163-00\Analyses\Slope Stability\May 2010\1_s.in
Output Filename:          U:\2006\06-163-00\Analyses\Slope Stability\May 2010\1_s.OUT
Unit System:              English
Plotted Output Filename:  U:\2006\06-163-00\Analyses\Slope Stability\May 2010\1_s.PLT
PROBLEM DESCRIPTION:  Typical Fill Slope, 65 ft High,
                      Static analysis
BOUNDARY COORDINATES
    5 Top   Boundaries
    5 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.        (ft)        (ft)        (ft)        (ft)     Below Bnd
    1         0.00      100.00      100.00      100.00         1
    2       100.00      100.00      164.00      132.00         1
    3       164.00      132.00      170.00      132.00         1
    4       170.00      132.00      236.00      165.00         1
    5       236.00      165.00      400.00      165.00         1
Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
 1 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   120.0    130.0     300.0     30.0    0.00       0.0      0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
  20 Surface(s) Initiate(s) From Each Of    50 Points Equally Spaced
Along The Ground Surface Between  X =  50.00(ft)
                              and  X = 100.00(ft)
Each Surface Terminates Between   X = 236.00(ft)
                              and  X = 350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
20.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Attempted =  1000
      Number of Trial Surfaces With Valid FS = 1000
      Statistical Data On All Valid FS Values:
         FS Max =   4.131   FS Min =   1.884   FS Ave =   2.845
         Standard Deviation =    0.511   Coefficient of Variation =   17.95 %
      Failure Surface Specified By 10 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        88.776     100.000
          2       108.688      98.133
          3       128.680      98.690
          4       148.458     101.661
```

5	167.732	107.004
6	186.217	114.640
7	203.642	124.456
8	219.751	136.309
9	234.308	150.024
10	246.765	165.000

Circle Center At X = 114.111 ; Y = 262.925 ; and Radius = 164.883

Factor of Safety

*** 1.884 ***

Individual data on the 13 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	11.2	708.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	8.7	3786.2	0.0	0.0	0.	0.	0.0	0.0	0.0
3	20.0	26223.5	0.0	0.0	0.	0.	0.0	0.0	0.0
4	19.8	45353.2	0.0	0.0	0.	0.	0.0	0.0	0.0
5	15.5	45317.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	3.7	11424.6	0.0	0.0	0.	0.	0.0	0.0	0.0
7	2.3	6676.5	0.0	0.0	0.	0.	0.0	0.0	0.0
8	16.2	48189.8	0.0	0.0	0.	0.	0.0	0.0	0.0
9	17.4	52100.9	0.0	0.0	0.	0.	0.0	0.0	0.0
10	16.1	43428.5	0.0	0.0	0.	0.	0.0	0.0	0.0
11	14.6	30303.8	0.0	0.0	0.	0.	0.0	0.0	0.0
12	1.7	2748.5	0.0	0.0	0.	0.	0.0	0.0	0.0
13	10.8	8359.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.939	100.000
2	116.842	98.032
3	136.838	98.402
4	156.655	101.104
5	176.020	106.102
6	194.670	113.328
7	212.348	122.681
8	228.812	134.035
9	243.838	147.234
10	257.220	162.098
11	259.274	165.000

Circle Center At X = 123.684 ; Y = 268.868 ; and Radius = 170.973

Factor of Safety

*** 1.901 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.939	100.000
2	116.733	97.141
3	136.733	97.058
4	156.551	99.752
5	175.803	105.171
6	194.116	113.210
7	211.136	123.714
8	226.532	136.479
9	240.008	151.258
10	249.410	165.000

Circle Center At X = 127.364 ; Y = 239.958 ; and Radius = 143.227

Factor of Safety

*** 1.902 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.000	100.000
2	119.859	102.373
3	139.496	106.165
4	158.810	111.356

5	177.703	117.921
6	196.075	125.824
7	213.832	135.025
8	230.884	145.478
9	247.141	157.127
10	256.611	165.000

Circle Center At X = 77.290 ; Y = 375.887 ; and Radius = 276.820

Factor of Safety

*** 1.907 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	77.551	100.000
2	97.233	96.447
3	117.200	95.296
4	137.160	96.564
5	156.821	100.231
6	175.895	106.244
7	194.105	114.516
8	211.182	124.925
9	226.879	137.319
10	240.965	151.517
11	251.439	165.000

Circle Center At X = 116.718 ; Y = 260.696 ; and Radius = 165.400

Factor of Safety

*** 1.921 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.510	100.000
2	95.208	96.535
3	115.181	95.491
4	135.132	96.882
5	154.766	100.688
6	173.793	106.853
7	191.928	115.286
8	208.904	125.860
9	224.468	138.420
10	238.391	152.779
11	247.645	165.000

Circle Center At X = 113.755 ; Y = 259.696 ; and Radius = 164.212

Factor of Safety

*** 1.925 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.000	100.000
2	119.958	101.293
3	139.765	104.067
4	159.311	108.305
5	178.487	113.985
6	197.188	121.075
7	215.311	129.535
8	232.754	139.320
9	249.421	150.375
10	265.220	162.638
11	267.836	165.000

Circle Center At X = 92.611 ; Y = 368.712 ; and Radius = 268.814

Factor of Safety

*** 1.926 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.653	100.000
2	102.564	98.120
3	122.564	98.143
4	142.471	100.071

5	162.104	103.885
6	181.285	109.550
7	199.839	117.016
8	217.599	126.214
9	234.402	137.061
10	250.096	149.458
11	264.539	163.293
12	266.010	165.000

Circle Center At X = 112.356 ; Y = 307.325 ; and Radius = 209.442

Factor of Safety

*** 1.937 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	87.755	100.000
2	107.561	97.219
3	127.552	96.622
4	147.488	98.216
5	167.130	101.983
6	186.242	107.877
7	204.594	115.827
8	221.966	125.738
9	238.148	137.491
10	252.947	150.944
11	265.359	165.000

Circle Center At X = 122.994 ; Y = 279.033 ; and Radius = 182.468

Factor of Safety

*** 1.939 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	74.490	100.000
2	94.022	95.699
3	113.946	93.961
4	133.928	94.814
5	153.632	98.244
6	172.726	104.194
7	190.891	112.563
8	207.821	123.211
9	223.231	135.960
10	236.863	150.594
11	247.153	165.000

Circle Center At X = 117.370 ; Y = 248.236 ; and Radius = 154.314

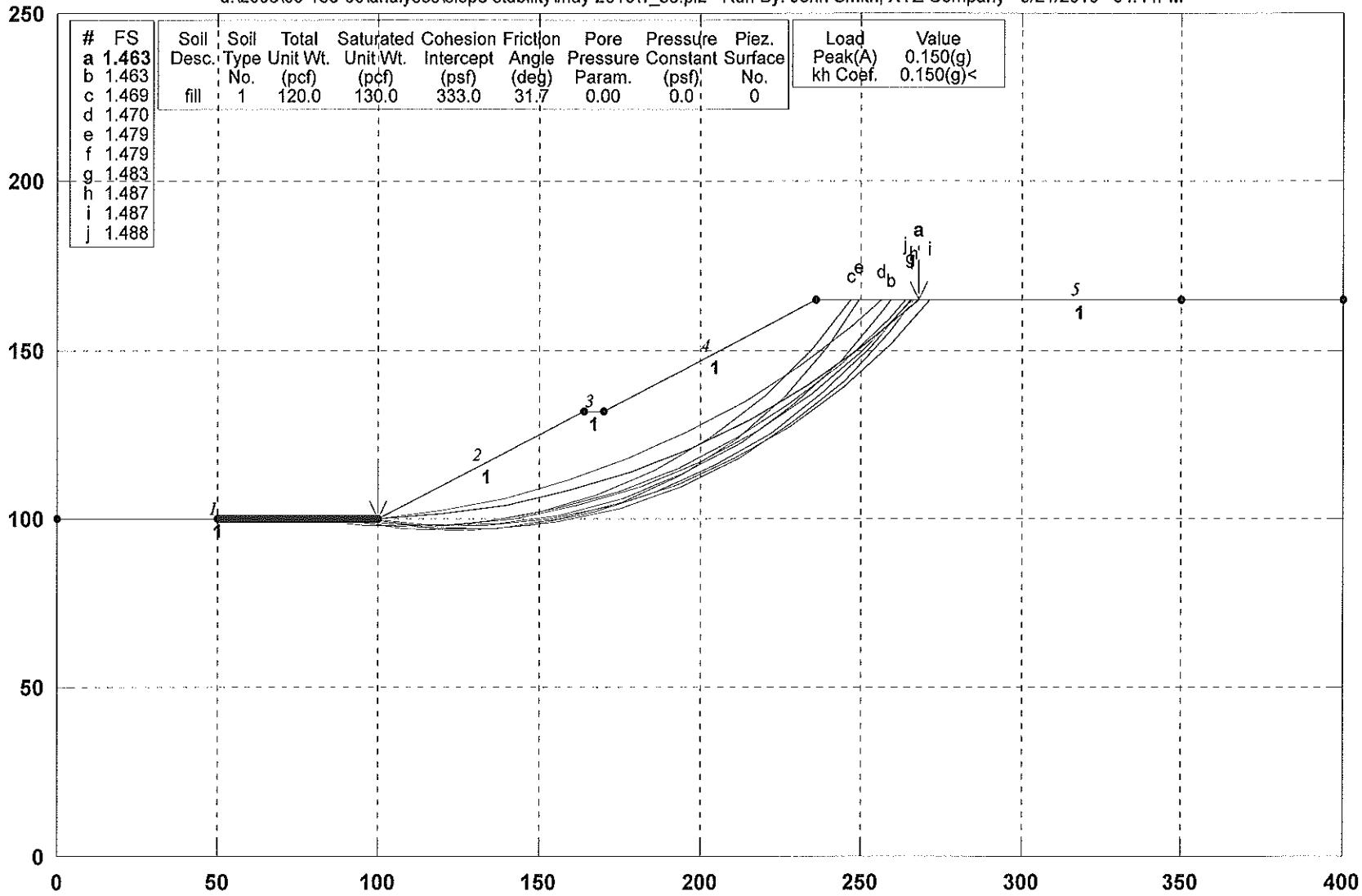
Factor of Safety

*** 1.943 ***

**** END OF GSTABL7 OUTPUT ****

Typical Fill Slope, 65 ft High, Pseudostatic analysis

u:\2006\06-163-00\analyses\slope stability\may 2010\1_se.pl2 Run By: John Smith, XYZ Company 5/21/2010 04:44PM

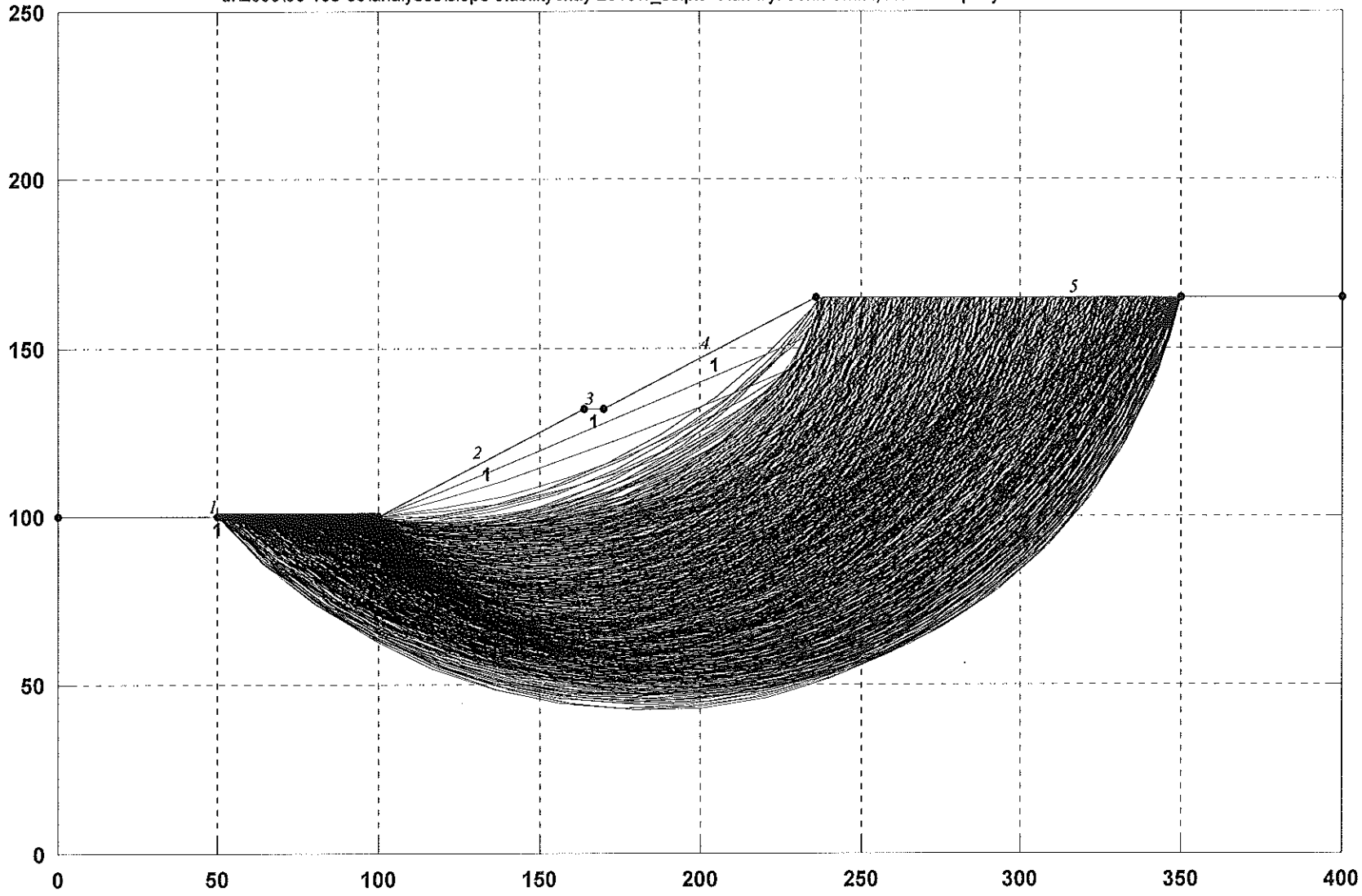


GSTABL7 v.2 FSmin=1.463

Safety Factors Are Calculated By The Modified Bishop Method

Typical Fill Slope, 65 ft High, Pseudostatic analysis

u:\2006\06-163-00\analyses\slope stability\may 2010\1_se.plt Run By: John Smith, XYZ Company 5/21/2010 04:44PM



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                    ***  GSTABL7  ***
              ** GSTABL7 by Garry H. Gregory, P.E. **
   ** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **
              (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                    SLOPE STABILITY ANALYSIS SYSTEM
       Modified Bishop, Simplified Janbu, or GLE Method of Slices.
       (Includes Spencer & Morgenstern-Price Type Analysis)
       Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
       Nonlinear Undrained Shear Strength, Curved Phi Envelope,
       Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
       Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
*******************************************************************************
Analysis Run Date:        5/21/2010
Time of Run:              04:44PM
Run By:                   John Smith, XYZ Company
Input Data Filename:      U:\2006\06-163-00\Analyses\Slope Stability\May 2010\1_se.in
Output Filename:          U:\2006\06-163-00\Analyses\Slope Stability\May 2010\1_se.OUT
Unit System:              English
Plotted Output Filename:  U:\2006\06-163-00\Analyses\Slope Stability\May 2010\1_se.PLT
PROBLEM DESCRIPTION:  Typical Fill Slope, 65 ft High,
                      Pseudostatic analysis
BOUNDARY COORDINATES
    5 Top   Boundaries
    5 Total Boundaries
Boundary     X-Left     Y-Left    X-Right    Y-Right    Soil Type
   No.        (ft)       (ft)       (ft)       (ft)     Below Bnd
```

1	0.00	100.00	100.00	100.00	1
2	100.00	100.00	164.00	132.00	1
3	164.00	132.00	170.00	132.00	1
4	170.00	132.00	236.00	165.00	1
5	236.00	165.00	400.00	165.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	130.0	333.0	31.7	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.150(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1000 Trial Surfaces Have Been Generated.
20 Surface(s) Initiate(s) From Each Of 50 Points Equally Spaced
Along The Ground Surface Between X = 50.00(ft)
and X = 100.00(ft)
Each Surface Terminates Between X = 236.00(ft)
and X = 350.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
20.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 1000
Number of Trial Surfaces With Valid FS = 1000
Statistical Data On All Valid FS Values:
FS Max = 2.828 FS Min = 1.463 FS Ave = 2.069
Standard Deviation = 0.330 Coefficient of Variation = 15.93 %
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.000	100.000
2	119.958	101.293
3	139.765	104.067
4	159.311	108.305
5	178.487	113.985
6	197.188	121.075
7	215.311	129.535
8	232.754	139.320
9	249.421	150.375
10	265.220	162.638
11	267.836	165.000

Circle Center At X = 92.611 ; Y = 368.712 ; and Radius = 268.814
Factor of Safety
*** 1.463 ***
Individual data on the 13 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	20.0	10401.3	0.0	0.0	0.	0.	1560.2	0.0	0.0
2	19.8	29118.1	0.0	0.0	0.	0.	4367.7	0.0	0.0
3	19.5	43586.6	0.0	0.0	0.	0.	6538.0	0.0	0.0
4	4.7	12283.1	0.0	0.0	0.	0.	1842.5	0.0	0.0
5	6.0	15420.6	0.0	0.0	0.	0.	2313.1	0.0	0.0
6	8.5	21788.9	0.0	0.0	0.	0.	3268.3	0.0	0.0
7	18.7	52488.5	0.0	0.0	0.	0.	7873.3	0.0	0.0

8	18.1	53974.7	0.0	0.0	0.	0.	8096.2	0.0	0.0
9	17.4	51467.4	0.0	0.0	0.	0.	7720.1	0.0	0.0
10	3.2	9268.2	0.0	0.0	0.	0.	1390.2	0.0	0.0
11	13.4	30722.4	0.0	0.0	0.	0.	4608.4	0.0	0.0
12	15.8	16103.7	0.0	0.0	0.	0.	2415.6	0.0	0.0
13	2.6	370.8	0.0	0.0	0.	0.	55.6	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.939	100.000
2	116.842	98.032
3	136.838	98.402
4	156.655	101.104
5	176.020	106.102
6	194.670	113.328
7	212.348	122.681
8	228.812	134.035
9	243.838	147.234
10	257.220	162.098
11	259.274	165.000

Circle Center At X = 123.684 ; Y = 268.868 ; and Radius = 170.973

Factor of Safety

*** 1.463 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.776	100.000
2	108.688	98.133
3	128.680	98.690
4	148.458	101.661
5	167.732	107.004
6	186.217	114.640
7	203.642	124.456
8	219.751	136.309
9	234.308	150.024
10	246.765	165.000

Circle Center At X = 114.111 ; Y = 262.925 ; and Radius = 164.883

Factor of Safety

*** 1.469 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.000	100.000
2	119.859	102.373
3	139.496	106.165
4	158.810	111.356
5	177.703	117.921
6	196.075	125.824
7	213.832	135.025
8	230.884	145.478
9	247.141	157.127
10	256.611	165.000

Circle Center At X = 77.290 ; Y = 375.887 ; and Radius = 276.820

Factor of Safety

*** 1.470 ***

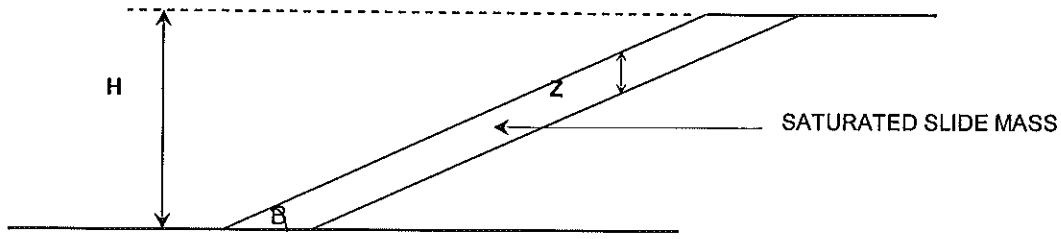
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	96.939	100.000
2	116.733	97.141
3	136.733	97.058
4	156.551	99.752
5	175.803	105.171
6	194.116	113.210
7	211.136	123.714
8	226.532	136.479
9	240.008	151.258

```
   10        249.410      165.000
Circle Center At X =   127.364 ; Y =   239.958 ; and Radius =   143.227
       Factor of Safety
      ***    1.479   ***
Failure Surface Specified By 12 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         82.653      100.000
    2        102.564       98.120
    3        122.564       98.143
    4        142.471      100.071
    5        162.104      103.885
    6        181.285      109.550
    7        199.839      117.016
    8        217.599      126.214
    9        234.402      137.061
   10        250.096      149.458
   11        264.539      163.293
   12        266.010      165.000
Circle Center At X =   112.356 ; Y =   307.325 ; and Radius =   209.442
       Factor of Safety
      ***    1.479   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         87.755      100.000
    2        107.561       97.219
    3        127.552       96.622
    4        147.488       98.216
    5        167.130      101.983
    6        186.242      107.877
    7        204.594      115.827
    8        221.966      125.738
    9        238.148      137.491
   10        252.947      150.944
   11        265.359      165.000
Circle Center At X =   122.994 ; Y =   279.033 ; and Radius =   182.468
       Factor of Safety
      ***    1.483   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         95.918      100.000
    2        115.748       97.395
    3        135.745       97.070
    4        155.649       99.030
    5        175.199      103.249
    6        194.140      109.672
    7        212.223      118.215
    8        229.214      128.766
    9        244.889      141.188
   10        259.043      155.317
   11        266.745      165.000
Circle Center At X =   128.582 ; Y =   271.855 ; and Radius =   174.932
       Factor of Safety
      ***    1.487   ***
Failure Surface Specified By 11 Coordinate Points
  Point       X-Surf       Y-Surf
   No.         (ft)         (ft)
    1         93.878      100.000
    2        113.773       97.958
    3        133.773       97.950
    4        153.670       99.976
    5        173.258      104.014
    6        192.334      110.023
    7        210.700      117.941
    8        228.166      127.686
```

```
    9        244.550      139.156
   10        259.683      152.232
   11        271.728      165.000
Circle Center At X =   123.853 ; Y =   294.128 ; and Radius =   196.428
       Factor of Safety
      ***    1.487   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         75.510      100.000
    2         95.404       97.938
    3        115.403       97.726
    4        135.335       99.365
    5        155.031      102.842
    6        174.320      108.127
    7        193.037      115.173
    8        211.022      123.922
    9        228.121      134.298
   10        244.185      146.211
   11        259.079      159.559
   12        264.121      165.000
Circle Center At X =   107.769 ; Y =   312.541 ; and Radius =   214.975
       Factor of Safety
      ***    1.488   ***
          **** END OF GSTABL7 OUTPUT ****
```

SURFICIAL STABILITY ANALYSIS OF SLOPE SURFACE



VERTICAL DEPTH OF SLOPE SURFACE(Z)	5	ft.
UNIT WEIGHT OF SOIL(W)	0.12	kcf
COHESION(C')	0.3	kcf
PHI(P')	30	degrees
SLOPE ANGLE (B)	26.6	degrees
***FACTOR OF SAFETY SURFICIAL STABILITY (FS) =**	**1.80**	

$$*FS= \frac{C'+(W-.062)ZCOS(B)^2TAN(P')}{W(Z)COS(B)SIN(B)}$$

GMU GEOTECHNICAL, INC.

PLATE 1

APPENDIX D

Probabilistic Seismic Hazard Analysis

GMU
GEOTECHNICAL, INC.

Probabilistic Seismic Hazard Analysis

Probabilistic Spectra results for EZ-FRISK 7.32 Build 001

ANNUAL FREQUENCY OF EXCEEDANCE: 4.041e-004
RETURN PERIOD: 2474.9
PROBABILITY OF EXCEEDENCE: 2.0% IN 50.0 YEARS
Column 1: Spectral Frequency
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS2008
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008

1	2	3	4	5
PGA	7.033e-001	7.129e-001	6.083e-001	7.725e-001

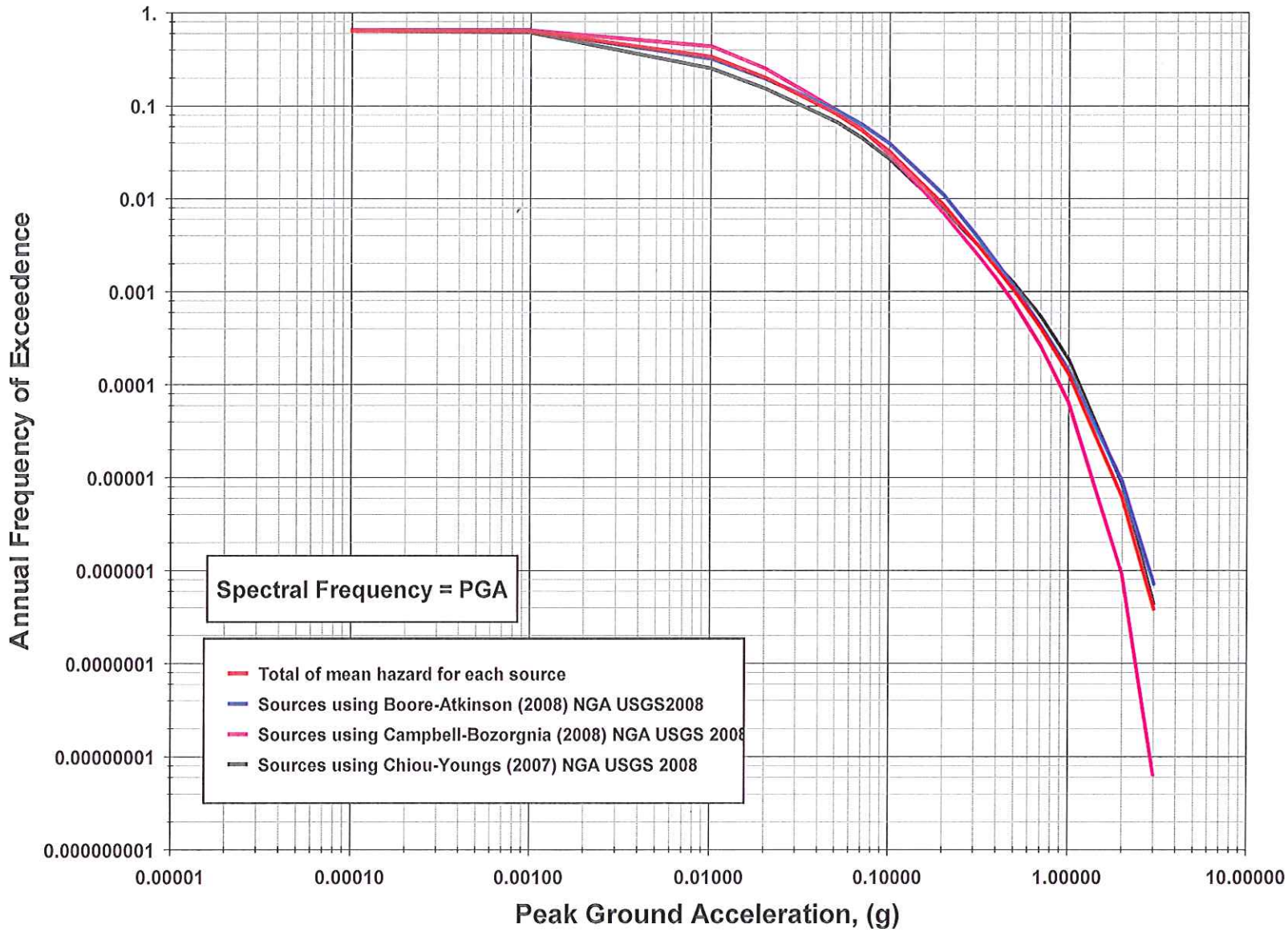
ANNUAL FREQUENCY OF EXCEEDANCE: 1.026e-003
RETURN PERIOD: 974.8
PROBABILITY OF EXCEEDENCE: 5.0% IN 50.0 YEARS
Column 1: Spectral Frequency
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS2008
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008

1	2	3	4	5
PGA	4.981e-001	5.120e-001	4.428e-001	5.358e-001

ANNUAL FREQUENCY OF EXCEEDANCE: 2.107e-003
RETURN PERIOD: 474.6
PROBABILITY OF EXCEEDENCE: 10.0% IN 50.0 YEARS
Column 1: Spectral Frequency
Column 2: Acceleration (g) for: Mean
Column 3: Acceleration (g) for: Boore-Atkinson (2008) NGA USGS2008
Column 4: Acceleration (g) for: Campbell-Bozorgnia (2008) NGA USGS 2008
Column 5: Acceleration (g) for: Chiou-Youngs (2007) NGA USGS 2008

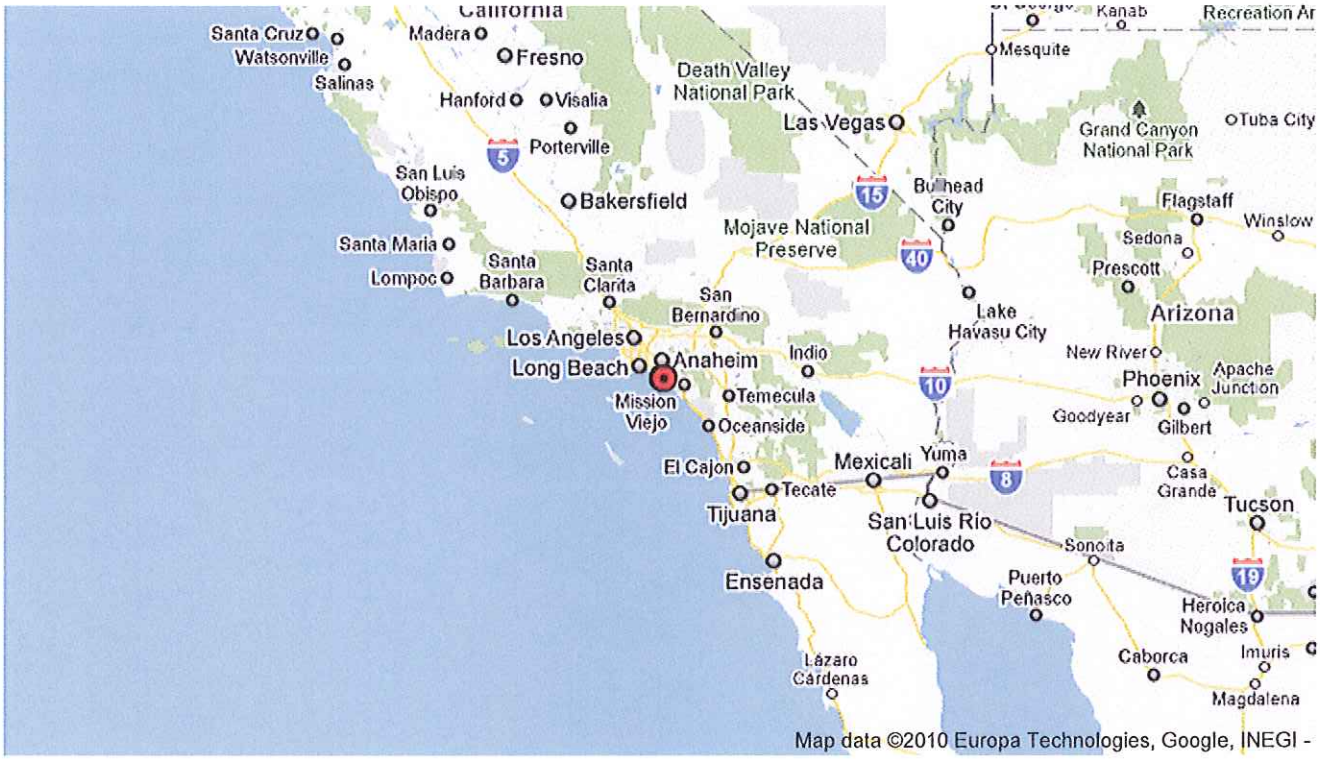
1	2	3	4	5
PGA	3.708e-001	3.924e-001	3.330e-001	3.836e-001

Total Hazard

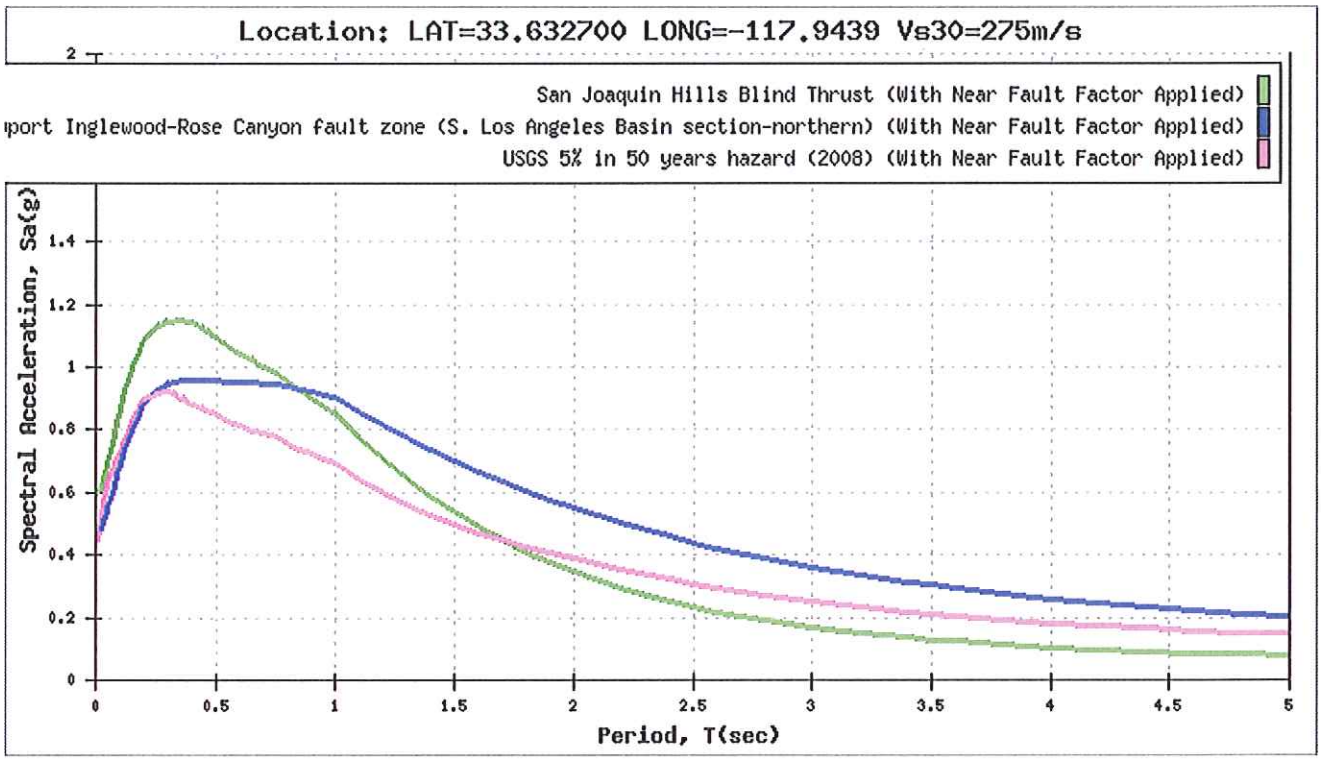


Caltrans Seismic Hazard Analysis

SELECT SITE LOCATION



CALCULATED SPECTRA



SITE DATA

Shear Wave Velocity, Vs_{30}:	275 m/s
Latitude:	33.632700
Longitude:	-117.943900
Depth to Vs = 1.0 km/s:	326 m
Depth to Vs = 2.5 km/s:	2.00 km

DETERMINISTIC

San Joaquin Hills Blind Thrust

Fault ID:	7
Maximum Magnitude (MMax):	6.6
Fault Type:	R
Fault Dip:	23 Deg
Dip Direction:	SW
Bottom of Rupture Plane:	8.00 km
Top of Rupture Plane(Ztor):	2.00 km
Rrup	4.77 km
Rjb:	0.42 km
Rx:	7.41 km
Fnorm:	0
Frev:	1

Period	SA (Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA (Final Spectrum)
0.01	0.601	1.000	1.000	0.601
0.02	0.613	1.000	1.000	0.613
0.022	0.618	1.000	1.000	0.618
0.025	0.626	1.000	1.000	0.626
0.029	0.635	1.000	1.000	0.635
0.03	0.638	1.000	1.000	0.638
0.032	0.644	1.000	1.000	0.644
0.035	0.653	1.000	1.000	0.653
0.036	0.656	1.000	1.000	0.656
0.04	0.666	1.000	1.000	0.666
0.042	0.672	1.000	1.000	0.672
0.044	0.677	1.000	1.000	0.677
0.045	0.680	1.000	1.000	0.680
0.046	0.683	1.000	1.000	0.683
0.048	0.689	1.000	1.000	0.689
0.05	0.694	1.000	1.000	0.694
0.055	0.710	1.000	1.000	0.710
0.06	0.727	1.000	1.000	0.727
0.065	0.743	1.000	1.000	0.743
0.067	0.749	1.000	1.000	0.749
0.07	0.759	1.000	1.000	0.759
0.075	0.775	1.000	1.000	0.775

0.08	0.794	1.000	1.000	0.794
0.085	0.811	1.000	1.000	0.811
0.09	0.829	1.000	1.000	0.829
0.095	0.847	1.000	1.000	0.847
0.1	0.864	1.000	1.000	0.864
0.11	0.896	1.000	1.000	0.896
0.12	0.926	1.000	1.000	0.926
0.13	0.953	1.000	1.000	0.953
0.133	0.960	1.000	1.000	0.960
0.14	0.975	1.000	1.000	0.975
0.15	0.996	1.000	1.000	0.996
0.16	1.017	1.000	1.000	1.017
0.17	1.036	1.000	1.000	1.036
0.18	1.054	1.000	1.000	1.054
0.19	1.070	1.000	1.000	1.070
0.2	1.085	1.000	1.000	1.085
0.22	1.104	1.000	1.000	1.104
0.24	1.119	1.000	1.000	1.119
0.25	1.126	1.000	1.000	1.126
0.26	1.130	1.000	1.000	1.130
0.28	1.139	1.000	1.000	1.139
0.29	1.141	1.000	1.000	1.141
0.3	1.144	1.000	1.000	1.144
0.32	1.147	1.000	1.000	1.147
0.34	1.148	1.000	1.000	1.148
0.35	1.147	1.000	1.000	1.147
0.36	1.147	1.000	1.000	1.147
0.38	1.145	1.000	1.000	1.145
0.4	1.142	1.000	1.000	1.142
0.42	1.133	1.000	1.000	1.133
0.44	1.123	1.000	1.000	1.123
0.45	1.119	1.000	1.000	1.119
0.46	1.114	1.000	1.000	1.114
0.48	1.105	1.000	1.000	1.105
0.5	1.096	1.000	1.000	1.096
0.55	1.047	1.000	1.020	1.068
0.6	1.004	1.000	1.040	1.044
0.65	0.964	1.000	1.060	1.021
0.667	0.951	1.000	1.067	1.014
0.7	0.927	1.000	1.080	1.001
0.75	0.892	1.000	1.100	0.982
0.8	0.851	1.000	1.120	0.953
0.85	0.812	1.000	1.140	0.926
0.9	0.776	1.000	1.160	0.900
0.95	0.742	1.000	1.180	0.876
1	0.710	1.000	1.200	0.853
1.1	0.645	1.000	1.200	0.773
1.2	0.587	1.000	1.200	0.704
1.3	0.536	1.000	1.200	0.643

1.4	0.491	1.000	1.200	0.589
1.5	0.451	1.000	1.200	0.541
1.6	0.409	1.000	1.200	0.491
1.7	0.373	1.000	1.200	0.447
1.8	0.341	1.000	1.200	0.409
1.9	0.313	1.000	1.200	0.376
2	0.289	1.000	1.200	0.347
2.2	0.245	1.000	1.200	0.294
2.4	0.209	1.000	1.200	0.251
2.5	0.194	1.000	1.200	0.233
2.6	0.181	1.000	1.200	0.217
2.8	0.158	1.000	1.200	0.190
3	0.139	1.000	1.200	0.167
3.2	0.125	1.000	1.200	0.150
3.4	0.113	1.000	1.200	0.135
3.5	0.107	1.000	1.200	0.129
3.6	0.102	1.000	1.200	0.123
3.8	0.094	1.000	1.200	0.112
4	0.086	1.000	1.200	0.103
4.2	0.081	1.000	1.200	0.097
4.4	0.076	1.000	1.200	0.091
4.6	0.072	1.000	1.200	0.086
4.8	0.068	1.000	1.200	0.081
5	0.064	1.000	1.200	0.077

Newport Inglewood-Rose Canyon fault zone (S. Los Angeles Basin section-northern)

Fault ID:	145
Maximum Magnitude (MMax):	7.5
Fault Type:	RLSS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	13.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	2.29 km
Rjb:	2.29 km
Rx:	2.29 km
Fnorm:	0
Frev:	0

Period	SA (Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA (Final Spectrum)
0.01	0.470	1.000	1.000	0.470
0.02	0.478	1.000	1.000	0.478
0.022	0.482	1.000	1.000	0.482
0.025	0.489	1.000	1.000	0.489
0.029	0.496	1.000	1.000	0.496
0.03	0.499	1.000	1.000	0.499
0.032	0.504	1.000	1.000	0.504

0.035	0.512	1.000	1.000	0.512
0.036	0.515	1.000	1.000	0.515
0.04	0.524	1.000	1.000	0.524
0.042	0.530	1.000	1.000	0.530
0.044	0.535	1.000	1.000	0.535
0.045	0.538	1.000	1.000	0.538
0.046	0.541	1.000	1.000	0.541
0.048	0.546	1.000	1.000	0.546
0.05	0.551	1.000	1.000	0.551
0.055	0.563	1.000	1.000	0.563
0.06	0.576	1.000	1.000	0.576
0.065	0.588	1.000	1.000	0.588
0.067	0.594	1.000	1.000	0.594
0.07	0.601	1.000	1.000	0.601
0.075	0.614	1.000	1.000	0.614
0.08	0.629	1.000	1.000	0.629
0.085	0.644	1.000	1.000	0.644
0.09	0.658	1.000	1.000	0.658
0.095	0.672	1.000	1.000	0.672
0.1	0.687	1.000	1.000	0.687
0.11	0.713	1.000	1.000	0.713
0.12	0.738	1.000	1.000	0.738
0.13	0.761	1.000	1.000	0.761
0.133	0.767	1.000	1.000	0.767
0.14	0.780	1.000	1.000	0.780
0.15	0.797	1.000	1.000	0.797
0.16	0.817	1.000	1.000	0.817
0.17	0.835	1.000	1.000	0.835
0.18	0.851	1.000	1.000	0.851
0.19	0.867	1.000	1.000	0.867
0.2	0.881	1.000	1.000	0.881
0.22	0.901	1.000	1.000	0.901
0.24	0.918	1.000	1.000	0.918
0.25	0.925	1.000	1.000	0.925
0.26	0.930	1.000	1.000	0.930
0.28	0.940	1.000	1.000	0.940
0.29	0.943	1.000	1.000	0.943
0.3	0.946	1.000	1.000	0.946
0.32	0.951	1.000	1.000	0.951
0.34	0.955	1.000	1.000	0.955
0.35	0.956	1.000	1.000	0.956
0.36	0.957	1.000	1.000	0.957
0.38	0.957	1.000	1.000	0.957
0.4	0.956	1.000	1.000	0.956
0.42	0.958	1.000	1.000	0.958
0.44	0.958	1.000	1.000	0.958
0.45	0.958	1.000	1.000	0.958
0.46	0.959	1.000	1.000	0.959
0.48	0.958	1.000	1.000	0.958

0.5	0.958	1.000	1.000	0.958
0.55	0.936	1.000	1.020	0.954
0.6	0.916	1.000	1.040	0.952
0.65	0.896	1.000	1.060	0.950
0.667	0.890	1.000	1.067	0.949
0.7	0.878	1.000	1.080	0.948
0.75	0.861	1.000	1.100	0.947
0.8	0.837	1.000	1.120	0.937
0.85	0.815	1.000	1.140	0.929
0.9	0.793	1.000	1.160	0.920
0.95	0.773	1.000	1.180	0.912
1	0.754	1.000	1.200	0.904
1.1	0.713	1.000	1.200	0.856
1.2	0.677	1.000	1.200	0.813
1.3	0.644	1.000	1.200	0.772
1.4	0.613	1.000	1.200	0.736
1.5	0.584	1.000	1.200	0.701
1.6	0.555	1.000	1.200	0.665
1.7	0.527	1.000	1.200	0.633
1.8	0.503	1.000	1.200	0.603
1.9	0.480	1.000	1.200	0.576
2	0.460	1.000	1.200	0.552
2.2	0.418	1.000	1.200	0.501
2.4	0.382	1.000	1.200	0.458
2.5	0.366	1.000	1.200	0.439
2.6	0.351	1.000	1.200	0.421
2.8	0.324	1.000	1.200	0.389
3	0.301	1.000	1.200	0.361
3.2	0.280	1.000	1.200	0.335
3.4	0.261	1.000	1.200	0.313
3.5	0.252	1.000	1.200	0.303
3.6	0.244	1.000	1.200	0.293
3.8	0.229	1.000	1.200	0.275
4	0.216	1.000	1.200	0.259
4.2	0.205	1.000	1.200	0.246
4.4	0.194	1.000	1.200	0.233
4.6	0.184	1.000	1.200	0.221
4.8	0.176	1.000	1.200	0.211
5	0.167	1.000	1.200	0.201

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	SA (Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA (Final Spectrum)
0.01	0.444	1.000	1.000	0.444

0.02	0.516	1.000	1.000	0.516
0.022	0.526	1.000	1.000	0.526
0.025	0.541	1.000	1.000	0.541
0.029	0.559	1.000	1.000	0.559
0.03	0.563	1.000	1.000	0.563
0.032	0.571	1.000	1.000	0.571
0.035	0.582	1.000	1.000	0.582
0.036	0.585	1.000	1.000	0.585
0.04	0.599	1.000	1.000	0.599
0.042	0.605	1.000	1.000	0.605
0.044	0.611	1.000	1.000	0.611
0.045	0.614	1.000	1.000	0.614
0.046	0.617	1.000	1.000	0.617
0.048	0.622	1.000	1.000	0.622
0.05	0.628	1.000	1.000	0.628
0.055	0.641	1.000	1.000	0.641
0.06	0.653	1.000	1.000	0.653
0.065	0.664	1.000	1.000	0.664
0.067	0.669	1.000	1.000	0.669
0.07	0.675	1.000	1.000	0.675
0.075	0.685	1.000	1.000	0.685
0.08	0.695	1.000	1.000	0.695
0.085	0.704	1.000	1.000	0.704
0.09	0.712	1.000	1.000	0.712
0.095	0.721	1.000	1.000	0.721
0.1	0.729	1.000	1.000	0.729
0.11	0.750	1.000	1.000	0.750
0.12	0.771	1.000	1.000	0.771
0.13	0.790	1.000	1.000	0.790
0.133	0.795	1.000	1.000	0.795
0.14	0.808	1.000	1.000	0.808
0.15	0.825	1.000	1.000	0.825
0.16	0.842	1.000	1.000	0.842
0.17	0.857	1.000	1.000	0.857
0.18	0.872	1.000	1.000	0.872
0.19	0.887	1.000	1.000	0.887
0.2	0.901	1.000	1.000	0.901
0.22	0.907	1.000	1.000	0.907
0.24	0.912	1.000	1.000	0.912
0.25	0.914	1.000	1.000	0.914
0.26	0.916	1.000	1.000	0.916
0.28	0.921	1.000	1.000	0.921
0.29	0.923	1.000	1.000	0.923
0.3	0.925	1.000	1.000	0.925
0.32	0.915	1.000	1.000	0.915
0.34	0.905	1.000	1.000	0.905
0.35	0.901	1.000	1.000	0.901
0.36	0.896	1.000	1.000	0.896
0.38	0.888	1.000	1.000	0.888

0.4	0.880	1.000	1.000	0.880
0.42	0.873	1.000	1.000	0.873
0.44	0.866	1.000	1.000	0.866
0.45	0.863	1.000	1.000	0.863
0.46	0.860	1.000	1.000	0.860
0.48	0.853	1.000	1.000	0.853
0.5	0.847	1.000	1.000	0.847
0.55	0.812	1.000	1.020	0.828
0.6	0.781	1.000	1.040	0.813
0.65	0.754	1.000	1.060	0.799
0.667	0.745	1.000	1.067	0.795
0.7	0.730	1.000	1.080	0.788
0.75	0.708	1.000	1.100	0.778
0.8	0.676	1.000	1.120	0.757
0.85	0.648	1.000	1.140	0.739
0.9	0.622	1.000	1.160	0.722
0.95	0.599	1.000	1.180	0.707
1	0.578	1.000	1.200	0.693
1.1	0.534	1.000	1.200	0.641
1.2	0.497	1.000	1.200	0.596
1.3	0.465	1.000	1.200	0.558
1.4	0.437	1.000	1.200	0.524
1.5	0.413	1.000	1.200	0.495
1.6	0.391	1.000	1.200	0.469
1.7	0.372	1.000	1.200	0.446
1.8	0.355	1.000	1.200	0.426
1.9	0.339	1.000	1.200	0.407
2	0.325	1.000	1.200	0.390
2.2	0.293	1.000	1.200	0.352
2.4	0.267	1.000	1.200	0.321
2.5	0.256	1.000	1.200	0.307
2.6	0.245	1.000	1.200	0.294
2.8	0.227	1.000	1.200	0.272
3	0.210	1.000	1.200	0.252
3.2	0.195	1.000	1.200	0.234
3.4	0.182	1.000	1.200	0.218
3.5	0.175	1.000	1.200	0.210
3.6	0.170	1.000	1.200	0.204
3.8	0.159	1.000	1.200	0.191
4	0.150	1.000	1.200	0.180
4.2	0.143	1.000	1.200	0.172
4.4	0.138	1.000	1.200	0.165
4.6	0.132	1.000	1.200	0.159
4.8	0.127	1.000	1.200	0.153
5	0.123	1.000	1.200	0.147

Envelope Data

Period	SA
0.01	0.601
0.02	0.613
0.022	0.618
0.025	0.626
0.029	0.635
0.03	0.638
0.032	0.644
0.035	0.653
0.036	0.656
0.04	0.666
0.042	0.672
0.044	0.677
0.045	0.680
0.046	0.683
0.048	0.689
0.05	0.694
0.055	0.710
0.06	0.727
0.065	0.743
0.067	0.749
0.07	0.759
0.075	0.775
0.08	0.794
0.085	0.811
0.09	0.829
0.095	0.847
0.1	0.864
0.11	0.896
0.12	0.926
0.13	0.953
0.133	0.960
0.14	0.975
0.15	0.996
0.16	1.017
0.17	1.036
0.18	1.054
0.19	1.070
0.2	1.085
0.22	1.104
0.24	1.119
0.25	1.126
0.26	1.130
0.28	1.139
0.29	1.141
0.3	1.144
0.32	1.147
0.34	1.148

0.35	1.147
0.36	1.147
0.38	1.145
0.4	1.142
0.42	1.133
0.44	1.123
0.45	1.119
0.46	1.114
0.48	1.105
0.5	1.096
0.55	1.068
0.6	1.044
0.65	1.021
0.667	1.014
0.7	1.001
0.75	0.982
0.8	0.953
0.85	0.926
0.9	0.900
0.95	0.876
1	0.853
1.1	0.773
1.2	0.704
1.3	0.643
1.4	0.589
1.5	0.541
1.6	0.491
1.7	0.447
1.8	0.426
1.9	0.407
2	0.390
2.2	0.352
2.4	0.321
2.5	0.307
2.6	0.294
2.8	0.272
3	0.252
3.2	0.234
3.4	0.218
3.5	0.210
3.6	0.204
3.8	0.191
4	0.180
4.2	0.172
4.4	0.165
4.6	0.159
4.8	0.153
5	0.147