

GEOTECHNICAL REPORT

MILES LAKEWOOD VILLAGE

2ND ADDITION LEVEE

WICHITA, KANSAS

PREPARED FOR

CITY OF WICHITA

JULY 1995

ALLIED LABORATORIES PROJECT NO: 72-95398-42

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1. SCOPE OF STUDY

This report presents the results of a geotechnical study of the existing levee for the Miles Lakewood 2nd Addition, Wichita, Kansas. The study was conducted to explore the subsurface and existing levee conditions according to our proposal to the City of Wichita on January 12, 1995.

A field exploration program was conducted to obtain information on the subsurface conditions. Samples obtained during the field investigation were tested in the laboratory to determine physical and engineering characteristics of the in-situ soils. Field exploration and laboratory test results were analyzed to develop conclusions regarding fill types, levee consolidation and foundation settlement. Results of the field exploration, laboratory testing and our conclusions are presented herein.

2. EXISTING SITE CONDITIONS

The project site is located in the west portion of Wichita, Kansas as shown on Figure A-1. The existing levee is located near the Cowskin Creek. This levee was constructed in 1975. Approximately 2 feet of fill was added to the levee in 1986. The existing levee appeared to be stable with no evidence of slope erosion. The ground surface was grass covered.

Subsurface conditions in the existing levee consisted of lean clay and sandy lean clay fill. The natural soils below the fill consisted of lean clay, fat clay and sand. Free water was encountered in exploratory boring B-4 during drilling.

3. FIELD EXPLORATION

The field exploration was conducted on June 22, 1995. Eight (8) exploratory borings were drilled in the existing levee to explore subsurface conditions and obtain samples for laboratory testing. Exploratory borings were located referencing existing site features as shown on the Boring Location Plan, Figure A-2. Ground elevations at the boring locations were determined by a level survey referencing the benchmark, "Top Bolt of Fire Hydrant at 9832 Dubon Street, Elevation = 100.0, assumed".

Exploratory borings were advanced through the overburden soils with a Mobile Drill B-31 drill rig utilizing 4-inch diameter continuous flight augers. The borings were logged in the field by a representative of Allied Laboratories based on visual procedures. All field and laboratory testing was performed under the direction of a Professional Engineer registered in the State of Kansas.

Undisturbed samples of the subsurface materials were obtained by hydraulically pushing 3 inch diameter seamless Shelby Tubes into the in-situ soils according to ASTM D-1587. Disturbed samples were obtained with a 2-inch O.D. splitspoon sampler. The sampler was driven into the various strata using a 140-pound hammer falling 30 inches. The number of blows required to advance the sampler three successive six-inch increments is recorded. The total number of blows required to advance the sampler the second and third six 6-inch increments is the penetration resistance (N-Value). Penetration resistance values indicate the relative density of cohesionless soils and consistency of cohesive soils. Standard Penetration tests were performed in according to ASTM D-1586.

Measurements of the water levels were attempted in the borings shortly after completion of drilling and 24 hours after drilling in Boring B-4. All borings were backfilled with auger cuttings and tamped upon completion of drilling or water level measurements.

4. LABORATORY TESTING

Soil samples obtained during the field exploration were observed and visually classified according to ASTM D-2488 "Soil Classification for Engineering Purposes" which is based on the Unified Soil Classification System. Selected samples were tested to determine engineering and physical properties (ASTM D-2487). Tests performed included; Moisture Content, Dry Unit Weight, Liquid and Plastic Limits, One Dimensional Consolidation, and Moisture-Density Relationship. Laboratory test results are summarized on the attached figures and exploratory boring logs.

5. SUBSURFACE CONDITIONS

The subsurface profile encountered in the borings generally consisted of existing fill overlying clay and sand. Bedrock was not encountered. Brief descriptions of the soils encountered follow. The attached Boring Logs should be reviewed for actual subsurface conditions at each boring location.

5.1 EXISTING FILL

The existing fill in the levee varied from lean clay to lean clay with sand to sandy lean clay. Fill depths varied from 4 to 6 feet. The fill did not appear to contain debris or deleterious materials. This fill was visually characterized as moist to very moist with a firm consistency. Moisture contents of the fill varied from 12.0 to 23.6 percent with dry unit weights ranging from 98.7 to 119.1 pcf.

5.2 NATURAL SOILS

The natural soils below the levee ranged from lean clay to sand. The clay soils were generally characterized as medium stiff to stiff and the sand soils as medium dense. Color of the soils varied from dark grey to reddish-brown to brown. Moisture contents varied from 13.9 to 28.4 percent with dry unit weights ranging from 90.8 to 106.4 pcf.

5.3 GROUNDWATER

Free water was encountered in the exploratory boring B-4 at the time of drilling. The groundwater level during the field exploration does not necessarily denote a static groundwater level. Groundwater levels can vary depending on climatic conditions, time of year, surface runoff and other factors beyond the scope of this report.

6. CONCLUSIONS

Considering the results of the field exploration and laboratory testing, the following conclusions are presented.

6.1 LEVEE FILL

Field exploration results indicate the fill in the existing levee varied from lean clay to sandy clay with the majority of the soils classifying as lean clay with sand. The compaction of the existing levee fill was evaluated by comparing dry unit weights obtained from undisturbed Shelby tube samples to the Standard Proctor values. Standard Proctor tests were performed on two combined samples of the subsurface soils as shown in figures B-7 and B-8. The apparent compaction results are as follow.

BORING NO.	DEPTH (Feet)	STANDARD PROCTOR (pcf)	DRY UNIT WEIGHT (pcf)	APPARENT COMPACTION (%)
B-1	3.0 - 5.0	103.9	104.5	101
B-2	3.0 - 5.0	103.9	98.7	95
B-3	3.0 - 5.0	106.9	101.0	94
B-4	3.0 - 5.0	106.9	106.6	100
B-5	3.0 - 5.0	106.9	109.9	103
B-6	3.0 - 5.0	106.9	100.4	94
B-7	1.0 - 3.0	106.9	119.1	112
B-8	5.0 - 7.0	106.9	99.8	94

6.2 FILL CONSOLIDATION

The fill in the existing levee generally consisted of lean clay with sand. Consolidation characteristics of levee fill was analyzed by one-dimensional consolidation testing as shown in figure B-6. Considering the age of the fill and these test results, the majority of fill consolidation has occurred. Additional consolidation is estimated to be minimal (less than 1/4 inch).

6.3 EMBANKMENT FOUNDATION SETTLEMENT

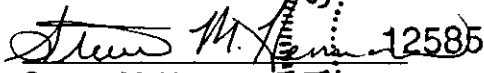
The embankment foundation soils consisted mainly of medium stiff to stiff lean clay and sandy lean clay. Settlement characteristics of the foundation soils were analyzed by one dimensional consolidation testing and correlation with standard penetration testing. Considering the age of the embankment and the consolidation characteristics of the foundation soils, future settlement will be negligible unless additional fill is added to the levee.

7. LIMITATIONS

This report has been prepared according to generally accepted soil and foundation engineering practices in this area. The conclusions are based on the subsurface conditions at the exploratory boring locations at the time of drilling. The conclusions are intended for the exclusive use of the client. Individual portions should not be taken out of the report context for this project or used for other projects. The conclusions presented are based on the data obtained from eight (8) exploratory borings at the locations indicated on the Boring Location Plan. If subsurface conditions vary significantly across the project site, the conclusions presented may not be valid.

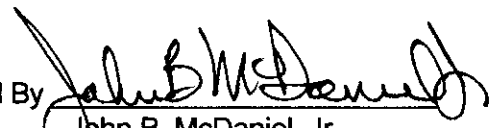
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APPENDIX A

FIELD EXPLORATION RESULTS

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE WICHITA, KANSAS

ALLIED PROJECT NO: 72-95398-42

SITE LOCATION MAP	Figure A-1
BORING LOCATION PLAN	Figure A-2
PROFILE OF EXPLORATORY BORINGS	Figure A-3 & A-4
EXPLORATORY BORING LOGS	Figure A-5 to A-12
LEGEND	Figure A-13
GENERAL GEOTECHNICAL NOTES	Figure A-14

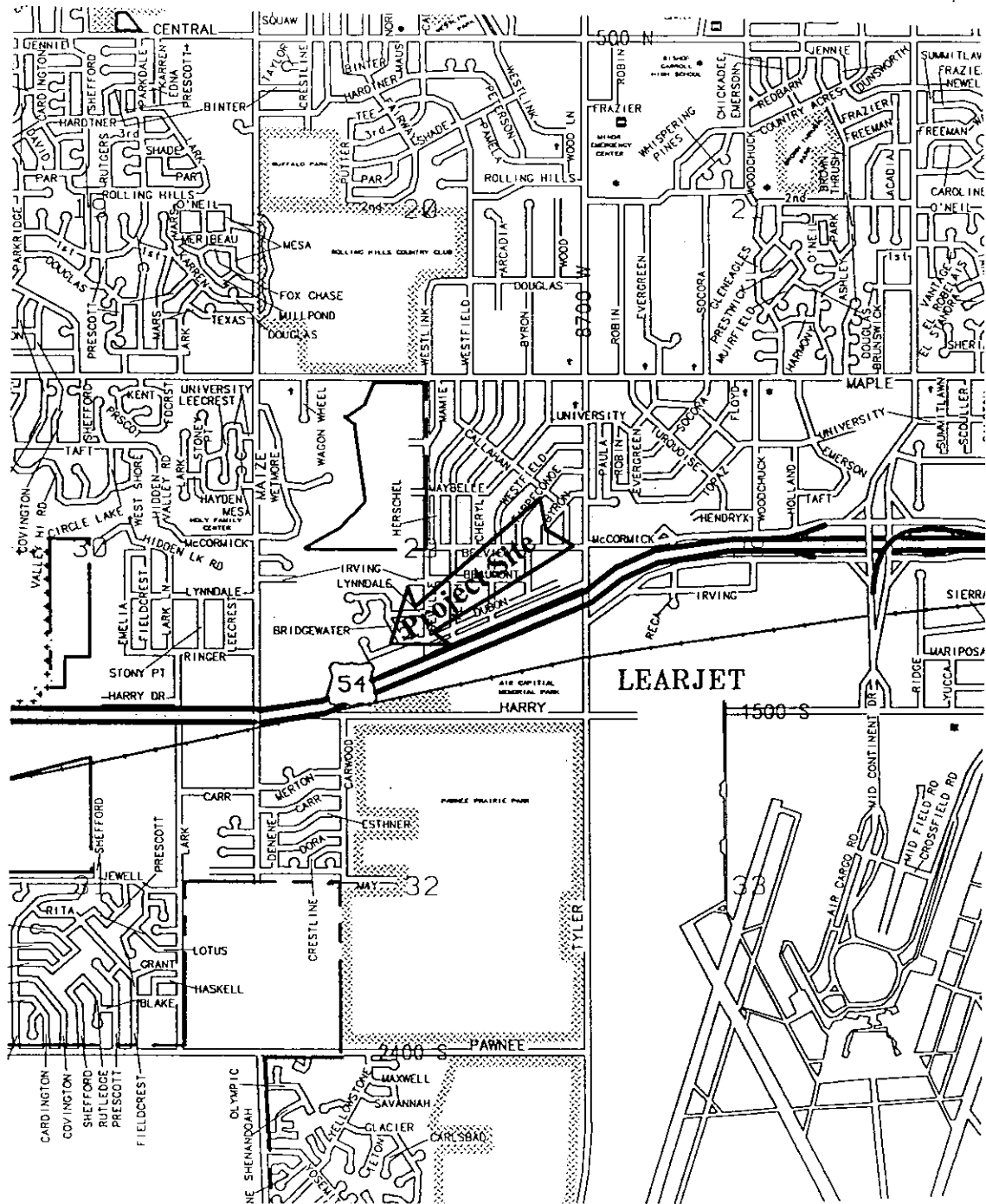


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SITE LOCATION MAP

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE - WICHITA, KS

Allied Project No: 72-95398-42



No Scale



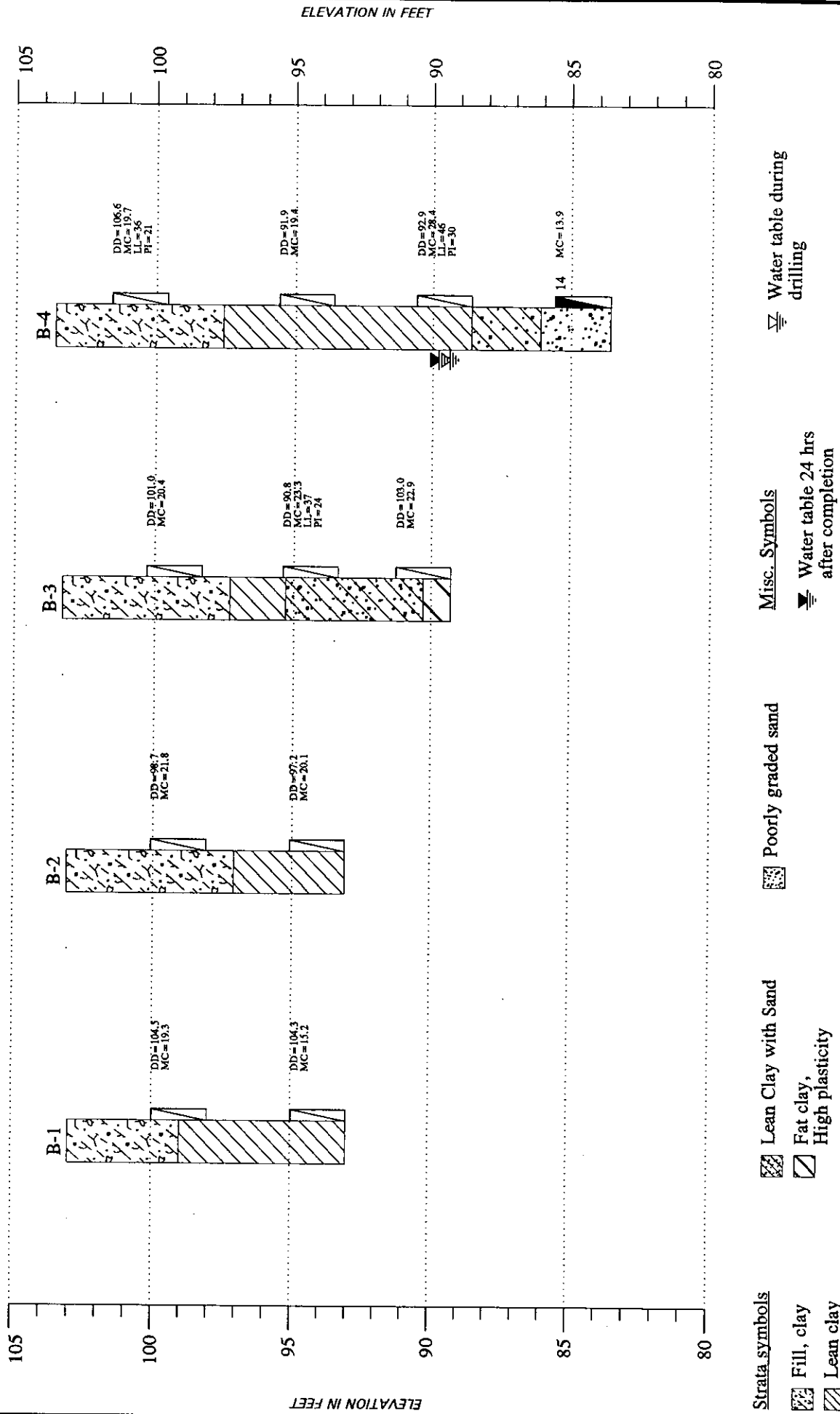
Prepared By: SMH

Figure A-1

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PROFILE OF EXPLORATORY BORINGS

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE



NOTE: Profiles are not proportional and may not present a cross section of the site.

FIGURE A-3



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EXPLORATORY BORING LOG

B-1

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

PROJECT NO: 72-95398-42

BORING LOCATION: See Boring Location Plan

SCALE: 1 IN = 5 FT.

BORING DATE 6/22/95

DRILLER KJP

LOGGED BY RBB

CHECKED BY SMH

WATER LEVEL @ DRILL Dry

DATE 6/22/95

WATER LEVEL AFTER DRILL

DATE

LOG	ELEVATION	SOIL DESCRIPTION	S No.	TOOL	BPF	% Moist.	Dry Unit Wt. (pcf)	Qu (psf)	% Sand	% Fines	LL	PI
	0	103										
	5	99	1-1	S		19.3	104.5					
	10	93	1-2	S		15.2	104.3					
	15											
	20											
	25											
	30											
	35											

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

FIGURE A-5



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EXPLORATORY BORING LOG

B-2

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

PROJECT NO: 72-95398-42

BORING LOCATION: See Boring Location Plan

SCALE: 1 IN = 5 FT.

BORING DATE 6/22/95

DRILLER KJP

LOGGED BY RBB

CHECKED BY SMH

WATER LEVEL @ DRILL Dry

DATE 6/22/95

WATER LEVEL AFTER DRILL

DATE

LOG	ELEVATION	SOIL DESCRIPTION	S No.	TOOL	BPF	% Moist.	Dry Unit Wt. (pcf)	Qu (psf)	% Sand	% Fines	LL	PI
	103.1	FILL: lean clay, brown to grey, lightly moist to moist, firm										
			2-1	S		21.8	98.7					
	97.1	LEAN CLAY: dark grey to brown, very moist, medium stiff										
			2-2	S		20.1	97.2					
	93.1	End of boring at 10 feet.										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

FIGURE A-6



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EXPLORATORY BORING LOG

B-3

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

PROJECT NO: 72-95398-42		BORING LOCATION: See Boring Location Plan			
SCALE: 1 IN = <u>5</u> FT.	BORING DATE 6/22/95	DRILLER KJP	LOGGED BY RBB	CHECKED BY SMH	
WATER LEVEL @ DRILL Dry	DATE 6/22/95	WATER LEVEL AFTER DRILL		DATE	

LOG	ELEVATION	SOIL DESCRIPTION	S No.	TOOL	BPF	% Moist.	Dry Unit Wt. (pcf)	Qu (psf)	% Sand	% Fines	LL	PI
	103.3	<i>FILL: lean clay to sandy lean clay, reddish-brown to dark grey to brown, lightly moist to very moist, firm</i>	3-1	S		20.4	101.0					
	97.3	<i>LEAN CLAY: dark grey to brown, very moist, firm</i>										
	95.3	<i>LEAN CLAY WITH SAND: dark grey to brown, very moist, medium stiff, thin sand seams</i>	3-2	S		23.3	90.8		3	97	37	24
	90.3	<i>FAT CLAY: grey, very moist, stiff, caliche</i>	3-3	S		22.9	103.0					
	89.3	End of boring at 14 feet.										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

FIGURE A-7



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EXPLORATORY BORING LOG

B-4

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

PROJECT NO: 72-95398-42

BORING LOCATION: See Boring Location Plan

SCALE: 1 IN = 5 FT.

BORING DATE 6/22/95

DRILLER KJP

LOGGED BY RBB

CHECKED BY SMH

WATER LEVEL @ DRILL 14.2

DATE 6/22/95

WATER LEVEL AFTER DRILL 13.8

DATE 6/23/95

LOG	ELEVATION	SOIL DESCRIPTION	S No.	TOOL	BPF	% Moist.	Dry Unit Wt. (pcf)	Qu (psf)	% Sand	% Fines	LL	PI
	103.6	<i>FILL: lean clay to sandy lean clay, reddish brown to dark grey, lightly moist to very moist, firm</i>	4-1	S		19.7	106.6		20	80	36	21
	97.6	<i>LEAN CLAY: dark grey to brown, very moist, soft to medium stiff</i>	4-2	S		19.4	91.9					
		<i>... very moist to wet, soft</i>	4-3	S		28.4	92.9		9	91	46	30
	88.6	<i>SANDY LEAN CLAY: grey to brown, very moist, medium stiff to soft</i>										
	86.1	<i>SAND: grey to brown, saturated, medium dense, fine to medium grained</i>	4-4	P	14	13.9						
	83.6	End of boring at 20 feet.										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

FIGURE A-8



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EXPLORATORY BORING LOG

B-5

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

PROJECT NO: **72-95398-42** BORING LOCATION: **See Boring Location Plan**
 SCALE: 1 IN = 5 FT. BORING DATE **6/22/95** DRILLER **KJP** LOGGED BY **RBB** CHECKED BY **SMH**
 WATER LEVEL @ DRILL **Dry** DATE **6/22/95** WATER LEVEL AFTER DRILL DATE

LOG	ELEVATION	SOIL DESCRIPTION	S No.	TOOL	BPF	% Moist.	Dry Unit Wt. (pcf)	Qu (psf)	% Sand	% Fines	LL	PI
	0	104.1										
	5			5-1	S		17.0	109.9	24	76	34	20
	10	94.1										
	15											
	20											
	25											
	30											
	35											

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

FIGURE A-9



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EXPLORATORY BORING LOG

B-6

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

PROJECT NO: 72-95398-42	BORING LOCATION: See Boring Location Plan			
SCALE: 1 IN = <u>5</u> FT.	BORING DATE 6/22/95	DRILLER KJP	LOGGED BY RBB	CHECKED BY SMH
WATER LEVEL @ DRILL Dry	DATE 6/22/95	WATER LEVEL AFTER DRILL		DATE

LOG	ELEVATION	SOIL DESCRIPTION	S No.	TOOL	BPF	% Moist.	Dry Unit Wt. (pcf)	Qu (psf)	% Sand	% Fines	LL	PI
	103.6	<i>FILL: lean clay to sandy lean clay, reddish-brown to brown, moist to very moist, firm</i>										
			6-1	S		17.2	100.4		33	67	27	10
	98.6	<i>LEAN CLAY WITH SAND: dark grey to brown, very moist, medium stiff</i>										
		<i>... with thin sand streamers, very moist to wet</i>	6-2	P	6	20.6	104.4					
	90.5	<i>SILTY SAND: grey to brown, saturated, very moist to wet</i>	6-3	P	2							
	88.6	End of boring at 15 feet.										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

FIGURE A-10



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EXPLORATORY BORING LOG

B-7

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

PROJECT NO: **72-95398-42**

BORING LOCATION: **See Boring Location Plan**

SCALE: 1 IN = 5 FT.

BORING DATE **6/22/95**

DRILLER **KJP**

LOGGED BY **RBB**

CHECKED BY **SMH**

WATER LEVEL @ DRILL **Dry**

DATE **6/22/95**

WATER LEVEL AFTER DRILL

DATE

LOG	ELEVATION	SOIL DESCRIPTION	S No.	TOOL	BPF	% Moist.	Dry Unit Wt. (pcf)	Qu (psf)	% Sand	% Fines	LL	PI
	103.7	<i>FILL: sandy lean clay and lean clay, reddish-brown to grey to brown, lightly moist to moist, firm</i>	7-1	S		12.0	119.1					
	98.7	<i>LEAN CLAY WITH SAND: dark grey to brown, moist, stiff</i>	7-2	P	11	21.7	102.1					
	90.6	<i>FAT CLAY: grey, moist, stiff, sandy</i>	7-3	P	8	20.1	106.4					
	88.7	End of boring at 15 feet.										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

FIGURE A-11



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EXPLORATORY BORING LOG

B-8

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

PROJECT NO: 72-95398-42

BORING LOCATION: See Boring Location Plan

SCALE: 1 IN = 5 FT.

BORING DATE 6/22/95

DRILLER KJP

LOGGED BY RBB

CHECKED BY SMH

WATER LEVEL @ DRILL Dry

DATE 6/22/95

WATER LEVEL AFTER DRILL

DATE

LOG	ELEVATION	SOIL DESCRIPTION	S No.	TOOL	BPF	% Moist.	Dry Unit Wt. (pcf)	Qu (psf)	% Sand	% Fines	LL	PI
	103.8	<i>FILL: lean clay to sandy lean clay, reddish-brown to brown, lightly moist to moist, firm</i>	8-1	S								
	97.8	<i>LEAN CLAY WITH SAND: dark grey, very moist, soft to medium stiff</i>	8-2	S		23.6	99.8					
	93.8	<i>SILTY SAND: brown, very moist to wet, medium dense, fine grained ... saturated</i>	8-3	S		20.6	93.5		26	74		
	89.8	<i>SAND: light brown, saturated, loose, medium grained</i>	8-4	P	5	18.3						
	88.8	End of boring at 15 feet.										

NOTE: This information only pertains to this boring at the time of drilling and may not be indicative of entire site.

FIGURE A-12



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EXPLORATORY BORING LEGEND

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE

Strata symbols



Fill, clay



Lean clay
low plasticity



Lean Clay with Sand



Fat clay,
High plasticity



Clayey sand



Poorly graded sand



Silty sand



Standard penetration test

Misc. Symbols



Water table 24 hrs
after completion



Water table during
drilling

Soil Samplers



Undisturbed thin wall
Shelby tube

Notes:

1. Exploratory borings were drilled on 6/22/95 with a Mobil Drill B-31 drill rig utilizing 4 inch diameter continuous flight auger.
2. Groundwater was encountered in boring B-4 at the time of drilling and at 24 hour measurement.
3. Borings were located referencing existing site features. Elevations were determined by a level survey referencing a benchmark established as, "Top Bolt of Fire Hydrant at 9832 Dubon Street, Elevation = 100.0 assumed".
4. The exploratory logs are subject to the limitations, conclusions, and recommendations included in the Geotechnical Report.
5. Depths to transitions between soil types presented on the exploratory boring logs are approximate within the limits of this investigation.



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GENERAL GEOTECHNICAL NOTES

SOIL CLASSIFICATION TERMINOLOGY

Soil classification is based on ASTM D-2487 "Soil Classification for Engineering Purposes" which is based on the Unified Soil Classification System. Fine grained soils have less than 50 percent of their particles retained on the No. 200 sieve. These soils are classified as silts if they are nonplastic to slightly plastic and as clays if they classify as plastic. Coarse grained soils have more than 50 percent of their particles retained on the No. 200 sieve and are classified as sands, gravels, cobbles and boulders depending on the grain size. Minor and major constituents may be added as modifiers depending on the proportions of the soil types. Additionally, fine grained soils are described based on their consistency and coarse grained soils are delineated by their relative density. Examples: Fat clay with sand (CH) and Silty sand (SM).

WATER LEVEL MEASUREMENTS

Water level measurements presented on the test boring logs are for the times indicated. These measurements may not necessarily represent the actual groundwater levels at the site. Fine grained soils of low permeability may require measurements for extended periods to accurately reflect free water levels. Coarse grained soils will generally reflect true groundwater levels after short periods. Groundwater levels and seepage water can vary depending on time of year, climatic conditions and other factors beyond the scope of normal geotechnical explorations. Typical water level abbreviations follows:

- | | |
|---|---|
| WD - Water level during drilling | WA - Water level after drilling |
| W24 - Water level 24 hours after drilling | W48 - Water level 48 hours after drilling |
| CW - Depth to wet cave of boring | CD - Depth to dry cave of boring |

SAMPLING AND DRILLING ABBREVIATIONS

Drilling and sampling procedures are typically performed in accordance with ASTM standards unless otherwise noted. Typical sampling and drilling abbreviations follows:

- | | |
|--|--|
| P - Standard Penetration sampler
(1-3/8 in. ID split-spoon) | SB - Sawtooth bit barrel sampler |
| S - 3 in. diameter thin walled Shelby Tube | CF4 - 4 in. diameter continuous flight auger |
| D - Denison Barrel Sampler | CF6 - 6 in. diameter continuous flight auger |
| B - Bulk/grab sample | HS - 7-1/4 in. diameter hollow stem auger |
| | NX - Diamond bit coring |

CONSISTENCY OF COARSE GRAINED SOILS

CONSISTENCY OF FINE GRAINED SOILS

Relative Density (D_R)	Percent D_R	Approximate N - Value (blows/foot)	Consistency	Unconfined Compressive Strength (Q_u) psf	Approximate N - Value (blows/foot)
Very Loose	less than 15	0 to 4	Very Soft	Less than 500	0 to 2
Loose	15 to 35	4 to 10	Soft	500 to 1000	2 to 4
Medium Dense	35 to 65	10 to 30	Medium Stiff	1000 to 2000	4 to 8
Dense	65 to 85	30 to 50	Stiff	2000 to 4000	8 to 16
Very Dense	85 to 100	over 50	Very Stiff	4000 to 8000	16 to 30
			Hard	Over 8000	Over 30

BEDROCK HARDNESS DESCRIPTIONS

GRAIN SIZE DESCRIPTIONS

Hardness	Approximate N - Value (blows/foot)	Constituant Description	Particle Size
Weathered (Soft)	Less than 20	Silt or Clay Sand Gravel Cobbles Boulders	Passing No. 200 Sieve (0.075 mm)
Firm	20 to 30		No. 200 to No. 4 Sieve (0.075 to 4.75 mm)
Medium Hard	30 to 50		No. 4 to 3 inch Sieve (4.75 to 75 mm)
Hard	50 to 80		3 to 12 inch Sieve (75 to 300 mm)
Very Hard	Over 80		Over 12 inch Sieve (300 mm)
PROPORTIONING OF CONSTITUENTS			
Constituant Description	Percent		
Trace	Less than 5		
With	5 to 12		
Modifier	More than 12		

Figure A-14



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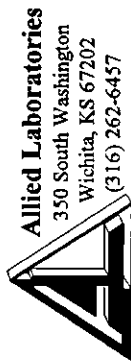
APPENDIX B

LABORATORY TEST RESULTS

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE WICHITA, KANSAS

Allied Project No: 72-95398-42

SUMMARY OF LABORATORY TESTS	Figure B-1 & B-2
REPORT OF LIQUID AND PLASTIC LIMITS	Figure B-3 & B-4
CONSOLIDATION TEST RESULTS	Figure B-5 & B-6
MOISTURE - DENSITY CURVES	Figure B-7 & B-8
SOIL CLASSIFICATION CHART	Figure B-9



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SUMMARY OF LABORATORY TEST RESULTS

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE - WICHITA KANSAS

Allied Project No. 72-95398-42

Boring No.	Sample No.	Depth (feet)	% Moist. Content	Dry Unit Wt. (pcf)	Qu (psf)	Atterberg Limits			Grain Size (%)			Soil Classification
						LL	PL	PI	Gravel	Sand	Silt/Clay	
B-1	1-1	3.0-5.0	19.3	104.5								Lean Clay (FILL)
B-1	1-2	8.0-10.0	15.2	104.3								Lean Clay
B-2	2-1	3.0-5.0	21.8	98.7								Lean Clay (FILL)
B-2	2-2	8.0-10.0	20.1	97.2								Lean Clay
B-3	3-1	3.0-5.0	20.4	101.0								Lean Clay with Sand (FILL - CL)
B-3	3-2	8.0-10.0	23.3	90.8	37	13	24		3	97		Lean Clay (CL)
B-3	3-3	13.0-15.0	22.9	103.0								Fat Clay
B-4	4-1	3.0-5.0	19.7	106.6	36	15	21		20	80		Lean Clay with Sand (FILL - CL)
B-4	4-2	8.0-10.0	19.4	91.9								Lean Clay
B-4	4-3	13.0-15.0	28.4	92.9	46	16	30		9	91		Lean Clay (CL)
B-4	4-4	18.0-20.0	13.9									Sand
B-5	5-1	3.0-5.0	17.0	109.9	34	14	20		24	76		Lean Clay with Sand (FILL - CL)
B-5	5-2	8.0-10.0	22.4	91.8								Lean Clay
B-6	6-1	3.0-5.0	17.4	100.4	27	17	10		33	67		Sandy Lean Clay (FILL - CL)
B-6	6-2	8.0-10.0	20.6	104.4								Lean Clay

Figure B-1



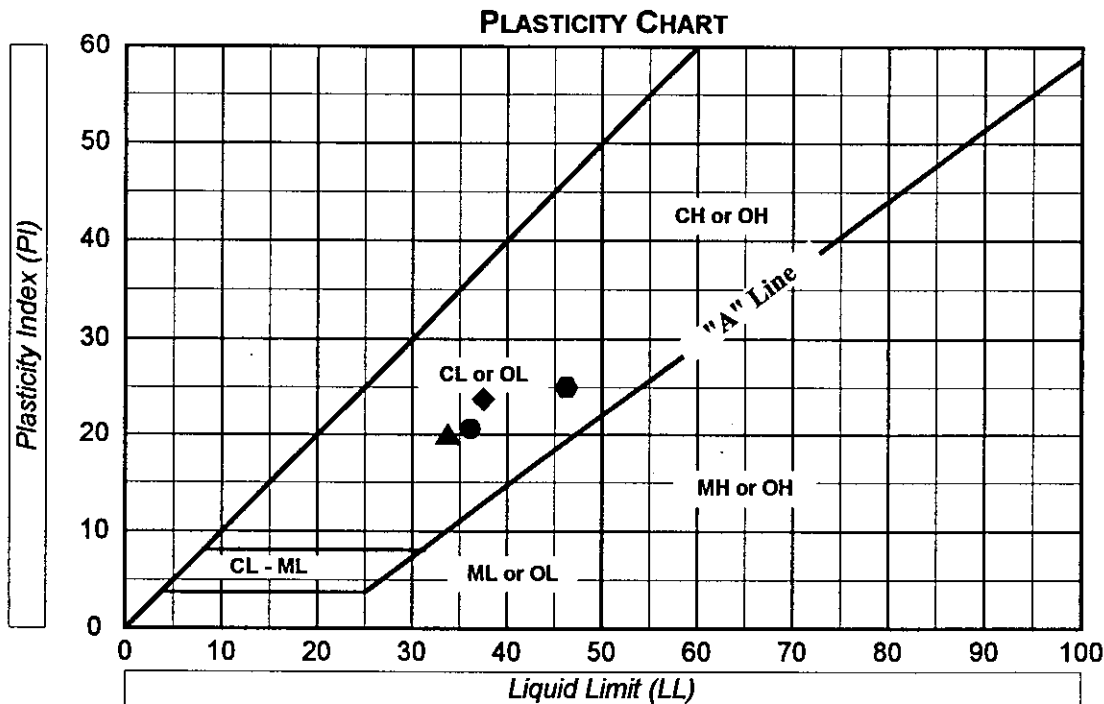
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 Wichita, KS 67202
 (316) 262-6457

LIQUID AND PLASTIC LIMITS TEST REPORT

ASTM D-4318

Project No. 72-95398-42

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE



TEST RESULTS

Location/Description	LL	PL	PI	% Fines	ASTM D - 2487
◆ Boring B-3, Sample 3-2 Depth: 8.0-10.0 feet	37	13	24	97	Lean Clay (CL)
● Boring B-4, Sample 4-1 Depth: 2.0-4.0 feet	36	15	21	80	Lean Clay with Sand (CL)
◐ Boring B-4, Sample 4-3 Depth: 13.0-15.0 feet	46	16	30	91	Lean Clay (CL)
▲ Boring B-5, Sample 5-1 Depth: 3.0-5.0 feet	34	14	20	76	Lean Clay with Sand (CL)
■					

Figure B-3



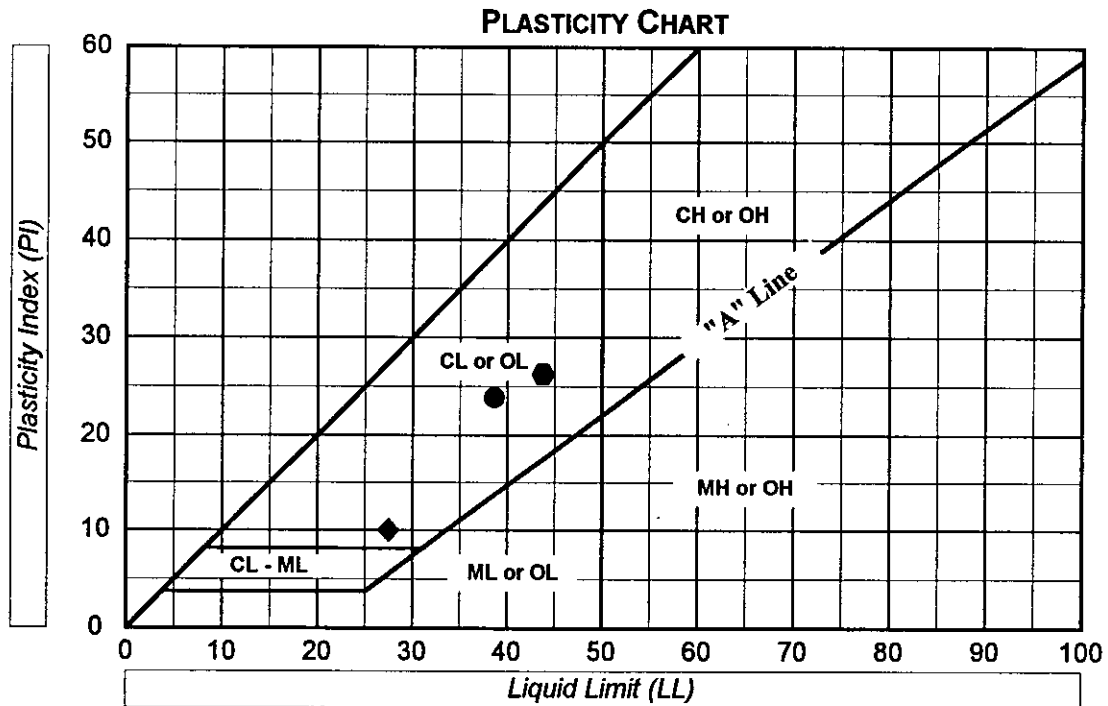
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LIQUID AND PLASTIC LIMITS TEST REPORT

ASTM D-4318

Project No. 72-95398-42

MILES LAKEWOOD VILLAGE 2ND ADDITION LEVEE



TEST RESULTS

Location/Description		LL	PL	PI	% Fines	ASTM D - 2487
◆	Boring B-6, Sample 6-1 Depth: 3.0-5.0 feet	27	17	24	67	Sandy Lean Clay (CL)
●	Combined Bulk 1 Depth: 0.0-5.0 feet	39	15	24	72	Lean Clay with Sand (CL)
●	Combined Bulk 2 Depth: 5.0-10.0 feet	44	18	26	89	Lean Clay (CL)
▲						
■						

Figure B-4

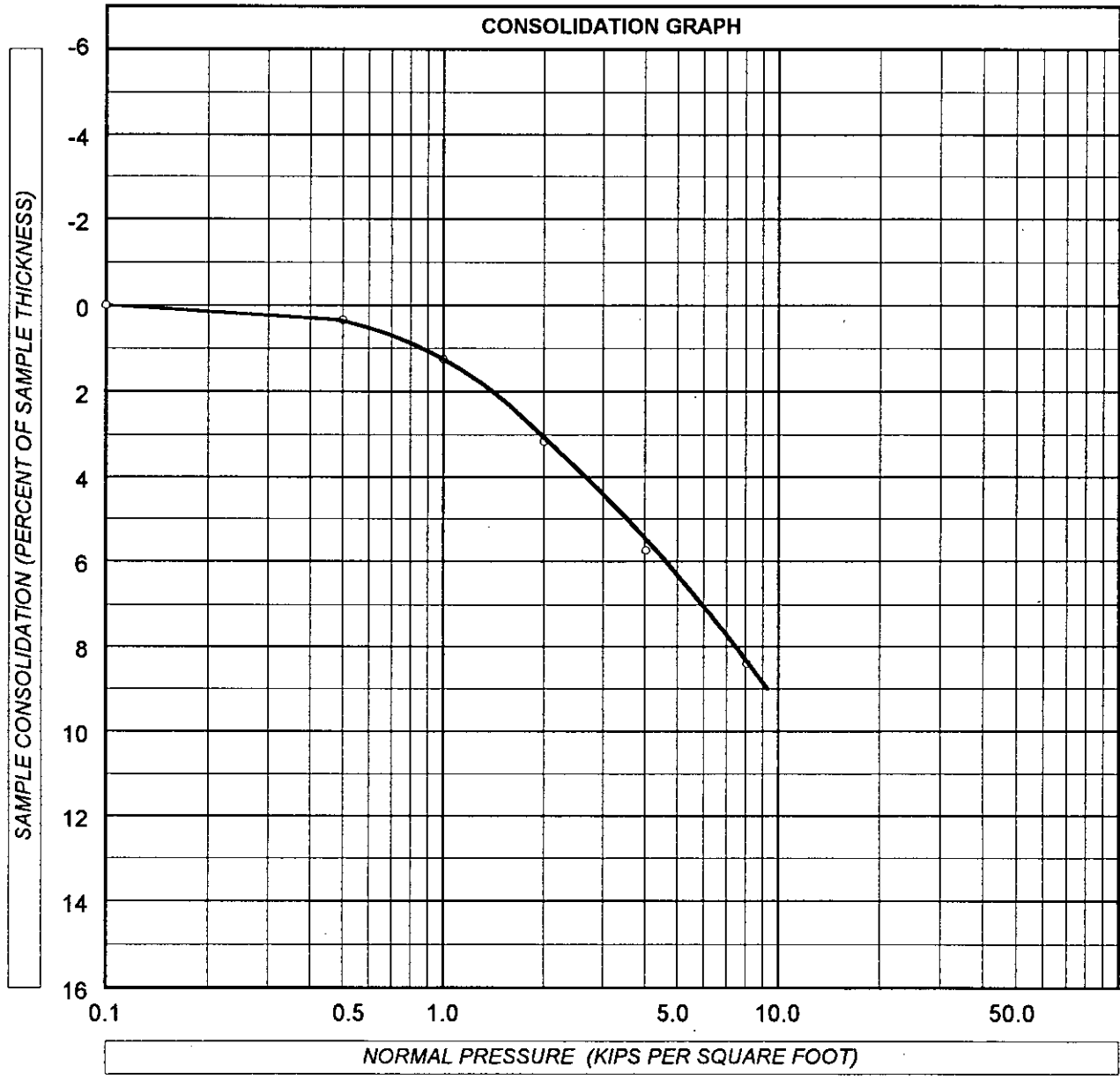


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CONSOLIDATION TEST RESULTS

ASTM D-4546, Method B

Project No: 72-95398-42		Project Name: Miles Lakewood Village 2nd Addition Levee		Date: 7/1/95
Boring No: B-4		Sample No: 4-3		Depth 13.0-15.0 feet
Soil Description: Lean Clay: dark brown, slightly sandy				Classification: CL
Liquid Limit: 46	Plastic Limit: 16	Plasticity Index: 30		Specific Gravity: 2.65 assumed
Initial Moisture Content (%): 28.2		Initial Dry Density (pcf): 94.9	Saturation (%): 99.6	
Final Moisture Content (%): 22.2		Final Dry Density (pcf): 105.2	Silt/Clay (percent): 91	
Sample Length (inch): 1.00		Sample Diameter (inch): 2.50	Height of Solids (inch): 0.5696	
Specimen Condition: <input checked="" type="checkbox"/> Undisturbed <input type="checkbox"/> Remolded <input type="checkbox"/> Compacted <input type="checkbox"/> Other _____				



Checked By: **SMH**

Figure B-5

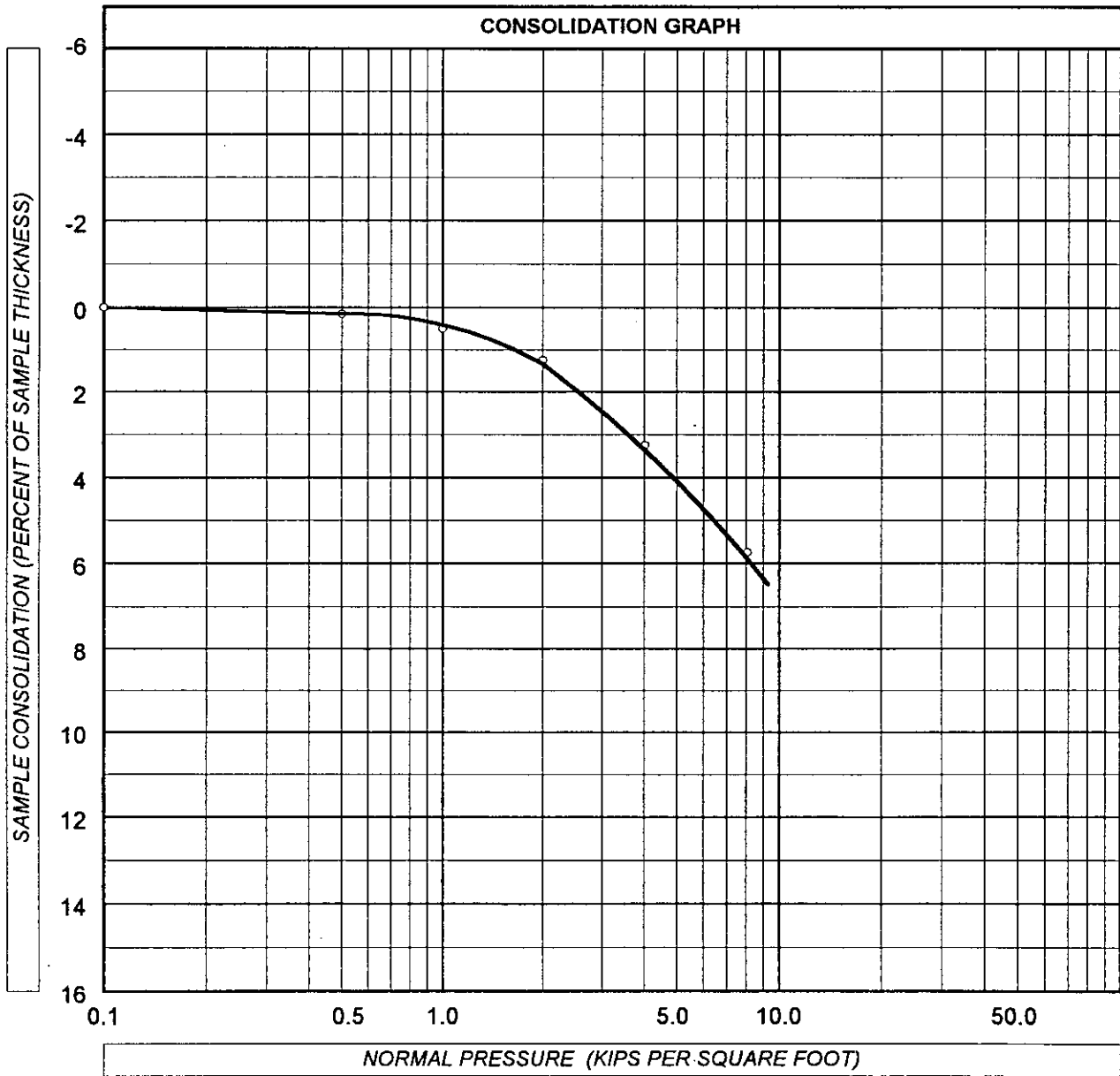


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CONSOLIDATION TEST RESULTS

ASTM D-4546, Method B

Project No: 72-95398-42		Project Name: Miles Lakewood Village 2nd Addition Levee		Date: 7/1/95
Boring No: B-5		Sample No: 5-1		Depth 3.0-5.0 feet
Soil Description: Lean Clay with Sand: brown				Classification: CL
Liquid Limit: 34	Plastic Limit: 13	Plasticity Index: 24	Specific Gravity: 2.65 assumed	
Initial Moisture Content (%): 18.8		Initial Dry Density (pcf): 108.8	Saturation (%): 94.5	
Final Moisture Content (%): 17.4		Final Dry Density (pcf): 116.7	Silt/Clay (percent): 76	
Sample Length (inch): 1.00		Sample Diameter (inch): 2.50	Height of Solids (inch): 0.653	
Specimen Condition: <input checked="" type="checkbox"/> Undisturbed <input type="checkbox"/> Remolded <input type="checkbox"/> Compacted <input type="checkbox"/> Other _____				



Checked By: SMH

Figure B-6

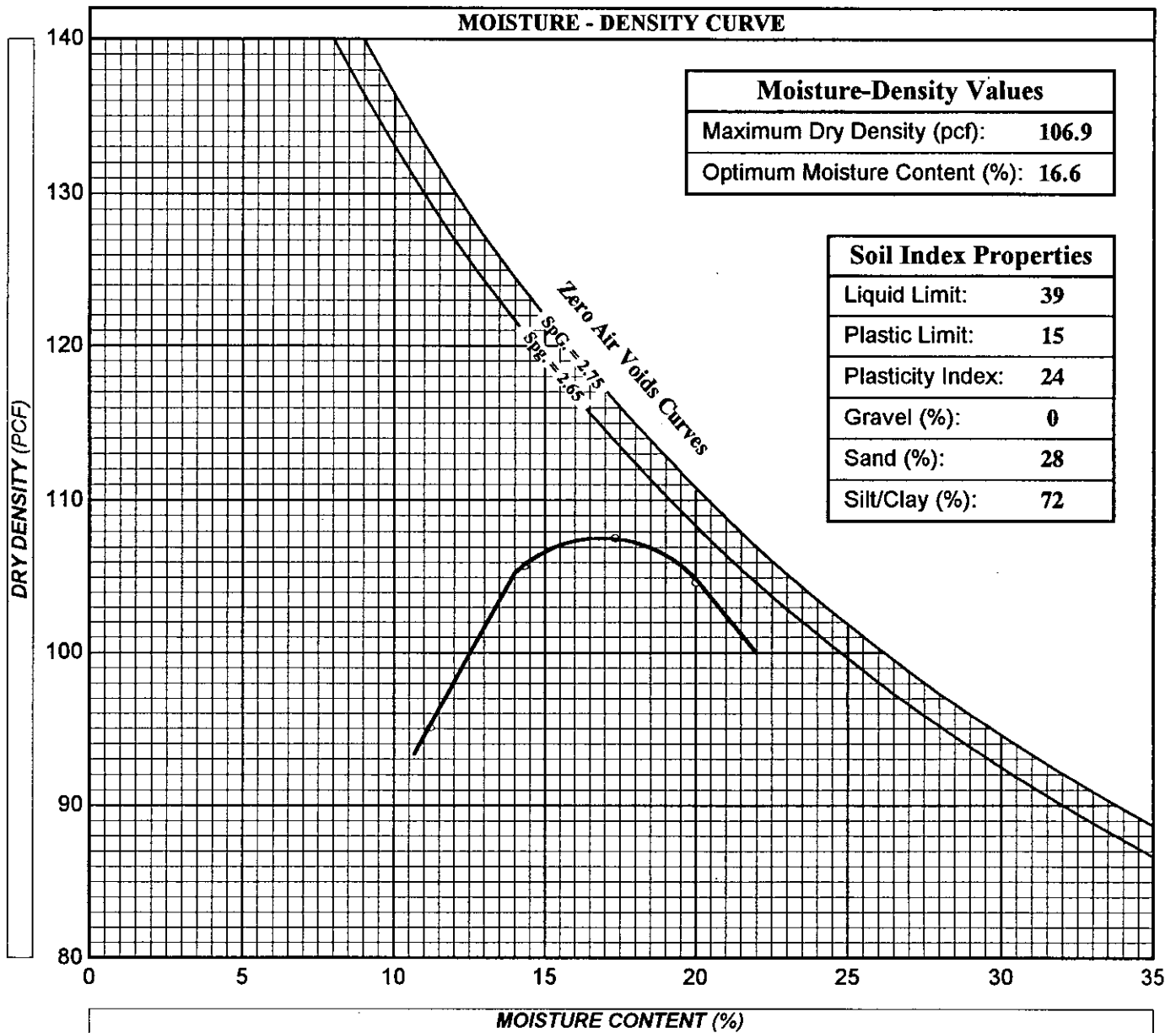


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MOISTURE - DENSITY RELATIONSHIP

Curve No.: na

Project Name: Miles Lakewood Village 2nd Addition Levee	Project No: 72-95398-42	Date: 6/30/95
Soil Description: Lean Clay with Sand: FILL	Classification: CL	
Sample Location: Combined Bulk 0.0-5.0 feet	Sampled By: Allied	Date: 6/22/95



AASHTO Designation:	T-99	ASTM Designation:	D-698
Weight of Hammer (lbs):	5.5	Height of Drop (inch):	12
Blows per Lift:	25	Number of Lifts:	3
	Diameter of Cylinder:	4 in	Volume of Cylinder: 0.0333 ft ³

Figure B-7

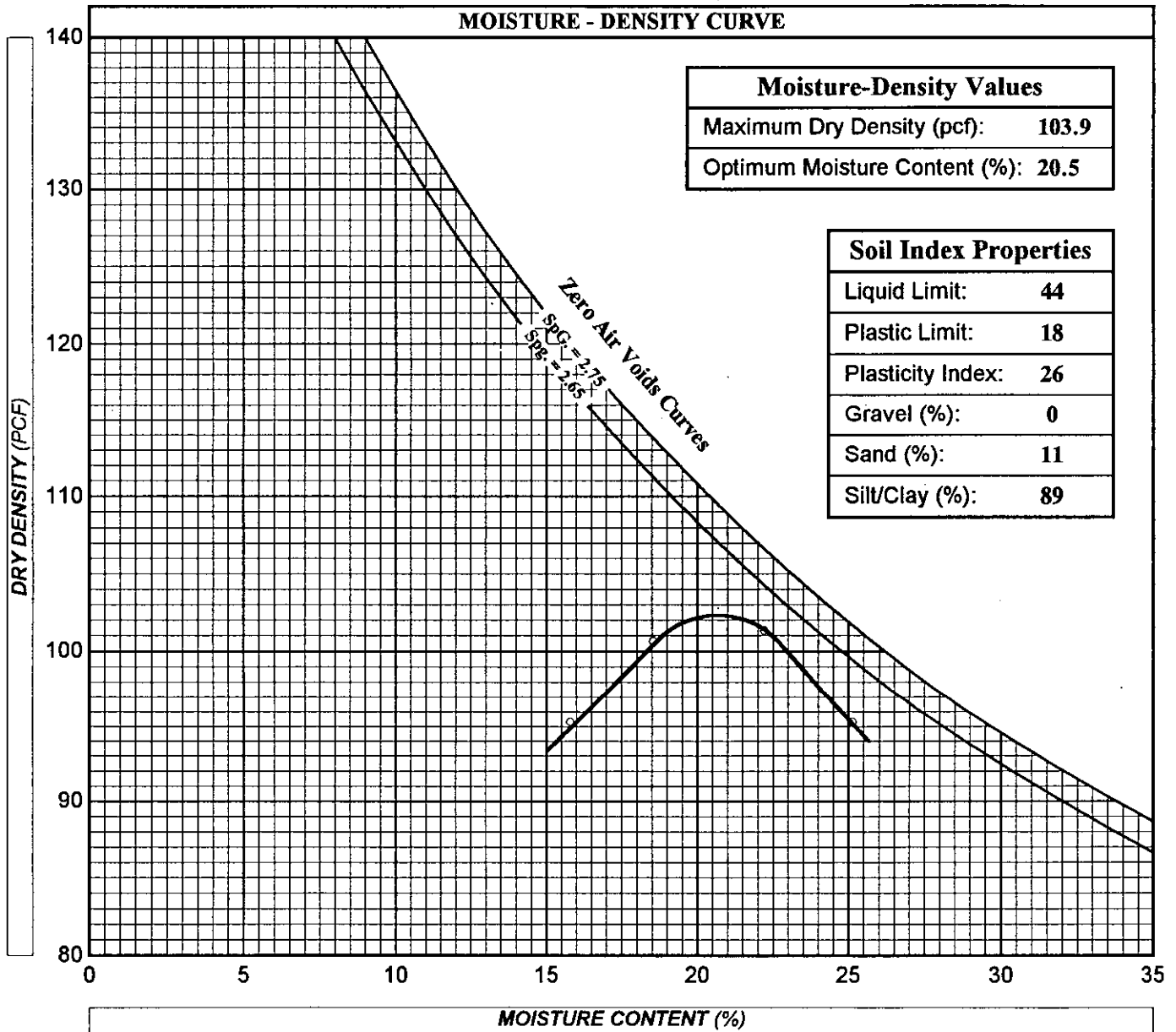


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MOISTURE - DENSITY RELATIONSHIP

Curve No.: na

Project Name: Miles Lakewood Village 2nd Addition Levee	Project No: 72-95398-42	Date: 6/30/95
Soil Description: Lean Clay: FILL	Classification: CL	
Sample Location: Combined Bulk 2: 5.0 - 10.0 feet	Sampled By: Allied	Date: 6/22/95



AASHTO Designation:	T-99	ASTM Designation:	D-698		
Weight of Hammer (lbs):	5.5	Height of Drop (inch):	12	Number of Lifts:	3
Blows per Lift:	25	Diameter of Cylinder:	4 in	Volume of Cylinder:	0.0333 ft ³

Figure B-8



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CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487
 (Based on Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification	
				Group Symbol	Group Name ^B
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well graded gravel ^F
			$Cu < 4$ and/or $1 > Cc > 3$ ^E	GP	Poorly graded gravel ^F
		Gravels with fines More than 12% fines ^C	Fines Classify as ML or MH	GM	Silty gravel ^{F,G,H}
			Fines Classify as CL or CH	GC	Clayey gravel ^{F,G,H}
	Sands 50% or more passes No. 4 sieve	Clean Sands Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	SW	Well graded sand ^I
			$Cu < 6$ and/or $1 > Cc > 3$ ^E	SP	Poorly graded sand ^I
		Sands with Fines More than 12% fines ^D	Fines Classify as ML and MH	SM	Silty sand ^{G,H,I}
			Fines Classify as CL and CH	SC	Clayey sand ^{G,H,I}
Fine Grained Soils 50% or more passes the No. 200 Sieve	Silts and Clays Liquid limit less than 50.	Inorganic	$PI > 7$ and plots on or above "A" line ^J	CL	Lean clay ^{K,L,M}
			$PI < 4$ and plots on or below "A" line ^J	ML	Silt ^{K,L,M}
		Organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} \leq 0.75$	OL	Organic clay ^{K,L,M,N}
					Organic silt ^{K,L,M}
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" Line	CH	Fat clay ^{K,L,M}
			PI plots below "A" Line	MH	Elastic silt ^{K,L,M}
		Organic	$\frac{\text{Liquid limit - oven dried}}{\text{Liquid limit - not dried}} \leq 0.75$	OH	Organic clay ^{K,L,M,P}
					Organic silt ^{K,L,M,Q}
Highly organic soils	Primarily organic matter, dark in color, and organic odor			Pt	Peat

- ^A Based on the material passing the 3-in. (75-mm) sieve.
^B If field sample contained cobbles or boulders, or both add "with cobbles or boulders, or both" to group name.
^C Gravels with 5 to 12% fines require dual symbols:
 GW-GM Well graded gravel with silt.
 GW-GC Well graded gravel with clay.
 GP-GM Poorly graded gravel with silt.
 GP-GC Poorly graded gravel with clay.
^D Sands with 5 to 12% fines require dual symbols:
 SW-SM Well graded sand with silt.
 SW-SC Well graded sand with clay.
 SP-SM Poorly graded sand with silt.
 SP-SC Poorly graded sand with clay.

- ^E $Cu = D_{60}/D_{10}$; $Cc = (D_{30})^2 / (D_{10} \times D_{60})$.
^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.
^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
^H If fines are organic, add "with organic fines" to group name.
^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
^J If Atterberg limits plot in hatched area, soil is a CL-ML silty clay.
^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel" to group name.
^L If soil contains $\geq 30\%$ plus No. 200, predominately sand, add "sandy" to group name.
^M If soil contains $\geq 30\%$ plus No. 4, predominately gravel, add "gravelly" to group name.
^N $PI \geq 4$ and plots on or above "A" line.
^O $PI < 4$ or plots below "A" line.
^P PI plots on or above "A" line.
^Q PI plots below "A" line.

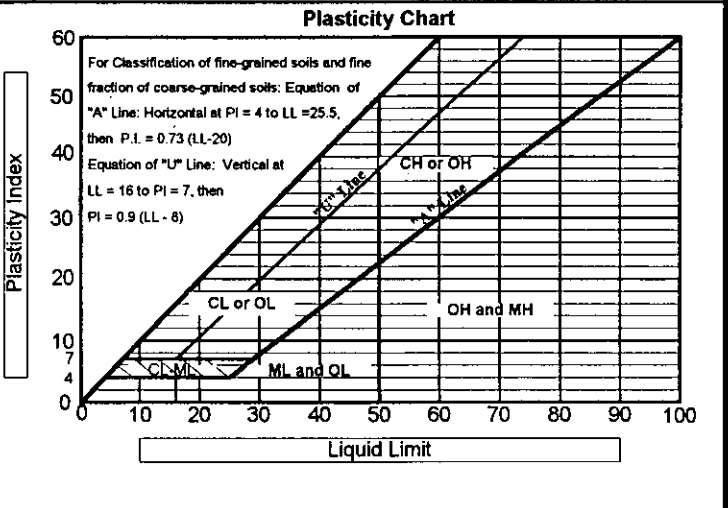
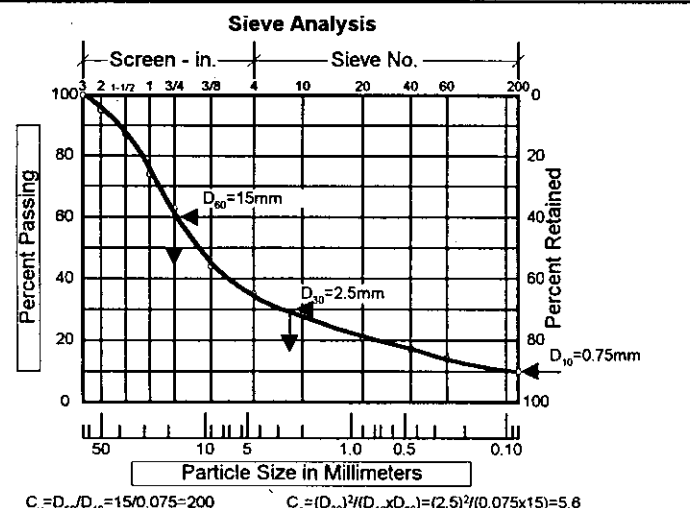


Figure R-9