

2015

# Saganashkee Slough - McMahon Woods Section 506 Great Lakes Fishery & Ecosystem Restoration Study

Appendix D – Geotechnical Design



**MCMAHON WOODS**

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**APPENDIX D**

**GEOTECHNICAL DESIGN**

U.S. Army Corps of Engineers, Chicago District  
Geotechnical and Survey Section

August 6, 2015

Appendix D: Geotechnical  
McMahon Woods section 506

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- G-1 Drilling Logs
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## I. Introduction and Study Area

1. Under the Section 506 Great Lakes Fisheries and Ecosystem Restoration Authority, a study of McMahon Woods and Saganashkee Slough was initiated to evaluate the feasibility of restoring the study area to its original ecological integrity. A geotechnical subsurface investigation was required for the project to identify the stratigraphy and soil properties within project boundaries. This investigation included digging nine (9) test pits in the McMahon Fen area to determine soil type and material characteristics to verify if material could be reused as the chosen alternative designates. The following figures indicate the location of Saganashkee Slough and McMahon Fen general study area as well as the approximate location of each test pit within the Fen area respectively.



Figure 1: Saganashkee Slough and McMahon Fen Boundaries

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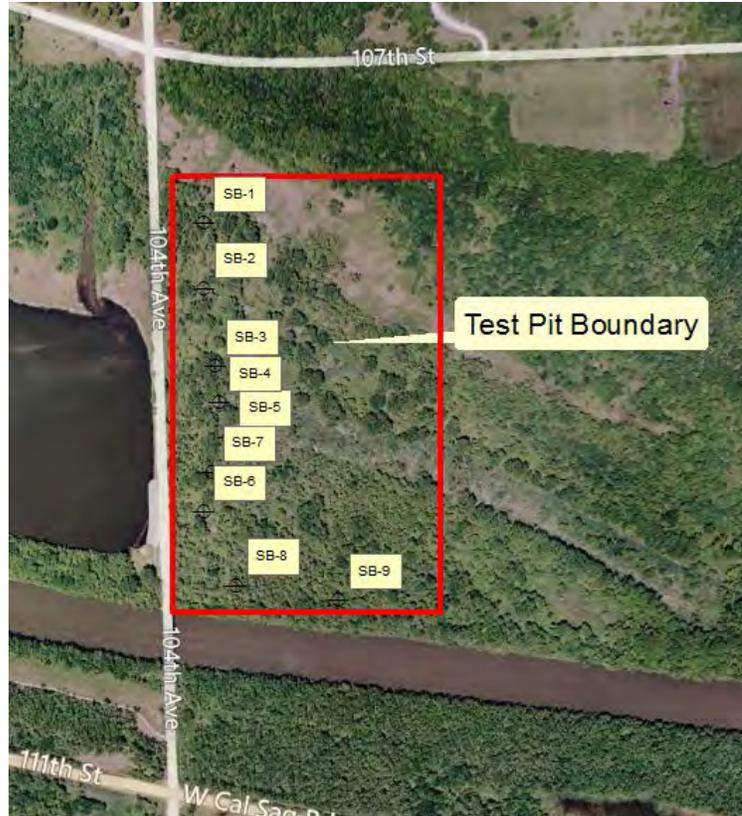


Figure 2: Test pit location

2. Opportunities for the materials characterized within the Fen includes placing material in the Slough to restore native aquatic beds and gravel bars and filling the rivulets located in the Fen in an effort to remove anthropogenic stressors and resurge the spring and fen hydrology. These opportunities hinge on the alternative chosen as well as the characterization of the material contained within the fen. This measure was removed from consideration after preliminary assessments found that the Forest Preserves of Cook County was uncomfortable with some measures related to Saganashkee Slough and removal of material from the fen was dropped from further consideration.

## II. Regional Geology

3. Bedrock Geology. Much of the Chicago area bedrock is comprised of Silurian dolomite underlain by Ordovician dolomite and limestone. Both the Silurian and Ordovician system consist of marine sediments deposited by a shallow sea that covered much of the interior part of the continent. The bedrock in the Chicago area is relatively flat, but has a slight eastward dip due to the Kankakee Arch. The surface of the bedrock is an undulating plain with steep sloped valleys as much as 100 to 150 feet deep. The slopes of

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the bedrock surface are rarely parallel to the slopes of the present topography, and outcrops are common.

4. Glacial Geology. The topography of the Chicagoland area today resulted mainly from the Wisconsin glaciations advance and subsequent erosion and man-made alterations. Though there were previous glacial processes, Wisconsin glaciers eroded the Chicago area so intensely that no deposits prior to this advance have been found (Bretz, 1955). Saganashkee Slough is located within an Outwash Plain south of two moraine systems from the Wisconsin glacial advance (Figure 3). The Valparaiso Moraine, the older and more prominent Moraine within the area, is a low-broad glacial ridge that encompasses an area running roughly southeastward through the western Chicago region into Indiana. The moraine is a complex of roughly parallel ridges, depressions and valleys generally between 10-15 miles wide. The second Moraine, the Tinley Moraine, is a narrower swath of Moraines that basically parallel the Valparaiso Moraine but is about 6 miles closer to Lake Michigan (Willman, 1971).

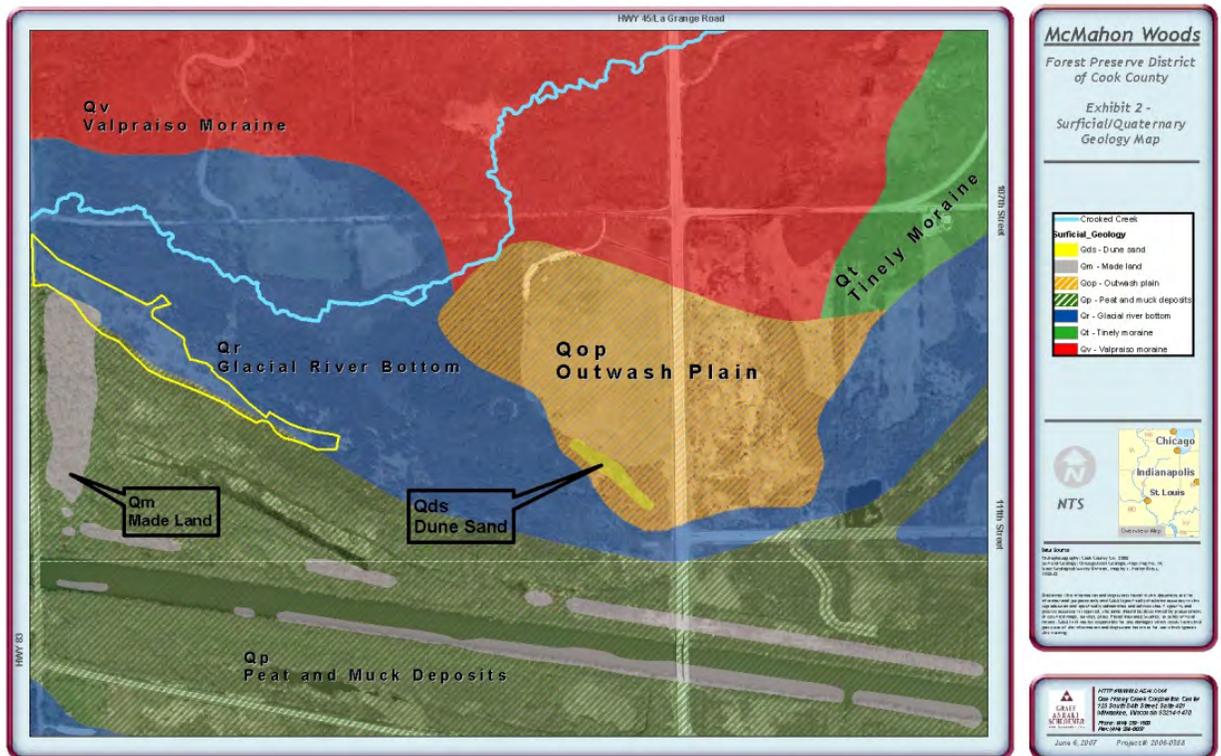


Figure 3: Physiographic Map of Project Area

5. Overburden Geology of McMahon Fen. With the formation of each Moraine system, new materials were deposited at the forefront of the receding glacier. Geological mapping of the Slough area shows evidence that the Slough itself occupies an erosional channel

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containing local deposits of sand and gravel of the Henry Formation (Figure 4). The Henry formation is characterized by sand and gravel from glacial meltwater rivers and streams in the outwash plains. To the north of the fen area along the Valparaiso and Tinley Moraine borders, deposits are largely silty, sandy, or gravelly till with local areas of silty clayey till. Lenses of poorly sorted gravel can be found as well. The Henry formation is subdivided into three members, the Wasco, Batavia, and Macinaw Members, based on general differences in the composition and sorting. From the map below it can be seen that the Batavia and Macinaw member are present on the project site. (Willman, 1971)

6. Overburden Geology of Saganashkee Slough. Grayslake peat is the dominant soil type of the Slough area. It occurs in area bordering existing lakes or in depressions that previously were lake basins. Although dominantly composed of peat, it can include organic silts and interbedded silts and sands from local slopewash into the basins. Grayslake peat is generally less than 20 ft thick and in some areas is less than 5 feet thick.

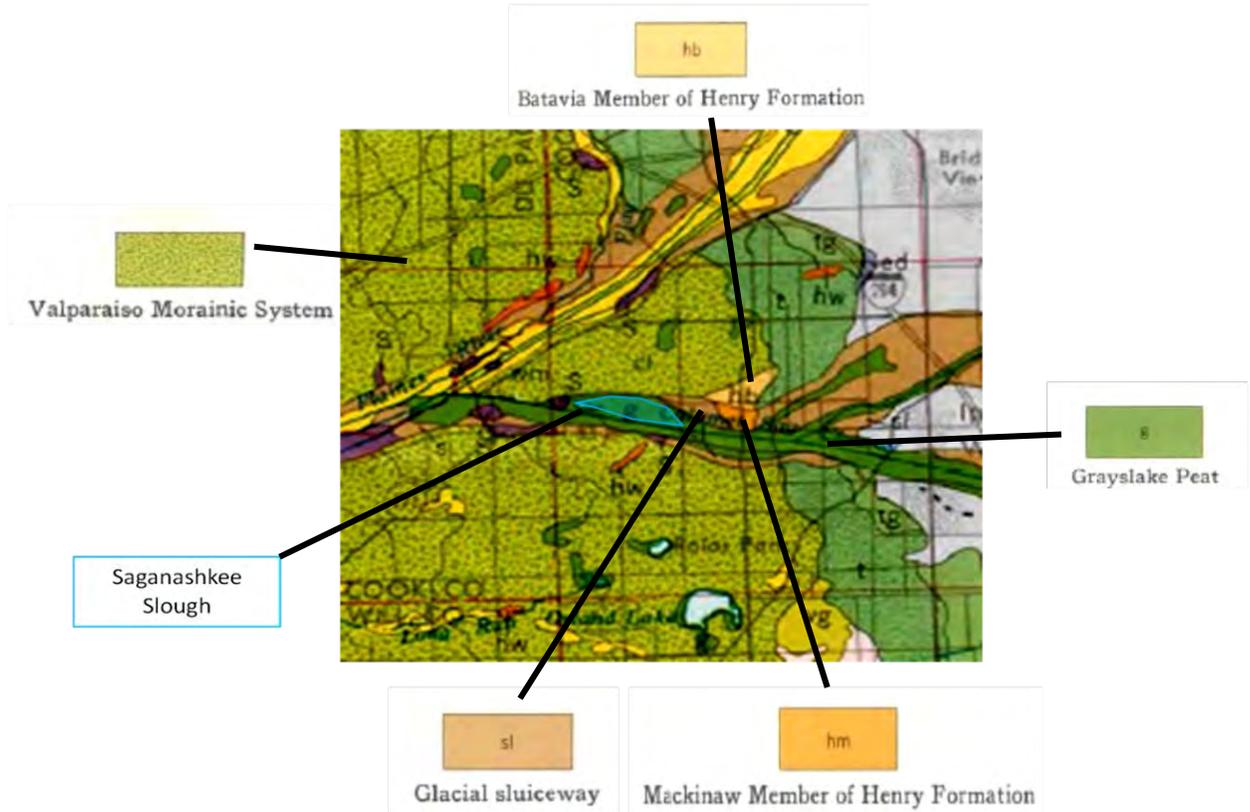


Figure 4: Overburden Geology of Project Area

### III. Project Location History

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7. Up until the early 1900s the swampy nature of the area discouraged development within the project boundaries. A map of the Saganashkee Slough project location from 1889 shows no development (Figure 5).



Figure 5: 1889 Project Location Map

8. In 1906, the Sanitary District of Chicago planned to expand the sanitary system of Chicago to meet the growing population of the city and the associated demand for more drawoffs of Lake Michigan. As a result, the Cal-Sag Canal was proposed to direct sewage from South Chicago, IL and East Chicago, IN. This 16.5 mile extension was to run from the main drainage channel near the Saganashkee Bridge to the Little Calumet River. Today this extension runs directly below the project location.
9. The secondary purpose for this channel was initially navigation, but between 1932 and 1944 freight traffic on the Cal-Sag channel increased from 67,000 tons to over 1 million tons. With the passage of the Rivers and Harbors Act in 1946, the Cal-Sag became the primary navigation route. Major improvements including widening the channel and altering overpass structures followed as a result (Larson, 1980).
10. Following the development and freight increase on the Cal-Sag Channel, the area within the current project boundaries started to be cultivated into farmlands and pastures. Human influences such as farming practices, ditch digging, and dumping sites for the channel expansion has been thought to have been the main catalyst for the degradation of the project area (Figure \_\_\_\_). Determining the extent of this degradation was one outcome necessary for this subsurface investigation.

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Figure 6: 1939 Project Location Map (CCFP)

#### IV. Subsurface Investigation

11. Nine (9) test pits were excavated within McMahon Fen to a depth of at least 4 ft. The subsurface conditions of the soil within each test pit were concluded from representative samples taken from each pit as well as visual analysis. The laboratory results performed on each representative sample are summarized below:

Table 1: Laboratory Tests Performed

Test Items	Standard Name
Unified Soil Classification	ASTM D 2487
Particle Size Analysis	ASTM D 422
Atterberg Limits	ASTM D 4318
Specific Gravity	ASTM D 854
Dry Density (Standard Proctor)	ASTM D 698
Moisture Content	ASTM D 2216

12. Generalized Descriptions. Most test pits were overlain by topsoil that measured up to 0.8 ft at the thickest (test pit SB-1). This topsoil covered caly, silt, and sand soils; bedrock

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was not encountered at the depths required for the study. Clay soils were encountered in six (6) test pits at approximate depths between the ground surface and 5.5 ft below the ground surface. These clay soils were classified as CL under the Uniform Soil Classification System (USCS). Test pits SB-1, SB-5, and SB-8 contained gray and brown silt soil between the ground surface and 5 ft below the ground surface. The silt soils were classified as ML under USCS. Gray and Brown clayey sand and silty, clayey sand soils were encountered in test pits SB-3 and SB-6 at approximate depths between the ground surface and 4.5 ft. These sands were classified as SC and SC-SM under USCS. For further detailed descriptions of the soils as well as the stratigraphy of the soil layers, see attachment G-1 at the end of this report.

13. Laboratory results. Two samples were taken from each test pit and mixed into a representative bulk sample for laboratory testing. Tests identified in Table 1 were performed on all of the samples. A summary of the results are included in Table 2 and Table 3 below. Full Laboratory Results are included in Attachment G-2.

Table 2: Laboratory Results

Boring Number	Depth, ft	Moisture Content	Soil Classification	Particle Size Distribution				Atterberg Limits		
			USCS	Gravel %	Sand %	Silt %	Clay %	LL	PL	PI
SB-1	0.8-4.5	13.0	SILT ML	10.2	32.8	41.0	16.0	38	26	12
SB-2	0.2-5.0	22.7	Lean CLAY CL	5.1	23.2	48.3	23.4	45	26	19
SB-3	0.5-3.5	11.4	SILT ML	1.8	52.2	32.3	13.7	29	22	7
SB-4	0.0-3.0	21.0	Silty, Clayey SAND SC- SM	0.2	6.7	69.8	23.3	33	23	10
SB-5	1.0-3.5	20.8	SILT ML	0.0	14.6	58.7	26.7	45	28	17
SB-6	0.1-4.5	11.0	Clayey SAND SC	26.7	27.2	23.8	20.3	35	20	15
SB-7	1.9-4.0	16.4	Lean CLAY CL	0.3	8.0	61.8	29.9	38	24	14
SB-8	0.0-3.0	24.0	SILT ML	0.4	13.0	64.4	22.2	42	30	12
SB-9	0.0-3.0	14.4	Lean CLAY CL	3.3	10.5	64.9	21.3	29	21	8

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Table 3: Laboratory Density and Moisture Content

Sample No.	Specific Gravity	Maximum Dry Density, pcf	Optimum Moisture Content, %
SB-1	2.33	118.3	13.5
SB-2	2.51	94.1	22.9
SB-3	2.70	89.2	28.2
SB-4	2.65	110.8	16.9
SB-5	2.45	99.0	20.1
SB-6	2.62	108.7	17.4
SB-7	2.55	114.7	12.7
SB-8	2.61	101.0	21.0
SB-9	2.68	108.3	17.6

## V. Design Considerations

14. Though the material may have been moved or affected by human means to create the topography present today, no debris or possible dredge material was detected during the subsurface investigation. Because of the absence of debris and dredge material in the fen area, the material is adequate for the filling, grading and reuse measures indicated in the alternatives.
15. In an effort foster fish growth and abundance in the Slough, specific fish component measures were added to the project. Slough contouring, specifically adding deep holes in various locations within the Slough, was one suggested measure. To accomplish this, holes roughly 10-15 ft deep would be excavated in the slough in an effort to create a more acceptable habitat for fish. These holes would have a 1.5:1 ft side slope and be under as much as 10 ft of water. A slop stability analysis was run utilizing GeoSlope software to determine if this steep slope was feasible for construction. This measure was also removed from further consideration.
16. Because no test pits were located within the Slough itself, a few assumptions about the material comprising the slope profile were made. It was assumed that the material would not vary greatly from the material that comprised the test pits in the nearby fen location. Since test pit #8 was the closest in proximity to the Slough, the slope profile used in the stability analysis modeled the material characteristics of this test pit. Therefore, it was assumed that 3 ft of silt over a lean clay was a good representation to determine the stability of the slope.

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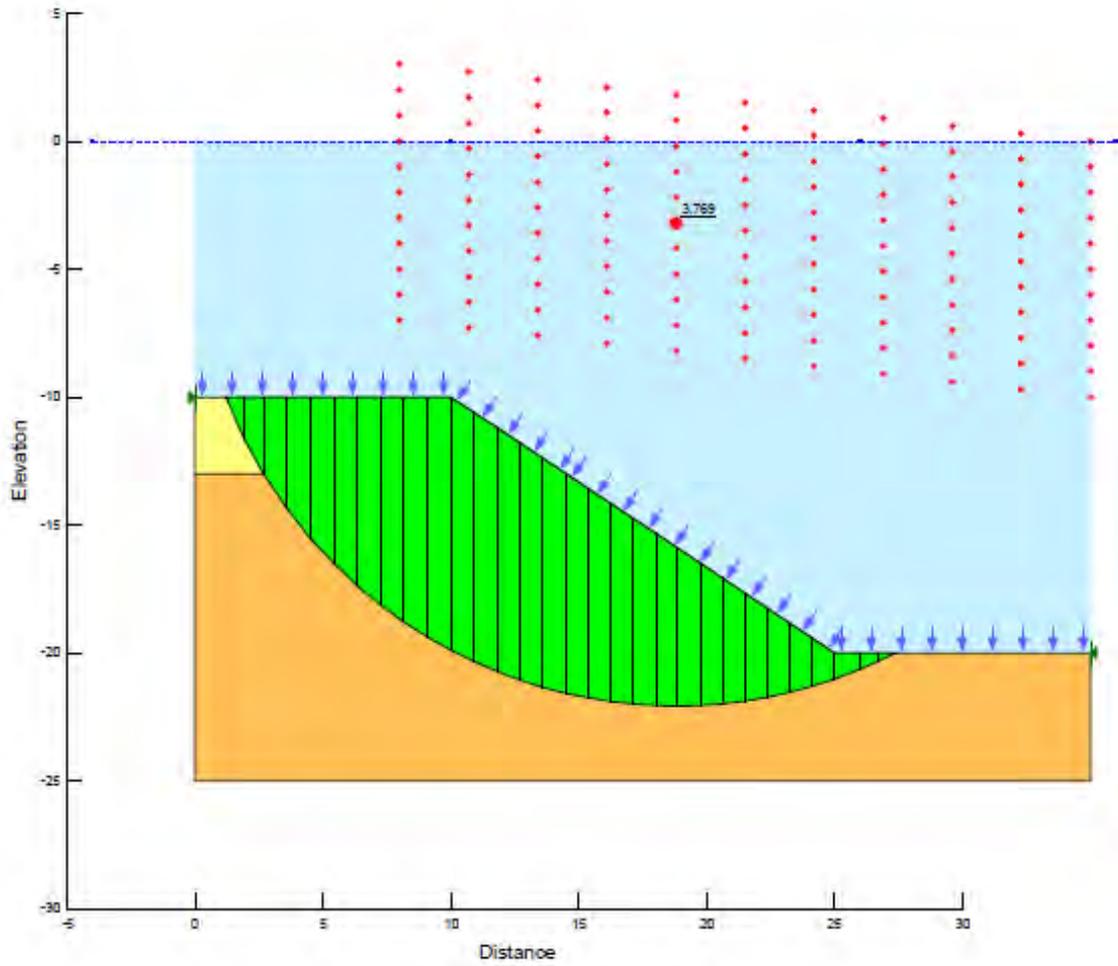


Figure 7: Slope Profile 10ft Depth

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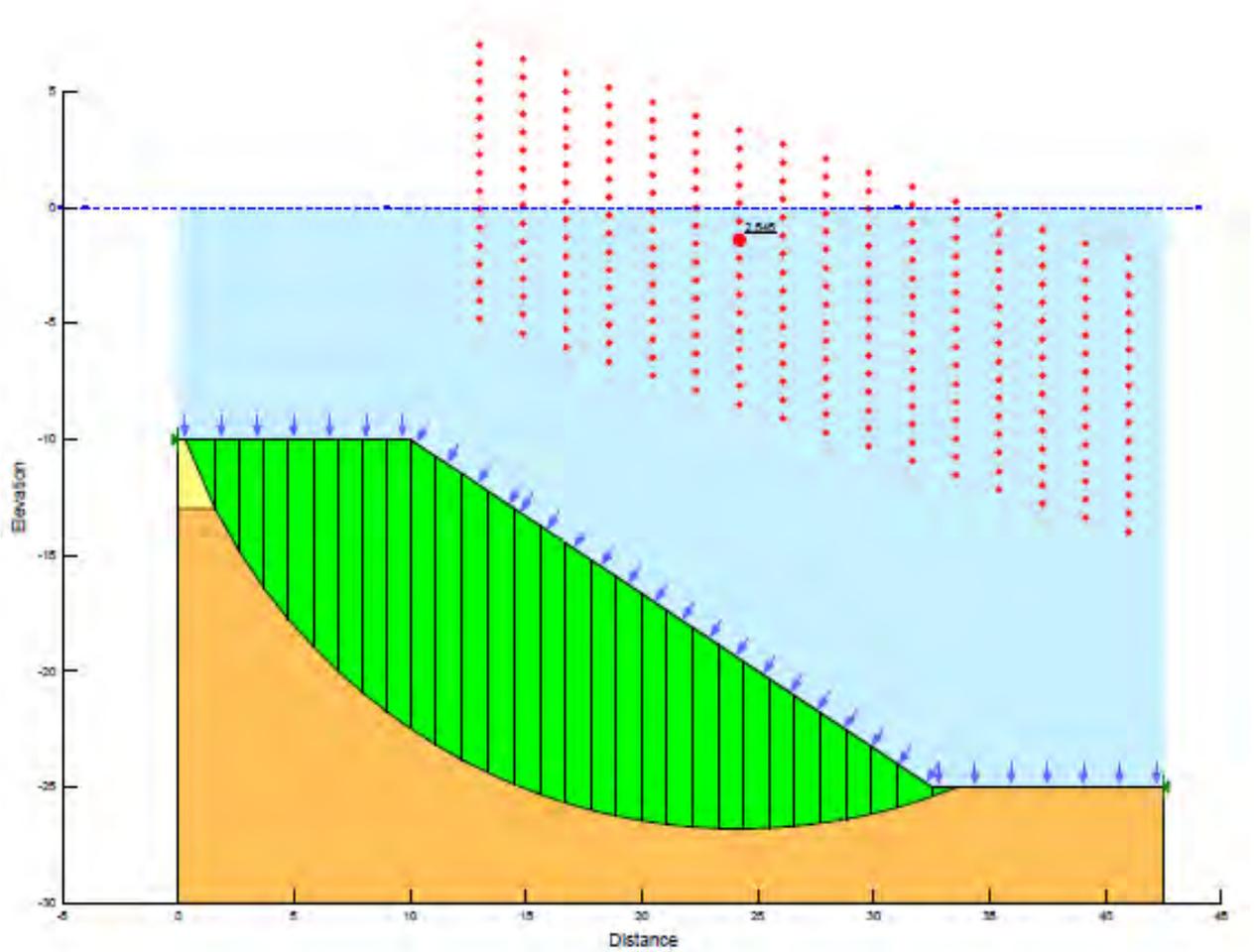


Figure 8: Slope Profile 15ft Depth

17. A factor of safety against slope failure of 3.769 and 2.545 was determined for the 10ft and 15ft deep holes respectively. Any factor of safety greater than 1 is considered stable. Therefore a slope of 1.5:1 should be able to be achieved within the Slough.

## REFERENCES

Bretz, J. H., “Geology of the Chicago Region” Part II – The Pleistocene, ISGS Bulletin No. 65, Part II, 1955

Larson, John W., “Those Army Engineers: a history of the Chicago District, U.S. Army Corps of Engineers”, 1980

Willman, H.B. and Jerry Lineback, “Surficial Geology of the Chicago Region”, 1970.

Willman, H.B. “Summary of the Geology of the Chicago Area”, ISGS Circular 460, 1971.

“Water and Related Wells in Illinois” ISGS IL Well Interactive Map viewer, 12/15/2008,  
<http://runoff.isgs.uiuc.edu/website/ilwater/viewer.htm>

## **ATTACHMENT**

G-1 Saganashkee Slough Borings

<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
1. PROJECT Saganashkee Slough		10. SIZE AND TYPE OF BIT NA	
2. LOCATION (Coordinates or Station) Palos, IL		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY TesTech		12. MANUFACTURER'S DESIGNATION OF DRILL NA	
4. HOLE NO. (As shown on drawing title and file number) SB-1		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 3 UNDISTURBED	
5. NAME OF DRILLER Greg Reid		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 8/10/2012 COMPLETED 8/10/2012	
8. DEPTH DRILLED INTO ROCK NA		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 4.5		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.0		TOPSOIL		1 0.0 0.8	All samples are 'Bulk Samples' retrieved from side of test pit.
	0.8		Brown Sandy SILT, few gravel (ML)		2 0.8 1.9	
	4.5				3 1.9 4.5	

<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
1. PROJECT Saganashkee Slough		10. SIZE AND TYPE OF BIT NA	
2. LOCATION (Coordinates or Station) Palos, IL N 1,830,856.8 E 1,109,816.4		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY TesTech		12. MANUFACTURER'S DESIGNATION OF DRILL NA	
4. HOLE NO. (As shown on drawing title and file number) SB-2		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 2 UNDISTURBED	
5. NAME OF DRILLER Greg Reid		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 8/10/2012 COMPLETED 8/10/2012	
8. DEPTH DRILLED INTO ROCK NA		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 5.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.0		TOPSOIL			All samples are 'Bulk Samples' retrieved from side of test pit.
	0.2		Brown CLAY, some sand, (CL)		1 0.2 1.8	
						2 1.8 5.0
	5.0					

<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
	1. PROJECT Saganashkee Slough		10. SIZE AND TYPE OF BIT NA
2. LOCATION (Coordinates or Station) Palos, IL N 1,830,564.1 E 1,109,645.7		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY TesTech		12. MANUFACTURER'S DESIGNATION OF DRILL NA	
4. HOLE NO. (As shown on drawing title and file number) SB-3		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 3	DISTURBED UNDISTURBED
5. NAME OF DRILLER Greg Reid		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 8/10/2012	COMPLETED 8/10/2012
8. DEPTH DRILLED INTO ROCK NA		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 5.5		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.0		TOPSOIL			All samples are 'Bulk Samples' retrieved from side of test pit.
	0.7		Brown Silty Clayey SAND (SC-SM)		1 0.2 2.0	
	3.5				2 2.0 3.5	
	5.5		Brown Silty CLAY, trace gravel (CL)		3 3.5 5.5	

<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
	1. PROJECT Saganashkee Slough		10. SIZE AND TYPE OF BIT NA
2. LOCATION (Coordinates or Station) Palos, IL N 1,830,222.6 E 1,109,685.3		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY TesTech		12. MANUFACTURER'S DESIGNATION OF DRILL NA	
4. HOLE NO. (As shown on drawing title and file number) SB-4		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 3	DISTURBED 3 UNDISTURBED
5. NAME OF DRILLER Greg Reid		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 8/10/2012	COMPLETED 8/10/2012
8. DEPTH DRILLED INTO ROCK NA		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 5.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.0		TOPSOIL		1 0.0 1.2	All samples are 'Bulk Samples' retrieved from side of test pit.
	0.4		Brown CLAY (CL)		2 1.2 3.0	
	3.0		Brown Silty Sandy CLAY, trace gravel, trace organics (CL)		3 3.0 5.0	
	5.0					

<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
1. PROJECT Saganashkee Slough		10. SIZE AND TYPE OF BIT NA	
2. LOCATION (Coordinates or Station) Palos, IL N 1,830,320.1 E 1,109,971.9		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY TesTech		12. MANUFACTURER'S DESIGNATION OF DRILL NA	
4. HOLE NO. (As shown on drawing title and file number) SB-5		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 3 UNDISTURBED	
5. NAME OF DRILLER Greg Reid		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 8/10/2012 COMPLETED 8/10/2012	
8. DEPTH DRILLED INTO ROCK NA		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 5.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.1		TOPSOIL			All samples are 'Bulk Samples' retrieved from side of test pit.
			Brown SILT (ML)		1 0.1 1.0	
					2 1.0 3.5	
					3 3.5 5.0	
	5.0					

<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
1. PROJECT Saganashkee Slough	10. SIZE AND TYPE OF BIT NA		
2. LOCATION (Coordinates or Station) Palos, IL N 1,829,893.3 E 1,109,773.7	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
3. DRILLING AGENCY TesTech	12. MANUFACTURER'S DESIGNATION OF DRILL NA		
4. HOLE NO. (As shown on drawing title and file number) SB-6	13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 2	DISTURBED 2	UNDISTURBED
5. NAME OF DRILLER Greg Reid	14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.	15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERBURDEN	16. DATE HOLE 8/9/2012	STARTED 8/9/2012	COMPLETED 8/10/2012
8. DEPTH DRILLED INTO ROCK NA	17. ELEVATION TOP OF HOLE		
9. TOTAL DEPTH OF HOLE 4.5	18. TOTAL CORE RECOVERY FOR BORING		%
	19. SIGNATURE OF INSPECTOR		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.1		TOPSOIL		1	All samples are 'Bulk Samples' retrieved from side of test pit.
			Brown Clayey SAND, some gravel (SC)		0.1 2.1	
					2	
					2.1	
					4.5	
	4.5					

<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
1. PROJECT Saganashkee Slough		10. SIZE AND TYPE OF BIT NA	
2. LOCATION (Coordinates or Station) Palos, IL N 1,830,067.1 E 1,109,984.1		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY TesTech		12. MANUFACTURER'S DESIGNATION OF DRILL NA	
4. HOLE NO. (As shown on drawing title and file number) SB-7		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 3 UNDISTURBED	
5. NAME OF DRILLER Greg Reid		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 8/9/2012 COMPLETED 8/10/2012	
8. DEPTH DRILLED INTO ROCK NA		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 4.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.1		TOPSOIL			All samples are 'Bulk Samples' retrieved from side of test pit.
			Brown Sandy CLAY, silt and gravel (CL)		1 0.1 1.9	
	1.9		Gray CLAY (CL)		2 1.9 2.9	
					3 2.9 4.0	
	4.0					

<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
	1. PROJECT Saganashkee Slough		10. SIZE AND TYPE OF BIT NA
2. LOCATION (Coordinates or Station) Palos, IL N 1,830,000.0 E 1,110,411.0		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY TesTech		12. MANUFACTURER'S DESIGNATION OF DRILL NA	
4. HOLE NO. (As shown on drawing title and file number) SB-8		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN 3	DISTURBED UNDISTURBED
5. NAME OF DRILLER Greg Reid		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE 8/10/2012	STARTED COMPLETED 8/10/2012
8. DEPTH DRILLED INTO ROCK NA		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 5.0		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.0		Gray SILT (ML)		1 0.0 1.0	All samples are 'Bulk Samples' retrieved from side of test pit.
					2 1.0 3.0	
	3.0		Brown Sandy CLAY, trace silt, trace gravel (CL)		3 3.0 5.0	
	5.0					

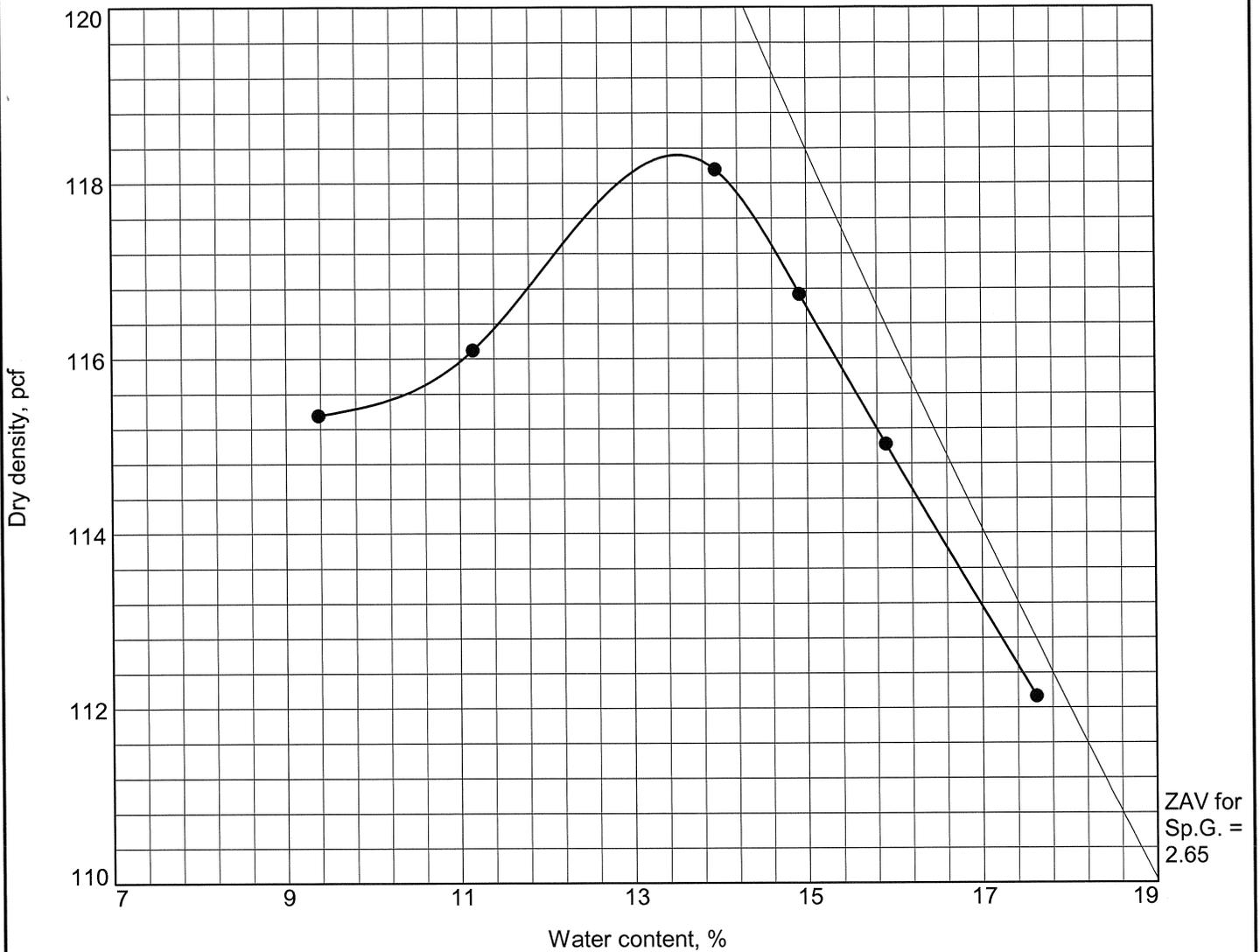
<b>DRILLING LOG</b>	DIVISION Chicago	INSTALLATION Test Pit	SHEET 1 OF 1 SHEETS
1. PROJECT Saganashkee Slough		10. SIZE AND TYPE OF BIT NA	
2. LOCATION (Coordinates or Station) Palos, IL N 1,829,625.1 E 1,110,359.2		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY TesTech		12. MANUFACTURER'S DESIGNATION OF DRILL NA	
4. HOLE NO. (As shown on drawing title and file number) SB-9		13. TOTAL NO. OF OVERBURDEN SAMPLES TAKEN DISTURBED 3 UNDISTURBED	
5. NAME OF DRILLER Greg Reid		14. TOTAL NUMBER CORE BOXES	
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED --- DEG. FROM VERT.		15. ELEVATION GROUND WATER	
7. THICKNESS OF OVERBURDEN		16. DATE HOLE STARTED 8/10/2012 COMPLETED 8/10/2012	
8. DEPTH DRILLED INTO ROCK NA		17. ELEVATION TOP OF HOLE	
9. TOTAL DEPTH OF HOLE 4.5		18. TOTAL CORE RECOVERY FOR BORING %	
		19. SIGNATURE OF INSPECTOR	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth weathering, etc., if significant) g
	0.0		Brown CLAY, trace gravel (CL)		1 0.0 1.0	All samples are 'Bulk Samples' retrieved from side of test pit.
					2 1.0 3.0	
	3.0		Gray Silty CLAY, trace sand, trace gravel (CL)		3 3.0 4.5	
	4.5					

## **ATTACHMENT**

G-2 Lab Results

# COMPACTION TEST REPORT

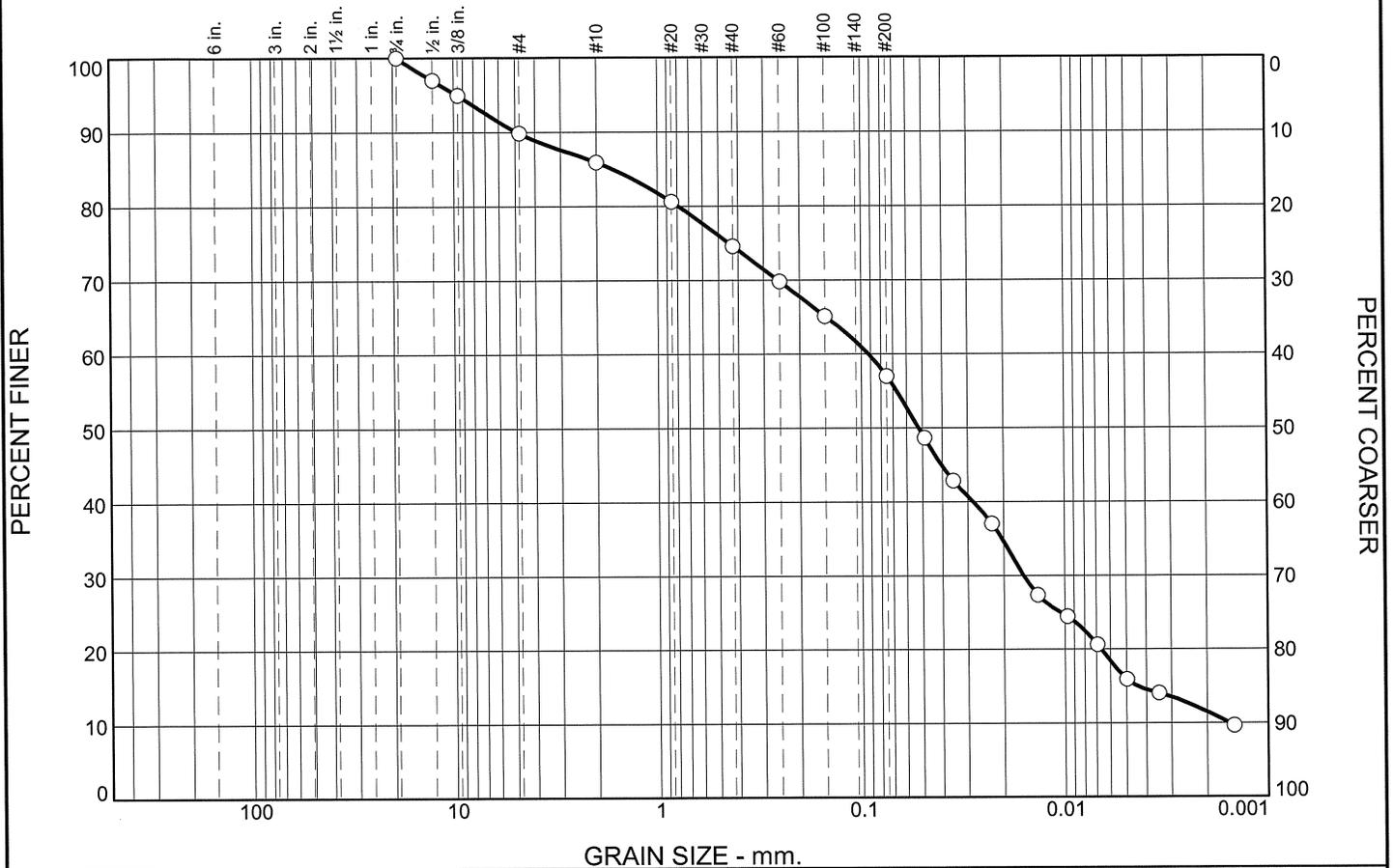


Test specification: ASTM D 698-07 Method C Standard  
 ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
0.8' - 4.5'				2.33			16.5	

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 118.3 pcf Optimum moisture = 13.5 %	brown sandy SILT
<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL ○ <b>Loc.:</b> SB-1 Samples 1 & 2 <b>Depth:</b> 0.8' - 4.5' <b>Sample No.:</b> 0954	<b>Remarks:</b> Date Received: 8/29/12 Lab No.: 0954
<b>TES TECH</b>	<b>File No</b>

# Particle Size Distribution Report - ASTM D2487



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.2	3.9	11.3	17.6	41.0	16.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.5	97.0		
0.375	94.9		
#4	89.8		
#10	85.9		
#20	80.6		
#40	74.6		
#60	69.8		
#100	65.1		
#200	57.0		

\* (no specification provided)

**Material Description**  
brown sandy SILT

**Atterberg Limits**  
PL= 26      LL= 38      PI= 12

**Coefficients**  
D<sub>90</sub>= 4.8756      D<sub>85</sub>= 1.6637      D<sub>60</sub>= 0.0921  
D<sub>50</sub>= 0.0523      D<sub>30</sub>= 0.0160      D<sub>15</sub>= 0.0044  
D<sub>10</sub>= 0.0016      C<sub>u</sub>= 59.20      C<sub>c</sub>= 1.78

**Classification**  
USCS= ML      AASHTO= A-6(5)

**Remarks**  
Date of Instructions: 8/27/12  
Lab No.: 0954  
Sample Contains Tiny Shell Fragments

Location: SB-1 Samples 1 & 2  
Sample Number: 0954      Depth: 0.8' - 4.5'

Date: 8/24/12



Client: Detroit/Chicago District, Corps of Engineers  
Project: Saganashkee Slough Subsurface Investigation - Palos, IL

Project No: G030-IL

File No

**GRAIN SIZE DISTRIBUTION TEST DATA**

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-1 Samples 1 & 2

**Depth:** 0.8' - 4.5'

**Sample Number:** 0954

**Material Description:** brown sandy SILT

**Date:** 8/24/12

**PL:** 26

**LL:** 38

**PI:** 12

**USCS Classification:** ML

**AASHTO Classification:** A-6(5)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

Sample Contains Tiny Shell Fragments

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1375.19	764.33	0.00	0.75	0.00	100.0	0.0
			0.5	18.52	97.0	3.0
			0.375	30.92	94.9	5.1
			#4	62.07	89.8	10.2
51.42	0.00	0.00	#10	86.04	85.9	14.1
			#20	3.20	80.6	19.4
			#40	6.79	74.6	25.4
			#60	9.65	69.8	30.2
			#100	12.47	65.1	34.9
			#200	17.32	57.0	43.0

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 85.9

Weight of hydrometer sample = 51.420

Hygroscopic moisture correction:

Moist weight and tare = 266.70

Dry weight and tare = 257.58

Tare weight = 111.71

Hygroscopic moisture = 6.2%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.33

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	29.0	25.1	0.0144	29.0	11.5	0.0489	48.6	51.4
2.00	24.5	26.0	22.1	0.0144	26.0	12.0	0.0353	42.8	57.2
5.00	24.5	23.0	19.1	0.0144	23.0	12.5	0.0228	37.0	63.0
15.00	24.5	18.0	14.1	0.0144	18.0	13.3	0.0136	27.3	72.7
30.00	24.5	16.5	12.6	0.0144	16.5	13.6	0.0097	24.4	75.6
60.00	24.6	14.5	10.6	0.0144	14.5	13.9	0.0069	20.6	79.4
120.00	24.8	12.0	8.2	0.0143	12.0	14.3	0.0050	15.9	84.1
250.00	24.9	11.0	7.2	0.0143	11.0	14.5	0.0034	14.0	86.0
1440.00	24.1	9.0	5.0	0.0145	9.0	14.8	0.0015	9.6	90.4

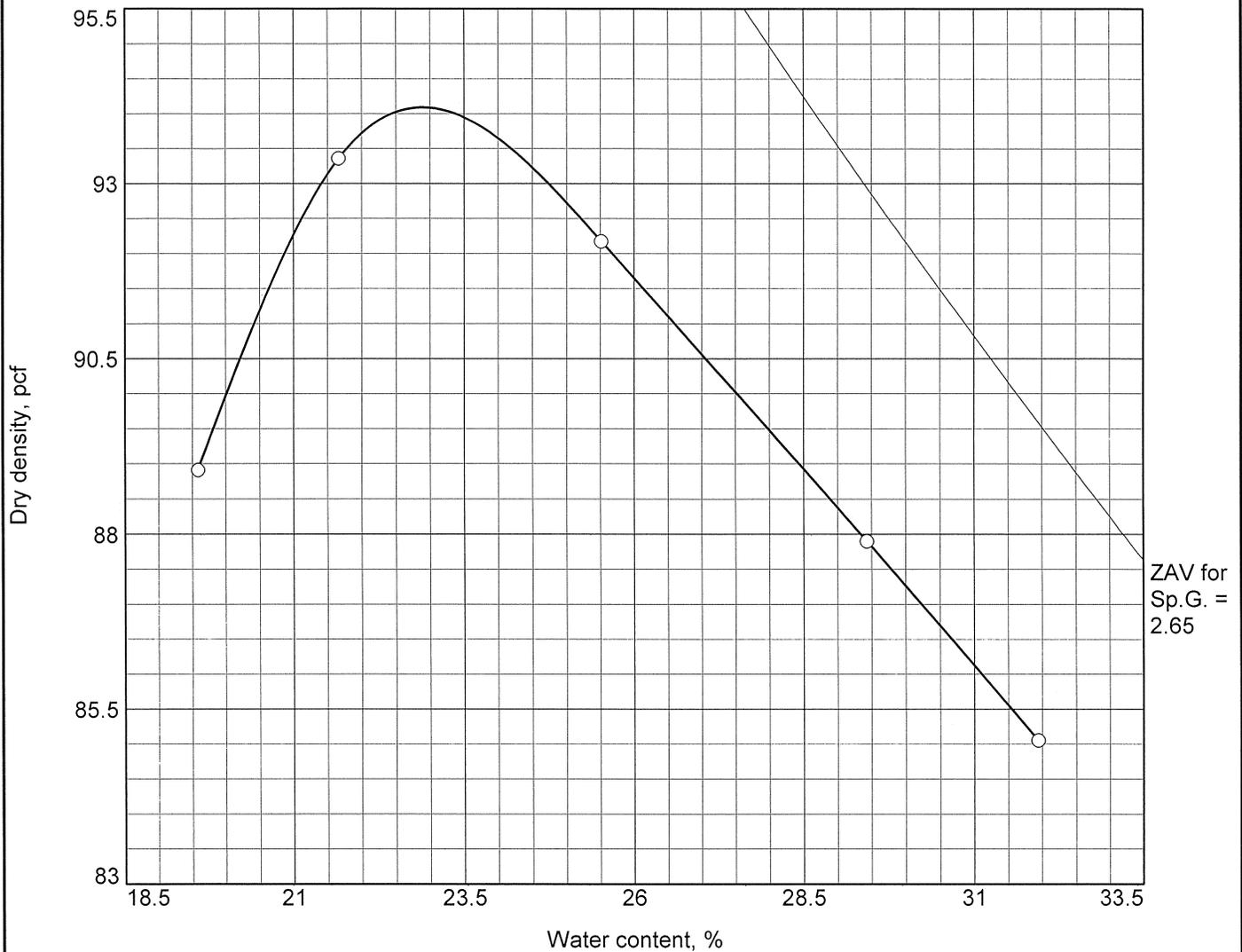
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	10.2	10.2	3.9	11.3	17.6	32.8	41.0	16.0	57.0

D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
0.0016	0.0044	0.0066	0.0160	0.0523	0.0921	0.7915	1.6637	4.8756	9.6061

Fineness Modulus	C <sub>u</sub>	C <sub>c</sub>
1.31	59.20	1.78

# COMPACTION TEST REPORT

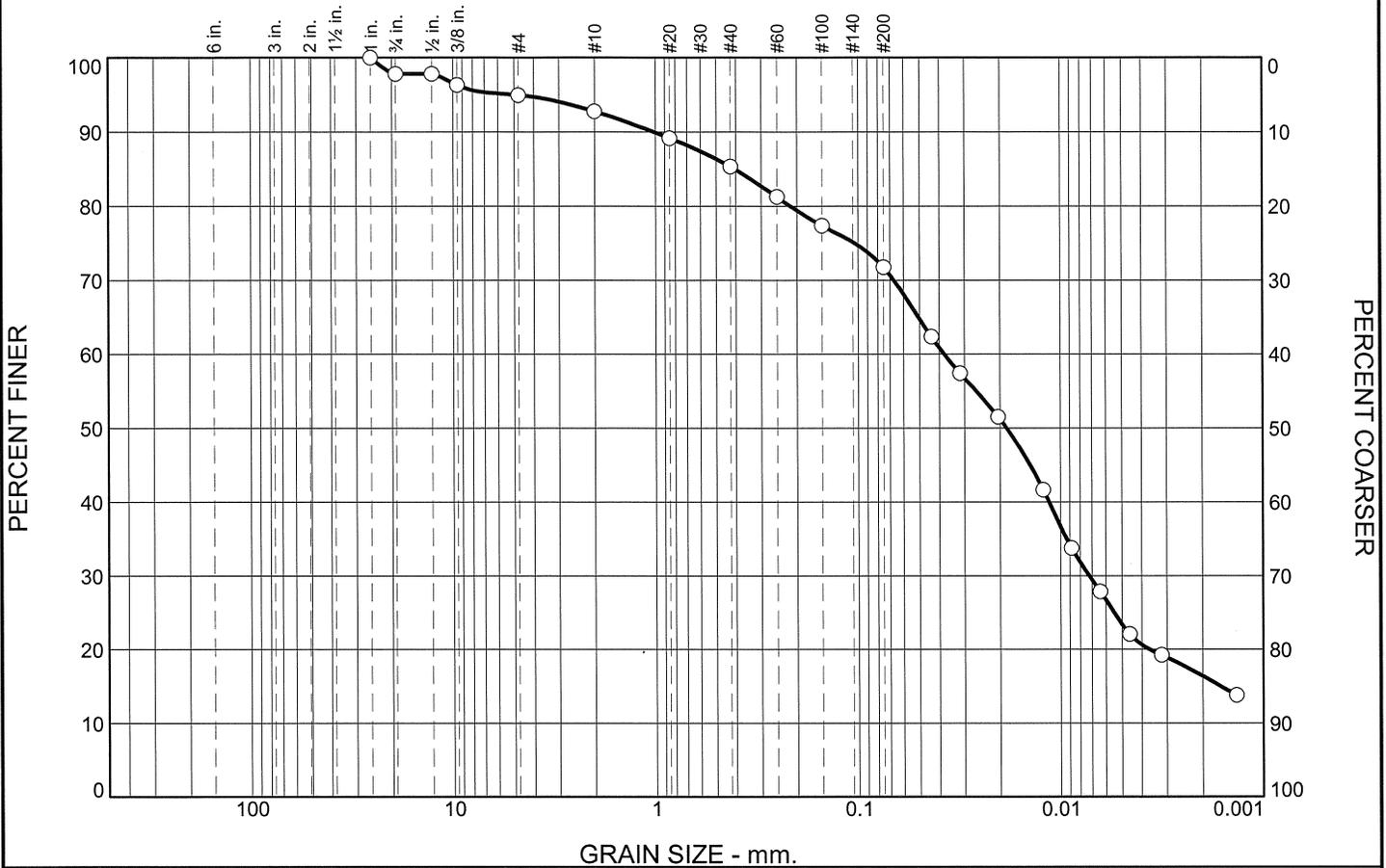


Test specification: ASTM D 698-07 Method B Standard  
 ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0.2' - 5.0'	CL	A-7-6(13)		2.51	45	19	3.7	71.7

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 94.1 pcf Optimum moisture = 22.9 %	dark brown lean CLAY with sand
<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL ○ <b>Location:</b> SB-2 Samples 1 & 2 <b>Sample Number:</b> 0954	<b>Remarks:</b> Date Received: 8/29/12 Lab No.: 0954
	File

# Particle Size Distribution Report - ASTM D2487



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.2	2.9	2.1	7.5	13.6	48.3	23.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0	100.0		
0.75	97.8		
0.5	97.8		
0.375	96.3		
#4	94.9		
#10	92.8		
#20	89.2		
#40	85.3		
#60	81.2		
#100	77.3		
#200	71.7		

**Material Description**

dark brown lean CLAY with sand

**Atterberg Limits**

PL= 26      LL= 45      PI= 19

**Coefficients**

D<sub>90</sub>= 1.0201      D<sub>85</sub>= 0.4066      D<sub>60</sub>= 0.0378  
D<sub>50</sub>= 0.0185      D<sub>30</sub>= 0.0072      D<sub>15</sub>= 0.0016  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= CL              AASHTO= A-7-6(13)

**Remarks**

Date of Instructions: 8/27/12  
Lab No.: 0954  
Sample Contains Tiny Sea Shell Fragments

\* (no specification provided)

**Location:** SB-2 Samples 1 & 2  
**Sample Number:** 0954      **Depth:** 0.2' - 5.0'

**Date:** 8/24/12

<b>TESTTECH</b>	<p><b>Client:</b> Detroit/Chicago District, Corps of Engineers</p> <p><b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL</p> <p><b>Project No:</b> G030-IL      <b>File No</b></p>
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**GRAIN SIZE DISTRIBUTION TEST DATA**

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-2 Samples 1 & 2

**Depth:** 0.2' - 5.0'

**Sample Number:** 0954

**Material Description:** dark brown lean CLAY with sand

**Date:** 8/24/12

**PL:** 26

**LL:** 45

**PI:** 19

**USCS Classification:** CL

**AASHTO Classification:** A-7-6(13)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

Sample Contains Tiny Sea Shell Fragments

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1439.69	721.30	0.00	1.0	0.00	100.0	0.0
			0.75	15.67	97.8	2.2
			0.5	15.67	97.8	2.2
			0.375	26.29	96.3	3.7
			#4	36.31	94.9	5.1
			#10	52.02	92.8	7.2
			#20	2.10	89.2	10.8
54.01	0.00	0.00	#40	4.34	85.3	14.7
			#60	6.71	81.2	18.8
			#100	8.99	77.3	22.7
			#200	12.25	71.7	28.3

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 92.8

Weight of hydrometer sample = 54.009

Hygroscopic moisture correction:

Moist weight and tare = 257.33

Dry weight and tare = 242.92

Tare weight = 111.03

Hygroscopic moisture = 10.9%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.51

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	35.5	31.6	0.0135	35.5	10.5	0.0437	62.3	37.7
2.00	24.5	33.0	29.1	0.0135	33.0	10.9	0.0315	57.4	42.6
5.00	24.5	30.0	26.1	0.0135	30.0	11.4	0.0204	51.5	48.5
15.00	24.5	25.0	21.1	0.0135	25.0	12.2	0.0122	41.6	58.4
30.00	24.5	21.0	17.1	0.0135	21.0	12.9	0.0088	33.7	66.3
60.00	24.5	18.0	14.1	0.0135	18.0	13.3	0.0064	27.8	72.2
120.00	24.7	15.0	11.2	0.0135	15.0	13.8	0.0046	22.0	78.0
250.00	24.9	13.5	9.7	0.0134	13.5	14.1	0.0032	19.2	80.8
1440.00	24.1	11.0	7.0	0.0136	11.0	14.5	0.0014	13.8	86.2

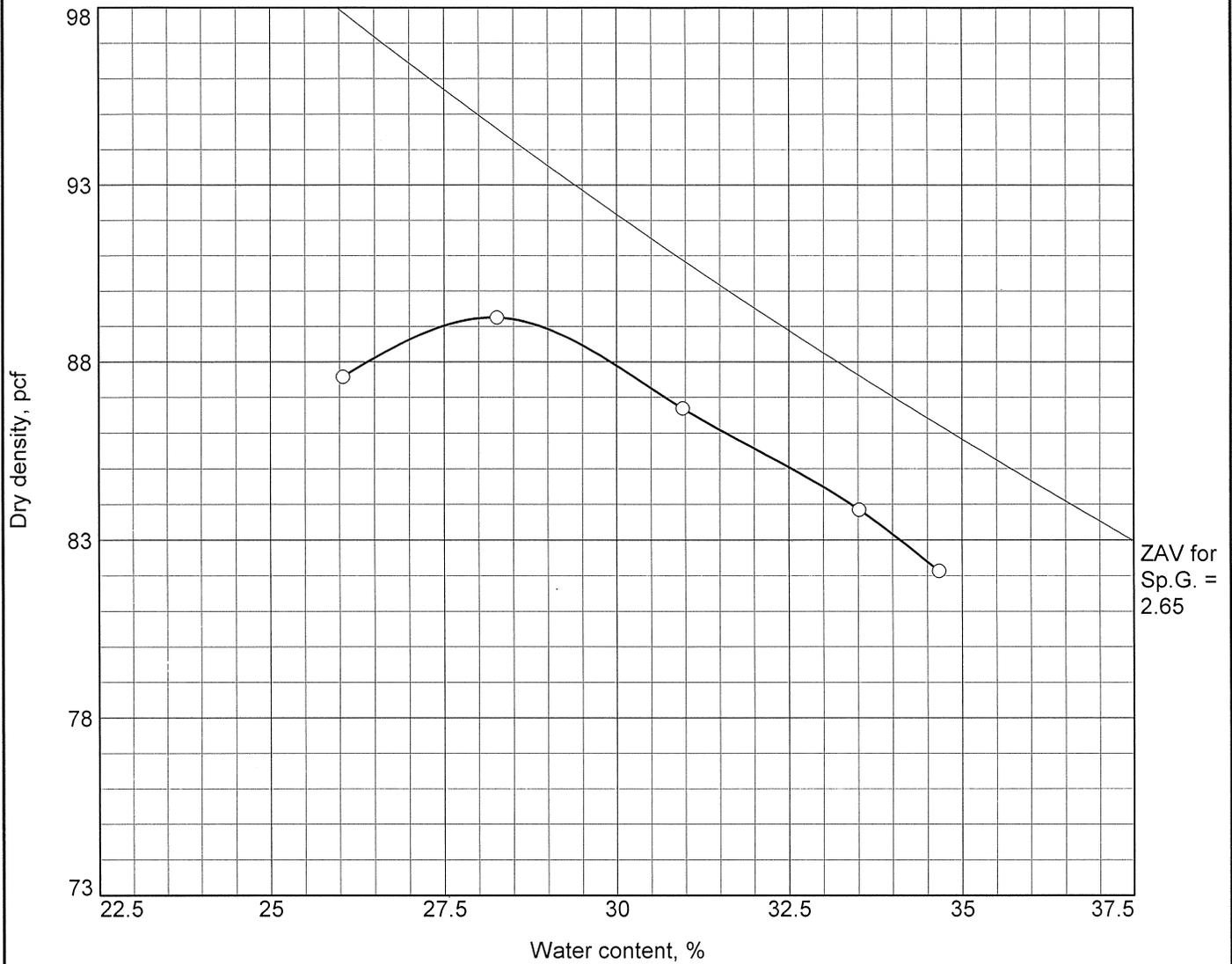
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	2.2	2.9	5.1	2.1	7.5	13.6	23.2	48.3	23.4	71.7

D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
	0.0016	0.0037	0.0072	0.0185	0.0378	0.2149	0.4066	1.0201	5.0281

Fineness Modulus
0.79

# COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0.2' - 3.5'	SC-SM	A-4(1)		2.70	29	7	0.0	46.0

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 89.2 pcf Optimum moisture = 28.2 %	dark brown silty, clayey SAND
<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL Location: SB-3 Samples 1 & 2 <b>Sample Number:</b> 0954	<b>Remarks:</b> Date Received: 8/29/12 Lab No.: 0954
	File



**GRAIN SIZE DISTRIBUTION TEST DATA**

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-3 Samples 1 & 2

**Depth:** 0.2' - 3.5'

**Sample Number:** 0954

**Material Description:** dark brown silty, clayey SAND

**Date:** 8/31/12

**PL:** 22

**LL:** 29

**PI:** 7

**USCS Classification:** SC-SM

**AASHTO Classification:** A-4(1)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1577.96	736.62	0.00	0.375	0.00	100.0	0.0
			#4	14.80	98.2	1.8
			#10	62.82	92.5	7.5
52.44	0.00	0.00	#20	6.91	80.3	19.7
			#40	12.36	70.7	29.3
			#60	19.25	58.6	41.4
			#100	23.04	51.9	48.1
			#200	26.37	46.0	54.0

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 92.5

Weight of hydrometer sample = 52.440

Hygroscopic moisture correction:

Moist weight and tare = 271.64

Dry weight and tare = 263.70

Tare weight = 110.77

Hygroscopic moisture = 5.2%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.70

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	24.0	20.1	0.0127	24.0	12.4	0.0448	36.9	63.1
2.00	24.5	22.0	18.1	0.0127	22.0	12.7	0.0321	33.2	66.8
5.00	24.5	19.0	15.1	0.0127	19.0	13.2	0.0207	27.7	72.3
15.00	24.5	16.5	12.6	0.0127	16.5	13.6	0.0121	23.1	76.9
30.00	24.5	14.0	10.1	0.0127	14.0	14.0	0.0087	18.6	81.4
60.00	24.5	12.0	8.1	0.0127	12.0	14.3	0.0062	14.9	85.1
120.00	24.7	11.0	7.2	0.0127	11.0	14.5	0.0044	13.2	86.8
250.00	24.9	10.0	6.2	0.0127	10.0	14.7	0.0031	11.5	88.5
1440.00	24.1	8.0	4.0	0.0128	8.0	15.0	0.0013	7.3	92.7

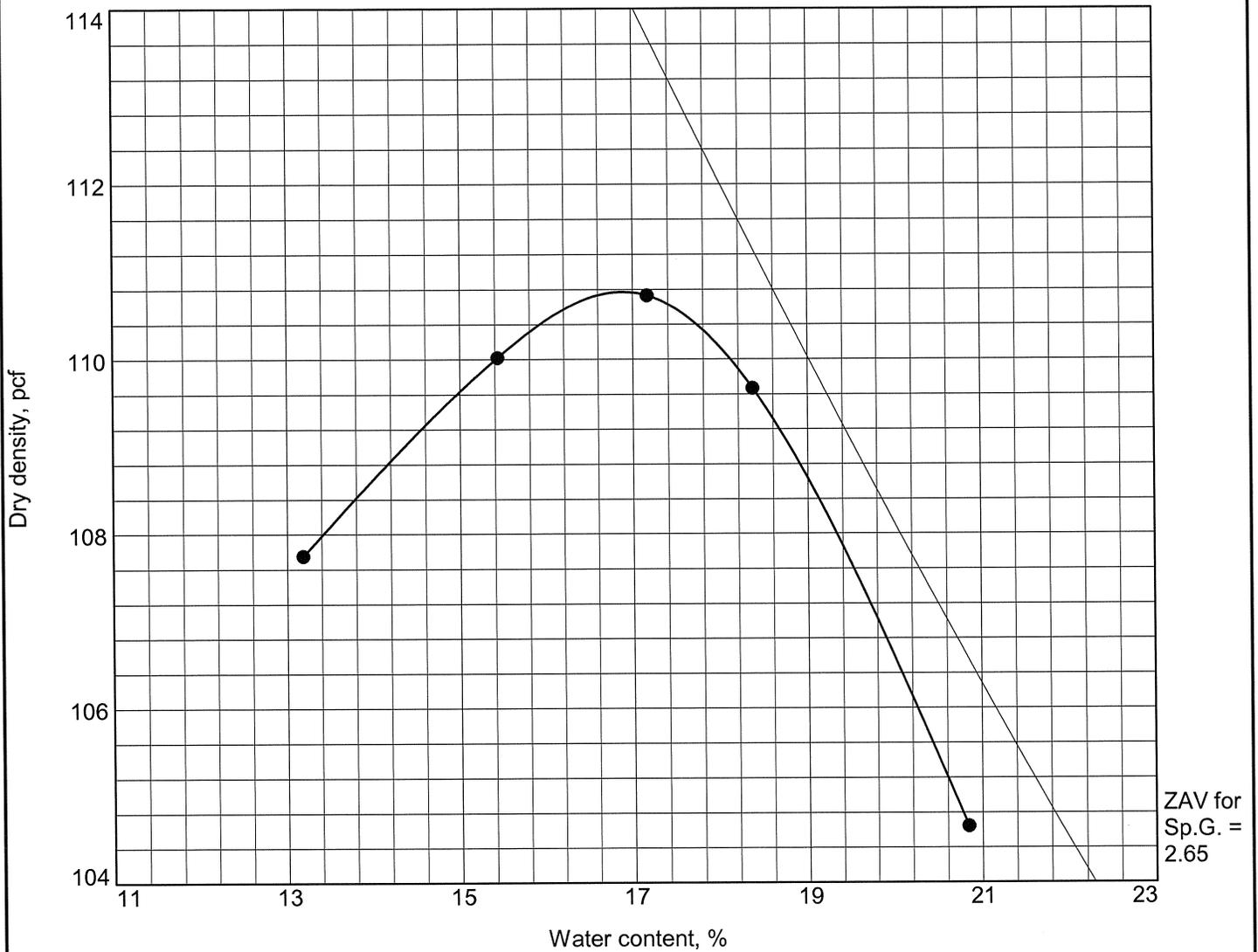
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	1.8	1.8	5.7	21.8	24.7	52.2	32.3	13.7	46.0

D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
0.0023	0.0063	0.0096	0.0249	0.1133	0.2677	0.8277	1.1755	1.6434	2.5744

Fineness Modulus	C <sub>u</sub>	C <sub>c</sub>
1.32	117.40	1.02

# COMPACTION TEST REPORT

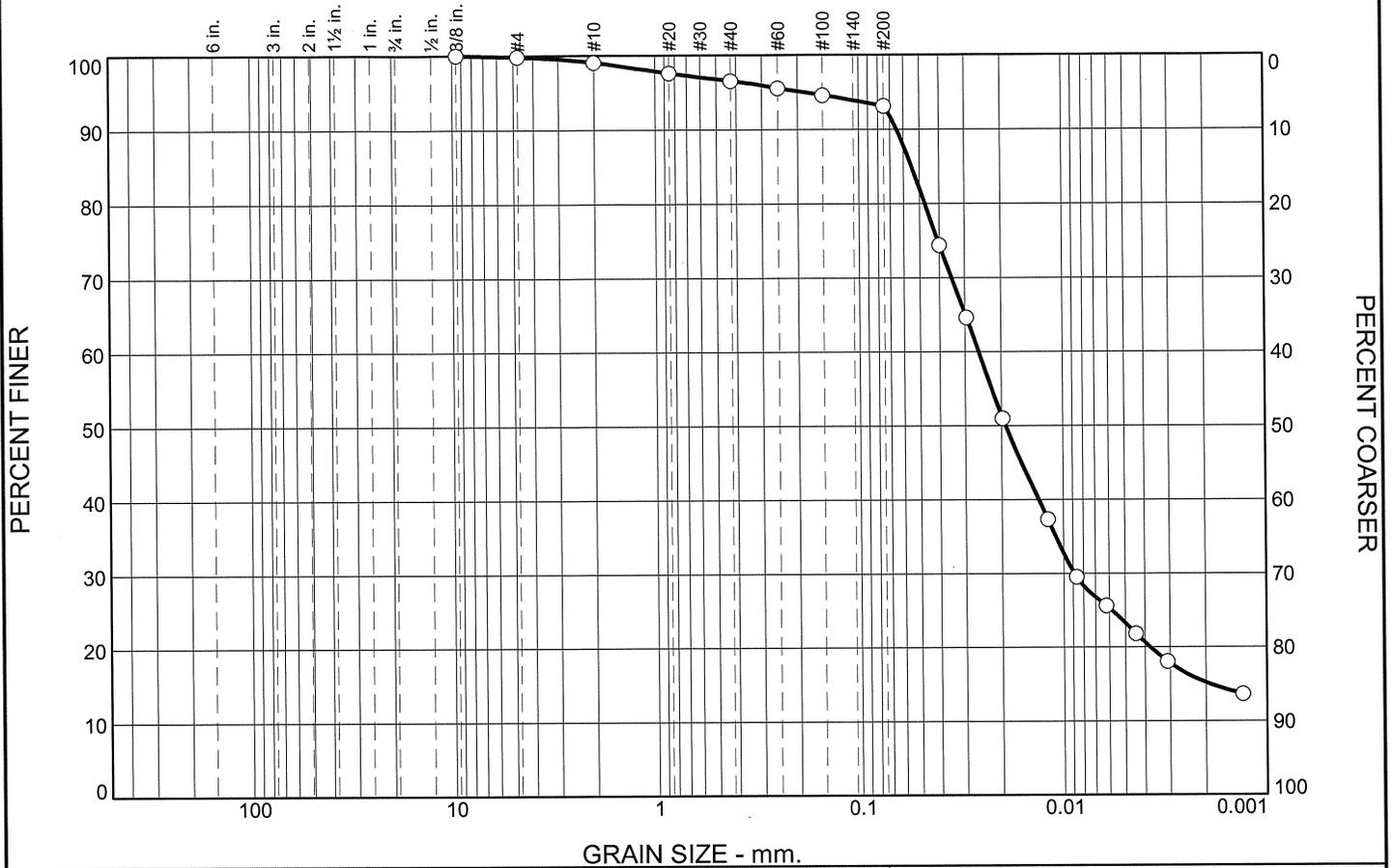


Test specification: ASTM D 698-07 Method B Standard  
 ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0.0' - 3.0'				2.65			17.4	

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 110.8 pcf Optimum moisture = 16.9 %	dark brown lean CLAY
<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL ○ <b>Loc.:</b> SB-4 Samples 1 & 2 <b>Depth:</b> 0.0' - 3.0' <b>Sample No.:</b> 0954	<b>Remarks:</b> Date Received: 8/29/12 Lab No.: 0954
<b>TESTECH</b>	<b>File No</b>

# Particle Size Distribution Report - ASTM D2487



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.7	2.6	3.4	69.8	23.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.8		
#10	99.1		
#20	97.6		
#40	96.5		
#60	95.5		
#100	94.6		
#200	93.1		

**Material Description**

dark brown lean CLAY

**Atterberg Limits**

PL= 23      LL= 33      PI= 10

**Coefficients**

D<sub>90</sub>= 0.0648      D<sub>85</sub>= 0.0547      D<sub>60</sub>= 0.0258  
D<sub>50</sub>= 0.0191      D<sub>30</sub>= 0.0089      D<sub>15</sub>= 0.0019  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= CL                      AASHTO= A-4(10)

**Remarks**

Date of Instructions: 8/27/12  
Lab No.: 0954

\* (no specification provided)

**Location:** SB-4 Samples 1 & 2  
**Sample Number:** 0954      **Depth:** 0.0' - 3.0'

**Date:** 8/24/12

	<p><b>Client:</b> Detroit/Chicago District, Corps of Engineers</p> <p><b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL</p> <p><b>Project No:</b> G030-IL      <b>File No</b></p>
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**GRAIN SIZE DISTRIBUTION TEST DATA**

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-4 Samples 1 & 2

**Depth:** 0.0' - 3.0'

**Sample Number:** 0954

**Material Description:** dark brown lean CLAY

**Date:** 8/24/12

**PL:** 23

**LL:** 33

**PI:** 10

**USCS Classification:** CL

**AASHTO Classification:** A-4(10)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1458.47	765.35	0.00	0.375	0.00	100.0	0.0
			#4	1.11	99.8	0.2
			#10	6.46	99.1	0.9
53.37	0.00	0.00	#20	0.79	97.6	2.4
			#40	1.36	96.5	3.5
			#60	1.91	95.5	4.5
			#100	2.41	94.6	5.4
			#200	3.20	93.1	6.9

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 99.1

Weight of hydrometer sample = 53.372

Hygrosopic moisture correction:

Moist weight and tare = 151.35

Dry weight and tare = 145.15

Tare weight = 3.91

Hygrosopic moisture = 4.4%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.62

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	42.0	38.1	0.0130	42.0	9.4	0.0400	74.4	25.6
2.00	24.5	37.0	33.1	0.0130	37.0	10.2	0.0295	64.6	35.4
5.00	24.5	30.0	26.1	0.0130	30.0	11.4	0.0197	50.9	49.1
15.00	24.5	23.0	19.1	0.0130	23.0	12.5	0.0119	37.3	62.7
30.00	24.5	19.0	15.1	0.0130	19.0	13.2	0.0086	29.5	70.5
60.00	24.5	17.0	13.1	0.0130	17.0	13.5	0.0062	25.6	74.4
120.00	24.7	15.0	11.2	0.0130	15.0	13.8	0.0044	21.8	78.2
250.00	24.9	13.0	9.2	0.0130	13.0	14.2	0.0031	18.0	82.0
1440.00	24.1	11.0	7.0	0.0131	11.0	14.5	0.0013	13.6	86.4

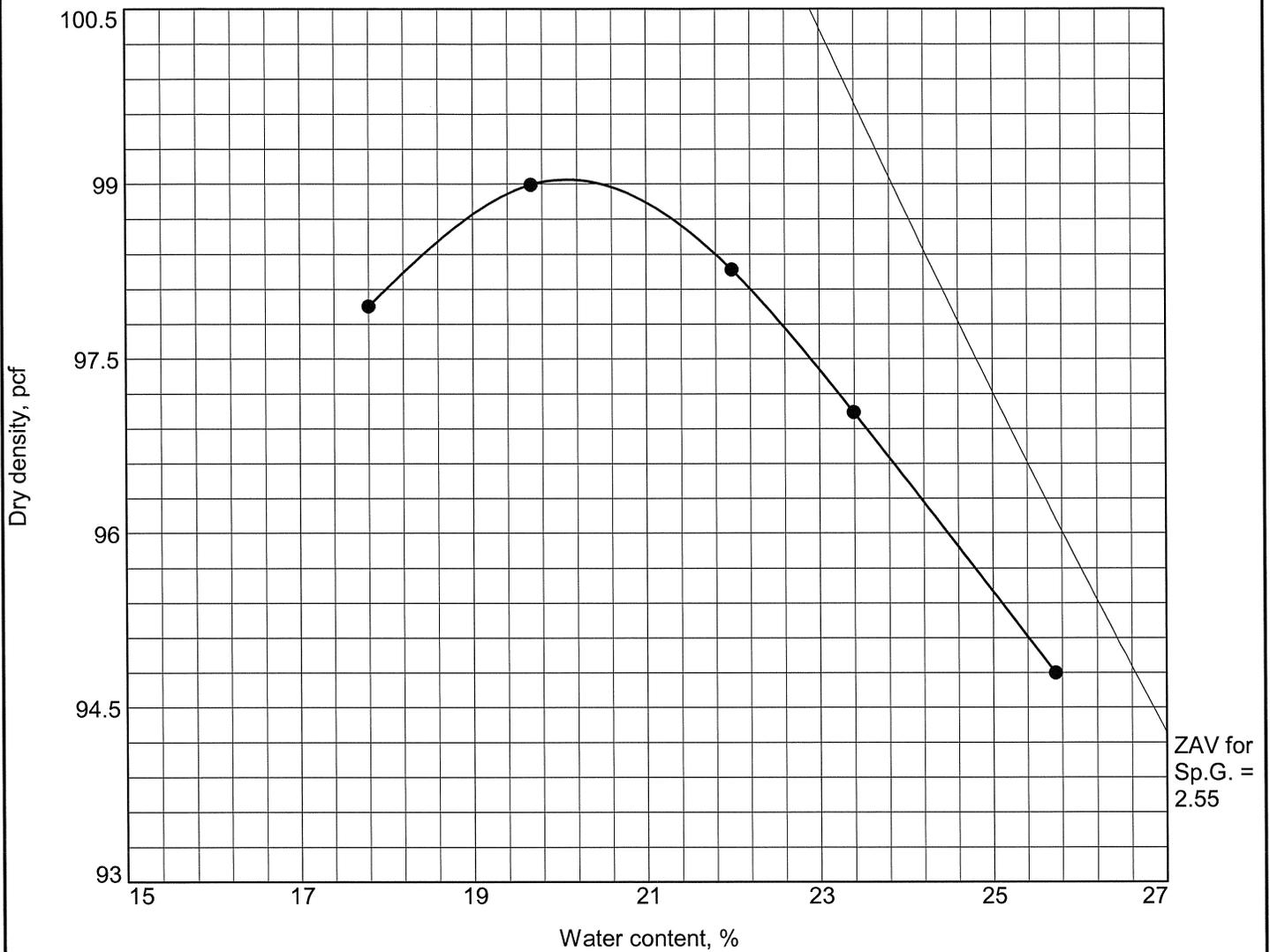
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.2	0.2	0.7	2.6	3.4	6.7	69.8	23.3	93.1

D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
	0.0019	0.0038	0.0089	0.0191	0.0258	0.0472	0.0547	0.0648	0.1859

Fineness Modulus
0.15

# COMPACTION TEST REPORT

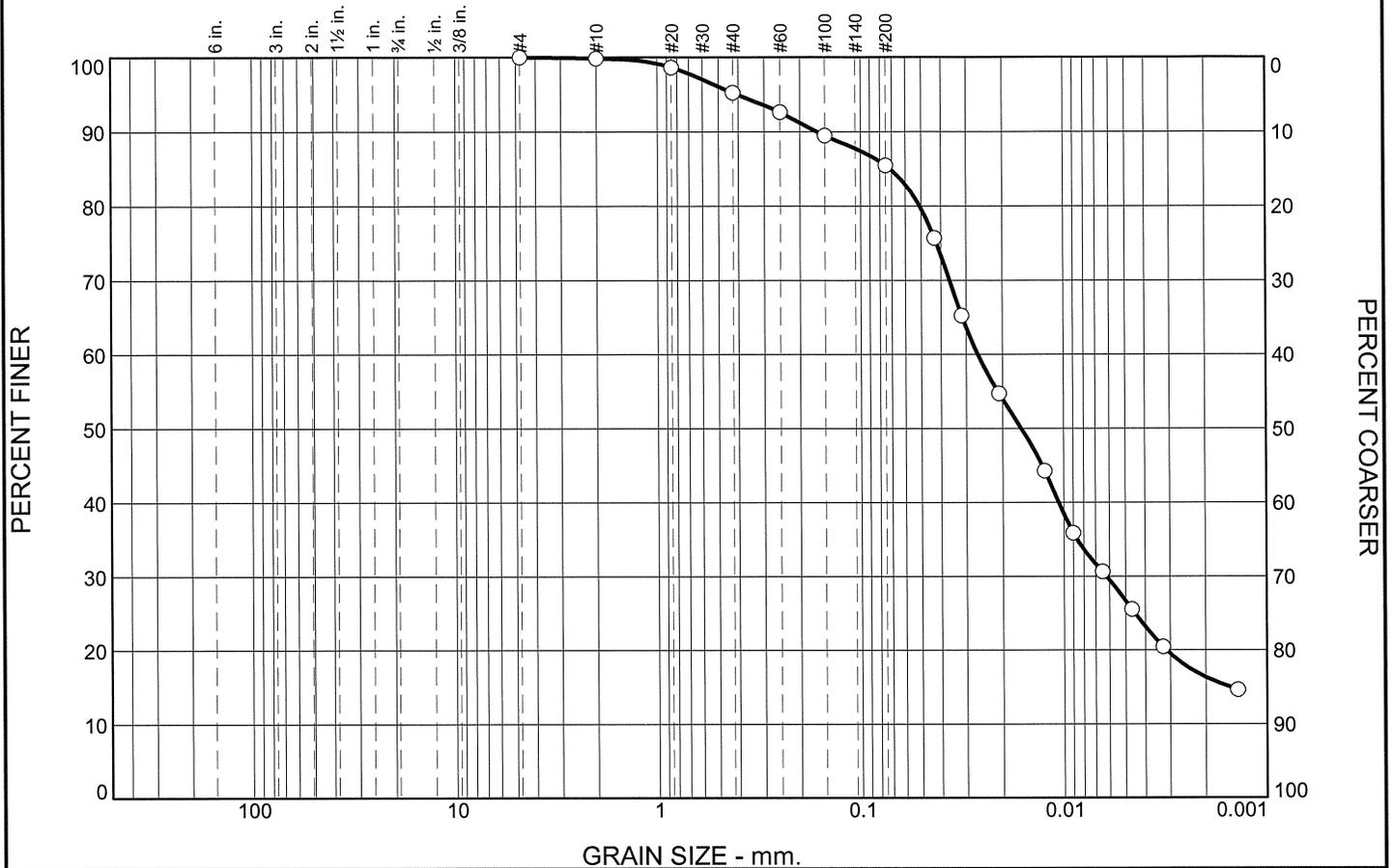


Test specification: ASTM D 698-07 Method B Standard  
 ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
1.0' - 3.5'				2.45			11.2	

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 99.0 pcf Optimum moisture = 20.1 %	dark brown SILT
<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL ○ <b>Loc.:</b> SB-5 Samples 2 & 3 <b>Depth:</b> 1.0' - 3.5' <b>Sample No.:</b> 0954	<b>Remarks:</b> Date of Instructions: 8/27/12 Lab No.: 0954
<b>TESTECH</b>	<b>File No</b>

# Particle Size Distribution Report - ASTM D2487



**GRAIN SIZE DISTRIBUTION TEST DATA**

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-5 Samples 2 & 3

**Depth:** 1.0' - 3.5'

**Sample Number:** 0954

**Material Description:** dark brown SILT

**Date:** 8/24/12

**PL:** 28

**LL:** 45

**PI:** 17

**USCS Classification:** ML

**AASHTO Classification:** A-7-6(16)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

Sample Contains Tiny Sea Shell Fragments

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1486.23	909.83	0.00	#4	0.00	100.0	0.0
			#10	0.79	99.9	0.1
56.56	0.00	0.00	#20	0.68	98.7	1.3
			#40	2.62	95.2	4.8
			#60	4.11	92.6	7.4
			#100	5.89	89.5	10.5
			#200	8.17	85.4	14.6

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 99.9

Weight of hydrometer sample = 56.560

Hygroscopic moisture correction:

Moist weight and tare = 255.28

Dry weight and tare = 238.90

Tare weight = 111.19

Hygroscopic moisture = 12.8%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.45

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	40.0	36.1	0.0138	40.0	9.7	0.0430	75.7	24.3
2.00	24.5	35.0	31.1	0.0138	35.0	10.6	0.0317	65.2	34.8
5.00	24.5	30.0	26.1	0.0138	30.0	11.4	0.0208	54.7	45.3
15.00	24.5	25.0	21.1	0.0138	25.0	12.2	0.0124	44.2	55.8
30.00	24.5	21.0	17.1	0.0138	21.0	12.9	0.0090	35.9	64.1
60.00	24.5	18.5	14.6	0.0138	18.5	13.3	0.0065	30.6	69.4
120.00	24.7	16.0	12.2	0.0137	16.0	13.7	0.0046	25.5	74.5
250.00	24.9	13.5	9.7	0.0137	13.5	14.1	0.0033	20.4	79.6
1440.00	24.1	11.0	7.0	0.0138	11.0	14.5	0.0014	14.6	85.4

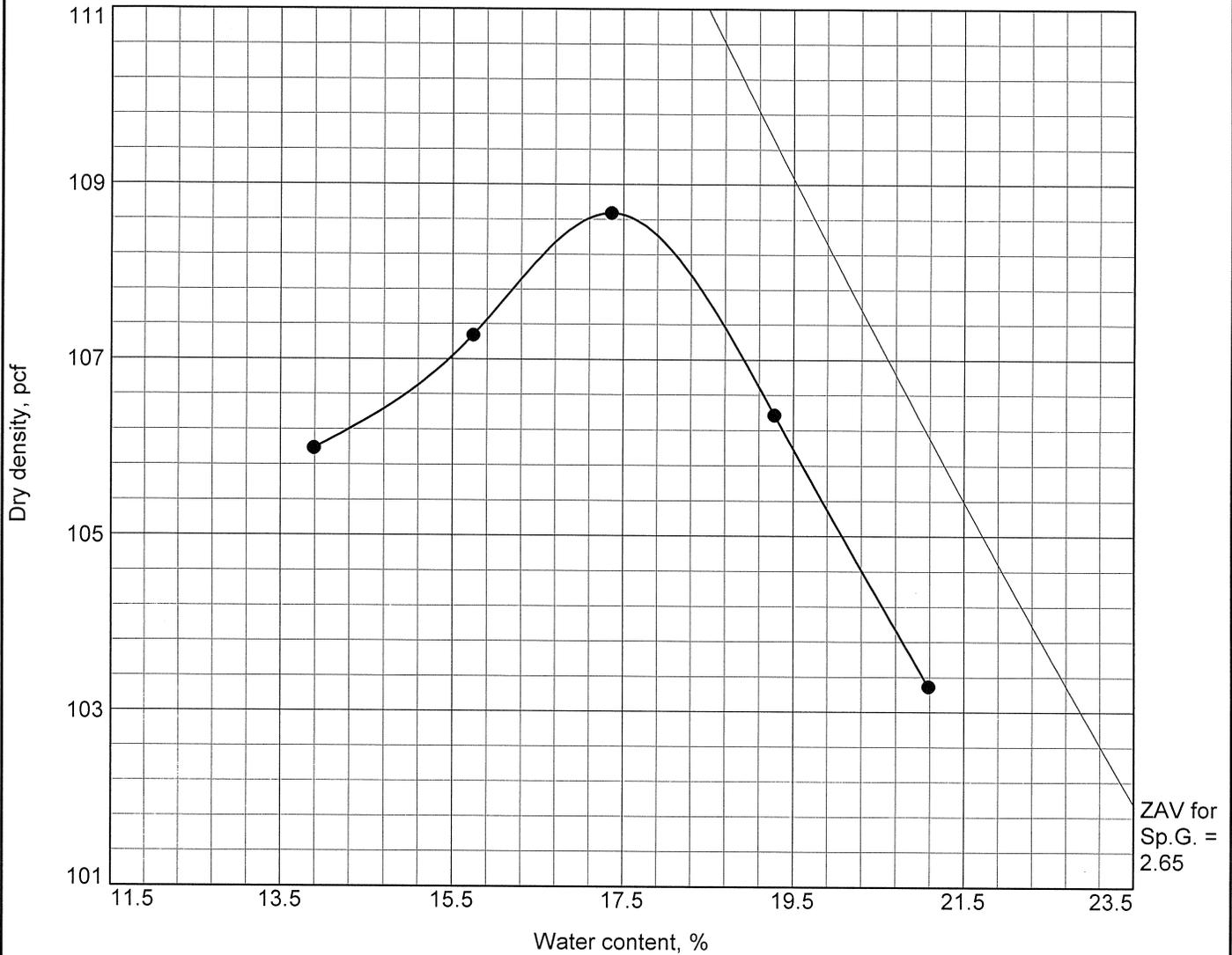
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.1	4.7	9.8	14.6	58.7	26.7	85.4

D10	D15	D20	D30	D50	D60	D80	D85	D90	D95
	0.0015	0.0031	0.0062	0.0162	0.0264	0.0509	0.0715	0.1646	0.4051

<b>Fineness Modulus</b>
0.21

# COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method B Standard  
 ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0.1' - 4.5'	SC	A-6(3)		2.62	35	15	18.9	44.1

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 108.7 pcf Optimum moisture = 17.4 %	dark brown clayey SAND with gravel

<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL <input type="radio"/> <b>Location:</b> SB-6 Samples 1 & 2 <b>Sample Number:</b> 0954	<b>Remarks:</b> Date Received: 8/29/12 Lab No.: 0954
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## GRAIN SIZE DISTRIBUTION TEST DATA

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-6 Samples 1 & 2

**Depth:** 0.1' - 4.5'

**Sample Number:** 0954

**Material Description:** dark brown clayey SAND with gravel

**Date:** 8/24/12

**PL:** 20

**LL:** 35

**PI:** 15

**USCS Classification:** SC

**AASHTO Classification:** A-6(3)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

### Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1409.32	591.78	0.00	1.5	0.00	100.0	0.0
			1.0	89.12	89.1	10.9
			0.75	89.12	89.1	10.9
			0.5	132.43	83.8	16.2
			0.375	154.28	81.1	18.9
			#4	218.60	73.3	26.7
			#10	284.56	65.2	34.8
55.99	0.00	0.00	#20	4.86	59.5	40.5
			#40	8.18	55.7	44.3
			#60	11.42	51.9	48.1
			#100	14.84	47.9	52.1
			#200	18.14	44.1	55.9

### Hydrometer Test Data

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 65.2

Weight of hydrometer sample = 55.990

Hygroscopic moisture correction:

Moist weight and tare = 248.65

Dry weight and tare = 240.48

Tare weight = 94.69

Hygroscopic moisture = 5.6%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.62

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	36.0	32.1	0.0130	36.0	10.4	0.0420	39.8	60.2
2.00	24.5	35.0	31.1	0.0130	35.0	10.6	0.0300	38.5	61.5
5.00	24.5	31.0	27.1	0.0130	31.0	11.2	0.0195	33.6	66.4
15.00	24.5	28.0	24.1	0.0130	28.0	11.7	0.0115	29.8	70.2
30.00	24.5	25.0	21.1	0.0130	25.0	12.2	0.0083	26.1	73.9
60.00	24.5	22.0	18.1	0.0130	22.0	12.7	0.0060	22.4	77.6
120.00	24.7	19.0	15.2	0.0130	19.0	13.2	0.0043	18.8	81.2
250.00	24.9	17.0	13.2	0.0130	17.0	13.5	0.0030	16.4	83.6
1440.00	24.1	15.0	11.0	0.0131	15.0	13.8	0.0013	13.6	86.4

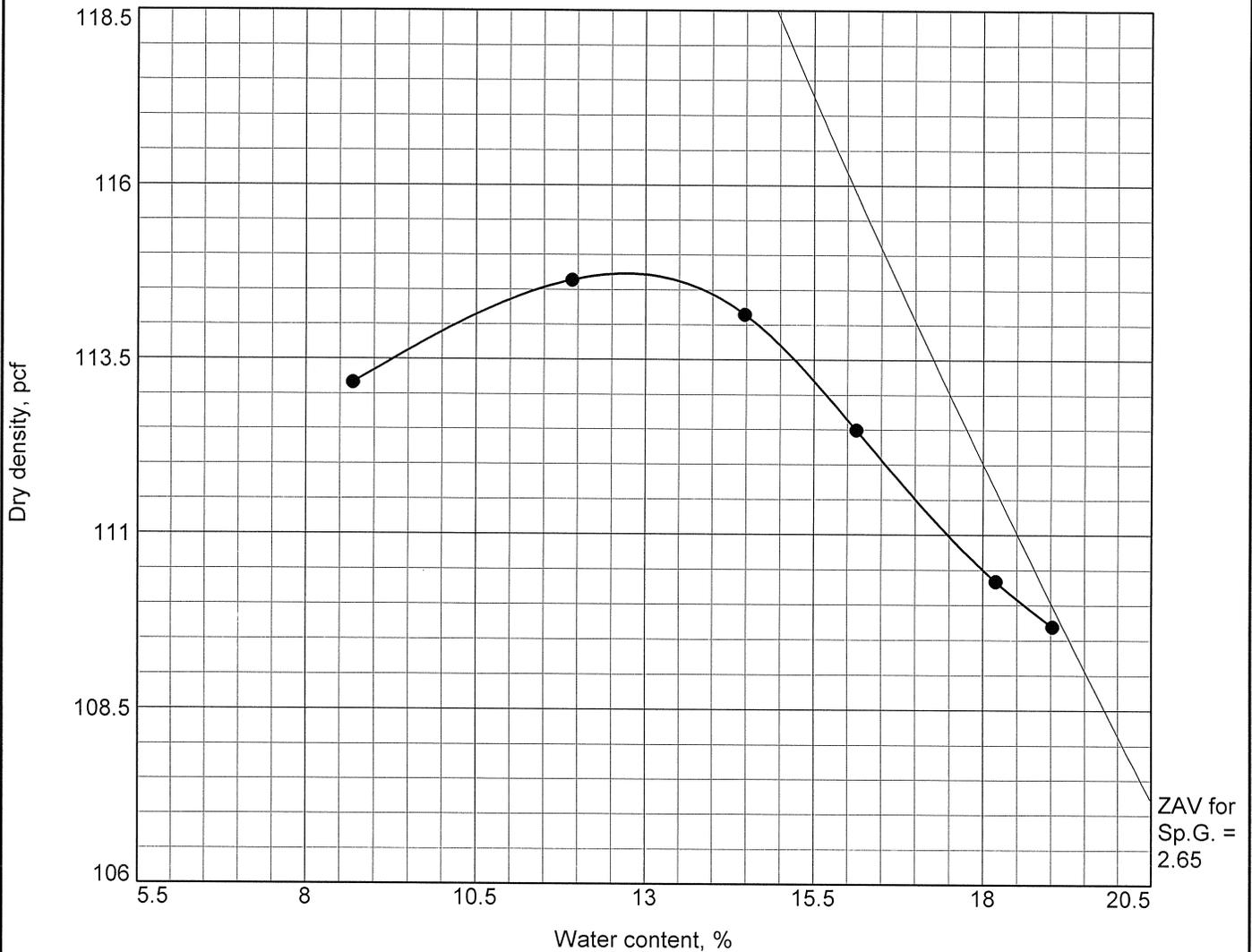
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	10.9	15.8	26.7	8.1	9.5	11.6	29.2	23.8	20.3	44.1

D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
	0.0021	0.0049	0.0117	0.1985	0.9219	8.4387	13.7734	27.2392	33.0267

Fineness Modulus
2.70

# COMPACTION TEST REPORT

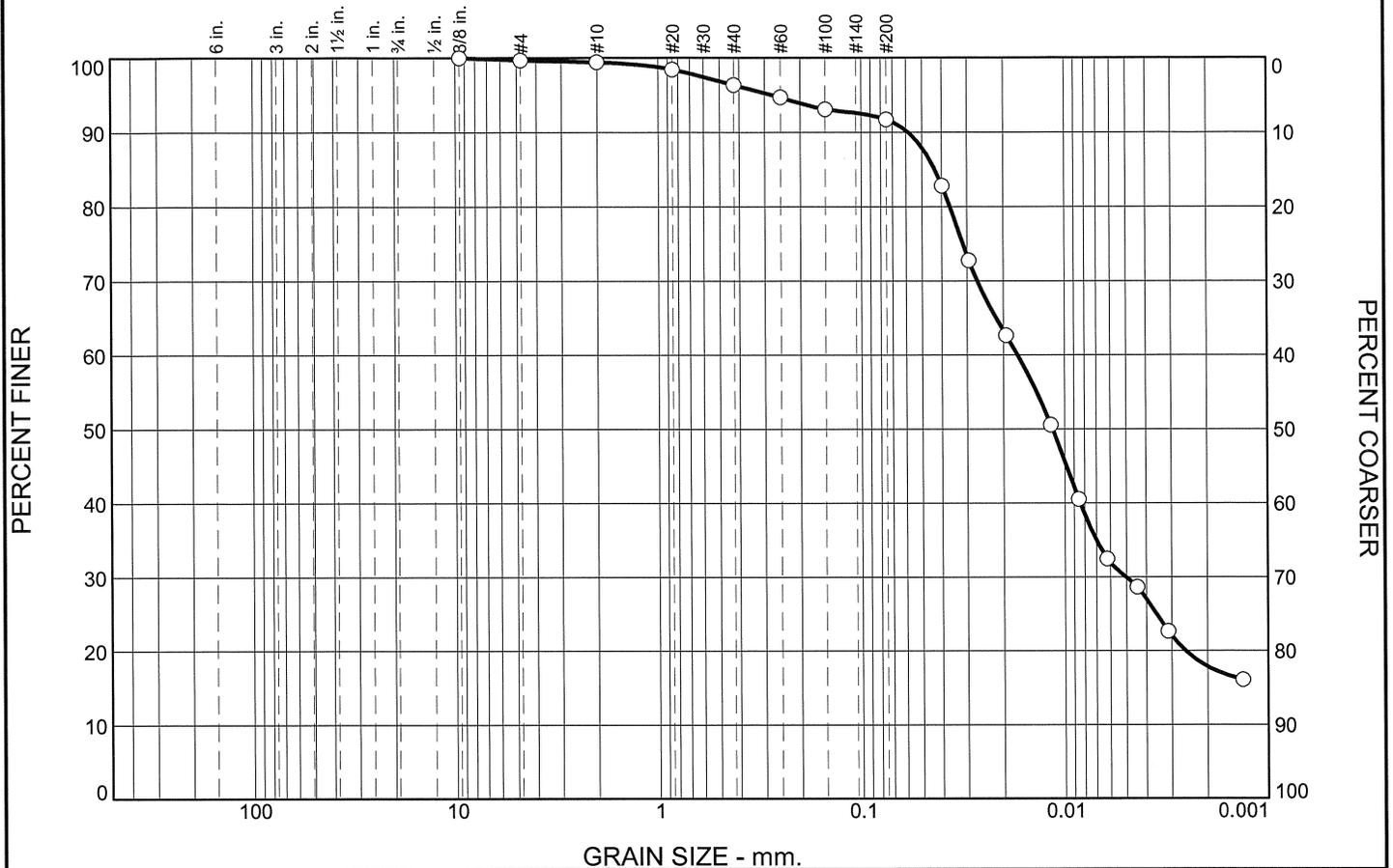


Test specification: ASTM D 698-07 Method C Standard  
 ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1.9' - 4.0'				2.55			17.3	

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 114.7 pcf Optimum moisture = 12.7 %	dark brown lean CLAY
<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL ○ <b>Location:</b> SB-7 Samples 2 & 3 <b>Sample Number:</b> 0954	<b>Remarks:</b> Date Received: 8/29/12 Lab No.: 0954
	File

# Particle Size Distribution Report - ASTM D2487



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.3	3.0	4.7	61.8	29.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.7		
#10	99.4		
#20	98.4		
#40	96.4		
#60	94.7		
#100	93.1		
#200	91.7		

**Material Description**

dark brown lean CLAY

**Atterberg Limits**

PL= 24      LL= 38      PI= 14

**Coefficients**

D<sub>90</sub>= 0.0585      D<sub>85</sub>= 0.0432      D<sub>60</sub>= 0.0171  
D<sub>50</sub>= 0.0115      D<sub>30</sub>= 0.0050      D<sub>15</sub>=  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= CL                      AASHTO= A-6(14)

**Remarks**

Date of Instructions: 8/27/12  
Lab No.: 0954

\* (no specification provided)

**Location:** SB-7 Samples 2 & 3  
**Sample Number:** 0954      **Depth:** 1.9' - 4.0'

**Date:** 8/24/12

	<p><b>Client:</b> Detroit/Chicago District, Corps of Engineers</p> <p><b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL</p> <p><b>Project No:</b> G030-IL      <b>File No</b></p>
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**GRAIN SIZE DISTRIBUTION TEST DATA**

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-7 Samples 2 & 3

**Depth:** 1.9' - 4.0'

**Sample Number:** 0954

**Material Description:** dark brown lean CLAY

**Date:** 8/24/12

**PL:** 24

**LL:** 38

**PI:** 14

**USCS Classification:** CL

**AASHTO Classification:** A-6(14)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1493.84	906.14	0.00	0.375	0.00	100.0	0.0
			#4	1.85	99.7	0.3
			#10	3.41	99.4	0.6
54.56	0.00	0.00	#20	0.54	98.4	1.6
			#40	1.68	96.4	3.6
			#60	2.60	94.7	5.3
			#100	3.48	93.1	6.9
			#200	4.24	91.7	8.3

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 99.4

Weight of hydrometer sample = 54.561

Hygroscopic moisture correction:

Moist weight and tare = 248.66

Dry weight and tare = 237.78

Tare weight = 99.83

Hygroscopic moisture = 7.9%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.55

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	45.0	41.1	0.0133	45.0	8.9	0.0398	82.8	17.2
2.00	24.5	40.0	36.1	0.0133	40.0	9.7	0.0294	72.7	27.3
5.00	24.5	35.0	31.1	0.0133	35.0	10.6	0.0194	62.6	37.4
15.00	24.5	29.0	25.1	0.0133	29.0	11.5	0.0117	50.6	49.4
30.00	24.5	24.0	20.1	0.0133	24.0	12.4	0.0086	40.5	59.5
60.00	24.5	20.0	16.1	0.0133	20.0	13.0	0.0062	32.4	67.6
120.00	24.8	18.0	14.2	0.0133	18.0	13.3	0.0044	28.6	71.4
250.00	24.9	15.0	11.2	0.0133	15.0	13.8	0.0031	22.6	77.4
1440.00	24.1	12.0	8.0	0.0134	12.0	14.3	0.0013	16.1	83.9

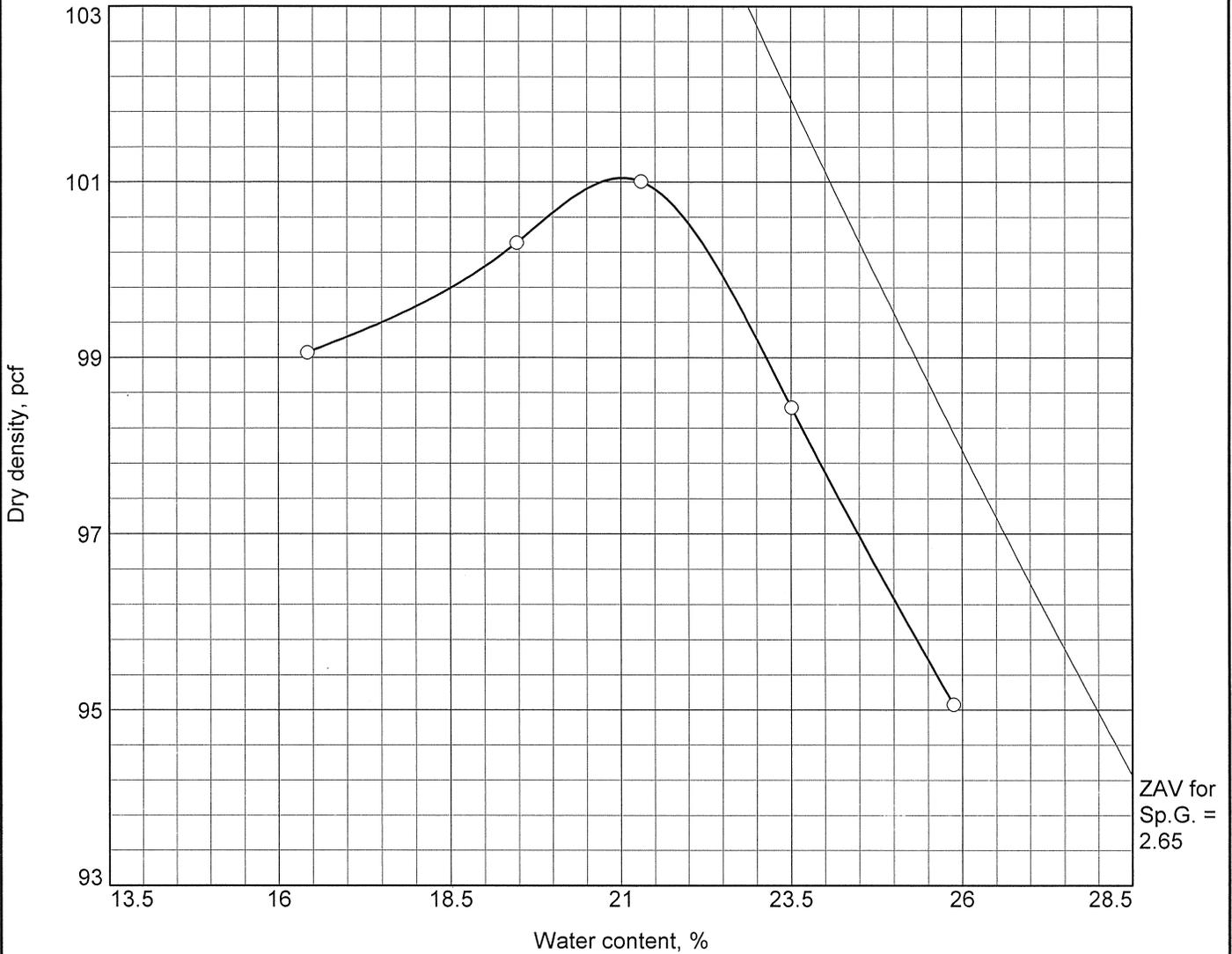
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.3	0.3	0.3	3.0	4.7	8.0	61.8	29.9	91.7

D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
		0.0026	0.0050	0.0115	0.0171	0.0365	0.0432	0.0585	0.2751

Fineness Modulus
0.16

# COMPACTION TEST REPORT

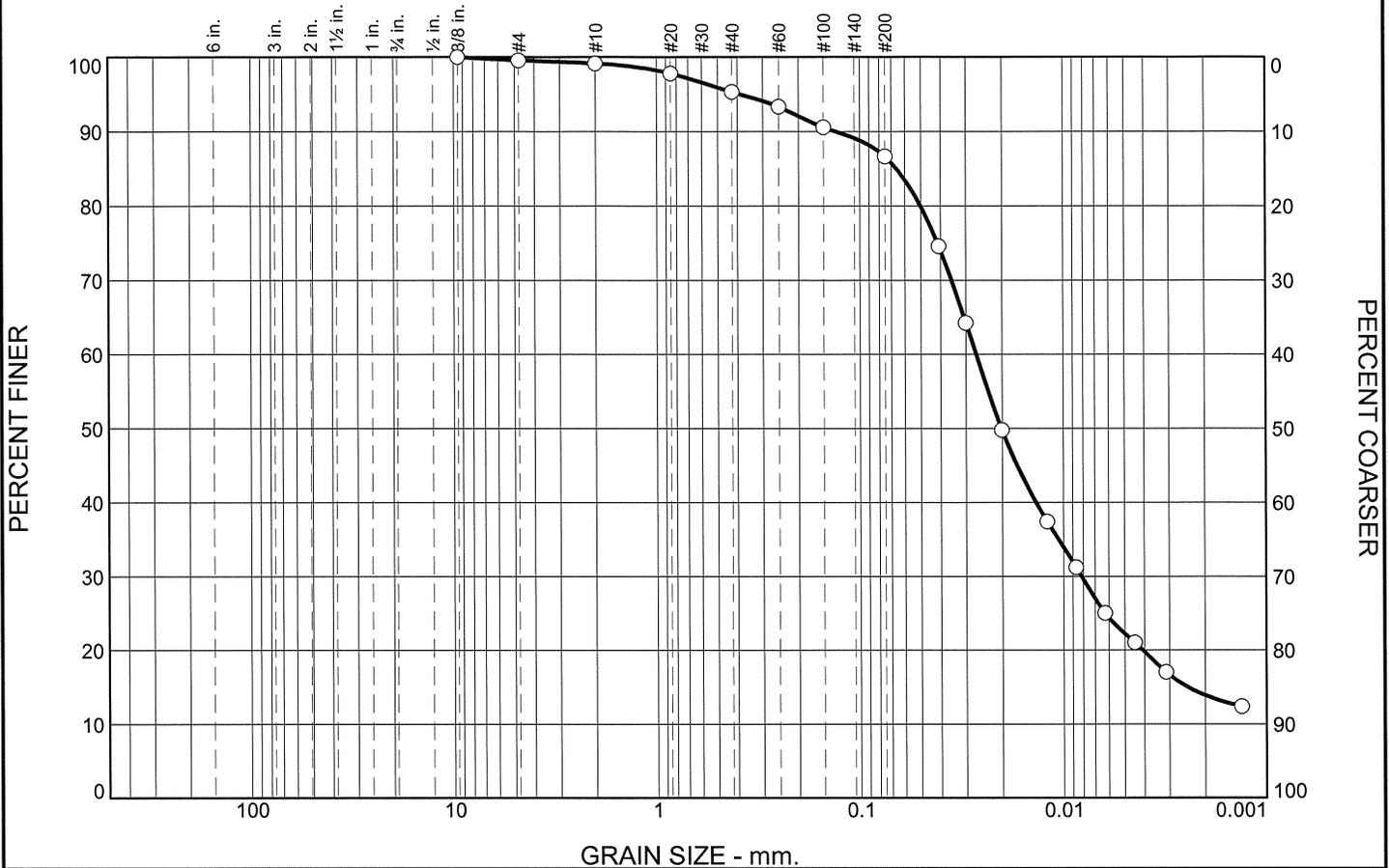


Test specification: ASTM D 698-07 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0.0' - 3.0'	ML	A-7-5(12)		2.61	42	12	0.0	86.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 101.0 pcf Optimum moisture = 21.0 %	dark brown SILT
<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL ○ <b>Location:</b> SB-8 Samples 1 & 2 <b>Sample Number:</b> 0954	<b>Remarks:</b> Date Received: 8/29/12 Lab No.: 0954
	File

# Particle Size Distribution Report - ASTM D2487



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.5	3.8	8.7	64.4	22.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.6		
#10	99.1		
#20	97.8		
#40	95.3		
#60	93.3		
#100	90.5		
#200	86.6		

**Material Description**

dark brown SILT

**Atterberg Limits**

PL= 30      LL= 42      PI= 12

**Coefficients**

D<sub>90</sub>= 0.1318      D<sub>85</sub>= 0.0659      D<sub>60</sub>= 0.0268  
D<sub>50</sub>= 0.0202      D<sub>30</sub>= 0.0082      D<sub>15</sub>= 0.0024  
D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= ML              AASHTO= A-7-5(12)

**Remarks**

Date of Instructions: 8/27/12  
Lab No.: 0954

\* (no specification provided)

**Location:** SB-8 Samples 1 & 2  
**Sample Number:** 0954      **Depth:** 0.0' - 3.0'

**Date:** 8/24/12



**Client:** Detroit/Chicago District, Corps of Engineers  
**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL  
**Project No:** G030-IL      **File No**

**GRAIN SIZE DISTRIBUTION TEST DATA**

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-8 Samples 1 & 2

**Depth:** 0.0' - 3.0'

**Sample Number:** 0954

**Material Description:** dark brown SILT

**Date:** 8/24/12

**PL:** 30

**LL:** 42

**PI:** 12

**USCS Classification:** ML

**AASHTO Classification:** A-7-5(12)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1274.92	740.42	0.00	0.375	0.00	100.0	0.0
			#4	2.29	99.6	0.4
			#10	4.56	99.1	0.9
51.34	0.00	0.00	#20	0.69	97.8	2.2
			#40	1.98	95.3	4.7
			#60	3.02	93.3	6.7
			#100	4.46	90.5	9.5
			#200	6.48	86.6	13.4

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 99.1

Weight of hydrometer sample = 51.345

Hygroscopic moisture correction:

Moist weight and tare = 263.07

Dry weight and tare = 254.51

Tare weight = 109.92

Hygroscopic moisture = 5.9%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.61

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	40.0	36.1	0.0131	40.0	9.7	0.0408	74.5	25.5
2.00	24.5	35.0	31.1	0.0131	35.0	10.6	0.0300	64.2	35.8
5.00	24.5	28.0	24.1	0.0131	28.0	11.7	0.0200	49.8	50.2
15.00	24.5	22.0	18.1	0.0131	22.0	12.7	0.0120	37.4	62.6
30.00	24.5	19.0	15.1	0.0131	19.0	13.2	0.0087	31.2	68.8
60.00	24.5	16.0	12.1	0.0131	16.0	13.7	0.0062	25.0	75.0
120.00	24.7	14.0	10.2	0.0130	14.0	14.0	0.0045	21.0	79.0
250.00	24.9	12.0	8.2	0.0130	12.0	14.3	0.0031	17.0	83.0
1440.00	24.1	10.0	6.0	0.0131	10.0	14.7	0.0013	12.3	87.7

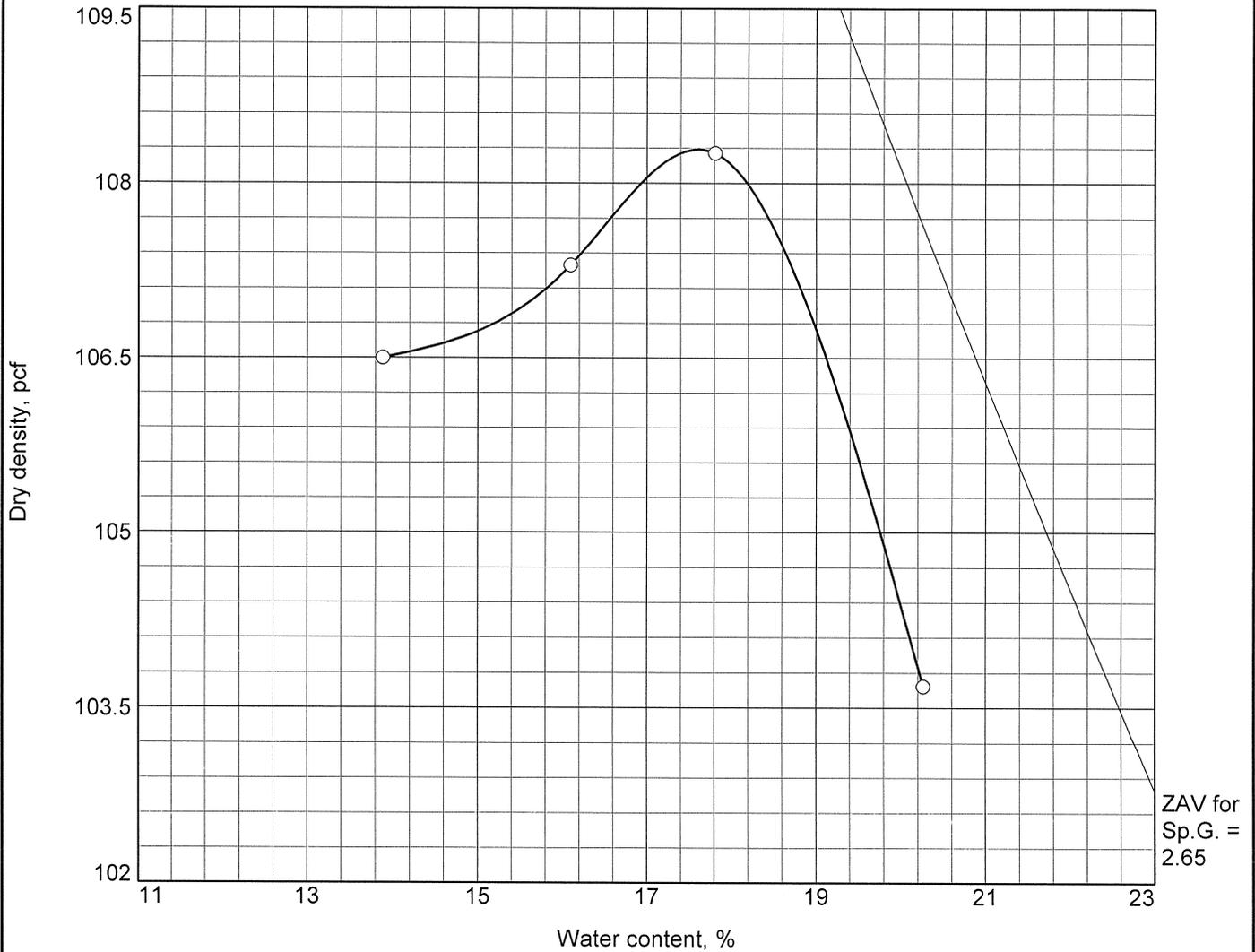
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.4	0.4	0.5	3.8	8.7	13.0	64.4	22.2	86.6

D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
	0.0024	0.0041	0.0082	0.0202	0.0268	0.0503	0.0659	0.1318	0.3870

Fineness Modulus
0.21

# COMPACTION TEST REPORT



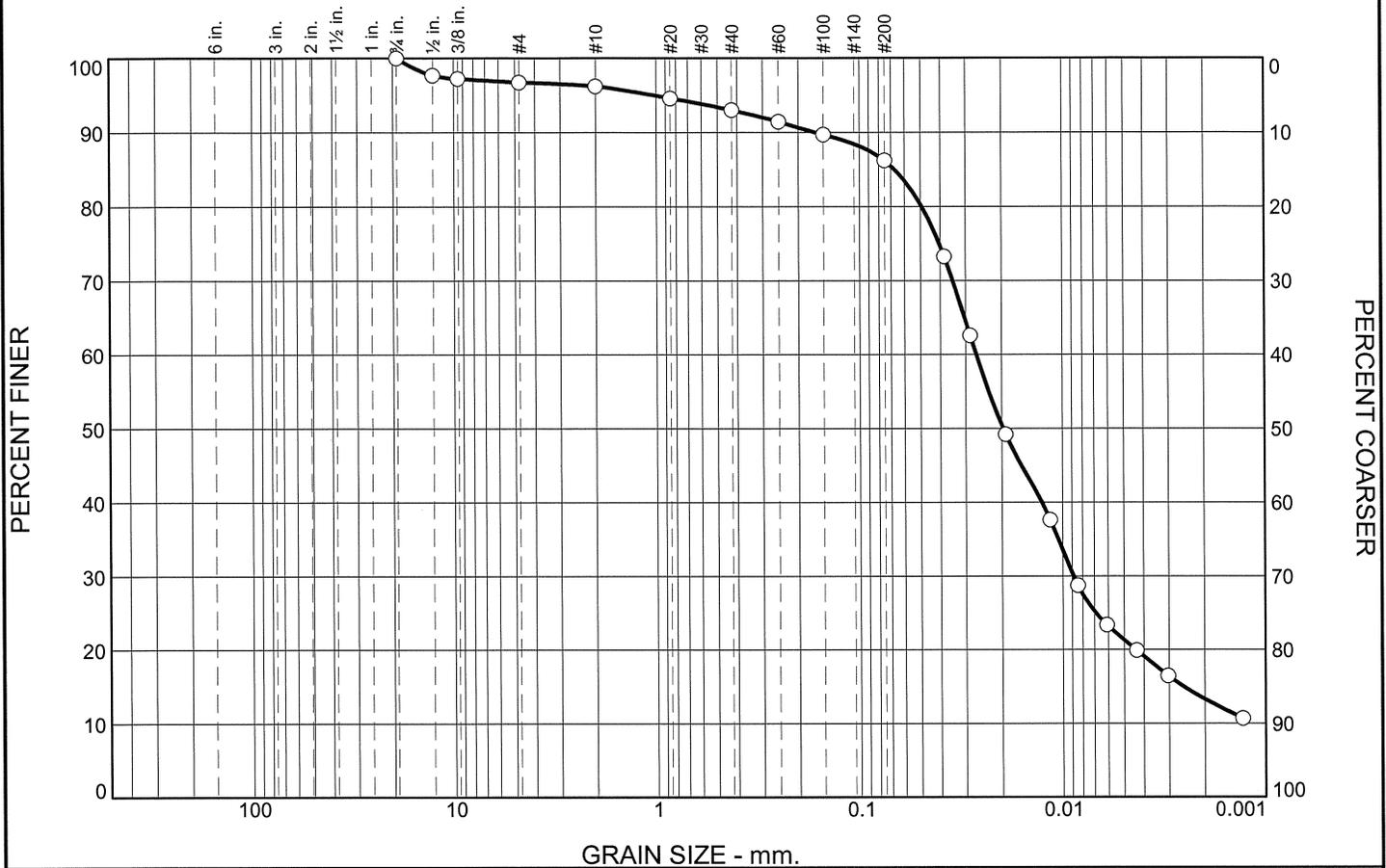
Test specification: ASTM D 698-07 Method B Standard  
 ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0.0' - 3.0'	CL	A-4(6)		2.68	29	8	2.8	86.2

ROCK CORRECTED TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 108.3 pcf Optimum moisture = 17.6 %	dark brown lean CLAY
<b>Project No.</b> G030-IL <b>Client:</b> Detroit/Chicago District, Corps of Engineers <b>Project:</b> Saganashkee Slough Subsurface Investigation - Palos, IL  Location: SB-9 Samples 1 & 2 <b>Sample Number:</b> 0954	<b>Remarks:</b> Date Received: 8/29/12 Lab No.: 0954
	

File

# Particle Size Distribution Report - ASTM D2487



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.3	0.5	3.2	6.8	64.9	21.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.5	97.7		
0.375	97.2		
#4	96.7		
#10	96.2		
#20	94.6		
#40	93.0		
#60	91.4		
#100	89.7		
#200	86.2		

**Material Description**

dark brown lean CLAY

**Atterberg Limits**

PL= 21      LL= 29      PI= 8

**Coefficients**

D<sub>90</sub>= 0.1662      D<sub>85</sub>= 0.0672      D<sub>60</sub>= 0.0266  
 D<sub>50</sub>= 0.0197      D<sub>30</sub>= 0.0089      D<sub>15</sub>= 0.0025  
 D<sub>10</sub>=              C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= CL              AASHTO= A-4(6)

**Remarks**

Date of Instructions: 8/27/12  
 Lab No.: 0954  
 Sample Contains Sea Shell Fragments

\* (no specification provided)

Location: SB-9 Samples 1 & 2  
 Sample Number: 0954      Depth: 0.0' - 3.0'

Date: 8/24/12



**Client:** Detroit/Chicago District, Corps of Engineers  
**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project No:** G030-IL

**File No**

**GRAIN SIZE DISTRIBUTION TEST DATA**

9/4/2012

**Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

**Project Number:** G030-IL

**Location:** SB-9 Samples 1 & 2

**Depth:** 0.0' - 3.0'

**Sample Number:** 0954

**Material Description:** dark brown lean CLAY

**Date:** 8/24/12

**PL:** 21

**LL:** 29

**PI:** 8

**USCS Classification:** CL

**AASHTO Classification:** A-4(6)

**Testing Remarks:** Date of Instructions: 8/27/12

Lab No.: 0954

Sample Contains Sea Shell Fragments

**Sieve Test Data**

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer	Percent Retained
1642.57	859.90	0.00	0.75	0.00	100.0	0.0
			0.5	18.10	97.7	2.3
			0.375	21.79	97.2	2.8
			#4	25.49	96.7	3.3
55.90	0.00	0.00	#10	29.91	96.2	3.8
			#20	0.93	94.6	5.4
			#40	1.85	93.0	7.0
			#60	2.76	91.4	8.6
			#100	3.79	89.7	10.3
			#200	5.82	86.2	13.8

**Hydrometer Test Data**

Hydrometer test uses material passing #10

Percent passing #10 based upon complete sample = 96.2

Weight of hydrometer sample = 55.901

Hygroscopic moisture correction:

Moist weight and tare = 160.38

Dry weight and tare = 154.03

Tare weight = 3.82

Hygroscopic moisture = 4.2%

Automatic temperature correction

Composite correction (fluid density and meniscus height) at 20 deg. C = -5.0

Meniscus correction only = 0.0

Specific gravity of solids = 2.68

Hydrometer type = 152H

Hydrometer effective depth equation:  $L = 16.294964 - 0.164 \times R_m$

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	24.5	45.0	41.1	0.0128	45.0	8.9	0.0382	73.2	26.8
2.00	24.5	39.0	35.1	0.0128	39.0	9.9	0.0285	62.5	37.5
5.00	24.5	31.5	27.6	0.0128	31.5	11.1	0.0191	49.2	50.8
15.00	24.5	25.0	21.1	0.0128	25.0	12.2	0.0115	37.6	62.4
30.00	24.5	20.0	16.1	0.0128	20.0	13.0	0.0084	28.7	71.3
60.00	24.5	17.0	13.1	0.0128	17.0	13.5	0.0061	23.3	76.7
120.00	24.7	15.0	11.2	0.0128	15.0	13.8	0.0043	19.9	80.1
250.00	24.9	13.0	9.2	0.0127	13.0	14.2	0.0030	16.5	83.5
1440.00	24.1	10.0	6.0	0.0129	10.0	14.7	0.0013	10.7	89.3

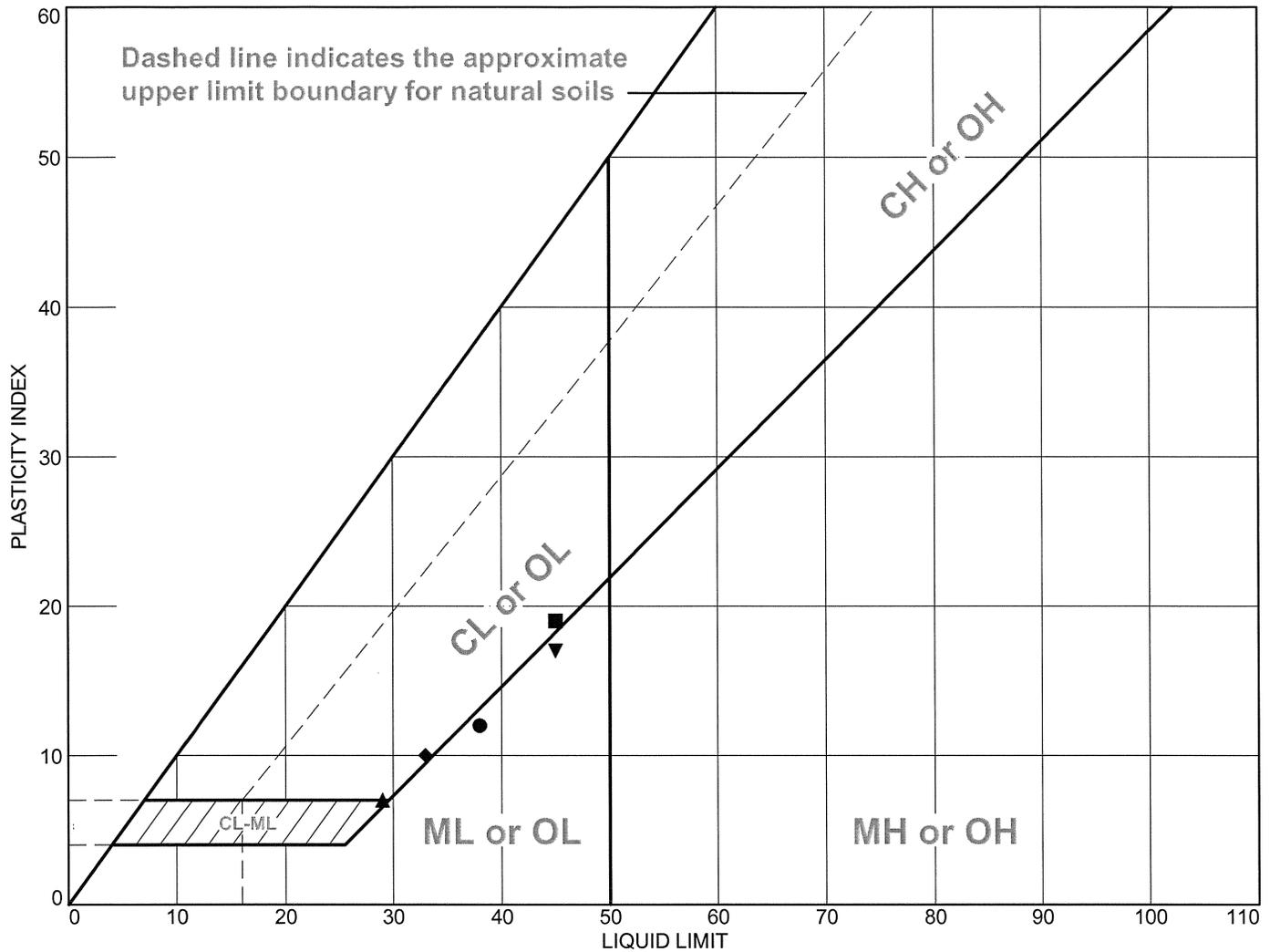
**Fractional Components**

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	3.3	3.3	0.5	3.2	6.8	10.5	64.9	21.3	86.2

D <sub>10</sub>	D <sub>15</sub>	D <sub>20</sub>	D <sub>30</sub>	D <sub>50</sub>	D <sub>60</sub>	D <sub>80</sub>	D <sub>85</sub>	D <sub>90</sub>	D <sub>95</sub>
	0.0025	0.0044	0.0089	0.0197	0.0266	0.0494	0.0672	0.1662	1.0334

<b>Fineness Modulus</b>
0.39

# LIQUID AND PLASTIC LIMITS TEST REPORT - ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	brown sandy SILT	38	26	12	74.6	57.0	ML
■	dark brown lean CLAY with sand	45	26	19	85.3	71.7	CL
▲	dark brown silty, clayey SAND	29	22	7	70.7	46.0	SC-SM
◆	dark brown lean CLAY	33	23	10	96.5	93.1	CL
▼	dark brown SILT	45	28	17	95.2	85.4	ML

**Project No.** G030-IL      **Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

● <b>Loc.:</b> SB-1 Samples 1 & 2	<b>Depth:</b> 0.8' - 4.5'	<b>Sample No.:</b> 0954
■ <b>Loc.:</b> SB-2 Samples 1 & 2	<b>Depth:</b> 0.2' - 5.0'	<b>Sample No.:</b> 0954
▲ <b>Loc.:</b> SB-3 Samples 1 & 2	<b>Depth:</b> 0.2' - 3.5'	<b>Sample No.:</b> 0954
◆ <b>Loc.:</b> SB-4 Samples 1 & 2	<b>Depth:</b> 0.0' - 3.0'	<b>Sample No.:</b> 0954
▼ <b>Loc.:</b> SB-5 Samples 2 & 3	<b>Depth:</b> 1.0' - 3.5'	<b>Sample No.:</b> 0954

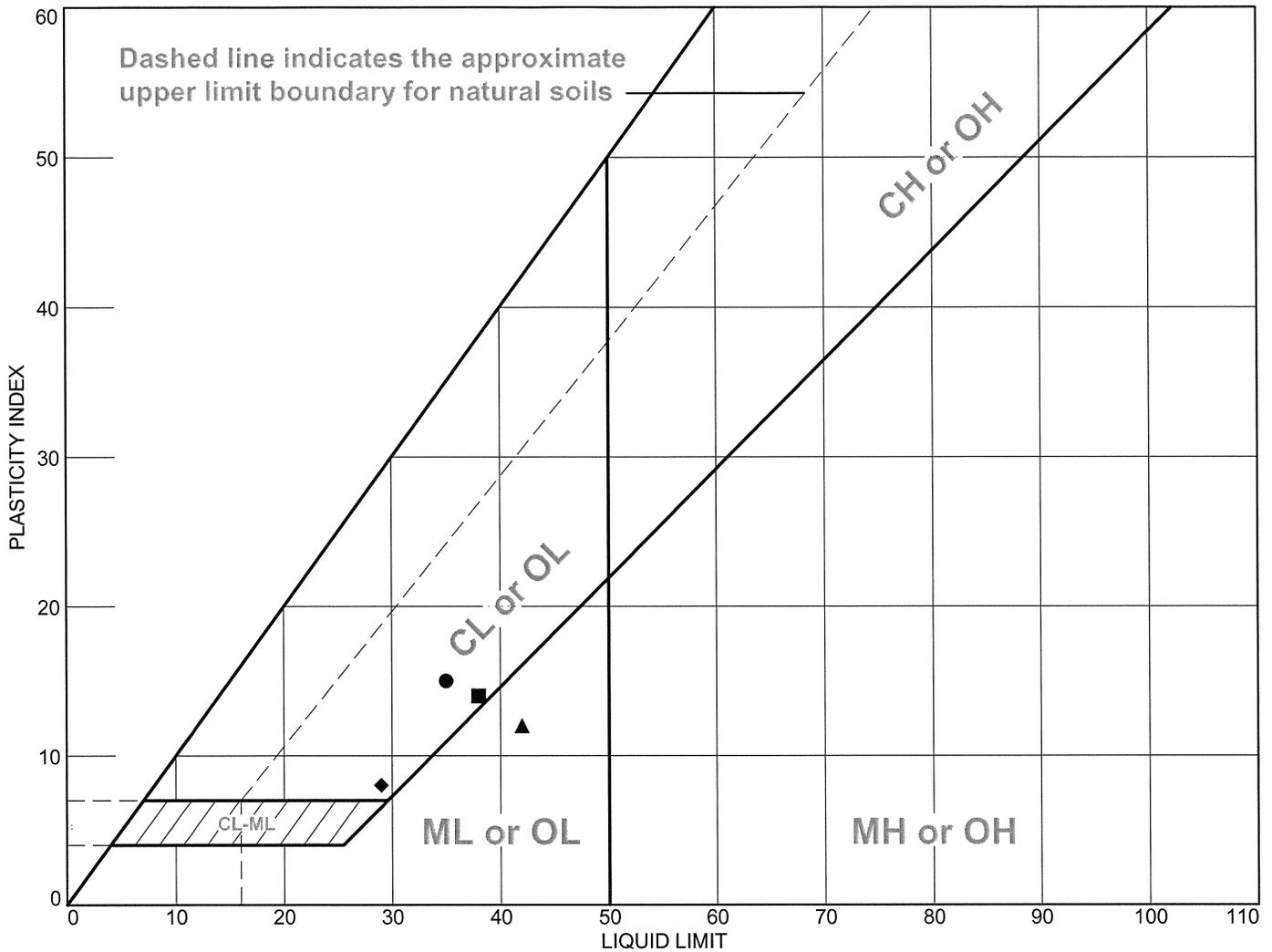
**Remarks:**

- Date of Instructions: 8/27/12  
Lab No.: 0954
- Date of Instructions: 8/27/12  
Lab No.: 0954
- ▲ Date of Instructions: 8/27/12  
Lab No.: 0954
- ◆ Date of Instructions: 8/27/12  
Lab No.: 0954
- ▼ Date of Instructions: 8/27/12  
Lab No.: 0954

**TES**TECH

**File No**

# LIQUID AND PLASTIC LIMITS TEST REPORT - ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	dark brown clayey SAND with gravel	35	20	15	55.7	44.1	SC
■	dark brown lean CLAY	38	24	14	96.4	91.7	CL
▲	dark brown SILT	42	30	12	95.3	86.6	ML
◆	dark brown lean CLAY	29	21	8	93.0	86.2	CL

**Project No.** G030-IL      **Client:** Detroit/Chicago District, Corps of Engineers

**Project:** Saganashkee Slough Subsurface Investigation - Palos, IL

● <b>Loc.:</b> SB-6 Samples 1 & 2	<b>Depth:</b> 0.1' - 4.5'	<b>Sample No.:</b> 0954
■ <b>Loc.:</b> SB-7 Samples 2 & 3	<b>Depth:</b> 1.9' - 4.0'	<b>Sample No.:</b> 0954
▲ <b>Loc.:</b> SB-8 Samples 1 & 2	<b>Depth:</b> 0.0' - 3.0'	<b>Sample No.:</b> 0954
◆ <b>Loc.:</b> SB-9 Samples 1 & 2	<b>Depth:</b> 0.0' - 3.0'	<b>Sample No.:</b> 0954

**Remarks:**

- Date of Instructions: 8/27/12  
Lab No.: 0954
- Date of Instructions: 8/27/12  
Lab No.: 0954
- ▲ Date of Instructions: 8/27/12  
Lab No.: 0954
- ◆ Date of Instructions: 8/27/12  
Lab No.: 0954

**TESTECH**

**File No**

# TestTech, Inc.

## ASTM D2216 - Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Client: Detroit/Chicago District, Corps of Engineers  
Project: Saganashkee Slough Subsurface Investigation - Palos, IL

Lab No.: 954  
Project No.: G030-IL  
Date: 8/31/2012

Boring Number	Sample Number	Depth (ft)	Depth (m)	Moisture Content (%)	Comments
SB-1	1 & 2	0.8 - 4.5	0.2 - 1.4	13.0	
SB-2	1 & 2	0.2 - 5.0	0.1 - 0.5	22.7	
SB-3	1 & 2	0.2 - 3.5	0.1 - 0.5	11.4	
SB-4	1 & 2	0.0 - 3.0	0.0 - 0.5	21.0	
SB-5	2 & 3	1.0 - 3.5	0.3 - 0.8	20.8	
SB-6	1 & 2	0.1 - 1.6	0.0 - 0.5	11.0	
SB-7	2 & 3	1.9 - 4.0	0.6 - 1.0	16.4	
SB-8	1 & 2	0.0 - 3.0	0.0 - 0.5	24.0	
SB-9	1 & 2	0.0 - 3.0	0.0 - 0.5	14.4	