SUBSURFACE EXPLORATION REPORT
EMBANKMENT STABILITY EVALUATION
M.C. STILES FACILITY EARTHEN EMBANKMENT
MEMPHIS, TENNESSEE

Prepared for:

FISHER & ARNOLD, INC.
Memphis, Tennessee

Prepared by:

GEOTECHNOLOGY, INC.
Memphis, Tennessee

Geotechnology, Inc. Project No. J020438.01

March 27, 2013

GEOTECHNOLOGY INC
FROM THE GROUND UP

March 27, 2013

J020438.01

Mr. Tim Verner, P.E. Vice President
Fisher & Arnold, Inc.
9180 Crestwyn Hills Drive
Memphis, TN 38125

SUBSURFACE EXPLORATION REPORT
EMBANKMENT STABILITY EVALUATION
M.C. STILES FACILITY EARTHEN EMBANKMENT
MEMPHIS, TENNESSEE

Dear Mr. Verner:

Enclosed is the report of the subsurface exploration performed by Geotechnology, Inc. for the referenced project. The report includes our understanding of the project, observed site conditions, conclusions and/or recommendations, and support data as listed in the Table of Contents.

It has been our pleasure to provide these services to you, and we would welcome the opportunity to provide other services during the course of the project. Please contact us if you need further information or clarification about this document.

Very truly yours,

GEOTECHNOLOGY, INC.

ASHRAF ELSAYED
No. 106527

Ashraf S. Elsayed, Ph.D., P.E.
Chief Engineer – Memphis Branch

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Copies submitted: (3) Hard copies
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J020438.01

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MEMPHIS, TENNESSEE

SECTION I - PROJECT DATA

AUTHORIZATION

The services documented in this report were provided in accordance with the terms, conditions, and scope of services described in Geotechnology's Proposal No. P020438.01 dated April 10, 2012. A representative of Fisher & Arnold authorized our services.

PURPOSE AND SCOPE OF SERVICES

The City of Memphis requested consulting engineering services to evaluate the integrity of earthen structures located at the M.C. Stiles Wastewater Treatment Facility. The purpose of our services is to evaluate the integrity of the earthen embankments and provide recommendations for stability improvement, if deemed necessary. Briefly, services consisted of site reconnaissance, drilling 14 borings, laboratory testing, engineering analyses, developing recommendations and preparing this report. Important information prepared by The Association of Engineering Firms Practicing in the Geosciences (ASFE) for studies of this type is presented in Appendix A for your review.

PROJECT AND SITE DESCRIPTION

The M.C. Stiles Wastewater Treatment plant is located at 2303 North Second Street in Memphis, Tennessee. The embankments are located on the east bank of the Mississippi river as shown on Plate 1 (Site Location and Topography). The facility consists of Sludge Lagoons Nos. 1, 2 and 3 and a sludge landfill. Sludge Lagoons Nos. 1 and 2 are each approximately 700 feet x 700 feet, and Sludge Lagoon No. 3 is approximately 2,300 feet x 700 feet. The sludge landfill is approximately 2000 feet x 700 feet. The slopes of the embankments typically range from 15 to 30 feet in height and have inclinations ranging from 1V:2.5H (vertical:horizontal) to 1V:5H. Based on the provided topographic survey[1], the tops of the embankments range from El 239[2] to 247, and the toe elevations range from El 215 to 220. The slopes are currently grass covered; rip-rap covers the slope in the northwest portion of the landfill. The area east of the sludge lagoons and sludge landfill embankments is relatively flat and is currently covered with grass. The Mississippi Riverbank west of the embankments is currently covered with grass and rip-rap.

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[1] Site Survey by Milestone Land Surveying, Inc., dated July 16, 2012

[2] Elevations provided herein are in feet with a vertical reference datum of Mean Sea Level (MSL)

REVIEW OF AVAILABLE INFORMATION

Geotechnology reviewed a geotechnical evaluation of the embankments, dated February 5, 1988, prepared by Hall, Blake and Associates. The report contains five boring logs, B-1 to B-5, that were drilled in the vicinity of the embankments. The logs are attached in Appendix D. This information was utilized during our analysis.

Geotechnology also reviewed the drawings and specifications for expansion of the sludge landfill embankments, dated October 6, 1999, prepared by Consolidated Technologies. The expansion consisted of increasing the height of the sludge landfill embankments by approximately 9 feet and the width by approximately 46 feet. The material used to expand the embankments was silty clay. The elevation of the landfill embankment was increased from approximately El 237 to 246. The inbound slopes of the sludge landfill and lagoons are approximately 1V:2H.

SECTION II - FIELD EXPLORATION AND LABORATORY TESTING

FIELD EXPLORATION

The field exploration consisted of drilling 14 borings, designated as Borings S-1 to S-14, at the approximate locations shown on Plate 2. The locations of Borings B-1 to B-5 that were drilled in 1988 are also shown on Plate 2. The borings were located by personnel from Geotechnology using reference points at the site. The elevations and locations of the borings were surveyed by representatives of Milestone Land Surveying, Inc. after drilling was completed.

The borings were drilled to an approximate depth of 60 feet at the toes of the embankments and 80 feet at the tops of the embankments with a track-mounted Diedrich D-50 rotary drill rig using hollow-stem auger and rotary wash drilling methods. Standard Penetration Tests (SPT's) were performed using an automatic hammer. The collected samples were described by the drill crew, transported to our laboratory for further testing, and examined by an engineer from Geotechnology. The boring logs are presented in Appendix B. An explanation of the terms and symbols used on the boring logs is also provided in Appendix B.

The boring logs represent conditions observed at the time of exploration and have been edited to incorporate results of the laboratory test data, as appropriate. Unless noted on the boring logs, the lines designating the changes between various strata represent approximate boundaries. The transition between materials could be gradual or could occur between recovered samples. The stratification given on the boring logs, or described herein, is for use by Geotechnology in its analyses and should not be used as the basis of design or construction cost estimates without realizing that there can be variation from that shown or described.

The boring logs and related information depict subsurface conditions only at the specific locations and times where sampling was conducted. The passage of time could result in changes in conditions, interpreted to exist, at or between the locations where sampling was conducted.

LABORATORY TESTING

Soil samples collected from the borings were visually examined in the laboratory and subsequently classified in general accordance with the Unified Soil Classification System (ASTM D 2487 and D 2488).

Laboratory tests were performed on select soil samples to evaluate pertinent engineering and index properties. The testing included: moisture content determinations, grain size analyses, Atterberg limits, unconfined compression (UC), direct shear and consolidated-undrained triaxial compression tests (CU). The laboratory test results are presented on the boring logs or in Appendix C. The laboratory test and corresponding test method standard used are presented in the following table.

SUMMARY OF LABORATORY TESTS AND METHODS

Laboratory Test	ASTM Test Method
Moisture Content	D 2216
Atterberg Limits	D 4318
Grain Size Distribution	D 422
Unconfined Compression (UC)	D 2166
Consolidated-Undrained Triaxial Compression (CU)	D 4767
Direct Shear Test of Soils Under Consolidated-Drained Conditions	D 3080

SECTION III - SUBSURFACE CONDITIONS

STRATIGRAPHY

The embankments consist of both fine- and coarse-grained material. The fine-grained material consists of silty clay (CL) and silt (ML), and the coarse-grained material consists of silty sand (SM). The moisture contents of the tested fine-grained samples ranged from approximately 9 to 28 percent. The liquid limit (LL) and plasticity index (PI) values of the tested fine-grained samples ranged from 35 to 41 percent and from 13 to 22 percent, respectively. The SPT N-values of the fine-grained soils ranged from 4 to 21 blows per foot (bpf). Four unconfined compression tests from relatively undisturbed samples resulted in undrained shear strengths ranging from 500 and 1,800 pounds per square foot (psf). The results of field and laboratory tests indicate soft to very stiff consistencies for the fine-grained soil within the embankment. The N-values of coarse-grained embankment soil ranged from 12 to 32 bpf, indicating medium dense to dense conditions.

The stratigraphy of the foundation soils underlying the embankments consists of interlayered fine- and coarse grained soils to the depth of exploration. The fine-grained soils consist of silty clay (CL), silt (ML), elastic silt (MH) and fat clay (CH). The moisture contents of the tested samples ranged from approximately 10 to 45 percent. The liquid limit (LL) and plasticity index (PI) values of the tested samples ranged from 32 to 102 percent and from 9 to 59 percent, respectively. The SPT N-values ranged from 2 to 35 bpf. Two unconfined compression tests from relatively undisturbed samples resulted in undrained shear strengths of 500 and 1,800 psf. The results of field and laboratory tests indicate soft to very stiff consistencies for the fine-grained foundation soils. The coarse-grained foundation soils consist of silty sand (SM) and fine- to medium-grained sand (SP). The SPT N-values ranged from 7 to 55 bpf, indicating loose to very dense conditions.

GROUNDWATER

Groundwater was encountered in Borings S-6 and S-11 at 50 feet and 35 feet, respectively, which corresponds to an approximate water level of El 188. Perched groundwater was observed in Borings S-5 and S-8 at 5 feet and 14.5 feet, respectively, which corresponds to water levels of El 233 and El 226.5. The Mississippi River water level during the exploration was approximately at EL 181. Groundwater levels are anticipated to vary significantly over time due to precipitation, water levels in the lagoons, the Mississippi River stage, or other factors not evident at the time of exploration.

SECTION IV – EVALUATION & CONCLUSIONS

SEISMIC INFORMATION

The plant lies within the influence of the New Madrid Seismic Zone (NMSZ). It is our understanding that the structure was designed in accordance with the International Building Code (IBC). For seismic analysis purposes, the Site Class was estimated to be Category D, “stiff soil” profile. A peak ground acceleration (PGA) of 0.36g was determined from USGS published information.

LIQUEFACTION ANALYSIS

A study was performed to determine the liquefaction potential at Borings S-1 to S-14. Both field and laboratory data were used to perform the analysis. The field measurements include the depth of the water table and SPT N-values. The laboratory data include USCS soil classification, soil unit weight, and percent fines of soil samples obtained from various strata. An earthquake magnitude (M_w) of 7.7 (probability of exceedance of 2% in 50 year, or 2,500-year return interval) was considered. A corresponding peak ground acceleration of 0.36g was determined from USGS published information and was used in the analysis. A groundwater elevation of 200 was used, corresponding to an approximate average elevation of the Mississippi River.

Subsurface conditions (as characterized by the field and laboratory data) and earthquake characteristics were used to determine the safety factors against liquefaction in each soil layer, as well as the associated dynamic settlement during the design seismic event. Based on the analysis, there is liquefaction potential at the site. The results of the analyses are presented in the following table.

Results of Liquefaction Analysis

Boring	**Zones with Liquefaction Factor of Safety Less Than 1.0**	**Estimated Dynamic Settlement (in)**
S-1	18 to 21 feet	2
S-2	44 to 45 and 51 to 57 feet	2
S-5	44 to 53 feet	3
S-6	39 to 47 and 78 to 80 feet	4
S-7	18 to 20, 38 to 52 and 56 to 60 feet	4
S-8	36 to 42, 45 to 56 and 61 to 73 feet	8
S-9	26 to 36 and 52 to 60 feet	4
S-10	46 to 52 feet	2
S-11	22 to 32, 45 to 50 and 57 to 60 feet	3
S-12	53 to 57 feet	1
S-13	24 to 28 and 47 to 51 feet	2

SLOPE STABILITY

Geotechnology performed stability analyses using nine different cross sections to generate the soil profile of the embankments. The following table presents information about the cross sections used to generate the soil profiles.

EMBANKMENT CROSS SECTIONS					
Cross Section No.	Borings*	Lagoon/Landfill	Side of Embankment (East/West)	Inclination (outside of the embankment)	Height (toe to crest) (ft)
1	S-1 and S-2	Landfill	West	1V:2.9H	24
2	S-3 and B-2	Landfill	East	1V:2.7H	28
3	S-4 and S-5	Lagoon No. 3	East	1V:2.5H top 10 ft. 1V:3.1H to toe	20
4	S-6 and S-7	Lagoon No. 3	West	1V:4.5H	15
5	S-8 and S-9	Lagoon No. 3	West	1V:5.3H	14
6	S-10 and B-5	Lagoon No. 1	West	1V:4.7H	16
7	S-11 and B-4	Lagoon No. 2	East	1V:3.2H	18
8	S-12 and B-1	Landfill	West	1V:2.9H	23
9	S-13 and S-14	Landfill	West	1V:3.5H	23

*Borings labeled "S" are were performed by Geotechnology. Borings Labeled "B" were performed by Hall, Blake & Associates in 1988.

Soil properties used in the analysis were selected based on laboratory triaxial compression testing, published correlations with soil index properties, and Geotechnology's experience with similar materials. The soil properties used in the analysis models are summarized in the following table. It should be noted that a deep-seated slope stability failure that includes the entire riverbank (below the Mississippi River water level) was not included in the analyses since hydrographic information was not provided. Based on our experience in the vicinity of the site and published information by USACE, it is our understanding that the water elevation for the Project Flood in this area is approximately EL 239.5. This water level was considered in the sudden drawdown analysis. The water level for all other conditions was set at an assumed average elevation of El 200, based on historical Mississippi River elevation data.

SOIL PROPERTIES USED IN THE GLOBAL STABILITY MODELS						
Soil Description	Unit Weight (pcf)	Drained Shear Strength		Consolidated-Undrained Shear Strength		
		Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)	Su (psf)
Clay Fill	122	0	28	1200	0	1200
Silt/Sandy Silt	120	0	28-30	200	15	NA
Sandy Clay	122	0	30	200	16	NA
Fat Clay	111-115	0	23-24	300	12	NA
Elastic Silt	115	0	22	500	10	NA
Clay	120	0	28	250	15	NA
Silty Sand Fill	120	0	32	0	32	NA
Silty Sand/ SP	125	0	32	0	32	NA
Clayey Sand	120	0	28	0	28	NA
Sludge / Waste	100	0	0	0	0	NA
Liquified Soils*	125	0	10	0	10	NA

*Residual shear strength of liquefied soils obtained using empirical correlations published by Idriss and Boulanger, 2007

The stability analyses were performed using the SLOPE/W software developed by GEO-SLOPE International Ltd. Spencer's procedure was used to compute factors of safety. Four stability conditions were used to analyze each cross section. The stability conditions are summarized in the following table.

STABILITY CONDITIONS			
Stability Condition	Loading	Water Level	Shear Strength
Long Term	Static	El 200	Drained
Rapid Drawdown	Static	El 240 to El 200	Drained/ Undrained
Earthquake	Earthquake/ Transient	El 200	Undrained
Post-Earthquake	Static	El 200	Undrained/ Residual Liquefied

Stability analysis results are summarized in the following table; the SLOPE/W output plots are presented in Appendix E.

SUMMARY OF SLOPE STABILITY ANALYSIS				
Cross Section No.	**Condition**			
	Long Term	**Rapid Drawdown**	**Earthquake**	**Post-Earthquake**
Target Minimum FOS[1]	1.5	1.2	1.1	1.1
1	1.60	***1.17***	1.12	1.53
Rev. 1[3]	-	1.22	-	-
2	1.61	1.38	***1.09***	NA[2]
Rev. 2[3]	-	-	1.12	-
3	***1.44***	1.41	1.12	1.70
Rev. 3[3]	1.71	-	-	-
4	2.61	2.75	1.11	1.91
5	2.15	2.15	1.42	2.09
6	2.34	2.34	1.45	2.34
7	1.91	1.67	1.18	1.91
8	1.76	1.59	1.21	1.76
9	1.71	1.25	1.36	1.83

1. Table 6-1b, Minimum Factors of Safety – Levee Slope Stability, EM 1110-2-1913, April 30, 2000.
2. Analysis indicated that liquefiable soils are not present.
3. Analysis based on revisions recommended in the following Assessment and Recommendations. The analysis results are presented in Appendix E.

The calculated factors of safety meet the required factors of safety for all analyses except for Cross Section 1 during the sudden drawdown condition, Cross Section 3 for the long term condition, and Cross Section 2 during the earthquake condition.

Assessment and Recommendations. An insufficient FOS was calculated for Cross Section 3 using long-term stability conditions. It should be noted that the slip surface is shallow and located near the face of the slope. The critical slip surface does not indicate that massive embankment failure will occur. Maintenance may be required if the slope surface cover is eroded. Based on our analysis a minimum FOS can be achieved if the top of the slope has an inclination of 1V:3H or flatter.

The FOS for Cross Section 2 is lower than the recommended value for the earthquake loading condition. A site-specific seismic study could be performed to obtain site-specific seismic response spectra relative to the site conditions. It is our experience that this may reduce the design peak ground acceleration by up to 20 percent and has the potential to improve the results of the seismic slope stability analysis. Cross Sections 1 and 2 represent areas with the tallest and steepest slopes at the site. In order to improve stability during sudden drawdown and earthquake conditions, the slopes may be graded to flatter inclinations (1V:3H or flatter) or fill buttresses may be used at the bottom of the slope to increase the driving resistance. Geotechnology can provide further assistance if a stability improvement is to be considered.

SECTION V - RECOMMENDED ADDITIONAL SERVICES

The conclusions and recommendations given in this report are based on interpretation of exploration data and Geotechnology's experience. The client must recognize that variations could occur from conditions observed in the borings. Actual subsurface conditions could vary from those encountered in the borings.

SECTION VI - LIMITATIONS OF REPORT

This report has been prepared on behalf of and for the exclusive use of the client for specific application to the named project as described herein. If this report is provided to prospective contractors, the client should make it clear that the information is provided for information only and not as a warranty of subsurface conditions described in this report.

Geotechnology has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. No other representation, expressed or implied, is included or intended.

Unless specifically stated in our proposal or this report, the scope of our services for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic material in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope did not include any services to investigate or detect the presence of mold or any other biological contaminants (such as spores, fungus, bacteria, viruses, and the by-products of such organisms) on and around the site, or any services designed or intended to prevent or lower the risk of the occurrence of an infestation of mold or other biological contaminants.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Discrete sampling cannot be relied on to accurately reflect natural variations in stratigraphy that could exist between sample locations and/or intervals.

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

APPENDIX B

LOGS OF BORINGS S-1 THROUGH S-14
BORING LOG: TERMS AND SYMBOLS

APPENDIX C

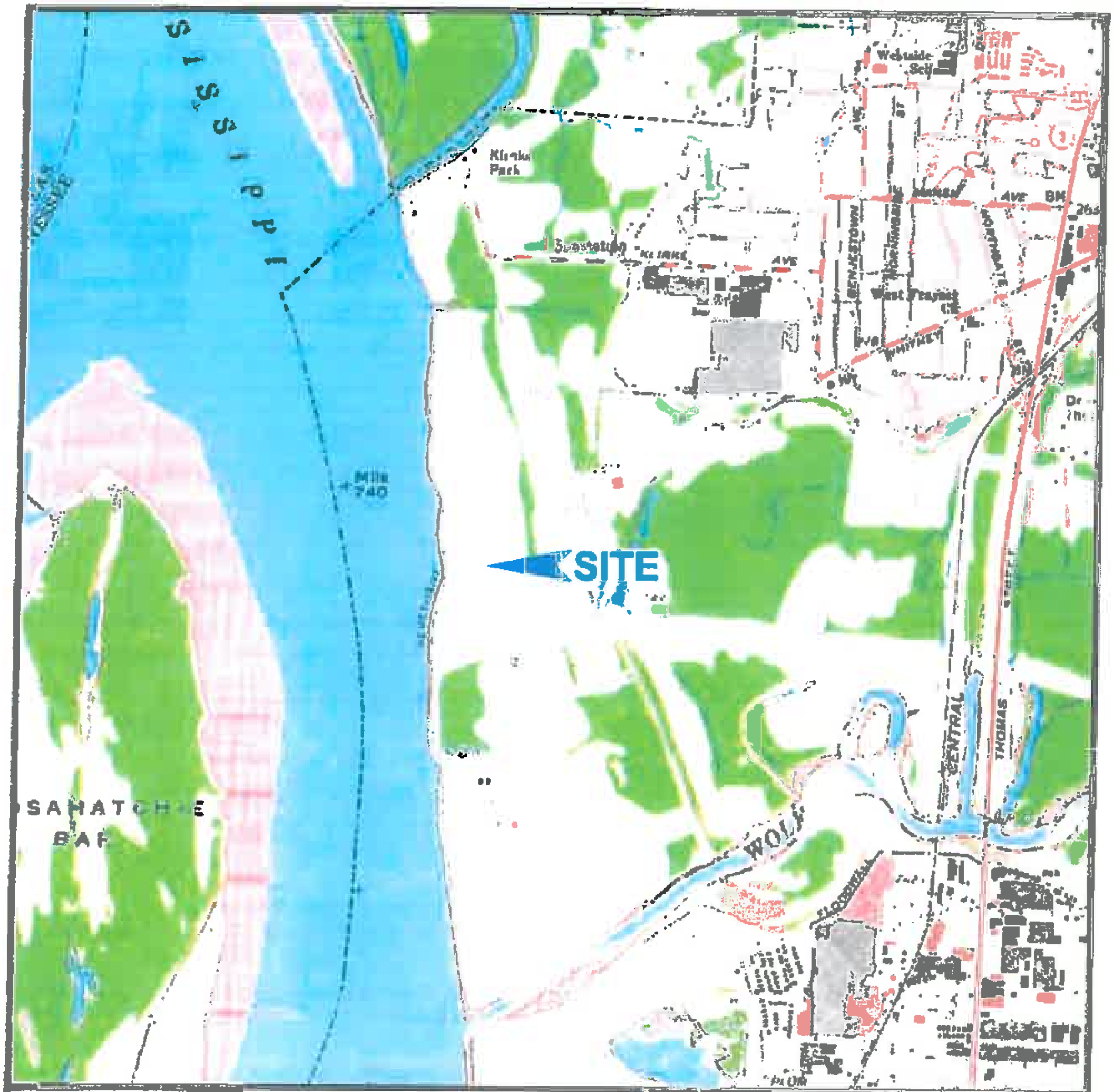
LABORATORY TEST RESULTS

APPENDIX D

LOGS OF BORING B-1 THROUGH B-5
FROM HALL BLAKE & ASSOCIATES

APPENDIX E

SLOPE STABILITY ANALYSIS RESULTS



NOTES

Plan adapted from a 7.5 minute U.S.G.S. map for Northwest Memphis, Tennessee Quadrangle, last revised in 1973.

0 2,000 4,000

SCALE IN FEET

N

Drawn By: SLC	Ck'd By:	App'vd By:
Date: 07-26-12	Date:	Date:

GEOTECHNOLOGY INC

FROM THE GROUND UP

M. C. Stiles
Wastewater Treatment Facility
Memphis, Tennessee

SITE LOCATION AND TOPOGRAPHY

Project Number
J020438.01

PLATE 1

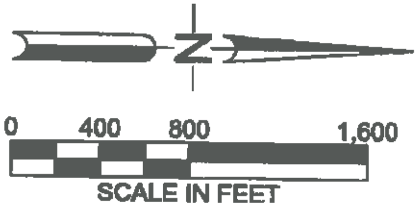
NOTES

1. Plan adapted from an aerial photograph courtesy of Google Earth Pro.

2. Borings were located in the field with reference to site features and are shown approximate only.

LEGEND

● Boring Location



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Date: 07-26-12	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

M. C. Stiles
Wastewater Treatment Facility
Memphis, Tennessee

AERIAL PHOTOGRAPH OF SITE AND BORING LOCATIONS

Project Number
J020438.01

PLATE 2

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/The Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE THE GEOPROFESSIONAL
BUSINESS ASSOCIATION

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

APPENDIX B

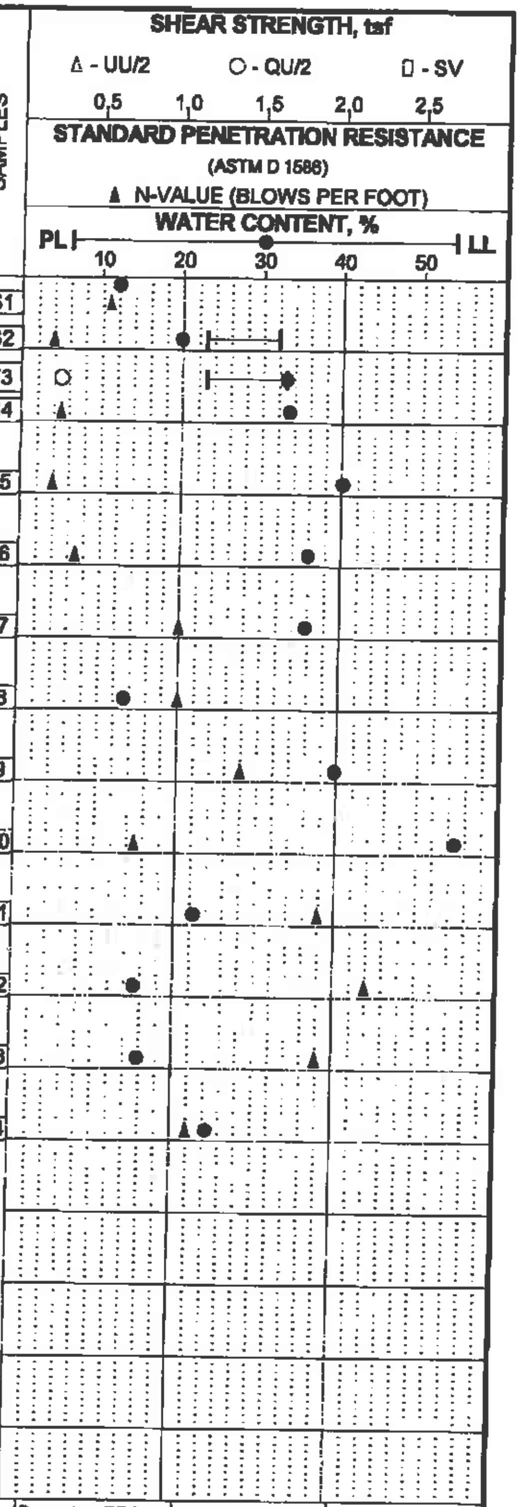
LOGS OF BORINGS S-1 THROUGH S-14
BORING LOG: TERMS AND SYMBOLS

Surface Elevation 221

Datum MSL

Completion Date: 6/23/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Stiff, brown, sandy SILT - ML		13-6-5	SS1
5	Soft to medium stiff, brown and gray, silty CLAY - (CL)	▨	3-1-3	SS2
		▨	91	ST3
10		▨	1-2-3	SS4
	Soft, brown and gray, FAT CLAY - CH	▨		
15		▨	1-2-2	SS5
	Medium stiff, brown, sandy SILT - ML			
20			3-3-4	SS6
	Medium dense to dense, brown and gray, silty SAND - SM			
25			9-10-10	SS7
30			8-8-12	SS8
35			7-13-15	SS9
40	CH seam		6-7-8	SS10
45			10-18-20	SS11
50			14-18-26	SS12
55			14-18-20	SS13
60	trace clay		12-12-10	SS14
	Boring terminated at 60 feet.			
65				
70				
75				
80				



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT __ FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 10 FEET

DT DRILLER CM LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/25/12	Date:	Date:

GEOTECHNOLOGY, INC.
ENGINEERING AND ENVIRONMENTAL SERVICES
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STILES LEVEE
Fisher and Arnold

LOG OF BORING: S-01

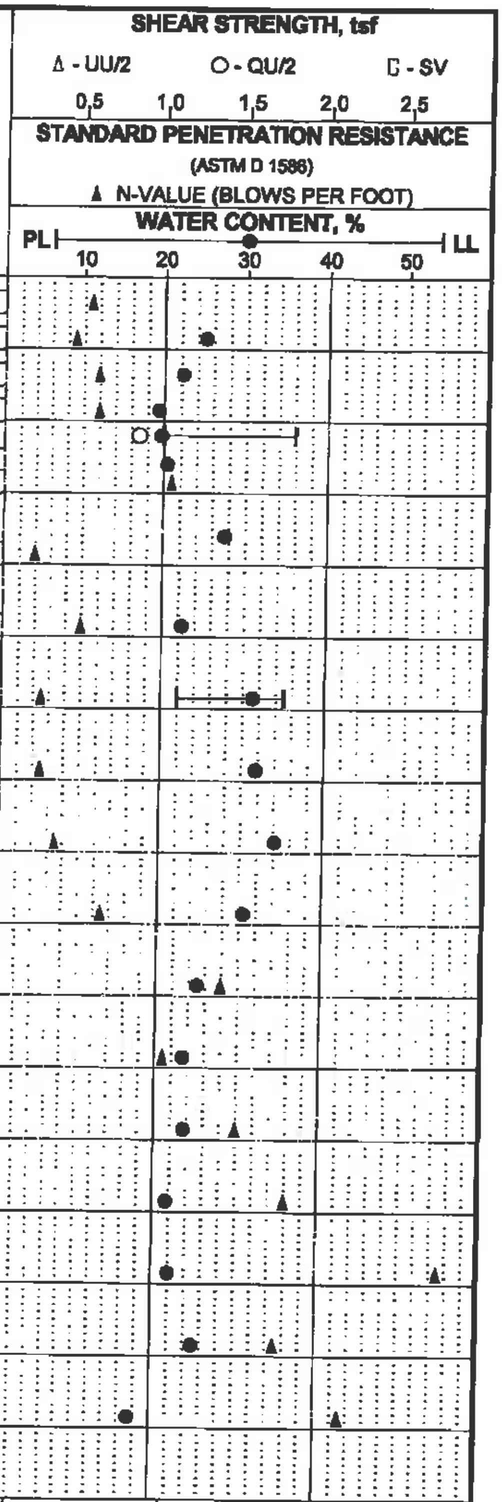
Project No. J020438.01

Surface Elevation 246

Datum MSL

Completion Date: 6/14/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Very stiff to soft, brown and gray, silty CLAY - (CL)		5-5-6	SS1
5			3-4-5	SS2
			5-6-6	SS3
10			3-5-7	SS4
			108	ST
15			7-7-14	SS5
20			3-2-2	SS6
25			4-5-5	SS7
30			3-2-3	SS8
35			2-2-3	SS9
40			3-3-4	SS10
45	Stiff, gray, sandy SILT - ML		6-7-6	SS11
50	Medium dense to very dense, brown SAND - SP		12-12-16	SS12
55			11-8-13	SS13
60			8-12-18	SS14
65	with trace clay		17-16-20	SS15
70			20-25-30	SS16
75	with trace lignite		12-15-20	SS17
80	Boring terminated at 80 feet.		13-20-23	SS18



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT __ FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 25 FEET

DT DRILLER CM LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/15/12	Date:	Date:

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STILES LEVEE
Fisher and Arnold

LOG OF BORING: S-02

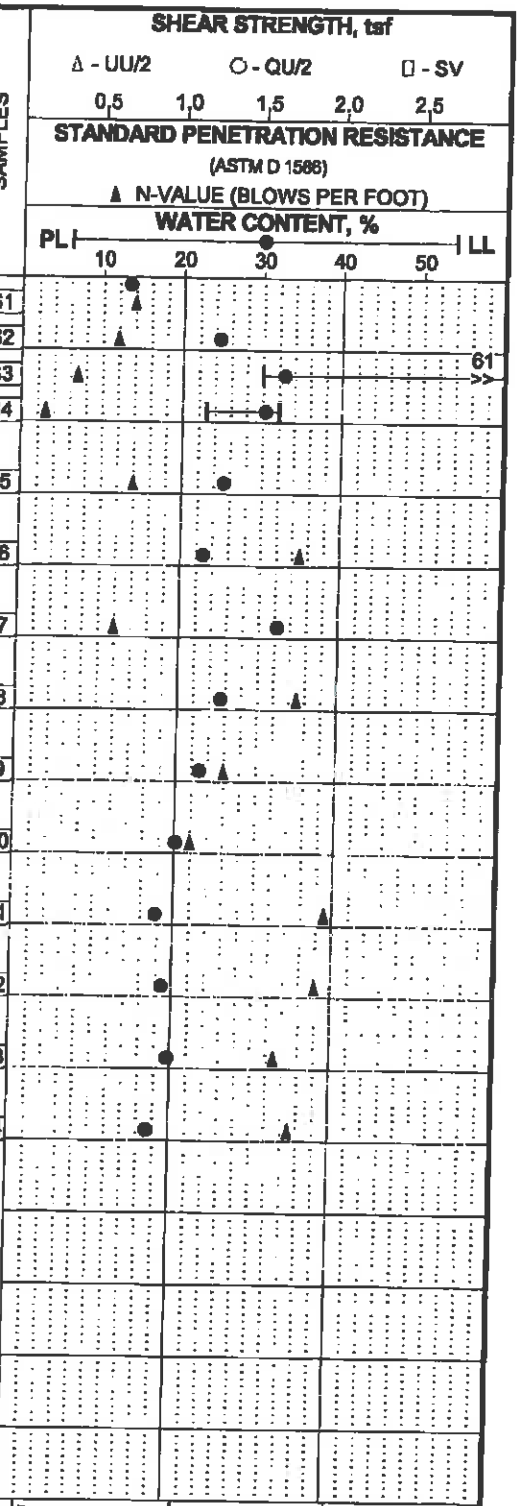
Project No. J020438.01

Surface Elevation 215

Datum MSL

Completion Date: 6/23/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Stiff, brown and gray, sandy SILT - ML			
	trace clay		9-6-8	SS1
5	trace clay		5-6-6	SS2
	Medium stiff to soft, brown, FAT CLAY - (CH)		2-3-4	SS3
10	Soft to stiff, brown, silty CLAY - (CL)		2-1-2	SS4
15			3-6-8	SS5
	Dense, brown, silty SAND - SM			
20			10-15-20	SS6
	Stiff, gray, silty CLAY - CL			
25	Dense to medium dense, brown and gray, silty SAND - SM		7-4-8	SS7
30			11-15-20	SS8
35			12-13-13	SS9
40			10-11-11	SS10
45			13-18-21	SS11
50			18-19-19	SS12
55			11-16-17	SS13
60			13-18-17	SS14
	Boring terminated at 60 feet.			
65				
70				
75				
80				



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT ___ FEET
AT ___ FEET AFTER ___ DAYS
AT ___ FEET AFTER ___ DAYS
X FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

___ AUGER 3.25 HOLLOW STEM
WASHBORING FROM 10 FEET
DT DRILLER CM LOGGER
D-50 DRILL RIG
HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/25/12	Date:	Date:

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STILES LEVEE
Fisher and Arnold

LOG OF BORING: S-03

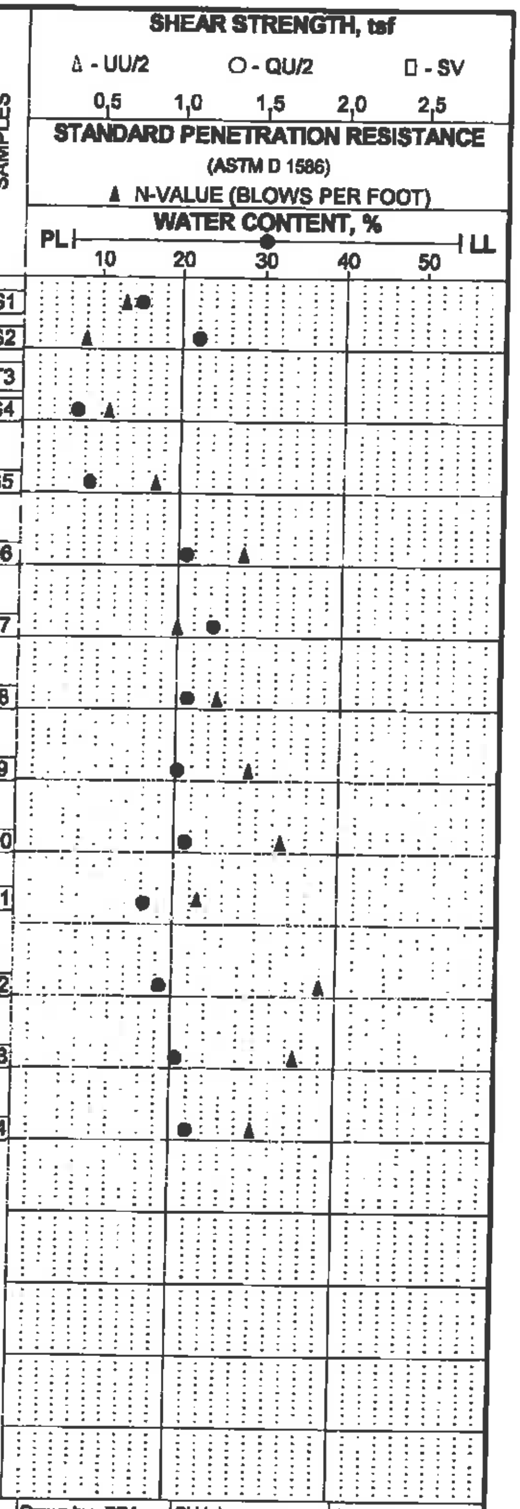
Project No. J020438.01

Surface Elevation 219

Datum MSL

Completion Date: 6/29/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Stiff to medium stiff, brown, silty CLAY - CL			
	trace sand		7-6-7	SS1
5	trace sand		3-3-5	SS2
				ST3
10	Medium dense, brown and tan, silty SAND - SM		3-5-6	SS4
15			5-8-9	SS5
20			8-13-15	SS6
25			8-9-11	SS7
30	Medium dense to dense, gray SAND - SP trace gravel		13-12-13	SS8
35			5-15-14	SS9
40			13-17-16	SS10
45	trace gravel		10-11-12	SS11
50			15-17-21	SS12
55	trace gravel		13-16-19	SS13
60	Boring terminated at 60 feet.		13-15-15	SS14
65				
70				
75				
80				



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT __ FEET
AT __ FEET AFTER __ DAYS
AT __ FEET AFTER __ DAYS
X FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM
WASHBORING FROM 15 FEET
CF DRILLER DTC LOGGER
B-58 DRILL RIG
HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/29/12	Date:	Date:

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Fisher and Arnold

LOG OF BORING: S-04

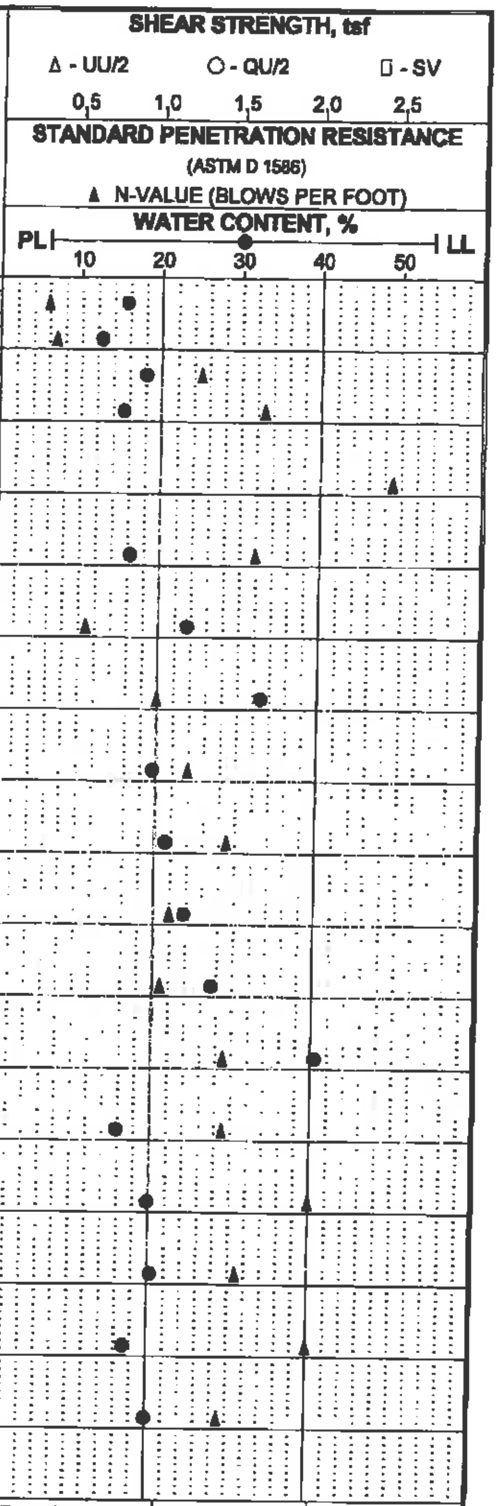
Project No. J020438.01

Surface Elevation 238

Datum MSL

Completion Date: 6/12/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Asphalt to 2.5 feet.	5-4-2	SS1
5	Medium stiff, brown, sandy SILT - ML	4-4-3	SS2
	Medium dense, brown, clayey SAND - SC	10-11-14	SS3
10	Dense, brown and gray, silty SAND - SM	11-15-18	SS4
15		13-21-28	SS5
20		13-15-17	SS6
	Stiff, gray, FAT CLAY - CH		
25		3-4-7	SS7
30	Medium dense to dense, brown and gray SAND - SP	7-8-12	SS8
35		6-13-11	SS9
40		14-13-16	SS10
45	CH seam	11-7-15	SS11
50		12-9-12	SS12
55	trace lignite	9-12-17	SS13
60		16-15-14	SS14
65		16-16-24	SS15
70	trace lignite	12-14-17	SS16
75		17-13-27	SS17
80	Boring terminated at 80 feet.	12-16-13	SS18



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 5 FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

___ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 5 FEET

DT DRILLER NR LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

REMARKS: PERCHED GROUND WATER AT 5 FEET

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 8/14/12	Date:	Date:

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LOG OF BORING: S-05

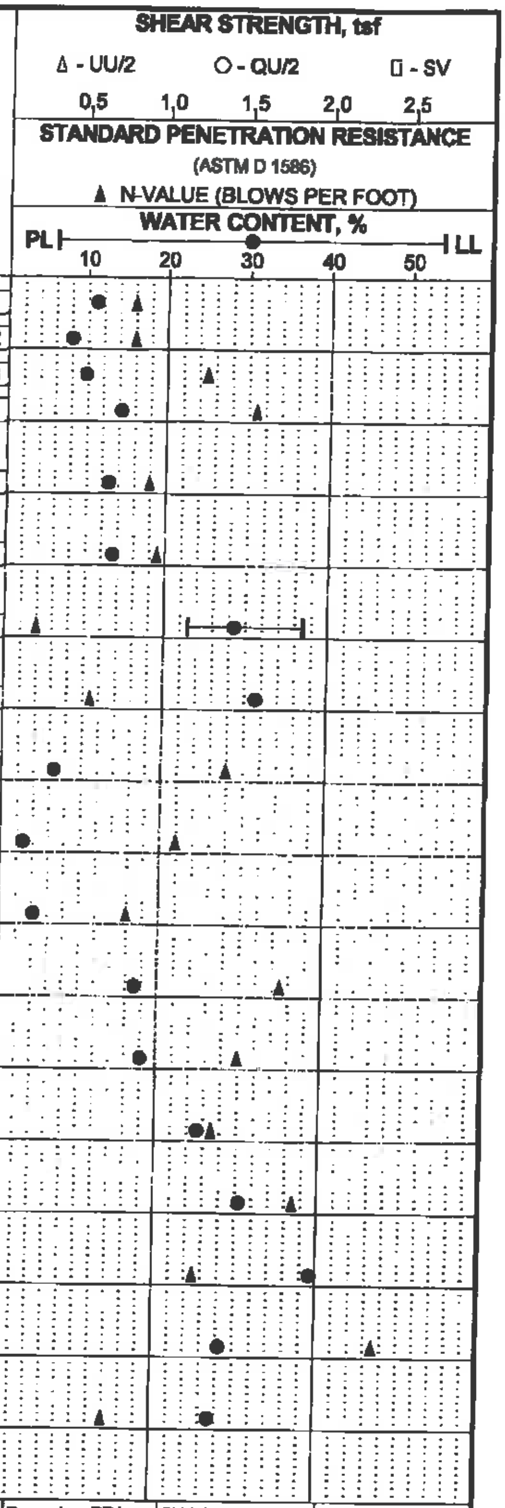
Project No. J020438.01

Surface Elevation 238

Datum MSL

Completion Date: 6/14/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium dense, brown, silty SAND, trace clay - SM	6-7-9	SS1
5		6-7-9	SS2
		4-11-14	SS3
10		9-14-17	SS4
15	Very stiff, gray, sandy SILT, trace clay - ML	5-7-11	SS5
20	Medium dense, gray, silty SAND - SM	5-10-9	SS6
25	Soft, brown and gray, silty CLAY - (CL)	2-2-2	SS7
30		3-4-7	SS8
35	Medium dense to dense, brown and tan, SAND - SP	8-12-16	SS9
40		7-9-13	SS10
45		7-7-9	SS11
50		11-17-18	SS12
55		13-10-20	SS13
60		10-12-15	SS14
65		24-20-17	SS15
70		13-12-13	SS16
75		23-22-25	SS17
80	Stiff, gray, sandy SILT - ML with gravel	12-6-8	SS18
	Boring terminated at 80 feet.		



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 50 FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

___ FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 55 FEET

DT DRILLER CM LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/15/12	Date:	Date:

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Fisher and Arnold

LOG OF BORING: S-06

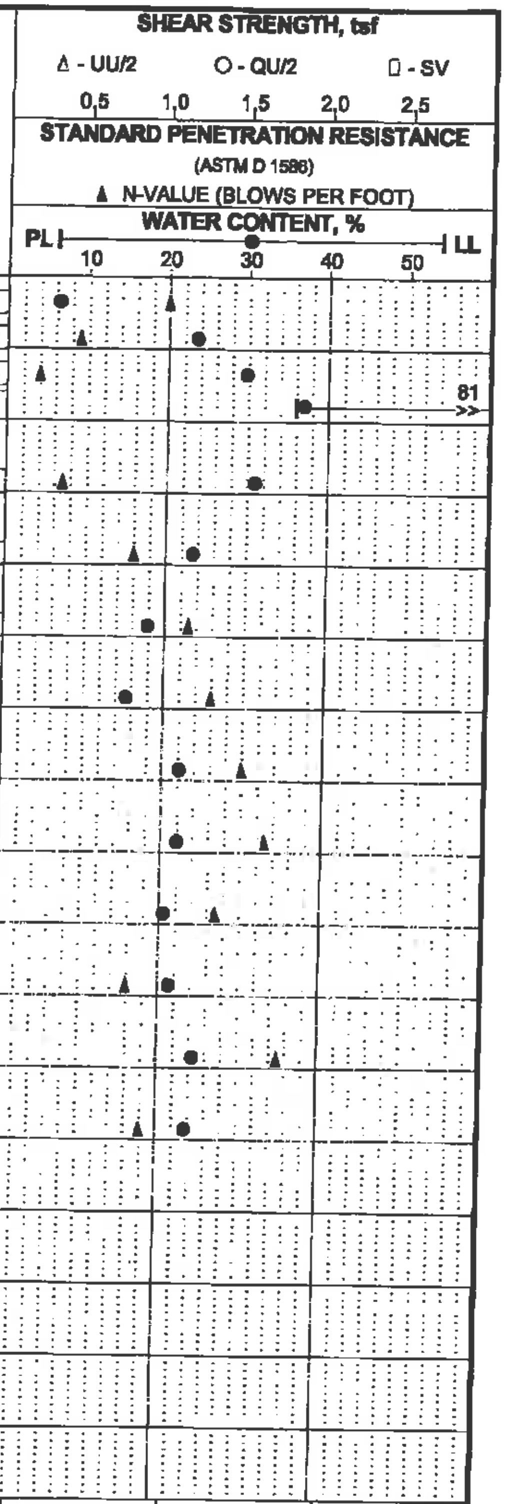
Project No. J020438.01

Surface Elevation 222

Datum MSL

Completion Date: 6/19/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Very stiff to stiff, brown, sandy SILT - ML		8-9-11	SS1
5			4-4-5	SS2
	Soft to medium stiff, brown and gray, FAT CLAY - (CH) 89.1 percent passing the No. 200 sieve.		2-2-2	SS3
10			83	ST4
15	with trace sand		2-2-5	SS5
20	Medium dense, tan and brown, silty SAND - SM		5-6-10	SS6
25	Medium dense to dense, tan and gray SAND - SP		7-9-14	SS7
30			9-10-16	SS8
35			12-17-13	SS9
40			9-14-19	SS10
45			10-12-15	SS11
50	with trace lignite		9-8-8	SS12
55			12-15-20	SS13
60	with trace lignite Boring terminated at 60 feet.		19-9-9	SS14
65				
70				
75				
80				



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT __ FEET
AT __ FEET AFTER __ DAYS
AT __ FEET AFTER __ DAYS
X FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM
WASHBORING FROM 10 FEET
MH DRILLER CM LOGGER
D-50 DRILL RIG
HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/20/12	Date:	Date:

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STILES LEVEE
Fisher and Arnold

LOG OF BORING: S-07

Project No. J020438.01

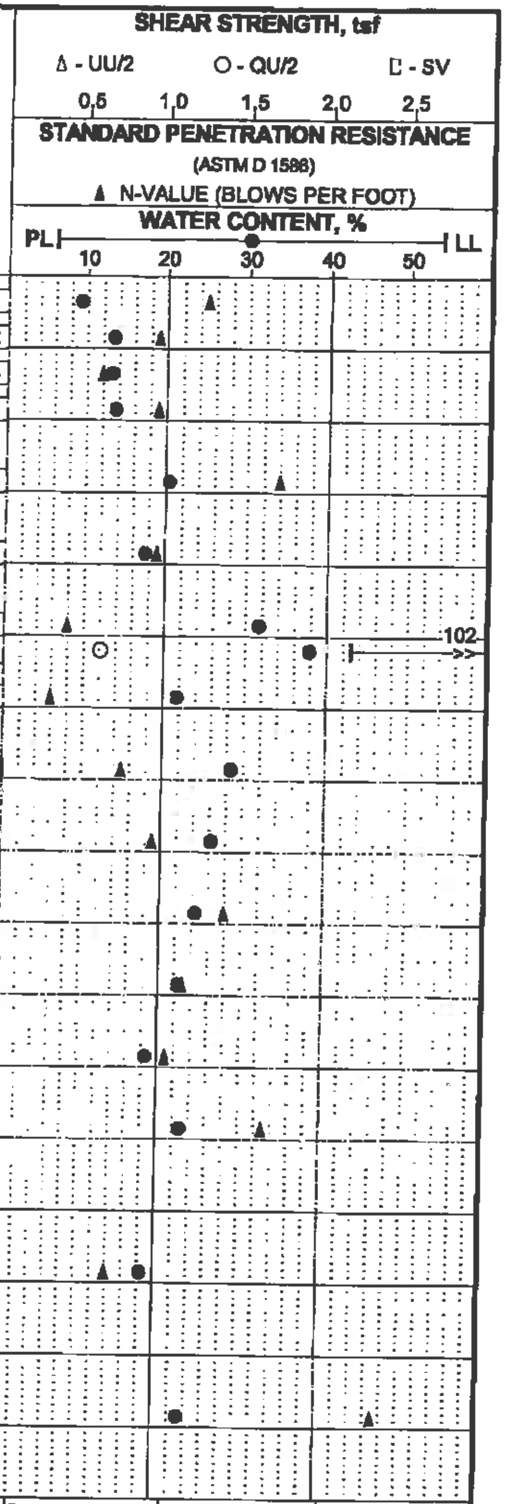
Surface Elevation 241

Datum MSL

Completion Date: 6/18/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium dense, brown and gray, silty SAND - SM	7-11-14	SS1
5	with trace clay	6-8-11	SS2
		5-5-7	SS3
10	with trace organics	5-7-12	SS4
15		10-15-19	SS5
	Very stiff, gray, sandy SILT - ML		
20		8-9-10	SS6
	Medium stiff, gray and brown, elastic SILT - (MH)		
25		2-3-5	SS7
		83	ST8
30		3-3-3	SS9
	Loose to dense, tan and brown, silty SAND - SM		
35		8-8-7	SS10
40		7-9-10	SS11
45		11-13-15	SS12
50		8-11-12	SS13
55		8-10-11	SS14
60		12-17-16	SS15
65			
70		8-6-8	SS16
75			
80	Boring terminated at 80 feet.	29-24-23	SS17

GRAPHIC LOG



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 14.5 FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

__ FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 30 FEET

MH DRILLER DT LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/20/12	Date:	Date:

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STILES LEVEE
Fisher and Arnold

LOG OF BORING: S-08

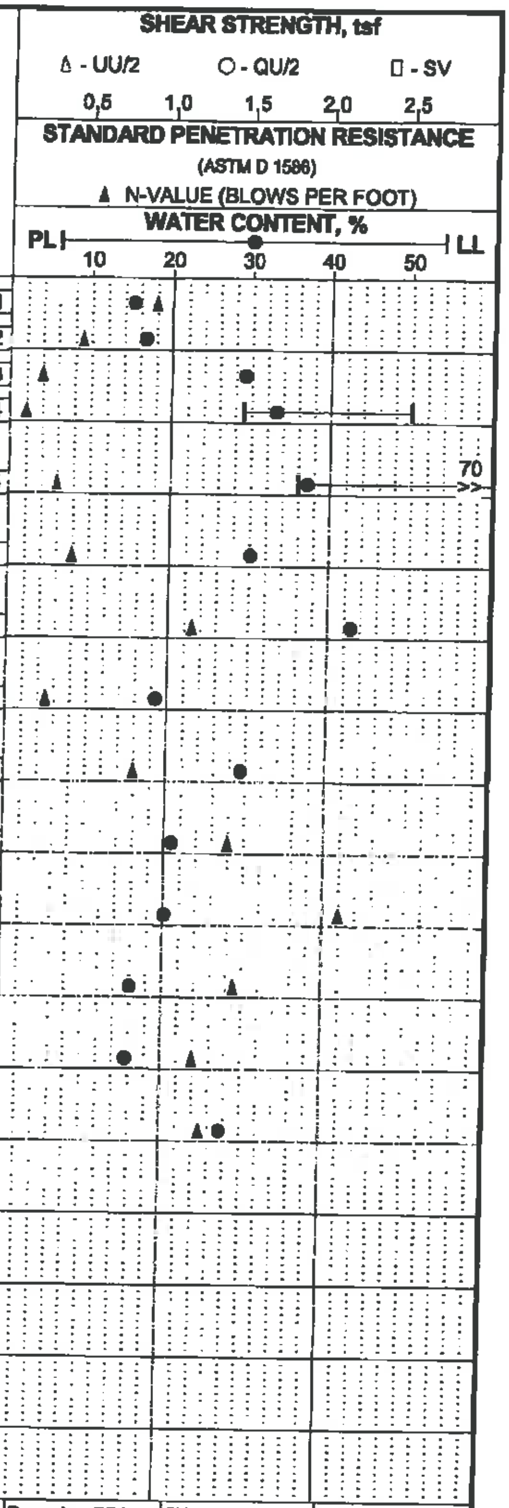
Project No. J020438.01

Surface Elevation 222

Datum MSL

Completion Date: 6/19/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium dense to loose, brown, silty SAND - SM		5-8-10	SS1
			4-4-5	SS2
5	Soft, brown and gray, sandy SILT - ML		3-2-2	SS3
	Soft to medium stiff, gray, elastic SILT - (MH)		2-1-1	SS4
15			2-2-4	SS5
	Medium stiff, gray, FAT CLAY - CH		5-4-4	SS6
25	Very stiff, gray, sandy SILT - ML		11-11-12	SS7
30	Loose to medium dense, brown and gray, silty SAND - SM		2-3-2	SS8
35	with trace lignite		6-6-10	SS9
40	Medium dense to dense, brown and gray SAND - SP		9-12-16	SS10
45			12-21-21	SS11
50			12-14-15	SS12
55			10-11-13	SS13
60	Boring terminated at 60 feet.		5-12-13	SS14



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT __ FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

X FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 10 FEET

DT DRILLER CM LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/20/12	Date:	Date:

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Fisher and Arnold

LOG OF BORING: S-09

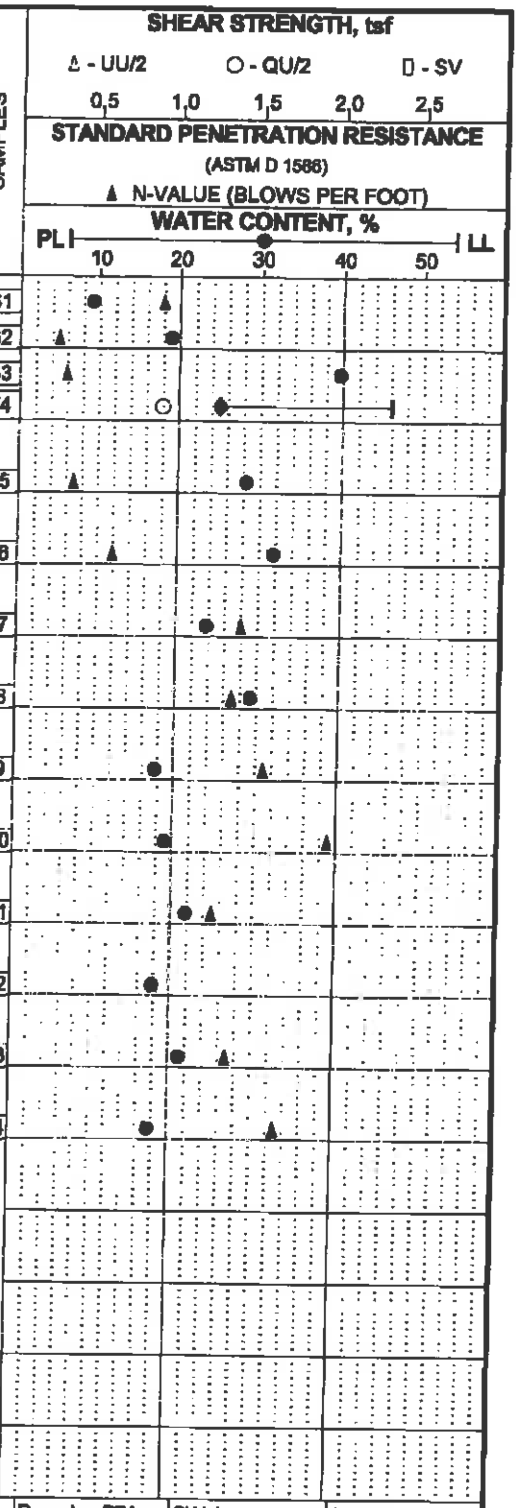
Project No. J020438.01

Surface Elevation 224

Datum MSL

Completion Date: 6/19/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Very stiff, brown and tan, sandy SILT - ML		7-8-10	SS1
5	Loose, brown, silty SAND - SM		3-3-2	SS2
	Medium stiff to stiff, brown, silty CLAY - (CL) 97.2 percent passing the No. 200 sieve.		2-2-4	SS3
10			95	ST4
15			2-3-4	SS5
20			5-8-4	SS6
25	Medium dense to dense, tan and gray, silty SAND - SM		11-14-14	SS7
30			10-12-15	SS8
35			9-14-17	SS9
40	Dense to medium dense, tan and gray SAND - SP		14-18-21	SS10
45			13-12-13	SS11
50			9-10-8	SS12
55			9-13-14	SS13
60	Boring terminated at 60 feet.		9-13-20	SS14
65				
70				
75				
80				



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT __ FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

X FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 10 FEET

MH DRILLER CM LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/20/12	Date:	Date:

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STILES LEVEE
Fisher and Arnold

LOG OF BORING: S-10

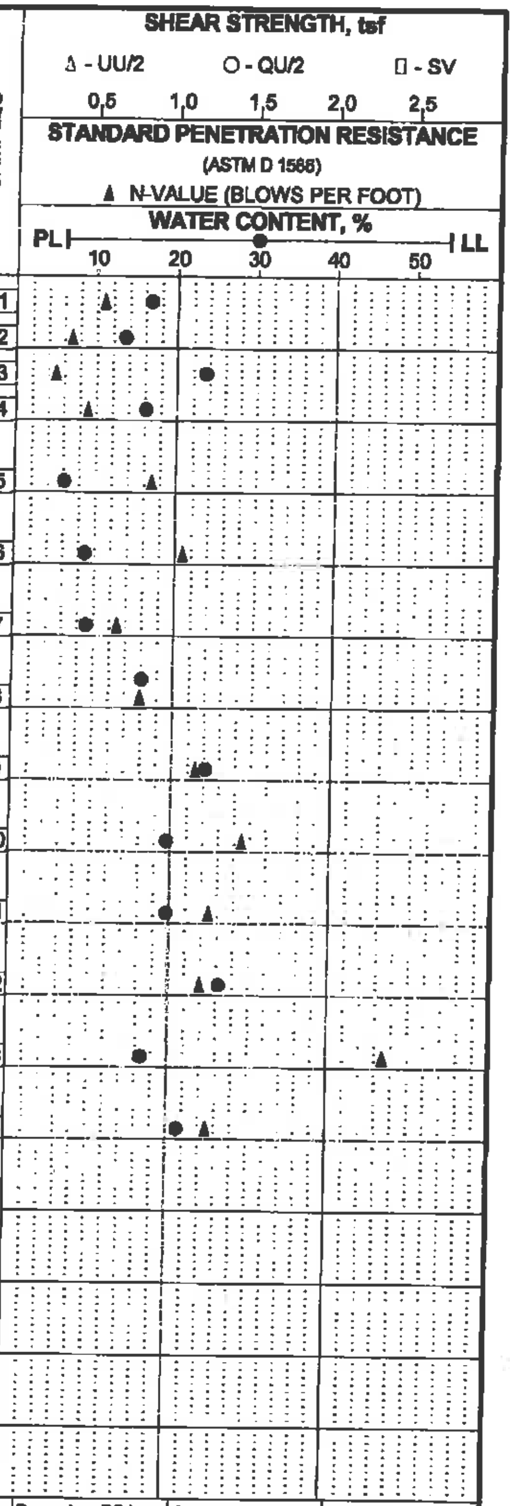
Project No. J020438.01

Surface Elevation 223

Datum MSL

Completion Date: 6/12/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium dense, brown, silty SAND - SM		
		4-5-6	SS1
5		3-2-5	SS2
	Medium stiff, brown, silty CLAY - CL	4-2-3	SS3
10	Loose to medium dense, brown, silty SAND - SM	2-3-6	SS4
15		4-7-10	SS5
20		7-10-11	SS6
25		7-9-4	SS7
30		5-7-9	SS8
	Medium dense to dense, brown and gray SAND - SP		
35		13-11-12	SS9
40	with trace gravel	9-13-16	SS10
45	with trace gravel	9-12-13	SS11
50		9-8-15	SS12
55		19-24-23	SS13
60	Boring terminated at 60 feet.	10-11-14	SS14
65			
70			
75			
80			



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 35 FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

___ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 35 FEET

DT DRILLER NR LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/14/12	Date:	Date:

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ENGINEERING AND ENVIRONMENTAL SERVICES
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STILES LEVEE
Fisher and Arnold

LOG OF BORING: S-11

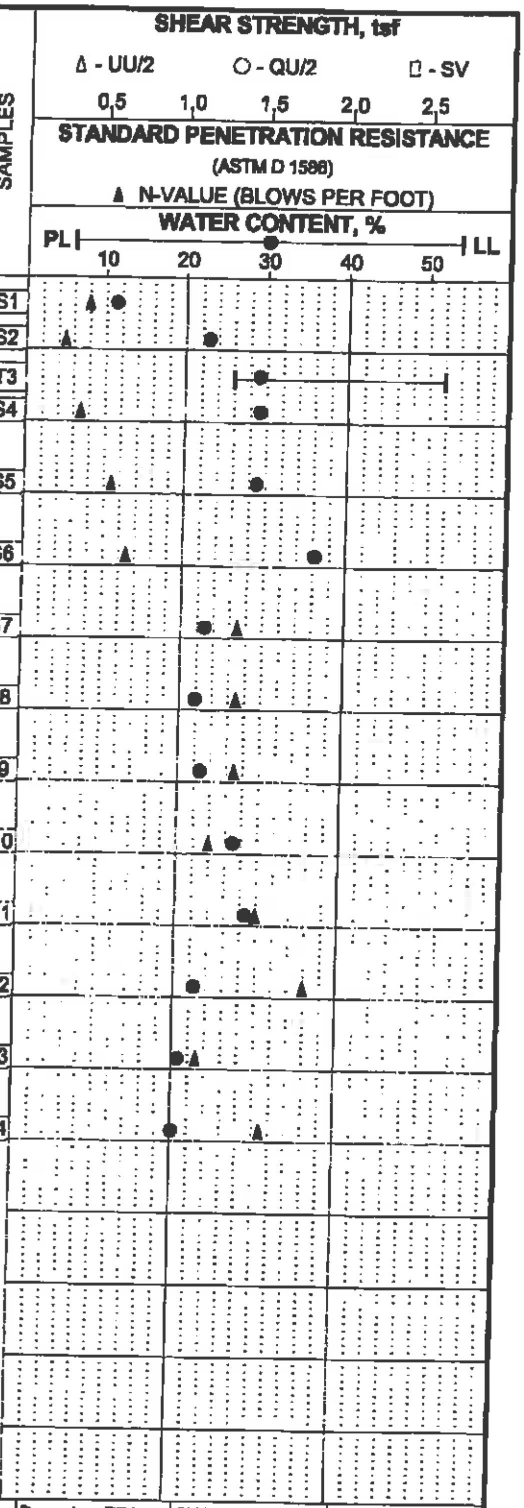
Project No. J020438.01

Surface Elevation 223

Datum MSL

Completion Date: 6/23/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff, brown, sandy SILT - ML	7-5-3	SS1
5	trace clay	5-2-3	SS2
	Medium stiff, brown, FAT CLAY - (CH)	90	ST3
10		2-3-4	SS4
	Medium dense, brown, silty SAND, trace clay - SM		
15		3-5-6	SS5
	Stiff, brown, silty CLAY - CL		
20		2-4-9	SS6
25	Medium dense to dense, brown and gray, silty SAND - SM	13-12-15	SS7
30		10-12-15	SS8
35		9-13-14	SS9
40		10-10-14	SS10
45	trace lignite	9-13-17	SS11
50		10-14-22	SS12
55	trace lignite	8-10-13	SS13
60	Boring terminated at 60 feet.	21-16-15	SS14
65			
70			
75			
80			



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT ___ FEET

AT ___ FEET AFTER ___ DAYS

AT ___ FEET AFTER ___ DAYS

X FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

___ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 10 FEET

DT DRILLER CM LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/23/12	Date:	Date:

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STILES LEVEE
Fisher and Arnold

LOG OF BORING: S-12

Project No. J020438.01

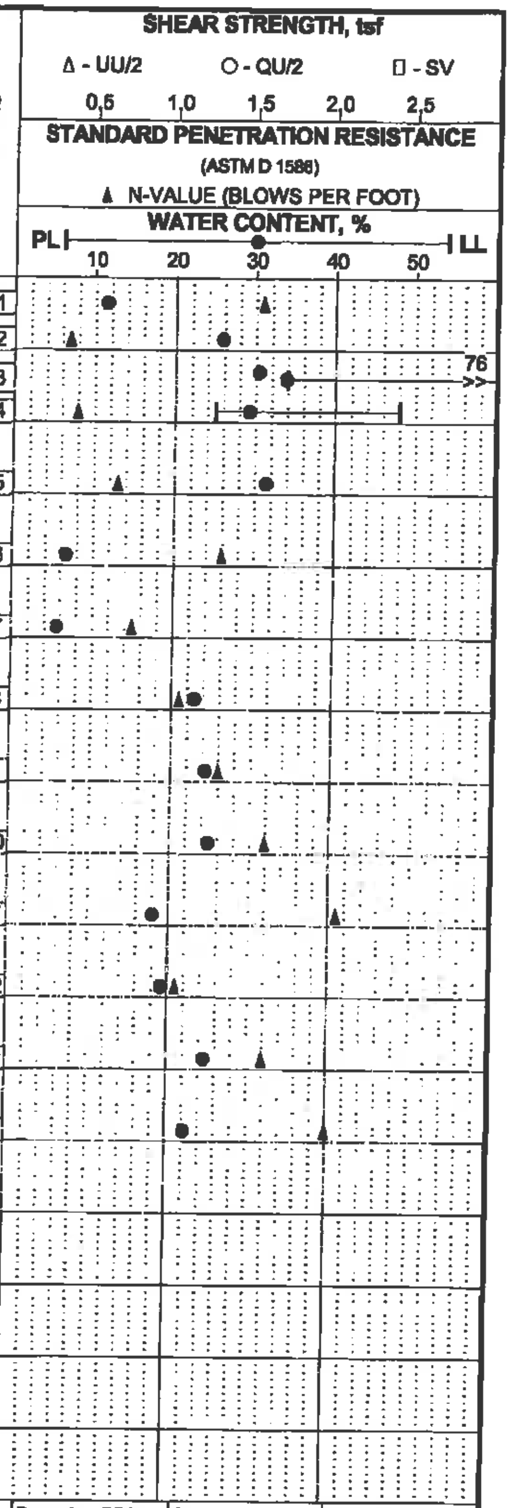
LOG OF BORING J020438.01STILES LEVEE.GPJ GEES.GDT 9/19/12

Surface Elevation 223

Datum MSL

Completion Date: 6/22/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Hard to medium stiff, brown, FAT CLAY - (CH)		20-16-15	SS1
5			3-3-4	SS2
	90.9 percent passing the No. 200 sieve.		88	ST3
	Medium stiff, brown and gray, silty CLAY - (CL)		85	
10			3-4-4	SS4
15	Stiff, brown and gray, sandy CLAY - CL		3-4-9	SS5
	Medium dense, brown and gray, silty SAND - SM			
20			12-12-14	SS6
25			9-7-8	SS7
30			7-9-12	SS8
35			10-12-14	SS9
40			12-14-18	SS10
45			17-20-21	SS11
50			9-9-12	SS12
55			10-15-17	SS13
	trace lignite			
60	Boring terminated at 60 feet.		12-20-20	SS14
65				
70				
75				
80				



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT __ FEET

AT __ FEET AFTER __ DAYS

AT __ FEET AFTER __ DAYS

X FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM 10 FEET

DT DRILLER CM LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/25/12	Date:	Date:

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LOG OF BORING: S-13

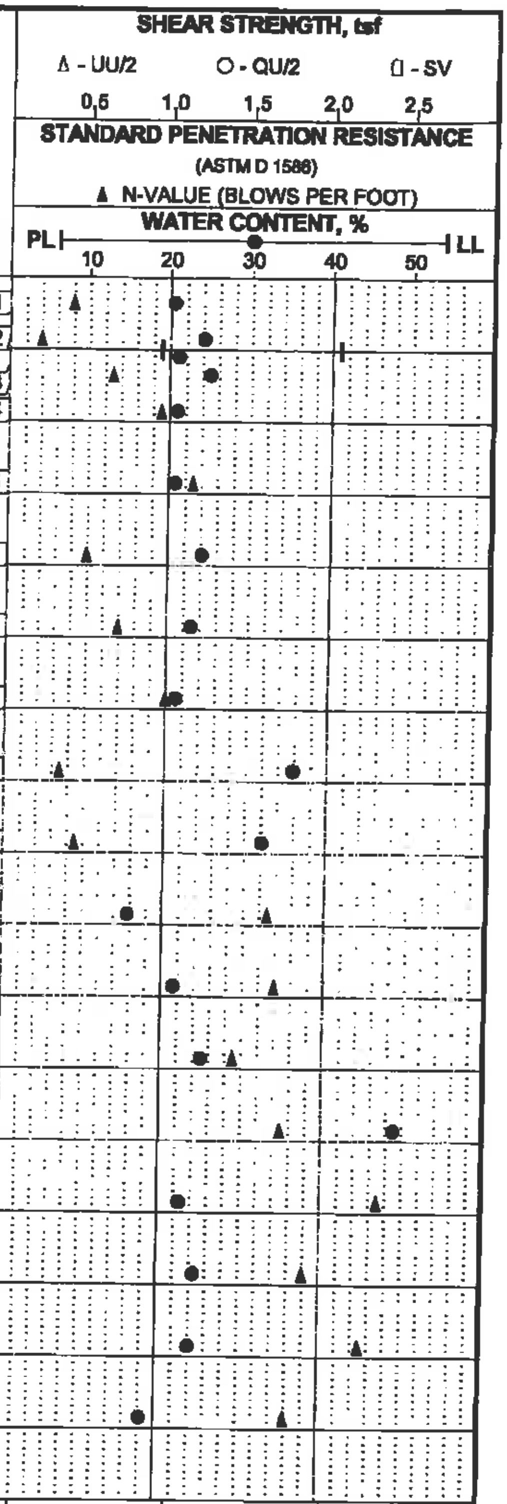
Project No. J020438.01

Surface Elevation 245

Datum MSL

Completion Date: 6/13/12

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (PCF) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Soft to very stiff, brown and gray, silty CLAY - (CL) with gravel	10-5-3	SS1
5	88.2 percent passing the No. 200 sieve.	3-2-2	SS2
		102	ST
		3-4-9	SS3
10		3-6-13	SS4
15	trace ash	9-10-13	SS5
20		3-5-5	SS6
25		4-6-8	SS7
30	Very stiff, gray, sandy CLAY - CL	4-5-15	SS8
35	Medium stiff, gray and brown, FAT CLAY - CH	2-3-4	SS9
40	Stiff, gray and brown, silty CLAY - CL	3-4-5	SS10
45	Dense to medium dense, tan and brown SAND - SP	18-17-16	SS11
50		12-17-17	SS12
55		15-14-15	SS13
60	Hard, gray, FAT CLAY - CH	14-17-18	SS14
	Dense, gray SAND - SP		
65		16-20-27	SS15
70		16-17-21	SS16
75		19-19-26	SS17
80	Boring terminated at 80 feet.	14-14-22	SS18



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT __ FEET
AT __ FEET AFTER __ DAYS
AT __ FEET AFTER __ DAYS
X FREE WATER NOT ENCOUNTERED DURING DRILLING

REMARKS:

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM
WASHBORING FROM __ FEET
DT DRILLER CM LOGGER
D-50 DRILL RIG
HAMMER TYPE Auto

Drawn by: DBA	Ck'd. by:	App'vd. by:
Date: 6/14/12	Date:	Date:

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LOG OF BORING: S-14

Project No. J020438.01

BORING LOG: TERMS AND SYMBOLS

GENERAL NOTES

1. *Information on each boring log is a compilation of subsurface conditions based on soil or rock classifications obtained from the field as well as from laboratory testing of samples. The strata lines on the logs may be approximate or the transition between the strata may be gradual rather than distinct. Water level measurements refer only to those observed at the times and places indicated, and may vary with time, geologic condition or construction activity.*
2. *Relative composition and Unified Soil Classification designations are based on visual estimates and are approximate only. If laboratory tests were performed to classify the soil, the unified designation is show in parenthesis.*
3. *Value given in Unit Dry Weight/SPT Column is either a unit dry weight in pounds per cubic foot, if adjacent to a ST sample designation, or blows per 6-inch increment if adjacent to a SS sample designation.*

ABBREVIATIONS

UU/2	*Shear Strength from Unconsolidated -- Undrained Triaxial Test (ASTM D2850)*
QU/2	*Shear Strength from Unconfined Compression Test (ASTM D2166)*
SV	*Shear Strength from Field Vane (ASTM D2573)*
PL	*Plastic Limit (ASTM D4318)*
LL	*Liquid Limit (ASTM D4318)*

LEGEND

CS	Continuous Sampler
GB	Grab Sample Taken From Auger Cuttings Or Wash Water Return
NX 100 42	NX Rock Core with Percent Recovery/R.Q.D. Given In Adjacent Column
PST	Three Inch Diameter Piston Tube Sample
SS	Split Spoon Sample (Standard Penetration Test)
ST	Three Inch Diameter Shelby Tube Sample
*	Sample Not Recovered
SV	Field Vane Test

SPLIT – BARREL SAMPLER DRIVING RECORD

Blow Per Foot (N-Value)	*Description*
25	*25 blows drove sampler 12 inches after initial 6 inches of seating.*
75/10"	*75 blows drove sampler 10 inches after initial 6 inches of seating.*
50/S3"	*50 blows drove sampler 3 inches during initial 6 inch seating interval.*

NOTES:

1. *To avoid damage to sampling tools, driving is limited to 50 blows during any six inch interval.*
2. *N-Value (Blow Count) is the standard penetration resistance based on the total number of blows, using a 140-lb hammer with 30-inch free fall, required to drive a split spoon the last two of three, 6-inch drive increments. (Example: 4/7/9, N = 7 + 9 = 16). Values are shown as a summation on grid plot and may be shown as 4/7/9 in Unit Dry Weight – SPT column.*

RELATIVE COMPOSITION

Trace	*0-10 %*
With/Some	*11-35 %*
Soil modifier such	*> 35 %*

As silty, clayey, sandy, etc.

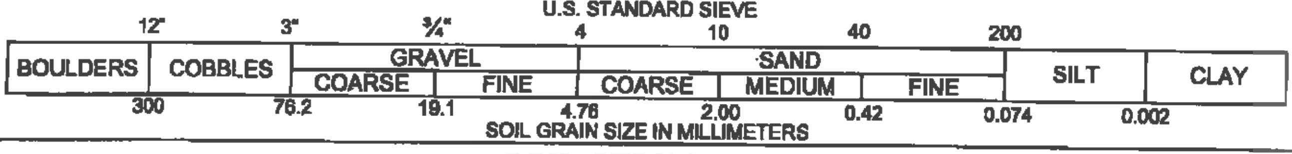
DENSITY OF GRANULAR SOILS

Descriptive Term:	*N—Value*
Very Loose	*0 - 4*
Loose	*5 - 10*
Medium Dense	*11 - 30*
Dense	*31 - 50*
Very Dense	*> 50*

STRENGTH OF COHESIVE SOILS

Consistency	Undrained Shear Strength Tons Per Sq. Ft.	Field Test	Approximate N-Value Range
Very Soft	*less than 0.12*	*Thumb will penetrate soil more than 1"*	*0 - 1*
Soft	*0.13 to 0.25*	*Thumb will penetrate soil about 1"*	*2 - 4*
Medium Stiff	*0.26 to 0.50*	*Thumb will penetrate soil about ¼"*	*5 – 8*
Stiff	*0.51 to 1.00*	*Thumb hardly indents soil*	*9 – 15*
Very Stiff	*1.01 to 2.00*	*Thumb will not indent soil, but readily indented with thumbnail*	*16 – 30*
Hard	*greater than 2.00*	*Thumbnail will not indent soil*	*> 30*

SOIL GRAIN SIZE



SOIL STRUCTURE

Calcareous *– Having appreciable quantities of carbonate.*

Fissured *– Containing shrinkage or relief cracks, often filled with sand or silt; usually more or less vertical.*

Slickensided *– Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the ease of breaking along those planes.*

Layer *– Inclusion greater than 3 inches thick.*

Seam *– Inclusion 1/8 inch to 3 inches thick extending through the sample*

Parting *– Inclusion less than 1/8 inch thick.*

Pocket *– Inclusion of material of different texture that is smaller than the diameter of the sample.*

Interlayered *– Soil samples composed of alternating layers of different soil types.*

Intermixed *– Soil samples composed of pockets of different soil types and a layered or laminated structure is not evident.*

Laminated *– Soil sample composed of alternating partings or seams of different soil type.*

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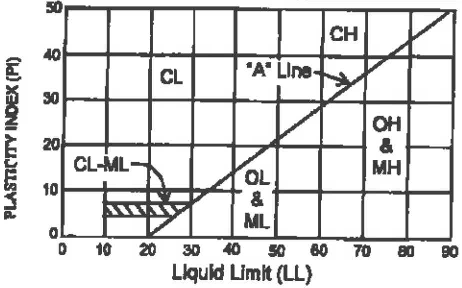
UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL	DESCRIPTION
Coarse-Grained Soils (More than 50% Larger than No 200 Sieve Size)	Gravel and Gravelly Soils	Clean Gravels Little or no Fines	GW	Well-Graded Gravel, Gravel-Sand Mixture
			GP	Poorly –Graded Gravel, Gravel-Sand Mixture
		Gravels with Appreciable Fines	GM	Silty Gravel, Gravel-Sand-Silt Mixture
			GC	Clayey-Gravel, Gravel-Sand-Clay Mixture
	Sand and Sandy Soils	Clean Sands Little or no Fines	SW	Well-Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sands with Appreciable Fines	SM	Silty Sand, Sand-Silt Mixture
			SC	Clayey Sand, Sand-Clay Mixture
Fine-Grained Soils (More than 50% Smaller than No 200 Sieve Size)	Silts and Clays	Liquid Limit Less Than 50	ML	Silt, Clayey Silt, Silty or Clayey Very Fine Sand, Slight Plasticity
			CL	Clay, Sandy Clay, Silty Clay, Low to Medium Plasticity
			OL	Organic Silts, or Silty Clays of Low Plasticity
	Silts and Clays	Liquid Limit More Than 50	MH	Silt, Fine Sandy or Silt Soil with High Plasticity
			CH	Clay, High Plasticity
			OH	Organic Clay of Medium to High Plasticity
	Highly Organic Soils		PT	Peat, Humus, Swamp Soil

PLASTICITY CHART



RELATIVE PLASTICITY

Nonplastic	Cannot Roll Into Ball
Trace Plasticity	Barely Roll Into Ball
Medium Plastic	Can be Rolled Into Ball
Highly Plastic	No Rupture by Kneading

VISUAL DESCRIPTION CRITERIA*

TABLE 1: CRITERIA FOR DESCRIBING ANGULARITY OF COARSE-GRAINED PARTICLES

Description	*Criteria*
Angular	*Particles have sharp edges and relatively plane sides with unpolished surfaces*
Subangular	*Particles are similar to angular description but have rounded edges*
Subrounded	*Particles have nearly plane sides but have well-rounded corners and edges*
Rounded	*Particles have smoothly curved sides and no edges*

TABLE 2: CRITERIA FOR DESCRIBING PARTICLE SHAPE

Description	*Criteria*
Flat	*Particles with width/thickness X3*
Elongated	*Particles with length/width X3*
Flat and Elongated	*Particles meet criteria for both flat and elongated*

TABLE 3: CRITERIA FOR DESCRIBING MOISTURE CONDITION

Description	*Criteria*
Dry	*Absence of moisture, dusty, dry to the touch*
Moist	*Damp, but no visible water*
Wet	*Visible free water, usually soil is below the water table*

TABLE 4: CRITERIA FOR DESCRIBING REACTION WITH HCL

Description	*Criteria*
None	*No visible reaction*
Weak	*Some reaction, with bubbles forming slowly*
Strong	*Violent reaction, with bubbles forming rapidly*

TABLE 6: CRITERIA FOR DESCRIBING CEMENTATION

Description	*Criteria*
Weak	*Crumbles or breaks with handling or little finger pressure*
Moderate	*Crumbles or breaks with considerable finger pressure*
Strong	*Will not crumble or break with finger pressure*

TABLE 8: CRITERIA FOR DESCRIBING DRY STRENGTH

Description	*Criteria*
None	*The dry specimen crumbles into powder with mere pressure of handling*
Low	*The dry specimen crumbles into powder with some finger pressure*
Medium	*The dry specimen breaks into pieces or crumbles with considerable finger pressure*
High	*The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.*
Very High	*The dry specimen cannot be broken between the thumb and a hard surface*

TABLE 9: CRITERIA FOR DESCRIBING DILATANCY

Description	*Criteria*
None	*No visible change in the specimen*
Slow	*Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.*
Rapid	*Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.*

TABLE 10: CRITERIA FOR DESCRIBING TOUGHNESS

Description	*Criteria*
Low	*Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.*
Medium	*Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness*
High	*Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness*

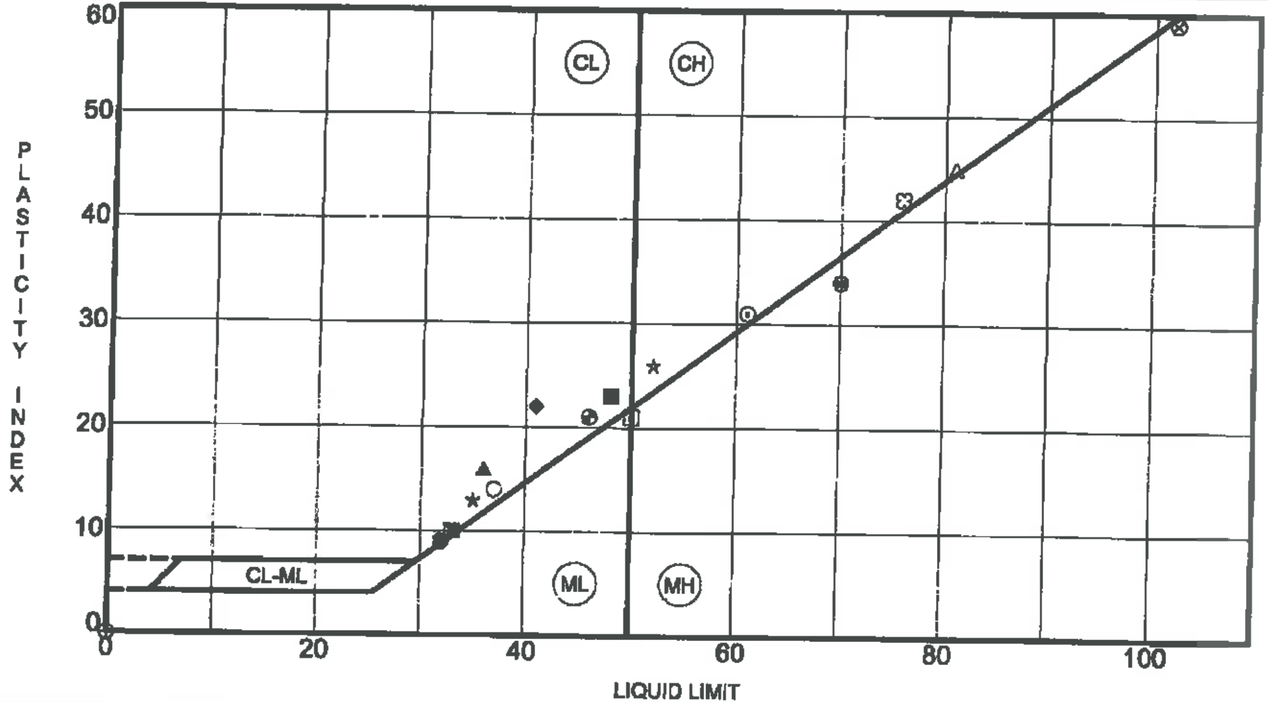
TABLE 12: IDENTIFICATION OF INORGANIC FINE-GRAINED SOILS FROM MANUAL TESTS

Soil Symbol	*Dry Strength*	*Dilatancy*	*Toughness*
ML	*None to low*	*Slow to rapid*	*Low or thread cannot be formed*
CL	*Medium to high*	*None to slow*	*Medium*
MH	*Low to medium*	*None to slow*	*Low to medium*
CH	*High to very high*	*none*	*High*

**NOTES: 1. Tables adapted from ASTM D2488 "Description and identification of Soils" (Visual-Manual Procedure)*
2. Tables 5, 7 and 11 incorporated into other information on this plate.

APPENDIX C

LABORATORY TEST RESULTS



	Specimen Identification		LL	PL	PI	Fines	Classification
●	S-01	3.5	32	23	9		LEAN CLAY(CL)
⊠	S-01	6.0	33	23	10		LEAN CLAY(CL)
▲	S-02	10.0	36	20	16		LEAN CLAY(CL)
★	S-02	28.5	35	22	13		LEAN CLAY(CL)
⊙	S-03	6.0	61	30	31		FAT CLAY(CH)
✿	S-03	8.5	32	23	9		LEAN CLAY(CL)
○	S-06	23.5	37	23	14		LEAN CLAY(CL)
△	S-07	8.0	81	36	45	89	FAT CLAY(CH)
⊗	S-08	25.0	102	43	59		ELASTIC SILT(MH)
⊕	S-08	33.5	NP	NP	NP	5	POORLY GRADED SAND(SP)
□	S-09	8.5	50	29	21		ELASTIC SILT(MH)
⊜	S-09	13.5	70	36	34		ELASTIC SILT(MH)
⊛	S-10	8.0	46	25	21	97	LEAN CLAY(CL)
★	S-12	6.0	52	26	26		FAT CLAY(CH)
⌘	S-13	6.0	76	34	42	91	FAT CLAY(CH)
■	S-13	8.5	48	25	23		LEAN CLAY(CL)
◆	S-14	4.0	41	19	22	88	LEAN CLAY(CL)

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ATTERBERG LIMITS RESULTS

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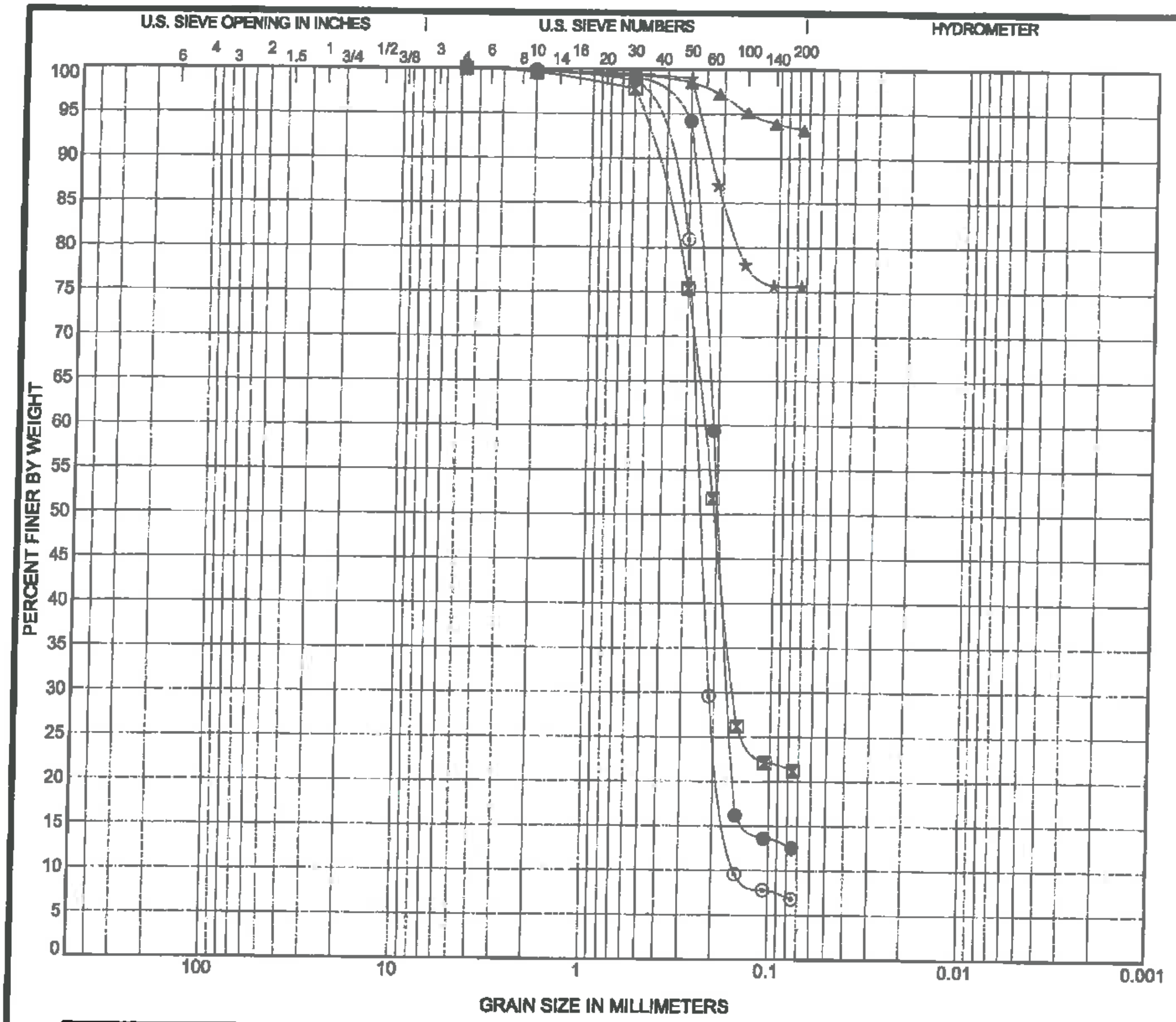

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	S-01	23.5	SILTY SAND(SM)					
⊠	S-01	38.5	SILTY SAND(SM)					
▲	S-02	3.5	LEAN CLAY(CL)					
★	S-02	43.5	LEAN CLAY(CL)					
⊙	S-02	53.5	POORLY GRADED SAND(SP)				1.15	1.72

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-01	23.5	4.75	0.213	0.168		0.0	87.5	12.5	
⊠	S-01	38.5	4.75	0.239	0.158		0.0	78.8	21.2	
▲	S-02	3.5	4.75				0.0	6.8	93.2	
★	S-02	43.5	4.75				0.0	24.4	75.6	
⊙	S-02	53.5	4.75	0.26	0.213	0.151	0.0	93.2	6.8	

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GRAIN SIZE DISTRIBUTION

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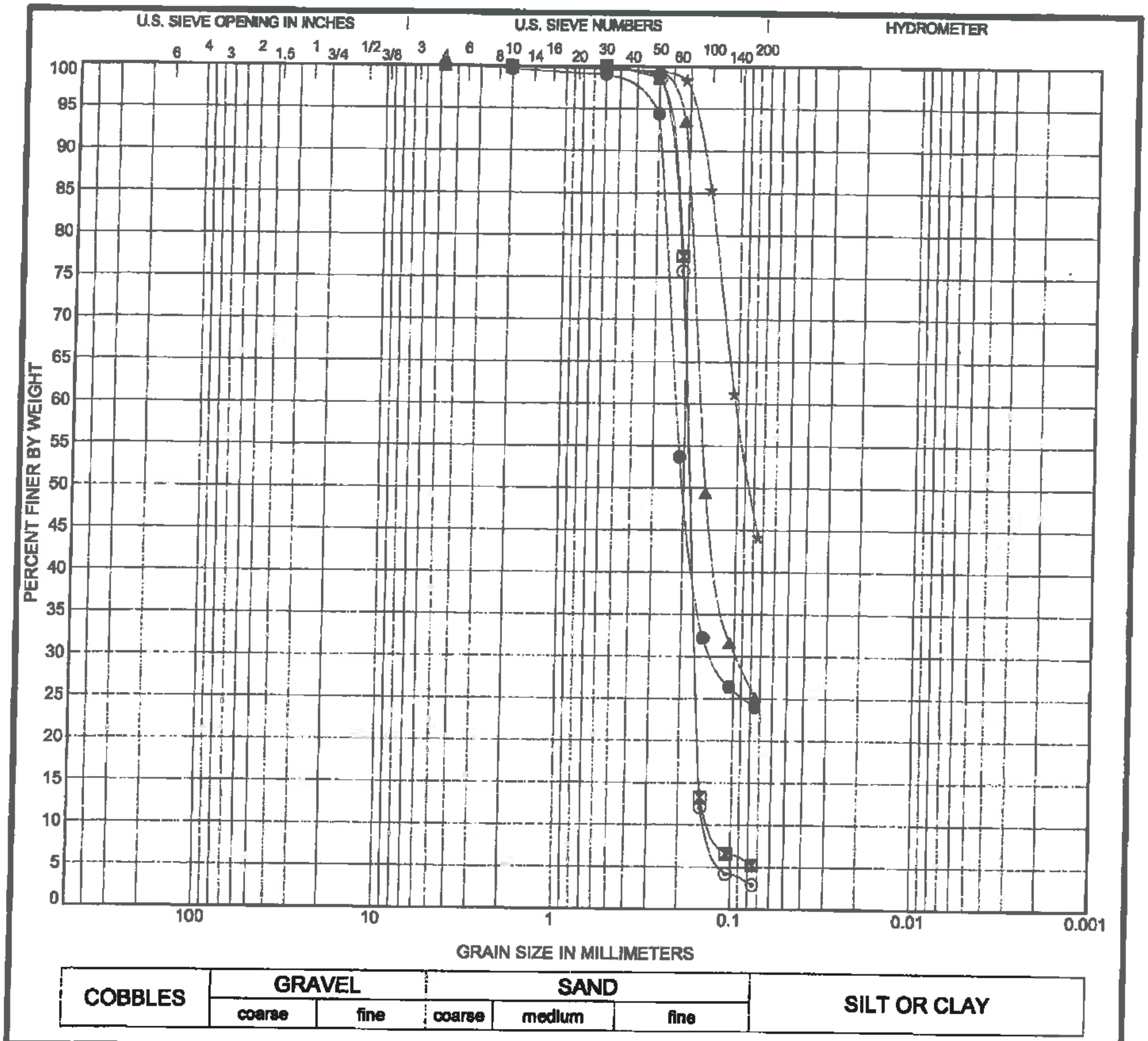

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	S-03	23.5	SILTY SAND(SM)					
⊠	S-05	48.5	POORLY GRADED SAND(SP)				1.10	1.53
▲	S-06	3.5	SILTY SAND(SM)					
★	S-06	18.5	ELASTIC SILT(MH)					
⊙	S-06	43.5	POORLY GRADED SAND(SP)				1.03	1.42

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-03	23.5	4.75	0.224	0.131		0.0	76.0	24.0	
⊠	S-05	48.5	2	0.193	0.164	0.126	0.0	94.8	5.2	
▲	S-06	3.5	4.75	0.163	0.097		0.0	74.9	25.1	
★	S-06	18.5	4.75	0.103			0.0	55.8	44.2	
⊙	S-06	43.5	4.75	0.195	0.165	0.137	0.0	97.1	2.9	

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GRAIN SIZE DISTRIBUTION

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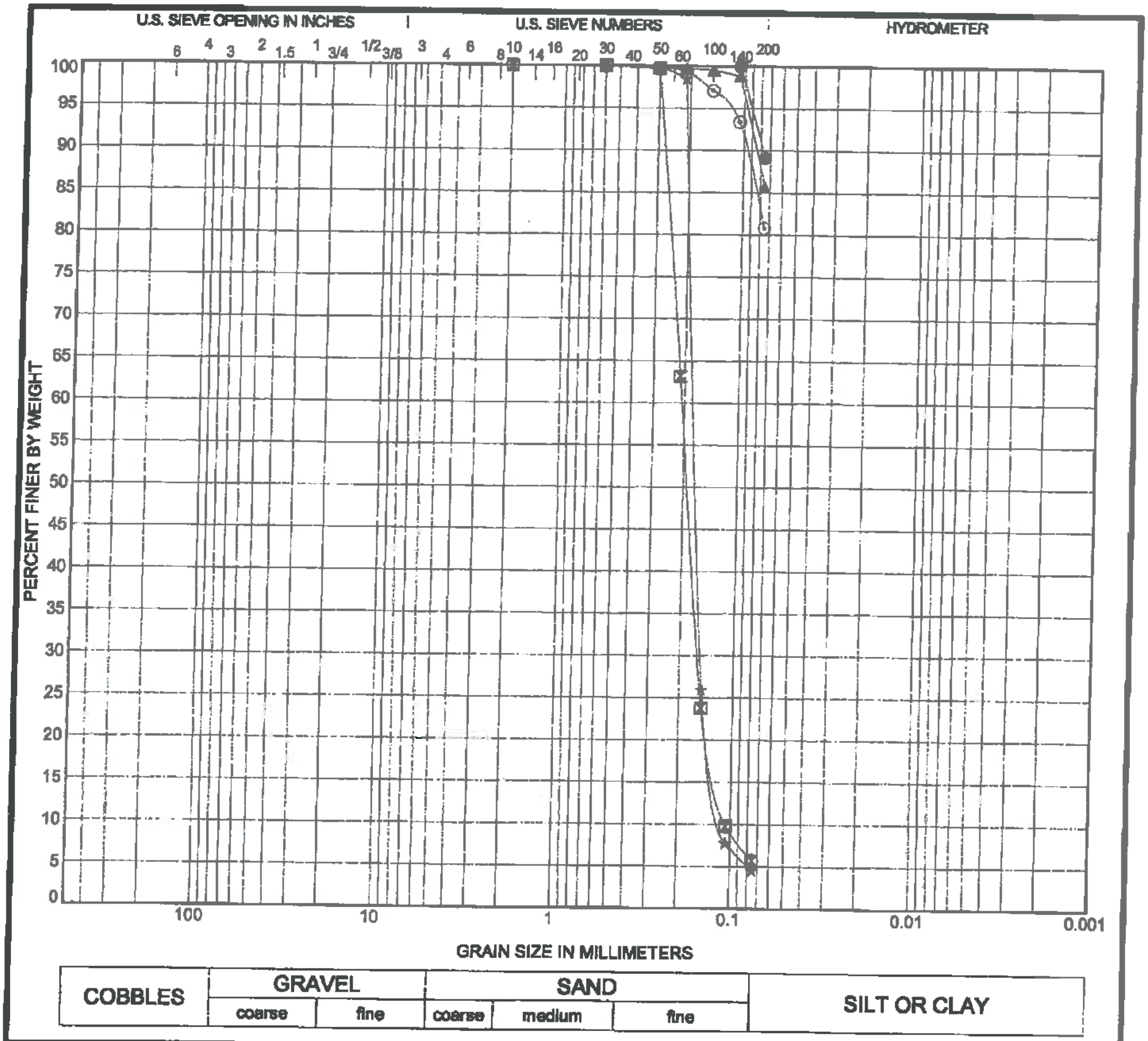
US_GRAIN_SIZE J020438.01STILES LEVEE.GPJ US_LAB.GDT 8/29/12



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	S-07	8.0	FAT CLAY(CH)	81	36	45		
☒	S-07	18.5	SILTY SAND(SM)				1.14	1.93
▲	S-08	28.5	SILT(MH)					
★	S-08	33.5	POORLY GRADED SAND(SP)	NP	NP	NP	1.20	1.60
⊙	S-09	6.0	SILT WITH SAND(ML)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-07	8.0	0.106				0.0	10.9	89.1	
☒	S-07	18.5	2	0.206	0.158	0.107	0.0	94.3	5.7	
▲	S-08	28.5	0.6				0.0	14.3	85.7	
★	S-08	33.5	0.6	0.176	0.153	0.111	0.0	95.4	4.6	
⊙	S-09	6.0	2				0.0	19.2	80.8	

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GRAIN SIZE DISTRIBUTION

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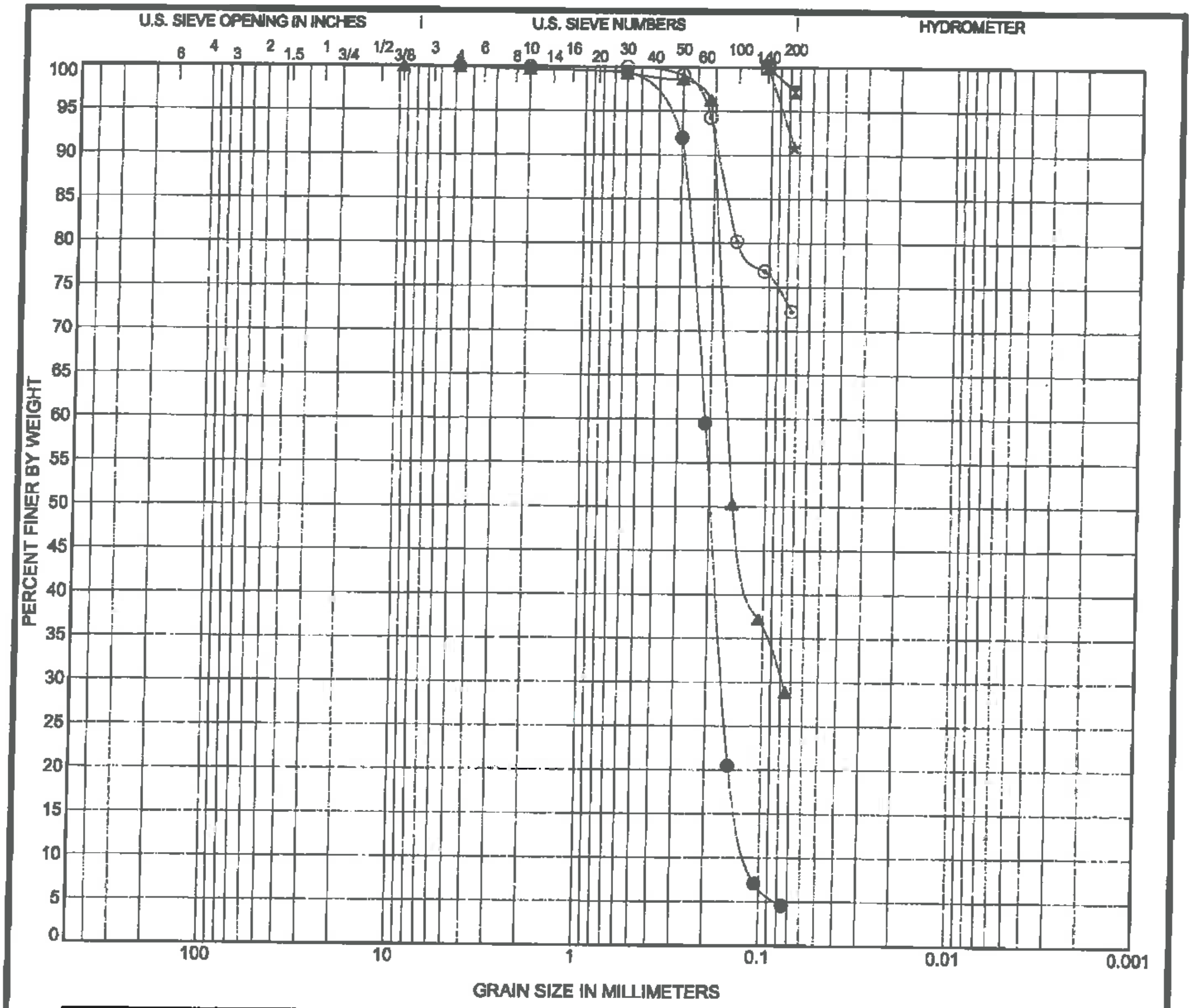
J020438.01



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

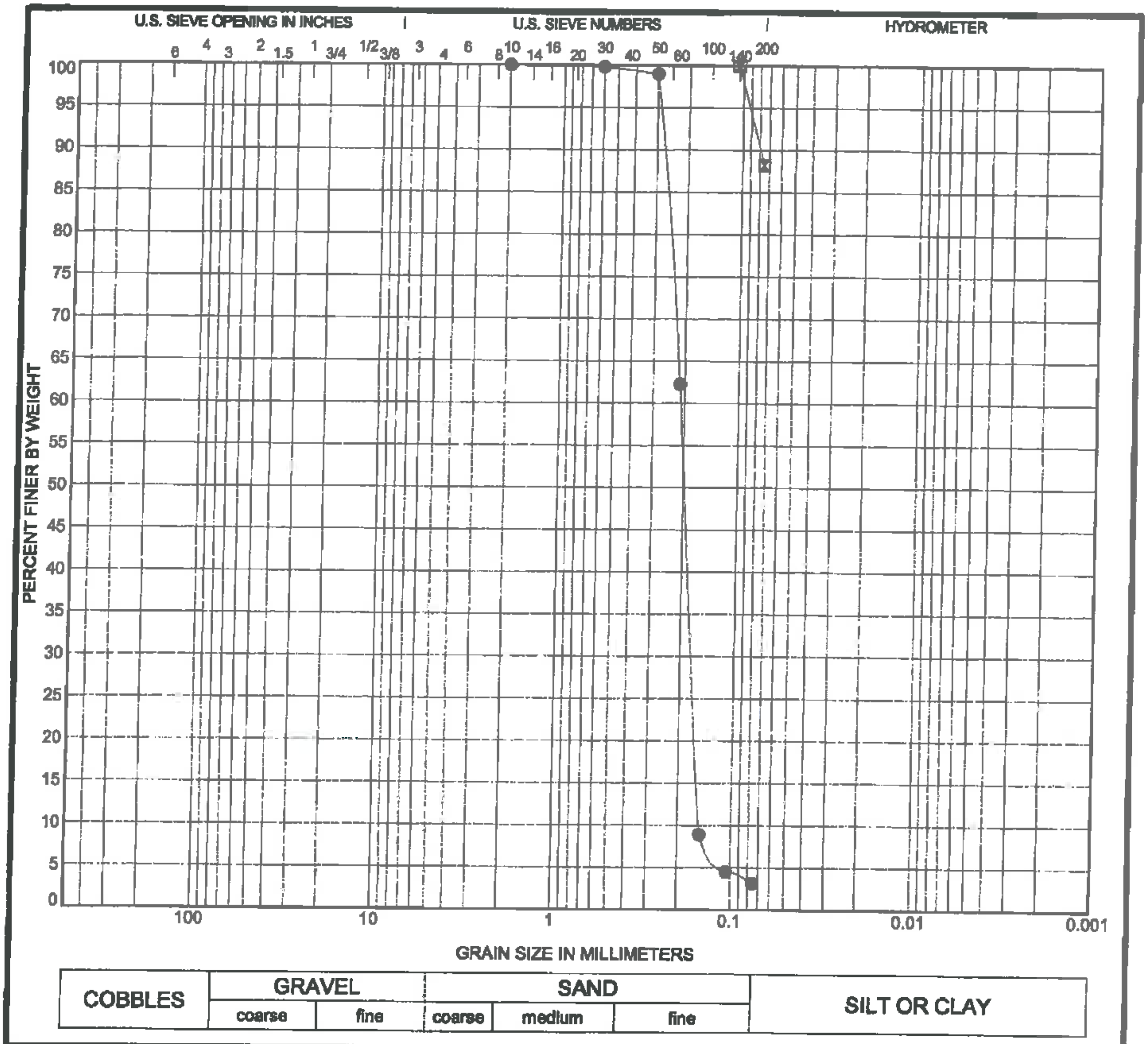
	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	S-09	28.5	POORLY GRADED SAND(SP)				1.09	1.87
⊠	S-10	8.0	LEAN CLAY(CL)	46	25	21		
▲	S-11	8.5	SILTY SAND(SM)					
★	S-13	6.0	FAT CLAY(CH)	76	34	42		
⊙	S-13	13.5	SILT WITH SAND(ML)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-09	28.5	4.75	0.213	0.163	0.114	0.0	95.4	4.6	
⊠	S-10	8.0	0.106				0.0	2.8	97.2	
▲	S-11	8.5	9.5	0.161	0.079		0.1	71.0	28.9	
★	S-13	6.0	0.106				0.0	9.1	90.9	
⊙	S-13	13.5	2				0.0	27.8	72.2	

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

STILES LEVEE
Fisher and Arnold
J020438.01



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	S-13	23.5	POORLY GRADED SAND(SP)				0.94	1.38
☒	S-14	4.0	LEAN CLAY(CL)	41	19	22		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	S-13	23.5	2	0.209	0.172	0.151	0.0	96.9	3.1	
☒	S-14	4.0	0.106				0.0	11.8	88.2	

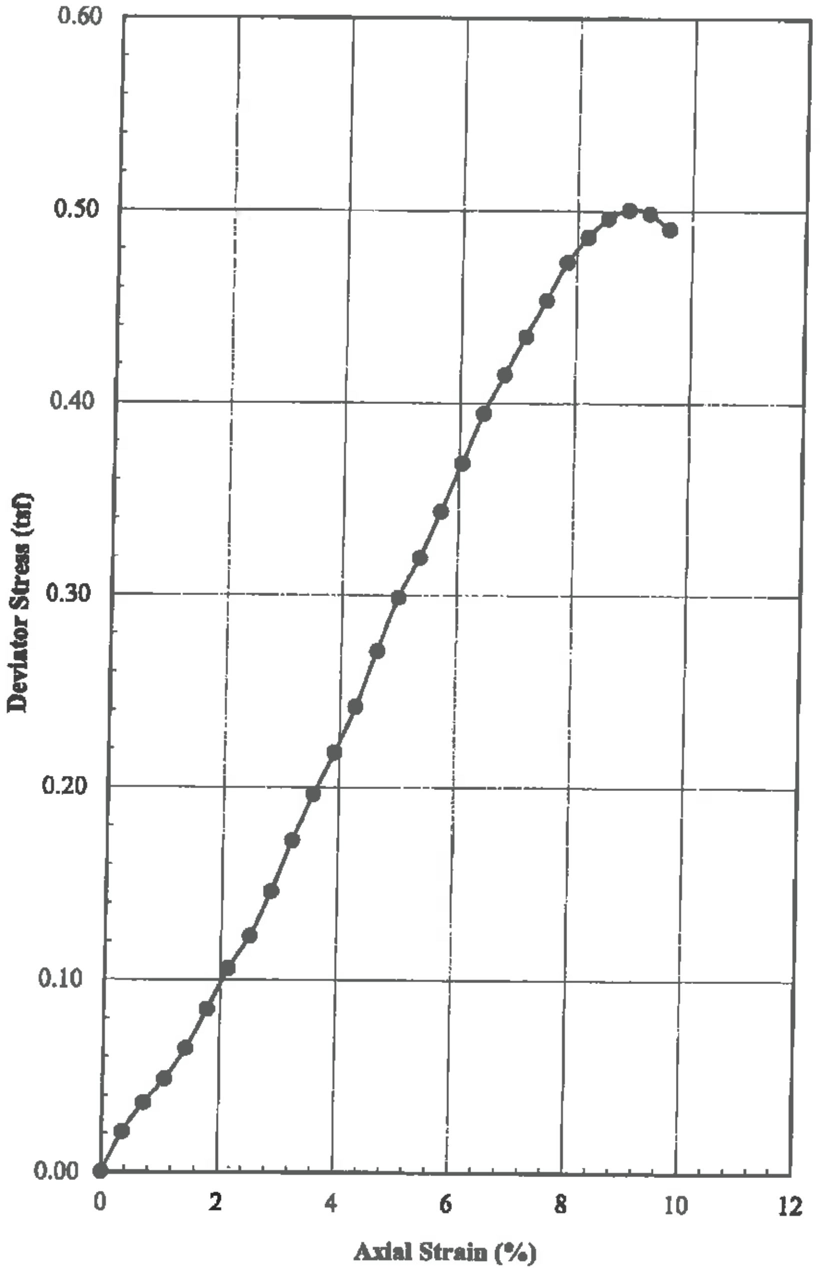
US GRAIN SIZE J020438.01STILES LEVEE.GPJ US LAB.GDT 8/29/12

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

STILES LEVEE
Fisher and Arnold
J020438.01

GEOTECHNOLOGY INC
FROM THE GROUND UP



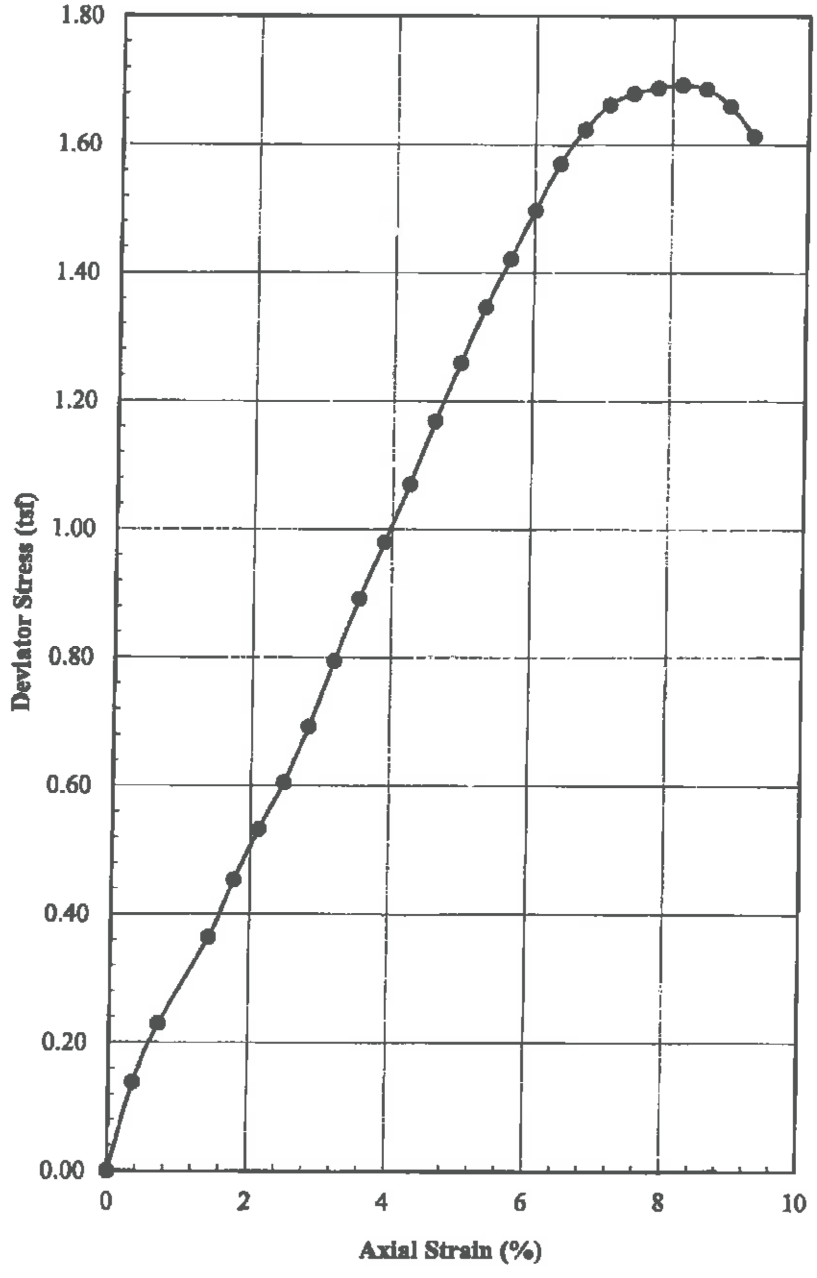
UNCONFINED COMPRESSION TEST

ASTM D 2166

Project No.: J020438.01

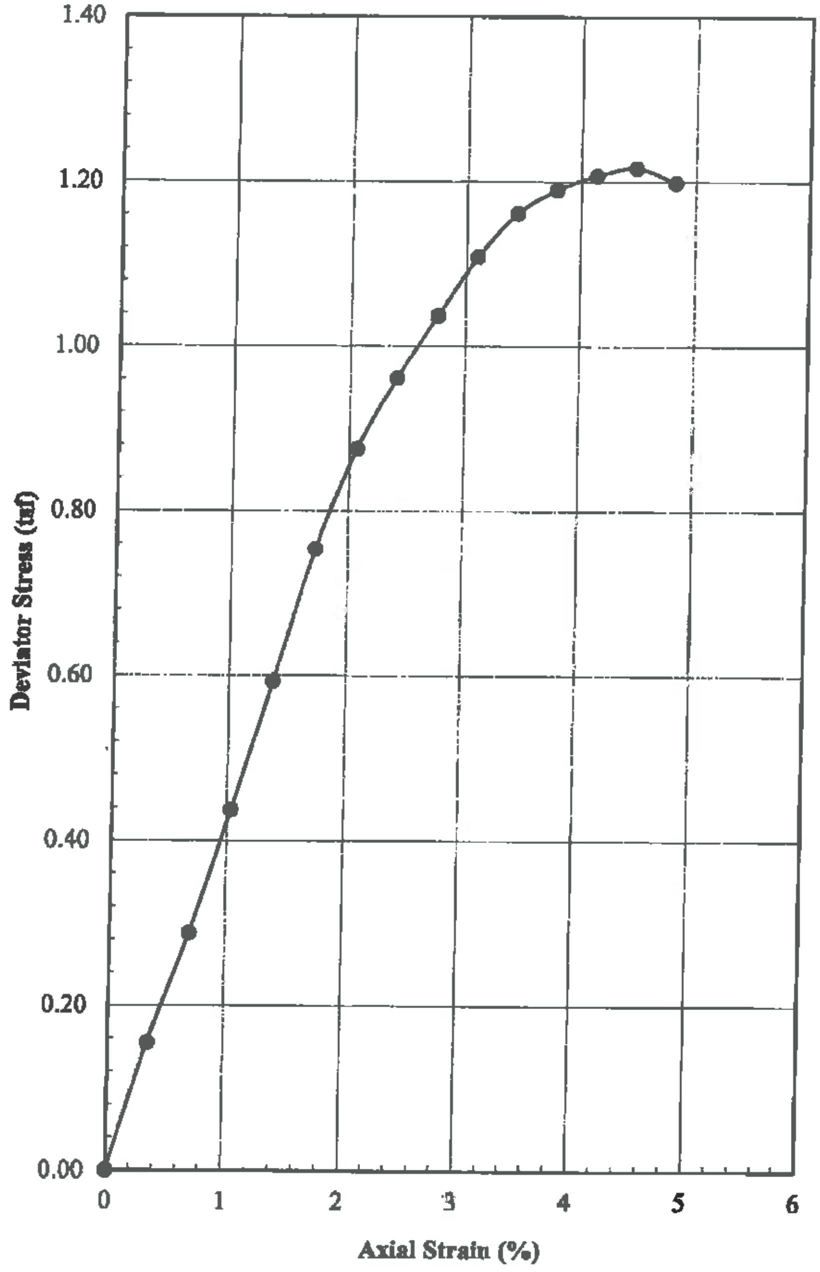
Boring: S-1

Sample: ST-3 - Depth: 6 ft.



UNCONFINED COMPRESSION TEST

ASTM D 2166
Project No.: J020438.01
Boring: **S-2**
Sample: ST-1 - Depth: 10 ft.



UNCONFINED COMPRESSION TEST

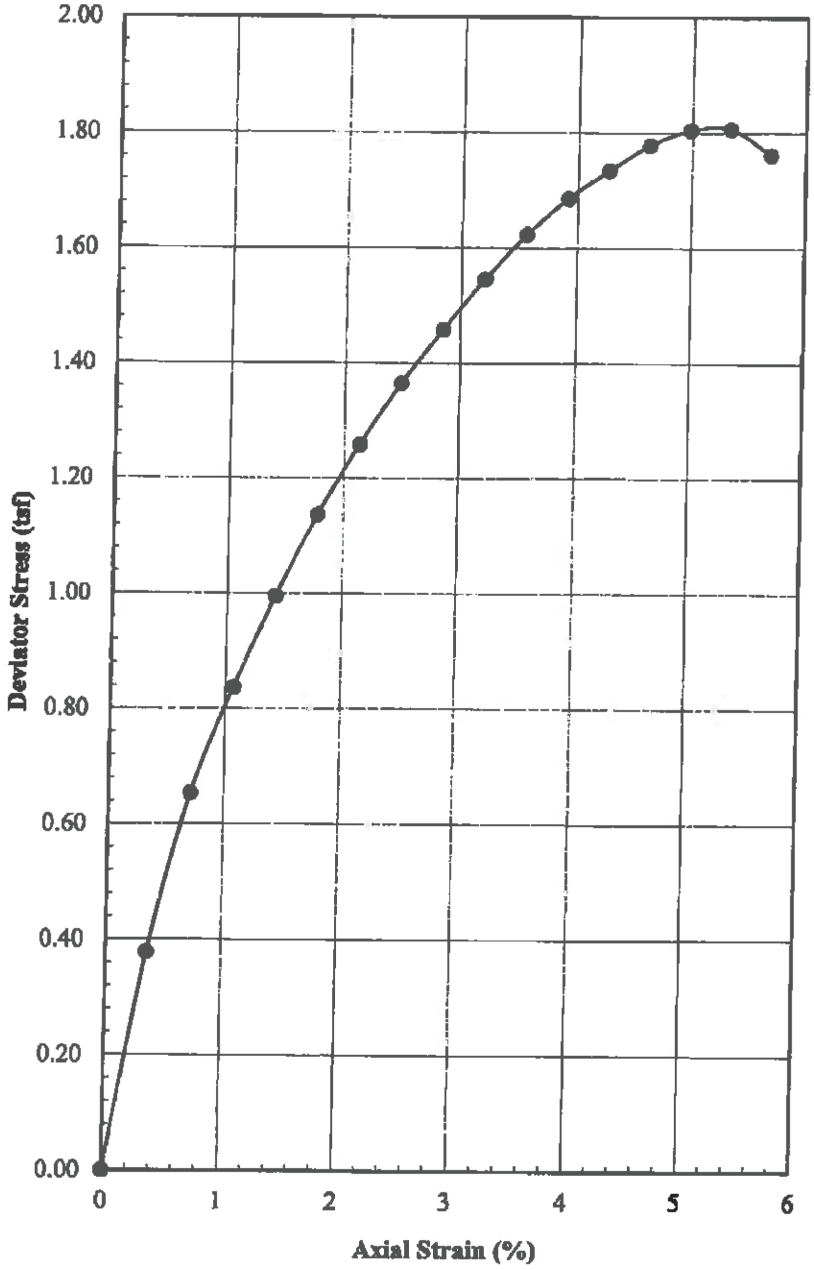
ASTM D 2166

Project No.: J020438.01

Boring: S-8

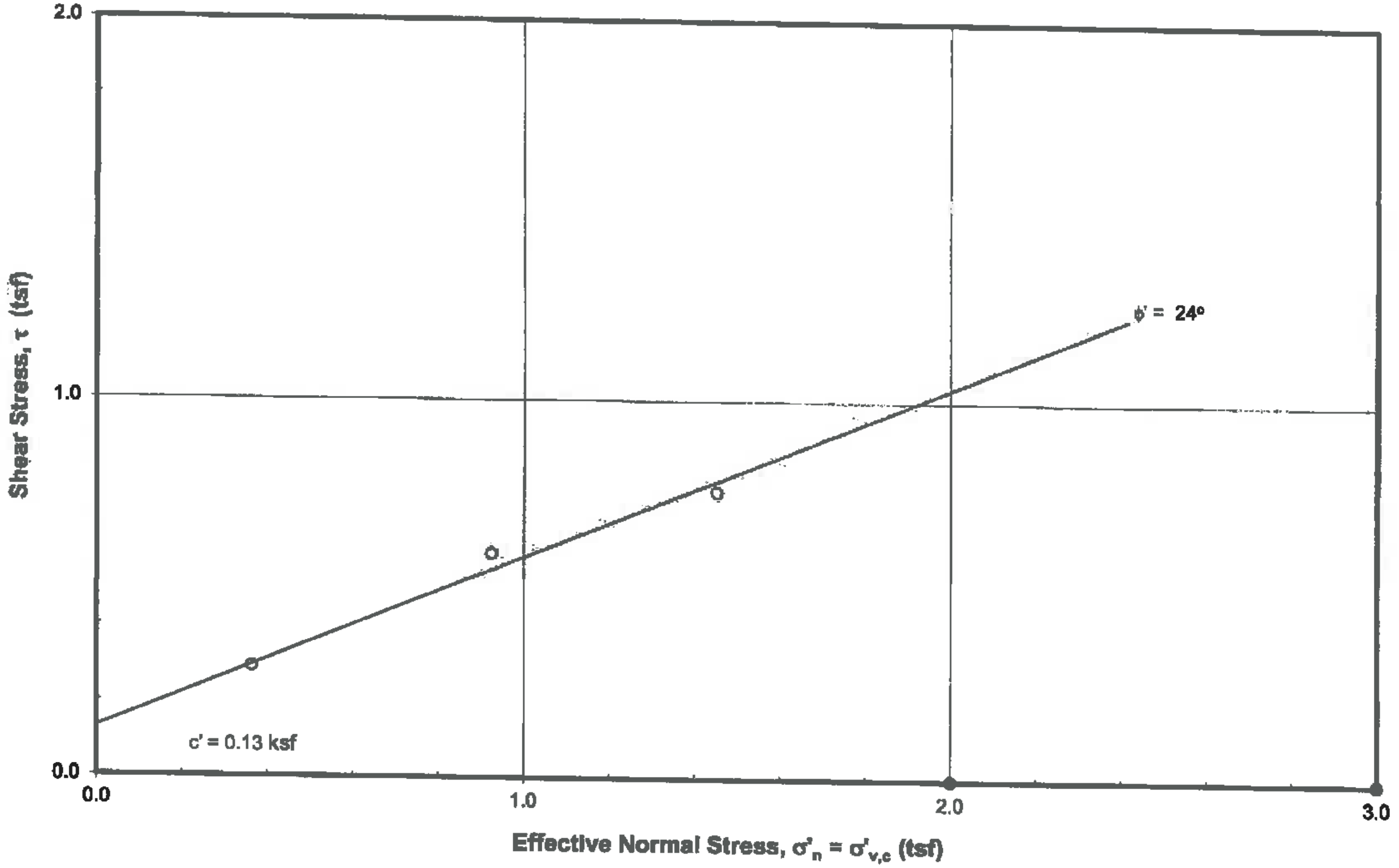
Sample: ST-8 - Depth: 25 ft.

GEOTECHNOLOGY INC
FROM THE GROUND UP



UNCONFINED COMPRESSION TEST
ASTM D 2166
Project No.: J020438.01
Boring: S-10
Sample: ST-4 - Depth: 8 ft.

GEOTECHNOLOGY INC
FROM THE GROUND UP

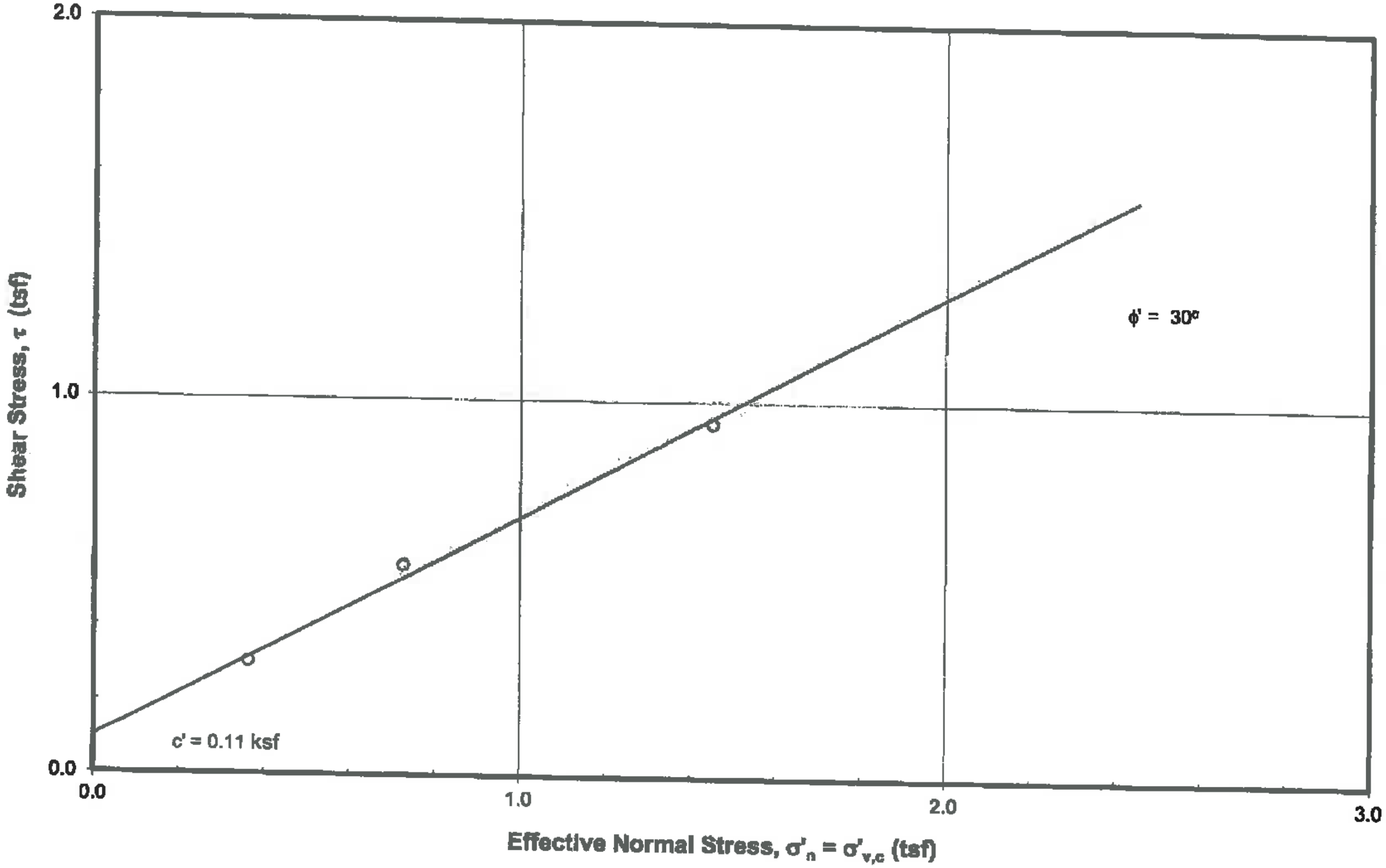


DRAINED DIRECT SHEAR TEST
ASTM D 3080
Boring: S-7
Sample: ST-4, Depth: 8ft

P706a (12/14/10)

J020438.01-7_4DSRESULT.xls, c-phi plot, 9/17/2012

GEOTECHNOLOGY INC
FROM THE GROUND UP

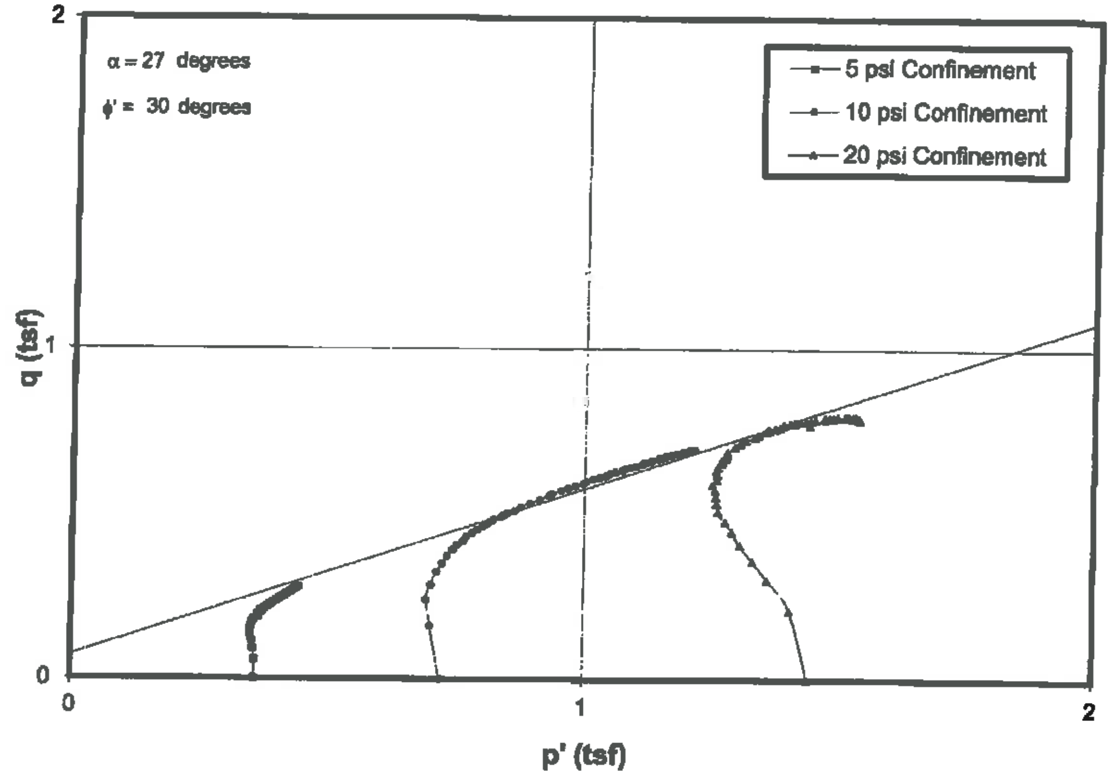


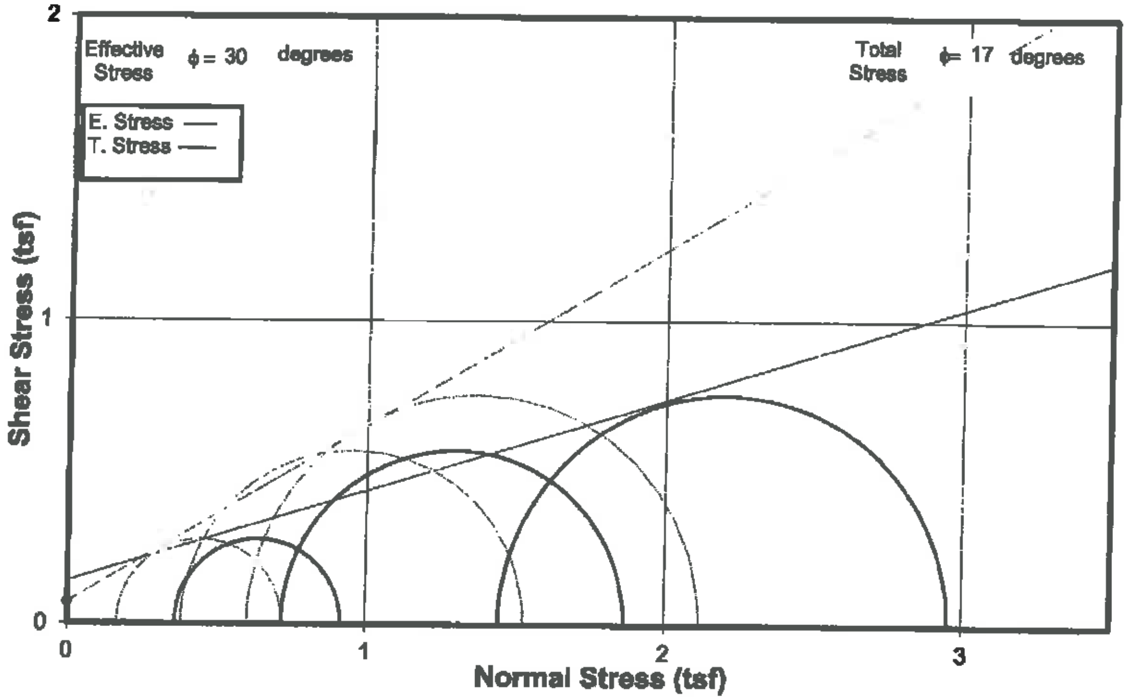
DRAINED DIRECT SHEAR TEST
ASTM D 3080
Boring: S-12
Sample: ST-3, Depth: 6 ft, 6.5 ft, 7 ft

P708a (12/14/10)

J020438.01-12_3DSRESULT.xls, c-phi plot, 9/17/2012

GEOTECHNOLOGY INC
FROM THE GROUND UP

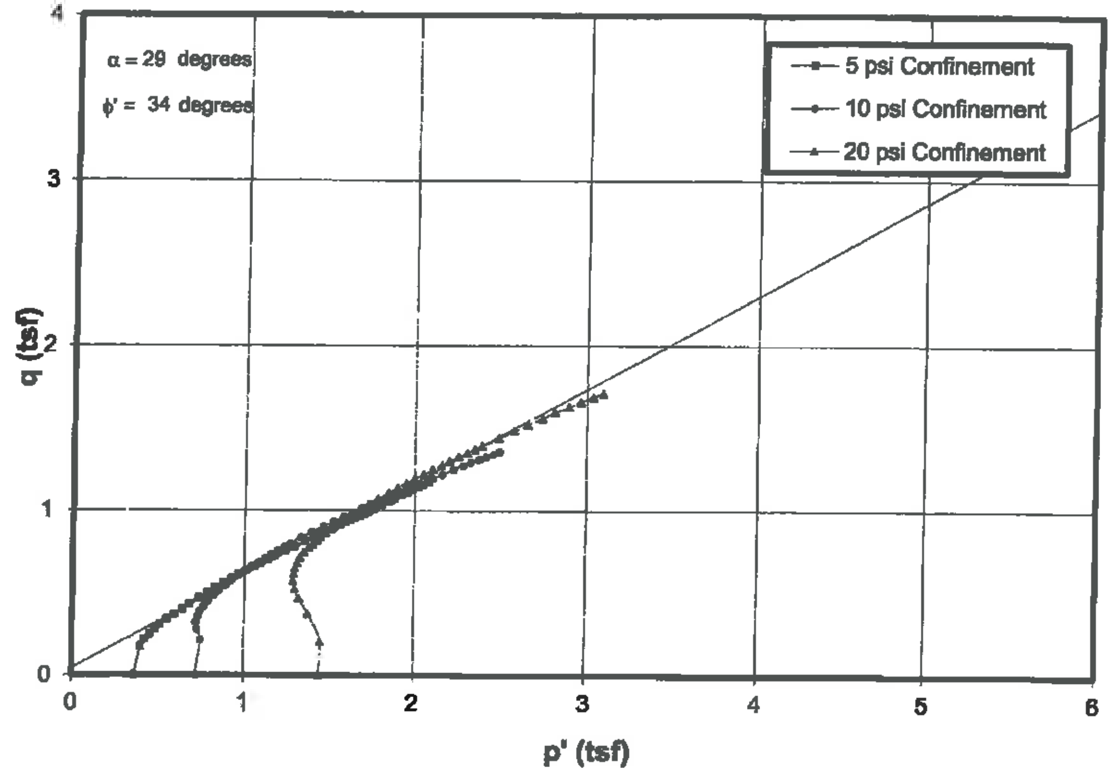


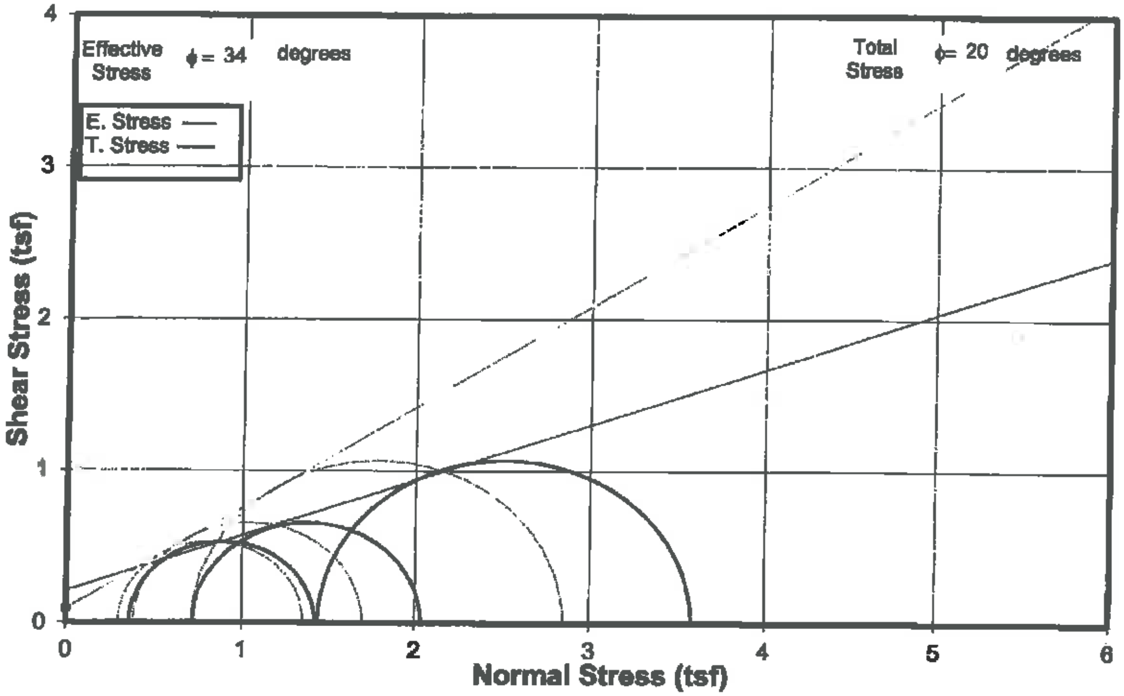


CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 4767
Project No.: J020438.01
Boring: S-13, S-13, S-13
Sample: ST-3, ST-3, ST-3 - Depth: 6, 6, 6

GEOTECHNOLOGY INC
FROM THE GROUND UP





CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 4767
Project No.: J020438.01
Boring: S-14, S-14, S-14
Sample: ST-4, ST-4, ST-4 - Depth: 4, 4.5, 5

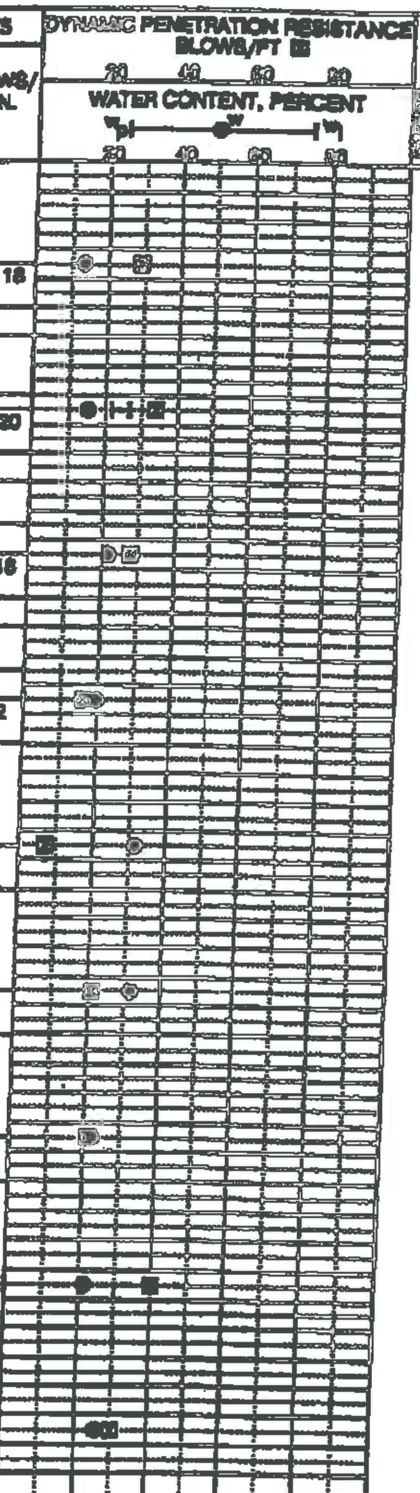
APPENDIX D

LOGS OF BORING B-1 THROUGH B-5
FROM HALL BLAKE & ASSOCIATES

PROJECT MAYNARD STILES TREATMENT PLANT

FOR City of Memphis

DEPTH SCALE FEET	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	ELEVATION FEET	WATER LEVEL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/ 6 IN.	SHEAR STRENGTH (TSF)	DRY DENSITY (PCF)	TORVANE (TSF)	PPR (TSF)
0	SILTY SAND (SM) gray in color, medium dense to dense										
4					1	■	8 11 18				
5			235								
7					S-1	▨					
9					2	■	8 14 20				
10			230								
12					S-2	▨					
13				∇							
14					3	■	8 10 16				
15			225								
17	SAND (SP) poorly graded, gray in color, medium dense				S-4	▨					
19					4	■	4 6 12				
20			220								
22	SANDY CLAY dark gray in color										
24					5	■	2 3 4				
25			215								
26	SILTY SAND (SP-SM and SM) gray in color, loose to dense										
29					6	■	3 9 12				
30			210								
34					7	■	6 9 12				
35			205								
39					8	■	16 18 22				
40			200								
44					9	■	12 13 17				
45	Bottom of Boring @ 45'		195								



PROJECT NO. 91-01008

BORING NO. B-1

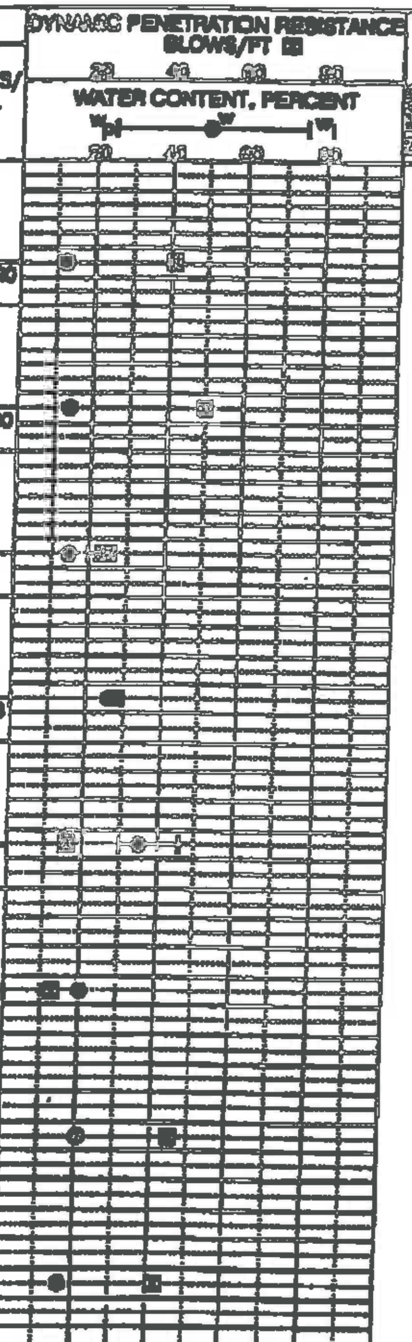
PAGE 1 of 1

DATE 1/16/91

PROJECT MAYNARD STILES TREATMENT PLANT

FOR City of Memphis

DEPTH SCALE FEET	SOIL PROFILE DESCRIPTION	ELEVATION FEET	WATER LEVEL	SAMPLES NUMBER	TYPE	BLOWS/ 6 IN.	PPR (TSF)
0	SILTY SAND brown to gray in color, dense to very dense	240					
4				1	■	12 21 20	
5		235					
9			▼	2	■	12 20 30	
10		230					
12	SANDY SILT (ML) dark gray in color, very stiff consistency						
14				3	■	8 9 16	
15		225					
16	SILTY SAND (SP-SM) gray in color, medium dense		▽				
19				4	■	18 15 13	
20		220					
22	CLAYEY, SANDY SILT (ML) dark gray in color, very stiff consistency						
24				5	■	9 7 9	1.75
25		215					
26	SILTY SAND (SP-SM) brown in color, medium to very dense						
29				6	■	4 6 7	
30		210					
34				7	■	10 14 30	
35		205					
39				8	■	10 22 40	
40	Bottom of Boring @ 40'	200					



SHEAR STRENGTH (PSF) | DRY DENSITY (PCF) | TORVANE (TSF)

PROJECT NO. 91-01008

BORING NO. B-2

PAGE 1 of 1

DATE 1/17/91

DRILLER T.Bass

HALL, BLAKE AND ASSOCIATES, INC.

PROJECT MAYNARD STILES TREATMENT PLANT

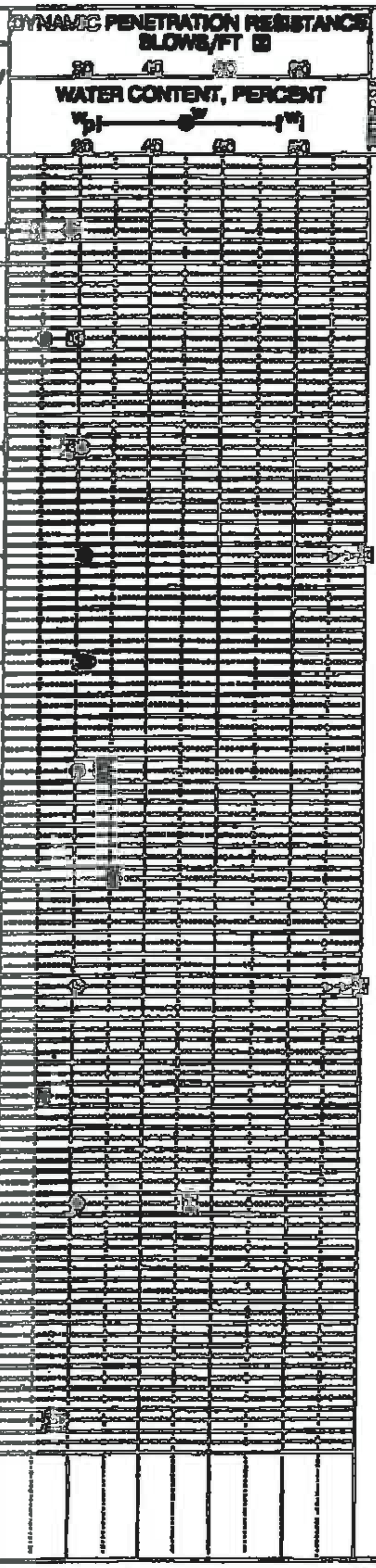
FOR City of Memphis

SOIL PROFILE

DEPTH	DESCRIPTION	ELEVATION FEET
0	**SILTY SAND (SM)** brown in color	220
12	**SAND (SP-SM)** poorly graded, contains trace of silt, encountered gravel(48.0 to 59.0 feet)	209
60	Bottom of B-3 @ 60'	

SAMPLES

NUMBER	TYPE	BLOWS/ 6 IN.
1	■	2 4 4
2	■	5 8 11
3	■	4 5 9
4	■	40=3"
5	■	6 8 13
6	■	6 12 15
7	■	7 14 17
8	■	40=3"
9	■	6 6 6
10	■	13 28 26
11	■	5 6 10



TORVANE (TSF)

PPR (TSF)

PROJECT NO. 91-01006

BORING NO. B-3

PAGE 1 of 1

DATE 2/13/91

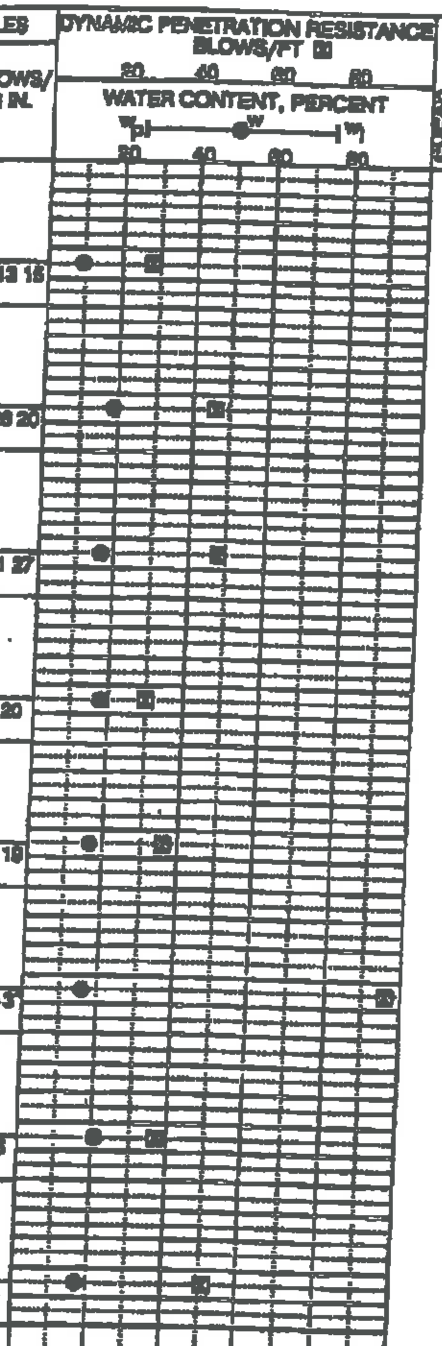
DRILLER M. Moore/J. Nichols

HALL, BLAKE AND ASSOCIATES, INC.

PROJECT **MAYNARD STILES TREATMENT PLANT**

FOR **City of Memphis**

DEPTH	SOIL PROFILE DESCRIPTION	ELEVATION FEET	WATER LEVEL	SAMPLES NUMBER	TYPE	BLOWS/ 6 IN.	SHEAR STRENGTH	DENSITY	TORVANE (TSF)	PPR (TSF)
0	SILTY SAND brown in color	240								
4				1	■	13 13 15				
5		235								
9			▼	2	■	11 26 20				
10		230								
14				3	■	11 21 27				
15		225	▼							
19	SANDY CLAY gray in color			4	■	8 10 20				3.00
20		220								
22	SAND trace of silt									
24				5	■	10 17 19				
25		215								
29				6	■	30 24=3"				
30		210								
34				7	■	5 12 25				
35		205								
39				8	■	9 17 34				
40	Bottom of B-4 @ 40'	200								



PROJECT NO. 91-01008

BORING NO. B-4

PAGE 1 of 1

DATE 2/19/91

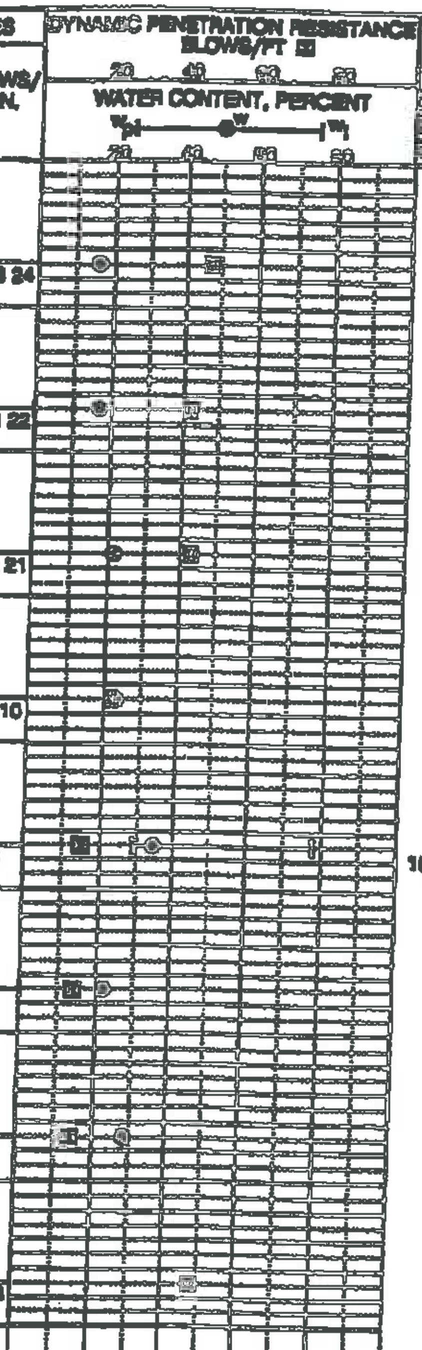
DRILLER W.G. Hall

HALL, BLAKE AND ASSOCIATES, INC.

PROJECT **MAYNARD STILES TREATMENT PLANT**

FOR **City of Memphis**

DEPTH SCALE FEET	SOIL PROFILE DESCRIPTION	GRAPHIC LOG	ELEVATION FEET	WATER LEVEL	SAMPLES NUMBER	TYPE	BLOWS/ 6 IN.	[illegible]	DRY DENSITY (PCF)	TORVANE (TSF)	PPR (TSF)
0	SAND (SP-SM) poorly graded, contains trace of fines	▨	240								
4					1	▨	11 23 24				
5			235								
9					2	■	14 20 22				
10			230	∇							
13				▼							
14					3	■	14 22 21				
15			225								
19					4	■	13 12 10				
20			220								
22.5	CLAY (CH) gray in color, very stiff	▨									
24					5	▨	5 7 8	1610	77.1	1.00+	2.50
25			215								
25.5	SILTY SAND (SM) gray in color	▨									
29					6	■	5 7 7				
30			210								
34					7	▨	4 7 7				
35			205								
39					8	■	12 20 23				
40	Bottom of B-5 @ 40'		200								



PROJECT NO. 91-01008

BORING NO. B-5

PAGE 1 of 1

DATE 2/19/91

DRILLER W.G. Hall

HALL, BLAKE AND ASSOCIATES, INC.

APPENDIX E

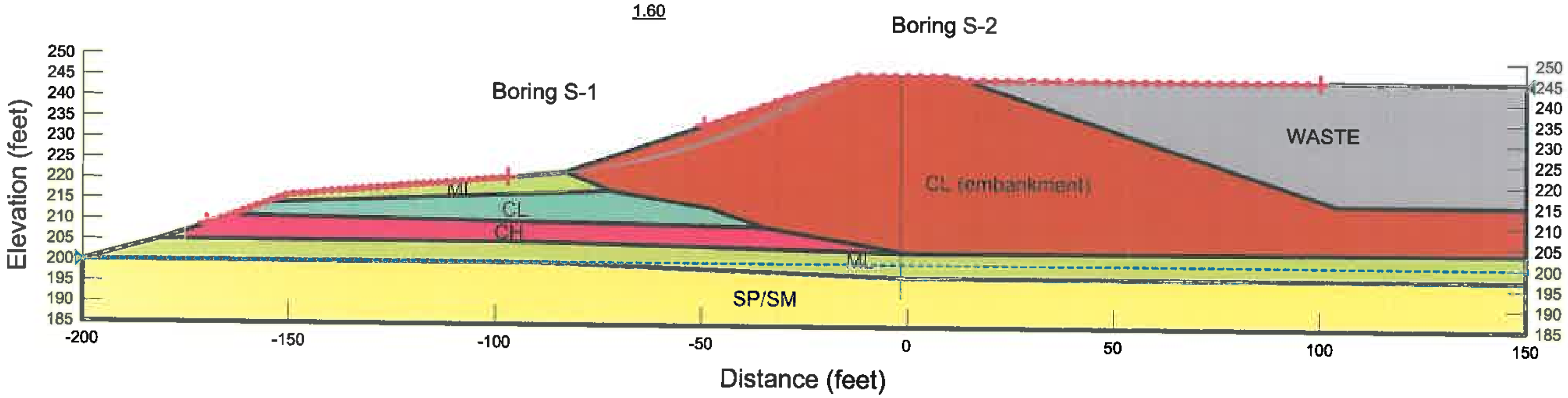
SLOPE STABILITY ANALYSIS RESULTS

Slope Stability Analyses

Cross Section 1

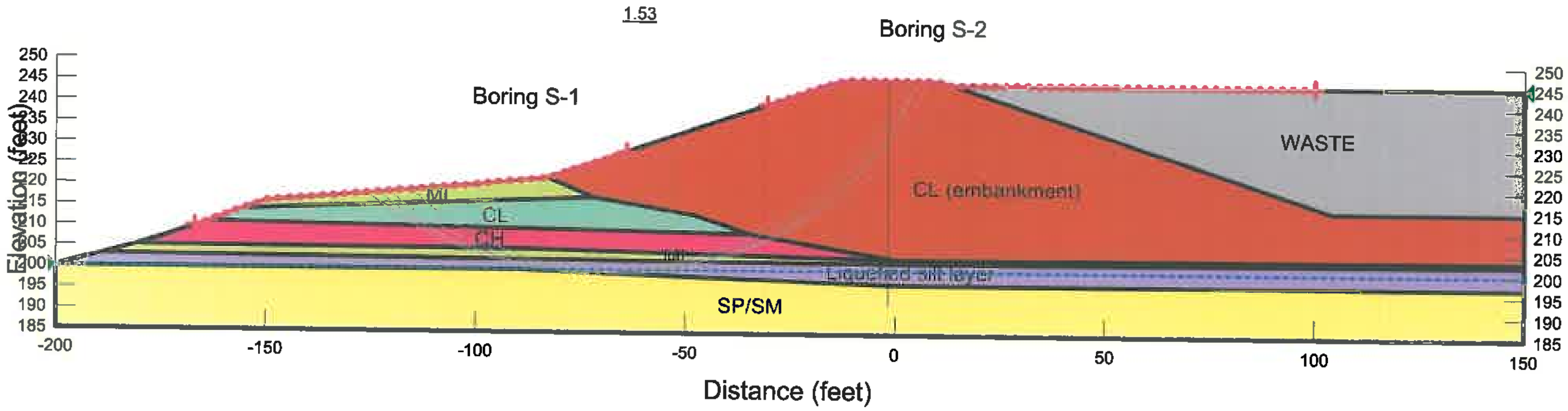
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long-term Analysis
Spencer Method

Name: SP/SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: WASTE Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1



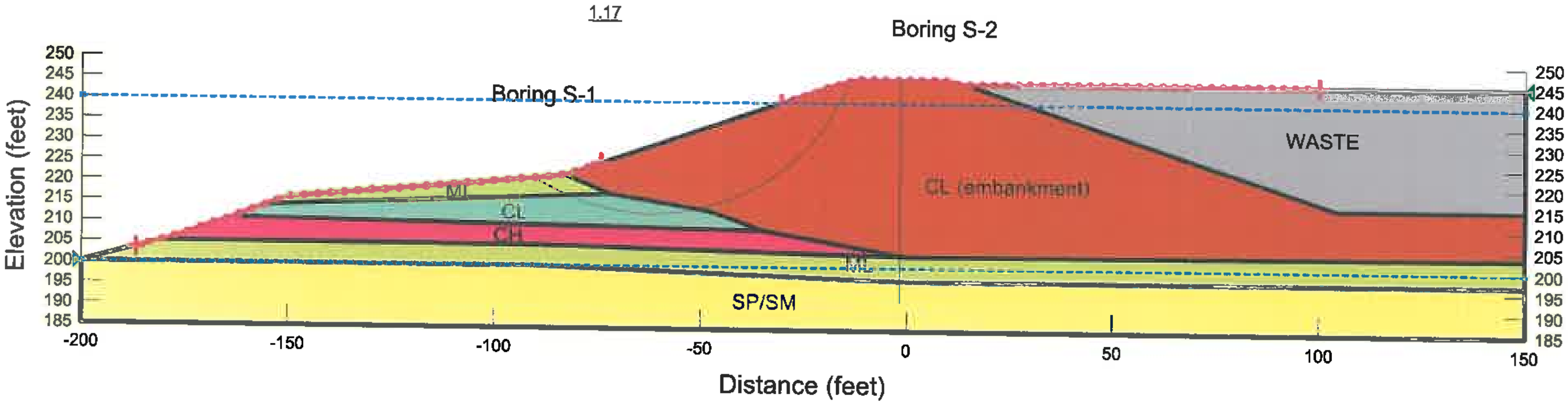
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Post Liquefaction Analysis
Spencer Method

Name: SP/SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: WASTE Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 275 psf Phi': 15 ° Piezometric Line: 1
Name: Liquefied silt layer Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 10 ° Piezometric Line: 1



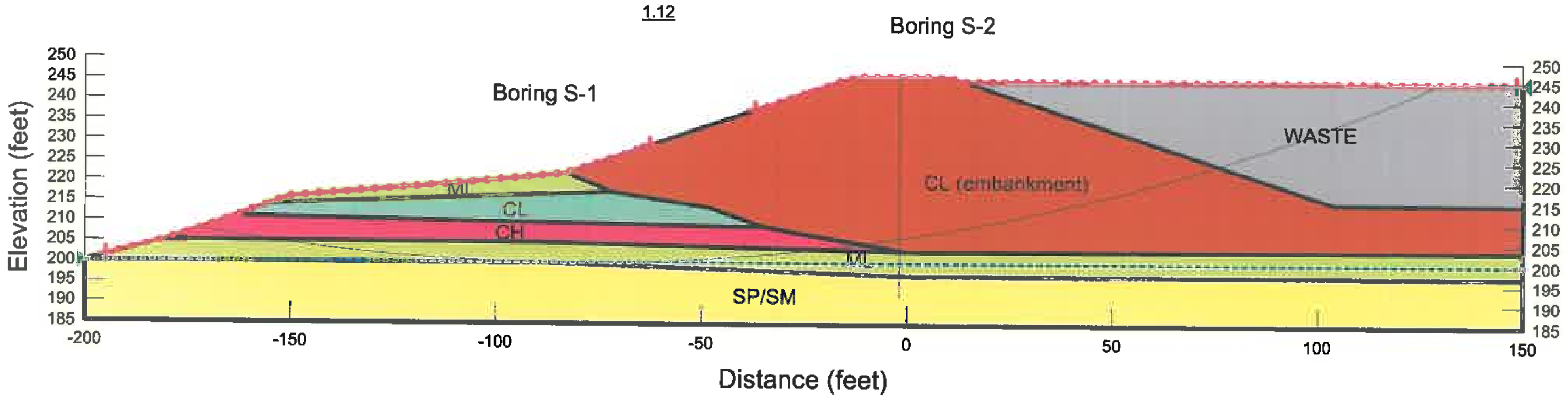
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown
Spencer Method

Name: SP/SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Total Cohesion: 200 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Total Cohesion: 300 psf Total Phi: 12 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 250 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: WASTE Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 275 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdow



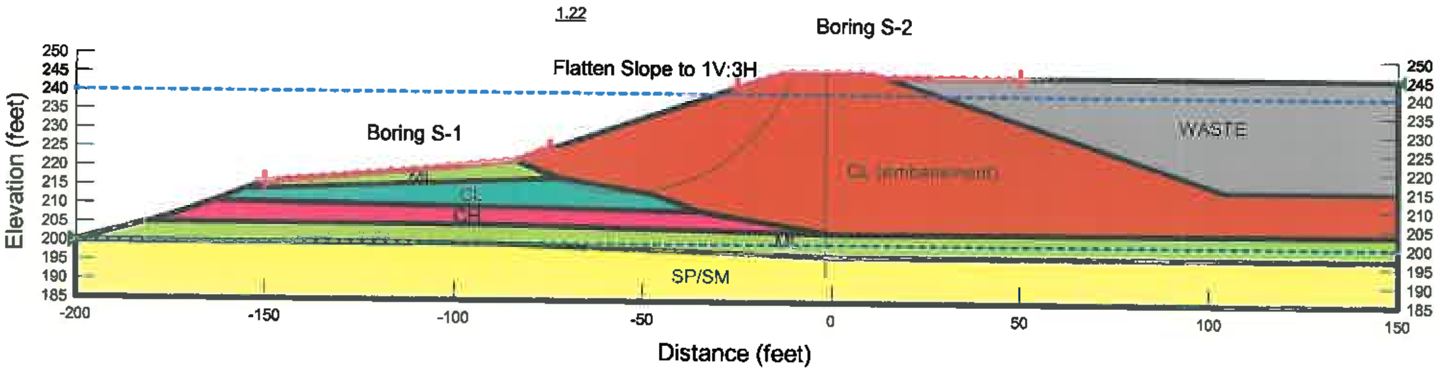
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic
Spencer Method

Name: SP/SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: WASTE Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 1,200 psf Phi': 0 ° Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown
Spencer Method

Name: SP/SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Total Cohesion: 200 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Total Cohesion: 300 psf Total Phi: 12 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 250 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: WASTE Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 275 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdc

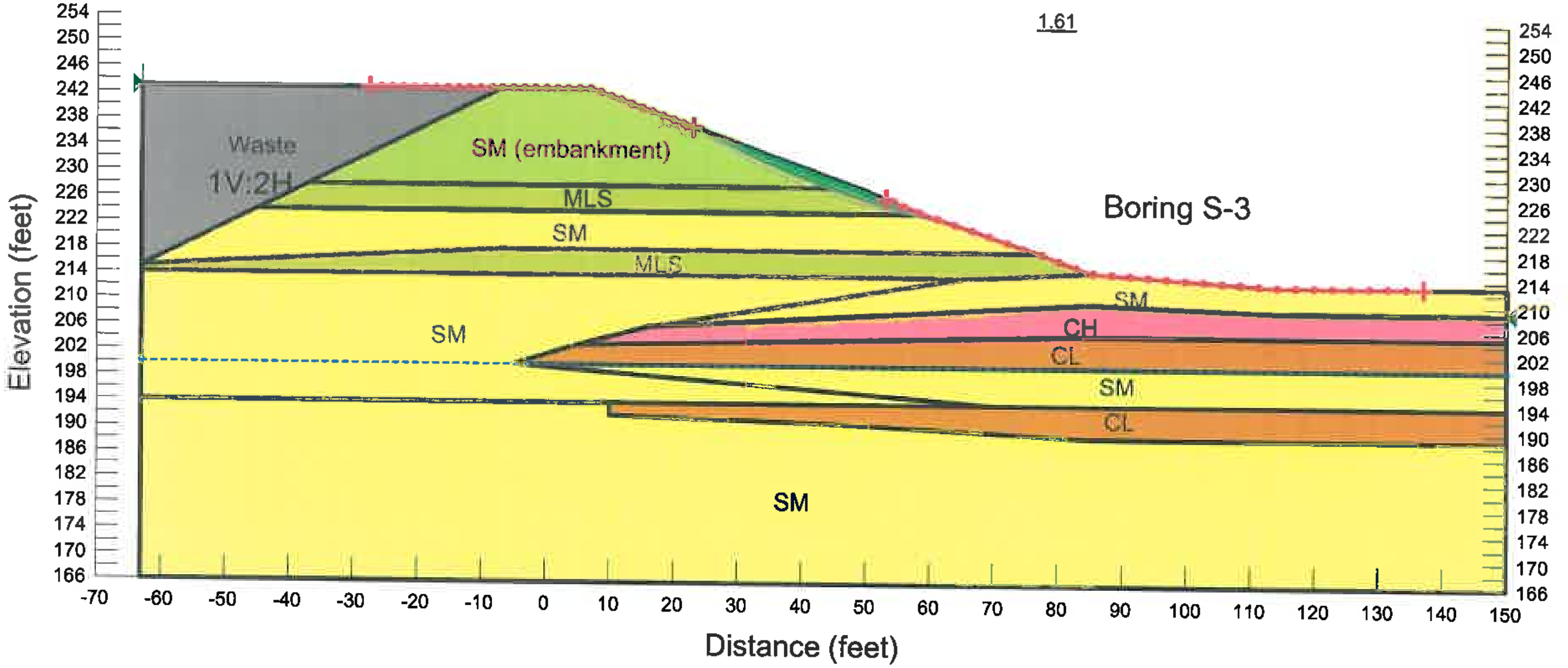


Slope Stability Analyses

Cross Section 2

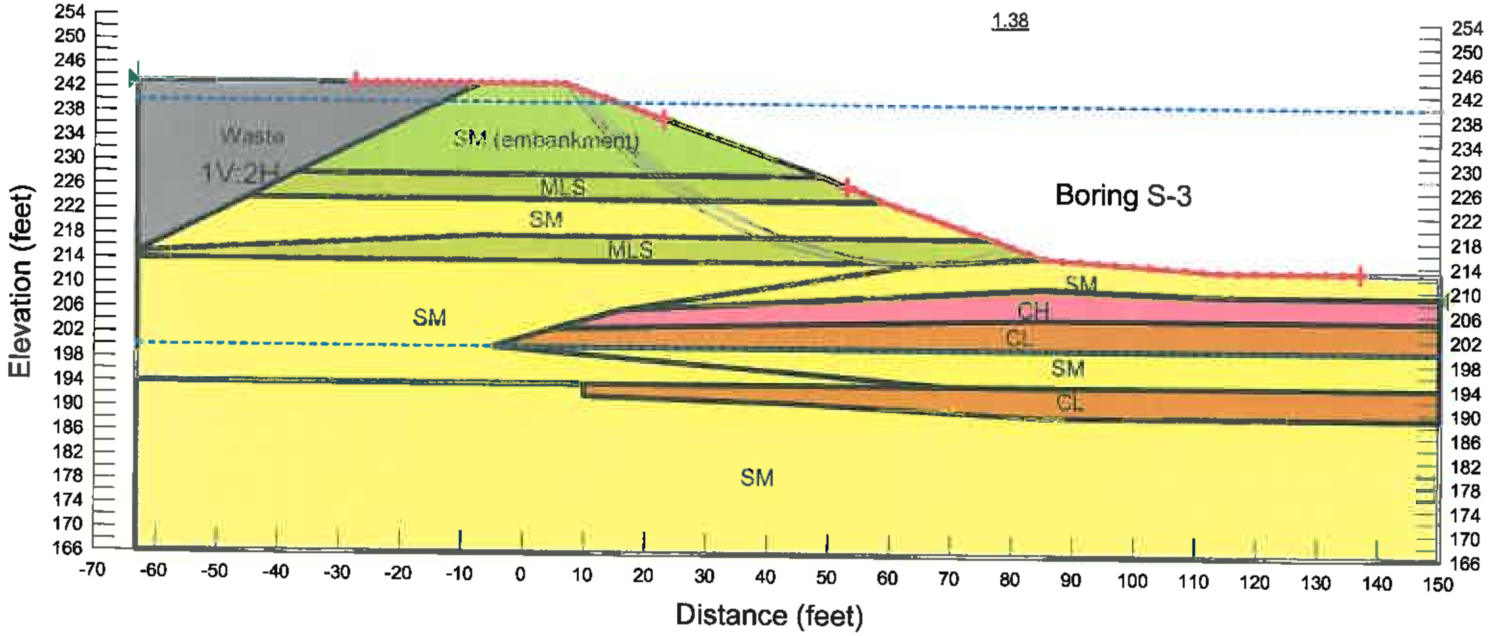
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long Term
Spencer Method

Name: SM	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1
Name: CL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 28 °	Piezometric Line: 1
Name: Waste	Model: Mohr-Coulomb	Unit Weight: 100 pcf	Cohesion': 0 psf	Phi': 0 °	Piezometric Line: 1
Name: MLS	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 28 °	Piezometric Line: 1
Name: CH	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 24 °	Piezometric Line: 1
Name: SM (embankment)	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1



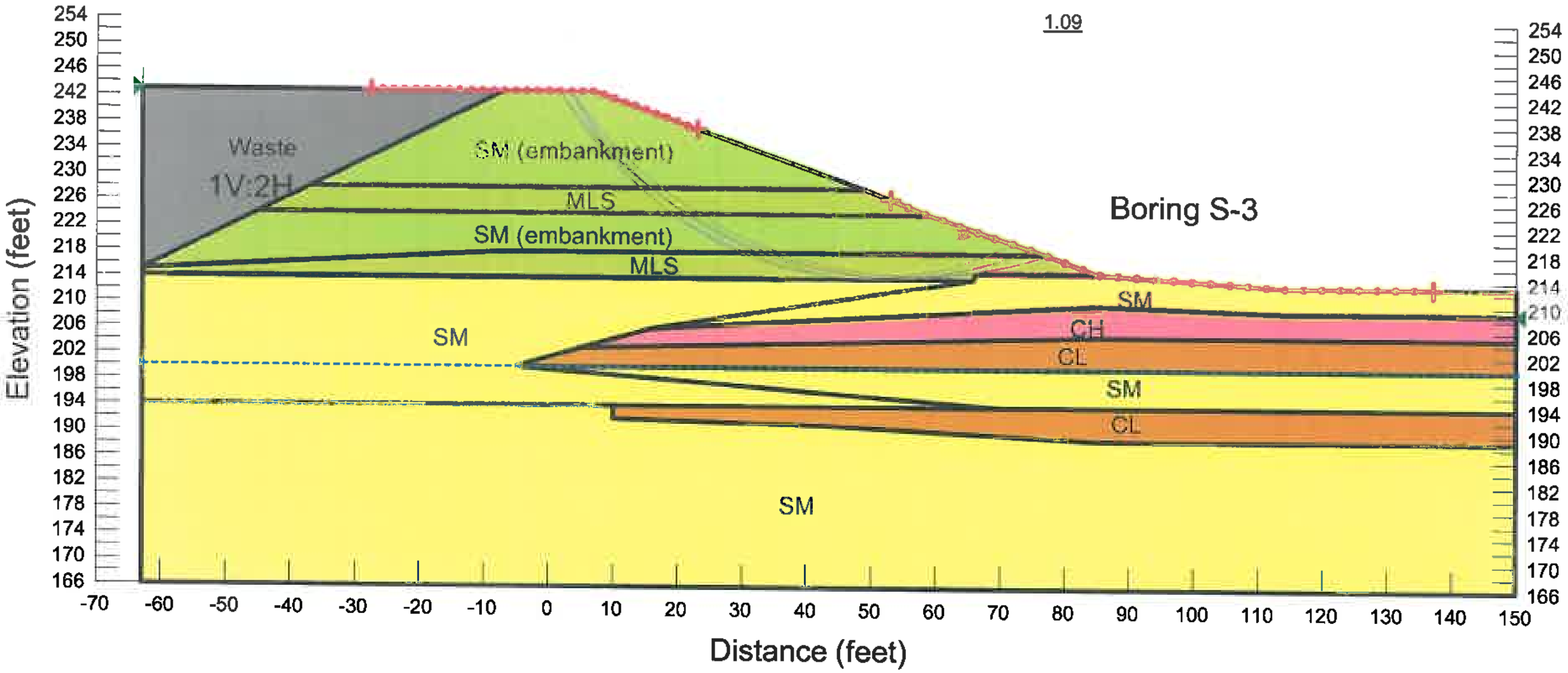
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown
Spencer Method

Name: SM	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 32 °	Total Cohesion: 0 psf	Total Phi: 0 °	Piezometric Line: 2	Piezometric Line After Drawdown: 1
Name: CL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 28 °	Total Cohesion: 250 psf	Total Phi: 15 °	Piezometric Line: 2	Piezometric Line After Drawdown: 1
Name: Waste	Model: Mohr-Coulomb	Unit Weight: 100 pcf	Cohesion': 0 psf	Phi': 0 °	Total Cohesion: 0 psf	Total Phi: 0 °	Piezometric Line: 2	Piezometric Line After Drawdown: 1
Name: MLS	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 28 °	Total Cohesion: 200 psf	Total Phi: 15 °	Piezometric Line: 2	Piezometric Line After Drawdown: 1
Name: CH	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 24 °	Total Cohesion: 300 psf	Total Phi: 12 °	Piezometric Line: 2	Piezometric Line After Drawdown: 1
Name: SM (embankment)	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Total Cohesion: 0 psf	Total Phi: 0 °	Piezometric Line: 2	Piezometric Line After Drawdown



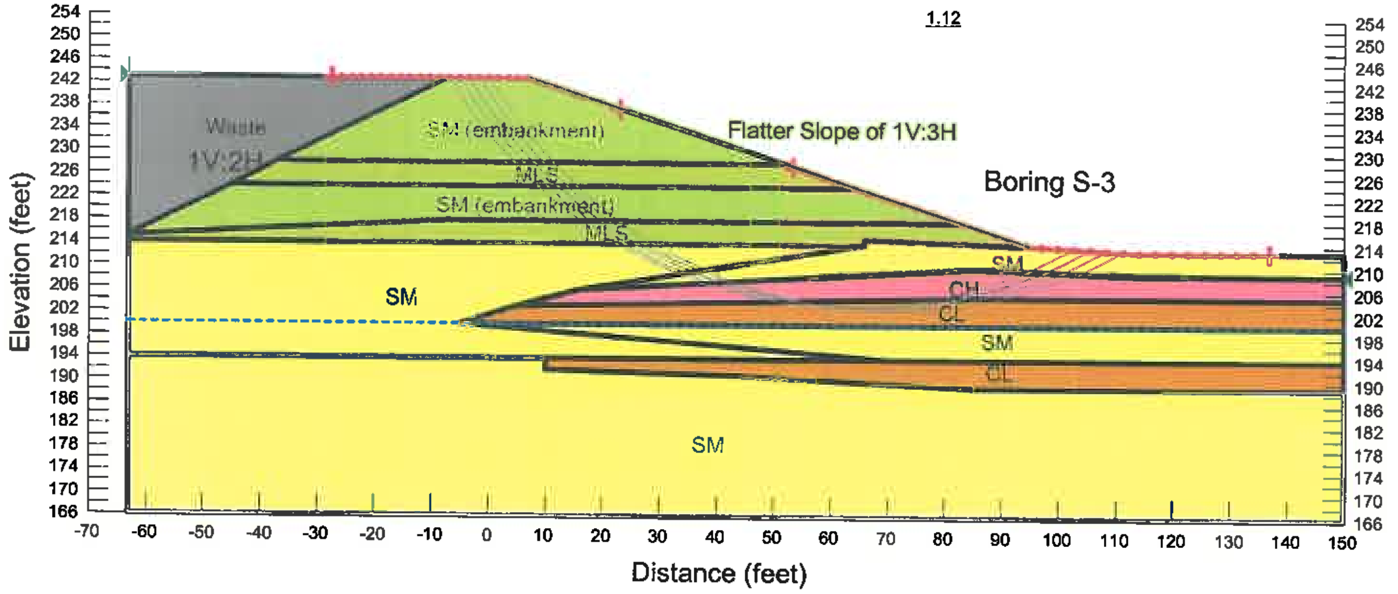
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic
Spencer Method

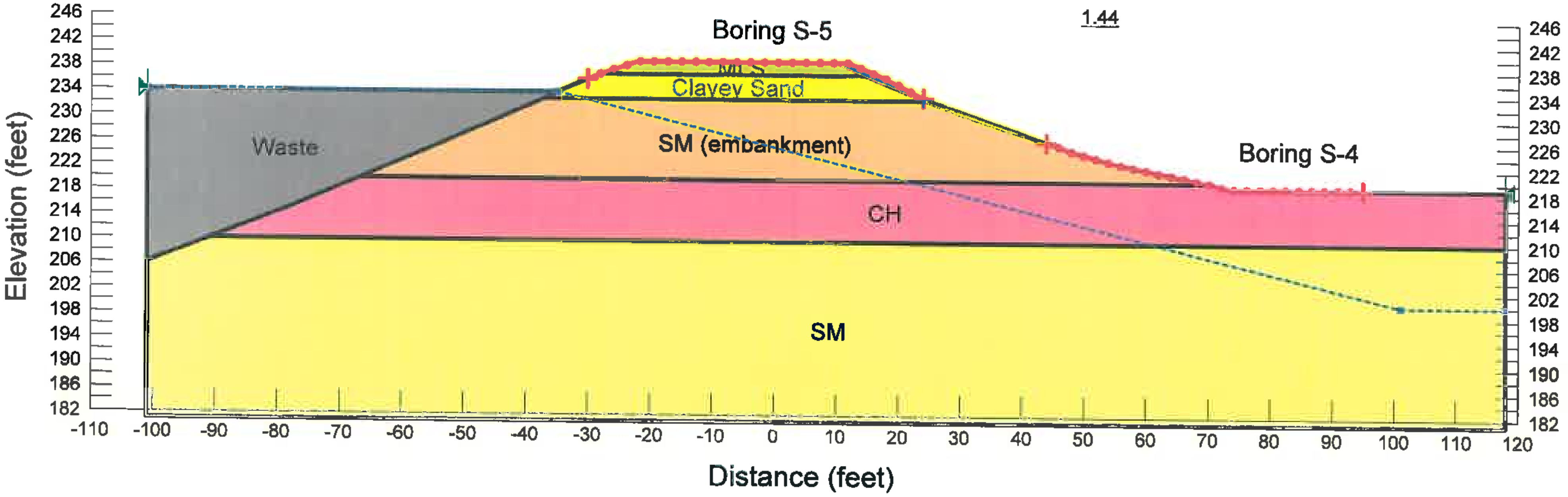
Name: SM	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1
Name: CL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 250 psf	Phi': 15 °	Piezometric Line: 1
Name: Waste	Model: Mohr-Coulomb	Unit Weight: 100 pcf	Cohesion': 0 psf	Phi': 0 °	Piezometric Line: 1
Name: MLS	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 200 psf	Phi': 15 °	Piezometric Line: 1
Name: CH	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 300 psf	Phi': 12 °	Piezometric Line: 1
Name: SM (embankment)	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1



Slope Stability Analyses

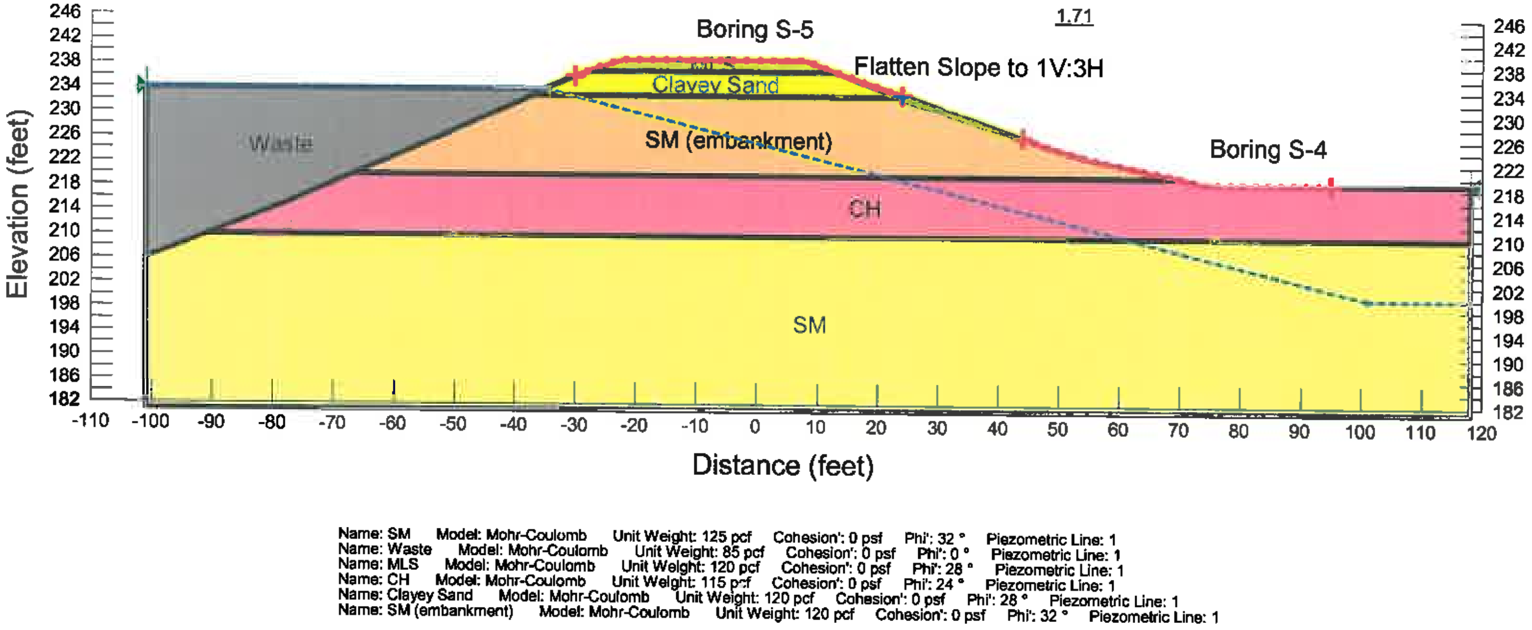
Cross Section 3

M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long-Term Analysis
Spencer Method



Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 85 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Piezometric Line: 1
Name: Clayey Sand Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1

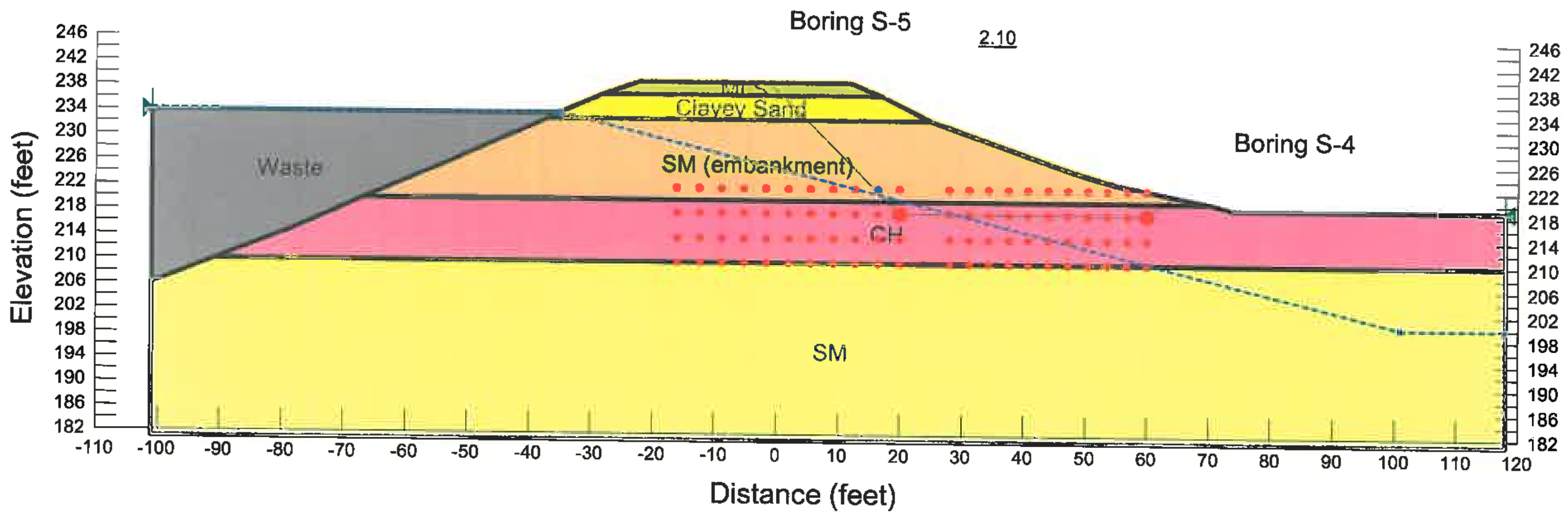
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long-Term Analysis
Spencer Method



Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 85 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Piezometric Line: 1
Name: Clayey Sand Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1

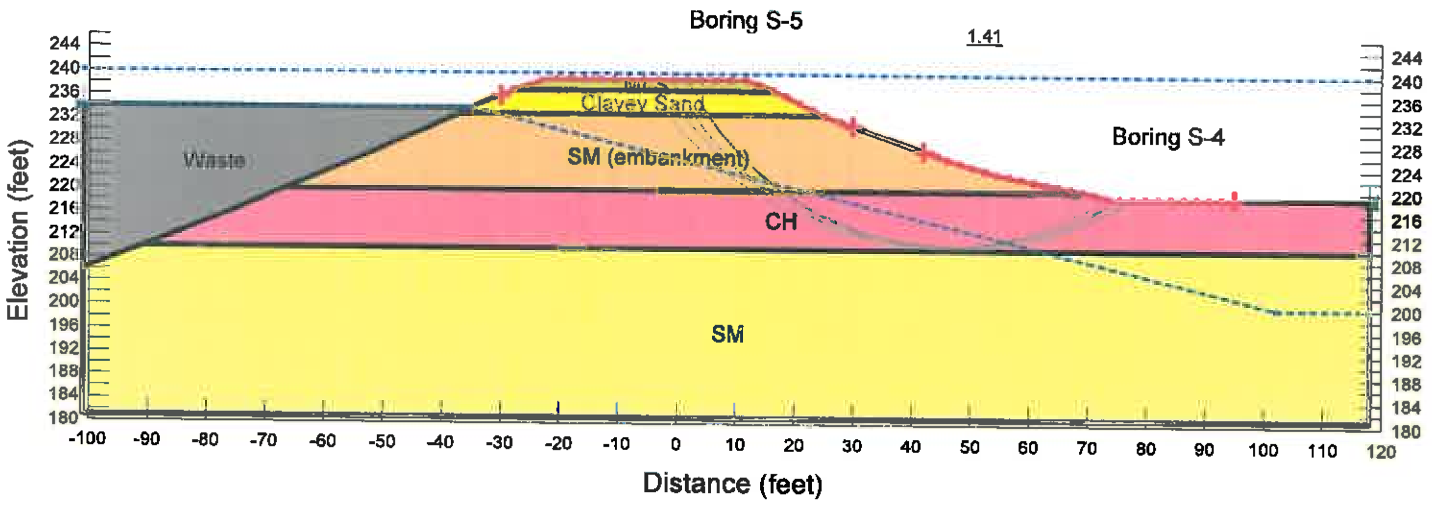
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long-Term Analysis
Spencer Method - Block Failure

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 85 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Piezometric Line: 1
Name: Clayey Sand Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1



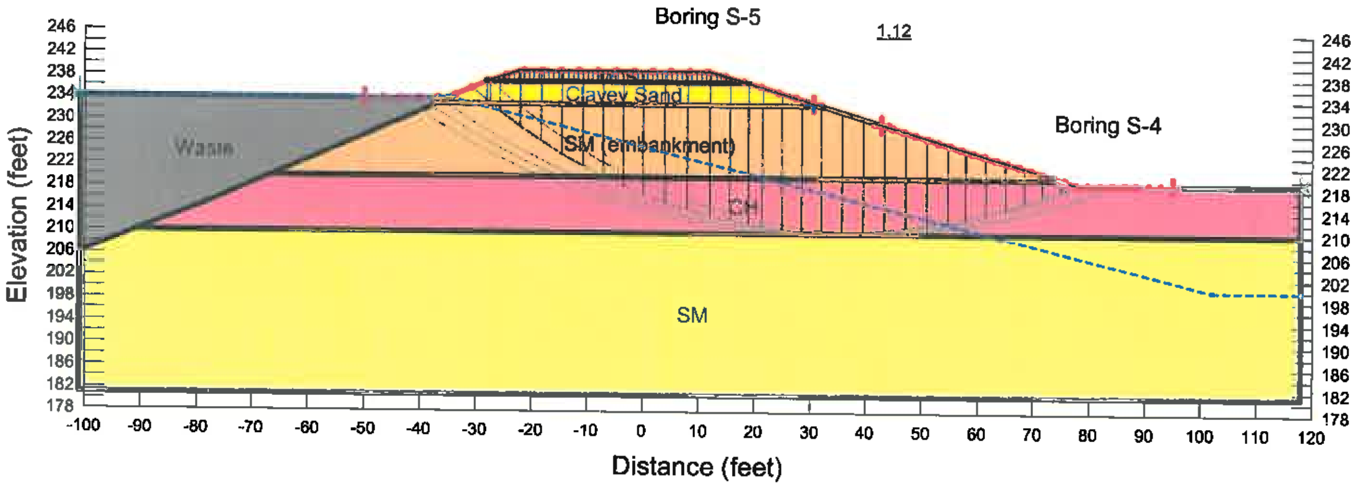
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid drawdown
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 200 psf Total Phi: 15 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Total Cohesion: 300 psf Total Phi: 12 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: Clayey Sand Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 1 Piezometric Line After Drawdow



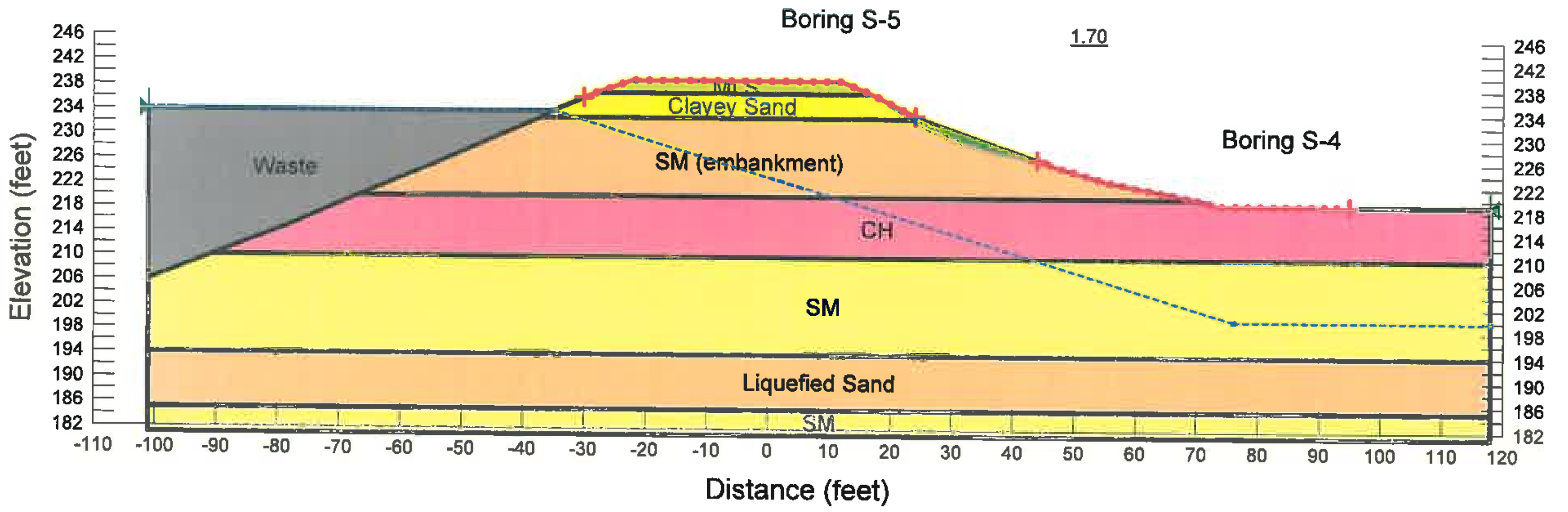
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: Clayey Sand Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Post Liquefaction
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: Clayey Sand Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Liquefied Sand Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 10 ° Piezometric Line: 1

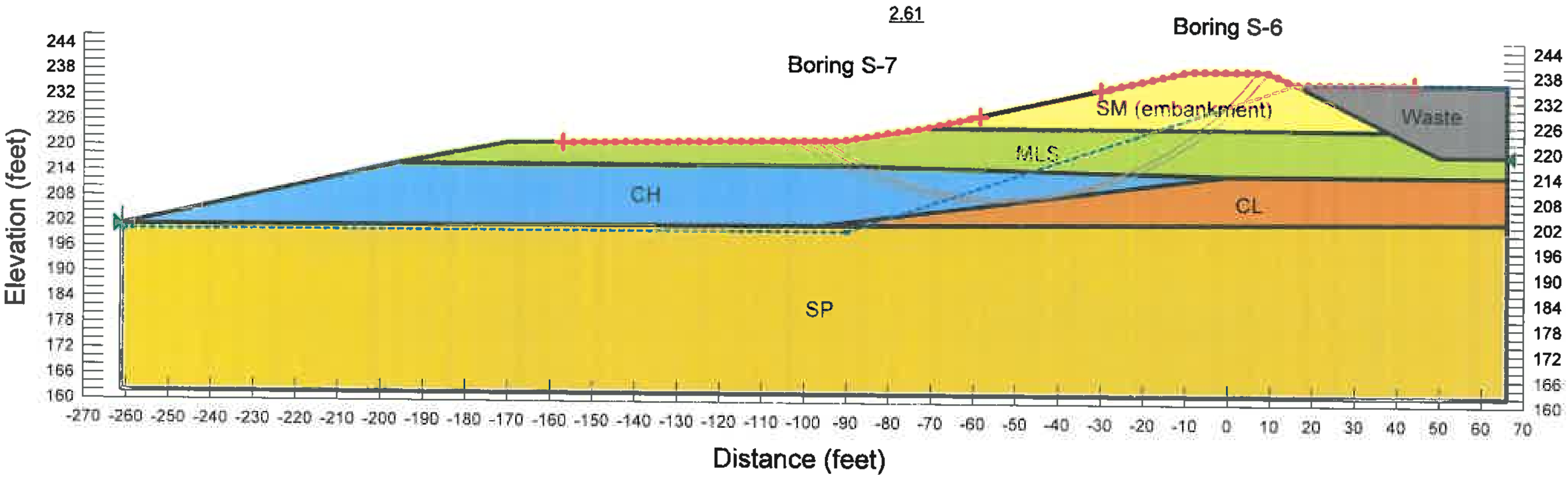


Slope Stability Analyses

Cross Section 4

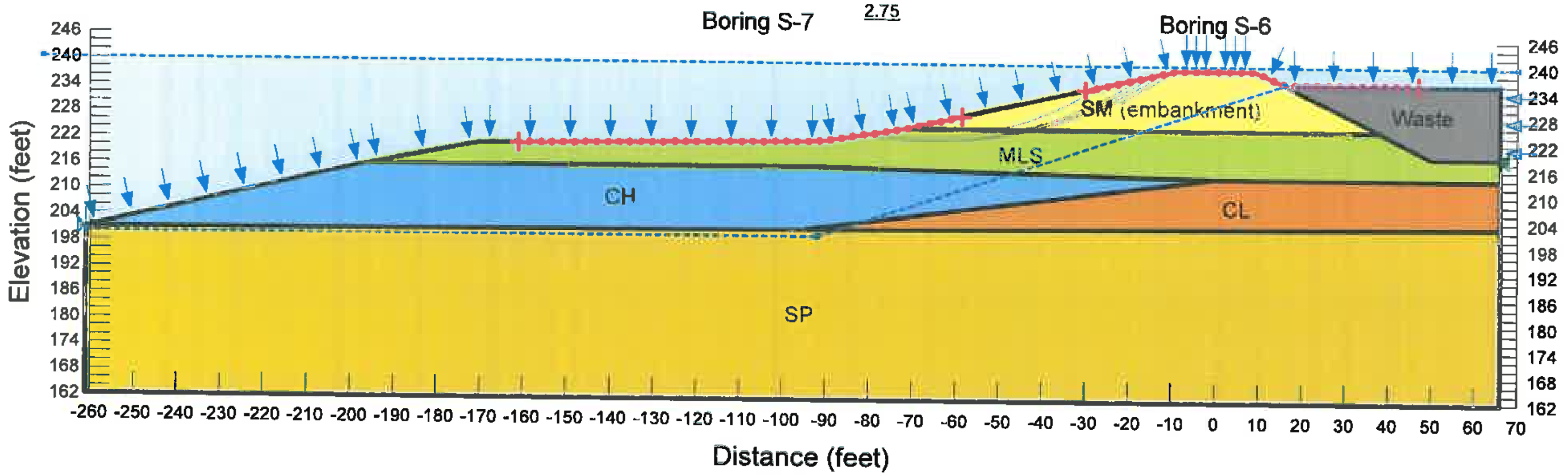
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long-Term Analysis
Spencer Method

Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: SP Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 23 ° Piezometric Line: 1



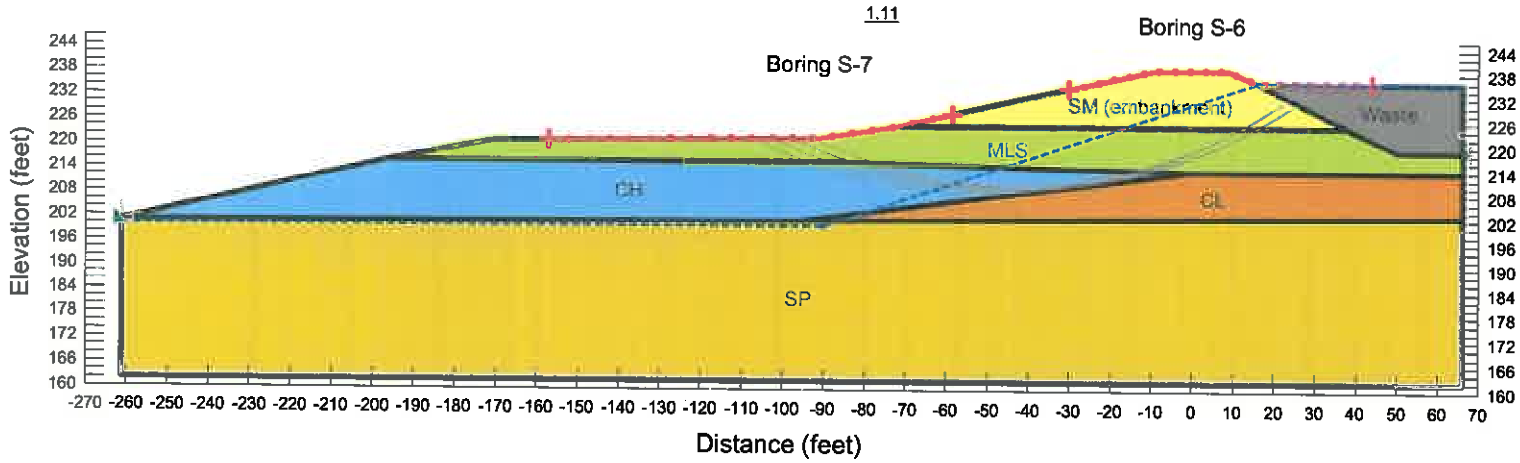
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown
Spencer Method

Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 250 psf Total Phi: 15 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: SP Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 200 psf Total Phi: 15 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2
Name: CH Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 0 psf Phi': 23 ° Total Cohesion: 300 psf Total Phi: 12 ° Piezometric Line: 1 Piezometric Line After Drawdown: 2



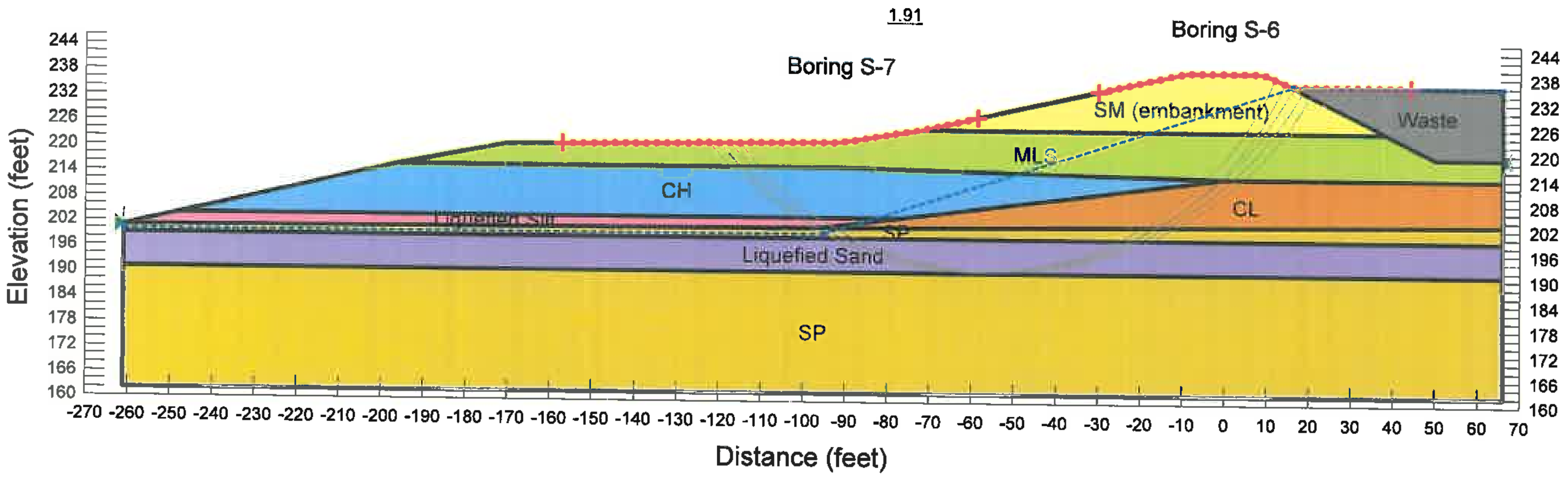
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic Analysis
Spencer Method

Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: SP Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Post Liquefaction Analysis
Spencer Method

Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: SP Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 111 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: Liquefied Sand Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 10 ° Piezometric Line: 1
Name: Liquefied Silt Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 8 ° Piezometric Line: 1

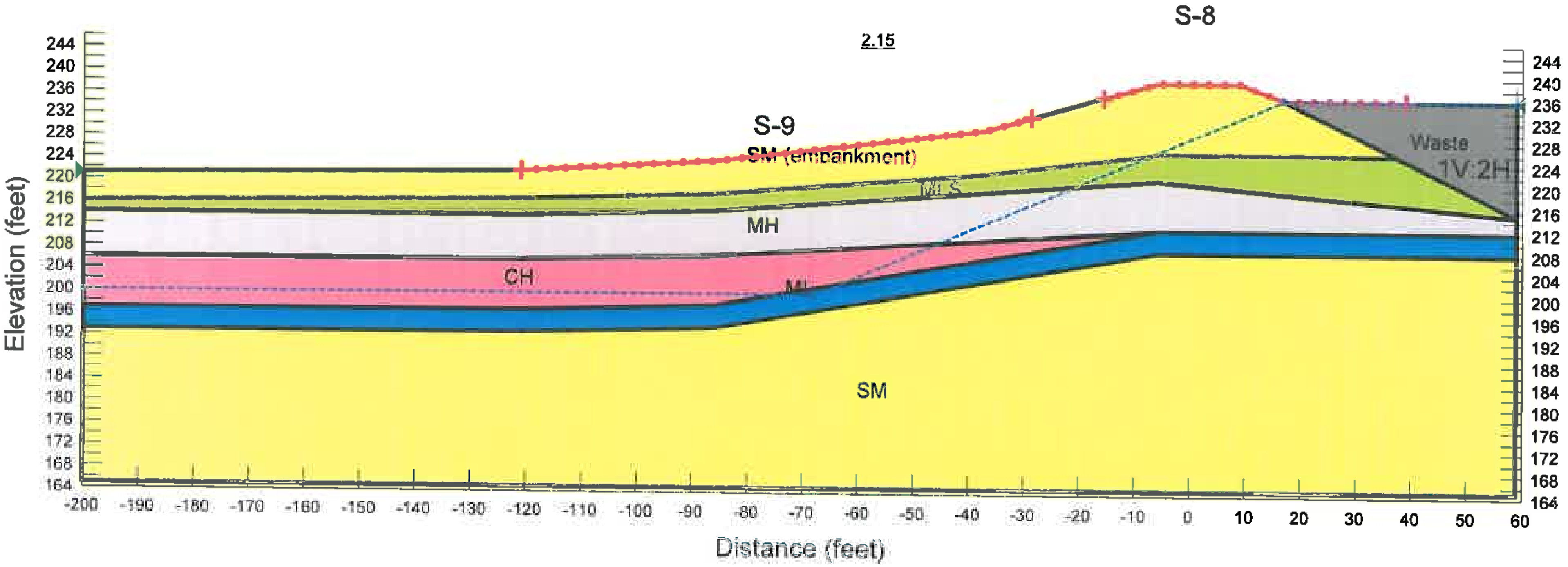


Slope Stability Analyses

Cross Section 5

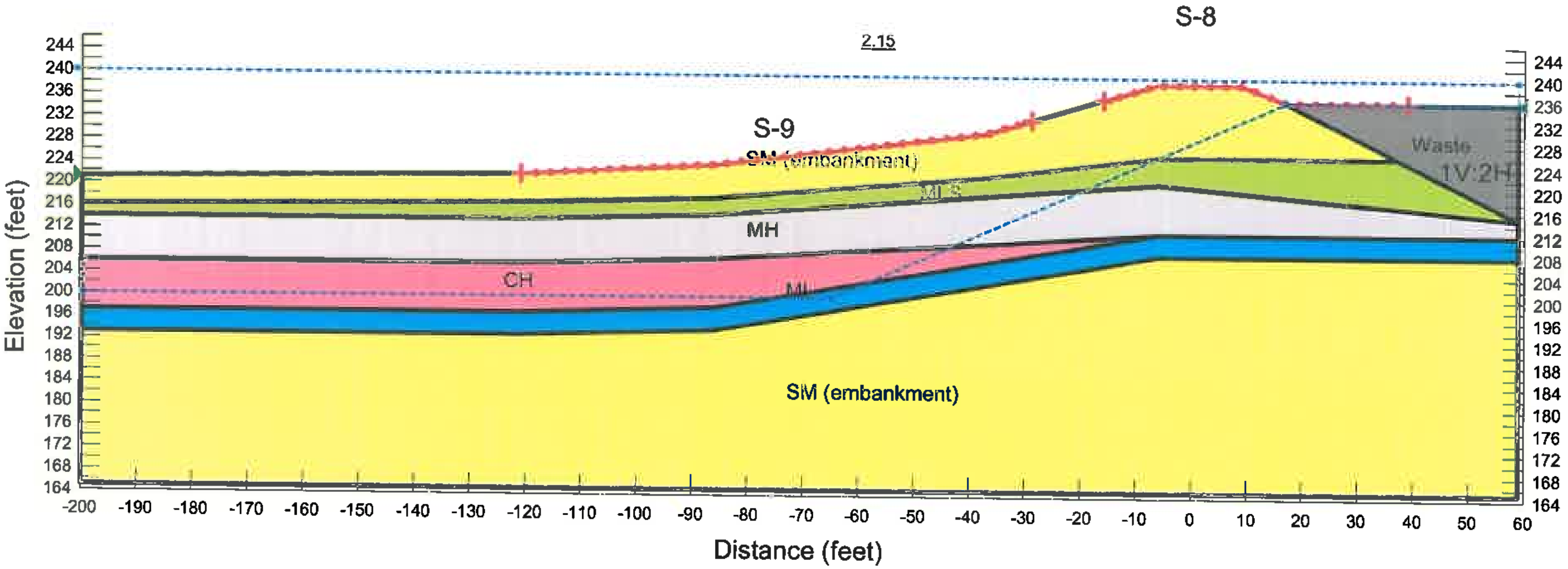
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long-Term Analysis
Spencer Method

Name: SM (embankment)	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1
Name: Waste	Model: Mohr-Coulomb	Unit Weight: 100 pcf	Cohesion': 0 psf	Phi': 0 °	Piezometric Line: 1
Name: MLS	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 28 °	Piezometric Line: 1
Name: CH	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 24 °	Piezometric Line: 1
Name: ML	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 30 °	Piezometric Line: 1
Name: MH	Model: Mohr-Coulomb	Unit Weight: 115 pcf	Cohesion': 0 psf	Phi': 22 °	Piezometric Line: 1
Name: SM	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1



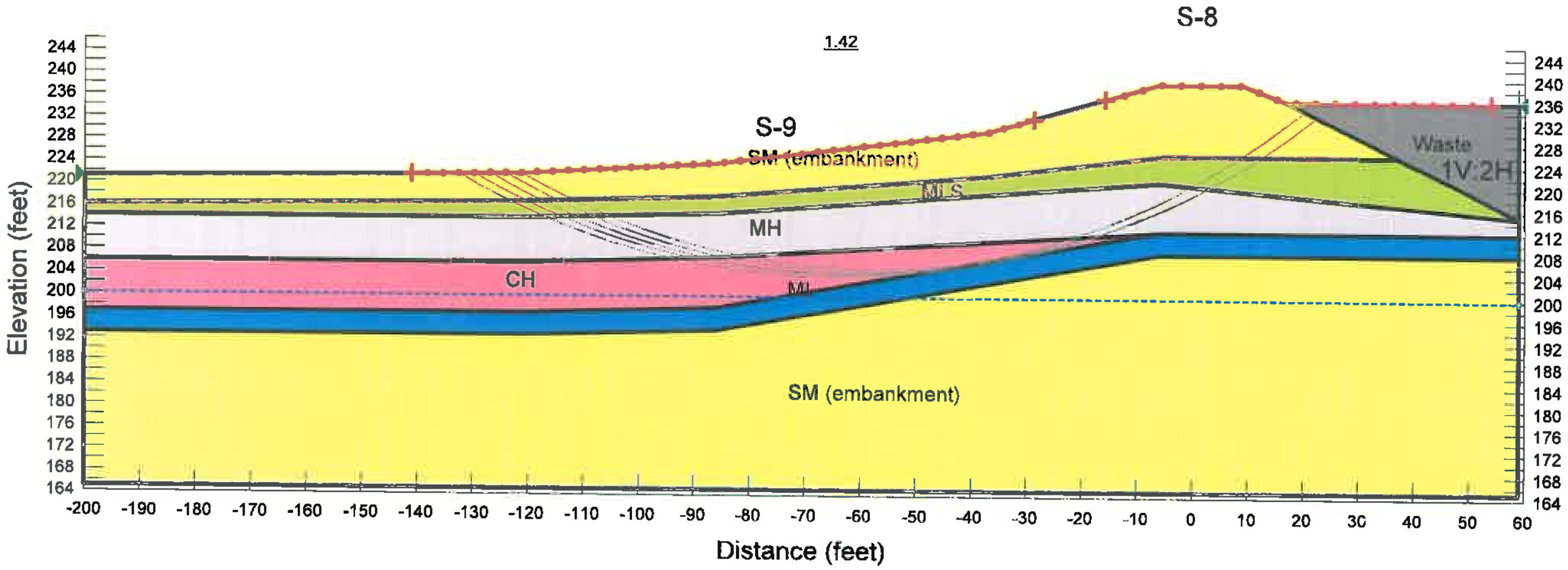
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown
Spencer Method

Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 85 pcf Cohesion': 0 psf Phi': 0 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 200 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Total Cohesion: 300 psf Total Phi: 12 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Total Cohesion: 200 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: MH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 22 ° Total Cohesion: 500 psf Total Phi: 10 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1



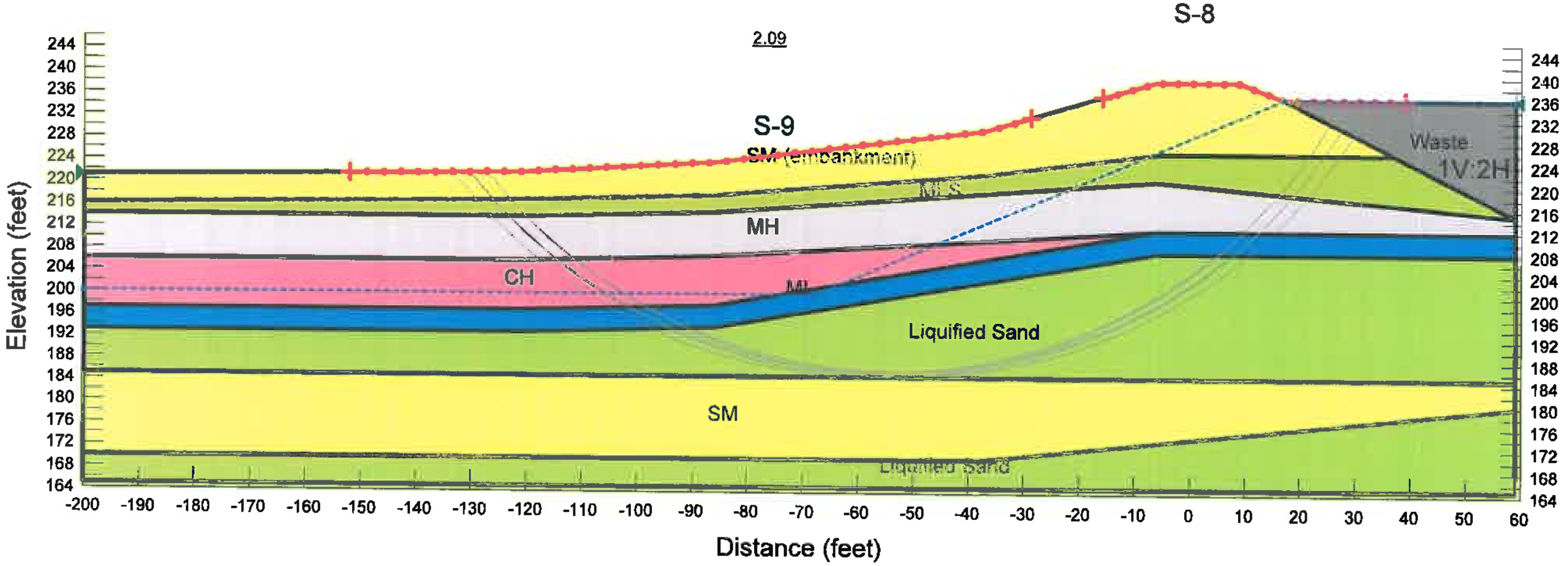
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic Conditions
Spencer Method

Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: MH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 500 psf Phi': 10 ° Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Post Liquefaction Analysis
Spencer Method

Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: MH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 500 psf Phi': 10 ° Piezometric Line: 1
Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Liquified Sand Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 10 ° Piezometric Line: 1

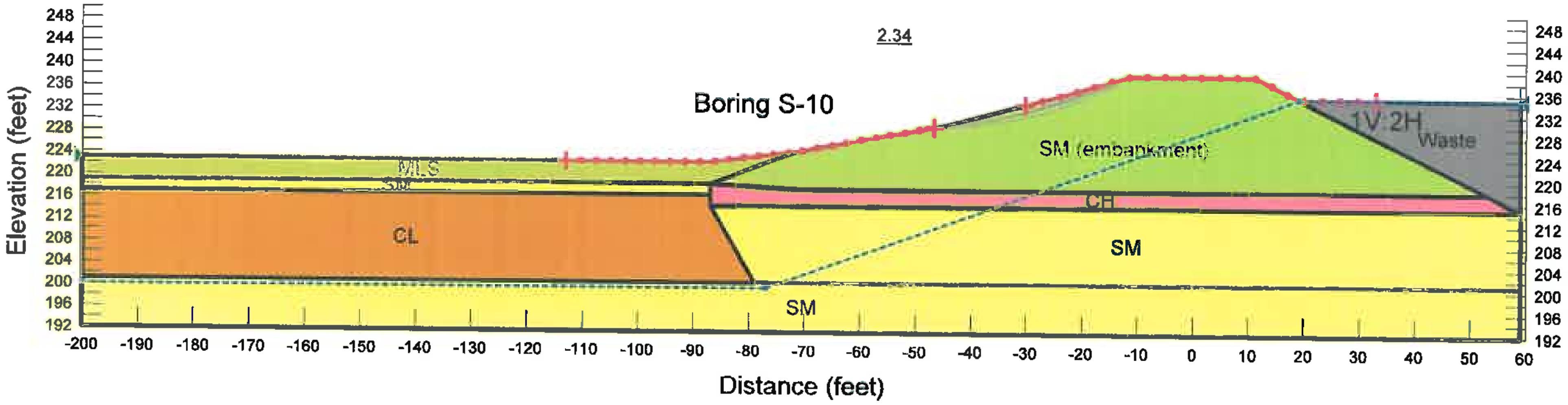


Slope Stability Analyses

Cross Section 6

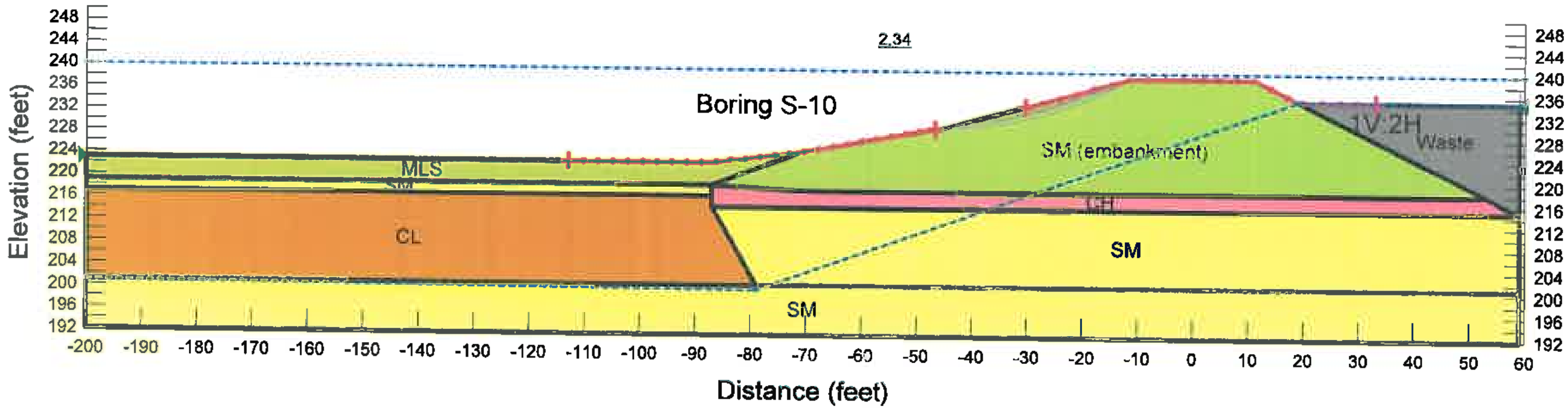
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long-Term Analysis
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1



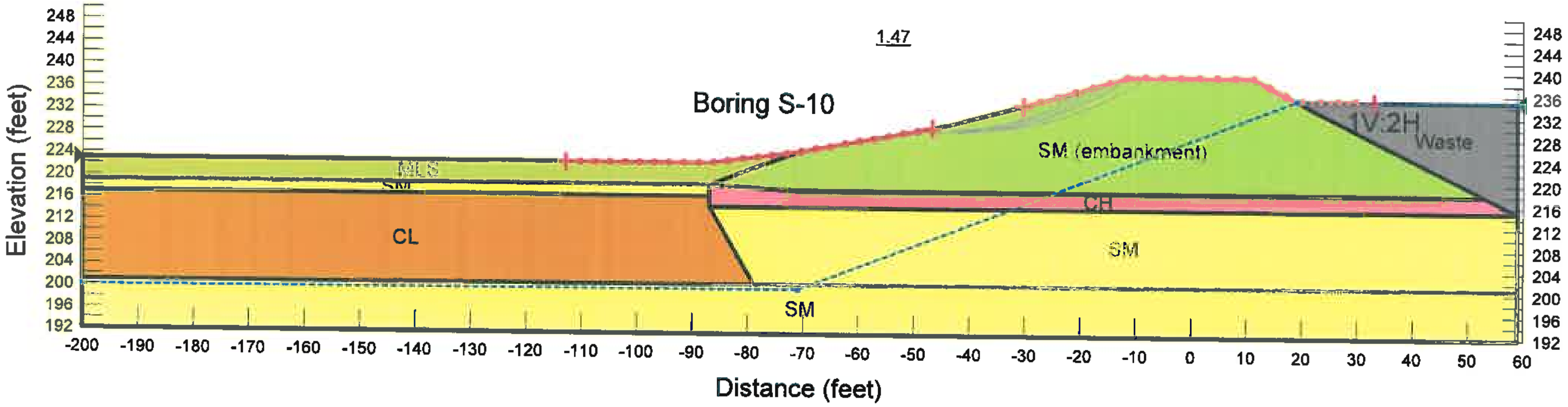
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 250 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 200 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Total Cohesion: 300 psf Total Phi: 12 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1



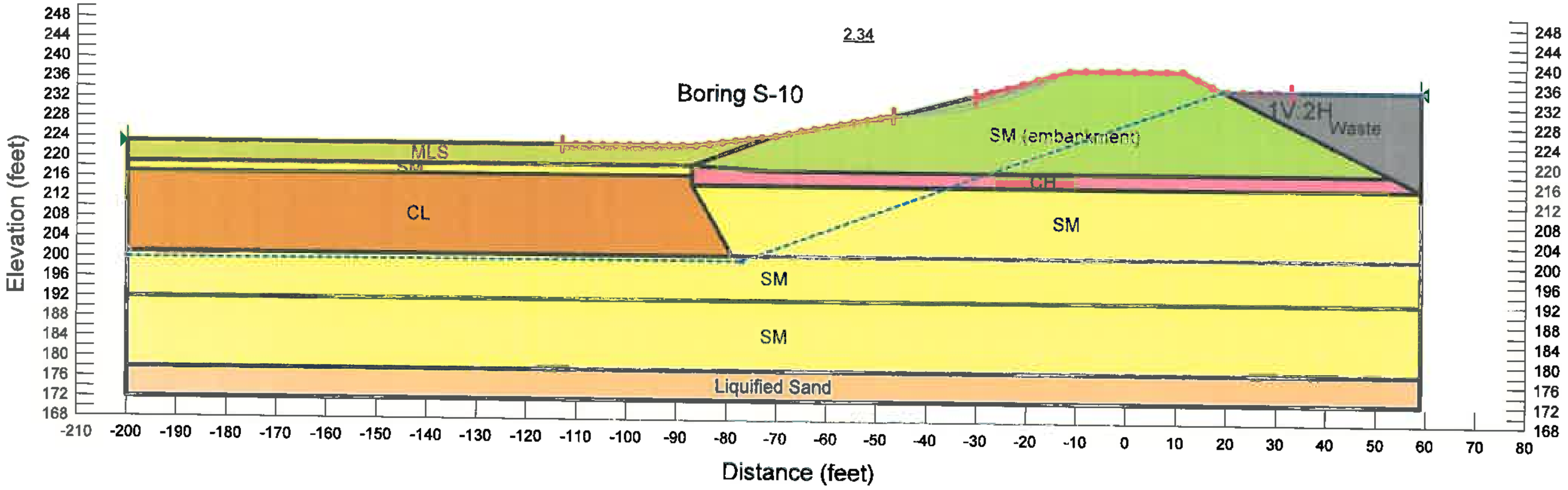
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic Conditions
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Post Liquefaction Analysis
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: MLS Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Liquified Sand Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 10 ° Piezometric Line: 1

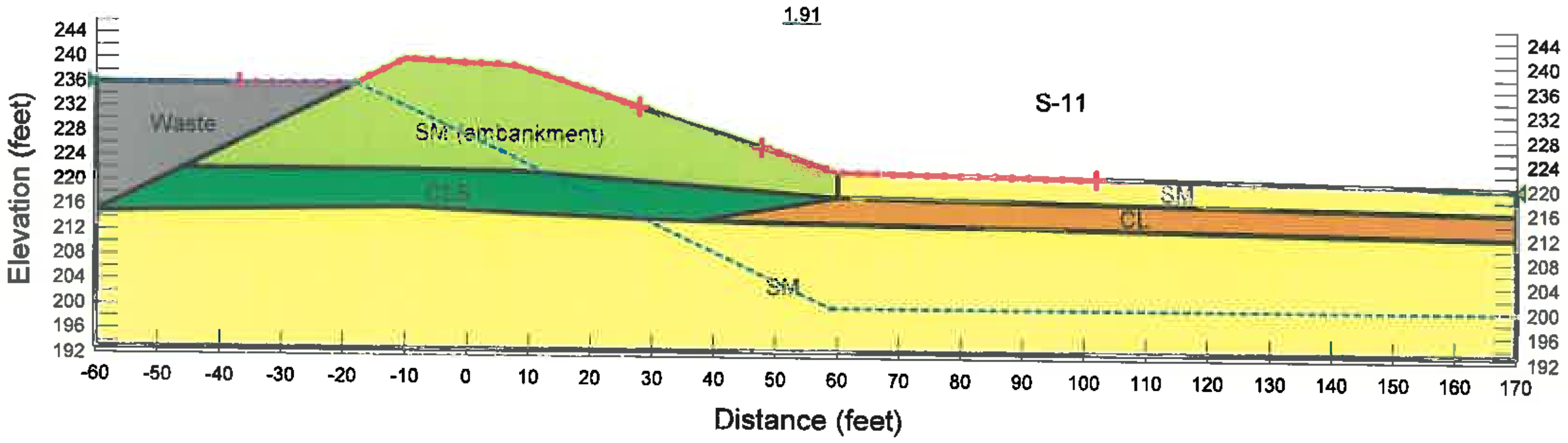


Slope Stability Analyses

Cross Section 7

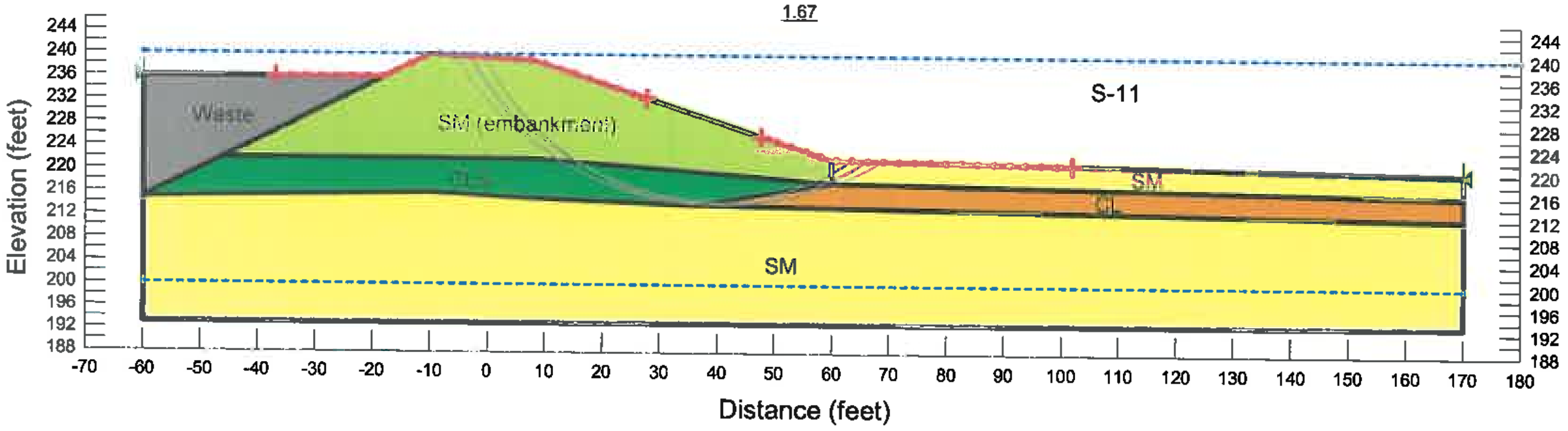
Earthen Embankment Integrity Evaluation
J020438.01
Long-Term Analysis
Spencer Method

Name: SM	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1
Name: CL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 28 °	Piezometric Line: 1
Name: Waste	Model: Mohr-Coulomb	Unit Weight: 100 pcf	Cohesion': 0 psf	Phi': 0 °	Piezometric Line: 1
Name: CLS	Model: Mohr-Coulomb	Unit Weight: 122 pcf	Cohesion': 0 psf	Phi': 30 °	Piezometric Line: 1
Name: SM (embankment)	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1



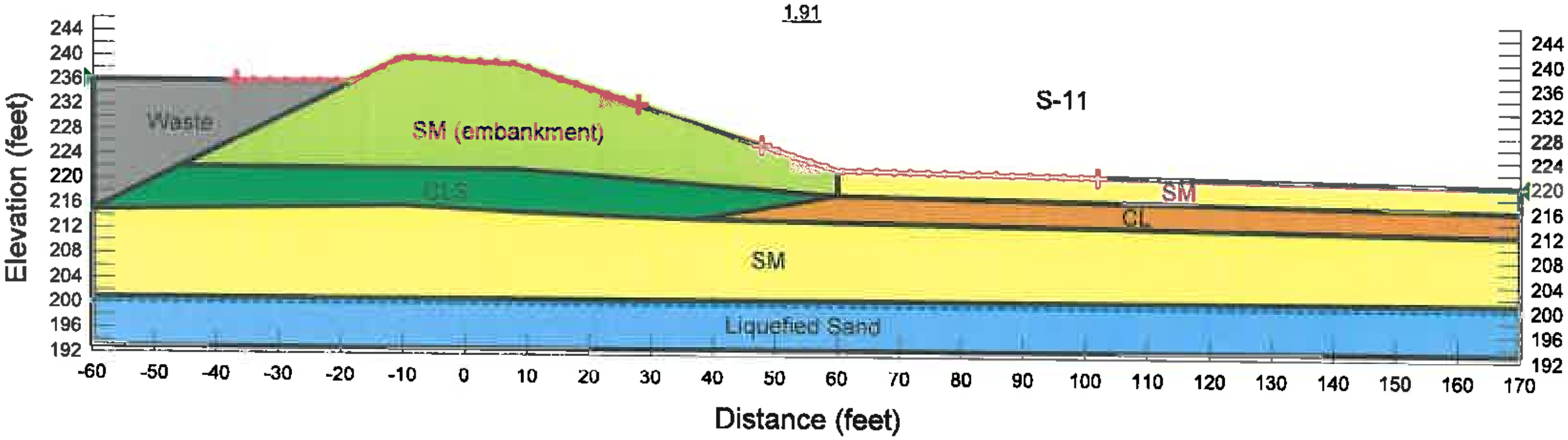
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 250 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 85 pcf Cohesion': 0 psf Phi': 0 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CLS Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 30 ° Total Cohesion: 200 psf Total Phi: 16 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown:



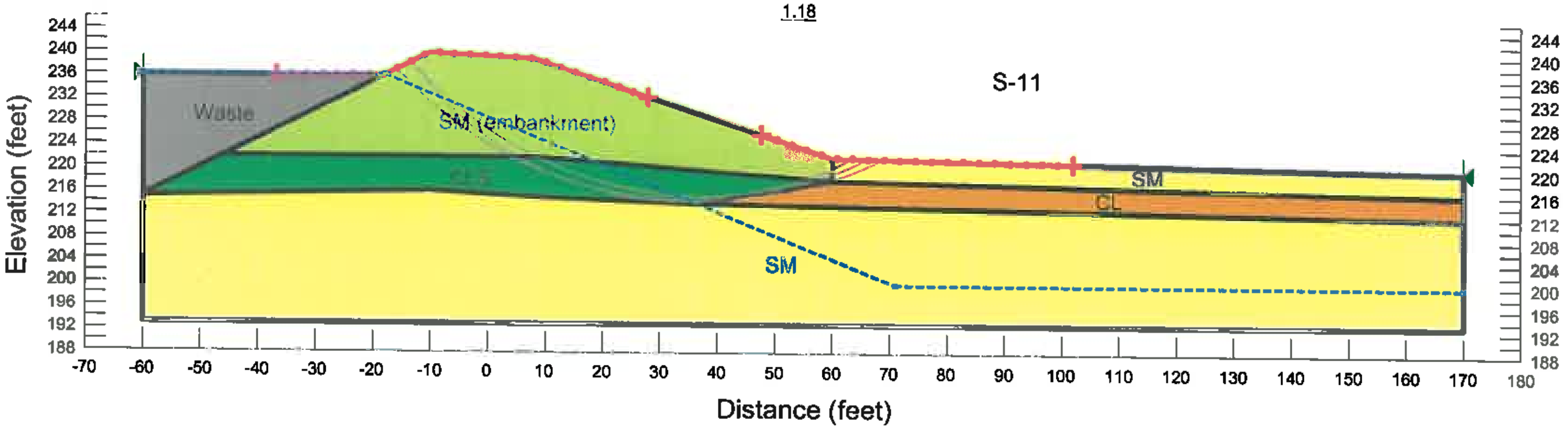
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Post Liquesfaction Analysis
Spencer Method

Name: SM	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1
Name: CL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 250 psf	Phi': 15 °	Piezometric Line: 1
Name: Waste	Model: Mohr-Coulomb	Unit Weight: 85 pcf	Cohesion': 0 psf	Phi': 0 °	Piezometric Line: 1
Name: CLS	Model: Mohr-Coulomb	Unit Weight: 122 pcf	Cohesion': 200 psf	Phi': 16 °	Piezometric Line: 1
Name: SM (embankment)	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1
Name: Liquefied Sand	Model: Mohr-Coulomb	Unit Weight: 125 pcf	Cohesion': 0 psf	Phi': 10 °	Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic
Spencer Method

Name: SM	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1
Name: CL	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 250 psf	Phi': 15 °	Piezometric Line: 1
Name: Waste	Model: Mohr-Coulomb	Unit Weight: 100 pcf	Cohesion': 0 psf	Phi': 0 °	Piezometric Line: 1
Name: CLS	Model: Mohr-Coulomb	Unit Weight: 122 pcf	Cohesion': 200 psf	Phi': 16 °	Piezometric Line: 1
Name: SM (embankment)	Model: Mohr-Coulomb	Unit Weight: 120 pcf	Cohesion': 0 psf	Phi': 32 °	Piezometric Line: 1

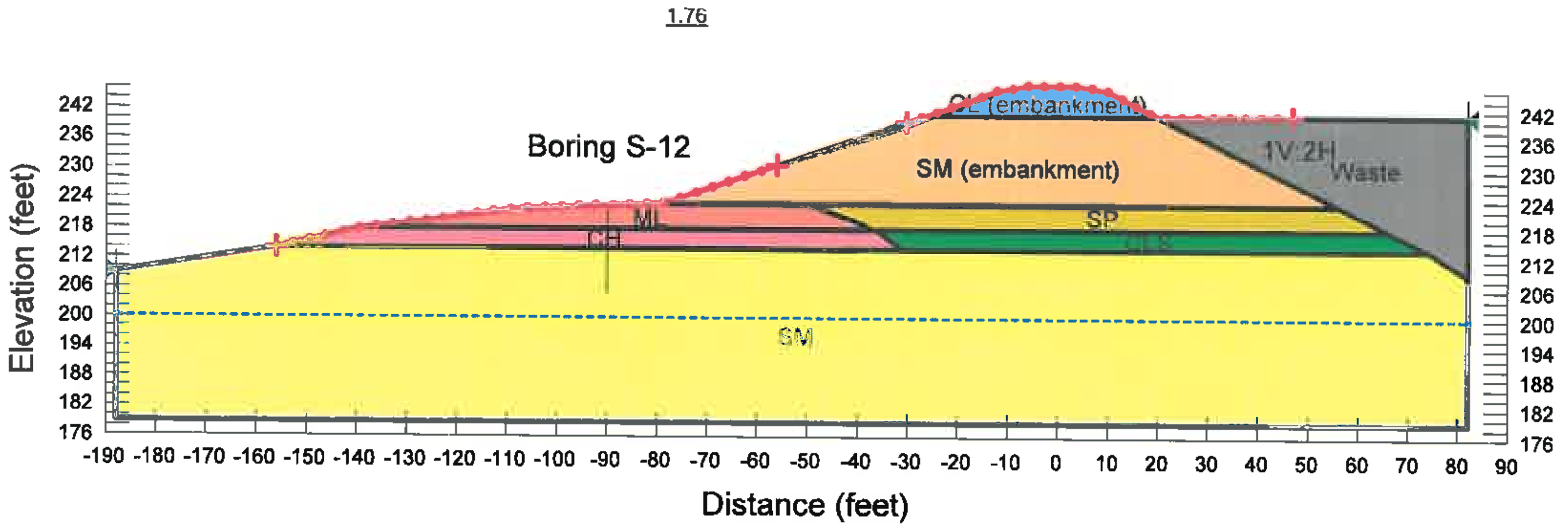


Slope Stability Analyses

Cross Section 8

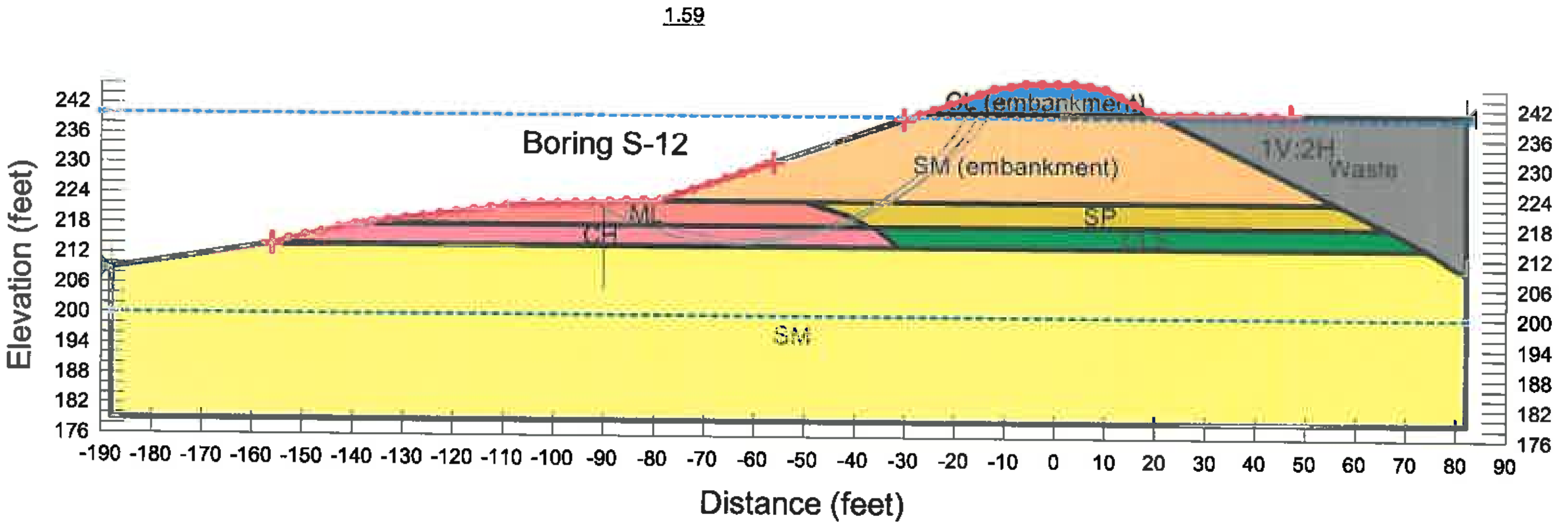
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long Term Conditions
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: SP Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: CLS Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Piezometric Line: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1



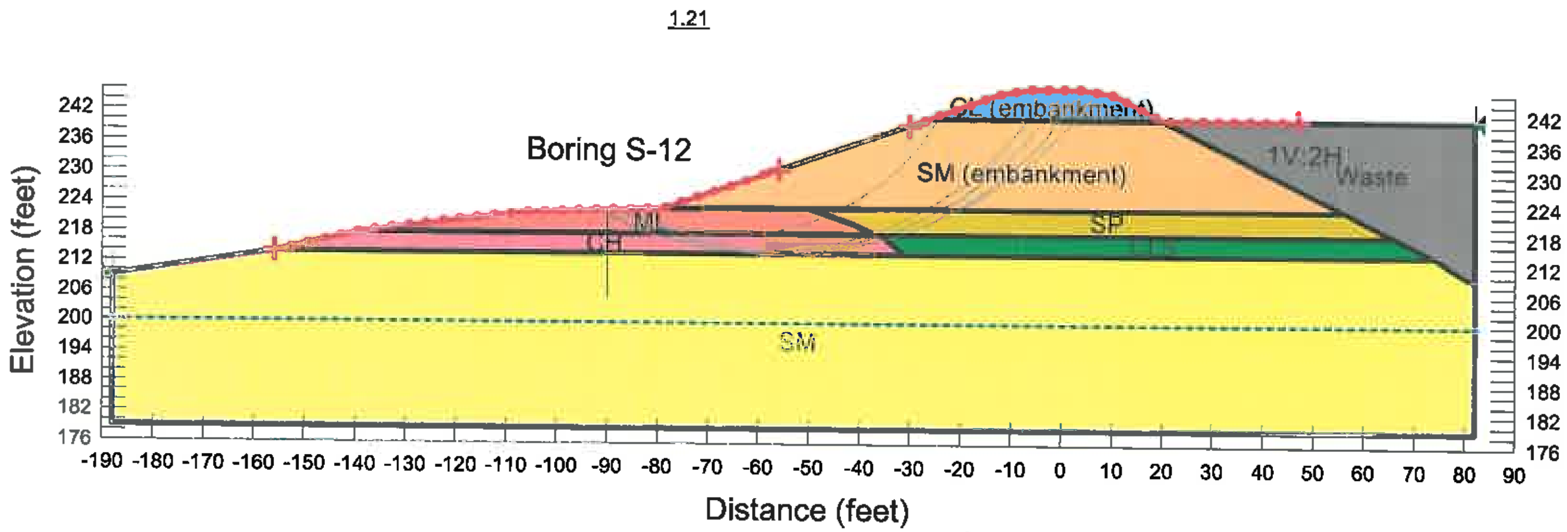
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: SP Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 275 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CLS Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 30 ° Total Cohesion: 200 psf Total Phi: 16 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Total Cohesion: 300 psf Total Phi: 12 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 200 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1



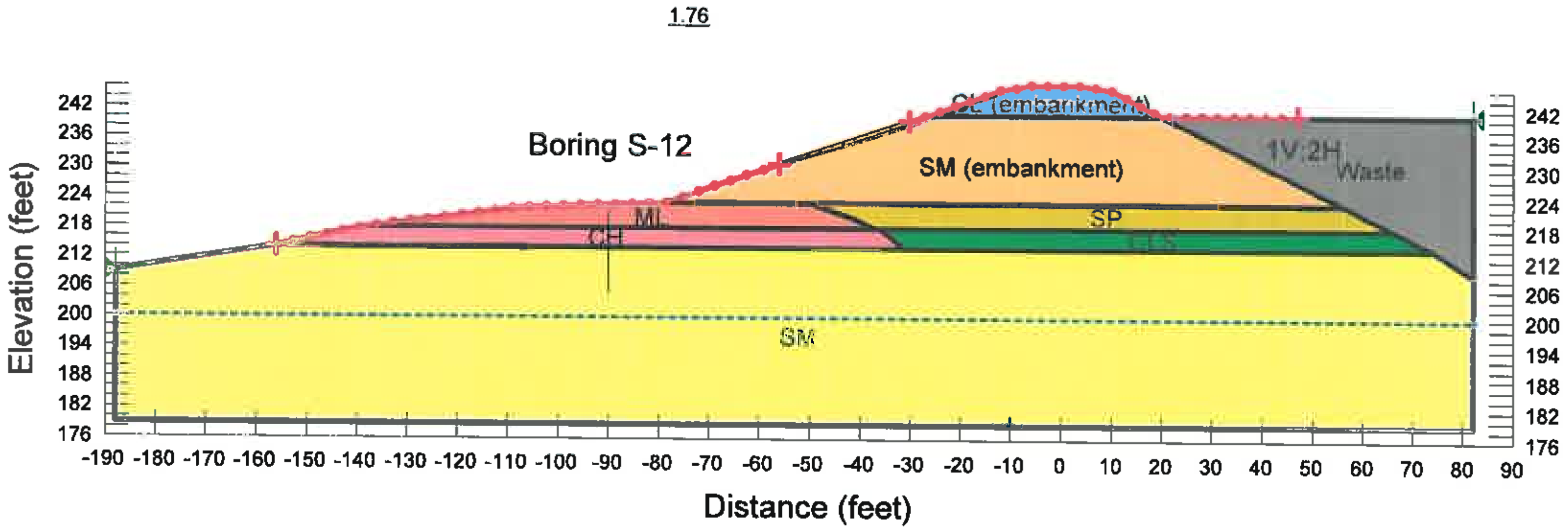
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic Conditions
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: SP Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 275 psf Phi': 15 ° Piezometric Line: 1
Name: CLS Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 200 psf Phi': 16 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Post Liquefaction Conditions
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Waste Model: Mohr-Coulomb Unit Weight: 85 pcf Cohesion': 0 psf Phi': 0 ° Piezometric Line: 1
Name: SP Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: CLS Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Piezometric Line: 1
Name: ML Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 ° Piezometric Line: 1
Name: SM (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1



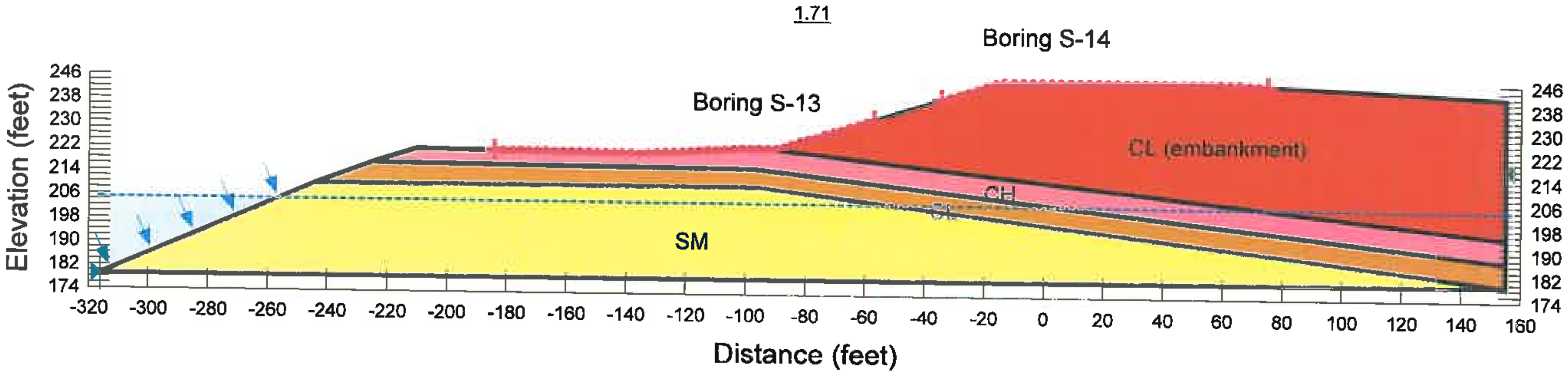
NOTE: Liquefiable layer too deep to affect slope stability.

Slope Stability Analyses

Cross Section 9

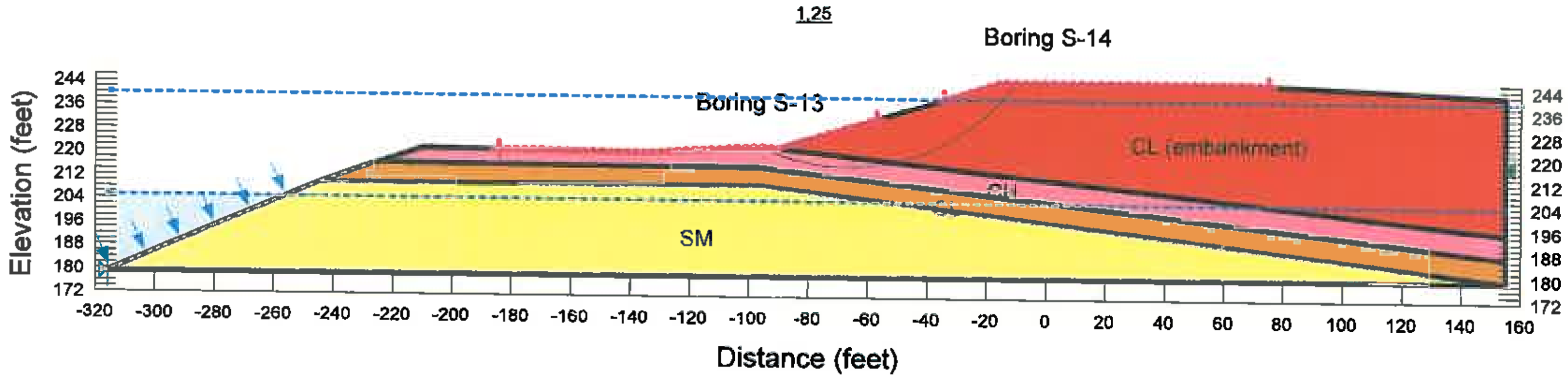
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Long-Term Analysis
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 ° Piezometric Line: 1



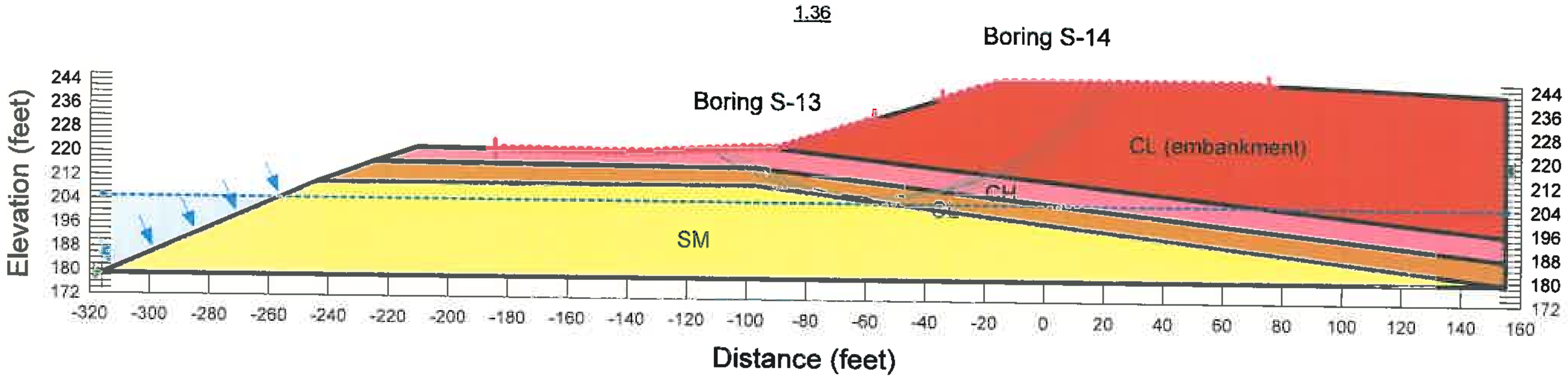
M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Rapid Drawdown Analysis
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Total Cohesion: 0 psf Total Phi: 0 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 250 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 24 ° Total Cohesion: 300 psf Total Phi: 12 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 ° Total Cohesion: 275 psf Total Phi: 15 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Seismic Conditions
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 1,200 psf Phi': 0 ° Piezometric Line: 1



M.C. Stiles Wastewater Treatment Plant
Earthen Embankment Integrity Evaluation
J020438.01
Post Liquefaction Analysis
Spencer Method

Name: SM Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: CL Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 250 psf Phi': 15 ° Piezometric Line: 1
Name: CH Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 300 psf Phi': 12 ° Piezometric Line: 1
Name: CL (embankment) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 275 psf Phi': 15 ° Piezometric Line: 1
Name: Liquefied Sand Layer Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 10 ° Piezometric Line: 1