LOG OF BORING NO. MC-271

CLIENT
HNTB

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 973+08, 120 feet left of centerline

Approx. Surface Elev.: 1205.0 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	SANDY GRAVEL, with clay red, white and gray, dense, moist		GP	1	AS					
	20 — 1185.0	5, 10, 15, 20								
	GRAVEL, with silt and clay light brown and white, dense, moist		GP	2	AS					
	25 — 1180.0	25								
	26 — 1179.0 **CHERT++** stratified, abundant clay seams, white and pink, very thin bedded, very fine grained, highly weathered, hard, with cavities			RUN 1	DB	17%	RQD 0%			
	27 — 1178.0 **CHERT++** stratified, trace limestone seams, white and light gray, medium bedded, very fine grained, weathered, hard, solid, trace vugs	30		RUN 2	DB	100%	RQD 57%			
				RUN 3	DB	100%	RQD 83%			

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	∇ DRY WD	∇ DRY AB	
WL	∇ DRY 24 hr AB	∇	
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

300

LOG OF BORING NO. MC-271

CLIENT: HNTB

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
		35								
	CHERT++ stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid			RUN 4	DB	100%	RQD 90%			
		40								
				RUN 5	DB	90%	RQD 78%			
		45								
				RUN 6	DB	100%	RQD 94%			
		50		RUN 7	DB	100%	RQD 100%			
				RUN 8	DB	100%	RQD 95%			
		55								
				RUN 9	DB	100%	RQD 95%			
		60								
				RUN 10	DB	95%	RQD 90%			
		65								

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	∇ DRY	WD	∇ DRY AB
WL	∇ DRY 24 hr AB		∇
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

LOG OF BORING NO. MC-271

CLIENT: HNTB

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
	CHERT++ stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid			RUN 11	DB	100%	RQD 88%			
		70								
				RUN 12	DB	100%	RQD 97%			
		75								
	76 1129.0									
	CHERT++ stratified, with limestone seams, light gray and gray, thick bedded, very fine to fine grained, fresh, hard, solid			RUN 13	DB	100%	RQD 97%			
		80								
				RUN 14	DB	97%	RQD 69%			
		85								
	BOTTOM OF BORING AT 96 FEET BORING BACKFILLED WITH CUTTINGS 08/22/03			RUN 15	DB	95%	RQD 87%			
	++ Classification estimated from core samples. Petrographic analysis may reveal other rock types.	90								
	Note: Catcher broke - lost last foot of core from barrel.			RUN 16	DB	75%	RQD 69%			
	96 1109.0	95								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▽ DRY AB
WL	▽ DRY 24 hr AB		▽
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

LOG OF BORING NO. MC-271

CLIENT: HNTB

GEOLOGIC LOG

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	
	OVERBURDEN										
	25 1180.0	25									
CT CLAY	**CHERT++** stratified, abundant clay seams, white and pink, very thin bedded, very fine grained, highly weathered, hard, with cavities 26 1179.0			RUN 1	DB	17%	RQD 0%				
CT	**CHERT++** stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid			RUN 2	DB	100%	RQD 57%				
	REED SPRINGS FORMATION - highly fractured										
CT											
LS											
CT											
		30									

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▽ DRY AB
WL	▽ DRY 24 hr	AB	▽
WL			

Terracon

BORING STARTED	8-20-03
BORING COMPLETED	8-22-03
RIG ATV, #98	FOREMAN SS
APPROVED BRO	JOB # J7P0601

303

LOG OF BORING NO. MC-271

CLIENT: HNTB

GEOLOGIC LOG

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
CT	31 1174.0									
CT LS CT LS CT CT CT LS CT	**CHERT++** stratified, trace limestone seams, white and light gray, medium bedded, very fine grained, weathered, hard, solid, trace vugs	35		RUN 3	DB	100%	RQD 83%			
	36 1169.0									
CT LS CT LS CT LS CT	**CHERT++** stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid	40		RUN 4	DB	100%	RQD 90%			

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY WD	▽ DRY AB	
WL	▽ DRY 24 hr AB	▽	
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

LOG OF BORING NO. MC-271

CLIENT: HNTB

GEOLOGIC LOG

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	CT 41 1164.0									
	CHERT++ CT stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid CT 46 1159.0	45		RUN 5	DB	90%	RQD 78%			
	CHERT++ stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid CT 48.8 1156.2			RUN 6	DB	100%	RQD 94%			
	CHERT++ CT stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid	50		RUN 7	DB	100%	RQD 100%			

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽ DRY 24 hr	AB	▼
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

305

LOG OF BORING NO. MC-271

CLIENT: HNTB

GEOLOGIC LOG

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
CT, LS	51 — 1154.0									
CT, LS, CT, CT, CLAY, CT, CT, 56 LS	**CHERT++** stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid — 1149.0	55		RUN 8	DB	100%	RQD 95%			
CT, CT, CT, LS, CT, CT+LS, CT	**CHERT++** stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid	60		RUN 9	DB	100%	RQD 95%			

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL	DRY 24 hr AB		
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

LOG OF BORING NO. MC-271

CLIENT: HNTB

GEOLOGIC LOG

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
CT	61 1144.0									
CT, LS, CT, LS, LS, CT	**CHERT++** stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid	65		RUN 10	DB	95%	RQD 90%			
	66 1139.0									
CT, CT, CT	**CHERT++** stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid → highly fractured, w/clay seams	70		RUN 11	DB	100%	RQD 88%			

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▼ DRY 24 hr	AB	▼
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

307

LOG OF BORING NO. MC-271

CLIENT: HNTB

SITE: McDONALD COUNTY, MISSOURI

GEOLOGIC LOG

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
CT, LS	71 — 1134.0									
LS, CT, CLAY	**CHERT++** stratified, with limestone seams, white and light gray, medium to thick bedded, very fine grained, slightly weathered to fresh, hard, solid			RUN 12	DB	100%	RQD 97%			
CT, LS, CT, CT, CLAY, LS	76 — 1129.0	75								
CT, CT, LS, CT, CT, CT	**CHERT++** stratified, with limestone seams, light gray and gray, thick bedded, very fine to fine grained, fresh, hard, solid			RUN 13	DB	100%	RQD 97%			
		80								

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▽ DRY AB
WL	▽ DRY 24 hr AB		▽
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

LOG OF BORING NO. MC-271

CLIENT: HNTB

GEOLOGIC LOG

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	
CT, LS, 81	**CHERT++** stratified, with limestone seams, light gray and gray, thick bedded, very fine to fine grained, fresh, hard, solid — 1124.0										
CT, CT, LS, CT, LS, CT, LS, SH, CT, SH, CT, 87	**CHERT++** stratified, with limestone seams, light gray and gray, thick bedded, very fine to fine grained, fresh, hard, solid — 1118.0	85		RUN 14	DB	97%	RQD 69%				
SH, LS, CT, LS, CT, LS	**CHERT++** stratified, with limestone seams, light gray and gray, thick bedded, very fine to fine grained, fresh, hard, solid	90		RUN 15	DB	95%	RQD 87%				

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	∇ DRY	WD	∇ DRY AB
WL	∇ DRY 24 hr AB		∇
WL			

Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

309

LOG OF BORING NO. MC-271

CLIENT: HNTB

SITE: McDONALD COUNTY, MISSOURI

GEOLOGIC LOG

PROJECT: I-49, MISSOURI

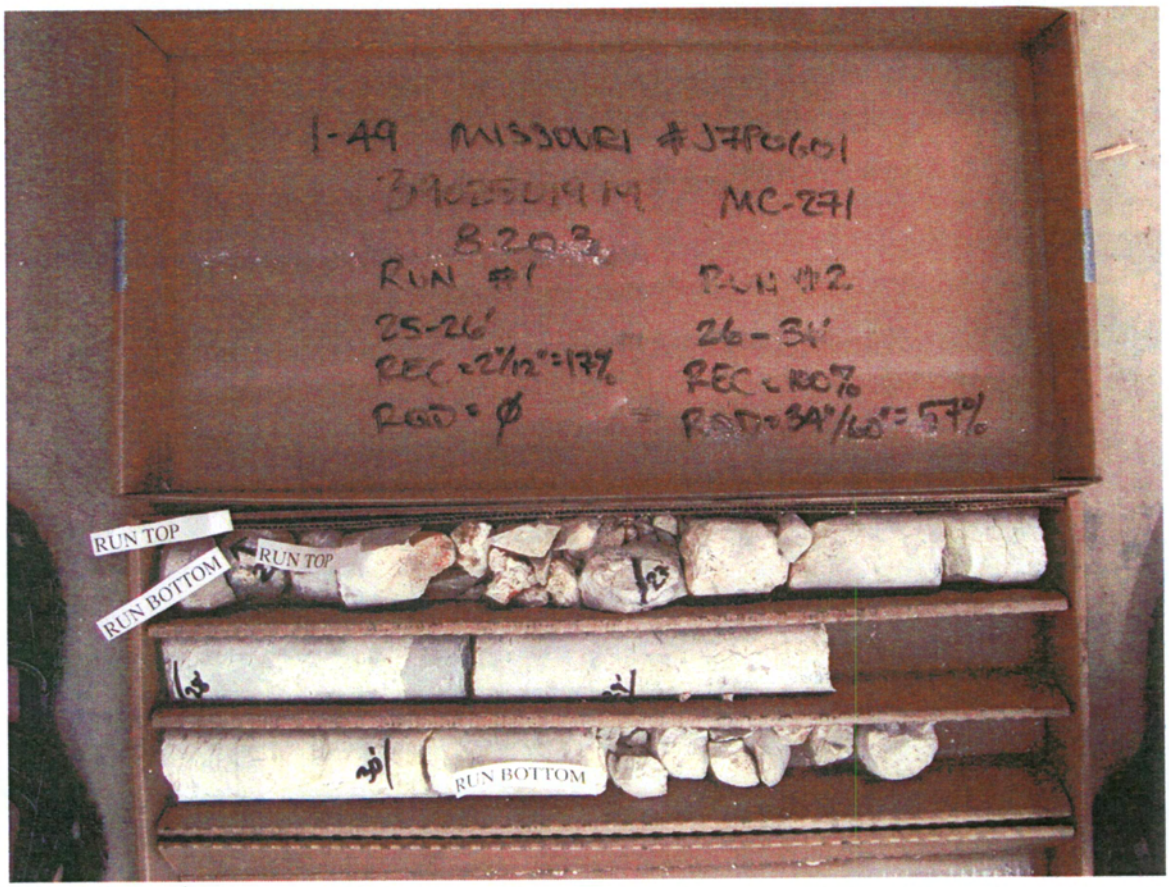
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
LS, CT, CT	**CHERT++** stratified, with limestone seams, light gray and gray, thick bedded, very fine to fine grained, fresh, hard, solid									
92	1113.0									
LS, CT, SH, CT+LS, CT+LS, LS, CT	**CHERT++** stratified, with limestone seams, light gray and gray, thick bedded, very fine to fine grained, fresh, hard, solid			RUN 16	DB	75%	RQD 69%			
		95								
96	1109.0									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▽ DRY AB
WL	▽ DRY 24 hr AB		▽
WL			

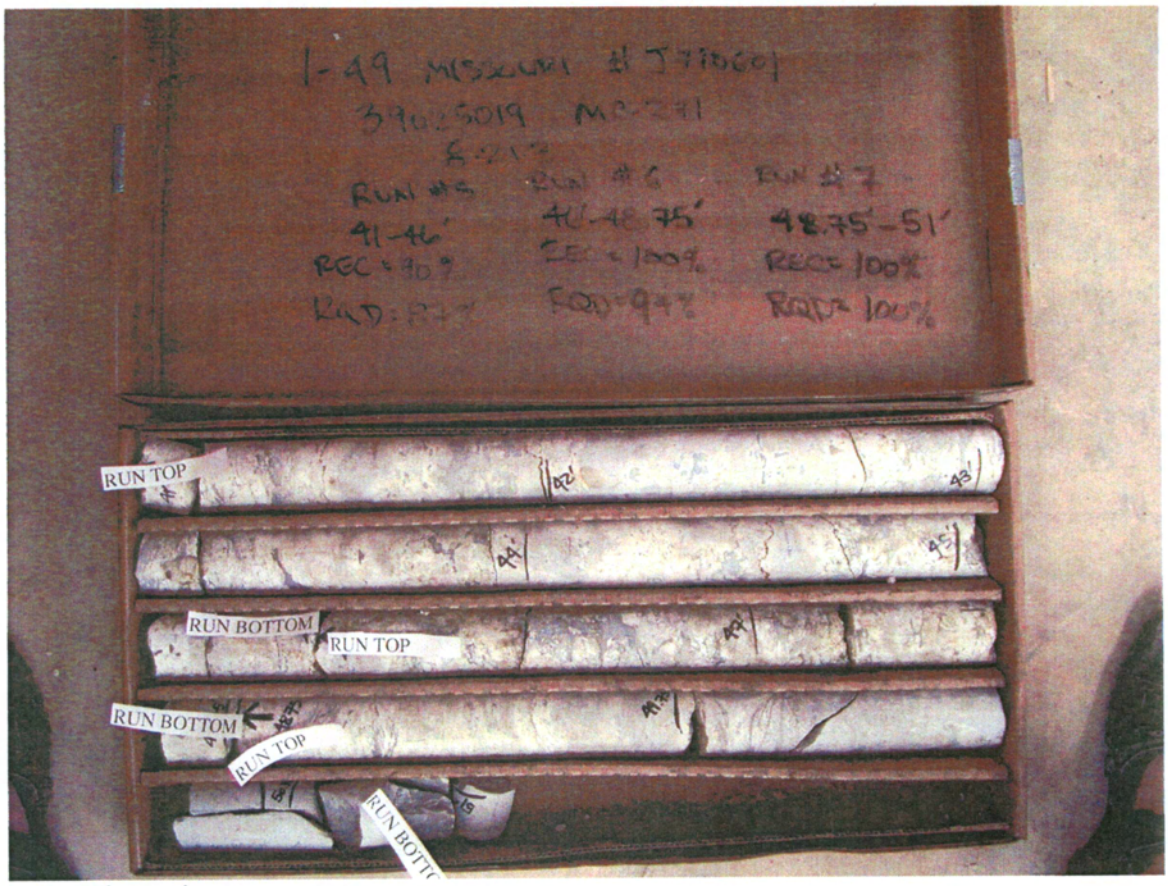
Terracon

BORING STARTED	8-20-03		
BORING COMPLETED	8-22-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

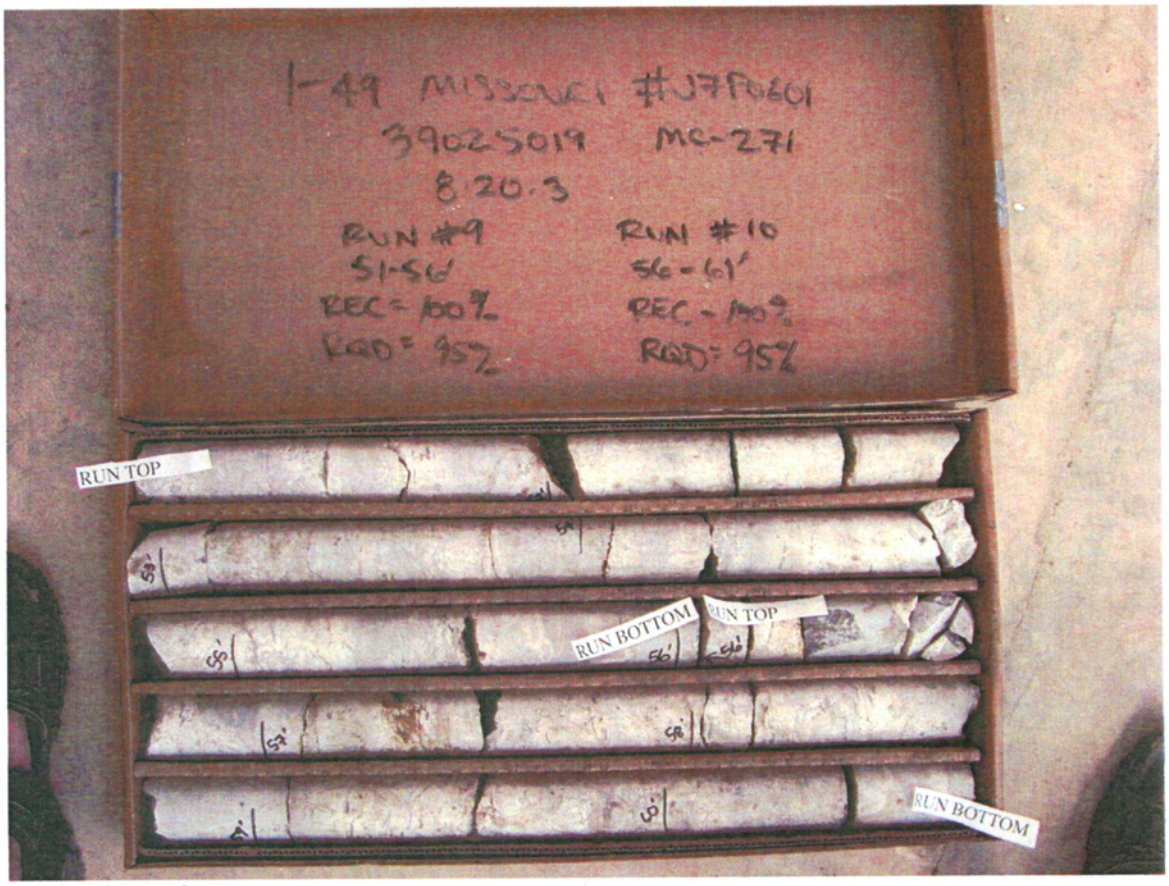


I 49 Missouri
Missouri J7P0601
Boring No. MC 271
Run No. 1
25.0 Feet to 26.0 Feet
Run No. 2
26.0 Feet to 31.0 Feet

I 49 Missouri
Missouri J7P0601
Boring No. MC 271
Run No. 3
31.0 Feet to 36.0 Feet
Run No. 4
36.0 Feet to 41.0 Feet

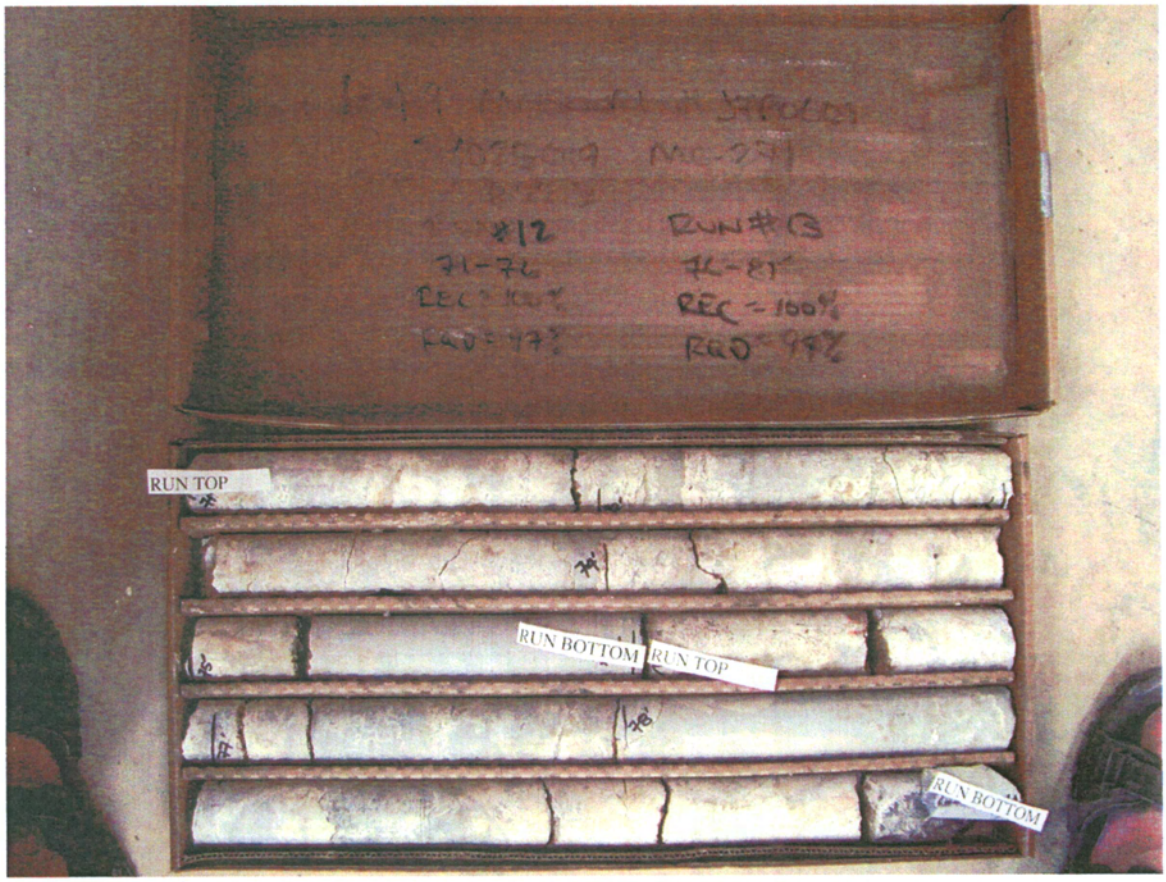


I 49 Missouri
Missouri J7P0601
Boring No. MC 271
Run No. 5
41.0 Feet to 46.0 Feet
Run No. 6
46.0 Feet to 48.75 Feet
Run No. 7
48.75 Feet to 51.0 Feet

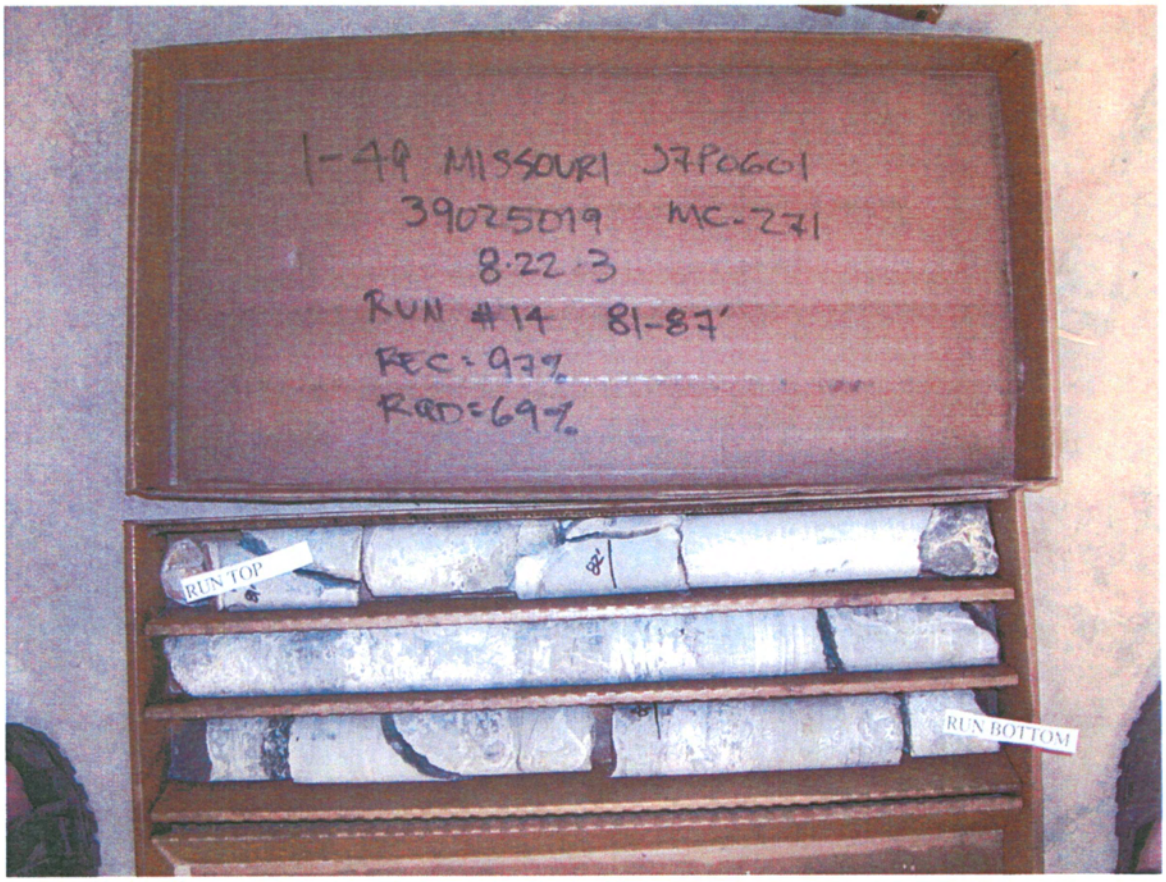


I 49 Missouri
Missouri J7P0601
Boring No. MC 271
Run No. 8
51.0 Feet to 56.0 Feet
Run No. 9
56.0 Feet to 61.0 Feet

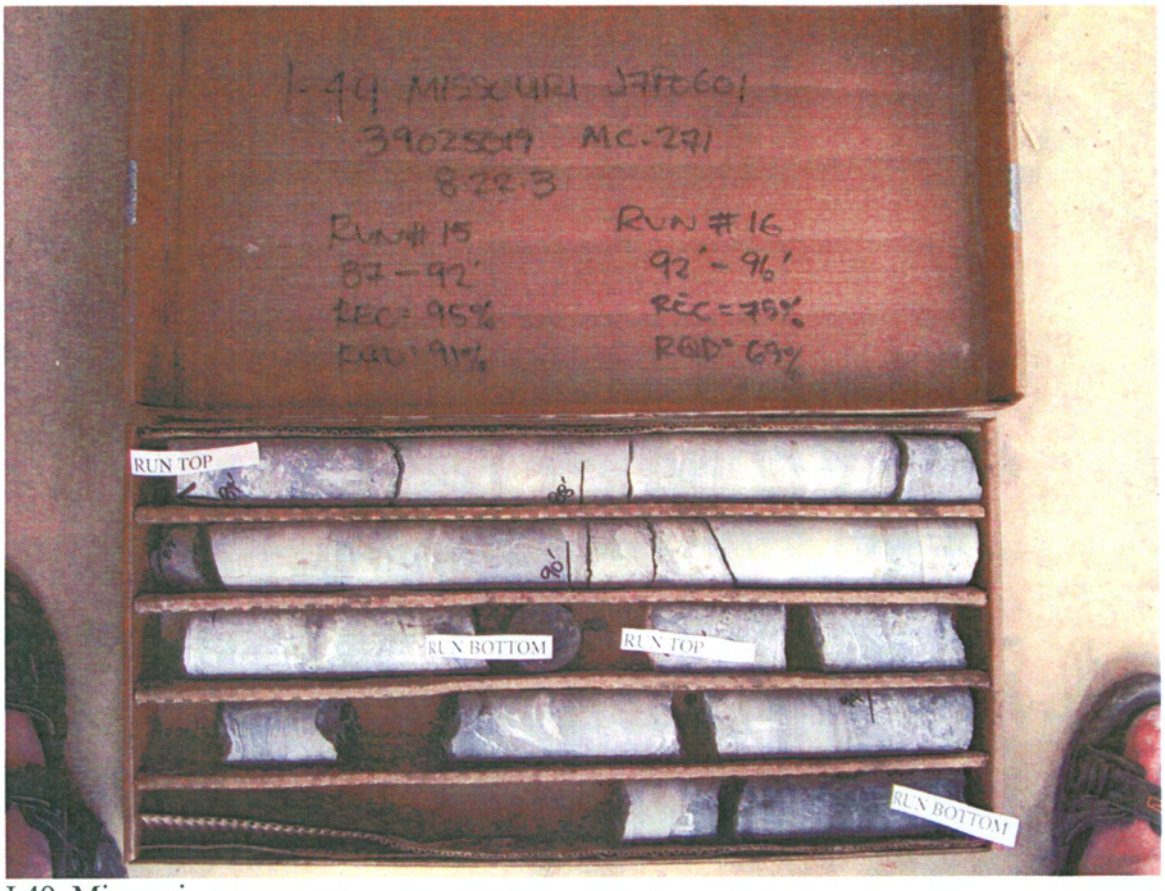
I 49 Missouri
Missouri J7P0601
Boring No. MC 271
Run No. 10
61.0 Feet to 66.0 Feet
Run No. 11
66.0 Feet to 71.0 Feet



I 49 Missouri
Missouri J7P0601
Boring No. MC 271
Run No. 12
71.0 Feet to 76.0 Feet
Run No. 13
76.0 Feet to 81.0 Feet



I 49 Missouri
Missouri J7P0601
Boring No. MC 271
Run No. 14
81.0 Feet to 87.0 Feet



I 49 Missouri
Missouri J7P0601
Boring No. MC 271
Run No. 15
87.0 Feet to 92.0 Feet
Run No. 16
92.0 Feet to 96.0 Feet

LOG OF BORING NO. MC-283

CLIENT: HNTB

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 981+08, 120 feet left of centerline

Approx. Surface Elev.: 1183.0 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf
	GRAVEL, with silt and clay light brown and white, medium dense to dense, dry		GC	1	AS					
	20 1163.0	20								
	GRAVEL, with clay reddish brown, dense, dry to moist			2	AS					
					RB					

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	8-12-03		
BORING COMPLETED	8-20-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BO	JOB #	J7P0601

319

LOG OF BORING NO. MC-283

CLIENT: HNTB

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WT pcf	TESTS: UNCONFINED STRENGTH, psf
	GRAVEL, with clay reddish brown, dense, dry to moist	35								
		40								
		45								
		50								
		55								
		60								
	65 1118.0	65								

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	8-12-03		
BORING COMPLETED	8-20-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BO	JOB #	J7P0601

LOG OF BORING NO. MC-283

CLIENT: HNTB

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf
	CHERT++ stratified, abundant limestone seams and beds, gray to dark gray, medium bedded, very fine grained, fresh, hard, solid			RUN 1	DB	100%	RQD 44%			
		70		RUN 2	DB	90%	RQD 58%			
73	1110.0									
	CHERT++ stratified, with limestone seams, trace shale laminations, white, light gray and dark gray, medium bedded, very fine grained, fresh, very hard, solid	75		RUN 3	DB	90%	RQD 85%			
78	1105.0									

BOTTOM OF BORING AT 78 FEET
BACKFILLED WITH CUTTINGS 08/20/03

++ Classification estimated from core samples. Petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	8-12-03		
BORING COMPLETED	8-20-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BO	JOB #	J7P0601

LOG OF BORING NO. MC-283

CLIENT: HNTB

SITE: McDONALD COUNTY, MISSOURI

GEOLOGIC LOG

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WT pcf	TESTS: UNCONFINED STRENGTH, psf
	OVERBURDEN									
	65 — 1118.0									
CT, LS	**CHERT++** stratified, abundant limestone seams and beds, gray to dark gray, medium bedded, very fine grained, fresh, hard, solid	65		RUN 1	DB	100%	RQD 44%			
CT	REED SPRINGS FORMATION									
LS, CT										
	68 — 1115.0									
LS, CT, LS, CT	**CHERT++** stratified, abundant limestone seams and beds, gray to dark gray, medium bedded, very fine grained, fresh, hard, solid			RUN 2	DB	90%	RQD 58%			
		70								

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	8-12-03		
BORING COMPLETED	8-20-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

322

LOG OF BORING NO. MC-283

CLIENT: HNTB

GEOLOGIC LOG

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WT pcf	TESTS: UNCONFINED STRENGTH, psf
	CHERT++ stratified, abundant limestone seams and beds, gray to dark gray, medium bedded, very fine grained, fresh, hard, solid (CT, CT, LS, CT) 73	1110.0								
	CHERT++ stratified, with limestone seams, trace shale laminations, white, light gray and dark gray, medium bedded, very fine grained, fresh, very hard, solid (CT, SH, CT, CT+LS, LS, CT, SH, LS, CT, CT, LS, CT, SH, CT, SH, CT+LS) 78	1105.0		RUN 3	DB	90%	RQD 85%			

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	8-12-03		
BORING COMPLETED	8-20-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

I 49 Missouri
Missouri J7P0601
Boring No. MC 283
Run No. 1
65.0 Feet to 68.0 Feet
Run No. 2
68.0 Feet to 73.0 Feet

I 49 Missouri
Missouri J7P0601
Boring No. MC 283
Run No. 3
73.0 Feet to 78.0 Feet

9.4 Roadway Structure Boring Logs

LOG OF BORING NO. MS-23

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 738+62, 175 Feet right from baseline southbound ramp

Approx. Surface Elev.: 943.6 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	GRAVEL, trace clay light brown and white, loose to dense, moist		GP		HS						
			GP	1	SS	14	10				5, 5, 5
		5	GP		HS						
			GP	2	SS	10	10				4, 4, 6
		10	GP		HS						
	14 929.6		GP	3	SS	11	30				13, 13, 17
	LIMESTONE GRAVEL, with sand gray, dense, dry	15	GP								
	17 926.6										

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 17 FEET
BACKFILLED WITH CUTTINGS 10/15/02

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▼ DRY 24 hr AB		▼
WL			

Terracon

BORING STARTED	10-15-02		
BORING COMPLETED	10-15-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-24

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 740+47, 51 Feet left from baseline southbound ramp

Approx. Surface Elev.: 963.2 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	Blow Counts for 18"
	GRAVEL, with silt light brown and gray, dense, dry		GM		HS						
	3.5 959.7										
	3.8 959.4 **CHERT++** gray, hard, dry		GM	1	SS	0	50/1"				20/1", 30/0"

AUGER REFUSAL ON CHERT

BOTTOM OF BORING AT 3.8 FEET
BACKFILLED WITH CUTTINGS 10/18/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽ DRY 24 hr AB		▼
WL			

Terracon

BORING STARTED			10-17-02
BORING COMPLETED			10-17-02
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-41

CLIENT
HNTB

Automatic Hammer Efficiency = 83%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 768+04, 400 Feet left of centerline

Approx. Surface Elev.: 995.1 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	CLAYEY GRAVEL dark brown and white, loose, dry to moist		GC		PA						
			GC	1	SS	12	9				3, 4, 5
		5	GC		PA						
			GC	2	SS	10	10				5, 5, 5
		10	GC		PA						
	13.5 / 981.6										
	GRAVELLY LEAN CLAY, scattered sand brown and white, medium stiff, moist		CL	3	SS	14	11				5, 5, 6
		15	CL		PA						
	18.3 / 976.8										
	AUGER REFUSAL ON APPARENT CHERT BOTTOM OF BORING AT 18.3 FEET BACKFILLED WITH CUTTINGS 11/14/03										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽ DRY 24 hr AB		▼
WL			

Terracon

BORING STARTED	11-13-02		
BORING COMPLETED	11-13-02		
RIG	ATV, #98	FOREMAN	DB
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-42

CLIENT: HNTB

Automatic Hammer Efficiency = 83%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 767+90, Centerline

Approx. Surface Elev.: 977.6 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	GRAVEL WITH COBBLES brown, dry		GP		PA						
	3.5 — 974.1										
	GRAVELLY SAND, trace clay brown and white, loose to medium dense, dry		SP	1	SS	6	14				2, 5, 9
		5	SP		PA						
			SP	2	SS	4	4				2, 1, 3
	11 — 966.6	10	SP		PA						
	11.4 — 966.2 **LIMESTONE++** gray, hard										

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 11.4 FEET
BACKFILLED WITH CUTTINGS 11/13/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL	DRY 24 hr AB		
WL			

Terracon

BORING STARTED	11-13-02		
BORING COMPLETED	11-13-02		
RIG	ATV, #98	FOREMAN	DB
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-43

CLIENT
HNTB

Automatic Hammer Efficiency = 83%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 767+97, 440 Feet right of centerline

Approx. Surface Elev.: 966.0 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
GRAVEL, with clay brown and white, medium dense, dry to moist		GC		PA						
		GC	1	SS	10	12				5, 6, 6
	5	GC		PA						
		GC	2	SS	6	12				5, 7, 5
	10	GC		PA						
14.5 / 951.5		GC	3	SS	10	9				5, 4, 5
SANDY LEAN CLAY brown, very soft, moist	15	CL		PA						
19 / 947.0										
19.5 / 946.5 **LIMESTONE++** light brown, hard, highly weathered		CL	4 5	ST SS	6 0	50/0"				50/0"

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 19.5 FEET
BACKFILLED WITH CUTTINGS 11/13/03

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	11-13-02		
BORING COMPLETED	11-13-02		
RIG	ATV, #98	FOREMAN	DB
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-59

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 783+36, 150 Feet left of centerline

Approx. Surface Elev.: 1034.3 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	GRAVEL gray, loose, dry	1.5 / 1032.8	GP		HS						
	AUGER REFUSAL ON APPARENT CHERT										
	BOTTOM OF BORING AT 1.5 FEET BACKFILLED WITH CUTTINGS 10/22/02										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▼ DRY 24 hr AB		▼
WL			

Terracon

BORING STARTED	10-22-02		
BORING COMPLETED	10-22-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-60

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 784+25, 248 Feet right of centerline

Approx. Surface Elev.: 1010.4 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	GRAVEL, with silt light brown and gray, very dense, dry		GM		HS						
	4.5 1005.9			1	SS	10	18/6" 50/2"				25, 18, 50/2"
	5 1005.4 **CHERT++** gray, hard	5			HS						
	AUGER REFUSAL ON CHERT										
	BOTTOM OF BORING AT 5 FEET BACKFILLED WITH CUTTINGS 10/18/02										
	++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽ DRY 24 hr AB		▽
WL			

Terracon

BORING STARTED	10-18-02		
BORING COMPLETED	10-18-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

323

LOG OF BORING NO. MS-72

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 792+28, 250 Feet right of centerline

Approx. Surface Elev.: 979.8 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
CLAYEY GRAVEL, with silt brown, light brown and reddish brown, medium dense, moist		GC		HS						
		GC	1	SS	10	14				6, 6, 8
	5	GC		HS						
8 971.8										
CHERT++ gray, hard			2	SS HS	0	55/2"				5/2", 50/0"
	10									
11.2 968.6										

AUGER REFUSAL ON CHERT

BOTTOM OF BORING AT 11.2 FEET
BACKFILLED WITH CUTTINGS 10/17/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL	DRY 24 hr AB		
WL			

Terracon

BORING STARTED	10-17-02		
BORING COMPLETED	10-17-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-73

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 795+49, Centerline

Approx. Surface Elev.: 990.4 ft

DESCRIPTION	Depth, ft.	USCS Symbol	Samples: Number	Samples: Type	Samples: Recovery, in.	Samples: SPT - N Blows / ft.	Tests: Water Content, %	Tests: Dry Unit Wt pcf	Tests: Unconfined Strength, psf	Blow Counts for 18"
SILTY GRAVEL brown, medium dense, dry (3.5 – 986.9)		GM		HS						
SILTY SANDY GRAVEL brown, light reddish brown and gray, medium dense, dry to moist		GM	1	SS	14	13				10, 7, 6
	5	GM		HS						
		GM	2	SS	4	11				5, 5, 6
	10	GM		HS						
		GM	3	SS	8	16				8, 10, 6
	15	GM		HS						
(17 – 973.4) **CLAYEY GRAVEL**, with sand brown, medium dense, moist (19.5 – 970.9)		GC	4	SS	8	13/6" 50/1"				6, 13, 50/1"
BROKEN CHERT++, with sand gray, hard, moist (21.8 – 968.6)	20			HS						

AUGER REFUSAL ON CHERT

BOTTOM OF BORING AT 21.8 FEET
BACKFILLED WITH CUTTINGS 10/21/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL	DRY 24 hr AB		
WL			

Terracon

BORING STARTED	10-21-02		
BORING COMPLETED	10-21-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-74

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 797+99, 200 Feet left of centerline

Approx. Surface Elev.: 994.0 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	SILTY GRAVEL brown, medium dense, moist		GM		HS						
	3.5 990.5										
	SILTY SANDY GRAVEL brown, light reddish brown and gray, medium dense, moist		GM	1	SS	12	14				8, 7, 7
		5	GM		HS						
			GM	2	SS	12	12				4, 6, 6
		10	GM		HS						
			GM	3	SS	14	24				7, 13, 11
		15			HS						
	17.3 976.7										

AUGER REFUSAL ON APPARENT CHERT

BOTTOM OF BORING AT 17.3 FEET
BACKFILLED WITH CUTTINGS 10/22/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL	DRY 24 hr AB		
WL			

Terracon

BORING STARTED	10-21-02		
BORING COMPLETED	10-21-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-103

CLIENT: HNTB

Automatic Hammer Efficiency = 83%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 818+71, 239 Feet right of centerline

Approx. Surface Elev.: 1039.7 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	LEAN CLAY, trace gravel light brown and gray, medium stiff, dry		CL		HS						
			CL	1	SS	12	13/6" ~~50/2"~~				7, 13, 50/2"
	- scattered cobbles below 4.7 feet	5	CL		HS						
	6 1033.7										
	7 **LIMESTONE++** 1032.7 brown to gray, hard, weathered to fresh										

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 7 FEET
BACKFILLED WITH CUTTINGS 05/05/03

++ Classification estimated from disturbed samples. Core samples or petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	5-5-03		
BORING COMPLETED	5-5-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BKM	JOB #	J7P0601

LOG OF BORING NO. MS-119

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 830+76, 188 Feet left of centerline

Approx. Surface Elev.: 1086.3 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	GRAVEL AND COBBLES, with sand and clay dark brown and white, medium dense, dry 3.5 1082.8		GP		PA						
	GRAVEL, scattered clay reddish brown and brown, medium dense, moist 5 1081.3		GP	1	SS	12	8/6" 50/2"				7, 8, 50/2"
		5	GP		HS						

AUGER REFUSAL ON APPARENT CHERT

BOTTOM OF BORING AT 5 FEET
BACKFILLED WITH CUTTINGS 10/24/02

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	10-24-02		
BORING COMPLETED	10-24-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-120

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 831+28, 4 Feet right of centerline

Approx. Surface Elev.: 1077.7 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	GRAVEL, scattered clay and cobbles brown and white, dense, dry		GP		PA						
	3.5 — 1074.2										
	GRAVEL, with clay brown, reddish brown and white, dense, dry		GC	1	SS	18	47				22, 26, 21
		5	GC		HS						
	7.5 — 1070.2										
	8 **CHERT++** white, hard, weathered — 1069.7										

AUGER REFUSAL ON CHERT

BOTTOM OF BORING AT 8 FEET
BACKFILLED WITH CUTTINGS 10/24/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	10-24-02		
BORING COMPLETED	10-24-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-121

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 832+24, 276 Feet right of centerline

Approx. Surface Elev.: 1062.7 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	GRAVEL, abundant clay, scattered cobbles and sand gray, grayish brown and white, dense to very dense, dry		GC		HS						
	4 — 1058.7										
	4.8 **CHERT++** light gray, hard — 1057.9		GC	1	SS	8	17/6" 50/6"				17/6", 50/6"
					HS						

AUGER REFUSAL ON CHERT

BOTTOM OF BORING AT 4.8 FEET
BACKFILLED WITH CUTTINGS 10/24/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	10-24-02		
BORING COMPLETED	10-24-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-129

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 841+03, 375 Feet right of centerline

Approx. Surface Elev.: 1052.7 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	GRAVEL AND COBBLES, with clay dark brown, medium dense, moist		GP GC		HS						
	3.5 1049.2										
	GRAVEL AND COBBLES, with clay brown, light reddish brown and white, medium dense, moist		GP GC	1	SS	4	13				7, 7, 6
		5	GP GC		HS						
	9 1043.7										
	10 **LEAN CLAY**, with sand, trace gravel brown, very stiff, moist 1042.7		CL	2	SS	12	13				7, 6, 7
	CHERT++, with clay seams	10			HS						
	12 white, moderately hard, highly weathered 1040.7										

AUGER REFUSAL ON CHERT

BOTTOM OF BORING AT 12 FEET
BACKFILLED WITH CUTTINGS 10/25/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	10-25-02		
BORING COMPLETED	10-25-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-130

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 843+99, Centerline

Approx. Surface Elev.: 1064.3 ft

DESCRIPTION	Elev.	DEPTH, ft.	USCS SYMBOL	NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
GRAVEL AND COBBLES, trace clay dark brown, loose, wet			GP		HS						
3.5	1060.8										
SILTY SANDY GRAVEL brown, light reddish brown and gray, medium dense, moist			GP	1	SS	4	8				9, 6, 2
		5	GP		HS						
			GP	2	SS	3	11				10, 5, 6
		10	GP		HS						
13.5	1050.8										
14 **FAT CLAY**, with gravel dark brown and white, stiff, moist	1050.3		CH	3	SS	12	12				12, 50/6"
15 **CHERT++**, trace clay seams white, hard, highly weathered	1049.3	15			HS		50/6"				

AUGER REFUSAL ON CHERT

BOTTOM OF BORING AT 15 FEET
BACKFILLED WITH CUTTINGS 10/24/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	10-24-02		
BORING COMPLETED	10-24-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-131

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 847+53, 328 Feet left of centerline

Approx. Surface Elev.: 1074.4 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	GRAVEL AND COBBLES, scattered clay dark brown, medium dense (3.5 – 1070.9)		GP		HS						
	GRAVEL, with clay brown, reddish brown and white, medium dense, moist (8 – 1066.4)		GC	1	SS	8	22				7, 10, 12
		5	GC		HS						
	CHERT++, with clay seams white, hard, highly weathered to fresh (10.5 – 1063.9)			2	SS	4	13/6"				13/6", 50/3"
		10			HS		50/3"				

AUGER REFUSAL ON CHERT

BOTTOM OF BORING AT 10.5 FEET
BACKFILLED WITH CUTTINGS 10/25/02

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft		
WL	▽	▼
WL	▼	▼
WL		

Terracon

BORING STARTED	10-25-02		
BORING COMPLETED	10-25-02		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-168

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 884+52, 476 Feet left of centerline

Approx. Surface Elev.: 1074.6 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	SANDY GRAVEL, few clay brown, medium dense, dry		GP		PA						
			GP	1	SS	18	13				8, 7, 6
		5	GP		PA						
	9.2	1065.4	CL	2	SS	13	3 50/2"			5000*	5, 3, 50/2"
	9.7 **LEAN CLAY** reddish brown, very stiff, moist	1064.9									
	CHERT AND LIMESTONE++, trace clay seams light gray, moderately hard to hard, highly weathered	10			PA						
				3	SS PA	0	50/0.5"				50/0.5"
		15									
	18.2	1056.4									
	CHERT++, with limestone seams, trace clay seams light gray and white, hard			4	SS PA	0	50/0.25"				50/0.25"
	19.7	1054.9									

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 19.7 FEET
BACKFILLED WITH CUTTINGS 10/08/03

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	10-8-03		
BORING COMPLETED	10-8-03		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-169

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 887+97, 53 Feet right of centerline

Approx. Surface Elev.: 1056.7 ft

DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	SANDY GRAVEL AND COBBLES, with clay; dark brown, very dense, dry (2 – 1054.7)								
	SP		PA						
	GRAVELLY SAND; light brown, very dense, dry								
	SP	1	SS	18	31				10, 16, 15
5	SP		PA						
	SANDY GRAVEL, with clay; gray and reddish brown, very dense, dry (7.5 – 1049.2)								
	GP	2	SS	10	50/5.5"				41, 50/5.5"
	GC		PA						
10	GP GC								
	CLAYEY GRAVEL; gray and reddish brown, medium dense, moist (12.5 – 1044.2)								
	GC	3	SS	18	17				10, 9, 8
15	GC		PA						
	SANDY GRAVEL, with clay; brown, loose to very loose, dry (17.5 – 1039.2)								
	GP	4	SS	4	1/8" 50/1"				6, 1/8", 50/1"
	GC		PA						
20	GP GC								
	FAT CLAY, trace chert seams; reddish brown, stiff, moist (20 – 1036.7)								
	CH	5	SS	18	20			3000*	6, 6, 14
			PA						

24 – 1032.7

24.5 – 1032.2

LIMESTONE++; gray, hard

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 24.5 FEET
BACKFILLED WITH CUTTINGS 10/08/03

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	10-8-03		
BORING COMPLETED	10-8-03		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-170

CLIENT: HNTB

Automatic Hammer Efficiency = 84.1%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 890+67, 496 Feet right of centerline

Approx. Surface Elev.: 1145.8 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	FAT CLAY, with to abundant gravel brown, very stiff, moist		CH		HS						
			CH	1	SS	18	21				7, 11, 10
		5	CH		HS						
	9.1 1136.7		CH	2	SS	10	10/6"				10, 50/5"
	9.7 **LIMESTONE++** 1136.1 gray to light gray, hard, fresh				HS		50/5"				

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 9.7 FEET
BACKFILLED WITH CUTTINGS 12/22/02

++ Classification estimated from disturbed samples. Core samples or petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽		▼
WL			

Terracon

BORING STARTED	12-22-02		
BORING COMPLETED	12-22-02		
RIG CME-75,#386	FOREMAN	JW	
APPROVED BKM	JOB #	J7P0601	

LOG OF BORING NO. MS-173

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 899+51, 49 Feet left of centerline

Approx. Surface Elev.: 1089.1 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	Blow Counts for 18"
	SILTY GRAVEL brown, loose, moist (3.5 / 1085.6)		GM		PA						
	FAT CLAY, scattered gravel olive brown, stiff, moist (7 / 1082.1)	5	CH	1	SS	14	10				3, 4, 6
	LIMESTONE++ gray, hard (8.5 / 1080.6)		CH		PA						

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 8.5 FEET
BACKFILLED WITH CUTTINGS 01/13/03

++ Classification estimated from disturbed samples. Core samples or petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ DRY	WD	▼ DRY	AB
WL	▽ DRY	24 hr	▼	
WL				

Terracon

BORING STARTED			1-13-03
BORING COMPLETED			1-13-03
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-174

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 900+30, 200 Feet right of centerline

Approx. Surface Elev.: 1068.1 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
CLAYEY GRAVEL dark brown and gray, medium dense, moist		GC		PA						
		GC	1	SS	18	11				7, 5, 6
	5	GC		PA						
8 / 1060.1										
SHALE++ gray to brownish gray, hard, weathered			2	SS PA	3	50/3"				50/3"
	10									
			3	SS PA	2	50/2"				50/2"
	15									
			4	SS PA	1	50/2"				50/2"
	20									
			5	SS PA	0	50/2"				50/2"
	25									
			6	SS PA	1	50/2"				50/2"
	30									

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ DRY	WD	▼ DRY	AB
WL	▽ DRY	24 hr	▼	
WL				

Terracon

BORING STARTED	1-13-03		
BORING COMPLETED	1-13-03		
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

338

LOG OF BORING NO. MS-174

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	SHALE++ gray to brownish gray, hard, weathered										
		35		7	SS PA	0	50/2"				50/2"
		40		8	SS PA	1	50/2"				50/2"
		45		9	SS PA	0	50/3"				50/3"
	50 1018.1	50		10	SS PA	0	50/2"				50/2"
	AUGER REFUSAL ON SHALE BOTTOM OF BORING AT 50 FEET BACKFILLED WITH CUTTINGS 01/13/03 ++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ DRY	WD	▼ DRY AB
WL	▽ DRY	24 hr	▼
WL			

Terracon

BORING STARTED			1-13-03
BORING COMPLETED			1-13-03
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-175

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 901+16, 597 Feet right of centerline

Approx. Surface Elev.: 1030.0 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	GRAVELLY LEAN CLAY, with sand dark brown, very stiff, moist to wet		CL		PA						
			CL	1	SS	18	14				4, 5, 9
		5	CL		PA						
	7 1023.0										
	SHALE++ dark gray to brownish gray, moderately hard to hard, weathered			2	SS PA	2	50/5"				50/5"
		10									
				3	SS PA	1	50/2"				50/2"
		15									
				4	SS PA	2	50/2"				50/2"
		20									
	22 1008.0										

AUGER REFUSAL ON SHALE

BOTTOM OF BORING AT 22.0 FEET
BACKFILLED WITH CUTTINGS 01/13/03

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 3.5	WD	▼ 22	AB
WL	▼ 2	24 hr	▽	
WL				

Terracon

BORING STARTED	1-13-03		
BORING COMPLETED	1-13-03		
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-181A

CLIENT
HNTB

Automatic Hammer Efficiency = 83%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 909+15, 248 Feet left of centerline

Approx. Surface Elev.: 1057.0 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	Blow Counts for 18"
	SHALE++ grayish brown, soft to moderately hard, highly weathered				PA						
				1	SS	16	45/6" 50/2"				30, 45, 50/2"
		5			PA						
	- sample wet at 9 feet			2	SS	6	50/6"				50/6"
		10			PA						
	13.6 - becoming gray, hard, fresh below 13.5 feet 1043.4			3	SS	1	50/1"				50/1"

AUGER REFUSAL ON SHALE

BOTTOM OF BORING AT 13.6 FEET
BACKFILLED WITH CUTTINGS 06/05/03

++ Classification estimated from disturbed samples. Core samples or petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 9.0	WD	▼ DRY AB
WL	▼ DRY 24 hr AB		▼
WL			

Terracon

BORING STARTED	6-5-03		
BORING COMPLETED	6-5-03		
RIG	ATV, #98	FOREMAN	SS
APPROVED	BRO	JOB #	J7P0601

LOG OF BORING NO. MS-182

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 908+87, 46 Feet left of centerline

Approx. Surface Elev.: 1048.1 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
1 **GRAVEL**, with silt, dark brown, loose, dry — 1047.1		GM		PA						
SHALE++ brownish gray, moderately hard to hard, weathered			1	SS PA	0	50/2"				50/2"
	5									
			2	SS PA	2	50/2"				50/2"
	10									
			3	SS PA	1	50/3"				50/3"
	15									
			4	SS PA	3	50/5"				50/5"
AUGER REFUSAL ON SHALE	20									
BOTTOM OF BORING AT 26.0 FEET BACKFILLED WITH CUTTINGS 01/14/03										
++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types. — 26 — 1022.1			5	SS PA	2	50/2"				50/2"
	25									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	8.5	WD 20	AB
WL			
WL			

Terracon

BORING STARTED	1-14-03		
BORING COMPLETED	1-14-03		
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-183

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 909+24, 241 Feet right of centerline

Approx. Surface Elev.: 1044.8 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
GRAVELLY LEAN CLAY dark brown and reddish brown, very stiff, moist		CL		PA						
5 / 1039.8		CL	1	SS	3	16				8, 8, 8
SHALE++ brownish gray to gray, moderately hard to hard, weathered	5			PA						
			2	~~SS~~ PA	~~9~~	~~30~~ 50/3"				30, 50/3"
	10									
			3	SS PA	2	50/3"				50/3"
	15									
			4	SS PA	0	50/3"				50/3"
	20									
22.5 / 1022.3										

AUGER REFUSAL ON SHALE

BOTTOM OF BORING AT 22.5 FEET
BACKFILLED WITH CUTTINGS 01/14/03

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	1-14-03		
BORING COMPLETED	1-14-03		
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-184

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 909+71, 575 Feet right of centerline

Approx. Surface Elev.: 1033.5 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	Blow Counts for 18"
	GRAVELLY SILT, with clay dark brown, dense, moist to wet ∇		ML		PA						
	4 — 1029.5										
	SHALEY LEAN CLAY / HIGHLY WEATHERED SHALE dark gray and brown, hard, moist to wet		CL	1	SS	12	35				10, 15, 20
		5	CL		PA						
	8.5 — 1025.0										

AUGER REFUSAL ON APPARENT SHALE

BOTTOM OF BORING AT 8.5 FEET
BACKFILLED WITH CUTTINGS 01/14/03

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	∇ 2	WD	▼ DRY AB
WL	∇		▼
WL			

Terracon

BORING STARTED	1-14-03		
BORING COMPLETED	1-14-03		
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-218

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 935+80, 216 Feet left of centerline

Approx. Surface Elev.: 1020.8 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
CLAYEY GRAVEL, with sand dark brown, loose, moist		GC		PA						
		GC	1	SS	6	13				4, 6, 7
	5	GC		PA						
		GC	2	SS	14	11				8, 6, 5
	10	GC		PA						
		GC	3	SS	6	20				9, 9, 11
	15	GC		PA						
17 1003.8										
SHALE++ dark gray and gray, moderately hard to hard, weathered			4	SS PA	2	50/2"				50/2"
	20									
AUGER REFUSAL ON SHALE										
BOTTOM OF BORING AT 28.0 FEET BACKFILLED WITH CUTTINGS 01/14/03			5	SS PA	2	50/2"				50/2"
	25									
++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.										
28 992.8										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	27 AB
WL			
WL			

Terracon

BORING STARTED	1-14-03		
BORING COMPLETED	1-14-03		
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-219

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 936+09, 17 Feet right of centerline

Approx. Surface Elev.: 1024.0 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
CLAYEY GRAVEL, with sand dark brown, loose, moist		GC		PA						
		GC	1	SS	5	4				3, 2, 2
	5	GC		PA						
- with clay seams below 8.5 feet		GC	2	SS	5	9				4, 4, 5
	10	GC		PA						
		GC	3	SS	18	16				8, 8, 8
	15	GC		PA						
- changing to brown and reddish brown, moist to wet below 18.5 feet		GC	4	SS	18	10				4, 4, 6
	20	GC		PA						
23.5 / 1000.5										
SHALE++ dark gray and gray, moderately hard to hard, weathered			5	SS PA	0	50/3"				50/3"
	25									
			6	SS PA	6	50/6"				50/6"
	30									

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	1-14-03		
BORING COMPLETED	1-14-03		
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

346

LOG OF BORING NO. MS-219

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, in.	SAMPLES: SPT - N BLOWS / ft.	TESTS: WATER CONTENT, %	TESTS: DRY UNIT WT pcf	TESTS: UNCONFINED STRENGTH, psf	Blow Counts for 18"
	33 991.0										
	AUGER REFUSAL ON SHALE										
	BOTTOM OF BORING AT 33.0 FEET BACKFILLED WITH CUTTINGS 01/14/03										
	++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ DRY	WD	▼ DRY	AB
WL	▽		▼	
WL				

Terracon

BORING STARTED	1-14-03		
BORING COMPLETED	1-14-03		
RIG	ATV, #103E	FOREMAN	KS
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-220

CLIENT: HNTB

Automatic Hammer Efficiency = 84.1%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 936+62, 244 Feet right of centerline

Approx. Surface Elev.: 1020.3 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
CLAYEY GRAVEL brown, stiff to very stiff, moist to wet		GC		PA						
		GC	1	SS	12	7				4, 4, 3
	5	GC		PA						
		GC	2	SS	12	18				5, 8, 10
11 / 1009.3	10	CH		PA						
FAT CLAY, abundant gravel brown to dark brown, moist to wet		CH	3	SS	3	13				5, 6, 7
	15	CH		PA						
		CH	4	SS	8	29				4, 16, 13
	20	CH		PA						
23.8 / 996.5			~~5~~	~~SS~~	~~0~~	~~50/6"~~				50/6"
SHALE++ dark gray, hard, weathered	25		6	PA						
BOTTOM OF BORING AT 27.8 FEET BACKFILLED WITH CUTTINGS 12/22/02 / 27.8 / 992.5			7	SS	8	45/6" 50/2"				45/6", 50/2"

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	12-22-02		
BORING COMPLETED	12-22-02		
RIG CME-75, #386	FOREMAN	JW	
APPROVED BKM	JOB #	J7P0601	

LOG OF BORING NO. MS-259

CLIENT
HNTB

Automatic Hammer Efficiency = 80.7%

SITE
McDONALD COUNTY, MISSOURI

PROJECT
I-49, MISSOURI

Boring Location: 963+89, 193 Feet left of centerline

Approx. Surface Elev.: 1075.1 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	SILTY GRAVEL gray and dark brown, dense, dry to moist	2 (1073.1)	GM		PA						
	LIMESTONE++, with chert seams gray, hard	2.5 (1072.6)		1	SS	0	50/0"				50/0"

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 2.5 FEET
BACKFILLED WITH CUTTINGS 01/19/03

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	1-19-03		
BORING COMPLETED	1-19-03		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-260

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 964+72, 3 Feet right of centerline

Approx. Surface Elev.: 1070.1 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	SILTY GRAVEL gray and dark brown, dense, dry to moist		GM		PA						
	4 ▼ 1066.1										
	4.5 **LIMESTONE++**, with chert seams gray, hard 1065.6		GM	1	SS	6	12/6" 50/0"				4, 12, 50/0"

AUGER REFUSAL ON LIMESTONE

BOTTOM OF BORING AT 4.5 FEET
BACKFILLED WITH CUTTINGS 01/19/03

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 4	WD ▼ 4	AB
WL	▽	▼	
WL			

Terracon

BORING STARTED			1-19-03
BORING COMPLETED			1-19-03
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

350

LOG OF BORING NO. MS-261

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 965+57, 258 Feet right of centerline

Approx. Surface Elev.: 1058.5 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	SILTY GRAVEL gray and dark brown, dense, dry to moist		GM		PA						
	2 1056.5		GM	1	SS	0	50/0"				50/0"

AUGER REFUSAL ON APPARENT LIMESTONE

BOTTOM OF BORING AT 2.0 FEET
BACKFILLED WITH CUTTINGS 01/19/03

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	DRY	WD	DRY AB
WL			
WL			

Terracon

BORING STARTED	1-19-03		
BORING COMPLETED	1-19-03		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-288

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 987+29, 300 Feet left of centerline

Approx. Surface Elev.: 1040.3 ft

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, in.	SAMPLES SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT pcf	TESTS UNCONFINED STRENGTH, psf	TESTS Blow Counts for 18"
	CLAYEY GRAVEL, with cobbles reddish brown, brown and white, loose to medium dense, moist		GC		PA						
			GC	1	SS	8	6				2, 3, 3
			GC		PA						
			GC	2	SS	6	15				7, 8, 7
		5	GC		PA						
	8.5 / 1031.8										
	GRAVEL, with sand and clay brown and white, medium dense, wet		GP GC	3	SS	4	12				4, 6, 6
		10	GP GC		PA						
			GP GC	4	SS	1	6/6" 54/5"				4, 6, 54/5"
	14.9 / 1025.4										
			GP GC		PA						
	AUGER REFUSAL ON APPARENT LIMESTONE										
	BOTTOM OF BORING AT 14.9 FEET BACKFILLED WITH CUTTINGS 01/30/03										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 9.5	WD	▼ 10	AB
WL	▼ 4.3	24 hr	▽	
WL				

Terracon

BORING STARTED	1-30-03		
BORING COMPLETED	1-30-03		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-289

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 986+60, Centerline

Approx. Surface Elev.: 1041.9 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
SILTY LEAN CLAY, with gravel dark brown, stiff, moist		CL ML		PA						
		CL ML	1	SS	12	12			2000*	3, 5, 7
	5	CL ML		PA						
8 ▽ 1033.9										
CLAYEY SAND, with gravel reddish brown, medium dense to loose, moist to wet		SC	2	SS	16	13				4, 6, 7
▽	10	SC		PA						
▼										
		SC	3	SS	5	12				5, 5, 7
	15	SC		PA						
		SC	4	SS	6	6				9, 3, 3
	20	SC		PA						
22 1019.9										
SHALE++ dark gray and gray, moderately hard to hard, weathered			5	SS PA	4	50/4"				50/4"
	25									
			6	SS PA	2	50/2"				50/2"
	30									

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 11	WD	▼ 13	AB
WL	▽ 7.5	24 hr	▼	
WL				

Terracon

BORING STARTED	1-20-03
BORING COMPLETED	1-29-03
RIG ATV, #103E	FOREMAN JW
APPROVED CSK	JOB # J7P0601

353

LOG OF BORING NO. MS-289

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	SHALE++ dark gray and gray, moderately hard to hard, weathered										
		35		7	SS HS	2	50/2"				50/2"
		40		8	SS HS	1	50/1"				50/1"
		45		9	SS HS	1	50/1"				50/1"
	50.5 991.4	50		10	SS HS	1	50/1"				50/1"

AUGER REFUSAL ON SHALE

BOTTOM OF BORING AT 50.5 FEET
BACKFILLED WITH CUTTINGS 01/30/03

++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 11	WD	▼ 13	AB
WL	▼ 7.5	24 hr	▼	
WL				

Terracon

BORING STARTED	1-20-03		
BORING COMPLETED	1-29-03		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	CSK	JOB #	J7P0601

LOG OF BORING NO. MS-290

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

Boring Location: 986+00, 300 Feet right of centerline

Approx. Surface Elev.: 1038.0 ft

DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
GRAVEL, with sand and clay reddish brown, brown and white, loose to medium dense, moist		GP		PA						
		GP	1	SS	12	17				9, 8, 9
	5	GP		PA						
		GP	2	SS	10	9				6, 4, 5
	10	GP		PA						
		GP	3	SS	2	30				11, 13, 17
	15	GP		PA						
18.5 / 1019.5										
SANDY GRAVEL, with clay reddish brown and white, loose to medium dense, moist to wet		GP	4	SS	6	6				3, 3, 3
	20	GP		PA						
		GP	5	SS	10	16				9, 8, 8
25.5 / 1012.5	25	GP		PA						
SHALE++ dark gray and gray, moderately hard to hard, weathered			6	SS PA	1	50/1"				50/1"
	30									

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft				
WL	▽ 14	WD	▼ 9.5	AB
WL	▽ 6	24 hr	▼	
WL				

Terracon

BORING STARTED	1-30-03		
BORING COMPLETED	1-30-03		
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

LOG OF BORING NO. MS-290

CLIENT: HNTB

Automatic Hammer Efficiency = 80.7%

SITE: McDONALD COUNTY, MISSOURI

PROJECT: I-49, MISSOURI

GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	TESTS WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	Blow Counts for 18"
	SHALE++ dark gray and gray, moderately hard to hard, weathered	35		7	SS HS	1	50/1"				50/1"
		40		8	SS HS	1	50/1"				50/1"
		45		9	SS HS	2	50/3"				50/3"
		50		10	SS HS	1	50/1"				50/1"
	51.8 / 986.2										
	AUGER REFUSAL ON SHALE BOTTOM OF BORING AT 51.8 FEET BACKFILLED WITH CUTTINGS 01/30/03 ++ Classification estimated from disturbed samples. Core samples and petrographic analysis may reveal other rock types.										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

*Calibrated Hand Penetrometer

WATER LEVEL OBSERVATIONS, ft			
WL	▽ 14	WD	▼ 9.5 AB
WL	▼ 6	24 hr	▼
WL			

Terracon

BORING STARTED			1-30-03
BORING COMPLETED			1-30-03
RIG	ATV, #103E	FOREMAN	JW
APPROVED	SPB	JOB #	J7P0601

10.0 TEST DATA

10.1 Summary of Laboratory Test Data

I-49 MISSOURI LAB TEST DATA
PINEVILLE, MISSOURI TO ARKANSAS STATE LINE
McDONALD COUNTY, MISSOURI
MODOT PROJECT NO. J7P0601

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	Atterberg Limits LL	PL	PI	Sieve Analysis (percent passing) 1.5"	1"	3/4"	3/8"	No. 4	No. 10	No. 40	No. 100	No. 200	pH	Resistivity (ohm/cm)	Unit Weight, pcf In-situ	Dry	Std Compaction (pcf) @ %	Unconfined (psf)	Lab CBR (@0.1 in.)	AASHTO	Group Index
MC-3	Bulk	5-16.3'	11.6	29	20	9			96	83	64	49	38		31					108.0 @ 17.3		1.7	A-2-4	0
MC-19	Bulk	5-15.5'	8.6	29	17	12			100	93	82	64	42		33	8.3	4470						A-2-6	0
MC-28	S-1	0-2'	20.1	38	34	4																		
MC-28	S-2	2-5'	17.9	40	20	20																		
MC-28	S-3	5-10'	28.9																					
MC-28	S-4	10-13'	22.2																					
MC-28	S-5	13-20'	22.6	27	25	2																		
MC-28	S-6	20-25'	19.8	26	23	3																		
MC-28	S-7	25-27.5'	20.6	24	22	2																		
MC-33	Bulk	0-5.5'	13.7	38	21	17			96	75	34	32	27		24					102.3 @ 19.0			A-2-6	1
MC-39	Bulk	2-35'	0.8	30	20	10			98	90	75	56	44		38					100.8 @ 17.8			A-4	1
MS-43	Tube	18.5'-19'	16.5															Note 1	Note 1		Note 1			
MC-44	Bulk	0-10.5'	13.7	30	19	11			100	97	89	73	53		41								A-6	2
MC-49	AS-1	0-4'	13.4																					
MC-49	AS-2	4-10'	24.5																					
MC-49	AS-3	10-15'	22.9	27	24	3																		
MC-49	AS-4	15-20'	27.4																					
MC-57	Bulk	0-6.8'	17.8	28	20	8			98	91	77	63	49		41	4.9	2881						A-4	1
MC-57	Tube	5.5-6.6'	17.6	31	21	10												113.2	96.1		1200			
MC-65	Bulk	0-25.0'	9.8	31	24	7			100	95	80	59	37		29								A-2-4	0
MC-79	Bulk	3-23.5'	0.7	32	23	9			99	84	65	50	38		31								A-2-4	0
MC-85	AS-1	0-3'	15.3																					
MC-85	AS-2	3-10'	25.1																					
MC-85	AS-3	10-15'	22.3																					
MC-85	AS-4	15-20'	33.7																					
MC-85	AS-5	20-25'	25.3																					
MC-85	AS-6	25-30'	22.2																					
MC-88	Bulk	3-20.0'	0.5	27	22	5			99	90	73	59	48		41					97.2 @ 22.6			A-4	1
MC-94	Bulk	0-9.5'	3.9	47	19	28			100	92	83	75	67		54								A-7-6	11
MC-125	Bulk	1-25'	32.8	48	25	23			100	97	92	83	70		53	4.9	9470			101.7 @ 18.9		5.1	A-7-6	9
MC-125	Tube	6-6.8'	25.1	43	21	22												117.6	94.0		1550			
MC-133	Tube	8-9'	18.3	38	21	17												Note 1	Note 1		Note 1			
MC-137	Tube	3-4'	14.0	37	19	18												125.6	110.2		Note 1			
MC-142	Tube	8'-9.5'	25.0															118.0	94.4		760			
MC-148	Tube	8-9.5'	18.8	48	24	24												121.5	102.3		1550			
MC-153	Bulk	4-30'	22.9	49	22	27			96	94	88	82	74		69	4.4	9120			103.5 @ 15.9		6.0	A-7-6	15
MC-153	Tube	8.5-9.4'	21.9	53	26	27												123.6	101.3		1850			
MC-158	Tube	3-5'	7.6	46	23	23												Note 1	Note 1		Note 1			
MC-159	AS-1	0-2'	17.8																					
MC-159	AS-2	2-10'	26.3	54	21	33																		
MC-159	AS-3	10-17'	28.3																					
MC-159	AS-4	17-20'	34.8	53	23	30																		
MC-159	AS-5	20-25'	32.7																					
MC-164	Bulk	1'-32'	25.5	56	19	37	100	100	100	98	96	92	83	77	74	5.6	5602			106.3 @ 18.2		3.1	A-7-6	19
MC-177	Bulk	0 - 13.0'	6.6	20	17	3	100	95	92	79	56	35	22	17	16					124.2 @ 9.5			A-2-4	0
MC-178A	1	0 - 8	2.6	30	23	7	100	86	70	25	12	10	8	7	7								A-2-4	0
MC-178A	2	8 - 13	2.2	27	20	7	83	74	53	25	10	7	6	5	5								A-2-4	0
MC-178A	3	13 - 18	11.4	22	16	6	100	100	98	85	65	44	28	22	20								A-2-4	0
MC-186	Bulk	0-4'	3.8	24	21	3	100	93	84	40	11	7	6	5	5								A-2-4	0
MC-186	Bulk	4'-9.8'	10.7	28	19	9	100	100	97	81	63	50	40	36	34								A-2-4	0
MC-189	Bulk	2' - 22.8'	3.6	20	17	3	98	96	96	88	68	47	29	23	21								A-2-4	0
MC-189	S-1	0'-2'	4.0																					
MC-189	S-3	7'-22.8'	3.2																					

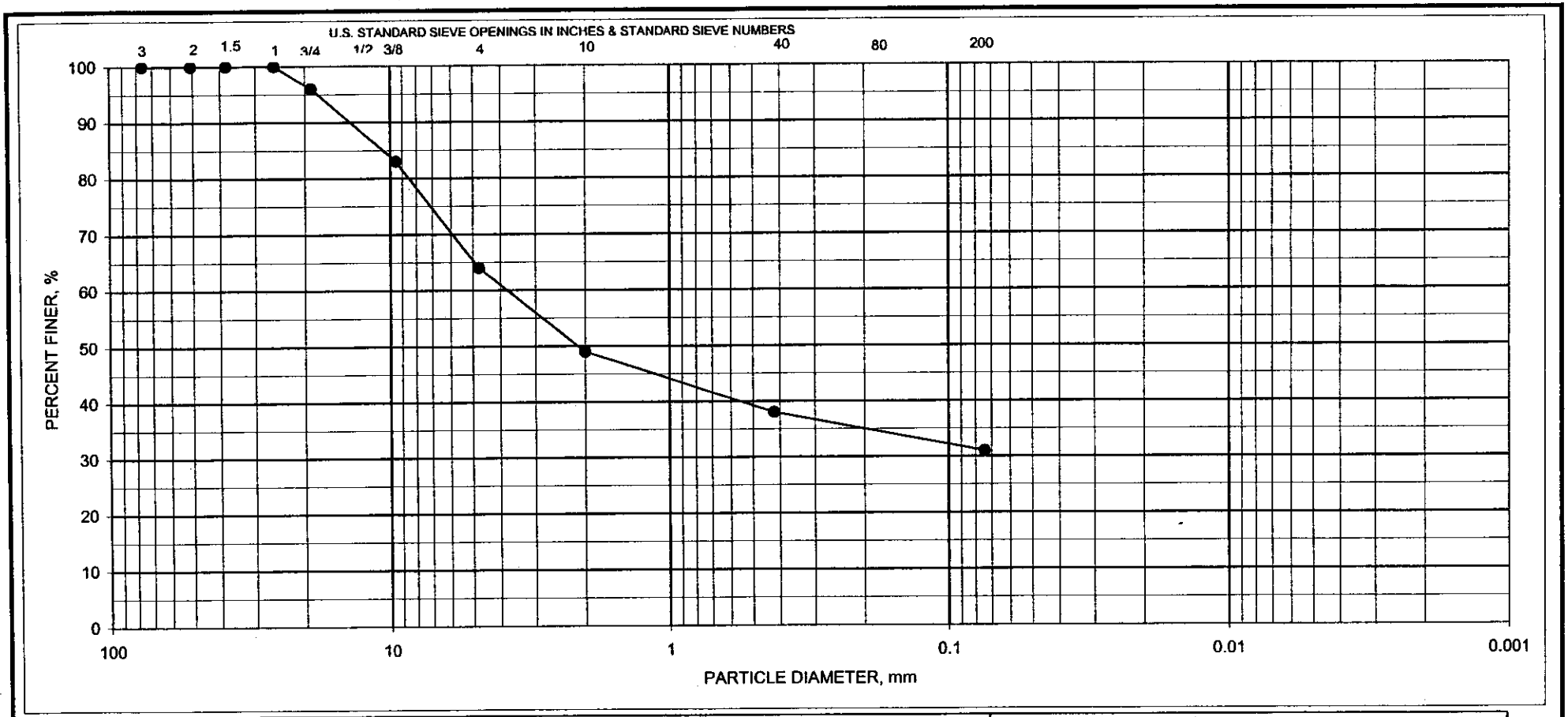
358

I-49 MISSOURI LAB TEST DATA
PINEVILLE, MISSOURI TO ARKANSAS STATE LINE
McDONALD COUNTY, MISSOURI
MODOT PROJECT NO. J7P0601

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	Atterberg Limits LL	PL	PI	Sieve Analysis (percent passing) 1.5"	1"	3/4"	3/8"	No. 4	No. 10	No. 40	No. 100	No. 200	pH	Resistivity (ohm/cm)	Unit Weight, pcf In-situ	Dry	Std Compaction (pcf) @ %	Unconfined (psf)	Lab CBR (@0.1 in.)	AASHTO	Group Index
MC-190A	1	0 - 4	6.1	25	19	6	100	100	89	74	50	36	27	25	24								A-2-4	0
MC-190A	2	4 - 9	6.3	25	20	5	100	100	94	77	52	36	27	25	23								A-2-4	0
MC-190A	3	9 - 14	4.3	26	20	6	100	96	91	76	52	36	27	25	24								A-2-4	0
MC-190A	4	14 - 19	2.0	26	19	7	100	87	71	39	20	13	8	7	6								A-2-4	0
MC-190A	5	19 - 24	1.9	29	19	10	83	83	67	38	14	6	5	5	4								A-2-4	0
MC-202	AS-1	0'-10'	6.0																					
MC-202	AS-2	10'-15.5'	5.4																					
MC-204	Bulk	0.5'-21.5'	5.9	24	19	5	100	100	100	95	80	62	42	35	32	5.0	28			109.6 @ 16.6			A-2-4	0
MC-205A	Bulk	0 - 11	4.9	26	19	7	100	100	100	86	63	47	35	31	30								A-2-4	0
MC-213	Bulk	0.8'-18.2'	11.0	24	18	6	100	100	100	95	83	66	49	43	40								A-4	1
MS-218	SS	8.5'-10'	18.1	40	18	22																		
MS-219	SS	3'-5'	16.5																					
MS-219	SS	8.5'-10'	21.3																					
MS-219	SS	13.5'-15'	15.0																					
MS-220	SS	3.5'-5.0'	6.5	36	22	14																		
MC-224	Bulk	0'-10'	7.1	29	16	13	100	100	98	94	81	61	40	33	30					124.1 @ 9.4			A-2-6	0
MC-226	AS-1	0'-10'	12.0																					
MC-226	AS-2	10'-14.5'	18.6																					
MC-227	Bulk	0'-20'	9.3	28	20	8	100	100	100	94	82	66	49	43	41	4.5	2			112.7 @ 16.2		7.8	A-4	1
MC-242	AS-1	0'-5'	17.3																					
MC-242	AS-2	5'-15'	21.0																					
MC-242	AS-3	15'-20'	18.9																					
MC-245	Bulk	0'-20'	12.6	33	22	11	100	100	98	94	82	69	54	48	46								A-6	3
MC-257	Bulk	0'-7'	1.3																					
MC-263	Bulk	0'-19'	11.5	29	20	9	100	100	100	91	77	63	49	47	45								A-4	2
MC-264	AS-1	3.5'-10'	10.8																					
MC-264	AS-2	10'-20'	9.4																					
MC-264	AS-3	20'-30'	12.2																					
MC-266	Bulk	0'-24'	8.8	31	21	10	100	100	100	95	78	60	42	36	33								A-2-4	0
MC-272	Bulk	6'-13.5'	10.6	34	26	8	100	100	99	96	85	69	51	45	42	4.4	2			94.2 @ 23.7			A-4	1
MC-277	Bulk	0'-12.5'	10.6	22	18	4	100	91	87	75	60	46	35	31	30								A-2-4	0
MC-281	AS-1	0'-5'	15.1																					
MC-281	AS-2	5'-10'	7.4																					
MC-281	AS-3	10'-15'	7.0																					
MC-281	AS-4	15'-20'	9.1																					
MC-281	AS-5	20'-25'	13.2																					
MC-281	AS-6	25'-30'	10.3																					
MC-284	Bulk	20'-51'	14.3	37	20	17	100	100	100	97	90	77	57	49	46	5.7	2			106.0 @ 13.0		7.5	A-6	4
MC-284	ST-6	25'-27'	17.7															Note 1	Note 1		Note 1			
MS-289	SS	8.5'-10'	25.2	42	21	21																		
MS-290	SS	8.5'-10'	23.8	48	20	28																		

Note 1: Sample could not be recovered intact for unit weight and unconfined compressive strength testing.

10.2 Grain Size Curves



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-3	Bulk	5 to 16.3 feet	Clayey Gravel with Sand	GC	11.6	29	20	9

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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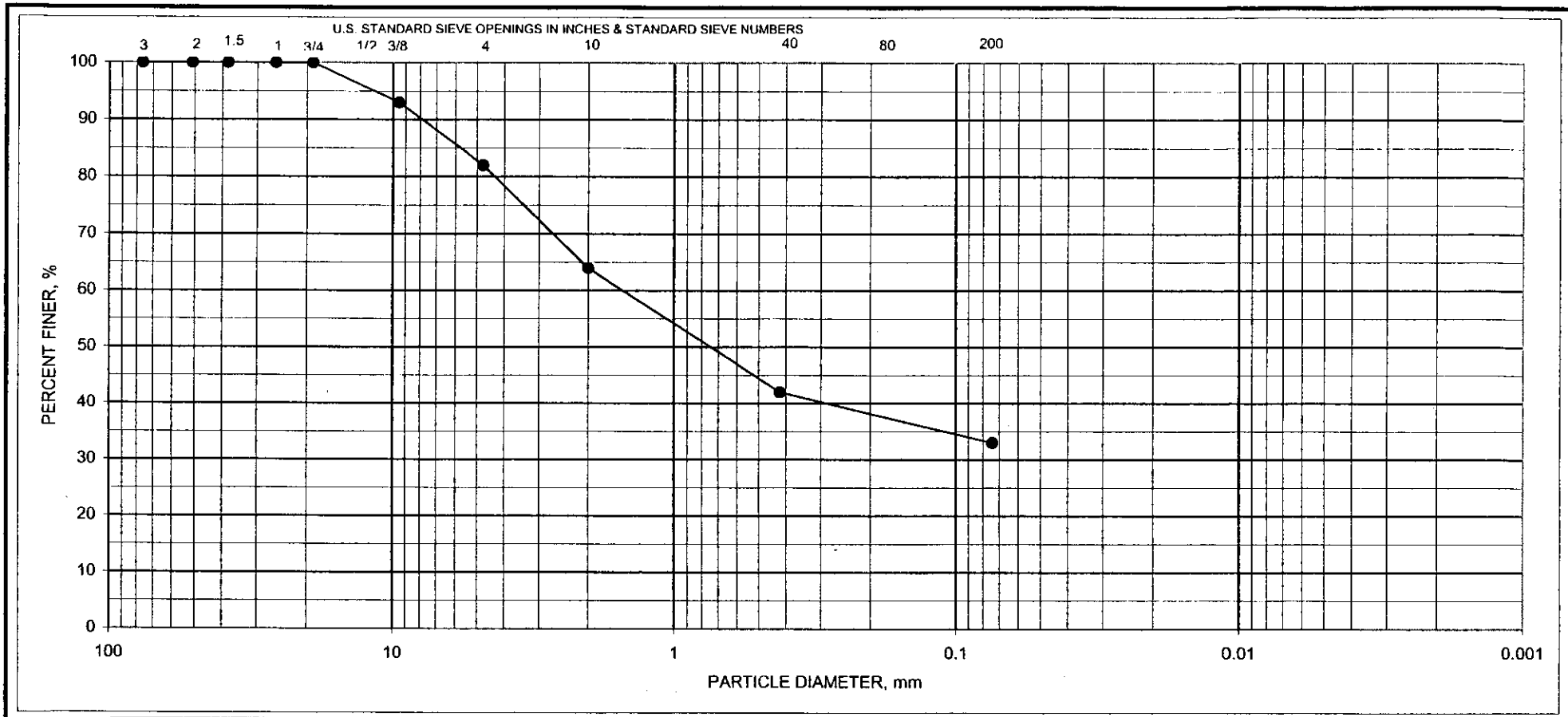
361



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-19	Bulk	5 to 15.5 feet	Clayey Sand with Gravel	SC	8.6	29	17	12

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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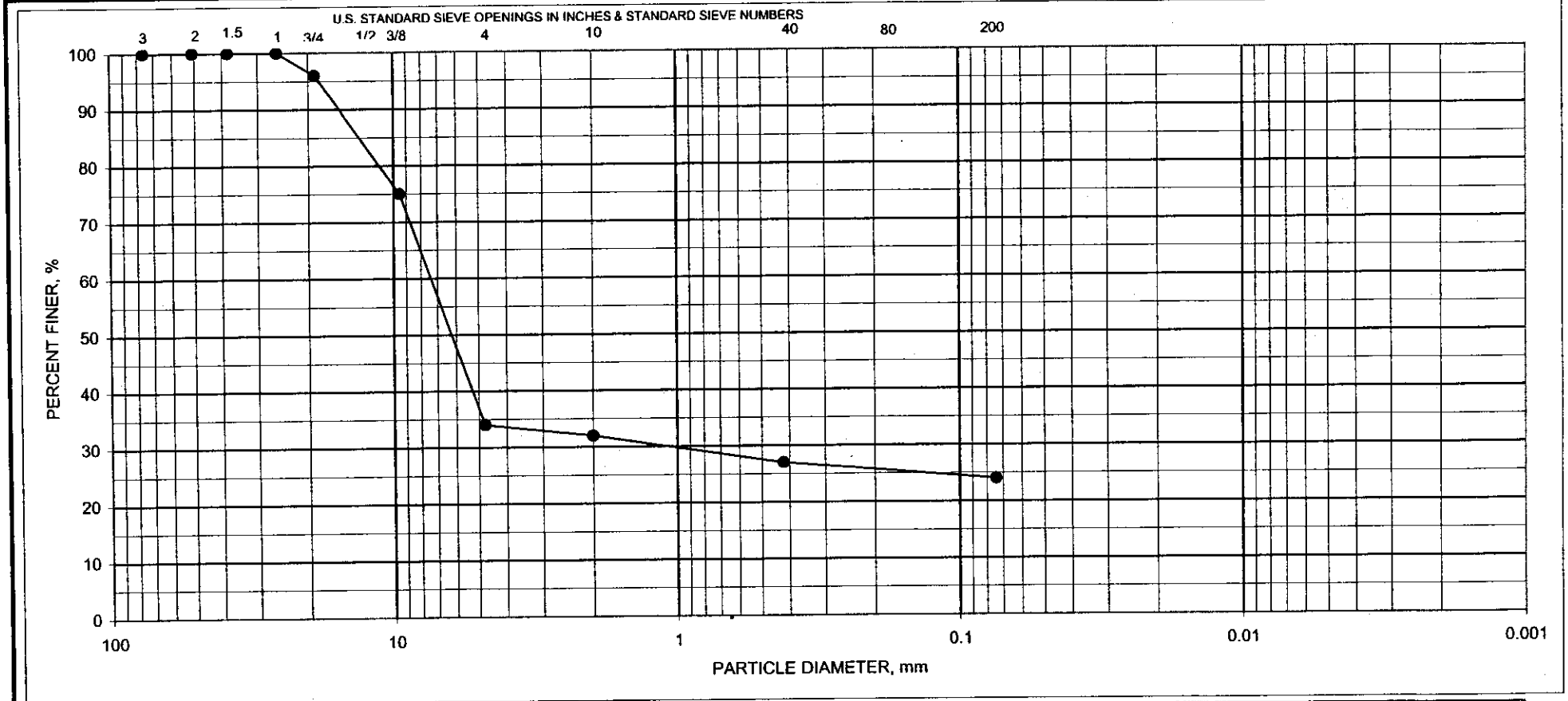

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-33	Bulk	0 to 5.5 feet	Clayey Gravel with Sand	GC	13.7	38	21	17

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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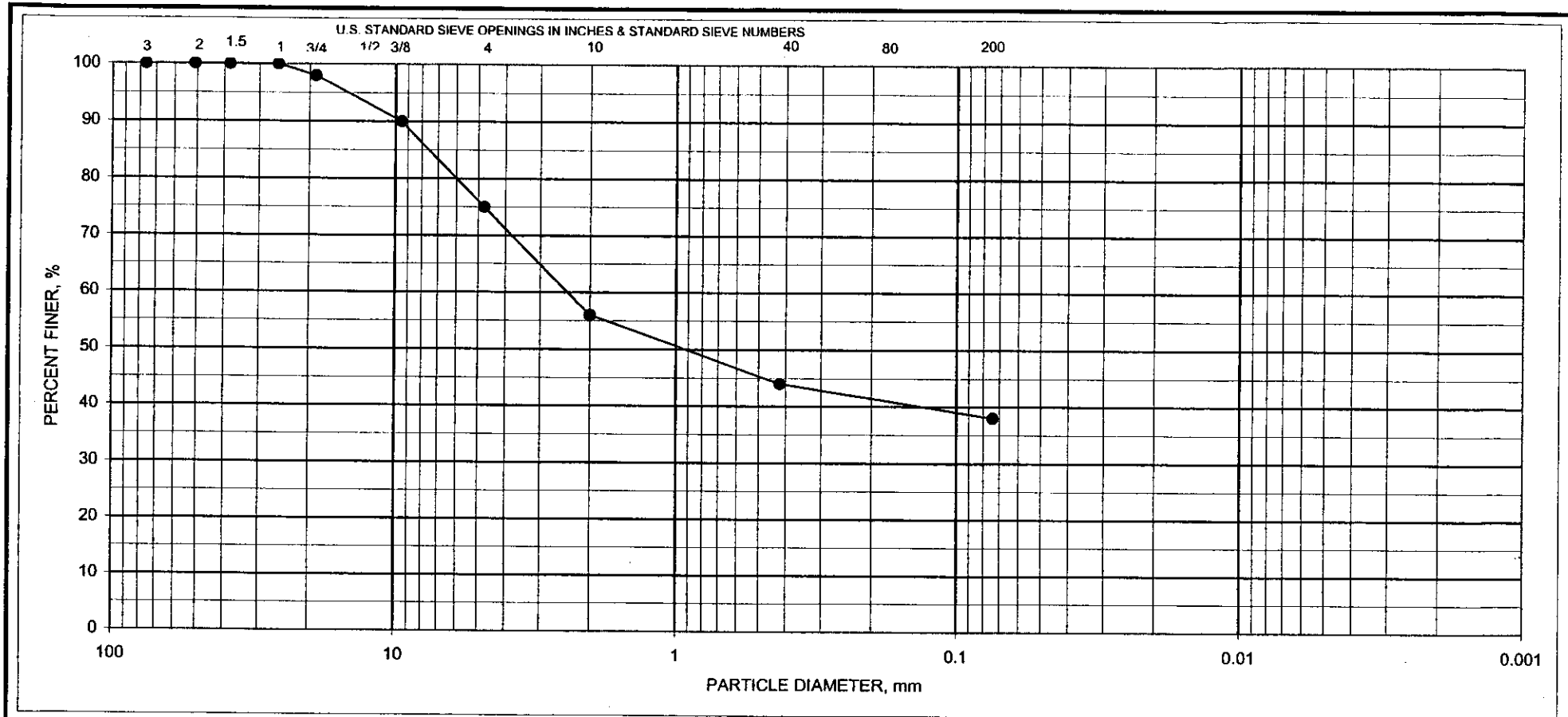

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-39	Bulk	2 to 35 feet	Clayey Sand with Gravel	SC	0.8	30	20	10

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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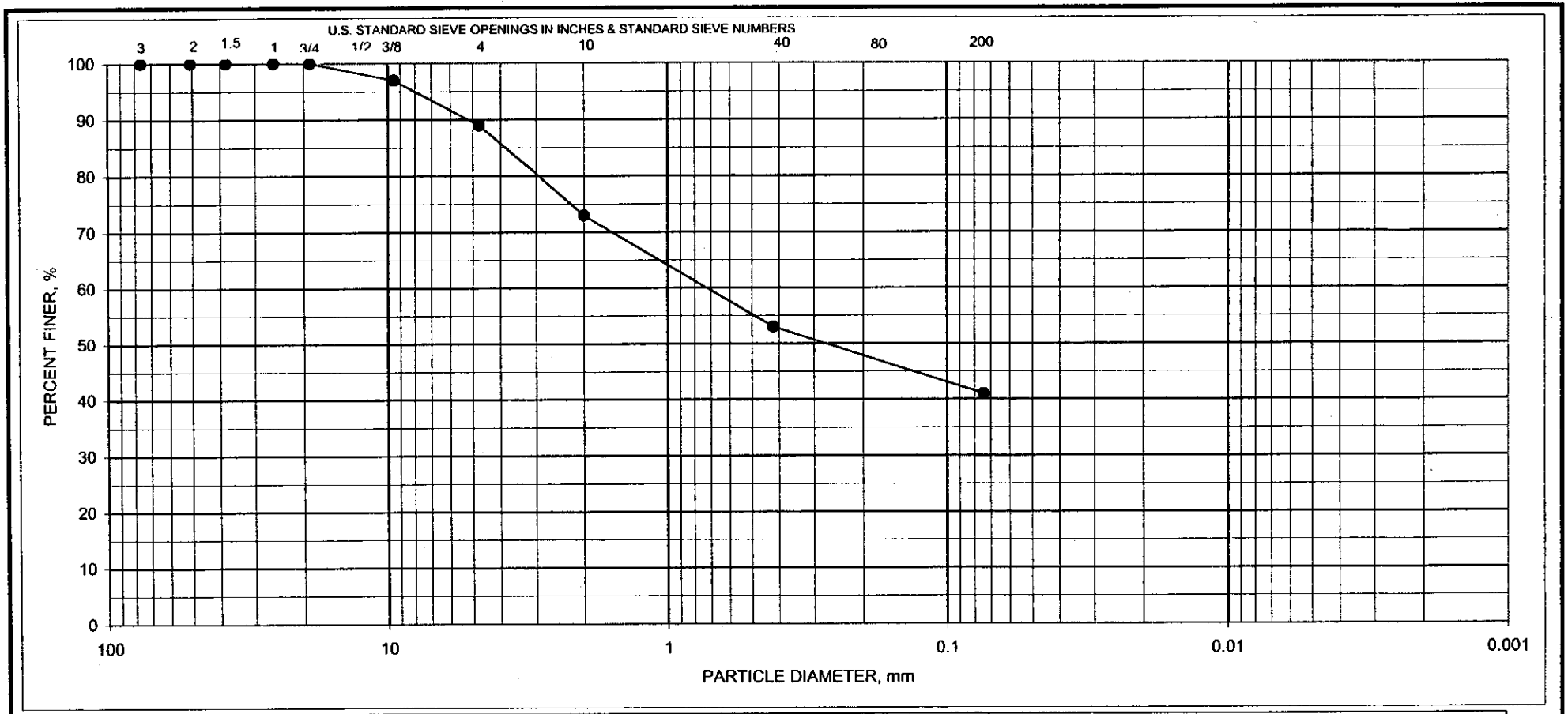

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-44	Bulk	0 to 10.5 feet	Clayey Sand	SC	13.7	30	19	11

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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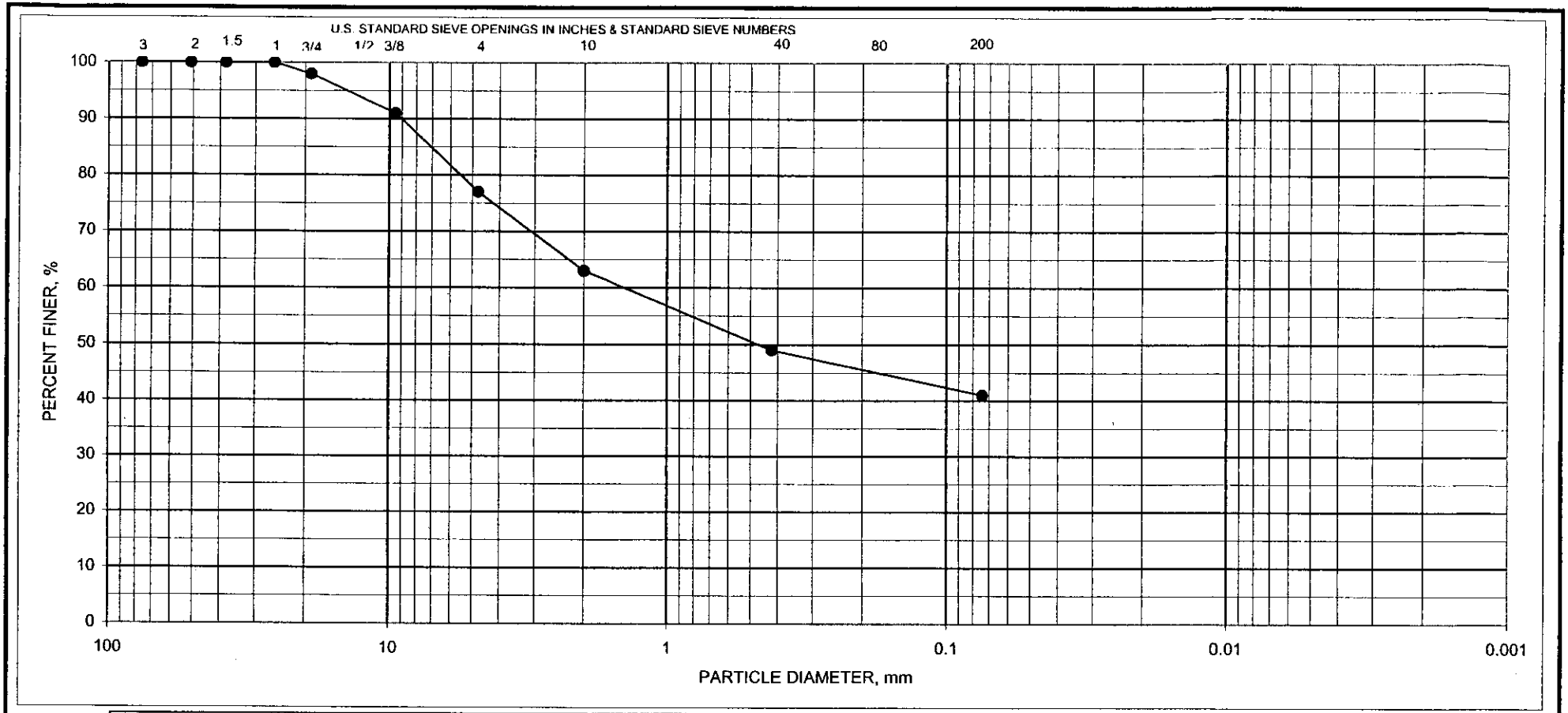

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-57	Bulk	0 to 6.8 feet	Clayey Sand with Gravel	SC	17.8	28	20	8

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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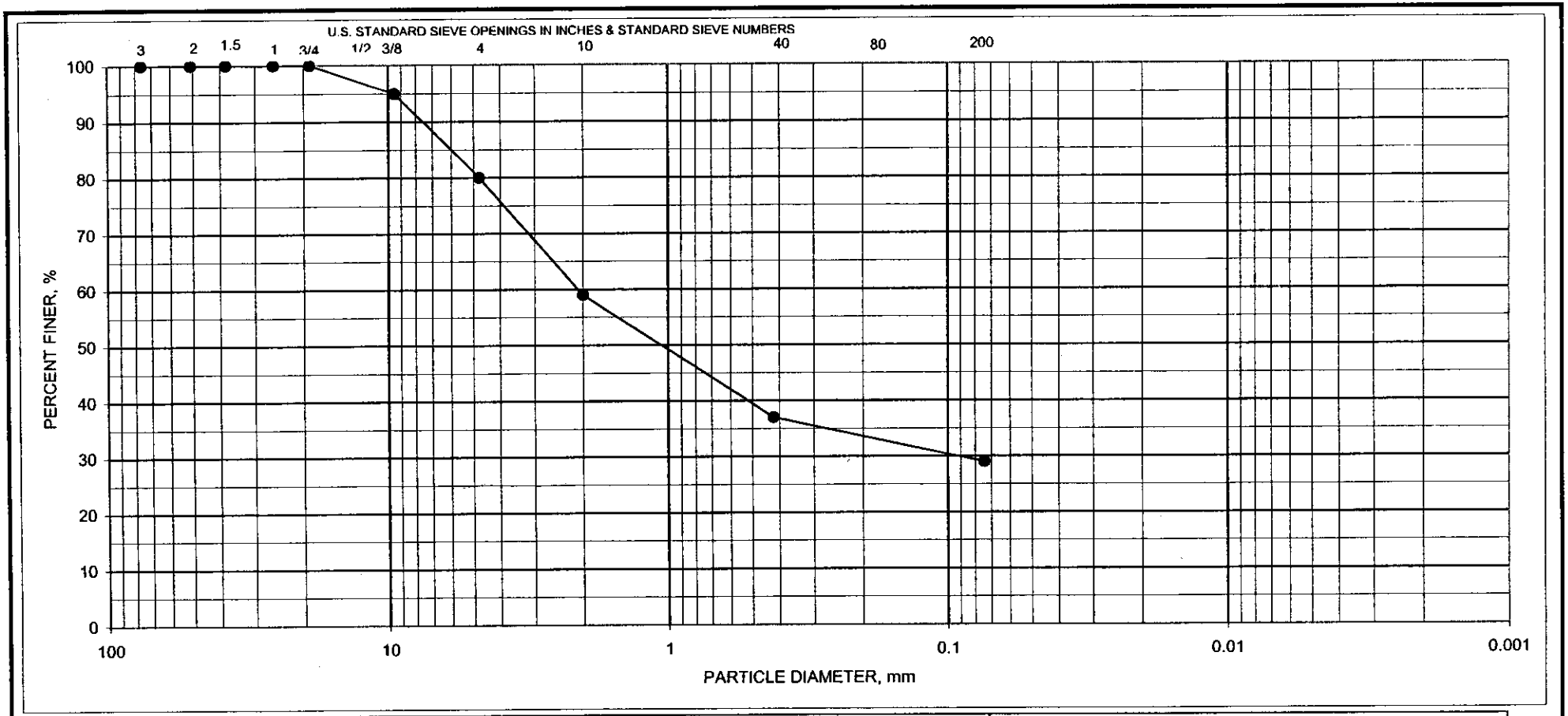

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-65	Bulk	0 to 25 feet	Silty Sand with Gravel	SM	9.8	31	24	7

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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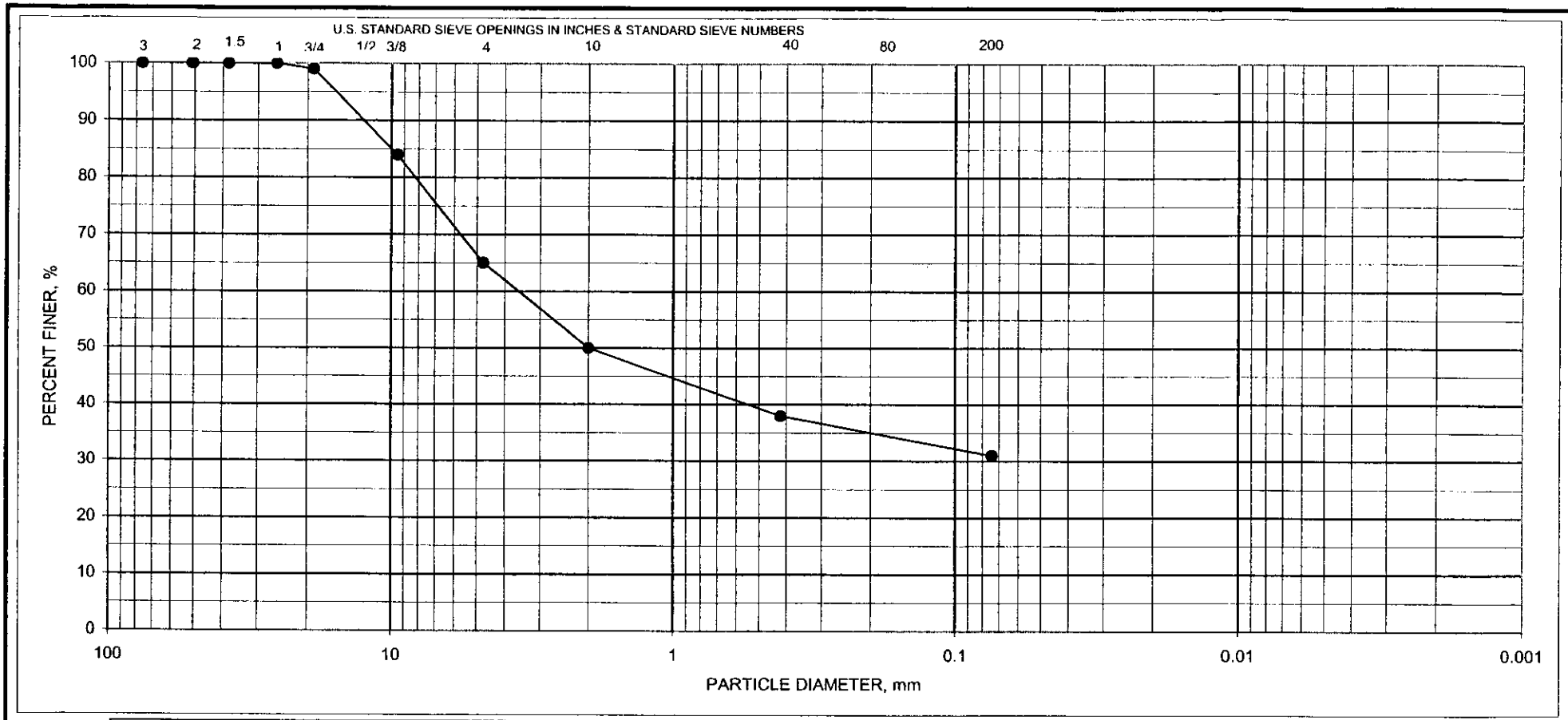

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-79	Bulk	3 to 23.5 feet	Clayey Gravel with Sand	GC	0.7	32	23	9

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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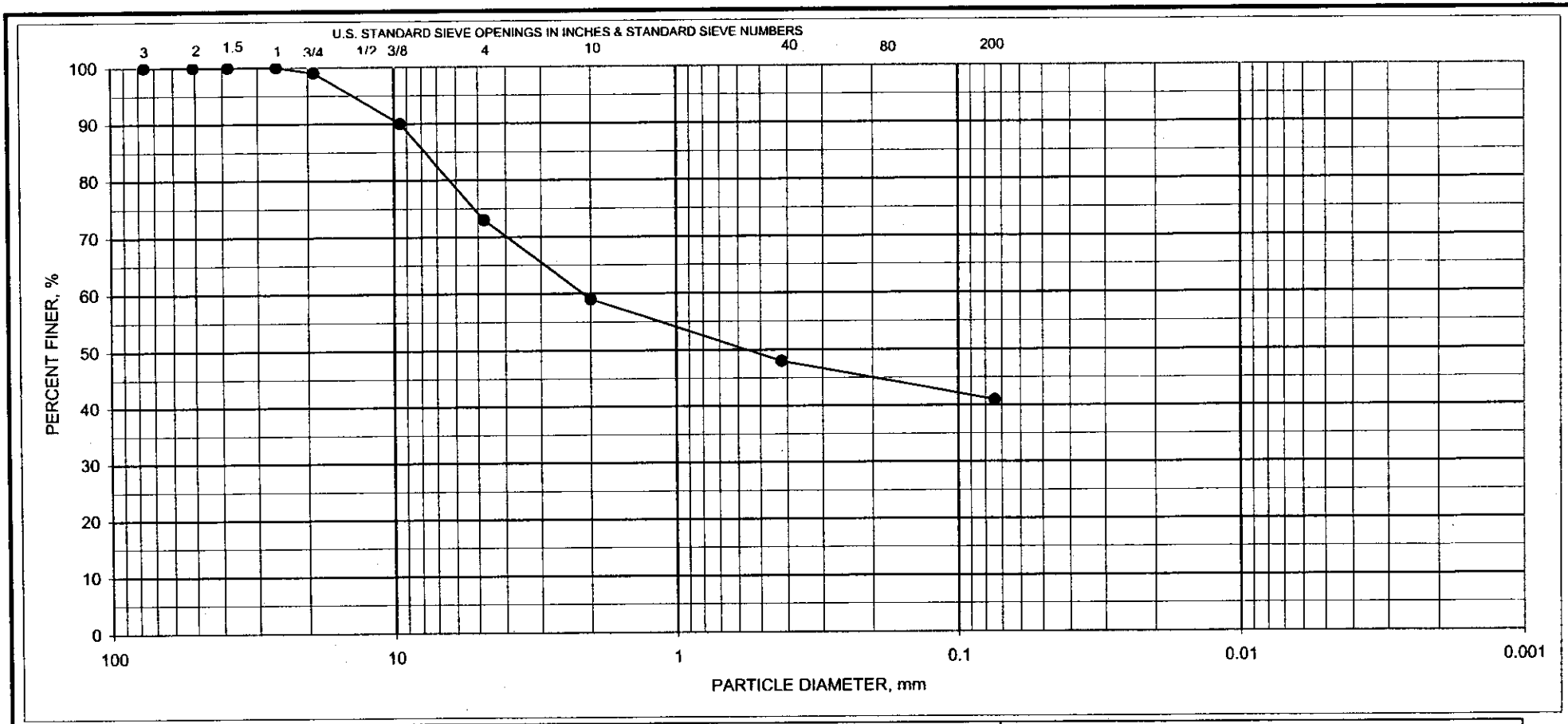

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-88	Bulk	3 to 20 feet	Silty Sand with Gravel	SM	0.5	27	22	5

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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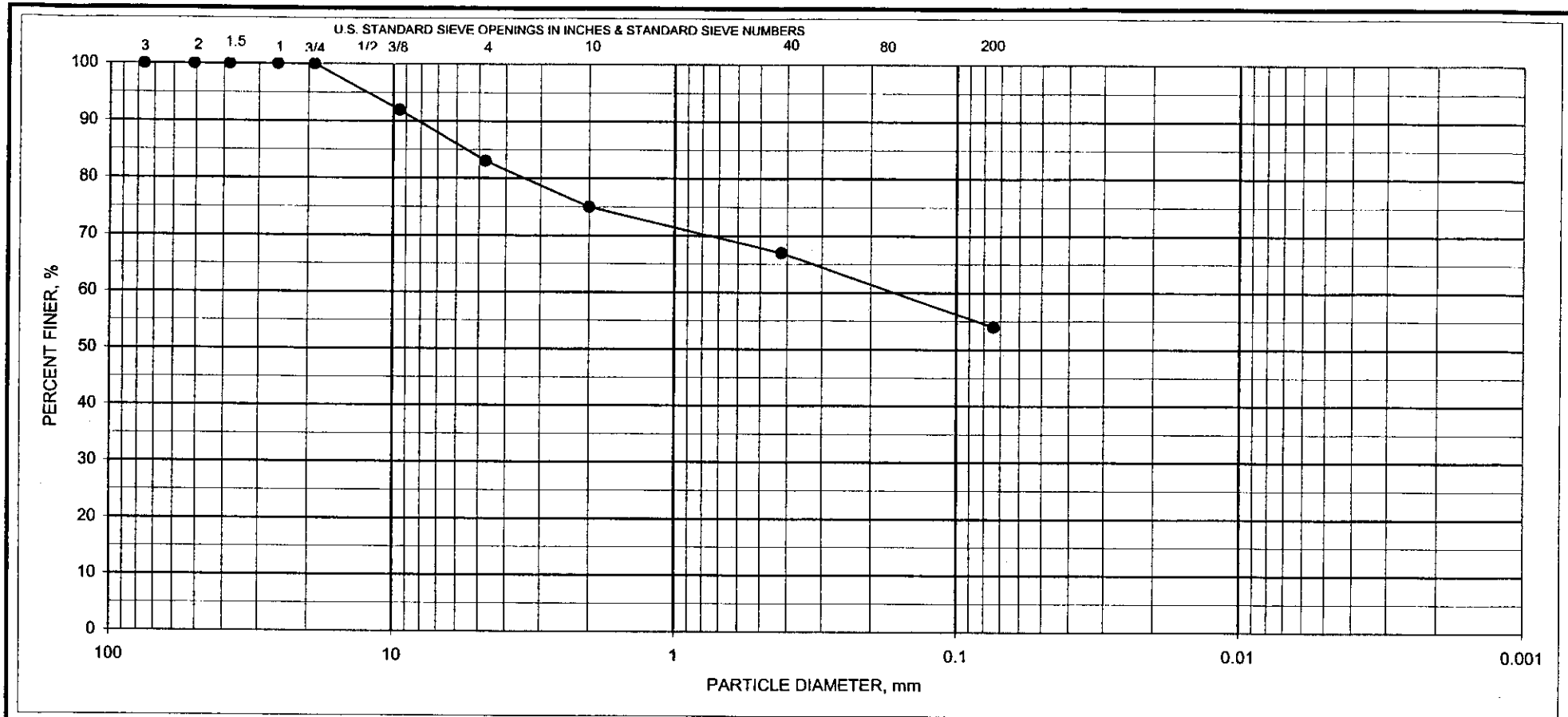

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-94	Bulk	0 to 9.5 feet	Sandy Lean Clay with Gravel	CL	3.9	47	19	28

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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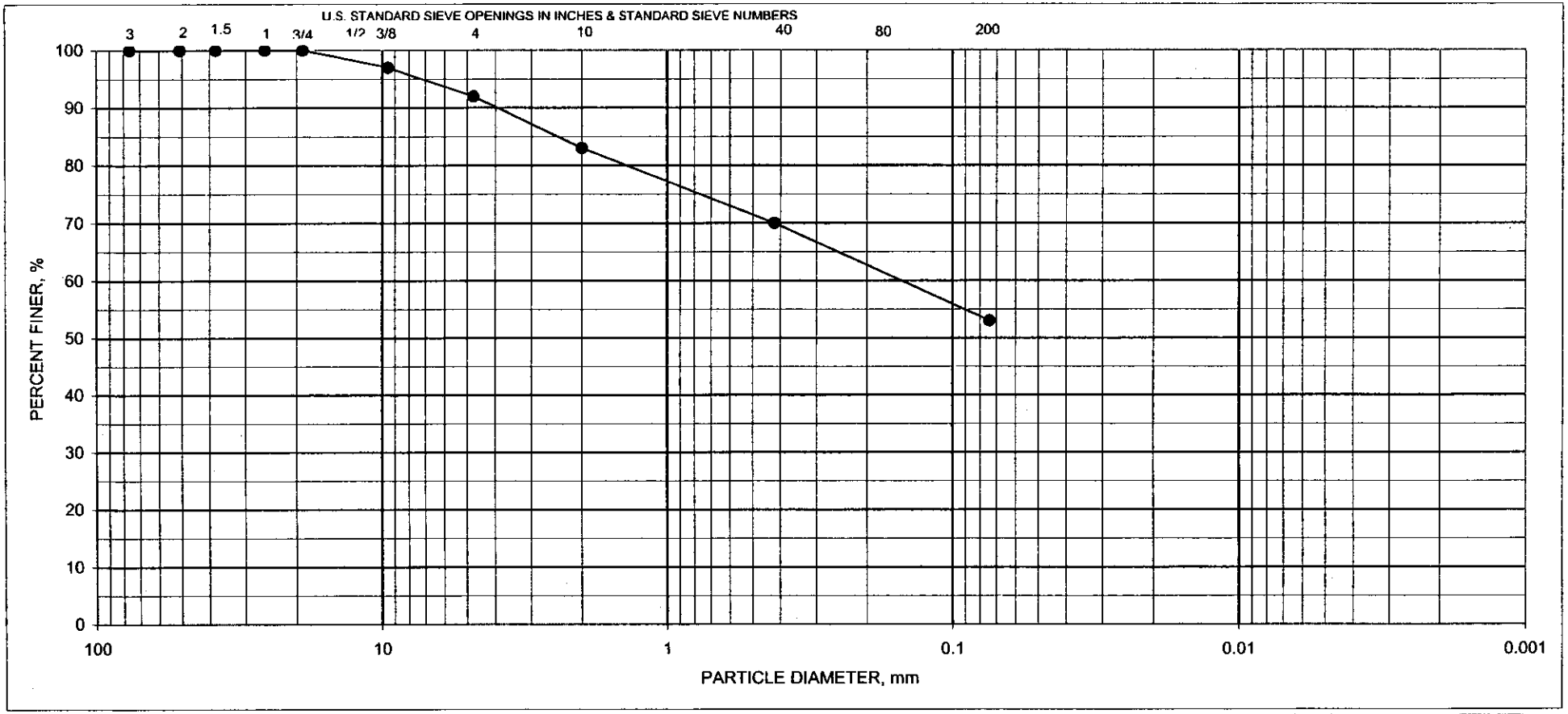

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-125	Bulk	1 to 25 feet	Sandy Lean Clay	CL	32.8	48	25	23

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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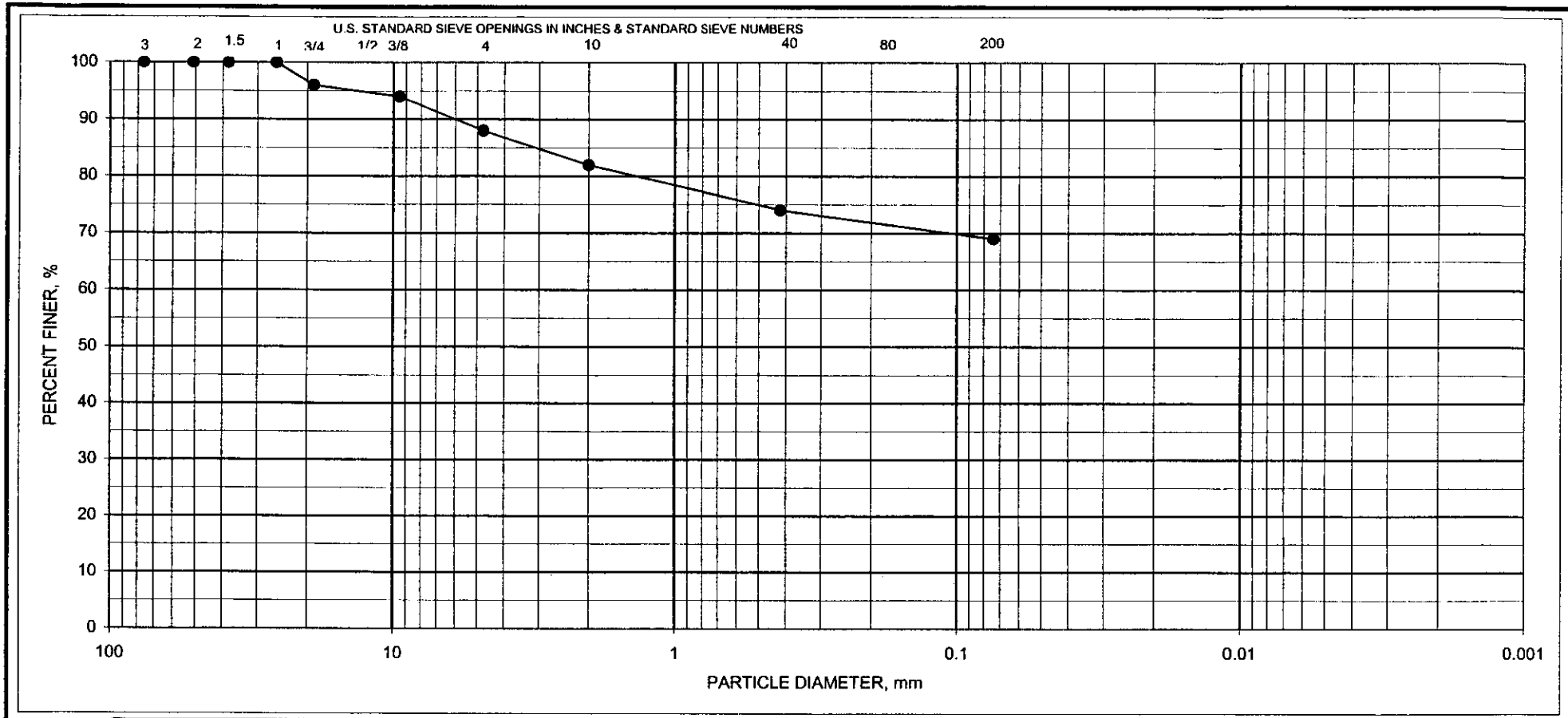

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-153	Bulk	4 to 30 feet	Sandy Lean Clay	CL	22.9	49	22	27

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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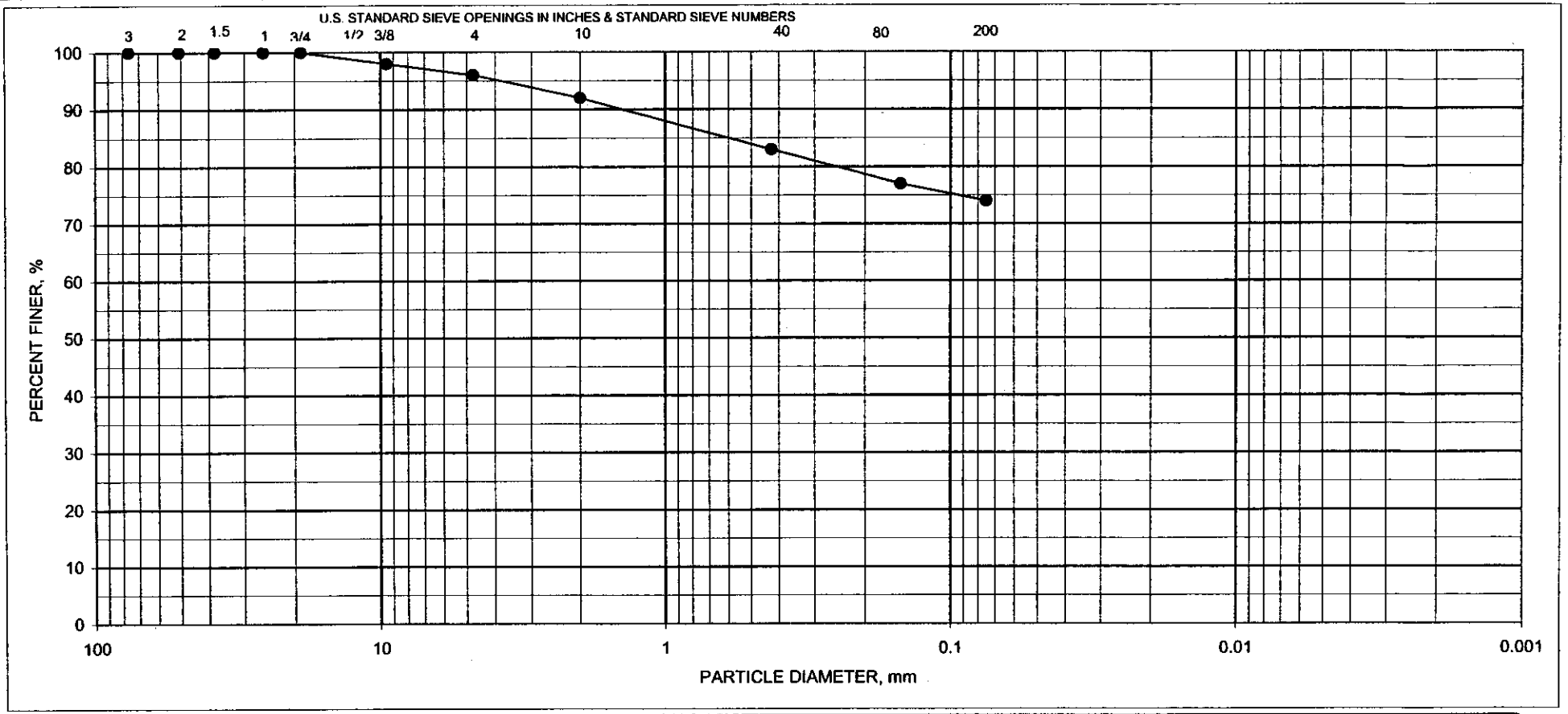

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-164	Bulk	1 to 32 feet	Fat Clay with Sand	CL	25.5	56	19	37

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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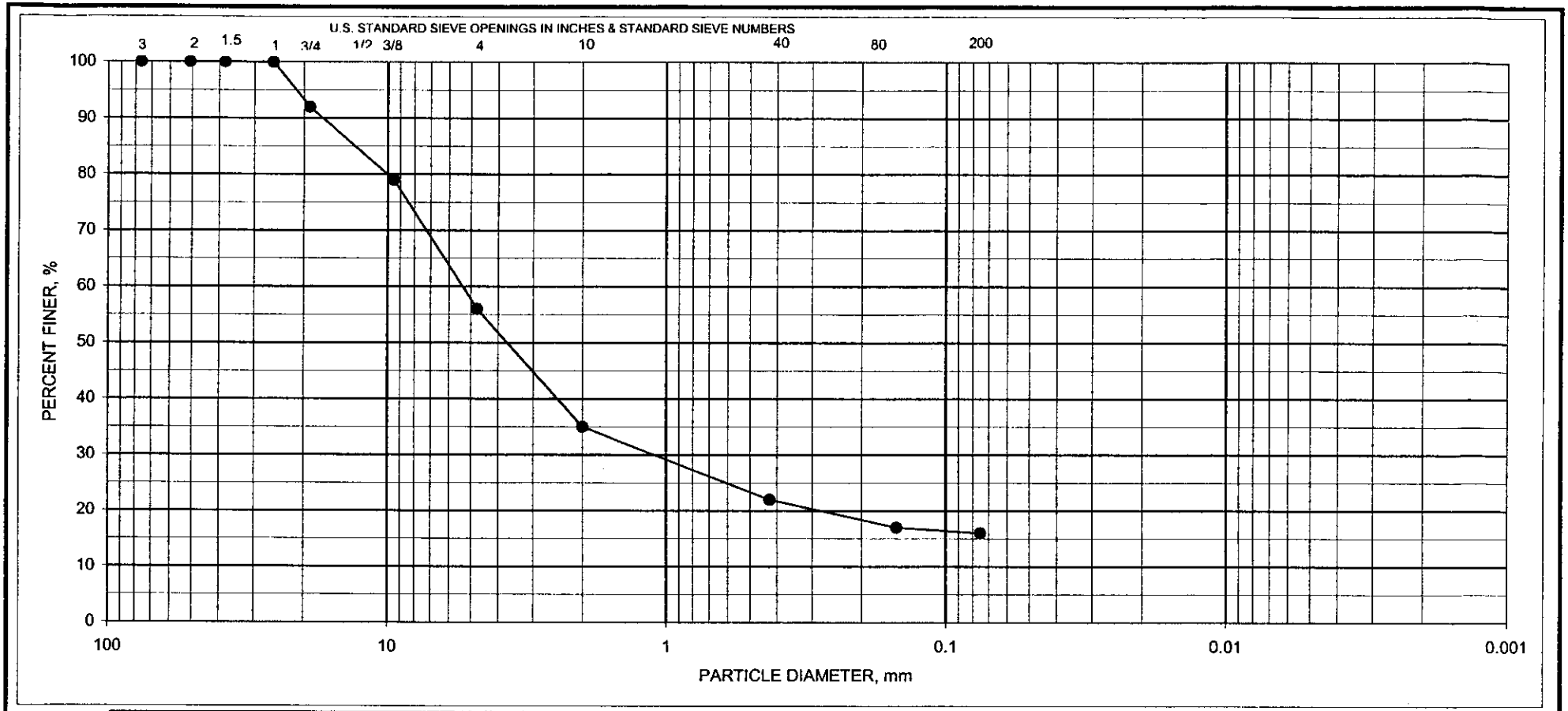

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-177	Bulk	0 to 13 feet	Silty Gravel with Sand	SM	6.6	20	17	3

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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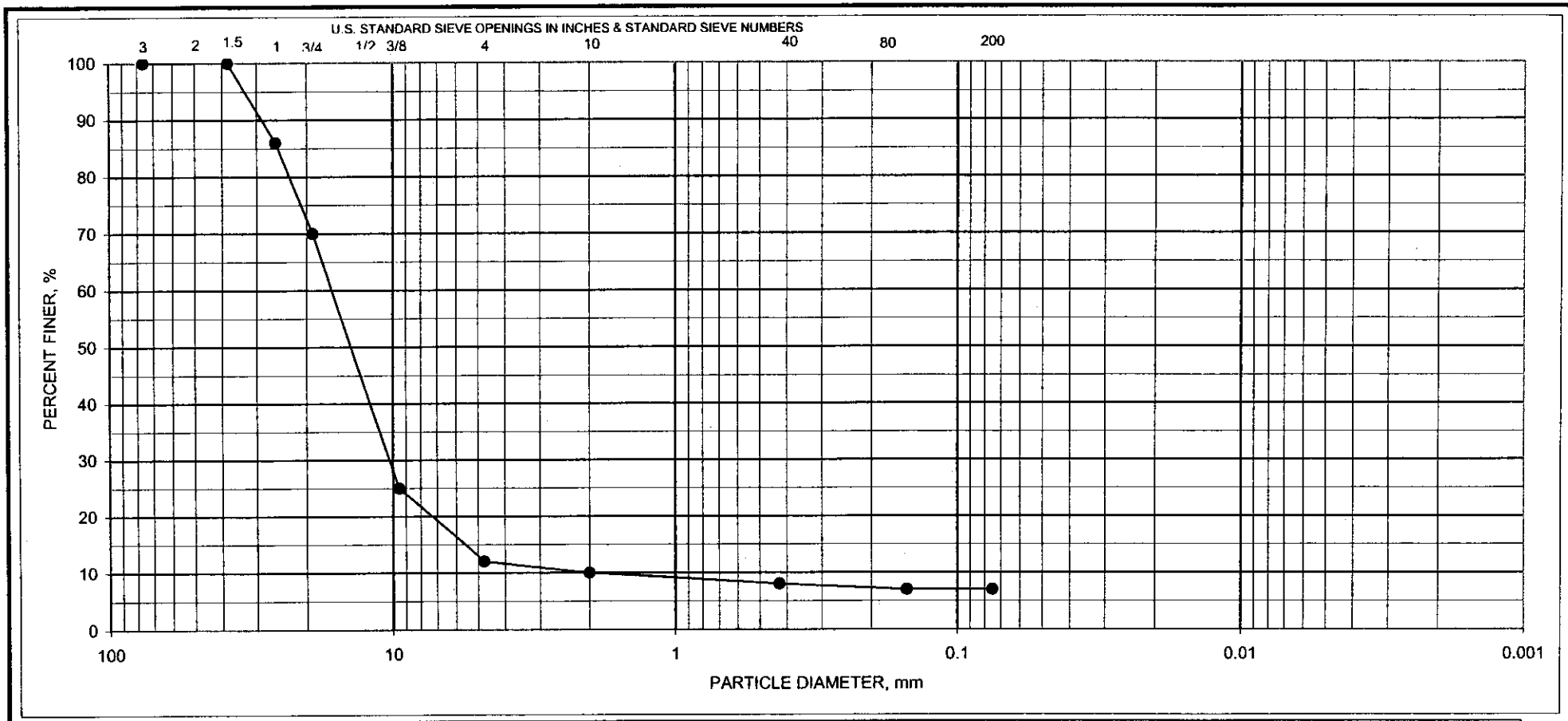

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-178A	1	0 - 8	Poorly Graded Gravel with Silt	GP-GM	2.6	30	23	7

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

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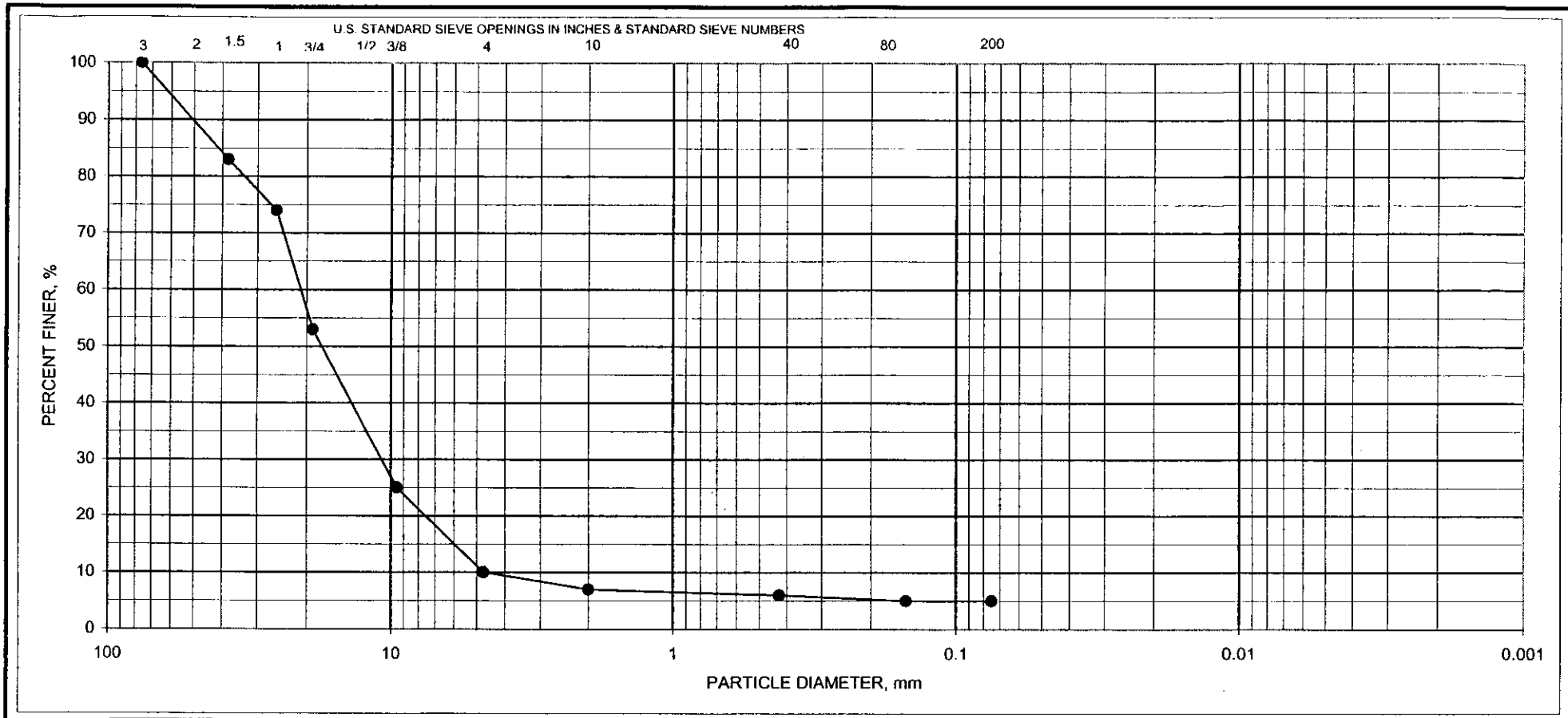

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-178A	2	8 - 13	Well Graded Gravel with Silty Clay	GW-GC	2.2	27	20	7

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

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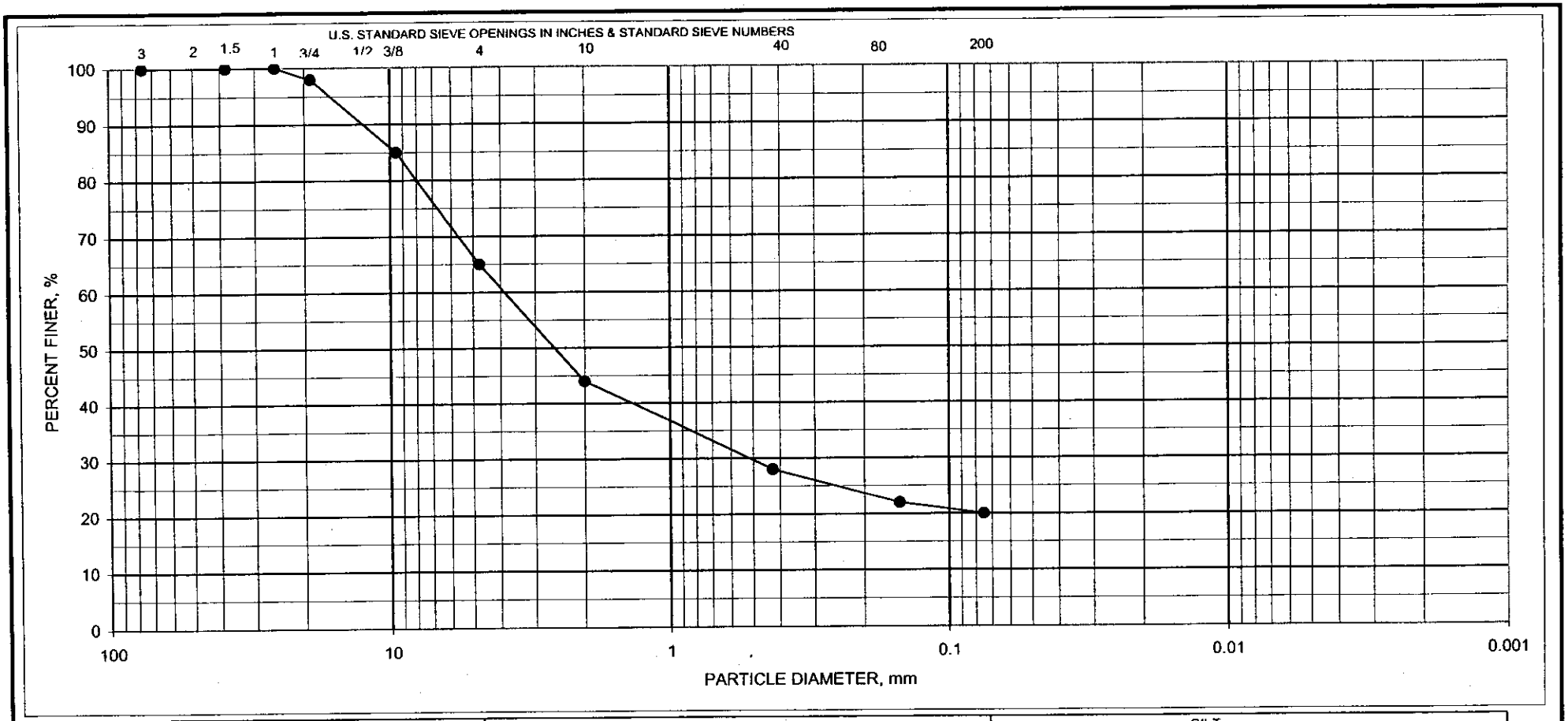

GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-178A	3	13 - 18	Silty, Clayey Sand with Gravel	SC-SM	11.4	22	16	6

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

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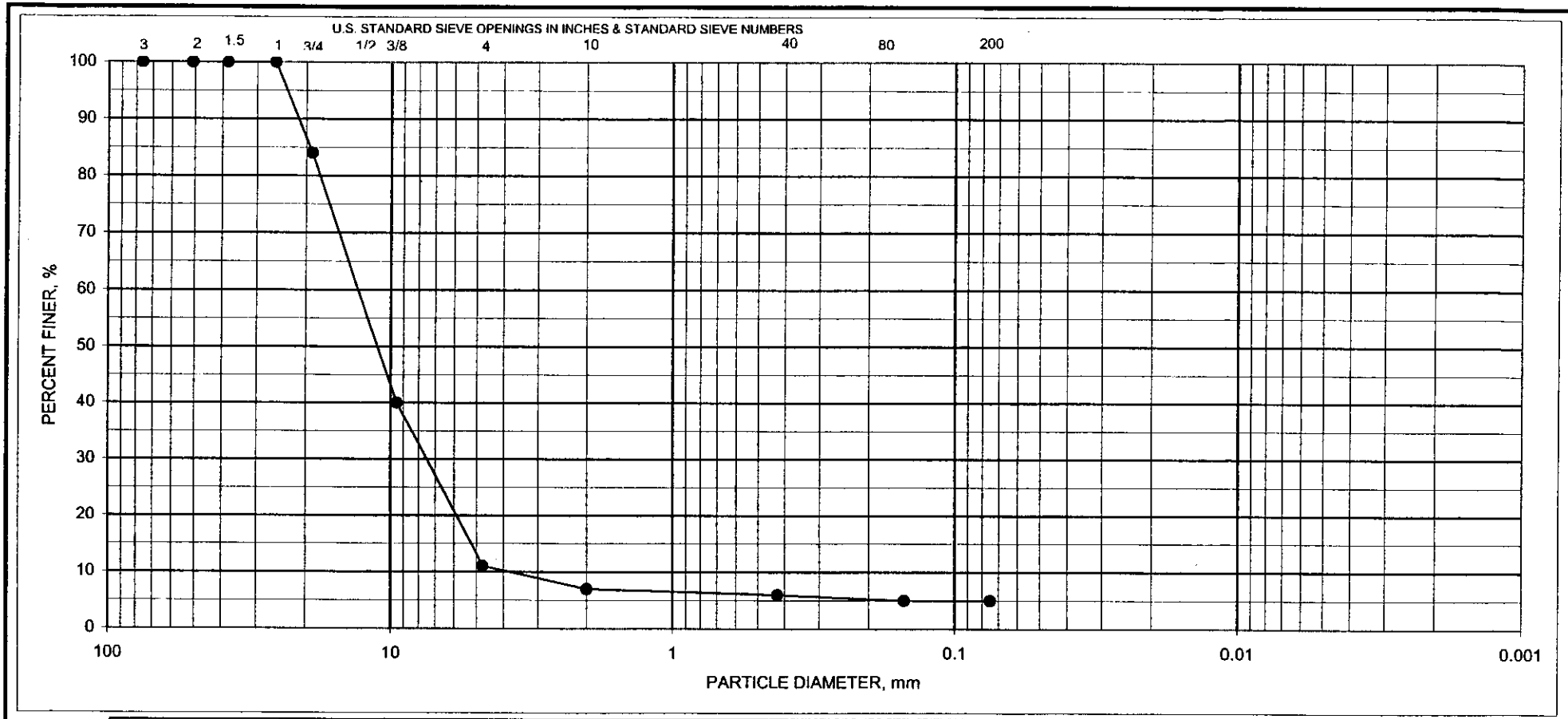


GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

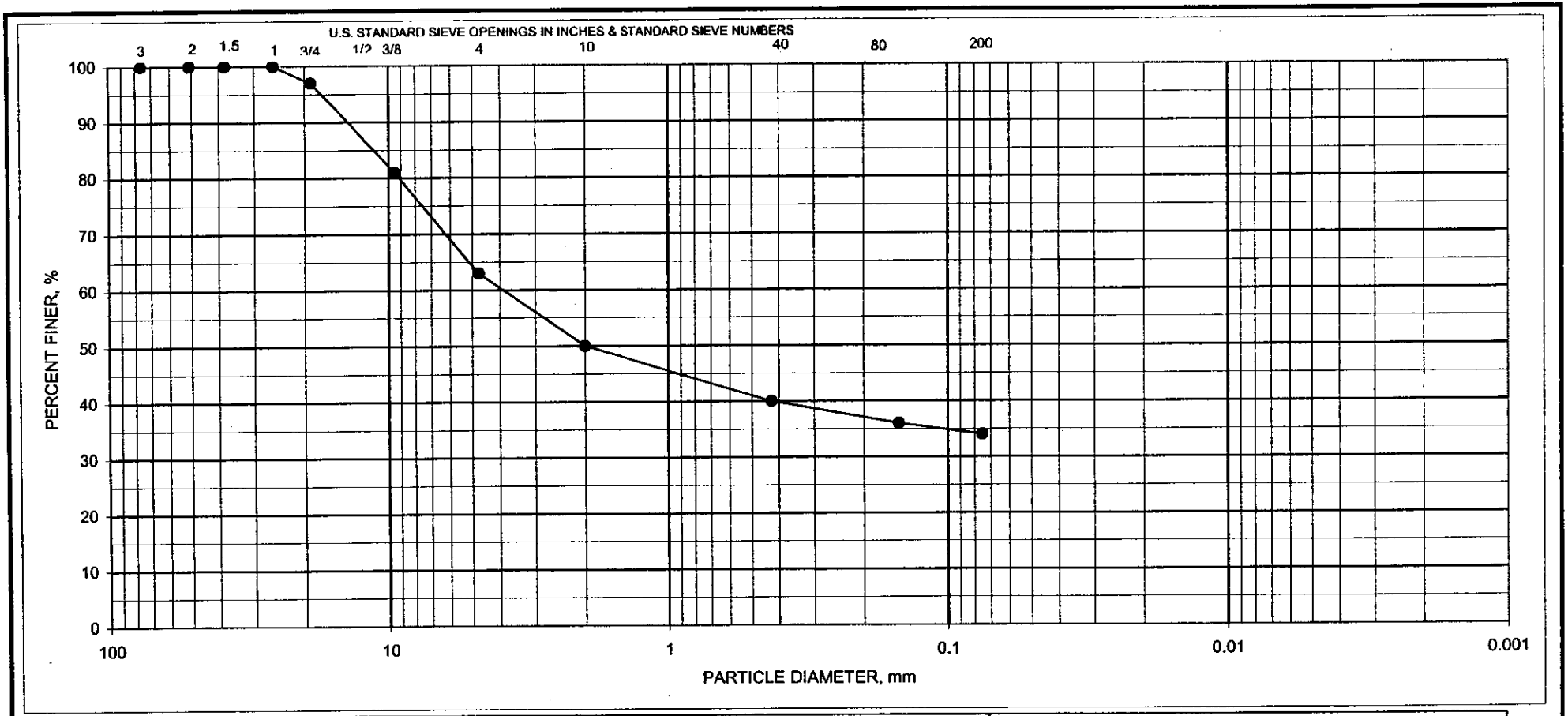
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-186	Bulk	0 to 4 feet	Well Graded Gravel	GW	3.8	24	21	3

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-186	Bulk	4 to 9.8 feet	Clayey Gravel with Sand	GC	10.7	28	19	9

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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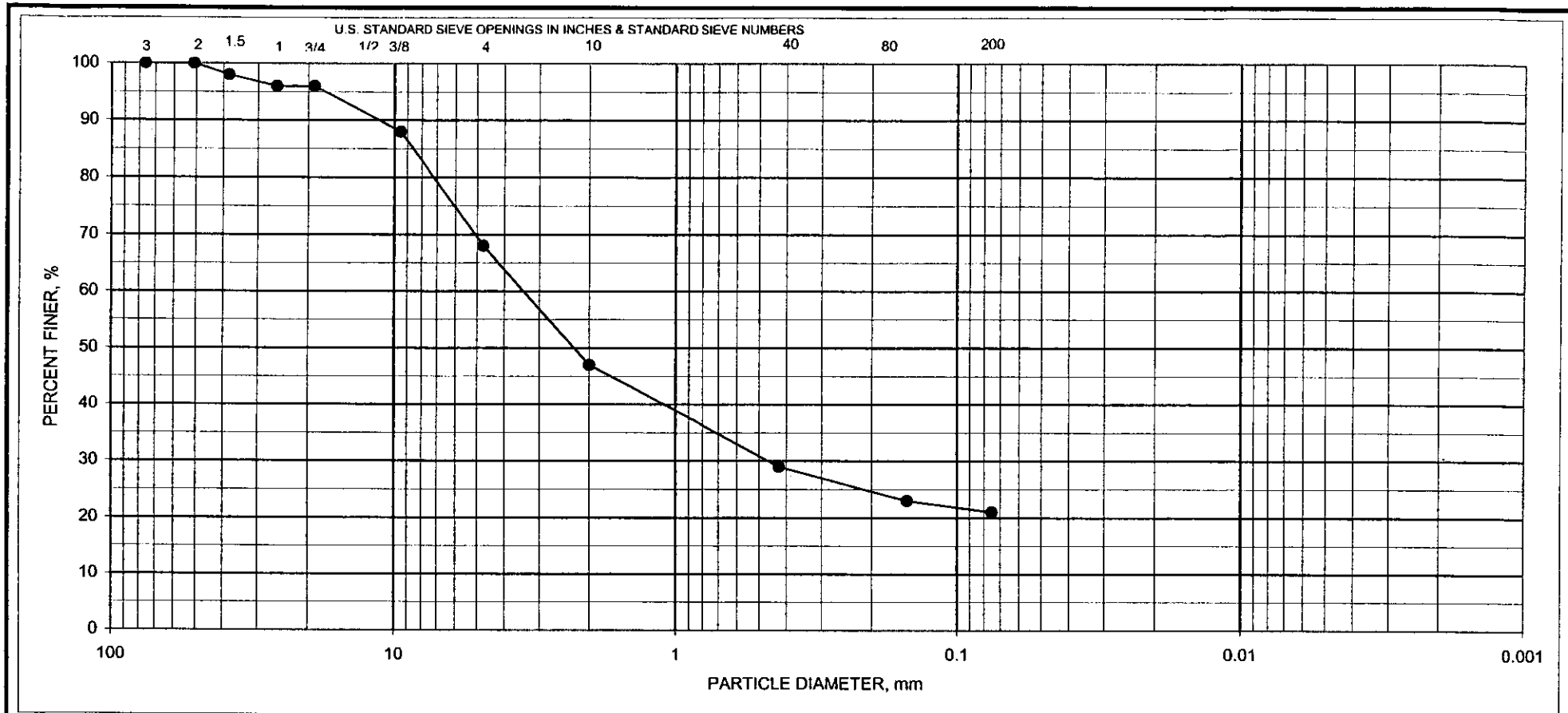
379



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

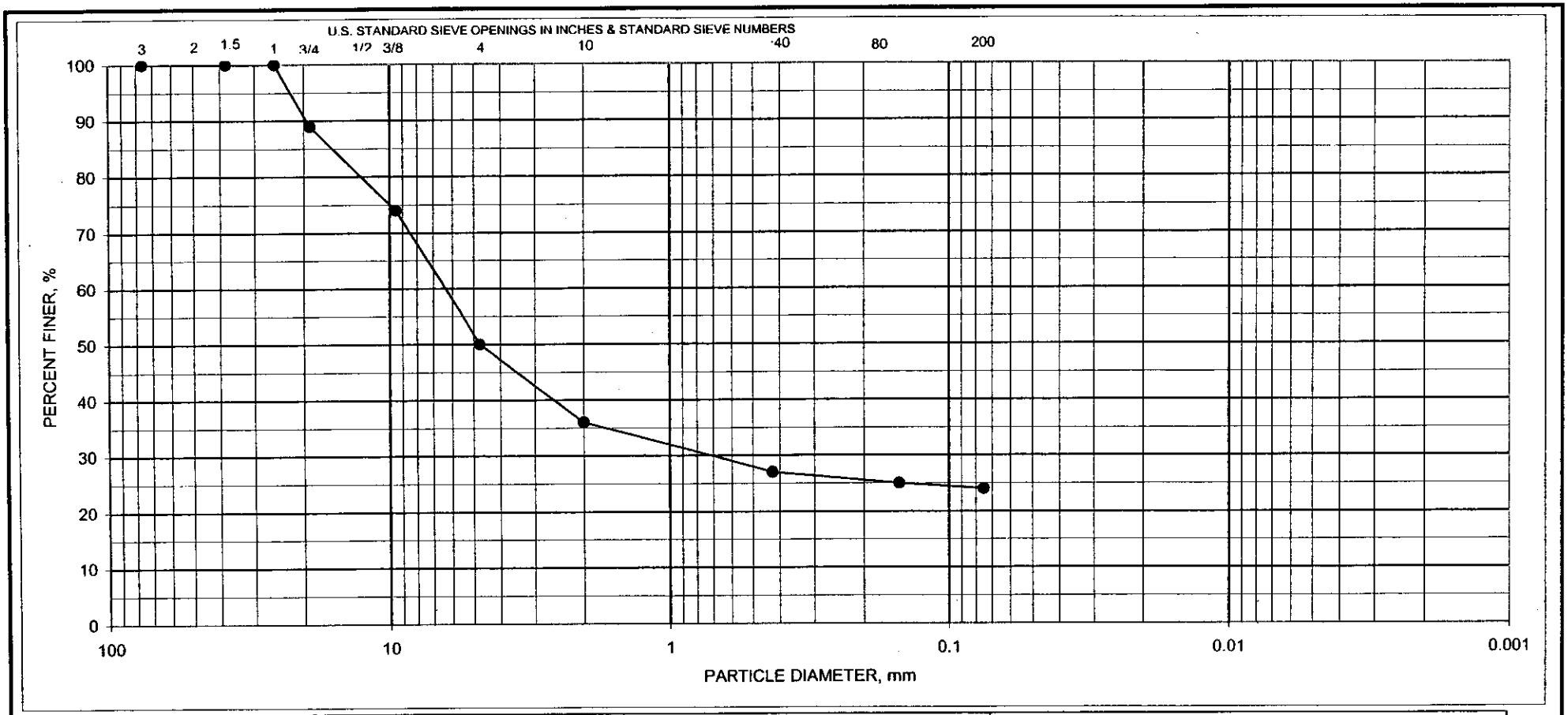
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-189	Bulk	2 to 22.8 feet	Silty Sand with Gravel	SM	3.6	20	17	3

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-190A	1	0 - 4	Silty, Clayey Gravel with Sand	GC-GM	6.1	25	19	6

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

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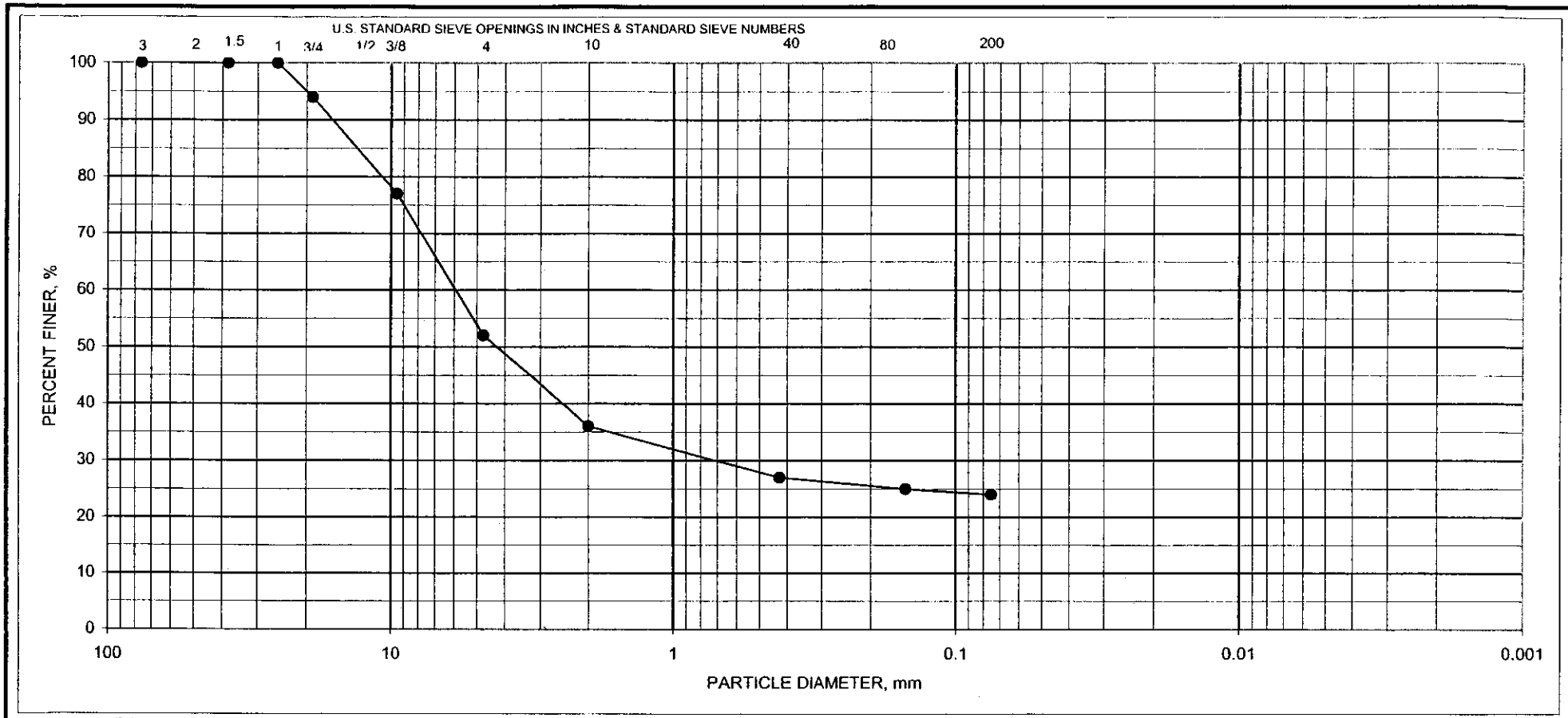


GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

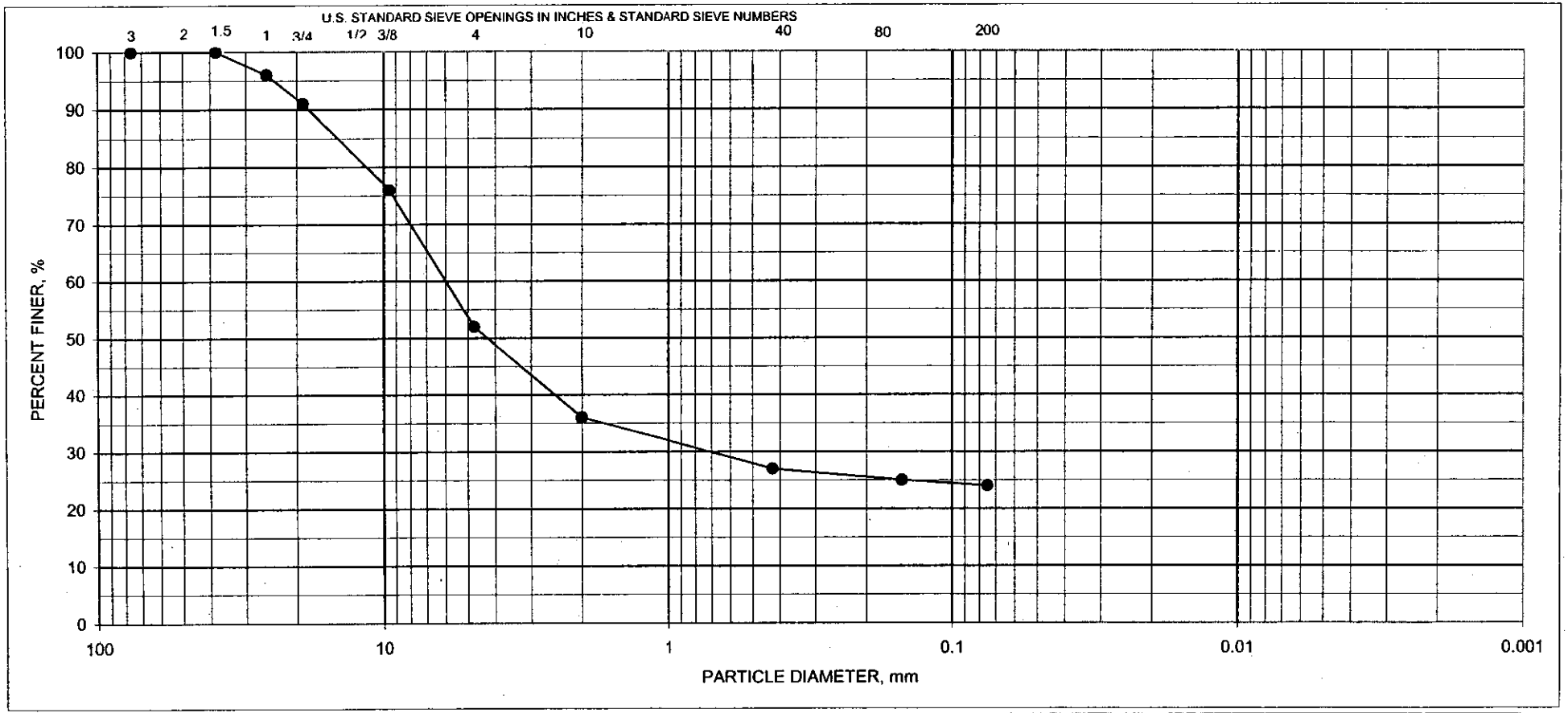
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-190A	2	4 - 9	Silty, Clayey Gravel with Sand	GC-GM	6.3	25	20	5

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

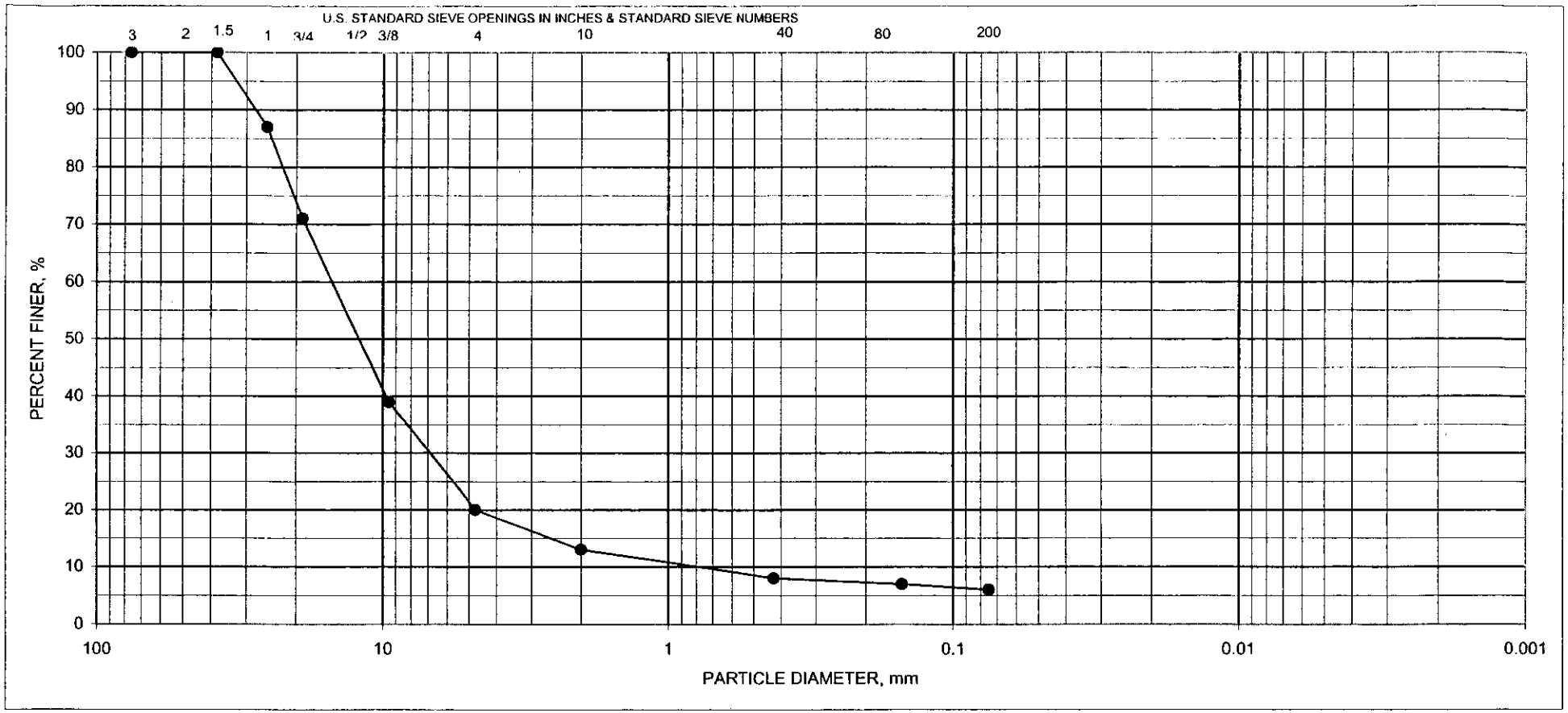
BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-190A	3	9 - 14	Silty, Clayey Gravel with Sand	GC-GM	4.3	26	20	6

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

Terracon

385



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

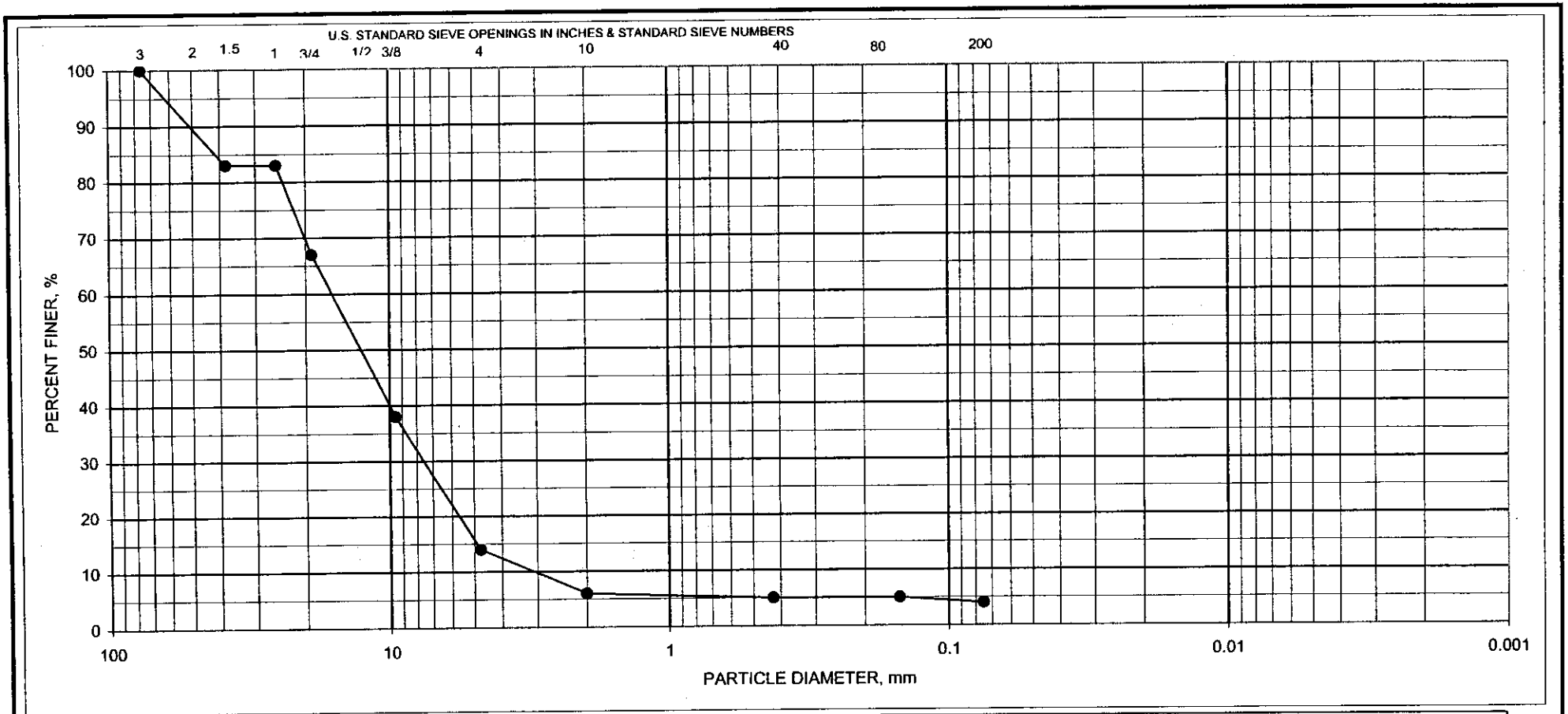
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-190A	4	14 - 19	Poorly Graded Gravel with Silty Clay	GP-GC	2	26	19	7

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-190A	5	19 - 24	Well Graded Gravel	GW	1.9	29	19	10

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

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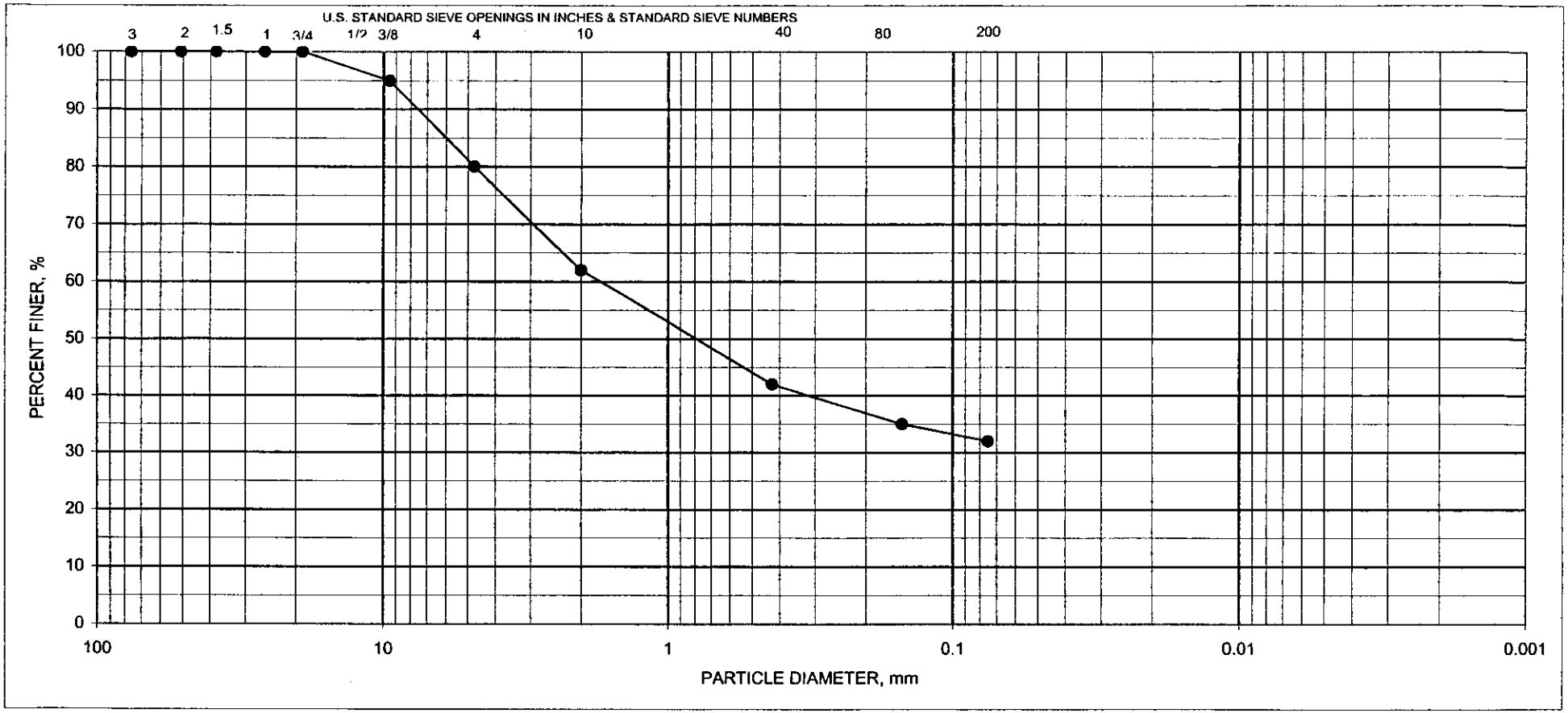


GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

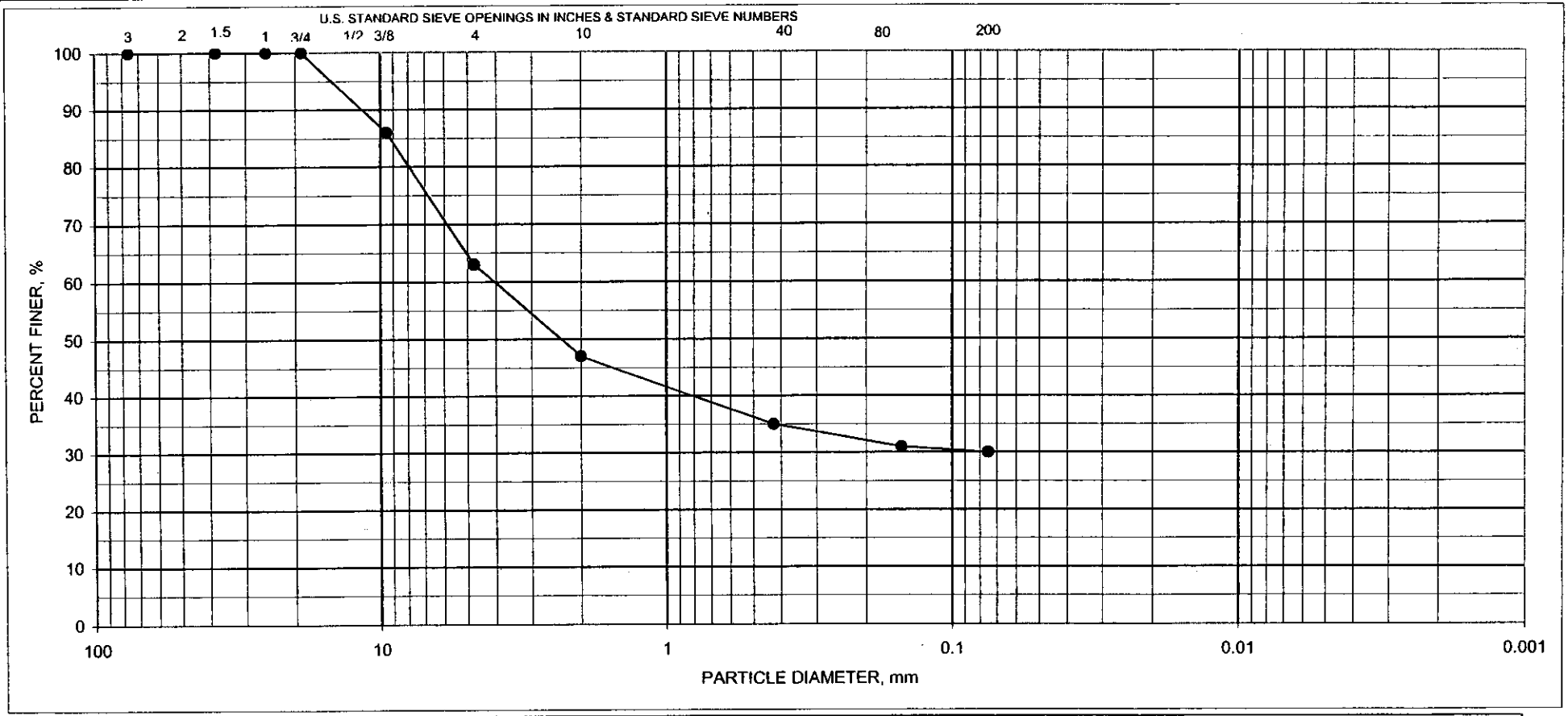
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-204	Bulk	0.5 to 21.5 feet	Silty Clayey Sand with Gravel	SC-SM	5.9	24	19	5

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

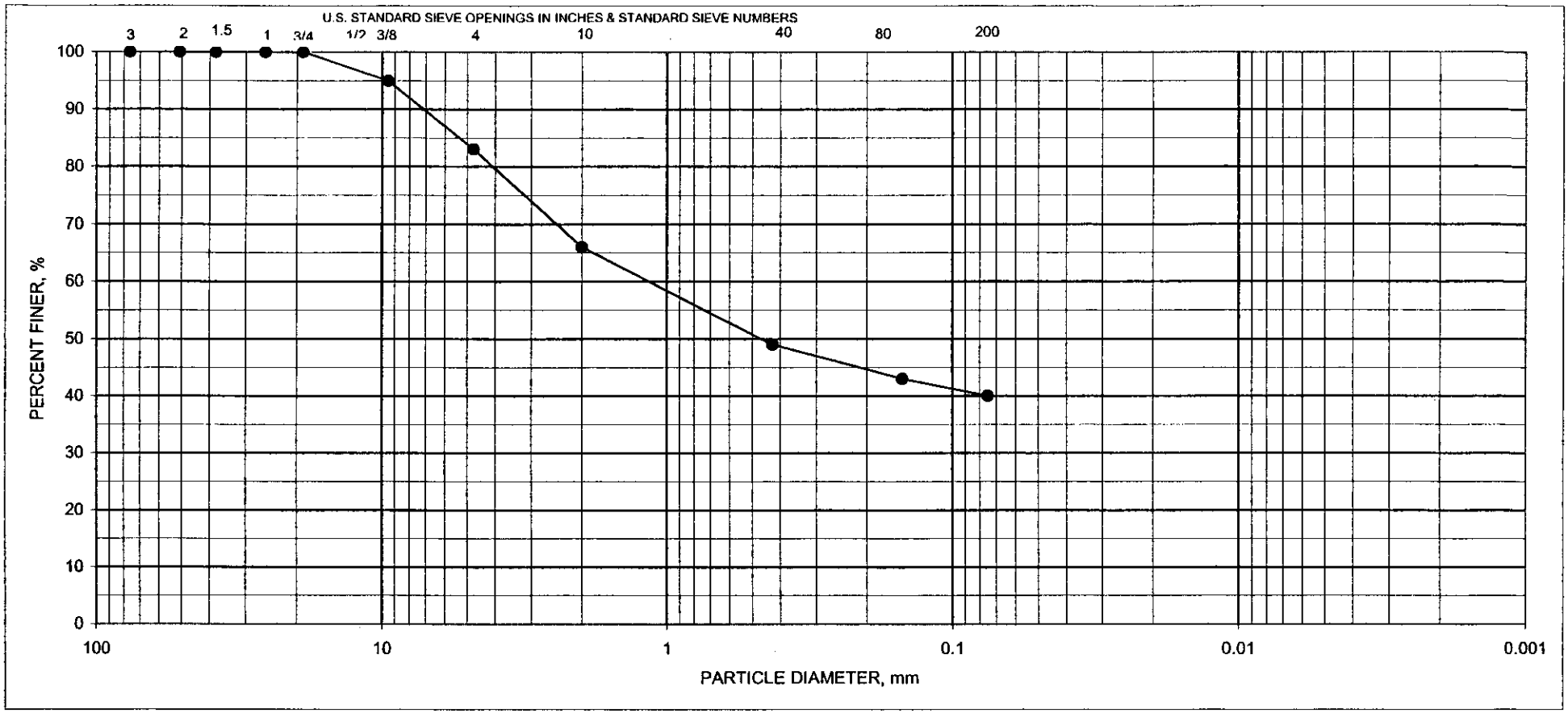
BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-205A	1, 2, 3	0 - 11	Silty, Clayey Gravel with Sand	GC-GM	4.9	26	19	7

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE November 2003

Terracon

384



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

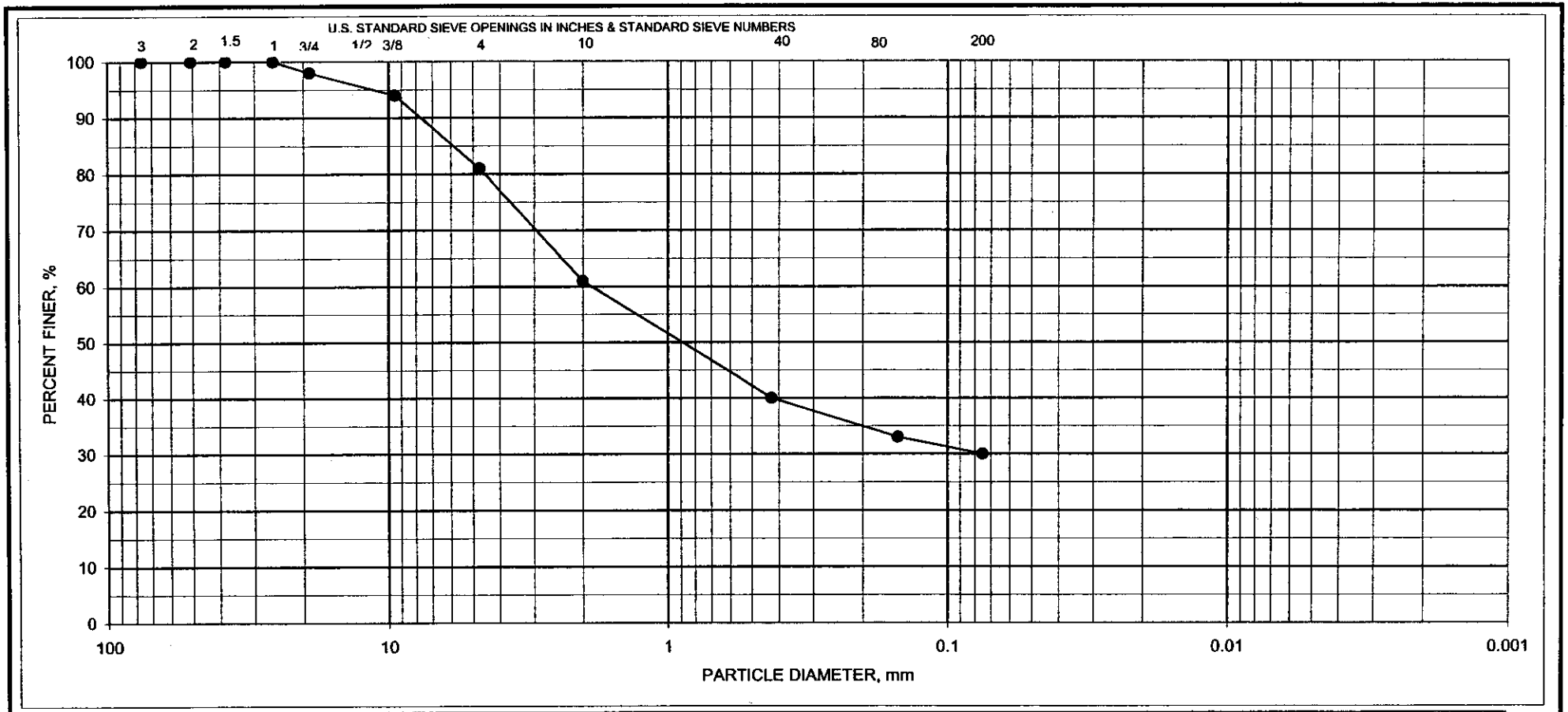
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-213	Bulk	0.8 to 18.2 feet	Silty Clayey Sand with Gravel	SC-SM	11	24	18	6

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-224	Bulk	0 to 10 feet	Clayey Sand with Gravel	SC	7.1	29	16	13

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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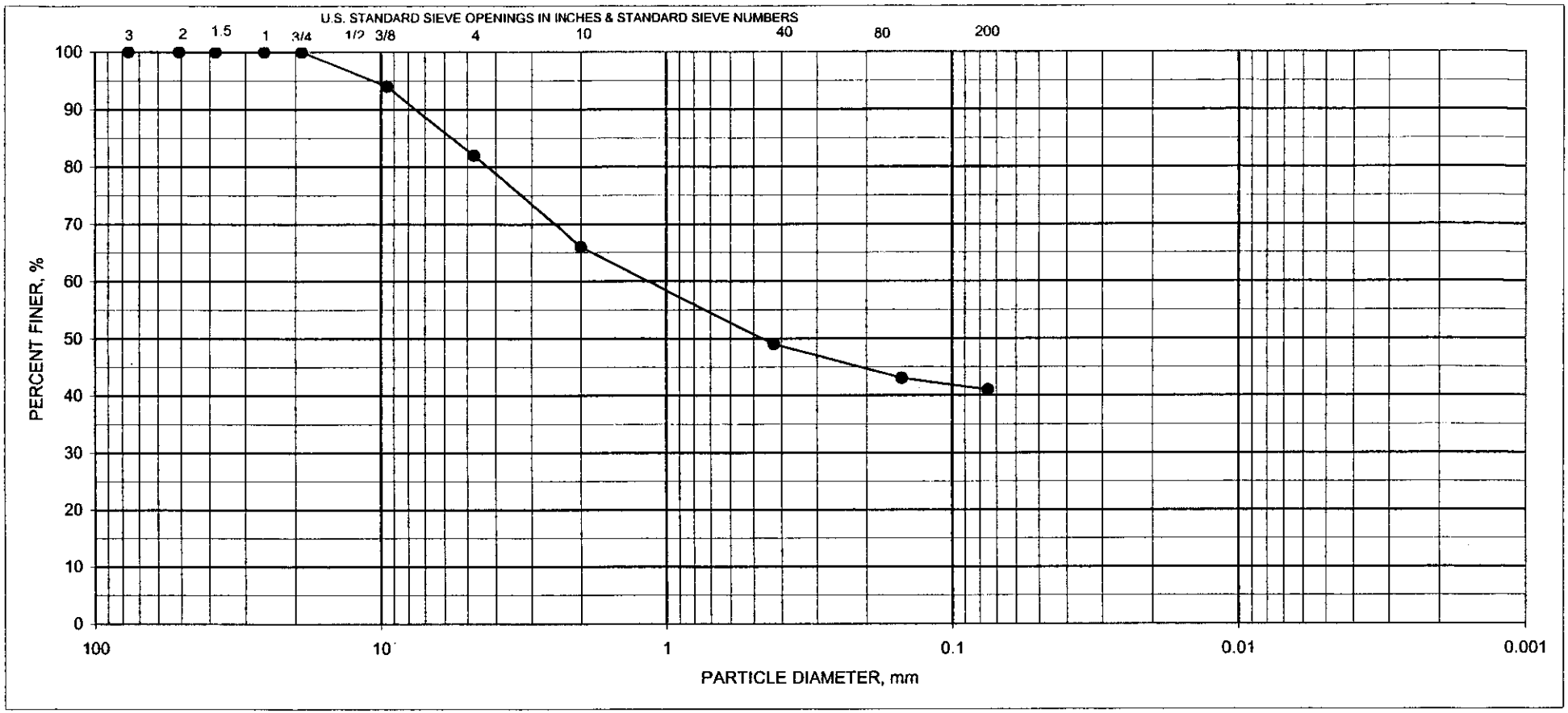
389



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

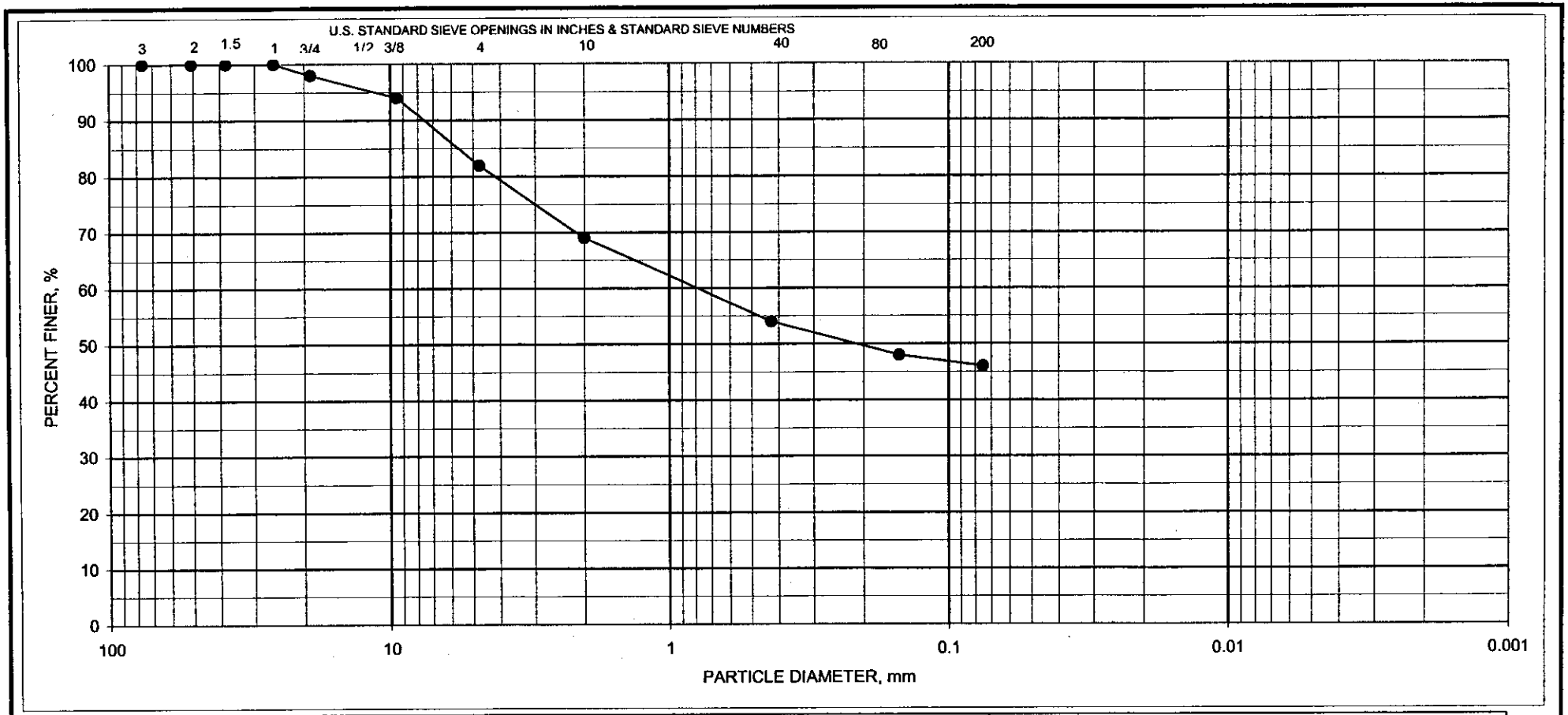
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-227	Bulk	0 to 20 feet	Clayey Sand with Gravel	SC	9.3	28	20	8

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-245	Bulk	0 to 20 feet	Clayey Sand with Gravel	SC	12.6	33	22	11

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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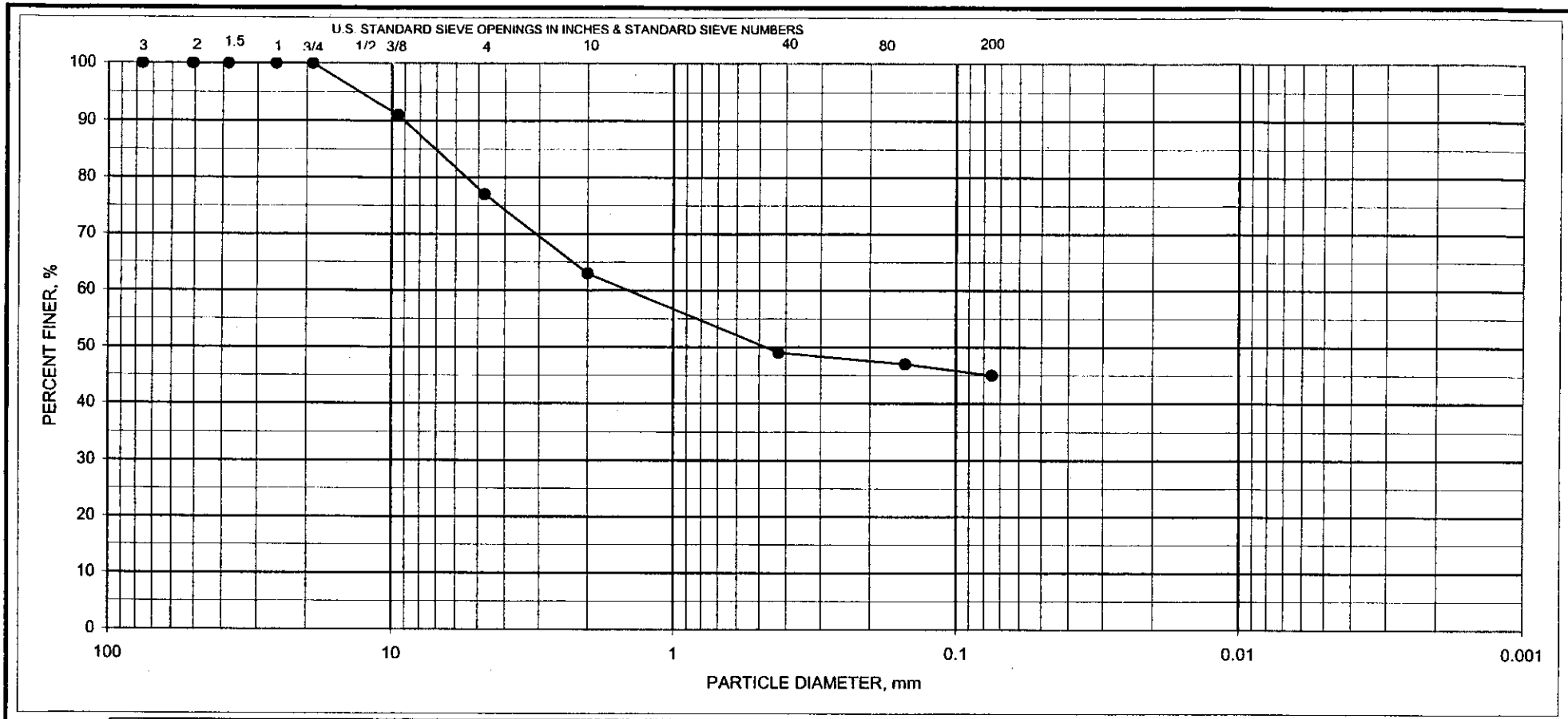
391



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

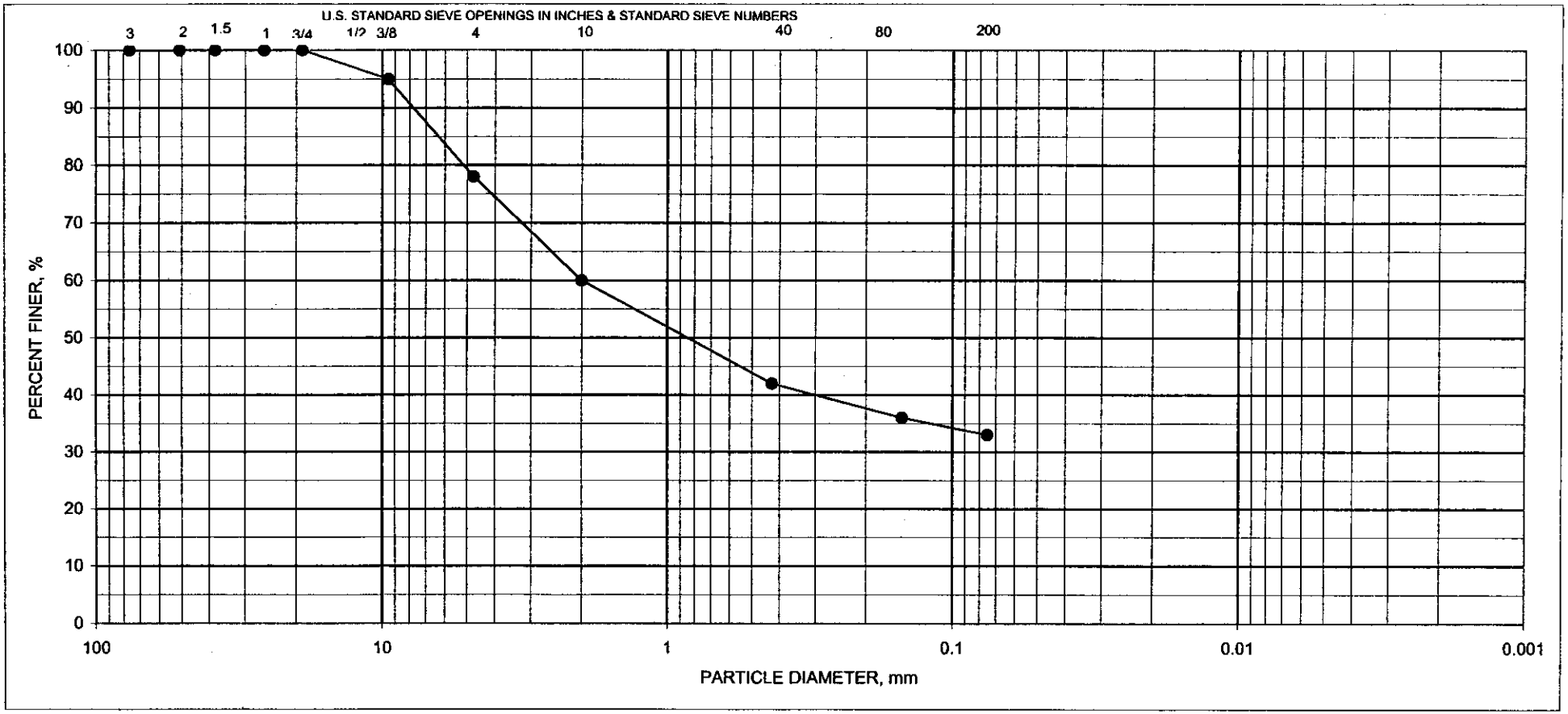
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-263	Bulk	0 to 19 feet	Clayey Sand with Gravel	SC	11.5	29	20	9

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

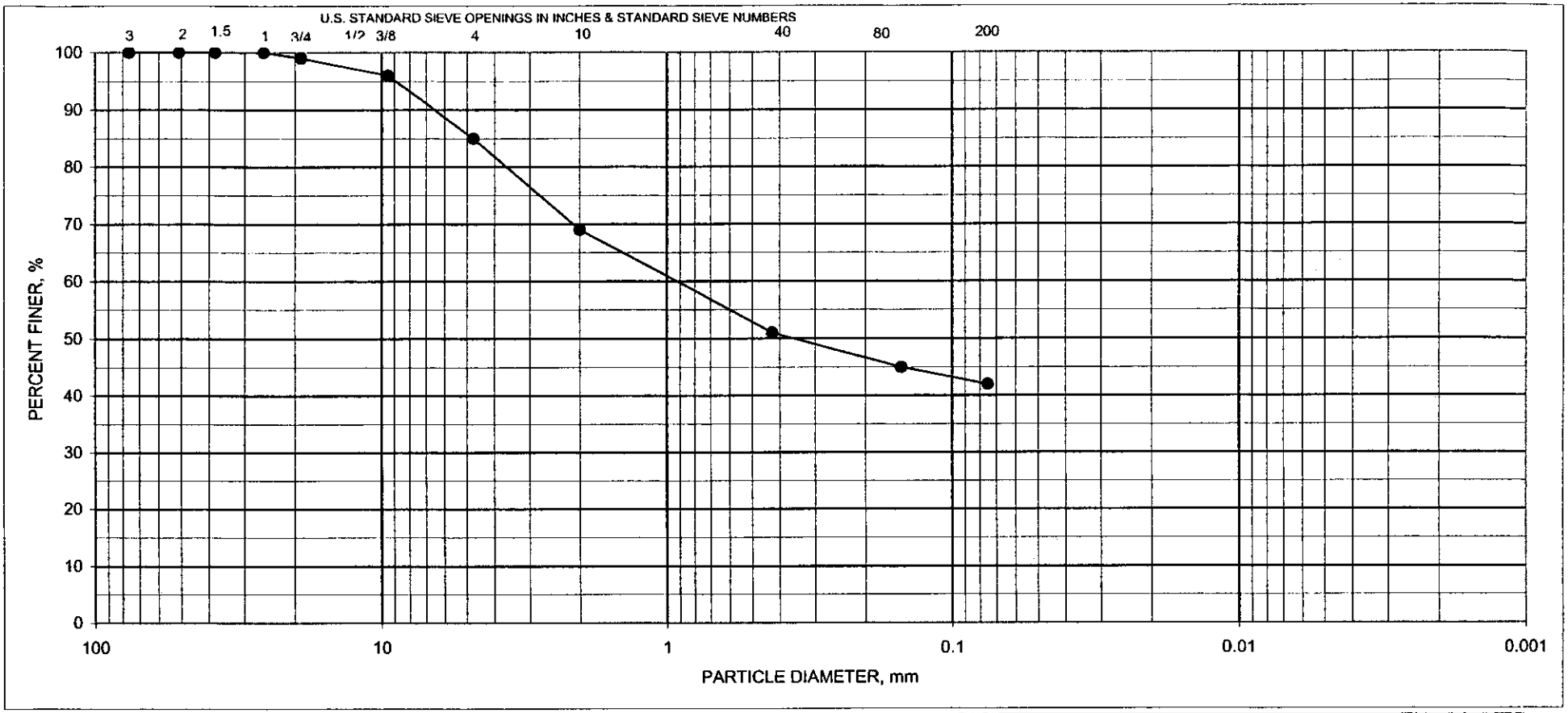
BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-266	Bulk	0 to 24 feet	Clayey Sand with Gravel	SC	8.8	31	21	10

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

Terracon

393



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

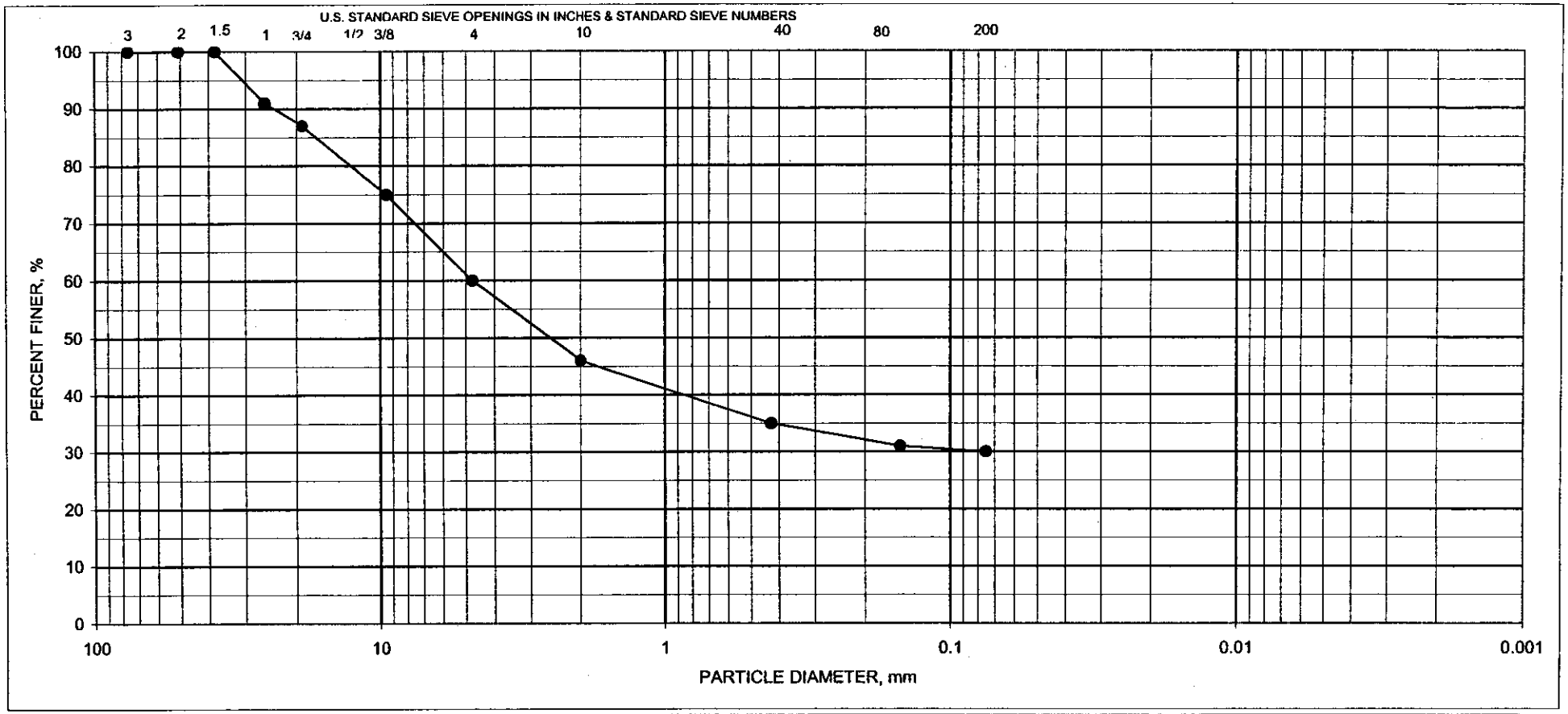
GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-272	Bulk	6 to 13.5 feet	Silty Sand with Gravel	SM	10.6	34	26	8

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-277	Bulk	0 to 12.5 feet	Silty Clayey Gravel with Sand	GC-GM	10.6	22	18	4

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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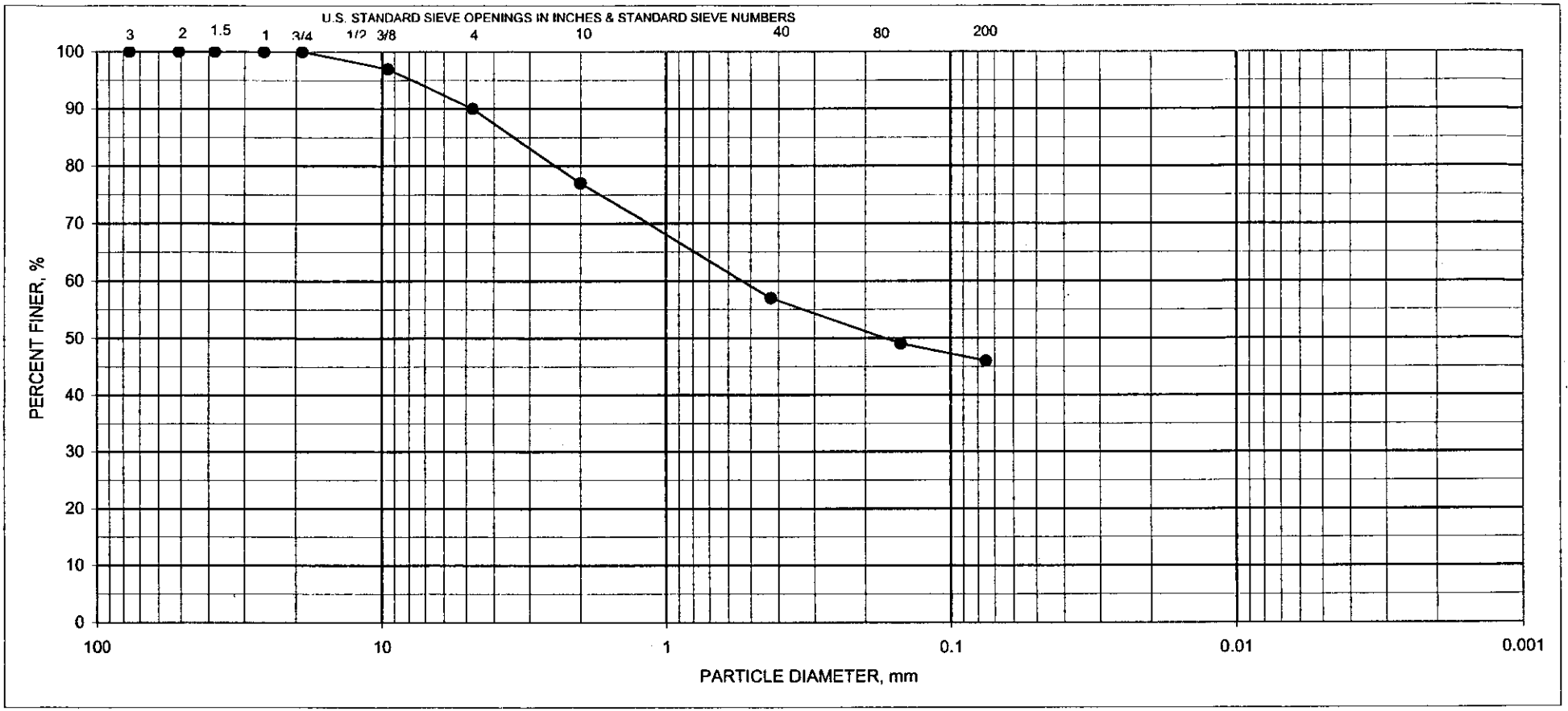
395



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	UNIFIED SYMBOL	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
MC-284	Bulk	20 to 51 feet	Clayey Sand	SC	14.3	37	20	17

PROJECT I 49 - Missouri Project Number J7P0601 - Pineville, Missouri to Arkansas State Line

McDonald County, Missouri JOB NO. 39025019M DATE April 2003

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10.3 Standard Compaction Results

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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-3 5 to 16.3 feet
Sample Description:

Material Designation: Sample date:
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

Project No.: 39025019M Date: April 2003

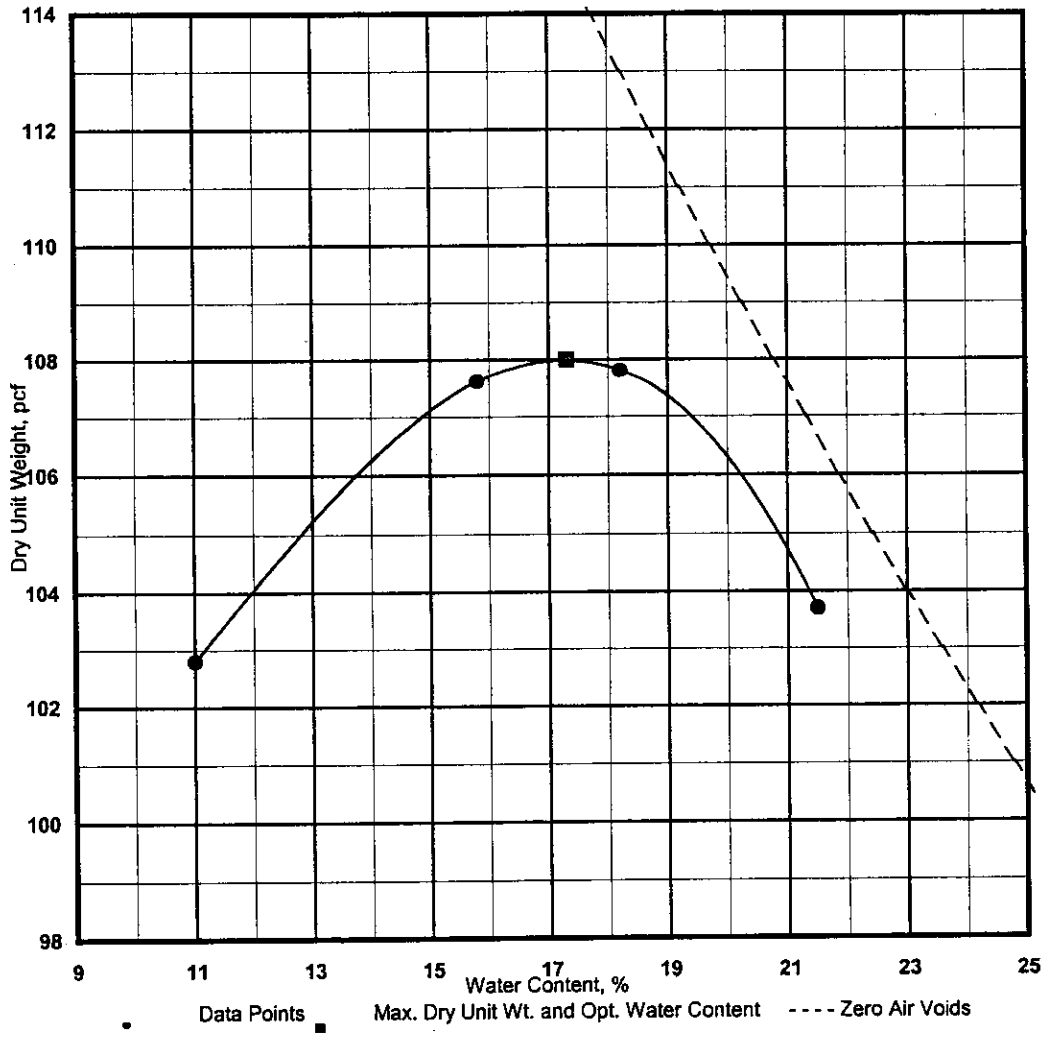
TEST RESULTS

Maximum Dry Unit Wt.: 108.0 pcf
Optimum Water Content: 17.3 %

Liquid Limit: 29 Plastic Limit: 20
Plasticity Index: 9
% passing # 200 sieve: 31

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



399

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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-33 0 to 5.5 feet
Sample Description:

Material Designation: Sample date:
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

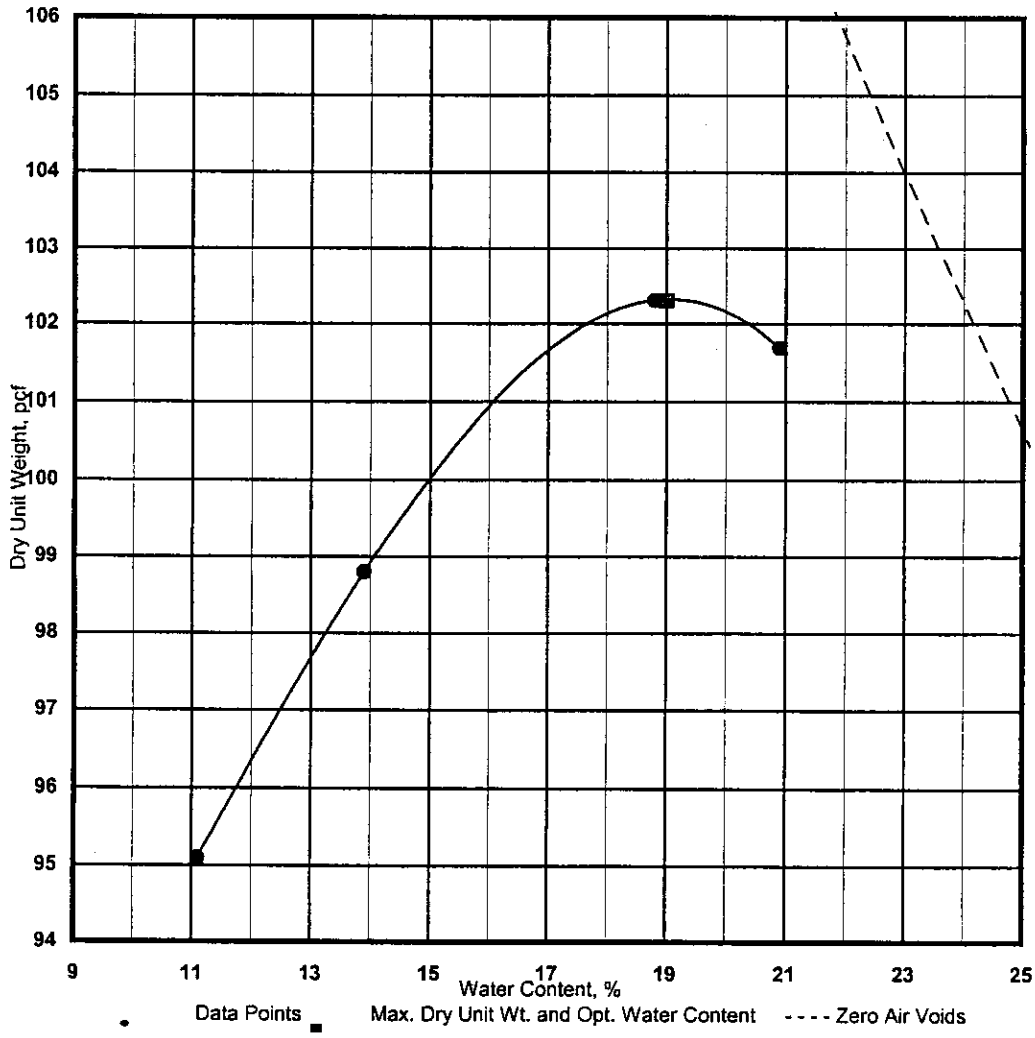
Project No.: 39025019M Date: April 2003

TEST RESULTS
Maximum Dry Unit Wt.: 102.3 pcf
Optimum Water Content: 19.0 %

Liquid Limit: 38 Plastic Limit: 21
Plasticity Index: 17
% passing # 200 sieve: 24

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



900

Terracon

Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-39 2 to 35 feet
Sample Description:

Material Designation: Sample date:
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

Project No.: 39025019M Date: April 2003

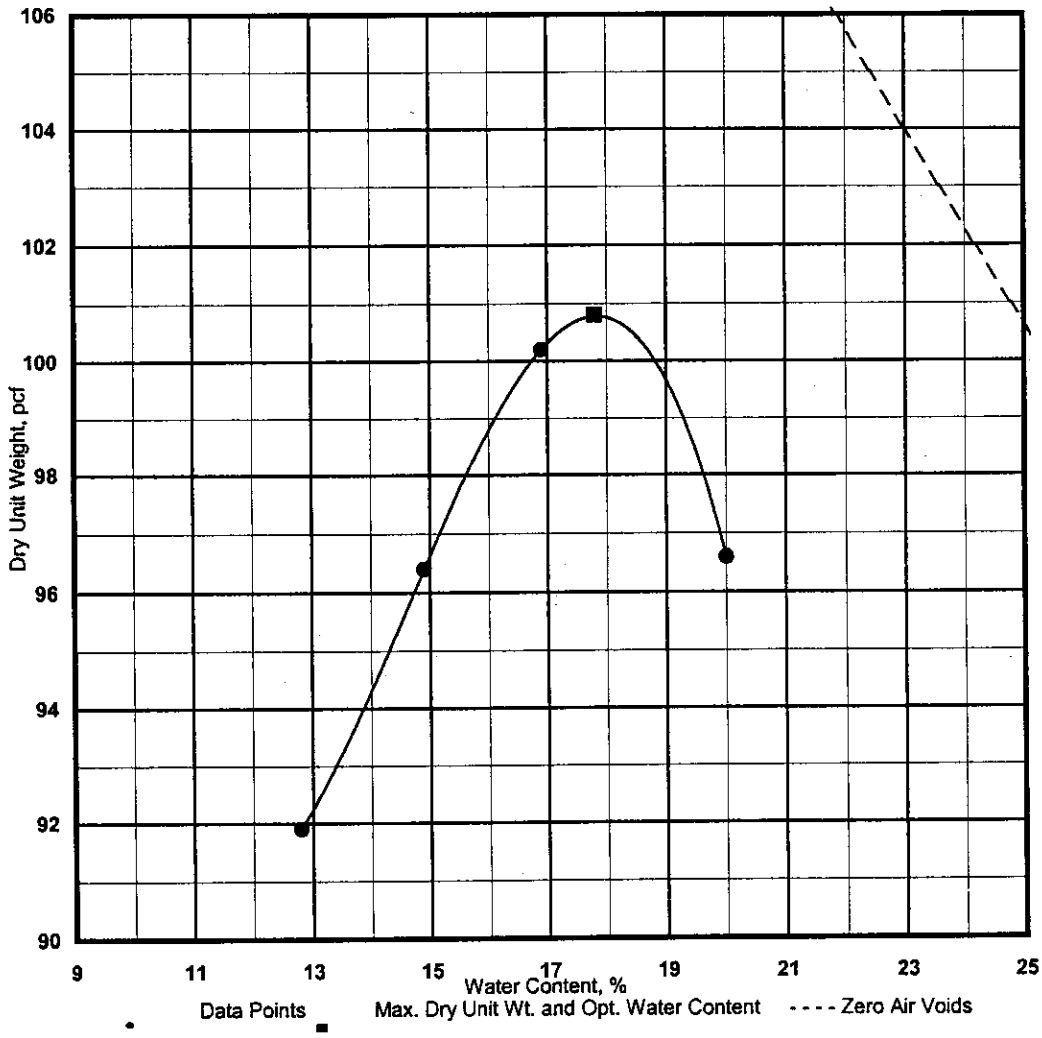
TEST RESULTS

Maximum Dry Unit Wt.: 100.8 pcf
Optimum Water Content: 17.8 %

Liquid Limit: 30 Plastic Limit: 20
Plasticity Index: 10
% passing # 200 sieve: 38

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



401

Terracon

Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-88 3.0 to 20.0 feet
Sample Description:

Material Designation: Sample date:
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

Project No.: 39025019M Date: April 2003

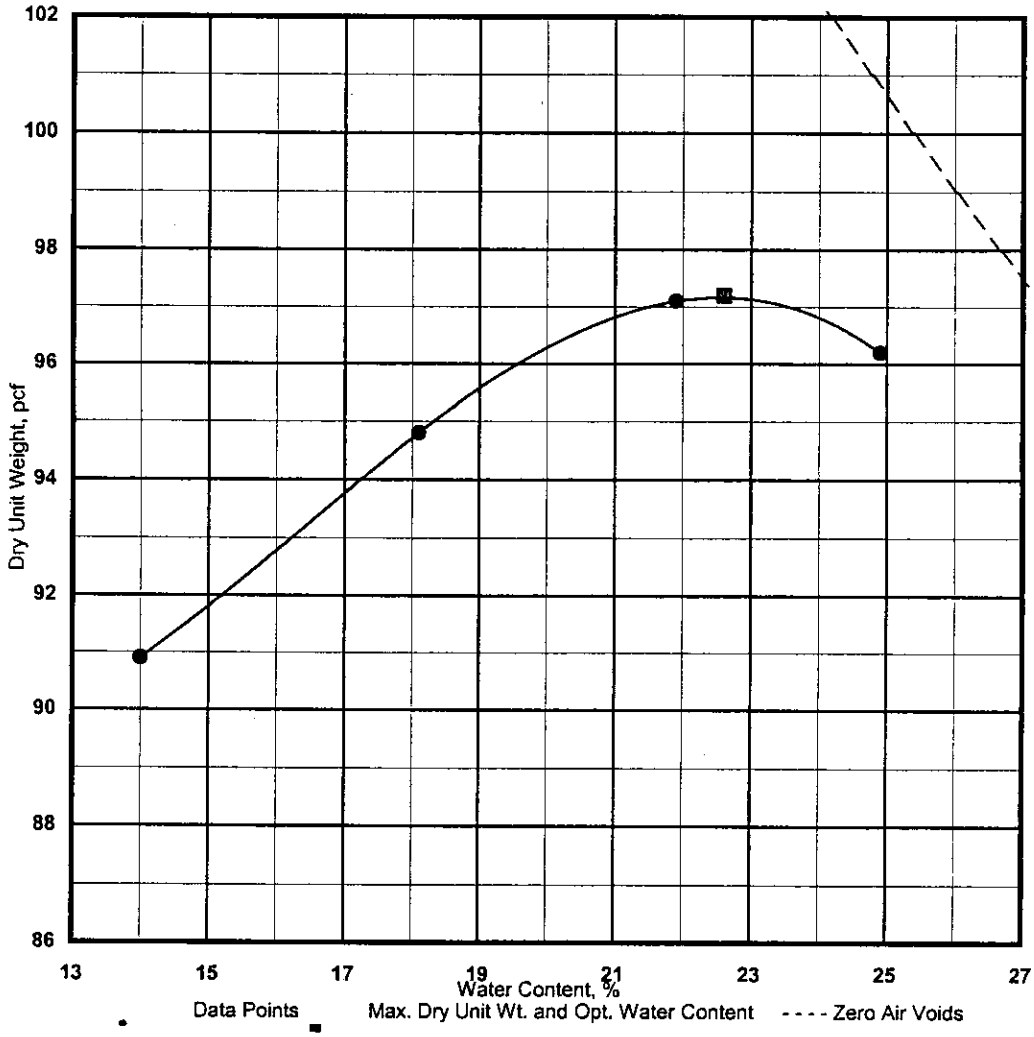
TEST RESULTS

Maximum Dry Unit Wt.: 97.2 pcf
Optimum Water Content: 22.6 %

Liquid Limit: 27 Plastic Limit: 22
Plasticity Index: 5
% passing # 200 sieve: 41

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



402

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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-125 1 to 25 feet
Sample Description:

Material Designation: Sample date:
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

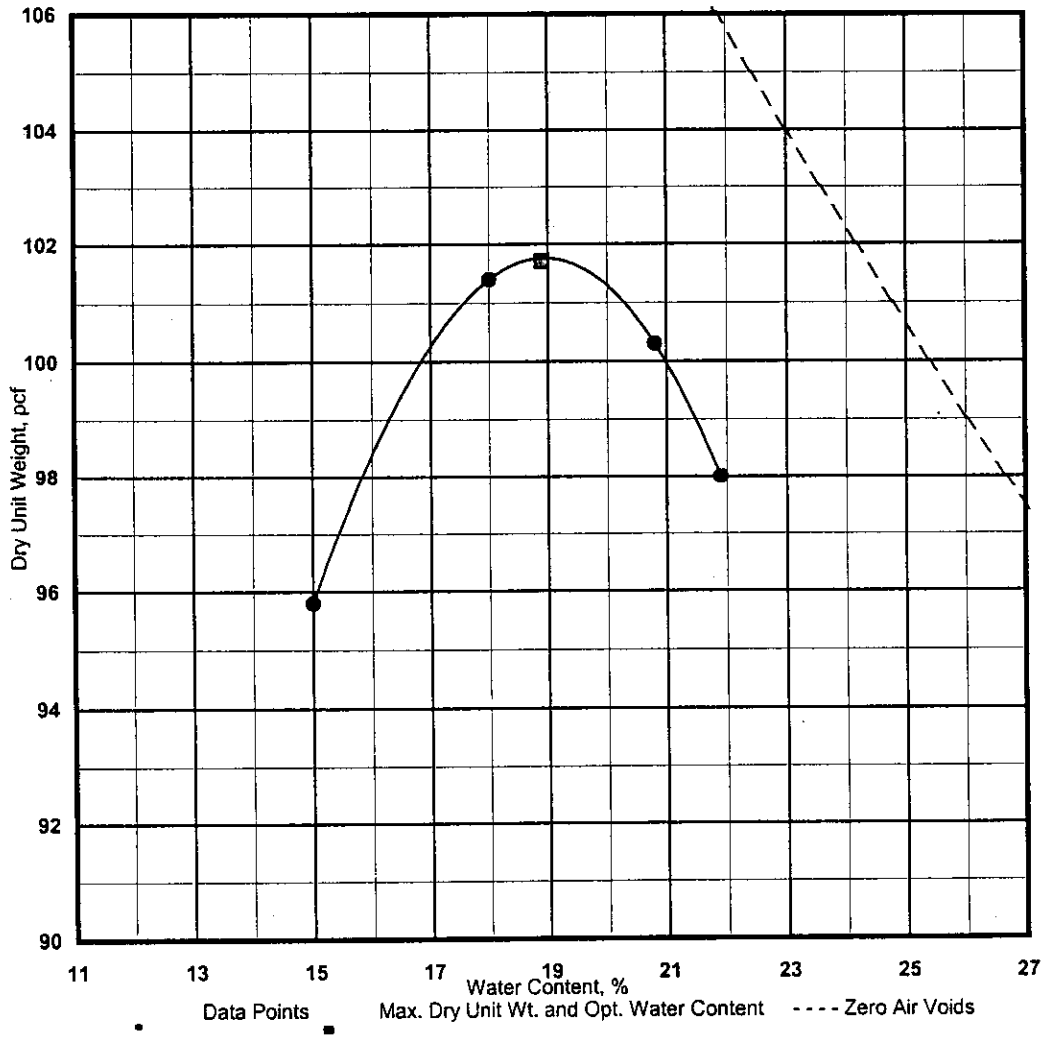
Project No.: 39025019M Date: April 2003

TEST RESULTS
Maximum Dry Unit Wt.: 101.7 pcf
Optimum Water Content: 18.9 %

Liquid Limit: 48 Plastic Limit: 25
Plasticity Index: 23
% passing # 200 sieve: 53

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



403

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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-153 4 to 30 feet
Sample Description:

Material Designation: _____ Sample date: _____
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ____ Mechanical X Manual

Project No.: 39025019M Date: April 2003

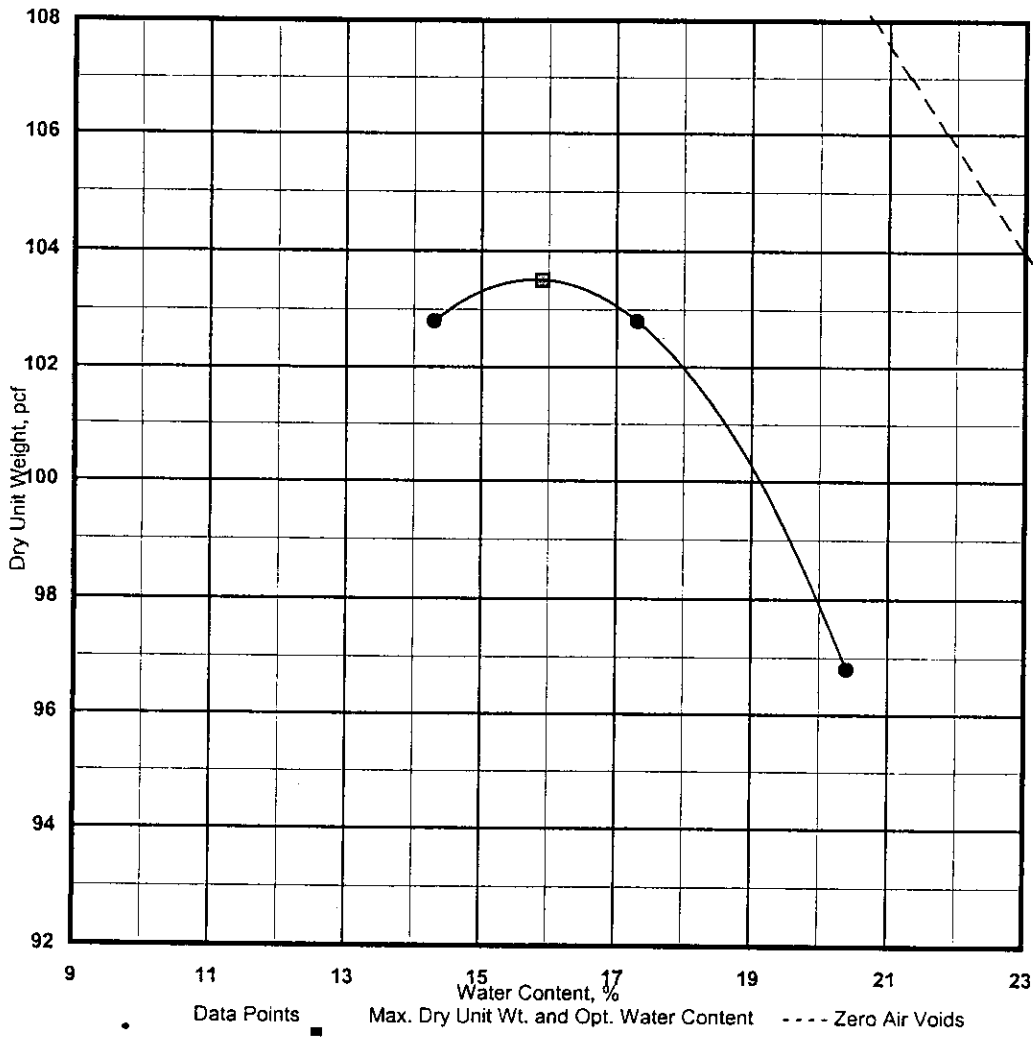
TEST RESULTS

Maximum Dry Unit Wt.: 103.5 pcf
Optimum Water Content: 15.9 %

Liquid Limit: 49 Plastic Limit: 22
Plasticity Index: 27
% passing # 200 sieve: 69

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-164 1.0 to 32.0 feet
Sample Description:

Material Designation: Sample date:
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

Project No.: 39025019M Date: April 2003

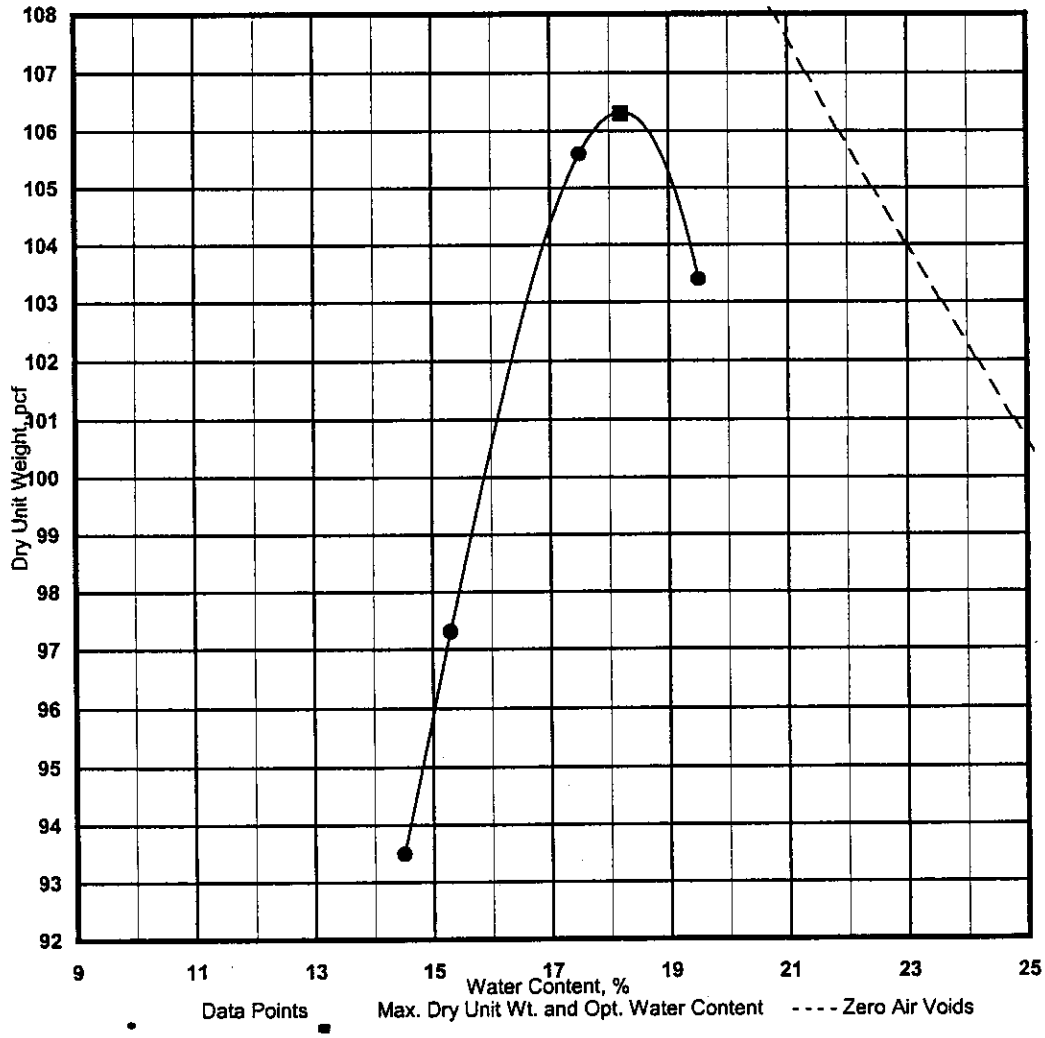
TEST RESULTS

Maximum Dry Unit Wt.: 106.3 pcf
Optimum Water Content: 18.2 %

Liquid Limit: 56 Plastic Limit: 19
Plasticity Index: 37
% passing # 200 sieve: 74

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



405

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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-177 0 to 13.0 feet
Sample Description:

Material Designation: _____ Sample date: _____
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: AASHTO T99
Rammer: ____ Mechanical X Manual

Project No.: 39025019M Date: April 2003

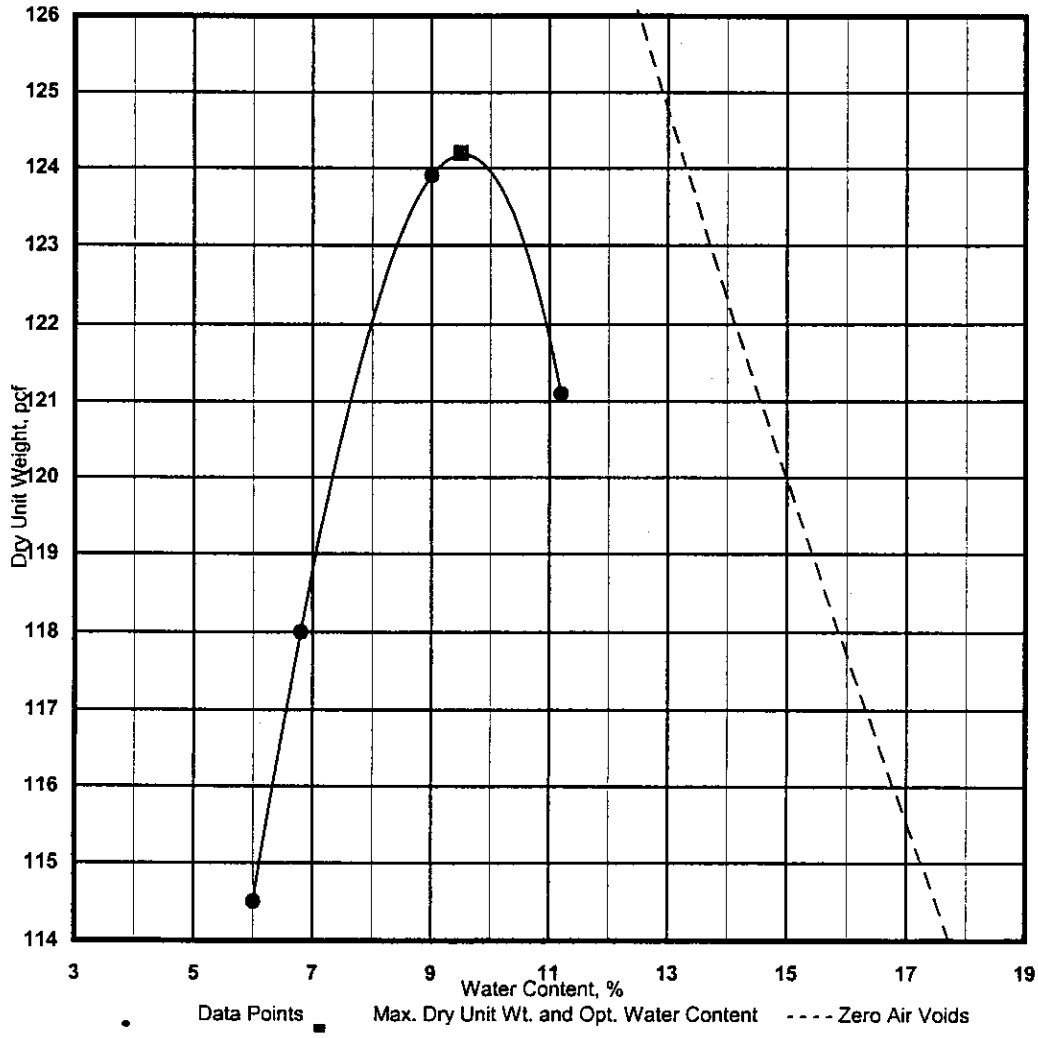
TEST RESULTS

Maximum Dry Unit Wt.: 124.2 pcf
Optimum Water Content: 9.5 %

Liquid Limit: 20 Plastic Limit: 17
Plasticity Index: 3
% passing # 200 sieve: 16

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-204 0.5 to 21.5 feet
Sample Description:

Material Designation: Sample date:
Test Method: AASHTO T99
Test Procedure: Method A
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

Project No.: 39025019M Date: April 2003

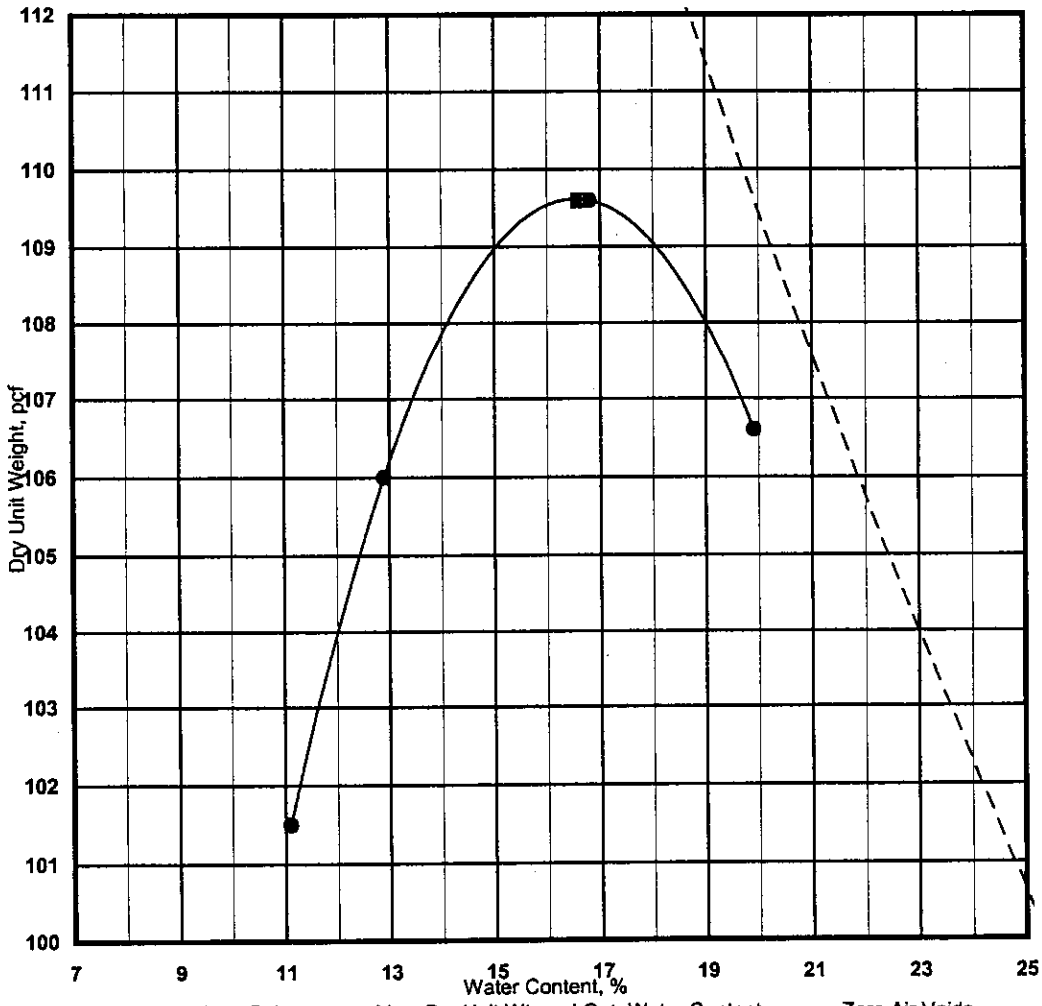
TEST RESULTS

Maximum Dry Unit Wt.: 109.6 pcf
Optimum Water Content: 16.6 %

Liquid Limit: 24 Plastic Limit: 19
Plasticity Index: 5
% passing # 200 sieve: 32

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



• Data Points ■ Max. Dry Unit Wt. and Opt. Water Content - - - - Zero Air Voids

407

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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-224 0 to 10.0 feet
Sample Description:

Material Designation: _____ Sample date: _____
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

Project No.: 39025019M Date: April 2003

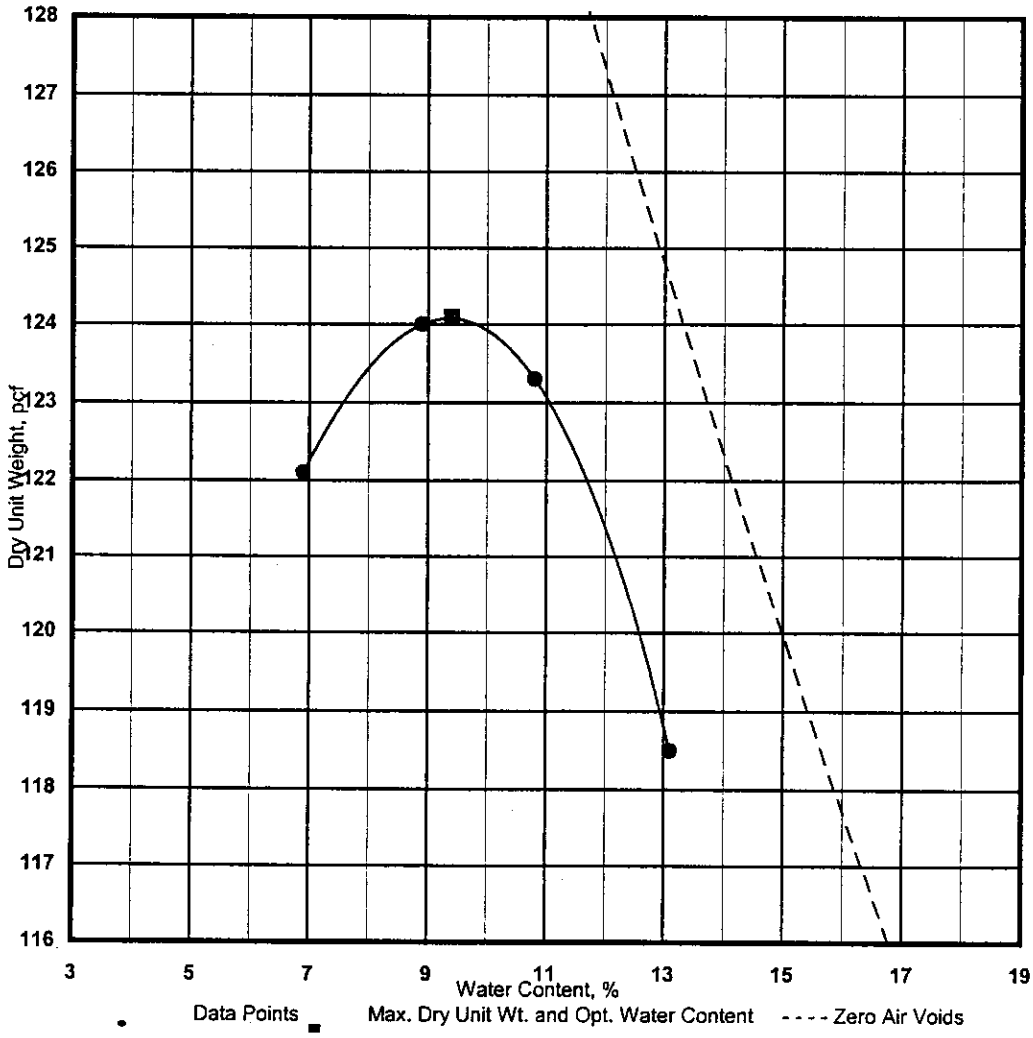
TEST RESULTS

Maximum Dry Unit Wt.: 124.1 pcf
Optimum Water Content: 9.4 %

Liquid Limit: 29 Plastic Limit: 16
Plasticity Index: 13
% passing # 200 sieve: 30

Reviewed by: SPB

Zero air voids for specific gravity of 2.70



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Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-227 0 to 20.0 feet
Sample Description:

Material Designation: Sample date:
Test Method: AASHTO T99
Test Procedure: Method A
Sample Preparation: Wet Preparation
Rammer: ___ Mechanical X Manual

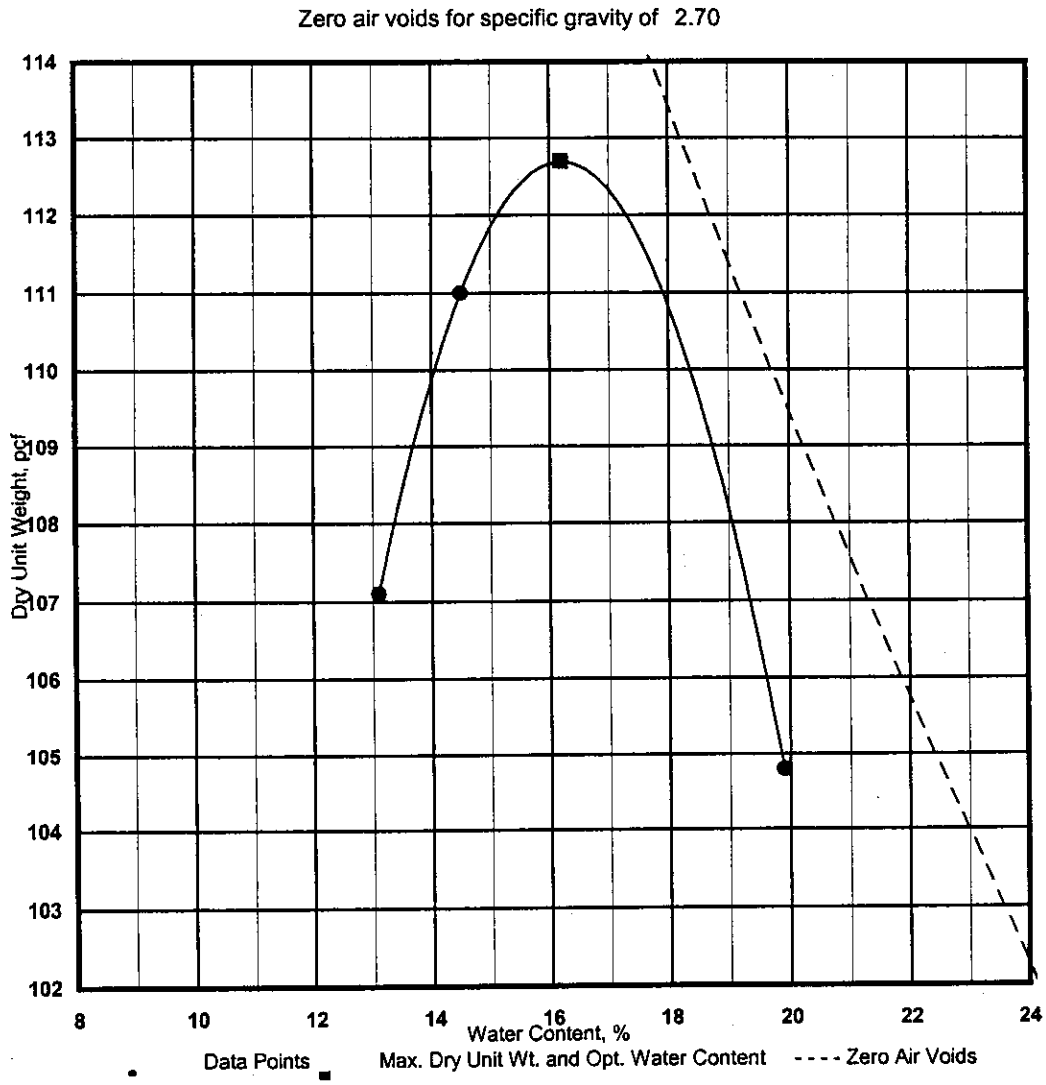
Project No.: 39025019M Date: April 2003

TEST RESULTS

Maximum Dry Unit Wt.: 112.7 pcf
Optimum Water Content: 16.2 %

Liquid Limit: 28 Plastic Limit: 20
Plasticity Index: 8
% passing # 200 sieve: 41

Reviewed by: SPB



409

Terracon

Laboratory Compaction Characteristics of Soil

2201-C S Thompson, #3
Springdale, AR 72764
(479)750-9775

Client Name: HNTB Corporation
Project Name: I 49 - Missouri Project Number J7P0601
Location: Pineville, Missouri to Arkansas State Line
City & State: McDonald County, Missouri

Source Material: MC-272 6.0 to 13.5 feet
Sample Description:

Material Designation: _____ Sample date: _____
Test Method: AASHTO T99
Test Procedure: Method C
Sample Preparation: Wet Preparation
Rammer: ____ Mechanical X Manual

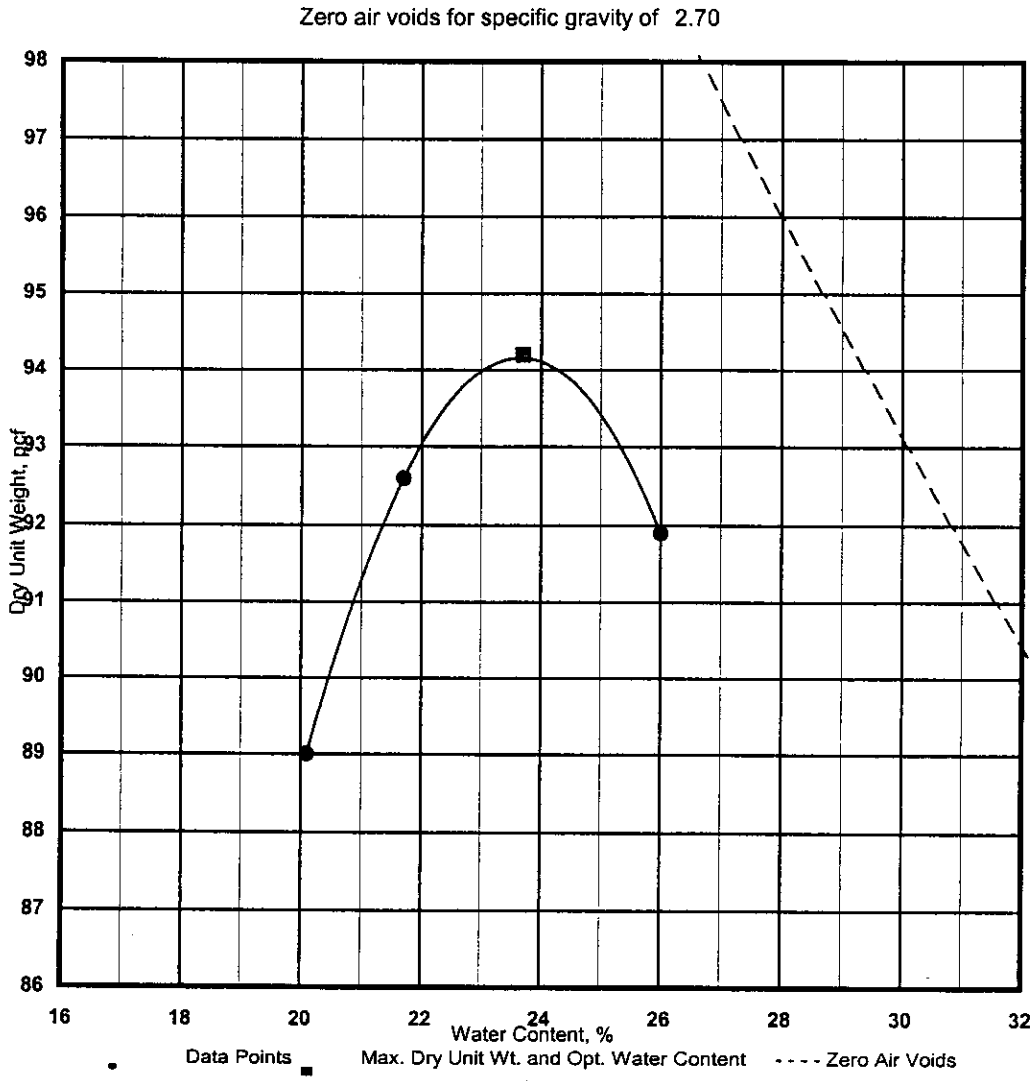
Project No.: 39025019M Date: April 2003

TEST RESULTS

Maximum Dry Unit Wt.: 94.2 pcf
Optimum Water Content: 23.7 %

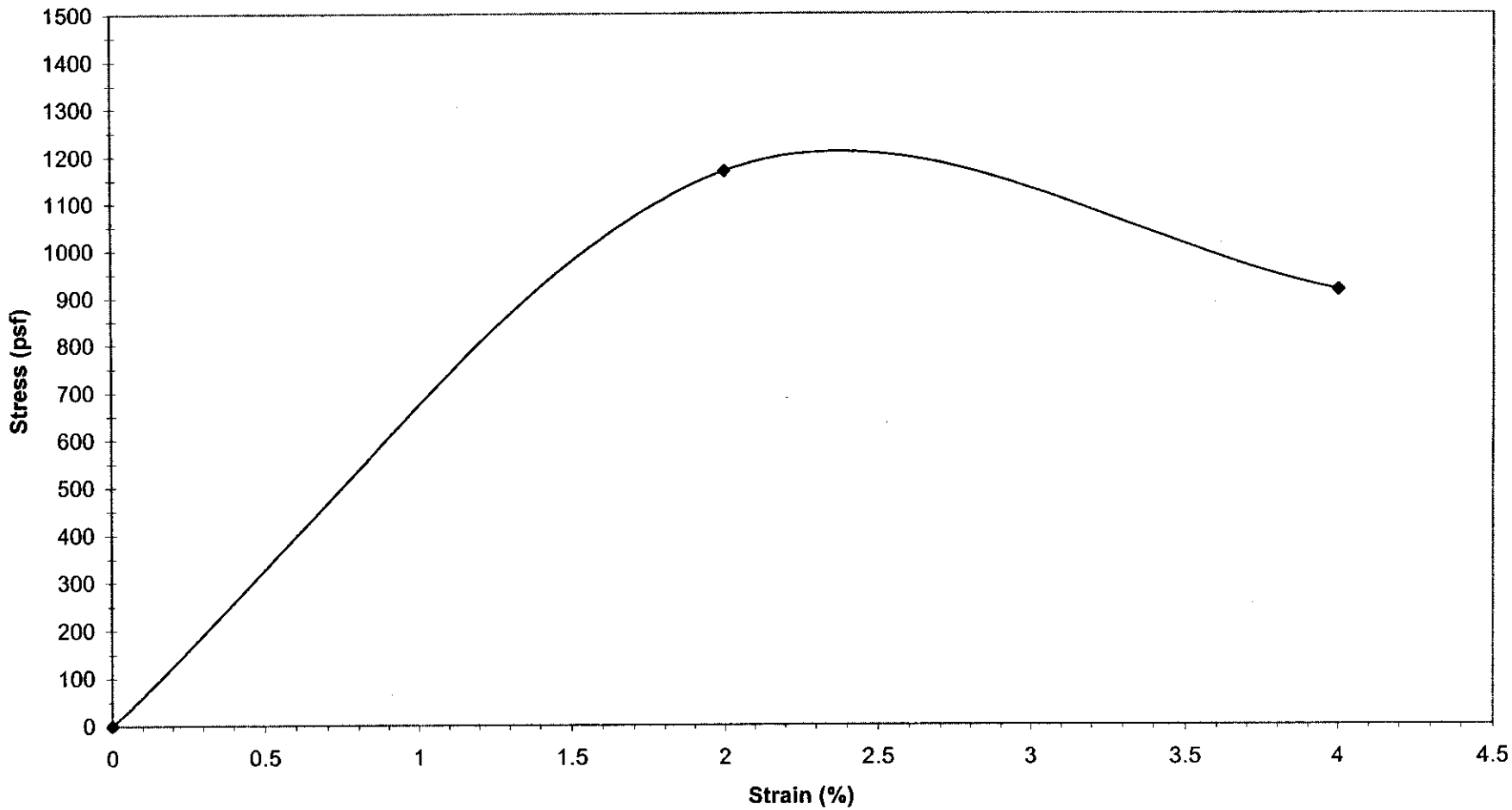
Liquid Limit: 34 Plastic Limit: 26
Plasticity Index: 8
% passing # 200 sieve: 42

Reviewed by: SPB



10.4 Unconfined Compression Strength Results

Unconfined Compressive Strength of Cohesive Soil
Boring MC-57, Sample ST-2, 5.5 to 6.6 feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



4/1

412

Terracon

Dry Unit Weight of Soil

Field Sampled by Shelby Tube

ASTM D-1587
ASTM D-2166

10930 East 56th Street
Tulsa, Oklahoma 74146
(918)250-0461

Job Name: I 49 Missouri Project J7P0601 Project No.: 39025019M Date: January 2003
Pineville, Missouri to Arkansas State Line

Boring MC-57 Sample ST-2 Depth 5.5 to 6.6 feet

Recovery 13" Qp 1.5 tsf Sample Description Sandy Lean Clay, Red Brown

Unit Weight Data

Mold Wt.	1072.4	
Mold + Soil	2104.1	
Mass	1031.7	2.275
	gms	= lbs.

Tube Sample Geometry

Do=	2.813	in.	Initial Diameter
Ao=	6.215	sq. in.	Initial Area
Ao=	0.0432	sq. ft.	
Lo=	5.594	in.	Initial Length
Vo=	34.74	cu. In.	Initial Volume
Vo=	0.0201	cu. Ft.	
Lo/Do=	2.0		

Moisture Content

Tare No#	t-6		Tare No#		
Wet Wt + Tare	120.6	g	Wet Wt + Tare		g
Dry Wt + Tare	105.9	g	Dry Wt + Tare		g
Tare Wt.	23.3	g	Tare Wt.		g
Wt of Water	14.7	g	Wt of Water		g
Wt of Dry Soil	82.6	g	Wt of Dry Soil		g
Moisture Content	17.8 %		Moisture Content	%	

3" Shelby Tube Sample Proving Ring _____

Load Dial Reading	Axial Load (lbs.)	Strain	Unit Strain (%)	Corrected Area (sq. ft.)	Stress (PSF)
0	0	0	0	0	0
	51.5	0.112	2	22.7	1169
	41.2	0.224	4	22.2	916
		0.336	6	21.8	0
		0.448	8	21.3	0
		0.559	10	20.9	0
		0.671	12	20.4	0
		0.783	14	19.9	0
		0.895	16	19.5	0
		1.007	18	19.0	0
		1.119	20	18.5	0

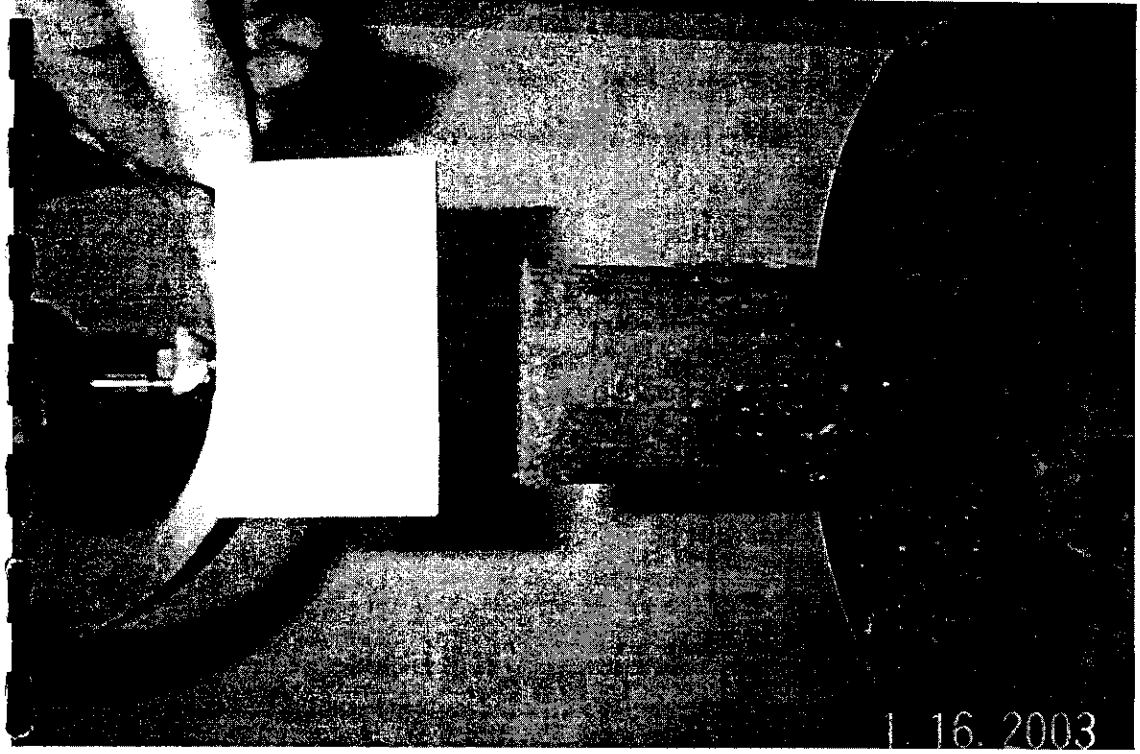
Failure Sketch

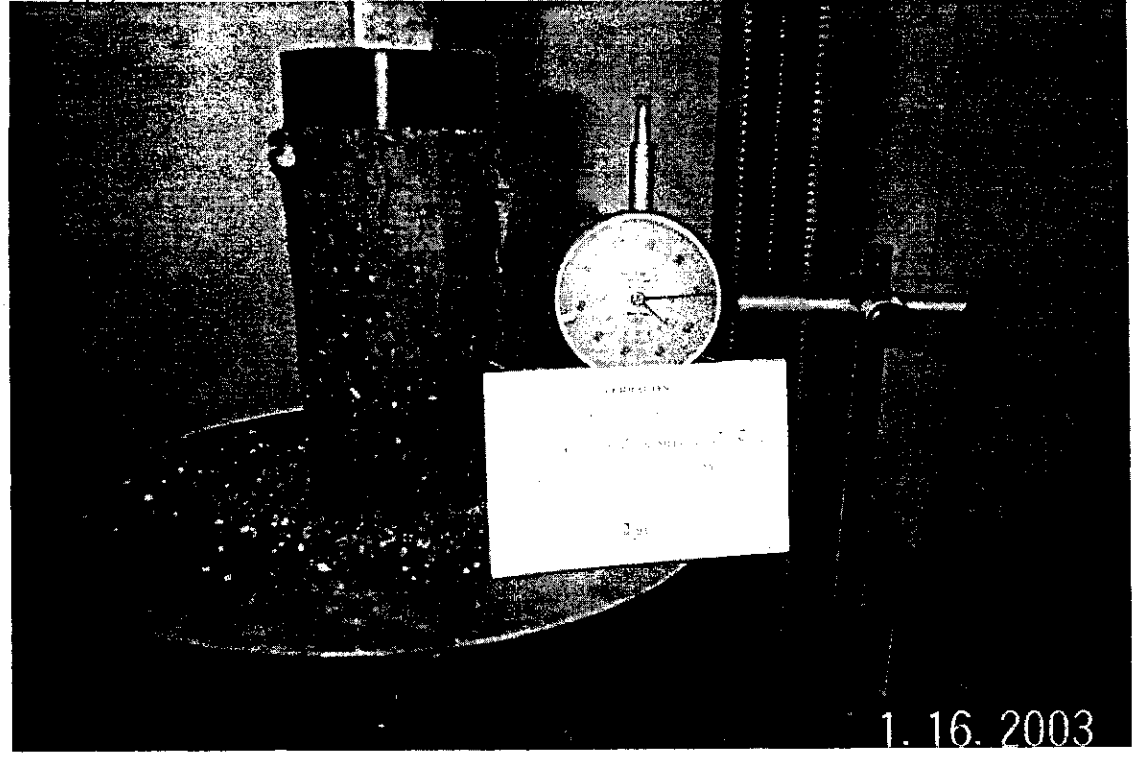
Wet Density 113.2 (pcf)

Dry Density 96.1 (pcf)

qu= 1200 psf

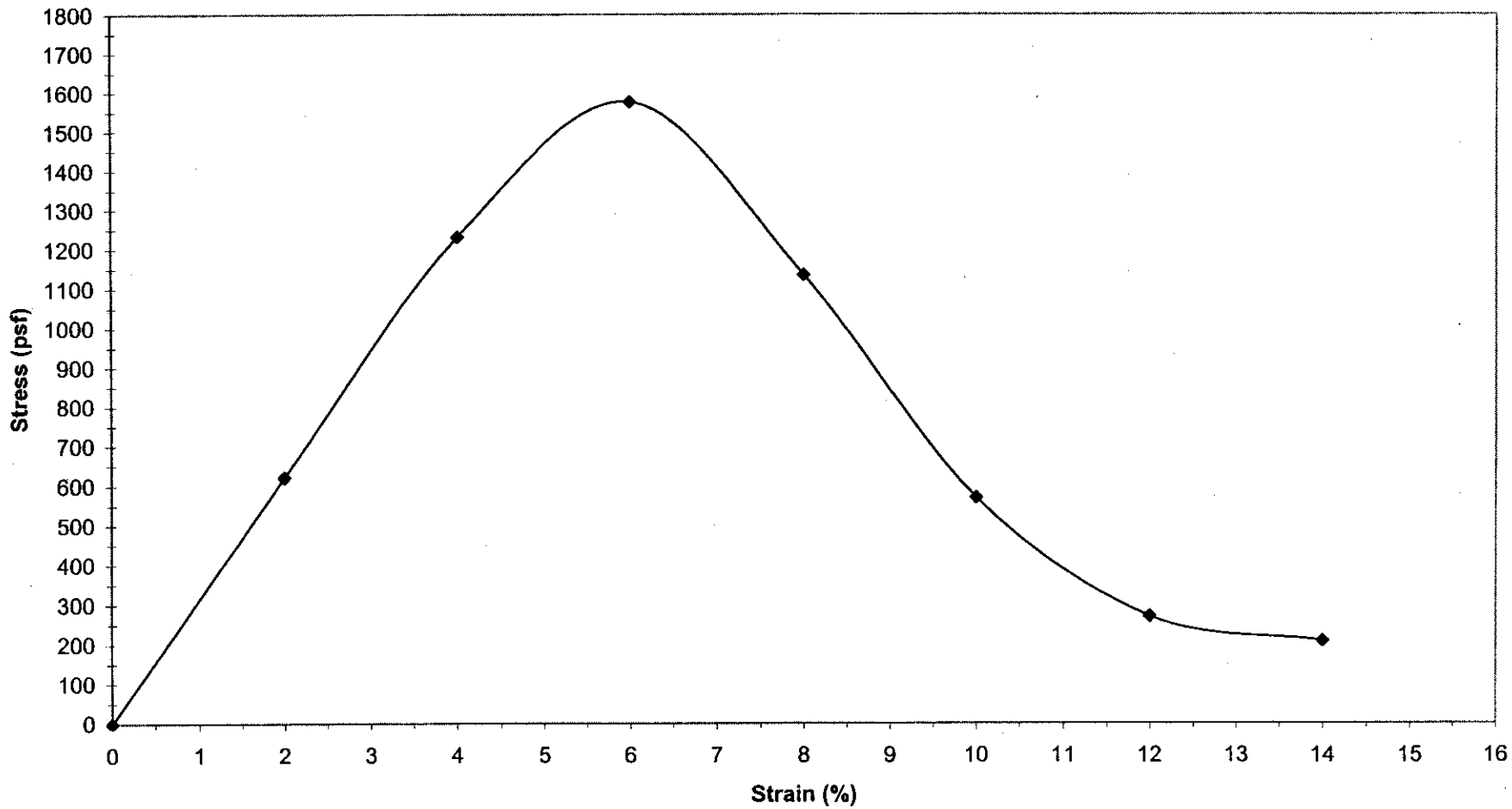
su= 600 psf


1. 16. 2003



414

Unconfined Compressive Strength of Cohesive Soil
Boring MC-125, Sample ST-2a, 6.0 to 6.8 feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



415

4/6

Terracon

Dry Unit Weight of Soil

Field Sampled by Shelby Tube

ASTM D-1587
ASTM D-2166

10930 East 56th Street
Tulsa, Oklahoma 74146
(918)250-0461

Job Name: I 49 Missouri Project J7P0601 Project No.: 39025019M Date: January 2003
Pineville, Missouri to Arkansas State Line

Boring MC-125 Sample ST-2a Depth 6 to 6.8 feet

Recovery 8" Qp 1.75 tsf Sample Description Lean Clay, trace gravel - Red Brown

Unit Weight Data

Mold Wt.	1072.5	
Mold + Soil	2145.1	
Mass	1072.6	2.365
	gms	= lbs.

Tube Sample Geometry

Do=	2.813	in.	Initial Diameter
Ao=	6.215	sq. in.	Initial Area
Ao=	0.0432	sq. ft.	
Lo=	5.594	in.	Initial Length
Vo=	34.74	cu. In.	Initial Volume
Vo=	0.0201	cu. Ft.	
Lo/Do=	2.0		

Moisture Content

Tare No#	t-72		Tare No#		
Wet Wt + Tare	133.9	g	Wet Wt + Tare		g
Dry Wt + Tare	111.2	g	Dry Wt + Tare		g
Tare Wt.	20.7	g	Tare Wt.		g
Wt of Water	22.7	g	Wt of Water		g
Wt of Dry Soil	90.5	g	Wt of Dry Soil		g
Moisture Content	25.1 %		Moisture Content	%	

3" Shelby Tube Sample Proving Ring _____

Load Dial Reading	Axial Load (lbs.)	Strain	Unit Strain (%)	Corrected Area (sq. ft.)	Stress (PSF)
0	0	0	0	0	0
	27.4	0.112	2	22.7	622
	55.4	0.224	4	22.2	1232
	72.4	0.336	6	21.8	1577
	53.3	0.448	8	21.3	1136
	27.4	0.559	10	20.9	571
	13.3	0.671	12	20.4	271
	10.5	0.783	14	19.9	209
		0.895	16	19.5	0
		1.007	18	19.0	0
		1.119	20	18.5	0

Failure Sketch

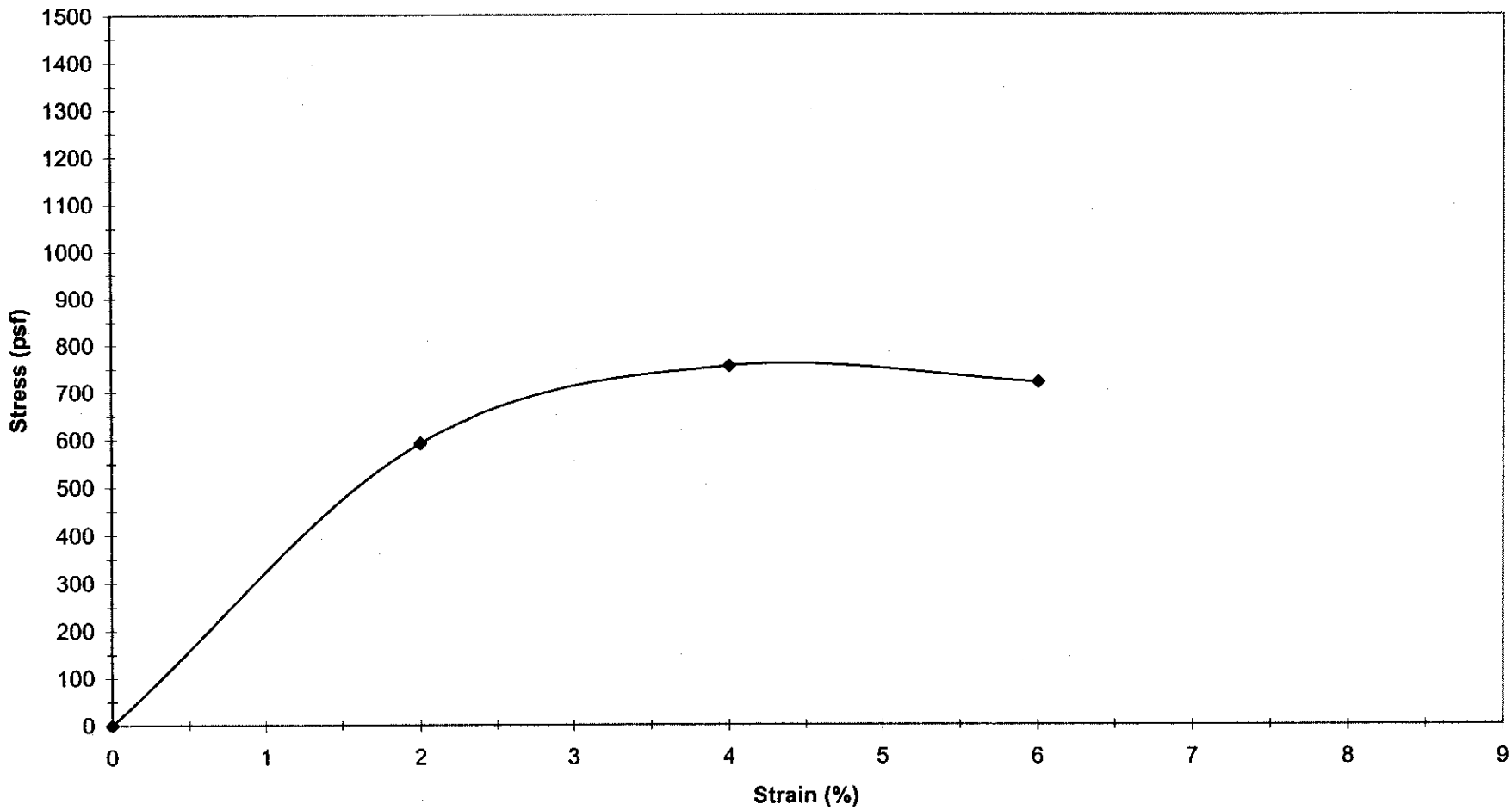
Wet Density 117.6 (pcf)

Dry Density 94.1 (pcf)

qu= 1550 psf

su= 775 psf

Unconfined Compressive Strength of Cohesive Soil
Boring MC-142, Sample ST-3, 8.0 to 9.5 feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



4/4

418

Terracon

Dry Unit Weight of Soil

Field Sampled by Shelby Tube

ASTM D-1587
ASTM D-2166

10930 East 56th Street
Tulsa, Oklahoma 74146
(918)250-0461

Job Name: I 49 Missouri Project J7P0601 Project No.: 39025019M Date: April 2003

Pineville, Missouri to Arkansas State Line

Boring MC-142 Sample ST-3 Depth 8 to 9.5 feet

Recovery 10" Qp 4.0 tsf Sample Description Lean Clay, with gravel - Red Brown

Unit Weight Data

Mold Wt.	1073.5	
Mold + Soil	2149.2	
Mass	1075.7	2.372
	gms	= lbs.

Tube Sample Geometry

Do=	2.813	in.	Initial Diameter
Ao=	6.215	sq. in.	Initial Area
Ao=	0.0432	sq. ft.	
Lo=	5.594	in.	Initial Length
Vo=	34.74	cu. In.	Initial Volume
Vo=	0.0201	cu. Ft.	
Lo/Do=	2.0		

Moisture Content

Tare No#	3I		Tare No#		
Wet Wt + Tare	487.5	g	Wet Wt + Tare		g
Dry Wt + Tare	413.7	g	Dry Wt + Tare		g
Tare Wt.	118.5	g	Tare Wt.		g
Wt of Water	73.8	g	Wt of Water		g
Wt of Dry Soil	295.2	g	Wt of Dry Soil		g
Moisture Content	25.0 %		Moisture Content	%	

3" Shelby Tube Sample Proving Ring

Load Dial Reading	Axial Load (lbs.)	Strain	Unit Strain (%)	Corrected Area (sq. ft.)	Stress (PSF)
	0	0	0	0	0
	26.1	0.112	2	22.7	593
	34	0.224	4	22.2	756
	33.1	0.336	6	21.8	721

Failure Sketch

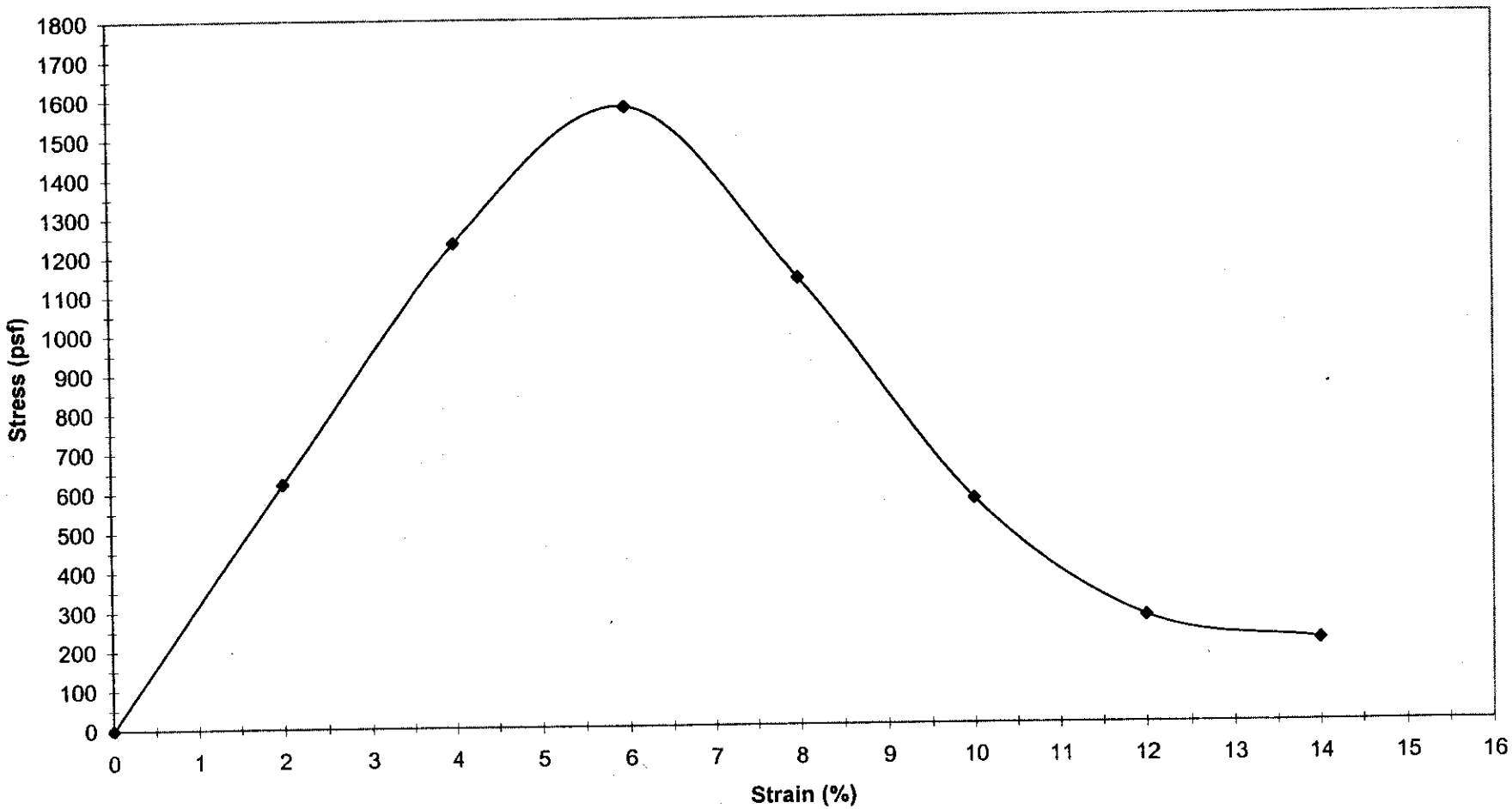
Wet Density 118.0 (pcf)

Dry Density 94.4 (pcf)

qu= 760 psf

su= 380 psf

Unconfined Compressive Strength of Cohesive Soil
Boring MC-148, Sample ST-3, 8.0 to 9.5 feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



420

Terracon

Dry Unit Weight of Soil

Field Sampled by Shelby Tube

ASTM D-1587
ASTM D-2166

10930 East 56th Street
Tulsa, Oklahoma 74146
(918)250-0461

Job Name: I 49 Missouri Project J7P0601
Pineville, Missouri to Arkansas State Line

Project No.: 39025019M Date: January 2003

Boring MC-148 Sample ST-3 Depth 8.0 to 9.5 feet

Recovery 12.5" Qp 3.25 tsf Sample Description Lean Clay, with gravel, trace sand, Red Brown

Unit Weight Data

Mold Wt. 1072.5

Mold + Soil 2180.5

Mass 1108 2.443
gms = lbs.

Tube Sample Geometry

Do=	2.813	in.	Initial Diameter
Ao=	6.215	sq. in.	Initial Area
Ao=	0.0432	sq. ft.	
Lo=	5.594	in.	Initial Length
Vo=	34.74	cu. In.	Initial Volume
Vo=	0.0201	cu. Ft.	
Lo/Do=	2.0		

Moisture Content

Tare No# t46

Wet Wt + Tare 123.5 g

Dry Wt + Tare 107.3 g

Tare Wt. 21.2 g

Wt of Water 16.2 g
Wt of Dry Soil 86.1 g

Moisture Content
18.8 %

Tare No# ____

Wet Wt + Tare ____ g

Dry Wt + Tare ____ g

Tare Wt. ____ g

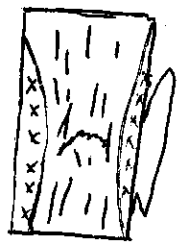
Wt of Water ____ g
Wt of Dry Soil ____ g

Moisture Content
%

3" Shelby Tube Sample Proving Ring ____

Load Dial Reading	Axial Load (lbs.)	Strain	Unit Strain (%)	Corrected Area (sq. ft.)	Stress (PSF)
0	0	0	0	0	0
	27.4	0.112	2	22.7	622
	55.4	0.224	4	22.2	1232
	72.4	0.336	6	21.8	1577
	53.3	0.448	8	21.3	1136
	27.4	0.559	10	20.9	571
	13.3	0.671	12	20.4	271
	10.5	0.783	14	19.9	209
		0.895	16	19.5	0
		1.007	18	19.0	0
		1.119	20	18.5	0

Failure Sketch



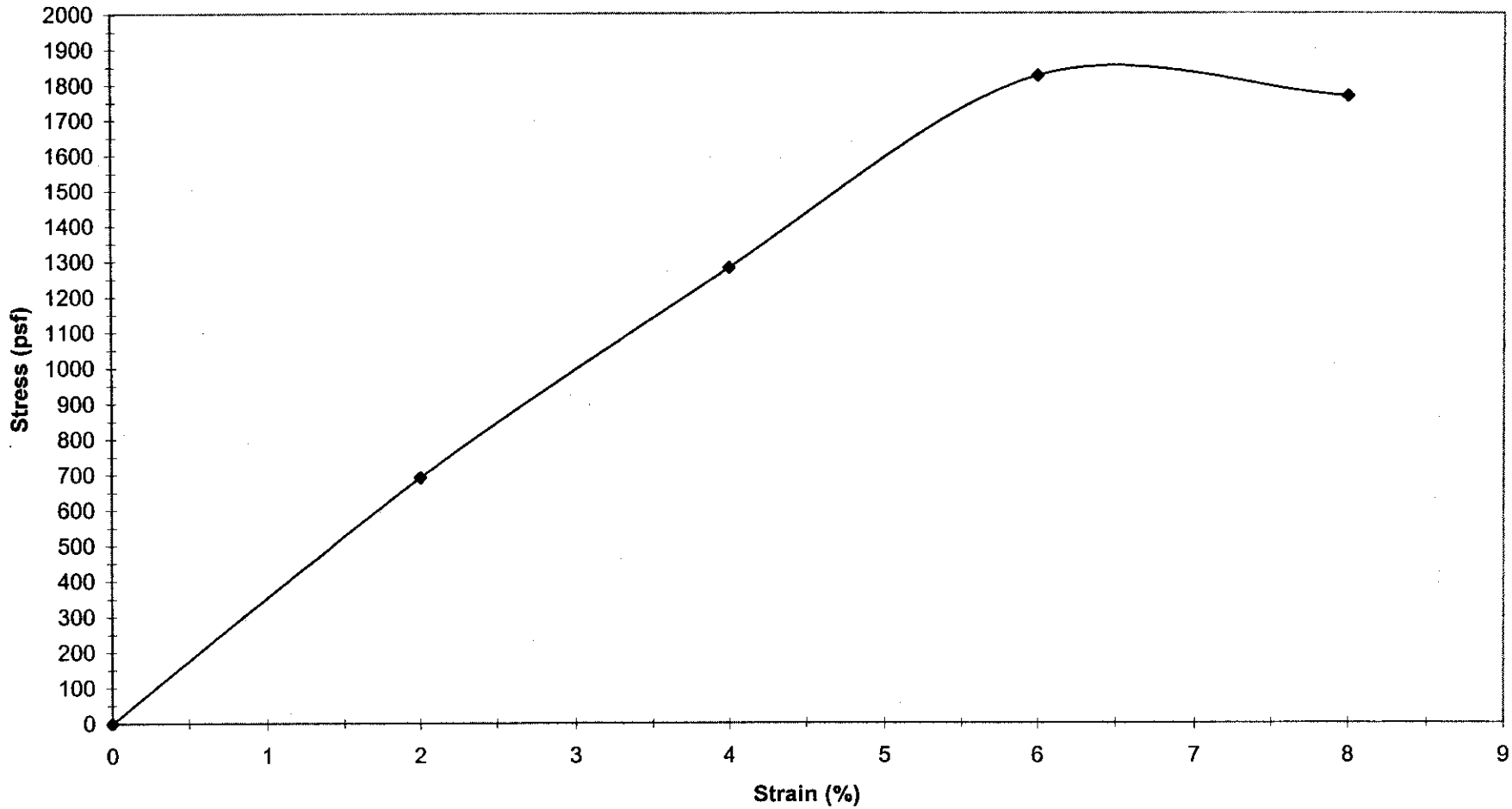
Wet Density
121.5 (pcf)

Dry Density
102.3 (pcf)

qu= 1550 psf

su= 775 psf

Unconfined Compressive Strength of Cohesive Soil
Boring MC-153, Sample ST-3, 8.5 to 9.4 feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



422

Terracon

Dry Unit Weight of Soil

Field Sampled by Shelby Tube

ASTM D-1587
ASTM D-2166

10930 East 56th Street
Tulsa, Oklahoma 74146
(918)250-0461

Job Name: I 49 Missouri Project J7P0601 Project No.: 39025019M Date: January 2003
Pineville, Missouri to Arkansas State Line

Boring MC-153 Sample ST-3 Depth 8.5 to 9.4 feet

Recovery 14" Qp 2.0 tsf Sample Description Fat Clay, with sand, trace gravel - Red Brown

Unit Weight Data

Mold Wt. 1072.5

Mold + Soil 2199.1

Mass 1126.6 2.484
gms = lbs.

Tube Sample Geometry

Do=	2.813	in.	Initial Diameter
Ao=	6.215	sq. in.	Initial Area
Ao=	0.0432	sq. ft.	
Lo=	5.594	in.	Initial Length
Vo=	34.74	cu. In.	Initial Volume
Vo=	0.0201	cu. Ft.	
Lo/Do=	2.0		

Moisture Content

Tare No# t14

Wet Wt + Tare 130.8 g

Dry Wt + Tare 111.5 g

Tare Wt. 23.5 g

Wt of Water 19.3 g
Wt of Dry Soil 88 g

Moisture Content
21.9 %

Tare No# ____

Wet Wt + Tare ____ g

Dry Wt + Tare ____ g

Tare Wt. ____ g

Wt of Water ____ g
Wt of Dry Soil ____ g

Moisture Content
%

3" Shelby Tube Sample Proving Ring ____

Load Dial Reading	Axial Load (lbs.)	Strain	Unit Strain (%)	Corrected Area (sq. ft.)	Stress (PSF)
0	0	0	0	0	0
	30.5	0.112	2	22.7	693
	57.6	0.224	4	22.2	1281
	83.8	0.336	6	21.8	1825
	82.9	0.448	8	21.3	1767
		0.559	10	20.9	0
		0.671	12	20.4	0
		0.783	14	19.9	0
		0.895	16	19.5	0
		1.007	18	19.0	0
		1.119	20	18.5	0

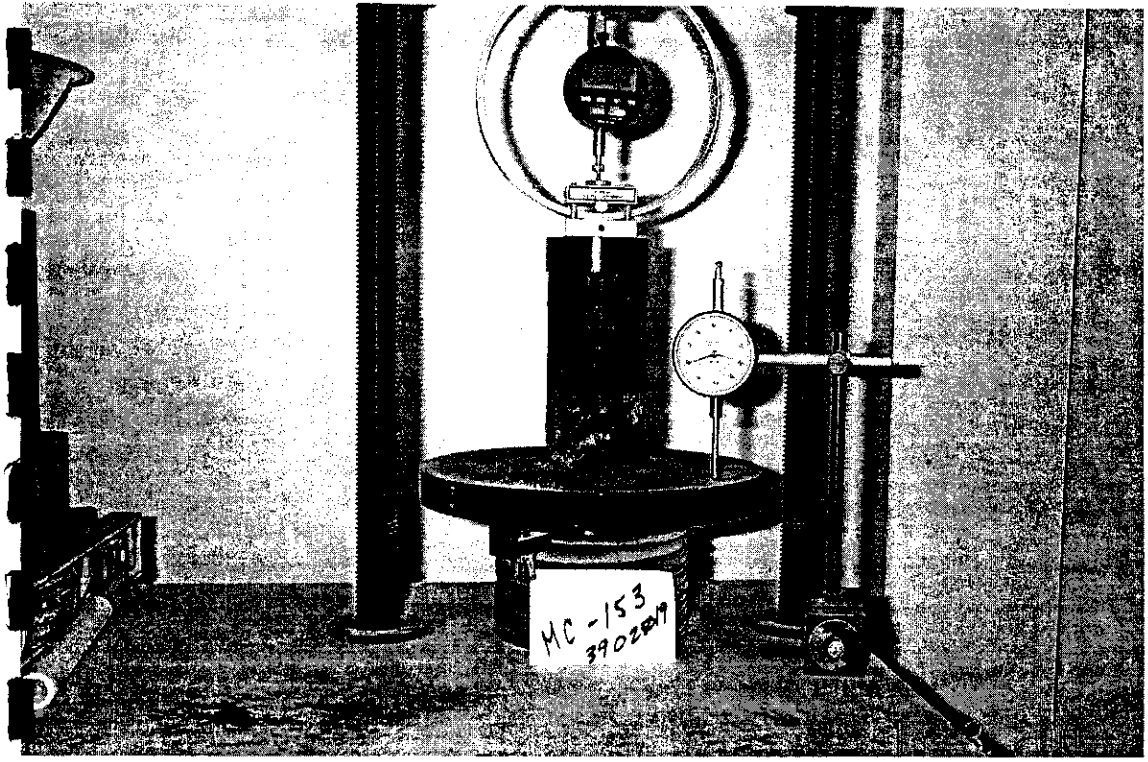
Failure Sketch

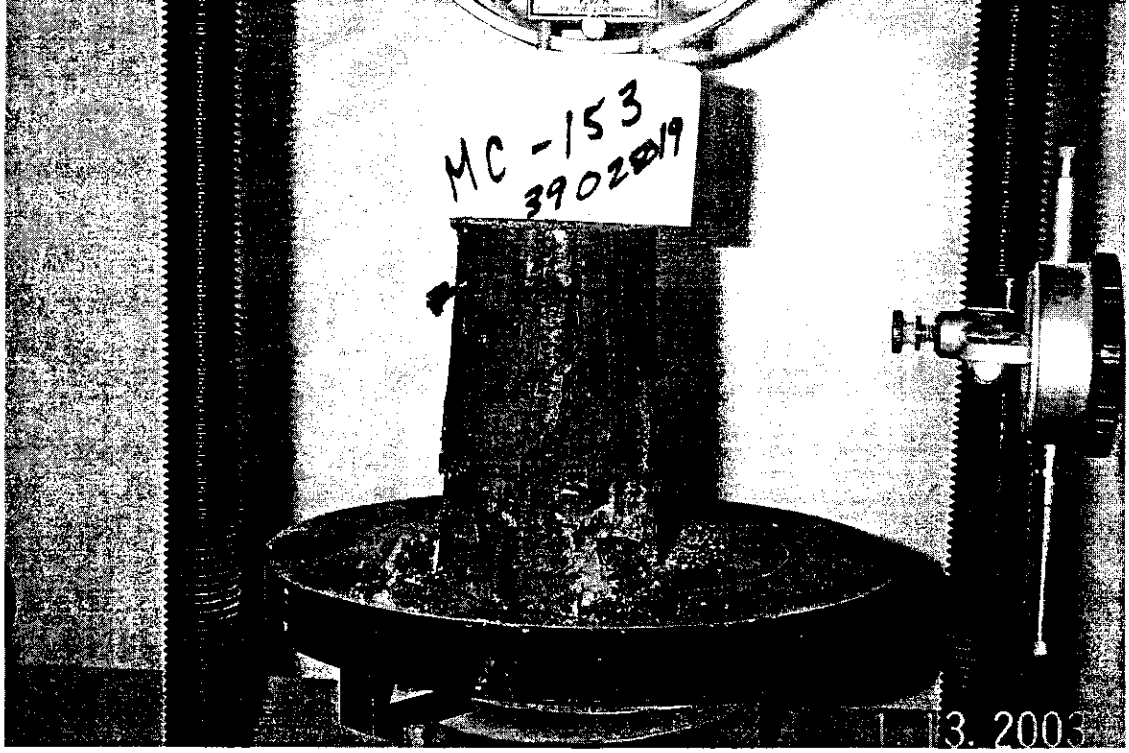
Wet Density
123.6 (pcf)

Dry Density
101.3 (pcf)

qu= 1850 psf

su= 925 psf

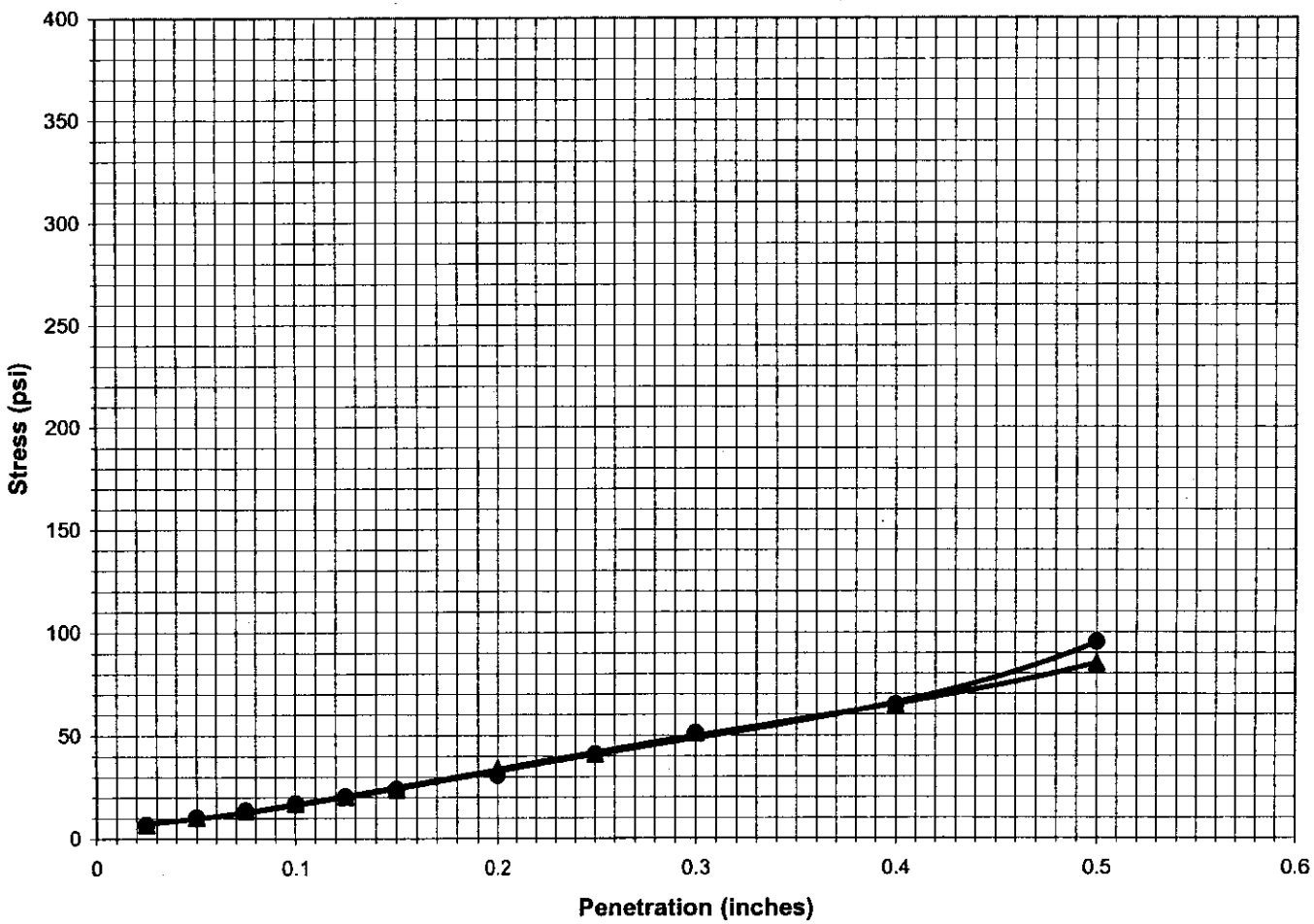

MC-153
390209



424

10.5 California Bearing Ratio Results

California Bearing Ratio
MC-3: Bulk Sample from 5 to 16.3 Feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



○ Top As Soaked
△ Bottom As soaked
● Corrected Top, As Soaked
▲ Corrected Bottom, As Soaked

Corrected CBR Top
As Soaked = 1.7

Corrected CBR Bottom
As Soaked = 1.7

427

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

CALIFORNIA BEARING RATIO TEST INFORMATION

Input:	Diameter of Penetration Piston (in.):	2	**39025019M**
Calcs:	Area of Penetration Piston (in.^{2}):	3.14	MC-3: 5 to 16.3 Feet

MOISTURE CONTENT DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Wet Soil & Tare (g):	2046.5	774.9	2582.6
	Wt. Dry Soil & Tare (g):	1886.6	684.8	2223.5
	Wt. Tare (g):	373	250.1	371.7
Results:	Wt. of Water (g):	159.90	90.10	359.10
	Wt. of Dry Soil (g):	1513.60	434.70	1851.80
	Moisture Content (%):	10.56421776	20.726938	19.39194297

DENSITY DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Moist Soil & Mold (g):	8532.7	8567.1	8567.1
	Wt. Empty Mold (g):	4319.5	4319.5	4319.5
Results:	Wt. Moist Soil (g):	4213.2	4247.6	4247.6
	Wet Density (lb./ft.^{3}):	123.9	124.9	124.9
	Dry Density (lb./ft.^{3}):	112.0327015	103.43958	104.5962038

Top As Soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value		
0.025	2		6.8		0.025	
0.050	3		10.2		0.050	
0.075	4		13.6		0.075	
0.100	5		17.0	1.70	0.100	1.7
0.125	6		20.4		0.125	
0.150	7		23.8		0.150	
0.200	9		30.6	2.04	0.200	
0.250	12		40.9		0.250	
0.300	15		51.1		0.300	
0.400	19		64.7		0.400	
0.500	28		95.3		0.500	

Bottom As soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value		
0.025	2		6.8		0.025	
0.050	3		10.2		0.050	
0.075	4		13.6		0.075	
0.100	5		17.0	1.70	0.100	1.7
0.125	6		20.4		0.125	
0.150	7		23.8		0.150	
0.200	10		34.0	2.27	0.200	
0.250	12		40.9		0.250	
0.300	15		51.1		0.300	
0.400	19		64.7		0.400	
0.500	25		85.1		0.500	

Density Correction

Final Moisture Content	19.39194
Final Moist Wt of Soil	4247.6
Dry Weight of Soil	3557.694

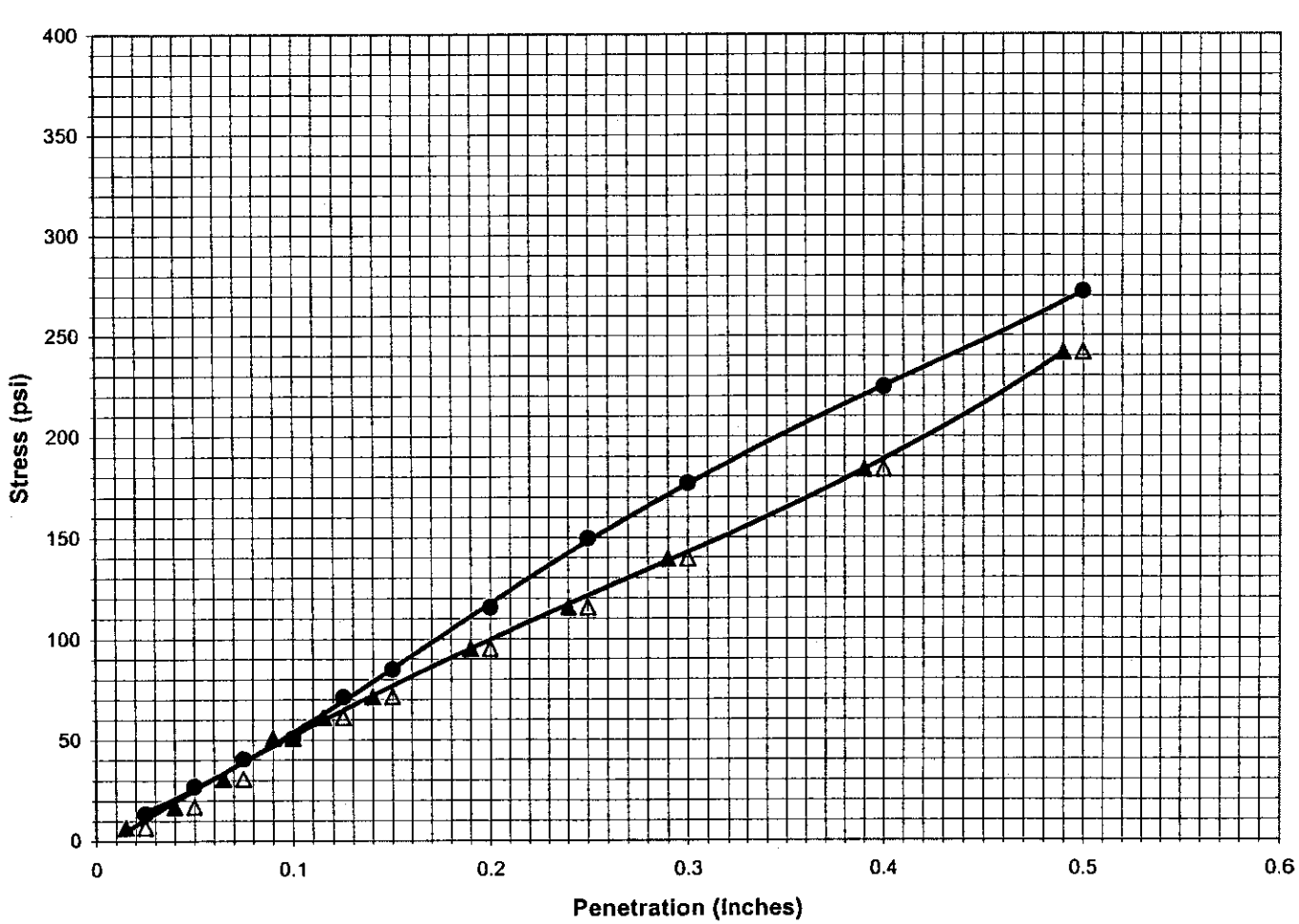
Initial Moisture Content

Initial Moisture Wt of Soil	4213.2
Weight of Water initial	655.5
Initial Moisture Content	18.4

Initial Density of Soil

Initial Wet Density	123.9
Initial Dry Density	104.6

California Bearing Ratio
MC-125: Bulk Sample from 1 to 25 Feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



○ Top As Soaked
△ Bottom As soaked
● Corrected Top, As Soaked
▲ Corrected Bottom, As Soaked

Corrected CBR Top
As Soaked = 5.1

Corrected CBR Bottom
As Soaked = 5.1

429

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

CALIFORNIA BEARING RATIO TEST INFORMATION

Input:	Diameter of Penetration Piston (in.):	2	**39025019M**
Calcs:	Area of Penetration Piston (in.^{2}):	3.14	MC-125: 1 to 25 feet

MOISTURE CONTENT DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Wet Soil & Tare (g):	1832.6	1085.8	2251.1
	Wt. Dry Soil & Tare (g):	1597.4	959.2	1951
	Wt. Tare (g):	237.6	241	249.7
Results:	Wt. of Water (g):	235.20	126.60	300.10
	Wt. of Dry Soil (g):	1359.80	718.20	1701.30
	Moisture Content (%):	17.29666127	17.627402	17.63945218

DENSITY DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Moist Soil & Mold (g):	8072.4	8027.5	8027.5
	Wt. Empty Mold (g):	4129.6	4129.6	4129.6
Results:	Wt. Moist Soil (g):	3942.8	3897.9	3897.9
	Wet Density (lb./ft.^{3}):	115.9	114.6	114.6
	Dry Density (lb./ft.^{3}):	98.82491005	97.424799	97.4148195

Top As Soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value	
0.025	4		13.6		0.025
0.050	8		27.2		0.050
0.075	12		40.9		0.075
0.100	15		51.1	5.11	0.100
0.125	21		71.5		0.125
0.150	25		85.1		0.150
0.200	34		115.8	7.72	0.200
0.250	44		149.8		0.250
0.300	52		177.0		0.300
0.400	66		224.7		0.400
0.500	80		272.4		0.500

Bottom As soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value	
0.025	2		6.8		0.015
0.050	5		17.0		0.040
0.075	9		30.6		0.065
0.100	15		51.1	5.11	0.090
0.125	18		61.3		0.115
0.150	21		71.5		0.140
0.200	28		95.3	6.36	0.190
0.250	34		115.8		0.240
0.300	41		139.6		0.290
0.400	54		183.9		0.390
0.500	71		241.7		0.490

Density Correction

Final Moisture Content	17.63945
Final Moist Wt of Soil	3897.9
Dry Weight of Soil	3313.429

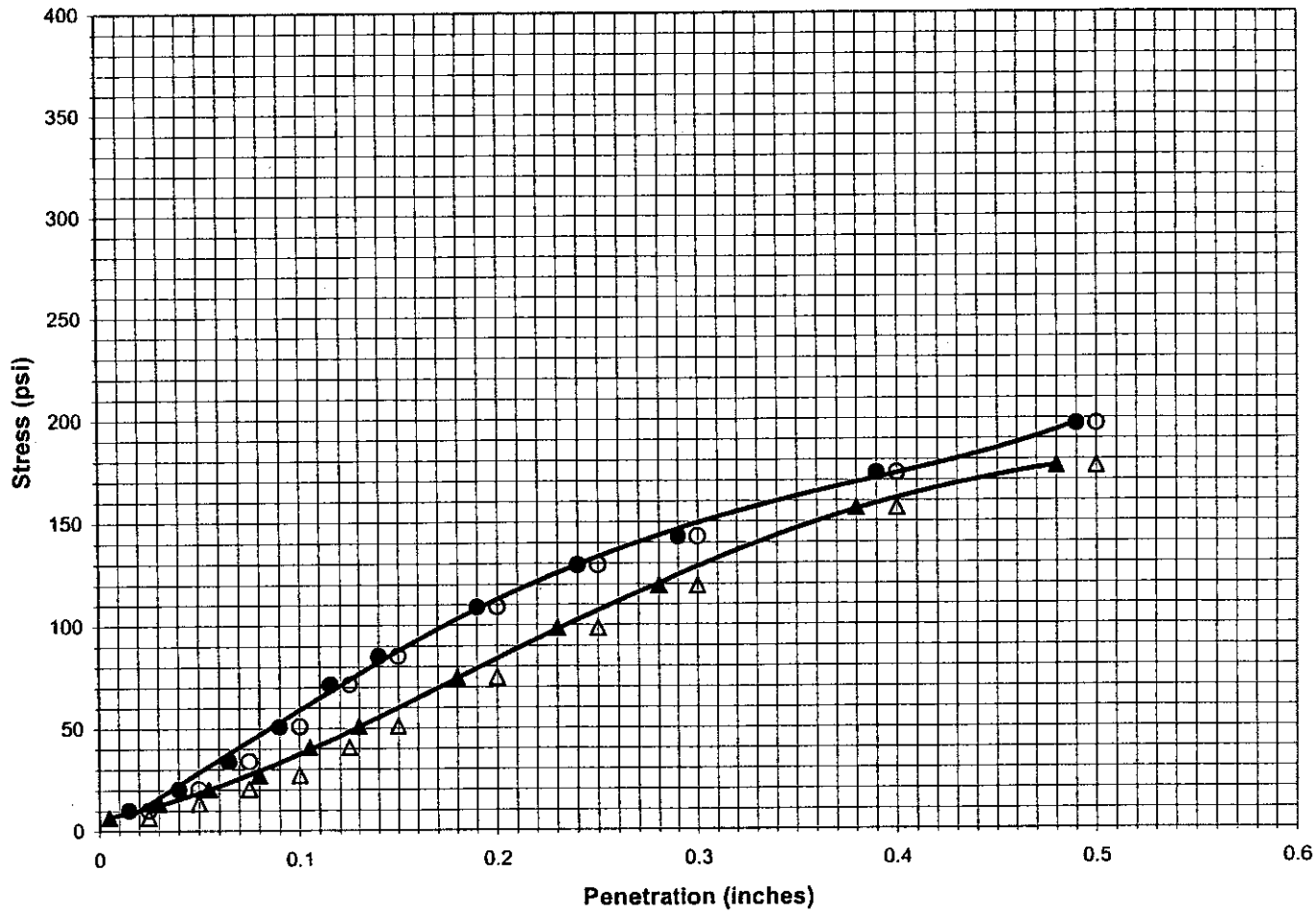
Initial Moisture Content

Initial Moisture Wt of Soil	3942.8
Weight of Water initial	629.4
Initial Moisture Content	19.0

Initial Density of Soil

Initial Wet Density	115.9
Initial Dry Density	97.4

California Bearing Ratio
MC-153: Bulk Sample from 4 to 30 Feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



○ Top As Soaked
△ Bottom As soaked
● Corrected Top, As Soaked
▲ Corrected Bottom, As Soaked

Corrected CBR Top
As Soaked = 6.0

Corrected CBR Bottom
As Soaked = 3.8

431

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

CALIFORNIA BEARING RATIO TEST INFORMATION

Input:	Diameter of Penetration Piston (in.):	2	**39025019M**
Calcs:	Area of Penetration Piston (in.^{2}):	3.14	MC-153: 4 to 30 feet

MOISTURE CONTENT DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Wet Soil & Tare (g):	2728.6	1043.2	2369.8
	Wt. Dry Soil & Tare (g):	2431.9	929.6	2085.2
	Wt. Tare (g):	249.4	237.3	245.9
Results:	Wt. of Water (g):	296.70	113.60	284.60
	Wt. of Dry Soil (g):	2182.50	692.30	1839.30
	Moisture Content (%):	13.59450172	16.409071	15.47327788

DENSITY DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Moist Soil & Mold (g):	8179.2	8178.3	8178.3
	Wt. Empty Mold (g):	4287.9	4287.9	4287.9
Results:	Wt. Moist Soil (g):	3891.3	3890.4	3890.4
	Wet Density (lb./ft.^{3}):	114.4	114.4	114.4
	Dry Density (lb./ft.^{3}):	100.7128147	98.255023	99.05128018

Top As Soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value	
0.025	3		10.2		0.015
0.050	6		20.4		0.040
0.075	10		34.0		0.065
0.100	15		51.1	5.11	0.090
0.125	21		71.5		0.115
0.150	25		85.1		0.140
0.200	32		109.0	7.26	0.190
0.250	38		129.4		0.240
0.300	42		143.0		0.290
0.400	51		173.6		0.390
0.500	58		197.5		0.490

Bottom As soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value	
0.025	2		6.8		0.005
0.050	4		13.6		0.030
0.075	6		20.4		0.055
0.100	8		27.2	2.72	0.080
0.125	12		40.9		0.105
0.150	15		51.1		0.130
0.200	22		74.9	4.99	0.180
0.250	29		98.7		0.230
0.300	35		119.2		0.280
0.400	46		156.6		0.380
0.500	52		177.0		0.480

Density Correction

Final Moisture Content	15.47328
Final Moist Wt of Soil	3890.4
Dry Weight of Soil	3369.091

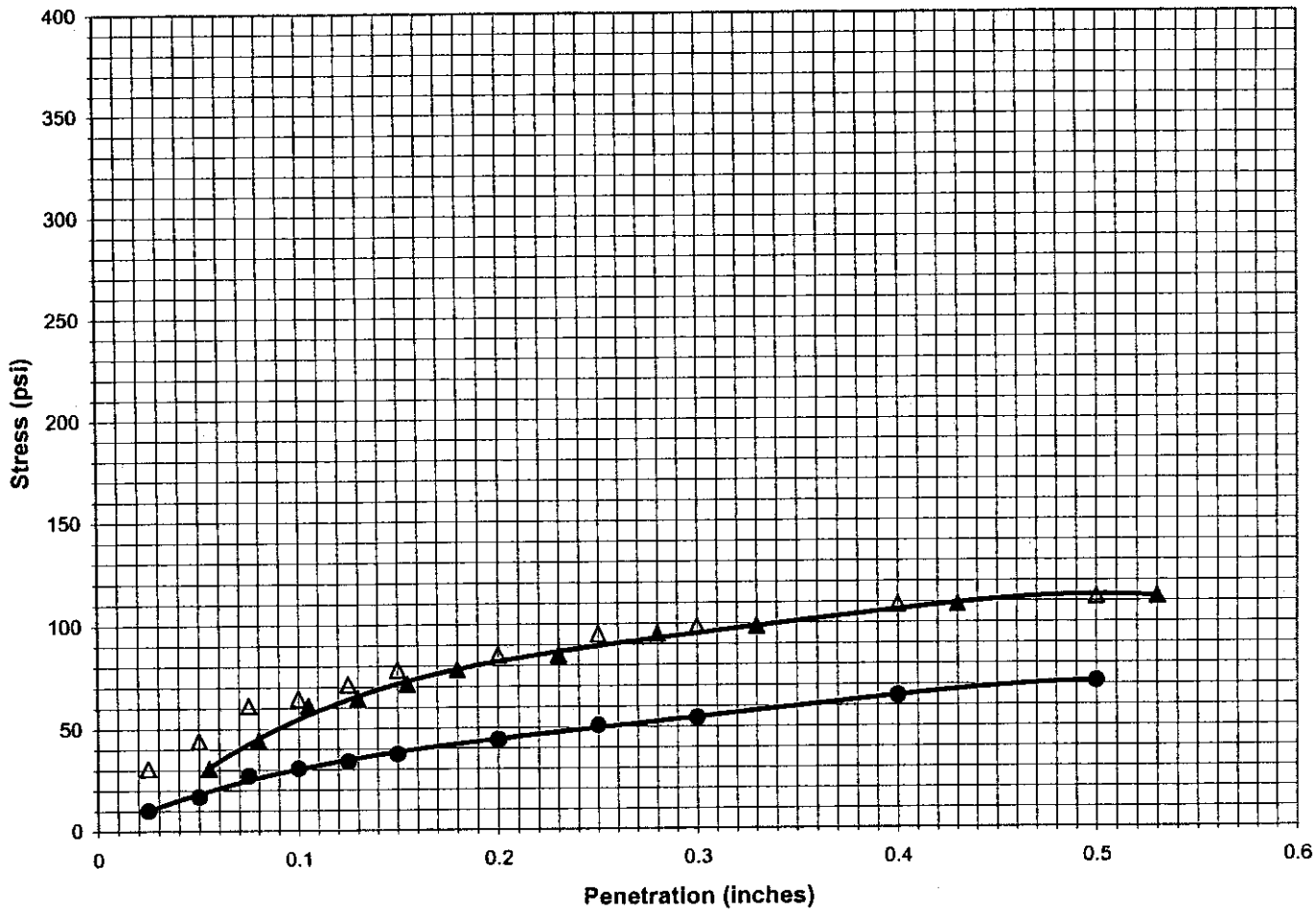
Initial Moisture Content

Initial Moisture Wt of Soil	3891.3
Weight of Water initial	522.2
Initial Moisture Content	15.5

Initial Density of Soil

Initial Wet Density	114.4
Initial Dry Density	99.1

California Bearing Ratio
MC-164: Bulk Sample from 1 to 32 Feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



○ Top As Soaked
△ Bottom As soaked
● Corrected Top, As Soaked
▲ Corrected Bottom, As Soaked

Corrected CBR Top
As Soaked = 3.1

Corrected CBR Bottom
As Soaked = 5.5

433

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

CALIFORNIA BEARING RATIO TEST INFORMATION

Input:	Diameter of Penetration Piston (in.):	2	**39025019M**
Calcs:	Area of Penetration Piston (in.^{2}):	3.14	MC-164: 1 to 32 feet

MOISTURE CONTENT DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Wet Soil & Tare (g):	710.1	1035.4	2416.7
	Wt. Dry Soil & Tare (g):	646.4	864.9	1996.6
	Wt. Tare (g):	240.8	244.9	247.2
Results:	Wt. of Water (g):	63.70	170.50	420.10
	Wt. of Dry Soil (g):	405.60	620.00	1749.40
	Moisture Content (%):	15.70512821	27.5	24.01394764

DENSITY DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Moist Soil & Mold (g):	8021.4	8216.8	8216.8
	Wt. Empty Mold (g):	4116.8	4116.8	4116.8
Results:	Wt. Moist Soil (g):	3904.6	4100.0	4100.0
	Wet Density (lb./ft.^{3}):	114.8	120.5	120.5
	Dry Density (lb./ft.^{3}):	99.21361463	94.541176	97.19874441

Top As Soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value		
0.025	3		10.2		0.025	
0.050	5		17.0		0.050	
0.075	8		27.2		0.075	
0.100	9		30.6	3.06	0.100	3.1
0.125	10		34.0		0.125	
0.150	11		37.5		0.150	
0.200	13		44.3	2.95	0.200	
0.250	15		51.1		0.250	
0.300	16		54.5		0.300	
0.400	19		64.7		0.400	
0.500	21		71.5		0.500	

Bottom As soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value		
0.025	9		30.6		0.055	
0.050	13		44.3		0.080	
0.075	18		61.3		0.105	
0.100	19		64.7	6.47	0.130	5.5
0.125	21		71.5		0.155	
0.150	23		78.3		0.180	
0.200	25		85.1	5.67	0.230	
0.250	28		95.3		0.280	
0.300	29		98.7		0.330	
0.400	32		109.0		0.430	
0.500	33		112.4		0.530	

Density Correction

Final Moisture Content	24.01395
Final Moist Wt of Soil	4100.0
Dry Weight of Soil	3306.08

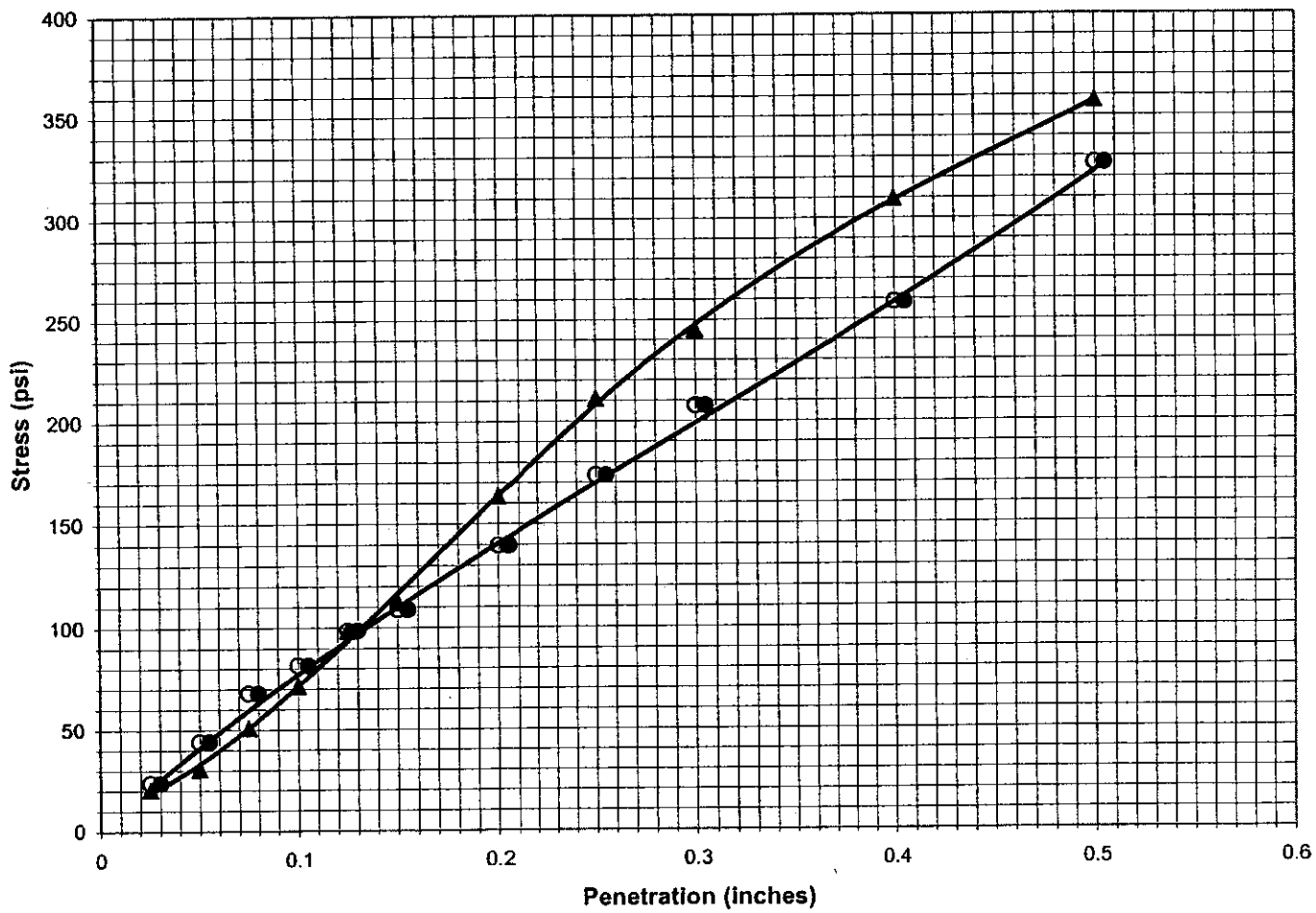
Initial Moisture Content

Initial Moisture Wt of Soil	3904.6
Weight of Water initial	598.5
Initial Moisture Content	18.1

Initial Density of Soil

Initial Wet Density	114.8
Initial Dry Density	97.2

California Bearing Ratio
MC-227: Bulk Sample from 0 to 20 Feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



○ Top As Soaked
△ Bottom As soaked
● Corrected Top, As Soaked
▲ Corrected Bottom, As Soaked

Corrected CBR Top
As Soaked = 7.8

Corrected CBR Bottom
As Soaked = 7.2

435

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

CALIFORNIA BEARING RATIO TEST INFORMATION

Input:	Diameter of Penetration Piston (in.):	2	**39025019M**
Calcs:	Area of Penetration Piston (in.^{2}):	3.14	MC-227: 0 to 20 feet

MOISTURE CONTENT DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Wet Soil & Tare (g):	1091.2	777.8	2843.4
	Wt. Dry Soil & Tare (g):	966	692.7	2437.2
	Wt. Tare (g):	247.6	236.8	248.4
Results:	Wt. of Water (g):	125.20	85.10	406.20
	Wt. of Dry Soil (g):	718.40	455.90	2188.80
	Moisture Content (%):	17.42761693	18.666374	18.55811404

DENSITY DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Moist Soil & Mold (g):	8338.1	8379.6	8379.6
	Wt. Empty Mold (g):	4127.1	4127.1	4127.1
Results:	Wt. Moist Soil (g):	4211.0	4252.5	4252.5
	Wet Density (lb./ft.^{3}):	123.8	125.0	125.0
	Dry Density (lb./ft.^{3}):	105.4295431	105.35714	105.4533475

Top As Soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value		
0.025	7		23.8		0.030	
0.050	13		44.3		0.055	
0.075	20		68.1		0.080	
0.100	24		81.7	8.17	0.105	7.8
0.125	29		98.7		0.130	
0.150	32		109.0		0.155	
0.200	41		139.6	9.31	0.205	
0.250	51		173.6		0.255	
0.300	61		207.7		0.305	
0.400	76		258.8		0.405	
0.500	96		326.9		0.505	

Bottom As soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value		
0.025	6		20.4		0.025	
0.050	9		30.6		0.050	
0.075	15		51.1		0.075	
0.100	21		71.5	7.15	0.100	7.2
0.125	29		98.7		0.125	
0.150	33		112.4		0.150	
0.200	48		163.4	10.90	0.200	
0.250	62		211.1		0.250	
0.300	72		245.1		0.300	
0.400	91		309.8		0.400	
0.500	105		357.5		0.500	

Density Correction

Final Moisture Content	18.55811
Final Moist Wt of Soil	4252.5
Dry Weight of Soil	3586.849

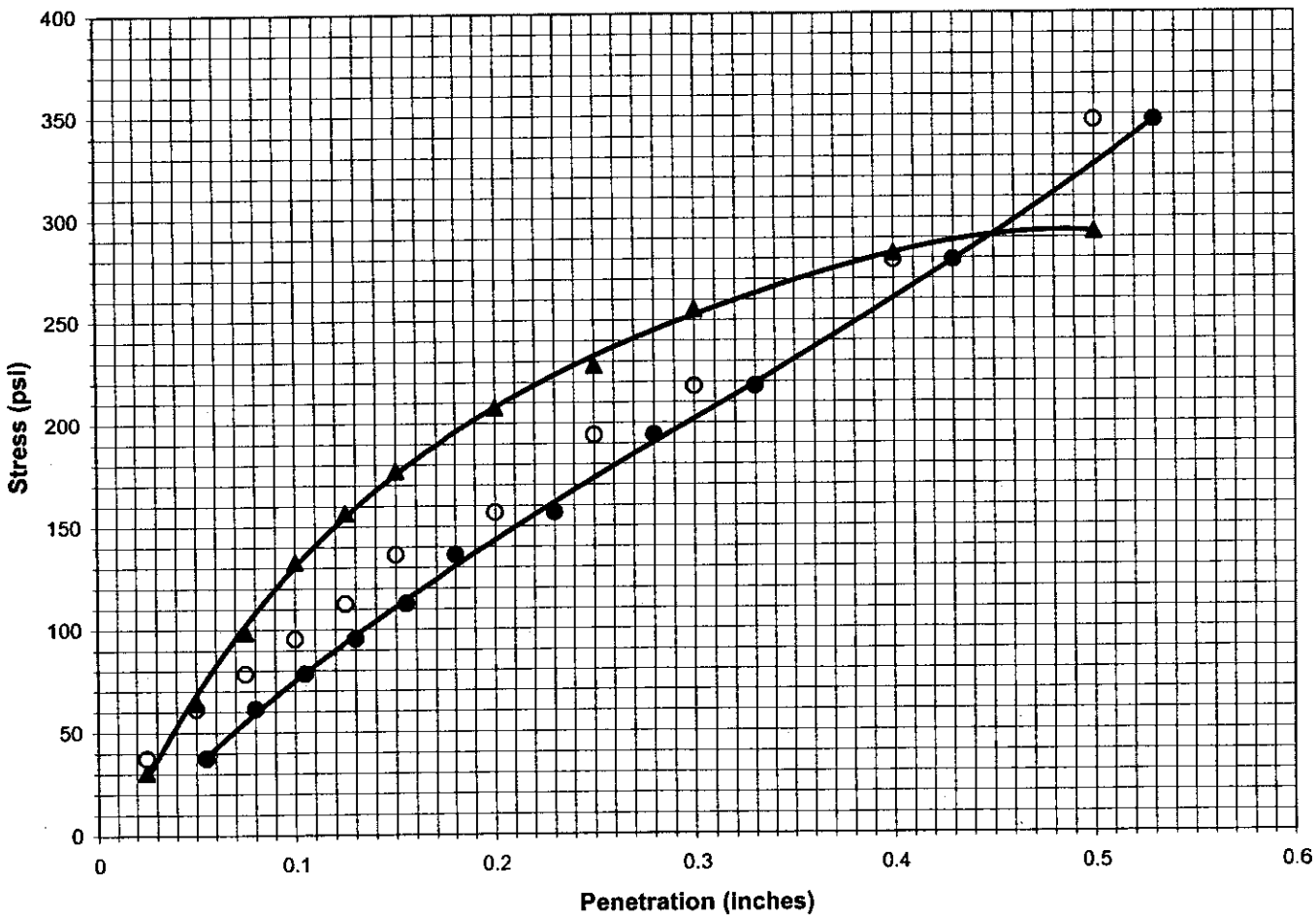
Initial Moisture Content

Initial Moisture Wt of Soil	4211.0
Weight of Water initial	624.2
Initial Moisture Content	17.4

Initial Density of Soil

Initial Wet Density	123.8
Initial Dry Density	105.5

California Bearing Ratio
MC-284: Bulk Sample from 20 to 51 Feet
I 49 Missouri - Project J7P0601
McDonald County, Missouri



○ Top As Soaked
△ Bottom As soaked
● Corrected Top, As Soaked
▲ Corrected Bottom, As Soaked

Corrected CBR Top
As Soaked = 7.5

Corrected CBR Bottom
As Soaked = 13.3

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

CALIFORNIA BEARING RATIO TEST INFORMATION

Input:	Diameter of Penetration Piston (in.):	2	**39025019M**
Calcs:	Area of Penetration Piston (in.^{2}):	3.14	MC-284: 20 to 51 feet

MOISTURE CONTENT DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Wet Soil & Tare (g):	1115.4	995.8	3564.7
	Wt. Dry Soil & Tare (g):	1002.7	861.8	3039.6
	Wt. Tare (g):	244	240.8	245.8
Results:	Wt. of Water (g):	112.70	134.00	525.10
	Wt. of Dry Soil (g):	758.70	621.00	2793.80
	Moisture Content (%):	14.85435614	21.5781	18.79518935

DENSITY DETERMINATION

		Before Soaking	After Soaking	
			Top 1"	Average
Input:	Wt. Moist Soil & Mold (g):	8088.5	8244	8244
	Wt. Empty Mold (g):	4117.5	4117.5	4117.5
Results:	Wt. Moist Soil (g):	3971.0	4126.5	4126.5
	Wet Density (lb./ft.^{3}):	116.7	121.3	121.3
	Dry Density (lb./ft.^{3}):	101.6482125	99.786968	102.1245899

Top As Soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value		
0.025	11		37.5		0.055	
0.050	18		61.3		0.080	
0.075	23		78.3		0.105	
0.100	28		95.3	9.53	0.130	**7.5**
0.125	33		112.4		0.155	
0.150	40		136.2		0.180	
0.200	46		156.6	10.44	0.230	
0.250	57		194.1		0.280	
0.300	64		217.9		0.330	
0.400	82		279.2		0.430	
0.500	102		347.3		0.530	

Bottom As soaked

Penetration (in.)	Load Dial (div.)	Load (lbs.)	Stress (lb./in.^{2})	Uncorrected CBR Value		
0.025	9		30.6		0.025	
0.050	19		64.7		0.050	
0.075	29		98.7		0.075	
0.100	39		132.8	13.28	0.100	**13.3**
0.125	46		156.6		0.125	
0.150	52		177.0		0.150	
0.200	61		207.7	13.85	0.200	
0.250	67		228.1		0.250	
0.300	75		255.4		0.300	
0.400	83		282.6		0.400	
0.500	86		292.8		0.500	

Density Correction

Final Moisture Content	18.79519
Final Moist Wt of Soil	4126.5
Dry Weight of Soil	3473.626

Initial Moisture Content

Initial Moisture Wt of Soil	3971.0
Weight of Water initial	497.4
Initial Moisture Content	14.3

Initial Density of Soil

Initial Wet Density	116.7
Initial Dry Density	102.1

11.0 MoDOT TRAFFIC INFORMATION

439

MEMORANDUM

Missouri Department of Transportation
Transportation Planning
2217 St. Marys Blvd.

Post-it® Fax Note 7671	Date 2/1/2002	# of pages ▶ 3
To JOHN MARTEL	From SEAN MATLOCK	
Co./Dept. HNTB	Co. MoDOT	
Phone # (816) 527-2231	Phone # (417) 629-3378	
Fax # (816) 472-4086	Fax # (417) 629-3314	

TO: Sean L. Matlock-7de

CC: Diane Heckemeyer-de
Ken Fryer-po
Shyam Gupta-br

FROM: Barb Dudenhoeffer BD
Transportation Planner

DATE: January 31, 2002

SUBJECT: Design Traffic
Route 71, McDonald County
Rte. H to Arkansas State Line
Job No. J7P0601

We are providing updated estimates of average daily traffic and 18-kip ESAL units for the above project as requested.

US 71	ADT	Daily ESAL Units (Two Way) Flexible	Rigid
Construction Year (2007)	17,200	3,630	6,060
Design Year (2027)	28,700	6,060	10,120
Peak Hour – 8%			
Directional Distribution – 60%			
ADT Trucks – 22%			
Accumulated 20-year ESAL units (thousands)		34,820	58,110
Accumulated 35-year ESAL units (thousands)		75,040	125,240

Route 90	ADT	Daily ESAL Units (Two Way) Flexible	Rigid
Construction Year (2007)	1,220	80	120
Design Year (2027)	2,040	130	200
ADT Trucks – 11%			
Accumulated 20-year ESAL units (thousands)		760	1,130
Accumulated 35-year ESAL units (thousands)		1,630	2,430

Attached are estimated construction and design year turning movements for the intersection of US 71 and Route 90. The traffic estimates are based on manual and machine counts.

cw

Attachment

J:\analysis\j7p0601.doc

Missouri Highway and Transportation Department

Transportation Management Systems

Turning Movement Diagram and Summary

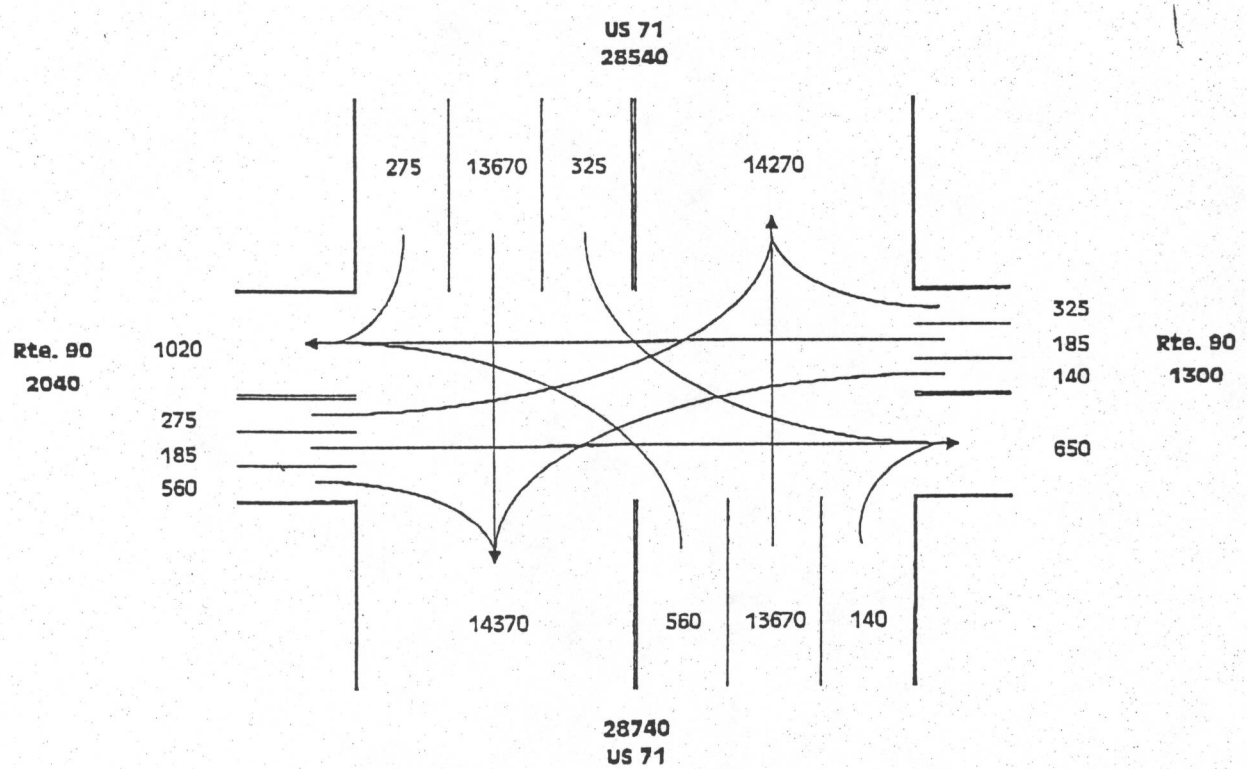
McDonald County

Station Location: Intersection of US 71 & Rte. 90 Date: January, 2002

Base Year: _____ Const. Year: 2007 Design Year: 2027

20 Year Design Factor 1.68

		Base		Const. 2007		Design 2027		
North to West				165		275		
North to South				8180		13670		
North to East				195		325		
East to North				195		325		
East to West				110		185		
East to South				85		140		
South to East				85		140		
South to North				8180		13670		
South to West				335		560		
West to South				335		560		
West to East				110		185		
West to North				165		275		



Comments: _____

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