JANUARY 26, 2007

TECHNICAL PROPOSAL FOR THE

TXDOT SH121 TOLL PROJECT

D.5 GEOTECHNICAL STUDIES

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1. Terracon Cover letter

December 15, 2006, 2006

Terracon
Consulting Engineers & Scientists

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Mr. Christopher Campbell, P.E.
Regional Manager, North Texas
Othon, Inc., Consulting Engineers
11910 Greenville Ave., Suite 200
Dallas, Texas 75243

Re: Geotechnical Data
SH 121 Toll Road Project
Collin County, Texas
Terracon Report No. 94065243

Dear Mr. Campbell:

Terracon has completed the requested geotechnical field, laboratory, and engineering studies for the SH-121 Toll Road project. The project limits for this study are shown on Figure 1.

The field work included soil borings and collection of bulk samples of soil and Austin Chalk for evaluation. Laboratory tests were performed to characterize soil types, strength, sulfate content, and volume change potential.

Attached are the results of boring and laboratory tests. A plan of borings along the SH-121 alignment and logs of borings drilled along the alignment and in potential borrow sites are presented in Exhibit E. Laboratory test results on the natural soils are presented in Exhibit F. Laboratory Lime-pH Series Test results are presented in Exhibit G. Strength, California Bearing Ratio, and swell test results on lime treated clays are presented in Exhibit H. California Bearing Ratio, grain size analyses, and swell test results on Austin Chalk samples are presented in Exhibit I.

Engineering analyses were performed for bridge foundations, retaining walls, roadway embankments, and pavements. The geologic formations outcropping in the project area and anticipated characteristics of soils obtained from these geologic formations are presented on Figures 2 and 3. Drilled shaft foundation depth tables are presented on Figures 4 and 5. The variation in soil Plasticity Indices for soils in the SH-121 alignment are presented on Figure 6.

If you have any questions or require additional information, please do not hesitate to contact us.

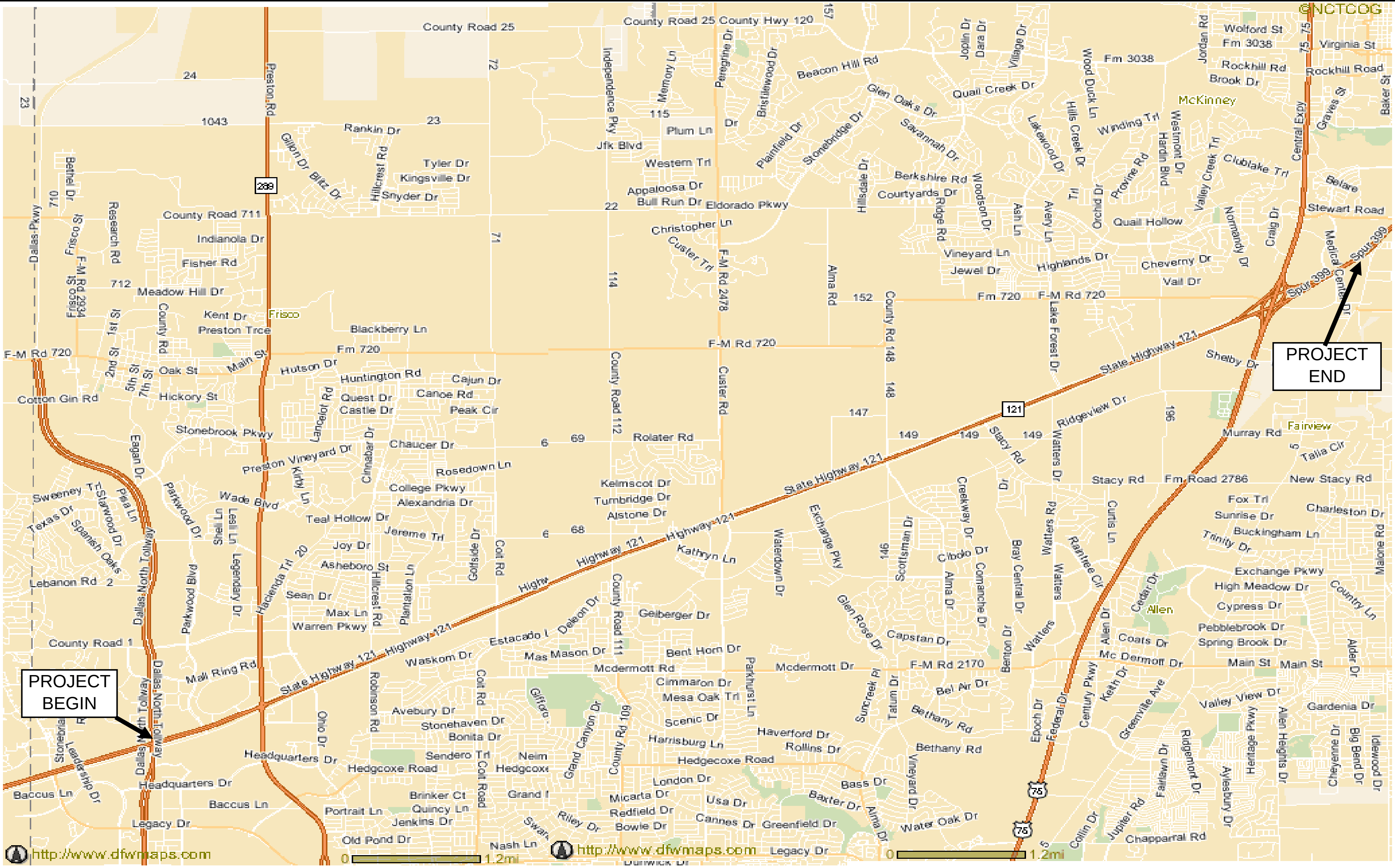
Sincerely,

TERRACON CONSULTANTS, INC.

Ranasinghege (Jay) Jayatilaka, Ph.D., P.E.
Project Manager

Tim G. Abrams, P.E.
Manager, Geotechnical Services

2. Figures



PROJECT VICINITY MAP
SH 121 TOLL ROAD PROJECT
COLLIN COUNTY, TEXAS

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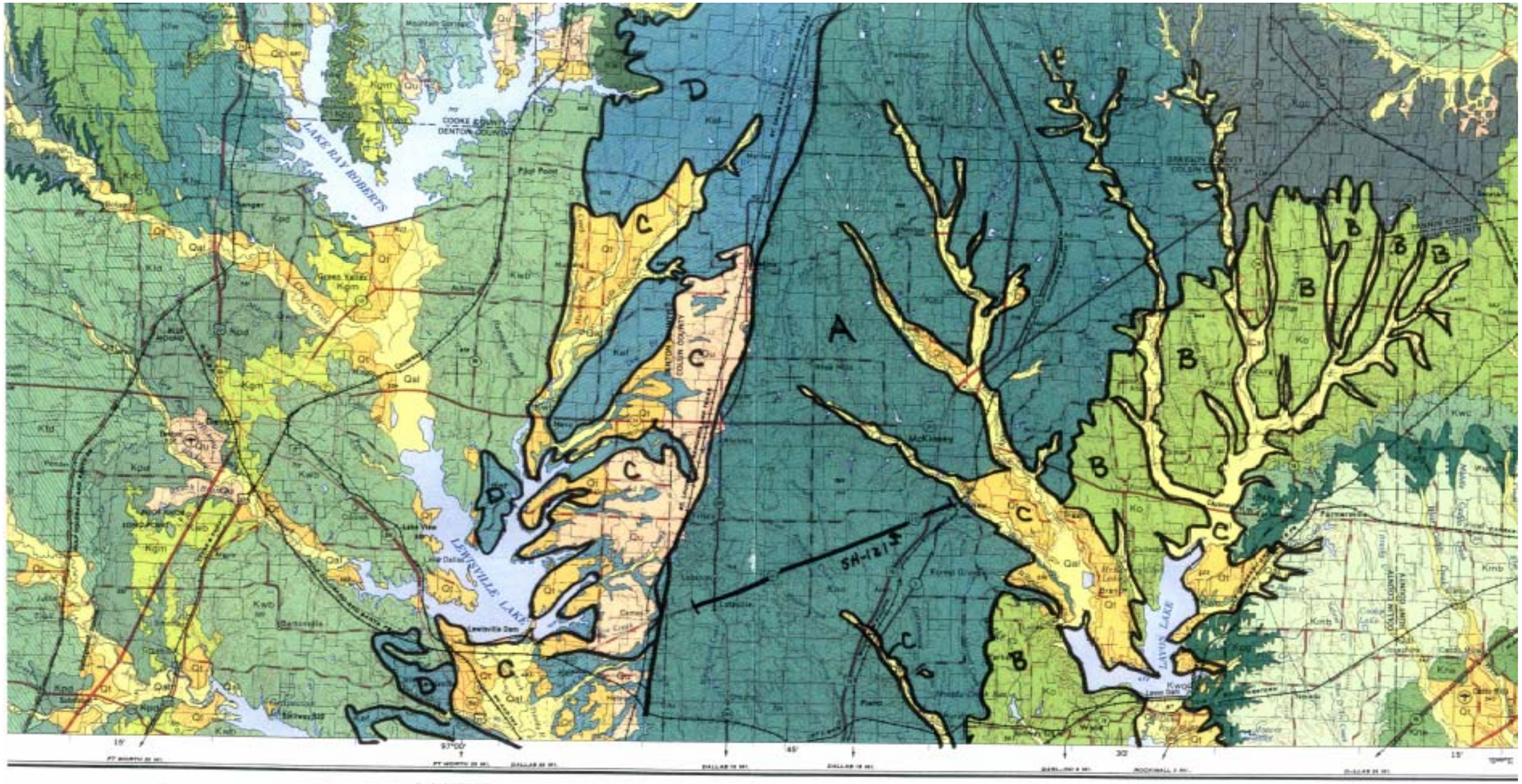
Terracon Job No. 94065243

FIGURE 1



Scale 1:250,000

CONTOUR INTERVAL 50 FEET

TRANSVERSE MERCATOR PROJECTION

ROADWAY EMBANKMENT FILL BORROW SOURCE AREAS

- Borrow source Areas A, B, and C suitable for embankment core fill
- Borrow source A is underlain by Austin Chalk. The depth to the top of the Austin Chalk is expected to vary from 1 to 15 feet. Austin Chalk can be broken down for use as embankment fill.
-Borrow source areas A, B, and C can be used for pavement subgrades, but will require the addition of lime to reduce swell potential. Soils from borrow source C may require less lime treatment.
-Borrow source area D is recommended only for embankment fill core material.

GEOLOGY MAP
SH 121 TOLL ROAD PROJECT
COLLIN COUNTY, TEXAS

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FIGURE 2

Borrow Source Area	Geologic Formation	Soil Types Expected	Pavement Subgrade	Embankment Core
A	Austin Chalk	Moderate to High Plasticity Clays over Tan Limestone and Gray Limestone. Clays are expected to have PI's ranging from 30 to 60 with typically values in the 40 to 45 range. Fines in broken down tan limestone and gray limestone can have PI's ranging from 10 to 30, typically in the low 20's range.	Lime treatment of clays required to reduce PI's to acceptable range for pavement subgrades. Lime treatment of broken down tan and gray limestones is typically not required.	Clays can be used in core with side slopes 4H:1V or flatter to reduce risk of shallow skin slides. Tan and Gray Limestone can be broken down with rollers for use in core with 3H:1V side slopes.
B	Ozan	Highly Plastic Clays over Clay Shale. Clays are expected to have PI's ranging from 30 to 60 with typically values in the 40 to 45 range.	Lime treatment of clays required to reduce PI's to acceptable range for pavement subgrades.	Clays can be used in core with side slopes 4H:1V or flatter to reduce risk of shallow skin slides
C	Alluvial and Terrace	Clays, Sandy Clays, Clayey Sands, Sands. Clays can have PI's in the 30 to 60 range, Sandy Clays in the 15 to 30 range, and Clayey Sands in the 3 to 25 range.	Lime treatment of clays and some sandy clays may be required to reduce PI's to acceptable range for pavement subgrades. Some sandy clays and clayey sands will not require lime treatment.	Clays can be used in core with side slopes 4H:1V or flatter to reduce risk of shallow skin slides. Sandy clays and clayey sands can be placed on 3H:1V slopes.
D	Eagle Ford Shale	High Plasticity Clays. Clays expected to have PI's in the 35 to 65 range. Typically ranges from about 45 to 50. Contains soluble sulfates	Clays can contain high concentrations of soluble sulfates that can cause lime/sulfate induced heave if clays are lime stabilized. Other types of stabilizers required.	Clays can be used in core with side slopes 4H:1V or flatter to reduce risk of shallow skin slides. PI soils in the 60 PI range could require 5H:1V or flatter slopes to control frequency of shallow skin slides. Shaley clays present below 5 to 15 feet could require extensive processing to raise soil moisture contents to acceptable levels.

GEOLOGIC CHARACTERISTICS OF POTENTIAL BORROW AREAS

SH-121 TOLL ROAD PROJECT
COLLIN COUNTY, TEXAS

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Terracon Project 94065243

FIGURE 3

					Drilled Shaft Diameter, inches	30	36	42	48	54	60
					TxDOT Service Load, tons	275	400	525	700	900	1100
					Required Penetration into Gray Limesotne, feet	5	6	7	8	9	10
Bridge	**Station**	**Boring No.**	**Ground Elevation**	**Top of Gray Limestone Depth (ft)**	**Top of Gray Limestone Elevation**	**Drilled Shaft Penetration Depth Below Ground Surface, Feet**					
Coit Road	874+50	MLB - 1	763.6	15	748.6	20	21	22	23	24	25
Coit Road	876+50	MLB - 2	765.8	8	757.8	13	14	15	16	17	18
Independence Parkway	932+70	CH - 42	683.7	8	675.7	13	14	15	16	17	18
Independence Parkway	932+75	CH - 43	683.4	12	671.4	17	18	19	20	21	22
Independence Parkway	934+00	CH - 41	685.4	9	676.4	14	15	16	17	18	19
Rowlett Creek	1035+50	MLB - 3	636.7	10	626.7	15	16	17	18	19	20
Rowlett Creek	1037+00	MLB - 4	631.4	2	629.4	7.5	9	10.5	12	13.5	15
County Road 147	1049+00	MLB - 5	661.5	30.5	631.0	35.5	36.5	37.5	38.5	39.5	40.5
County Road 147	1051+00	MLB - 6	664.1	33	631.1	38	39	40	41	42	43
Alma Road	1078+50	MLB - 7	705.3	9	696.3	14	15	16	17	18	19
Alma Road	1080+50	MLB - 8	706.5	8	698.5	13	14	15	16	17	18
Stacy Road	1130+25	MLB - 9	714.1	16	698.1	21	22	23	24	25	26
Stacy Road	1132+50	MLB - 10	710.8	15	695.8	20	21	22	23	24	25
Lake Forest Road	1170+50	MLB - 11	702.2	19	683.2	24	25	26	27	28	29
Lake Forest Road	1173+75	MLB - 12	697.7	20	677.7	25	26	27	28	29	30
Cottonwood Creek	1190+00	CH - 4	674.9	20	654.9	25	26	27	28	29	30
Cottonwood Creek	1191+25	CH - 7	677.4	18	659.4	23	24	25	26	27	28
Cottonwood Creek	1193+75	CH - 5	669.7	13	656.7	18	19	20	21	22	23
Cottonwood Creek	1193+85	CH - 1	672.8	17	655.8	22	23	24	25	26	27
Harden Road (Watters Rd)	1226+50	CB - 2	688.8	19.5	669.3	24.5	25.5	26.5	27.5	28.5	29.5

Note: Rock conditions at Boring CB-25 are anomalous with soft shale zones below 13 feet. Allowable end Bearing values reduced to 15 tsf.
Note: Embedment depth to 3 shaft diameters at Boring MLB-4 for Rowlett Creek because of shallow depth of gray limestone.
Note: Driled shaft penetration depths do not include group effects.

DRILLED SHAFT BRIDGE FOUNDATION PENETRATION DEPTHS

SH-121 TOLL ROAD PROJECT
COLLIN COUNTY, TEXAS

Terracon

Terracon Project 94065243

FIGURE 4

Bridge	Station	Boring No.	Ground Elevation	Top of Gray Limestone Depth (ft)	Top of Gray Limestone Elevation						
					Drilled Shaft Diameter, inches	30	36	42	48	54	60
					TxDOT Service Load, tons	275	400	525	700	900	1100
					Required Penetration into Gray Limesotne, feet	5	6	7	8	9	10
						Drilled Shaft Penetration Depth Below Ground Surface, Feet					
SH-121/US-75 Interchange	**Stations Referenced to SH-121 Centerline**										
ES Connector	1265+50	CB - 5	659.4	29	630.4	34	35	36	37	38	39
NW Connector	1270+50	CB - 6	654.9	22	632.9	27	28	29	30	31	32
US 75	1280+00	CB - 11	661.1	13.5	647.6	18.5	19.5	20.5	21.5	22.5	23.5
SH 121	1280+50	CB - 13	672.9	12.5	660.4	17.5	18.5	19.5	20.5	21.5	22.5
US 75	1283+00	CB - 12	661.2	12	649.2	17	18	19	20	21	22
US 75	1286+00	CB - 15	672.4	7	665.4	12	13	14	15	16	17
SH 121	1289+50	CB - 14	674.9	15	659.9	20	21	22	23	24	25
US 75	1290+00	CB - 16	669.0	8	661.0	13	14	15	16	17	18
Medical Center Drive	1330+00	CB - 23	617.8	5	612.8	10	11	12	13	14	15
SH-121/US-75 Interchange	**Stations Referenced to US-75 Centerline**										
US 75	643+00	CB - 7	639.4	27	612.4	32	33	34	35	36	37
ES Connector	645+00	CB - 8	643.9	22	621.9	27	28	29	30	31	32
NW Connector	655+25	CB - 9	644.1	20	624.1	25	26	27	28	29	30
NW Connector	659+50	CB - 10	653.6	23.5	630.1	28.5	29.5	30.5	31.5	32.5	33.5
EN Connector	663+50	CB - 11	661.1	13.5	647.6	18.5	19.5	20.5	21.5	22.5	23.5
NE Connector	665+50	CB - 12	661.2	12	649.2	17	18	19	20	21	22
SH 121	667+25	CB - 13	672.9	13	659.9	18	19	20	21	22	23
SH 121	672+00	CB - 14	671.9	15	656.9	20	21	22	23	24	25
SW Connector	674+00	CB - 15	672.4	8	664.4	13	14	15	16	17	18
SH 121	676+00	CB - 16	669.0	8	661.0	13	14	15	16	17	18
SW Connector	671+50	CB - 17	657.5	8	649.5	13	14	15	16	17	18
US 75	685+25	CB - 18	655.5	11	644.5	16	17	18	19	20	21

Note: Driled shaft penetration depths do not include group effects.

DRILLED SHAFT BRIDGE FOUNDATION PENETRATION DEPTHS

SH-121 TOLL ROAD PROJECT
COLLIN COUNTY, TEXAS

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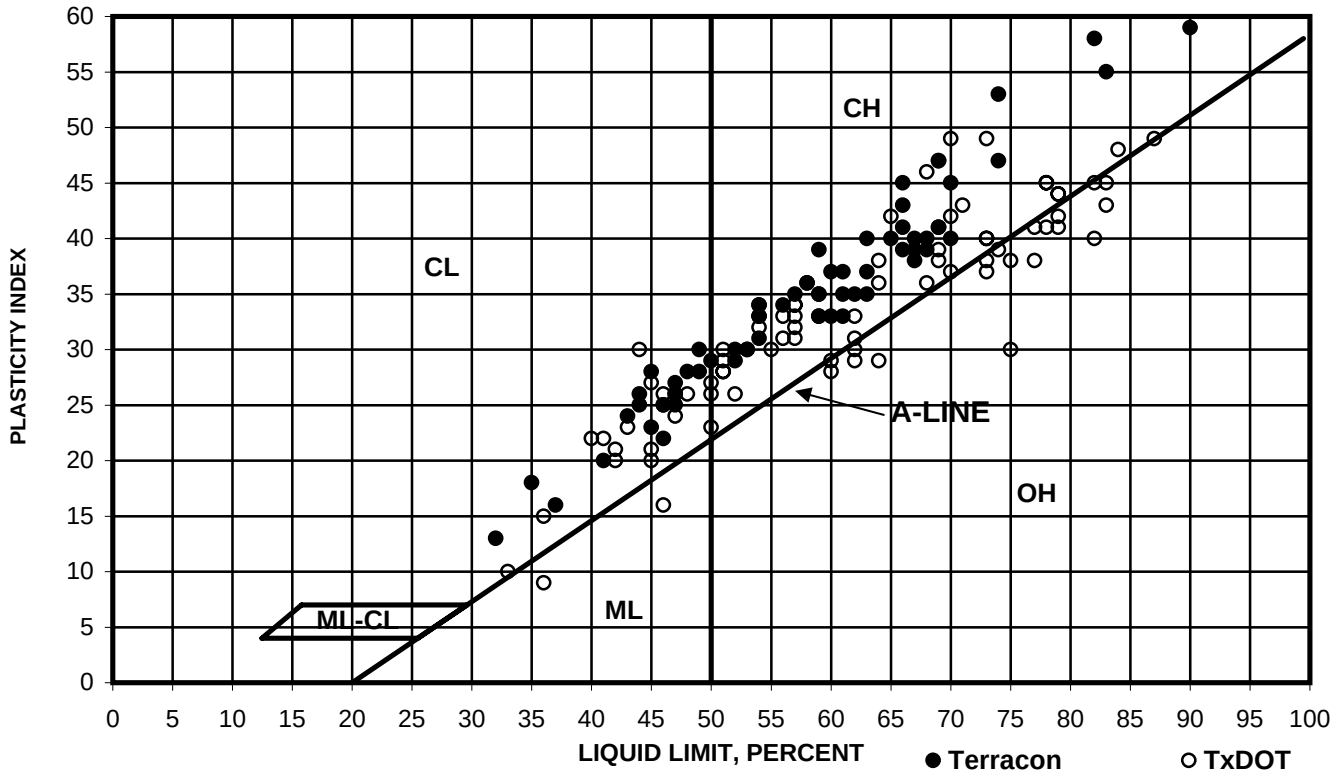
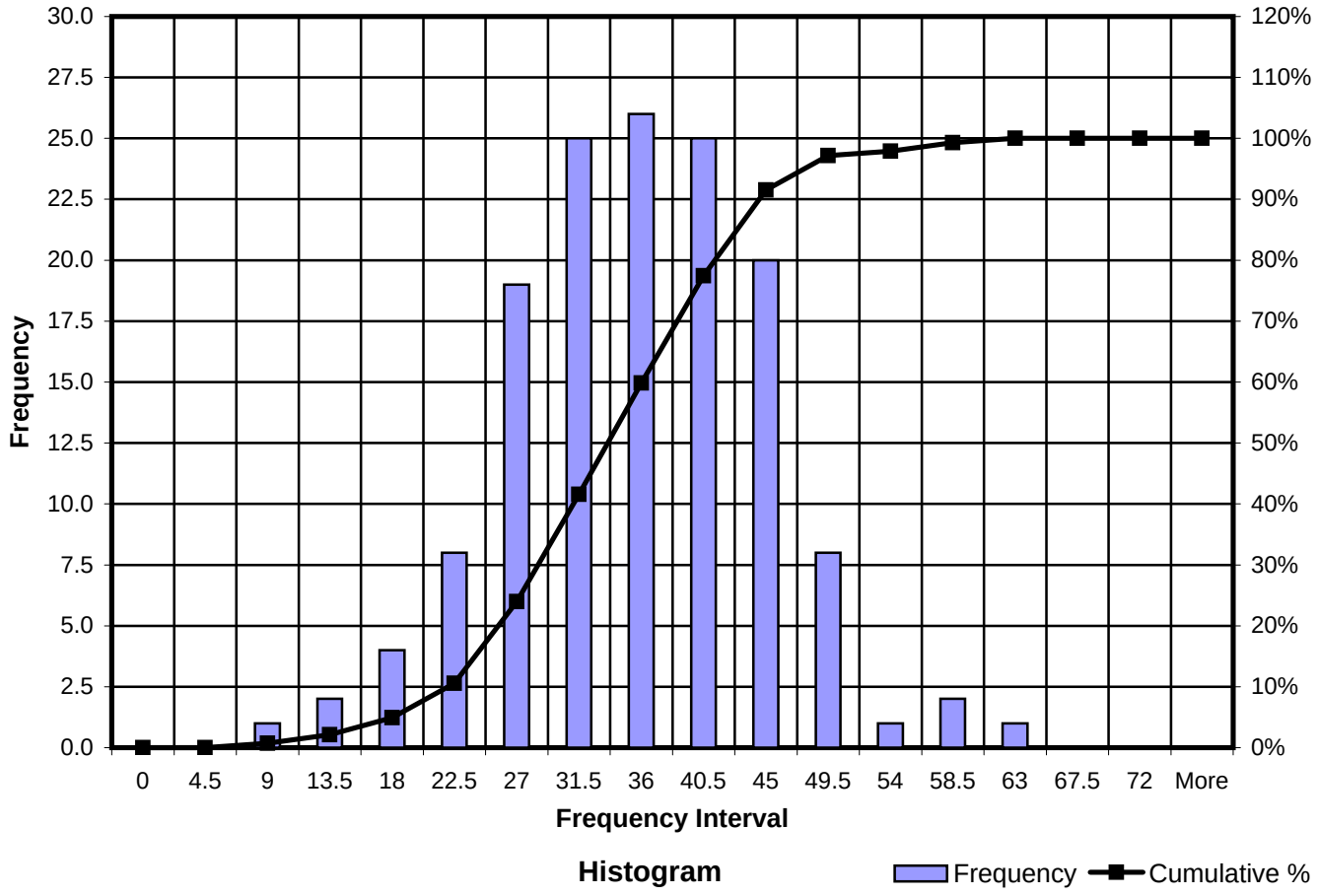
Terracon Project 94065243

FIGURE 5





LIQUID LIMITS VS. PLASTICITY INDICES
SH-121 TOLL ROAD PROJECT, COLLIN COUNTY

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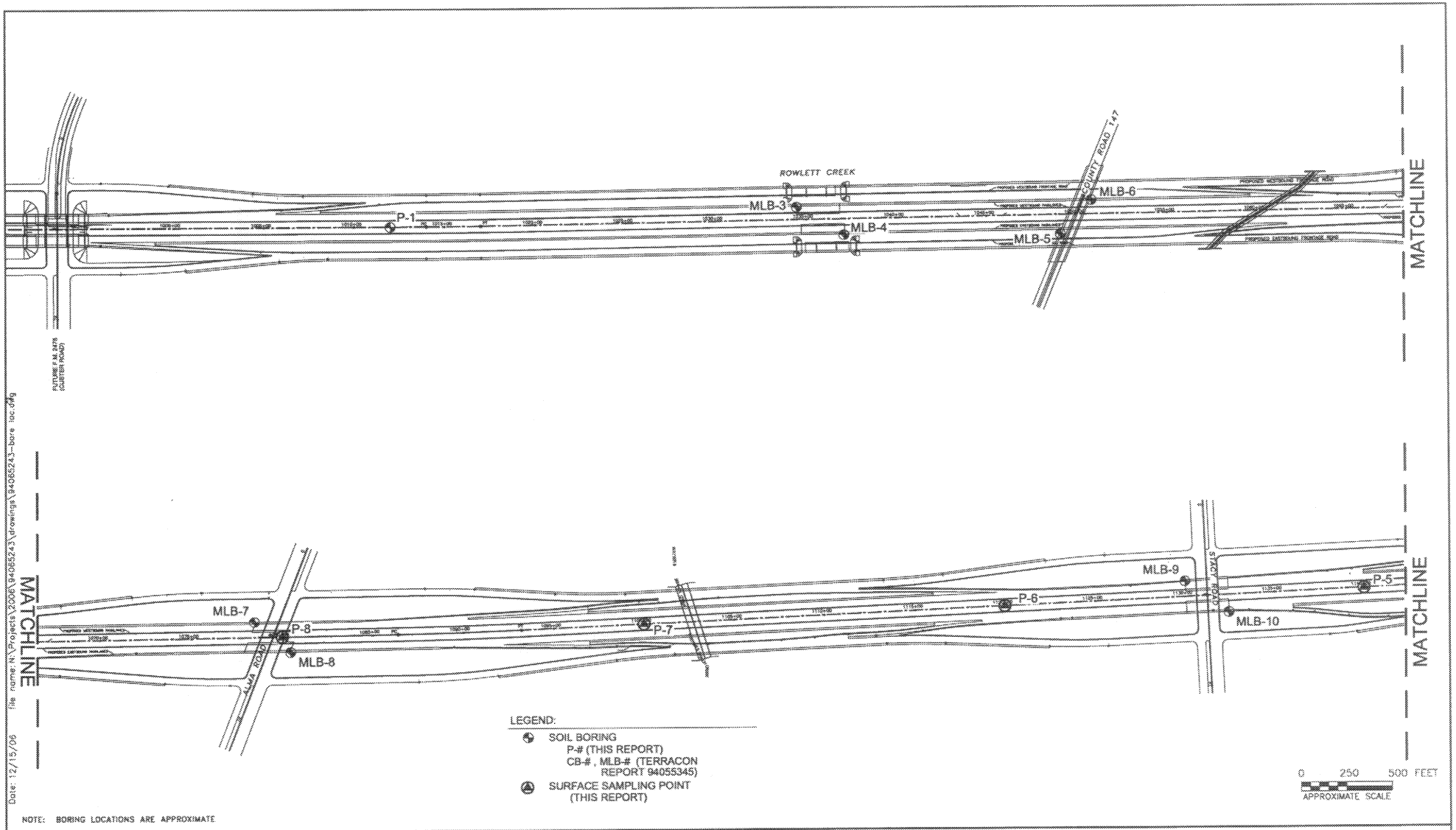
Terracon Job No. 94065243

FIGURE 6

3. Exhibit E

EXHIBIT E
Borings Drilled for this Study

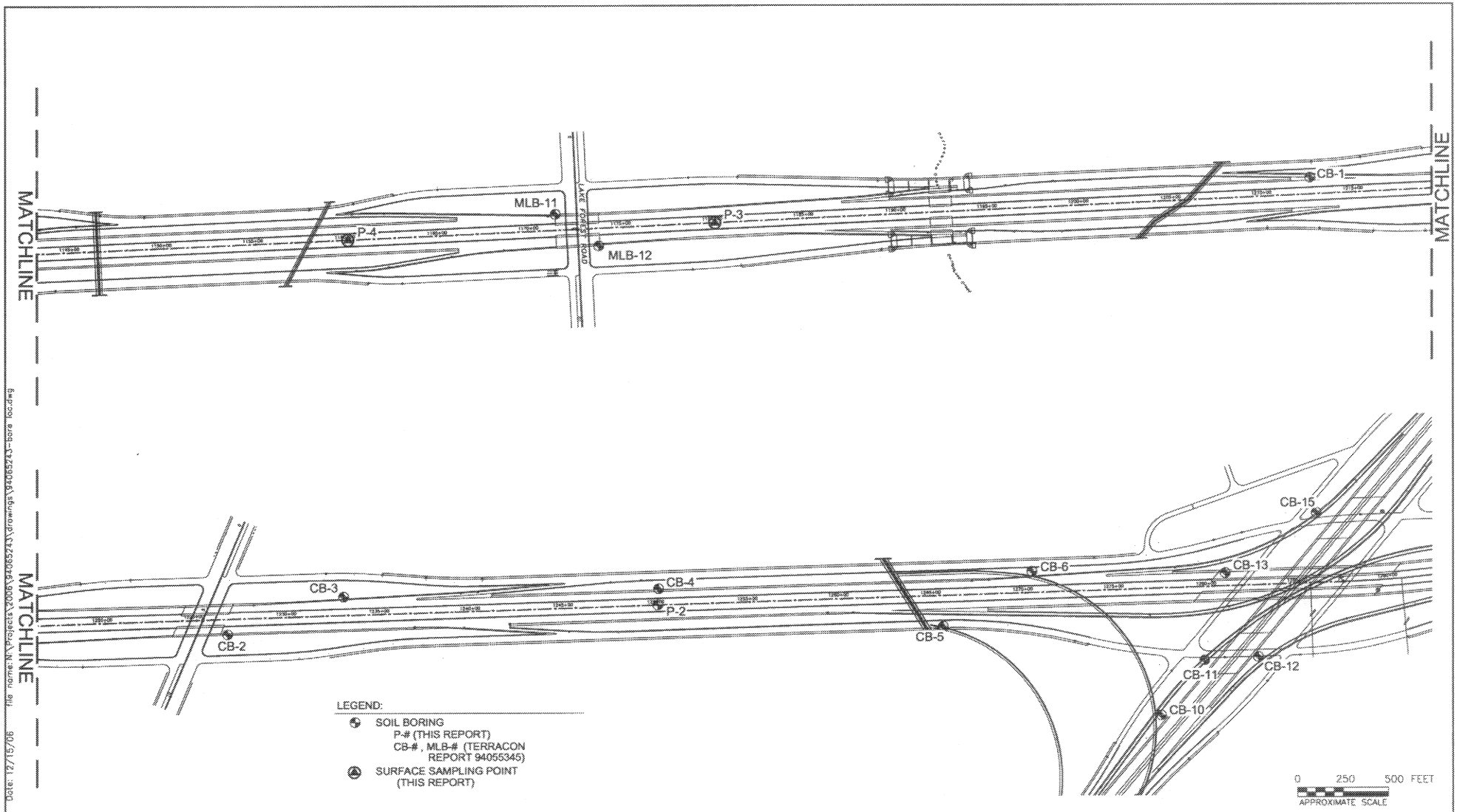


BORING LOCATION DIAGRAM FOR SH-121 MAIN LANES

SH 121 MANAGED LANES
STATE HIGHWAY 121
COLLIN COUNTY, TEXAS

FIGURE E-1

Terracon
Project No.: 94065243



NOTE: BORING LOCATIONS ARE APPROXIMATE

BORING LOCATION DIAGRAM FOR SH-121 MAIN LANES

SH-121 MANAGED LANES
STATE HIGHWAY 121
COLLIN COUNTY, TEXAS

FIGURE E-2

Terracon
Project No.: 94065243

LOG OF BORING NO. P-1

CLIENT: **Othon, Inc.**
Dallas, Texas

PROJECT: **SH-121 Managed Lanes**

BORING LOCATION: **See Figure 1**
Station: 1012+00

SITE: **State Highway 121**
Collin County, Texas

Approx. Surface Elevation: N/A ft

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	1.0 **FAT CLAY,** Tannish brown, with calcareous nodules		CH	ST		4.5+								
	FAT CLAY, Tan, with calcareous nodules		CL	ST		4.5+		18		61	37			
			CL	ST		4.5+		18		57	34	95		
				ST										
			CL	ST		4.5+								
		5		ST		4.5+		23		66	41	96		
			CL	ST		4.5+								
			CL	ST		4.5+		20		53	30			
				ST										
		10		ST										
	11.0 **LIMESTONE,** Tan, with clay layers													
		15												
	16.5 **LIMESTONE,** Gray													
	20.0 B.H. at 20.0'	20												

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET

No seepage observed.

Terracon

DATE DRILLED
9/20/2006

PROJECT NUMBER
94065243

FIGURE E- 3

LOG OF BORING NO. P-2

CLIENT: **Othon, Inc.**
Dallas, Texas

PROJECT: **SH-121 Managed Lanes**

BORING LOCATION: **See Figure 1**
Station: 1200+00

SITE: **State Highway 121**
Collin County, Texas

Approx. Surface Elevation: N/A ft

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FILL, LEAN SILTY CLAY Dark brown, with limestone and gravel		CL	ST										
				ST		4.5+		5						
	2.0 **LEAN SILTY CLAY,** Tan, with limestone fragments		CL	ST										
				ST		4.5+		15		45	24	93		
	5.0 **LIMESTONE,** Tan, with clay layers			ST				12		37	18			
		5												
		10												
	14.0 **LIMESTONE,** Gray													
	15.0	15												

B.H. at 15.0'

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET

No seepage observed.

Terracon

DATE DRILLED
9/20/2006

PROJECT NUMBER
94065243

FIGURE E- 4

LOB 94065243-D.GPJ 12/15/06

LOG OF BORING NO. A-1

CLIENT:	**Othon, Inc.** **Dallas, Texas**	PROJECT:	**BORROW SOURCE SOUTHWEST OF McKINNEY, TX**
BORING LOCATION:	**See Figure 1**	SITE:	**State Highway 121 Managed Lanes** **Collin County, Texas**

Graphic Log	DESCRIPTION **Approx. Surface Elevation: N/A ft**	DEPTH, FEET	SAMPLES: USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	TESTS: MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FAT CLAY, Brown			ST		4.5+								
				ST		4.5+								
	4.0													
	4.1 **LIMESTONE,** Tan			ST		4.5+								
	B.H. at 4'2"													

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET	
▽	▼
▽	▽
No seepage observed.	

Terracon

DATE DRILLED	Page 1 of 1
9/29/2006	**FIGURE**
PROJECT NUMBER	**E- 5**
94065243	

LOB 94065243-A-TXDOT.GPJ 12/15/06

LOG OF BORING NO. A-2

CLIENT: **Othon, Inc.**
Dallas, Texas

PROJECT: **BORROW SOURCE SOUTHWEST OF McKINNEY, TX**

BORING LOCATION: **See Figure 1**

SITE: **State Highway 121 Managed Lanes**
Collin County, Texas

Approx. Surface Elevation: N/A ft

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FAT CLAY, Brown			ST		2.0								
				ST		4.5+		19		69	43			
				ST										
				ST		4.5+		22		66	41			
		5		ST										
	6.0													
	FAT CLAY, Tan and gray			ST		2.5								
				ST		3.75		22		82	54			
				ST										
		10		ST		3.0								
				ST										
				ST		4.25		20		46	25			
				ST		4.5								
	15.0													
	B.H. at 15.0'	15												

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET

No seepage observed.

Terracon

DATE DRILLED
9/29/2006

PROJECT NUMBER
94065243

FIGURE E- 6

LOB 94065243-A-TXDOT.GPJ 12/15/06

LOG OF BORING NO. A-3

CLIENT: **Othon, Inc.**
Dallas, Texas

PROJECT: **BORROW SOURCE SOUTHWEST OF McKINNEY, TX**

BORING LOCATION: **See Figure 1**

SITE: **State Highway 121 Managed Lanes**
Collin County, Texas

Approx. Surface Elevation: N/A ft

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FAT CLAY, Brown			BS										
	2.0													
	FAT CLAY, Tan			ST		4.5+		21		66	41			
				ST										
		5		ST		4.5+								
	6.0													
	FAT CLAY, Tan and gray			ST		4.5+		20		69	43			
				ST										
				ST		4.5+								
	10.0	10												
	LEAN SILTY CLAY, Tan, with limestone fragments			ST										
				ST		4.5+		17		32	14			
	13.0			ST										
	B.H. at 13' on Tan Limestone													

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET

No seepage observed.

Terracon

DATE DRILLED
9/29/2006

PROJECT NUMBER
94065243

FIGURE
E- 7

LOB 94065243-A-TXDOT.GPJ 12/15/06

LOG OF BORING NO. A-4

CLIENT: **Othon, Inc.**
Dallas, Texas

PROJECT: **BORROW SOURCE SOUTHWEST OF McKINNEY, TX**

BORING LOCATION: **See Figure 1**

SITE: **State Highway 121 Managed Lanes**
Collin County, Texas

Approx. Surface Elevation: N/A ft

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FAT CLAY, Brown			ST		4.5+								
				ST		4.5+		17		74	47			
				ST										
		5		ST		4.5+								
	6.0													
	FAT CLAY, Light brown			ST		4.5+								
	7.5													
	FAT CLAY, Tan and gray			ST		4.5+		18		54	31			
				ST										
		10		ST		4.5+								
				ST		4.5+								
				ST		4.5+		20		54	31			
	15.0	15												
	B.H. at 15.0'													

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET

No seepage observed.

Terracon

DATE DRILLED
9/29/2006

PROJECT NUMBER
94065243

FIGURE
E- 8

LOB 94065243-A-TXDOT.GPJ 12/15/06

LOG OF BORING NO. B-1

CLIENT:	**Othon, Inc.** **Dallas, Texas**	PROJECT:	**BORROW SOURCE EAST OF CELINA, TEXAS**
BORING LOCATION:	**See Figure 6**	SITE:	**State Highway 121 Managed Lanes** **Collin County, Texas**

Graphic Log	DESCRIPTION **Approx. Surface Elevation: N/A ft**	DEPTH, FEET	SAMPLES: USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	TESTS: MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FAT CLAY, Light brown			ST		4.5+								
	2.0													
	LEAN SILTY CLAY, Tan			ST		4.5+								
	3.0													
	B.H. at 3' on Tan Limestone													

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET			DATE DRILLED	Page 1 of 1
▽	▼	Terracon	9/29/2006	FIGURE
▼	▼		PROJECT NUMBER	E- 9
No seepage observed.			94065243	

LOB 94065243-B-TXDOT.GPJ 12/15/06

LOG OF BORING NO. B-2

CLIENT:	**Othon, Inc.** **Dallas, Texas**	PROJECT:	**BORROW SOURCE EAST OF CELINA, TEXAS**
BORING LOCATION:	**See Figure 6**	SITE:	**State Highway 121 Managed Lanes** **Collin County, Texas**

Graphic Log	DESCRIPTION **Approx. Surface Elevation: N/A ft**	DEPTH, FEET	SAMPLES: USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	TESTS: MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FAT CLAY, Brown			ST		4.5+								
				ST		4.5+								
	4.0													
	FAT CLAY, Tan and gray	5		ST		4.5+								
				ST		4.5+								
				ST		4.5+								
		10		ST		3.0								
				ST		3.0								
		15		ST		3.0								
				ST		2.5								
				ST		2.5								
	20.0			ST		2.0								
	B.H. at 20.0'	20												

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET			
▽	▼	Terracon	DATE DRILLED 9/29/2006
▽	▼		PROJECT NUMBER 94065243
No seepage observed.			

Page 1 of 1

FIGURE E-10

LOB 94065243-B-TXDOT.GPJ 12/15/06

LOG OF BORING NO. C-1

CLIENT:	**Othon, Inc.** **Dallas, Texas**	PROJECT:	**BORROW SOURCE EAST OF CELINA, TEXAS**
BORING LOCATION:	**See Figure 9**	SITE:	**State Highway 121 Managed Lanes** **Collin County, Texas**

Graphic Log	DESCRIPTION **Approx. Surface Elevation: N/A ft**	DEPTH, FEET	SAMPLES: USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	TESTS: MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FAT CLAY, Brown 2.0			ST		4.5+								
	FAT CLAY, Light brown 4.0			ST		4.5+								
	FAT CLAY, Tan 5.0			ST		4.5+								
	B.H. at 5' on Tan Limestone	5												

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET			
▽	▼	DATE DRILLED 9/29/2006	**Page 1 of 1**
▽	▼	PROJECT NUMBER 94065243	**FIGURE E-11**
No seepage observed.			

Terracon

LOB 94065243-C-TXDOT.GPJ 12/15/06

LOG OF BORING NO. C-2

CLIENT:	**Othon, Inc.** **Dallas, Texas**	PROJECT:	**BORROW SOURCE EAST OF CELINA, TEXAS**
BORING LOCATION:	**See Figure 9**	SITE:	**State Highway 121 Managed Lanes** **Collin County, Texas**

Graphic Log	DESCRIPTION **Approx. Surface Elevation: N/A ft**	DEPTH, FEET	SAMPLES: USCS SYMBOL	TYPE	SPT OR TXDOT CPT BLOWS/INCH	CALIBRATED HAND PENETROM., TSF	RECOVERY, % / RQD, %	TESTS: MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, KSF	FAILURE STRAIN, %
	FAT CLAY, Brown			ST		4.5+								
	2.0													
	FAT CLAY, Light brown			ST		4.5+								
	3.0													
	FAT CLAY, Tan													
		5		ST		4.5+								
				ST										
	8.0													
	B.H. at 8' on Tan Limestone													

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL AND ROCK TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS:

WATER LEVEL OBSERVATIONS, FEET				
▽	▼	Terracon	DATE DRILLED 9/29/2006	**Page 1 of 1**
▼	▼		PROJECT NUMBER 94065243	**FIGURE E-12**
No seepage observed.				

4. Exhibit F

EXHIBIT F
Laboratory Test Results for Natural Soils

Boring	Depth (Feet)	Moisture Content (%)	Unit Dry Weight (pcf)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	No. 200 Sieve	Soluble Sulfates, ppm
P-1	1 to 2	18		61	24	37		<100
P-1	2 to 3	18.3		57	22	35	95	<100
P-1	5 to 6	22.5		66	25	41	95	
P-1	8 to 9	19.6		53	23	30		
P-2	1 to 2	5.2						
P-2	3 to 4	15.2		45	22	23		105
P-2	4 to 5	11.9		37	21	16	93	307
P3	0 - 1			59	24	35		
P4	0 - 1			54	21	33		
P5	0 - 1			65	25	40		
P6	0 - 1			60	23	37		
P7	0 - 1			54	23	31		
P8	0 - 1			56	22	34		
A -2	2 - 3	18.6		69	22	47		<100
A -2	4 - 5	21.9		66	21	45		
A -2	8 - 9	21.7		82	24	58		<100
A -2	13 - 14	20.2		46	21	25		
A-3	2 - 3	20.7		66	23	43		<100
A-3	6 - 7	19.6		69	22	47		
A-3	11 - 12	17.4		32	19	13		
A-4	2 - 3	17.1		74	21	53		<100
A-4	8 - 9	17.6		54	20	34		
A-4	14 - 15	19.6		54	20	34		<100

SUMMARY OF LABORATORY TESTS
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Project No. 94065243

FIGURE F-1

Boring	Bulk Sample	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	No. 200 Sieve	Soluble Sulfates, ppm
Bulk 1	Combined Soil Samples	68	29	39		<100
Bulk 2	Combined Soil Samples	54	23	31		110
Bulk 3	Combined Soil Samples	43	19	24		390
P1-A Bulk	Combined Soil Samples	67	28	39		
P2-A Bulk	Combined Soil Samples	59	26	33		
P1-B -Bulk	Combined Soil Samples	66	27	39		
P2-B- Bulk	Combined Soil Samples	47	20	27		
P-1C- Bulk	Surfical Sample	72	26	46		
Gray Austin Chalk	Wier Quarry	33	15	14		
Gray Austin Chalk	Wier Quarry	31	20	11		
Bulk Tan Austin Chalk	Rock Core	39	18	21	69	
Bulk Gray Austin Chalk	Rock Core	41	18	23	4.4	

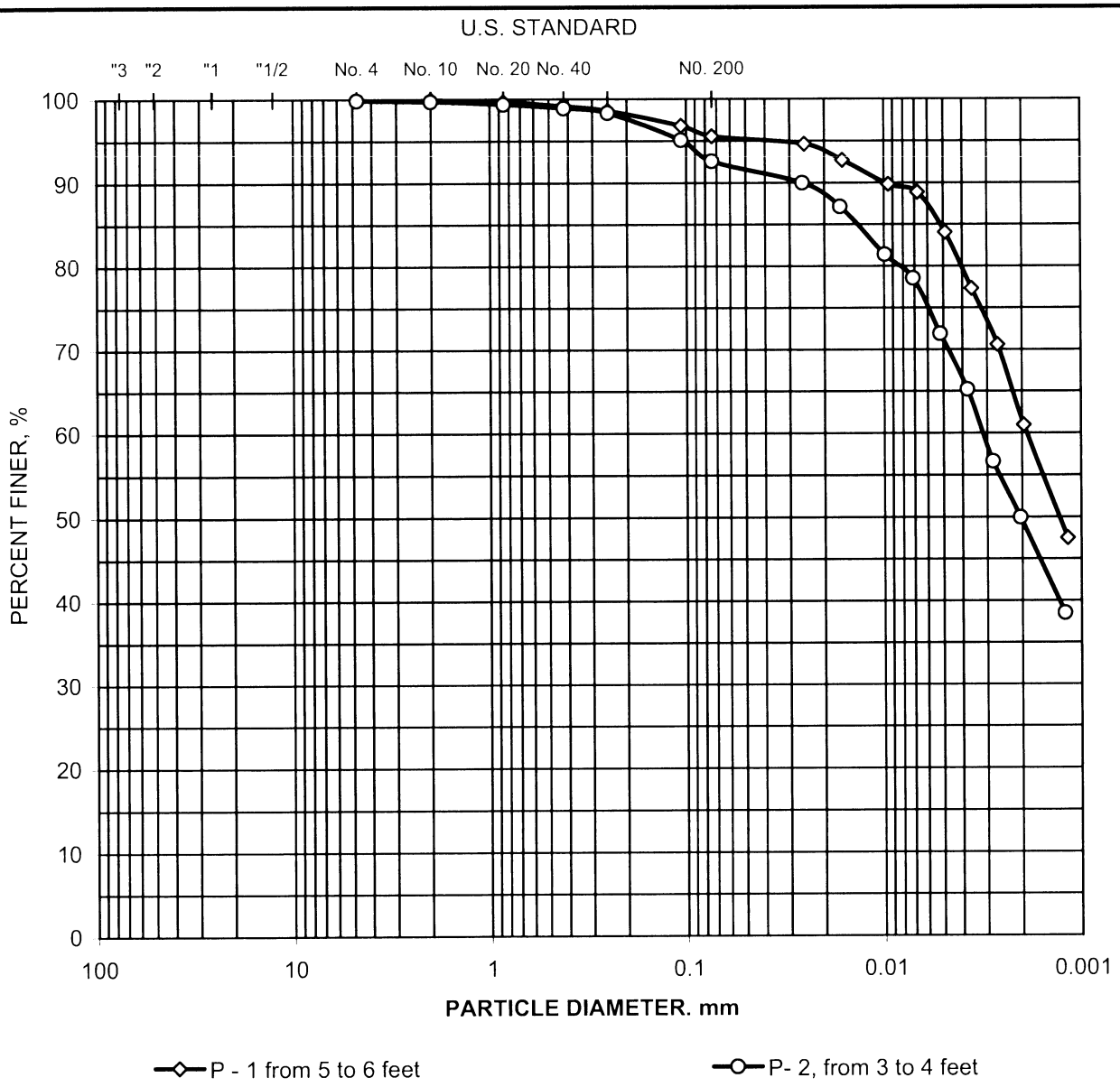
SUMMARY OF LABORATORY TESTS ON BULK SAMPLES

SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon

Project No. 94065243

FIGURE F-2



BORING NO.	DEPTH FEET	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS		
					LL	PL	PI
P-1	5 - 6	Dark Brown Clay	CH		66	25	41
P-2	3 to 4	Tan Clay	CL		45	22	23

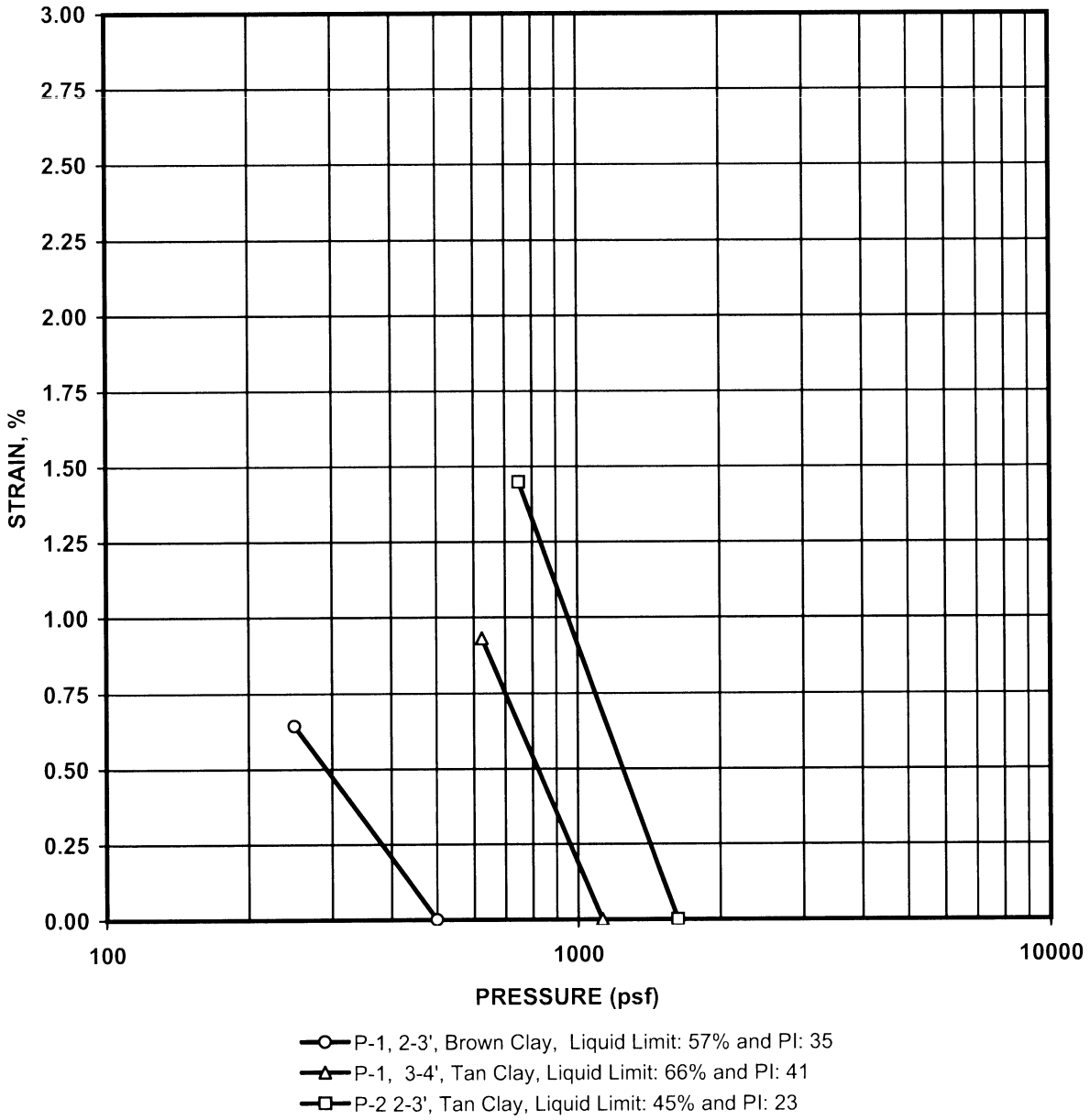
GRAIN SIZE DISTRIBUTION CURVE ON CLAYS

SH121 MANAGED LANES, COLLIN COUNTY TEXAS

Terracon

Project No. 94065243

FIGURE F-3



BORING	DEPTH, ft	SURCHARGE LOAD, psf	INITIAL MOISTURE CONTENT, %	FINAL MOISTURE CONTENT, %	SWELL, %	SWELL PRESSURE, psf
P-1	2-3	500	18.1	20.6	0.6	500
P-1	3-4	625	14.9	16.5	0.9	1125
P-2	2-3	750	23.9	26.3	1.4	1625

PRESSURE-SWELL TEST RESULTS

SH-121 MANAGED LANES

COLLIN COUNTY, TEXAS

Terracon

Project No. 94065243

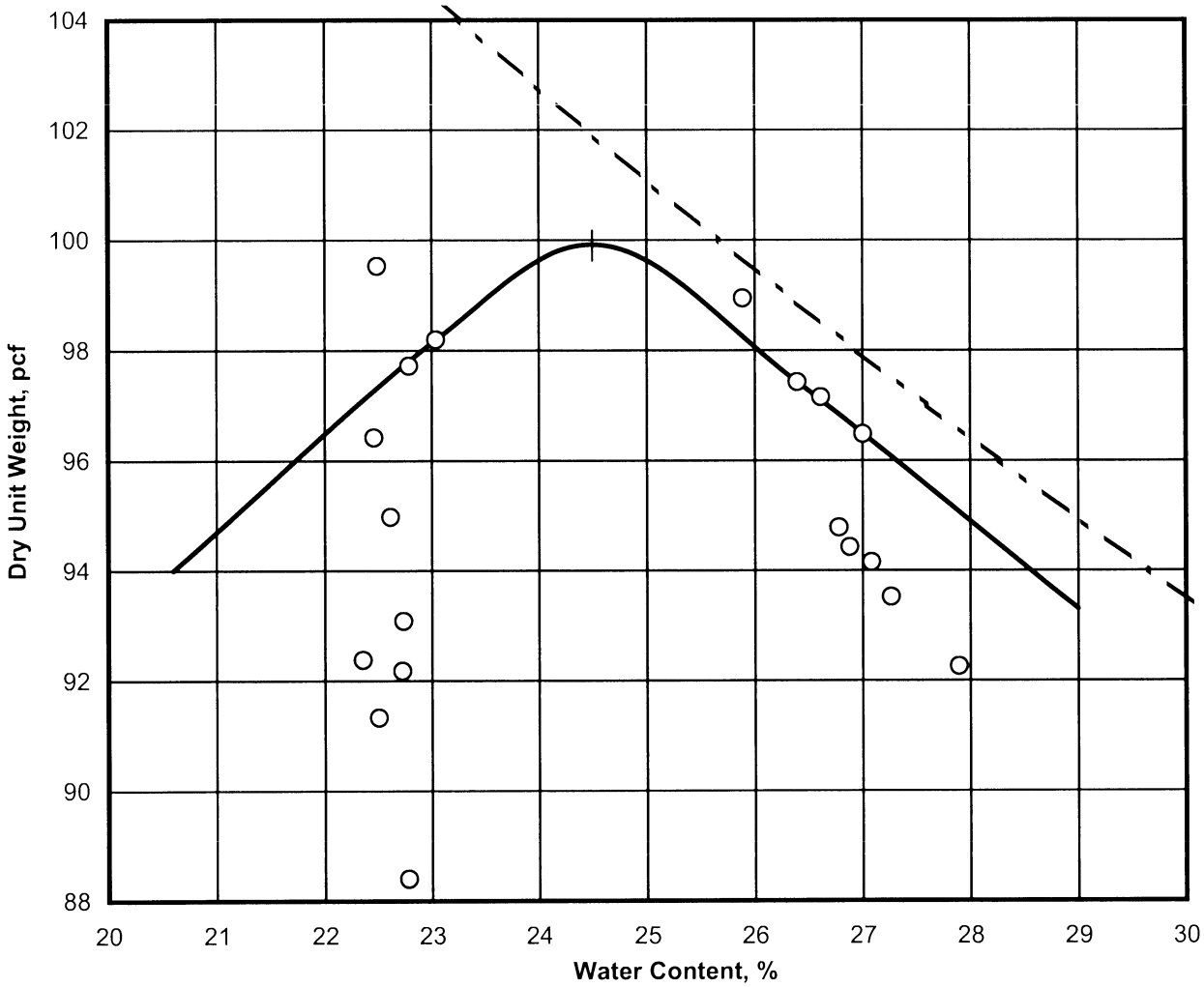
FIGURE F-4

Sample Designation	Wet or Dry of Optimum	Liquid Limit (%)	Plasticity Index	Unit Dry Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Surcharge Load psf	Swell
P2A-Bulk	Wet	59	33	93.5	27.3	30.6	540	0.5%
P2A-Bulk	Wet	59	33	96.5	27.0	29.5	540	-0.3%
P2A-Bulk	Wet	59	33	94.2	27.1	29.9	900	0.0%
P2A-Bulk	Wet	59	33	94.6	31.7	30.9	900	0.2%
P2A-Bulk	Wet	59	33	94.8	26.8	29.6	1260	-1.1%
P2A-Bulk	Wet	59	33	92.3	27.9	31.2	1260	0.0%
P2A-Bulk	Wet	59	33	94.4	26.9	28.5	1620	-0.2%
P2A-Bulk	Wet	59	33	97.1	26.6	28.0	1620	0.2%
P2A-Bulk	Wet	59	33	97.4	26.4	28.3	1980	-0.5%
P2A-Bulk	Wet	59	33	98.9	25.9	26.9	1980	0.0%
P2A-Bulk	Dry	59	33	88.4	22.8	33.9	540	1.4%
P2A-Bulk	Dry	59	33	92.2	22.7	30.5	540	2.2%
P2A-Bulk	Dry	59	33	91.3	22.5	32.0	900	1.2%
P2A-Bulk	Dry	59	33	92.4	22.4	30.5	900	1.4%
P2A-Bulk	Dry	59	33	93.1	22.7	29.7	1260	0.9%
P2A-Bulk	Dry	59	33	98.2	23.0	29.1	1260	0.8%
P2A-Bulk	Dry	59	33	95.0	22.6	29.5	1620	0.5%
P2A-Bulk	Dry	59	33	96.4	22.5	28.4	1620	0.9%
P2A-Bulk	Dry	59	33	99.5	22.5	28.0	1980	0.3%
P2A-Bulk	Dry	59	33	97.7	22.8	29.0	1980	0.5%

SUMMARY OF SWELL TESTS ON CLAYS
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Project No. 94065243

FIGURE F-5



— - Zero Air Voids

O Swell Test Data Points

——— Estimated Standard Proctor Curve

+ Optimum Moisture at Maximum Dry Density

Sample Location: Bulk sample from Boring P-2
Sample Description: Dark brown Clay
Liquid Limit: 59 %
Plastic Limit: 26 %
Plasticity Index: 33

Optimum Moisture Content, %: 24.5
Maximum Dry Density, pcf: 99.9

Swell Samples Compacted in accordance with Test Method: ASTM D-698, Method A

STANDARD PROCTOR BULK SAMPLE P-2A
SH-121 MANAGED LANES , C0LLIN COUNTY, TEXAS

Terracon

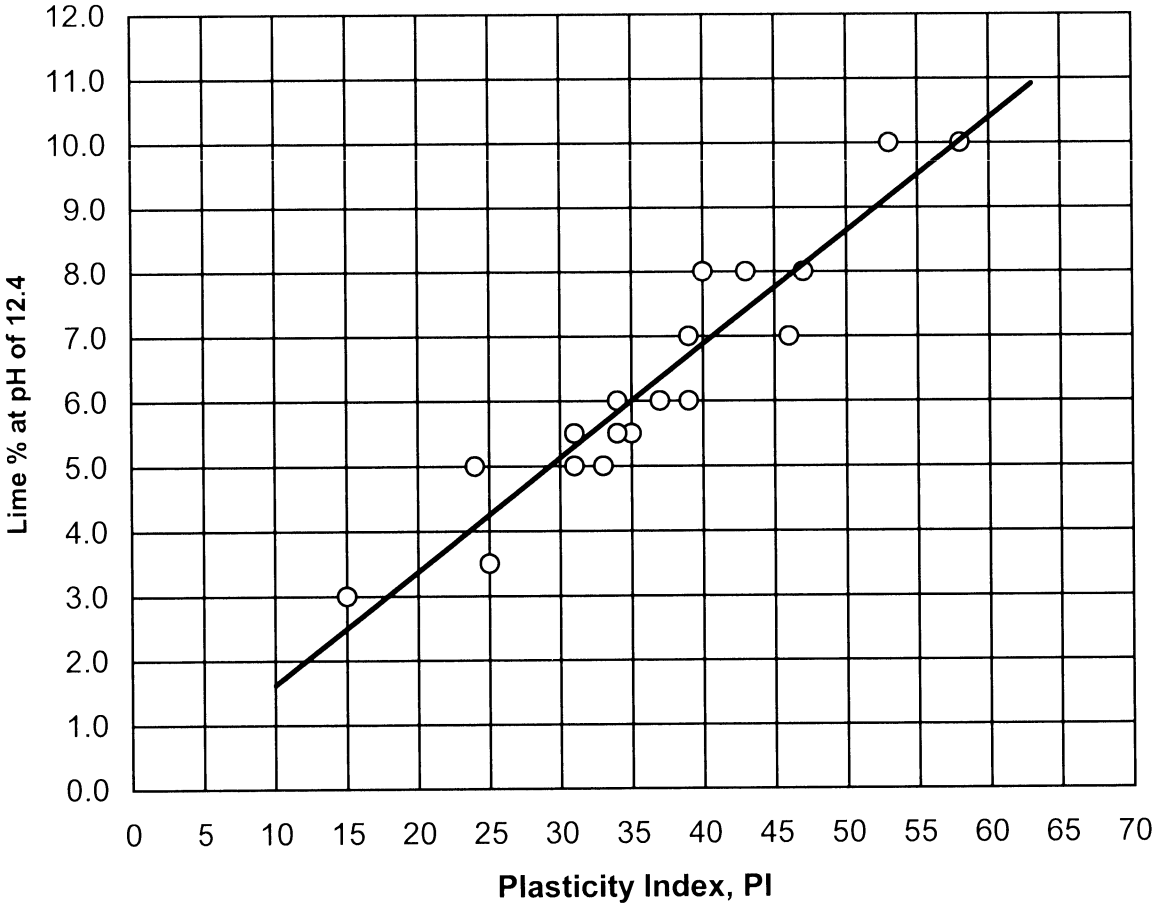
Terracon Job No. 94065243

FIGURE F-6

5. Exhibit G

EXHIBIT G

Laboratory Lime-pH Test Results



Boring	Liquid Limit %	Plastic Limit, %	PI	Lime, % at pH of 12.4
P-1	66	27	39	6.0
P-2	47	22	25	3.5
P-3	59	24	35	5.5
P-4	54	21	33	5.0
P-5	65	25	40	8.0
P-6	60	23	37	6.0
P-7	54	23	31	5.0
P-8	56	22	34	5.5
Bulk Sample 1	68	29	39	7.0
Bulk Sample 2	54	23	31	5.5
Bulk Sample 3	43	19	24	5.0
A-2, 2-3'	69	22	47	8.0
A-2, 8-9'	82	24	58	10.0
A-3, 2-3'	66	23	43	8.0
A-4, 2-3'	74	21	53	10.0
A-4, 14-15'	54	20	34	6.0
P-1C Bulk Sample	72	26	46	7.0
Wier Austin Chalk Quarry	33	18	15	3.0

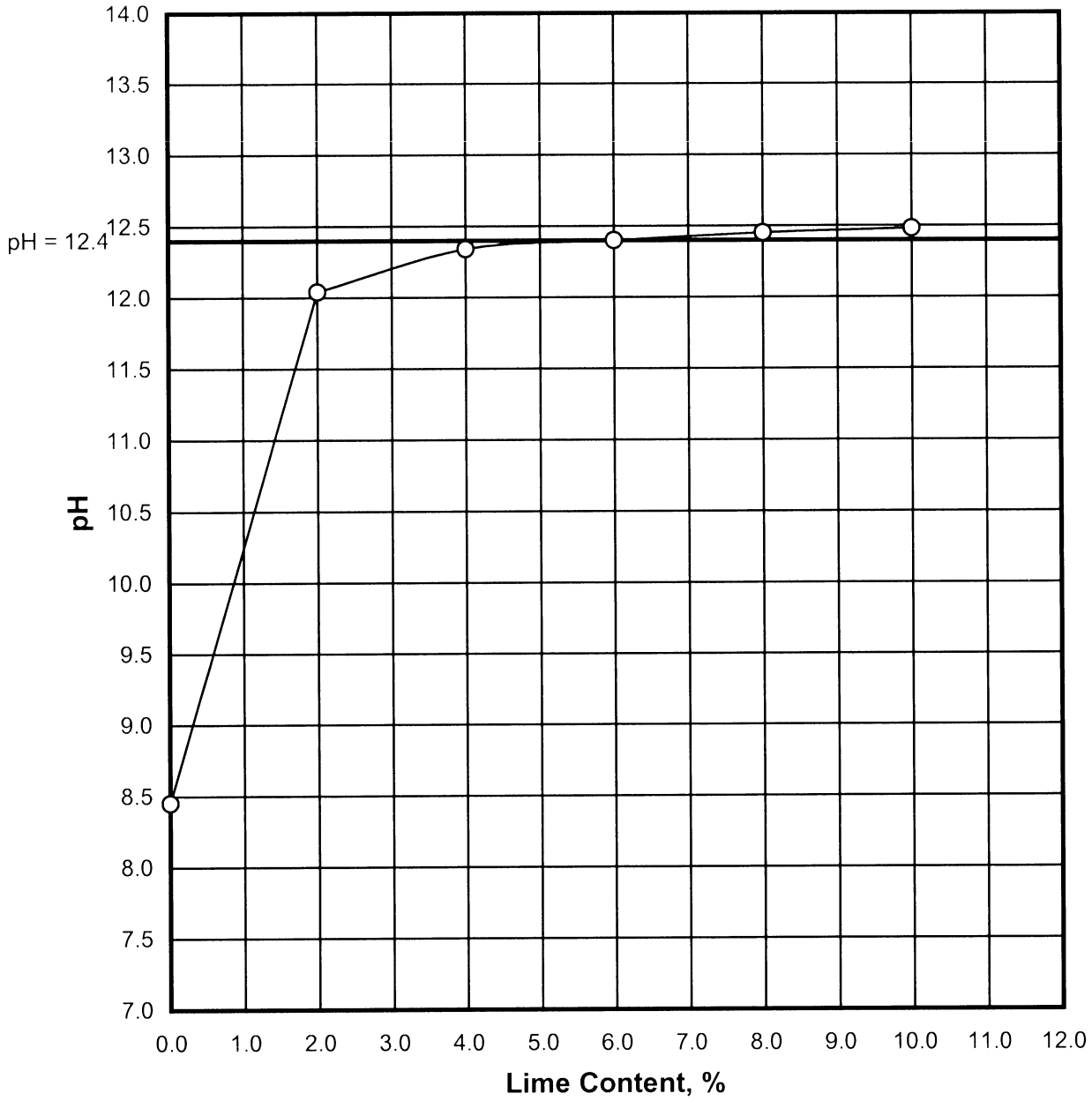
SUMMARY OF LIME - pH SERIES TESTS

SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon

Terracon Project 94065243

FIGURE G-1



Approximate Location: Sta. 1012+00 Centerline SH-121
Sample Description: P-1, Dark Brown Clay
Liquid Limit: 66 %
Plastic Limit: 27 %
Plasticity Index: 39 %

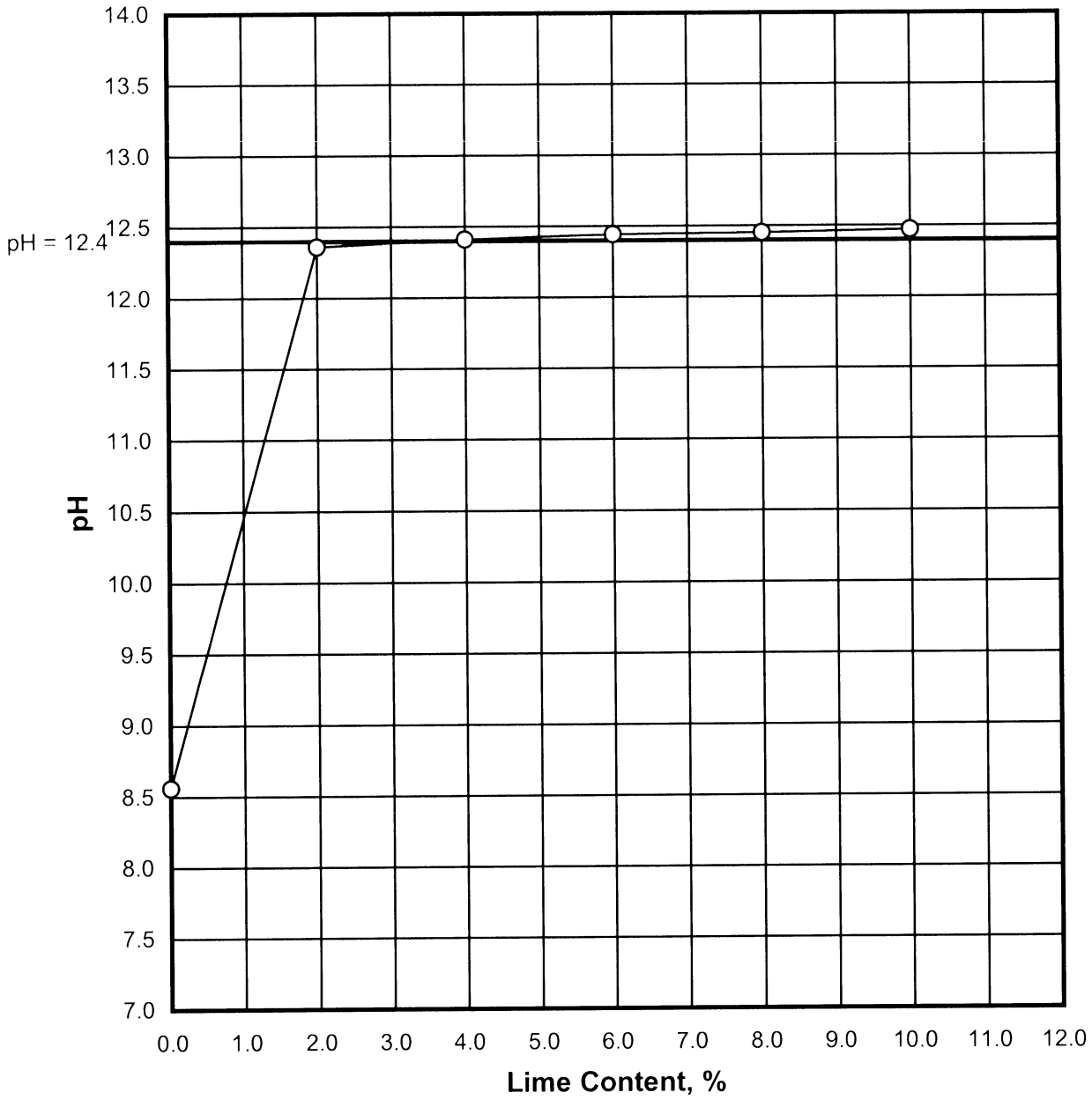
Percent Lime at pH of 12.4: 6 %

Lime (%)	pH
0.0	8.45
2.0	12.04
4.0	12.34
6.0	12.40
8.0	12.45
10.0	12.48

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-2



Approximate Location: Sta. 1200+00 Centerline SH-121
Sample Description: P-2, Tan Clay
Liquid Limit: 47 %
Plastic Limit: 22 %
Plasticity Index: 23 %

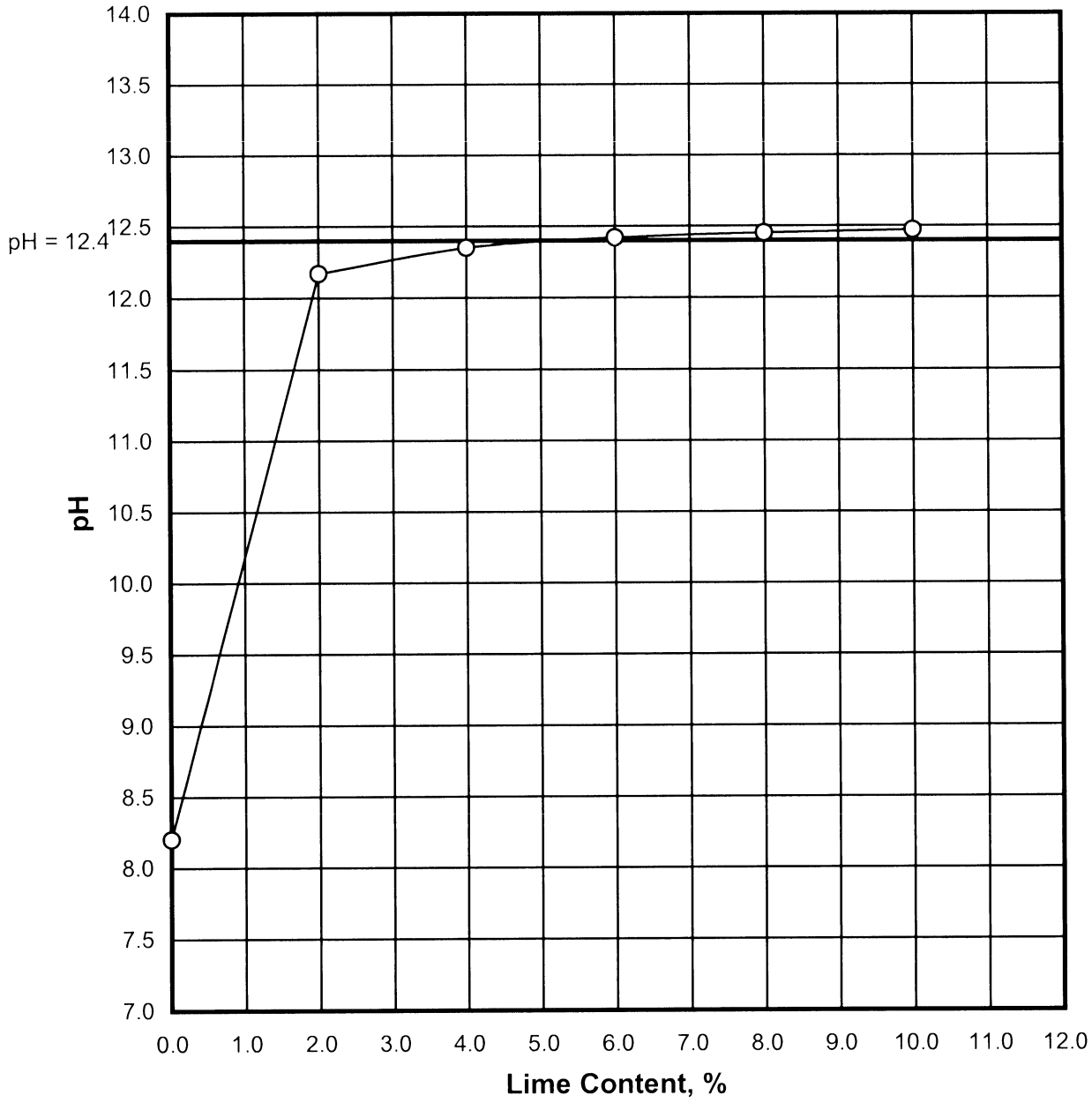
Percent Lime at pH of 12.4: 3.5 %

Lime (%)	pH
0.0	8.56
2.0	12.36
4.0	12.41
6.0	12.44
8.0	12.45
10.0	12.47

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-3



Approximate Location: Sta. 1180+00 Centerline SH-121
Sample Description: P-3, Brown Clay
Liquid Limit: 59 %
Plastic Limit: 24 %
Plasticity Index: 35 %

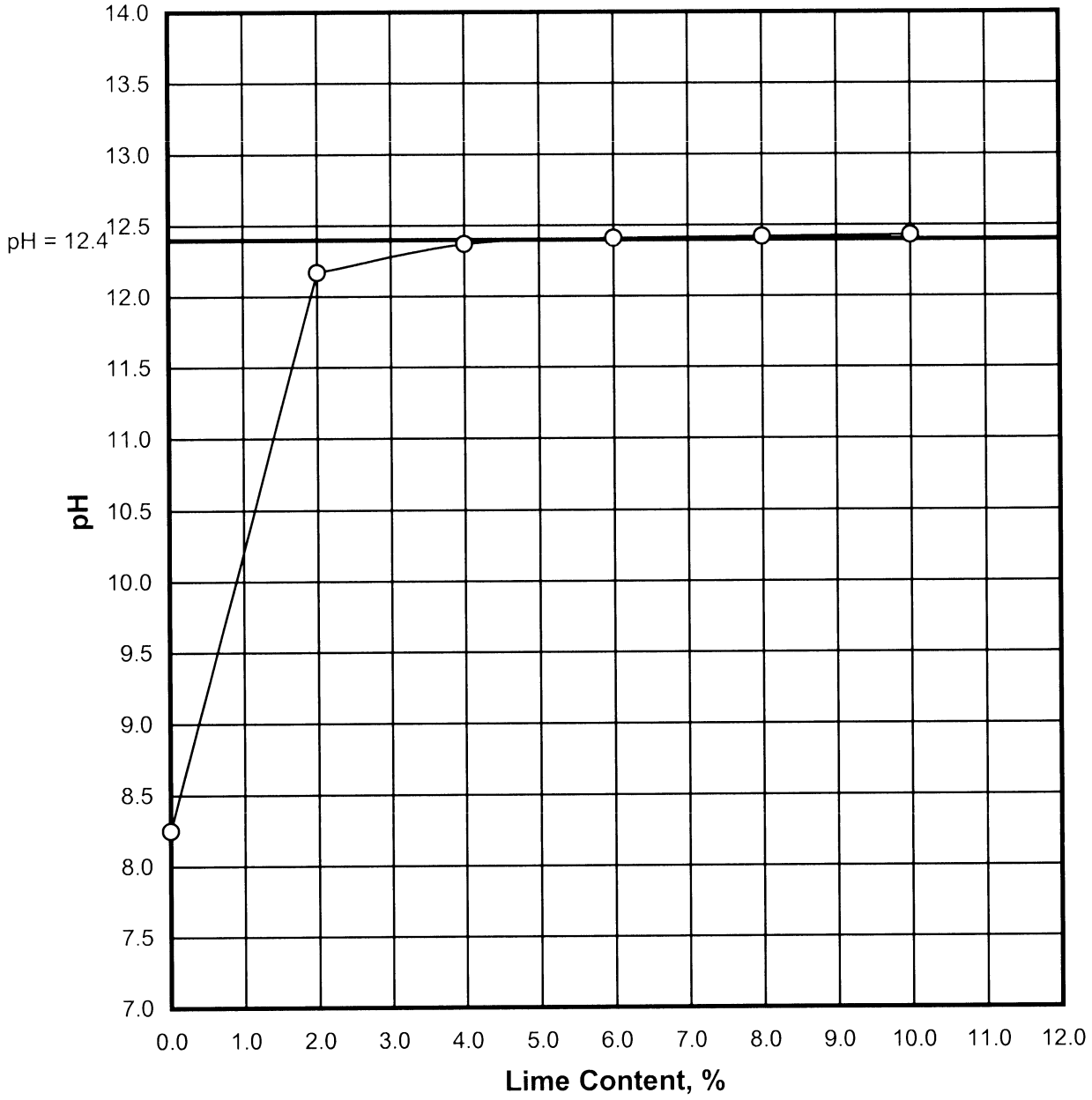
Percent Lime at pH of 12.4: 5.5 %

Lime (%)	pH
0.0	8.20
2.0	12.17
4.0	12.35
6.0	12.42
8.0	12.45
10.0	12.47

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-4



Approximate Location: Sta. 1160+00 Centerline SH-121
Sample Description: P-4, Tan Clay
Liquid Limit: 54 %
Plastic Limit: 21 %
Plasticity Index: 33 %

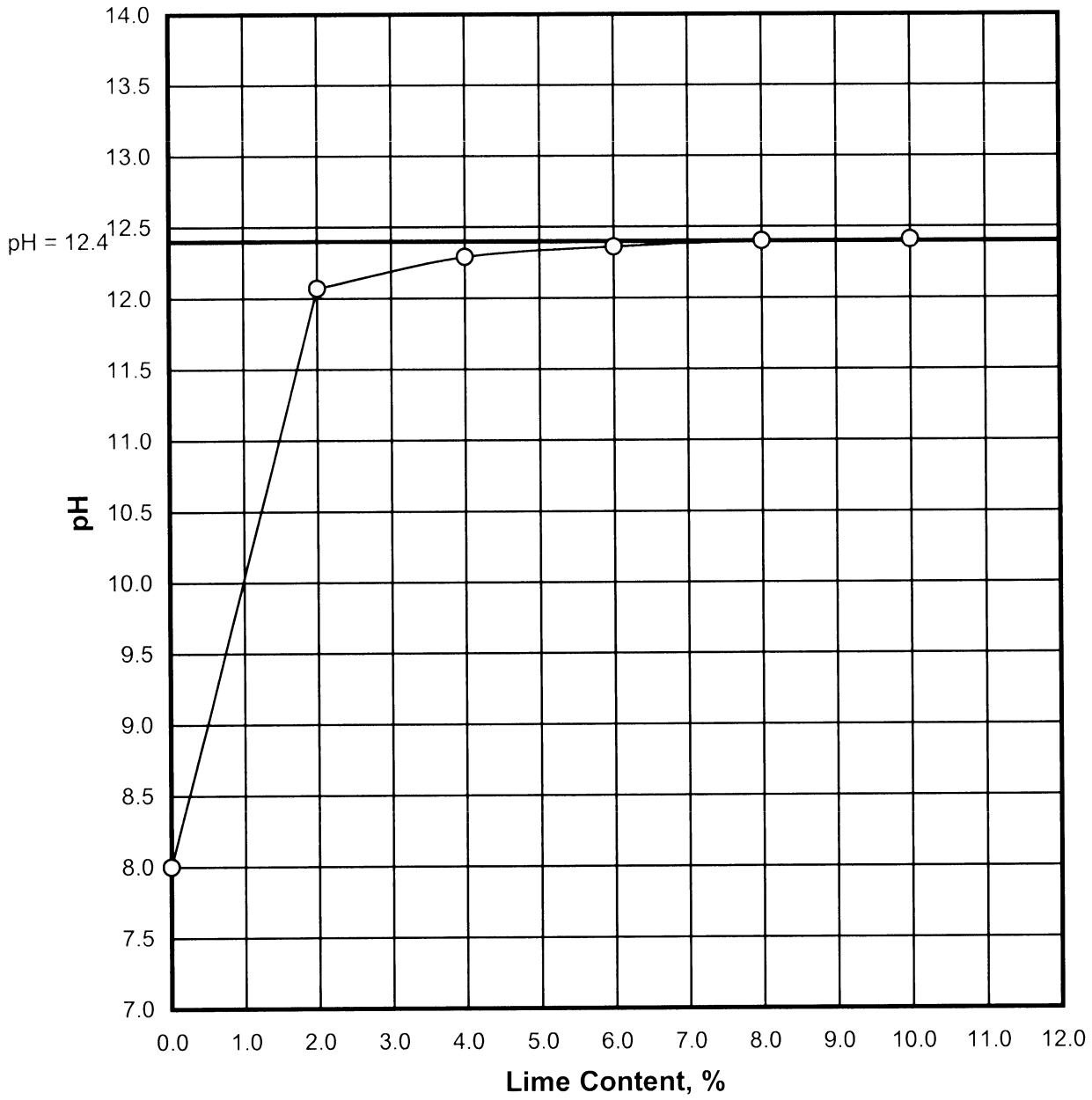
Percent Lime at pH of 12.4: 5.0 %

Lime (%)	pH
0.0	8.25
2.0	12.17
4.0	12.37
6.0	12.41
8.0	12.42
10.0	12.43

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-5



Approximate Location: Sta. 1140+00 Centerline SH-121
Sample Description: P-5, Brown Clay
Liquid Limit: 65 %
Plastic Limit: 25 %
Plasticity Index: 40 %

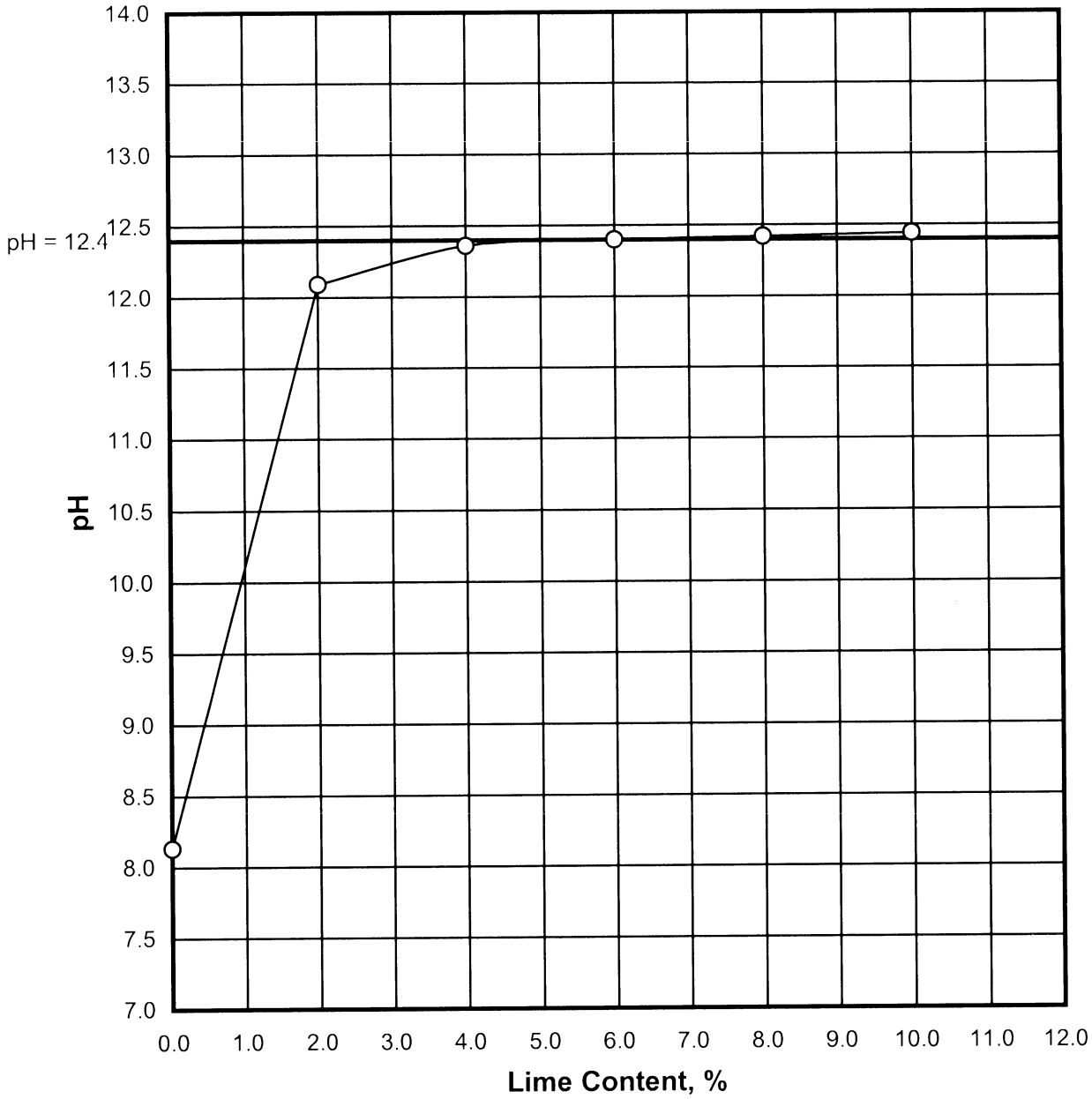
Percent Lime at pH of 12.4: 8.0 %

Lime (%)	pH
0.0	8.00
2.0	12.07
4.0	12.29
6.0	12.36
8.0	12.40
10.0	12.41

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-6



Approximate Location: Sta. 1120+00 Centerline SH-121
Sample Description: P-6, Brown Clay
Liquid Limit: 60 %
Plastic Limit: 23 %
Plasticity Index: 37 %

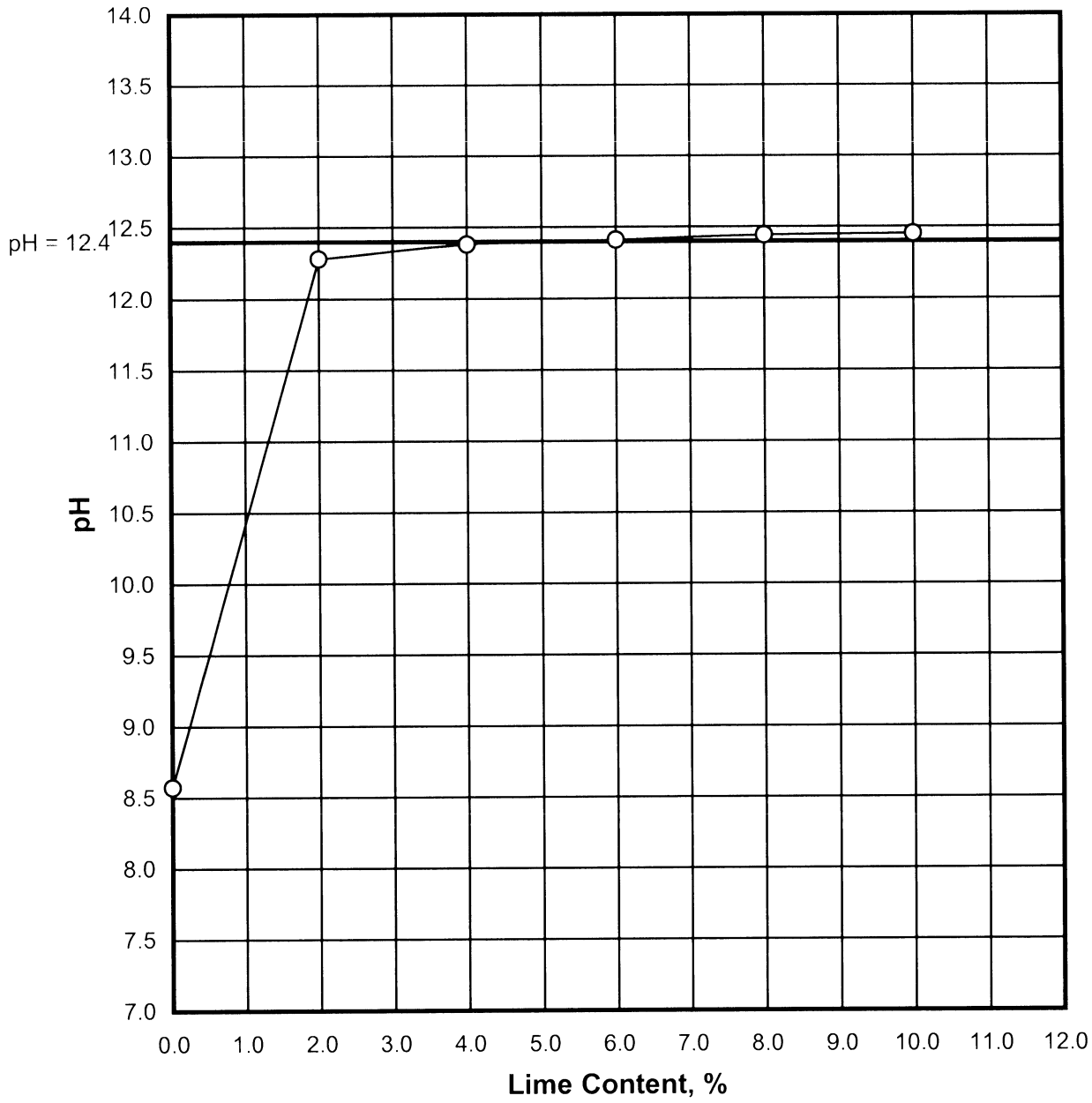
Percent Lime at pH of 12.4: 6.0 %

Lime (%)	pH
0.0	8.13
2.0	12.09
4.0	12.36
6.0	12.40
8.0	12.42
10.0	12.44

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-7



Approximate Location: Sta. 1100+00 Centerline SH-121
Sample Description: P-7, Tan Clay
Liquid Limit: 54 %
Plastic Limit: 23 %
Plasticity Index: 31 %

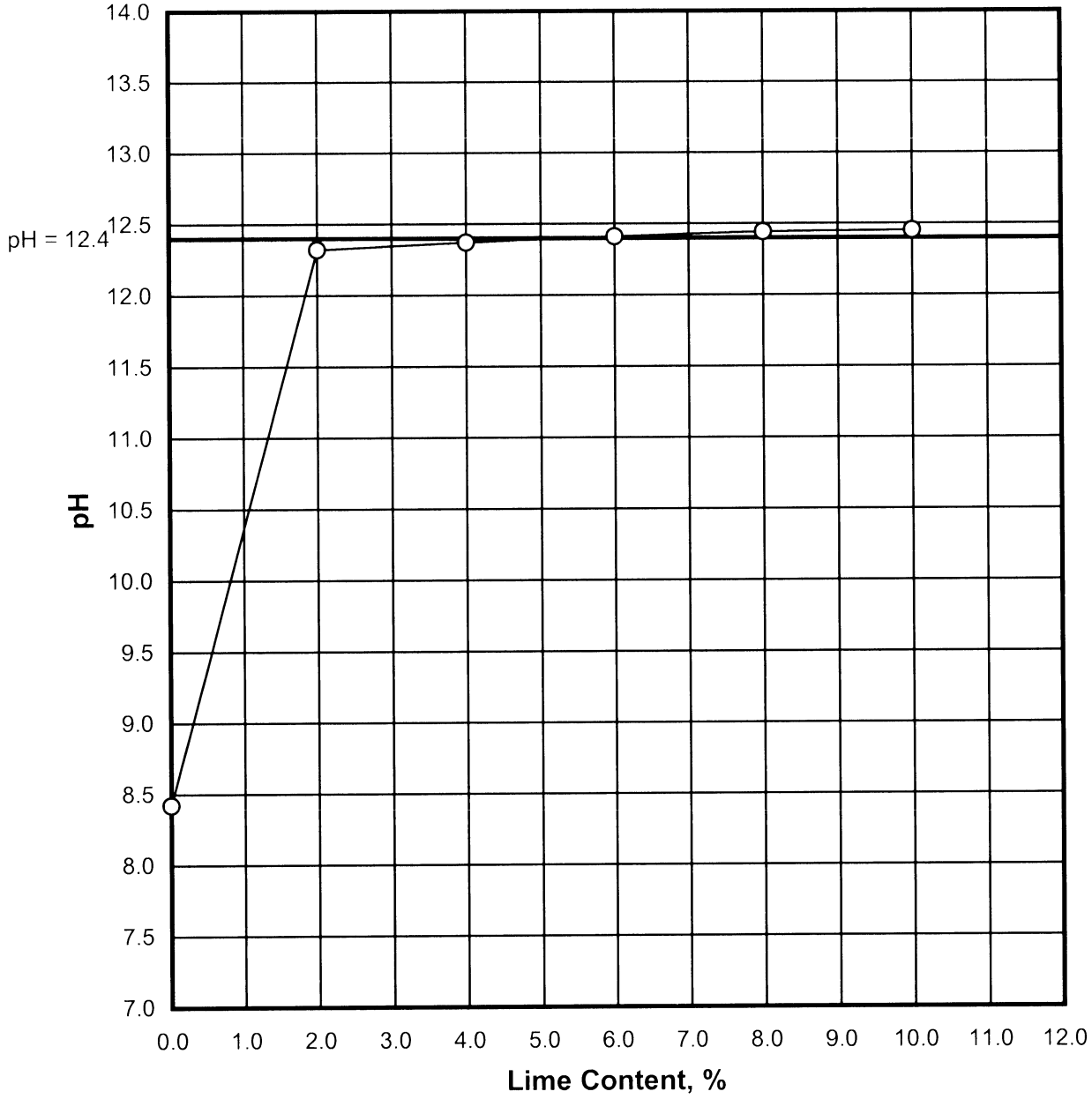
Percent Lime at pH of 12.4: 5.0 %

Lime (%)	pH
0.0	8.57
2.0	12.28
4.0	12.38
6.0	12.41
8.0	12.44
10.0	12.45

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-8



Approximate Location: Sta. 1080+00 Centerline SH-121
Sample Description: P-8, Tan Clay
Liquid Limit: 56 %
Plastic Limit: 22 %
Plasticity Index: 34 %

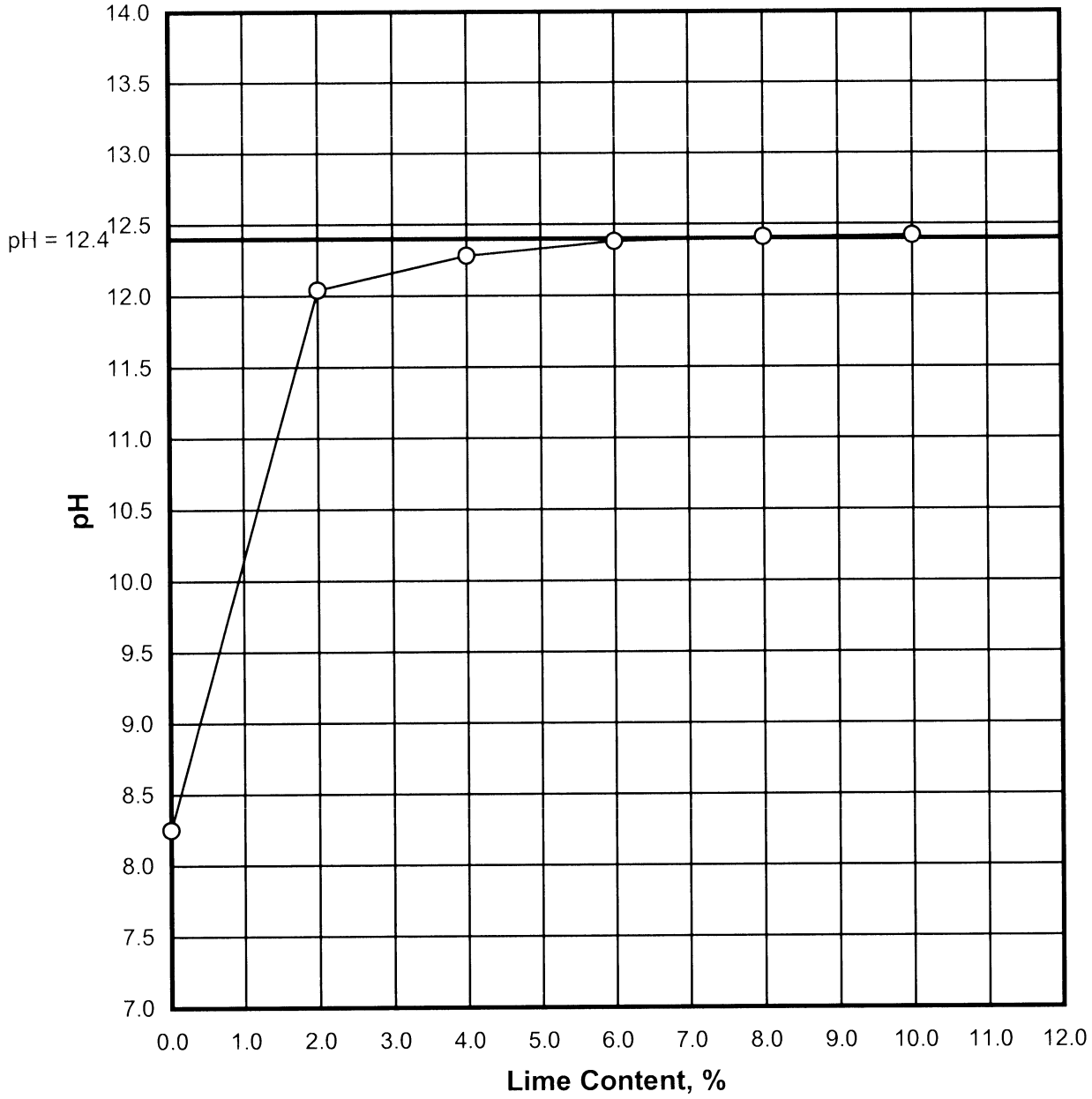
Percent Lime at pH of 12.4: 5.5 %

Lime (%)	pH
0.0	8.42
2.0	12.32
4.0	12.37
6.0	12.41
8.0	12.44
10.0	12.45

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G- 9



Location: Composite Bulk Sample
Sample Description: Sample 1, Dark Brown Clay
Liquid Limit: 68 %
Plastic Limit: 29 %
Plasticity Index: 39 %

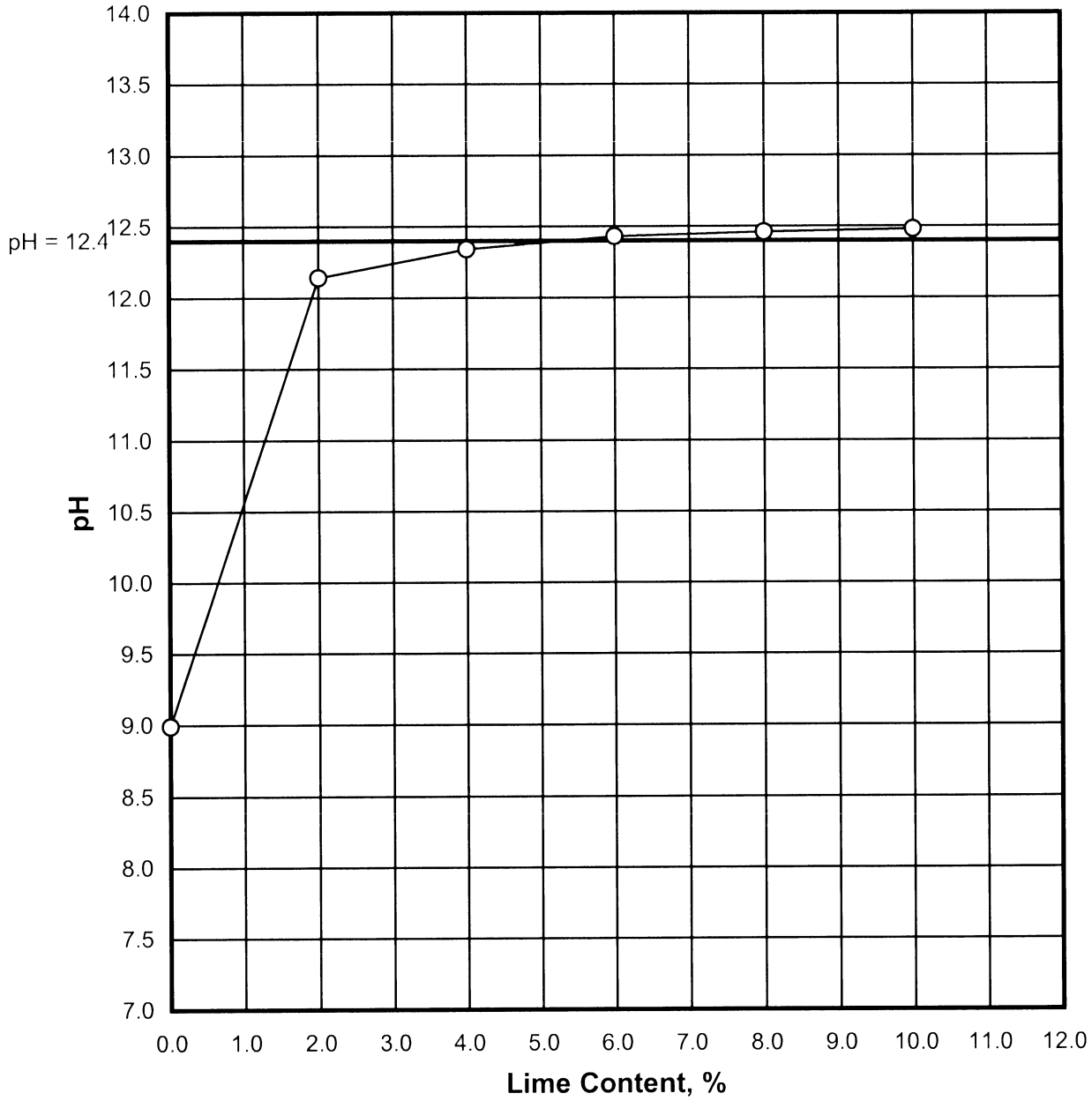
Percent Lime at pH of 12.4: 7 %

Lime (%)	pH
0.0	8.25
2.0	12.04
4.0	12.28
6.0	12.38
8.0	12.41
10.0	12.42

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-10



Location: Composite Bulk Sample
Sample Description: Bulk Sample 2, Tan and Brown Clay
Liquid Limit: 54 %
Plastic Limit: 23 %
Plasticity Index: 31 %

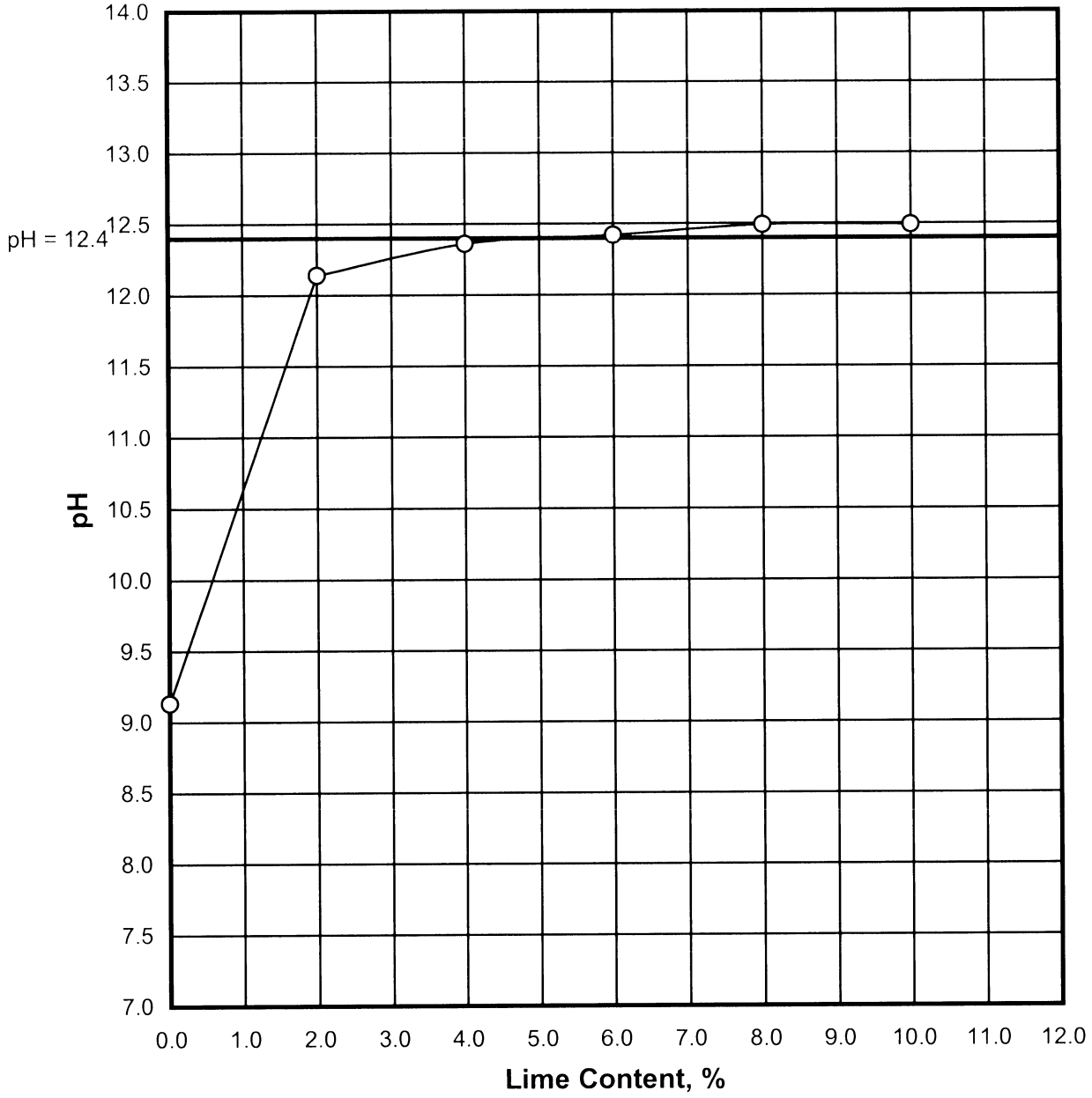
Percent Lime at pH of 12.4: 5.5 %

Lime (%)	pH
0.0	8.99
2.0	12.14
4.0	12.34
6.0	12.43
8.0	12.46
10.0	12.48

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-11



Location: Composite Bulk Sample
Sample Description: Bulk Sample 3, Tan Clay
Liquid Limit: 43 %
Plastic Limit: 19 %
Plasticity Index: 24 %

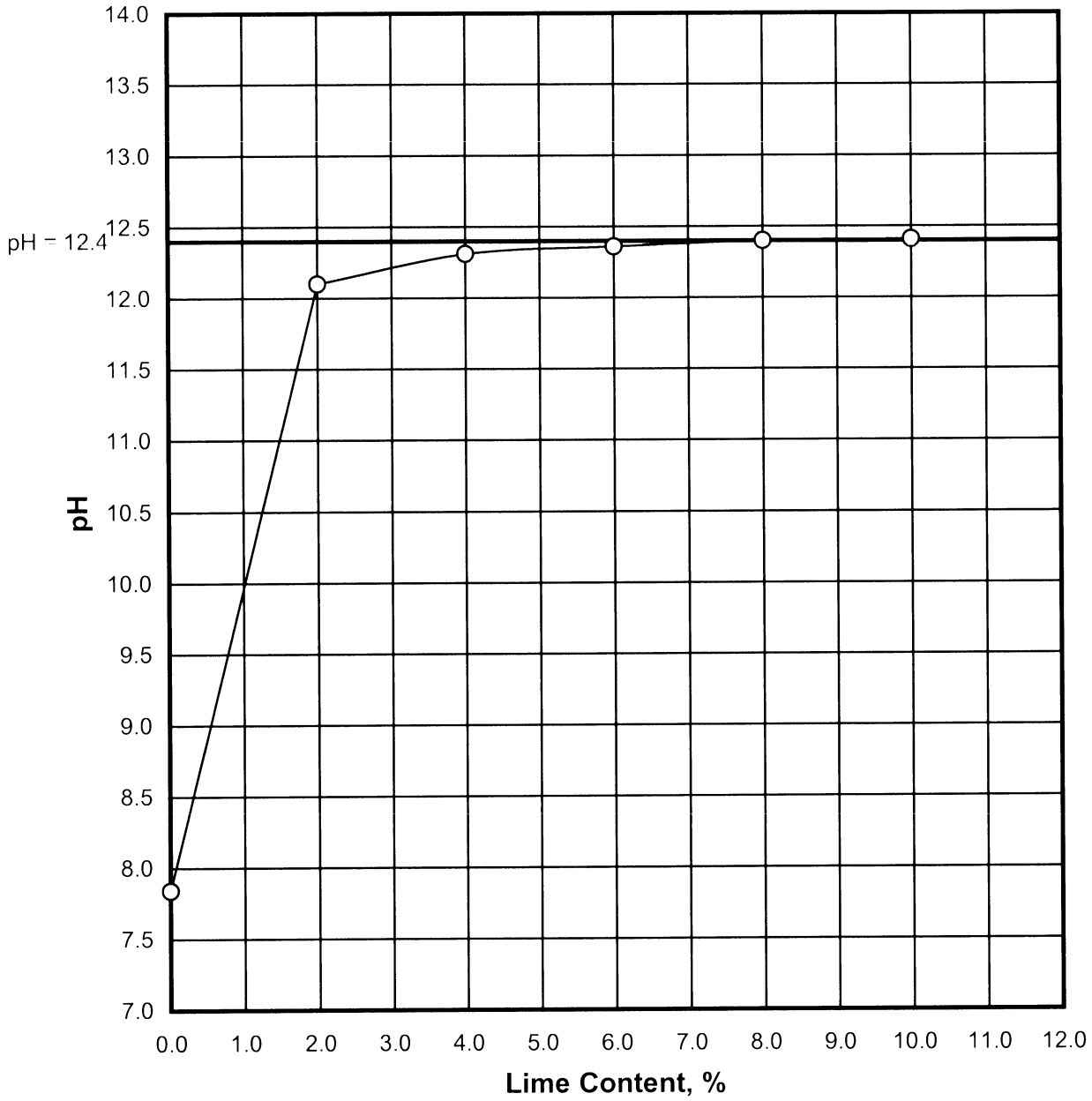
Percent Lime at pH of 12.4: 5.0 %

Lime (%)	pH
0.0	9.13
2.0	12.14
4.0	12.36
6.0	12.42
8.0	12.49
10.0	12.49

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-12



Boring: A-2
Depth, feet: 2-3
Sample Description: Brown Clay
Liquid Limit: 69 %
Plastic Limit: 22 %
Plasticity Index: 47 %

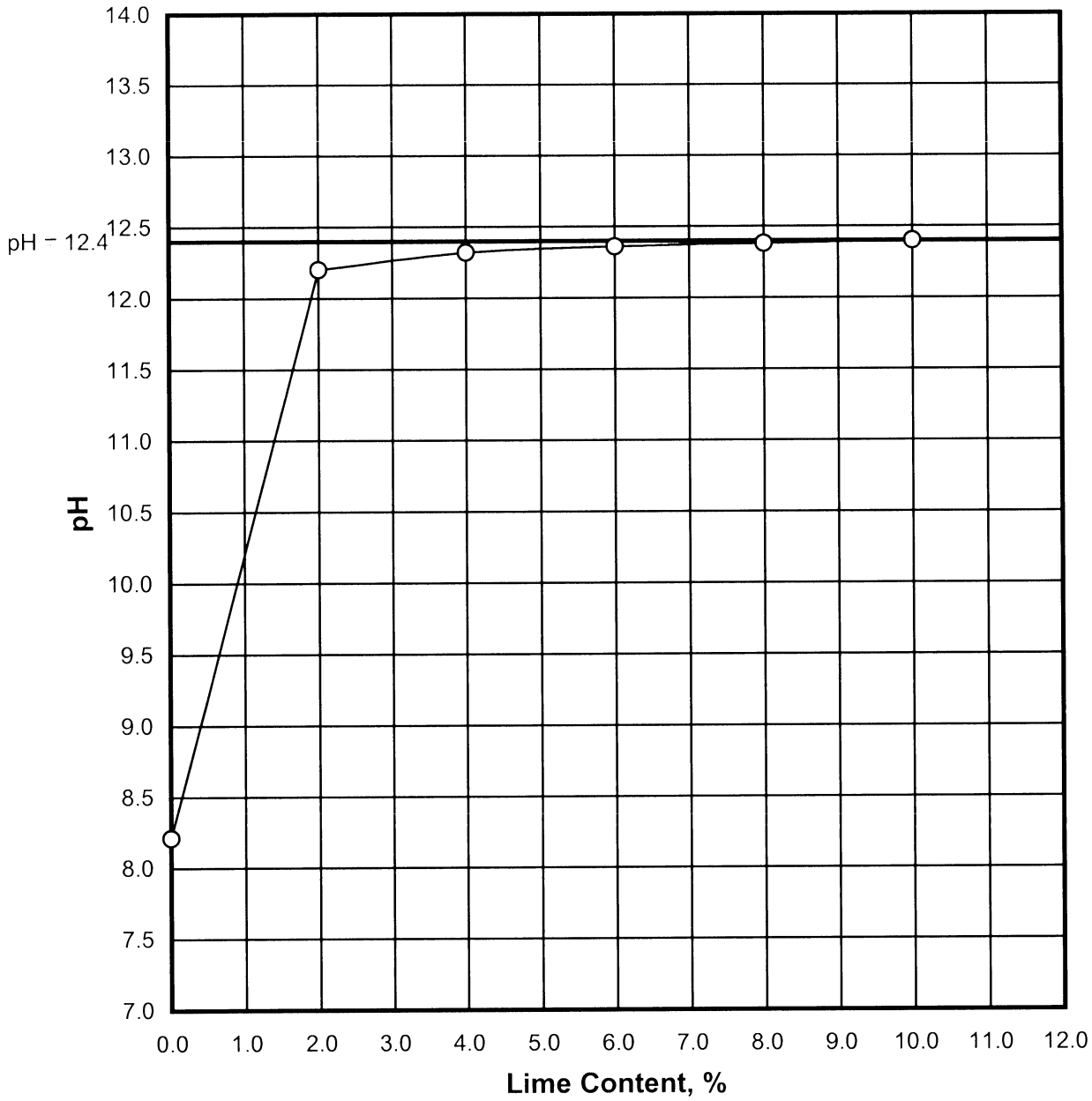
Percent Lime at pH of 12.4: 8.0 %

Lime (%)	pH
0.0	7.84
2.0	12.10
4.0	12.31
6.0	12.36
8.0	12.40
10.0	12.41

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-13



Boring: A-2
Depth, feet: 8-9
Sample Description: Light Brown Clay
Liquid Limit: 82 %
Plastic Limit: 24 %
Plasticity Index: 58 %

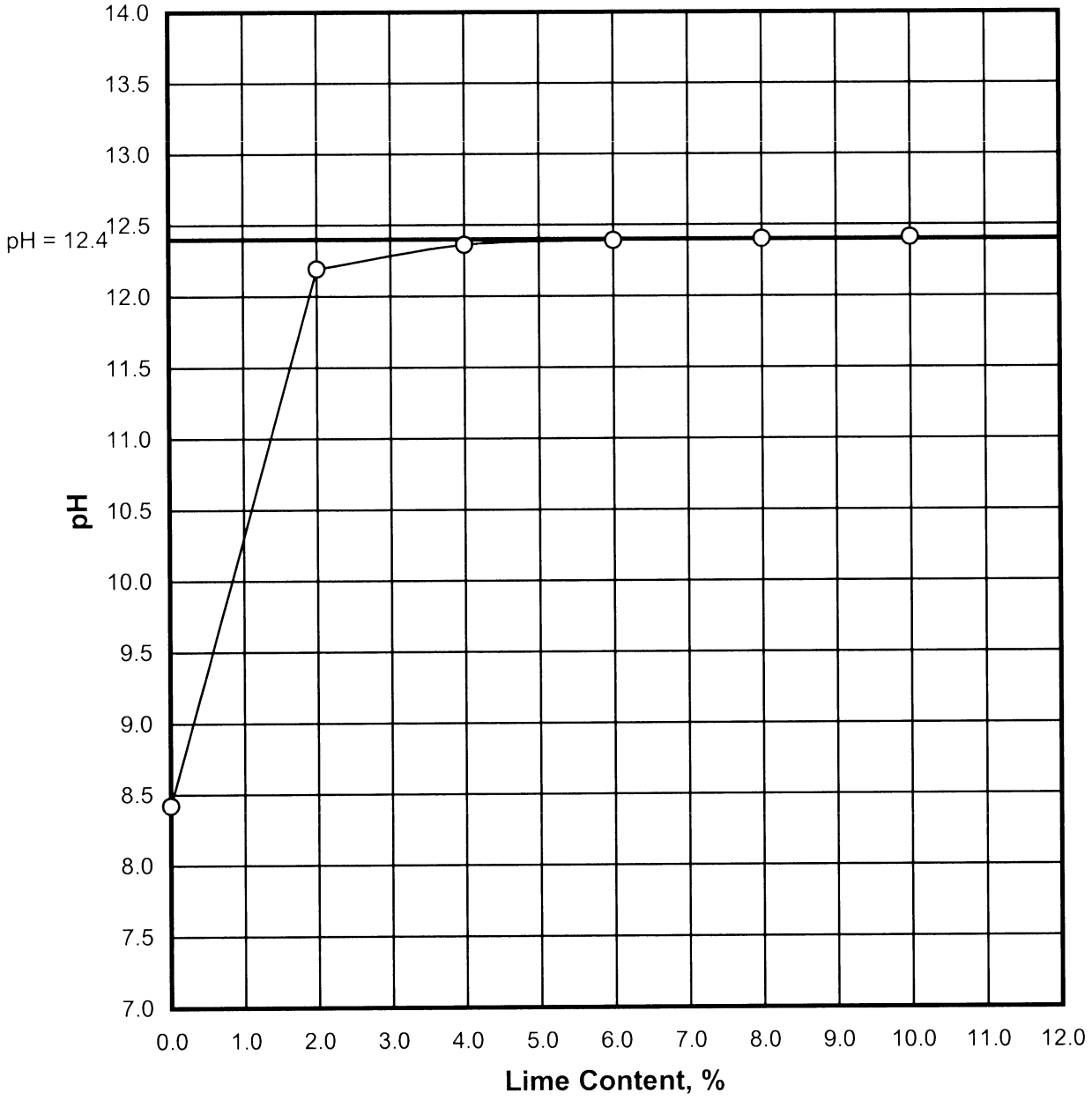
Percent Lime at pH of 12.4: 10.0 %

Lime (%)	pH
0.0	8.21
2.0	12.20
4.0	12.32
6.0	12.36
8.0	12.38
10.0	12.40

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-14



Boring: A-3
Depth, feet: 2-3
Sample Description: Brown Clay
Liquid Limit: 66 %
Plastic Limit: 23 %
Plasticity Index: 43 %

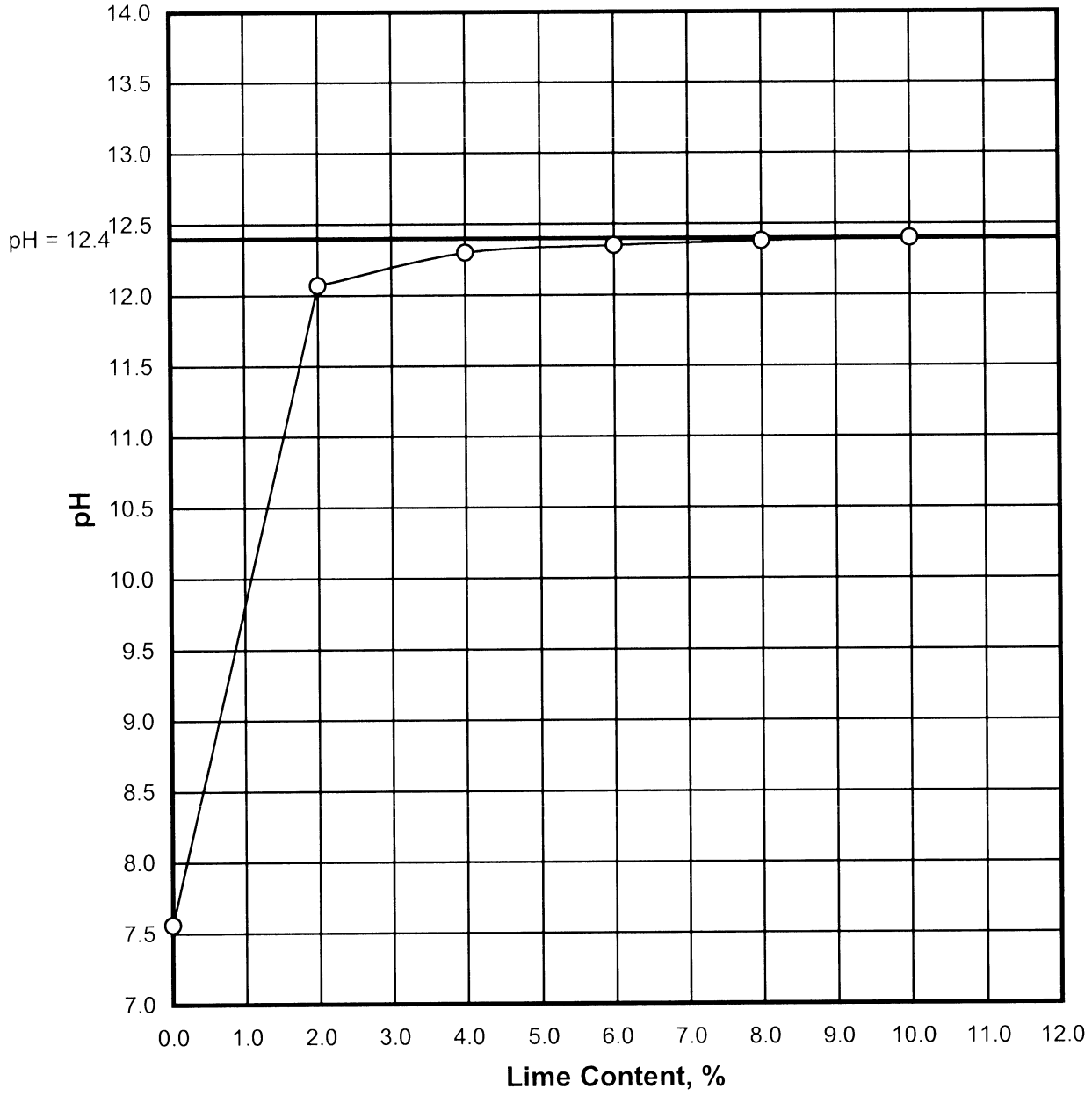
Percent Lime at pH of 12.4: 8.0 %

Lime (%)	pH
0.0	8.42
2.0	12.19
4.0	12.36
6.0	12.39
8.0	12.40
10.0	12.41

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-15



Boring: A-4
Depth, feet: 2-3
Sample Description: Brown Clay
Liquid Limit: 74 %
Plastic Limit: 21 %
Plasticity Index: 53 %

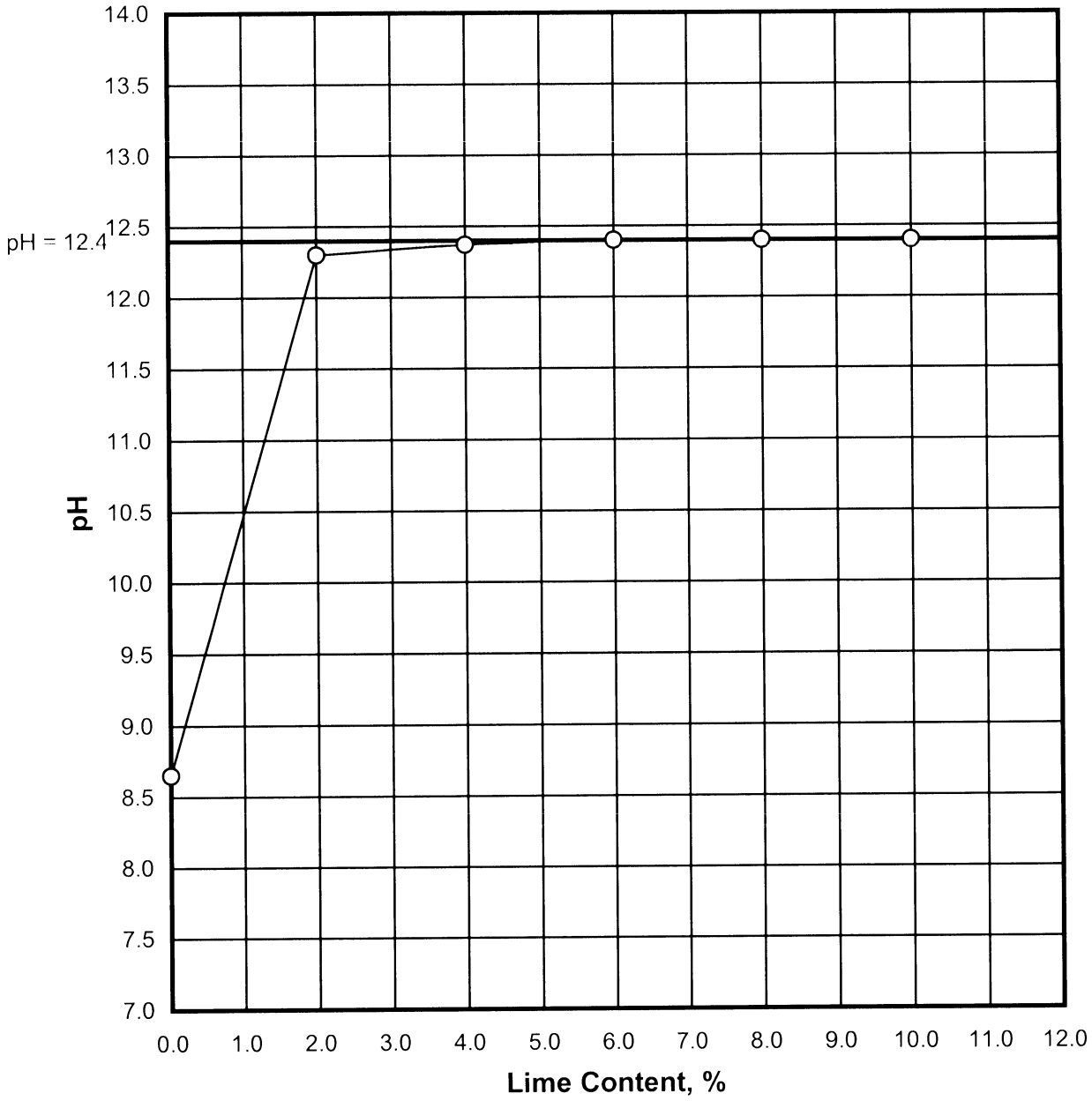
Percent Lime at pH of 12.4: 10.0 %

Lime (%)	pH
0.0	7.56
2.0	12.07
4.0	12.30
6.0	12.35
8.0	12.38
10.0	12.40

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-16



Boring: A-4
Depth, feet: 14-15
Sample Description: Tan Clay
Liquid Limit: 54 %
Plastic Limit: 20 %
Plasticity Index: 34 %

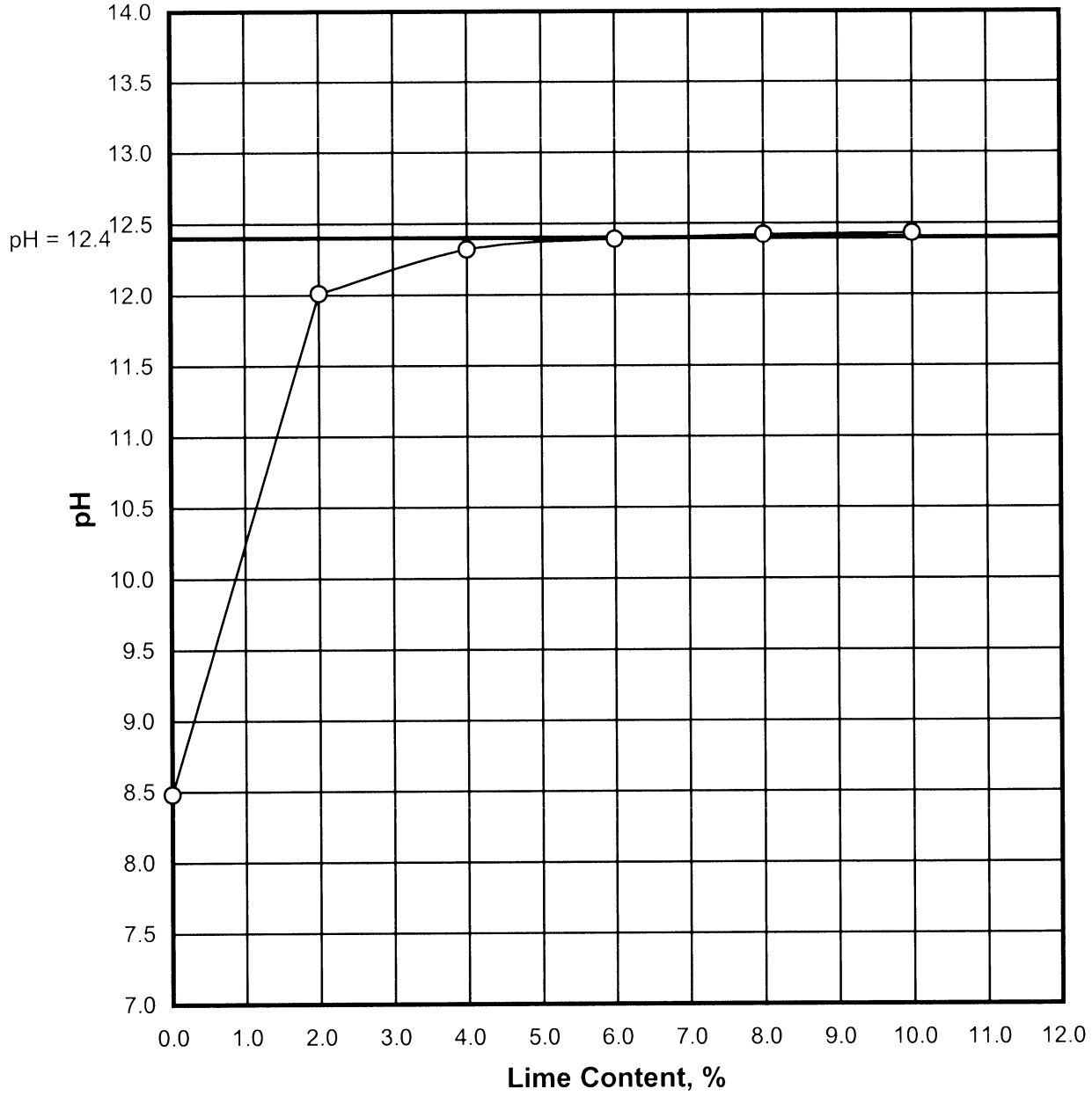
Percent Lime at pH of 12.4: 6.0 %

Lime (%)	pH
0.0	8.65
2.0	12.30
4.0	12.37
6.0	12.40
8.0	12.40
10.0	12.40

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-17



Approximate Location: Sta. 1012+00 Centerline SH-121
Sample Description: P-1C, Dark Brown Clay
Liquid Limit: 72 %
Plastic Limit: 26 %
Plasticity Index: 46 %

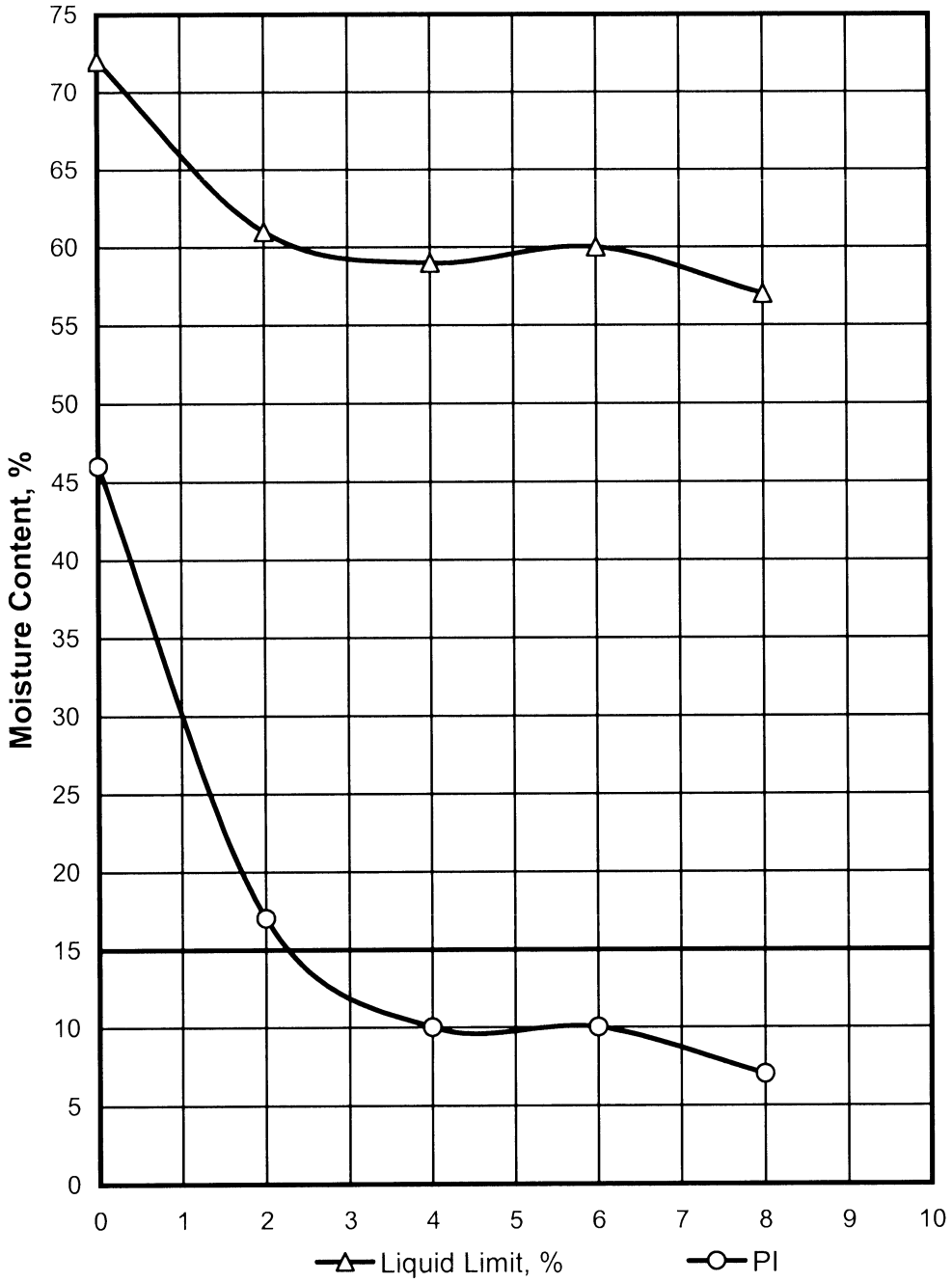
Percent Lime at pH of 12.4: 7 %

Lime (%)	pH
0.0	8.48
2.0	12.01
4.0	12.32
6.0	12.39
8.0	12.42
10.0	12.43

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE G-18



Approximate Location: Sta. 1012+00 Centerline SH-121
Sample Description: P-1C, Dark Brown Clay

Liquid Limit: 72 %
Plastic Limit: 26 %
Plasticity Index: 46 %

Percent Lime at pH of 12.4: 7 %

Lime (%)	PI	LL %
0.0	46.00	72
2.0	17.00	61
4.0	10.00	59
6.0	10.00	60
8.0	7.00	57

LIME - PI SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

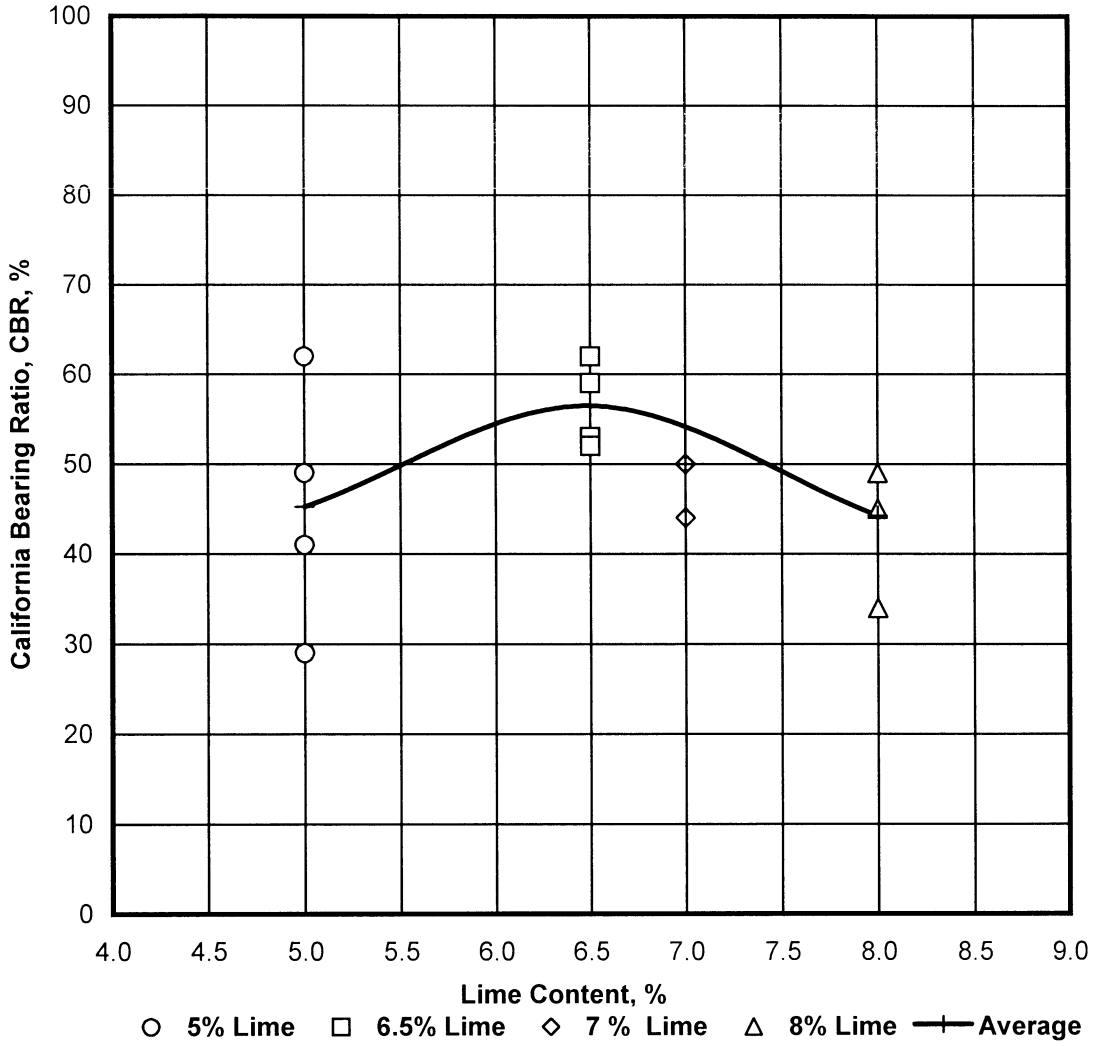
Terracon
Terracon Project 94065243

FIGURE G-19

6. Exhibit H

EXHIBIT H

Laboratory Test Results for Lime Treated Soils



Sample Description: Bulk Sample P-1C, Dark Brown Clay, LL=72, PI=46, 5, 6.5, and 8% Lime

Sample Description: Bulk Sample P-1A, Dark Brown Clay, LL=67, PI=39, 7% Lime

Lime, %	Moisture Content, %	Molded Dry Density, pcf	CBR, %
5.0	36.9	80.7	62.0
5.0	38.6	79.5	49.0
5.0	38.6	79.4	41.0
5.0	41.1	76.8	29.0
6.5	35.9	81.6	59.0
6.5	37.0	81.0	62.0
6.5	38.4	79.6	53.0
6.5	38.9	79.6	52.0
7.0	28.7	89.2	44.0
7.0	26.5	90.1	50.0
8.0	37.4	74.2	49.0
8.0	37.4	77.8	49.0
8.0	37.4	79.5	45.0
8.0	39.6	78.0	34.0

CBR TEST RESULTS LIME TREATED CLAY

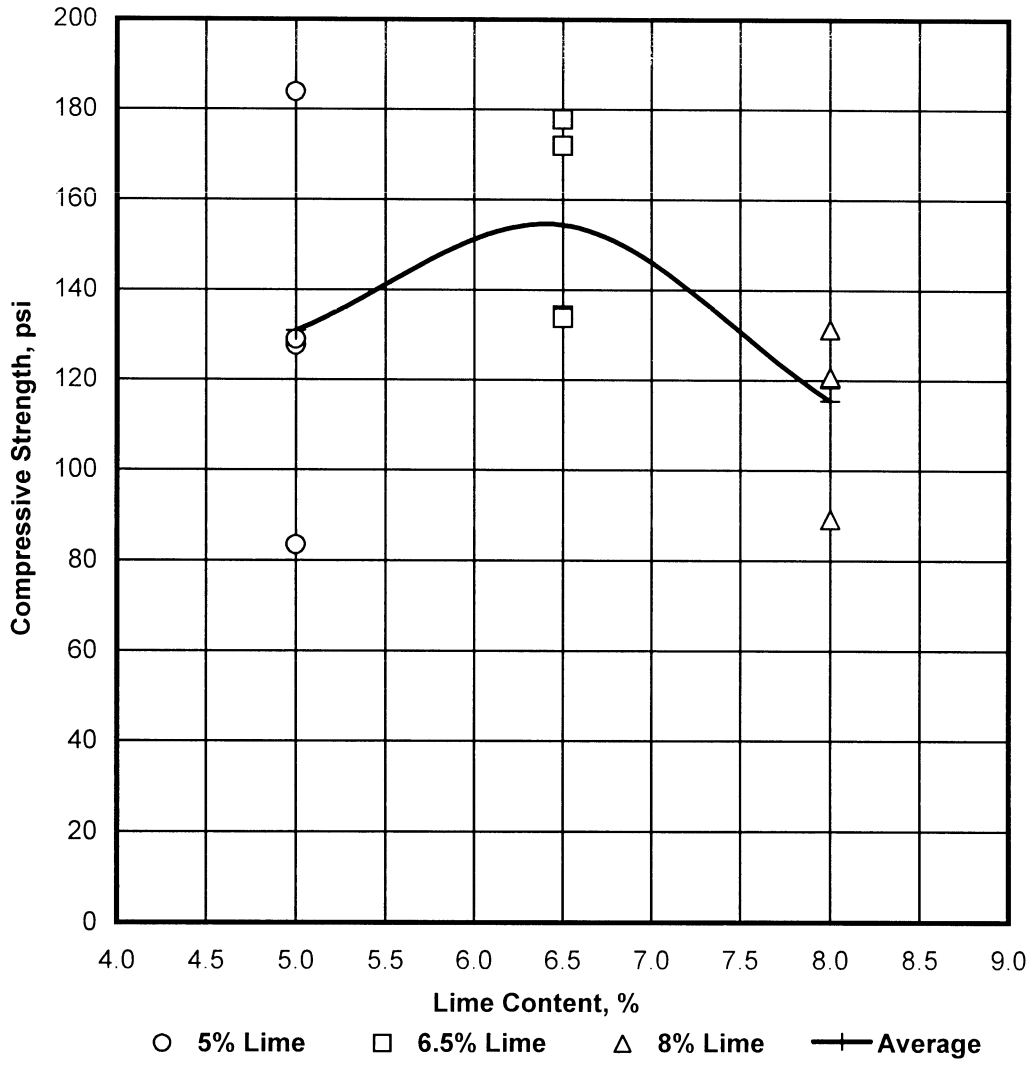
SH-121 MANAGED LANES

COLLIN COUNTY, TEXAS

Terracon

Terracon Job No. 94065243

FIGURE H-1



Sample Description: Bulk Sample P-1C, Dark Brown Clay, LL=72, PI=46

Lime, %	Moisture Content, %	Molded Dry Density, pcf	Compressive Strength, psi	Failure Strain
5.0	36.9	80.7	183.8	1.8
5.0	38.6	79.5	127.6	2.2
5.0	38.6	79.4	129.0	2.7
5.0	41.1	76.8	83.5	2.5
6.5	35.9	81.6	177.8	2.0
6.5	37.0	81.0	171.9	2.1
6.5	38.4	79.6	134.3	2.7
6.5	38.9	79.6	133.8	2.7
8.0	37.4	74.2	131.3	2.6
8.0	37.4	77.8	120.4	2.7
8.0	37.4	79.5	120.7	2.8
8.0	39.6	78.0	89.1	2.8

STRENGTH TEST RESULTS LIME TREATED CLAY

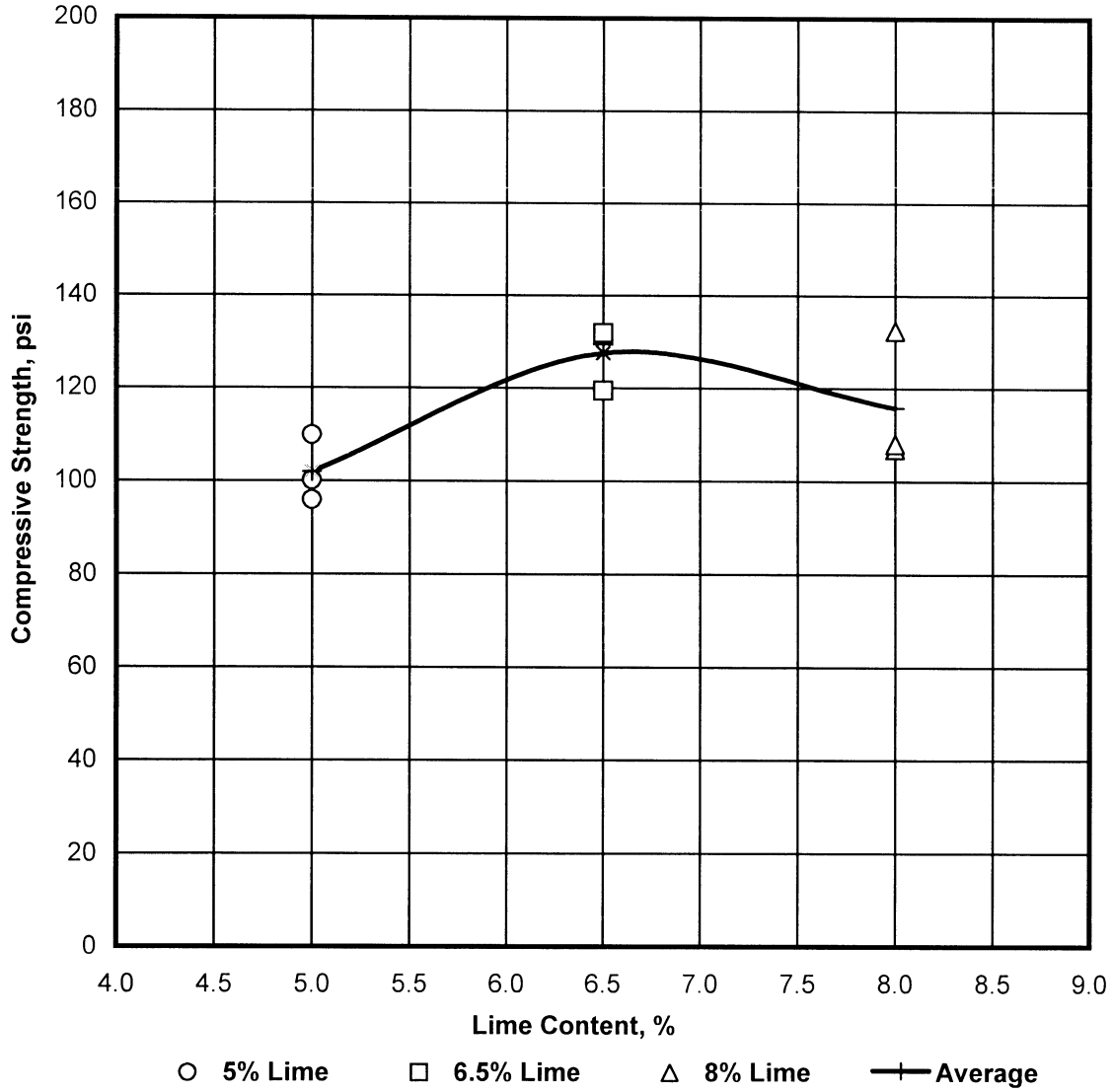
SH-121 MANAGED LANES

COLLIN COUNTY, TEXAS

Terracon

Terracon Job No. 94065243

FIGURE H-2



Sample Description: Bulk Sample P-1C, Dark Brown Clay, LL=72, PI=46

Lime, %	Molded Moisture Content, %	Molded Dry Density, pcf	Compressive Strength, psi	Failure Strain
5.0	47.1	72.0	96.0	1.6
5.0	47.1	72.0	100.1	1.1
5.0	47.1	72.6	109.9	1.1
6.5	43.5	75.1	131.4	1.7
6.5	43.5	75.0	119.5	2.0
6.5	43.5	75.2	131.9	1.6
8.0	43.7	74.1	107.0	1.9
8.0	43.7	74.1	132.4	1.6
8.0	43.7	74.7	108.1	1.7

STRENGTH TEST RESULTS LIME TREATED CLAY

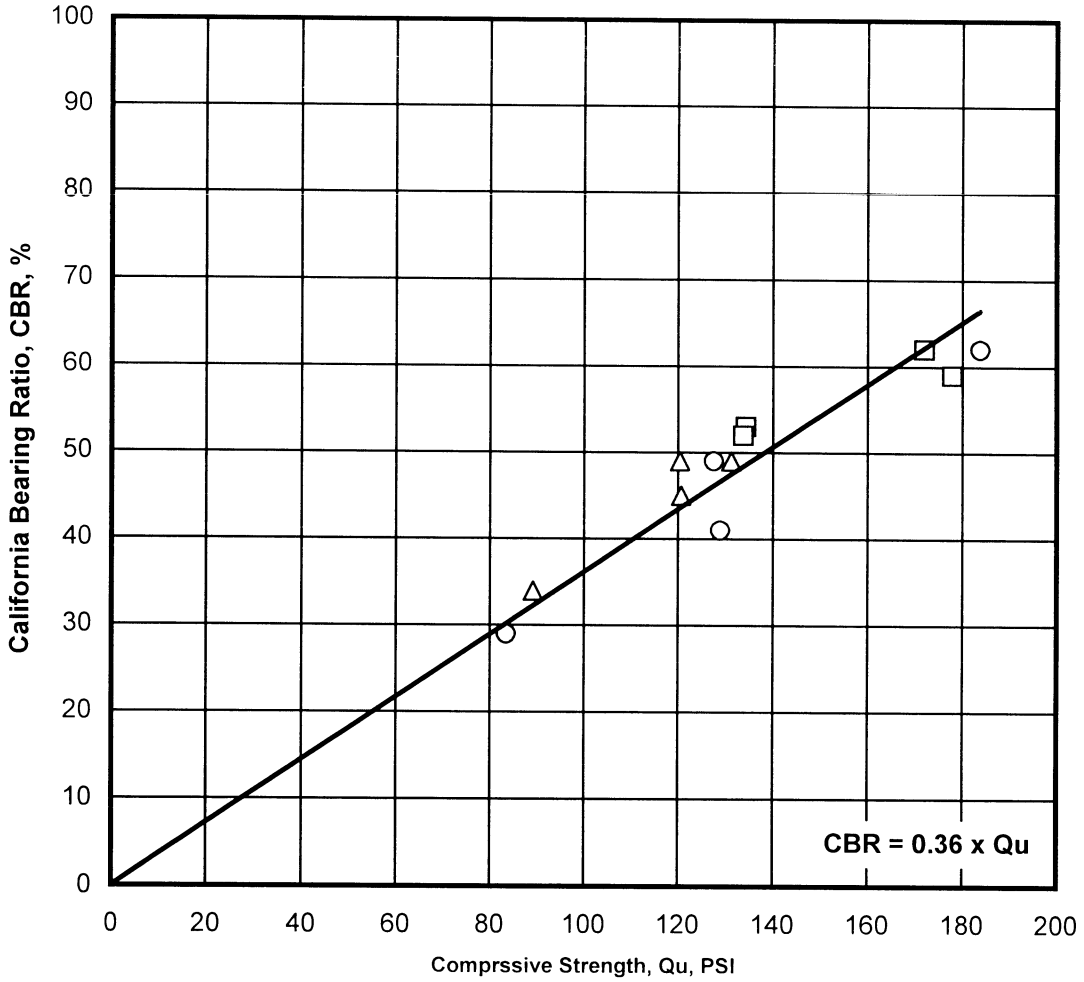
SH-121 MANAGED LANES

COLLIN COUNTY, TEXAS

Terracon

Terracon Job No. 94065243

FIGURE H-3



○ 5% Lime □ 6.5% Lime △ 8% Lime —— Linear (Trendline)

Sample Description: Bulk Sample P-1C, Dark Brown Clay, LL=72, PI=46, 5, 6.5, and 8% Lime

Lime, %	Moisture Content, %	Molded Dry Density, pcf	CBR, %	Compressive Strength, psi
5.0	36.9	80.7	62.0	183.8
5.0	38.6	79.5	49.0	127.6
5.0	38.6	79.4	41.0	129.0
5.0	41.1	76.8	29.0	83.5
6.5	35.9	81.6	59.0	177.8
6.5	37.0	81.0	62.0	171.9
6.5	38.4	79.6	53.0	134.3
6.5	38.9	79.6	52.0	133.8
8.0	37.4	74.2	49.0	131.3
8.0	37.4	77.8	49.0	120.4
8.0	37.4	79.5	45.0	120.7
8.0	39.6	78.0	34.0	89.1

CBR VS. COMPRESSIVE STRENGTHS FOR LIME TREATED CLAY

SH-121 MANAGED LANES

COLLIN COUNTY, TEXAS

Terracon

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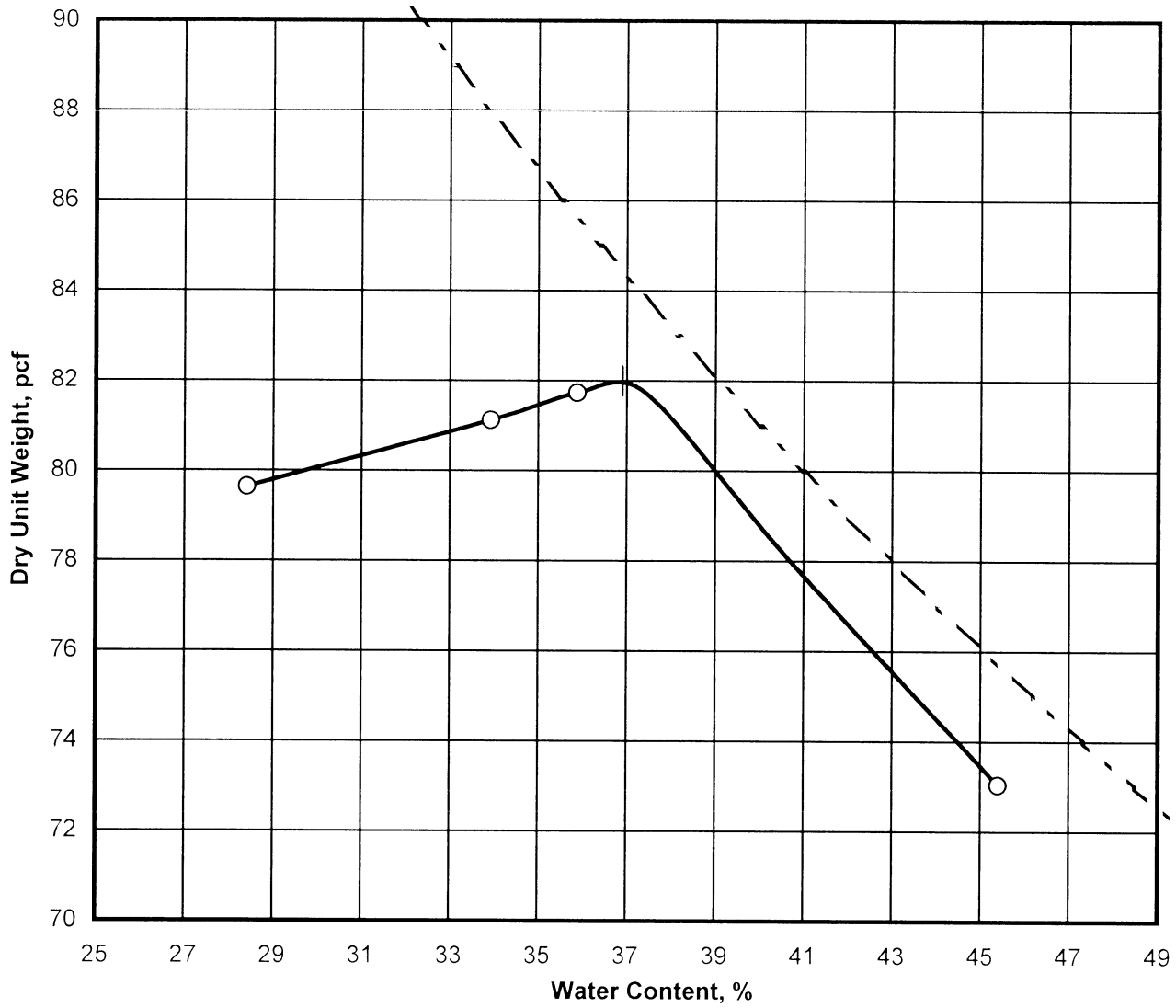
FIGURE H-4



△ **Maximum Dry Unit Weight**
○ **Data Points**
— - **Zero Air Voids**
\+ **Optimum Moisture at Maximum Dry Density**

Sample Location: Bulk Sample from near Boring P-1
Sample Description: Dark Brown Clay treated with 3% Lime

Optimum Moisture Content:	36.9	%
Maximum Dry Density	82.0	pcf

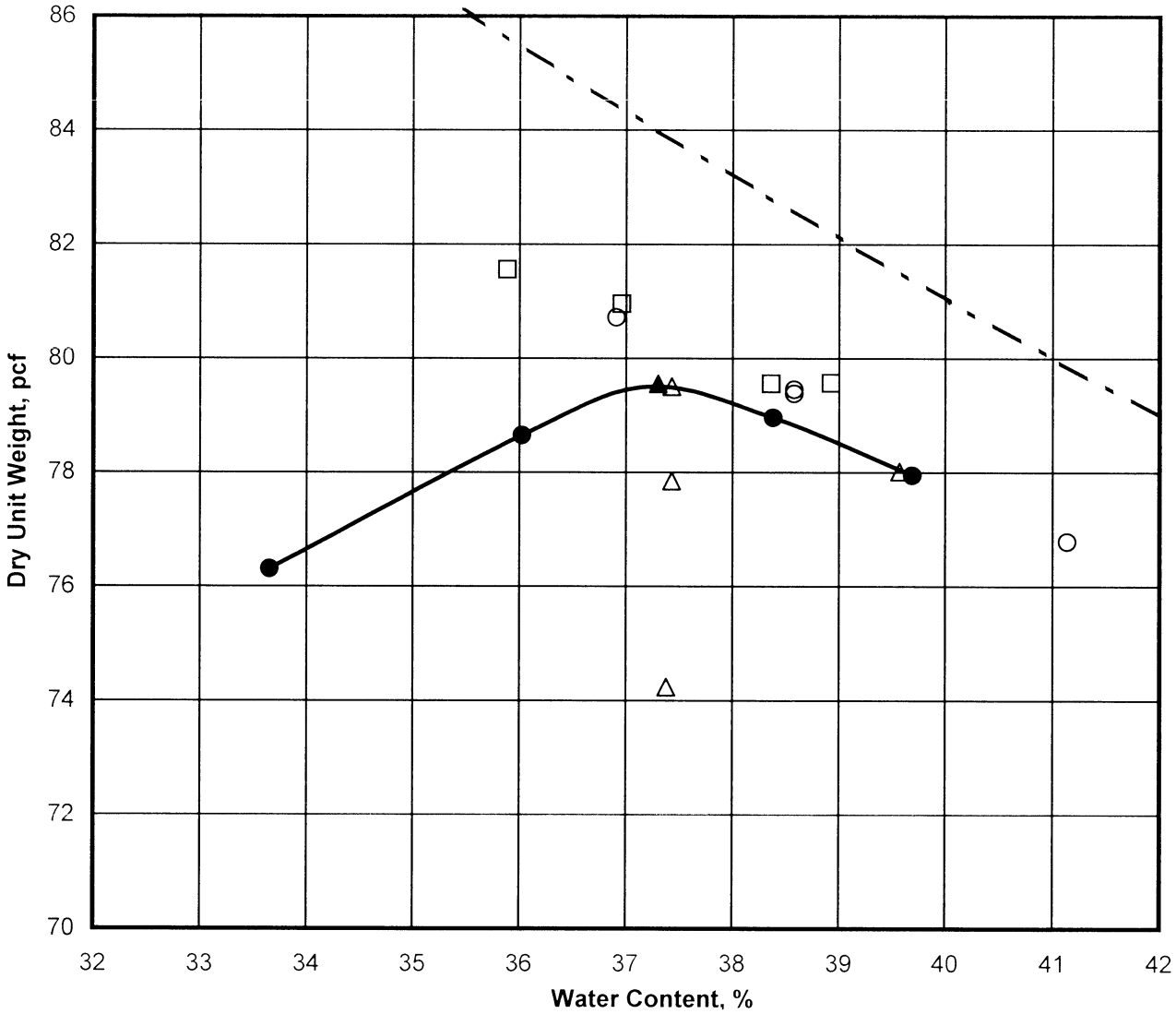
Test Method: ASTM D-698, Method A

STANDARD PROCTOR CLAY TREATED WITH 3% LIME
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon

Terracon Job No. 94065243

FIGURE H-5



▲ **Maximum Dry Unit Weight** — - **Zero Air Voids**

● **Proctor Data Points** □ **CBR and Strength Tests at 6.5 % Lime**

○ **CBR and Strength Tests at 5.0 % Lime** △ **CBR and Strength Tests at 8 % Lime**

Sample Description:	Dark Brown Clay with 6.5 % Lime	
Natural Liquid Limit:	72	%
Natural Plastic Limit:	26	%
Natural Plasticity Index:	46	
Passing No. 200		%
Optimum Moisture Content:	37.3	%
Maximum Dry Density	79.6	pcf

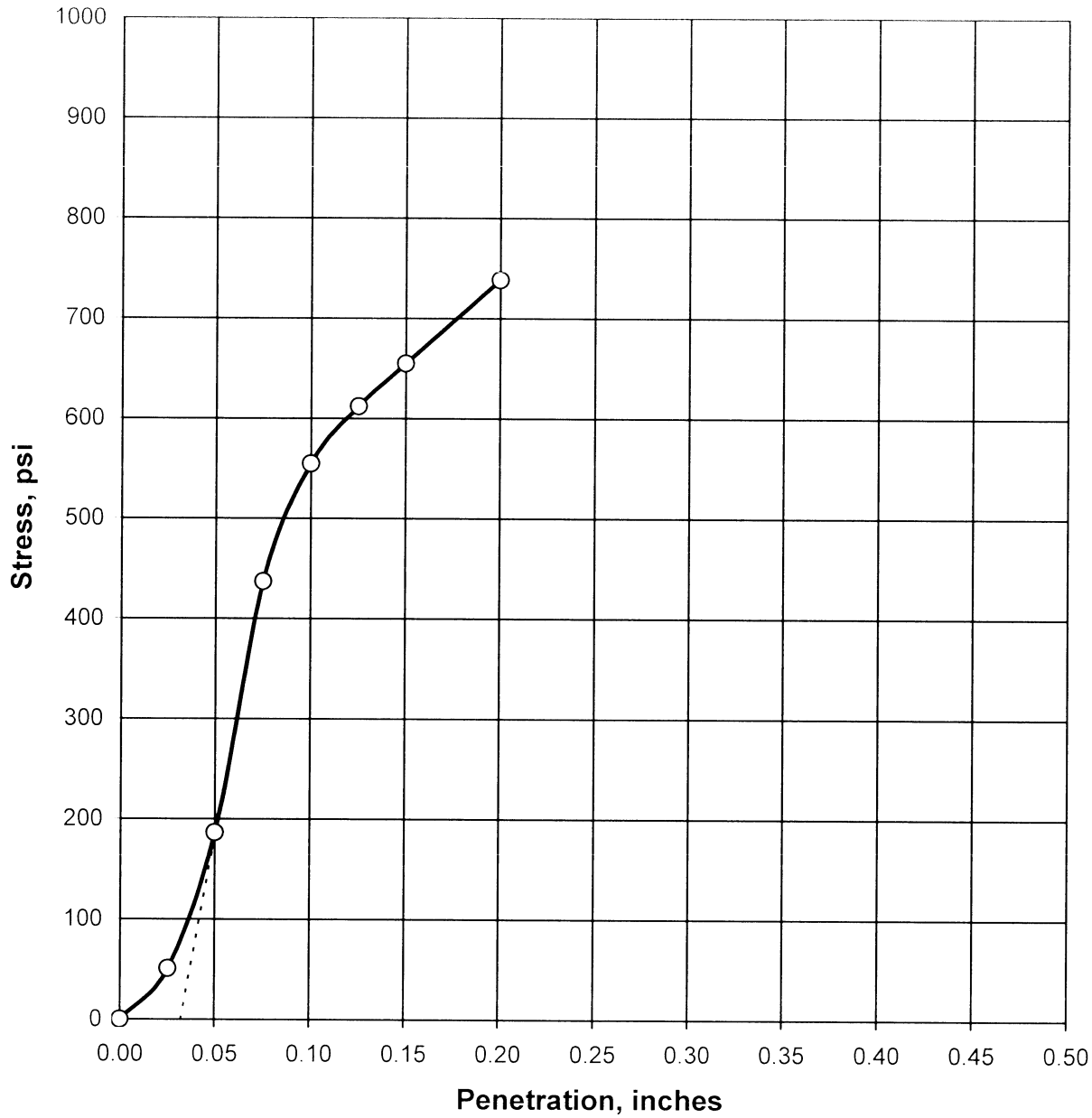
Test Method: ASTM D-698, Method A

STANDARD PROCTOR ON DARK BROWN CLAY
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon

Terracon Job No. 94065243

FIGURE H-6



Test Method ASTM D 1883-99

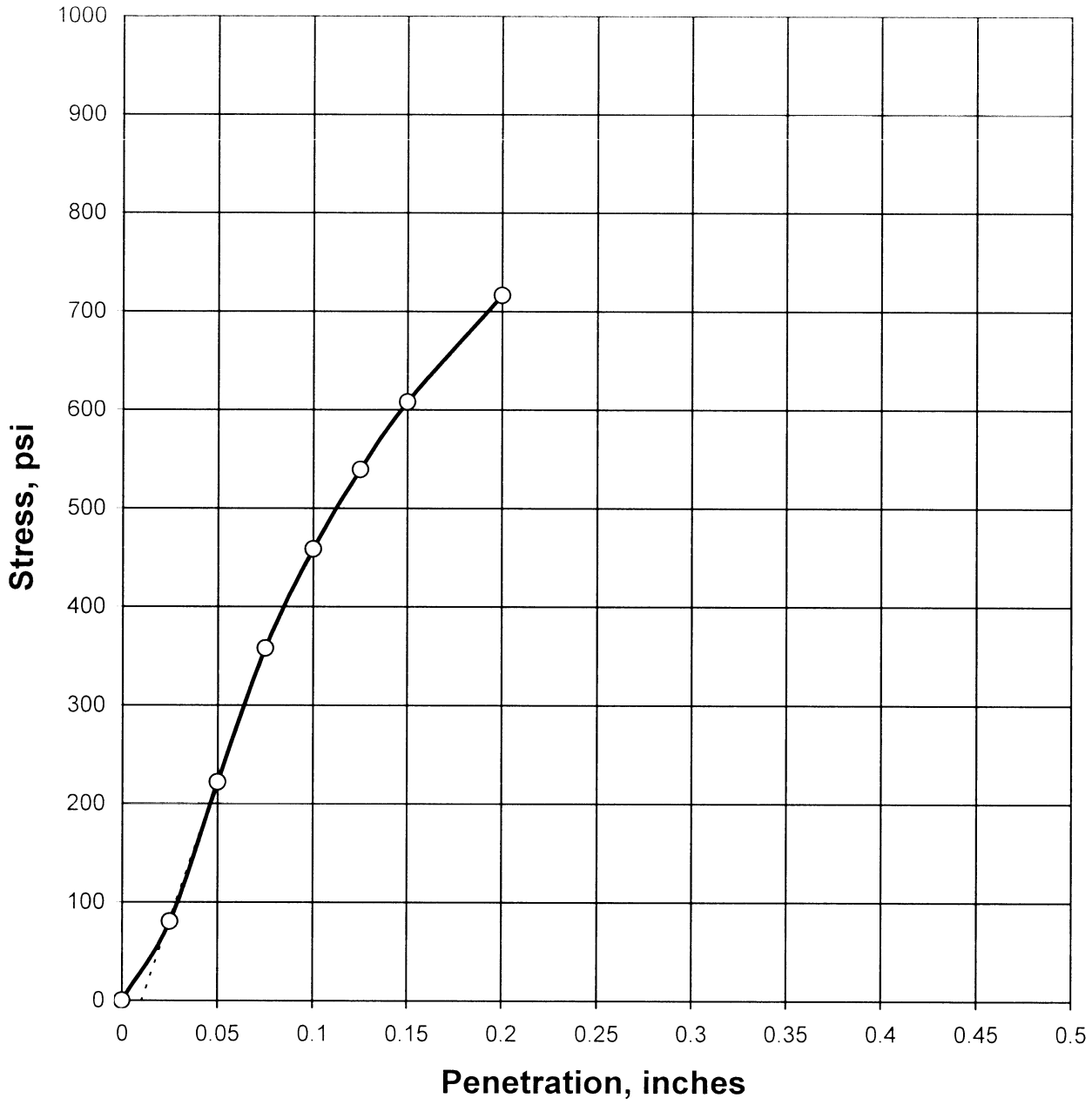
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 5% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	80.7	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	36.9%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	62.0	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 1 RESULTS
CLAY WITH 5 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-7



Test Method ASTM D 1883-99

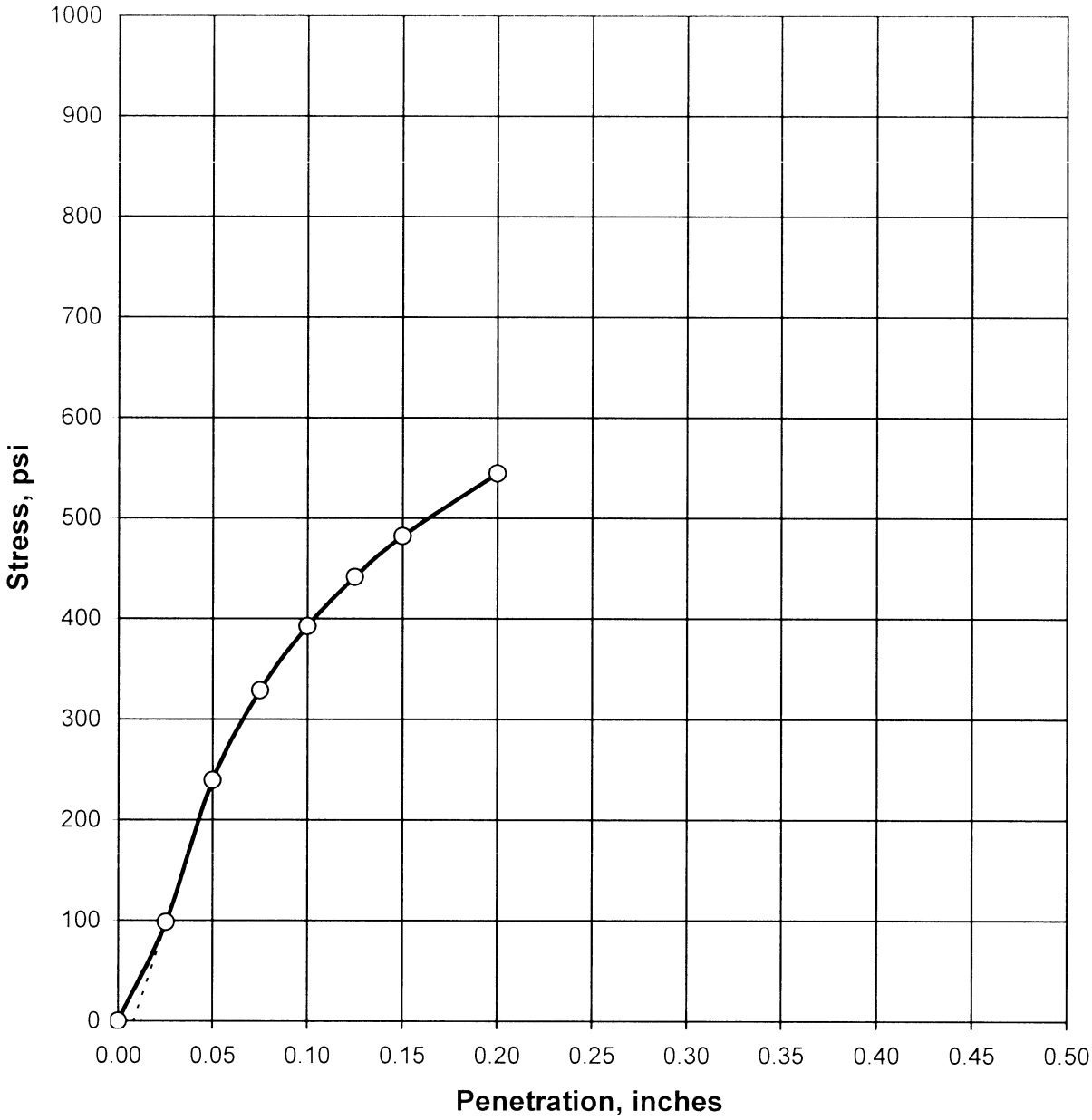
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 5% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	79.5	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	38.6%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	49	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 2 RESULTS
CLAY WITH 5 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-8



Test Method ASTM D 1883-99

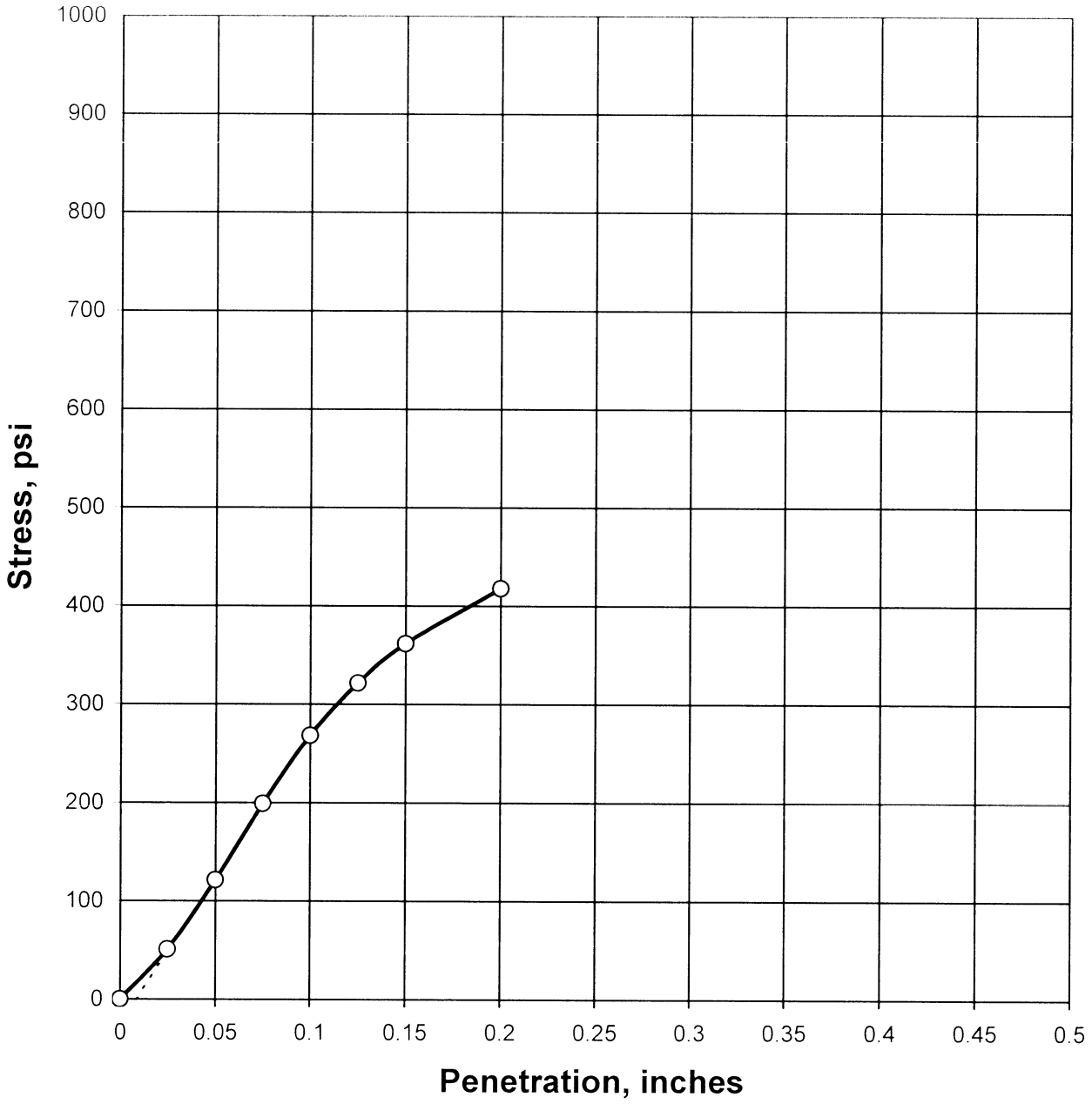
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 5% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	79.4	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	38.6%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	41.0	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 3 RESULTS
CLAY WITH 5 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-9



Test Method ASTM D 1883-99

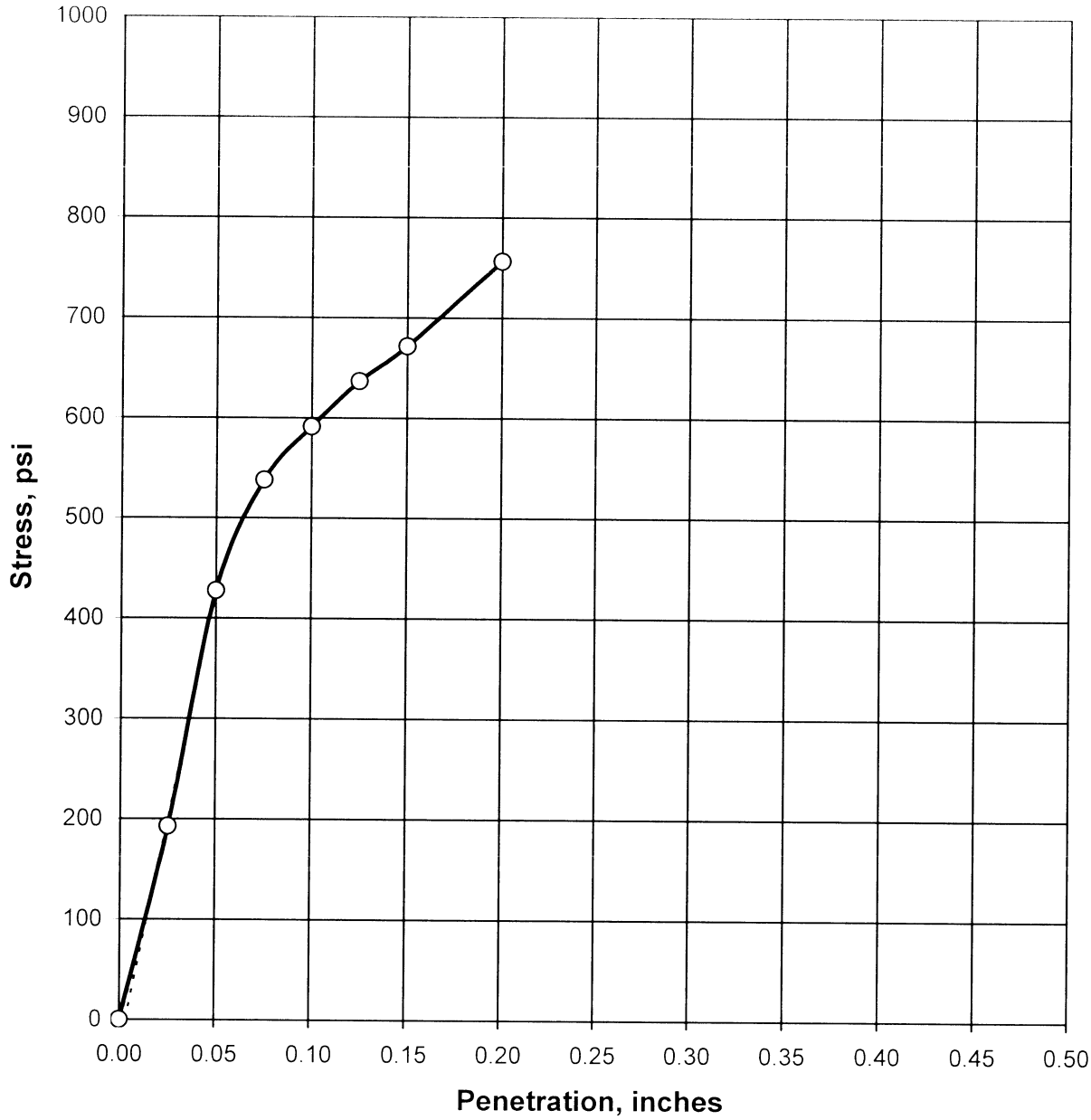
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 5% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	76.8	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	41.1%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	29	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 4 RESULTS
CLAY WITH 5 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-10



Test Method ASTM D 1883-99

Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 6.5% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	81.6	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	35.9%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	59.0	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 5 RESULTS
CLAY WITH 6.5 % LIME

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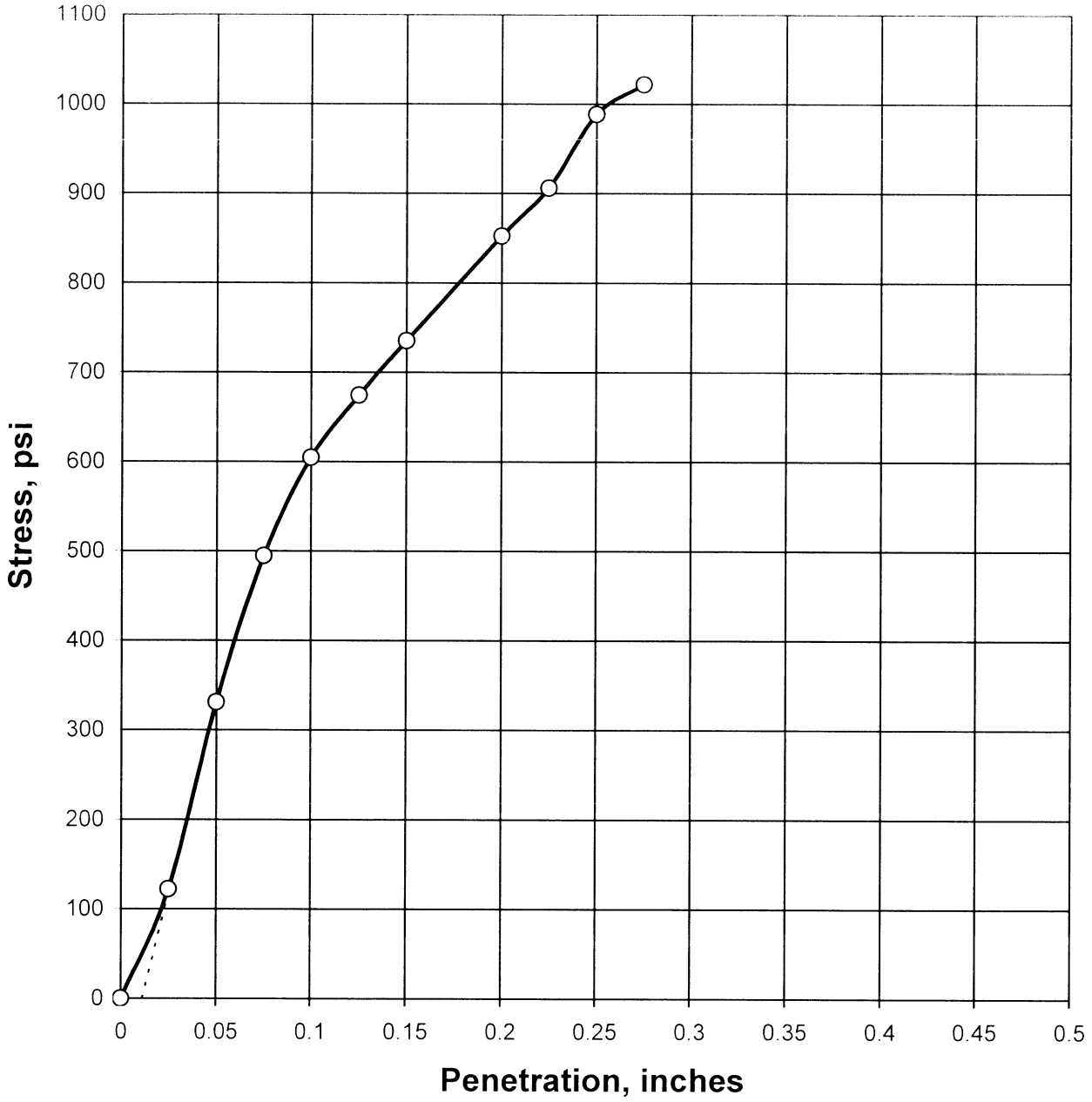
Terracon Job No. 94065243

FIGURE H-11



Test Method ASTM D 1883-99

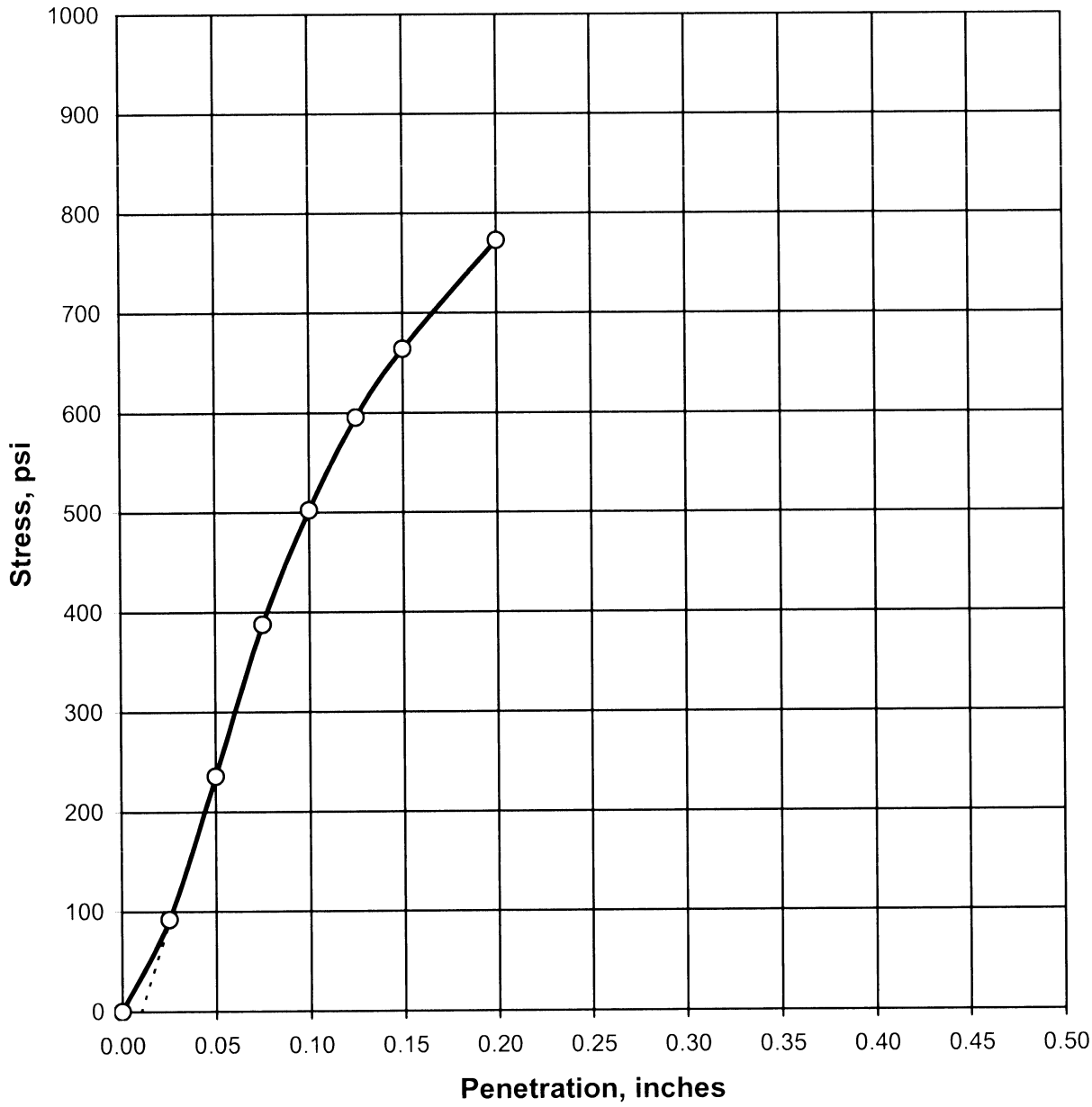
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 6.5% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	81.0	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	37.0%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	62	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 6 RESULTS
CLAY WITH 6.5 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-12



Test Method ASTM D 1883-99

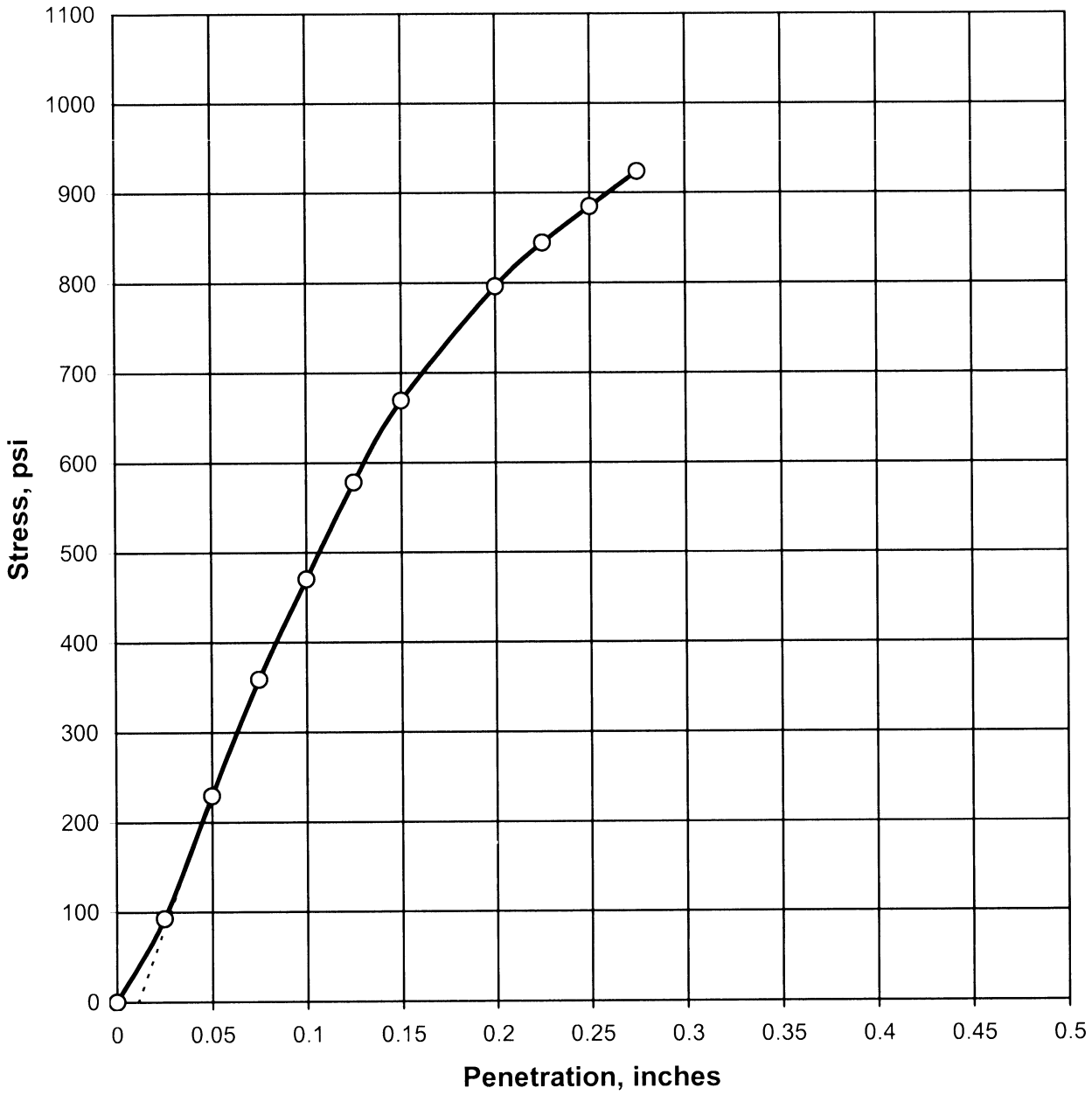
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 6.5% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	79.6	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	38.4%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	53.0	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 7 RESULTS
CLAY WITH 6.5 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-13



Test Method ASTM D 1883-99

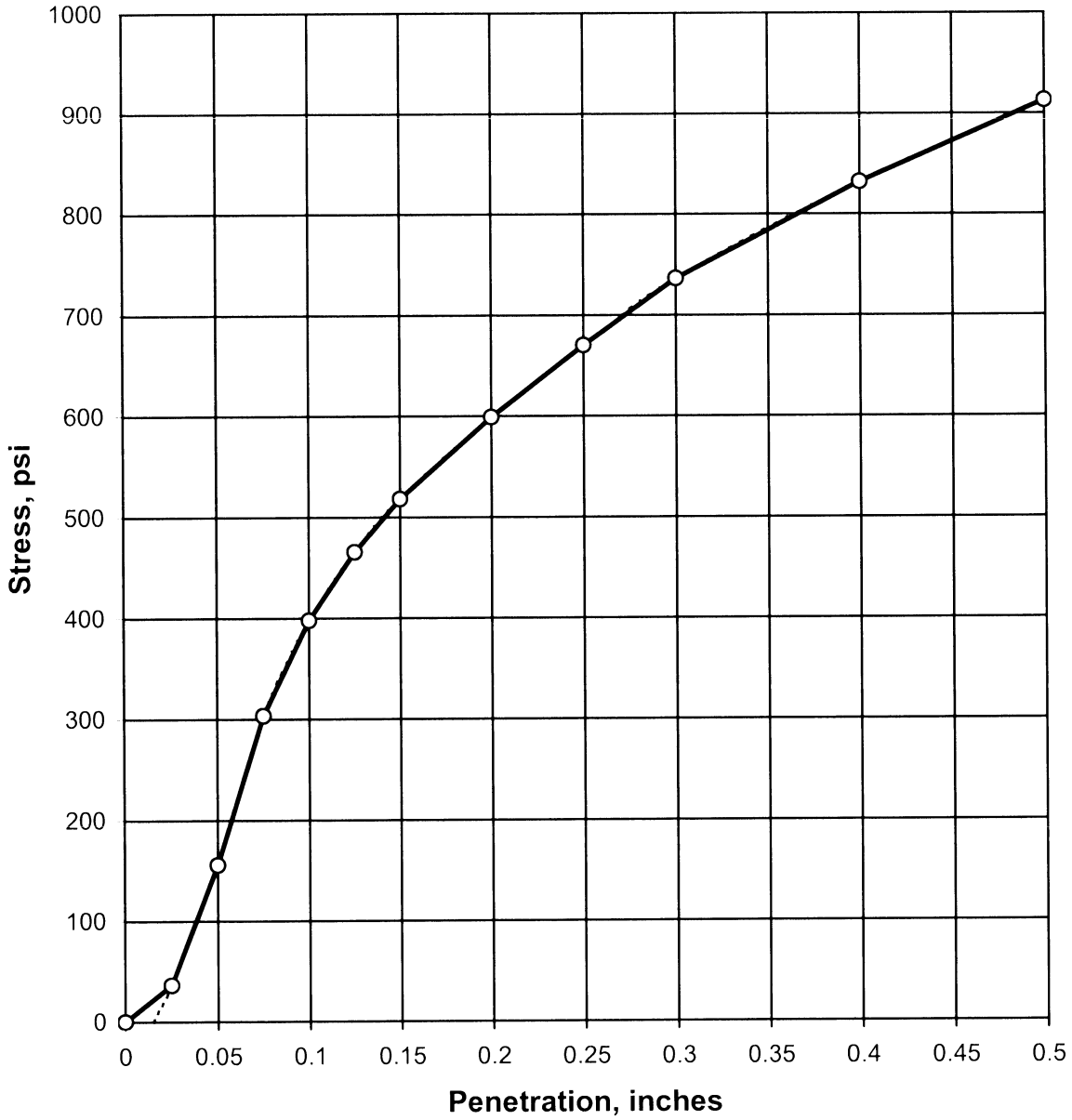
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 6.5% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	79.6	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	38.9%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	52	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 8 RESULTS
CLAY WITH 6.5 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-14



Test Method ASTM D 1883-99

Boring No.	P-1A			
Sample Preparation:	Sample Compacted at Standard Proctor, Near Optimum			
Sample Description:	Dark brown clay			
Natural Liquid Limit:	67	Molded Dry Density:	89.2	pcf
Natural Plasticity Index:	39	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	28.7%	Moisture Content after test:	30.5%	
Swell:	0.1%			
Soaked CBR at 0.1 inch Penetration:	44.0	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 9 RESULTS
LIME CONTENT 7 % NEAR OPTIMUM MOISTURE CONTENT

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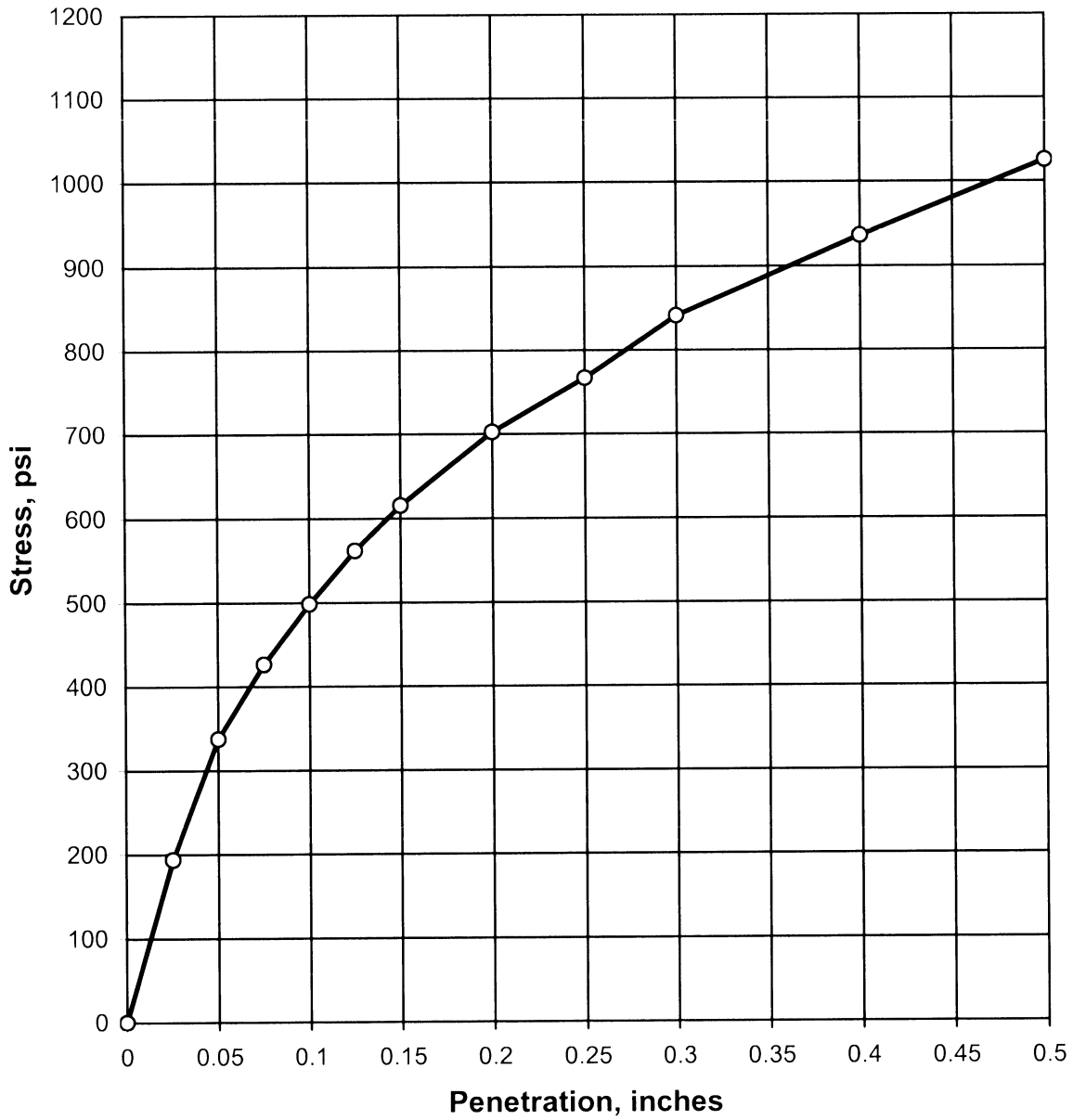
FIGURE H-15



Test Method ASTM D 1883-99

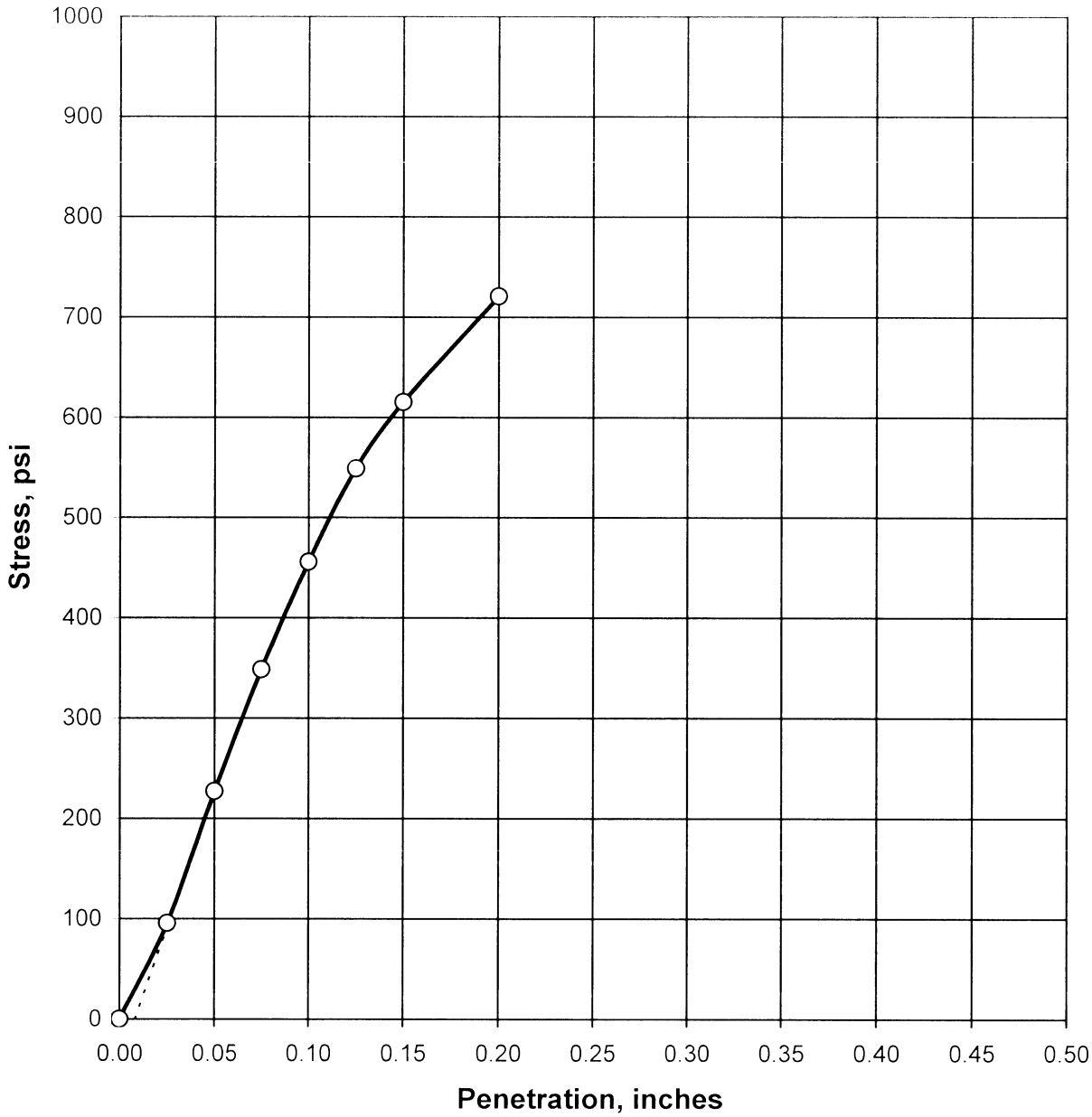
Boring No.	P-1A		
Sample Preparation:	Sample Compacted at Standard Proctor, Wet of Optimum		
Sample Description:	Dark brown clay		
Liquid Limit:	67	Molded Dry Density:	90.1 pcf
Plasticity Index:	39	Maximum Dry Density:	pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:	
Molding Moisture Content:	26.5%	Moisture Content after test:	28.8%
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	50.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 10 RESULTS
LIME CONTENT 7 % AT 2% ABOVE OPTIMUM MOISTURE CONTENT

Terracon

Terracon Job No. 94065243

FIGURE H-16



Test Method ASTM D 1883-99

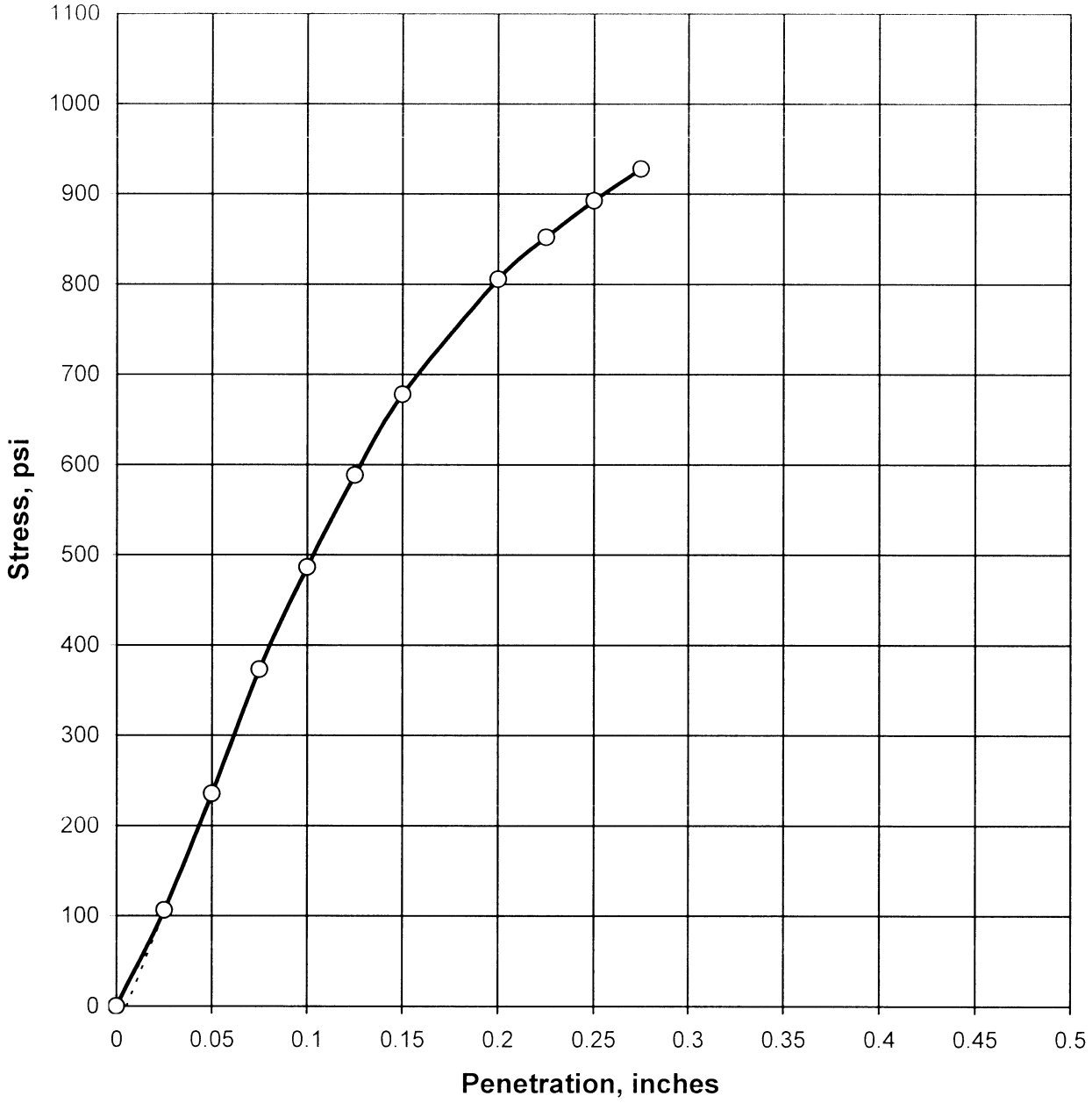
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 8.0% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	80.2	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	37.4%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	49	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 11 RESULTS
CLAY WITH 8.0 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-17



Test Method ASTM D 1883-99

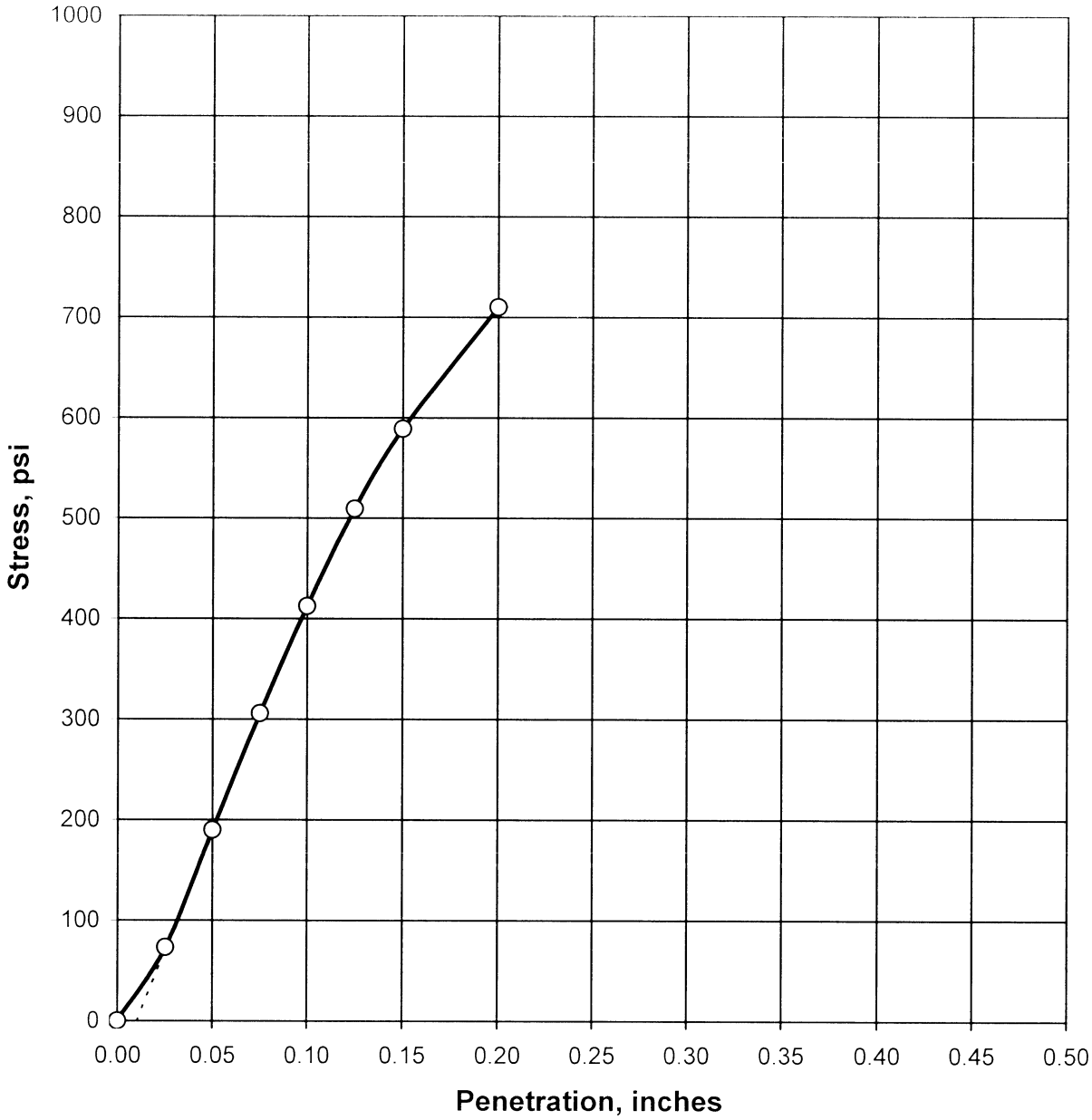
Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 8.0% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	80.1	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	37.5%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	49	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 12 RESULTS
CLAY WITH 8.0 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-18



Test Method ASTM D 1883-99

Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 8.0% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	80.1	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	37.5%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	45.0	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 13 RESULTS
CLAY WITH 8.0 % LIME

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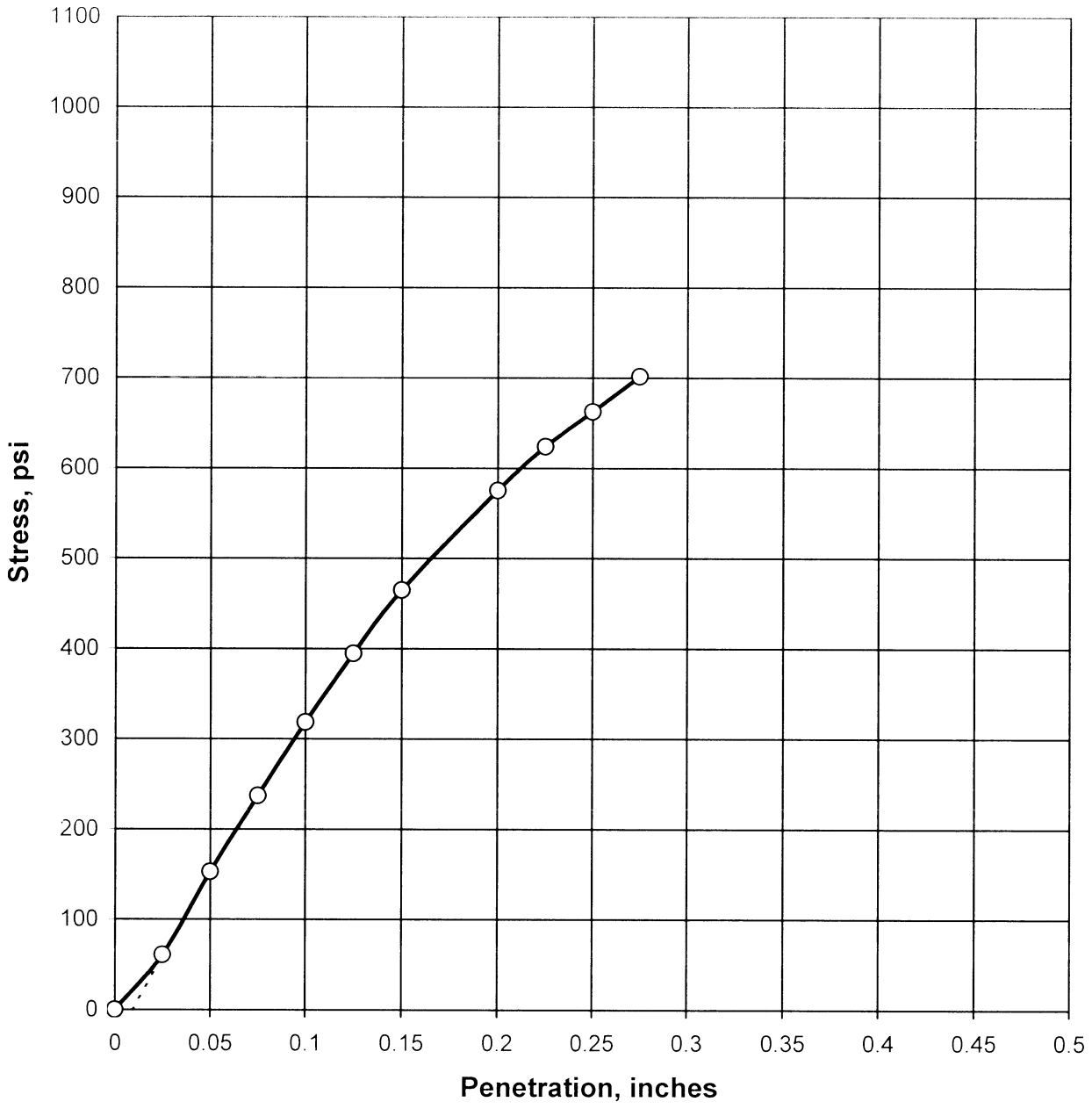
Terracon Job No. 94065243

FIGURE H-19



Test Method ASTM D 1883-99

Sample Preparation:	Standard Proctor			
Sample Description:	Dark Brown Clay with 8.0% Lime			
Natural Liquid Limit:	72	Molded Dry Density:	78.3	pcf
Natural Plasticity Index:	46	Maximum Dry Density:		pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:		
Molding Moisture Content:	39.6%	Moisture Content after test:		
Swell:	0.0%			
Soaked CBR at 0.1 inch Penetration:	34	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 14 RESULTS
CLAY WITH 8.0 % LIME

Terracon

Terracon Job No. 94065243

FIGURE H-20

Sample Designation	Lime Content %	Liquid Limit (%)	Plasticity Index	Unit Dry Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Surcharge Load psf	Swell
P1-Bulk	0.0	72	46	88.4	24.0	40.4	200	11.1%
P1-Bulk	0.0	72	46	89.4	23.6	39.5	200	9.8%
P1-Bulk	2.0			84.4	26.3	36.7	200	0.3%
P1-Bulk	2.0			87.8	26.1	33.2	200	0.3%
P1-Bulk	2.0			88.5	26.2	34.8	200	0.2%
P1-Bulk	4.0			86.3	26.9	34.7	200	0.0%
P1-Bulk	4.0			84.9	26.9	35.6	200	0.0%
P1-Bulk	4.0			87.1	26.7	33.9	200	0.2%
P1-Bulk	6.5			86.1	34.4	38.9	200	0.2%
P1-Bulk	6.5			79.6	34.5	40.2	200	0.2%
P1-Bulk	2.0			80.6	24.3	40.1	200	2.5%
P1-Bulk	2.0			82.2	23.2	39.5	200	2.3%
P1-Bulk	2.0			79.4	23.1	41.0	200	2.8%
P1-Bulk	4.0			71.5	27.1	44.4	200	0.2%
P1-Bulk	4.0			78.8	26.2	41.0	200	0.5%
P1-Bulk	4.0			69.7	27.6	44.6	200	0.6%
P1-Bulk	6.0			80.9	32.6	40.9	200	0.2%
P1-Bulk	6.0			79.5	32.3	41.2	200	0.0%
P1-Bulk	6.0			79.6	32.5	40.9	200	0.0%

SUMMARY OF SWELL TESTS ON LIME TREATED CLAYS

SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Project No. 94065243

FIGURE H-21

Sample Designation	Lime Content %	Liquid Limit (%)	Plasticity Index	Unit Dry Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Surcharge Load psf	Swell
P1A-Bulk	0.0	67	39					
P1A-Bulk	5.0			94.3	30.3	31.2	200	-0.2%
P1A-Bulk	5.0			92.9	30.1	31.3	200	-0.2%
P1A-Bulk	7.0			90.6	31.7	33.0	200	-0.2%
P1A-Bulk	7.0			90.2	31.4	32.3	200	0.0%
P2B-Bulk	0.0	47	27					
P2B-Bulk	5.0			103.0	23.8	24.8	200	0.0%
P2B-Bulk	5.0			100.0	24.4	26.8	200	0.0%
P2B-Bulk	7.0			102.1	24.3	25.6	200	0.0%
P2B-Bulk	7.0			98.9	24.4	27.6	200	0.2%

SUMMARY OF SWELL TESTS ON LIME TREATED CLAYS

SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

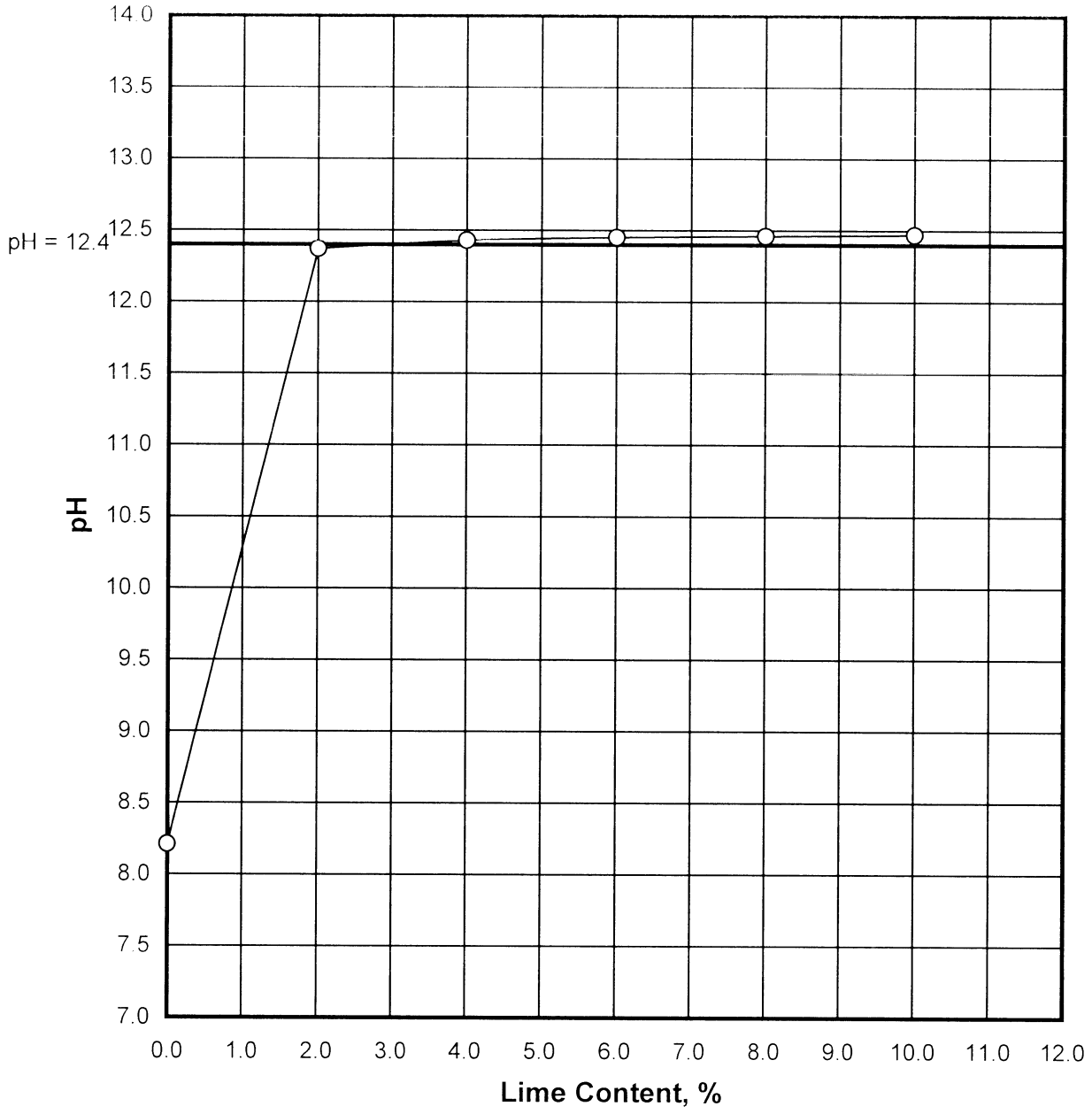
Terracon
Project No. 94065243

FIGURE H-22

7. Exhibit I

EXHIBIT I

Laboratory Test Results for Austin Chalk



Approximate Location: Weir Austin Chalk Quarry
Sample Description: Crushed Gray Limestone
Liquid Limit: 33 %
Plastic Limit: 18 %
Plasticity Index: 15 %

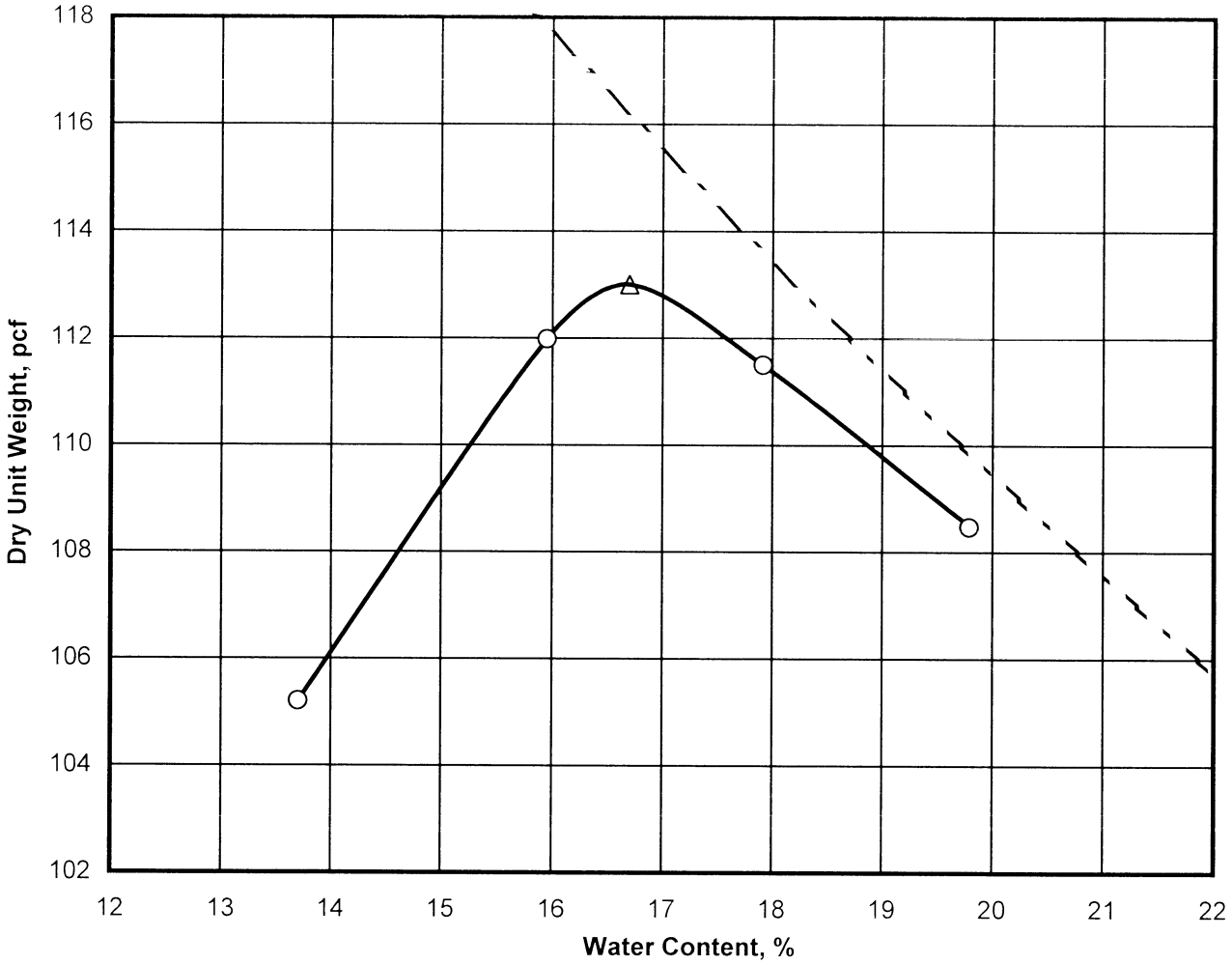
Percent Lime at pH of 12.4: 3.0 %

Lime (%)	pH
0.0	8.21
2.0	12.37
4.0	12.43
6.0	12.45
8.0	12.46
10.0	12.47

LIME - pH SERIES
SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Terracon Project 94065243

FIGURE I-1



○ **Data Points** △ **Maximum Dry Unit Weight** — - **Zero Air Voids**

Sample Description:	Laboratory Crushed Tan Austin Chalk - Rock Core	
Liquid Limit:	39	%
Plastic Limit:	18	%
Plasticity Index:	21	
Passing No. 200	18.9	%
Optimum Moisture Content:	16.7	%
Maximum Dry Density	113.0	pcf

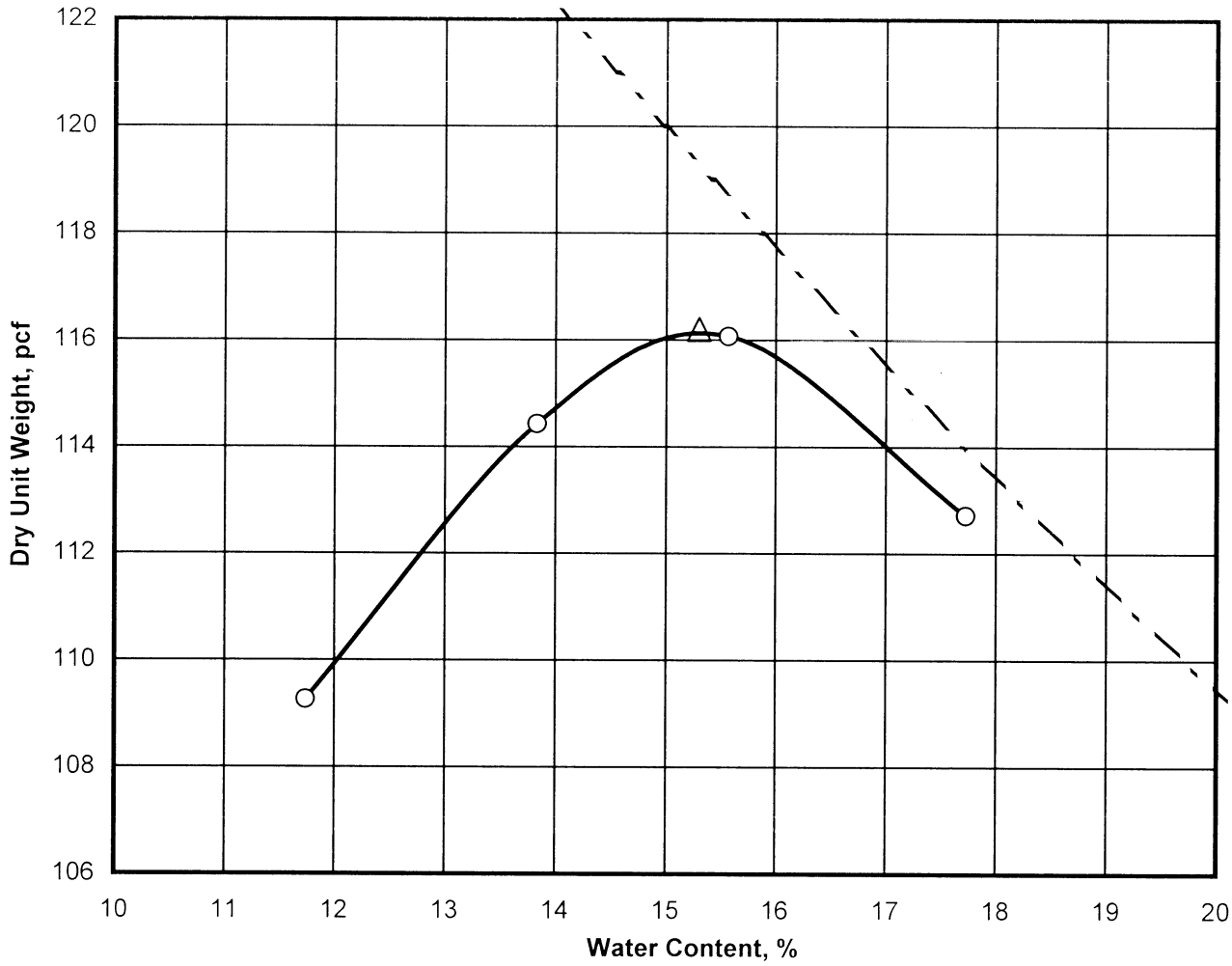
Test Method: ASTM D-698, Method A

STANDARD PROCTOR ON TAN AUSTIN CHALK
ROCK CORE SAMPLES FROM SH-121 ALIGNMENT
SH-121 MANAGED LANES, COLLIN COUNTY, TEXAS

Terracon

Terracon Job No. 94065243

FIGURE I-2



○ **Data Points** △ **Maximum Dry Unit Weight** — - **Zero Air Voids**

Sample Description:	Laboratory Crushed Gray Austin Chalk - Rock Core	
Liquid Limit:	41	%
Plastic Limit:	18	%
Plasticity Index:	23	
Passing No. 200	4.4	%
Optimum Moisture Content:	15.3	%
Maximum Dry Density	116.2	pcf

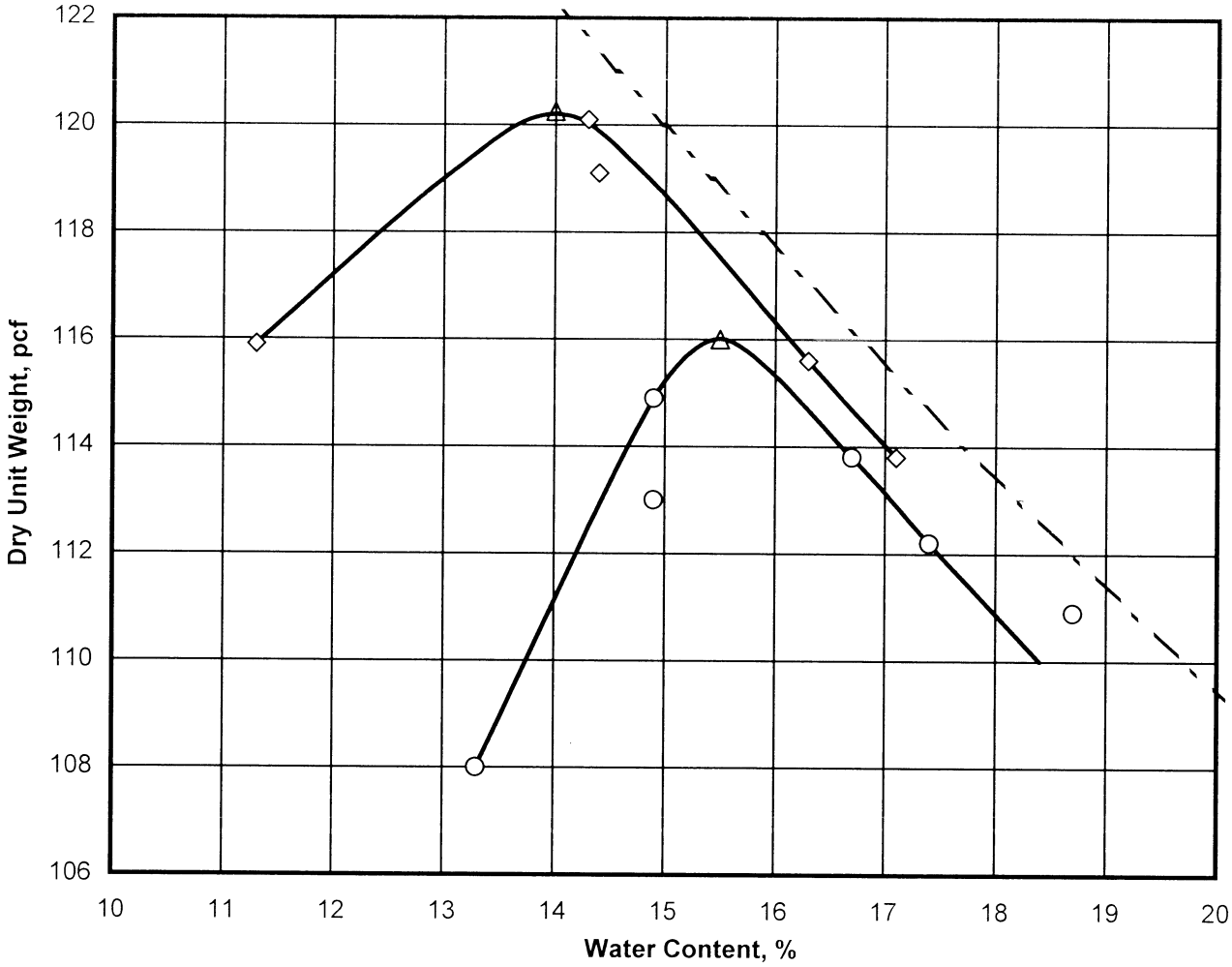
Test Method: ASTM D-698, Method A

STANDARD PROCTOR ON GRAY AUSTIN CHALK
ROCK CORE SAMPLES FROM SH-121 ALIGNMENT
SH-121 MANAGED LANES, COLLIN COUNTY, TEXAS

Terracon

Terracon Job No. 94065243

FIGURE I-3



△ **Maximum Dry Unit Weight** — - **Zero Air Voids**

○ **Standard Proctor Data Points** ◇ **Modified Proctor Data Points**

Sample Description:	Laboratory Crushed Gray Austin Chalk -Quarry	
Liquid Limit:	33	%
Plastic Limit:	18	%
Plasticity Index:	15	
Passing No. 200 before compaction:	19	%

	Standard	Modified
Optimum Moisture Content, %:	15.5	14.0
Maximum Dry Density, pcf:	116	120.3

Test Methods: ASTM D-698, Method A and ASTM D-1557 Method A

TANDARD AND MODIFIED PROCTORS ON GRAY AUSTIN CHAL
LIMESTONE SAMPLES FROM WEIR'S MCKINNEY QUARRY
SH-121 MANAGED LANES , C0LLIN COUNTY, TEXAS

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Terracon Job No. 94065243

FIGURE I-4

Sample Designation	Liquid Limit (%)	Plasticity Index	Unit Dry Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Surcharge Load psf	Swell
Gray Austin Chalk	33	14	101.6	14.1	23.1	200	0.15%
Gray Austin Chalk	33	14	108.6	14.8	19.8	200	0.23%
Gray Austin Chalk	33	14	118.1	14.3	17.5	200	0.23%

Notes: Austin Chalk Sample passed through No. 10 Sieve
Swell tests on remolded Austin Chalk compacted at Standard Proctor effort.
Samples molded dry of optimum moisture content

SUMMARY OF SWELL TESTS ON GRAY AUSTIN CHALK

SH-121 MANAGED LANES
COLLIN COUNTY, TEXAS

Terracon
Project No. 94065243

FIGURE I-5

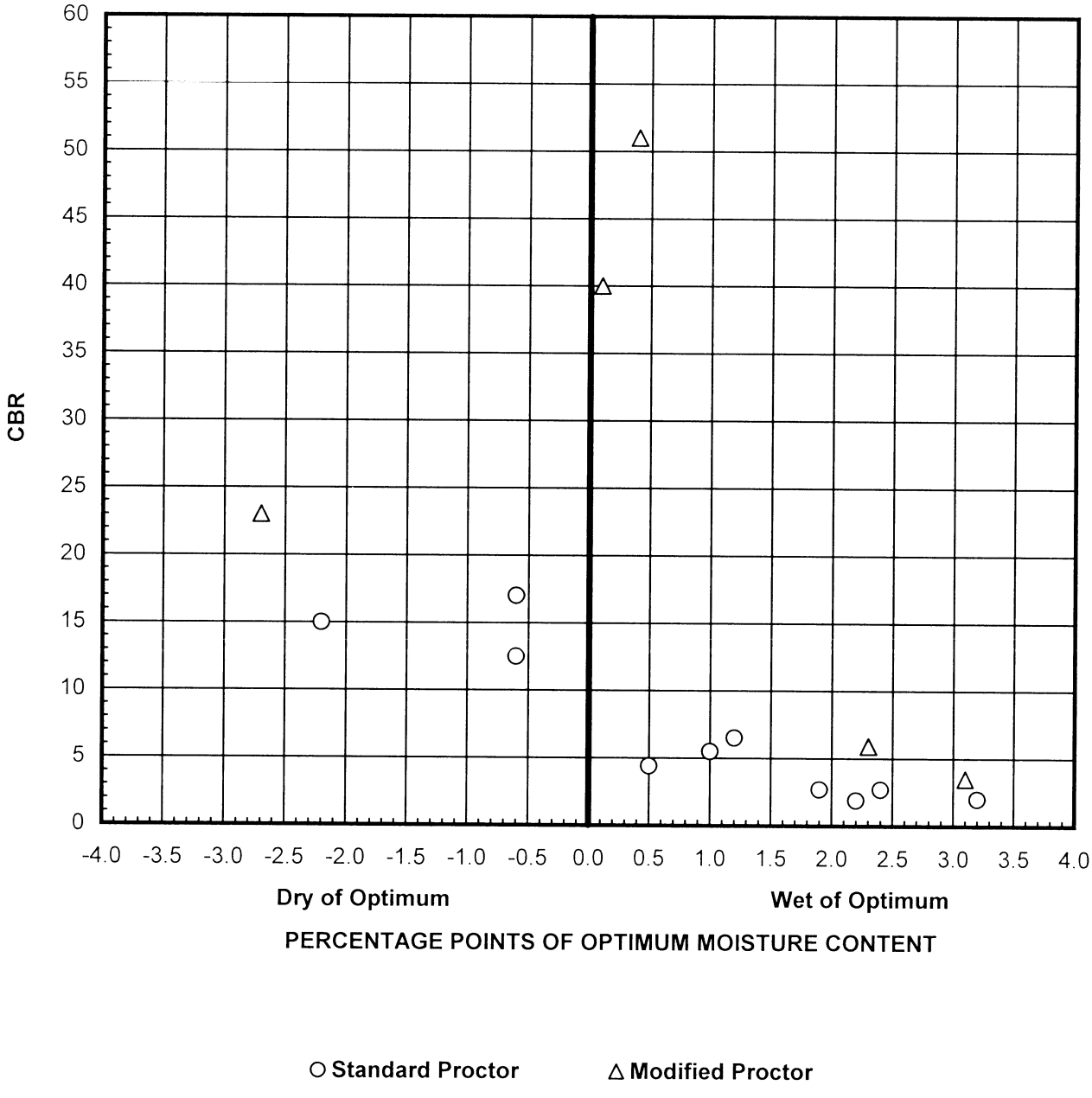
Test No.	Sample Description	Plasticity Index (PI)	Sample Preparation	Optimum Moisture Content, %	Maximum Dry Density, pcf	Percent Fines Passing No. 200 Sieve		Molding Moisture Content, %	Molded Dry Density pcf	Moisture Points Wet or (Dry) of Optimum	Percent Compaction	California Bearing Ratio (CBR)
						Before Compaction	After Compaction					
1	Tan Austin Chalk - Rock Core	21	Standard Proctor	16.7	113	18.9		17.7	110.6	1.0	97.9%	5.5
2	Tan Austin Chalk - Rock Core	21	Standard Proctor	16.7	113	19		19.1	108.1	2.4	95.7%	2.7
3	Gray Austin Chalk - Rock Core	23	Standard Proctor	15.3	116.2	4.4		15.8	115	0.5	99.0%	4.4
4	Gray Austin Chalk - Rock Core	23	Standard Proctor	15.3	116.2	4.4		17.5	113.1	2.2	97.3%	1.9
5	Gray Austin Chalk - Rock Core	15	Standard Proctor	15.5	116	26.7	31.1	13.3	108	(2.2)	93%	15.0
6	Gray Austin Chalk - Quarry	15	Standard Proctor	15.5	116	26.7	31.1	14.9	114.9	(0.6)	99%	12.5
7	Gray Austin Chalk - Quarry	15	Standard Proctor	15.5	116	26.7		14.9	113.0	(0.6)	97%	17.0
8	Gray Austin Chalk - Quarry	15	Standard Proctor	15.5	116	26.7		17.4	112.2	1.9	97%	2.7
9	Gray Austin Chalk - Quarry	15	Standard Proctor	15.5	116	26.7		18.7	110.9	3.2	96%	2.0
10	Gray Austin Chalk - Quarry	15	Standard Proctor Unsoaked	15.5	116	26.7	33.7	16.7	113.8	1.2	98%	6.5
11	Gray Austin Chalk - Quarry	15	Modified Proctor	14.0	120.3	26.7		11.3	115.9	(2.7)	96%	23
12	Gray Austin Chalk - Quarry	15	Modified Proctor	14.0	120.3	26.7	50.1	14.1	120.1	0.1	100%	40
13	Gray Austin Chalk - Quarry	15	Modified Proctor	14.0	120.3	26.7		14.4	119.1	0.4	99%	51
14	Gray Austin Chalk - Quarry	15	Modified Proctor	14.0	120.3	26.7	45.2	16.3	115.6	2.3	96%	5.9
15	Gray Austin Chalk - Quarry	15	Modified Proctor	14.0	120.3	26.7		17.1	113.8	3.1	95%	3.5

SUMMARY OF CALIFORNIA BEARING RATIO TEST RESULTS
AUSTIN CHALK AT STANDARD AND MODIFIED COMPACTION
SH-121 MANAGED LANES, COLLIN COUNTY, TEXAS

Terracon

Terracon Job No. 94065243

FIGURE I-6



Note: Values shown in plot are compaction moisture content percentage points wet or dry of optimum moisture.

CBR COMPACTION MOISTURE CONTENT COMPARISONS
AUSTIN CHALK AT STANDARD AND MODIFIED COMPACTION

Terracon

Terracon Job No. 94065243

FIGURE I-7

Test No.	Sample Description	Additive	Sample Preparation	Molding Moisture Content, %	Moisture Content After Test %	Molded Dry Density pcf	California Bearing Ratio (CBR)
16	Gray Limestone	3% Lime	Standard Proctor	15.8	17.2	111.0	36
17	Gray Limestone	3% Lime	Standard Proctor	17 8	17 6	110.4	23
18	Gray Limestone	4.5% Lime	Standard Proctor	18.2	18.4	109.9	20
19	Gray Limestone	4.5% Lime	Standard Proctor	18.8	18.5	109.7	18
20	Gray Limestone	6% Lime	Standard Proctor	17.4	18.1	108.8	33
21	Gray Limestone	6% Lime	Standard Proctor	21.1	19.6	105.7	11

SUMMARY CALIFORNIA BEARING RATIO TEST RESULTS
AUSTIN CHALK STABILIZED WITH LIME
SH-121 MANAGED LANES, COLLIN COUNTY, TEXAS

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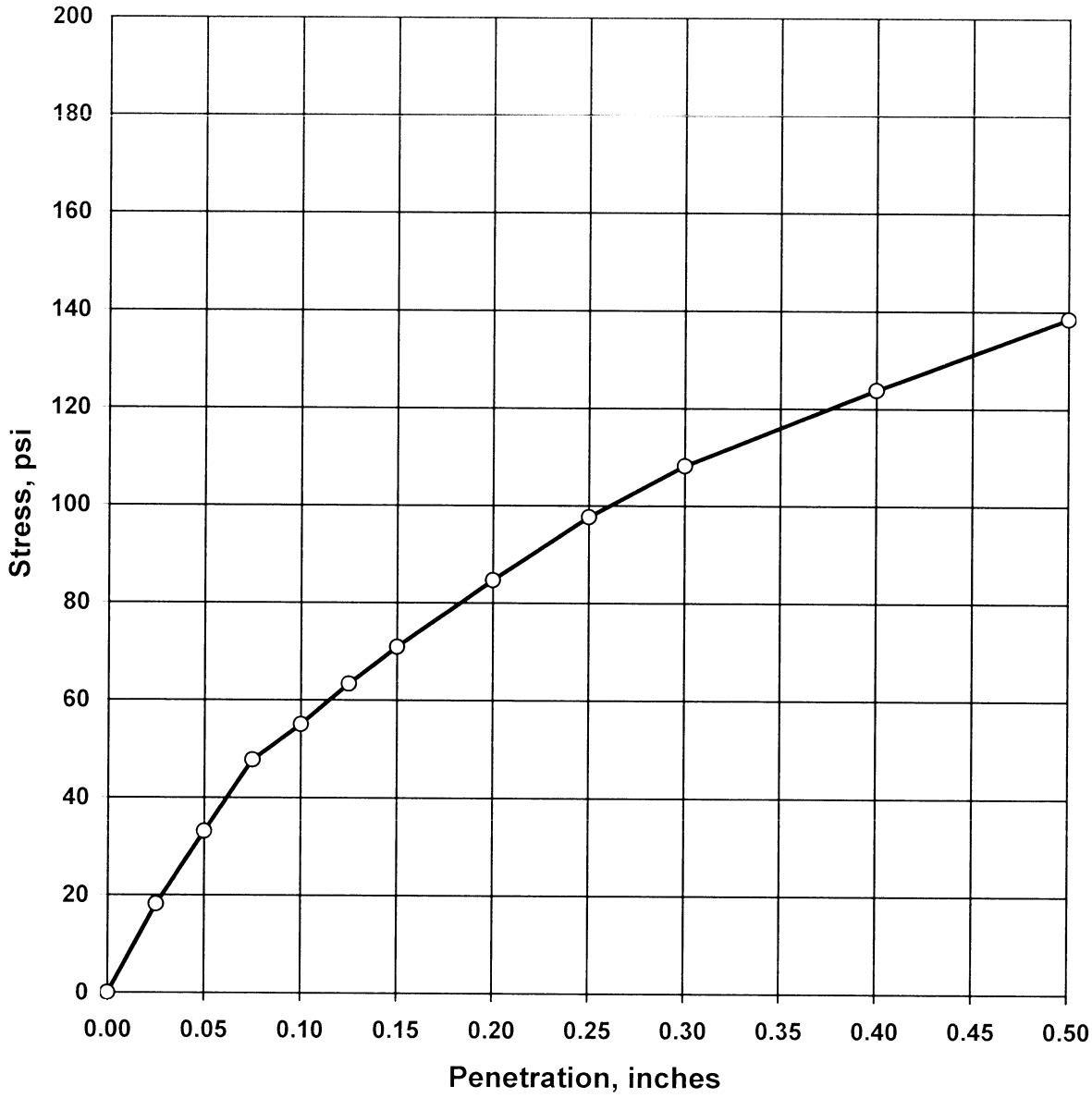
Terracon Job No. 94065243

FIGURE I-8



Test Method ASTM D 1883-99

Sample Preparation: Standard Proctor Wet of Optimum
Sample Description: Tan Crushed Austin Chalk - Rock Core

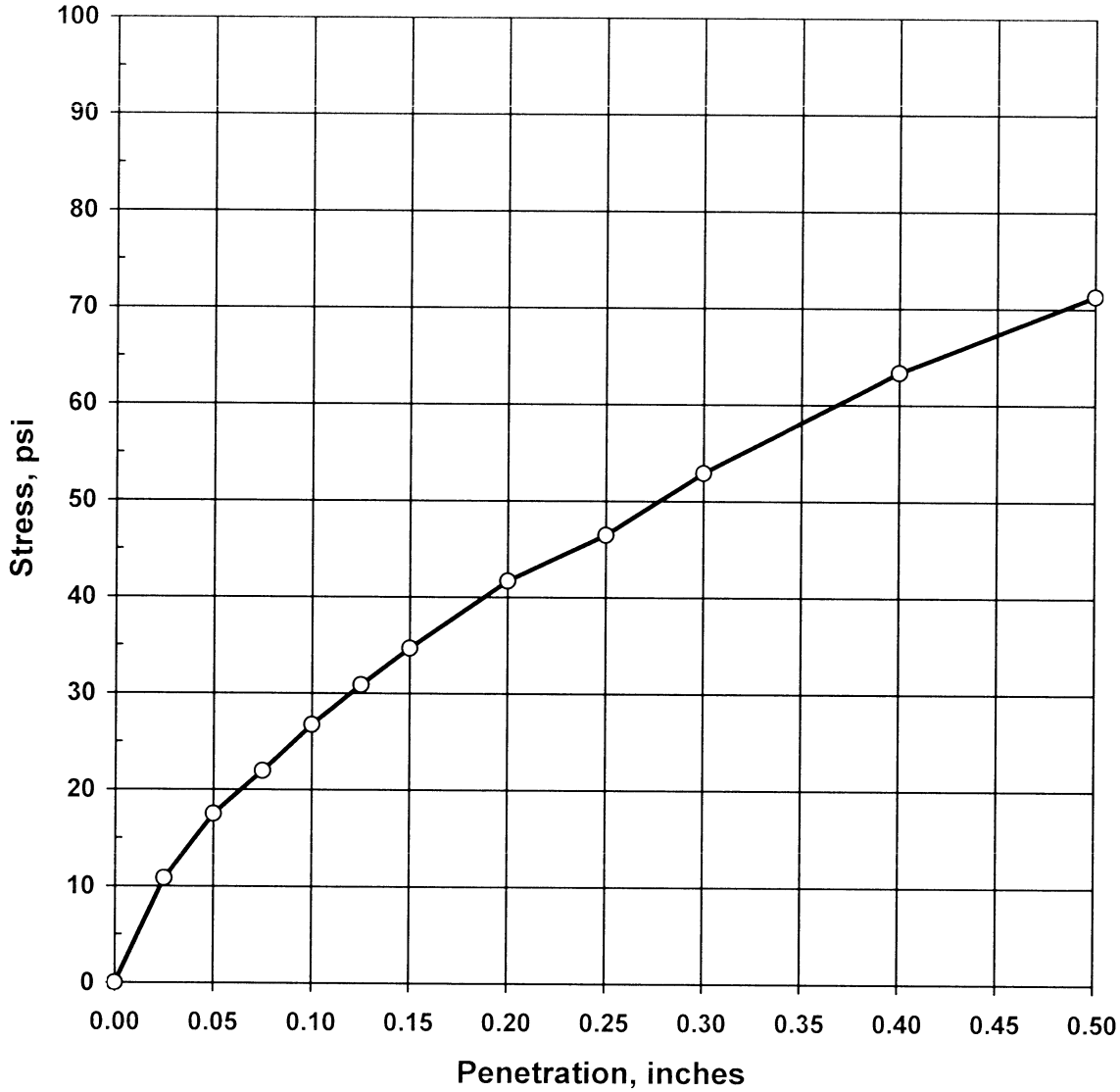
Liquid Limit:	39%	Molded Dry Density:	110.6	pcf
Plasticity Index:	21	Maximum Dry Density:	112.3	pcf
Before Compaction Passing No. 200 Sieve:	19%	Optimum Moisture Content:	16.7%	
Molding Moisture Content:	17.7%	Moisture Content after test:	19.1%	
Swell:	0.1%			
Soaked CBR at 0.1 inch Penetration:	5.5	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 1 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-9



Test Method ASTM D 1883-99

Sample Preparation: Standard Proctor Wet of Optimum
Sample Description: Tan Crushed Austin Chalk - Rock Core

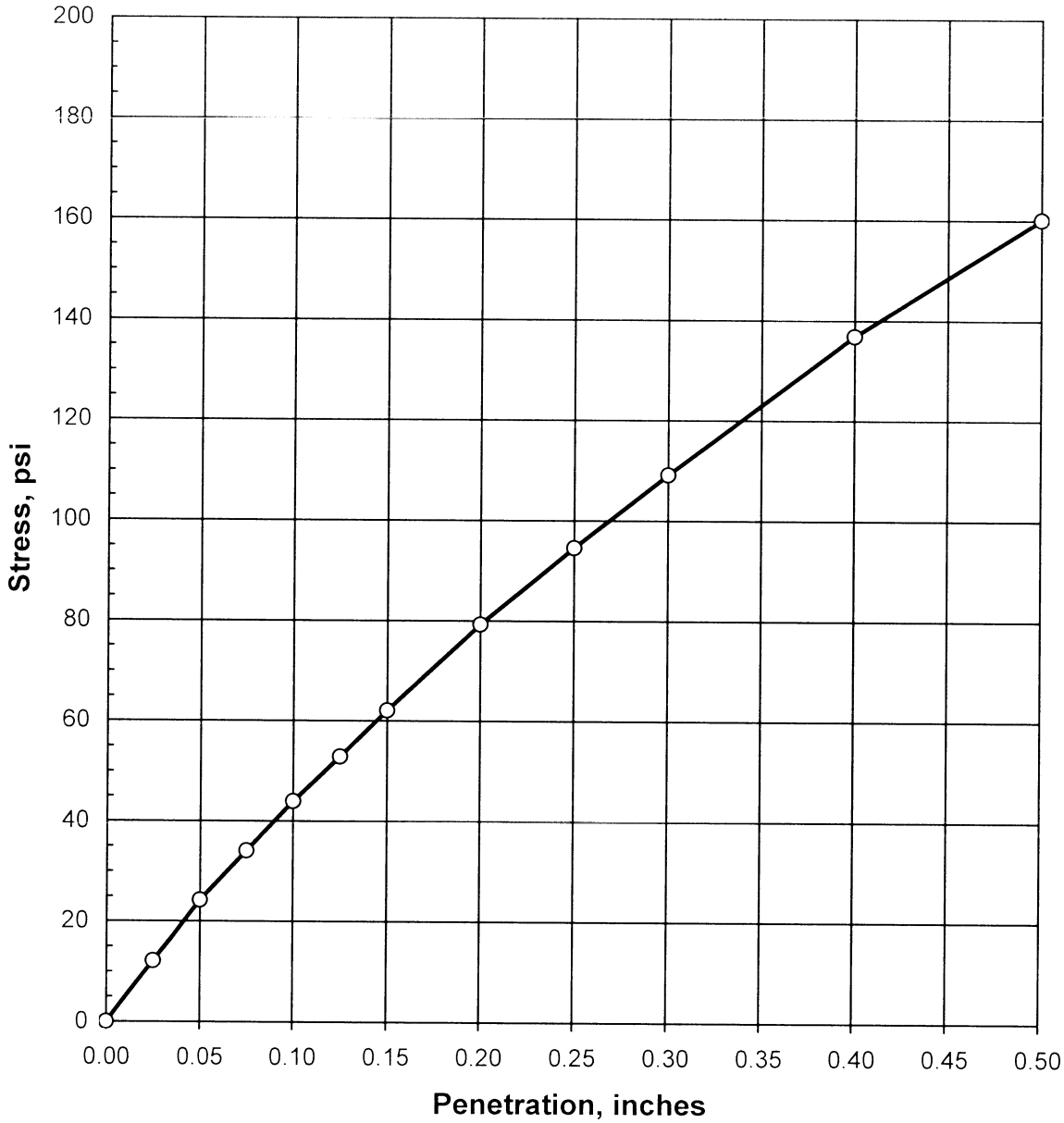
Liquid Limit:	39%	Molded Dry Density:	108.1	pcf
Plasticity Index:	21	Maximum Dry Density:	112.3	pcf
Before Compaction Passing No. 200 Sieve:	19%	Optimum Moisture Content:	16.7%	
Molding Moisture Content:	19.1%	Moisture Content after test:	19.8%	
Swell:	0.1%			
Soaked CBR at 0.1 inch Penetration:	2.7	with 10 pound surcharge		

CALIFORNIA BEARING RATIO TEST 2 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-10



Test Method ASTM D 1883-99

Sample Preparation: Standard Proctor Near Optimum Moisture Content
Sample Description: Gray Crushed Austin Chalk - Rock Core

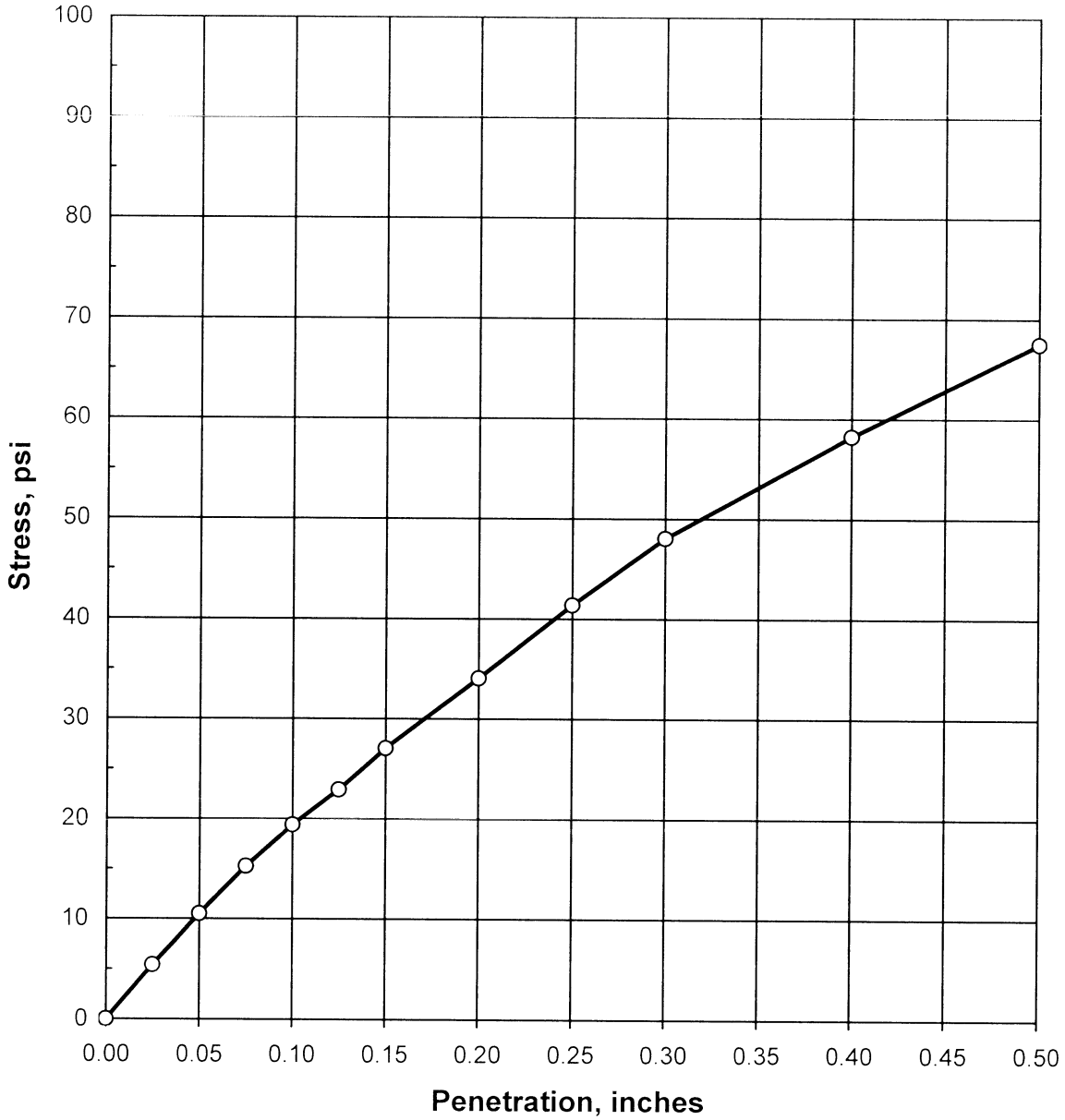
Liquid Limit on Passing No. 40 Sieve:	41%	Molded Dry Density:	115.0 pcf
Plasticity Index on Passing No. 40 Sieve:	23	Maximum Dry Density:	116.1 pcf
Before Compaction Passing No. 200 Sieve:	4.4%	Optimum Moisture Content:	15.6%
Molding Moisture Content:	15.8%	Moisture Content after test:	16.9%
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	4.4	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 3 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-11



Test Method ASTM D 1883-99

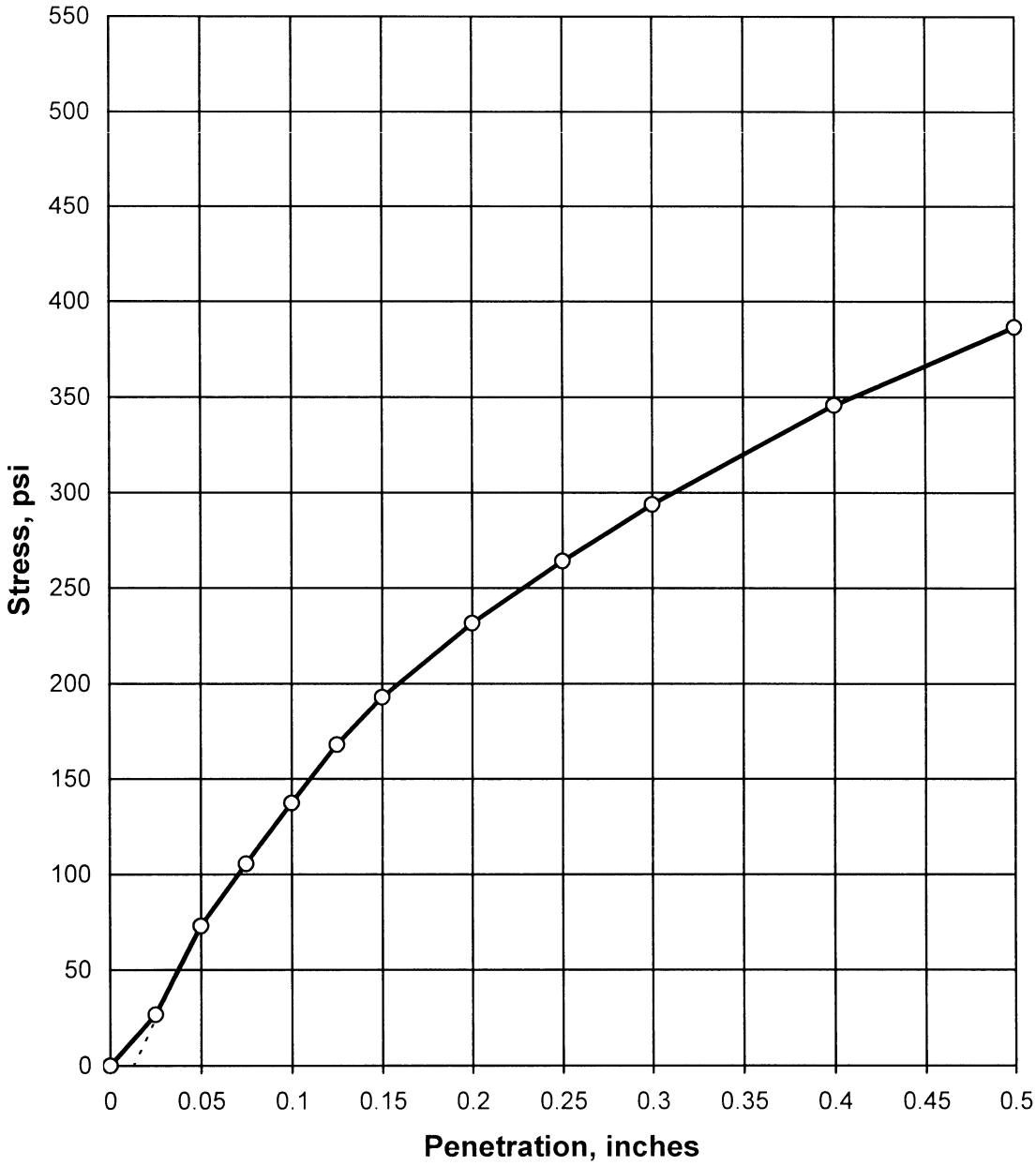
Sample Preparation:	Standard Proctor Wet of Optimum Moisture Content		
Sample Description:	Gray Crushed Austin Chalk - Rock Core		
Liquid Limit on Passing No. 40 Sieve:	41%	Molded Dry Density:	113.1 pcf
Plasticity Index on Passing No. 40 Sieve:	23	Maximum Dry Density:	116.1 pcf
Before Compaction Passing No. 200 Sieve:	4.4%	Optimum Moisture Content:	15.6%
Molding Moisture Content:	17.5%	Moisture Content after test:	17.7%
Swell:	-0.1%		
Soaked CBR at 0.1 inch Penetration:	1.9	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 4 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-12



Test Method ASTM D 1883-99

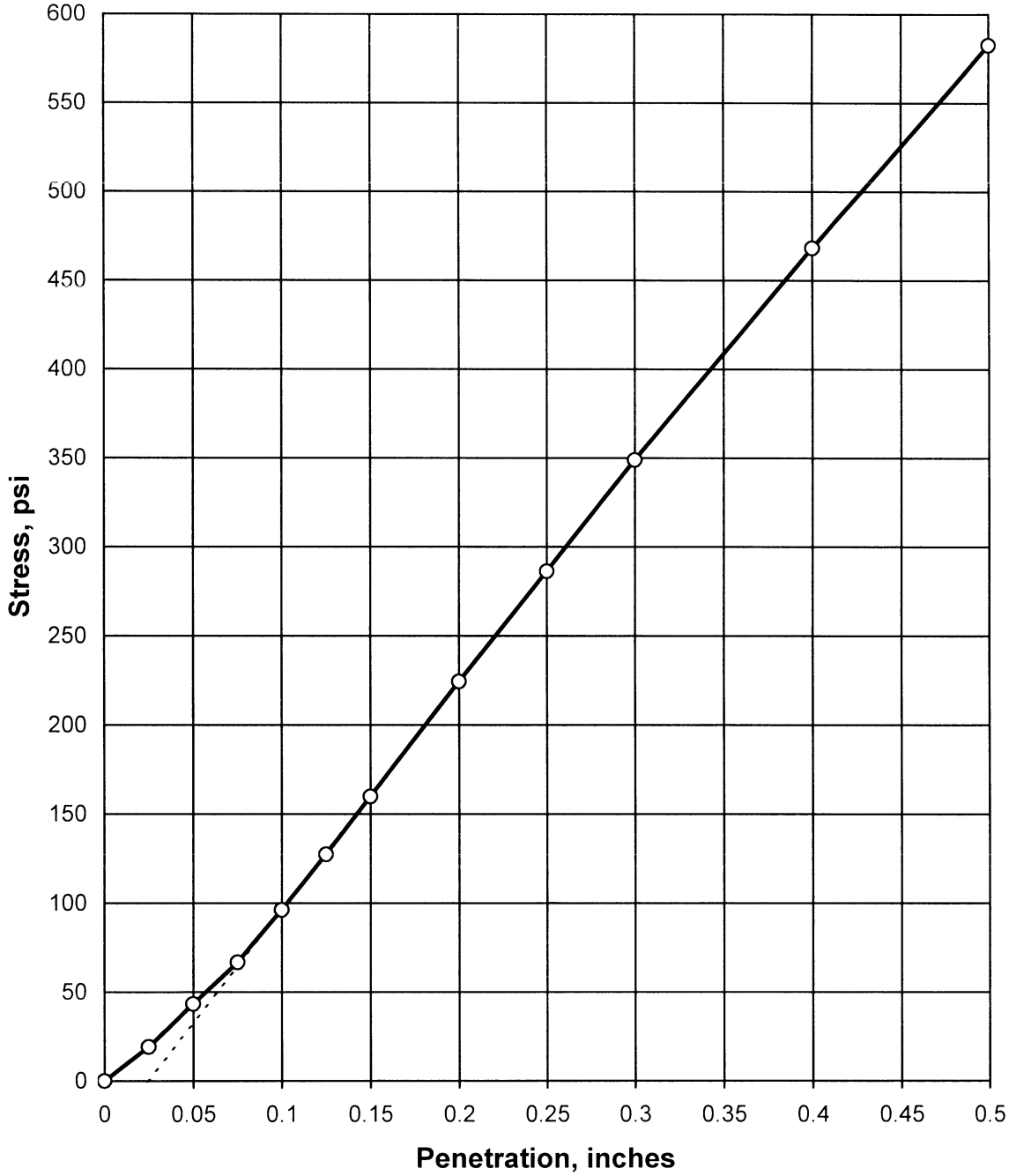
Sample Preparation:	Standard Proctor Dry of Optimum Moisture Content		
Sample Description:	Gray Austin Chalk - Quarry		
Liquid Limit:	33	Molded Dry Density:	108.0 pcf
Plasticity Index:	15	Maximum Dry Density:	116.0 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	15.5%
Molding Moisture Content:	13.3%		
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	15.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 5 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-13



Test Method ASTM D 1883-99

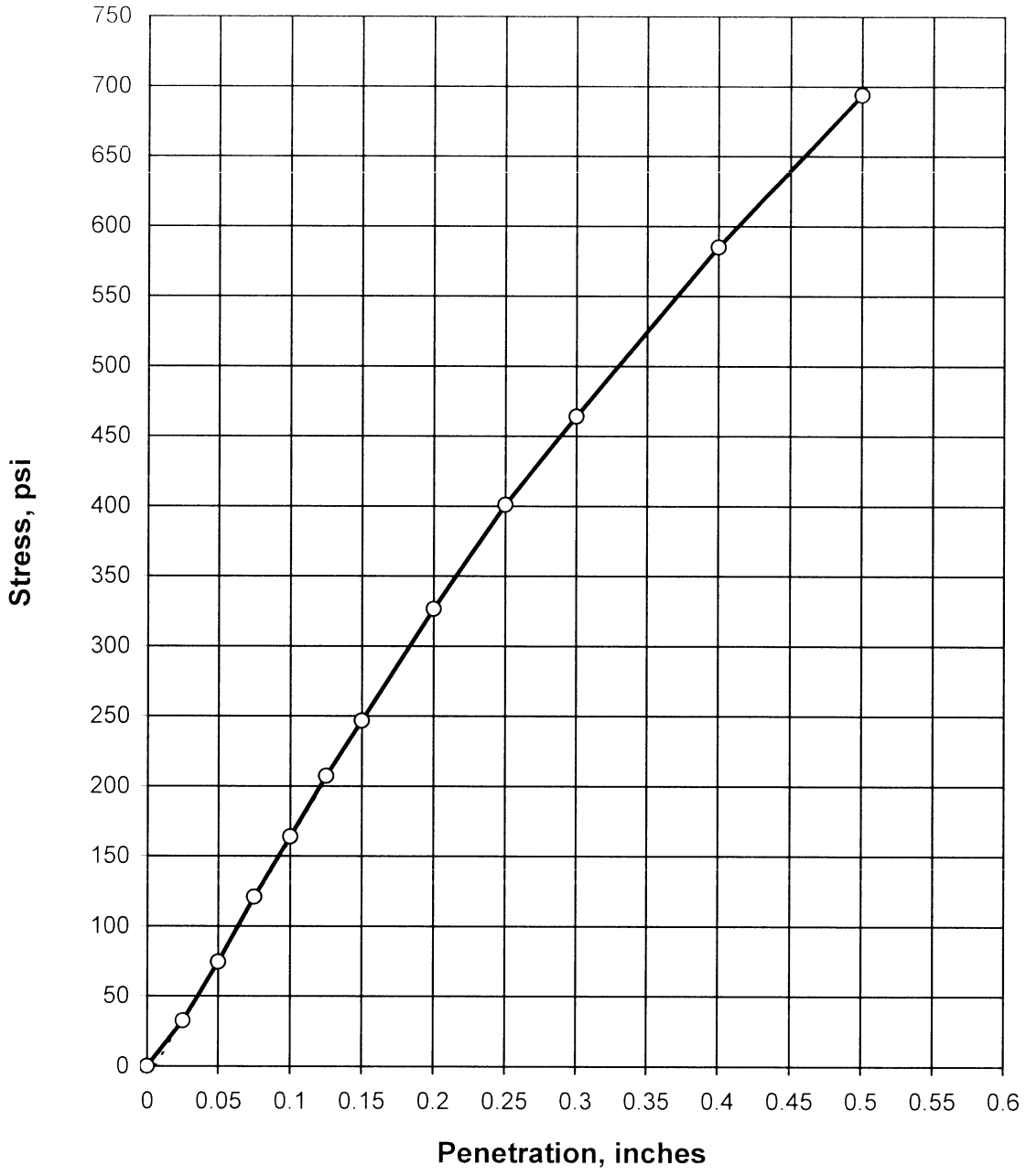
Sample Preparation:	Standard Proctor at Near Optimum Moisture Content		
Sample Description:	Gray Austin Chalk - Quarry		
Liquid Limit:	33	Molded Dry Density:	114.9 pcf
Plasticity Index:	15	Maximum Dry Density:	116.0 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	15.5%
Molding Moisture Content:	14.9%	Moisture Content after test:	16.2%
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	12.5	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 6 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-14



Test Method ASTM D 1883-99

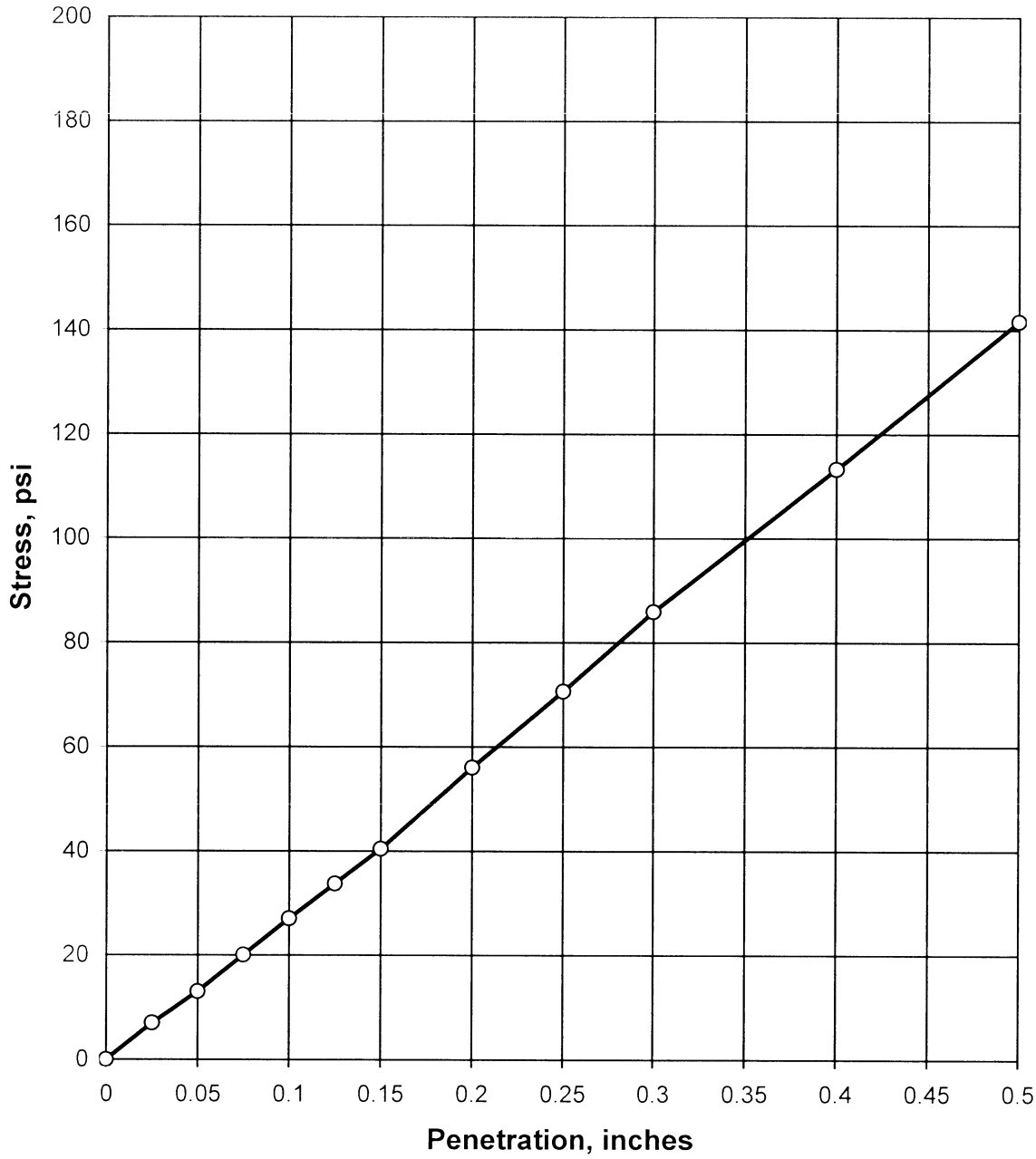
Boring No.	Standard Proctor Dry of Optimum Moisture Content		
Sample Description:	Gray Austin Chalk - Quarry		
Liquid Limit:	33	Molded Dry Density:	113.0 pcf
Plasticity Index:	15	Maximum Dry Density:	116.0 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	15.5%
Molding Moisture Content:	14.9%	Moisture Content after test:	16.2%
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	17.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 7 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-15



Test Method ASTM D 1883-99

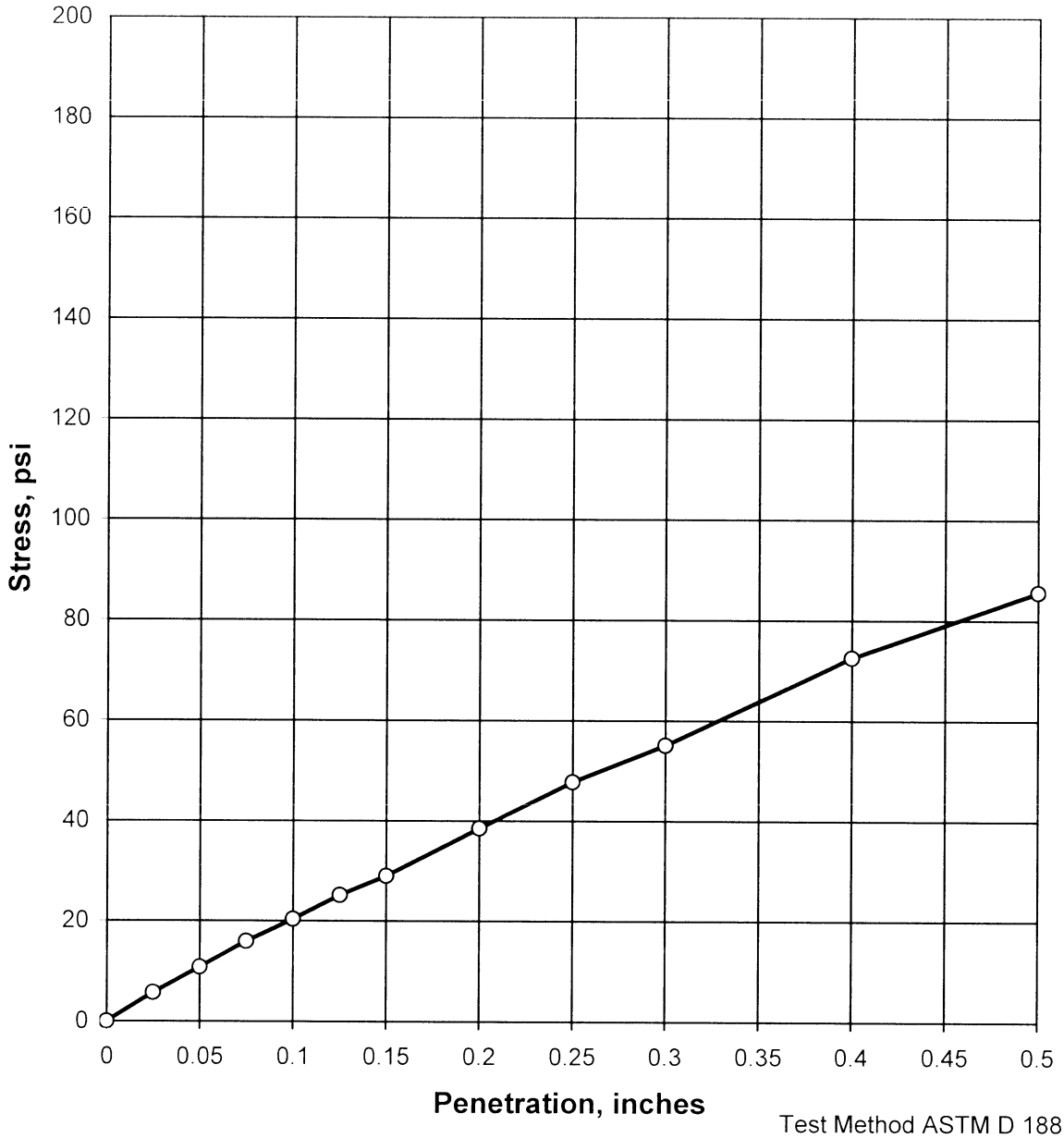
Boring No.	Standard Proctor Wet of Optimum Moisture Content		
Sample Description:	Gray Austin Chalk - Quarry		
Liquid Limit:	33	Molded Dry Density:	112.2 pcf
Plasticity Index:	15	Maximum Dry Density:	116.1 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	15.6%
Molding Moisture Content:	17.4%	Moisture Content after test:	17.4%
Swell:	-0.1%		
Soaked CBR at 0.1 inch Penetration:	2.7	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 8 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-16



Test Method ASTM D 1883-99

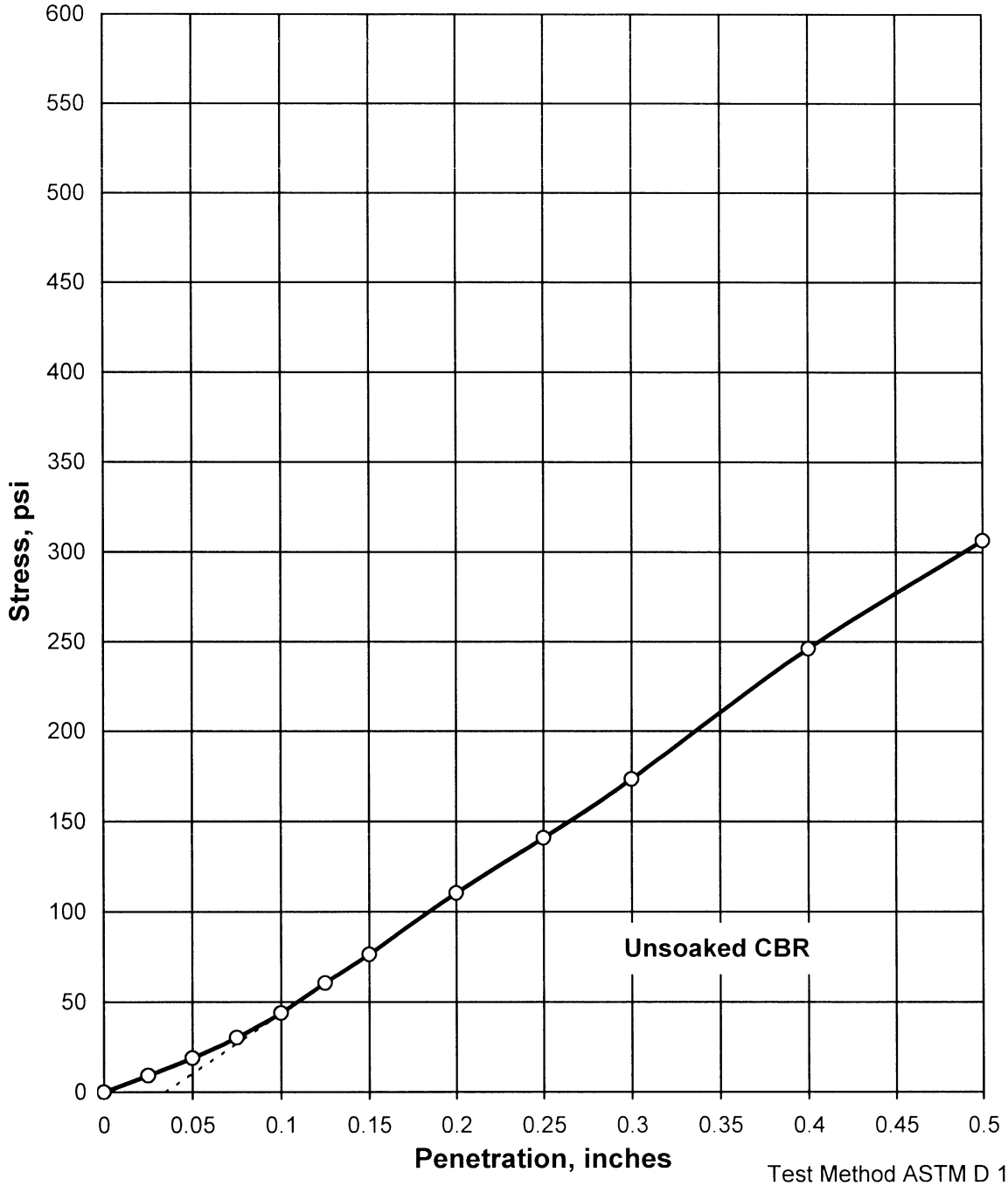
Boring No.	Standard Proctor Wet of Optimum Moisture Content		
Sample Description:	Gray Austin Chalk - Quarry		
Liquid Limit:	33	Molded Dry Density:	110.9 pcf
Plasticity Index:	15	Maximum Dry Density:	116.1 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	15.6%
Molding Moisture Content:	18.7%	Moisture Content after test:	17.7%
Swell:	-0.2%		
Soaked CBR at 0.1 inch Penetration:	2.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 9 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-17



Test Method ASTM D 1883-99

Sample Preparation: Standard Proctor Wet of Optimum Moisture Content
Sample Description: Gray Austin Chalk - Quarry

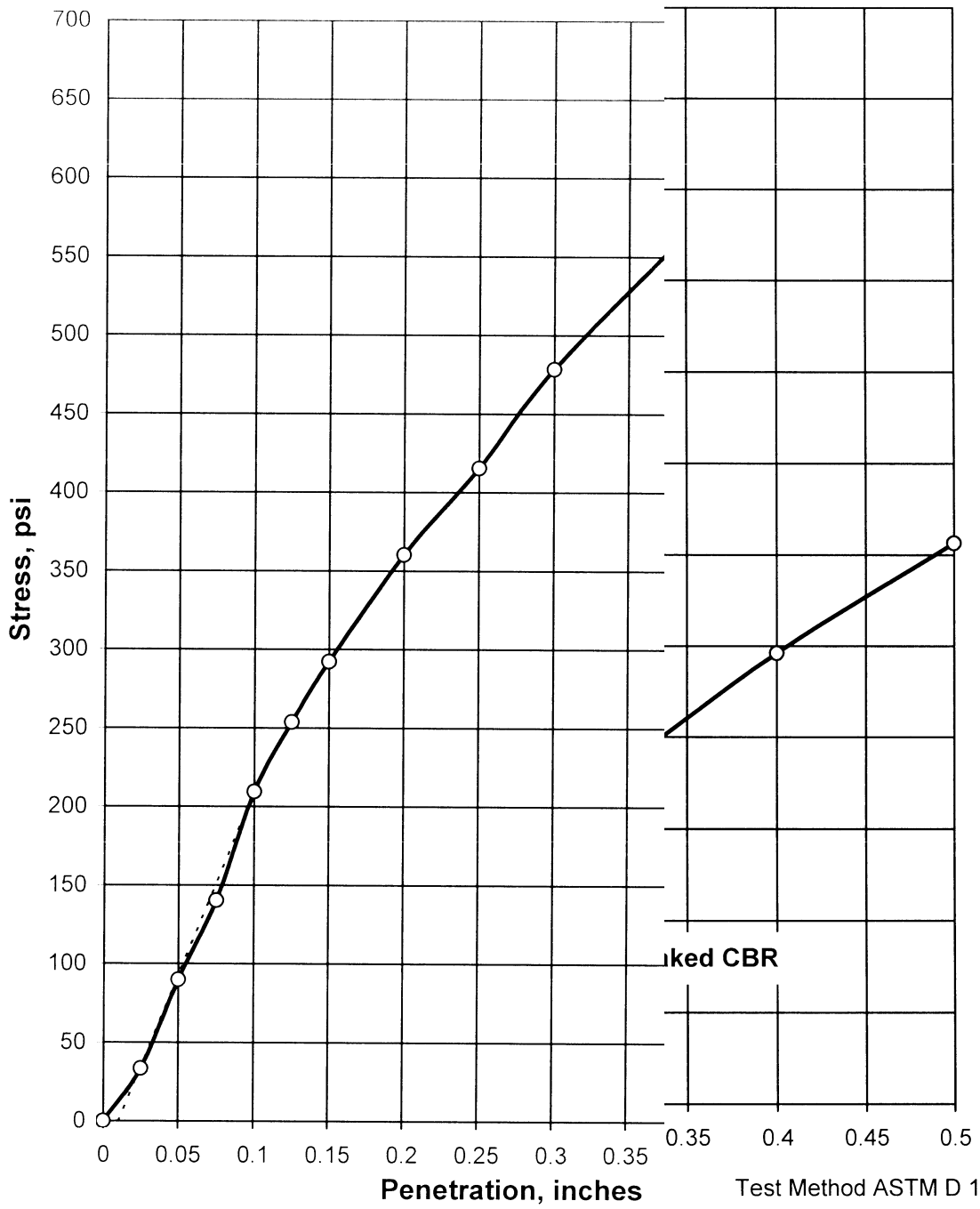
Liquid Limit:	33	Molded Dry Density:	113.8 pcf
Plasticity Index:	15	Maximum Dry Density:	116.0 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	15.5%
Molding Moisture Content:	16.7%	Moisture Content after test:	16.7%
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	6.5	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 10 RESULTS
AUSTIN CHALK AT STANDARD PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-18



Test Method ASTM D 1883-99

et of Optimum Moisture Content
Quarry

Sample Preparation:	Modified Proctor Dry	ded Dry Density:	113.8 pcf
Sample Description:	Gray Austin Chalk - C	ium Dry Density:	116.0 pcf
Liquid Limit:	33	Mold	
Plasticity Index:	15	Maximu	
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Mc	
Molding Moisture Content:	11.3%	Moisture Co	
Swell:	2.7%		
Soaked CBR at 0.1 inch Penetration:	23	with 10 pounc	

Moisture Content:	15.5%
ontent after test:	16.7%

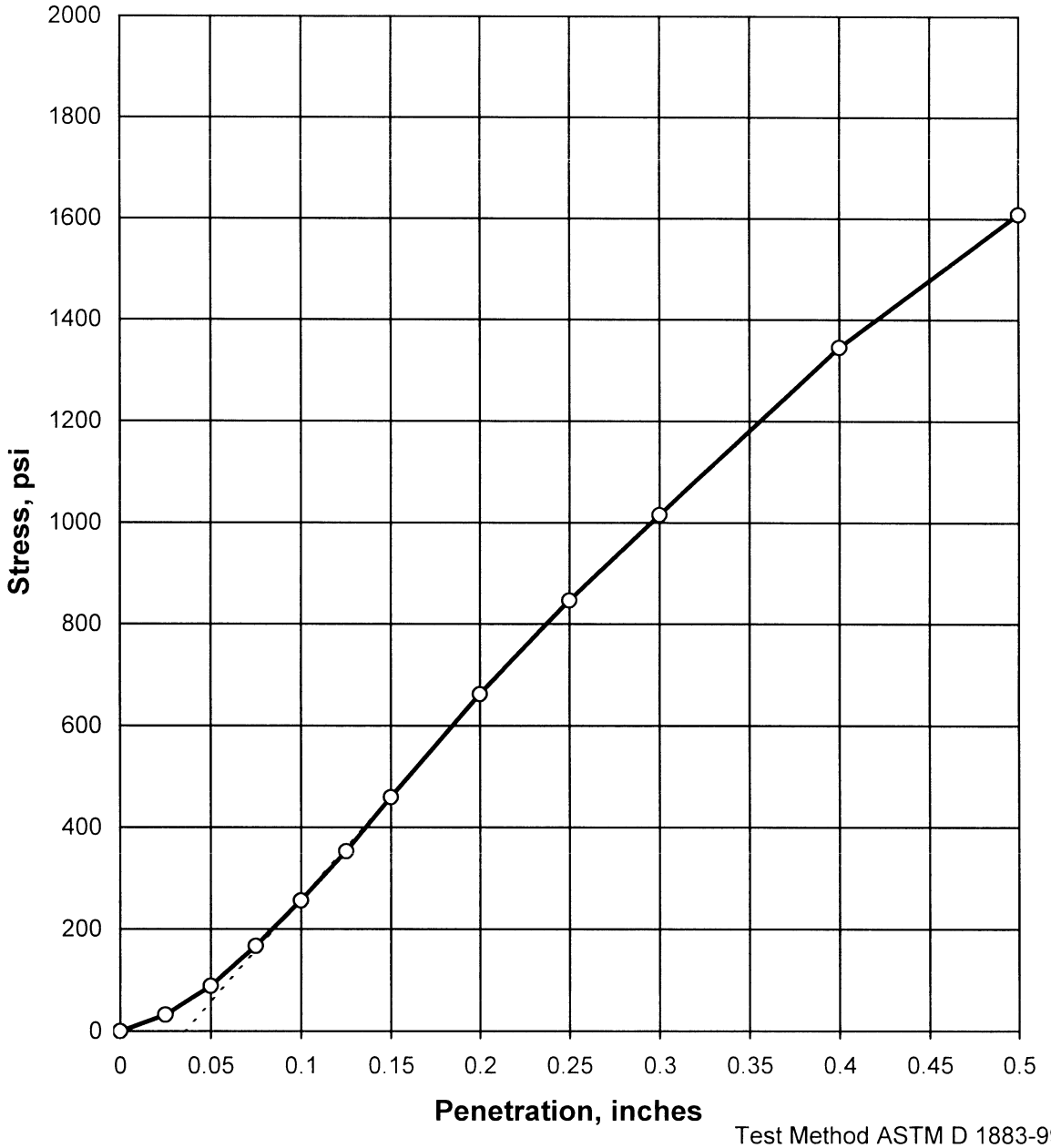
nd surcharge

CALIFORNIA BEARING RATIO TEST 11 RESULTS
AUSTIN CHALK AT MODIFIED PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-18



Test Method ASTM D 1883-99

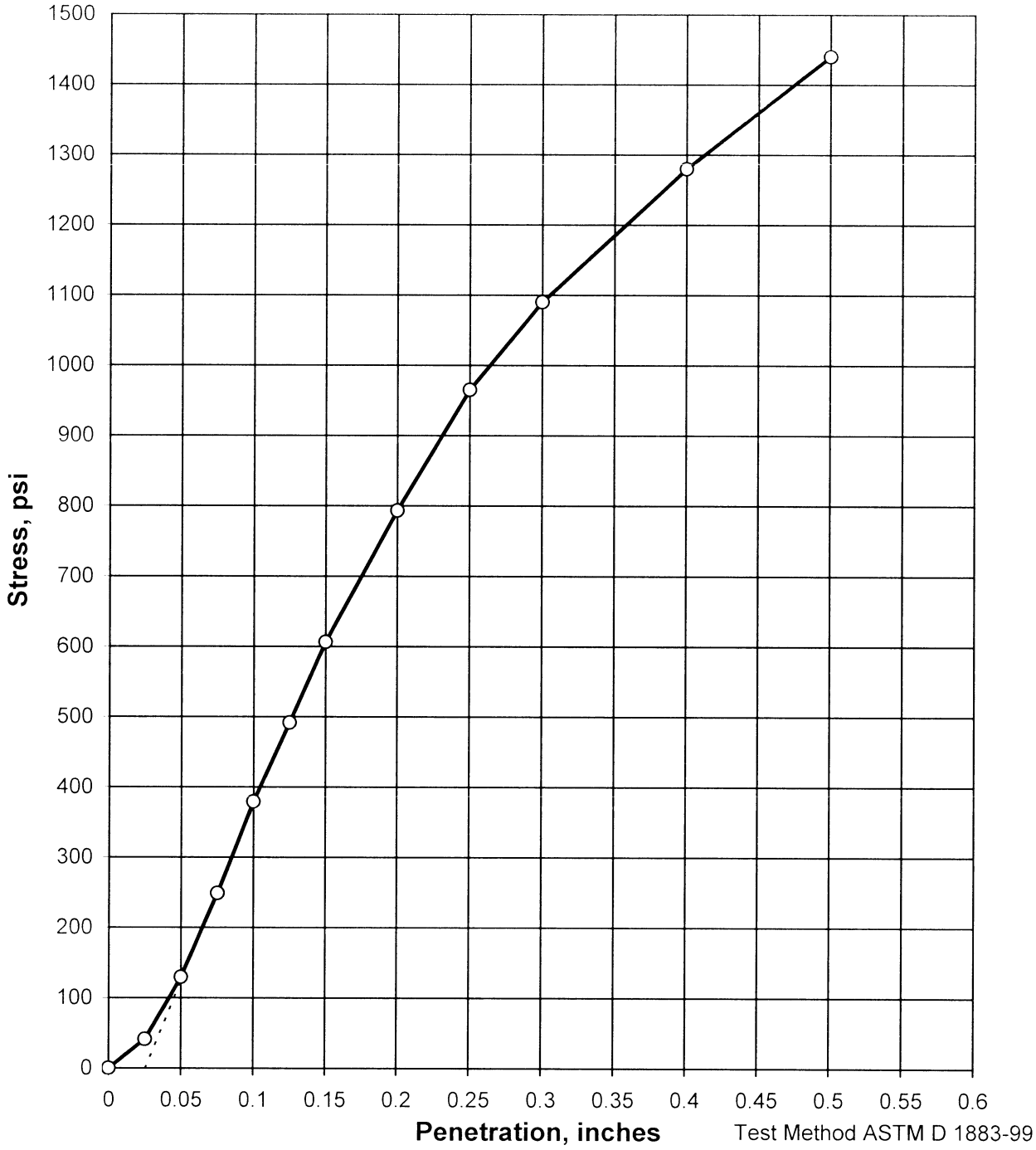
Sample Preparation:	Modified Proctor at Near Optimum Moisture Content		
Sample Description:	Gray Austin Chalk - Quarry		
Liquid Limit:	33	Molded Dry Density:	120.1 pcf
Plasticity Index:	15	Maximum Dry Density:	120.3 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	14.0%
Molding Moisture Content:	14.1%	Moisture Content after test:	14.6%
Swell:	0.1%		
Soaked CBR at 0.1 inch Penetration:	40.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 12 RESULTS
AUSTIN CHALK AT MODIFIED PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-20



Test Method ASTM D 1883-99

Sample Preparation: Modified Proctor Near Optimum Moisture Content
Sample Description: Gray Austin Chalk Limestone - Quarry

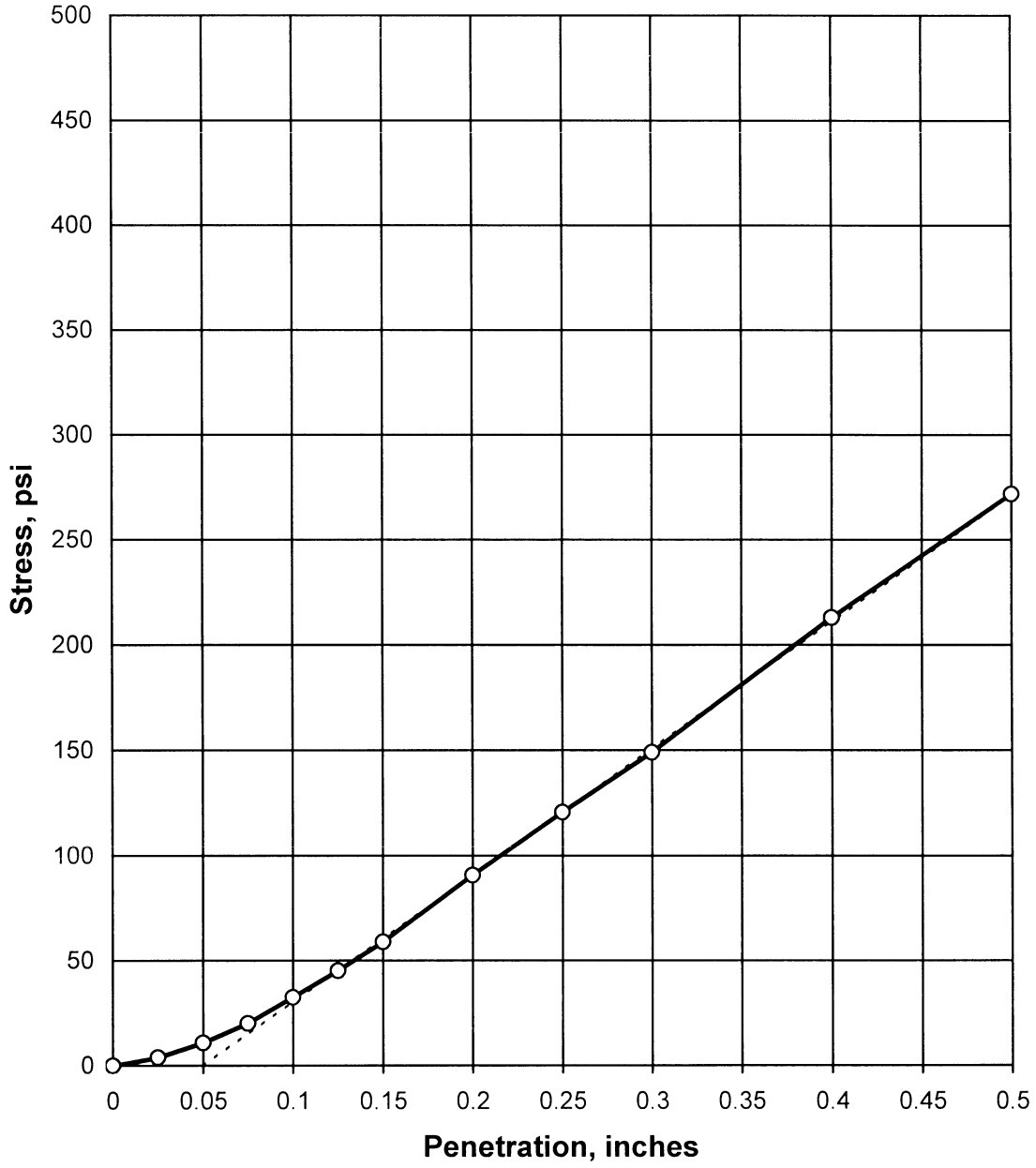
Liquid Limit:	33	Molded Dry Density:	119.1 pcf
Plasticity Index:	15	Maximum Dry Density:	120.3 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	14.0%
Molding Moisture Content:	14.4%	Moisture Content after test:	14.8%
Swell:	0.2%		
Soaked CBR at 0.1 inch Penetration:	51	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 13 RESULTS
AUSTIN CHALK AT MODIFIED PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-21



Test Method ASTM D 1883-99

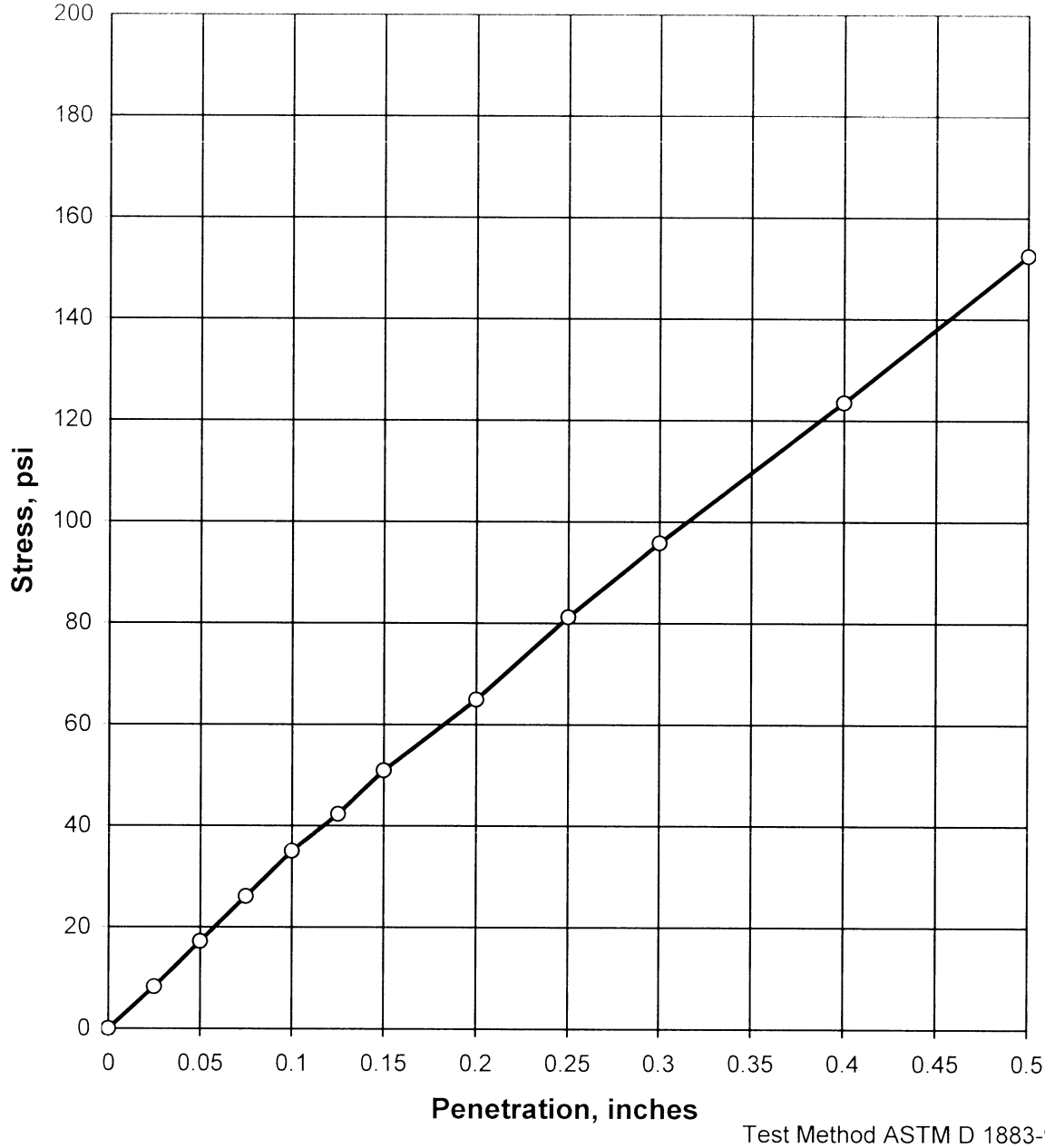
Sample Preparation:	Modified Proctor Wet of Optimum Moisture Content		
Sample Description:	Gray Austin Chalk - Quarry		
Liquid Limit:	33	Molded Dry Density:	115.6 pcf
Plasticity Index:	15	Maximum Dry Density:	120.3 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	14.0%
Molding Moisture Content:	16.3%		
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	5.9	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 14 RESULTS
AUSTIN CHALK AT MODIFIED PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-22



Test Method ASTM D 1883-99

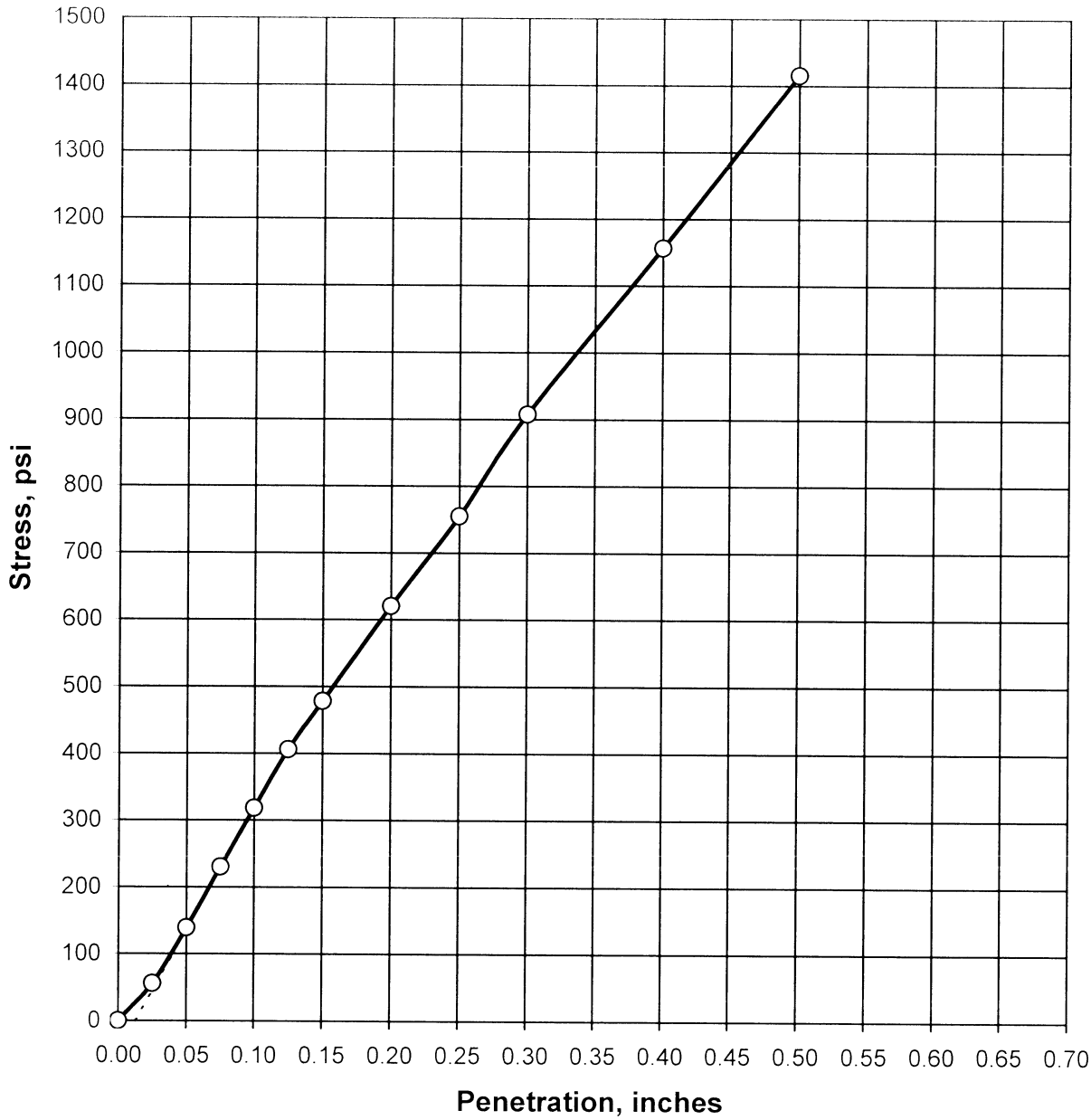
Sample Preparation:	Modified Proctor Wet of Optimum Moisture Content		
Sample Description:	Gray Austin Chalk - Quarry		
Liquid Limit:	33	Molded Dry Density:	113.8 pcf
Plasticity Index:	15	Maximum Dry Density:	120.3 pcf
Before Compaction Passing No. 200 Sieve, %:	26.7	Optimum Moisture Content:	14.0%
Molding Moisture Content:	17.1%	Moisture Content after test:	16.9%
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	3.5	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 15 RESULTS
AUSTIN CHALK AT MODIFIED PROCTOR

Terracon

Terracon Job No. 94065243

FIGURE I-23



Test Method ASTM D 1883-99

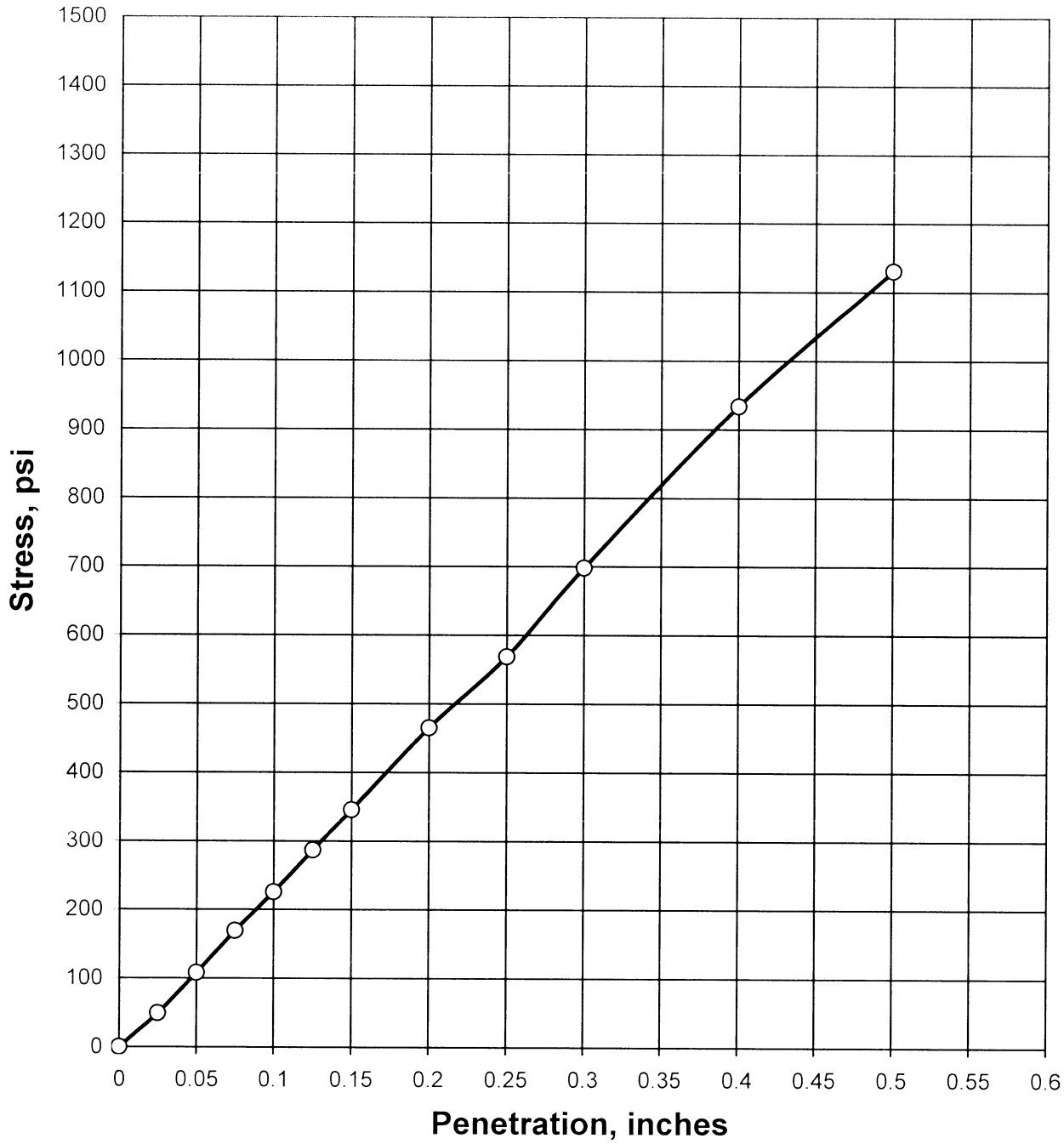
Sample Preparation:	Standard Proctor		
Sample Description:	Gray Austin Chalk with 3 % Lime		
Liquid Limit:		Molded Dry Density:	111.0 pcf
Plasticity Index:		Maximum Dry Density:	pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:	
Molding Moisture Content:	15.8%	Moisture Content after test:	17.2%
Swell:	0.2%		
Soaked CBR at 0.1 inch Penetration:	36.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 16 RESULTS
AUSTIN CHALK WITH 3% LIME

Terracon

Terracon Job No. 94065243

FIGURE I-24



Test Method ASTM D 1883-99

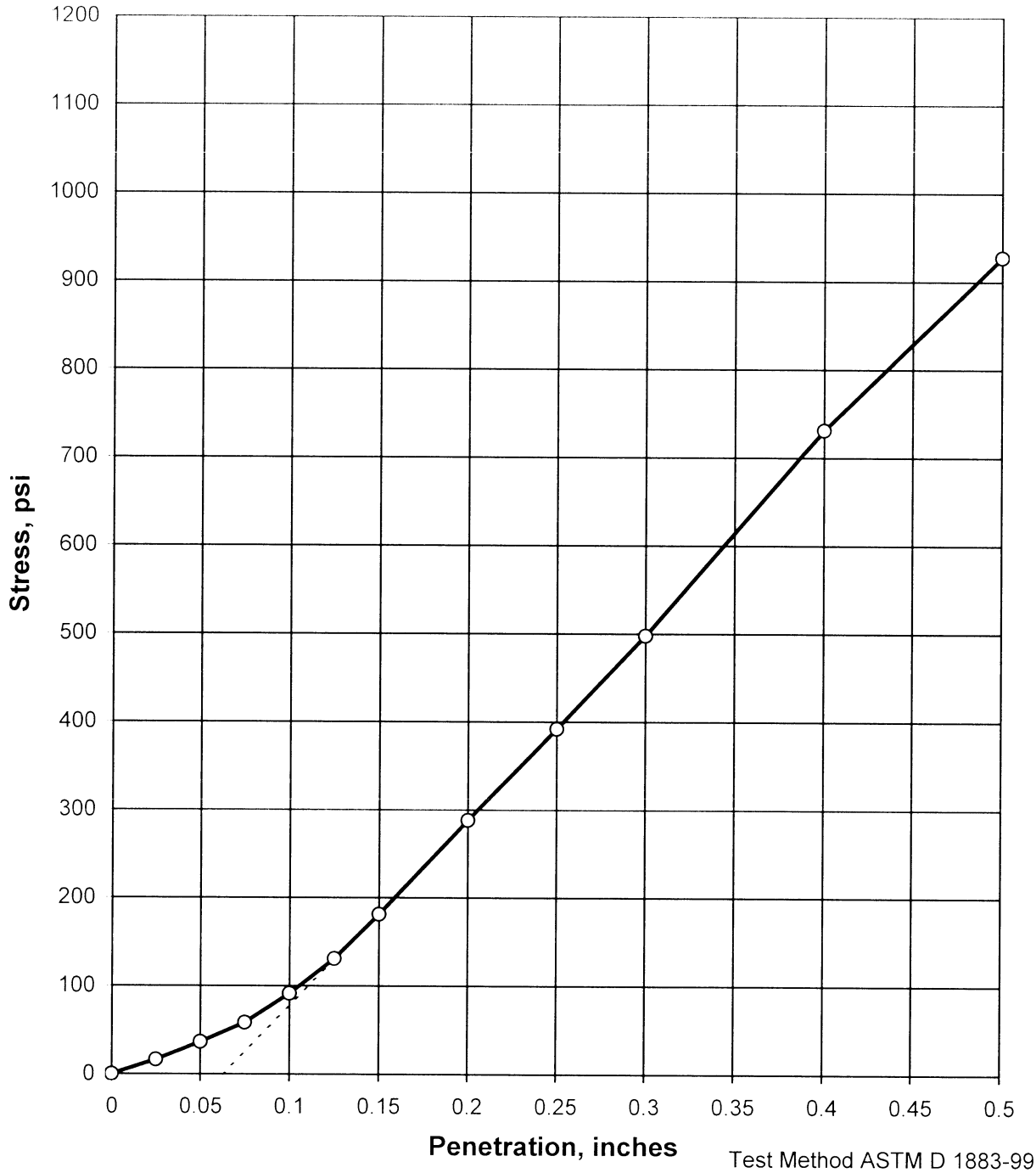
Sample Preparation:	Standard Proctor		
Sample Description:	Gray Austin Chalk with 3 % Lime		
Liquid Limit:		Molded Dry Density:	110.4 pcf
Plasticity Index:		Maximum Dry Density:	pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:	
Molding Moisture Content:	17.8%	Moisture Content after test:	17.6%
Swell:	0.0%		
Soaked CBR at 0.1 inch Penetration:	23	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 17 RESULTS
AUSTIN CHALK WITH 3% LIME

Terracon

Terracon Job No. 94065243

FIGURE I-25



Test Method ASTM D 1883-99

Sample Preparation: Standard Proctor
Sample Description: Austin Chalk with 4.5 % Lime

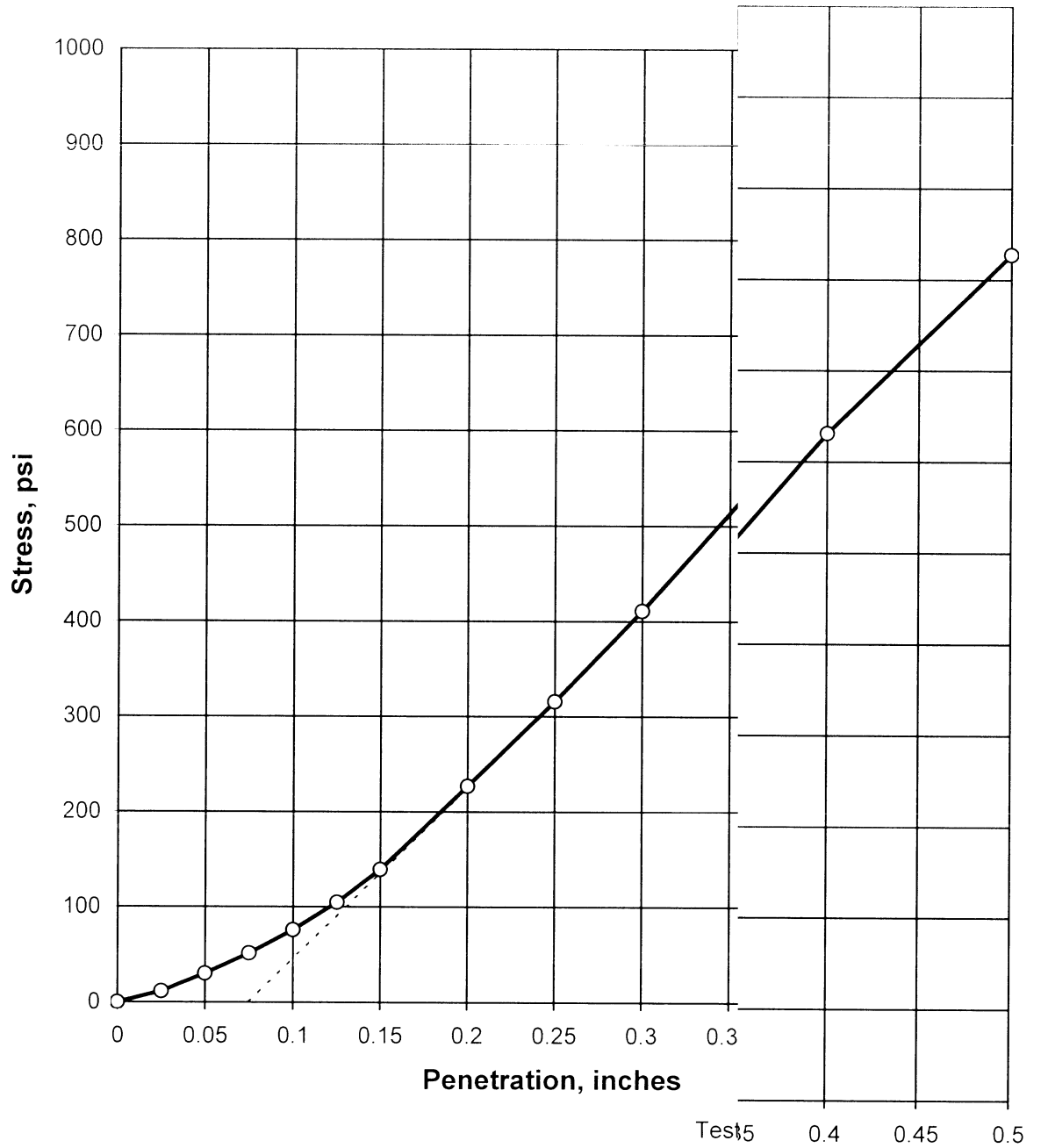
Liquid Limit:		Molded Dry Density:	109.9 pcf
Plasticity Index:		Maximum Dry Density:	pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:	
Molding Moisture Content:	18.2%	Moisture Content after test:	18.4%
Swell:	0.1%		
Soaked CBR at 0.1 inch Penetration:	20.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 18 RESULTS
AUSTIN CHALK WITH 4.5% LIME

Terracon

Terracon Job No. 94065243

FIGURE I-26



Test Method ASTM D 1883-99

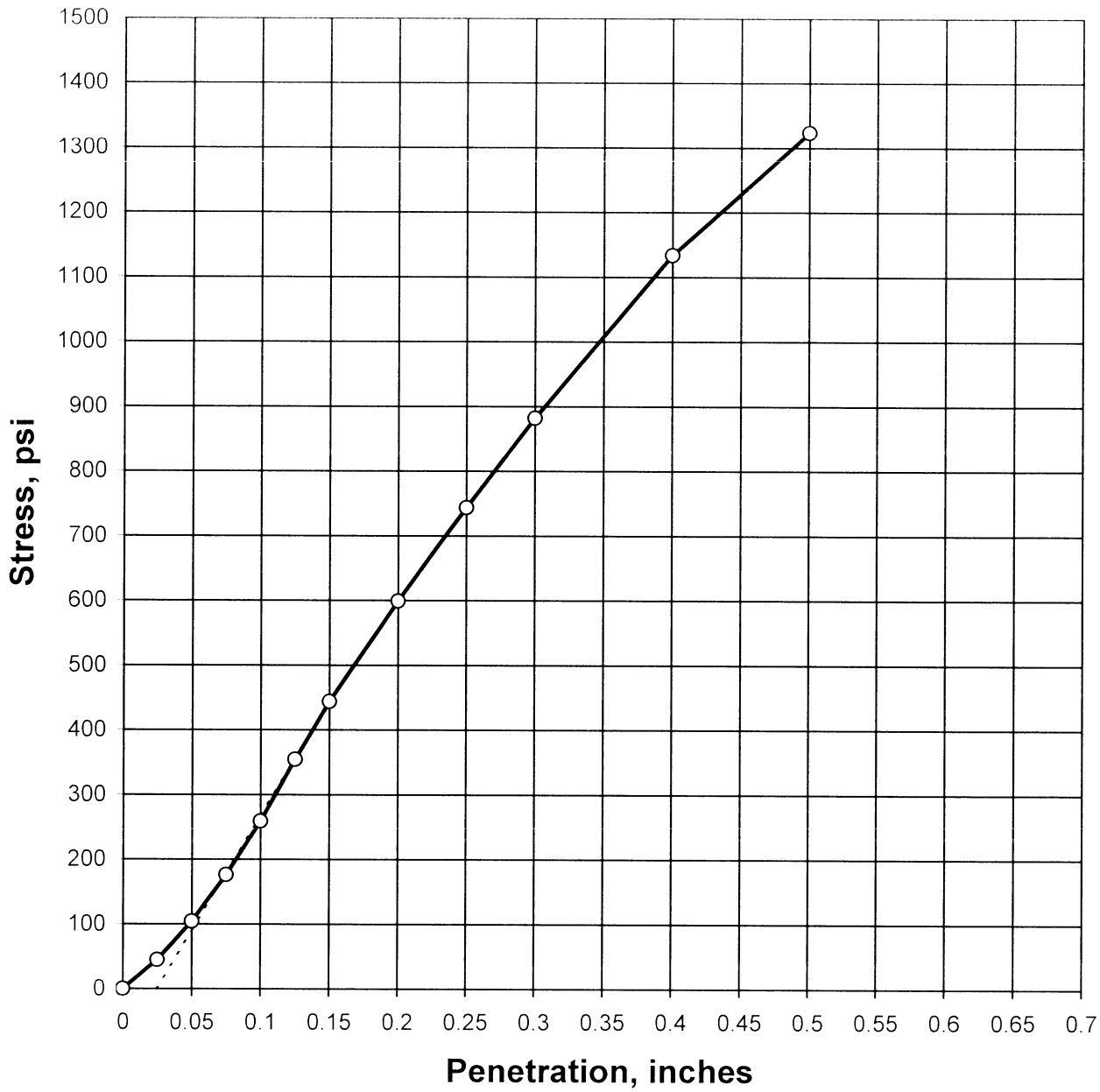
Sample Preparation: Standard Proctor
Sample Description: Austin Chalk with 4.5 % Lime
Liquid Limit: Molded Dry Density: 109.9 pcf
Plasticity Index: Maximum Dry Density: pcf
Percent Passing No. 200 Sieve: Optimum Moisture Content:
Molding Moisture Content: 18.8% Moisture Content after test: 18.4%
Swell: 0.0%
Soaked CBR at 0.1 inch Penetration: 18.0 with 10 pound surcharge

CALIFORNIA BEARING RATIO TEST 19 RESULTS
AUSTIN CHALK WITH 4.5% LIME

Terracon

Terracon Job No. 94065243

FIGURE I-26



Test Method ASTM D 1883-99

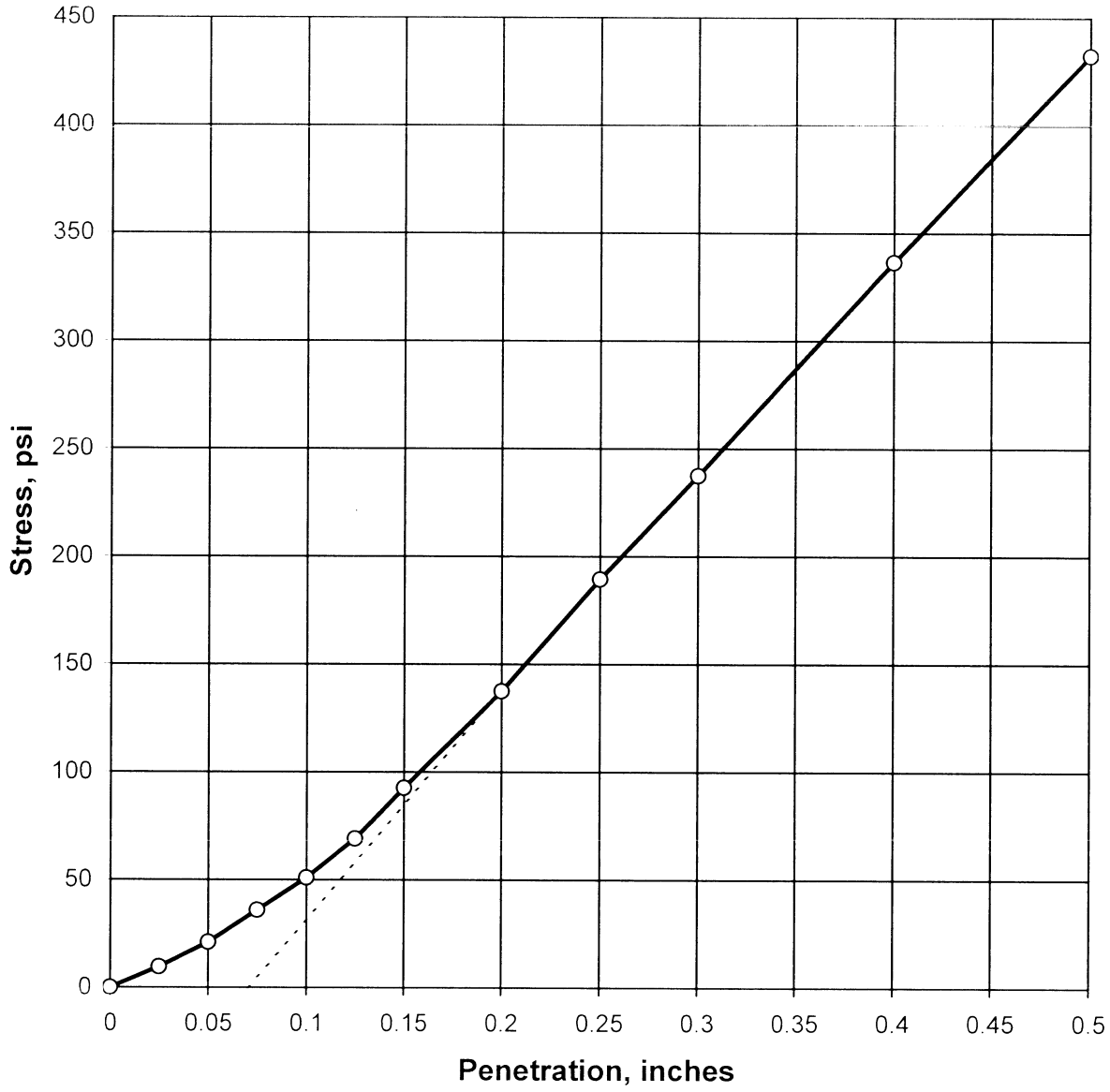
Sample Preparation:	Standard Proctor		
Sample Description:	Gray Austin Chalk with 6 % Lime		
Liquid Limit:		Molded Dry Density:	108.8 pcf
Plasticity Index:		Maximum Dry Density:	pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:	
Molding Moisture Content:	17.4%	Moisture Content after test:	18.1%
Swell:	0.1%		
Soaked CBR at 0.1 inch Penetration:	33.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 20 RESULTS
AUSTIN CHALK WITH 6% LIME

Terracon

Terracon Job No. 94065243

FIGURE I-28



Test Method ASTM D 1883-99

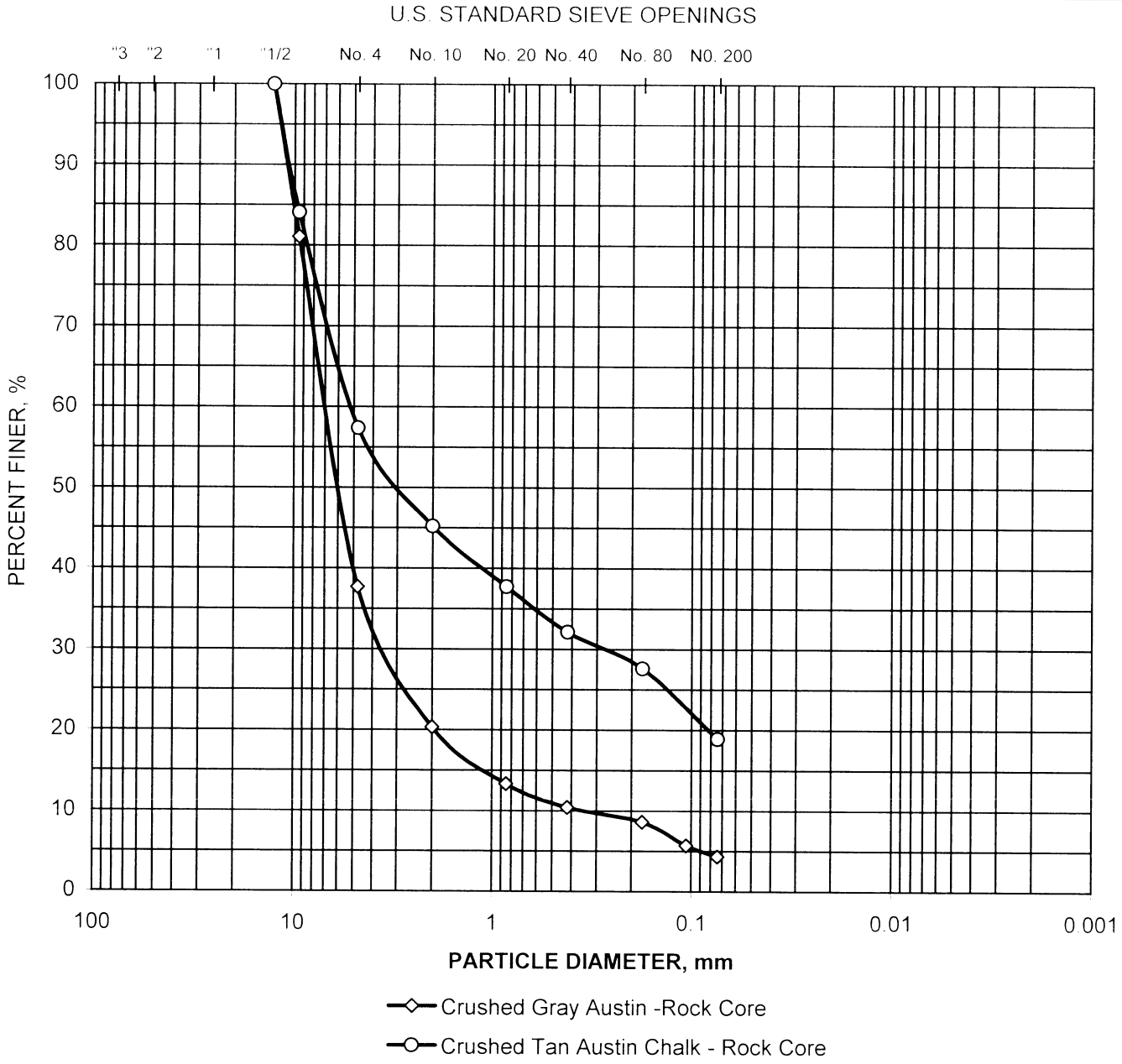
Sample Preparation:	Standard Proctor		
Sample Description:	Gray Austin Chalk with 6 % Lime		
Liquid Limit:		Molded Dry Density:	105.7 pcf
Plasticity Index:		Maximum Dry Density:	pcf
Percent Passing No. 200 Sieve:		Optimum Moisture Content:	
Molding Moisture Content:	21.1%	Moisture Content after test:	19.6%
Swell:	-0.1%		
Soaked CBR at 0.1 inch Penetration:	11.0	with 10 pound surcharge	

CALIFORNIA BEARING RATIO TEST 21 RESULTS
AUSTIN CHALK WITH 6% LIME

Terracon

Terracon Job No. 94065243

FIGURE I-29



BORING NO.	DEPTH FEET	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS		
					LL	PL	PI
		Crushed Gray Austin -Rock Core			41	18	23
		Crushed Tan Austin Chalk - Rock Core			39	18	21

GRAIN SIZE DISTRIBUTION CURVE - BEFORE COMPACTION

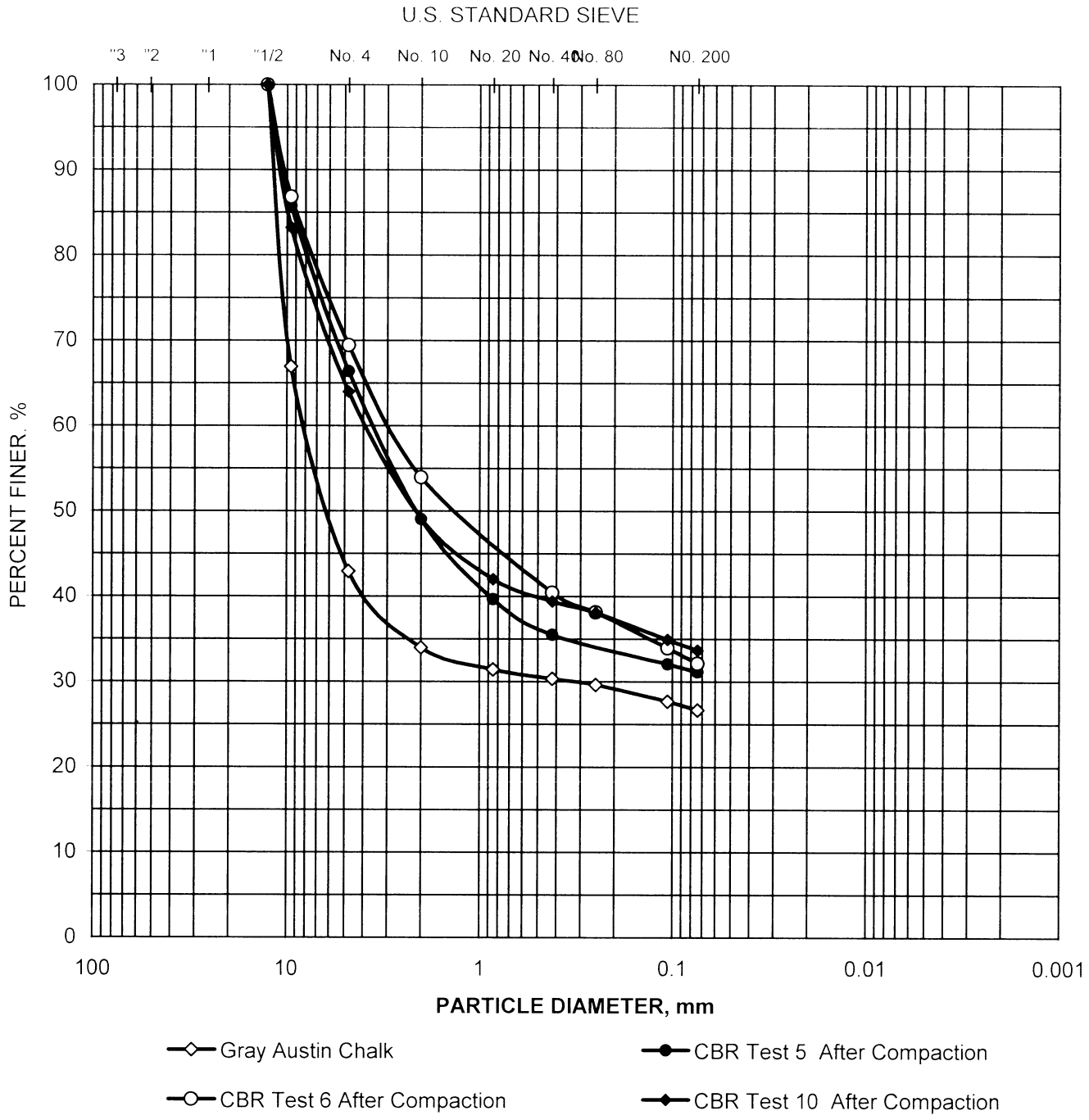
STANDARD COMPACTIVE EFFORT ROCK CORE SAMPLES

SH121 MANAGED LANES, COLLIN COUNTY TEXAS

Terracon

Project No. 94065243

FIGURE I-30



BORING NO.	DEPTH FEET	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS		
					LL	PL	PI
		Gray Austin Chalk			33	18	15

GRAIN SIZE DISTRIBUTION CURVE ON CRUSHED GRAY AUSTIN CHALK

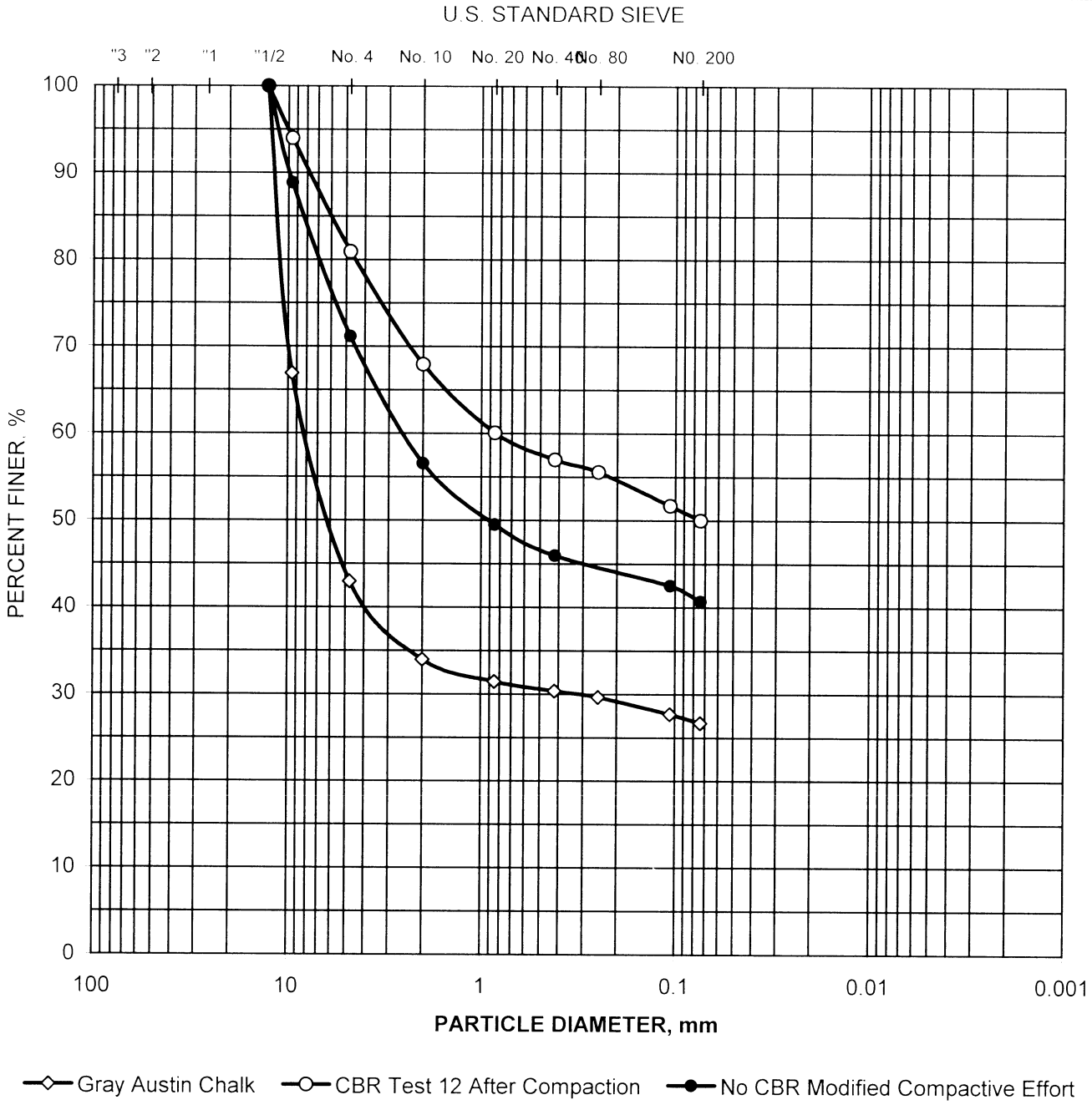
STANDARD COMPACTIVE EFFORT QUARRY SAMPLES

SH121 MANAGED LANES, COLLIN COUNTY TEXAS

Terracon

Project No. 94065243

FIGURE I-31



BORING NO.	DEPTH FEET	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS		
					LL	PL	PI
		Gray Austin Chalk			33	18	15

GRAIN SIZE DISTRIBUTION CURVE ON CRUSHED GRAY AUSTIN CHALK

MODIFIED COMPACTIVE EFFORT QUARRY SAMPLES

SH121 MANAGED LANES, COLLIN COUNTY TEXAS

Terracon

Project No. 94065243

FIGURE I-32