ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

SUBSURFACE INVESTIGATION

STATE JOB NO. 090376

FEDERAL AID PROJECT NO. HPP2-9036(20)

HWY. 62/102 INTCHNG. IMPVTS. & 8TH STREET WIDENING (BENTONVILLE) (S)

STATE HIGHWAY 49 **SECTION** 29

IN BENTON **COUNTY**

LETTING OF NOVEMBER 2, 2016

The information contained herein was obtained by the Department for design and estimating purposes only. It is being furnished with the express understanding that said information does not constitute a part of the Proposal or Contract and represents only the best knowledge of the Department as to the location, character and depth of the materials encountered. The information is only included and made available so that bidders may have access to subsurface information obtained by the Department and is not intended to be a substitute for personal investigation, interpretation and judgment of the bidder. The bidder should be cognizant of the possibility that conditions affecting the cost and/or quantities of work to be performed may differ from those indicated herein.

Preliminary Geotechnical Engineering Report

8th Street Widening Project

Proposed Pavements

SE 8th Street from SW I Street to Interstate 540

Bentonville, Arkansas

June 11, 2014

Terracon Project No. 04135111

Prepared for:

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

Prepared by:

Terracon Consultants, Inc.
Tulsa, Oklahoma

June 11, 2014

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, MO 64114

Attn: Mr. David Hurt, P.E.
P: (816) 822 3426
E: dhurt@burnsmcd.com

Re: Preliminary Geotechnical Engineering Report
8th Street Widening Project – Proposed Pavements
SE 8th Street from SW I Street to Interstate 540
Bentonville, Arkansas
Terracon Project No. 04135111

Dear Mr. Hurt:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This geotechnical study was performed in general accordance with our Proposal No. P04090495 dated February 26, 2010 and the Amendment to Consultant Agreement dated May 21, 2010 between Burns & McDonnell Engineering Company, Inc. and Terracon Consultants, Inc. for Burns & McDonnell Project No. 090218.

This preliminary report presents the findings of the subsurface exploration, laboratory test results, and results of our analyses, and provides geotechnical recommendations concerning earthwork and the design and construction of pavements for the proposed project. We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.
Cert. Of Auth. #CA-233 exp. 12/31/15

Jaime E. Granados
Staff Geotechnical Engineer

Craig K. Denny, Ph.D.
Senior Consultant

Michael H. Homan
Regional Manager

Copies to: Addressee (1 via email)

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BENTONVILLE, ARKANSAS

Terracon Project No. 04135111
June 11, 2014

1.0 INTRODUCTION

This preliminary engineering report has been completed as a part of the 8th Street widening project in Bentonville, Arkansas. This report addresses our geotechnical recommendations for pavements along SE 8th Street from SW I Street to Interstate 540/Route 71.

A total of 41 borings, designated BR-001 through BR-041, were drilled for the project to depths of approximately 0.5 to 10 feet below the existing ground surface. One boring, BR-011, was not extended deeper than the asphalt pavement bottom due to the presence of underground and overhead utilities and its proximity to the Bentonville City Fire Department. A site location map along with boring location plans and boring logs are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- pavement subgrade preparation
- pavement thicknesses

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See Appendix A, Figure A-2, Boring Location Plan.
Proposed Structures	This phase of the project will consist of widening 8th Street from SW I Street to Moberly Lane and extending 8th Street from Moberly Lane to the intersection of 8th Street with Interstate 540/Route 71. On and off-ramps and tunnel pavements will also be constructed. The total length of the project is approximately 2.6 miles.

Item	Description
General Considerations	We understand that the Arkansas Highway Transportation Department (AHTD) will be responsible for widening and extending 8th Street from SE J Street to Interstate 540/ Route 71 (Section 1) and that the City of Bentonville will be responsible for widening 8th Street from SW I Street to SE J Street (Section 2).

2.2 Site Location and Description

Item	Description
Location	SE 8th Street from SW I Street to Interstate 540/Route 71 in Bentonville, Arkansas.
Traffic Loads	Traffic information was provided to us by Burns & McDonnell Engineering Company, Inc. on September 23 and October 4, 2013. A summary of the traffic is given in section **4.6 Pavements**.
Current Ground Cover	Existing asphalt paved surfaces and grass areas with some concrete paved areas and concrete sidewalks.
Grading	Based on the preliminary plans provided to us by Burns & McDonnell (file name: J:\Bentonville\8th_Street_Final\Civil\Drawings\I20\PLAN_09_090218_150.dgn) and the elevation of the borings, the proposed road alignment will have slopes between 0.5% and 3.0%. Road alignment slopes in excess of about 3.0% are anticipated for the proposed bridge abutments and ramps.

3.0 SUBSURFACE CONDITIONS

3.1 Existing Pavement Thickness

The summary of the asphalt thicknesses measured in our borings is provided below. Due to the drilling and coring methods used to extend our borings, we were not able to accurately measure aggregate base thicknesses. Therefore, the aggregate base thicknesses presented below should be considered approximate.

Boring No.	Asphalt Thickness (inches)	Aggregate Base Thickness (inches)
BR-001	9	N/A
BR-002	N/A	N/A
BR-003	11	N/A
BR-004	3 ½	2 ½
BR-005	5 ½	N/A
BR-006	4 ¾	6
BR-007	N/A	N/A
BR-008	6	N/A
BR-009	5	N/A
BR-010	6	N/A

Boring No.	Asphalt Thickness (inches)	Aggregate Base Thickness (inches)
BR-011	5	N/A
BR-012	4 – (concrete parking lot)	N/A
BR-013	N/A	N/A
BR-014	4	N/A
BR-015	N/A	N/A
BR-016	6 ½	N/A
BR-017	N/A	N/A
BR-018	N/A	N/A
BR-019	5	N/A
BR-020	9	N/A
BR-021	8	N/A
BR-022	5	2
BR-023	4.5 asphalt over 7 ¾ concrete	N/A
BR-024	6 ¾	3
BR-025	6 ½	N/A
BR-026	7 ½	N/A
BR-027	5	6
BR-028	3 ½	3
BR-029	2 ½	3
BR-030	2 ½	3
BR-031	3 ½	2
BR-032	3 ½	2
BR-033	4	N/A
BR-034	5	N/A
BR-035	3 ½	2
BR-036	4 ¼	2 ½
BR-037	N/A	N/A
BR-038	N/A	N/A
BR-039	N/A	N/A
BR-040	N/A	N/A
BR-041	N/A	N/A

3.2 Typical Subsurface Profile

Based on the results of the borings, subsurface conditions along the project alignment can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
1 [1]	1 to 5 feet	Fill: Low to medium plasticity clay with various amounts of sand and gravel and chert or limestone gravel with various amounts of fines	N/A
2 [2]	Borings terminated in this stratum at depths of 4.5 to 10 feet	Low to high plasticity clay with various amounts of silt, sand, and chert gravel	Soft to stiff

1. The composition of the fill materials encountered during our field exploration varies along the project alignment. Actual fill depths are sometimes difficult to identify due to similarities of the fill with the native soils and preliminary earthwork activities. Fill materials may exist in the vicinity of the construction areas at locations away from our borings. Existing fill materials were encountered in all borings except BR-013/015/017/018/024/039/040.
2. All borings terminated in this stratum except BR-007, which was terminated in apparent fill materials; BR-011, which was not extended into the subgrade soils; BR-024, which was terminated in apparent weathered sandstone; BR-025, which was terminated in apparent shale; and BR-040, which was terminated in silty chert gravel.

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil and rock types; in-situ, the transition between materials may be gradual.

3.3 Groundwater

The boreholes were observed while drilling and immediately after boring completion for the presence and level of groundwater. Groundwater was only observed in boring BR-041 at depths of about 4 feet and 3 feet while drilling and after boring, respectively. Groundwater was not observed in the other borings during our field exploration.

The groundwater level observations made during our exploration provide an indication of the groundwater conditions at the time the borings were drilled. Longer monitoring in piezometers or cased holes, sealed from the influence of surface water, would be required to evaluate long-term groundwater conditions. During some periods of the year, perched water could be present at various depths. Fluctuations in groundwater levels should be expected throughout the year depending upon variations in the amount of rainfall, runoff, evaporation, and other hydrological factors not apparent at the time the borings were performed.

4.0 ANALYSIS AND RECOMMENDATIONS

4.1 Geotechnical Considerations

As described in the Project Information section of this report, we understand that the total length of the project will be approximately 2.6 miles. We also understand that the City of Bentonville will be responsible for widening approximately 1.4 miles of 8th Street from SW I Street to SE J Street (Section 2) and that the Arkansas Highway Transportation Department (AHTD) will be responsible for widening and extending 8th Street from SE J Street to Interstate 540/ Route 71 (Section 1).

Due to the presence of underground and overhead utility lines, most of our borings were drilled through the existing 8th Street pavement. Based on the results of our borings, we determined that the asphalt thicknesses of the existing pavement sections vary between approximately 2 and 11 inches. At this time, we understand that the majority of the existing pavement sections will be replaced full depth with new pavement sections. If a mill and overlay of existing pavements will be considered in lieu of the new pavement sections, we will need to provide additional recommendations.

Traffic information, which included Average Daily Traffic (ADT) and percent trucks estimated for the year 2030, was provided by Burns & McDonnell. Based on the traffic information given to us, the 1993 AASHTO Guide for Design of Pavement Structures, and the City of Bentonville and AHTD specifications for pavement construction, three pavement section alternatives are presented in section **4.3 Pavements**.

Recommendations regarding earthwork and subgrade preparation and the design and construction of pavements are presented in the following sections.

4.2 General Earthwork

4.2.1 Site Preparation

The recommendations presented below apply to general site preparation for pavement areas. Areas to be graded should be stripped and cleared of surface vegetation, topsoil, trees, bushes, debris, and any other deleterious material. Any loose soils at the surface, tree stumps, and major root systems should be removed full-depth and the resultant excavations should be cleaned of all loose material and water and properly backfilled with tested and approved engineered fill. In addition, surface and subsurface features such as existing pavements or underground abandoned utilities should be removed full-depth and the resultant excavations should be properly backfilled with tested and approved engineered fill.

After stripping and completing any required grading cuts, and before placing any new fill, the exposed subgrade should be proofrolled with a fully-loaded dump truck, scraper, or other rubber-tired construction equipment weighing at least 25 tons to evaluate the presence of any low strength, unstable soils. Any low strength, unstable soils identified by the proofrolling should be overexcavated and replaced with tested and approved fill as indicated in section **4.3 Material Types**, if they cannot be adequately stabilized in-place. Based on the results of our field exploration and experience with similar projects, unstable soils with high moisture content may be encountered directly beneath existing pavements.

After completing a successful proofroll, and before placing any fill, the exposed subgrade should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted as recommended in section **4.4 Compaction Requirements**.

4.2.2 Fill Material Types

Engineered fill, where required to raise the subgrade elevation and to backfill excavations, should meet the following specifications:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
"Hillside" Borrow Material [2] (off-site borrow)	GC, GM	All locations and elevations
Approved Crushed Stone [2] (off-site borrow)	GW, GP	All locations and elevations
Locally Available Crushed Shale and Sandstone [2] (off-site borrow)	SC, SP, GC, GP	All locations and elevations
Clay Soils	Low to high plasticity clay [3] (CL, CL-CH, CH, CL-ML)	Should not be placed within 10 inches of final pavement subgrade, unless chemically treated as recommended in section **4.3.4 Subgrade Improvement Recommendations**.
	Existing fill [4]	Upon approval of the geotechnical engineer

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris and contain maximum rock size of 3 inches. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Approved, granular soils having a maximum Liquid Limit (LL) of 40, a maximum Plasticity Index (PI) of 15, and containing at least 15% fines (material passing the No. 200 sieve, based on dry weight). The California Bering Ratio (CBR) and/or Resilient Modulus (MR) values of these soils, when compacted as recommended in section **4.3.2 Compaction Requirements**, should be 8 or greater and 9,600 psi or grater, respectively.
3. Clay soils could be used as fill within 10 inches of pavement subgrade, only if they are effectively modified with Class "C" fly ash to achieve a CBR value of 8 or greater and/or a MR value of 9,600 psi or greater. Similarly, the maximum LL and PI values should not exceed 40 and 15, respectively. We estimate a minimum of approximately 15 to 17 percent Class "C" fly ash, based on the soil's compacted dry unit weight, would be required to achieve the required CBR and/or MR

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values. The actual amounts of Class "C" fly ash should be determined in the laboratory and verified in the field as the amount required to achieve satisfactory CBR and/or MR values.

4. Because the variable composition and quality of existing fill materials along the project site, we recommend that existing fills be removed within 10 inches of final pavement subgrade and replaced with tested and approved engineered fill materials. However, existing fills could be used if the geotechnical engineer considers that those materials are suitable and meet the CBR and/or MR values and the plasticity required.

4.2.3 Compaction Requirements

The scarified and compacted subgrade and new fills should be moisture conditioned and compacted using the recommendations presented in the following table.

Item	Description
Subgrade Scarification Depth	10-inches
Fill Lift Thickness [1]	12-inches or less in loose thickness
Compaction Requirements [2]	At least 95% of the material's maximum dry density based on AASHTO T-99 or AASHTO T-180 standard specifications depending on the content of fines (AHTD Specifications section 210.10).
Moisture Content	A level within minus 2 to plus 2 of the material's optimum moisture content, determined in accordance with AASHTO T-99/T-180.

1. Thinner lifts are recommended in confined areas or when hand-operated compaction equipment is used.
2. The scarified and compacted subgrade and new fills should be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

The recommended moisture content should be maintained in the scarified and compacted subgrade and new fills, until fills are completed and pavements are constructed.

4.2.4 Construction Considerations for Earthwork

The surficial lean clay soils are moisture sensitive and subject to disturbance and instability when they experience increases in moisture content. If wet conditions exist during construction, equipment mobility will be hindered and it will be necessary to overexcavate and replace or stabilize the full-depth of these soils to develop support for new fills and pavements, and allow construction to proceed.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to pavement construction. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, excessively wet or dry, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to pavement construction.

The geotechnical engineer should be retained during the construction phase of the project to provide observation and testing during subgrade preparation and earthwork.

4.3 Pavements

Three pavement section alternatives are presented for consideration of Burns & McDonnell, the City of Bentonville, and the Arkansas Highway Transportation Department (AHTD):

- Full-Depth Flexible Pavement
- Flexible Pavement with Aggregate Base
- Rigid Pavement

The traffic information provided by Burns & McDonnell included Average Daily Traffic (ADT) and percent trucks estimated for the year 2030. The plan with traffic information for 2030, as provided by Burns & McDonnell, is included in Appendix D-4. The traffic was recalculated for the year 2015 based on an average traffic growth of 2%. The design lane traffic was calculated as per the 1993 AASHTO Guide for Design of Pavement Structures, as follows:

$$W_{18} = D_D \times D_L \times W_{18TOTAL}$$

Where

W_{18} : Design lane traffic
D_D : Percent of traffic on each direction (0.5 for 8th Street and 1.0 for ramps)
D_L : Low factor for 2 lanes in the same direction (0.5 for 8th Street and 1.0 for ramps)
$W_{18TOTAL}$: Total ADT

Based on the traffic information provided to us, we divided the pavement design into twelve sections, Section I through XII. A summary of the ADT data and design lane traffic is given as follows.

		Traffic Data			Design Lane Traffic (W_{18}) [3]	
8th Street Section [1, 2, 3]		ADT 2030	ADT 2015	Trucks (%)	Cars	Trucks
I	8th Street from SW I Street to SW A Street	14,600	10,848	5%	4,122	217
II	8th Street from SW A Street to SE J Street	17,500	13,003	5%	4,941	260
III	8th Street from SE J Street to Moberly Lane	20,500	15,232	6%	5,727	366
IV	8th Street from Moberly Lane to I-540	27,500	20,433	6%	7,683	490
V	8th Ramp 1	21,200	15,752	8%	14,492	1,260
VI	8th Ramp 2	5,200	3,864	8%	3,555	309
VII	8th Ramp 3	4,600	3,418	8%	3,144	273
VIII	8th Ramp 4	19,600	14,563	8%	13,398	1,165
IX	102 Ramp 1	12,800	9,511	8%	8,750	761
X	102 Ramp 2	5,700	4,235	8%	3,896	339
XI	102 Ramp 3	6,700	4,978	8%	4,580	398
XII	102 Ramp 4	13,900	10,328	8%	9,502	826

1. Sections I and II are to be designed and constructed as per the City of Bentonville Standard Specifications for Streets (2006 or latest edition).
2. Sections III through XII are to be designed and constructed as per AHTD Roadway Design Plan Development Guidelines (2006 or latest edition).
3. See Appendix D-4 for location of sections I through XII.

Our analyses were performed based on the 1993 AASHTO Guide for Design of Pavement Structures. The pavement sections are based on the Average Daily Traffic (ADT) and design lane traffic (W_{18}) given in the above-table starting in 2015. A summary of our design considerations is given below.

- Annual Traffic Growth Rate — 2%
- Minimum Subgrade California Bearing Ration (CBR) — 8
- Minimum Subgrade Resilient Modulus (M_R) — 9,600 psi
- Reliability Primary: 8th Street — 90%
- Reliability Interstate: Ramps — 95%
- Standard Deviation (flexible pavement) — 0.45
- Standard Deviation (rigid pavement) — 0.35
- Initial Serviceability — 4.5
- Terminal Serviceability — 2.5
- Design Serviceability Loss — 2
- Design Life — 20 years
- Load Transfer “J” (for tied Portland Cement Concrete) — 2.8
- Drainage Coefficient (for aggregate base material) — 1.0

Additional pavement design and construction considerations are given as follows:

■ Asphalt Performance Grade	PG 76-22 (Used on North of I-40)
■ ACHM Surface course	12.5 mm - 1/2' (Granular texture)
■ ACHM Binder course	25 mm - 1''
■ ACHM Base course	37.5 mm - 1 1/2''
■ Aggregate Base course	AHTD – Class 7

Structural layer coefficients of 0.44 were used for asphaltic concrete surface and binder, 0.36 for asphaltic concrete base, and 0.14 for the aggregate base material. For analysis purposes, the truck traffic was considered to consist of semi-tractor trailer combinations with 5+ axles having a gross weight of 80,000 pounds or equivalent traffic loading. Periodic maintenance should be expected to realize the anticipated design life.

Our calculations were developed based on a subgrade Resilient Modulus (MR) of 9,600 psi or approximate equivalent California Bearing Ration (CBR) of 8. Four composite soil samples compacted at their Optimum Moisture Content (OMC) and OMC+2% were tested in our laboratory to determine their MR values. The samples were selected from different boring locations to represent the general subgrade soil conditions along the project alignment.

Our laboratory test results indicated that the on-site lean clay soils encountered at the site (i.e. bulk samples 1 through 3) generally do not meet the MR or CBR requirements for moisture contents within the above mentioned moisture content range and anticipated field confining pressures, which we anticipate will vary between approximately 2 and 4 pounds per square inch (psi).

On the other hand, our laboratory results indicated that the granular soils encountered at this site, which generally corresponded to imported fill materials (i.e. bulk sample 4, which was classified as clayey/silty chert gravel), will probably meet the desired MR value and that similar materials can be used to improve the subgrade as described in section **4.3.4 Subgrade Improvement Recommendations**.

Recommended pavement sections for the three alternatives are provided in the following sections. Other pavement sections could be considered.

4.3.1 Full-Depth Flexible Pavement

The table below shows the full-depth flexible pavement design for each section of the project. A typical full-depth flexible pavement section should include the following layers:

- Asphalt Concrete Hot Mix (ACHM) Surface Course
- over ACHM Binder Course
- over ACHM Base Course
- over geotextile fabric
- over improved subgrade

Minimum Full-Depth Asphalt Pavement Sections (inches)					
8th Street Section [1,2]		ESALs (million)	ACHM Surface	ACHM Binder	ACHM Base
I	8th Street from SW I Street to SW A Street	4.7	3.0	2.0	5.0
II	8th Street from SW A Street to SE J Street	5.6	3.0	2.0	5.5
III	8th Street from SE J Street to Moberly Lane	7.9	2.0	3.0	8.0
IV	8th Street from Moberly Lane to I-540	10.6	2.0	3.0	8.0
V	8th Ramp 1	26.5	2.0	3.0	9.0
VI	8th Ramp 2	6.7	2.0	3.0	8.0
VII	8th Ramp 3	5.9	2.0	3.0	8.0
VIII	8th Ramp 4	24.5	2.0	3.0	8.5
IX	102 Ramp 1	16.0	2.0	3.0	8.0
X	102 Ramp 2	7.3	2.0	3.0	8.0
XI	102 Ramp 3	8.6	2.0	3.0	8.0
XII	102 Ramp 4	17.8	2.0	3.0	8.0

1. A geotextile fabric is recommended beneath the pavement section to prevent intrusion of fines into the aggregate base.
2. For subgrade improvement, see section **4.3.4 Subgrade Improvement Recommendations**.

4.3.2 Flexible Pavement with Aggregate Base

The table below shows the flexible pavement design with aggregate base for each section of the project. A typical flexible pavement with aggregate base section should include the following layers:

- Asphalt Concrete Hot Mix (ACHM) Surface Course
- over ACHM Binder Course
- over ACHM Base Course
- over aggregate base
- over geotextile fabric
- over improved subgrade

Minimum Asphalt Pavement with Aggregate Base Sections (inches)						
8th Street Section [1, 2, 3]		**ESALs (million)**	**ACHM Surface**	**ACHM Binder**	**ACHM Base**	**Aggregate Base**
I	8th Street from SW I Street to SW A Street	4.7	3.0	2.0	4.0	6.0
II	8th Street from SW A Street to SE J Street	5.6	3.0	2.0	4.0	6.0
III	8th Street from SE J Street to Moberly Lane	7.9	2.0	3.0	4.0	6.0
IV	8th Street from Moberly Lane to I-540	10.6	2.0	3.0	4.0	8.0
V	8th Ramp 1	26.5	2.0	3.0	5.0	10.0
VI	8th Ramp 2	6.7	2.0	3.0	4.0	6.0
VII	8th Ramp 3	5.9	2.0	3.0	4.0	6.0
VIII	8th Ramp 4	24.5	2.0	3.0	5.0	10.0
IX	102 Ramp 1	16.0	2.0	3.0	4.0	10.0
X	102 Ramp 2	7.3	2.0	3.0	4.0	6.0
XI	102 Ramp 3	8.6	2.0	3.0	4.0	8.0
XII	102 Ramp 4	17.8	2.0	3.0	4.0	10.0

1. A geotextile fabric is recommended beneath the pavement section to prevent intrusion of fines into the aggregate base.
2. For subgrade improvement, see section **4.3.4 Subgrade Improvement Recommendations**.

4.3.3 Rigid Pavement

The table below shows the rigid pavement design for each section of the project. A typical rigid pavement section should include the following layers:

- 3,500 psi air entrained doweled joint Portland Cement Concrete (PCC)
- over aggregate base
- over geotextile fabric
- over improved subgrade

Minimum Rigid Pavement Sections (inches)				
8th Street Section [1]		**ESALs (million)**	**PCC Concrete**	**Aggregate Base**
I	8th Street from SW I Street to SW A Street	7.8	10.0	6.0
II	8th Street from SW A Street to SE J Street	9.4	10.5	6.0
III	8th Street from SE J Street to Moberly Lane	13.2	11.0	6.0
IV	8th Street from Moberly Lane to I-540	17.7	11.5	6.0
V	8th Ramp 1	45.5	13.5	10.0
VI	8th Ramp 2	11.2	11.0	6.0
VII	8th Ramp 3	9.9	11.0	6.0
VIII	8th Ramp 4	42.0	13.5	10.0
IX	102 Ramp 1	27.5	12.5	8.0
X	102 Ramp 2	12.2	11.5	6.0
XI	102 Ramp 3	14.4	11.5	6.0
XII	102 Ramp 4	29.8	13.0	8.0

Continued from page 12

1. A geotextile fabric is recommended beneath the pavement section to prevent intrusion of fines into the aggregate base.
2. For subgrade improvement, see section **4.3.4 Subgrade Improvement Recommendations**.

4.3.4 Subgrade Improvement Recommendations

In order to achieve a MR of approximately 9,600 psi, we recommend that clay soils within 10 inches of pavement subgrade be removed and replaced with imported engineered fill materials as recommended in section **4.2.2 Fill Material Types**. We understand that "hillside" materials consisting of clayey chert gravel and/or low plasticity cherty clay have been used in similar projects near the vicinity of this project site with satisfactory results.

The City of Bentonville recommends that as a minimum, the upper 24 inches of pavement subgrade should be treated or removed and replaced if the California Bearing Ratio (CBR) is less than 8 and/or if the subgrade soils are susceptible to frost action. Based on our laboratory results, correlations between CBR and MR values, and our experience with similar materials; the clay soils encountered along 8th Street have CBR values of less than 8. Furthermore, the on-site clay soils are susceptible to frost action. Thus, subgrade soils within 24 inches of final pavement subgrade between SW I Street to SW A Street and SW A Street to SE J Street should be removed and replaced with tested and approved engineered fill.

As an alternative to removing and replacing the upper 10 or 24 inches of the subgrade soils and importing "off-site borrow" materials, the on-site clay soils could be used as fill within 10 inches of pavement subgrade, if they are effectively modified with Class "C" fly ash to achieve a California Bering Ratio (CBR) value of 8 or greater and/or a Resilient Modulus (MR) value of 9,600 psi or greater. We estimate a minimum of approximately 15 to 17 percent Class "C" fly ash, based on the soil's compacted dry weight, would be required to achieve the required CBR and/or MR values. The actual amounts of Class "C" fly ash should be determined in the laboratory and verified in the field as the amount required to achieve satisfactory CBR and/or MR values. Treating the on-site clay soils with Class "C" fly ash would also be a positive means to resist frost action.

4.4 Additional Pavement Considerations

4.4.1 Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration.

4.4.2 Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance including crack and joint sealing, patching, and surface sealing should be performed. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide testing and observation during excavation, grading, foundation and construction phases of the project.

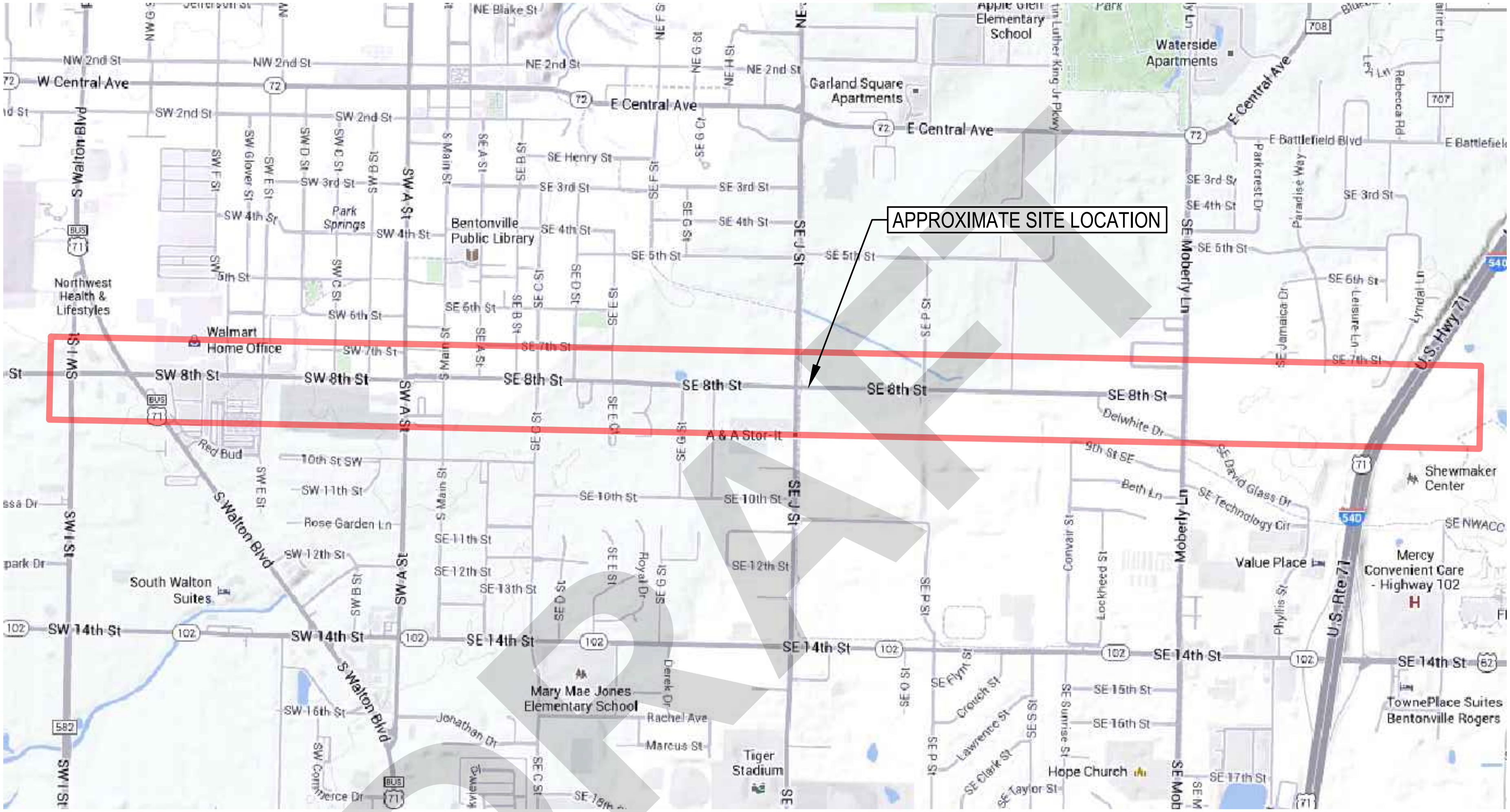
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between the borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION



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1600	0	800	1600

APPROXIMATE SCALE IN FEET

Project Mngr: JEG	Project No. 04135111	Terracon Consulting Engineers and Scientists 9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145 PH. (918) 250-0461 FAX. (918) 250-4570	SITE LOCATION MAP GEOTECHNICAL EXPLORATION 8TH STREET WIDENING PROJECT BENTONVILLE, ARKANSAS	EXHIBIT NO. A-1
Drawn By: JM	Scale: SEE BAR SCALE			
Checked By: JEG	File No. 04135111			
Approved By: MHH	Date: JUNE 2014			

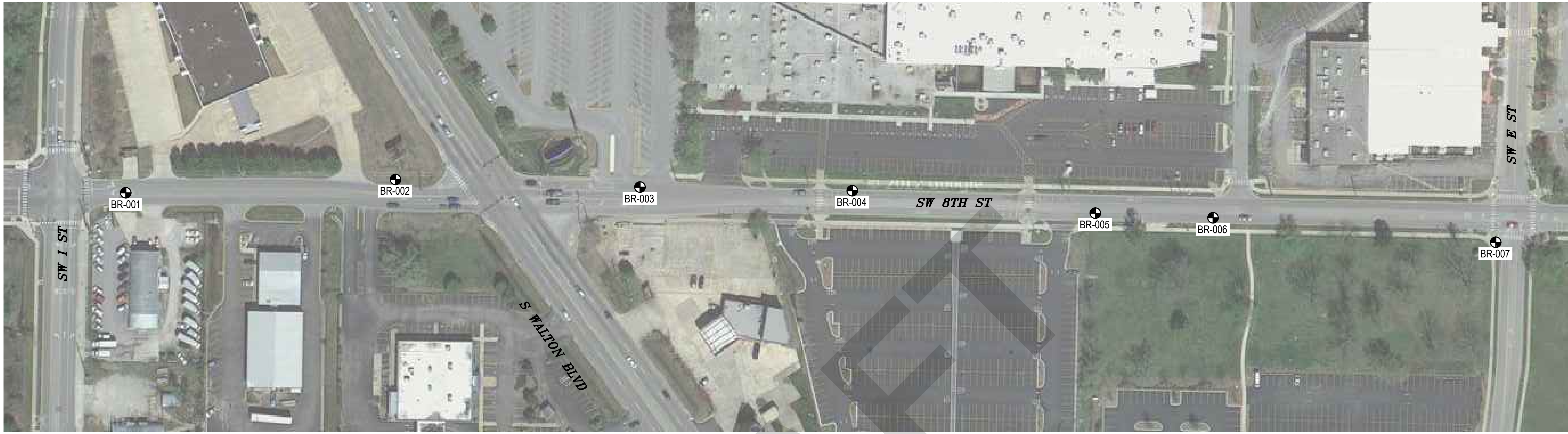

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND
BORING LOCATION

140 0 70 140
APPROXIMATE SCALE IN FEET

N

Project Mngr: JEG	Project No. 04135111		
Drawn By: JM	Scale: SEE BAR SCALE		
Checked By: JEG	File No. 04135111		
Approved By: MHH	Date: JUNE 2014		

Terracon
Consulting Engineers and Scientists
9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145
PH. (918) 250-0461 FAX. (918) 250-4570

BORING LOCATION PLAN
GEOTECHNICAL EXPLORATION
8TH STREET WIDENING PROJECT
BENTONVILLE, ARKANSAS

PAGE 1 OF 4

EXHIBIT NO.
A-2

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND
BORING LOCATION

140 0 70 140
APPROXIMATE SCALE IN FEET

N

Project Mngr: JEG	Project No. 04135111	Terracon	BORING LOCATION PLAN
Drawn By: JM	Scale: SEE BAR SCALE	Consulting Engineers and Scientists	GEOTECHNICAL EXPLORATION
Checked By: JEG	File No. 04135111	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145	8TH STREET WIDENING PROJECT
Approved By: MHH	Date: JUNE 2014	PH. (918) 250-0461 FAX. (918) 250-4570	BENTONVILLE, ARKANSAS

EXHIBIT NO. A-2

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND
⊕ BORING LOCATION

140 0 70 140
APPROXIMATE SCALE IN FEET

Project Mngr: JEG	Project No. 04135111	Terracon Consulting Engineers and Scientists	BORING LOCATION PLAN	EXHIBIT NO.
Drawn By: JM	Scale: SEE BAR SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145	GEOTECHNICAL EXPLORATION 8TH STREET WIDENING PROJECT BENTONVILLE, ARKANSAS	A-2
Checked By: JEG	File No. 04135111	PH. (918) 250-0461 FAX. (918) 250-4570		
Approved By: MHH	Date: JUNE 2014		PAGE 3 OF 4	

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DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND
⊕ BORING LOCATION

140 0 70 140

APPROXIMATE SCALE IN FEET

Project Mngr: JEG	Project No. 04135111
Drawn By: JM	Scale: SEE BAR SCALE
Checked By: JEG	File No. 04135111
Approved By: MHH	Date: JUNE 2014

Terracon
Consulting Engineers and Scientists

9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145
PH. (918) 250-0461 FAX. (918) 250-4570

BORING LOCATION PLAN

GEOTECHNICAL EXPLORATION
8TH STREET WIDENING PROJECT
BENTONVILLE, ARKANSAS

PAGE 4 OF 4

EXHIBIT NO.

A-2

Field Exploration Description

The boring locations and elevations were established in the field by B & F Engineering, Inc. prior to commencement of our field activities. The majority of the borings located along sidewalks were offset to the road due to the presence of underground and overhead utility lines. Actual boring locations are shown on the boring location plan in Appendix A. Ground elevations at the boring locations and boring coordinates were estimated based on the distances measured in the field by our drill crew. Elevations shown on the logs have been rounded to the nearest 0.5 feet. The boring locations and elevations should be considered accurate only to the degree implied by the methods used to define them.

We drilled the borings with ATV-mounted rotary drill rigs using continuous flight augers and rotary cutting bits to advance the boreholes. Representative samples were obtained by the split-barrel sampling procedure. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound auto-hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). The N-value is used to estimate the in-situ relative density of cohesionless soils, and to a lesser degree of accuracy, the consistency of cohesive soils and hardness of weathered bedrock.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings. Generally, a greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report. The sampling depths, penetration distances, and N-values are reported on the boring logs. The samples were tagged for identification, sealed to reduce moisture loss and returned to the laboratory for further examination, testing and classification. In addition to split-barrel samples, bulk samples were obtained from the subgrade soils from different locations.

We cored the existing pavement at select boring locations using an approximate 6-inch diameter, diamond-bit core barrel. After pavement coring, the thickness of the pavement was measured at each location and the pavement cores brought to our laboratory for observation. Photographic logs of the pavement cores are provided in Appendix A.

Dynamic Cone Penetration (DCP) tests were also performed on the subgrade soils at the majority of our boring locations, right beneath pavement and aggregate base, if any. The DCP test consists of driving a steel cone, by means of a 10.1-pound weight with a free fall of 22.5 inches, into the subgrade materials. The penetration depth and number of blows are used to calculate the DCP Penetration Index, which is in turns used to correlate the California Bearing Ratio (CBR) of the subgrade soils. Our DCP tests realized refusal at several locations due to the presence of gravel materials. Results of our DCP tests are provided in Appendix C.

Field Exploration Description (Continued)

A field log of each boring was prepared by the drill crew along with the DCP tests. The logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the subsurface conditions at the borings based on field and laboratory data and observation of the samples.

BORING LOG NO. BR-001

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36433391° Longitude: -94.22157012°

Surface Elev.: 1279 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		9" Asphalt **FILL - SANDY SILT**, with gravel, very pale brown (10YR 8/3)									
						X	10	5-6-8 N=14	27	NP	56
						X	12	5-7-7 N=14	24		
	3.8		1275.5								
		SANDY LEAN CLAY (CL), trace gravel, very pale brown (10YR 8/3), medium stiff				X	16	3-3-3 N=6	37	40-22-18	67
	5.3		1273.5	5							
		Boring Terminated at 5.3 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-4

BORING LOG NO. BR-002

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36439033° Longitude: -94.2203197°

Surface Elev.: 1285 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **FILL - LEAN CLAY**, trace chert, dark brown (2.5Y 3/3)					14	2-3-3 N=6	22		
2.0		1283								
	LEAN CLAY (CL), with gravel, light yellowish-brown (2.5Y 6/4) and yellowish-red (5YR 4/6), medium stiff					18	3-3-4 N=7	20	38-18-20	77
3.5		1281.5								
	FAT CLAY (CH), trace gravel, light yellowish-brown (2.5Y 6/4), dark olive-brown (2.5Y 3/3), and dark yellowish-brown (10YR 4/6), soft to medium stiff					18	2-2-2 N=4	31		
5.0		1280	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-5

BORING LOG NO. BR-003

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36436747° Longitude: -94.2192277°

Surface Elev.: 1287.5 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
11" Asphalt **FILL - LEAN CLAY** , trace sand, chert, and limestone gravel, dark grayish-brown (2.5Y 4/2)					8	6-4-4 N=8	17	33-20-13	89
2.3	1285								
SANDY LEAN CLAY (CL), trace gravel, dark grayish-brown (2.5Y 4/2), medium stiff					6	2-2-3 N=5	15	36-21-15	69
3.8	1283.5								
GRAVELLY LEAN CLAY (CL), with sand, mottled dark grayish-brown (2.5Y 4/2) and dark gray (2.5Y 4/1), medium stiff		5			18	3-3-3 N=6	26	43-22-21	50
5.3	1282								

Boring Terminated at 5.3 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/2/2014 | Boring Completed: 2/2/2014

Drill Rig: ATV#945 | Driller: TJ

Project No.: 04135111 | Exhibit: A-6

BORING LOG NO. BR-004

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36434448° Longitude: -94.21826447°

Surface Elev.: 1288.5 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-½" Asphalt 2-½" Aggregate Base **FILL - SILTY GRAVEL**, with sand, pale brown (10YR 6/3)							6		7
						14	16-12-24 N=36	4	21-18-3	28
	2.5	1286								
	FAT CLAY (CH), dark olive-brown (2.5Y 3/3) to olive-brown (2.5Y 4/3), stiff					12	10-9-8 N=17	19	61-18-43	93
						18	3-5-5 N=10	35		
	5.0	1283.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-7

BORING LOG NO. BR-005

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36426007° Longitude: -94.21713939°

Surface Elev.: 1290 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5-½" Asphalt **FILL - CLAYEY GRAVEL**, very pale brown (10YR 8/2) and dark grayish-brown (2.5Y 4/2)					8	6-7-5 N=12	18		
2.0	**LEAN CLAY (CL)**, trace sand and chert gravel, dark grayish-brown (2.5Y 4/2), medium stiff	1288				14	2-2-3 N=5	17	36-18-18	89
4.0	**FAT CLAY (CH)**, mottled dark yellowish-brown (10YR 4/6) and gray (10YR 6/1), medium stiff	1286	5			16	3-3-3 N=6	22		83
5.3	***Boring Terminated at 5.3 Feet***	1284.5								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/2/2014	Boring Completed: 2/2/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-8

BORING LOG NO. BR-006

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36424306° Longitude: -94.21663313°

Surface Elev.: 1290 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	4-¾" Asphalt 6" Aggregate Base **FILL - SILTY GRAVEL**, with sand, gray (7.5YR 5/1) and strong brown (7.5YR 5/6) 2.0	1288				12	20-8-7 N=15	13	NP	12
	CHERTY LEAN TO FAT CLAY (CL-CH), very pale brown (10YR 7/3), medium stiff 3.5	1286.5				12	5-5-3 N=8	34		
	LEAN CLAY (CL), trace sand, medium stiff 5.0	1285	5			18	3-3-4 N=7	21	39-22-17	89
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-9

BORING LOG NO. BR-007

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36415162° Longitude: -94.21534115°

Surface Elev.: 1287.5 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **FILL - LEAN CLAY**, with chert gravel, dark brown (10YR 3/3) and very pale brown (10YR 7/3)				14	5-5-4 N=9	17		
	2.0 — 1285.5								
	FILL - SILTY GRAVEL, with sand, olive-brown (2.5Y 4/3) and pale brown (10YR 6/3)				10	6-5-6 N=11	21	NP	37
					4	1-2-2 N=4	15		
	5.0 — 1282.5	5							
	Boring Terminated at 5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-10

BORING LOG NO. BR-008

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36421341° Longitude: -94.21428342°

Surface Elev.: 1286 (Ft.)

GRAPHIC LOG	DEPTH / MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	6-½" Asphalt **FILL - CLAYEY GRAVEL**, with sand, pale brown (10YR 6/3)					10	10-50/4"	11	36-18-18	26
	2.0	1284								
	LEAN TO FAT CLAY (CL-CH), very dark brown (7.5YR 2.5/2), medium stiff to stiff					16	4-4-5 N=9	14	46-19-27	94
						0	2-3-3 N=6	26		
	5.0	1281	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-11

BORING LOG NO. BR-009

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36418129° Longitude: -94.21325161°

Surface Elev.: 1285.5 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5" Asphalt **FILL - LEAN CLAY**, with gravel, dark reddish-brown (5YR 3/3)					12	28-12-19 N=31	10		
	2.0	1283.5								
	FAT CLAY (CH), dark gray (10YR 4/1) and grayish-brown (2.5Y 5/2), medium stiff					16	4-4-4 N=8	35		
						18	2-3-4 N=7	29		
	5.0	1280.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-12

BORING LOG NO. BR-010

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36416649° Longitude: -94.21217996°

Surface Elev.: 1286.5 (Ft.)

GRAPHIC LOG	DEPTH / MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	6" Asphalt									
	FILL - SILTY GRAVEL, with sand, dark brown (10YR 3/3) and dark gray (10YR 4/1)					18	15-14-7 N=21	19	NP	41
	2.0	1284.5								
	LEAN CLAY (CL), mottled gray (10YR 5/1), yellowish-brown (10YR 5/8), and yellowish-red (5YR 4/6), medium stiff					18	2-3-4 N=7	22	34-17-17	
						18	3-3-4 N=7	30		
	5.0	1281.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-13

BORING LOG NO. BR-011

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.364183° Longitude: -94.210965° Surface Elev.: 1288 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5" Asphalt 0.5 Boring was not extended below asphalt due to the presence of underground utilities — 1287.5 ***Boring Terminated at 0.5 Foot***								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit

Abandonment Method:
Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/23/2014	Boring Completed: 2/23/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-14

BORING LOG NO. BR-012

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36427081° Longitude: -94.2104741°

Surface Elev.: 1289.5 (Ft.)

GRAPHIC LOG	DEPTH / MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	4" Concrete **FILL - SANDY LEAN CLAY**, with gravel, dark grayish-brown (2.5Y 4/2)					10	8-12-6 N=18	20		61
	2.0	1287.5								
	FAT CLAY (CH), very dark gray (2.5Y 3/1) to gray (2.5Y 3/1), medium stiff					18	3-3-3 N=6	21	61-27-34	97
						18	3-3-3 N=6	20		
	5.0	1284.5	5							
	Boring Terminated at 5 Feet									

DRAFT

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-15

BORING LOG NO. BR-013

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36415788° Longitude: -94.2088613°

Surface Elev.: 1291 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **LEAN CLAY (CL)**, with sand, light olive-brown (2.5Y 5/4), medium stiff					18	3-4-2 N=6	24	41-18-23	76
	2.0	1289								
	LEAN CLAY (CL), trace sand, olive-yellow (2.5Y 5/6), gray (2.5Y 6/1) and dark red (6.5Y 3/6), medium stiff					16	2-2-3 N=5	31		
						18	3-3-5 N=8	25	43-19-24	88
	5.0	1286	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-16

BORING LOG NO. BR-014

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36423202° Longitude: -94.20788526°

Surface Elev.: 1291 (Ft.)

GRAPHIC LOG	DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2.0	4" Asphalt 2" Aggregate Base **FILL - SANDY LEAN CLAY**, with chert gravel, dark grayish-brown (2.5Y 4/2)	1289				12	13-13-6 N=19	18		
	3.5	**LEAN CLAY (CL)**, olive-brown (2.5Y 4/3), medium stiff	1287.5				18	2-2-3 N=5	21	36-18-18	90
	5.0	**FAT CLAY (CH)**, dark grayish-brown (2.5Y 4/2) to olive-brown (2.5Y 4/3), medium stiff	1286	5			18	2-2-3 N=5	23	62-26-36	92
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-17

BORING LOG NO. BR-015

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:

Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36414265° Longitude: -94.20662564°

Surface Elev.: 1293.5 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **LEAN CLAY (CL)**, trace gravel, olive-brown (2.5Y 4/3), soft					14	3-2-1 N=3	20		
	2.0	1291.5								
	FAT CLAY (CH), mottled gray, dark red (2.5 Y 3./6) and brownish-yellow (10YR 6/8), medium stiff					18	3-3-3 N=6	27		88
	3.5	1290								
	LEAN TO FAT CLAY (CL-CH), trace gravel and sand, mottled gray, dark red (2.5 Y 3./6) and brownish-yellow (10YR 6/8), medium stiff					18	2-3-3 N=6	17		
	5.0	1288.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-18

BORING LOG NO. BR-016

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36434465° Longitude: -94.20574375°

Surface Elev.: 1298 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	6-½" Asphalt **FILL - LEAN CLAY** , with sand, mottled yellowish-brown (10YR 5/6) and dark gray (2.5Y 4/1)					18	4-7-11 N=18	15	31-18-13	82
3.0	(reddish-brown (2.5YR 4/4) below 2 feet)	1295				18	5-5-15 N=20	20	34-22-12	73
5.1	**SANDY SILTY LEAN CLAY (CL-ML)**, trace sandstone fragments and chert, yellowish-brown (10YR 5/8), very stiff	1293	5			18	9-17-20 N=37	16	28-21-7	66
	Boring Terminated at 5.1 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-19

BORING LOG NO. BR-017

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.3642379° Longitude: -94.2043806°

Surface Elev.: 1301.5 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **LEAN CLAY (CL)**, trace sand, yellowish-brown (10YR, 5/4), medium stiff					18	3-3-3 N=6	20	25-17-8	87
	2.0	1299.5								
	LEAN TO FAT CLAY (CL-CH), trace sand, dark red (2.5YR, 3/6) and gray (5YR, 6/1), stiff					18	3-4-6 N=10	20		
						18	3-5-6 N=11	19		
	5.0	1296.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-20

BORING LOG NO. BR-018

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36428172° Longitude: -94.20327869°

Surface Elev.: 1300.5 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		3" Topsoil **LEAN CLAY (CL)**, trace sand, dark yellowish-brown (10YR, 4/6), medium stiff					18	1-1-3 N=4	23		
	2.0		1298.5								
		LEAN CLAY, dark yellowish-brown (10YR, 4/6), yellowish-red (5YR, 4/6) and gray (5YR, 6/1), stiff					18	3-6-9 N=15	19	37-18-19	88
							18	4-5-5 N=10	20		
	5.0		1295.5	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon

9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014

Boring Completed: 2/15/2014

Drill Rig: ATV#945

Driller: TJ

Project No.: 04135111

Exhibit: A-21

BORING LOG NO. BR-019

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:

Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36406477° Longitude: -94.20215958°

Surface Elev.: 1295.5 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5" Asphalt **FILL - LEAN CLAY**, with chert and gravel, trace sand, dark olive-brown (2.5Y 3/3)									
					X	16	12-8-5 N=13	12		
2.3		1293.5								
	LEAN TO FAT CLAY (CL-CH), trace sand, gray (5YR 6/1) and light olive-brown (2.5Y 5/6), soft to medium stiff				X	18	2-2-2 N=4	23		
					X	18	2-2-2 N=4	23		
5.3		1290	5							
	Boring Terminated at 5.3 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-22

BORING LOG NO. BR-020

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36399523° Longitude: -94.200852°

Surface Elev.: 1291.5 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	9" Asphalt **FILL - LEAN CLAY**, trace gravel, very dark gray (2.5Y 3/1) and brownish-gray (2.5Y 6/2)					2	12-6-7 N=13	21		90
	2.5	1289								
	LEAN TO FAT CLAY (CL-CH), gray (5YR 6/1) and brownish-yellow (10YR 6/8), medium stiff					18	3-3-3 N=6	21	45-23-22	
			5			18	3-3-4 N=7	26		
	5.5	1286								
	Boring Terminated at 5.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-23

BORING LOG NO. BR-021

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36399264° Longitude: -94.19973959°

Surface Elev.: 1290 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	8" Asphalt **FILL - CLAYEY GRAVEL** , dark grayish-brown (10YR 4/2) and very dark brown (10YR 2/2)					6	8-4-4 N=8	17		33
2.0	**LEAN CLAY (CL)**, trace sand, dark olive-brown (2.5Y 3/3), medium stiff	1288				18	2-3-3 N=6	25	26-17-9	87
3.7	**FAT CLAY (CH)**, very dark gray (10YR 3/1), medium stiff to stiff	1286.5				18	3-4-4 N=8	26		
5.2	***Boring Terminated at 5.2 Feet***	1285	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-24

BORING LOG NO. BR-022

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36399031° Longitude: -94.19859746°

Surface Elev.: 1292.5 (Ft.)

GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2.0	5" Asphalt 2" Aggregate Base **FILL - LEAN CLAY**, with chert and gravel, very dark grayish-brown (2.5YR 3/2) and dark reddish-brown (5YR 3/4)	1290.5				16	12-17-11 N=28	10		
	3.5	**LEAN CLAY (CL)**, very dark gray (7.5YR 3/1) to mottled yellowish-brown (10YR 5/8) and dark reddish-brown (5YR 3/4), medium stiff	1289				18	4-3-3 N=6	26		
	5.0	**FAT CLAY (CH)**, mottled gray (10YR 5/1), yellowish-brown (10YR 5/8) and dark reddish-brown (5YR 3/4), stiff	1287.5	5			18	3-4-5 N=9	26	52-21-31	89
		Boring Terminated at 5 Feet							7		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-25

BORING LOG NO. BR-023

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.3639326° Longitude: -94.19727447°

Surface Elev.: 1304 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	4-½" Asphalt 7-¼" Concrete **FILL - LEAN TO FAT CLAY**, with chert, dark red (2.5YR 3/6) and light olive-brown (2.5Y 5/4)					18	4-3-3 N=6	43		
	2.5	1301.5								
	LEAN CLAY (CL), trace sand, gray (5YR 6/1) and yellowish-brown (10YR 5/8), very soft to stiff					18	0-3-3 N=6	23	33-18-15	
			5			18	3-4-5 N=9	21		
	5.5	1298.5								
	Boring Terminated at 5.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-26

BORING LOG NO. BR-024

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36398608° Longitude: -94.19608908°

Surface Elev.: 1309 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		6-¼" Asphalt 3" Aggregate Base **LEAN CLAY (CL)**, trace sand, mottled yellowish-brown (10YR 5/4) and gray (10YR 6/1), medium stiff							6		3
							16	6-2-3 N=5	19	35-18-17	87
	2.5		1306.5								
		GRAVELLY LEAN CLAY (CL), with sand, mottled dark reddish-brown (2.5YR 3/4) and yellowish-brown (10YR 5/4), very stiff					18	3-9-20 N=29	20	36-21-15	65
	4.3	(apparent weathered sandstone with clay seams below 3.8 feet)	1304.5				6	50/6"	16	27-19-8	51
		Boring Terminated at 4.3 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-27

BORING LOG NO. BR-025

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36396537° Longitude: -94.1950879°

Surface Elev.: 1314.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	6-½ " Asphalt									
2.0	**FILL - LEAN CLAY**, with sand, trace chert and limestone gravel, dark red (2.5YR 3/6) and yellowish-red (5YR 4/6)	1312.5				10	6-3-4 N=7	21	35-18-17	77
3.0	**LEAN CLAY (CL)**, mottled gray (5YR 5/1), dark red (2.5YR 3/6) and strong brown (7.5YR 4/6), very stiff	1311.5				18	6-9-30 N=39	18		
4.5	**SHALEY LEAN CLAY (CL)**, with sand, red (2.5YR 4/8) and reddish-yellow (5YR 6/8), very stiff (apparent weathered sandstone with clay seams below 4 feet)	1310				12	12-50/6"	13		

Boring Terminated at 4.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-28

BORING LOG NO. BR-026

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36394386° Longitude: -94.19419173°

Surface Elev.: 1318.5 (Ft.)

GRAPHIC LOG	DEPTH	LOCATION / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		7-½" Asphalt **FILL - LEAN CLAY**, with limestone and chert gravel, dark grayish-brown (10YR 4/2) and dark reddish-brown (5YR 3/4)					12	7-6-6 N=12	19		
	2.0		1316.5								
		LEAN CLAY (CL), trace sand, mottled gray (5YR 5/1), dark red (2.5YR 3/5) and yellowish-red (5YR 4/6), stiff to very stiff (moisture content determined from auger cuttings)					18	3-4-4 N=8	23	42-23-19	89
							18	4-6-10 N=16	23		
	5.1		1313.5	5							
		Boring Terminated at 5.1 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-29

BORING LOG NO. BR-027

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36392428° Longitude: -94.1930245°

Surface Elev.: 1320.5 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5" Asphalt, . 6" Aggregate Base **FILL - GRAVELLY LEAN CLAY** , red (2.5YR 4/8)					6	50/6"	15		
	2.0	1318.5								
	LEAN TO FAT CLAY (CL-CH), with limestone gravel, strong brown (7.5YR 5/8) and olive-brown (2.5Y 4/3), stiff					0	6-5-5 N=10	20		
	4.0	1316.5								
	GRAVELLY LEAN CLAY (CL), yellowish-red (5YR 4/6) and dark red (2.5YR 3/6), very stiff					18	6-15-20 N=35	16	35-19-16	69
	5.0	1315.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-30

BORING LOG NO. BR-028

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36399932° Longitude: -94.19214895°

Surface Elev.: 1317.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	3-½" Asphalt, . 3" Aggregate Base **FILL - CLAYEY SAND** , with chert gravel, dark red (2.5YR 3/6) and pale brown (10YR 6/3)	1315.5				14	8-6-6 N=12	25		35
3.5	**SANDY LEAN CLAY (CL)**, with sandstone fragments, mottled strong brown (7.5Y 5/8), light olive-brown (2.5Y, 1/3) and brownish-yellow (10YR 6/8), stiff	1314				18	3-4-8 N=12	15	31-16-15	
5.0	**SHALEY LEAN CLAY (CL)**, yellowish-red (5YR, 4/6), dark red (2.5YR 3/6) and gray (2.5Y 6/1), very stiff	1312.5	5			14	8-8-8 N=16	23		
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-31

BORING LOG NO. BR-029

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36383552° Longitude: -94.19108345°

Surface Elev.: 1315 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	1.0	2-½" Asphalt 3" Aggregate Base **FILL - CLAYEY GRAVEL**, with sand, gray (10YR 5/1)	1314								
	2.0	**FILL - SANDY LEAN CLAY**, dark yellowish-brown (10YR 3/4)	1313			X	16	8-9-6 N=15	18		
		LEAN CLAY (CL), trace sand, gray (10YR 5/1) and yellowish-brown (10YR 5/8), soft to medium stiff				X	18	1-2-2 N=4	23	35-18-17	94
	5.0		1310	5		X	18	1-2-2 N=4	23		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-32

BORING LOG NO. BR-030

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36385149° Longitude: -94.19000222°

Surface Elev.: 1314.5 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2-½" Asphalt, . 3" Aggregate Base **FILL - CLAYEY GRAVEL**, with sand, gray (10YR 5/1)									
1.0	**FILL - SANDY LEAN CLAY**, dark yellowish-brown (10YR 3/4)	1313.5				18	11-16-6 N=22	19		85
2.0	**LEAN CLAY (CL)**, with sand, yellowish-red (5YR 4/6) and strong brown (7.5YR 4/6), stiff	1312.5				16	3-5-6 N=11	21	31-15-16	84
3.5	**LEAN CLAY (CL)**, trace sand, yellowish-red (5YR 4/6) and brownish-gray (2.5Y 6/2), medium stiff	1311				18	3-3-3 N=6	25		
5.0	***Boring Terminated at 5 Feet***	1309.5	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-33

BORING LOG NO. BR-031

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.3638189° Longitude: -94.18900365° Surface Elev.: 1313 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-½" Asphalt, . 2" Aggregate Base **FILL - LEAN CLAY** , trace sand and chert gravel, gray (10YR 6/1), dark red (2.5YR 3/6), and yellowish-red (5YR 4/8)				18	4-6-8 N=14	18		
	2.0 — 1311								
	SANDY LEAN CLAY (CL), trace chert gravel, gray (10YR 6/1) and dark red (2.5YR 3/6), stiff				18	4-5-10 N=15	21	40-16-24	
					18	4-6-9 N=15	23		
	5.0 — 1308	5							
	Boring Terminated at 5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-34

BORING LOG NO. BR-032

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36380607° Longitude: -94.18791965°

Surface Elev.: 1310 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		3-½" Asphalt 2" Aggregate Base **FILL - SANDY SILTY-CLAY**, with chert gravel, olive-brown (2.5Y 4/4) and pale brown (10YR 6/3)							4		
	2.0		1308				18	9-13-24 N=37	18	23-19-4	51
		LEAN CLAY (CL), trace sand, dark gray (10YR 4/1) to olive-brown (2.5Y 4/3), stiff					16	7-7-5 N=12	16		
		(dark yellowish-brown (10YR 4/6) below 3.5 feet)					18	3-5-8 N=13	18	31-19-12	91
	5.0		1305	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-35

BORING LOG NO. BR-033

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36376817° Longitude: -94.18705516°

Surface Elev.: 1308 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		4" Asphalt **FILL - SILTY GRAVEL** , with sand, pale brown (10YR 6/3)					10	9-7-5 N=12	17	NP	40
	2.0		1306								
		SILTY CLAY (CL-ML), gray (2.5Y 5/1) and light olive-brown (2.5Y 5/3) to olive-brown (2.5Y 4/6) and light brownish-gray (2.5Y 6/2), stiff					18	1-2-8 N=10	27	24-18-6	95
							14	6-6-6 N=12	28		
	5.0		1303	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-36

BORING LOG NO. BR-034

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36376052° Longitude: -94.18589578°

Surface Elev.: 1311 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		5" Asphalt **FILL - LEAN CLAY**, trace chert gravel, strong brown (7.5 YR 4/6)					18	8-7-6 N=13	14	43-16-27	69
	1.5		1309.5								
		LEAN CLAY, mottled strong brown (2.5YR 4/6) and gray (7.5YR 5/1), stiff					18	3-4-6 N=10	22	33-19-14	98
		(with chert gravel, reddish-brown (5YR 4/4) below 3.5 feet)					18	3-4-5 N=9	17	33-19-14	78
	5.0		1306	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-37

DRAFT

BORING LOG NO. BR-035

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36373215° Longitude: -94.1849849°

Surface Elev.: 1316 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-½" Asphalt, . 2" Aggregate Base **FILL - LEAN CLAY**, with chert gravel, dark red (2.5YR 3/6) and dark yellowish-brown (10YR 5/6)					14	4-4-4 N=8	17		
2.0		1314								
	GRAVELLY LEAN CLAY (CL), with sand, gray (5YR 6/1), dark red (2.5YR 3/6), and reddish-yellow (7.5YR 6/8), stiff					18	3-5-10 N=15	12	37-19-18	60
						18	4-6-9 N=15	16		
5.0		1311	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-38

BORING LOG NO. BR-036

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36372987° Longitude: -94.18399196°

Surface Elev.: 1319 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		4-¼" Asphalt 2-½" Aggregate Base **FILL - LEAN CLAY**, with sand, trace chert gravel, dark reddish-brown (2.5YR 3/4) and dark brown (10YR 3/3)							5		3
	2.0		1317				12	16-7-4 N=11	16	24-16-8	75
		LEAN CLAY (CL), with sand, reddish-brown (2.5YR 4/4), medium stiff to stiff					18	2-2-3 N=5	18	30-20-10	83
	5.1		1314	5			18	3-4-5 N=9	21		90
		Boring Terminated at 5.1 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-39

BORING LOG NO. BR-037

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:

Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36387086° Longitude: -94.18299681°

Surface Elev.: 1321 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - LEAN CLAY, with sand and chert gravel, olive-brown (2.5Y 4/4)									
	1.0		1320								
		LEAN CLAY (CL), trace chert fragments, reddish-brown (2.5YR 4/4), medium stiff to stiff					12	4-2-2 N=4	25		
							8	3-3-3 N=6	24	44-16-28	
							10	6-6-5 N=11	22		
	5.0		1316	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-40

BORING LOG NO. BR-038

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36379009° Longitude: -94.18190021°

Surface Elev.: 1323.5 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - LEAN TO FAT CLAY, with chert gravel, reddish-brown (2.5YR 4/4) and brown (10YR 4/3)					10	3-3-2 N=5	25		
2.0	**LEAN TO FAT CLAY (CL-CH)**, trace chert gravel, reddish-brown (5YR 4/4), medium stiff to stiff	1321.5				11	3-3-3 N=6	25		
						10	4-4-7 N=11	25		
5.0	***Boring Terminated at 5 Feet***	1318.5	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-41

BORING LOG NO. BR-039

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36372825° Longitude: -94.18045492°

Surface Elev.: 1327 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, brown (10YR 4/3), soft to medium stiff					10	3-2-2 N=4	22		
2.0		1325								
	LEAN CLAY (CL), trace sand, mottled red (2.5YR 4/6) and dark yellowish-brown (10YR 4/4), stiff					8	3-6-6 N=12	25	41-19-22	90
						12	4-6-8 N=14	22		
5.0		1322	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-42

BORING LOG NO. BR-040

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.3638271° Longitude: -94.17944946°

Surface Elev.: 1324 (Ft.)

DEPTH	Description	ELEVATION (Ft.)
	LEAN CLAY (CL), with sand, dark yellowish-brown (10YR 4/6), stiff	
3.0	**SILTY CHERT GRAVEL (GM)**, dark yellowish-brown (10YR 4/6), dense	1321
5.0	***Boring Terminated at 5 Feet***	1319

Sample	Recovery (In.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	8	4-5-4 N=9	15		
2	12	3-5-10 N=15	22		
3	3	8-30-9 N=39			

Depth (Ft.): 5

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-43

BORING LOG NO. BR-041

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36382327° Longitude: -94.17881456°

Surface Elev.: 1322.5 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - CHERTY LEAN CLAY, with sand and fat clay pockets, trace debris, dark yellowish-brown (10YR 4/4) and reddish-brown (2.5YR 4/4)				X	8	3-3-3 N=6	18	33-15-18	66
2.0	**FILL - CHERTY LEAN TO FAT CLAY**, brown (7.5YR 4/4)	1320.5		▽	X	10	13-15-13 N=28	19		
				▽						
5.0	**LEAN TO FAT CLAY (CL-CH)**, dark grayish-brown (10YR 4/2), medium stiff	1317.5	5		X	10	3-3-3 N=6	28	48-17-31	95
					X	12	3-4-4 N=8	28		
10.0	***Boring Terminated at 10 Feet***	1312.5	10							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *4 ft while drilling*

▽ *3 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-44

TOP

Terracon

CORE LOG

CORE NUMBER	BR-001
DATE CORED	2/22/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 3/4	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	2	
	Asphaltic Concrete	2	
	Asphaltic Concrete	2	
	Total Core Thickness	**9**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-003
DATE CORED	2/2/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	3	
	Asphaltic Concrete	2 1/2	
	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	4	
	Total Core Thickness	**11**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-004
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2	
	Total Core Thickness	**3 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-005	
DATE CORED	2/2/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	2	
	Asphaltic Concrete	3 3/5	
	Total Core Thickness	**5 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-006
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 3/4	
	Asphaltic Concrete	3	
	Total Core Thickness	**4 3/4**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-008
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	2 1/2	
	Total Core Thickness	**6**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-009	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 3/4	
	Asphaltic Concrete	2	
	Total Core Thickness	**5**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-010
DATE CORED	2/22/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3	
	Asphaltic Concrete	1 1/2	

Total Core Thickness **6**

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-011
DATE CORED	2/23/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2 1/4	
	Asphaltic Concrete	1 1/4	
	Total Core Thickness	**5**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-014
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

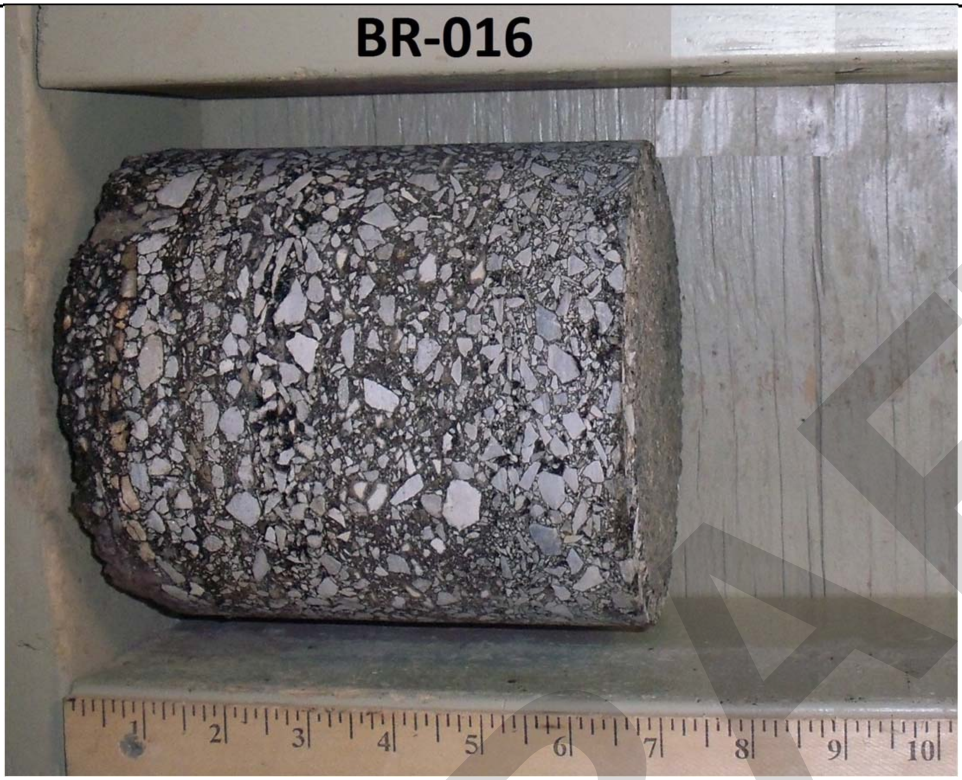
CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2 1/2	
	Asphaltic Concrete		
	Asphaltic Concrete		
	Asphaltic Concrete		
	Asphaltic Concrete		

Total Core Thickness 4

*** Asphalt type based on visual observation only**

BOT.



Terracon **CORE LOG**

CORE NUMBER	BR-016	
DATE CORED	2/1/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	2 1/4	
	Asphaltic Concrete	3/4	
	Asphaltic Concrete	3/4	
	Asphaltic Concrete	3/4	
	Asphaltic Concrete	3/4	
	Total Core Thickness	**6 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-019	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3 1/2	
	Total Core Thickness	**5**	

*** Asphalt type based on visual observation only**

TOP

DRAFT

Terracon **CORE LOG**

CORE NUMBER	BR-021
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2 1/4	
	Asphaltic Concrete	1	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1	
	Asphaltic Concrete	1	
	Total Core Thickness	**8**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-022	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	3	
	Asphaltic Concrete	3/4	
	Asphaltic Concrete		
	Asphaltic Concrete		
	Asphaltic Concrete		

Total Core Thickness **5**

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-023	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	4 1/2	
	Total Core Thickness	**4 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-023	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☐ A.C. ☑ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
2	Portland Concrete Cement	7 1/4	
	Total Core Thickness	**7 1/4**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-024
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3 1/4	
	Total Core Thickness	**6 1/4**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-025	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2	
	Asphaltic Concrete	3	
	Total Core Thickness	**6 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-026	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	6	
	Total Core Thickness	**7 1/2**	

*** Asphalt type based on visual observation only**

TOP

CORE LOG

CORE NUMBER	BR-027
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

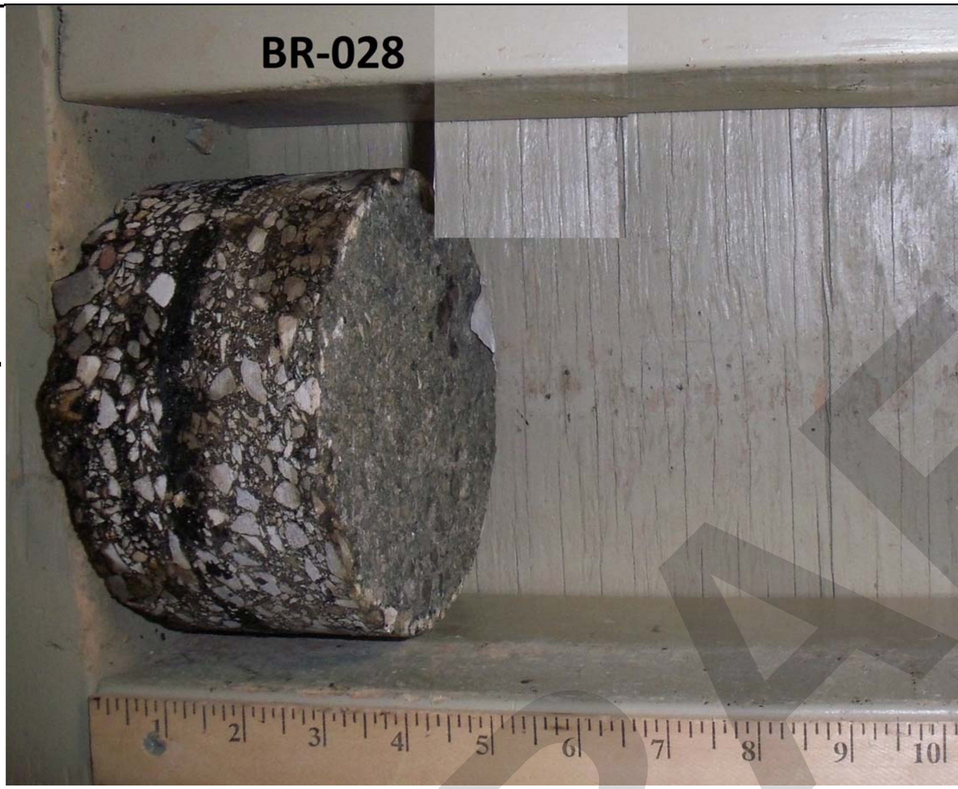
Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3 1/2	
	Total Core Thickness	**5**	

*** Asphalt type based on visual observation only**

BOT.



Terracon **CORE LOG**

CORE LAYER DATA (FROM TOP TO BOTTOM):

CORE NUMBER	BR-028
DATE CORED	2/22/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 3/4	
	Asphaltic Concrete	1 3/4	
	Total Core Thickness	**3 1/2**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

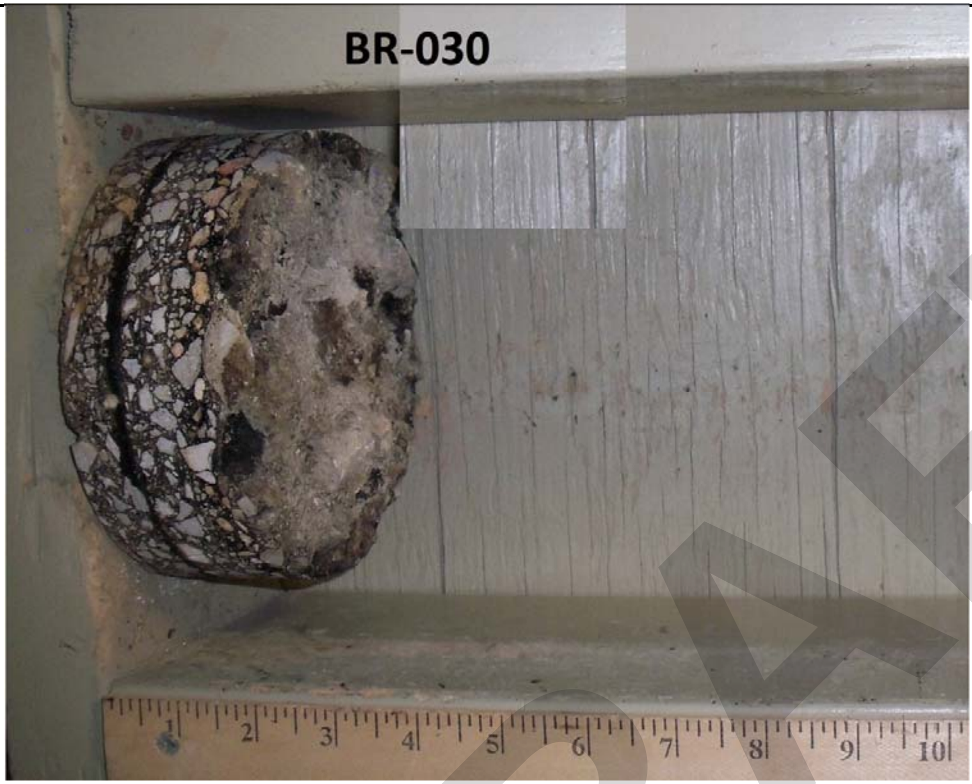
Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP



Terracon

CORE LOG

CORE NUMBER	BR-030	
DATE CORED	2/22/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	3/4	
	Asphaltic Concrete	1 3/4	
	Total Core Thickness	**2 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE LAYER DATA (FROM TOP TO BOTTOM):

CORE NUMBER	BR-031
DATE CORED	2/22/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	2 1/4	
	Total Core Thickness	**3 1/2**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

CORE LOG

CORE NUMBER	BR-032
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☑ Separation ☐ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

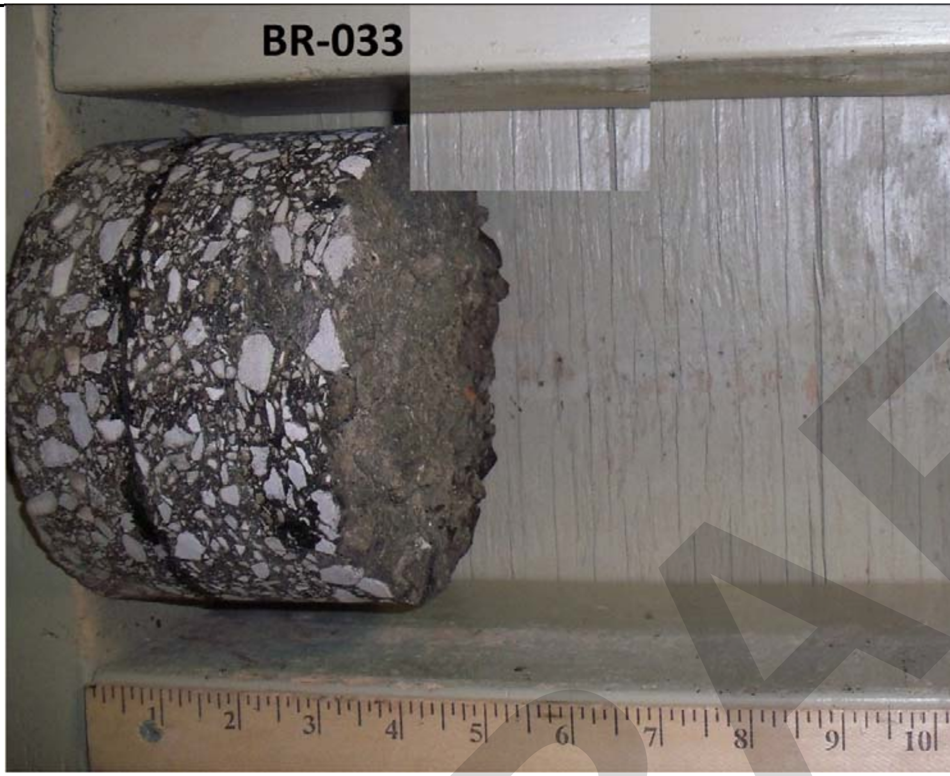
Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1	
	Total Core Thickness	**3 1/2**	

*** Asphalt type based on visual observation only**

TOP



Terracon

CORE LOG

CORE NUMBER	BR-033	
DATE CORED	2/22/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1	
	Total Core Thickness	**4**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-034	
DATE CORED	2/1/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1	
	Asphaltic Concrete	1	
	Asphaltic Concrete	1 1/2	
	Total Core Thickness	**5**	

*** Asphalt type based on visual observation only**

TOP

Terracon

CORE LOG

CORE NUMBER	BR-035	
DATE CORED	2/22/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3/4	
	Total Core Thickness	**3 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-036
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☑ Separation ☐ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 1/2	
	Total Core Thickness	**4 1/4**	

*** Asphalt type based on visual observation only**

Approximate boring coordinates and elevations

Boring	Approximate Elevation	Approximate Coordinates			
		Latitude	Longitude	Northing	Easting
BR-001	1279	36.36433391	-94.22157012	746680	658258
BR-002	1285	36.36439033	-94.2203197	746692	658627
BR-003	1287.5	36.36436747	-94.2192277	746677	658949
BR-004	1288.5	36.36434448	-94.21826447	746662	659232
BR-005	1290	36.36426007	-94.21713939	746624	659562
BR-006	1290	36.36424306	-94.21663313	746614	659711
BR-007	1287.5	36.36415162	-94.21534115	746572	660090
BR-008	1286	36.36421341	-94.21428342	746588	660402
BR-009	1285.5	36.36418129	-94.21325161	746570	660705
BR-010	1286.5	36.36416649	-94.21217996	746557	661020
BR-011	1288	36.364183	-94.210965	746527	661380
BR-012	1289.5	36.36427081	-94.2104741	746583	661524
BR-013	1291	36.36415788	-94.2088613	746531	661998
BR-014	1291	36.36423202	-94.20788526	746552	662285
BR-015	1293.5	36.36414265	-94.20662564	746512	662656
BR-016	1298	36.36434465	-94.20574375	746579	662917
BR-017	1301.5	36.3642379	-94.2043806	746531	663318
BR-018	1300.5	36.36428172	-94.20327869	746539	663642
BR-019	1295.5	36.36406477	-94.20215958	746454	663971
BR-020	1291.5	36.36399523	-94.200852	746420	664354
BR-021	1290	36.36399264	-94.19973959	746411	664683
BR-022	1292.5	36.36399031	-94.19859746	746403	665019
BR-023	1304	36.3639326	-94.19727447	746373	665407
BR-024	1309	36.36398608	-94.19608908	746385	665757
BR-025	1314.5	36.36396537	-94.1950879	746371	666052
BR-026	1318.5	36.36394386	-94.19419173	746357	666315
BR-027	1320.5	36.36392428	-94.1930245	746342	666659
BR-028	1317.5	36.36399932	-94.19214895	746364	666917
BR-029	1315	36.36383552	-94.19108345	746297	667229
BR-030	1314.5	36.36385149	-94.19000222	746296	667548
BR-031	1313	36.3638189	-94.18900365	746277	667842
BR-032	1310	36.36380607	-94.18791965	746266	668161
BR-033	1308	36.36376817	-94.18705516	746246	668415
BR-034	1311	36.36376052	-94.18589578	746236	668756
BR-035	1316	36.36373215	-94.1849849	746220	669023
BR-036	1319	36.36372987	-94.18399196	746212	669316
BR-037	1321	36.36387086	-94.18299681	746257	669610
BR-038	1323.5	36.36379009	-94.18190021	746221	669931
BR-039	1327	36.36372825	-94.18045492	746190	670357
BR-040	1324	36.3638271	-94.17944946	746218	670654
BR-041	1322.5	36.36382327	-94.17881456	746213	670841

APPENDIX B

LABORATORY TESTS

Laboratory Tests

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix A. Bedrock materials were classified according to the General Notes and described using commonly accepted geotechnical terminology. The field descriptions were modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil and rock samples. The laboratory test results are presented on the boring logs next to the respective samples and attached to this appendix. Laboratory tests were performed in general accordance with the applicable ASTM, AASHTO, local or other accepted standards.

The following tests were performed on selected soil and rock samples:

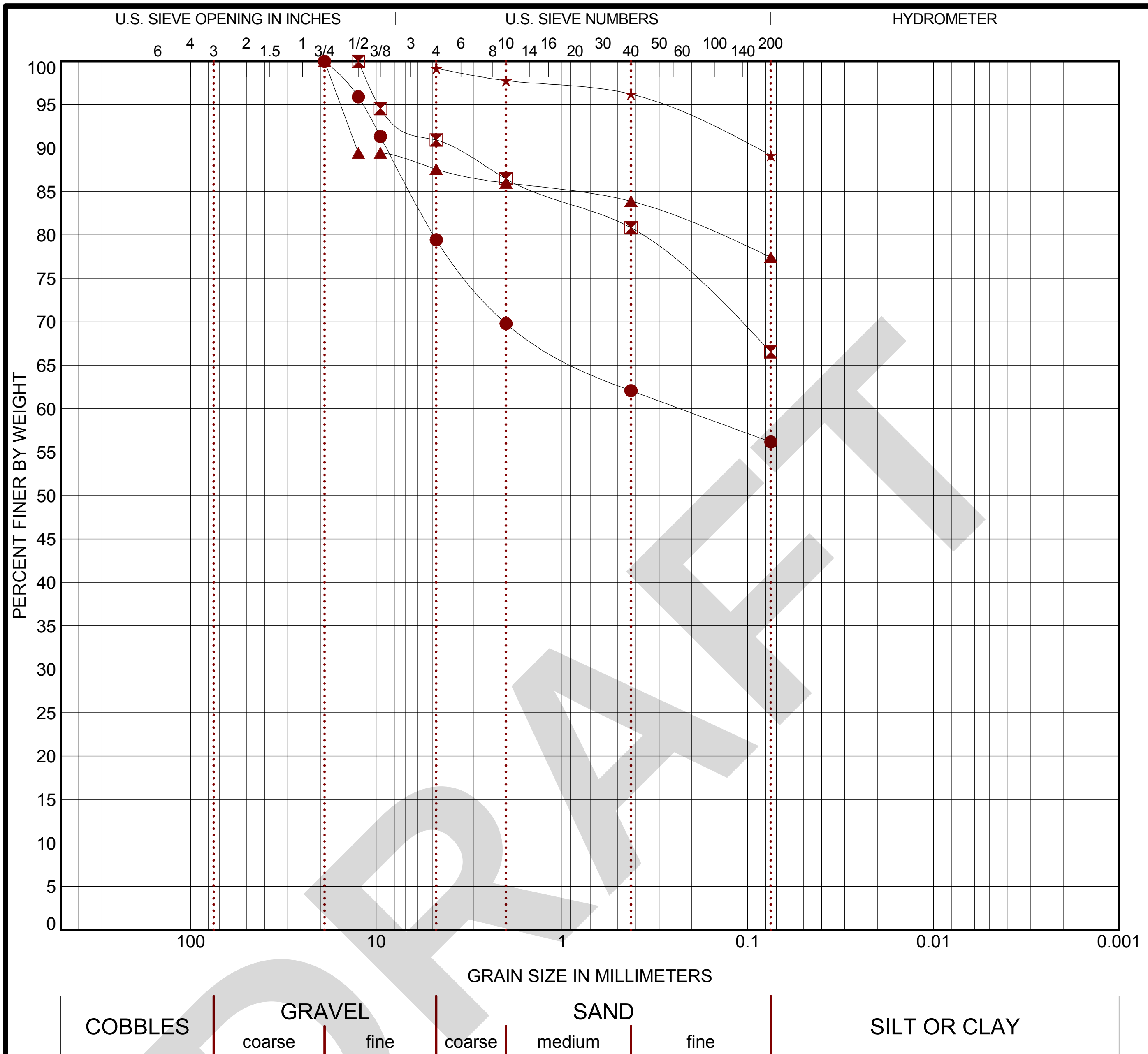
- Water content
- Atterberg limits
- Percent passing the No. 200 sieve
- Particle size distribution
- Moisture-Density relationships
- Resilient Modulus (MR)

Four soil composite samples were prepared for Resilient Modulus tests. The samples were taken from the subgrade soils from depths of about 1 to 3 feet below existing ground surface.

Composite Sample	Borings	Soil Type
Bulk 1	BR-004/9/12/14	Lean clay PI = 17
Bulk 2	BR-017/19/21	Lean Clay PI = 10
Bulk 3	BR-030/35/36	Lean Clay PI = 25
Bulk 4	BR-003/4/5/12	Silty Clayey Gravel

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-001	0.8	SANDY SILT with GRAVEL(ML)	0(A-4)	NP	NP	NP		
⧗	BR-001	3.8	SANDY LEAN CLAY(CL)	11(A-6)	40	22	18		
▲	BR-002	2.0	LEAN CLAY with GRAVEL(CL)	14(A-6)	38	18	20		
★	BR-003	0.8	LEAN CLAY(CL)	11(A-6)	33	20	13		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-001	0.8	19	0.232			20.6	23.3	56.2	
⧗	BR-001	3.8	12.5				9.1	24.4	66.5	
▲	BR-002	2.0	19				12.4	10.1	77.4	
★	BR-003	0.8	4.75				0.0	10.0	89.2	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

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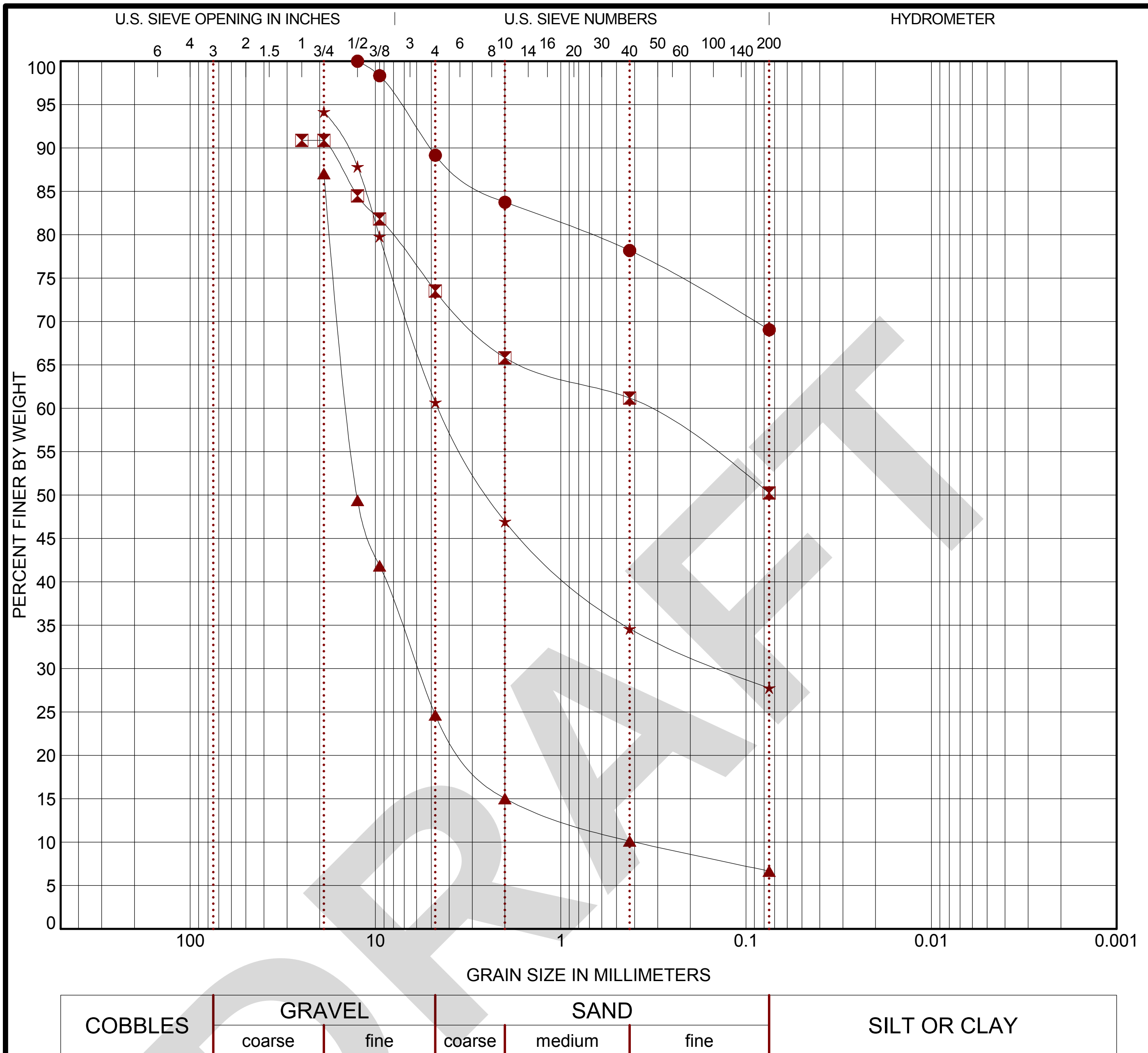

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-003	2.3	SANDY LEAN CLAY(CL)	9(A-6)	36	21	15		
⧗	BR-003	3.8	GRAVELLY LEAN CLAY with SAND(CL)	7(A-7-6)	43	22	21		
▲	BR-004	0.3						6.21	35.41
★	BR-004	0.5	SILTY GRAVEL with SAND(GM)	0(A-2-4)	21	18	3		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-003	2.3	12.5				10.8	20.1	69.1	
⧗	BR-003	3.8	25	0.352			17.4	23.3	50.2	
▲	BR-004	0.3	19	14.064	5.891	0.397	62.4	18.0	6.7	
★	BR-004	0.5	19	4.548	0.132		33.5	32.9	27.8	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

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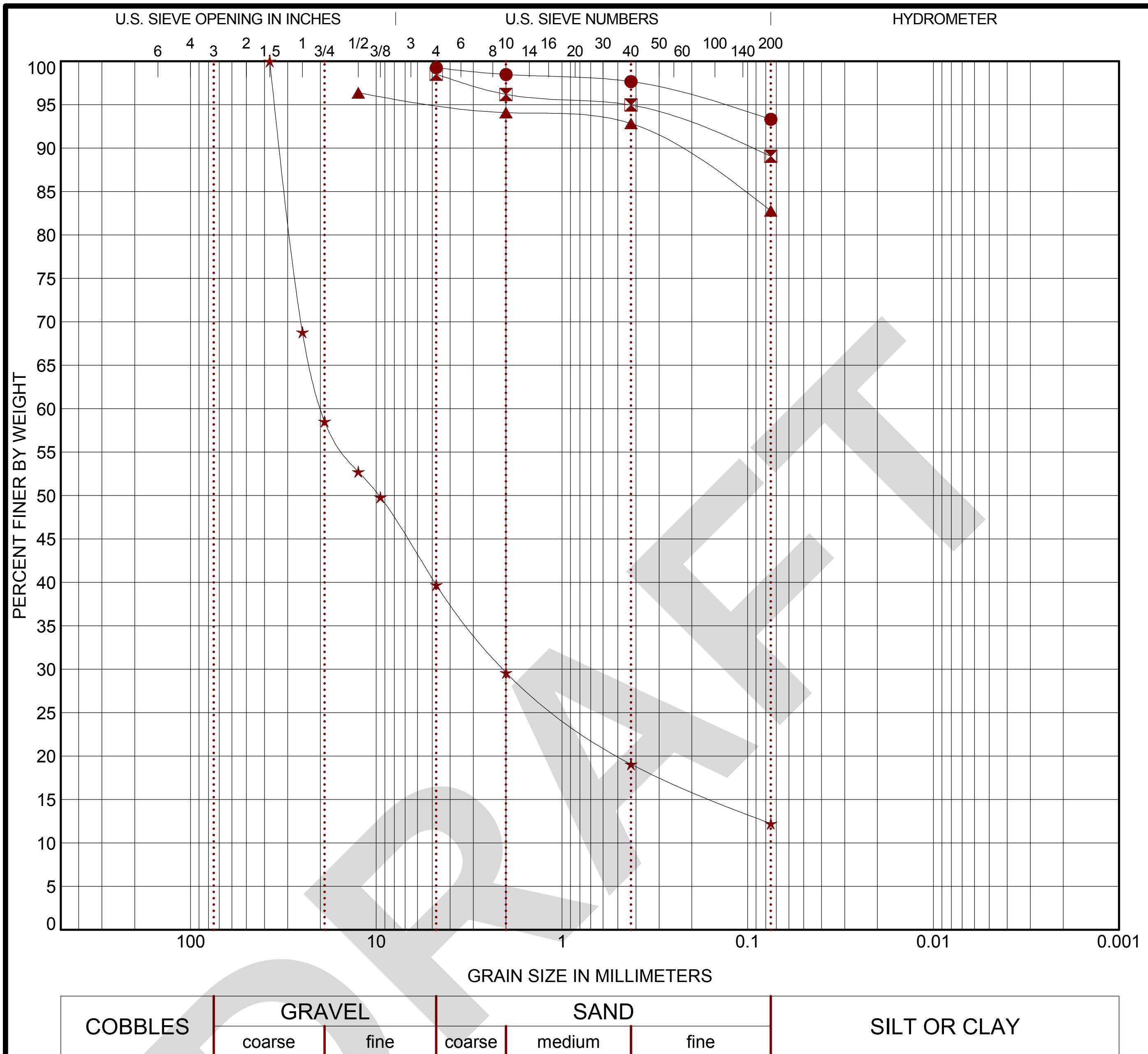

Symbol	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-004	2.0	FAT CLAY(CH)	43(A-7-6)	61	18	43		
⧗	BR-005	2.3	LEAN CLAY(CL)	16(A-6)	36	18	18		
▲	BR-005	3.8							
★	BR-006	0.5	SILTY GRAVEL with SAND(GM)	0(A-1-a)	NP	NP	NP	5.09	464.09

Symbol	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-004	2.0	4.75				0.0	5.9	93.3	
⧗	BR-005	2.3	4.75				0.0	9.4	89.1	
▲	BR-005	3.8	12.5				1.2	12.4	82.8	
★	BR-006	0.5	37.5	19.757	2.07		60.3	27.5	12.2	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-3

GRAIN SIZE DISTRIBUTION

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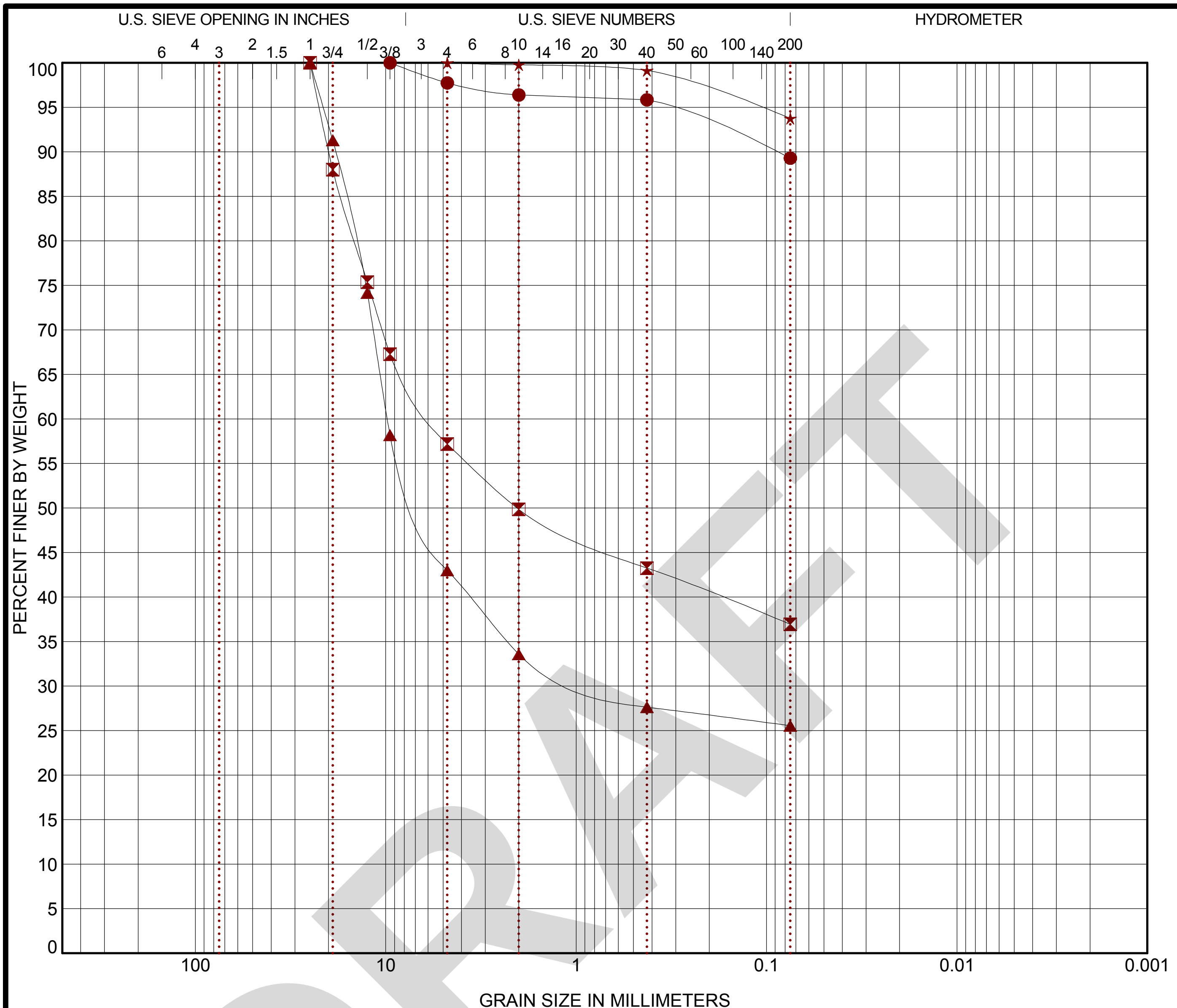


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-006	3.5	LEAN CLAY(CL)	16(A-6)	39	22	17		
⧗	BR-007	2.0	SILTY GRAVEL with SAND(GM)	0(A-4)	NP	NP	NP		
▲	BR-008	0.5	CLAYEY GRAVEL with SAND(GC)	1(A-2-6)	36	18	18		
★	BR-008	2.0	LEAN CLAY(CL)	27(A-7-6)	46	19	27		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-006	3.5	9.5				2.3	8.4	89.3	
⧗	BR-007	2.0	25	5.76			42.8	20.3	36.9	
▲	BR-008	0.5	25	9.801	0.789		57.0	17.4	25.6	
★	BR-008	2.0	4.75				0.0	6.2	93.8	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

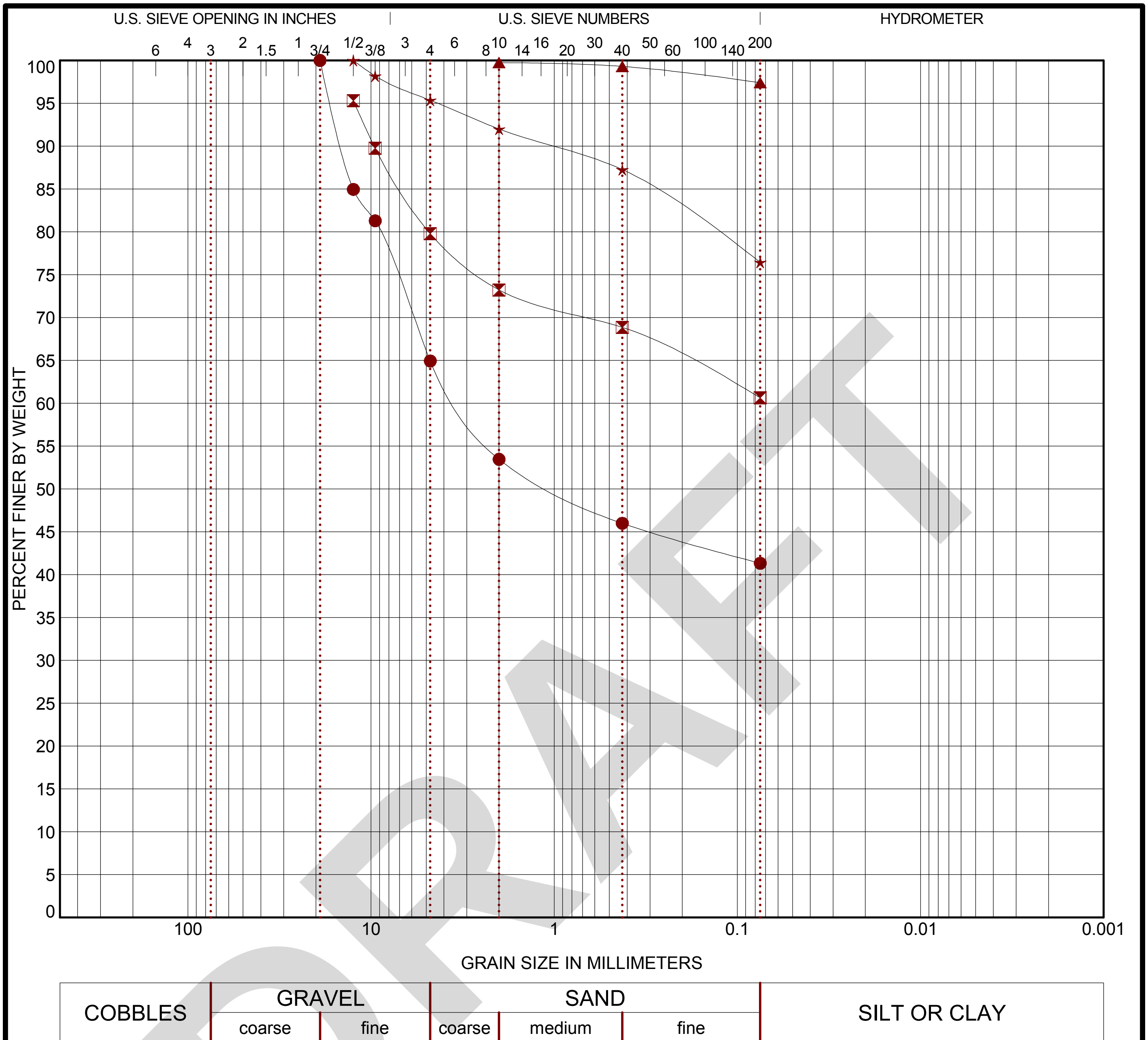
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-4

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-010	0.5	SILTY GRAVEL with SAND(GM)	0(A-4)	NP	NP	NP		
⧗	BR-012	0.5							
▲	BR-012	2.0	FAT CLAY(CH)	39(A-7-6)	61	27	34		
★	BR-013	0.5	LEAN CLAY with SAND(CL)	16(A-7-6)	41	18	23		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-010	0.5	19	3.276			35.1	23.6	41.3	
⧗	BR-012	0.5	12.5				15.5	19.2	60.6	
▲	BR-012	2.0	2				0.0	2.3	97.4	
★	BR-013	0.5	12.5				4.6	18.9	76.4	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

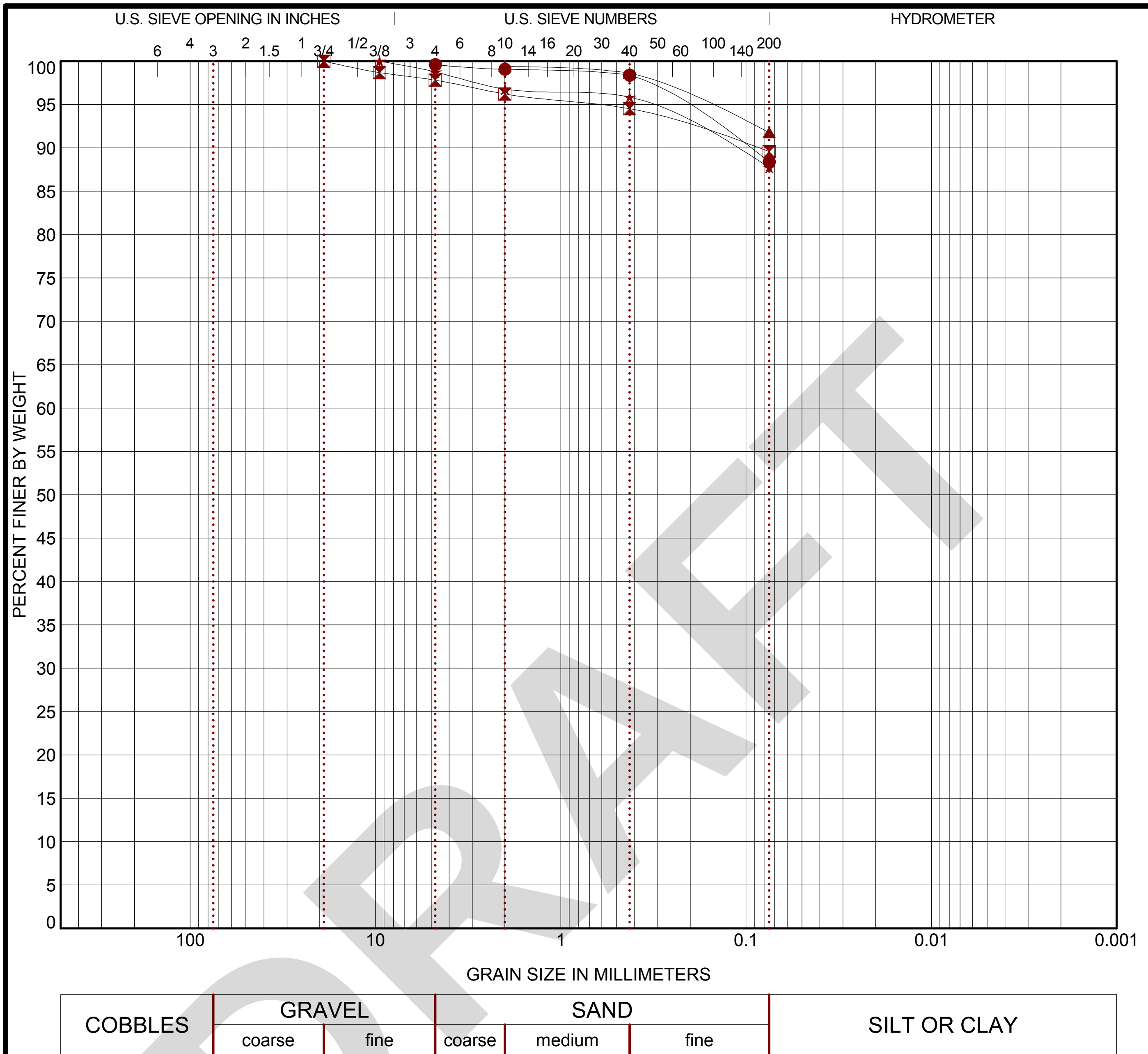
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-5

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-013	3.5	LEAN CLAY(CL)	22(A-7-6)	43	19	24		
⧗	BR-014	2.0	LEAN CLAY(CL)	16(A-6)	36	18	18		
▲	BR-014	3.5	FAT CLAY(CH)	38(A-7-6)	62	26	36		
★	BR-015	2.0							

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-013	3.5	4.75				0.0	11.2	88.4	
⧗	BR-014	2.0	19				2.2	8.2	89.6	
▲	BR-014	3.5	2				0.0	7.6	91.8	
★	BR-015	2.0	9.5				1.3	11.0	87.7	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

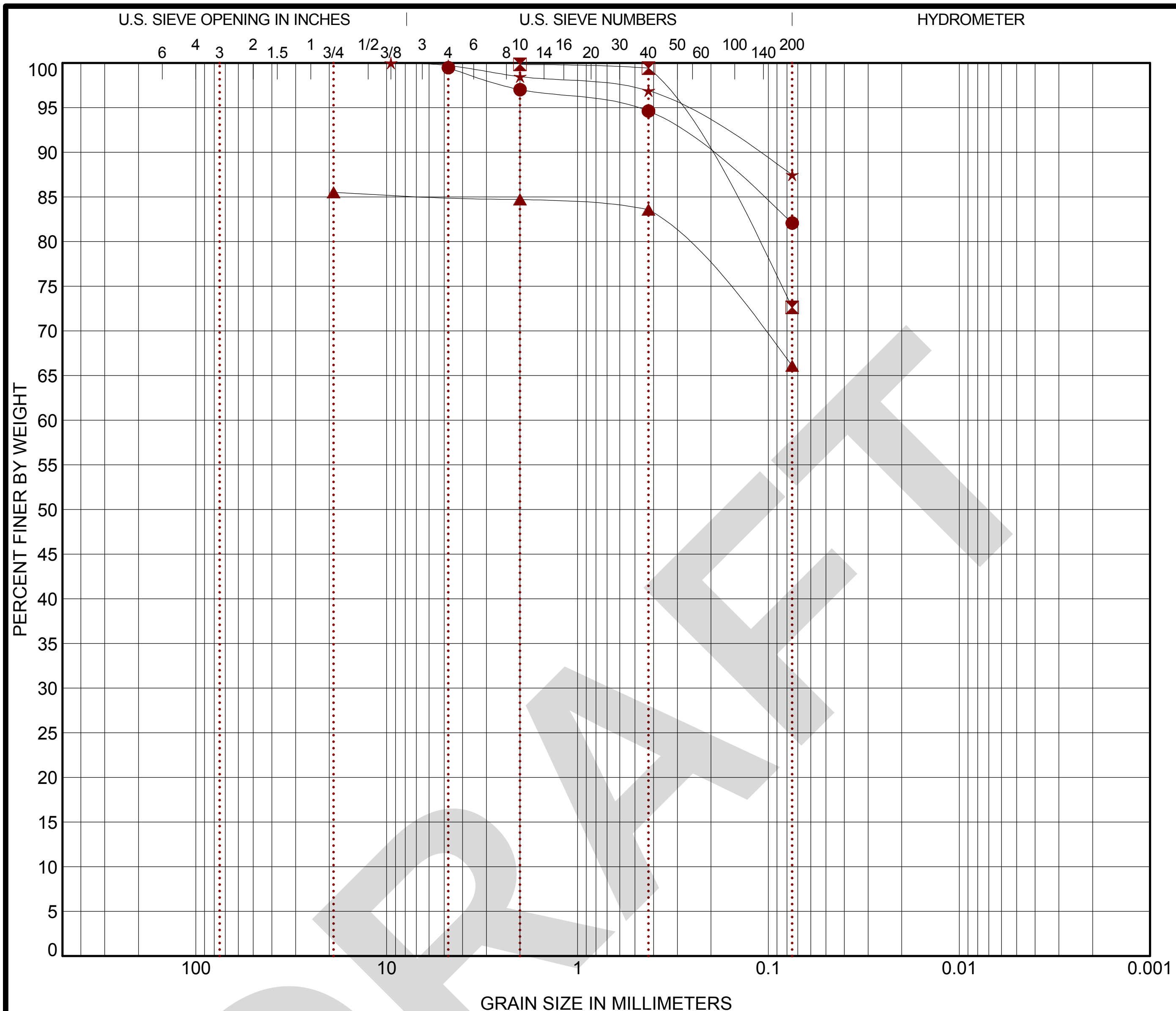
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-6

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-016	0.6	LEAN CLAY with SAND(CL)	9(A-6)	31	18	13		
⧗	BR-016	2.1	LEAN CLAY with SAND(CL)	8(A-6)	34	22	12		
▲	BR-016	3.6	SANDY SILTY CLAY(CL-ML)	3(A-4)	28	21	7		
★	BR-017	0.5	LEAN CLAY(CL)	5(A-4)	25	17	8		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-016	0.6	4.75				0.0	17.4	82.1	
⧗	BR-016	2.1	2				0.0	27.2	72.6	
▲	BR-016	3.6	19				0.5	18.9	66.1	
★	BR-017	0.5	9.5				0.3	12.2	87.5	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon

9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

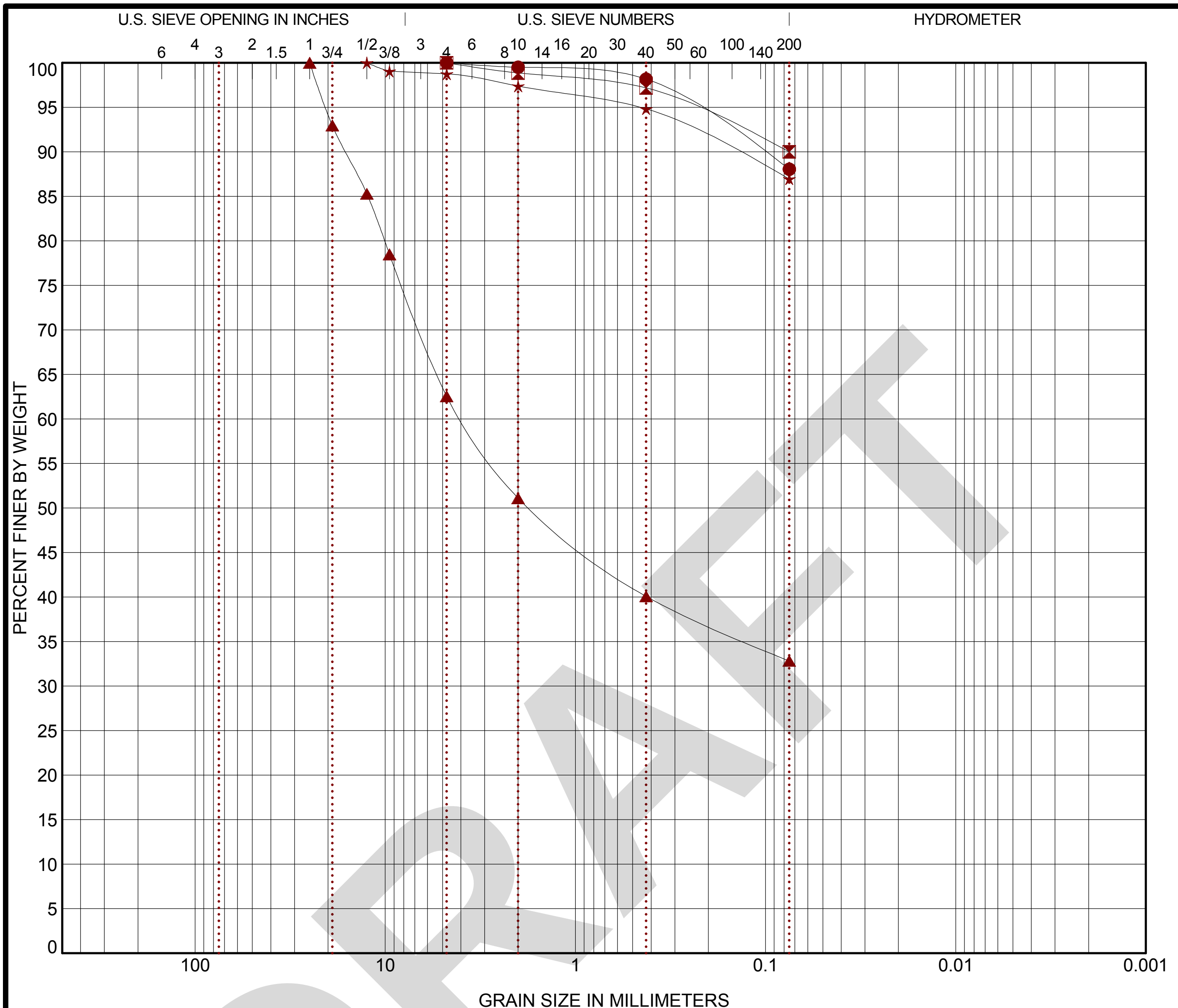
CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-7

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 04135111 - BR - 8TH STREET.GPJ TERRACON2012.GDT 6/2/14

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

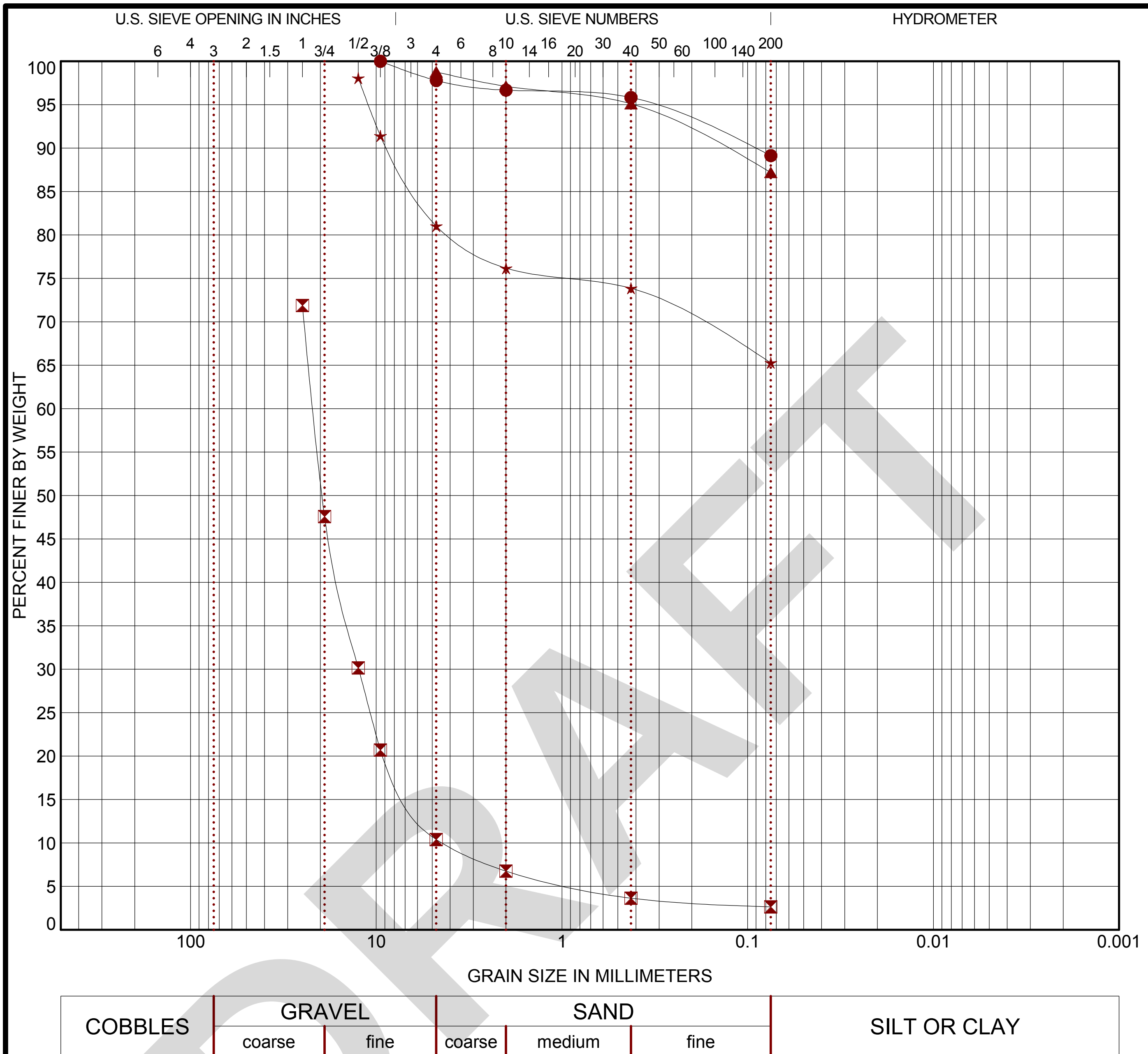
	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-018	2.0	LEAN CLAY(CL)	16(A-6)	37	18	19		
⧗	BR-020	2.0							
▲	BR-021	0.7							
★	BR-021	2.2	LEAN CLAY(CL)	6(A-4)	26	17	9		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-018	2.0	4.75				0.0	12.0	88.0	
⧗	BR-020	2.0	4.75				0.0	10.0	90.0	
▲	BR-021	0.7	25	3.919			37.5	29.7	32.8	
★	BR-021	2.2	12.5				1.3	11.8	87.0	

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas		CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-8

GRAIN SIZE DISTRIBUTION

ASTM D422



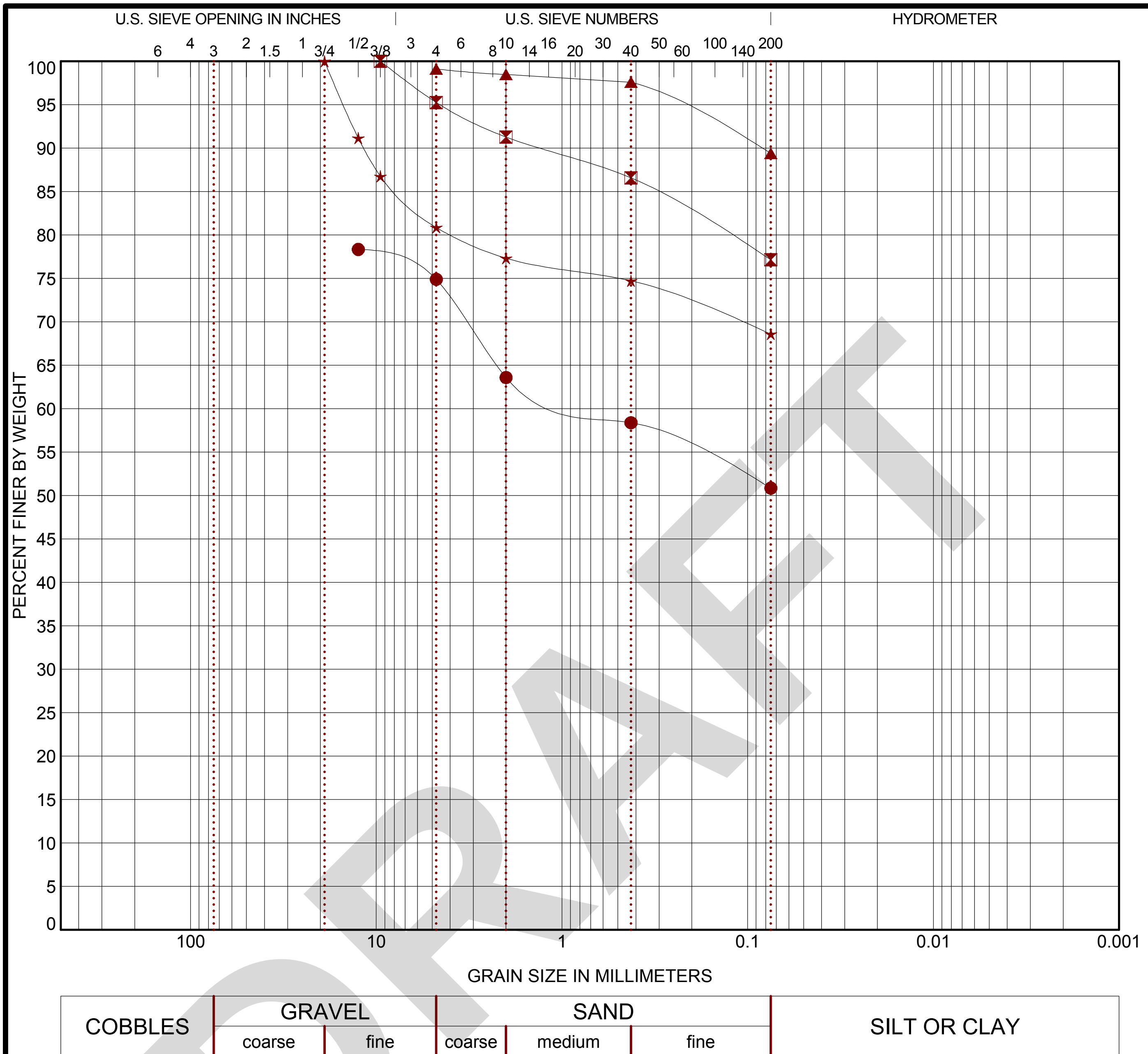
	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-022	3.5	FAT CLAY(CH)	30(A-7-6)	52	21	31		
⧗	BR-024	0.5	WELL-GRADED GRAVEL(GW)					1.64	5.06
▲	BR-024	0.8	LEAN CLAY(CL)	14(A-6)	35	18	17		
★	BR-024	2.3	GRAVELLY LEAN CLAY with SAND(CL)	8(A-6)	36	21	15		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-022	3.5	9.5				2.2	8.7	89.1	
⧗	BR-024	0.5	25	21.86	12.443	4.32	61.5	7.8	2.6	
▲	BR-024	0.8	4.75				0.0	11.6	87.2	
★	BR-024	2.3	12.5				17.0	15.8	65.3	

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas	9522 East 47th Place, Unit D Tulsa, Oklahoma	CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-9

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-024	3.8	GRAVELLY LEAN CLAY with SAND(CL)	1(A-4)	27	19	8		
⧗	BR-025	0.5	LEAN CLAY with SAND(CL)	12(A-6)	35	18	17		
▲	BR-026	2.1	LEAN CLAY(CL)	18(A-7-6)	42	23	19		
★	BR-027	3.5	GRAVELLY LEAN CLAY(CL)	9(A-6)	35	19	16		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-024	3.8	12.5	0.688			3.4	24.0	50.9	
⧗	BR-025	0.5	9.5				4.7	18.1	77.1	
▲	BR-026	2.1	4.75				0.0	9.7	89.4	
★	BR-027	3.5	19				19.1	12.3	68.6	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

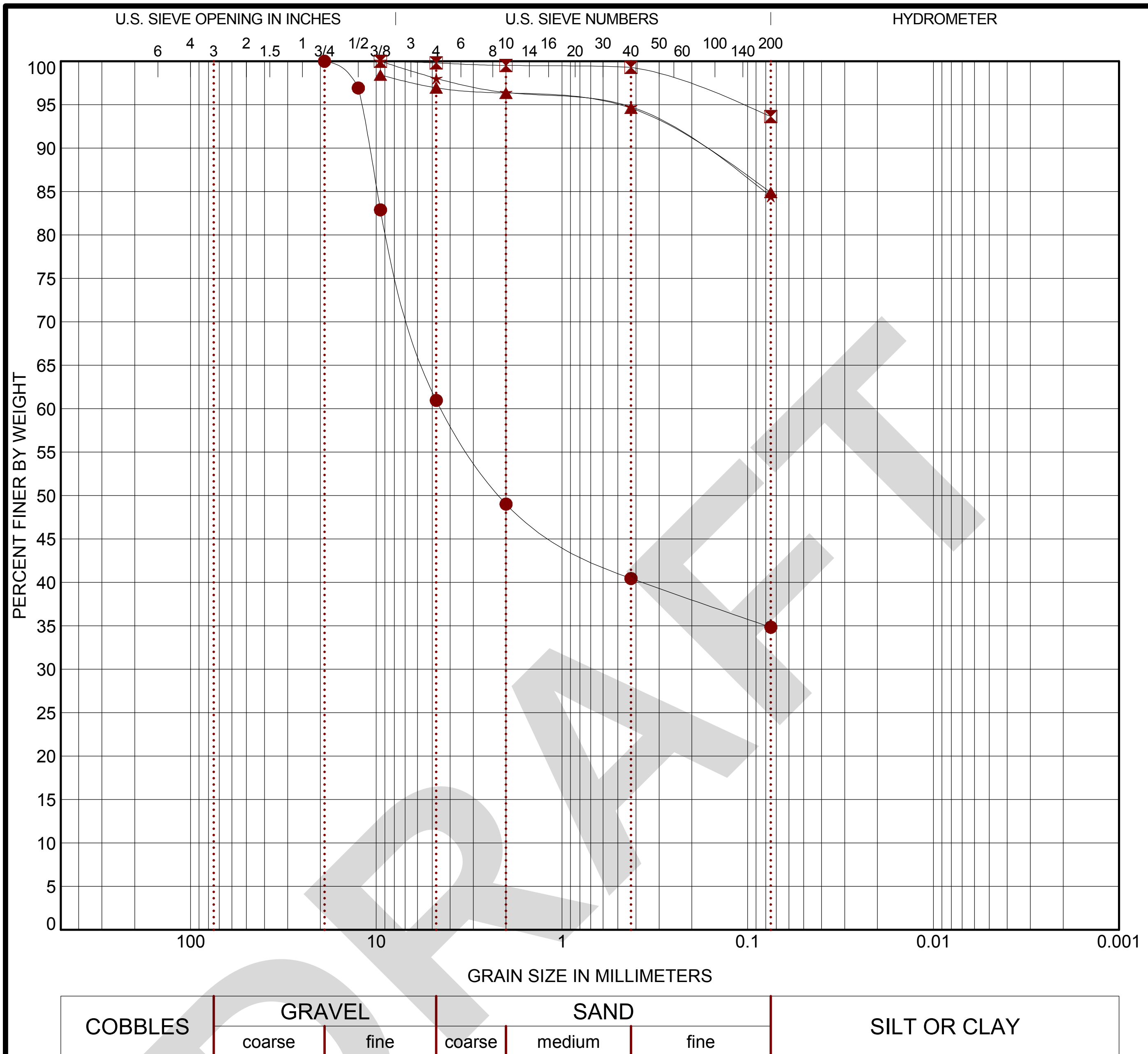
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-10

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-028	0.5							
⧗	BR-029	2.0	LEAN CLAY(CL)	16(A-6)	35	18	17		
▲	BR-030	0.5							
★	BR-030	2.0	LEAN CLAY with SAND(CL)	12(A-6)	31	15	16		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-028	0.5	19	4.432			39.0	26.1	34.8	
⧗	BR-029	2.0	9.5				0.2	6.2	93.6	
▲	BR-030	0.5	9.5				1.5	12.0	84.9	
★	BR-030	2.0	9.5				2.0	13.6	84.4	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

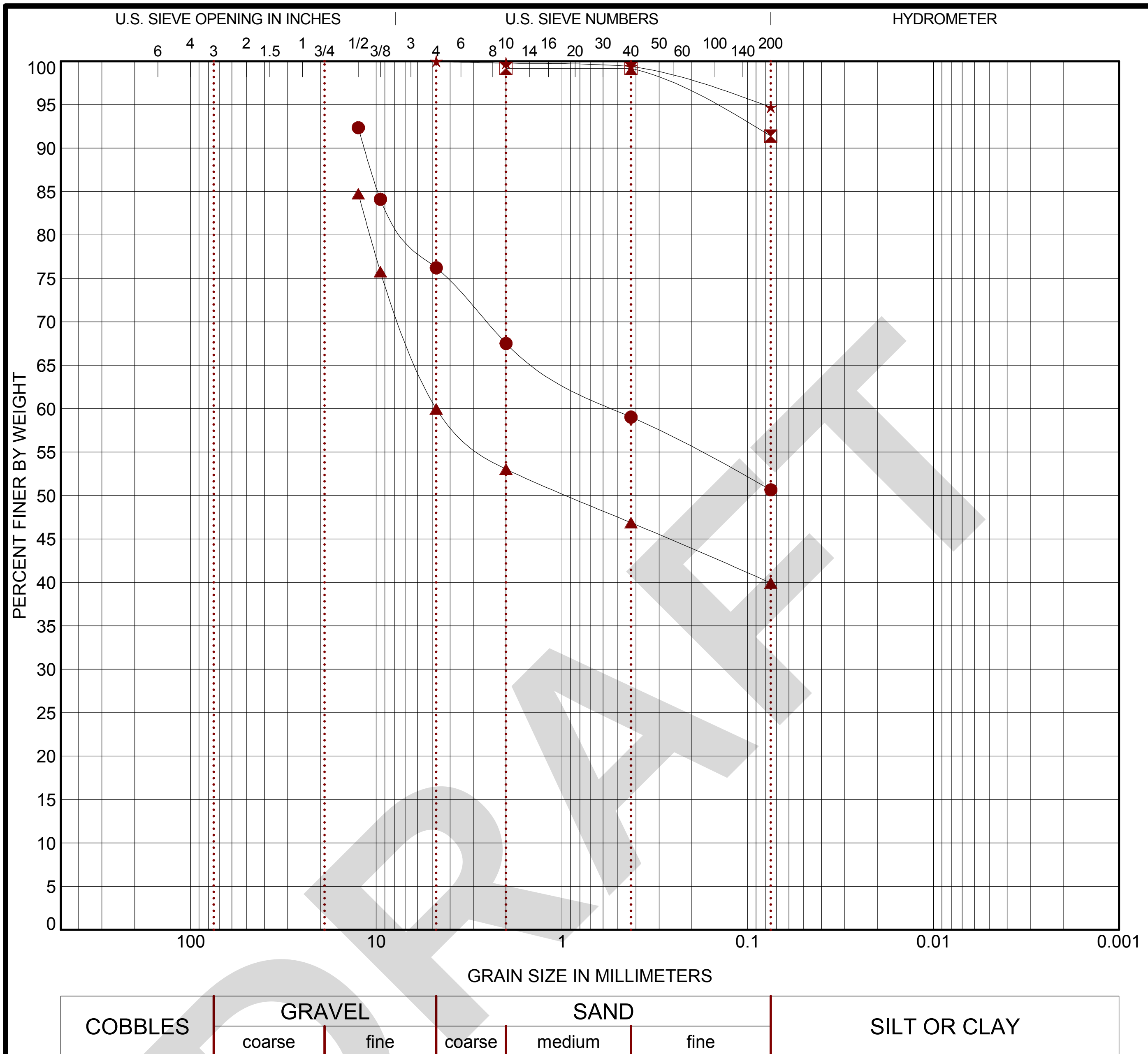
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-11

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-032	0.5	SANDY SILTY CLAY with GRAVEL(CL-ML)	0(A-4)	23	19	4		
⧗	BR-032	3.5	LEAN CLAY(CL)	10(A-6)	31	19	12		
▲	BR-033	0.5	SILTY GRAVEL with SAND(GM)	0(A-4)	NP	NP	NP		
★	BR-033	2.0	SILTY CLAY(CL-ML)	4(A-4)	24	18	6		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-032	0.5	12.5	0.507			16.1	25.6	50.7	
⧗	BR-032	3.5	2				0.0	7.8	91.4	
▲	BR-033	0.5	12.5	4.755			24.8	20.0	39.9	
★	BR-033	2.0	4.75				0.0	5.3	94.7	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

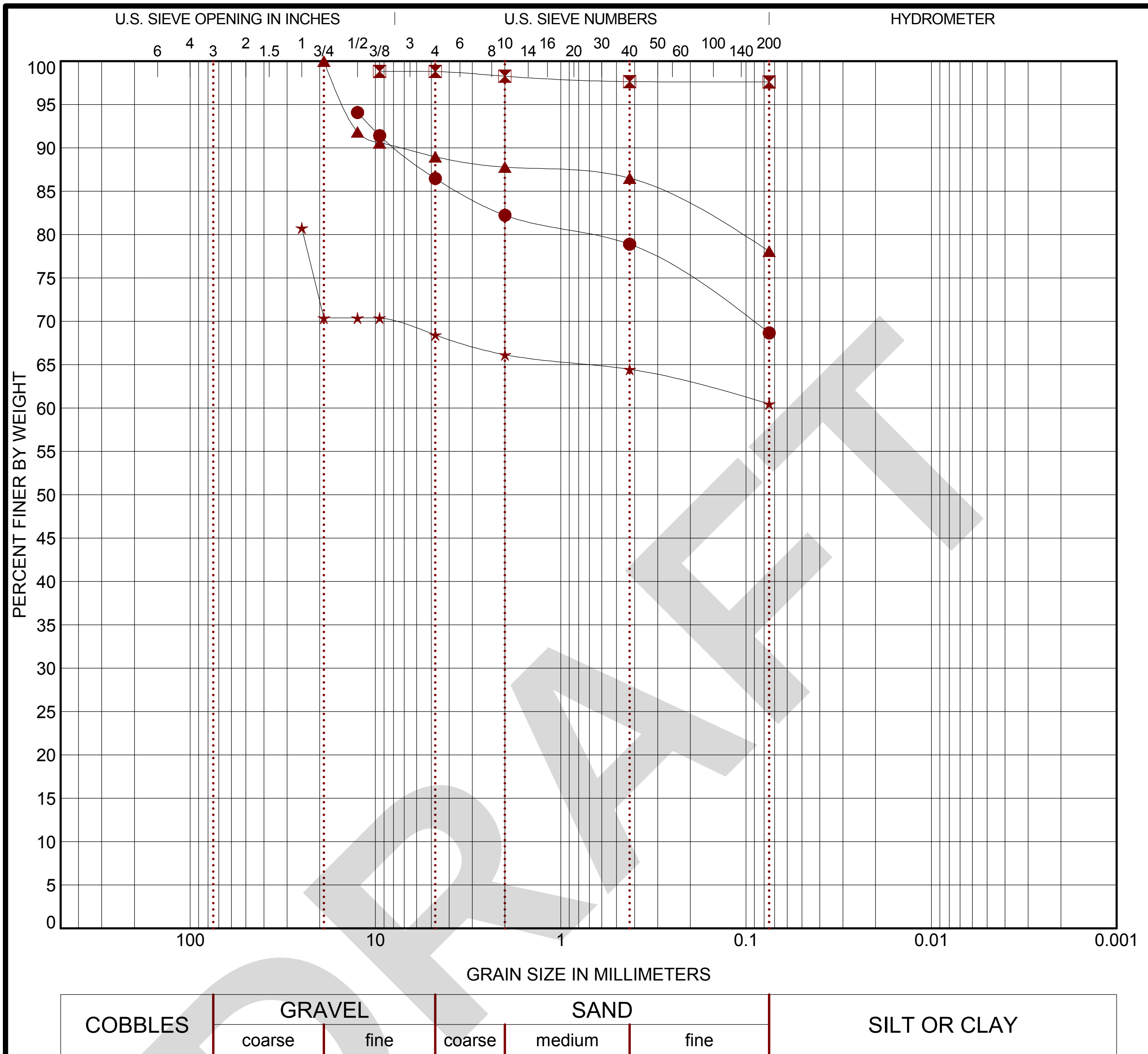
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-12

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-034	0.5	SANDY LEAN CLAY(CL)	16(A-7-6)	43	16	27		
⊠	BR-034	2.0	LEAN CLAY(CL)	14(A-6)	33	19	14		
▲	BR-034	3.5	LEAN CLAY with GRAVEL(CL)	10(A-6)	33	19	14		
★	BR-035	2.0	GRAVELLY LEAN CLAY(CL)	8(A-6)	37	19	18		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-034	0.5	12.5				7.6	17.8	68.7	
⊠	BR-034	2.0	9.5				0.0	1.2	97.6	
▲	BR-034	3.5	19				11.0	10.9	78.1	
★	BR-035	2.0	25				12.3	8.0	60.5	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

9522 East 47th Place, Unit D
Tulsa, Oklahoma

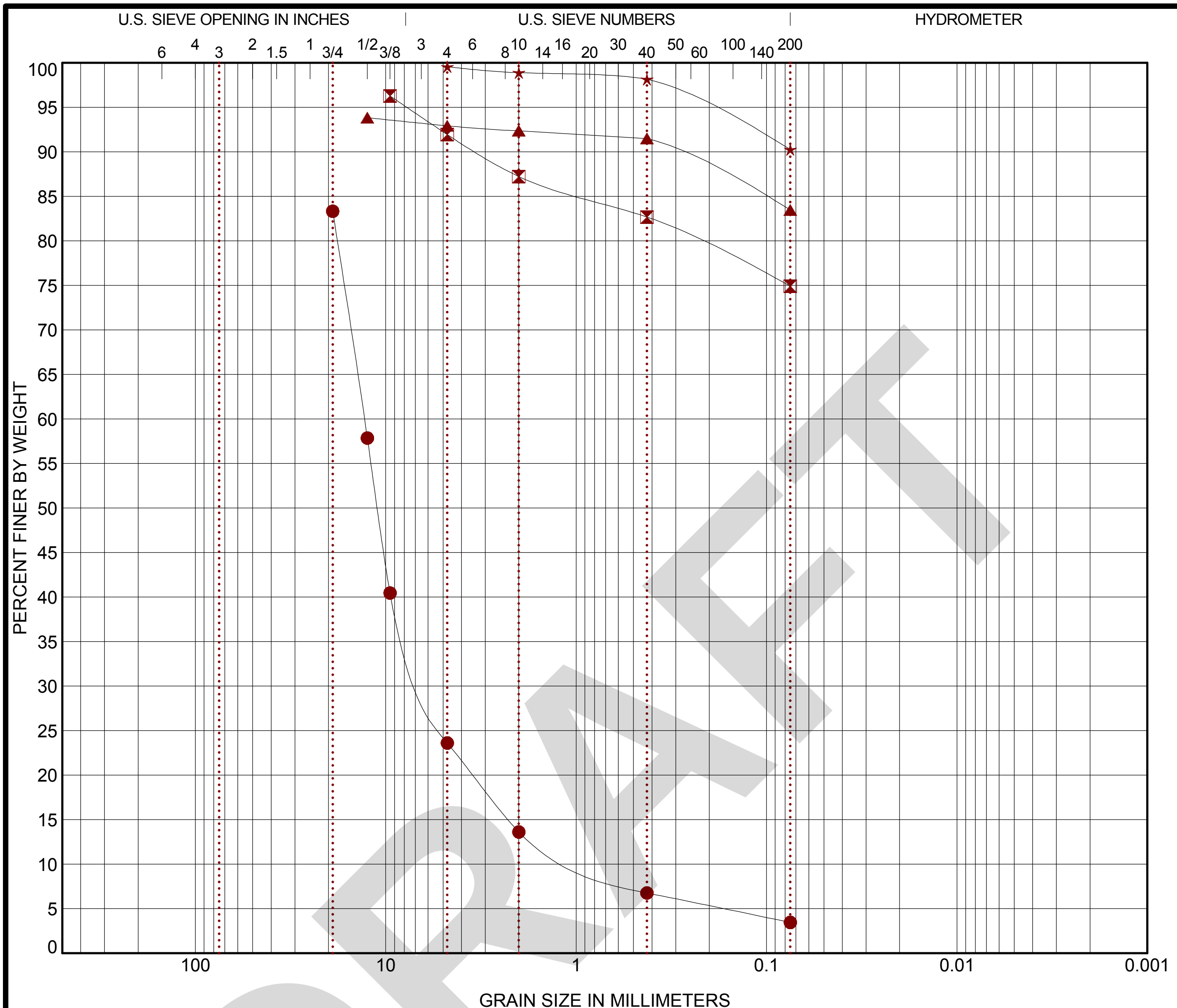
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-13

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-036	0.4	POORLY GRADED GRAVEL with SAND(GP)					3.33	14.64
⊠	BR-036	0.6	LEAN CLAY with SAND(CL)	4(A-4)	24	16	8		
▲	BR-036	2.1	LEAN CLAY with SAND(CL)	7(A-4)	30	20	10		
★	BR-036	3.6							

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-036	0.4	19	12.949	6.179	0.884	59.7	20.2	3.5	
⊠	BR-036	0.6	9.5				4.3	17.0	74.9	
▲	BR-036	2.1	12.5				0.9	9.4	83.5	
★	BR-036	3.6	4.75				0.0	9.3	90.3	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

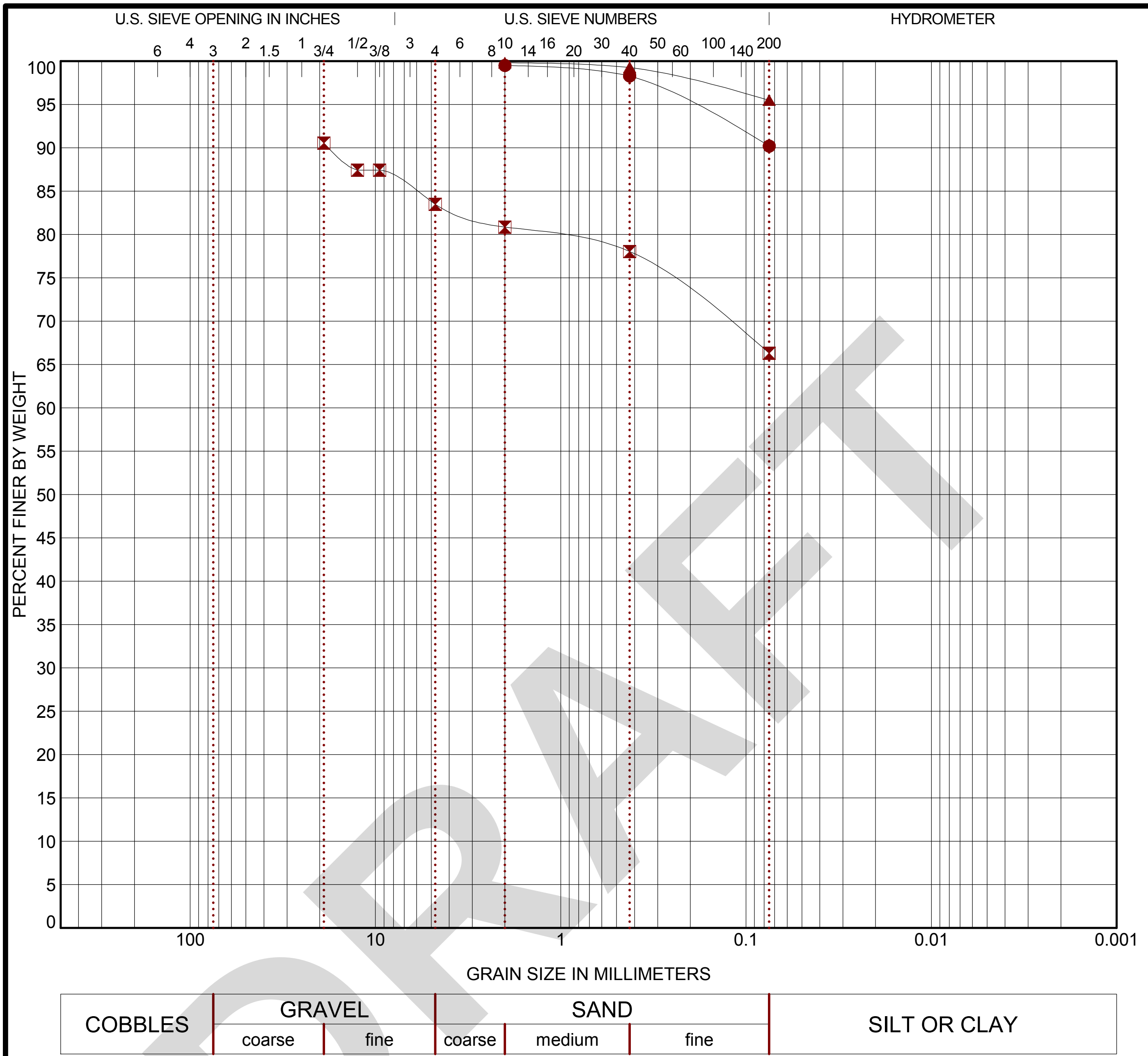
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-14

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-039	2.0	LEAN CLAY(CL)	20(A-7-6)	41	19	22		
⧗	BR-041	0.5	SANDY LEAN CLAY with GRAVEL(CL)	9(A-6)	33	15	18		
▲	BR-041	5.0	LEAN CLAY(CL)	31(A-7-6)	48	17	31		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-039	2.0	2				0.0	9.3	90.2	
⧗	BR-041	0.5	19				7.1	17.2	66.3	
▲	BR-041	5.0	2				0.0	4.3	95.5	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

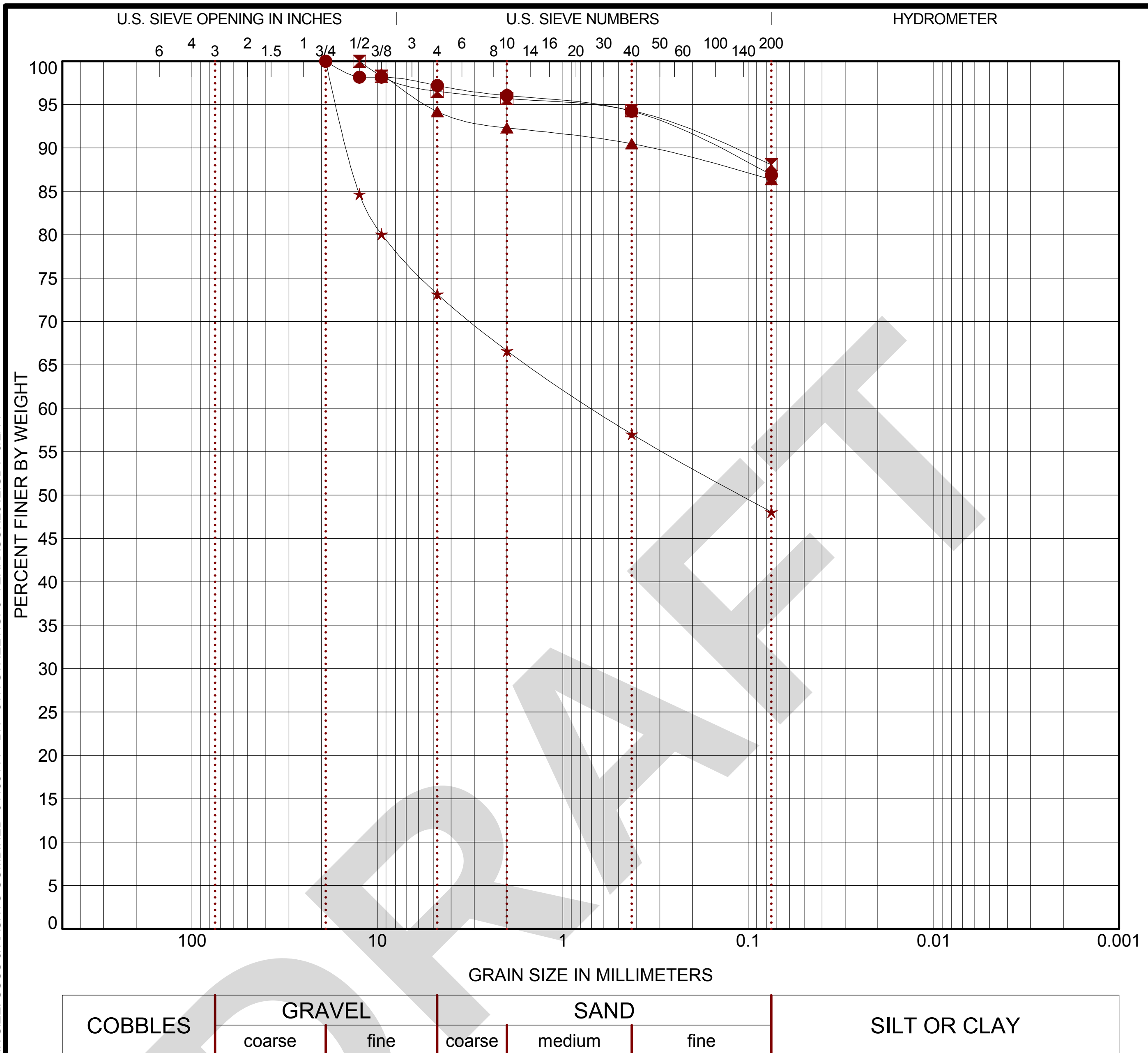
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-15

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	Bulk 1	0.0	LEAN CLAY(CL)	14(A-6)	33	16	17		
⧗	Bulk 2	0.0	LEAN CLAY(CL)	8(A-4)	29	19	10		
▲	Bulk 3	0.0	LEAN CLAY(CL)	21(A-7-6)	41	16	25		
★	Bulk 4	0.0	SILTY, CLAYEY GRAVEL with SAND(GC-GM)	0(A-4)	22	18	4		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	Bulk 1	0.0	19				2.8	10.3	86.9	
⧗	Bulk 2	0.0	12.5				3.5	8.5	88.1	
▲	Bulk 3	0.0	9.5				4.4	7.8	86.3	
★	Bulk 4	0.0	19	0.686			26.8	25.1	48.1	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

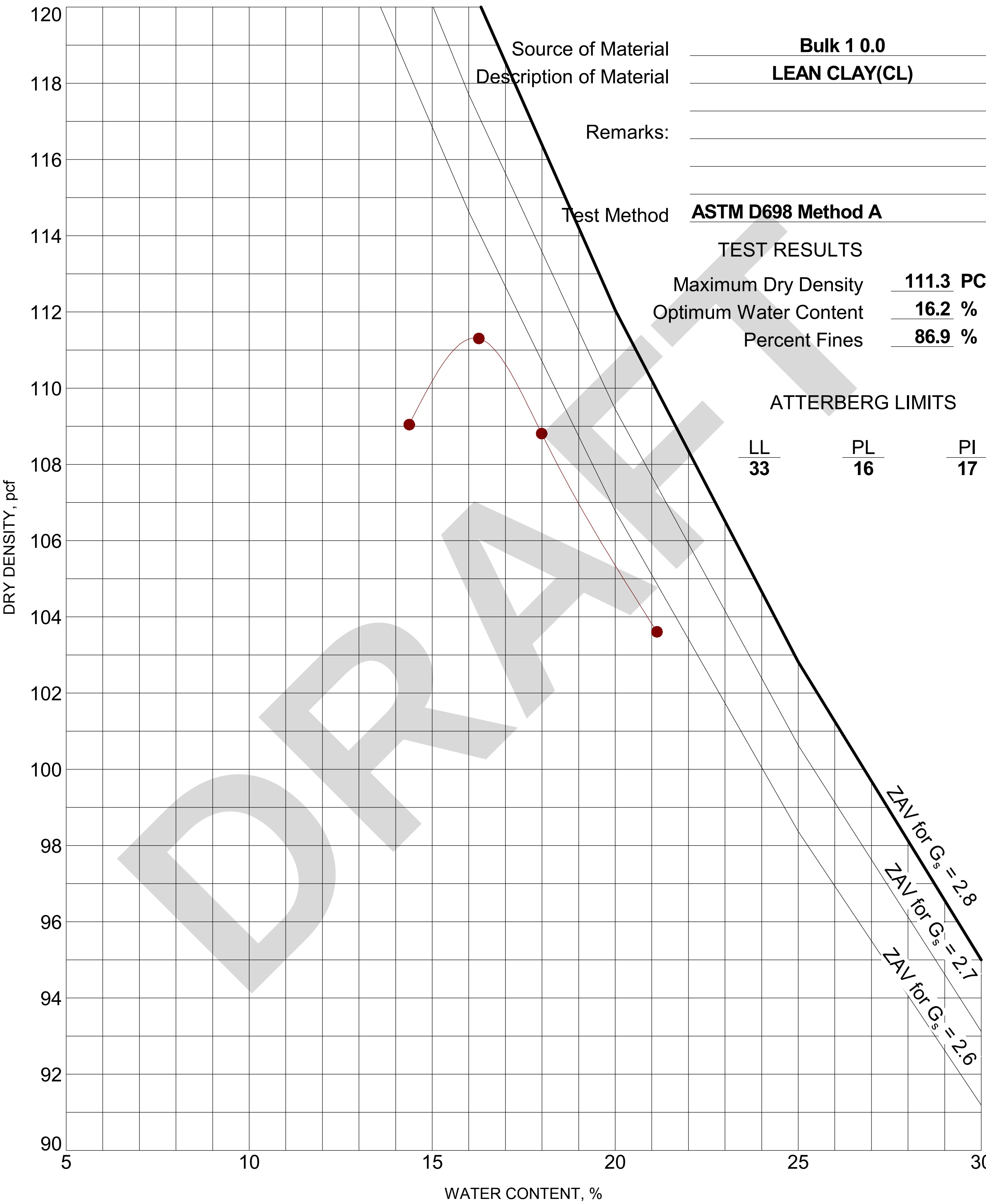
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-16

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material	**Bulk 1 0.0**
Description of Material	**LEAN CLAY(CL)**
Remarks:	
Test Method	**ASTM D698 Method A**

TEST RESULTS

Maximum Dry Density	**111.3**	**PCF**
Optimum Water Content	**16.2**	**%**
Percent Fines	**86.9**	**%**

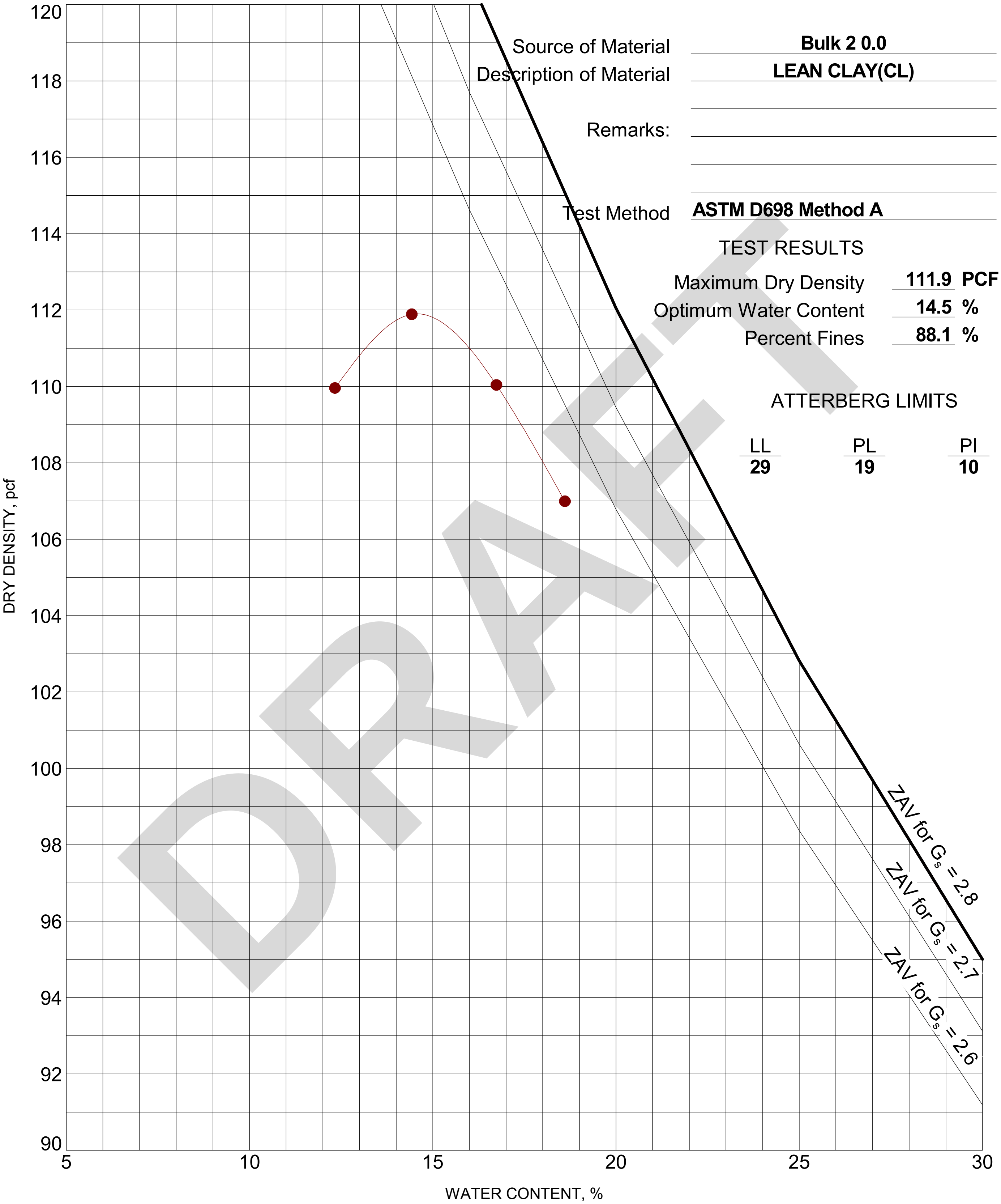
ATTERBERG LIMITS

LL	PL	PI
33	**16**	**17**

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas	9522 East 47th Place, Unit D Tulsa, Oklahoma	CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-17

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material **Bulk 2 0.0**

Description of Material **LEAN CLAY(CL)**

Remarks:

Test Method **ASTM D698 Method A**

TEST RESULTS

Maximum Dry Density	**111.9**	**PCF**
Optimum Water Content	**14.5**	**%**
Percent Fines	**88.1**	**%**

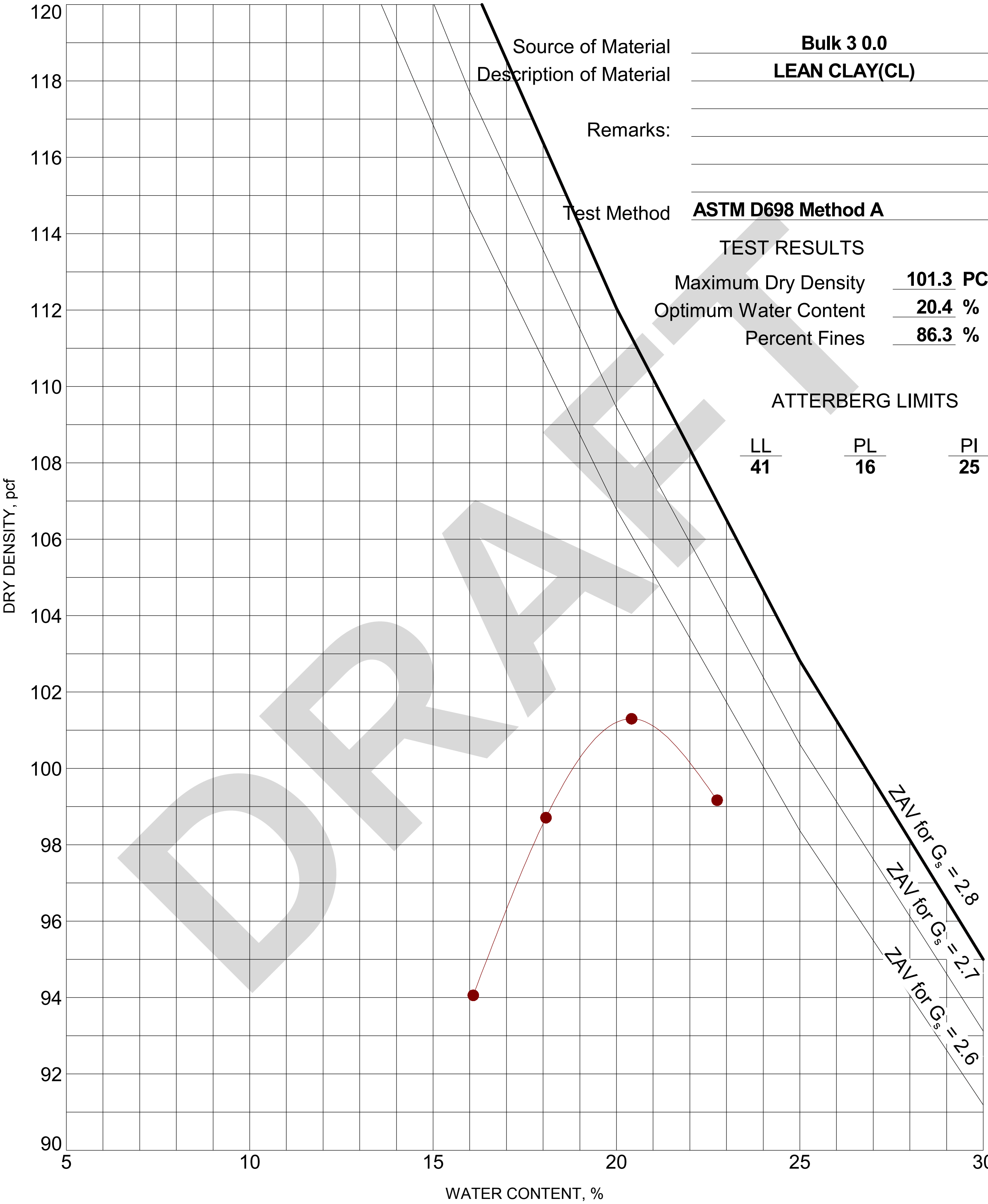
ATTERBERG LIMITS

LL	PL	PI
29	**19**	**10**

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas		CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-18

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material	**Bulk 3 0.0**
Description of Material	**LEAN CLAY(CL)**
Remarks:	
Test Method	**ASTM D698 Method A**

TEST RESULTS

Maximum Dry Density	**101.3**	**PCF**
Optimum Water Content	**20.4**	**%**
Percent Fines	**86.3**	**%**

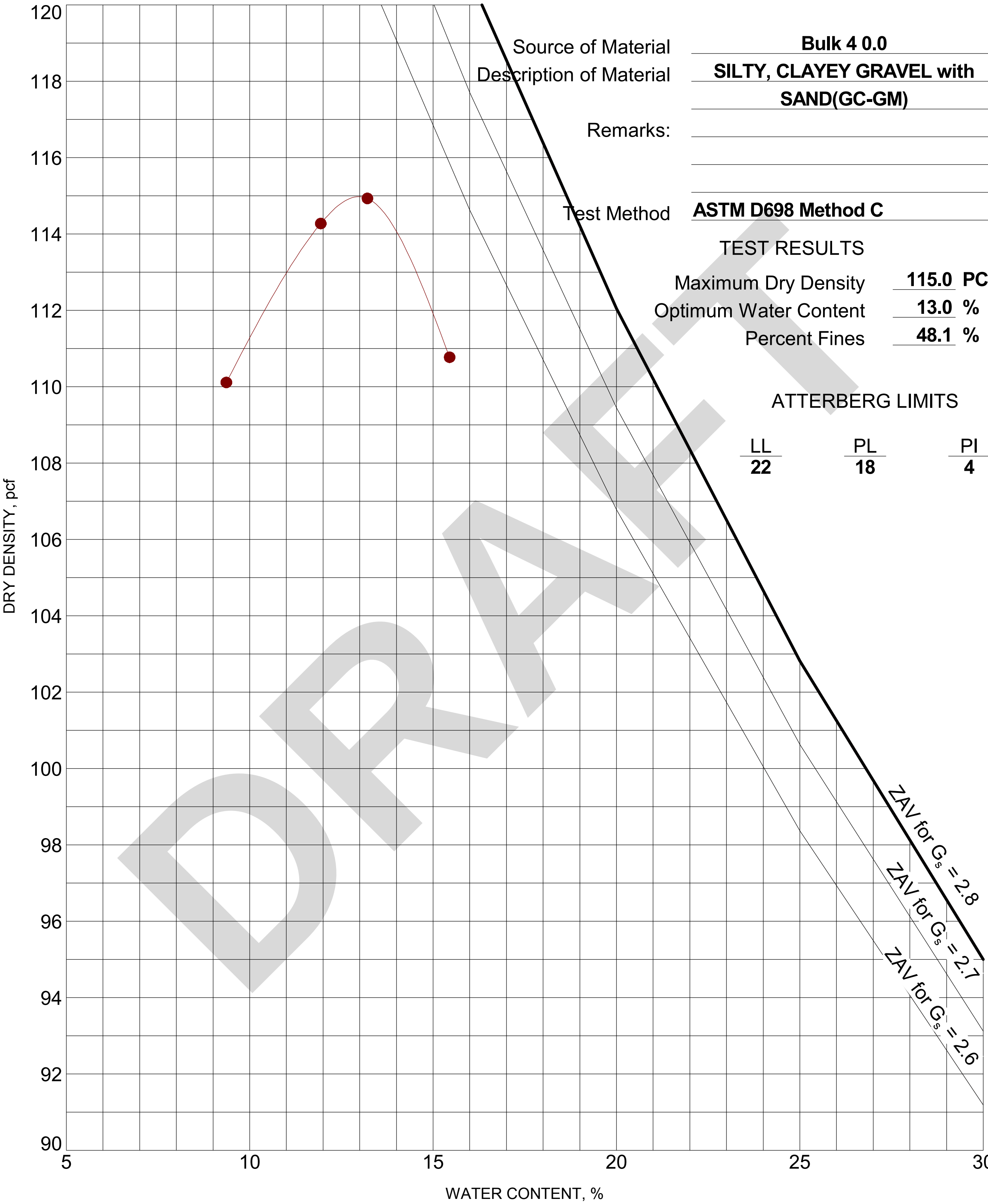
ATTERBERG LIMITS

LL	PL	PI
41	**16**	**25**

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas		CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-19

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material	**Bulk 4 0.0**
Description of Material	**SILTY, CLAYEY GRAVEL with SAND(GC-GM)**
Remarks:	
Test Method	**ASTM D698 Method C**

TEST RESULTS

Maximum Dry Density	**115.0**	**PCF**
Optimum Water Content	**13.0**	**%**
Percent Fines	**48.1**	**%**

ATTERBERG LIMITS

LL	PL	PI
22	**18**	**4**

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas	9522 East 47th Place, Unit D Tulsa, Oklahoma	CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-20

Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date:	27-May-14
Lab No.:	Bulk 1_OMC
Project No.:	04135111
Test Date:	March 22, 2014

Soil Map Unit:	0
Soil Symbol:	CL
Depth (in.)	6 to 36
Compaction Method	Static
Max. Dry Density (pcf)	111.3
Opt. Moisture Content (%)	16.2
Inside Mold Diameter (in)	3.94

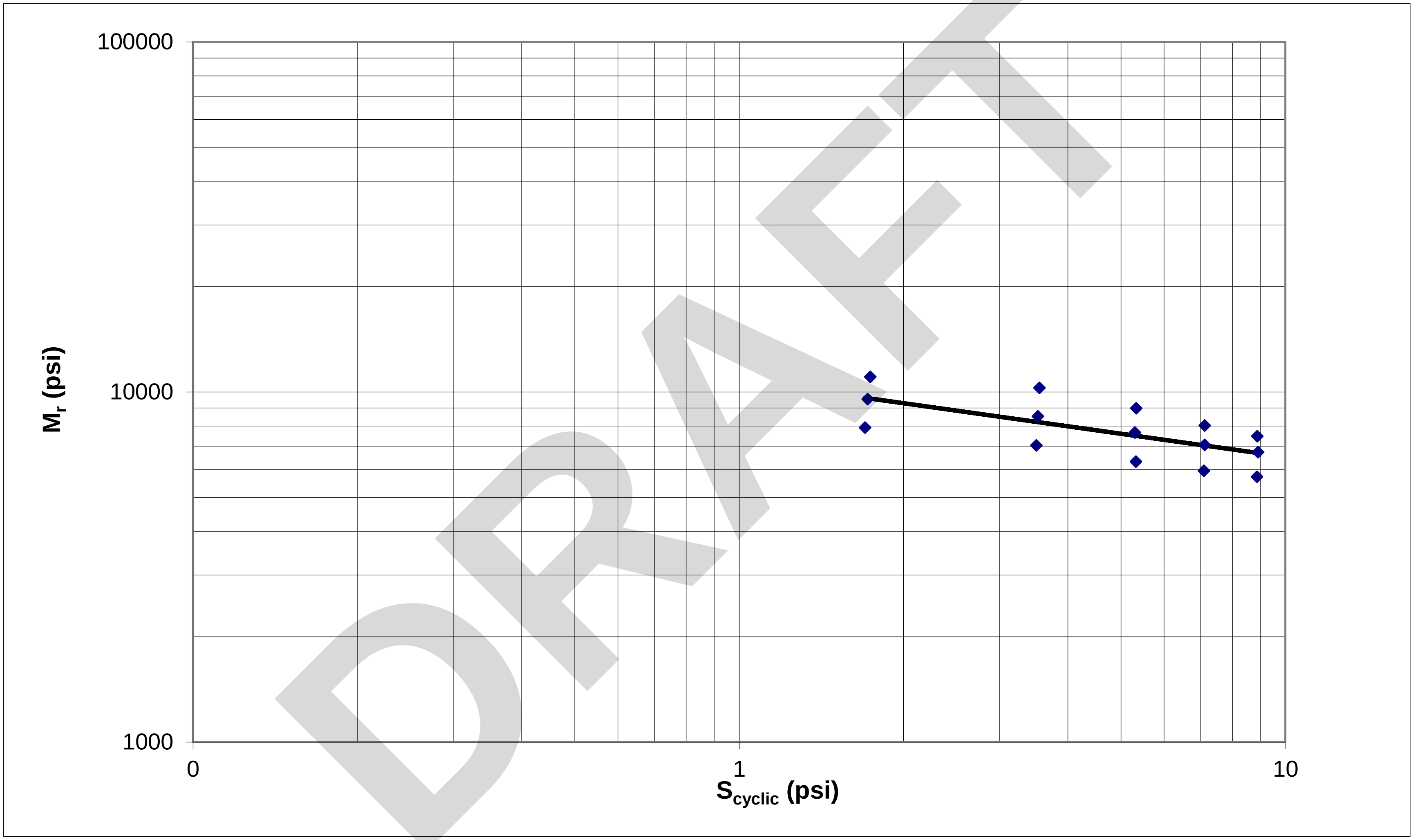
Weight of Wet Soil (lb)	6.61
Initial Sample Diameter (in)	3.94
Initial Sample Height (in)	7.87
Initial Sample Area (in^2)	12.17
Sample Volume (in^3)	95.86
Compacted Moisture Content(%)	16.7
Wet Density (pcf)	119.2
Dry Density (pcf)	102.1

Final Sample Height (in)	7.9
Final Sample Wet Weight (lb)	6.61
Final Moisture Content (%)	16.7
Accumulated Strain (%)	0.28
Percent Passing No. 10	3
Percent Passing No. 200	87.0
Liquid Limit	33
Plasticity Index	17

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	24.5	21.2	3.4	2.02	1.74	0.276	0.0013	0.0012	0.0012	0.000158	11,038
6.00	4.00	48.9	43.2	5.7	4.01	3.55	0.468	0.0028	0.0026	0.0027	0.000345	10,269
6.00	6.00	73.3	65.0	8.3	6.02	5.34	0.684	0.0050	0.0043	0.0047	0.000595	8,974
6.00	8.00	97.6	86.7	10.9	8.02	7.12	0.897	0.0074	0.0066	0.0070	0.000889	8,013
6.01	10.00	121.8	108.2	13.6	10.01	8.89	1.115	0.0097	0.0090	0.0094	0.001190	7,473
4.01	2.00	24.5	20.9	3.5	2.01	1.72	0.291	0.0014	0.0014	0.0014	0.000181	9,530
4.01	4.00	49.0	42.9	6.1	4.02	3.53	0.499	0.0034	0.0031	0.0033	0.000414	8,511
4.01	6.00	73.2	64.6	8.6	6.01	5.30	0.710	0.0058	0.0052	0.0055	0.000693	7,654
4.01	8.00	97.6	86.7	10.9	8.02	7.12	0.893	0.0082	0.0077	0.0079	0.001009	7,057
4.01	10.00	121.9	108.5	13.4	10.02	8.91	1.102	0.0106	0.0102	0.0104	0.001325	6,729
2.00	2.00	24.2	20.7	3.5	1.99	1.70	0.291	0.0017	0.0017	0.0017	0.000215	7,913
2.00	4.00	48.6	42.6	6.0	3.99	3.50	0.491	0.0040	0.0039	0.0039	0.000498	7,033
2.00	6.00	73.3	64.9	8.4	6.02	5.33	0.694	0.0069	0.0064	0.0066	0.000843	6,326
2.00	8.00	97.3	86.4	10.9	7.99	7.10	0.897	0.0095	0.0093	0.0094	0.001192	5,951
2.00	10.00	121.5	108.0	13.5	9.98	8.88	1.106	0.0123	0.0121	0.0122	0.001551	5,722

Terracon

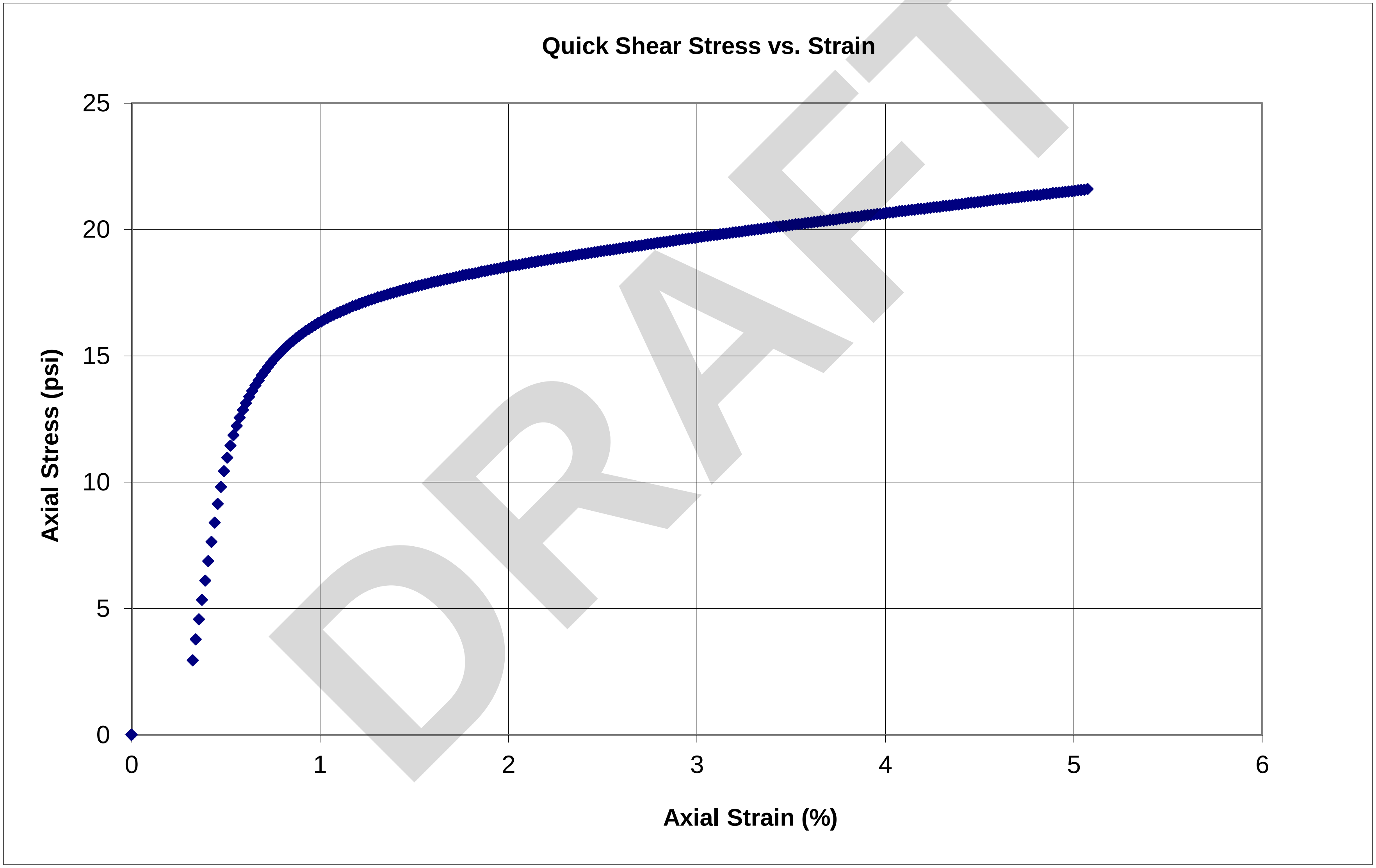
Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 1_OMC
Project No. 04135111



$Mr = K1 \times S_{cylic}^{k2}$

S3 (psi)	K1	K2	R^2
6	13164.8	-0.245	0.93
4	10885.8	-0.216	0.99
2	8881.2	-0.201	0.99
All	10810.6	-0.219	0.47

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 1_OMC
Project No. 04135111



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 27-May-14
Lab No.: Bulk 1_OMC+2
Project No.: 04135111

Soil Map Unit: 0
Soil Symbol: CL
Depth (in.): 6 to 36
Compaction Method: Static
Max. Dry Density (pcf): 111.3
Opt. Moisture Content (%): 16.2
Inside Mold Diameter (in): 3.94

Weight of Wet Soil (lb): 6.72
Initial Sample Diameter (in): 3.94
Initial Sample Height (in): 7.88
Initial Sample Area (in^2): 12.17
Sample Volume (in^3): 95.96
Compacted Moisture Content(%): 18.7
Wet Density (pcf): 121.0
Dry Density (pcf): 102.0

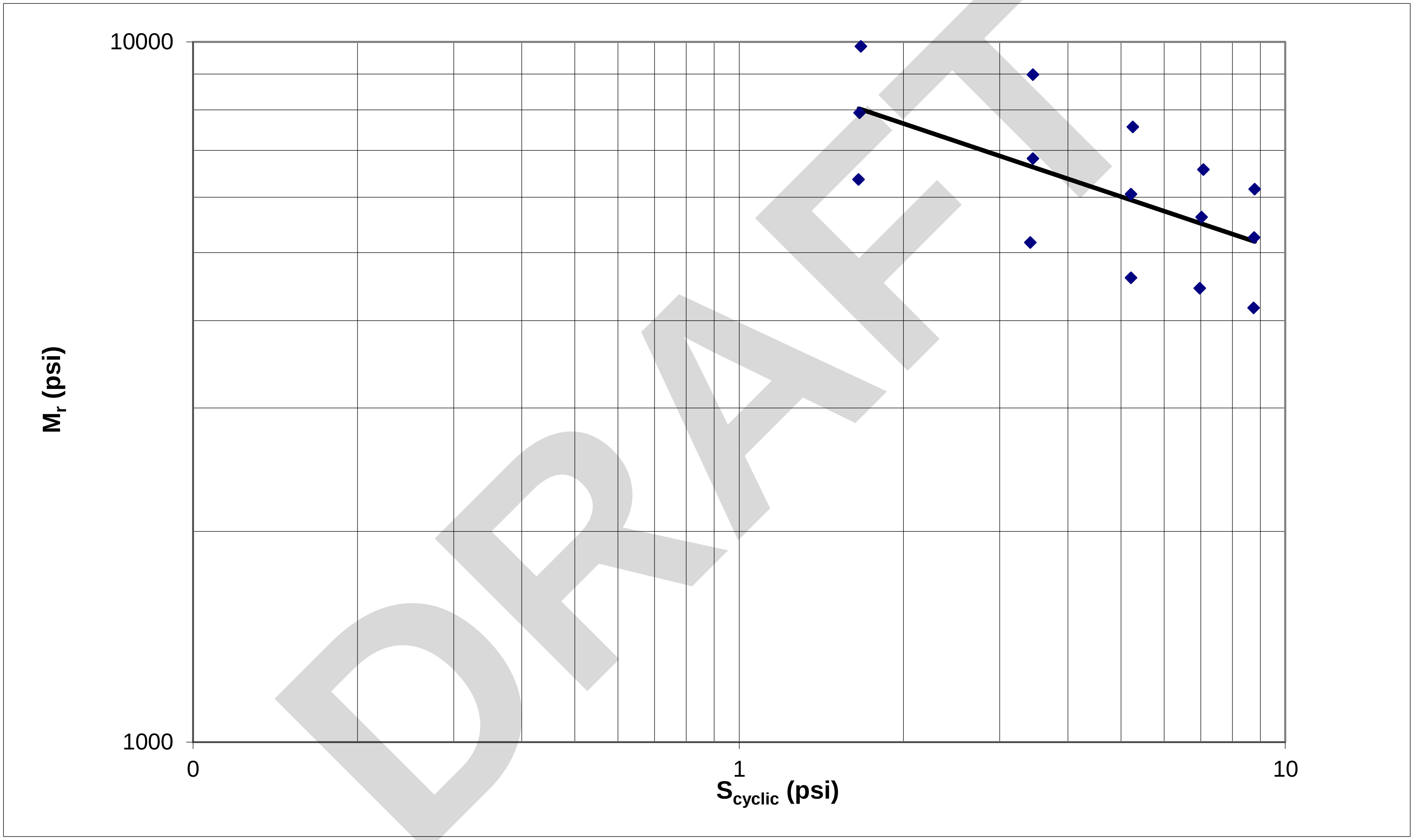
Test Date: March 22, 2014

Final Sample Height (in): 7.8
Final Sample Wet Weight (lb): 6.72
Final Moisture Content (%): 18.7
Accumulated Strain (%): 0.81

Percent Passing No. 10: 3
Percent Passing No. 200: 87.0
Liquid Limit: 33
Plasticity Index: 17

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	24.5	20.3	4.1	2.01	1.67	0.339	0.0014	0.0012	0.0013	0.000170	9,856
6.01	4.00	48.7	42.0	6.7	4.00	3.45	0.551	0.0033	0.0027	0.0030	0.000384	8,979
6.00	6.00	72.9	64.0	8.9	5.99	5.26	0.734	0.0059	0.0051	0.0055	0.000696	7,559
6.00	8.00	97.5	86.2	11.2	8.01	7.09	0.924	0.0092	0.0078	0.0085	0.001079	6,569
6.00	10.00	121.5	107.0	14.5	9.98	8.79	1.188	0.0114	0.0111	0.0112	0.001427	6,164
4.01	2.00	24.1	20.2	3.9	1.98	1.66	0.319	0.0018	0.0015	0.0017	0.000210	7,923
4.00	4.00	48.6	42.0	6.5	3.99	3.45	0.537	0.0042	0.0038	0.0040	0.000507	6,814
4.00	6.00	72.7	63.5	9.2	5.97	5.22	0.752	0.0069	0.0067	0.0068	0.000861	6,063
4.00	8.00	97.1	85.6	11.5	7.98	7.03	0.948	0.0100	0.0097	0.0099	0.001251	5,621
4.00	10.00	120.9	106.8	14.1	9.94	8.77	1.162	0.0132	0.0131	0.0132	0.001670	5,253
2.00	2.00	23.8	20.1	3.7	1.96	1.66	0.304	0.0022	0.0019	0.0021	0.000260	6,360
2.00	4.00	48.2	41.6	6.7	3.96	3.42	0.547	0.0053	0.0052	0.0052	0.000661	5,169
2.00	6.00	72.4	63.5	8.9	5.95	5.22	0.730	0.0090	0.0089	0.0089	0.001134	4,601
2.00	8.00	96.5	84.9	11.6	7.93	6.97	0.953	0.0124	0.0123	0.0124	0.001568	4,446
2.00	10.00	120.7	106.5	14.2	9.92	8.75	1.163	0.0166	0.0165	0.0165	0.002099	4,170

Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 1_OMC+2
Project No. 04135111



$Mr = K1 \times S_{cylic}^{k2}$

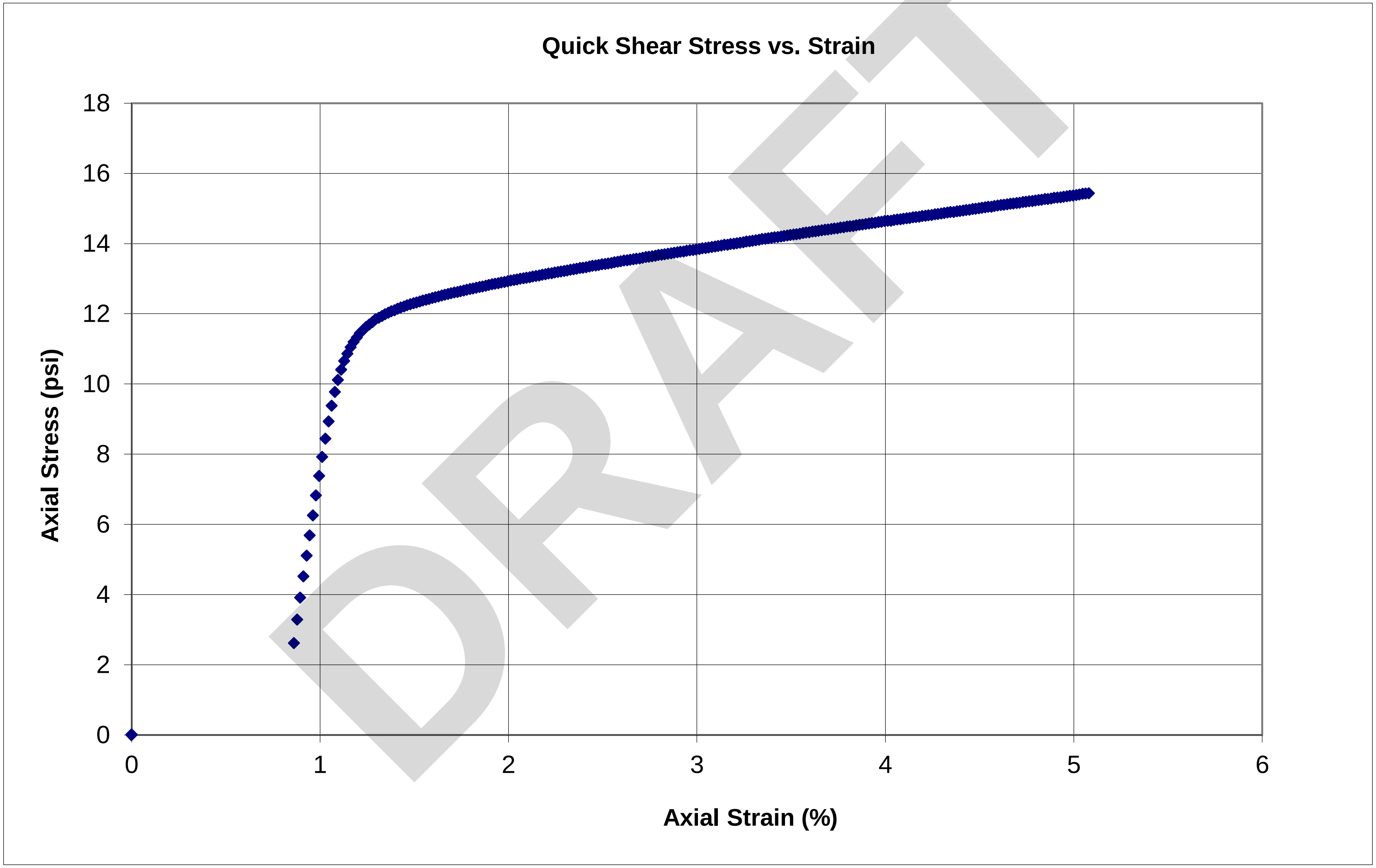
S3 (psi)	K1	K2	R^2
6	12007.6	-0.294	0.94
4	9084.2	-0.247	0.99
2	7128.0	-0.251	0.99
All	9165.2	-0.262	0.40

Terracon

Date Reported: 5/27/2014 0

Terracon Lab No. Bulk 1_OMC+2

Project No. 04135111



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

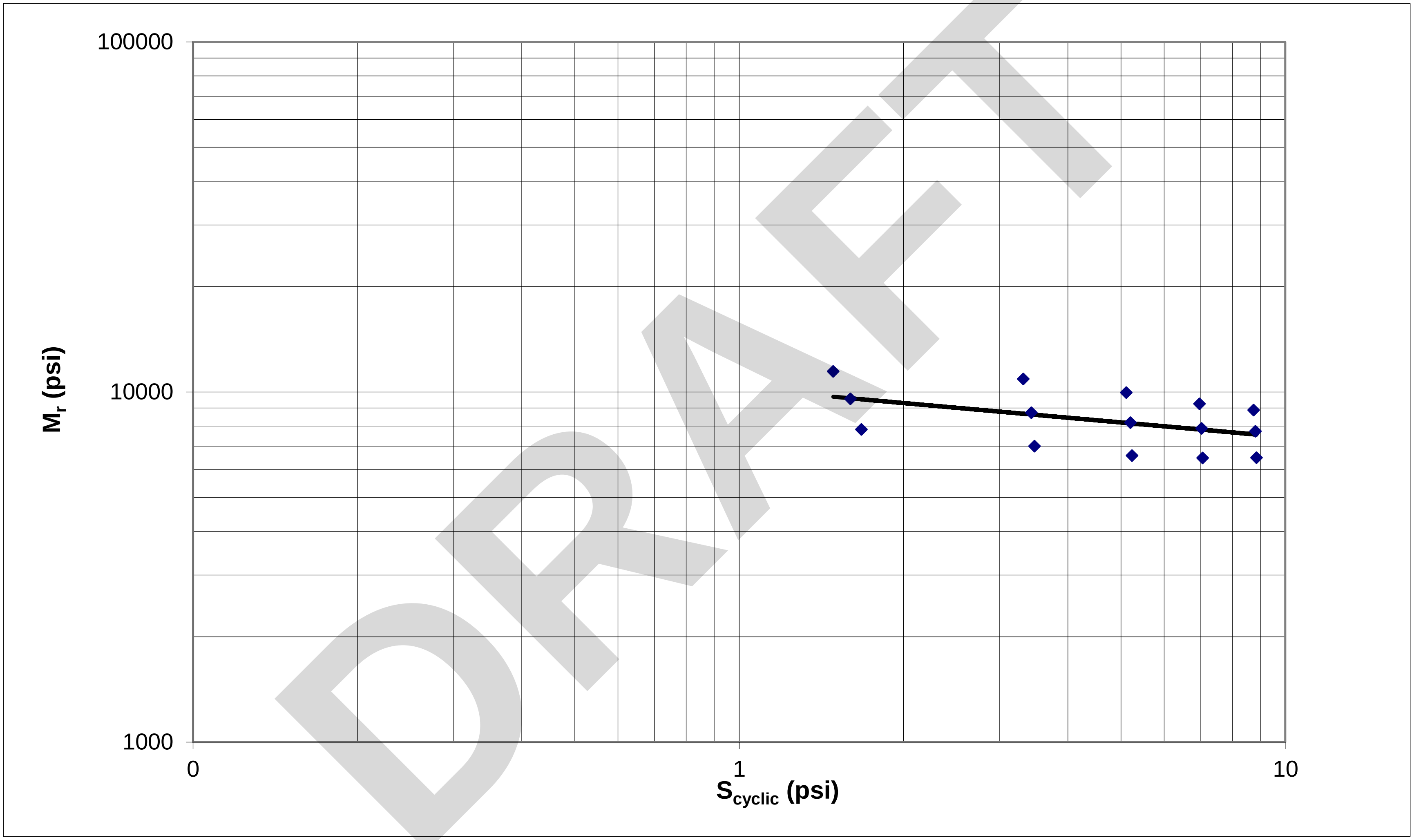
Report Date:	27-May-14
Lab No.:	Bulk 2_OMC
Project No.:	04135111
Test Date:	March 22, 2014

Soil Map Unit:	0				
Soil Symbol:	CL	Weight of Wet Soil (lb)	6.55		
Depth (in.)	6 to 36	Initial Sample Diameter (in)	3.94		
Compaction Method	Static	Initial Sample Height (in)	7.87	Final Sample Height (in)	7.9
Max. Dry Density (pcf)	111.9	Initial Sample Area (in^2)	12.17	Final Sample Wet Weight (lb)	6.55
Opt. Moisture Content (%)	14.5	Sample Volume (in^3)	95.86	Final Moisture Content (%)	15.0
Inside Mold Diameter (in)	3.94	Compacted Moisture Content(%)	15.0	Accumulated Strain (%)	0.20
		Wet Density (pcf)	118.0		
		Dry Density (pcf)	102.6	Percent Passing No. 10	4
				Percent Passing No. 200	88.0
				Liquid Limit	29
				Plasticity Index	10

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	23.1	18.1	5.0	1.90	1.49	0.412	0.0010	0.0010	0.0010	0.000130	11,448
5.99	4.00	47.5	40.4	7.2	3.90	3.31	0.589	0.0024	0.0024	0.0024	0.000304	10,893
6.00	6.00	72.4	62.3	10.1	5.94	5.12	0.827	0.0041	0.0040	0.0040	0.000514	9,952
6.00	8.00	97.1	84.8	12.3	7.98	6.96	1.014	0.0058	0.0061	0.0059	0.000753	9,247
6.00	10.00	121.4	106.6	14.8	9.97	8.75	1.214	0.0076	0.0080	0.0078	0.000986	8,875
4.01	2.00	23.9	19.5	4.5	1.97	1.60	0.367	0.0013	0.0013	0.0013	0.000167	9,561
4.00	4.00	48.6	41.7	6.9	3.99	3.43	0.567	0.0030	0.0032	0.0031	0.000393	8,717
4.01	6.00	73.0	63.4	9.6	6.00	5.21	0.785	0.0051	0.0050	0.0050	0.000638	8,167
4.01	8.00	97.5	85.6	11.9	8.01	7.03	0.980	0.0070	0.0071	0.0070	0.000893	7,872
4.00	10.00	121.6	107.4	14.2	9.99	8.82	1.167	0.0088	0.0092	0.0090	0.001142	7,721
2.00	2.00	24.3	20.4	3.9	1.99	1.67	0.319	0.0017	0.0017	0.0017	0.000214	7,807
2.00	4.00	48.7	42.3	6.4	4.00	3.48	0.523	0.0038	0.0040	0.0039	0.000496	7,001
2.00	6.00	72.9	63.9	9.1	5.99	5.24	0.743	0.0063	0.0062	0.0063	0.000797	6,577
2.00	8.00	97.5	86.0	11.5	8.01	7.06	0.947	0.0084	0.0088	0.0086	0.001090	6,479
2.00	10.00	121.7	107.8	13.9	9.99	8.86	1.139	0.0105	0.0110	0.0107	0.001365	6,488

Terracon

Date Reported:	5/27/2014	0.00
Terracon Lab No.	Bulk 2_OMC	
Project No.	04135111	

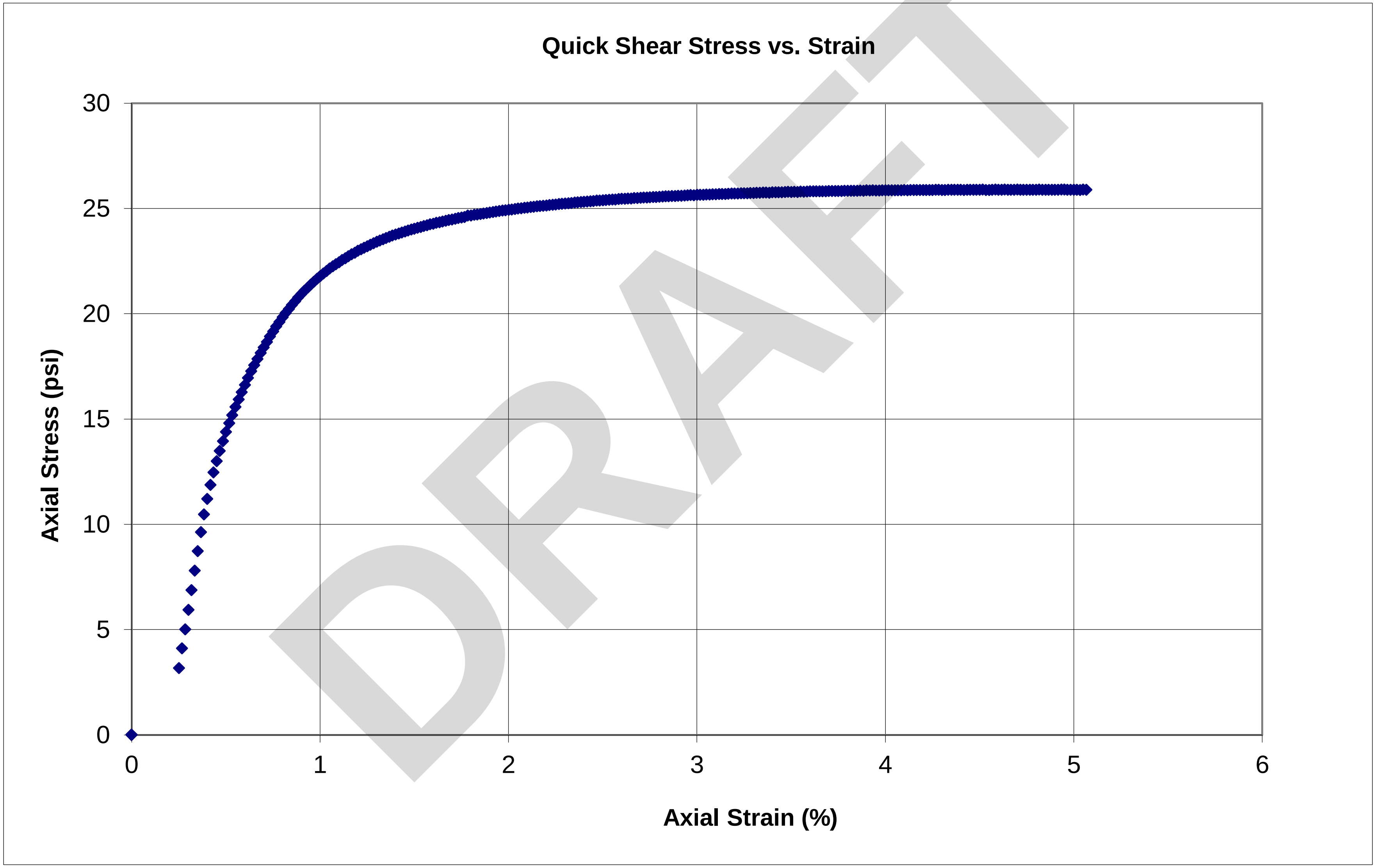


$Mr = K1 \times S_{cylic}^{k2}$

S3 (psi)	K1	K2	R^2
6	12462.4	-0.148	0.93
4	10160.9	-0.129	1.00
2	8182.7	-0.117	0.94
All	10242.2	-0.139	0.23

Terracon

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 2_OMC
Project No. 04135111



Resilient Modulus Testing - AASHTO T 307-99 English Units

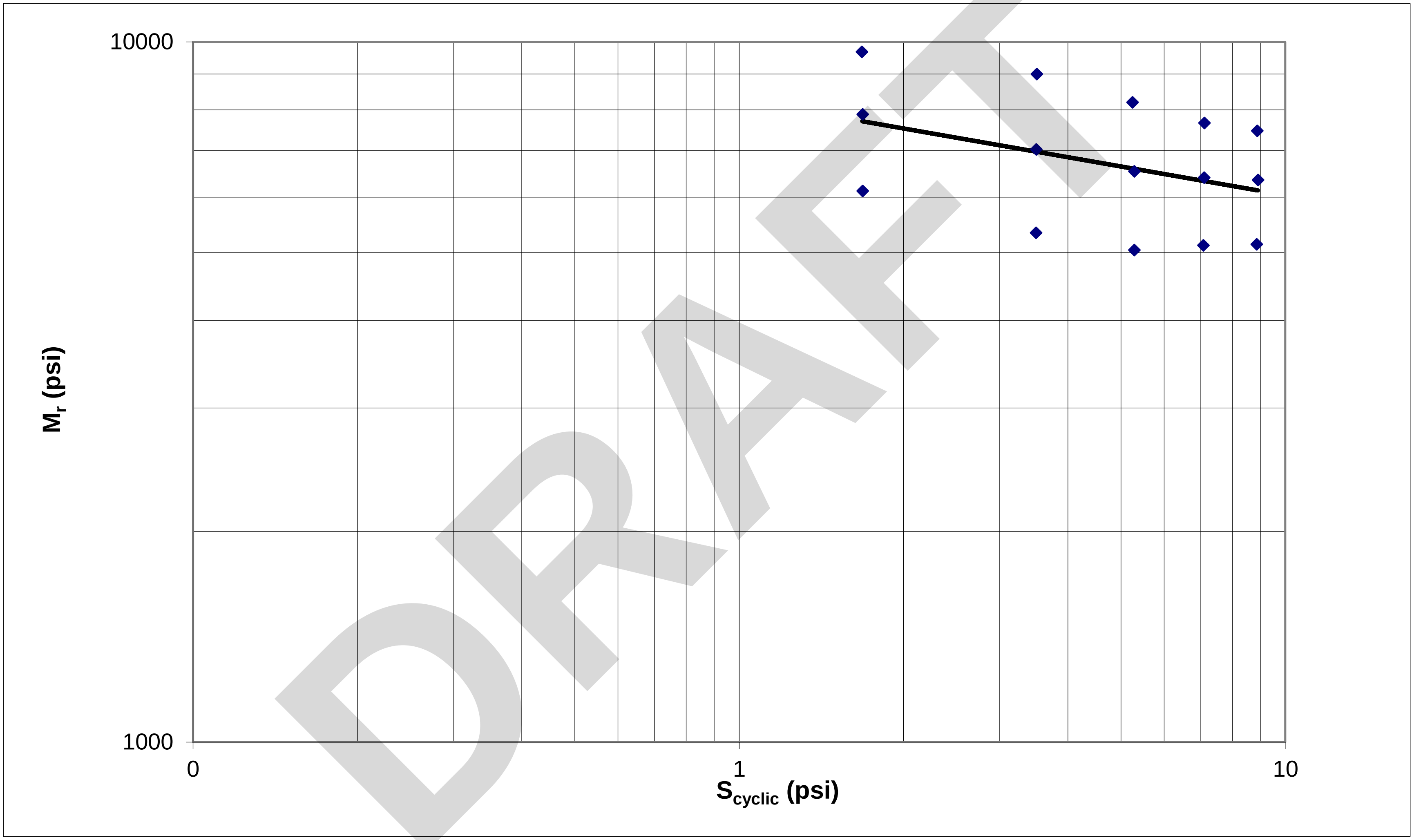
Report Date:	27-May-14
Lab No.:	Bulk 2_OMC+2%
Project No.:	04135111
Test Date:	March 22, 2014

Soil Map Unit:	0				
Soil Symbol:	CL	Weight of Wet Soil (lb)	6.67		
Depth (in.)	6 to 36	Initial Sample Diameter (in)	3.94		
Compaction Method	Static	Initial Sample Height (in)	7.87	Final Sample Height (in)	7.8
Max. Dry Density (pcf)	111.9	Initial Sample Area (in^2)	12.17	Final Sample Wet Weight (lb)	6.67
Opt. Moisture Content (%)	14.5	Sample Volume (in^3)	95.87	Final Moisture Content (%)	17.0
Inside Mold Diameter (in)	3.94	Compacted Moisture Content(%)	16.9	Accumulated Strain (%)	0.50
		Wet Density (pcf)	120.2		
		Dry Density (pcf)	102.8	Percent Passing No. 10	4
				Percent Passing No. 200	81.0
				Liquid Limit	29
				Plasticity Index	10

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
5.99	2.00	24.4	20.4	4.0	2.01	1.68	0.328	0.0014	0.0013	0.0014	0.000173	9,681
5.99	4.00	49.1	42.8	6.3	4.03	3.51	0.518	0.0031	0.0030	0.0031	0.000390	8,999
6.00	6.00	73.5	64.0	9.5	6.04	5.25	0.781	0.0052	0.0049	0.0050	0.000641	8,199
6.01	8.00	97.9	86.6	11.4	8.04	7.11	0.932	0.0077	0.0069	0.0073	0.000928	7,658
6.01	10.00	122.1	108.2	13.9	10.03	8.88	1.142	0.0098	0.0089	0.0094	0.001191	7,462
4.00	2.00	24.4	20.5	3.9	2.00	1.68	0.317	0.0018	0.0016	0.0017	0.000214	7,882
4.01	4.00	48.9	42.6	6.3	4.01	3.50	0.515	0.0041	0.0038	0.0039	0.000498	7,024
4.01	6.00	73.4	64.5	8.9	6.03	5.30	0.732	0.0069	0.0059	0.0064	0.000810	6,534
4.01	8.00	97.8	86.5	11.2	8.03	7.11	0.923	0.0092	0.0083	0.0087	0.001110	6,399
4.01	10.00	122.3	108.6	13.7	10.04	8.91	1.124	0.0116	0.0105	0.0111	0.001404	6,348
1.99	2.00	24.2	20.5	3.7	1.99	1.68	0.303	0.0023	0.0021	0.0022	0.000275	6,126
2.00	4.00	48.7	42.6	6.1	4.00	3.50	0.504	0.0055	0.0049	0.0052	0.000656	5,335
2.00	6.00	73.0	64.5	8.5	6.00	5.29	0.702	0.0088	0.0077	0.0083	0.001050	5,043
2.00	8.00	97.5	86.2	11.3	8.01	7.08	0.924	0.0115	0.0103	0.0109	0.001383	5,122
2.00	10.00	121.8	108.0	13.7	10.00	8.87	1.126	0.0143	0.0129	0.0136	0.001726	5,140

Terracon

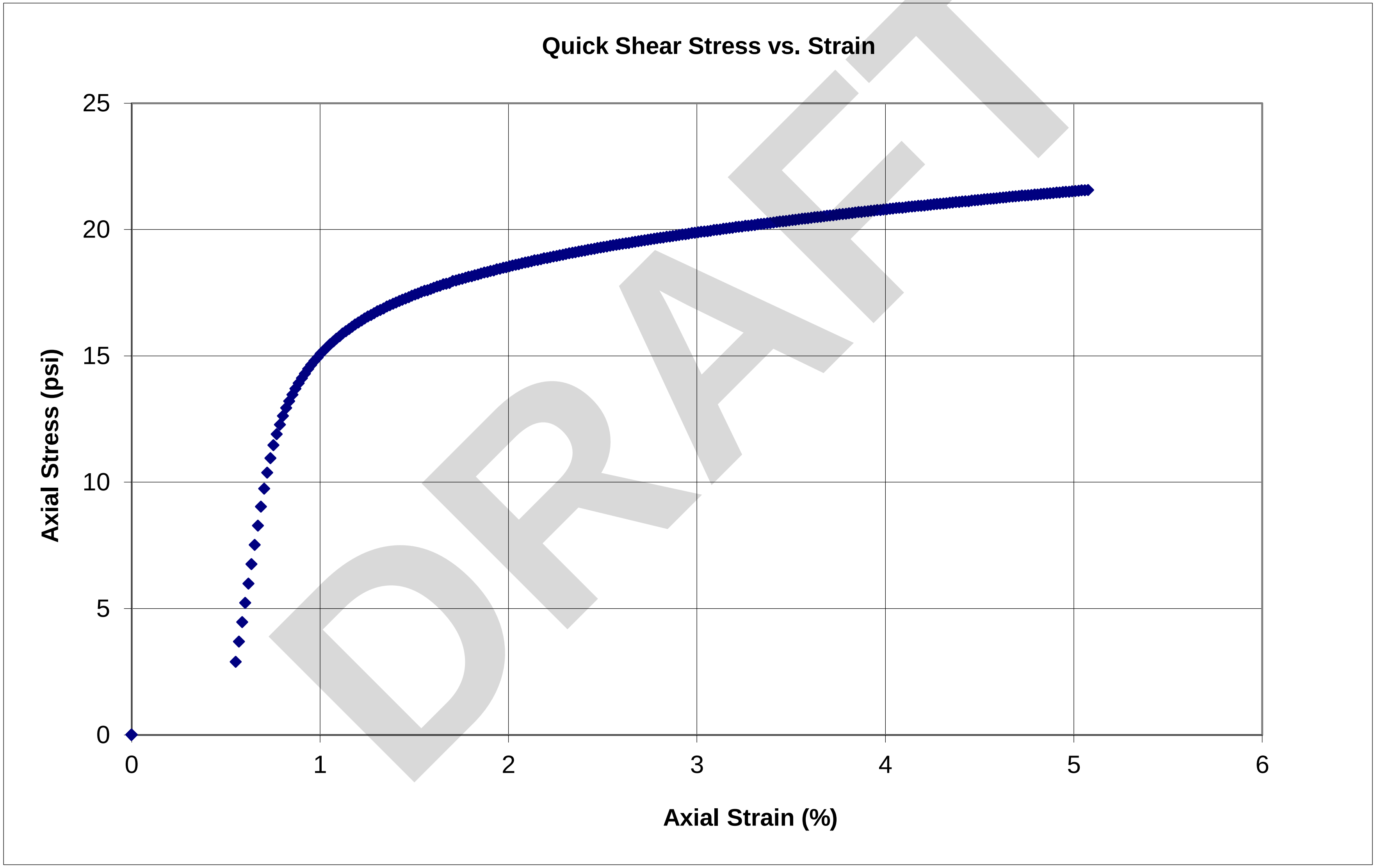
Date Reported:	5/27/2014	0.00
Terracon Lab No.	Bulk 2_OMC+2%	
Project No.	04135111	



$Mr = K1 \times S_{cylic}^{k2}$

S3 (psi)	K1	K2	R^2
6	10716.5	-0.164	0.97
4	8371.3	-0.136	0.97
2	6305.6	-0.110	0.82
All	8271.3	-0.136	0.16

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 2_OMC+2%
Project No. 04135111



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 27-May-14
Lab No.: Bulk 3_OMC
Project No.: 04135111

Soil Map Unit: 0
Soil Symbol: CL
Depth (in.): 6 to 36
Compaction Method: Static
Max. Dry Density (pcf): 101.3
Opt. Moisture Content (%): 20.4
Inside Mold Diameter (in): 3.94

Weight of Wet Soil (lb): 6.24
Initial Sample Diameter (in): 3.94
Initial Sample Height (in): 7.90
Initial Sample Area (in^2): 12.17
Sample Volume (in^3): 96.16
Compacted Moisture Content(%): 20.9
Wet Density (pcf): 112.1
Dry Density (pcf): 92.7

Test Date: March 24, 2014

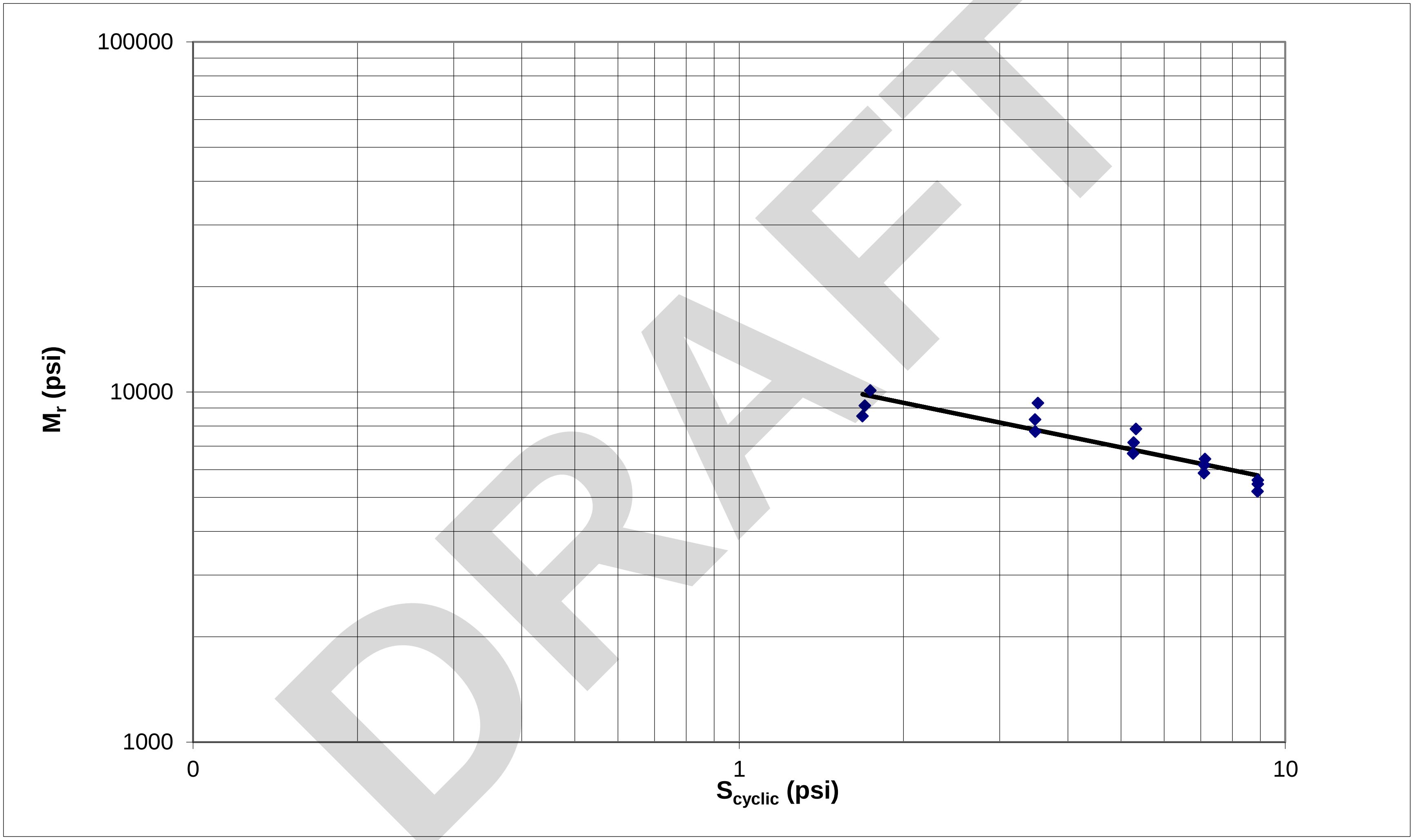
Final Sample Height (in): 7.9
Final Sample Wet Weight (lb): 6.24
Final Moisture Content (%): 20.7
Accumulated Strain (%): 0.26

Percent Passing No. 10: 8
Percent Passing No. 200: 86.0
Liquid Limit: 41
Plasticity Index: 25

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.01	2.00	24.0	21.2	2.8	1.97	1.74	0.232	0.0015	0.0012	0.0014	0.000172	10,095
6.00	4.00	48.2	42.9	5.3	3.96	3.53	0.437	0.0032	0.0027	0.0030	0.000379	9,291
6.01	6.00	72.8	64.9	8.0	5.98	5.33	0.654	0.0055	0.0052	0.0054	0.000680	7,837
6.00	8.00	97.4	86.8	10.6	8.00	7.13	0.869	0.0094	0.0081	0.0088	0.001108	6,437
6.01	10.00	121.8	108.4	13.4	10.01	8.90	1.102	0.0133	0.0118	0.0126	0.001591	5,596
4.02	2.00	24.0	20.7	3.3	1.97	1.70	0.269	0.0016	0.0013	0.0015	0.000186	9,144
4.00	4.00	48.2	42.4	5.8	3.96	3.48	0.479	0.0037	0.0029	0.0033	0.000417	8,345
4.00	6.00	72.9	64.2	8.7	5.99	5.28	0.715	0.0064	0.0052	0.0058	0.000736	7,169
4.01	8.00	97.4	86.5	10.9	8.00	7.10	0.895	0.0098	0.0083	0.0091	0.001148	6,188
4.00	10.00	121.6	108.4	13.2	9.99	8.91	1.085	0.0137	0.0121	0.0129	0.001632	5,455
2.00	2.00	23.7	20.5	3.2	1.95	1.68	0.264	0.0017	0.0014	0.0016	0.000197	8,533
2.02	4.00	48.3	42.4	5.9	3.97	3.48	0.484	0.0040	0.0032	0.0036	0.000452	7,707
2.02	6.00	72.7	64.1	8.6	5.97	5.26	0.710	0.0069	0.0056	0.0062	0.000790	6,666
2.02	8.00	97.2	86.4	10.7	7.98	7.10	0.883	0.0102	0.0089	0.0096	0.001211	5,864
1.99	10.00	121.4	108.3	13.1	9.97	8.90	1.075	0.0142	0.0128	0.0135	0.001711	5,201

Terracon

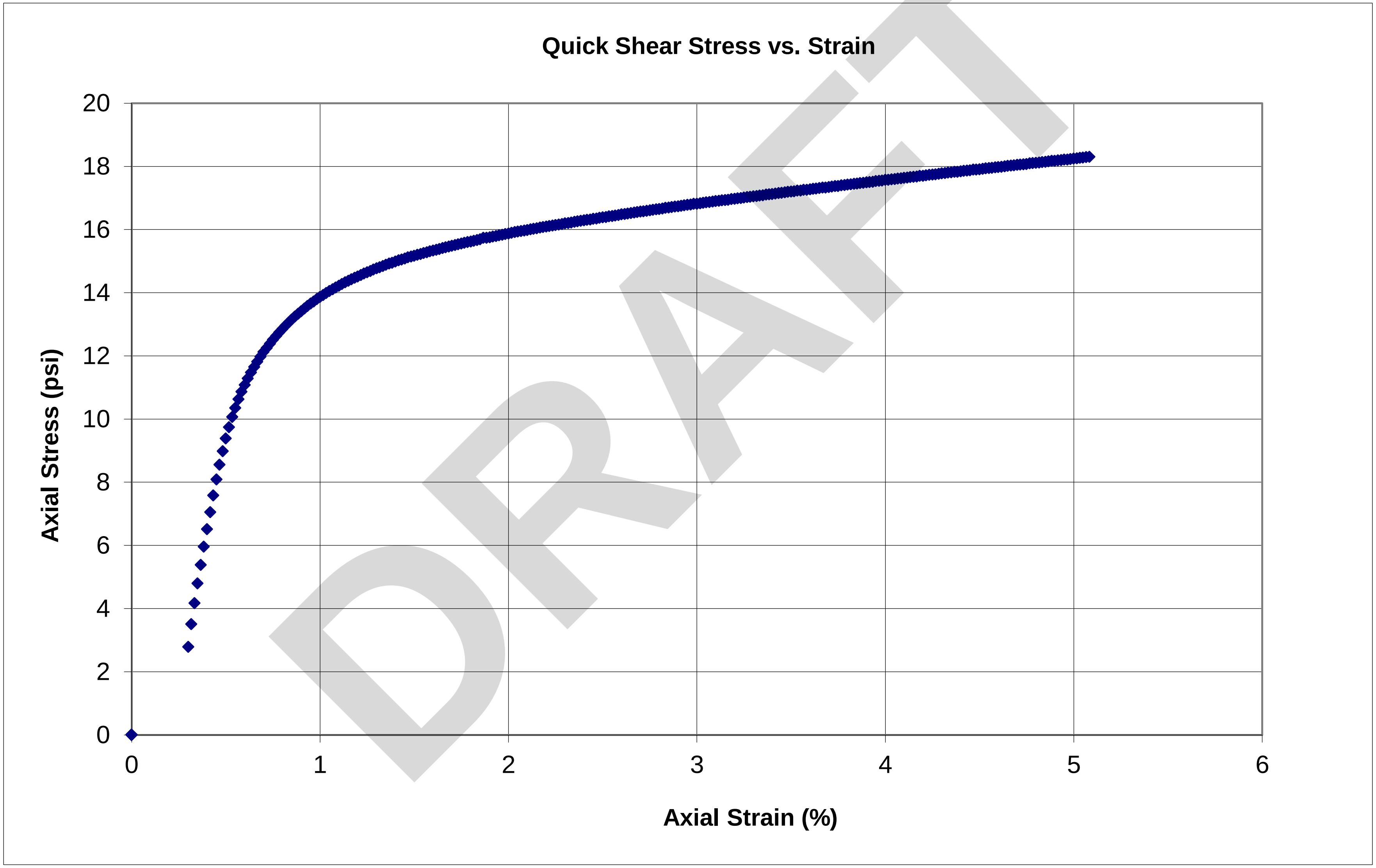
Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 3_OMC
Project No. 04135111



$Mr = K1 \times S_{cylic}^{k2}$

S3 (psi)	K1	K2	R^2
6	13284.4	-0.360	0.89
4	11399.7	-0.309	0.92
2	10430.3	-0.293	0.93
All	11620.9	-0.319	0.83

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 3_OMC
Project No. 04135111



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

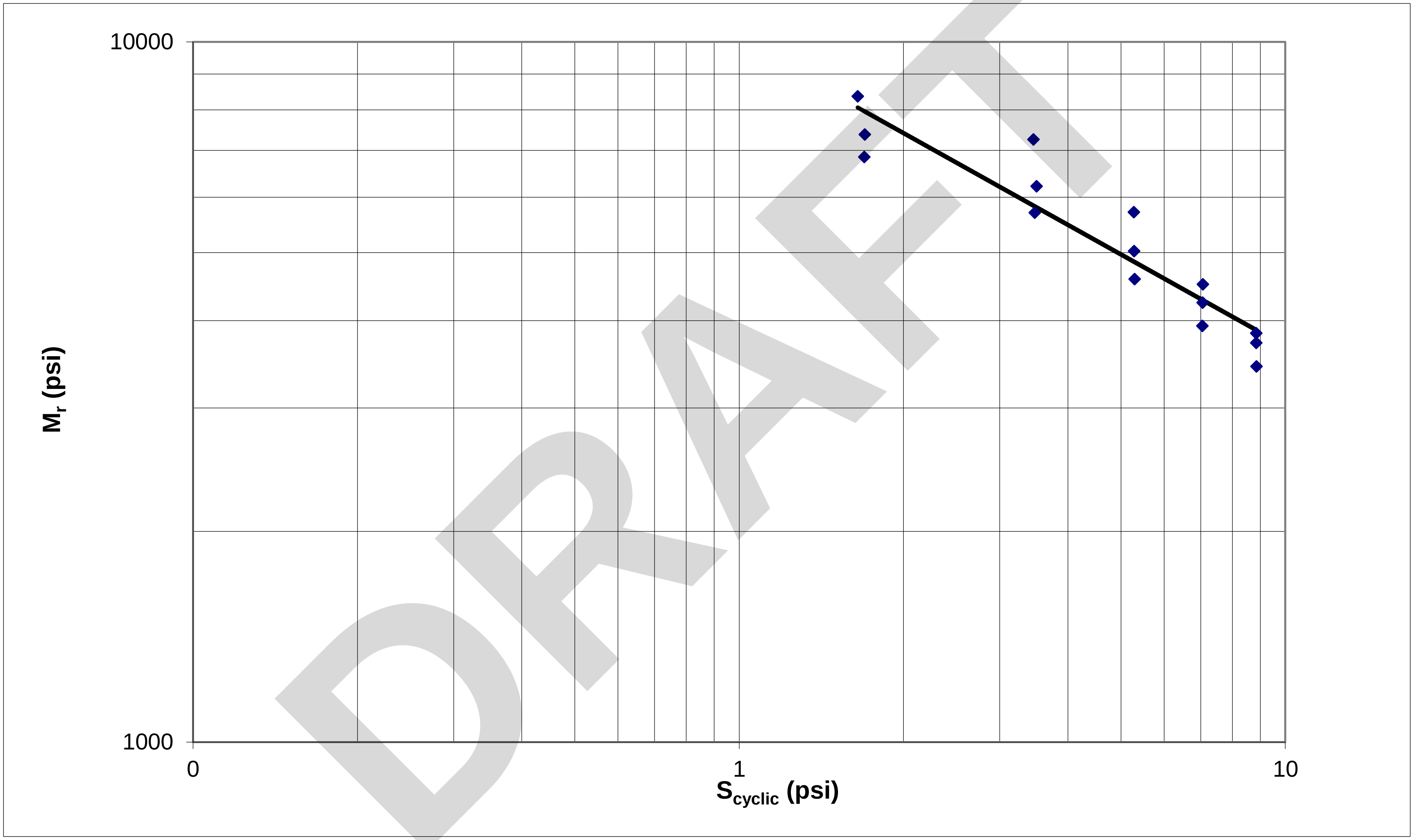
Report Date: 27-May-14
Lab No.: Bulk 3_OMC+2%
Project No.: 04135111

Test Date: March 24, 2014

Soil Map Unit:	0				
Soil Symbol:	CL	Weight of Wet Soil (lb)	6.34		
Depth (in.)	6 to 36	Initial Sample Diameter (in)	3.94		
Compaction Method	Static	Initial Sample Height (in)	7.87	Final Sample Height (in)	7.8
Max. Dry Density (pcf)	101.3	Initial Sample Area (in^2)	12.17	Final Sample Wet Weight (lb)	6.34
Opt. Moisture Content (%)	20.4	Sample Volume (in^3)	95.86	Final Moisture Content (%)	22.7
Inside Mold Diameter (in)	3.94	Compacted Moisture Content(%)	22.9	Accumulated Strain (%)	0.75
		Wet Density (pcf)	114.2		
		Dry Density (pcf)	92.9	Percent Passing No. 10	8
				Percent Passing No. 200	86.0
				Liquid Limit	41
				Plasticity Index	25

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	24.2	20.1	4.1	1.99	1.65	0.337	0.0016	0.0015	0.0016	0.000197	8,360
6.00	4.00	48.7	42.1	6.5	4.00	3.46	0.537	0.0039	0.0036	0.0038	0.000477	7,255
6.01	6.00	73.4	64.3	9.1	6.02	5.28	0.745	0.0076	0.0070	0.0073	0.000924	5,713
6.00	8.00	97.7	86.1	11.6	8.02	7.07	0.951	0.0130	0.0117	0.0124	0.001569	4,505
6.00	10.00	121.8	107.8	14.0	10.00	8.85	1.148	0.0189	0.0175	0.0182	0.002307	3,835
4.03	2.00	24.7	20.7	4.0	2.02	1.70	0.327	0.0020	0.0016	0.0018	0.000230	7,377
4.02	4.00	49.1	42.7	6.4	4.03	3.51	0.525	0.0049	0.0039	0.0044	0.000563	6,222
4.01	6.00	73.3	64.4	8.9	6.02	5.29	0.732	0.0089	0.0077	0.0083	0.001052	5,026
4.02	8.00	97.5	86.0	11.5	8.00	7.06	0.946	0.0142	0.0120	0.0131	0.001664	4,241
4.00	10.00	121.7	107.8	13.9	9.99	8.85	1.143	0.0196	0.0179	0.0188	0.002381	3,715
2.00	2.00	24.5	20.6	3.8	2.01	1.69	0.315	0.0021	0.0018	0.0019	0.000248	6,846
1.99	4.00	48.8	42.4	6.4	4.01	3.48	0.527	0.0053	0.0043	0.0048	0.000610	5,702
1.99	6.00	73.4	64.6	8.8	6.02	5.30	0.722	0.0099	0.0083	0.0091	0.001157	4,582
1.99	8.00	97.1	85.9	11.3	7.97	7.05	0.925	0.0152	0.0131	0.0141	0.001794	3,928
2.01	10.00	121.7	107.9	13.8	9.99	8.86	1.132	0.0212	0.0194	0.0203	0.002578	3,438

Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 3_OMC+2%
Project No. 04135111

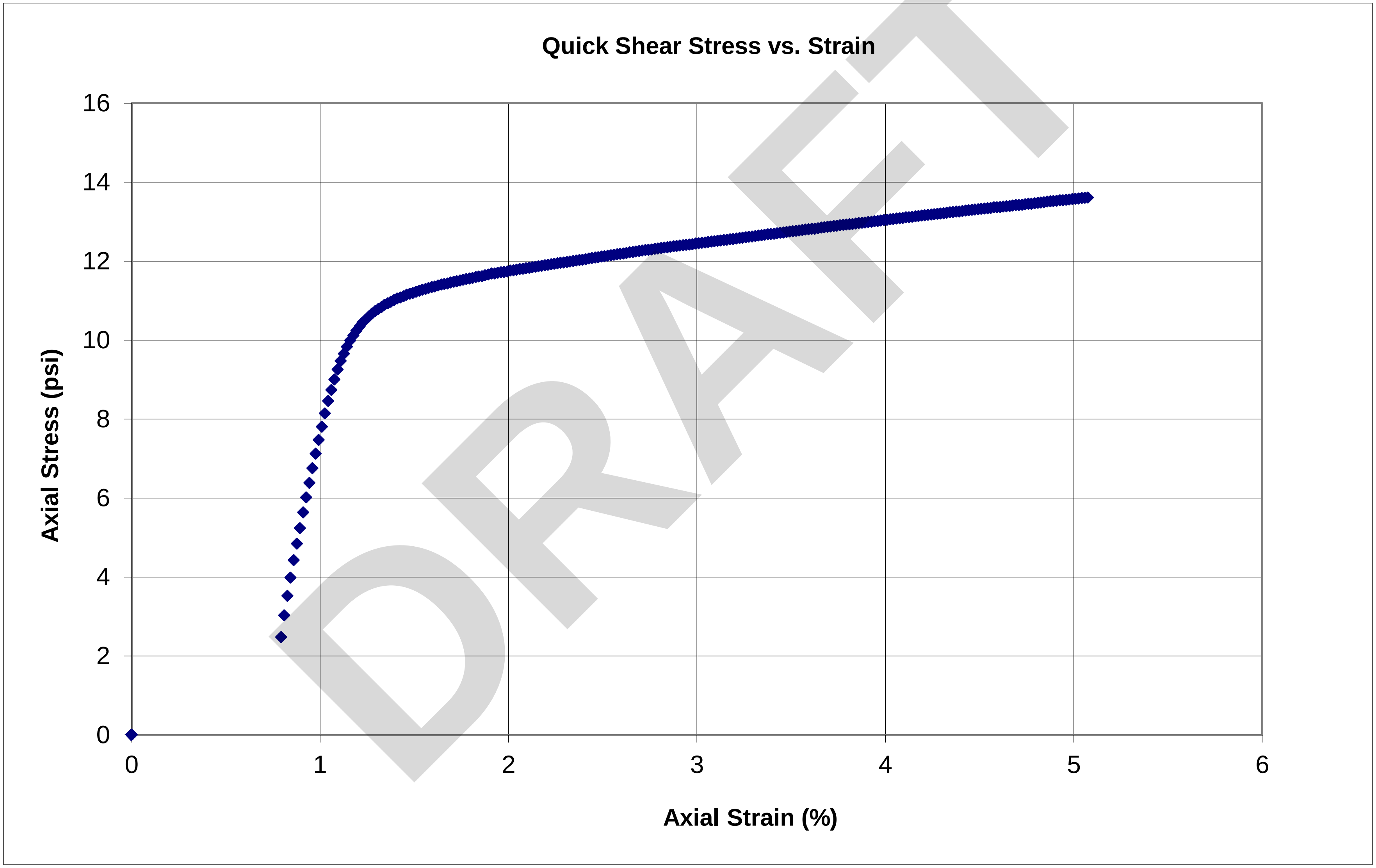


$Mr = K1 \times S_{cylic}^{k2}$

S3 (psi)	K1	K2	R^2
6	11498.6	-0.466	0.92
4	9716.6	-0.418	0.96
2	8953.4	-0.418	0.97
All	10017.4	-0.435	0.87

Terracon

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 3_OMC+2%
Project No. 04135111



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date:	27-May-14
Lab No.:	Bulk 4_OMC
Project No.:	04135111
Test Date:	April 1, 2014

Soil Map Unit:	0
Soil Symbol:	A-4 / GC-GM
Depth (in.)	0
Compaction Method	Static
Max. Dry Density (pcf)	115.0
Opt. Moisture Content (%)	13.0
Inside Mold Diameter (in)	3.94

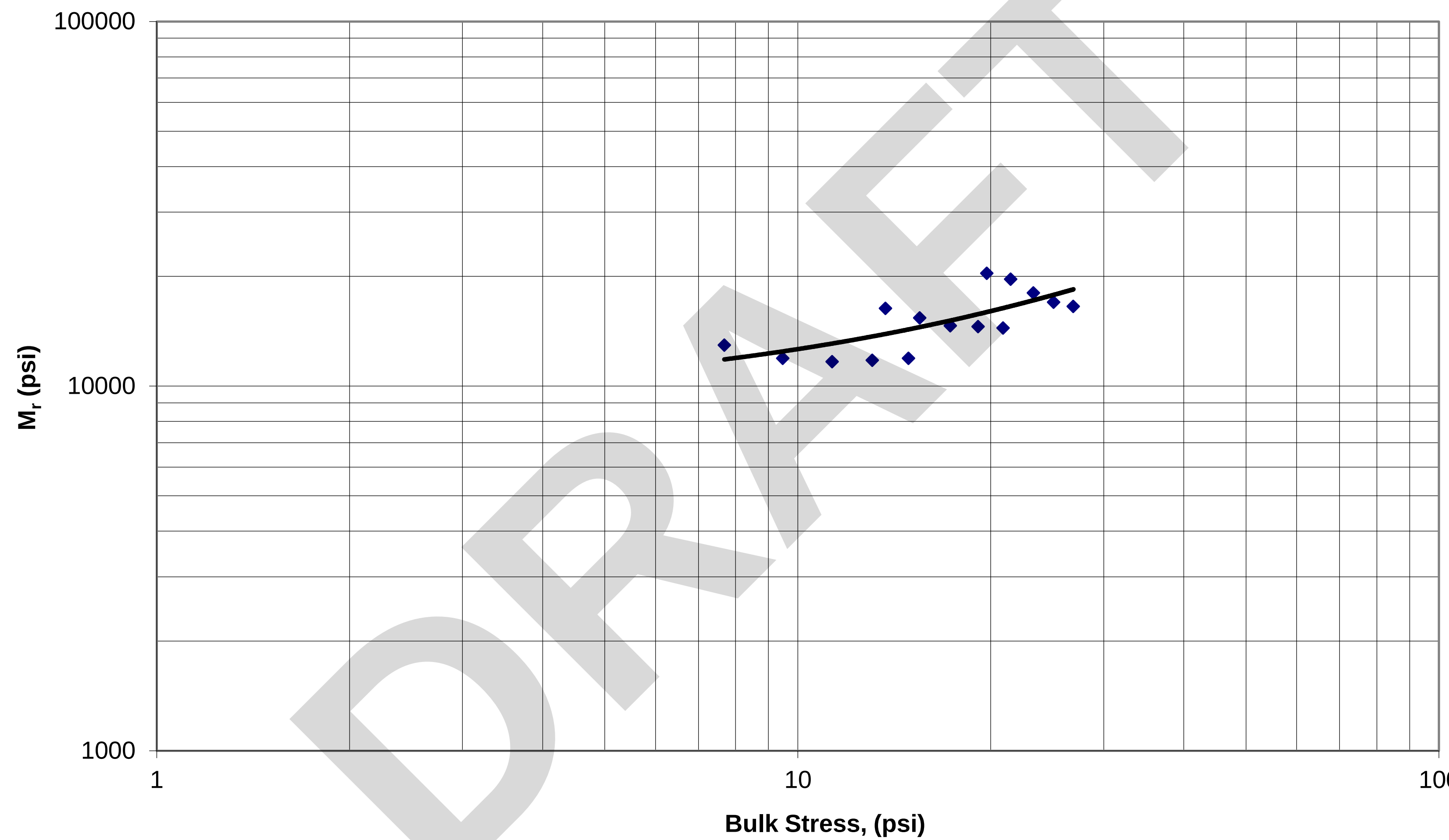
Weight of Wet Soil (lb)	6.85
Initial Sample Diameter (in)	3.94
Initial Sample Height (in)	7.87
Initial Sample Area (in^2)	12.17
Sample Volume (in^3)	95.86
Compacted Moisture Content(%)	12.5
Wet Density (pcf)	123.4
Dry Density (pcf)	109.7

Final Sample Height (in)	7.9
Final Sample Wet Weight (lb)	6.84
Final Moisture Content (%)	12.5
Accumulated Strain (%)	0.17
Percent Passing No. 10	0
Percent Passing No. 200	0.0
Liquid Limit	22
Plasticity Index	4

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	24.2	20.8	3.4	1.99	1.71	0.281	0.0007	0.0006	0.0007	0.000084	20,369
5.99	4.00	48.5	42.8	5.7	3.99	3.52	0.472	0.0014	0.0014	0.0014	0.000179	19,618
6.00	6.00	73.0	64.6	8.4	5.99	5.31	0.687	0.0025	0.0022	0.0023	0.000295	17,993
6.00	8.00	97.4	86.1	11.3	8.00	7.07	0.925	0.0034	0.0031	0.0033	0.000417	16,971
6.00	10.00	121.8	108.2	13.6	10.01	8.89	1.114	0.0044	0.0041	0.0042	0.000538	16,520
4.00	2.00	24.2	20.7	3.5	1.99	1.70	0.291	0.0009	0.0007	0.0008	0.000104	16,337
4.00	4.00	48.5	42.5	6.0	3.98	3.49	0.492	0.0019	0.0017	0.0018	0.000227	15,369
4.00	6.00	73.0	64.5	8.5	6.00	5.30	0.701	0.0031	0.0026	0.0029	0.000362	14,633
4.01	8.00	97.5	86.2	11.2	8.01	7.08	0.924	0.0041	0.0035	0.0038	0.000487	14,547
4.00	10.00	121.7	108.2	13.5	10.00	8.89	1.106	0.0051	0.0046	0.0049	0.000617	14,414
2.01	2.00	24.0	20.3	3.7	1.97	1.67	0.306	0.0011	0.0009	0.0010	0.000129	12,953
2.00	4.00	48.6	42.4	6.2	3.99	3.48	0.506	0.0024	0.0022	0.0023	0.000292	11,920
2.00	6.00	73.0	64.6	8.4	6.00	5.31	0.692	0.0039	0.0033	0.0036	0.000456	11,651
2.00	8.00	97.3	86.2	11.1	7.99	7.08	0.909	0.0051	0.0044	0.0047	0.000603	11,755
2.00	10.00	121.6	108.1	13.5	9.99	8.89	1.108	0.0062	0.0056	0.0059	0.000746	11,905

Terracon

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 4_OMC
Project No. 04135111

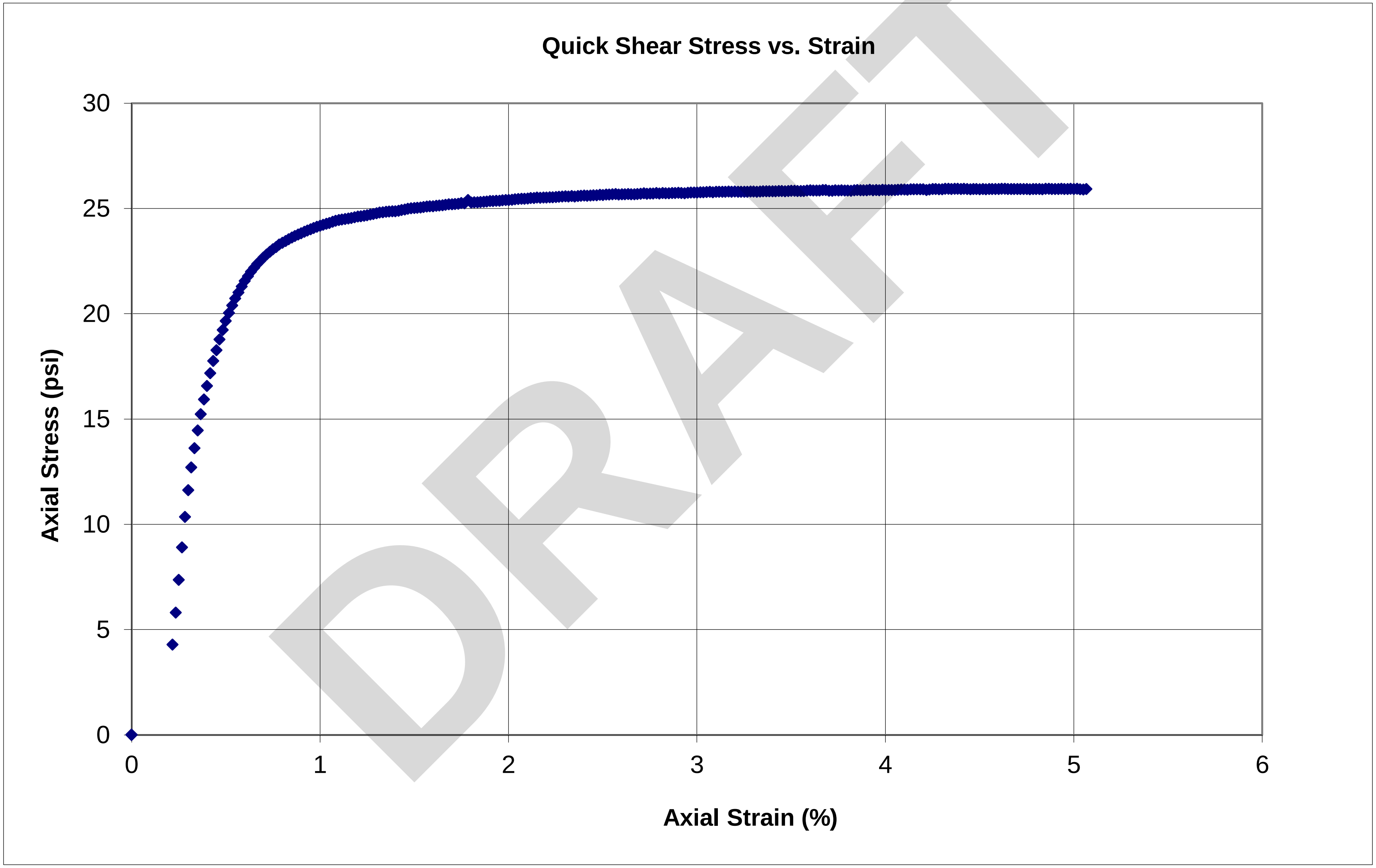


$Mr = K1 \times \Theta^{k2}$

$[\Theta = S_{cyclic} + 3\ (S3)]$

S3 (psi)	K1	K2	R^2
6	179639.9	-0.728	0.98
4	34888.8	-0.296	0.89
2	16096.9	-0.122	0.56
All	5424.1	0.361	0.50

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 4_OMC
Project No. 04135111



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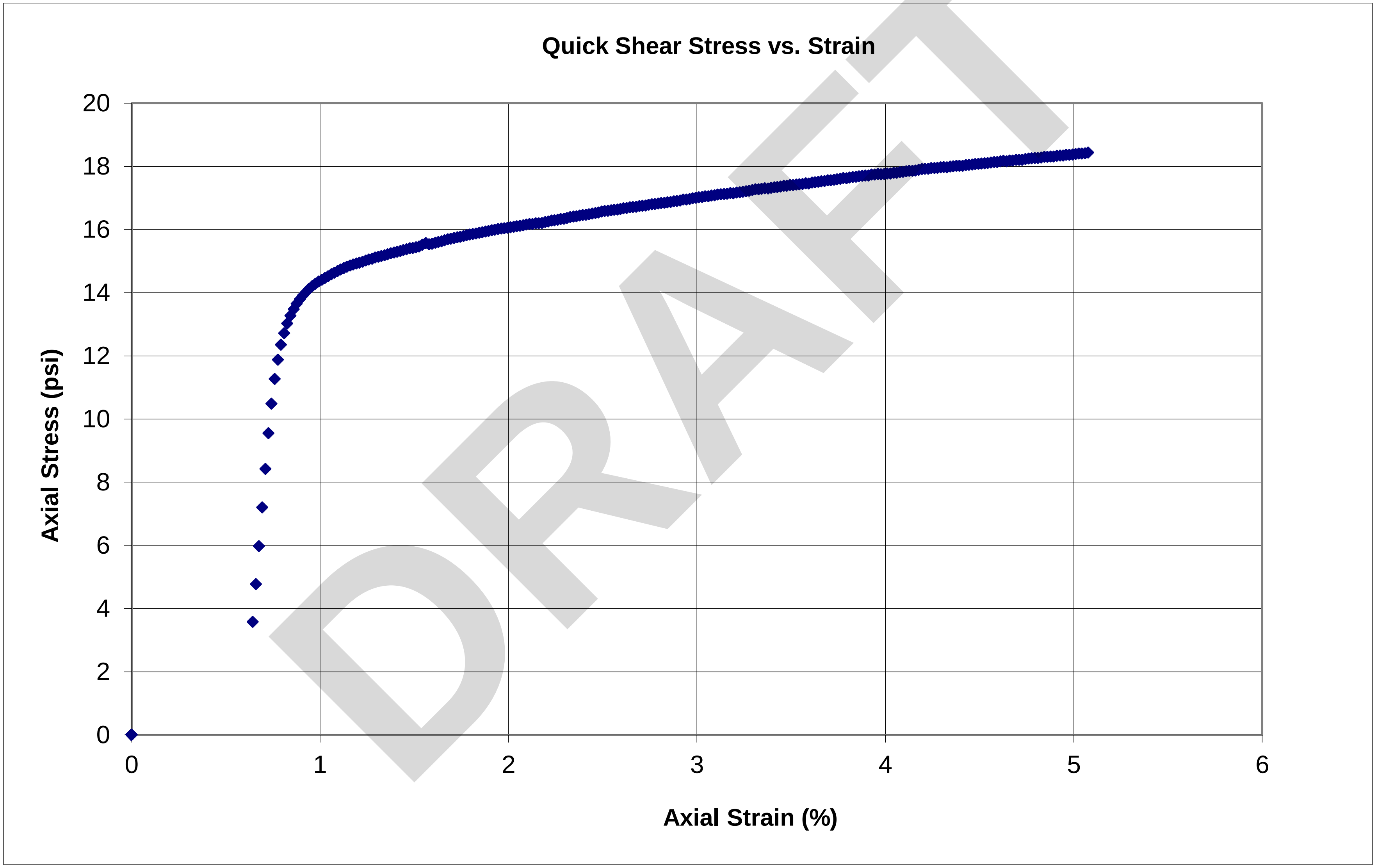
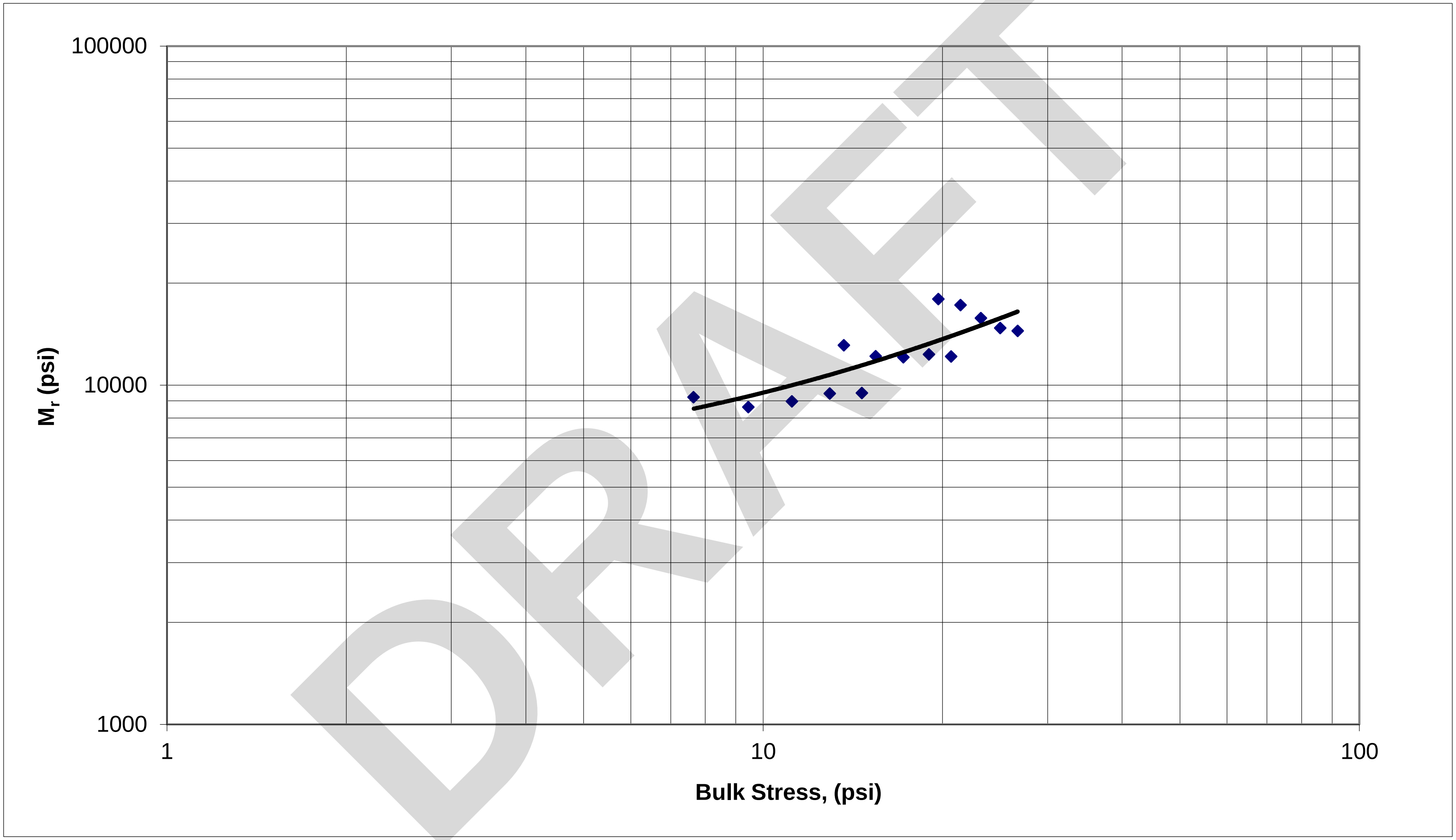
Project No. 04135111



Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 4_OMC+2%
Project No. 04135111



$Mr = K1 \times \Theta^{k2}$

$[\Theta = S_{cyclic} + 3\ (S3)]$

S3 (psi)	K1	K2	R^2
6	180051.2	-0.772	0.97
4	18431.2	-0.141	0.48
2	7516.4	0.082	0.28
All	2650.1	0.547	0.67

Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date:	27-May-14
Lab No.:	Bulk 4_OMC+2%
Project No.:	04135111
Test Date:	April 1, 2014

Soil Map Unit:	0
Soil Symbol:	A-4 / GC-GM
Depth (in.)	0
Compaction Method	Static
Max. Dry Density (pcf)	115.0
Opt. Moisture Content (%)	13.0
Inside Mold Diameter (in)	3.94

Weight of Wet Soil (lb)	6.97
Initial Sample Diameter (in)	3.94
Initial Sample Height (in)	7.87
Initial Sample Area (in^2)	12.17
Sample Volume (in^3)	95.86
Compacted Moisture Content(%)	14.5
Wet Density (pcf)	125.6
Dry Density (pcf)	109.7

Final Sample Height (in)	7.8
Final Sample Wet Weight (lb)	6.96
Final Moisture Content (%)	14.5
Accumulated Strain (%)	0.60
Percent Passing No. 10	0
Percent Passing No. 200	0.0
Liquid Limit	22
Plasticity Index	4

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.01	2.00	23.6	20.0	3.6	1.94	1.64	0.299	0.0007	0.0007	0.0007	0.000091	17,943
6.01	4.00	47.5	41.4	6.1	3.90	3.40	0.498	0.0016	0.0015	0.0016	0.000197	17,232
6.00	6.00	71.9	63.2	8.7	5.91	5.19	0.715	0.0027	0.0025	0.0026	0.000330	15,754
6.00	8.00	96.4	85.1	11.4	7.92	6.99	0.934	0.0038	0.0037	0.0037	0.000474	14,745
6.00	10.00	120.3	106.3	14.0	9.88	8.73	1.151	0.0048	0.0048	0.0048	0.000605	14,438
4.00	2.00	23.8	20.3	3.4	1.95	1.67	0.283	0.0010	0.0010	0.0010	0.000127	13,096
4.01	4.00	47.7	41.7	6.0	3.92	3.43	0.492	0.0022	0.0022	0.0022	0.000282	12,173
4.00	6.00	71.9	63.3	8.6	5.91	5.20	0.705	0.0034	0.0033	0.0034	0.000431	12,071
4.01	8.00	96.1	84.9	11.2	7.89	6.97	0.924	0.0045	0.0044	0.0045	0.000566	12,312
4.00	10.00	119.6	105.6	14.0	9.82	8.67	1.153	0.0056	0.0056	0.0056	0.000713	12,155
2.00	2.00	23.8	20.1	3.7	1.95	1.65	0.301	0.0014	0.0015	0.0014	0.000180	9,208
2.00	4.00	47.9	42.0	5.9	3.93	3.45	0.485	0.0031	0.0032	0.0032	0.000401	8,610
2.00	6.00	71.9	63.0	8.9	5.91	5.18	0.732	0.0046	0.0045	0.0046	0.000578	8,956
2.00	8.00	95.7	84.5	11.2	7.86	6.94	0.921	0.0058	0.0057	0.0058	0.000735	9,437
2.00	10.00	119.2	105.2	14.0	9.79	8.64	1.151	0.0072	0.0072	0.0072	0.000912	9,474

APPENDIX C

DYNAMIC CONE PENETRATION TEST RESULTS

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-001
Date: 22-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	80	2
20	130	2
20	270	2
20	330	2
20	390	2
20	450	2
20	560	2
20	680	2
20	730	2
14	910	2
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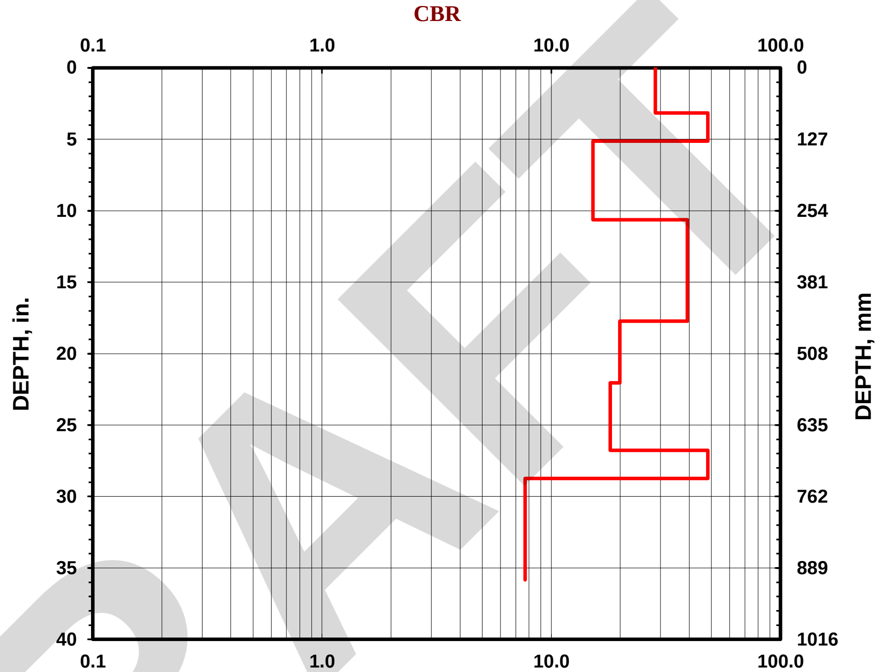

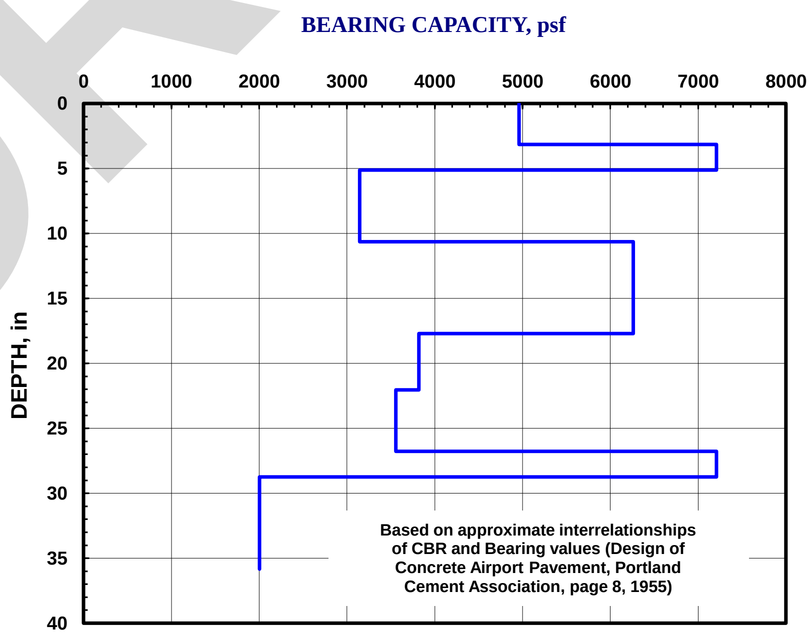

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-002

Date: 22-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	290	2
10	560	2
15	910	2
		2
		2
		2
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		2
		2
		2
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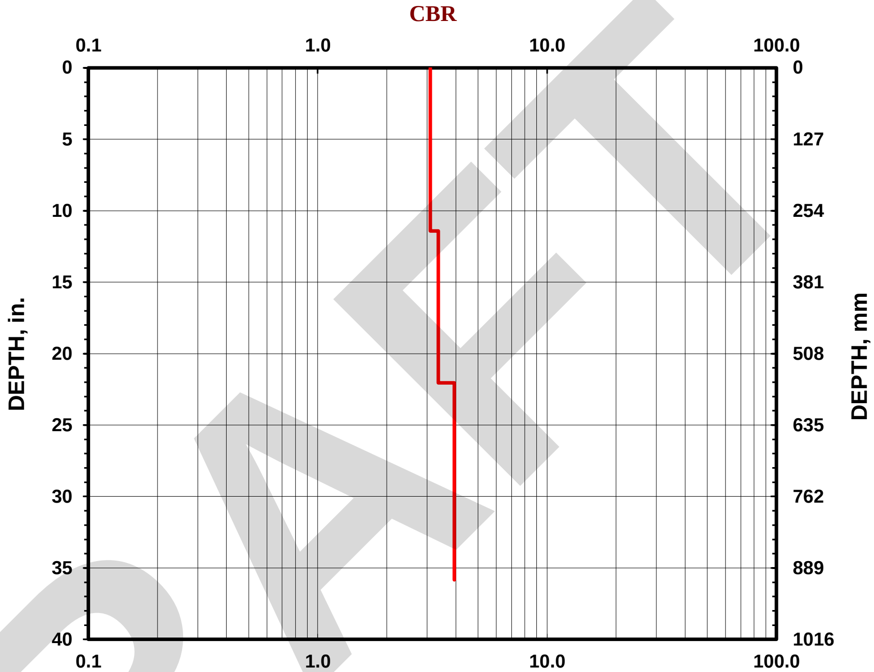

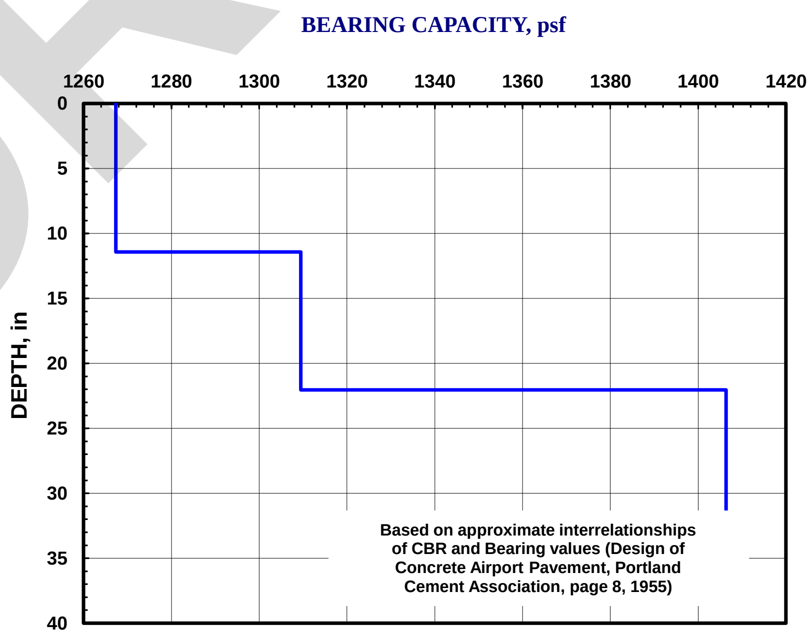

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 2-Feb-14
Location: BR-003 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	30	2
10	40	2
10	100	2
10	270	2
10	460	2
10	630	2
17	910	2
		2
		2
		2
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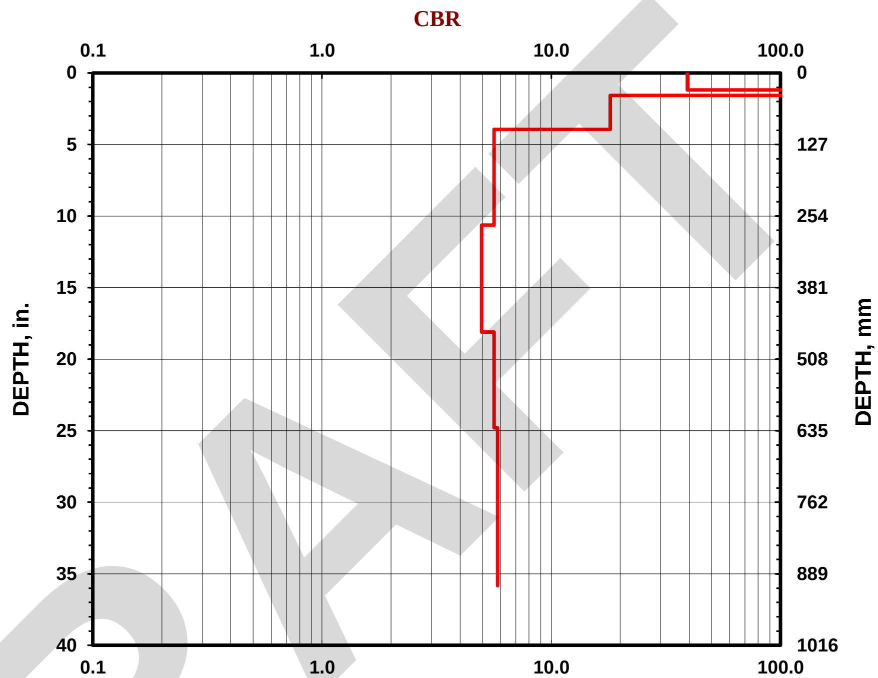

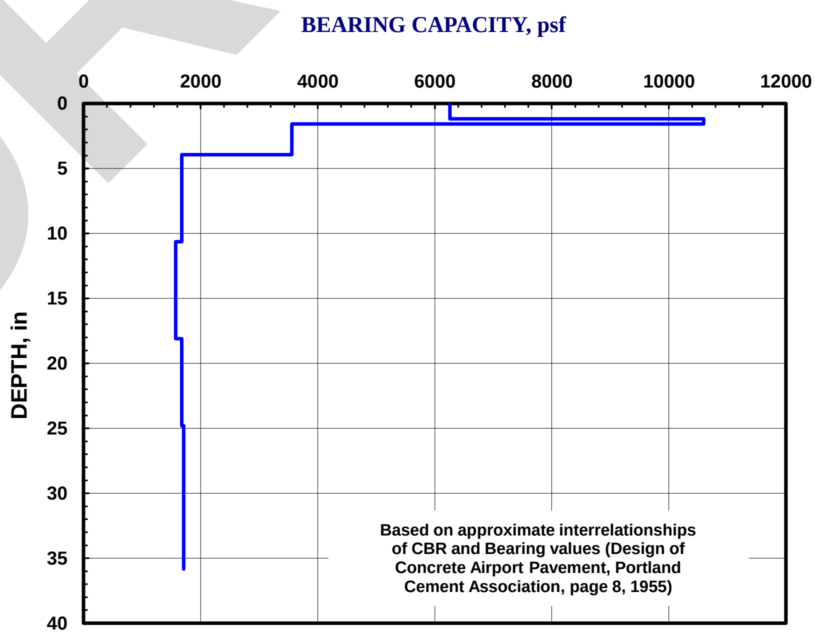

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-004

Date: 1-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	40	2
10	60	2
10	70	2
20	80	2
20	90	2
20	90	2
20	110	2
20	120	2
20	140	2
20	150	2
20	170	2
20	200	2
20	290	2
20	310	2
20	310	2
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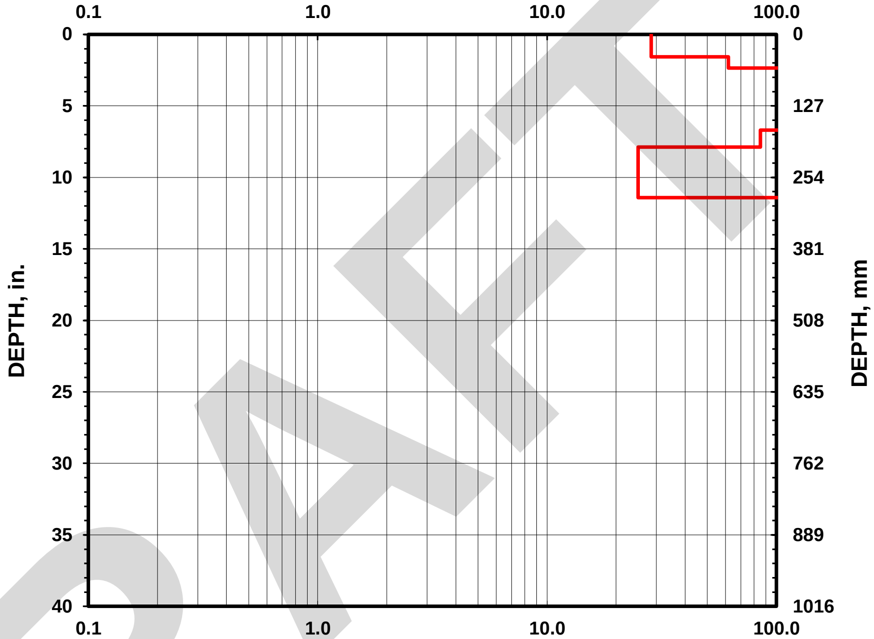

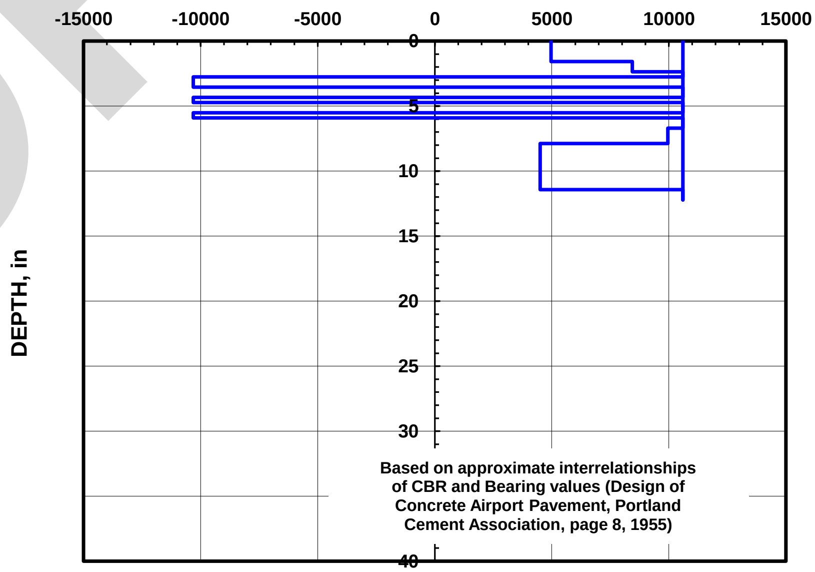

Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 2-Feb-14
Location: BR-005 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	140	2
10	330	2
10	540	2
4	910	2
		2
		2
		2
		2
		2
		2
		2
		2
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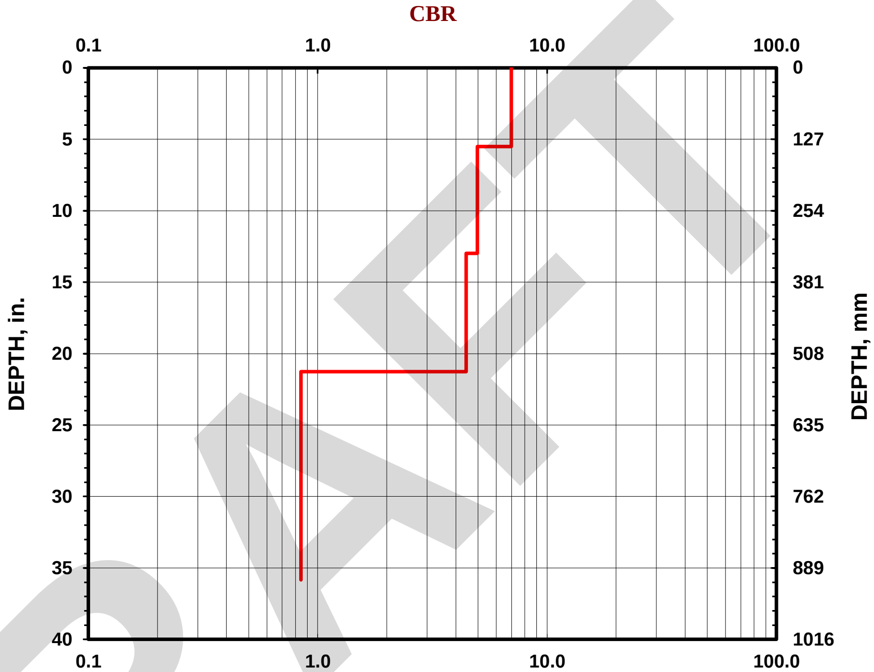

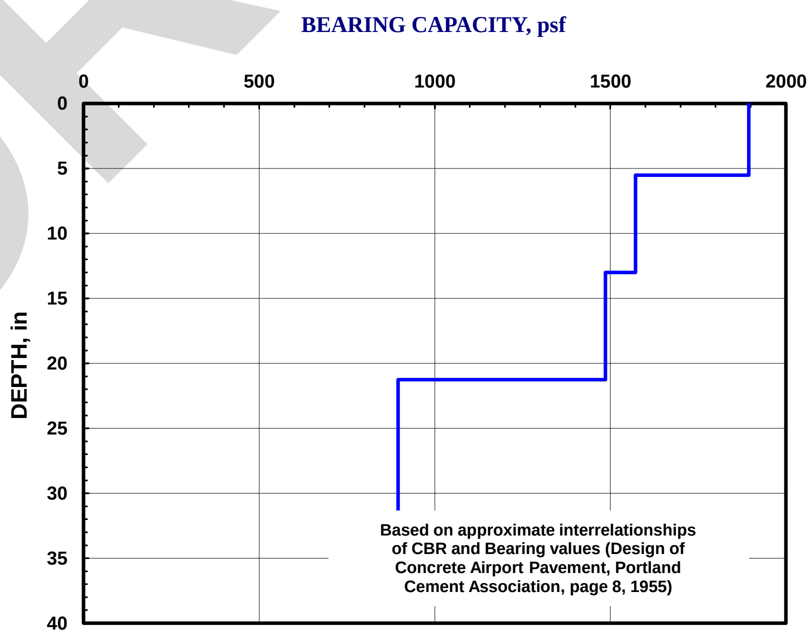

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14

Location: BR-006 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	50	2
10	80	2
20	90	2
20	120	2
20	140	2
20	140	2
	DCP Refusal	2
		2
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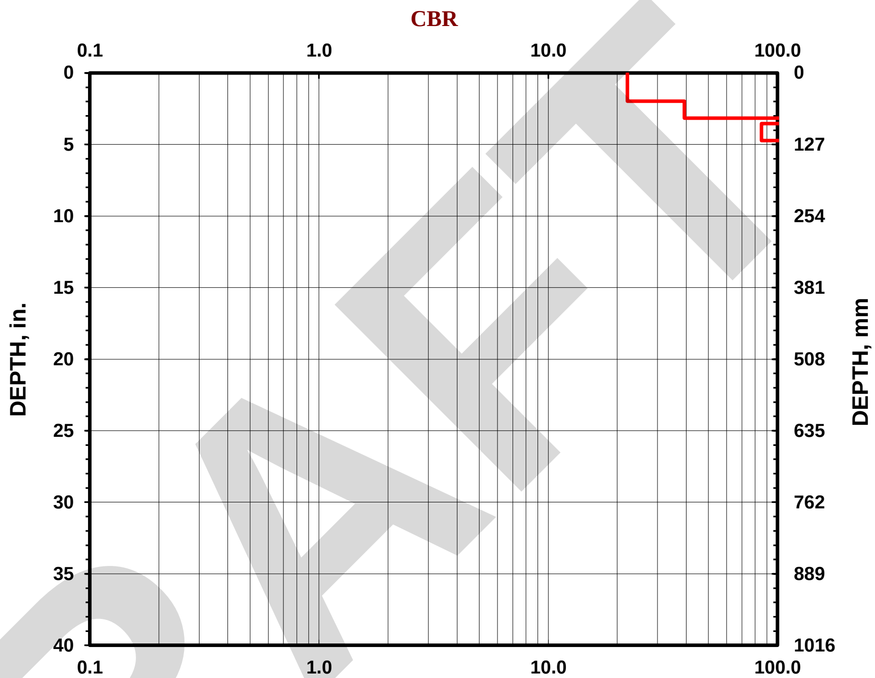

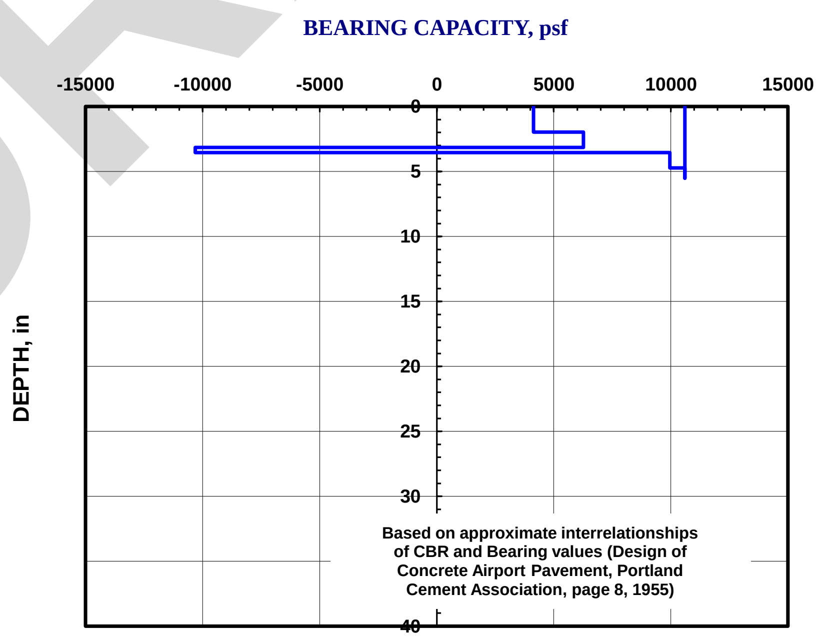

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-007

Date: 15-Feb-14
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	230	2
10	360	2
10	530	2
10	580	2
10	690	2
10	780	2
10	910	2
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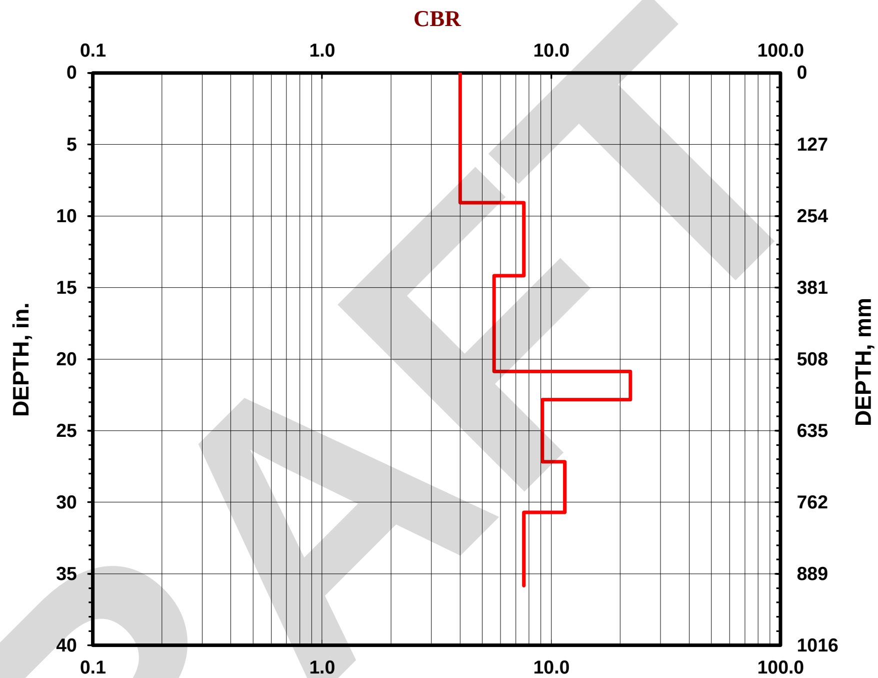

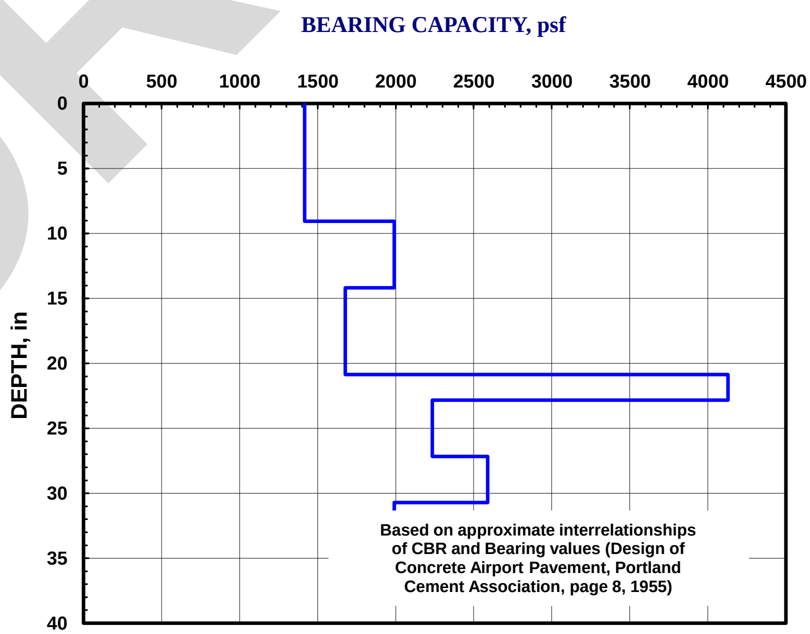

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-008

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	90	2
10	150	2
10	200	2
10	210	2
10	220	2
20	220	2
	DCP Refusal	2
		2
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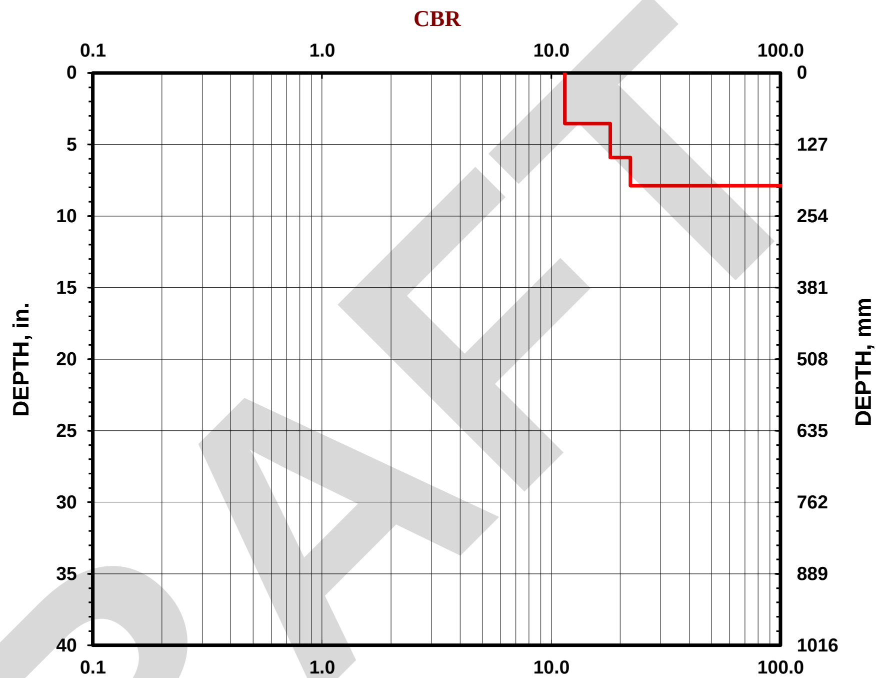

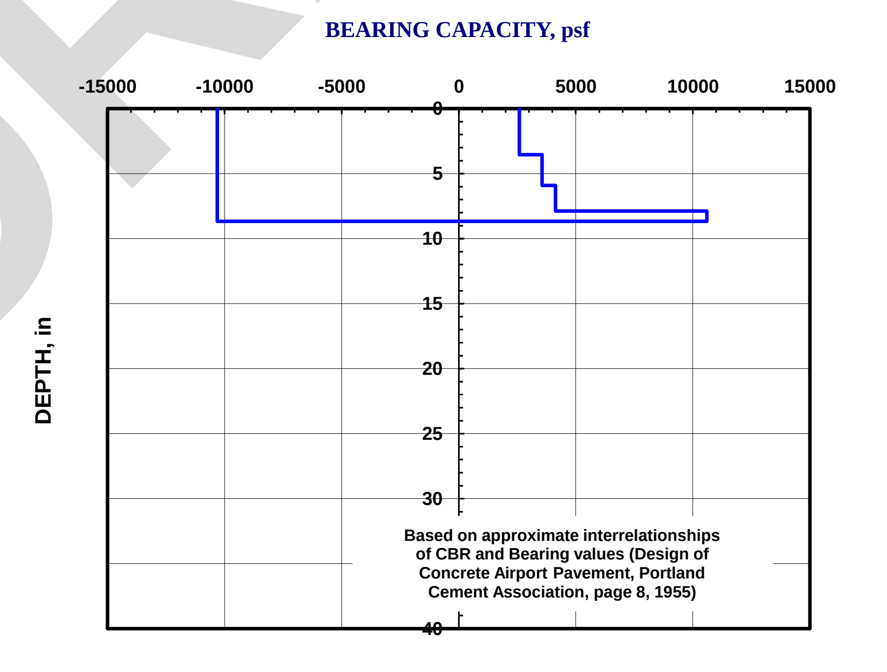

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14

Location: BR-009 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	20	2
10	40	2
20	50	2
20	50	2
20	50	2
	DCP Refusal	2
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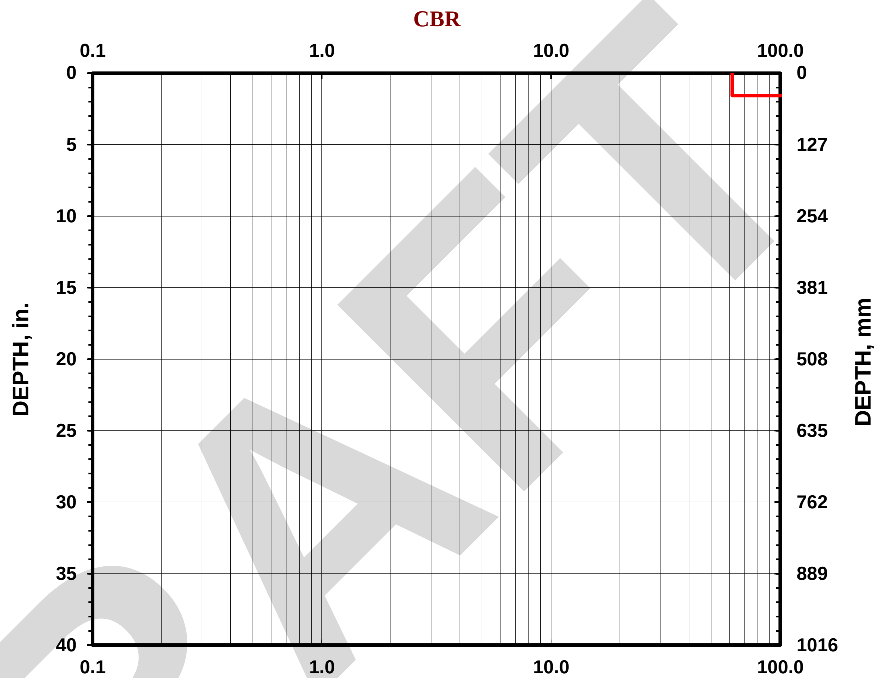

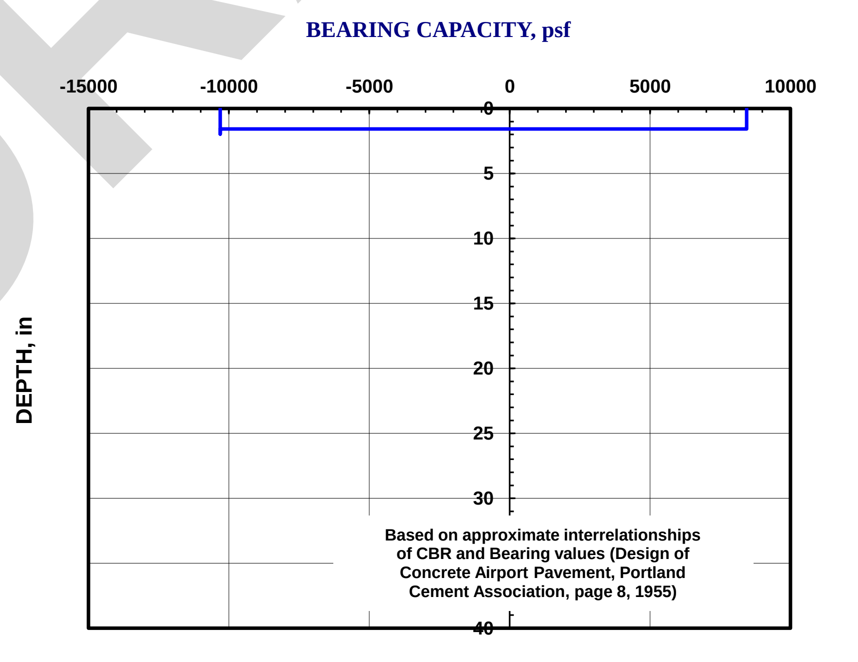

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-010

Date: 22-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	60	2
20	130	2
20	150	2
20	160	2
20	160	2
	DCP Refusal	2
		2
		2
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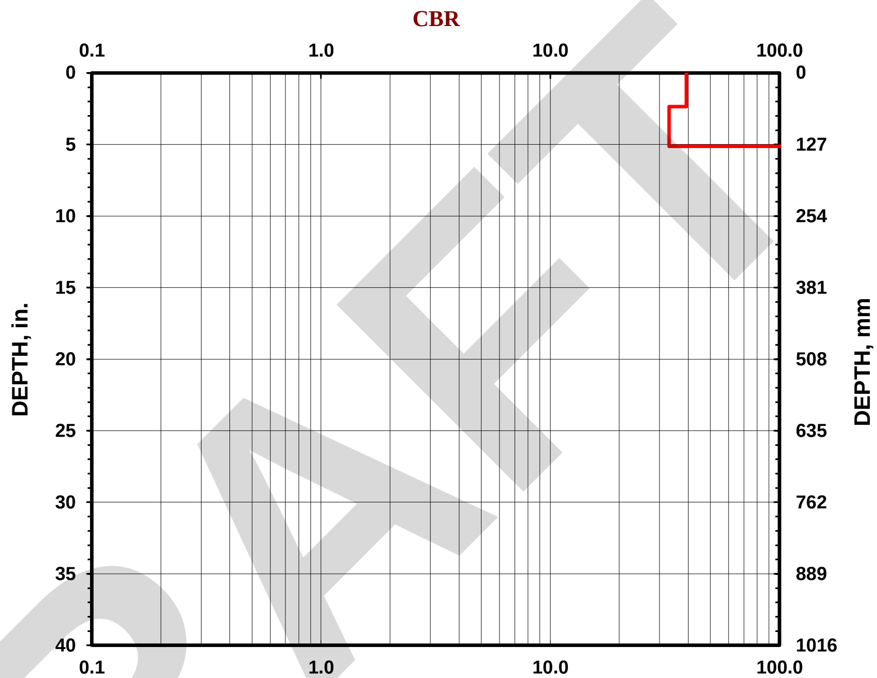

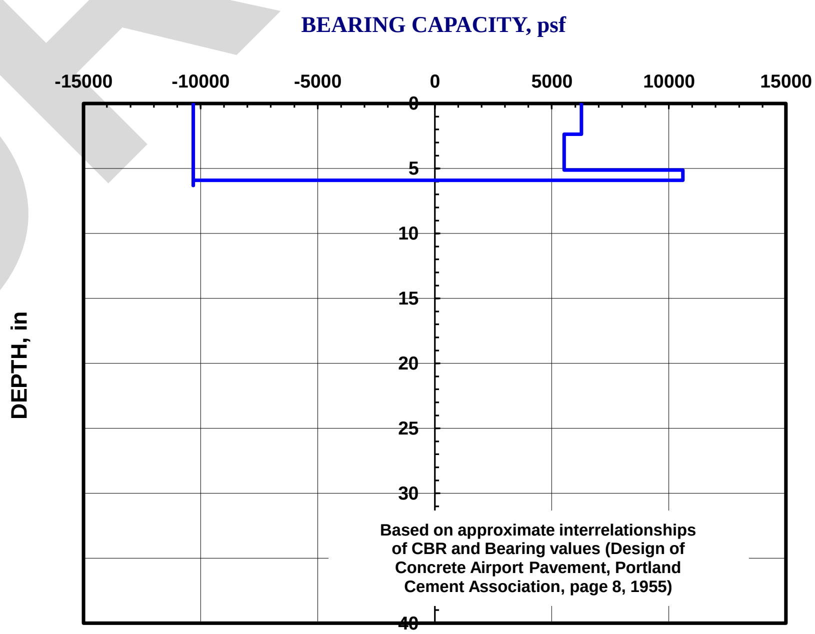

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 1-Feb-14
Location: BR-012 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	110	2
10	150	2
10	180	2
10	210	2
10	240	2
10	280	2
10	360	2
10	700	2
10	840	2
3	910	2
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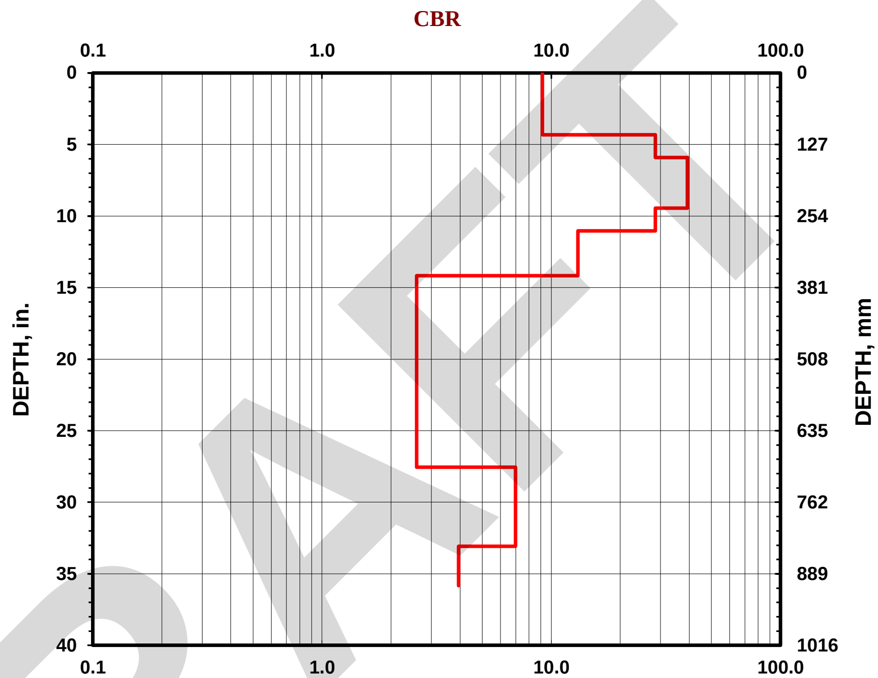

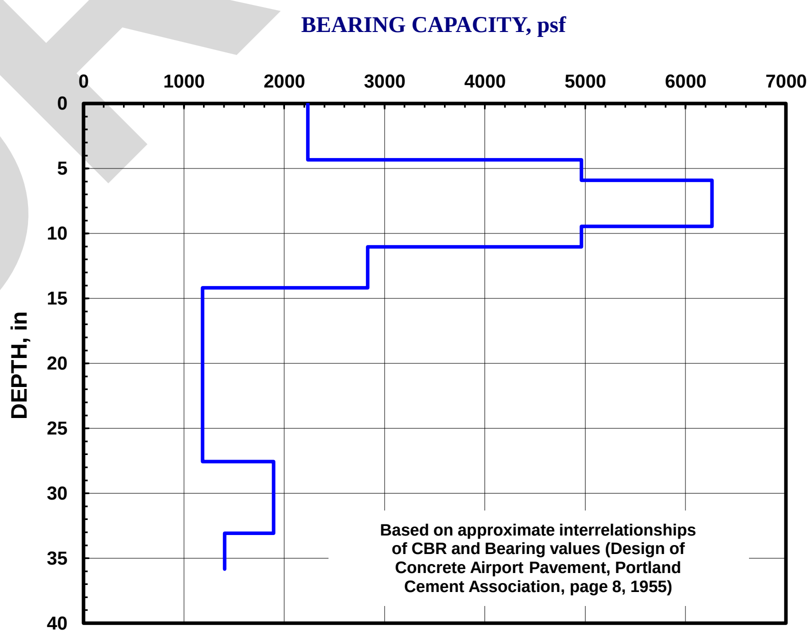

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 15-Feb-14
Location: BR-013 **Soil Type(s):** See boring log

Hammer
◉ 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	130	2
10	520	2
13	910	2
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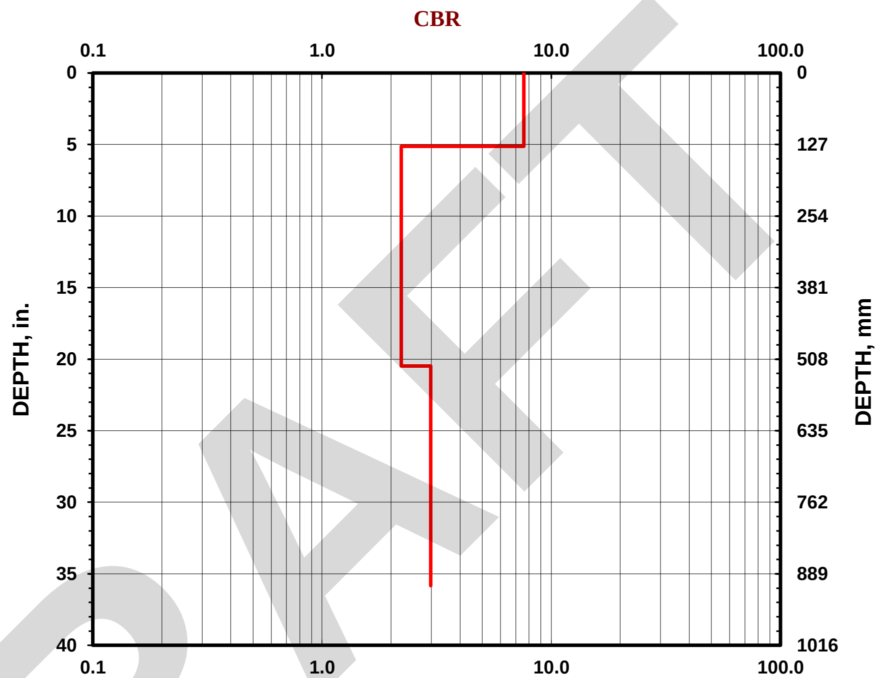

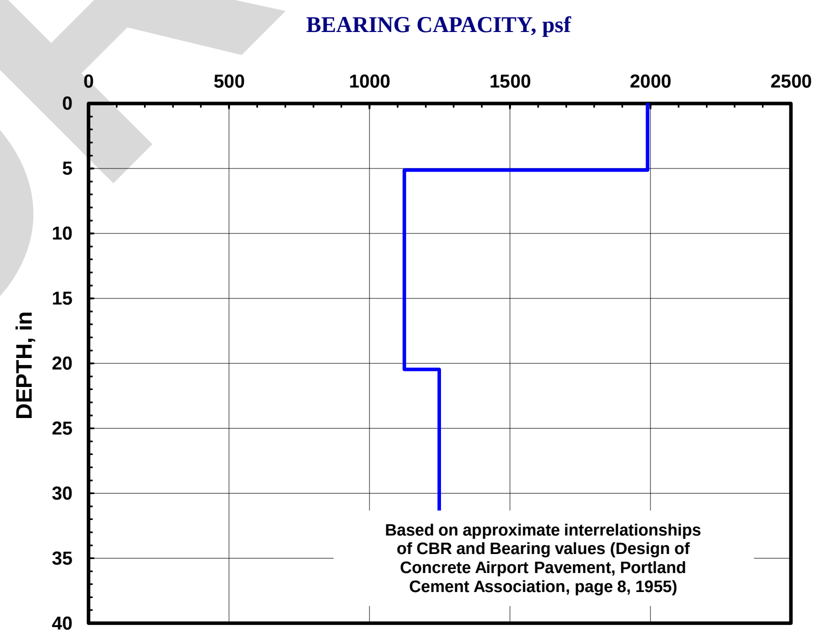

DCP TEST DATA

File Name:

Project: *04135111*
Date: 1-Feb-14
Location: BR-014
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	70	2
10	100	2
10	120	2
10	130	2
10	150	2
10	160	2
10	170	2
20	190	2
20	205	2
20	215	2
20	220	2
20	250	2
20	370	2
20	720	2
16	910	2
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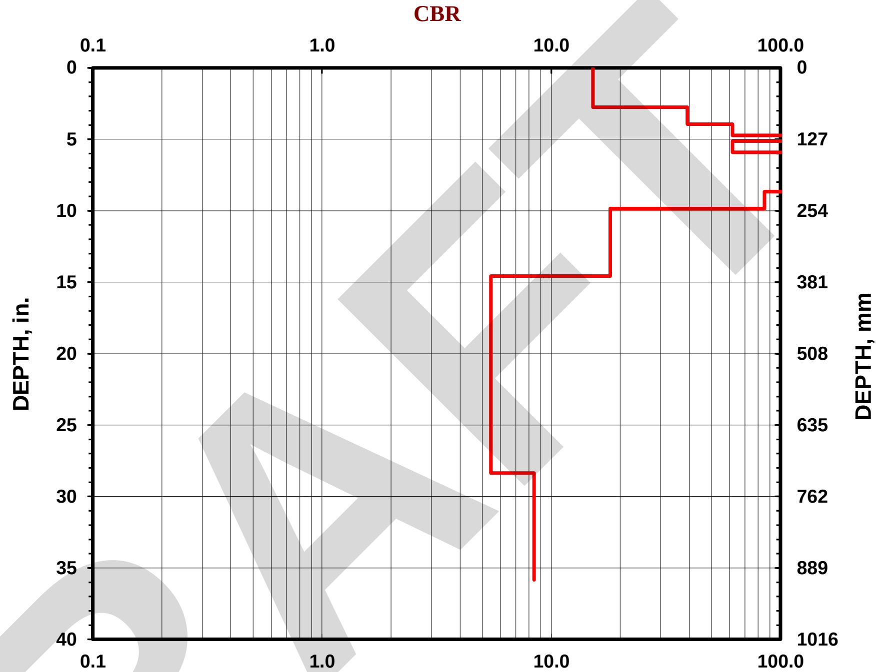

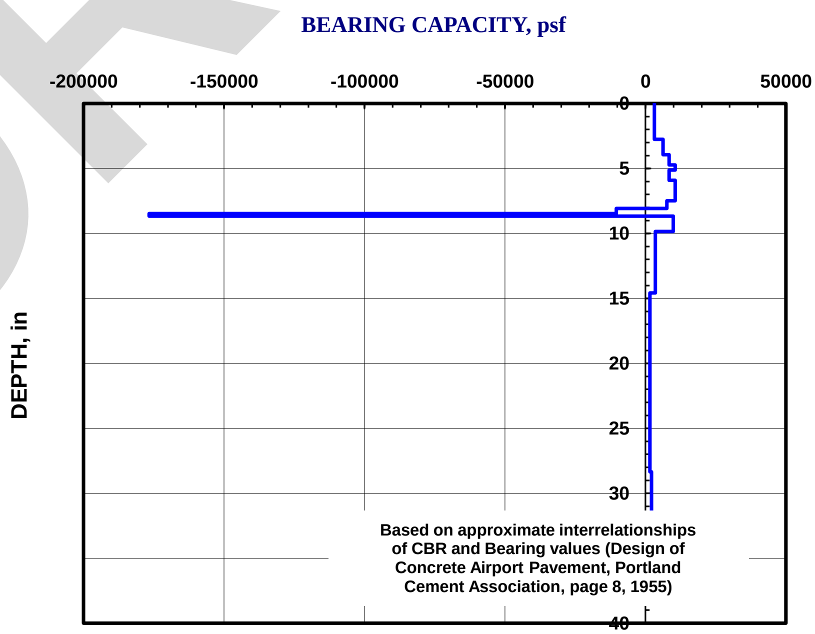

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 15-Feb-14

Location: BR-015 **Soil Type(s):** High plasticity Clay

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- (●) CH
- ( ) CL
- ( ) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	150	2
10	390	2
8	910	2
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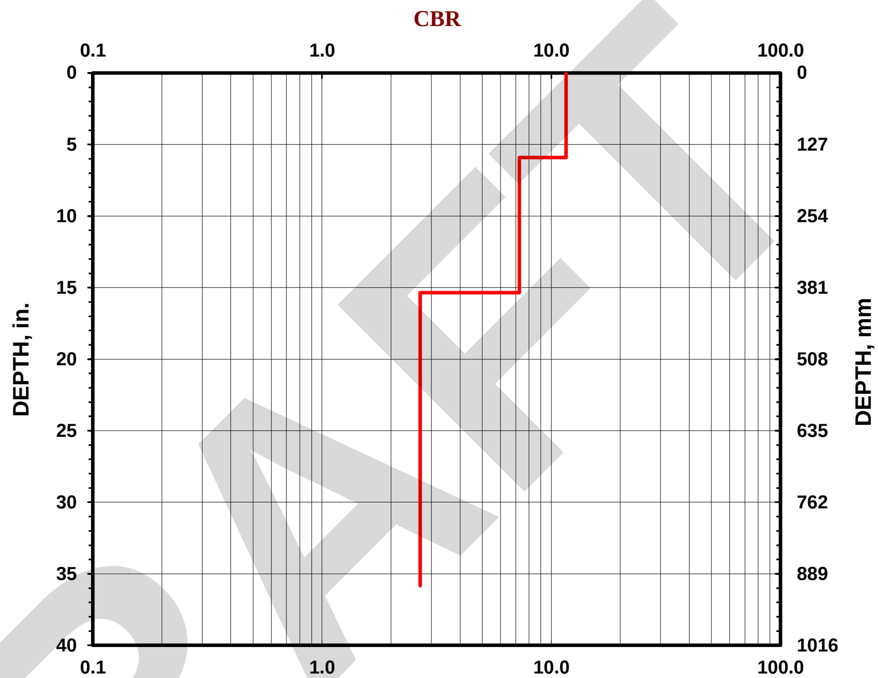

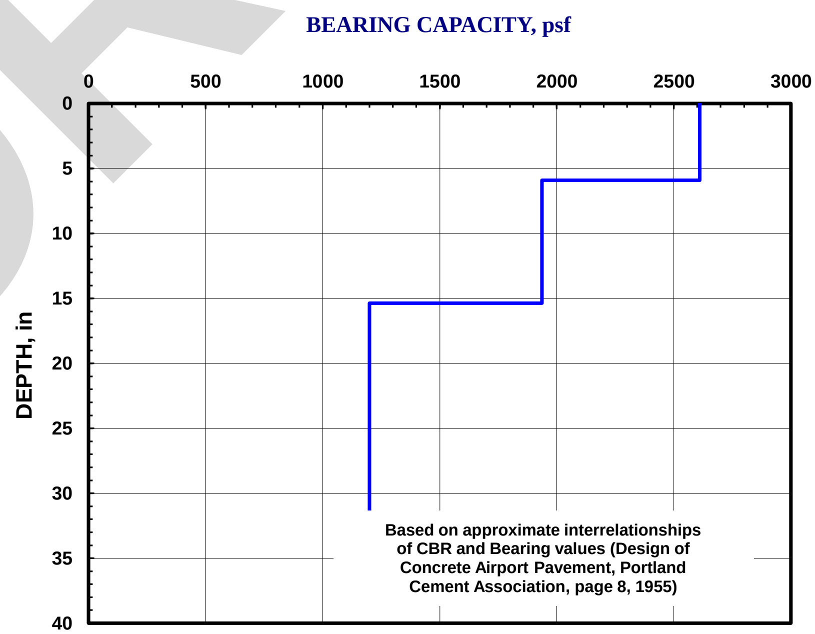

DCP TEST DATA

File Name:

Project: *04135111*
Date: 1-Feb-14
Location: BR-016
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	180	2
10	270	2
10	360	2
10	390	2
10	410	2
10	430	2
10	500	2
10	580	2
10	640	2
10	670	2
10	720	2
10	910	2
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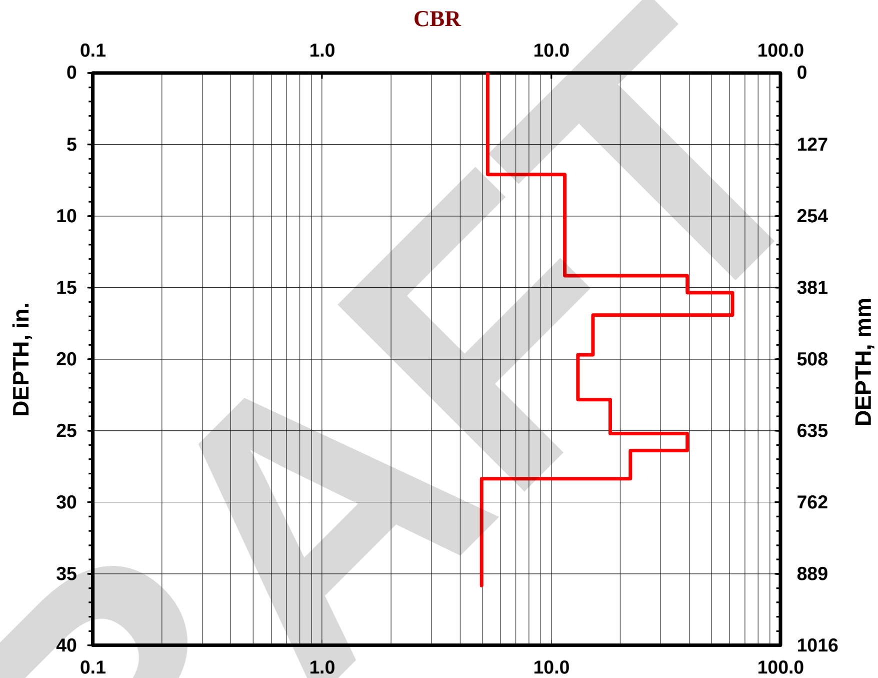

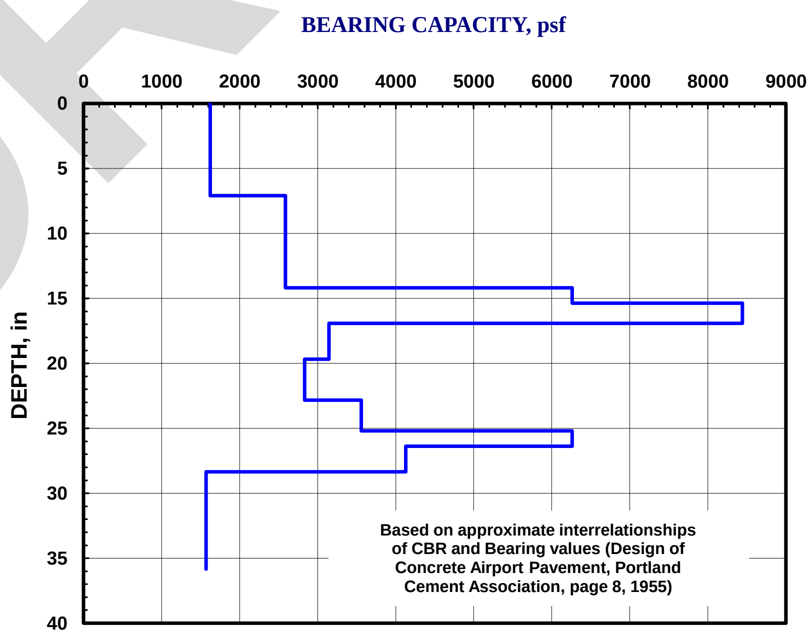

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-017

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Date: 15-Feb-14
Soil Type(s): Low plasticity Clay with CBR<10

Soil Type
- ○ CH
- ◉ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	240	2
10	710	2
12	910	2
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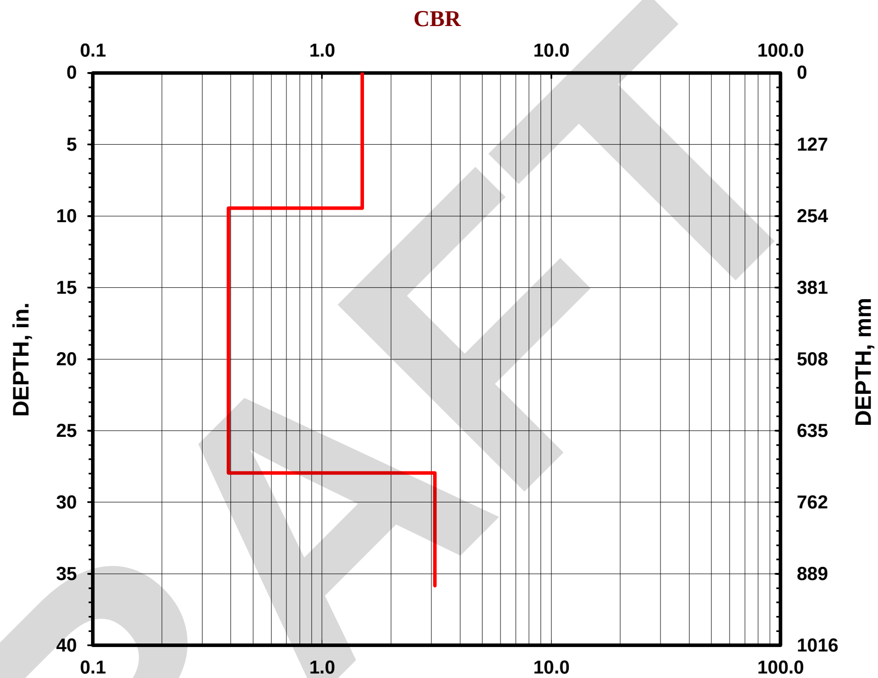

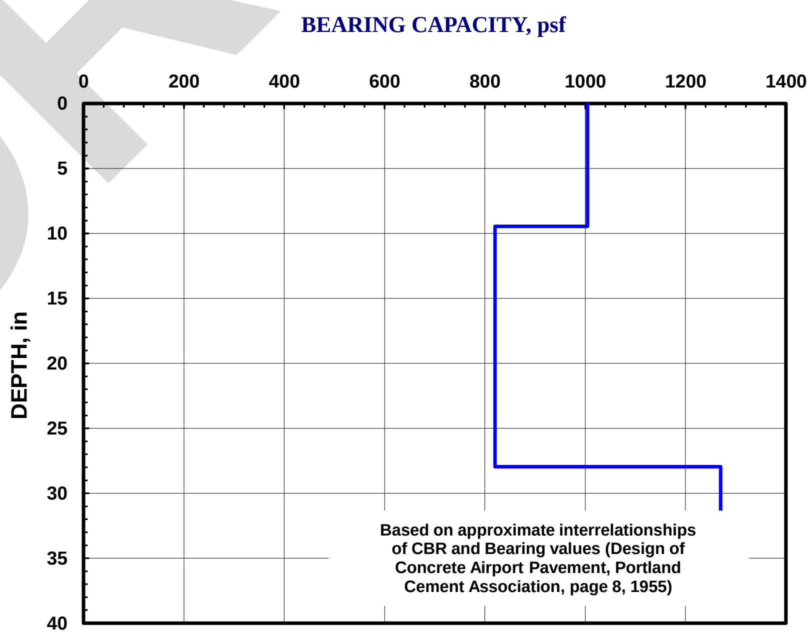

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 17-Feb-14
Location: BR-018 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	580	2
8	910	2
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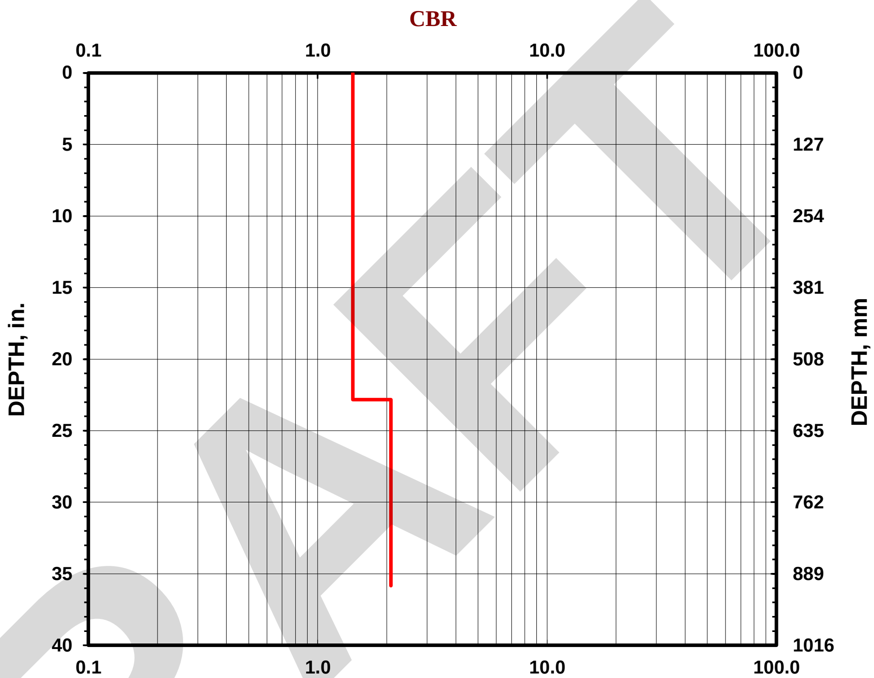

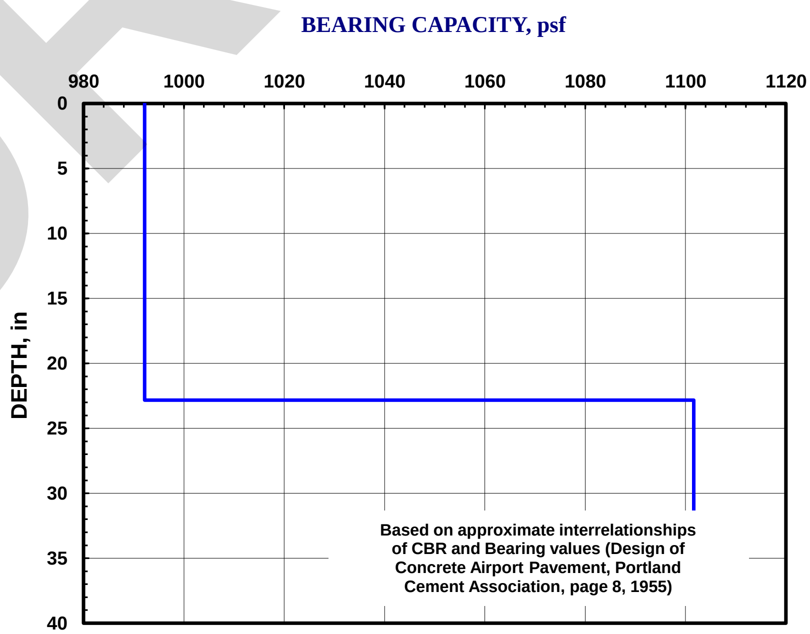

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-019

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
◉ 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	40	2
10	80	2
20	90	2
20	90	2
20	110	2
20	120	2
20	135	2
20	135	2
	DCP Refusal	2
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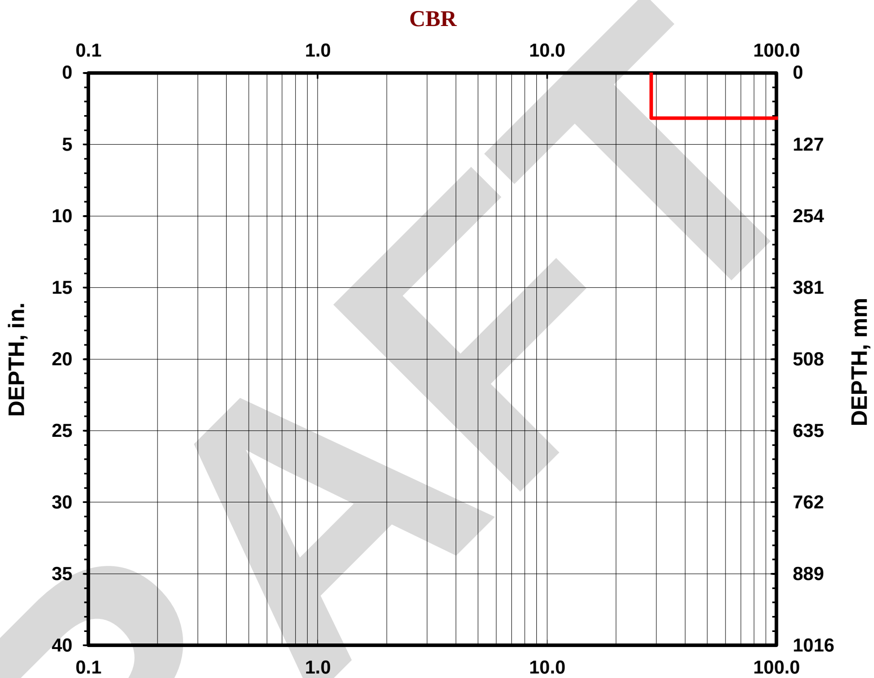

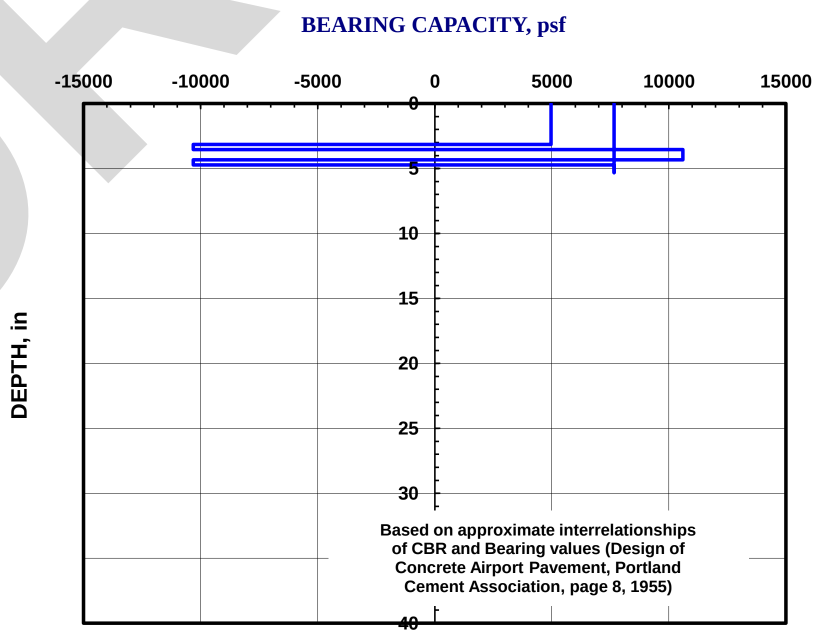

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-020
Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	30	2
20	50	2
20	110	2
21	160	2
10	290	2
10	460	2
10	650	2
10	910	2
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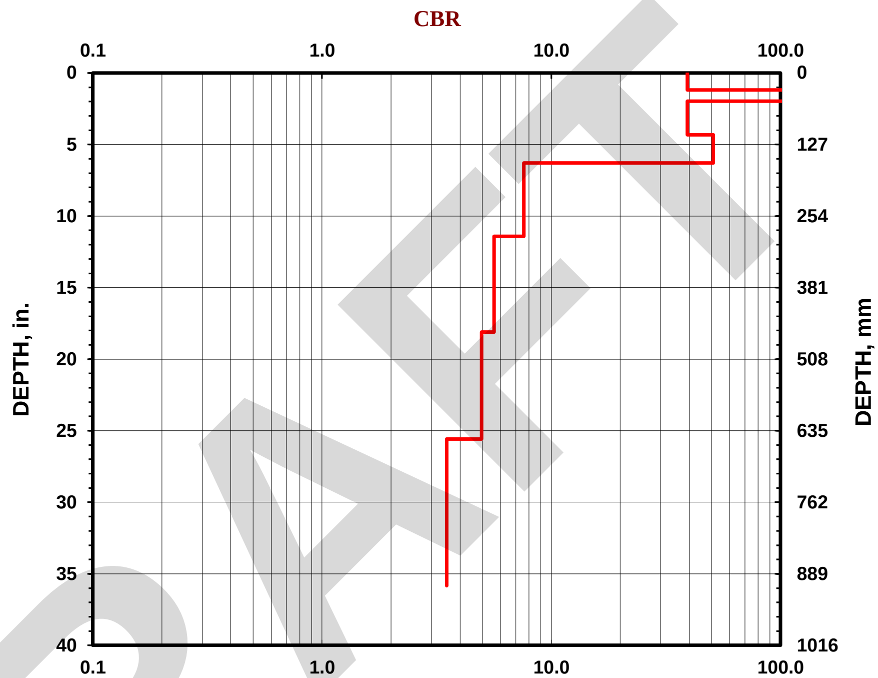

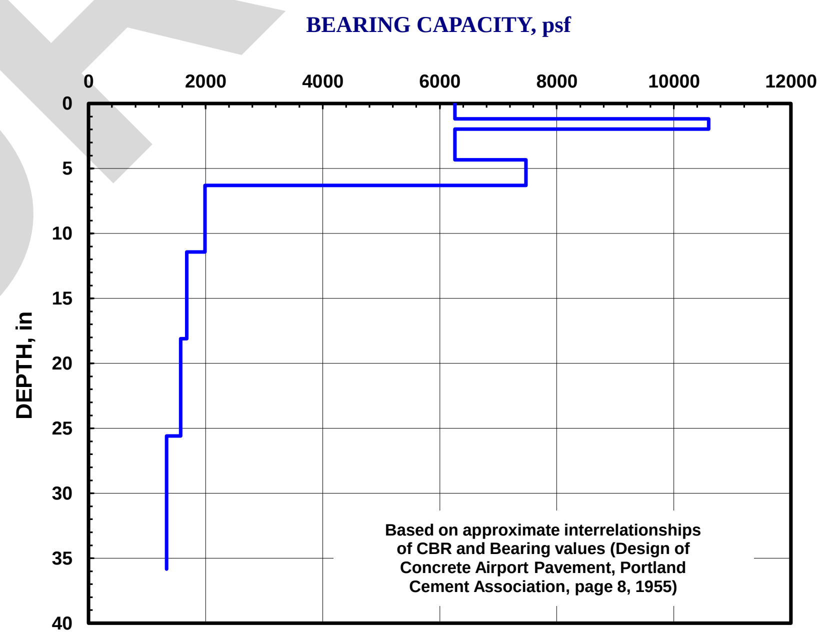

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14
Location: BR-021 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	110	2
20	170	2
20	410	2
24	910	2
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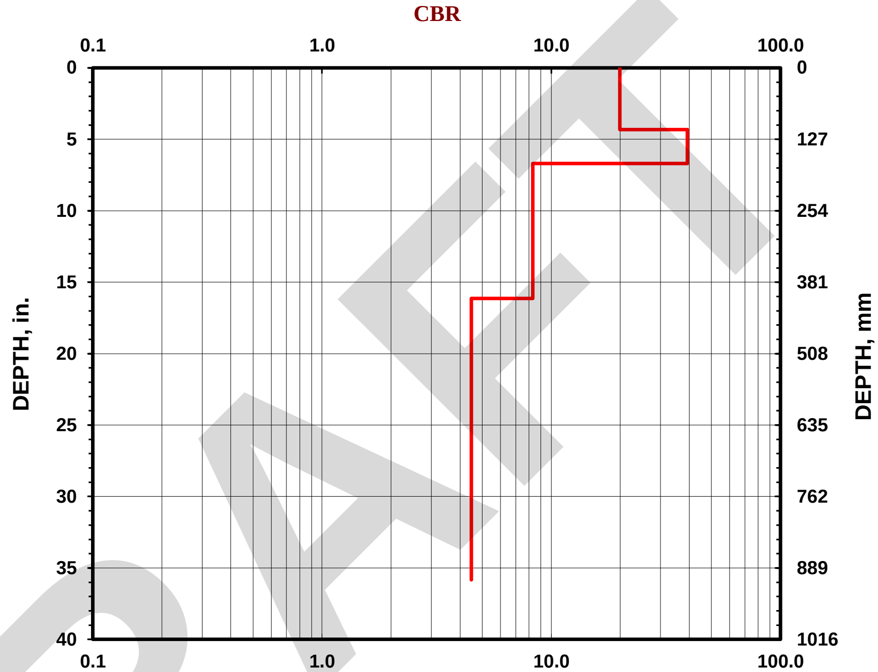

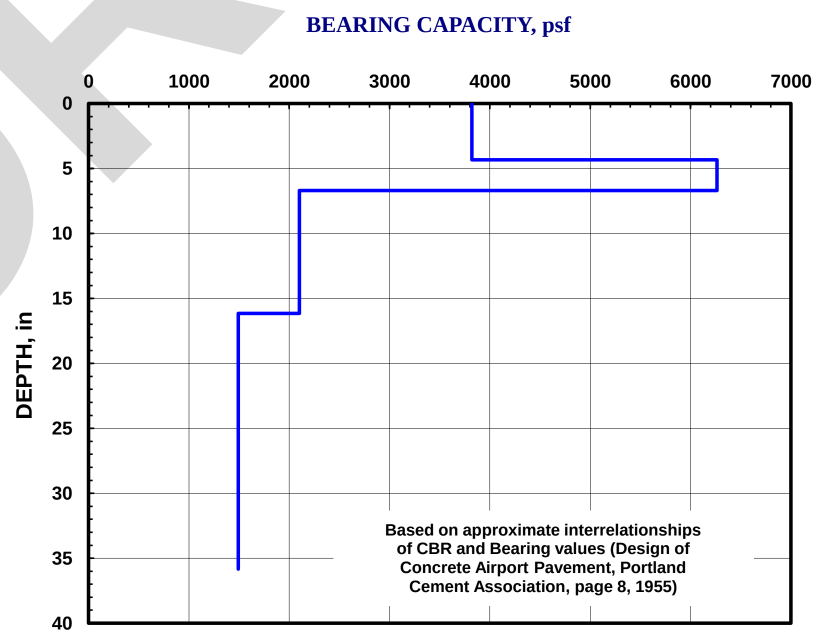

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-022

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	90	2
20	130	2
20	140	2
20	160	2
20	190	2
20	210	2
20	300	2
20	520	2
18	910	2
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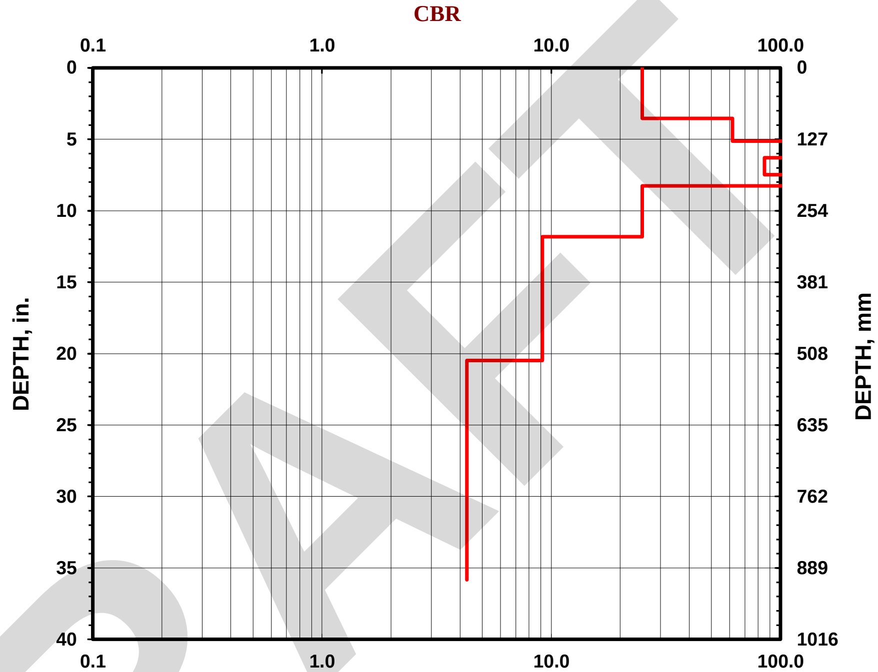

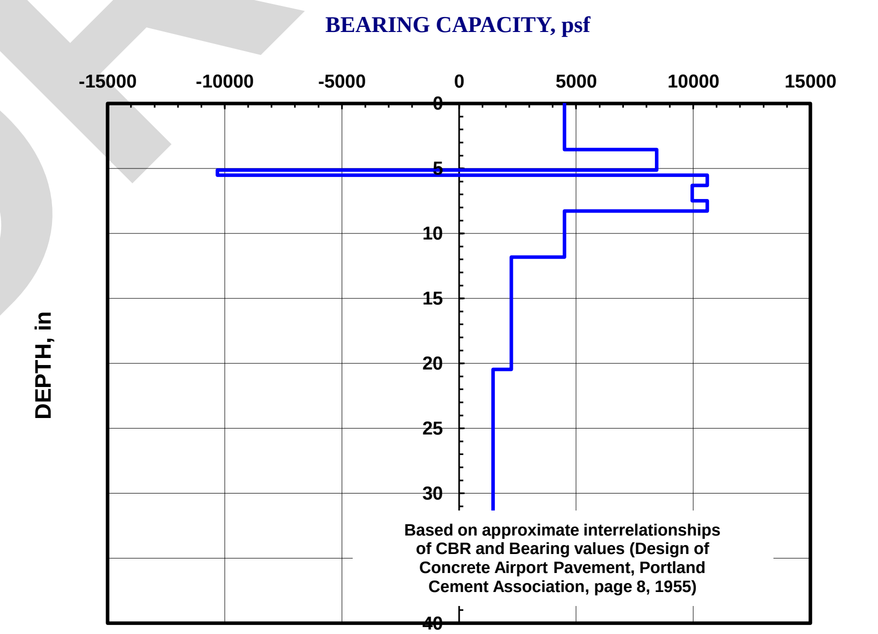

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-023

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	140	2
10	910	2
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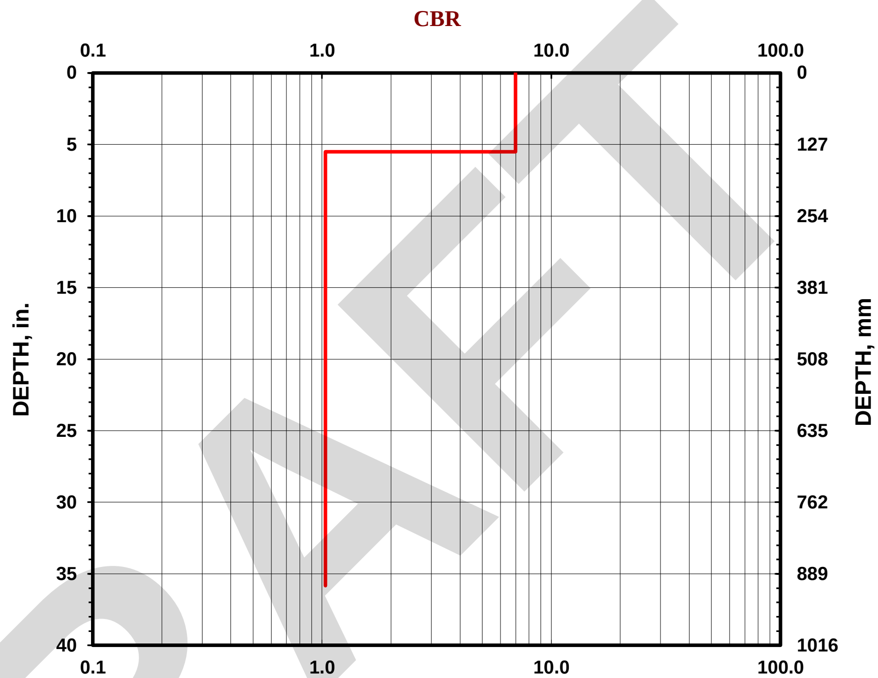

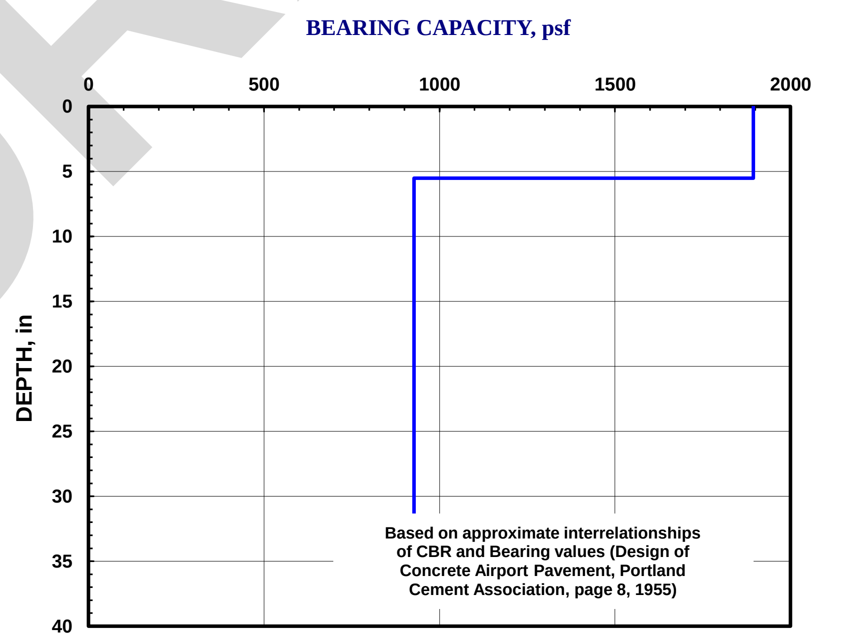

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-024

Date: 1-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	80	2
10	370	2
10	490	2
10	580	2
10	620	2
10	650	2
10	690	2
10	720	2
10	750	2
10	750	2
	DCP Refusal	2
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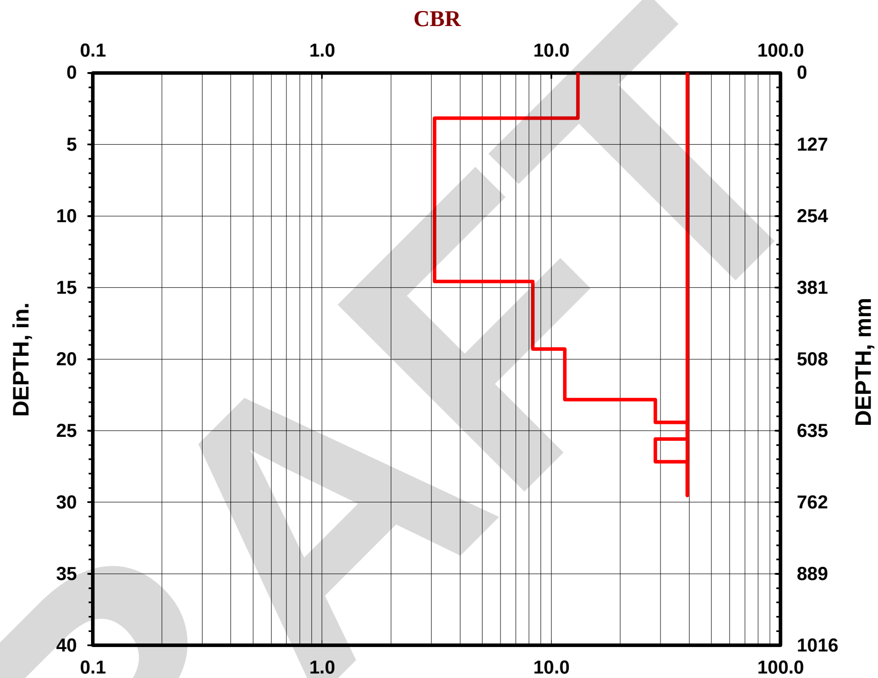

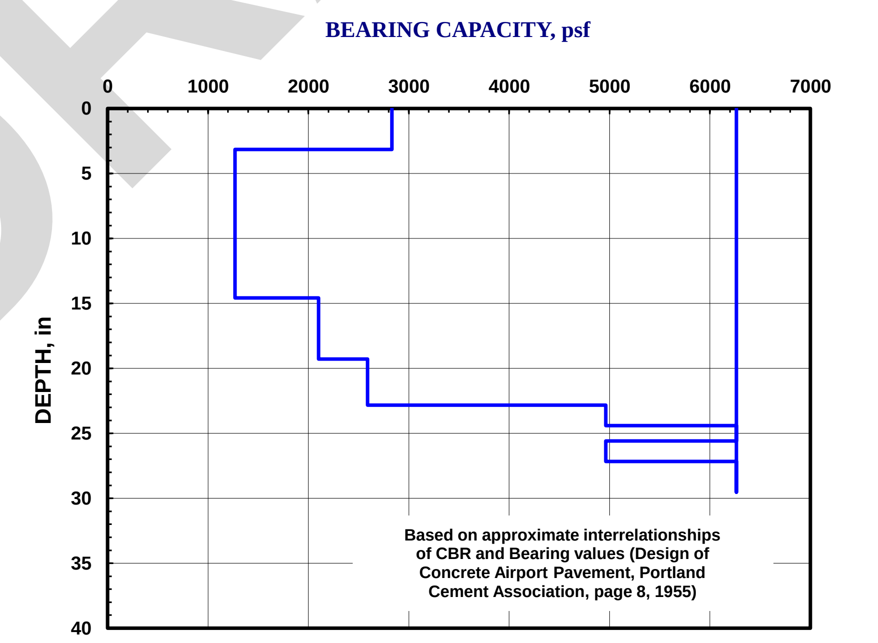

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14
Location: BR-025 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	180	2
10	410	2
10	560	2
10	660	2
10	740	2
10	760	2
20	790	2
20	790	2
	DCP Refusal	2
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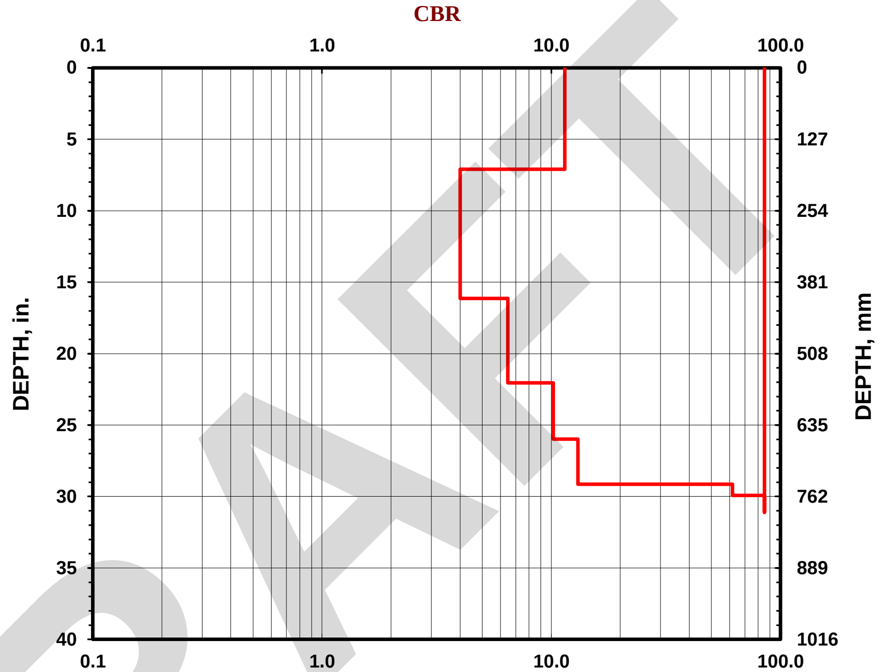

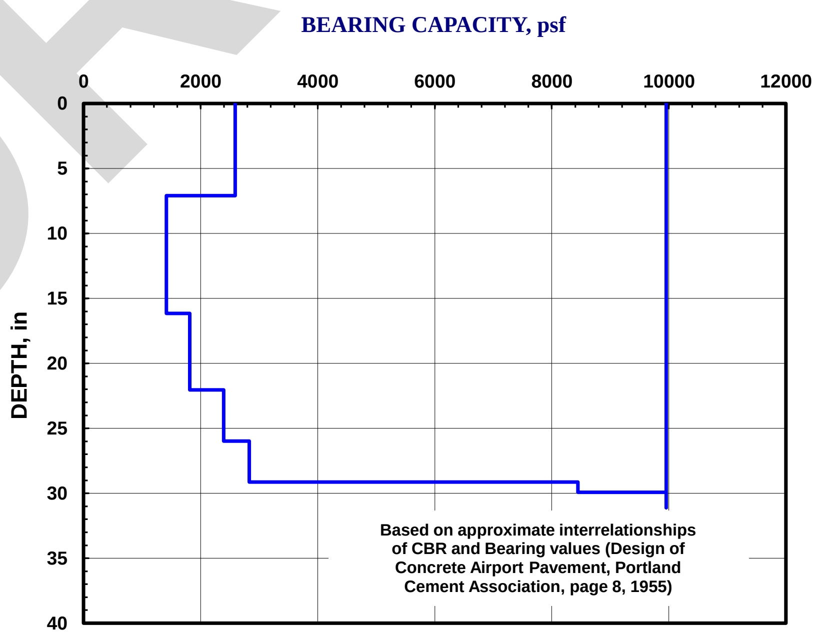

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14
Location: BR-026 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	50	2
20	160	2
20	310	2
20	580	2
10	750	2
12	910	2
		2
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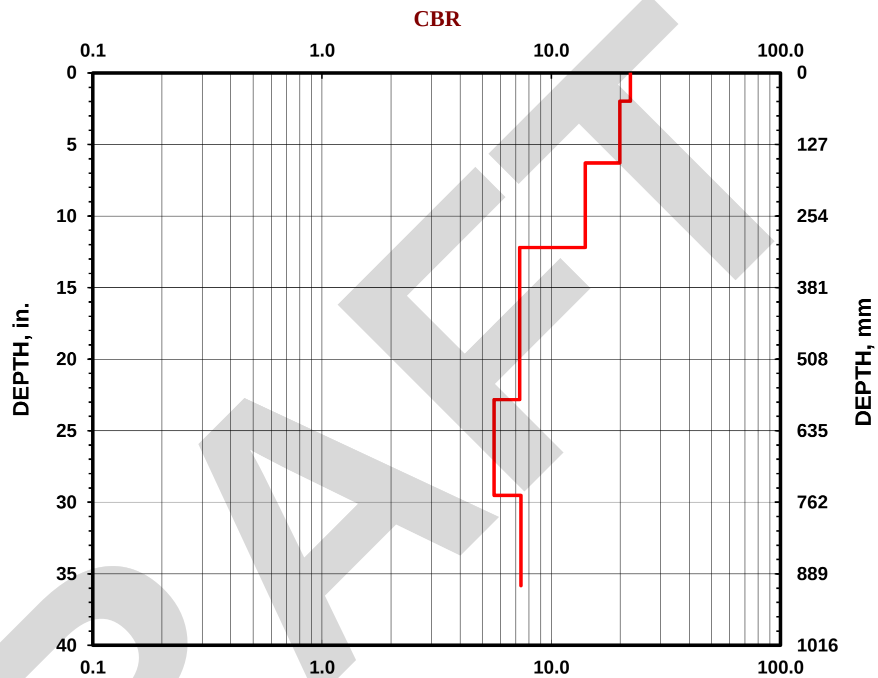

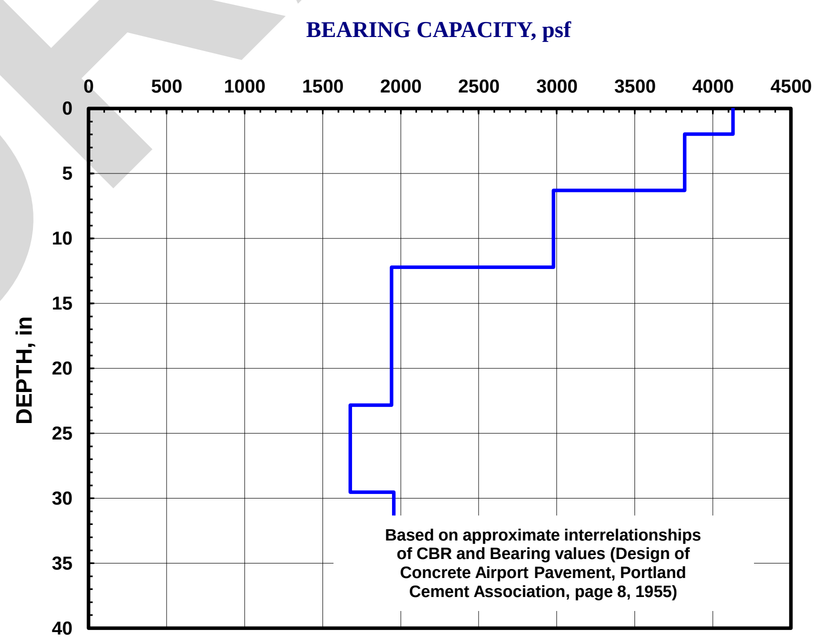

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-027
Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	20	2
20	35	2
20	70	2
20	100	2
20	160	2
20	160	2
	DCP Refusal	2
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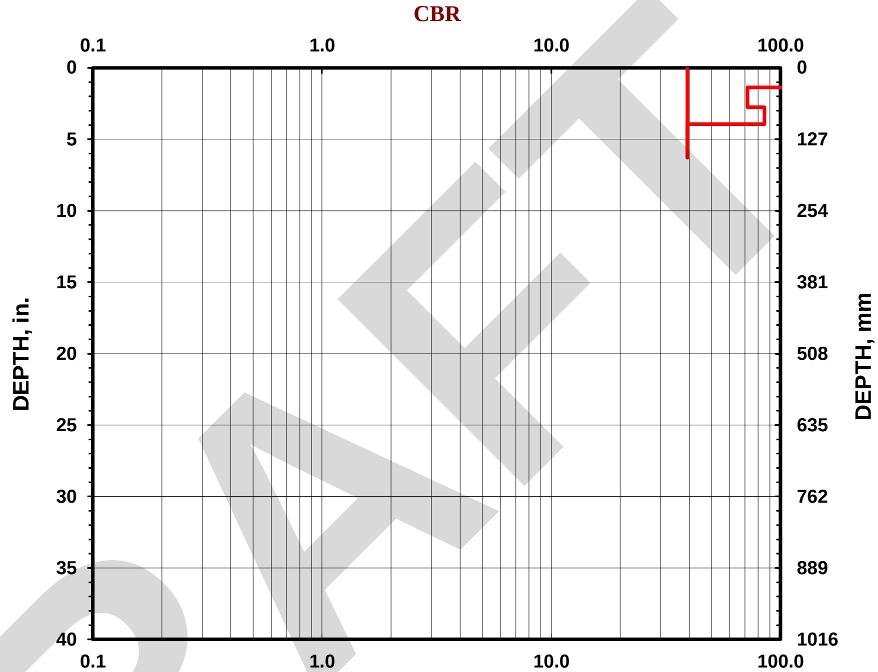

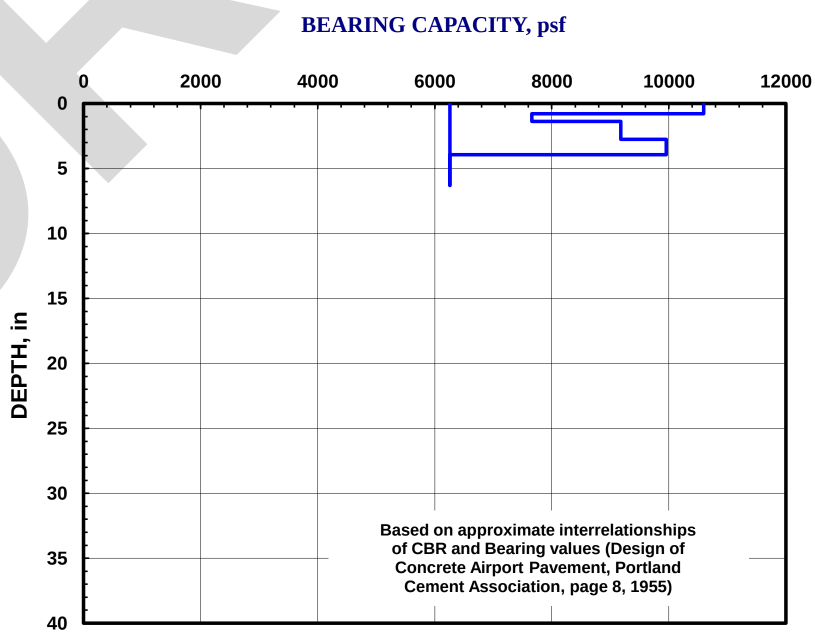

DCP TEST DATA

File Name:

Project: *04135111*　　**Date:** 22-Feb-14

Location: BR-028　　**Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	80	2
20	140	2
20	200	2
20	260	2
20	450	2
20	740	2
8	910	2
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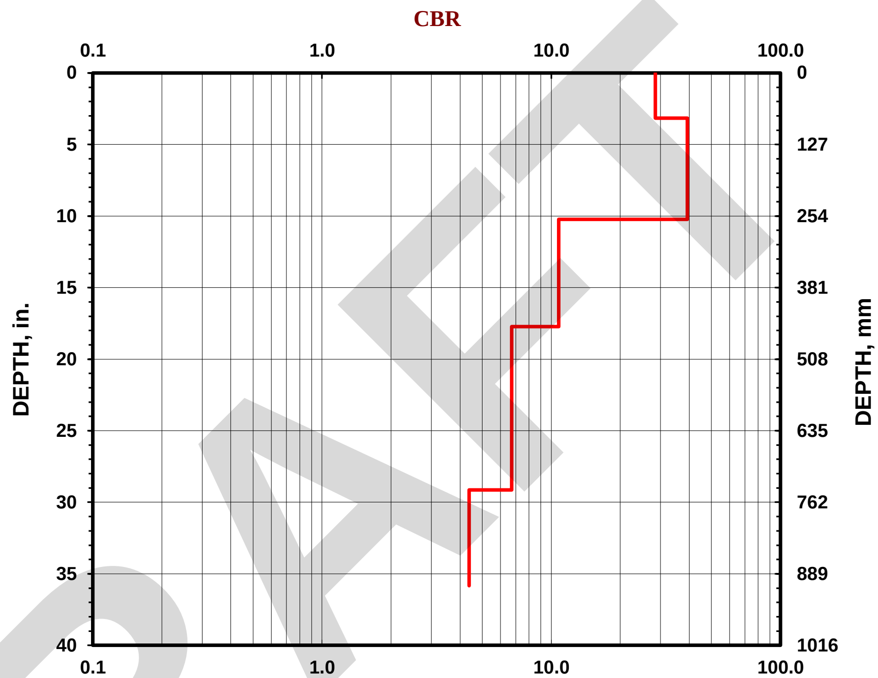

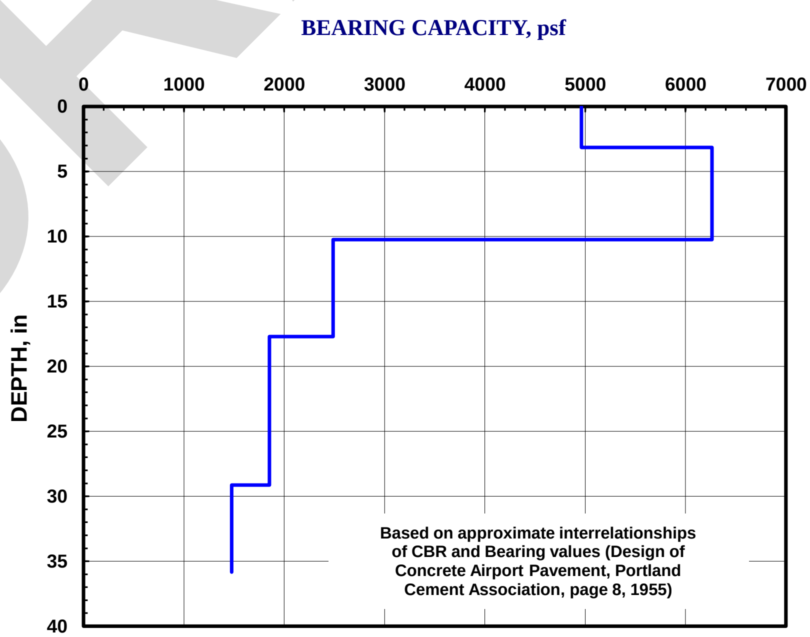

DCP TEST DATA

File Name:

Project: *04135111*
Date: 22-Feb-14
Location: BR-029
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	90	2
20	110	2
20	130	2
20	160	2
20	200	2
20	280	2
20	460	2
20	760	2
5	910	2
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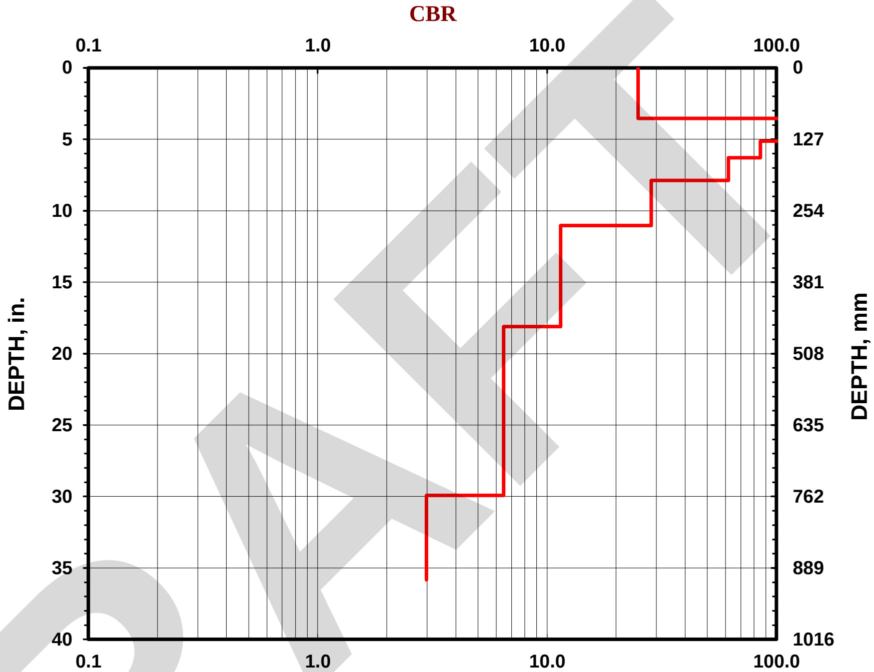

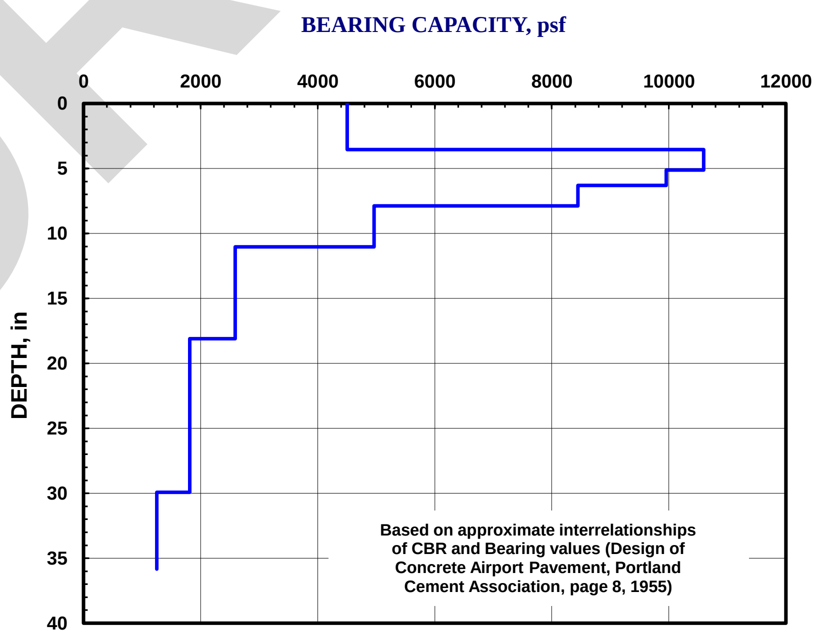

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-030

Date: 22-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	60	2
20	110	2
20	160	2
20	200	2
20	210	2
20	260	2
20	300	2
20	340	2
20	380	2
20	710	2
20	910	2
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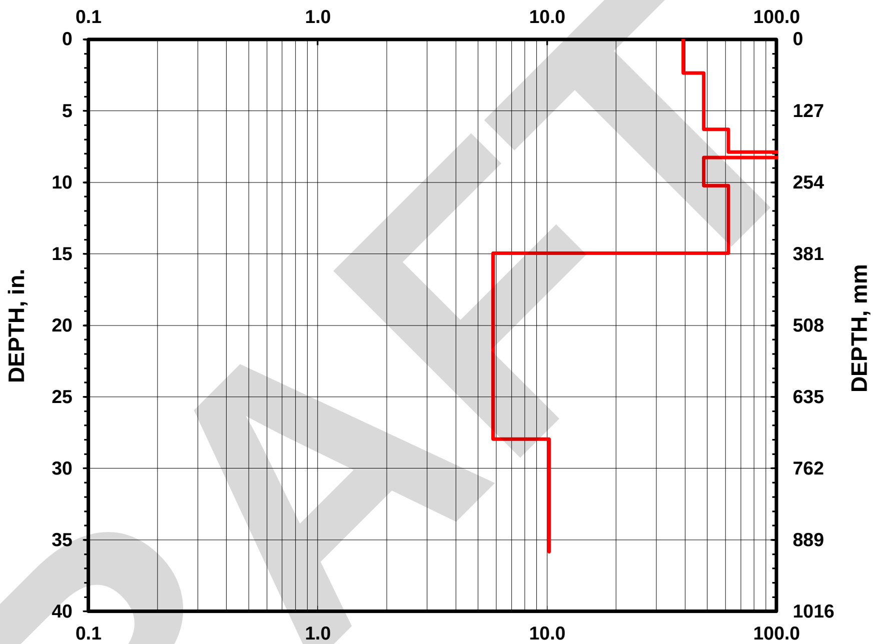

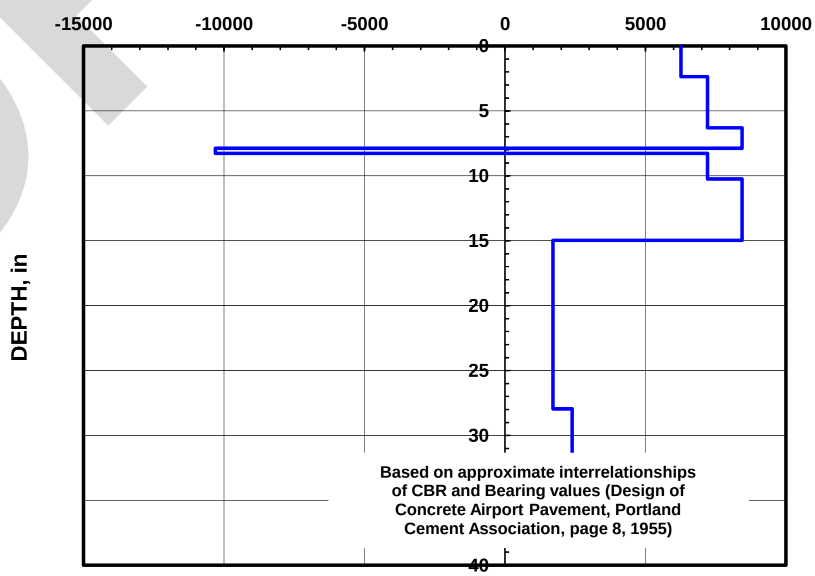

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-031

Date: 22-Feb-14
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	190	2
20	430	2
20	630	2
30	910	2
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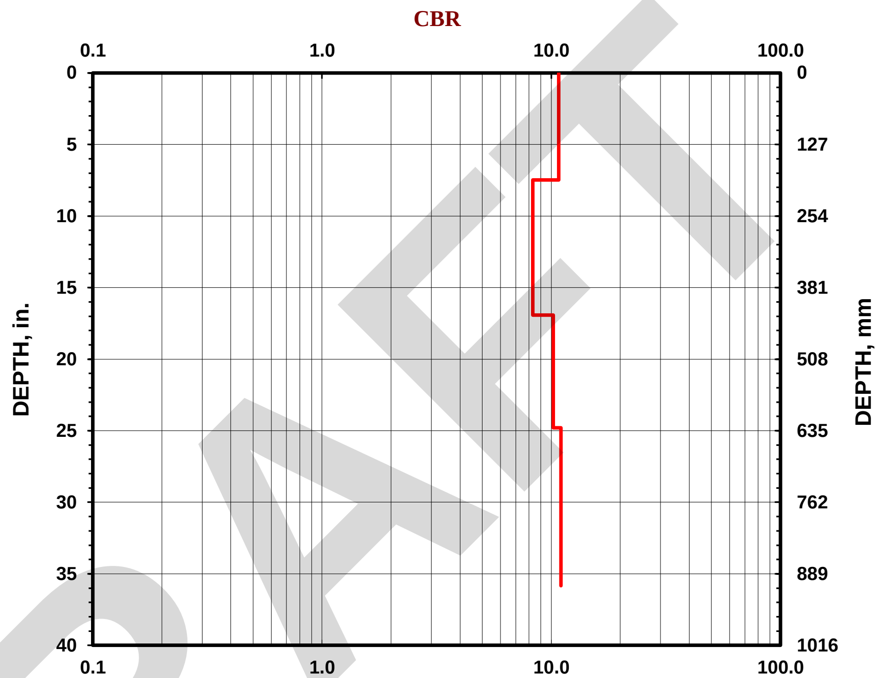

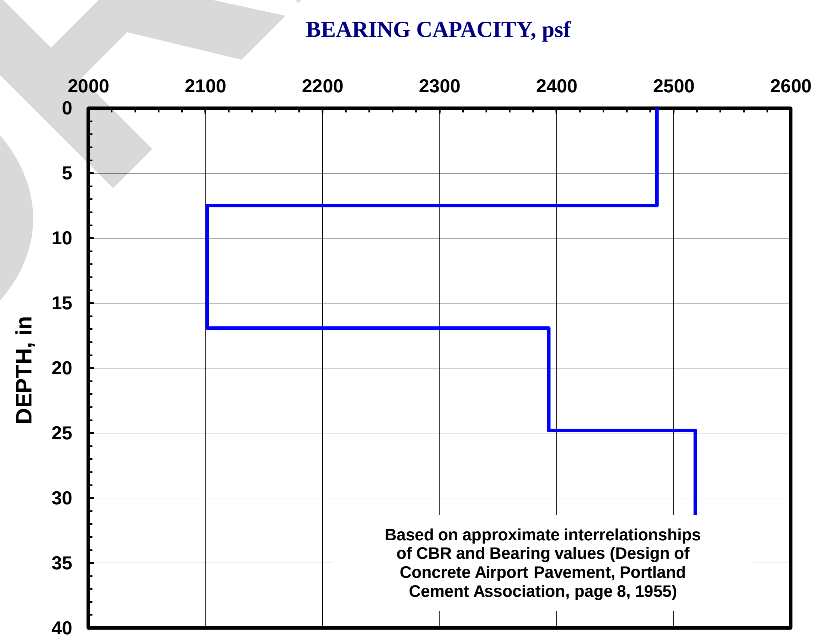

DCP TEST DATA

File Name:

Project: *04135111*
Date: 22-Feb-14
Location: BR-032
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	30	2
10	60	2
10	80	2
10	110	2
10	170	2
10	220	2
10	250	2
10	260	2
10	270	2
10	280	2
15	290	2
15	300	2
10	300	2
	DCP Refusal	2
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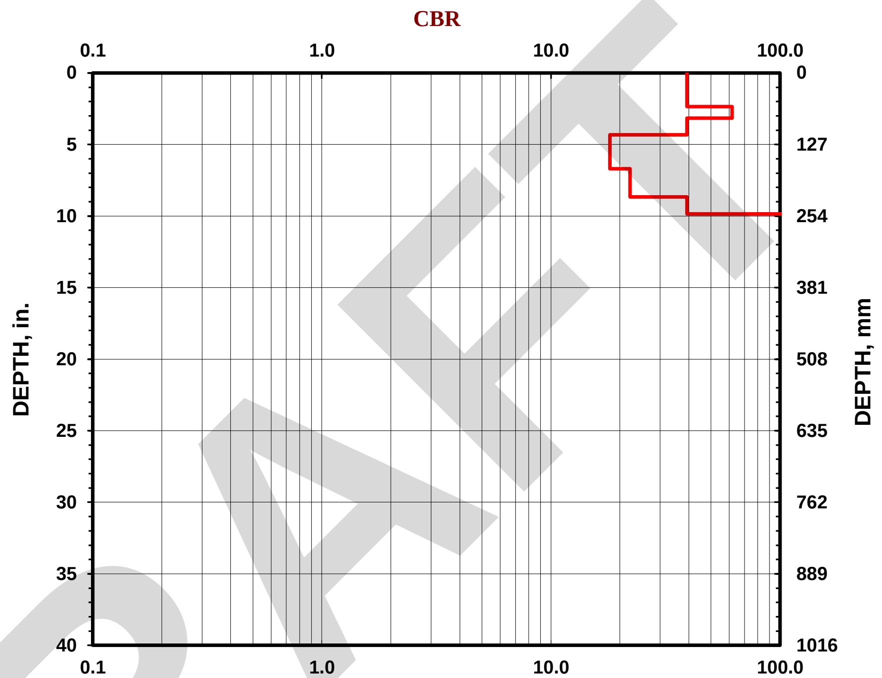

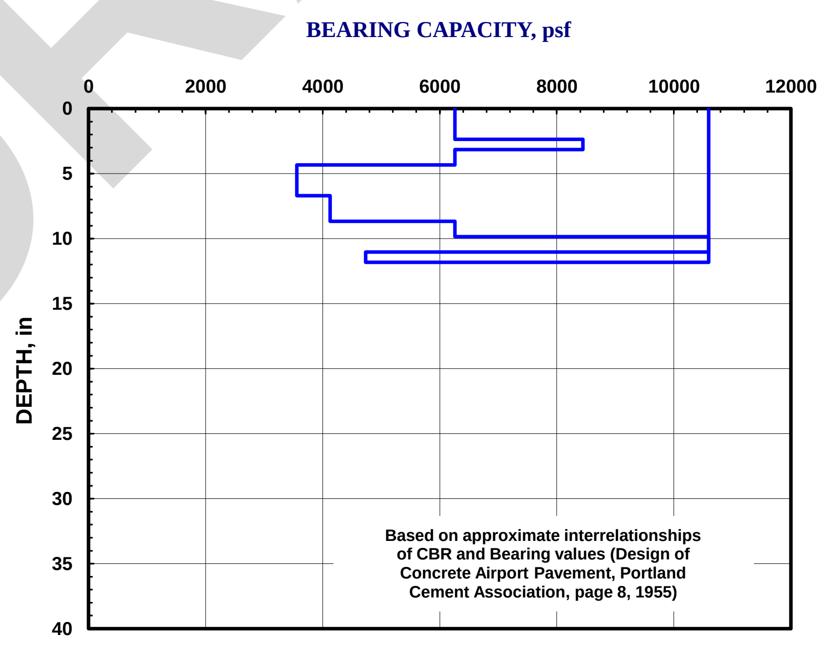

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 22-Feb-14
Location: BR-033 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	80	2
20	120	2
20	140	2
20	190	2
20	300	2
20	490	2
13	910	2
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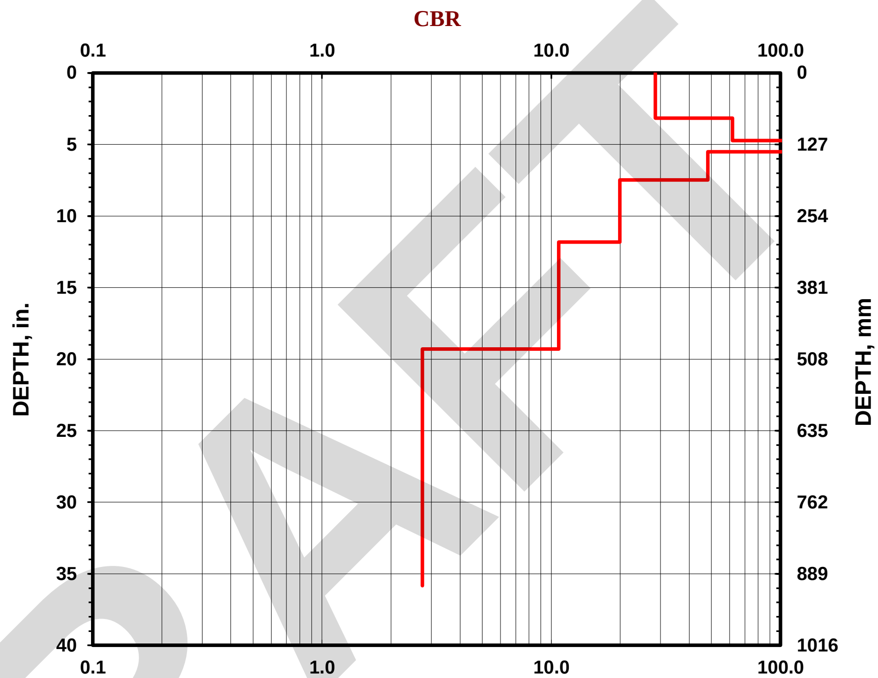

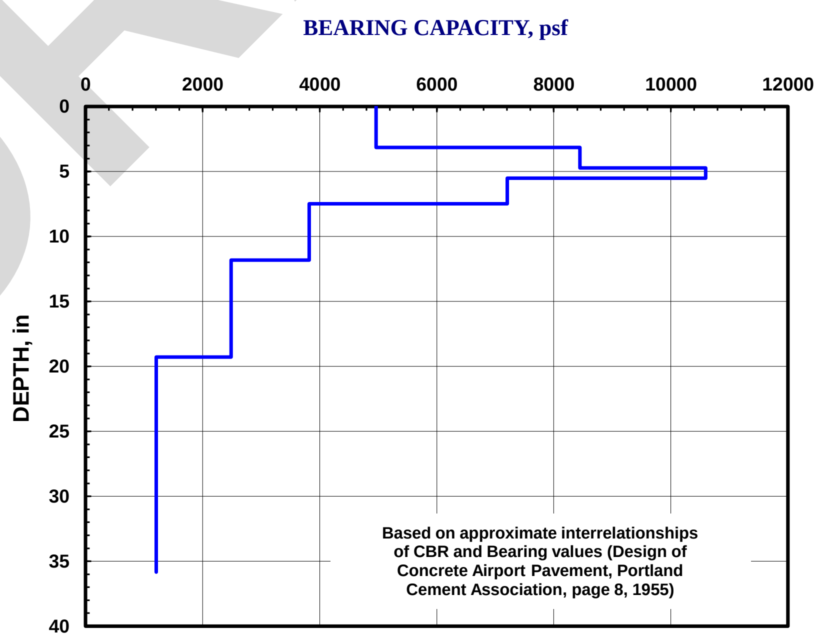

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 1-Feb-14
Location: BR-034 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	50	2
10	120	2
10	230	2
10	310	2
10	490	2
10	625	2
10	720	2
10	910	2
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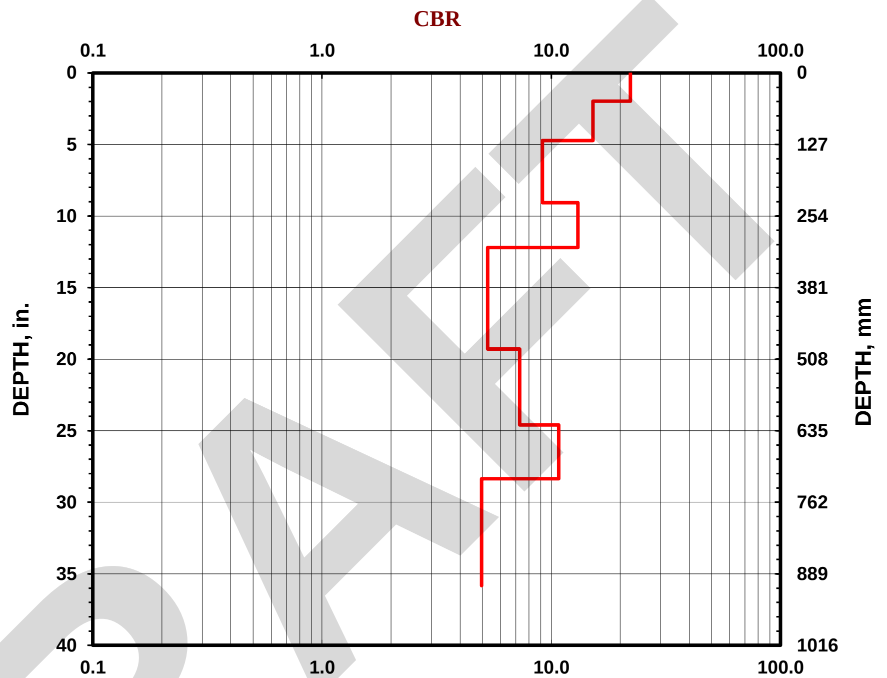

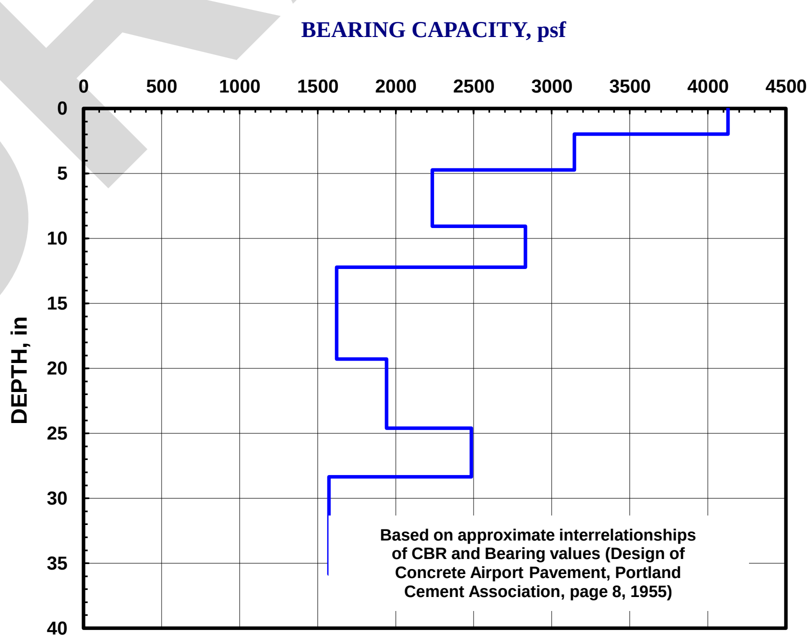

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-035

Date: 22-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	40	2
20	80	2
20	130	2
20	220	2
20	510	2
22	910	2
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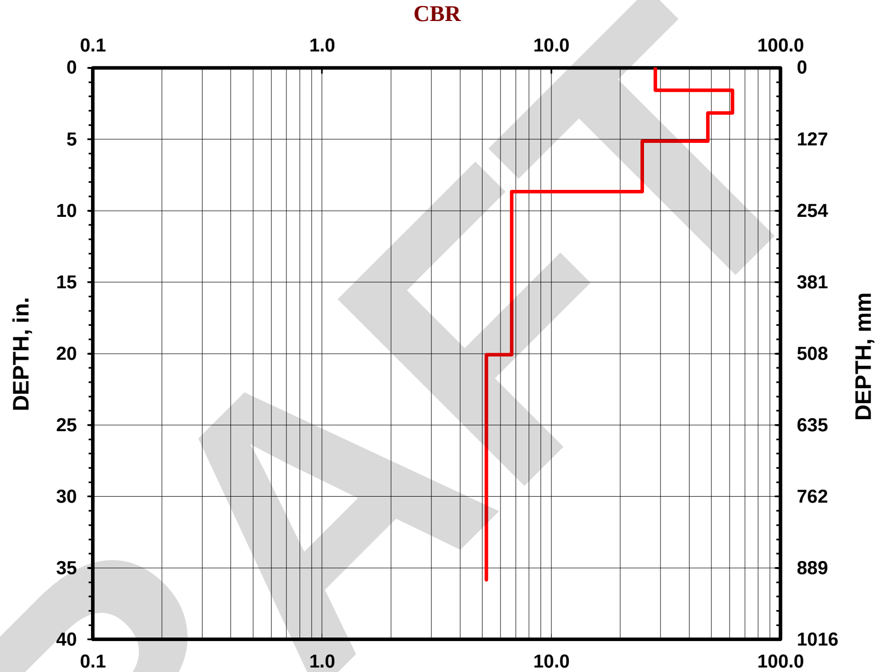

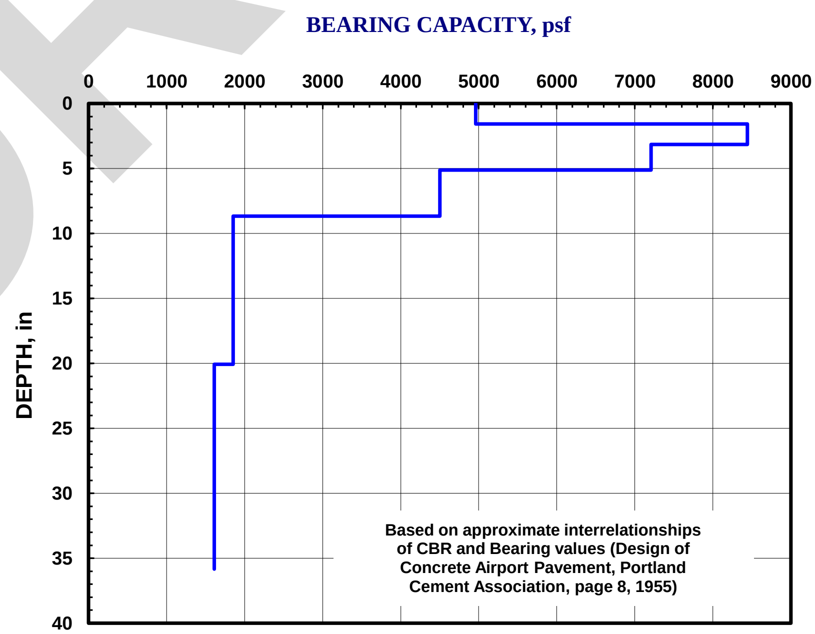

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 1-Feb-14
Location: BR-036 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	60	2
10	100	2
10	135	2
10	180	2
10	240	2
10	330	2
10	670	2
6	910	2
		2
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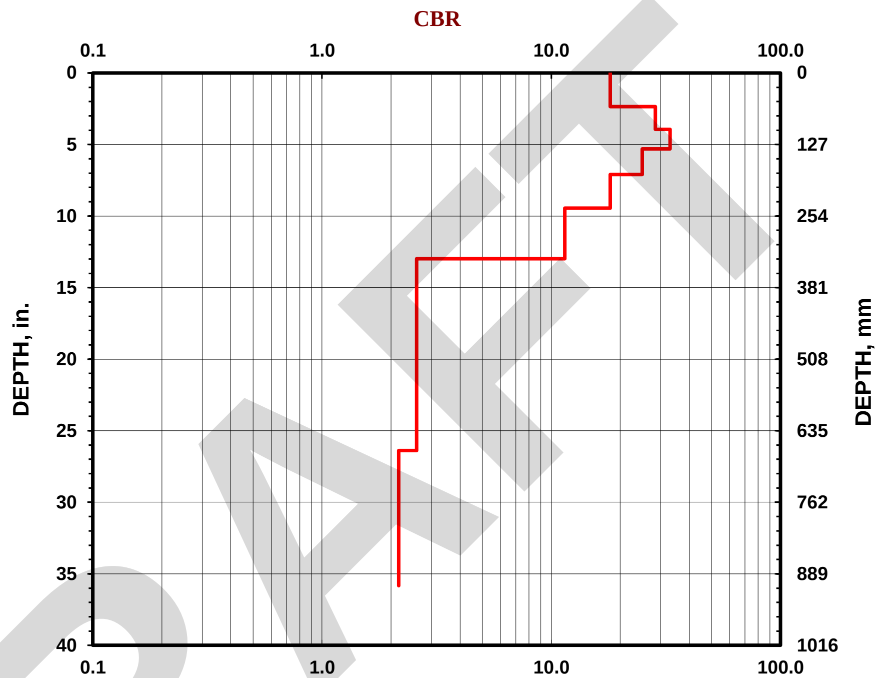

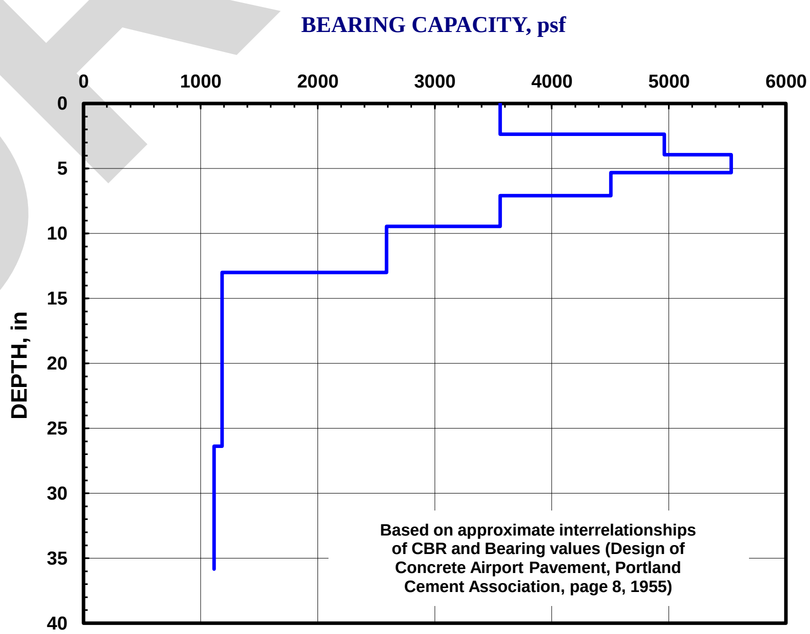

APPENDIX D

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING	Auger	Split Spoon	
	Shelby Tube	Macro Core	
	Ring Sampler	Rock Core	
	Grab Sample	No Recovery	

WATER LEVEL

- **Water Initially Encountered**
- **Water Level After a Specified Period of Time**
- **Water Level After a Specified Period of Time**

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	**Hand Penetrometer**
(T)	**Torvane**
(b/f)	**Standard Penetration Test (blows per foot)**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	$\geq$ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

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UNIFIED SOIL CLASSIFICATION SYSTEM

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

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains $\geq$ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] $PI \geq 4$ and plots on or above "A" line.

[O] $PI < 4$ or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

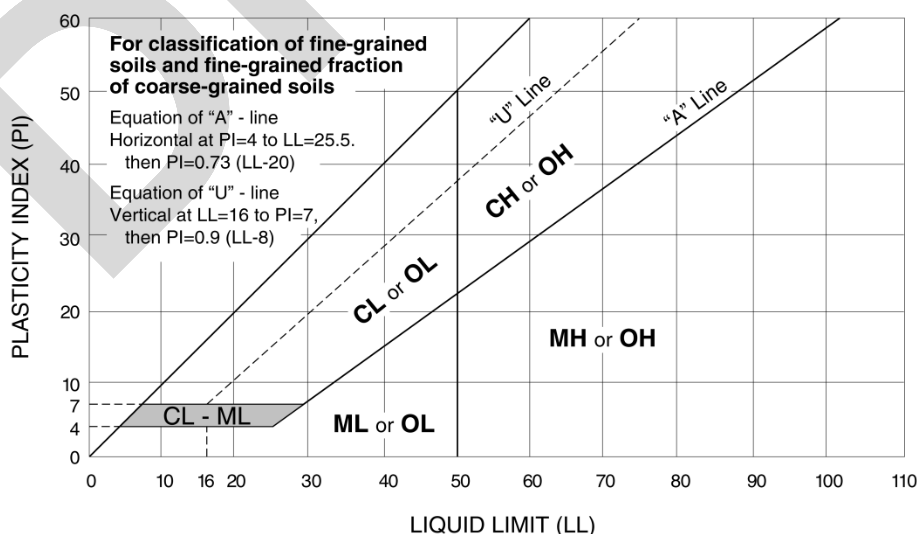

Exhibit D-2

GENERAL NOTES

Sedimentary Rock Classification

DESCRIPTIVE ROCK CLASSIFICATION:

Sedimentary rocks are composed of cemented clay, silt and sand sized particles. The most common minerals are clay, quartz and calcite. Rock composed primarily of calcite is called limestone; rock of sand size grains is called sandstone, and rock of clay and silt size grains is called mudstone or claystone, siltstone, or shale. Modifiers such as shaly, sandy, dolomitic, calcareous, carbonaceous, etc. are used to describe various constituents. Examples: sandy shale; calcareous sandstone.

LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of $CaCo_3$, reacts readily with HCl.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of $CaMg(CO_3)_2$, harder than limestone, reacts with HCl when powdered.
CHERT	Light to dark colored, very fine-grained texture, composed of micro-crystalline quartz ($Si0_2$), brittle, breaks into angular fragments, will scratch glass.
SHALE	Very fine-grained texture, composed of consolidated silt or clay, bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone or mudstone.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand size grains of quartz, feldspar, etc. Cement usually is silica but may be such minerals as calcite, iron-oxide, or some other carbonate.
CONGLOMERATE	Rounded rock fragments of variable mineralogy varying in size from near sand to boulder size but usually pebble to cobble size (½ inch to 6 inches). Cemented together with various cementing agents. Breccia is similar but composed of angular, fractured rock particles cemented together.

PHYSICAL PROPERTIES:

DEGREE OF WEATHERING

Slight	Slight decomposition of parent material on joints. May be color change.
Moderate	Some decomposition and color change throughout.
High	Rock highly decomposed, may be extremely broken.

HARDNESS AND DEGREE OF CEMENTATION

Limestone and Dolomite:

Hard	Difficult to scratch with knife.
Moderately Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Soft	Can be scratched with fingernail.

Shale, Siltstone and Claystone

Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be easily dented but not molded with fingers.

Sandstone and Conglomerate

Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers.

BEDDING AND JOINT CHARACTERISTICS

Bed Thickness	Joint Spacing	Dimensions
Very Thick	Very Wide	>10′
Thick	Wide	3′ - 10′
Medium	Moderately Close	1′ - 3′
Thin	Close	2″ - 1′
Very Thin	Very Close	.4″ - 2″
Laminated	—	.1″ - .4″

Bedding Plane	A plane dividing sedimentary rocks of the same or different lithology.
Joint	Fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.
Seam	Generally applies to bedding plane with an unspecified degree of weathering.

SOLUTION AND VOID CONDITIONS

Solid	Contains no voids.
Vuggy (Pitted)	Rock having small solution pits or cavities up to ½ inch diameter, frequently with a mineral lining.
Porous	Containing numerous voids, pores, or other openings, which may or may not interconnect.
Cavernous	Containing cavities or caverns, sometimes quite large.

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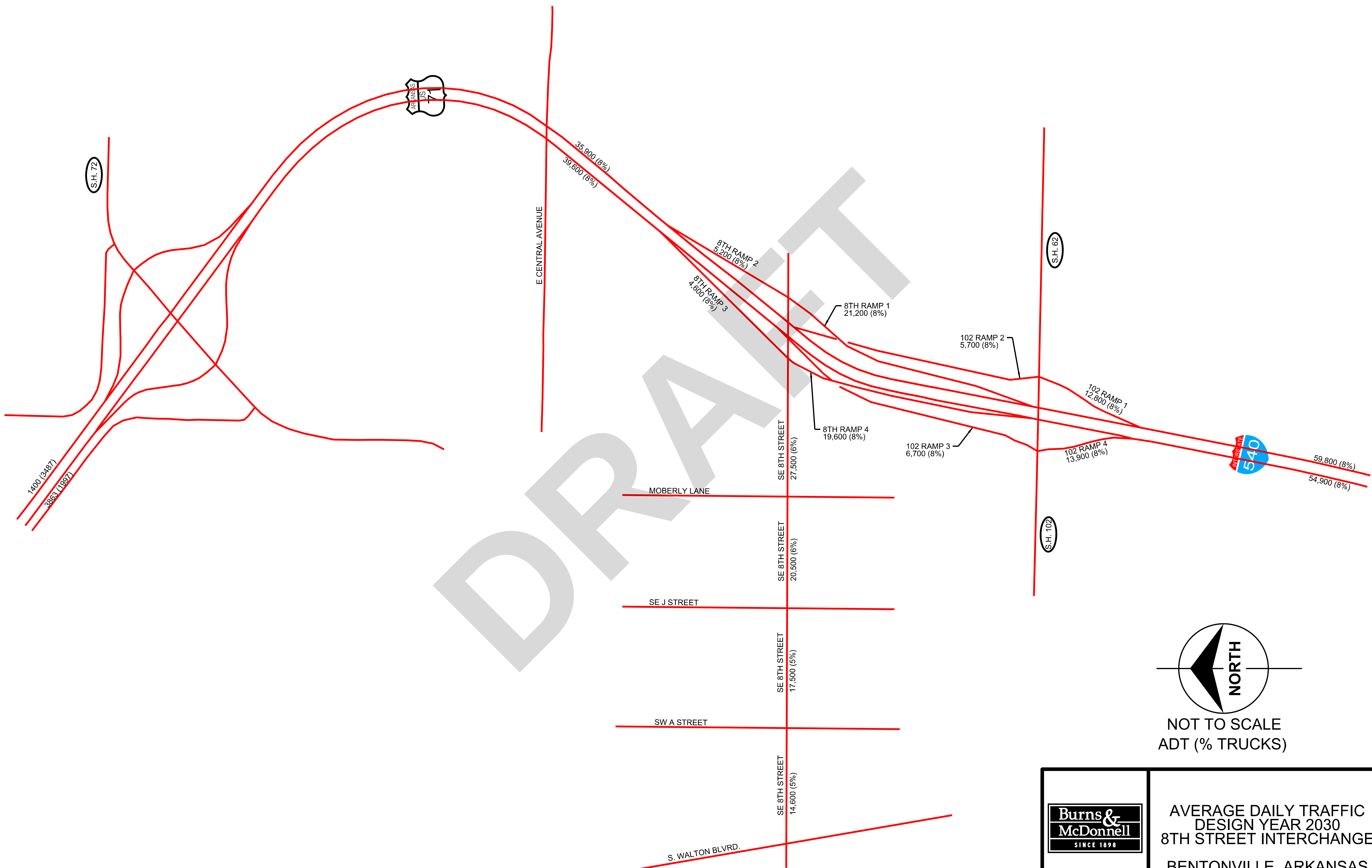

Burns & McDonnell SINCE 1898

AVERAGE DAILY TRAFFIC
DESIGN YEAR 2030
8TH STREET INTERCHANGE

BENTONVILLE, ARKANSAS

Geotechnical Engineering Report

8th Street Widening Project

Proposed Bridge over Interstate 49

Bentonville, Arkansas

December 17, 2015

Terracon Project No. 04135111

Prepared for:

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

Prepared by:

Terracon Consultants, Inc.
Tulsa, Oklahoma

Terracon

December 17, 2015

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, Missouri 64114

Attn: Mr. David Hurt, P.E.
P: (816) 822 3426
E: dhurt@burnsmcd.com

Re: Geotechnical Engineering Report
8th Street Widening Project
Proposed Bridge over Interstate 49
Bentonville, Arkansas
Terracon Project Number: 04135111

Dear Mr. Hurt:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This geotechnical study was performed in general accordance with our Proposal No. P04090495 dated February 26, 2010 and the Amendment to Consultant Agreement dated May 21, 2010 between Burns & McDonnell Engineering Company, Inc. and Terracon Consultants, Inc. for Burns & McDonnell Project No. 090218.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations for bridge foundations and lateral earth pressures for abutment walls, as related to the subsurface conditions encountered at the bridge borings.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.
Cert. Of Auth. #CA-223 exp. 12/31/17

Jaime E. Granados
Geotechnical Engineer

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No. 7052
MICHAEL H. HOMAN

12/17/2015

Michael H. Homan, P.E.
Arkansas No. 7052

JEG:MHH:lo
Enclosures
Addressee (3 via US mail and 1 via email)

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TABLE OF CONTENTS (Continued)

GEOTECHNICAL ENGINEERING REPORT
8TH STREET WIDENING PROJECT
PROPOSED BRIDGE OVER INTERSTATE 49
BENTONVILLE, ARKANSAS

Terracon Project No. 04135111
December 17, 2015

1.0 INTRODUCTION

This geotechnical engineering report has been completed as a part of the 8th Street widening project in Bentonville, Arkansas. This report addresses recommendations regarding bridge foundations and lateral earth pressures for abutment walls for the proposed 8th Street bridge over Interstate 49.

Four bridge borings, designated BM-001 through BM-004, were drilled to depths of approximately 27.5 to 54 feet below the existing surface. Per Burns & McDonnell's request, only borings BM-001, BM-002, and BM-004 were extended into the bedrock. Boring logs along with a site location map and a boring location diagram are included in **Appendix A** of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil and rock conditions
- groundwater conditions
- general earthwork
- lateral earth pressures for rigid wing walls
- global and external stability of MSE abutment walls
- bridge foundation design and construction recommendations

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See **Appendix A**, Figure A-2, Boring Location Plan
Proposed Construction	We understand that the proposed bridge will be constructed along the 8th Street alignment over Interstate 49 (I-49). The bridge will serve as a single point urban interchange and will be a two-span structure supported on driven piles. MSE walls are planned to be constructed at the bridge abutments. Underpass structures will also be constructed at the abutment locations as part of the interchange project.

2.2 Site Location and Description

Item	Description
Location	New intersection between 8th Street and Interstate 49 in Bentonville, Arkansas.
Existing improvements	Existing Interstate 49
Existing ground surface	Pavements and grass
Existing topography	Relatively flat

3.0 SUBSURFACE CONDITIONS

3.1 Geology

Based on information obtained from the Arkansas Geological Survey website (www.geology.ar.gov), the geology of the project site is underlain by the Boone Formation, which consists of gray, fine- to coarse-grained fossiliferous limestone interbedded with chert. Some sections may be predominantly limestone or chert. The cherts are dark in color in the lower part of the sequence and light in the upper part. The quantity of chert varies considerably both vertically and horizontally. The Boone Formation is well known for dissolutional features, such as sinkholes, caves, and enlarged fissures. The thickness of the Boone Formation is 300 to 350 feet in most of northern Arkansas, but as much as 390 feet has been reported.

According to the US Geological Survey (USGS), the Peak Ground Acceleration (PGA) for the City of Bentonville, Arkansas corresponds to 0.049g. Thus, seismic analyses for the MSE wall structures are not required for external stability.

3.2 Typical Subsurface Profile

Based on the results of the bridge borings, subsurface conditions along the bridge project can be generalized as indicated in the following table.

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Surface	3 inches	Topsoil	N/A
Stratum 1 [1]	2 feet	Fill: Lean clay with various amounts of sand	N/A
Stratum 2 [2]	13.5 to 18.5 feet	Lean clay and fat clay with different amounts of sand and chert gravel	Stiff to very stiff
Stratum 3 [3]	23.5 feet	Elastic silt with various amounts of sand, chert gravel, and chert seams	Stiff to very stiff

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Stratum 4 [4]	27.5 to 32 feet	Clayey & silty chert gravel and clayey & silty sand with various amounts of chert gravel	Loose to very dense
Stratum 5 [5]	29.5 to 33.5 feet	Fat clay with various amounts of sand and chert gravel	Stiff
Stratum 6 [6]	Boring terminated in this stratum	Limestone with chert seams and cherty limestone	Hard

1. Encountered in bridge borings BM-001 and BM-002
2. Encountered in all bridge borings
3. Encountered in bridge borings BM-001 and BM-002
4. Encountered in bridge borings BM-001, BM-003, and BM-004
5. Encountered at relatively deep depths in bridge borings BM-002 and BM-004
6. Bridge borings BM-001, BM-002, and BM-004 penetrated and were terminated in this stratum at depths of about 50 to 54 feet. Boring BM-003 terminated in auger refusal in this stratum at a depth of about 27.5 feet.

Atterberg limits and percent passing the No. 200 sieve tests were performed on select soil samples taken from the bridge borings as indicated in the table below. The on-site clays were classified as medium to highly plastic. The samples tested had the following measured Liquid Limit (LL), Plastic Limit (PL), and Plasticity Index (PI) values and percentage of material passing the No. 200 sieve:

Sample Location, Depth	Liquid Limit, (%)	Plastic Limit, (%)	Plasticity Index, (%)	Percent Passing No. 200 Sieve, (%)
Boring BM-001, 2.0-3.5 ft.	46	24	22	94
Boring BM-001, 13.5-15.0 ft.	67	38	29	53
Boring BM-001, 28.5-30.0 ft.	69	27	42	46
Boring BM-002, 8.5-10.0 ft.	59	29	30	75
Boring BM-002, 13.5-15.0 ft.	79	36	43	87
Boring BM-003, 0.5-2.0 ft.	52	20	32	70
Boring BM-003, 23.5-25.0 ft.	59	23	36	22
Boring BM-004, 8.5-10.0 ft.	42	21	21	80
Boring BM-004, 23.5-25.0 ft.	63	28	35	41

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil and rock types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs in **Appendix A**.

3.3 Groundwater

The boreholes were observed while drilling and immediately after completion for the presence and level of groundwater. The water levels observed are noted on the attached boring logs, and are summarized below.

Approximate Groundwater Depth / Elevation (feet)			
Boring	**While drilling**	**After drilling**	**24 hours after drilling**
BM-001	Not encountered to 32’ / 1285’	Not determined, boring caved in	Not determined, boring caved in
BM-002	27’ / 1289.5’	Not determined, boring caved in	Not determined, boring caved in
BM-003	24’ / 1291’	Not determined, boring caved in	Not determined, boring caved in
BM-004	Not encountered to 34’ / 1288’	Not determined, boring caved in	Not determined, boring caved in

Monitoring Water Well (BW-706)

To obtain longer-term groundwater levels, a temporary piezometer (monitoring water well) was installed at boring location BW-706, near the west bridge abutment. Upon installation of the temporary piezometer, water was bailed from the piezometer the same day. Groundwater levels were then measured between October 10, 2013 and April 16, 2014. Boring log for BW-706 is provided in **Appendix A**.

Approximate Groundwater Depth / Elevation (feet)				
Boring No.	**October 10, 2013**	**December 14, 2013**	**January 29, 2014**	**April 16, 2014**
BW706	23.8’ / 1292.8’	29.5’ / 1287.1’	23.0’ / 1293.6’	24.5’ / 1292.1’

Fluctuations in the groundwater level should be expected due to seasonal variations in the amount of rainfall, runoff and other factors not apparent at the time the borings were drilled. Evaluation of these factors and their effect on the groundwater levels is beyond the scope of this report. The possibility of groundwater level fluctuations and the presence of perched water should be considered when designing and developing the construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The proposed 8th Street bridge over I-49 will include the construction of MSE walls at the bridge abutments along with three bridge bents and wingwalls at the bridge ends. Based on the results of our exploration and our understanding of the project, bents and wingwalls can be supported on driven steel H-piles driven to practical refusal. We understand that bridge foundations consisting of HP 12×53 piles are desired. However, the results of our pile drivability analyses indicate that a bigger pile size will be required near the bridge abutments. Based on our analysis, we anticipate that HP 12×53 piles can be used to support the bridge structures with predrilling through the overburden soil and chert seams to extend the piles to suitable bedrock. We have included recommendations for HP 14×73 piles in this report. Piles will develop their capacity from end bearing on the recommended bedrock materials and/or side friction within the overburden soils.

Based on the results of the bridge borings, the top of the bedrock will be encountered at elevations of about 1285.5 to 1288.5 feet. The overburden soil thicknesses along the bridge alignment vary from about 27.5 to 33.5 feet. Overburden soil depths as thick as 40 feet were encountered at some of the previously drilled MSE wall borings.

Recommendations regarding earthwork and design and construction of bridge foundations, lateral earth pressures, and MSE walls for the proposed project are provided in the following sections.

4.2 Earthwork

4.2.1 Site Preparation

Areas to be graded should be stripped and cleared of all surface vegetation, bushes, debris, and any other deleterious material. Any surface and subsurface features from previous site use near the proposed project limits should be removed full-depth.

After stripping and completing any required cuts and undercuts, and before placing any new fill, the exposed subgrade should be proofrolled with a fully-loaded dump truck, scraper, or other rubber-tired construction equipment weighing at least 25 tons to evaluate the presence of any low strength, unstable soils. Any low strength, unstable soils identified by the proofrolling should be overexcavated and replaced with tested and approved fill as indicated in section **4.3 Fill Material Types**, if they cannot be adequately stabilized in-place. Areas too small to proofroll should be evaluated by a representative of the geotechnical engineer.

After completing a successful proofroll, and before placing any fill, the exposed subgrade should be scarified to a minimum depth of 9 inches, moisture conditioned, and compacted as recommended in section **4.4 Compaction Requirements**.

4.2.2 Fill Material Types

We anticipate that fill materials for MSE walls for the bridge abutments will be divided into 1) soils for the reinforced zone and 2) retained soils.

We assume that the backfill materials used within the reinforced zone will meet American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA) National Concrete Masonry Association (NCMA), and/or Arkansas Highway Transportation Department (AHTD) standard specifications for design and construction of MSE walls. Although currently the use of materials with up to 35 percent fines can be allowed within the reinforced zone, we recommend that relatively clean (with a maximum content of fines of 15 percent), free draining material with a minimum effective friction angle of 34 degrees be used within the reinforced zone.

We anticipate that retained backfill soils will consist of materials similar to the soils encountered in areas near the proposed bridge. Based on the results of our geotechnical exploration, such soils consist of low to high plasticity clays and granular soils with different amounts of fines. We recommend that soils having Plasticity Index (PI) values greater than 20 be blended with lower PI soils before being used as new fill. On-site clayey gravel or imported clayey gravel ("hillside") material must have a liquid limit of less than 45 or, if the liquid limit is 45 or greater, clayey gravel or imported clayey gravel must have less than 35 percent passing a No. 200 sieve. On-site or imported clayey gravel should be tested and approved by the geotechnical engineer prior to its use.

4.2.3 Fill Compaction Requirements

The scarified and compacted subgrade and new fills should be moisture conditioned and compacted using the recommendations presented in the following table.

Item	Description
Subgrade Scarification Depth	9-inches
Fill Lift Thickness [1]	12-inches or less in loose thickness
Compaction Requirements [2]	At least 95% of the material's maximum dry density based on AASHTO T-99 standard specifications.
Moisture Content	A level within minus 2 to plus 2 of the material's optimum moisture content, determined in accordance with AASHTO T-99.

1. Thinner lifts are recommended in confined areas or when hand-operated compaction equipment is used.
2. The scarified and compacted subgrade and new fills should be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

The recommended moisture content should be maintained in the scarified and compacted subgrade and new fills, until fills are completed.

Although the moisture content and density relationship of free-draining backfill materials cannot be suitably tested using the AASHTO T-99 standard, these materials should still be constructed in a controlled manner and tested during construction. An observation-based procedure in which the granular material is densified by multiple passes of the compaction equipment until the maximum achievable density is reached or relative density test procedures should be performed to verify that adequate compaction of clean granular material has been achieved.

The fill material should be placed on a relatively level surface. Existing slopes configured at ratios greater than 4H:1V should be continuously benched to avoid placing fill on a sloped surface. The benches should be of sufficient width for easy access to placement and compaction equipment.

4.3 Driven Pile Foundations

Based on the results of our geotechnical exploration and analyses, bridge bents and wingwalls can be supported on driven steel H-piles driven to practical refusal in the limestone and/or cherty limestone bedrock that was encountered in our bridge borings and nearby MSE wall borings at depths of about 25 to 40 feet and elevations of about 1281 to 1289 feet.

We understand that steel piles will be primarily designed to develop their capacity from end bearing on the limestone and cherty limestone bedrock materials encountered in the bridge borings. Side friction in the overburden soils can also be used in foundation design to resist vertical and uplift forces. However, side friction to resist vertical loads in compression is only recommended if pile refusal is not achieved in the recommended bedrock bearing materials and piles are designed for side friction only.

Based on the preliminary design drawings provided to us by Burns & McDonnell, we understand that 50 ksi grade steel, HP 12×53 piles driven to bedrock are desired. However, the results of our pile drivability analyses indicate that driving the HP 12×53 piles to bedrock might result in damaged piles due to the presence of chert seams, especially near the bridge abutments. Our analyses were based on using two typical hammers, a small and a medium size hammer, based on our local experience.

Based on our analysis, we anticipate that HP 12×53 piles can be used to support the bridge structures with predrilling through the overburden soil and chert seams to extend the piles to suitable bedrock. To avoid pile predrilling, a larger pile size and a medium-size hammer can be used. Based on the results of our analyses, 50 ksi grade steel, HP 14×73 piles and a Delmag D 30-32, or similar hammer size, can be used as an alternative to the HP 12×53 piles.

To develop the pile capacity from end bearing, steel piles should be driven to practical refusal in the bedrock materials. If driven to practical refusal, the allowable stress of the pile cross section will control the pile capacity. The capacity of the pile can be determined as 25% of the pile yield stress multiplied by the actual cross section area of the pile.

Because of the high variation in the amount of chert content and thickness and depth to chert seams in the overburden soils, we recommend that the pile length be estimated based on piles being driven to penetrations of less than 3 feet into the hard, limestone and/or cherty limestone bedrock. Because of the high driving resistance anticipated in the overburden (clayey chert gravel, silty chert gravel, and chert seams) and bedrock materials, we recommend that the steel piles be equipped with driving tips that can endure high driving stresses.

Variations may occur in the depth to and quality of bedrock and in the density and strength of overburden soils with distances away from the borings. All piles should be driven until satisfactory driving resistance is developed for the design capacity of the pile section. The required driving resistance and appropriate "refusal" criteria should be evaluated in accordance with an appropriate dynamic pile driving formula or wave equation analysis.

We recommend a minimum spacing of 3 pile diameters center-to-center between adjacent piles to account for both pile constructability and pile bearing capacity.

Long-term settlement of driven pile foundations, designed and constructed as recommended above, should be on the order of 1/2 inch or less.

We estimate that the total settlement of the foundation soils will be on the order of about 1 ½ to 2 ½ inches. With that magnitude of settlement, downdrag forces on driven piles that are located within new fill areas as a result of bridge MSE wall/bridge approach settlement will have to be considered in the driven pile design. We anticipate that the majority of the new fill settlement constructed for the bridge MSE wall/bridge approaches will occur within about 2 to 3 months after completion of MSE wall construction. To reduce the downdrag force to a negligible amount, we recommend that driven piles be installed 3 months or longer after finishing MSE wall construction.

4.3.1 Drivability of Pile Foundations

GRL WEAP analyses were performed to evaluate the pile capacity and drivability at the East abutment and center bent. The soil profiles used in the analyses were based on boring BM-004 for the East abutment and on boring B-002 for the center bent. Borings at the East and West abutments indicate similar subsurface conditions. The consistency of the cohesive soils and relative density of the granular soils were assigned based on the SPT-N values shown on the respective boring logs.

The analyses were performed for two steel HP pile sizes, HP 12x53 and HP 14x73, 50 ksi grade steel, using two hammer types. Delmag D19-42 and Delmag D30-32 hammers were used in the analyses. A hammer efficiency of 0.6 was assigned for set limitation whereas a hammer efficiency of 0.8 was used for the pile stress limitation check. The following hammer characteristics were used:

Hammer Type	Ram Weight	Energy/Power	Pressure	Stroke
Delmag D19-42	4.0 kips	43.24 kips-feet	1520 psi	10.81 feet
Delmag D30-32	6.6 kips	75.43 kips-feet	1400 psi	11.43 feet

Cushion

Type: **50% Alum + 50% Conbest**
Area: 415 in^2
Elastic Modulus: 530 ksi
Thickness: 2 in.
C.O.R: 0.8
Stiffness: 0 kips/in.
Helmet Weight: 3.2 kips

Driven pile acceptability criteria included a pile stress limitation corresponding to the allowable pile driving stress of 0.9 fy (45 ksi) based on ASSHTO criteria (Article 6.5.4.2). The set limitation was taken as not less than 2 inches per 20 blows based on our experience.

The following conclusions were determined based on the results of our GRL WEAP analyses:

- Drivability will be critical in order to drive the piles to bedrock at the abutments. Borings drilled for the abutments encountered chert/gravel layers. The friction angle in the chert/gravel may be as high as 40 degrees where there is SPT refusal. There is also the possibility of refusal on larger gravel, although these materials were not observed in the borings.

- Based on the results of the drivability analyses, a D30-32 hammer with HP 14x73 piles is recommended in order to realize refusal in bedrock without predrilling as it meets the driven pile acceptability criteria.

- Based on the results of the drivability analyses, neither the D19-42 nor the D30-32 hammers with HP 12x53 piles meet the driven pile acceptability criteria. Thus, predrilling will be required in order to extend HP 12x53 piles at the abutments to realize refusal in bedrock.

- If piles refuse in the chert/gravel layer during driving, settlement may occur because of the fat clay layer below the chert/gravel and above the bedrock. Therefore, we recommend performing settlement analyses to meet the serviceability condition (Service I Limit State).

- Based on the bearing results, we recommend a maximum 400 kips to 420 kips nominal bearing capacity (based on the pier being critical for stress) for HP 14x73 piles using a D30-32 hammer. Note that this nominal bearing capacity is a slightly higher than the 25% of the pile yield stress.

- We recommend Dynamic Load Testing / Pile Driving Analyzer (PDA) testing to allow for a higher resistance factor of 0.65 and to take advantage of the efficiency of driving to bedrock (or to the gravel/chert layers). Testing with a PDA could also reduce the number of piles driven to equivalent penetration when compared to utilizing a 0.5 resistance factor with WEAP alone. Stresses and hammer efficiency could also be confirmed through the use of a PDA. PDA could also confirm limitation of set to insure that the 0.9Fy stress is not exceeded and for adjusting the fuel setting on the hammer to meet the drivability criteria.

- The bearing and drivability analyses results from the GRL WEAP software are presented in **Appendix C**.

4.3.2 Frictional Capacity of Pile Foundations

Side friction in the overburden soils can also be used in foundation design to resist axial compression or uplift forces only if refusal is not achieved in the recommended bedrock bearing materials. If the piles bear in rock, we anticipate that side friction in compression will not be developed as piles will not mobilize their frictional capacity.

Nominal side resistance curves for bridge borings BM-001 through BM-004 are provided in **Appendix D**. A side resistance factor (φ_{stat}) of 0.35 for clay and mixed soils and a side resistance factor of 0.45 for sands (granular materials), as outlined in Table 10.5.5.2.3-1 of AASHTO *LRFD Bridge Design Specification, 6th Edition, 2012,* should be applied to the nominal values.

4.3.3 Lateral Capacity of Pile Foundations

We understand that lateral loads will be supported by the pile foundations. Parameters that can be used for the lateral analysis of single driven pile foundations are provided in in **Appendix E** of this report for the computer program LPILE Version 6.0 (developed by Ensoft, Inc.).

Reduction factors for lateral analysis of driven pile foundations are recommended if the spacing between adjacent piles is less than 6 times the pile diameter. For lateral load resistance of grouped piles, we recommend using the reduction factors (p-multipliers) presented in the “Drilled Shafts: Construction Procedures and LRFD Design Methods” manual published by the Federal Highway Administration (FHWA). The reduction factors depend on each pile’s relative position within the group and pier spacing.

Pile Center-to-Center Spacing in the direction of loading	Recommended p-Multiplier		
	Lead Row	2nd Row	3rd and Higher Row
3D	0.7	0.5	0.35
4D	0.85	0.65	0.5
5D	1	0.85	0.7
≥6D	1	1	1

D: pile diameter

4.4 Seismic Considerations

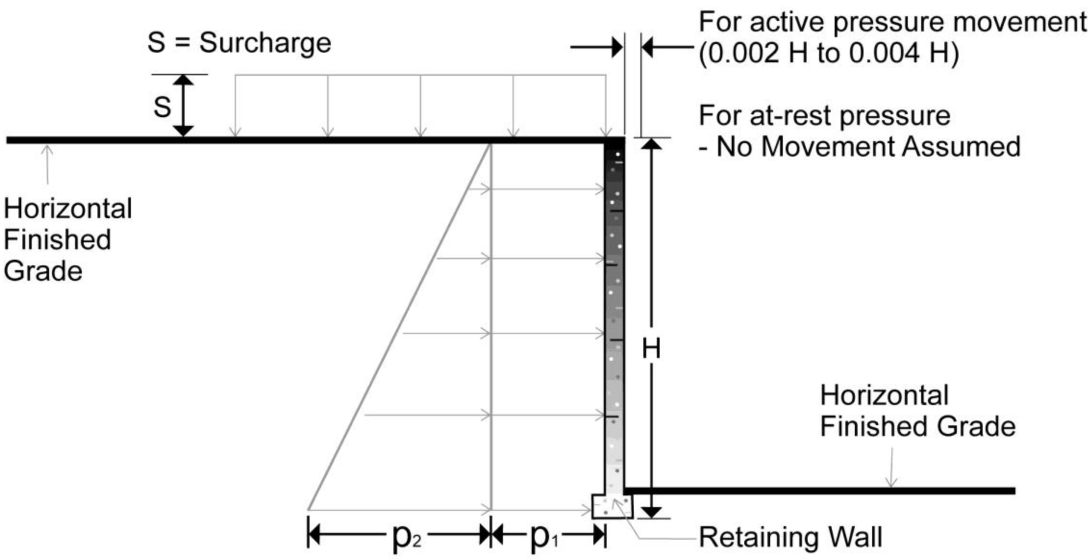
Code Used	Site Classification
2012 AASHTO LRFD [1]	C

1. In general accordance with the *2012 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS,* Table 3.10.3.1-1 – Site Class Definitions.

4.5 Lateral Earth Pressures for Cast-in-Place Concrete Walls

The lateral earth pressure recommendations provided in this section are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever, or gravity type concrete walls. These recommendations are not applicable to the design of modular block – geogrid reinforced backfill walls.

Reinforced concrete walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.



Earth Pressure Coefficients

Earth Pressure Conditions	Coefficient for Backfill Type	Equivalent Fluid Density (pcf)	Surcharge Pressure, p_1 (psf)	Earth Pressure, p_2 (psf)
Active (Ka)	Granular - 0.30	38	(0.30)S	(38)H
	Clay - 0.36	45	(0.36)S	(45)H
At-Rest (Ko)	Granular - 0.46	58	(0.46)S	(58)H
	Clay - 0.53	66	(0.53)S	(66)H
Passive (Kp)	Granular - 3.39	424	---	---
	Clay - 2.77	346	---	---

Applicable conditions to the above include:

- For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 **H** to 0.004 **H**, where **H** is wall height
- For passive earth pressure to develop, wall must move horizontally to mobilize resistance
- Uniform surcharge, where S is surcharge pressure. We recommend using a uniform surcharge due to traffic load parallel to the walls of 240 psf and a uniform surcharge due to traffic load perpendicular to the walls of 500 psf
- In-situ soil backfill weight a maximum of 125 pcf
- Horizontal backfill, compacted between 95 and 98 percent of standard Proctor maximum dry density
- Loading from heavy compaction equipment not included
- No hydrostatic pressures acting on wall
- No dynamic loading
- No safety factor included in soil parameters
- Ignore passive pressure within the 2 feet of the final adjacent grade

Backfill placed against the wall should consist of granular soils or low plasticity imported or on-site cohesive soils that satisfy the requirements outlined in section **4.2.2 Fill Material Types**. For the granular values to be valid, the granular backfill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

To control hydrostatic pressure behind the wall, we recommend that drainage be provided behind the wall with a collection pipe leading to a reliable discharge. These pressures do not include the influence of surcharge, equipment loading, which should be added. Heavy equipment should not operate within a distance closer than the exposed height (opposite of backfill side of wall) of retaining walls, or depth of excavation to prevent lateral pressures more than those provided. Walk-behind rollers may be used within this area.

The upper 2 feet of backfill placed adjacent to the walls should consist of a compacted, relatively impermeable, clay material (on-site clay soils with a PI greater than 12 may be used) to limit the downward flow of surface water along the walls. These soils should be placed following the recommendations provided in section **4.2.3 Fill Compaction Requirements**. Also, positive surface drainage should be developed and maintained around the walls to prevent the ponding of water and to divert drainage away from the walls.

4.6 Mechanically Stabilized Earth (MSE) Walls

We understand that the retaining walls planned in the front of the bridge abutments beneath the bridge will be constructed as a modular block faced – geogrid reinforced backfill system. These walls are typically subcontracted as design-build structures, since design details are often manufacturer specific. Established design methods for modular block walls address local and internal stability, but do not specifically address the global stability of the wall system. Therefore, we recommend the following general and specific considerations be included in the project specifications for the wall design.

Internal stability analyses should conform to the latest design methodology accepted for use by the Federal Highway Administration (FHWA). Since this analysis procedure is based on the use of drained strength parameters, the backfill used for the geogrid reinforced backfill section should be a drainable, granular material to conform with the assumptions of the analysis. Cohesive soil or granular material containing high amounts of fines are not considered drainable and should not be allowed in the geogrid reinforced backfill zone unless provisions are made to provide backslope and surface drainage that would prevent water from entering the backfill. The designer should state in the construction specifications the backfill material description and design strength parameters so that unsuitable materials are not allowed in the backfill zone during construction.

We recommend that select aggregate fill material consisting of Arkansas Highway and Transportation Department (AHTD) Class 7 aggregate, or equivalent, be used to construct the reinforced zone of backfill.

We have performed external and global stability analyses for the MSE walls for the bridge abutments based on the preliminary bridge plans provided to us and the results of borings BM-001 and BM-004. The wall contractor/designer should be required to provide the global stability analyses based on the planned final cross section, including the topography above and below the wall, using the generalized subsurface stratigraphy discussed in this report.

Terracon should be provided the opportunity to review and comment on the wall system design and analysis prior to construction. Testing and monitoring during construction by qualified geotechnical personnel is recommended.

4.6.1 Design Parameters for MSE Walls

The following recommended values can be used in external stability analyses of MSE walls for the bridge abutments. Global stability of the wall system should be analyzed using both drained and undrained strength parameters. Parameters used in the analysis should not exceed those given in the following table. These parameters are based on laboratory testing performed as part of this study and/or our past experience with similar materials. Confirmatory testing is recommended.

Material Type	**Recommended Strength Parameters**			
	Total Stress (Undrained) Parameters		**Effective Stress (Drained) Parameters**	
	C_u, psf	ϕ, degrees	C’, psf	ϕ’, degrees
Foundation Soils				
Lean clay and lean to fat clay	1,750	0	50	29
Elastic silt and fat clays	1,500	0	0	23
Clayey Chert Gravel	0	30	0	30
Bedrock	125	38	125	38
Reinforced Backfill (AHTD Class 7 aggregate)	0	34	0	34
Retained Backfill				
Clays	1,500	0	0	28
Clayey Chert Gravel	0	32	0	32

MSE wall foundations should bear on the stiff to very stiff native clays and can be designed using a nominal bearing resistance of 11,500 pounds per square foot (psf). A bearing resistance factor (φ_b) of 0.65, as outlined in Table 11.5.7-1 of AASHTO *LRFD Bridge Design Specification, 6th Edition, 2012,* should be applied to the nominal bearing value.

Lateral loads can be resisted by frictional resistance between the base of the MSE wall foundations and the underlying bearing materials. The nominal sliding resistance between the base of the MSE wall foundations and the underlying bearing materials can be calculated using a coefficient of friction value (tan δ) of 0.36. A resistance factor (φ_τ) of 1.0, as outlined in Table 11.5.7-1 of AASHTO *LRFD Bridge Design Specification, 6th Edition, 2012,* should be applied to the calculated nominal sliding resistance.

MSE wall foundations should be embedded a minimum of 2 feet below final adjacent exterior grade to provide frost protection to the bearing materials.

Based on our experience on projects of similar size and scope, consolidation test results for the MSE wall borings near the bridge location, and empirical data, long-term total settlement of the foundation soils at the MSE walls/bridge approaches is expected to be on the order of about 1 ½ to 2 ½ inches. Differential settlement is expected to be on the order of ½ to 1 ½ inches per 100 feet of linear wall. Settlement of new fills is expected to be on the order of about 1 to 3 inches.

We anticipate that the majority of the foundation settlement will occur within about 3 to 6 months after construction and that about 75 percent of the new fill settlement will occur during construction over about a 2 to 3 month period. Recommendations for monitoring plates or special techniques to reduce settlement at the bridge approaches are not considered necessary at this time. If the structural engineer is concerned with the settlement values and settlement rates presented above, we can provide additional recommendations or provisions as required.

4.6.2 Global Stability of MSE Walls

AASHTO *LRFD Bridge Design Specifications, 6th Edition, 2012* recommends that global (overall) stability of the retaining wall, retained slope, and foundation soil be evaluated using limiting equilibrium methods of analysis, in which a single Factor of Safety (FOS) is generated by slope stability software.

The computer program SLIDE v6.0 (by Rocscience, Inc.) was used to evaluate the global stability of the MSE wall to be constructed in front of the West abutment. The analyses were performed based on the GLE/Morgenstern-Price analysis method, which consists of satisfying equilibrium of forces and moments acting on individual blocks to calculate the Factor of Safety. The results of boring BM-001 and BM-004 were used to estimate the strength parameters.

Based on the results of the global stability analyses, the minimum required reinforcing strap length for the MSE walls in front of the West and East abutments should be 80 percent of the wall height. The wall height is taken as the exposed height of the wall plus the embedment depth. The minimum reinforcement length required to satisfy the global stability is based on a FOS value equal to or greater than 1.5 for critical structures. The factor of safety values for both the long-term (drained) and short-term (undrained) conditions for the MSE walls were calculated as greater than 1.5. The SLIDE output for the West and East MSE walls is provided in **Appendix F**.

4.6.3 Construction Considerations for MSE Walls

The subgrade soils exposed at the bottom of the excavation for the retaining wall should consist stiff to very stiff native clays. Any low strength soils and/or undocumented existing fill materials will need to be removed full-depth and replaced with tested and approved fill.

The construction specifications should provide the backfill material description and design strength parameters that are required for the different fill zones so that unsuitable materials are not used in the reinforced backfill zone during construction.

Prior to starting construction of the MSE wall, fill material proposed to be used in constructing the reinforced zone for the wall should be sampled and tested in the laboratory to confirm that the engineering properties of the backfill satisfy the assumed properties used in design. Observation and field testing during earthwork activities and construction of MSE walls should be provided by qualified geotechnical personnel.

Any overexcavations for compacted backfill placement below the retaining wall should extend laterally a minimum of 5 feet beyond the front of the retaining wall toe to a minimum distance behind the wall equal to the width of the reinforced zone. The overexcavation should then be backfilled to the foundation base elevation with approved fill materials as recommended in section **4.2.3 Fill Compaction Requirements**.

If soils encountered during construction differ from the soils described in this report, Terracon should be consulted so proper adjustments and/or reevaluation of our analyses can be performed.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, pavement construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION

Field Exploration Description

The boring locations and elevations were established in the field by B & F Engineering, Inc. prior to commencement of our field activities. Borings BM-001 and BM-002 were offset in the field from their originally designated locations due to rig access constrains and/or the presence of underground utilities. Offset distances and elevation differences with respect to the staked borings were determined for the offset borings. Offset distances, ground elevations at the boring locations, and boring coordinates are shown on the boring logs in this Appendix. Elevations shown on the logs have been rounded to the nearest 0.1 feet. The boring locations and elevations should be considered accurate only to the degree implied by the methods used to define them.

We drilled the borings with ATV-mounted rotary drill rigs using continuous flight augers and rotary cutting bits to advance the boreholes. Representative samples were obtained by the split-barrel sampling procedure. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound auto-hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). The N-value is used to estimate the in-situ relative density of cohesionless soils, and to a lesser degree of accuracy, the consistency of cohesive soils and hardness of weathered bedrock.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings. Generally, a greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The sampling depths, penetration distances, and N-values are reported on the boring logs. The samples were tagged for identification, sealed to reduce moisture loss and returned to the laboratory for further examination, testing and classification.

We cored the bedrock at select boring locations using a NQ-size, diamond-bit core barrel. After the core samples were retrieved, the cores were placed in a box and logged. The rock was visually classified, and the “percent recovery” and rock quality designation (RQD) was determined for each run. The “percent recovery” is the ratio of the recovered sample length to the cored length, expressed as a percent. An indication of the actual in-situ rock quality is provided by calculating the core’s RQD. The RQD is the percentage of the total length of core retrieved that are in segments at least 4 inches in length compared to each core run length.

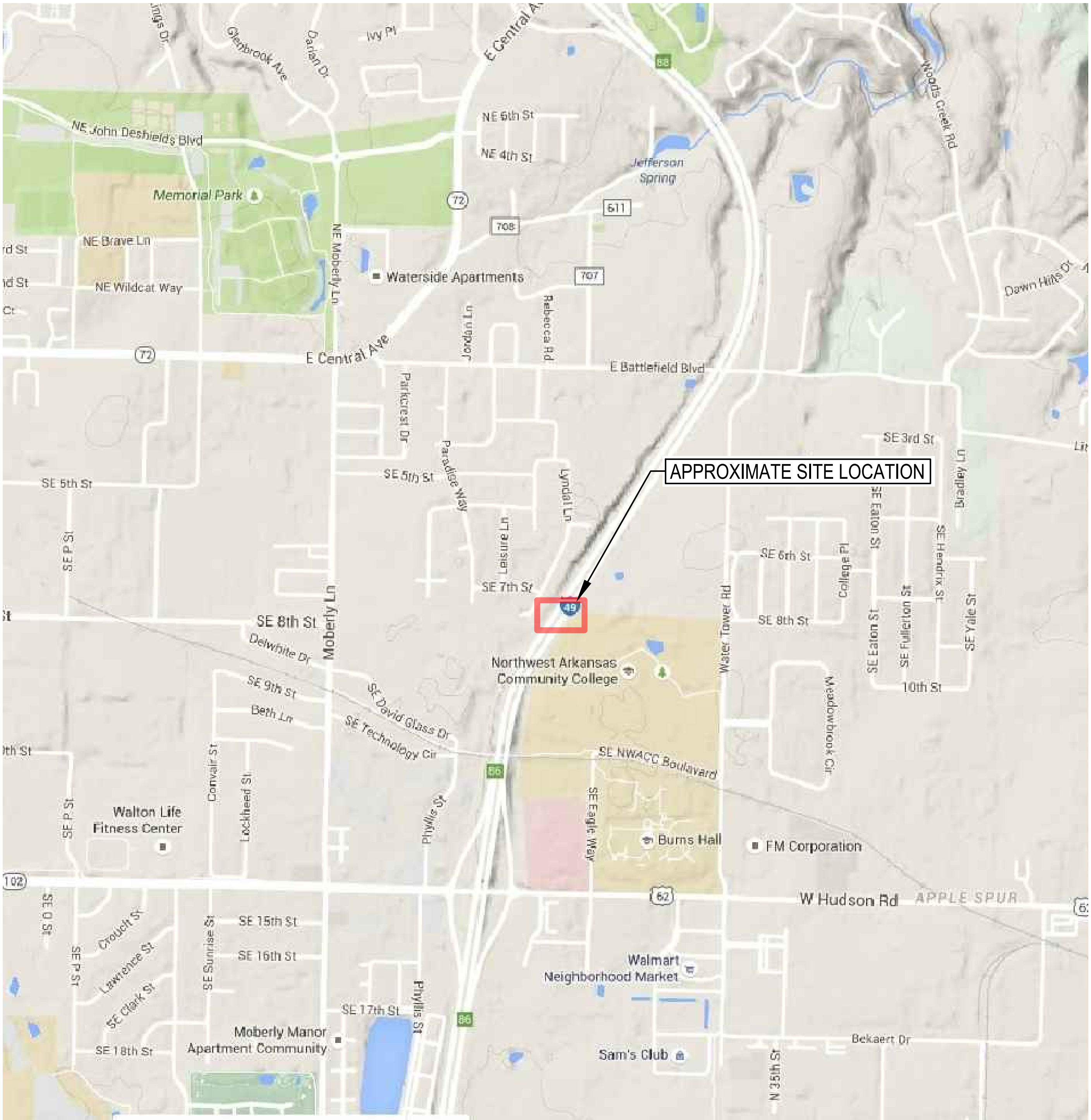
After drilling completion, the borings were backfilled with a cement-grout mix and soil cuttings as described on the individual borings logs.

Field Exploration Description (continued)

A field log of each boring was prepared by a geologist. These logs included visual classifications of the materials encountered during drilling as well as the geologist interpretation of the subsurface conditions between samples. Final boring logs include modifications based on observation and laboratory tests of the samples retrieved.

APPENDIX A

FIELD EXPLORATION



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N

1500 0 500 1000 1500

APPROXIMATE SCALE IN FEET

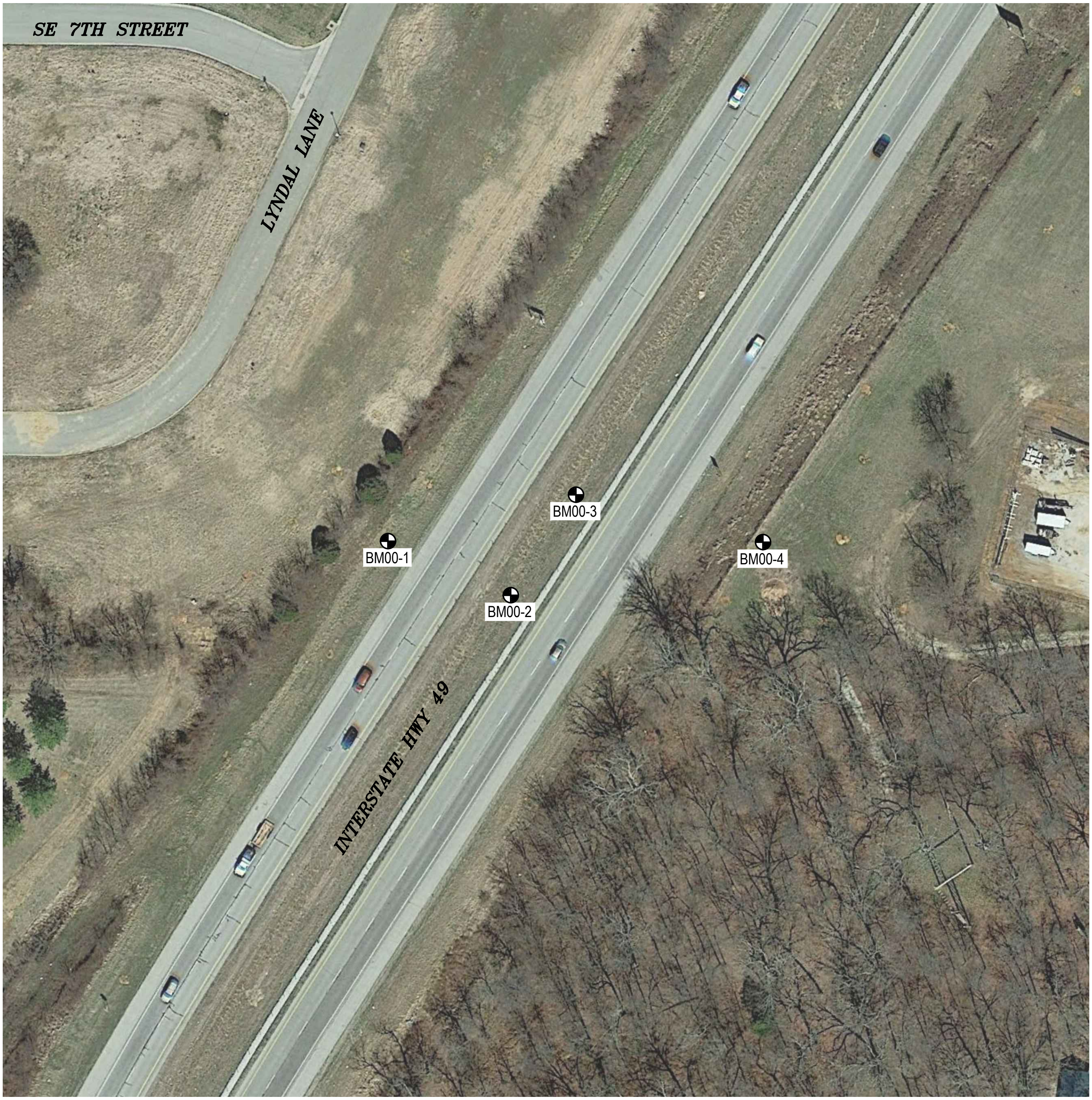
Project Mngr:	JEG
Drawn By:	JM
Checked By:	JEG
Approved By:	MHH

Project No.	04135111
Scale:	SEE BAR SCALE
File No.	04135111
Date:	AUGUST 2015

Terracon
Consulting Engineers and Scientists
9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145
PH. (918) 250-0461 FAX. (918) 250-4570

SITE LOCATION MAP
GEOTECHNICAL EXPLORATION
8TH STREET WIDENING PROJECT - BM
BENTONVILLE, ARKANSAS

EXHIBIT NO.
A-1



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LEGEND	
⊕	BORING LOCATION

100 0 25 50 75 100

APPROXIMATE SCALE IN FEET

N

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr: JEG	Project No. 04135111	Terracon Consulting Engineers and Scientists	BORING LOCATION PLAN	EXHIBIT NO.
Drawn By: JM	Scale: SEE BAR SCALE		GEOTECHNICAL EXPLORATION	A-2
Checked By: JEG	File No. 04135111	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145	8TH STREET WIDENING PROJECT - BM	
Approved By: MHH	Date: AUGUST 2015	PH. (918) 250-0461 FAX. (918) 250-4570	BENTONVILLE, ARKANSAS	

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An automatic SPT hammer was used to advance the split-barrel sampler in the borings. Generally, a greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The sampling depths, penetration distances, and N-values are reported on the boring logs. The samples were tagged for identification, sealed to reduce moisture loss and returned to the laboratory for further examination, testing and classification.

We cored the bedrock at select boring locations using a NQ-size, diamond-bit core barrel. After the core samples were retrieved, the cores were placed in a box and logged. The rock was visually classified, and the “percent recovery” and rock quality designation (RQD) was determined for each run. The “percent recovery” is the ratio of the recovered sample length to the cored length, expressed as a percent. An indication of the actual in-situ rock quality is provided by calculating the core’s RQD. The RQD is the percentage of the total length of core retrieved that are in segments at least 4 inches in length compared to each core run length.

After drilling completion, the borings were backfilled with a cement-grout mix and soil cuttings as described on the individual borings logs.

Field Exploration Description (Continued)

A field log of each boring was prepared by a geologist. These logs included visual classifications of the materials encountered during drilling as well as the geologist interpretation of the subsurface conditions between samples. Final boring logs include modifications based on observation and laboratory tests of the samples retrieved.

BORING LOG NO. BM-001

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION Offset 10 feet East

Latitude: 36.36374° Longitude: -94.17602°

Approximate Surface Elev: 1317.3 (Ft.) +/-

DEPTH	Material Description	ELEVATION (Ft.)
	3" Topsoil	
2.0	**FILL - SANDY LEAN CLAY**, brown (10YR,5/3) and yellowish-brown (10YR,5/8)	1315.5+/-
8.5	**LEAN CLAY (CL)**, reddish-brown (5YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff - becoming brown (10YR,5/3) and reddish-brown (5YR,5/3) below 5 feet	1309+/-
13.5	**FAT CLAY (CH)**, with chert fragments, reddish-brown (5YR,5/3), very stiff	1304+/-
	CHERTY ELASTIC SILT (MH), with sand, reddish-brown (5YR,5/3) and pinkish-gray (5YR,7/2), very stiff	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5–2		X	9	7-11-10 N=21		14		
2–3.5		X	18	4-7-11 N=18		23	46-24-22	94
5–6.5		X	18	3-5-8 N=13		19		
8.5–10		X	3	12-17-17 N=34		39		
13.5–15		X	16	6-15-11 N=26		40	67-38-29	53
18.5–20		X	3	9-8-8 N=16		45		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 32 feet
Diamond Bit below 32 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.
At offset location

Notes:

WATER LEVEL OBSERVATIONS
none to 32 feet while drilling
(See advancement method)
25 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-4

BORING LOG NO. BM-001

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION Offset 10 feet East

Latitude: 36.36374° Longitude: -94.17602°

Approximate Surface Elev: 1317.3 (Ft.) +/-

DEPTH / Material Description / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
CHERTY ELASTIC SILT (MH), with sand, reddish-brown (5YR,5/3) and pinkish-gray (5YR,7/2), very stiff *(continued)*									
	25	Cave	Split spoon	4	11-16-9 N=25		37		
28.5 — 1289+/-									
CLAYEY CHERT GRAVEL (GC), with sand, dark reddish-brown (5YR,3/3) and reddish-brown (5YR,5/3), loose	30		Split spoon	13	4-5-3 N=8		56	69-27-42	46
32.0 — 1285.5+/-									
LIMESTONE+, with chert seams, light gray (10YR,7/2), hard	35		Core		REC = 97% RQD = 92%	7960			
	40		Core		REC = 98% RQD = 91%	10580			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Power Auger to 32 feet
Diamond Bit below 32 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.
At offset location

Notes:

WATER LEVEL OBSERVATIONS

none to 32 feet while drilling

(See advancement method)

25 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-4

BORING LOG NO. BM-001

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION Offset 10 feet East

Latitude: 36.36374° Longitude: -94.17602°

Approximate Surface Elev: 1317.3 (Ft.) +/-

DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
LIMESTONE+, with chert seams, light gray (10YR,7/2), hard *(continued)*					REC = 100% RQD = 88%	10270			
	45				REC = 100% RQD = 91%	7590			
52.0 / 1265.5+/-	50				REC = 81% RQD = 81%				
Boring Terminated at 52 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Power Auger to 32 feet
Diamond Bit below 32 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.
At offset location

Notes:

WATER LEVEL OBSERVATIONS

none to 32 feet while drilling

(See advancement method)

25 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-4

BORING LOG NO. BM-002

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36366° Longitude: -94.17575°

Surface Elev.: 1316.7 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **FILL - SANDY LEAN CLAY**, brown (10YR,5/3) and reddish-brown (5YR,5/3)			X	12	7-12-6 N=18		12		
2.0		1314.5								
	LEAN CLAY (CL), reddish-brown (5YR,5/3) and yellowish-brown (10YR,5/8), stiff			X	18	3-6-8 N=14		27		
5.0		1311.5	5							
	FAT CLAY (CH), with sand, reddish-brown (5YR,5/3), stiff to very stiff			X	18	4-8-15 N=23				
				X	18	3-10-10 N=20		34	59-29-30	75
			10							
13.5		1303								
	ELASTIC SILT (MH), trace chert gravel, reddish-brown (5YR,5/3), stiff			X	18	3-4-8 N=12		44	79-36-43	87
			15							
	- with dense, chert seams below 18.5 feet			X	1	50/3"		21		
			20							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 30 feet
Diamond Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
27 ft while drilling
4 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-5

BORING LOG NO. BM-002

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36366° Longitude: -94.17575°

Surface Elev.: 1316.7 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	ELASTIC SILT (MH), trace chert gravel, reddish-brown (5YR,5/3), stiff *(continued)*										
23.5		1293									
	CHERTY FAT CLAY (CH), reddish-brown (5YR,5/3) and pinkish-gray (5YR,7/2), stiff		25			66	12-8-6 N=14		29		
				▽							
29.7		1287				1	3-14-50/5"		24		
	LIMESTONE+, with chert seams, light gray (10YR,7/2), hard		30				REC = 100% RQD = 72%	7830			
			35				REC = 100% RQD = 96%	8280			
			40								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 30 feet
Diamond Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *27 ft while drilling*

4 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-5

BORING LOG NO. BM-002

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.36366° Longitude: -94.17575°

Surface Elev.: 1316.7 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LIMESTONE+, with chert seams, light gray (10YR,7/2), hard *(continued)*					REC = 100% RQD = 88%	9660			
		45				REC = 100% RQD = 90%	6510			
	49.7 — 1267									
	Boring Terminated at 49.7 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Power Auger to 30 feet
Diamond Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix G for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

27 ft while drilling

4 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-5

BORING LOG NO. BM-003

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36384° Longitude: -94.1756°

Surface Elev.: 1314.9 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **CHERTY FAT CLAY (CH)**, yellowish-brown (10YR,5/8) and reddish-brown (5YR,5/3), stiff to very stiff		X	4	7-16-14 N=30		20	52-20-32	70
2.0	**FAT CLAY (CH)**, with chert gravel, reddish-brown (5YR,5/3), stiff to very stiff	1313	X	12	7-12-21 N=33		39		
			X	12	4-28-50/3"		39		
			X	11	11-14-11 N=25		44		
			X	12	3-28-6 N=34		45		
18.5	**CLAYEY SAND (SC)**, with chert gravel, light gray (10YR,7/2) and brownish-yellow (10YR,6/6), dense	1296.5	X	8	43-23-21 N=44		15		

DEPTH (Ft.): 5, 10, 15, 20

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
24 ft while drilling
8 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-6

BORING LOG NO. BM-003

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36384° Longitude: -94.1756°

Surface Elev.: 1314.9 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY SAND (SC), with chert gravel, light gray (10YR,7/2) and brownish-yellow (10YR,6/6), dense *(continued)*										
23.5	**CLAYEY SAND (SC)**, with chert gravel, reddish-brown (5YR,5/3) and pinkish-gray (5YR,7/2), loose	1291.5	25	▽	X	12	7-6-3 N=9		44	59-23-36	22
27.5	***Auger Refusal at 27.5 Feet***	1287.5									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *24 ft while drilling*
8 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-6

BORING LOG NO. BM-004

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION Offset 30 feet East

Latitude: 36.36372° Longitude: -94.17518°

Approximate Surface Elev: 1321.8 (Ft.) +/-

DEPTH	Description	ELEVATION (Ft.)
	3" Topsoil **SANDY LEAN CLAY (CL)**, brown (10YR,5/3), very stiff	
2.0		1320+/-
	SANDY LEAN CLAY (CL), brown (10YR,5/3), stiff	
5.0		1317+/-
	LEAN CLAY (CL), with sand and chert gravel, reddish-brown (5YR,5/3) and brown (10YR,5/3), stiff to very stiff	
18.5		1303.5+/-
	CLAYEY CHERT GRAVEL (GC), light gray (10YR,7/2) and reddish-brown (5YR,5/3), very dense	

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
12	14-12-7 N=19		8		
17	2-3-6 N=9		21		
18	4-5-8 N=13		24		
18	3-15-44 N=59		21	42-21-21	80
9	25-28-27 N=55		24		
5	2-20-50/1"		42		

DEPTH (Ft.): 5, 10, 15, 20

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 34 feet
Diamond Bit below 34 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.
At offset location

Notes:

WATER LEVEL OBSERVATIONS
none to 34 feet while drilling
(See advancement method)
6 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-7

BORING LOG NO. BM-004

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION Offset 30 feet East

Latitude: 36.36372° Longitude: -94.17518°

Approximate Surface Elev: 1321.8 (Ft.) +/-

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), light gray (10YR,7/2) and reddish-brown (5YR,5/3), very dense *(continued)*										
23.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR,7/2) and reddish-brown (5YR,5/3), medium dense	1298.5+/-	25			5	25-14-8 N=22		30	63-28-35	41
28.5	**CHERTY FAT CLAY (CH)**, reddish-brown (5YR,5/3), stiff	1293.5+/-	30				5-6-3 N=9		54		
33.5	**LIMESTONE+**, with chert seams, light gray (10YR,7/2), hard	1288.5+/-					0-50/1"				
			35				REC = 95% RQD = 73%	8060			
			40								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Power Auger to 34 feet
Diamond Bit below 34 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.
At offset location

Notes:

WATER LEVEL OBSERVATIONS
none to 34 feet while drilling
(See advancement method)
6 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-7

BORING LOG NO. BM-004

PROJECT: 8th Street Widening Project - Bridge

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

GRAPHIC LOG	LOCATION Offset 30 feet East Latitude: 36.36372° Longitude: -94.17518° Approximate Surface Elev: 1321.8 (Ft.) +/- DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LIMESTONE+, with chert seams, light gray (10YR,7/2), hard *(continued)*					REC = 100% RQD = 89%	7320			
		45				REC = 100% RQD = 88%	7290			
		50				REC = 100% RQD = 91%	11930			
	54.2 — 1267.5+/-									
	Boring Terminated at 54.2 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Power Auger to 34 feet
Diamond Bit below 34 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix G for explanation of symbols and abbreviations.
At offset location

Notes:

WATER LEVEL OBSERVATIONS

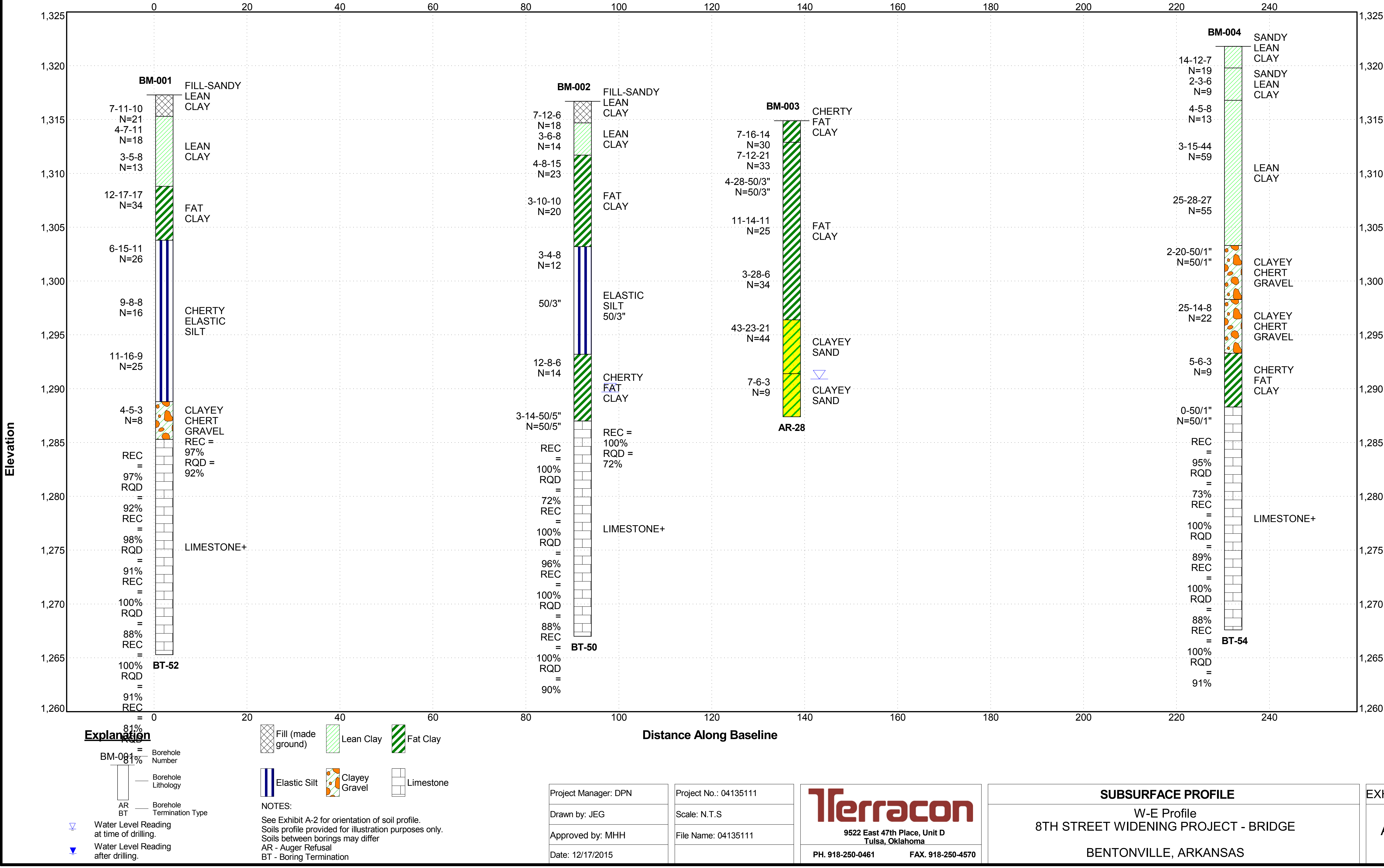
none to 34 feet while drilling

(See advancement method)

6 ft Cave in depth

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/17/2015	Boring Completed: 8/17/2015
Drill Rig: ATV 884	Driller: DB / Geologist: DPN
Project No.: 04135111	Exhibit: A-7



NOTES:
See Exhibit A-2 for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project Manager: DPN	Project No.: 04135111	Terracon	SUBSURFACE PROFILE	EXHIBIT
Drawn by: JEG	Scale: N.T.S	9522 East 47th Place, Unit D Tulsa, Oklahoma	W-E Profile 8TH STREET WIDENING PROJECT - BRIDGE	A-8
Approved by: MHH	File Name: 04135111		BENTONVILLE, ARKANSAS	
Date: 12/17/2015		PH. 918-250-0461 FAX. 918-250-4570		

BM-001 32.0' to 40.0'

BM-001 40.0' to 50.0'

BM-001 50.0’ to 52.0’

BM-002 29.7’ to 39.7’

BM-002 39.7' to 47.7'

BM-002 47.7' to 49.7'

BM-004 34.2' to 44.2'

BM-004 44.2' to 52.2'

BM-004 52.2' to 54.2'

APPENDIX B

LABORATORY TESTING

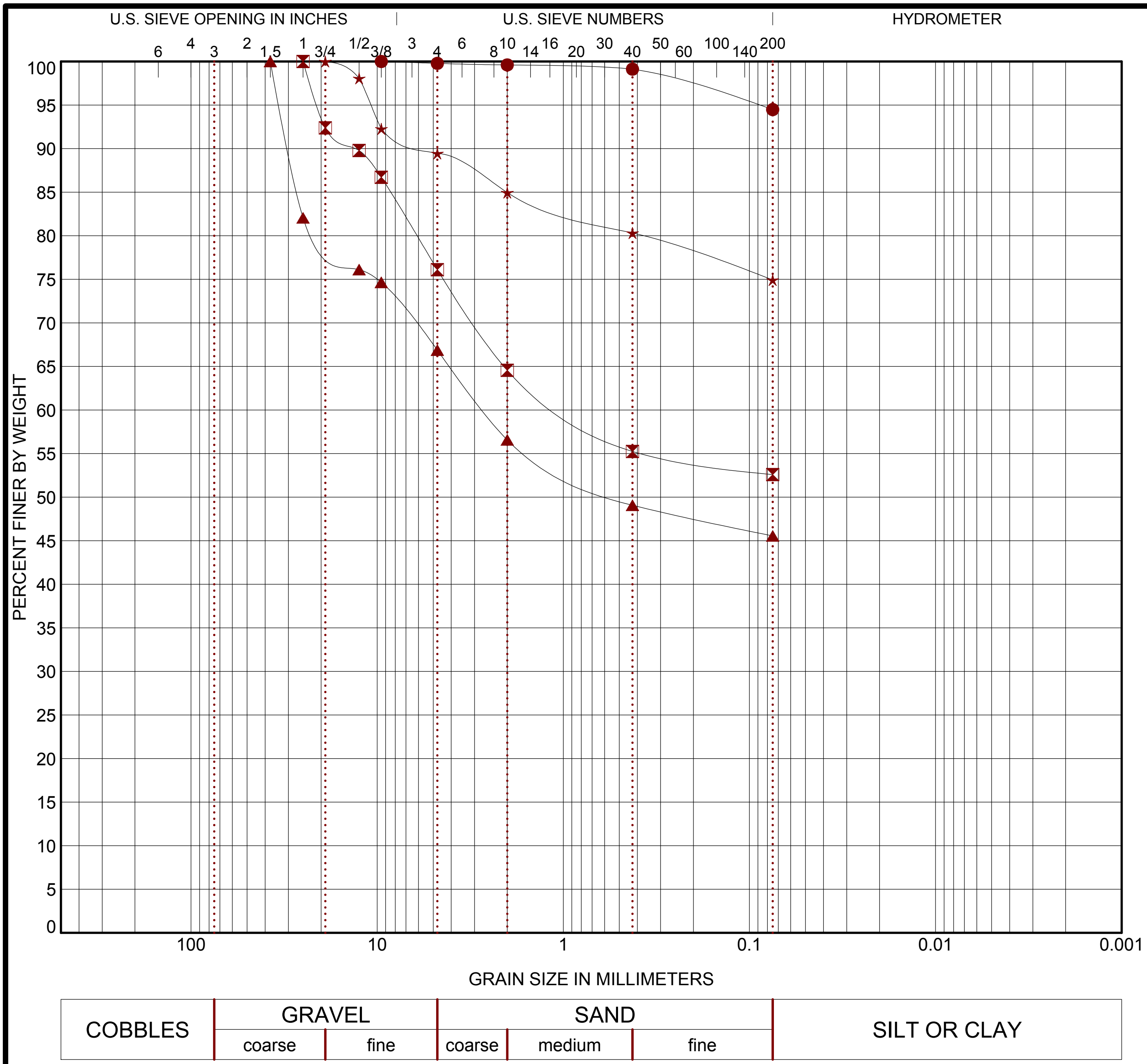
Laboratory Testing

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix G. Bedrock materials were classified according to the General Notes and described using commonly accepted geotechnical terminology. The field descriptions were modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil and rock samples. The laboratory test results are presented on the boring logs next to the respective samples and attached to this appendix. Laboratory tests were performed in general accordance with the applicable ASTM, AASHTO, local or other accepted standards.

The following tests were performed on selected soil and rock samples:

- Water content
- Atterberg limits
- Particle size distribution
- Rock unconfined compressive strength



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BM-001	2 - 3.5	LEAN CLAY(CL)	A-7-6(23)	46	24	22		
⧗	BM-001	13.5 - 15	GRAVELLY ELASTIC SILT with SAND(MH)	A-7-5(13)	67	38	29		
▲	BM-001	28.5 - 30	CLAYEY GRAVEL with SAND(GC)	A-7-6(14)	69	27	42		
★	BM-002	8.5 - 10	FAT CLAY with SAND(CH)	A-7-6(24)	59	29	30		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BM-001	2 - 3.5	9.5				0.2	5.3	94.5	
⧗	BM-001	13.5 - 15	25	0.937			23.9	23.5	52.6	
▲	BM-001	28.5 - 30	37.5	2.668			33.1	21.3	45.5	
★	BM-002	8.5 - 10	19				10.5	14.5	74.9	

PROJECT: 8th Street Widening Project - Bridge

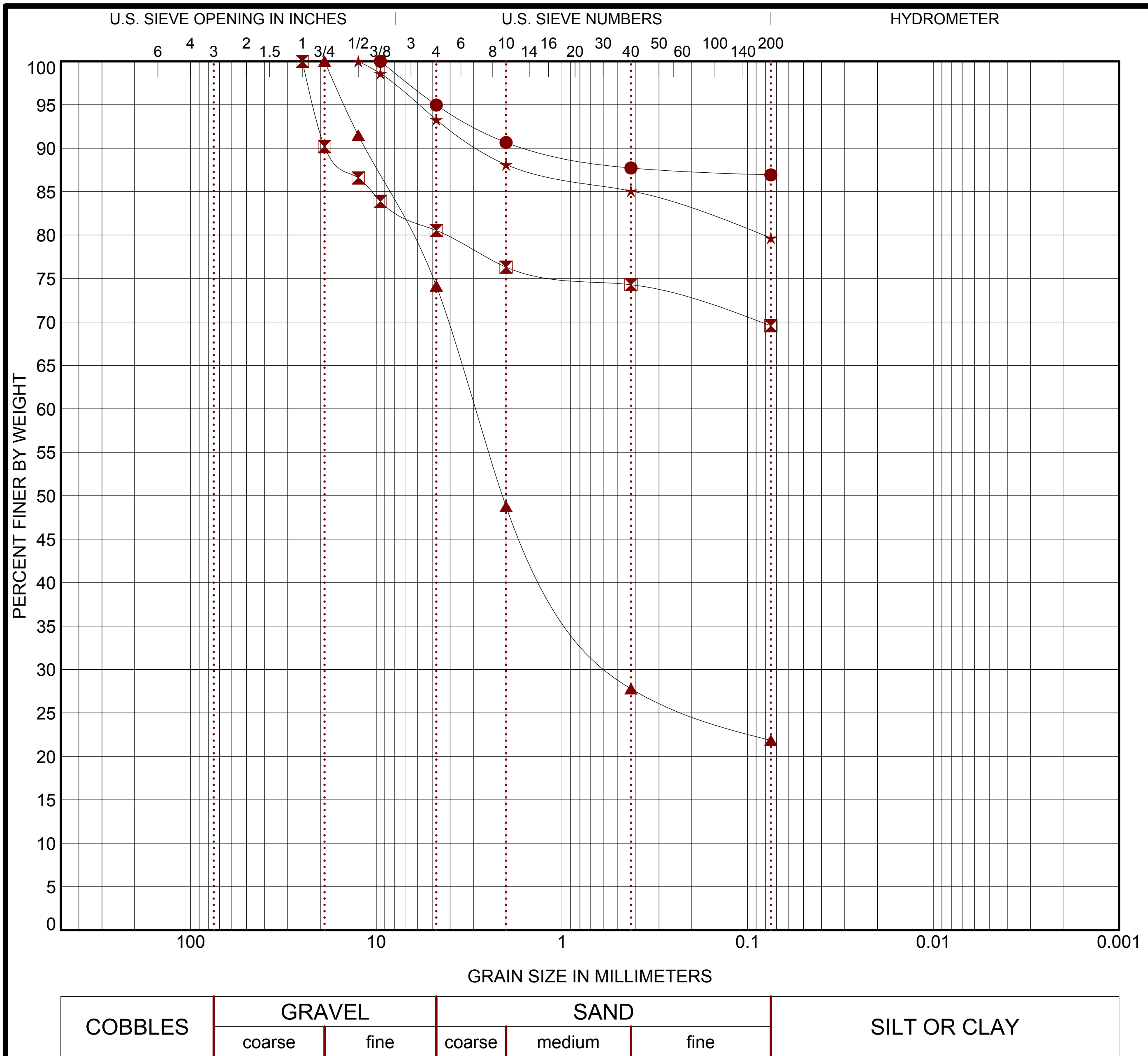
SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-2



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BM-002	13.5 - 15	ELASTIC SILT(MH)	A-7-5(44)	79	36	43		
⧗	BM-003	0.5 - 2	GRAVELLY FAT CLAY(CH)	A-7-6(21)	52	20	32		
▲	BM-003	23.5 - 25	CLAYEY SAND with GRAVEL(SC)	A-2-7(2)	59	23	36		
★	BM-004	8.5 - 10	LEAN CLAY with SAND(CL)	A-7-6(17)	42	21	21		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BM-002	13.5 - 15	9.5				5.0	8.0	86.9	
⧗	BM-003	0.5 - 2	25				19.5	11.0	69.6	
▲	BM-003	23.5 - 25	19	2.933	0.501		25.9	52.3	21.8	
★	BM-004	8.5 - 10	12.5				6.7	13.6	79.7	

PROJECT: 8th Street Widening Project - Bridge

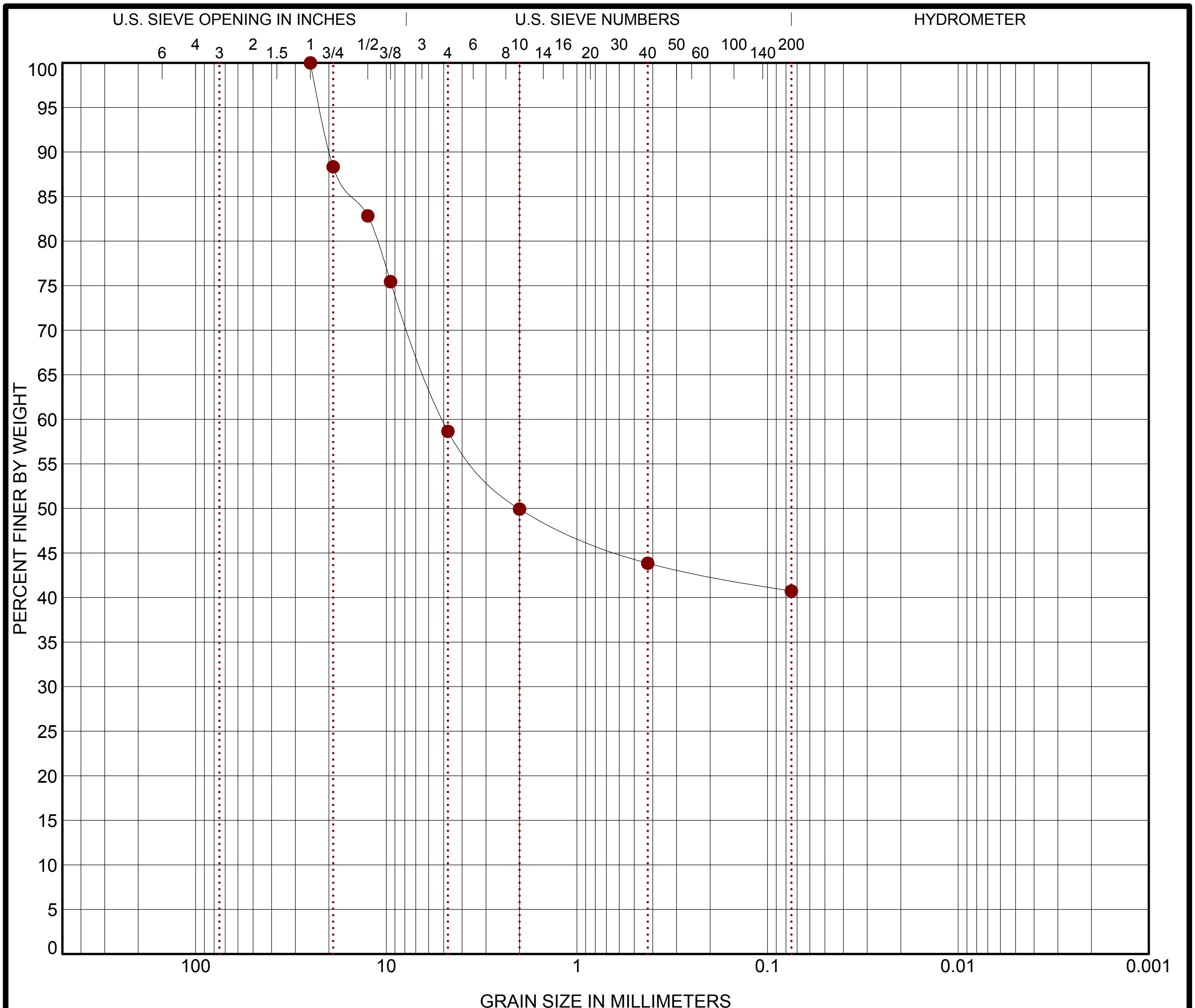
SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
● BM-004	23.5 - 25	CLAYEY GRAVEL with SAND(GC)	A-7-6(8)	63	28	35		

Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
● BM-004	23.5 - 25	25	5.022			41.3	17.9	40.7	

PROJECT: 8th Street Widening Project - Bridge

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-3

APPENDIX C

PILE DRIVABILITY

Summary of Pile Drivability Analyses

Boring BM-002 (Center Bent)

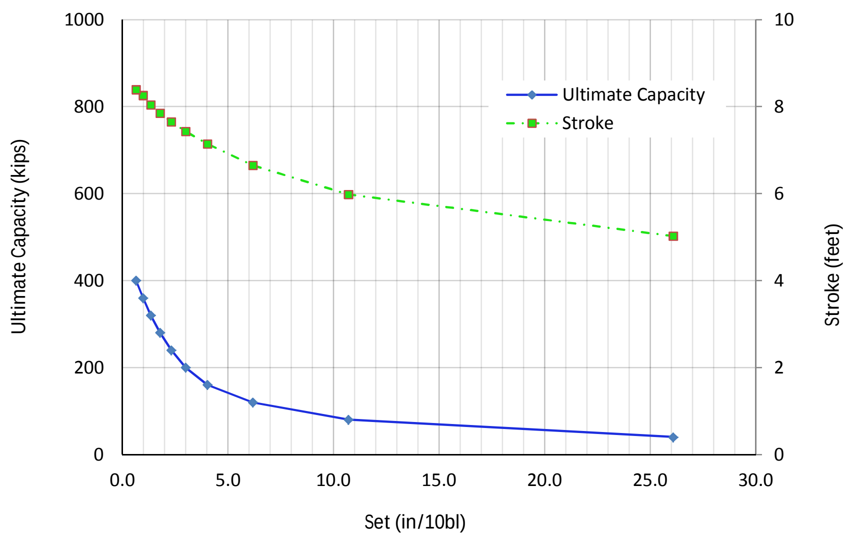
Pile Type	Hammer	Hammer Efficiency	Set (in/20 blows)		Stress (ksi)		Remark	Result
HP 12X53	D 19-42	0.6	9.8	9.2			at depth of 28-30 feet	OK
		0.8			26.7	27.9	at depth of 28-30 feet	OK
	D 30-32	0.6	20	18.8			at depth of 28-30 feet	OK
		0.8			33.9	35.2	at depth of 28-30 feet	OK
HP 14X73	D 19-42	0.6	4	3.7			at depth of 28-30 feet	OK
		0.8			24.9	25.7	at depth of 28-30 feet	OK
	D 30-32	0.6	8.3	7.8			at depth of 28-30 feet	OK
		0.8			28.7	30.2	at depth of 28-30 feet	OK

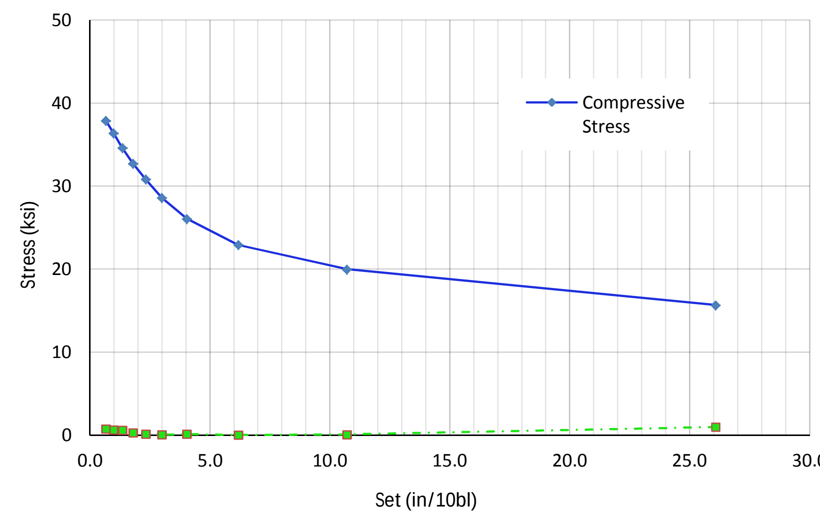
Boring BM-004 (East Abutment)

Pile Type	Hammer	Hammer Efficiency	Set (in/20 blows)		Stress (ksi)		Remark	Result
HP 12X53	D 19-42	0.6	1	0.6			at depth of 20-22 feet	Not OK
		0.8			42.4	42.5	at depth of 20-22 feet	OK
	D 30-32	0.6	4.2	3.6			at depth of 20-22 feet	OK
		0.8			55.3	55.7	at depth of 20-22 feet	Not OK
HP 14X73	D 19-42	0.6	1	0.8			at depth of 20-22 feet	Not OK
		0.8			32.4	32.3	at depth of 20-22 feet	OK
	D 30-32	0.6	4.2	3.6			at depth of 20-22 feet	OK
		0.8			41.9	42.2	at depth of 20-22 feet	OK

Pile:	HP12x53	Soil Boring:	BM-002
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

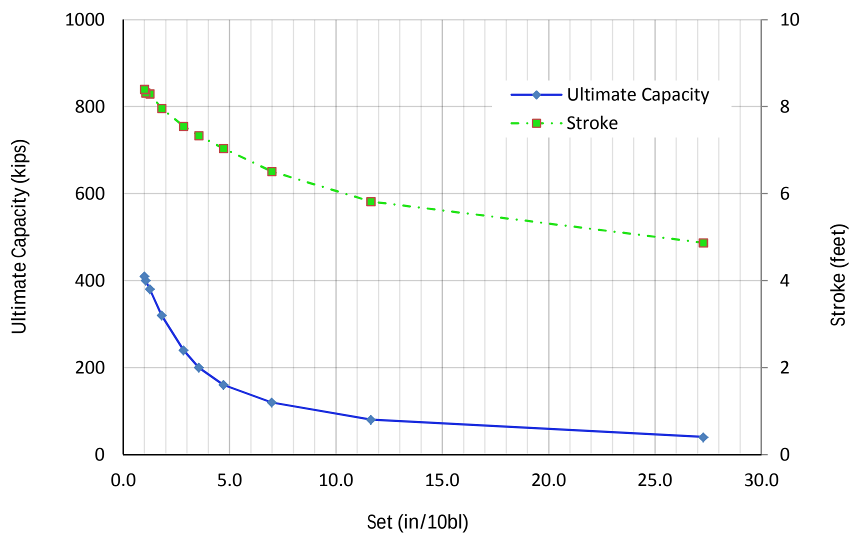
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
40	15.64	0.98	26.1	5.02	18.9
80	19.96	0.07	10.7	5.98	15.5
120	22.92	0.02	6.2	6.65	13.9
160	26.05	0.12	4.0	7.14	13.1
200	28.57	0.06	3.0	7.43	12.7
240	30.82	0.14	2.3	7.65	12.4
280	32.72	0.29	1.8	7.85	12.3
320	34.59	0.59	1.4	8.04	12.4
360	36.36	0.64	1.0	8.26	12.5
400	37.87	0.75	0.7	8.39	12.5

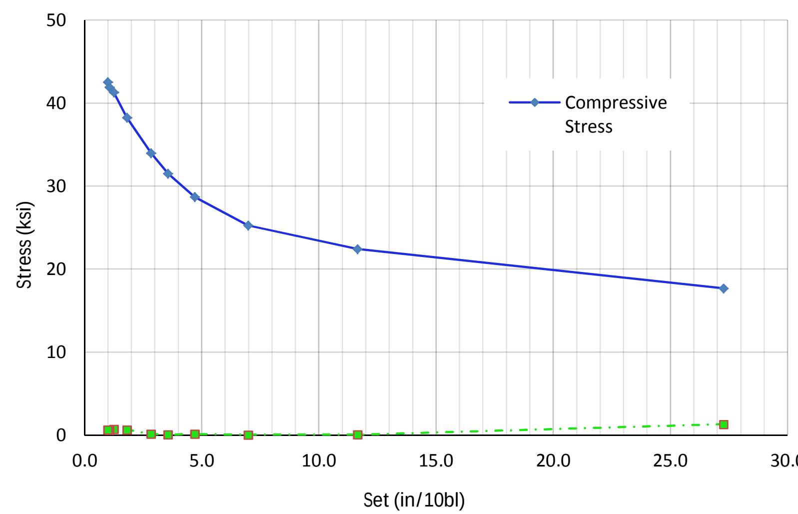




Pile:	HP12x53	Soil Boring	BM-002
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

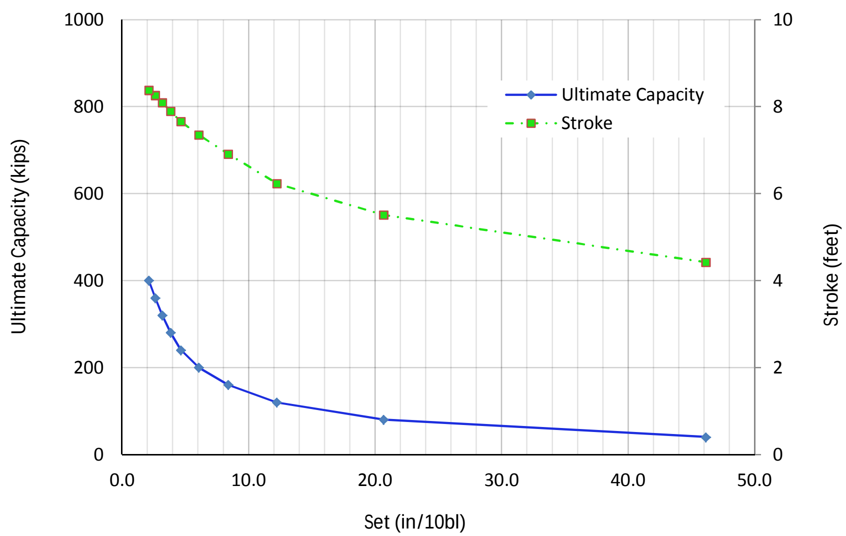
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
40	17.65	1.3	27.3	4.87	20.8
80	22.41	0.06	11.7	5.82	17.9
120	25.27	0.03	7.0	6.51	16.7
160	28.68	0.13	4.7	7.04	16.2
200	31.5	0.06	3.6	7.33	15.8
240	33.96	0.12	2.8	7.55	15.6
320	38.24	0.64	1.8	7.96	15.7
380	41.29	0.7	1.3	8.3	16.0
400	41.91	0.59	1.1	8.32	15.9
410	42.54	0.62	1.0	8.4	16.0

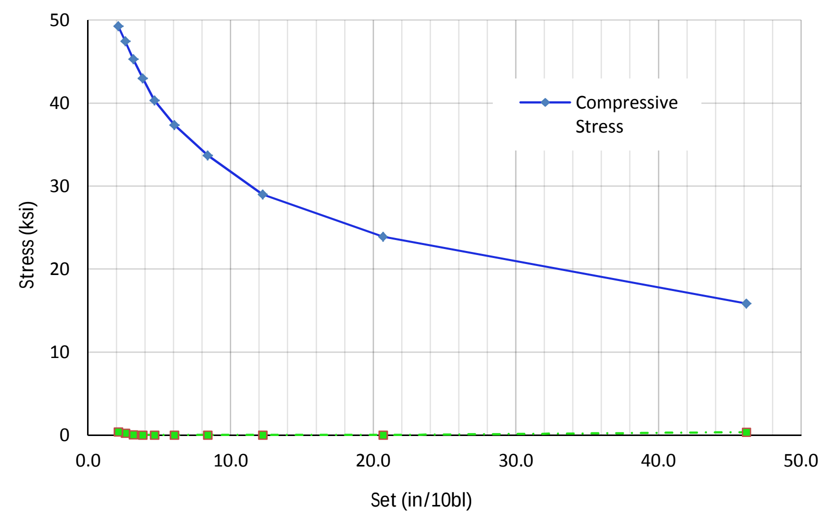




Pile:	HP12X53	Soil Boring	BM-002
Hammer:	DELMAG D30-32	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

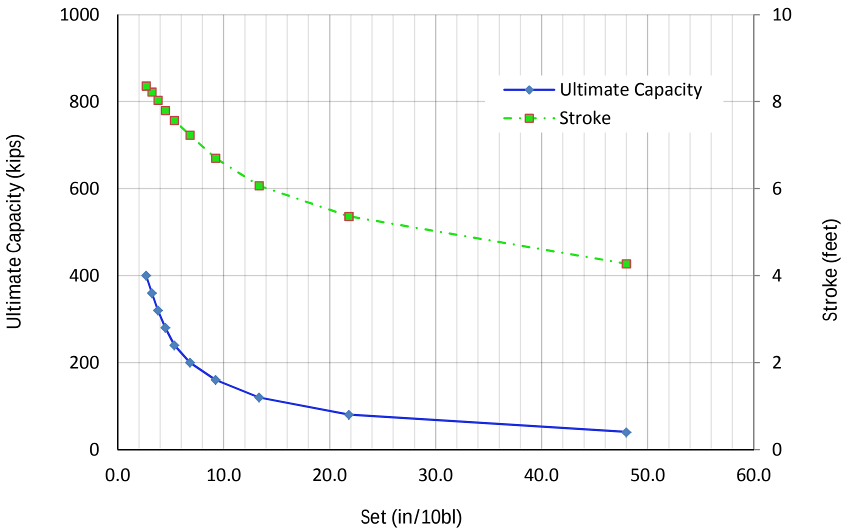
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
40	15.86	0.36	46.2	4.42	39.4
80	23.92	0	20.7	5.51	32.9
120	29.01	0	12.2	6.23	29.2
160	33.7	0	8.4	6.91	27.4
200	37.35	0	6.1	7.35	25.8
240	40.35	0	4.7	7.66	24.7
280	43.01	0	3.8	7.89	24.4
320	45.31	0.06	3.2	8.09	24.0
360	47.45	0.25	2.6	8.26	23.9
400	49.28	0.39	2.1	8.38	23.7

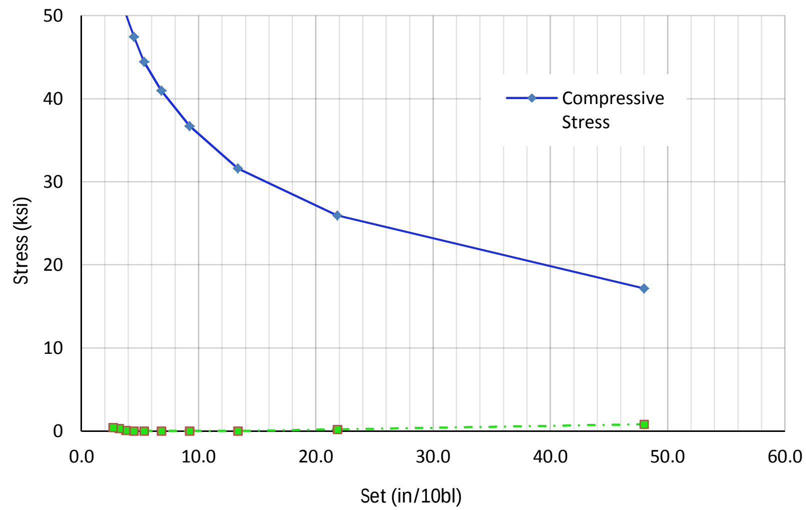




Pile:	HP12X53	Soil Boring	BM-002
Hammer:	DELMAG D30-32	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

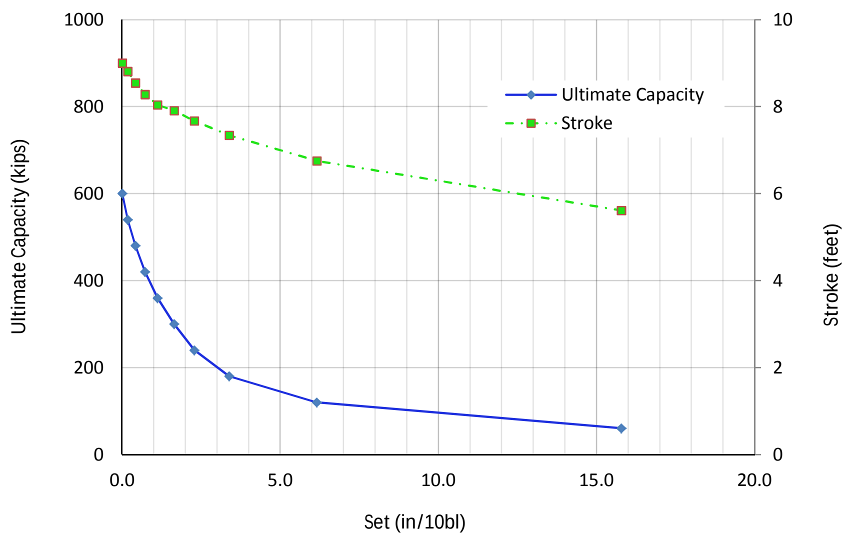
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
40	17.17	0.82	48.0	4.27	41.9
80	25.95	0.19	21.8	5.36	36.6
120	31.62	0	13.3	6.07	33.5
160	36.72	0	9.2	6.7	32.0
200	40.99	0	6.8	7.23	31.0
240	44.46	0	5.3	7.57	30.2
280	47.45	0	4.5	7.8	30.0
320	50.12	0.08	3.8	8.03	29.8
360	52.53	0.31	3.2	8.22	29.8
400	54.71	0.42	2.7	8.36	29.9

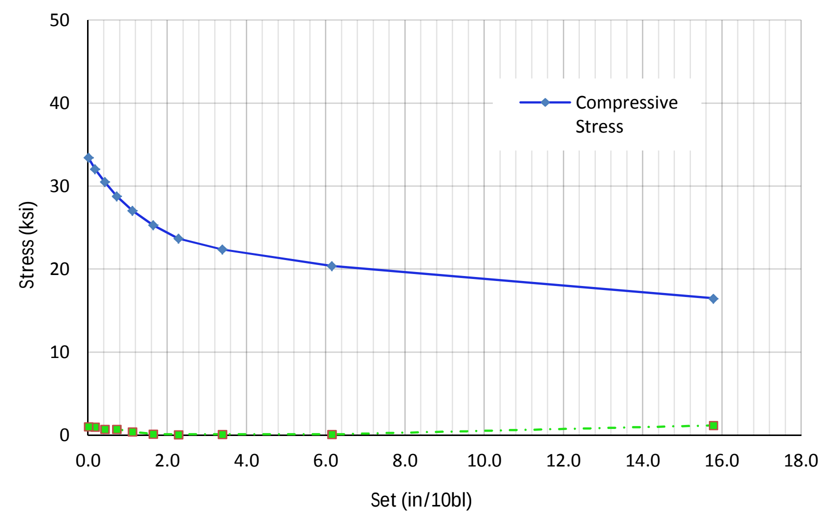




Pile:	HP14X73	Soil Boring	BM-002
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

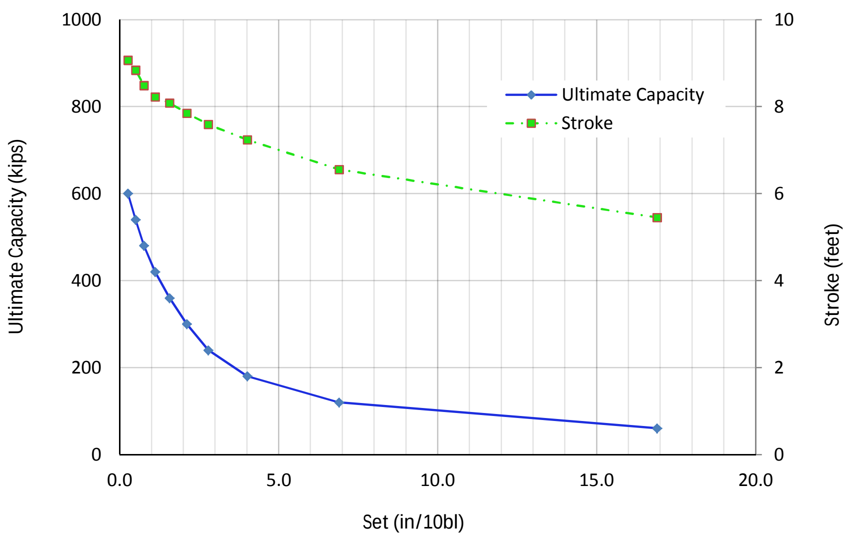
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
60	16.45	1.17	15.8	5.61	16.6
120	20.38	0.1	6.2	6.75	13.9
180	22.37	0.09	3.4	7.34	12.7
240	23.68	0.07	2.3	7.67	12.1
300	25.29	0.13	1.6	7.91	12.0
360	27.05	0.39	1.1	8.04	11.8
420	28.78	0.69	0.7	8.28	11.9
480	30.51	0.71	0.4	8.55	12.1
540	32.06	0.99	0.2	8.81	12.4
600	33.42	1.02	0.0	9	12.6

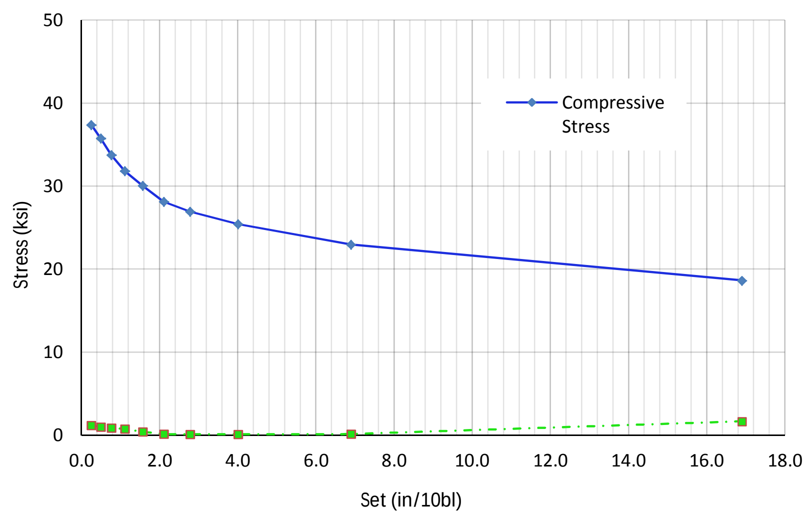




Pile:	HP14X73	Soil Boring	BM-002
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

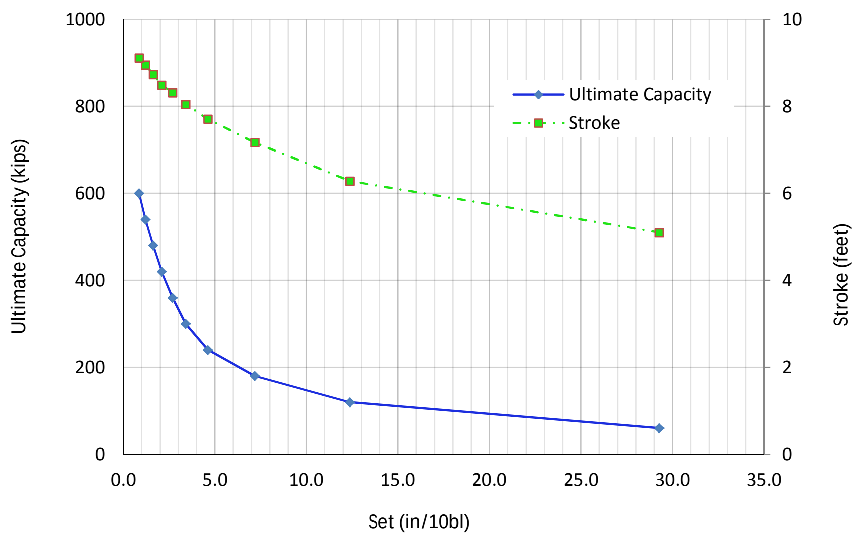
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
60	18.61	1.65	16.9	5.45	18.7
120	22.93	0.12	6.9	6.55	16.6
180	25.41	0.09	4.0	7.24	15.9
240	26.92	0.08	2.8	7.59	15.4
300	28.11	0.12	2.1	7.85	15.3
360	30.03	0.39	1.6	8.08	15.4
420	31.8	0.73	1.1	8.22	15.3
480	33.74	0.86	0.8	8.49	15.7
540	35.74	0.98	0.5	8.84	16.4
600	37.38	1.16	0.3	9.07	16.7

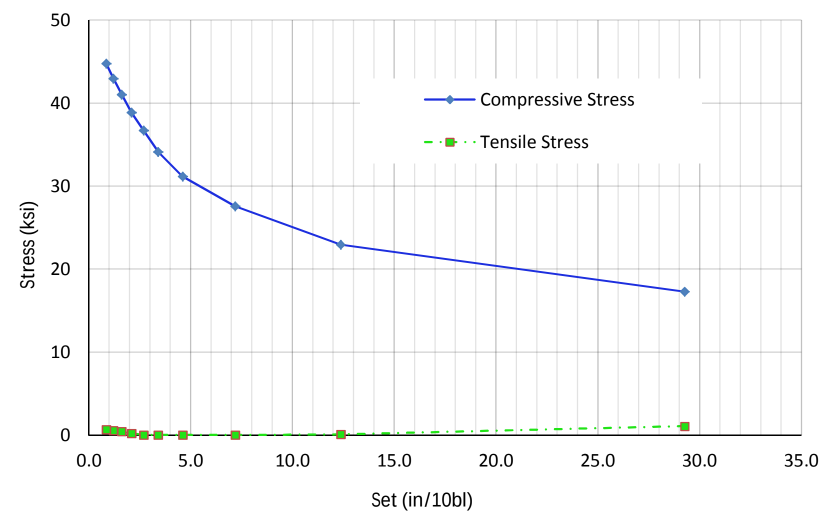




Pile:	HP14X73	Soil Boring	BM-002
Hammer:	DELMAG D 30-32	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

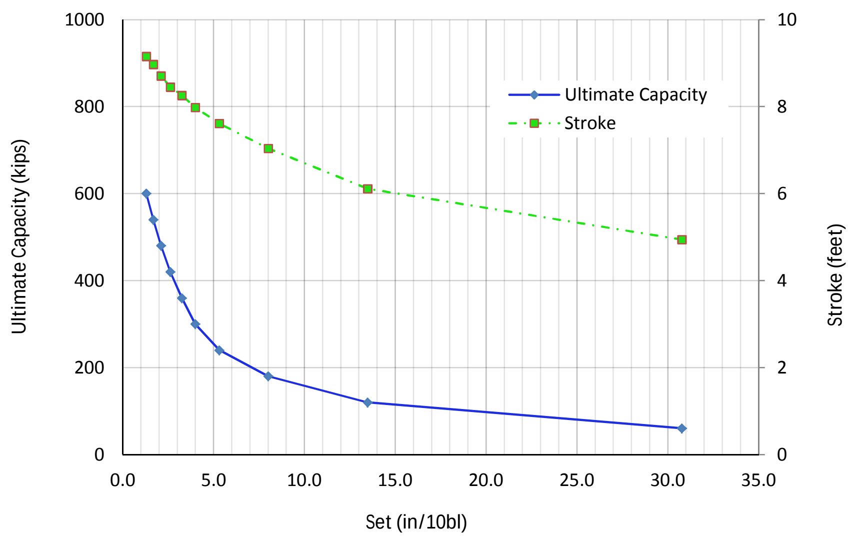
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
60	17.28	1.07	29.3	5.1	35.3
120	22.95	0.09	12.4	6.28	29.1
180	27.58	0	7.2	7.17	26.3
240	31.15	0	4.6	7.71	24.3
300	34.14	0	3.4	8.05	23.4
360	36.71	0	2.7	8.32	23.2
420	38.85	0.21	2.1	8.49	23.0
480	41.02	0.42	1.6	8.74	23.2
540	42.94	0.57	1.2	8.95	23.2
600	44.77	0.68	0.9	9.11	23.4

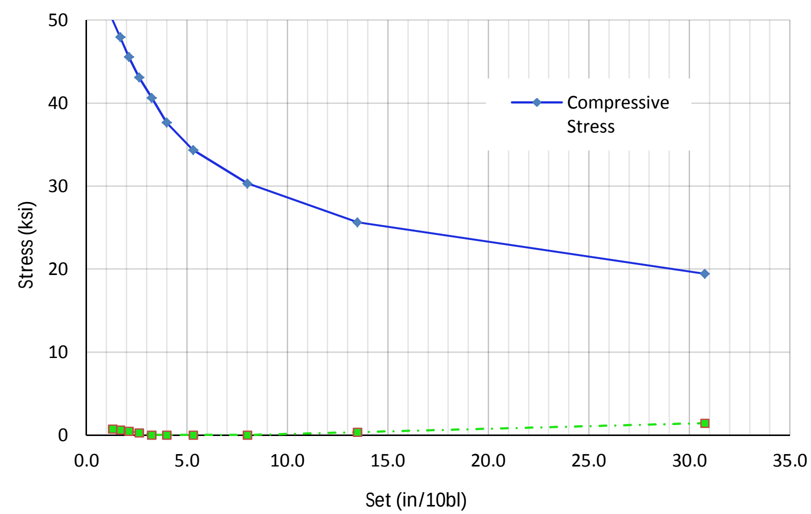




Pile:	HP14X73	Soil Boring	BM-002
Hammer:	DELMAG D 30-32	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

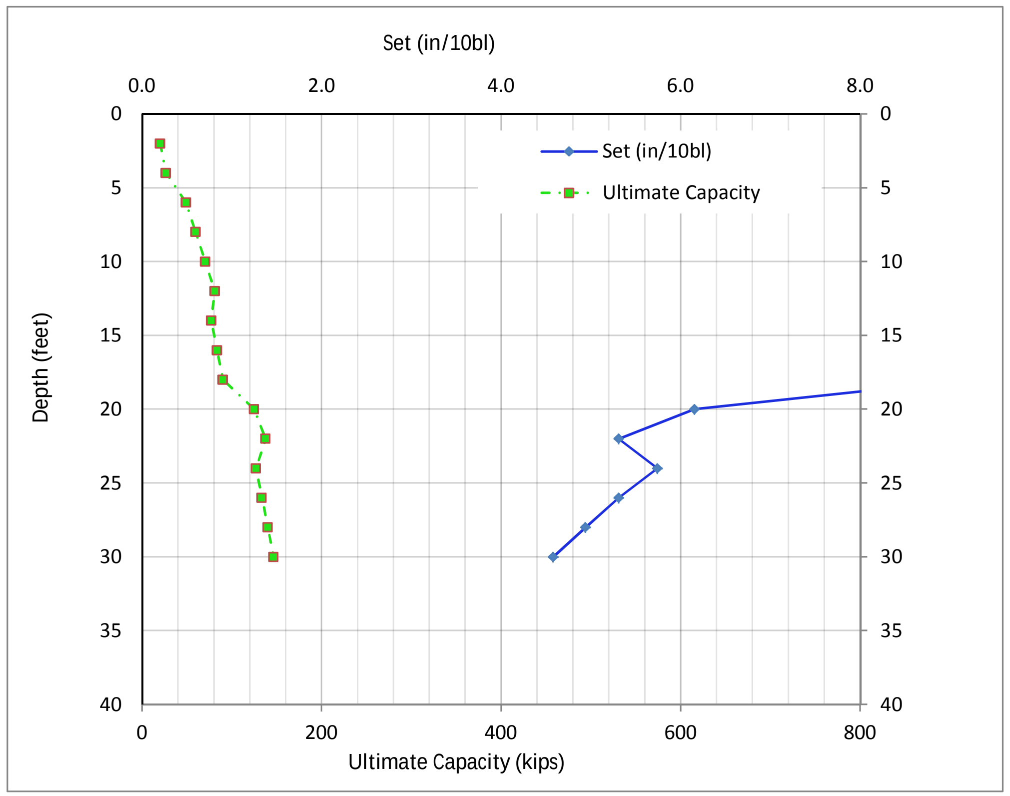
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
60	19.43	1.44	30.8	4.94	38.5
120	25.64	0.37	13.5	6.11	33.4
180	30.33	0	8.0	7.04	31.5
240	34.35	0	5.3	7.61	29.9
300	37.69	0	4.0	7.98	29.1
360	40.64	0	3.3	8.26	29.1
420	43.12	0.27	2.6	8.45	29.1
480	45.58	0.46	2.1	8.71	29.4
540	47.98	0.63	1.7	8.97	29.9
600	50.04	0.74	1.3	9.16	30.2

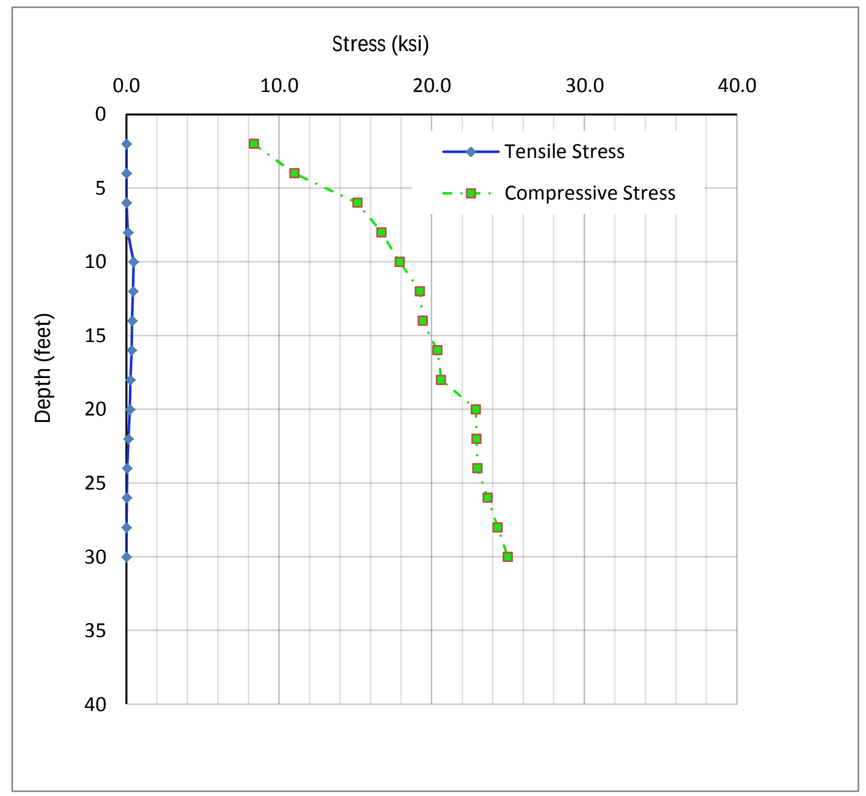


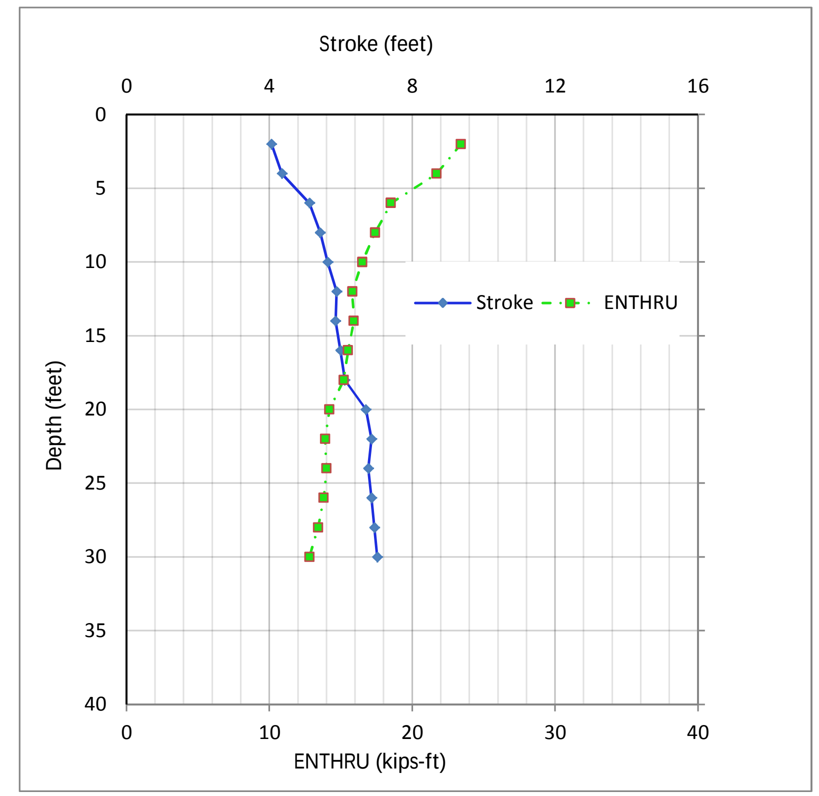


Pile: HP12x53 Soil Boring BM-002
Hammer: DELMAG D 19-42 Hammer Efficiency: 0.6
Toe Quake: 0.04 in

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	20.1	6.5	13.6	63.2	8.3	0.0	4.06	23.4
4	26.6	13	13.6	46.2	11.0	0.0	4.35	21.7
6	48.8	21.6	27.1	21.8	15.1	0.0	5.12	18.5
8	59.5	32.3	27.1	16.7	16.7	0.1	5.42	17.4
10	70.2	43	27.1	13.3	17.9	0.5	5.63	16.5
12	80.9	53.7	27.1	11.0	19.2	0.4	5.88	15.8
14	77	63.4	13.6	11.4	19.4	0.4	5.85	15.9
16	83.5	69.9	13.6	10.3	20.4	0.3	5.99	15.5
18	90	76.4	13.6	9.2	20.6	0.3	6.11	15.2
20	124.8	89.3	35.5	6.2	22.9	0.2	6.7	14.2
22	137.7	102.2	35.5	5.3	22.9	0.1	6.86	13.9
24	127	113.4	13.6	5.7	23.0	0.0	6.77	14
26	133.5	120	13.6	5.3	23.7	0.0	6.86	13.8
28	140.1	126.5	13.6	4.9	24.3	0.0	6.94	13.4
30	146.6	133	13.6	4.6	25.0	0.0	7.02	12.8

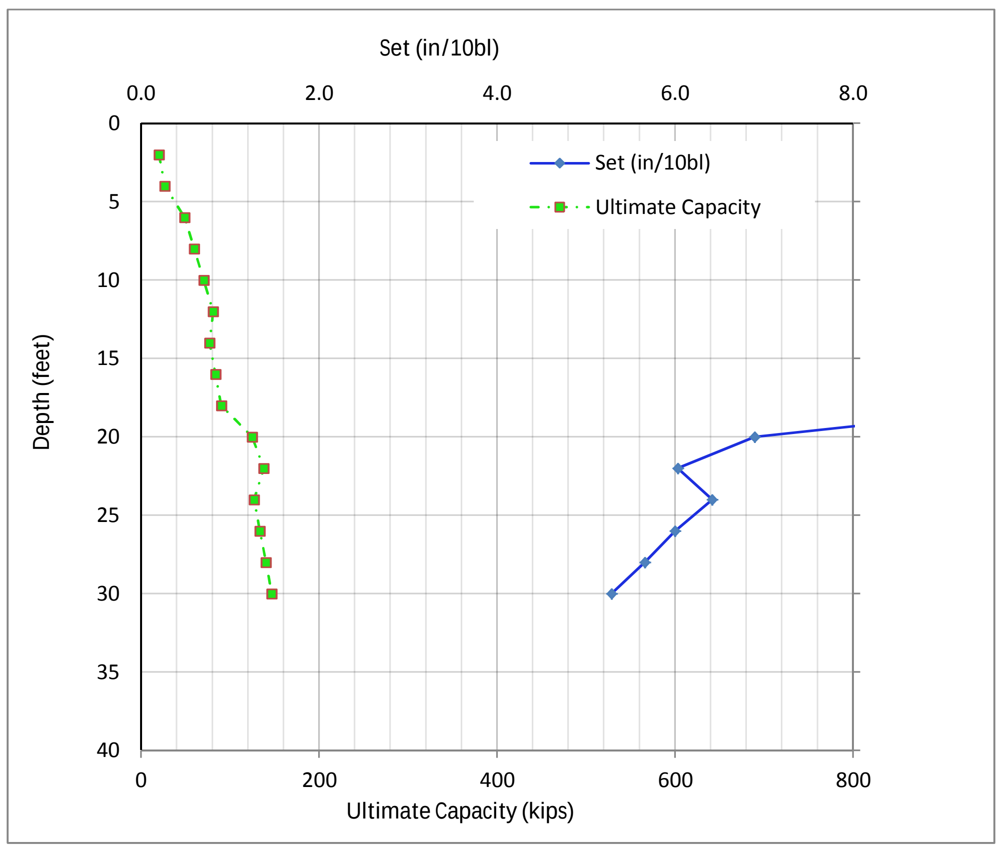


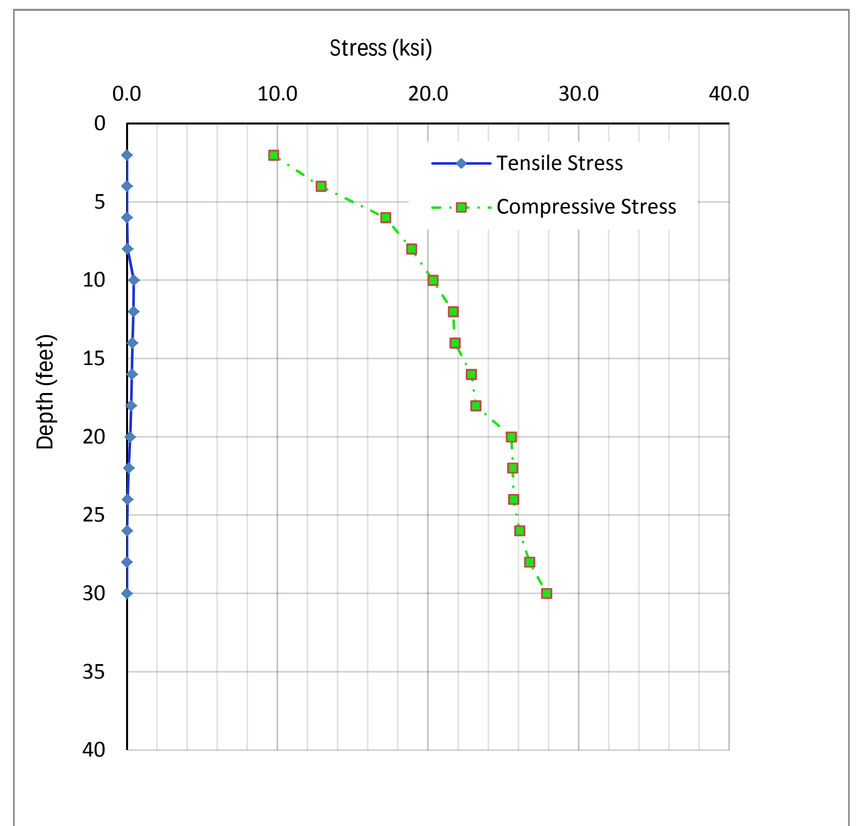


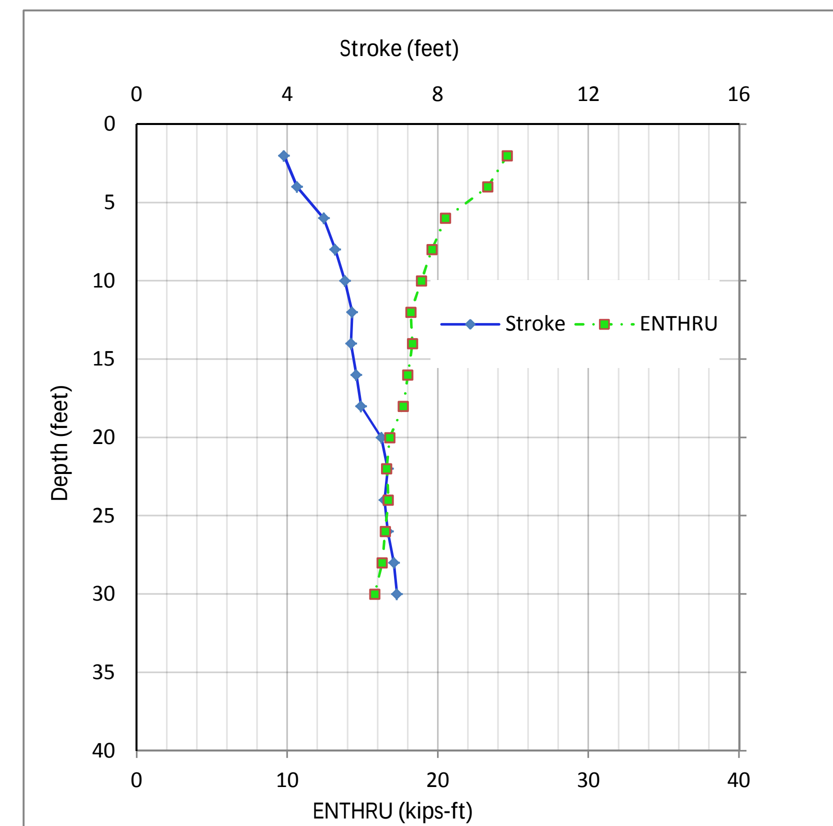


Pile:	HP12x53	Soil Boring	BM-002
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	20.1	6.5	13.6	66.7	9.7	0.0	3.91	24.6
4	26.6	13	13.6	48.0	12.9	0.0	4.26	23.3
6	48.8	21.6	27.1	23.1	17.2	0.0	4.97	20.5
8	59.5	32.3	27.1	17.9	18.9	0.0	5.27	19.6
10	70.2	43	27.1	14.5	20.3	0.5	5.53	18.9
12	80.9	53.7	27.1	12.0	21.7	0.4	5.72	18.2
14	77	63.4	13.6	12.5	21.8	0.4	5.69	18.3
16	83.5	69.9	13.6	11.2	22.9	0.3	5.83	18
18	90	76.4	13.6	10.2	23.2	0.3	5.96	17.7
20	124.8	89.3	35.5	6.9	25.5	0.2	6.5	16.8
22	137.7	102.2	35.5	6.0	25.6	0.1	6.67	16.6
24	127	113.4	13.6	6.4	25.7	0.0	6.58	16.7
26	133.5	120	13.6	6.0	26.1	0.0	6.67	16.5
28	140.1	126.5	13.6	5.7	26.7	0.0	6.83	16.3
30	146.6	133	13.6	5.3	27.9	0.0	6.91	15.8



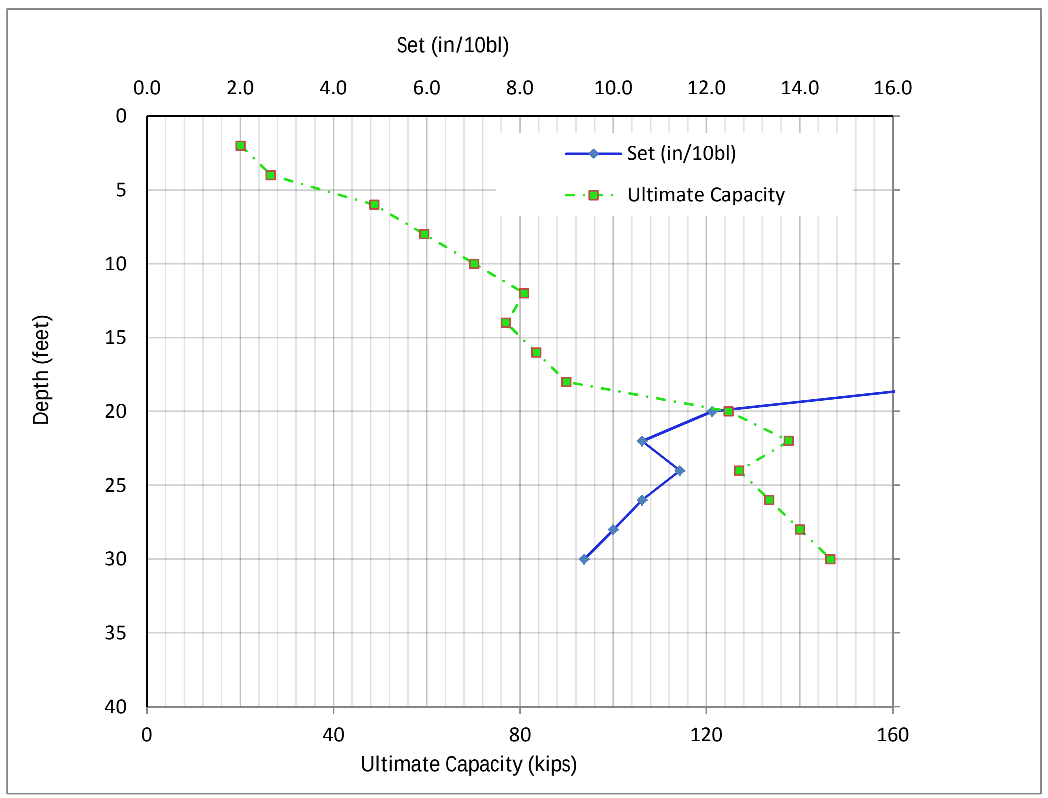


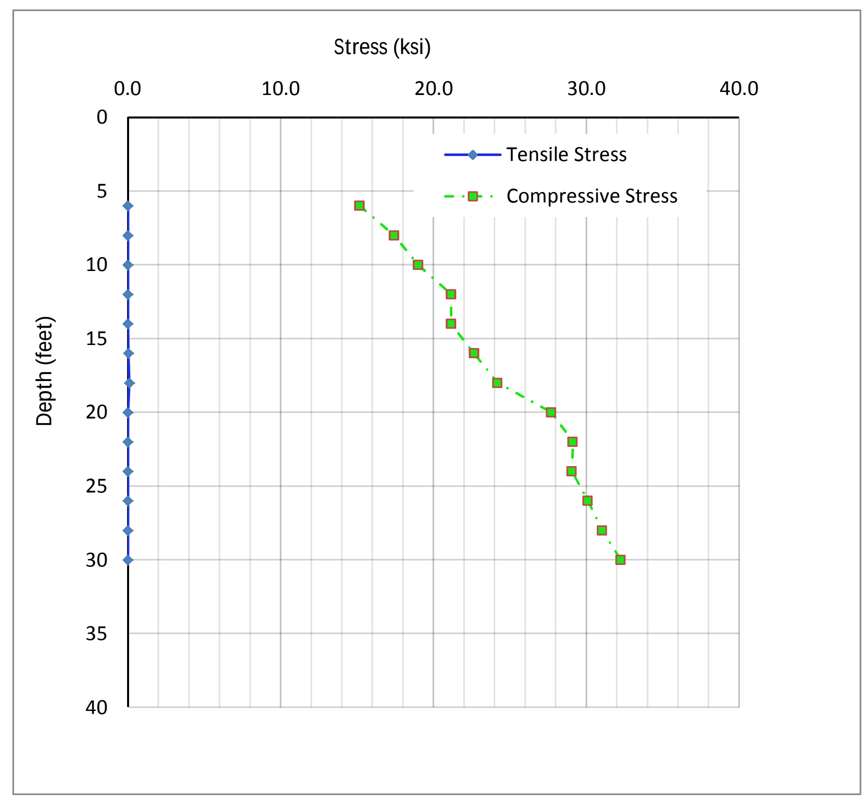


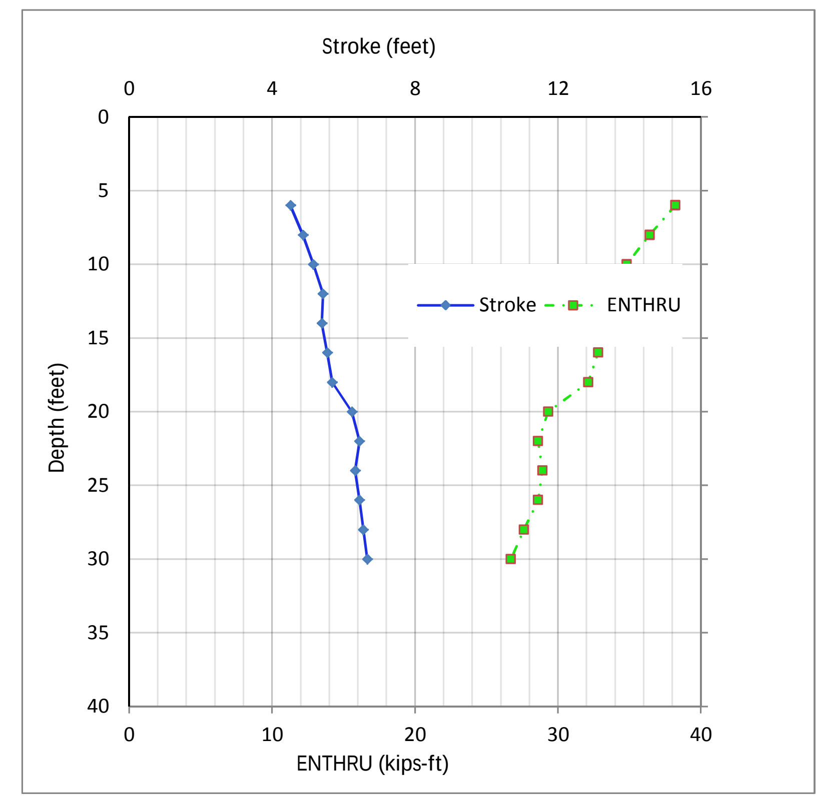
Pile: HP12X53
Hammer: DELMAG D30-32
Toe Quake: 0.04 in

Soil Boring BM-002
Hammer Efficiency: 0.6

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	20.1	6.5	13.6					
4	26.6	13	13.6					
6	48.8	21.6	27.1	40.0	15.2	0.0	4.51	38.2
8	59.5	32.3	27.1	30.8	17.4	0.0	4.86	36.4
10	70.2	43	27.1	25.0	19.0	0.0	5.15	34.8
12	80.9	53.7	27.1	21.1	21.1	0.0	5.42	33.5
14	77	63.4	13.6	21.8	21.1	0.0	5.39	33.5
16	83.5	69.9	13.6	19.7	22.6	0.0	5.54	32.8
18	90	76.4	13.6	17.9	24.2	0.1	5.68	32.1
20	124.8	89.3	35.5	12.1	27.7	0.0	6.23	29.3
22	137.7	102.2	35.5	10.6	29.1	0.0	6.44	28.6
24	127	113.4	13.6	11.4	29.0	0.0	6.32	28.9
26	133.5	120	13.6	10.6	30.1	0.0	6.44	28.6
28	140.1	126.5	13.6	10.0	31.0	0.0	6.55	27.6
30	146.6	133	13.6	9.4	32.3	0.0	6.66	26.7

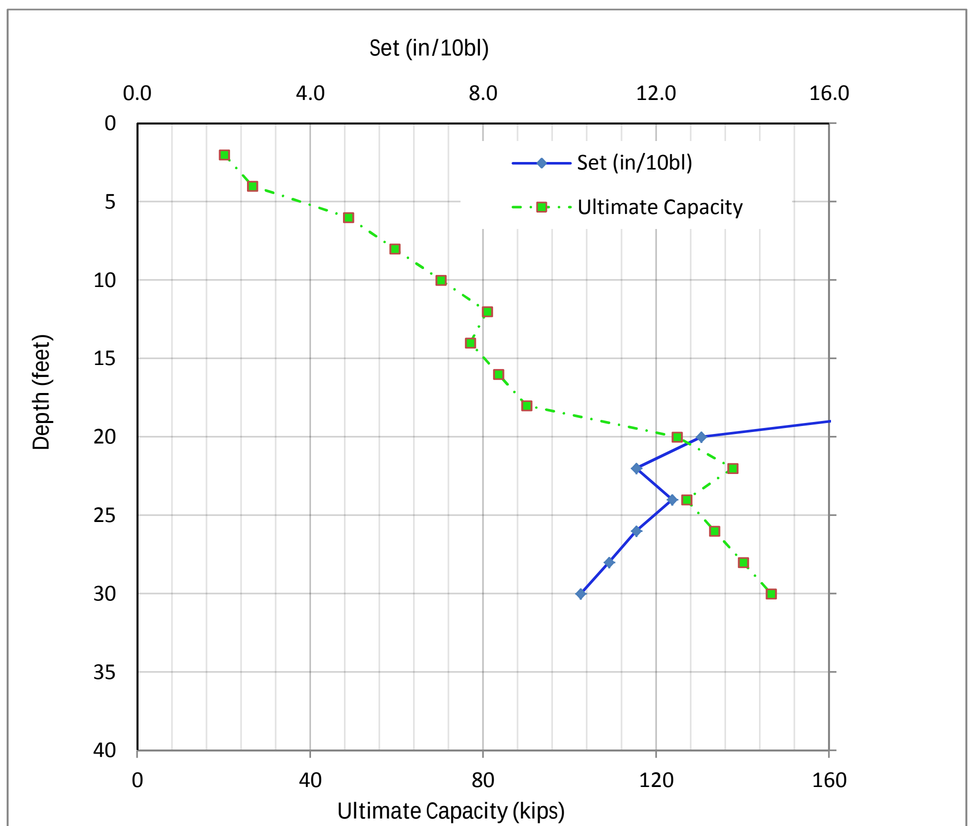


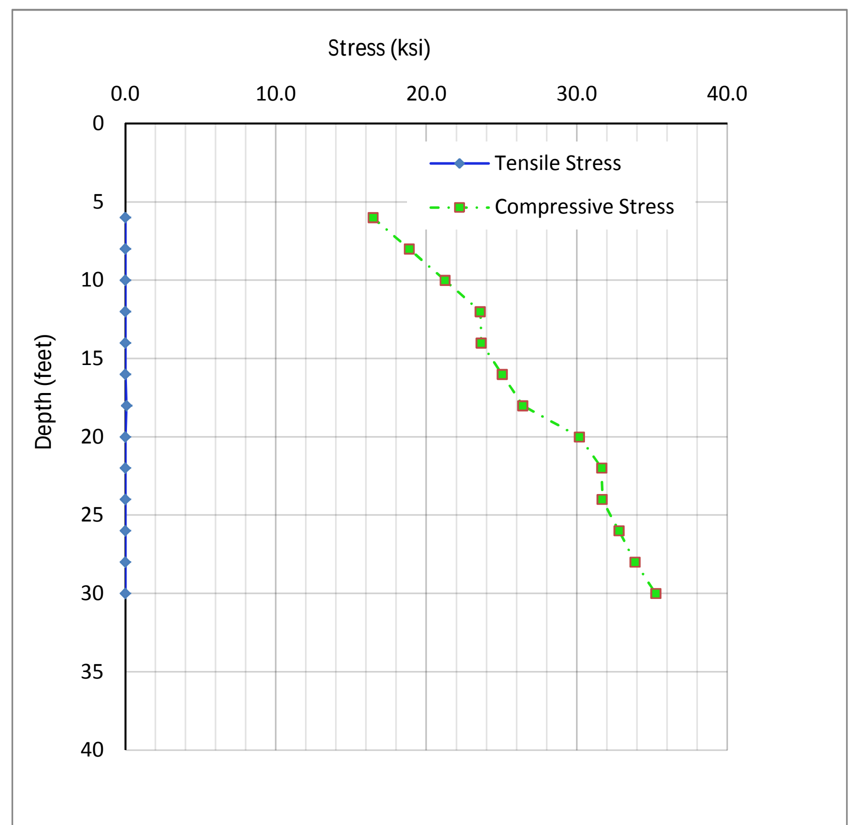


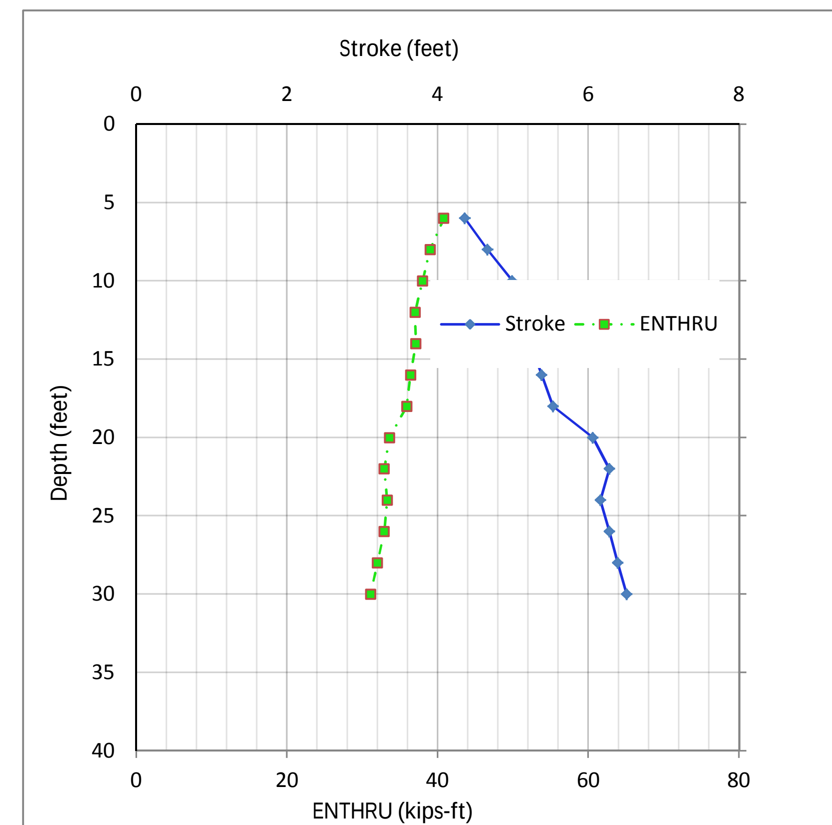


Pile:	HP12x53		Soil Boring	BM-002
Hammer:	DELMAG D30-32		Hammer Efficiency:	0.8
Toe Quake:	0.04 in			

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	20.1	6.5	13.6					
4	26.6	13	13.6					
6	48.8	21.6	27.1	41.4	16.5	0.0	4.36	40.8
8	59.5	32.3	27.1	32.4	18.8	0.0	4.66	39
10	70.2	43	27.1	26.7	21.2	0.0	4.99	38
12	80.9	53.7	27.1	22.2	23.6	0.0	5.26	37
14	77	63.4	13.6	23.1	23.6	0.0	5.23	37.1
16	83.5	69.9	13.6	21.1	25.0	0.0	5.38	36.4
18	90	76.4	13.6	19.0	26.4	0.1	5.53	35.9
20	124.8	89.3	35.5	13.0	30.2	0.0	6.06	33.6
22	137.7	102.2	35.5	11.5	31.7	0.0	6.28	32.9
24	127	113.4	13.6	12.4	31.7	0.0	6.16	33.3
26	133.5	120	13.6	11.5	32.8	0.0	6.28	32.9
28	140.1	126.5	13.6	10.9	33.9	0.0	6.39	32
30	146.6	133	13.6	10.3	35.2	0.0	6.51	31.1

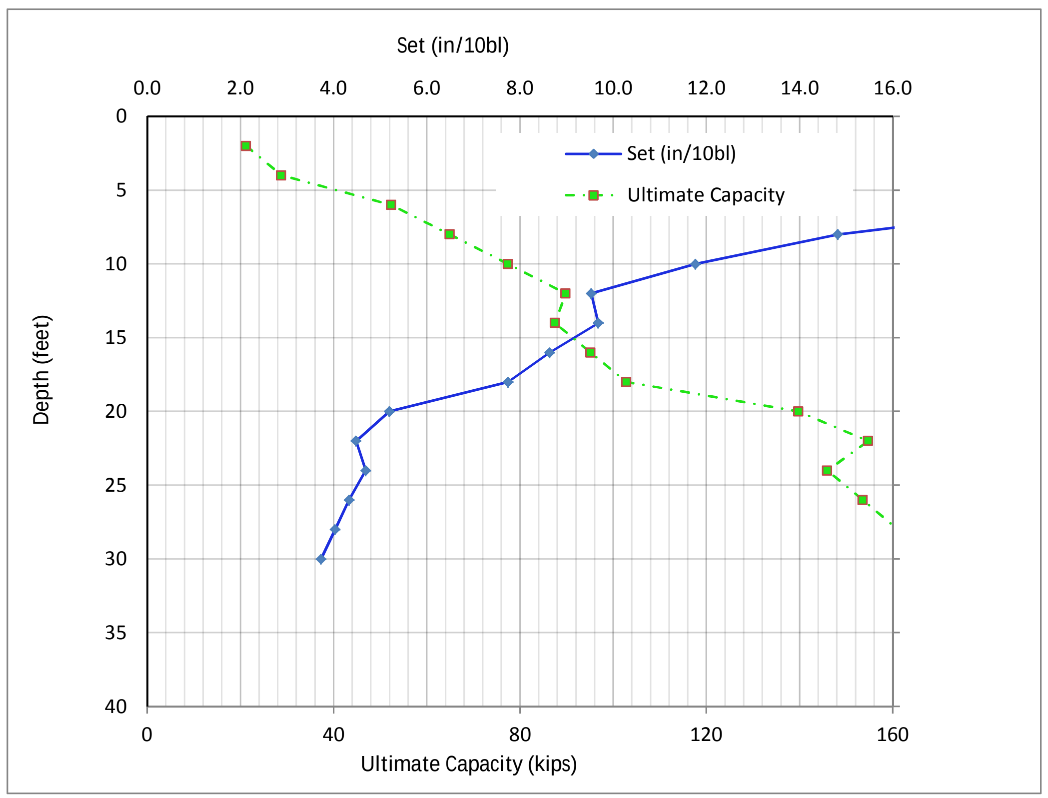


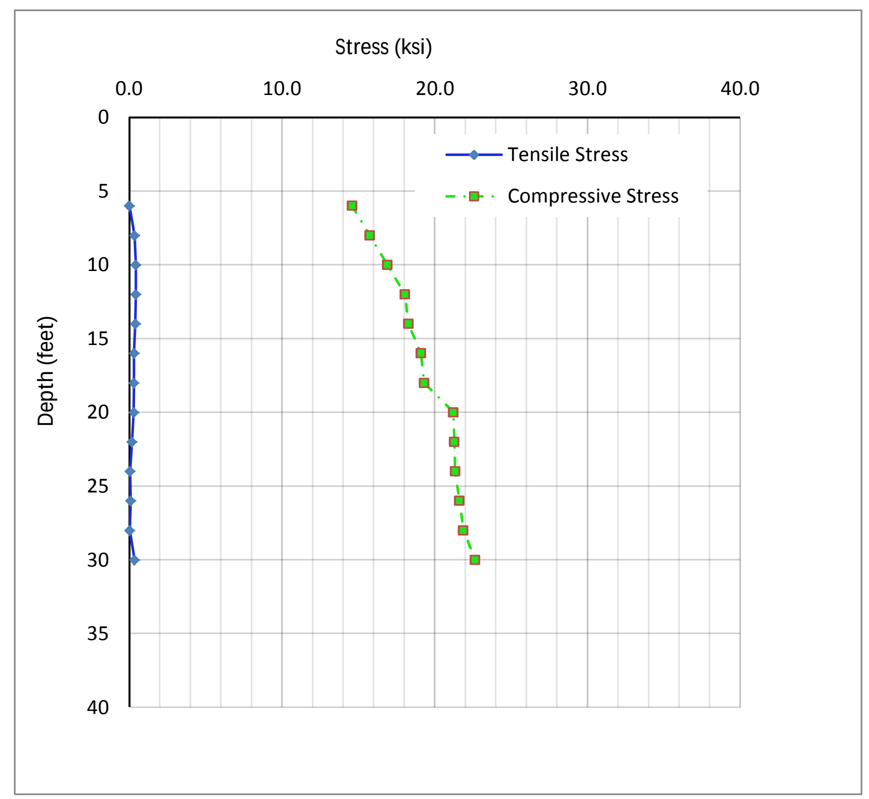


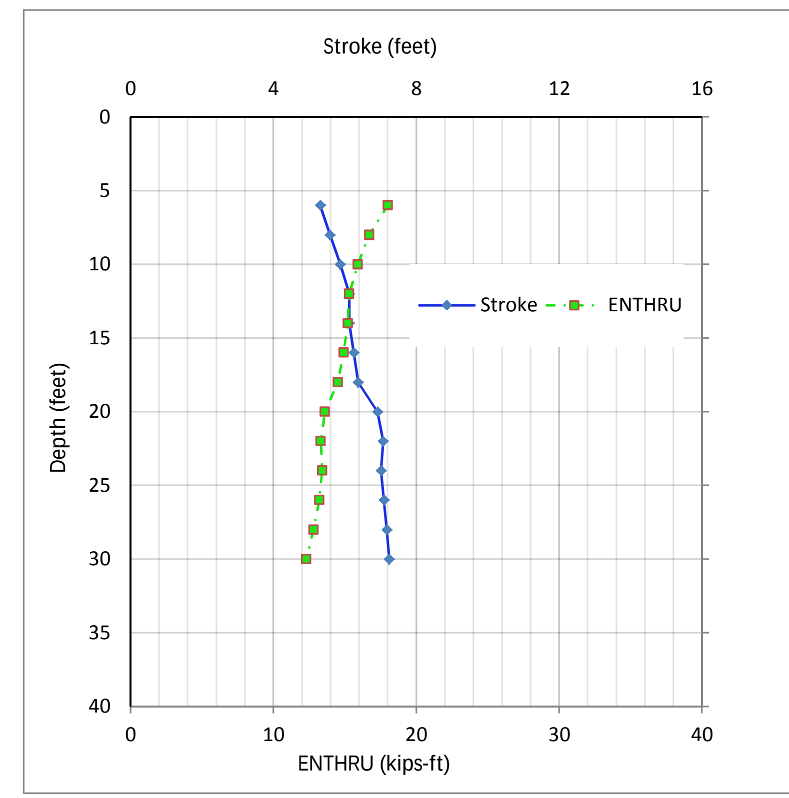


Pile:	HP14X73	Soil Boring	BM-002
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	21.2	7.6	13.6					
4	28.8	15.2	13.6					
6	52.4	25.3	27.1	20.0	14.6	0.0	5.31	18
8	64.9	37.7	27.1	14.8	15.7	0.3	5.58	16.7
10	77.4	50.2	27.1	11.8	16.9	0.4	5.87	15.9
12	89.8	62.7	27.1	9.5	18.1	0.4	6.12	15.3
14	87.5	74	13.6	9.7	18.3	0.4	6.12	15.2
16	95.1	81.6	13.6	8.6	19.1	0.3	6.25	14.9
18	102.8	89.2	13.6	7.7	19.3	0.3	6.37	14.5
20	139.7	104.2	35.5	5.2	21.2	0.3	6.91	13.6
22	154.7	119.2	35.5	4.5	21.3	0.2	7.07	13.3
24	145.9	132.3	13.6	4.7	21.3	0.0	7.01	13.4
26	153.5	140	13.6	4.3	21.6	0.1	7.09	13.2
28	161.1	147.6	13.6	4.0	21.9	0.0	7.17	12.8
30	168.8	155.2	13.6	3.7	22.6	0.3	7.24	12.3

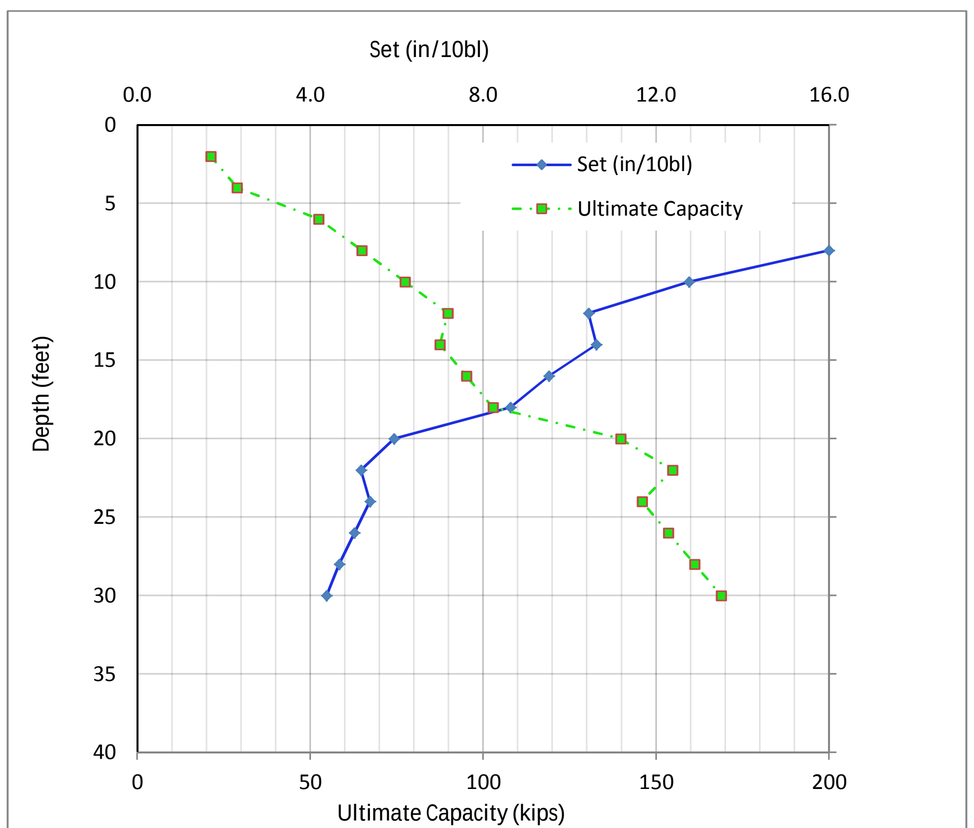


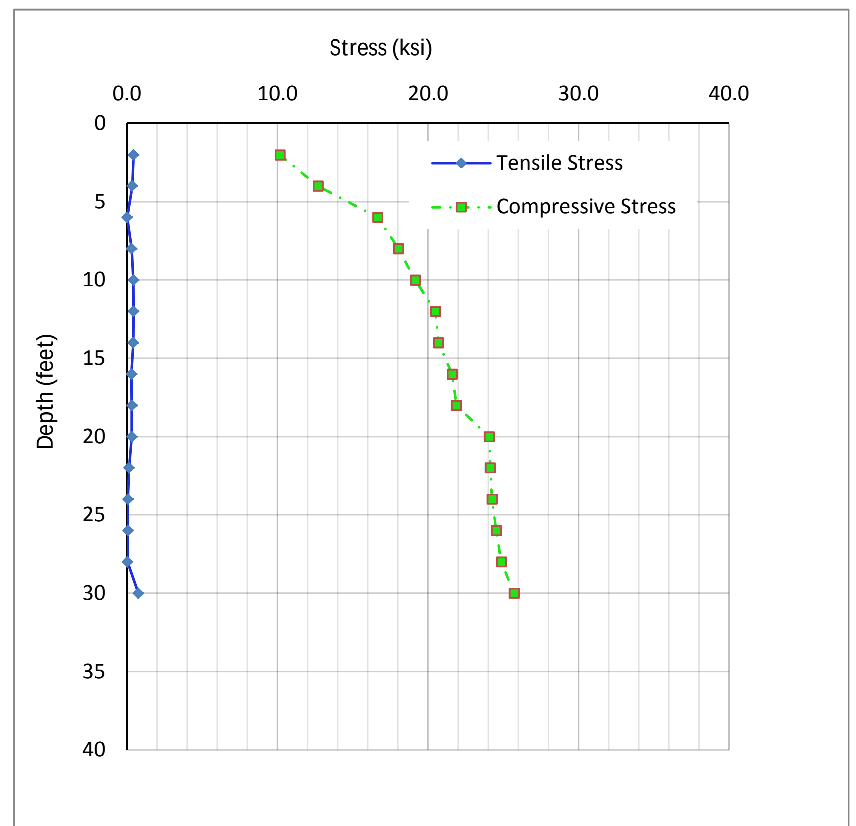


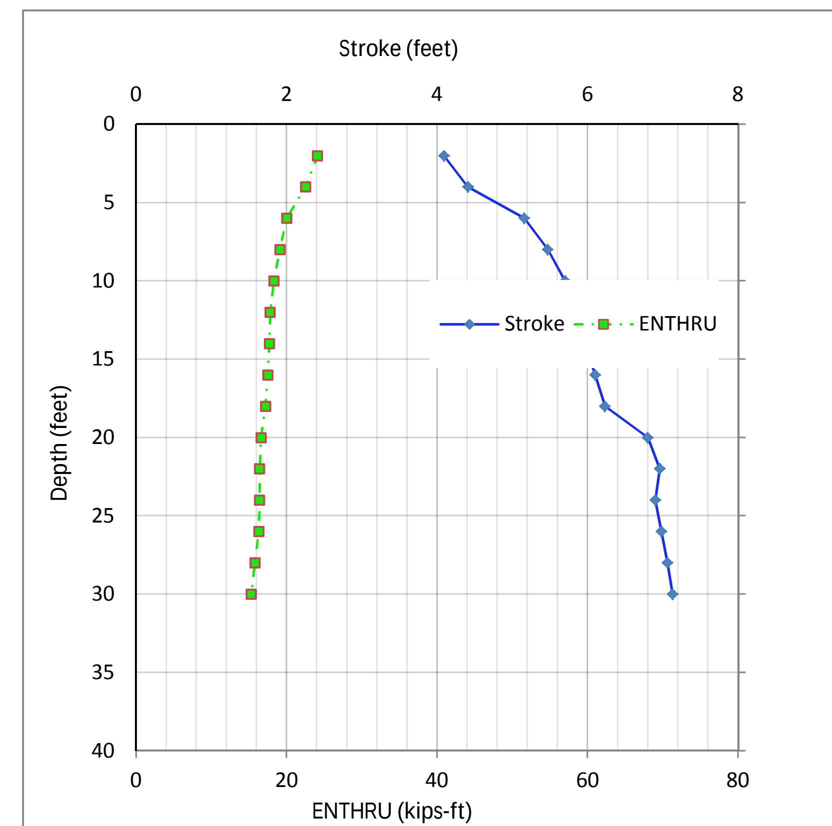


Pile:	HP14X73		Soil Boring	BM-002
Hammer:	DELMAG D 19-42		Hammer Efficiency:	0.8
Toe Quake:	0.04 in			

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	21.2	7.6	13.6	63.2	10.2	0.4	4.09	24.1
4	28.8	15.2	13.6	42.9	12.7	0.3	4.41	22.5
6	52.4	25.3	27.1	21.4	16.7	0.0	5.16	20
8	64.9	37.7	27.1	16.0	18.0	0.3	5.47	19.1
10	77.4	50.2	27.1	12.8	19.1	0.4	5.7	18.3
12	89.8	62.7	27.1	10.4	20.5	0.4	5.96	17.8
14	87.5	74	13.6	10.6	20.7	0.4	5.96	17.7
16	95.1	81.6	13.6	9.5	21.6	0.3	6.1	17.5
18	102.8	89.2	13.6	8.6	21.9	0.3	6.23	17.2
20	139.7	104.2	35.5	5.9	24.1	0.3	6.8	16.6
22	154.7	119.2	35.5	5.2	24.1	0.1	6.96	16.4
24	145.9	132.3	13.6	5.4	24.2	0.1	6.9	16.4
26	153.5	140	13.6	5.0	24.5	0.1	6.98	16.3
28	161.1	147.6	13.6	4.7	24.9	0.0	7.06	15.8
30	168.8	155.2	13.6	4.4	25.7	0.8	7.13	15.3

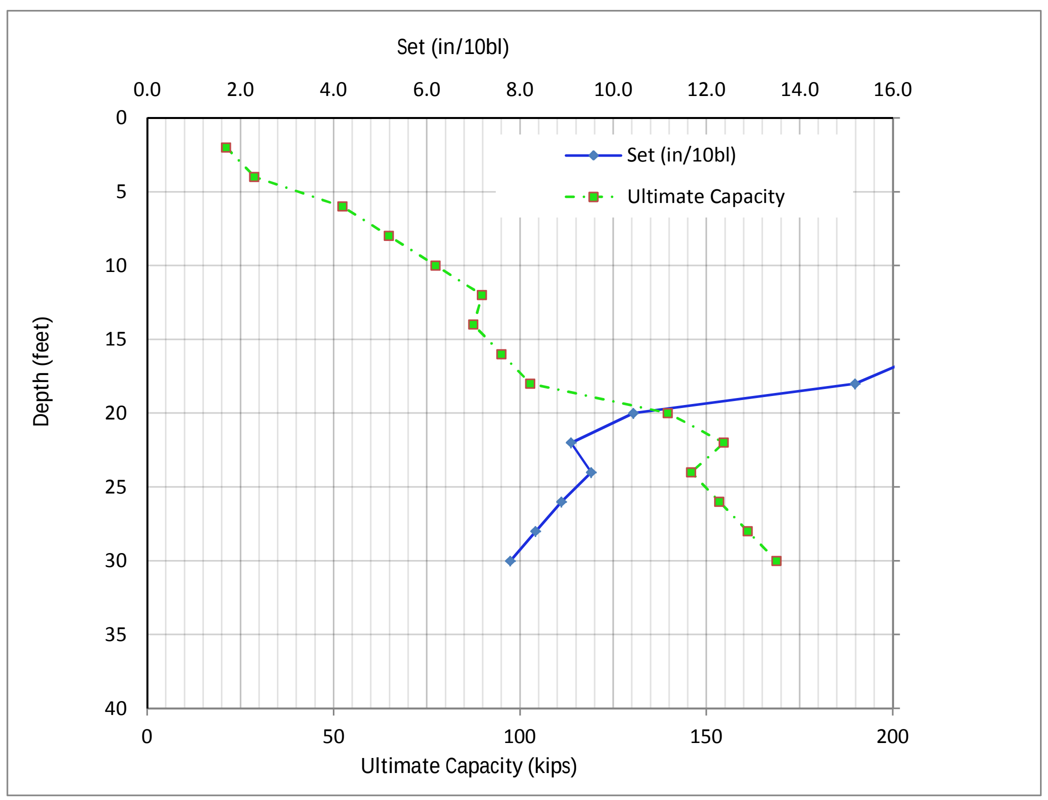


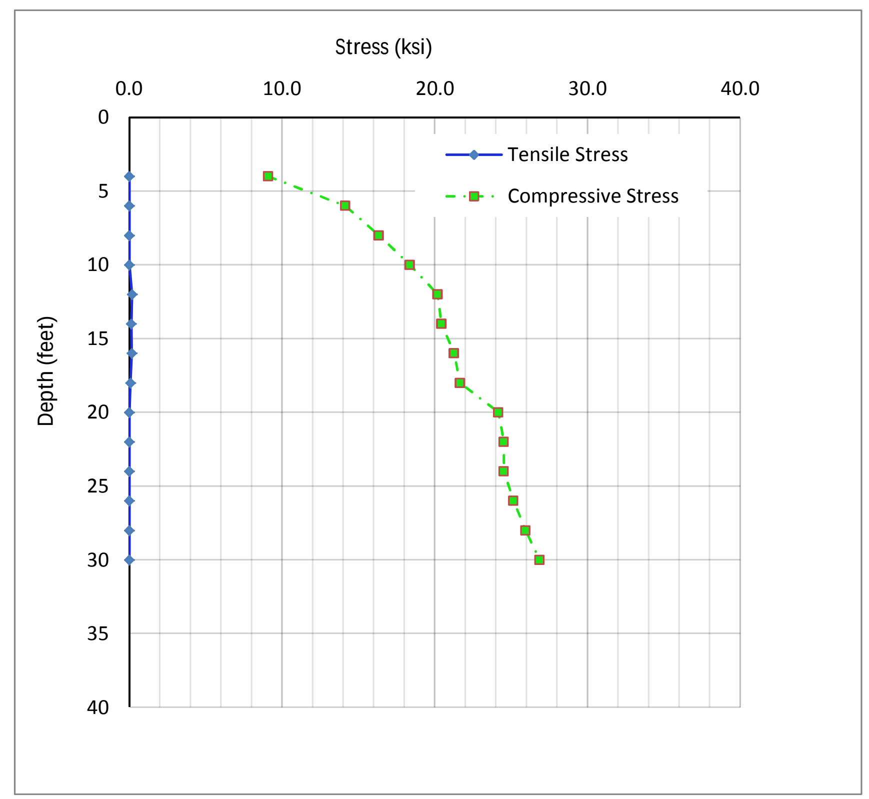


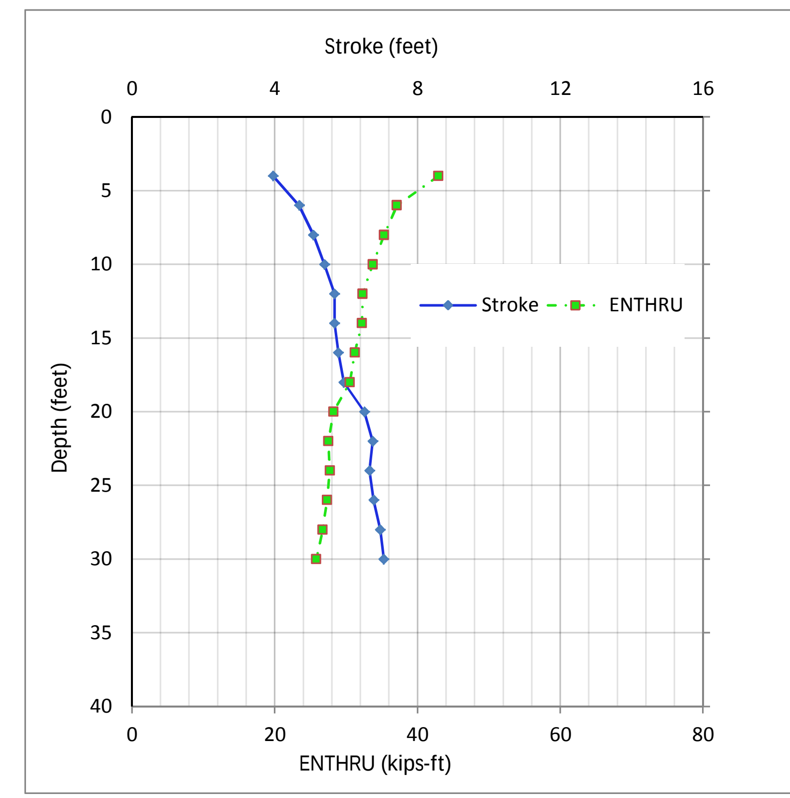


Pile:	HP14X73		Soil Boring	BM-002
Hammer:	DELMAG D 30-32		Hammer Efficiency:	0.6
Toe Quake:	0.04 in			

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	21.2	7.6	13.6					
4	28.8	15.2	13.6	75.0	9.1	0.0	3.95	42.9
6	52.4	25.3	27.1	37.5	14.1	0.0	4.68	37.1
8	64.9	37.7	27.1	27.9	16.3	0.0	5.08	35.3
10	77.4	50.2	27.1	22.6	18.4	0.0	5.39	33.7
12	89.8	62.7	27.1	18.5	20.2	0.2	5.67	32.3
14	87.5	74	13.6	18.8	20.4	0.1	5.67	32.2
16	95.1	81.6	13.6	16.7	21.3	0.2	5.78	31.2
18	102.8	89.2	13.6	15.2	21.7	0.1	5.93	30.5
20	139.7	104.2	35.5	10.4	24.2	0.0	6.51	28.2
22	154.7	119.2	35.5	9.1	24.5	0.0	6.74	27.5
24	145.9	132.3	13.6	9.5	24.5	0.0	6.65	27.7
26	153.5	140	13.6	8.9	25.2	0.0	6.77	27.3
28	161.1	147.6	13.6	8.3	26.0	0.0	6.95	26.7
30	168.8	155.2	13.6	7.8	26.9	0.0	7.05	25.8

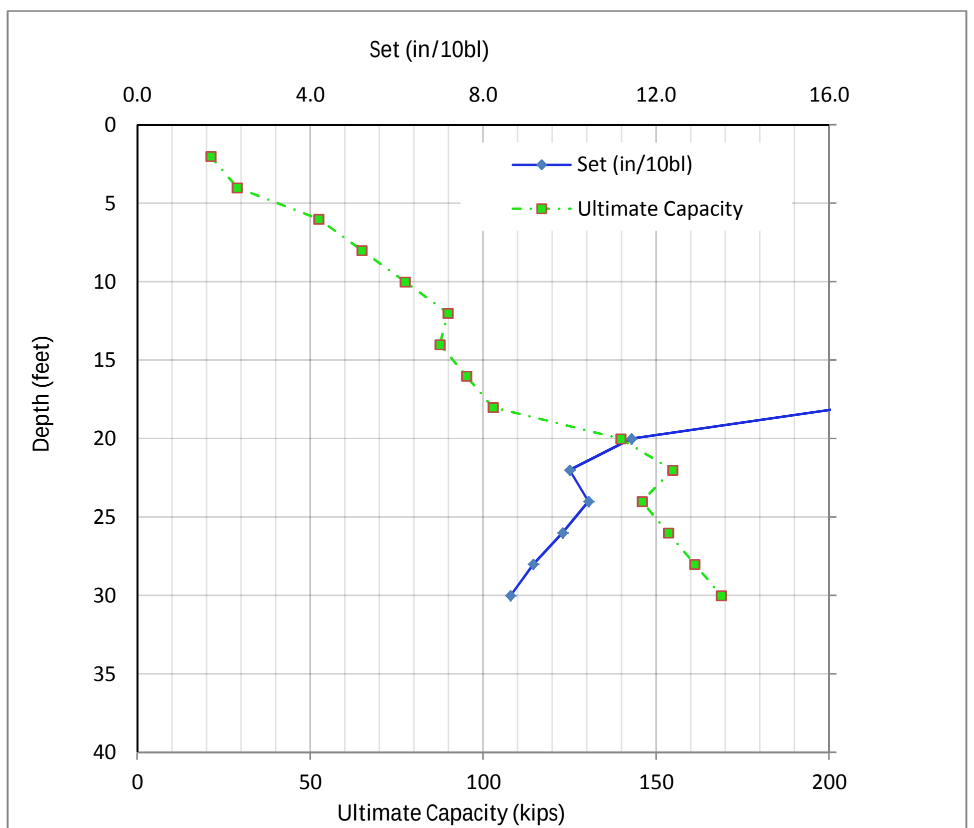


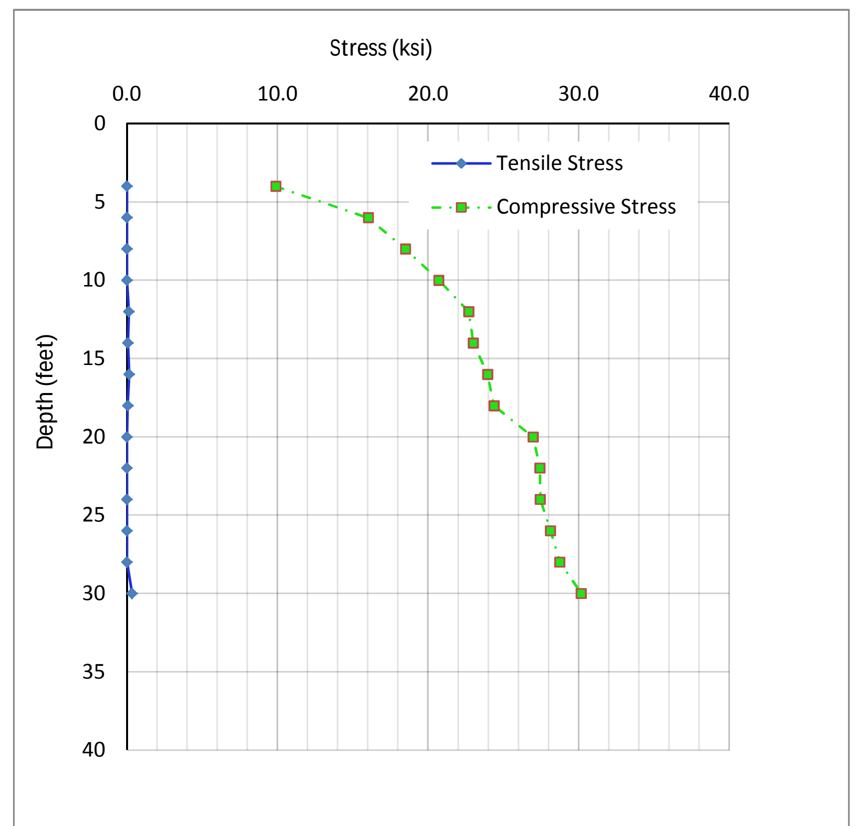


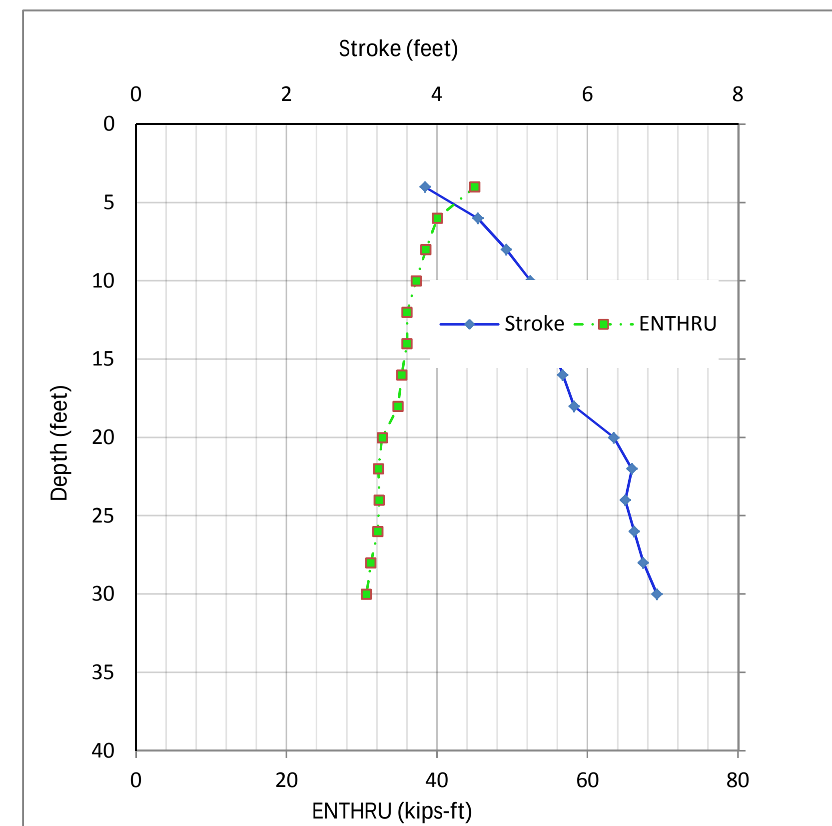


Pile:	HP14X73		Soil Boring	BM-002
Hammer:	DELMAG D 30-32		Hammer Efficiency:	0.8
Toe Quake:	0.04 in			

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	21.2	7.6	13.6					
4	28.8	15.2	13.6	75.0	9.9	0.0	3.84	45
6	52.4	25.3	27.1	38.7	16.0	0.0	4.54	40
8	64.9	37.7	27.1	30.0	18.5	0.0	4.92	38.5
10	77.4	50.2	27.1	24.0	20.7	0.0	5.24	37.2
12	89.8	62.7	27.1	19.7	22.7	0.1	5.51	36
14	87.5	74	13.6	20.0	23.0	0.1	5.52	36
16	95.1	81.6	13.6	17.9	23.9	0.1	5.67	35.3
18	102.8	89.2	13.6	16.4	24.4	0.1	5.82	34.8
20	139.7	104.2	35.5	11.4	27.0	0.0	6.35	32.7
22	154.7	119.2	35.5	10.0	27.4	0.0	6.59	32.2
24	145.9	132.3	13.6	10.4	27.4	0.0	6.5	32.3
26	153.5	140	13.6	9.8	28.1	0.0	6.62	32.1
28	161.1	147.6	13.6	9.2	28.7	0.0	6.74	31.2
30	168.8	155.2	13.6	8.6	30.2	0.3	6.92	30.6

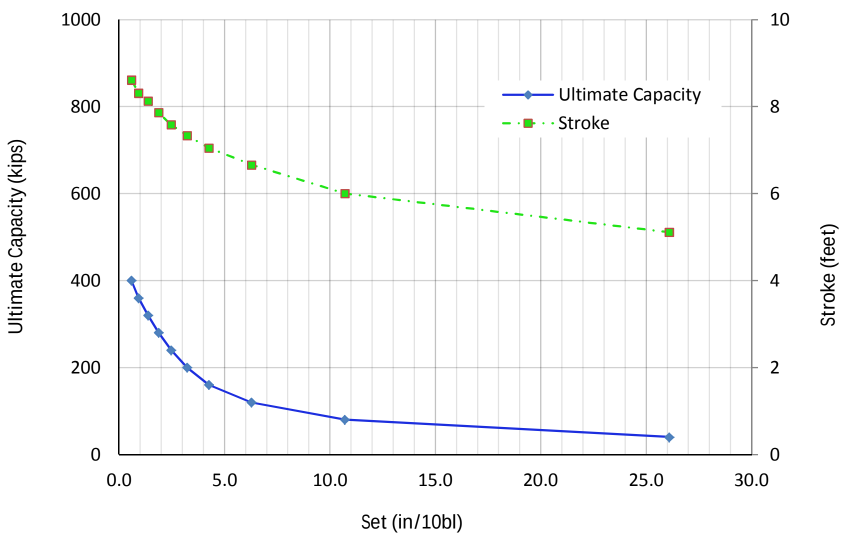


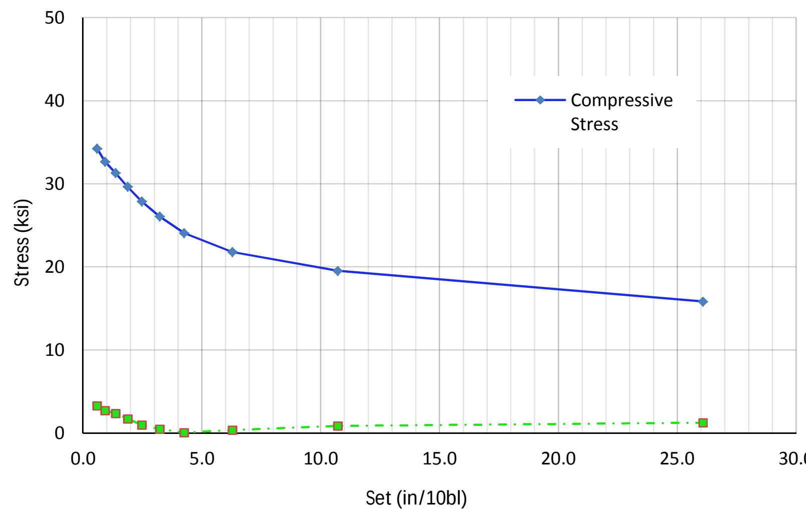




Pile:	HP12x53	Soil Boring	BM-004
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

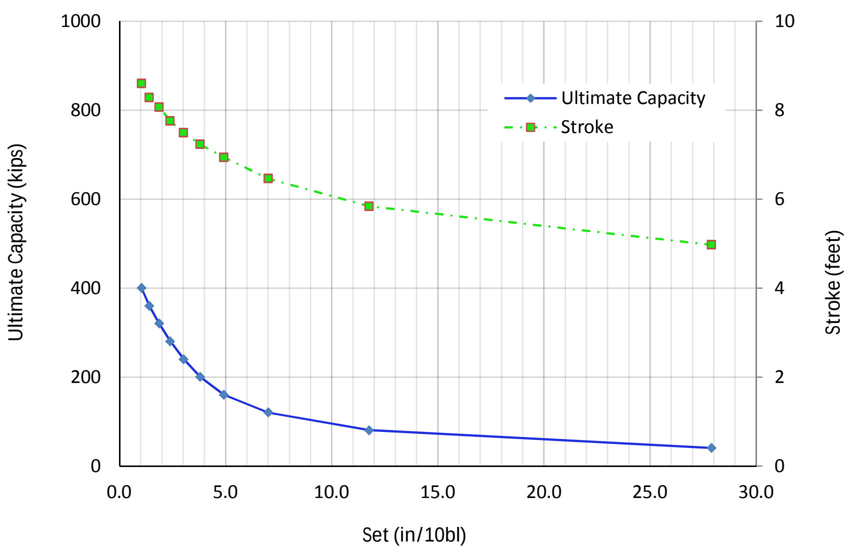
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
40	15.8	1.23	26.1	5.11	18.8
80	19.53	0.86	10.7	6	15.5
120	21.8	0.37	6.3	6.66	14.3
160	24.08	0.05	4.3	7.05	13.5
200	26.08	0.47	3.2	7.33	13.3
240	27.87	0.98	2.5	7.58	13.5
280	29.64	1.72	1.9	7.86	13.8
320	31.3	2.36	1.4	8.13	14.0
360	32.68	2.73	0.9	8.31	14.2
400	34.26	3.28	0.6	8.61	14.7

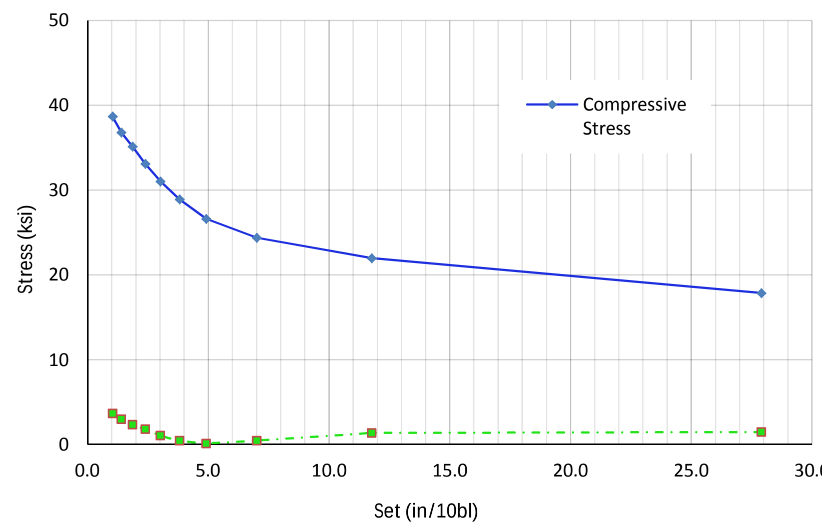




Pile:	HP12x53	Soil Boring	BM-004
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

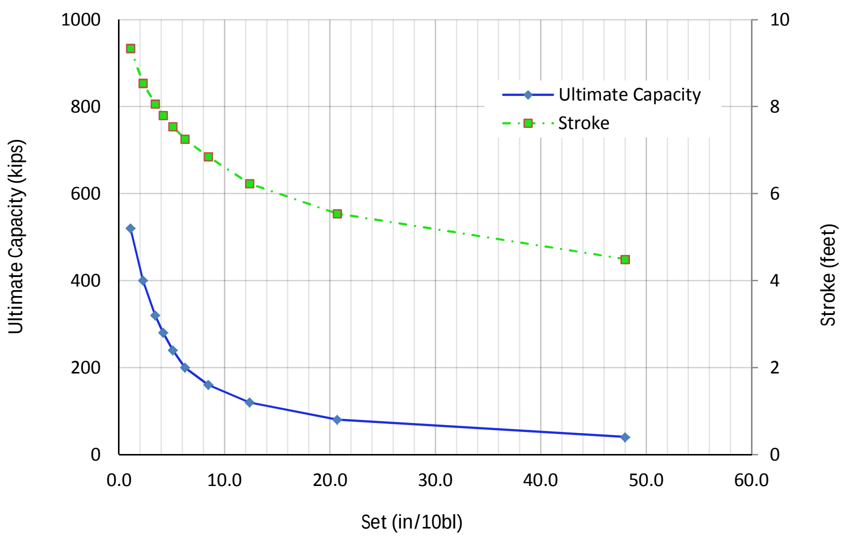
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
40	17.84	1.47	27.9	4.97	20.6
80	21.95	1.36	11.8	5.84	17.9
120	24.37	0.45	7.0	6.46	16.8
160	26.6	0.12	4.9	6.94	16.6
200	28.9	0.43	3.8	7.23	16.4
240	31.01	1.04	3.0	7.49	16.6
280	33.09	1.8	2.4	7.76	17.1
320	35.1	2.33	1.9	8.07	17.6
360	36.75	2.98	1.4	8.28	18.0
400	38.65	3.67	1.0	8.6	18.7

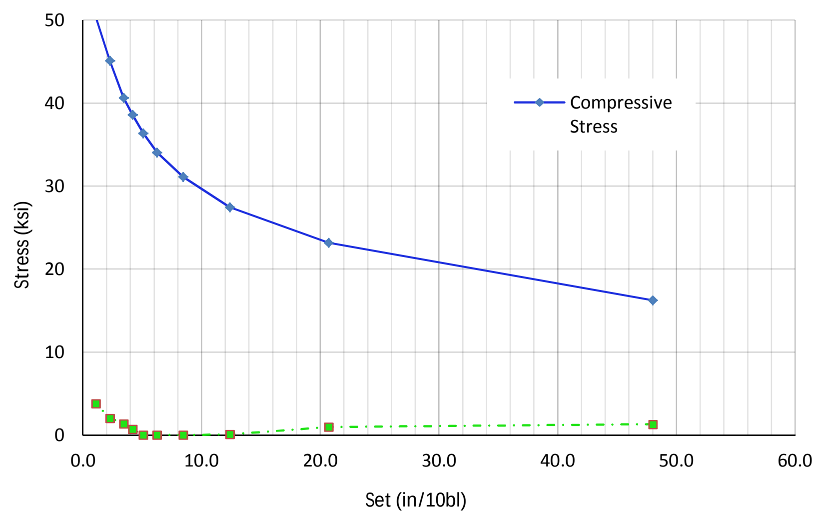




Pile:	HP12X53	Soil Boring	BM-004
Hammer:	DELMAG D30-32	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

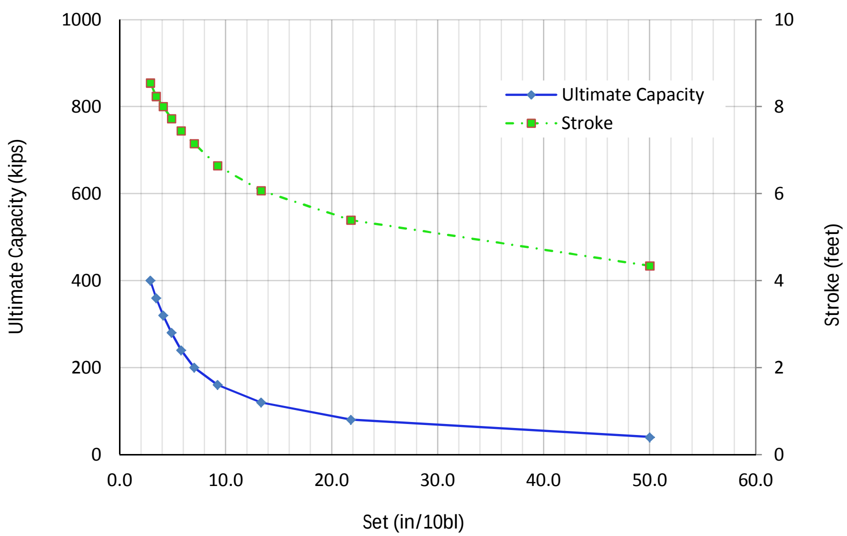
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
40	16.23	1.3	48.0	4.49	39.0
80	23.17	0.97	20.7	5.54	32.8
120	27.44	0.1	12.4	6.23	29.5
160	31.13	0	8.5	6.85	27.8
200	34.05	0	6.3	7.25	26.5
240	36.38	0	5.1	7.54	26.1
280	38.59	0.7	4.2	7.8	26.3
320	40.64	1.38	3.4	8.06	26.5
400	45.1	2.03	2.3	8.54	27.4
520	50.41	3.78	1.1	9.34	29.3

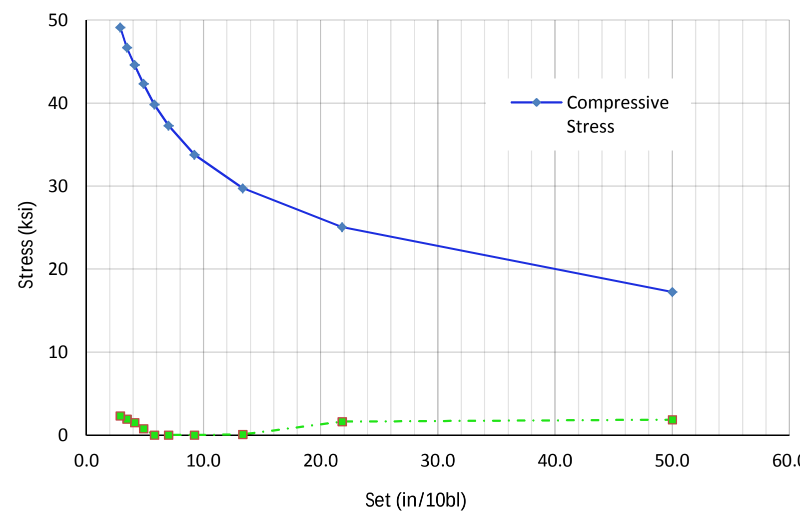




Pile:	HP12X53		Soil Boring	BM-004	
Hammer:	DELMAG D30-32		Hammer Efficiency:	0.8	
Toe Quake:	0.04 in				

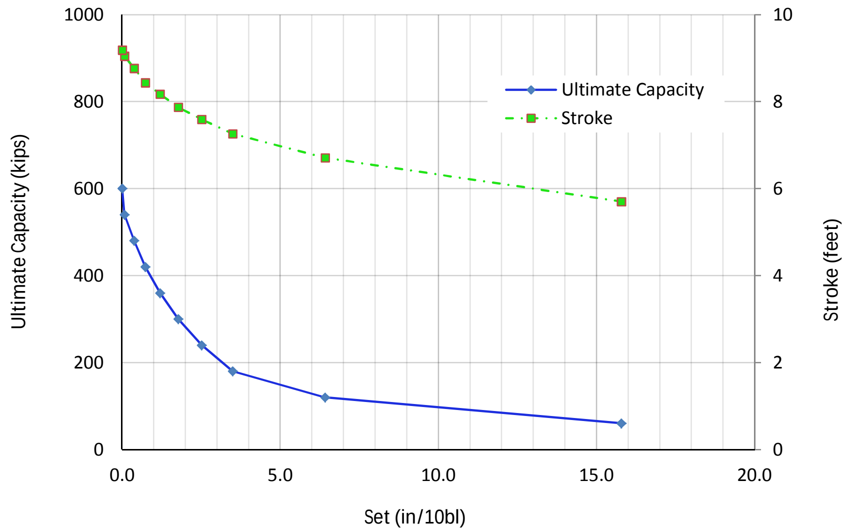
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
40	17.23	1.86	50.0	4.34	41.6
80	25.06	1.64	21.8	5.39	36.5
120	29.75	0.08	13.3	6.07	33.7
160	33.77	0	9.2	6.64	32.2
200	37.27	0	7.0	7.15	31.7
240	39.84	0	5.8	7.44	31.5
280	42.34	0.8	4.9	7.72	32.0
320	44.6	1.5	4.1	8	32.6
360	46.69	1.93	3.4	8.24	33.1
400	49.14	2.33	2.9	8.55	34.0

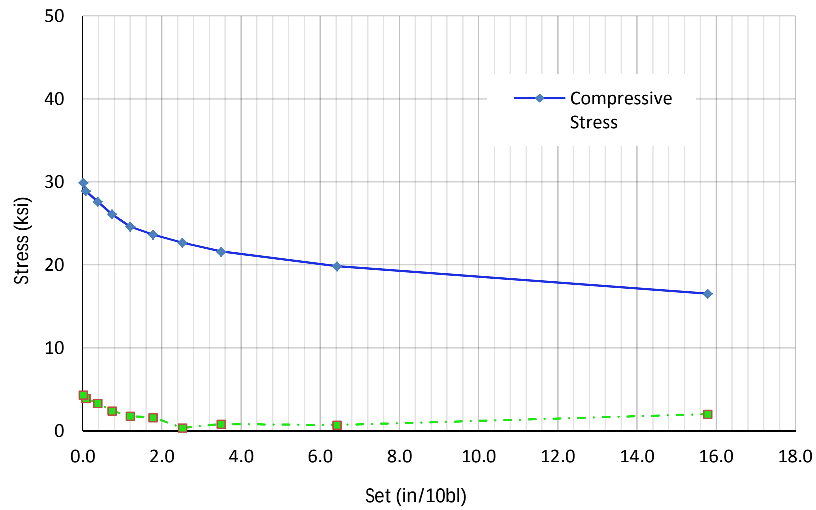




Pile:	HP14X73	Soil Boring	BM-004
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

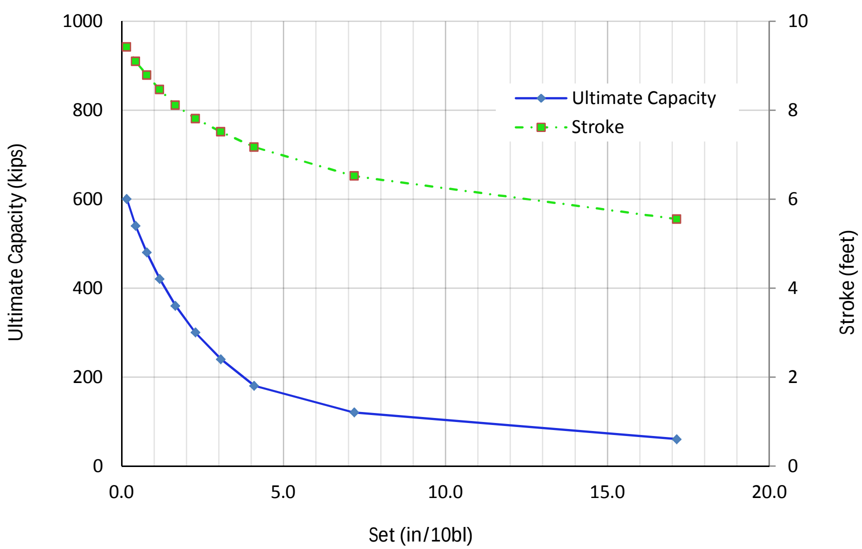
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
60	16.51	2	15.8	5.7	16.4
120	19.82	0.7	6.4	6.71	14.0
180	21.58	0.82	3.5	7.26	13.0
240	22.69	0.36	2.5	7.59	12.8
300	23.65	1.61	1.8	7.87	13.0
360	24.62	1.77	1.2	8.17	13.2
420	26.11	2.42	0.7	8.44	13.5
480	27.6	3.31	0.4	8.77	14.0
540	28.88	3.9	0.1	9.05	14.4
600	29.9	4.34	0.0	9.19	14.5

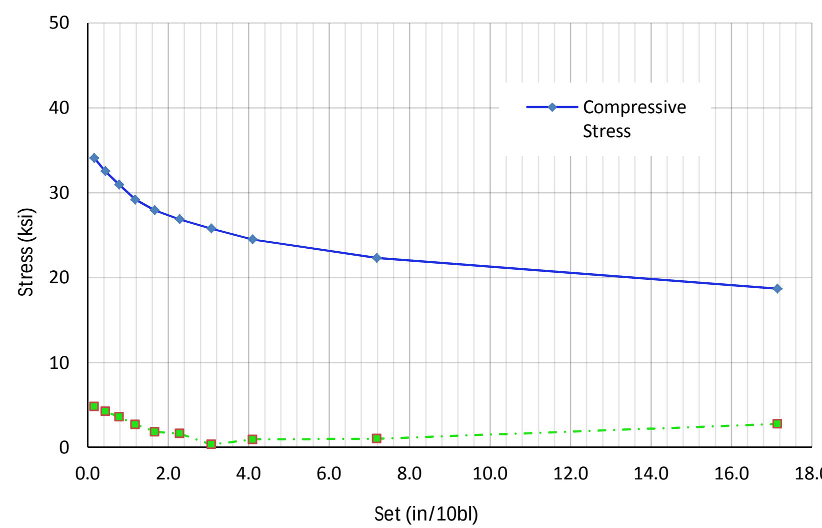




Pile:	HP14X73	Soil Boring	BM-004
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

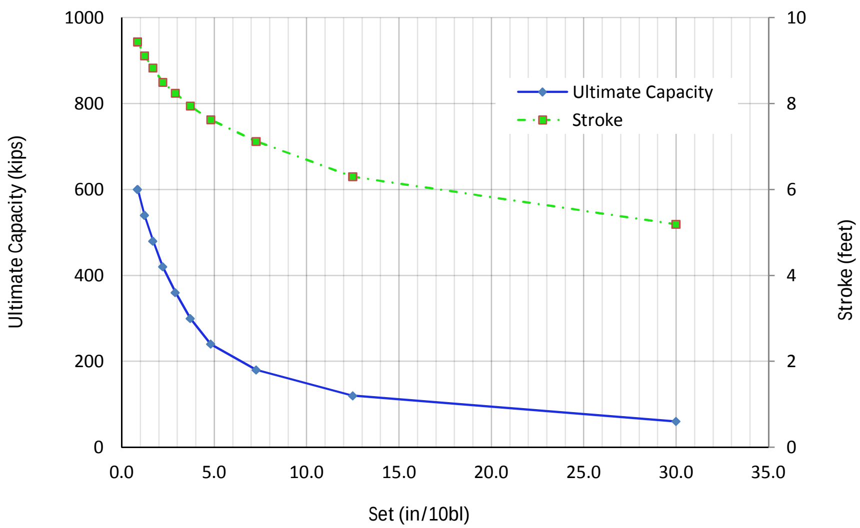
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
60	18.7	2.77	17.1	5.55	18.6
120	22.31	1.04	7.2	6.52	16.6
180	24.5	0.94	4.1	7.17	16.1
240	25.78	0.37	3.1	7.51	16.1
300	26.87	1.64	2.3	7.81	16.4
360	27.94	1.85	1.7	8.11	16.8
420	29.2	2.71	1.2	8.46	17.4
480	30.96	3.6	0.8	8.79	18.0
540	32.54	4.27	0.4	9.1	18.6
600	34.08	4.81	0.2	9.42	19.2

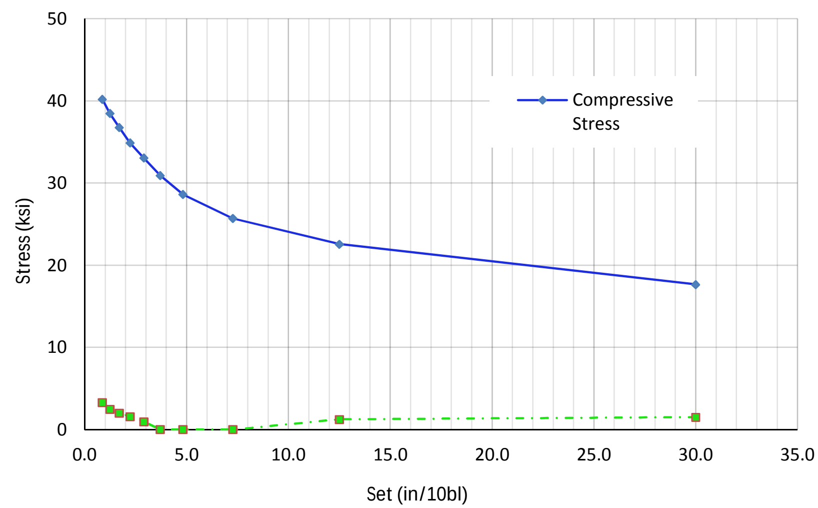




Pile:	HP14X73	Soil Boring	BM-004
Hammer:	DELMAG D 30-32	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

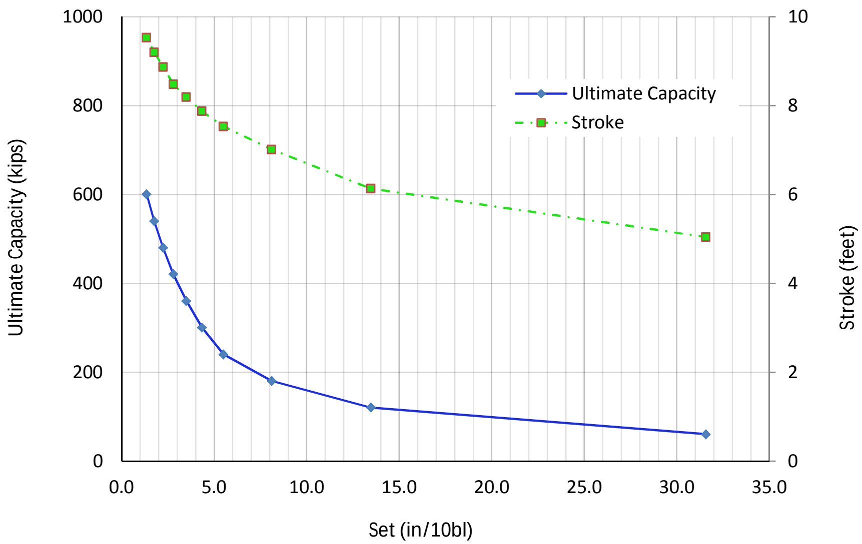
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
60	17.64	1.49	30.0	5.19	35.0
120	22.55	1.23	12.5	6.3	29.1
180	25.68	0	7.3	7.12	26.6
240	28.61	0	4.8	7.62	25.0
300	30.9	0	3.7	7.94	24.8
360	33.05	0.94	2.9	8.24	25.3
420	34.87	1.57	2.2	8.49	25.6
480	36.77	1.99	1.7	8.83	26.3
540	38.48	2.44	1.2	9.11	27.0
600	40.17	3.27	0.9	9.44	27.8

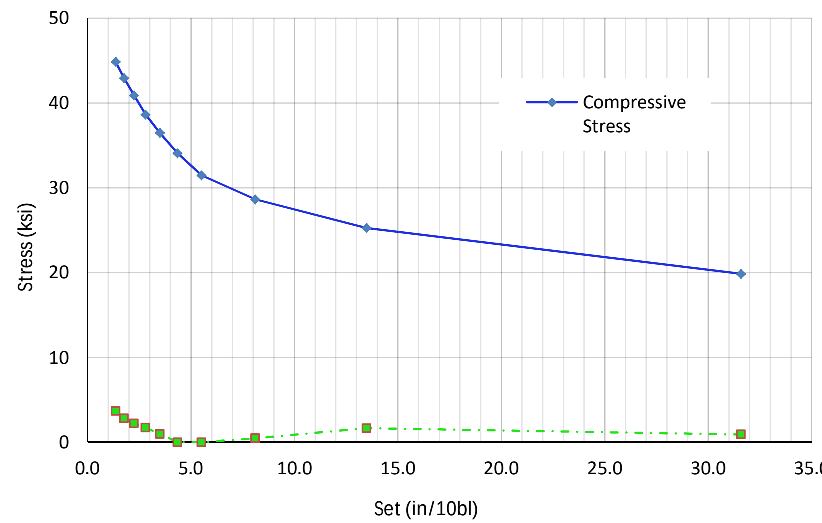




Pile:	HP14X73	Soil Boring	BM-004
Hammer:	DELMAG D 30-32	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

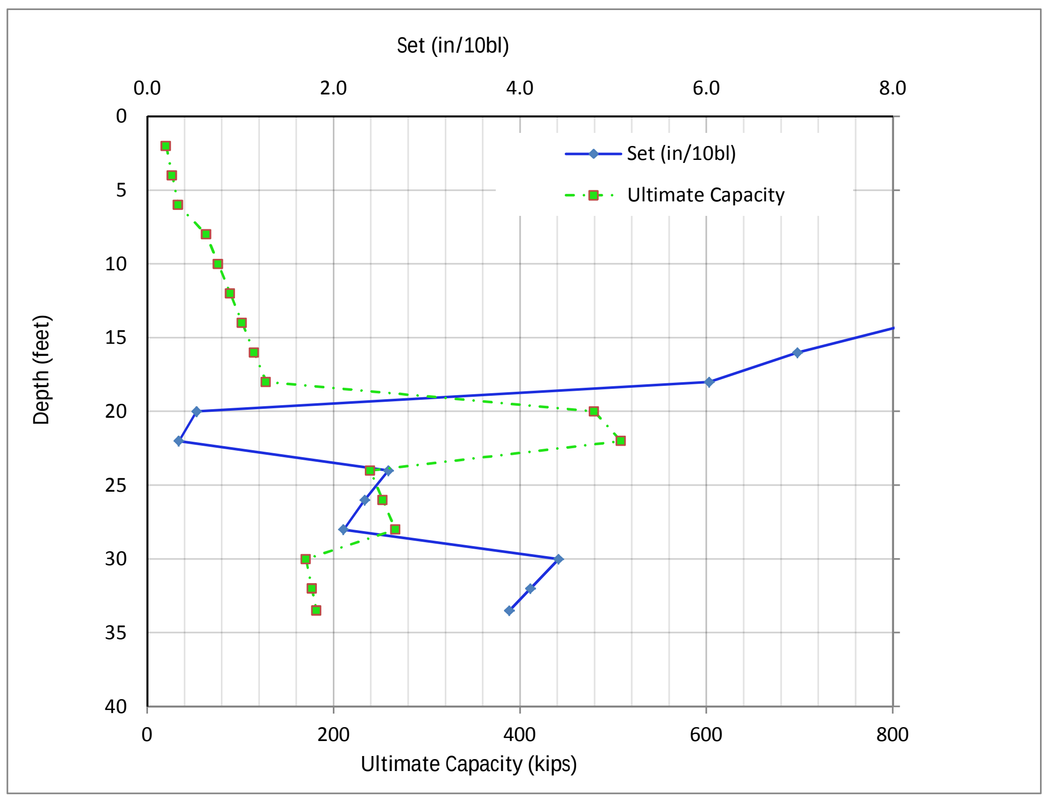
Ultimate Capacity	Max. Comp. Stress	Max. Tensile Stress	Set	Stroke	Energy
Kips	ksi	ksi	in/10bl	ft	kips-ft
60	19.84	0.92	31.6	5.04	38.3
120	25.25	1.66	13.5	6.13	33.4
180	28.63	0.47	8.1	7.01	31.8
240	31.46	0	5.5	7.53	30.5
300	34.06	0	4.3	7.87	30.6
360	36.46	0.98	3.5	8.19	31.3
420	38.62	1.72	2.8	8.48	32.0
480	40.89	2.23	2.2	8.87	33.2
540	42.91	2.81	1.8	9.2	34.3
600	44.85	3.69	1.4	9.53	35.5

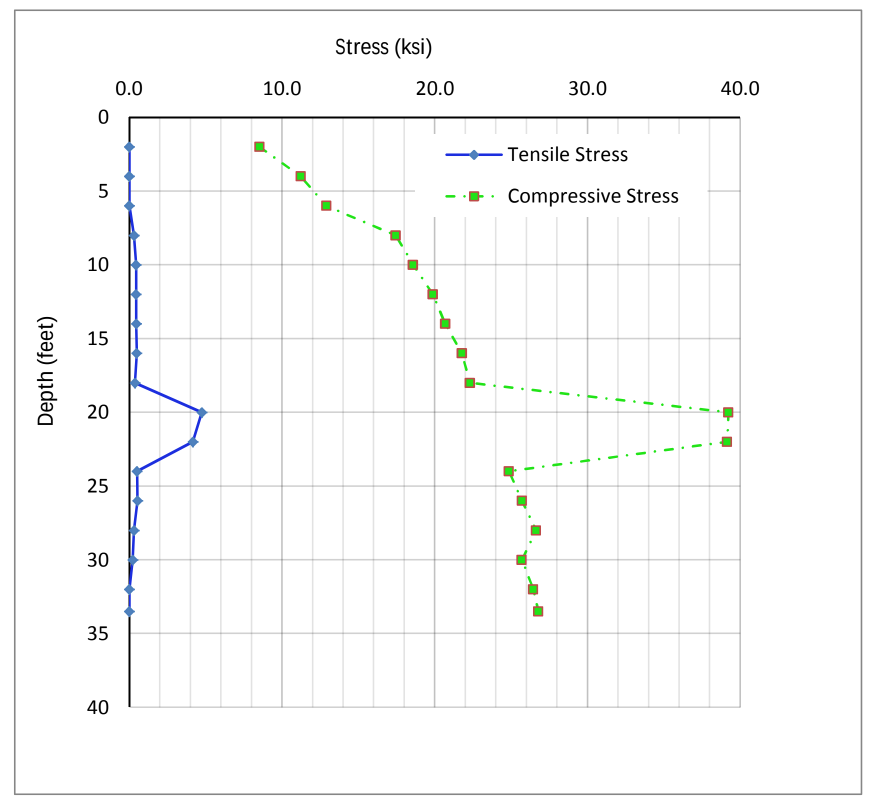


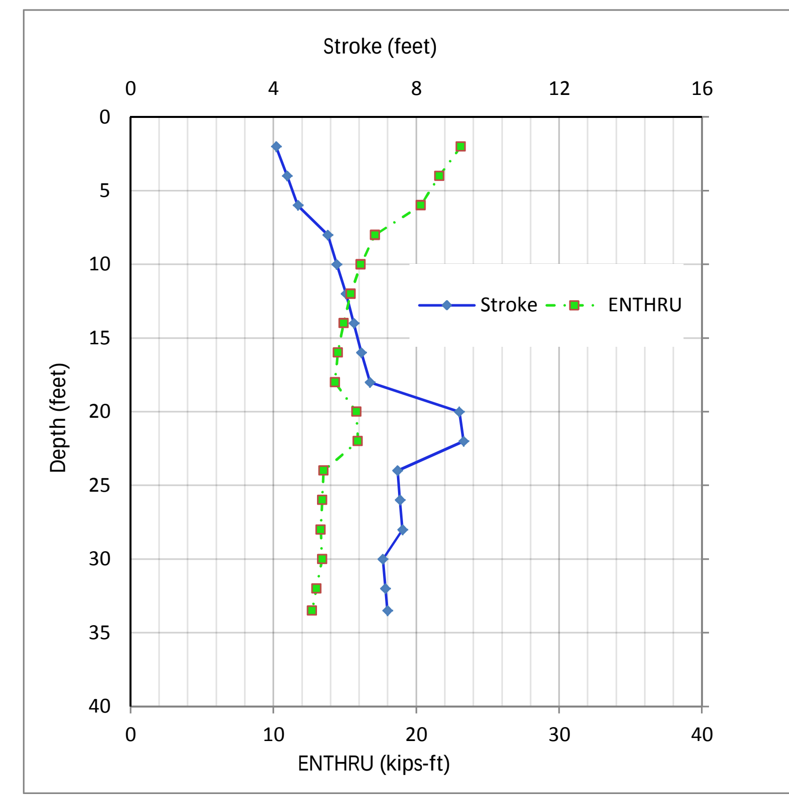


Pile:	HP12x53	Soil Boring	BM-004
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	20.1	6.5	13.6	63.2	8.5	0.0	4.07	23.1
4	26.6	13	13.6	46.2	11.2	0.0	4.38	21.6
6	33.1	19.6	13.6	34.3	12.9	0.0	4.68	20.3
8	63.2	27.7	35.5	15.8	17.4	0.3	5.52	17.1
10	76	40.5	35.5	12.2	18.6	0.4	5.77	16.1
12	88.9	53.4	35.5	9.9	19.9	0.4	6.03	15.4
14	101.8	66.3	35.5	8.2	20.7	0.5	6.25	14.9
16	114.6	79.1	35.5	7.0	21.8	0.5	6.46	14.5
18	127.5	92	35.5	6.0	22.3	0.4	6.7	14.3
20	479.4	104.9	374.5	0.5	39.2	4.7	9.2	15.8
22	508.1	119.1	389.1	0.3	39.1	4.2	9.32	15.9
24	239.3	132.6	106.6	2.6	24.9	0.5	7.47	13.5
26	252.6	140.8	111.8	2.3	25.7	0.5	7.54	13.4
28	266.4	149.5	116.9	2.1	26.6	0.3	7.61	13.3
30	170.2	156.6	13.6	4.4	25.7	0.2	7.06	13.4
32	176.7	163.1	13.6	4.1	26.4	0.0	7.13	13
33.5	181.6	168	13.6	3.9	26.8	0.0	7.19	12.7

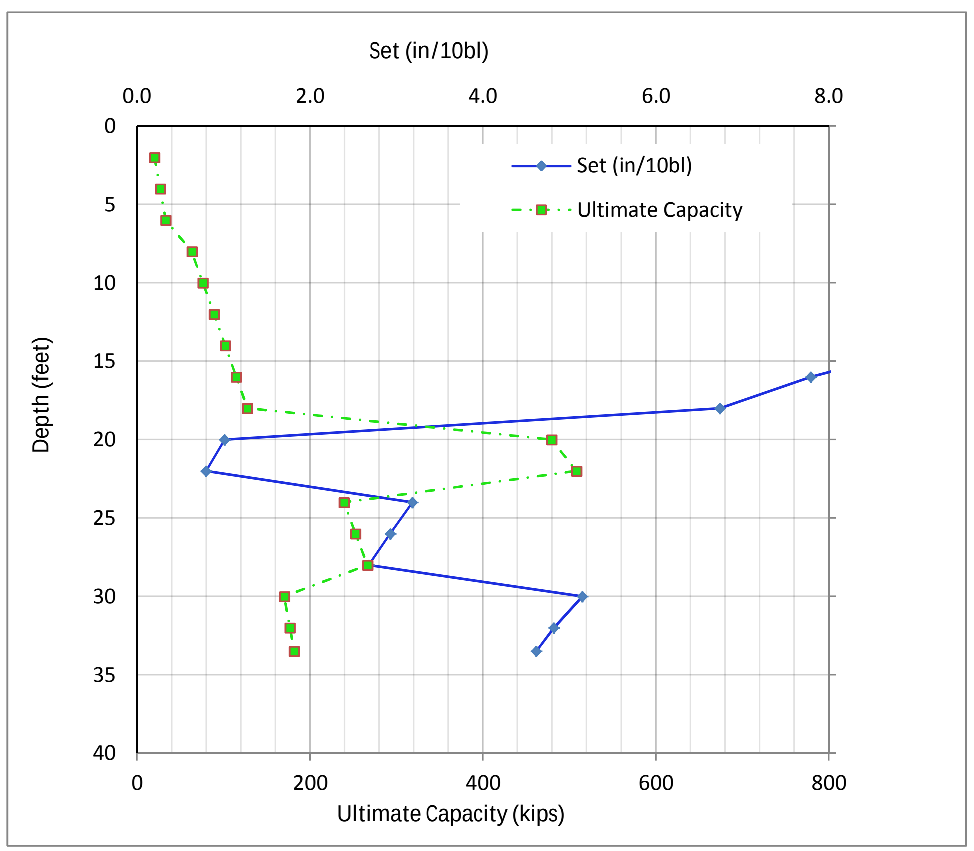


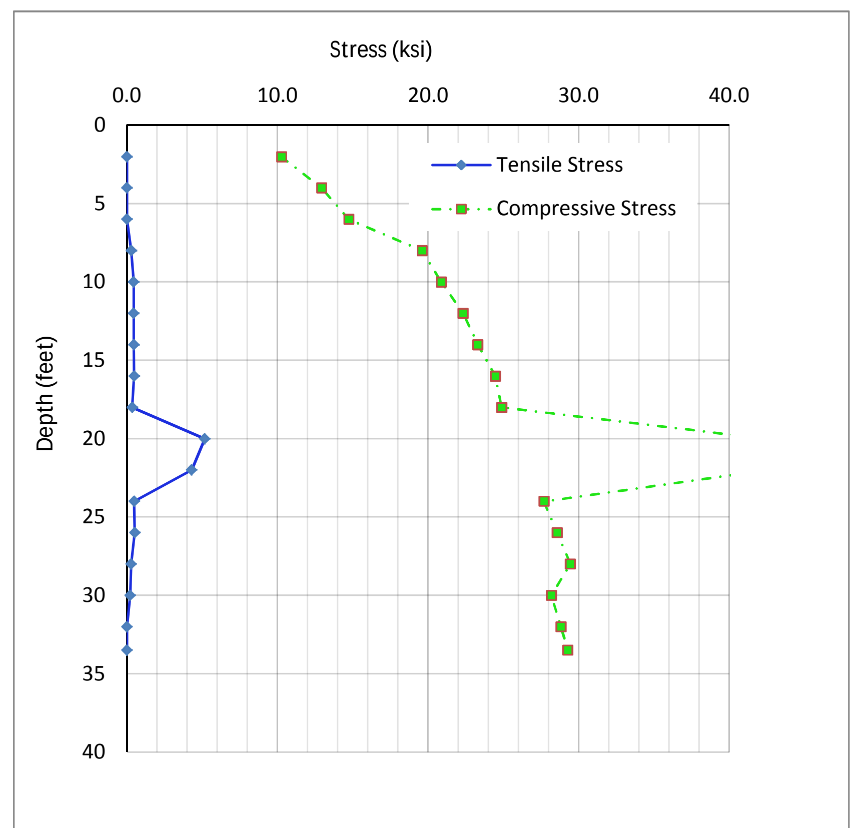


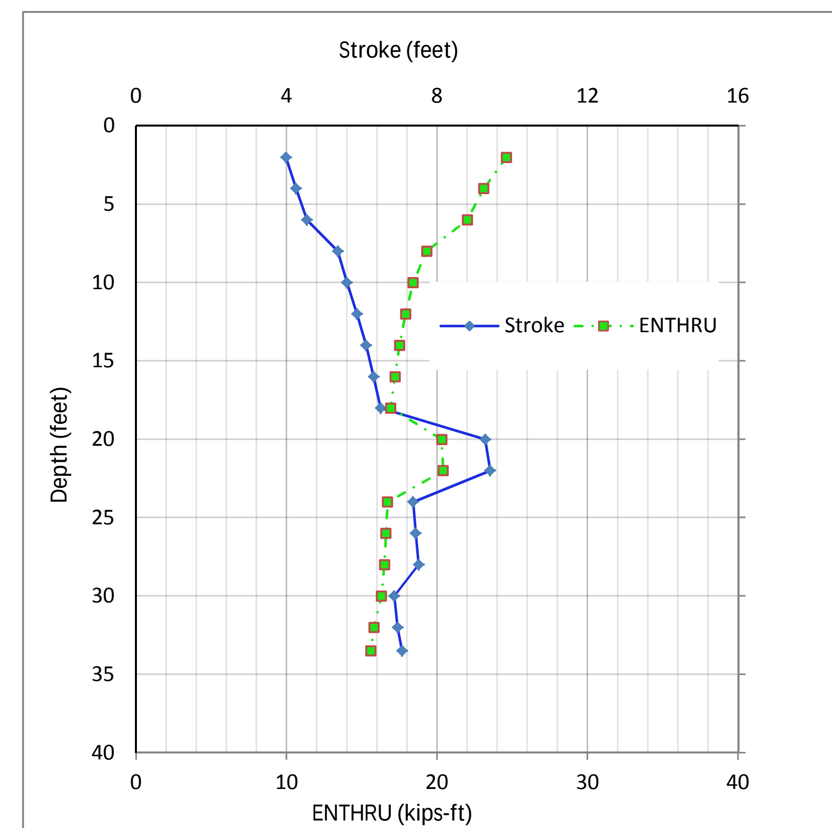


Pile: HP12x53 Soil Boring BM-004
Hammer: DELMAG D 19-42 Hammer Efficiency: 0.8
Toe Quake: 0.04 in

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	20.1	6.5	13.6	66.7	10.3	0.0	3.98	24.6
4	26.6	13	13.6	48.0	12.9	0.0	4.25	23.1
6	33.1	19.6	13.6	36.4	14.7	0.0	4.54	22
8	63.2	27.7	35.5	17.1	19.6	0.3	5.36	19.3
10	76	40.5	35.5	13.3	20.9	0.4	5.6	18.4
12	88.9	53.4	35.5	10.9	22.3	0.4	5.87	17.9
14	101.8	66.3	35.5	9.2	23.3	0.5	6.11	17.5
16	114.6	79.1	35.5	7.8	24.5	0.5	6.31	17.2
18	127.5	92	35.5	6.7	24.9	0.4	6.5	16.9
20	479.4	104.9	374.5	1.0	42.4	5.2	9.28	20.3
22	508.1	119.1	389.1	0.8	42.5	4.3	9.41	20.4
24	239.3	132.6	106.6	3.2	27.7	0.5	7.36	16.7
26	252.6	140.8	111.8	2.9	28.6	0.5	7.43	16.6
28	266.4	149.5	116.9	2.7	29.4	0.3	7.51	16.5
30	170.2	156.6	13.6	5.2	28.2	0.2	6.86	16.3
32	176.7	163.1	13.6	4.8	28.8	0.0	6.95	15.8
33.5	181.6	168	13.6	4.6	29.3	0.0	7.07	15.6

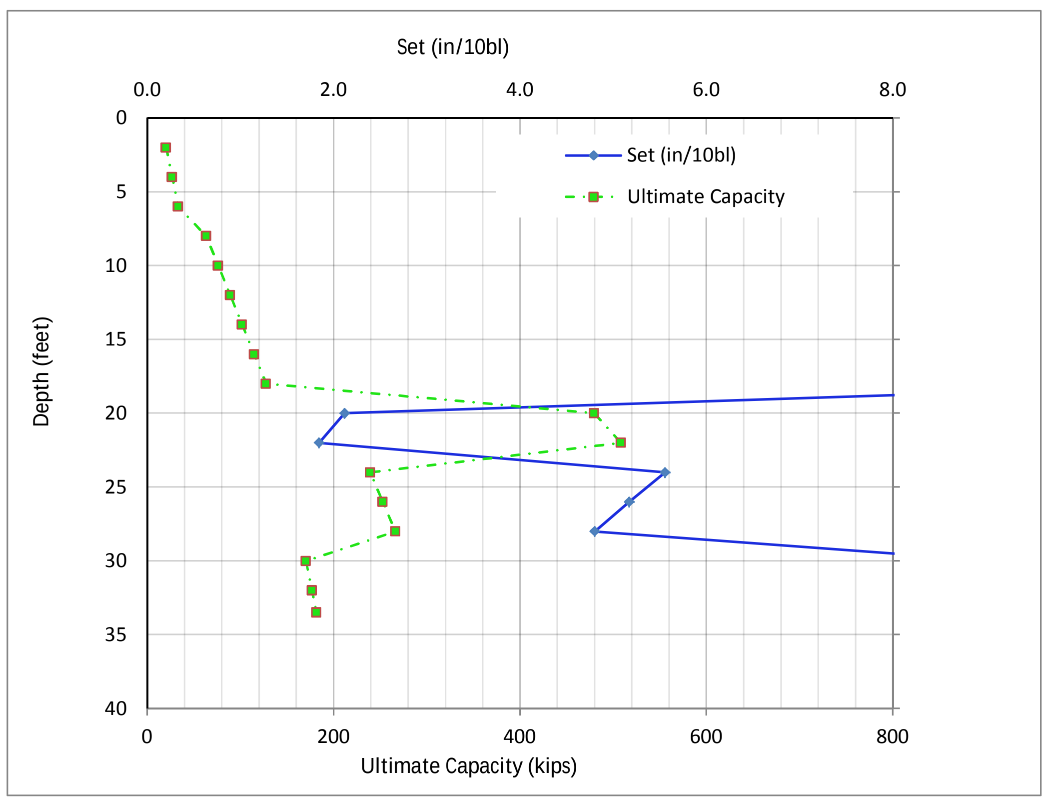


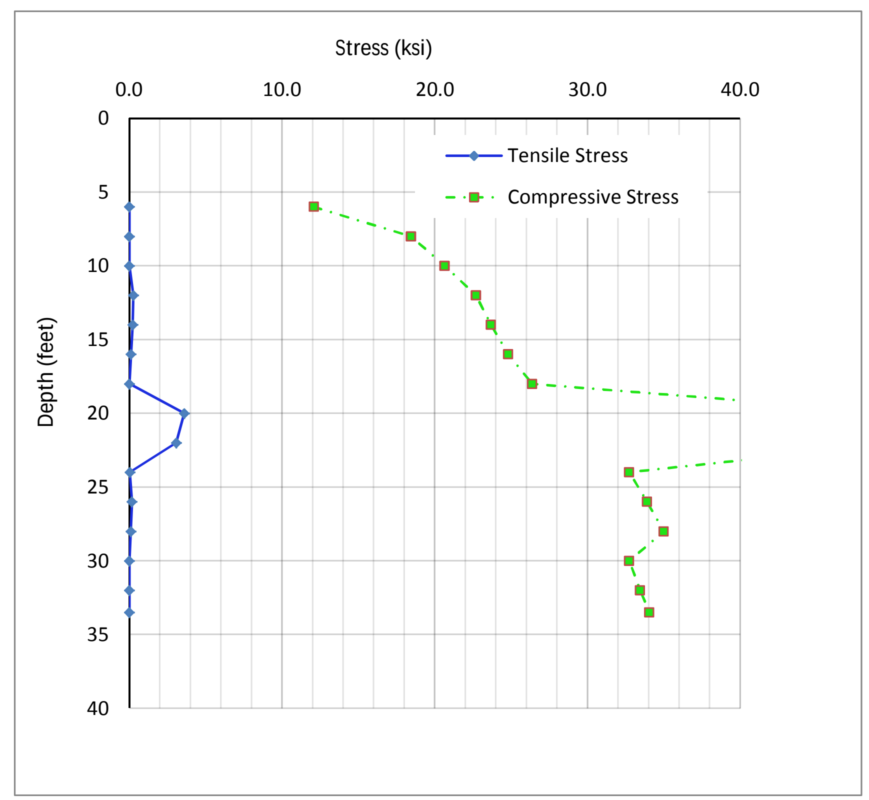


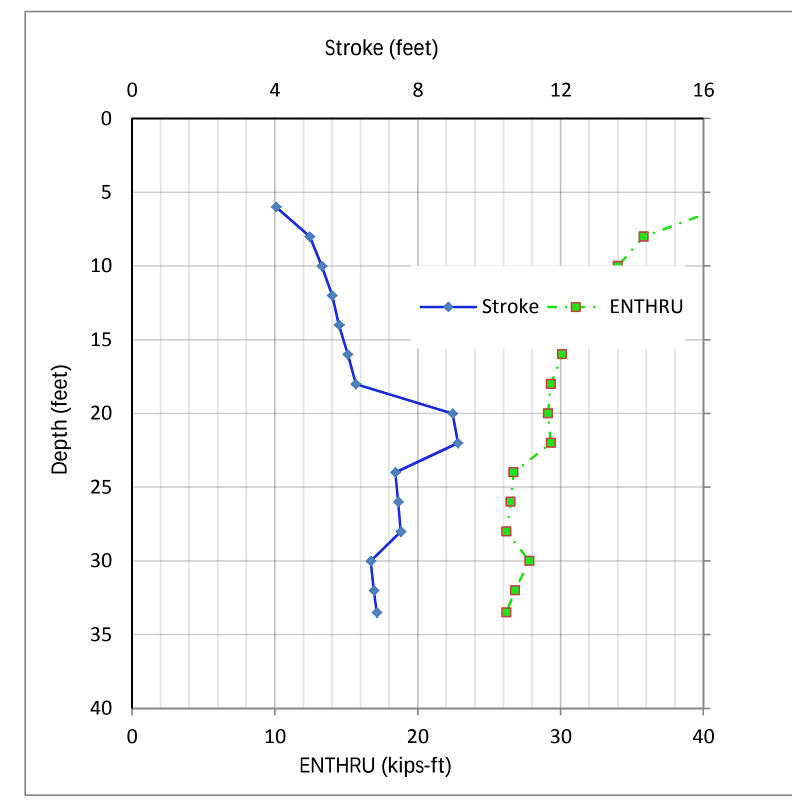


Pile:	HP12X53	Soil Boring	BM-004
Hammer:	DELMAG D30-32	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	20.1	6.5	13.6					
4	26.6	13	13.6					
6	33.1	19.6	13.6	63.2	12.1	0.0	4.03	41.4
8	63.2	27.7	35.5	29.3	18.4	0.0	4.97	35.8
10	76	40.5	35.5	23.5	20.7	0.0	5.31	34
12	88.9	53.4	35.5	19.0	22.7	0.3	5.6	32.6
14	101.8	66.3	35.5	16.0	23.7	0.2	5.79	31.1
16	114.6	79.1	35.5	13.6	24.8	0.1	6.04	30.1
18	127.5	92	35.5	11.8	26.4	0.0	6.26	29.3
20	479.4	104.9	374.5	2.1	50.7	3.6	8.97	29.1
22	508.1	119.1	389.1	1.8	51.0	3.1	9.12	29.3
24	239.3	132.6	106.6	5.6	32.7	0.0	7.37	26.7
26	252.6	140.8	111.8	5.2	33.9	0.2	7.45	26.5
28	266.4	149.5	116.9	4.8	35.0	0.1	7.52	26.2
30	170.2	156.6	13.6	9.1	32.7	0.0	6.68	27.8
32	176.7	163.1	13.6	8.6	33.4	0.0	6.77	26.8
33.5	181.6	168	13.6	8.2	34.1	0.0	6.85	26.2

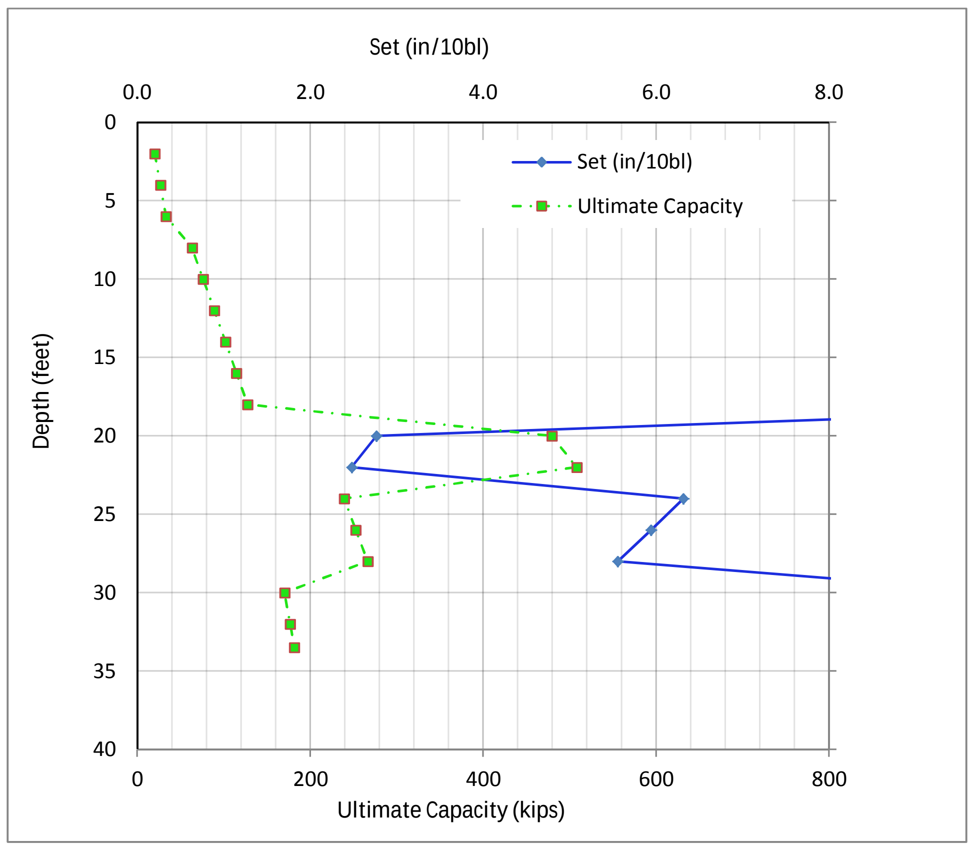


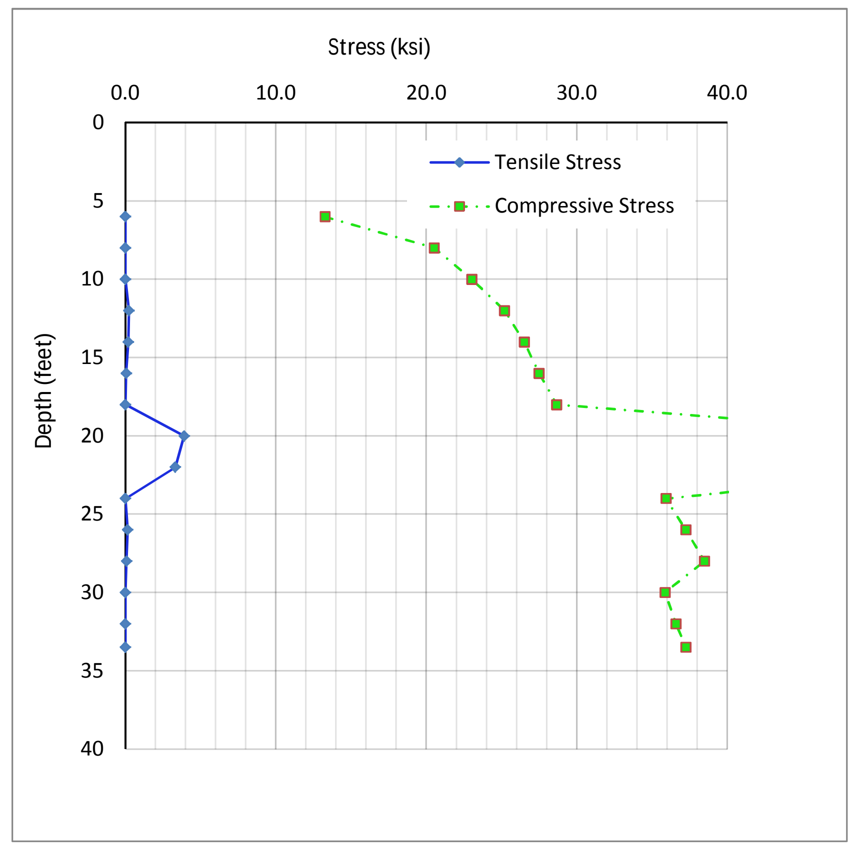


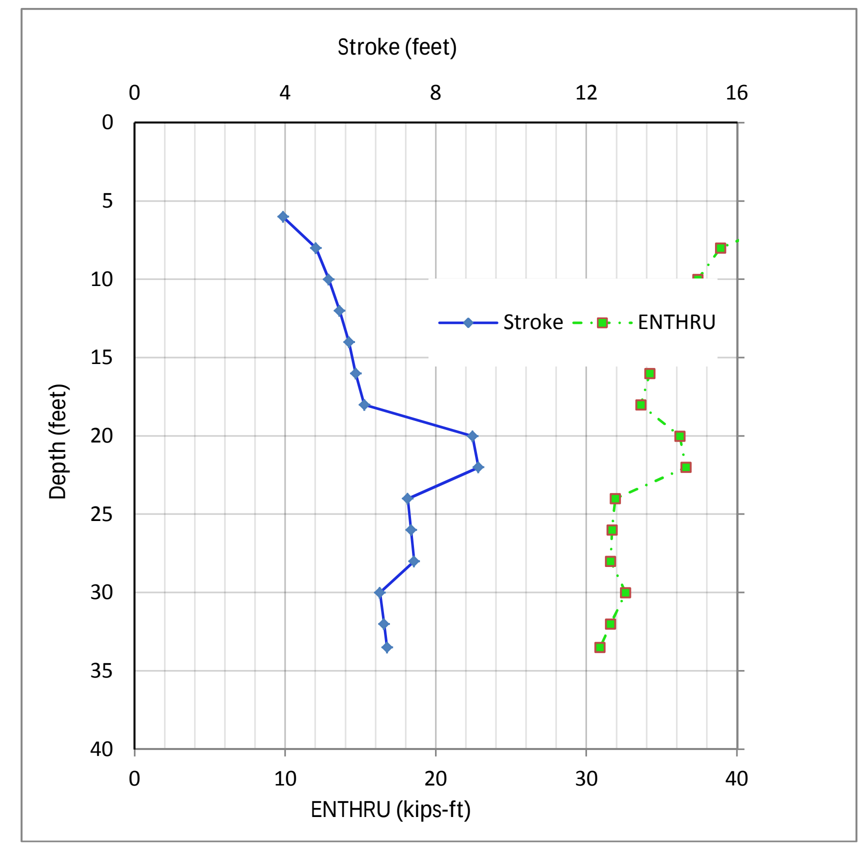


Pile:	HP12x53		Soil Boring	BM-004
Hammer:	DELMAG D30-32		Hammer Efficiency:	0.8
Toe Quake:	0.04 in			

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	20.1	6.5	13.6					
4	26.6	13	13.6					
6	33.1	19.6	13.6	63.2	13.3	0.0	3.94	43.9
8	63.2	27.7	35.5	30.8	20.5	0.0	4.81	38.9
10	76	40.5	35.5	24.5	23.0	0.0	5.15	37.4
12	88.9	53.4	35.5	20.3	25.2	0.2	5.44	36.3
14	101.8	66.3	35.5	17.1	26.5	0.2	5.69	35.4
16	114.6	79.1	35.5	14.6	27.5	0.1	5.87	34.2
18	127.5	92	35.5	12.8	28.7	0.0	6.1	33.6
20	479.4	104.9	374.5	2.8	55.3	3.9	8.97	36.2
22	508.1	119.1	389.1	2.5	55.7	3.3	9.13	36.6
24	239.3	132.6	106.6	6.3	35.9	0.0	7.25	31.9
26	252.6	140.8	111.8	5.9	37.2	0.1	7.34	31.7
28	266.4	149.5	116.9	5.6	38.5	0.1	7.42	31.6
30	170.2	156.6	13.6	10.1	35.9	0.0	6.51	32.6
32	176.7	163.1	13.6	9.5	36.6	0.0	6.62	31.6
33.5	181.6	168	13.6	9.1	37.2	0.0	6.7	30.9

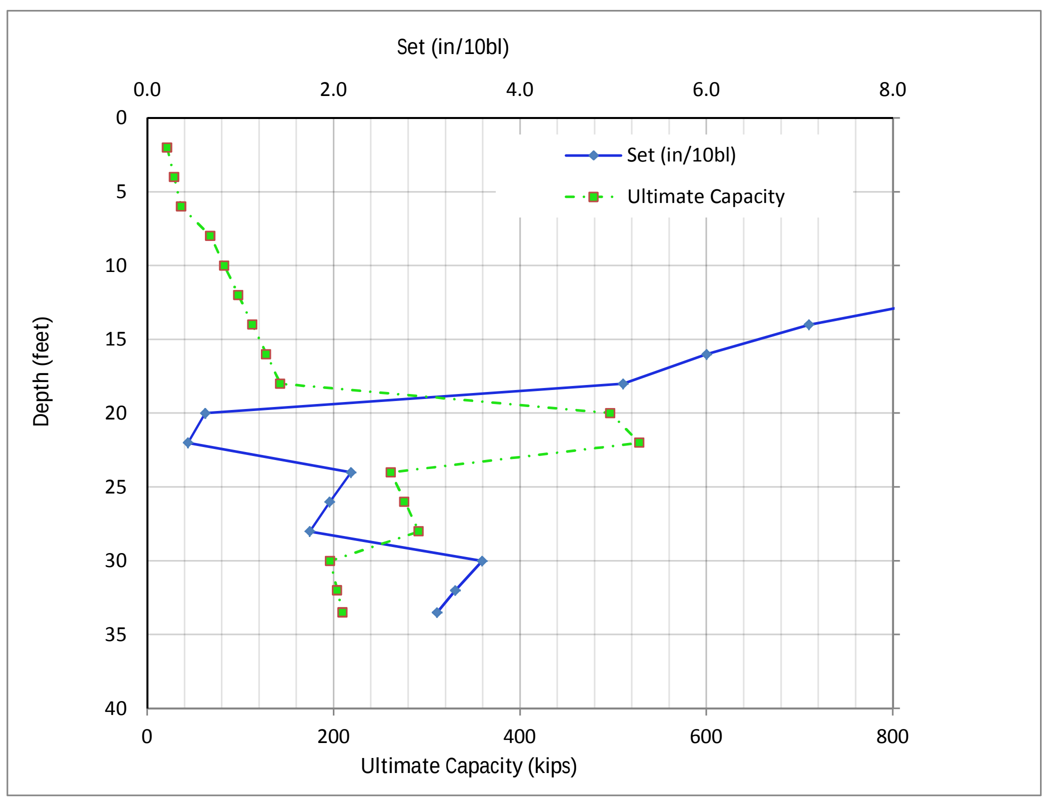


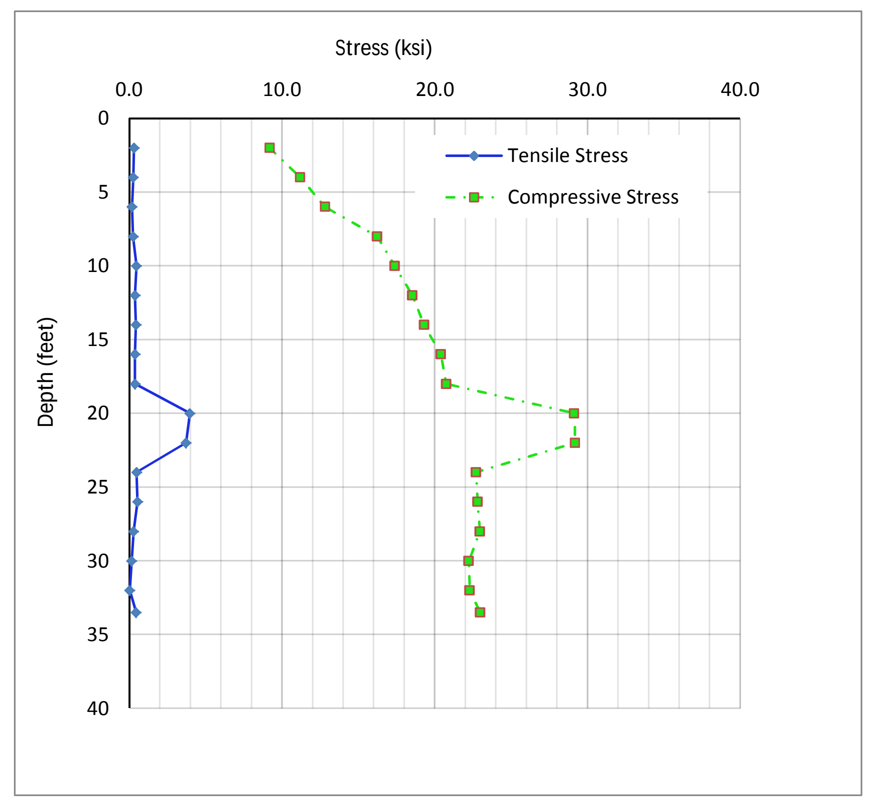


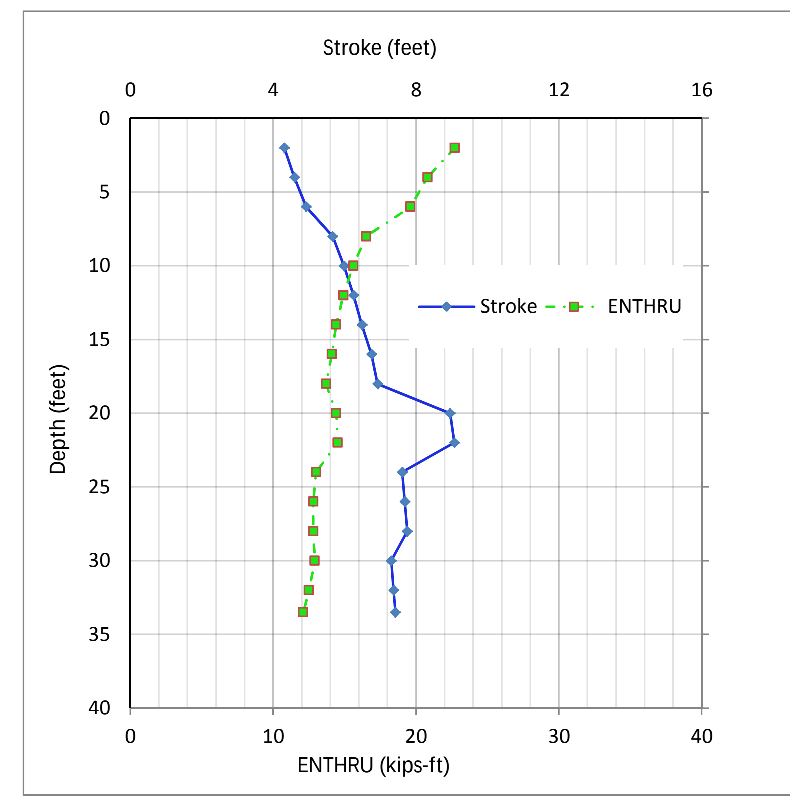


Pile:	HP14X73	Soil Boring	BM-004
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.6
Toe Quake:	0.04 in		

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	21.2	7.6	13.6	60.0	9.2	0.3	4.31	22.7
4	28.8	15.2	13.6	41.4	11.2	0.2	4.59	20.8
6	36.4	22.8	13.6	30.8	12.8	0.2	4.92	19.6
8	67.8	32.3	35.5	14.5	16.2	0.2	5.66	16.5
10	82.8	47.3	35.5	11.0	17.4	0.5	5.98	15.6
12	97.8	62.3	35.5	8.8	18.5	0.4	6.25	14.9
14	112.8	77.3	35.5	7.1	19.3	0.4	6.48	14.4
16	127.8	92.3	35.5	6.0	20.4	0.4	6.75	14.1
18	142.8	107.3	35.5	5.1	20.7	0.4	6.92	13.7
20	496.9	122.4	374.5	0.6	29.1	4.0	8.95	14.4
22	528	138.9	389.1	0.4	29.2	3.7	9.07	14.5
24	261.4	154.7	106.6	2.2	22.7	0.5	7.61	13
26	276.1	164.3	111.8	2.0	22.8	0.5	7.68	12.8
28	291.3	174.4	116.9	1.7	23.0	0.3	7.75	12.8
30	196.3	182.7	13.6	3.6	22.2	0.1	7.3	12.9
32	203.9	190.3	13.6	3.3	22.3	0.0	7.37	12.5
33.5	209.6	196	13.6	3.1	23.0	0.4	7.42	12.1

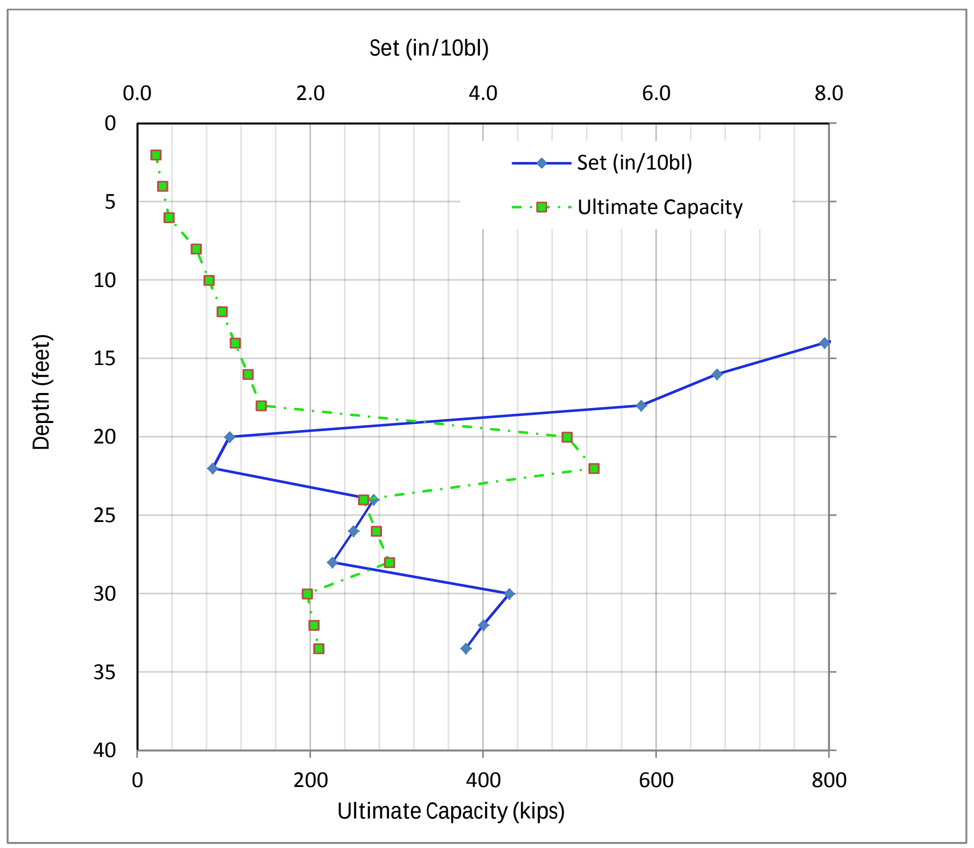


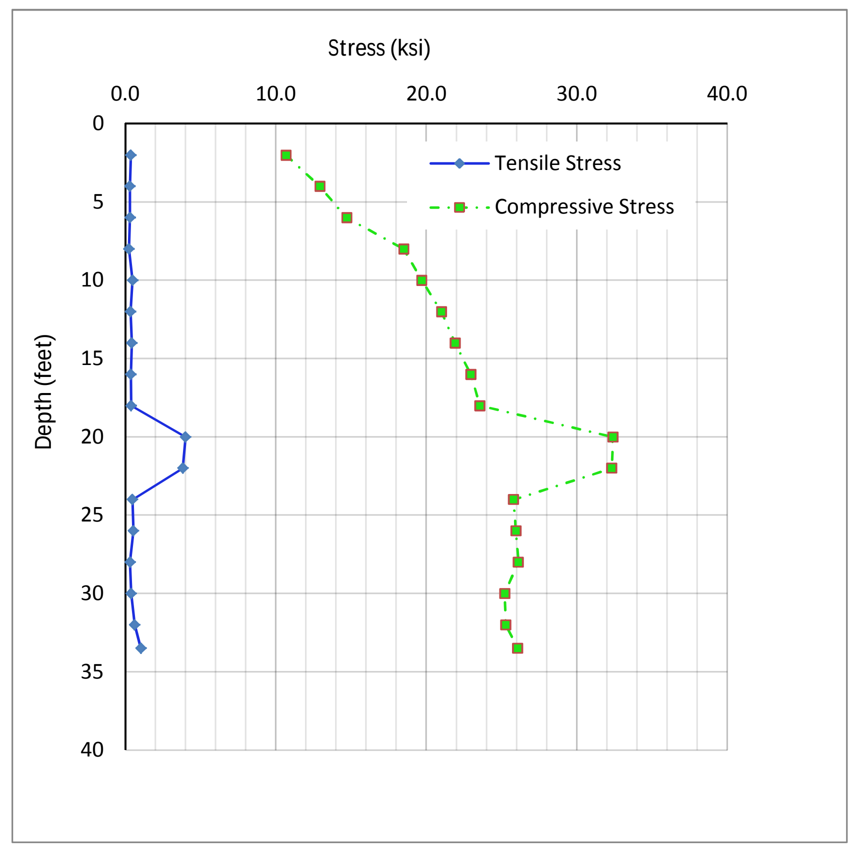


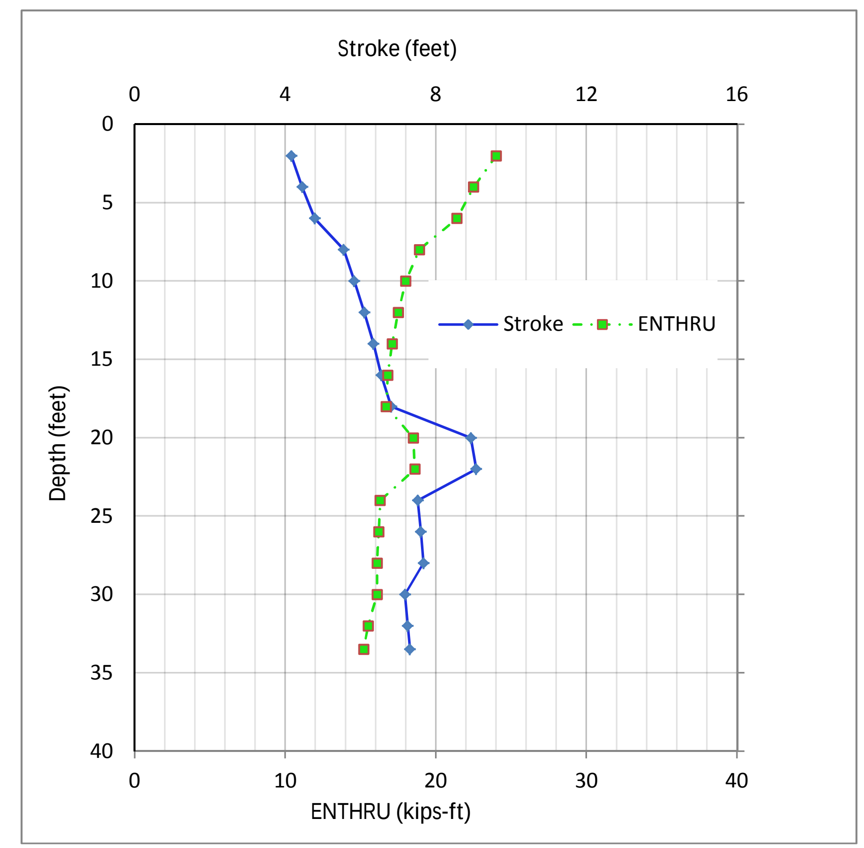


Pile:	HP14X73	Soil Boring	BM-004
Hammer:	DELMAG D 19-42	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	21.2	7.6	13.6	63.2	10.7	0.4	4.16	24
4	28.8	15.2	13.6	44.4	12.9	0.3	4.45	22.5
6	36.4	22.8	13.6	32.4	14.7	0.3	4.78	21.4
8	67.8	32.3	35.5	15.6	18.5	0.2	5.55	18.9
10	82.8	47.3	35.5	12.0	19.7	0.5	5.83	18
12	97.8	62.3	35.5	9.7	21.0	0.3	6.1	17.5
14	112.8	77.3	35.5	7.9	21.9	0.4	6.34	17.1
16	127.8	92.3	35.5	6.7	23.0	0.4	6.55	16.8
18	142.8	107.3	35.5	5.8	23.6	0.4	6.81	16.7
20	496.9	122.4	374.5	1.1	32.4	4.0	8.93	18.5
22	528	138.9	389.1	0.9	32.3	3.8	9.07	18.6
24	261.4	154.7	106.6	2.7	25.8	0.5	7.52	16.3
26	276.1	164.3	111.8	2.5	26.0	0.5	7.6	16.2
28	291.3	174.4	116.9	2.3	26.1	0.3	7.67	16.1
30	196.3	182.7	13.6	4.3	25.2	0.4	7.18	16.1
32	203.9	190.3	13.6	4.0	25.3	0.6	7.25	15.5
33.5	209.6	196	13.6	3.8	26.1	1.0	7.31	15.2

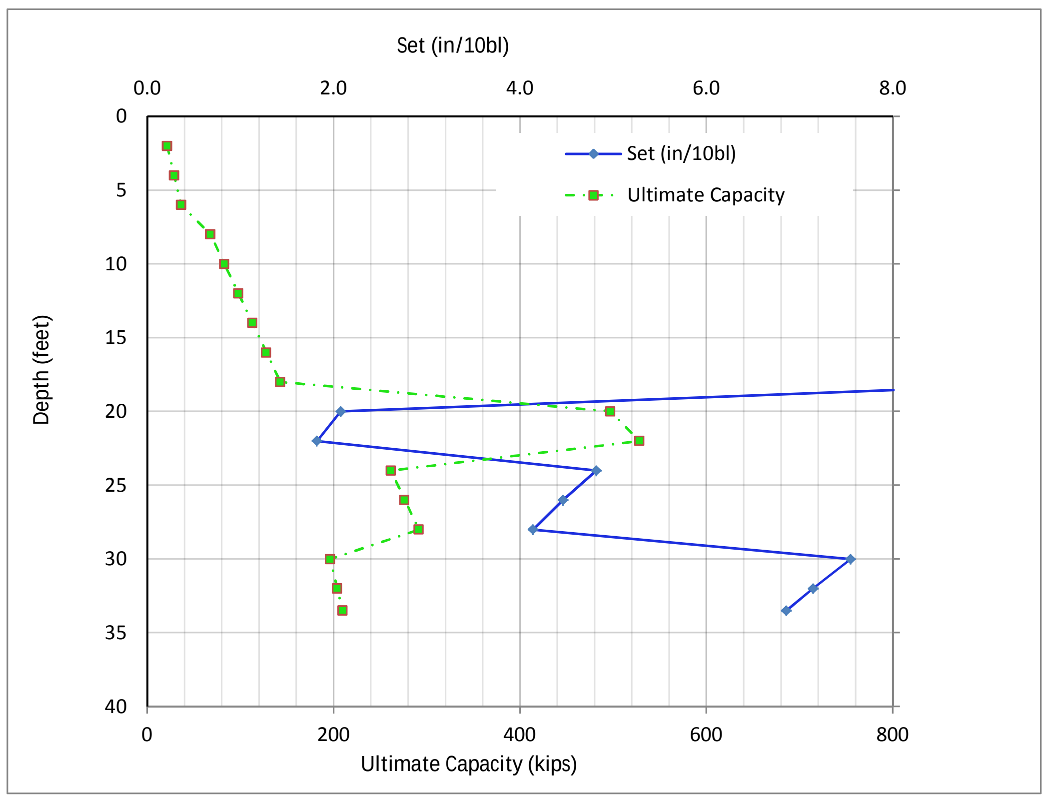


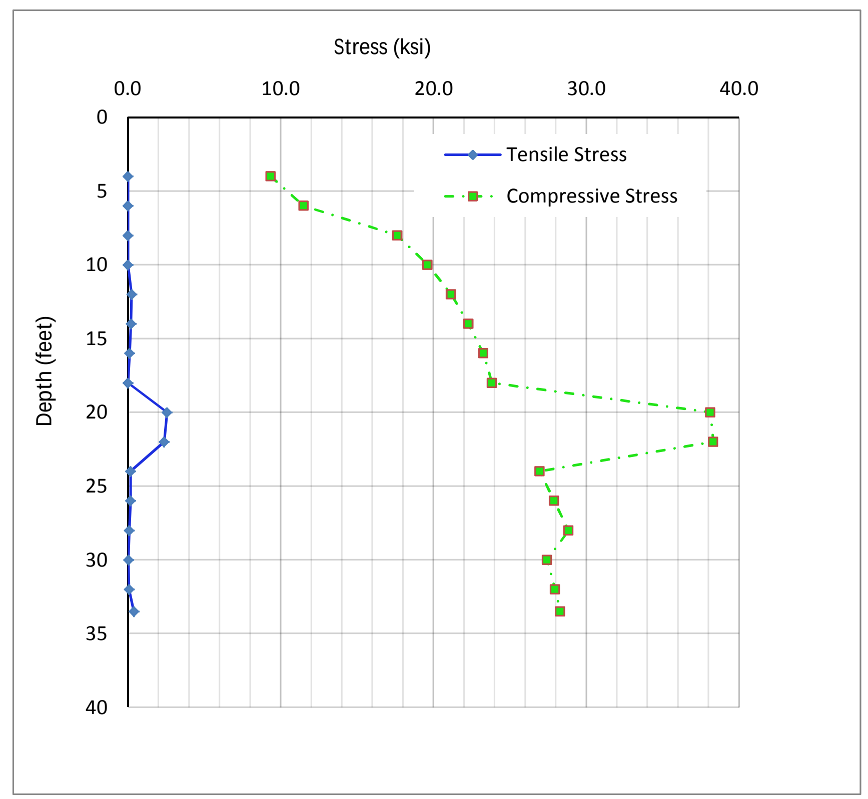


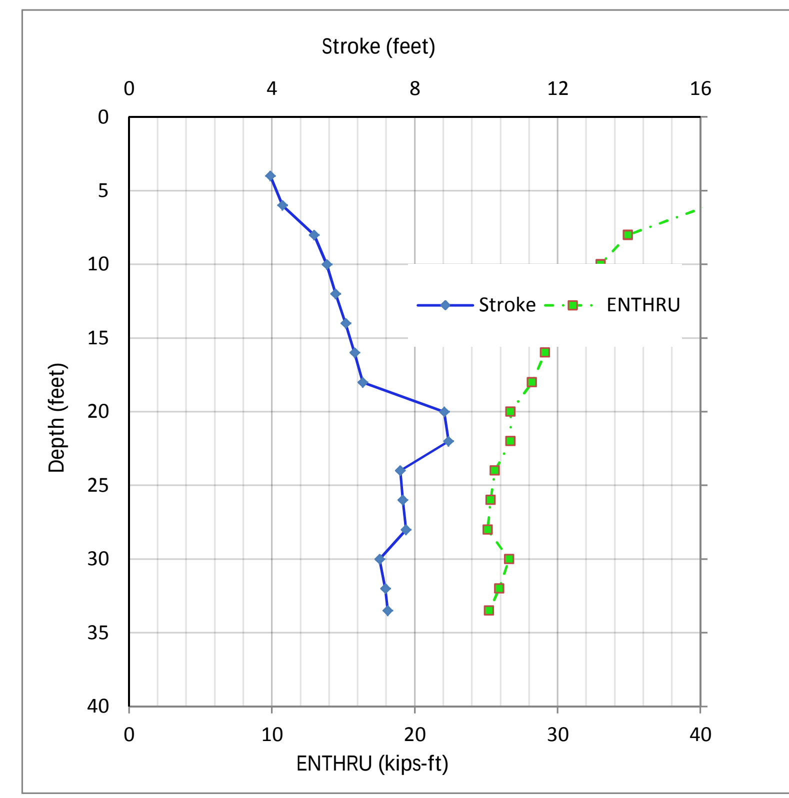


Pile:	HP14X73		Soil Boring	BM-004
Hammer:	DELMAG D 30-32		Hammer Efficiency:	0.6
Toe Quake:	0.04 in			

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	21.2	7.6	13.6					
4	28.8	15.2	13.6	75.0	9.3	0.0	3.95	42.5
6	36.4	22.8	13.6	57.1	11.5	0.0	4.29	40.6
8	67.8	32.3	35.5	27.3	17.6	0.0	5.18	34.9
10	82.8	47.3	35.5	21.1	19.6	0.0	5.53	33
12	97.8	62.3	35.5	16.9	21.1	0.2	5.78	31.2
14	112.8	77.3	35.5	14.1	22.3	0.2	6.06	30.1
16	127.8	92.3	35.5	11.9	23.3	0.1	6.31	29.1
18	142.8	107.3	35.5	10.3	23.8	0.0	6.54	28.2
20	496.9	122.4	374.5	2.1	38.1	2.5	8.82	26.7
22	528	138.9	389.1	1.8	38.3	2.4	8.94	26.7
24	261.4	154.7	106.6	4.8	26.9	0.2	7.59	25.6
26	276.1	164.3	111.8	4.5	27.9	0.2	7.66	25.3
28	291.3	174.4	116.9	4.1	28.8	0.1	7.75	25.1
30	196.3	182.7	13.6	7.5	27.4	0.0	7.01	26.6
32	203.9	190.3	13.6	7.1	28.0	0.1	7.17	25.9
33.5	209.6	196	13.6	6.9	28.3	0.4	7.24	25.2

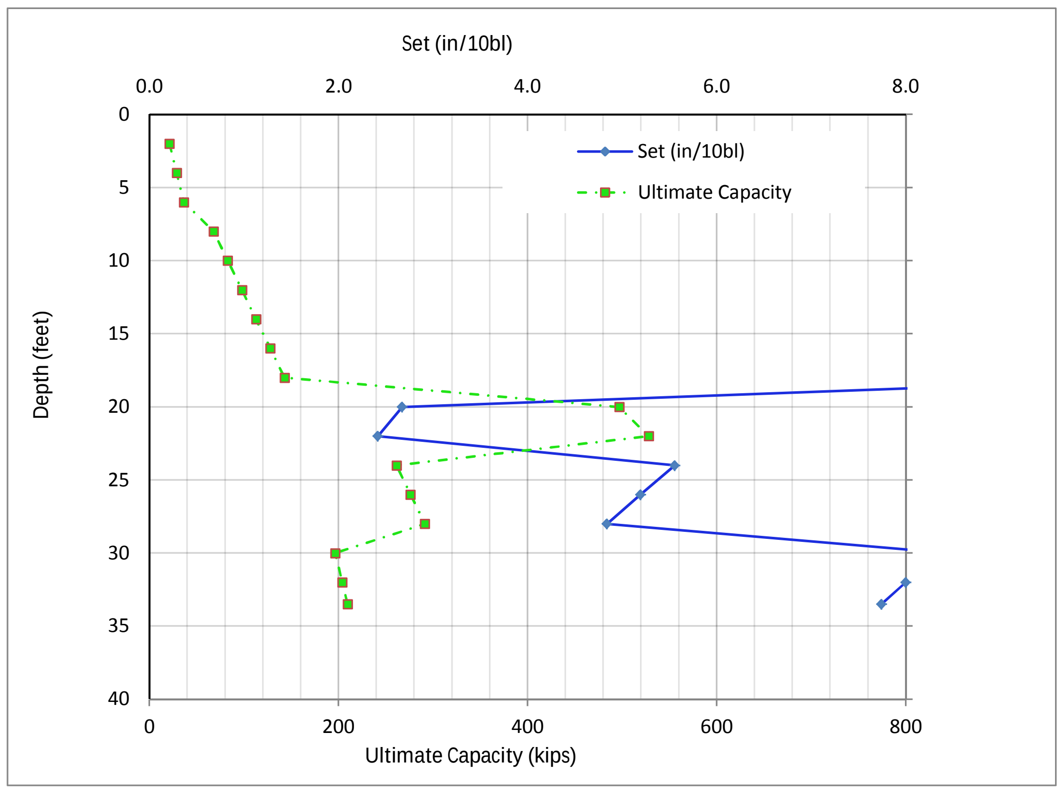


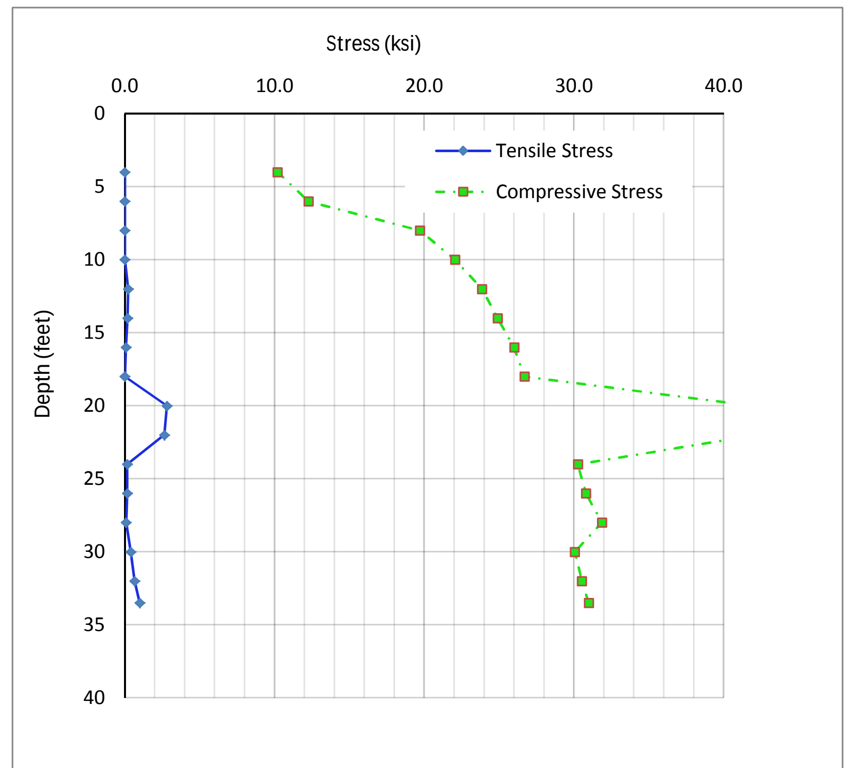


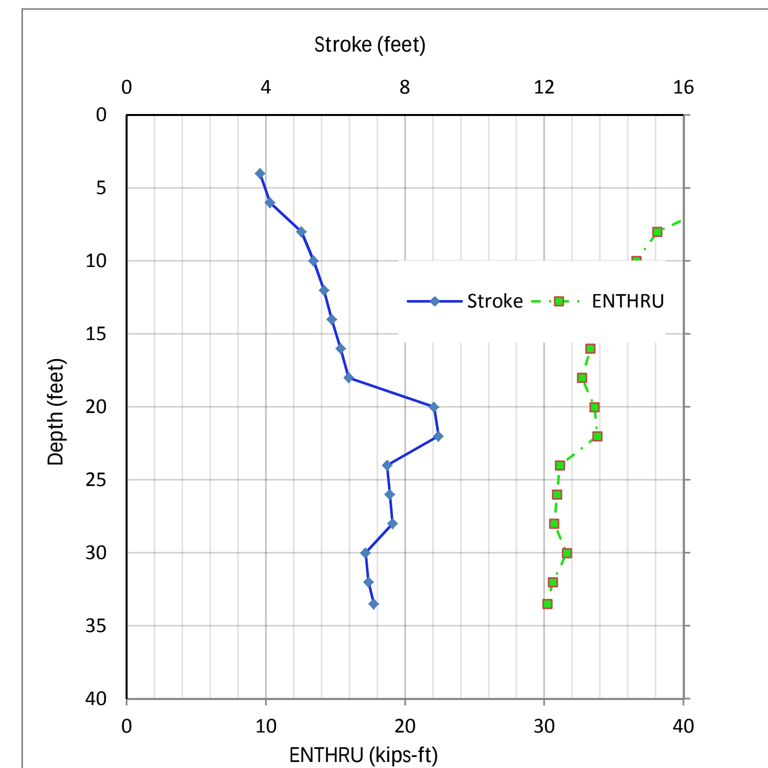


Pile:	HP14X73	Soil Boring	BM-004
Hammer:	DELMAG D 30-32	Hammer Efficiency:	0.8
Toe Quake:	0.04 in		

Depth	Ultimate Capacity	Friction	End Bearing	Set	Comp. Stress	Tensile Stress	Stroke	ENTHRU
ft	kips	kips	kips	in/10bl	ksi	ksi	ft	kips-ft
2	21.2	7.6	13.6					
4	28.8	15.2	13.6	75.0	10.2	0.0	3.83	44.6
6	36.4	22.8	13.6	57.1	12.3	0.0	4.12	42.6
8	67.8	32.3	35.5	28.6	19.7	0.0	5.02	38.1
10	82.8	47.3	35.5	22.2	22.1	0.0	5.37	36.6
12	97.8	62.3	35.5	18.2	23.9	0.2	5.67	35.5
14	112.8	77.3	35.5	15.0	24.9	0.2	5.89	34.1
16	127.8	92.3	35.5	12.9	26.0	0.1	6.15	33.3
18	142.8	107.3	35.5	11.1	26.7	0.0	6.38	32.7
20	496.9	122.4	374.5	2.7	41.9	2.8	8.83	33.6
22	528	138.9	389.1	2.4	42.2	2.6	8.96	33.8
24	261.4	154.7	106.6	5.6	30.3	0.2	7.48	31.1
26	276.1	164.3	111.8	5.2	30.8	0.2	7.56	30.9
28	291.3	174.4	116.9	4.8	31.9	0.1	7.64	30.7
30	196.3	182.7	13.6	8.5	30.0	0.4	6.86	31.6
32	203.9	190.3	13.6	8.0	30.5	0.7	6.95	30.6
33.5	209.6	196	13.6	7.7	31.0	1.0	7.1	30.2

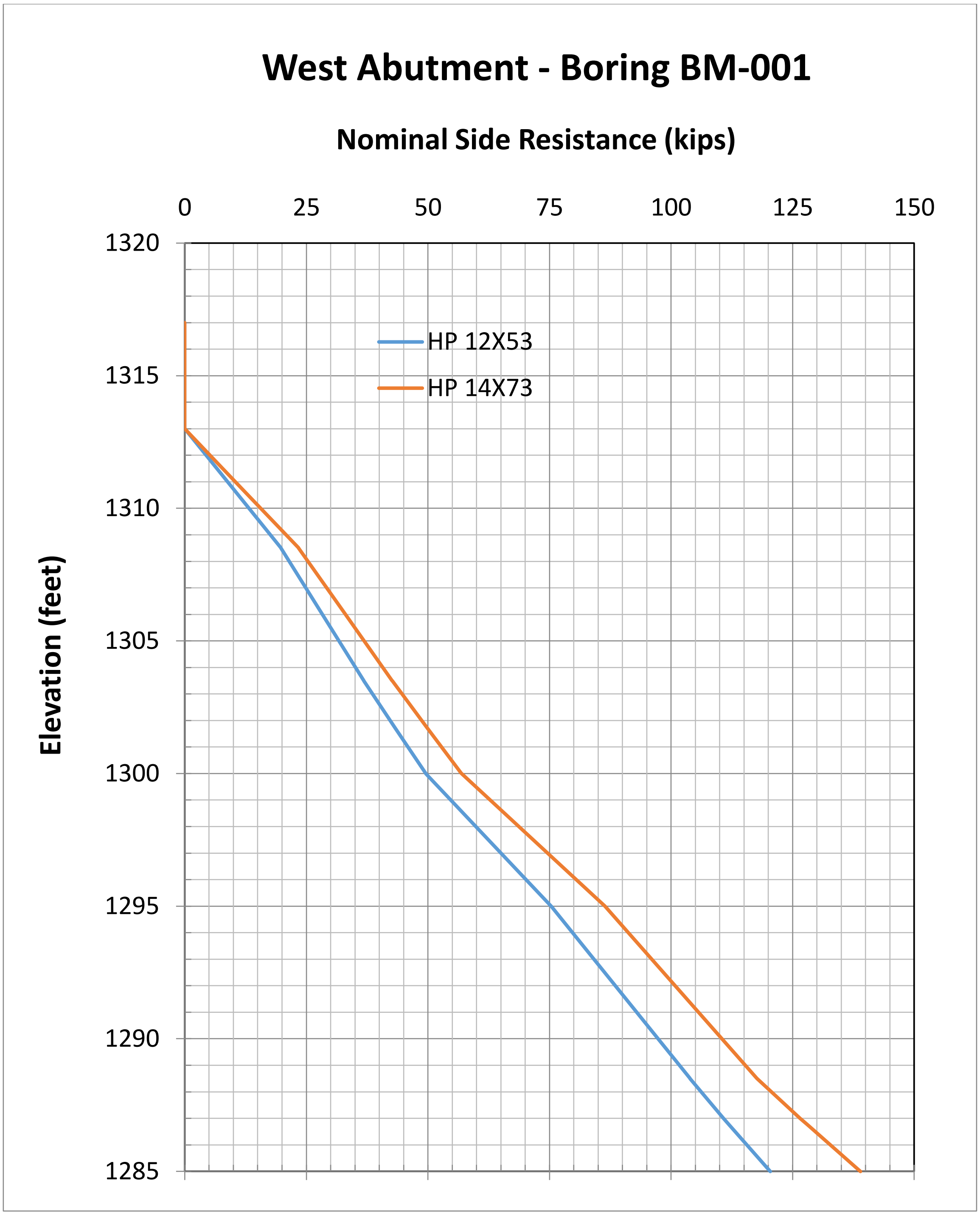




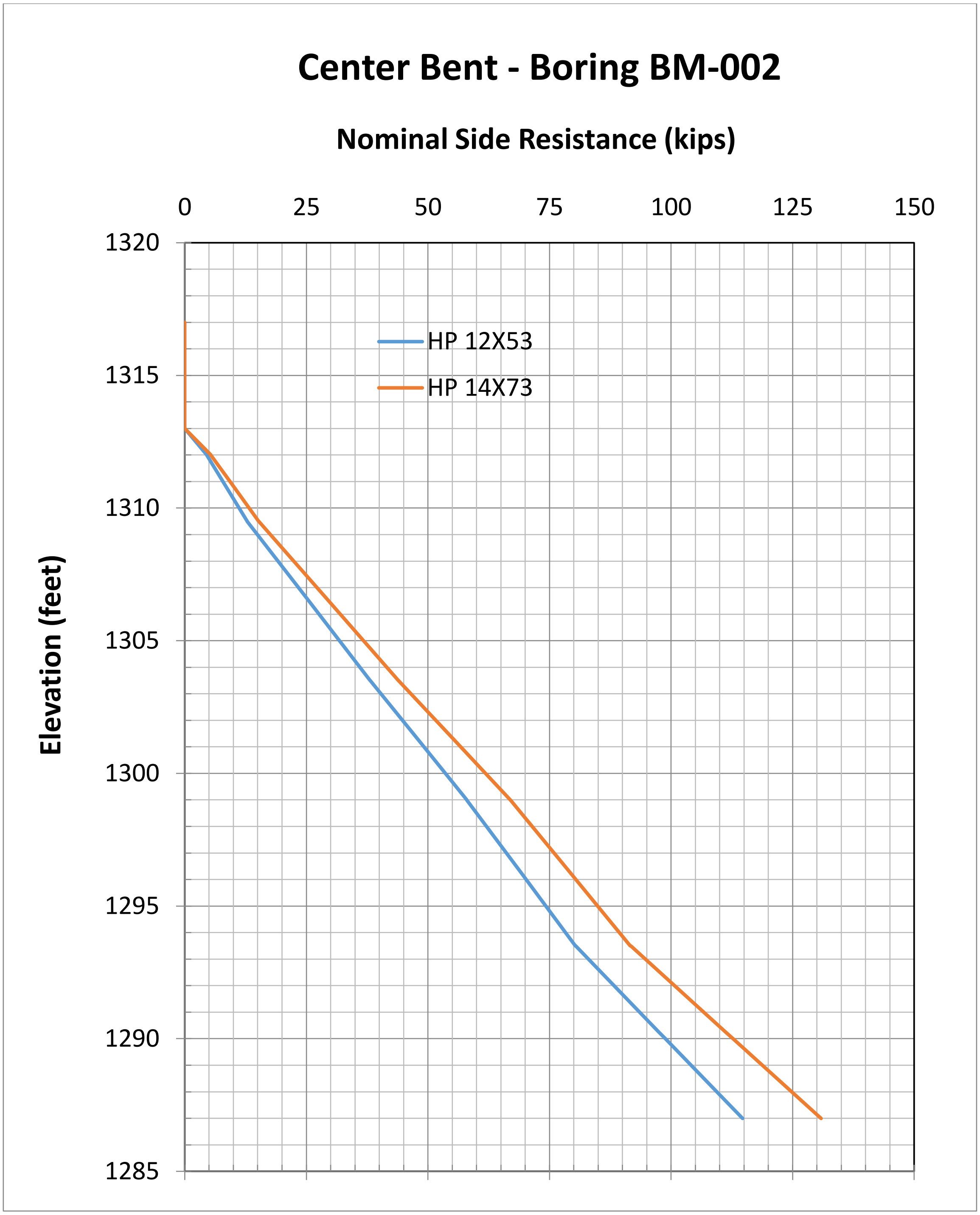


APPENDIX E

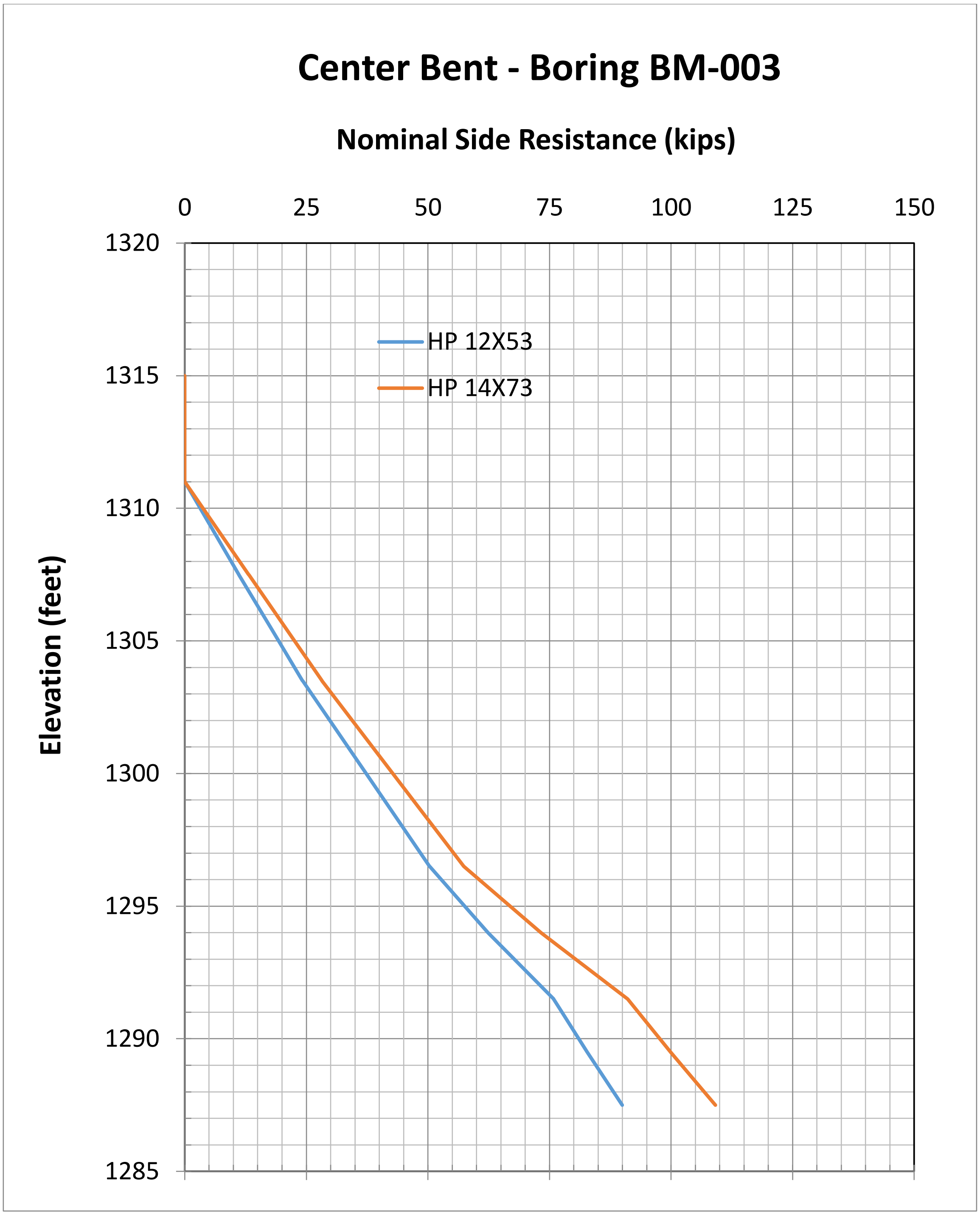
FRICTIONAL CAPACITY OF DRIVEN PILES



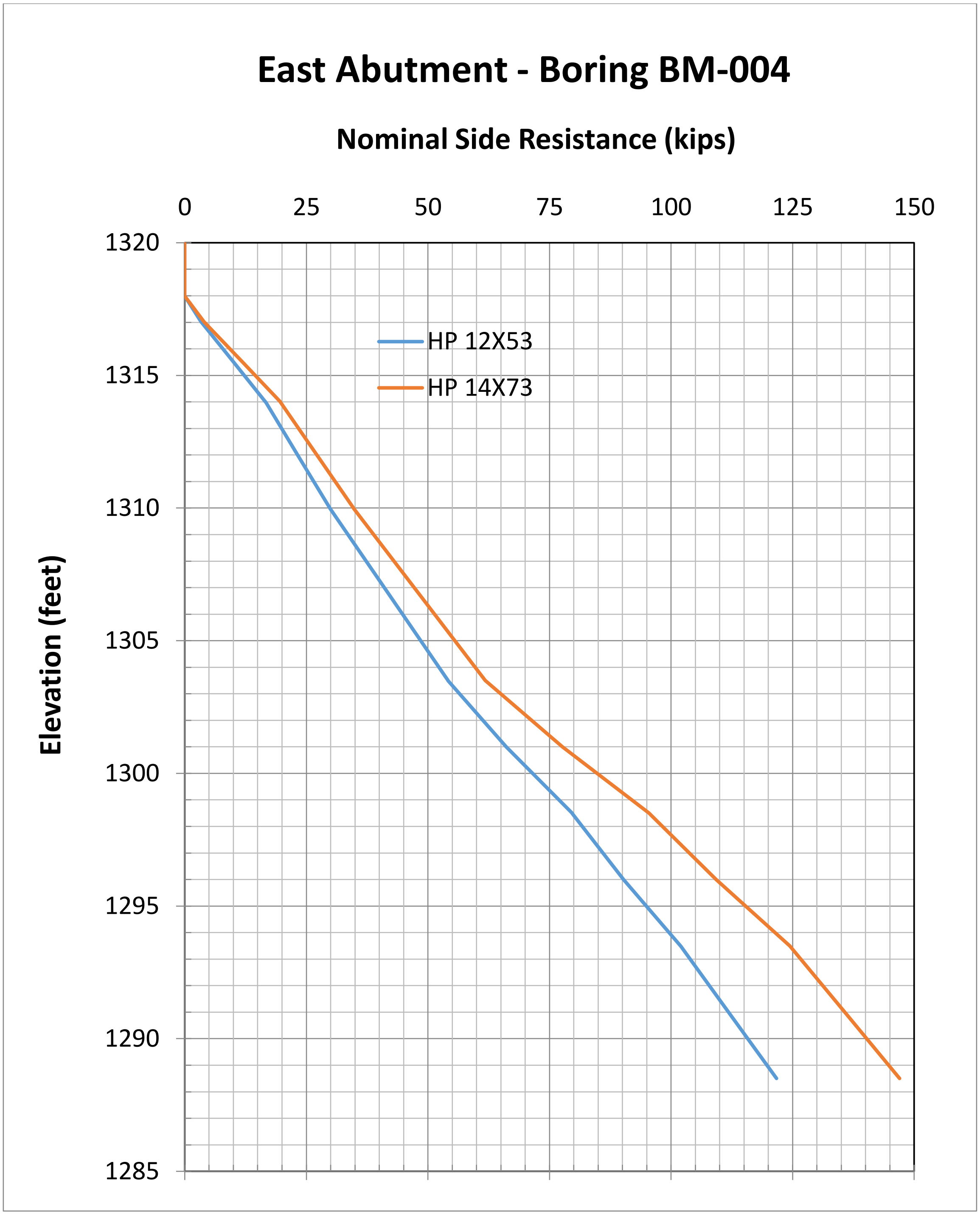
West Abutment - Boring BM-001
Nominal Side Resistance (kips)
0
25
50
75
100
125
150
1320
1315
1310
1305
1300
1295
1290
1285
Elevation (feet)
HP 12X53
HP 14X73



Center Bent - Boring BM-002
Nominal Side Resistance (kips)
0
25
50
75
100
125
150
1320
1315
1310
1305
1300
1295
1290
1285
Elevation (feet)
HP 12X53
HP 14X73



Center Bent - Boring BM-003
Nominal Side Resistance (kips)
0
25
50
75
100
125
150
1320
1315
1310
1305
1300
1295
1290
1285
Elevation (feet)
HP 12X53
HP 14X73



East Abutment - Boring BM-004
Nominal Side Resistance (kips)
0
25
50
75
100
125
150
1320
1315
1310
1305
1300
1295
1290
1285
Elevation (feet)
HP 12X53
HP 14X73

APPENDIX E

LATERAL CAPACITY – LPILE PARAMETERS

LPILE PARAMETERS FOR BORING BM-001

Recommended Design Parameters for Lateral Load Resistance								
Abutment / Pier	Elevation, feet [1]	p-y Curve Model	Effective Unit Weight (pcf) [1]	Internal Friction Angle (degree)	Cohesion (psf) [2]	E_{50}	Static k Value for Subgrade Modulus (pci)	Uniaxial Compressive Strength (psi)
West Abutment (BM-001)	1317 - 1309	Stiff Clay w/o Free Water	115	-	1,500	0.007	-	-
	1309 - 1304	Stiff Clay w/o Free Water	115	-	3,500	0.005	-	-
	1304 - 1295	Stiff Clay w/o Free Water	115	-	2,200	0.006	-	-
	1295 - 1289	Stiff Clay w/o Free Water	55	-	2,600	0.006	-	-
	1289 - 1285	Sand	55	30	-	-	20	-
	1285 - 1265	Strong Rock	140	-	-	-	-	2,500

1. Assumes groundwater level at EL. 1,295
2. Lateral resistance should be neglected within the frost zone

LPILE PARAMETERS FOR BORING BM-002

Recommended Design Parameters for Lateral Load Resistance								
Abutment / Pier	Elevation, feet [1]	p-y Curve Model	Effective Unit Weight (pcf) [1]	Internal Friction Angle (degree)	Cohesion (psf) [2]	E_{50}	Static k Value for Subgrade Modulus (pci)	Uniaxial Compressive Strength (psi)
Center Bent (BM-002)	1317 - 1312	Stiff Clay w/o Free Water	115	-	1,500	0.007	-	-
	1312 - 1303	Stiff Clay w/o Free Water	115	-	2,000	0.006	-	-
	1303 - 1298	Stiff Clay w/o Free Water	115	-	1,200	0.007	-	-
	1298 - 1293	Stiff Clay w/o Free Water	55	-	3,500	0.005	-	-
	1293 - 1287	Stiff Clay w/o Free Water	55	-	1,500	0.007	-	-
	1287 - 1267	Strong Rock	140	-	-	-	-	2,500

1. Assumes groundwater level at EL. 1,298
2. Lateral resistance should be neglected within the frost zone

LPILE PARAMETERS FOR BORING BM-003

Recommended Design Parameters for Lateral Load Resistance								
Abutment / Pier	**Elevation, feet [1]**	**p-y Curve Model**	**Effective Unit Weight (pcf) [1]**	**Internal Friction Angle (degree)**	**Cohesion (psf) [2]**	**E_{50}**	**Static k Value for Subgrade Modulus (pci)**	**Uniaxial Compressive Strength (psi)**
Center Bent (BM-003)	1315 - 1305	Stiff Clay w/o Free Water	115	-	2,500	0.006	-	-
	1305 - 1296	Stiff Clay w/o Free Water	115	-	3,000	0.005	-	-
	1296 - 1293	Sand	55	36	-	-	125	-
	1293 - 1287	Sand	55	30	-	-	60	-
	1287 - 1267	Strong Rock	140	-	-	-	-	2,500

1. Assumes groundwater level at EL. 1,296
2. Lateral resistance should be neglected within the frost zone

LPILE PARAMETERS FOR BORING BM-004

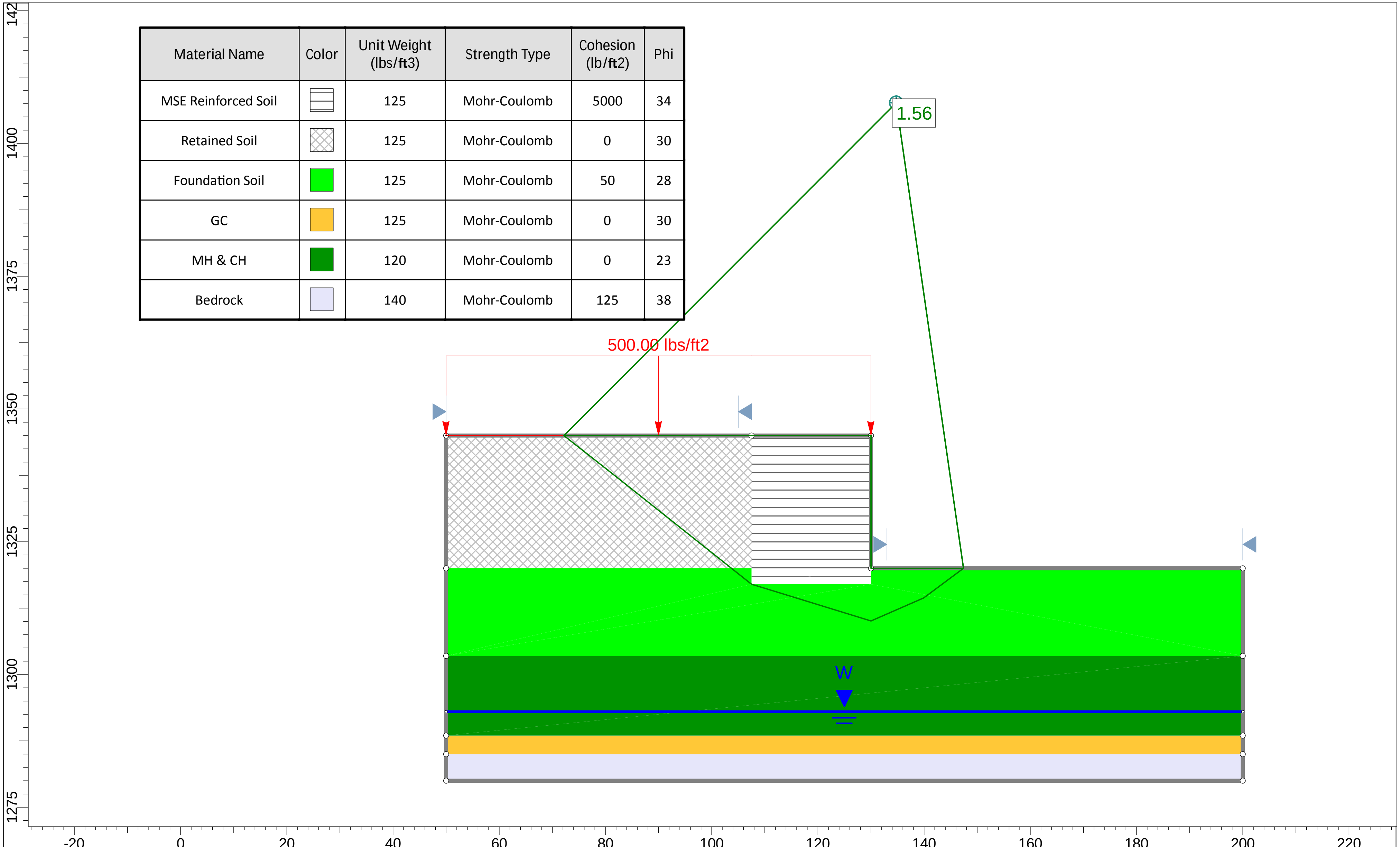
Recommended Design Parameters for Lateral Load Resistance								
Abutment / Pier	**Elevation, feet [1]**	**p-y Curve Model**	**Effective Unit Weight (pcf) [1]**	**Internal Friction Angle (degree)**	**Cohesion (psf) [2]**	**E_{50}**	**Static k Value for Subgrade Modulus (pci)**	**Uniaxial Compressive Strength (psi)**
East Abutment (BM-004)	1322 - 1314	Stiff Clay w/o Free Water	115	-	1,250	0.007	-	-
	1314 - 1304	Stiff Clay w/o Free Water	115	-	4,000	0.004	-	-
	1304 - 1299	Sand	115	36	-	-	225	-
	1299 - 1294	Sand	115	32	-	-	90	-
	1294 - 1288	Stiff Clay w/o Free Water	55	-	1,000	0.007	-	-
	1288 - 1268	Strong Rock	140	-	-	-	-	2,500

1. Assumes groundwater level at EL. 1,294
2. Lateral resistance should be neglected within the frost zone

APPENDIX F

GLOBAL STABILITY RESULTS

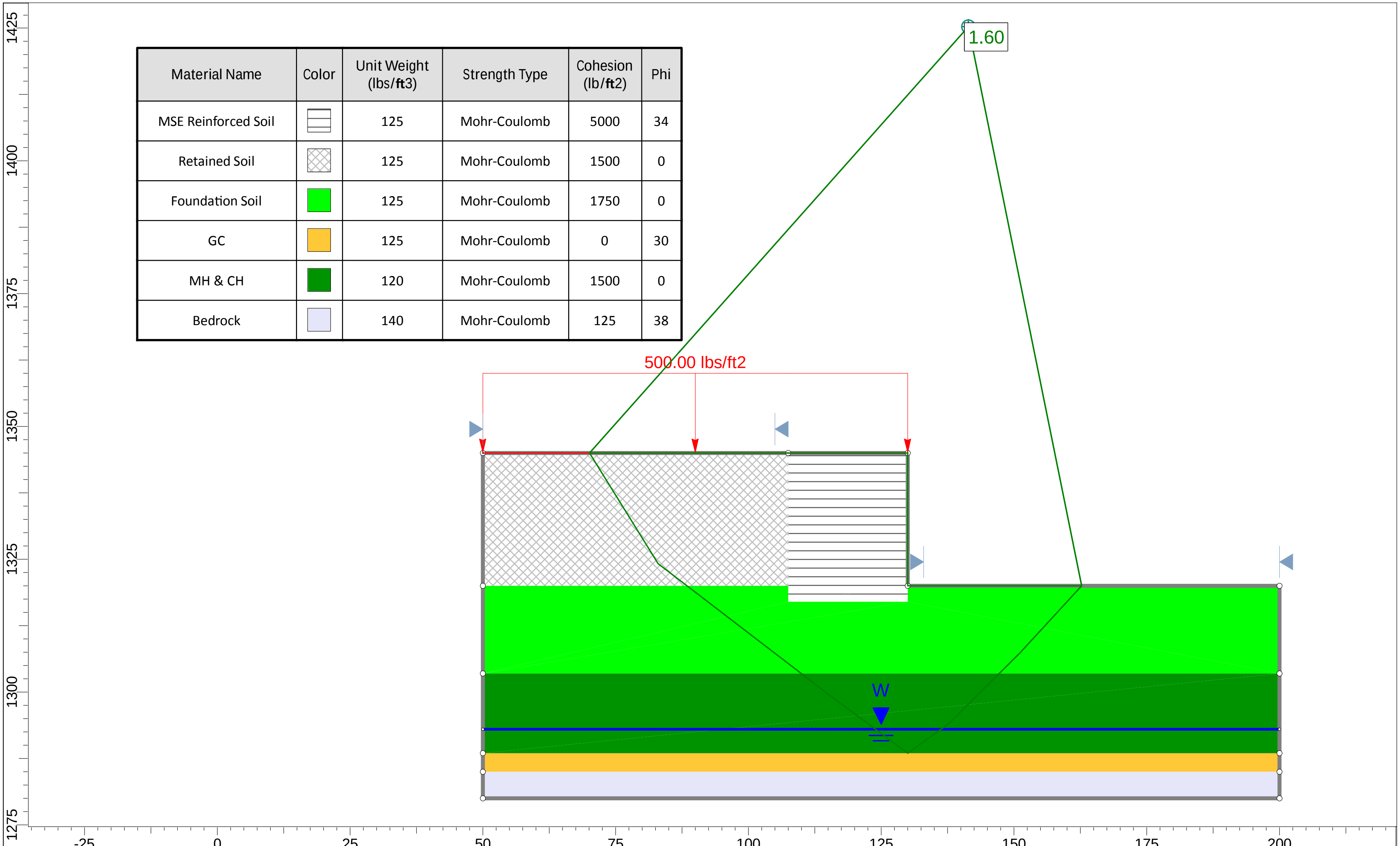
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Soil		125	Mohr-Coulomb	0	30
Foundation Soil		125	Mohr-Coulomb	50	28
GC		125	Mohr-Coulomb	0	30
MH & CH		120	Mohr-Coulomb	0	23
Bedrock		140	Mohr-Coulomb	125	38



SLIDEINTERPRET 6.008

Project	04135111 - 8th Street Widening Project - Bridge Abutment - Near BM001 - Long Term Stability
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:300
Company	Terracon Consultants, Inc.
Date	OCT 2015
File Name	BM001 - L=0.80H - Bridge Abutment - Long Term.slim

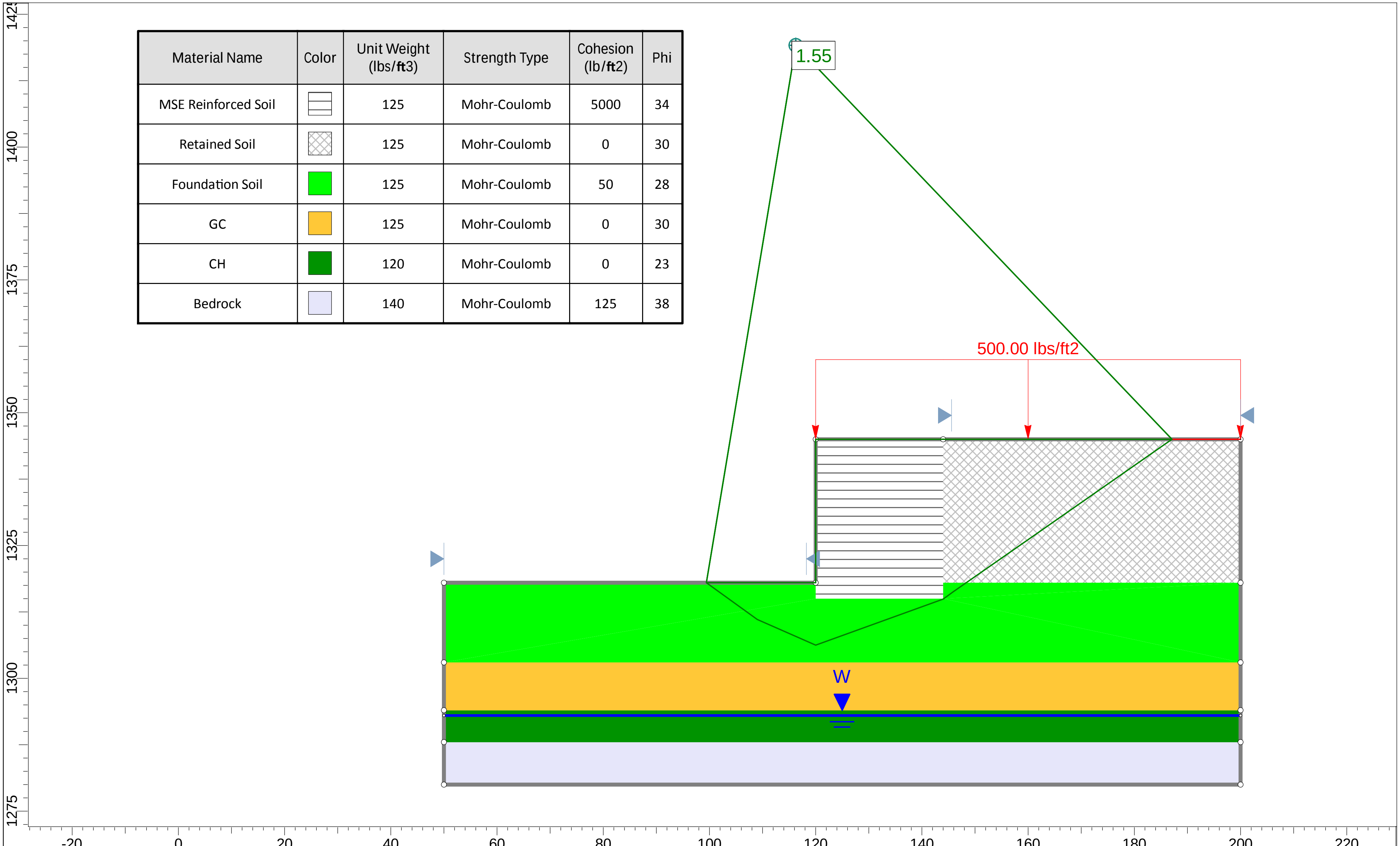
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Soil		125	Mohr-Coulomb	1500	0
Foundation Soil		125	Mohr-Coulomb	1750	0
GC		125	Mohr-Coulomb	0	30
MH & CH		120	Mohr-Coulomb	1500	0
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - Bridge Abutment - Near BM001 - Short Term Stability
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:300
Company	Terracon Consultants, Inc.
Date	OCT 2015
File Name	BM001 - L=0.80H - Bridge Abutment - Short Term.slim

SLIDEINTERPRET 6.008

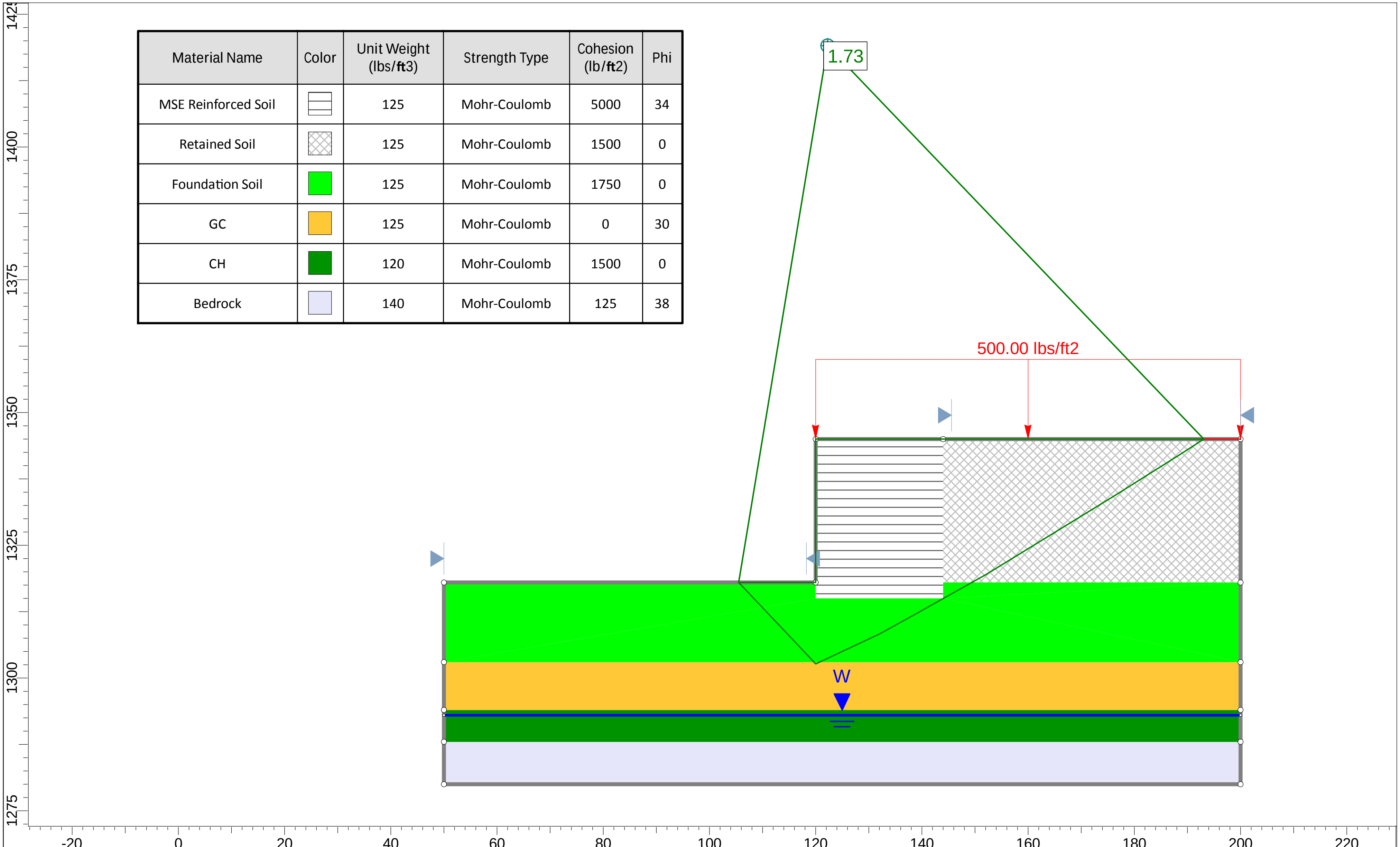
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Soil		125	Mohr-Coulomb	0	30
Foundation Soil		125	Mohr-Coulomb	50	28
GC		125	Mohr-Coulomb	0	30
CH		120	Mohr-Coulomb	0	23
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - Bridge Abutment - Near BM004 - Long Term Stability		
Analysis Description	GLE/Morgenstern-Price		
Drawn By JEG	Scale 1:300	Company	Terracon Consultants, Inc.
Date DEC 2015		File Name	BM004 - L=0.80H - Bridge Abutment - Long Term.slim

SLIDEINTERPRET 6.008

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Soil		125	Mohr-Coulomb	1500	0
Foundation Soil		125	Mohr-Coulomb	1750	0
GC		125	Mohr-Coulomb	0	30
CH		120	Mohr-Coulomb	1500	0
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - Bridge Abutment - Near BM004 - Short Term Stability
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:300
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	BM004 - L=0.80H - Bridge Abutment - Short Term.slim

SLIDEINTERPRET 6.008

APPENDIX G

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

Auger	Split Spoon
Shelby Tube	Macro Core
Ring Sampler	Rock Core
Grab Sample	No Recovery

WATER LEVEL

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon

UNIFIED SOIL CLASSIFICATION SYSTEM

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

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10} \quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

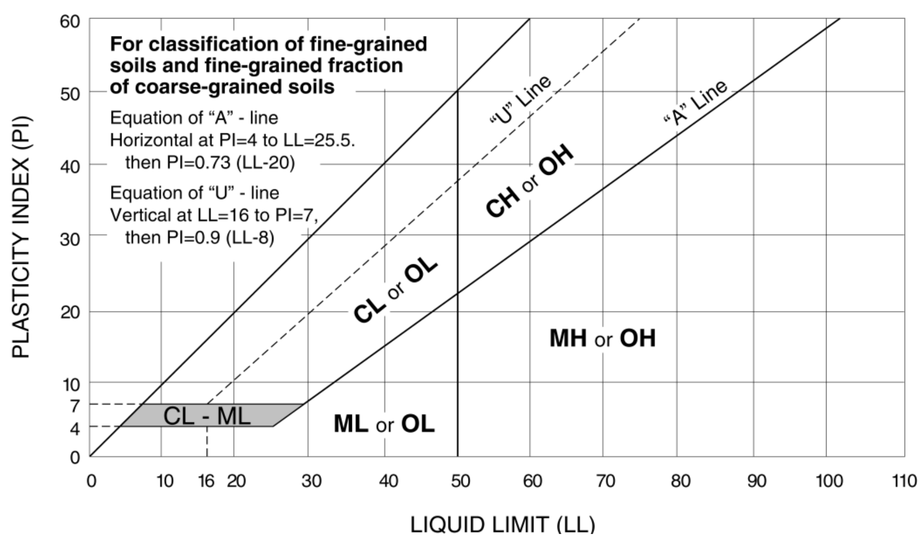


Exhibit G-2

GENERAL NOTES

Sedimentary Rock Classification

DESCRIPTIVE ROCK CLASSIFICATION:

Sedimentary rocks are composed of cemented clay, silt and sand sized particles. The most common minerals are clay, quartz and calcite. Rock composed primarily of calcite is called limestone; rock of sand size grains is called sandstone, and rock of clay and silt size grains is called mudstone or claystone, siltstone, or shale. Modifiers such as shaly, sandy, dolomitic, calcareous, carbonaceous, etc. are used to describe various constituents. Examples: sandy shale; calcareous sandstone.

LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of $CaCo_3$, reacts readily with HCl.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of $CaMg(CO_3)_2$, harder than limestone, reacts with HCl when powdered.
CHERT	Light to dark colored, very fine-grained texture, composed of micro-crystalline quartz ($Si0_2$), brittle, breaks into angular fragments, will scratch glass.
SHALE	Very fine-grained texture, composed of consolidated silt or clay, bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone or mudstone.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand size grains of quartz, feldspar, etc. Cement usually is silica but may be such minerals as calcite, iron-oxide, or some other carbonate.
CONGLOMERATE	Rounded rock fragments of variable mineralogy varying in size from near sand to boulder size but usually pebble to cobble size (½ inch to 6 inches). Cemented together with various cementing agents. Breccia is similar but composed of angular, fractured rock particles cemented together.

PHYSICAL PROPERTIES:

DEGREE OF WEATHERING

Slight	Slight decomposition of parent material on joints. May be color change.
Moderate	Some decomposition and color change throughout.
High	Rock highly decomposed, may be extremely broken.

HARDNESS AND DEGREE OF CEMENTATION

Limestone and Dolomite:

Hard	Difficult to scratch with knife.
Moderately Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Soft	Can be scratched with fingernail.

Shale, Siltstone and Claystone

Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be easily dented but not molded with fingers.

Sandstone and Conglomerate

Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers.

BEDDING AND JOINT CHARACTERISTICS

Bed Thickness	Joint Spacing	Dimensions
Very Thick	Very Wide	>10′
Thick	Wide	3′ - 10′
Medium	Moderately Close	1′ - 3′
Thin	Close	2″ - 1′
Very Thin	Very Close	.4″ - 2″
Laminated	—	.1″ - .4″

Bedding Plane	A plane dividing sedimentary rocks of the same or different lithology.
Joint	Fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.
Seam	Generally applies to bedding plane with an unspecified degree of weathering.

SOLUTION AND VOID CONDITIONS

Solid	Contains no voids.
Vuggy (Pitted)	Rock having small solution pits or cavities up to ½ inch diameter, frequently with a mineral lining.
Porous	Containing numerous voids, pores, or other openings, which may or may not interconnect.
Cavernous	Containing cavities or caverns, sometimes quite large.

Terracon

Geotechnical Engineering Report

8th Street Widening Project

Proposed Mechanically Stabilized Earth (MSE) Walls

Bentonville, Arkansas

February 3, 2016

Terracon Project No. 04135111

Prepared for:

Burns & McDonnell Engineering Company, Inc.

Kansas City, Missouri

Prepared by:

Terracon Consultants, Inc.

Tulsa, Oklahoma

Terracon

February 3, 2016

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, MO 64114

Attn: Mr. David Hurt, P.E.
P: (816) 822 3426
E: dhurt@burnsmcd.com

Re: Geotechnical Engineering Report
8th Street Widening Project
Proposed Mechanically Stabilized Earth (MSE) Walls
Bentonville, Arkansas
Terracon Project No. 04135111

Dear Mr. Hurt:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This geotechnical study was performed in general accordance with our Proposal No. P04090495 dated February 26, 2010 and the Amendment to Consultant Agreement dated May 21, 2010 between Burns & McDonnell Engineering Company, Inc. and Terracon Consultants, Inc. for Project No. 090218.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of MSE Walls for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.
Cert. Of Auth. #CA-223 exp. 12/31/17

Jaime E. Granados
Geotechnical Engineer

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No. 7052
MICHAEL H. HOMAN

Michael H. Homan, P.E.
Arkansas No. 7052
2/3/2016

JEG:MHH:lo
Enclosures
Copies to: Addressee (3 via US mail and 1 via email)

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GEOTECHNICAL ENGINEERING REPORT
8TH STREET WIDENING PROJECT
PROPOSED MECHANICALLY STABILIZED EARTH (MSE) WALLS
BENTONVILLE, ARKANSAS

Terracon Project No. 04135111
February 3, 2016

1.0 INTRODUCTION

This geotechnical engineering report has been completed as a part of the 8th Street widening project in Bentonville, Arkansas. We presented a preliminary geotechnical engineering report to Burns & McDonnell on June 19, 2014 with preliminary information and results for 9 MSE walls. Based on the updated 60% design plans provided to us, revised plans dated July 13, 2015, we understand that two walls within the southern area have been eliminated. Thus, a total of seven Mechanically Stabilized Earth (MSE) walls, designated Wall 1 through Wall 7, will be constructed for the project. The walls will be constructed along the northbound and southbound of Interstate 49 near 8th Street.

A total of 90 borings were proposed for the project; however, we only performed 86 borings to depths of about 20 to 63.5 feet below the existing ground surface. A description of the proposed MSE Walls and the borings performed for each wall is provided in the table below. Logs of the borings along with a site location map and boring location plans are included in Appendix A of this report.

MSE Wall	Borings
Wall 1 – Sta. 1036+16.5 to 1053+70.58 – South Bound [1]	BW-101 through BW-108 BW-301 through BW-309 BW-501 through BW-505
Wall 2 – Sta. 1040+62.55 to 1052+39.00 – North Bound [1]	BW-201 through BW-206 BW-401 through BW-409
Wall 3A – Sta. 1044+25 to 1053+00 – 8th Street	BW-510 through BW-515
Wall 3B – Sta. 1047+32.04 to 1058+17.43 – South Bound [2]	BW-501 through BW-509
Wall 4 – Sta. 1055+50 to 1060+13.48 – North Bound	BW-601 through BW-607
Wall 5A – Sta. 1054+00 to Sta. 1060+05.82 – South Bound	BW-701 through BW-706
Wall 5B – Sta. 1059+41.15 Sta. 1069+03.67 – South Bound	BW-706 through BW-715
Wall 6A – Sta. 1057+40 to Sta. 1061+86.41 – North Bound	BW-801 through BW-805
Wall 6B – Sta. 1061+49.77 to 1069+28.45 – North Bound	BW-806 through BW-814
Wall 7 – Sta. 1067+00 to Sta. 1072+36.89 – South Bound	BW-715 through BW-718 BW-901 through BW-904

1. Borings BW-107, BW-108, and BW-206 were not drilled due to drill rig access constrains and their proximity to the railroad right of way.

Continued from page 1

2. Boring BW-306 was not drilled due to presence of underground utilities and drill rig access constrains.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil and rock conditions
- groundwater conditions
- external and global stability analyses of select MSE wall cross sections
- general earthwork
- estimated foundation settlement
- general design and construction recommendations for MSE walls

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site layout	See Appendix A, Figure A-2, Boring Location Plans.
Proposed structures	The 8th Street Widening project will consist of constructing an interchange at Interstate 49 over 8th Street in Bentonville, AR. Based on the 60% design plans provided to us, we understand that the project will require the construction of seven (7) Mechanically Stabilized Earth (MSE) retaining walls. The proposed MSE walls will be constructed on both the west and east sides of the existing Interstate 49. The approximate total project length is 8,000 feet. We understand that the walls must be designed using the AASHTO Load and Resistance Factor Design (LFRD) method.
Proposed grading	The proposed MSE walls will have maximum exposed heights of about 30 feet. Some of the walls will be constructed over existing slopes configured at about 3H:1V slopes. Some of the walls will be constructed on flat areas.

2.2 Site Location

Item	Description
Location	The project is located along Interstate 49 near 8th Street in Bentonville, Arkansas. The proposed MSE walls will start near the intersection of I-49 and SE 14th Street (Route 62) and will extend north approximately 5,350 feet.
Existing improvements	Interstate 49

Item	Description
Current ground cover	Grass, asphalt pavements, and areas of thick vegetation. Bulldozed pads were required to gain access to some of our borings.
Existing topography	The project alignment generally slopes downward from south to north.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Subsurface Profile

Based on information obtained from the Arkansas Geological Survey website (www.geology.ar.gov), the geology of the project site is underlain by the Boone Formation, which consists of gray, fine- to coarse-grained fossiliferous limestone interbedded with chert. Some sections may be predominantly limestone or chert. The cherts are dark in color in the lower part of the sequence and light in the upper part. The quantity of chert varies considerably both vertically and horizontally. The Boone Formation is well known for dissolutional features, such as sinkholes, caves, and enlarged fissures. The thickness of the Boone Formation is 300 to 350 feet in most of northern Arkansas.

As reported on our boring logs and summarized in section **3.2 Typical Subsurface Profile**, voids were observed at some boring locations within the upper elevation of the bedrock. Based on the results of our analyses, the location and depths of the voids observed during our field exploration will not have an apparent impact on our external stability analyses for the proposed MSE walls. However, it should be realized that voids might exist at locations away from our borings and that our scope of work is limited to the information collected from our borings.

According to the US Geological Survey (USGS), the Peak Ground Acceleration (PGA) for the City of Bentonville, Arkansas corresponds to 0.049g. Thus, seismic analyses for the MSE wall structures are not required for external stability.

3.2 Typical Subsurface Profile

Based on the results of the borings, subsurface conditions along the project alignment can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
1 [1]	2 to 33.5 feet	Fill: Chert gravel and sand with various amounts of fines and medium to highly plastic clay with various amounts of chert gravel and sand	N/A

Stratum	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
2	2 to 20 feet	Low to medium plastic clays with various amounts of silt, sand, and chert gravel	Soft to very stiff
3 [2]	Underlying Stratum 2 to top of bedrock	Chert gravel and sand with various amounts of silt and clay, interbedded with layers of medium to highly plastic clay and silt	Granular soils: Loose to very dense Fine soils: Very soft to very stiff
4 [3]	Underlying Stratum 2 to boring termination depths [4]	Cherty limestone and limestone [5]	Predominantly hard

1. Fill materials exist at the bridge approaches and may exist in the vicinity of the construction areas at locations away from our borings. Actual fill depths are sometimes difficult to identify due to similarities of the fill with the native soils and preliminary earthwork activities. Existing fill materials were encountered in 20 borings: BW-101/102/103/106, BW-201/203/204, BW-301/308/309, BW-501/502/515, and BW-702/703/704/705/709/714/715.
2. Granular soils with different gradations in a clay matrix of relatively medium to high plasticity. Chert seams of various thicknesses were encountered at different depths in our borings.
3. Thirty six (36) borings were extended into the hard cherty limestone or limestone bedrock using rock coring techniques: BW105/106, BW301 through BW305, BW-401/402/405, BW-503 through BW-510, BW-604, BW-701/702/705 through BW-708/712/718, BW-804 through BW-808/BW811/812/814, and BW-901 through BW-903.
4. Elevation of top of rock varies between approximately 1281.5 and 1301.5 feet along the project alignment. Bottom of stratum was not determined.
5. Voids were observed near the top of the bedrock or within the upper 10 feet of the bedrock at borings BW-505/509, BW-702, and BW-903. Voids might be associated with clay layers within the rock that were washed out during rock coring operations.

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil and rock types; in-situ, the transition between materials may be gradual.

3.3 Groundwater

The majority of the boreholes were observed while drilling and immediately after boring completion for the presence and level of groundwater. Select borings were also observed 24 hours after boring. In general, the borings were extended into the overburden soils using a combination of dry and wash boring techniques. Rock core techniques, which use water, were used to extend the borings into the bedrock materials. Thus, water introduced into these boreholes can mask the presence and level of groundwater. Groundwater observations made during our field exploration are summarized in the following table.

		Approximate Groundwater Level / Elevation		
Boring No.	**Elevation**	**While Drilling (feet)**	**After Boring (feet)**	**24 Hours after Boring (feet)**
BW-101	1333.3	not encountered	not determined	not determined
BW-102	1311.8	18 / 1293.8	not determined	not determined
BW-103	1338.6	not encountered	not encountered	not determined
BW-104	1312.1	none to 6.5	not determined	not determined
BW-105	1312.7	19 / 1293.7	not determined	not determined
BW-106	1341.7	48 / 1293.7	not determined	not determined
BW-107	not drilled			
BW-108	not drilled			
BW-201	1337.1	not encountered	not encountered	not determined
BW-202	1306.7	13.5 / 1293.2	20 / 1286.7	not determined
BW-203	1340.5	38.5 / 1302.0	not determined	not determined
BW-204	1339.9	none to 6.5	not determined	not determined
BW-205	1308.6	18 / 1290.6	18 / 1290.6	not determined
BW-206	not drilled			
BW-301	1342.2	50 / 1292.2	not determined	not determined
BW-302	1314.7	20 / 1294.7	13 / 1301.7	not determined
BW-303	1316.0	19.5 / 1296.5	not determined	19.5 / 1296.5
BW-304	1315.4	none to 8.5	not determined	not determined
BW-305	1315.0	19 / 1296.0	not determined	10 / 1305.0
BW-306	not drilled			
BW-307	1315.0	22 / 1293.0	not determined	16 / 1299.0
BW-308	1322.0	10 / 1312.0	12 / 1310.0	not determined
BW-309	1323.0	2 / 1321.0	2 / 1321.0	not determined
BW-401	1311.8	13 / 1298.8	not determined	not determined
BW-402	1312.5	19 / 1293.5	not determined	not determined
BW-403	1313.2	19 / 1294.2	13 / 1300.2	not determined
BW-404	1314.5	20 / 1294.5	15 / 1299.5	not determined
BW-405	1314.3	18 / 1296.3	10 / 1304.3	not determined
BW-406	1315.2	22 / 1293.2	23 / 1292.2	not determined
BW-407	1315.8	not encountered	not determined	not determined
BW-408	1317.8	not encountered	not determined	not determined
BW-409	1317.8	not encountered	not encountered	not determined
BW-501	1338.3	not encountered	not encountered	not determined
BW-502	1337.3	40 / 1297.3	42 / 1295.3	not determined
BW-503	1315.0	22 / 1293.0	not determined	22 / 1293.0
BW-504	1315.0	23.5 / 1291.5	not determined	16 / 1299.0
BW-505	1315.7	not determined	not determined	not determined
BW-506	1316.6	23 / 1293.6	not determined	not determined
BW-507	1316.0	23 / 1293.0	not determined	not determined
BW-508	1317.6	28 / 1289.6	not determined	not determined
BW-509	1318.0	28 / 1290.0	not determined	not determined
BW-510	1319.7	33 / 1286.7	not determined	not determined

		Approximate Groundwater Level / Elevation		
Boring No.	**Elevation**	**While Drilling (feet)**	**After Boring (feet)**	**24 Hours after Boring (feet)**
BW-511	1322.2	none to 10	not determined	not determined
BW-512	1323.1	23 / 1300.1	28 / 1295.1	not determined
BW-513	1319.0	not encountered	not determined	not determined
BW-514	1322.7	not encountered	not encountered	not encountered
BW-515	1319.1	25 / 1294.1	24.5 / 1294.6	24 / 1295.1
BW-601	1318.7	24.5 / 1294.2	not determined	not determined
BW-602	1319.8	23.5 / 1296.5	25 / 1295	not determined
BW-603	1321.0	28.5 / 1292.5	27.5 / 1293.5	not determined
BW-604	1320.8	28.5 / 1292.5	18 / 1303	not determined
BW-605	1322	28.5 / 1293.5	26 / 1296	not determined
BW-606	1322.6	not encountered	not encountered	not determined
BW-607	1324.0	29.5 / 1294.5	not determined	not determined
BW-701	1315.9	22 / 1293.9	not determined	23 / 1292.9
BW-702	1328.1	none to 8.5	not encountered	not determined
BW-703	1327.1	38.5 / 1288.6	36.5 / 1290.6	36 / 1291.1
BW-704	1320.1	none to 8.5	32 / 1288.1	not determined
BW-705	1320.4	25 / 1295.4	27 / 1293.4	26 / 1294.4
BW-706	1316.6	25 / 1291.6	23 / 1293.6	not determined
BW-707	1320.4	30 / 1290.4	19 / 1301.4	16 / 1304.4
BW-708	1320.8	28.5 / 1292.3	16 / 1304.8	13 / 1307.8
BW-709	1320.9	28.5 / 1292.4	29.5 / 1291.4	not encountered
BW-710	1319.8	not encountered	not encountered	not encountered
BW-711	1320.9	not encountered	not encountered	not encountered
BW-712	1306.0	10 / 1296.0	13 / 1293.0	not determined
BW-713	1322.2	33.5 / 1288.7	16 / 1306.2	not encountered
BW-714	1303.7	15 / 1288.7	not encountered	not determined
BW-715	1303.0	16.5 / 1286.5	16.5 / 1286.5	not determined
BW-716	1323.5	not encountered	not encountered	not encountered
BW-717	1324.4	38.5 / 1285.9	not encountered	not encountered
BW-718	1302.0	16.5 / 1285.5	16.5 / 1285.5	not determined
BW-801	1318.8	24.5 / 1294.3	not encountered	not determined
BW-802	1317.0	24.5 / 1292.5	not encountered	not determined
BW-803	1322.1	33.5 / 1288.6	28 / 1294.1	27 / 1295.1
BW-804	1313.5	25 / 1288.5	25 / 1288.5	23 / 1290.5
BW-805	1320.3	28.5 / 1291.8	26 / 1294.3	16 / 1304.3
BW-806	1318.8	28.5 / 1290.3	25 / 1293.8	21 / 1297.8
BW-807	1317.6	22.5 / 1295.1	26 / 1291.6	22 / 1295.6
BW-808	1317.3	28.5 / 1288.8	27 / 1290.3	25 / 1292.3
BW-809	1317.1	28.5 / 1288.6	27 / 1290.1	not encountered
BW-810	1317.6	23 / 1294.6	not encountered	not determined
BW-811	1303.4	15 / 1288.4	9 / 1294.4	9 / 1294.4
BW-812	1302.0	15 / 1287.0	14 / 1288.0	14 / 1288.0

		Approximate Groundwater Level / Elevation		
Boring No.	**Elevation**	**While Drilling (feet)**	**After Boring (feet)**	**24 Hours after Boring (feet)**
BW-813	1319.3	29.5 / 1289.8	not encountered	not encountered
BW-814	1300.7	15 / 1285.7	not encountered	not encountered
BW-901	1325.2	none to 26.4	not encountered	not encountered
BW-902	1301.0	15 / 1286.0	17.5 / 1283.5	not determined
BW-903	1300.5	10 / 1290.5	not encountered	not encountered
BW-904	1324.1	not encountered	not encountered	not encountered

Groundwater Level Monitoring Wells

To obtain longer-term groundwater levels, temporary piezometers (groundwater level monitoring wells) were installed at select boring locations. Upon installation of the temporary piezometers, water was bailed from the piezometers the same day. Groundwater levels were then measured between October 10, 2013 and April 16, 2014. Results of groundwater levels observed in piezometers/monitoring wells can be representative of water levels observed during drilling operations. Therefore, the groundwater elevations given in the following table were used for external stability analyses of MSE Walls.

		Approximate Groundwater Level / Elevation (feet)			
Boring No.	**Boring Elevation**	**October 10, 2013**	**December 14, 2013**	**January 29, 2014**	**April 16, 2014**
BW-105	1312.7	5.0 / 1307.7	4.5 / 1308.2	4.6 / 1308.1	4.5 / 1308.2
BW-205	1308.6	2.8 / 1305.8	Not determined	1.8 / 1306.8	13 / 1295.6
BW-302	1314.7	8.5 / 1306.2	8.5 / 1306.2	8.6 / 1306.1	8 / 1306.7
BW-407	1315.8	11.5 / 1304.3	Not determined	11.4 / 1304.4	11 / 1304.8
BW-512	1323.1	27.2 / 1295.9	27.5 / 1295.6	27.1 / 1296.0	27.8 / 1295.3
BW-706	1316.6	23.8 / 1292.8	29.5 / 1287.1	23.0 / 1293.6	24.5 / 1292.1
BW-712	1306	17.8 / 1288.2	19.5 / 1286.5	17.4 / 1288.6	18.5 / 1287.5
BW-811	1303.4	14.5 / 1288.9	Not determined	13.1 / 1290.3	14.6 / 1288.8
BW-902	1301	18.0 / 1283.0	16.5 / 1284.5	17.2 / 1283.8	18 / 1283.0
BT-102	1323.4	28.0 / 1295.4	Not determined	26.9 / 1296.5	28.3 / 1295.1
BT-004	1320.1	Not determined	24.5 / 1295.6	27.8 / 1292.3	Not determined [1]

1. The pipe was broken by others between our January 29 and April 16, 2014 readings.

During our field exploration and visits to the project site, we observed that surficial water tends to accumulate near the bottom of the existing bridge embankments near retaining walls No. 1 through No. 5. There is also a relatively shallow ditch running in the north-south direction near the bottom of proposed retaining walls No. 3 and No. 5.

Fluctuations in the groundwater level should be expected due to seasonal variations in the amount of rainfall, runoff and other factors not apparent at the time the borings were drilled. Evaluation of these factors and their effect on the groundwater levels is beyond the scope of this report. The possibility of groundwater level fluctuations and the presence of perched water should be considered when designing and developing the construction plans for the project.

4.0 ANALYSIS AND RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

We presented a preliminary Geotechnical Engineering Report for the MSE Walls for the 8th Street Widening project on June 19, 2014. The report included geotechnical recommendations for design and construction of 9 MSE Walls. Based on the 60% design, we understand that some of the walls were combined and that the updated design includes 7 MSE Walls. Changes to the geometry of the updated walls include reduction in some of the wall heights. Minor changes to the general location of the walls were observed. This final report includes revisions to the results of our wall external and global stability analyses to account for the changes to the preliminary wall geometry and additional information requested via email on various dates.

Based on the results of our geotechnical exploration, native soils within the upper elevations (2 to 20 feet below existing ground surface) generally consist of low to medium plasticity clays. Chert gravel materials in a relatively high plasticity clay matrix were encountered below the low to medium plasticity native clays and extended to top of bedrock. The amounts of fine and granular soils along the proposed wall alignments are variable. This is in agreement with our past experience with projects near this site. The results of our borings were used to develop generalized subsurface profiles for each wall.

Bedrock materials consisted of cherty limestone and limestone, which is in agreement with the geological description provided by the Arkansas Geological Survey website. At some boring locations, the top of the rock has a slight to high degree of weathering. Voids or apparent voids were observed at some borings near the top of the rock as indicated on the attached boring logs and section **3.2 Typical Subsurface Profile**. Based on the results of our borings and our analyses, conditions do not warrant further exploration such as seismic refraction testing to identify potential voids. However, if taller walls or different structures are planned for the site, Terracon should be consulted to reconsider this assessment.

Based on the cross sections provided to us by Burns & McDonnell Engineering Company, Inc., we understand that several portions of the proposed MSE walls will be constructed on existing embankment slopes with configurations of 3H:1V, or flatter, and native cuts with configurations of 2H:1V, or flatter. Existing slopes should be benched prior to placement and compaction of new fill materials. Based on the cross sections, we also understand that exposed wall faces can be up to approximately 30 feet in height. The tallest wall sections were observed near the proposed 8th Street bridge over Interstate 49.

Relatively low strength, high moisture content, near surface soils were encountered in some of our borings. Similar soils can exist away from our borings. The consistency of the near surface soils might vary depending on the time of construction and their actual moisture content. Surficial, low strength soils identified during earthwork and subgrade preparation should be removed full-depth and the resultant excavations should be backfilled with tested and approved fill materials, if unstable soils cannot be adequately stabilized in-place. Close observation and testing will be required during earthwork activities and construction of MSE walls to verify that suitable bearing materials are encountered and new fills properly placed.

Recommendations regarding earthwork preparation and design and construction of MSE walls are provided in the following sections.

4.2 Earthwork

4.2.1 Site Preparation

Areas to be graded should be stripped and cleared of surface vegetation, topsoil, trees, bushes, debris, and any other deleterious material. Considering the thick vegetation that exists along some of the proposed retaining walls, striping depths greater than 6 inches should be expected to remove soils that contain roots and organic matter. Also, any loose soils at the surface, tree stumps, and major root systems should be removed full-depth and the resultant excavations should be cleaned of all loose material and water and properly backfilled.

Wherever existing slopes steeper than 4:1 (H:V) will be covered by new fill materials, the existing slope must be benched. Benches should be wide enough to accommodate compaction and earth moving equipment, and to allow placement of horizontal lifts of fill. New fill should be placed starting at the toe of the slope. The fill should be benched into the exposed soils.

After stripping and completing any required cuts and undercuts, and before placing any new fill, the exposed subgrade should be proofrolled with a fully-loaded dump truck, scraper, or other rubber-tired construction equipment weighing at least 25 tons to evaluate the presence of any low strength, unstable soils. Any low strength, unstable soils identified by the proofrolling should be overexcavated and replaced with tested and approved fill as indicated in section **4.2.2 Material Types**, if they cannot be adequately stabilized in-place.

After completing a successful proofroll, and before placing any fill, the exposed subgrade should be scarified to a minimum depth of 9 inches, moisture conditioned, and compacted as recommended in section **4.2.3 Compaction Requirements**.

It is critical that the earthwork be performed in strict conformance with the geotechnical recommendations.

4.2.2 Select Fill Materials

We anticipate that fill materials will be divided into 1) soils for the reinforced zone and 2) retained soils.

We recommend that backfill materials used within the reinforced zone meet American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA), and/or Arkansas Highway Transportation Department (AHTD) standard specifications for design and construction of MSE walls. In general, we recommend that a relatively clean (with a maximum content of fines of 10 percent), free draining material with a minimum effective friction angle of 34 degrees be used.

We assume that retained backfill soils will consist of materials similar to the soils encountered in the existing embankments, which consist of low to high plasticity clays and granular soils with different amounts of fines. We understand that these soil types are typically available near the project site and have been used in similar projects. We recommend that soils having Plasticity Index (PI) values greater than 20 be blended with lower PI soils before being used as new fill.

4.2.3 Compaction Requirements

The scarified and compacted subgrade and new fills should be moisture conditioned and compacted using the recommendations presented in the following table.

Item	Description
Subgrade Scarification Depth	9-inches
Fill Lift Thickness [1]	12-inches or less in loose thickness
Compaction Requirements [2]	At least 95% of the material's maximum dry density based on AASHTO T-99 or AASHTO T-180 standard specifications, depending on the content of fines (AHTD Specifications section 210.10).
Moisture Content	A level within minus 2 to plus 2 of the material's optimum moisture content, determined in accordance with AASHTO T-99/T-180. [3]

1. Thinner lifts are recommended in confined areas or when hand-operated compaction equipment is used.
2. The scarified and compacted subgrade and new fills should be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
3. Granular materials should be compacted at a workable moisture content.

The recommended moisture content should be maintained in the scarified and compacted subgrade and new fills, until fills are completed.

Although the moisture content and density relationship of free-draining backfill materials cannot be suitably tested using the AASHTO T-99 or T-180 standards, these materials should still be constructed in a controlled manner and tested during construction. An observation-based procedure in which the granular material is densified by multiple passes of the compaction equipment until the maximum achievable density is reached or relative density test procedures should be performed to verify that adequate compaction of clean granular material has been achieved.

The fill material should be placed on a relatively level surface. Existing slopes configured at ratios greater than 4H:1V should be continuously benched to avoid placing fill on a sloped surface. The benches should be of sufficient width for easy access to placement and compaction equipment.

4.2.4 Construction Considerations for MSE Walls

The construction specifications should provide the backfill material description and design strength parameters that are required for the different fill zones so that unsuitable materials are not used in the reinforced backfill zone during construction.

Prior to starting construction of the MSE wall, fill material proposed for constructing the reinforced zone of the wall should be sampled and tested in the laboratory to confirm that the engineering properties of the backfill satisfy the assumed properties used in design. Observation and field testing during earthwork activities and construction of MSE walls should be provided by qualified geotechnical personnel.

If the subgrade should become frozen, excessively wetted or dried, or disturbed, the affected material should be removed or scarified, moisture conditioned, and recompacted prior to construction of new fill layers.

Any overexcavations for compacted backfill placement below the retaining wall should extend laterally a minimum of 5 feet beyond the front of the retaining wall toe to a minimum distance behind the wall equal to the width of the reinforced zone. The overexcavation should then be backfilled to the foundation base elevation with approved fill materials as recommended in section **4.2.3 Compaction Requirements**.

If soils encountered during construction differ from the soils described in this report, Terracon should be consulted so proper adjustments and/or reevaluation of our analyses can be performed.

The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

4.3 External Stability Analysis of MSE Walls

Our external stability analyses of select MSE wall sections included bearing capacity, direct sliding, overturning, and global stability. Our analyses were performed at multiple wall sections based on the plans, profiles, and cross sections provided to us by Burns & McDonnell, 60% Plans, Rev. July 31, 2015. We evaluated MSE wall sections with total heights between about 10 and 33.5 feet. Our external stability analyses included the following criteria and considerations:

- Long term stability analyses for the proposed MSE wall structures were performed based upon drained parameters.
- Short term stability analyses for the proposed MSE wall structures were performed based upon undrained parameters. The short term stability was checked for select cross sections based on the lowest global stability Factor of Safety (FOS) values or the longest reinforcement lengths as calculated during our long term stability analyses.
- Direct sliding was evaluated at the base of the reinforced zone for the interface between the foundation soils and the new reinforced soils. <u>We assume that the first reinforcement layer will not be placed between the interface of the bearing materials and reinforced soils to avoid generating a weak sliding surface</u>.
- Generally, overturning is not a concern for MSE walls. However, we evaluated the Capacity Demand Ratio (CDR) for select cross sections.
- A traffic surcharge load of 240 psf was used for traffic parallel to the wall alignments and 500 psf for traffic perpendicular to the wall alignments (abutment walls), in accordance with AASHTO LRFD.
- The reinforced zone is considered to act as a rigid block. We used a theoretical cohesion (c') value of 5,000 psf to prevent the failure surface from extending through the reinforced zone.
- Our global stability analyses were performed using GLE/Morgenstern-Price method.
- We used a minimum embedment depth of 3.0 feet as shown on the 60% Plans, Rev. July 31, 2015.
- A minimum reinforcement length of 8 feet or 70% of the design wall height, whichever is greater, should be used. Longer reinforcement lengths will be required at various locations.

- Several MSE walls will be constructed over existing embankments with slope inclinations at the toe of the walls of 3H:1V, or flatter. Some MSE walls will be constructed over native cuts with slope inclinations of 2H:1V, or flatter.

- To simulate the effect of the existing residential houses near borings BW-716 and BW-902 on the external stability, we included additional permanent loads of 750 psf.

- Internal stability analyses will be performed by others (e.g. wall manufacturer).

Geotechnical parameters used in our analyses and the description of the AASHTO *LRFD Bridge Design Specifications, 6th Edition, 2012* methodology are given in the following sections. Section **4.3.7 Summary of External Stability Analyses** summarizes the results of the Capacity Demand Ratio (CDR) values calculated for select cross sections under long term conditions. A CDR value is defined as the result of the factored driving forces over the factored resisting forces. A CDR of 1.0 is generally considered in design. Section **4.3.8 Summary of Global Stability Analyses under Short Term Conditions** summarizes the results of the Factor of Safety (FOS) values calculated for select cross sections under short term conditions.

4.3.1 Design Parameters

In general, soil and rock strength parameters for our external stability analyses were estimated based on the results of our field exploration, visual classification of soils and rock materials, laboratory test results (soil classification tests, Unconsolidated Undrained Triaxial, Consolidated Undrained Triaxial, and consolidation tests), literature review, and our experience with similar materials and projects with similar scope.

Based on the results of our laboratory testing program, effective friction angle values between approximately 28 and 34 degrees and effective cohesion values between approximately 100 and 800 pounds per square foot (psf) were calculated for the clay soils. Based on a "drained-fully softened condition" approach, effective friction angle and cohesion values of the low to high plasticity clay soils range from approximately 23 to 32 degrees and 0 to 100 psf, respectively.

Undrained shear strength values in the range of 500 psf to 2,000 psf were used for the clay soils for our short term global stability analyses. Total and effective friction angle values for granular soils were assumed to be the same under short term and long term conditions.

The following design parameters were used for the stability analysis of the proposed MSE walls. The shear strength parameters (effective friction angle and cohesion) shown below are based on drained conditions to account for the long-term stability.

Effective Shear Strength Parameters and Soil/Rock Unit Weights for Analysis and Design

Soil Type	Soil Classification	Effective Friction Angle, Φ' (degrees)	Effective Cohesion, c' (psf)	Total Unit Weight, γ (pcf)
Reinforced Zone (Aggregate base)	AHTD Class 7	34	0 [1]	125
Existing Fill Materials: (Low to high plasticity clays and granular soils with fines)	Retained Soil	28 – 30	0	125
	Foundation Soil	28 – 32	0 - 100	115 - 125
Fine Soils	Medium plasticity, lean and lean to fat clay	26 – 32	0 – 100 [2]	110 – 130
	High plasticity, fat clay	23 – 28	0 – 25 [2]	105 – 120
	Low plasticity, silty clay	25 – 28	0	105 – 120
	Non-plastic, silt	26 – 30	0	105 – 120
	High plasticity, elastic silt	23 – 28	0	105 – 120
Granular soils	Poorly graded sand and silty sand	28 – 34	0	115 - 130
	Chert gravel with fines	28 – 34	0	115 – 130
Bedrock	Cherty limestone and limestone	38	125	140 - 145

1. For global stability analysis, the reinforced zone was treated as a rigid body with an apparent cohesion of 5,000 psf to prevent the critical failure surface from extending through the reinforced zone.
2. Cohesion parameters range valid for this project due to the overconsolidation ratios (OCR) of the surficial lean and lean to fat clay soils. Fat clays, which were encountered at deeper elevations at this site, would normally exhibit lower OCR values.

4.3.2 Load and Resistance Factors

The following load and resistance factors should be applied during the analysis and design of MSE walls, as indicated in the AASHTO *LRFD Bridge Design Specifications, 6th Edition, 2012*.

- Load Factor for vertical earth pressure, EV, from Table 3.4.1-2 and Figures C11.5.6-1 & 2:

$\gamma_{p\text{-}EV}$ = 1.00 Direct Sliding and Eccentricity

$\gamma_{p\text{-}EV}$ = 1.35 Bearing Capacity

- Load factor for active earth pressure, EH, from Table 3.4.1-2 and Figures C11.5.6-1 & 2:

  $\gamma_{p\text{-}EH}$ = 1.50 Bearing Capacity, Direct Sliding, and Eccentricity

- Load Factor for live load surcharge, LS, from Table 3.4.1-1 and Figure C11.5.6-3:

  $\gamma_{p\text{-}LL}$ = 1.75 Bearing Capacity, Direct Sliding, and Eccentricity

- Resistance factor for bearing resistance of MSE walls from Table 11.5.7-1:

  φ_b = 0.65

- Resistance factor for sliding of MSE walls from Table 11.5.7-1:

  φ_τ = 1.0 Reinforced Soil and Foundation

- Resistance factor for global (overall) stability of MSE walls from Section 11.6.2.3:

  φ = 0.75 for structures that do not support structural elements

  φ = 0.65 for structures that support structural elements (e.g. abutment walls)

  The equivalent minimum factor of safety (FOS) using limiting equilibrium methods of analysis (i.e. Allowable Stress Design – ASD) for the above global stability resistance factors correspond to 1.3 and 1.5, respectively

4.3.3 Foundation Bearing Capacity

The factored bearing resistance (q_R) was evaluated using the following equation:

$$q_R = \varphi_b \, q_n \qquad \text{(Equation 10.6.3.1.1-1)}$$

where: φ_b = resistance factor

q_n = nominal bearing resistance, which is defined as

$$q_n = c\,N_{cm} + \gamma\,D_f\,N_{qm}\,C_{wq} + 0.5\,\gamma\,B\,N_{\gamma m}\,C_{w\gamma} \qquad \text{(Equation 10.6.3.1.2a-1)}$$

where: c : cohesion

γ : total unit weight

N_{cm}, N_{qm} and $N_{\gamma\mu}$: dimensionless bearing capacity factors

B : total reinforcement length

C_{wq} and $C_{w\gamma}$: correction factors to account for the location of groundwater table

The bearing capacity equations given above are dependent on soil properties, foundation shape, foundation embedment, loads acting on the wall, load inclination, groundwater level, and the design reinforcement length (total and effective foundation width). We have also taking into account the effects of the relatively shallow bedrock in our analyses. A summary of the Capacity Demand Ratio (CDR) values for bearing capacity for the cross sections analyzed is given in section **4.3.7 Summary of External Stability Analyses**.

4.3.4 Direct Sliding

The factored resistance against failure by sliding was determined using the following equation.

$$R_R = \varphi_\tau R_\tau \qquad \text{(Equation 10.6.3.4-1)}$$

where: φ_τ = resistance factor for shear resistance between soil and foundation
R_τ = nominal sliding resistance between soil and foundation

$$R_\tau = V \tan \delta \qquad \text{(Equation 10.6.3.4-2)}$$

where: V = total vertical force
δ = interface friction angle between foundation soil and reinforced zone

We used the assumption that the interface friction angle between the foundation soil and the reinforced zone corresponds to the minimum of the foundation friction angle and the reinforced zone friction angle. Generally, the friction angle of the foundation soil is lower than the friction angle of the reinforced zone and therefore, we used tan δ = tan ϕ', where ϕ' corresponds to the effective (drained) friction angle of the foundation soil. A summary of the Capacity Demand Ratio (CDR) values for direct sliding for the cross sections analyzed is given in section **4.3.7 Summary of External Stability Analyses**.

4.3.5 Overturning

According to AASHTO *LRFD Bridge Design Specifications*, generally overturning due to eccentricity does not govern the design of MSE walls. However, MSE structures shall be proportioned to satisfy eccentricity. To satisfy overturning, the location of the resultant of the reaction forces shall be within the middle two-thirds of the base width. The following general equation provides for the calculation of eccentricity:

$$e = \frac{(\Psi_{EHA})\,(F_1)\,(H/3) + (\Psi_{LS})\,(F_2)\,(H/2)}{(\Psi_{EV})\,(V_1)}$$

where:

Ψ_{EHA}	=	load factor for horizontal earth pressure (i.e. 1.50)
Ψ_{LS}	=	load factor for traffic surcharge load (i.e. 1.75)
Ψ_{EV}	=	load factor for dead load of earth fill (i.e. 1.0)
H	=	design height wall
V	=	factorized vertical load due to reinforced zone

F_1 & F_2 = factorized horizontal loads due to retained soil and traffic surcharge

The Capacity Demand Ratio (CDR) for overturning is calculated as the ratio between the factored resistance forces and the factored driving forces. A summary of the Capacity Demand Ratio (CDR) values for overturning for the cross sections analyzed is given in section **4.3.7 Summary of External Stability Analyses**.

4.3.6 Global Stability

AASHTO *LRFD Bridge Design Specifications, 6th Edition, 2012* recommends that global (overall) stability of the retaining wall, retained slope, and foundation soil be evaluated using limiting equilibrium methods of analysis, in which a single Factor of Safety (FOS) is generated by slope stability software.

The computer program SLIDE v6.0 (by Rocscience, Inc.) was used to evaluate the global stability of select cross sections. We used the GLE/Morgenstern-Price limit equilibrium method to perform our analyses. This stability analysis method requires satisfying equilibrium of forces and moments acting on individual blocks. MSEW – Mechanically Stabilized Earth Walls (by ADAMA Engineering, Inc.) was also used to evaluate the influence of loads located away from the top of the walls due to the existence of residential houses near boring locations BW-716 and BW-902.

A summary of the Capacity Demand Ratio (CDR) values for global stability for the cross sections analyzed is given in section **4.3.7 Summary of External Stability Analyses**.

4.3.7 Summary of Long Term External Stability Analyses

Based on the subsurface conditions encountered in the borings and the design considerations mentioned in this report, the minimum required reinforcing strap lengths for this project vary between 70 and 85 percent of the wall height, or 8 to 26.5 feet. The wall height corresponds to the exposed height of the wall plus the embedment depth.

The minimum reinforcement length required to satisfy the external stability of a section of an MSE walls corresponds to the length that satisfies Capacity Demand Ratio (CDR) values equal to or greater than 1.0 for bearing capacity (BC), direct sliding (DS) and overturning (OT) and factor of safety (FOS) values for global stability (GS) greater than 1.3 for non-critical MSE walls and 1.5 for critical MSE walls.

The following table shows the summary of the Capacity Demand Ratio (CDR) and Factor of Safety (FS) values for each external stability condition and the minimum reinforcement lengths to satisfy the external stability of the cross sections analyzed. The values presented for the combined sections correspond to the factor of safety for the global stability of the tiered walls. The wall manufacturer is responsible for evaluating internal stability. Longer reinforcements might be required to satisfy internal stability.

MSE Wall	Boring / Approx. Sta.	H_D (feet)	CDR_{BC}	CDR_{DS}	CDR_{OT}	FOS_{GS}	Controls	$(L/H)_{min}$	L_{MIN} (feet)
Wall 1	BW-106 Sta. 1042+00	12.0	1.1	1.0	2.1	1.4	L_{DS}	75%	9.0
	BW-301 Sta. 1045+50	17.5	1.0	1.3	3.1	1.6	L_{BC}	85%	14.9
	BW-305 Sta. 1049+50	11.0	1.8	1.0	2.7	1.5	L_{DS}	85%	9.4
Wall 2	BW-205 Sta. 1043+50	12.0	13	1.1	2.1	1.4	L_{DS}	75%	9.0
	BW-402 Sta. 1047+50	12.0	1.1	1.0	2.1	1.3	$L_{DS/GS}$	75%	9.0
	BW-405 Sta. 1049+50	15.5	1.1	1.0	2.8	1.6	L_{DS}	85%	13.0
Wall 3A	BW-511 Sta. 138+00	21.0	1.3	1.0	2.2	1.6	L_{DS}	70%	14.7
Wall 3B	BW-502 Sta. 1049+50	12.5	1.1	1.0	2.1	1.4	L_{BC}	75%	9.4
	BW-503 Sta. 1052+50	16.0	1.3	1.1	2.1	1.4	L_{MIN}	70%	11.2
	BW-506 Sta. 1054+50	17.0	1.4	1.1	2.1	1.4	L_{MIN}	70%	11.9
	BW-509 Sta. 1056+50	26.0	1.5	1.1	2.3	1.5	L_{MIN}	70%	18.2
Wall 4	BW-603 Sta. 1057+00	11.0	1.1	1.0	2.1	1.4	L_{DS}	75%	8.3
	BW-606 Sta. 1059+00	25.0	1.2	1.2	3.0	1.3	L_{GS}	80%	20.0
Wall 5A	BW-509 Sta. 1056+50	16.0	2.2	1.0	2.4	1.4	L_{DS}	85%	13.6
	BW-705 Sta. 1058+00	24.5	1.6	1.1	2.3	1.5	L_{MIN}	70%	17.2
Wall 5B	BW-708 Sta. 1061+00	28.0	1.0	1.0	2.9	1.3	L_{GS}	85%	23.8
	BW-715 Sta. 1067+50	10.5	1.9	1.0	2.7	1.5	L_{DS}	85%	8.9
Wall 6A	BW-802/606 Sta. 1059+00	18.5	1.5	1.0	2.2	1.4	L_{DS}	85%	15.7
Wall 6B	BW-806 Sta. 1062+00	31	1.3	1.1	3.6	1.3	L_{GS}	85%	26.4
	BW-809 Sta. 1064+50	16.5	1.3	1.2	2.4	1.3	L_{GS}	75%	12.4
	BW-812 Sta. 1067+00	14	1.2	1.0	2.6	1.4	L_{DS}	80%	11.2
Wall 7	BW-716 Sta. 1067+50	14.0	1.6	1.1	2.0	2.3	L_{MIN}	70%	9.8
	BW-902 Sta. 1070+50	18.5	1.1	1.4	2.9	1.5	L_{GS}	85%	15.7
Combined (Tiered) Walls	BW-305/502 Sta. 1049+50		N/A	N/A	N/A	1.6			
	BW-715/716 Sta. 1067+50		N/A	N/A	N/A	1.9			

Continued from page 18

Table notes:

H_D :	Design height (total wall height = Face of the wall plus embedment depth)
CDR :	Capacity Demand Ratio in accordance to AASHTO LRFD 2012
FOS :	Factor of Safety for global stability based on Allowable Stress Design (ASD) methodology, in accordance with AASHTO LRFD 2012
BC :	Bearing Capacity
DS :	Direct Sliding
OT :	Overturning
GS:	Global Stability
$(L/H)_{min}$:	Minimum Reinforcement Length (L) – Wall Height (H) ratio
L_{min} :	Minimum Reinforcement Length
E_m :	Minimum Embedment depth is 3 feet for Abutment Walls

4.3.8 Summary of Short Term Global Stability Analyses

The global stability of select cross sections was analyzed under short term conditions as indicated in the table below. Based on the results of our geotechnical exploration and analyses, the cross sections meet the minimum factor of safety required under short term conditions.

MSE Wall No.	Approximate Station	Boring	FOS_{GS}
Wall 1	Sta. 1042+00	BW-106	2.4
Wall 2	Sta. 1047+50	BW-402	2.2
Wall 3B	Sta. 1054+50	BW-506	2.8
Wall 4	Sta. 1059+00	BW-606	2.2
Wall 5B	Sta. 1061+00	BW-708	1.7
Wall 6B	Sta. 1064+50	BW-809	1.9
Wall 7	Sta. 1070+50	BW-902	1.6

4.3.9 Minimum Recommended Reinforcement Lengths

We prepared the following minimum recommended reinforcement length versus approximate project stations based on the results of our external and global stability analyses for the proposed MSE Walls.

MSE Wall	Approximate Total Wall Height (H)	Approximate Stations	Min. Recommended Reinforcement Length
Wall 1	6.5 to 17.5 feet	Sta. 1038+16.55 to Sta. 1043+00	Greater of 0.75H or 8.0'
		Sta. 1043+00 to Sta. 1053+70.58	Greater of 0.85H or 8.0'
Wall 2	5.5 to 23.5 feet	Sta. 1040+62.55 to Sta. 1048+00	Greater of 0.75H or 8.0'
		Sta. 1048+00 to Sta. 1052+39	Greater of 0.85H or 8.0'
Wall 3A	3.5 to 25 feet	Sta. 1038+16.55 to Sta. 1043+00	Greater of 0.70H or 8.0'
Wall 3B	6 to 26 feet	Sta. 1047+32.04 to Sta. 1051+00	Greater of 0.75H or 8.0'
		Sta. 1051+00 to Sta. 1058+17.43	Greater of 0.70H or 8.0'
Wall 4	4 to 31.5 feet	Sta. 1055+50 to Sta. 1058+00	Greater of 0.75H or 8.0'
		Sta. 1058+00 to Sta. 1060+13.48	Greater of 0.80H or 8.0'

MSE Wall	Approximate Total Wall Height (H)	Approximate Stations	Min. Recommended Reinforcement Length
Wall 5A	6 to 33 feet	Sta. 1054+00 to Sta. 1057+50	Greater of 0.85H or 8.0'
		Sta. 1057+50 to Sta. 1060+05.82	Greater of 0.70H or 8.0'
Wall 5B	7.5 to 31.5 feet	Sta. 1059+41.15 to Sta. 1069+03.67	Greater of 0.85H or 8.0'
Wall 6A	5 to 32.5 feet	Sta. 1057+40 to Sta. 1059+50	Greater of 0.85H or 8.0'
		Sta. 1059+50 to Sta. 1061+86.41	Greater of 0.80H or 8.0'
Wall 6B	5.5 to 33 feet	Sta. 1061+49.77 to Sta. 1064+00	Greater of 0.85H or 8.0'
		Sta. 1064+00 to Sta. 1069+28.45	Greater of 0.80H or 8.0'
Wall 7	4.5 to 20 feet	Sta. 1067+00 to Sta. 1068+00	Greater of 0.70H or 8.0'
		Sta. 1068+00 to Sta. 1072+36.89	Greater of 0.85H or 8.0'

4.4 Seismic Considerations

Code Used	Site Classification
2012 AASHTO LRFD [1]	C

1. In general accordance with the *2012 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS,* Table 3.10.3.1-1 – Site Class Definitions.

4.5 Settlement of Reinforced Zone

Total settlement of an earth structure is caused by compression of the earth structure due to its own weight and by compression of the foundation soils due to the weight of the new structure. Based on our understanding of the project, we anticipate that retained fill materials will be similar to the soils encountered in the existing embankments and that reinforced fill materials will consist of higher quality soil types. Thus, settlement of the proposed MSE walls will depend upon variations within the subsurface soil profile, fill material types, structural loading conditions, construction length, and quality of the earthwork operations. Because of the variations associated with these parameters, we cannot accurately estimate settlements under all design scenarios.

In order to estimate the settlement of the proposed MSE walls, we assumed the following considerations:

- Foundation bearing conditions generally match our subsurface data.
- Any low strength, unstable soils identified during construction will be overexcavated and replaced with tested and approved fill as indicated in Section **4.4 Compaction Requirements**, if they cannot be adequately stabilized in-place.
- Settlement time rates of fine-grained soils are higher than settlement rates of granular materials. Therefore, differential settlement can occur when transitioning from one soil type to another.

- Part of the settlement of the new fills will occur during construction as compaction is performed and pore water pressure is dissipated. We anticipate that about 75% of the new fill settlement will occur during construction.

- Construction of a single MSE wall will take about 2 to 3 months.

- Based on limited, one-dimensional consolidation tests performed on select soil samples, the upper native clays exhibit overconsolidation ratios (OCR) on the order of approximately 6 to 7. Lower OCR values can be expected for clays located at deeper elevations.

The results of our analyses indicate that maximum total settlement will occur near the center line of the walls or near the toe of the existing embankments. Total post-construction settlement along the facing panels will be on the range of 1 to 3 ½ inches with differential settlements not expected to exceed a slope of 1:200.

The settlement of the foundation soils was computed based on the results of limited one-dimensional consolidation tests, available empirical correlations between compressibility and Standard Penetration Test (SPT) values obtained from our borings, and our experience with similar soils. Estimation of new fill settlement included recommendations provided by the U.S. Army Corps of Engineers (Manual 1110-1-1904 – 11/1990) and NAVFAC DM 7.2 (Design Manual 7.02 – 11/1986) for settlement analysis of compacted fills.

The following table summarizes the range of post-construction settlement values that can be expected due to construction of the proposed MSE walls. If the designer considers that total and differential settlement values exceed the design requirements, ground improvement methods can be considered. We will be pleased to provide ground improvement alternatives upon request.

Estimated Post-Construction Total and Differential Settlement (inches)		
MSE Wall	Total Settlement Along Wall Facing	**Differential Settlement Over 100 Feet [1]**
Wall 1 – Sta. 1036+16.5 to 1053+70.58 – South Bound	1 to 3	½ to 1
Wall 2 – Sta. 1040+62.55 to 1052+39.00 – North Bound	1 to 3	½ to 1
Wall 3A – Sta. 1044+25 to 1053+00 – 8th Street	1 to 2 ½	½ to 1
Wall 3B – Sta. 1047+32.04 to 1058+17.43 – South Bound	2 to 3	½ to 1
Wall 4 – Sta. 1055+50 to 1060+13.48 – North Bound	1 to 2 ½	½ to 1
Wall 5A – Sta. 1054+00 to Sta. 1060+05.82 – South Bound	1 to 2 ½	½ to 1
Wall 5B – Sta. 1059+41.15 Sta. 1069+03.67 – South Bound	1 ½ to 3 ½	½ to 1 ½
Wall 6A – Sta. 1057+40 to Sta. 1061+86.41 – North Bound	1 to 2 ½	½ to 1
Wall 6B – Sta. 1061+49.77 to 1069+28.45 – North Bound	1 to 2 ½	½ to 1
Wall 7 – Sta. 1067+00 to Sta. 1072+36.89 – South Bound	1 to 2 ½	½ to 1

Continued from page 21

1. Differential settlement will be the greatest where transitioning between relatively soft and stiff bearing materials or fine soils and granular soils.

4.6 Wall Drainage Recommendations

Care should be taken in the design and during construction to develop and maintain rapid, positive drainage away from the retaining wall area. Water should not be allowed to pond adjacent to either the upslope or downslope sides of the retaining wall. We recommend that drainage swales with sufficient gradients be constructed along both the upslope and downslope sides of the wall to direct surface water away from the wall. Proper surface drainage is needed to prevent water from flowing over the face of the wall and saturating either the fill behind the wall or the subgrade soils at the base of the wall.

If Arkansas Highway Transportation Department (AHTD) "Class 7" aggregate base material is used to construct the reinforced zone, we recommend that a backslope drain, comprised of a geocomposite drainage blanket, such as Miradrain or equivalent, be attached to the face of the cut backslope and extend down to a collector drain pipe placed along the bottom of the reinforced zone at the base of the cut slope. The collector drain should consist of a perforated PVC pipe that is placed in free-draining aggregate such as No. 57 stone, with the stone wrapped in a geotextile filter fabric. The collector drain should be sloped to drain out beyond one or both ends of the retaining wall. The geocomposite drainage blanket should be cut off at a depth of 2 feet below the finished ground surface at the back of the reinforced backfill zone to allow a minimum cover of 2 feet of compacted clayey soil over the drain to prevent the infiltration of surface water into the backslope drain.

Alternatively, select drainable aggregate fill material consisting of crushed No. 57 stone could be imported to construct the entire reinforced zone. If the crushed No. 57 stone is used to construct the reinforced backfill zone, we recommend that a geotextile filter fabric, such as Mirafi 140N be placed between the face of the cut slope and the reinforced backfill zone to prevent the migration of fines from the native soils into the free-draining No. 57 stone.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide testing and observation during excavation, grading, foundation and construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between the borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION

1600 0 800 1600

APPROXIMATE SCALE IN FEET

N

Project Mngr: JEG	Project No. 04135111
Drawn By: JM	Scale: SEE BAR SCALE
Checked By: JEG	File No. 04135111
Approved By: MHH	Date: JAN 2016

Terracon
Consulting Engineers and Scientists
9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145
PH. (918) 250-0461 FAX. (918) 250-4570

SITE LOCATION MAP

GEOTECHNICAL EXPLORATION

8TH STREET WIDENING PROJECT - MSE WALLS

BENTONVILLE, ARKANSAS

EXHIBIT NO.

A-1

100 0 50 100

APPROXIMATE SCALE IN FEET

LEGEND
BORING LOCATION

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr: JEG	Project No. 04135111	Terracon Consulting Engineers and Scientists	BORING LOCATION PLAN
Drawn By: JM	Scale: SEE BAR SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145	GEOTECHNICAL EXPLORATION
Checked By: JEG	File No. 04135111	PH. (918) 250-0461 FAX. (918) 250-4570	8TH STREET WIDENING PROJECT - MSE WALLS
Approved By: MHH	Date: JAN 2016		BENTONVILLE, ARKANSAS

EXHIBIT NO. A-2

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100 0 50 100

APPROXIMATE SCALE IN FEET

N

LEGEND
BORING LOCATION

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr: JEG	Project No. 04135111
Drawn By: JM	Scale: SEE BAR SCALE
Checked By: JEG	File No. 04135111
Approved By: MHH	Date: JAN 2016

Terracon
Consulting Engineers and Scientists
9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145
PH. (918) 250-0461 FAX. (918) 250-4570

BORING LOCATION PLAN

GEOTECHNICAL EXPLORATION
8TH STREET WIDENING PROJECT - MSE WALLS
BENTONVILLE, ARKANSAS

PAGE 2 OF 4

EXHIBIT NO.
A-2

160 0 80 160

APPROXIMATE SCALE IN FEET

LEGEND
BORING LOCATION

Project Mngr:	JEG
Drawn By:	JM
Checked By:	JEG
Approved By:	MHH

Project No.	04135111
Scale:	SEE BAR SCALE
File No.	04135111
Date:	JAN 2016

Terracon
Consulting Engineers and Scientists
9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145
PH. (918) 250-0461 FAX. (918) 250-4570

BORING LOCATION PLAN

GEOTECHNICAL EXPLORATION
8TH STREET WIDENING PROJECT - MSE WALLS
BENTONVILLE, ARKANSAS

PAGE 3 OF 4

EXHIBIT NO.
A-2

100 0 50 100

APPROXIMATE SCALE IN FEET

N

LEGEND
BORING LOCATION

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr: JEG	Project No. 04135111	Terracon Consulting Engineers and Scientists	BORING LOCATION PLAN
Drawn By: JM	Scale: SEE BAR SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145	GEOTECHNICAL EXPLORATION
Checked By: JEG	File No. 04135111	PH. (918) 250-0461 FAX. (918) 250-4570	8TH STREET WIDENING PROJECT - MSE WALLS
Approved By: MHH	Date: JAN 2016		BENTONVILLE, ARKANSAS

EXHIBIT NO. A-2

Field Exploration Description

The boring locations and elevations were established in the field by B & F Engineering, Inc. prior to commencement of our field activities. Several borings were offset in the field due to rig access constrains and/or the presence of underground utilities. Borings located in the mid-slope were offset perpendicular to the proposed MSE wall alignments to either the toe or the crest of the existing slopes. The actual ground elevations at the majority of the boring locations and boring coordinates were recalculated in the field by B & F Engineering, Inc. upon field exploration completion. At some locations, Terracon recalculated ground elevations and coordinates based on the relative elevation and distances between the staked (proposed) boring and the actual boring location using an engineer's level and tape. Elevations given to us by B & F Engineering, Inc. have been rounded to the nearest 0.1 and elevations calculated using our in-house engineer's level have been rounded to the nearest 0.5 feet. The boring locations and elevations should be considered accurate only to the degree implied by the methods used to define them.

We drilled the borings with ATV-mounted rotary drill rigs using continuous flight augers and rotary cutting bits to advance the boreholes. Representative samples were obtained by the split-barrel and thin-walled tube sampling procedures. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound auto-hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). The N-value is used to estimate the in-situ relative density of cohesionless soils, and to a lesser degree of accuracy, the consistency of cohesive soils and hardness of weathered bedrock. The thin-walled sampling procedure uses a standard 3-inch, O.D. tube (Shelby tube) that is pushed hydraulically into the soil to recover relatively undisturbed samples of cohesive soils.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings. Generally, a greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The sampling depths, penetration distances, and N-values are reported on the boring logs. The samples were tagged for identification, sealed to reduce moisture loss and returned to the laboratory for further examination, testing and classification.

We cored the bedrock at select boring locations using a NQ-size, diamond-bit core barrel. After the core samples were retrieved, the cores were placed in a box and logged. The rock was visually classified, and the "percent recovery" and rock quality designation (RQD) was determined for each run. The "percent recovery" is the ratio of the recovered sample length to the cored length, expressed as a percent. An indication of the actual in-situ rock quality is provided by calculating the core's RQD. The RQD is the percentage of the total length of core retrieved that are in segments at least 4 inches in length compared to each core run length.

Field Exploration Description (Continued)

In addition to split-barrel and thin-walled tube samples, bulk samples were obtained within the soils from different interval depths at the majority of the boring locations to aid in soil classification and to develop generalized strength parameters.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on observation and laboratory tests of the samples retrieved.

BORING LOG NO. BW-101

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.358251° Longitude: -94.178257°

Surface Elev.: 1333.3 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Gravel and base course **FILL - CLAYEY CHERT GRAVEL**, reddish-brown (5YR 4/4)									
			Split spoon	9	5-6-10 N=16		11			
5.0	**FILL - CHERTY LEAN TO FAT CLAY**, reddish-brown (5YR 4/4) to yellowish-red (5YR 5/8)	1328.5	Split spoon	11	3-6-6 N=12		21			
	(trace limestone fragments below 8.5 feet)		Split spoon	9	9-6-7 N=13		14			
			Shelby tube	11					45-20-25	58
15.0	**FILL - SANDY FAT CLAY**, with chert, reddish-brown (5YR 4/4) to yellowish-red (5YR 5/8)	1318.5	Split spoon	6	6-8-9 N=17		10		72-25-47	61
18.5	**FILL - CLAYEY SAND**, with chert gravel, reddish-brown (5YR 4/4)	1315	Split spoon	18	6-8-9 N=17		20			39
23.5	**CHERTY LEAN TO FAT CLAY (CL-CH)**, reddish-brown (5YR 4/4), medium stiff	1310	Split spoon	6	6-25-10 N=35		19			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013	Boring Completed: 10/6/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-4

BORING LOG NO. BW-101

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.358251° Longitude: -94.178257° Surface Elev.: 1333.3 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY LEAN TO FAT CLAY (CL-CH), reddish-brown (5YR 4/4), medium stiff *(continued)*										
				X	3	2-3-5 N=8		18		46-20-26	
	30.0 / 1303.5	30									
	Boring Terminated at 30 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013	Boring Completed: 10/6/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-4

BORING LOG NO. BW-102

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.358526° Longitude: -94.178434°

Surface Elev.: 1311.8 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
2.0	**FILL - LEAN CLAY**, with chert gravel, dark yellowish-brown (10YR 4/4) and light gray (10 YR 7/1)	1310
5.0	**LEAN CLAY (CL)**, trace sand, dark yellowish-brown (10YR 4/4), stiff	1307
8.5	**SANDY LEAN CLAY (CL)**, trace chert gravel, yellowish-red (5YR 4/6), very stiff	1303.5
13.5	**CLAYEY CHERT GRAVEL (GC)**, strong brown (7.5YR 5/8), very dense	1298.5
18.0	**SILTY SAND (SM)**, with chert gravel, strong brown (7.5YR 5/8) to yellowish-red (5YR 5/8), dense	1294
20.0	**CHERTY LEAN TO FAT CLAY (CH-CL)**, yellowish-red (5YR 5/8), medium stiff	1292

Boring Terminated at 20 Feet

SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
X	18	2-5-5 N=10		20			
X	18	4-5-5 N=10		20			
X	18	4-6-16 N=22		25		40-20-20	69
X	16	15-45-50/4"		15			
X	15	22-30-17 N=47		10		NP	22
X	18	7-4-4 N=8					

WATER LEVEL OBSERVATIONS: ▽ at 18 ft

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *18 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/9/2013	Boring Completed: 10/9/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-5

BORING LOG NO. BW-103

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.358711° Longitude: -94.178081°

Surface Elev.: 1338.6 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - SANDY FAT CLAY, with chert gravel, dark yellowish-brown (10YR 4/4) and dark grayish-brown (10YR 4/2)											
					X	13	3-6-6 N=12		30			
			5		X	8	4-6-10 N=16		11			55
8.5		1330										
	FILL - FAT CLAY, trace sand and chert gravel, mottled yellowish-brown (10YR 5/8) and reddish-brown (5YR 4/4)				X	10	5-5-4 N=9		26			
			10									
					■	14						
15.0		1323.5	15									
	FILL - FAT CLAY, trace chert gravel, reddish-brown (5YR 4/4)				X	16	4-9-11 N=20		19			
					X	16	5-9-14 N=23		24			
			20									
23.5		1315										
	LEAN CLAY (CL), with sand, trace chert gravel, reddish-brown (5YR 4/4), very stiff				X	18	6-9-8 N=17		21		42-17-25	77
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013	Boring Completed: 10/6/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-6

BORING LOG NO. BW-103

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.358711° Longitude: -94.178081°

Surface Elev.: 1338.6 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**LEAN CLAY (CL)**, with sand, trace chert gravel, reddish-brown (5YR 4/4), very stiff *(continued)*	1310										
33.5	**LEAN CLAY (CL)**, yellowish-brown (2.5Y 5/4), very stiff	1305	30		X	15	4-7-10 N=17		16			
38.0	**CLAYEY CHERT GRAVEL (GC)**, yellowish-red (5YR 5/8), dense		35		X	18	8-19-20 N=39		21			
	(apparent hard limestone)	1300.5			X	0	N=50/0"					
	Boring Terminated at 38 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013	Boring Completed: 10/6/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-6

BORING LOG NO. BW-104

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.358984° Longitude: -94.178329°

Surface Elev.: 1312.1 (Ft.)

DEPTH	Description	ELEVATION (Ft.)
	LEAN TO FAT CLAY (CL-CH), with sand, dark grayish-brown (10YR 4/2) to dark red (2.5YR 3/6), medium stiff	
5.0	**CLAYEY CHERT GRAVEL (GC)**, yellowish-brown (10YR 5/6) to light gray (10YR 7/1), dense	1307
8.5	**FAT CLAY (CH)**, with sand, trace chert gravel, light red (2.5YR 6/6), stiff to very stiff	1303.5
10.5	(auger refusal at 10.5 feet on a hard chert seam) **CLAYEY CHERT GRAVEL (GC)**, light gray (10 YR 7/1) and light red (2.5YR 6/6), dense to very dense	1301.5
20.5	**SILTY CHERT GRAVEL (GM)**, with sand, strong brown (7.5YR 5/8), medium dense	1291.5
23.5	**CHERTY LEAN CLAY (CL)**, strong brown (7.5YR 5/8) to light red (2.5YR 6/8), stiff	1288.5

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		Split spoon	12	2-4-4 N=8		21			
		Split spoon	16	3-4-4 N=8		19		47-20-27	83
5		Split spoon	16	8-28-13 N=41		21			
		Split spoon	16	5-5-19 N=24		26		64-27-37	72
10–15		Core		REC=17% RQD=8%					
15–20		Core		REC=10% RQD=0%					
20		Split spoon	6	4-7-3 N=10		41		NP	19
		Split spoon	14	3-2-9 N=11		47			
25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 6.5 feet
Wash Bore below 6.5 feet
Diamond Core Bit below 10. 5 feet
Wash Bore below 20.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

none to 6.5 feet while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/9/2013	Boring Completed: 10/9/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-7

BORING LOG NO. BW-104

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.358984° Longitude: -94.178329°

Surface Elev.: 1312.1 (Ft.)

DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
CHERTY LEAN CLAY (CL), strong brown (7.5YR 5/8) to light red (2.5YR 6/8), stiff *(continued)*										
			X	9	2-50/3"		44			
(with chert seams below 29 feet)	30									
(soft clay and loose highly weathered chert gravel below 31 feet)										
33.5 (apparent hard limestone) 1278.5			X	0	N=50/0"					
Boring Terminated at 33.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 6.5 feet
Wash Bore below 6.5 feet
Diamond Core Bit below 10. 5 feet
Wash Bore below 20.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

none to 6.5 feet while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/9/2013	Boring Completed: 10/9/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-7

PIEZOMETER LOG NO. BW-105

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION: See Exhibit A-2

Latitude: 36.359218° Longitude: -94.178261°

Surface Elev.: 1312.7 (Ft.)

DEPTH / ELEVATION (Ft.)	Description	Installation Details	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	LEAN CLAY (CL), with sand, dark grayish-brown (10YR 4/2) to dark red (2.5YR 3/6), stiff	Cement Grout; Bentonite				14	3-3-6 N=9		16			
						17	4-4-6 N=10		24			
		Riser 2" PVC	5			17			17	107	37-21-16	82
7.0 / 1305.5	**CLAYEY CHERT GRAVEL (GC)**, with sand, light gray (10YR 7/1) to strong brown (7.5YR 5/6), dense to medium dense	Sand 10/20 Silica				18	11-18-16 N=34		18		34-21-13	49
						17	6-9-14 N=23		19			
			10									
13.5 / 1299	**SILTY CHERT GRAVEL (GM)**, with sand, light gray (10YR 7/1) to strong brown (7.5YR 5/6), medium dense					11	4-12-10 N=22		21		NP	28
			15									
				▽		12	2-14-9 N=23		39			
			20									
23.5 / 1289	**CHERTY LEAN CLAY (CL)**, strong brown (7.5YR 5/6), stiff to very stiff	Screen 2" PVC 0.01 Slot				11	4-11-7 N=18		22		42-27-15	60
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Holow Stem Auger to 30 feet
Diamond Core Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *19 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/10/2013	Boring Completed: 10/10/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-8

PIEZOMETER LOG NO. BW-105

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION: See Exhibit A-2

Latitude: 36.359218° Longitude: -94.178261°

Surface Elev.: 1312.7 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	WELL	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
29.0		1283.5	Well Cap				8	12-50/3"		9			
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard (with clay seams from 29 to 31 feet)			30				REC=100% RQD=38%	6,690				
				35				REC=100% RQD=97%					
								REC=100% RQD=96%					
40.0		1272.5		40									
	Boring Terminated at 40 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Holow Stem Auger to 30 feet
Diamond Core Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

19 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/10/2013	Boring Completed: 10/10/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-8

BORING LOG NO. BW-106

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.359383° Longitude: -94.177881°

Surface Elev.: 1341.7 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - LEAN TO FAT CLAY, with sand and chert gravel, reddish-brown (5YR 4/4)										
				X	14	4-4-6 N=10		17			
		5		X	14	3-6-8 N=14		19			
		10		X	18	3-4-5 N=9		22		45-16-29	
				■	15			17	113	49-22-27	76
		15		X	12	7-6-7 N=13		17			
				X	11	3-8-5 N=13		19			
		20									
				X	14	4-5-7 N=12		21			
		25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 57.5 feet
Wash Bore below 57.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *48 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013 | Boring Completed: 10/6/2013
Drill Rig: ATV | Driller: SB
Project No.: 04135111 | Exhibit: A-9

BORING LOG NO. BW-106

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.359383° Longitude: -94.177881°

Surface Elev.: 1341.7 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - LEAN TO FAT CLAY, with sand and chert gravel, reddish-brown (5YR 4/4) *(continued)*											
28.5		1313										
	LEAN CLAY (CL), trace sand, reddish-brown (5YR 4/4), medium stiff				X	14	3-6-3 N=9		22			
			30									
					X	2	3-2-3 N=5		25		32-19-13	89
			35									
38.5		1303										
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1), dense				X	8	12-20-20 N=40		14			
			40									
43.5		1298										
	FAT CLAY (CH), with highly weathered chert gravel, yellowish-red (5YR 5/8) and very pale brown (10YR 7/4), medium stiff to stiff				X	18	3-3-10 N=13		61			
			45									
				▽								
					X	18	10-5-4 N=9		49			
			50									
	(dark reddish-brown (5YR 3/4) below 53.5 feet)				X	18						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 57.5 feet
Wash Bore below 57.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *48 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013	Boring Completed: 10/6/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-9

BORING LOG NO. BW-106

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.359383° Longitude: -94.177881°

Surface Elev.: 1341.7 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), with highly weathered chert gravel, yellowish-red (5YR 5/8) and very pale brown (10YR 7/4), medium stiff to stiff *(continued)*		55		X	18	5-5-1 N=6		75		58-38-20	
57.5		1284										
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard				X	0	N=50/0"					
			60									
63.5		1278			X	0	N=50/0"					

Boring Terminated at 63.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 57.5 feet
Wash Bore below 57.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

48 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013	Boring Completed: 10/6/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-9

BORING LOG NO. BW-107

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.35966° Longitude: -94.17807° DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Boring BW-107 was not drilled due to the presence of underground utilities and/or drill rig access constrains ***Boring Terminated at 0.01 Foot***										

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:	See Exhibit A-3 for description of field procedures. See Appendix B for description of laboratory procedures and additional data (if any). See Appendix D for explanation of symbols and abbreviations.	Notes:
Abandonment Method:		

WATER LEVEL OBSERVATIONS	Terracon	Boring Started:	Boring Completed:
	9522 East 47th Place, Unit D Tulsa, Oklahoma	Drill Rig:	Driller:
		Project No.: 04135111	Exhibit: A-10

BORING LOG NO. BW-108

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 0° Longitude: 0° DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Boring BW-108 was not drilled due to the presence of underground utilities and/or drill rig access constrains ***Boring Terminated at 0.01 Foot***										

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:	See Exhibit A-3 for description of field procedures. See Appendix B for description of laboratory procedures and additional data (if any). See Appendix D for explanation of symbols and abbreviations.	Notes:
Abandonment Method:		

WATER LEVEL OBSERVATIONS

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started:	Boring Completed:
Drill Rig:	Driller:
Project No.: 04135111	Exhibit: A-11

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 04135111 - BW.GPJ

BORING LOG NO. BW-201

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.358631° Longitude: -94.177321°

Surface Elev.: 1337.1 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - LEAN CLAY, with chert gravel, trace limestone gravel, dark brown (10YR 3/3), dark red (2.5YR 3/6), and light gray (10YR 7/1)				X	18	11-12-7 N=19		15			
					X	7	5-7-9 N=16		20			
			5		X	12	5-8-6 N=14		16			
	8.5	1328.5										
	FILL - CLAYEY GRAVEL, with sand, dark reddish-brown (5YR 3/4)		10		■	11			28	92	71-23-48	41
	13.5	1323.5										
	FILL - LEAN TO FAT CLAY, with chert gravel, dark red (2.5YR 3/6)		15		X	4			16			
	18.5	1318.5										
	FILL - FAT CLAY, trace chert gravel, light olive-brown (2.5Y 5/4) and yellowish-red (5YR 5/8)				X	18			24			
	20.0	1317	20									
	Boring Terminated at 20 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/10/2013	Boring Completed: 9/10/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-12

BORING LOG NO. BW-202

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.358865° Longitude: -94.176971°

Surface Elev.: 1306.7 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), with sand, dark grayish-brown (10YR 4/2), medium dense				X	14	4-5-6 N=11		18			
					X	7	4-6-6 N=12		21		35-18-17	34
	(with chert seams below 5.5 feet)		5		X	8	28-50/3"		8			
8.5		1298										
	SILTY SAND (SM), with chert gravel, dark reddish-brown (2.5YR 3/4) and strong brown (7.5YR 5/6), medium dense		10		X	17	5-14-14 N=28		36		79-40-39	42
13.5		1293		▽								
	FAT CLAY (CH), with chert gravel, dark reddish-brown (2.5YR 3/4), medium stiff		15		X	18	4-3-5 N=8		59			
18.5		1288										
	SILTY CHERT GRAVEL (GM), with sand, strong brown (7.5YR 4/6), loose		20	▽	X	18	2-1-2 N=3		65		53-39-14	34
23.5		1283										
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 3/4), medium stiff to stiff				X	18	6-4-6 N=10		49			
25.0		1281.5	25									
	Boring Terminated at 25 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *13.5 ft while drilling*

▽ *20 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/9/2013	Boring Completed: 10/9/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-13

BORING LOG NO. BW-203

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.359119° Longitude: -94.177367°

Surface Elev.: 1340.5 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
FILL - CLAYEY CHERT GRAVEL, reddish-brown (5YR 4/4)				X	7	5-17-5 N=22		9			
5.0	1335.5	5									
FILL - SANDY FAT CLAY, with chert gravel, light gray (10YR 7/1), reddish-brown (5YR 4/4), and red (2.5YR 4/6)				X	15	4-6-8 N=14		19			53
				X	10	9-10-14 N=24		17			
		10									
				X	10	4-50/5"		21			
		15									
18.5	1322										
FILL - SANDY FAT CLAY, trace chert gravel, light gray (10YR 7/1), reddish-brown (5YR 4/4), and red (2.5YR 4/6)				X	17	4-5-8 N=13		29		53-23-30	66
		20									
				X	15	7-9-10 N=19		19			
		25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

38.5 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013	Boring Completed: 10/6/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-14

BORING LOG NO. BW-203

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.359119° Longitude: -94.177367°

Surface Elev.: 1340.5 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - SANDY FAT CLAY, trace chert gravel, light gray (10YR 7/1), reddish-brown (5YR 4/4), and red (2.5YR 4/6) *(continued)*				X	17	7-13-11 N=24		24		52-23-29	
			30									
33.5		1307										
	LEAN TO FAT CLAY (CL-CH), trace sand, strong brown (7.5YR 5/8), stiff				X	18	3-5-5 N=10		19			
			35									
38.5		1302		▽								
	FAT CLAY (CH), with chert seams, reddish-brown (5YR 4/4), stiff				X	9	10-50/3"		24			
			40									
43.5		1297										
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and reddish-brown (5YR 4/4), dense				X	15	11-15-15 N=30		32			
45.0		1295.5	45									
	Boring Terminated at 45 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *38.5 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/6/2013	Boring Completed: 10/6/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-14

BORING LOG NO. BW-204

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.359367° Longitude: -94.177315°

Surface Elev.: 1339.9 (Ft.)

DEPTH / ELEVATION (Ft.) — Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
FILL - LEAN TO FAT CLAY, with chert gravel, reddish-brown (5YR 4/4) to strong brown (7.5YR 4/6)										
			X	8	2-4-6 N=10		14			
	5		X	14	2-5-5 N=10		24			
8.5 — 1331.5										
FILL - CLAYEY SAND, with chert gravel, reddish-brown (5YR 4/4)			X	14	4-5-5 N=10		30		50-22-28	40
	10									
			X	13	3-5-5 N=10		22			
	15									
			X	10	5-15-15 N=30		23			
	20									
23.5 — 1316.5										
FILL - CHERTY FAT CLAY, reddish-brown (5YR 4/4)			X	18	4-10-16 N=26				63-25-38	
	25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 6.5 feet
Wash Bore below 6.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

none to 6.5 feet while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/9/2013	Boring Completed: 10/9/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-15

BORING LOG NO. BW-204

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.359367° Longitude: -94.177315°

Surface Elev.: 1339.9 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**FILL - CHERTY FAT CLAY**, reddish-brown (5YR 4/4) *(continued)*	1311.5										
33.5	**FILL - CLAYEY CHERT GRAVEL**, reddish-brown (5YR 4/4)	1306.5	30		X	16	26-10-12 N=22		30			
38.5	**SILTY CLAY (CL-ML)**, with sand, trace chert gravel, dark grayish-brown (10YR 4/2), medium stiff	1301.5	35		X	18	4-3-2 N=5		22		24-19-5	75
48.5	**CLAYEY CHERT GRAVEL (GC)**, reddish-brown (5YR 4/4) and strong brown (7.5YR 5/6), dense	1291.5	40		X	13	11-23-19 N=42		26			
			45		X	15	8-20-12 N=32		28			
50.0	**CLAYEY CHERT GRAVEL (GC)**, strong brown (7.5YR 4/6), medium dense	1290	50		X	18	8-10-6 N=16		60			
	Boring Terminated at 50 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 6.5 feet
Wash Bore below 6.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
none to 6.5 feet while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/9/2013	Boring Completed: 10/9/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-15

PIEZOMETER LOG NO. BW-205

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION: See Exhibit A-2

Latitude: 36.359579° Longitude: -94.176897°

Surface Elev.: 1308.6 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)
0–5.0	**CHERTY LEAN CLAY (CL)**, with sand, dark yellowish-brown (10YR 4/4), stiff (with chert seams below 2 feet)	1303.5
5.0–8.5	**SANDY FAT CLAY (CH)**, with chert gravel, dark reddish-brown (2.5YR 3/4) and light gray (10YR 7/1), stiff to very stiff	1300
8.5–13.5	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 3/4), medium stiff	1295
13.5–18.5	**SILTY CHERT GRAVEL (GM)**, with sand, red (2.5YR 5/8) to strong brown (7.5YR 5/8), medium dense	1290
18.5–20.0	**CHERTY LEAN CLAY (CL)**, strong brown (7.5YR 5/8) to reddish-yellow (7.5YR 6/6), stiff	1288.5

Boring Terminated at 20 Feet

INSTALLATION DETAILS: Cement Grout; Bentonite; Riser 2" PVC; Sand 10/20 Silica; Screen 2" PVC 0.01 Slot; Well Cap

Sample	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	17	4-4-9 N=13		24		39-19-20	53
2	5	46-50/1"					
3	18	16-27-18 N=45		28		75-34-41	52
4	5	4-2-3 N=5		42			
5	18	6-5-6 N=11		53		55-37-18	32
6	18	5-4-5 N=9		55			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

18 ft while drilling
18 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/8/2013	Boring Completed: 10/8/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-16

BORING LOG NO. BW-206

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 0° Longitude: 0° DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Boring BW-206 was not drilled due to the presence of underground utilities and/or drill rig access constrains ***Boring Terminated at 0.01 Foot***										

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:	See Exhibit A-3 for description of field procedures. See Appendix B for description of laboratory procedures and additional data (if any). See Appendix D for explanation of symbols and abbreviations.	Notes:
Abandonment Method:		

WATER LEVEL OBSERVATIONS	Terracon	Boring Started:	Boring Completed:
	9522 East 47th Place, Unit D Tulsa, Oklahoma	Drill Rig:	Driller:
		Project No.: 04135111	Exhibit: A-17

BORING LOG NO. BW-301

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.360357° Longitude: -94.177703°

Surface Elev.: 1342.2 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	SAMPLE DEPTH (Ft.) (approx.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - CLAYEY CHERT GRAVEL, light gray (10YR 7/1) and dark yellowish-brown (10YR 4/6)				X	8	10-15-14 N=29		11			
2.0		1340										
	FILL - FAT CLAY, dark reddish-brown (2.5YR 2.5/4)				X	12	7-9-7 N=16		20			
	(with chert gravel, stiff below 5 feet)		5		X	10	3-4-4 N=8		22			
8.5		1333.5										
	FILL - CLAYEY CHERT GRAVEL, with sand, light gray (10YR 7/1) and dark reddish-brown (2.5YR 2.5/4)		10		X	12	4-9-8 N=17		26		62-23-39	42
13.5		1328.5										
	FILL - FAT CLAY, dark reddish-brown (2.5YR 2.5/4)		15		X	16	3-4-7 N=11		22			
			20		X	15	4-4-6 N=10		25			
23.5		1318.5										
	FILL - CHERTY FAT CLAY, dark reddish-brown (2.5YR 2.5/4)		25		X	8	5-13-8 N=21		16			
26.0		1316										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 57 feet
Diamond Core Bit below 57 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

50 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/17/2013	Boring Completed: 9/17/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-18

BORING LOG NO. BW-301

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.360357° Longitude: -94.177703°

Surface Elev.: 1342.2 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN TO FAT CLAY (CL-CH), with silt, trace sand, dark olive-brown (2.5Y 3/3), medium stiff *(continued)*											
			30		X	12	1-3-3 N=6		24			
33.5		1308.5										
	LEAN CLAY (CL), trace sand, yellowish-red (5YR 5/8) and light olive-brown (2.5Y 5/6), stiff		35		X	16	1-2-9 N=11		27		36-21-15	89
38.5		1303.5										
	FAT CLAY (CH), with chert seams, dark reddish-brown (2.5YR 2.5/4), stiff to very stiff		40		X	15	12-21-50/5"		38			
43.5		1298.5										
	FAT CLAY (CH), trace chert gravel, yellowish-red (5YR 5/8), medium stiff		45		X	16	2-2-5 N=7		51			
48.5		1293.5										
	CHERTY FAT CLAY (CH), reddish-yellow (5YR 5/8), medium stiff to stiff		50	▽	X	10	5-5-6 N=11		44			
	(reddish-brown (5YR 4/4) below 53.5 feet)				X	8						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 57 feet
Diamond Core Bit below 57 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *50 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/17/2013	Boring Completed: 9/17/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-18

BORING LOG NO. BW-301

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.360357° Longitude: -94.177703°

Surface Elev.: 1342.2 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY FAT CLAY (CH), reddish-yellow (5YR 5/8), medium stiff to stiff *(continued)*		55		Split spoon	8	3-9-3 N=12		79			
56.5		1285.5										
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		60		Rock core		REC=100% RQD=100%	7,910				
			65		Rock core		REC=100% RQD=97%					
67.0		1275										

Boring Terminated at 67 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 57 feet
Diamond Core Bit below 57 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *50 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/17/2013	Boring Completed: 9/17/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-18

PIEZOMETER LOG NO. BW-302

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION: See Exhibit A-2

Latitude: 36.360602° Longitude: -94.177983°

Surface Elev.: 1314.7 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	INSTALLATION DETAILS
0 – 5.5	**LEAN CLAY**, trace sand, dark brown (10YR 3/3) to dark yellowish-brown (10YR 4/6), medium stiff to stiff	1309	Cement Grout; Bentonite
5.5 – 13.5	**LEAN TO FAT CLAY (CL-CH)**, yellowish-red (5YR 5/6) to light gray (10YR 7/1), stiff to very stiff (with chert seams below 8.5 feet)	1301	Riser 2" PVC; Sand 10/20 Silica
13.5 – 23.5	**FAT CLAY (CH)**, with chert gravel, dark reddish-brown (2.5YR 2.5/4) to yellowish-red (5YR 5/8), stiff	1291	
23.5 –	**FAT CLAY (CH)**, with chert gravel, reddish-yellow (5YR 5/8), medium stiff		Screen 2" PVC 0.01 Slot

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
10	4-7-7 N=14		16		31-20-11	87
10	3-4-4 N=8		21			
12					34-18-16	92
16	6-15-15 N=30		22			
1	N=50/4"		11			
16	7-5-5 N=10		50		83-30-53	77
4	6-2-8 N=10		29			
12	3-3-3 N=6		64			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 29.5 feet
Diamond Core Bit below 29.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
20 ft while drilling
13 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/17/2013	Boring Completed: 9/17/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-19

PIEZOMETER LOG NO. BW-302

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION: See Exhibit A-2

Latitude: 36.360602° Longitude: -94.177983°

Surface Elev.: 1314.7 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	Well	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5		1286	Well Cap										
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1)						0	N=50/2"					
				30					10,930				
								REC=100% RQD=90%					
				35									
								REC=100% RQD=98%					
39.5		1275											
	Boring Terminated at 39.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 29.5 feet
Diamond Core Bit below 29.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
20 ft while drilling
13 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/17/2013	Boring Completed: 9/17/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-19

BORING LOG NO. BW-303

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.360861° Longitude: -94.177908°

Surface Elev.: 1316 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, mottled brown (10YR 4/3) and light olive-brown (2.5Y 5/3), stiff				Split spoon	18	2-2-11 N=13		19			
					Split spoon	18	4-4-5 N=9		24			
			5		Shelby tube	18			21	102	41-17-24	91
7.0	**CLAYEY CHERT GRAVEL (GC)**, dark red (2.5YR 3/6) and light gray (10YR 7/1), dense	1309			Split spoon	18	6-14-19 N=33		22			
			10		Split spoon	12	19-14-19 N=33		26			
			15		Split spoon	12	4-20-12 N=32		12			
18.5	**CHERTY FAT CLAY (CH)**, yellowish-red (5YR 5/8), medium stiff	1297.5	20	▼	Split spoon	12	5-3-2 N=5		33			
23.5	**FAT CLAY (CH)**, with chert and highly weathered chert gravel, yellowish-red (5YR 5/8) and pale brown (10YR 6/3)	1292.5	25		Split spoon	12	6-3-5 N=8		47			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8 feet
Hollow Stem Auger below 8 feet
Diamond Core Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *19.5 ft while drilling*

▼ *19.5 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/26/2013	Boring Completed: 8/26/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-20

BORING LOG NO. BW-303

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.360861° Longitude: -94.177908°

Surface Elev.: 1316 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), with chert and highly weathered chert gravel, yellowish-red (5YR 5/8) and pale brown (10YR 6/3) *(continued)*											
29.0		1287			Split spoon	9	5-50/5"		46			
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		30		Core		REC=97% RQD=97%	9,070				
			35		Core		REC=100% RQD=97%					
40.0		1276	40									

Boring Terminated at 40 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8 feet
Hollow Stem Auger below 8 feet
Diamond Core Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- ▽ *19.5 ft while drilling*
- ▼ *19.5 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/26/2013	Boring Completed: 8/26/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-20

BORING LOG NO. BW-304

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361109° Longitude: -94.177834°

Surface Elev.: 1315.4 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		LEAN CLAY (CL), trace sand, mottled brown (10YR 4/3) and olive-brown (2.5Y 4/4), medium stiff		X	12	1-2-4 N=6		21			
				■	18			17	113	37-20-17	91
				X	18	2-3-5 N=8		21			
5.0	1310.5	**CLAYEY CHERT GRAVEL (GC)**, with sand and brown clay pockets, gray (10YR 6/1) to yellowish-red (5YR 5/8), medium dense		X	18	7-9-18 N=27					
8.5	1307	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and yellowish-red (5YR 5/8), very dense (recovery not recorded)		X		21-22-30 N=52		18			
				X	6	N=50/6"		14			
18.5	1297	**FAT CLAY (CH)**, trace chert gravel (moisture content taken from soil cuttings), yellowish-red (5YR 5/8), medium stiff to stiff		X	0	4-5-5 N=10					
		(recovery not recorded)		X		10-8-8 N=16		47			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8.5 feet
Hollow Stem Auger below 8.5 feet
Diamond Core Bit below 29 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
none to 8.5 feet while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/27/2013	Boring Completed: 8/27/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-21

BORING LOG NO. BW-304

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361109° Longitude: -94.177834°

Surface Elev.: 1315.4 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), trace chert gravel (moisture content taken from soil cuttings), yellowish-red (5YR 5/8), medium stiff to stiff *(continued)*											
29.0		1286.5				3	6-50/0" N=50/0"		26			
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		30					9,760				
							REC=100% RQD=95%					
			35				REC=100% RQD=95%					
39.0		1276.5										
	Boring Terminated at 39 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8.5 feet
Hollow Stem Auger below 8.5 feet
Diamond Core Bit below 29 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
none to 8.5 feet while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/27/2013	Boring Completed: 8/27/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-21

BORING LOG NO. BW-305

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361367° Longitude: -94.177741°

Surface Elev.: 1315 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	WATER LEVEL OBSERVATIONS	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), with sand, dark yellowish-brown (10YR 4/4), soft to medium stiff			12	0-2-2 N=4		20			
				18	3-2-3 N=5		20		35-17-18	83
5.0		1310								
	LEAN CLAY (CL), trace sand, reddish-brown (5YR 5/3) and gray (5YR 6/1), stiff to very stiff			18			21	101	41-19-22	90
				18	5-7-9 N=16		24			
9.0		1306								
	CLAYEY GRAVEL (GC), with sand and chert seams, yellowish-red (5YR 4/6) and dark gray (5YR 4/1), dense to medium dense		▼ (10 ft)	17	14-32-50/5"		21			
				12			18	99	45-17-28	41
14.5		1300.5								
	FAT CLAY (CH), with chert gravel, dark reddish-brown (5YR 3/4) and light gray (10YR 7/1), very stiff			18	15-12-12 N=24		41		78-29-49	71
18.5		1296.5								
	FAT CLAY (CH), with chert gravel, yellowish-red (5YR 5/8), stiff		▽ (19 ft)	16	5-6-7 N=13		54			
				12	7-6-7 N=13		43			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8.5 feet
Hollow Stem Auger below 8.5 feet
Diamond Core Bit below 29.5 feet

Abandonment Method:
Backfilled with cuttings above 4’; grouted 4’ to 14’; backfilled with cuttings from 14’ to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *19 ft while drilling*
▼ *10 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/27/2013	Boring Completed: 8/27/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-22

BORING LOG NO. BW-305

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361367° Longitude: -94.177741°

Surface Elev.: 1315 (Ft.)

GRAPHIC LOG	DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FAT CLAY (CH), with chert gravel, yellowish-red (5YR 5/8), stiff *(continued)*											
	29.0	(very soft below 28.5 feet)	1286				6	0-50/0" N=50/0"		42			
		CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		30				REC=100% RQD=93%					
				35				REC=98% RQD=92%					
	39.5		1275.5										
		Boring Terminated at 39.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8.5 feet
Hollow Stem Auger below 8.5 feet
Diamond Core Bit below 29.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
19 ft while drilling
10 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/27/2013	Boring Completed: 8/27/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-22

BORING LOG NO. BW-306

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.36163° Longitude: -94.17776° DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Boring BW-306 was not drilled due to the presence of underground utilities and/or drill rig access constrains ***Boring Terminated at 0.01 Foot***										

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:	See Exhibit A-3 for description of field procedures. See Appendix B for description of laboratory procedures and additional data (if any). See Appendix D for explanation of symbols and abbreviations.	Notes:
Abandonment Method:		

WATER LEVEL OBSERVATIONS	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	Boring Started:	Boring Completed:
		Drill Rig:	Driller:
		Project No.: 04135111	Exhibit: A-23

BORING LOG NO. BW-307

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361872° Longitude: -94.177556°

Surface Elev.: 1315 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY, trace sand, brown (10YR 4/3), medium stiff to stiff				18	3-5-3 N=8		23			
3.5		1311.5			18			23	103	40-17-23	88
	LEAN CLAY, trace sand, yellowish-brown (10YR 5/8), stiff				18	3-8-7 N=15		20			
					18	5-5-6 N=11		26		35-18-17	92
8.5	**CLAYEY CHERT GRAVEL**, light olive-brown (2.5Y 5/4) and dark brown (10YR 3/3), dense to very dense	1306.5			18	12-43-19 N=62		42			
	(light olive-brown (2.5Y 5/4) and yellowish-red (5YR 5/8) below 13.5 feet)				12	29-18-14 N=32		17		56-21-35	47
18.5	**FAT CLAY (CH)**, trace chert gravel, dark reddish-brown (2.5YR 2.5/4), stiff	1296.5			18	6-7-7 N=14		40			
23.5	**SANDY FAT CLAY (CH)**, trace chert gravel, dark reddish-brown (2.5YR 2.5/4), stiff	1291.5			10	5-6-5 N=11		39			66

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 5 feet
Hollow Stem Auger below 5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

22 ft while drilling

16 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/28/2013	Boring Completed: 8/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-24

BORING LOG NO. BW-307

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361872° Longitude: -94.177556°

Surface Elev.: 1315 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDY FAT CLAY (CH), trace chert gravel, dark reddish-brown (2.5YR 2.5/4), stiff *(continued)*										
	(yellowish-red (5YR 5/8) below 28.5 feet)			X	18	6-7-7 N=14		42			
	30.0 — 1285	30									
	Boring Terminated at 30 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 5 feet
Hollow Stem Auger below 5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
22 ft while drilling
16 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/28/2013	Boring Completed: 8/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-24

BORING LOG NO. BW-308

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362152° Longitude: -94.177613°

Surface Elev.: 1322 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
0.0–2.0	**FILL - LEAN CLAY**, trace sand, brown (10YR 4/3)	1320
2.0–5.0	**FILL - LEAN TO FAT CLAY**, with gravel, brown (10YR 4/3) and reddish-brown (2.5YR 4/4)	1317
5.0–13.5	**LEAN CLAY (CL)**, trace sand, dark yellowish-brown (10YR 4/6), medium stiff to stiff (with cobbles below 8.5 feet)	1308.5
13.5–19.0	**CLAYEY CHERT GRAVEL (GC)**, red (2.5YR 4/6), very dense	1303
	Boring Terminated at 19 Feet	

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
6	3-5-5 N=10				29-18-11	86
12	4-4-3 N=7		31			
12	3-2-2 N=4		23		34-16-18	92
18	2-4-4 N=8		23			
14	13-32-23 N=55		18			
4	42-50/0" N=50/0"		30			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

10 ft while drilling

12 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2013
Boring Completed: 12/14/2013
Drill Rig: ATV
Driller: SB
Project No.: 04135111
Exhibit: A-25

BORING LOG NO. BW-309

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362413° Longitude: -94.177495°

Surface Elev.: 1323 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - LEAN CLAY, trace sand and chert gravel, brown (10YR 4/3)			▽	X	8	1-5-5 N=10		23			
					X	3	3-4-2 N=6					
5.0		1318	5									
	LEAN CLAY (CL), dark yellowish-brown (10YR 4/6), medium stiff				X	10	2-3-2 N=5		22			
8.5		1314.5										
	LEAN CLAY (CL), trace sand, brown (10YR 4/3), very soft				X	14	0-0-0 N=0		32		35-18-17	85
			10									
14.0		1309										
	CLAYEY CHERT GRAVEL (GC), red (2.5YR 4/6), dense to very dense				X	14	10-34-50/5"		20			
			15									
19.0		1304			X	5	N=50/5"		20			
	Boring Terminated at 18.9 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *2 ft while drilling*

▽ *2 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2013	Boring Completed: 12/14/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-26

BORING LOG NO. BW-401

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.360265° Longitude: -94.176748°

Surface Elev.: 1311.8 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**LEAN CLAY (CL)**, trace sand, brown (10YR 5/3), medium stiff	1310				14	6-4-4 N=8		17			
5.0	**LEAN TO FAT CLAY (CL-CH)**, with chert gravel, reddish-brown (2.5YR 4/4), very stiff	1307				14	3-5-13 N=18		23			
8.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and reddish-brown (2.5YR 4/4), very dense	1303.5	5			13	25-50/5"		14			
12.5	**CHERTY ELATIC SILT (MH)**, with sand, reddish-brown (2.5YR 4/4) and light gray (10YR 7/1), very stiff	1299.5	10			14	5-13-6 N=19		20		71-37-34	65
						10					64-33-31	
18.5	**FAT CLAY (CH)**, dark reddish-brown (2.5YR 2.5/4) to reddish-brown (5YR 4/4), stiff	1293.5		▽		13	2-4-4 N=8		52			
			15			18	4-3-7 N=10		64			
23.0	**CLAYEY CHERT GRAVEL (GC)**, with sand, reddish-brown (5YR 4/4) to brownish-yellow (10YR 6/6), loose	1289	20			10	11-5-4 N=9		49		54-19-35	35
						0	N=50/0"					
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		25				REC=89% RQD=56%	9,710				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 23 feet
Diamond Core Bit below 23 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *13 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/4/2013	Boring Completed: 10/4/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-27

BORING LOG NO. BW-401

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.360265° Longitude: -94.176748° Surface Elev.: 1311.8 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard *(continued)* 31.0 / 1281	30				REC=100% RQD=80%					
	Boring Terminated at 31 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 23 feet
Diamond Core Bit below 23 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *13 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/4/2013	Boring Completed: 10/4/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-27

BORING LOG NO. BW-402

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.360531° Longitude: -94.176734°

Surface Elev.: 1312.5 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**LEAN CLAY (CL)**, trace sand, brown (10YR 5/3), medium stiff	1310.5		X	18	2-2-2 N=4		21		28-17-11	90
5.0	**LEAN TO FAT CLAY (CL-CH)**, reddish-brown (2.5YR 4/4), medium stiff	1307.5		X	16	1-2-3 N=5		22			
13.5	**CLAYEY CHERT GRAVEL (GC)**, reddish-brown (2.5YR 4/4), dense	1299		X	18	7-14-20 N=34		20			
				X	11	10-42-23 N=65		11			
18.5	**CHERTY ELATIC SILT (MH)**, yellowish-red (5YR 5/8) and dark reddish-brown (2.5YR 2.5/4), stiff	1294		X	17	3-3-5 N=8		58		72-37-35	70
27.0	**CHERTY FAT CLAY (CH)**, (reddish-brown (5YR 4/4) below 18.5 feet), stiff to very stiff	1285.5	▽	X	6	11-8-8 N=16		43			
				X	18	7-3-5 N=8		40			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 27 feet
Diamond Core Bit below 27 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *19 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/3/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-28

BORING LOG NO. BW-402

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.360531° Longitude: -94.176734°

Surface Elev.: 1312.5 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard	30				REC=85% RQD=73%	11,490				
		35				REC=95% RQD=80%					
	37.0 / 1275.5					REC=100% RQD=100%					
	Boring Terminated at 37 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 27 feet
Diamond Core Bit below 27 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

19 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/3/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-28

BORING LOG NO. BW-403

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.360755° Longitude: -94.176725°

Surface Elev.: 1313.2 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, brown (10YR 5/3) to reddish-brown (5YR 4/4), medium stiff				X	16	2-2-3 N=5		22			
					X	18	2-3-4 N=7		23			
	(stiff below 5 feet)		5		X	18	3-5-10 N=15		19		41-19-22	89
8.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and reddish-brown (5YR 4/4), very dense	1304.5			X	7	10-50/5"		10			
			10									
				▽ (13 ft)								
13.5	**FAT CLAY (CH)**, with chert gravel, reddish-brown (5YR 4/4), very stiff	1299.5			X	11	2-13-7 N=20		32			
			15									
18.5	**CHERTY FAT CLAY (CH)**, reddish-brown (5YR 4/4) and yellowish-brown (10YR 5/8), very stiff	1294.5		▽ (19 ft)	X	11	6-13-5 N=18		46			
			20									
23.5	**FAT CLAY (CH)**, with chert gravel, reddish-brown (5YR 5/4), soft	1289.5			X	3	4-1-1 N=2		53			
			25									
27.0	(apparent hard cherty limestone at 27 feet)	1286			X	0	N=50/0"					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *19 ft while drilling*
▽ *13 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/3/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-29

BORING LOG NO. BW-403

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.360755° Longitude: -94.176725° Surface Elev.: 1313.2 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Boring Terminated at 27 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

19 ft while drilling
13 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/3/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-29

BORING LOG NO. BW-404

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.360955° Longitude: -94.176689°

Surface Elev.: 1314.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), brown (10YR 5/3), soft				Split spoon	14	1-1-1 N=2		23			
2.0		1312.5										
	LEAN CLAY (CL), trace sand, brown (10YR 5/3) to reddish-brown (5YR 4/4), medium stiff				Split spoon	18	3-4-4 N=8		21		28-18-10	93
			5		Shelby tube	19						
7.0		1307.5										
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and reddish-yellow (5YR 5/8), dense to very dense				Split spoon	7	40-50/2"		19			
					Split spoon	9	13-50/3"		11			
			10									
13.5		1301										
	CLAYEY CHERT GRAVEL (GC), reddish-brown (2.5YR 4/4), medium dense			▽	Split spoon	4	9-10-8 N=18		10			
			15									
18.5		1296										
	CHERTY FAT CLAY (CH), strong brown (7.5YR 5/6), medium stiff			▽	Split spoon	18	3-3-3 N=6		57			
			20									
					Split spoon	10	1-2-4 N=6					
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *20 ft while drilling*
▽ *15 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/3/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-30

BORING LOG NO. BW-404

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.360955° Longitude: -94.176689° Surface Elev.: 1314.5 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	28.0 (apparent hard cherty limestone at 28 feet) 1286.5				0	N=50/0"					
	Auger Refusal at 28 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

20 ft while drilling

15 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/3/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-30

BORING LOG NO. BW-405

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361165° Longitude: -94.176641°

Surface Elev.: 1314.3 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, dark yellowish-brown (10YR 4/6) to yellowish-brown (10YR 5/6), soft					14	1-1-2 N=3		27			
						10	1-2-2 N=4		17			
5.0		1309.5	5			9					35-18-17	91
	CLAYEY CHERT GRAVEL (GC), with sand, brownish-yellow (10YR 6/6), light gray (10YR 7/1), and reddish-brown (2.5YR 4/4), very dense to medium dense					17	10-35-50/5"		20			
			10	▽		12	7-7-15 N=22		15		67-31-36	35
13.5		1301										
	FAT CLAY (CH), with chert gravel, red (2.5YR 5/6), medium stiff		15			17	3-3-4 N=7		50			
				▽								
			20			18	3-4-3 N=7					
23.5		1291										
	CLAYEY CHERT GRAVEL (GC), with sand, yellowish-brown (10YR 5/4), loose					4	4-4-4 N=8		50			17
25.5		1289	25				N=50/0"					
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard							8,070				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 25.5 feet
Diamond Core Bit below 25.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *18 ft while drilling*

▽ *10 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/4/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-31

BORING LOG NO. BW-405

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.361165° Longitude: -94.176641°

Surface Elev.: 1314.3 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard *(continued)*	30				REC=100% RQD=78%					
	35.5 — 1279	35				REC=98% RQD=88%					
	Boring Terminated at 35.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 25.5 feet
Diamond Core Bit below 25.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *18 ft while drilling*

▽ *10 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/4/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-31

BORING LOG NO. BW-406

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.361397° Longitude: -94.176577°

Surface Elev.: 1315.2 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, dark yellowish-brown (10YR 4/6), soft				Split spoon	4	2-2-2 N=4		23			
2.0		1313										
	LEAN CLAY (CL), with sand, yellowish-red (5YR 4/6), stiff to very stiff				Shelby tube	14			16	102	37-19-18	91
			5		Split spoon	18	3-6-12 N=18		19			
6.0		1309										
	CHERTY LEAN CLAY (CL), with chert seams, yellowish-red (5YR 5/6), very stiff				Split spoon	18	8-23-28 N=51		17		37-21-16	70
					Split spoon	1	N=50/1"		8			
			10									
13.5		1301.5										
	CHERTY FAY CLAY (CH), reddish-brown (5YR 4/4), stiff				Split spoon	11	10-6-4 N=10		31			
			15									
18.5		1296.5										
	ELASTIC SILT (MH), with sand, trace chert gravel, red (2.5YR 4/6), soft				Split spoon	18	1-1-2 N=3		78		59-41-18	78
			20									
				▽ (22 ft)								
				▽ (23 ft)								
	(pale brown (10YR 6/3) below 23.5 feet)				Split spoon	18	3-3-1 N=4		59			
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *22 ft while drilling*

▽ *23 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/4/2013	Boring Completed: 10/4/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-32

BORING LOG NO. BW-406

PROJECT: 8th Street Widening Project - MSE Walls | **CLIENT: Burns & McDonell Engineering Company, Inc.**

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.361397° Longitude: -94.176577° Surface Elev.: 1315.2 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	27.3 (apparent hard cherty limestone at 27.3 feet) 1288 ***Auger Refusal at 27.3 Feet***				0	N=50/0"					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
22 ft while drilling
23 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/4/2013 | Boring Completed: 10/4/2013
Drill Rig: ATV | Driller: SB
Project No.: 04135111 | Exhibit: A-32

PIEZOMETER LOG NO. BW-407

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION: See Exhibit A-2

Latitude: 36.361617° Longitude: -94.176517°

Surface Elev.: 1315.8 (Ft.)

DEPTH (Ft.)	DESCRIPTION	ELEVATION (Ft.)
2.0	**LEAN CLAY (CL)**, yellowish-brown (10YR 5/6), soft	1314
5.0	**LEAN CLAY (CL)**, yellowish-brown (10YR 5/6) to brown (10YR 5/3), stiff	1311
8.5	**LEAN TO FAT CLAY (CL-CH)**, with chert gravel, dark reddish-brown (2.5YR 3/4)	1307.5
18.5	**SILTY SAND (SM)**, with chert seams, dark reddish-brown (2.5YR 3/4) and light gray (10YR 7/1), very dense	1297.5
23.5	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 3/4), stiff	1292.5
25.0	**CLAYEY CHERT GRAVEL (GC)**, pale brown (10YR 6/3) and brownish-yellow (10YR 6/6), medium dense	1291

Boring Terminated at 25

INSTALLATION DETAILS: Cement Grout; Bentonite; Riser 2" PVC; Sand 10/20 Silica; Screen 2" PVC 0.01 Slot; Well Cap

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
12	2-2-2 N=4		20		38-19-19	93
16	3-5-7 N=12		21			
20			24	96	43-20-23	
14	7-12-16 N=28		18			
13	7-13-50/2"		15			
8	17-16-50/4"		9		NP	15
15	2-4-6 N=10		70			
15	10-19-8 N=27		32			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not determined while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/4/2013	Boring Completed: 10/4/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-33

PIEZOMETER LOG NO. BW-407

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION: See Exhibit A-2 Latitude: 36.361617° Longitude: -94.176517° Surface Elev.: 1315.8 (Ft.) DEPTH ELEVATION (Ft.)		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not determined while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/4/2013	Boring Completed: 10/4/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-33

BORING LOG NO. BW-408

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361785° Longitude: -94.176333°

Surface Elev.: 1317.8 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, dark yellowish-brown (10YR 4/4), soft				X	16	2-2-2 N=4					
2.0		1316										
	LEAN CLAY (CL), reddish-brown (5YR 4/4), stiff				X	18	4-6-7 N=13		24		42-25-17	92
			5		■	17			15	110	44-18-26	89
7.0		1311										
	FAT CLAY (CH), with chert gravel, reddish-brown (5YR 4/4) to olive-brown (2.5Y 4/4), very stiff				X	18	6-9-15 N=24		22			
					X	18	10-12-13 N=25		28			
			10									
	(with chert seams below 14 feet)				X	16	5-37-50/6"		15			
			15									
	(with highly weathered chert fragments below 18.5 feet)				X	18	2-4-6 N=10		50			
20.0		1298	20									
	Boring Terminated at 20 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not determined while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/3/2013	Boring Completed: 10/3/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-34

BORING LOG NO. BW-409

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361996° Longitude: -94.176218°

Surface Elev.: 1317.8 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, dark yellowish-brown (10YR 4/4), medium stiff					18	1-3-5 N=8		22			
						21			10	105	36-22-14	93
4.0		1314										
	LEAN CLAY (CL), with chert gravel, strong brown (7.5YR 4/6), medium stiff to stiff		5			18	3-7-13 N=20					
						8	4-11-28 N=39		15		41-21-20	
						11	4-50/5"		19			
			10									
13.5		1304.5										
	CHERTY FAT CLAY (CH), with sand, dark reddish-brown (2.5YR 3/4), very stiff					11	10-18-10 N=28		20		67-21-46	63
			15									
18.5		1299.5										
	CHERTY FAT CLAY (CH), yellowish-red (5YR 5/6) to strong brown (7.5YR 4/6), stiff					18	3-5-7 N=12		59			
20.0		1298	20									
	Boring Terminated at 20 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/2/2013	Boring Completed: 10/2/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-35

BORING LOG NO. BW-501

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.361382° Longitude: -94.177482°

Surface Elev.: 1338.3 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**FILL - CLAYEY CHERT GRAVEL**, dark reddish-brown (2.5YR 2.5/4) to gray (10YR 6/1)	1336.5			X	8	12-14-7 N=21		13			
5.0	**FILL - LEAN TO FAT CLAY**, with chert gravel, reddish-yellow (5YR 5/8)	1333.5			X	10	7-5-5 N=10		20			
8.5	**FILL - SILTY CHERT GRAVEL**, with sand, light gray (10YR 7/1)	1330	5		X	8	15-25-12 N=37		14		NP	7
13.5	**FILL - FAT CLAY**, with chert gravel, dark reddish-brown (2.5YR 3/4)	1325	10		X	8	5-7-10 N=17		24			
18.5	**FILL - LEAN TO FAT CLAY**, with chert gravel, dark reddish-brown (2.5YR 3/4) and dark yellowish-brown (10YR 4/4)	1320	15		X	14	4-7-9 N=16		16			
20.0	**FILL - LEAN CLAY**, with sand and chert gravel, dark reddish-brown (2.5YR 3/4) and dark yellowish-brown (10YR 4/4)	1318.5	20		X	16	3-5-10 N=15		18		39-18-21	73
	Boring Terminated at 20 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/17/2013	Boring Completed: 9/17/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-36

BORING LOG NO. BW-502

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.361601° Longitude: -94.177406°

Surface Elev.: 1337.3 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)
0.0 – 2.0	**FILL - CHERTY LEAN CLAY**, yellowish-brown (10YR 5/4) and light gray (10YR 7/1)	1335.5
2.0 – 5.0	**FILL - FAT CLAY**, dark reddish-brown (2.5YR 2.5/4)	1332.5
5.0 – 13.5	**FILL - CLAYEY CHERT GRAVEL**, with sand, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1)	1324
13.5 – 18.5	**FILL - SILTY CHERT GRAVEL**, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1)	1319
18.5 – 23.5	**FILL - CLAYEY CHERT GRAVEL**, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1)	1314
23.5 –	**LEAN CLAY (CL)**, with sand, dark olive-brown (2.5Y 3/3), soft	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5–2		X	4	11-10-9 N=19		9			
2–3.5		X	10	3-5-5 N=10		23			
5–6		■	6					61-31-30	47
6–7.5		X	0	8-9-8 N=17					
8.5–10		X	14	4-8-9 N=17		21			
13.5–15		X	4	3-5-8 N=13		14		NP	50
18.5–20		X	9	4-11-16 N=27		24			
23.5–25		X	3	4-2-2 N=4		19			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *40 ft while drilling*
- *42 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/17/2013	Boring Completed: 9/17/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-37

BORING LOG NO. BW-502

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.361601° Longitude: -94.177406°

Surface Elev.: 1337.3 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**LEAN CLAY (CL)**, with sand, dark olive-brown (2.5Y 3/3), soft *(continued)*	1309										
33.5	**CLAYEY CHERT GRAVEL (GC)**, with sand, yellowish-brown (10YR 5/8) and reddish-brown (2.5YR 5/4), medium dense	1304	30		X	16	4-6-17 N=23		24		39-18-21	39
38.5	**CLAYEY CHERT GRAVEL (GC)**, reddish-brown (5YR 5/3) and light gray (10YR 7/1), dense	1299	35		X	16	15-16-18 N=34		20			
50.5	**FAT CLAY (CH)**, with highly weathered chert gravel, reddish-yellow (5YR 5/8), medium stiff to soft	1287	40	▽ (40 ft)	X	16	4-3-1 N=4		53			
				▽ (42 ft)								
			45		X	15	6-2-2 N=4		53			
			50		X	14	1-1-1 N=2		86			
51.1	**LIMESTONE INTERBEDDED WITH CHERT+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	1286			X	1	N=50/1"		51			

Boring Terminated at 51.1 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *40 ft while drilling*

▽ *42 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/17/2013	Boring Completed: 9/17/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-37

BORING LOG NO. BW-503

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.362088° Longitude: -94.177411°

Surface Elev.: 1315 (Ft.)

GRAPHIC LOG	DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2.0	3" Topsoil **LEAN CLAY (CL)**, with sand, olive-brown (2.5Y 4/3), very stiff	1313				18	3-9-12 N=21		13			
		LEAN CLAY (CL), trace sand and chert gravel, mottled olive-brown (2.5Y 4/3) to yellowish-brown (10YR 5/8), stiff					18	5-8-6 N=14		23		30-17-13	88
				5			18			20	98	39-20-19	83
							18	6-7-7 N=14		27			
	13.5	(with chert seams below 8.5 feet)	1301.5	10			6	N=50/6"		17			
	18.5	**CHERTY FAT CLAY (CH)**, reddish-brown (2.5YR 4/4) and strong brown (7.5YR 5/6), very stiff	1296.5	15			14	20-21-9 N=30		29			
	23.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and dark reddish-brown (2.5YR 2.5/4), medium dense	1291.5	20	▼ (22 ft)		18	5-6-6 N=12		68		101-32-69	30
		FAT CLAY (CH), with chert gravel, yellowish-red (5YR 5/6), stiff		25			18	5-3-3 N=6		45			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 6.5 feet
Hollow Stem Auger below 6.5 feet
Diamond Core Bit below 31 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

22 ft while drilling

22 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/28/2013	Boring Completed: 8/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-38

BORING LOG NO. BW-503

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362088° Longitude: -94.177411°

Surface Elev.: 1315 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**FAT CLAY (CH)**, with chert gravel, yellowish-red (5YR 5/6), stiff *(continued)*	1286.5										
31.0	**SILTY SAND (SM)**, with chert gravel, yellowish-red (5YR 5/6), loose	1284	30			12	5-2-5 N=7		56		49-30-19	45
41.0	**CHERTY LIMESTONE+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	1274	35				REC=97% RQD=83%	9,390				
			40				REC=97% RQD=93%					

Boring Terminated at 41 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 6.5 feet
Hollow Stem Auger below 6.5 feet
Diamond Core Bit below 31 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
22 ft while drilling
22 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/28/2013	Boring Completed: 8/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-38

BORING LOG NO. BW-504

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362306° Longitude: -94.177297°

Surface Elev.: 1315 (Ft.)

DEPTH	ELEVATION (Ft.)	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		LEAN CLAY (CL), with sand, yellowish-brown, stiff				14	3-5-5 N=10		20		43-18-25	83
						16						
3.5	1311.5	**FAT CLAY (CH)**, with chert gravel, yellowish-red (5YR 5/8) and gray (5YR 5/1), medium stiff to stiff				18	3-4-5 N=9		26			
			5			18	3-3-5 N=8		33			
8.5	1306.5	**CLAYEY CHERT GRAVEL (GC)**, with chert seams, yellowish-red (5YR 5/8) and light gray (10YR 7/1), dense to very dense				18	5-18-27 N=45		22			47
			10									
						6	N=50/6"		13			
			15									
						3	N=50/3"		26			
			20									
23.5	1291.5	**CHERTY LEAN TO FAT CLAY (CL-CH)**, dark reddish-brown (5YR 3/4), stiff				16	4-8-4 N=12		36		46-22-24	64
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 5 feet
Hollow Stem Auger below 5 feet
Diamond Core Bit below 33.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *23.5 ft while drilling*
▼ *16 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/28/2013	Boring Completed: 8/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-39

BORING LOG NO. BW-504

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362306° Longitude: -94.177297°

Surface Elev.: 1315 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**CHERTY LEAN TO FAT CLAY (CL-CH)**, dark reddish-brown (5YR 3/4), stiff *(continued)*	1286.5										
33.5	**CLAYEY CHERT GRAVEL (GC)**, yellowish-red (5YR 5/6), medium dense	1281.5	30			18	19-21-8 N=29		32			
40.0	**CHERTY LIMESTONE+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	1275	35				REC=89% RQD=66%					
							REC=94% RQD=90%	6,150				
	Boring Terminated at 40 Feet		40									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 5 feet
Hollow Stem Auger below 5 feet
Diamond Core Bit below 33.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

23.5 ft while drilling

16 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/28/2013	Boring Completed: 8/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-39

BORING LOG NO. BW-505

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.362531° Longitude: -94.177204°

Surface Elev.: 1315.7 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**LEAN CLAY (CL)**, with silt and sand, dark yellowish-brown (10YR 3/4), stiff	1313.5				6	2-5-6 N=11		20			
5.0	**FAT CLAY (CH)**, trace sand, dark yellowish-brown (10YR 4/6), medium stiff to stiff	1310.5				18	3-4-4 N=8		34		52-28-24	90
7.0	**LEAN CLAY (CL)**, with sand, yellowish-brown (10YR 5/6) to gray (10YR 5/3), stiff	1308.5	5			18			22	100	44-17-27	83
13.5	**CHERTY LEAN CLAY (CL)**, with sand, dark yellowish-brown (10YR 4/6), stiff to very stiff	1302				18	10-13-15 N=28		24			
			10			18	7-16-30 N=46		19		35-20-15	60
18.5	**FAT CLAY (CH)**, with chert seams, dark reddish-brown (2.5YR 2.5/4) to light gray (10YR 7/1), stiff to very stiff	1297	15			8	20-50/2"		27			
23.5	**CLAYEY CHERT GRAVEL (GC)**, yellowish-red (5YR 4/6), medium dense	1292	20			16	37-6-5 N=11		24			28
	FAT CLAY (CH), with chert gravel, yellowish-red (5YR 5/8), soft to medium stiff		25			18	5-3-2 N=5					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Power Auger to 8.5 feet
Hollow Stem Auger below 8.5 feet
Diamond Core Bit below 31 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not determined while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/27/2013 | Boring Completed: 8/27/2013

Drill Rig: ATV | Driller: DB

Project No.: 04135111 | Exhibit: A-40

BORING LOG NO. BW-505

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362531° Longitude: -94.177204°

Surface Elev.: 1315.7 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**FAT CLAY (CH)**, with chert gravel, yellowish-red (5YR 5/8), soft to medium stiff *(continued)*	1287										
			30			18	5-5-5 N=10					
31.0	**FAT CLAY (CH)**, with chert gravel, yellowish-red (5YR 5/8), medium stiff	1284.5										
32.3	**CHERTY LIMESTONE+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	1283.5					REC=39% RQD=25%					
35.5	(void from approximately 32.3 to 35.5 feet)	1280	35									
			40				REC=95% RQD=80%					
45.5	**CHERTY LIMESTONE+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	1270	45				REC=97% RQD=76%	5,260				

Boring Terminated at 45.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8.5 feet
Hollow Stem Auger below 8.5 feet
Diamond Core Bit below 31 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not determined while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/27/2013	Boring Completed: 8/27/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-40

BORING LOG NO. BW-506

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362769° Longitude: -94.177132°

Surface Elev.: 1316.6 (Ft.)

GRAPHIC LOG / DEPTH	DESCRIPTION	ELEVATION (Ft.)
	LEAN TO FAT CLAY (CL-CH), trace sand, reddish-brown (5YR 5/4) and grayish-brown (10YR 5/2), soft to medium stiff (stiff below 5 feet)	
8.5		1308
	CLAYEY CHERT GRAVEL (GC), gray (10YR 6/1) and (dark reddish-brown (2.5YR 3/4)	
18.5		1298
	SANDY SILT (ML), with chert gravel, (dark reddish-brown (2.5YR 3/4), stiff	

WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	X	2	2-2-2 N=4		31		45-17-28	87
	X	12	2-2-3 N=5		25			
	X	12	3-4-5 N=9		24			
	X	7	10-24-11 N=35		22			
	X	6	29-50/4"		25			
	X	10	14-20-11 N=31		43			
▽								
	X	8	2-2-13 N=15		55		41-29-12	53

DEPTH (Ft.): 5, 10, 15, 20, 25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 28.5 feet
Diamond Core Bit below 28.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *23 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/16/2013	Boring Completed: 12/16/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-41

BORING LOG NO. BW-506

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362769° Longitude: -94.177132°

Surface Elev.: 1316.6 (Ft.)

GRAPHIC LOG	DEPTH / MATERIAL DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDY SILT (ML), with chert gravel, (dark reddish-brown (2.5YR 3/4), stiff *(continued)*										
	28.5 — 1288				0	N=50/0"					
	LIMESTONE+, with chert, light gray (10YR 7/1) and gray (10YR 6/1), hard	30				REC=100% RQD=85%	10,020				
	33.5 — 1283										
	Boring Terminated at 33.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 28.5 feet
Diamond Core Bit below 28.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
23 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/16/2013	Boring Completed: 12/16/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-41

BORING LOG NO. BW-507

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362888° Longitude: -94.177008°

Surface Elev.: 1316 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)
	LEAN CLAY (CL), trace sand and chert gravel, reddish-brown (5YR 5/4) and dark yelowish-brown (10YR 4/6) to olive-brown (2.5Y 4/4), stiff	
8.5	**LEAN TO FAT CLAY (CL-CH)**, with chert gravel, reddish-brown (5YR 5/4), very stiff	1307.5
13.5	**CLAYEY CHERT GRAVEL (GC)**, gray (10YR 6/1) and reddish-brown (5YR 5/4), dense	1302.5
23.5	**CHERTY LEAN CLAY (CL)**, strong brown (7.5YR 5/6), medium stiff	1292.5

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
7	2-6-5 N=11		14			
12	3-5-8 N=13		17			
14	3-4-4 N=8		26		35-17-18	90
6	6-7-15 N=22		28			
10	11-30-10 N=40		37			15
6	9-6-4 N=10		37			
10	2-3-5 N=8		79			

DEPTH (Ft.): 5, 10, 15, 20, 25

Water level observation: ▽ at approx. 23 ft

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 28 feet
Diamond Core Bit below 28 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *23 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/16/2013	Boring Completed: 12/16/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-42

BORING LOG NO. BW-507

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362888° Longitude: -94.177008°

Surface Elev.: 1316 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.0		1288				0	N=50/0"					
	LIMESTONE+, with chert, light gray (10YR 7/1), hard		30				REC=100% RQD=92%	8,980				
			35				REC=100% RQD=83%					
38.0		1278					REC=100% RQD=88%					

Boring Terminated at 38 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 28 feet
Diamond Core Bit below 28 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

23 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/16/2013	Boring Completed: 12/16/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-42

BORING LOG NO. BW-508

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363113° Longitude: -94.176865°

Surface Elev.: 1317.6 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), reddish-brown (5YR 5/4) and dark yellowish-brown (10YR 4/6), stiff				X	7	2-4-4 N=8		18			
	(olive-brown (2.5Y 4/4) below 2 feet)				X	14	3-5-7 N=12		22		39-15-24	88
			5		X	12	4-6-5 N=11		22			
8.5	**CLAYEY CHERT GRAVEL (GC)**, gray (10YR 6/1) and reddish-brown (5YR 5/4), very dense	1309			X	6	48-50/1"		20			
			10									
					X	0	N=50/1"					
			15									
					X	3	10-12-6 N=18		16			
			20									
23.5	**CHERTY LEAN TO FAT CLAY (CL-CH)**, reddish-brown (5YR 5/4), medium stiff to stiff	1294			X	17	6-5-4 N=9		68			
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 30 feet
Diamond Core Bit below 30.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/17/2013 | Boring Completed: 12/17/2013
Drill Rig: ATV | Driller: SB
Project No.: 04135111 | Exhibit: A-43

BORING LOG NO. BW-508

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363113° Longitude: -94.176865°

Surface Elev.: 1317.6 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY LEAN TO FAT CLAY (CL-CH), reddish-brown (5YR 5/4), medium stiff to stiff *(continued)*			▽								
					Split spoon	0	3-15-8 N=23					
30.5		1287	30									
	LIMESTONE+, with chert, light gray (10YR 7/1), hard				Core		REC=100% RQD=83%	10,110				
35.5		1282	35									

Boring Terminated at 35.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 30 feet
Diamond Core Bit below 30.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/17/2013	Boring Completed: 12/17/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-43

BORING LOG NO. BW-509

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363266° Longitude: -94.176655°

Surface Elev.: 1318 (Ft.)

DEPTH	Description	ELEVATION (Ft.)
	LEAN CLAY (CL), trace sand, brown (10YR 4/3), medium stiff to stiff	
2.5	**LEAN CLAY (CL)**, with sand, yellowish-brown (10YR 5/6), very stiff	1315.5
8.5	**CLAYEY CHERT GRAVEL (GC)**, reddish-brown (2.5YR 4/4) and gray (10YR 6/1), very dense	1309.5
13.5	**CHERTY LEAN TO FAT CLAY (CL-CH)**, reddish-brown (2.5YR 4/4) and gray (10YR 6/1), very stiff	1304.5
18.5	**CLAYEY CHERT GRAVEL (GC)**, reddish-brown (2.5YR 4/4) and gray (10YR 6/1), very dense	1299.5
23.5	**LEAN TO FAT CLAY (CL-CH)**, with chert gravel, reddish-brown (2.5YR 4/4) and gray (10YR 6/1), medium stiff to stiff	1294.5

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
8	4-5-3 N=8		16		27-19-8	87
10	3-14-10 N=24		20			
12	5-10-16 N=26		14			
12	11-32-26 N=58		22			
2	4-12-12 N=24		42			
8	14-47-24 N=71		21			
0	5-4-5 N=9					

Depth scale (Ft.): 5, 10, 15, 20, 25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 35 feet
Diamond Core Bit below 35 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
28 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/17/2013	Boring Completed: 12/17/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-44

BORING LOG NO. BW-509

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.363266° Longitude: -94.176655°

Surface Elev.: 1318 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5		1289.5		▽								
	SILTY CHERT GRAVEL (GM), with sand, strong brown (7.5YR 5/6), loose		30		Split spoon	10	2-4-3 N=7		61		48-39-9	45
					Split spoon	5	10-9-1 N=10		30			
35.0	(possible void from 34.5 to 35 feet, on top of rock)	1283	35									
	LIMESTONE+, with chert, light gray (10YR 7/1), hard (100% water loss from 35 to 45 feet)				Rock core		REC=95% RQD=90%	7,780				
			40		Rock core		REC=100% RQD=78%					
45.0		1273	45									
	Boring Terminated at 45 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 35 feet
Diamond Core Bit below 35 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/17/2013	Boring Completed: 12/17/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-44

BORING LOG NO. BW-510

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363486° Longitude: -94.176935°

Surface Elev.: 1319.7 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN TO FAT CLAY (CL-CH), trace sand and chert gravel, brown (10YR 4/3), stiff				X	10	4-4-8 N=12		16			
	(very stiff, yellowish-brown (10YR 5/6) below 2 feet)				X	8	10-15-16 N=31		11		47-18-29	91
			5		X	12	9-13-15 N=28		16			
9.0	**CLAYEY CHERT GRAVEL (GC)**, reddish-brown (2.5YR 4/4) and gray (10YR 6/1), dense to very dense	1310.5			X	8	8-13-43 N=56		13			
			10									
			15		X	7	10-13-14 N=27		19			
			20		X	6	21-30-50/5"		15			25
23.5	**CHERTY FAT CLAY (CH)**, reddish-brown (2.5YR 4/4), medium stiff to stiff	1296			X	5	5-6-8 N=14		47			
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 35 feet
Diamond Core Bit below 35 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

33 ft while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/17/2013	Boring Completed: 12/17/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-45

BORING LOG NO. BW-510

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.363486° Longitude: -94.176935°

Surface Elev.: 1319.7 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY FAT CLAY (CH), reddish-brown (2.5YR 4/4), medium stiff to stiff *(continued)*				Split spoon	7	1-6-5 N=11		78			
			30									
33.5		1286		▽								
35.0	**SILTY CHERT GRAVEL (GM)**, very pale brown (10YR 7/3), dense	1284.5			Split spoon	5	10-16-14 N=30		41			
			35									
40.0	**LIMESTONE+**, with chert, light gray (10YR 7/1), hard	1279.5	40		Rock core		REC=100% RQD=95%	12,070				
	Boring Terminated at 40 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 35 feet
Diamond Core Bit below 35 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *33 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/17/2013	Boring Completed: 12/17/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-45

BORING LOG NO. BW-511

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363646° Longitude: -94.177241°

Surface Elev.: 1322.2 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), with sand, dark yellowish-brown (10YR 4/4), medium stiff to stiff		8	2-3-3 N=6		16			
			10	5-7-7 N=14		8		37-19-18	85
5.0	**LEAN TO FAT CLAY (CL-CH)**, trace chert gravel, dark yellowish-brown (10YR 4/4) to dark reddish-brown (2.5YR 3/4), very stiff	1317	24			19	106	46-23-23	89
			18	5-11-13 N=24		19			
			18	5-13-19 N=32		19		48-22-26	88
	(with chert seams below 10 feet)								
13.5	**FAT CLAY (CH)**, trace sand and chert gravel, reddish-brown (2.5YR 4/4), very stiff	1308.5	18	8-8-8 N=16		34			
			2	N=50/2"		25			
23.5	**CLAYEY SAND (SC)**, with chert gravel, reddish-brown (2.5YR 4/4), dense	1298.5	18	10-34-9 N=43		26		58-24-34	21

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 10 feet
Wash Bore below 10 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

none to 10 feet while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/8/2013	Boring Completed: 10/8/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-46

BORING LOG NO. BW-511

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363646° Longitude: -94.177241°

Surface Elev.: 1322.2 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY SAND (SC), with chert gravel, reddish-brown (2.5YR 4/4), dense *(continued)*											
	28.5	1293.5										
	CHERTY LEAN TO FAT CLAY (CL-CH), reddish-brown (2.5YR 4/4) to strong brown (7.5YR 5/6), stiff				X	9	9-7-4 N=11		31			
			30									
	33.5	1288.5										
	SILTY SAND (SM), with chert gravel, reddish-brown (2.5YR 4/4), loose to medium dense				X	6	2-8-2 N=10		18		NP	25
			35									
	(apparent hard cherty limestone at 37 feet)											
	38.5	1283.5			X	0	N=50/0"					
	Boring Terminated at 38.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 10 feet
Wash Bore below 10 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
none to 10 feet while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/8/2013	Boring Completed: 10/8/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-46

PIEZOMETER LOG NO. BW-512

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION: See Exhibit A-2

Latitude: 36.363655° Longitude: -94.177484°

Surface Elev.: 1323.1 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)
2.0	**LEAN CLAY (CL)**, trace sand, brown (10YR 4/3), soft	1321
8.0	**LEAN CLAY (CL)**, trace sand, dark yellowish-brown (10YR 4/4) to brown (10YR 5/3), stiff	1315
12.5	**FAT CLAY (CH)**, with sand, reddish-brown (2.5YR 4/4) to reddish-gray 2.5YR (5/1), stiff to very stiff (with chert seams below 9 feet)	1310.5
23.5	**CLAYEY CHERT GRAVEL (GC)**, with sand, light gray (10YR 7/1) and strong brown (7.5YR 5/6), very dense	1299.5
	SILT (ML), with sand and chert gravel, dark reddish-brown (2.5YR 3/4) and strong brown (7.5YR 5/6), medium stiff	

INSTALLATION DETAILS: Cement Grout; Bentonite; Riser 2" PVC; Sand 10/20 Silica

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
11	2-2-2 N=4		16		30-17-13	88
12	2-5-5 N=10		12			
18	5-6-7 N=13		20			
11			10	113	52-22-30	72
16	29-50/3"		21			
11	21-50/5"		10			
13	5-12-14 N=26		12		61-27-34	31
18	1-2-3 N=5		75			

DEPTH (Ft.): 5, 10, 15, 20, 25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

23 ft while drilling
28 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/8/2013	Boring Completed: 10/8/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-47

PIEZOMETER LOG NO. BW-512

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION: See Exhibit A-2

Latitude: 36.363655° Longitude: -94.177484°

Surface Elev.: 1323.1 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	WELL	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILT (ML), with sand and chert gravel, dark reddish-brown (2.5YR 3/4) and strong brown (7.5YR 5/6), medium stiff *(continued)*	Screen 2" PVC 0.01 Slot	30			18	2-4-3 N=7		69		48-38-10	80
	33.5 (apparent hard, weathered cherty limestone at 33 feet) 1289.5	Well Cap				0	N=50/0"					
	Boring Terminated at 33.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

23 ft while drilling

28 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/8/2013	Boring Completed: 10/8/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-47

BORING LOG NO. BW-513

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363472° Longitude: -94.177841°

Surface Elev.: 1319 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, dark yellowish-brown (10YR 4/4), medium stiff to stiff				X	10	2-2-2 N=4		17			
					X	12	2-4-5 N=9		17		42-19-23	88
5.0		1314	5									
	FAT CLAY (CH), with chert gravel, red (2.65YR 4/6), very stiff				X	12	7-10-10 N=20		18			
	(with chert seams below 9 feet)				X	10	12-50/4"		30			
			10									
13.5		1305.5										
	CHERTY FAT CLAY (CH), red (2.65YR 4/6), stiff				X	8	6-6-5 N=11		35			
			15									
					X	8	4-10-7 N=17		22			
			20									
					X	10	2-4-4 N=8		73			
25.0		1294	25									
	Boring Terminated at 25 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/16/2014	Boring Completed: 12/16/2014
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-48

BORING LOG NO. BW-514

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363645° Longitude: -94.178111°

Surface Elev.: 1322.7 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)
0 – 5.0	**LEAN CLAY (CL)**, trace sand, dark yellowish-brown (10YR 4/4) (with chert gravel below 2 feet)	1317.5
5.0 – 8.5	**LEAN CLAY (CL)**, trace sand, motled dark yellowish-brown (10YR 4/4) and dark brown (10YR 3/3)	1314
8.5 – 18.5	**FAT CLAY (CH)**, grayish-brown (10YR 5/2) to yellowish-red (5YR 5/8), medium stiff to stiff (with chert seams below 13.5 feet)	1304
18.5 – 23.5	**CLAYEY CHERT GRAVEL (GC)**, yellowish-red (5YR 5/8) and gray (10YR 6/1), medium dense	1299
23.5 – 25.0	**FAT CLAY (CH)**, with highly weathered chert gravel, dark reddish-brown (2.5YR 2.5/4) and pale brown (10YR 6/3), stiff to very stiff	1297.5
	Boring Terminated at 25 Feet	

Stratum	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
LEAN CLAY (CL)		X	10	4-4-8 N=12		12		26-17-9	89
LEAN CLAY (CL)		X	4	6-6-6 N=12		12			
LEAN CLAY (CL)		X	8	2-3-4 N=7		17			
FAT CLAY (CH)		X	16	5-4-4 N=8		26			
FAT CLAY (CH)		X	5	N=50/5"		14			
CLAYEY CHERT GRAVEL (GC)		X	6	10-11-11 N=22		18			
FAT CLAY (CH)		X	15	4-7-10 N=17		66			

Depth scale (Ft.): 5, 10, 15, 20, 25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/28/2013	Boring Completed: 9/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-49

BORING LOG NO. BW-515

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363671° Longitude: -94.178632°

Surface Elev.: 1319.1 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2.0	**FILL - LEAN CLAY**, trace limestone gravel, dark brown (10YR 3/3)	1317				6	13-13-9 N=22		16			
	5.0	**LEAN CLAY (CL)**, trace chert gravel, dark brown (10YR 3/3)	1314	5			8	4-6-8 N=14		17		36-18-18	94
	6.5	**SILTY CLAY (CL-ML)**, trace sand, dark brown (10YR 3/3)	1312.5				16					22-18-4	88
	8.5	**CHERTY FAT CLAY (CH)**, dark brown (10YR 3/3) and gray (10YR 6/1)	1310.5				6	5-8-6 N=14		20			
	13.5	**FAT CLAY (CH)**, with chert seams, dark reddish-brown (2.5YR 2.5/4), stiff to very stiff	1305.5	10			12	4-18-50/1"		36			
	18.5	**CLAYEY CHERT GRAVEL (GC)**, yellowish-red (5YR 5/8), gray (10YR 6/1), and yellowish-brown (10YR 5/6), very dense	1300.5	15			4	30-50/3"		19			
	23.5	**FAT CLAY (CH)**, with chert gravel, dark reddish-brown (2.5YR 2.5/4), medium stiff	1295.5	20			13	10-4-2 N=6		68			
	26.1	**CLAYEY CHERT GRAVEL (GC)**, pale brown (10YR 6/3), loose	1293	25	▼ ▽ ▽		5	8-3-2 N=5		20			
							0	N=50/1"					
		(apparent hard limestone at 26 feet)											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- ▽ *25 ft while drilling*
- ▽ *24.5 ft after boring*
- ▼ *24 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/28/2013	Boring Completed: 9/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-50

BORING LOG NO. BW-515

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.363671° Longitude: -94.178632° Surface Elev.: 1319.1 (Ft.) DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Boring Terminated at 26.1 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *25 ft while drilling*
- *24.5 ft after boring*
- *24 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/28/2013	Boring Completed: 9/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-50

BORING LOG NO. BW-601

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362491° Longitude: -94.175976°

Surface Elev.: 1318.7 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**LEAN CLAY (CL)**, trace sand, dark yellowish-brown (10YR 4/4), soft	1316.5				15	2-1-2 N=3		21			
	LEAN CLAY (CL), trace sand, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/4), medium stiff					18	2-3-5 N=8		21		35-18-17	
7.0	(reddish-brown (5YR 4/4) and gray (5YR 5/1) below 5 feet)	1311.5	5			24			20	105	33-16-17	88
	CLAYEY CHERT GRAVEL (GC), yellowish-brown (10YR 5/8) and yellowish-red (5YR 4/6), very dense					14	4-42-33 N=75		20			
13.5		1305	10			11	13-10-25 N=35		13			
18.5	**SILTY CHERT GRAVEL (GM)**, with sand, yellowish-brown (10YR 5/8) and yellowish-red (5YR 4/6), medium dense	1300	15			8	21-14-11 N=25		10		NP	37
	CHERTY FAT CLAY (CH), red (2.5YR 4/6) and brownish-yellow (10YR 6/6), stiff to very stiff		20			16	5-9-8 N=17		41			
25.0		1293.5	25	▽		16	3-5-6 N=11		74			

Boring Terminated at 25 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *24.5 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/2/2013	Boring Completed: 10/2/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-51

BORING LOG NO. BW-602

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36269° Longitude: -94.17581°

Surface Elev.: 1319.8 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **LEAN CLAY (CL)**, trace sand, brown (10YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff				X	10	3-6-7 N=13		12			
					X	10	4-8-11 N=19		15		31-19-12	90
5.0	**FAT CLAY (CH)**, with chert fragments, reddish-brown (5YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff	1315	5		X	12	5-12-21 N=33		18			
8.5	**CHERTY FAT CLAY (CH)**, reddish-brown (5YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff	1311.5			X	3	50/6"					
			10									
					X	3	50/6"					
			15									
18.5	**FAT CLAY (CH)**, with sand and chert fragments, reddish-brown (5YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff	1301.5			X	12	11-27-4 N=31		41		57-24-33	75
			20									
				▽								
			25	▽	X	12	3-8-2 N=10		66			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *23.5 ft while drilling*
▽ *25 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-52

BORING LOG NO. BW-602

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.36269° Longitude: -94.17581° Surface Elev.: 1319.8 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), with sand and chert fragments, reddish-brown (5YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff *(continued)* - becoming yellow (10YR,8/6) and reddish-brown (5YR,5/3) below 28.5 feet				7	5-7-6 N=13		50			
	31.0 — 1289	30									
	31.6 **LIMESTONE+**, very pale brown (10YR,8/3), hard — 1288				0	50/1"					
	Auger Refusal at 31.6 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- *23.5 ft while drilling*
- *25 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-52

BORING LOG NO. BW-603

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36289° Longitude: -94.17565°

Surface Elev.: 1321 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SANDY LEAN CLAY (CL), brown (10YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff				Split spoon	10	3-3-5 N=8		11			
					Split spoon	10	4-7-10 N=17		13			
5.0	**LEAN CLAY (CL)**, with sand, brown (10YR,5/3) and yellowish-brown (10YR,5/8), very stiff	1316	5		Split spoon	12	5-9-12 N=21		18		39-19-20	81
8.5	**FAT CLAY (CH)**, with chert fragments, reddish-brown (5YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff	1312.5			Split spoon	18	15-16-18 N=34		23			
			10									
	- becoming reddish-brown (5YR,5/3) below 13.5 feet				Shelby tube	13			42		80-32-48	88
			15		Split spoon	10	11-14-25 N=39		25			
	- becoming reddish-brown (5YR,5/3) and light gray (10YR,7/1) below 18.5 feet				Split spoon	4	50/5"		22			
			20									
23.5	**CLAYEY CHERTY GRAVEL (GC)**, with sand, very pale brown (10YR,8/4) and brown (10YR,5/3), medium dense	1297.5	25		Split spoon	8	12-13-12 N=25		13		68-27-41	31

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

28.5 ft while drilling

27.5 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-53

BORING LOG NO. BW-603

PROJECT: 8th Street Widening Project - MSE Walls

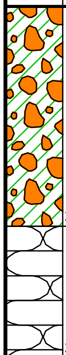
CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36289° Longitude: -94.17565°

Surface Elev.: 1321 (Ft.)



DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERTY GRAVEL (GC), with sand, very pale brown (10YR,8/4) and brown (10YR,5/3), medium dense *(continued)*			▽ ▽								
					X	8	3-7-8 N=15		65			
			30									
32.0		1289										
	WEATHERED CHERT+, very pale brown (10YR,8/3), soft to hard											
					X	8	2-50/5"					
35.0		1286	35									

Auger Refusal at 35 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *28.5 ft while drilling*
▽ *27.5 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-53

BORING LOG NO. BW-604

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.36304° Longitude: -94.1754°

Surface Elev.: 1320.8 (Ft.)

DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
LEAN CLAY (CL), trace sand, brown (10YR,5/3), stiff to very stiff				X	10	6-5-5 N=10		9		29-18-11	94
- becoming brown (10YR/5/8) and yellowish-brown (10YR,5/8) below 2 feet				X	14	6-8-11 N=19		24			
		5		■	15			20	98	40-19-21	92
8.5	1312.5										
FAT CLAY (CH), with chert fragments, reddish-brown (5YR,5/3) and yellowish-brown (10YR,5/8), stiff to very stiff		10		X	14	3-6-8 N=14		20			
- becoming reddish-brown (5YR,4/4) below 13.5 feet		15		X	14	6-8-8 N=16		40			
			∇								
- with chert seams, becoming reddish-brown (5YR,4/8) and light gray (10YR,7/1) below 18.5 feet		20		X	8	9-25-50/1"		27			
		25		X	8	6-10-11 N=21		36			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 34.8 feet
Diamond Core Bit below 34.8 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

∇ *28.5 ft while drilling*

∇ *18 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-54

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 04135111 - BW.GPJ

BORING LOG NO. BW-604

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.36304° Longitude: -94.1754°

Surface Elev.: 1320.8 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	28.5 — 1292.5		▽								
	SILTY CHERT GRAVEL (GM), with sand, very pale brown (10YR,8/4) and brown (10YR,5/3), medium dense	30			8	3-7-5 N=12		61		NP	35
	34.5 — 1286.5				4	3-4-50/1"		53			
	LIMESTONE+, with chert seams, light gray (10YR,7/1) and gray (10YR,6/1), hard - auger refusal at 34.8 feet	35				REC = 97% RQD = 85%	7520				
		40				REC = 100% RQD = 100%	4900				
	44.8 — 1276										

Boring Terminated at 44.8 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 34.8 feet
Diamond Core Bit below 34.8 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28.5 ft while drilling*

▼ *18 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-54

BORING LOG NO. BW-605

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36328° Longitude: -94.1753°

Surface Elev.: 1322 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, brown (10YR,5/3), stiff to very stiff				X	10	3-5-5 N=10		10			
					X	12	3-7-9 N=16		14		38-18-20	93
5.0		1317	5									
	FAT CLAY (CH), trace chert fragments, reddish-brown (10YR,7/1) and light gray (5YR,5/3), very stiff				X	12	4-8-13 N=21		20			
8.5		1313.5										
	CLAYEY CHERT GRAVEL (GC), with sand, reddish-brown (5YR,5/3) and reddish-yellow (5YR,6/8), dense to very dense		10		X	10	35-31-9 N=40		28		63-28-35	40
			15		X	10	11-25-20 N=45		36			
			20		X	10	17-18-19 N=37		15		50-23-27	17
	- with chert seams below 23.5 feet				X	0	50/1"					
			25	▽								
27.0		1295										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28.5 ft while drilling*
▽ *26 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-55

BORING LOG NO. BW-605

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.36328° Longitude: -94.1753°

Surface Elev.: 1322 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY FAT CLAY (CH), dark reddish-brown (5YR,3/3) and very pale brown (10YR,8/4), stiff			∇								
			30		X	8	18-11-4 N=15		74			
			35		X	6	4-7-4 N=11		60			
36.0		1286										
36.6	**CHERT+**, very pale brown (10YR,8/3), hard	1285.5			X	0	50/1"					
	Auger Refusal at 36.6 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

∇ *28.5 ft while drilling*

∇ *26 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-55

BORING LOG NO. BW-606

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36351° Longitude: -94.17522°

Surface Elev.: 1322.6 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, brown (10YR,5/3), stiff			Split spoon	12	3-5-6 N=11	11			
				Split spoon	14	5-6-8 N=14	18			
5.0		1317.5	5							
	LEAN CLAY (CL), reddish-brown (5YR,5/3) and reddish-brown (5YR,6/8), stiff			Shelby tube			21	100	37-20-17	93
8.5		1314								
	CHERTY LEAN CLAY (CL), reddish-brown (5YR,5/3) and reddish-brown (5YR,6/8), very stiff		10	Split spoon	8	9-32-26 N=58	19			
13.5		1309								
	FAT CLAY (CH), trace chert fragments, reddish-brown (5YR,5/3) and reddish-yellow (5YR,6/8), very stiff		15	Split spoon	16	6-6-11 N=17	38		65-32-33	94
	- becoming dark reddish-brown (5YR,3/4) and reddish-yellow (5YR,6/8) below 18.5 feet		20	Split spoon	16	8-31-8 N=39	22			
23.5		1299								
	CHERTY FAT CLAY (CH), reddish-brown (5YR,5/3) and reddish-yellow (5YR,6/8), stiff to very stiff		25	Split spoon	7	7-34-29 N=63	28		60-23-37	52

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015	Boring Completed: 8/13/2015
Drill Rig: ATV 884	Driller: DB
Project No.: 04135111	Exhibit: A-56

BORING LOG NO. BW-606

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36351° Longitude: -94.17522°

Surface Elev.: 1322.6 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY FAT CLAY (CH), reddish-brown (5YR,5/3) and reddish-yellow (5YR,6/8), stiff to very stiff *(continued)*											
			30			11	6-8-4 N=12		52			
			35				4-5-7 N=12					
36.5	**CHERT+**, very pale brown (10YR,8/3), moderately hard to hard	1286										
38.9		1283.5					50/4"					

Boring Terminated at 38.9 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/13/2015 | Boring Completed: 8/13/2015

Drill Rig: ATV 884 | Driller: DB

Project No.: 04135111 | Exhibit: A-56

BORING LOG NO. BW-607

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363661° Longitude: -94.174861°

Surface Elev.: 1324 (Ft.)

DEPTH		ELEVATION (Ft.)
	LEAN CLAY (CL), with sand, dark yellowish-brown (10YR 4/4), stiff	
8.5		1315.5
	FAT CLAY (CH), trace sand, dark reddish-brown (2.5YR 3/4) to red (2.5YR 5/8), very stiff	
	(with chert seams below 14.5 feet)	

SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
X	8	5-5-5 N=10		11			
X	10	3-6-6 N=12		12			
■	21						
X	18	3-7-9 N=16		21		52-25-27	88
X	14	7-4-50/4"		37			
X	18	2-9-22 N=31		49			
X	2	N=50/2"		23			

DEPTH (Ft.): 5, 10, 15, 20, 25

WATER LEVEL OBSERVATIONS

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *29.5 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/2/2013	Boring Completed: 10/2/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-57

BORING LOG NO. BW-607

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363661° Longitude: -94.174861°

Surface Elev.: 1324 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**FAT CLAY (CH)**, trace sand, dark reddish-brown (2.5YR 3/4) to red (2.5YR 5/8), very stiff *(continued)*	1295.5										
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 3/4), stiff			▽	X	14	13-7-5 N=12		25			
33.5		1290.5	30									
	SILT (ML), with sand, trace chert gravel, strong brown (7.5YR 4/6), soft				X	18	2-3-1 N=4		67		41-26-15	71
37.5		1286.5	35		X	0	N=50/0"					

Boring Terminated at 37.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *29.5 ft while drilling*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 10/2/2013	Boring Completed: 10/2/2013
Drill Rig: ATV	Driller: SB
Project No.: 04135111	Exhibit: A-57

BORING LOG NO. BW-701

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362668° Longitude: -94.177091°

Surface Elev.: 1315.9 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)
	SANDY LEAN CLAY (CL), with roots, trace chert gravel, dark yellowish-brown (10YR 3/4), medium stiff	
2.0	**FAT CLAY (CH)**, strong brown (7.5YR 4/6) and dark gray (7.5YR 4/1), stiff	1314
5.0	**LEAN CLAY (CL)**, with sand, light browniish-gray (10YR 6/2), stiff	1311
8.5	**FAT CLAY (CH)**, with chert gravel, yellowish-red (5YR 5/8), very stiff	1307.5
13.5	**GRAVELLY FAT CLAY (CH)**, interbedded with chert seams, yellowish-red (5YR 5/8) and light gray (10YR 7/1), very stiff	1302.5

DEPTH (Ft.) (approx.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5–2.0		Split spoon	14	3-3-4 N=7		21			
2.0–3.5		Shelby tube	18			23	101	67-21-46	93
3.5–5.0		Split spoon	18	5-6-6 N=12		20			
5.0–6.5		Split spoon	18	4-5-6 N=11		23		36-18-18	
8.5–10.0		Split spoon	18	8-16-10 N=26		19			
13.5		Split spoon	3	N=50/3"		32			
18.5		Split spoon	3	N=50/3"		28			
22	▽								
23	▼								
23.5–25.0		Split spoon	18	2-2-3 N=5		67		65-31-34	66

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 5 feet
Hollow Stem Auger below 5 feet
Diamond Core Bit below 29 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *22 ft while drilling*

▼ *23 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/31/2013	Boring Completed: 8/31/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-58

BORING LOG NO. BW-701

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.362668° Longitude: -94.177091°

Surface Elev.: 1315.9 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		GRAVELLY FAT CLAY (CH), interbedded with chert seams, yellowish-red (5YR 5/8) and light gray (10YR 7/1), very stiff *(continued)*											
	29.0		1287				6	5-50 N=50/0"		46			
		CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		30					6,800				
								REC=95% RQD=83%					
				35				REC=100% RQD=92%					
	39.0		1277										
		Boring Terminated at 39 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 5 feet
Hollow Stem Auger below 5 feet
Diamond Core Bit below 29 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

22 ft while drilling

23 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/31/2013	Boring Completed: 8/31/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-58

BORING LOG NO. BW-702

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362789° Longitude: -94.176793°

Surface Elev.: 1328.1 (Ft.)

DEPTH (Ft.)	MATERIAL DESCRIPTION	ELEVATION (Ft.)
0 – 3.5	**FILL - LEAN TO FAT CLAY**, with sand, dark reddish-brown (2.5YR 2.5/4)	1324.5
3.5 – 8.5	**FILL - GRAVELLY LEAN TO FAT CLAY**, with sand, yellowish-red (5YR 4/6) and dark gray (5YR 4/1)	1319.5
8.5 – 13.5	**LEAN TO FAT CLAY (CL-CH)**, interbedded with chert seams, dark reddish-brown (2.5YR 2.5/4), stiff to very stiff	1314.5
13.5 – 18.5	**FAT CLAY (CH)**, with sand and chert gravel, yellowish-red (5YR 5/8), stiff	1309.5
18.5 –	**FAT CLAY (CH)**, trace chert gravel, grayish-brown (10YR 5/2) to yellowish-brown (10YR 5/8), stiff to very stiff (with chert seams below 23.5 feet)	

SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
X	11	9-9-8 N=17		15		46-17-29	81
X	12	8-7-6 N=13		17			
■	15			16	106	48-20-28	61
X	18	7-9-9 N=18		14			
X	12	5-50/6"		22			
X	18	3-4-5 N=9		26		57-22-35	85
X	18	3-5-10 N=15		28			
X	5	N=50/5"		22			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8.5 feet
Diamond Core Bit below 8.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
none to 8.5 feet while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/4/2013	Boring Completed: 9/4/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-59

BORING LOG NO. BW-702

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.362789° Longitude: -94.176793°

Surface Elev.: 1328.1 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**CHERTY FAT CLAY (CH)**, yellowish-brown (10YR 5/8) to dark reddish-brown (2.5YR 3/4), stiff to very stiff	1299.5	30		SPT	12	5-17-10 N=27		27			
33.5	**FAT CLAY (CH)**, with chert gravel, yellowish-red (5YR 5/6), stiff	1294.5	35		SPT	18	4-7-4 N=11		59			
			40		SPT	9	6-7-7 N=14		43			
42.0	(water loss at approximately 42 feet, possible void on or near top of rock) **CHERTY LIMESTONE+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	1286	45		Core		REC=97% RQD=83%	17,750				
47.0	***Boring Terminated at 47 Feet***	1281										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 8.5 feet
Diamond Core Bit below 8.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

none to 8.5 feet while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/4/2013	Boring Completed: 9/4/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-59

BORING LOG NO. BW-703

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362968° Longitude: -94.176622°

Surface Elev.: 1327.1 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**FILL - CLAYEY CHERT GRAVEL**, gray (10YR 6/1) and reddish-brown (2.5YR 4/4)	1325			X	6	10-20-11 N=31		9			
8.5	**FILL - LEAN TO FAT CLAY**, trace chert gravel, dark reddish-brown (2.5YR 2.5/4)	1318.5	5		X	10	6-6-10 N=16		16			
					X	12	3-5-19 N=24		18			
13.5	**LEAN TO FAT CLAY (CL-CH)**, dark reddish-brown (2.5YR 2.5/4), medium stiff	1313.5	10		X	12	3-2-4 N=6		21			
18.5	**LEAN CLAY (CL)**, trace sand, gray (10YR 5/1), stiff	1308.5	15		X	14	4-4-6 N=10		20		35-18-17	89
	CLAYEY CHERT GRAVEL (GC), yellowish-red (5YR 5/8) and light gray (10YR 7/1), medium dense to dense		20		X	8	11-18-7 N=25		17			
	(with chert seams below 23.5 feet)		25		X	0	N=50/2"					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

38.5 ft while drilling
36.5 ft after boring
36 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/16/2013	Boring Completed: 9/16/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-60

BORING LOG NO. BW-703

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.362968° Longitude: -94.176622°

Surface Elev.: 1327.1 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), yellowish-red (5YR 5/8) and light gray (10YR 7/1), medium dense to dense *(continued)*										
		30		X	12	18-32-7 N=39		19			
	33.5 — 1293.5										
	SILTY CHERT GRAVEL (GM), with sand, reddish-yellow (5YR 6/8), loose	35		X	6	10-4-4 N=8		40		46-30-16	28
	38.0 — 1289										
	38.7 **WEATHERED CHERTY LIMESTONE+**, gray (10YR 6/1), moderately hard to hard — 1288.5			X	1	N=50/2"		38			
	Boring Terminated at 38.7 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *38.5 ft while drilling*
- *36.5 ft after boring*
- *36 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/16/2013	Boring Completed: 9/16/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-60

BORING LOG NO. BW-704

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363367° Longitude: -94.176389°

Surface Elev.: 1320.1 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
0.0 – 5.0	**FILL - LEAN CLAY**, trace sand, dark yellowish-brown (10YR 3/4)	1315
5.0 – 8.5	**LEAN TO FAT CLAY (CL-CH)**, trace sand, mottled brownish-yellow (10YR 6/6) and gray (10YR 6/1), very stiff	1311.5
8.5 – 13.5	**CHERTY FAT CLAY (CH)**, dark red (2.5YR 3/6), very stiff to hard	1306.5
13.5 – 18.5	**FAT CLAY (CH)**, with chert gravel, dark reddish-brown (2.5YR 2.5/4) to gray (10YR 6/1), very stiff	1301.5
18.5 –	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 2.5/4) to light gray (10YR 7/1), stiff	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5–2		Split spoon	13	5-6-7 N=13		13			
2–3.5		Split spoon	16	7-8-5 N=13		16		33-17-16	91
3.5–5		Shelby tube	18			5	116	35-19-16	88
5–6.5		Split spoon	18	7-8-9 N=17		19			
8.5–10		Split spoon	18	9-16-16 N=32		22			
13.5–15		Split spoon	15	15-9-9 N=18		33			
18.5–20		Split spoon	18	7-8-7 N=15		42		53-24-29	66
23.5–25		Split spoon	18	12-13-20 N=33		47			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Power Auger to 5 feet
Hollow Stem Auger below 5 feet
Wash Bore below 8.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
none to 8.5 feet while drilling
32 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/4/2013	Boring Completed: 9/4/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-61

BORING LOG NO. BW-704

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.363367° Longitude: -94.176389°

Surface Elev.: 1320.1 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 2.5/4) to light gray (10YR 7/1), stiff *(continued)*		30	∇	X	12	5-7-12 N=19		66			
33.5	**FAT CLAY (CH)**, with highly weathered chert gravel, reddish-brown (2.5YR 4/4), medium stiff	1286.5	35		X	18	3-3-3 N=6		68			
38.5		1281.5			X	1	N=50/3"		11			
38.8	**WEATHERED LIMESTONE+**, light gray (10YR 7/1), moderately hard	1281.5										

Boring Terminated at 38.8 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Power Auger to 5 feet
Hollow Stem Auger below 5 feet
Wash Bore below 8.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

none to 8.5 feet while drilling

∇ *32 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/4/2013	Boring Completed: 9/4/2013
Drill Rig: ATV	Driller: TS
Project No.: 04135111	Exhibit: A-61

BORING LOG NO. BW-705

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363554° Longitude: -94.176154°

Surface Elev.: 1320.4 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - LEAN CLAY, with sand				X	13	12-10-10 N=20		13			
					Tube	14			7	111	41-22-19	
3.5	**FILL - LEAN CLAY**, trace sand and chert gravel	1317			X	13	5-6-9 N=15		20			
			5		X	16	4-6-8 N=14		23		38-17-21	88
8.5	**FAT CLAY (CH)**, trace chert gravel, very stiff	1312			X	14	2-4-20 N=24		19			
			10									
13.5	**CLAYEY CHERT GRAVEL (GC)**, with sand, medium dense	1307			X	16	9-14-12 N=26		26		57-24-33	48
			15									
18.5	**FAT CLAY (CH)**, with chert gravel, stiff to very stiff	1302			X	12	5-12-10 N=22		34			
			20									
23.5	**CLAYEY CHERT GRAVEL (GC)**, yellowish-red (5YR 4/6) and gray (10YR 6/1), very dense	1297			X	10	22-38-29 N=67		20			
			25	▽ ▼ ▽								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 37 feet
Diamond Core Bit below 37 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *25 ft while drilling*
▽ *27 ft after boring*
▼ *26 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/16/2013	Boring Completed: 9/16/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-62

BORING LOG NO. BW-705

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363554° Longitude: -94.176154°

Surface Elev.: 1320.4 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), yellowish-red (5YR 4/6) and gray (10YR 6/1), very dense *(continued)* — 28.5 / 1292										
	FAT CLAY (CH), with chert gravel, yellowish-red (5YR 4/6) and gray (10YR 6/1), very stiff	30			8	5-11-15 N=26		53			
	33.5 / 1287										
	FAT CLAY (CH), trace chert gravel, strong brown (7.5YR 5/8), medium stiff	35			8	3-4-3 N=7		41			
	37.0 / 1283.5										
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard	40				REC=100% RQD=95%	8,790				
		45				REC=100% RQD=92%					
	47.0 / 1273.5										
	Boring Terminated at 47 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 37 feet
Diamond Core Bit below 37 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

25 ft while drilling
27 ft after boring
26 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/16/2013	Boring Completed: 9/16/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-62

PIEZOMETER LOG NO. BW-706

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION: See Exhibit A-2

Latitude: 36.363864° Longitude: -94.175923°

Surface Elev.: 1316.6 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
	LEAN CLAY (CL), mottled yellowish-brown (10YR 5/8) and red (2.5YR 5/8), very stiff	
5.0		1311.5
	LEAN CLAY (CL), with sand and chert gravel, mottled yellowish-brown (10YR 5/8) and red (2.5YR 5/8), very stiff	
8.5		1308
	FAT CLAY (CH), with chert gravel, yellowish-red (5YR 5/8), very stiff	
13.5		1303
	FAT CLAY (CH), trace chert gravel, yellowish-red (5YR 5/8), stiff	
18.5		1298
	CHERTY FAT CLAY (CH), yellowish-red (5YR 5/8), very stiff	
23.5		1293
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and yellowish-red (5YR 5/8), medium dense	

INSTALLATION DETAILS: Cement Grout; Bentonite; Riser 2" PVC; Sand 10/20 Silica; Screen 2" PVC 0.01 Slot

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
12	10-11-13 N=24		18			
14	6-8-11 N=19		19			
10	3-13-15 N=28		17		42-18-24	70
12	8-15-15 N=30		37			
12	3-4-4 N=8		29			
13	27-15-50/5"		45			
4	8-8-7 N=15		22			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 30 feet
Diamond Core Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- *25 ft while drilling*
- *23 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/12/2013	Boring Completed: 9/12/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-63

PIEZOMETER LOG NO. BW-706

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION: See Exhibit A-2

Latitude: 36.363864° Longitude: -94.175923°

Surface Elev.: 1316.6 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	Well	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5		1288											
30.0	**SILTY SAND (SM)**, with chert gravel, brown (10YR 5/3), loose	1286.5	Well Cap	30			10	1-5-2 N=7		71		NP	43
	LIMESTONE+, with chert, light gray (10YR 7/1) and gray (10YR 6/1), hard							REC=98% RQD=72%	6,950				
				35				REC=100% RQD=95%					
40.0		1276.5		40									

Boring Terminated at 40 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 30 feet
Diamond Core Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

25 ft while drilling

23 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/12/2013	Boring Completed: 9/12/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-63

BORING LOG NO. BW-707

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.364273° Longitude: -94.175963°

Surface Elev.: 1320.4 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)
0.0 – 6.5	**LEAN CLAY (CH)**, trace sand, yellowish-brown (10YR 5/6) and strong brown (7.5YR 5/6), stiff to medium stiff	1314
6.5 – 9.0	**LEAN TO FAT CLAY (CL-CH)**, trace sand, light olive-brown (2.5Y 5/4), yellowish-brown (10YR 5/6), and strong brown (7.5YR 5/6)	1311.5
9.0 – 11.0	**CHERT+**, light gray (2.5Y 7/1), moderately hard to hard	1309.5
11.0 – 18.5	**CHERTY FAT CLAY (CH)**, with interbedded clayey chert gravel, mottled dark yellowish-brown (10YR 4/6) and dark reddish-brown (2.5YR 3/4), very stiff	1302
18.5 – 21.0	**CLAYEY CHERT GRAVEL (GC)**, dark reddish-brown (2.5YR 3/4) and light gray (10YR 7/1), dense	1299.5
21.0 –	**CHERT GRAVEL (GP)**, with fat clay seams, light gray (10YR 7/1) and dark reddish-brown (2.5YR 3/4)	

SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
Split spoon	12	5-6-4 N=10		16			
Split spoon	12	3-2-2 N=4		16		29-17-12	89
Shelby tube	14			17	105	38-19-19	94
Split spoon	16	4-5-7 N=12		20		48-21-27	88
Split spoon	14	4-27-50/2"		21			
Split spoon	12	11-10-10 N=20		42			
Split spoon	10	25-23-17 N=40		14			
Split spoon	4	29-50/6"		24			

Depth (Ft.): 5, 10, 15, 20, 25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 33 feet
Diamond Core Bit below 33 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *30 ft while drilling*
- *19 ft after boring*
- *16 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-64

BORING LOG NO. BW-707

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364273° Longitude: -94.175963°

Surface Elev.: 1320.4 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**CHERT GRAVEL (GP)**, with fat clay seams, light gray (10YR 7/1) and dark reddish-brown (2.5YR 3/4) *(continued)*	1292										
32.5	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 3/4) and light gray (10YR 7/1) to gray (10YR 5/1)	1288	30	▽		4	6-7-4 N=11		14			
43.0	**LIMESTONE+**, with chert, light gray (2.5Y 7/1)	1277.5				1	N=50/2"		16			
			35				REC=100% RQD=85%	8,900				
			40				REC=100% RQD=73%					
	Boring Terminated at 43 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 33 feet
Diamond Core Bit below 33 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *30 ft while drilling*
- ▽ *19 ft after boring*
- ▼ *16 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-64

BORING LOG NO. BW-708

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.364446° Longitude: -94.175772°

Surface Elev.: 1320.8 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**LEAN CLAY (CL)**, with silt, dark yellowish-brown (10YR 3/6) and dark reddish-brown (5YR 3/4), stiff	1319				12	4-4-5 N=9		15			
3.5	**SILT (ML)**, trace sand, dark yellowish-brown (10YR 3/6), medium stiff to stiff	1317.5				17			16	113	NP	87
8.5	**SILTY CLAY (CL-ML)**, trace sand and roots, dark olive-brown (2.5Y 3/3) and dark yellowish-brown (10YR 3/3), soft	1312.5	5			13	1-1-2 N=3		25		26-19-7	90
						6	1-1-2 N=3		17			
13.5	**SILTY SAND (SM)**, with chert gravel, red (2.5YR 4/8) to yellowish-red (5YR 4/6) and light gray (10YR 7/1), dense	1307.5	10			14	18-23-17 N=40		30		50-31-19	28
18.5	**FAT CLAY (CH)**, with chert gravel, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), very stiff	1302.5	15			12	8-11-7 N=18		31			
23.0	**FAT CLAY (CH)**, with sand, trace chert gravel, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), stiff	1298	20			12	2-7-4 N=11		55		80-33-47	84
23.5	**CHERT+**, light gray (2.5Y 7/1), moderately hard to hard	1297.5										
	CLAYEY CHERT GRAVEL (GC), gray (10YR 5/1) and dark reddish-brown (2.5YR 2.5/4), dense		25			5	9-19-11 N=30		44			21

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 33 feet
Diamond Core Bit below 33 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- *28.5 ft while drilling*
- *16 ft after boring*
- *13 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-65

BORING LOG NO. BW-708

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364446° Longitude: -94.175772°

Surface Elev.: 1320.8 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	28.5	**CLAYEY CHERT GRAVEL (GC)**, gray (10YR 5/1) and dark reddish-brown (2.5YR 2.5/4), dense *(continued)*	1292.5		▽								
	33.0	**FAT CLAY (CH)**, with chert gravel, dark reddish-brown (2.5YR 2.5/4) and gray (10YR 5/1), medium stiff	1288	30			1	4-3-3 N=6		56			
							1	N=50/2"		16			
	43.0	**CHERTY LIMESTONE+**, light gray (2.5Y 7/1), hard	1278	35				REC=100% RQD=87%	10,340				
				40				REC=100% RQD=83%					

Boring Terminated at 43 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 33 feet
Diamond Core Bit below 33 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28.5 ft while drilling*

▽ *16 ft after boring*

▼ *13 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-65

BORING LOG NO. BW-709

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364597° Longitude: -94.175558°

Surface Elev.: 1320.9 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - LEAN CLAY, trace sand, yellowish-brown (10YR 5/6) to dark yellowish-brown (10YR 4/4)					10	4-4-5 N=9		15			
3.5		1317.5				18			10	111	28-17-11	89
	FILL - SILTY SAND, with concrete fragments, brown (10YR 4/3)					8	16-34-7 N=41		10		NP	40
5.0		1316	5									
	SILTY CLAY (CL-ML), dark olive-brown (2.5Y 3/8), stiff					7	3-7-7 N=14		17			
8.5		1312.5										
	SILTY CHERT GRAVEL (GM), red (2.5YR 4/8) to yellowish-red (5YR 4/5) and light gray (10YR 7/1), dense					7	12-14-27 N=41		10		NP	39
			10									
13.5		1307.5										
	FAT CLAY (CH), with chert gravel, dark reddish-brown (2.5YR 2.5/4) trace yellowish-brown (10YR 5/8), stiff to very stiff					12	4-7-8 N=15		43			
			15									
18.5		1302.5										
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 2.5/4) trace yellowish-brown (10YR 5/8), very stiff					12	3-10-50/5"		34		78-35-43	69
			20									
23.5		1297.5										
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and dark reddish-brown (2.5YR 2.5/4), medium dense					5	34-17-8 N=25		38			
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

28.5 ft while drilling
29.5 ft after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-66

BORING LOG NO. BW-709

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364597° Longitude: -94.175558°

Surface Elev.: 1320.9 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	28.5		1292.5		▽								
		CHERTY FAT CLAY (CH), with sand, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), soft to medium stiff		30	▽		10	1-2-2 N=4		61			52
	32.0		1289										
	32.6	**LIMESTONE+**, light gray (2.5Y 7/1), hard	1288.5				1	N=50/1					

Boring Terminated at 32.6 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28.5 ft while drilling*
▽ *29.5 ft after boring*
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-66

BORING LOG NO. BW-710

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.364845° Longitude: -94.175474°

Surface Elev.: 1319.8 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), with chert gravel, dark yellowish-brown (10YR 4/4) and dark reddish-brown (5YR 3/4), stiff				Split spoon	16	3-7-6 N=13		44			
	(brown (10YR 4/4) below 2 feet)				Split spoon	14	3-5-5 N=10		17		34-16-18	84
5.0		1315	5									
	SILTY CLAY (CL-ML), brown (10YR 4/4), stiff				Shelby tube	15			19	107	26-20-6	96
7.0		1313										
	FAT CLAY (CH), olive-brown (2.5Y 4/4) to light olive-brown (2.5Y 5/6), stiff to medium stiff				Split spoon	16	3-4-5 N=9		32			
					Split spoon	16	2-3-4 N=7		29		59-22-37	94
			10									
13.5		1306.5										
	FAT CLAY (CH), with chert fragments, dark reddish-brown (2.5YR 2.5/4), very stiff				Split spoon	16	8-11-14 N=25		33			
			15									
18.5		1301.5										
	FAT CLAY (CH), mottled dark reddish-brown (2.5YR 2.5/4) and yellowish-brown (10YR 5/8), medium stiff to stiff				Split spoon	16	3-3-11 N=14		20			
			20									
23.5		1296.5										
	FAT CLAY (CH), with chert fragments, red (2.5YR 4/8) and light gray (10YR 7/1), stiff				Split spoon	1	6-8-6 N=14		20			
25.0	***Boring Terminated at 25 Feet***	1295	25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/1/2013	Boring Completed: 8/1/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-67

BORING LOG NO. BW-711

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.364982° Longitude: -94.175241°

Surface Elev.: 1320.9 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.0–5.0	**LEAN CLAY (CL)**, trace sand, dark yellowish-brown (10YR 3/6) and dark reddish-brown (5YR 3/4), medium stiff to stiff		X	13	2-3-4 N=7		16		30-16-14	90
			X	13	5-6-6 N=12		13			
5.0		1316								
5.0–8.5	**SILTY CLAY (CL-ML)**, light yellowish-brown (10YR 6/4), stiff		X	16	4-4-5 N=9		5		23-18-5	91
8.5		1312.5								
8.5–13.5	**LEAN CLAY (CL)**, with sand, mottled grayish-brown (10YR 5/2) and brownish-yellow (10YR 6/8), very stiff		X	10	4-8-11 N=19		18			
13.5		1307.5								
13.5–18.5	**SILTY CHERT GRAVEL (GM)**, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), dense		X	16	11-21-12 N=33		17		NP	44
18.5		1302.5								
18.5–23.5	**FAT CLAY (CH)**, trace sand, yellowish-red (5YR 4/6), stiff		X	9	2-5-5 N=10		26			
23.5		1297.5								
23.5–25.0	**CLAYEY CHERT GRAVEL (GC)**, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), very dense		X	9	47-34-34 N=68		23			
25.0	***Boring Terminated at 25 Feet***	1296								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/1/2013	Boring Completed: 8/1/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-68

PIEZOMETER LOG NO. BW-712

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION: See Exhibit A-2

Latitude: 36.365159° Longitude: -94.174841°

Surface Elev.: 1306 (Ft.)

Depth	Description	Elevation (Ft.)	Installation Details	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY CHERT GRAVEL (GM), gray (10YR 6/1), very dense		Cement Grout; Bentonite				6	13-21-50/6"		4			
							8	23-36-30 N=66		10		NP	15
5.0	**LEAN TO FAT CLAY (CL-CH)**, with sand, yellowish-red (5YR 5/8), stiff	1301	Riser 2" PVC	5			14	4-4-5 N=9		24			
8.5	**CHERT GRAVEL (GP)**, with silt, light gray (10YR 7/1) to very pale brown (10YR 7/4), very dense	1297.5	Sand 10/20 Silica				8	15-20-34 N=54		12		NP	11
				10	▽								
					▽								
13.5	**FAT CLAY (CH)**, yellowish-red (5YR 5/8), stiff	1292.5	Screen 2" PVC 0.01 Slot	15			12	5-4-10 N=14		38			
	(soft to medium stiff below 18.5 feet)		Well Cap				2	2-2-50/2"		33			
20.0	**CHERTY LIMESTONE+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	1286		20				REC=98% RQD=95%	6,360				
				25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 33 feet
Diamond Core Bit below 33 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *10 ft while drilling*
▽ *13 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/12/2013	Boring Completed: 9/12/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-69

PIEZOMETER LOG NO. BW-712

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

GRAPHIC LOG	LOCATION: See Exhibit A-2 Latitude: 36.365159° Longitude: -94.174841° Surface Elev.: 1306 (Ft.) DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard *(continued)* 30.0 1276	30				REC=100% RQD=95%					
	Boring Terminated at 30 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 33 feet
Diamond Core Bit below 33 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
10 ft while drilling
13 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/12/2013	Boring Completed: 9/12/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-69

BORING LOG NO. BW-713

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365398° Longitude: -94.174977°

Surface Elev.: 1322.2 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
2.0	**LEAN CLAY (CL)**, trace sand, mottled dark yellowish-brown (10YR 3/4) and red (2.5YR 4/6), medium stiff to stiff	1320
5.0	**SILTY CLAY (CL-ML)**, with sand, light yellowish-brown (10YR 6/4), stiff	1317
8.5	**LEAN TO FAT CLAY (CL-CH)**, trace sand, mottled grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/8), hard	1313.5
13.5	**FAT CLAY (CH)**, trace sand, dark reddish-brown (2.5YR 2.5/4), very stiff	1308.5
18.5	**FAT CLAY (CH)**, olive-yellow (2.5Y 6/6), stiff	1303.5
23.5	**CLAYEY CHERT GRAVEL (GC)**, with sand, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), medium dense	1298.5
	CLAYEY CHERT GRAVEL (GC), dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), dense	

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5	3-4-4 N=8		18			
5	3-7-10 N=17		5		23-17-6	83
15	8-15-21 N=36		14			
14	6-12-17 N=29		21		50-24-26	94
15	4-5-6 N=11		19			
8			19		49-22-27	27
5	4-4-18 N=22		39			
6	10-24-11 N=35		51			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

33.5 ft while drilling
16 ft after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-70

BORING LOG NO. BW-713

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.365398° Longitude: -94.174977°

Surface Elev.: 1322.2 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
28.5	**CLAYEY CHERT GRAVEL (GC)**, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), dense *(continued)*	1293.5										
	SILTY CHERT GRAVEL (GM), with sand, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), loose		30		X	1	12-4-4 N=8		7		NP	13
	(with clay, yellowish-brown (10YR 5/6) below 33.5 feet)		35	▽	X	8	9-4-4 N=8		22			
38.1	(apparent hard limestone at 38 feet)	1284			X	0	N=50/1"					
	Boring Terminated at 38.1 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *33.5 ft while drilling*

▽ *16 ft after boring*

not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-70

BORING LOG NO. BW-714

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365541° Longitude: -94.174531°

Surface Elev.: 1303.7 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2.0	**FILL - CHERTY LEAN CLAY**, pale brown (10YR 6/3)	1301.5			X	5	13-15-14 N=29		12			
	8.5	**LEAN CLAY (CL)**, with sand, trace chert gravel, dark reddish-brown (2.5YR 2.5/4), medium stiff to soft	1295			X	10	9-4-5 N=9					
				5		X	14	2-2-2 N=4				36-16-20	72
	13.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and dark reddish-brown (2.5YR 2.5/4), medium stiff	1290	10		X	1	5-9-14 N=23		13			
	18.5	**CHERTY FAT CLAY (CH)**, light gray (10YR 7/1) and dark reddish-brown (2.5YR 2.5/4), stiff	1285	15	▽	X	14	1-4-7 N=11		73		100-30-70	67
	18.6	**LIMESTONE+**, light gray (10YR 7/1), hard	1285			X	1	N=50/1"		20			

Boring Terminated at 18.6 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *15 ft while drilling*

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/12/2013	Boring Completed: 9/12/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-71

BORING LOG NO. BW-715

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.365725° Longitude: -94.174367°

Surface Elev.: 1303 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.0	**FILL - CLAYEY CHERT GRAVEL**, pale brown (10YR 6/3)	1301				6	13-41-50/5"		10			
5.0	**FAT CLAY (CH)**, dark reddish-brown (2.5YR 2.5/4), stiff	1298				13	9-6-4 N=10		41		65-32-33	98
8.5	**CHERTY FAT CLAY (CH)**, light gray (10YR 7/1), stiff to very stiff	1294.5	5			3	3-7-12 N=19		36			
16.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1), medium dense to dense	1286.5	10			3	4-7-24 N=31		28			
			15			5	13-10-5 N=15		23			13
				▽		0	N=50/0"					
21.5	**CHERTY LIMESTONE+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	1281.5	20				REC=100% RQD=92%	10,820				

Boring Terminated at 21.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 16.5 feet
Diamond Core Bit below 16.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *16.5 ft while drilling*

▽ *16.5 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/12/2013	Boring Completed: 9/12/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-72

BORING LOG NO. BW-716

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365818° Longitude: -94.174544°

Surface Elev.: 1323.5 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), with silt, trace sand, yellowish-brown (10YR 5/6) to yellowish-red (5YR 5/8), stiff to very stiff			X	10	4-7-9 N=16		12			
				X	12	5-11-13 N=24		13			
		5		X	10	7-12-18 N=30		12		37-19-18	90
	8.5 — 1315										
	LEAN TO FAT CLAY (CL-CH), trace sand, yellowish-red (5YR 5/8), hard			X	12	6-14-17 N=31		12			
		10									
		15		X	12	7-12-21 N=33		12		45-20-25	93
	18.5 — 1305										
	CLAYEY CHERT GRAVEL (GC), gray (10YR 6/1) to yellowish-red (5YR 5/8), very dense			X	8	7-44-12 N=56		17			
		20									
	23.5 — 1300										
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 2.5/4), stiff			X	12	5-8-4 N=12		21			
		25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/28/2013	Boring Completed: 9/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-73

BORING LOG NO. BW-716

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365818° Longitude: -94.174544°

Surface Elev.: 1323.5 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	28.5	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 2.5/4), stiff *(continued)*	1295										
	33.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and reddish-yellow (5YR 6/8), very dense	1290	30		X	8	21-25-26 N=51		14			
	35.0	**CLAYEY CHERT GRAVEL (GC)**, gray (10YR 6/1), medium dense	1288.5	35		X	4	4-5-8 N=13		15			

Boring Terminated at 35 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/28/2013	Boring Completed: 9/28/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-73

BORING LOG NO. BW-717

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365998° Longitude: -94.174396°

Surface Elev.: 1324.4 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)
0.0 – 5.0	**LEAN CLAY (CL)**, with silt, trace sand, yellowish-brown (10YR 5/6) to yellowish-red (5YR 5/8), stiff	1319.5
5.0 – 13.5	**LEAN CLAY (CL)**, trace sand, yellowish-red (5YR 5/8) to olive-yellow (2.5Y 5/6), stiff to very stiff	1311
13.5 – 18.5	**CLAYEY CHERT GRAVEL (GC)**, gray (10YR 6/1) to very pale brown (10YR 7/4), dense	1306
18.5 – 23.5	**CLAYEY SAND (SC)**, with chert gravel, yellowish-red (5YR 5/8), medium stiff	1301
23.5 –	**FAT CLAY (CH)**, red (2.5YR 5/6) to reddish-brown (2.5YR 5/4), medium stiff	

STRATUM	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
LEAN CLAY (CL)		X	10	4-5-6 N=11		11			
LEAN CLAY (CL)		X	8	5-6-8 N=14		9			
LEAN CLAY (CL)		X	10	5-8-10 N=18		16			
LEAN CLAY (CL)		X	10	6-11-15 N=26		13			
CLAYEY CHERT GRAVEL (GC)		X	8	1-16-17 N=33		8		31-19-12	19
CLAYEY SAND (SC)		X	5	3-3-3 N=6		22			
FAT CLAY (CH)		X	12	1-1-7 N=8		41		87-30-57	96

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

38.5 ft while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/27/2013	Boring Completed: 9/27/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-74

BORING LOG NO. BW-717

PROJECT: 8th Street Widening Project - MSE Walls | **CLIENT: Burns & McDonell Engineering Company, Inc.**

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.365998° Longitude: -94.174396°

Surface Elev.: 1324.4 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), red (2.5YR 5/6) to reddish-brown (2.5YR 5/4), medium stiff *(continued)*											
28.5		1296										
	CLAYEY CHERT GRAVEL (GC), gray (10YR 6/1), loose				X	1	11-5-4 N=9		10			
			30									
					X	0	2-4-2 N=6					
			35									
38.5		1286		∇	X	1	N=50/1"					
38.6	**CHERT+**, gray (10YR 6/1), hard	1286										
	Boring Terminated at 38.6 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

∇ *38.5 ft while drilling*

not encountered after boring

not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/27/2013	Boring Completed: 9/27/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-74

BORING LOG NO. BW-718

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.366097° Longitude: -94.174055°

Surface Elev.: 1302 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), with sand, gray (10YR 6/1) and reddish-brown (2.5YR 4/4), medium dense					6	8-6-7 N=13		10		74-28-46	28
						4	7-5-7 N=12		22			
			5			6	7-14-14 N=28		17			
	8.5	1293.5										
	FAT CLAY (CH), with chert gravel, dark reddish-brown (2.5YR 2.5/4) and gray (10YR 6/1), medium stiff to stiff		10			1	10-4-7 N=11		99			
	13.5	1288.5										
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 2.5/4) and gray (10YR 6/1), very soft		15			6	0-0-1 N=1				102-31-71	64
	17.0	1285		▽								
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		20				REC=100% RQD=70%	9,340				
			25				REC=100% RQD=100%					
	27.0	1275										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 16.5 feet
Diamond Core Bit below 16.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *16.5 ft while drilling*
▽ *16.5 ft after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/11/2013	Boring Completed: 9/11/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-75

BORING LOG NO. BW-718

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.366097° Longitude: -94.174055° Surface Elev.: 1302 (Ft.) DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	Boring Terminated at 27 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 16.5 feet
Diamond Core Bit below 16.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
16.5 ft while drilling
16.5 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/11/2013	Boring Completed: 9/11/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-75

BORING LOG NO. BW-801

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363291° Longitude: -94.175717°

Surface Elev.: 1318.8 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, mottled yellowish-brown (10YR 5/6) and reddish-brown (5YR 4/4), very stiff					14	7-6-10 N=16		16		37-18-19	93
						14	6-7-10 N=17		22			
	5.0	1314	5									
	LEAN TO FAT CLAY (CL-CH), trace sand, mottled yellowish-red (5YR 4/6) and grayish-brown (10YR 5/2), stiff					14			21	99	47-20-27	90
						16	3-5-7 N=12		19			
	8.5	1310.5										
	FAT CLAY (CH), with sand, trace chert gravel, light red (2.5YR 6/8), stiff to very stiff		10			16	7-15-19 N=34		31		50-25-25	74
			15			10	6-25-16 N=41		32			
	(with chert seams below 19 feet)		20			3	14-50/6"		21			
	25.0	1294	25	▽		6	21-21-9 N=30		47			
	Boring Terminated at 25 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *24.5 ft while sampling*

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-76

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 04135111 - BW.GPJ

BORING LOG NO. BW-802

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363507° Longitude: -94.175542°

Surface Elev.: 1317 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, mottled yellowish-red (5YR 5/8), dark yellowish-brown (10YR 4/6), and grayish-brown (10YR 5/2), stiff to very stiff				X	13	5-6-10 N=16		23			
					X	10	3-5-7 N=12		19		44-21-23	89
5.0		1312	5									
	LEAN TO FAT CLAY (CL-CH) (CH), with sand, trace chert gravel, dark reddish-brown (2.5YR 2.5/4), stiff to very stiff				■	9			18		49-20-29	82
					X	16	14-11-22 N=33		22			
8.5		1308.5										
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), very stiff				X	8	3-5-15 N=20		33			
			10									
13.5		1303.5										
	SILTY CHERT GRAVEL (GM), with sand, yellowish-red (5YR 5/8) and light gray (10YR 7/1), very dense				X	8	12-32-18 N=50		17		NP	19
			15									
18.5		1298.5										
	CLAYEY CHERT GRAVEL (GC), yellowish-red (5YR 5/8), dense to very dense				X	10	12-50/5"		22			
			20									
23.5		1293.5										
	CHERTY FAT CLAY (CH), yellowish-red (5YR 5/8), medium stiff to stiff			▽	X	4	8-5-5 N=10		20			
25.0		1292	25									
	Boring Terminated at 25 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *24.5 ft while sampling*

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-77

BORING LOG NO. BW-803

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363643° Longitude: -94.175271°

Surface Elev.: 1322.1 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), with silt, trace sand, brown (10YR 5/3), stiff			X	16	8-8-7 N=15		10			
				X	14	2-4-6 N=10		19			
5.0		1317	5								
	FAT CLAY (CH), with sand, brown (10YR 5/3) to yellowish-red (5YR 5/6), stiff			■	12			23	96	52-20-32	85
				X	16	4-5-8 N=13		22			
8.5		1313.5									
	SILTY CHERT GRAVEL (GM), with sand, light gray (10YR 7/1) and dark reddish-brown (5YR 3/4), dense			X	6	15-27-18 N=45		10		NP	32
			10								
13.5		1308.5									
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and dark reddish-brown (5YR 3/4), medium dense			X	8	16-12-14 N=26		18			
			15								
	(with chert seams below 18.5 feet)			X	2	N=50/2"		13			
			20								
	(third N-value not recorded)			X	5	37-8 N=		12			
			25								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *33.5 ft while drilling*
- *28 ft after boring*
- *27 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 7/7/1902	Boring Completed: 7/7/1902
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-78

BORING LOG NO. BW-803

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363643° Longitude: -94.175271°

Surface Elev.: 1322.1 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and dark reddish-brown (5YR 3/4), medium dense *(continued)* — 28.5 / 1293.5		▽								
	SANDY FAT CLAY (CH), trace chert gravel, dark reddish-brown (5YR 3/4), stiff — 33.5 / 1288.5	30		X	14	7-7-3 N=10		75		83-30-53	52
	LIMESTONE+, gray (10YR 6/1), hard — 33.7 / 1288.5		▽	X	1	N=50/2"		26			
	Boring Terminated at 33.7 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- ▽ *33.5 ft while drilling*
- ▽ *28 ft after boring*
- ▼ *27 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 7/7/1902	Boring Completed: 7/7/1902
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-78

BORING LOG NO. BW-804

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363903° Longitude: -94.175217°

Surface Elev.: 1313.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) to dark reddish-brown (2.5YR 2.5/4), very dense					8	18-32-20 N=52		30			
2.0		1311.5										
	CHERTY FAT CLAY (CH), with sand, dark reddish-brown (2.5YR 2.5/4), very stiff to hard					16	6-11-21 N=32		37		70-33-37	53
5.0		1308.5	5									
	FAT CLAY (CH), trace chert gravel, dark reddish-brown (2.5YR 2.5/4) to yellowish-red (5YR 5/8)					16	4-5-7 N=12		15			
						13	3-10-10 N=20		18		61-24-37	88
			10									
	(with chert seams below 13.5 feet)					3	N=50/4"		36			
			15									
						4	4-10-7 N=17		30			
			20									
				23 ft 24 hrs after boring								
						0	1-1-50/1"					
24.5		1289										
	LIMESTONE+, with chert, gray (10YR 6/1), hard		25	25 ft				7,660				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 25 feet
Diamond Core Bit below 25 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *25 ft while drilling*
- *25 ft after boring*
- *23 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-79

BORING LOG NO. BW-804

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.363903° Longitude: -94.175217°

Surface Elev.: 1313.5 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LIMESTONE+, with chert, gray (10YR 6/1), hard *(continued)*					REC=95% RQD=87%					
		30				REC=100% RQD=93%					
	35.0 — 1278.5	35									
	Boring Terminated at 35 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 25 feet
Diamond Core Bit below 25 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

25 ft while drilling
25 ft after boring
23 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-79

BORING LOG NO. BW-805

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364021° Longitude: -94.174944°

Surface Elev.: 1320.3 (Ft.)

DEPTH (Ft.)	Material Description	ELEVATION (Ft.)
0 – 2.0	**LEAN CLAY (CL)**, trace sand, brown (10YR 4/3), medium stiff	1318.5
2.0 – 6.5	**LEAN CLAY (CL)**, with sand, yellowish-brown (10YR 5/8), stiff	1314
6.5 – 8.5	**CLAYEY CHERT GRAVEL (GC)**, yellowish-red (5YR 5/8) and light gray (10YR 7/1), very dense	1312
8.5 – 23.5	**CHERTY FAT CLAY (CH)**, yellowish-red (5YR 5/8), dark reddish-brown (2.5YR 3/4) and light gray (10YR 7/1), stiff to very stiff	1297
23.5 –	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 3/4) and light gray (10YR 7/1), stiff	

Sample depth (Ft., approx.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0.5 – 2	Split spoon	10	4-3-2 N=5		14		28-19-9	88
2 – 3.5	Split spoon	12	3-5-6 N=11		17			
5 – 6.5	Shelby tube	12						
6.5 – 8	Split spoon	14	20-44-33 N=77		14			
8.5 – 10	Split spoon	8	13-15-12 N=27		36			
13.5 – 15	Split spoon	16	18-8-6 N=14		48		81-21-60	53
18.5 – 20	Split spoon	10	17-18-24 N=42		33			
23.5 – 25	Split spoon	12	6-5-6 N=11		38			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 31 feet
Diamond Core Bit below 31 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *28.5 ft while drilling*
- *26 ft after boring*
- *16 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-80

BORING LOG NO. BW-805

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364021° Longitude: -94.174944°

Surface Elev.: 1320.3 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 3/4) and light gray (10YR 7/1), stiff *(continued)*			▽								
					X	4	8-9-5 N=14		41			
31.0		1289.5	30									
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard				Core		REC=97% RQD=67%	6,930				
			35		Core		REC=98% RQD=45%					
41.0		1279.5	40									
	Boring Terminated at 41 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 31 feet
Diamond Core Bit below 31 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28.5 ft while drilling*
▽ *26 ft after boring*
▼ *16 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-80

BORING LOG NO. BW-806

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364132° Longitude: -94.174748°

Surface Elev.: 1318.8 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	SILTY CLAY (CL-ML), brown (10YR 4/3), soft to medium stiff			Split spoon	10	3-2-2 N=4		17			
2.0		1317									
	LEAN CLAY (CL), strong brown (7.5YR 5/6), stiff			Shelby tube	17			18	108	43-17-26	89
				Split spoon	13	4-8-10 N=18		22			
5.0		1314									
	LEAN TO FAT CLAY (CL-CH), dark reddish-brown (2.5YR 2.5/4), stiff to very stiff			Split spoon	14	4-8-10 N=18		20		45-18-27	93
8.5		1310.5									
	FAT CLAY (CH), with chert gravel, reddish-brown (2.5YR 4/4), stiff to very stiff			Split spoon	8	3-9-10 N=19		22			
13.5		1305.5									
	FAT CLAY (CH), reddish-brown (2.5YR 4/4) to light olive-brown (2.5Y 5/6), stiff			Split spoon	16	2-3-10 N=13		42			
18.5		1300.5									
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and reddish-brown (2.5YR 4/4), medium dense			Split spoon	5	11-13-16 N=29		18			
			▼ (21 ft)								
23.5		1295.5									
	CLAYEY CHERT GRAVEL (GC), with sand, light gray (10YR 7/1) and reddish-brown (2.5YR 4/4), loose		▽ (25 ft)	Split spoon	16	3-4-5 N=9		47			37

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 29.5 feet
Diamond Core Bit below 29.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28.5 ft while drilling*

▽ *25 ft after boring*

▼ *21 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-81

BORING LOG NO. BW-806

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.364132° Longitude: -94.174748°

Surface Elev.: 1318.8 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), with sand, light gray (10YR 7/1) and reddish-brown (2.5YR 4/4), loose *(continued)*			▽								
	29.0	1290				5	N=50/5"		60			
	CHERTY LIMESTONE+, light gray (10YR 7/1), hard		30				REC=98% RQD=72%	6,040				
			35				REC=100% RQD=82%					
	39.3	1279.5										
	Boring Terminated at 39.3 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 29.5 feet
Diamond Core Bit below 29.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- ▽ *28.5 ft while drilling*
- ▽ *25 ft after boring*
- ▼ *21 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-81

BORING LOG NO. BW-807

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364311° Longitude: -94.174526°

Surface Elev.: 1317.6 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2.0	**SILTY CLAY (CL-ML)**, pale brown (10YR 6/3), medium stiff	1315.5			X	10	4-3-2 N=5		16			
	6.5	**LEAN CLAY (CL)**, trace sand, pale brown (10YR 6/3), medium stiff to stiff	1311			X	13	3-3-5 N=8		22		39-19-20	89
				5		■	13					38-21-17	92
	13.5	**CLAYEY CHERT GRAVEL (GC)**, gray (10YR 5/1) to yellowish-red (5YR 4/6), dense (with shert seams below 8.5 feet)	1304			X	13	14-31-18 N=49		24			
						X	4	N=50/6"		9			
				10									
	18.5	**FAT CLAY (CH)**, trace chert gravel, yellowish-red (5YR 4/6), stiff	1299	15		X	13	5-2-9 N=11		49		93-36-57	88
	23.5	**FAT CLAY (CH)**, with chert seams, yellowish-red (5YR 4/6) and light gray (10YR 7/1), stiff	1294	20	▼ ▽	X	6	7-8-50/3"		39			
	27.0	**FAT CLAY (CH)**, with highly weathered chert gravel, yellowish-brown (10YR 5/4), medium stiff	1290.5	25	▽	X	10	4-3-3 N=6		65			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 27.5 feet
Diamond Core Bit below 27.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *22.5 ft while drilling*

▽ *26 ft after boring*

▼ *22 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-82

BORING LOG NO. BW-807

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.364311° Longitude: -94.174526° Surface Elev.: 1317.6 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard				0	N=50/0"					
		30				REC=100% RQD=92%	5,690 8,370				
	37.5 / 1280	35				REC=100% RQD=85%					
	Boring Terminated at 37.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 27.5 feet
Diamond Core Bit below 27.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
22.5 ft while drilling
26 ft after boring
22 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-82

BORING LOG NO. BW-808

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364557° Longitude: -94.174464°

Surface Elev.: 1317.3 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), with silt, light olive-brown (2.5Y 5/4), stiff			10	5-6-8 N=14					
				12			22			
5.0	**LEAN TO FAT CLAY (CL-CH)**, trace sand, yellowish-brown (10YR 5/6) and gray (10YR 6/1), stiff	1312.5		16	3-5-8 N=13		24		46-22-24	88
				16	3-5-8 N=13					
8.5	**FAT CLAY (CH)**, with chert, yellowish-red (5YR 5/8) and light gray (10YR 7/1), stiff to very stiff	1309		15	5-8-16 N=24		30			
				4	4-5-11 N=16		39			
18.5	**SILTY CHERT GRAVEL (GM)**, with sand, light gray (10YR 7/1) to yellowish-red (5YR 5/8), dense	1299		8	10-8-31 N=39		25		NP	17
23.5	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 3/4) to light gray (10YR 7/1)	1294		5	7-5-4 N=9		16			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 30 feet
Diamond Core Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- *28.5 ft while drilling*
- *27 ft after boring*
- *25 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-83

BORING LOG NO. BW-808

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.364557° Longitude: -94.174464° Surface Elev.: 1317.3 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY FAT CLAY (CH), dark reddish-brown (2.5YR 3/4) to light gray (10YR 7/1) *(continued)*		▽								
	29.0 (yellowish-brown (10YR 5/6) below 28.5 feet) 1288.5				3	3-50/4"		22			
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard	30									
						REC=98% RQD=75%	8,410				
		35				REC=100% RQD=83%					
	40.0 1277.5	40									
	Boring Terminated at 40 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 30 feet
Diamond Core Bit below 30 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- ▽ *28.5 ft while drilling*
- ▽ *27 ft after boring*
- ▼ *25 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-83

BORING LOG NO. BW-809

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364689° Longitude: -94.174339°

Surface Elev.: 1317.1 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
0 – 5.0	**LEAN CLAY (CL)**, grayish-brown (10YR 5/2), medium stiff to stiff	1312
5.0 – 13.5	**FAT CLAY (CH)**, with chert seams, gray (10YR 5/1) and light gray (10YR 7/1), very stiff	1303.5
13.5 – 18.5	**SILT (ML)**, with highly weathered chert gravel, dark reddish-brown (2.5YR 2.5/4) and yellowish-red (5YR 5/6), medium stiff	1298.5
18.5 –	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and yellowish-red (5YR 5/8), dense (medium dense below 23.5 feet)	

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
13	5-4-4 N=8		14			
13	3-5-8 N=13		19			
21			20	106	52-21-31	95
16	3-7-50/5"		26			
4	14-50/3"		29			
10	5-3-4 N=7		36		NP	85
8	28-27-11 N=38		22			
5	9-9-8 N=17		13			

DEPTH (Ft.): 5, 10, 15, 20, 25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

28.5 ft while drilling
27 ft after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-84

BORING LOG NO. BW-809

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364689° Longitude: -94.174339°

Surface Elev.: 1317.1 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	28.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and yellowish-red (5YR 5/8), dense *(continued)*	1288.5		▽								
	28.9	**WEATHERED CHERT+**, yellowish-red (5YR 5/8) to light gray (10YR 7/1), soft	1288			X	5	N=50/5"		64			

Boring Terminated at 28.9 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *28.5 ft while drilling*

▽ *27 ft after boring*

not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/6/2013	Boring Completed: 9/6/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-84

BORING LOG NO. BW-810

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.364903° Longitude: -94.174145°

Surface Elev.: 1317.6 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), grayish-brown (10YR 5/2), stiff				X	13	3-6-7 N=13					
					■	13						
					X	16	4-7-8 N=15					
			5		X	16	2-3-3 N=6					
8.5		1309										
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and dark reddish-brown (2.5YR 2.5/4), very dense				X	16	5-11-38 N=49					
			10									
					X	6	2-14-50/2"					
			15									
18.5		1299										
	CHERTY FAT CLAY (CH), gray (10YR 5/1) and dark reddish-brown (2.5YR 2.5/4), stiff to very stiff				X	5	4-6-16 N=22					
			20									
				▽								
25.0		1292.5	25		X	12	6-11-31 N=42					
	Boring Terminated at 25 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *23 ft while drilling*
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 8/2/2013	Boring Completed: 8/2/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-85

PIEZOMETER LOG NO. BW-811

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION: See Exhibit A-2

Latitude: 36.365257° Longitude: -94.174097°

Surface Elev.: 1303.4 (Ft.)

DEPTH (Ft.)	DESCRIPTION	ELEVATION (Ft.)
0.0–2.0	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and yellowish-brown (10YR 5/6), medium dense	1301.5
2.0–5.0	**FAT CLAY (CH)**, with chert gravel and sand pockets, dark reddish-brown (2.5YR 2.5/4), yellowish-red (5YR 5/8), and light gray (10YR 7/1), stiff	1298.5
5.0–8.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) and dark reddish-brown (2.5YR 2.5/4), loose	1295
8.5–13.5	**CLAYEY CHERT GRAVEL (GC)**, light gray (10YR 7/1) to yellowish-brown (10YR 5/8), dense	1290
13.5–17.0	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 2.5/4), yellowish-red (5YR 5/8), and light gray (10YR 7/1), soft	1286.5
17.0–	**LIMESTONE INTERBEDDED WITH CHERT+**, light gray (10YR 7/1) and gray (10YR 6/1), hard	

INSTALLATION DETAILS: Cement Grout; Bentonite; Riser 2" PVC; Sand 10/20 Silica; Screen 2" PVC 0.01 Slot; Well Cap

Approx. Depth (Ft.)	Recovery (In.)	Field Test Results	Unconfined Compressive Strength (psi)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1–2.5	7	8-16-11 N=27		10			
2.5–4	7	4-7-5 N=12		38			
5.5–7	5	4-5-4 N=9		18			41
9–10.5	8	19-19-12 N=31		23			
13.5–15	16	5-1-2 N=3		80		61-23-38	63
17	0	N=50/0"					
17.5–22.5		REC=100% RQD=95%	7,920				
22.5–27		REC=100% RQD=83%					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

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

Advancement Method:
Hollow Stem Auger to 17.5 feet
Diamond Core Bit below 17.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

15 ft while drilling

9 ft after boring

9 ft 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-86

PIEZOMETER LOG NO. BW-811

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION: See Exhibit A-2 Latitude: 36.365257° Longitude: -94.174097° Surface Elev.: 1303.4 (Ft.) DEPTH / ELEVATION (Ft.)		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	27.5 / 1276											
	Boring Terminated at 27.5 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 17.5 feet
Diamond Core Bit below 17.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- *15 ft while drilling*
- *9 ft after boring*
- *9 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-86

BORING LOG NO. BW-812

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365463° Longitude: -94.173932°

Surface Elev.: 1302 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FAT CLAY (CH), trace chert gravel, dark reddish-brown (2.5YR 2.5/4), stiff				X	12	6-6-6 N=12		49			
					X	12	2-3-10 N=13		31		81-35-46	90
5.0		1297	5									
	CLAYEY CHERT GRAVEL (GC), gray (10YR 6/1), dense				X	4	17-28-11 N=39		13			
	(medium dense below 8.5 feet)				X	3	4-4-8 N=12		26			16
			10									
13.5		1288.5										
	FAT CLAY (CH), with chert gravel, yellowish-brown (10YR 5/8), medium stiff			▼ 14 ft, ▽ 15 ft	X	16	4-4-1 N=5		49			
16.0		1286	15									
	LIMESTONE INTERBEDDED WITH CHERT+, light gray (10YR 7/1) and gray (10YR 6/1), hard				X	0	N=50/0"					
					Core		REC=100% RQD=93%	4,300				
			20									
					Core		REC=100% RQD=75%					
26.3		1275.5	25									
	Boring Terminated at 26.3 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 16.3 feet
Diamond Core Bit below 16.3 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
▽ *15 ft while drilling*
▽ *14 ft after boring*
▼ *14 ft 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-87

BORING LOG NO. BW-813

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365574° Longitude: -94.173582°

Surface Elev.: 1319.3 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, light yellowish-brown (10YR 6/4), very stiff		X	7	7-10-11 N=21		6			
2.5		1317								
	LEAN CLAY (CL), trace sand, yellowish-red (5YR 5/8), very stiff		X	8	7-8-8 N=16		16			
			X	16	3-7-11 N=18		21			
8.5		1311								
	LEAN CLAY (CL), yellowish-red (5YR 5/8), stiff		X	14	4-5-6 N=11		28		41-20-21	96
13.5		1306								
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and yellowish-red (5YR 5/8), medium dense		X	8	13-10-13 N=23		13			
18.5		1301								
	FAT CLAY (CH), trace chert gravel, dark reddish-brown (2.5YR 2.5/4), stiff		X	16	2-5-4 N=9		28			
23.5		1296								
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and yellowish-red (5YR 5/8), medium dense		X	6	6-16-5 N=21		22			

DEPTH (Ft.): 5, 10, 15, 20, 25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 16.3 feet
Wash Bore below 16.3 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- *29.5 ft while sampling*
- *not encountered after boring*
- *not encountered 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/19/2013	Boring Completed: 9/19/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-88

BORING LOG NO. BW-813

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365574° Longitude: -94.173582°

Surface Elev.: 1319.3 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), light gray (10YR 7/1) and yellowish-red (5YR 5/8), medium dense *(continued)*										
			▽		5	10-20-9 N=29		14			
	30.0 — 1289.5	30									
	Boring Terminated at 30 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 16.3 feet
Wash Bore below 16.3 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- ▽ *29.5 ft while sampling*
- *not encountered after boring*
- *not encountered 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/19/2013	Boring Completed: 9/19/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-88

BORING LOG NO. BW-814

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.365872° Longitude: -94.173599°

Surface Elev.: 1300.7 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAYEY CHERT GRAVEL (GC), dark reddish-brown (2.5YR 3/4) and light gray (10YR 7/1), medium dense				X	13	10-11-12 N=23		19			40
					X	7	7-10-18 N=28		21			
	(yellowish-brown (10YR 5/4) below 5 feet)		5		X	3	5-8-5 N=13		10			
8.5		1292										
	SILTY SAND (SM), with chert gravel, light gray (10YR 7/1) to yellowish-red (5YR 5/8), very dense				X	7	11-29-28 N=57		37		NP	22
			10									
13.5		1287										
	FAT CLAY (CH), with highly weathered chert gravel, dark reddish-brown (2.5YR 2.5/4), soft		15	▽	X	14	6-1-2 N=3		53			
16.0		1284.5										
	LIMESTONE INTERBEDDED WITH CHERT+, light gray (10YR 7/1) and gray (10YR 6/1), hard				X		N=50/0"					
			20		Core		REC=100% RQD=93%	5,140				
21.3		1279.5										
	Boring Terminated at 21.3 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 16.3 feet
Diamond Core Bit below 16.3 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *15 ft while drilling*
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-89

BORING LOG NO. BW-901

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.366251° Longitude: -94.174202°

Surface Elev.: 1325.2 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, yellowish-brown (10YR 5/8), stiff				X	8	3-5-8 N=13		8			
2.0		1323										
	FAT CLAY (CH), with hard limestone seams, trace sand, reddish-brown (5YR 4/4) to red (2.5YR 4/6), very stiff				X	8	5-8-13 N=21		12			
			5		X	8	5-8-11 N=19		15		53-21-32	93
					X	8	5-8-11 N=19		10			
			10									
13.5		1311.5										
	CLAYEY CHERT GRAVEL (GC), gray (10YR 6/1) and very pale brown (10YR 7/4), medium dense				X	4	15-12-9 N=21		10			
			15									
18.5		1306.5										
	FAT CLAY (CH), yellowish-brown (10YR 5/8) to dark reddish-brown (2.5YR 2.5/4), very stiff				X	10	2-7-9 N=16		45		78-38-40	99
			20									
23.5		1301.5										
	LIMESTONE+, with chert and clay seams, light gray (10YR 7/1), soft to hard				X	1	N=50/5"		3			
			25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 26.4 feet
Diamond Core Bit below 26.4 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
none to 26.4 feet while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/27/2013	Boring Completed: 9/27/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-90

BORING LOG NO. BW-901

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.366251° Longitude: -94.174202°

Surface Elev.: 1325.2 (Ft.)

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LIMESTONE+, with chert and clay seams, light gray (10YR 7/1), soft to hard *(continued)*	30				REC=76% RQD=68%	7,200				
	31.2 — 1294										
	Boring Terminated at 31.2 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 26.4 feet
Diamond Core Bit below 26.4 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
none to 26.4 feet while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/27/2013	Boring Completed: 9/27/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-90

PIEZOMETER LOG NO. BW-902

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION: See Exhibit A-2

Latitude: 36.366352° Longitude: -94.173846°

Surface Elev.: 1301 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)
5.0	**SILTY CHERT GRAVEL (GM)**, with sand, light gray (10YR 7/1), medium dense	1296
8.5	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), medium stiff	1292.5
13.5	**SILTY CHERT GRAVEL (GM)**, with sand, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), very loose to loose	1287.5
18.5	**CHERTY FAT CLAY (CH)**, dark reddish-brown (2.5YR 2.5/4) and light gray (10YR 7/1), very soft	1282.5
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard	

INSTALLATION DETAILS: Cement Grout; Bentonite; Riser 2" PVC; Sand 10/20 Silica; Screen 2" PVC 0.01 Slot; Well Cap

RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
6	11-7-6 N=13		18			
4	12-9-7 N=16		12		NP	43
5	5-3-2 N=5		22			
4	3-2-2 N=4		20			12
3	0-0-1 N=1		62			
0	N=50/0"					
	REC=100% RQD=75%	6,990				
	REC=87% RQD=23%					

DEPTH (Ft.): 5, 10, 15, 20, 25

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 18.8 feet
Diamond Core Bit below 18.8 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
15 ft while drilling
17.5 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-91

PIEZOMETER LOG NO. BW-902

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION: See Exhibit A-2 Latitude: 36.366352° Longitude: -94.173846° Surface Elev.: 1301 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard *(continued)* 33.8 / 1267	30				REC=100% RQD=100%	6,620				
	Boring Terminated at 33.8 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 18.8 feet
Diamond Core Bit below 18.8 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
15 ft while drilling
17.5 ft after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/9/2013	Boring Completed: 9/9/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-91

BORING LOG NO. BW-903

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.366563° Longitude: -94.173681°

Surface Elev.: 1300.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace chert gravel, light olive-brown (2.5Y 5/4), stiff				X	6	10-15-15 N=30		18		28-19-9	92
2.0		1298.5										
	SILTY CHERT GRAVEL (GM), with sand, light gray (5YR 7/1) and yellowish-red (5YR 5/6), dense to medium dense				X	8	17-30-17 N=47		18			
			5		X	6	6-6-6 N=12		20			20
					X	1	4-50/3"		19			
9.0		1291.5										
	WEATHERED CHERTY LIMESTONE, gray (10YR 6/1), soft to moderately hard		10	▽								
					X	1	N=50/3"					
12.5		1288										
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		15		Core		REC=100% RQD=60%	8,470				
17.5		1283										
	(possible void or clay seam from 17.5 to 19.5 feet)				Core		REC=0% RQD=0%					
19.5		1281										
	CHERTY LIMESTONE+, light gray (10YR 7/1) and gray (10YR 6/1), hard		20		Core		REC=93% RQD=72%					
24.8		1275.5										
	Boring Terminated at 24.8 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger to 12.5 feet
Diamond Core Bit below 12.5 feet

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
- ▽ *10 ft while drilling*
- *not encountered after boring*
- *not encountered 24 hrs after boring*

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/10/2013	Boring Completed: 9/11/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-92

BORING LOG NO. BW-904

PROJECT: 8th Street Widening Project - MSE Walls

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.366869° Longitude: -94.173697°

Surface Elev.: 1324.1 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	UNCONFINED COMPRESSIVE STRENGTH (psi)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, strong brown (7.5YR 5/6), stiff					10	3-7-8 N=15		11			
3.5		1320.5				12			13	111	33-18-15	87
	LEAN CLAY (CL), trace sand, yellowish-red (5YR 5/8), stiff					14	4-6-8 N=14		19			
			5			16	3-5-7 N=12		18			
8.5		1315.5										
	LEAN TO FAT CLAY (CL-CH), with sand, yellowish-red (5YR 5/8) to light olive-brown (2.5Y 5/4), very stiff		10			14	4-12-15 N=27		23			76
13.5		1310.5										
	FAT CLAY (CH), mottled yellowish-red (5YR 5/8) and light olive-brown (2.5Y 5/4) and dark reddish-brown (2.5YR 2.5/4), very stiff		15			16	4-4-6 N=10		29			
18.5		1305.5										
20.0	**GRAVELLY LEAN CLAY (CL)**, with sand, mottled yellowish-red (5YR 5/8), light olive-brown (2.5Y 5/4), and gray (10YR 6/1), very stiff	1304	20			8	3-17-14 N=31		18		36-20-16	55

Boring Terminated at 20 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic
+Classification estimated from disturbed or core samples. Petrographic analysis may reveal other rock types.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with cuttings above 4'; grouted 4' to 14'; backfilled with cuttings from 14' to termination depth.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix D for explanation of symbols and abbreviations.

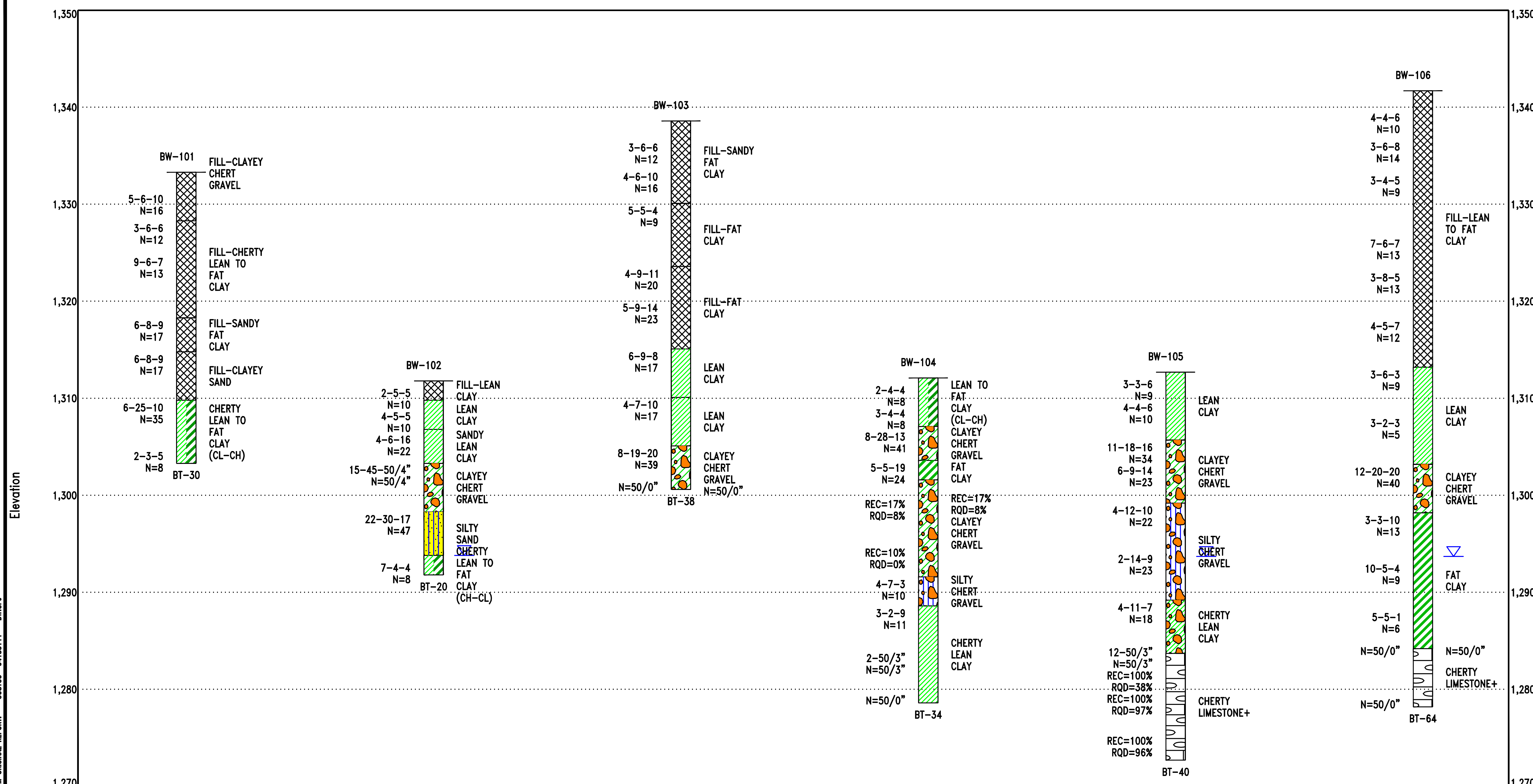
Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling
not encountered after boring
not encountered 24 hrs after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 9/27/2013	Boring Completed: 9/27/2013
Drill Rig: ATV	Driller: DB
Project No.: 04135111	Exhibit: A-93



Distance Along Baseline

Explanation

BW-101 — Borehole Number

Borehole Lithology

AR BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

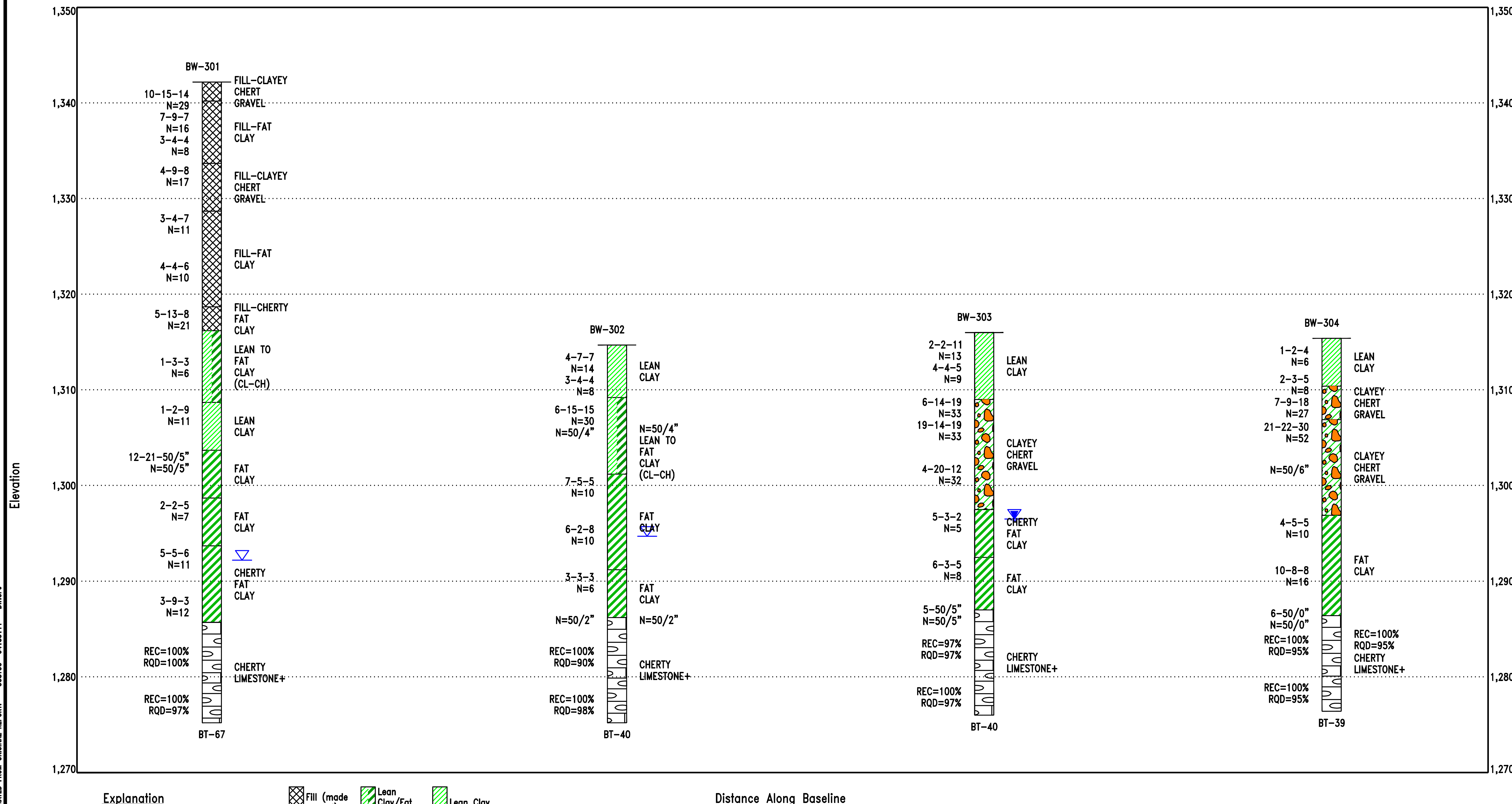
Fill (made ground) | Lean Clay/Fat Clay | Lean Clay | Clayey Gravel | Silty Sand | Fat Clay

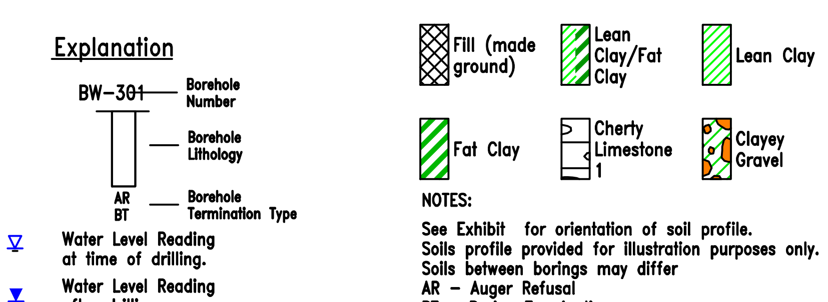
NOTES:

See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111	Terracon Consulting Engineers and Scientists	SUBSURFACE PROFILE	EXHIBIT
Drawn by: JM	Scale: NOT TO SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74146	WALL 1	A-94
Approved by: MHH	File Name: 04135111	PH. (918) 250-0461 FAX. (918) 250-4570	8TH STREET WIDENING PROJECT – MSE WALLS	
Date: 1/20/2016			BENTONVILLE, ARKANSAS	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COSTCO 04135111 - BW.GPJ





NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project Manager: JEG	Project No.: 04135111	Terracon	SUBSURFACE PROFILE	EXHIBIT
Drawn by: JM	Scale: NOT TO SCALE	Consulting Engineers and Scientists	WALL 1 8TH STREET WIDENING PROJECT - MSE WALLS	A-94
Approved by: MHH	File Name: 04135111	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74146 PH. (918) 250-0461 FAX. (918) 250-4570	BENTONVILLE, ARKANSAS	
Date: 1/20/2016				

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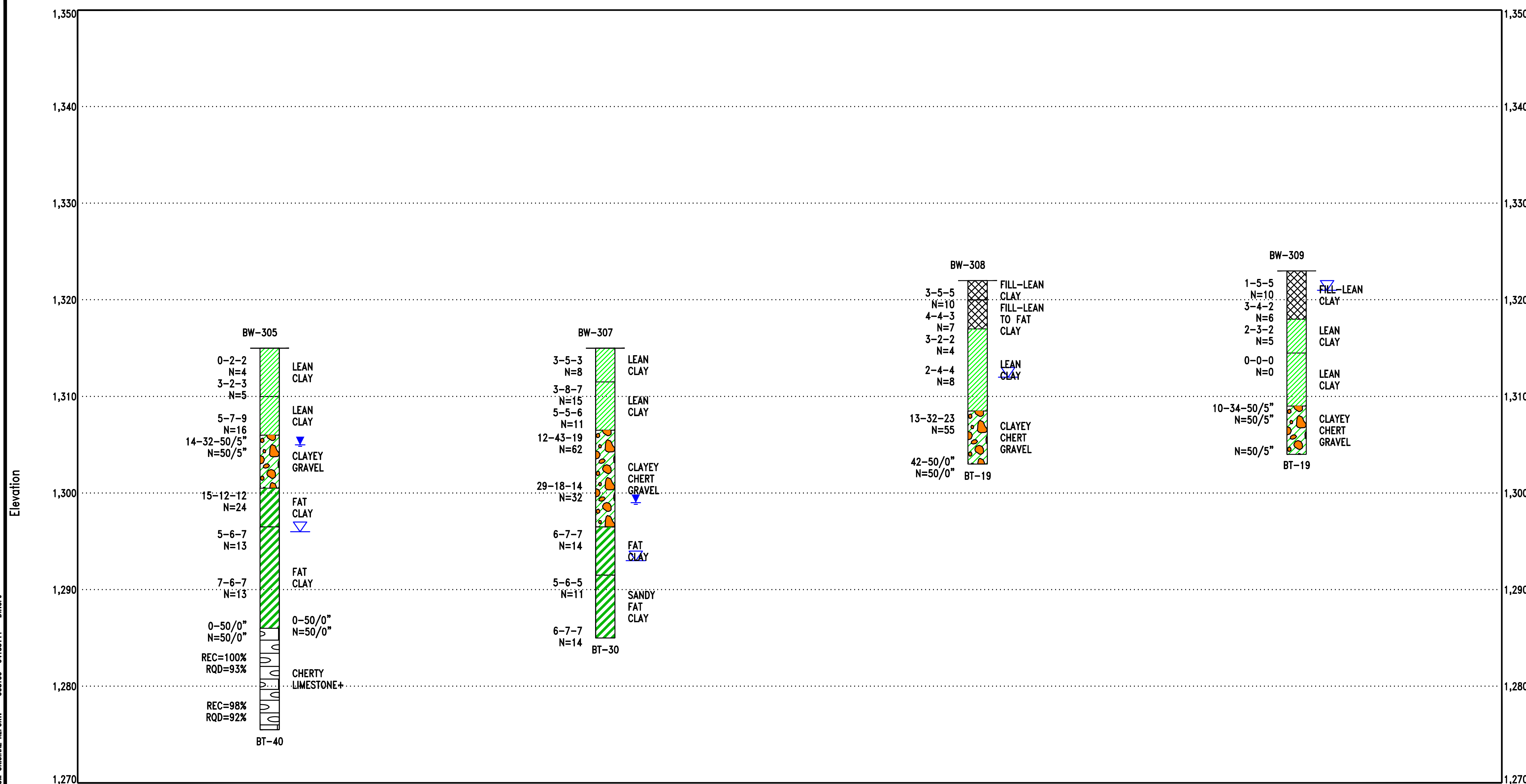

Explanation

BW-301 — Borehole Number
— Borehole Lithology
AR BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Fill (made ground) | Lean Clay/Fat Clay | Lean Clay
Fat Clay | Cherty Limestone 1 | Clayey Gravel

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Distance Along Baseline

Project Manager: JEG	Project No.: 04135111	SUBSURFACE PROFILE	EXHIBIT
Drawn by: JM	Scale: NOT TO SCALE	WALL 1 8TH STREET WIDENING PROJECT – MSE WALLS	A-94
Approved by: MHH	File Name: 04135111	BENTONVILLE, ARKANSAS	
Date: 1/20/2016			

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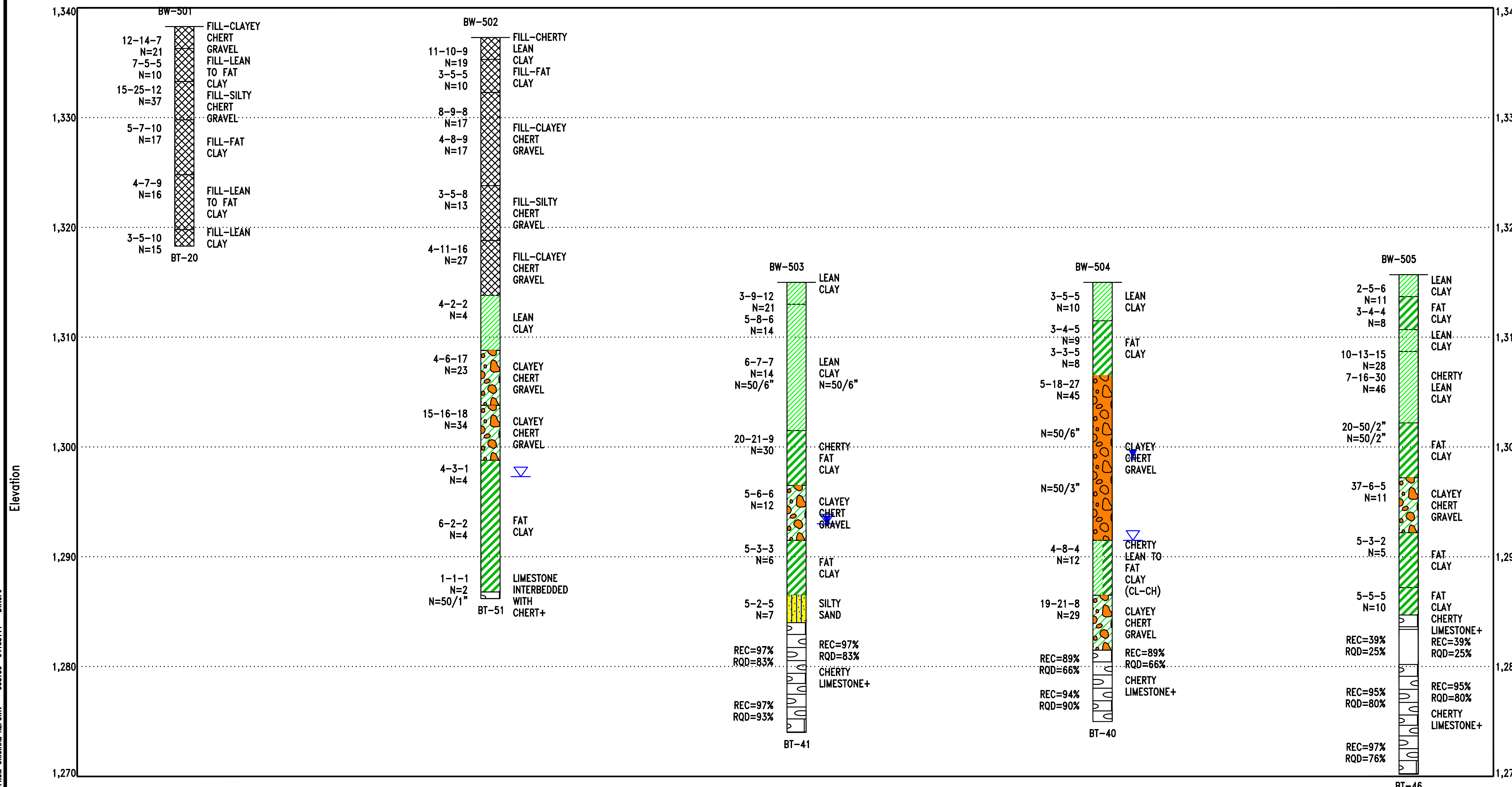


Explanation

BW-501 — Borehole Number

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Fill (made ground) | Lean Clay | Clayey Gravel

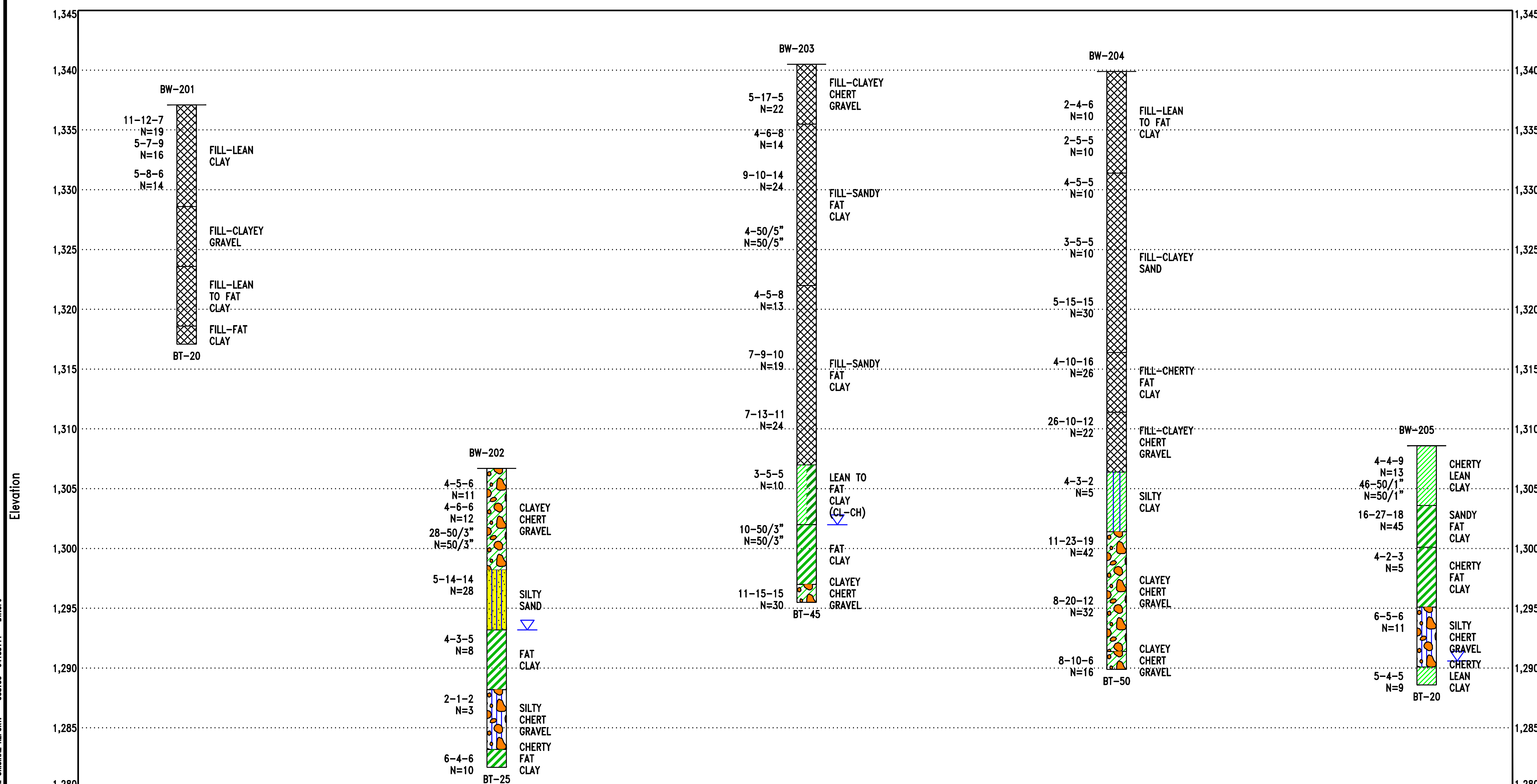
Fat Clay | Cherty Limestone 1 | Silty Sand

NOTES:

See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111	Terracon Consulting Engineers and Scientists 9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74146 PH. (918) 250-0461 FAX. (918) 250-4570	SUBSURFACE PROFILE
Drawn by: JM	Scale: NOT TO SCALE		WALL 1 8TH STREET WIDENING PROJECT – MSE WALLS
Approved by: MHH	File Name: 04135111		BENTONVILLE, ARKANSAS
Date: 1/20/2016			

EXHIBIT A-94



Explanation

BW-201 — Borehole Number
Borehole Lithology
AR / BT — Borehole Termination Type
Water Level Reading at time of drilling.
Water Level Reading after drilling.

Fill (made ground) | Clayey Gravel | Silty Sand | Fat Clay | Silty Gravel | Lean Clay/Fat Clay

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111	
Drawn by: JM	Scale: NOT TO SCALE	
Approved by: MHH	File Name: 04135111	
Date: 1/20/2016		

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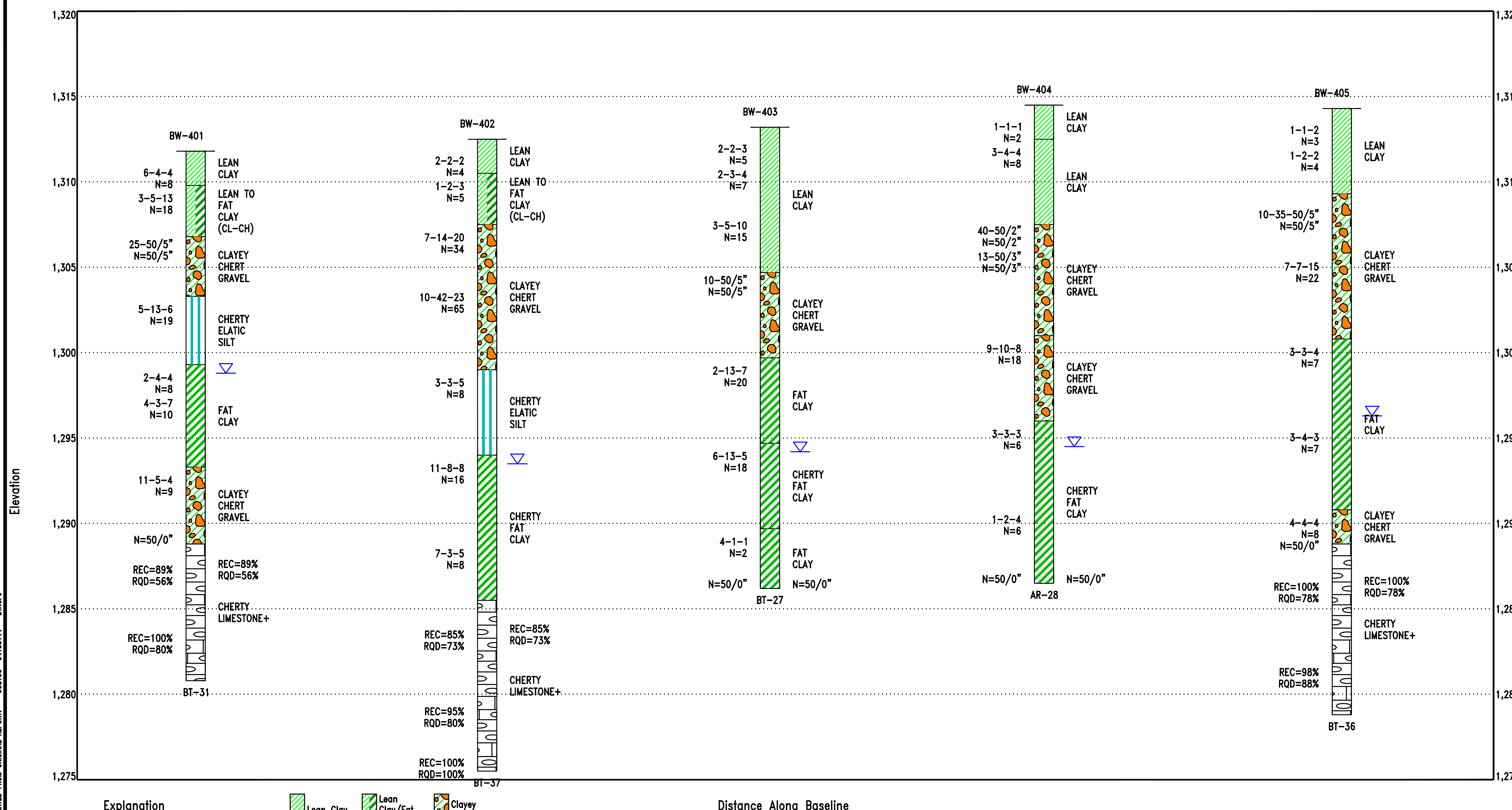
SUBSURFACE PROFILE
WALL 2
8TH STREET WIDENING PROJECT – MSE WALLS
BENTONVILLE, ARKANSAS

EXHIBIT
A-95



Explanation

BW-401 — Borehole Number

Borehole Lithology

AR BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Lean Clay | Lean Clay/Fat Clay | Clayey Gravel | Elastic Silt | Fat Clay | Cherty Limestone 1

NOTES:

See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

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SUBSURFACE PROFILE

WALL 2
8TH STREET WIDENING PROJECT – MSE WALLS

BENTONVILLE, ARKANSAS

EXHIBIT

A-95

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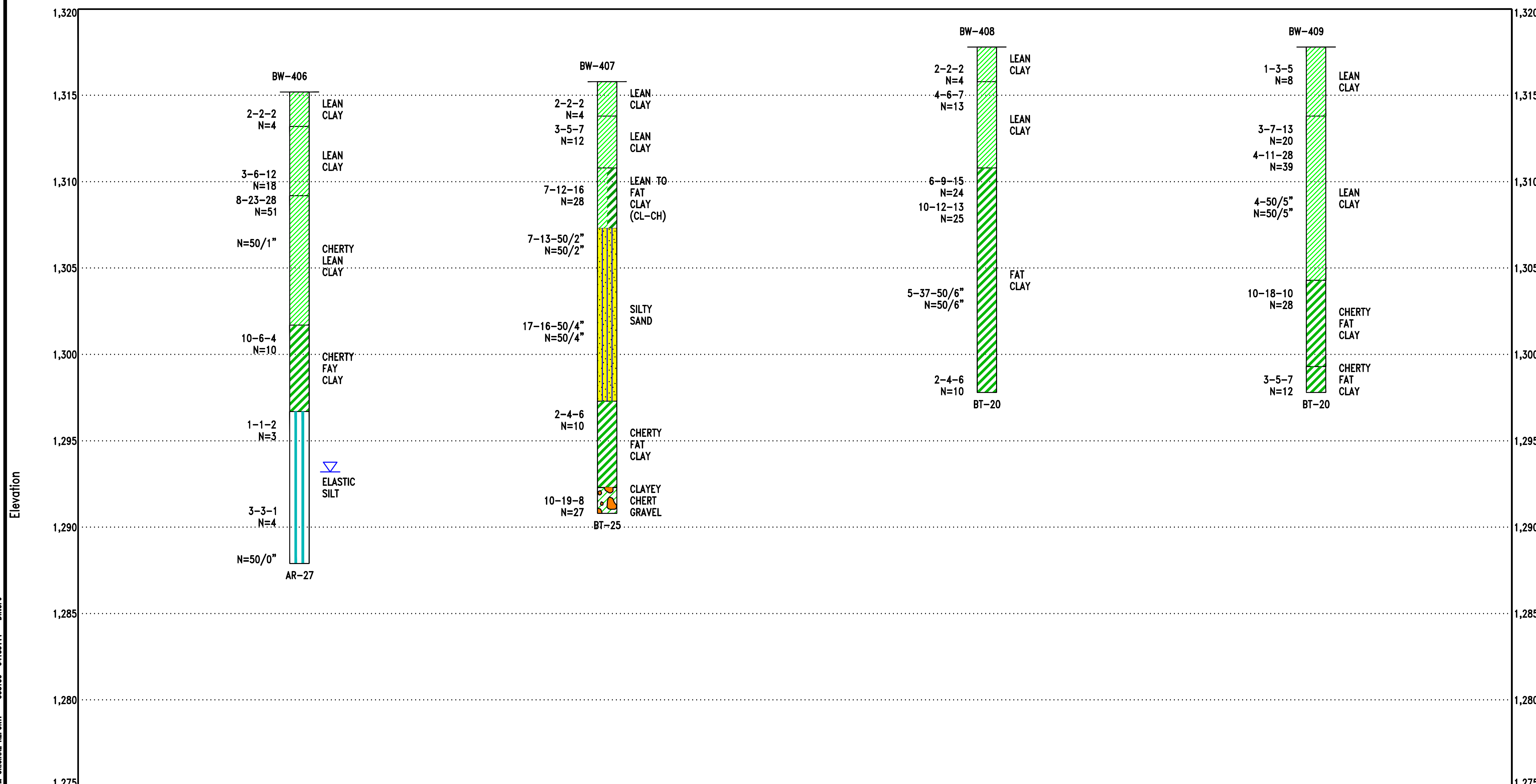

Distance Along Baseline

Explanation

BW-401 — Borehole Number

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Lean Clay | Lean Clay/Fat Clay | Clayey Gravel | Elastic Silt | Fat Clay | Cherty Limestone 1

NOTES:

See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

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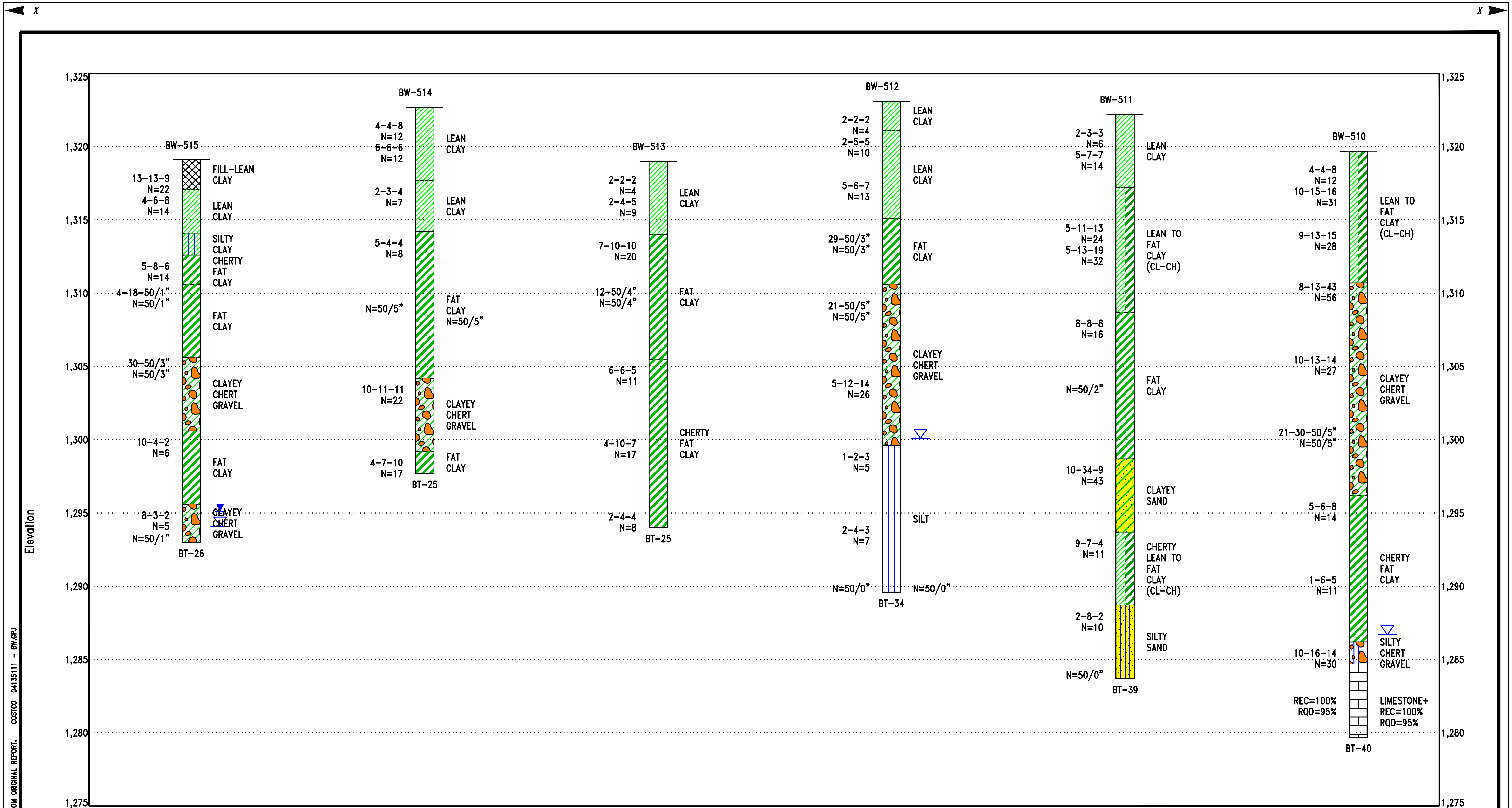
SUBSURFACE PROFILE

WALL 2
8TH STREET WIDENING PROJECT – MSE WALLS

BENTONVILLE, ARKANSAS

EXHIBIT

A–95



Explanation

BW-510 — Borehole Number

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Lean Clay/Fat Clay

Clayey Gravel

Fat Clay

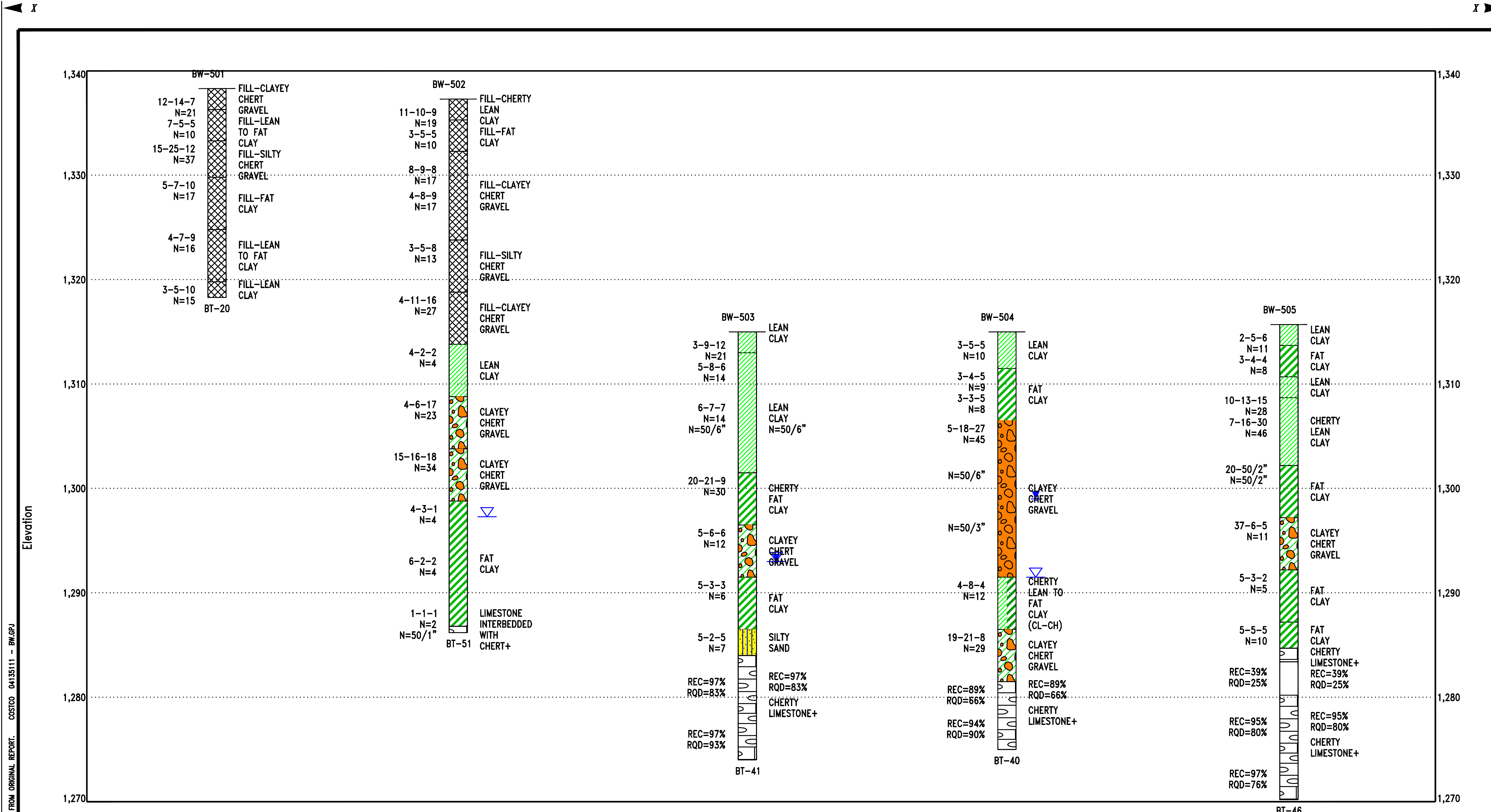
Silty Gravel

Limestone

Lean Clay

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111	Terracon Consulting Engineers and Scientists 9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74146 PH. (918) 250-0461 FAX. (918) 250-4570	SUBSURFACE PROFILE	EXHIBIT
Drawn by: JM	Scale: NOT TO SCALE		WALL 3A 8TH STREET WIDENING PROJECT – MSE WALLS BENTONVILLE, ARKANSAS	A-96
Approved by: MHH	File Name: 04135111			
Date: 1/20/2016				



Explanation

BW-501 — Borehole Number

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Fill (made ground) | Lean Clay | Clayey Gravel | Fat Clay | Cherty Limestone 1 | Silty Sand

NOTES:

See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111	Terracon Consulting Engineers and Scientists	SUBSURFACE PROFILE
Drawn by: JM	Scale: NOT TO SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74146	WALL 3B 8TH STREET WIDENING PROJECT – MSE WALLS
Approved by: MHH	File Name: 04135111	PH. (918) 250-0461 FAX. (918) 250-4570	BENTONVILLE, ARKANSAS
Date: 1/20/2016			

EXHIBIT

A-97

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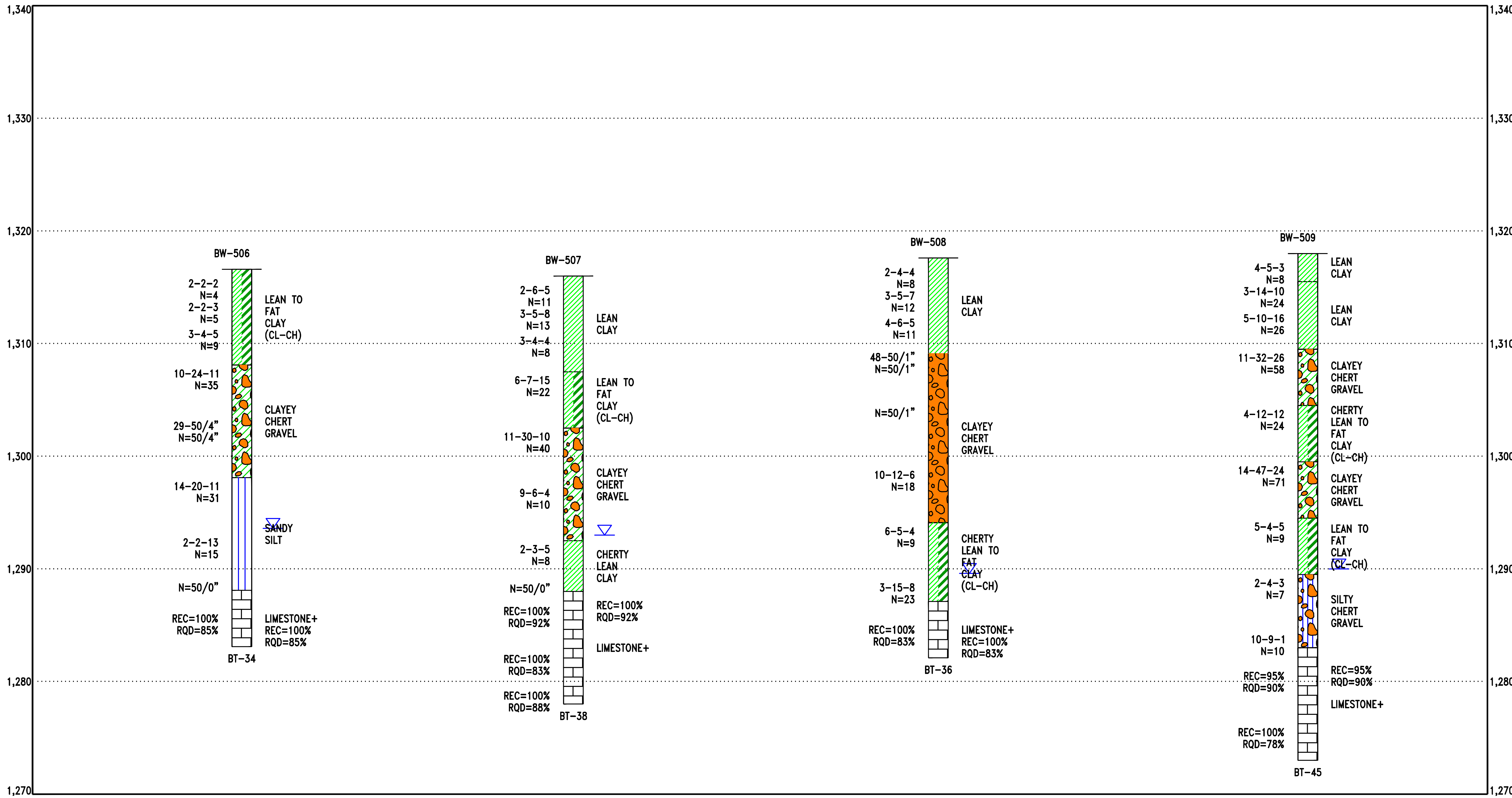


Explanation

BW-501 — Borehole Number

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

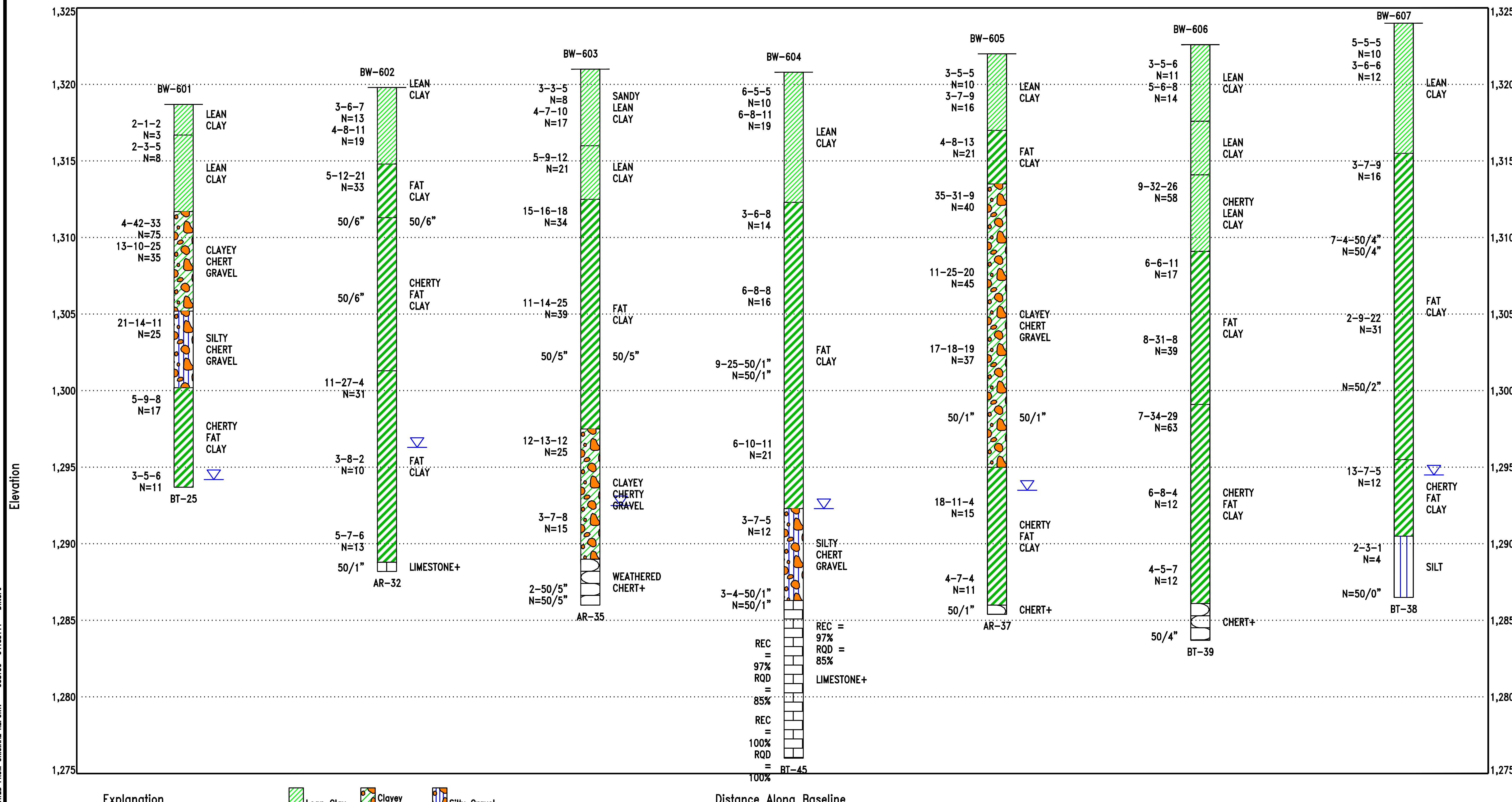
Fill (made ground) | Lean Clay | Clayey Gravel | Fat Clay | Cherty Limestone 1 | Silty Sand

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111	Terracon Consulting Engineers and Scientists	SUBSURFACE PROFILE
Drawn by: JM	Scale: NOT TO SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74146	WALL 3B 8TH STREET WIDENING PROJECT – MSE WALLS
Approved by: MHH	File Name: 04135111	PH. (918) 250-0461 FAX. (918) 250-4570	BENTONVILLE, ARKANSAS
Date: 1/20/2016			

EXHIBIT A-97

X X



Explanation

BW-601 — Borehole Number

Borehole Lithology

AR BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Lean Clay | Clayey Gravel | Silty Gravel | Fat Clay | Limestone | Bedded Chert 1

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

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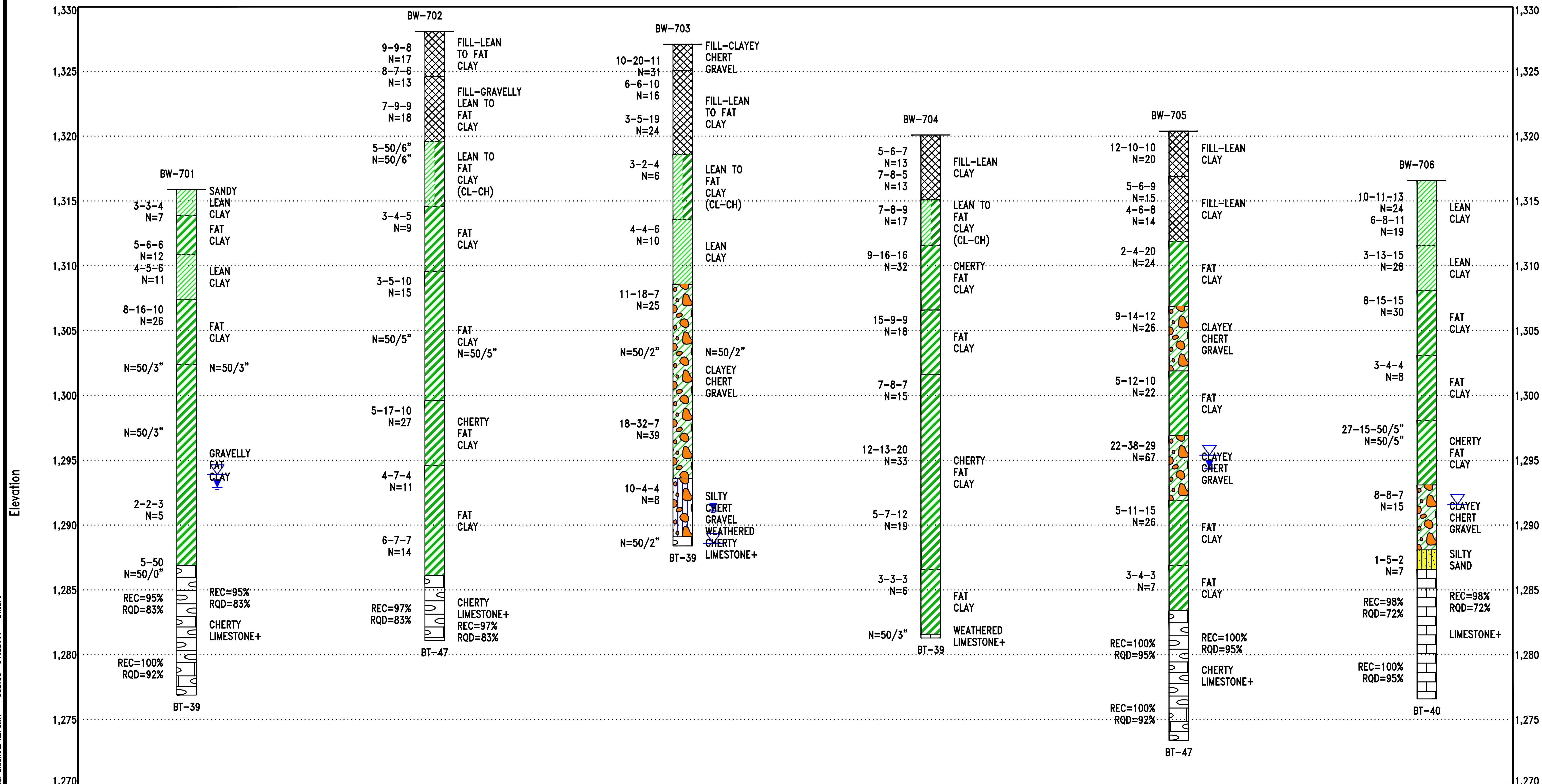
SUBSURFACE PROFILE
WALL 4
8TH STREET WIDENING PROJECT – MSE WALLS
BENTONVILLE, ARKANSAS

EXHIBIT
A-98



Explanation

BW-701 — Borehole Number

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Lean Clay | Fat Clay | Cherty Limestone 1 | Fill (made ground) | Lean Clay/Fat Clay | Clayey Gravel

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

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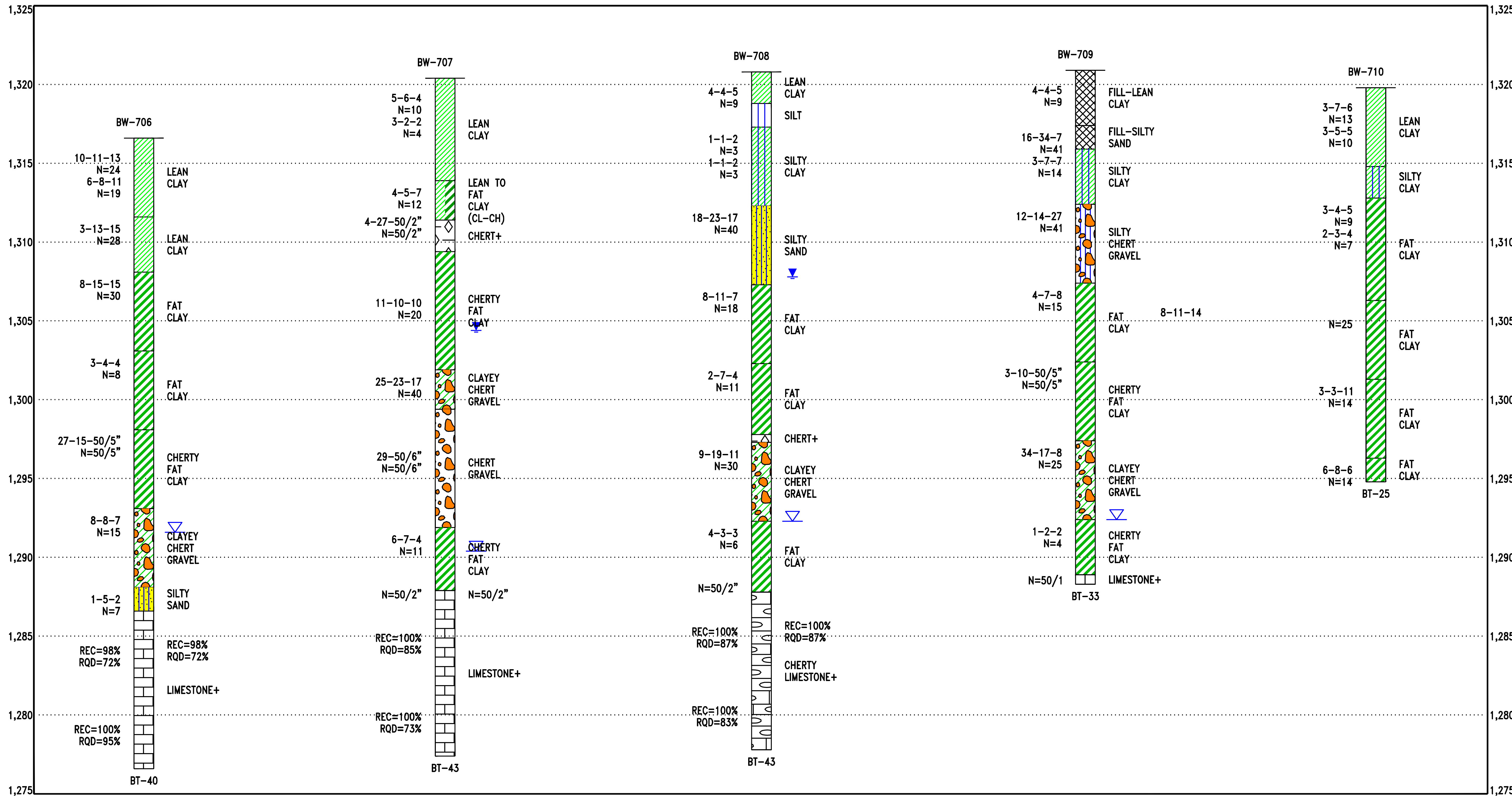
PH. (918) 250-0461 FAX. (918) 250-4570

SUBSURFACE PROFILE
WALL 5A
8TH STREET WIDENING PROJECT – MSE WALLS
BENTONVILLE, ARKANSAS

EXHIBIT
A-99

X X



Distance Along Baseline

Explanation

BW-706 — Borehole Number
Borehole Lithology
AR BT — Borehole Termination Type
Water Level Reading at time of drilling.
Water Level Reading after drilling.

Lean Clay
Fat Clay
Clayey Gravel
Silty Sand
Limestone
Lean Clay/Fat Clay

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

Terracon
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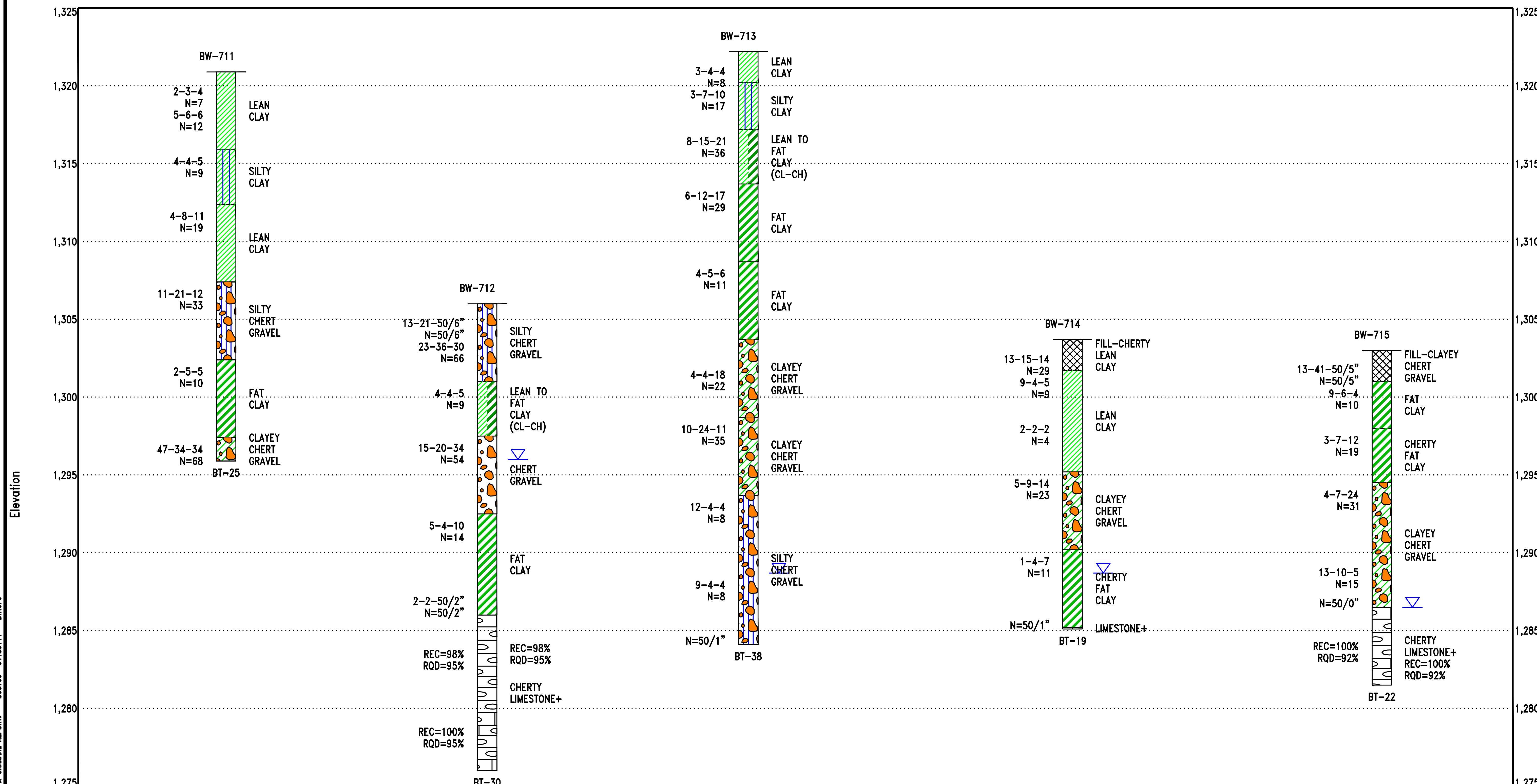
PH. (918) 250-0461 FAX. (918) 250-4570

SUBSURFACE PROFILE
WALL 5B
8TH STREET WIDENING PROJECT - MSE WALLS
BENTONVILLE, ARKANSAS

EXHIBIT
A-100



Explanation

BW-706 — Borehole Number
Borehole Lithology
AR / BT — Borehole Termination Type
Water Level Reading at time of drilling.
Water Level Reading after drilling.

Lean Clay | Fat Clay | Clayey Gravel | Silty Sand | Limestone | Lean Clay/Fat Clay

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

Terracon
Consulting Engineers and Scientists
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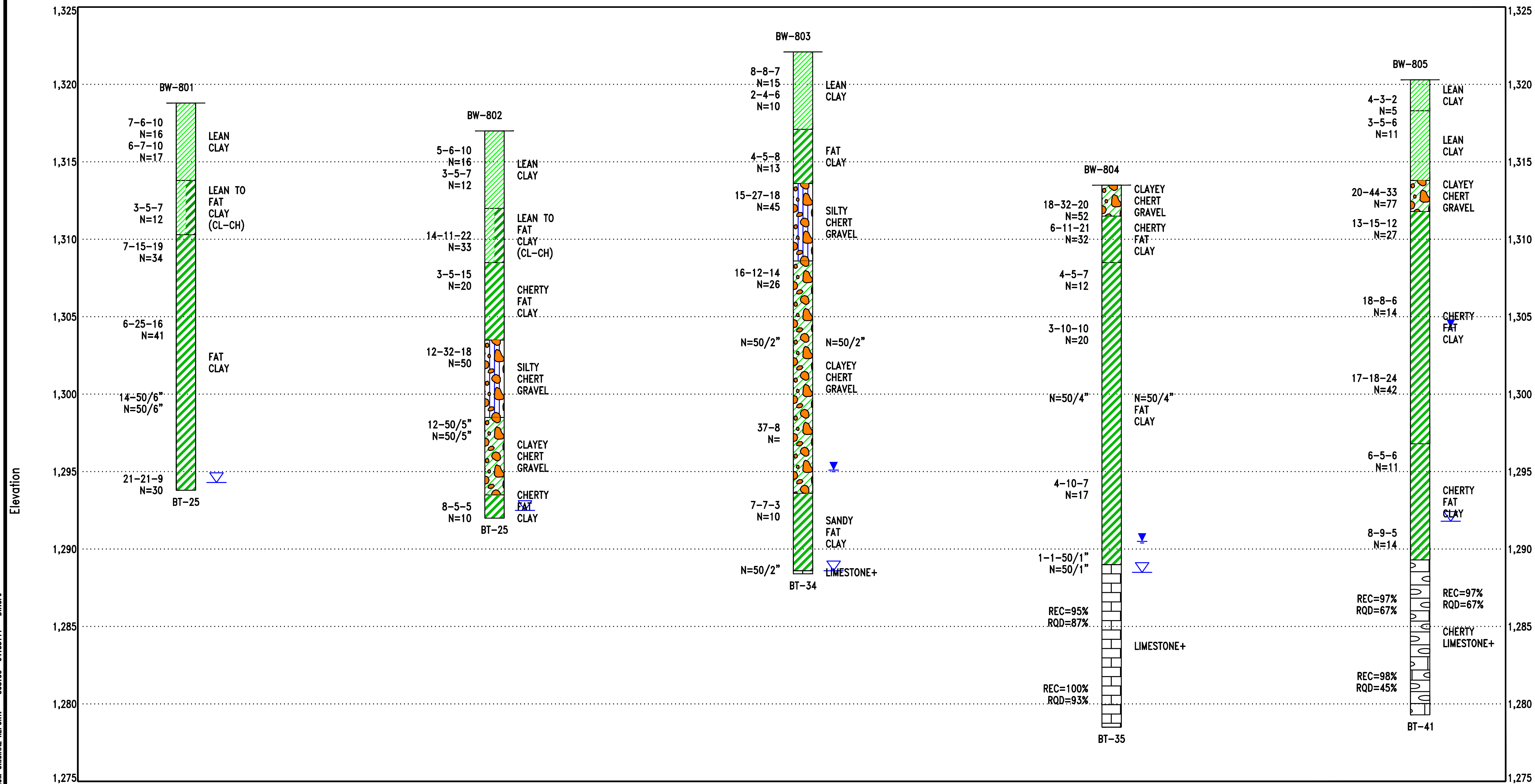
PH. (918) 250-0461 FAX. (918) 250-4570

SUBSURFACE PROFILE
WALL 5B
8TH STREET WIDENING PROJECT – MSE WALLS
BENTONVILLE, ARKANSAS

EXHIBIT
A-100

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COSTCO 04135111 - BW.GPJ



Distance Along Baseline

X X

Explanation

BW-801 — Borehole Number

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Lean Clay | Lean Clay/Fat Clay | Fat Clay | Silty Gravel | Clayey Gravel | Limestone

NOTES:

See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

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SUBSURFACE PROFILE

WALL 6A
8TH STREET WIDENING PROJECT - MSE WALLS

BENTONVILLE, ARKANSAS

EXHIBIT

A-101

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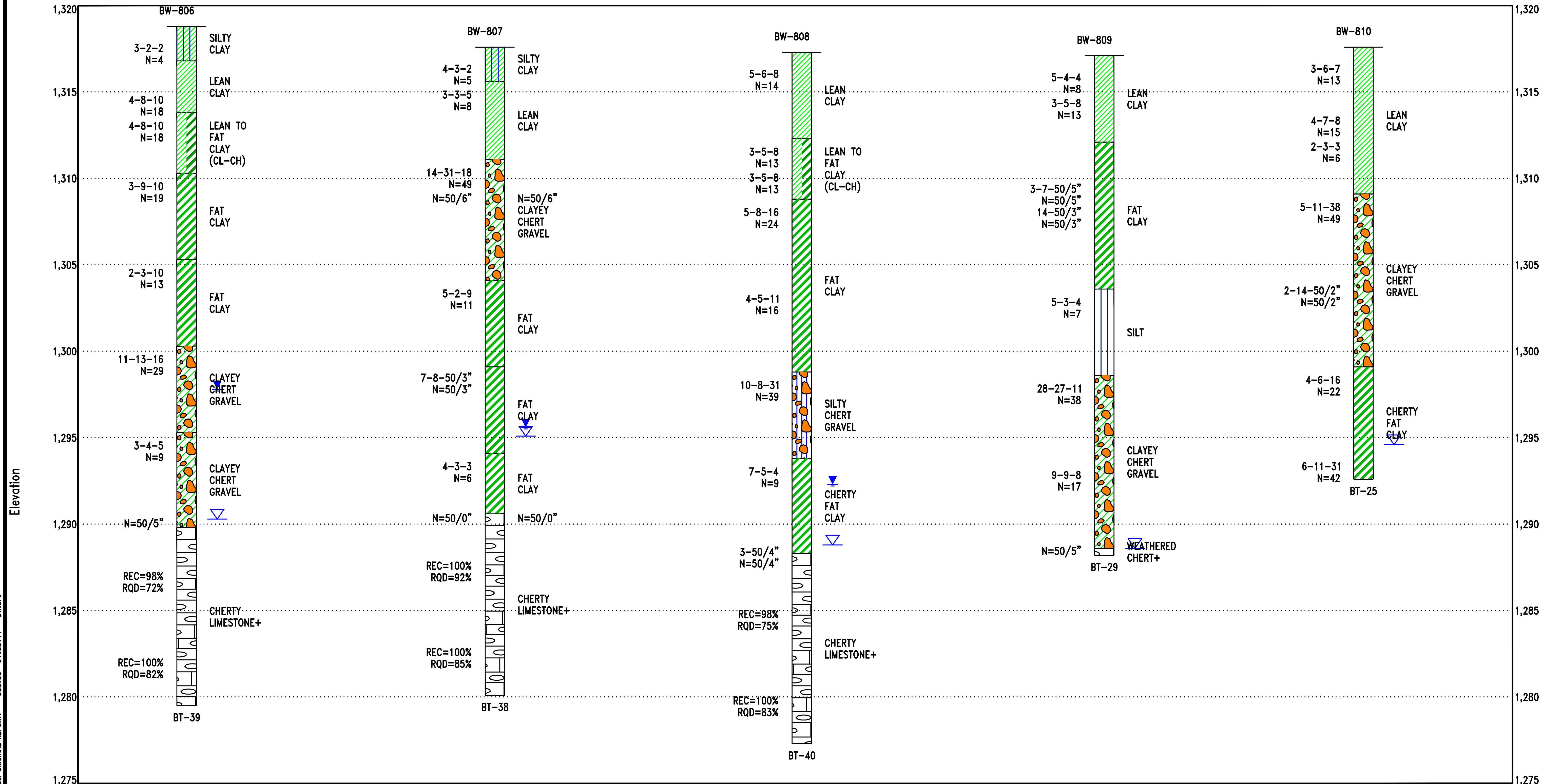

Explanation

BW-806 — Borehole Number

Borehole Lithology

AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Silty Clay | Lean Clay | Lean Clay/Fat Clay | Fat Clay | Clayey Gravel | Cherty Limestone 1

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

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SUBSURFACE PROFILE

WALL 6B

8TH STREET WIDENING PROJECT – MSE WALLS

BENTONVILLE, ARKANSAS

EXHIBIT

A-102

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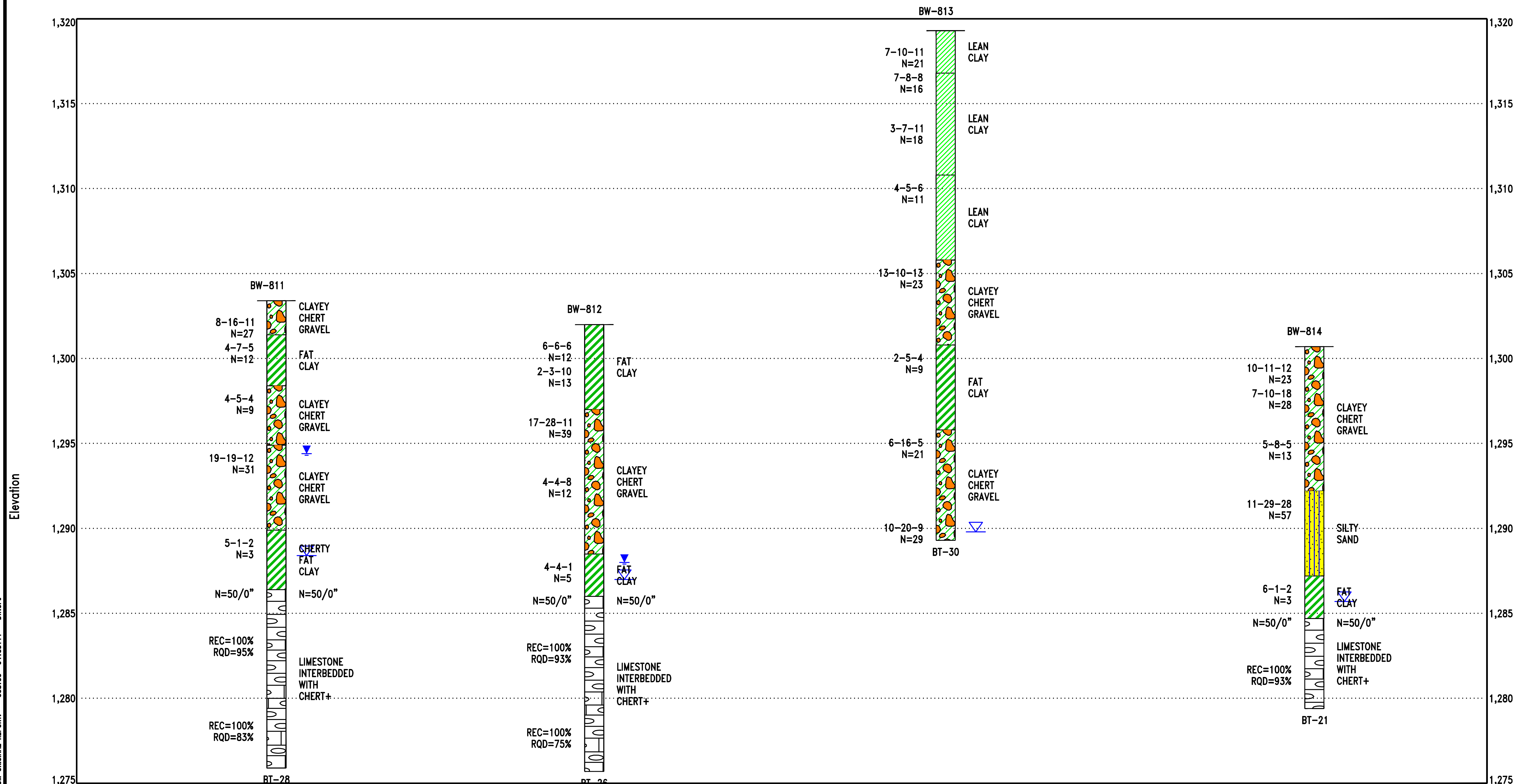


Explanation

BW-806 — Borehole Number
— Borehole Lithology
AR BT — Borehole Termination Type

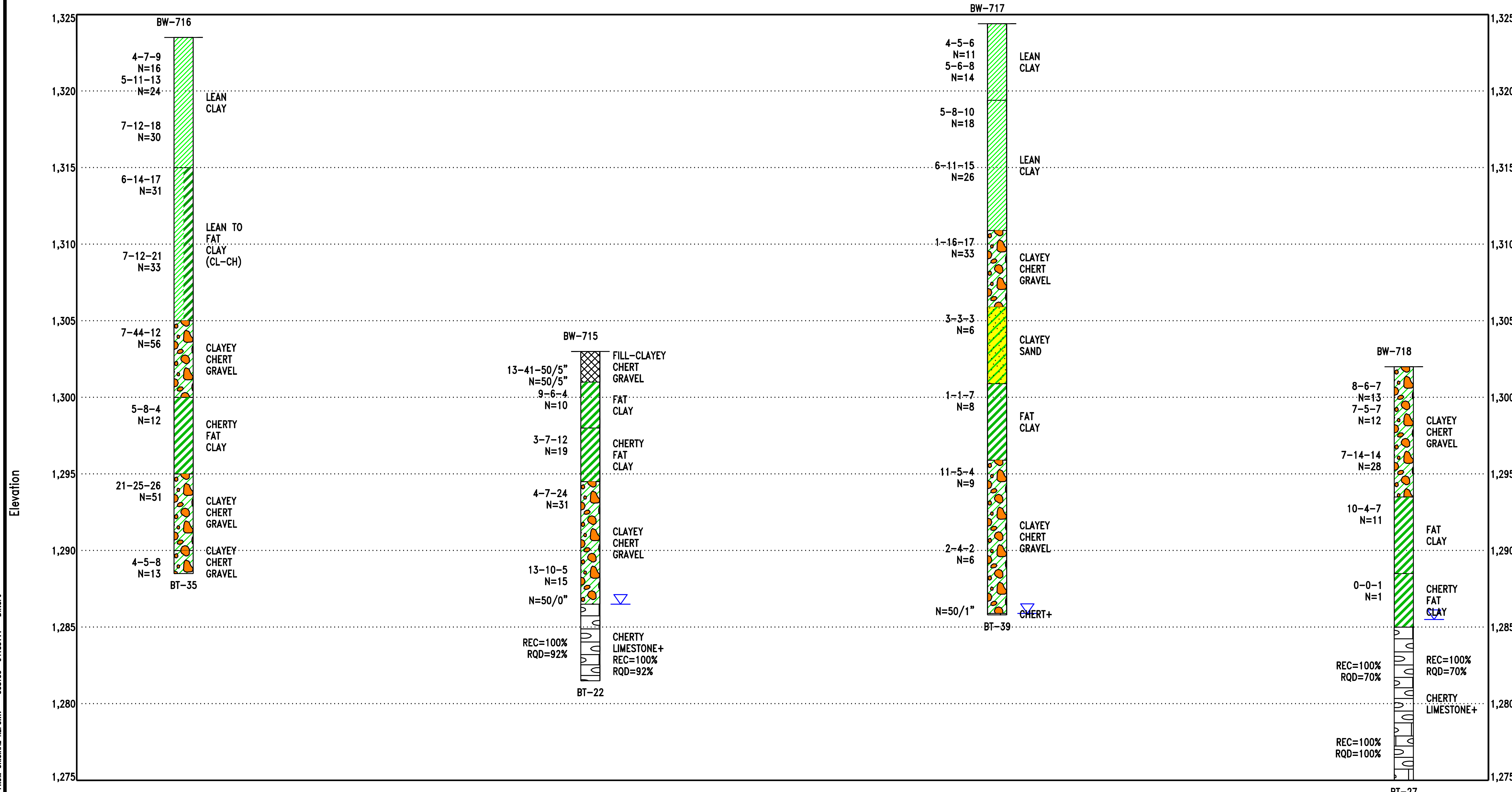
Water Level Reading at time of drilling.
Water Level Reading after drilling.

Silty Clay | Lean Clay | Lean Clay/Fat Clay | Fat Clay | Clayey Gravel | Cherty Limestone 1

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111	Terracon Consulting Engineers and Scientists	SUBSURFACE PROFILE
Drawn by: JM	Scale: NOT TO SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74146	WALL 6B
Approved by: MHH	File Name: 04135111	PH. (918) 250-0461 FAX. (918) 250-4570	8TH STREET WIDENING PROJECT – MSE WALLS
Date: 1/20/2016			BENTONVILLE, ARKANSAS

EXHIBIT A-102



Distance Along Baseline

Explanation

BW-715 — Borehole Number

Borehole Lithology

AR BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Fill (made ground) | Fat Clay | Clayey Gravel

Cherty Limestone 1 | Lean Clay | Lean Clay/Fat Clay

NOTES:

See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111	Terracon Consulting Engineers and Scientists	SUBSURFACE PROFILE	EXHIBIT
Drawn by: JM	Scale: NOT TO SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74146	WALL 7 8TH STREET WIDENING PROJECT – MSE WALLS	A-103
Approved by: MHH	File Name: 04135111	PH. (918) 250-0461 FAX. (918) 250-4570	BENTONVILLE, ARKANSAS	
Date: 1/20/2016				

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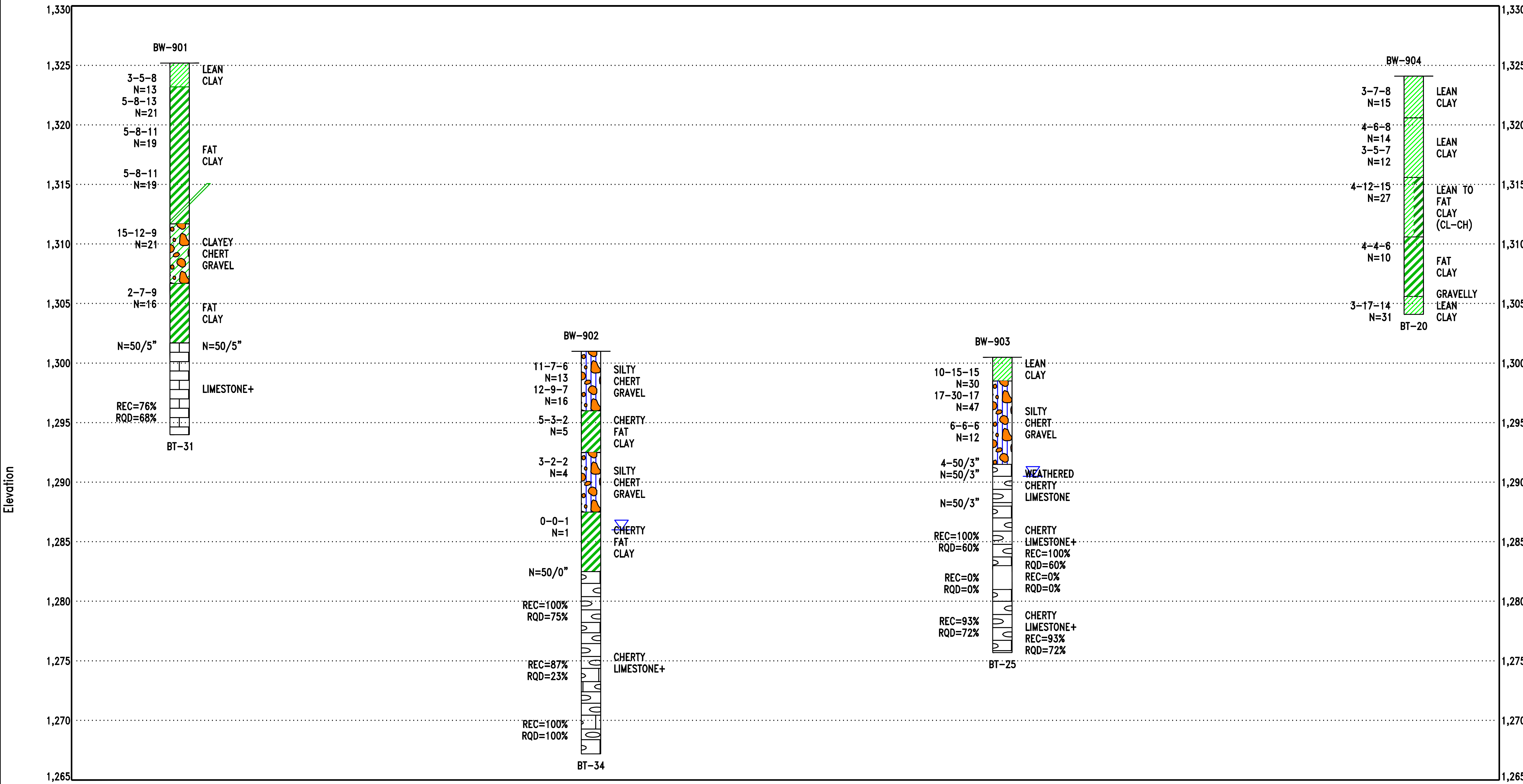

Distance Along Baseline

Explanation

BW-901 — Borehole Number
Borehole Lithology
AR / BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

Lean Clay | Fat Clay | Clayey Gravel | Limestone | Silty Gravel | Cherty Limestone 1

NOTES:
See Exhibit for orientation of soil profile.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR – Auger Refusal
BT – Boring Termination

Project Manager: JEG	Project No.: 04135111
Drawn by: JM	Scale: NOT TO SCALE
Approved by: MHH	File Name: 04135111
Date: 1/20/2016	

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SUBSURFACE PROFILE
WALL 7
8TH STREET WIDENING PROJECT – MSE WALLS
BENTONVILLE, ARKANSAS

EXHIBIT
A-103

Approximate Boring Coordinates and Elevations

Boring	Approximate Elevation	Approximate Coordinates			
		Latitude	Longitude	Northing	Easting
BW-101	1333.3	36.358251	-94.178257	744181	670960
BW-102	1311.8	36.358526	-94.178434	744282	670910
BW-103	1338.6	36.358711	-94.178081	744347	671016
BW-104	1312.1	36.358984	-94.178329	744448	670947
BW-105	1312.7	36.359218	-94.178261	744529	670967
BW-106	1341.7	36.359383	-94.177881	744590	671080
BW-107	Not drilled				
BW-108	Not drilled				
BW-201	1337.1	36.358631	-94.177321	744313	671239
BW-202	1306.7	36.358865	-94.176971	744396	671344
BW-203	1340.5	36.359119	-94.177367	744491	671229
BW-204	1339.9	36.359367	-94.177315	744581	671246
BW-205	1308.6	36.359579	-94.176897	744655	671371
BW-206	Not drilled				
BW-301	1342.2	36.360357	-94.177703	744944	671140
BW-302	1314.7	36.360602	-94.177983	745035	671060
BW-303	1316	36.360861	-94.177908	745128	671084
BW-304	1315.4	36.361109	-94.177834	745218	671108
BW-305	1315	36.361367	-94.177741	745312	671137
BW-306	Not drilled				
BW-307	1315	36.361872	-94.177556	745494	671195
BW-308	1322	36.362152	-94.177613	745596	671181
BW-309	1323	36.362413	-94.177495	745690	671218
BW-401	1311.8	36.360265	-94.176748	744904	671420
BW-402	1312.5	36.360531	-94.176734	745001	671427
BW-403	1313.2	36.360755	-94.176725	745082	671431
BW-404	1314.5	36.360955	-94.176689	745155	671443
BW-405	1314.3	36.361165	-94.176641	745231	671459
BW-406	1315.2	36.361397	-94.176577	745315	671480
BW-407	1315.8	36.361617	-94.176517	745395	671499
BW-408	1317.8	36.361785	-94.176333	745455	671555
BW-409	1317.8	36.361996	-94.176218	745531	671590
BW-501	1338.3	36.361382	-94.177482	745316	671213
BW-502	1337.3	36.361601	-94.177406	745394	671237
BW-503	1315	36.362088	-94.177411	745608	671241
BW-504	1315	36.362306	-94.177297	745651	671275
BW-505	1315.7	36.362531	-94.177204	745732	671304
BW-506	1316.6	36.362769	-94.177132	745818	671328
BW-507	1316	36.362888	-94.177008	745860	671365
BW-508	1317.6	36.363113	-94.176865	745940	671409
BW-509	1318	36.363266	-94.176655	745995	671472
BW-510	1319.7	36.363486	-94.176935	746078	671391
BW-511	1322.2	36.363646	-94.177241	746138	671303
BW-512	1323.1	36.363655	-94.177484	746143	671231
BW-513	1319	36.363472	-94.177841	746080	671125
BW-514	1322.7	36.363645	-94.178111	746143	671046
BW-515	1319.1	36.363671	-94.178632	746156	670893

Boring	Approximate Elevation	Approximate Coordinates			
		Latitude	Longitude	Northing	Easting
BW-601	1318.7	36.362491	-94.175976	745709	671666
BW-602	1319.8	36.36269	-94.17581	745779	671715
BW-603	1321	36.36289	-94.17565	745851	671763
BW-604	1320.8	36.36304	-94.1754	745906	671838
BW-605	1322	36.36328	-94.1753	745990	671871
BW-606	1322.6	36.36351	-94.17522	746073	671896
BW-607	1324	36.363661	-94.174861	746132	671999
BW-701	1315.9	36.362668	-94.177091	745781	671339
BW-702	1328.1	36.362789	-94.176793	745823	671427
BW-703	1327.1	36.362968	-94.176622	745887	671479
BW-704	1320.1	36.363367	-94.176389	746031	671551
BW-705	1320.4	36.363554	-94.176154	746097	671622
BW-706	1316.6	36.363864	-94.175923	746209	671692
BW-707	1320.4	36.364273	-94.175963	746358	671684
BW-708	1320.8	36.364446	-94.175772	746420	671741
BW-709	1320.9	36.364597	-94.175558	746473	671806
BW-710	1319.8	36.364845	-94.175474	746563	671832
BW-711	1320.9	36.364982	-94.175241	746611	671902
BW-712	1306	36.365159	-94.174841	746673	672021
BW-713	1322.2	36.365398	-94.174977	746761	671983
BW-714	1303.7	36.365541	-94.174531	746810	672115
BW-715	1303	36.365725	-94.174367	746876	672165
BW-716	1323.5	36.365818	-94.174544	746911	672114
BW-717	1324.4	36.365998	-94.174396	746976	672159
BW-718	1302	36.366097	-94.174055	747009	672260
BW-801	1318.8	36.363291	-94.175717	745999	671748
BW-802	1317	36.363507	-94.175542	746076	671801
BW-803	1322.1	36.363643	-94.175271	746124	671882
BW-804	1313.5	36.363903	-94.175217	746218	671901
BW-805	1320.3	36.364021	-94.174944	746259	671982
BW-806	1318.8	36.364132	-94.174748	746299	672040
BW-807	1317.6	36.364311	-94.174526	746362	672107
BW-808	1317.3	36.364557	-94.174464	746451	672127
BW-809	1317.1	36.364689	-94.174339	746499	672165
BW-810	1317.6	36.364903	-94.174145	746575	672224
BW-811	1303.4	36.365257	-94.174097	746704	672241
BW-812	1302	36.365463	-94.173932	746778	672291
BW-813	1319.3	36.365574	-94.173582	746816	672395
BW-814	1300.7	36.365872	-94.173599	746924	672392
BW-901	1325.2	36.366251	-94.174202	747066	672218
BW-902	1301	36.366352	-94.173846	747101	672324
BW-903	1300.5	36.366563	-94.173681	747176	672374
BW-904	1324.1	36.366869	-94.173697	747288	672372

APPENDIX B
LABORATORY TESTING

Laboratory Testing

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix D. Bedrock materials were classified according to the General Notes and described using commonly accepted geotechnical terminology. The field descriptions were modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil and rock samples. The laboratory test results are presented on the boring logs next to the respective samples and attached to this appendix. Laboratory tests were performed in general accordance with the applicable ASTM, AASHTO, local or other accepted standards.

The following tests were performed on selected soil and rock samples:

- Water content
- Atterberg limits
- Percent passing the No. 200 sieve
- Particle size distribution
- Hydrometer
- Dry unit weight
- One-dimensional consolidation of cohesive soils
- Unconsolidated Undrained (UU) triaxial compression
- Consolidated Undrained (CU) triaxial compression
- Rock unconfined compressive strength

Summary of One-Dimensional Consolidation Test Results

Boring	Depth (ft.)	Sample Type	σ_o (psf)	σ_c (psf)	OCR	Cc	Cr	e_o
BT-007 (near BW-706)	5	Undisturbed	720	4,200	5.9	0.06	0.01	0.60
BW-511	5	Undisturbed	680	4,800	7.1	0.12	0.01	0.75
BW-809	5	Undisturbed	700	4,200	6.0	0.08	0.01	0.74

Notes:
σ_o : Initial pressure
σ_c : Preconsolidation pressure
OCR: Overconsolidation ratio
Cc: Compression Index
Cr: Recompression Index
e_o: Initial void ratio

Laboratory Testing (Continued)

Summary of Unconsolidated Undrained (UU) Shear Test Results

Boring	Depth (ft.)	Sample Type	C_u (psf)
BW-106	13.5	Undisturbed	4,900
BW-511	5	Undisturbed	2,000
BW-809	5	Undisturbed	3,000

Notes:
C_u: Undrained cohesion

Summary of Consolidated Undrained Shear Test Results

Boring	Depth (ft.)	Sample Type	Test	ϕ' (degrees)	C' (psf)	LL	PL	PI	Clay (%)
BW-301	15	Remolded	3 samples	31.1	340	69	24	45	37
BW-407	3.5	Undisturbed	3 samples	28.4	820	43	20	23	31
BT-007 (near BW-706)	5	Undisturbed	Staged	33.9	420	39	19	20	28
BW-511	5	Undisturbed	Staged	34.8	680	46	23	23	34
BW-809	5	Undisturbed	Staged	33.4	520	52	21	31	40
BW-902	6	Remolded	3 samples	29.0	100	67	24	43	24

Notes:
Effective strength parameters were calculated based on peak principal stresses from p-q diagrams
ϕ': Effective friction angle
C': Effective cohesion
LL: Liquid Limit
PL: Plastic Limit
PI: Plasticity Index

Remolded samples consisted of bulk samples taken during our field exploration from select borings. Due to variable composition of the soils and the presence of chert gravel, we segregated the gravel from the samples tested to evaluate the strength properties of the “clay matrix.”

GRAIN SIZE DISTRIBUTION

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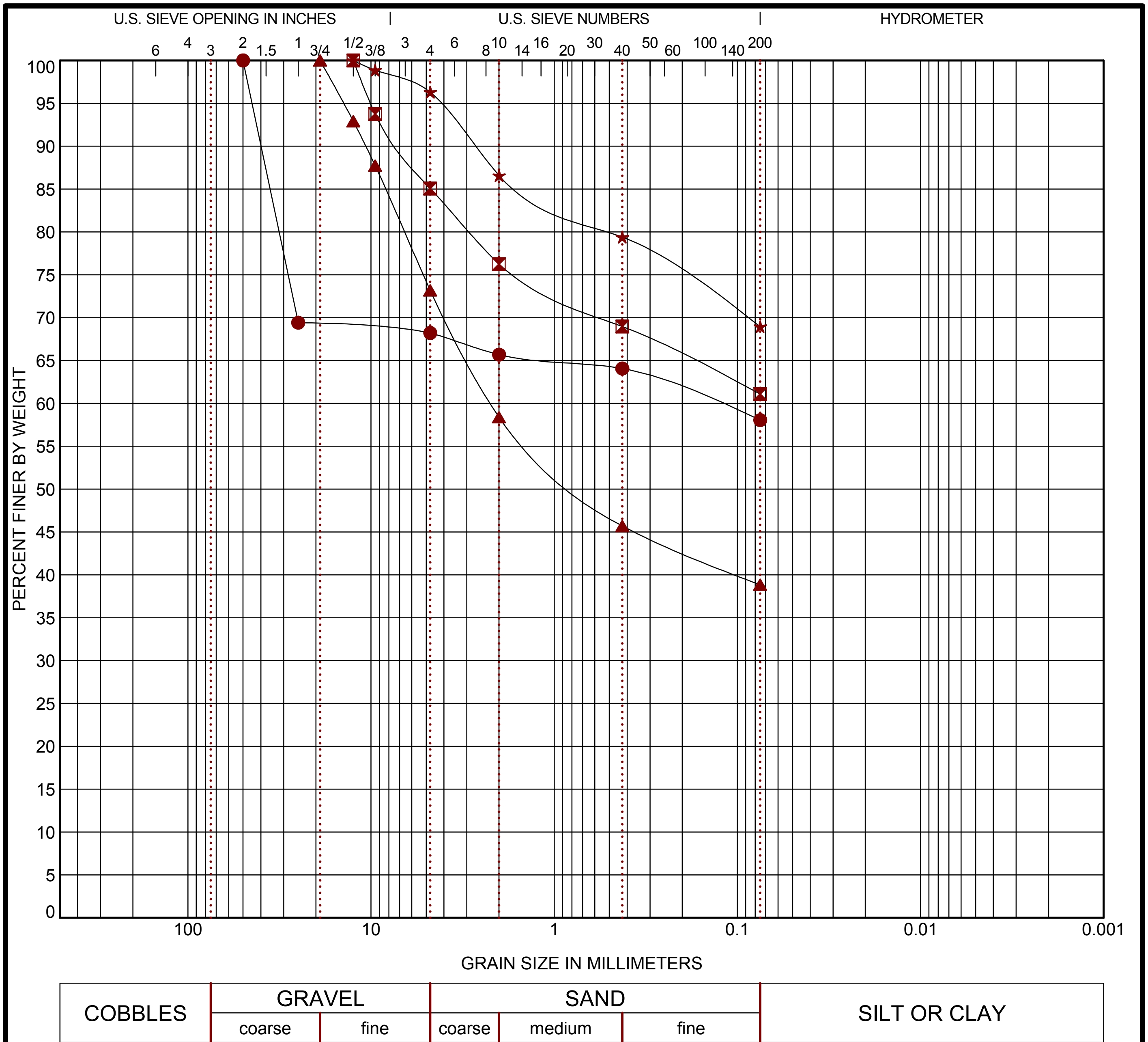

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-101	13 - 15	GRAVELLY LEAN CLAY (CL)	A-7-6(12)	45	20	25		
⊠	BW-101	15 - 16.5	SANDY FAT CLAY (CH)	A-7-6(26)	72	25	47		
▲	BW-101	18.5 - 20	()	()					
★	BW-102	5 - 7	SANDY LEAN CLAY (CL)	A-6(12)	40	20	20		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-101	13 - 15	50	0.132			31.8	10.2	58.0	
⊠	BW-101	15 - 16.5	12.5				14.9	24.0	61.1	
▲	BW-101	18.5 - 20	19	2.199			26.8	34.3	38.8	
★	BW-102	5 - 7	12.5				3.7	27.3	69.0	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

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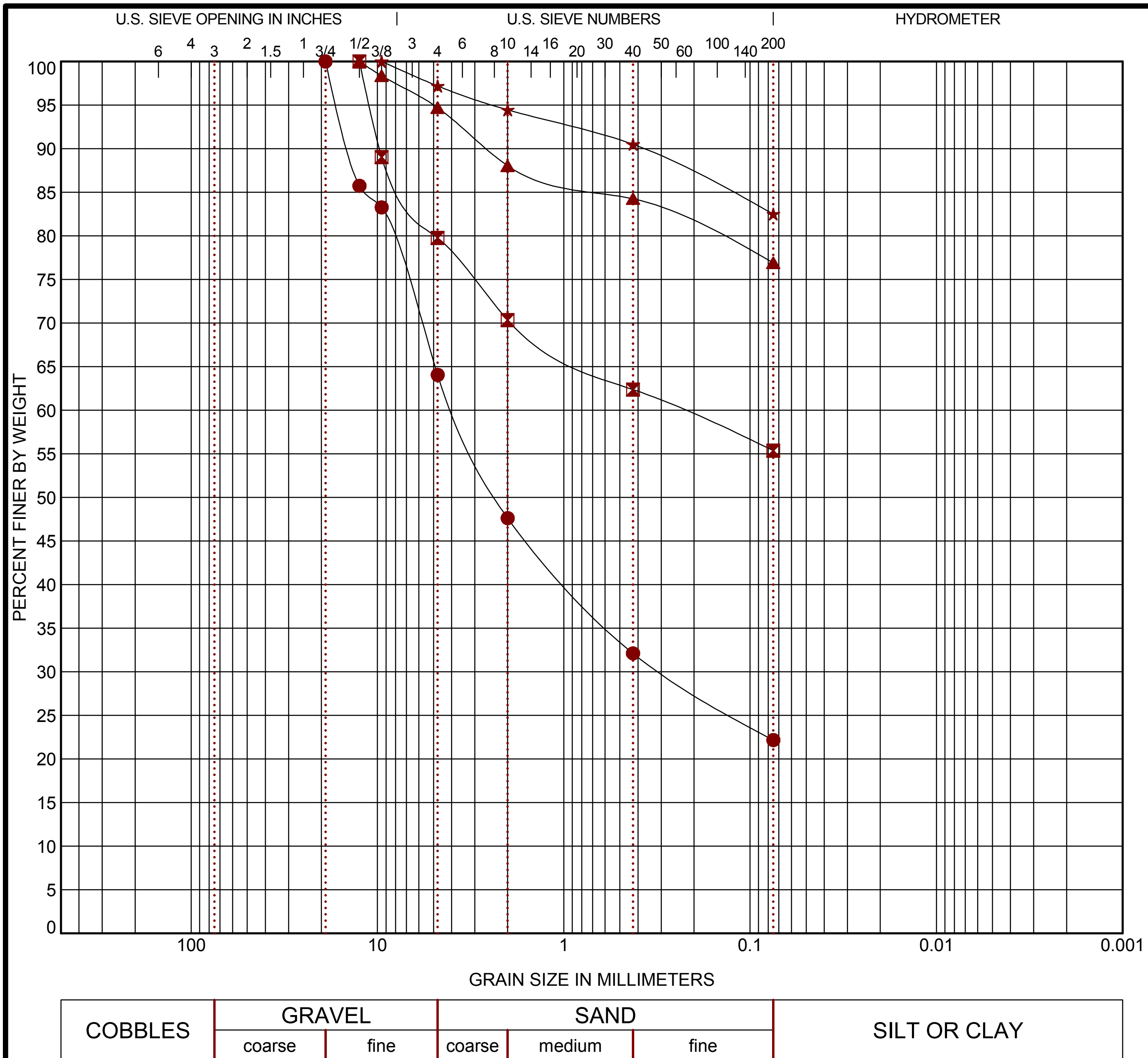

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-102	13.5 - 15	SILTY SAND with GRAVEL (SM)	A-1-b(0)	NP	NP	NP		
⊠	BW-103	5 - 6.5	()	()					
▲	BW-103	23.5 - 25	LEAN CLAY with SAND (CL)	A-7-6(18)	42	17	25		
★	BW-104	2 - 3.5	LEAN CLAY with SAND (CL)	A-7-6(23)	47	20	27		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-102	13.5 - 15	19	3.837	0.294		35.9	41.9	22.2	
⊠	BW-103	5 - 6.5	12.5	0.236			20.2	24.4	55.4	
▲	BW-103	23.5 - 25	12.5				5.3	17.8	76.9	
★	BW-104	2 - 3.5	9.5				2.8	14.7	82.5	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 04135111 - BW.GPJ TERRACON2012.GDT 1/19/16

GRAIN SIZE DISTRIBUTION

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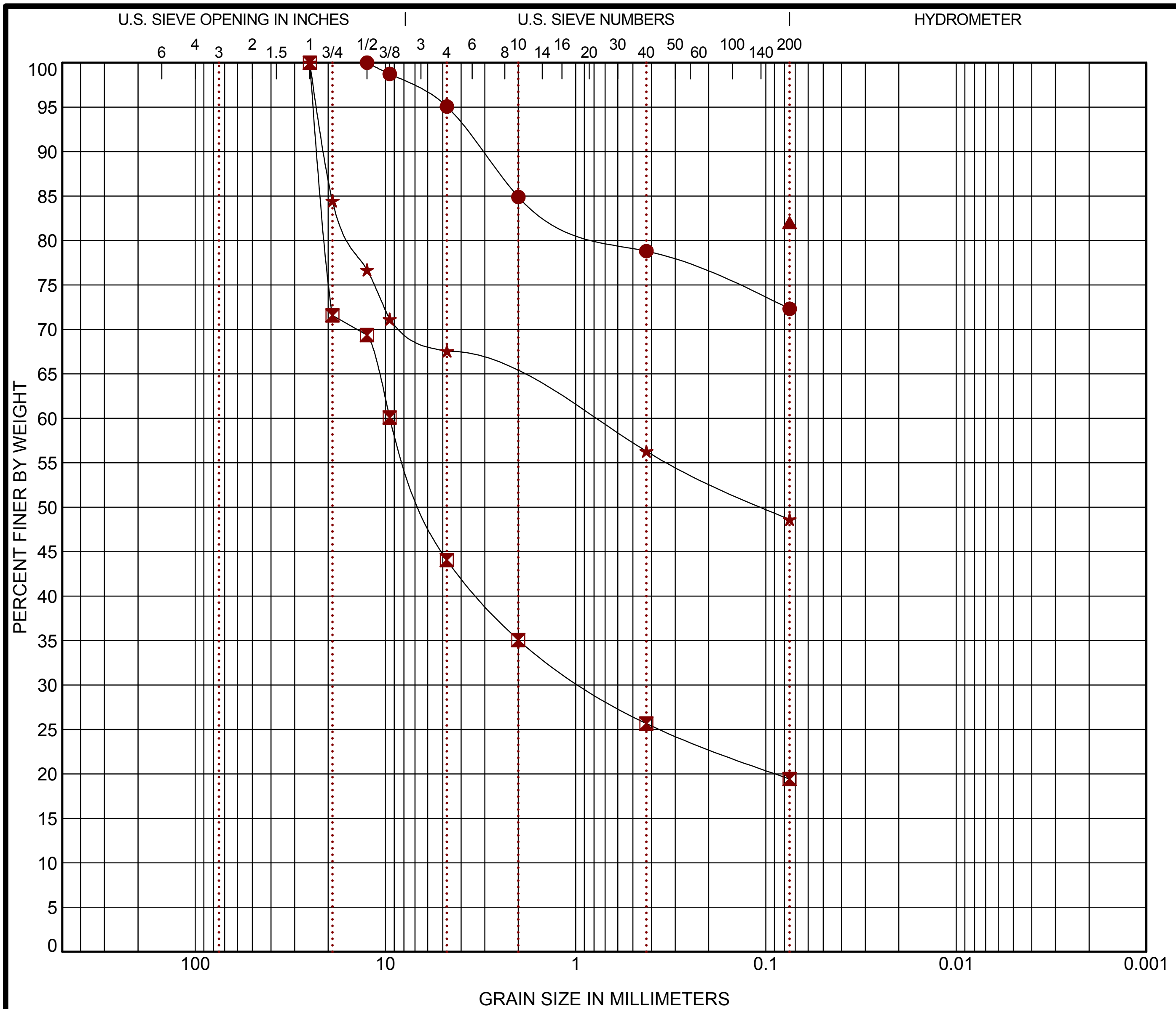


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

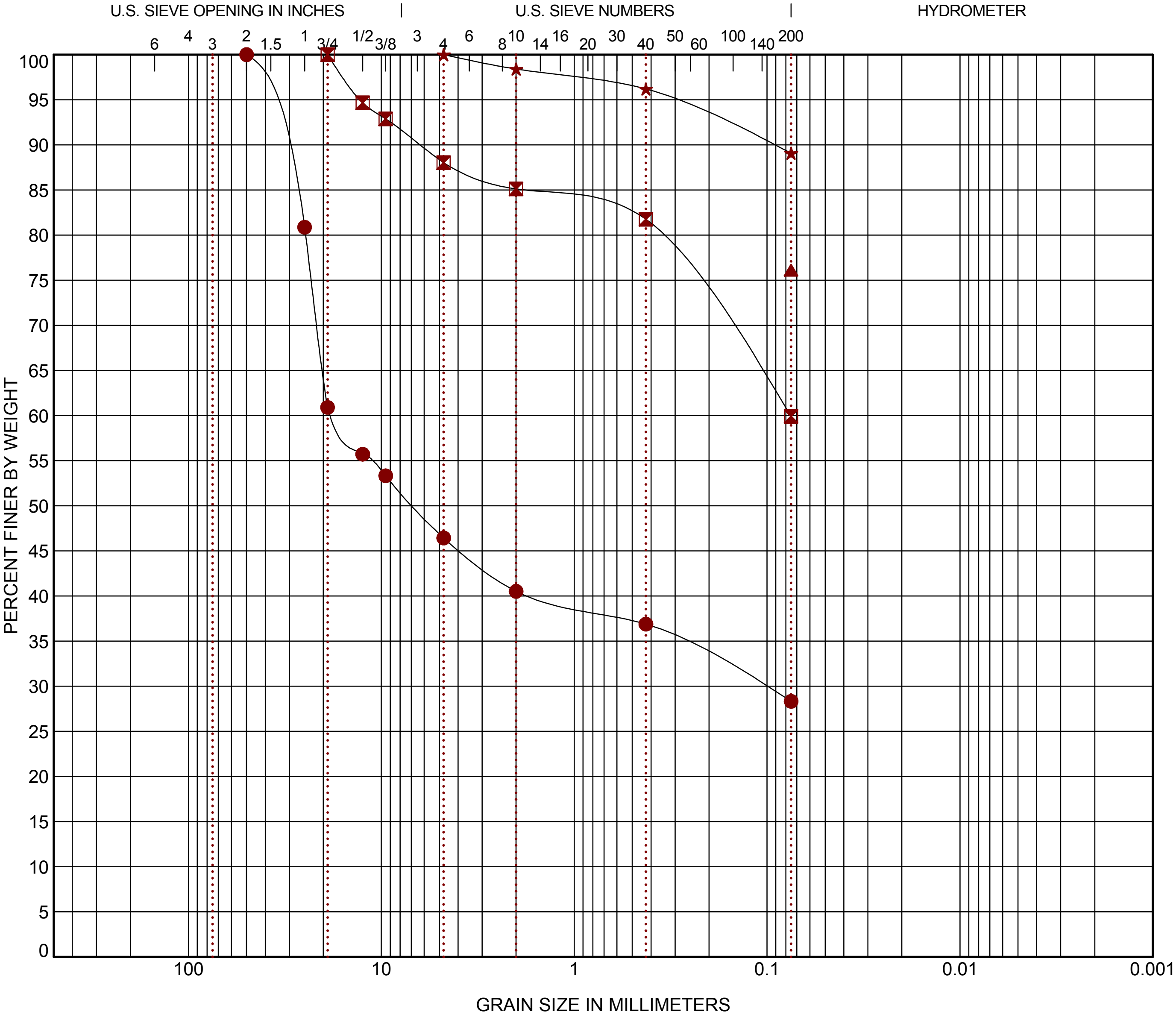
	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-104	8.5 - 10	FAT CLAY with SAND (CH)	A-7-6(27)	64	27	37		
⊠	BW-104	20.5 - 22	SILTY GRAVEL with SAND (GM)	A-1-b(0)	NP	NP	NP		
▲	BW-105	5 - 7	LEAN CLAY with SAND (CL)	A-6(13)	37	21	16		
★	BW-105	7 - 8.5	CLAYEY GRAVEL with SAND (GC)	A-6(3)	34	21	13		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-104	8.5 - 10	12.5				4.9	22.7	72.3	
⊠	BW-104	20.5 - 22	25	9.457	0.868		55.9	24.6	19.4	
▲	BW-105	5 - 7	0.075				0.0	0.0	82.0	
★	BW-105	7 - 8.5	25	0.942			32.4	18.9	48.6	

PROJECT: 8th Street Widening Project - MSE Walls	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas		CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-4

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-105	13.5 - 15	SILTY GRAVEL with SAND (GM)	A-2-4(0)	NP	NP	NP		
⊠	BW-105	23.5 - 25	SANDY SILT (ML)	A-7-6(8)	42	27	15		
▲	BW-106	13 - 15	LEAN CLAY with SAND (CL)	A-7-6(20)	49	22	27		
★	BW-106	33.5 - 35	LEAN CLAY (CL)	A-6(11)	32	19	13		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-105	13.5 - 15	50	17.667	0.105		53.6	18.1	28.3	
⊠	BW-105	23.5 - 25	19	0.076			12.0	28.1	59.9	
▲	BW-106	13 - 15	0.075				0.0	0.0	76.1	
★	BW-106	33.5 - 35	4.75				0.0	10.9	89.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

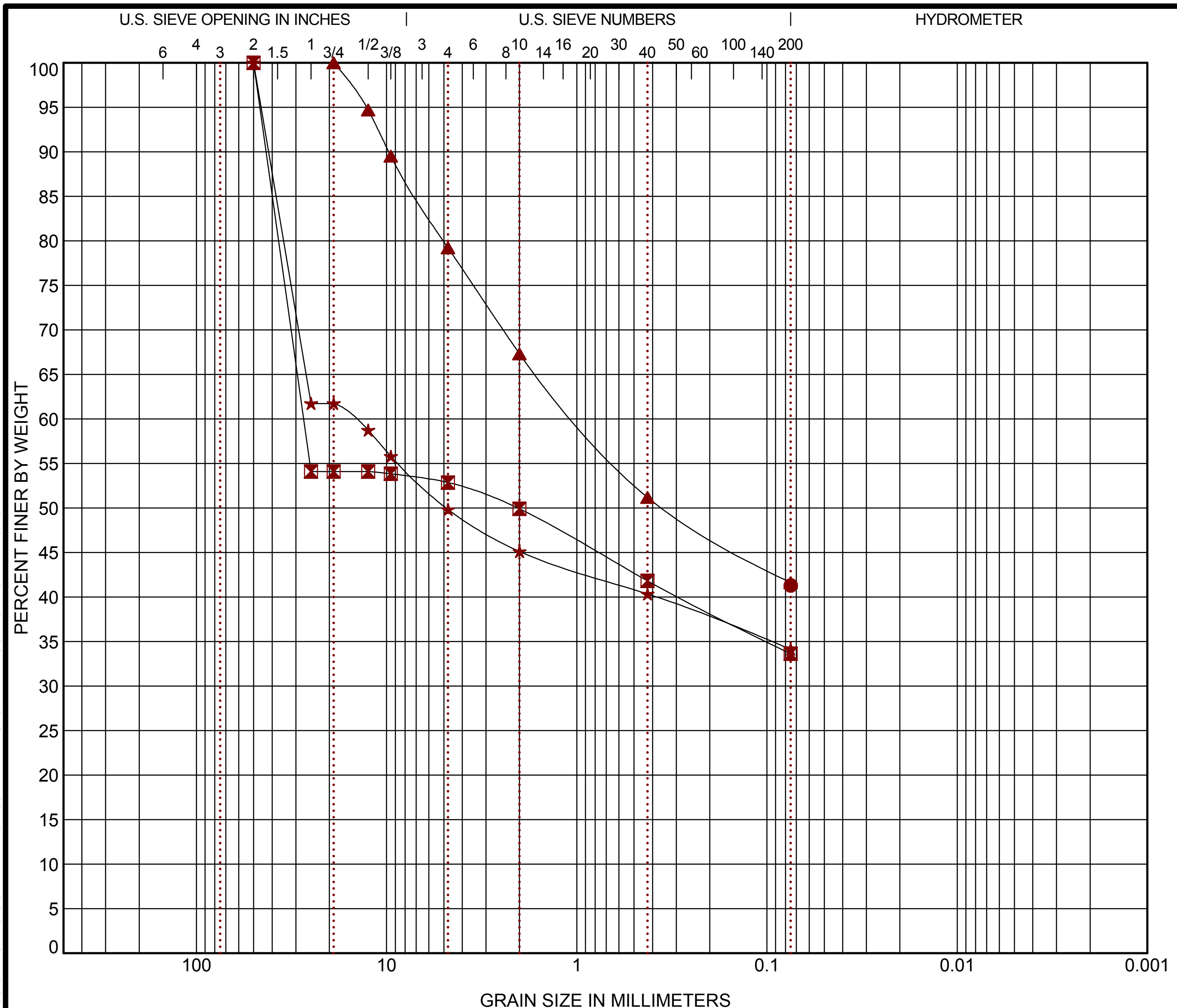
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-5

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-201	8.5 - 10	CLAYEY SAND (SC)	A-7-6(12)	71	23	48		
⊠	BW-202	2 - 3.5	CLAYEY GRAVEL with SAND (GC)	A-2-6(1)	35	18	17		
▲	BW-202	8.5 - 10	SILTY SAND with GRAVEL (SM)	A-7-5(11)	79	40	39		
★	BW-202	18.5 - 20	SILTY GRAVEL with SAND (GM)	A-2-7(1)	53	39	14		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-201	8.5 - 10	0.075				0.0	0.0	41.3	
⊠	BW-202	2 - 3.5	50	27.331			47.1	19.2	33.6	
▲	BW-202	8.5 - 10	19	0.991			20.8	37.6	41.6	
★	BW-202	18.5 - 20	50	14.903			50.2	15.7	34.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

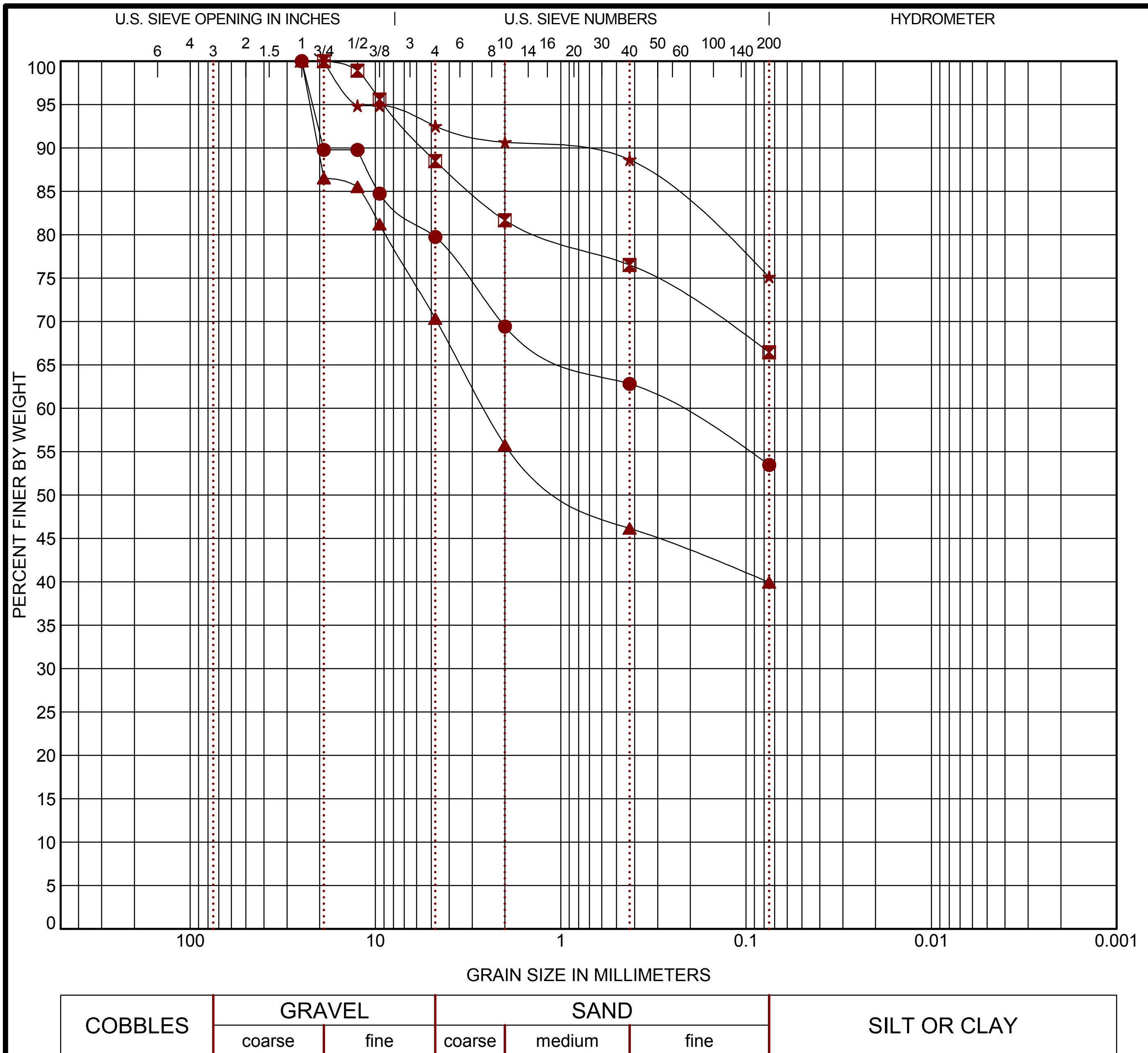
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-6

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-203	5 - 6.5	()	()					
⊠	BW-203	18.5 - 20	SANDY FAT CLAY (CH)	A-7-6(18)	53	23	30		
▲	BW-204	8.5 - 10	CLAYEY SAND with GRAVEL (SC)	A-7-6(6)	50	22	28		
★	BW-204	33.5 - 35	SILTY CLAY with SAND (CL-ML)	A-4(2)	24	19	5		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-203	5 - 6.5	25	0.252			20.3	26.3	53.5	
⊠	BW-203	18.5 - 20	19				11.5	22.0	66.5	
▲	BW-204	8.5 - 10	25	2.573			29.7	30.4	39.9	
★	BW-204	33.5 - 35	19				7.5	17.4	75.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

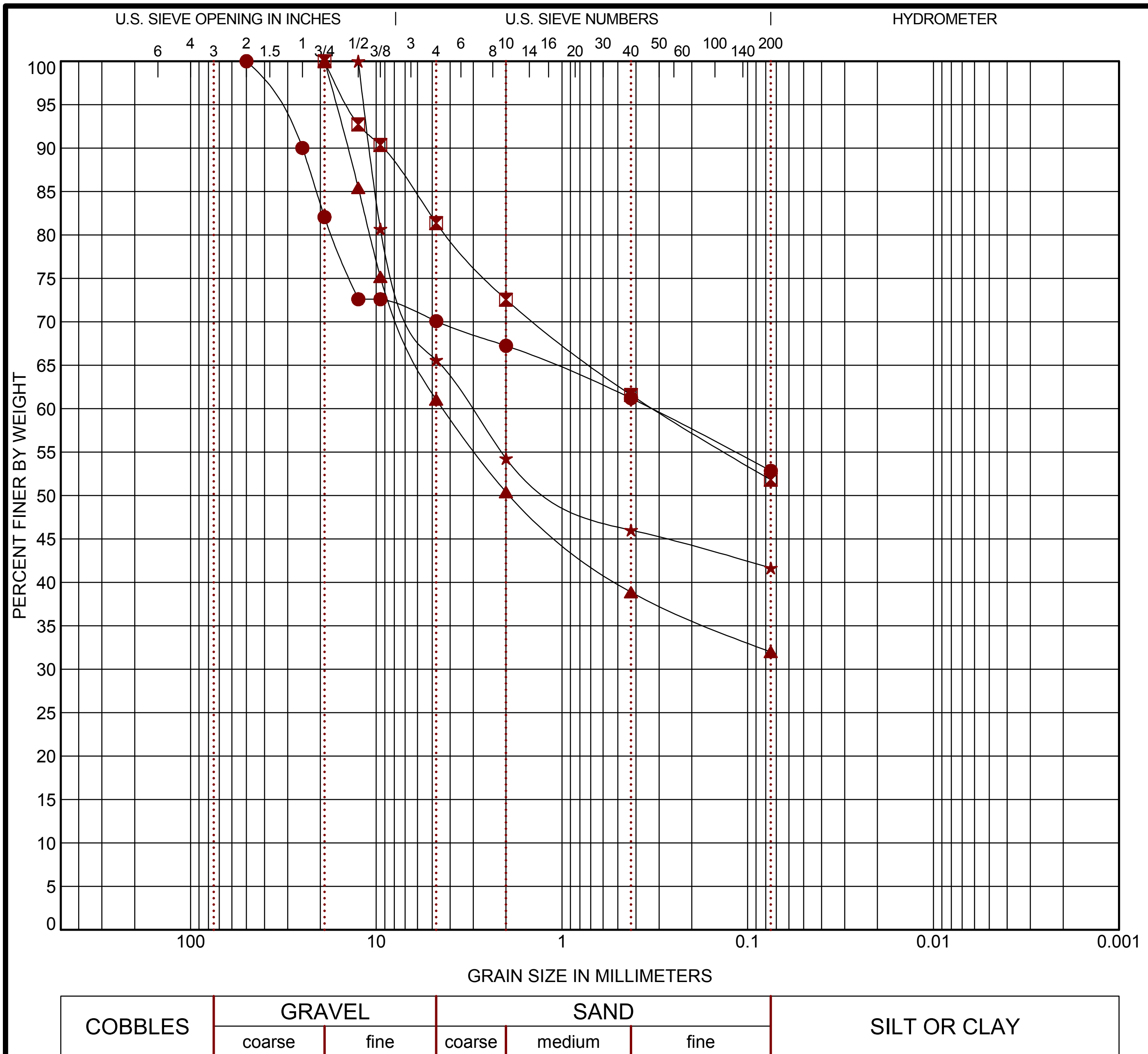
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-7

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-205	0.5 - 2	GRAVELLY LEAN CLAY with SAND (CL)	A-6(7)	39	19	20		
⊠	BW-205	5 - 6.5	SANDY FAT CLAY with GRAVEL (CH)	A-7-5(18)	75	34	41		
▲	BW-205	13.5 - 15	SILTY GRAVEL with SAND (GM)	A-2-7(1)	55	37	18		
★	BW-301	8.5 - 10	CLAYEY GRAVEL with SAND (GC)	A-7-6(10)	62	23	39		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-205	0.5 - 2	50	0.331			29.9	17.2	52.8	
⊠	BW-205	5 - 6.5	19	0.321			18.6	29.6	51.8	
▲	BW-205	13.5 - 15	19	4.364			39.0	29.0	32.0	
★	BW-301	8.5 - 10	12.5	3.1			34.4	23.9	41.7	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

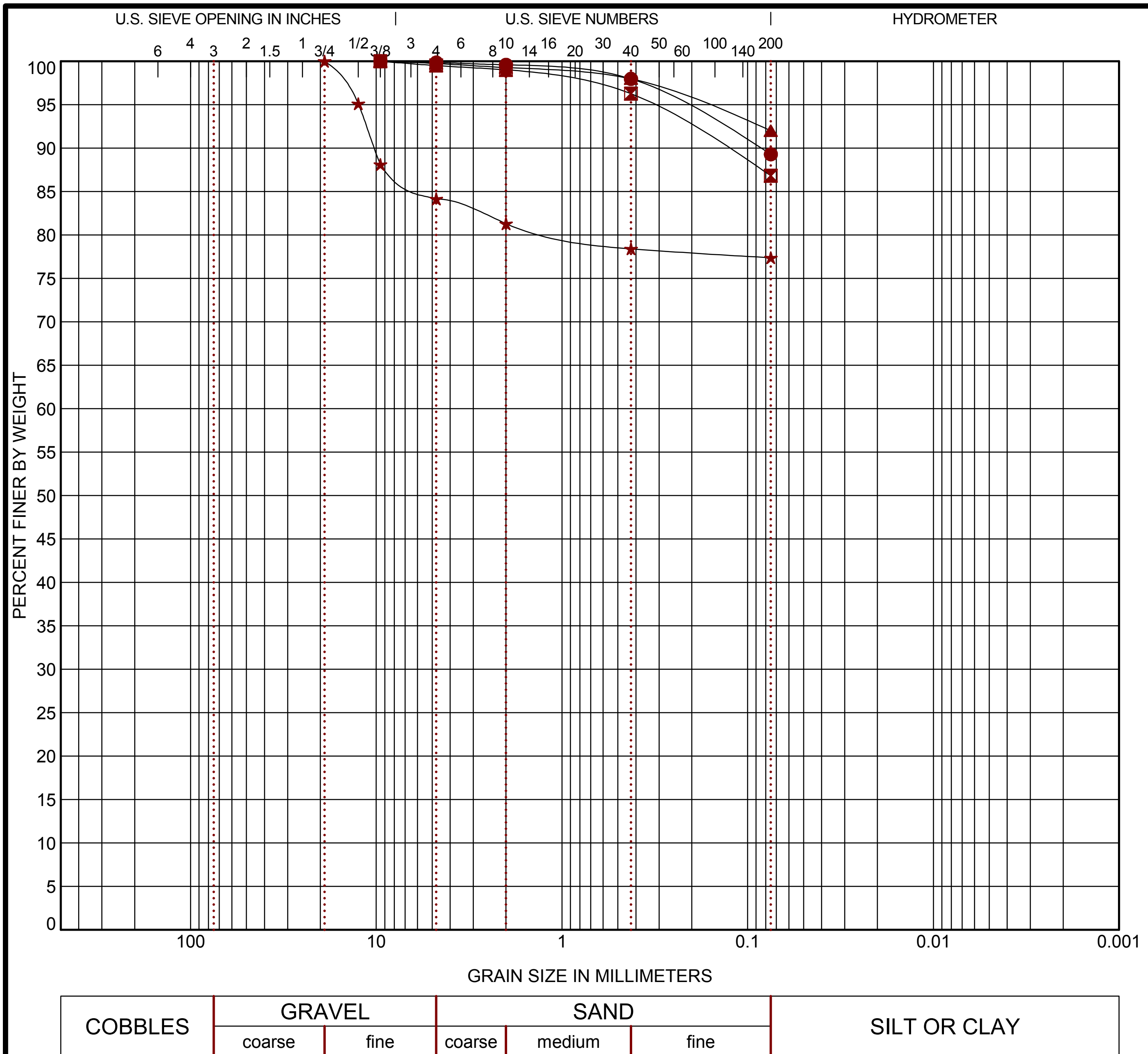
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-8

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-301	33.5 - 35	LEAN CLAY (CL)	A-6(13)	36	21	15		
⊠	BW-302	0.5 - 2	LEAN CLAY (CL)	A-6(9)	31	20	11		
▲	BW-302	5 - 6	LEAN CLAY (CL)	A-6(14)	34	18	16		
★	BW-302	13.5 - 15	FAT CLAY with GRAVEL (CH)	A-7-5(44)	83	30	53		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-301	33.5 - 35	9.5				0.2	10.6	89.3	
⊠	BW-302	0.5 - 2	9.5				0.5	12.7	86.8	
▲	BW-302	5 - 6	9.5				0.3	7.7	92.0	
★	BW-302	13.5 - 15	19				15.9	6.8	77.4	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

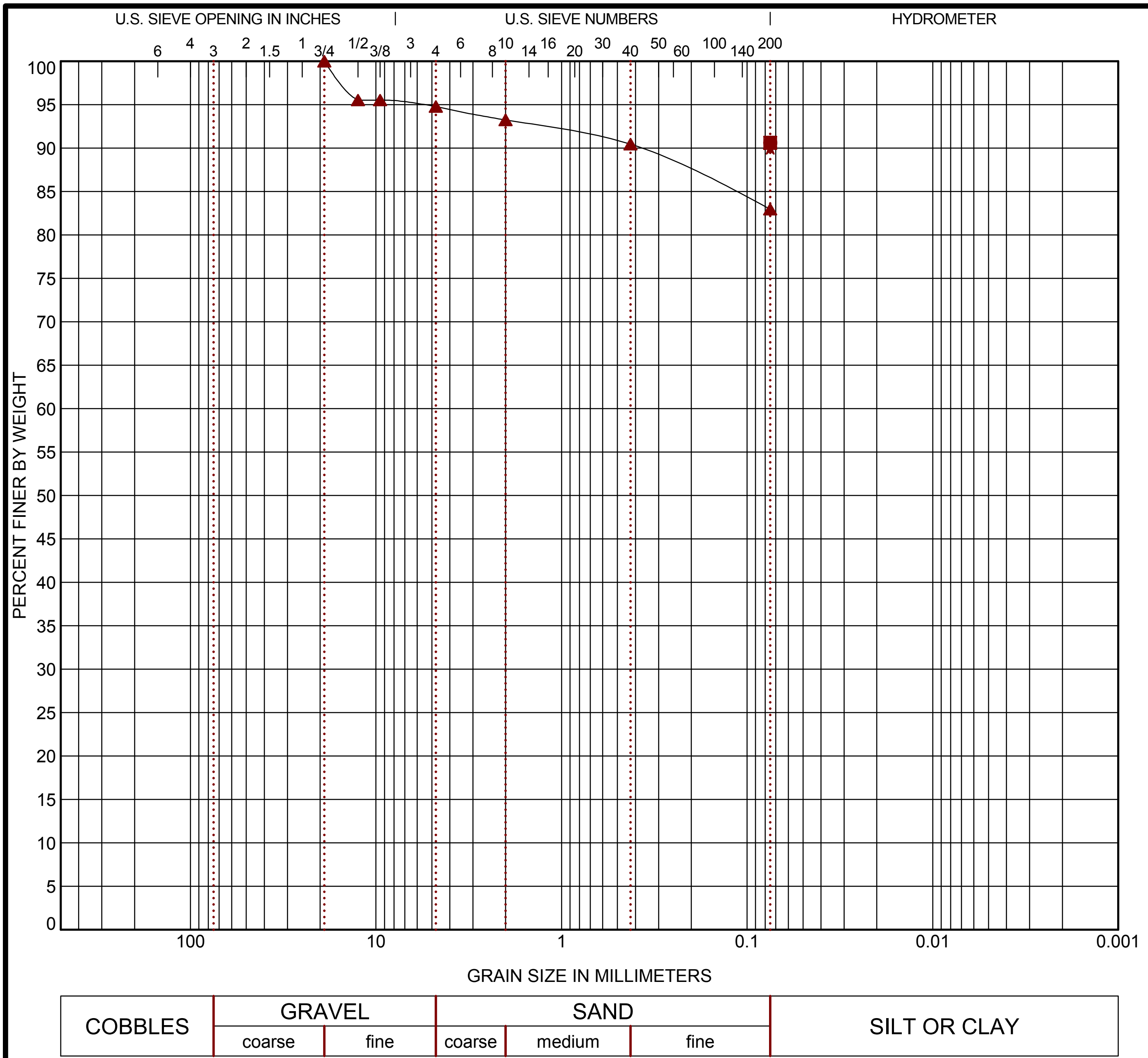
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-9

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-303	5 - 6.5	LEAN CLAY (CL)	A-7-6(22)	41	17	24		
⊠	BW-304	2 - 3.5	LEAN CLAY (CL)	A-6(16)	37	20	17		
▲	BW-305	2 - 3.5	LEAN CLAY with SAND (CL)	A-6(14)	35	17	18		
★	BW-305	5 - 6.5	LEAN CLAY (CL)	A-7-6(20)	41	19	22		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-303	5 - 6.5	0.075				0.0	0.0	90.6	
⊠	BW-304	2 - 3.5	0.075				0.0	0.0	90.6	
▲	BW-305	2 - 3.5	19				5.2	11.8	83.0	
★	BW-305	5 - 6.5	0.075				0.0	0.0	90.0	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

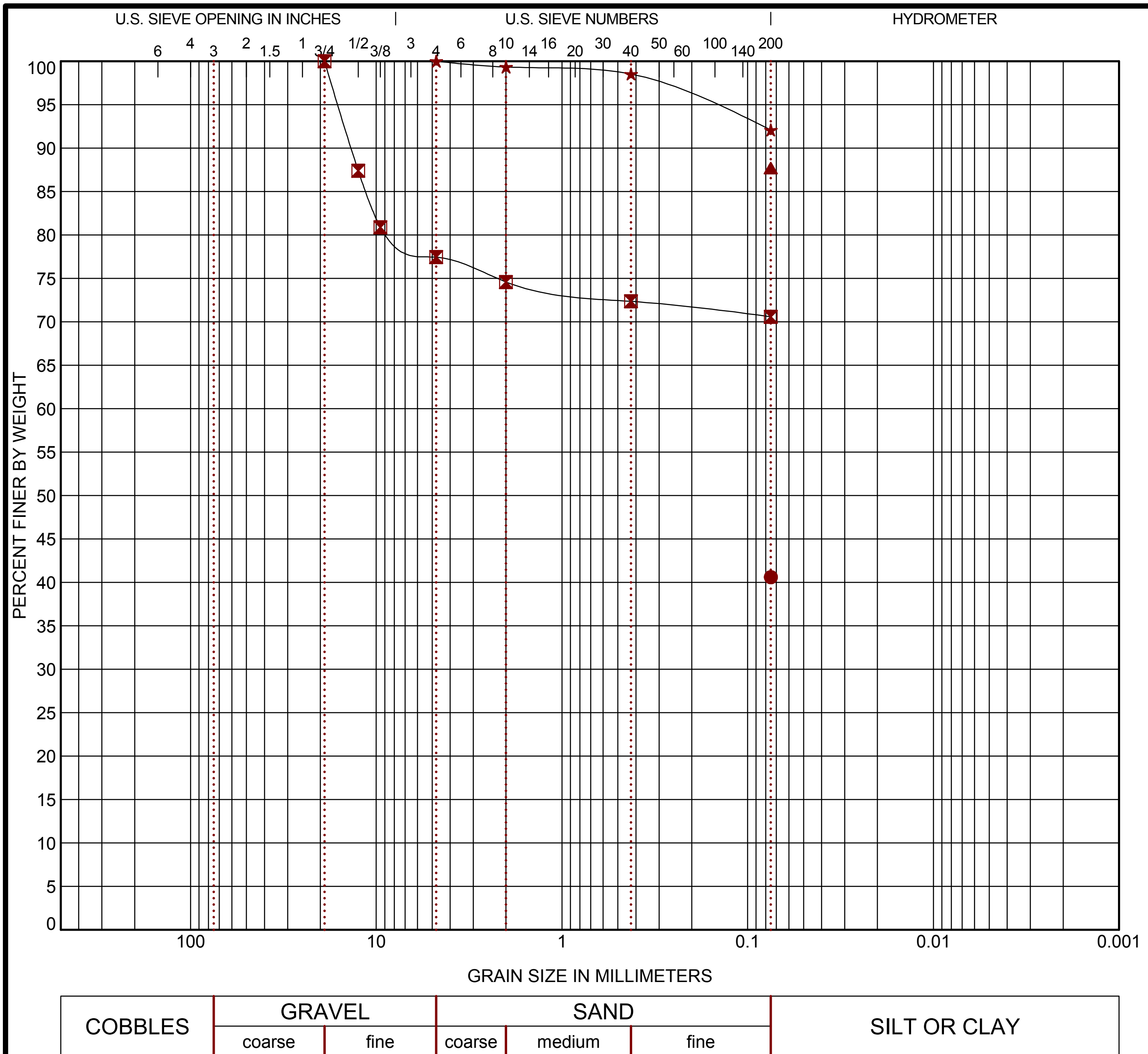
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-10

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-305	13.5 - 14.5	CLAYEY SAND (SC)	A-7-6(6)	45	17	28		
⊠	BW-305	14.5 - 16	FAT CLAY with GRAVEL (CH)	A-7-6(36)	78	29	49		
▲	BW-307	2 - 3.5	LEAN CLAY (CL)	A-6(20)	40	17	23		
★	BW-307	5 - 6.5	LEAN CLAY (CL)	A-6(15)	35	18	17		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-305	13.5 - 14.5	0.075				0.0	0.0	40.6	
⊠	BW-305	14.5 - 16	19				22.6	6.9	70.6	
▲	BW-307	2 - 3.5	0.075				0.0	0.0	87.7	
★	BW-307	5 - 6.5	4.75				0.0	7.9	92.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

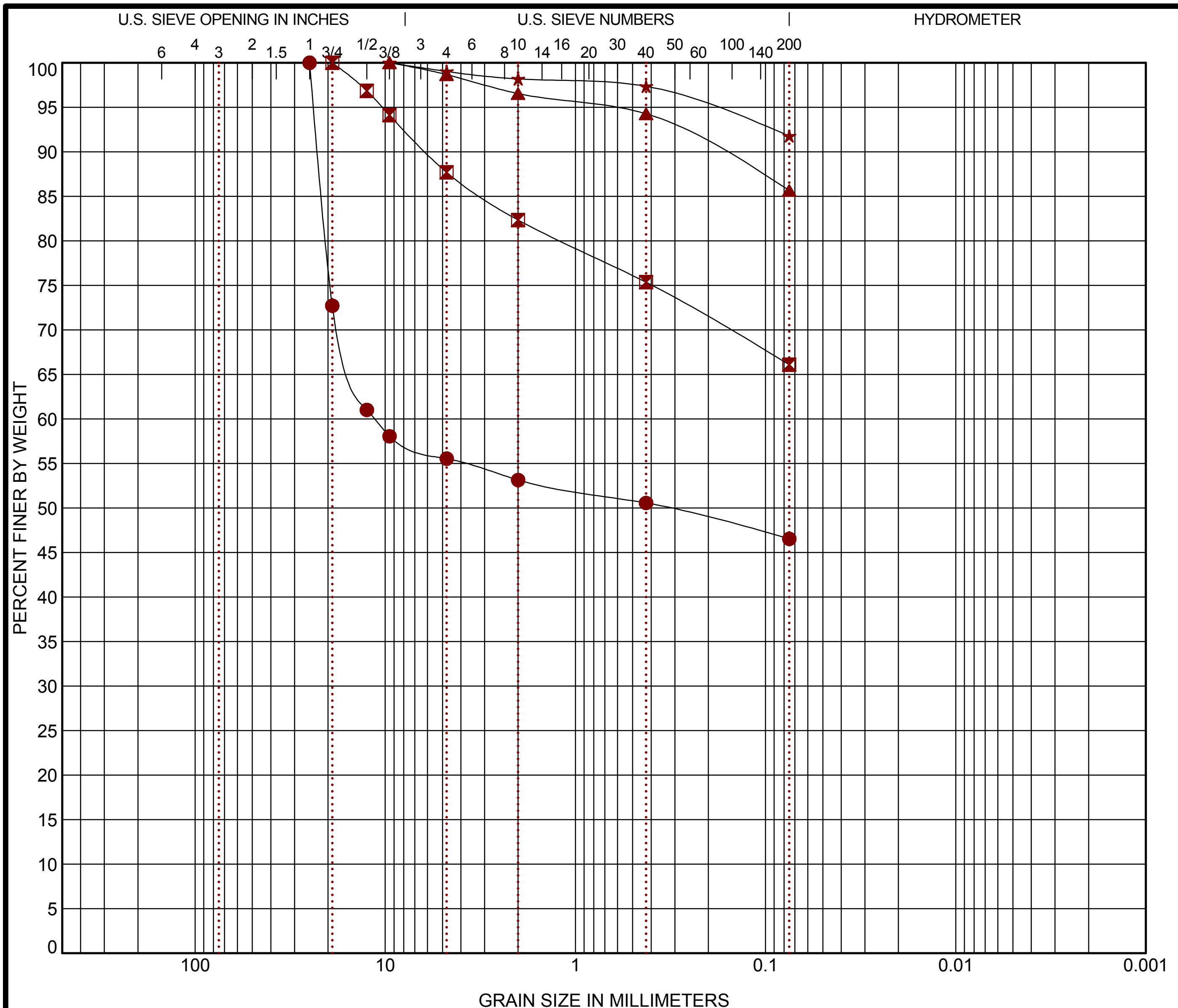
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-11

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-307	13.5 - 15	CLAYEY GRAVEL (GC)	A-7-6(11)	56	21	35		
☒	BW-307	23.5 - 25	()	()					
▲	BW-308	0.5 - 2	LEAN CLAY (CL)	A-6(8)	29	18	11		
★	BW-308	5 - 6.5	LEAN CLAY (CL)	A-6(16)	34	16	18		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-307	13.5 - 15	25	11.381			44.5	9.0	46.5	
☒	BW-307	23.5 - 25	19				12.3	21.6	66.1	
▲	BW-308	0.5 - 2	9.5				1.3	13.0	85.7	
★	BW-308	5 - 6.5	9.5				1.0	7.3	91.8	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

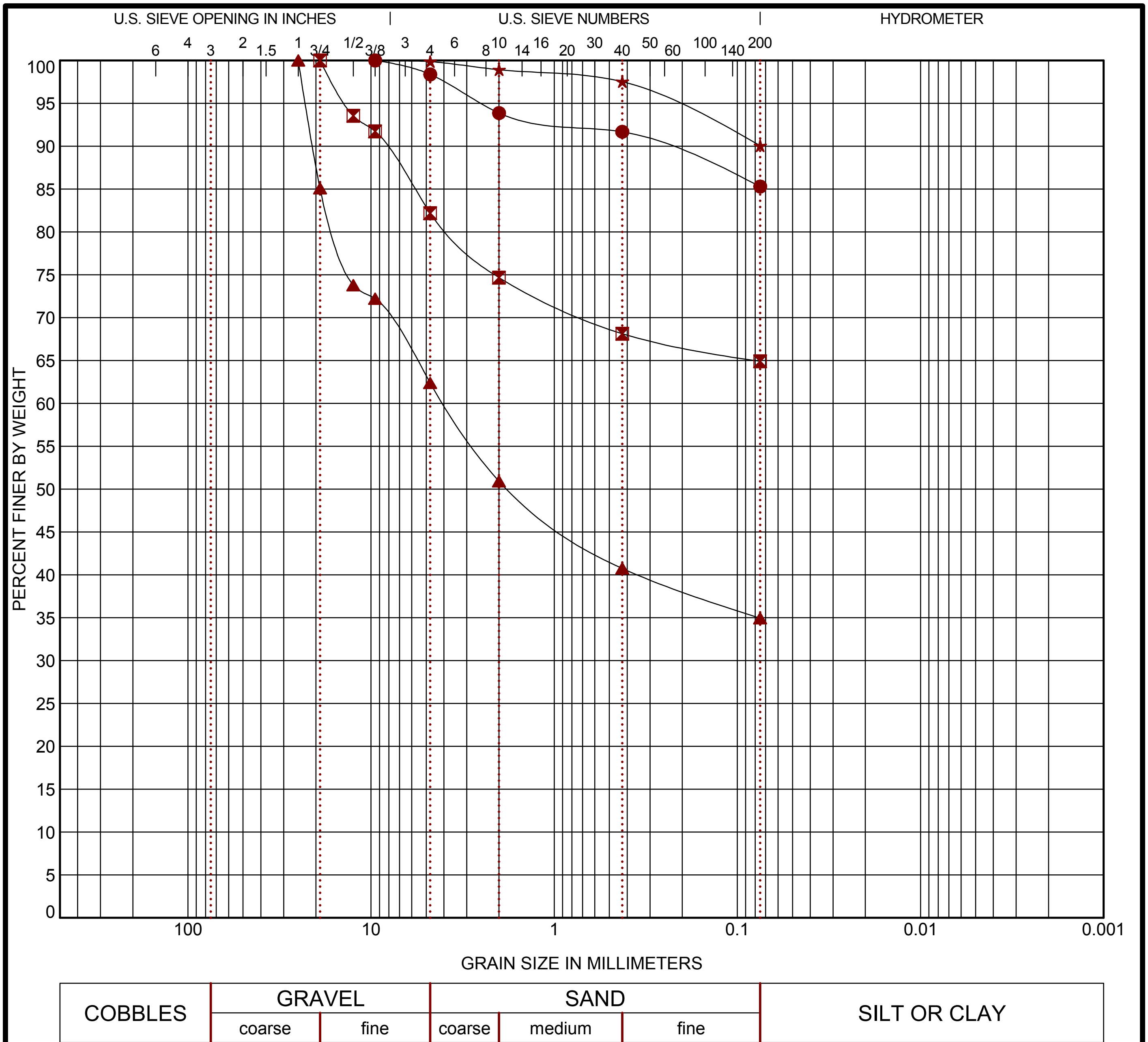
CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-12

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 04135111 - BW.GPJ TERRACON2012.GDT 1/19/16

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-309	8.5 - 10	LEAN CLAY (CL)	A-6(14)	35	18	17		
⊠	BW-401	8.5 - 10	GRAVELLY ELASTIC SILT with SAND (MH)	A-7-5(23)	71	37	34		
▲	BW-401	18.5 - 20	CLAYEY GRAVEL with SAND (GC)	A-2-7(5)	54	19	35		
★	BW-402	0.5 - 2	LEAN CLAY (CL)	A-6(8)	28	17	11		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-309	8.5 - 10	9.5				1.6	13.1	85.3	
⊠	BW-401	8.5 - 10	19				17.8	17.3	64.9	
▲	BW-401	18.5 - 20	25	3.97			37.6	27.4	34.9	
★	BW-402	0.5 - 2	9.5				0.1	9.8	90.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

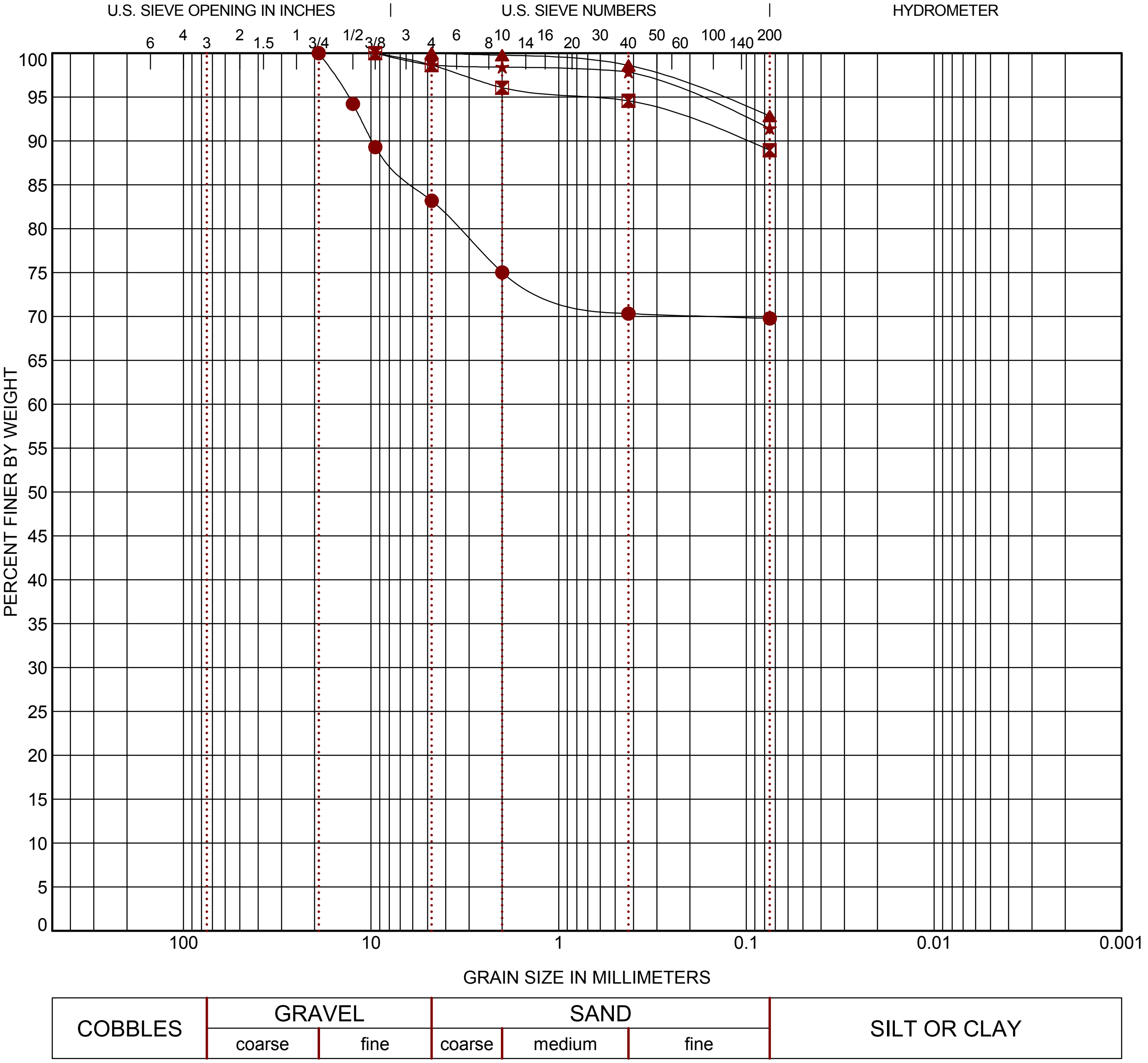
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-13

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-402	13.5 - 15	GRAVELLY ELASTIC SILT (MH)	A-7-5(26)	72	37	35		
⊠	BW-403	5 - 6.5	LEAN CLAY (CL)	A-7-6(20)	41	19	22		
▲	BW-404	2 - 3.5	LEAN CLAY (CL)	A-4(8)	28	18	10		
★	BW-405	3.5 - 5.5	LEAN CLAY (CL)	A-6(15)	35	18	17		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-402	13.5 - 15	19				16.8	13.4	69.8	
⊠	BW-403	5 - 6.5	9.5				1.4	9.7	88.9	
▲	BW-404	2 - 3.5	4.75				0.0	7.2	92.8	
★	BW-405	3.5 - 5.5	9.5				1.4	7.2	91.4	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

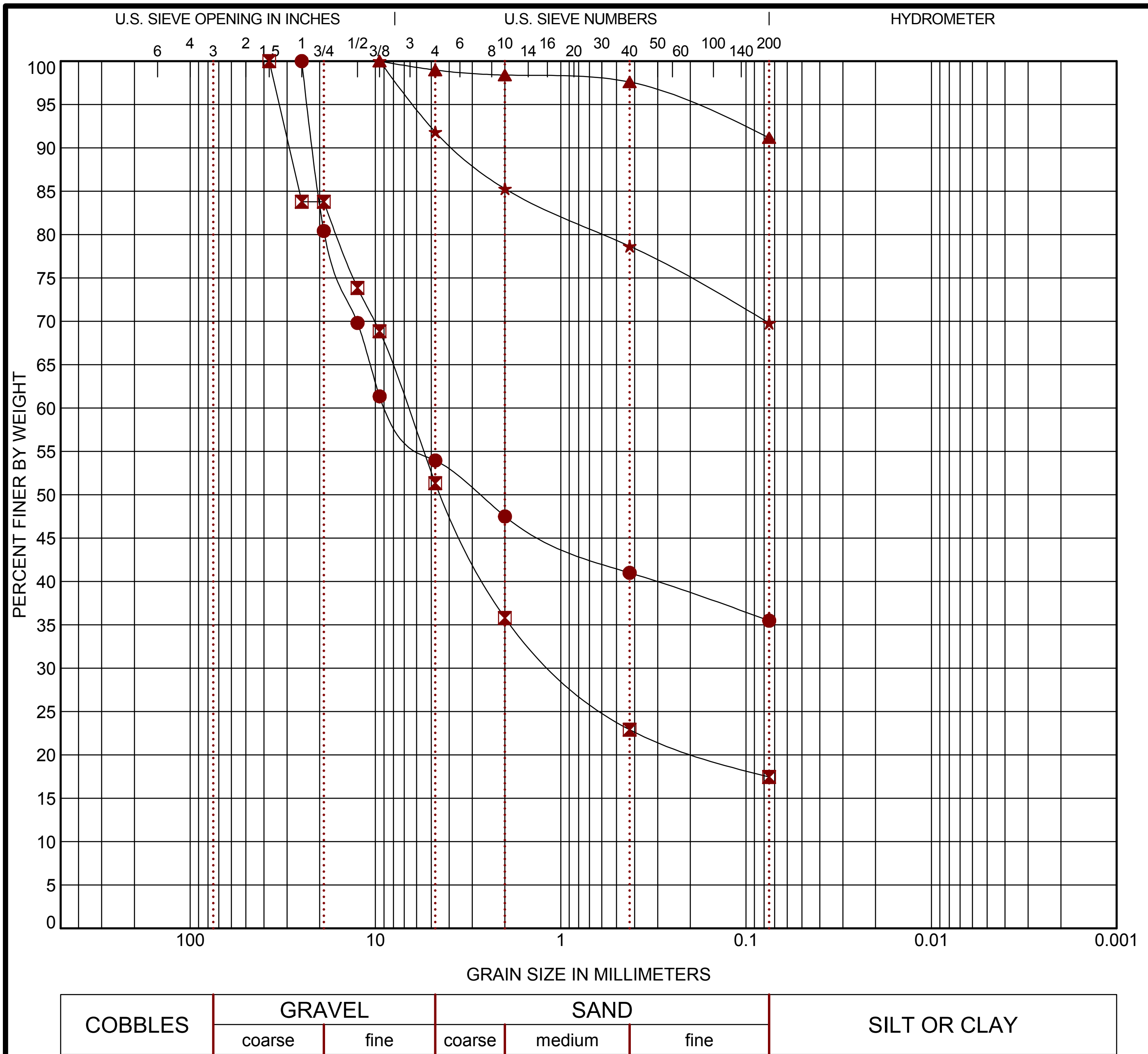
CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-14

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 04135111 - BW.GPJ TERRACON2012.GDT 1/19/16

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-405	8.5 - 10	CLAYEY GRAVEL with SAND (GC)	A-2-7(5)	67	31	36		
⊠	BW-405	23.5 - 25	()	()					
▲	BW-406	2 - 4	LEAN CLAY (CL)	A-6(16)	37	19	18		
★	BW-406	5.5 - 7	SANDY LEAN CLAY (CL)	A-6(10)	37	21	16		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-405	8.5 - 10	25	8.375			46.1	18.5	35.5	
⊠	BW-405	23.5 - 25	37.5	6.694	0.997		48.7	33.9	17.5	
▲	BW-406	2 - 4	9.5				1.0	7.8	91.2	
★	BW-406	5.5 - 7	9.5				8.2	22.0	69.8	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

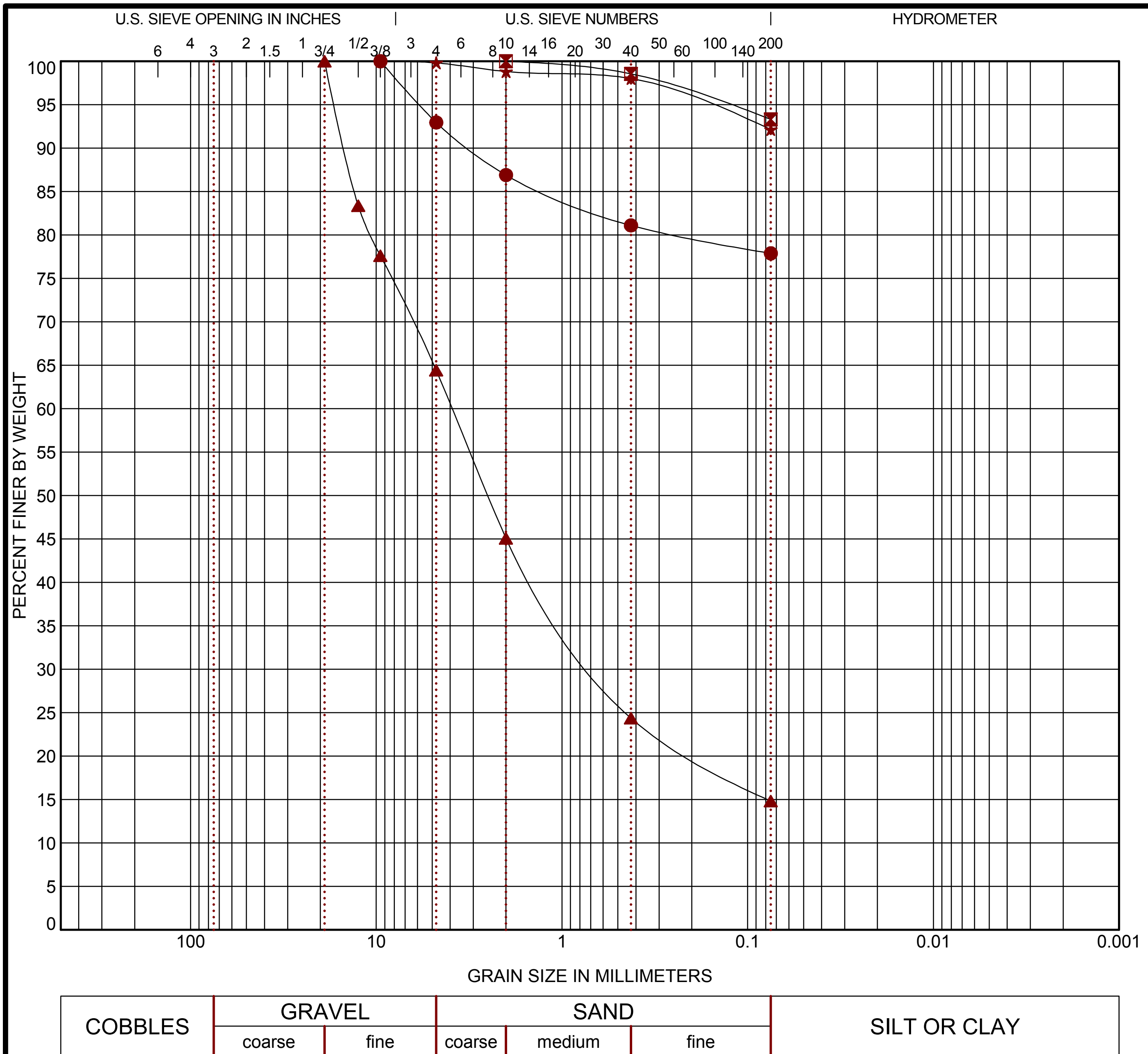
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-15

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-406	18.5 - 20	ELASTIC SILT with SAND (MH)	A-7-5(18)	59	41	18		
⊠	BW-407	0.5 - 2	LEAN CLAY (CL)	A-6(18)	38	19	19		
▲	BW-407	13.5 - 14.8	SILTY SAND with GRAVEL (SM)	A-1-a(0)	NP	NP	NP		
★	BW-408	2 - 3.5	LEAN CLAY (CL)	A-7-6(17)	42	25	17		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-406	18.5 - 20	9.5				7.1	15.1	77.9	
⊠	BW-407	0.5 - 2	2				0.0	6.7	93.3	
▲	BW-407	13.5 - 14.8	19	3.899	0.648		35.6	49.6	14.8	
★	BW-408	2 - 3.5	9.5				0.2	7.7	92.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

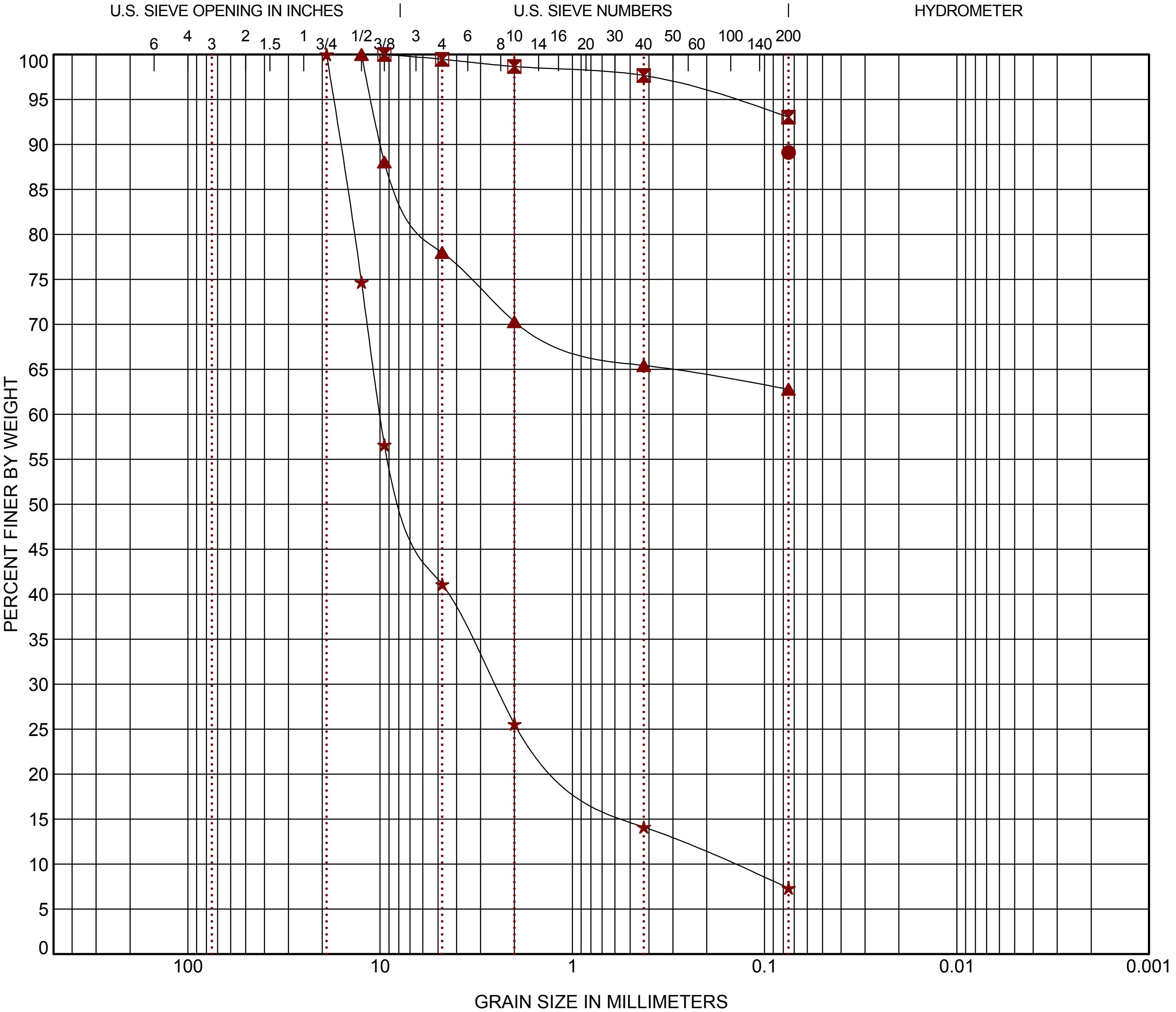
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-16

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-408	5 - 7	LEAN CLAY (CL)	A-7-6(24)	44	18	26		
⊠	BW-409	2 - 4	LEAN CLAY (CL)	A-6(14)	36	22	14		
▲	BW-409	13.5 - 15	GRAVELLY FAT CLAY with SAND (CH)	A-7-6(27)	67	21	46		
★	BW-501	5 - 6.5	POORLY GRADED GRAVEL with SILT and SAND (GP-GM)	A-1-a(0)	NP	NP	NP	4.41	67.30

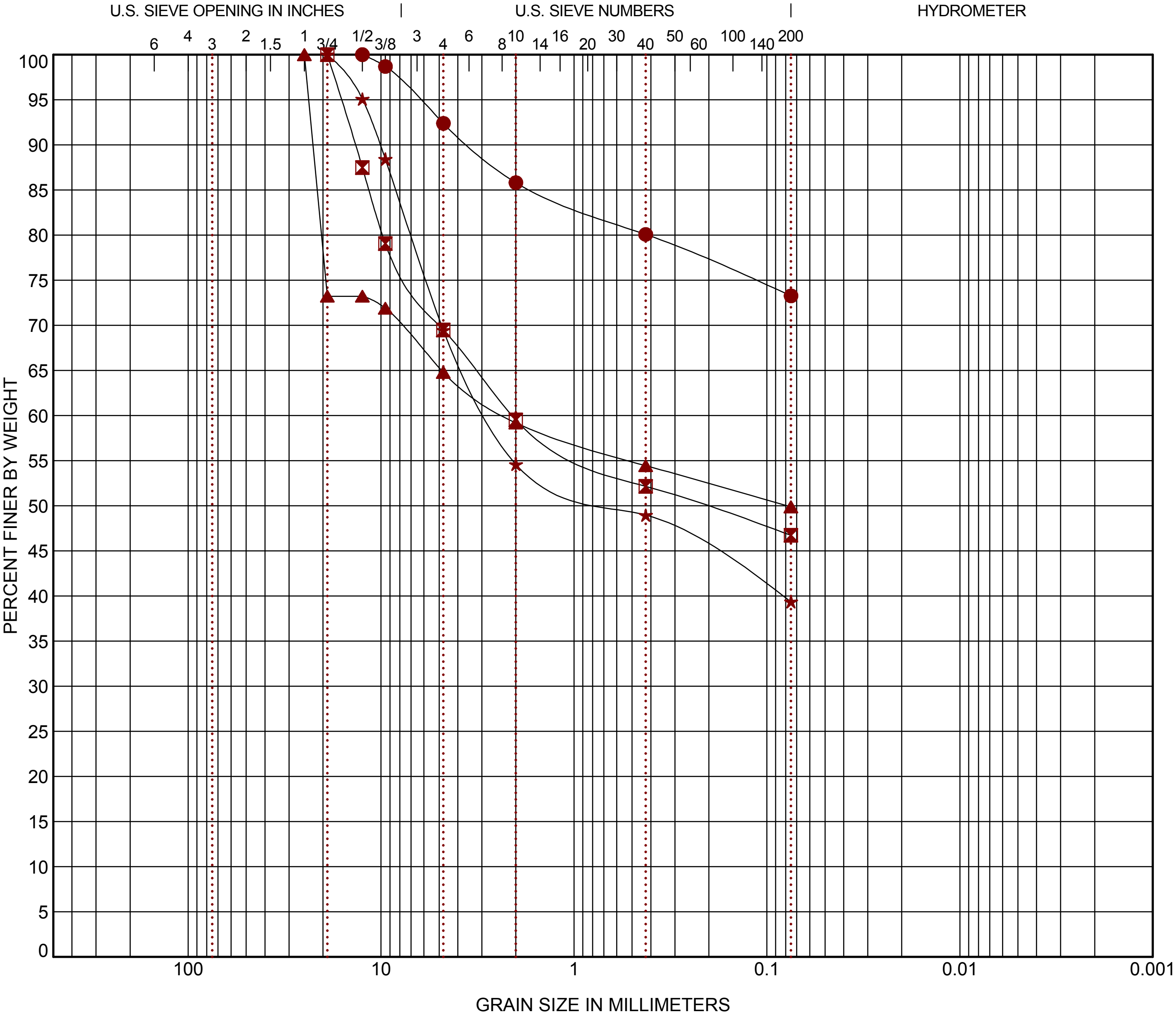
	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-408	5 - 7	0.075				0.0	0.0	89.1	
⊠	BW-409	2 - 4	9.5				0.5	6.4	93.0	
▲	BW-409	13.5 - 15	12.5				22.0	15.2	62.8	
★	BW-501	5 - 6.5	19	10.003	2.561	0.149	58.9	33.8	7.3	

PROJECT: 8th Street Widening Project - MSE Walls	Terracon	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas	9522 East 47th Place, Unit D Tulsa, Oklahoma	CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-17

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 04135111 - BW.GPJ TERRACON2012.GDT 1/19/16

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-501	18.5 - 20	LEAN CLAY with SAND (CL)	A-6(14)	39	18	21		
⊠	BW-502	5 - 6	CLAYEY GRAVEL with SAND (GC)	A-7-5(10)	61	31	30		
▲	BW-502	13.5 - 15	SILTY GRAVEL (GM)	A-4(0)	NP	NP	NP		
★	BW-502	28.5 - 30	CLAYEY GRAVEL with SAND (GC)	A-6(3)	39	18	21		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-501	18.5 - 20	12.5				7.6	19.1	73.3	
⊠	BW-502	5 - 6	19	2.087			30.5	22.8	46.7	
▲	BW-502	13.5 - 15	25	2.272			35.2	14.9	49.9	
★	BW-502	28.5 - 30	19	2.74			30.5	30.1	39.4	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

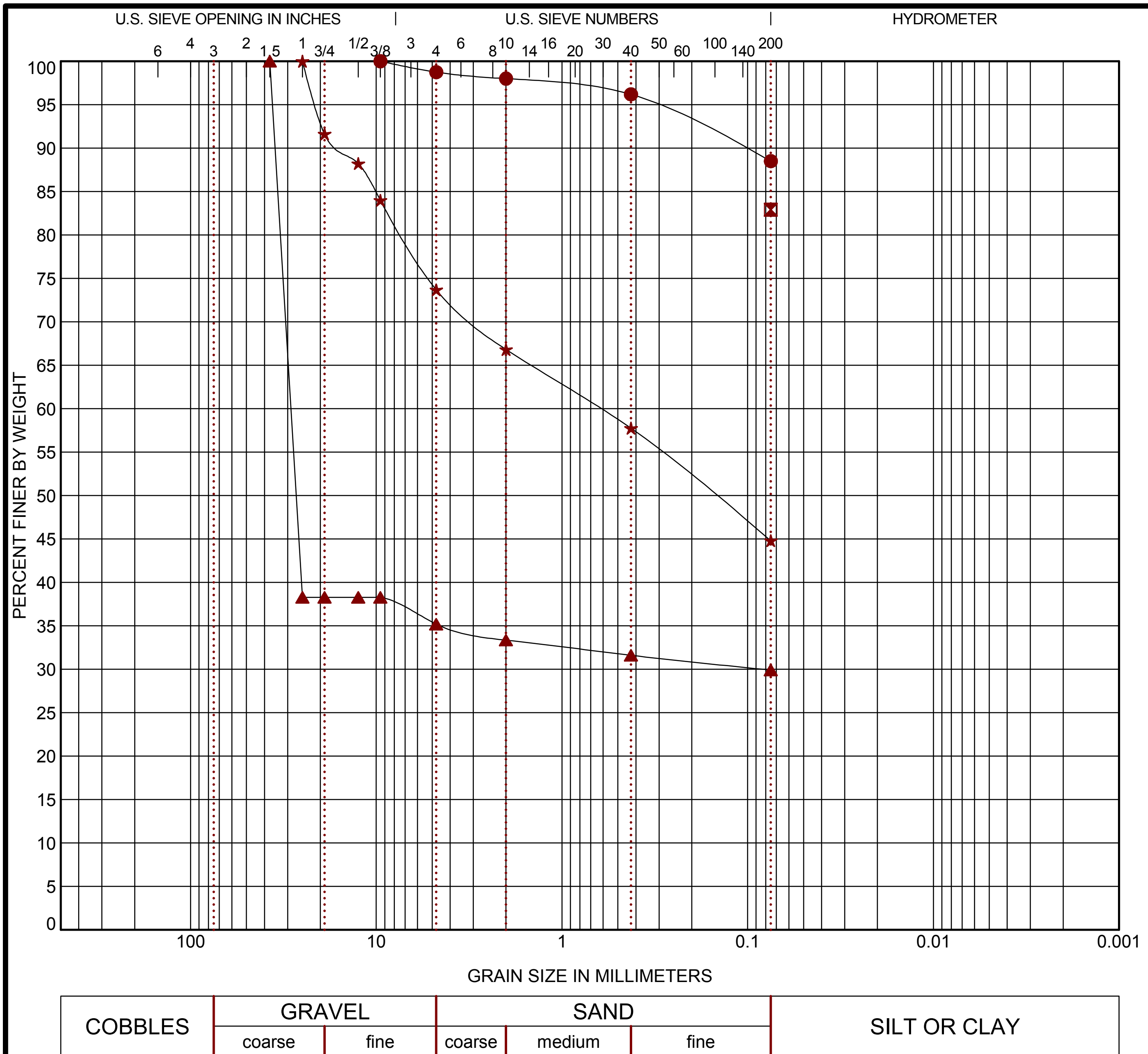
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-18

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-503	2 - 3.5	LEAN CLAY (CL)	A-6(10)	30	17	13		
⊠	BW-503	5 - 6.5	LEAN CLAY with SAND (CL)	A-6(15)	39	20	19		
▲	BW-503	18.5 - 20	CLAYEY GRAVEL (GC)	A-2-7(9)	101	32	69		
★	BW-503	28.5 - 30	SILTY SAND with GRAVEL (SM)	A-7-5(5)	49	30	19		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-503	2 - 3.5	9.5				1.3	10.2	88.5	
⊠	BW-503	5 - 6.5	0.075				0.0	0.0	82.9	
▲	BW-503	18.5 - 20	37.5	28.835	0.083		64.8	5.3	29.9	
★	BW-503	28.5 - 30	25	0.624			26.3	28.9	44.8	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

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9522 East 47th Place, Unit D
Tulsa, Oklahoma

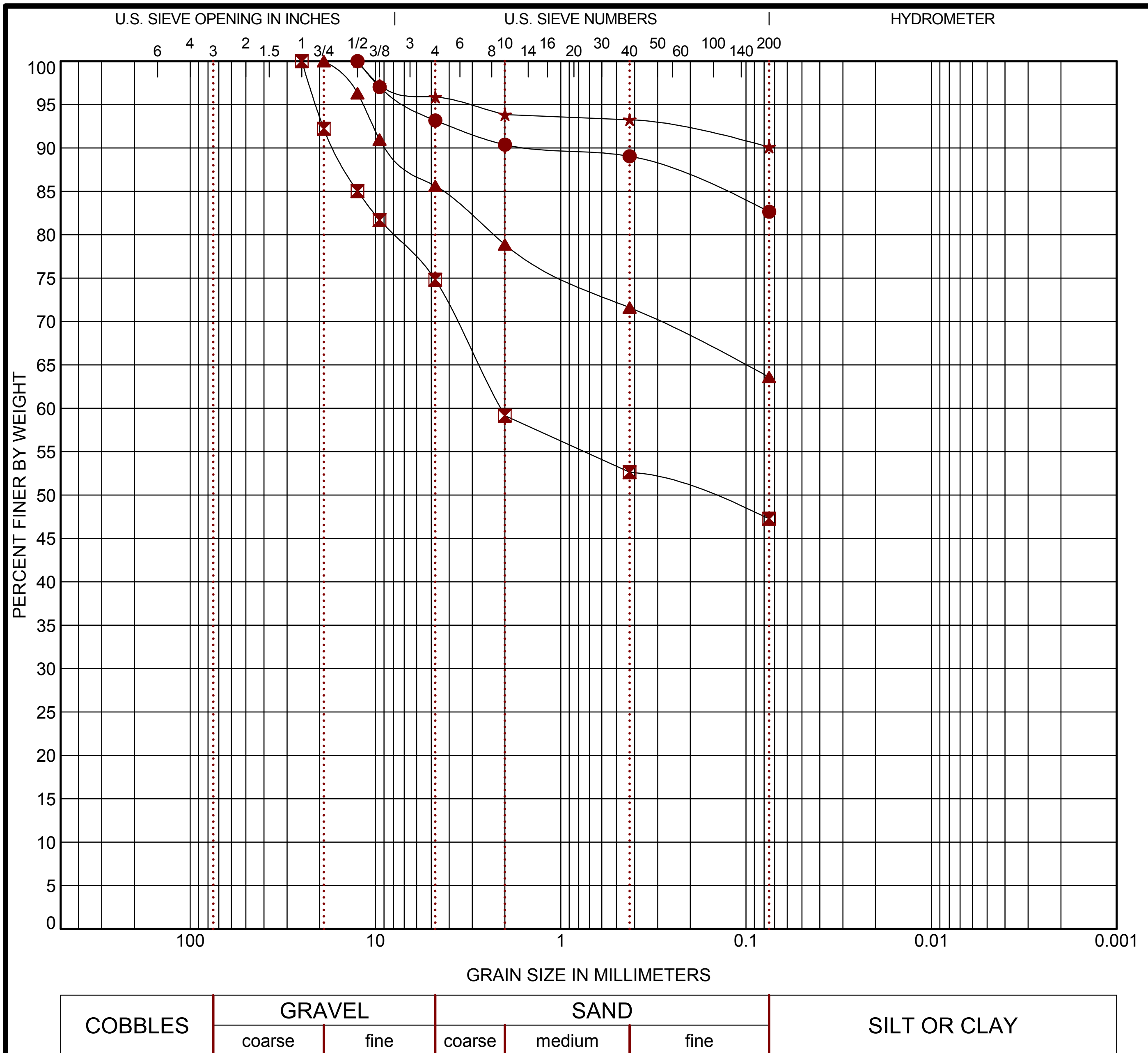
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-19

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-504	0.5 - 2	LEAN CLAY with SAND (CL)	A-7-6(21)	43	18	25		
⊠	BW-504	8.5 - 10	()	()					
▲	BW-504	23.5 - 25	SANDY LEAN CLAY (CL)	A-7-6(14)	46	22	24		
★	BW-505	2 - 3.5	FAT CLAY (CH)	A-7-6(25)	52	28	24		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-504	0.5 - 2	12.5				6.8	10.5	82.7	
⊠	BW-504	8.5 - 10	25	2.095			25.2	27.5	47.3	
▲	BW-504	23.5 - 25	19				14.4	22.0	63.6	
★	BW-505	2 - 3.5	12.5				4.1	5.8	90.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

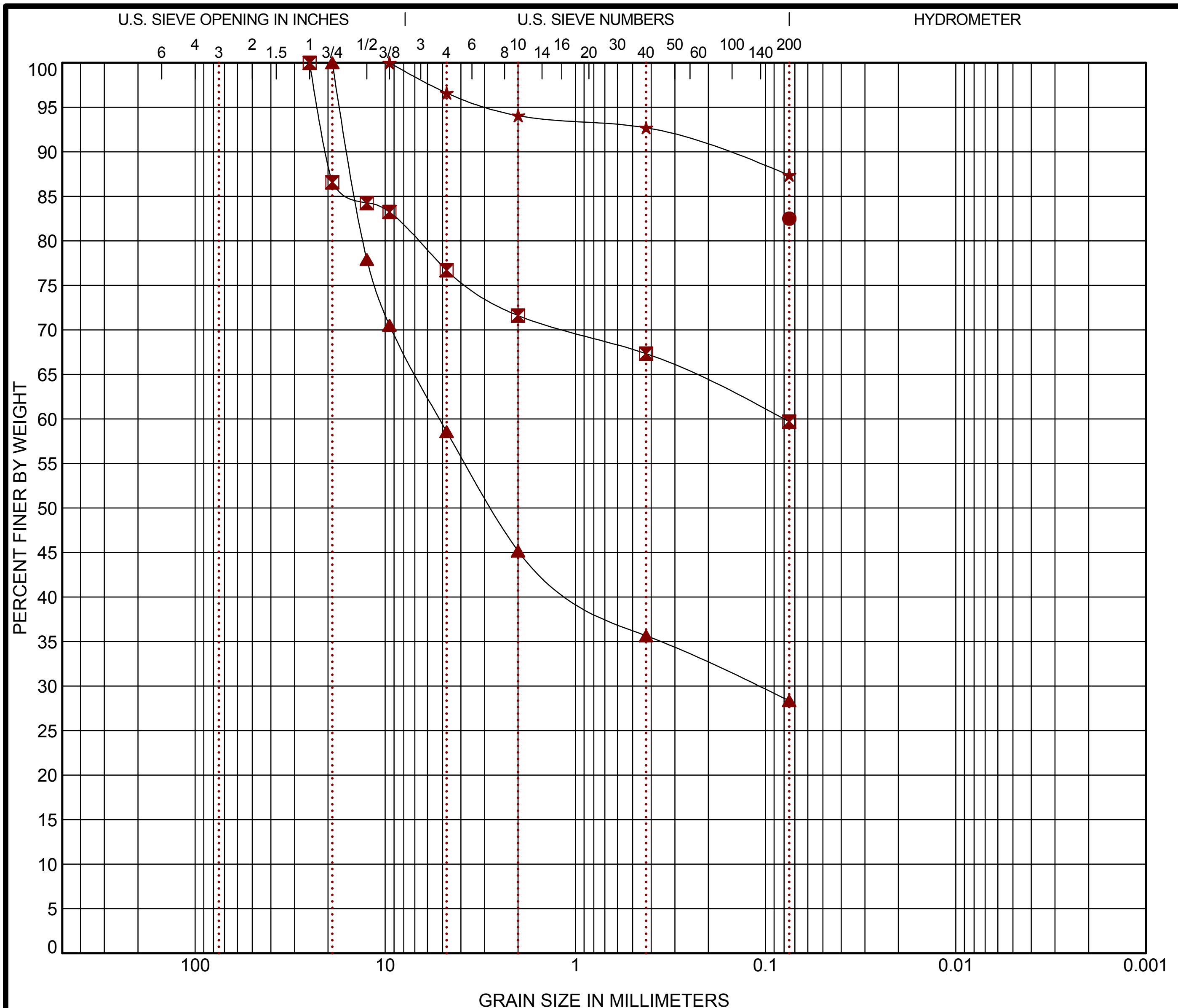
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-20

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-505	5 - 6.5	LEAN CLAY with SAND (CL)	A-7-6(22)	44	17	27		
⊠	BW-505	8.5 - 10	GRAVELLY LEAN CLAY with SAND (CL)	A-6(7)	35	20	15		
▲	BW-505	18.5 - 20	()	()					
★	BW-506	0.5 - 2	LEAN CLAY (CL)	A-7-6(25)	45	17	28		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-505	5 - 6.5	0.075				0.0	0.0	82.5	
⊠	BW-505	8.5 - 10	25	0.08			23.3	17.0	59.7	
▲	BW-505	18.5 - 20	19	5.16	0.111		41.4	30.2	28.4	
★	BW-506	0.5 - 2	9.5				3.4	9.2	87.4	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

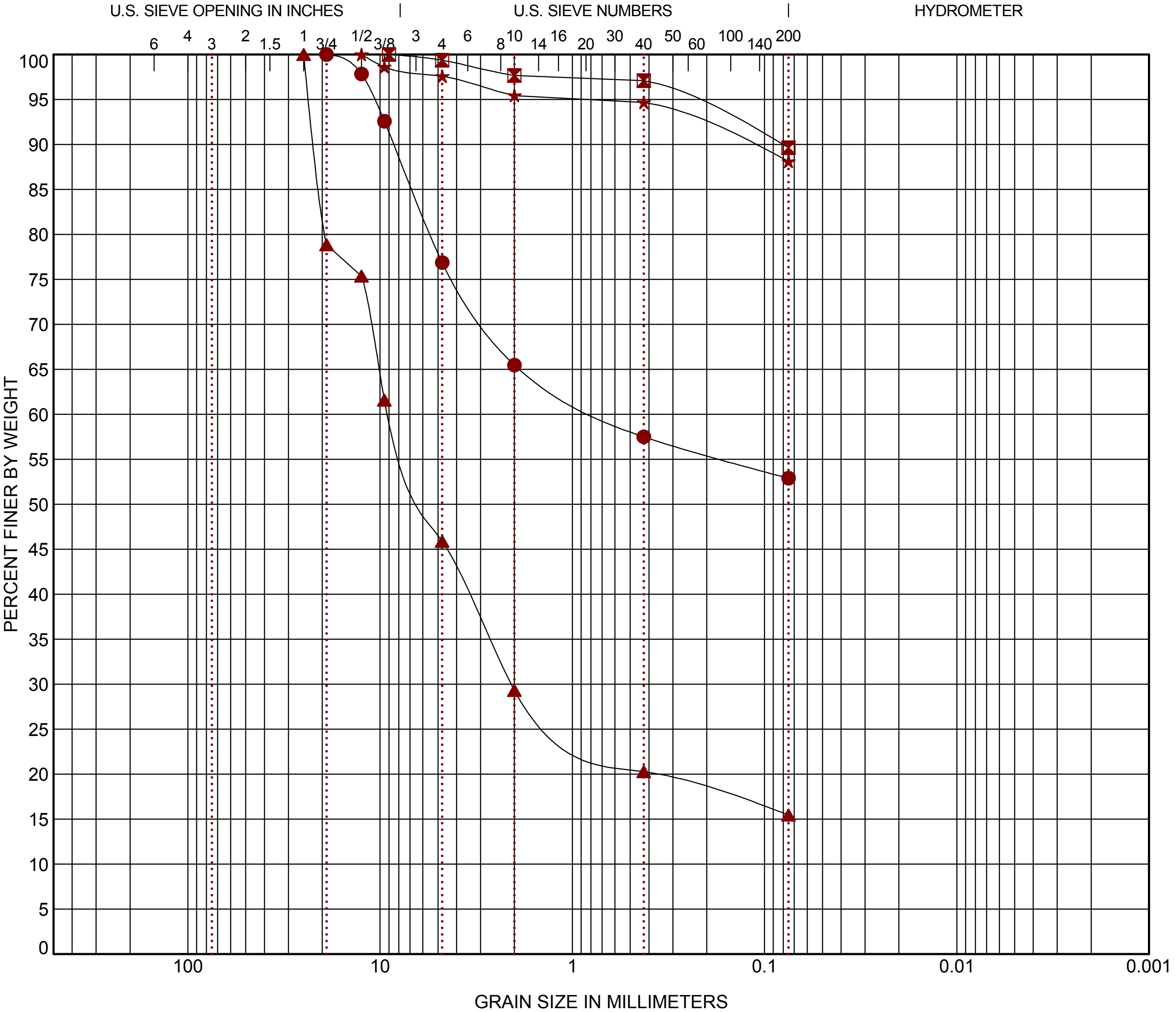
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-21

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-506	23.5 - 25	SANDY SILT with GRAVEL (ML)	A-7-6(4)	41	29	12		
⊠	BW-507	5 - 6.5	LEAN CLAY (CL)	A-6(16)	35	17	18		
▲	BW-507	13.5 - 15	()	()					
★	BW-508	2 - 3.5	LEAN CLAY (CL)	A-6(21)	39	15	24		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-506	23.5 - 25	19	0.691			23.1	24.0	52.9	
⊠	BW-507	5 - 6.5	9				0.6	9.7	89.6	
▲	BW-507	13.5 - 15	25	8.863	2.075		54.1	30.4	15.5	
★	BW-508	2 - 3.5	12.5				2.4	9.5	88.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

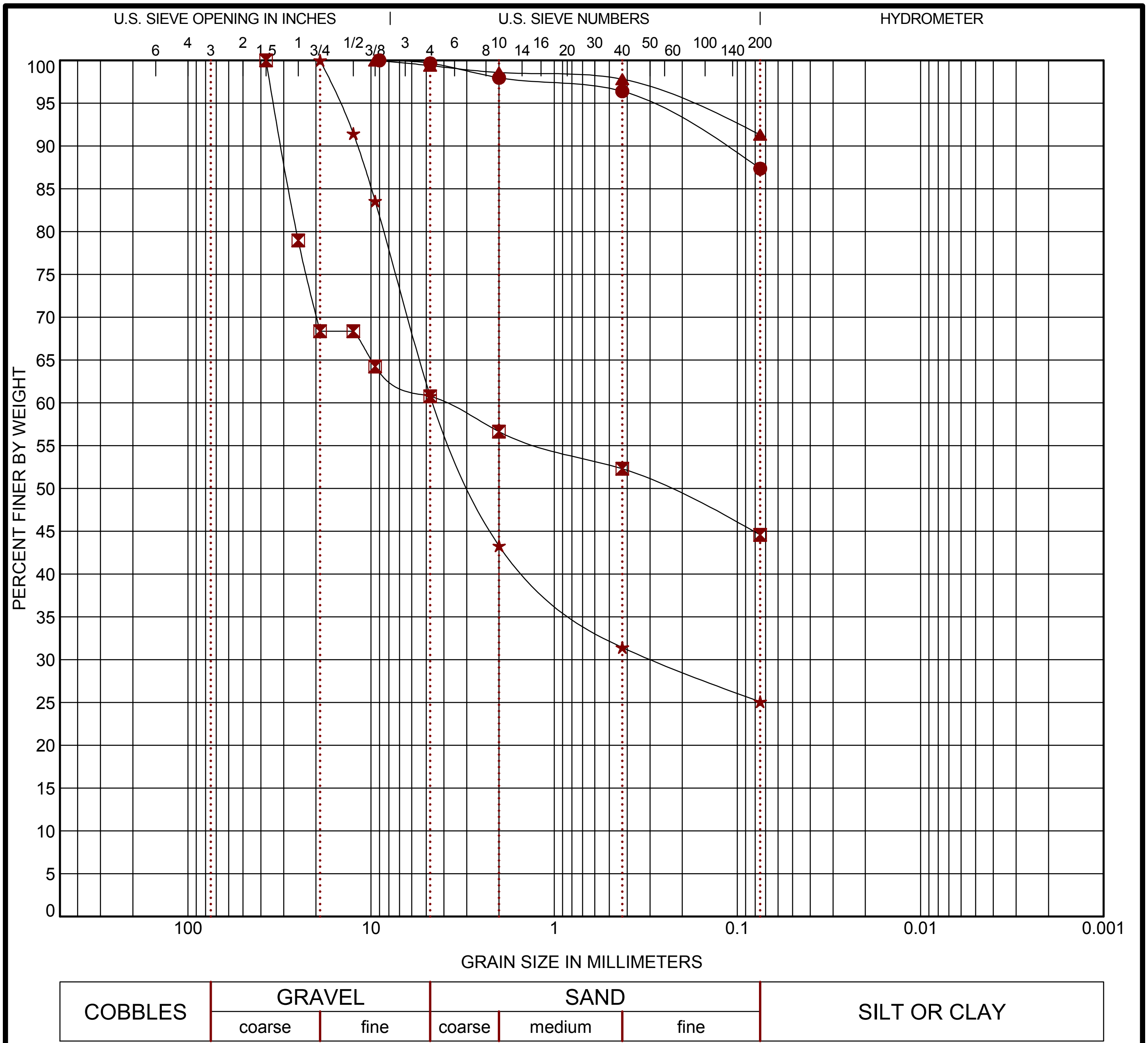
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-22

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-509	0.5 - 2	LEAN CLAY (CL)	A-4(6)	27	19	8		
⊠	BW-509	28.5 - 30	SILTY GRAVEL with SAND (GM)	A-5(2)	48	39	9		
▲	BW-510	2 - 3.5	LEAN CLAY (CL)	A-7-6(28)	47	18	29		
★	BW-510	18.5 - 19.9	()	()					

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-509	0.5 - 2	9				0.3	12.3	87.4	
⊠	BW-509	28.5 - 30	37.5	4.058			39.2	16.2	44.6	
▲	BW-510	2 - 3.5	9.5				0.6	8.1	91.3	
★	BW-510	18.5 - 19.9	19	4.568	0.288		39.2	35.7	25.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

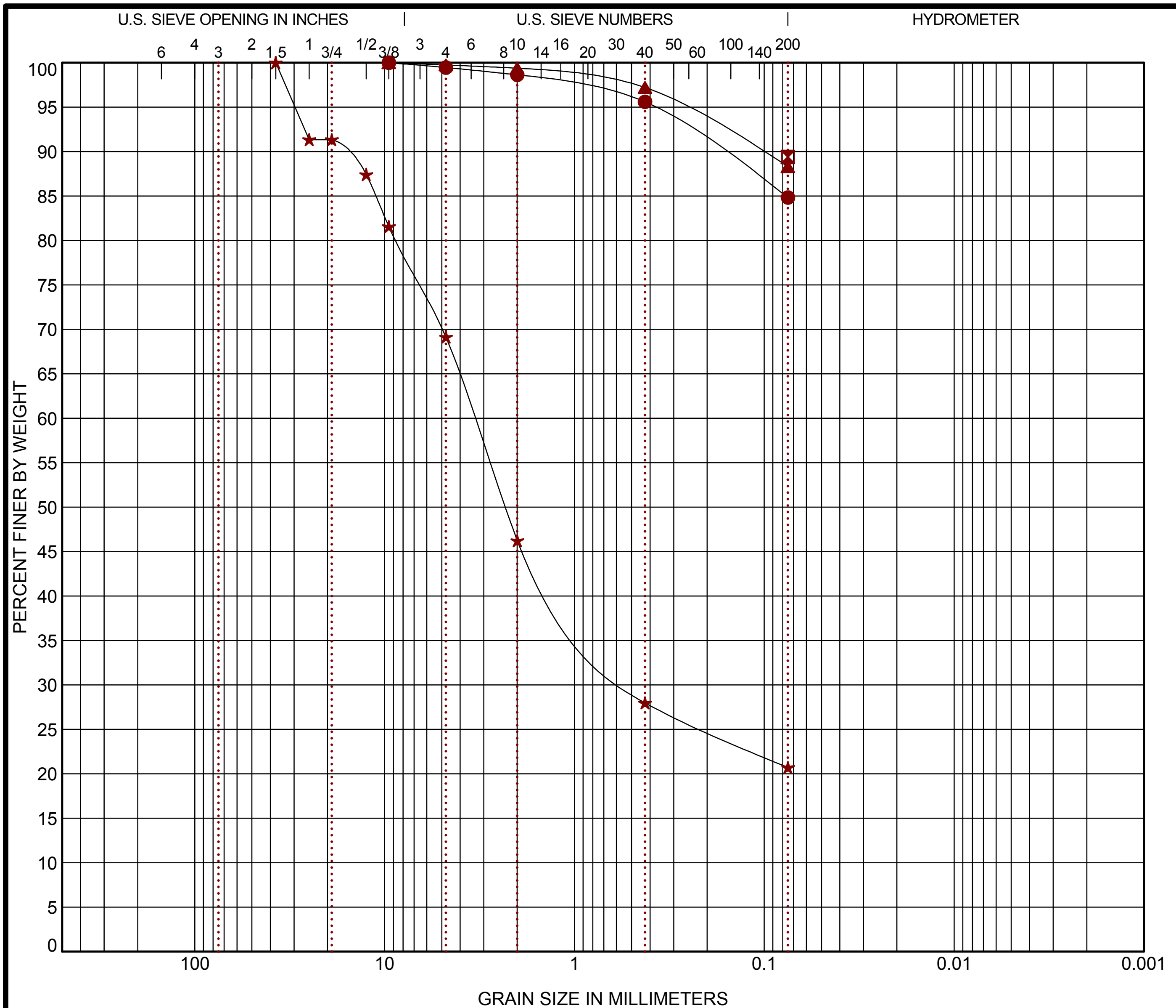
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-23

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-511	2 - 3.5	LEAN CLAY with SAND (CL)	A-6(15)	37	19	18		
⊠	BW-511	5 - 7	LEAN CLAY (CL)	A-7-6(22)	46	23	23		
▲	BW-511	8.5 - 10	LEAN CLAY (CL)	A-7-6(24)	48	22	26		
★	BW-511	23.5 - 25	CLAYEY SAND with GRAVEL (SC)	A-2-7(1)	58	24	34		

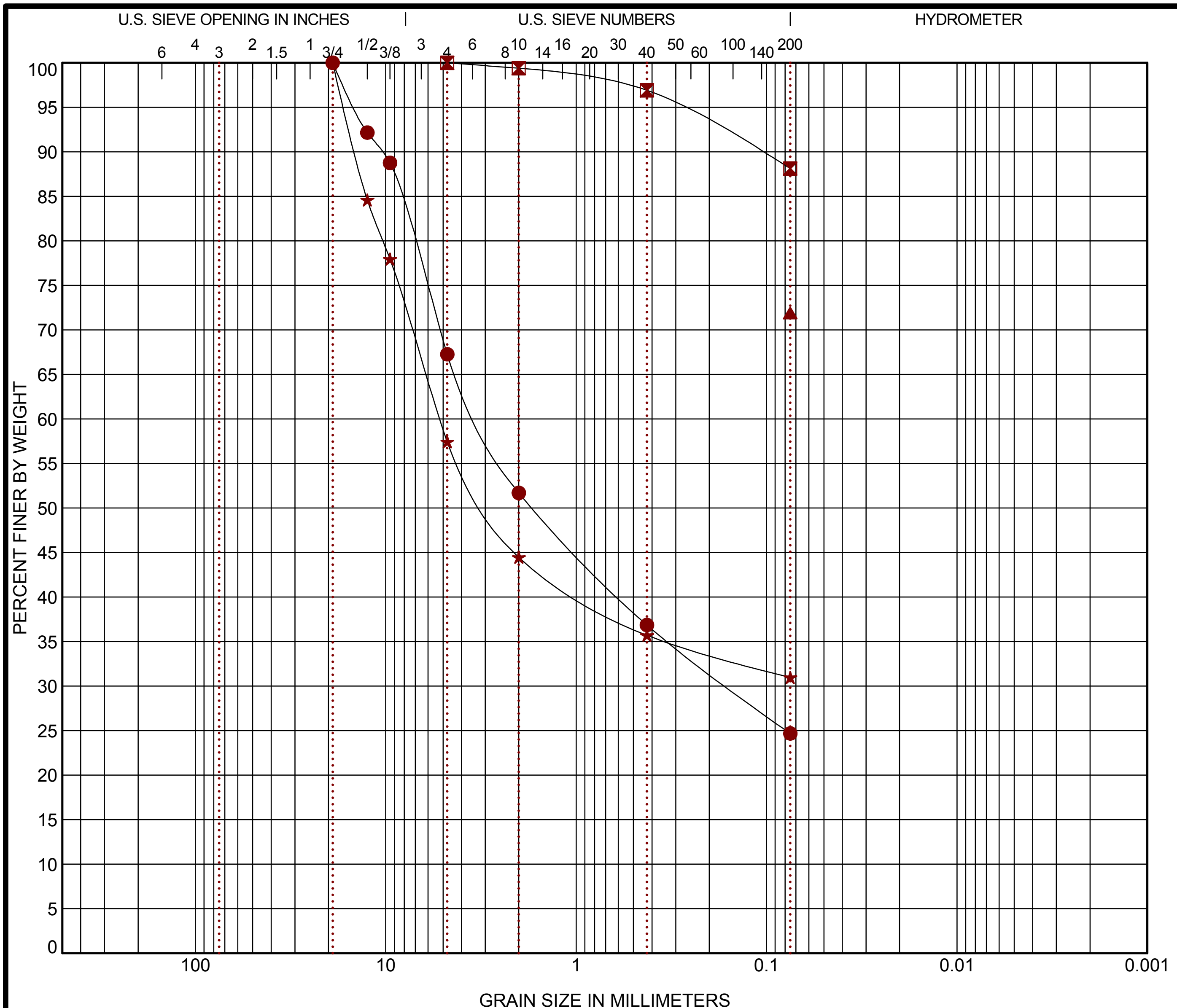
	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-511	2 - 3.5	9.5				0.5	14.6	84.8	
⊠	BW-511	5 - 7	0.075				0.0	0.0	89.4	
▲	BW-511	8.5 - 10	9.5				0.3	11.4	88.3	
★	BW-511	23.5 - 25	37.5	3.364	0.505		30.9	48.4	20.7	

PROJECT: 8th Street Widening Project - MSE Walls	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas		CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-24

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 04135111 - BW.GPJ TERRACON2012.GDT 1/19/16

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-511	33.5 - 35	SILTY SAND with GRAVEL (SM)	A-1-b(0)	NP	NP	NP		
⊠	BW-512	0.5 - 2	LEAN CLAY (CL)	A-6(10)	30	17	13		
▲	BW-512	8 - 9	FAT CLAY with SAND (CH)	A-7-6(21)	52	22	30		
★	BW-512	18.5 - 20	CLAYEY GRAVEL with SAND (GC)	A-2-7(4)	61	27	34		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-511	33.5 - 35	19	3.173	0.16		32.7	42.6	24.7	
⊠	BW-512	0.5 - 2	4.75				0.0	11.9	88.1	
▲	BW-512	8 - 9	0.075				0.0	0.0	71.9	
★	BW-512	18.5 - 20	19	5.18			42.6	26.5	31.0	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

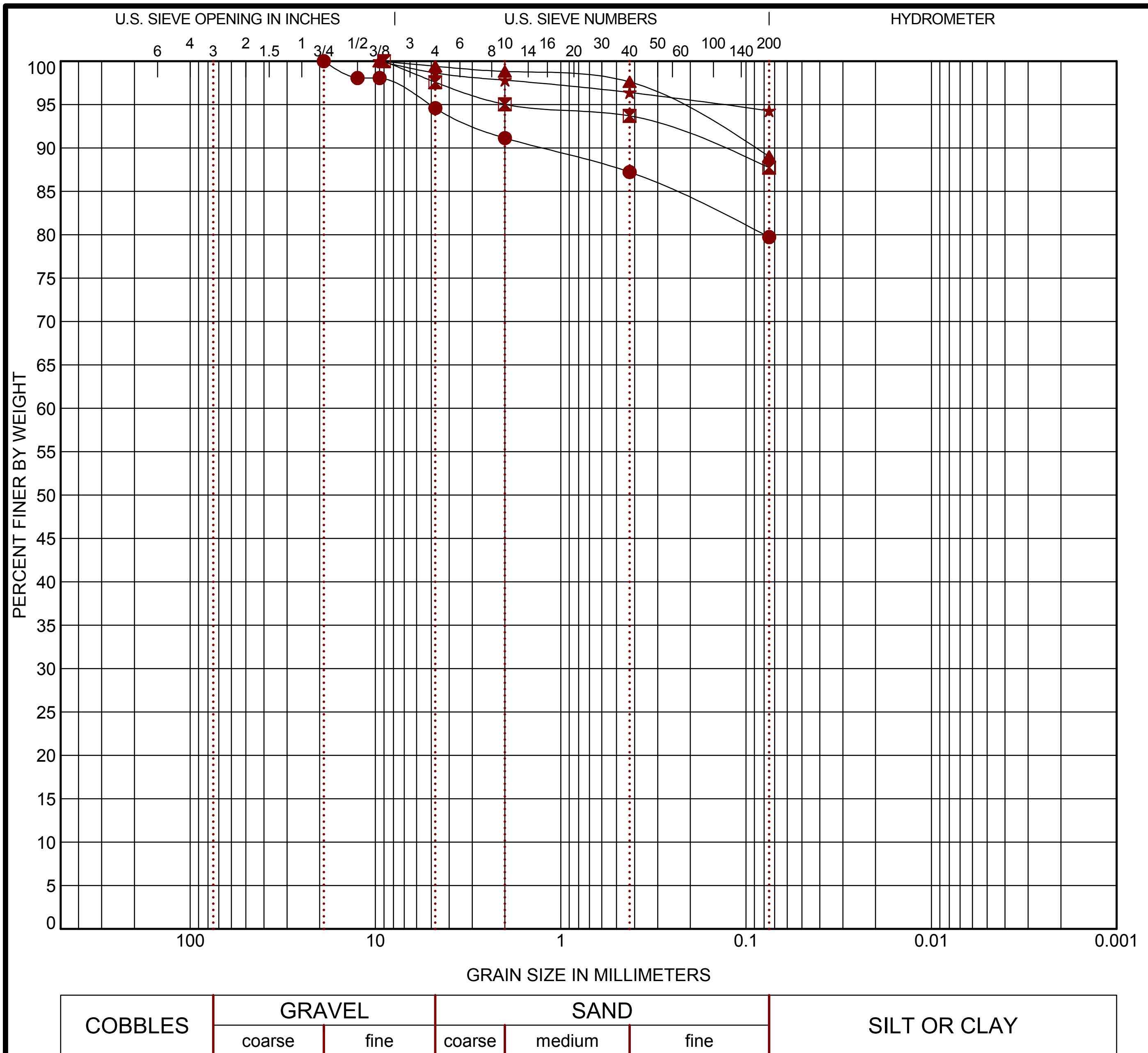
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-25

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-512	28.5 - 30	SILT with SAND (ML)	A-5(11)	48	38	10		
⊠	BW-513	2 - 3.5	LEAN CLAY (CL)	A-7-6(21)	42	19	23		
▲	BW-514	0.5 - 2	LEAN CLAY (CL)	A-4(6)	26	17	9		
★	BW-515	2 - 3.5	LEAN CLAY (CL)	A-6(17)	36	18	18		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-512	28.5 - 30	19				5.4	14.9	79.7	
⊠	BW-513	2 - 3.5	9				2.4	9.8	87.7	
▲	BW-514	0.5 - 2	9.5				0.6	10.4	89.0	
★	BW-515	2 - 3.5	9.5				1.4	4.3	94.3	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

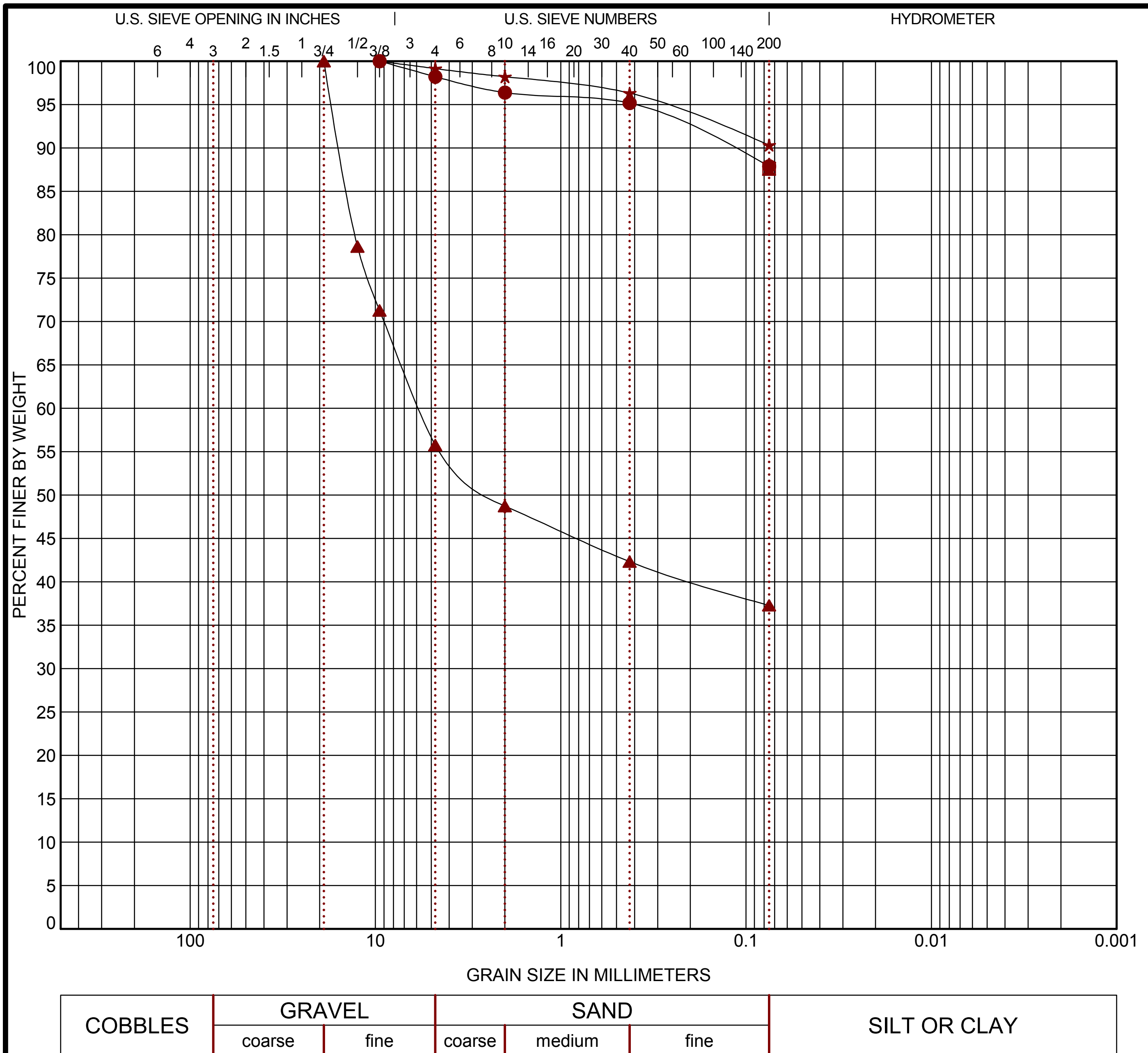
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-26

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-515	5 - 6.5	SILTY CLAY (CL-ML)	A-4(1)	22	18	4		
⊠	BW-601	5 - 7	LEAN CLAY (CL)	A-6(14)	33	16	17		
▲	BW-601	13.5 - 15	SILTY GRAVEL with SAND (GM)	A-4(0)	NP	NP	NP		
★	BW-602	2 - 3.5	LEAN CLAY (CL)	A-6(10)	31	19	12		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-515	5 - 6.5	9.5				1.8	10.3	87.9	
⊠	BW-601	5 - 7	0.075				0.0	0.0	87.6	
▲	BW-601	13.5 - 15	19	5.74			44.2	18.5	37.3	
★	BW-602	2 - 3.5	9.5				0.9	8.8	90.3	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

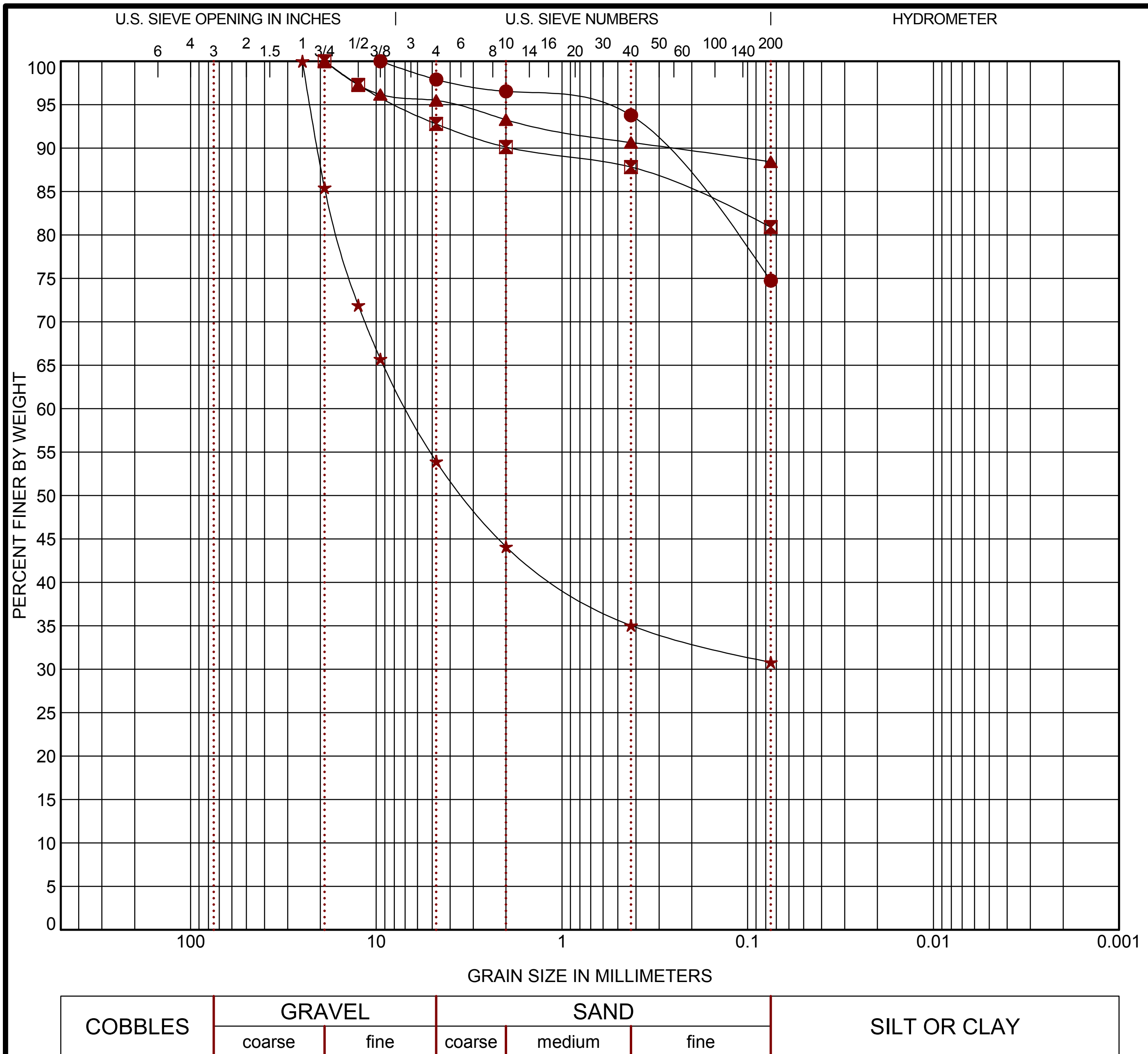
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-27

GRAIN SIZE DISTRIBUTION

ASTM D422



Symbol	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-602	18.5 - 20	FAT CLAY with SAND (CH)	A-7-6(25)	57	24	33		
⊠	BW-603	5 - 6.5	LEAN CLAY with SAND (CL)	A-6(16)	39	19	20		
▲	BW-603	13.5 - 14.5	FAT CLAY (CH)	A-7-5(49)	80	32	48		
★	BW-603	23.5 - 25	CLAYEY GRAVEL with SAND (GC)	A-2-7(5)	68	27	41		

Symbol	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-602	18.5 - 20	9.5				2.1	23.2	74.7	
⊠	BW-603	5 - 6.5	19				7.2	11.9	80.9	
▲	BW-603	13.5 - 14.5	19				4.5	7.1	88.4	
★	BW-603	23.5 - 25	25	6.791			46.1	23.1	30.8	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

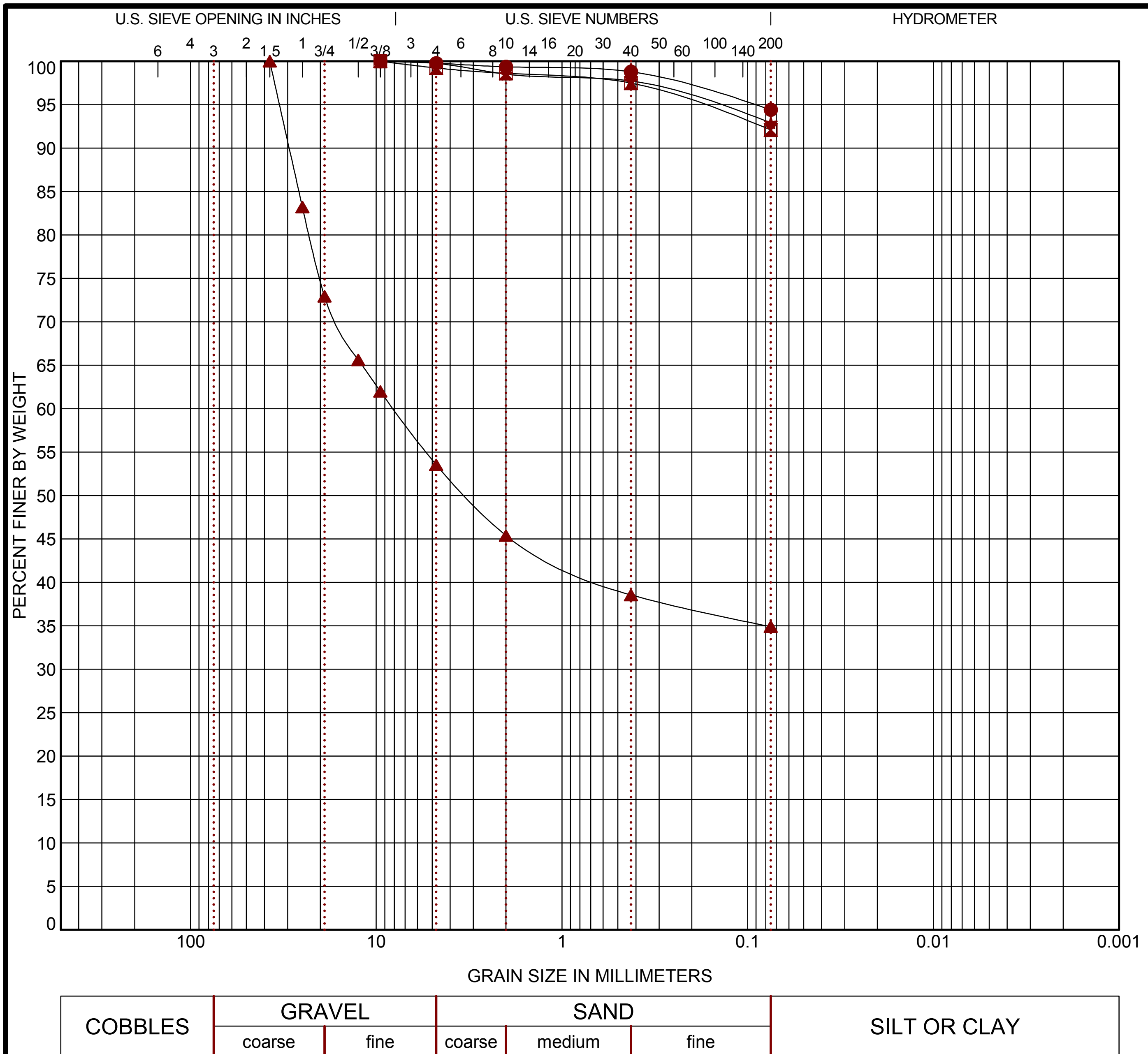
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-28

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-604	0.5 - 2	LEAN CLAY (CL)	A-6(9)	29	18	11		
⊠	BW-604	5 - 6.5	LEAN CLAY (CL)	A-6(20)	40	19	21		
▲	BW-604	28.5 - 30	SILTY GRAVEL with SAND (GM)	A-2-4(0)	NP	NP	NP		
★	BW-605	2 - 3.5	LEAN CLAY (CL)	A-6(19)	38	18	20		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-604	0.5 - 2	9.5				0.2	5.4	94.4	
⊠	BW-604	5 - 6.5	9.5				0.8	7.1	92.1	
▲	BW-604	28.5 - 30	37.5	8.075			46.5	18.6	34.9	
★	BW-605	2 - 3.5	9.5				0.2	6.8	92.9	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

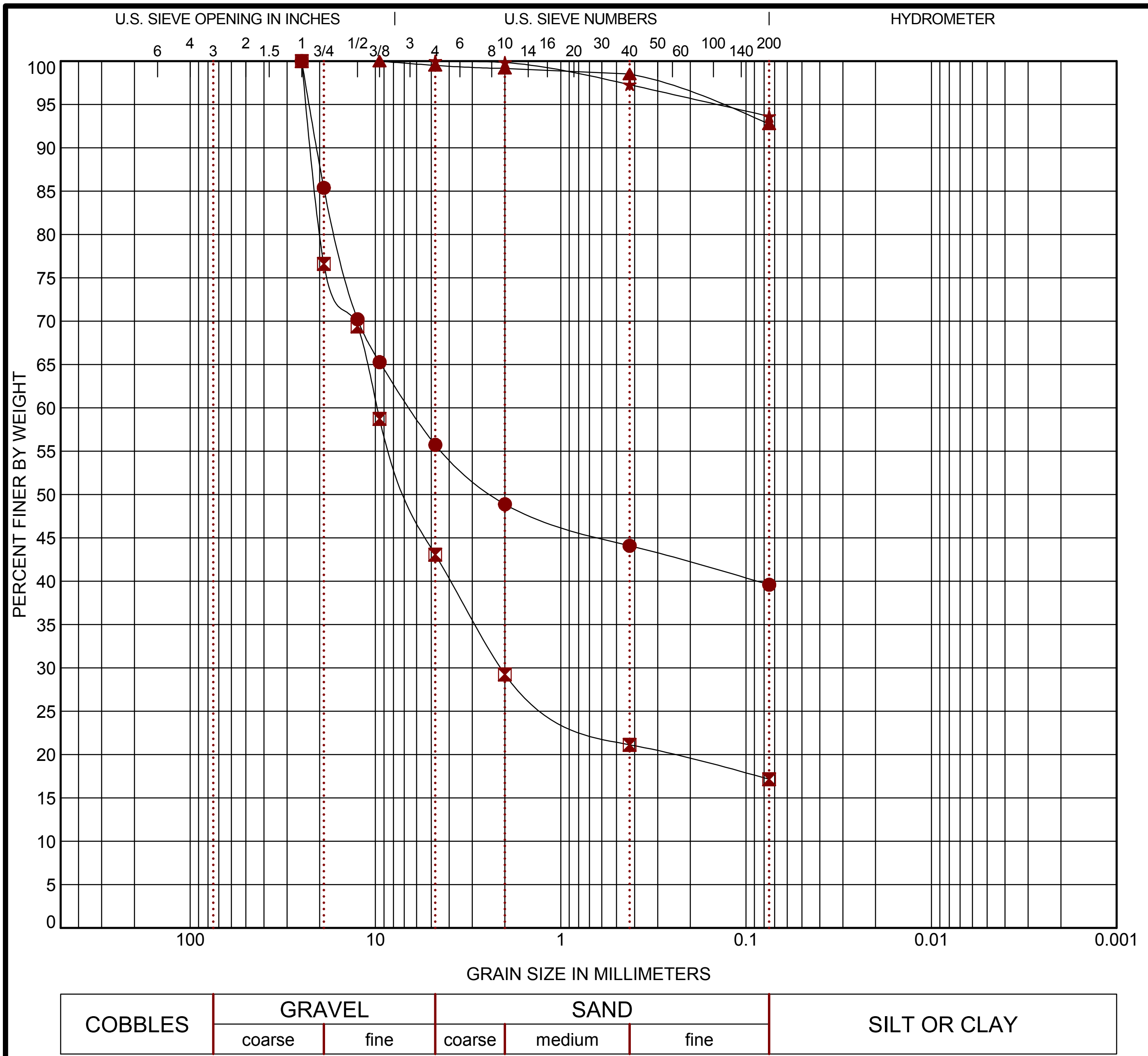
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-29

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-605	8.5 - 10	CLAYEY GRAVEL with SAND (GC)	A-7-6(8)	63	28	35		
☒	BW-605	18.5 - 20	CLAYEY GRAVEL with SAND (GC)	A-2-7(0)	50	23	27		
▲	BW-606	5 - 6.5	LEAN CLAY (CL)	A-6(16)	37	20	17		
★	BW-606	13.5 - 15	FAT CLAY (CH)	A-7-5(37)	65	32	33		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-605	8.5 - 10	25	6.478			44.3	16.1	39.6	
☒	BW-605	18.5 - 20	25	9.818	2.096		56.9	25.9	17.2	
▲	BW-606	5 - 6.5	9.5				0.5	6.8	92.7	
★	BW-606	13.5 - 15	4.75				0.0	6.4	93.6	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

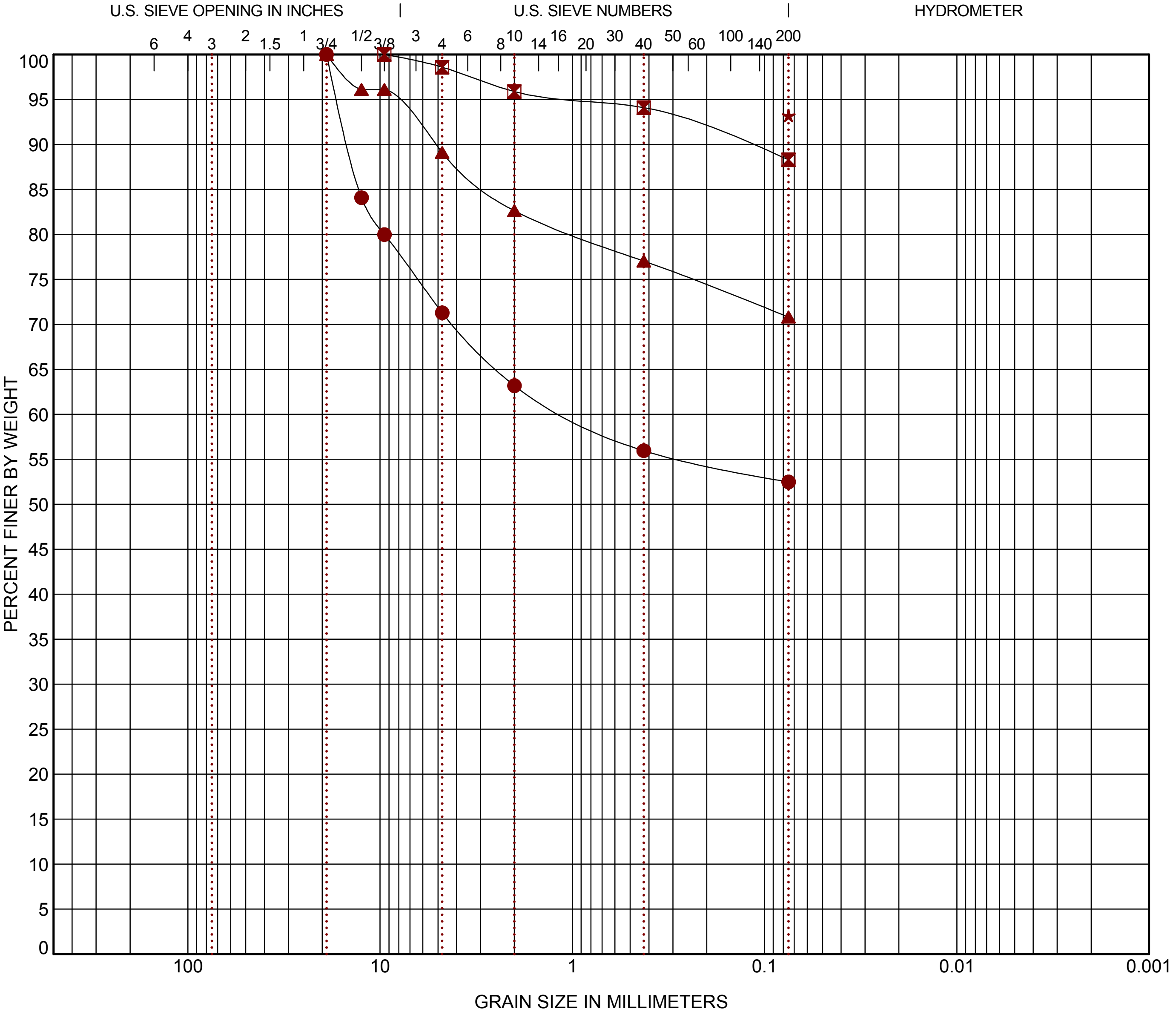
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-30

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-606	23.5 - 25	GRAVELLY FAT CLAY with SAND (CH)	A-7-6(15)	60	23	37		
⊠	BW-607	8.5 - 10	FAT CLAY (CH)	A-7-6(26)	52	25	27		
▲	BW-607	33.5 - 35	SILT with SAND (ML)	A-7-6(10)	41	26	15		
★	BW-701	2 - 3.5	FAT CLAY (CH)	A-7-6(48)	67	21	46		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-606	23.5 - 25	19	1.012			28.7	18.8	52.5	
⊠	BW-607	8.5 - 10	9.5				1.4	10.3	88.3	
▲	BW-607	33.5 - 35	19				10.9	18.3	70.8	
★	BW-701	2 - 3.5	0.075				0.0	0.0	93.2	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

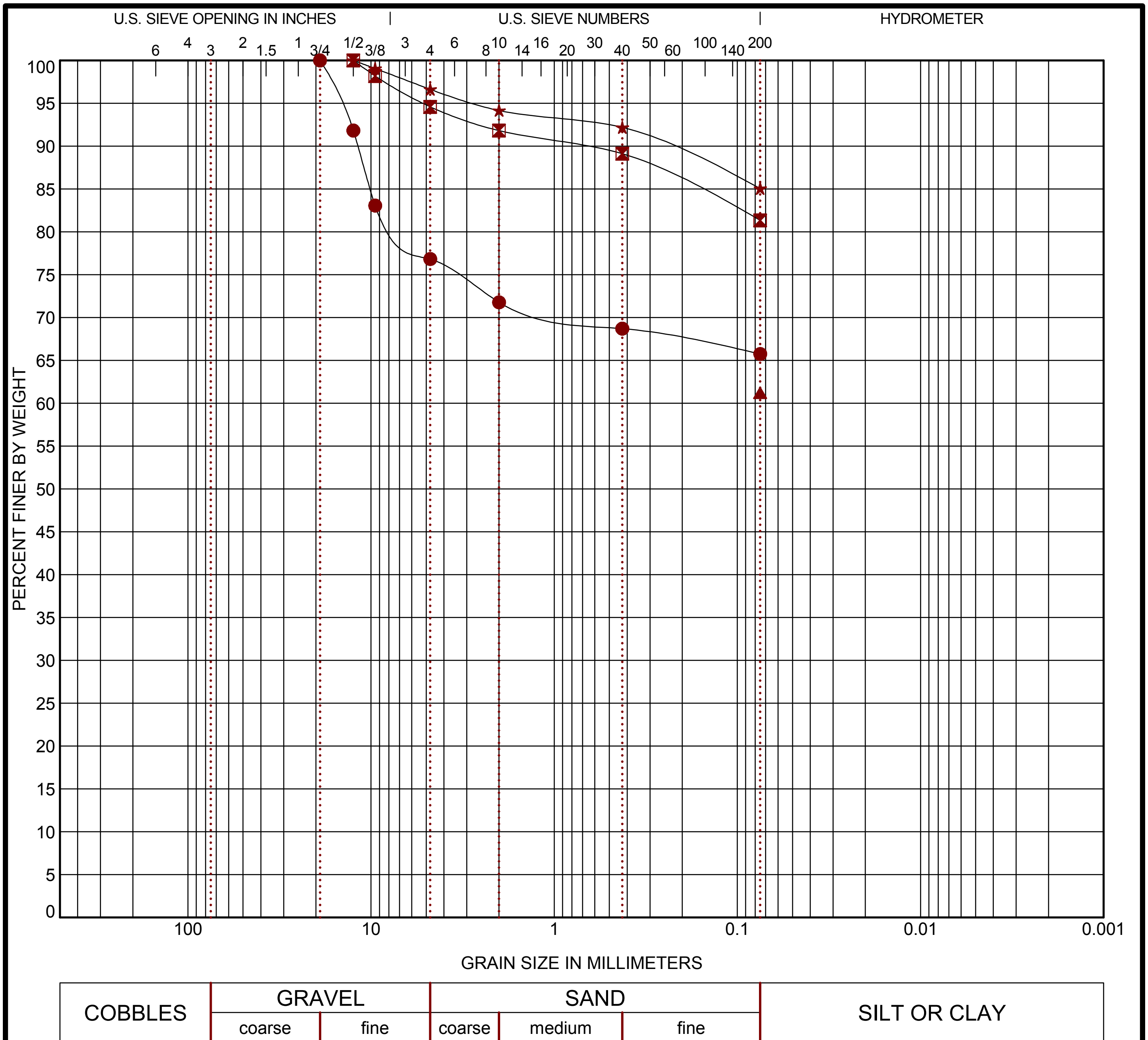
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-31

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-701	23.5 - 25	GRAVELLY FAT CLAY (CH)	A-7-5(22)	65	31	34		
⊠	BW-702	0.5 - 2	LEAN CLAY with SAND (CL)	A-7-6(23)	46	17	29		
▲	BW-702	3.5 - 5	SANDY LEAN CLAY (CL)	A-7-6(15)	48	20	28		
★	BW-702	13.5 - 15	FAT CLAY (CH)	A-7-6(32)	57	22	35		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-701	23.5 - 25	19				23.2	11.1	65.7	
⊠	BW-702	0.5 - 2	12.5				5.4	13.2	81.3	
▲	BW-702	3.5 - 5	0.075				0.0	0.0	61.2	
★	BW-702	13.5 - 15	12.5				3.4	11.6	85.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon

9522 East 47th Place, Unit D
Tulsa, Oklahoma

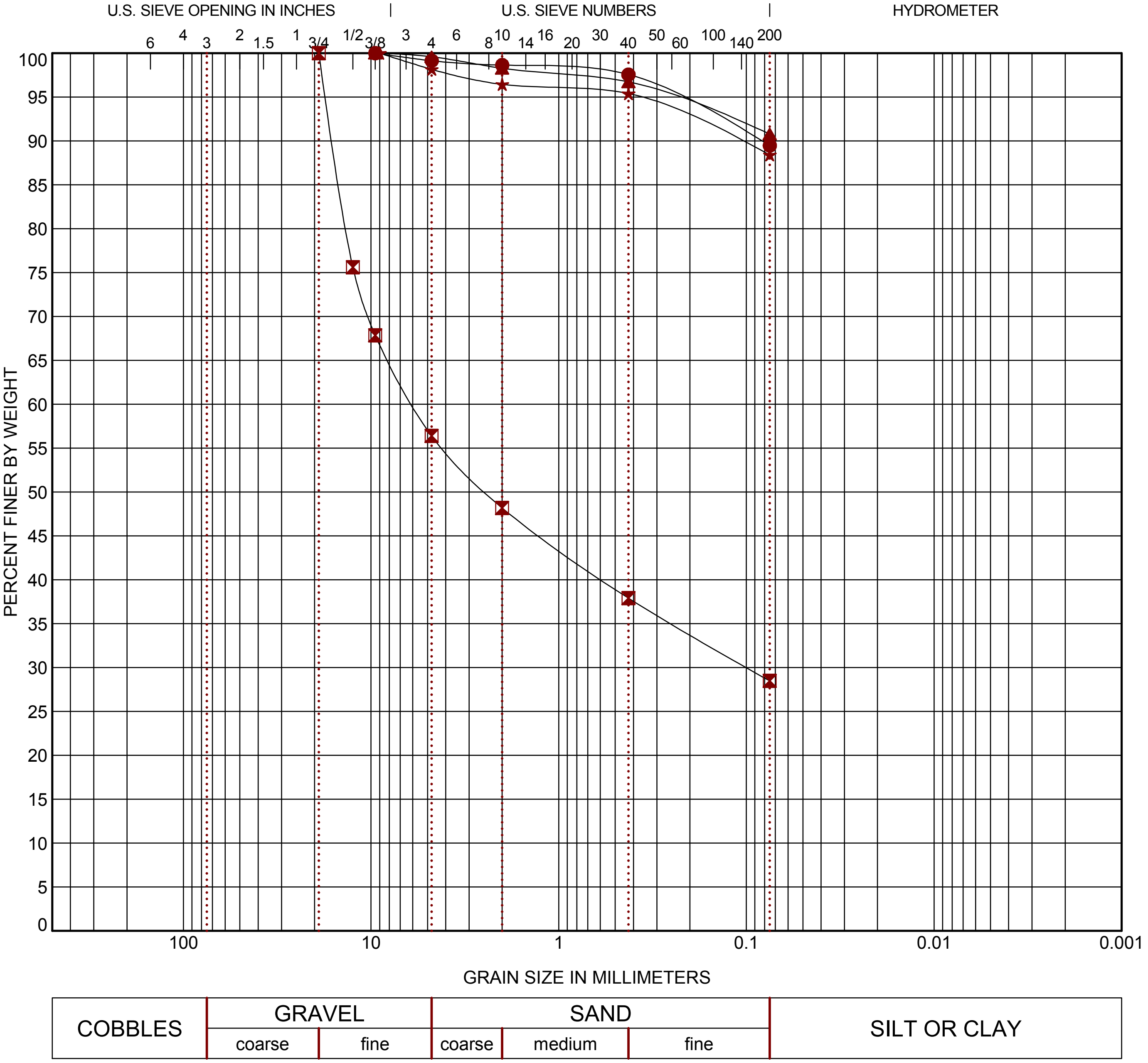
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-32

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-703	13.5 - 15	LEAN CLAY (CL)	A-6(15)	35	18	17		
⊠	BW-703	33.5 - 35	SILTY GRAVEL with SAND (GM)	A-2-7(1)	46	30	16		
▲	BW-704	2 - 3.5	LEAN CLAY (CL)	A-6(14)	33	17	16		
★	BW-704	3.5 - 5	LEAN CLAY (CL)	A-6(14)	35	19	16		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-703	13.5 - 15	9.5				0.9	9.7	89.5	
⊠	BW-703	33.5 - 35	19	5.91	0.099		43.6	27.9	28.5	
▲	BW-704	2 - 3.5	9.5				0.4	8.8	90.8	
★	BW-704	3.5 - 5	9				1.8	9.8	88.4	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

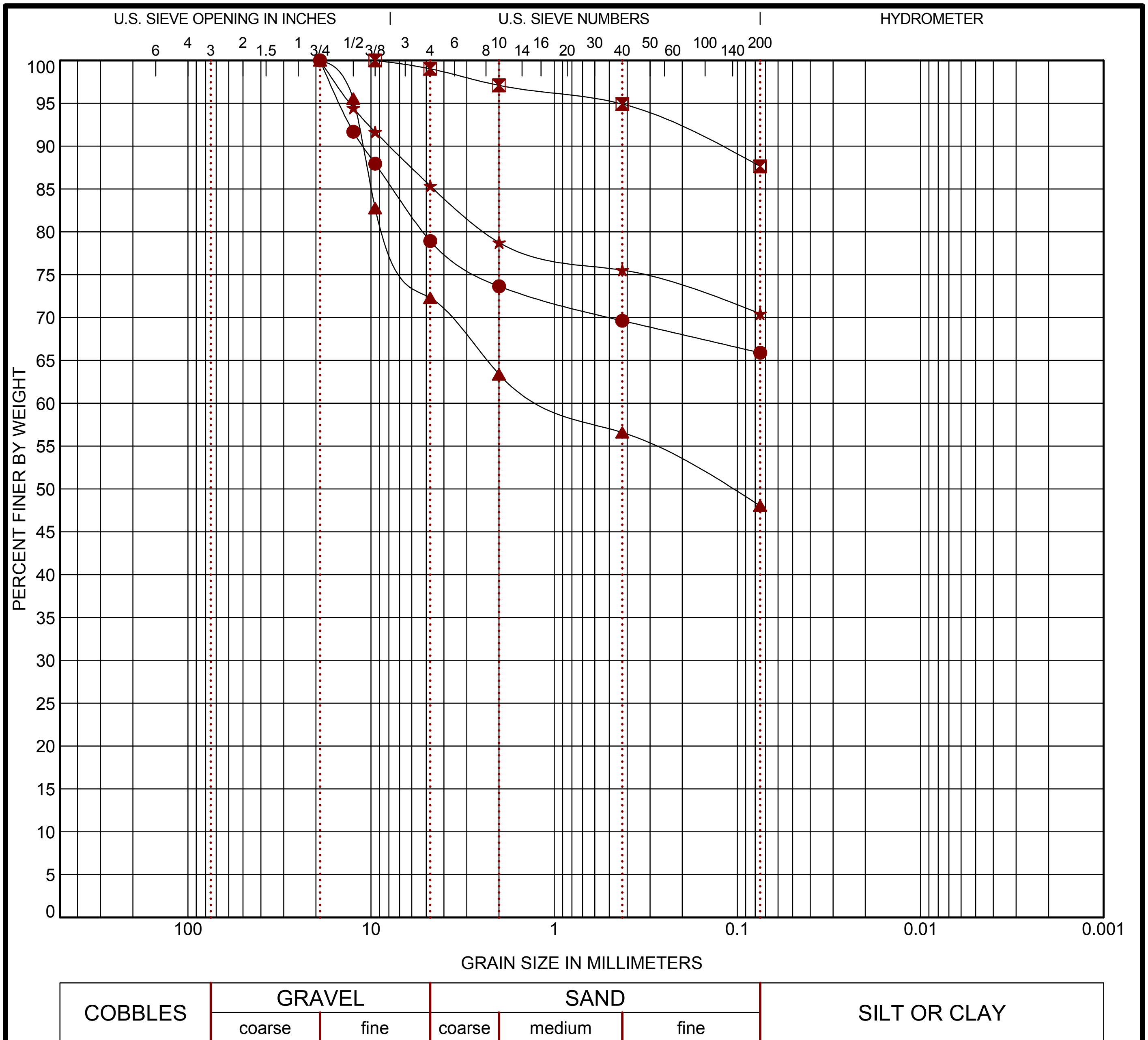
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-33

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-704	18.5 - 20	GRAVELLY FAT CLAY (CH)	A-7-6(18)	53	24	29		
⊠	BW-705	5 - 6.5	LEAN CLAY (CL)	A-6(18)	38	17	21		
▲	BW-705	13.5 - 15	CLAYEY GRAVEL with SAND (GC)	A-7-6(11)	57	24	33		
★	BW-706	5 - 6.5	LEAN CLAY with SAND (CL)	A-7-6(15)	42	18	24		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-704	18.5 - 20	19				21.1	13.0	65.9	
⊠	BW-705	5 - 6.5	9.5				1.0	11.4	87.6	
▲	BW-705	13.5 - 15	19	0.927			27.7	24.3	48.0	
★	BW-706	5 - 6.5	19				14.6	14.9	70.4	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

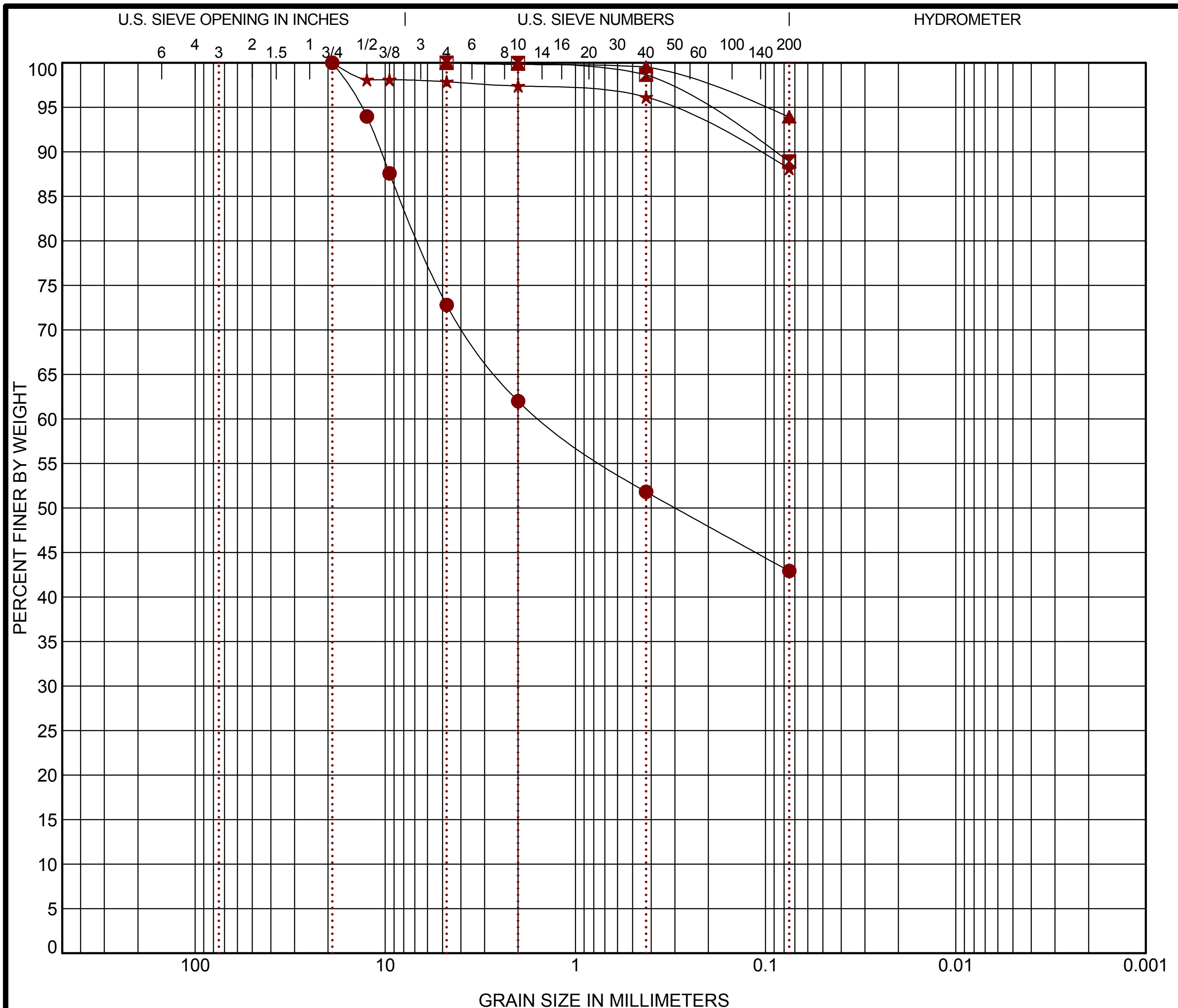
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-34

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-706	28.5 - 30	SILTY SAND with GRAVEL (SM)	A-4(0)	NP	NP	NP		
⊠	BW-707	2 - 3.5	LEAN CLAY (CL)	A-6(9)	29	17	12		
▲	BW-707	5 - 6.5	LEAN CLAY (CL)	A-6(18)	38	19	19		
★	BW-707	6.5 - 8	LEAN CLAY (CL)	A-7-6(25)	48	21	27		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-706	28.5 - 30	19	1.476			27.2	29.9	42.9	
⊠	BW-707	2 - 3.5	4.75				0.0	11.1	88.9	
▲	BW-707	5 - 6.5	4.75				0.0	6.1	93.9	
★	BW-707	6.5 - 8	19				2.1	9.8	88.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

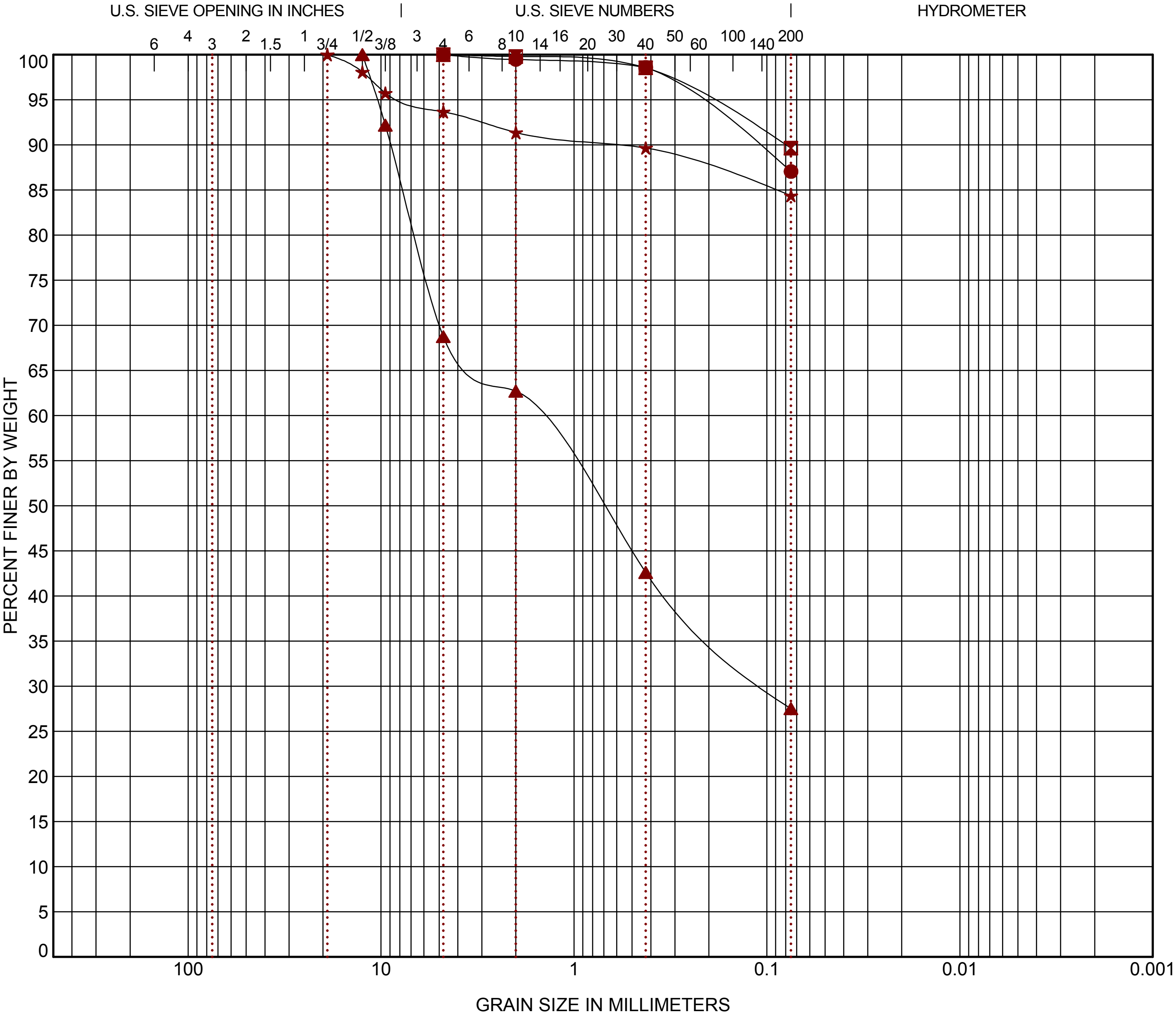
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-35

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-708	2 - 3.5	SILT (ML)	A-4(0)	NP	NP	NP		
⊠	BW-708	3.5 - 5	SILTY CLAY (CL-ML)	A-4(5)	26	19	7		
▲	BW-708	8.5 - 10	SILTY SAND with GRAVEL (SM)	A-2-7(1)	50	31	19		
★	BW-708	18.5 - 20	FAT CLAY with SAND (CH)	A-7-5(45)	80	33	47		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-708	2 - 3.5	4.75				0.0	13.0	87.0	
⊠	BW-708	3.5 - 5	4.75				0.0	10.4	89.6	
▲	BW-708	8.5 - 10	12.5	1.624	0.1		31.3	41.2	27.5	
★	BW-708	18.5 - 20	19				6.3	9.3	84.4	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

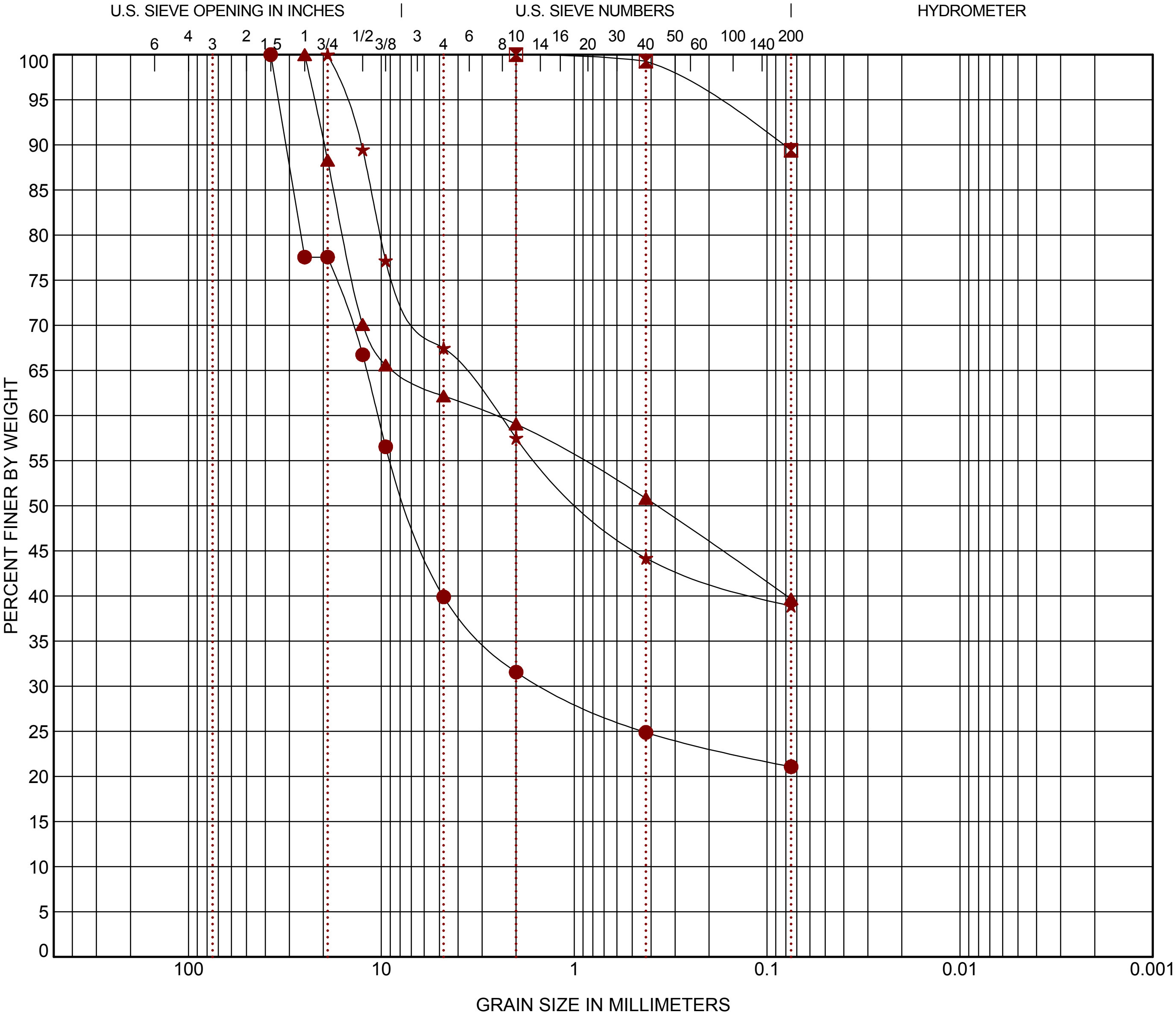
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-36

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-708	23.5 - 25	()	()					
⊠	BW-709	2 - 3.5	LEAN CLAY (CL)	A-6(8)	28	17	11		
▲	BW-709	3.5 - 5	SILTY GRAVEL with SAND (GM)	A-4(0)	NP	NP	NP		
★	BW-709	8.5 - 10	SILTY GRAVEL with SAND (GM)	A-4(0)	NP	NP	NP		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-708	23.5 - 25	37.5	10.427	1.393		60.1	18.8	21.1	
⊠	BW-709	2 - 3.5	2				0.0	10.6	89.4	
▲	BW-709	3.5 - 5	25	2.599			37.8	22.5	39.7	
★	BW-709	8.5 - 10	19	2.485			32.5	28.6	38.9	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

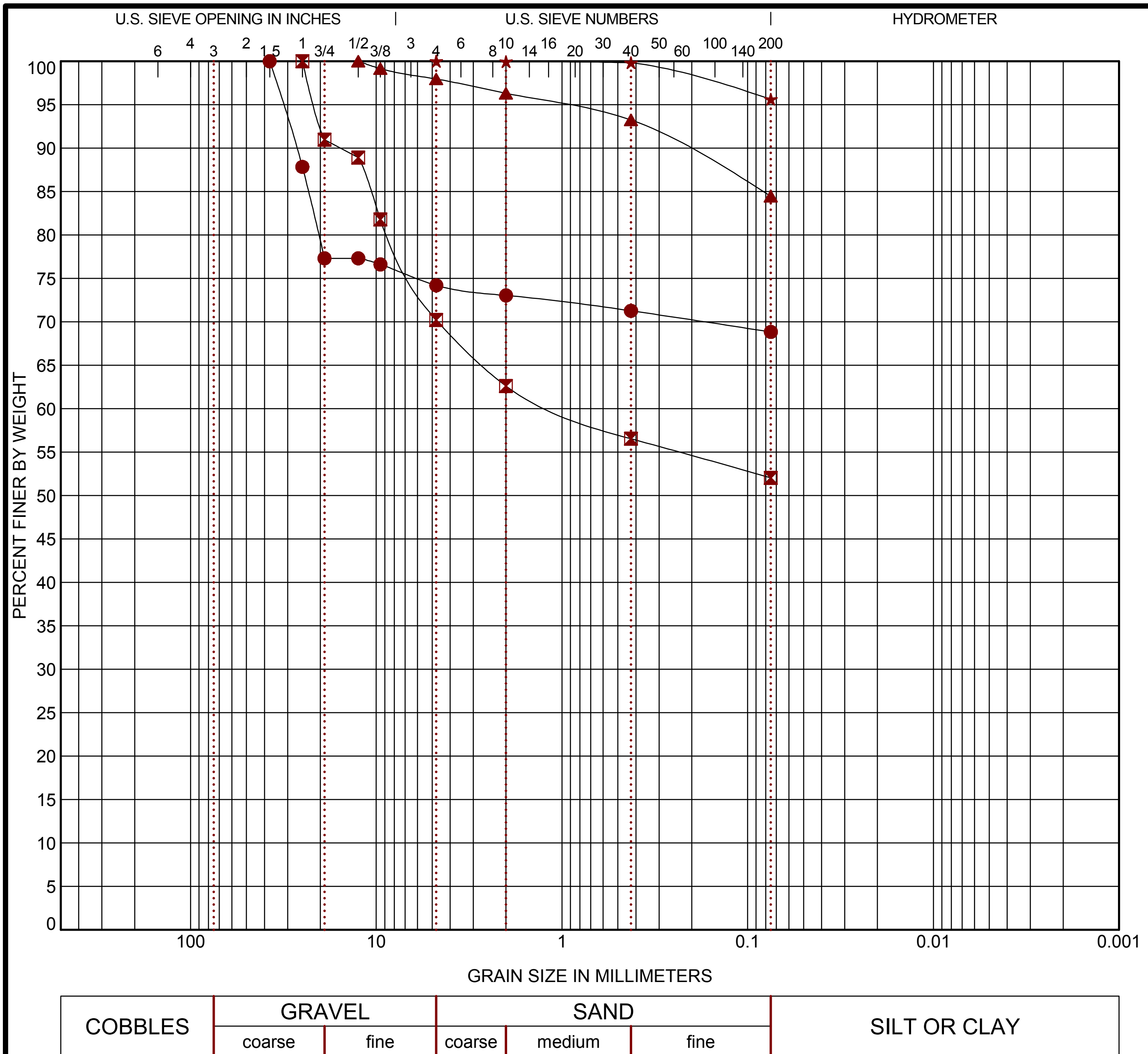
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-37

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-709	18.5 - 19.9	GRAVELLY FAT CLAY (CH)	A-7-5(31)	78	35	43		
⊠	BW-709	28.5 - 30	()	()					
▲	BW-710	2 - 3.5	LEAN CLAY with SAND (CL)	A-6(14)	34	16	18		
★	BW-710	5 - 7	SILTY CLAY (CL-ML)	A-4(5)	26	20	6		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-709	18.5 - 19.9	37.5				25.8	5.4	68.8	
⊠	BW-709	28.5 - 30	25	1.03			29.8	18.2	52.0	
▲	BW-710	2 - 3.5	12.5				2.0	13.5	84.5	
★	BW-710	5 - 7	4.75				0.0	4.4	95.6	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

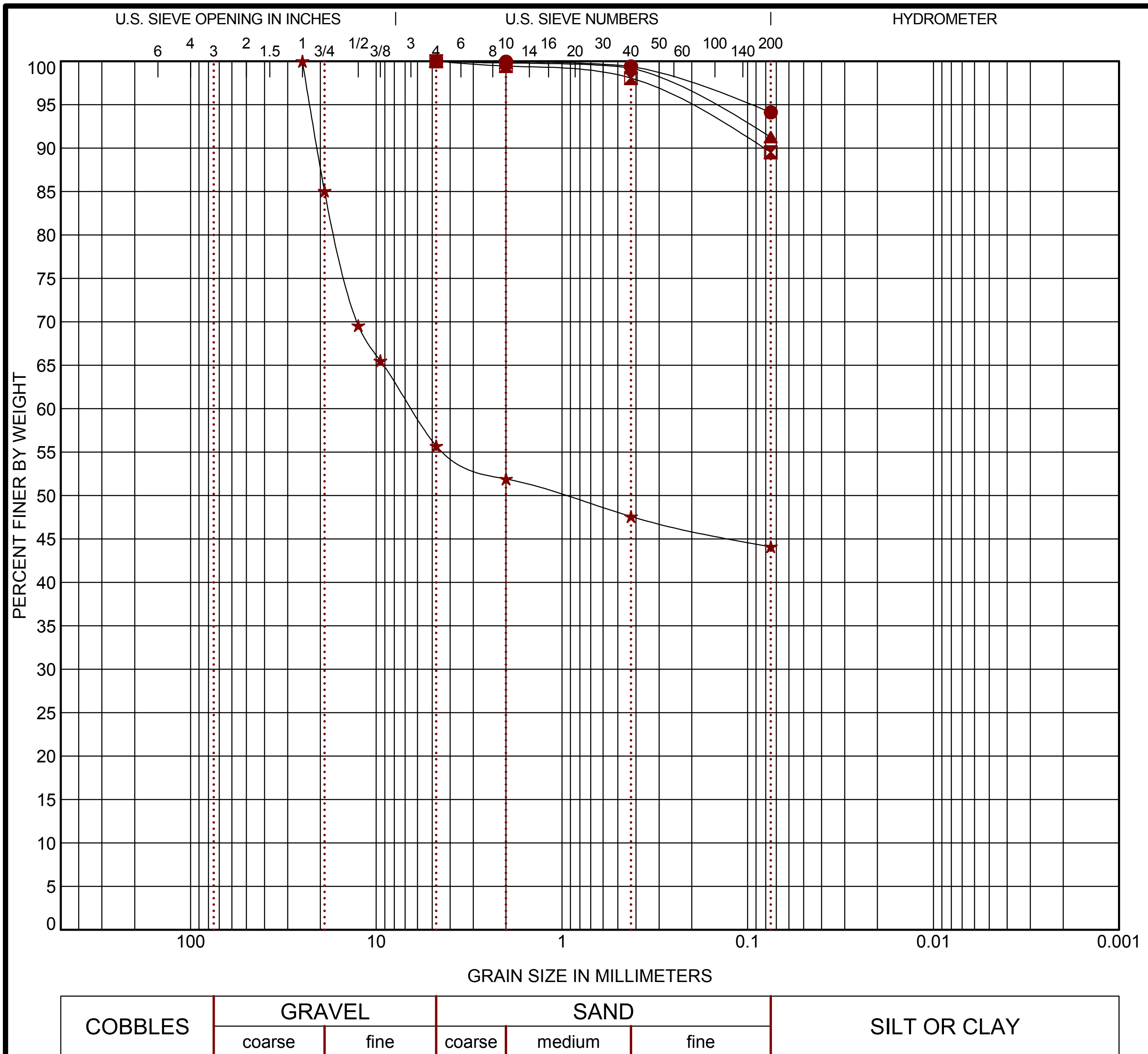
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-38

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-710	8.5 - 10	FAT CLAY (CH)	A-7-6(39)	59	22	37		
⊠	BW-711	0.5 - 2	LEAN CLAY (CL)	A-6(11)	30	16	14		
▲	BW-711	5 - 6.5	SILTY CLAY (CL-ML)	A-4(3)	23	18	5		
★	BW-711	13.5 - 15	SILTY GRAVEL (GM)	A-4(0)	NP	NP	NP		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-710	8.5 - 10	4.75				0.0	5.9	94.1	
⊠	BW-711	0.5 - 2	4.75				0.0	10.5	89.5	
▲	BW-711	5 - 6.5	4.75				0.0	8.7	91.3	
★	BW-711	13.5 - 15	25	6.436			44.3	11.6	44.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

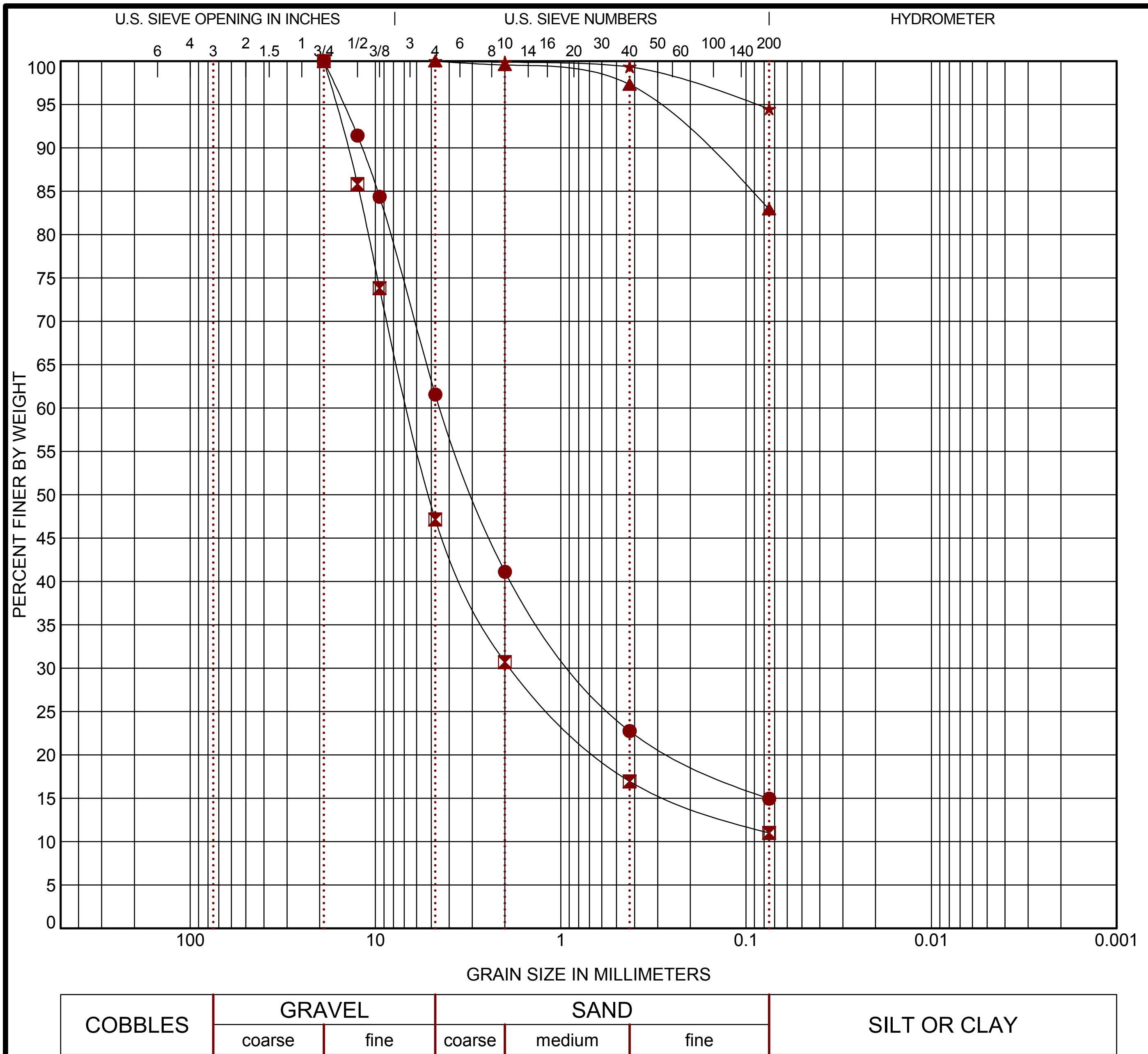
CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-39

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS & AASHTO COMBINED 04135111 - BW.GPJ TERRACON2012.GDT 1/19/16

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-712	2 - 3.5	SILTY SAND with GRAVEL (SM)	A-1-a(0)	NP	NP	NP		
⊠	BW-712	8.5 - 10	POORLY GRADED GRAVEL with SILT and SAND (GP-GM)	A-1-a(0)	NP	NP	NP	9.20	118.58
▲	BW-713	2 - 3.5	SILTY CLAY with SAND (CL-ML)	A-4(3)	23	17	6		
★	BW-713	8.5 - 10	FAT CLAY (CH)	A-7-6(27)	50	24	26		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-712	2 - 3.5	19	4.447	0.783		38.4	46.6	14.9	
⊠	BW-712	8.5 - 10	19	6.633	1.848		52.8	36.1	11.0	
▲	BW-713	2 - 3.5	4.75				0.0	17.1	82.9	
★	BW-713	8.5 - 10	4.75				0.0	5.5	94.5	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

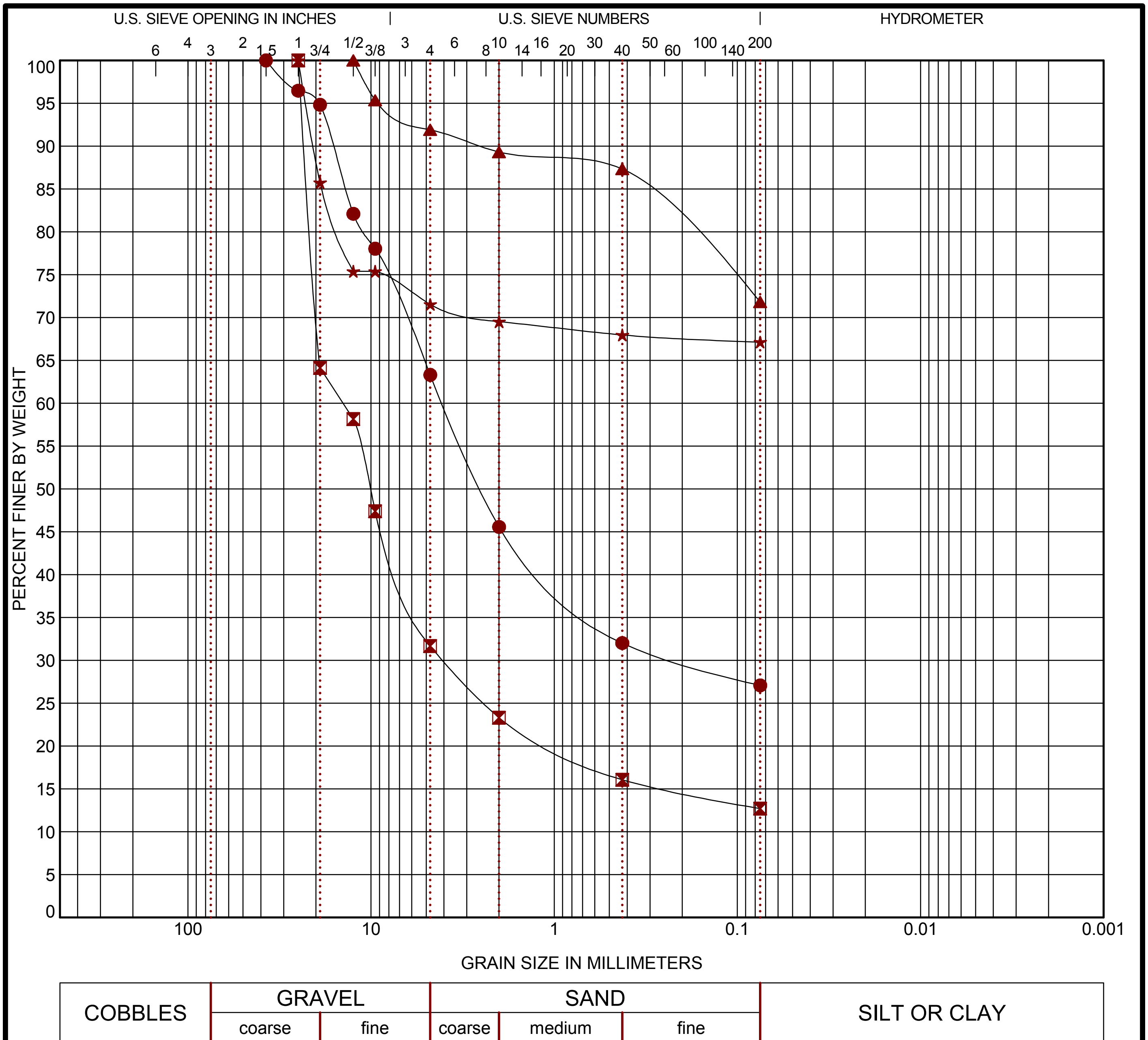
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-40

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-713	18.5 - 20	CLAYEY GRAVEL with SAND (GC)	A-2-7(2)	49	22	27		
⊠	BW-713	28.5 - 30	SILTY GRAVEL with SAND (GM)	A-1-a(0)	NP	NP	NP		
▲	BW-714	5 - 6.5	LEAN CLAY with SAND (CL)	A-6(12)	36	16	20		
★	BW-714	13.5 - 15	GRAVELLY FAT CLAY (CH)	A-7-5(47)	100	30	70		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-713	18.5 - 20	37.5	4.043	0.21		36.7	36.2	27.1	
⊠	BW-713	28.5 - 30	25	14.241	3.997		68.3	19.0	12.7	
▲	BW-714	5 - 6.5	12.5				8.1	20.1	71.8	
★	BW-714	13.5 - 15	25				28.5	4.4	67.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

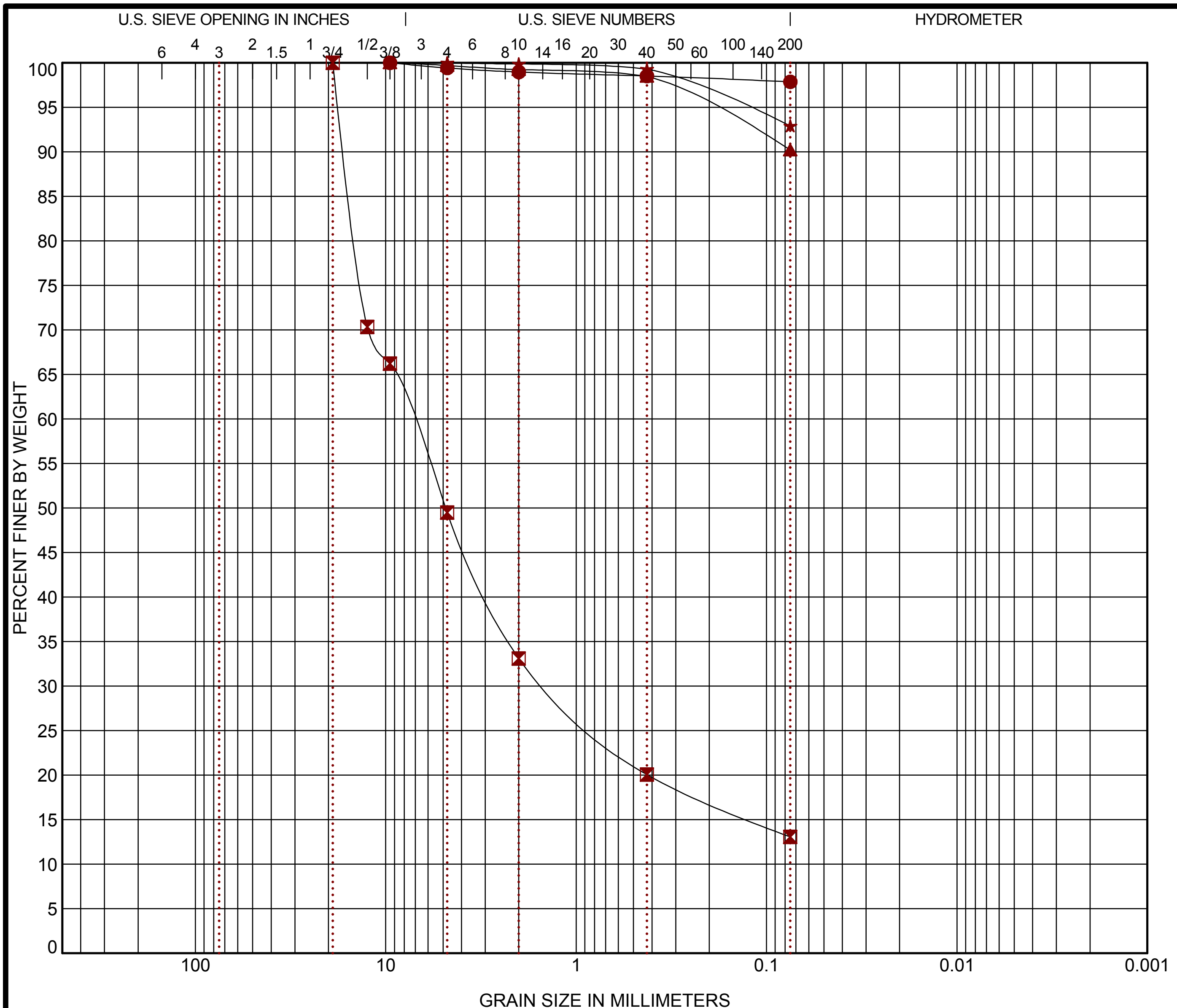
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-41

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-715	2 - 3.5	FAT CLAY (CH)	A-7-5(40)	65	32	33		
⊠	BW-715	13.5 - 15	()	()					
▲	BW-716	5 - 6.5	LEAN CLAY (CL)	A-6(16)	37	19	18		
★	BW-716	13.5 - 15	LEAN CLAY (CL)	A-7-6(25)	45	20	25		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-715	2 - 3.5	9.5				0.6	1.6	97.9	
⊠	BW-715	13.5 - 15	19	7.343	1.385		50.5	36.4	13.1	
▲	BW-716	5 - 6.5	9.5				0.3	9.5	90.2	
★	BW-716	13.5 - 15	4.75				0.0	7.1	92.9	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

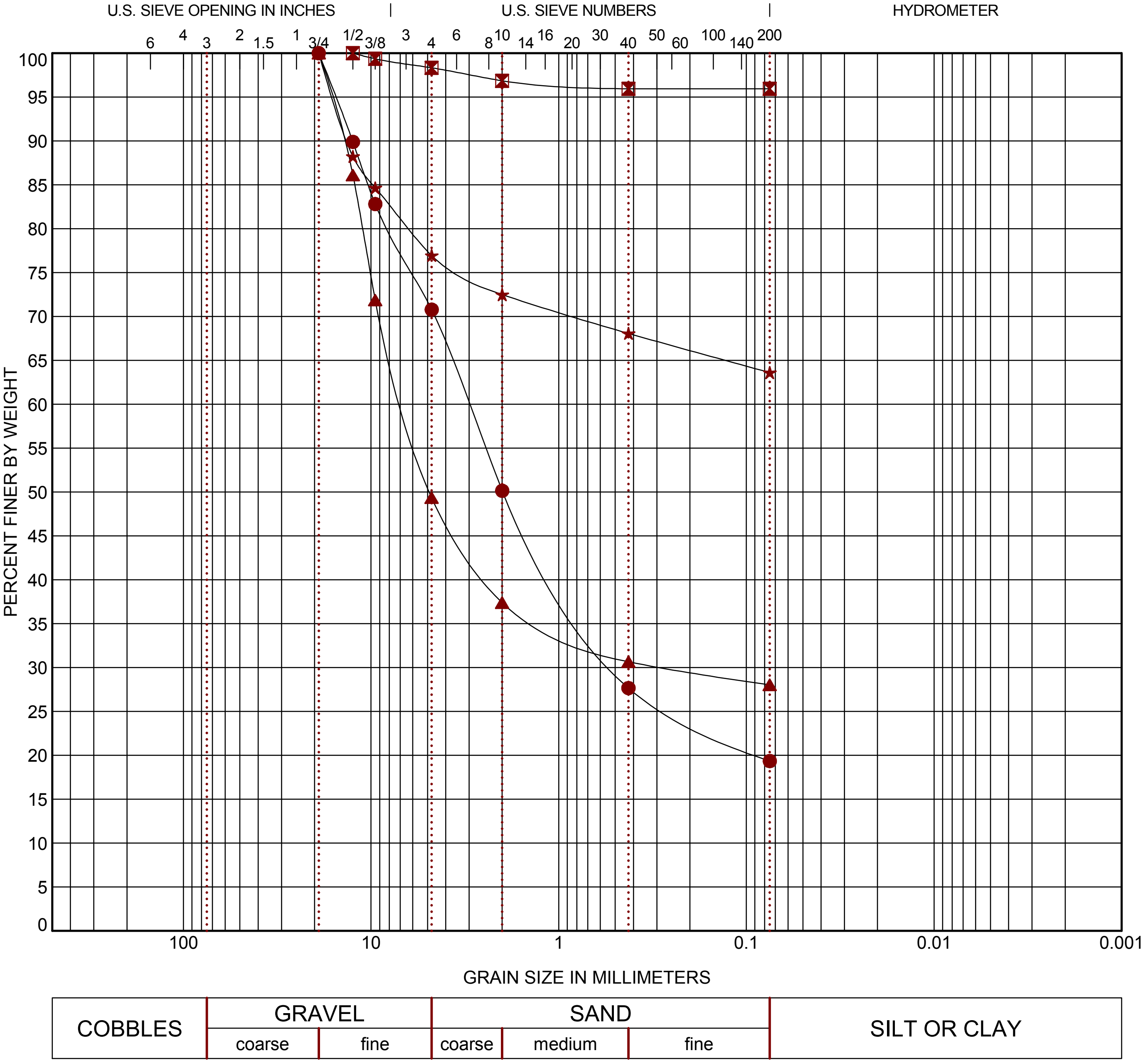
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-42

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-717	13.5 - 15	CLAYEY SAND with GRAVEL (SC)	A-2-6(0)	31	19	12		
⊠	BW-717	23.5 - 25	FAT CLAY (CH)	A-7-5(65)	87	30	57		
▲	BW-718	0.5 - 2	CLAYEY GRAVEL with SAND (GC)	A-2-7(5)	74	28	46		
★	BW-718	13.5 - 15	GRAVELLY FAT CLAY (CH)	A-7-5(45)	102	31	71		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-717	13.5 - 15	19	3.024	0.499		29.2	51.4	19.3	
⊠	BW-717	23.5 - 25	12.5				1.7	2.4	95.9	
▲	BW-718	0.5 - 2	19	6.594	0.276		50.7	21.3	28.0	
★	BW-718	13.5 - 15	19				23.1	13.3	63.6	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

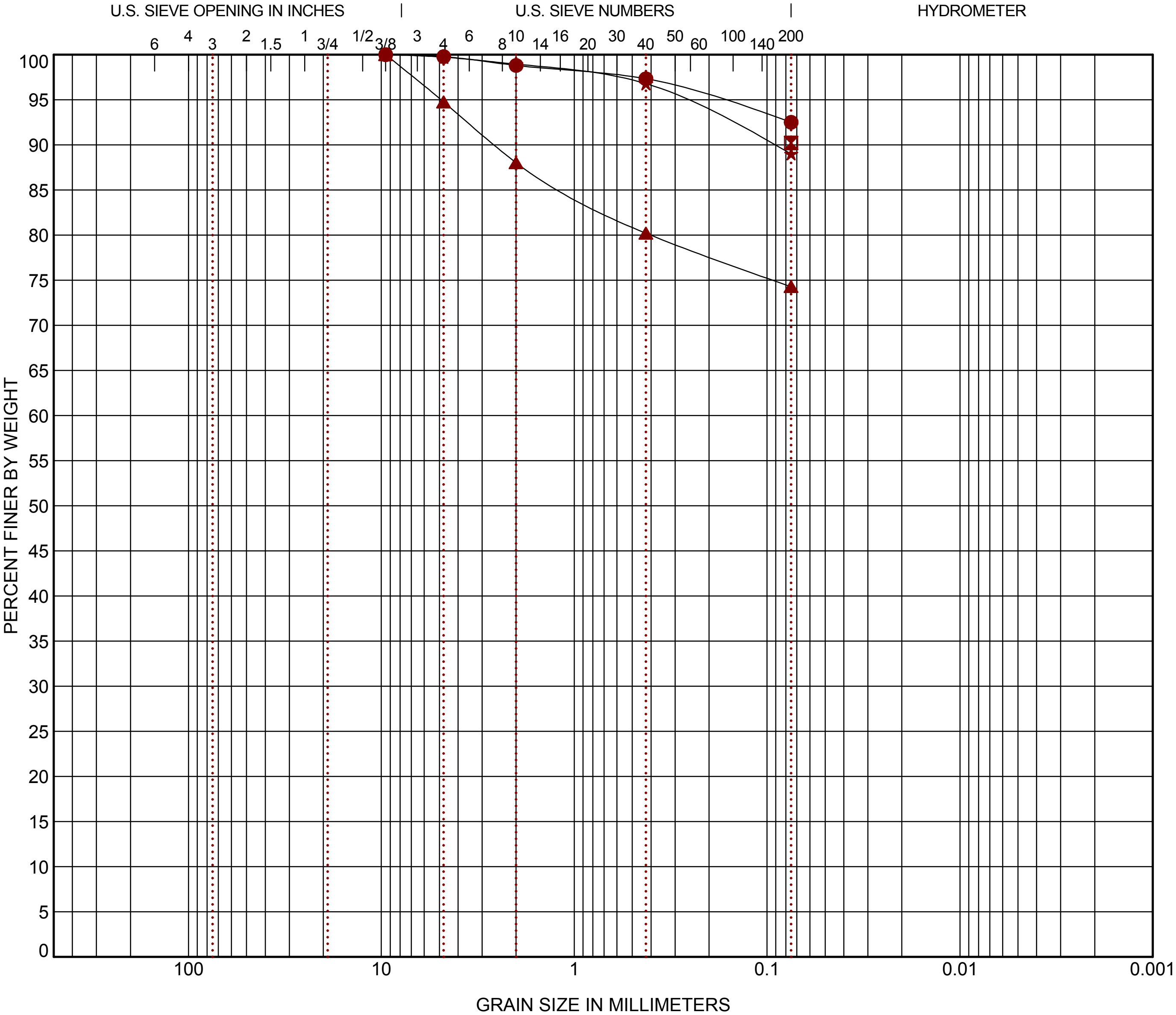
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-43

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-801	0.5 - 2	LEAN CLAY (CL)	A-6(18)	37	18	19		
⊠	BW-801	5 - 6	LEAN CLAY (CL)	A-7-6(26)	47	20	27		
▲	BW-801	8.5 - 10	FAT CLAY with SAND (CH)	A-7-6(19)	50	25	25		
★	BW-802	2 - 3.5	LEAN CLAY (CL)	A-7-6(22)	44	21	23		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-801	0.5 - 2	9.5				0.2	7.3	92.5	
⊠	BW-801	5 - 6	0.075				0.0	0.0	90.2	
▲	BW-801	8.5 - 10	9.5				5.2	20.5	74.3	
★	BW-802	2 - 3.5	9.5				0.3	10.7	89.0	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

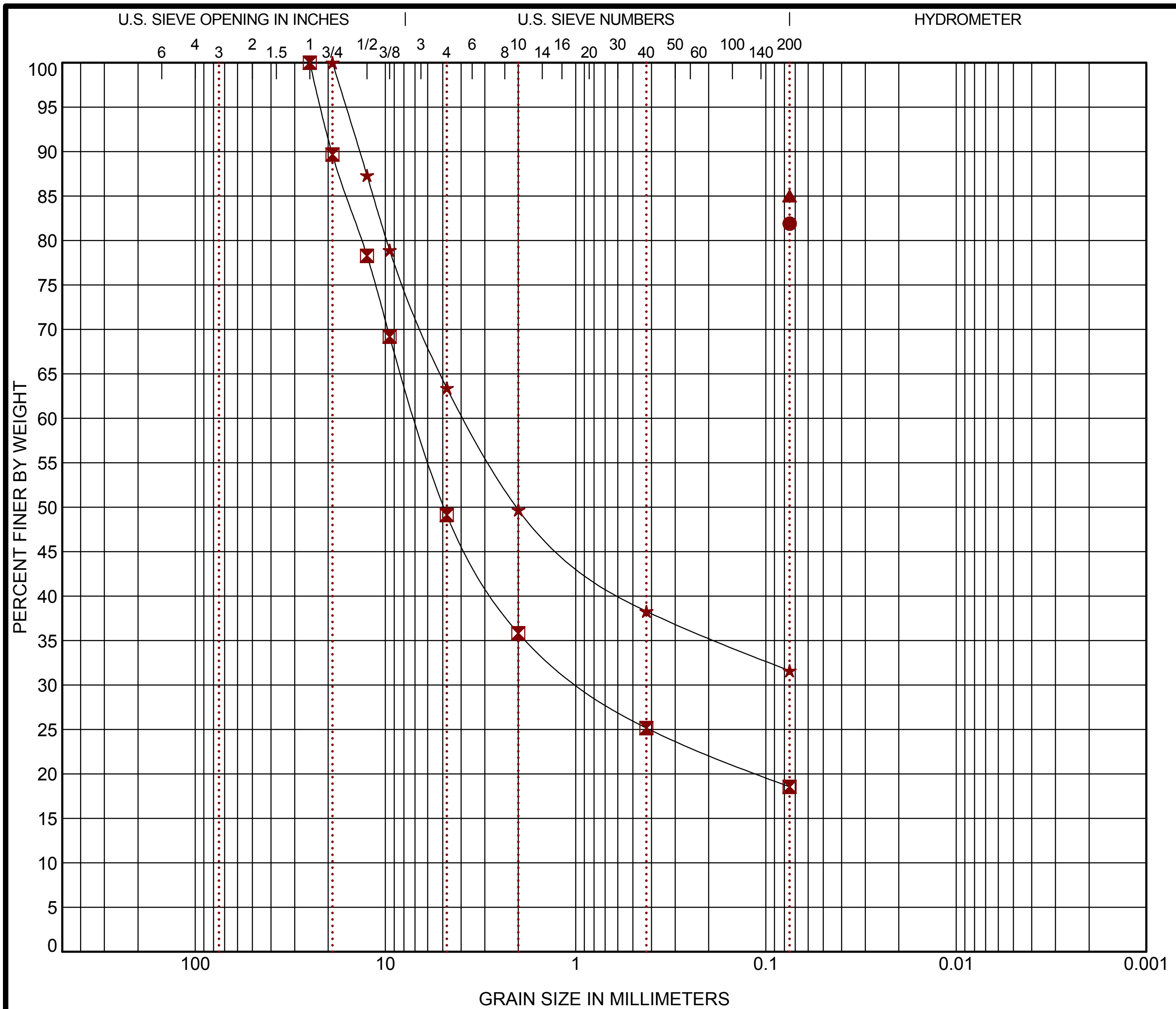
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-44

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-802	5 - 6	LEAN CLAY with SAND (CL)	A-7-6(24)	49	20	29		
⊠	BW-802	13.5 - 15	SILTY GRAVEL with SAND (GM)	A-1-b(0)	NP	NP	NP		
▲	BW-803	5 - 6	FAT CLAY with SAND (CH)	A-7-6(28)	52	20	32		
★	BW-803	8.5 - 10	SILTY GRAVEL with SAND (GM)	A-2-4(0)	NP	NP	NP		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-802	5 - 6	0.075				0.0	0.0	81.9	
⊠	BW-802	13.5 - 15	25	6.917	0.859		50.9	30.5	18.6	
▲	BW-803	5 - 6	0.075				0.0	0.0	85.0	
★	BW-803	8.5 - 10	19	3.834			36.6	31.8	31.6	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

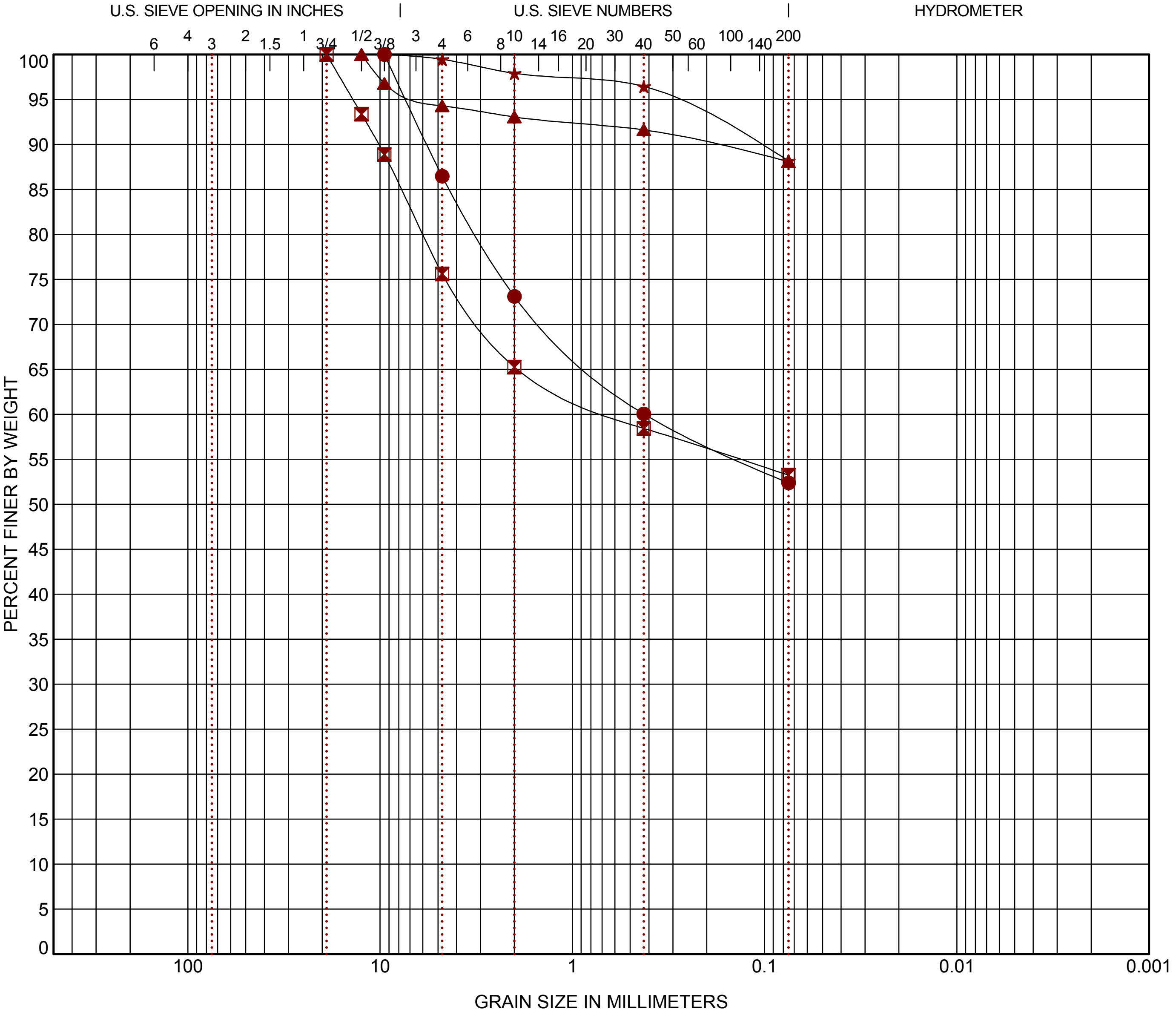
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-45

GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-803	28.5 - 30	SANDY FAT CLAY (CH)	A-7-5(23)	83	30	53		
⊠	BW-804	2 - 3.5	GRAVELLY FAT CLAY with SAND (CH)	A-7-5(17)	70	33	37		
▲	BW-804	8.5 - 10	FAT CLAY (CH)	A-7-6(36)	61	24	37		
★	BW-805	0.5 - 2	LEAN CLAY (CL)	A-4(7)	28	19	9		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-803	28.5 - 30	9.5	0.421			13.5	34.1	52.4	
⊠	BW-804	2 - 3.5	19	0.606			24.4	22.4	53.2	
▲	BW-804	8.5 - 10	12.5				5.7	6.2	88.1	
★	BW-805	0.5 - 2	9.5				0.5	11.3	88.2	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

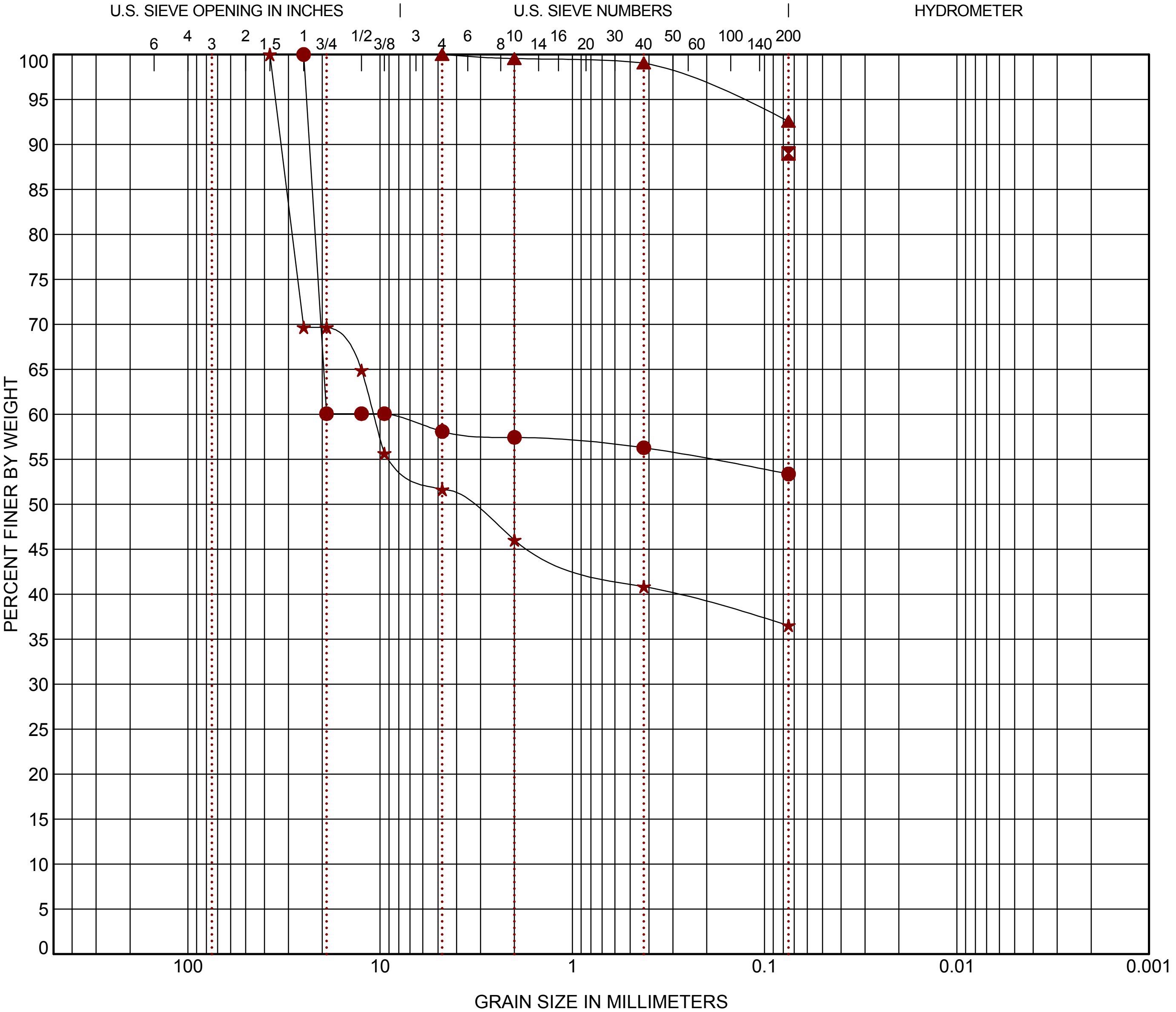
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-46

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-805	13.5 - 15	GRAVELLY FAT CLAY (CH)	A-7-6(26)	81	21	60		
⊠	BW-806	2 - 3.5	LEAN CLAY (CL)	A-7-6(23)	43	17	26		
▲	BW-806	5 - 6.5	LEAN CLAY (CL)	A-7-6(26)	45	18	27		
★	BW-806	23.5 - 25	()	()					

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-805	13.5 - 15	25	9.276			41.9	4.7	53.4	
⊠	BW-806	2 - 3.5	0.075				0.0	0.0	89.0	
▲	BW-806	5 - 6.5	4.75				0.0	7.4	92.6	
★	BW-806	23.5 - 25	37.5	10.809			48.4	15.1	36.5	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

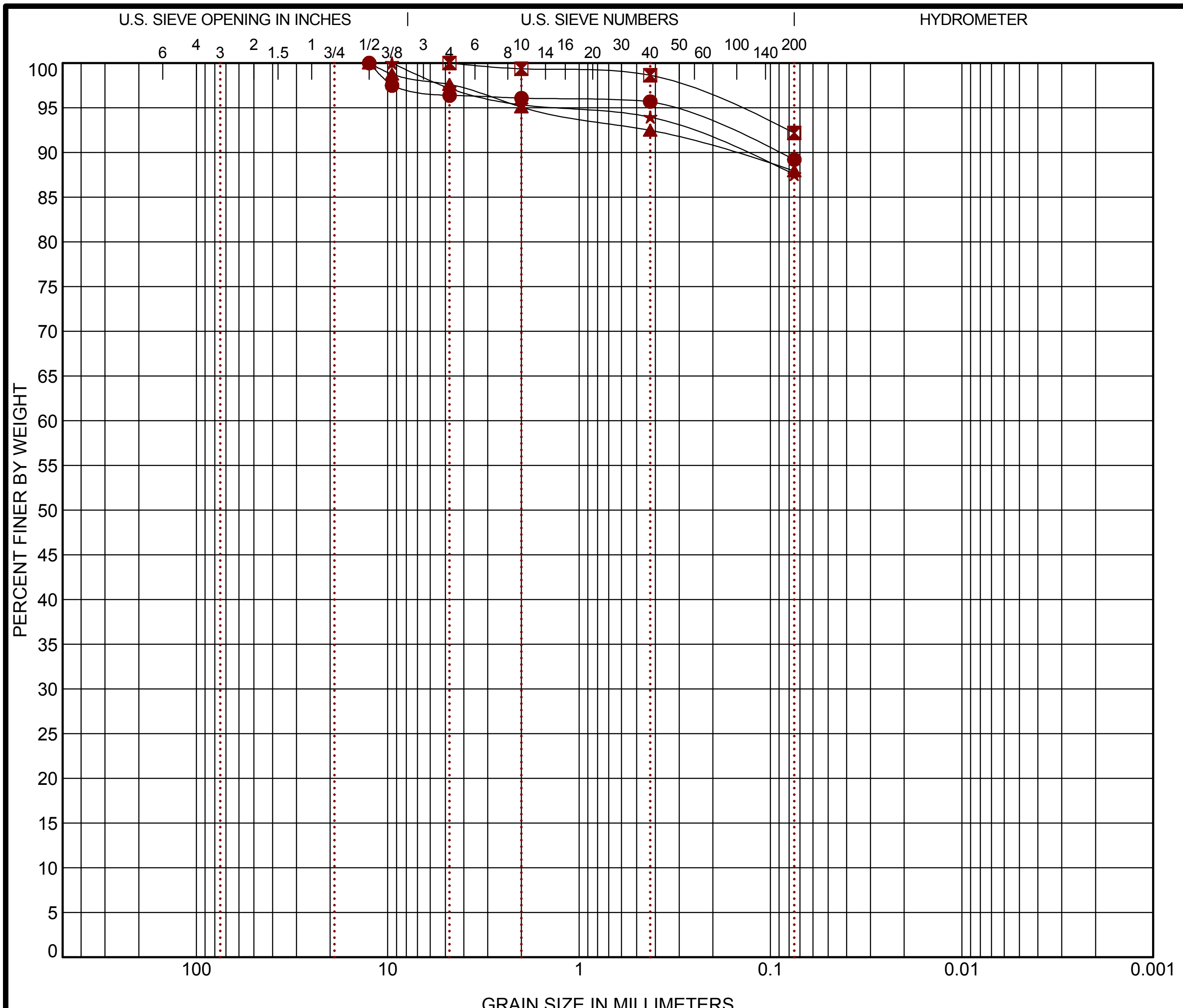
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-47

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-807	2 - 3.5	LEAN CLAY (CL)	A-6(18)	39	19	20		
⊠	BW-807	5 - 6.5	LEAN CLAY (CL)	A-6(16)	38	21	17		
▲	BW-807	13.5 - 15	FAT CLAY (CH)	A-7-5(59)	93	36	57		
★	BW-808	5 - 6.5	LEAN CLAY (CL)	A-7-6(22)	46	22	24		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-807	2 - 3.5	12.5				3.6	7.2	89.2	
⊠	BW-807	5 - 6.5	4.75				0.0	7.8	92.2	
▲	BW-807	13.5 - 15	12.5				2.4	9.7	87.9	
★	BW-808	5 - 6.5	9.5				2.8	9.6	87.5	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

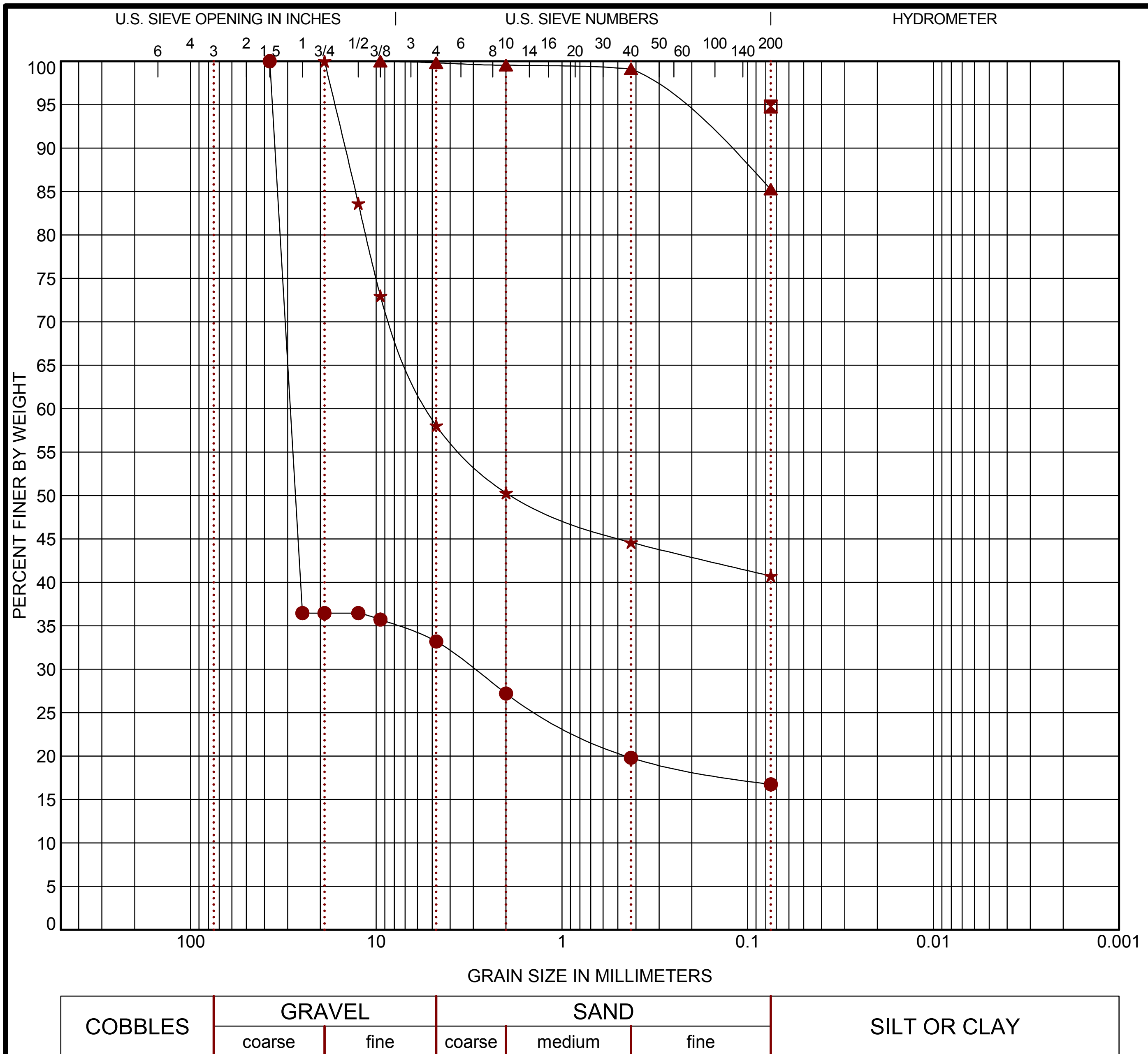
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-48

GRAIN SIZE DISTRIBUTION

ASTM D422



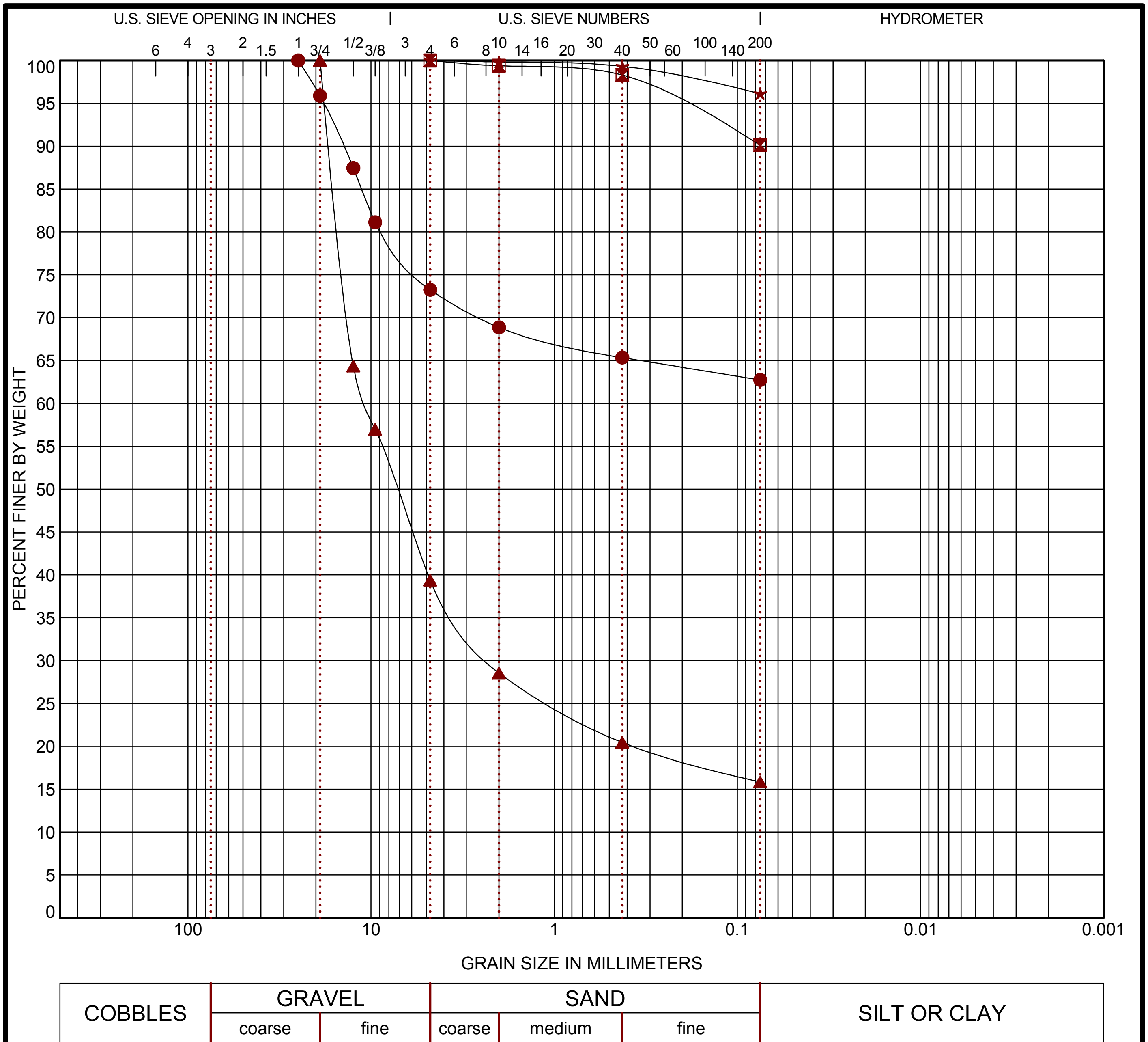
	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-808	18.5 - 20	SILTY GRAVEL with SAND (GM)	A-1-b(0)	NP	NP	NP		
⊠	BW-809	5 - 7	FAT CLAY (CH)	A-7-6(32)	52	21	31		
▲	BW-809	13.5 - 15	SILT (ML)	A-4(0)	35	36	NP		
★	BW-811	5 - 6.5	()	()					

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-808	18.5 - 20	37.5	29.052	2.997		66.8	16.4	16.7	
⊠	BW-809	5 - 7	0.075				0.0	0.0	94.8	
▲	BW-809	13.5 - 15	9.5				0.2	14.6	85.3	
★	BW-811	5 - 6.5	19	5.201			42.0	17.3	40.7	

PROJECT: 8th Street Widening Project - MSE Walls	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas		CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-49

GRAIN SIZE DISTRIBUTION

ASTM D422



Boring ID		Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-811	13.5 - 15	GRAVELLY FAT CLAY (CH)	A-7-6(22)	61	23	38		
⊠	BW-812	2 - 3.5	FAT CLAY (CH)	A-7-5(49)	81	35	46		
▲	BW-812	8.5 - 10	()	()					
★	BW-813	8.5 - 10	LEAN CLAY (CL)	A-7-6(21)	41	20	21		

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-811	13.5 - 15	25				26.7	10.5	62.7	
⊠	BW-812	2 - 3.5	4.75				0.0	9.9	90.1	
▲	BW-812	8.5 - 10	19	10.634	2.247		60.6	23.5	15.8	
★	BW-813	8.5 - 10	4.75				0.0	3.9	96.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

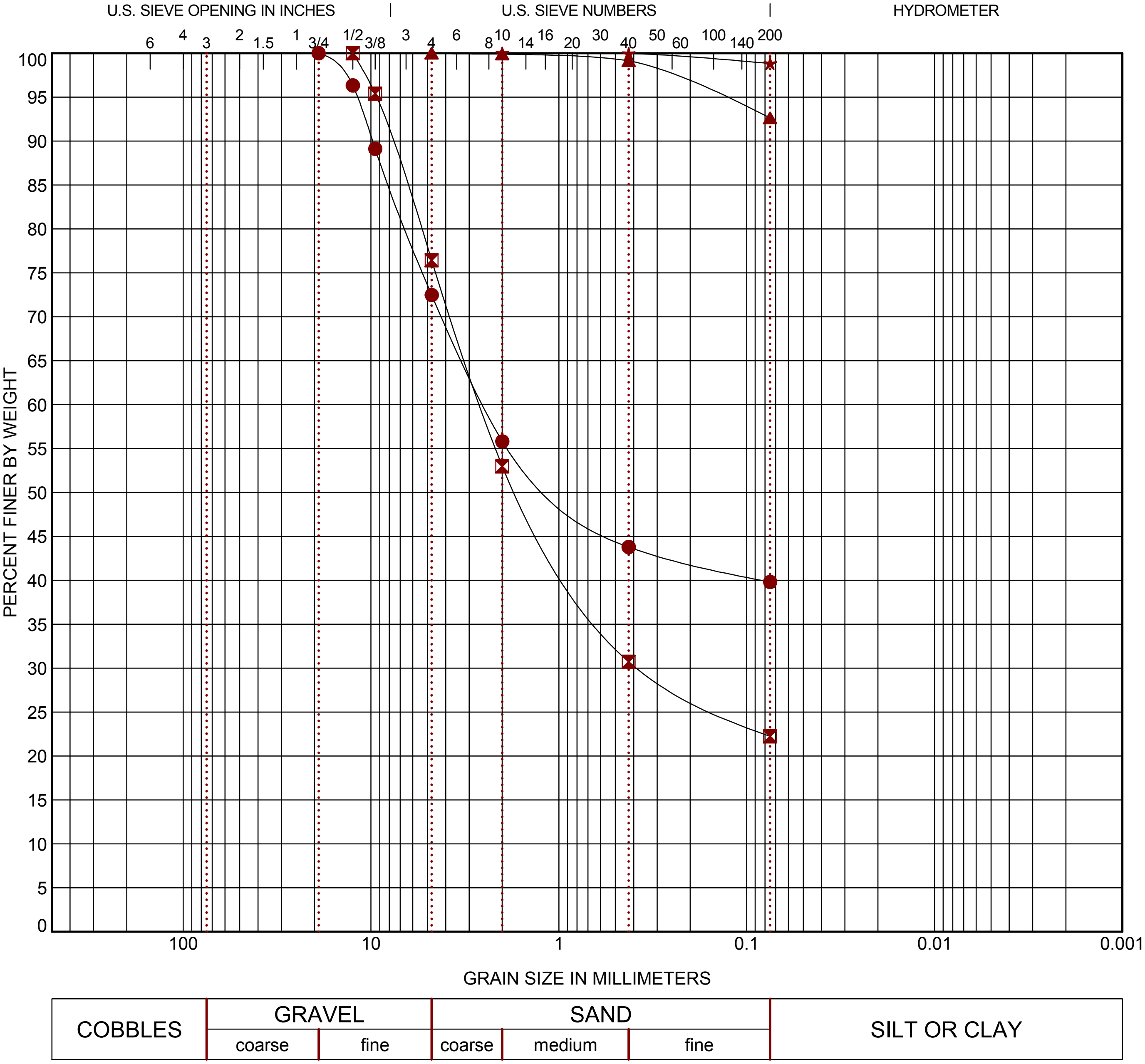
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-50

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-814	0.5 - 2	()	()					
⊠	BW-814	8.5 - 10	SILTY SAND with GRAVEL (SM)	A-1-b(0)	NP	NP	NP		
▲	BW-901	5 - 6.5	FAT CLAY (CH)	A-7-6(33)	53	21	32		
★	BW-901	18.5 - 20	ELASTIC SILT (MH)	A-7-5(50)	78	38	40		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-814	0.5 - 2	19	2.486			27.5	32.7	39.8	
⊠	BW-814	8.5 - 10	12.5	2.592	0.366		23.6	54.2	22.3	
▲	BW-901	5 - 6.5	4.75				0.0	7.4	92.6	
★	BW-901	18.5 - 20	2				0.0	1.2	98.8	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

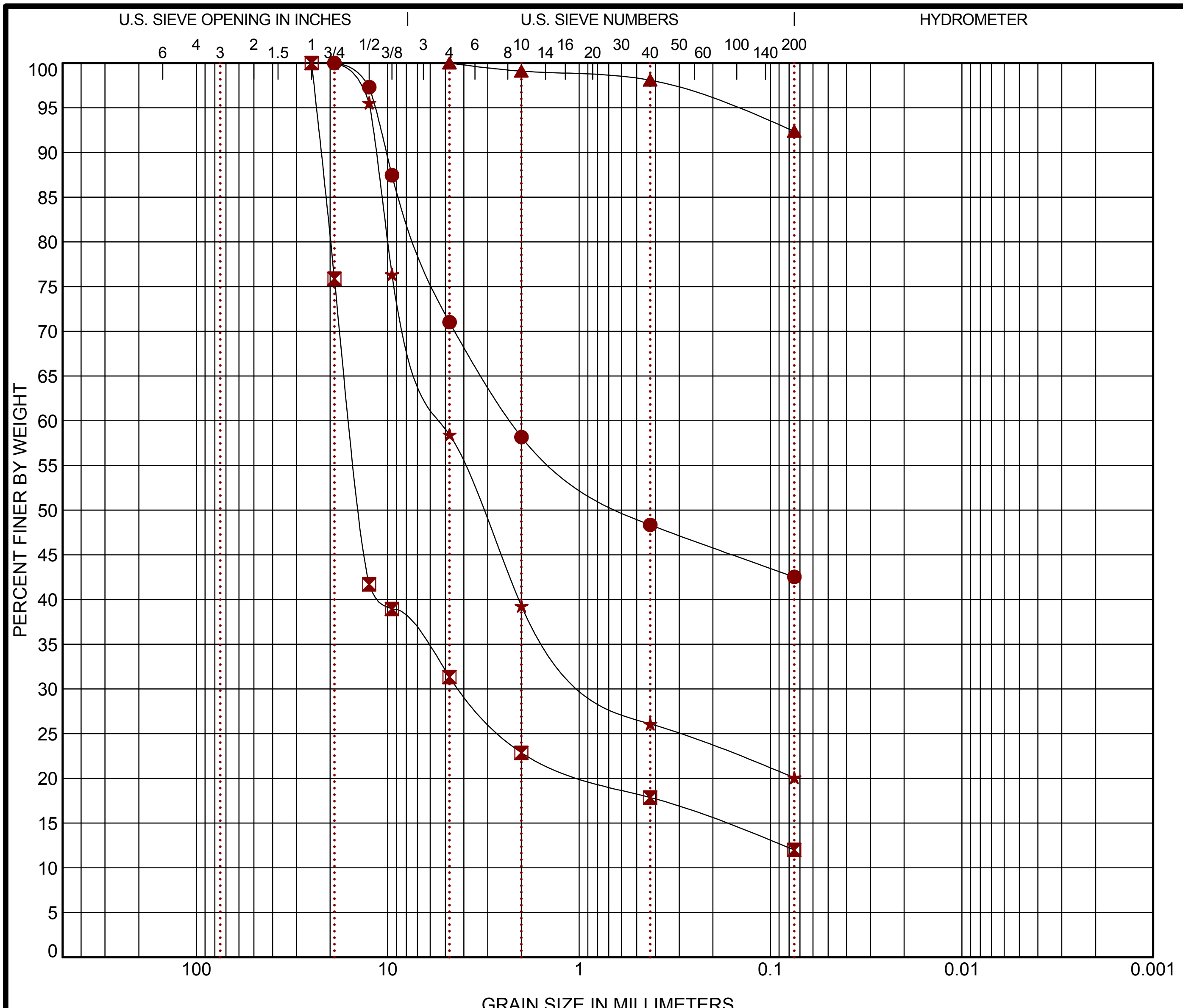
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-51

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-902	2 - 3.5	SILTY GRAVEL with SAND (GM)	A-4(0)	NP	NP	NP		
⊠	BW-902	8.5 - 10	()	()				26.35	375.36
▲	BW-903	0.5 - 2	LEAN CLAY (CL)	A-4(7)	28	19	9		
★	BW-903	5 - 6.5	()	()					

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-902	2 - 3.5	19	2.263			29.0	28.5	42.5	
⊠	BW-902	8.5 - 10	25	15.642	4.145		68.7	19.3	12.0	
▲	BW-903	0.5 - 2	4.75				0.0	7.6	92.4	
★	BW-903	5 - 6.5	19	5.047	0.673		41.6	38.3	20.1	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

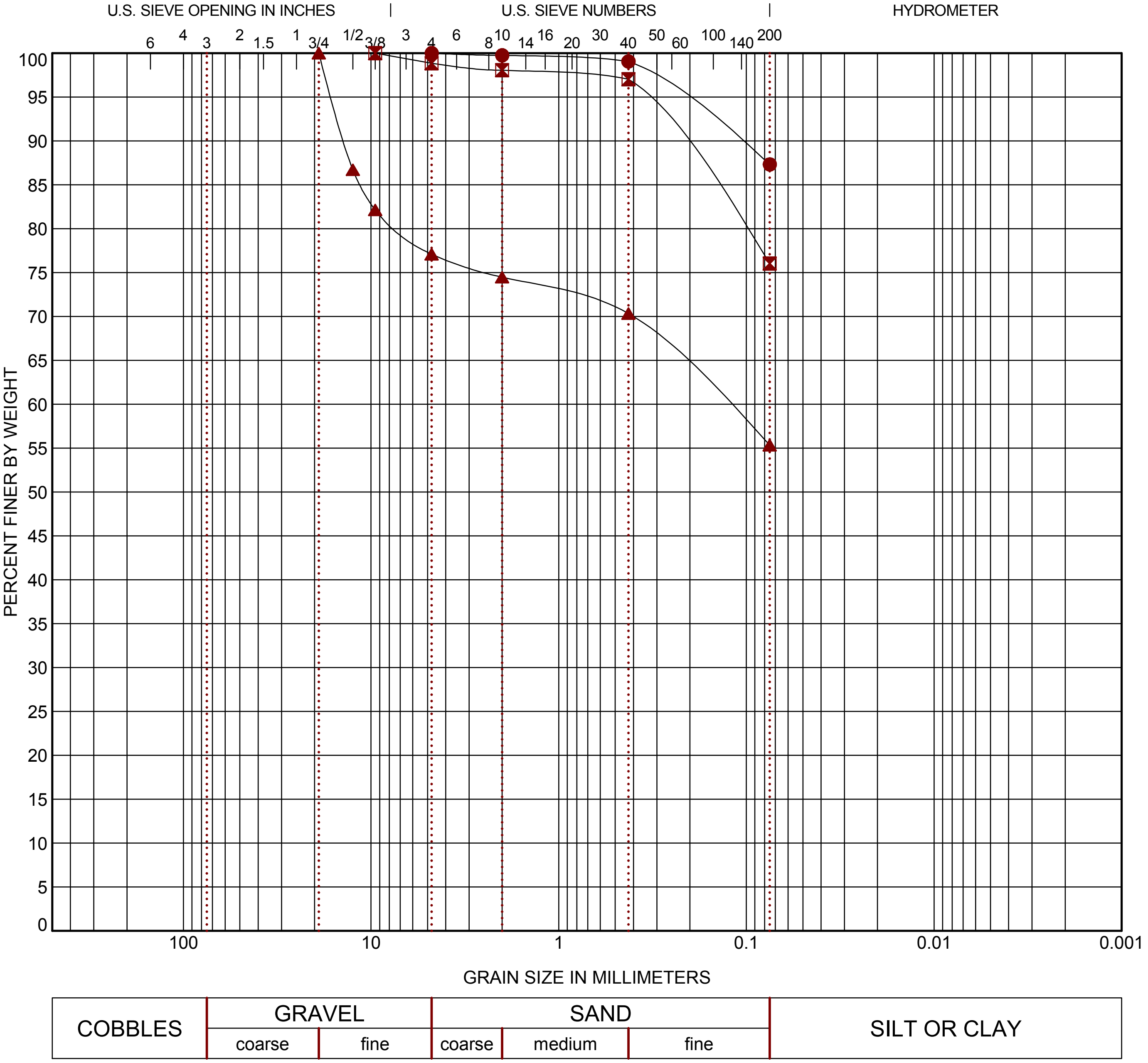
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-52

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BW-904	2 - 3.5	LEAN CLAY (CL)	A-6(12)	33	18	15		
⊠	BW-904	8.5 - 10	()	()					
▲	BW-904	18.5 - 20	GRAVELLY LEAN CLAY with SAND (CL)	A-6(6)	36	20	16		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BW-904	2 - 3.5	4.75				0.0	12.7	87.3	
⊠	BW-904	8.5 - 10	9.5				1.1	22.8	76.0	
▲	BW-904	18.5 - 20	19	0.129			22.9	21.8	55.3	

PROJECT: 8th Street Widening Project - MSE Walls

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

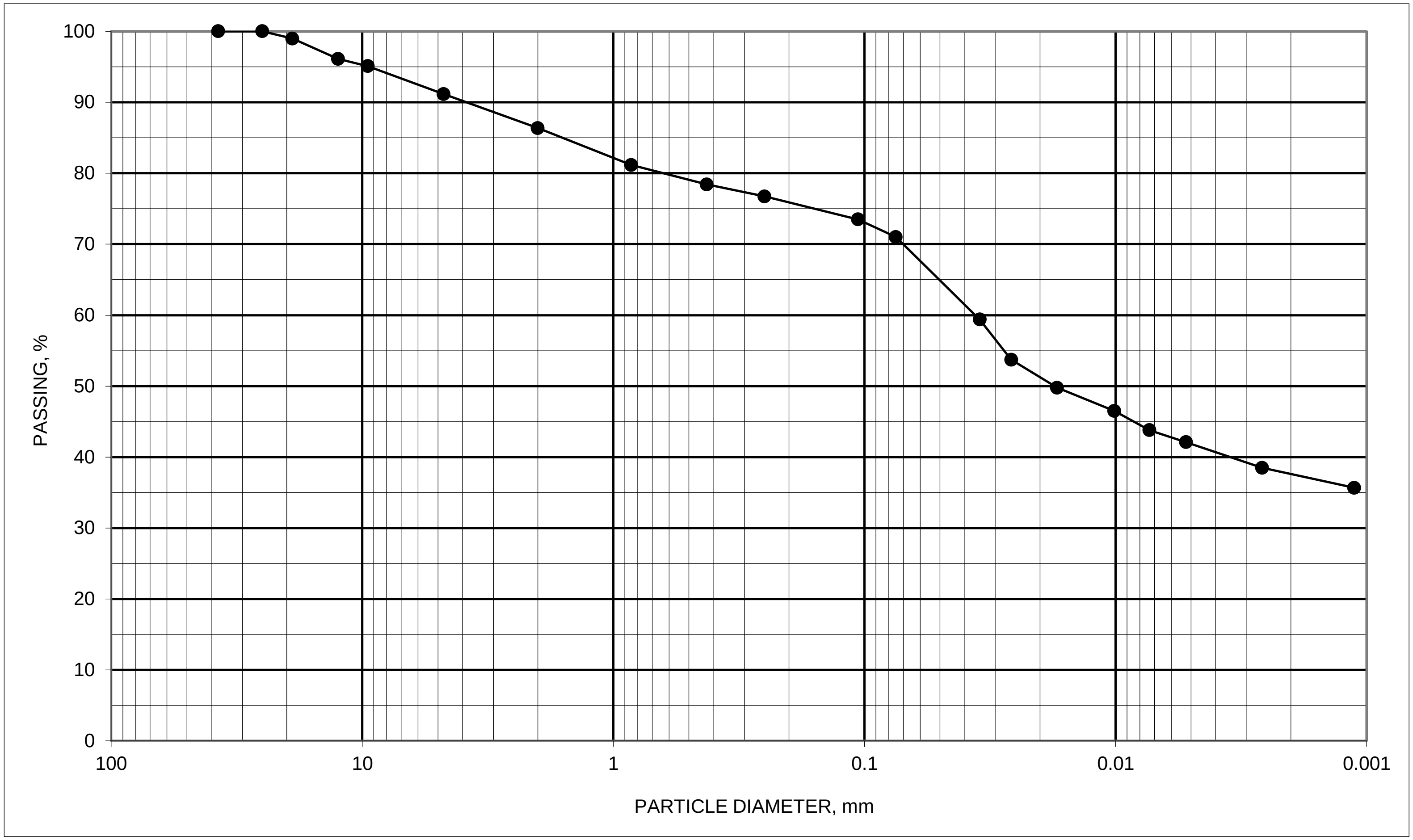
CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-53

SIEVE SIZE	DIAMETER, mm	PASS. %
1.5"	37.5	100
1"	25.0	100
3/4"	19.0	99
1/2"	12.5	96
3/8"	9.50	95
#4	4.75	91
#10	2.00	86
#20	0.850	81
#40	0.425	78
#60	0.250	77
#140	0.106	73
#200	0.075	71.0
	0.0347	59.4
	0.0260	53.7
	0.0171	49.8
	0.0101	46.5
	0.0073	43.8
	0.0052	42.1
	0.0026	38.5
	0.0011	35.7

D60 0.0362

SPECIFIC GRAVITY 2.70 ASSUMED



ASTM D422 PARTICLE-SIZE ANALYSIS OF SOILS

BORING ID	SAMPLE ID	DEPTH, feet	USCS DESCRIPTION	USCS SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
BW-301		15 TO 20	FAT CLAY WITH SAND 2.5YR 4/6 RED	CH		69	24	45

PROJECT 8TH STREET WIDENING PROJECT

RETAINING WALLS JOB NO. 04135111 DATE 3/10/2014

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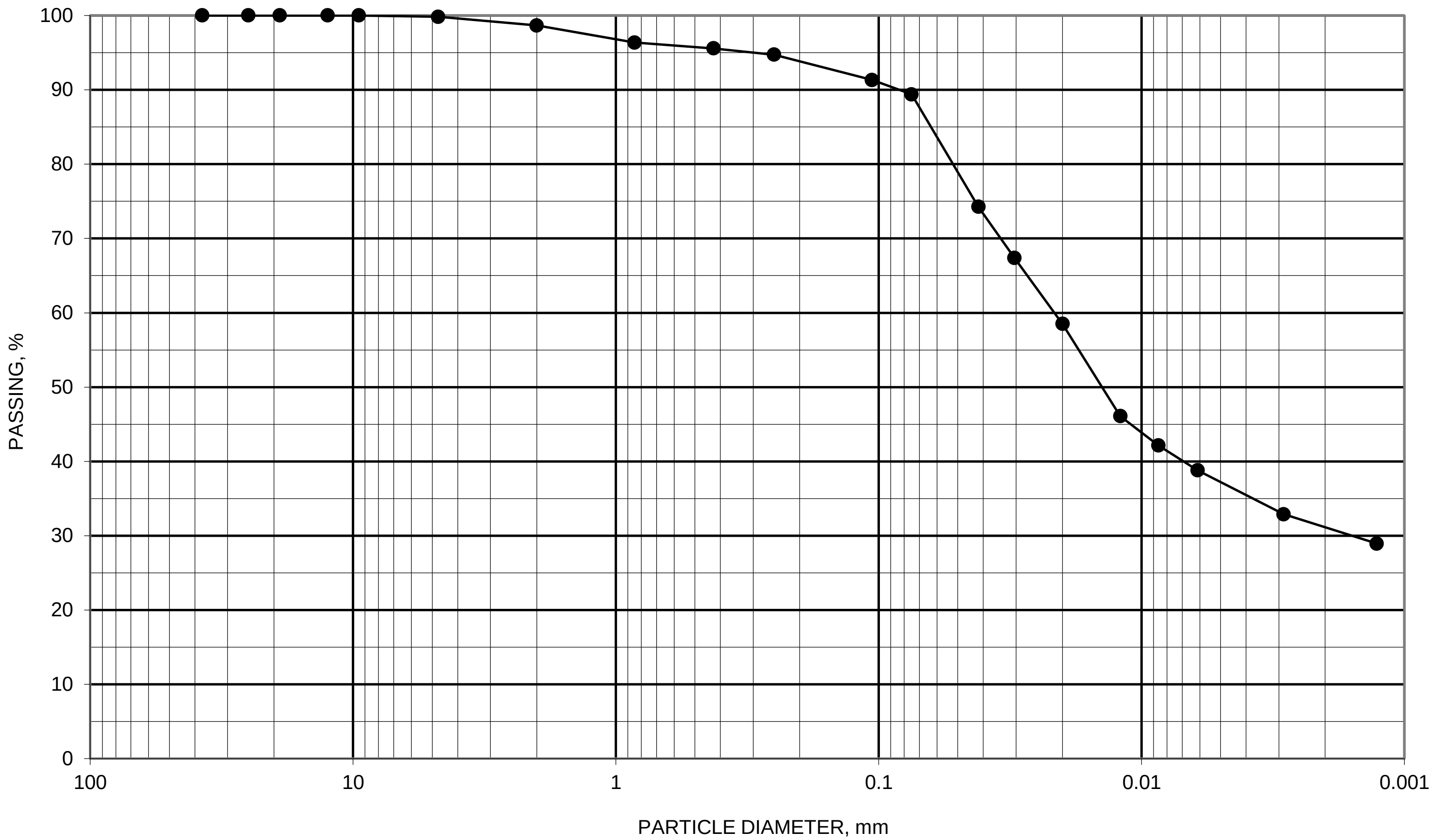
Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
1.5"	37.5	100
1"	25.0	100
3/4"	19.0	100
1/2"	12.5	100
3/8"	9.50	100
#4	4.75	100
#10	2.00	99
#20	0.850	96
#40	0.425	96
#60	0.250	95
#140	0.106	91
#200	0.075	89.4
	0.0417	74.3
	0.0304	67.4
	0.0200	58.5
	0.0120	46.1
	0.0086	42.1
	0.0061	38.8
	0.0029	32.9
	0.0013	29.0

D60	0.0215
D30	0.0016

SPECIFIC GRAVITY 2.70
ASSUMED



ASTM D422 PARTICLE-SIZE ANALYSIS OF SOILS

BORING ID	SAMPLE ID	DEPTH, feet	USCS DESCRIPTION	USCS SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
BW-407	3	3.5 TO 5.5	LEAN CLAY 5YR 4/6 YELLOWISH BROWN WITH 5YR 5/1 GRAY	CL		43	20	23

PROJECT 8TH STREET WIDENING PROJECT

RETAINING WALLS JOB NO. 04135111 DATE 2/20/2014

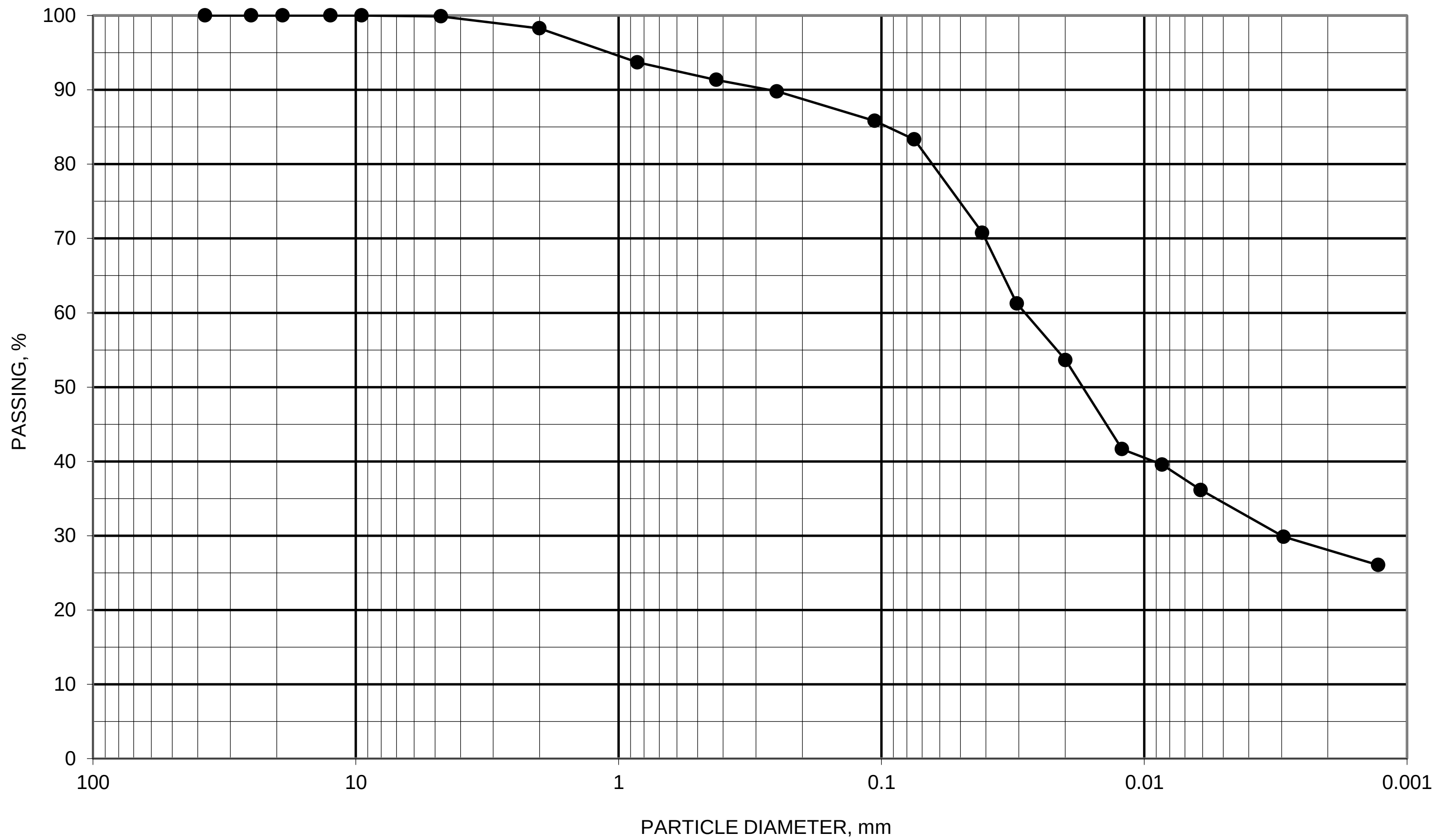
N:\CM\LAB_DATA\00 Projects in Progress\2013 Projects in Progress\04135111 Lab data\[04135111 Hydrometer Plot BW511-3-5.0.xlsx]REPORT

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
1.5"	37.5	100
1"	25.0	100
3/4"	19.0	100
1/2"	12.5	100
3/8"	9.50	100
#4	4.75	100
#10	2.00	98
#20	0.850	94
#40	0.425	91
#60	0.250	90
#140	0.106	86
#200	0.075	83.3
	0.0414	70.8
	0.0305	61.3
	0.0199	53.7
	0.0121	41.7
	0.0086	39.6
	0.0061	36.1
	0.0030	29.9
	0.0013	26.1

D60 0.0284
D30 0.0030

SPECIFIC GRAVITY 2.70 ASSUMED



ASTM D422 PARTICLE-SIZE ANALYSIS OF SOILS

BORING ID	SAMPLE ID	DEPTH, feet	USCS DESCRIPTION	USCS SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
BT-007	3	5 TO 6.5	LEAN CLAY WITH SAND 2.5YR 4/4 REDDISH BROWN WITH 10YR 5/6 YELLOWISH BROWN	CL		39	19	20

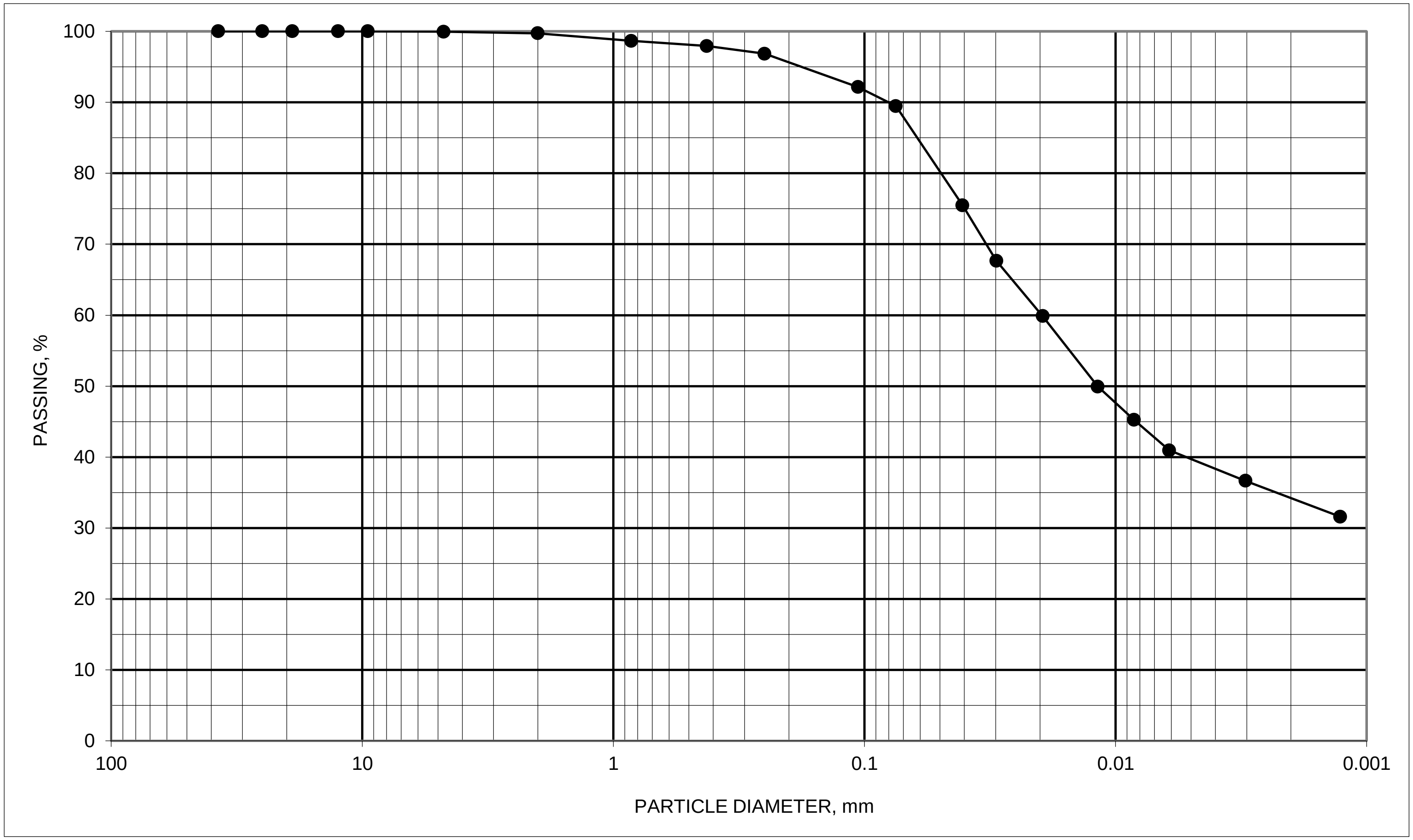
PROJECT 8TH STREET WIDENING PROJECT

RETAINING WALLS JOB NO. 04135111 DATE 2/20/2014

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
1.5"	37.5	100
1"	25.0	100
3/4"	19.0	100
1/2"	12.5	100
3/8"	9.50	100
#4	4.75	100
#10	2.00	100
#20	0.850	99
#40	0.425	98
#60	0.250	97
#140	0.106	92
#200	0.075	89.5
	0.0407	75.5
	0.0298	67.7
	0.0195	59.9
	0.0118	49.9
	0.0084	45.2
	0.0061	41.0
	0.0030	36.7
	0.0013	31.6
	D60	0.0196

SPECIFIC GRAVITY 2.70
ASSUMED



ASTM D422 PARTICLE-SIZE ANALYSIS OF SOILS

BORING ID	SAMPLE ID	DEPTH, feet	USCS DESCRIPTION	USCS SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
BW-511	3	5 TO 7	LEAN CLAY 2.5YR 4/4 REDDISH BROWN WITH 7.5YR 6/8 REDDISH YELLOW	CL		46	23	23

PROJECT 8TH STREET WIDENING PROJECT

RETAINING WALLS JOB NO. 04135111 DATE 2/20/2014

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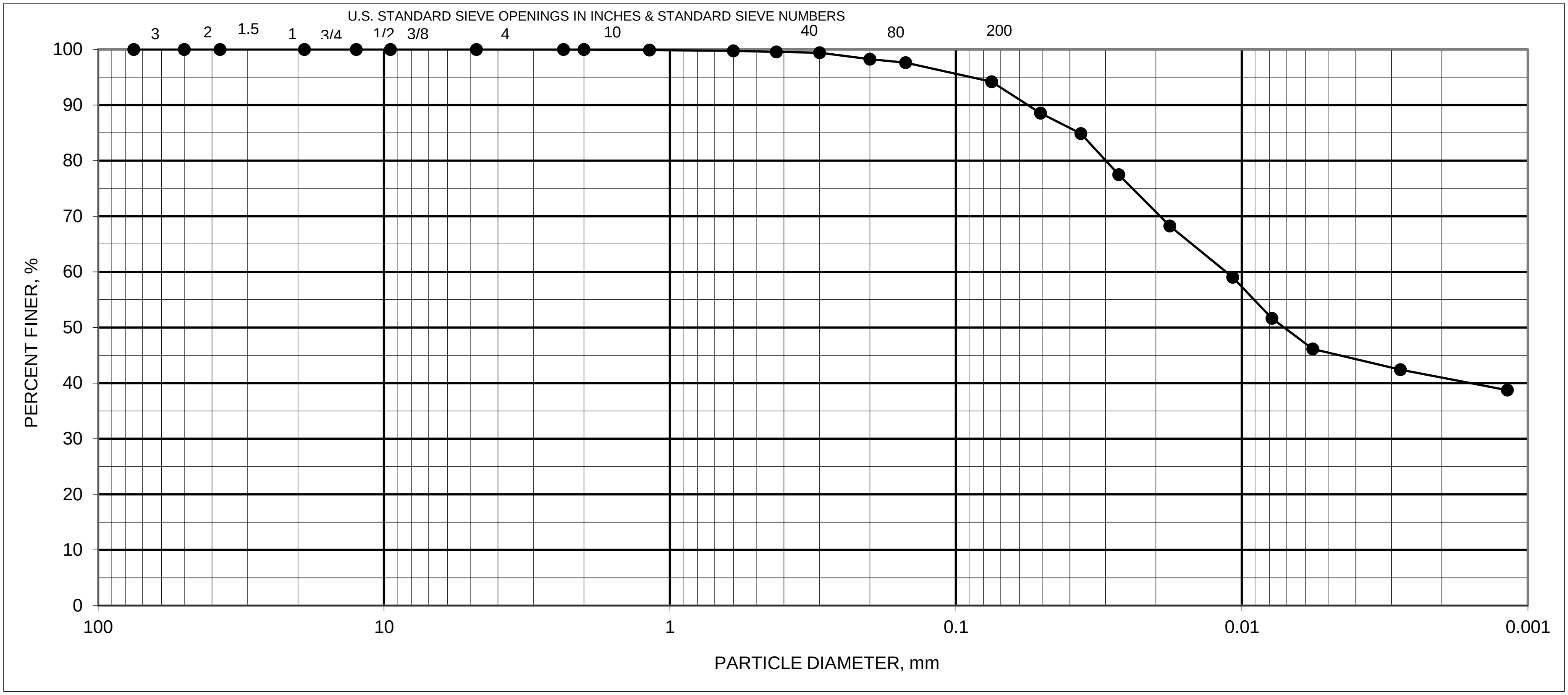
Terracon



GRAVEL		SAND			SILT or CLAY
Coarse	Fine	Coarse	Medium	Fine	

GRAIN SIZE DISTRIBUTION CURVE

BORING NO.	SAMPLE NO.	DEPTH, feet	ASTM DESCRIPTION	USCS CLASS.	NAT. WC, %	ATTERBERG LIMITS LL	PL	PI
BW-606	S-3	5.0-6.5	LEAN CLAY 5YR 5/3 AND 5YR 6/8 REDDISH-BROWN	CL	21	37	20	17

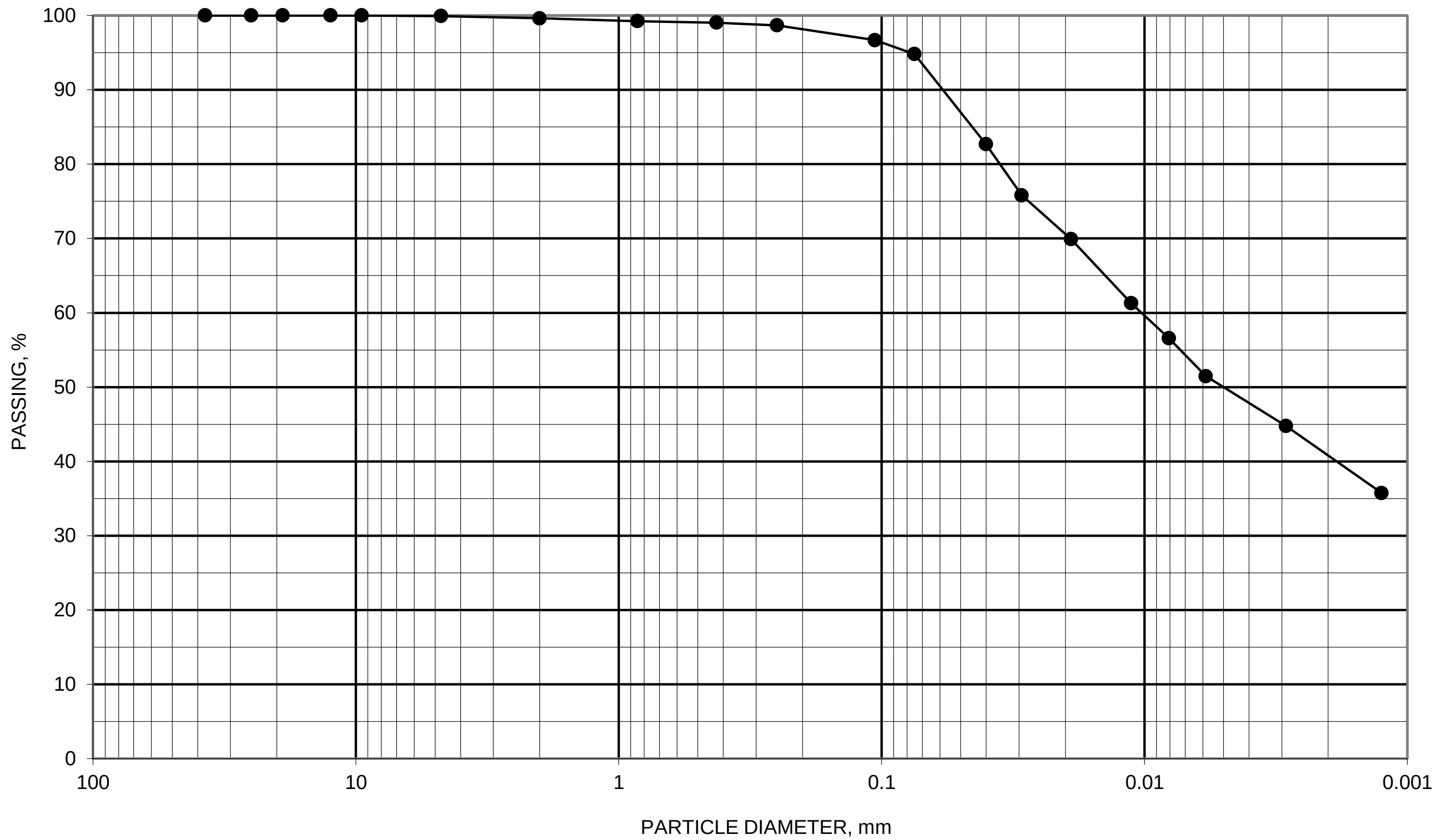
PROJECT 8TH STREET WIDENING PROJECT

RETAINING WALLS JOB NO. 04135111 DATE 8/27/2015

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
1.5"	37.5	100
1"	25.0	100
3/4"	19.0	100
1/2"	12.5	100
3/8"	9.50	100
#4	4.75	100
#10	2.00	100
#20	0.850	99
#40	0.425	99
#60	0.250	99
#140	0.106	97
#200	0.075	94.8
	0.0401	82.7
	0.0293	75.8
	0.0190	69.9
	0.0112	61.3
	0.0081	56.6
	0.0058	51.5
	0.0029	44.8
	0.0013	35.7
	D60	0.0103

SPECIFIC GRAVITY 2.70 ASSUMED



ASTM D422 PARTICLE-SIZE ANALYSIS OF SOILS

BORING ID	SAMPLE ID	DEPTH, feet	USCS DESCRIPTION	USCS SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
BW-809	3	5 TO 7	FAT CLAY 10YR 4/6 DARK YELLOWISH BROWN WITH 10YR 5/1 GRAY	CH		52	21	31

PROJECT 8TH STREET WIDENING PROJECT

RETAINING WALLS JOB NO. 04135111 DATE 2/20/2014

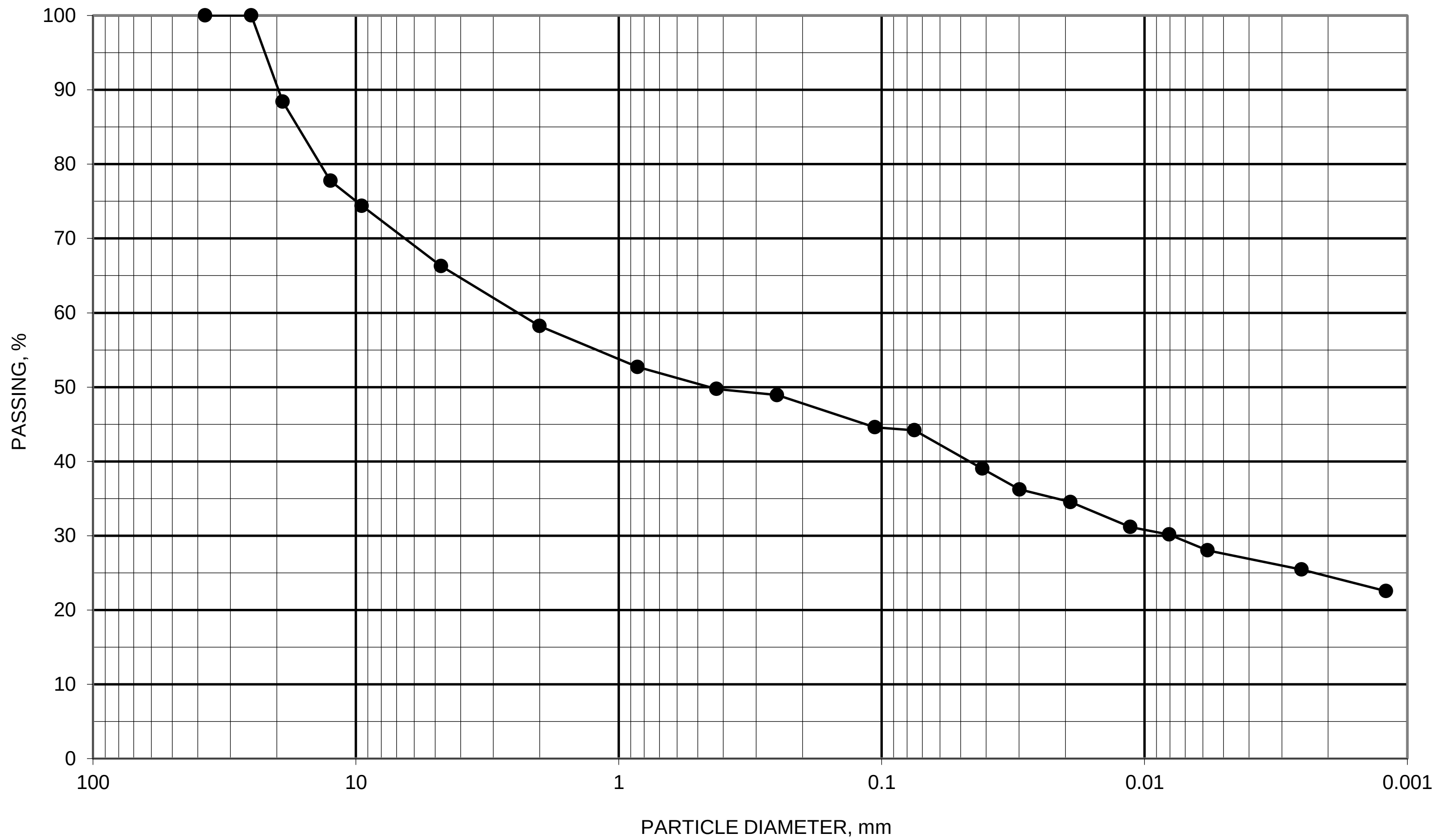
N:\CM\LAB_DATA\00 Projects in Progress\2013 Projects in Progress\04135111 Lab data\[04135111 Hydrometer Plot BW511-3-5.0.xlsx]REPORT

Terracon

SIEVE SIZE	DIAMETER, mm	PASS, %
1.5"	37.5	100
1"	25.0	100
3/4"	19.0	88
1/2"	12.5	78
3/8"	9.50	74
#4	4.75	66
#10	2.00	58
#20	0.850	53
#40	0.425	50
#60	0.250	49
#140	0.106	45
#200	0.075	44.2
	0.0414	39.0
	0.0299	36.2
	0.0191	34.5
	0.0113	31.2
	0.0081	30.2
	0.0058	28.0
	0.0025	25.5
	0.0012	22.5

D60 2.4213
D30 0.0078

SPECIFIC GRAVITY 2.70
ASSUMED



ASTM D422 PARTICLE-SIZE ANALYSIS OF SOILS

BORING ID	SAMPLE ID	DEPTH, feet	USCS DESCRIPTION	USCS SYMBOL	NAT M%	ATTERBERG LIMITS LL	PL	PI
BW-902	BULK	6 TO 10	CLAYEY GRAVEL WITH SAND 2.5YR 4/4 REDDISH BROWN	GC		67	24	43

PROJECT 8TH STREET WIDENING PROJECT

RETAINING WALLS JOB NO. 04135111 DATE 5/2/2014

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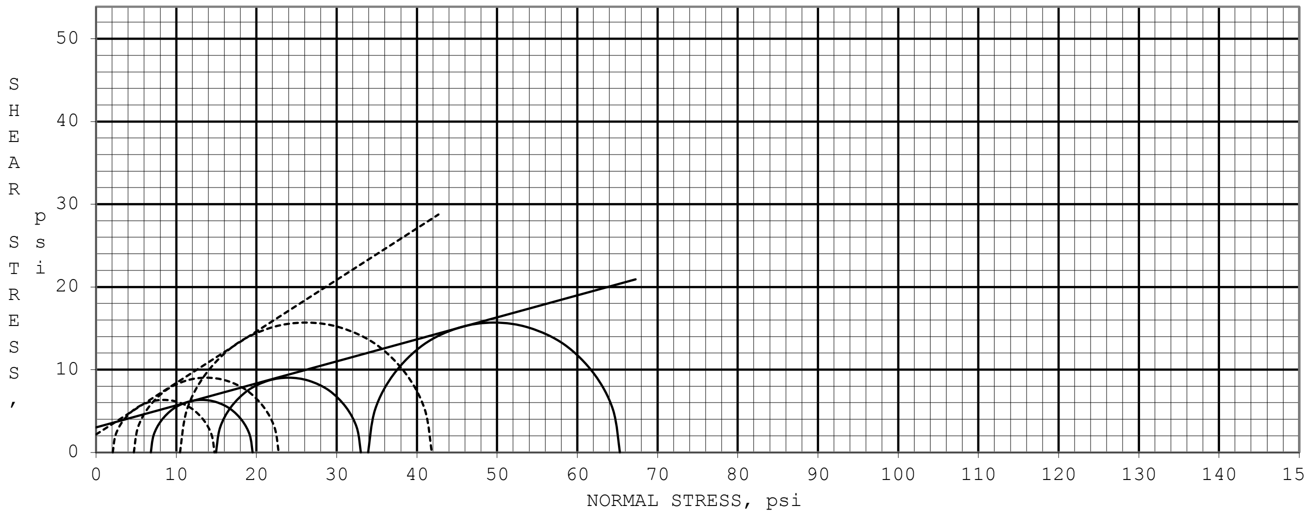
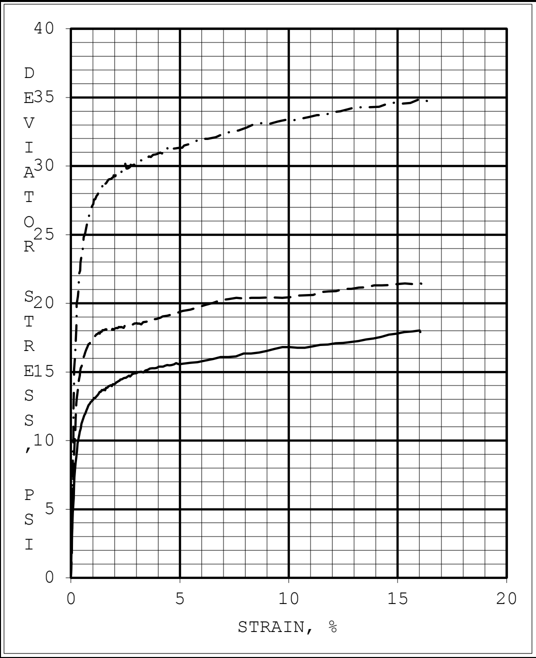


EFFECTIVE STRESS ---	ANGLE OF INTERNAL FRICTION, deg	**31.9**	COHESION, psi	**2.2**
TOTAL STRESS ——	ANGLE OF INTERNAL FRICTION, deg	**14.9**	COHESION, psi	**3.0**



SPECIMEN ID:		A	B	C
INITIAL	WATER CONTENT, %	24.0	24.0	24.1
INITIAL	DRY DENSITY, pcf	94.8	94.7	94.9
INITIAL	SATURATION, %	83	83	84
INITIAL	VOID RATIO	0.78	0.78	0.78
BEFORE SHEAR	WATER CONTENT, %	28.5	28.1	26.3
BEFORE SHEAR	DRY DENSITY, pcf	95.3	95.8	98.6
BEFORE SHEAR	SATURATION (B PARAMETER)	0.96	1.00	0.95
BEFORE SHEAR	VOID RATIO	0.77	0.76	0.71
BEFORE SHEAR	FINAL BACK PRESSURE, psi	100.5	100.3	100.3
MINOR PRINCIPAL STRESS, psi		6.8	15.0	33.9
EFFECTIVE STRESS PEAK AT % STRAIN		0.9	1.5	4.4
EFF. DEVIATOR STRESS AT PEAK STRAIN, psi		12.7	18.0	31.4
TOTAL STRESS PEAK AT % STRAIN		0.9	1.5	4.4
TOTAL DEVIATOR STRESS AT PEAK STRAIN, psi		12.7	18.0	31.4
ULTIMATE DEVIATOR STRESS (15% STR), psi		17.8	21.4	34.6
TIME TO 50% PRIMARY CONSOLIDATION, min		0.53	0.46	1.30
STRAIN RATE, % / hour		5.37	5.35	5.44
INITIAL DIAMETER, inch		2.005	2.007	2.004
INITIAL HEIGHT, inch		4.013	4.012	4.015
AREA AFTER CONSOLIDATION, inch2		3.154	3.143	3.092

CONTROLLED - STRAIN TEST

SAMPLE TYPE: RE-COMPACTED

DESCRIPTION OF SPECIMENS:
FAT CLAY WITH SAND, 2.5YR 4/6 RED

LL	PL	PI	Gs
69	24	45	2.7 EST.

PROJECT NO. 04135111	PROJECT: 8TH STREET WIDENING PROJECT RETAINING WALLS
	BORING #: BW-301
LABORATORY: TERRACON - LENEXA	SAMPLE #:
DATE: 3/11/2014	DEPTH, feet: 15.0 - 20.0

PROCEDURE: ASTM D4767, CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS

Terracon

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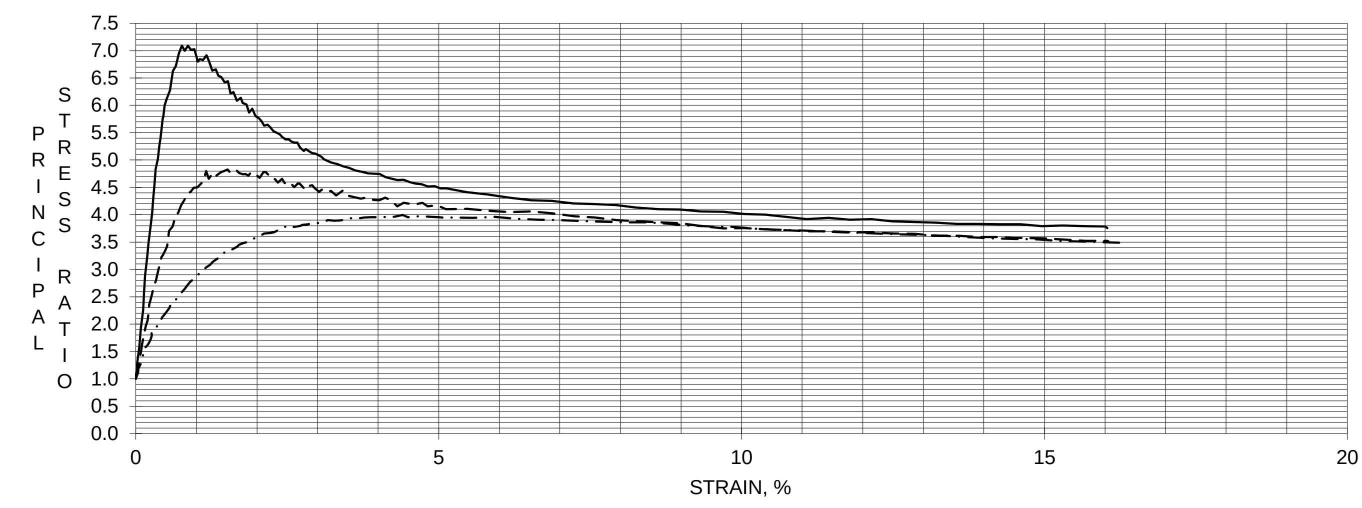
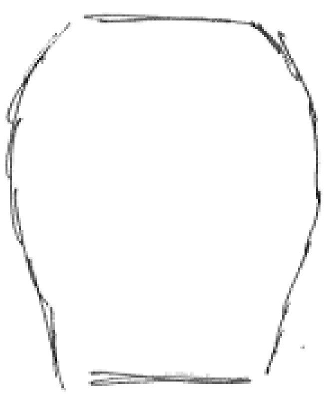
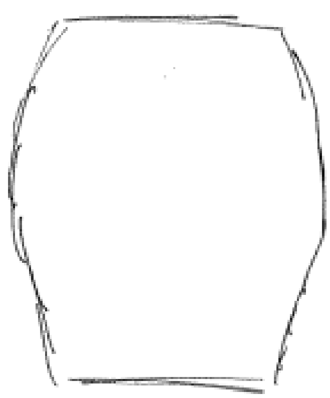
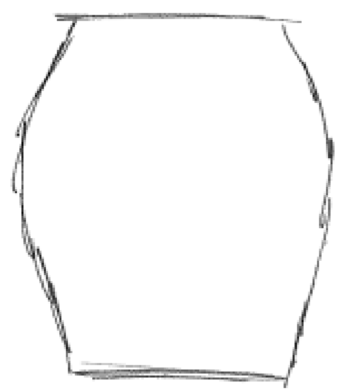
8TH STREET WIDENING PROJECT

04135111 BW-301 15.0 - 20.0



FAILURE SKETCH	FAILURE SKETCH	FAILURE SKETCH
		
SPECIMEN A	SPECIMEN B	SPECIMEN C

REMARKS:

SPECIMENS SATURATED BY THE WET METHOD.

EFFECTIVE STRESS FAILURE DATA BASED ON PEAK PRINCIPAL STRESS RATIO % STRAIN.

EFFECTIVE STRESS MOHR'S CIRCLES DRAWN AT PEAK PRINCIPAL STRESS RATIO % STRAIN.

TOTAL STRESS FAILURE DATA BASED ON PEAK PRINCIPAL STRESS RATIO % STRAIN.

TOTAL STRESS MOHR'S CIRCLES DRAWN AT PEAK PRINCIPAL STRESS RATIO % STRAIN.

DEVIATOR STRESSES CORRECTED FOR MEMBRANE AND FILTER PAPER EFFECTS.

AREA AFTER CONSOLIDATION CALCULATED AS PER SECTION 10.3.2.1 METHOD A

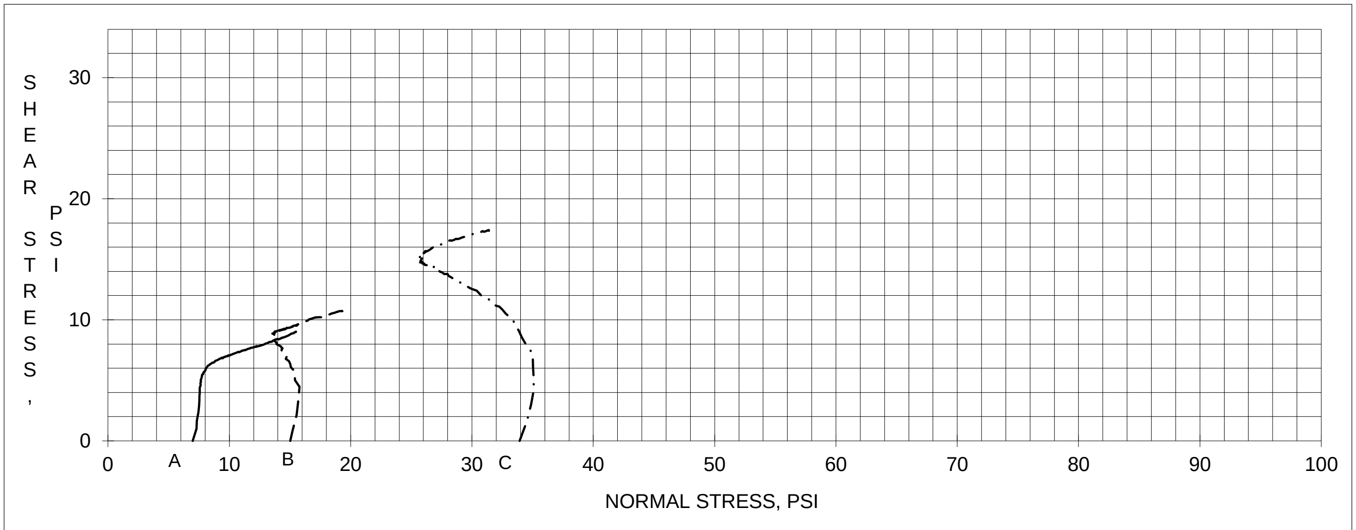
STANDARD PROCTOR = 95pcf @ 24% MOISTURE

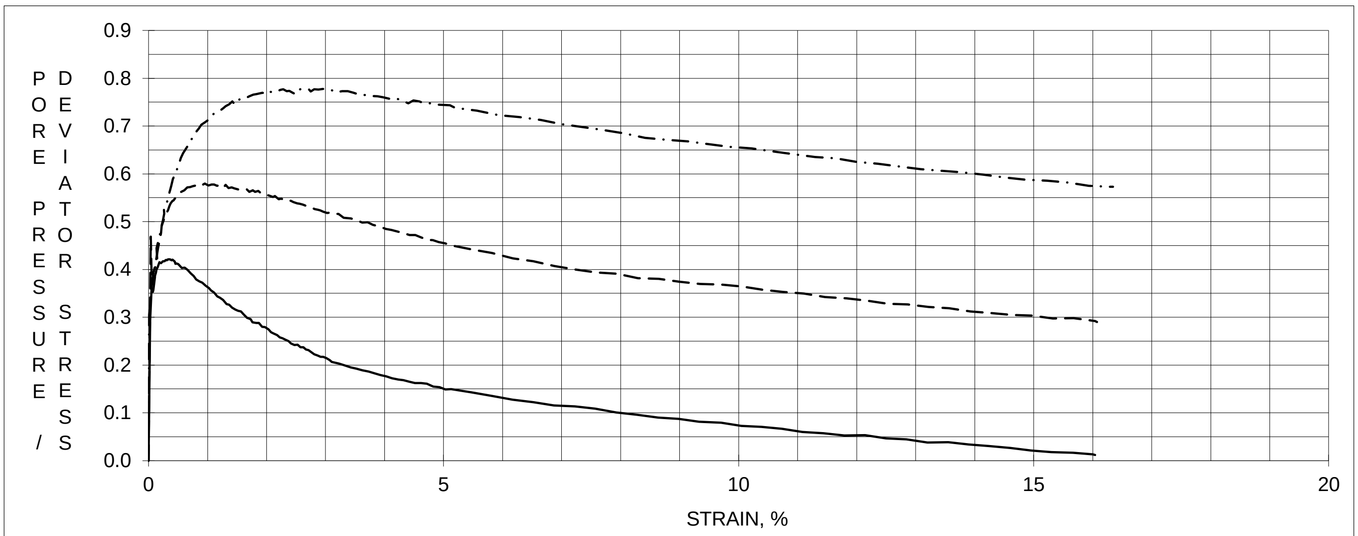
REMOLDED TO 94.8 pcf @ 24.1% MOISTURE REMOLDED TO 99.8% COMPACTION

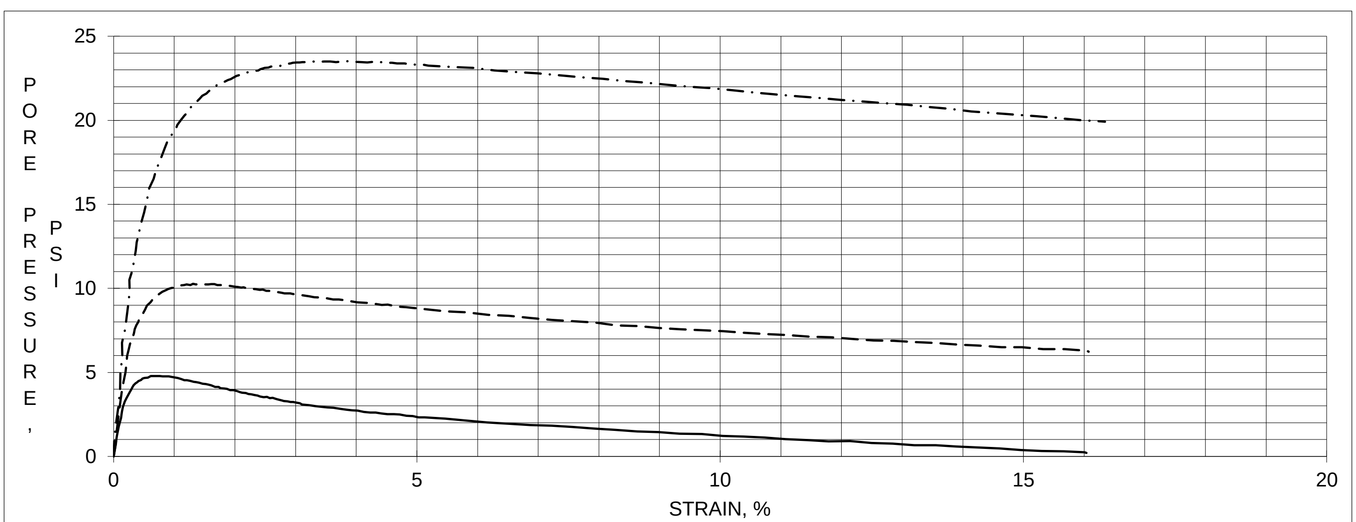
Terracon

8TH STREET WIDENING PROJECT

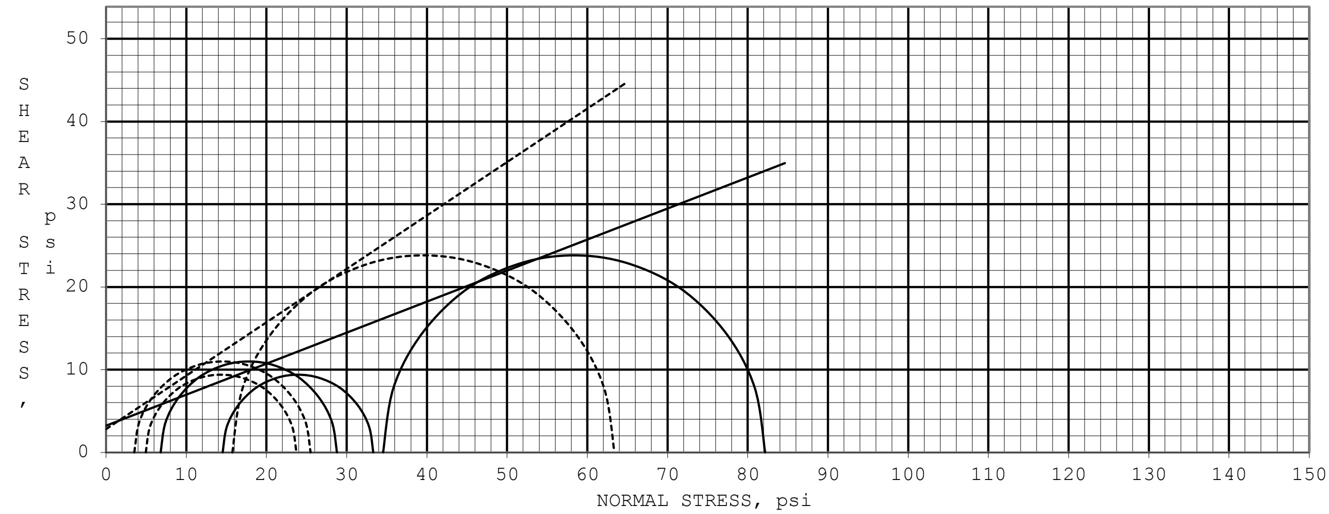
04135111 BW-301 15.0 - 20.0



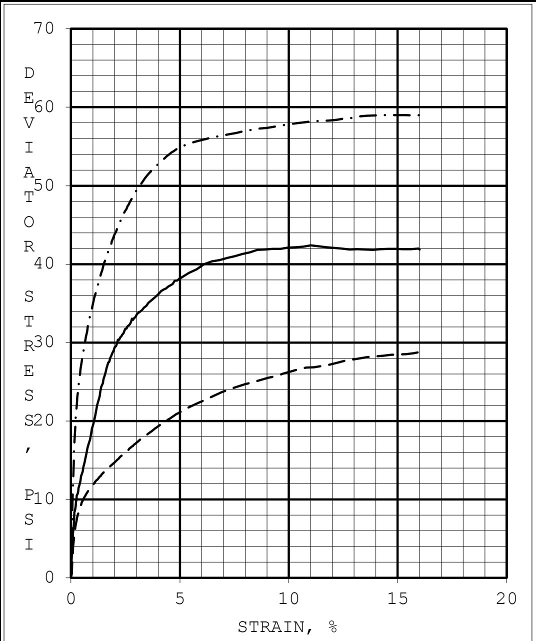




Terracon



EFFECTIVE STRESS ---	ANGLE OF INTERNAL FRICTION, deg	**28.4**	COHESION, psi	**5.7**
TOTAL STRESS ——	ANGLE OF INTERNAL FRICTION, deg	**20.6**	COHESION, psi	**3.2**



SPECIMEN ID:		A	B	C
INITIAL	WATER CONTENT, %	23.0	29.4	19.6
INITIAL	DRY DENSITY, pcf	101.9	95.3	106.2
INITIAL	SATURATION, %	95	103	90
INITIAL	VOID RATIO	0.65	0.77	0.59
BEFORE SHEAR	WATER CONTENT, %	24.0	27.3	20.4
BEFORE SHEAR	DRY DENSITY, pcf	102.3	97.0	108.7
BEFORE SHEAR	SATURATION (B PARAMETER)	0.99	0.99	0.96
BEFORE SHEAR	VOID RATIO	0.65	0.74	0.55
BEFORE SHEAR	FINAL BACK PRESSURE, psi	99.8	100.5	100.6
MINOR PRINCIPAL STRESS, psi		6.8	14.5	34.5
EFFECTIVE STRESS PEAK AT % STRAIN		1.2	3.7	2.6
EFF. DEVIATOR STRESS AT PEAK STRAIN, psi		22.0	18.8	47.6
TOTAL STRESS PEAK AT % STRAIN		1.2	3.7	2.6
TOTAL DEVIATOR STRESS AT PEAK STRAIN, psi		22.0	18.8	47.6
ULTIMATE DEVIATOR STRESS (15% STR), psi		41.9	28.5	59.0
TIME TO 50% PRIMARY CONSOLIDATION, min		0.90	1.20	1.40
STRAIN RATE, % / hour		5.10	5.36	5.30
INITIAL DIAMETER, inch		2.857	2.854	2.848
INITIAL HEIGHT, inch		5.860	5.850	5.670
AREA AFTER CONSOLIDATION, inch2		6.400	6.349	6.284

CONTROLLED - STRAIN TEST

SAMPLE TYPE: 3" SHELBY TUBE

DESCRIPTION OF SPECIMENS:

LEAN CLAY, 5YR 4/6 YELLOWISH BROWN WITH 5YR 5/1 GRAY

LL 43	PL 20	PI 23	Gs 2.7 EST.

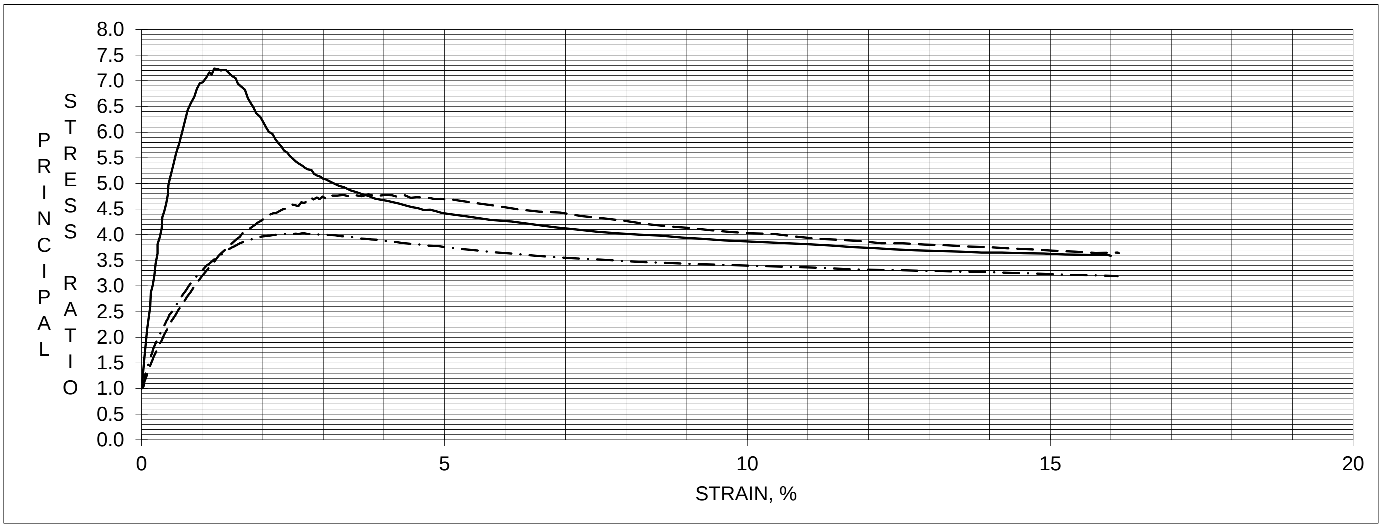
PROJECT NO. 04135111	PROJECT: 8TH STREET WIDENING PROJECT RETAINING WALLS
	BORING #: BW-407
LABORATORY: TERRACON - LENEXA	SAMPLE #: 3
DATE: 2/24/2014	DEPTH, feet: 3.5 - 5.5

PROCEDURE: ASTM D4767, CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS

Terracon

8TH STREET WIDENING PROJECT

04135111 BW-407 3 3.5 - 5.5



FAILURE SKETCH

SPECIMEN A

FAILURE SKETCH

SPECIMEN B

FAILURE SKETCH

SPECIMEN C

REMARKS:

SPECIMENS SATURATED BY THE WET METHOD.

EFFECTIVE STRESS FAILURE DATA BASED ON PEAK PRINCIPAL STRESS RATIO % STRAIN.

EFFECTIVE STRESS MOHR'S CIRCLES DRAWN AT PEAK PRINCIPAL STRESS RATIO % STRAIN.

TOTAL STRESS FAILURE DATA BASED ON PEAK PRINCIPAL STRESS RATIO % STRAIN.

TOTAL STRESS MOHR'S CIRCLES DRAWN AT PEAK PRINCIPAL STRESS RATIO % STRAIN.

DEVIATOR STRESSES CORRECTED FOR MEMBRANE AND FILTER PAPER EFFECTS.

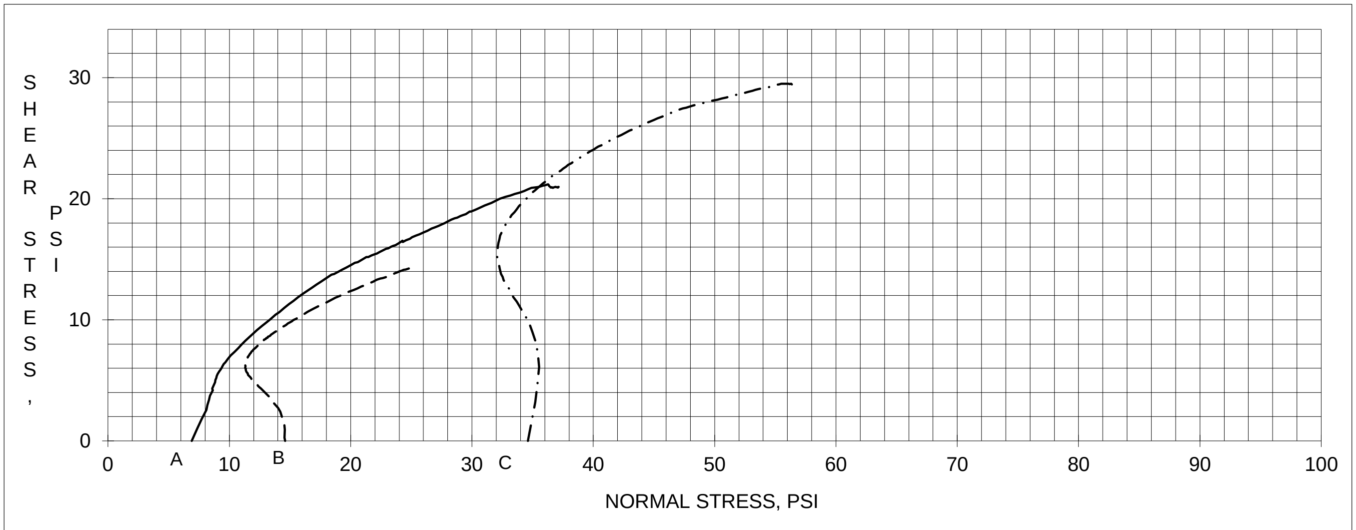
AREA AFTER CONSOLIDATION CALCULATED AS PER SECTION 10.3.2.1 METHOD A

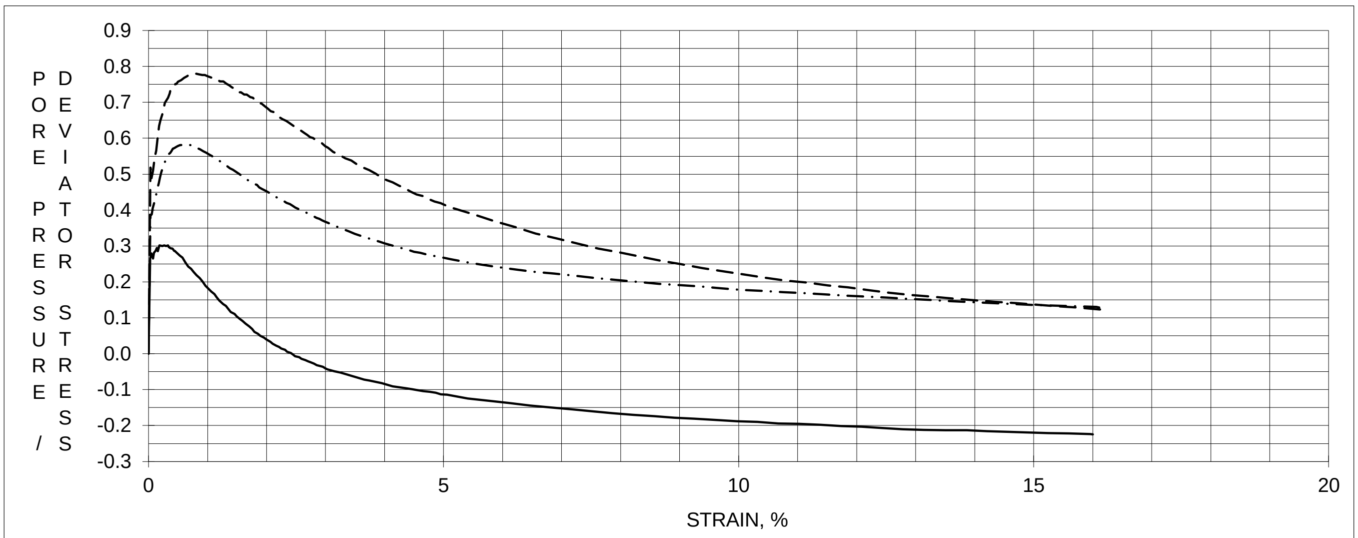
ADDITIONAL NOTE: EFFECTIVE SHEAR STRENGTH PARAMETERS WERE HAND CALCULATED

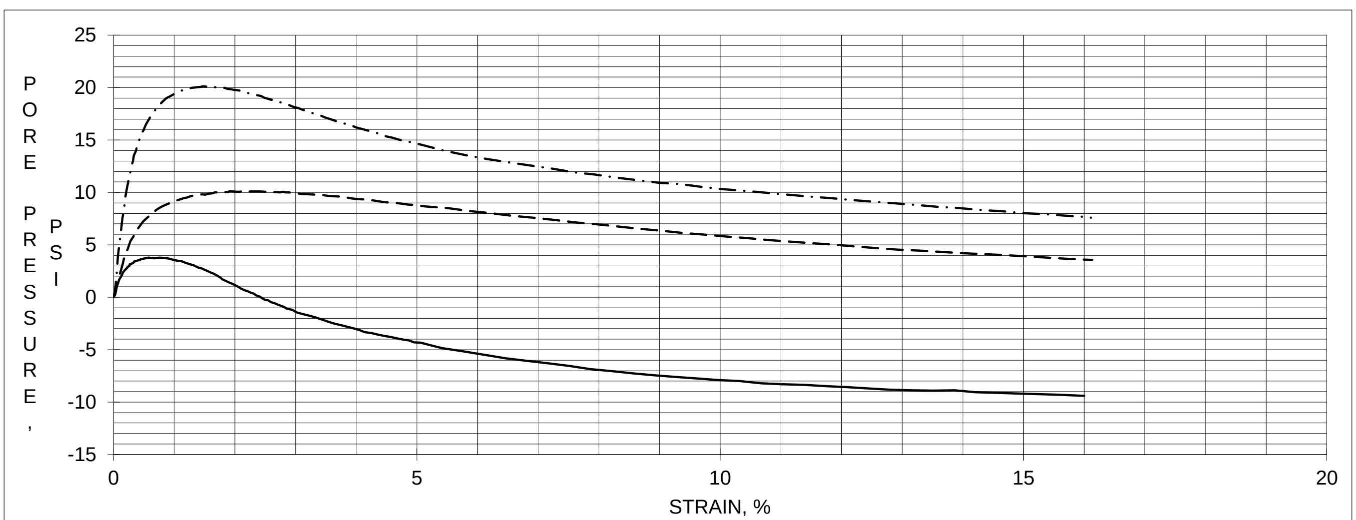
Terracon

8TH STREET WIDENING PROJECT

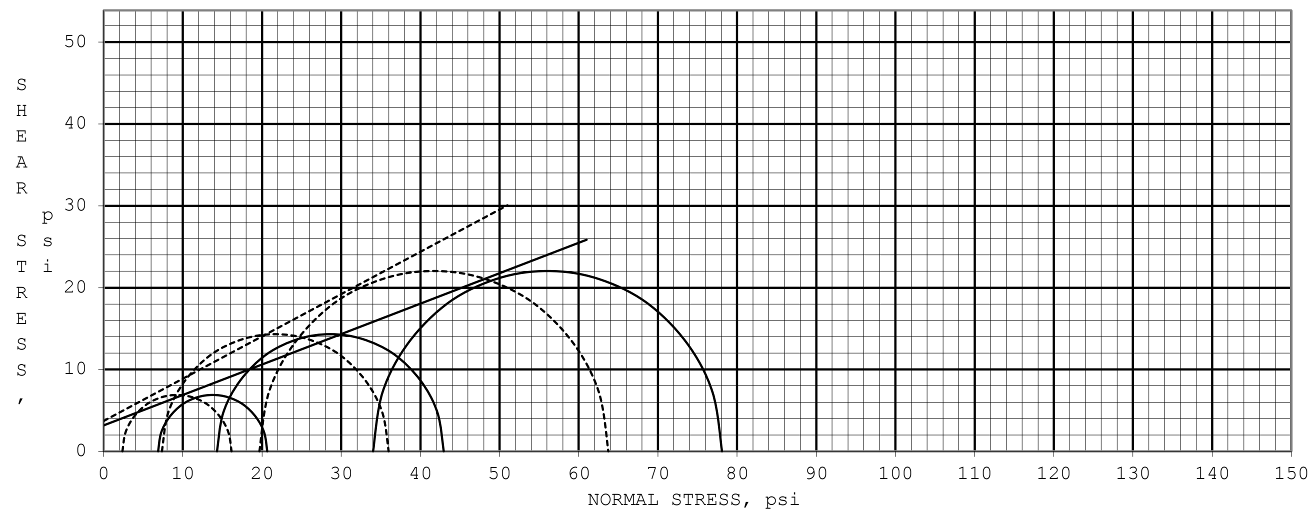
04135111 BW-407 3 3.5 - 5.5



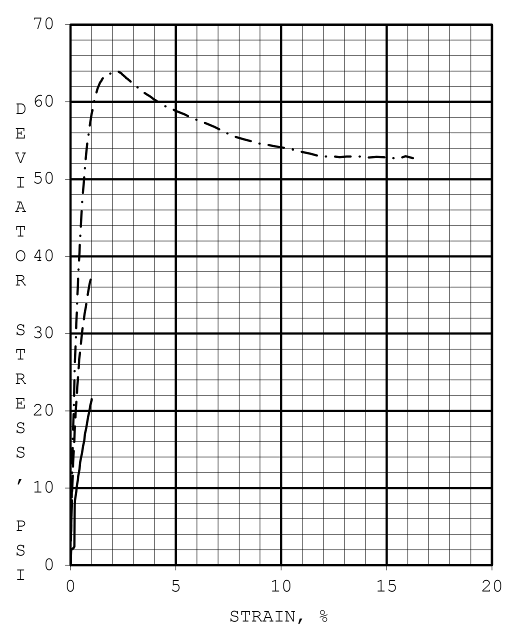




Terracon



EFFECTIVE STRESS	ANGLE OF INTERNAL FRICTION, deg	**33.9**	COHESION, psi	**2.9**
TOTAL STRESS	ANGLE OF INTERNAL FRICTION, deg	**20.4**	COHESION, psi	**3.2**



SPECIMEN #:		A	B	C
INITIAL	WATER CONTENT, %	21.3	23.9	23.6
	DRY DENSITY, pcf	102.1	102.5	103.0
	SATURATION, %	88	100	100
	VOID RATIO	0.65	0.64	0.64
BEFORE SHEAR	WATER CONTENT, %	23.9	23.6	23.1
	DRY DENSITY, pcf	102.5	102.9	103.7
	SATURATION (B PARAMETER)	1.00	1.00	1.00
	VOID RATIO	0.64	0.64	0.62
	FINAL BACK PRESSURE, psi	100.4	100.2	100.3
MINOR PRINCIPAL STRESS, psi		6.9	14.3	34.0
DEVIATOR STRESS @ 1.0% STRAIN, psi		13.8	28.6	44.1
TIME TO 1.0% STRAIN, min.		8	8	8
ULTIMATE DEVIATOR STRESS, psi		NA	NA	52.8
INITIAL DIAMETER, inch		2.876	2.882	2.884
INITIAL HEIGHT, inch		5.890	5.841	5.808
AREA AFTER CONSOLIDATION, inch2*		6.483	6.497	6.488

CONTROLLED - STRAIN TEST

t_{50} 0.33 min | Strain Rate, %/hr 4.00

DESCRIPTION OF SPECIMENS: LEAN CLAY WITH SAND, 2.5YR 4/4 REDDISH BROWN WITH 10YR 5/6 YELLOWISH BROWN

LL 39 | PL 19 | PI 20 | Gs 2.7 EST. | SAMPLE TYPE: 3" SHELBY TUBE | TEST TYPE: $\overline{CU}$

REMARKS:

MOHR'S CIRCLES DRAWN AT 1% STRAIN

SAMPLE WAS STAGE LOADED

EFFECTIVE STRENGTH PARAMETERS CALCULATED BASED ON PEAK SHEAR STRESS VALUES (p-q DIAGRAM)

* SECTION 10.2.2.1 METHOD A

PROJECT: 8TH STREET WIDENING PROJECT
RETAINING WALLS 04135111

BORING #: BT-007

SAMPLE #: 3

DEPTH OR ELEV.: 5.0 - 6.5 feet

LABORATORY: TERRACON - LENEXA | DATE: 2/24/2014

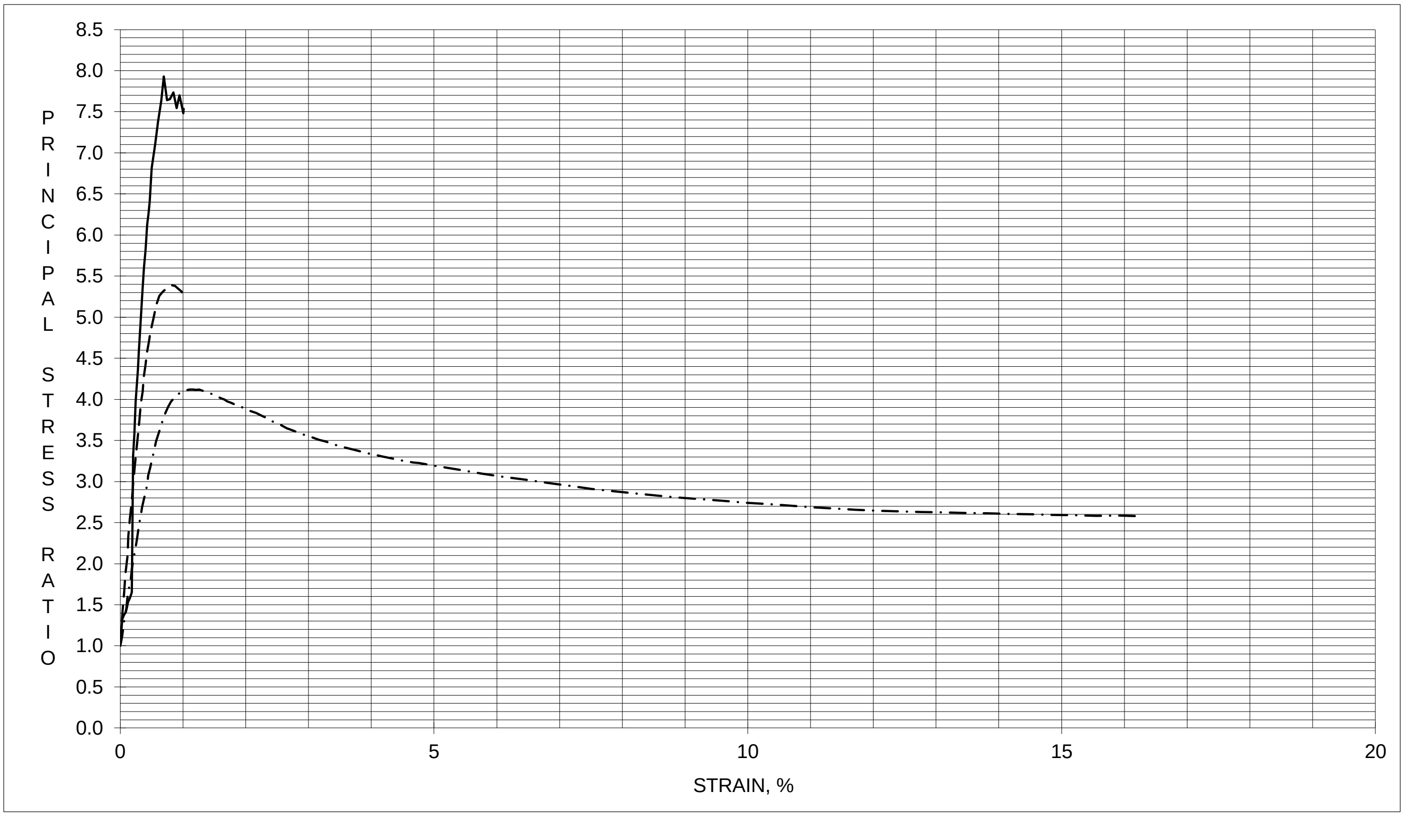
TRIAXIAL COMPRESSION TEST REPORT

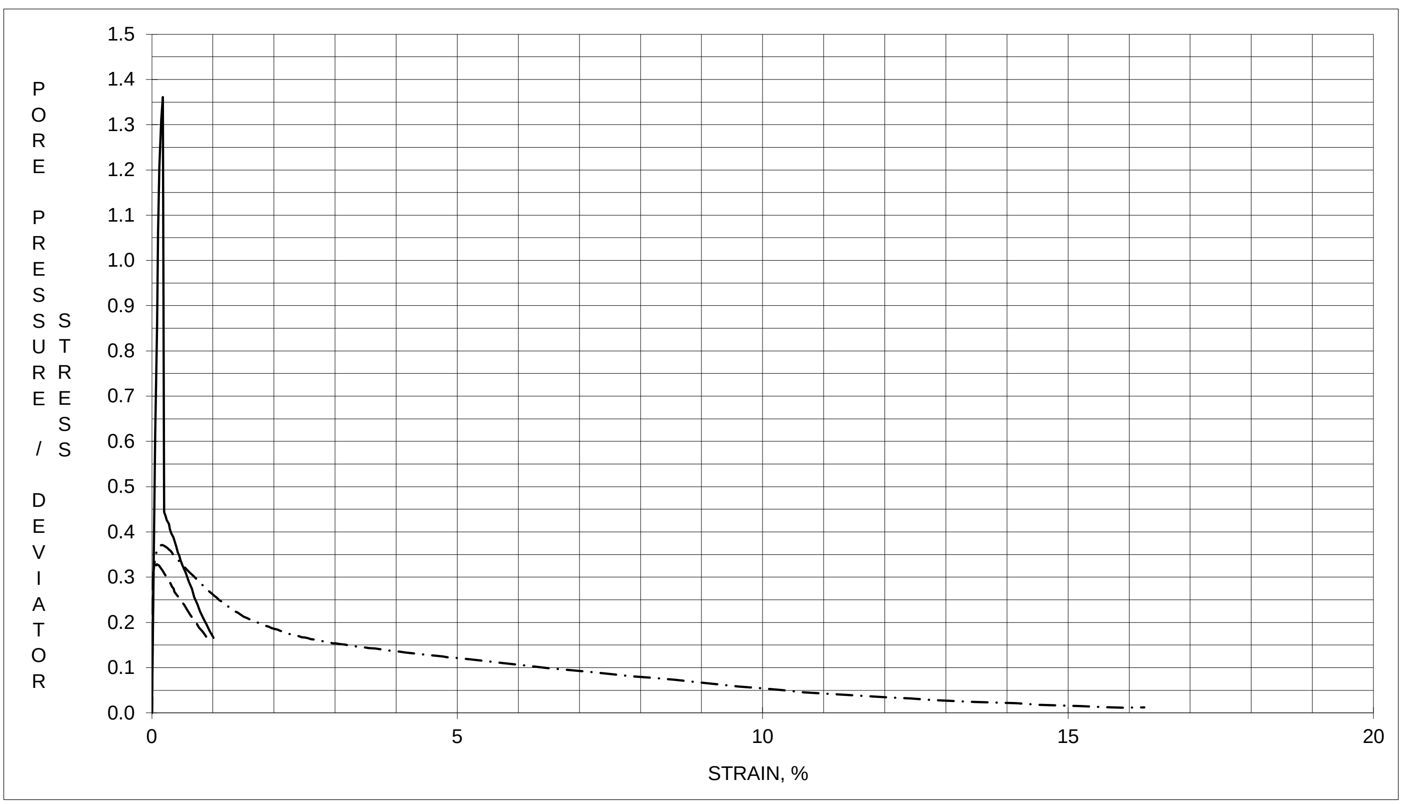
PROCEDURE: ASTM D4767, CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS (TERRACON MODIFIED FOR STAGE LOADING)

Terracon

8TH STREET WIDENING PROJECT

04135111 BT-007 5.0 - 6.5 feet

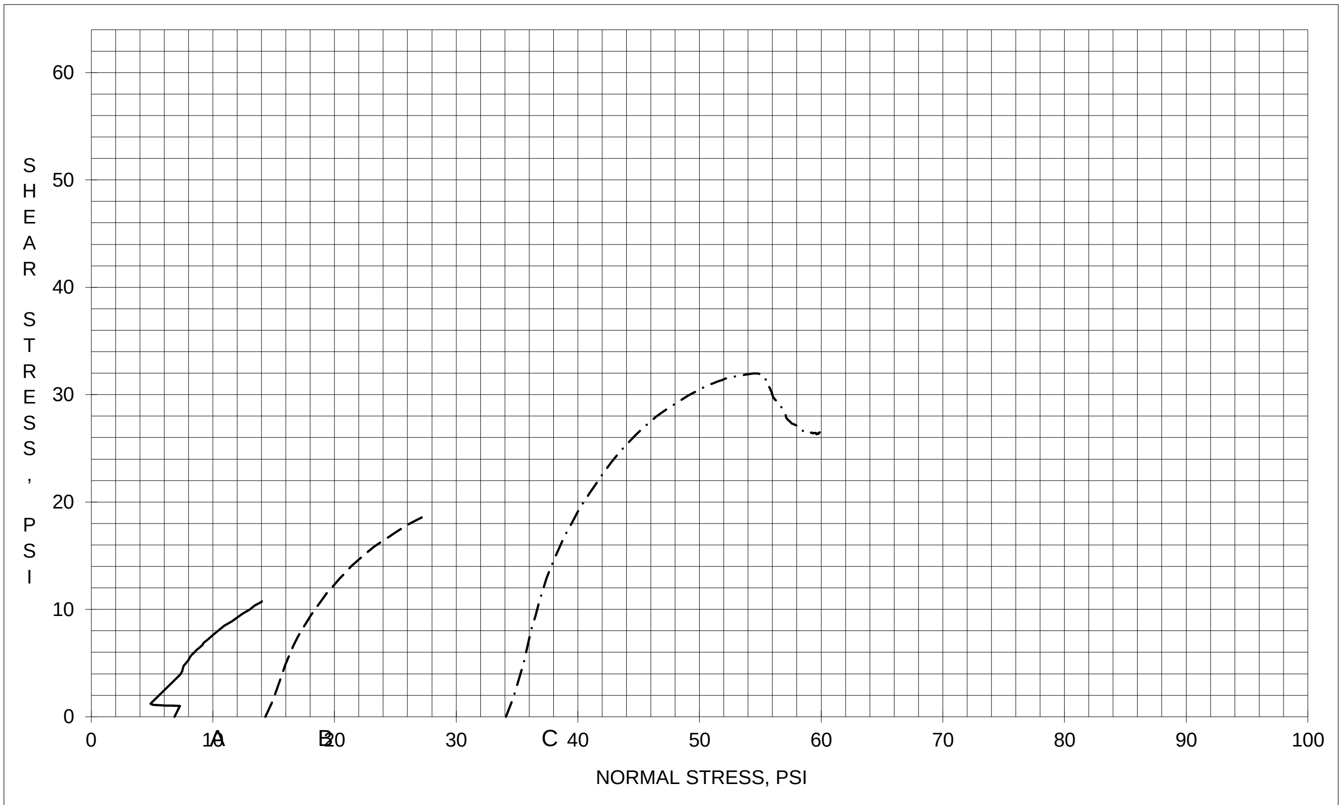


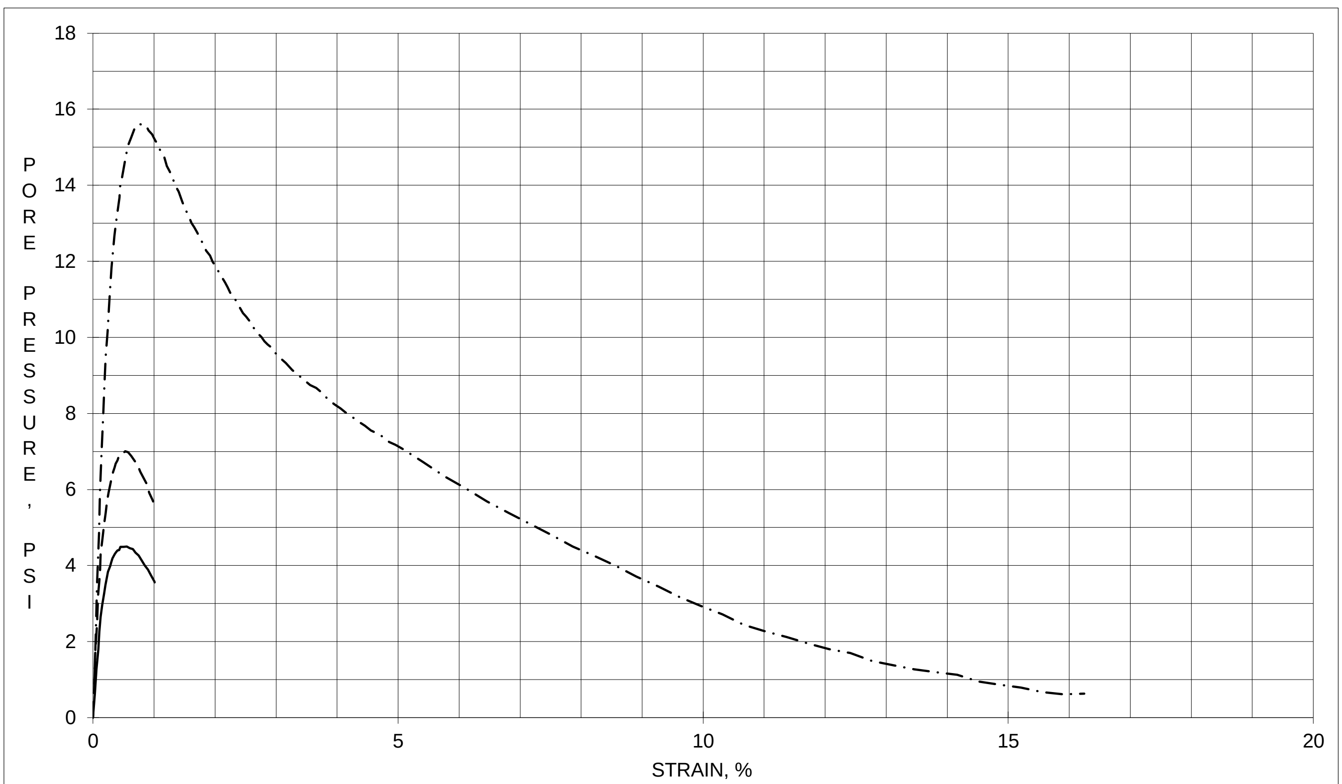


Terracon

8TH STREET WIDENING PROJECT

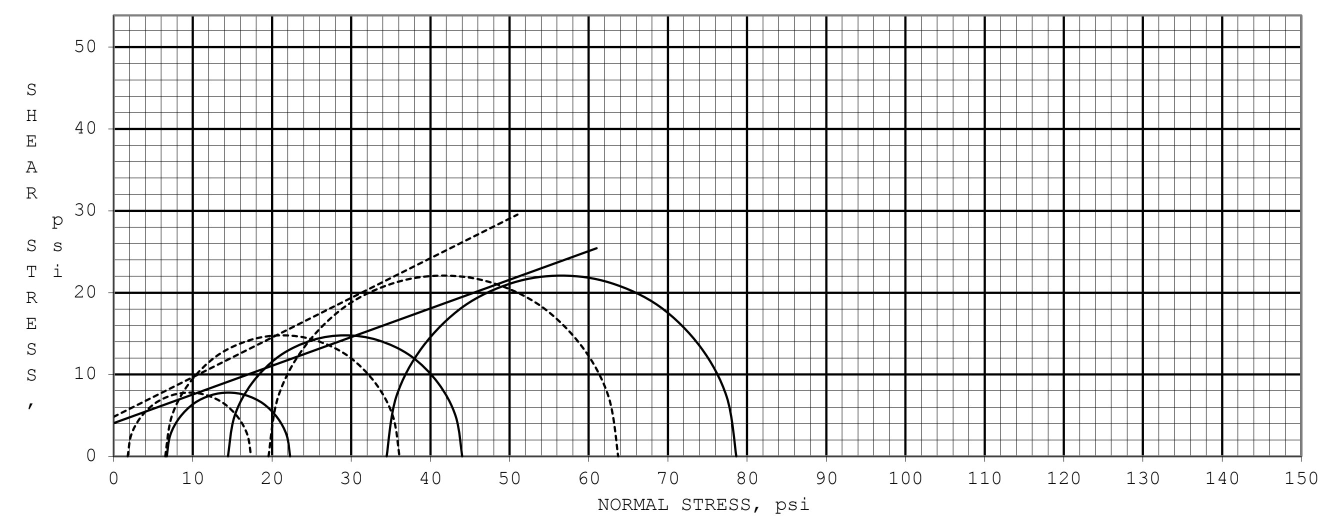
04135111 BT-007 5.0 - 6.5 feet



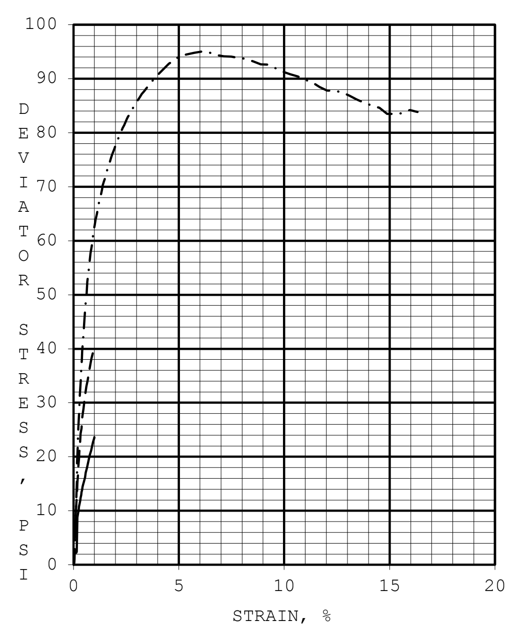


Terracon

N:\Projects\2013\04135111\Working Files\Laboratory-Field Data-Boring Logs\Walls - Lenexa Lab Results\TRIAXIAL TESTS DATA\[04135111 Triaxial CU Staged BT007-3-5.0.xlsx]REPORT



EFFECTIVE STRESS	ANGLE OF INTERNAL FRICTION, deg	**34.8**	COHESION, psi	**4.8**
TOTAL STRESS	ANGLE OF INTERNAL FRICTION, deg	**19.3**	COHESION, psi	**4.1**



SPECIMEN #:		A	B	C
INITIAL	WATER CONTENT, %	19.4	21.7	21.4
	DRY DENSITY, pcf	106.0	106.3	106.8
	SATURATION, %	89	100	100
	VOID RATIO	0.59	0.59	0.58
BEFORE SHEAR	WATER CONTENT, %	21.7	21.4	21.0
	DRY DENSITY, pcf	106.3	106.7	107.5
	SATURATION (B PARAMETER)	1.00	1.00	1.00
	VOID RATIO	0.59	0.58	0.57
	FINAL BACK PRESSURE, psi	100.2	100.0	100.0
MINOR PRINCIPAL STRESS, psi		6.7	14.4	34.5
DEVIATOR STRESS @ 1.0% STRAIN, psi		15.6	29.6	44.2
TIME TO 1.0% STRAIN, min.		8	8	8
ULTIMATE DEVIATOR STRESS, psi		NA	NA	83.5
INITIAL DIAMETER, inch		2.865	2.870	2.872
INITIAL HEIGHT, inch		6.010	5.969	5.936
AREA AFTER CONSOLIDATION, inch2*		6.433	6.445	6.435

CONTROLLED - STRAIN TEST

t_{50} 0.31 min | Strain Rate, %/hr 4.00

DESCRIPTION OF SPECIMENS: LEAN CLAY, 2.5YR 4/4 REDDISH BROWN WITH 7.5YR 6/8 REDDISH YELLOW

LL 46 | PL 23 | PI 23 | Gs 2.7 EST. | SAMPLE TYPE: 3" SHELBY TUBE | TEST TYPE: $\overline{CU}$

REMARKS:

MOHR'S CIRCLES DRAWN AT 1% STRAIN

SAMPLE WAS STAGE LOADED

EFFECTIVE STRENGTH PARAMETERS CALCULATED BASED ON PEAK SHEAR STRESS VALUES (p-q DIAGRAM)

* SECTION 10.2.2.1 METHOD A

PROJECT: 8TH STREET WIDENING PROJECT
RETAINING WALLS 04135111

BORING #: BW-511

SAMPLE #: 3

DEPTH OR ELEV.: 5.0 - 7.0 feet

LABORATORY: TERRACON - LENEXA | DATE: 2/24/2014

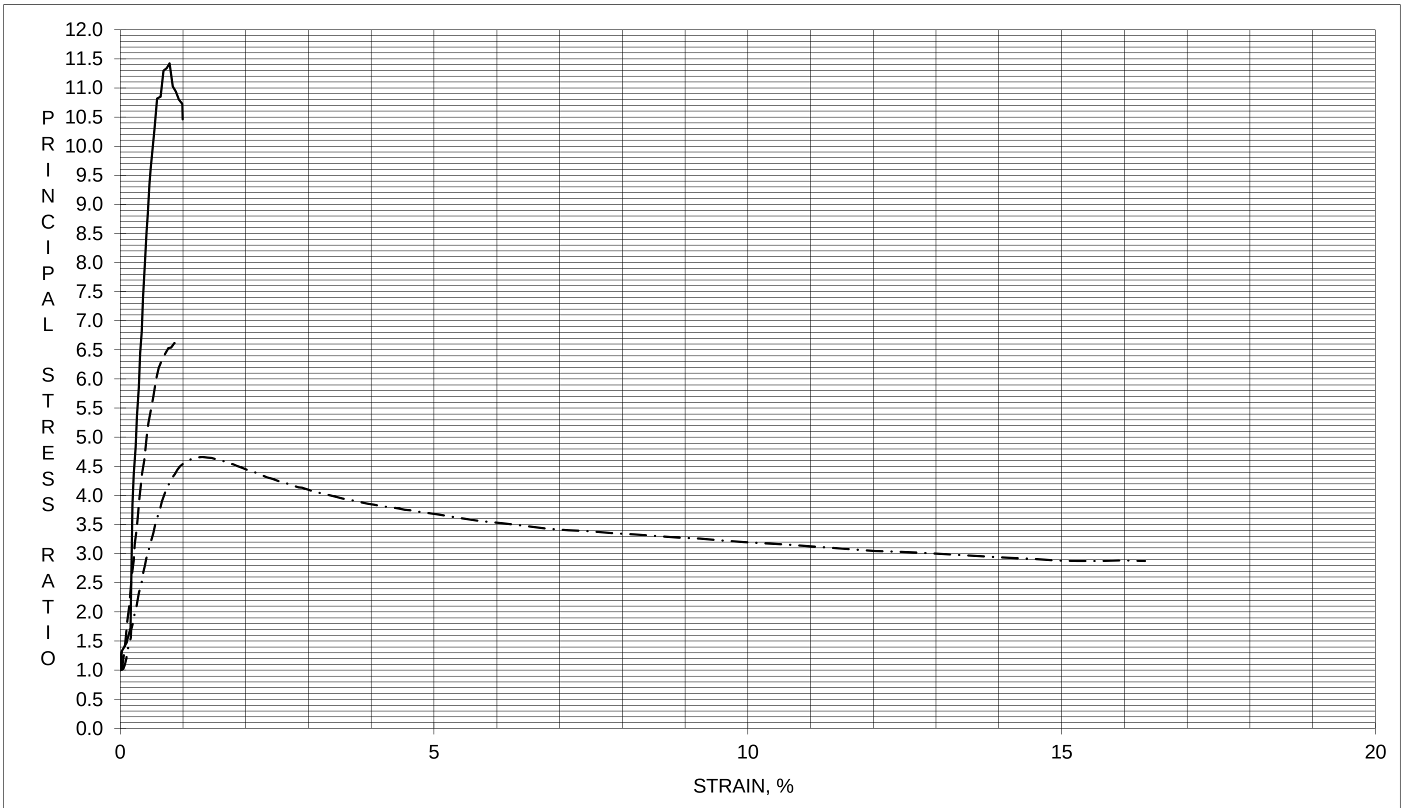
TRIAXIAL COMPRESSION TEST REPORT

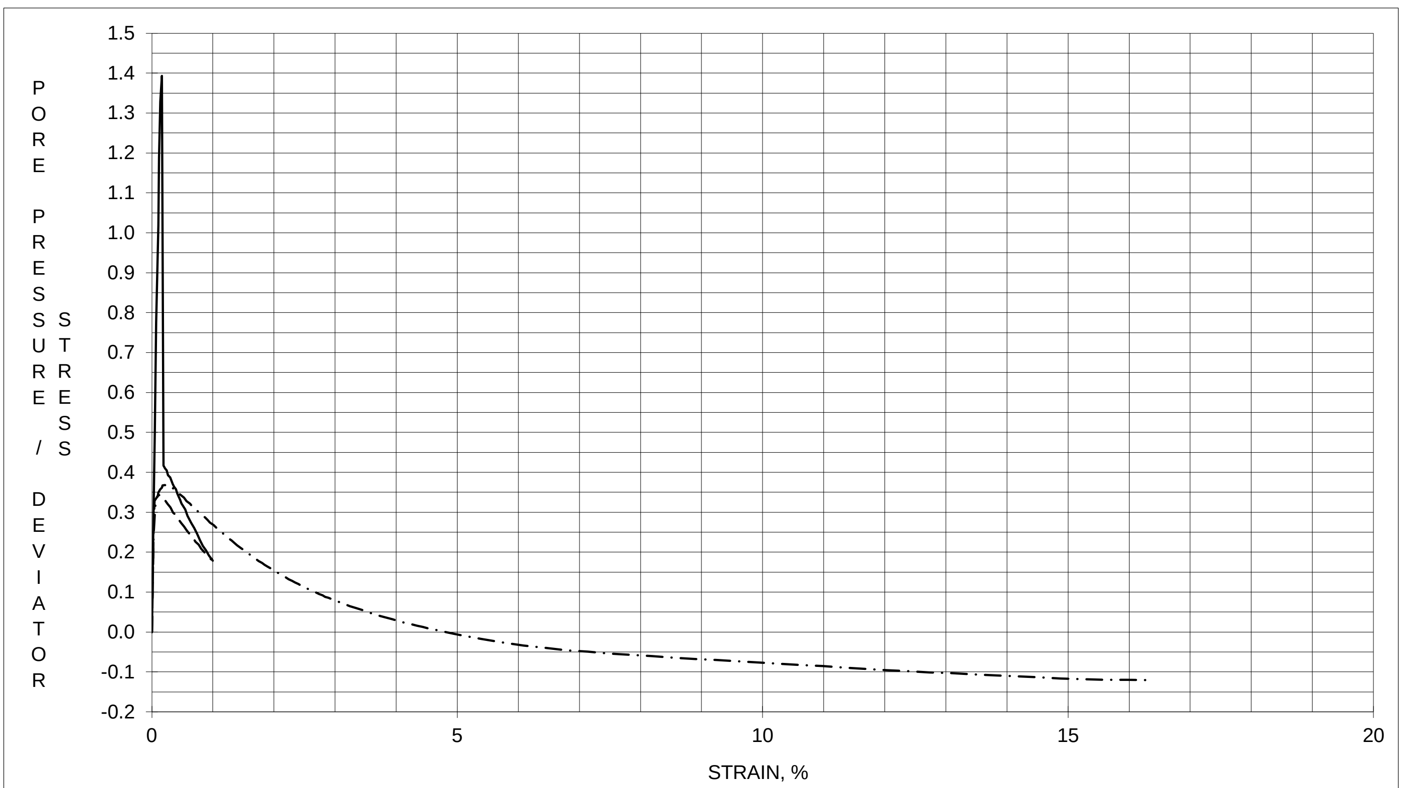
PROCEDURE: ASTM D4767, CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS (TERRACON MODIFIED FOR STAGE LOADING)

Terracon

8TH STREET WIDENING PROJECT

04135111 BW-511 5.0 - 7.0 feet

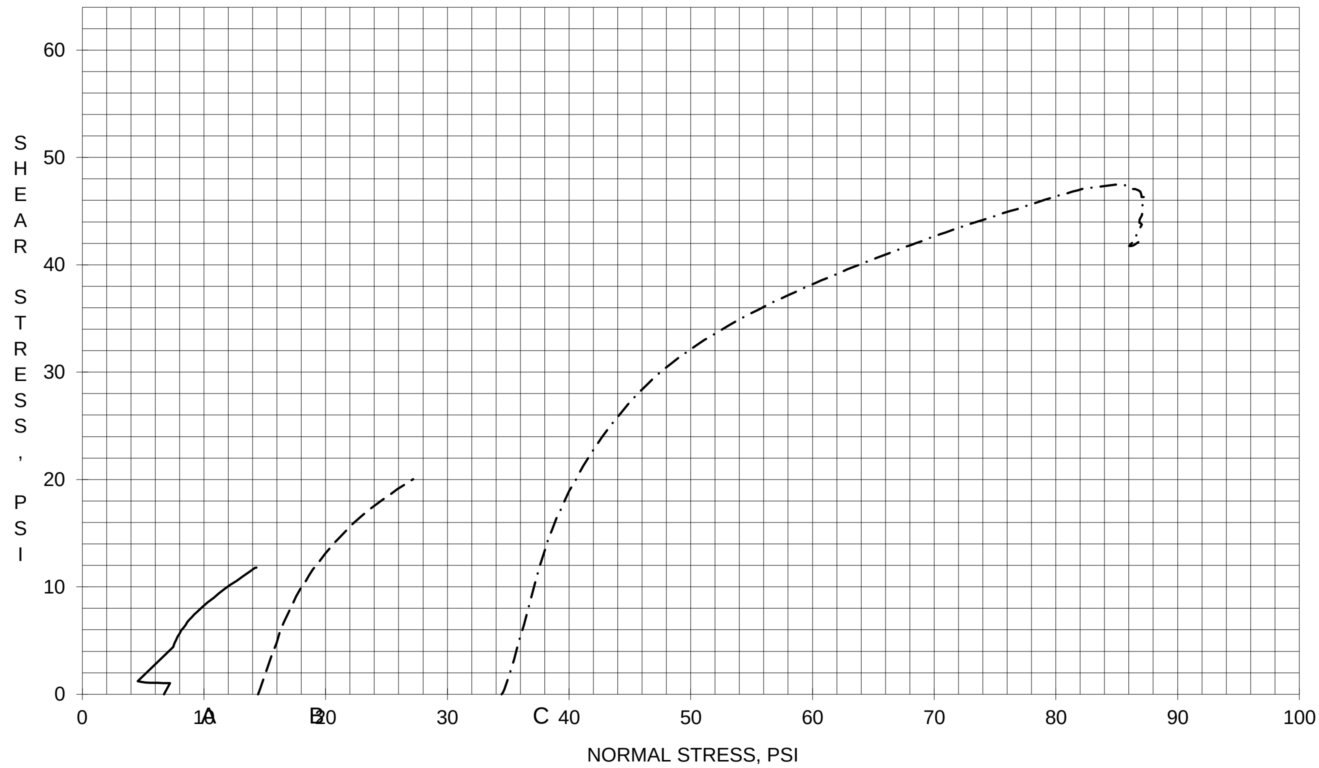


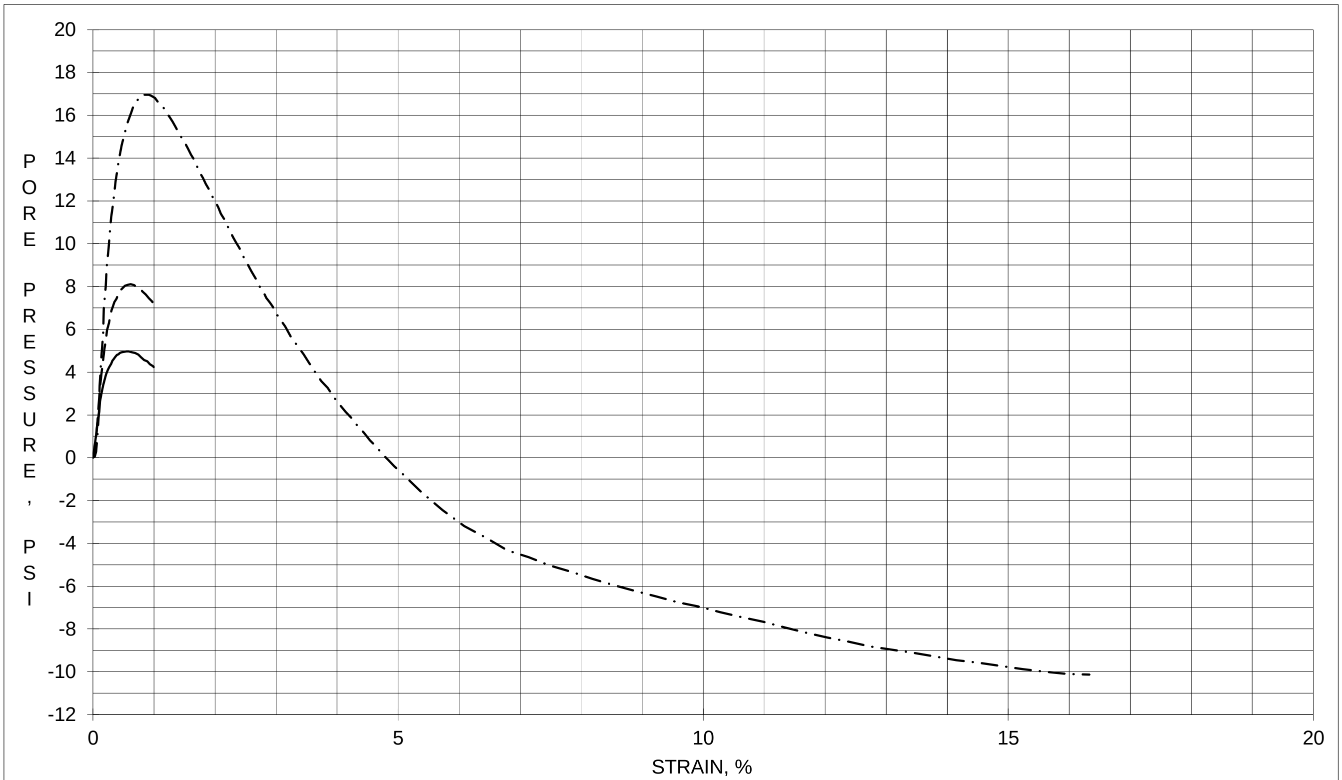


Terracon

8TH STREET WIDENING PROJECT

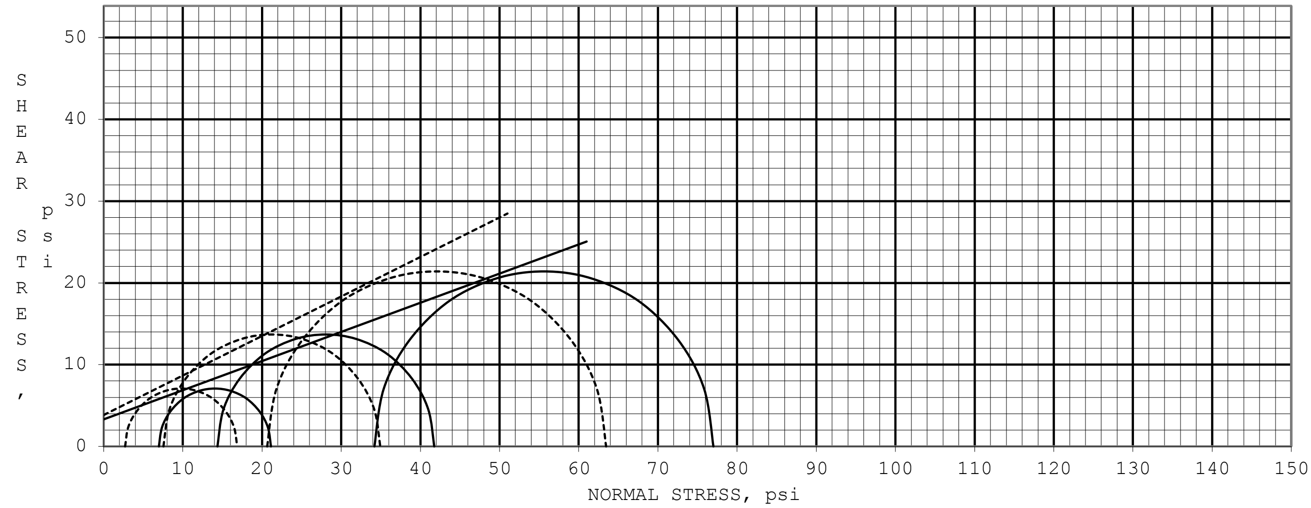
04135111 BW-511 5.0 - 7.0 feet



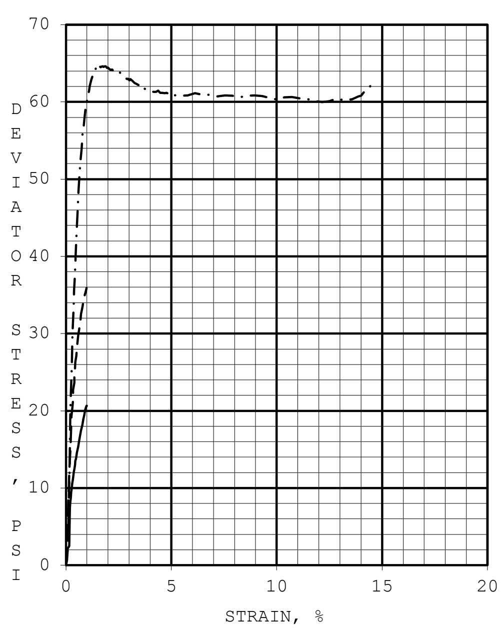


Terracon

N:\Projects\2013\04135111\Working Files\Laboratory-Field Data-Boring Logs\Walls - Lenexa Lab Results\TRIAXIAL TESTS DATA\[04135111 Triaxial CU Staged BW511-3-5.0.xlsx]REPORT



EFFECTIVE STRESS	ANGLE OF INTERNAL FRICTION, deg	**33.4**	COHESION, psi	**3.6**
TOTAL STRESS	ANGLE OF INTERNAL FRICTION, deg	**19.6**	COHESION, psi	**3.3**



SPECIMEN #:		A	B	C
INITIAL	WATER CONTENT, %	19.8	22.0	21.5
	DRY DENSITY, pcf	105.7	106.2	106.7
	SATURATION, %	90	101	100
	VOID RATIO	0.60	0.59	0.58
BEFORE SHEAR	WATER CONTENT, %	22.0	21.5	21.0
	DRY DENSITY, pcf	105.7	106.7	107.5
	SATURATION (B PARAMETER)	1.00	1.00	1.00
	VOID RATIO	0.59	0.58	0.57
	FINAL BACK PRESSURE, psi	99.7	99.7	99.7
MINOR PRINCIPAL STRESS, psi		7.0	14.4	34.2
DEVIATOR STRESS @ 1.0% STRAIN, psi		14.1	27.4	42.8
TIME TO 1.0% STRAIN, min.		8	8	8
ULTIMATE DEVIATOR STRESS, psi		NA	NA	60.6
INITIAL DIAMETER, inch		2.831	2.835	2.836
INITIAL HEIGHT, inch		5.866	5.819	5.787
AREA AFTER CONSOLIDATION, inch2*		6.303	6.281	6.290

CONTROLLED - STRAIN TEST

t_{50} 0.42 min | Strain Rate, %/hr 4.00

DESCRIPTION OF SPECIMENS: FAT CLAY, 10YR 4/6 DARK YELLOWISH BROWN WITH 10YR 5/1 GRAY

LL 52	PL 21	PI 31	Gs 2.7 EST.	SAMPLE TYPE: 3" SHELBY TUBE	TEST TYPE: $\overline{CU}$

REMARKS:

MOHR'S CIRCLES DRAWN AT 1% STRAIN

SAMPLE WAS STAGE LOADED

EFFECTIVE STRENGTH PARAMETERS CALCULATED BASED ON PEAK SHEAR STRESS VALUES (p-q DIAGRAM)

* SECTION 10.2.2.1 METHOD A

PROJECT: 8 TH STREET WIDENING PROJECT
RETAINING WALLS 04135111

BORING #: BW-809

SAMPLE #: 3

DEPTH OR ELEV.: 5.0 - 7.0 feet

LABORATORY: TERRACON - LENEXA | DATE: 2/24/2014

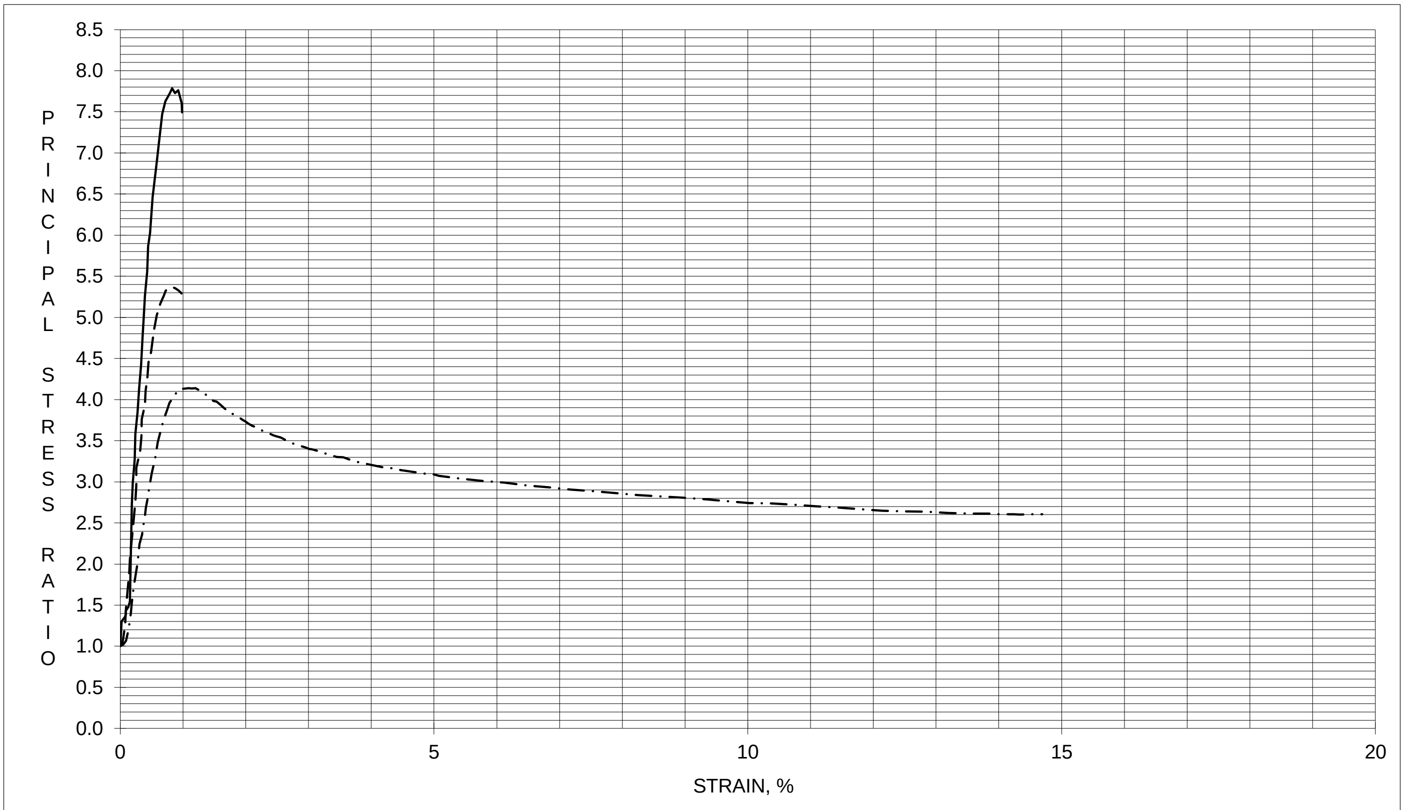
TRIAXIAL COMPRESSION TEST REPORT

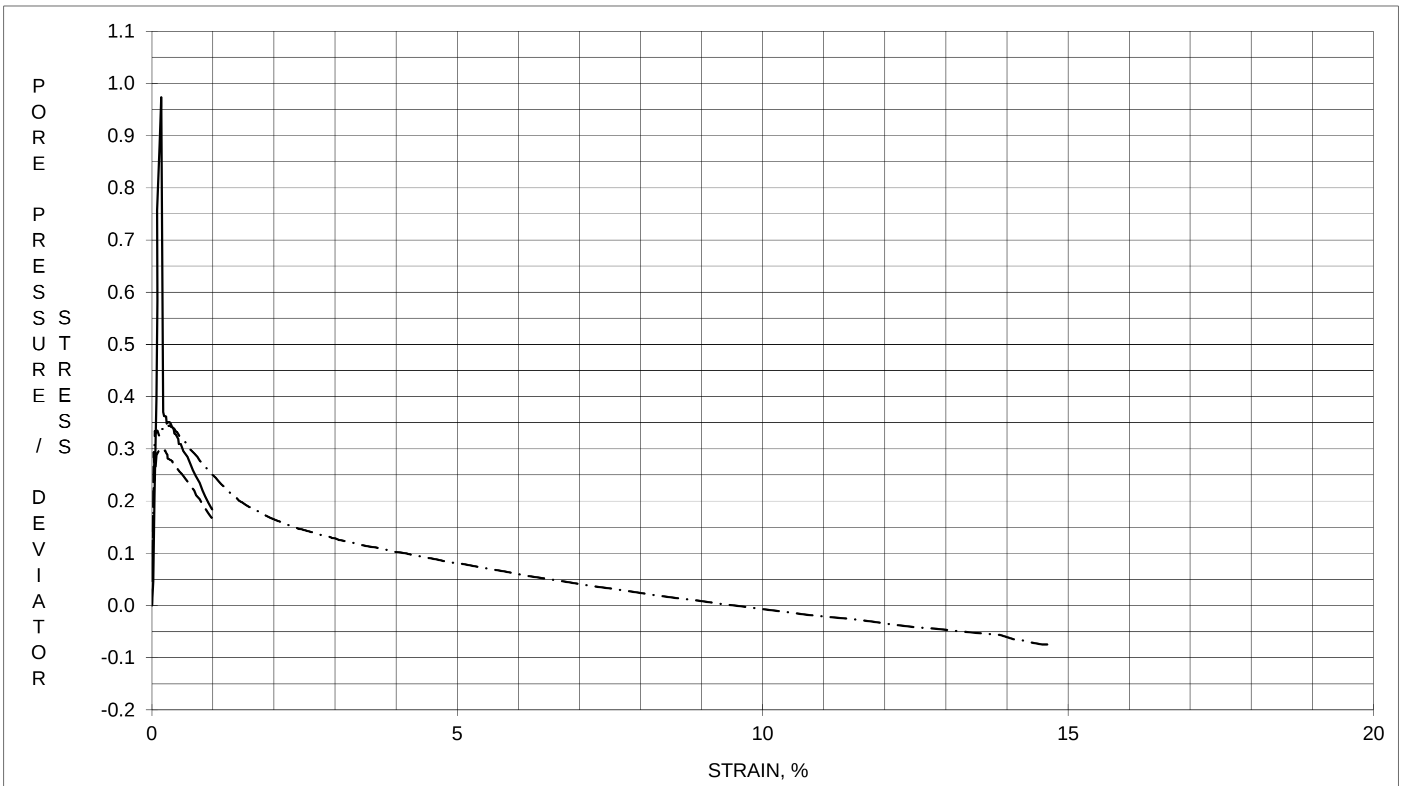
PROCEDURE: ASTM D4767, CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST ON COHESIVE SOILS (TERRACON MODIFIED FOR STAGE LOADING)

Terracon

8 TH STREET WIDENING PROJECT

04135111 BW-809 5.0 - 7.0 feet

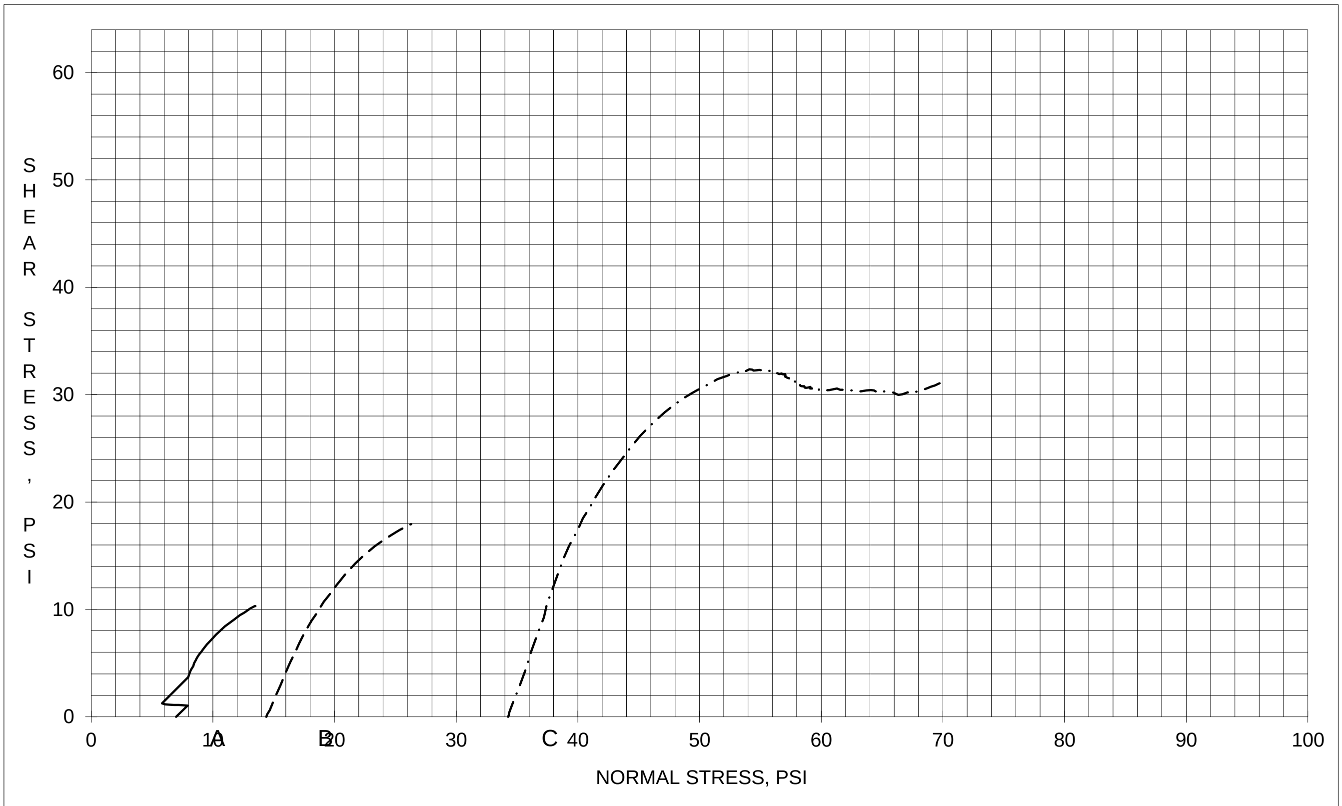


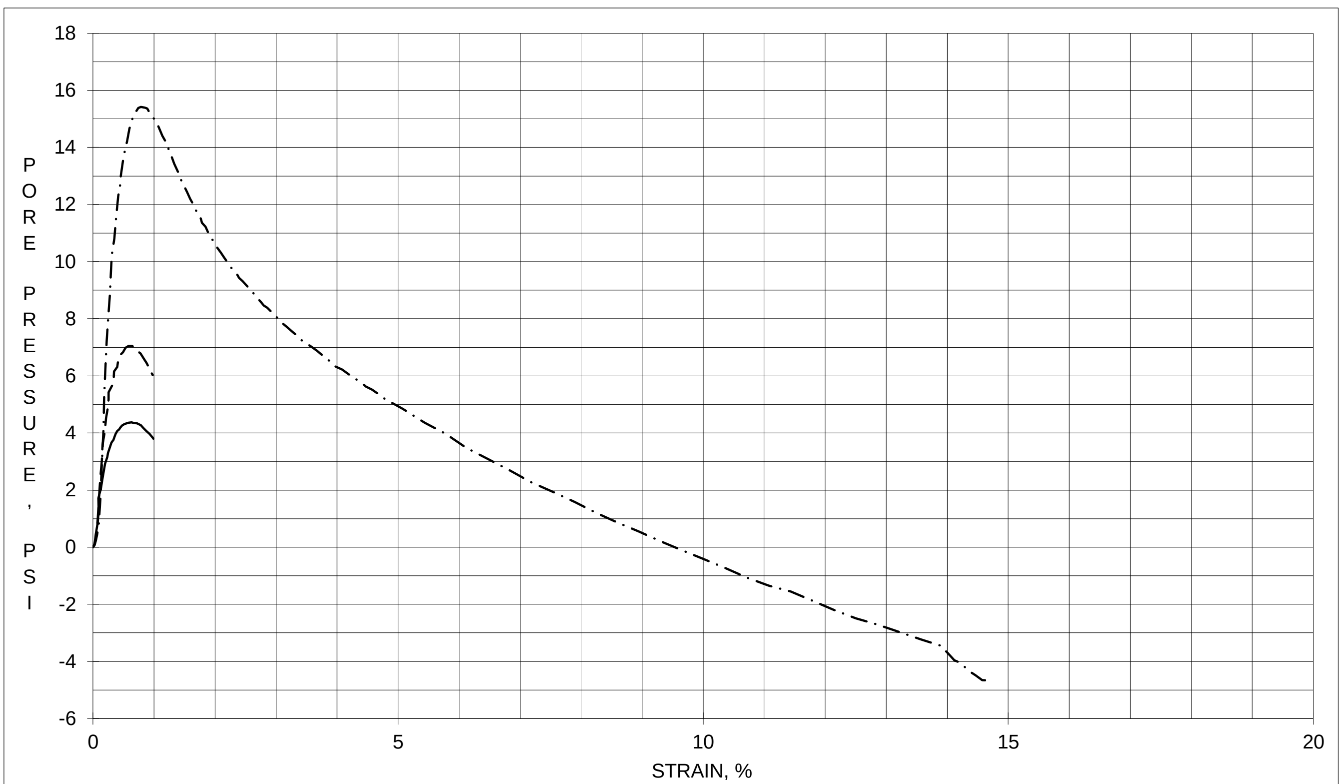


Terracon

8 TH STREET WIDENING PROJECT

04135111 BW-809 5.0 - 7.0 feet





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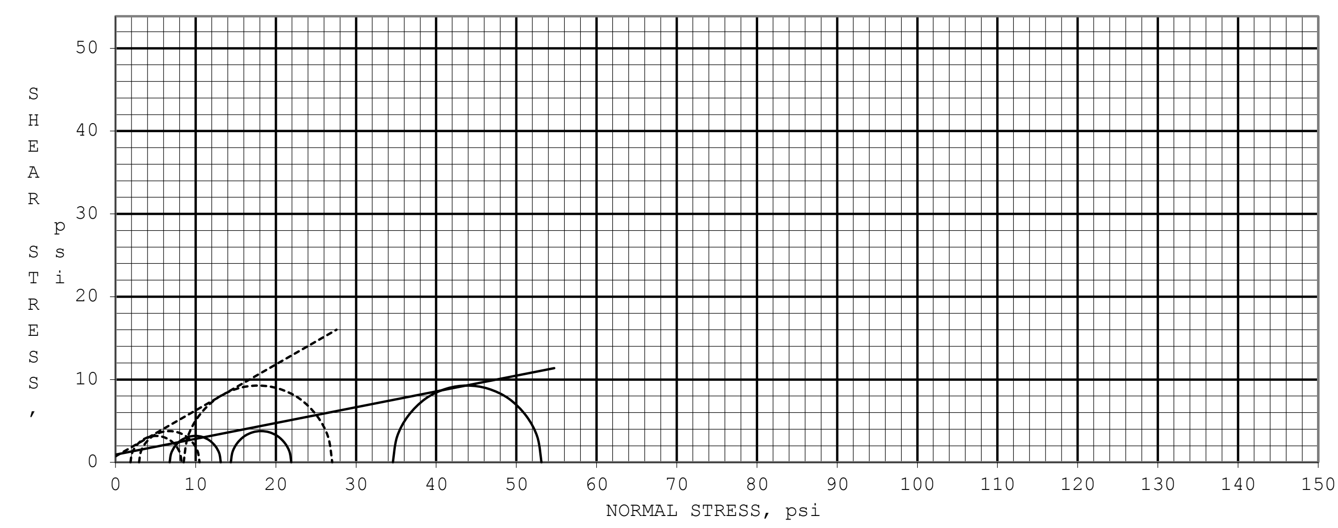
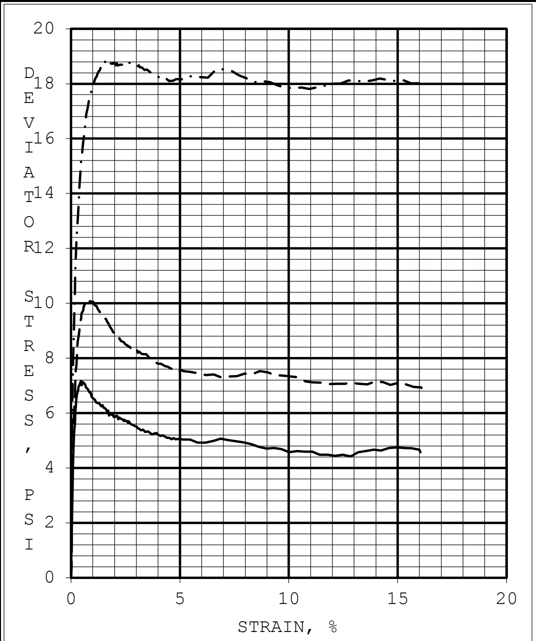


EFFECTIVE STRESS ---	ANGLE OF INTERNAL FRICTION, deg	**29.0**	COHESION, psi	**0.7**
TOTAL STRESS ——	ANGLE OF INTERNAL FRICTION, deg	**10.8**	COHESION, psi	**0.9**



SPECIMEN ID:		A	B	C
INITIAL	WATER CONTENT, %	21.9	22.0	21.9
INITIAL	DRY DENSITY, pcf	89.9	89.9	90.1
INITIAL	SATURATION, %	67	68	68
INITIAL	VOID RATIO	0.88	0.87	0.87
BEFORE SHEAR	WATER CONTENT, %	31.9	30.7	27.3
BEFORE SHEAR	DRY DENSITY, pcf	90.5	92.1	97.0
BEFORE SHEAR	SATURATION (B PARAMETER)	0.95	0.95	0.98
BEFORE SHEAR	VOID RATIO	0.86	0.83	0.74
BEFORE SHEAR	FINAL BACK PRESSURE, psi	101.3	101.3	101.1
MINOR PRINCIPAL STRESS, psi		6.8	14.4	34.6
EFFECTIVE STRESS PEAK AT % STRAIN		1.2	8.7	7.0
EFF. DEVIATOR STRESS AT PEAK STRAIN, psi		6.4	7.5	18.5
TOTAL STRESS PEAK AT % STRAIN		1.2	8.7	7.0
TOTAL DEVIATOR STRESS AT PEAK STRAIN, psi		6.4	7.5	18.5
ULTIMATE DEVIATOR STRESS (15% STR), psi		4.7	7.0	18.1
TIME TO 50% PRIMARY CONSOLIDATION, min		0.31	0.42	0.38
STRAIN RATE, % / hour		5.34	5.36	5.43
INITIAL DIAMETER, inch		2.006	2.005	2.004
INITIAL HEIGHT, inch		4.013	4.011	4.007
AREA AFTER CONSOLIDATION, inch2		3.146	3.106	2.997

CONTROLLED - STRAIN TEST

SAMPLE TYPE: RE-COMPACTED

DESCRIPTION OF SPECIMENS:
CLAYEY GRAVEL WITH SAND, 2.5YR 4/4
REDDSIH BROWN

LL 67	PL 24	PI 43	Gs 2.7 EST.

PROJECT NO. 04135111

PROJECT: 8TH STREET WIDENING PROJECT
RETAINING WALLS

BORING #: BW-902

LABORATORY: TERRACON - LENEXA

SAMPLE #: BULK

DATE: 5/14/2014

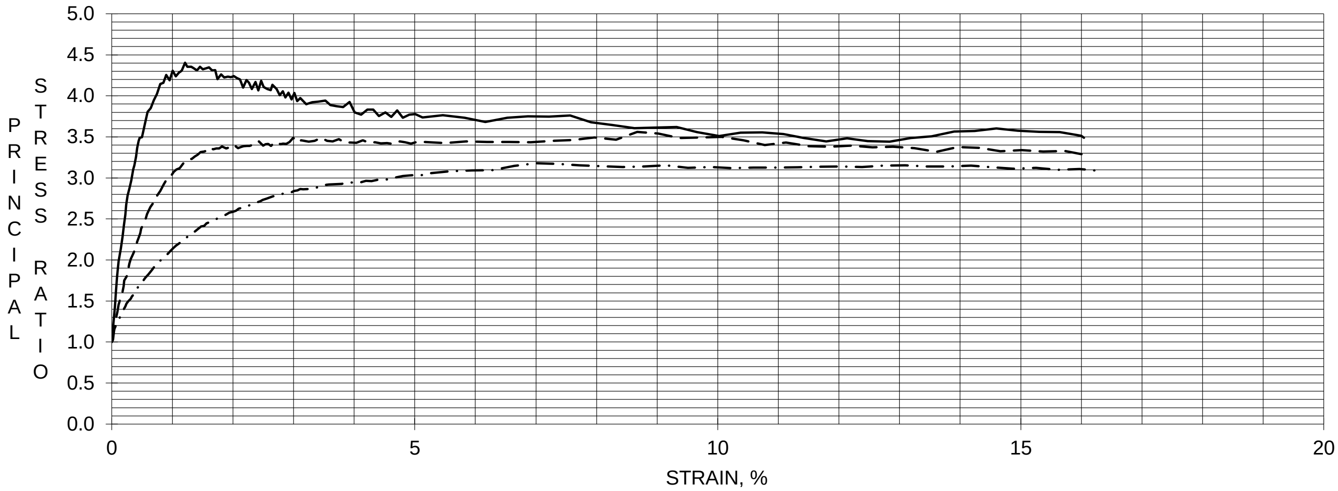
DEPTH, feet: 6.0 - 10.0

PROCEDURE: ASTM D4767, CONSOLIDATED-UNDRAINED TRIAXIAL
COMPRESSION TEST ON COHESIVE SOILS

Terracon

8TH STREET WIDENING PROJECT

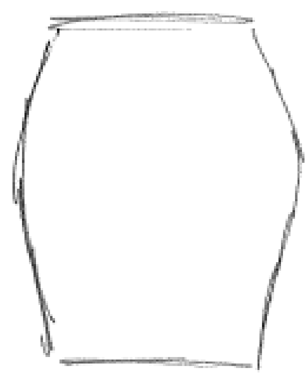
04135111	BW-902	BULK	6.0 - 10.0



FAILURE SKETCH

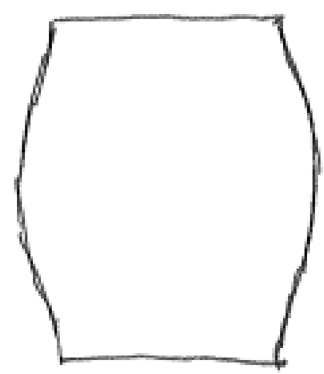
SPECIMEN A

FAILURE SKETCH



SPECIMEN B

FAILURE SKETCH



SPECIMEN C

REMARKS:

SPECIMENS SATURATED BY THE WET METHOD.

EFFECTIVE STRESS FAILURE DATA BASED ON PEAK PRINCIPAL STRESS RATIO % STRAIN.

EFFECTIVE STRESS MOHR'S CIRCLES DRAWN AT PEAK PRINCIPAL STRESS RATIO % STRAIN.

TOTAL STRESS FAILURE DATA BASED ON PEAK PRINCIPAL STRESS RATIO % STRAIN.

TOTAL STRESS MOHR'S CIRCLES DRAWN AT PEAK PRINCIPAL STRESS RATIO % STRAIN.

DEVIATOR STRESSES CORRECTED FOR MEMBRANE AND FILTER PAPER EFFECTS.

AREA AFTER CONSOLIDATION CALCULATED AS PER SECTION 10.3.2.1 METHOD A

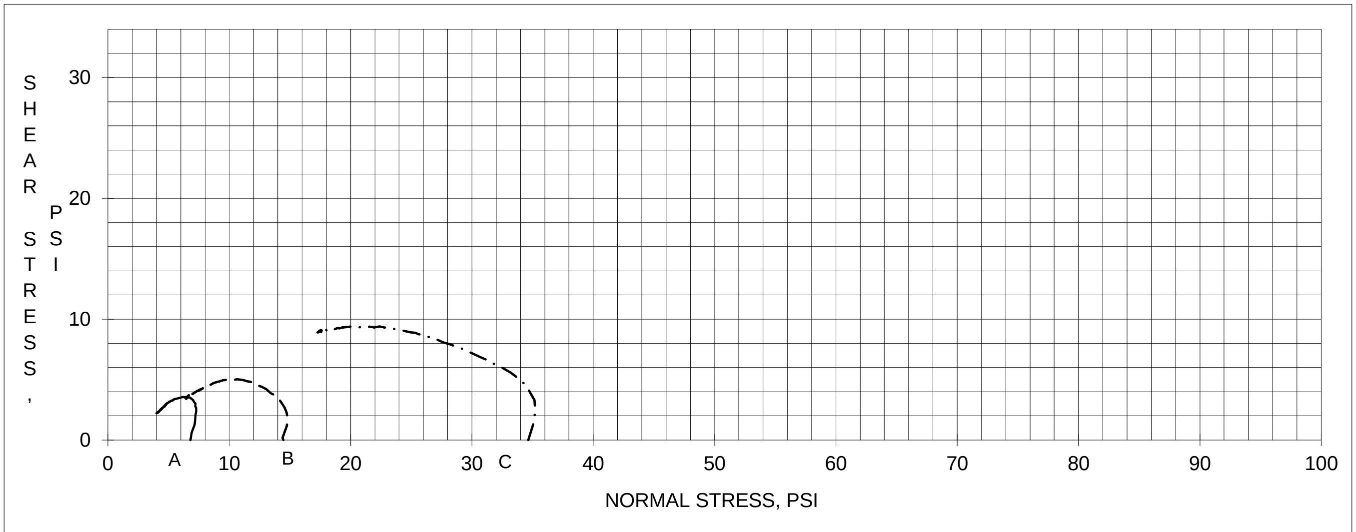
STANDARD PROCTOR = 90pcf @ 22% MOISTURE

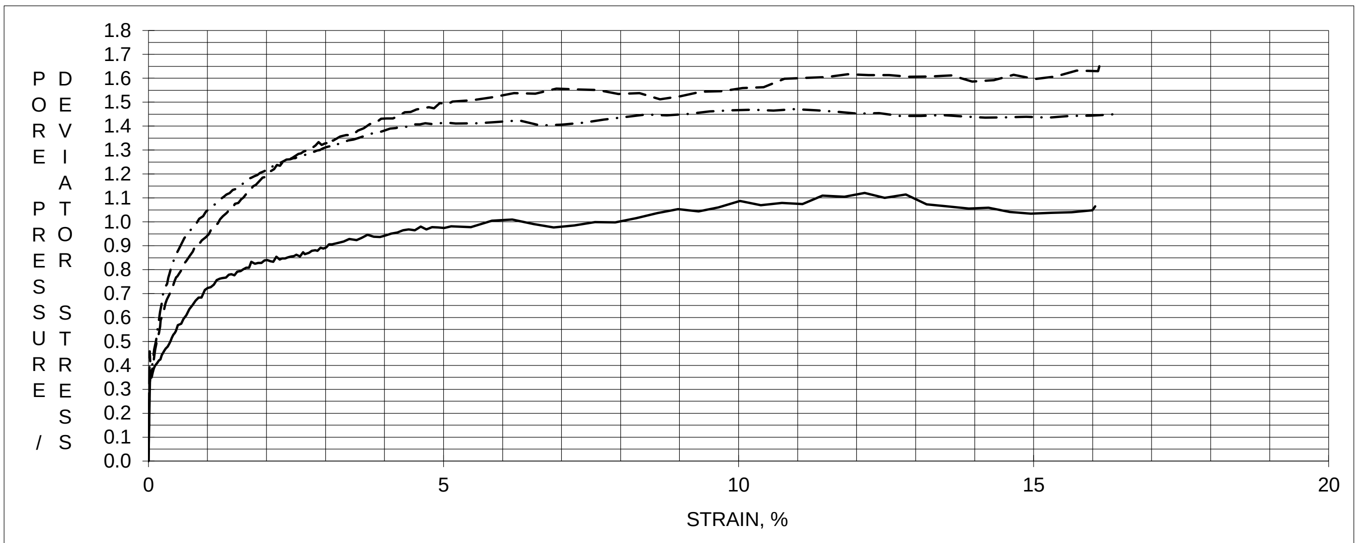
REMOLDED TO 90 pcf @ 21.9% MOISTURE REMOLDED TO 100% COMPACTION

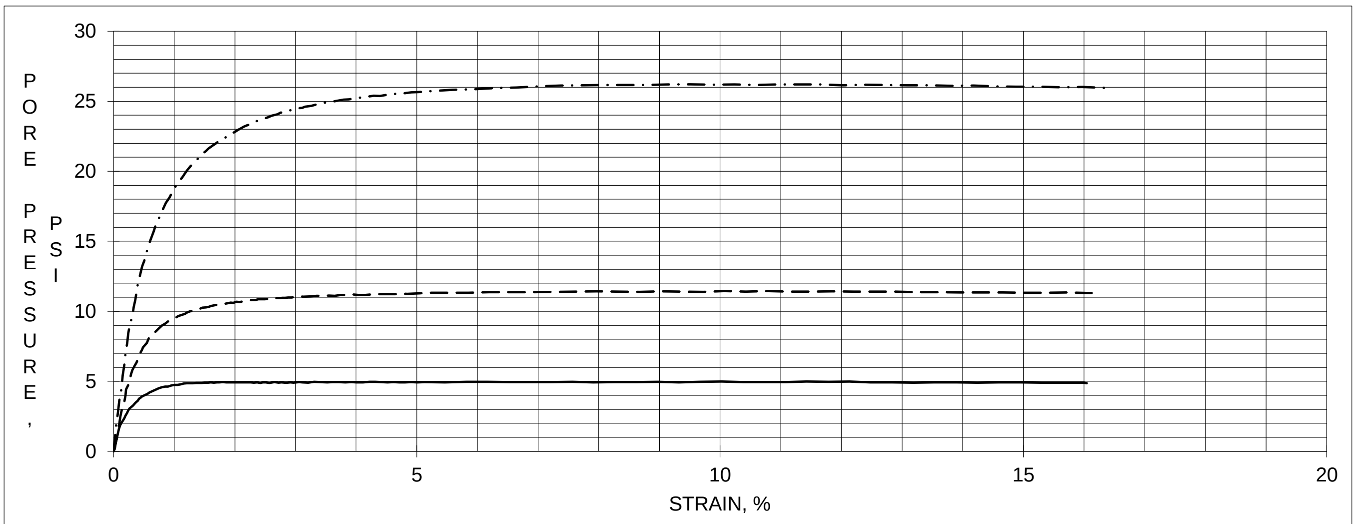
Terracon

8TH STREET WIDENING PROJECT

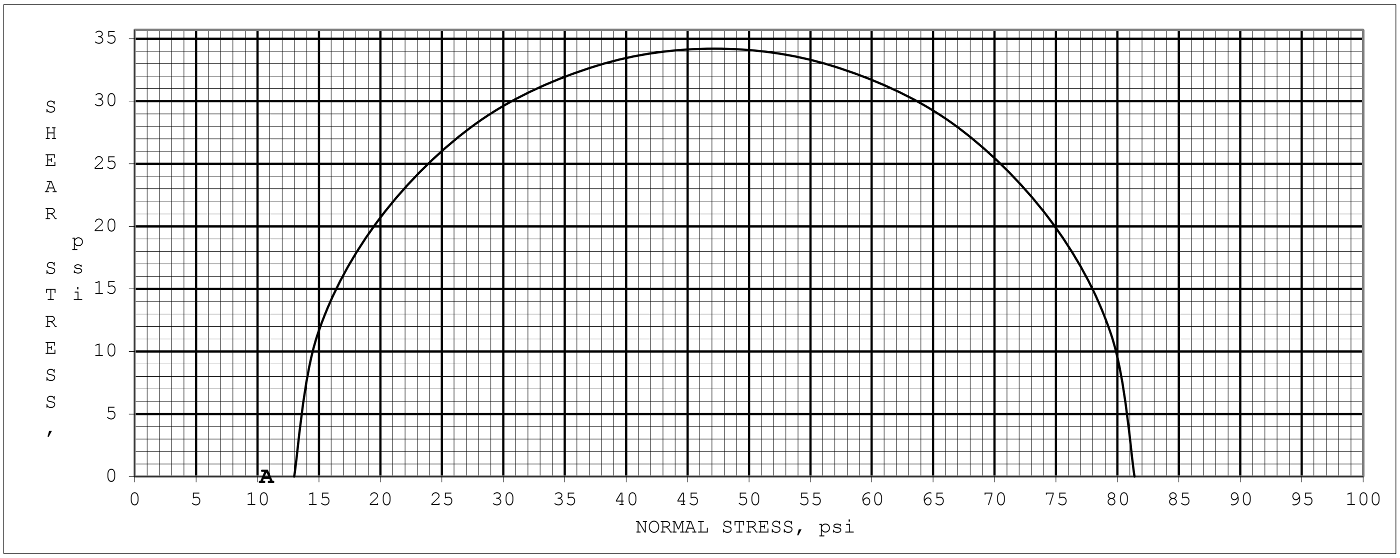
04135111 BW-902 BULK 6.0 - 10.0

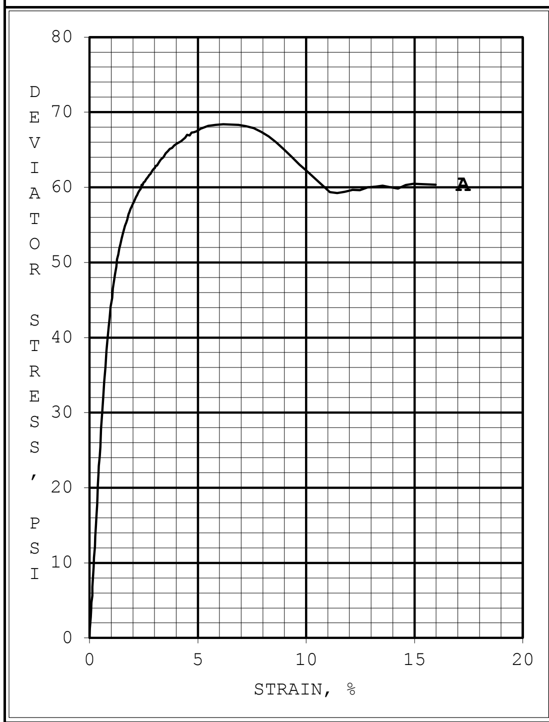






Terracon





SPECIMEN #:		A		
INITIAL	WATER CONTENT, % FROM TRIMMINGS	16.9		
	DRY DENSITY, pcf	113.4		
	SATURATION, %	94		
	VOID RATIO	0.49		
WATER CONTENT, % AFTER SHEAR		17.3		

A B C

MINOR PRINCIPAL STRESS, psi	13.0		
MOHR'S CIRCLES DRAWN AT % STRAIN	6.2		
DEVIATOR STRESS AT % STRAIN, psi	68.4		
STRAIN AT PEAK DEVIATOR STRESS, %	6.2		
DEVIATOR STRESS AT 15% STRAIN, psi	60.5		
INITIAL DIAMETER, inch	2.778		
INITIAL HEIGHT, inch	5.869		
STRAIN RATE, %/minute	0.33		

CONTROLLED - STRAIN TEST

DESCRIPTION OF SPECIMENS: LEAN CLAY WITH SAND, 2.5YR 3/4 DARK REDDISH BROWN WITH 2.5YR 5/1 REDDISH GRAY

LL 49	PL 22	PI 27	Gs 2.7 EST.	SAMPLE TYPE: 3" SHELBY TUBE	TEST TYPE: UU

REMARKS:

PROJECT: 8TH STREET WIDENING PROJECT
RETAINING WALLS 04135111

BORING #: BW-106

SAMPLE #: 4; A

DEPTH, feet: 13.5

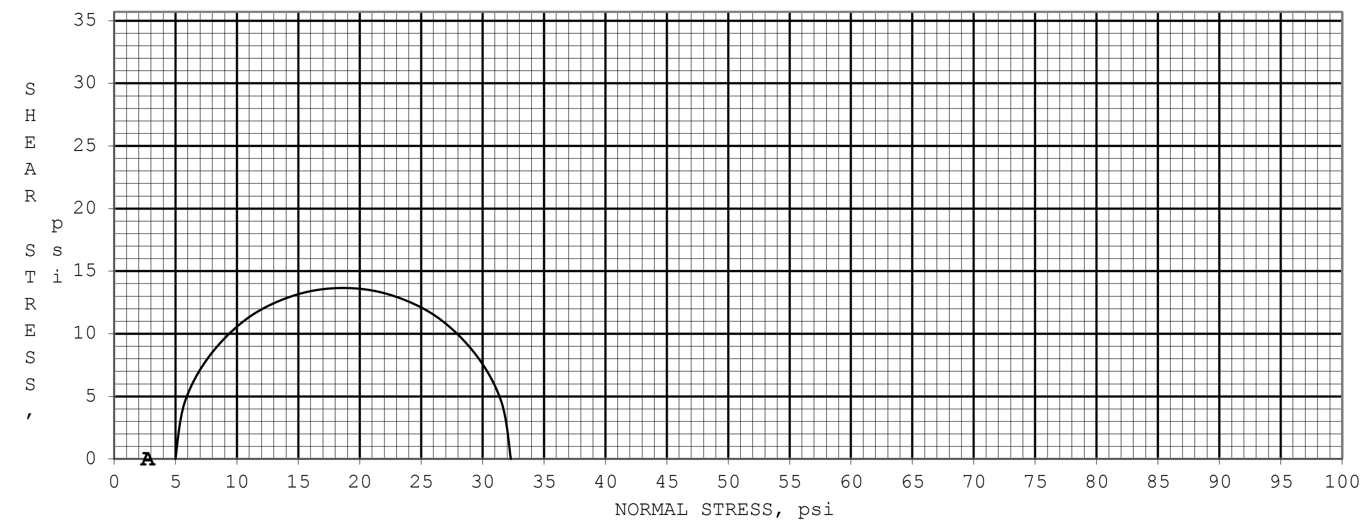
LABORATORY: TERRACON - LENEXA DATE: 2/24/2014

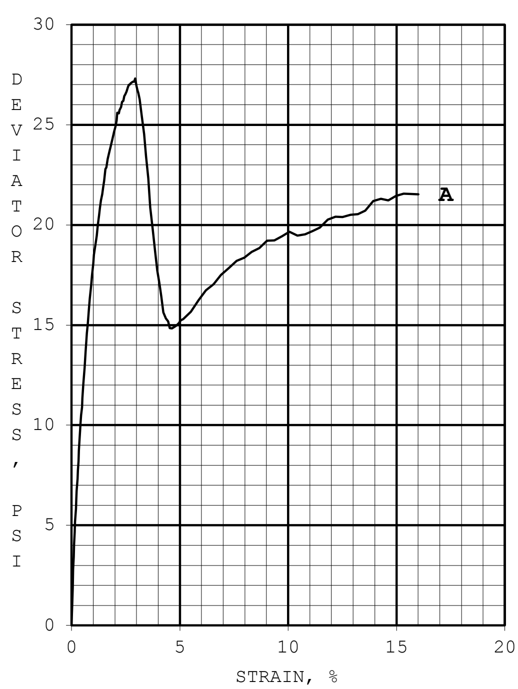
TRIAXIAL COMPRESSION TEST REPORT

PROCEDURE: ASTM D2850, UNCONSOLIDATED, UNDRAINED COMPRESSIVE STRENGTH OF COHESIVE SOILS IN TRIAXIAL COMPRESSION, MEMBRANE CORRECTION APPLIED. OTHER TESTS WERE CONDUCTED IN GENERAL ACCORDANCE WITH ASTMS D2216 AND D4318 IF APPLICABLE.

Terracon

N:\Projects\2013\04135111\Working Files\Laboratory-Field Data-Boring Logs\Walls - Lenexa Lab Results\TRIAXIAL TESTS DATA\[04135111 Triaxial UU BW106-4-13.5.xlsx]REPORT





SPECIMEN #:		A		
INITIAL	WATER CONTENT, % FROM TRIMMINGS	19.4		
	DRY DENSITY, pcf	98.2		
	SATURATION, %	73		
	VOID RATIO	0.72		
WATER CONTENT, % AFTER SHEAR		21.0		

A

B

C

MINOR PRINCIPAL STRESS, psi	5.0		
MOHR'S CIRCLES DRAWN AT % STRAIN	2.9		
DEVIATOR STRESS AT % STRAIN, psi	27.3		
STRAIN AT PEAK DEVIATOR STRESS, %	2.9		
DEVIATOR STRESS AT 15% STRAIN, psi	21.5		
INITIAL DIAMETER, inch	2.780		
INITIAL HEIGHT, inch	5.880		
STRAIN RATE, %/minute	0.33		

CONTROLLED - STRAIN TEST

DESCRIPTION OF SPECIMENS: LEAN CLAY WITH SAND, 10YR 4/6 DARK YELLOWISH BROWN WITH 10YR 5/3 BROWN

LL	PL	PI	Gs	SAMPLE TYPE:	TEST TYPE:
39	20	19	2.7 EST.	3" SHELBY TUBE	UU

REMARKS:

PROJECT: 8TH STREET WIDENING PROJECT
RETAINING WALLS 04135111

BORING #: BW-503

SAMPLE #: 3; A

DEPTH, feet: 5.0 - 7.0

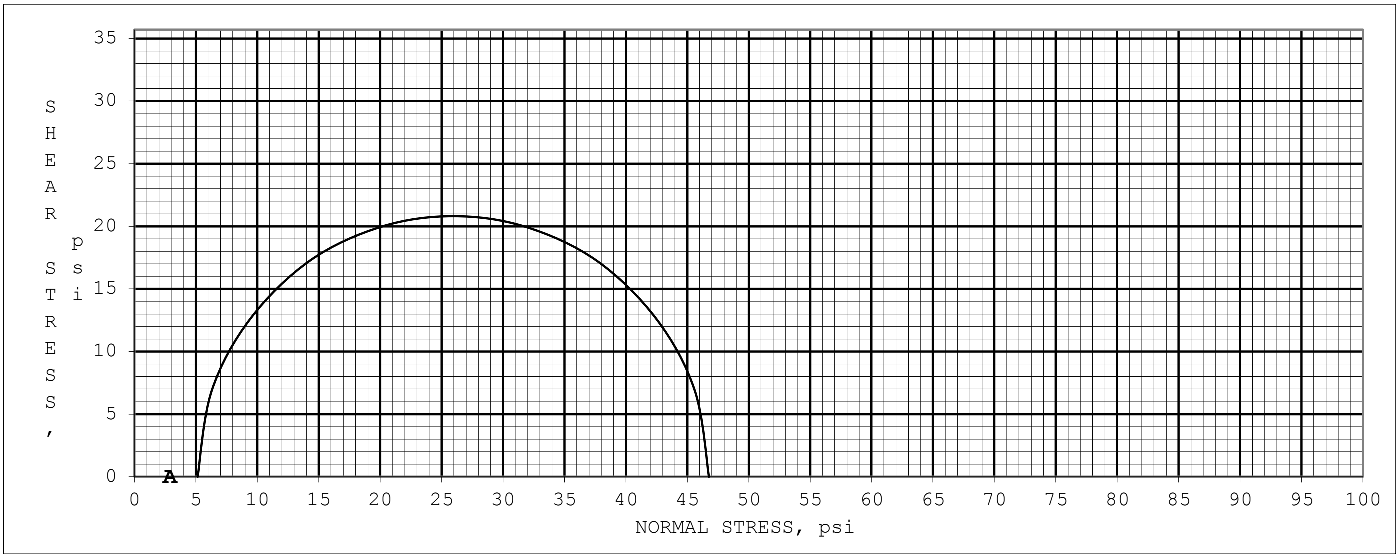
LABORATORY: TERRACON - LENEXA

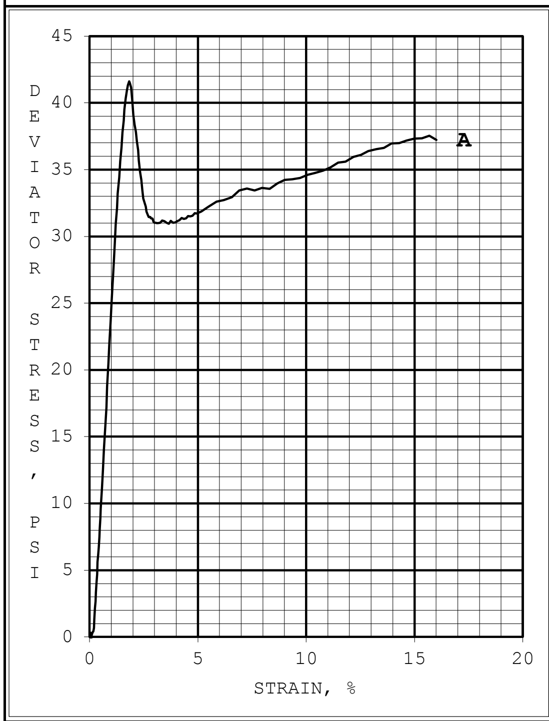
DATE: 2/24/2014

TRIAXIAL COMPRESSION TEST REPORT

PROCEDURE: ASTM D2850, UNCONSOLIDATED, UNDRAINED COMPRESSIVE STRENGTH OF COHESIVE SOILS IN TRIAXIAL COMPRESSION, MEMBRANE CORRECTION APPLIED. OTHER TESTS WERE CONDUCTED IN GENERAL ACCORDANCE WITH ASTMS D2216 AND D4318 IF APPLICABLE.

Terracon





SPECIMEN #:		A		
INITIAL	WATER CONTENT, % FROM TRIMMINGS	21.2		
INITIAL	DRY DENSITY, pcf	99.5		
INITIAL	SATURATION, %	82		
INITIAL	VOID RATIO	0.69		
WATER CONTENT, % AFTER SHEAR		21.6		

A

B

C

MINOR PRINCIPAL STRESS, psi	5.1		
MOHR'S CIRCLES DRAWN AT % STRAIN	1.8		
DEVIATOR STRESS AT % STRAIN, psi	41.6		
STRAIN AT PEAK DEVIATOR STRESS, %	1.8		
DEVIATOR STRESS AT 15% STRAIN, psi	37.3		
INITIAL DIAMETER, inch	2.790		
INITIAL HEIGHT, inch	5.817		
STRAIN RATE, %/minute	0.33		

CONTROLLED - STRAIN TEST

DESCRIPTION OF SPECIMENS: LEAN CLAY, 7.5YR 4/6 STRONG BROWN WITH 7.5YR 5/1 GRAY

LL 47 | PL 20 | PI 27 | Gs 2.7 EST. | SAMPLE TYPE: 3" SHELBY TUBE | TEST TYPE: UU

REMARKS:

PROJECT: 8TH STREET WIDENING PROJECT
RETAINING WALLS 04135111

BORING #: BW-801

SAMPLE #: 3; A

DEPTH, feet: 5.0 - 6.0

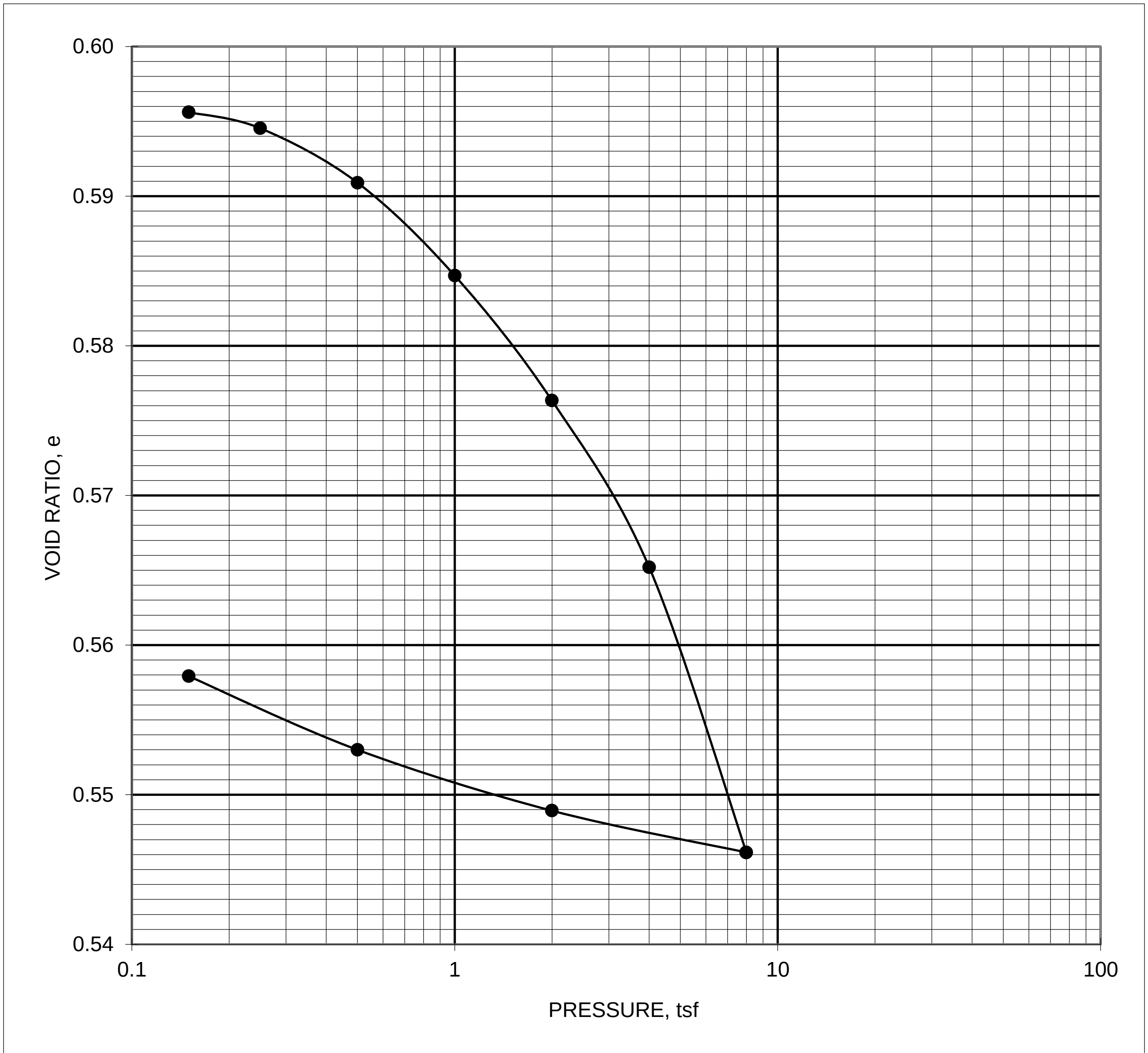
LABORATORY: TERRACON - LENEXA | DATE: 2/24/2014

TRIAXIAL COMPRESSION TEST REPORT

PROCEDURE: ASTM D2850, UNCONSOLIDATED, UNDRAINED COMPRESSIVE STRENGTH OF COHESIVE SOILS IN TRIAXIAL COMPRESSION, MEMBRANE CORRECTION APPLIED. OTHER TESTS WERE CONDUCTED IN GENERAL ACCORDANCE WITH ASTMS D2216 AND D4318 IF APPLICABLE.

Terracon

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF COHESIVE SOILS
ASTM D2435



DIAMETER, mm	63.59	HEIGHT, mm	18.94	PROPERTY		BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, tsf		0.36		MOISTURE, %		17.3	19.1
PRECONSOL. PRESSURE, tsf		2.11		DRY DENSITY, pcf		105.6	108.6
OVER CONSOLIDATION RATIO		5.9		SATURATION, %		78	93
COMPRESSION INDEX		0.06		VOID RATIO		0.596	0.558
REBOUND INDEX		0.008		SAMPLE TYPE		UNDISTURBED	
LIQUID LIMIT	39	PLASTIC LIMIT	19	PLASTICITY INDEX	20	SPECIFIC GRAVITY	2.7 ESTIMATED
SAMPLE DESCRIPTION	LEAN CLAY WITH SAND, 2.5YR 4/4 REDDISH BROWN WITH 10YR 5/6 YELLOWISH BROWN						
BORING NO.	BT-007	SAMPLE NO.	3	DEPTH, feet	5.0 - 6.5		

8TH STREET WIDENING PROJECT
RETAINING WALLS
04135111
2/24/2014

TESTED BY

APPROVED BY

Terracon

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8TH STREET WIDENING PROJECT
RETAINING WALLS
04135111
2/24/2014

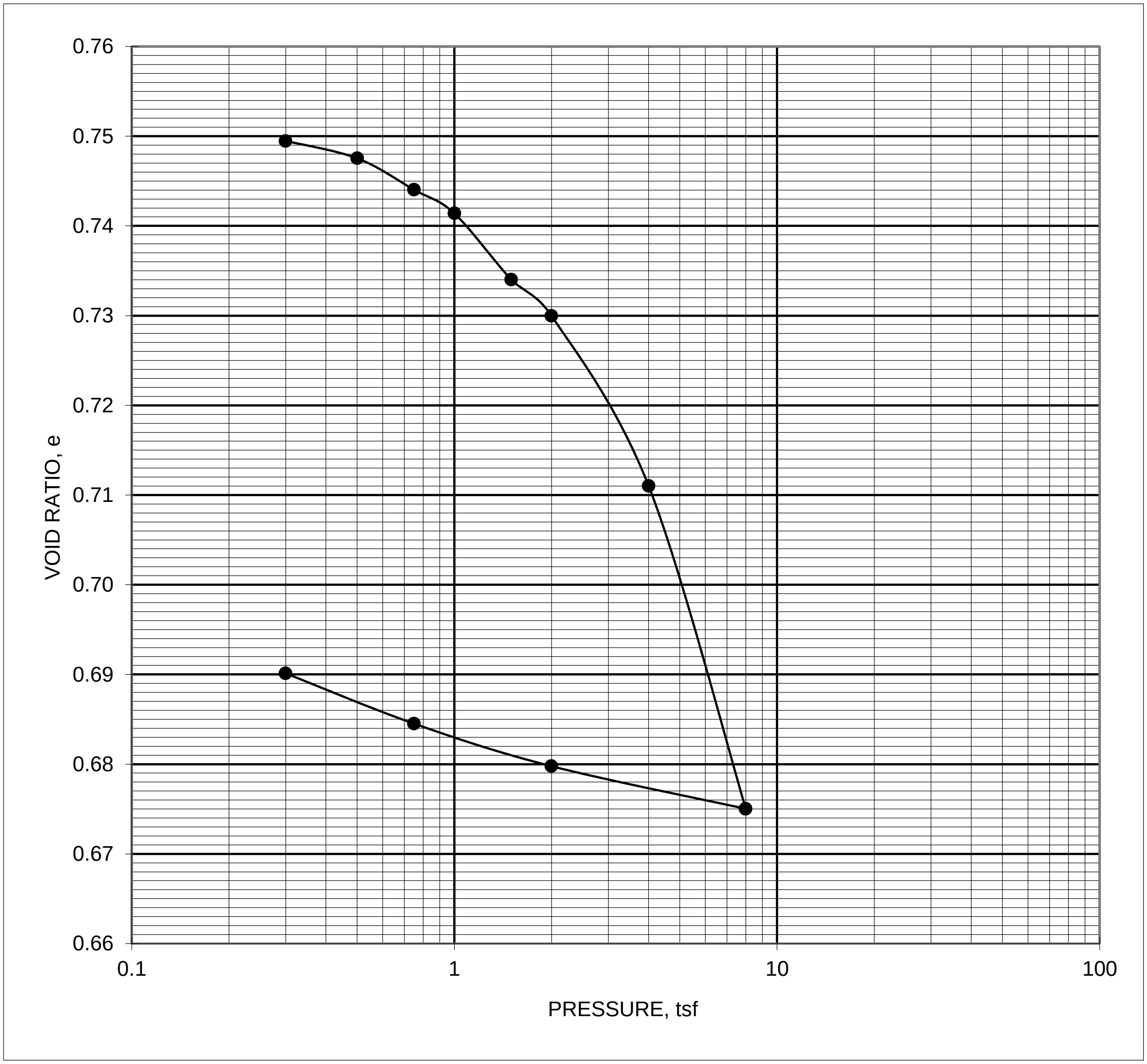
ADDITIONAL CONSOLIDATION DATA

BT-007
3
5.0 - 6.5

PRESSURE, tsf	Cv50, cm2/sec	Cv90, cm2/sec	Av, cm2/g	Mv, cm2/g	k, cm/sec
0					
0.15			5.83E-06	3.65E-06	
0.25	1.84E-04	1.85E-04	1.09E-05	6.86E-06	1.26E-09
0.5	1.63E-03	1.64E-03	1.49E-05	9.33E-06	1.52E-08
1	1.94E-04	1.95E-04	1.27E-05	7.98E-06	1.55E-09
2	1.92E-03	1.93E-03	8.53E-06	5.38E-06	1.03E-08
4	1.58E-03	1.59E-03	5.69E-06	3.61E-06	5.69E-09
8	1.63E-03	1.64E-03	4.87E-06	3.11E-06	5.08E-09
AVERAGE	1.19E-03	1.20E-03	9.06E-06	5.70E-06	6.51E-09

Terracon

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF COHESIVE SOILS
ASTM D2435



DIAMETER, mm	63.56	HEIGHT, mm	25.31	PROPERTY		BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, tsf		0.34		MOISTURE, %		17.6	23.8
PRECONSOL. PRESSURE, tsf		2.42		DRY DENSITY, pcf		96.3	95.4
OVER CONSOLIDATION RATIO		7.1		SATURATION, %		63	89
COMPRESSION INDEX		0.12		VOID RATIO		0.749	0.690
REBOUND INDEX		0.012		SAMPLE TYPE		UNDISTURBED	
LIQUID LIMIT	46	PLASTIC LIMIT	23	PLASTICITY INDEX	23	SPECIFIC GRAVITY	2.7 ESTIMATED
SAMPLE DESCRIPTION	LEAN CLAY, 2.5YR 4/4 REDDISH BROWN WITH 7.5YR 6/8 REDDISH YELLOW						
BORING NO.	BW-511	SAMPLE NO.	3	DEPTH, feet	5.0 - 7.0		

8TH STREET WIDENING PROJECT
RETAINING WALLS
04135111
2/24/2014

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8TH STREET WIDENING PROJECT
RETAINING WALLS
04135111
2/24/2014

ADDITIONAL CONSOLIDATION DATA

BW-511
3
5.0 - 7.0

PRESSURE, tsf	Cv50, cm2/sec	Cv90, cm2/sec	Av, cm2/g	Mv, cm2/g	k, cm/sec
0					
0.3					
0.5	1.87E-03	1.89E-03	9.87E-06	5.64E-06	1.06E-08
0.75	4.76E-04	4.78E-04	1.44E-05	8.21E-06	3.91E-09
1	6.52E-03	6.55E-03	1.08E-05	6.17E-06	4.02E-08
1.5	2.59E-03	2.61E-03	1.51E-05	8.65E-06	2.24E-08
2	6.51E-03	6.55E-03	8.25E-06	4.76E-06	3.10E-08
4	3.90E-03	3.92E-03	9.69E-06	5.60E-06	2.18E-08
8	2.45E-02	2.47E-02	9.19E-06	5.37E-06	1.32E-07
AVERAGE	6.63E-03	6.66E-03	1.10E-05	6.34E-06	3.74E-08

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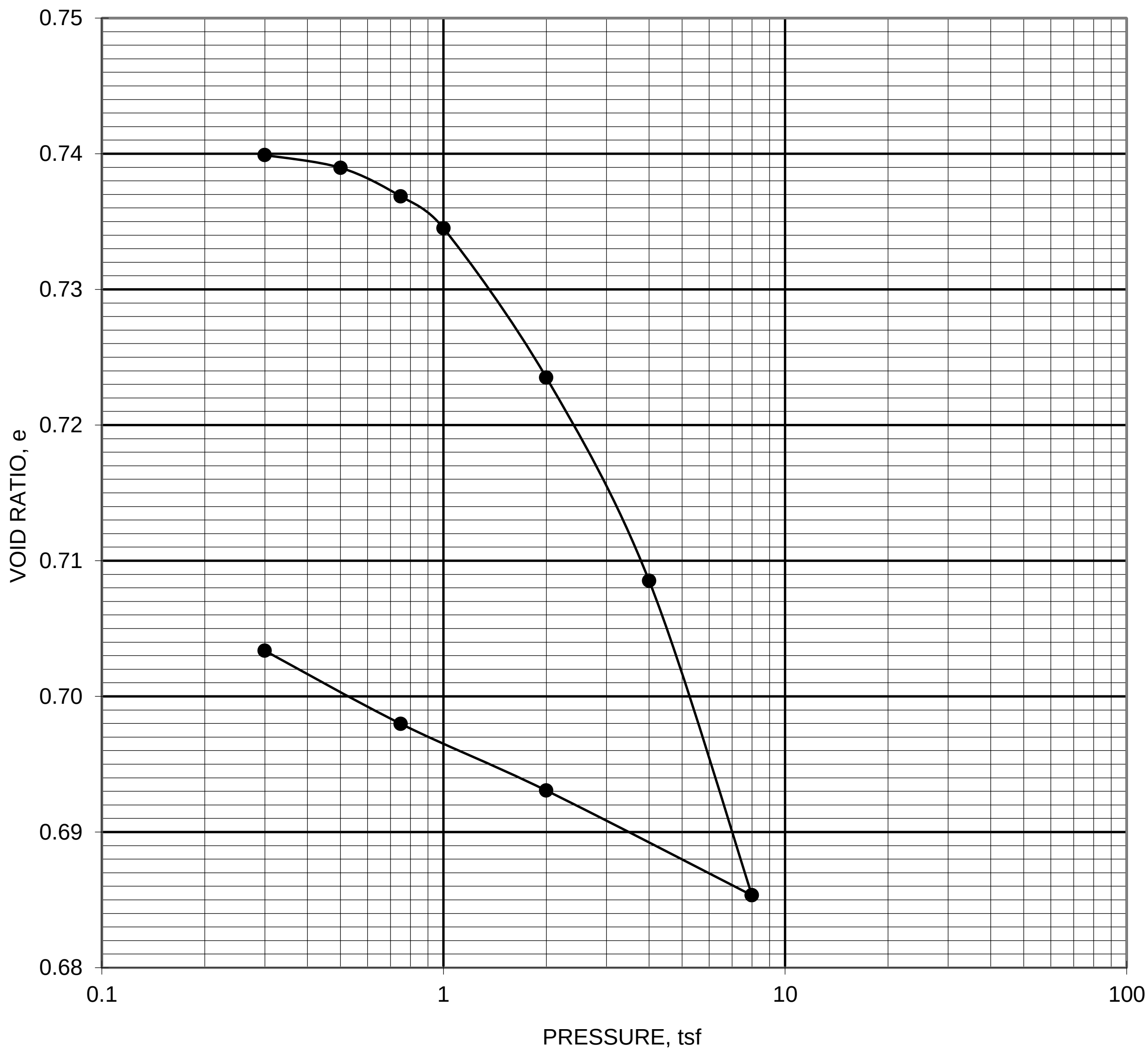
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF COHESIVE SOILS
ASTM D2435



DIAMETER, mm	63.61	HEIGHT, mm	18.87	PROPERTY	BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, tsf		0.35		MOISTURE, %	21.5	27.1
PRECONSOL. PRESSURE, tsf		2.12		DRY DENSITY, pcf	96.9	95.8
OVER CONSOLIDATION RATIO		6.0		SATURATION, %	78	100
COMPRESSION INDEX		0.08		VOID RATIO	0.740	0.708
REBOUND INDEX		0.013		SAMPLE TYPE	UNDISTURBED	

LIQUID LIMIT	52	PLASTIC LIMIT	21	PLASTICITY INDEX	31	SPECIFIC GRAVITY	2.7 ESTIMATED
SAMPLE DESCRIPTION	FAT CLAY, 10YR 4/6 DARK YELLOWISH BROWN WITH 10YR 5/1 GRAY						
BORING NO.	BW-809	SAMPLE NO.	3	DEPTH, feet	5.0 - 7.0		

8TH STREET WIDENING PROJECT
RETAINING WALLS
04135111
2/24/2014

TESTED BY

APPROVED BY

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8TH STREET WIDENING PROJECT
RETAINING WALLS
04135111
2/24/2014

ADDITIONAL CONSOLIDATION DATA

BW-809
3
5.0 - 7.0

PRESSURE, tsf	Cv50, cm2/sec	Cv90, cm2/sec	Av, cm2/g	Mv, cm2/g	k, cm/sec
0					
0.3					
0.5	4.78E-05	4.81E-05	4.79E-06	2.75E-06	1.32E-10
0.75	2.08E-03	2.09E-03	8.61E-06	4.95E-06	1.03E-08
1	9.68E-04	9.74E-04	9.57E-06	5.51E-06	5.34E-09
2	5.76E-04	5.79E-04	1.12E-05	6.48E-06	3.73E-09
4	3.11E-03	3.13E-03	7.66E-06	4.44E-06	1.38E-08
8	3.04E-03	3.05E-03	5.92E-06	3.47E-06	1.05E-08
AVERAGE	1.64E-03	1.65E-03	7.97E-06	4.60E-06	7.31E-09

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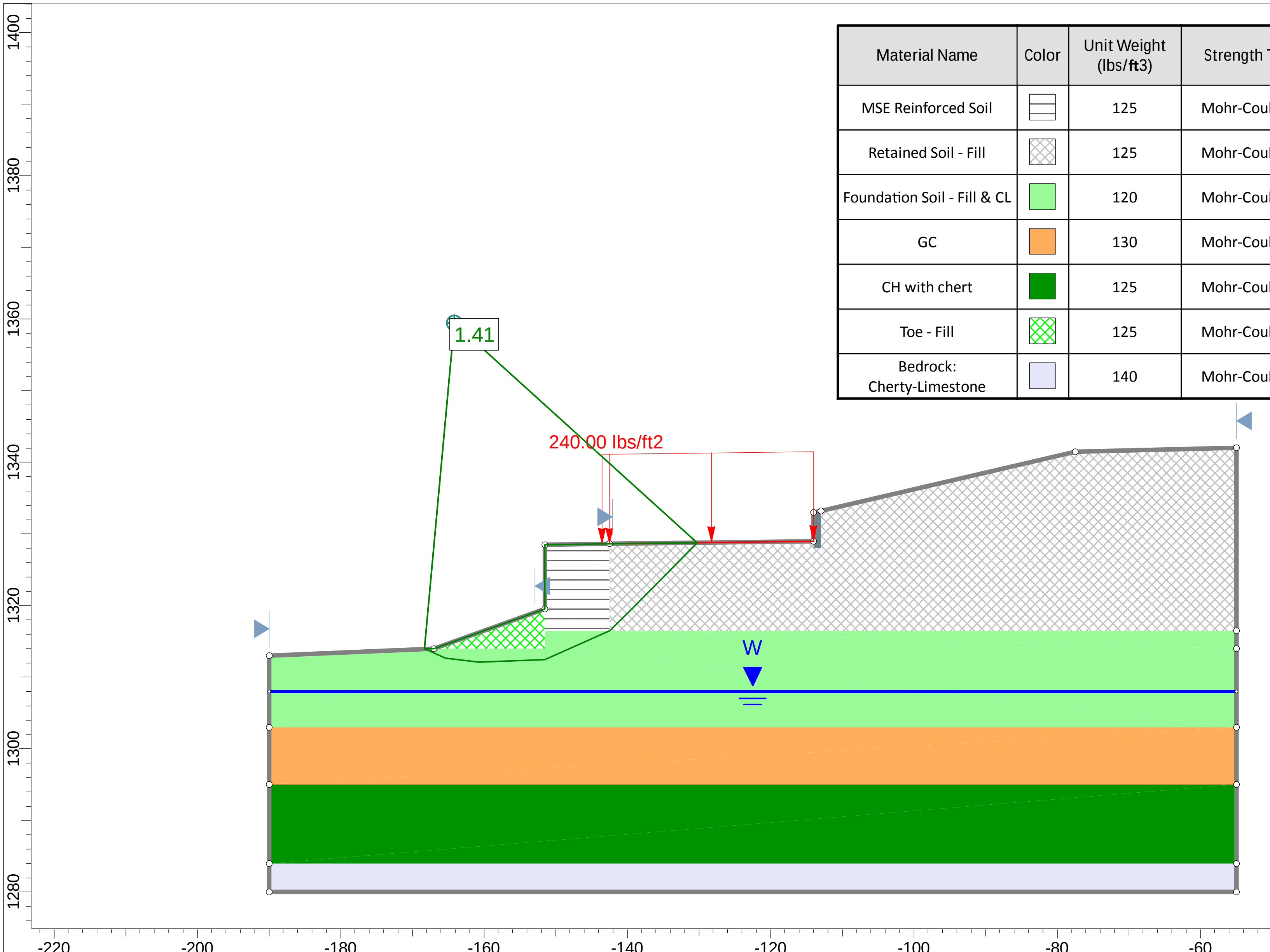
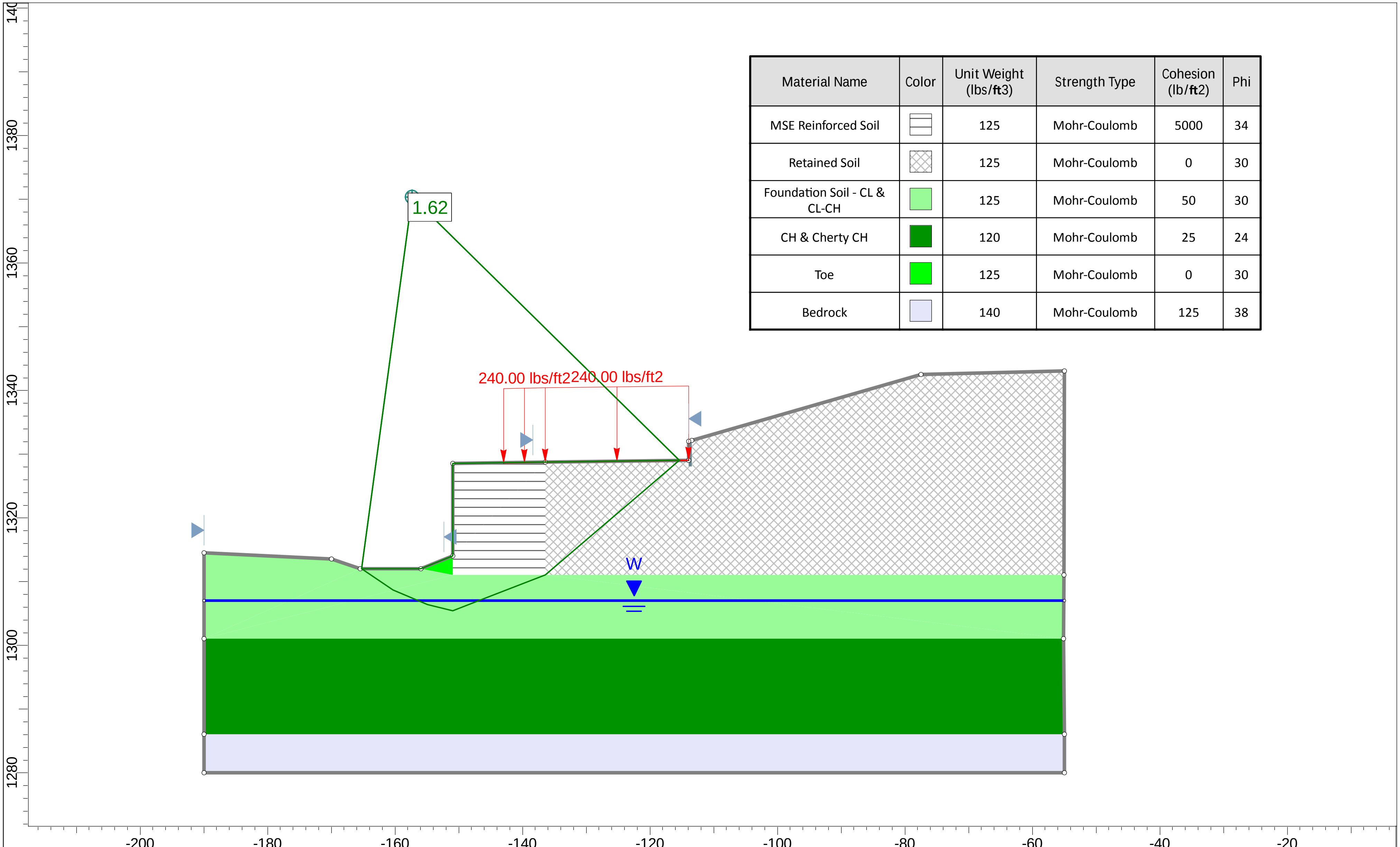
APPENDIX C
GLOBAL STABILITY OF MSE WALLS

LONG TERM GLOBAL STABILITY



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Soil - Fill		125	Mohr-Coulomb	0	29
Foundation Soil - Fill & CL		120	Mohr-Coulomb	25	30
GC		130	Mohr-Coulomb	0	34
CH with chert		125	Mohr-Coulomb	0	26
Toe - Fill		125	Mohr-Coulomb	0	30
Bedrock: Cherty-Limestone		140	Mohr-Coulomb	125	38

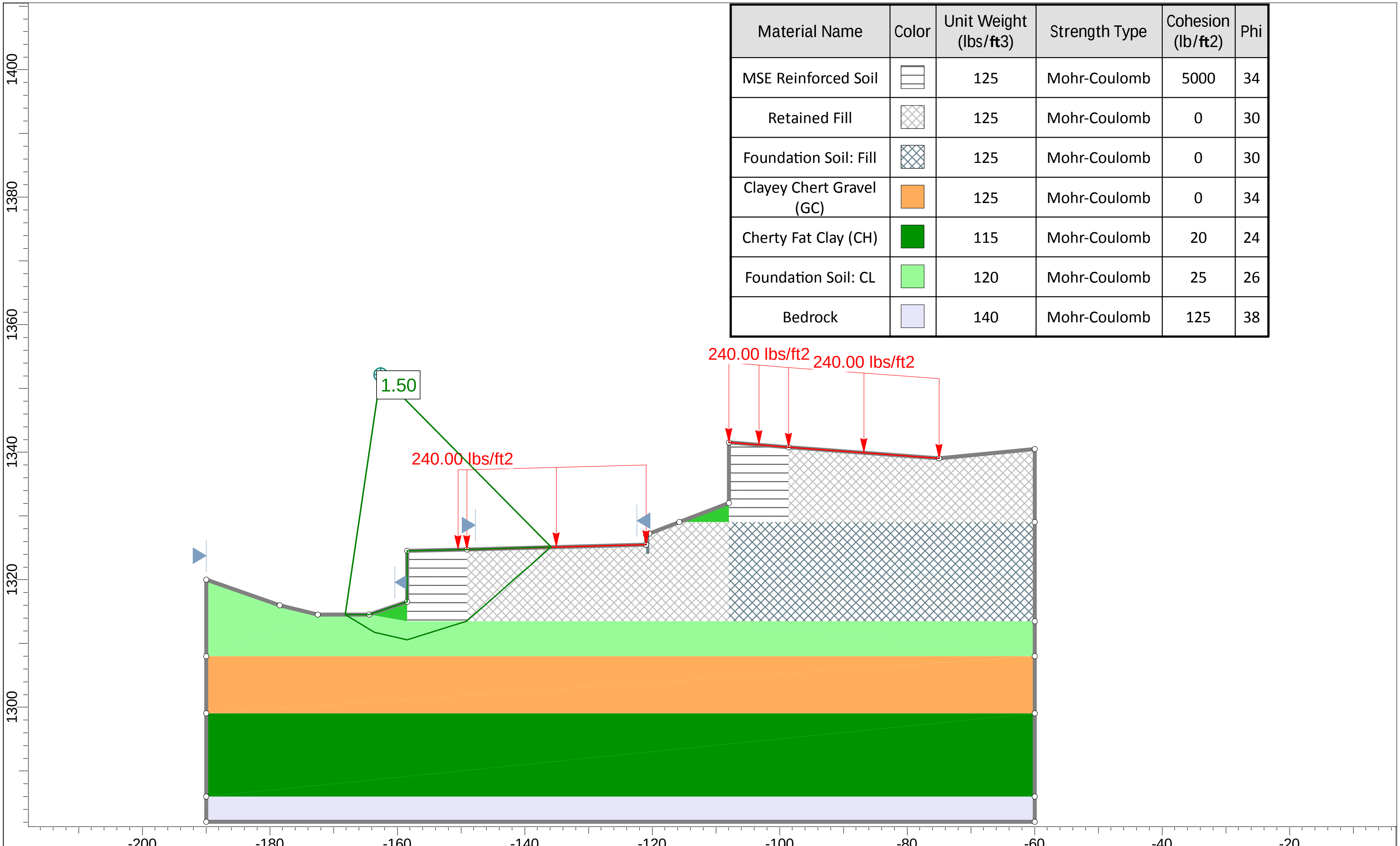
rocscience	*Project* 04135111 - 8th Street Widening Project - MSE Wall 1 - Near BW106 / Sta. 1042+00 (Long Term Stability)		
	Analysis Description GLE/Morgenstern-Price		
	Drawn By JEG	*Scale* 1:250	*Company* Terracon Consultants, Inc.
SLIDEINTERPRET 6.008	*Date* NOV 2015		*File Name* MSE Wall 1 - Sta. 1042+00 - BW106 - L=0.75H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Soil		125	Mohr-Coulomb	0	30
Foundation Soil - CL & CL-CH		125	Mohr-Coulomb	50	30
CH & Cherty CH		120	Mohr-Coulomb	25	24
Toe		125	Mohr-Coulomb	0	30
Bedrock		140	Mohr-Coulomb	125	38

Project	04135111 - 8th Street Widening Project - MSE Wall 1 - Near BW301 / Sta. 1045+50 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By	JEG	*Scale*	1:250
Company	Terracon Consultants, Inc.		
Date	NOV 2015	*File Name*	MSE Wall 1 - Sta. 1045+50 - BW301 - L=0.85H.slim

SLIDEINTERPRET 6.008



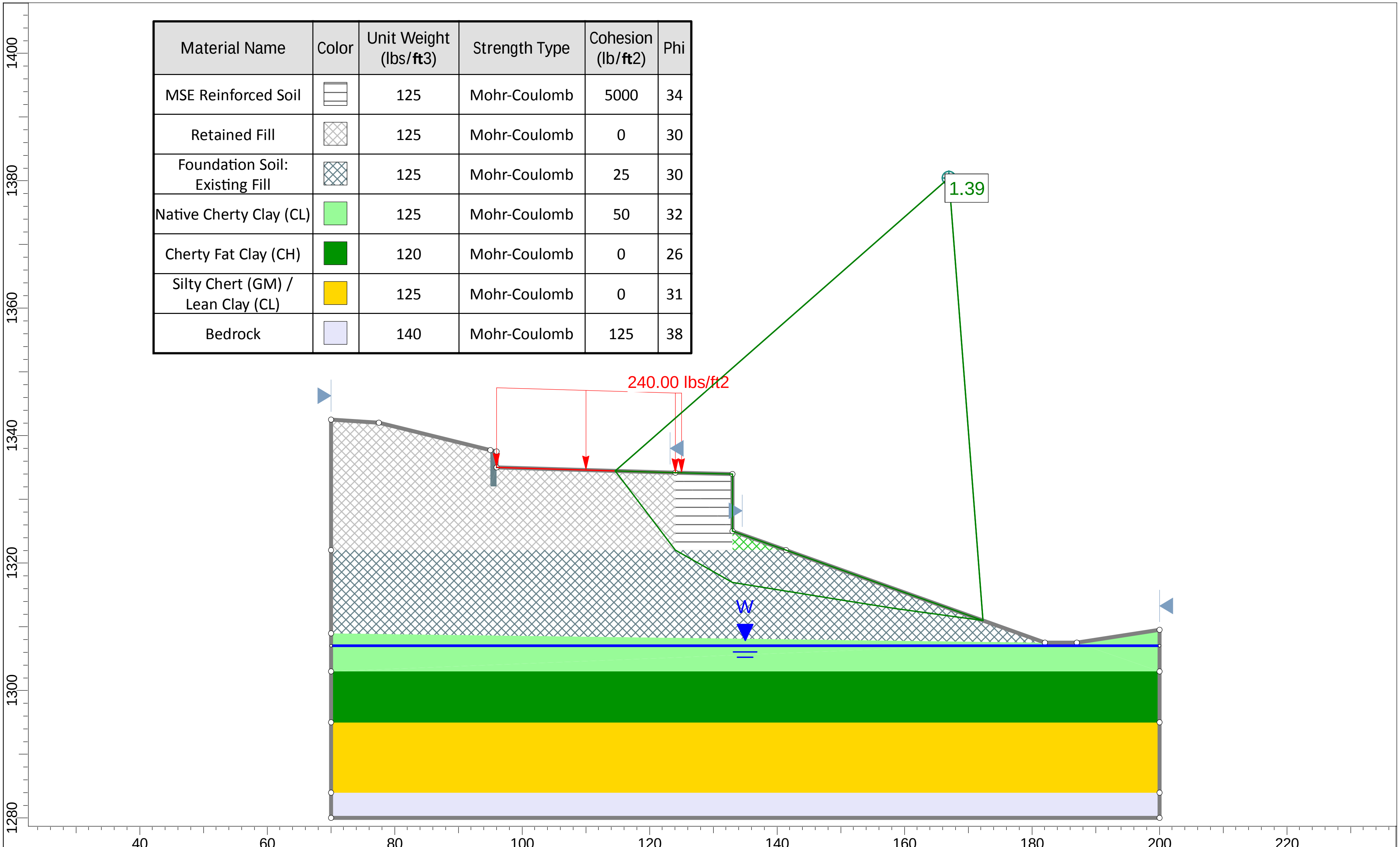
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Fill		125	Mohr-Coulomb	0	30
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	34
Cherty Fat Clay (CH)		115	Mohr-Coulomb	20	24
Foundation Soil: CL		120	Mohr-Coulomb	25	26
Bedrock		140	Mohr-Coulomb	125	38

rocscience

SLIDEINTERPRET 6.008

Project	04135111 - 8th Street Widening Project - MSE Wall 1 - Near BW305 & BW502 / Sta. 1049+50 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 1 - Sta. 1049+50 - BW305 - L=0.85H.slim

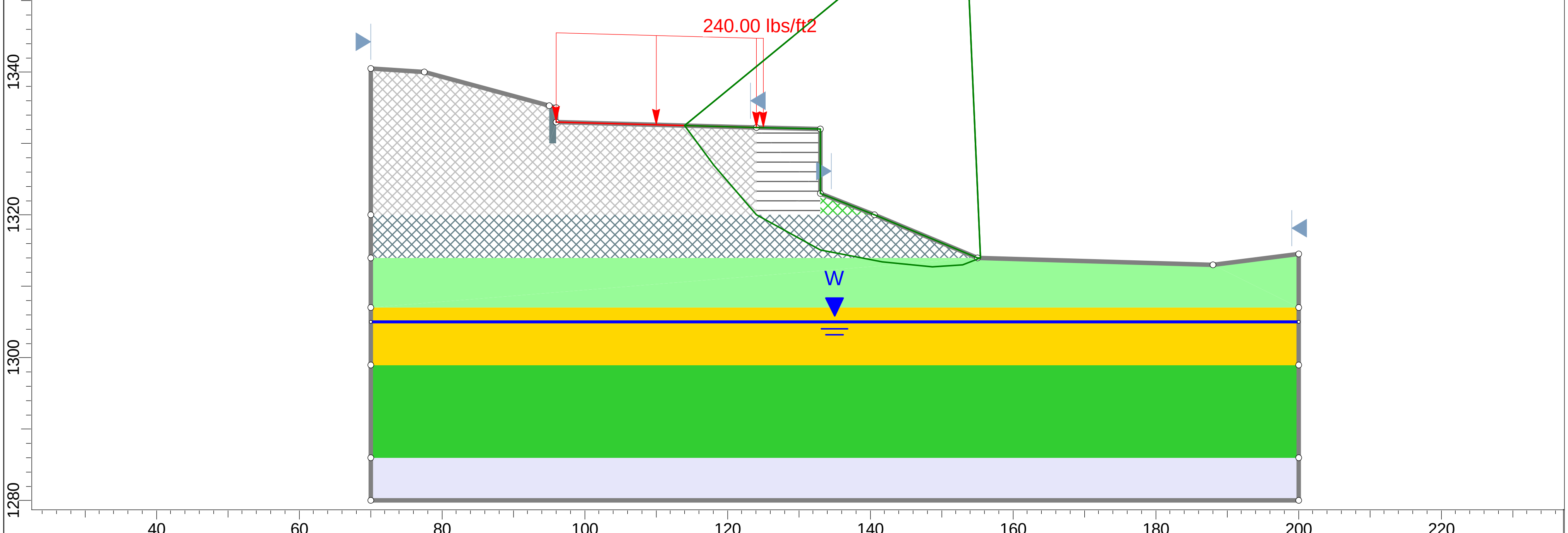
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Existing Fill		125	Mohr-Coulomb	25	30
Native Cherty Clay (CL)		125	Mohr-Coulomb	50	32
Cherty Fat Clay (CH)		120	Mohr-Coulomb	0	26
Silty Chert (GM) / Lean Clay (CL)		125	Mohr-Coulomb	0	31
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - MSE Wall 2 - Near BW205 / Sta. 1043+50 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 2 - Sta. 1043+50 - BW205 - L=0.75H.slim

SLIDEINTERPRET 6.008

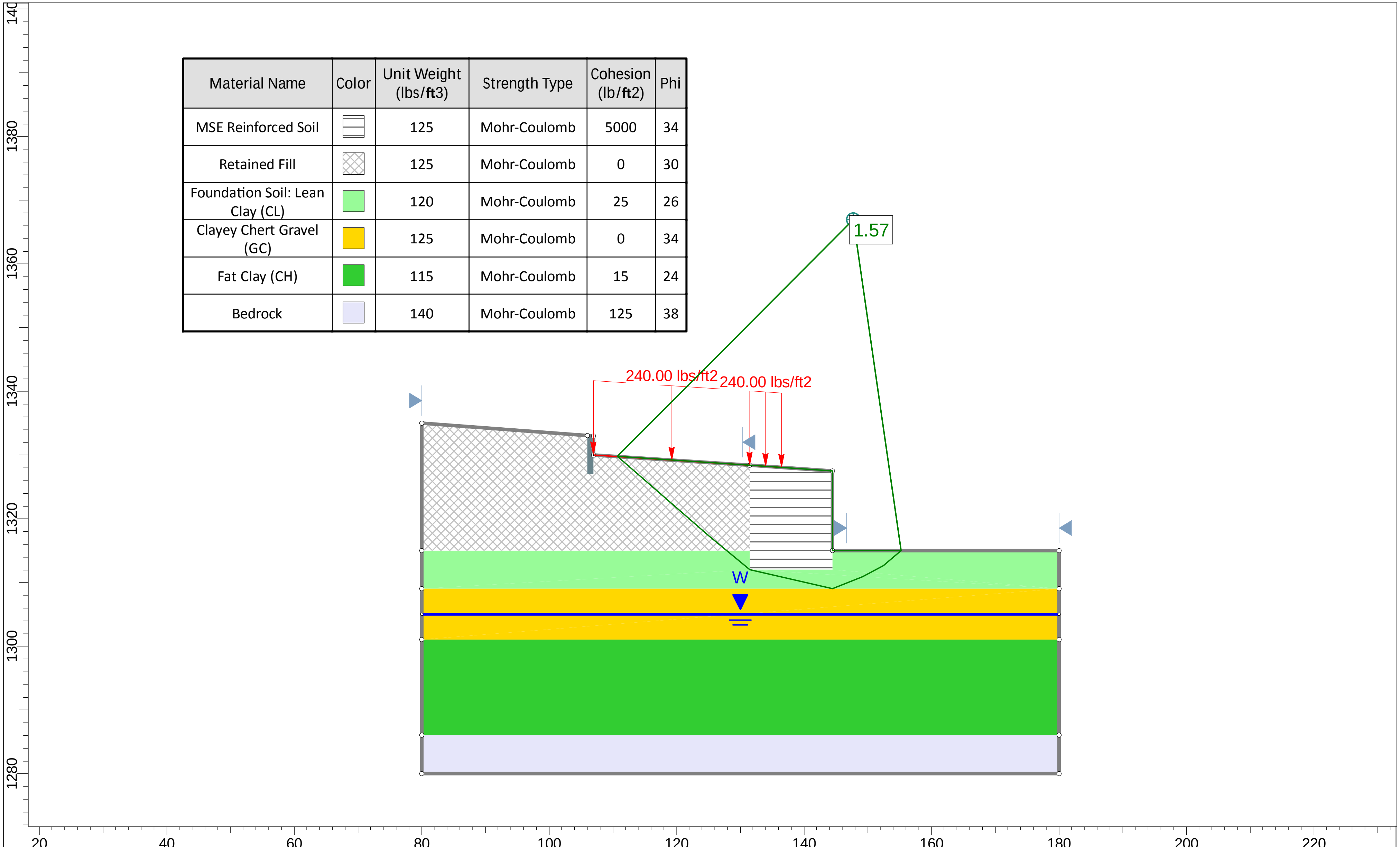
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Existing Fill		125	Mohr-Coulomb	25	30
Native Lean & Lean to Fat Clay (CL/CL-CH)		120	Mohr-Coulomb	50	28
Clayey Chert Gravel (GC)		130	Mohr-Coulomb	0	34
Cherty Fat Clay (CH)		120	Mohr-Coulomb	0	24
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - MSE Wall 2 - Near BW402 / Sta. 1047+50 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 2 - Sta. 1047+50 - BW402 - L=0.75H.slim

SLIDEINTERPRET 6.008

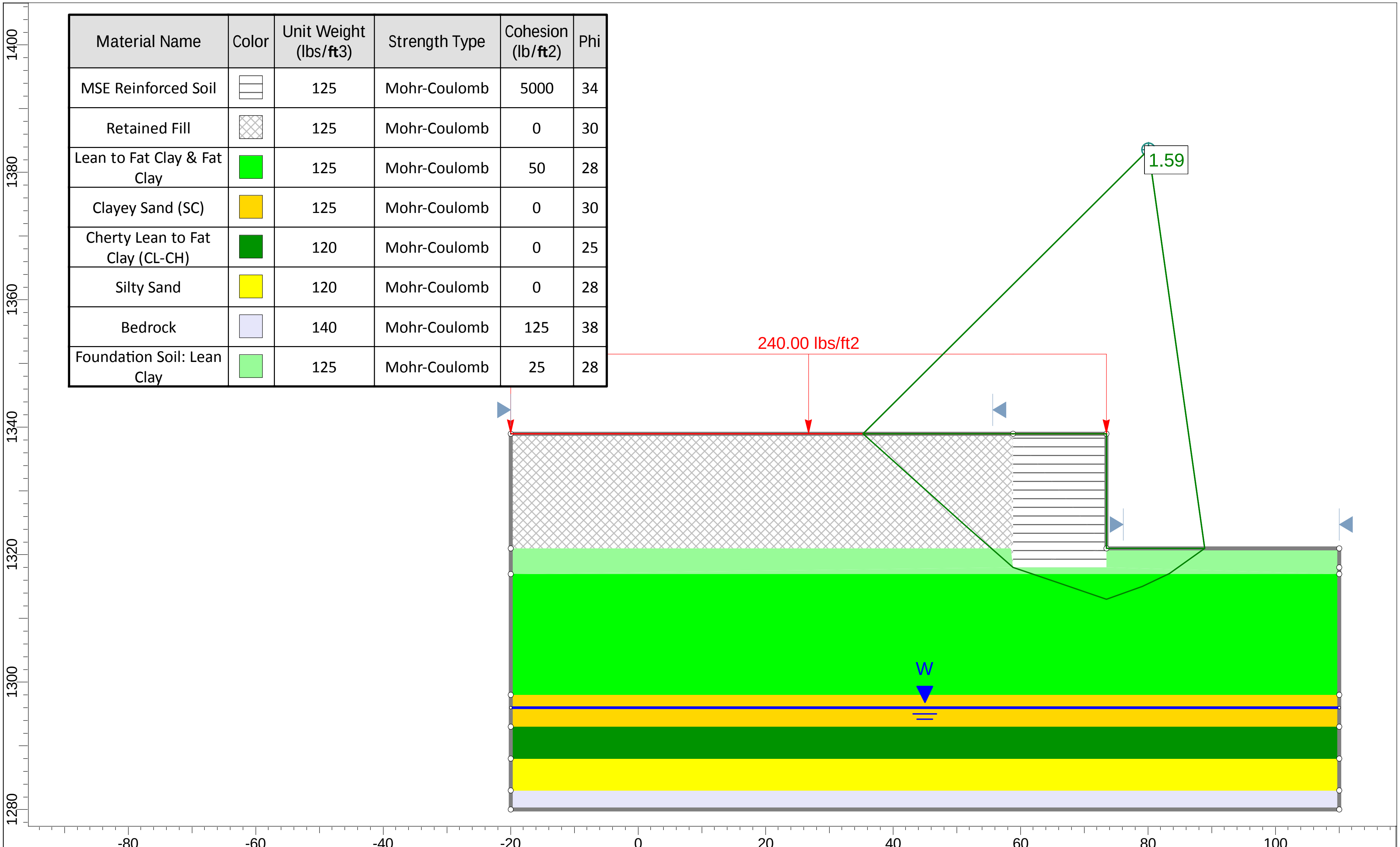
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Lean Clay (CL)		120	Mohr-Coulomb	25	26
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	34
Fat Clay (CH)		115	Mohr-Coulomb	15	24
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - MSE Wall 2 - Near BW405 / Sta. 1049+50 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By JEG	*Scale* 1:250	*Company*	Terracon Consultants, Inc.
Date DEC 2015		*File Name*	MSE Wall 2 - Sta. 1049+50 - BW405 - L=0.85H.slim

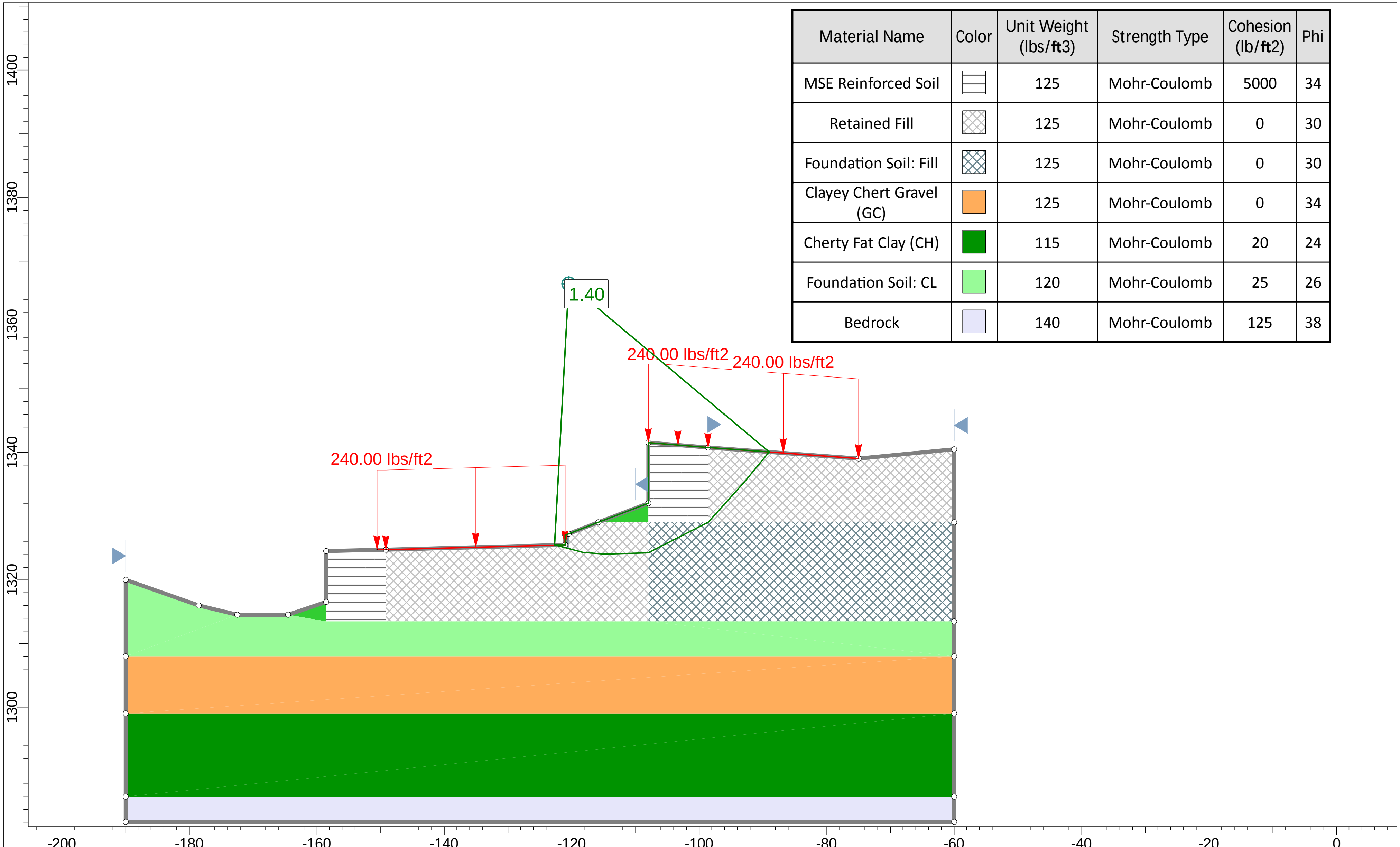
SLIDEINTERPRET 6.008

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Lean to Fat Clay & Fat Clay		125	Mohr-Coulomb	50	28
Clayey Sand (SC)		125	Mohr-Coulomb	0	30
Cherty Lean to Fat Clay (CL-CH)		120	Mohr-Coulomb	0	25
Silty Sand		120	Mohr-Coulomb	0	28
Bedrock		140	Mohr-Coulomb	125	38
Foundation Soil: Lean Clay		125	Mohr-Coulomb	25	28



Project	04135111 - 8th Street Widening Project - MSE Wall 3A - Near BW511 / Sta. 138+00 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By JEG	*Scale* 1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 3A - Sta. 138+00 - BW511 - L=0.70H.slim

SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Fill		125	Mohr-Coulomb	0	30
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	34
Cherty Fat Clay (CH)		115	Mohr-Coulomb	20	24
Foundation Soil: CL		120	Mohr-Coulomb	25	26
Bedrock		140	Mohr-Coulomb	125	38

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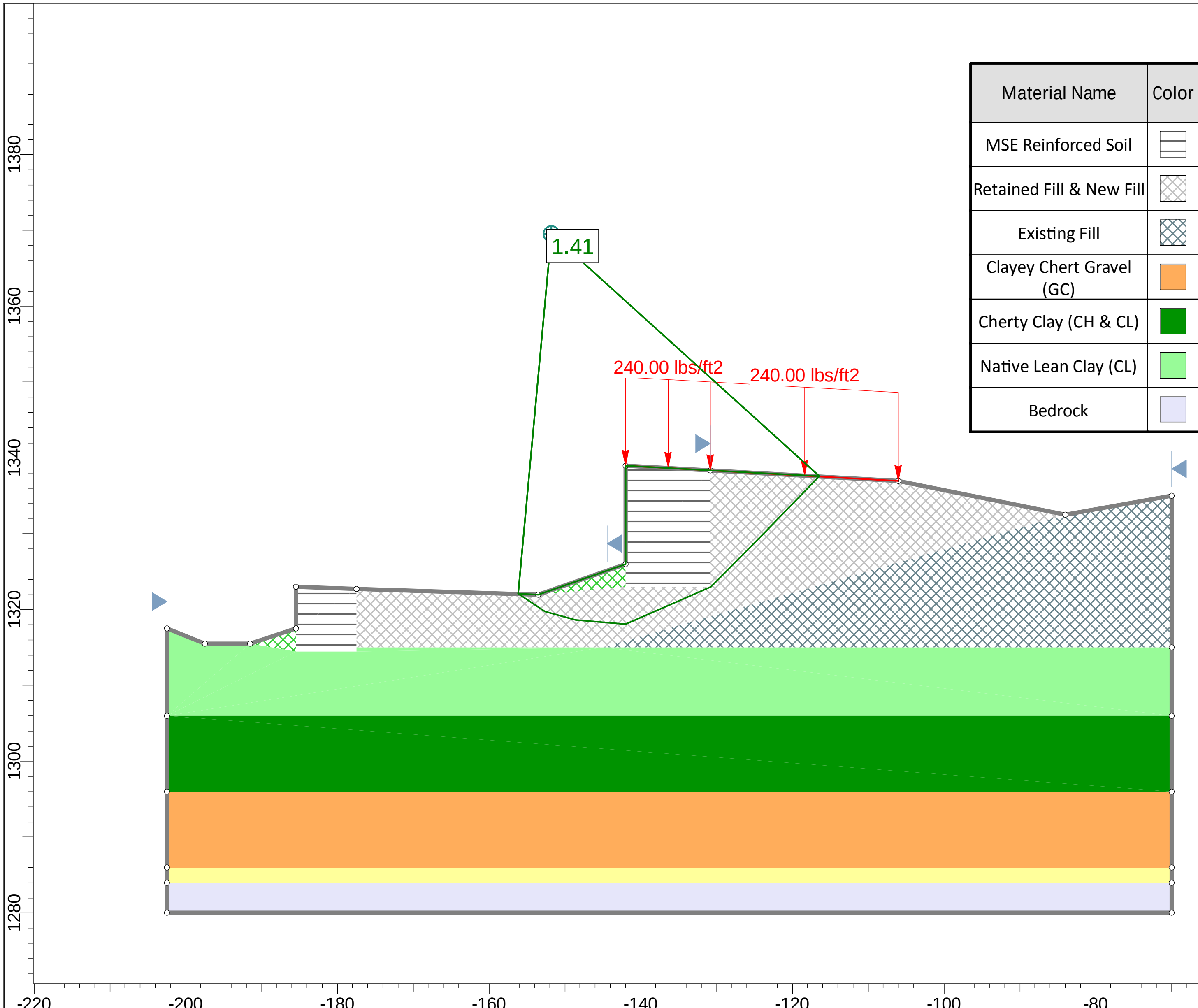
SLIDEINTERPRET 6.008

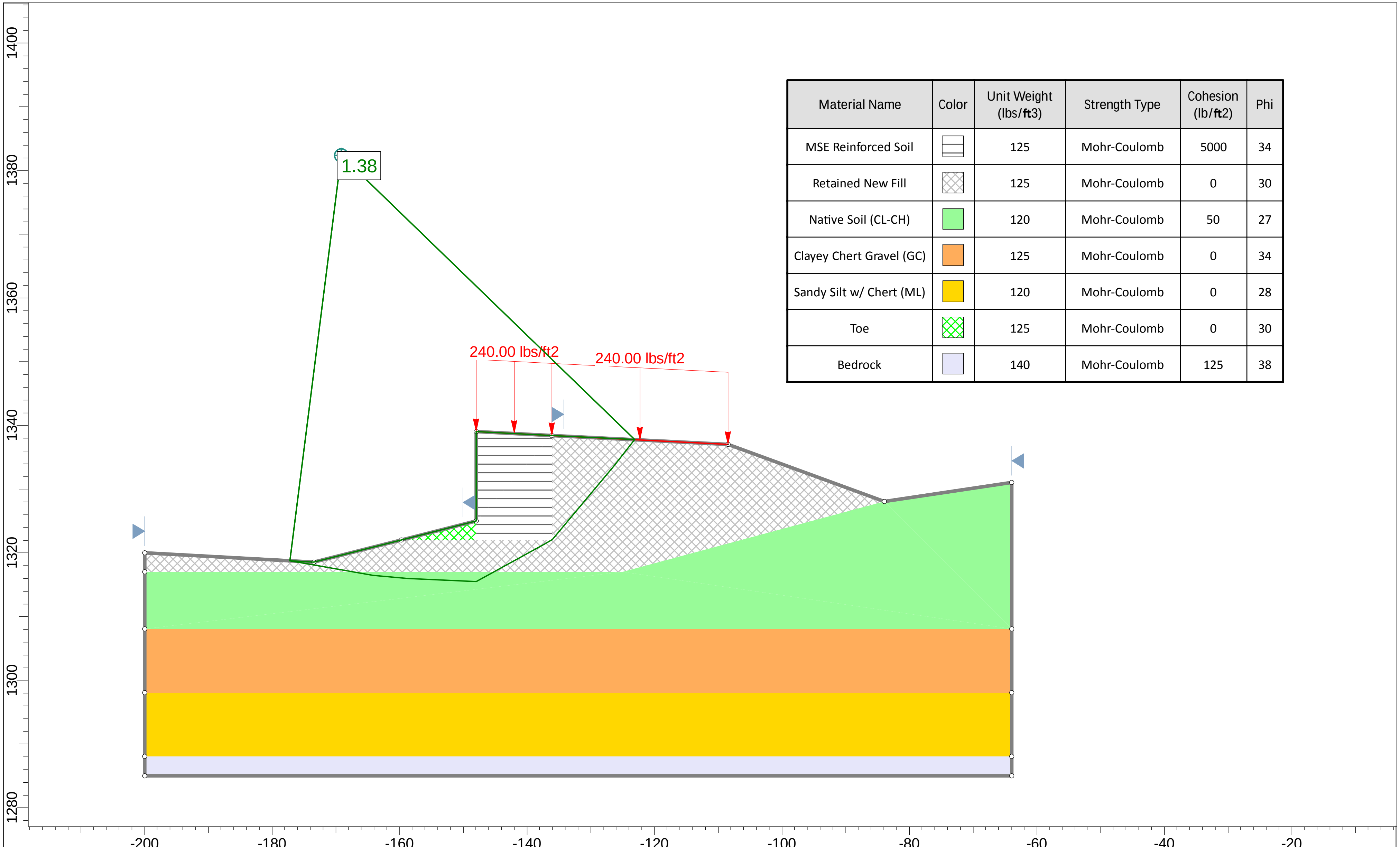
Project	04135111 - 8th Street Widening Project - MSE Wall 1 - Near BW305 & BW502 / Sta. 1049+50 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 3B - Sta. 1049+50 - BW502 - L=0.75H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill & New Fill		125	Mohr-Coulomb	0	30
Existing Fill		125	Mohr-Coulomb	0	30
Clayey Chert Gravel (GC)		120	Mohr-Coulomb	0	28
Cherty Clay (CH & CL)		125	Mohr-Coulomb	0	30
Native Lean Clay (CL)		120	Mohr-Coulomb	50	26
Bedrock		140	Mohr-Coulomb	125	38

Project	04135111 - 8th Street Widening Project - MSE Wall 3B - Near BW503 / Sta. 1052+50 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By	JEG	*Scale*	1:250
Company	Terracon Consultants, Inc.		
Date	DEC 2015	*File Name*	MSE Wall 3B - Sta. 1052+50 - BW503 - L=0.70H.slim

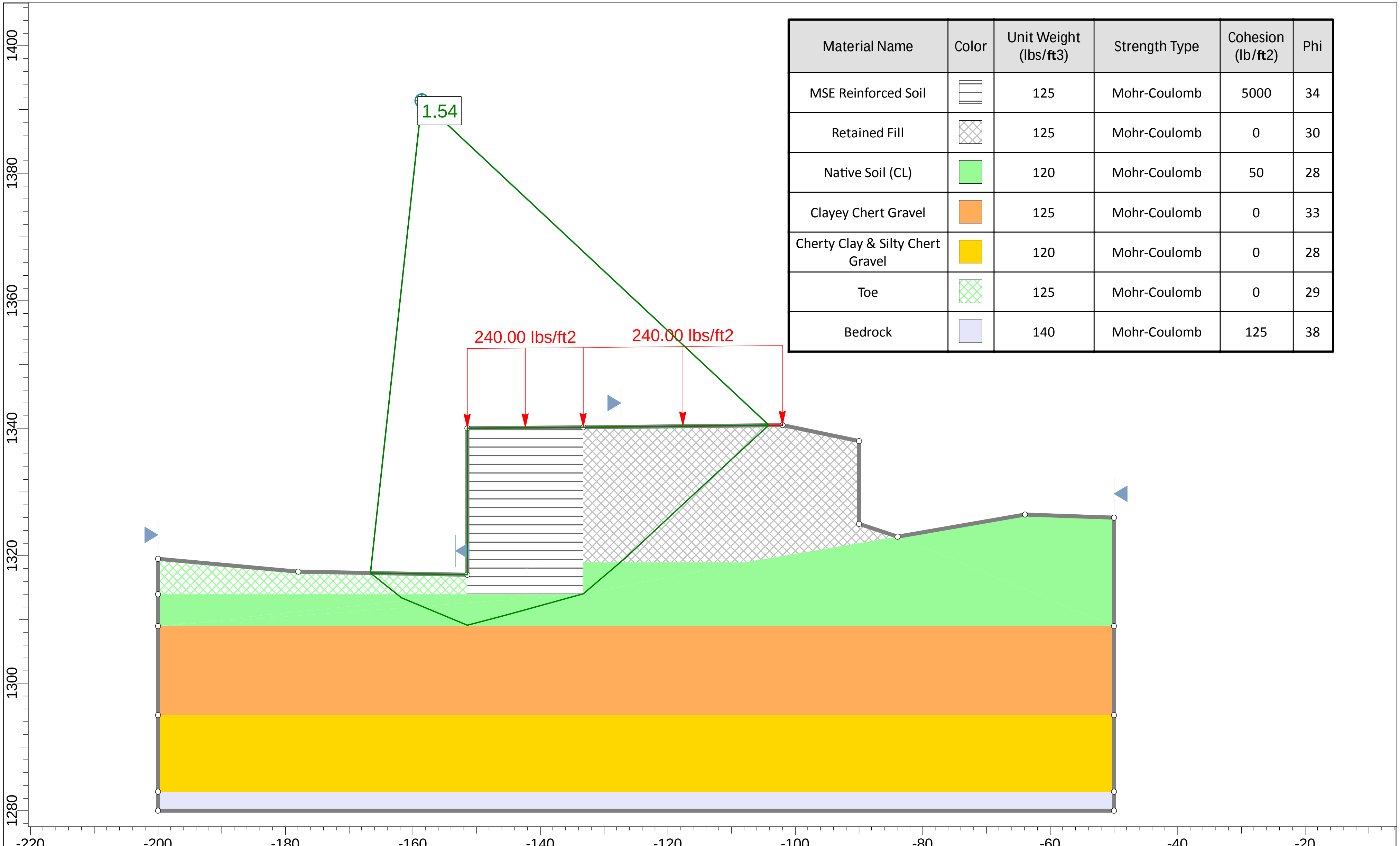
SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained New Fill		125	Mohr-Coulomb	0	30
Native Soil (CL-CH)		120	Mohr-Coulomb	50	27
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	34
Sandy Silt w/ Chert (ML)		120	Mohr-Coulomb	0	28
Toe		125	Mohr-Coulomb	0	30
Bedrock		140	Mohr-Coulomb	125	38

Project	04135111 - 8th Street Widening Project - MSE Wall 3B - Near BW506 / Sta. 1054+50 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By	JEG	*Scale*	1:250
Company	Terracon Consultants, Inc.		
Date	DEC 2015	*File Name*	MSE Wall 3B - Sta. 1054+50 - BW506 - L=0.70H.slim

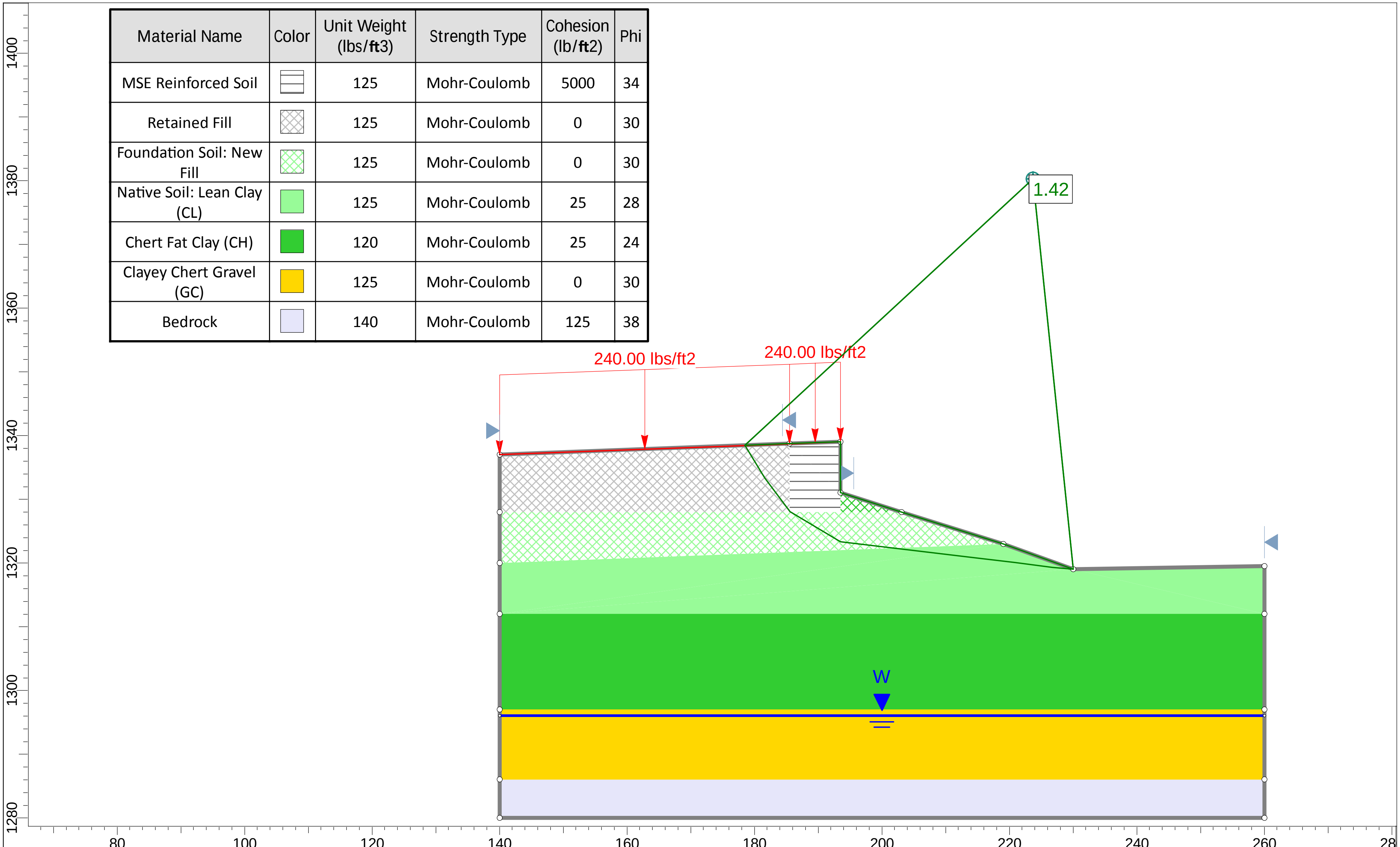
SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Native Soil (CL)		120	Mohr-Coulomb	50	28
Clayey Chert Gravel		125	Mohr-Coulomb	0	33
Cherty Clay & Silty Chert Gravel		120	Mohr-Coulomb	0	28
Toe		125	Mohr-Coulomb	0	29
Bedrock		140	Mohr-Coulomb	125	38

SLIDEINTERPRET 6.008	*Project* 04135111 - 8th Street Widening Project - MSE Wall 3B - Near BW509 / Sta. 1056+50 (Long Term Stability)		
	Analysis Description GLE/Morgenstern-Price		
	Drawn By JEG	*Scale* 1:250	*Company* Terracon Consultants, Inc.
	Date DEC 2015		*File Name* MSE Wall 3B - Sta. 1056+50 - BW509 - L=0.70H.slim

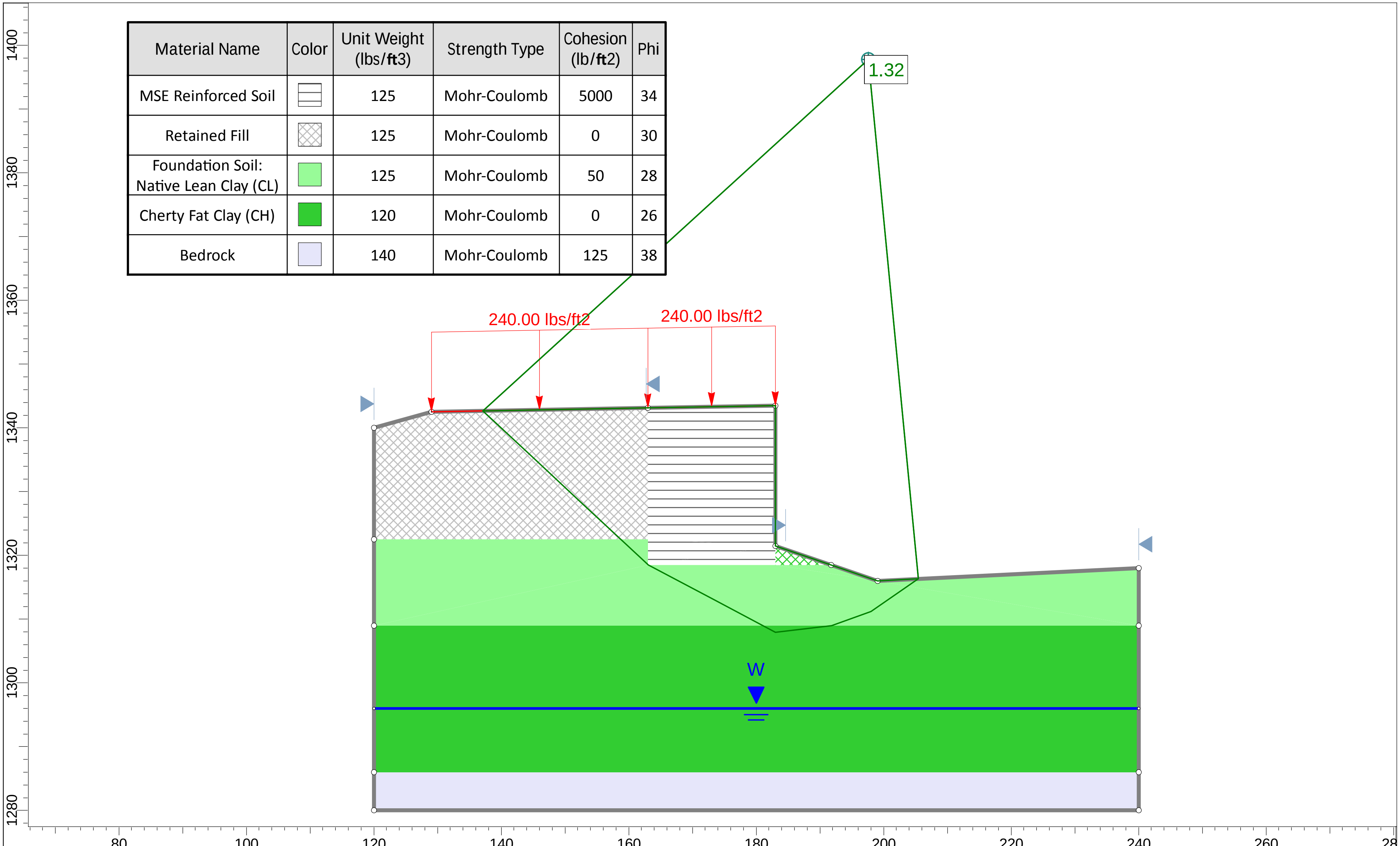
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: New Fill		125	Mohr-Coulomb	0	30
Native Soil: Lean Clay (CL)		125	Mohr-Coulomb	25	28
Chert Fat Clay (CH)		120	Mohr-Coulomb	25	24
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	30
Bedrock		140	Mohr-Coulomb	125	38



SLIDEINTERPRET 6.008

Project	04135111 - 8th Street Widening Project - MSE Wall 4 - Near BW603 / Sta. 1057+00 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 4 - Sta. 1057+00 - BW603 - L=0.75H.slim

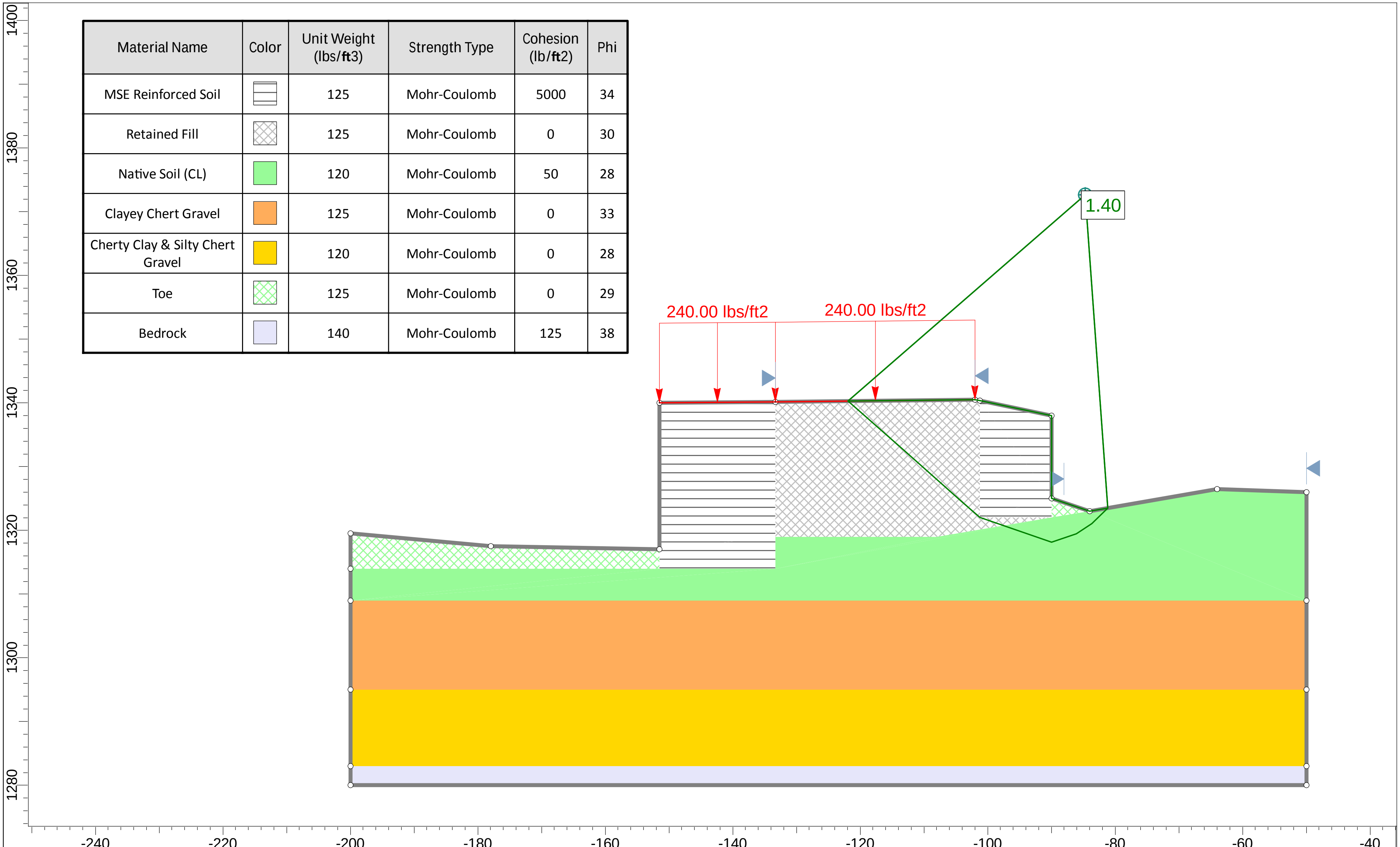
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Native Lean Clay (CL)		125	Mohr-Coulomb	50	28
Cherty Fat Clay (CH)		120	Mohr-Coulomb	0	26
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - MSE Wall 4 - Near BW606 / Sta. 1059+00 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By: JEG	Scale: 1:250	Company	Terracon Consultants, Inc.
Date: DEC 2015		File Name	MSE Wall 4 - Sta. 1059+00 - BW606 - L=0.80H.slim

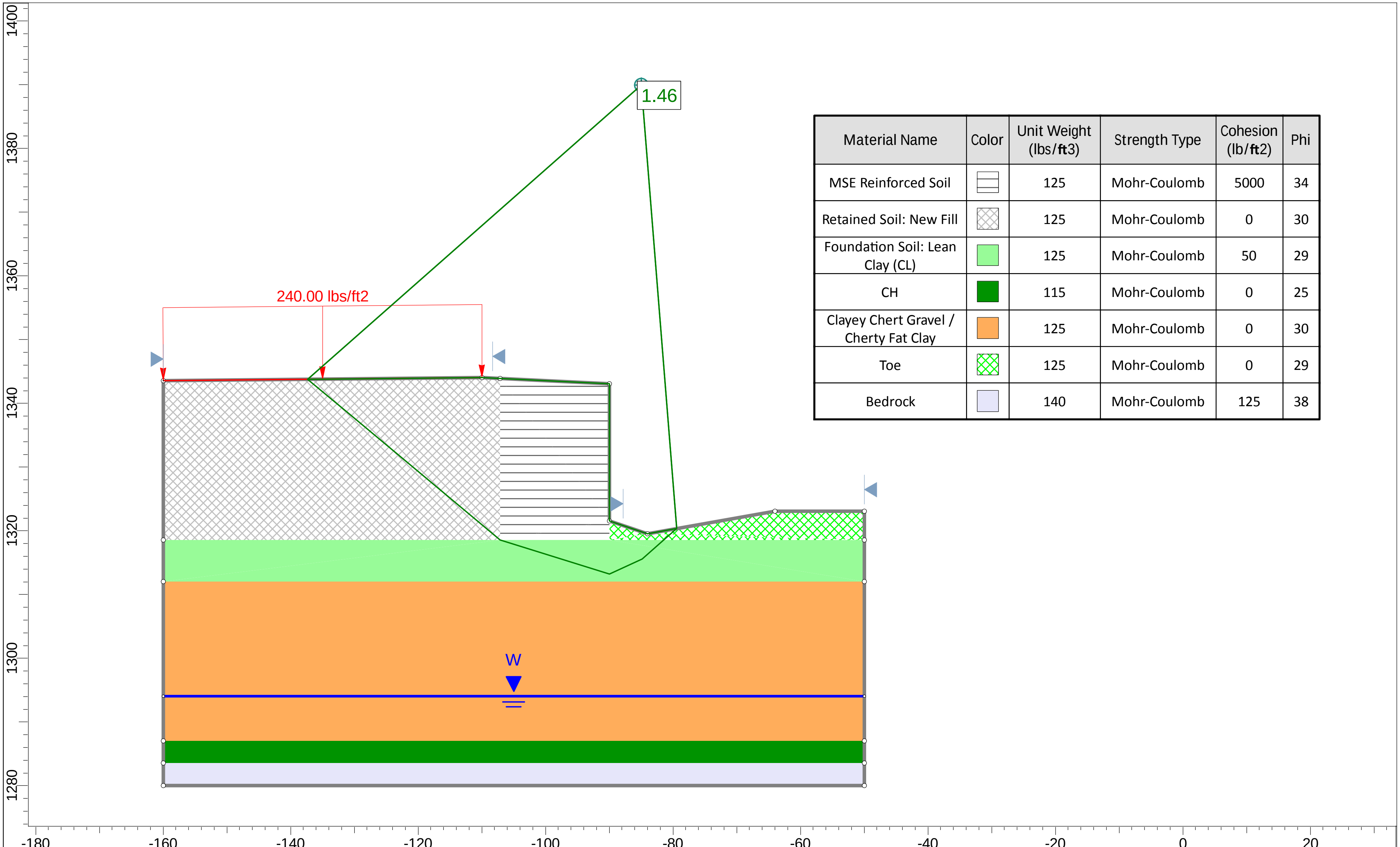
SLIDEINTERPRET 6.008

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Native Soil (CL)		120	Mohr-Coulomb	50	28
Clayey Chert Gravel		125	Mohr-Coulomb	0	33
Cherty Clay & Silty Chert Gravel		120	Mohr-Coulomb	0	28
Toe		125	Mohr-Coulomb	0	29
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - MSE Wall 5B - Near BW509 / Sta. 1056+50 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By	JEG	Scale	1:250
Company	Terracon Consultants, Inc.		
Date	DEC 2015	File Name	MSE Wall 5A - Sta. 1056+50 - BW509 - L=0.85H.slim

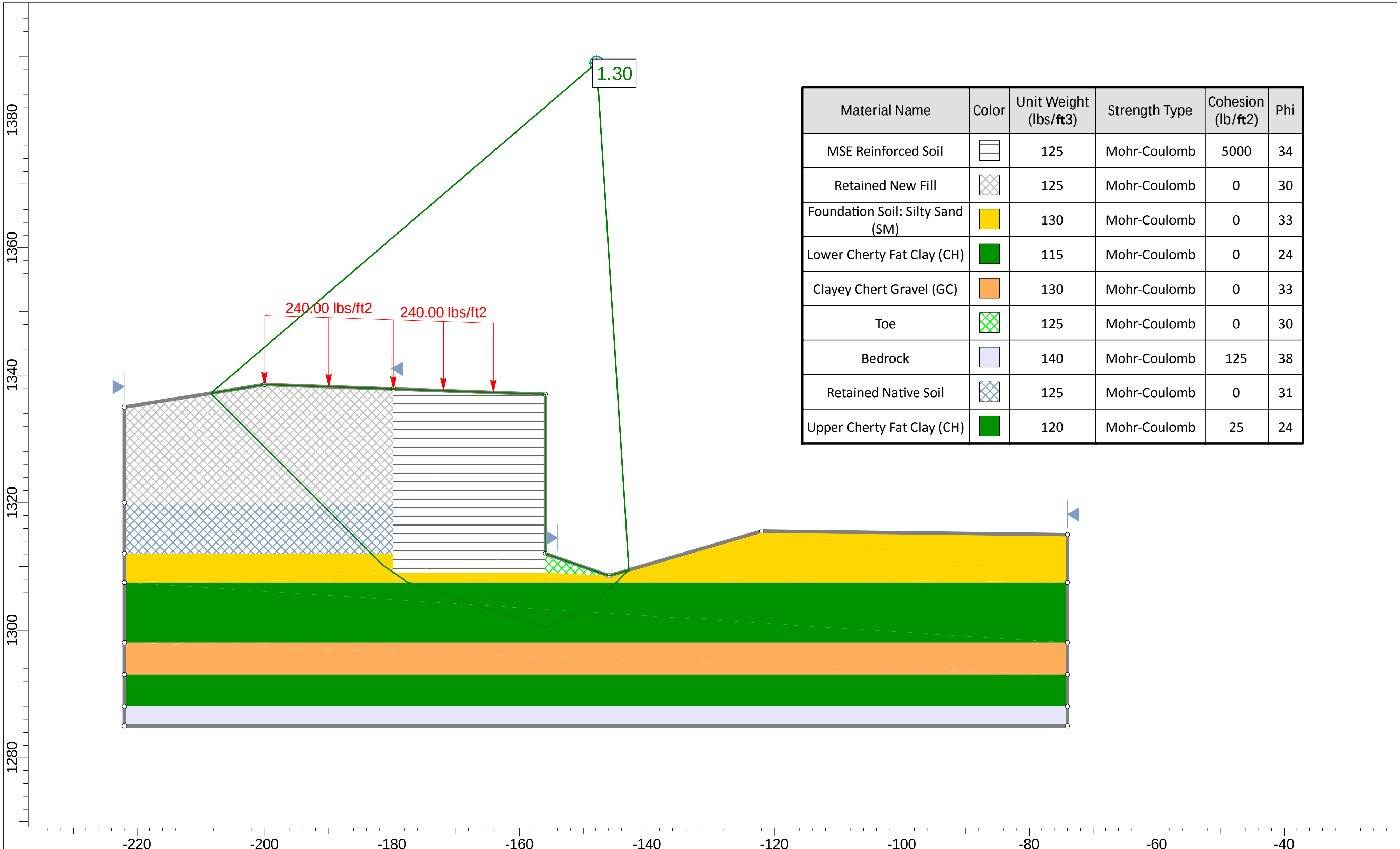
SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Soil: New Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Lean Clay (CL)		125	Mohr-Coulomb	50	29
CH		115	Mohr-Coulomb	0	25
Clayey Chert Gravel / Cherty Fat Clay		125	Mohr-Coulomb	0	30
Toe		125	Mohr-Coulomb	0	29
Bedrock		140	Mohr-Coulomb	125	38

Project	04135111 - 8th Street Widening Project - MSE Wall 5A - Near BW705 / Sta. 1058+00 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 5A - Sta. 1058+00 - BW705 - L=0.70H.slim

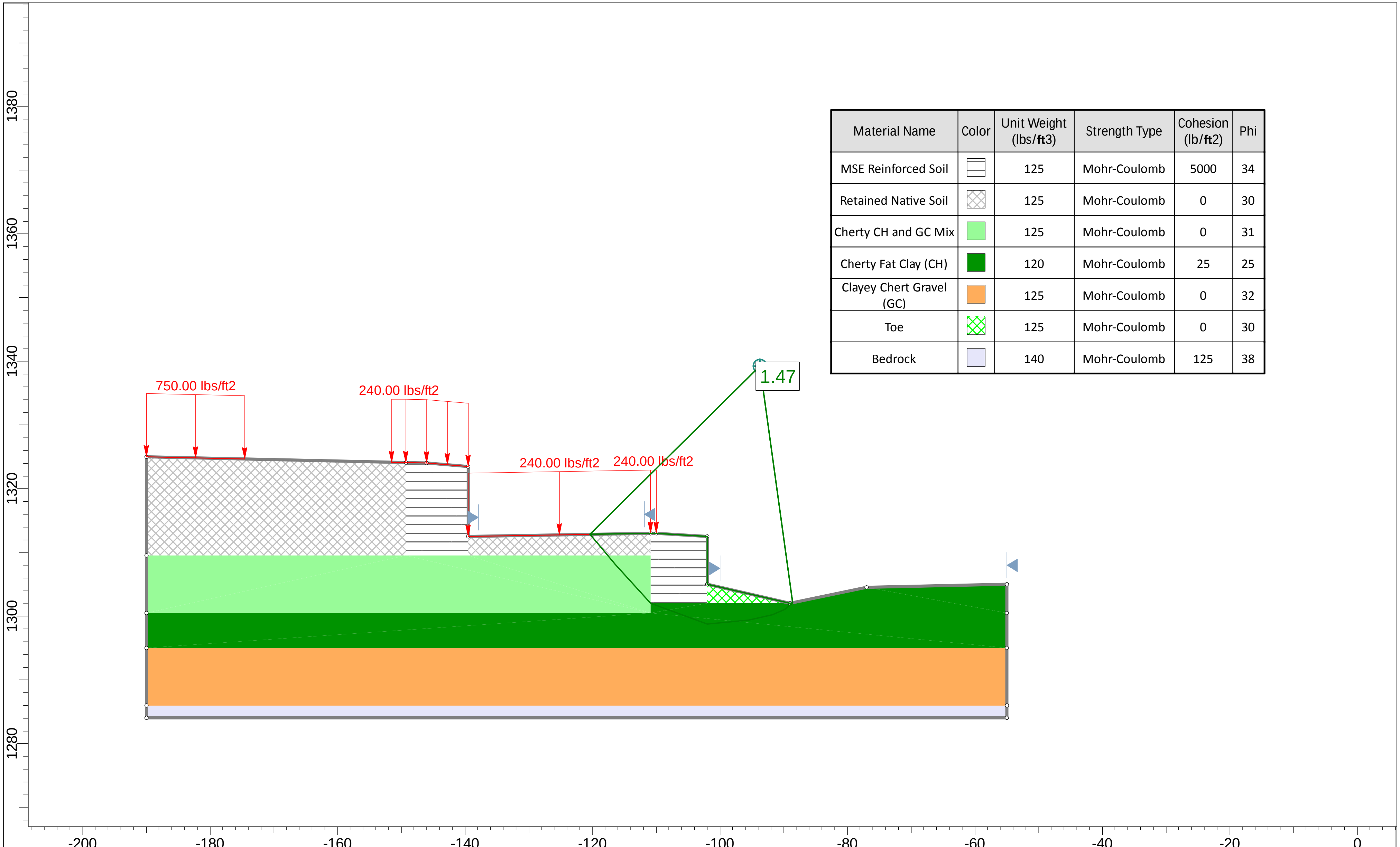
SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained New Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Silty Sand (SM)		130	Mohr-Coulomb	0	33
Lower Cherty Fat Clay (CH)		115	Mohr-Coulomb	0	24
Clayey Chert Gravel (GC)		130	Mohr-Coulomb	0	33
Toe		125	Mohr-Coulomb	0	30
Bedrock		140	Mohr-Coulomb	125	38
Retained Native Soil		125	Mohr-Coulomb	0	31
Upper Cherty Fat Clay (CH)		120	Mohr-Coulomb	25	24

Project	04135111 - 8th Street Widening Project - MSE Wall 5B - Near BW708 / Sta. 1061+00 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By	JEG	*Scale*	1:250
Company	Terracon Consultants, Inc.		
Date	DEC 2015	*File Name*	MSE Wall 5B - BW708 - Sta. 1061+00 - L=0.85H.slim

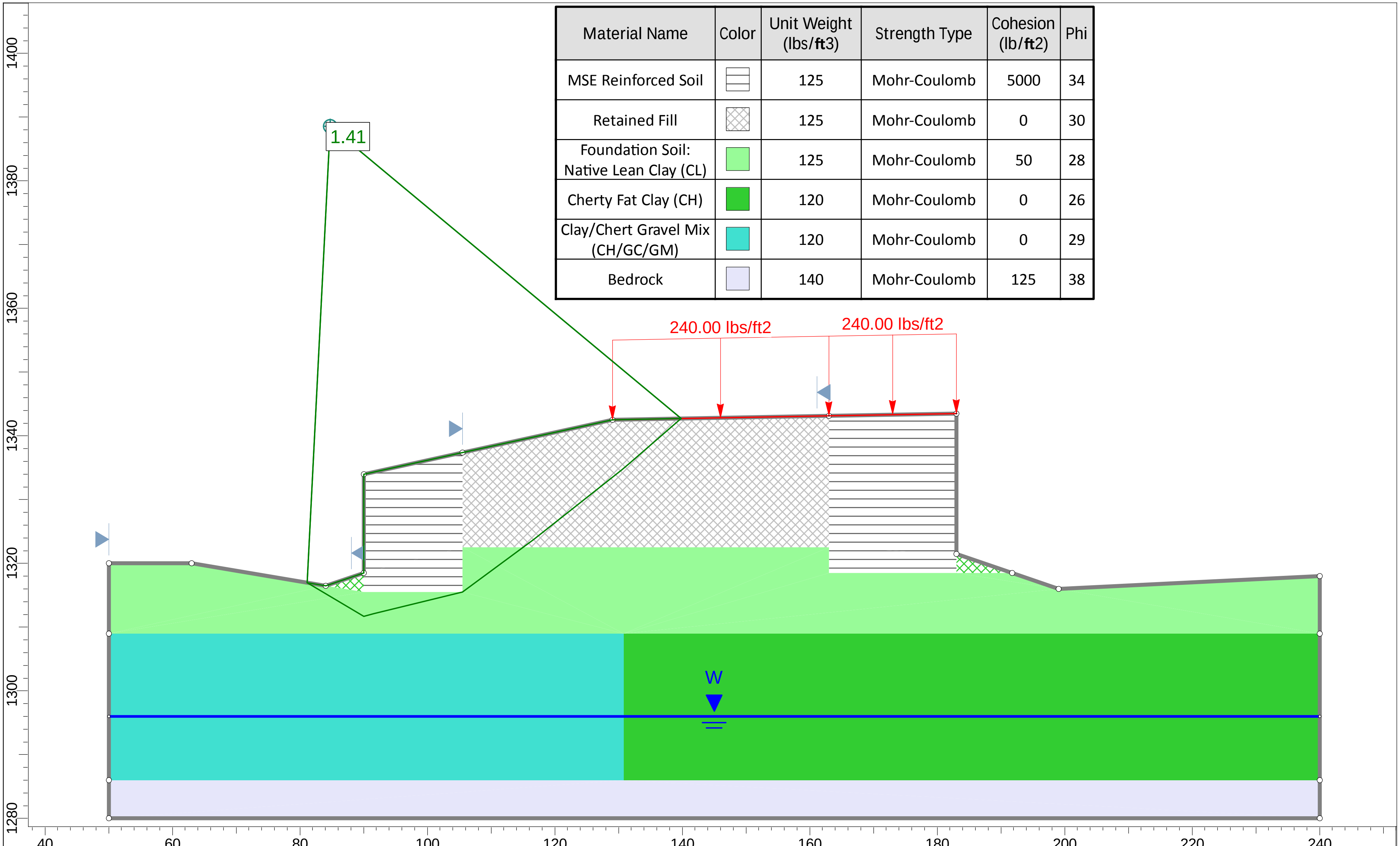
SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Native Soil		125	Mohr-Coulomb	0	30
Cherty CH and GC Mix		125	Mohr-Coulomb	0	31
Cherty Fat Clay (CH)		120	Mohr-Coulomb	25	25
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	32
Toe		125	Mohr-Coulomb	0	30
Bedrock		140	Mohr-Coulomb	125	38

SLIDEINTERPRET 6.008

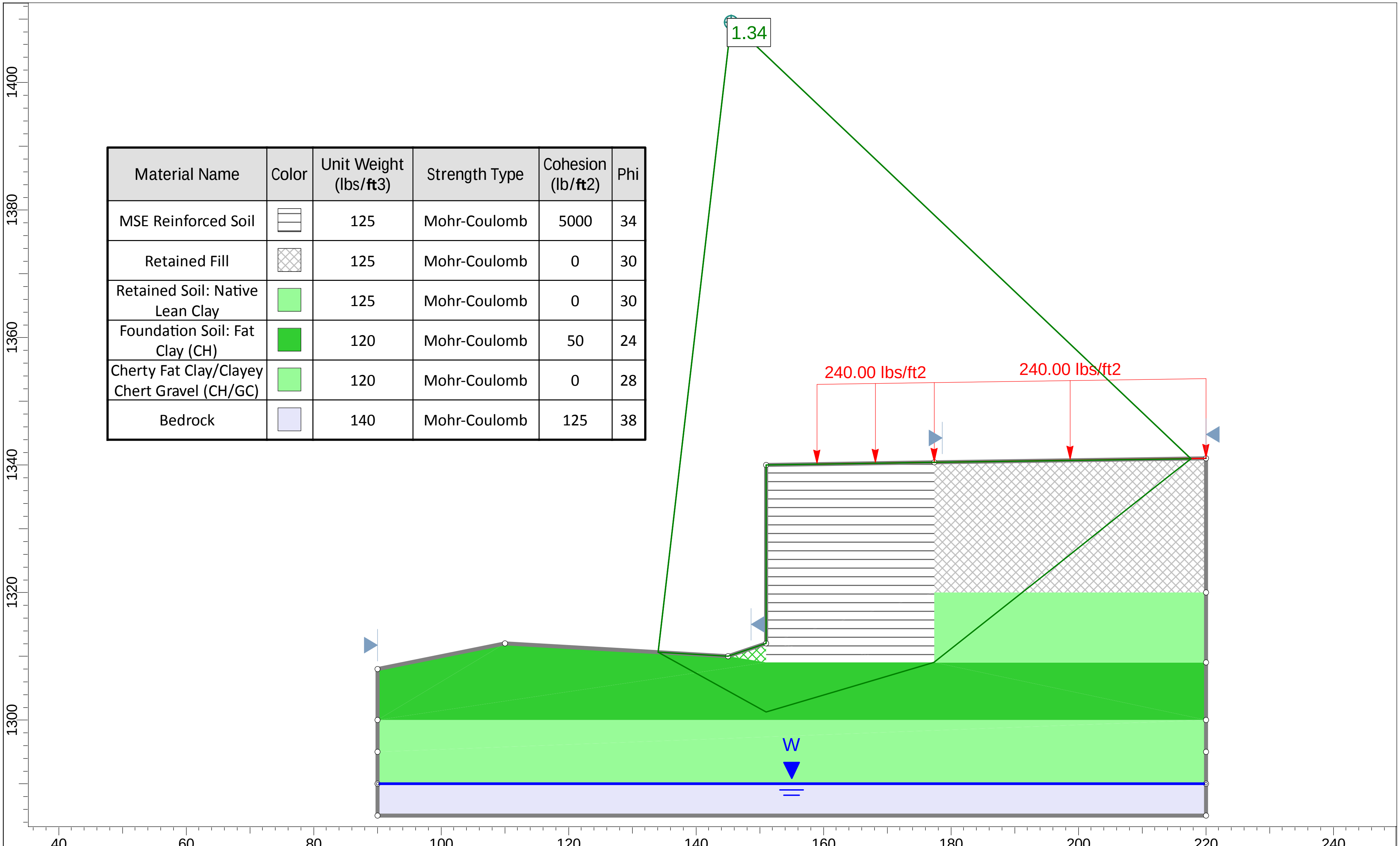
Project	04135111 - 8th Street Widening Project - MSE Walls 5B - Near BW715 / Sta. 1067+50 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By JEG	*Scale* 1:250	*Company*	Terracon Consultants, Inc.
Date	DEC 2015	*File Name*	MSE Wall 5B - BW715 - Sta. 1067+50 - L=0.85H.Slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Native Lean Clay (CL)		125	Mohr-Coulomb	50	28
Cherty Fat Clay (CH)		120	Mohr-Coulomb	0	26
Clay/Chert Gravel Mix (CH/GC/GM)		120	Mohr-Coulomb	0	29
Bedrock		140	Mohr-Coulomb	125	38

Project	04135111 - 8th Street Widening Project - MSE Wall 6A - Near BW802/606 / Sta. 1059+00 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By	JEG	*Scale*	1:250
Company	Terracon Consultants, Inc.		
Date	DEC 2015	*File Name*	MSE Wall 6A - Sta. 1059+00 - BW802 - L=0.85H.slim

SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Retained Soil: Native Lean Clay		125	Mohr-Coulomb	0	30
Foundation Soil: Fat Clay (CH)		120	Mohr-Coulomb	50	24
Cherty Fat Clay/Clayey Chert Gravel (CH/GC)		120	Mohr-Coulomb	0	28
Bedrock		140	Mohr-Coulomb	125	38

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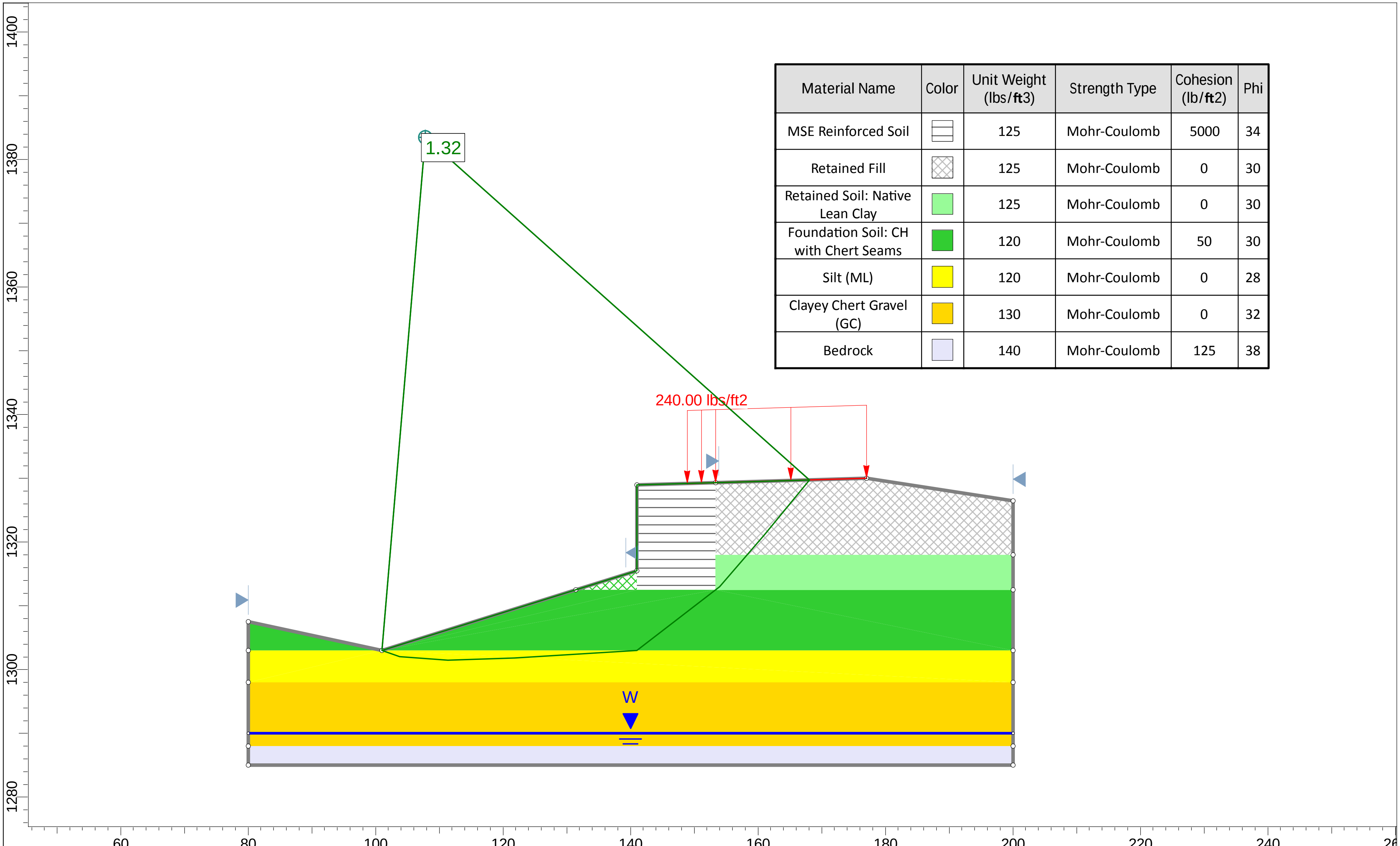
SLIDEINTERPRET 6.008

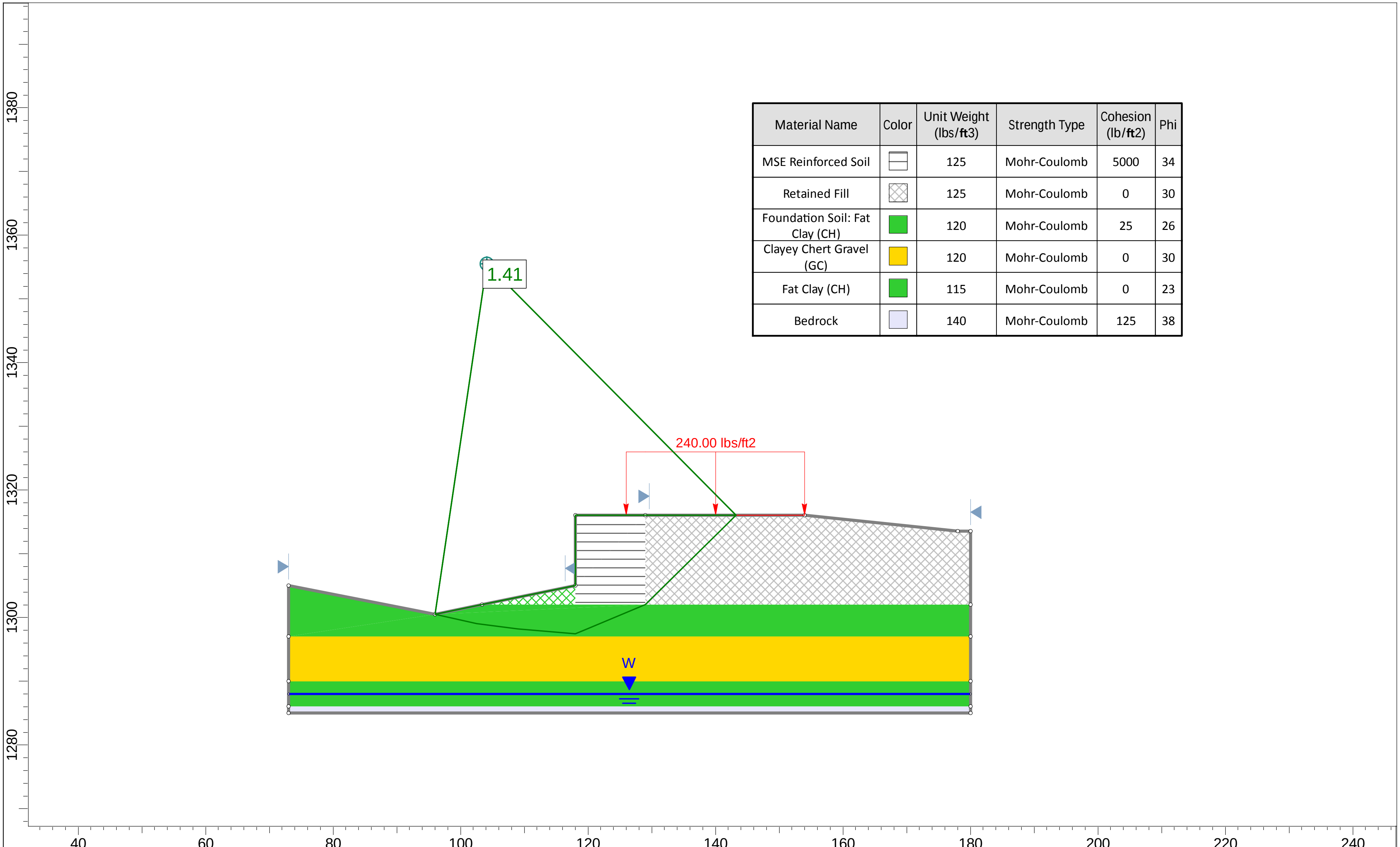
Project	04135111 - 8th Street Widening Project - MSE Wall 6B - Near BW806 / Sta. 1062+00 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 6B - Sta. 1062+00 - BW806 - L=0.85H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Retained Soil: Native Lean Clay		125	Mohr-Coulomb	0	30
Foundation Soil: CH with Chert Seams		120	Mohr-Coulomb	50	30
Silt (ML)		120	Mohr-Coulomb	0	28
Clayey Chert Gravel (GC)		130	Mohr-Coulomb	0	32
Bedrock		140	Mohr-Coulomb	125	38

Project	04135111 - 8th Street Widening Project - MSE Wall 6B - Near BW809 / Sta. 1064+50 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Wall 6B - Sta. 1064+50 - BW809 - L=0.75H.slim

SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Fat Clay (CH)		120	Mohr-Coulomb	25	26
Clayey Chert Gravel (GC)		120	Mohr-Coulomb	0	30
Fat Clay (CH)		115	Mohr-Coulomb	0	23
Bedrock		140	Mohr-Coulomb	125	38

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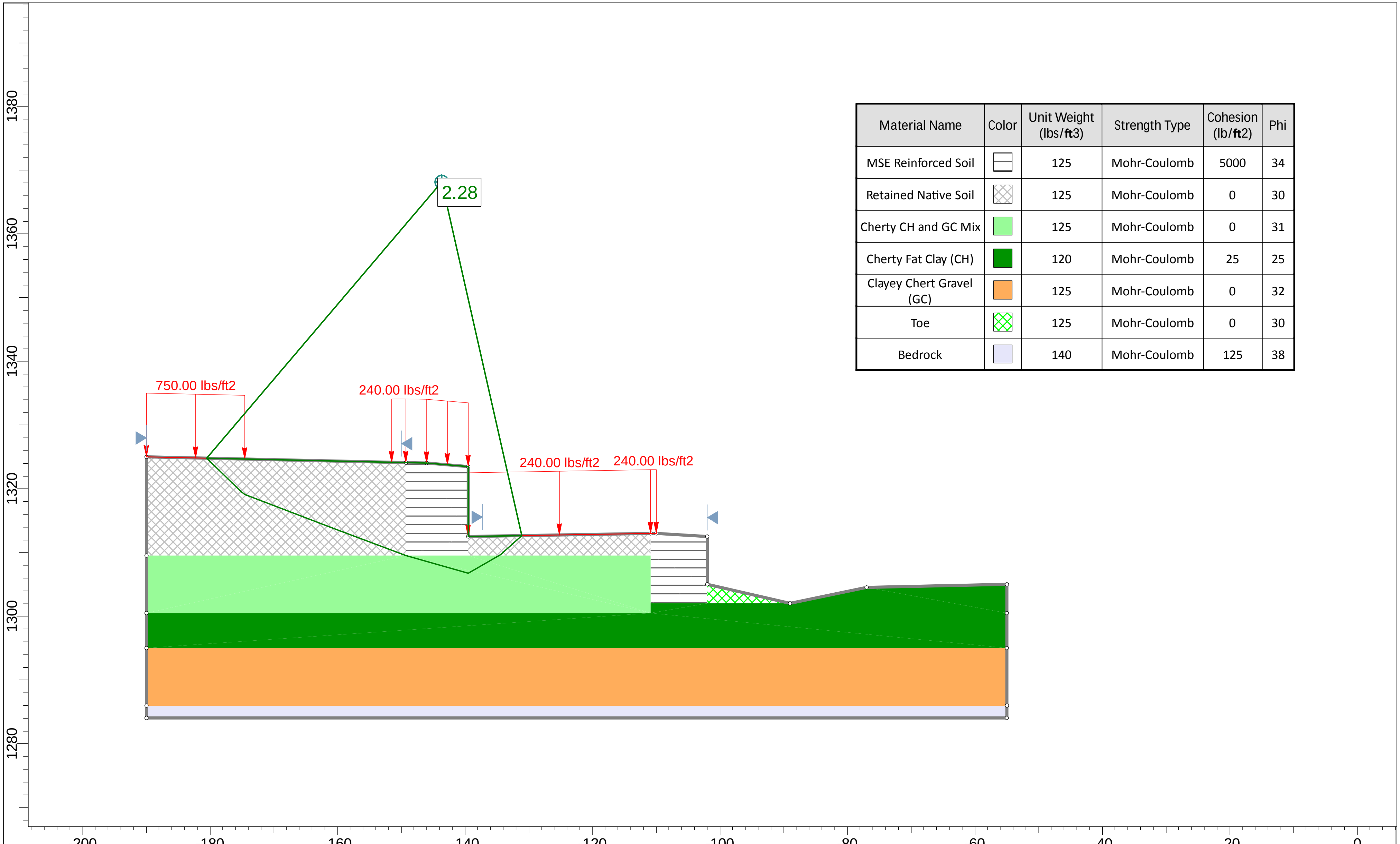
SLIDEINTERPRET 6.008

Project 04135111 - 8th Street Widening Project - MSE Wall 6B - Near BW811/812 / Sta. 1067+00 (Long Term Stability)

Analysis Description GLE/Morgenstern-Price

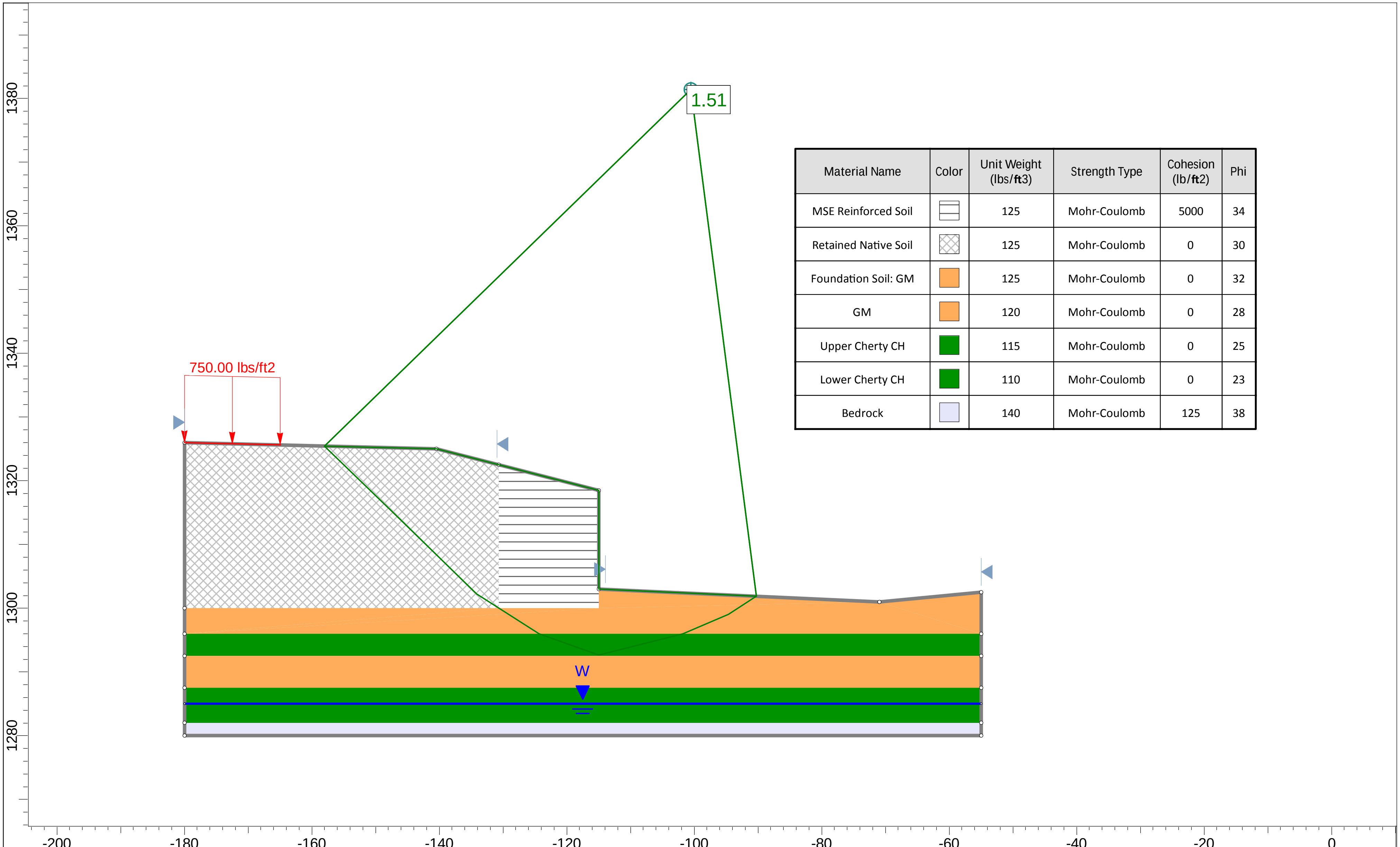
Drawn By JEG | *Scale* 1:250 | *Company* Terracon Consultants, Inc.

Date DEC 2015 | *File Name* MSE Wall 6B - Sta. 1067+00 - BW812 - L=0.80H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Native Soil		125	Mohr-Coulomb	0	30
Cherty CH and GC Mix		125	Mohr-Coulomb	0	31
Cherty Fat Clay (CH)		120	Mohr-Coulomb	25	25
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	32
Toe		125	Mohr-Coulomb	0	30
Bedrock		140	Mohr-Coulomb	125	38

SLIDEINTERPRET 6.008	*Project* 04135111 - 8th Street Widening Project - MSE Walls 7 - Near BW716 (& BW715) / Sta. 1067+50 (Long Term Stability)		
	Analysis Description GLE/Morgenstern-Price		
	Drawn By JEG	*Scale* 1:250	*Company* Terracon Consultants, Inc.
	Date DEC 2015		*File Name* MSE Wall 7 - BW716 - Sta. 1067+50 - L=0.70H.Slim

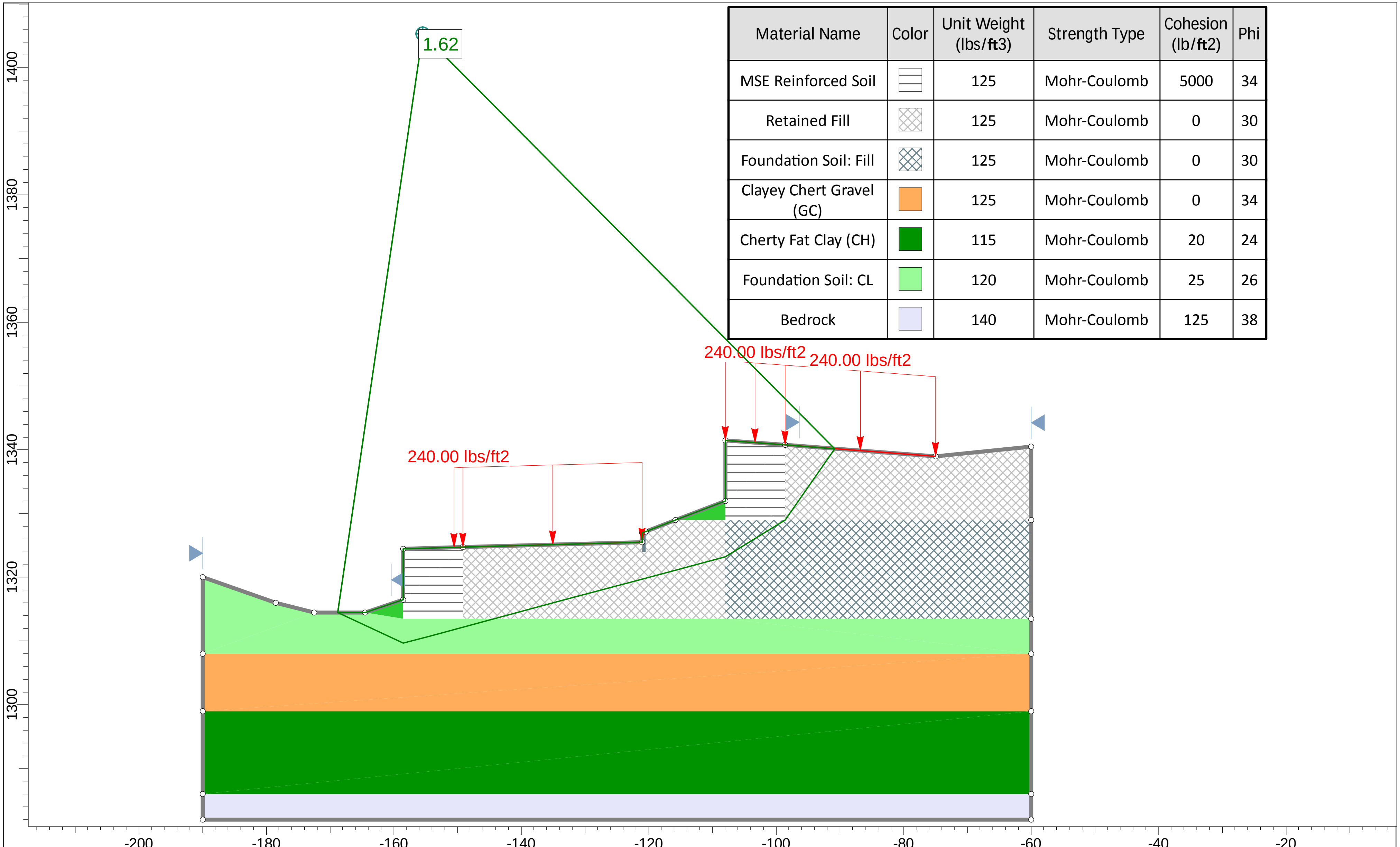


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Native Soil		125	Mohr-Coulomb	0	30
Foundation Soil: GM		125	Mohr-Coulomb	0	32
GM		120	Mohr-Coulomb	0	28
Upper Cherty CH		115	Mohr-Coulomb	0	25
Lower Cherty CH		110	Mohr-Coulomb	0	23
Bedrock		140	Mohr-Coulomb	125	38

Project	04135111 - 8th Street Widening Project - MSE Wall 7- Near BW902 / Sta. 1070+50 (Long Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By JEG	*Scale* 1:250	*Company*	Terracon Consultants, Inc.
Date DEC 2015		*File Name*	MSE Wall 7 - BW902 - Sta. 1070+50 - L=0.85H.Slim

SLIDEINTERPRET 6.008

LONG TERM GLOBAL STABILITY
COMBINED CROSS SECTIONS



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	0	30
Foundation Soil: Fill		125	Mohr-Coulomb	0	30
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	34
Cherty Fat Clay (CH)		115	Mohr-Coulomb	20	24
Foundation Soil: CL		120	Mohr-Coulomb	25	26
Bedrock		140	Mohr-Coulomb	125	38

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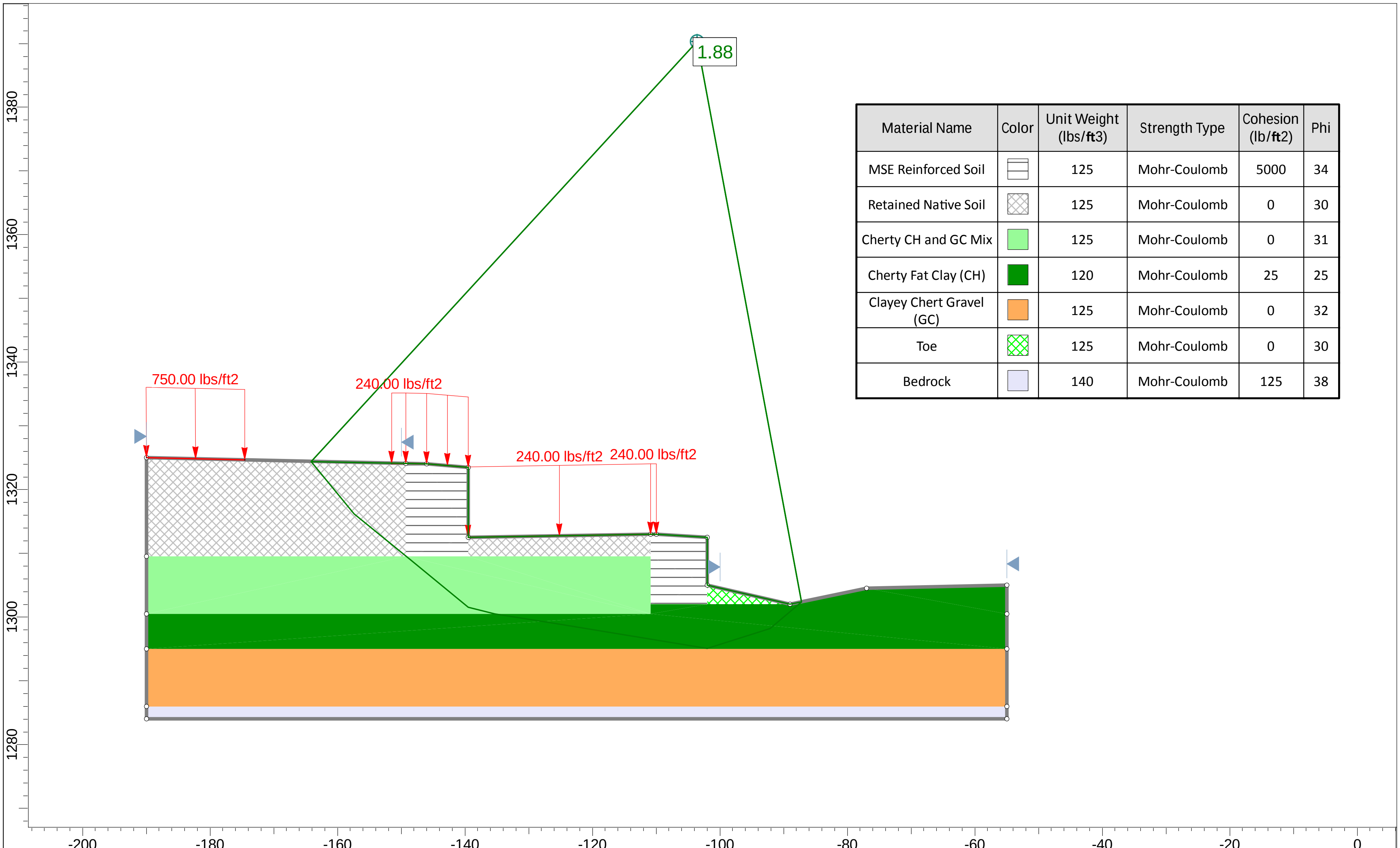
SLIDEINTERPRET 6.008

Project	04135111 - 8th Street Widening Project - Combined MSE Walls 1 & 3 - Near BW305 & BW502 / Sta. 1049+50 (Long Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	DEC 2015
File Name	MSE Walls 1 & 3 - Sta. 1049+50 - BW305 & 502 - L=0.85H & 0.75H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Native Soil		125	Mohr-Coulomb	0	30
Cherty CH and GC Mix		125	Mohr-Coulomb	0	31
Cherty Fat Clay (CH)		120	Mohr-Coulomb	25	25
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	32
Toe		125	Mohr-Coulomb	0	30
Bedrock		140	Mohr-Coulomb	125	38

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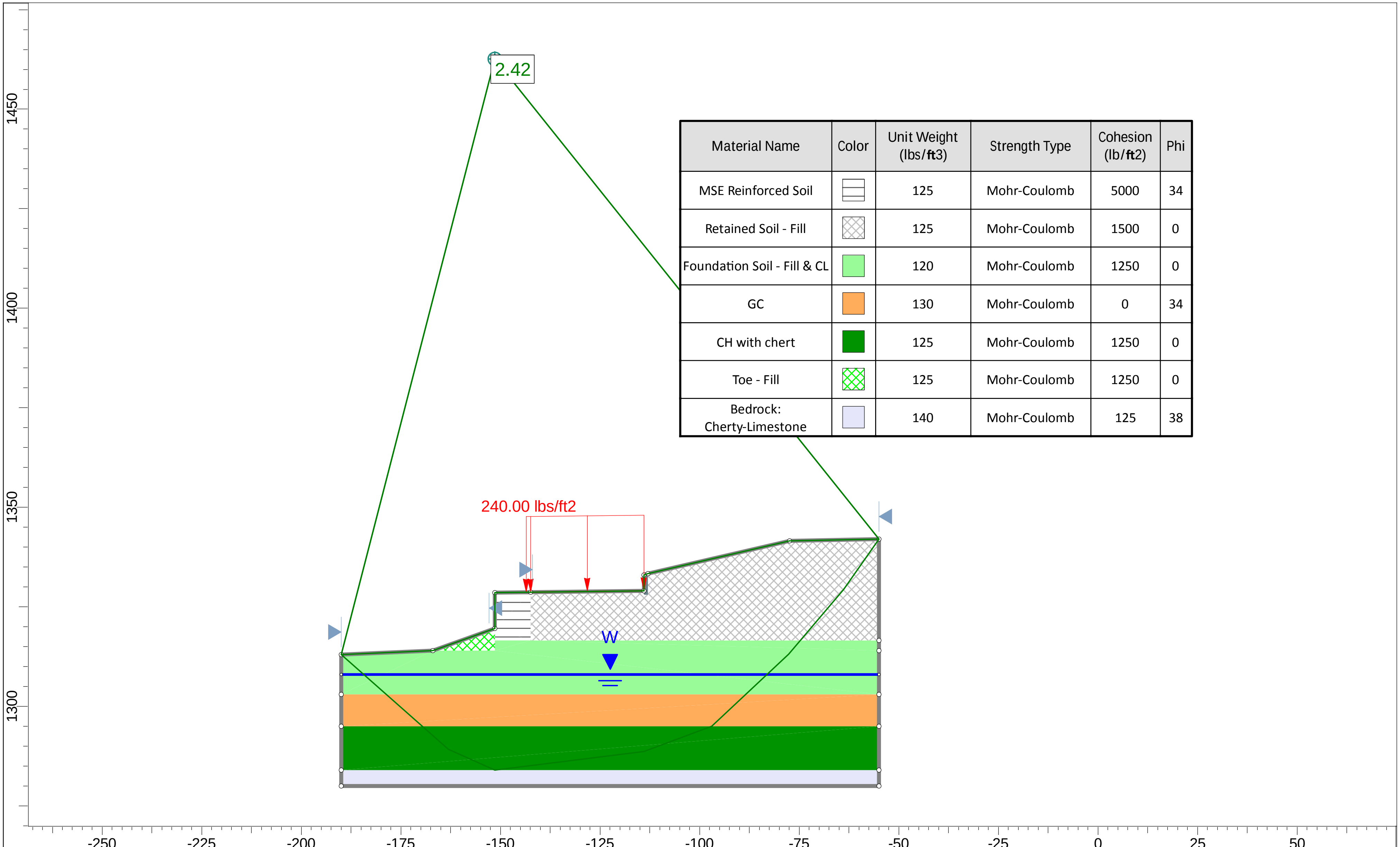
SLIDEINTERPRET 6.008

Project 04135111 - 8th Street Widening Project - Combined MSE Walls 5B & 7 - Near BW715 & BW716 / Sta. 1067+50 (Long Term Stability)			
Analysis Description GLE/Morgenstern-Price			
Drawn By JEG	*Scale* 1:250	*Company* Terracon Consultants, Inc.	
Date DEC 2015		*File Name* MSE Walls 5B & 7 - Sta. 1067+50 - BW715 & BW716 - L=0.85H & L=0.70H Slim	

SHORT TERM GLOBAL STABILITY

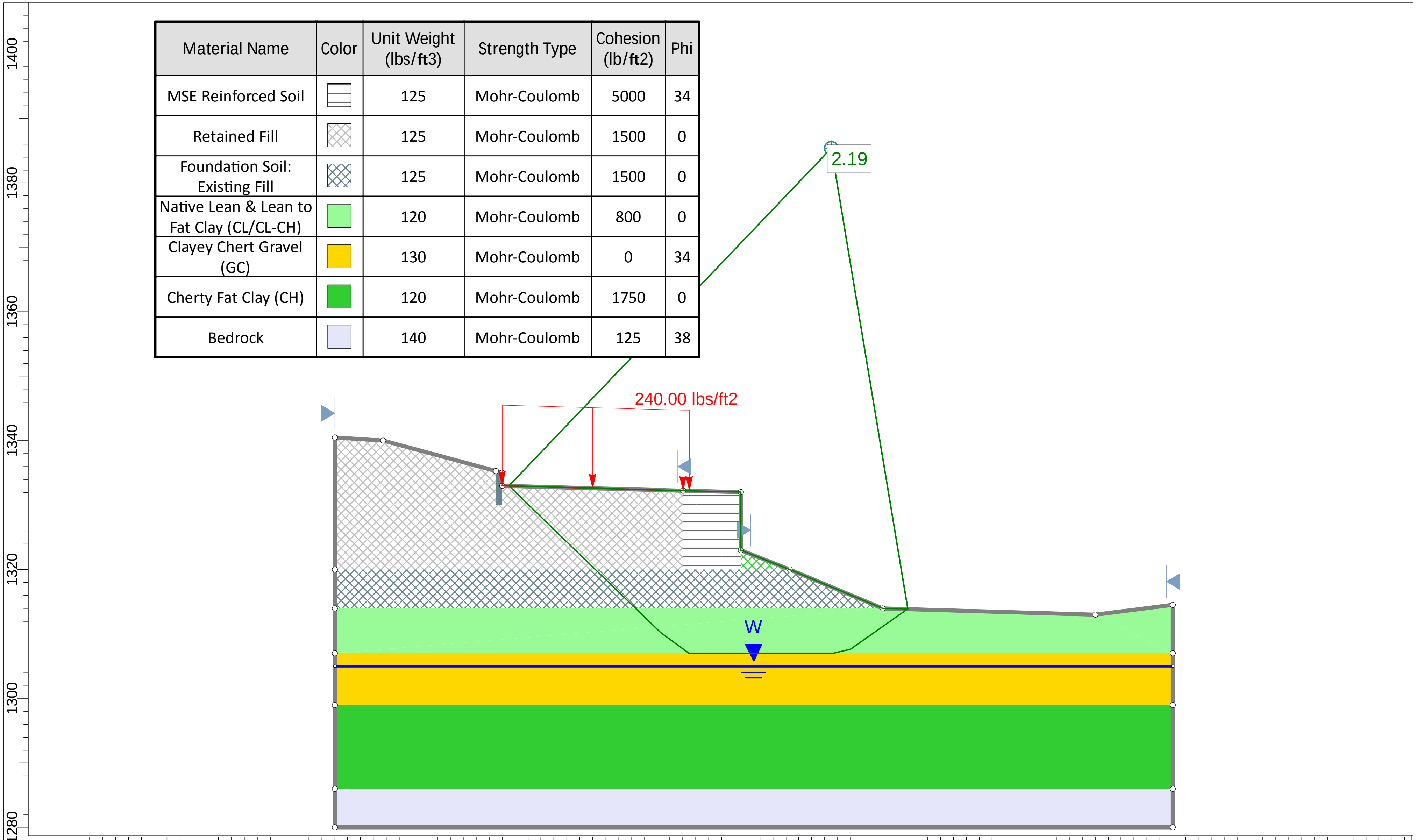


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Soil - Fill		125	Mohr-Coulomb	1500	0
Foundation Soil - Fill & CL		120	Mohr-Coulomb	1250	0
GC		130	Mohr-Coulomb	0	34
CH with chert		125	Mohr-Coulomb	1250	0
Toe - Fill		125	Mohr-Coulomb	1250	0
Bedrock: Cherty-Limestone		140	Mohr-Coulomb	125	38

Project	04135111 - 8th Street Widening Project - MSE Wall 1 - Near BW106 / Sta. 1042+00 (Short Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By	JEG	*Scale*	1:400
Company	Terracon Consultants, Inc.		
Date	JAN 2016	*File Name*	MSE Wall 1 - Sta. 1042+00 - BW106 - L=0.75H.slim

SLIDEINTERPRET 6.008

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	1500	0
Foundation Soil: Existing Fill		125	Mohr-Coulomb	1500	0
Native Lean & Lean to Fat Clay (CL/CL-CH)		120	Mohr-Coulomb	800	0
Clayey Chert Gravel (GC)		130	Mohr-Coulomb	0	34
Cherty Fat Clay (CH)		120	Mohr-Coulomb	1750	0
Bedrock		140	Mohr-Coulomb	125	38



Project	04135111 - 8th Street Widening Project - MSE Wall 2 - Near BW402 / Sta. 1047+50 (Short Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	JAN 2016
File Name	MSE Wall 2 - Sta. 1047+50 - BW402 - L=0.75H.slim

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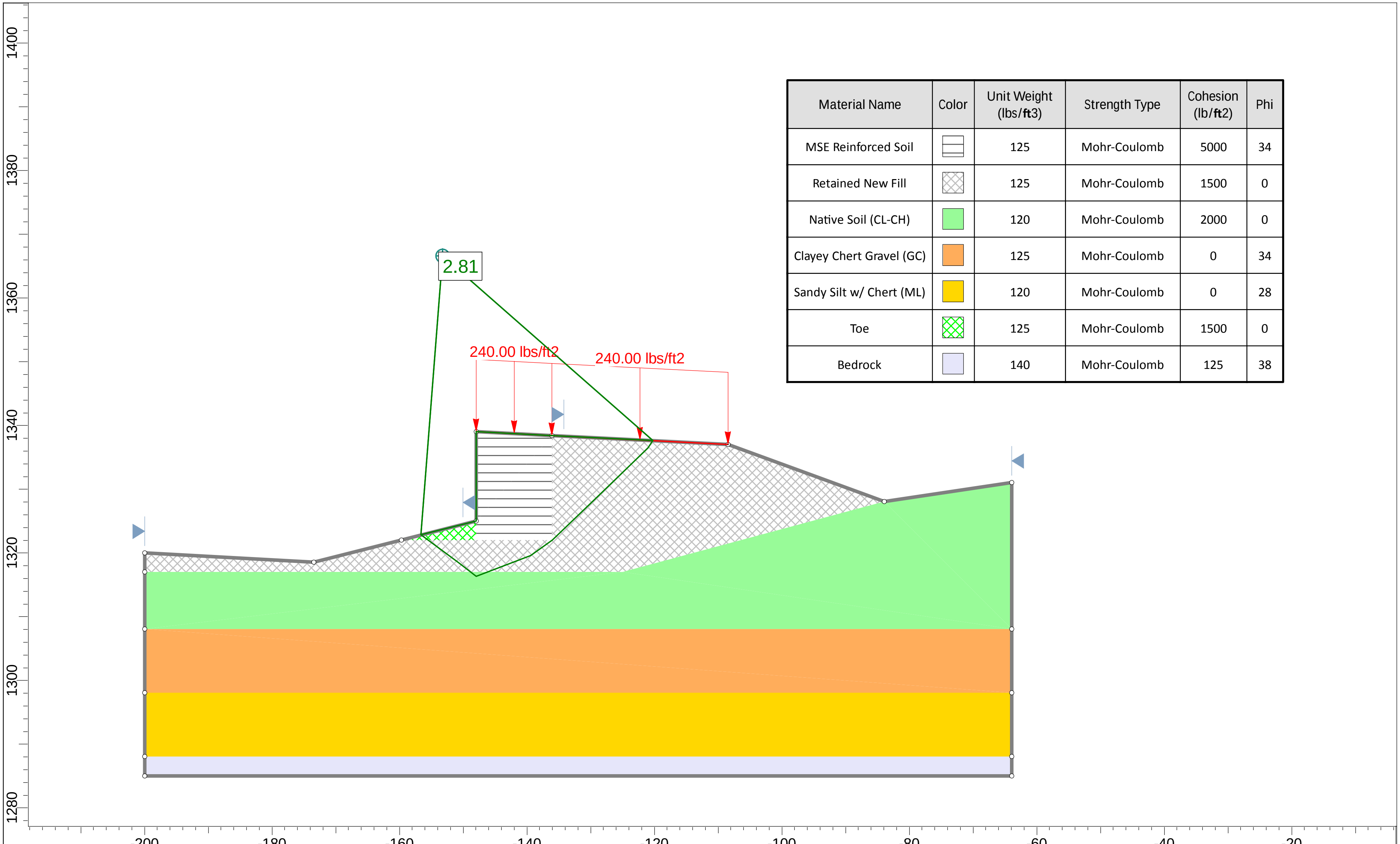
SLIDEINTERPRET 6.008



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained New Fill		125	Mohr-Coulomb	1500	0
Native Soil (CL-CH)		120	Mohr-Coulomb	2000	0
Clayey Chert Gravel (GC)		125	Mohr-Coulomb	0	34
Sandy Silt w/ Chert (ML)		120	Mohr-Coulomb	0	28
Toe		125	Mohr-Coulomb	1500	0
Bedrock		140	Mohr-Coulomb	125	38

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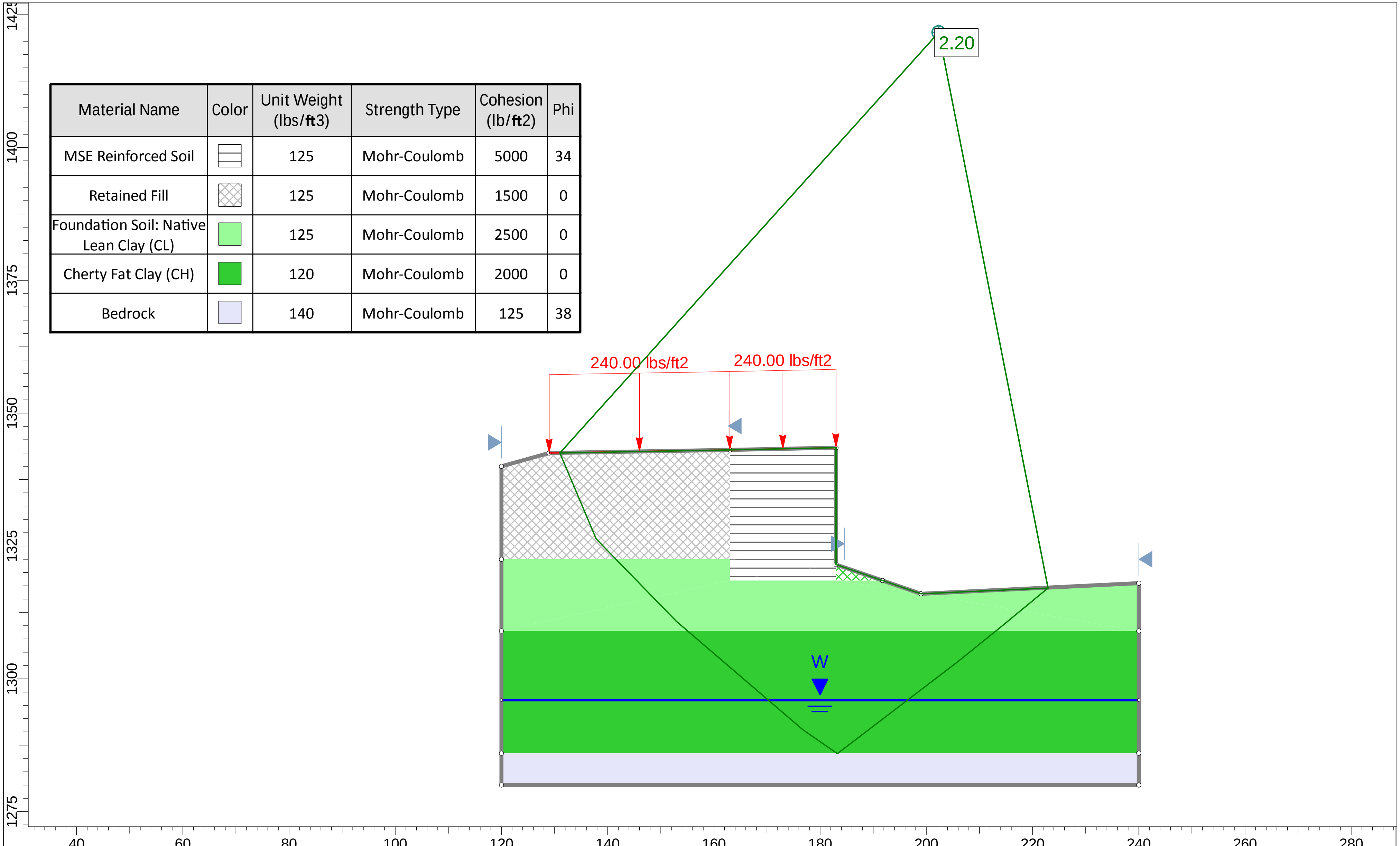
SLIDEINTERPRET 6.008

Project 04135111 - 8th Street Widening Project - MSE Wall 3B - Near BW506 / Sta. 1054+50 (Short Term Stability)

Analysis Description GLE/Morgenstern-Price

Drawn By JEG | *Scale* 1:250 | *Company* Terracon Consultants, Inc.

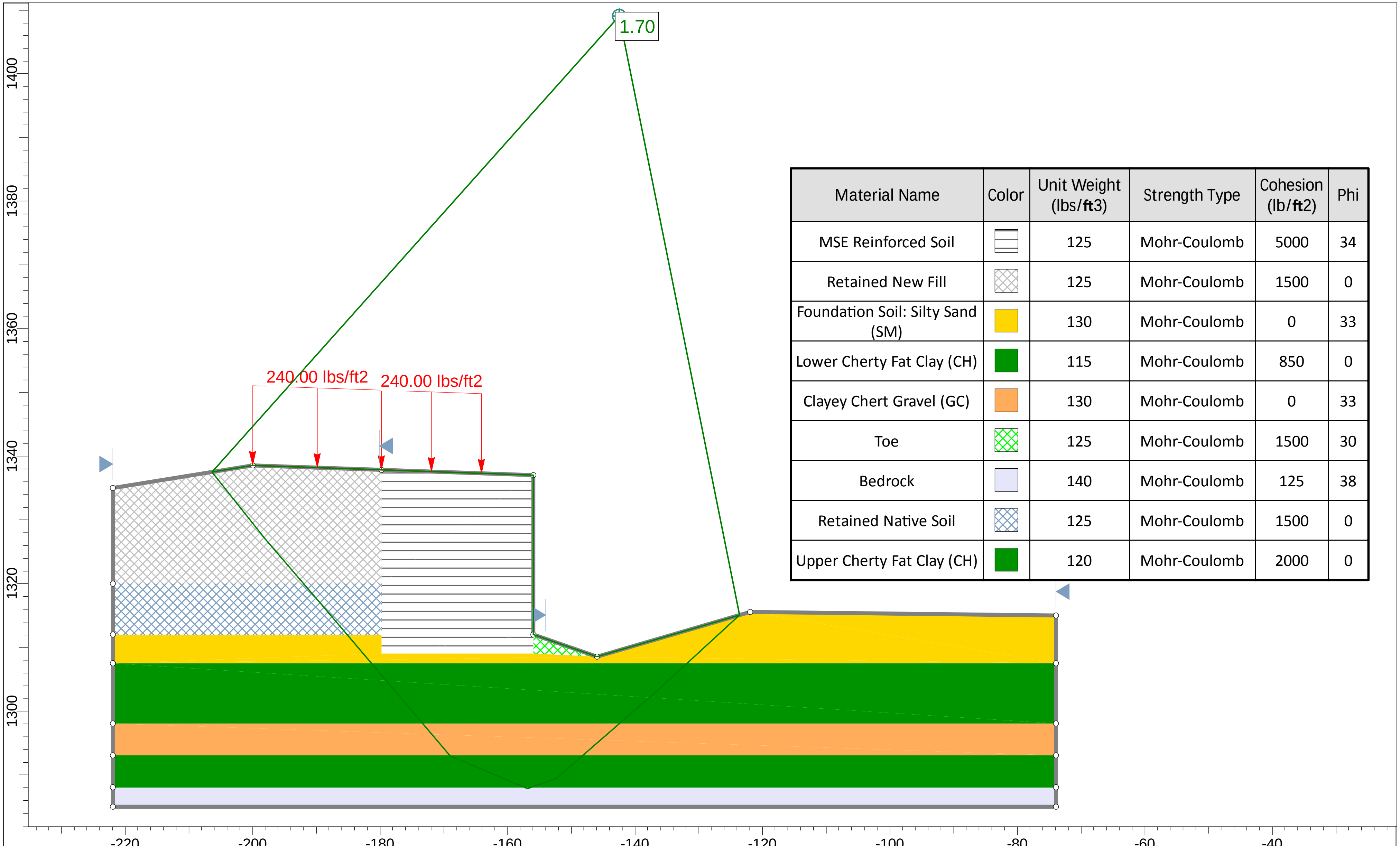
Date JAN 2016 | *File Name* MSE Wall 3B - Sta. 1054+50 - BW506 - L=0.70H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	1500	0
Foundation Soil: Native Lean Clay (CL)		125	Mohr-Coulomb	2500	0
Cherty Fat Clay (CH)		120	Mohr-Coulomb	2000	0
Bedrock		140	Mohr-Coulomb	125	38

SLIDEINTERPRET 6.008

Project	04135111 - 8th Street Widening Project - MSE Wall 4 - Near BW606 / Sta. 1059+00 (Short Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:300
Company	Terracon Consultants, Inc.
Date	JAN 2016
File Name	MSE Wall 4 - Sta. 1059+00 - BW606 - L=0.80H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained New Fill		125	Mohr-Coulomb	1500	0
Foundation Soil: Silty Sand (SM)		130	Mohr-Coulomb	0	33
Lower Cherty Fat Clay (CH)		115	Mohr-Coulomb	850	0
Clayey Chert Gravel (GC)		130	Mohr-Coulomb	0	33
Toe		125	Mohr-Coulomb	1500	30
Bedrock		140	Mohr-Coulomb	125	38
Retained Native Soil		125	Mohr-Coulomb	1500	0
Upper Cherty Fat Clay (CH)		120	Mohr-Coulomb	2000	0

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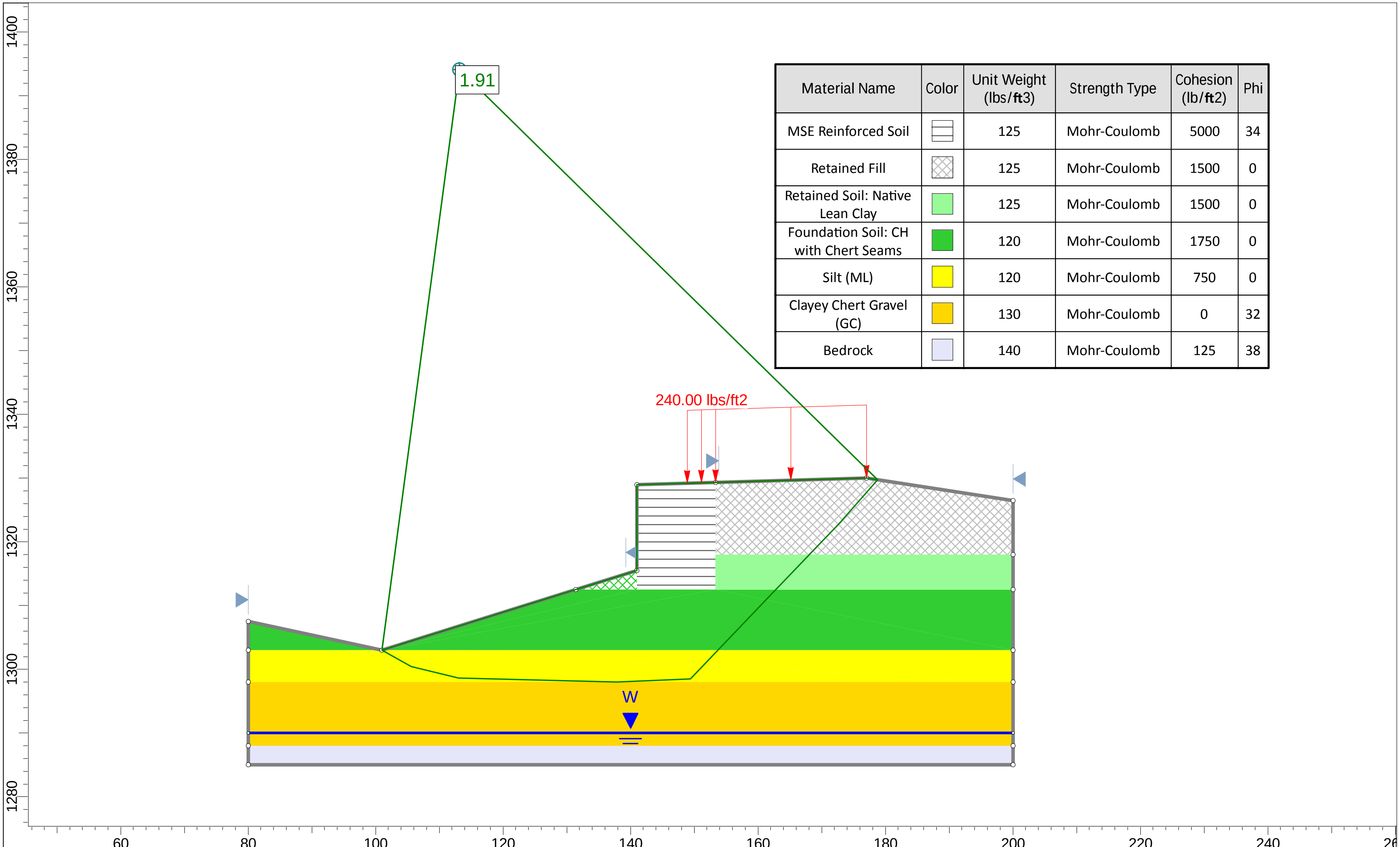
SLIDEINTERPRET 6.008

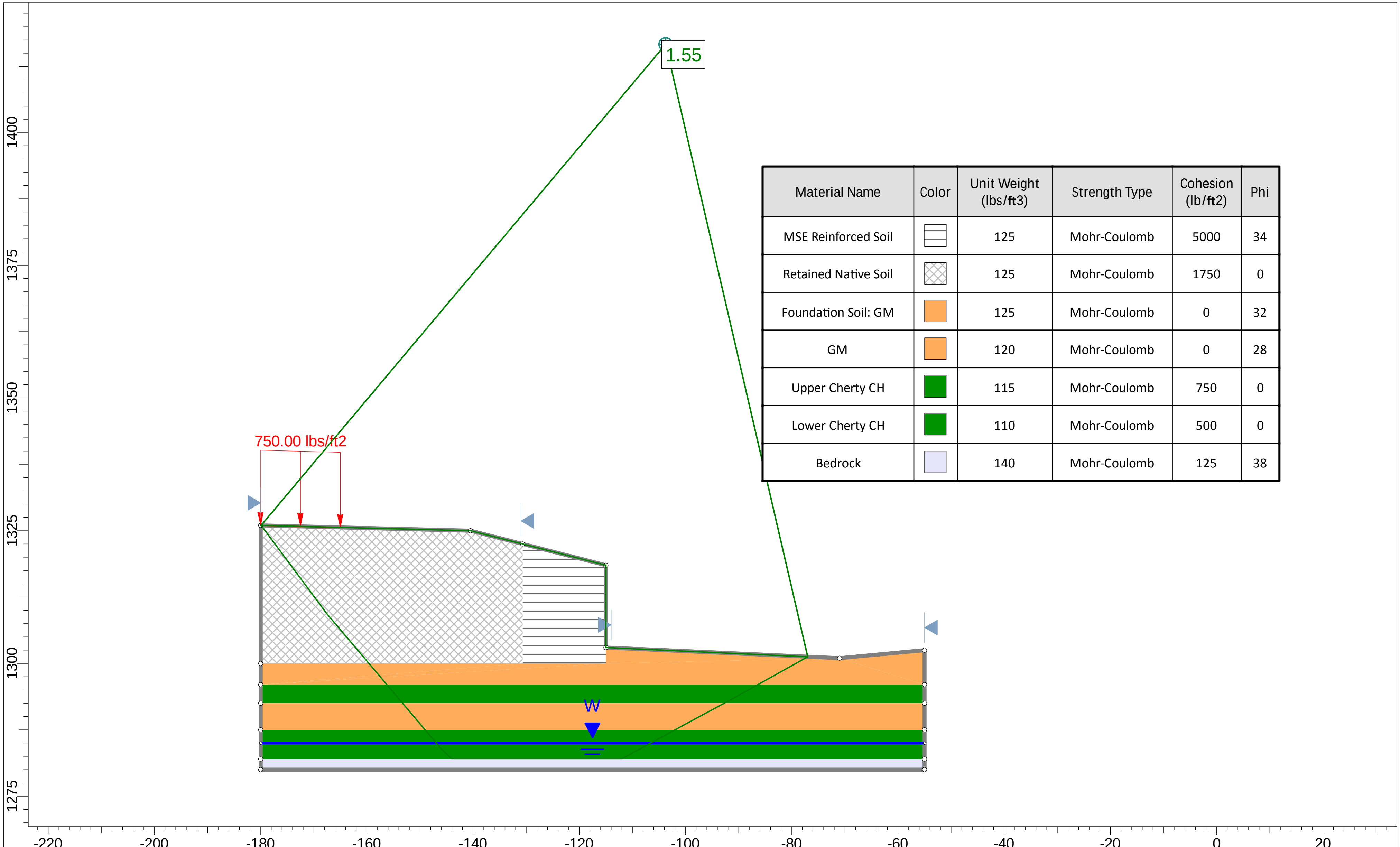
Project	04135111 - 8th Street Widening Project - MSE Wall 5B - Near BW708 / Sta. 1061+00 (Short Term Stability)		
Analysis Description	GLE/Morgenstern-Price		
Drawn By	JEG	*Scale*	1:250
Company	Terracon Consultants, Inc.		
Date	JAN 2016	*File Name*	MSE Wall 5B - BW708 - Sta. 1061+00 - L=0.85H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Fill		125	Mohr-Coulomb	1500	0
Retained Soil: Native Lean Clay		125	Mohr-Coulomb	1500	0
Foundation Soil: CH with Chert Seams		120	Mohr-Coulomb	1750	0
Silt (ML)		120	Mohr-Coulomb	750	0
Clayey Chert Gravel (GC)		130	Mohr-Coulomb	0	32
Bedrock		140	Mohr-Coulomb	125	38

SLIDEINTERPRET 6.008

Project	04135111 - 8th Street Widening Project - MSE Wall 6B - Near BW809 / Sta. 1064+50 (Short Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:250
Company	Terracon Consultants, Inc.
Date	JAN 2016
File Name	MSE Wall 6B - Sta. 1064+50 - BW809 - L=0.75H.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (lb/ft2)	Phi
MSE Reinforced Soil		125	Mohr-Coulomb	5000	34
Retained Native Soil		125	Mohr-Coulomb	1750	0
Foundation Soil: GM		125	Mohr-Coulomb	0	32
GM		120	Mohr-Coulomb	0	28
Upper Cherty CH		115	Mohr-Coulomb	750	0
Lower Cherty CH		110	Mohr-Coulomb	500	0
Bedrock		140	Mohr-Coulomb	125	38

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SLIDEINTERPRET 6.008

Project	04135111 - 8th Street Widening Project - MSE Wall 7- Near BW902 / Sta. 1070+50 (Short Term Stability)
Analysis Description	GLE/Morgenstern-Price
Drawn By	JEG
Scale	1:300
Company	Terracon Consultants, Inc.
Date	JAN 2016
File Name	MSE Wall 7 - BW902 - Sta. 1070+50 - L=0.85H.Slim

APPENDIX D

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING			WATER LEVEL		FIELD TESTS		
	Auger	Split Spoon		▽ Water Initially Encountered		(HP)	Hand Penetrometer
	Shelby Tube	Macro Core		▽ Water Level After a Specified Period of Time		(T)	Torvane
	Ring Sampler	Rock Core		▼ Water Level After a Specified Period of Time		(b/f)	Standard Penetration Test (blows per foot)
	Grab Sample	No Recovery		Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.		(PID)	Photo-Ionization Detector
						(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

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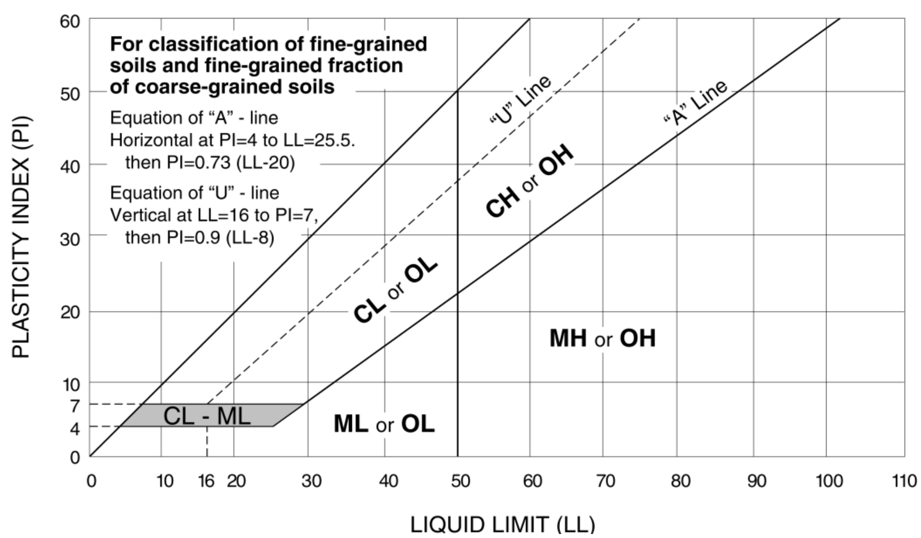
UNIFIED SOIL CLASSIFICATION SYSTEM

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

[A] Based on the material passing the 3-in. (75-mm) sieve
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay
[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



GENERAL NOTES

Sedimentary Rock Classification

DESCRIPTIVE ROCK CLASSIFICATION:

Sedimentary rocks are composed of cemented clay, silt and sand sized particles. The most common minerals are clay, quartz and calcite. Rock composed primarily of calcite is called limestone; rock of sand size grains is called sandstone, and rock of clay and silt size grains is called mudstone or claystone, siltstone, or shale. Modifiers such as shaly, sandy, dolomitic, calcareous, carbonaceous, etc. are used to describe various constituents. Examples: sandy shale; calcareous sandstone.

LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of $CaCo_3$, reacts readily with HCl.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of $CaMg(CO_3)_2$, harder than limestone, reacts with HCl when powdered.
CHERT	Light to dark colored, very fine-grained texture, composed of micro-crystalline quartz ($Si0_2$), brittle, breaks into angular fragments, will scratch glass.
SHALE	Very fine-grained texture, composed of consolidated silt or clay, bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone or mudstone.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand size grains of quartz, feldspar, etc. Cement usually is silica but may be such minerals as calcite, iron-oxide, or some other carbonate.
CONGLOMERATE	Rounded rock fragments of variable mineralogy varying in size from near sand to boulder size but usually pebble to cobble size (½ inch to 6 inches). Cemented together with various cementing agents. Breccia is similar but composed of angular, fractured rock particles cemented together.

PHYSICAL PROPERTIES:

DEGREE OF WEATHERING

Slight	Slight decomposition of parent material on joints. May be color change.
Moderate	Some decomposition and color change throughout.
High	Rock highly decomposed, may be extremely broken.

HARDNESS AND DEGREE OF CEMENTATION

Limestone and Dolomite:

Hard	Difficult to scratch with knife.
Moderately Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Soft	Can be scratched with fingernail.

Shale, Siltstone and Claystone

Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be easily dented but not molded with fingers.

Sandstone and Conglomerate

Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers.

BEDDING AND JOINT CHARACTERISTICS

Bed Thickness	Joint Spacing	Dimensions
Very Thick	Very Wide	>10′
Thick	Wide	3′ - 10′
Medium	Moderately Close	1′ - 3′
Thin	Close	2″ - 1′
Very Thin	Very Close	.4″ - 2″
Laminated	—	.1″ - .4″

Bedding Plane	A plane dividing sedimentary rocks of the same or different lithology.
Joint	Fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.
Seam	Generally applies to bedding plane with an unspecified degree of weathering.

SOLUTION AND VOID CONDITIONS

Solid	Contains no voids.
Vuggy (Pitted)	Rock having small solution pits or cavities up to ½ inch diameter, frequently with a mineral lining.
Porous	Containing numerous voids, pores, or other openings, which may or may not interconnect.
Cavernous	Containing cavities or caverns, sometimes quite large.

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Geotechnical Engineering Report

8th Street Widening Project

Proposed Pavements

8th Street from SW I Street to Interstate 49

Bentonville, Arkansas

March 13, 2015

Terracon Project No. 04135111

Prepared for:

Burns & McDonnell Engineering Company, Inc.

Kansas City, Missouri

Prepared by:

Terracon Consultants, Inc.

Tulsa, Oklahoma

Terracon

March 13, 2015

Burns & McDonnell Engineering Company, Inc.
9400 Ward Parkway
Kansas City, MO 64114

Attn: Mr. David Hurt, P.E.
P: (816) 822 3426
E: dhurt@burnsmcd.com

Re: Geotechnical Engineering Report
8th Street Widening Project – Proposed Pavements
8th Street from SW I Street to Interstate 49
Bentonville, Arkansas
Terracon Project No. 04135111

Dear Mr. Hurt:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal number P04090495 dated February 26, 2010. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning general earthwork and design and construction of the proposed pavements.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.
Cert. Of Auth. #CA-233 exp. 12/31/15

Seamer Orth for

Jaime E. Granados
Staff Geotechnical Engineer

Michael H. Homan, P.E.
Arkansas No. 7052

STATE OF ARKANSAS REGISTERED PROFESSIONAL ENGINEER No. 7052 MICHAEL H. HOMAN

3-13-2015

JEG:MHH:lo
Enclosures
Addressee (3 via US Mail and 1 via email)

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

APPENDIX D – SUPPORTING DOCUMENTS

GEOTECHNICAL ENGINEERING REPORT
8TH STREET WIDENING PROJECT – PROPOSED PAVEMENTS
8TH STREET FROM SW I STREET TO INTERSTATE 49
BENTONVILLE, ARKANSAS

Terracon Project No. 04135111
March 13, 2015

1.0 INTRODUCTION

This geotechnical engineering report has been completed as a part of the 8th Street widening project in Bentonville, Arkansas. This report addresses our geotechnical recommendations for pavements along 8th Street from SW I Street to Interstate 49.

A total of 41 borings, designated BR-001 through BR-041, were drilled for the project to depths of approximately 0.5 to 10 feet below the existing ground surface. One boring, BR-011, was not extended deeper than the asphalt pavement bottom due to the presence of underground and overhead utilities and its proximity to the Bentonville City Fire Department. A site location map along with boring location plans and boring logs are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- pavement subgrade preparation
- pavement design recommendations

2.0 PROJECT INFORMATION

2.1 Project Description

Item	Description
Site Layout	See Appendix A, Figure A-2, Boring Location Plan.
Proposed Construction	This phase of the project will consist of widening 8th Street from SW I Street to Moberly Lane and extending 8th Street from Moberly Lane to the intersection of 8th Street with Interstate 49. On and off-ramps and tunnel pavements will also be constructed. The total length of the project is approximately 2.6 miles.
General Considerations	We understand that the Arkansas Highway Transportation Department (AHTD) and the City of Bentonville will per be responsible for the project and that pavement design and construction should be performed according to their specifications.

2.2 Site Location and Description

Item	Description
Location	8th Street from SW I Street to Interstate 49 in Bentonville, Arkansas.
Current Ground Cover	Existing asphalt paved surfaces and grass areas with some concrete paved areas and concrete sidewalks.
Traffic Information and Pavement Design	We understand that Burns & McDonnell will be responsible for traffic information and pavement design.
Grading	Based on the preliminary plans provided to us by Burns & McDonnell (Bentonville\8th_Street_Final\Civil\Drawings\I20\PLAN_09_090218_150.dgn) and the elevation of the borings, the proposed road alignment will have slopes between 0.5% and 3.0%. Road alignment slopes in excess of about 3.0% are anticipated for the proposed bridge abutments and ramps.

3.0 SUBSURFACE CONDITIONS

3.1 Existing Pavement Thicknesses

The summary of the asphalt thicknesses measured in our borings is provided below. Due to the pavement coring methods used to extend our borings, we were not able to accurately measure aggregate base thicknesses. Therefore, the aggregate base thicknesses presented below should be considered approximate.

Boring No.	Asphalt Thickness (inches)	Aggregate Base Thickness (inches)
BR-001	9	Not Measured
BR-002	N/A	Not Measured
BR-003	11	Not Measured
BR-004	3 ½	2 ½
BR-005	5 ½	Not Measured
BR-006	4 ¾	6
BR-007	N/A	Not Measured
BR-008	6	Not Measured
BR-009	5	Not Measured
BR-010	6	Not Measured
BR-011	5	Not Measured
BR-012	4 – (concrete parking lot)	Not Measured
BR-013	N/A	Not Measured
BR-014	4	Not Measured
BR-015	N/A	Not Measured
BR-016	6 ½	Not Measured
BR-017	N/A	Not Measured
BR-018	N/A	Not Measured

Boring No.	Asphalt Thickness (inches)	Aggregate Base Thickness (inches)
BR-019	5	Not Measured
BR-020	9	Not Measured
BR-021	8	Not Measured
BR-022	5	2
BR-023	4 ½ asphalt over 7 ¾ concrete	Not Measured
BR-024	6 ¾	3
BR-025	6 ½	Not Measured
BR-026	7 ½	Not Measured
BR-027	5	6
BR-028	3 ½	3
BR-029	2 ½	3
BR-030	2 ½	3
BR-031	3 ½	2
BR-032	3 ½	2
BR-033	4	Not Measured
BR-034	5	Not Measured
BR-035	3 ½	2
BR-036	4 ¼	2 ½
BR-037	N/A	Not Measured
BR-038	N/A	Not Measured
BR-039	N/A	Not Measured
BR-040	N/A	Not Measured
BR-041	N/A	Not Measured

3.2 Typical Subsurface Profile

Based on the results of the borings, subsurface conditions along the project alignment can be generalized as follows:

Stratum	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
1 [1]	1 to 5 feet	Fill: Low to medium plasticity clay with various amounts of sand and gravel and chert or limestone gravel with various amounts of fines	N/A
2 [2]	Borings terminated in this stratum at depths of 4.5 to 10 feet	Low to high plasticity clay with various amounts of silt, sand, and chert gravel	Soft to stiff

1. The composition of the fill materials encountered during our field exploration varies along the project alignment. Actual fill depths are sometimes difficult to identify due to similarities of the fill with the native soils and preliminary earthwork activities. Fill materials may exist in the vicinity of the construction areas at locations away from our borings. Existing fill materials were encountered in all borings except BR-013/015/017/018/024/039/040.

Continued from page 3

2. All borings terminated in this stratum except BR-007, which was terminated in apparent fill materials; BR-011, which was not extended into the subgrade soils; BR-024, which was terminated in apparent weathered sandstone; BR-025, which was terminated in apparent shale; and BR-040, which was terminated in silty chert gravel.

Conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in material types; in-situ, the transition between materials may be gradual.

Laboratory tests were conducted on select soil samples. The test results are presented on the individual boring logs in Appendix A.

3.3 Groundwater

The boreholes were observed while drilling and immediately after boring completion for the presence and level of groundwater. Groundwater was only observed in boring BR-041 at depths of about 4 feet and 3 feet while drilling and after boring, respectively. Groundwater was not observed in the other borings during our field exploration.

The groundwater level observations made during our exploration provide an indication of the groundwater conditions at the time the borings were drilled. Longer monitoring in piezometers or cased holes, sealed from the influence of surface water, would be required to evaluate longer-term groundwater conditions. During some periods of the year, perched water could be present at various depths. Fluctuations in groundwater levels should be expected throughout the year depending upon variations in the amount of rainfall, runoff, evaporation, and other hydrological factors not apparent at the time the boring was performed.

4.0 ANALYSIS AND RECOMMENDATIONS

4.1 Geotechnical Considerations

As described in the Project Information section of this report, we understand that the total length of the project will be approximately 2.6 miles and that the City of Bentonville and the Arkansas Highway Transportation Department (AHTD) will be responsible for the project. We also understand that Burns & McDonnell will perform the pavement design analysis based on the results of our geotechnical investigation and in general agreement with the City of Bentonville and AHTD standard specifications for pavement design and construction.

Due to the presence of underground and overhead utility lines, most of our borings were drilled through the existing 8th Street pavements. Based on the results of our borings, we determined that the asphalt thicknesses of the existing pavement sections vary between approximately 2 and 11 inches. At this time, we understand that the majority of the existing pavement sections will be replaced full depth with new pavement sections. If a mill and overlay of existing pavements will be considered in lieu of the new pavement sections, we will need to provide additional recommendations.

General recommendations regarding earthwork and subgrade preparation and the design and construction of pavements are presented in the following sections.

4.2 Earthwork

4.2.1 Site Preparation

Areas to be graded should be stripped and cleared of surface vegetation, topsoil, trees, bushes, debris, and any other deleterious material. Any loose or soft soils at the surface, tree stumps, and major root systems should be removed full-depth and the resultant excavations should be cleaned of all loose or soft material and water and properly backfilled with tested and approved engineered fill. In addition, surface and subsurface features such as existing pavements or underground abandoned utilities should be removed full-depth and the resultant excavations should be properly backfilled with tested and approved engineered fill.

After stripping and completing any required grading cuts, and before placing any new fill, the exposed subgrade should be proofrolled with a fully-loaded dump truck, scraper, or other rubber-tired construction equipment weighing at least 25 tons to evaluate the presence of any low strength, unstable soils. Any low strength, unstable soils identified by the proofrolling should be overexcavated and replaced with tested and approved engineered fill as indicated in section **4.3 Fill Material Types**, if they cannot be adequately stabilized in-place. Based on the results of our field exploration and experience with similar projects, unstable soils with high moisture content are typically encountered directly beneath existing pavements.

After completing a successful proofroll, and before placing any fill, the exposed subgrade should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted as recommended in section **4.4 Compaction Requirements**.

4.2.2 Fill Material Types

Engineered fill, where required to raise the subgrade elevation and to backfill excavations, should meet the following specifications:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
"Hillside" Borrow Material [2] (off-site borrow)	GC, GM	All locations and elevations
Approved Crushed Stone [2] (off-site borrow)	GW, GP	All locations and elevations

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Locally Available Crushed Shale and Sandstone [2] (off-site borrow)	SC, SP, GC, GP	All locations and elevations
On-site Soils	Low to high plasticity clay [3] (CL, CL-CH, CH, CL-ML)	Upon approval of the geotechnical engineer
	Existing fill [4]	Upon approval of the geotechnical engineer

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris and contain maximum rock size of 3 inches. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.
2. Approved, granular soils having a maximum Liquid Limit (LL) of 40, a maximum Plasticity Index (PI) of 15, and containing at least 15% fines (material passing the No. 200 sieve, based on dry weight).
3. On-site clay soils could be used as fill if the geotechnical engineer considers that those materials are suitable and meet the design specifications.
4. Existing fills could be used if the geotechnical engineer considers that those materials are suitable and meet the design specifications.

4.2.3 Compaction Requirements

The scarified and compacted subgrade and new fills should be moisture conditioned and compacted using the recommendations presented in the following table.

Item	Description
Subgrade Scarification Depth	10-inches
Fill Lift Thickness [1]	12-inches or less in loose thickness
Compaction Requirements [2]	At least 95% of the material's maximum dry density based on AASHTO T-99 test protocol (standard Proctor compaction test).
Moisture Content	A level within minus 2 to plus 2 of the material's optimum moisture content, determined in accordance with AASHTO T-99. [3]

1. Thinner lifts are recommended in confined areas or when hand-operated compaction equipment is used.
2. The scarified and compacted subgrade and new fills should be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
3. Granular materials, if any, should be compacted at a workable moisture content.

The recommended moisture content should be maintained in the scarified and compacted subgrade and new fills, until fills are completed and pavements are constructed.

4.2.4 Earthwork Construction Considerations

The surficial lean clay soils are moisture sensitive and subject to disturbance and instability when they experience increases in moisture content. If wet conditions exist during construction, equipment mobility will be hindered and it will be necessary to overexcavate and replace or stabilize the full-depth of these soils to develop support for new fills and pavements, and allow construction to proceed.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to pavement construction. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, excessively wet or dry, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to pavement construction.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Health and Safety Administration (OSHA) regulations to provide stability and safe working conditions. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

The geotechnical engineer should be retained during the construction phase of the project to provide observation and testing during subgrade preparation and earthwork.

4.3 General Pavement Design Recommendations

The on-site subgrade materials were evaluated using various *in-situ* and laboratory test procedures including Standard Penetration Tests (SPT), Dynamic Cone Penetration (DCP), soil index properties, and Resilient Modulus (MR) tests. Due to the presence of chert and limestone gravel within the subgrade soils, DCP refusal was realized at several locations and thus, resilient modulus test results are recommended as the most suitable alternative to determine the recompacted subgrade support values for pavement design.

Four composite soil samples compacted at their Optimum Moisture Content (OMC) and OMC+2% were tested in our laboratory to determine their Resilient Modulus (MR) values. The samples were selected from different boring locations to represent the general subgrade soil conditions along the project alignment. The samples were collected as composite samples based on their similar soil properties and soil texture. The resilient modulus test results are summarized in the following table.

			Resilient Modulus (MR) Ranges (psi) [1]	
Composite Sample	**Borings**	**Soil Type**	**OMC**	**OMC+2%**
Bulk 1	BR-004/9/12/14	Lean clay PI = 17	5,700 to 9,500	4,200 to 8,000
Bulk 2	BR-017/19/21	Lean Clay PI = 10	6,500 to 9,600	5,000 to 7,900
Bulk 3	BR-030/35/36	Lean Clay PI = 25	5,200 to 9,100	3,400 to 7,400
Bulk 4	BR-003/4/5/12	Silty Clayey Gravel	11,700 to 16,300	8,600 to 13,100

1. Values rounded to the nearest 100 psi. MR values for chamber confining pressure values (S_3) between approximately 2 and 4 pounds per square inch (psi) and nominal maximum axial stress (S_{cyclic}) values between 2 and 10 psi.

The above results are in general agreement with the soil descriptions shown on the boring logs in Appendix A. Resilient modulus results for Bulk samples 1 through 3 are within similar ranges. Recommendations for pavements for both the sections to be designed and constructed per the City of Bentonville and the sections to be designed and constructed per the Arkansas Highway Transportation Department pavement specifications are provided below.

4.3.1 Recommendations for the City of Bentonville Pavement Sections

The City of Bentonville recommends that as a minimum, the upper 24 inches of pavement subgrade be treated or removed and replaced if the California Bearing Ratio (CBR) is less than 8 and/or if the subgrade soils are susceptible to frost action. Based on a standard correlation of $MR = 2{,}555 \cdot CBR^{0.64}$ (in psi units) as recommended by the Transportation and Road Research Laboratory (TRRL) and NCHRP 1-37A, 2004, a CBR value of 8 corresponds to a Resilient Modulus (MR) of about 9,700 psi. Our laboratory test results indicated that the on-site lean clay soils encountered along the project (i.e. bulk samples 1 through 3) generally do not meet this requirement. In addition, the on-site clay soils are susceptible to frost action.

If a subgrade resilient modulus of about 9,700 psi is required for the pavements to be constructed under the City of Bentonville pavement specifications, we recommend that as a minimum, clay soils within 10 inches of pavement subgrade be removed and replaced with imported engineered fill materials as recommended in section **4.2.2 Fill Material Types**. We understand that “hillside” materials consisting of clayey chert gravel and/or low plasticity cherty clay have been used in similar projects near the vicinity of this project site with satisfactory results.

As an alternative to removing and replacing the upper 10 to 24 inches of the subgrade soils and importing “off-site borrow” materials, the on-site clay soils could be used as fill within 10 inches of pavement subgrade, if they are effectively modified with Class “C” fly ash to achieve a California Bering Ratio (CBR) value of 8 or greater and/or a Resilient Modulus (MR) value of

9,700 psi or greater. We estimate a minimum of approximately 15 to 17 percent Class “C” fly ash, based on the soil’s compacted dry weight, would be required to achieve the required CBR and/or MR values. The actual amounts of Class “C” fly ash should be determined in the laboratory and verified in the field as the amount required to achieve satisfactory CBR and/or MR values. Treating the on-site clay soils with Class “C” fly ash would also be a positive means to resist frost action.

4.3.2 Recommendations for the AHTD Pavement Sections

We understand that per the Arkansas Highway Transportation Department (AHTD) pavement design specifications, the pavement design will be performed based on existing subgrade conditions. Based on the resilient modulus test results performed on sample Bulk 3, we recommend that the pavement section from Moberly Lane to I-49, which we understand will be designed per AHTD specifications, be designed using a resilient modulus of 4,600 psi. This resilient modulus value was estimated as the MR value corresponding to a confining pressure (S_3) of 4 psi and a cyclic stress (S_{cyclic}) of about 6 psi for a composite sample compacted at approximately OMC+2%.

$$M_R = k_1 \text{ x } S_{cyclic}^{k_2}$$

Where

S_3 = 4 psi (confining pressure)
S_{cyclic} = 6 psi (cyclic stress)
k_1 = 9,716.6
k_2 = -0.418

The above values were obtained after normalizing the results of a resilient modulus test performed on Bulk Sample 3, which was prepared at a moisture content of 2 percent above the optimum moisture content, under different confining pressures and cyclic loads. Based on our experience, this confining pressure and cyclic stress typically model the anticipated traffic conditions. Resilient modulus test results are presented in Appendix B of this report.

We assume that the proposed ramps will be constructed with imported fills and that MR values of about 9,700 psi or higher may be achieved using locally available fill materials. We recommend that evaluation of fill materials be performed prior to construction of ramps to verify the pavement design.

4.4 Additional Pavement Recommendations

4.4.1 Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration.

4.4.2 Pavement Maintenance

Periodic maintenance including crack and joint sealing, patching, and surface sealing should be performed. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION

© 2014 GOOGLE

1600	0	800	1600

APPROXIMATE SCALE IN FEET

Project Mngr:	JEG
Drawn By:	JM
Checked By:	JEG
Approved By:	MHH

Project No.	04135111
Scale:	SEE BAR SCALE
File No.	04135111
Date:	JUNE 2014

Terracon
Consulting Engineers and Scientists

9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145
PH. (918) 250-0461 FAX. (918) 250-4570

SITE LOCATION MAP

GEOTECHNICAL EXPLORATION
8TH STREET WIDENING PROJECT
BENTONVILLE, ARKANSAS

EXHIBIT NO.

A-1

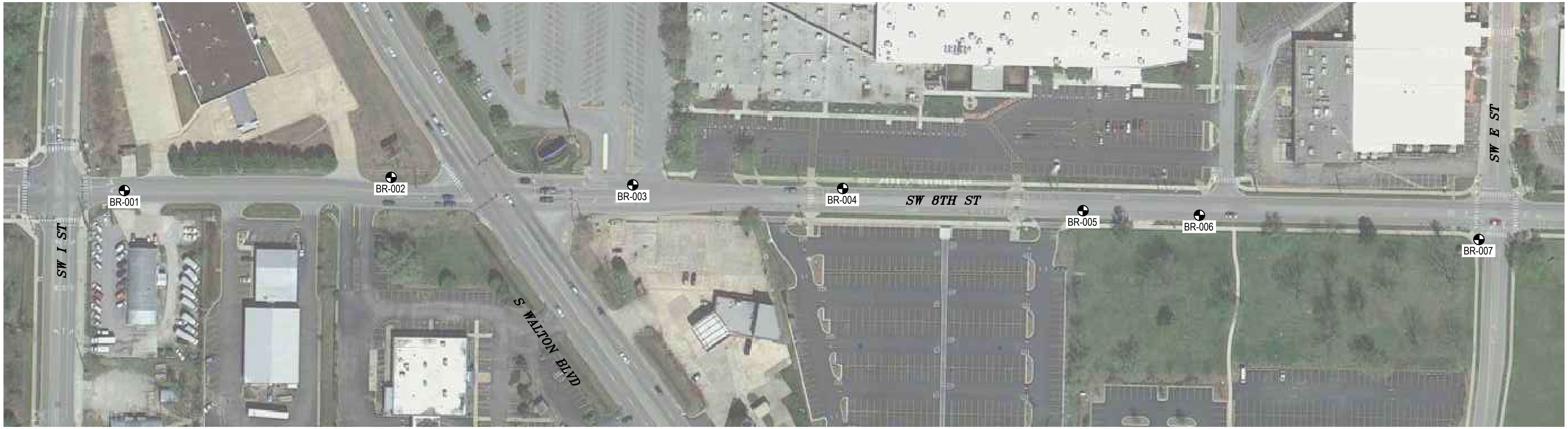

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND
⊕ BORING LOCATION

140 0 70 140
APPROXIMATE SCALE IN FEET

N

Project Mngr: JEG	Project No. 04135111		BORING LOCATION PLAN
Drawn By: JM	Scale: SEE BAR SCALE	Terracon Consulting Engineers and Scientists	GEOTECHNICAL EXPLORATION 8TH STREET WIDENING PROJECT BENTONVILLE, ARKANSAS
Checked By: JEG	File No. 04135111	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145	
Approved By: MHH	Date: JUNE 2014	PH. (918) 250-0461 FAX. (918) 250-4570	PAGE 1 OF 4

EXHIBIT NO.
A-2

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND
⊕ BORING LOCATION

140 0 70 140
APPROXIMATE SCALE IN FEET

N

Project Mngr: JEG	Project No. 04135111		
Drawn By: JM	Scale: SEE BAR SCALE		
Checked By: JEG	File No. 04135111		
Approved By: MHH	Date: JUNE 2014		

Terracon
Consulting Engineers and Scientists
9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145
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BORING LOCATION PLAN

GEOTECHNICAL EXPLORATION
8TH STREET WIDENING PROJECT
BENTONVILLE, ARKANSAS

EXHIBIT NO.
A-2

DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND
BORING LOCATION

140 0 70 140
APPROXIMATE SCALE IN FEET

N

Project Mngr: JEG	Project No. 04135111	Terracon	BORING LOCATION PLAN
Drawn By: JM	Scale: SEE BAR SCALE	Consulting Engineers and Scientists	GEOTECHNICAL EXPLORATION
Checked By: JEG	File No. 04135111	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145	8TH STREET WIDENING PROJECT
Approved By: MHH	Date: JUNE 2014	PH. (918) 250-0461 FAX. (918) 250-4570	BENTONVILLE, ARKANSAS

EXHIBIT NO. A-2

PAGE 3 OF 4

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DIAGRAM IS FOR GENERAL LOCATION ONLY,
AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

LEGEND
◐ BORING LOCATION

140 0 70 140
APPROXIMATE SCALE IN FEET

Project Mngr: JEG	Project No. 04135111	Terracon Consulting Engineers and Scientists	BORING LOCATION PLAN	EXHIBIT NO.
Drawn By: JM	Scale: SEE BAR SCALE	9522 EAST 47TH PLACE, UNIT D TULSA, OKLAHOMA 74145	GEOTECHNICAL EXPLORATION 8TH STREET WIDENING PROJECT BENTONVILLE, ARKANSAS	A-2
Checked By: JEG	File No. 04135111	PH. (918) 250-0461 FAX. (918) 250-4570		
Approved By: MHH	Date: JUNE 2014		PAGE 4 OF 4	

Field Exploration Description

The boring locations and elevations were established in the field by B & F Engineering, Inc. prior to commencement of our field activities. The majority of the borings located along sidewalks were offset to the road due to the presence of underground and overhead utility lines. Actual boring locations are shown on the boring location plan in Exhibit A-2 of this Appendix. Ground elevations at the boring locations and boring coordinates were estimated based on the distances measured in the field by our drill crew. Elevations shown on the logs have been rounded to the nearest 0.5 feet. The boring locations and elevations should be considered accurate only to the degree implied by the methods used to define them.

We drilled the borings with ATV-mounted rotary drill rigs using continuous flight augers and rotary cutting bits to advance the boreholes. Representative samples were obtained by the split-barrel sampling procedure. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound auto-hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). The N-value is used to estimate the in-situ relative density of cohesionless soils, and to a lesser degree of accuracy, the consistency of cohesive soils and hardness of weathered bedrock.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings. Generally, a greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report. The sampling depths, penetration distances, and N-values are reported on the boring logs. The samples were tagged for identification, sealed to reduce moisture loss and returned to the laboratory for further examination, testing and classification. In addition to split-barrel samples, bulk samples were obtained from the subgrade soils from different locations.

We cored the existing pavement at select boring locations using a 6-inch inner diameter, diamond-bit core barrel. After pavement coring, the thickness of the pavement was measured at each location and the pavement cores brought to our laboratory for observation. Photographic logs of the pavement cores are provided in this Appendix.

Dynamic Cone Penetration (DCP) tests were also performed on the subgrade soils at the majority of our boring locations, right beneath pavement and aggregate base, if any. The DCP test consists of driving a steel cone, by means of a 10.1-pound weight with a free fall of 22.5 inches, into the subgrade materials. The penetration depth and number of blows are used to calculate the DCP Penetration Index, which is in turns used to correlate the California Bearing Ratio (CBR) of the subgrade soils. Our DCP tests realized refusal at several locations due to the presence of gravel materials. Results of our DCP tests are provided in Appendix C.

Field Exploration Description (Continued)

A field log of each boring was prepared by the drill crew along with the DCP tests. The logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the subsurface conditions at the borings based on field and laboratory data and observation of the samples.

BORING LOG NO. BR-001

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36433391° Longitude: -94.22157012°

Surface Elev.: 1279 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		9" Asphalt **FILL - SANDY SILT**, with gravel, very pale brown (10YR 8/3)									
							10	5-6-8 N=14	27	NP	56
							12	5-7-7 N=14	24		
	3.8		1275.5								
		SANDY LEAN CLAY (CL), trace gravel, very pale brown (10YR 8/3), medium stiff					16	3-3-3 N=6	37	40-22-18	67
	5.3		1273.5	5							
		Boring Terminated at 5.3 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-4

BORING LOG NO. BR-002

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36439033° Longitude: -94.2203197°

Surface Elev.: 1285 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		3" Topsoil									
	2.0	**FILL - LEAN CLAY**, trace chert, dark brown (2.5Y 3/3)	1283				14	2-3-3 N=6	22		
	3.5	**LEAN CLAY (CL)**, with gravel, light yellowish-brown (2.5Y 6/4) and yellowish-red (5YR 4/6), medium stiff	1281.5				18	3-3-4 N=7	20	38-18-20	77
	5.0	**FAT CLAY (CH)**, trace gravel, light yellowish-brown (2.5Y 6/4), dark olive-brown (2.5Y 3/3), and dark yellowish-brown (10YR 4/6), soft to medium stiff	1280	5			18	2-2-2 N=4	31		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-5

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 04135111 - BR - 8TH STREET.GPJ

BORING LOG NO. BR-003

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36436747° Longitude: -94.2192277°

Surface Elev.: 1287.5 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.3	11" Asphalt **FILL - LEAN CLAY**, trace sand, chert, and limestone gravel, dark grayish-brown (2.5Y 4/2)	1285				8	6-4-4 N=8	17	33-20-13	89
3.8	**SANDY LEAN CLAY (CL)**, trace gravel, dark grayish-brown (2.5Y 4/2), medium stiff	1283.5				6	2-2-3 N=5	15	36-21-15	69
5.3	**GRAVELLY LEAN CLAY (CL)**, with sand, mottled dark grayish-brown (2.5Y 4/2) and dark gray (2.5Y 4/1), medium stiff	1282	5			18	3-3-3 N=6	26	43-22-21	50

Boring Terminated at 5.3 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/2/2014	Boring Completed: 2/2/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-6

BORING LOG NO. BR-004

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36434448° Longitude: -94.21826447°

Surface Elev.: 1288.5 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-½" Asphalt 2-½" Aggregate Base **FILL - SILTY GRAVEL**, with sand, pale brown (10YR 6/3)							6		7
						14	16-12-24 N=36	4	21-18-3	28
2.5		1286								
	FAT CLAY (CH), dark olive-brown (2.5Y 3/3) to olive-brown (2.5Y 4/3), stiff					12	10-9-8 N=17	19	61-18-43	93
						18	3-5-5 N=10	35		
5.0		1283.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-7

BORING LOG NO. BR-005

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36426007° Longitude: -94.21713939°

Surface Elev.: 1290 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5-½" Asphalt **FILL - CLAYEY GRAVEL** , very pale brown (10YR 8/2) and dark grayish-brown (2.5Y 4/2)									
						8	6-7-5 N=12	18		
2.0		1288								
	LEAN CLAY (CL), trace sand and chert gravel, dark grayish-brown (2.5Y 4/2), medium stiff					14	2-2-3 N=5	17	36-18-18	89
4.0		1286								
	FAT CLAY (CH), mottled dark yellowish-brown (10YR 4/6) and gray (10YR 6/1), medium stiff					16	3-3-3 N=6	22		83
5.3		1284.5	5							
	Boring Terminated at 5.3 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/2/2014	Boring Completed: 2/2/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-8

BORING LOG NO. BR-006

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36424306° Longitude: -94.21663313°

Surface Elev.: 1290 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2.0	4-¾" Asphalt 6" Aggregate Base **FILL - SILTY GRAVEL**, with sand, gray (7.5YR 5/1) and strong brown (7.5YR 5/6)	1288				12	20-8-7 N=15	13	NP	12
	3.5	**CHERTY LEAN TO FAT CLAY (CL-CH)**, very pale brown (10YR 7/3), medium stiff	1286.5				12	5-5-3 N=8	34		
	5.0	**LEAN CLAY (CL)**, trace sand, medium stiff	1285	5			18	3-3-4 N=7	21	39-22-17	89

Boring Terminated at 5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-9

BORING LOG NO. BR-007

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36415162° Longitude: -94.21534115°

Surface Elev.: 1287.5 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		3" Topsoil **FILL - LEAN CLAY**, with chert gravel, dark brown (10YR 3/3) and very pale brown (10YR 7/3)					14	5-5-4 N=9	17		
	2.0		1285.5								
		FILL - SILTY GRAVEL, with sand, olive-brown (2.5Y 4/3) and pale brown (10YR 6/3)					10	6-5-6 N=11	21	NP	37
							4	1-2-2 N=4	15		
	5.0		1282.5	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-10

BORING LOG NO. BR-008

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36421341° Longitude: -94.21428342°

Surface Elev.: 1286 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	6-½" Asphalt **FILL - CLAYEY GRAVEL**, with sand, pale brown (10YR 6/3)					10	10-50/4"	11	36-18-18	26
	2.0	1284								
	LEAN TO FAT CLAY (CL-CH), very dark brown (7.5YR 2.5/2), medium stiff to stiff					16	4-4-5 N=9	14	46-19-27	94
						0	2-3-3 N=6	26		
	5.0	1281	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-11

BORING LOG NO. BR-009

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36418129° Longitude: -94.21325161°

Surface Elev.: 1285.5 (Ft.)

GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		5" Asphalt **FILL - LEAN CLAY**, with gravel, dark reddish-brown (5YR 3/3)									
							12	28-12-19 N=31	10		
	2.0		1283.5								
		FAT CLAY (CH), dark gray (10YR 4/1) and grayish-brown (2.5Y 5/2), medium stiff					16	4-4-4 N=8	35		
							18	2-3-4 N=7	29		
	5.0		1280.5	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-12

BORING LOG NO. BR-010

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36416649° Longitude: -94.21217996°

Surface Elev.: 1286.5 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		6" Asphalt **FILL - SILTY GRAVEL**, with sand, dark brown (10YR 3/3) and dark gray (10YR 4/1)					18	15-14-7 N=21	19	NP	41
	2.0		1284.5								
		LEAN CLAY (CL), mottled gray (10YR 5/1), yellowish-brown (10YR 5/8), and yellowish-red (5YR 4/6), medium stiff					18	2-3-4 N=7	22	34-17-17	
							18	3-3-4 N=7	30		
	5.0		1281.5	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-13

BORING LOG NO. BR-011

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.364183° Longitude: -94.210965° Surface Elev.: 1288 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	0.5 5" Asphalt Boring was not extended below asphalt due to the presence of underground utilities 1287.5								
	Boring Terminated at 0.5 Foot								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit

Abandonment Method:
Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/23/2014	Boring Completed: 2/23/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-14

BORING LOG NO. BR-012

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36427081° Longitude: -94.2104741°

Surface Elev.: 1289.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	4" Concrete									
2.0	**FILL - SANDY LEAN CLAY**, with gravel, dark grayish-brown (2.5Y 4/2)	1287.5				10	8-12-6 N=18	20		61
	FAT CLAY (CH), very dark gray (2.5Y 3/1) to gray (2.5Y 3/1), medium stiff					18	3-3-3 N=6	21	61-27-34	97
5.0		1284.5	5			18	3-3-3 N=6	20		
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-15

BORING LOG NO. BR-013

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36415788° Longitude: -94.2088613°

Surface Elev.: 1291 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		3" Topsoil **LEAN CLAY (CL)**, with sand, light olive-brown (2.5Y 5/4), medium stiff					18	3-4-2 N=6	24	41-18-23	76
	2.0		1289								
		LEAN CLAY (CL), trace sand, olive-yellow (2.5Y 5/6), gray (2.5Y 6/1) and dark red (6.5Y 3/6), medium stiff					16	2-2-3 N=5	31		
							18	3-3-5 N=8	25	43-19-24	88
	5.0		1286	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-16

BORING LOG NO. BR-014

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36423202° Longitude: -94.20788526°

Surface Elev.: 1291 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	4" Asphalt 2" Aggregate Base **FILL - SANDY LEAN CLAY**, with chert gravel, dark grayish-brown (2.5Y 4/2)					12	13-13-6 N=19	18		
2.0		1289								
	LEAN CLAY (CL), olive-brown (2.5Y 4/3), medium stiff					18	2-2-3 N=5	21	36-18-18	90
3.5		1287.5								
	FAT CLAY (CH), dark grayish-brown (2.5Y 4/2) to olive-brown (2.5Y 4/3), medium stiff					18	2-2-3 N=5	23	62-26-36	92
5.0		1286	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-17

BORING LOG NO. BR-015

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36414265° Longitude: -94.20662564°

Surface Elev.: 1293.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **LEAN CLAY (CL)**, trace gravel, olive-brown (2.5Y 4/3), soft					14	3-2-1 N=3	20		
2.0	**FAT CLAY (CH)**, mottled gray, dark red (2.5 Y 3./6) and brownish-yellow (10YR 6/8), medium stiff	1291.5				18	3-3-3 N=6	27		88
3.5	**LEAN TO FAT CLAY (CL-CH)**, trace gravel and sand, mottled gray, dark red (2.5 Y 3./6) and brownish-yellow (10YR 6/8), medium stiff	1290				18	2-3-3 N=6	17		
5.0	***Boring Terminated at 5 Feet***	1288.5	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-18

BORING LOG NO. BR-016

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36434465° Longitude: -94.20574375°

Surface Elev.: 1298 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	6-½" Asphalt **FILL - LEAN CLAY**, with sand, mottled yellowish-brown (10YR 5/6) and dark gray (2.5Y 4/1)					18	4-7-11 N=18	15	31-18-13	82
3.0	(reddish-brown (2.5YR 4/4) below 2 feet)	1295				18	5-5-15 N=20	20	34-22-12	73
5.1	**SANDY SILTY LEAN CLAY (CL-ML)**, trace sandstone fragments and chert, yellowish-brown (10YR 5/8), very stiff	1293	5			18	9-17-20 N=37	16	28-21-7	66
	Boring Terminated at 5.1 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-19

BORING LOG NO. BR-017

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.3642379° Longitude: -94.2043806°

Surface Elev.: 1301.5 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3" Topsoil **LEAN CLAY (CL)**, trace sand, yellowish-brown (10YR, 5/4), medium stiff					18	3-3-3 N=6	20	25-17-8	87
2.0	**LEAN TO FAT CLAY (CL-CH)**, trace sand, dark red (2.5YR, 3/6) and gray (5YR, 6/1), stiff	1299.5				18	3-4-6 N=10	20		
						18	3-5-6 N=11	19		
5.0	***Boring Terminated at 5 Feet***	1296.5	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-20

BORING LOG NO. BR-018

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36428172° Longitude: -94.20327869°

Surface Elev.: 1300.5 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		3" Topsoil **LEAN CLAY (CL)**, trace sand, dark yellowish-brown (10YR, 4/6), medium stiff					18	1-1-3 N=4	23		
	2.0		1298.5								
		LEAN CLAY, dark yellowish-brown (10YR, 4/6), yellowish-red (5YR, 4/6) and gray (5YR, 6/1), stiff					18	3-6-9 N=15	19	37-18-19	88
							18	4-5-5 N=10	20		
	5.0		1295.5	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/15/2014	Boring Completed: 2/15/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-21

BORING LOG NO. BR-019

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36406477° Longitude: -94.20215958°

Surface Elev.: 1295.5 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		5" Asphalt **FILL - LEAN CLAY**, with chert and gravel, trace sand, dark olive-brown (2.5Y 3/3)					16	12-8-5 N=13	12		
	2.3		1293.5								
		LEAN TO FAT CLAY (CL-CH), trace sand, gray (5YR 6/1) and light olive-brown (2.5Y 5/6), soft to medium stiff					18	2-2-2 N=4	23		
							18	2-2-2 N=4	23		
	5.3		1290	5							
		Boring Terminated at 5.3 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-22

BORING LOG NO. BR-020

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36399523° Longitude: -94.200852°

Surface Elev.: 1291.5 (Ft.)

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	9" Asphalt **FILL - LEAN CLAY**, trace gravel, very dark gray (2.5Y 3/1) and brownish-gray (2.5Y 6/2)									
					X	2	12-6-7 N=13	21		90
2.5		1289								
	LEAN TO FAT CLAY (CL-CH), gray (5YR 6/1) and brownish-yellow (10YR 6/8), medium stiff				X	18	3-3-3 N=6	21	45-23-22	
			5		X	18	3-3-4 N=7	26		
5.5		1286								
	Boring Terminated at 5.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-23

BORING LOG NO. BR-021

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36399264° Longitude: -94.19973959°

Surface Elev.: 1290 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	8" Asphalt **FILL - CLAYEY GRAVEL** , dark grayish-brown (10YR 4/2) and very dark brown (10YR 2/2)					6	8-4-4 N=8	17		33
	2.0	1288								
	LEAN CLAY (CL), trace sand, dark olive-brown (2.5Y 3/3), medium stiff					18	2-3-3 N=6	25	26-17-9	87
	3.7	1286.5								
	FAT CLAY (CH), very dark gray (10YR 3/1), medium stiff to stiff		5			18	3-4-4 N=8	26		
	5.2	1285								
	Boring Terminated at 5.2 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-24

BORING LOG NO. BR-022

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:

Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36399031° Longitude: -94.19859746°

Surface Elev.: 1292.5 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5" Asphalt 2" Aggregate Base **FILL - LEAN CLAY**, with chert and gravel, very dark grayish-brown (2.5YR 3/2) and dark reddish-brown (5YR 3/4)					16	12-17-11 N=28	10		
2.0	**LEAN CLAY (CL)**, very dark gray (7.5YR 3/1) to mottled yellowish-brown (10YR 5/8) and dark reddish-brown (5YR 3/4), medium stiff	1290.5				18	4-3-3 N=6	26		
3.5	**FAT CLAY (CH)**, mottled gray (10YR 5/1), yellowish-brown (10YR 5/8) and dark reddish-brown (5YR 3/4), stiff	1289				18	3-4-5 N=9	26	52-21-31	89
5.0	***Boring Terminated at 5 Feet***	1287.5	5					7		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon

9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-25

BORING LOG NO. BR-023

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.3639326° Longitude: -94.19727447°

Surface Elev.: 1304 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	4-½" Asphalt 7-¼" Concrete **FILL - LEAN TO FAT CLAY**, with chert, dark red (2.5YR 3/6) and light olive-brown (2.5Y 5/4)									
						18	4-3-3 N=6	43		
	2.5	1301.5								
	LEAN CLAY (CL), trace sand, gray (5YR 6/1) and yellowish-brown (10YR 5/8), very soft to stiff					18	0-3-3 N=6	23	33-18-15	
			5			18	3-4-5 N=9	21		
	5.5	1298.5								
	Boring Terminated at 5.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-26

BORING LOG NO. BR-024

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

GRAPHIC LOG	LOCATION See Exhibit A-2 Latitude: 36.36398608° Longitude: -94.19608908° Surface Elev.: 1309 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	6-¼" Asphalt 3" Aggregate Base **LEAN CLAY (CL)**, trace sand, mottled yellowish-brown (10YR 5/4) and gray (10YR 6/1), medium stiff						6		3
					16	6-2-3 N=5	19	35-18-17	87
	2.5 — 1306.5								
	GRAVELLY LEAN CLAY (CL), with sand, mottled dark reddish-brown (2.5YR 3/4) and yellowish-brown (10YR 5/4), very stiff				18	3-9-20 N=29	20	36-21-15	65
	(apparent weathered sandstone with clay seams below 3.8 feet) 4.3 — 1304.5				6	50/6"	16	27-19-8	51
	Boring Terminated at 4.3 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-27

BORING LOG NO. BR-025

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36396537° Longitude: -94.1950879°

Surface Elev.: 1314.5 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	6-½ " Asphalt **FILL - LEAN CLAY**, with sand, trace chert and limestone gravel, dark red (2.5YR 3/6) and yellowish-red (5YR 4/6)		10	6-3-4 N=7	21	35-18-17	77
2.0	**LEAN CLAY (CL)**, mottled gray (5YR 5/1), dark red (2.5YR 3/6) and strong brown (7.5YR 4/6), very stiff	1312.5	18	6-9-30 N=39	18		
3.0	**SHALEY LEAN CLAY (CL)**, with sand, red (2.5YR 4/8) and reddish-yellow (5YR 6/8), very stiff (apparent weathered sandstone with clay seams below 4 feet)	1311.5	12	12-50/6"	13		
4.5		1310					

Boring Terminated at 4.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-28

BORING LOG NO. BR-026

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36394386° Longitude: -94.19419173°

Surface Elev.: 1318.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	7-½" Asphalt									
2.0	**FILL - LEAN CLAY**, with limestone and chert gravel, dark grayish-brown (10YR 4/2) and dark reddish-brown (5YR 3/4)	1316.5				12	7-6-6 N=12	19		
5.1	**LEAN CLAY (CL)**, trace sand, mottled gray (5YR 5/1), dark red (2.5YR 3/5) and yellowish-red (5YR 4/6), stiff to very stiff (moisture content determined from auger cuttings)	1313.5	5			18	3-4-4 N=8	23	42-23-19	89
						18	4-6-10 N=16	23		

Boring Terminated at 5.1 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-29

BORING LOG NO. BR-027

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36392428° Longitude: -94.1930245°

Surface Elev.: 1320.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5" Asphalt, . 6" Aggregate Base **FILL - GRAVELLY LEAN CLAY** , red (2.5YR 4/8)					6	50/6"	15		
2.0	**LEAN TO FAT CLAY (CL-CH)**, with limestone gravel, strong brown (7.5YR 5/8) and olive-brown (2.5Y 4/3), stiff	1318.5				0	6-5-5 N=10	20		
4.0	**GRAVELLY LEAN CLAY (CL)**, yellowish-red (5YR 4/6) and dark red (2.5YR 3/6), very stiff	1316.5				18	6-15-20 N=35	16	35-19-16	69
5.0	***Boring Terminated at 5 Feet***	1315.5	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/16/2014	Boring Completed: 2/16/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-30

BORING LOG NO. BR-028

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36399932° Longitude: -94.19214895°

Surface Elev.: 1317.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-½" Asphalt, . 3" Aggregate Base **FILL - CLAYEY SAND** , with chert gravel, dark red (2.5YR 3/6) and pale brown (10YR 6/3)					14	8-6-6 N=12	25		35
2.0	**SANDY LEAN CLAY (CL)**, with sandstone fragments, mottled strong brown (7.5Y 5/8), light olive-brown (2.5Y, 1/3) and brownish-yellow (10YR 6/8), stiff	1315.5				18	3-4-8 N=12	15	31-16-15	
3.5	**SHALEY LEAN CLAY (CL)**, yellowish-red (5YR, 4/6), dark red (2.5YR 3/6) and gray (2.5Y 6/1), very stiff	1314				14	8-8-8 N=16	23		
5.0	***Boring Terminated at 5 Feet***	1312.5	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-31

BORING LOG NO. BR-029

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36383552° Longitude: -94.19108345°

Surface Elev.: 1315 (Ft.)

GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	1.0	2-½" Asphalt 3" Aggregate Base **FILL - CLAYEY GRAVEL**, with sand, gray (10YR 5/1)	1314								
	2.0	**FILL - SANDY LEAN CLAY**, dark yellowish-brown (10YR 3/4)	1313				16	8-9-6 N=15	18		
		LEAN CLAY (CL), trace sand, gray (10YR 5/1) and yellowish-brown (10YR 5/8), soft to medium stiff					18	1-2-2 N=4	23	35-18-17	94
	5.0		1310	5			18	1-2-2 N=4	23		
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-32

BORING LOG NO. BR-030

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36385149° Longitude: -94.19000222°

Surface Elev.: 1314.5 (Ft.)

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	2-½" Asphalt, . 3" Aggregate Base **FILL - CLAYEY GRAVEL**, with sand, gray (10YR 5/1)									
1.0		1313.5								
	FILL - SANDY LEAN CLAY, dark yellowish-brown (10YR 3/4)					18	11-16-6 N=22	19		85
2.0		1312.5								
	LEAN CLAY (CL), with sand, yellowish-red (5YR 4/6) and strong brown (7.5YR 4/6), stiff					16	3-5-6 N=11	21	31-15-16	84
3.5		1311								
	LEAN CLAY (CL), trace sand, yellowish-red (5YR 4/6) and brownish-gray (2.5Y 6/2), medium stiff					18	3-3-3 N=6	25		
5.0		1309.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-33

BORING LOG NO. BR-031

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.3638189° Longitude: -94.18900365°

Surface Elev.: 1313 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-½" Asphalt, . 2" Aggregate Base **FILL - LEAN CLAY** , trace sand and chert gravel, gray (10YR 6/1), dark red (2.5YR 3/6), and yellowish-red (5YR 4/8)					18	4-6-8 N=14	18		
	2.0	1311								
	SANDY LEAN CLAY (CL), trace chert gravel, gray (10YR 6/1) and dark red (2.5YR 3/6), stiff					18	4-5-10 N=15	21	40-16-24	
						18	4-6-9 N=15	23		
	5.0	1308	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-34

BORING LOG NO. BR-032

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36380607° Longitude: -94.18791965°

Surface Elev.: 1310 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-½" Asphalt 2" Aggregate Base **FILL - SANDY SILTY-CLAY**, with chert gravel, olive-brown (2.5Y 4/4) and pale brown (10YR 6/3)							4		
						18	9-13-24 N=37	18	23-19-4	51
2.0		1308								
	LEAN CLAY (CL), trace sand, dark gray (10YR 4/1) to olive-brown (2.5Y 4/3), stiff					16	7-7-5 N=12	16		
	(dark yellowish-brown (10YR 4/6) below 3.5 feet)					18	3-5-8 N=13	18	31-19-12	91
5.0		1305	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-35

BORING LOG NO. BR-033

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36376817° Longitude: -94.18705516°

Surface Elev.: 1308 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	4" Asphalt **FILL - SILTY GRAVEL**, with sand, pale brown (10YR 6/3)					10	9-7-5 N=12	17	NP	40
2.0		1306								
	SILTY CLAY (CL-ML), gray (2.5Y 5/1) and light olive-brown (2.5Y 5/3) to olive-brown (2.5Y 4/6) and light brownish-gray (2.5Y 6/2), stiff					18	1-2-8 N=10	27	24-18-6	95
						14	6-6-6 N=12	28		
5.0		1303	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-36

BORING LOG NO. BR-034

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36376052° Longitude: -94.18589578°

Surface Elev.: 1311 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	5" Asphalt **FILL - LEAN CLAY**, trace chert gravel, strong brown (7.5 YR 4/6)				X	18	8-7-6 N=13	14	43-16-27	69
1.5	**LEAN CLAY**, mottled strong brown (2.5YR 4/6) and gray (7.5YR 5/1), stiff	1309.5			X	18	3-4-6 N=10	22	33-19-14	98
	(with chert gravel, reddish-brown (5YR 4/4) below 3.5 feet)				X	18	3-4-5 N=9	17	33-19-14	78
5.0	***Boring Terminated at 5 Feet***	1306	5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
not encountered while drilling
not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-37

BORING LOG NO. BR-035

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36373215° Longitude: -94.1849849°

Surface Elev.: 1316 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	3-½" Asphalt, .									
	2" Aggregate Base									
2.0	**FILL - LEAN CLAY** , with chert gravel, dark red (2.5YR 3/6) and dark yellowish-brown (10YR 5/6)	1314				14	4-4-4 N=8	17		
5.0	**GRAVELLY LEAN CLAY (CL)**, with sand, gray (5YR 6/1), dark red (2.5YR 3/6), and reddish-yellow (7.5YR 6/8), stiff	1311				18	3-5-10 N=15	12	37-19-18	60
			5			18	4-6-9 N=15	16		
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/22/2014	Boring Completed: 2/22/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-38

BORING LOG NO. BR-036

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE:
Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36372987° Longitude: -94.18399196°

Surface Elev.: 1319 (Ft.)

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	4-¼" Asphalt 2-½" Aggregate Base **FILL - LEAN CLAY**, with sand, trace chert gravel, dark reddish-brown (2.5YR 3/4) and dark brown (10YR 3/3)							5		3
						12	16-7-4 N=11	16	24-16-8	75
2.0		1317								
	LEAN CLAY (CL), with sand, reddish-brown (2.5YR 4/4), medium stiff to stiff					18	2-2-3 N=5	18	30-20-10	83
						18	3-4-5 N=9	21		90
5.1		1314	5							
	Boring Terminated at 5.1 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Pavement Core Bit and Power Auger

Abandonment Method:
Boring backfilled with a combination of soil cuttings and sand. Surface pavement patched upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 2/1/2014	Boring Completed: 2/1/2014
Drill Rig: ATV#945	Driller: TJ
Project No.: 04135111	Exhibit: A-39

BORING LOG NO. BR-037

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36387086° Longitude: -94.18299681°

Surface Elev.: 1321 (Ft.)

GRAPHIC LOG	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - LEAN CLAY , with sand and chert gravel, olive-brown (2.5Y 4/4)									
	1.0		1320								
		LEAN CLAY (CL), trace chert fragments, reddish-brown (2.5YR 4/4), medium stiff to stiff					12	4-2-2 N=4	25		
							8	3-3-3 N=6	24	44-16-28	
							10	6-6-5 N=11	22		
	5.0		1316	5							
		Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-40

BORING LOG NO. BR-038

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36379009° Longitude: -94.18190021°

Surface Elev.: 1323.5 (Ft.)

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	FILL - LEAN TO FAT CLAY, with chert gravel, reddish-brown (2.5YR 4/4) and brown (10YR 4/3)					10	3-3-2 N=5	25		
2.0		1321.5								
	LEAN TO FAT CLAY (CL-CH), trace chert gravel, reddish-brown (5YR 4/4), medium stiff to stiff					11	3-3-3 N=6	25		
						10	4-4-7 N=11	25		
5.0		1318.5	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-41

BORING LOG NO. BR-039

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: **Bentonville, Arkansas**

LOCATION See Exhibit A-2

Latitude: 36.36372825° Longitude: -94.18045492°

Surface Elev.: 1327 (Ft.)

GRAPHIC LOG	DEPTH / DESCRIPTION / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), trace sand, brown (10YR 4/3), soft to medium stiff								
					10	3-2-2 N=4	22		
	2.0 — 1325								
	LEAN CLAY (CL), trace sand, mottled red (2.5YR 4/6) and dark yellowish-brown (10YR 4/4), stiff				8	3-6-6 N=12	25	41-19-22	90
					12	4-6-8 N=14	22		
	5.0 — 1322	5							
	Boring Terminated at 5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-42

BORING LOG NO. BR-040

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.3638271° Longitude: -94.17944946°

Surface Elev.: 1324 (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), with sand, dark yellowish-brown (10YR 4/6), stiff									
					X	8	4-5-4 N=9	15		
					X	12	3-5-10 N=15	22		
	3.0	1321								
	SILTY CHERT GRAVEL (GM), dark yellowish-brown (10YR 4/6), dense									
					X	3	8-30-9 N=39			
	5.0	1319	5							
	Boring Terminated at 5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

not encountered while drilling

not encountered after boring

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-43

BORING LOG NO. BR-041

PROJECT: 8th Street Widening Project - Proposed Pavements

CLIENT: Burns & McDonell Engineering Company, Inc.

SITE: Bentonville, Arkansas

LOCATION See Exhibit A-2

Latitude: 36.36382327° Longitude: -94.17881456°

Surface Elev.: 1322.5 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
FILL - CHERTY LEAN CLAY, with sand and fat clay pockets, trace debris, dark yellowish-brown (10YR 4/4) and reddish-brown (2.5YR 4/4)				X	8	3-3-3 N=6	18	33-15-18	66
2.0	1320.5								
FILL - CHERTY LEAN TO FAT CLAY, brown (7.5YR 4/4)			▽ (4 ft)	X	10	13-15-13 N=28	19		
			▽ (3 ft)						
5.0	1317.5	5							
LEAN TO FAT CLAY (CL-CH), dark grayish-brown (10YR 4/2), medium stiff				X	10	3-3-3 N=6	28	48-17-31	95
				X	12	3-4-4 N=8	28		
10.0	1312.5	10							

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Power Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *4 ft while drilling*

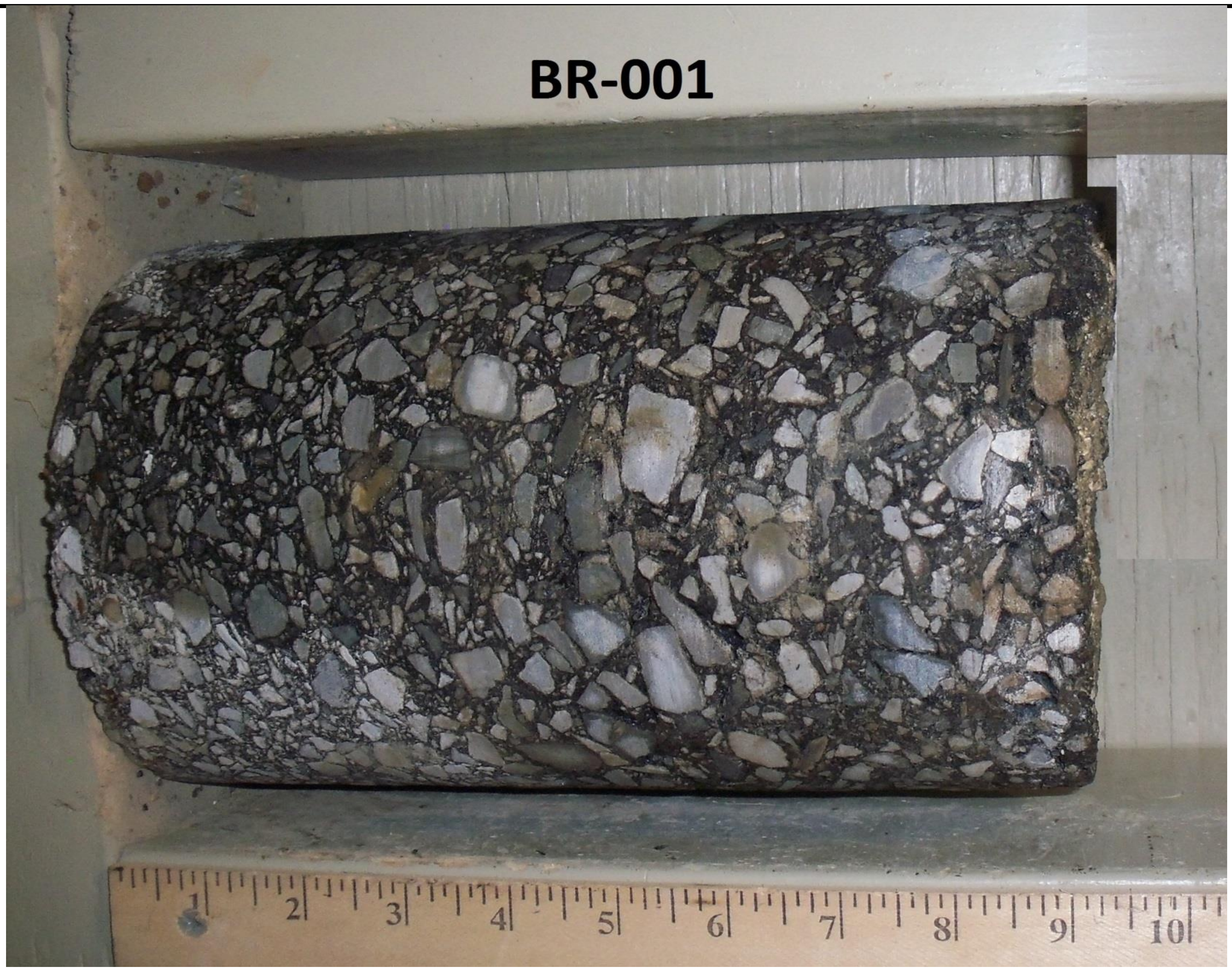
▽ *3 ft after boring*

Terracon

9522 East 47th Place, Unit D
Tulsa, Oklahoma

Boring Started: 12/14/2014	Boring Completed: 12/14/2014
Drill Rig: ATV#940	Driller: SB
Project No.: 04135111	Exhibit: A-44

TOP



Terracon **CORE LOG**

CORE NUMBER	BR-001
DATE CORED	2/22/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 3/4	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	2	
	Asphaltic Concrete	2	
	Asphaltic Concrete	2	
	Total Core Thickness	**9**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-003	
DATE CORED	2/2/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	3	
	Asphaltic Concrete	2 1/2	
	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	4	

Total Core Thickness **11**

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-004
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2	
	Total Core Thickness	**3 1/2**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-005
DATE CORED	2/2/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	2	
	Asphaltic Concrete	3 3/5	

Total Core Thickness **5 1/2**

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-006
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 3/4	
	Asphaltic Concrete	3	
	Total Core Thickness	**4 3/4**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-008
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	2 1/2	
	Total Core Thickness	**6**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

CORE LOG

CORE NUMBER	BR-009
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 3/4	
	Asphaltic Concrete	2	

Total Core Thickness **5**

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-010
DATE CORED	2/22/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE / LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3	
	Asphaltic Concrete	1 1/2	

Total Core Thickness **6**

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE LAYER DATA (FROM TOP TO BOTTOM):

CORE NUMBER	BR-011
DATE CORED	2/23/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2 1/4	
	Asphaltic Concrete	1 1/4	
	Total Core Thickness	**5**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

CORE LOG

CORE NUMBER	BR-014
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2 1/2	
	Asphaltic Concrete		
	Asphaltic Concrete		
	Asphaltic Concrete		
	Asphaltic Concrete		

Total Core Thickness 4

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

BOT.

Terracon

CORE LOG

CORE NUMBER	BR-016	
DATE CORED	2/1/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	2 1/4	
	Asphaltic Concrete	3/4	
	Asphaltic Concrete	3/4	
	Asphaltic Concrete	3/4	
	Asphaltic Concrete	3/4	
	Total Core Thickness	**6 1/2**	

*** Asphalt type based on visual observation only**

TOP

CORE LOG

CORE NUMBER	BR-019	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3 1/2	
	Total Core Thickness	**5**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-021
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2 1/4	
	Asphaltic Concrete	1	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1	
	Asphaltic Concrete	1	
	Total Core Thickness	**8**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-022
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	3	
	Asphaltic Concrete	3/4	
	Asphaltic Concrete		
	Asphaltic Concrete		
	Asphaltic Concrete		
	Total Core Thickness	**5**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-023
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	4 1/2	
	Total Core Thickness	**4 1/2**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-023	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☐ A.C. ☑ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
2	Portland Concrete Cement	7 1/4	
	Total Core Thickness	**7 1/4**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE LAYER DATA (FROM TOP TO BOTTOM):

CORE NUMBER	BR-024
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3 1/4	
	Total Core Thickness	**6 1/4**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-025
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	2	
	Asphaltic Concrete	3	
	Total Core Thickness	**6 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-026
DATE CORED	2/16/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	6	
	Total Core Thickness	**7 1/2**	

*** Asphalt type based on visual observation only**

TOP

CORE LOG

CORE NUMBER	BR-027	
DATE CORED	2/16/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3 1/2	
	Total Core Thickness	**5**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

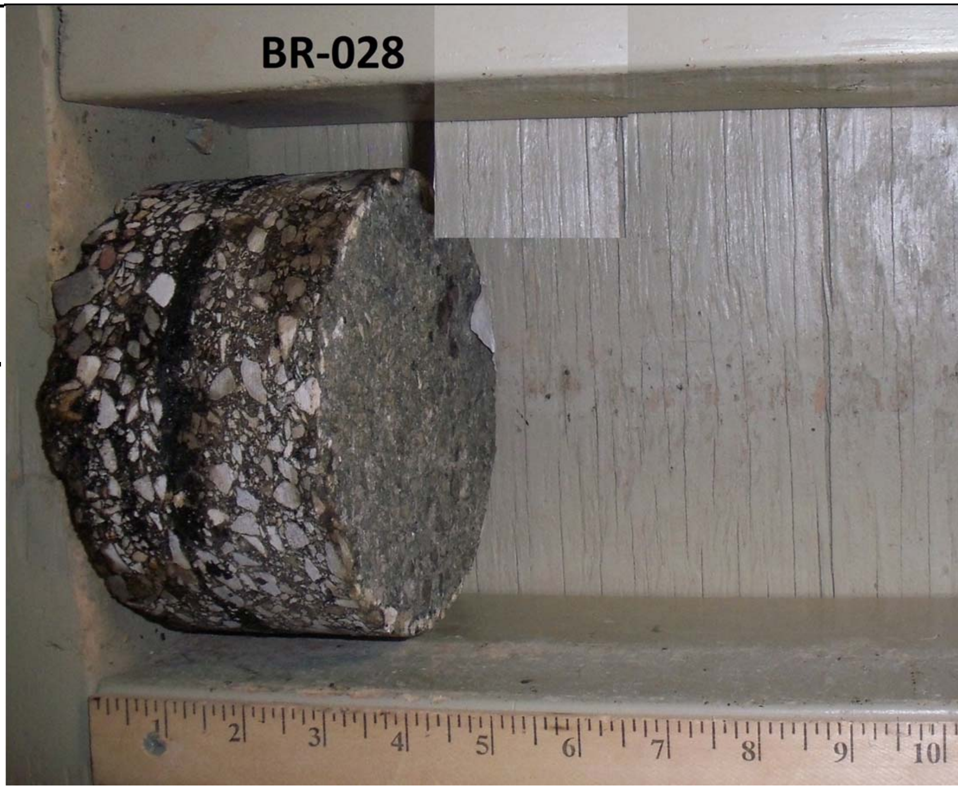
Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

BOT.



Terracon **CORE LOG**

CORE NUMBER	BR-028	
DATE CORED	2/22/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

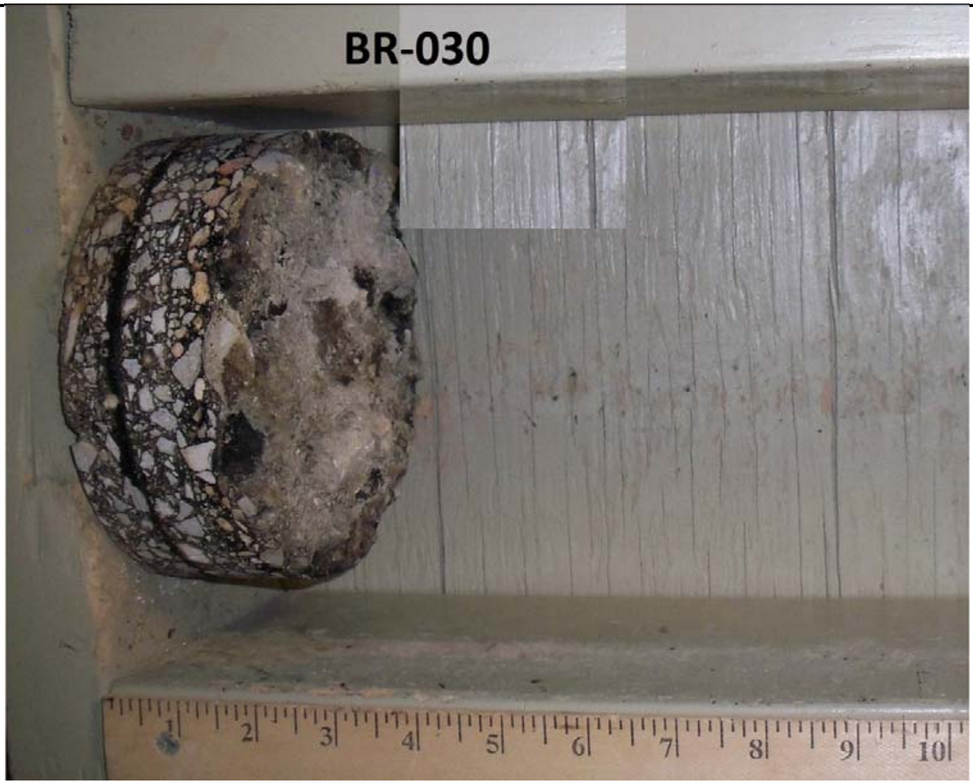
Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 3/4	
	Asphaltic Concrete	1 3/4	
	Total Core Thickness	**3 1/2**	

*** Asphalt type based on visual observation only**

TOP



Terracon **CORE LOG**

CORE NUMBER	BR-030	
DATE CORED	2/22/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	3/4	
	Asphaltic Concrete	1 3/4	
	Total Core Thickness	**2 1/2**	

*** Asphalt type based on visual observation only**

TOP

CORE LOG

CORE NUMBER	BR-031	
DATE CORED	2/22/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	2 1/4	
	Total Core Thickness	**3 1/2**	

*** Asphalt type based on visual observation only**

TOP

CORE LOG

CORE NUMBER	BR-032	
DATE CORED	2/1/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1	
	Total Core Thickness	**3 1/2**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

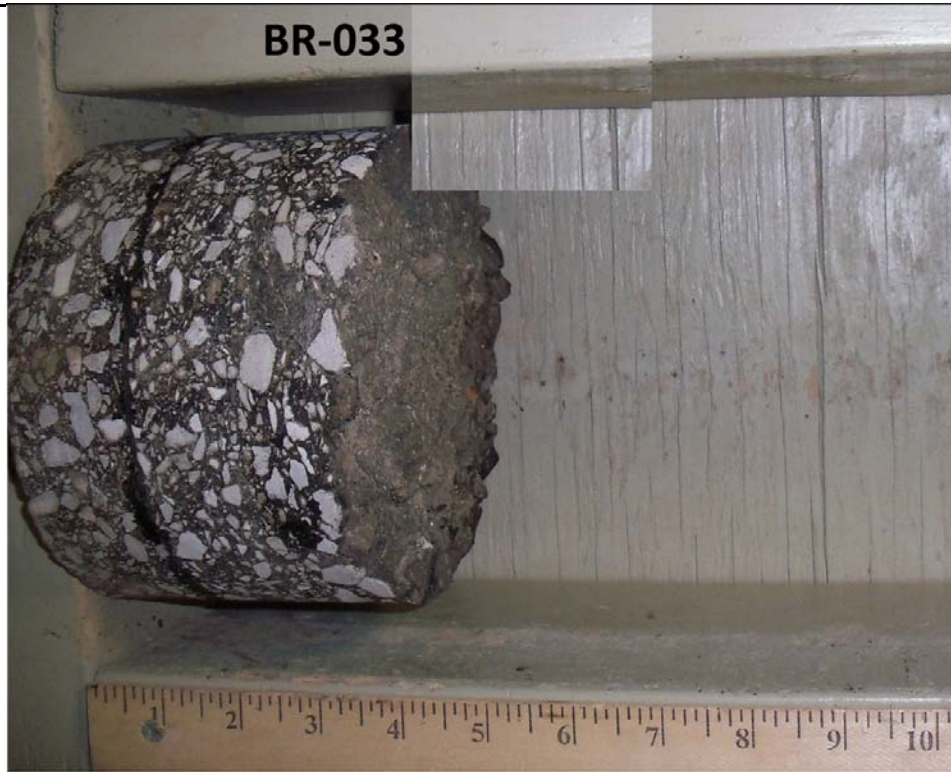
Stripping or Separation in Asphalt: ☐ Stripping ☑ Separation ☐ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP



Terracon **CORE LOG**

CORE NUMBER	BR-033	
DATE CORED	2/22/2014	
COUNTY	BENTON	
NEAREST TOWN	BENTONVILLE, AR	
CONTROL SECTION		
ROUTE	8TH STREET	
MILEPOST		
LANE DIRECTION		
CHAINAGE		
GPS	LATITUDE	LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1	
	Total Core Thickness	**4**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-034
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1	
	Asphaltic Concrete	1	
	Asphaltic Concrete	1 1/2	
	Total Core Thickness	**5**	

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-035
DATE CORED	2/22/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☐ Separation ☑ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	3/4	
	Total Core Thickness	**3 1/2**	

*** Asphalt type based on visual observation only**

TOP

Terracon **CORE LOG**

CORE NUMBER	BR-036
DATE CORED	2/1/2014
COUNTY	BENTON
NEAREST TOWN	BENTONVILLE, AR
CONTROL SECTION	
ROUTE	8TH STREET
MILEPOST	
LANE DIRECTION	
CHAINAGE	
GPS	LATITUDE LONGITUDE

CORE DATA

Surface Material Type: ☑ A.C. ☐ P.C.C. ☐ Continuously Reinforced Concrete

Stripping or Separation in Asphalt: ☐ Stripping ☑ Separation ☐ N/A

Honeycomb or "D" Cracking in PCC: ☐ Honeycomb ☐ "D" Cracking ☑ N/A

Stabilized Subgrade Beneath Pavement or Sub-base? ☐ Yes ☑ No ☐ Unknown

CORE LAYER DATA (FROM TOP TO BOTTOM):

Sample No	Layer Type	Layer Thickness (in.)	Layer Characteristics*
1	Asphaltic Concrete	1 1/2	
	Asphaltic Concrete	1 1/4	
	Asphaltic Concrete	1 1/2	
	Total Core Thickness	**4 1/4**	

*** Asphalt type based on visual observation only**

Approximate boring coordinates and elevations

Boring	Approximate Elevation	Approximate Coordinates			
		Latitude	Longitude	Northing	Easting
BR-001	1279	36.36433391	-94.22157012	746680	658258
BR-002	1285	36.36439033	-94.2203197	746692	658627
BR-003	1287.5	36.36436747	-94.2192277	746677	658949
BR-004	1288.5	36.36434448	-94.21826447	746662	659232
BR-005	1290	36.36426007	-94.21713939	746624	659562
BR-006	1290	36.36424306	-94.21663313	746614	659711
BR-007	1287.5	36.36415162	-94.21534115	746572	660090
BR-008	1286	36.36421341	-94.21428342	746588	660402
BR-009	1285.5	36.36418129	-94.21325161	746570	660705
BR-010	1286.5	36.36416649	-94.21217996	746557	661020
BR-011	1288	36.364183	-94.210965	746527	661380
BR-012	1289.5	36.36427081	-94.2104741	746583	661524
BR-013	1291	36.36415788	-94.2088613	746531	661998
BR-014	1291	36.36423202	-94.20788526	746552	662285
BR-015	1293.5	36.36414265	-94.20662564	746512	662656
BR-016	1298	36.36434465	-94.20574375	746579	662917
BR-017	1301.5	36.3642379	-94.2043806	746531	663318
BR-018	1300.5	36.36428172	-94.20327869	746539	663642
BR-019	1295.5	36.36406477	-94.20215958	746454	663971
BR-020	1291.5	36.36399523	-94.200852	746420	664354
BR-021	1290	36.36399264	-94.19973959	746411	664683
BR-022	1292.5	36.36399031	-94.19859746	746403	665019
BR-023	1304	36.3639326	-94.19727447	746373	665407
BR-024	1309	36.36398608	-94.19608908	746385	665757
BR-025	1314.5	36.36396537	-94.1950879	746371	666052
BR-026	1318.5	36.36394386	-94.19419173	746357	666315
BR-027	1320.5	36.36392428	-94.1930245	746342	666659
BR-028	1317.5	36.36399932	-94.19214895	746364	666917
BR-029	1315	36.36383552	-94.19108345	746297	667229
BR-030	1314.5	36.36385149	-94.19000222	746296	667548
BR-031	1313	36.3638189	-94.18900365	746277	667842
BR-032	1310	36.36380607	-94.18791965	746266	668161
BR-033	1308	36.36376817	-94.18705516	746246	668415
BR-034	1311	36.36376052	-94.18589578	746236	668756
BR-035	1316	36.36373215	-94.1849849	746220	669023
BR-036	1319	36.36372987	-94.18399196	746212	669316
BR-037	1321	36.36387086	-94.18299681	746257	669610
BR-038	1323.5	36.36379009	-94.18190021	746221	669931
BR-039	1327	36.36372825	-94.18045492	746190	670357
BR-040	1324	36.3638271	-94.17944946	746218	670654
BR-041	1322.5	36.36382327	-94.17881456	746213	670841

APPENDIX B
LABORATORY TESTING

Laboratory Testing

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix D. Bedrock materials were classified according to the General Notes and described using commonly accepted geotechnical terminology. The field descriptions were modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil samples. The laboratory test results are presented on the boring logs next to the respective samples and attached to this appendix. Laboratory tests were performed in general accordance with the applicable ASTM, AASHTO, local or other accepted standards.

The following tests were performed on selected soil samples:

- Water content
- Atterberg limits
- Percent passing the No. 200 sieve
- Particle size distribution
- Moisture-Density relationships
- Resilient Modulus (MR)

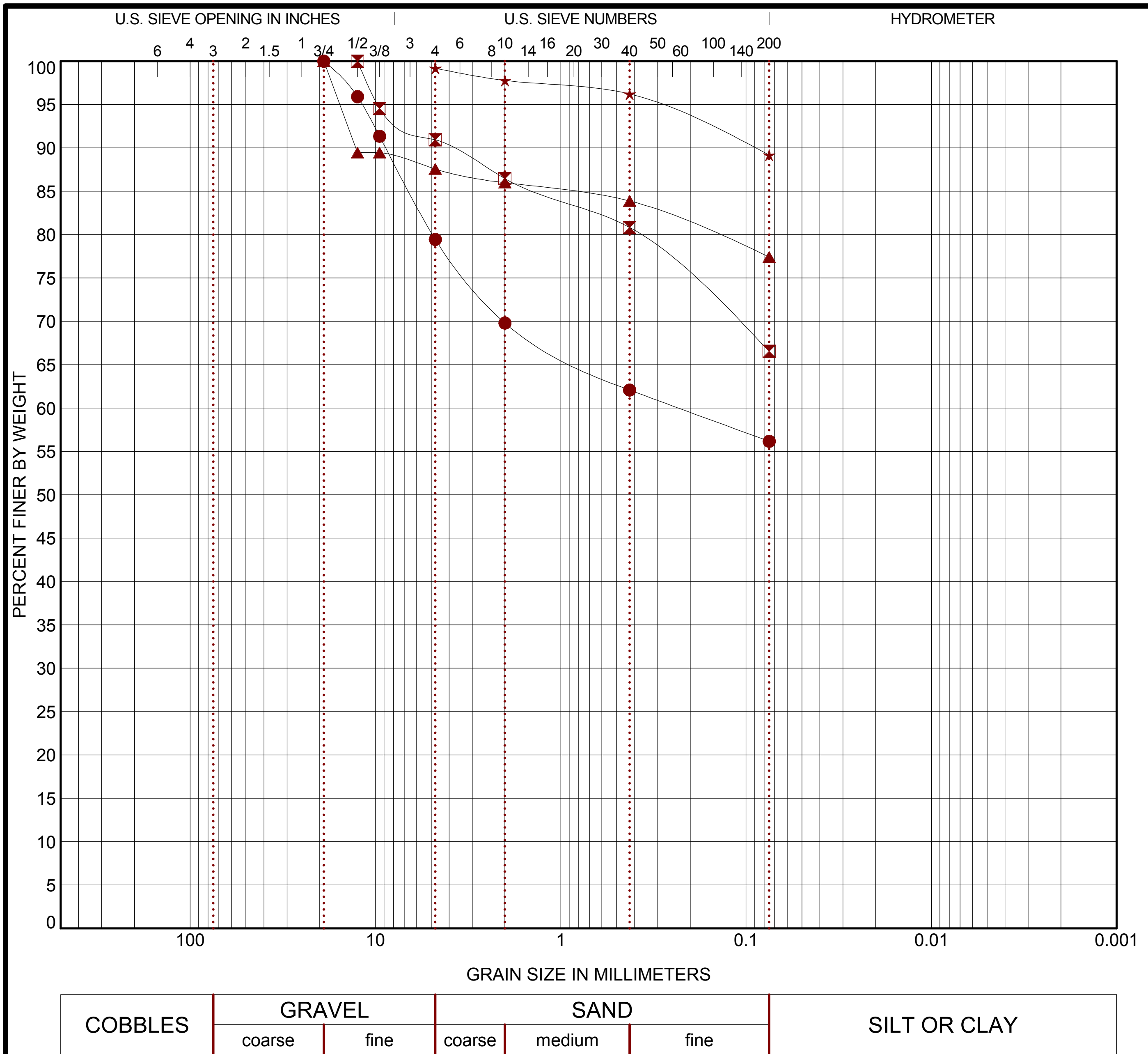
Four soil composite samples were prepared for Resilient Modulus testing. The samples were taken from the subgrade soils from depths of about 1 to 3 feet below existing ground surface.

Composite Sample	Borings	Soil Type
Bulk 1	BR-004/9/12/14	Lean clay PI = 17
Bulk 2	BR-017/19/21	Lean Clay PI = 10
Bulk 3	BR-030/35/36	Lean Clay PI = 25
Bulk 4	BR-003/4/5/12	Silty Clayey Gravel (Non-Plastic)

Procedural standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice and professional judgment.

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-001	0.8	SANDY SILT with GRAVEL(ML)	0(A-4)	NP	NP	NP		
⧗	BR-001	3.8	SANDY LEAN CLAY(CL)	11(A-6)	40	22	18		
▲	BR-002	2.0	LEAN CLAY with GRAVEL(CL)	14(A-6)	38	18	20		
★	BR-003	0.8	LEAN CLAY(CL)	11(A-6)	33	20	13		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-001	0.8	19	0.232			20.6	23.3	56.2	
⧗	BR-001	3.8	12.5				9.1	24.4	66.5	
▲	BR-002	2.0	19				12.4	10.1	77.4	
★	BR-003	0.8	4.75				0.0	10.0	89.2	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

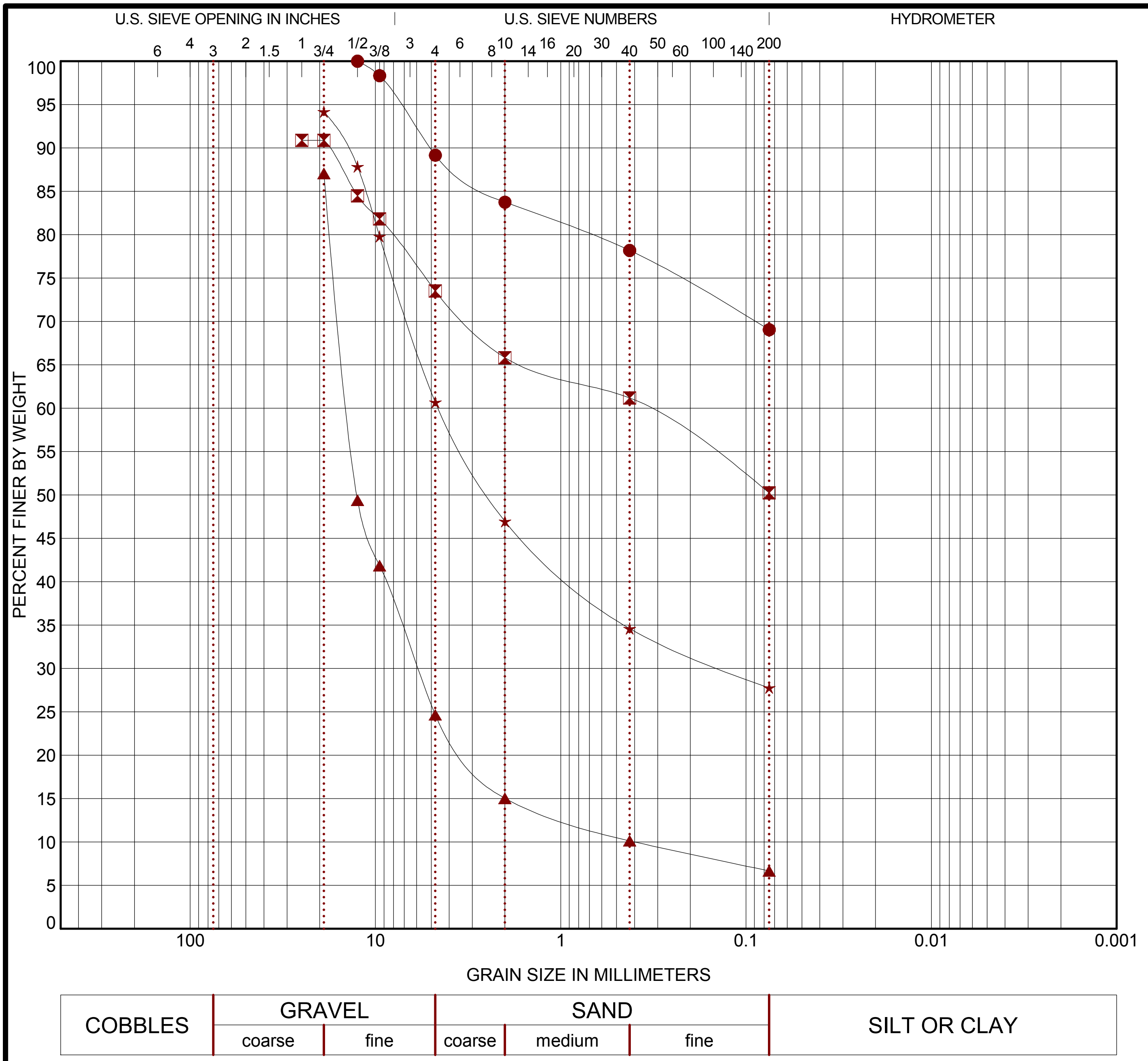
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-003	2.3	SANDY LEAN CLAY(CL)	9(A-6)	36	21	15		
⧗	BR-003	3.8	GRAVELLY LEAN CLAY with SAND(CL)	7(A-7-6)	43	22	21		
▲	BR-004	0.3						6.21	35.41
★	BR-004	0.5	SILTY GRAVEL with SAND(GM)	0(A-2-4)	21	18	3		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-003	2.3	12.5				10.8	20.1	69.1	
⧗	BR-003	3.8	25	0.352			17.4	23.3	50.2	
▲	BR-004	0.3	19	14.064	5.891	0.397	62.4	18.0	6.7	
★	BR-004	0.5	19	4.548	0.132		33.5	32.9	27.8	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

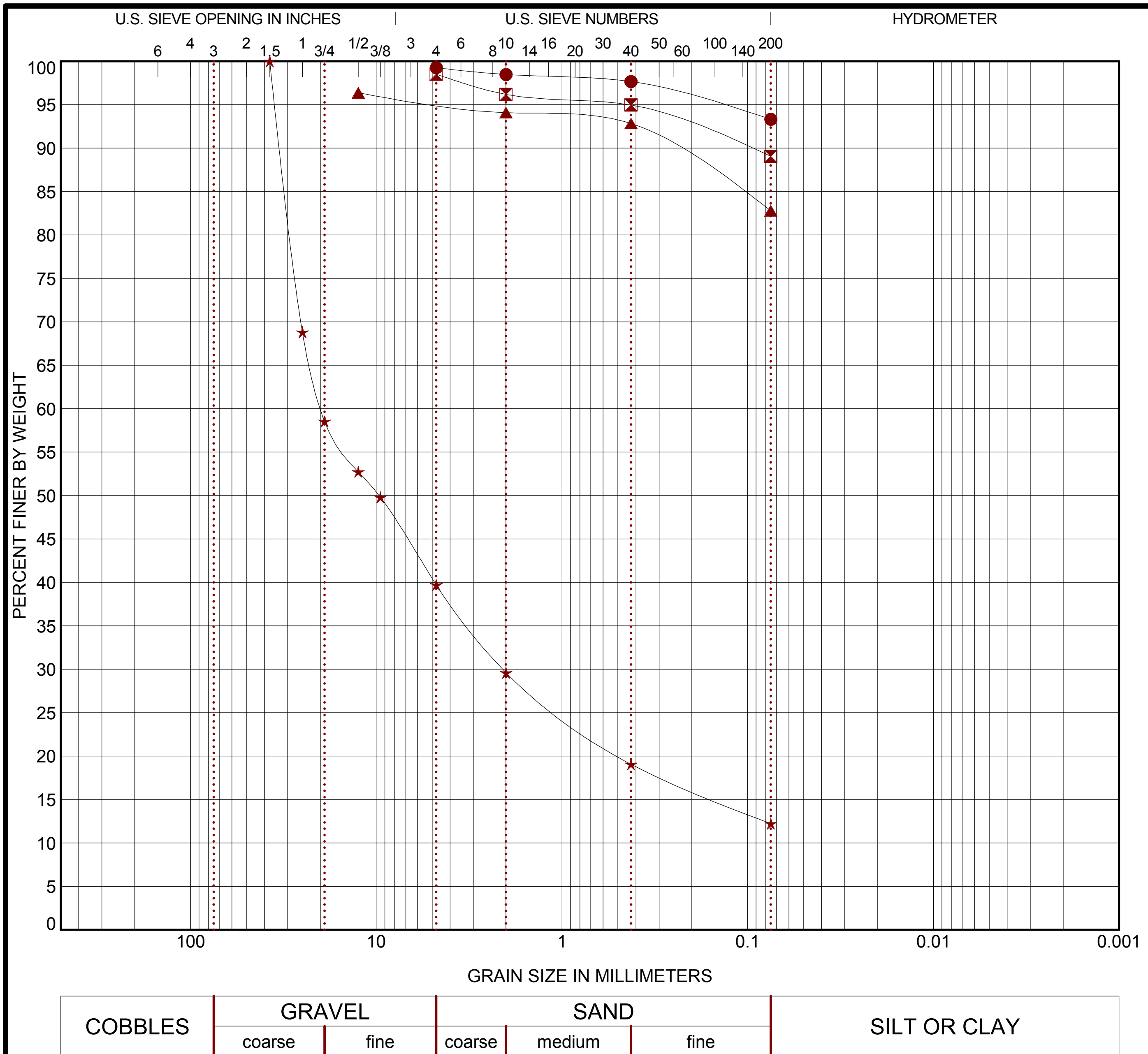
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

ASTM D422



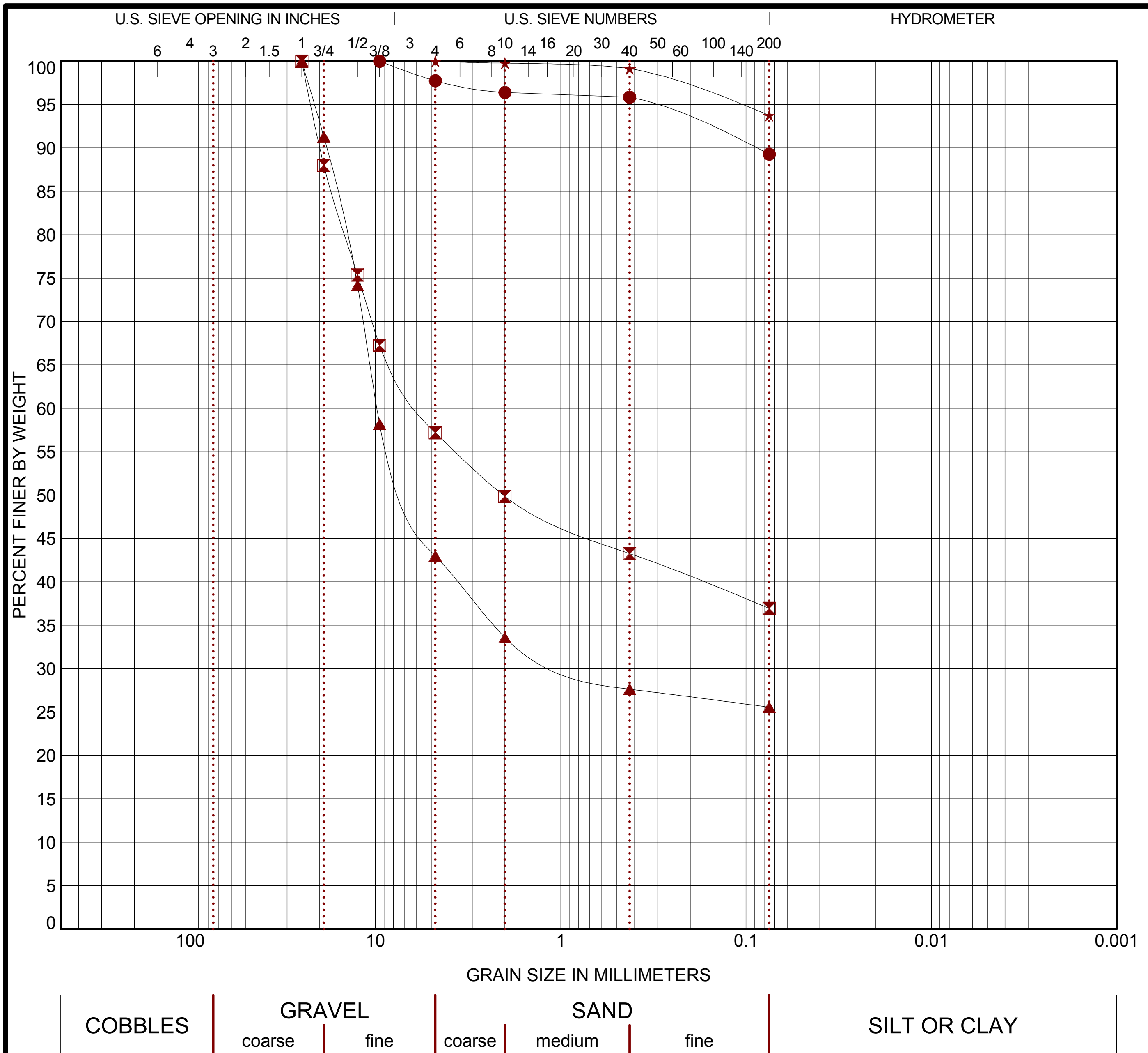
	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-004	2.0	FAT CLAY(CH)	43(A-7-6)	61	18	43		
⧗	BR-005	2.3	LEAN CLAY(CL)	16(A-6)	36	18	18		
▲	BR-005	3.8							
★	BR-006	0.5	SILTY GRAVEL with SAND(GM)	0(A-1-a)	NP	NP	NP	5.09	464.09

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-004	2.0	4.75				0.0	5.9	93.3	
⧗	BR-005	2.3	4.75				0.0	9.4	89.1	
▲	BR-005	3.8	12.5				1.2	12.4	82.8	
★	BR-006	0.5	37.5	19.757	2.07		60.3	27.5	12.2	

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas	9522 East 47th Place, Unit D Tulsa, Oklahoma	CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-3

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-006	3.5	LEAN CLAY(CL)	16(A-6)	39	22	17		
⧗	BR-007	2.0	SILTY GRAVEL with SAND(GM)	0(A-4)	NP	NP	NP		
▲	BR-008	0.5	CLAYEY GRAVEL with SAND(GC)	1(A-2-6)	36	18	18		
★	BR-008	2.0	LEAN CLAY(CL)	27(A-7-6)	46	19	27		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-006	3.5	9.5				2.3	8.4	89.3	
⧗	BR-007	2.0	25	5.76			42.8	20.3	36.9	
▲	BR-008	0.5	25	9.801	0.789		57.0	17.4	25.6	
★	BR-008	2.0	4.75				0.0	6.2	93.8	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

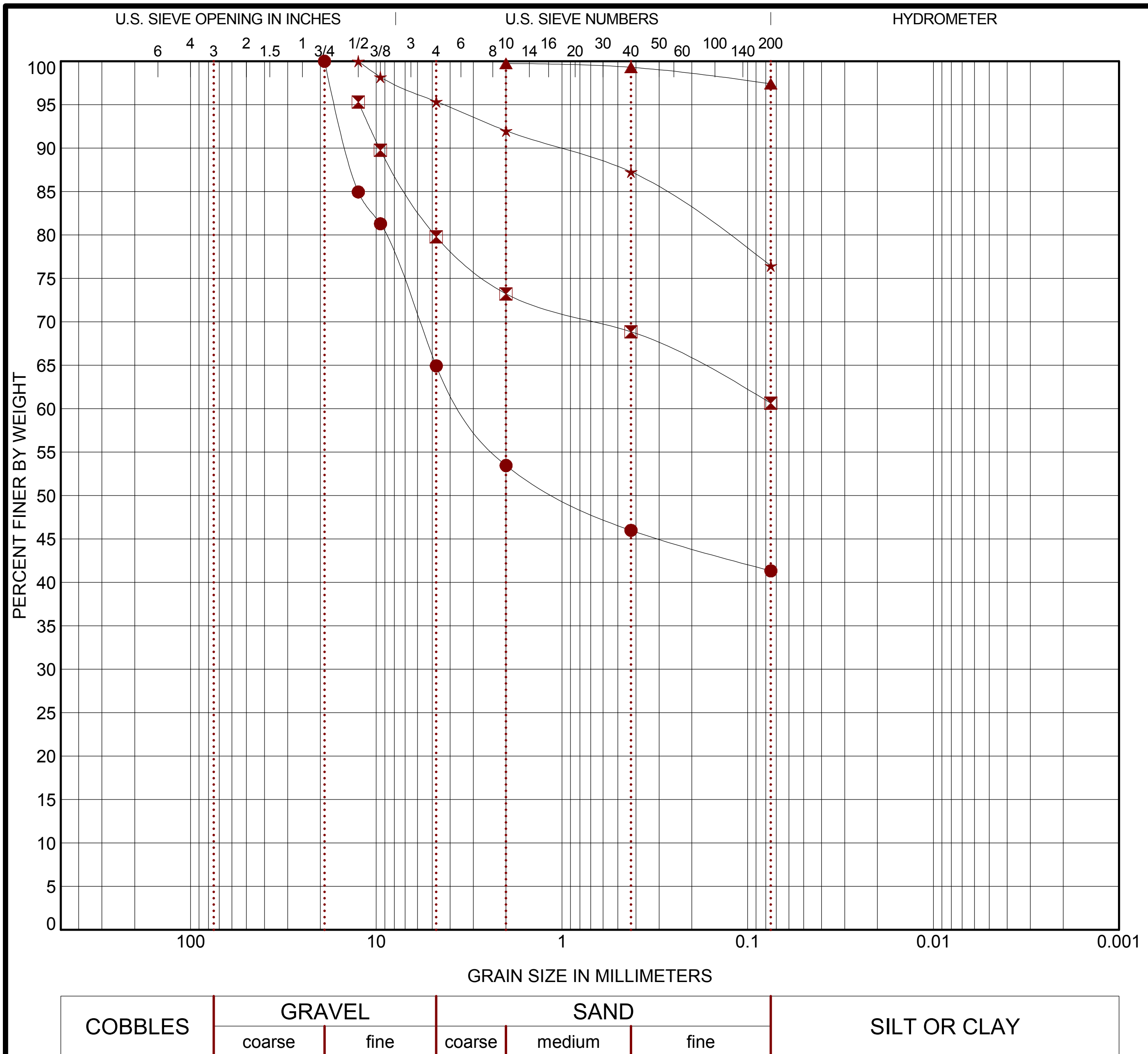
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-4

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-010	0.5	SILTY GRAVEL with SAND(GM)	0(A-4)	NP	NP	NP		
⊠	BR-012	0.5							
▲	BR-012	2.0	FAT CLAY(CH)	39(A-7-6)	61	27	34		
★	BR-013	0.5	LEAN CLAY with SAND(CL)	16(A-7-6)	41	18	23		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-010	0.5	19	3.276			35.1	23.6	41.3	
⊠	BR-012	0.5	12.5				15.5	19.2	60.6	
▲	BR-012	2.0	2				0.0	2.3	97.4	
★	BR-013	0.5	12.5				4.6	18.9	76.4	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

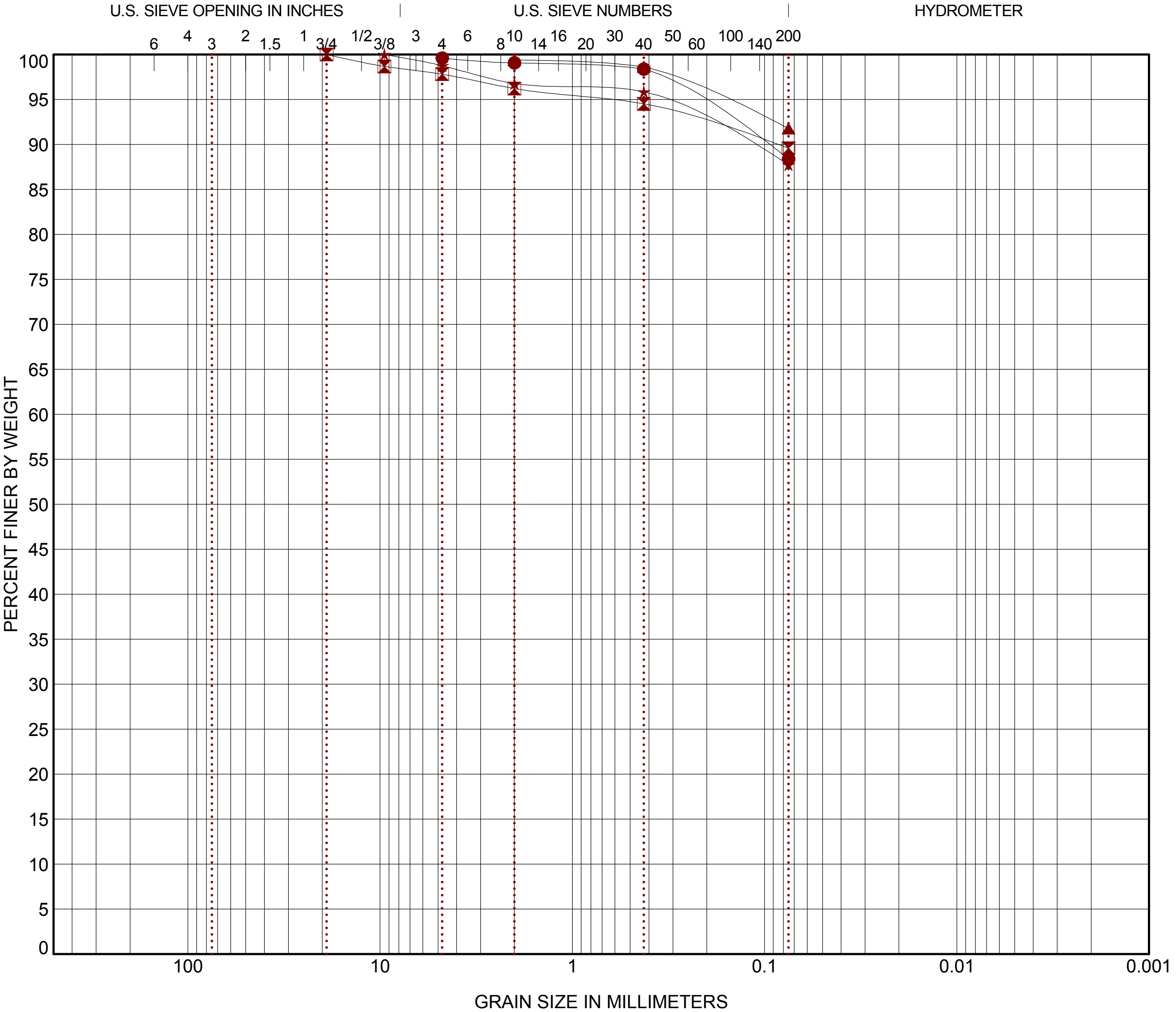
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-5

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-013	3.5	LEAN CLAY(CL)	22(A-7-6)	43	19	24		
⧗	BR-014	2.0	LEAN CLAY(CL)	16(A-6)	36	18	18		
▲	BR-014	3.5	FAT CLAY(CH)	38(A-7-6)	62	26	36		
★	BR-015	2.0							

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-013	3.5	4.75				0.0	11.2	88.4	
⧗	BR-014	2.0	19				2.2	8.2	89.6	
▲	BR-014	3.5	2				0.0	7.6	91.8	
★	BR-015	2.0	9.5				1.3	11.0	87.7	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

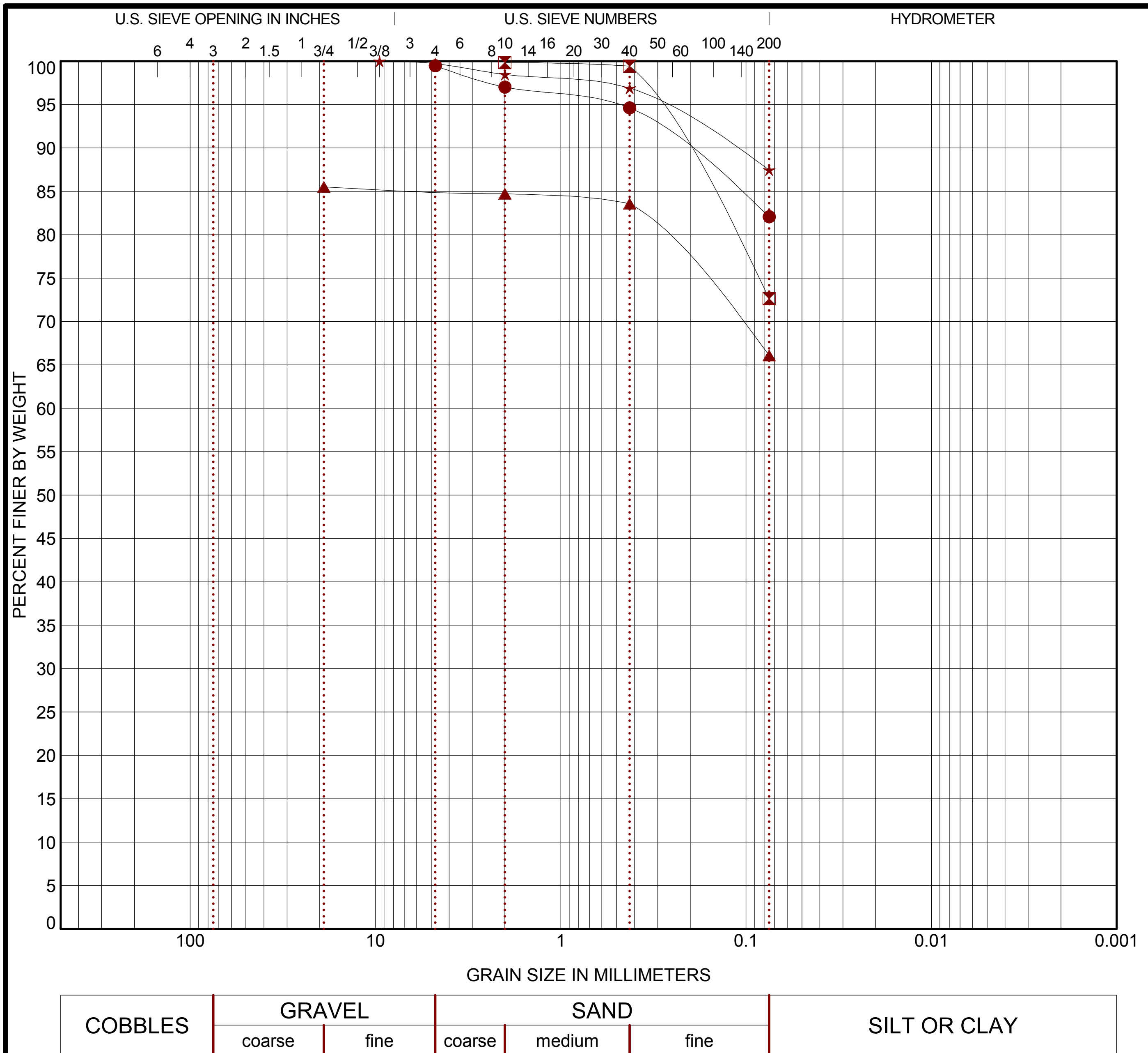
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-6

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-016	0.6	LEAN CLAY with SAND(CL)	9(A-6)	31	18	13		
⧗	BR-016	2.1	LEAN CLAY with SAND(CL)	8(A-6)	34	22	12		
▲	BR-016	3.6	SANDY SILTY CLAY(CL-ML)	3(A-4)	28	21	7		
★	BR-017	0.5	LEAN CLAY(CL)	5(A-4)	25	17	8		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-016	0.6	4.75				0.0	17.4	82.1	
⧗	BR-016	2.1	2				0.0	27.2	72.6	
▲	BR-016	3.6	19				0.5	18.9	66.1	
★	BR-017	0.5	9.5				0.3	12.2	87.5	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

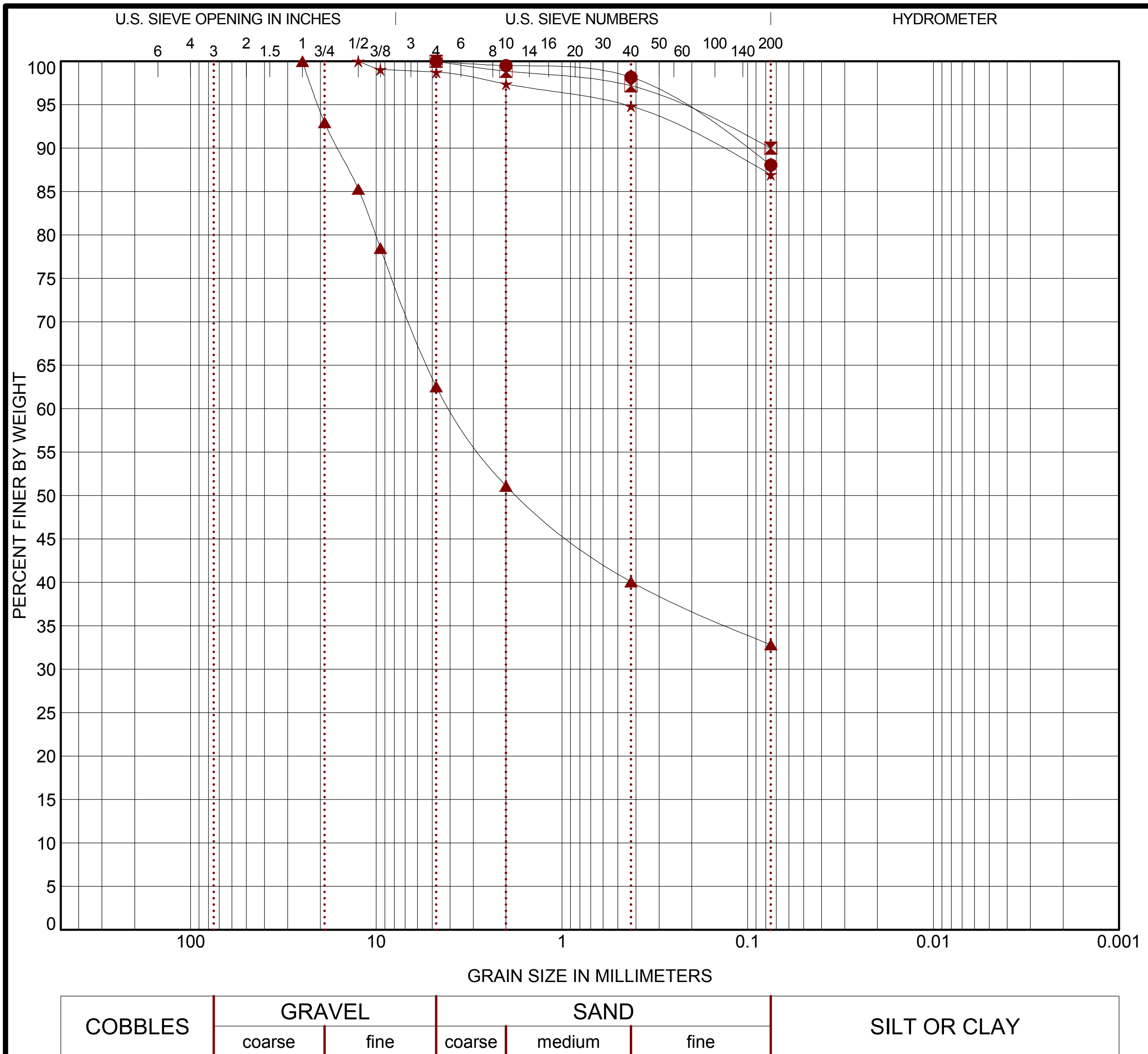
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-7

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-018	2.0	LEAN CLAY(CL)	16(A-6)	37	18	19		
⧗	BR-020	2.0							
▲	BR-021	0.7							
★	BR-021	2.2	LEAN CLAY(CL)	6(A-4)	26	17	9		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-018	2.0	4.75				0.0	12.0	88.0	
⧗	BR-020	2.0	4.75				0.0	10.0	90.0	
▲	BR-021	0.7	25	3.919			37.5	29.7	32.8	
★	BR-021	2.2	12.5				1.3	11.8	87.0	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon

9522 East 47th Place, Unit D
Tulsa, Oklahoma

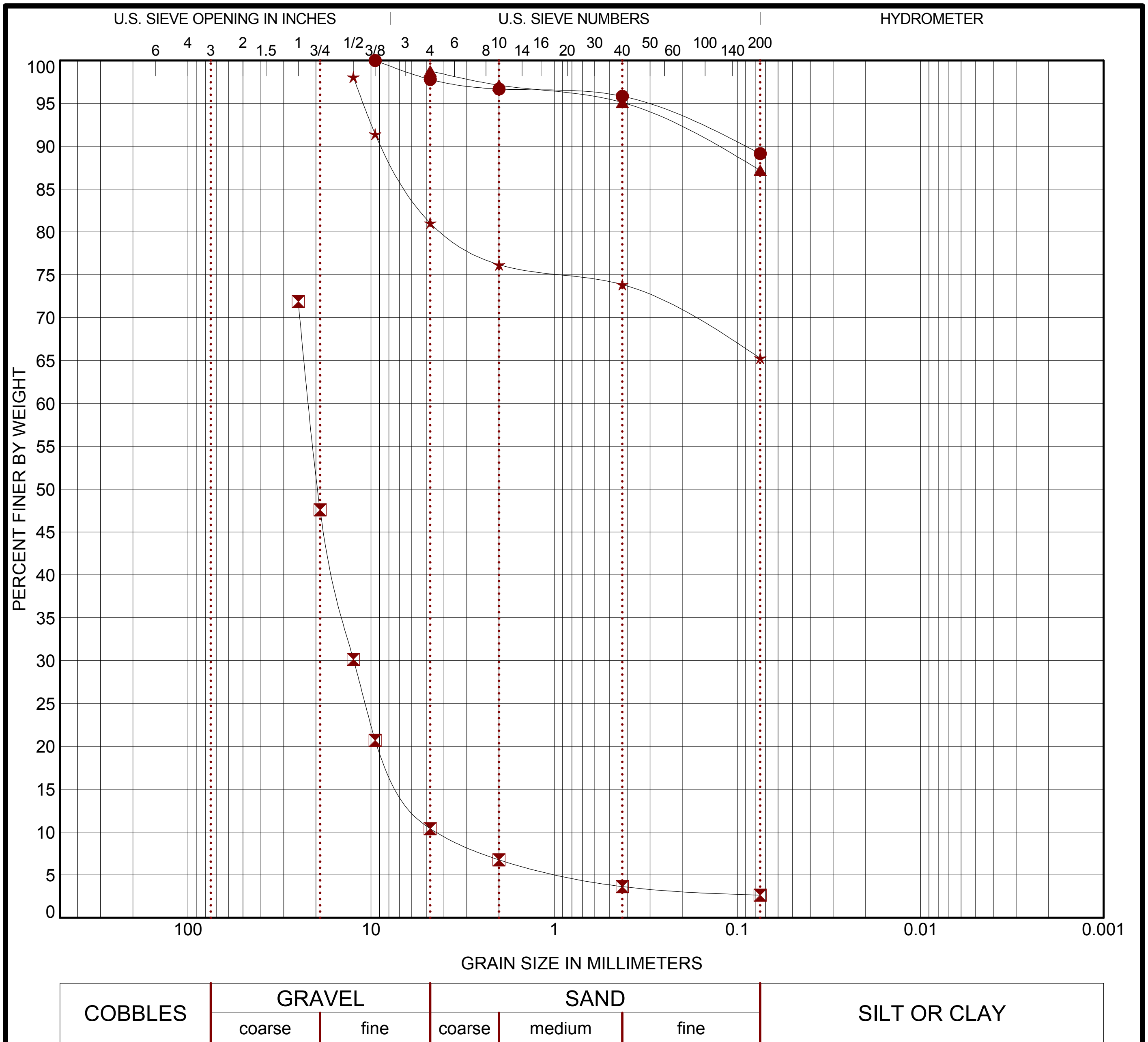
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-8

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-022	3.5	FAT CLAY(CH)	30(A-7-6)	52	21	31		
⧗	BR-024	0.5	WELL-GRADED GRAVEL(GW)					1.64	5.06
▲	BR-024	0.8	LEAN CLAY(CL)	14(A-6)	35	18	17		
★	BR-024	2.3	GRAVELLY LEAN CLAY with SAND(CL)	8(A-6)	36	21	15		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-022	3.5	9.5				2.2	8.7	89.1	
⧗	BR-024	0.5	25	21.86	12.443	4.32	61.5	7.8	2.6	
▲	BR-024	0.8	4.75				0.0	11.6	87.2	
★	BR-024	2.3	12.5				17.0	15.8	65.3	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon

9522 East 47th Place, Unit D
Tulsa, Oklahoma

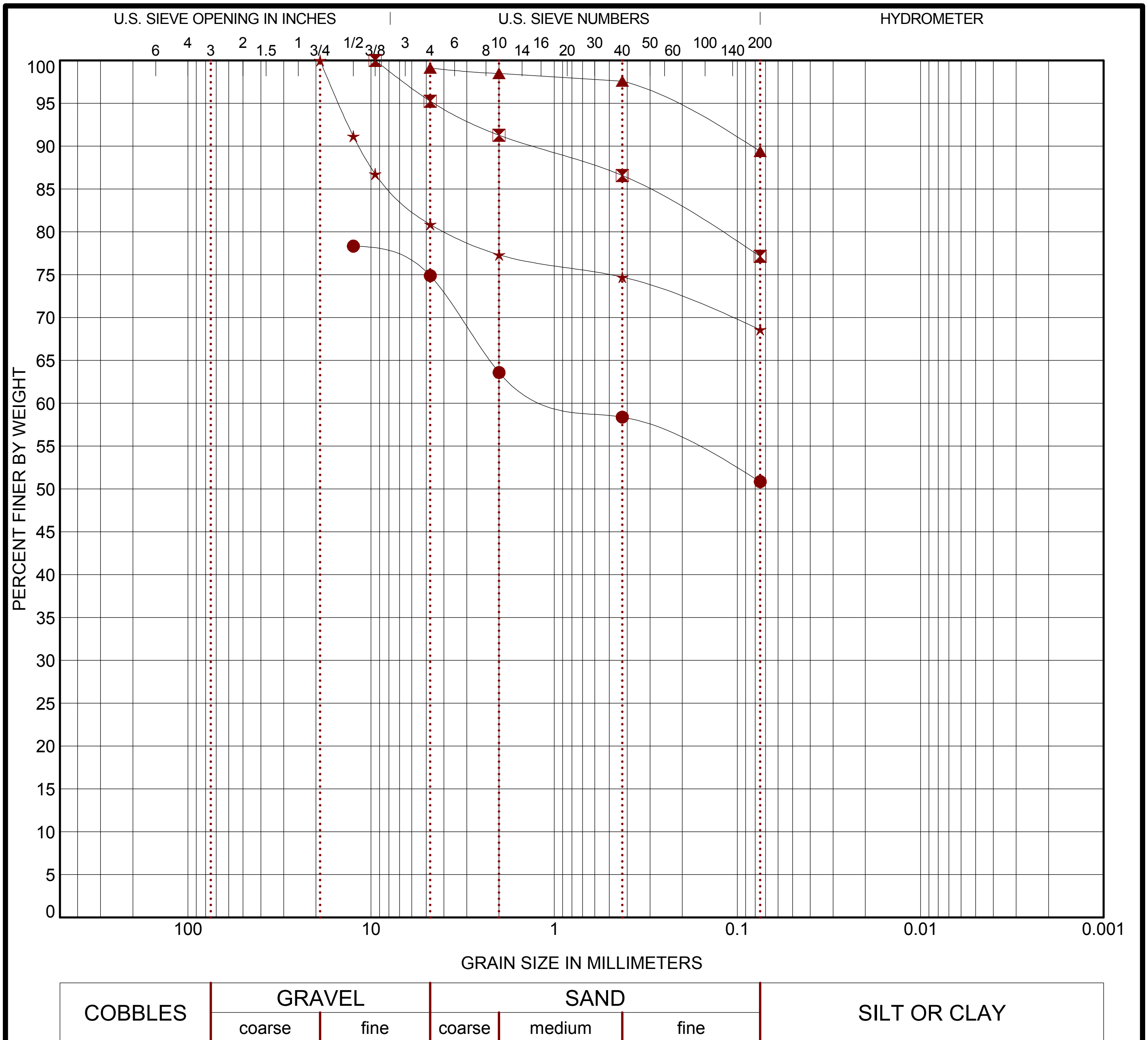
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-9

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-024	3.8	GRAVELLY LEAN CLAY with SAND(CL)	1(A-4)	27	19	8		
⧗	BR-025	0.5	LEAN CLAY with SAND(CL)	12(A-6)	35	18	17		
▲	BR-026	2.1	LEAN CLAY(CL)	18(A-7-6)	42	23	19		
★	BR-027	3.5	GRAVELLY LEAN CLAY(CL)	9(A-6)	35	19	16		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-024	3.8	12.5	0.688			3.4	24.0	50.9	
⧗	BR-025	0.5	9.5				4.7	18.1	77.1	
▲	BR-026	2.1	4.75				0.0	9.7	89.4	
★	BR-027	3.5	19				19.1	12.3	68.6	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

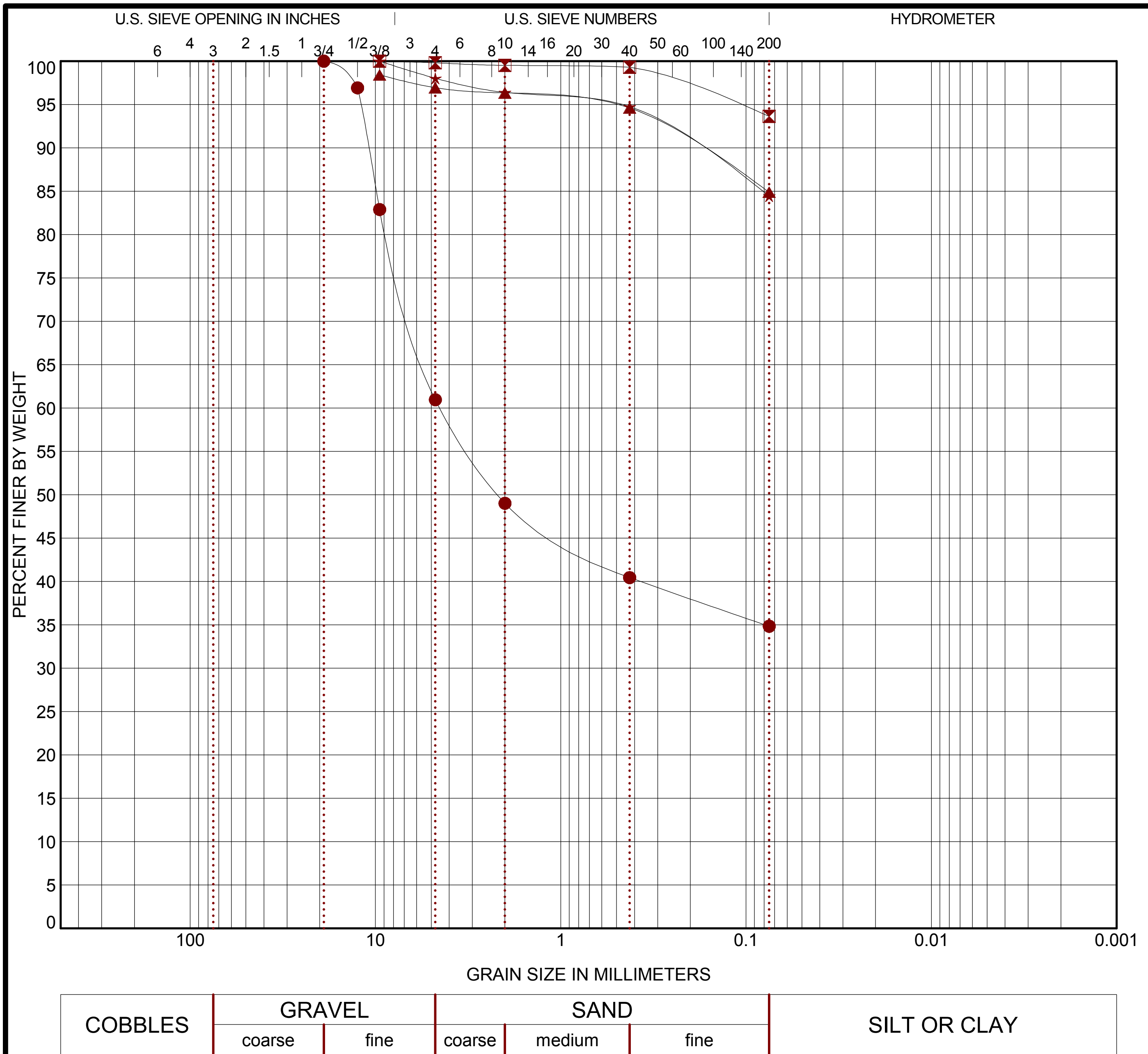
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-10

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-028	0.5							
⧗	BR-029	2.0	LEAN CLAY(CL)	16(A-6)	35	18	17		
▲	BR-030	0.5							
★	BR-030	2.0	LEAN CLAY with SAND(CL)	12(A-6)	31	15	16		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-028	0.5	19	4.432			39.0	26.1	34.8	
⧗	BR-029	2.0	9.5				0.2	6.2	93.6	
▲	BR-030	0.5	9.5				1.5	12.0	84.9	
★	BR-030	2.0	9.5				2.0	13.6	84.4	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

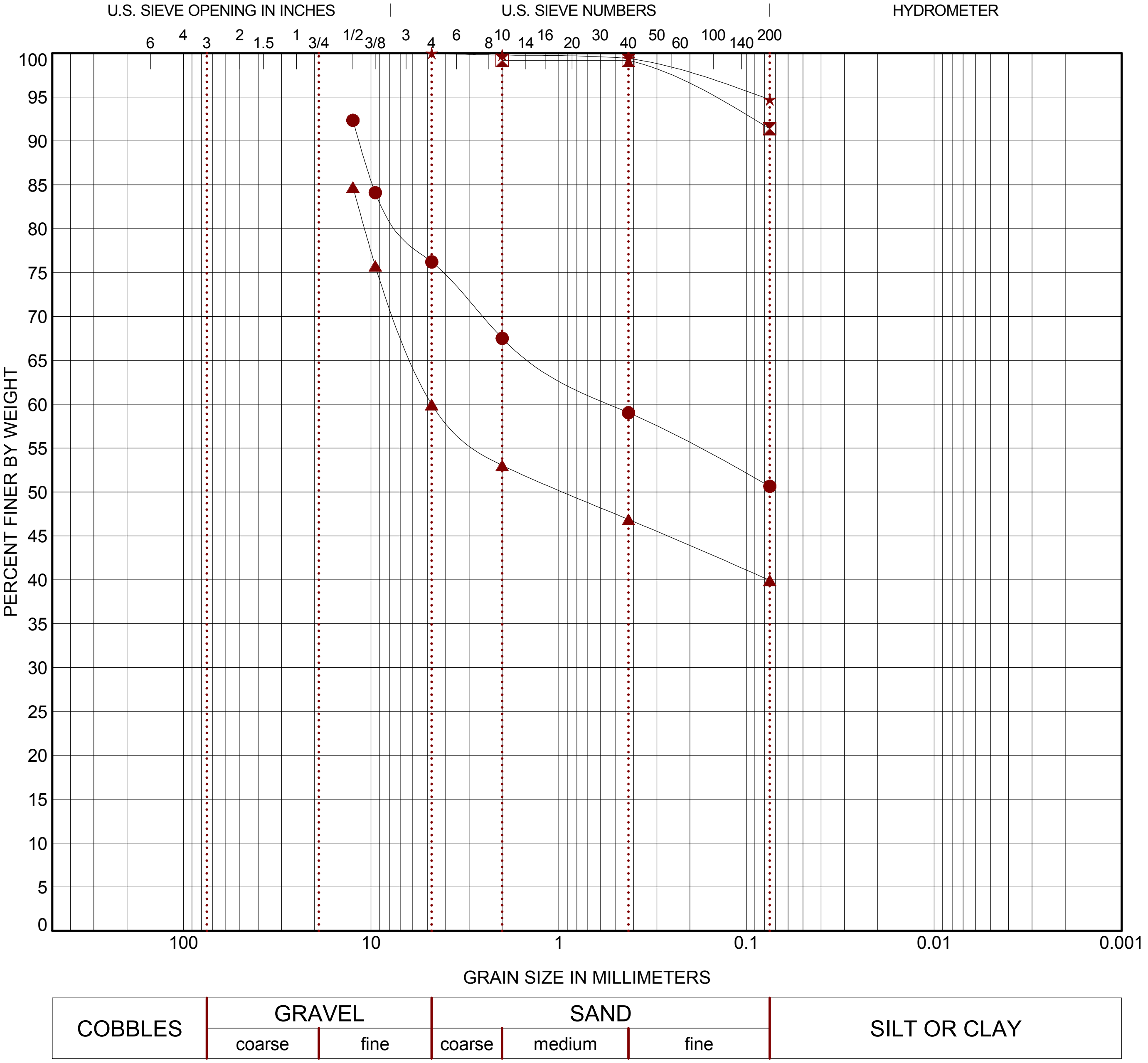
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-11

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-032	0.5	SANDY SILTY CLAY with GRAVEL(CL-ML)	0(A-4)	23	19	4		
⊠	BR-032	3.5	LEAN CLAY(CL)	10(A-6)	31	19	12		
▲	BR-033	0.5	SILTY GRAVEL with SAND(GM)	0(A-4)	NP	NP	NP		
★	BR-033	2.0	SILTY CLAY(CL-ML)	4(A-4)	24	18	6		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-032	0.5	12.5	0.507			16.1	25.6	50.7	
⊠	BR-032	3.5	2				0.0	7.8	91.4	
▲	BR-033	0.5	12.5	4.755			24.8	20.0	39.9	
★	BR-033	2.0	4.75				0.0	5.3	94.7	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

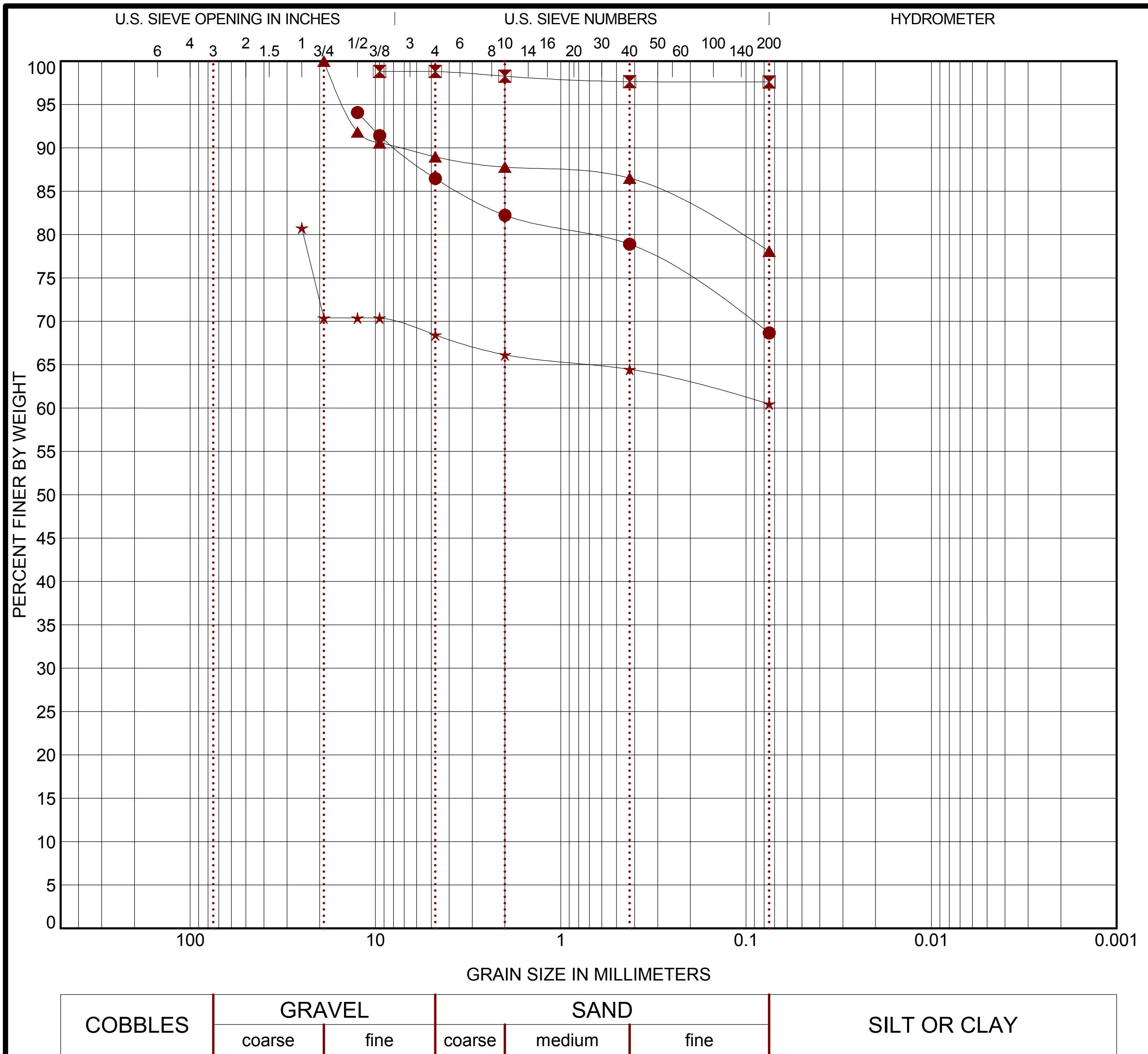
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-12

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-034	0.5	SANDY LEAN CLAY(CL)	16(A-7-6)	43	16	27		
⧗	BR-034	2.0	LEAN CLAY(CL)	14(A-6)	33	19	14		
▲	BR-034	3.5	LEAN CLAY with GRAVEL(CL)	10(A-6)	33	19	14		
★	BR-035	2.0	GRAVELLY LEAN CLAY(CL)	8(A-6)	37	19	18		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-034	0.5	12.5				7.6	17.8	68.7	
⧗	BR-034	2.0	9.5				0.0	1.2	97.6	
▲	BR-034	3.5	19				11.0	10.9	78.1	
★	BR-035	2.0	25				12.3	8.0	60.5	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

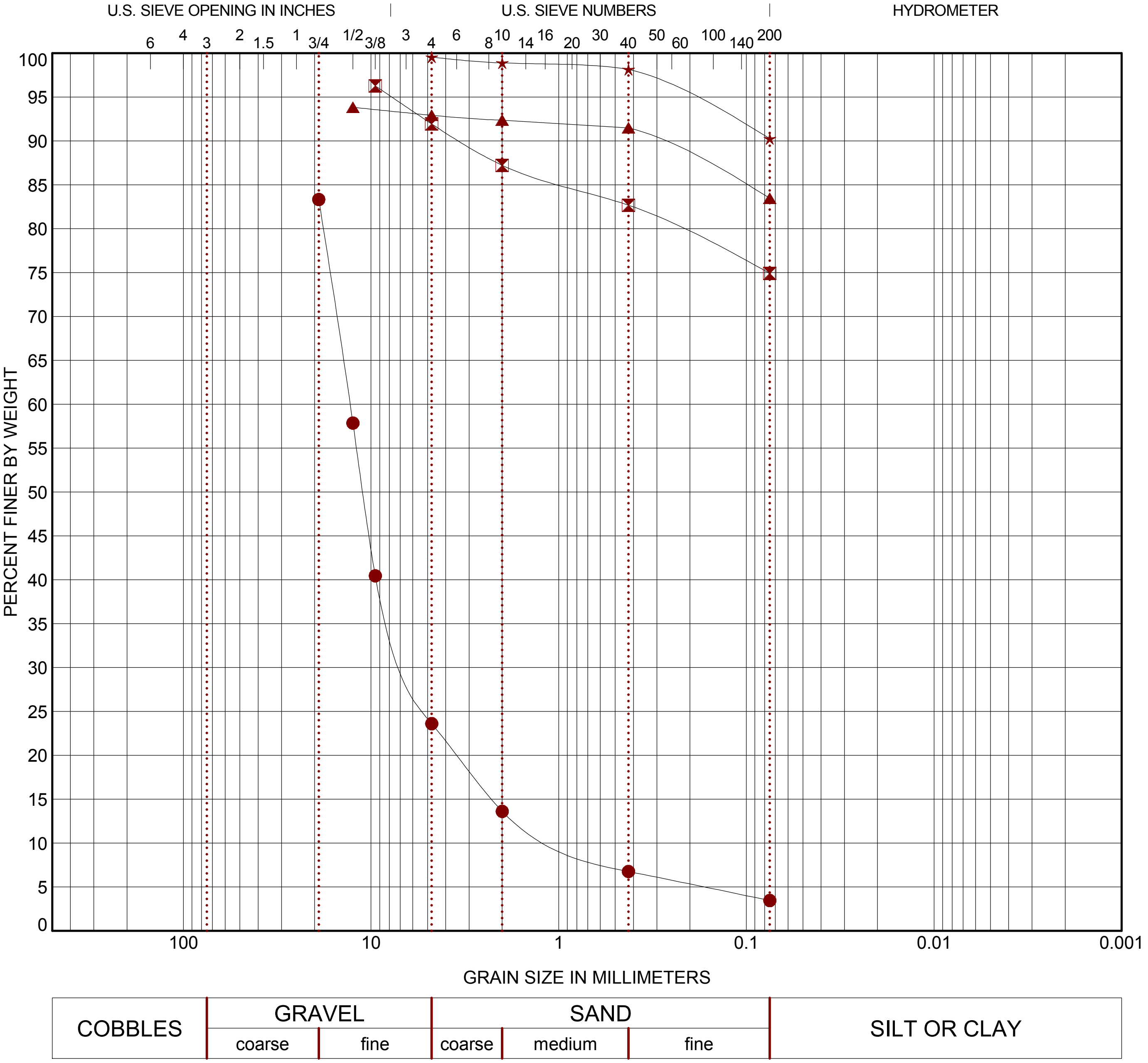
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-13

GRAIN SIZE DISTRIBUTION

ASTM D422



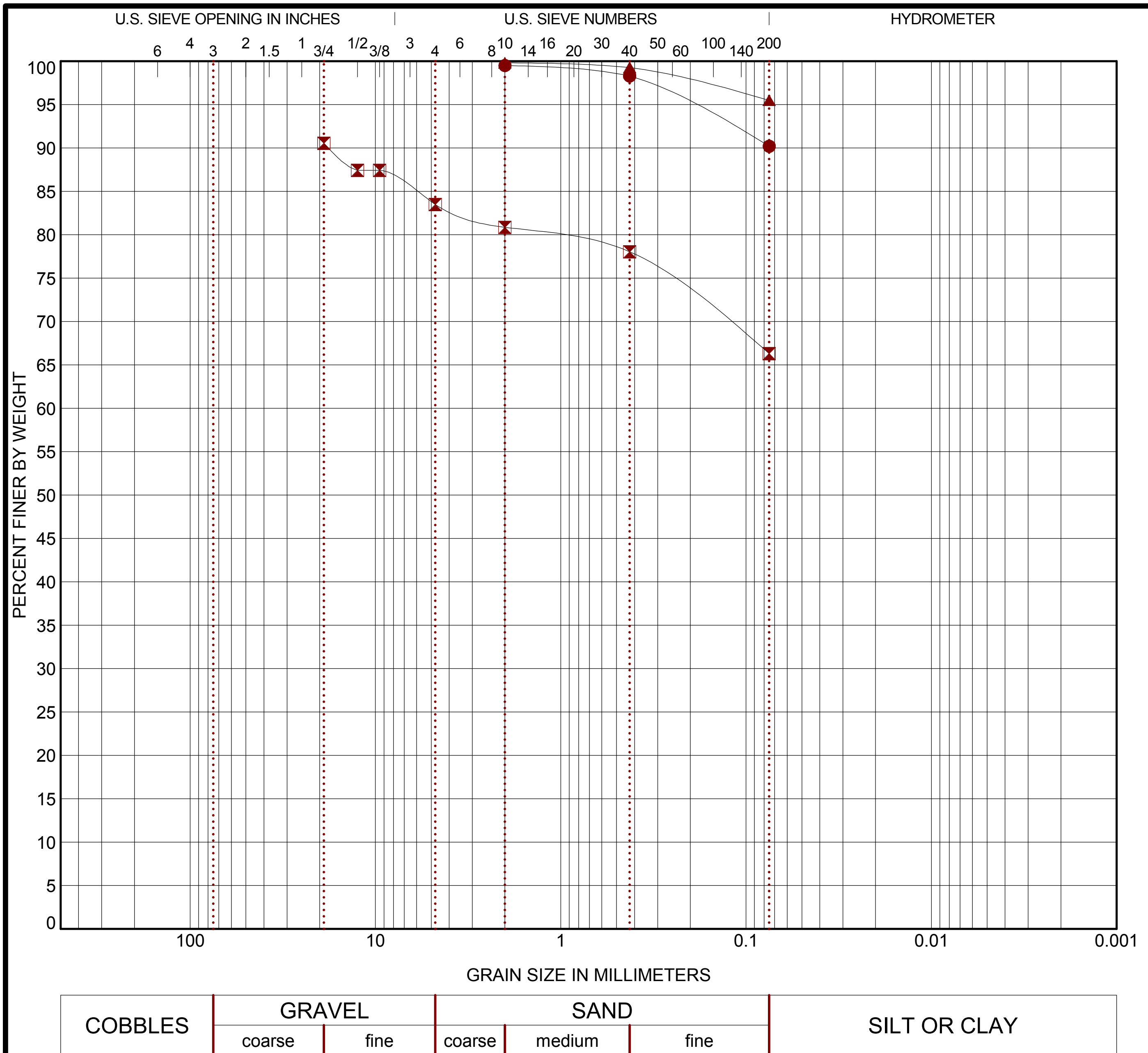
	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-036	0.4	POORLY GRADED GRAVEL with SAND(GP)					3.33	14.64
⊠	BR-036	0.6	LEAN CLAY with SAND(CL)	4(A-4)	24	16	8		
▲	BR-036	2.1	LEAN CLAY with SAND(CL)	7(A-4)	30	20	10		
★	BR-036	3.6							

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-036	0.4	19	12.949	6.179	0.884	59.7	20.2	3.5	
⊠	BR-036	0.6	9.5				4.3	17.0	74.9	
▲	BR-036	2.1	12.5				0.9	9.4	83.5	
★	BR-036	3.6	4.75				0.0	9.3	90.3	

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas		CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-14

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	BR-039	2.0	LEAN CLAY(CL)	20(A-7-6)	41	19	22		
⧗	BR-041	0.5	SANDY LEAN CLAY with GRAVEL(CL)	9(A-6)	33	15	18		
▲	BR-041	5.0	LEAN CLAY(CL)	31(A-7-6)	48	17	31		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	BR-039	2.0	2				0.0	9.3	90.2	
⧗	BR-041	0.5	19				7.1	17.2	66.3	
▲	BR-041	5.0	2				0.0	4.3	95.5	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

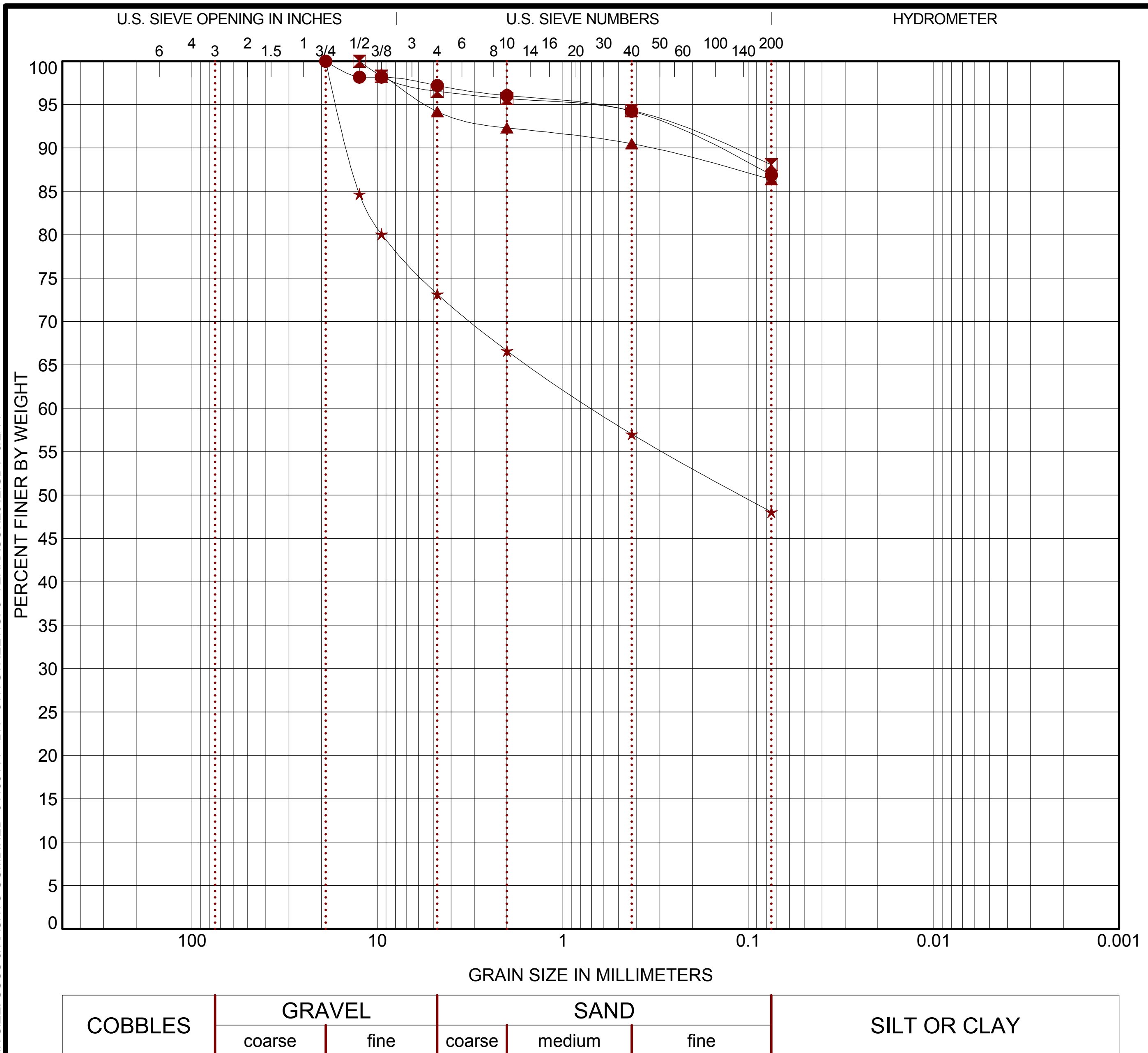
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-15

GRAIN SIZE DISTRIBUTION

ASTM D422



	Boring ID	Depth	USCS Classification	AASHTO Classification	LL	PL	PI	Cc	Cu
●	Bulk 1	0.0	LEAN CLAY(CL)	14(A-6)	33	16	17		
⊠	Bulk 2	0.0	LEAN CLAY(CL)	8(A-4)	29	19	10		
▲	Bulk 3	0.0	LEAN CLAY(CL)	21(A-7-6)	41	16	25		
★	Bulk 4	0.0	SILTY, CLAYEY GRAVEL with SAND(GC-GM)	0(A-4)	22	18	4		

	Boring ID	Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	Bulk 1	0.0	19				2.8	10.3	86.9	
⊠	Bulk 2	0.0	12.5				3.5	8.5	88.1	
▲	Bulk 3	0.0	9.5				4.4	7.8	86.3	
★	Bulk 4	0.0	19	0.686			26.8	25.1	48.1	

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

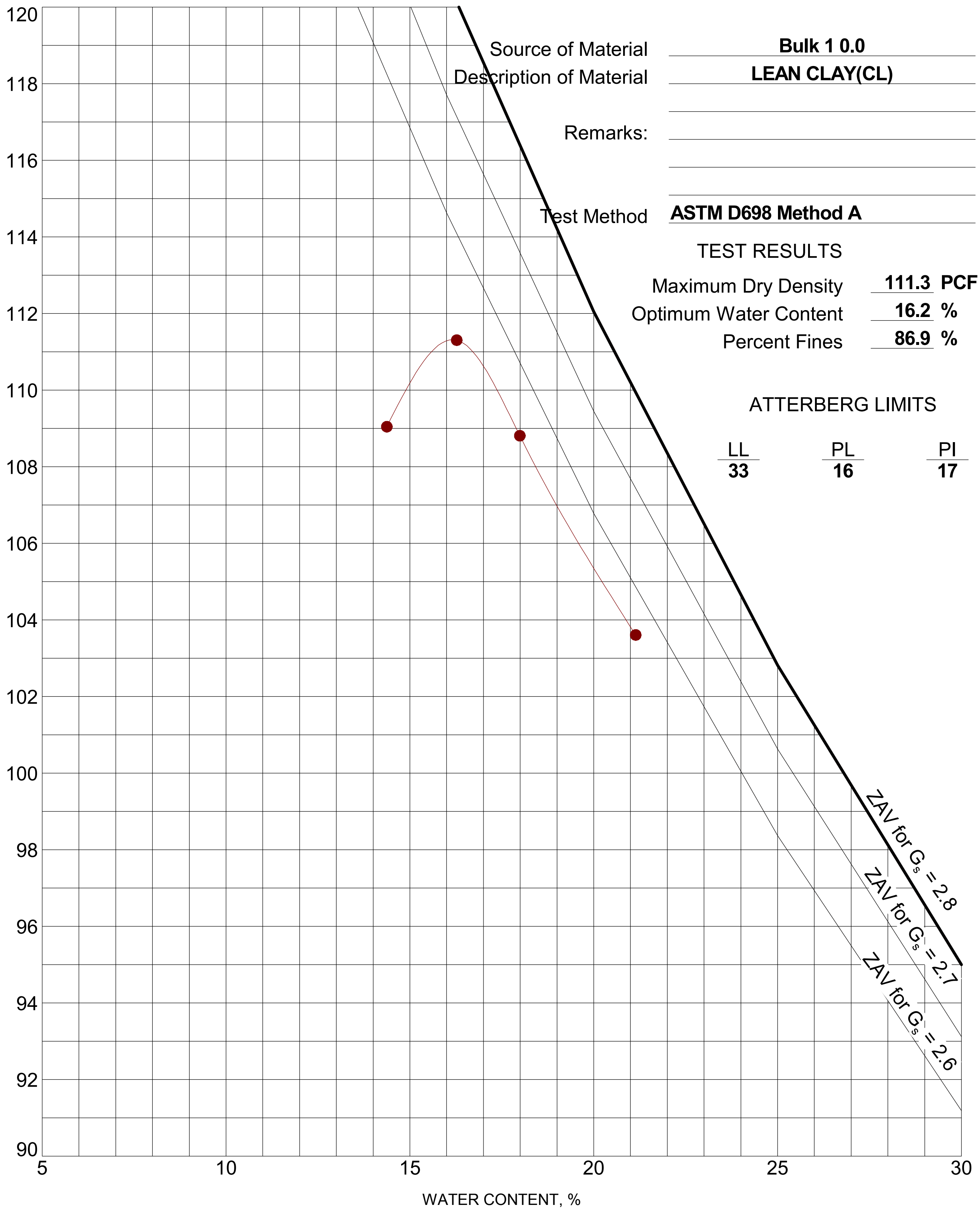
PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-16

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

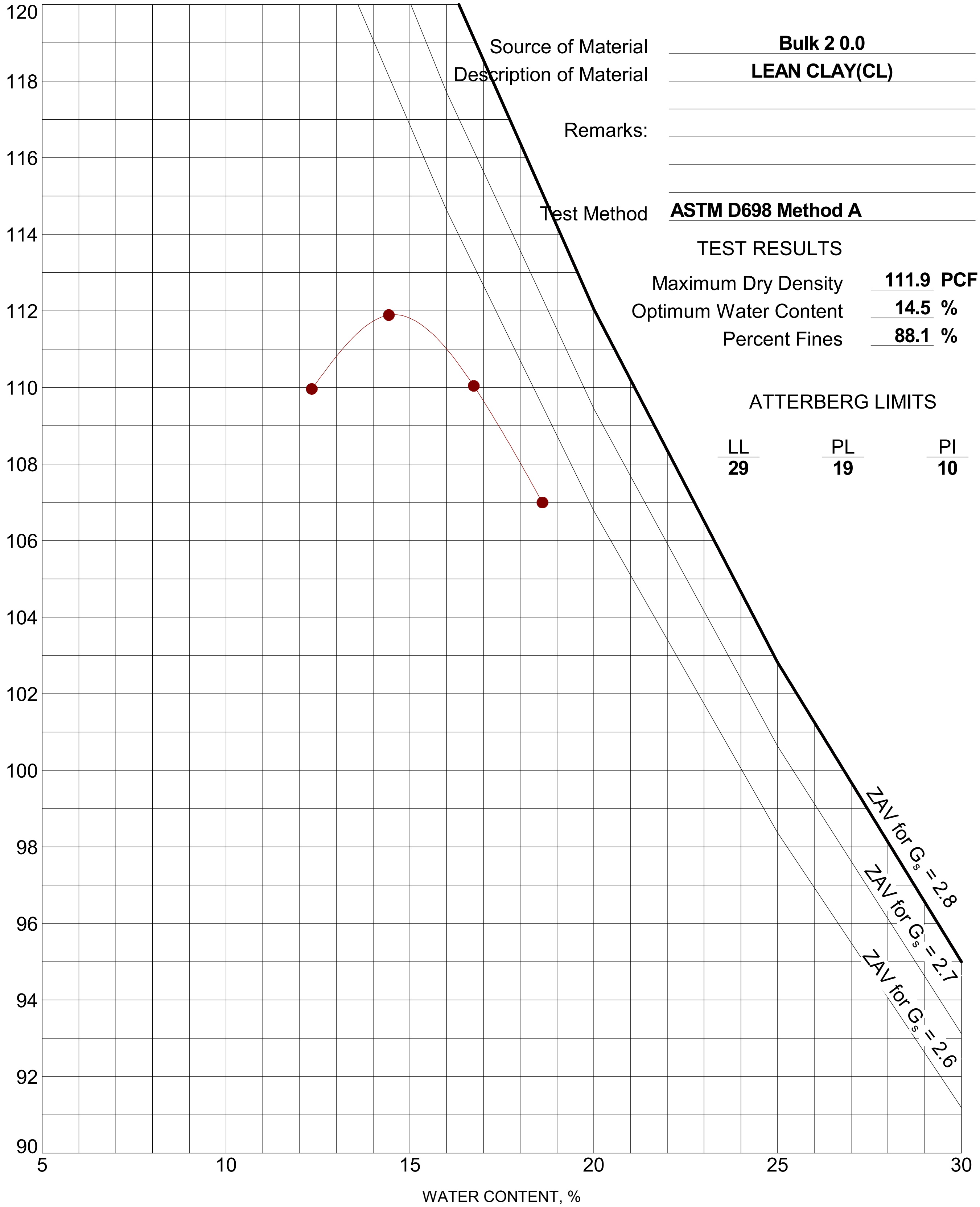


LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V1 04135111 - BR - 8TH STREET.GPJ MEASUREMENT FIELDS.GPJ 6/2/14

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas	9522 East 47th Place, Unit D Tulsa, Oklahoma	CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-17

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material	**Bulk 2 0.0**
Description of Material	**LEAN CLAY(CL)**
Remarks:	
Test Method	**ASTM D698 Method A**

TEST RESULTS

Maximum Dry Density	**111.9**	**PCF**
Optimum Water Content	**14.5**	**%**
Percent Fines	**88.1**	**%**

ATTERBERG LIMITS

LL	PL	PI
29	**19**	**10**

PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon 9522 East 47th Place, Unit D Tulsa, Oklahoma	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas		CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-18

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557

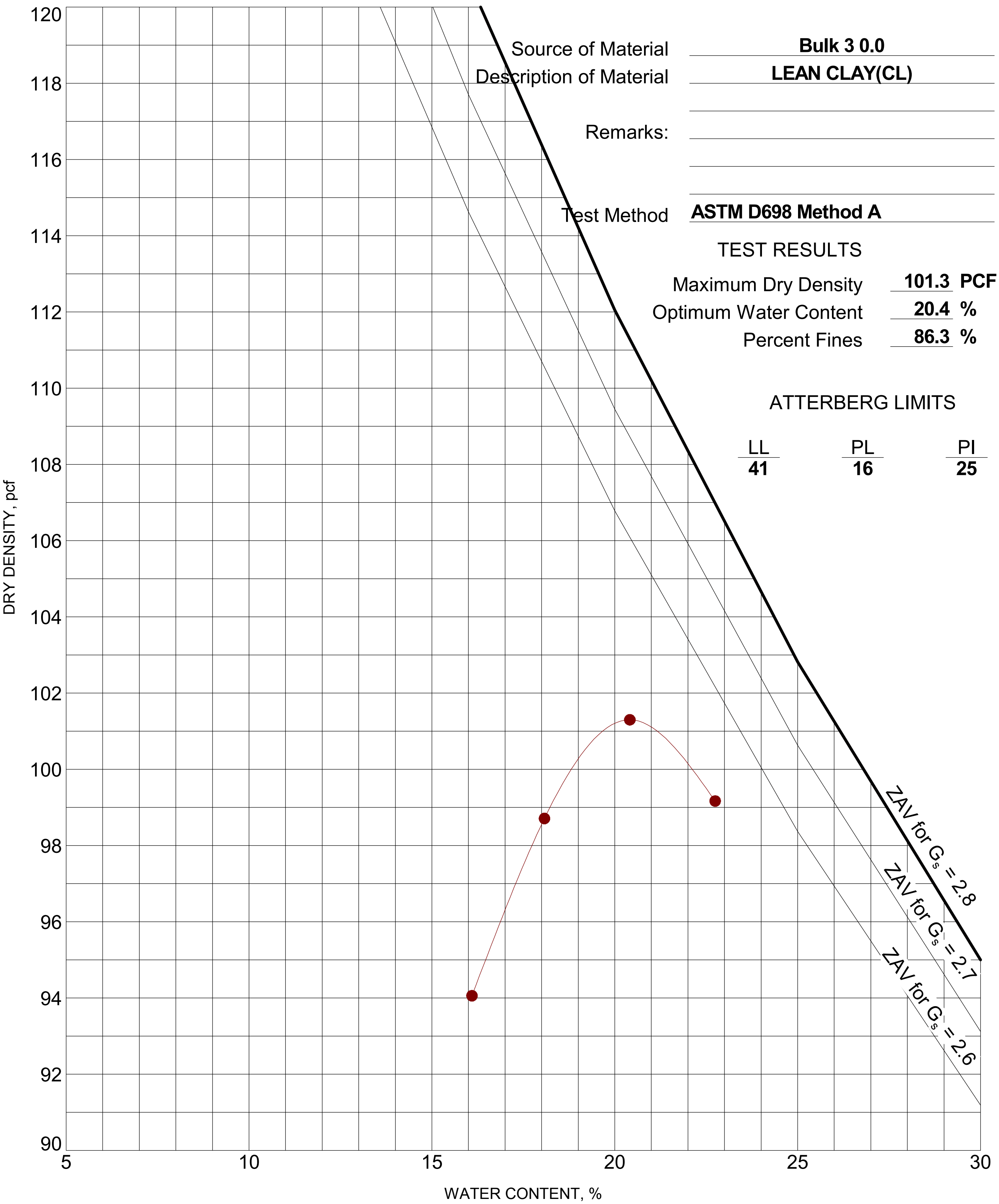
Source of Material	**Bulk 3 0.0**
Description of Material	**LEAN CLAY(CL)**
Remarks:	
Test Method	**ASTM D698 Method A**

TEST RESULTS

Maximum Dry Density	**101.3**	**PCF**
Optimum Water Content	**20.4**	**%**
Percent Fines	**86.3**	**%**

ATTERBERG LIMITS

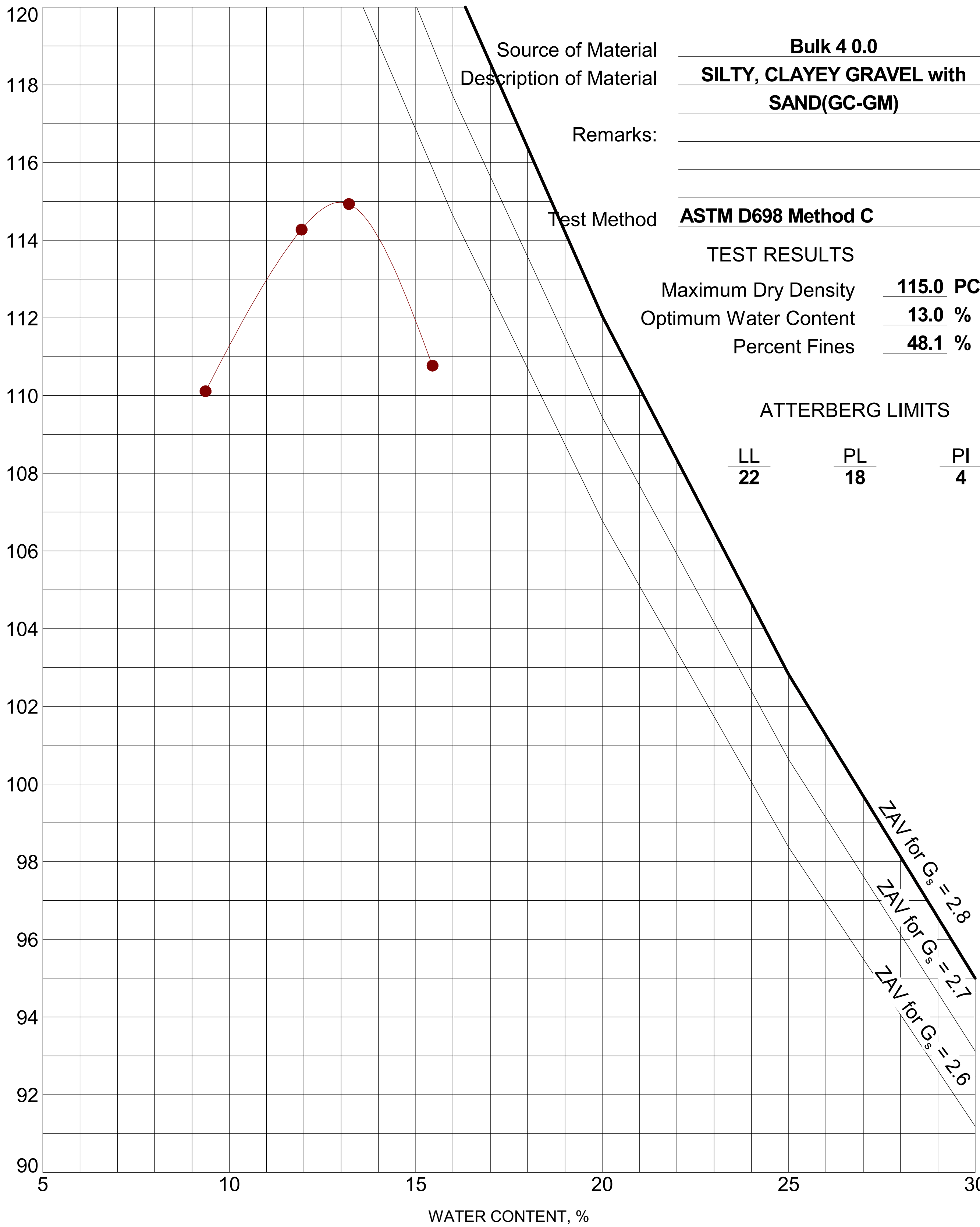
LL	PL	PI
41	**16**	**25**



PROJECT: 8th Street Widening Project - Proposed Pavements	Terracon	PROJECT NUMBER: 04135111
SITE: Bentonville, Arkansas	9522 East 47th Place, Unit D Tulsa, Oklahoma	CLIENT: Burns & McDonell Engineering Company, Inc.
		EXHIBIT: B-19

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material	**Bulk 4 0.0**
Description of Material	**SILTY, CLAYEY GRAVEL with SAND(GC-GM)**
Remarks:	
Test Method	**ASTM D698 Method C**

TEST RESULTS

Maximum Dry Density	**115.0**	**PCF**
Optimum Water Content	**13.0**	**%**
Percent Fines	**48.1**	**%**

ATTERBERG LIMITS

LL	PL	PI
22	**18**	**4**

PROJECT: 8th Street Widening Project - Proposed Pavements

SITE: Bentonville, Arkansas

Terracon
9522 East 47th Place, Unit D
Tulsa, Oklahoma

PROJECT NUMBER: 04135111

CLIENT: Burns & McDonell Engineering Company, Inc.

EXHIBIT: B-20

Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date:	27-May-14
Lab No.:	Bulk 1_OMC
Project No.:	04135111
Test Date:	March 22, 2014

Soil Map Unit:	0
Soil Symbol:	CL
Depth (in.)	6 to 36
Compaction Method	Static
Max. Dry Density (pcf)	111.3
Opt. Moisture Content (%)	16.2
Inside Mold Diameter (in)	3.94

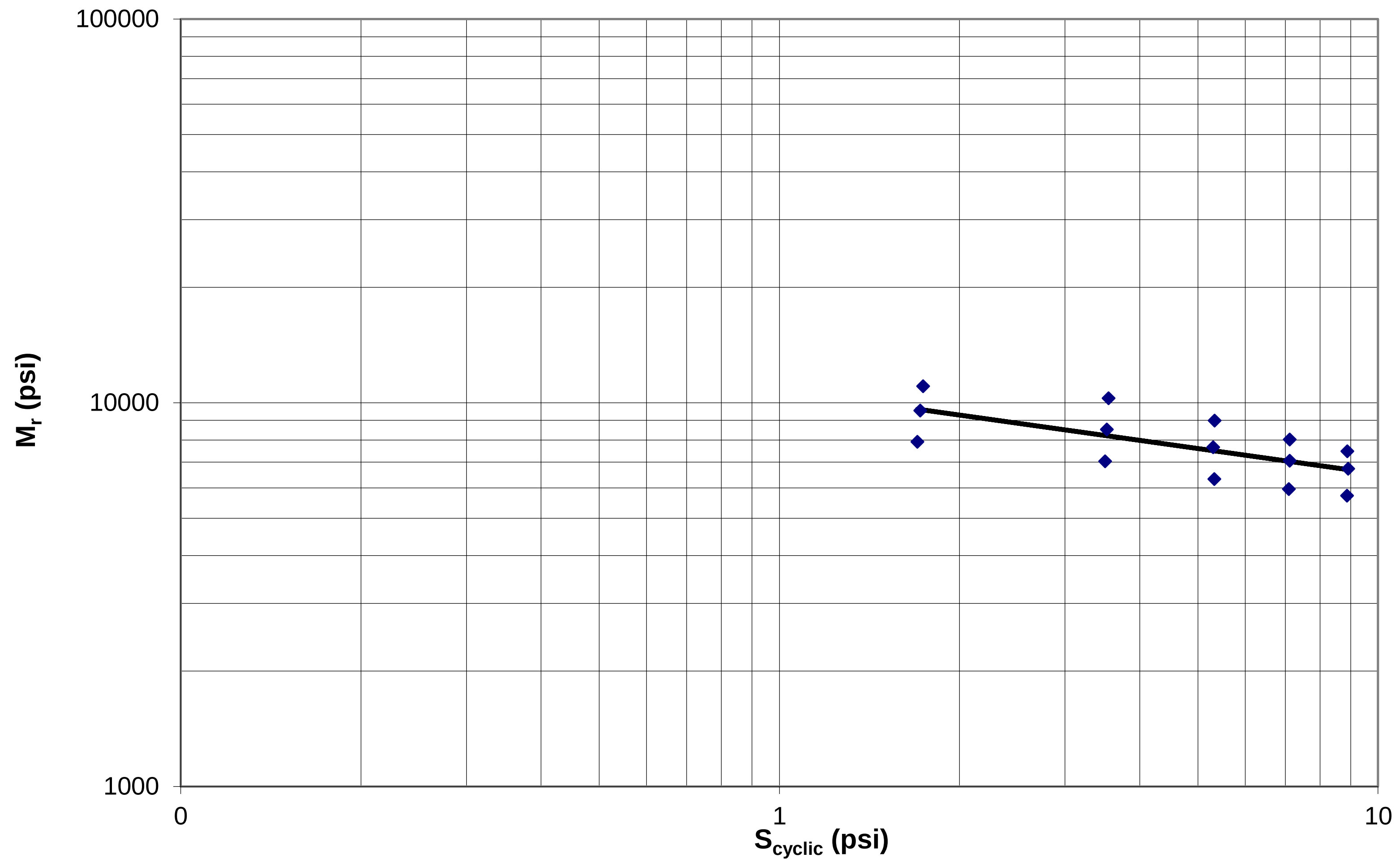
Weight of Wet Soil (lb)	6.61
Initial Sample Diameter (in)	3.94
Initial Sample Height (in)	7.87
Initial Sample Area (in^2)	12.17
Sample Volume (in^3)	95.86
Compacted Moisture Content(%)	16.7
Wet Density (pcf)	119.2
Dry Density (pcf)	102.1

Final Sample Height (in)	7.9
Final Sample Wet Weight (lb)	6.61
Final Moisture Content (%)	16.7
Accumulated Strain (%)	0.28
Percent Passing No. 10	3
Percent Passing No. 200	87.0
Liquid Limit	33
Plasticity Index	17

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	24.5	21.2	3.4	2.02	1.74	0.276	0.0013	0.0012	0.0012	0.000158	11,038
6.00	4.00	48.9	43.2	5.7	4.01	3.55	0.468	0.0028	0.0026	0.0027	0.000345	10,269
6.00	6.00	73.3	65.0	8.3	6.02	5.34	0.684	0.0050	0.0043	0.0047	0.000595	8,974
6.00	8.00	97.6	86.7	10.9	8.02	7.12	0.897	0.0074	0.0066	0.0070	0.000889	8,013
6.01	10.00	121.8	108.2	13.6	10.01	8.89	1.115	0.0097	0.0090	0.0094	0.001190	7,473
4.01	2.00	24.5	20.9	3.5	2.01	1.72	0.291	0.0014	0.0014	0.0014	0.000181	9,530
4.01	4.00	49.0	42.9	6.1	4.02	3.53	0.499	0.0034	0.0031	0.0033	0.000414	8,511
4.01	6.00	73.2	64.6	8.6	6.01	5.30	0.710	0.0058	0.0052	0.0055	0.000693	7,654
4.01	8.00	97.6	86.7	10.9	8.02	7.12	0.893	0.0082	0.0077	0.0079	0.001009	7,057
4.01	10.00	121.9	108.5	13.4	10.02	8.91	1.102	0.0106	0.0102	0.0104	0.001325	6,729
2.00	2.00	24.2	20.7	3.5	1.99	1.70	0.291	0.0017	0.0017	0.0017	0.000215	7,913
2.00	4.00	48.6	42.6	6.0	3.99	3.50	0.491	0.0040	0.0039	0.0039	0.000498	7,033
2.00	6.00	73.3	64.9	8.4	6.02	5.33	0.694	0.0069	0.0064	0.0066	0.000843	6,326
2.00	8.00	97.3	86.4	10.9	7.99	7.10	0.897	0.0095	0.0093	0.0094	0.001192	5,951
2.00	10.00	121.5	108.0	13.5	9.98	8.88	1.106	0.0123	0.0121	0.0122	0.001551	5,722

Terracon

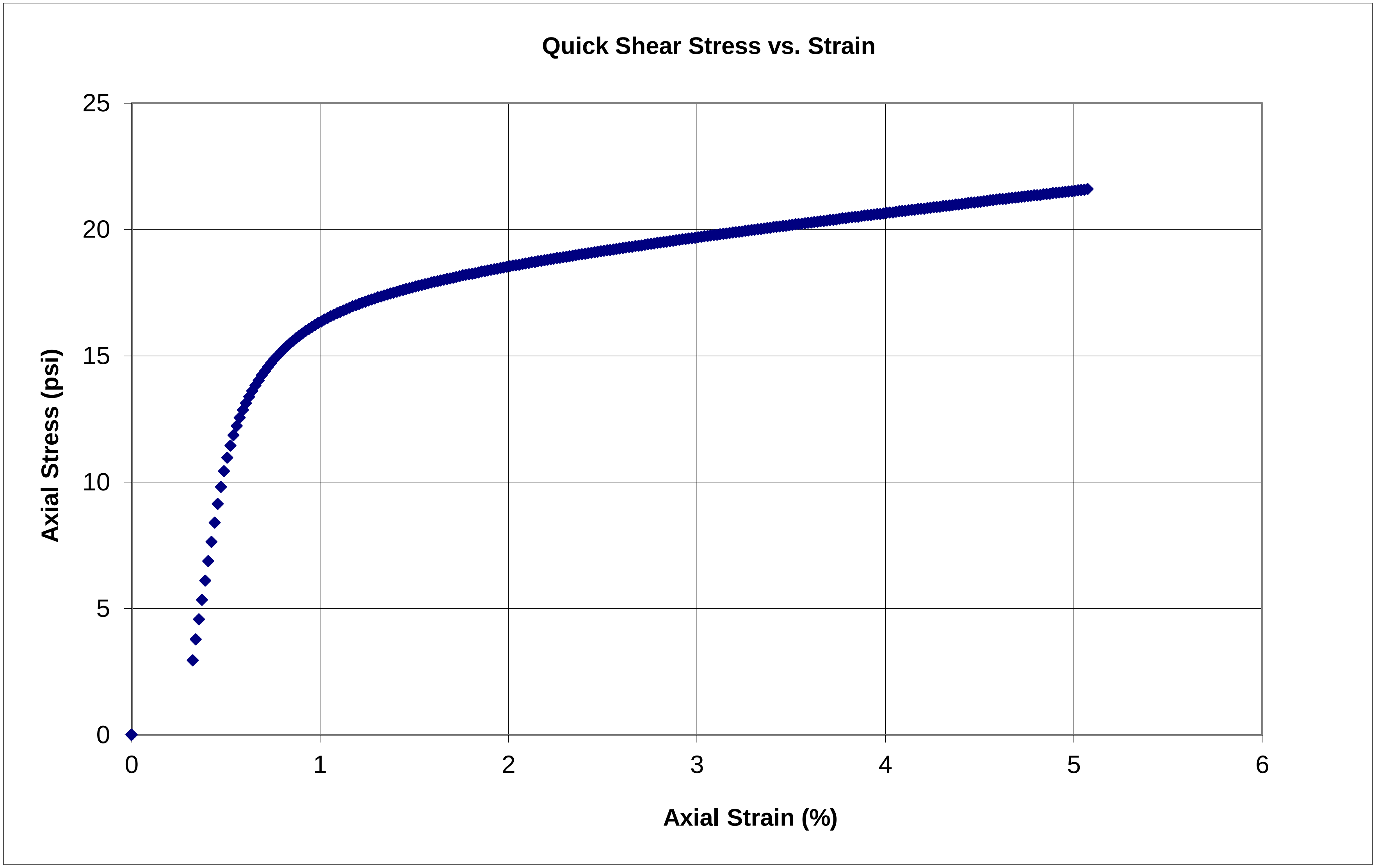
Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 1_OMC
Project No. 04135111



$Mr = K1 \times S_{cylic}^{k2}$

S3 (psi)	K1	K2	R^2
6	13164.8	-0.245	0.93
4	10885.8	-0.216	0.99
2	8881.2	-0.201	0.99
All	10810.6	-0.219	0.47

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 1_OMC
Project No. 04135111



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

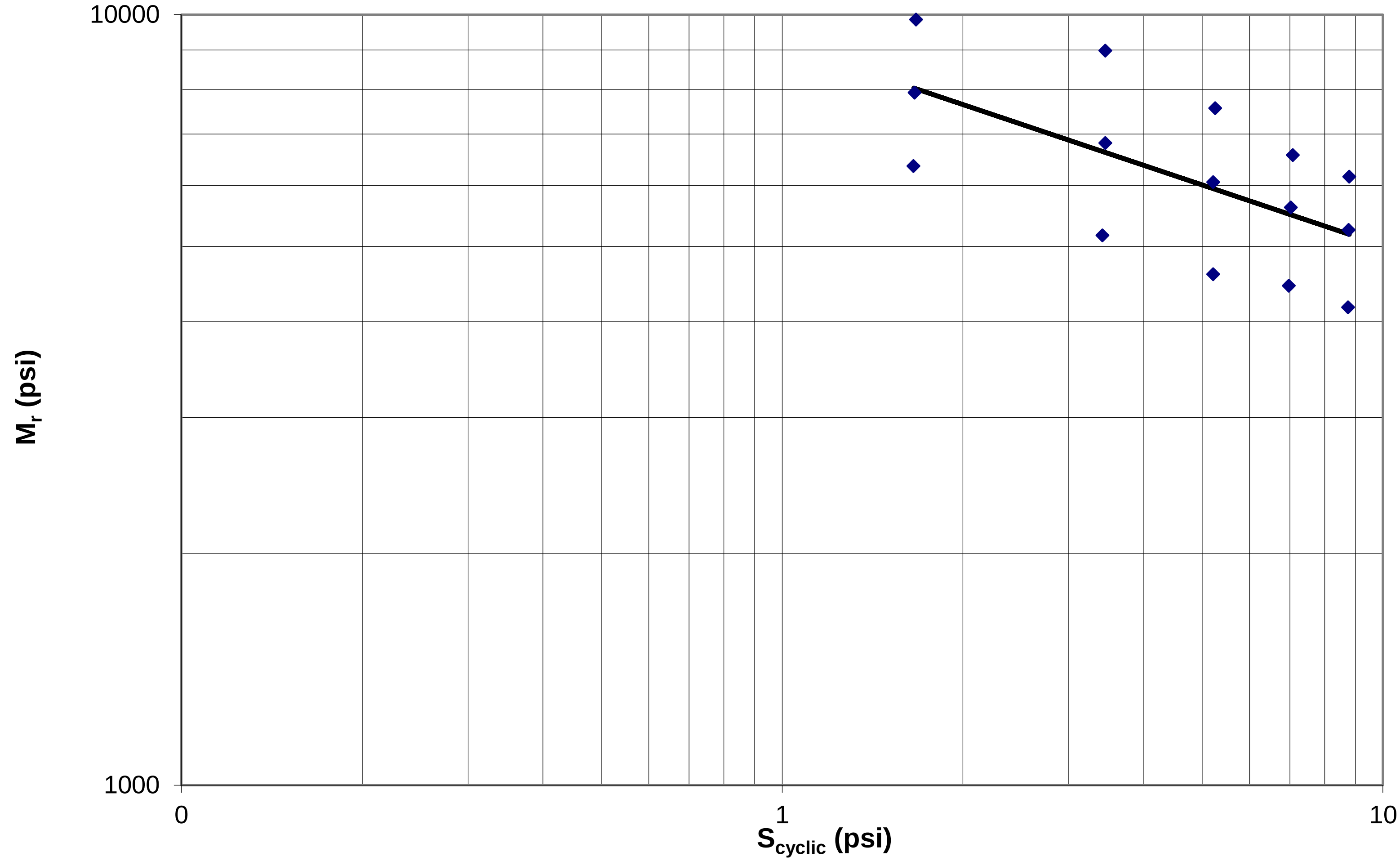
Report Date:	27-May-14
Lab No.:	Bulk 1_OMC+2
Project No.:	04135111
Test Date:	March 22, 2014

Soil Map Unit:	0				
Soil Symbol:	CL	Weight of Wet Soil (lb)	6.72		
Depth (in.)	6 to 36	Initial Sample Diameter (in)	3.94		
Compaction Method	Static	Initial Sample Height (in)	7.88	Final Sample Height (in)	7.8
Max. Dry Density (pcf)	111.3	Initial Sample Area (in^2)	12.17	Final Sample Wet Weight (lb)	6.72
Opt. Moisture Content (%)	16.2	Sample Volume (in^3)	95.96	Final Moisture Content (%)	18.7
Inside Mold Diameter (in)	3.94	Compacted Moisture Content(%)	18.7	Accumulated Strain (%)	0.81
		Wet Density (pcf)	121.0		
		Dry Density (pcf)	102.0	Percent Passing No. 10	3
				Percent Passing No. 200	87.0
				Liquid Limit	33
				Plasticity Index	17

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	24.5	20.3	4.1	2.01	1.67	0.339	0.0014	0.0012	0.0013	0.000170	9,856
6.01	4.00	48.7	42.0	6.7	4.00	3.45	0.551	0.0033	0.0027	0.0030	0.000384	8,979
6.00	6.00	72.9	64.0	8.9	5.99	5.26	0.734	0.0059	0.0051	0.0055	0.000696	7,559
6.00	8.00	97.5	86.2	11.2	8.01	7.09	0.924	0.0092	0.0078	0.0085	0.001079	6,569
6.00	10.00	121.5	107.0	14.5	9.98	8.79	1.188	0.0114	0.0111	0.0112	0.001427	6,164
4.01	2.00	24.1	20.2	3.9	1.98	1.66	0.319	0.0018	0.0015	0.0017	0.000210	7,923
4.00	4.00	48.6	42.0	6.5	3.99	3.45	0.537	0.0042	0.0038	0.0040	0.000507	6,814
4.00	6.00	72.7	63.5	9.2	5.97	5.22	0.752	0.0069	0.0067	0.0068	0.000861	6,063
4.00	8.00	97.1	85.6	11.5	7.98	7.03	0.948	0.0100	0.0097	0.0099	0.001251	5,621
4.00	10.00	120.9	106.8	14.1	9.94	8.77	1.162	0.0132	0.0131	0.0132	0.001670	5,253
2.00	2.00	23.8	20.1	3.7	1.96	1.66	0.304	0.0022	0.0019	0.0021	0.000260	6,360
2.00	4.00	48.2	41.6	6.7	3.96	3.42	0.547	0.0053	0.0052	0.0052	0.000661	5,169
2.00	6.00	72.4	63.5	8.9	5.95	5.22	0.730	0.0090	0.0089	0.0089	0.001134	4,601
2.00	8.00	96.5	84.9	11.6	7.93	6.97	0.953	0.0124	0.0123	0.0124	0.001568	4,446
2.00	10.00	120.7	106.5	14.2	9.92	8.75	1.163	0.0166	0.0165	0.0165	0.002099	4,170

Terracon

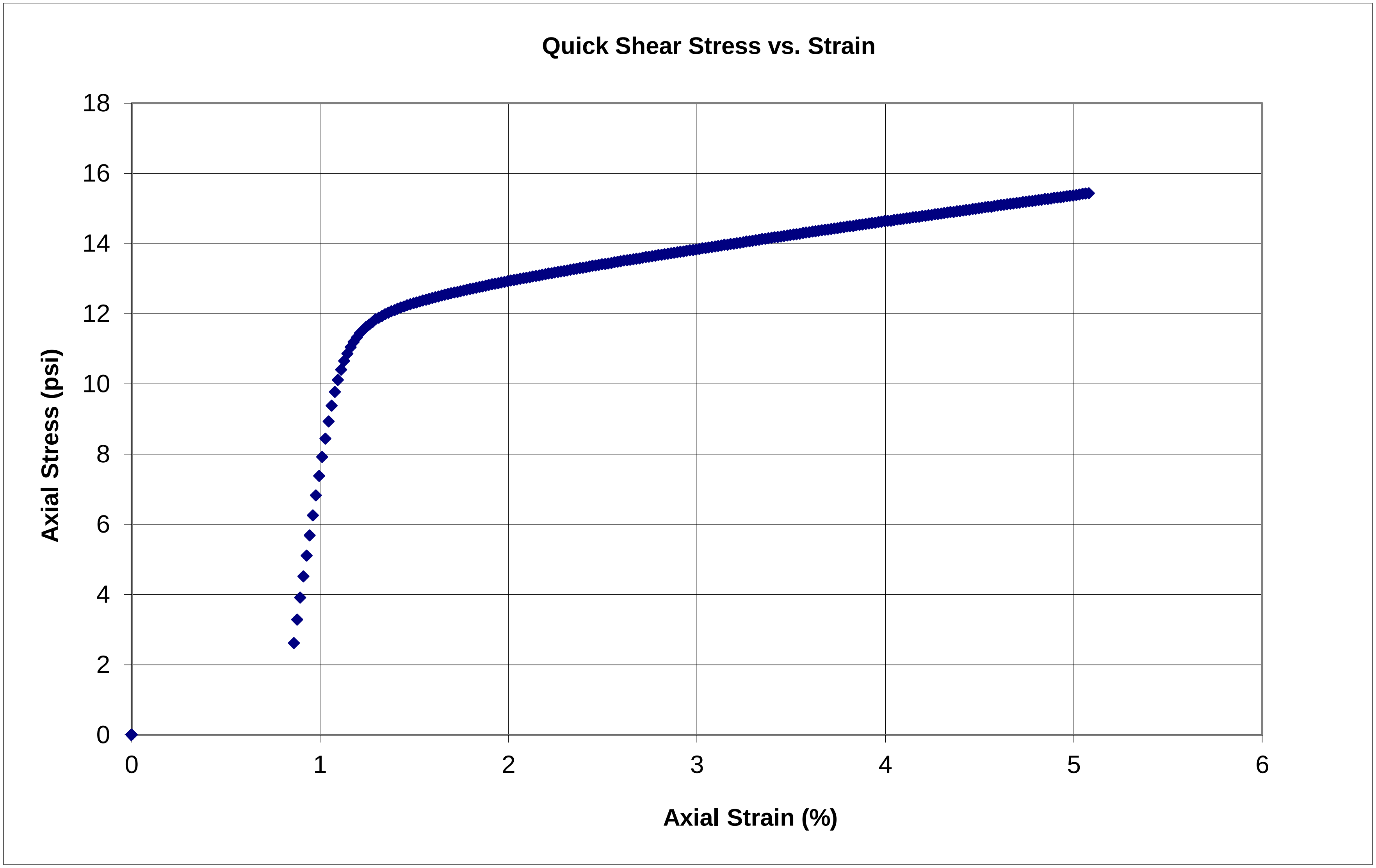
Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 1_OMC+2
Project No. 04135111



Mr = K1 x S_{cylic}^{k2}

S3 (psi)	K1	K2	R^2
6	12007.6	-0.294	0.94
4	9084.2	-0.247	0.99
2	7128.0	-0.251	0.99
All	9165.2	-0.262	0.40

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 1_OMC+2
Project No. 04135111



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

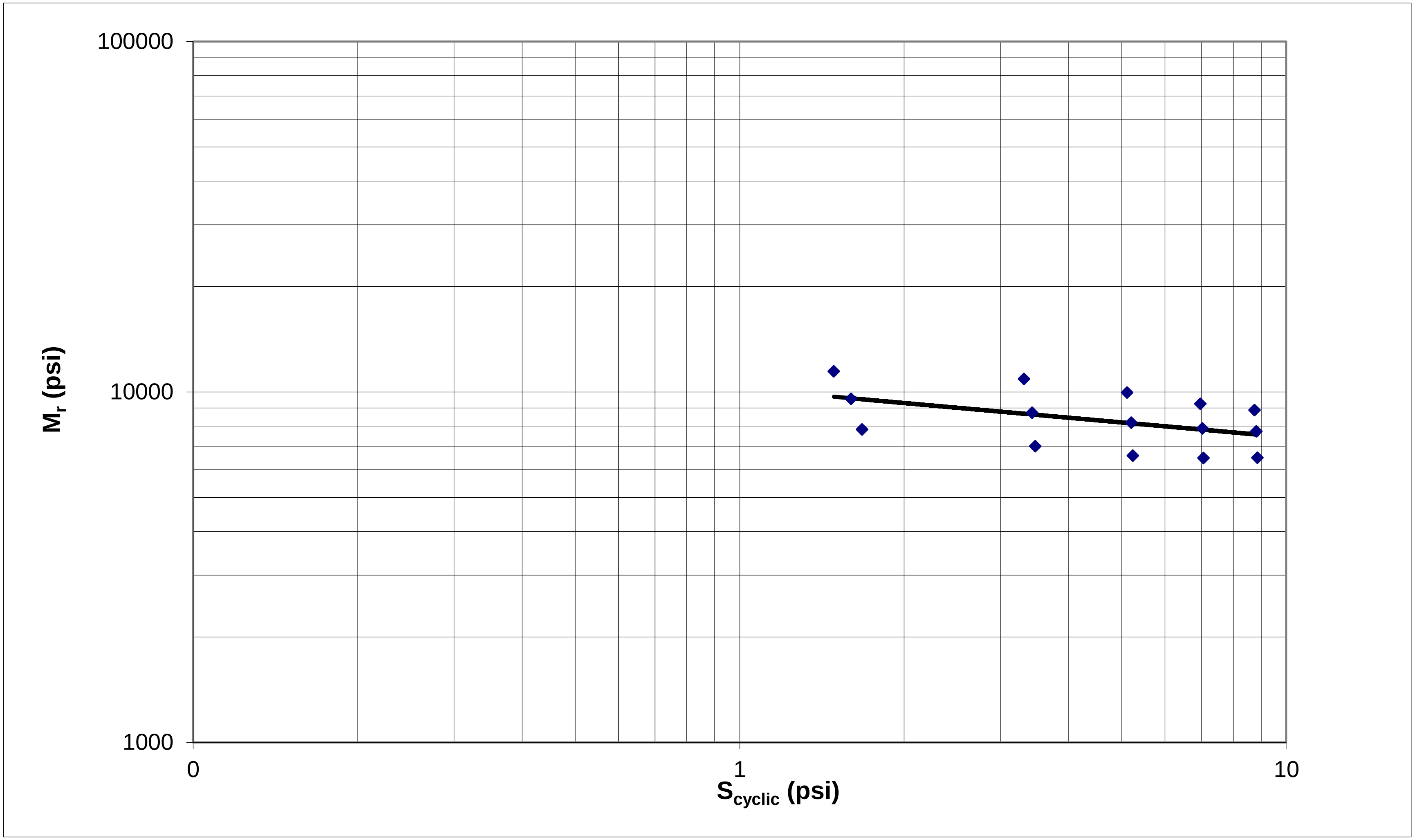
Report Date: 27-May-14
Lab No.: Bulk 2_OMC
Project No.: 04135111

Test Date: March 22, 2014

Soil Map Unit:	0				
Soil Symbol:	CL	Weight of Wet Soil (lb)	6.55		
Depth (in.)	6 to 36	Initial Sample Diameter (in)	3.94		
Compaction Method	Static	Initial Sample Height (in)	7.87	Final Sample Height (in)	7.9
Max. Dry Density (pcf)	111.9	Initial Sample Area (in^2)	12.17	Final Sample Wet Weight (lb)	6.55
Opt. Moisture Content (%)	14.5	Sample Volume (in^3)	95.86	Final Moisture Content (%)	15.0
Inside Mold Diameter (in)	3.94	Compacted Moisture Content(%)	15.0	Accumulated Strain (%)	0.20
		Wet Density (pcf)	118.0		
		Dry Density (pcf)	102.6	Percent Passing No. 10	4
				Percent Passing No. 200	88.0
				Liquid Limit	29
				Plasticity Index	10

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	23.1	18.1	5.0	1.90	1.49	0.412	0.0010	0.0010	0.0010	0.000130	11,448
5.99	4.00	47.5	40.4	7.2	3.90	3.31	0.589	0.0024	0.0024	0.0024	0.000304	10,893
6.00	6.00	72.4	62.3	10.1	5.94	5.12	0.827	0.0041	0.0040	0.0040	0.000514	9,952
6.00	8.00	97.1	84.8	12.3	7.98	6.96	1.014	0.0058	0.0061	0.0059	0.000753	9,247
6.00	10.00	121.4	106.6	14.8	9.97	8.75	1.214	0.0076	0.0080	0.0078	0.000986	8,875
4.01	2.00	23.9	19.5	4.5	1.97	1.60	0.367	0.0013	0.0013	0.0013	0.000167	9,561
4.00	4.00	48.6	41.7	6.9	3.99	3.43	0.567	0.0030	0.0032	0.0031	0.000393	8,717
4.01	6.00	73.0	63.4	9.6	6.00	5.21	0.785	0.0051	0.0050	0.0050	0.000638	8,167
4.01	8.00	97.5	85.6	11.9	8.01	7.03	0.980	0.0070	0.0071	0.0070	0.000893	7,872
4.00	10.00	121.6	107.4	14.2	9.99	8.82	1.167	0.0088	0.0092	0.0090	0.001142	7,721
2.00	2.00	24.3	20.4	3.9	1.99	1.67	0.319	0.0017	0.0017	0.0017	0.000214	7,807
2.00	4.00	48.7	42.3	6.4	4.00	3.48	0.523	0.0038	0.0040	0.0039	0.000496	7,001
2.00	6.00	72.9	63.9	9.1	5.99	5.24	0.743	0.0063	0.0062	0.0063	0.000797	6,577
2.00	8.00	97.5	86.0	11.5	8.01	7.06	0.947	0.0084	0.0088	0.0086	0.001090	6,479
2.00	10.00	121.7	107.8	13.9	9.99	8.86	1.139	0.0105	0.0110	0.0107	0.001365	6,488

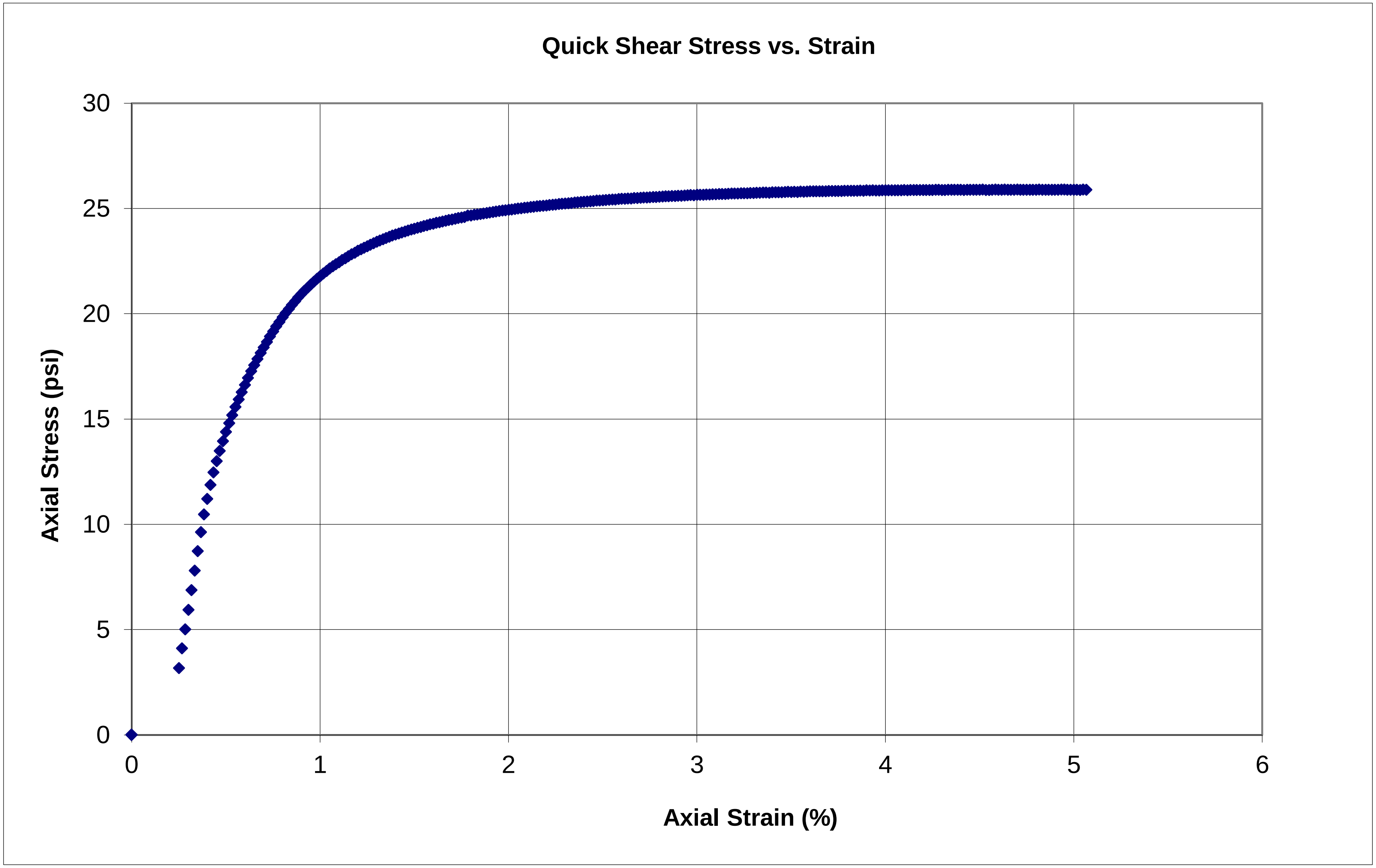
Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 2_OMC
Project No. 04135111



Mr = K1 x S_{cylic}^{k2}

S3 (psi)	K1	K2	R^2
6	12462.4	-0.148	0.93
4	10160.9	-0.129	1.00
2	8182.7	-0.117	0.94
All	10242.2	-0.139	0.23

Date Reported:	5/27/2014	0
Terracon Lab No.	Bulk 2_OMC	
Project No.	04135111	



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date:	27-May-14
Lab No.:	Bulk 2_OMC+2%
Project No.:	04135111
Test Date:	March 22, 2014

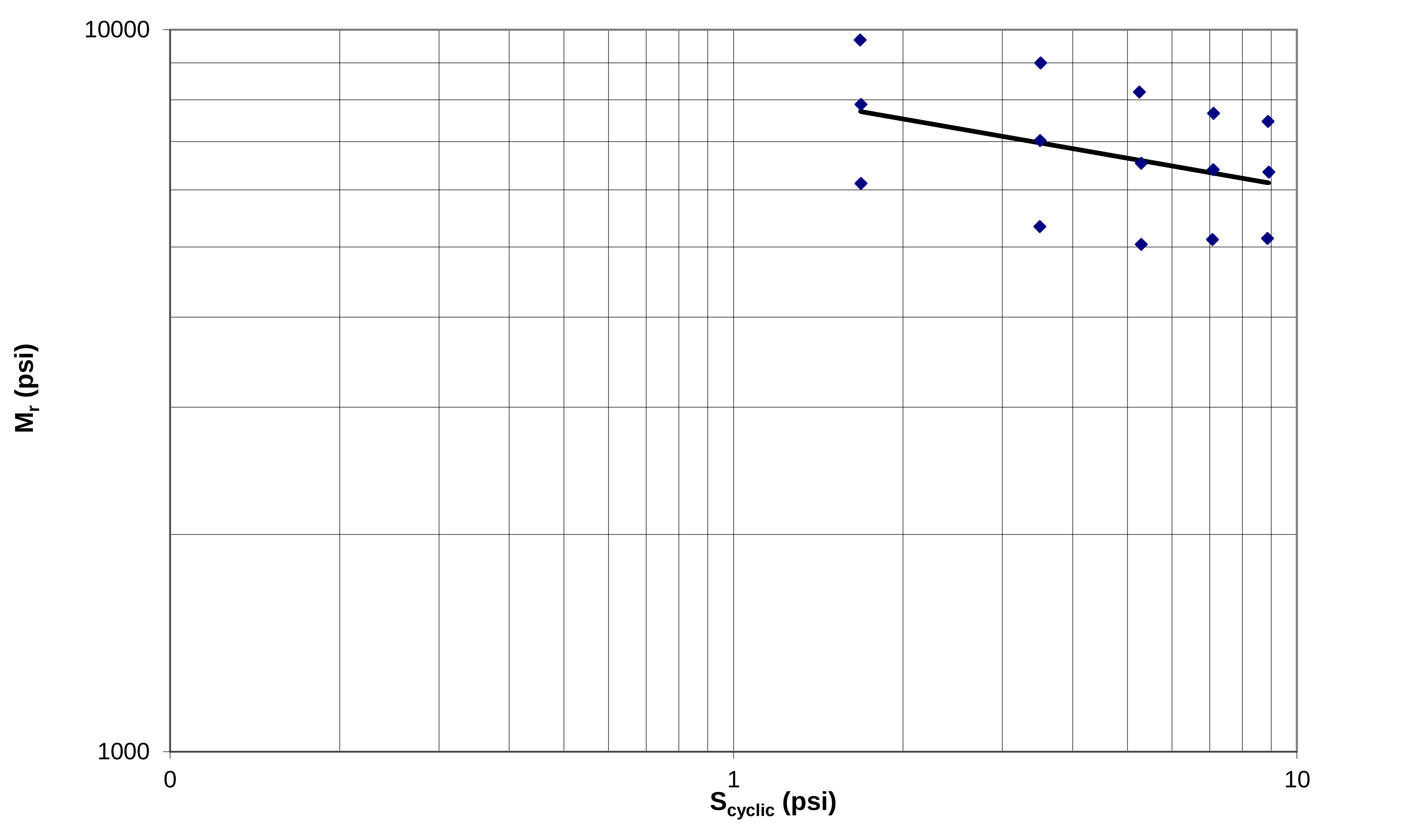
Soil Map Unit:	0
Soil Symbol:	CL
Depth (in.)	6 to 36
Compaction Method	Static
Max. Dry Density (pcf)	111.9
Opt. Moisture Content (%)	14.5
Inside Mold Diameter (in)	3.94

Weight of Wet Soil (lb)	6.67
Initial Sample Diameter (in)	3.94
Initial Sample Height (in)	7.87
Initial Sample Area (in^2)	12.17
Sample Volume (in^3)	95.87
Compacted Moisture Content(%)	16.9
Wet Density (pcf)	120.2
Dry Density (pcf)	102.8

Final Sample Height (in)	7.8
Final Sample Wet Weight (lb)	6.67
Final Moisture Content (%)	17.0
Accumulated Strain (%)	0.50
Percent Passing No. 10	4
Percent Passing No. 200	81.0
Liquid Limit	29
Plasticity Index	10

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
5.99	2.00	24.4	20.4	4.0	2.01	1.68	0.328	0.0014	0.0013	0.0014	0.000173	9,681
5.99	4.00	49.1	42.8	6.3	4.03	3.51	0.518	0.0031	0.0030	0.0031	0.000390	8,999
6.00	6.00	73.5	64.0	9.5	6.04	5.25	0.781	0.0052	0.0049	0.0050	0.000641	8,199
6.01	8.00	97.9	86.6	11.4	8.04	7.11	0.932	0.0077	0.0069	0.0073	0.000928	7,658
6.01	10.00	122.1	108.2	13.9	10.03	8.88	1.142	0.0098	0.0089	0.0094	0.001191	7,462
4.00	2.00	24.4	20.5	3.9	2.00	1.68	0.317	0.0018	0.0016	0.0017	0.000214	7,882
4.01	4.00	48.9	42.6	6.3	4.01	3.50	0.515	0.0041	0.0038	0.0039	0.000498	7,024
4.01	6.00	73.4	64.5	8.9	6.03	5.30	0.732	0.0069	0.0059	0.0064	0.000810	6,534
4.01	8.00	97.8	86.5	11.2	8.03	7.11	0.923	0.0092	0.0083	0.0087	0.001110	6,399
4.01	10.00	122.3	108.6	13.7	10.04	8.91	1.124	0.0116	0.0105	0.0111	0.001404	6,348
1.99	2.00	24.2	20.5	3.7	1.99	1.68	0.303	0.0023	0.0021	0.0022	0.000275	6,126
2.00	4.00	48.7	42.6	6.1	4.00	3.50	0.504	0.0055	0.0049	0.0052	0.000656	5,335
2.00	6.00	73.0	64.5	8.5	6.00	5.29	0.702	0.0088	0.0077	0.0083	0.001050	5,043
2.00	8.00	97.5	86.2	11.3	8.01	7.08	0.924	0.0115	0.0103	0.0109	0.001383	5,122
2.00	10.00	121.8	108.0	13.7	10.00	8.87	1.126	0.0143	0.0129	0.0136	0.001726	5,140

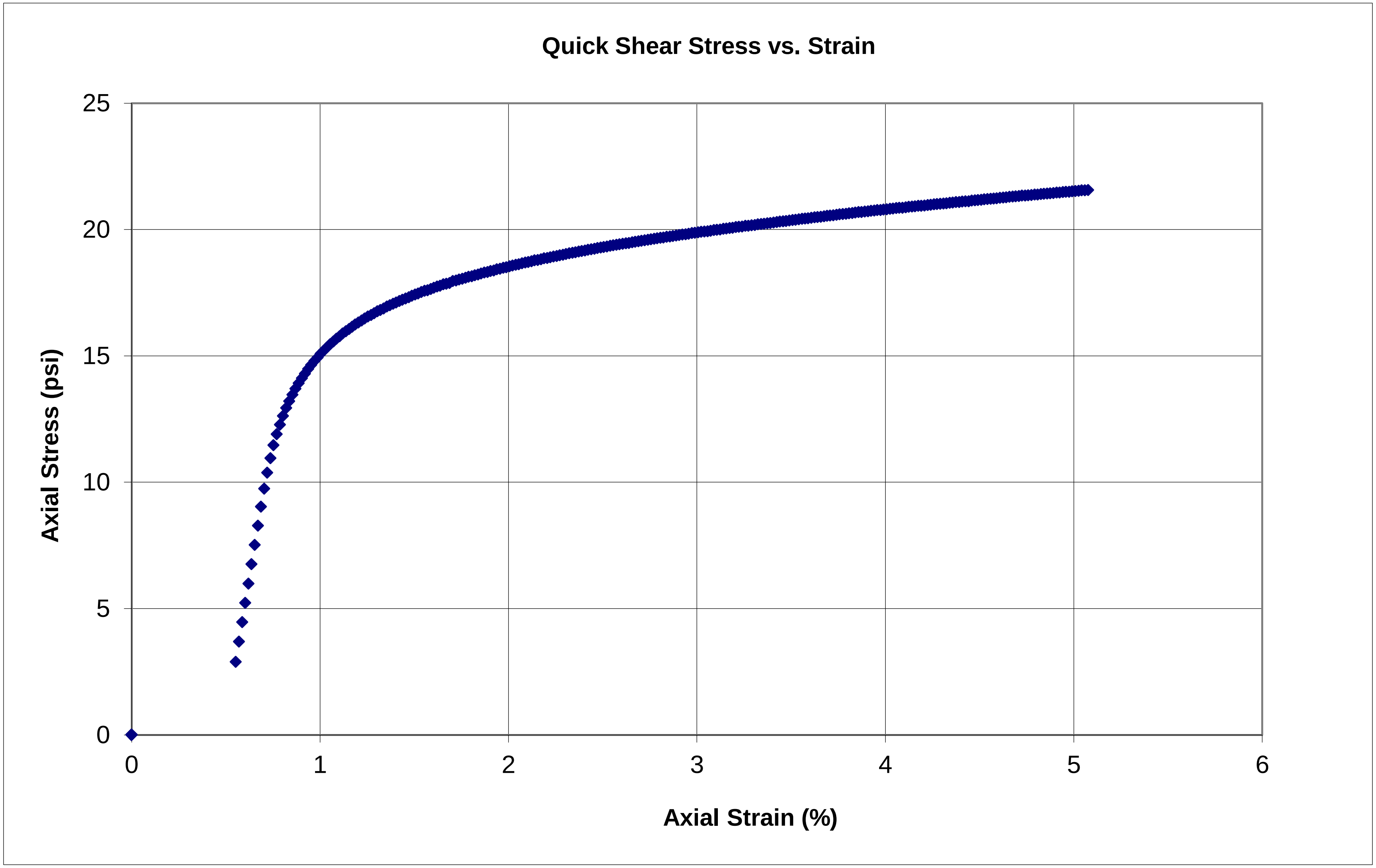
Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 2_OMC+2%
Project No. 04135111



$Mr = K1 \times S_{cylic}^{k2}$

S3 (psi)	K1	K2	R^2
6	10716.5	-0.164	0.97
4	8371.3	-0.136	0.97
2	6305.6	-0.110	0.82
All	8271.3	-0.136	0.16

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 2_OMC+2%
Project No. 04135111



Terracon

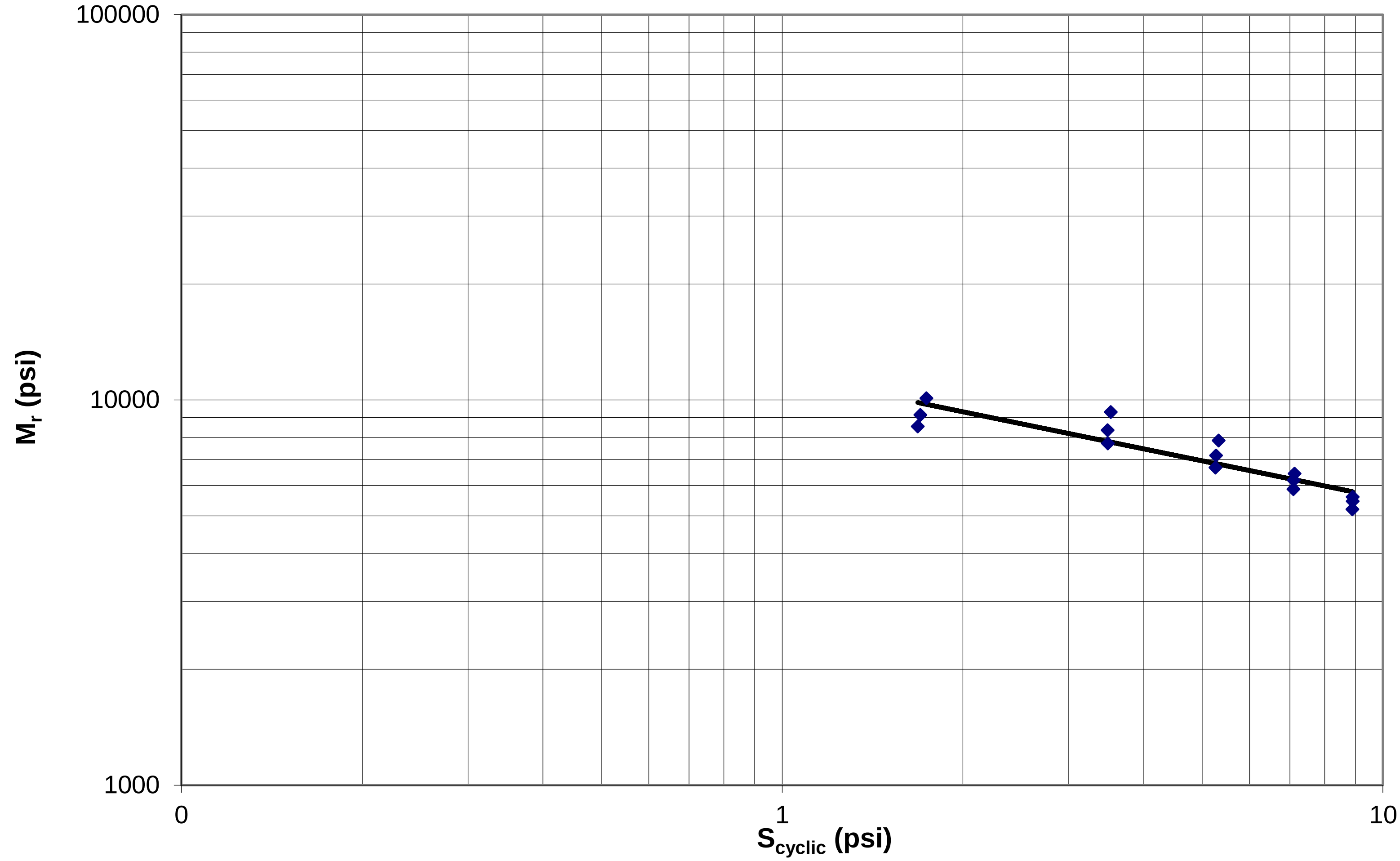
Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 27-May-14
Lab No.: Bulk 3_OMC
Project No.: 04135111

Soil Map Unit:	0				
Soil Symbol:	CL	Weight of Wet Soil (lb)	6.24	Test Date:	March 24, 2014
Depth (in.)	6 to 36	Initial Sample Diameter (in)	3.94		
Compaction Method	Static	Initial Sample Height (in)	7.90	Final Sample Height (in)	7.9
Max. Dry Density (pcf)	101.3	Initial Sample Area (in^2)	12.17	Final Sample Wet Weight (lb)	6.24
Opt. Moisture Content (%)	20.4	Sample Volume (in^3)	96.16	Final Moisture Content (%)	20.7
Inside Mold Diameter (in)	3.94	Compacted Moisture Content(%)	20.9	Accumulated Strain (%)	0.26
		Wet Density (pcf)	112.1		
		Dry Density (pcf)	92.7	Percent Passing No. 10	8
				Percent Passing No. 200	86.0
				Liquid Limit	41
				Plasticity Index	25

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.01	2.00	24.0	21.2	2.8	1.97	1.74	0.232	0.0015	0.0012	0.0014	0.000172	10,095
6.00	4.00	48.2	42.9	5.3	3.96	3.53	0.437	0.0032	0.0027	0.0030	0.000379	9,291
6.01	6.00	72.8	64.9	8.0	5.98	5.33	0.654	0.0055	0.0052	0.0054	0.000680	7,837
6.00	8.00	97.4	86.8	10.6	8.00	7.13	0.869	0.0094	0.0081	0.0088	0.001108	6,437
6.01	10.00	121.8	108.4	13.4	10.01	8.90	1.102	0.0133	0.0118	0.0126	0.001591	5,596
4.02	2.00	24.0	20.7	3.3	1.97	1.70	0.269	0.0016	0.0013	0.0015	0.000186	9,144
4.00	4.00	48.2	42.4	5.8	3.96	3.48	0.479	0.0037	0.0029	0.0033	0.000417	8,345
4.00	6.00	72.9	64.2	8.7	5.99	5.28	0.715	0.0064	0.0052	0.0058	0.000736	7,169
4.01	8.00	97.4	86.5	10.9	8.00	7.10	0.895	0.0098	0.0083	0.0091	0.001148	6,188
4.00	10.00	121.6	108.4	13.2	9.99	8.91	1.085	0.0137	0.0121	0.0129	0.001632	5,455
2.00	2.00	23.7	20.5	3.2	1.95	1.68	0.264	0.0017	0.0014	0.0016	0.000197	8,533
2.02	4.00	48.3	42.4	5.9	3.97	3.48	0.484	0.0040	0.0032	0.0036	0.000452	7,707
2.02	6.00	72.7	64.1	8.6	5.97	5.26	0.710	0.0069	0.0056	0.0062	0.000790	6,666
2.02	8.00	97.2	86.4	10.7	7.98	7.10	0.883	0.0102	0.0089	0.0096	0.001211	5,864
1.99	10.00	121.4	108.3	13.1	9.97	8.90	1.075	0.0142	0.0128	0.0135	0.001711	5,201

Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 3_OMC
Project No. 04135111

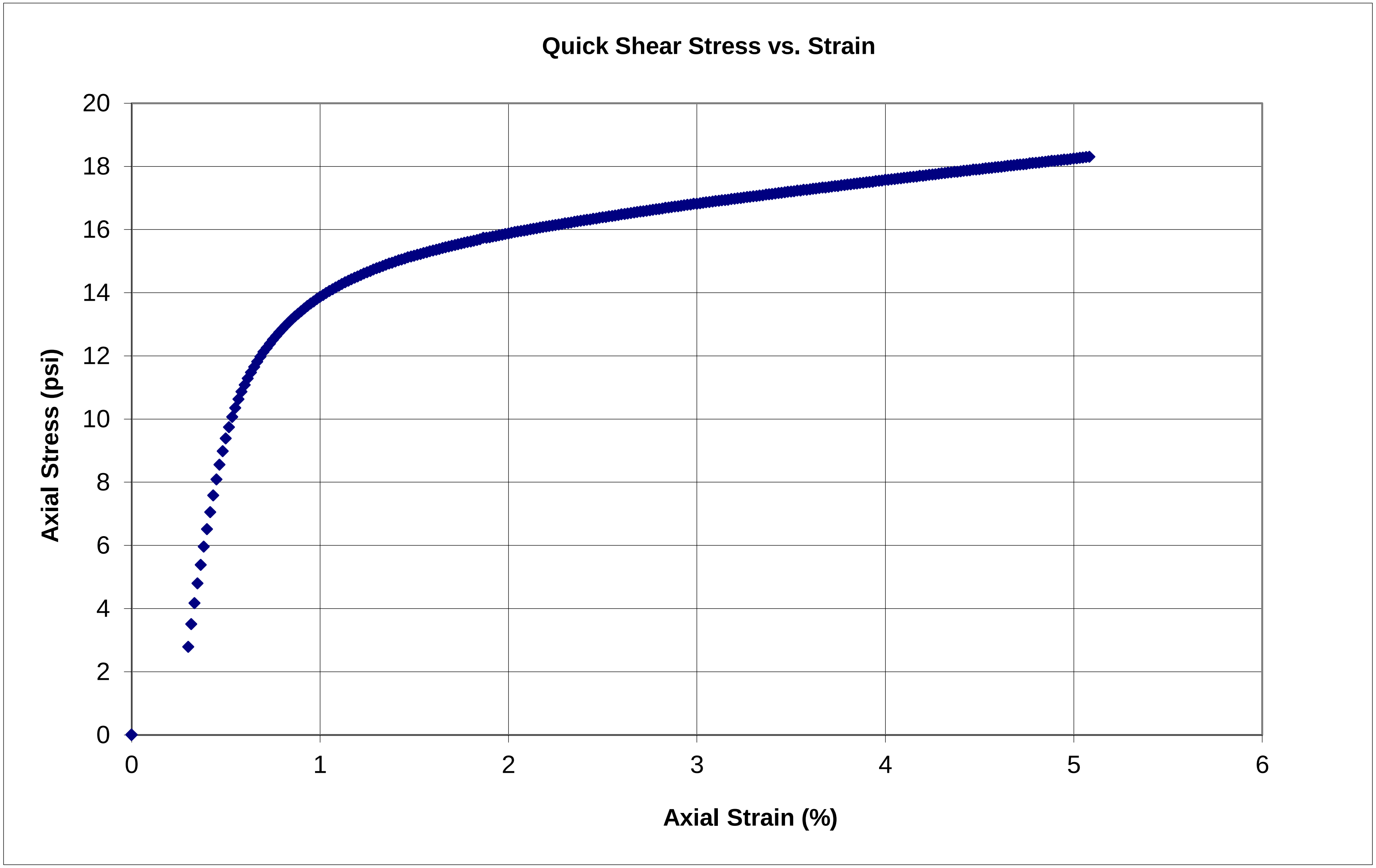


$Mr = K1 \times S_{cylic}^{k2}$

S3 (psi)	K1	K2	R^2
6	13284.4	-0.360	0.89
4	11399.7	-0.309	0.92
2	10430.3	-0.293	0.93
All	11620.9	-0.319	0.83

Terracon

Date Reported:	5/27/2014	0
Terracon Lab No.	Bulk 3_OMC	
Project No.	04135111	



Terracon

Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 27-May-14
Lab No.: Bulk 3_OMC+2%
Project No.: 04135111

Soil Map Unit: 0
Soil Symbol: CL
Depth (in.) 6 to 36
Compaction Method Static
Max. Dry Density (pcf) 101.3
Opt. Moisture Content (%) 20.4
Inside Mold Diameter (in) 3.94

Weight of Wet Soil (lb) 6.34
Initial Sample Diameter (in) 3.94
Initial Sample Height (in) 7.87
Initial Sample Area (in^2) 12.17
Sample Volume (in^3) 95.86
Compacted Moisture Content(%) 22.9
Wet Density (pcf) 114.2
Dry Density (pcf) 92.9

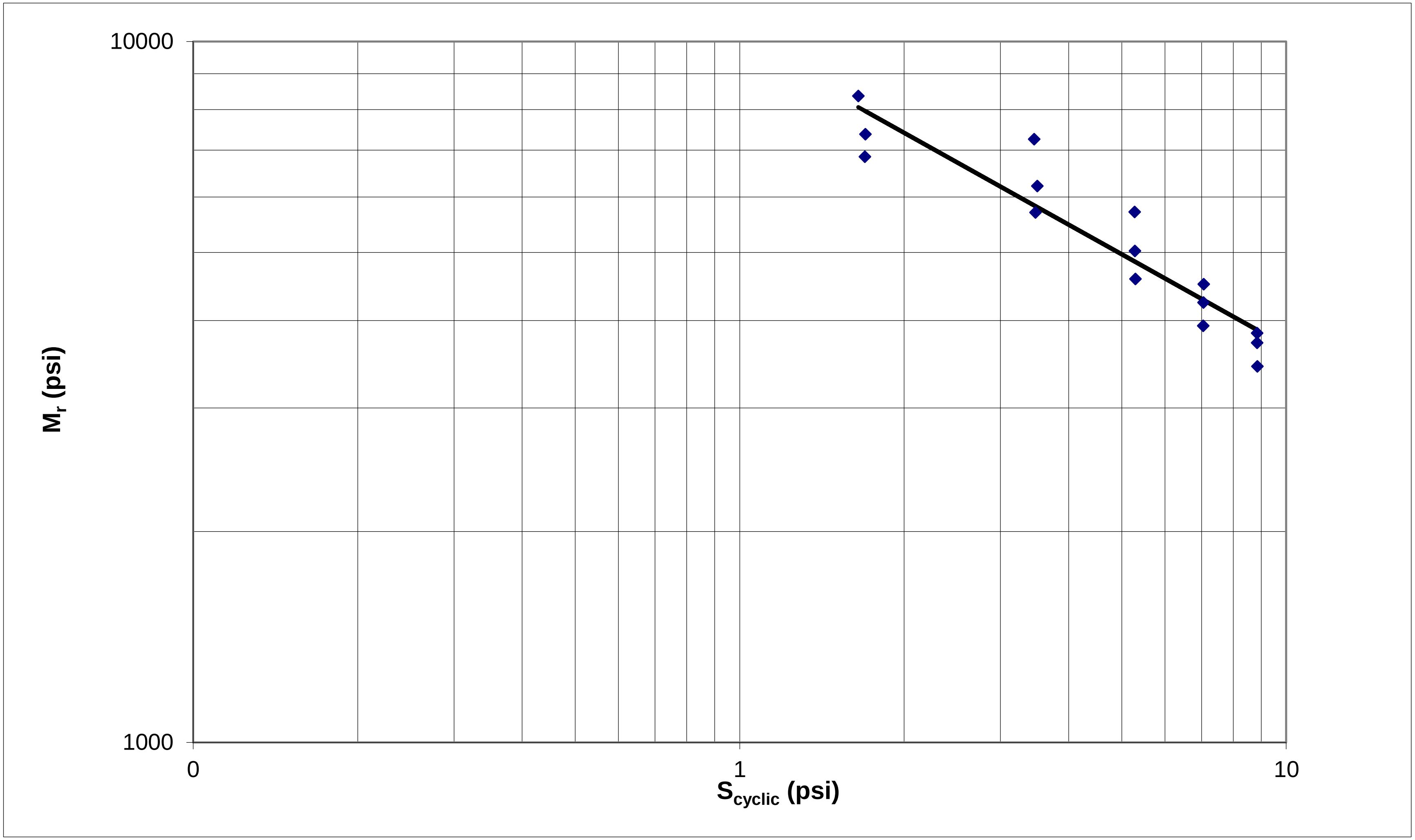
Test Date: March 24, 2014

Final Sample Height (in) 7.8
Final Sample Wet Weight (lb) 6.34
Final Moisture Content (%) 22.7
Accumulated Strain (%) 0.75

Percent Passing No. 10: 8
Percent Passing No. 200: 86.0
Liquid Limit: 41
Plasticity Index: 25

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	24.2	20.1	4.1	1.99	1.65	0.337	0.0016	0.0015	0.0016	0.000197	8,360
6.00	4.00	48.7	42.1	6.5	4.00	3.46	0.537	0.0039	0.0036	0.0038	0.000477	7,255
6.01	6.00	73.4	64.3	9.1	6.02	5.28	0.745	0.0076	0.0070	0.0073	0.000924	5,713
6.00	8.00	97.7	86.1	11.6	8.02	7.07	0.951	0.0130	0.0117	0.0124	0.001569	4,505
6.00	10.00	121.8	107.8	14.0	10.00	8.85	1.148	0.0189	0.0175	0.0182	0.002307	3,835
4.03	2.00	24.7	20.7	4.0	2.02	1.70	0.327	0.0020	0.0016	0.0018	0.000230	7,377
4.02	4.00	49.1	42.7	6.4	4.03	3.51	0.525	0.0049	0.0039	0.0044	0.000563	6,222
4.01	6.00	73.3	64.4	8.9	6.02	5.29	0.732	0.0089	0.0077	0.0083	0.001052	5,026
4.02	8.00	97.5	86.0	11.5	8.00	7.06	0.946	0.0142	0.0120	0.0131	0.001664	4,241
4.00	10.00	121.7	107.8	13.9	9.99	8.85	1.143	0.0196	0.0179	0.0188	0.002381	3,715
2.00	2.00	24.5	20.6	3.8	2.01	1.69	0.315	0.0021	0.0018	0.0019	0.000248	6,846
1.99	4.00	48.8	42.4	6.4	4.01	3.48	0.527	0.0053	0.0043	0.0048	0.000610	5,702
1.99	6.00	73.4	64.6	8.8	6.02	5.30	0.722	0.0099	0.0083	0.0091	0.001157	4,582
1.99	8.00	97.1	85.9	11.3	7.97	7.05	0.925	0.0152	0.0131	0.0141	0.001794	3,928
2.01	10.00	121.7	107.9	13.8	9.99	8.86	1.132	0.0212	0.0194	0.0203	0.002578	3,438

Date Reported: 5/27/2014 0.00
Terracon Lab No. Bulk 3_OMC+2%
Project No. 04135111

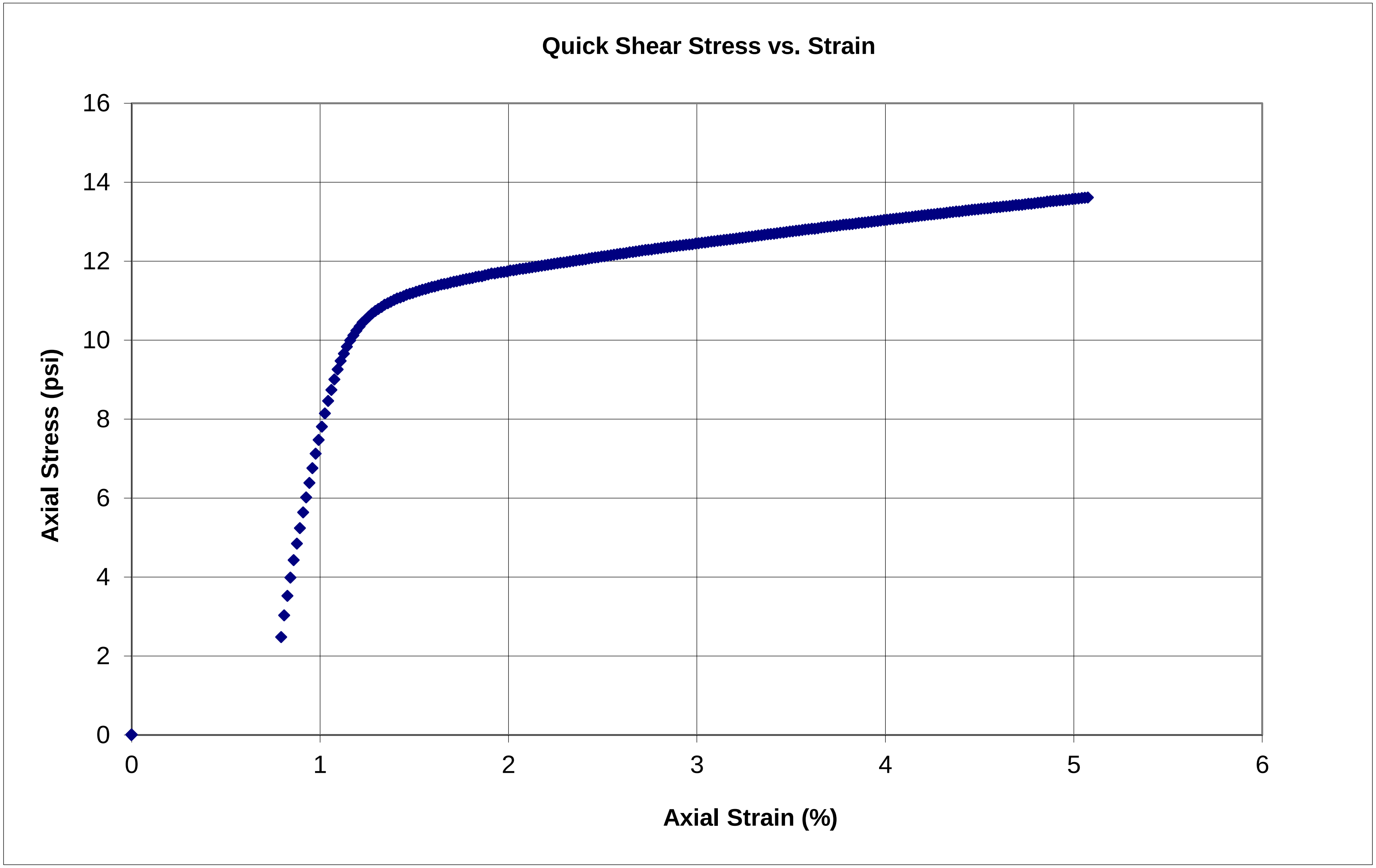


Mr = K1 x S_{cylic}^{k2}

S3 (psi)	K1	K2	R^2
6	11498.6	-0.466	0.92
4	9716.6	-0.418	0.96
2	8953.4	-0.418	0.97
All	10017.4	-0.435	0.87

Terracon

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 3_OMC+2%
Project No. 04135111



Terracon

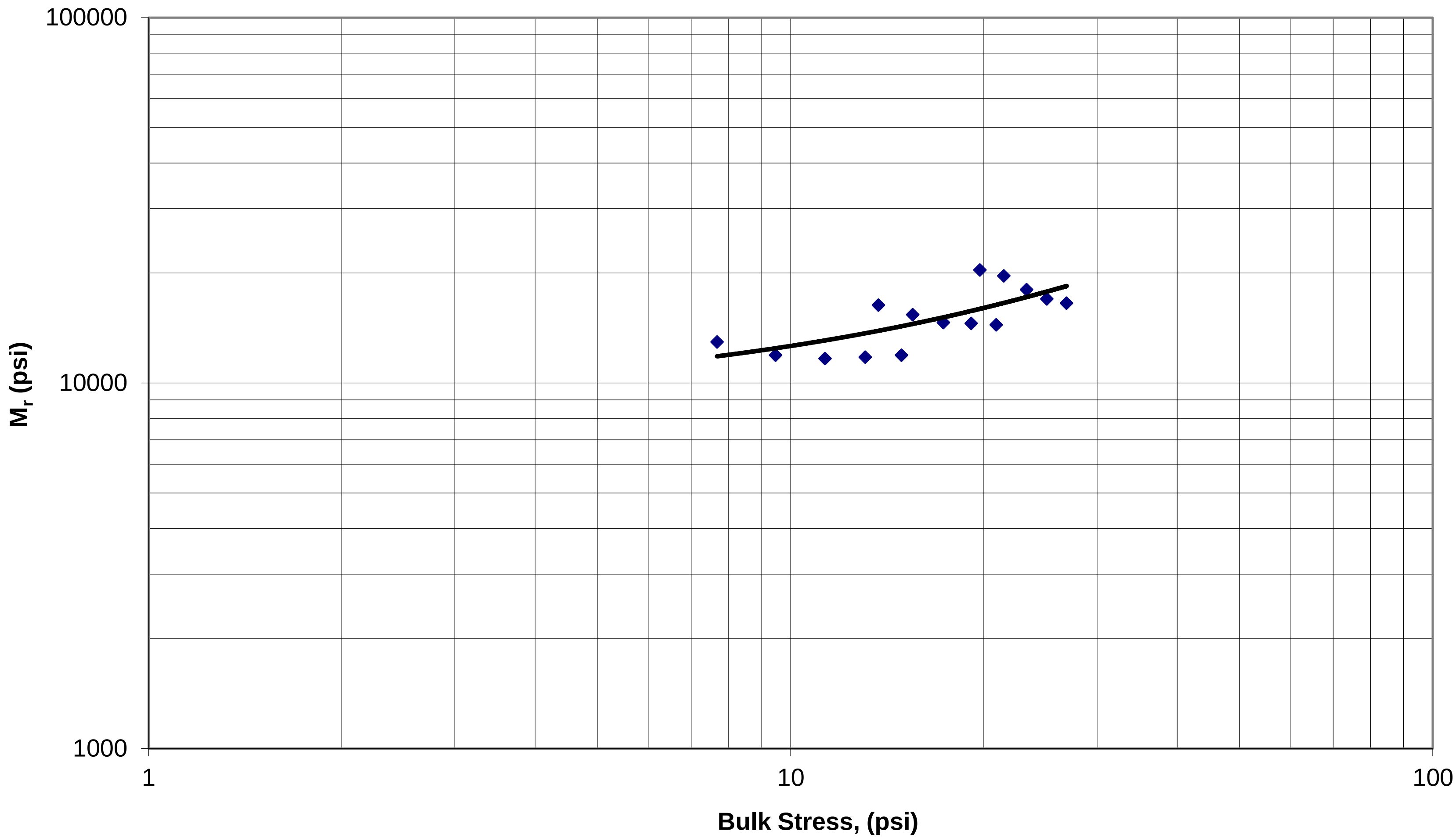
Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 27-May-14
Lab No.: Bulk 4_OMC
Project No.: 04135111

Soil Map Unit:	0				
Soil Symbol:	A-4 / GC-GM	Weight of Wet Soil (lb)	6.85	Test Date:	April 1, 2014
Depth (in.)	0	Initial Sample Diameter (in)	3.94		
Compaction Method	Static	Initial Sample Height (in)	7.87	Final Sample Height (in)	7.9
Max. Dry Density (pcf)	115.0	Initial Sample Area (in^2)	12.17	Final Sample Wet Weight (lb)	6.84
Opt. Moisture Content (%)	13.0	Sample Volume (in^3)	95.86	Final Moisture Content (%)	12.5
Inside Mold Diameter (in)	3.94	Compacted Moisture Content(%)	12.5	Accumulated Strain (%)	0.17
		Wet Density (pcf)	123.4		
		Dry Density (pcf)	109.7	Percent Passing No. 10	0
				Percent Passing No. 200	0.0
				Liquid Limit	22
				Plasticity Index	4

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.00	2.00	24.2	20.8	3.4	1.99	1.71	0.281	0.0007	0.0006	0.0007	0.000084	20,369
5.99	4.00	48.5	42.8	5.7	3.99	3.52	0.472	0.0014	0.0014	0.0014	0.000179	19,618
6.00	6.00	73.0	64.6	8.4	5.99	5.31	0.687	0.0025	0.0022	0.0023	0.000295	17,993
6.00	8.00	97.4	86.1	11.3	8.00	7.07	0.925	0.0034	0.0031	0.0033	0.000417	16,971
6.00	10.00	121.8	108.2	13.6	10.01	8.89	1.114	0.0044	0.0041	0.0042	0.000538	16,520
4.00	2.00	24.2	20.7	3.5	1.99	1.70	0.291	0.0009	0.0007	0.0008	0.000104	16,337
4.00	4.00	48.5	42.5	6.0	3.98	3.49	0.492	0.0019	0.0017	0.0018	0.000227	15,369
4.00	6.00	73.0	64.5	8.5	6.00	5.30	0.701	0.0031	0.0026	0.0029	0.000362	14,633
4.01	8.00	97.5	86.2	11.2	8.01	7.08	0.924	0.0041	0.0035	0.0038	0.000487	14,547
4.00	10.00	121.7	108.2	13.5	10.00	8.89	1.106	0.0051	0.0046	0.0049	0.000617	14,414
2.01	2.00	24.0	20.3	3.7	1.97	1.67	0.306	0.0011	0.0009	0.0010	0.000129	12,953
2.00	4.00	48.6	42.4	6.2	3.99	3.48	0.506	0.0024	0.0022	0.0023	0.000292	11,920
2.00	6.00	73.0	64.6	8.4	6.00	5.31	0.692	0.0039	0.0033	0.0036	0.000456	11,651
2.00	8.00	97.3	86.2	11.1	7.99	7.08	0.909	0.0051	0.0044	0.0047	0.000603	11,755
2.00	10.00	121.6	108.1	13.5	9.99	8.89	1.108	0.0062	0.0056	0.0059	0.000746	11,905

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 4_OMC
Project No. 04135111

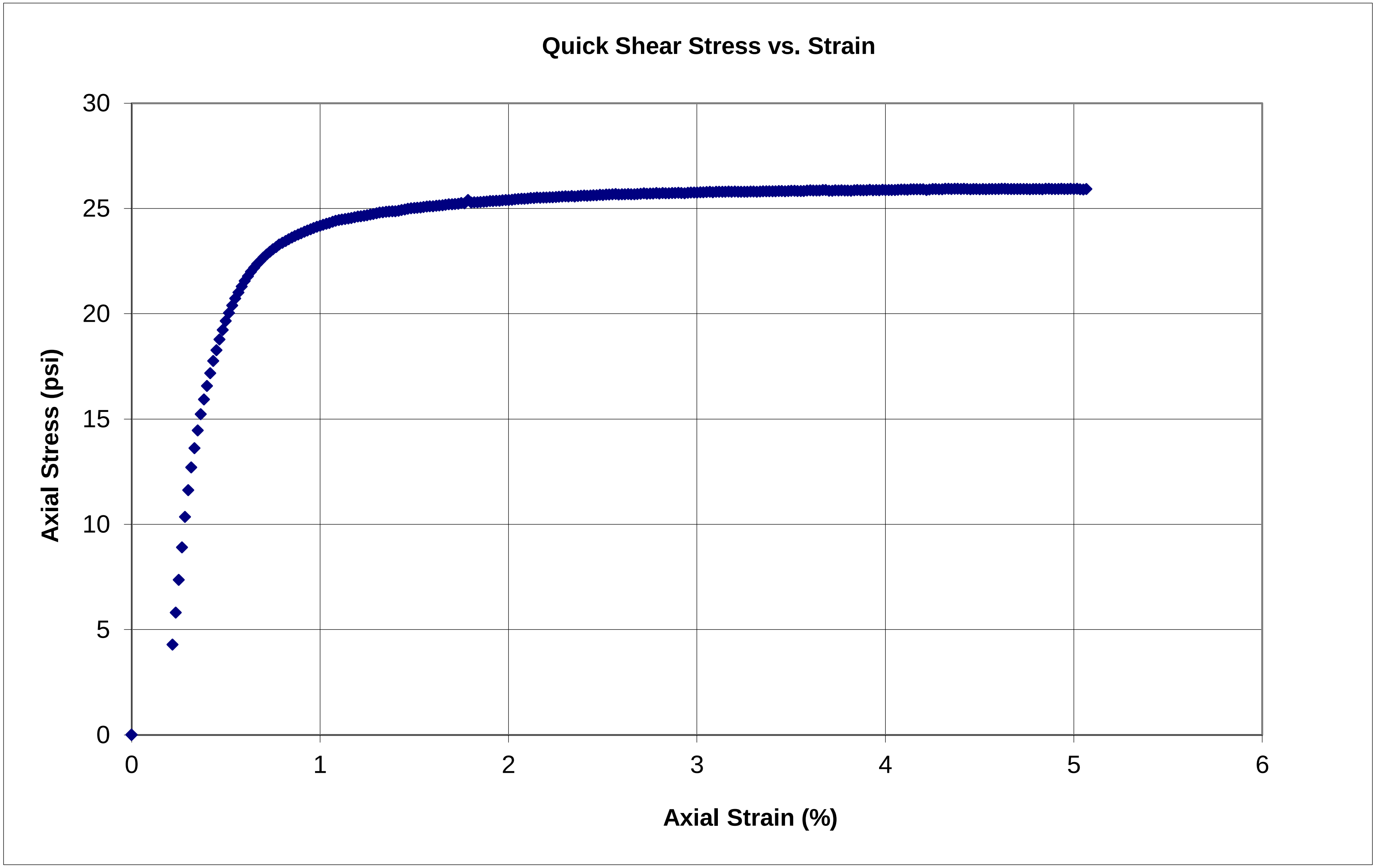


$Mr = K1 \times \Theta^{k2}$

$[\Theta = S_{cyclic} + 3\ (S3)]$

S3 (psi)	K1	K2	R^2
6	179639.9	-0.728	0.98
4	34888.8	-0.296	0.89
2	16096.9	-0.122	0.56
All	5424.1	0.361	0.50

Date Reported:	5/27/2014	0
Terracon Lab No.	Bulk 4_OMC	
Project No.	04135111	



Terracon

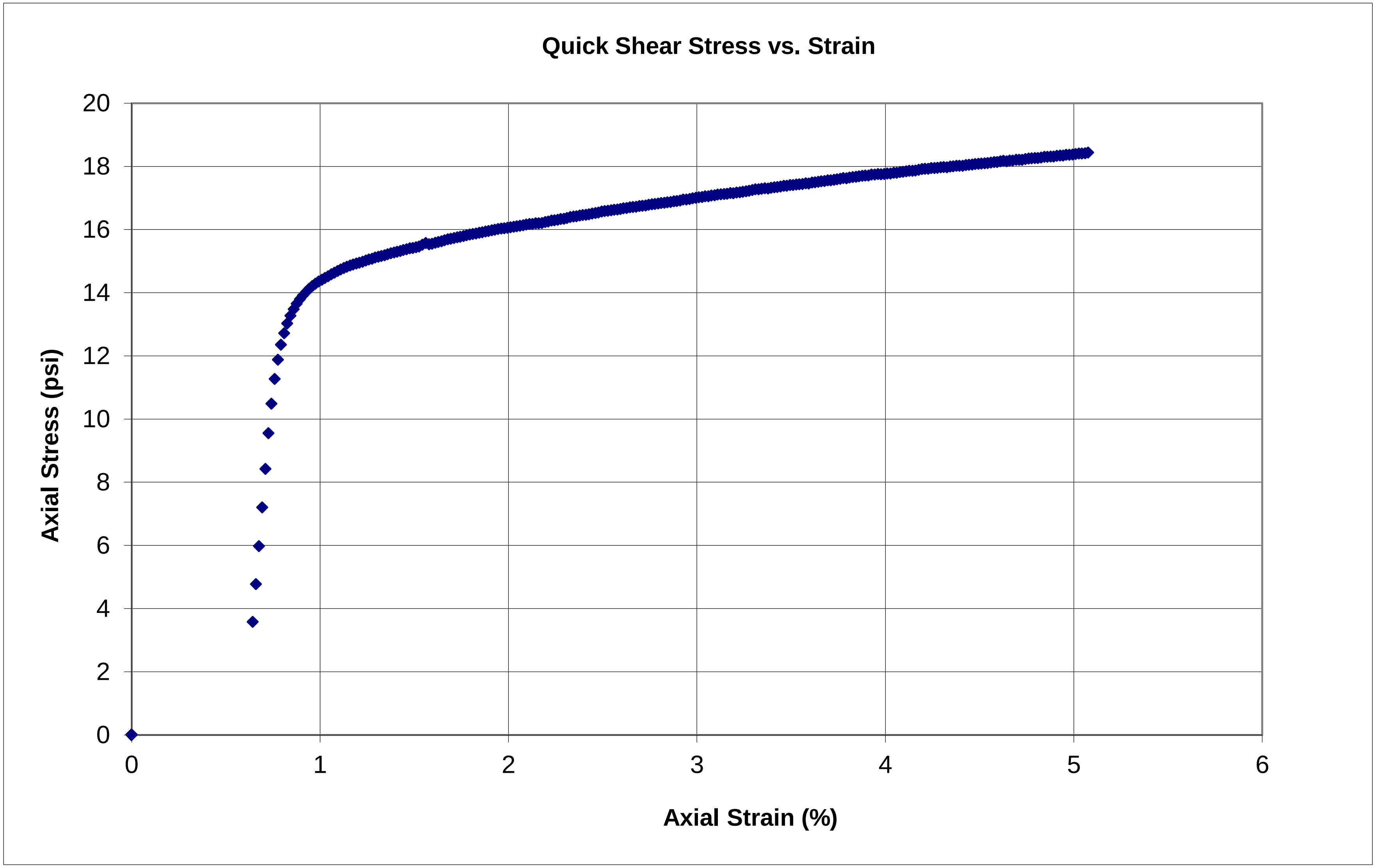
Resilient Modulus Testing - AASHTO T 307-99 English Units

Report Date: 27-May-14
Lab No.: Bulk 4_OMC+2%
Project No.: 04135111

Soil Map Unit:	0			Test Date:	April 1, 2014
Soil Symbol:	A-4 / GC-GM	Weight of Wet Soil (lb)	6.97		
Depth (in.)	0	Initial Sample Diameter (in)	3.94		
Compaction Method	Static	Initial Sample Height (in)	7.87	Final Sample Height (in)	7.8
Max. Dry Density (pcf)	115.0	Initial Sample Area (in^2)	12.17	Final Sample Wet Weight (lb)	6.96
Opt. Moisture Content (%)	13.0	Sample Volume (in^3)	95.86	Final Moisture Content (%)	14.5
Inside Mold Diameter (in)	3.94	Compacted Moisture Content(%)	14.5	Accumulated Strain (%)	0.60
		Wet Density (pcf)	125.6		
		Dry Density (pcf)	109.7	Percent Passing No. 10	0
				Percent Passing No. 200	0.0
				Liquid Limit	22
				Plasticity Index	4

Chamber Confining Pressure (S_3) psi	Nominal Maximum Axial Stress (S_{cyclic}) psi	Actual Applied Max. Axial Load (P_{max}) lb	Actual Applied Cyclic Load (P_{cyclic}) lb	Actual Applied Contact Load ($P_{contact}$) lb	Actual Applied Max. Axial Stress (S_{max}) psi	Actual Applied Cyclic Stress (S_{cyclic}) psi	Actual Applied Contact Stress ($S_{contact}$) psi	Recov. Def. LVDT #1 Reading (H_1) in	Recov. Def. LVDT #2 Reading (H_2) in	Average Recov. Def. LVDT 1 and 2 (H_{avg}) in	Resilient Strain (ϵ_r) in/in	Resilient Modulus (M_r) psi
6.01	2.00	23.6	20.0	3.6	1.94	1.64	0.299	0.0007	0.0007	0.0007	0.000091	17,943
6.01	4.00	47.5	41.4	6.1	3.90	3.40	0.498	0.0016	0.0015	0.0016	0.000197	17,232
6.00	6.00	71.9	63.2	8.7	5.91	5.19	0.715	0.0027	0.0025	0.0026	0.000330	15,754
6.00	8.00	96.4	85.1	11.4	7.92	6.99	0.934	0.0038	0.0037	0.0037	0.000474	14,745
6.00	10.00	120.3	106.3	14.0	9.88	8.73	1.151	0.0048	0.0048	0.0048	0.000605	14,438
4.00	2.00	23.8	20.3	3.4	1.95	1.67	0.283	0.0010	0.0010	0.0010	0.000127	13,096
4.01	4.00	47.7	41.7	6.0	3.92	3.43	0.492	0.0022	0.0022	0.0022	0.000282	12,173
4.00	6.00	71.9	63.3	8.6	5.91	5.20	0.705	0.0034	0.0033	0.0034	0.000431	12,071
4.01	8.00	96.1	84.9	11.2	7.89	6.97	0.924	0.0045	0.0044	0.0045	0.000566	12,312
4.00	10.00	119.6	105.6	14.0	9.82	8.67	1.153	0.0056	0.0056	0.0056	0.000713	12,155
2.00	2.00	23.8	20.1	3.7	1.95	1.65	0.301	0.0014	0.0015	0.0014	0.000180	9,208
2.00	4.00	47.9	42.0	5.9	3.93	3.45	0.485	0.0031	0.0032	0.0032	0.000401	8,610
2.00	6.00	71.9	63.0	8.9	5.91	5.18	0.732	0.0046	0.0045	0.0046	0.000578	8,956
2.00	8.00	95.7	84.5	11.2	7.86	6.94	0.921	0.0058	0.0057	0.0058	0.000735	9,437
2.00	10.00	119.2	105.2	14.0	9.79	8.64	1.151	0.0072	0.0072	0.0072	0.000912	9,474

Date Reported: 5/27/2014 0
Terracon Lab No. Bulk 4_OMC+2%
Project No. 04135111



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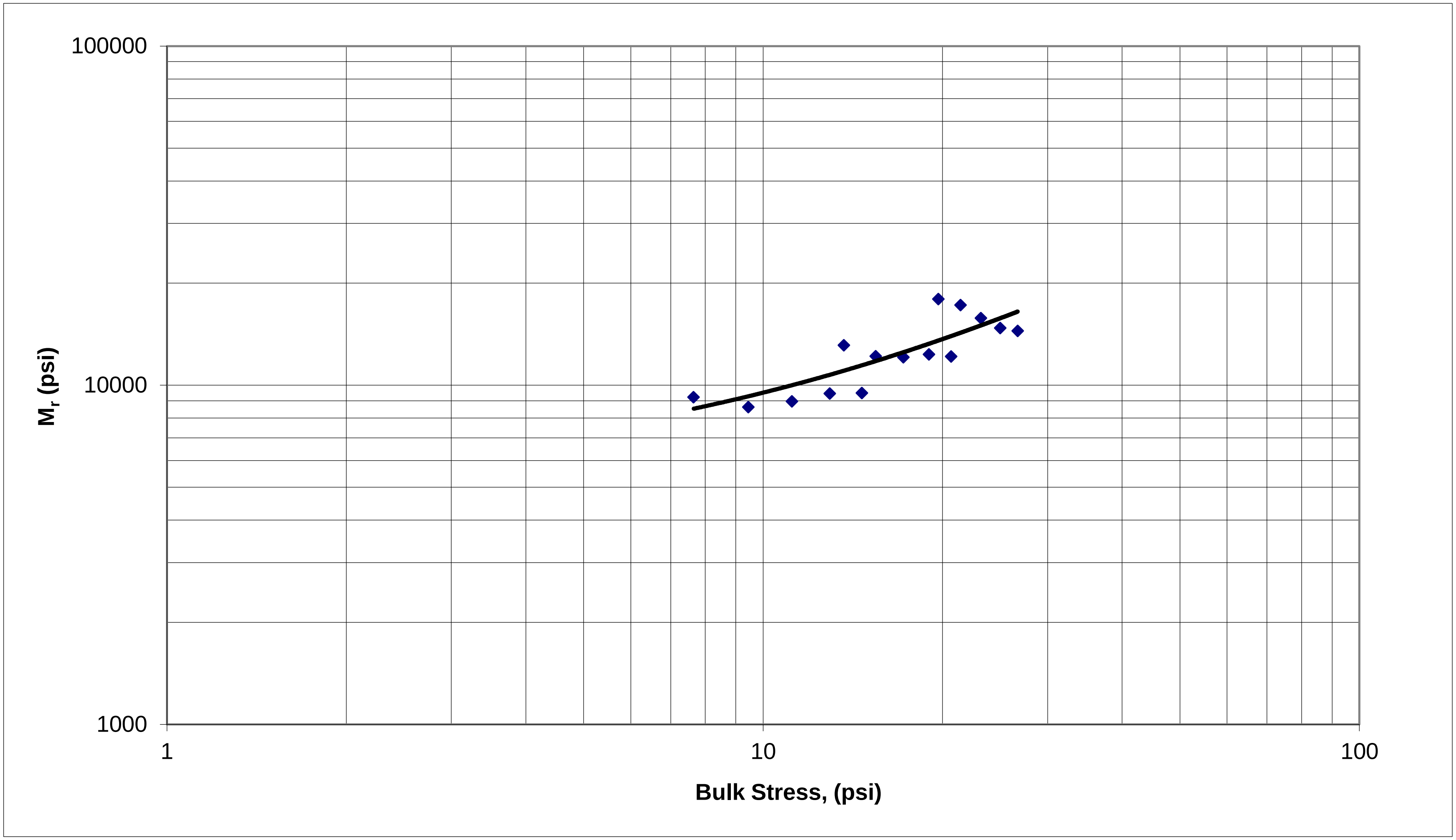

$Mr = K1 \times \Theta^{k2}$

$[\Theta = S_{cyclic} + 3\ (S3)]$

S3 (psi)	K1	K2	R^2
6	180051.2	-0.772	0.97
4	18431.2	-0.141	0.48
2	7516.4	0.082	0.28
All	2650.1	0.547	0.67

APPENDIX C

DYNAMIC CONE PENETRATION TEST RESULTS

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 22-Feb-14
Location: BR-001 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	80	2
20	130	2
20	270	2
20	330	2
20	390	2
20	450	2
20	560	2
20	680	2
20	730	2
14	910	2
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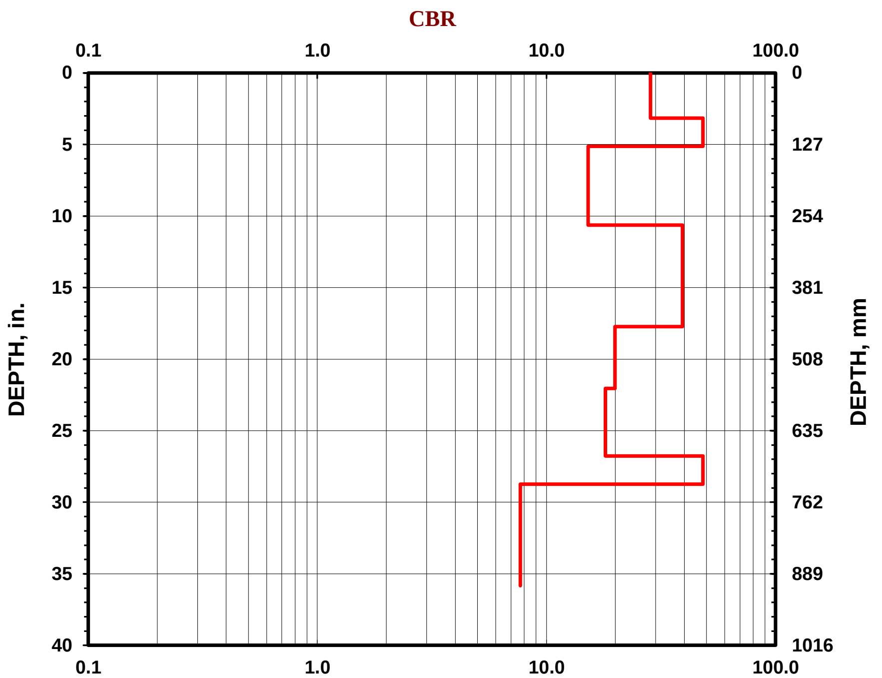

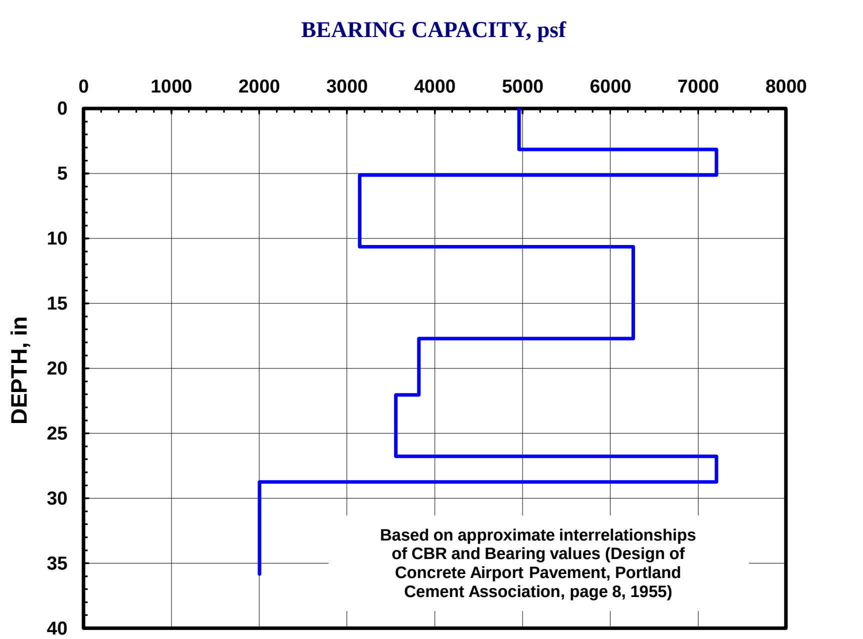

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 22-Feb-14
Location: BR-002 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	290	2
10	560	2
15	910	2
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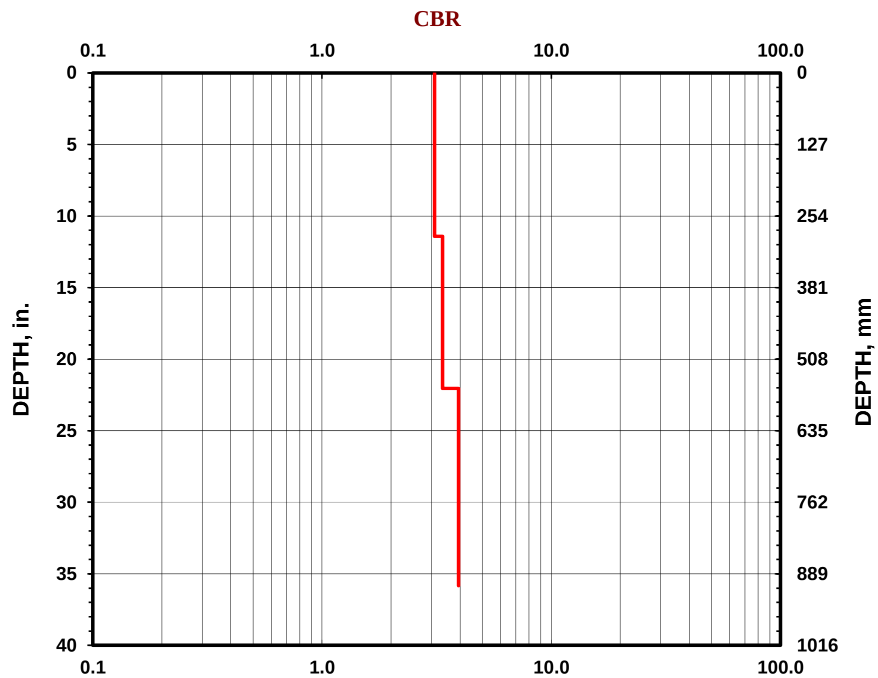

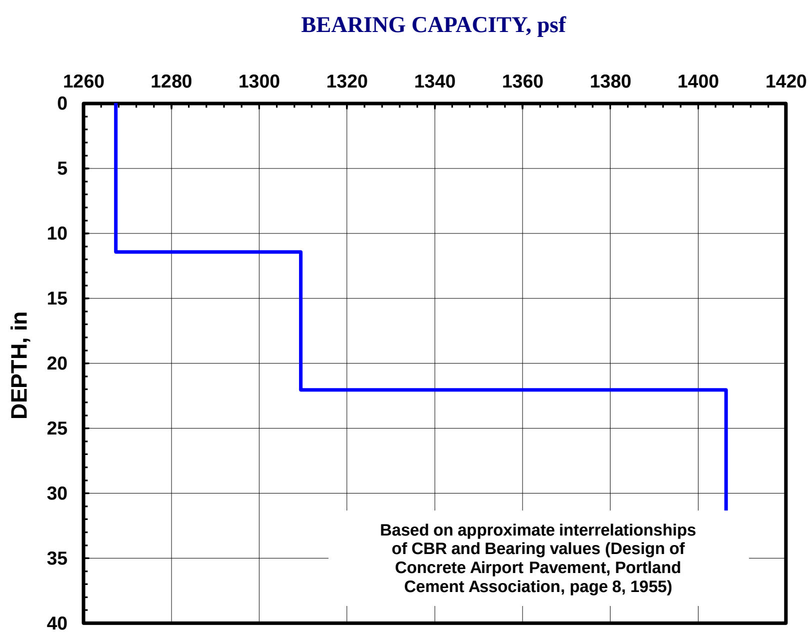

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-003

Date: 2-Feb-14
Soil Type(s): See boring log

Hammer
- (•) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (•) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	30	2
10	40	2
10	100	2
10	270	2
10	460	2
10	630	2
17	910	2
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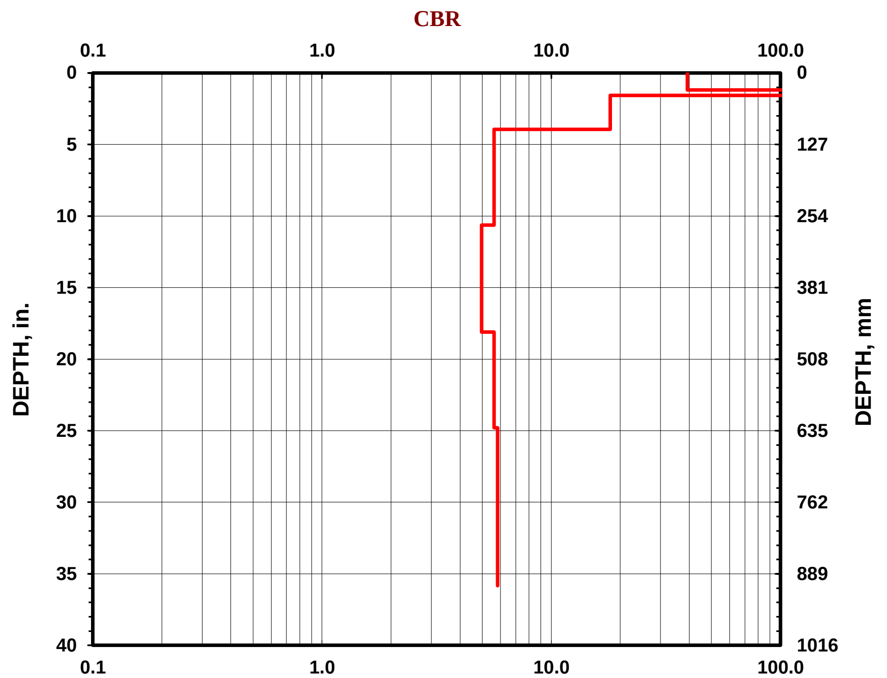

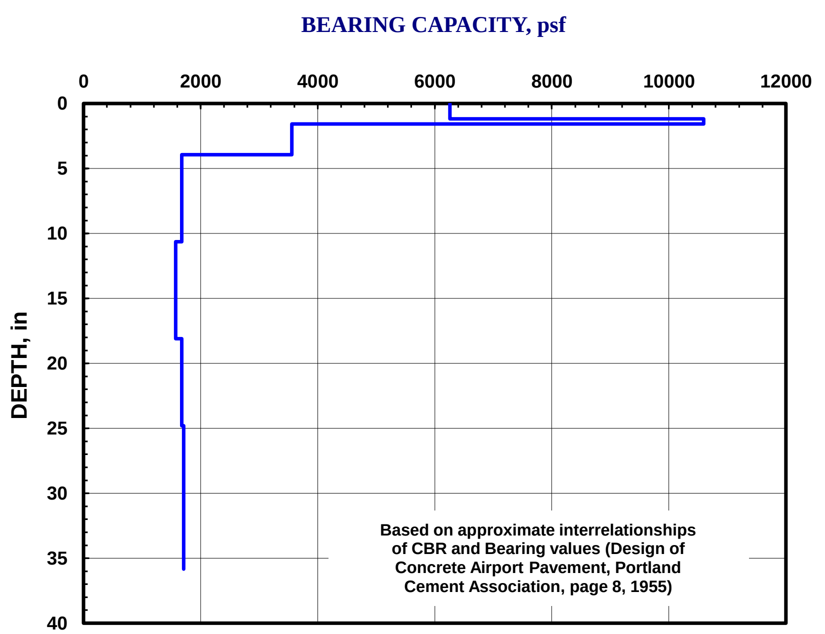

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 1-Feb-14

Location: BR-004 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	40	2
10	60	2
10	70	2
20	80	2
20	90	2
20	90	2
20	110	2
20	120	2
20	140	2
20	150	2
20	170	2
20	200	2
20	290	2
20	310	2
20	310	2
	DCP Refusal	2
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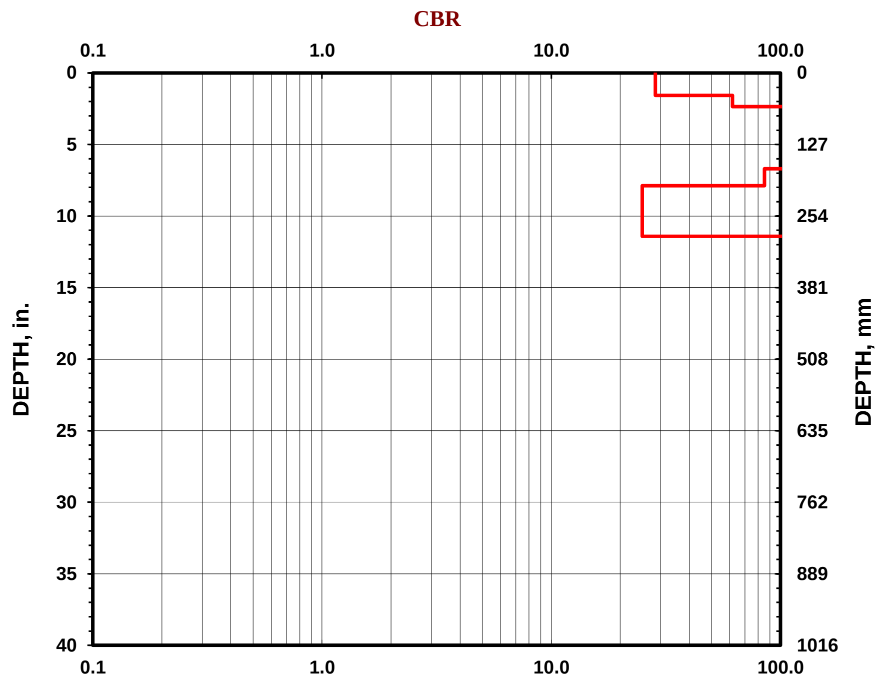

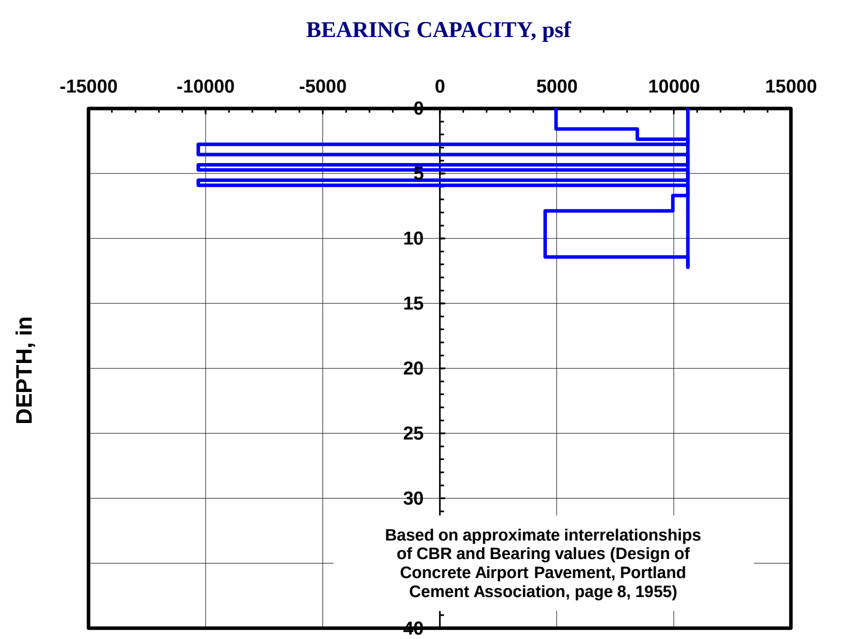

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-005

Date: 2-Feb-14
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ◯ 17.6 lbs.
- ◯ Both hammers used

Soil Type
- ◯ CH
- ◯ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	140	2
10	330	2
10	540	2
4	910	2
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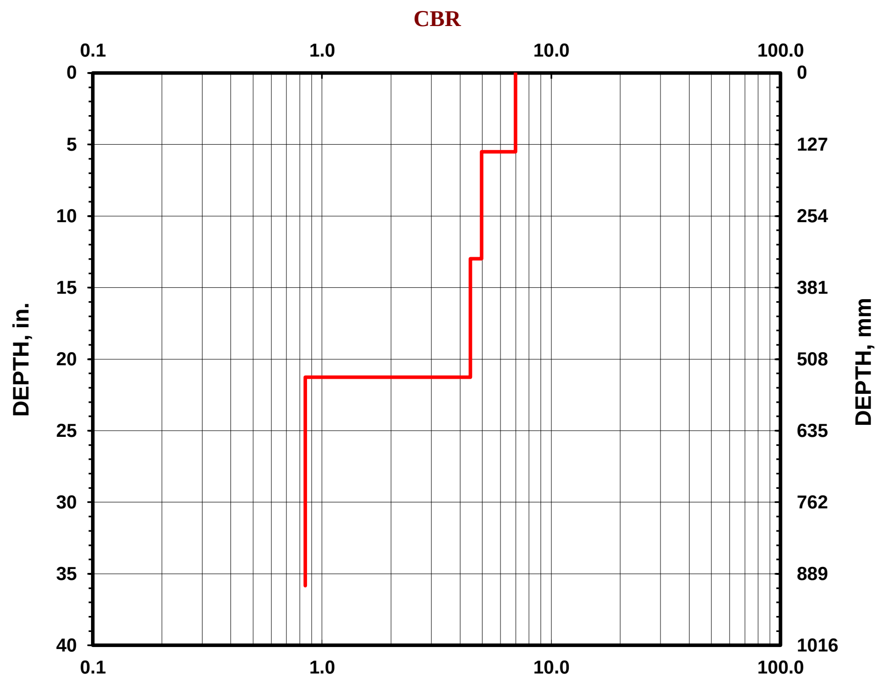

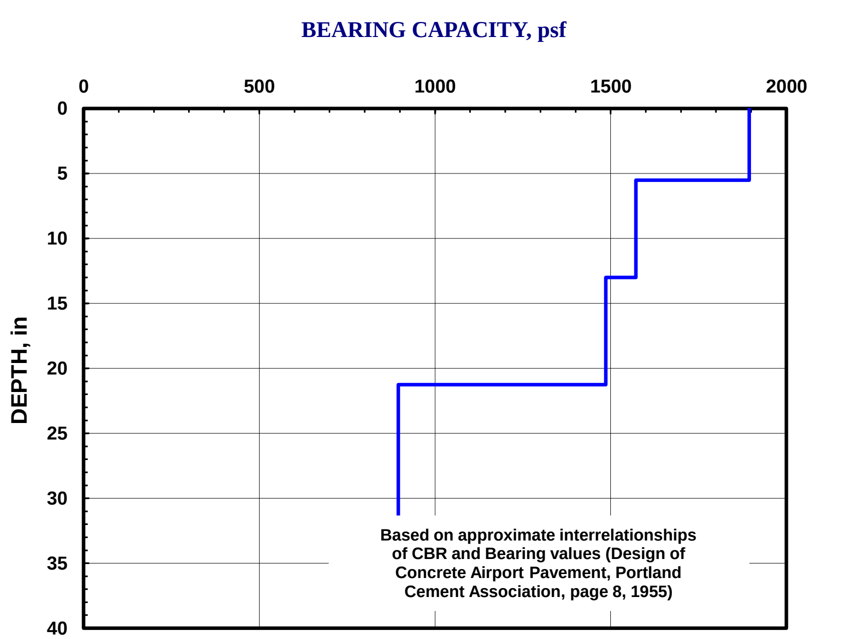

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14
Location: BR-006 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	50	2
10	80	2
20	90	2
20	120	2
20	140	2
20	140	2
	DCP Refusal	2
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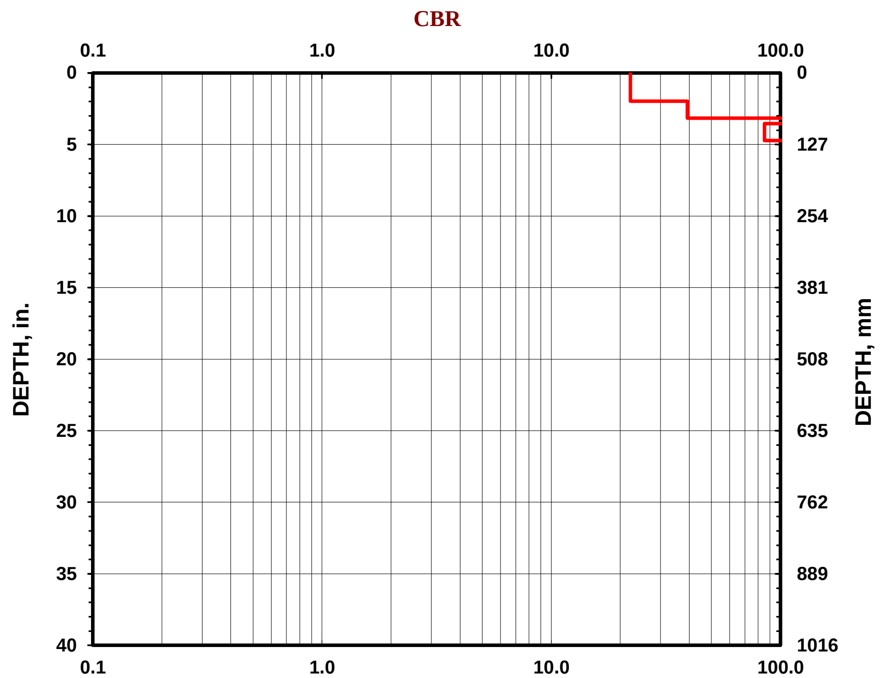

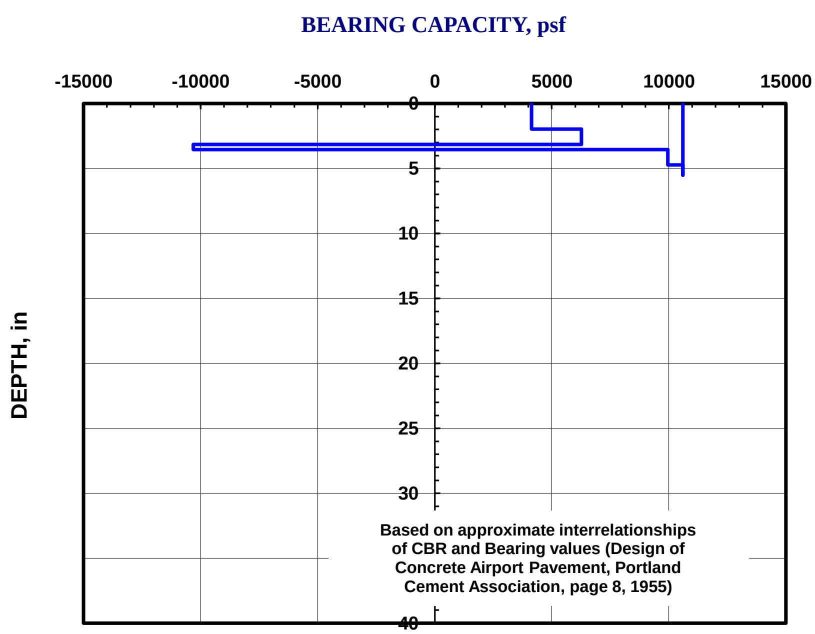

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 15-Feb-14

Location: BR-007 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	230	2
10	360	2
10	530	2
10	580	2
10	690	2
10	780	2
10	910	2
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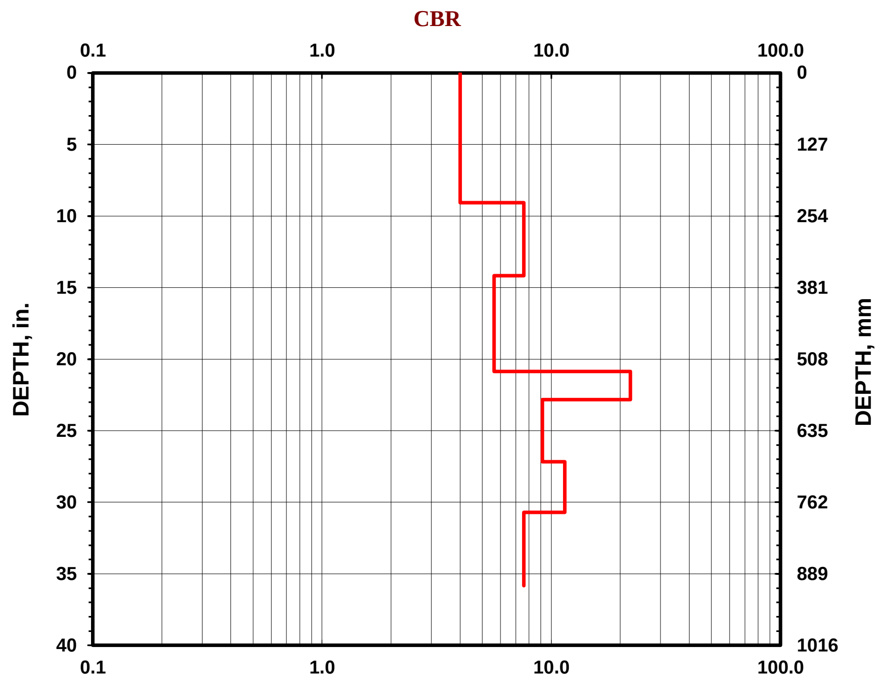

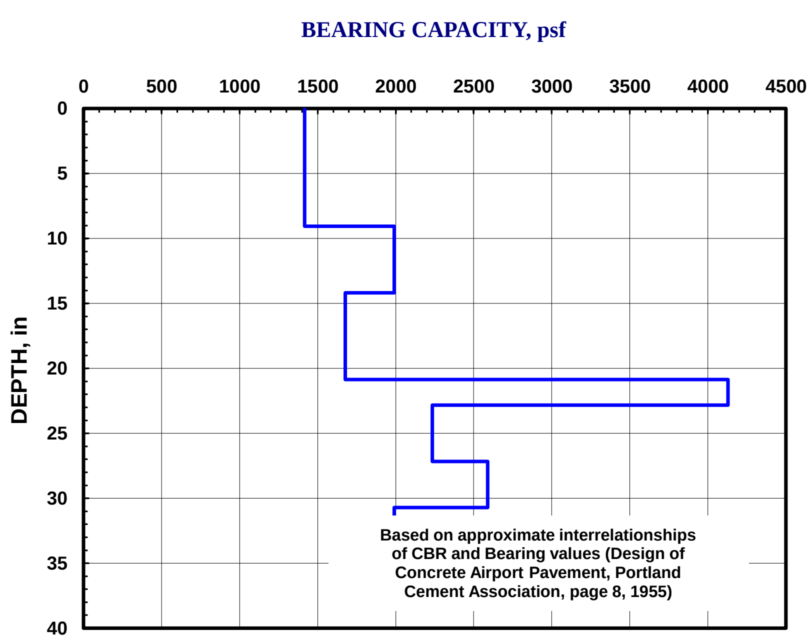

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-008

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	90	2
10	150	2
10	200	2
10	210	2
10	220	2
20	220	2
	DCP Refusal	2
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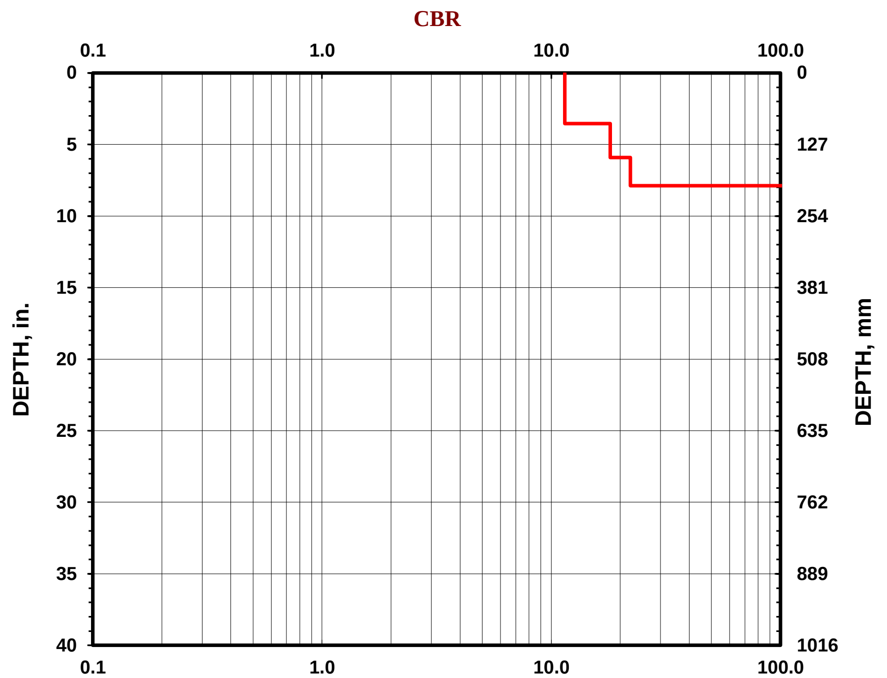

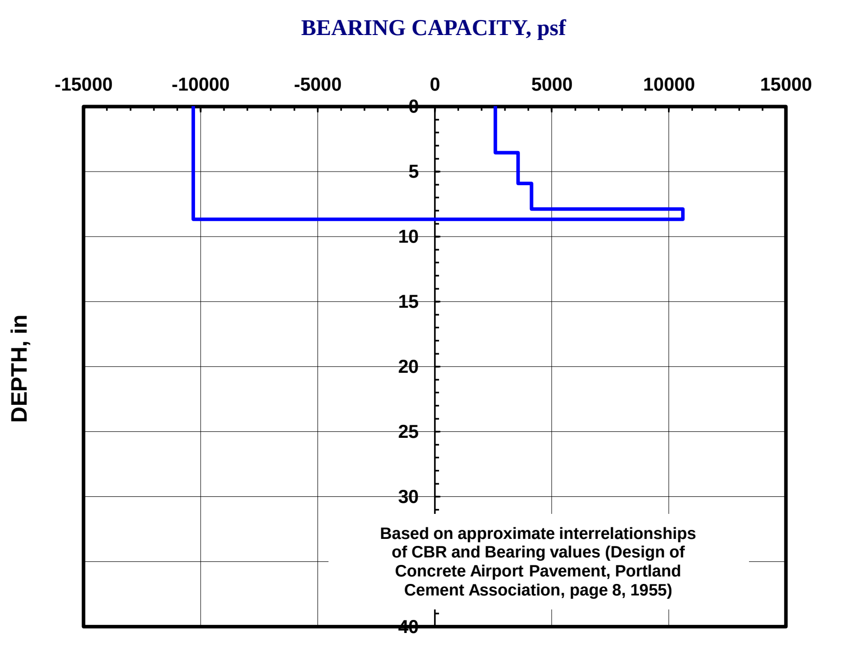

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-009

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	20	2
10	40	2
20	50	2
20	50	2
20	50	2
	DCP Refusal	2
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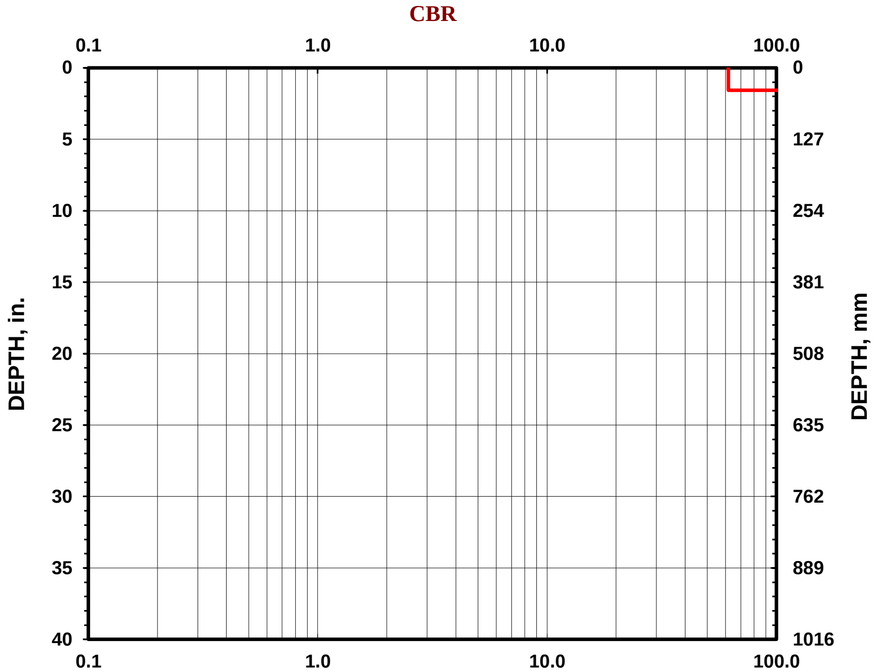

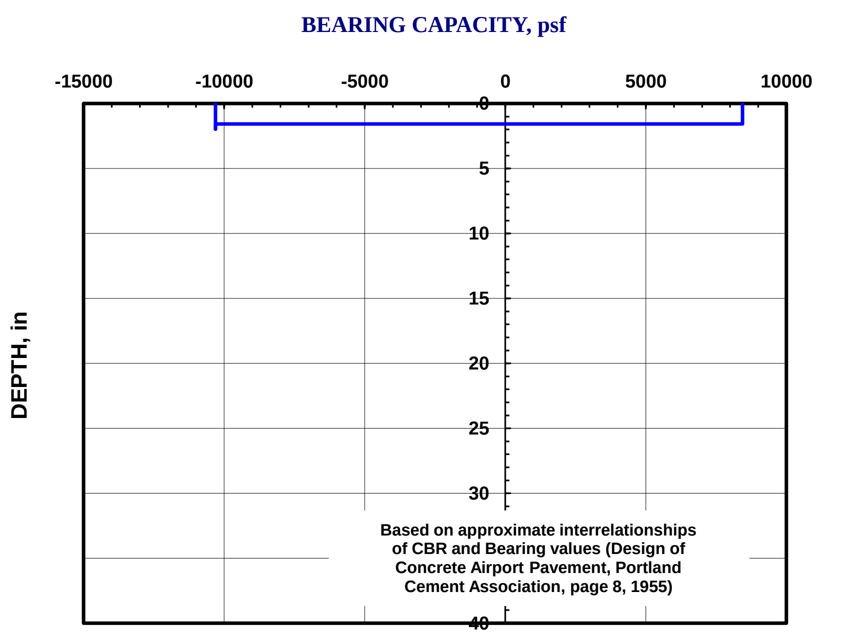

DCP TEST DATA

File Name:

Project: *04135111*

Location: BR-010

Date: 22-Feb-14

Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	60	2
20	130	2
20	150	2
20	160	2
20	160	2
	DCP Refusal	2
		2
		2
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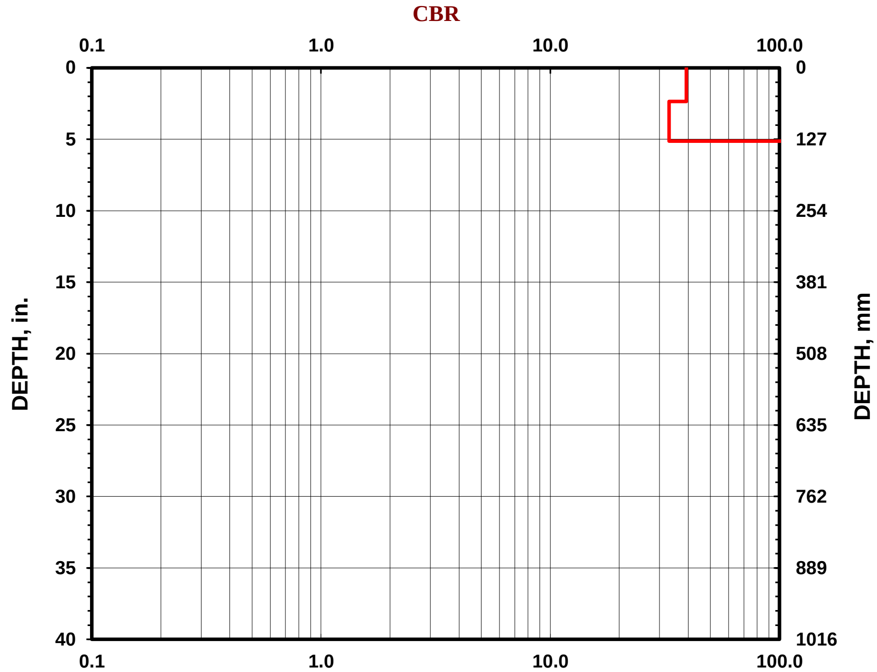

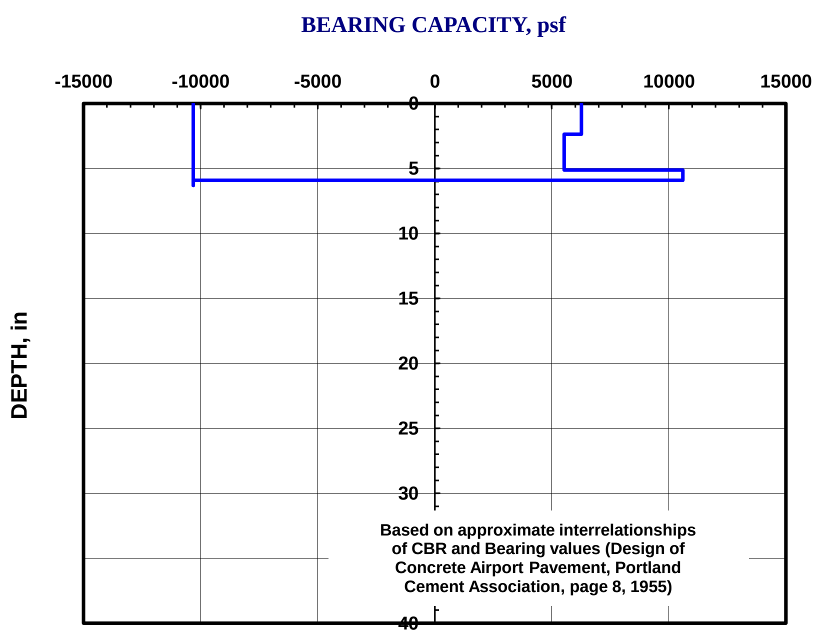

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-012

Date: 1-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	110	2
10	150	2
10	180	2
10	210	2
10	240	2
10	280	2
10	360	2
10	700	2
10	840	2
3	910	2
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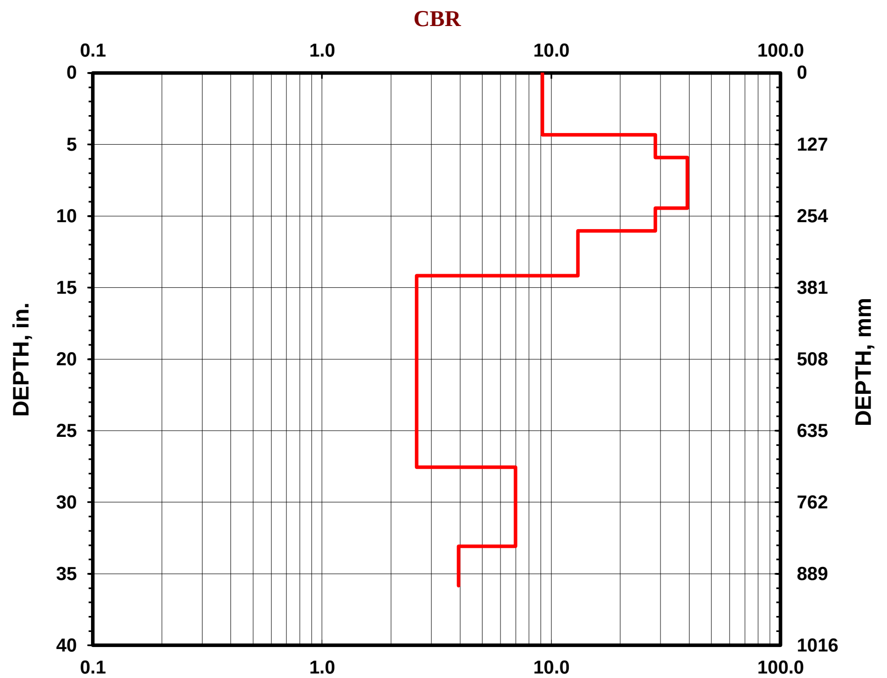

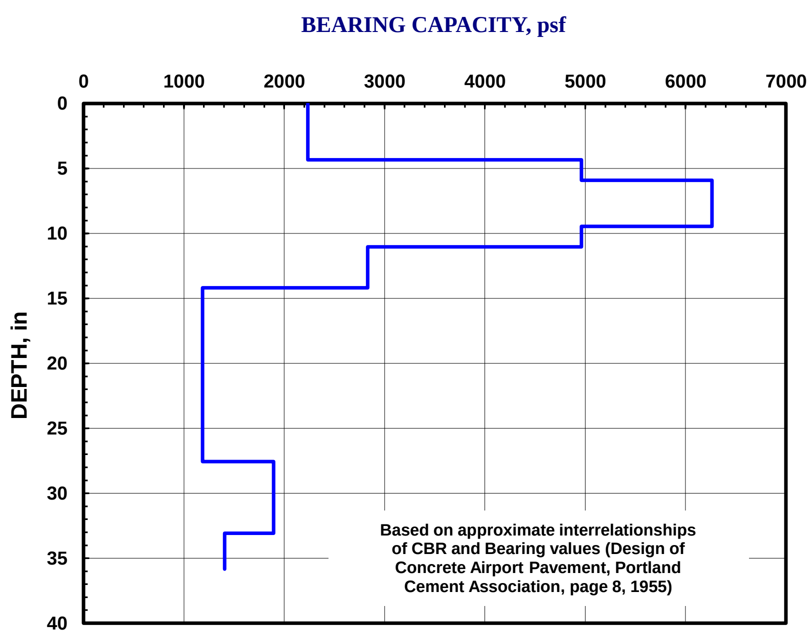

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 15-Feb-14
Location: BR-013 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	130	2
10	520	2
13	910	2
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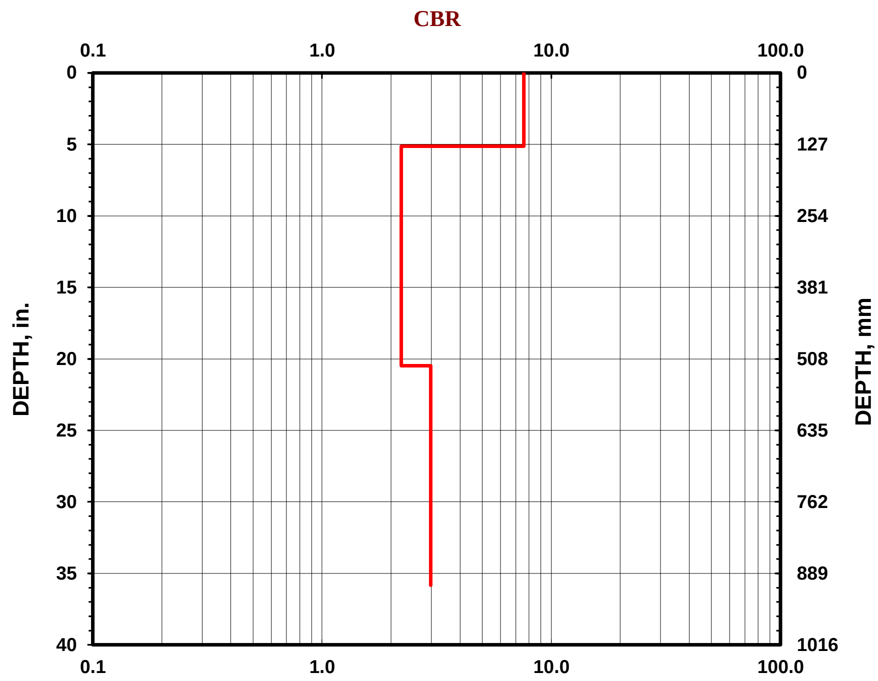

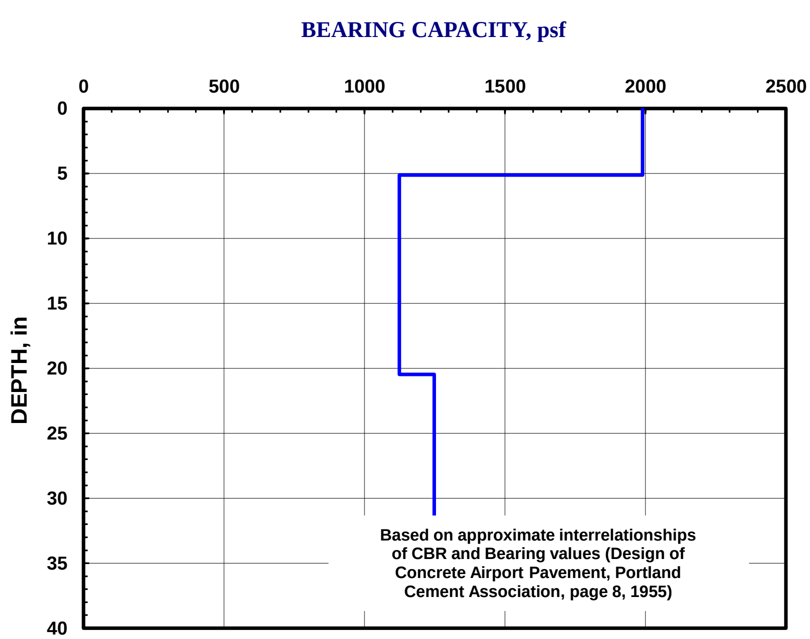

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-014

Date: 1-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	70	2
10	100	2
10	120	2
10	130	2
10	150	2
10	160	2
10	170	2
20	190	2
20	205	2
20	215	2
20	220	2
20	250	2
20	370	2
20	720	2
16	910	2
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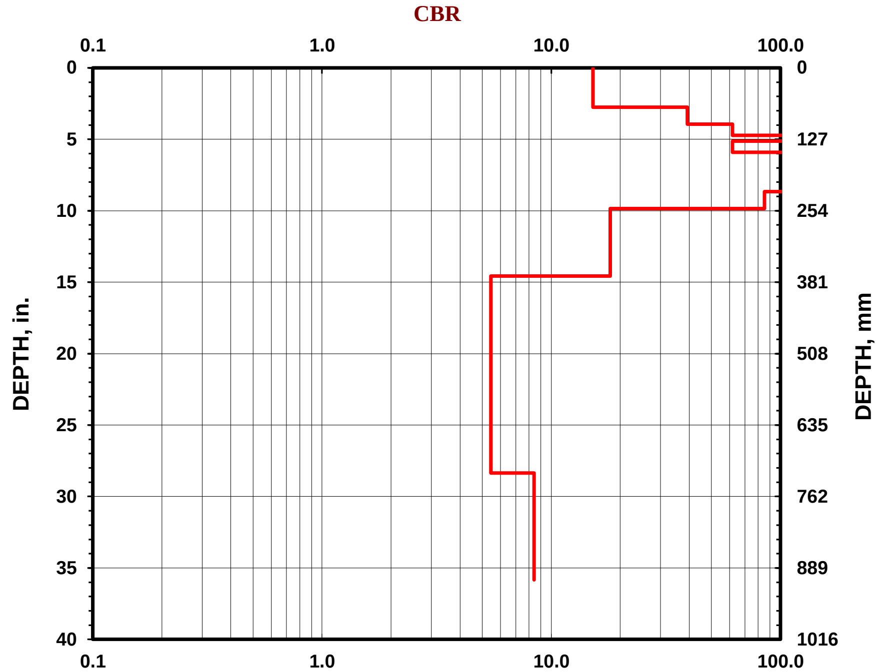

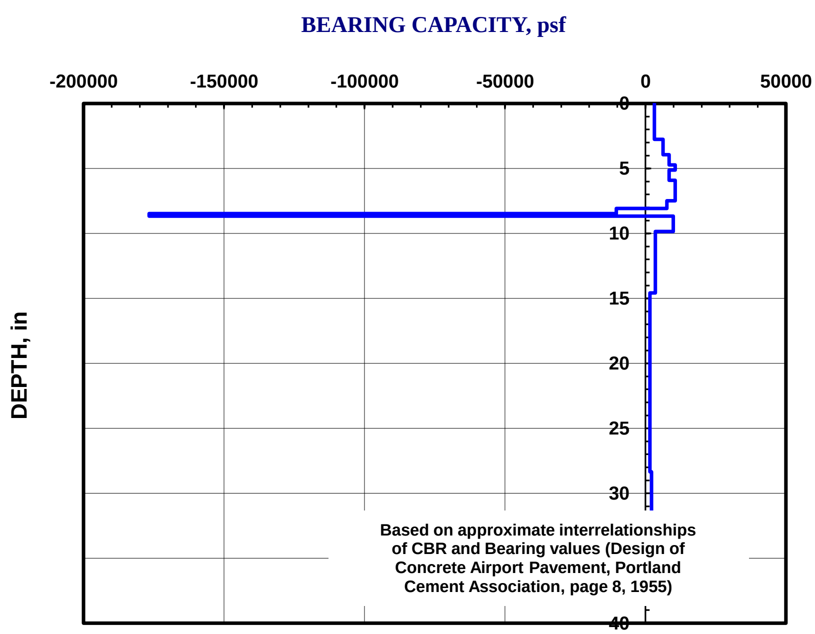

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-015

Date: 15-Feb-14
Soil Type(s): High plasticity Clay

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- (●) CH
- ( ) CL
- ( ) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	150	2
10	390	2
8	910	2
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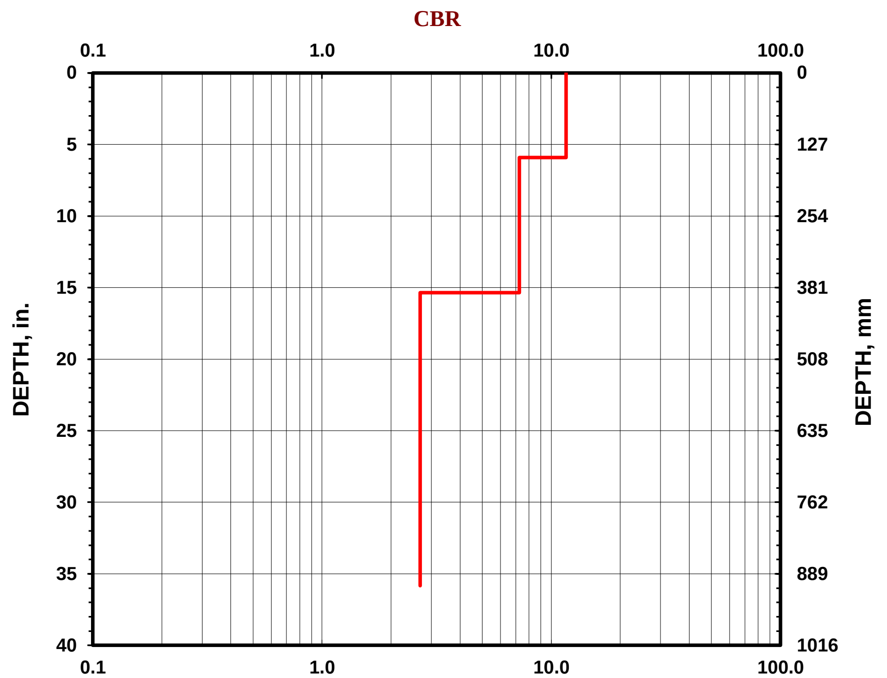

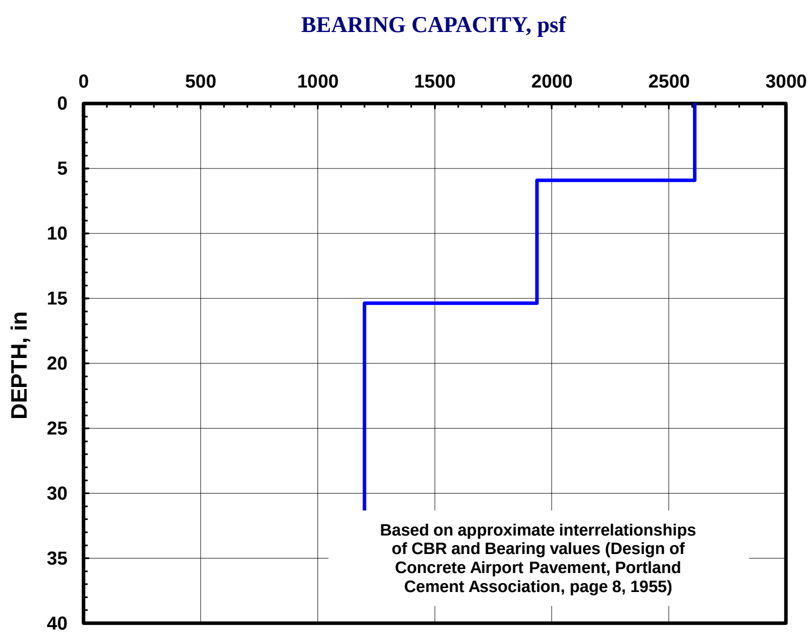

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 1-Feb-14
Location: BR-016 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	180	2
10	270	2
10	360	2
10	390	2
10	410	2
10	430	2
10	500	2
10	580	2
10	640	2
10	670	2
10	720	2
10	910	2
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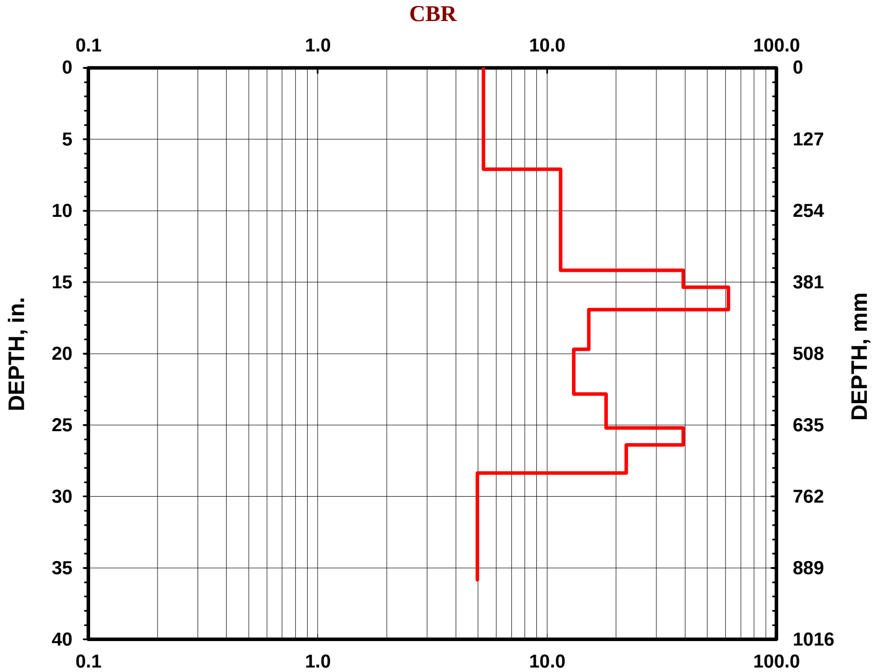

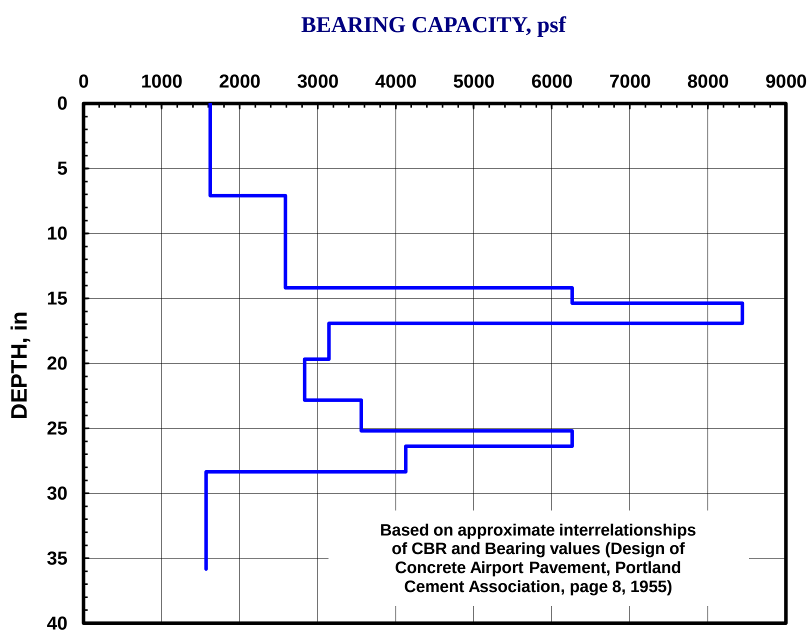

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 15-Feb-14
Location: BR-017 **Soil Type(s):** Low plasticity Clay with CBR<10

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ◉ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	240	2
10	710	2
12	910	2
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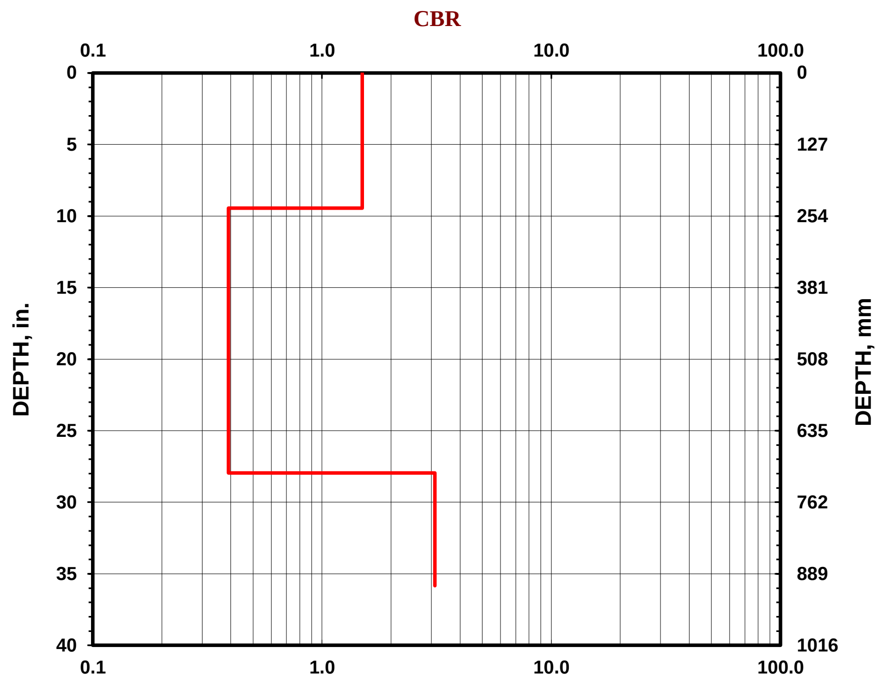

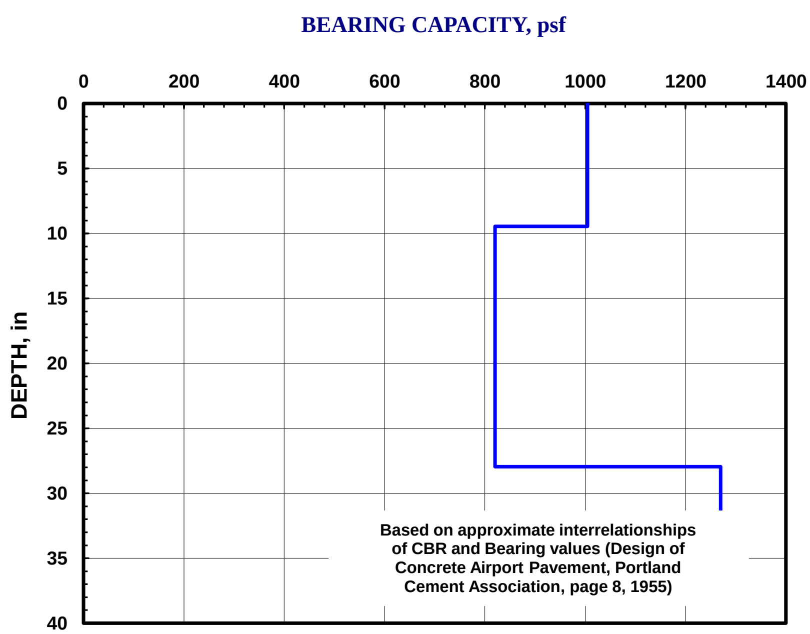

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 17-Feb-14
Location: BR-018 **Soil Type(s):** See boring log

Hammer
◉ 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	580	2
8	910	2
		2
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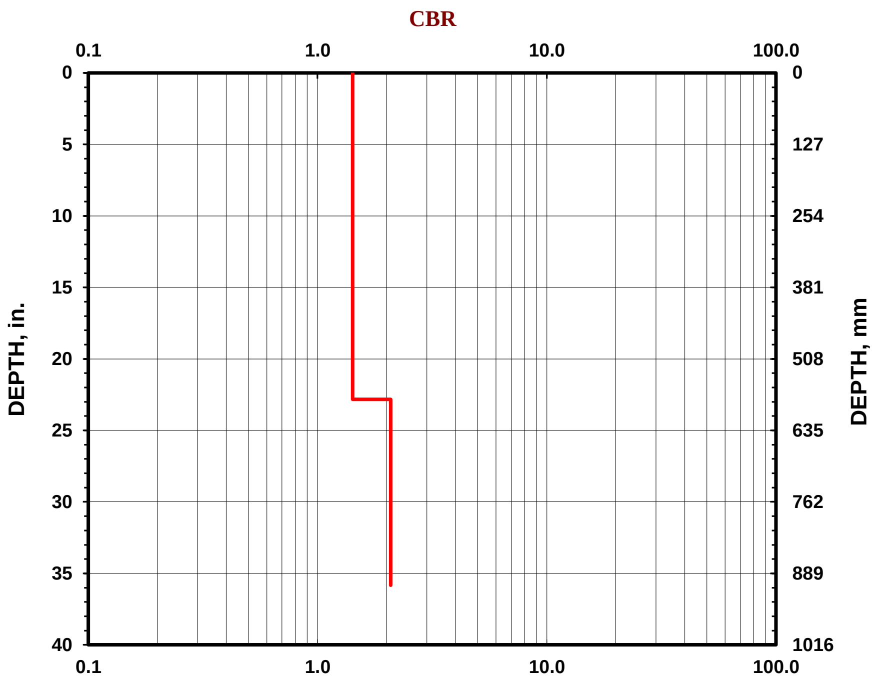

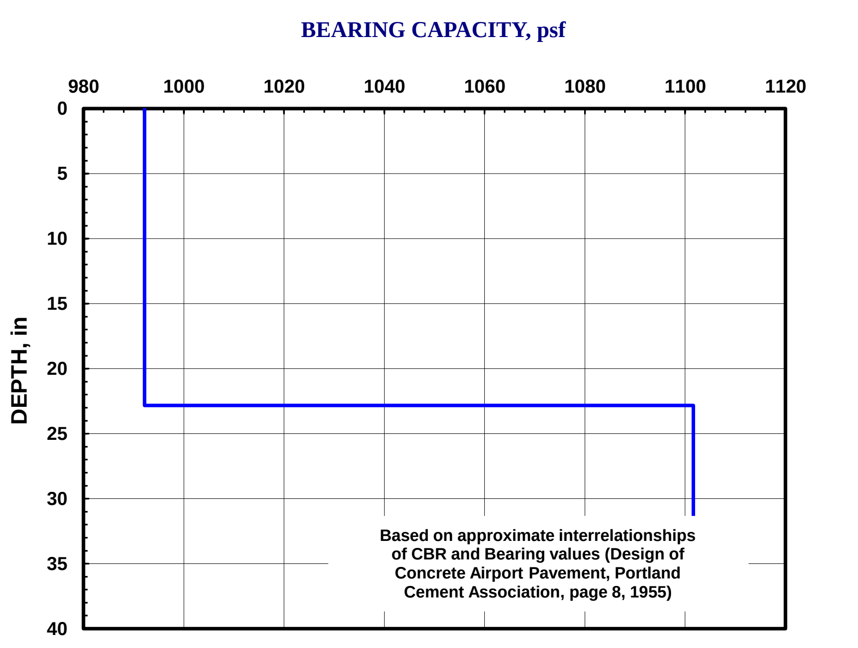

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14
Location: BR-019 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	40	2
10	80	2
20	90	2
20	90	2
20	110	2
20	120	2
20	135	2
20	135	2
	DCP Refusal	2
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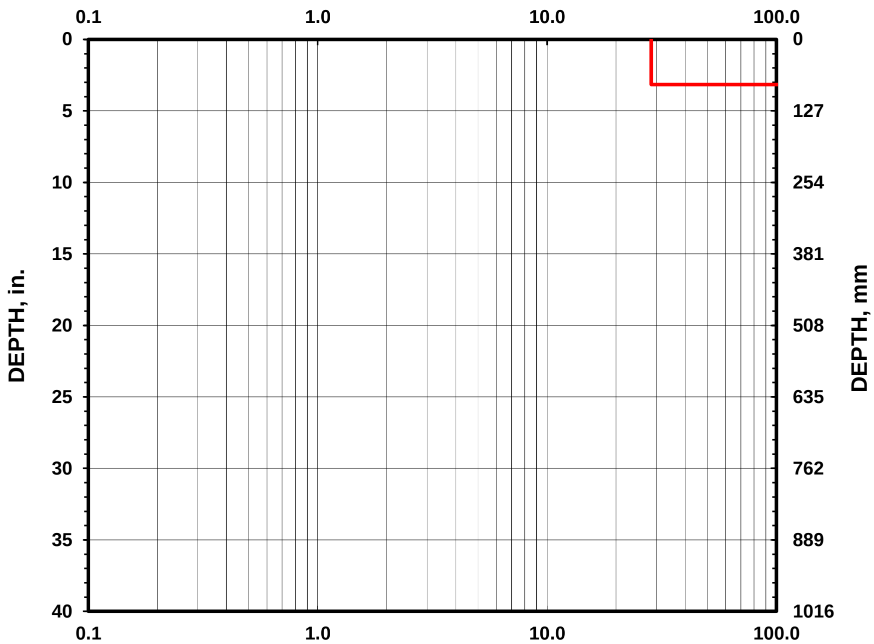
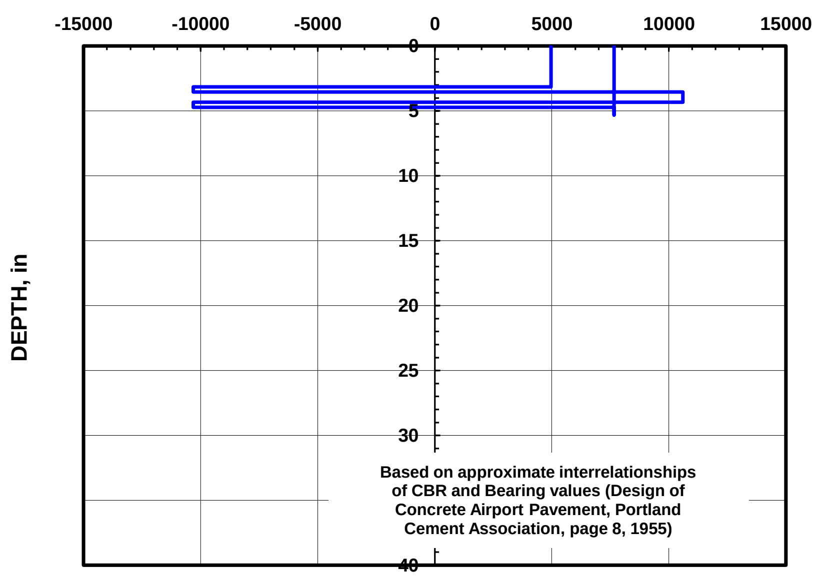
CBR



BEARING CAPACITY, psf



Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14
Location: BR-020 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	30	2
20	50	2
20	110	2
21	160	2
10	290	2
10	460	2
10	650	2
10	910	2
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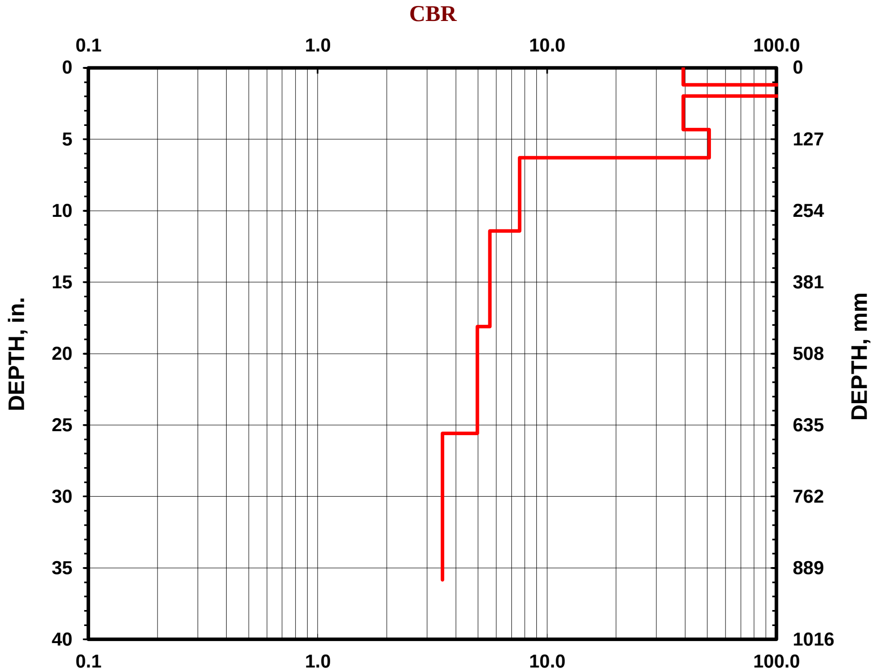

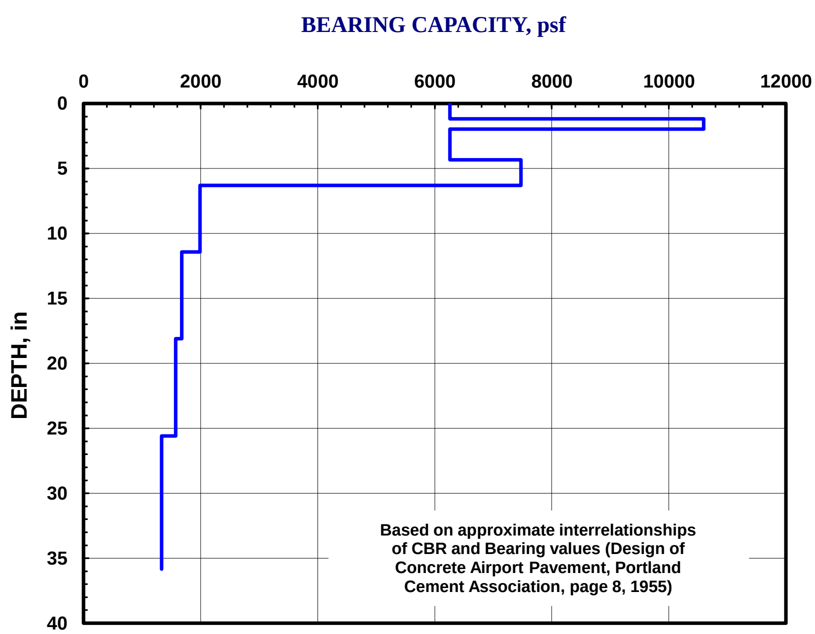

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14
Location: BR-021 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	110	2
20	170	2
20	410	2
24	910	2
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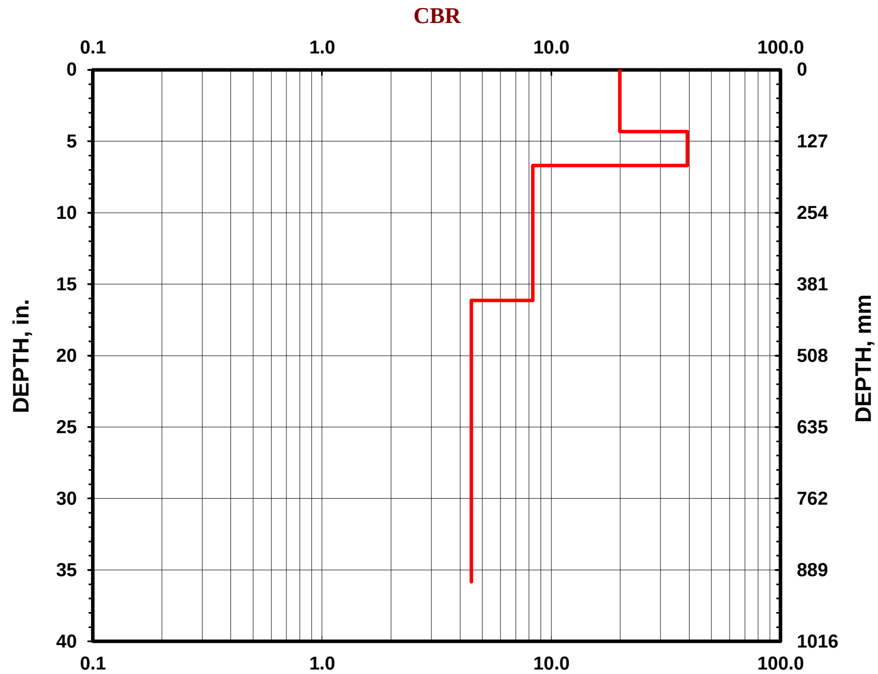

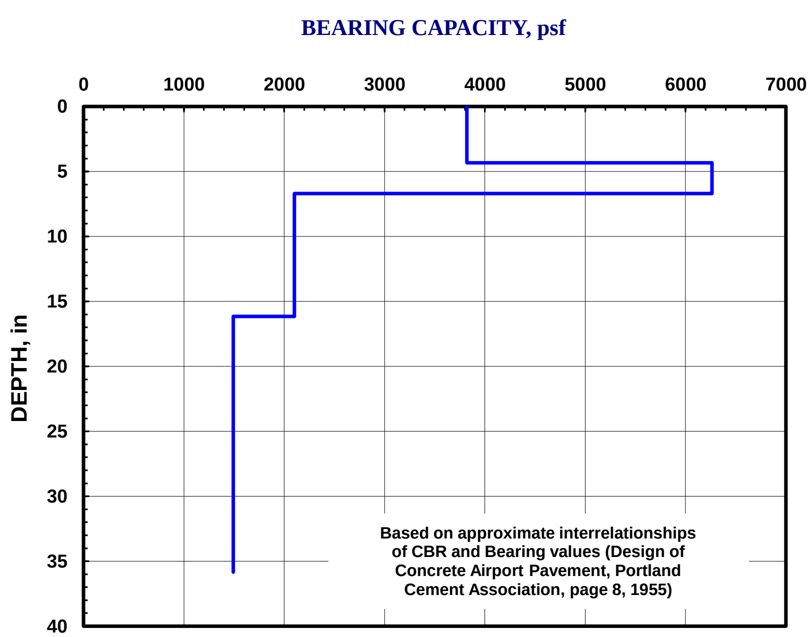

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-022

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	90	2
20	130	2
20	140	2
20	160	2
20	190	2
20	210	2
20	300	2
20	520	2
18	910	2
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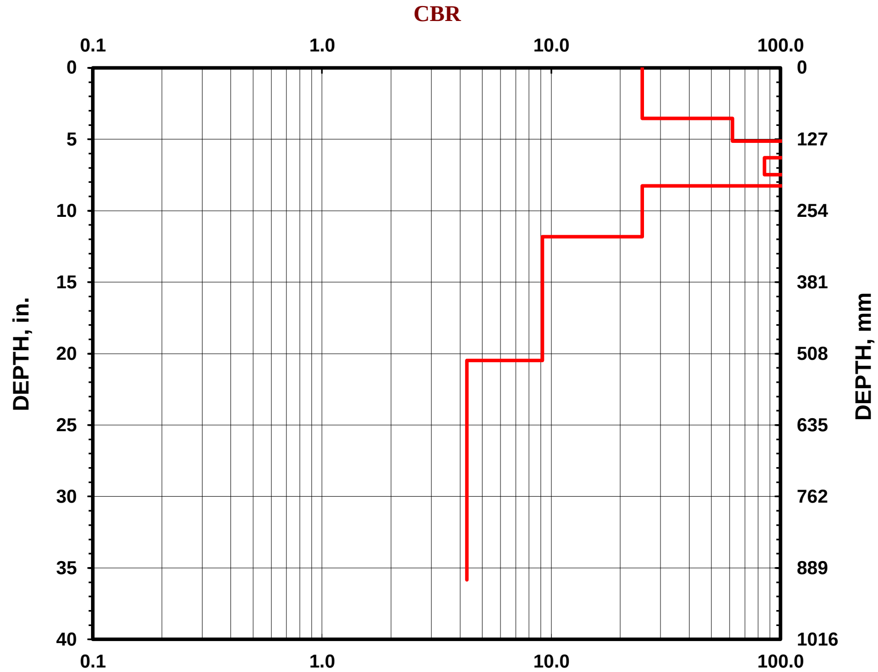

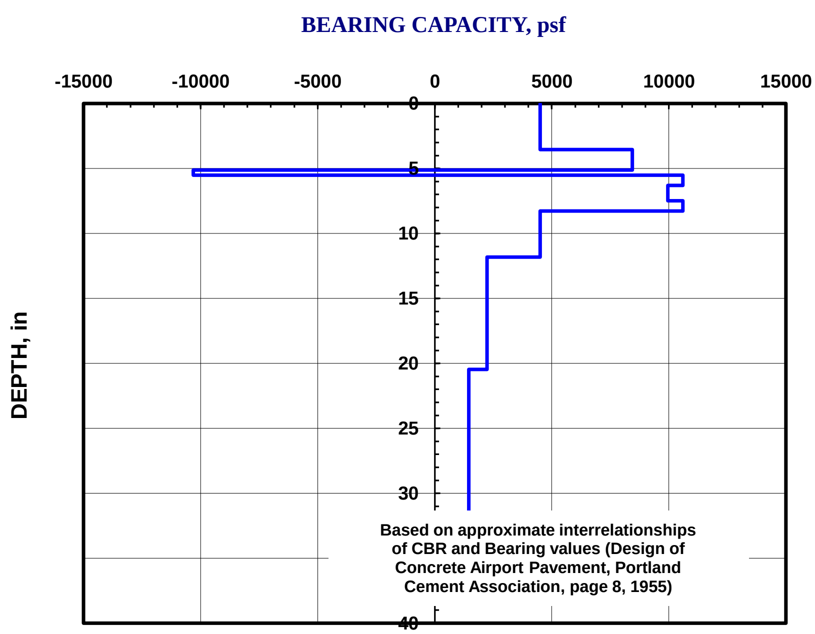

Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-023

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	140	2
10	910	2
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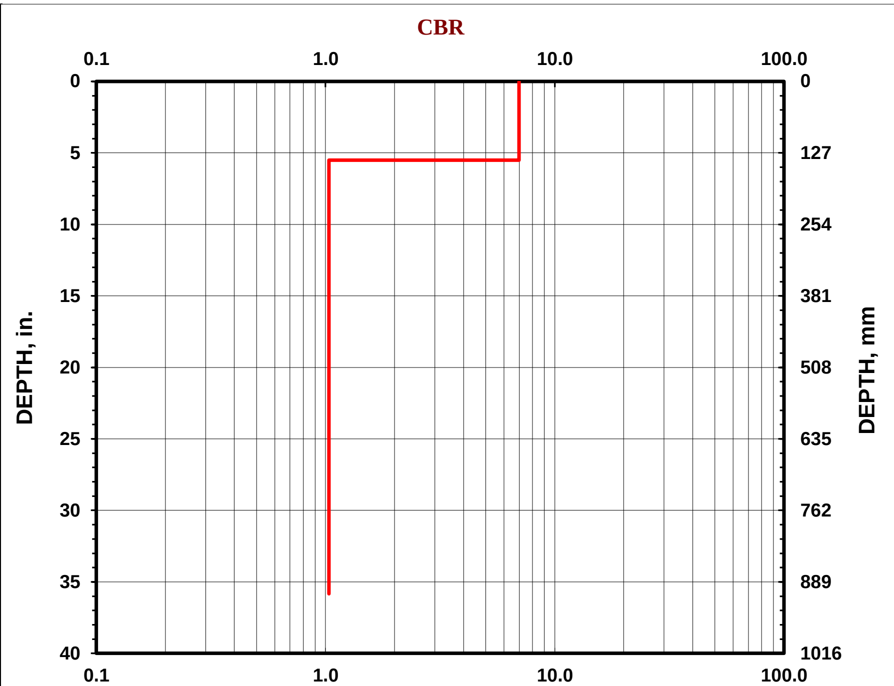

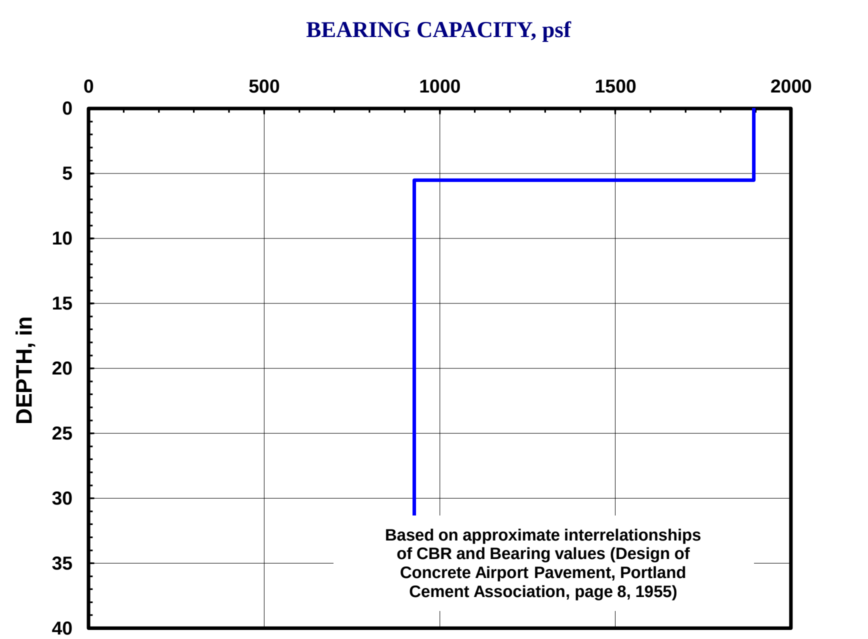

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-024
Date: 1-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	80	2
10	370	2
10	490	2
10	580	2
10	620	2
10	650	2
10	690	2
10	720	2
10	750	2
10	750	2
	DCP Refusal	2
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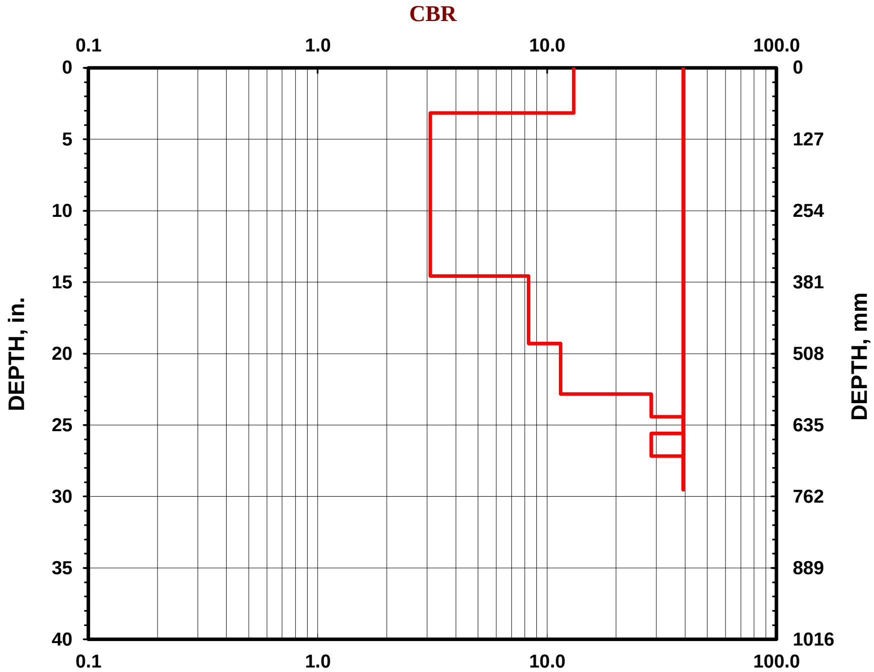

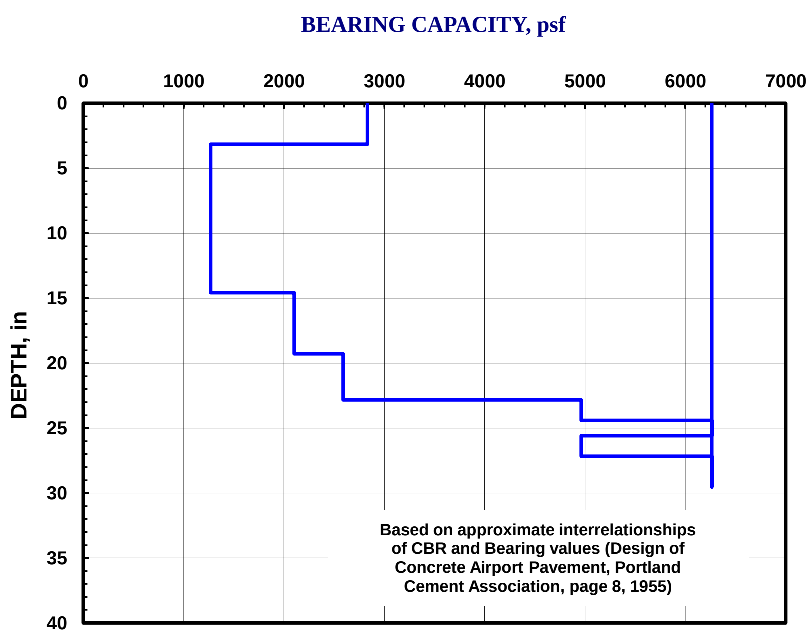

DCP TEST DATA

File Name:

Project: *04135111** **Date:** 16-Feb-14
Location: BR-025 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	180	2
10	410	2
10	560	2
10	660	2
10	740	2
10	760	2
20	790	2
20	790	2
	DCP Refusal	2
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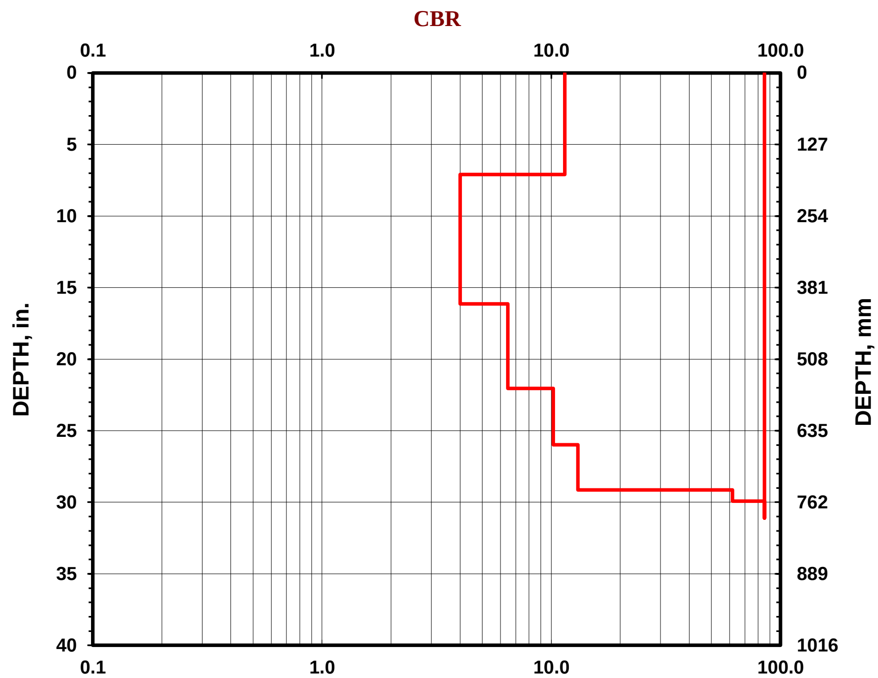

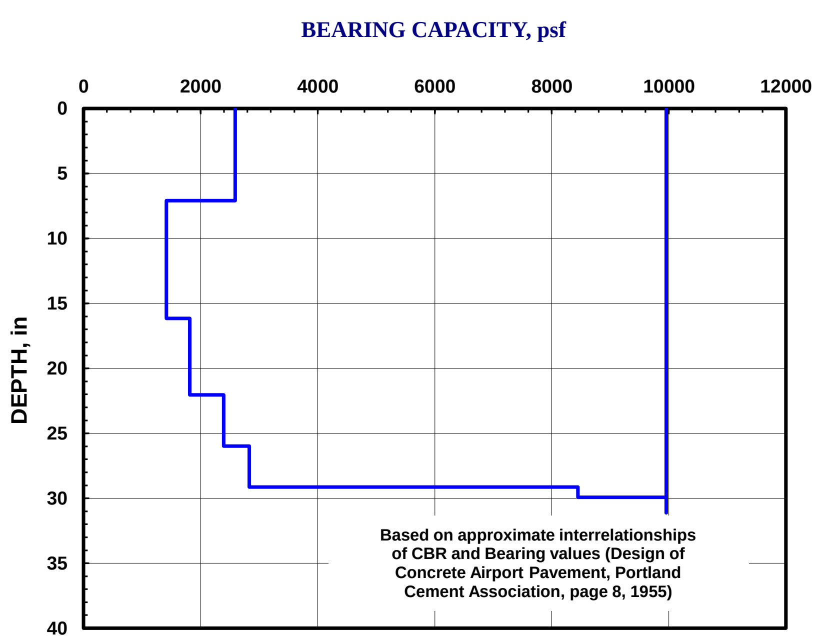

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 16-Feb-14
Location: BR-026 **Soil Type(s):** See boring log

Hammer
◉ 10.1 lbs.
○ 17.6 lbs.
○ Both hammers used

Soil Type
○ CH
○ CL
◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	50	2
20	160	2
20	310	2
20	580	2
10	750	2
12	910	2
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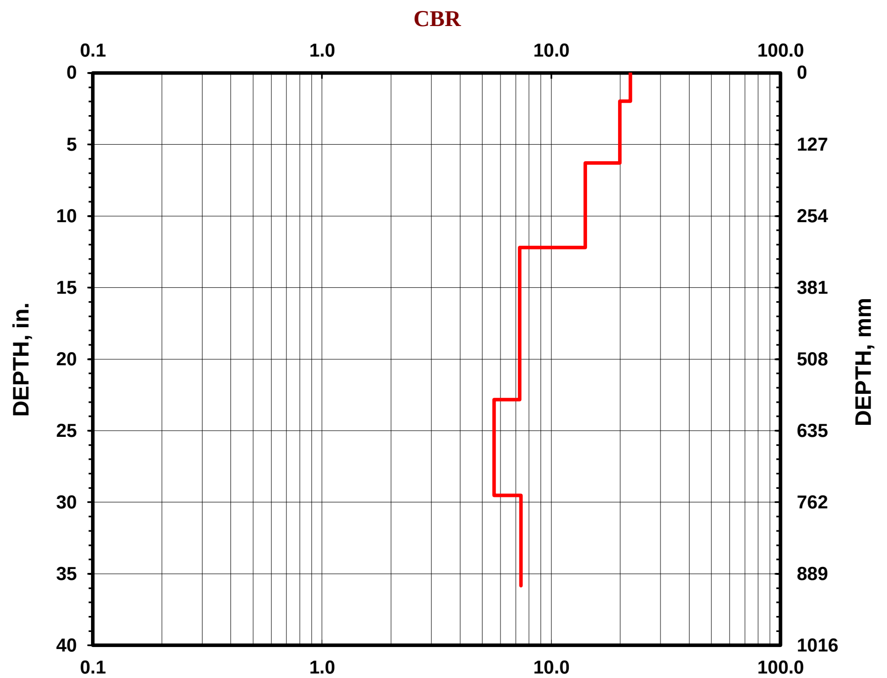

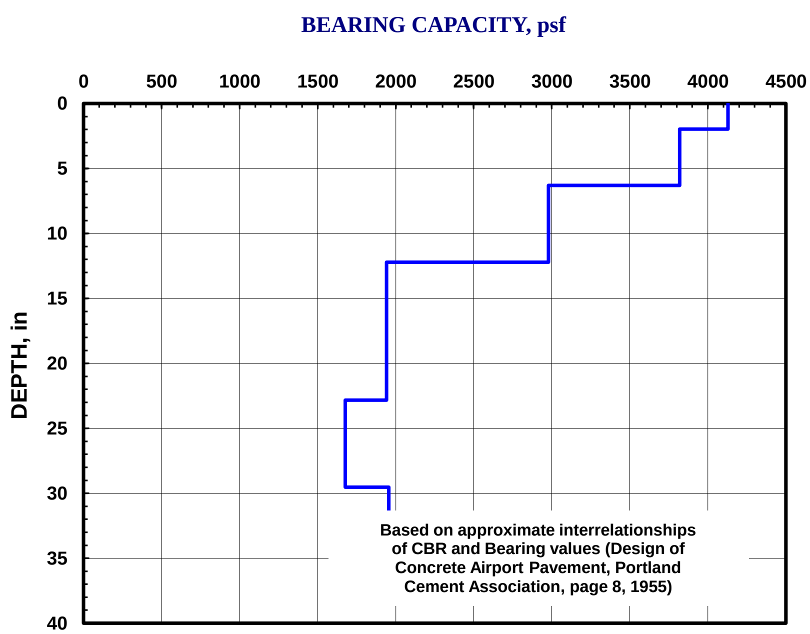

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-027

Date: 16-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	20	2
20	35	2
20	70	2
20	100	2
20	160	2
20	160	2
	DCP Refusal	2
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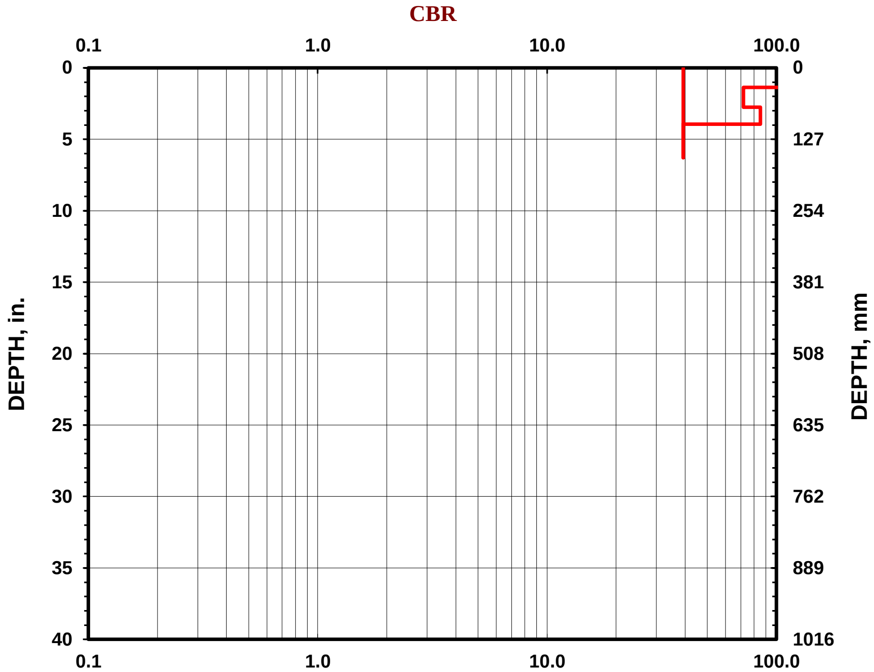

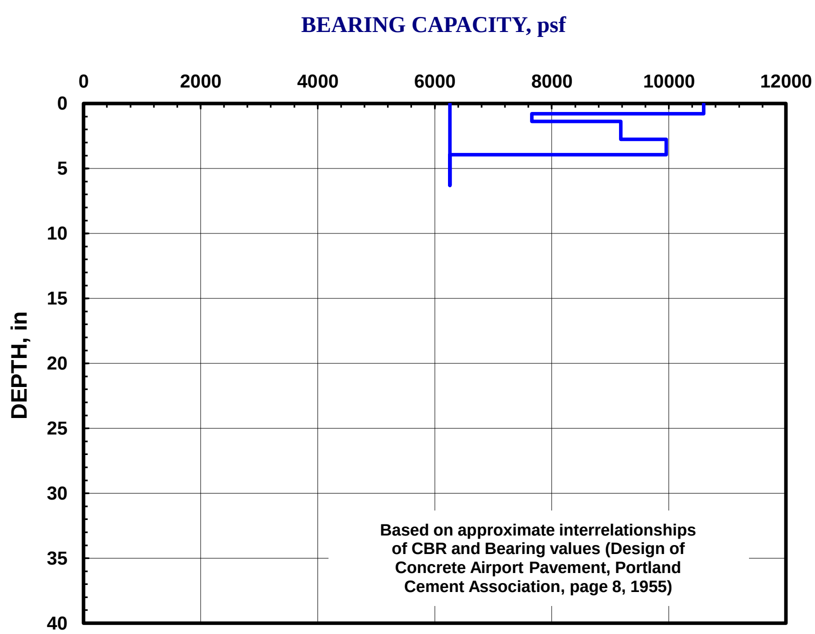

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 22-Feb-14
Location: BR-028 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	80	2
20	140	2
20	200	2
20	260	2
20	450	2
20	740	2
8	910	2
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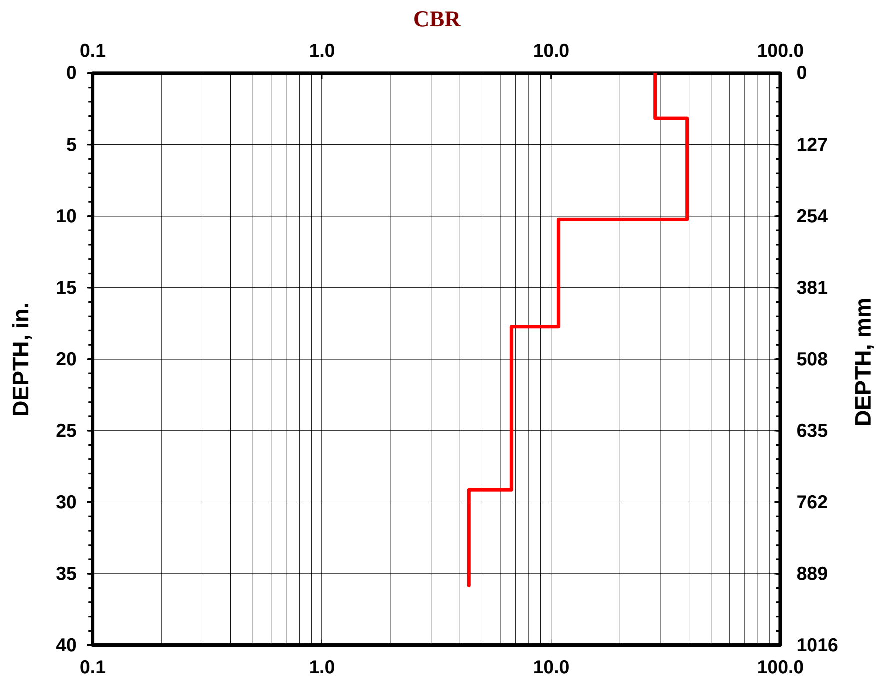

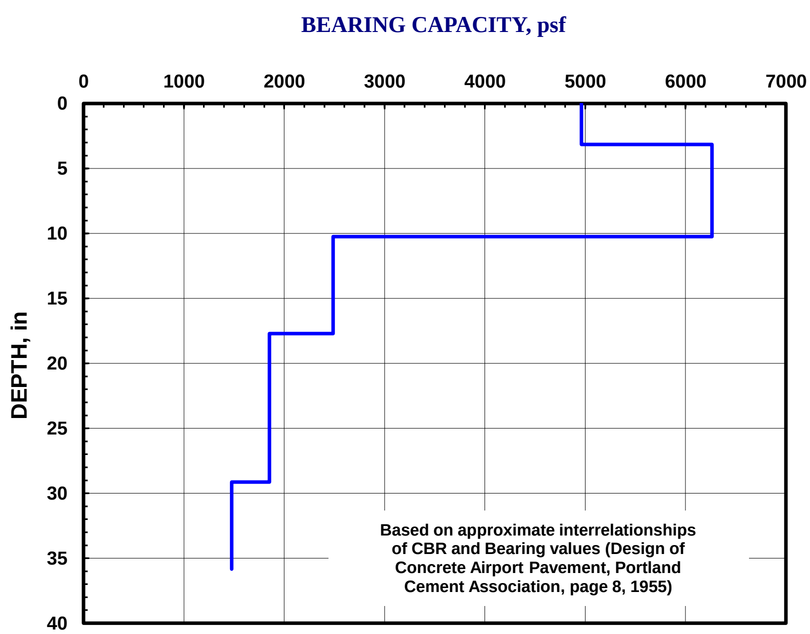

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 22-Feb-14
Location: BR-029 **Soil Type(s):** See boring log

Hammer
- ◉ 10.1 lbs.
- ○ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	90	2
20	110	2
20	130	2
20	160	2
20	200	2
20	280	2
20	460	2
20	760	2
5	910	2
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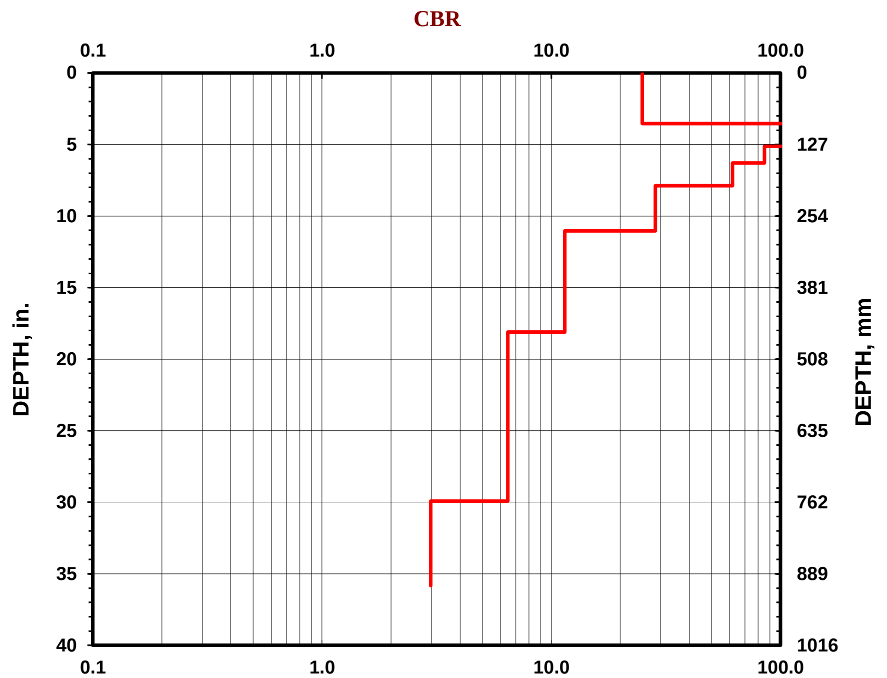

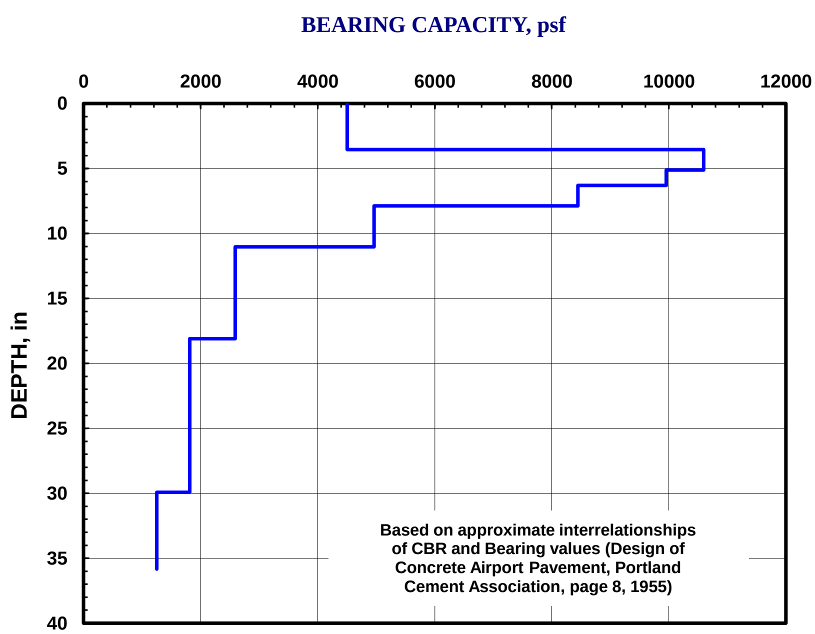

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-030

Date: 22-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	60	2
20	110	2
20	160	2
20	200	2
20	210	2
20	260	2
20	300	2
20	340	2
20	380	2
20	710	2
20	910	2
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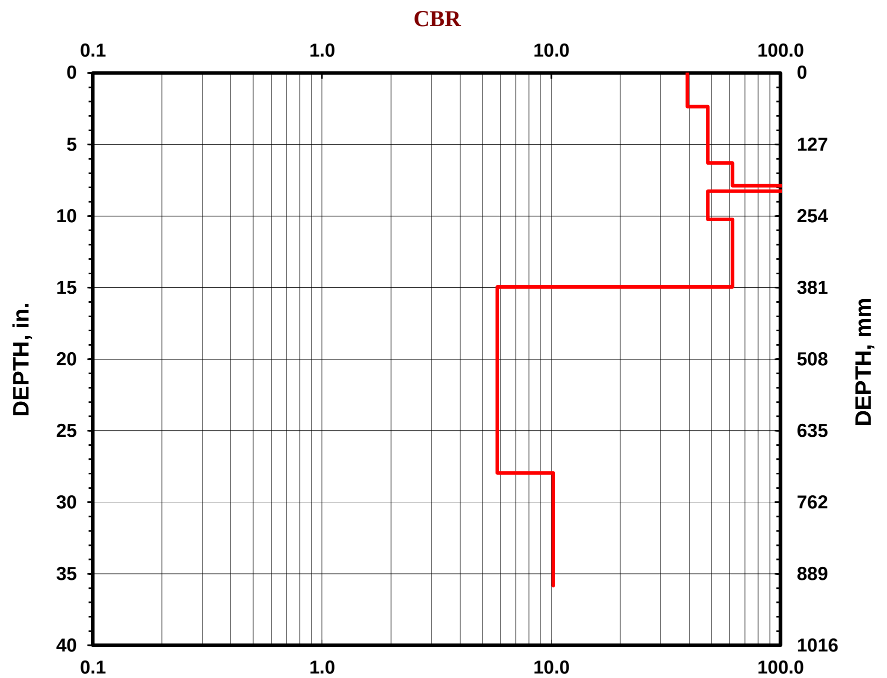

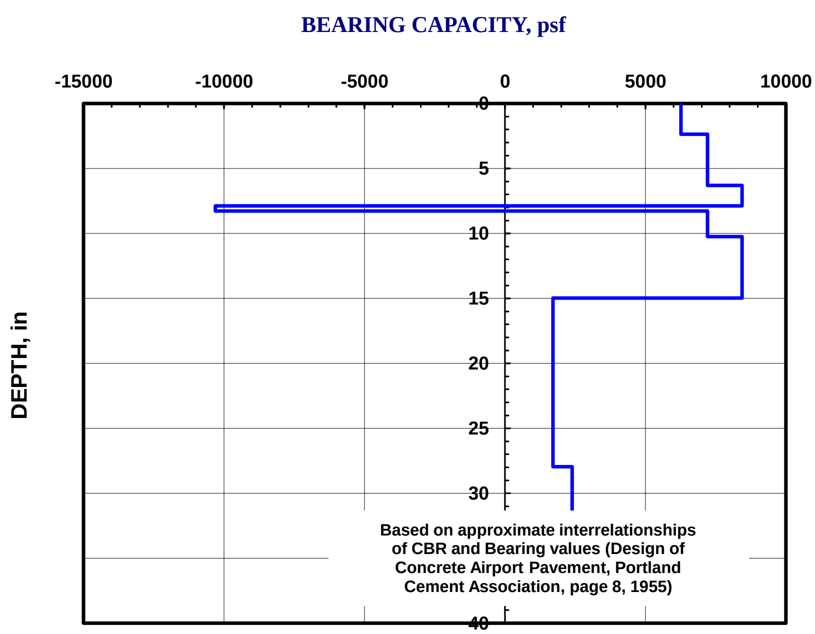

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 22-Feb-14
Location: BR-031 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	190	2
20	430	2
20	630	2
30	910	2
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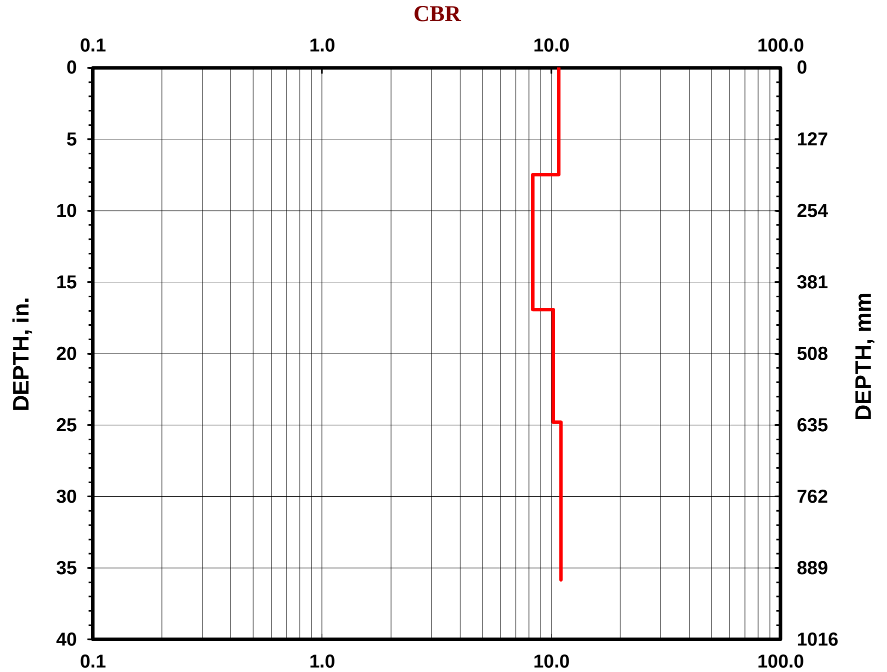

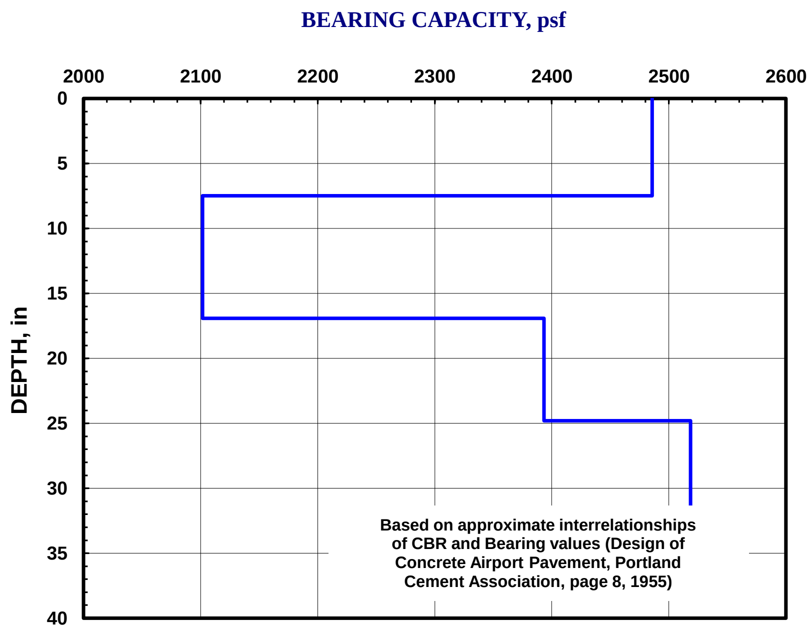

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File Name:

Project: *04135111* **Date:** 22-Feb-14

Location: BR-032 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	30	2
10	60	2
10	80	2
10	110	2
10	170	2
10	220	2
10	250	2
10	260	2
10	270	2
10	280	2
15	290	2
15	300	2
10	300	2
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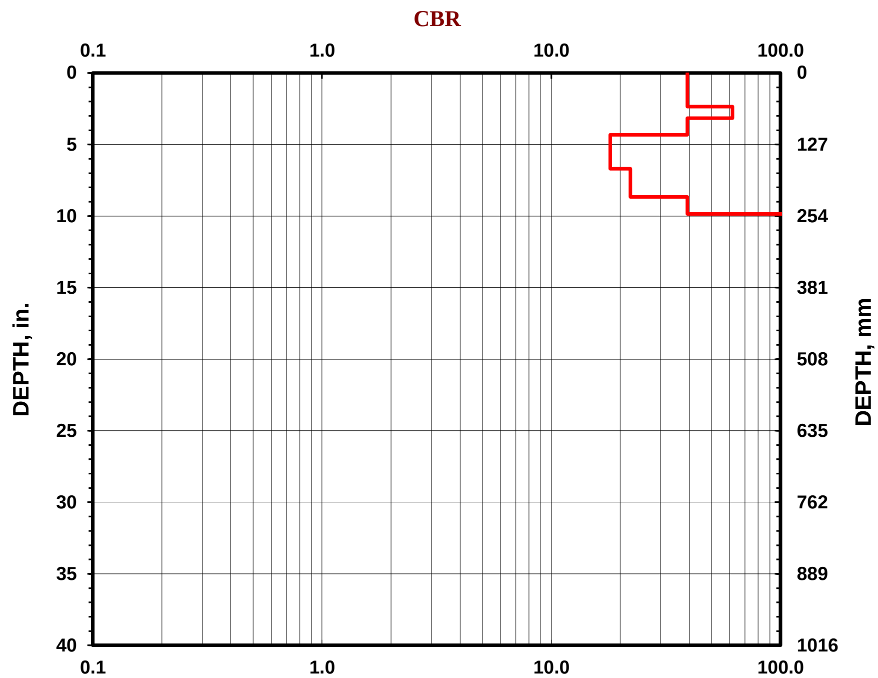

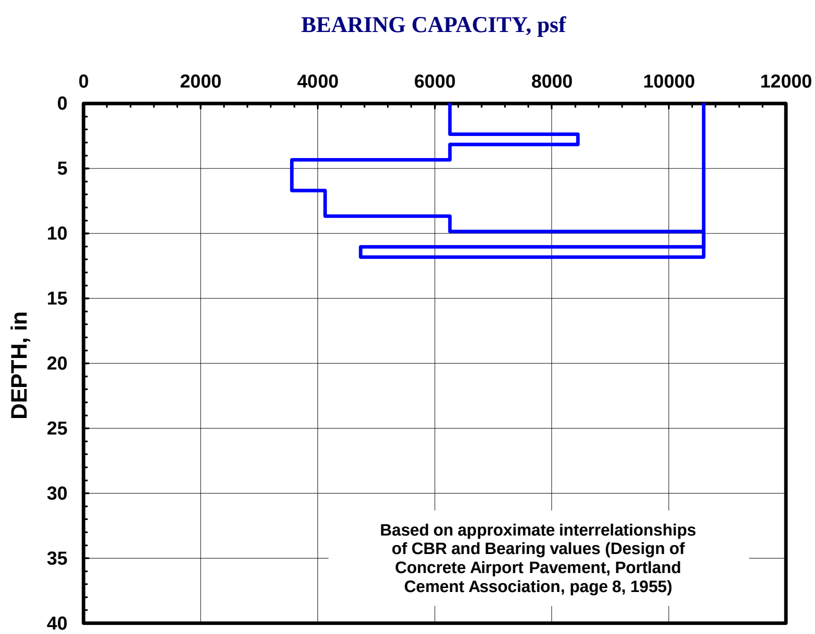

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File Name:

Project: *04135111* **Date:** 22-Feb-14
Location: BR-033 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
20	80	2
20	120	2
20	140	2
20	190	2
20	300	2
20	490	2
13	910	2
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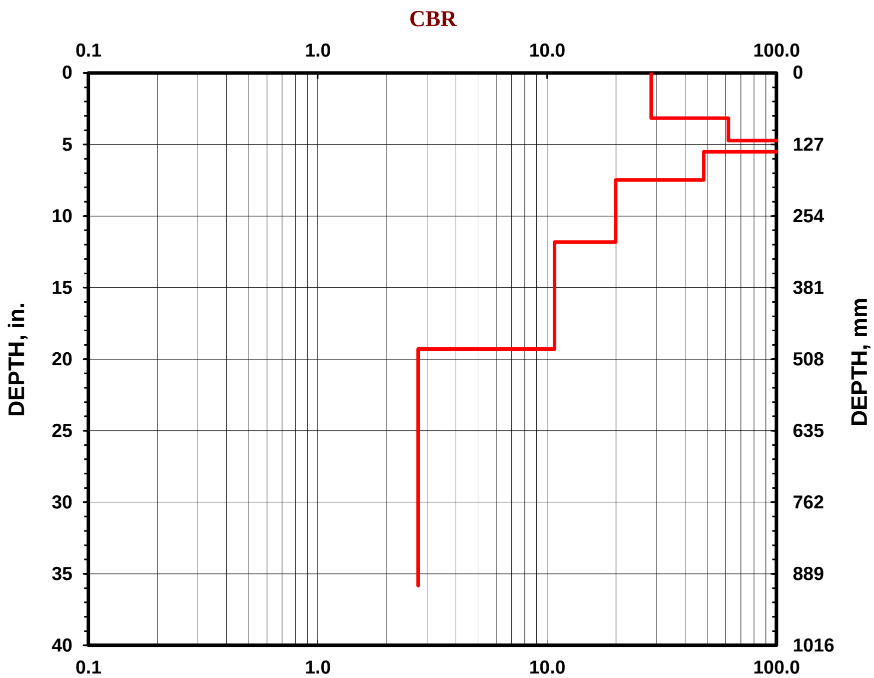

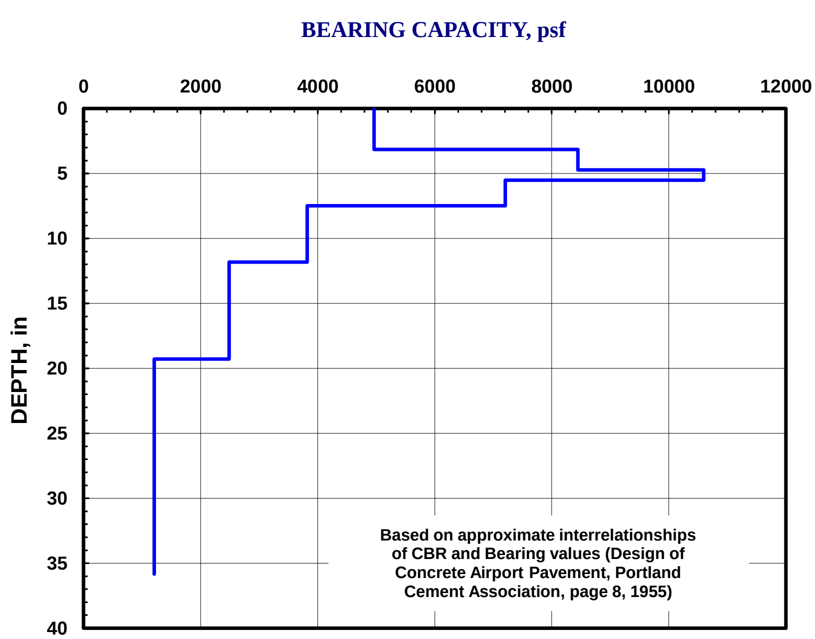

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-034

Date: 1-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	50	2
10	120	2
10	230	2
10	310	2
10	490	2
10	625	2
10	720	2
10	910	2
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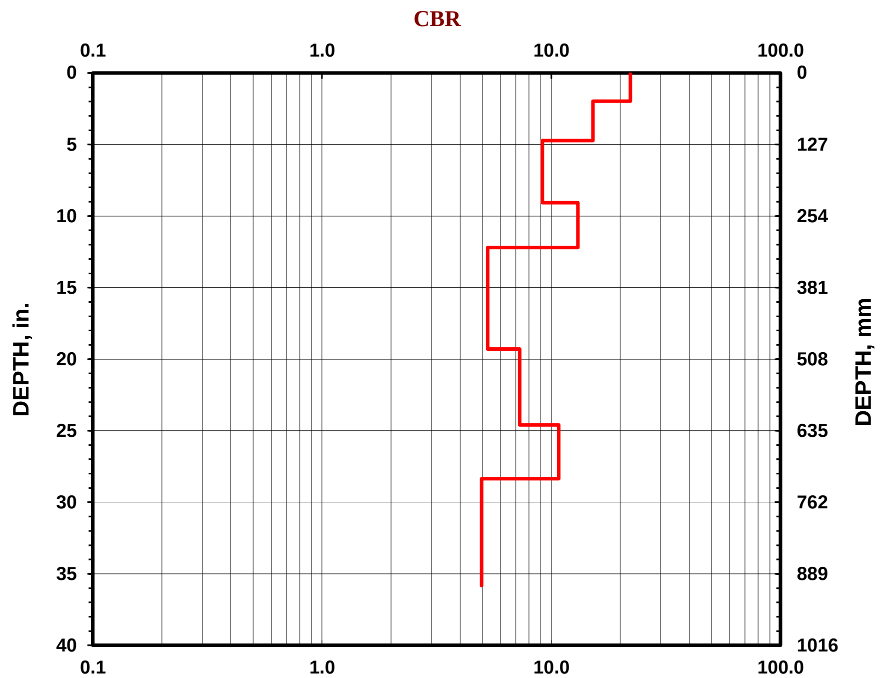

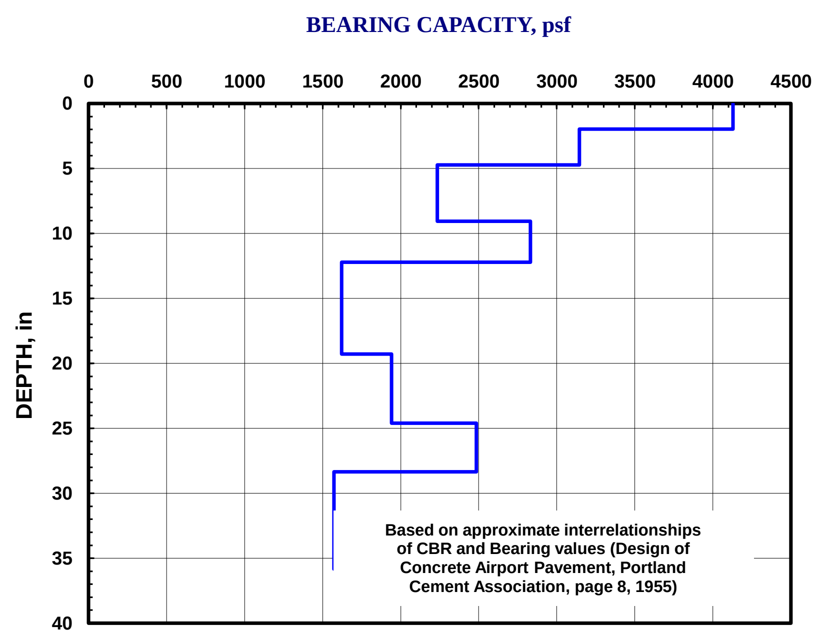

DCP TEST DATA

File Name:

Project: *04135111*
Location: BR-035

Date: 22-Feb-14
Soil Type(s): See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	40	2
20	80	2
20	130	2
20	220	2
20	510	2
22	910	2
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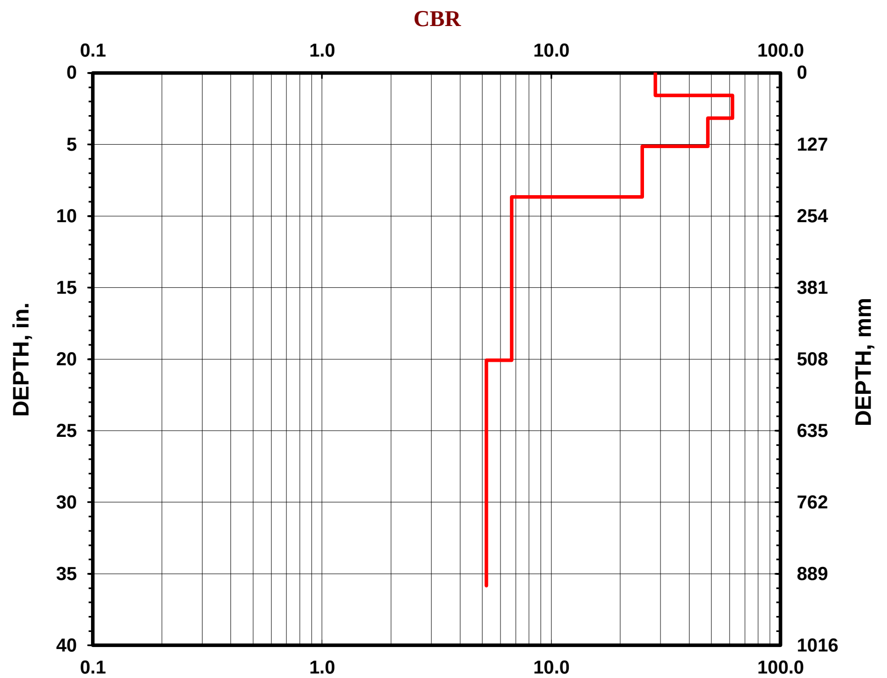

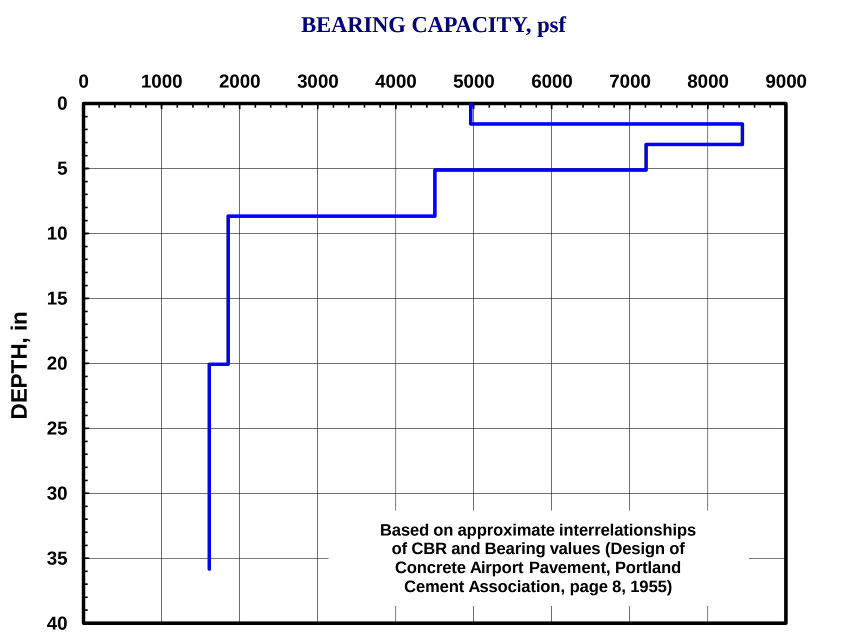

DCP TEST DATA

File Name:

Project: *04135111* **Date:** 1-Feb-14
Location: BR-036 **Soil Type(s):** See boring log

Hammer
- (●) 10.1 lbs.
- ( ) 17.6 lbs.
- ( ) Both hammers used

Soil Type
- ( ) CH
- ( ) CL
- (●) All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
10	60	2
10	100	2
10	135	2
10	180	2
10	240	2
10	330	2
10	670	2
6	910	2
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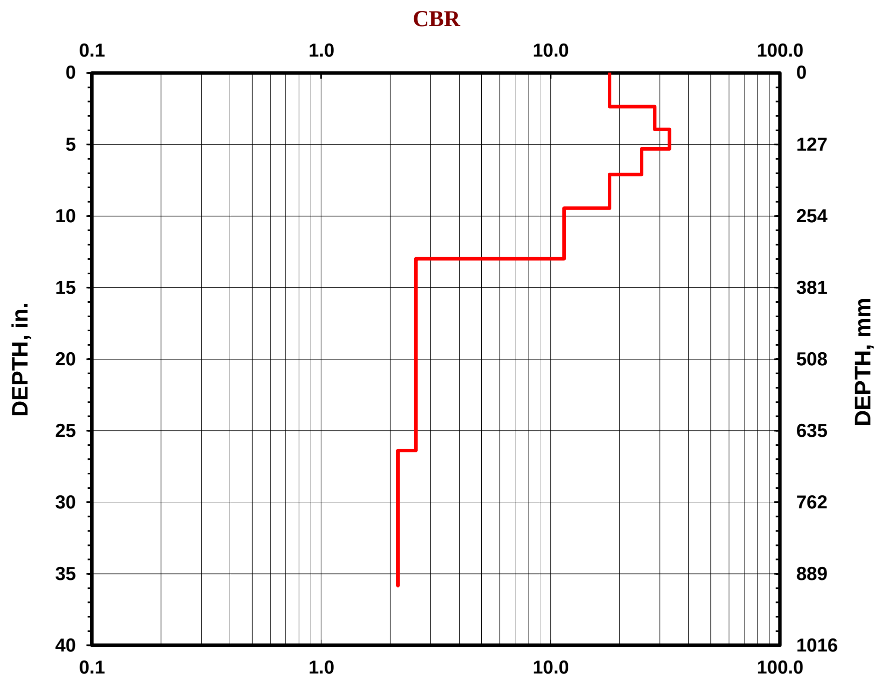

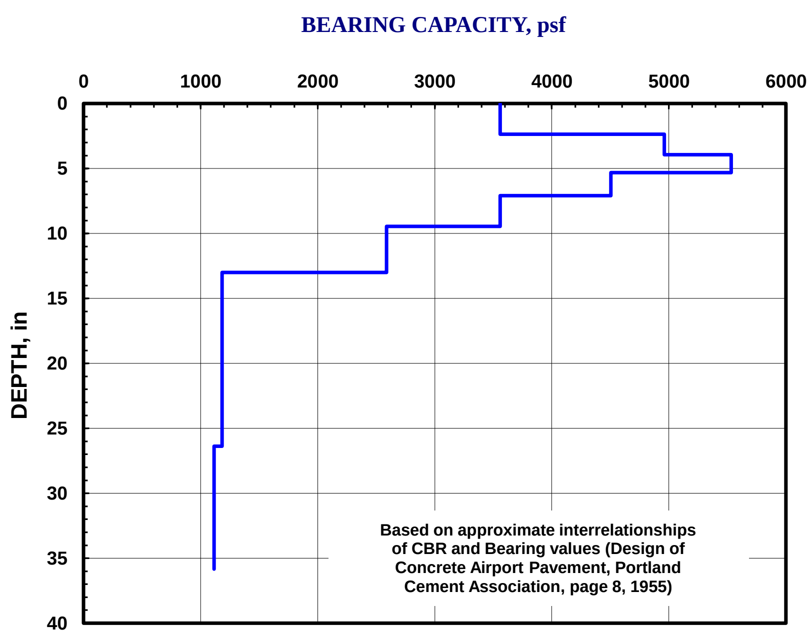

APPENDIX D

SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

Auger	Split Spoon
Shelby Tube	Macro Core
Ring Sampler	Rock Core
Grab Sample	No Recovery

WATER LEVEL

- **Water Initially Encountered**
- **Water Level After a Specified Period of Time**
- **Water Level After a Specified Period of Time**

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

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

[A] Based on the material passing the 3-in. (75-mm) sieve
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay
[E] $Cu = D_{60}/D_{10} \quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains $\geq$ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] $PI \geq 4$ and plots on or above "A" line.
[O] $PI < 4$ or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.

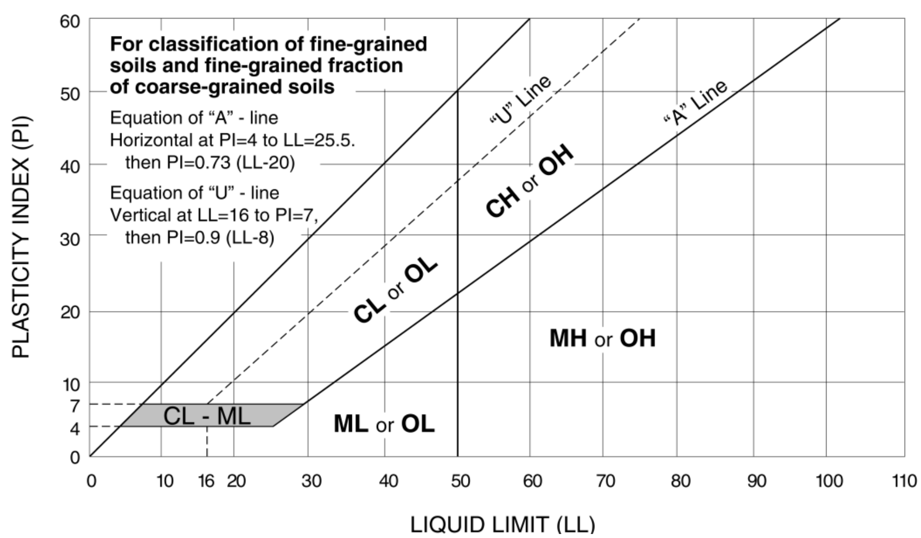

Exhibit D-2

GENERAL NOTES

Sedimentary Rock Classification

DESCRIPTIVE ROCK CLASSIFICATION:

Sedimentary rocks are composed of cemented clay, silt and sand sized particles. The most common minerals are clay, quartz and calcite. Rock composed primarily of calcite is called limestone; rock of sand size grains is called sandstone, and rock of clay and silt size grains is called mudstone or claystone, siltstone, or shale. Modifiers such as shaly, sandy, dolomitic, calcareous, carbonaceous, etc. are used to describe various constituents. Examples: sandy shale; calcareous sandstone.

LIMESTONE	Light to dark colored, crystalline to fine-grained texture, composed of $CaCo_3$, reacts readily with HCl.
DOLOMITE	Light to dark colored, crystalline to fine-grained texture, composed of $CaMg(CO_3)_2$, harder than limestone, reacts with HCl when powdered.
CHERT	Light to dark colored, very fine-grained texture, composed of micro-crystalline quartz ($Si0_2$), brittle, breaks into angular fragments, will scratch glass.
SHALE	Very fine-grained texture, composed of consolidated silt or clay, bedded in thin layers. The unlaminated equivalent is frequently referred to as siltstone, claystone or mudstone.
SANDSTONE	Usually light colored, coarse to fine texture, composed of cemented sand size grains of quartz, feldspar, etc. Cement usually is silica but may be such minerals as calcite, iron-oxide, or some other carbonate.
CONGLOMERATE	Rounded rock fragments of variable mineralogy varying in size from near sand to boulder size but usually pebble to cobble size (½ inch to 6 inches). Cemented together with various cementing agents. Breccia is similar but composed of angular, fractured rock particles cemented together.

PHYSICAL PROPERTIES:

DEGREE OF WEATHERING

Slight	Slight decomposition of parent material on joints. May be color change.
Moderate	Some decomposition and color change throughout.
High	Rock highly decomposed, may be extremely broken.

HARDNESS AND DEGREE OF CEMENTATION

Limestone and Dolomite:

Hard	Difficult to scratch with knife.
Moderately Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Soft	Can be scratched with fingernail.

Shale, Siltstone and Claystone

Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be easily dented but not molded with fingers.

Sandstone and Conglomerate

Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers.

BEDDING AND JOINT CHARACTERISTICS

Bed Thickness	Joint Spacing	Dimensions
Very Thick	Very Wide	>10′
Thick	Wide	3′ - 10′
Medium	Moderately Close	1′ - 3′
Thin	Close	2″ - 1′
Very Thin	Very Close	.4″ - 2″
Laminated	—	.1″ - .4″

Bedding Plane	A plane dividing sedimentary rocks of the same or different lithology.
Joint	Fracture in rock, generally more or less vertical or transverse to bedding, along which no appreciable movement has occurred.
Seam	Generally applies to bedding plane with an unspecified degree of weathering.

SOLUTION AND VOID CONDITIONS

Solid	Contains no voids.
Vuggy (Pitted)	Rock having small solution pits or cavities up to ½ inch diameter, frequently with a mineral lining.
Porous	Containing numerous voids, pores, or other openings, which may or may not interconnect.
Cavernous	Containing cavities or caverns, sometimes quite large.

Terracon