ARKANSAS DEPARTMENT OF TRANSPORTATION

SUBSURFACE INVESTIGATION

STATE JOB NO. 100942

FEDERAL AID PROJECT NO. STPLC-9227(71)

HWY. 351 RR OVERPASS (AIRPORT RD.) (JONESBORO) (S)

STATE HIGHWAY 351 **SECTION** 1

IN CRAIGHEAD **COUNTY**

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RESULTS of GEOTECHNICAL INVESTIGATION
ARDOT JOB 100942: HWY 351 RAILROAD OVERPASS (JONESBORO)(S)
JONESBORO, CRAIGHEAD COUNTY, ARKANSAS

INTRODUCTION

This report provides the results of the geotechnical investigation performed for the Hwy 351 over the Union Pacific Railroad (UPRR) railroad in Jonesboro, Craighead County, Arkansas. The project is designated as ARDOT Job No. 100942, Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S). The FAP No. is STPC-9227(71). This geotechnical investigation was authorized by the Michael Baker International, Inc. Subconsultant Agreement of September 14, 2017 and the Supplemental Agreement acknowledged by Grubbs, Hoskyn, Barton & Wyatt (GHBW) on January 27, 2019. Interim results and design recommendations have been provided throughout the course of this project.

The project has a total length of 3100 feet, with an alignment extending generally north from State Hwy 351 Log Mile 0.41 to Log Mile 1.03. The new alignment will be a two-lane roadway with an elevated grade separation over the Union Pacific Railroad main lanes. The elevated grade separation will be about 180 ft west of the current Hwy 351 at-grade rail crossing.

The project initially was to utilize a single-span composite plate girder structure with a total length of about 163 ft over the UPRR tracks. The initial geotechnical studies revealed a zone of soft and highly-compressible soils at the bridge location which limited embankment stability and mandated ground improvement. To avoid the embankment complications, the bridge design was modified to a seven-span structure with eight (8) bents. The current plans are for a continuous composite plate girder bridge with a total length of approximately 778 feet. For the

roadway embankment, simple slopes with nominal 3-horizontal to 1-vertical (3H:1V) slope configurations are planned.

The purposes of this phase of the geotechnical investigation were to explore subsurface conditions in the roadway and bridge alignment. The data developed through the field and laboratory studies were utilized to develop recommendations to guide design and construction of foundations, embankments, pavements, and earthwork. These purposes were achieved by a multi-phased study that has included:

- Drilling sample borings to evaluate subsurface conditions and to obtain samples for laboratory testing.
- Performing laboratory tests to establish pertinent engineering properties of the foundation and subgrade strata.
- Analyzing field and laboratory data to develop recommendations and conclusions for seismic site class, seismic design category/seismic performance zone, foundation design, embankment configurations, subgrade support, site grading, and construction considerations.

The relationship of these factors to design and construction of the roadway and new bridge and approaches has been considered in developing the recommendations discussed in the following report sections.

SUBSURFACE EXPLORATION

Subsurface conditions in the project alignment were evaluated by drilling a total of 27 sample borings to 10- to 150-ft depth. This total includes borings drilled for roadway, bridge foundations, and abutment walls. As noted, the bridge plans were revised from single-span, 163-ft structure with MSE abutment walls to a 778-ft, eight-span structure with simple slope embankments. Subsurface exploration for the initial study consisted of 18 borings drilled to 10- to 150-ft depth. After bridge plan revision, a supplemental subsurface exploration program consisting of nine (9) additional borings drilled to 78- to 120-ft depth was performed.

The site vicinity is shown on Plate 1. The approximate boring locations, for both project phases, are shown on the Plans of Borings, Plate 2. The boring logs are presented on Plates 3 through 50. The centerline station and offset of the boring locations and the inferred ground surface elevation are noted on the logs. The approximate boring surface elevation was inferred from the topographic information provided by the Engineer. It must be recognized that the elevations shown are approximate and actual elevations may vary. A key to the terms and symbols

used on the logs is provided as Plate 51. The subsurface exploration program is summarized on Plate 52. Preliminary bridge layouts are included as Plates 53 and 54.

To aid in visualizing subsurface conditions at the grade separation structure location, a generalized subsurface profile is provided in Appendix A. The stratigraphy illustrated by the profile has been inferred between discrete boring locations. In view of the natural variations in stratigraphy and conditions, variations from the stratigraphy illustrated by the profile should be anticipated.

The initial borings performed for this project (Borings 1 through 18) were drilled with truck-mounted SIMCO 2800 rotary-drilling rig using a combination of dry-auger and rotary-wash drilling methods. The supplemental borings (Borings 19 through 27) were drilled with a track-mounted CME 850X. Soil samples were typically obtained using a 2-in.-diameter split-barrel sampler driven into the strata by blows of a 140-lb automatic hammer dropped 30 in. as per Standard Penetration Test (SPT) procedures. The number of blows required to drive the standard split-barrel sampler the final 12 in. of an 18-in. total drive, or portion thereof, is defined as the Standard Penetration Number (N). Recorded N-values are shown on the boring logs in the "Blows Per Ft" column.

Selected undisturbed samples of cohesive soils were obtained using a 3-in.-diameter thin-walled tube hydraulically advanced into the soil. Undrained shear strength of the cohesive soils was estimated in the field using a calibrated hand penetrometer. Estimated shear strength values are plotted on the log forms, in tons per sq ft, as circles enclosing an "x". A hand-held vane shear device ("Torvane") was also utilized to estimate shear strength of very soft to soft cohesive soils. Where performed, these data are shown on the boring logs at the appropriate depth.

All samples were removed from sampling tools in the field, examined, and visually classified by a field geologist or geotechnical engineer. Samples were then placed in appropriate containers to prevent moisture loss and/or change in condition during transfer to our laboratory for further examination and testing.

Borings were advanced using dry-auger procedures to the extent possible to facilitate groundwater observations. Observations regarding groundwater are noted in the lower portion of each log and are discussed in subsequent sections of this report. All boreholes were backfilled after obtaining final water level readings.

LABORATORY TESTING

To evaluate pertinent physical and engineering characteristics of the subgrade and foundation soils, laboratory tests consisting of natural water content determinations, classification tests, shear strength measurements, and consolidation tests, were performed on selected representative samples. The laboratory testing program performed for the project alignment included the following.

- Soil water content (AASHTO T 265)
- Liquid limit, plastic limit, and plasticity index (AASHTO T 89 and T 90)
- Grain size analyses (AASHTO T 88)
- Unconsolidated-Undrained Triaxial Compression Tests (AASHTO T 296)
- Consolidated-Drained Direct Shear Tests (AASHTO T 236)
- One-Dimensional Consolidation Properties of Soils Using Incremental Loading (AASHTO T 216)
- Standard Proctor Test (AASHTO T 99)
- California Bearing Ratio (AASHTO T 193)

A total of 165 water content determinations were performed to develop information on *in-situ* soil water content in each boring. Water content results are plotted on the log forms in accordance with the scale and symbols shown in the legend located in the upper-right corner of the logs.

Atterberg (liquid and plastic) limit determinations were performed on 143 samples and 164 sieve analyses were performed on selected representative soil samples to evaluate soil plasticity and to verify field classification. The Atterberg limits are plotted on the logs as plus signs connected with a dashed line or denoted as Non-Plastic. The percentage by weight of soil passing the No. 200 sieve is noted in the "- No. 200%" column on the far right side of the log forms. A summary of classification test results and classification by the Unified Soil Classification System and AASHTO classification system is presented on Plates 1 through 9 of Appendix B. Grain-size distribution curves are also provided in Appendix B.

Soil shear strength was estimated in the field using hand penetrometer, SPT, and/or field vane shear results. Laboratory soil strength testing included three (3) unconfined compression and 34 unconsolidated-undrained triaxial compression tests. Undrained shear strength (cohesion) determined from the results of the compression tests is plotted at the appropriate depth, in tons per sq ft, as an open circle or open triangle, for unconfined compression and unconsolidated-

undrained triaxial compression tests, respectively. Unit dry weight and natural water content were also determined as a part of each strength test and are also reported on the logs.

Shear strength of on on-site soils was also measured by performing two (2) consolidated-drained direct shear tests. For the direct shear tests, an undisturbed soil sample was placed in a shear box, inundated with water and a normal (axial) load was applied. After consolidation, the sample was sheared at a rate sufficiently slow to prevent the development of excess pore pressure. This loading and shearing cycle was repeated with three (3) normal loads. The plot of shear stress versus normal stress could then be used to determine the angle of internal friction (φ') and the cohesion (c') intercept. The direct shear test results are presented in Appendix C.

The laboratory testing program also included five (5) one-dimensional consolidation tests. For the consolidation tests, an undisturbed soil sample was placed in a cell, inundated with water, and incrementally loaded. The deflection was measured with time until vertical movement had essentially stopped. At that point, another load increment was applied. After the completion of all loading cycles, the load was removed incrementally and rebound was measured. The consolidation test results are presented graphically as both change in height vs. vertical stress and change in void ratio vs. vertical stress in Appendix C.

Moisture-Density Relationship (Proctor) tests were performed on two (2) representative bulk samples. One (1) bulk sample each was obtained from the south side (near Boring 10) and the north side (near Boring 13) of the UPRR tracks. Pavement subgrade support properties were evaluated by performing two (2) California Bearing Ratio (CBR) tests (AASHTO T-193), with one (1) test performed for each bulk sample. To evaluate strength gain by addition of stabilization additive, one (1) CBR test was performed on each sample after the addition of 6 percent Portland cement by soil dry weight. For the CBR tests, the specimens were molded at approximately the optimum water content and 95 percent of the maximum dry density as determined by the corresponding laboratory Proctor tests. The Proctor and CBR test results are provided in Appendix D.

GENERAL SITE AND SUBSURFACE CONDITIONS

Site Conditions

The vicinity of the project alignment is shown on Plate 1. The Jonesboro, Arkansas alignment extends from Airport Road, north to intersect Highway 351 about 600 ft north of the

current at-grade rail crossing. The alignment area is an open field which has previously been used for agriculture. The terrain is flat and drainage is very poor. Ditches and tree lines parallel the existing railroad tracks. The ground surface is typically soft and access to truck-mounted equipment is difficult during wet weather.

Site Geology

The project site is located in the Mississippi Embayment Physiographic Province. The site vicinity is primarily within the mapped exposure of Quaternary Terrace Deposits, with the north end of the site in the mapped exposure of Pleistocene Silt and Sand. The Terrace deposits are flood-plain deposits comprising terraces of gravel, sand, silt and clay. The thickness of the Terrace deposits is variable. The Silt and Sand Deposits are flood-plain deposits comprised primarily of unconsolidated sand and silt with lenses of clay and gravel. The Terrace Deposits and Pleistocene Silt and Sand can be thick and typically lie over consolidated Tertiary sediments at varying depths. Bedrock (Paleozoic rock) in the Jonesboro area is reported to be about 1400 ft deep.

Seismic Conditions

Seismic Site Class. In light of the results of the borings performed for this study in 2018 and the surface geology of the alignment locale, a Seismic Site Class E (soft soil profile) has been determined for the planned bridge location. The seismic site class has been determined with respect to the criteria of the 2014 AASHTO LRFD Bridge Design Specifications[1].

Seismic Performance Zone / Seismic Design Category. Based on the planned railroad grade separation location and utilizing the General Procedure (code-based procedure) of the AASHTO LRFD seismic bridge design guides, the mapped 1.0-sec period spectral acceleration coefficient (S_1) for a Seismic Site Class B is 0.3 at the bridge location. This mapped S_1 value is based on a 7 percent chance of exceedance in 75 years (i.e., a mean return period of approximately 1000 years). The site coefficient (F_v) for S_1 adjusted for Seismic Site Class E is 2.8. Accordingly, the calculated design 1.0-sec period spectral acceleration coefficient (S_{D1}) with a Seismic Site Class E is 0.84 for the railroad overpass bridge location. Table 3.10.6-1 of the 2014 AASHTO LRFD Bridge Design Specifications indicates that a Seismic Performance Zone (SPZ) 4 is fitting for this location.

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1 AASHTO LRFD Bridge Design Specifications, AASHTO, 2014.

Design Peak Ground Acceleration (A_S).The code-based procedure of the AASHTO LRFD seismic bridge design guides indicates the Peak Ground Acceleration (PGA) having a 7 percent chance of exceedance in 75 years (or mean return period of approximately 1000 years) is predicted to be 0.65 for this location. For a Seismic Site Class E, the Site Coefficient for the PGA, F_{PGA} is determined to be 0.90. Consequently, a Design PGA (A_S) value of 0.59 for the railroad overpass bridge is considered appropriate in accordance with code-base procedure.

Design Earthquake Moment Magnitude (M_W). Based on the United States Geology Survey (USGS) Dynamic: Conterminous U.S. 2014 (v4.1.1) interactive deaggregation data[2], an earthquake moment magnitude (M_W) value of 6.9 is considered appropriate for the Highway 351 railroad overpass bridge alignment.

Liquefaction. Liquefaction analyses were performed to evaluate the liquefaction potential of the subsurface soils. The analyses were performed utilizing the results of the borings and the methodology and procedures proposed by Idriss and Boulanger[3] in 2008. A design PGA (A_S) value of 0.59, as per the site-specific seismic analysis, and an earthquake Moment Magnitude (M_W) of 6.9 were utilized.

The results of the liquefaction analyses are provided in Appendix E as plots of calculated factors of safety against liquefaction potential. The potentially liquefiable zones are indicated on the generalized subsurface profile also provided in Appendix E.

Subsurface Conditions

The results of the borings indicate that the subsurface conditions along the project alignment are highly variable. Below an upper 1 to 3 ft of very soft to firm clayey soils, the near-surface soil zones to about 15- to 30-ft depth are typically stiff to very stiff silty clay and clay units. Below these depths, firm to very stiff fine sandy clay, silty clay, and clay strata have interbedded units of loose to medium dense clayey fine sand and silty fine sand.

On the north end of the alignment, roughly north of approximately Sta 99+00, the predominantly clayey soil strata are underlain below about 60- to 95-ft depth by dense to very dense slightly silty fine to medium sand. To the south, i.e., downstation of Sta 99, the clayey soil strata of stiff to very stiff silty clay and clay extend deeper, though with some interbedded

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2 https://earthquake.usgs.gov/hazards/interactive/

3 "Soil Liquefaction during Earthquakes." Earthquake Engineering Research Institute, MNO-12, Idriss and Boulanger, 2008.

medium dense to dense silty fine sand and clayey fine sand units. Below about 95- to 100-ft depth, dense to very dense silty fine sand units are predominant.

Localized and discontinuous units of very weak and highly-compressible silty clay and clay were encountered below approximately 20-ft depth and extended to about 30- to 35-ft depth in the vicinity of Sta 100 to Sta 101+50. The silty clay and clay exhibit low shear strength and high compressibility.

A localized zone of very weak and highly compressible very soft to firm clayey silt and very loose to loose silt was also encountered between approximately Sta 97+50 and Sta 100. The low-strength silt units extend from about 18-ft depth to 35- to 38-ft depth. The weak clayey silt and silt are below groundwater levels and have some potential for liquefaction triggering.

The basal silty fine sand and fine to medium sand strata have high relatively density and low compressibility. The deeper stiff to very stiff silty clay and clay strata on the south end of the alignment are also relatively strong with low compressibility.

Groundwater Conditions

Groundwater observations are shown on the boring logs and the generalized subsurface profile. Groundwater levels will vary with seasonal precipitation, surface infiltration, and stream levels of nearby surface water features.

ANALYSES and RECOMMENDATIONS

Foundation Design

Foundations for the new grade separation structure must satisfy two (2) basic and independent design criteria: a) foundations must have an acceptable factor of safety against bearing failure under maximum design loads, and b) foundation movement due to consolidation or swelling and liquefaction of the underlying strata should not exceed tolerable limits for the structure. Construction factors, such as installation of foundations, excavation procedures and surface and groundwater conditions, must also be considered.

In light of the results of the borings and the anticipated moderate bridge foundation loads, we recommend deep foundation systems comprised of piling be utilized to support the foundation loads at the abutments and interior bents of the new bridges. Recommendations for piling are discussed in the following report sections.

Piling

We recommend the bridge foundation loads be supported on deep foundation systems comprised of steel shell piles. We understand that 18- or 24-in.-diameter steel shell piles are preliminarily planned. All steel shell piles will be filled with concrete after initial driving. Shear rings, shear studs, or other equivalents may be considered on the inside walls of the steel shells to enhance bonding between the concrete and the steel shells.

Nominal (ultimate) single pile capacity curves are provided for 18- and 24-in.-diameter steel shell piles are included in Appendix F. Nominal axial pile capacities have been developed using static pile capacity formulae, the results of the borings, and the plan pile cap bottom elevations shown on the preliminary bridge layout drawings. Soil shear strength was reduced in liquefiable zones. In addition, downdrag loads from embankment settlement and liquefaction were considered where appropriate.

For locations where there is the potential for liquefaction, three (3) potential earthquake scenarios / seismic conditions, characterized by respective soil shear strength parameters, were evaluated in developing axial pile capacity. These conditions include the following.

- Static Pre-Earthquake (Pre-Q) Scenario: This scenario evaluates a condition prior to the occurrence of design earthquake. Since the foundation soils have not liquefied, full shear strength is assumed for the foundation soils.
- Seismic End-of-Earthquake (EOQ) Scenario: This scenario models a condition immediately after occurrence of the design earthquake. The foundation soils are liquefied at this moment and full excess pore water pressure is generated. Consequently, residual shear strength of full liquefaction is utilized for the liquefied foundation soils. Downdrag is assumed to be mobilized on the piles by the liquefied soils and soils above the liquefied zone as a result of liquefaction settlement.
- Seismic Long-Term, Post-Earthquake (PQ) Scenario: This scenario analyzes a condition that the design earthquake has occurred for some time and some shear strength loss due to the earthquake liquefaction has been partially recovered. At this stage, the excess pore water pressure is assumed to be partially dissipated and settlement has stabilized. Residual shear strength of limited liquefaction is utilized for the liquefied foundation soils.

Based on AASHTO LRFD geotechnical design procedures, an effective resistance factor (φ_{stat}) of 0.35 is recommended for evaluation of factored compression capacity. For evaluation of factored uplift capacities, a resistance factor (φ_{up}) of 0.25 is recommended. These resistance factors are based on Strength Limit States. For Extreme Events Limit States such as earthquake

loading and collision, resistance factors of 1.0 for compression and 0.8 for uplift. Downdrag loads due to long-term embankment settlement and seismic (liquefaction) settlement have been considered in developing the nominal pile capacity curves.

The steel shell piles are expected to be driven some localized dense to very dense silty fine sand and fine to medium sand units. Jetting may be utilized to facilitate pile penetration to the plan pile tip elevation. Jetting is typically effective in granular soils. Final driving of the last 5 ft of penetration and any re-strikes should be performed using an impact hammer.

The nominal axial capacities are based on single, isolated foundations. Piles spaced closer than three (3) pile diameters may develop lower individual capacity due to group effects. The potential for group capacity reductions should be evaluated for pile spacing closer than three (3) diameters.

Battered piles can be utilized to resist lateral loads. The axial capacity of battered piles may be taken as equivalent to that of a vertical pile with the same tip elevation and embedment. Special driving equipment is typically required where pile batter exceeds about 1-horizontal to 4-vertical.

At this time, design ultimate pile capacity and plan tip elevation information is not available for use in driveability analyses. However, based on our experience on similar projects in the Craighead County area, we anticipate that a pile-hammer system with a minimum driving energy of 90 ft-kips will be warranted.

Piling Construction

In light of the uncertainties in subsurface conditions and the construction process, we recommend that test piles be installed at each bridge end and at the bents on each side of the rail crossing (i.e., Bents locations prior to final selection of production pile lengths. One (1) test pile should be installed at an abutment and at least one (1) test pile should be performed at an interior bent for each bridge. In general, test piles should have a length at least 10 ft longer than that anticipated for production piles.

Piles should be installed in compliance with Standard Specifications for Highway Construction, 2014 Edition, Section 805. Jetting is expected to be required for pile installation at Bent 1 of the Watt Street grade separation. Pile points are recommended at the pile tips to facilitate pile penetration.

Where jetting is to be utilized, containment of jetted materials must be provided unless approved by environmental agencies or other authorities. The final 5 ft of pile penetration must be achieved by impact hammers. Where jetting is used to facilitate pile penetration, the jetting pressure and flow rate through jet pipes will directly affect jetting effort. Excess flow and pressure can result in poor controllability and poor alignment of the pile being installed and/or misalignment and compromising of the adjacent piles. Too low water flow or pressure could make the jetting technique ineffective. The Contractor should have demonstrable experience in installing steel shell piles of similar sizes in subsurface conditions similar to those at this site. The Contractor must have appropriate equipment with sufficient jetting pressure / flow rate and adequate hammer energy to install piles to the plan tip elevation.

Safe bearing capacity of test piles and production piles should be determined by Standard Specifications for Highway Construction, 2014 Edition, Section 805.09, Method B. Driving records should be available for review by the Engineer or Department during pile installation.

Approach Embankments

Fill embankments will be utilized throughout the project alignment. Geosynthetics (uniaxial geogrid) are recommended to reinforce all embankments with height in excess of 12 feet. Stability analyses have been performed to evaluate and verify stability of the proposed embankment sections with respect to shear strength of geogrid-reinforced embankment fill for the maximum embankment height. An example special provision for geogrid and a reinforced embankment is provided in Appendix H. Analyses were also performed to verify the stability of unreinforced embankments with height less than 12 feet.

Stability analyses have been performed using the computer program SLOPE/W 2007[4] and a Morgenstern-Price analysis. These analyses included global stability for end slopes and side slopes. The loading conditions evaluated for the approach embankments included the following.

- End of construction condition with total stresses.
- Long term condition with effective stresses.
- Seismic condition with effective stresses. The analyses for the seismic condition have utilized a horizontal acceleration coefficient (k_h) value of one-half of the peak ground acceleration value.

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[4] Slope/W 2007; GEO-SLOPE International; March 2008.

As noted, geosynthetic (uniaxial geogrid) internal reinforcement is recommended for embankments with height in excess of 12 ft above final grade. For the purposes of the analyses, the internal reinforcement was assumed to be structural geogrids with a Long Term Design Strength (LTSD) of 1600 lbs/foot. The geogrid reinforcement was assumed to be spaced at 2-ft vertical intervals, starting from the subgrade surface and continuing to within 2 ft of the final grade. Laterally, the reinforcement in the new embankments has been assumed to extend from one side of the slope face to the opposite slope face. Geogrid reinforcement is considered to be warranted for all embankment heights in excess of 12 ft in the approaches.

Results of the stability analyses performed on various embankment sections for each structure are provided in Appendix G. The results of the analyses indicated suitable stability for all cases analyzed.

Maximum embankment heights on the order of 25 ft are anticipated. Given the predominance of cohesive soils in the embankment foundations, some consolidation settlement will occur.

Based on the results of the borings and the anticipated maximum embankment height, total settlement of the natural foundation soils below the embankments is estimated to be on the order of 2 inches. Settlement of cohesive fill in the embankments is expected to be on the order of 1 to 2 in. with 40 to 60 percent of the settlement occurring during construction. We recommend that embankment fill be placed as early in the construction sequence as possible to limit post-construction settlement after foundation construction.

Conclusions and Recommendations

Based on the results of the borings, the on-site subgrade soils are expected to be comprised primarily of silty clay and clayey silt. The AASHTO classification of the subgrade soils is expected to include A-4, A-6, and A-7-6 soils. Locally available borrow for use as unclassified embankment fill is expected to be comprised of similar soils. We recommend that all soils classifying as A-7-6 and soils with a plasticity index (PI) in excess of 18 be excluded from use as subgrade within 18 in. of the plan subgrade elevation. The top 18 in. of subgrade soils should have a maximum plasticity index (PI) of 18. The as-built pavement subgrade should be evaluated by the Engineer. Areas of unstable or otherwise unsuitable subgrade should be improved by undercut and replacement or treatment with additives approved by the Engineer.

Based on the results of the borings and laboratory CBR tests and correlation with the AASHTO classification of the anticipated subgrade soils, subgrade support is expected to be poor. The following parameters are recommended for use in pavement design.

- Resilient Modulus (M_R): 2550 lbs per sq inch
- R value: 4.6
- Modulus of subgrade reaction (k): 85 lb per sq in. per inch

Site Grading and Subgrade Preparation

Site grading and subgrade preparation should include necessary clearing and grubbing of trees and underbrush and stripping the organic-containing surface soils in work areas. All tree stumps must be completely excavated and stumpholes properly backfilled. The depth of stripping will be variable, with deeper stripping depths in the low-lying, poorly drained, and/or wooded areas, and less stripping required in the higher-terrain areas. In general, the stripping depth is estimated to be about 6 in. for open, unwooded areas, but may be 18 to 24 in. or more in the wooded tree lines that parallel the railroad. The zone of organic surface soils must be completely stripped in the embankment footprints.

Following stripping and grubbing, and prior to fill placement or otherwise continuing with subgrade preparation, the extent of weak and unsuitable soils should be determined. Proof-rolling is recommended to evaluate subgrade stability. Proof-rolling should be performed with a loaded tandem-wheel dump truck or similar equipment. Unstable soils exhibiting a tendency to rut and/or pump should be undercut and replaced with suitable fill. Care should be taken that undercuts, stump holes, and other excavations or low areas resulting from subgrade preparation are properly backfilled with compacted fill.

Based on the results of the borings, some undercuts will be required in the embankment alignment. Undercuts are expected to range from 2 to 3 ft below existing grades, more or less, along the length of the embankment. Required as-built depth of undercut will vary with seasonal site conditions and final grading plans. As-built undercut requirements must be field verified by the Engineer or Department. Undercuts for embankments may be backfilled with suitable embankment fill. All undercuts should extend beyond embankment toes a minimum lateral dimension equal to the undercut depth.

Should excavations or deeper undercuts encounter shallow perched water or seepage, or if areas of seepage are encountered during the work, backfill should consist of select granular fill

(AASHTO M 43, #57 stone), stone backfill (Standard Specifications for Highway Construction, 2014 Edition, Section 207), or clean aggregate (Standard Specifications for Highway Construction, 2014 Edition, Subsections 403.01 and 403.02 Class 3 mineral aggregate) extending up to an elevation above the inflow of seepage. In areas of seepage infiltration, the granular fill should be fully encapsulated with a filter fabric complying with Standard Specifications for Highway Construction, 2014 Edition, Subsection 625.02, Type 2.

Subgrade preparation in embankment areas, including undercuts, should extend a minimum lateral distance equal to the undercut depth or at least 5 ft for embankments over 10-ft high to the extent possible. Subgrade preparation in roadway areas should extend at least 3 ft outside pavement shoulder edges to the extent possible. Existing drainage features should be completely mucked out and all loose and/or organic soils removed prior to fill placement.

General fill and backfill may consist of unclassified borrow free of organics and other deleterious materials as per Standard Specifications for Highway Construction, 2014 Edition, Subsection 210.06. Because of the project location in an area of high seismic potential, we recommend the use of cohesive embankment fill for the embankment. The use of clayey embankment soils will improve seismic response of the earthen structure. An example special provision for cohesive embankment fill is provided in Appendix I.

Subgrade preparation should comply with Standard Specifications for Highway Construction, 2014 Edition, Section 212. Embankments should be constructed in accordance with ARDOT criteria (Standard Specifications for Highway Construction, 2014 Edition, Section 210). Fill and backfill should be placed in nominal 6- to 10-in.-thick loose lifts. All fill and backfill must be placed in horizontal lifts. Where fill is placed against existing slopes, short vertical cuts should be "notched" in the existing slope face to facilitate bonding of horizontal fill lifts. The in-place density and water content should be determined for each lift of backfill and fill and should be tested to verify compliance with the specified density and water content prior to placement of subsequent lifts.

CONSTRUCTION CONSIDERATIONS

Positive surface drainage should be established at the start of the work, be maintained during construction and following completion of the project to prevent surface water ponding and subsequent saturation of subgrade soils. Density and water content of all earthwork should be

maintained until the embankments and bridge work is completed. Subgrade soils that become saturated by ponding water or runoff should be excavated to undisturbed soils. The embankment subgrade should be evaluated by the Engineer during subgrade preparation.

Groundwater was encountered at 14 to 25 ft at the time of the field studies in late 2017 and December 2018/January 2019. Nevertheless, shallow perched groundwater could be encountered locally. Seepage into shallow excavations and cuts can typically be controlled by ditching or sump-and-pump methods. If seepage into excavations becomes a problem, backfill should consist of (AASHTO M 43, #57 stone), stone backfill (Standard Specifications for Highway Construction, 2014 Edition, Section 207), or clean aggregate (Standard Specifications for Highway Construction, 2014 Edition, Subsections 403.01 and 403.02 Class 3 mineral aggregate) to an elevation above the inflow of seepage. In areas of seepage infiltration, the granular fill should be fully encapsulated with a filter fabric complying with Standard Specifications for Highway Construction, 2014 Edition, Subsection 625.02, Type 2 and vented to positive discharge.

Piles should be installed in compliance with Standard Specifications for Highway Construction, 2014 Edition, Section 805. Piles should be carefully examined prior to driving and piles with structural defects should be rejected.

Pile installation should be monitored by qualified personnel to maintain specific and complete driving records and observe pile installation procedures. Driving records should be available for review by the Engineer or Department during pile installation. Compatible driving equipment should be utilized based on the results of drivability analyses performed by the Department or Engineer based on the Contractor's proposed pile-hammer system. Blow counts on steel piles should be limited to about 20 blows per inch. As-built pile capacities should be evaluated by use of wave equation analysis of piles (WEAP) in accordance of Standard Specifications for Highway Construction, 2014 Edition, Section 805.09, Method B.

The Piling Contractor should have demonstrable experience in installing steel shell piles of similar sizes in subsurface conditions similar to those at this site. The Contractor should have appropriate equipment with sufficient jetting pressure/flow rate and adequate hammer energy to install piles to the plan tip elevation.

CLOSURE

The Engineer, Department, or a designated representative thereof should monitor site preparation, grading work, ground improvements, and all foundation and embankment construction. Subsurface conditions significantly at variance with those encountered in the borings should be brought to the attention of the Geotechnical Engineer. The conclusions and recommendations of this report should then be reviewed in light of the new information.

The following illustrations are attached and complete this submittal.

Plate 1	Site Vicinity Map
Plate 2	Plan of Borings
Plates 3 through 50	Boring Logs
Plate 51	Key to Terms and Symbols
Plate 52	Summary of Subsurface Exploration
Plates 53 and 54	Preliminary Bridge Layouts
Appendix A	Generalized Subsurface Profile
Appendix B	Classification Test Results
Appendix C	Soil Strength and Compressibility Test Results
Appendix D	Compaction and Subgrade Support Test Results
Appendix E	Liquefaction Analysis Results
Appendix F	Nominal Pile Capacity Curves
Appendix G	Stability Analysis Results
Appendix H	Geogrid Reinforced Embankment Special Provision
Appendix I	Cohesive Embankment Fill Special Provision

* * * * *

We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this report, or if we may be of additional assistance during final design or construction, please call on us.

Sincerely,

GRUBBS, HOSKYN,
BARTON &WYATT, INC.

STATE OF ARKANSAS REGISTERED PROFESSIONAL ENGINEER No. 7791 MARK E. WYATT

Mark E. Wyatt, P.E.
President

JKB/BJD/MEW:jw

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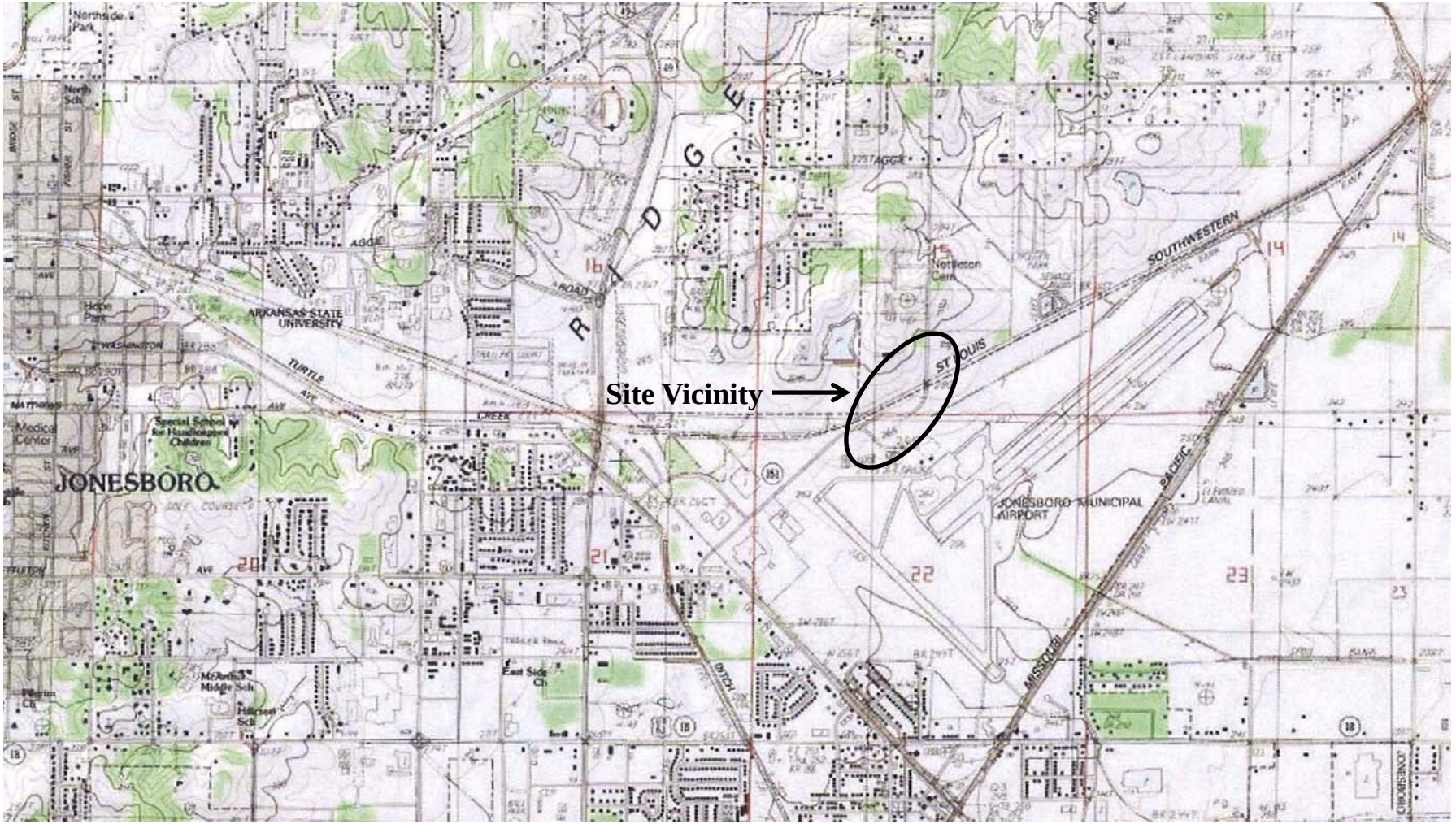
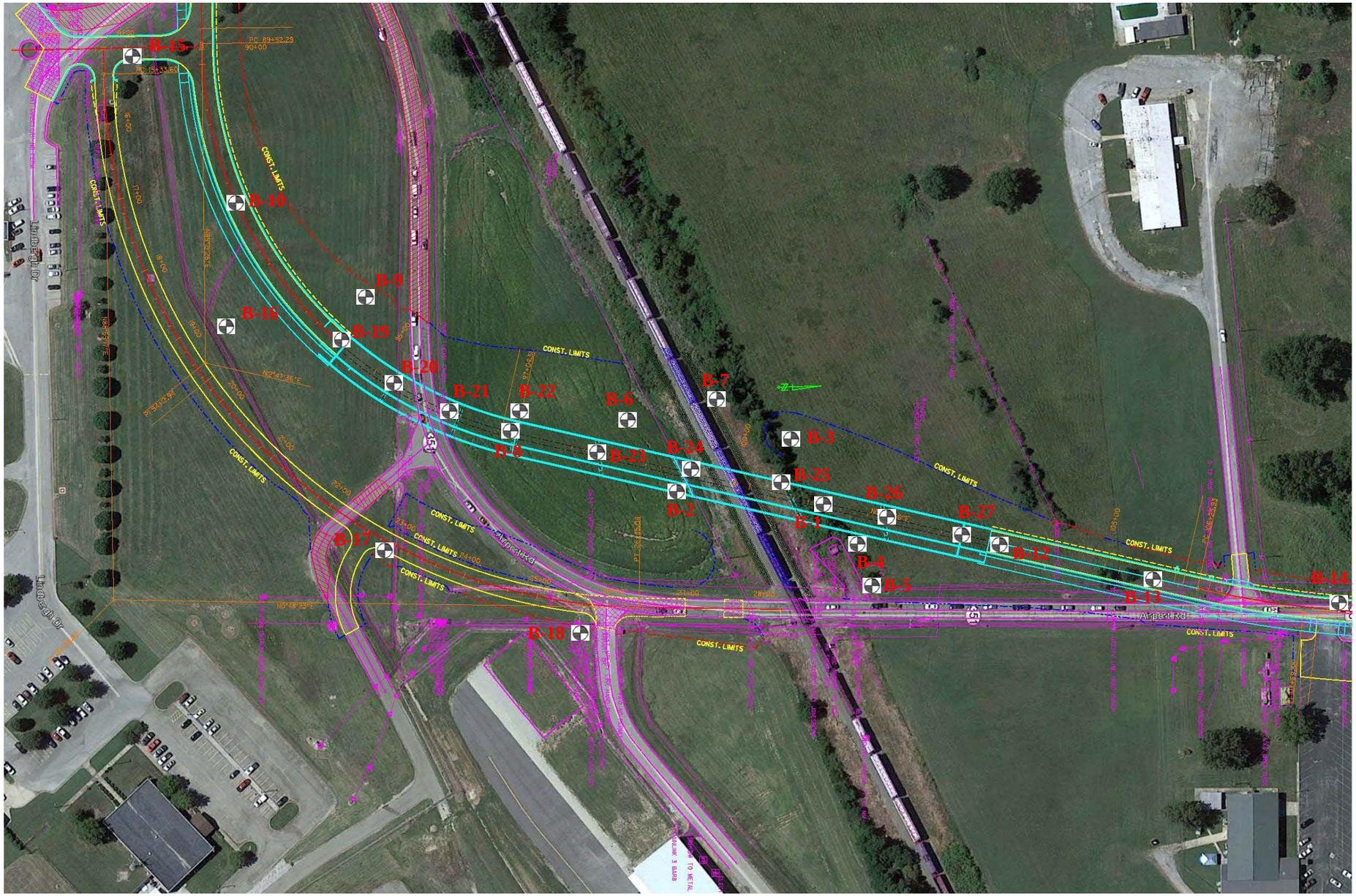
Attn: Mr. Byron Lawrence, P.E. (1-email)
Attn: Mr. Stephen Ross, P.E. (1-email)



Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**Site Vicinity Map** **ARDOT 100942 HWY 351 RR Overpass (Jonesboro) (S)** **Jonesboro, Craighead County, Arkansas**	**Job No. 17-127**	**Plate 1**

NOTE:
Boring 11 at
Sta 88+50, CL



Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**PLAN OF BORINGS** **ARDOT 100942 Hwy 351 RR Overpass** **Jonesboro, Arkansas**	**Scale: As Shown** **Date: December 2018**	**Job No. 17-122**	**PLATE 2**

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 1

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 101+20, CL

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	SURF. EL: 281±			
	Firm to stiff brown and tan silty clay w/occasional organics	10		
5	Stiff grayish brown silty clay w/occasional ferrous stains - with trace organics to 4 ft - grayish brown and gray with occasional silt pockets and more ferrous stains from 4 to 6 ft	12		97
10	- grayish brown with occasional ferrous nodules below 6 ft - grayish brown and reddish tan with occasional organic stains below 9 ft	14		
15	- very stiff below 13 ft		99	
	- water at 18 ft			
20	Very soft brown silty clay	0/WOH		97
25	- soft from 23 to 28 ft	6		
30	- very soft below 28 ft	0/WOH		99
35	Very soft brownish yellow fine sandy clay w/occasional ferrous nodules	0/WOH		55
40	Stiff reddish brown and reddish tan silty clay	13		91
45	Stiff reddish brown and gray silty clay, slightly sandy w/occasional silt pockets		95	86
50	Medium dense reddish tan clayey fine sand w/trace fine gravel	15		28
55	Dense reddish tan silty fine sand w/a little fine gravel	35		16
60	Stiff gray and brownish gray silty clay, blocky and occasional slickensided - firm to stiff at 63 to 68 ft	20 10		

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT + WATER CONTENT ● LIQUID LIMIT +

10 20 30 40 50 60 70

COMPLETION DEPTH: 150.0 ft
DATE: 11-1-17

DEPTH TO WATER IN BORING: 18 ft

DATE: 11/1/2017

LGBNEW 17-127.GPJ 1-30-19

PLATE 3

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 1

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 101+20, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (continued)	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
70			- very stiff with occasional silt partings from 68 to 73 ft		104	1.85	99
75			- stiff with occasional ferrous stains below 73 ft	16			
80			Dense brown and tan fine to medium sand, slightly silty	42			6
85				35			
90			- tan and reddish tan below 88 ft	31			6
95			- dense to very dense below 93 ft - brownish gray and reddish tan from 93 to 105 ft	50/8"			
100				50/7"			
105			- brownish gray below 105 ft				
110				50/6"			
115							
120				50/5"			
125				50/5"			8

COMPLETION DEPTH: 150.0 ft
DATE: 11-1-17

DEPTH TO WATER IN BORING: 18 ft

DATE: 11/1/2017

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 1

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 101+20, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
135							
140				50/5"			
145							
150				50/4"			
155							
160							
165							
170							
175							
180							
185							
190							

COMPLETION DEPTH: 150.0 ft
DATE: 11-1-17

DEPTH TO WATER IN BORING: 18 ft

DATE: 11/1/2017

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 2

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 99+30, 25 ft Rt

SURF. EL: 274±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Firm brown and gray silty clay w/occasional ferrous nodules and trace organics	9		
5	Very stiff grayish brown and reddish tan silty clay w/occasional ferrous stains and nodules		104	96
	- with occasional ferrous concretions below 6 ft		103	
10	Stiff gray and brownish gray silty clay w/occasional ferrous stains, nodules and concretions	18		96
15	Very stiff brownish yellow silty clay w/occasional ferrous nodules		100	99
20	Very soft reddish brown clayey silt, wet	2		92
25	- grayish brown with more clay from 23 to 26 ft	4		99
30	- reddish brown below 28 ft	2		95
35	- with occasional ferrous nodules below 33 ft	0/WOH		
40	Stiff brown, gray and reddish tan silty clay w/occasional silt pockets and ferrous stains, nodules and concretions	11		89
45	- firm to stiff, dark brown below 43 ft	10		
50	Stiff brownish yellow fine sandy clay	11		61
	- very stiff, reddish brown, gray and	34		

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT

10 20 30 40 50 60 70

COMPLETION DEPTH: 150.0 ft
DATE: 10-31-17

DEPTH TO WATER IN BORING: 18 ft

DATE: 10/31/2017

LGBNEW 17-127.GPJ 1-10-19

PLATE 6

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 2

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 99+30, 25 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (continued)	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			reddish tan with occasional ferrous stains below 53 ft				
60			Stiff light gray and reddish tan silty clay w/silty clay seams and layers	22			92
65			Dense to very dense brownish gray and reddish tan silty fine sand w/occasional medium sand and trace fine gravel	50/9"			
70			- with occasional fine sandy clay pockets from 68 to 72 ft	50/8"			15
75			Dense to very dense brownish gray fine to medium sand, slightly silty w/trace fine gravel	50/7"			
80				50/11"			
85				50/8"			7
90				50/10"			
95				50/8"			
100			- medium dense to dense from 96 - 105 ft	30			
105			- dense to very dense with more medium sand below 105 ft				
				50/9"			4

COMPLETION DEPTH: 150.0 ft
DATE: 10-31-17

DEPTH TO WATER IN BORING: 18 ft

DATE: 10/31/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 2

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 99+30, 25 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
115							
120		X		50/7"			
125							
130		X		50/7"			
135							
140		X		50/7"			
145							
150		X		50/7"			
155							
160							

COMPLETION DEPTH: 150.0 ft
DATE: 10-31-17

DEPTH TO WATER IN BORING: 18 ft

DATE: 10/31/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 3

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 100+60, 70 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 280±				
			Firm tan and brown clayey silt	8			94
5			Stiff tan and brown silty clay	13	101		93
10				16			
15			Stiff to very stiff gray and yellowish tan silty clay		102		99
			- water at 18 ft				
20			Very soft tan and brown silty clay, wet		80		100
25					94		
30					80		99
35							
40			Medium dense tan and gray clayey fine sand w/occasional clay pockets	16			47
45			Stiff tan and gray clay w/occasional organic stains	15			
50				11			100

COMPLETION DEPTH: 50.0 ft
DATE: 11-1-17

DEPTH TO WATER IN BORING: 18 ft

DATE: 11/1/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 4

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 101+80, 35 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 281±				
			Soft tan and brown clay	6			
			- gray, tan and brown below 2 ft - very stiff at 2 to 4 ft		96	2.12	98
5			- stiff below 4 ft	16			
			Stiff gray, tan and brown silty clay		103	T = 1.0 tsf	95
10				13			
			Very stiff yellowish tan silty clay				99
15							
			Very soft to soft tan and brown silty clay, wet		91		99
20			- water at 19 ft				
			- soft with clayey silt seams and layers from 23 to 28 ft		95	T = 0.25 tsf	100
25							
			- firm below 28 ft		87		
30							
35							91
			Stiff light gray and tan fine sandy clay w/clayey fine sand seams	11			62
40							
45			Stiff gray and tan clay w/silt pockets	17			
			Firm to stiff brown and tan silty clay				
50				10			

COMPLETION DEPTH: 50.0 ft
DATE: 11-1-17

DEPTH TO WATER IN BORING: 19 ft

DATE: 11/1/2017

LGBNEW 17-127.GPJ 1-30-19

PLATE 10

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 5

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 25 ft /Wash

LOCATION: Approx Sta 102+00, 90 ft Rt

SURF. EL: 279±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Stiff brown clayey silt	13		
	Very stiff gray, tan and brown silty clay w/occasional ferrous nodules and stains		96	94
5	- stiff from 4 to 6 ft	21		
	- very stiff from 6 to 8 ft			
	- stiff below 8 ft			
10		20		94
15				
20	Firm tan and brown silty clay		97	99
	- very soft from 23 to 28 ft			
25	- water at 25 ft			
	- firm below 28 ft			
30		9		
35	Firm tan fine sandy clay, silty w/occasional ferrous stains and nodules		109	67
	Firm gray and brown silty clay, slightly sandy w/occasional clay pockets and ferrous nodules	9		89
45	Dense gray and tan clayey fine sand, silty w/occasional clay pockets	30		50
50		34		

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT

10 20 30 40 50 60 70

COMPLETION DEPTH: 50.0 ft
DATE: 11-2-17

DEPTH TO WATER IN BORING: 25 ft
DATE: 11/2/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 6

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Appro Sta 98+45, 50 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 273±				
			Firm brown clayey silt w/organics	8			
			Firm gray and tan silty clay w/silt pockets and occasional ferrous nodules		100	2.23	94
5			- very stiff with occasional clay seams from 2 to 4 ft	17	99		
			- stiff below 4 ft				
10			- with more ferrous nodules and stains below 9 ft	16			
			Very stiff yellowish tan silty clay		103	1.91	99
15							
20			- water at 19 ft	4			95
			Very soft gray and brown clayey silt				
25			- tan and brown below 24 ft		85		98
			Very soft tan and brown silty clay	3			
30							
35			Stiff gray and brown silty clay, slightly sandy				88
40			Very soft reddish tan and gray fine sandy clay w/ferrous stains	2			74
45			Firm gray and brown silty clay	7			
			Dense gray and tan clayey fine sand w/occasional clay pockets		118		49
50							
55			- dense to very dense below 53 ft	50/9"			
			Dense to very dense tan fine sand				
60				50/9"			

COMPLETION DEPTH: 60.0 ft
DATE: 11-2-17

DEPTH TO WATER IN BORING: 19 ft
DATE: 11/2/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 7

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 19 ft /Wash

LOCATION: Approx Sta 99+55, 110 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 273±				
			Firm to stiff gray and brown silty clay	10			
			- stiff below 2 ft	14			
5			- very stiff from 4 to 6 ft		100		96
			- with occasional ferrous nodules and stains below 4 ft	11			
			- stiff with more ferrous nodules and stains below 6 ft	10			
10							
15							98
			Firm gray and tan silty clay, wet	9			
20			- water at 19 ft				
			- tan and brown below 23 ft		90	T =0.5 tsf	99
25							
			- soft below 28 ft	6			
30							
			Very stiff tan and brown silty clay, sandy		106		
35			- firm below 36 ft				
				9			
40			Loose reddish tan, gray and tan silty fine sand w/a little fine gravel and occasional fine sand seams, slightly clayey with numerous ferrous stains				
45			- dense below 43 ft	37			44
			Firm to stiff gray and brown fine sandy clay				
50				10			
			Medium dense gray and reddish tan clayey fine sand w/fine sand pockets and ferrous stains				
55				15			15
			Medium dense gray and tan silty fine sand w/a little fine to coarse gravel				
60			- dense with clayey fine sand seams below 58 ft	43			

COMPLETION DEPTH: 60.0 ft
DATE: 11-3-17

DEPTH TO WATER IN BORING: 19 ft
DATE: 11/3/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 8

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 25 ft /Wash LOCATION: Approx Sta 97+00, CL

SURF. EL: 269±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Firm gray, brown and tan silty clay	8		
	- gray below 1 ft	21		
5	Stiff reddish tan and gray clay w/ferrous nodules and stains			
	- very stiff from 4 - 6 ft	12		
	- tan and brown with more ferrous nodules below 6 ft		105	98
10	- stiff from 6 - 8 ft			
	- very stiff to hard, gray and reddish tan below 8 ft			
15		14		
	Medium dense tan and brown silt, slightly clayey w/ferrous stains			
20	- damp below 18 ft		97	98
	- water at 22 ft			
25	- loose below 24 ft	7		99
	Firm grayish brown silty clay		99	100
30				
	- very soft below 33 ft	WOH		
35				
40	Stiff reddish tan and gray silty clay w/ferrous stains and silt seams			93
		15		
45				
		14		
50				
55	Stiff to very stiff gray and tan fine sandy clay			53
	- stiff below 56 ft			
60		16		
65	Very soft gray, tan and brown silty clay, sandy w/ferrous stains	2		72
	- stiff below 68 ft			
70		20		
75	Dense reddish tan silty fine sand, slightly clayey w/clayey fine sand seams and a little fine to coarse gravel	47		18

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT: 10 20 30 40 50 60 70

2.15

-NON-PLASTIC-

COMPLETION DEPTH: 75.0 ft
DATE: 11-3-17

DEPTH TO WATER IN BORING: 22 ft
DATE: 11/3/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 9

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger

LOCATION: Approx Sta 94+70, 65 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 268±				
			Medium dense brown and tan fine sandy silt, slightly clayey	14			
			Very stiff gray and tan silty clay w/occasional silt pockets and ferrous nodules and stains	26			
5				27			
				25			
			- with more ferrous nodules below 8 ft	30			
10							
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry

DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 10

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger LOCATION: Approx Sta 92+00, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 266±				
			Medium dense brown fine sandy silt, slightly clayey				
			Stiff gray and tan silty clay w/occasional ferrous nodules and stains	14			91
			- with clay seams and layers from 2 to 4 ft				95
			- very stiff below 4 ft				
5				36			
			- with more ferrous nodules below 6 ft				
				33			
				24			
10							
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry

DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 11

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger LOCATION: Approx Sta 88+50, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 269±				
			Stiff brown clayey silt, sandy	14			74
			Stiff gray and tan silty clay w/numerous ferrous stains and occasional ferrous nodules	16			87
			- very stiff below 4 ft	28			
5			- with more ferrous nodules below 6 ft	30			
				30			
10							
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry

DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 12

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger LOCATION: Approx Sta 103+60, CL

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	SURF. EL: 286±			
	Stiff brown clayey silt w/organics	14		
	Stiff tan and brown silty clay w/occasional silt pockets	19		
5	- very stiff from 4 to 6 ft		104	96
	- stiff from 6 to 8 ft	14		
	- very stiff from 8 to 13 ft		102	
10				
	- stiff below 13 ft	17		99
15				
20	Soft to firm gray and tan silty clay			
	- water at 23 ft			
25	- very soft below 24 ft			99
		WOH		
30				
		2		
35				
	Stiff gray and tan fine sandy clay w/occasional ferrous nodules and stains	12		59
40				
	Dense to very dense reddish tan clayey fine sand w/some fine to coarse gravel and occasional clay pockets	50/9"		
45	NOTE: Boring caved at 6 ft at 24 hours.			

COHESION, TON/SQ FT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT: 10 20 30 40 50 60 70

COMPLETION DEPTH: 45.0 ft
DATE: 11-2-17

DEPTH TO WATER IN BORING: 23 ft
DATE: 11/2/2017

LGBNEW 17-127.GPJ 1-10-19

PLATE 18

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 13

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger LOCATION: Approx Sta 105+65, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 287±				
			Stiff to very stiff gray and tan silty clay w/occasional ferrous nodules and stains	24			98
			- very stiff with some silt pockets at 2 to 4 ft	42			
			- stiff, reddish tan below 4 ft	22			
5				18			
				21			
10							
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry
DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 14

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger LOCATION: Approx Sta 108+20, 10 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 297±				
			2 inches: Asphalt Concrete				
			Stiff to very stiff brown silty clay, slightly sandy w/a little fine to coarse gravel (fill)	24			76
			Stiff gray and tan silty clay w/occasional ferrous nodules and stains	18			69
5				16			
				15			
			- with more ferrous nodules below 8 ft				
				13			
10							
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry

DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

PLATE 20

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 15

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger LOCATION: Approx Sta 90+00, 85 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 266±				
			Stiff gray and tan silty clay w/occasional ferrous nodules and stains	22			94
			- with some silt pockets below 2 ft	11			
5			- very stiff with more ferrous nodules below 4 ft	31			
				27			
			- stiff below 8 ft	21			
10							
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry
DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 16

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger LOCATION: Approx Sta 93+40, 100 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 266±				
			Firm to stiff tan clayey silt, slightly sandy	10			91
			Stiff to very stiff gray and tan silty clay w/occasional ferrous nodules and stains	24			
5				25			
				24			
			- with more ferrous nodules below 8 ft	20			
10							
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry
DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 17

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger

LOCATION: Approx Sta 96+00, 200 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 264±				
			Firm gray and tan fine sandy clay, silty w/occasional silt pockets	9			69
			- stiff below 2 ft	11			
5			Stiff gray, reddish tan and tan silty clay w/some ferrous nodules and stains	14			
				16			
10				17			
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry

DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 18

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger LOCATION: Approx Sta 98+50, 240 ft Rt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 268±				
			Very stiff gray, brown and tan silty clay, slightly sandy w/some fine to coarse gravel, dry (fill)	25			51
				24			
			Stiff gray and tan silty clay w/silt pockets and occasional ferrous nodules and stains				
5				16			96
			- firm to stiff, gray, reddish tan and tan below 6 ft	9			
				10			
10							
15							

COMPLETION DEPTH: 10.0 ft
DATE: 10-26-17

DEPTH TO WATER IN BORING: Dry
DATE: 10/26/2017

LGBNEW 17-127.GPJ 1-10-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 19

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 23 ft /Wash

LOCATION: Approx Sta 94+46, 5 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 266±				
			10 inches: Soft dark brown and gray clayey silt w/rootlets and occasional organics (topsoil)	8			94
			Firm brownish gray, gray and tan clay - stiff below 2 ft	16			
5			Stiff to very stiff gray and tan silty clay w/some silt seams and layers - with silt pockets below 4 ft		103		95
			- gray, tan and reddish tan with some ferrous nodules below 8.5 ft	24			
10							
			- with occasional ferrous stains below 13.5 ft	32			
15							
					97		
20							
				16			
			Medium dense brownish gray, reddish tan and tan silt w/silty clay seams and ferrous stains				
25							
						-NON-PLASTIC-	
30					102		99
35				12			
			Stiff gray and reddish tan silty clay w/silty fine sand seams	17			
40			Stiff gray, tan and reddish tan fine sandy clay w/silt pockets and seams and ferrous stains				
					113		67
45				11			

COMPLETION DEPTH: 120.0 ft
DATE: 1-5-19

DEPTH TO WATER IN BORING: 23 ft

DATE: 12/7/2018

LGBNEW 17-127.GPJ 1-30-19

PLATE 25

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 19

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 23 ft /Wash

LOCATION: Approx Sta 94+46, 5 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
55			Firm to stiff reddish tan and gray silty clay, slightly sandy w/organic stains	10			
			- stiff below 58 ft	20			86
60							
65			Medium dense light brownish gray and yellowish brown clayey fine sand w/ferrous nodules				
70			Dense light grayish brown silty fine to medium sand w/some fine gravel	55			10
75			Very stiff tan and gray fine sandy clay w/ferrous stains	26			62
80			- stiff at 78 - 83 ft	12			
85			- very stiff at 83 - 88 ft	27			
90			- stiff with clay layers below 88 ft	21			
95			Very stiff yellowish brown and brown silty clay w/silty fine sand seams	25			86
			Very stiff brown and gray silt clay, slightly sandy	25			87

COMPLETION DEPTH: 120.0 ft
DATE: 1-5-19

DEPTH TO WATER IN BORING: 23 ft

DATE: 12/7/2018

LGBNEW 17-127.GPJ 1-30-19

PLATE 26

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 19

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 23 ft /Wash

LOCATION: Approx Sta 94+46, 5 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
105			Dense to very dense gray and tan silty fine sand				
110				52			43
115			Dense to very dense reddish tan and brown silty fine to medium sand w/a little fine gravel				
120				58		-NON-PLASTIC-	24
125							
130							
135							
140							
145							

COMPLETION DEPTH: 120.0 ft
DATE: 1-5-19

DEPTH TO WATER IN BORING: 23 ft

DATE: 12/7/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 20

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 3 ft /Wash

LOCATION: Approx Sta 95+25, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 268±				
			Very soft brown silty clay w/organics	2			
			Firm brown and tan silty clay w/occasional ferrous nodules and stains - perched water at 3 ft - very stiff below 4 ft	8 26 25			
10			Stiff to very stiff gray, tan and brown clay, slightly sandy w/organic stains	24			85
15			Stiff tan and brown silty clay	16			
20			- very stiff below 18 ft	34			
25			Medium dense reddish tan silt	13		-NON-PLASTIC-	97
30				15			
35			Stiff reddish tan silty clay, slightly sandy	15			89
40			Stiff tan and gray silty clay, slightly sandy	20			81
45			Dense gray, reddish tan and tan clayey fine sand w/occasional ferrous nodules and stains	42			43
50			Stiff gray and tan silty clay w/occasional ferrous nodules and stains	19			
				13			95

COMPLETION DEPTH: 120.0 ft
DATE: 1-7-19

DEPTH TO WATER IN BORING: 14 ft

DATE: 1/7/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 20

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 3 ft /Wash

LOCATION: Approx Sta 95+25, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
60				18			
65			Medium dense gray clayey fine sand	18			46
70			Very stiff gray and tan fine sandy clay w/ferrous stains	31			54
75			- with some fine sand partings and seams below 73 ft	26			
80			- stiff at 78 to 83 ft	16			
85			- very stiff below 83 ft	25			
90			Stiff light gray silty clay, slightly sandy w/occasional ferrous stains	20			
95				32			90
100				22			
105			Dense tan and gray silty fine to medium sand w/clay seams	48			41

COMPLETION DEPTH: 120.0 ft
DATE: 1-7-19

DEPTH TO WATER IN BORING: 14 ft

DATE: 1/7/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 20

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 3 ft /Wash

LOCATION: Approx Sta 95+25, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
115							
120				44			
125							
130							
135							
140							
145							
150							
155							
160							

COMPLETION DEPTH: 120.0 ft
DATE: 1-7-19

DEPTH TO WATER IN BORING: 14 ft

DATE: 1/7/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 21

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18 ft /Wash

LOCATION: Approx Sta 96+25, CL

SURF. EL: 268±

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	- No. 200 %
	Very soft to soft brown and tan silty clay, slightly sandy	4		87
	- stiff, brown, gray and reddish tan at 2 to 6 ft	17		
5		22		
	- firm to stiff with ferrous nodules and stains at 6 to 8 ft	10		
	- stiff with ferrous nodules and stains at 8 to 13 ft	14		
10				
	- very stiff, light brown and brown below 13 ft	25		
15				
	Medium dense gray and reddish tan silt	19		
20				
	- with ferrous nodules and stains to 22 ft			
	- loose at 23 to 28 ft	8		99
25				
	- medium dense at 28 to 33 ft	17		
30				
	- loose below 33 ft	9		
35				
	Stiff light brown and gray silty clay, slightly sandy	11		87
40	- with trace fine gravel below 40 ft			
	Stiff reddish tan and gray silty clay, slightly sandy	17		
45				
	- light brown and reddish tan and gray at 48 to 53 ft	21		86

COHESION, TON/SQ FT
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
10 20 30 40 50 60 70

-NON-PLASTIC-

COMPLETION DEPTH: 120.0 ft
DATE: 1-3-19

DEPTH TO WATER IN BORING: NA

DATE: 1/3/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 21

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18 ft /Wash

LOCATION: Approx Sta 96+25, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (continued)	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
55			- gray and reddish tan at 53 to 58 ft	16			
60			- reddish tan and light brown at 58 to 68 ft	12			
65				13			
70			- stiff to very stiff reddish tan and light brown at 68 to 73 ft	24			88
75			- stiff, brown with ferrous nodules and stains below 73 ft	14			
80			Dense reddish tan and brown silty fine sand	32			14
85			- medium dense at 83 to 88 ft	24			
90			- dense to very dense below 88 ft	60			
95			Very stiff gray and tan fine sandy clay	31			72
			Very stiff light brown fine sandy clay, silty	25			73

COMPLETION DEPTH: 120.0 ft
DATE: 1-3-19

DEPTH TO WATER IN BORING: NA

DATE: 1/3/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 21

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18 ft /Wash

LOCATION: Approx Sta 96+25, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
105			Medium dense reddish tan silty fine to medium sand				
110				25			45
115			Dense yellowish brown silty fine to medium sand				
120				34			16
125							
130							
135							
140							
145							

COMPLETION DEPTH: 120.0 ft
DATE: 1-3-19

DEPTH TO WATER IN BORING: NA

DATE: 1/3/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 22

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft wash

LOCATION: Approx Sta 97+05, 20 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 269±				
			Soft gray and tan silty clay w/silt pockets	6			
			- stiff below 2 ft	20			97
5				19			
			Stiff brown, gray and tan silty clay w/ferrous stains and nodules	15			
			- very stiff below 8 ft	25			96
10							
			Stiff reddish brown silty clay w/ferrous nodules and stains	17			94
15							
			Very stiff tan, gray and yellowish tan clayey silt	25			
20							
			- firm below 23 ft	8			99
25							
			Stiff brown and reddish tan silty clay	19			
30							
				13			92
35							
			Firm reddish tan and gray silty clay	8			
40							
			- stiff, tan and gray below 43 ft	22			91

COMPLETION DEPTH: 100.0 ft
DATE: 1-2-19

DEPTH TO WATER IN BORING: 17 ft

DATE: 12/21/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 22

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft wash

LOCATION: Approx Sta 97+05, 20 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (continued)	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
50			Stiff reddish tan silty clay w/ferrous stains	19			
55				18			
60			Medium dense brown, tan and gray clayey fine sand, silty	22		PL + WC ●	41
65							
70			Stiff yellowish red fine sandy clay w/trace fine gravel	22		PL + WC ●	53
75			Stiff to very stiff light gray and tan clay w/clayey fine sand seams				
80				24		WC ●	85
85							
			Medium dense tan silty fine sand	24		●	21

COMPLETION DEPTH: 100.0 ft
DATE: 1-2-19

DEPTH TO WATER IN BORING: 17 ft

DATE: 12/21/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 22

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft wash

LOCATION: Approx Sta 97+05, 20 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
95			- dense to very dense below 95 ft				
				50/6"			
100							
105							
110							
115							
120							
125							
130							

COMPLETION DEPTH: 100.0 ft
DATE: 1-2-19

DEPTH TO WATER IN BORING: 17 ft

DATE: 12/21/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 23

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft /Wash

LOCATION: Approx Sta 98+20, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 271±				
			Very soft grayish tan silty clay w/silt pockets and ferrous nodules	WOH			
			- very stiff at 2 - 6 ft	26			94
5			- grayish tan and yellowish tan below 4 ft	29			
			- stiff below 6 ft	21			
10			Very stiff gray and yellowish tan clay w/ferrous stains	30			92
15			Very stiff yellowish tan silty clay		103	1.86	99
20			Soft yellowish tan and brown clayey silt	6			
25				4			
30			- firm below 28 ft				99
35				8			
40			Stiff yellowish tan, tan and gray silty clay w/silt pockets	18			
			- stiff to very stiff below 43 ft		99		96

COMPLETION DEPTH: 110.0 ft
DATE: 12-19-18

DEPTH TO WATER IN BORING: 16.5 ft

DATE: 12/18/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 23

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft /Wash

LOCATION: Approx Sta 98+20, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (continued)	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
50			Stiff tan and reddish tan fine sandy clay	11			
			- stiff to very stiff below 53 ft		115		63
60			Stiff gray and reddish tan fine sandy clay	22			78
65			Dense to very dense reddish brown silty fine sand	50/6"			14
70			- fine to medium below 68 ft	50/6"			15
75			Very stiff light tan clay	31			
80					106		100
85				46			
			- very stiff to hard below 88 ft	50/6"			

COMPLETION DEPTH: 110.0 ft
DATE: 12-19-18

DEPTH TO WATER IN BORING: 16.5 ft

DATE: 12/18/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 23

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft /Wash

LOCATION: Approx Sta 98+20, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
95				50/5"			
100			Dense tan silty fine sand	51			21
105			Dense tan silty fine to medium sand				
110				46			17
115							
120							
125							
130							

COMPLETION DEPTH: 110.0 ft
DATE: 12-19-18

DEPTH TO WATER IN BORING: 16.5 ft

DATE: 12/18/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 24

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft /Wash

LOCATION: Approx Sta 99+35, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 274±				
			Very soft brown silty clay w/numerous organics	6			
			Soft yellowish tan and gray silty clay w/ferrous nodules and stains - stiff at 2 - 4 ft	22			95
5			- very stiff at 4 - 6 ft	25			
			- stiff below 6 ft	18			
10			Very stiff yellowish tan and gray clay w/ferrous stains		104	1.76	97
15			Stiff reddish brown silty clay	21			99
20			Loose tan and brown silt, slightly clayey		92		96
25				8			
30				5			
35			Soft brown fine sandy clay		102		75
40			Stiff reddish brown and gray silty clay	20			
					96		94

COMPLETION DEPTH: 110.0 ft
DATE: 12-19-18

DEPTH TO WATER IN BORING: 17 ft

DATE: 12/19/2018

LGBNEW 17-127.GPJ 1-31-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 24

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft /Wash

LOCATION: Approx Sta 99+35, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
50			Medium dense yellowish tan clayey fine sand, silty	11			47
55				29			
60			- dense to very dense below 58 ft	50/5"			
65			Dense to very dense tan fine sand, slightly silty	50/4"			5
70				50/5"			
75				50/5"			
80				50/5"			
85				50/5"			
				50/3"			

COMPLETION DEPTH: 110.0 ft
DATE: 12-19-18

DEPTH TO WATER IN BORING: 17 ft

DATE: 12/19/2018

LGBNEW 17-127.GPJ 1-31-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 24

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 18.5 ft /Wash

LOCATION: Approx Sta 99+35, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
95				50/6"			
100				50/4"			
105			Dense to very dense tan fine to medium sand, slightly silty				
110				50/6"			
115							
120							
125							
130							

COMPLETION DEPTH: 110.0 ft
DATE: 12-19-18

DEPTH TO WATER IN BORING: 17 ft
DATE: 12/19/2018

LGBNEW 17-127.GPJ 1-31-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 25

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 10 ft /Wash

LOCATION: Approx Sta 100+67, 15 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 280±				
			Very soft brown clayey silt	4			
			Stiff tan silty clay w/occasional fine to coarse gravel and silt pockets	16			
5			Stiff tan and gray silty clay	23			94
			- brown and tan below 6.5 ft - perched water at 6.7 ft	16			
10				22			
15			- water at 14 ft	16			
			Very soft brown silty clay				
20				2			100
			- firm below 23 ft				
25				7			
30			Stiff brown silty clay	12			
35			Medium dense gray, reddish tan and tan clayey fine sand w/ferrous stains and trace fine to coarse gravel	13			43
40				21			
			Very stiff light gray clay	36			

COMPLETION DEPTH: 78.0 ft
DATE: 1-9-19

DEPTH TO WATER IN BORING: 14 ft

DATE: 1/9/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 25

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 10 ft /Wash

LOCATION: Approx Sta 100+67, 15 ft Lt

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
50				18			99
55				19			
60			Stiff brown and light gray silty clay	21			99
65				16			
70				21			
75			Very stiff to hard gray and brownish gray silty clay	50/4"			94
80							
85							

COMPLETION DEPTH: 78.0 ft
DATE: 1-9-19

DEPTH TO WATER IN BORING: 14 ft

DATE: 1/9/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 26

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 25 ft /Wash

LOCATION: Approx Sta 102+05, Cl

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 281±				
			Soft brown and tan silty clay w/organics	6			
			Stiff tan and brown silty clay w/ferrous stains and occasional ferrous nodules	21			
5			- very stiff at 4 - 8 ft	26			
				31			
			- stiff to very stiff below 8 ft				
10				24			92
			Stiff yellowish tan silty clay				
15				23			
20							
			Soft to firm tan and brown silty clay, moist				
25			- water at 24 ft				
			Loose to medium dense reddish tan and light gray clayey fine sand	10			39
30							
			Stiff reddish tan and light gray clay w/ferrous stains and silt pockets	22			
35							
				19			98
40							
				23			

COMPLETION DEPTH: 110.0 ft
DATE: 1-8-19

DEPTH TO WATER IN BORING: 24 ft

DATE: 1/18/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 26

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 25 ft /Wash

LOCATION: Approx Sta 102+05, CI

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (continued)	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
50			- very stiff below 48 ft	25			
55			Stiff dark brown clay	21			
60				21			99
65				22			
70				20			
75			- very stiff below 73 ft	40			99
80				43			
85			- with fine sand seams below 83 ft	66			
			Dense tan and gray fine to medium sand w/clay seams and layers	50/4"			

COMPLETION DEPTH: 110.0 ft
DATE: 1-8-19

DEPTH TO WATER IN BORING: 24 ft

DATE: 1/18/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 26

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 25 ft /Wash

LOCATION: Approx Sta 102+05, Cl

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
95				50/6"			51
100			Dense to very dense tan and gray fine to coarse sand	50/6"			
105							
110				50/1"			
115							
120							
125							
130							

COMPLETION DEPTH: 110.0 ft
DATE: 1-8-19

DEPTH TO WATER IN BORING: 24 ft

DATE: 1/18/2019

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 27

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 103+07, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			SURF. EL: 287±				
			Very soft to soft dark brown and brown clayey silt w/rootlets and occasional organics	4			
			Very soft to soft brownish gray, gray and tan silty clay - with rootlets to 2 ft	22			
5			Very stiff tan silty clay - stiff, with more tan and some silt seams and layers below 2 ft		101		94
			- grayish brown and gray with ferrous stains and nodules below 3.5 ft	24			
10			Stiff to very stiff brown and tan silty clay w/occasional ferrous stains				
			- stiff below 13 ft		96		
15							
			- with less tan below 18 ft				
20			- water at 20 ft	18			98
			- very soft to soft at 23 - 28 ft - with occasional silt pockets below 23.5 ft				
25							
			- firm to stiff below 28 ft	10			
30			Loose to medium dense brown, reddish tan and gray clayey fine sand, silty w/trace fine gravel				
				10			
35							
					109		36
40			Dense reddish tan, tan and gray silty fine sand w/silty fine sand seams and ferrous stains				
				64		-NON-PLASTIC-	21

COMPLETION DEPTH: 120.0 ft
DATE: 12-12-18

DEPTH TO WATER IN BORING: 20 ft

DATE: 12/11/2018

LGBNEW 17-127.GPJ 1-30-19

PLATE 48

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 27

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 103+07, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (continued)	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
50			Stiff brownish yellow, gray and tan clay w/ferrous stains	21			96
55			Stiff dark brownish gray clay, varved		83		98
60				19			
65			- very stiff at 63 - 68 ft	25			
70			- stiff at 68 - 73 ft	19			
75			- very stiff below 73 ft	30			85
80			Stiff dark gray silty clay	22			
85			- stiff to very stiff at 83 to 88 ft		105		99
			- very stiff below 88 ft	31			

COMPLETION DEPTH: 120.0 ft
DATE: 12-12-18

DEPTH TO WATER IN BORING: 20 ft

DATE: 12/11/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

LOG OF BORING NO. 27

ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

TYPE: Auger to 20 ft /Wash

LOCATION: Approx Sta 103+07, CL

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70)	- No. 200 %
			(continued)				
95			Very stiff light reddish tan and brownish gray silty clay w/organic stains	52			98
100			Dense brownish gray fine to medium sand, slightly silty	49			6
105			- dense to very dense, yellowish brown below 105 ft				
110				50/3"			5
115							
120				50/2"			
125							
130							

COMPLETION DEPTH: 120.0 ft
DATE: 12-12-18

DEPTH TO WATER IN BORING: 20 ft

DATE: 12/11/2018

LGBNEW 17-127.GPJ 1-30-19

Grubbs, Hoskyn, Barton & Wyatt, Inc.
Consulting Engineers

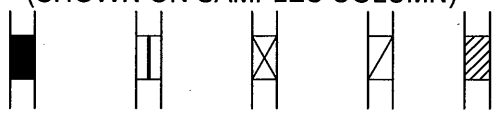
SYMBOLS AND TERMS USED ON BORING LOGS

SOIL TYPES
(SHOWN IN SYMBOLS COLUMN)

Gravel Sand Silt Clay

Predominant type shown heavy

SAMPLER TYPES
(SHOWN ON SAMPLES COLUMN)



Shelby Tube | Rock Core | Split Spoon | No Recovery | Cutting

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on No. 200 sieve): Includes (I) Clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests.

DESCRIPTIVE TERM	N-VALUE	RELATIVE DENSITY
VERY LOOSE	0-4	0-15%
LOOSE	4-10	15-35%
MEDIUM DENSE	10-30	35-65%
DENSE	30-50	65-85%
VERY DENSE	50 and above	85-100%

FINE GRAINED SOILS (major portion passing No. 200 sieve): Includes (1) Inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH TON/SQ. FT.
VERY SOFT	Less than 0.25
SOFT	0.25-0.50
FIRM	0.50-1.00
STIFF	1.00-2.00
VERY STIFF	2.00-4.00
HARD	4.00 and higher

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance.
FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
LAMINATED - composed of thin layers of varying color and texture.
INTERBEDDED - composed of alternate layers of different soil types.
CALCAREOUS - containing appreciable quantities of calcium carbonate.
WELL GRADED - having a wide range in grain sizes and substantial amounts of all intermediate particle sizes.
POORLY GRADED - predominantly of one grain size, or having a range of sizes with some intermediate sizes missing.

Terms used on this report for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in Technical Memorandum No.3-357, Waterways Experiment Station, March 1953

KEY 7-28-11

SUMMARY of SUBSURFACE EXPLORATION

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

Boring No.	Project Feature	Approx. Sta, ft	Offset, ft	Surf El, ft	Boring Depth, ft	Initial Project Feature
Initial Study						
1	Bent 7	101+20	CL	281	150	N Bridge End (Bent 2)
2	Bent 6	99+30	25	274	150	S Bridge End (Bent 1)
3	Bent 7 wall	100+60	-70	280	50	N Abutment Wall
4	Bent 7 wall	101+80	35	281	50	N Abutment Wall
5	Bent 7 wall	102+00	90	279	50	N Abutment Wall
6	Bent 6 wall	98+45	-50	273	60	S Abutment Wall
7	Bent 6 wall	99+55	110	273	60	S Abutment Wall
8	Bent 4	97+00	CL	269	75	S Embkt Toe
9	Bent 1	94+70	-65	268	10	HWY 351 Rdwy
10	Hwy 351 Rdwy	92+00	CL	266	10	Hwy 351 Rdwy
11	Hwy 351 Rdwy	88+50	CL	269	10	Hwy 351 Rdwy
12	N Embankment Toe	103+60	CL	286	45	N Embankment Toe
13	Hwy 351 Rdwy	105+65	CL	287	10	Hwy 351 Rdwy
14	Hwy 351 Rdwy	108+20	-10	297	10	Hwy 351 Rdwy
15	Airport Rd	90+00	85	266	10	Airport Rd
16	Airport Rd	93+40	100	266	10	Airport Rd
17	Airport Rd	96+00	200	264	10	Airport Rd
18	Airport Rd	98+50	240	268	10	Airport Rd
Suplemental Borings						
19	Bent 1	94+46	-5	266	120	S Bridge End
20	Bent 2	95+25	CL	268	120	
21	Bent 3	96+25	CL	268	120	
22	Bent 4	97+05	-20	269	100	
23	Bent 5	98+20	CL	271	110	
24	Bent 6	99+35	CL	274	110	S Main Span End
25	Bent 7	100+67	-15	280	78	N Main Span End
26	Bent 8	102+05	CL	281	110	N Bridge End
27	Deleted Bent 9	103+07	CL	287	120	Preliminary N bridge end

GENERAL NOTES

BENCH MARK: Vertical Control Data are shown on the Survey Control Data Sheets.

CONSTRUCTION SPECIFICATIONS: Arkansas State Highway and Transportation Department Standard Specifications for Highway Construction (2014 Edition) with applicable Supplemental Specifications and Special Provisions. Unless otherwise noted, Section and Subsection refer to the Standard Construction Specifications.

DESIGN SPECIFICATIONS: AASHTO LRFD Bridge Design Specifications, Seventh Edition with 2015 Interim Specifications.

LIVE LOADING: HL-93

SEISMIC ZONE: 4 S_{DI} =0.84 SITE CLASS = E

MATERIALS AND STRENGTHS:

Class S(AE) Concrete (superstructure)	f'c = 4,000 psi
Class S Concrete (substructure)	f'c = 3,500 psi
Reinforcing Steel (AASHTO M 31 or M 322, Type A, Gr, 60)	fy = 60,000 psi
Structural Steel (AASHTO M 270, Gr. 50)	Fy = 50,000 psi
Structural Steel (AASHTO M 270, Gr. 36)	Fy = 36,000 psi

BORING LOGS: Boring logs may be obtained from the Construction Contract Procurement Section of the Program Management Division.

STEEL SHELL PILING: Piling in Bents 1 through 8 shall be 18" dia. concrete filled steel shell piles and shall be driven closed-ended to a minimum ultimate bearing capacity as shown in the "Table of Variables" on Dwg. No. XXXXX. Piling shall be driven to the "Min. Pile Tip Elevation D" shown in the "Table of Variables" on Dwg. No. XXXXX or lower. All piling shall be driven with an approved air, steam or diesel hammer. Piling in end bents shall be driven after embankment to bottom of cap is in place. Actual lengths to be determined in the field. No additional payment will be made for cut-off or build-up. Test piles are not required but may be driven for the Contractor's information in accordance with Subsection 805.08(g).

Wing wall piling shall be 18" dia. concrete filled steel shell piles and shall be the lengths shown on the plans, no ultimate bearing capacity is required.

Any cost associated with achieving the minimum pile tip Elevation "D" shall be included in the item "Steel Shell Piling".

✳DRIVING SYSTEM: The driving system approval and the ultimate bearing capacity determination for piling shall be based on the requirements of Subsection 805.09(b), "Method B-Wave Equation Analysis (WEAP)". It is estimated that a minimum rated hammer energy of xx ft.-kips per blow will be required to obtain the ultimate bearing capacity for the 18" dia. concrete filled steel shell piling.

✳Required hammer energy pending drivability analysis.

TEXTURED COATING FINISH: Class 3 Textured Coating Finish shall be applied to bridge surfaces as specified in Special Provision Job No. 100942 "Textured Coating Finish" and in accordance with Subsection 802.19(b)(3). Class 1 Protective Surface Treatment shall not be applied on surfaces where Class 3 Textured Coating Finish is specified.

BRIDGE DECK: The concrete bridge deck shall be given a tine finish as specified for final finishing in Subsection 802.19 for Class 5 Tined Bridge Roadway Surface Finish. Shared Use Path shall be given a Class 6 Broomed Finish.

PROTECTIVE SURFACE TREATMENT: Class 1 Protective Surface Treatment shall be applied to the roadway surface and top of end bent backwalls. Class 1 Protective Surface Treatment shall meet the requirements of Section 803.

PAINT: All Structural Steel except galvanized members and some surfaces in contact with concrete shall be cleaned in accordance with Subsection 807.84(b) and painted as specified in Subsection 807.75. Unless noted otherwise the color of the paint shall be Red and shall match Federal Standard 595B, Color Chip No. 31350. The color of the Steel Fence, Posts, Type H and Type H-2 Metal Rail shall be Black and shall match Fed. Std. 595B Color Chip No. 27038.

DETAIL DRAWINGS	DRAWING NOS.
End Bent 1	XXXXX - XXXXX
Intermediate Bents 2 & 3	XXXXX - XXXXX
Intermediate Bent 4	XXXXX - XXXXX
Intermediate Bent 5	XXXXX - XXXXX
Intermediate Bent 6	XXXXX - XXXXX
Intermediate Bent 7	XXXXX - XXXXX
End Bent 8	XXXXX - XXXXX
Elastomeric Bearings	XXXXX
260'-0" Cont. Comp. Plate Girder Unit	XXXXX - XXXXX
222'-0" Cont. Comp. Plate Girder Unit	XXXXX - XXXXX
294'-0" Cont. Comp. Plate Girder Unit	XXXXX - XXXXX
Poured Silicone Joint	XXXXX
Strip Seal Joint	XXXXX
Type Special Approach Slab	XXXXX
Type Special Approach Gutters 1,2	XXXXX
Standard Details for Concrete Riprap	55002
Standard General Notes	55006
Steel Shell Piling	XXXXX
Type H & H-2 Railing	XXXXX

HORIZONTAL CURVE DATA

C.L. HWY. 351
P.I. = 94+12.94
Δ = 76°33'50" LT.
D = 10°45'00"
T = 420.65'
L = 712.22'
P.C. = 89+92.29
P.T. = 97+04.51

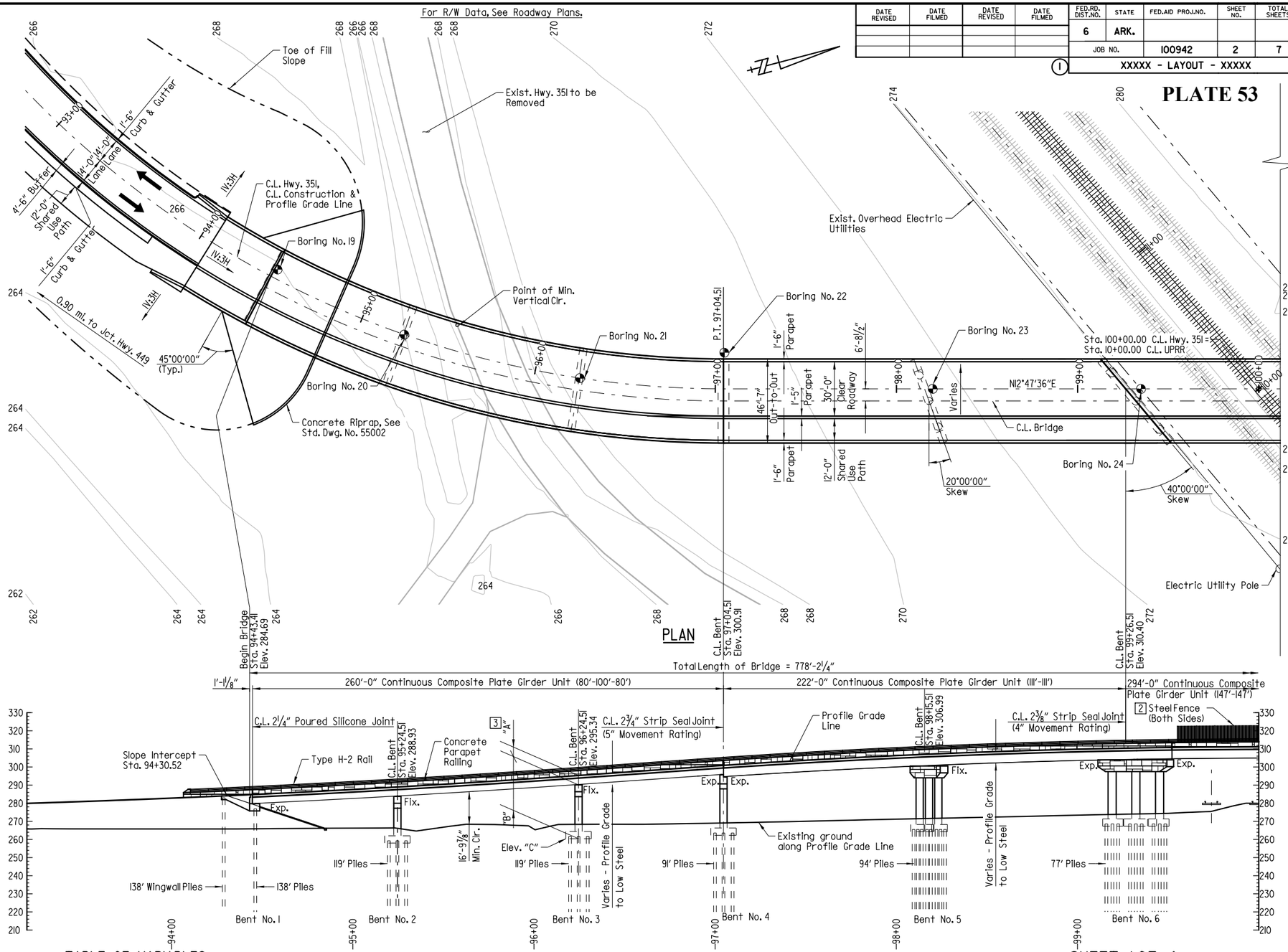


TABLE OF VARIABLES

Bent No(s).	Profile Grade @ C.L. Bent to Low Seat of Cap "A"	Low Seat of Cap to Bottom of Footing "B"	Elev. "C"	✳Min. Pile Tip Elevation "D"	Min. Ultimate Bearing Capacity (Kips)
1	-	-	-	140	772
2	5'-9"	25'-6"	257.68	141	614
3	5'-9 9/16"	30'-0"	259.58	143	614
4	6'-5 11/16"	32'-6"	261.94	173	586
5	6'-9⅞"	36'-6"	263.73	172	586
6	6'-10"	37'-0"	266.57	192	600
7	7'-2½"	31'-0"	272.58	199	658
8	-	-	-	205	1000

✳Not applicable to wing piles.

ELEVATION

Notes:
For Soil Borings See Dwg. Nos. xxxxx & xxxxx.

Stations shown are along C.L. Const. and Elevations Shown match the Profile Grade Line.

Use Type Special Approach Slab and Type Special Approach Gutters at both ends of bridge, See Dwg. Nos. XXXXX and XXXXX.

2 Steel tube fence from Hwy. 351 C.L. Sta. 99+15.00 Lt. to Sta. 100+55.00 Lt. on Left side of bridge and from Sta. 99+55.00 Rt. to Sta. 100+95.00 Rt. on right side of bridge.

3 Dimensions are taken from Profile Grade top of deck @ Centerline Bent to low seat of cap.

PRELIMINARY
SUBJECT TO REVISION

BRIDGE ENGINEER
PRINT DATE: 1/28/2019

DATE REVISED	DATE FILMED	DATE REVISED	DATE FILMED

FED.RD. DIST.NO.	STATE	FED.AID PROJ.NO.	SHEET NO.	TOTAL SHEETS
6	ARK.			
JOB NO.		100942	2	7

1 XXXXX - LAYOUT - XXXXX

PLATE 53

SHEET 1 OF 4
LAYOUT OF BRIDGE
HIGHWAY 351 OVER UNION PACIFIC RAILROAD (AIRPORT RD.) (JONESBORO) (S)
CRAIGHEAD COUNTY
ROUTE 351 SECTION 1
ARKANSAS STATE HIGHWAY COMMISSION
LITTLE ROCK, ARKANSAS

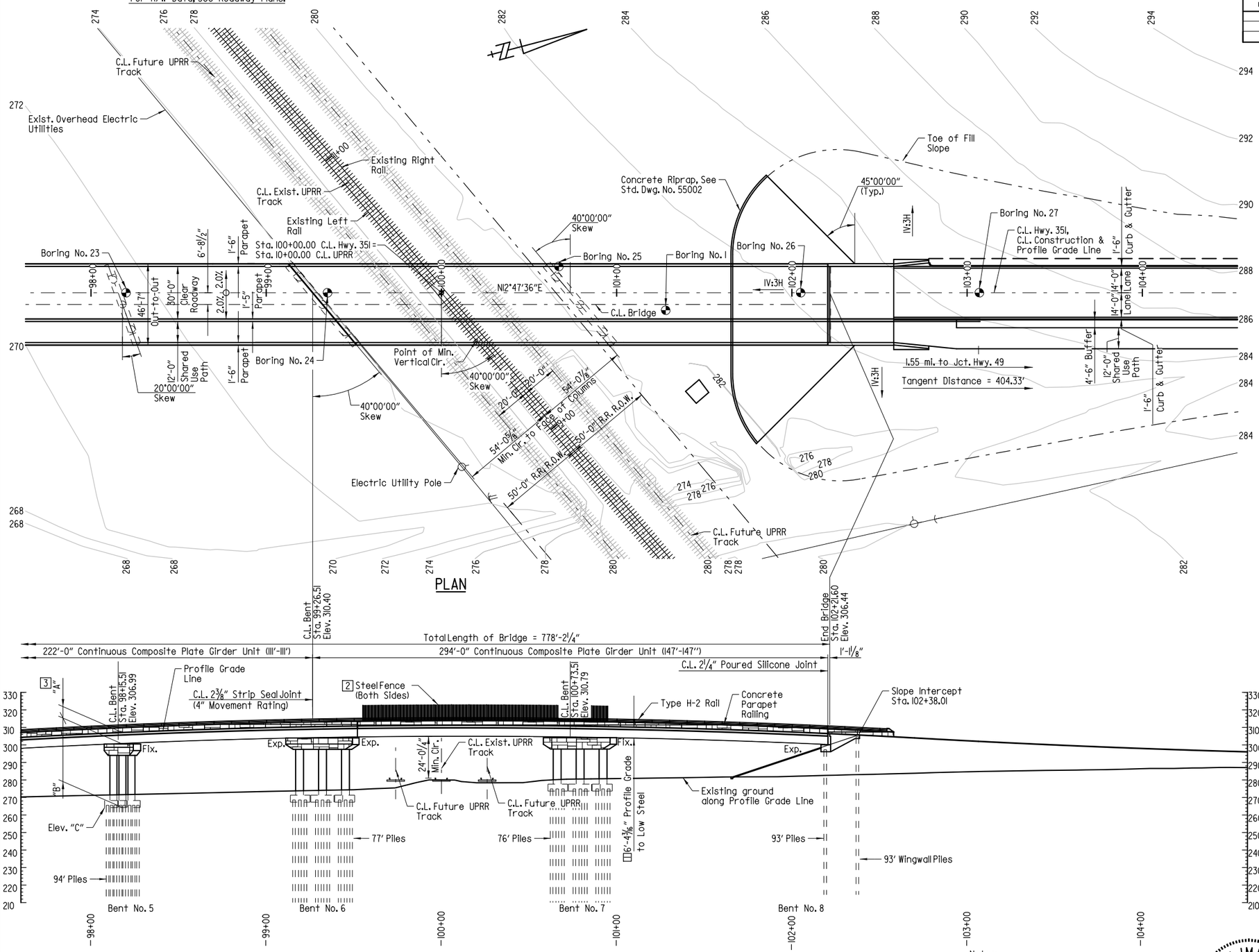
DRAWN BY: JPC DATE: 09/2018 FILENAME: b100942_LXI.dgn
CHECKED BY: SFH DATE: 01/2019
DESIGNED BY: JPC DATE: 09/2018 SCALE: 1" = 30'
BRIDGE NO. xxx DRAWING NO. xxx

Justin.carney 1/28/2019 8:35:29 AM
WORKSPACE: AHTD_Bridge
Y:\Projects\AHTD_16233_Hwy351RROverpass\Deliverables\BRIDGE\Bridge\B100942XLI_LXI.dgn
REVISED DATE:

DATE REVISED	DATE FILMED	DATE REVISED	DATE FILMED	FED.RD. DIST.NO.	STATE	FED.AID PROJ.NO.	SHEET NO.	TOTAL SHEETS
				6	ARK.			
				JOB NO.		I00942	3	7
				(1)	XXXXX - LAYOUT - XXXXX			

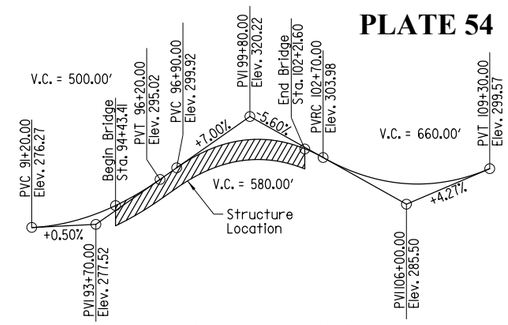
PLATE 54

For R/W Data, See Roadway Plans.



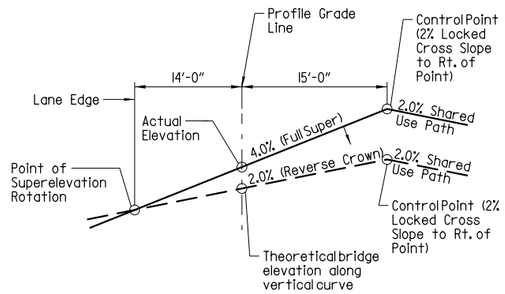
PLAN

ELEVATION

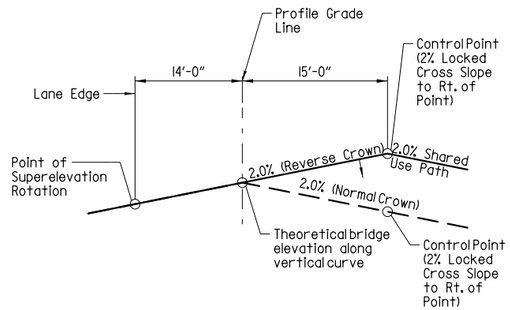


VERTICAL CURVE DATA

(Stations are along C.L. Construction and Elevations are along Profile Grade Line)



Begin Bridge (0.040'/') - Sta. 94+43.41
End Full Superelevation (0.040'/') - Sta. 96+04.51
Reverse Crown (0.020'/') - Sta. 97+29.51



Reverse Crown (0.020'/') - Sta. 97+29.51
Normal Crown (0.020'/') - Sta. 98+54.51

CROSS-SLOPE TRANSITION SKETCH

Looking Ahead

Note:
See "Table of Variables" on Drawing No. XXXXX for "A", "B", and Elev "C" values.

1. Measured to Working Point in 294'-0" Unit. See "Rounding Detail" on Dwg. No. xxxxx.
2. Steel tube fence from Hwy. 351 C.L. Sta. 99+15.00 Lt. to Sta. 100+55.00 Lt. on Left side of bridge and from Sta. 99+55.00 Rt. to Sta. 100+95.00 Rt. on right side of bridge.
3. Dimensions are taken from Profile Grade top of deck @ Centerline Bent to low seat of cap.

Notes:
For General Notes See Dwg. No. xxxxx. For Soil Borings See Dwg. No. XXXXX.

Stations shown are along C.L. Const. and Elevations Shown match the Profile Grade Line.

Use Type Special Approach Slab and Type Special Approach Gutters at both ends of bridge, See Dwg. Nos. XXXXX and XXXXX.

PRELIMINARY
SUBJECT TO REVISION

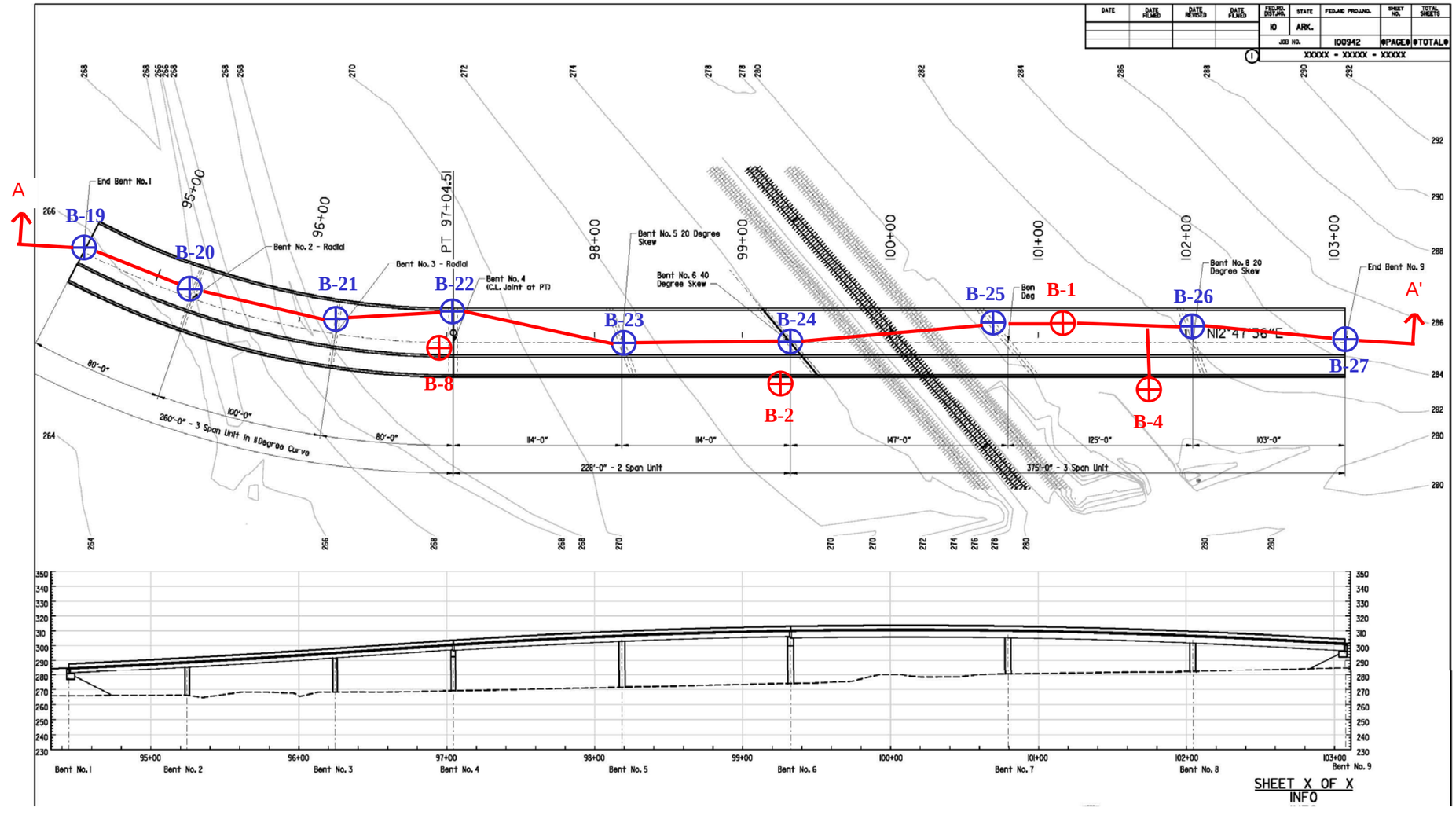
BRIDGE ENGINEER
PRINT DATE: 1/28/2019

SHEET 2 OF 4
LAYOUT OF BRIDGE
HIGHWAY 351 OVER UNION PACIFIC RAILROAD (AIRPORT RD.) (JONESBORO) (S)
CRAIGHEAD COUNTY
ROUTE 351 SECTION 1
ARKANSAS STATE HIGHWAY COMMISSION
LITTLE ROCK, ARKANSAS

DRAWN BY:	JPC	DATE:	09/2018	FILENAME:	bI00942_LX2.dgn
CHECKED BY:	SFH	DATE:	01/2019		
DESIGNED BY:	JPC	DATE:	09/2018	SCALE:	1" = 30'
BRIDGE NO.	xxx			DRAWING NO.	xxx

Justin.carney 1/28/2019 8:35:29 AM
WORKSPACE: AHTD_Bridge
Y:\Projects\AHTD_162313_Hwy351RROverpass\Deliverables\BRIDGE\Bridge\bI00942xLLX2.dgn
REVISED DATE:

APPENDIX A

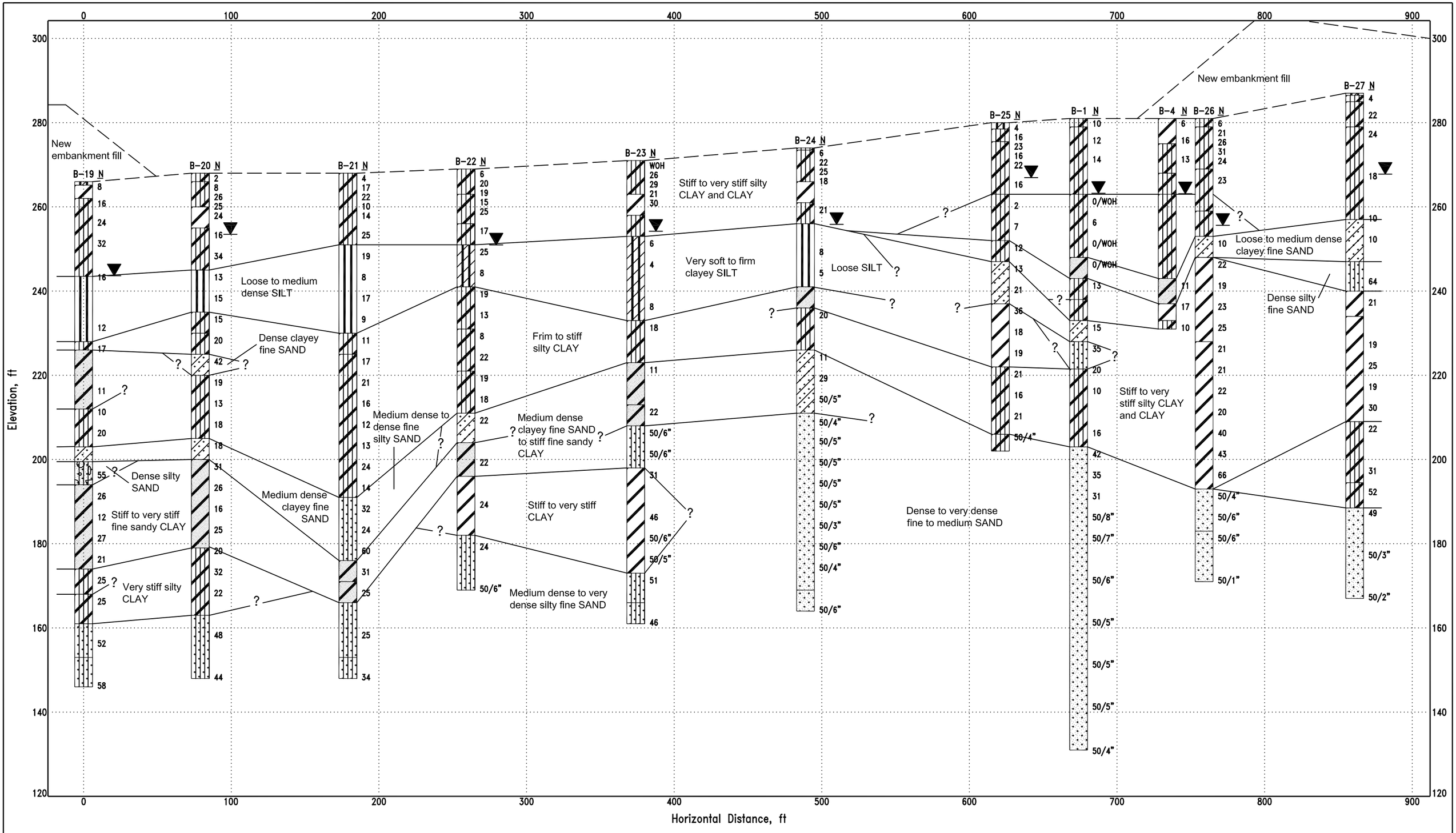


⊕ Borings of Initial Study

⊕ Supplemental Borings

50 ft 0 50 ft 100 ft

Grubbs, Hoskyn, Barton & Wyatt, INC. CONSULTING ENGINEERS	**SUBSURFACE PROFILE** **ARDOT 100942 Hwy 351 RR Overpass** **Jonesboro, Craighead, Arkansas**	**Scale: As Shown** **Date: December 2018**	**Job No. 17-127**	**PLATE 1**



Grubbs, Hoskyn,
Barton & Wyatt, Inc.

NOTES:
1. Subsurface conditions have been inferred between discrete boring locations. Actual conditions may vary.
2. Ground surface approximate.

SCALE:
1" = 60' Horizontal
1" = 20' Vertical

Generalized Subsurface Profile
ARDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Project Number: 17-127

APPENDIX B

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
1	6.5-7	21	36	20	16	---	---	100	---	---	97	CL	A-6
1	19-20	32	34	23	11	---	---	100	---	---	97	CL	A-6
1	29-30	37	33	23	10	---	---	100	100	100	99	CL	A-4
1	34-35	19	29	13	16	---	---	100	---	---	55	CL	A-6
1	39-40	25	46	18	28	---	---	100	---	---	91	CL	A-7-6
1	44.5-45	26	36	20	16	---	---	100	---	---	86	CL	A-6
1	49-50	18	22	14	8	---	---	98	---	---	28	SC	A-2-4
1	54-55	14	NON-PLASTIC			100	93	82	73	67	16	SM	A-2-4
1	69.5-70	22	41	18	23	---	---	100	---	---	99	CL	A-7-6
1	79-80	25	NON-PLASTIC			---	---	100	100	79	6	SP-SM	A-2-4
1	89-90	18	NON-PLASTIC			---	---	100	100	32	6	SP-SM	A-2-4
1	128.5-129	17	NON-PLASTIC			---	---	100	100	47	8	SP-SM	A-2-4
2	3-3.5	18	45	21	24	---	---	100	---	---	96	CL	A-7-6
2	9-10	20	36	18	18	---	---	100	---	---	96	CL	A-6
2	14.5-15	22	44	21	23	---	---	100	---	---	99	CL	A-7-6
2	19-20	36	28	24	4	---	---	96	---	---	92	ML	A-4
2	24-25	31	32	23	9	---	---	100	100	100	99	CL	A-4
2	29-30	32	29	23	6	---	---	100	---	---	95	ML	A-4
2	39-40	25	40	18	22	---	---	100	---	---	89	CL	A-6
2	49-50	17	28	14	14	---	---	99	---	---	61	CL	A-6
2	59-60	28	42	16	26	---	---	100	---	---	92	CL	A-7-6
2	68.5-69.5	20	---	---	---	100	96	95	94	87	15	SM	A-2-4

Grubbs, Hoskyn,
Barton & Wyatt, Inc.
CONSULTING ENGINEERS

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
2	83.5-84.5	23	---	---	---	100	100	100	100	81	7	SP-SM	A-2-4
2	108.5-109.5	22	---	---	---	100	100	100	100	65	4	SP	A-2-4
3	2.5-3	20	28	23	5	---	---	100	---	---	94	ML	A-4
3	7-7.5	22	36	21	15	---	---	100	---	---	93	CL	A-6
3	14.5-15	23	41	21	20	---	---	100	---	---	99	CL	A-7-6
3	19.5-20	37	31	22	9	---	---	100	---	---	100	CL	A-4
3	29.5-30	36	32	22	10	---	---	100	---	---	99	CL	A-4
3	39-40	14	48	15	33	---	---	100	---	---	47	SM	A-7-6
3	49-50	32	74	23	51	---	---	100	---	---	100	CH	A-7-6
4	3-3.5	25	65	23	42	---	---	100	---	---	98	CH	A-7-6
4	7-7.5	20	35	19	16	---	---	100	---	---	95	CL	A-6
4	14-14.5	26	46	21	25	---	---	100	---	---	99	CL	A-7-6
4	19.5-20	35	34	23	11	---	---	100	---	---	99	CL	A-6
4	24.5-25	32	31	24	7	---	---	100	---	---	100	ML	A-4
4	34-34.5	31	32	20	12	---	---	100	---	---	100	CL	A-6
4	39-40	18	26	13	13	---	---	100	---	---	62	CL	A-6
5	3-3.5	21	40	21	19	---	---	100	---	---	94	CL	A-6
5	9-10	20	36	20	16	---	---	100	---	---	94	CL	A-6
5	19.5-20	26	32	22	10	---	---	100	---	---	99	CL	A-4
5	34-34.5	20	29	14	15	---	---	100	---	---	67	CL	A-6

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
5	39-40	23	41	17	24	---	---	100	---	---	89	CL	A-7-6
5	44-45	12	18	13	5	---	---	100	---	---	50	SC-SM	A-4
6	3-3.5	22	51	21	30	---	---	100	---	---	94	CH	A-7-6
6	14.5-15	22	44	20	24	---	---	100	---	---	99	CL	A-7-6
6	19-20	39	30	26	4	---	---	100	---	---	95	ML	A-4
6	24.5-25	36	27	24	3	---	---	100	---	---	98	ML	A-4
6	34-34.5	23	32	20	12	---	---	100	---	---	88	CL	A-6
6	39-40	21	28	16	12	---	---	100	---	---	74	CL	A-6
6	44-45	31	37	22	15	---	---	100	100	98	95	CL	A-6
6	49.5-50	15	32	13	19	---	---	100	---	---	49	SC	A-6
7	5-5.5	21	42	19	23	---	---	100	---	---	96	CL	A-7-6
7	14-14.5	22	44	21	23	---	---	100	---	---	98	CL	A-7-6
7	24.5-25	30	30	23	7	---	---	100	---	---	99	CL	A-4
7	44-45	12	15	14	1	---	---	100	---	---	44	SM	A-4
7	54-55	---	31	15	16	---	---	100	---	---	15	SC	A-2-6
8	9.5-10	20	51	17	34	---	---	100	---	---	98	CH	A-7-6
8	19.5-20	27	27	24	3	---	---	100	---	---	98	ML	A-4
8	24-25	27	NON-PLASTIC			---	---	100	---	---	99	ML	A-4
8	29.5-30	25	32	24	8	---	---	100	---	---	100	ML	A-4
8	39-39.5	25	32	18	14	---	---	100	---	---	93	CL	A-6

Grubbs, Hoskyn,
Barton & Wyatt, Inc.
CONSULTING ENGINEERS

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
8	54-54.5	16	25	12	13	---	---	100	---	---	53	CL	A-6
8	64-65	21	30	16	14	---	---	100	---	---	72	CL	A-6
8	74-75	14	18	14	4	---	---	73	---	---	18	SC-SM	A-2-4
9	0.5-1.5	7	27	24	3	---	---	100	---	---	---	ML	A-4
10	0.5-1.5	14	34	22	12	---	---	100	---	---	91	CL	A-6
10	2.5-3.5	17	52	20	32	---	---	100	---	---	95	CH	A-7-6
11	0.5-1.5	9	33	26	7	---	---	100	---	---	74	ML	A-4
11	2.5-3.5	15	35	23	12	---	---	95	---	---	87	CL	A-6
12	5-5.5	20	35	20	15	---	---	100	---	---	96	CL	A-6
12	14-15	23	43	21	22	---	---	100	---	---	99	CL	A-7-6
12	24-24.5	28	34	22	12	---	---	100	---	---	99	CL	A-6
12	39-40	17	32	13	19	---	---	100	---	---	59	CL	A-6
13	0.5-1.5	12	45	21	24	---	---	100	---	---	98	CL	A-7-6
14	0.5-1.5	16	39	20	19	---	---	92	---	---	76	CL	A-6
14	2.5-3.5	16	42	23	19	---	---	83	---	---	69	CL	A-7-6
15	0.5-1.5	6	31	23	8	---	---	100	---	---	94	CL	A-4

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
16	0.5-1.5	12	36	27	9	---	---	100	---	---	91	ML	A-4
17	0.5-1.5	13	37	25	12	---	---	84	---	---	69	CL	A-6
18	0.5-1.5	8	37	21	16	---	---	63	---	---	51	CL	A-6
18	4.5-5.5	19	38	19	19	---	---	100	---	---	96	CL	A-6
						---	---						
19	2-4	28	63	21	42	---	---	100	---	---	94	CH	A-7-6
19	6-8	20	33	19	14	---	---	100	---	---	95	CL	A-6
19	28-30	27	NON-PLASTIC			---	---	100	---	---	99	ML	A-4
19	43-45	17	23	17	6	---	---	99	---	---	67	ML-CL	A-4
19	58.5-60	24	32	18	14	---	---	100	---	---	86	CL	A-6
19	68.5-70	16	---			100	98	94	88	41	10	SP-SM	A-1-b
19	74-75	17	25	15	10	---	---	100	---	---	62	CL	A-4
19	94-95	25	38	20	18	---	---	100	---	---	86	CL	A-6
19	99-100	22	29	19	10	---	---	100	---	---	87	CL	A-4
19	109-110	15	---			100	100	99	98	83	43	SM	A-4
19	119-120	19	NON-PLASTIC			---	---	93	---	---	24	SM	A-2-4
20	9-9.5	24	50	18	32	---	---	100	---	---	95	CH	A-7-6
20	24-25	28	NON-PLASTIC			---	---	100	---	---	97	ML	A-4
20	34-35	23	29	21	8	---	---	100	---	---	89	CL	A-4

Grubbs, Hoskyn,
Barton & Wyatt, Inc.
CONSULTING ENGINEERS

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
20	39-40	25	38	17	21	---	---	99	---	---	81	CL	A-6
20	44-45	14	23	13	10	---	---	90	---	---	43	SC	A-4
20	54-55	32	---			---	---	---	---	---	95	CL	A-6
20	64-65	14	21	13	8	---	---	94	---	---	46	SC	A-4
20	74-75	17	24	13	11	---	---	99	---	---	54	CL	A-6
20	94-95	22	35	18	17	---	---	---	---	---	90	CL	A-6
20	109-110	66	---			---	---	100	97	63	41	SM	A-4
21	0.5-1.5	25	28	23	5	---	---	99	---	---	87	ML	A-4
21	24-25	27	NON-PLASTIC			---	---	100	---	---	99	ML	A-4
21	39-40	24	30	19	11	---	---	100	---	---	87	CL	A-6
21	49-50	22	34	19	15	---	---	100	---	---	86	CL	A-6
21	69-70	25	37	20	17	---	---	100	---	---	88	CL	A-6
21	79-80	19	---			---	---	100	100	95	14	SM	A-2-4
21	94-95	22	55	19	36	---	---	100	---	---	72	CH	A-7-6
21	99-100	22	37	18	19	---	---	100	---	---	73	CL	A-6
21	109-110	20	---			100	98	97	96	62	45	SM	A-4
21	119-120	12	---			100	100	98	97	49	16	SM	A-2-4
22	2.5-3.5	24	44	21	23	---	---	100	---	---	97	CL	A-7-6
22	9-10	20	48	18	30	---	---	100	---	---	96	CL	A-7-6
22	14-15	27	37	22	15	---	---	100	---	---	94	CL	A-6
22	24-25	31	28	23	5	---	---	100	---	---	99	ML	A-4

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
22	34-35	24	29	20	9	---	---	100	---	---	92	CL	A-4
22	44-45	23	35	17	18	---	---	97	---	---	91	CL	A-6
22	59-60	15	26	13	13	---	---	100	---	---	41	SC	A-6
22	69-70	15	25	14	11	---	---	90	---	---	53	CL	A-6
22	79-80	25	---			---	---	100	---	---	85	CL	A-6
22	89-90	14	---			---	---	66	---	---	21	SM	A-2-4
23	2.5-3.5	25	39	22	17	---	---	100	---	---	94	CL	A-6
23	9-10	23	51	19	32	---	---	100	---	---	92	CH	A-7-6
23	14.5-15	22	43	20	23	---	---	100	---	---	99	CL	A-7-6
23	29.5-30	31	31	25	6	---	---	100	100	100	99	ML	A-4
23	44-44.5	25	38	22	16	---	---	100	---	---	96	CL	A-6
23	54.5-55	17	31	14	17	---	---	100	---	---	63	CL	A-6
23	59-60	22	34	18	16	---	---	100	---	---	78	CL	A-6
23	64-65	19	---			---	---	100	---	---	14	SM	A-2-4
23	69-70	18	---			---	---	100	97	23	15	SM	A-1-b
23	79.5-80	19	51	20	31	---	---	100	100	100	100	CH	A-7-6
23	99-100	21	---			100	98	98	97	70	21	SM	A-2-4
23	109-110	18	---			100	100	99	94	60	17	SM	A-2-4
24	2.5-3.5	25	43	21	22	---	---	100	---	---	95	CL	A-7-6
24	9.5-10	22	54	19	35	---	---	100	---	---	97	CH	A-7-6
24	14-15	25	40	22	18	---	---	100	---	---	99	CL	A-6

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
24	19.5-20	35	28	26	2	---	---	100	---	---	96	ML	A-4
24	34.5-35	22	29	16	13	---	---	100	---	---	75	CL	A-6
24	44.5-45	28	32	22	10	---	---	100	---	---	94	CL	A-4
24	49-50	17	21	13	8	---	---	100	---	---	47	SC	A-4
24	64-65	21	---			---	---	100	---	---	5	SP-SM	A-3
25	4.5-5.5	27	48	22	26	---	---	100	---	---	94	CL	A-7-6
25	19-20	33	30	23	7	---	---	100	100	100	100	ML-CL	A-4
25	34-35	15	25	11	14	---	---	92	---	---	43	SC	A-6
25	49-50	33	74	24	50	---	---	100	---	---	99	CH	A-7-6
25	64-65	23	42	19	23	---	---	100	---	---	99	CL	A-7-6
25	74-75	31	42	17	25	---	---	100	---	---	94	CL	A-7-6
26	9-9.5	25	---			---	---	100	---	---	92	CL	A-6
26	29-30	17	19	12	7	---	---	100	---	---	39	SM-SC	A-4
26	39-40	27	68	22	46	---	---	100	---	---	98	CH	A-7-6
26	59-60	43	---			---	---	100	---	---	99	CH	A-7-6
26	74-75	22	---			---	---	100	---	---	99	CL	A-7-6
26	94-95	38	---			---	---	100	98	59	51	CL	A-6
27	6-8	22	37	20	17	---	---	100	---	---	94	CL	A-6
27	18.5-20	30	36	22	14	---	---	100	---	---	98	CL	A-6
27	38-40	18	27	14	13	---	---	83	---	---	36	SC	A-6

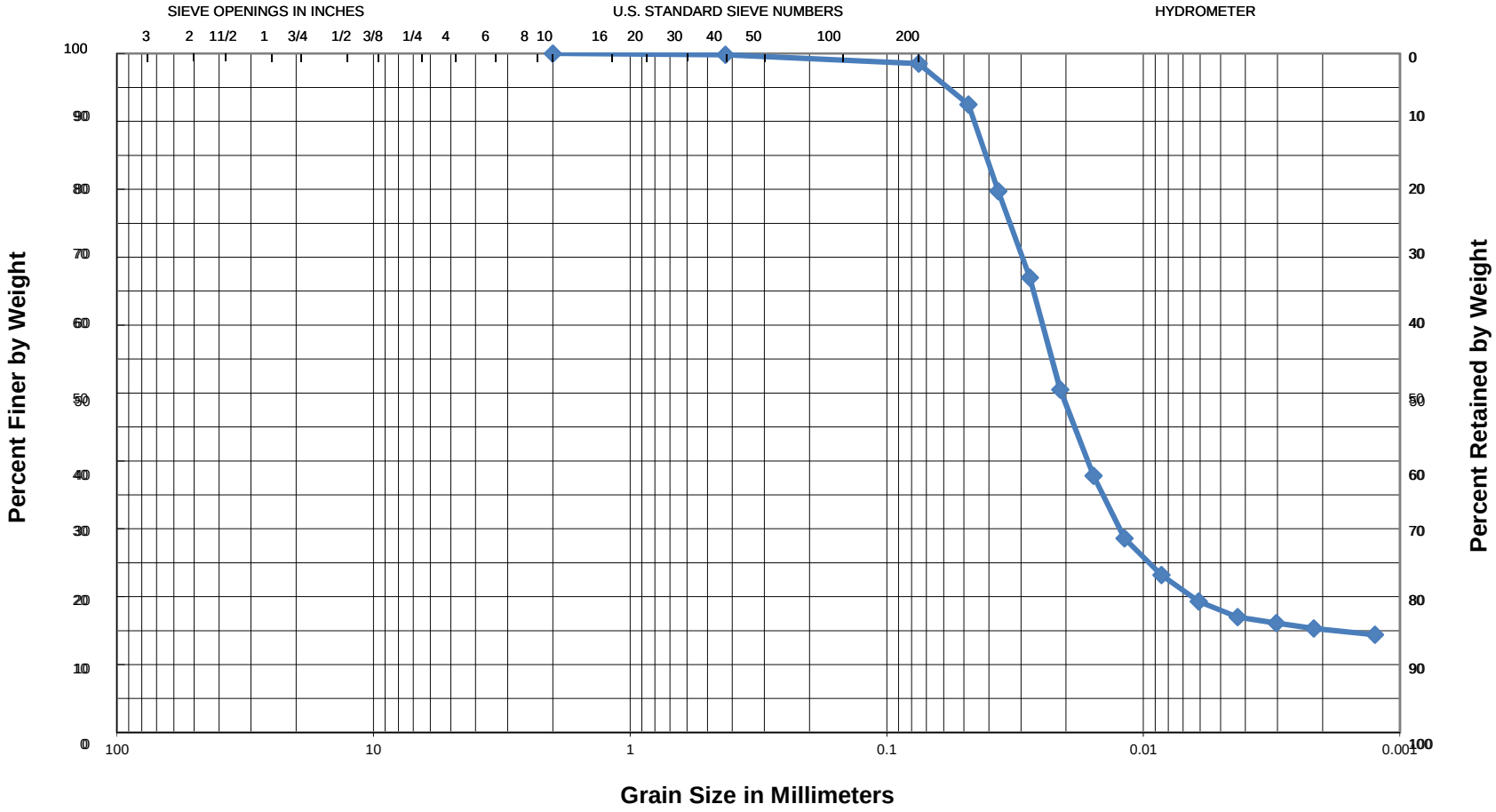
SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: ARDOT 100942 Hwy. 351 RR Overpass (Airport Rd.) (Jonesboro) (S)
LOCATION: Jonesboro, Craighead County, Arkansas
GHBW JOB NUMBER: 17-127

BORING NO.	SAMPLE DEPTH (FT)	WATER CONTENT (%)	ATTERBERG LIMITS			SIEVE ANALYSIS PERCENT PASSING						UNIFIED CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	3/4 in.	3/8 in.	#4	#10	#40	#200		
27	43.5-45	20	NON-PLASTIC			---	---	100	---	---	21	SM	A-2-4
27	48.5-50	31	65	21	44	---	---	100	---	---	96	CH	A-7-6
27	53-55	36	71	28	43	---	---	100	---	---	98	CH	A-7-6
27	73.5-75	45	85	27	58	---	---	---	---	---	---	CH	A-7-6
27	83-85	23	46	20	26	---	---	100	---	---	99	CL	A-7-6
27	93.5-95	23	43	19	24	---	---	100	---	---	98	CL	A-7-6
27	98.5-100	25	---			---	---	100	100	33	6	SW-SM	A-1-b
27	108.5-108.75	19	---			---	---	100	100	47	5	SP-SM	A-1-b

17-127

GRAIN SIZE CURVE



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

Sample: Boring 1, 29-30 ft
Properties: G_s = 2.705; LL = 33, PL = 23, PI = 10;
Description: Brown silty clay

USCS = CL; AASHTO = A-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

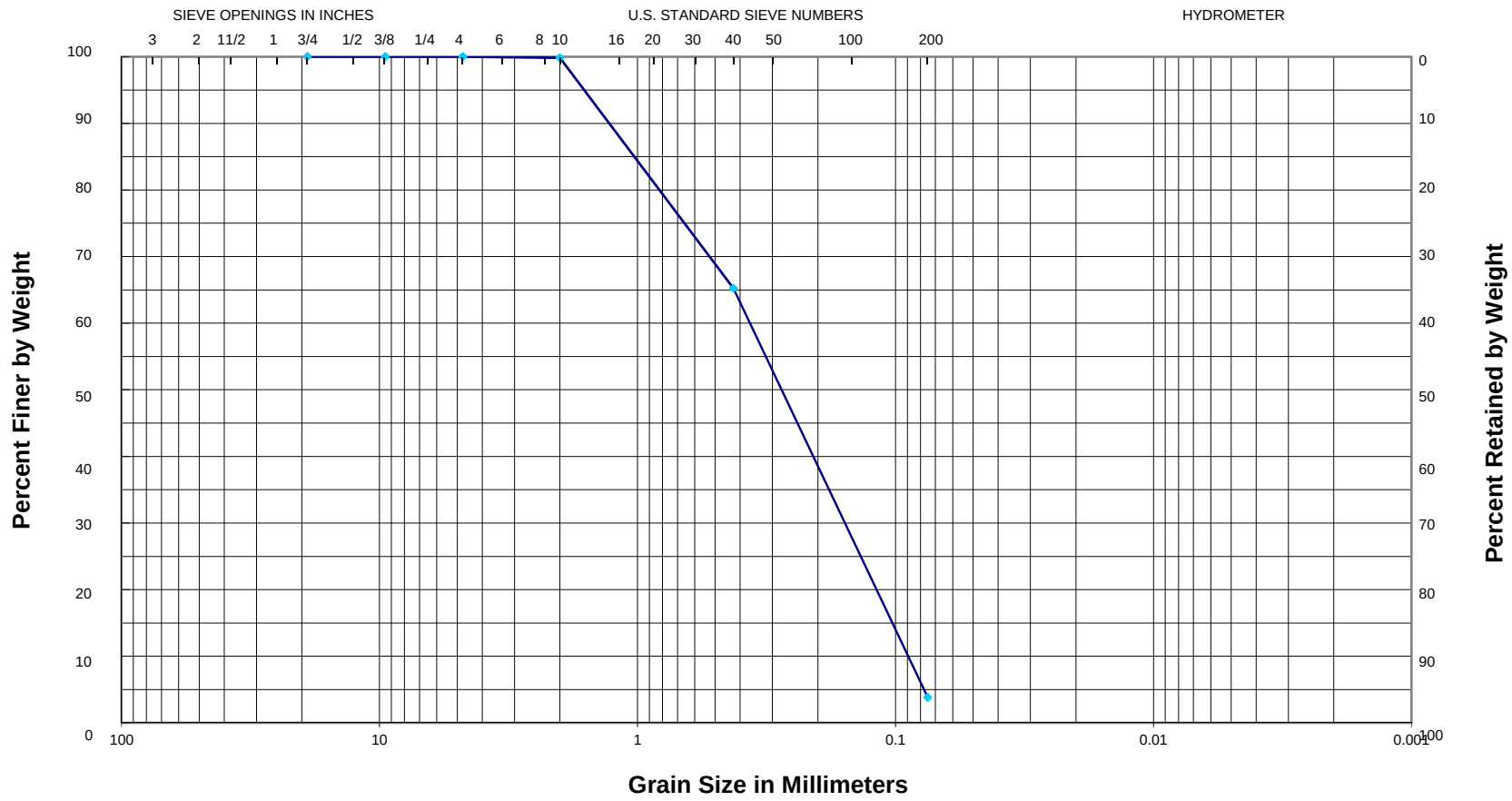
Sample: Boring 1, 54-55 ft; Non-Plastic
Description: Reddish tan silty fine sand with a little fine gravel

USCS =SM **AASHTO =A-2-4**

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

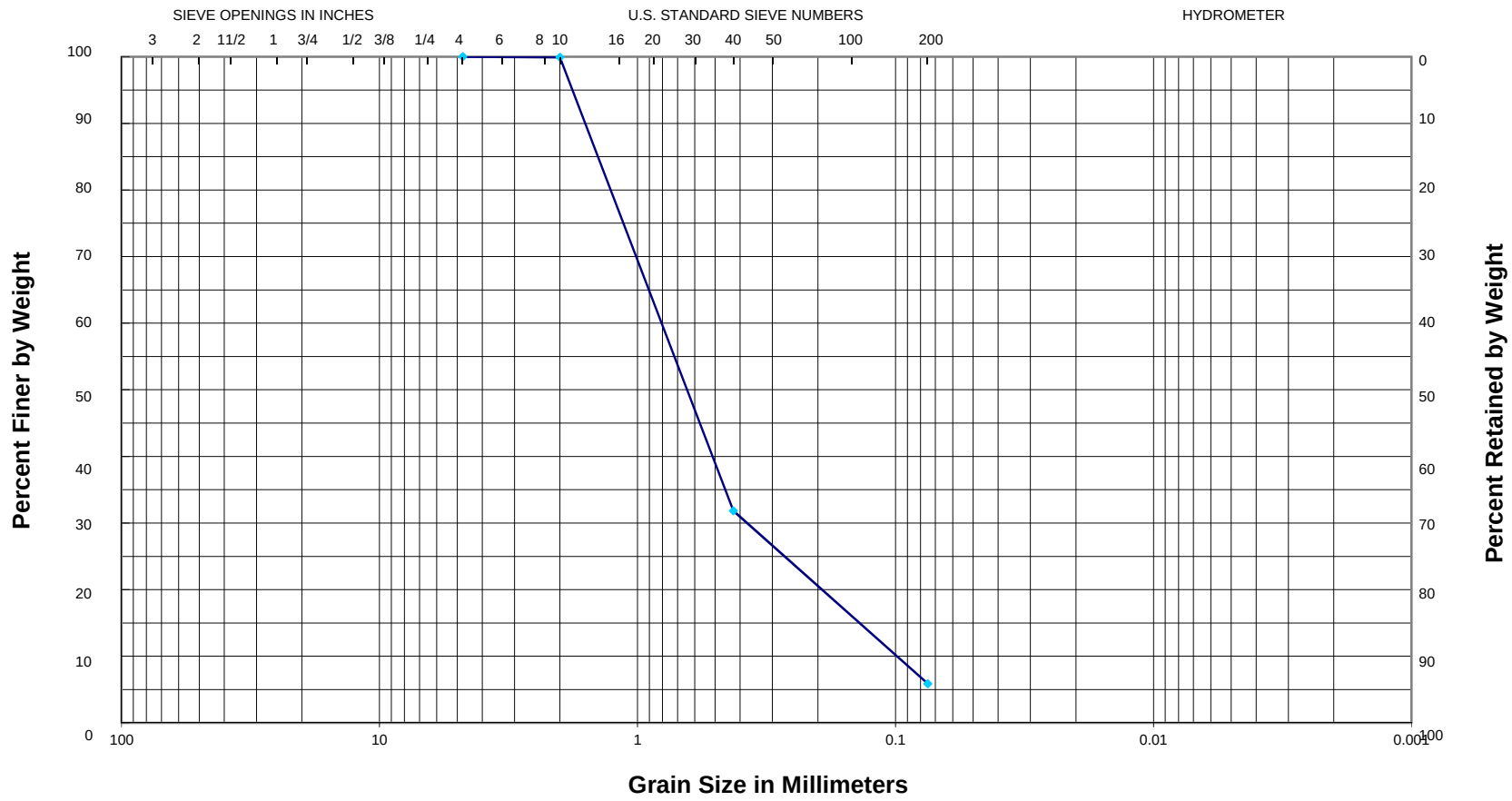
Sample: Boring 1, 79-80 ft; Non-Plastic
Description: Brown and tan fine to medium sand

USCS = SP-SM **AASHTO =A-2-4**

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

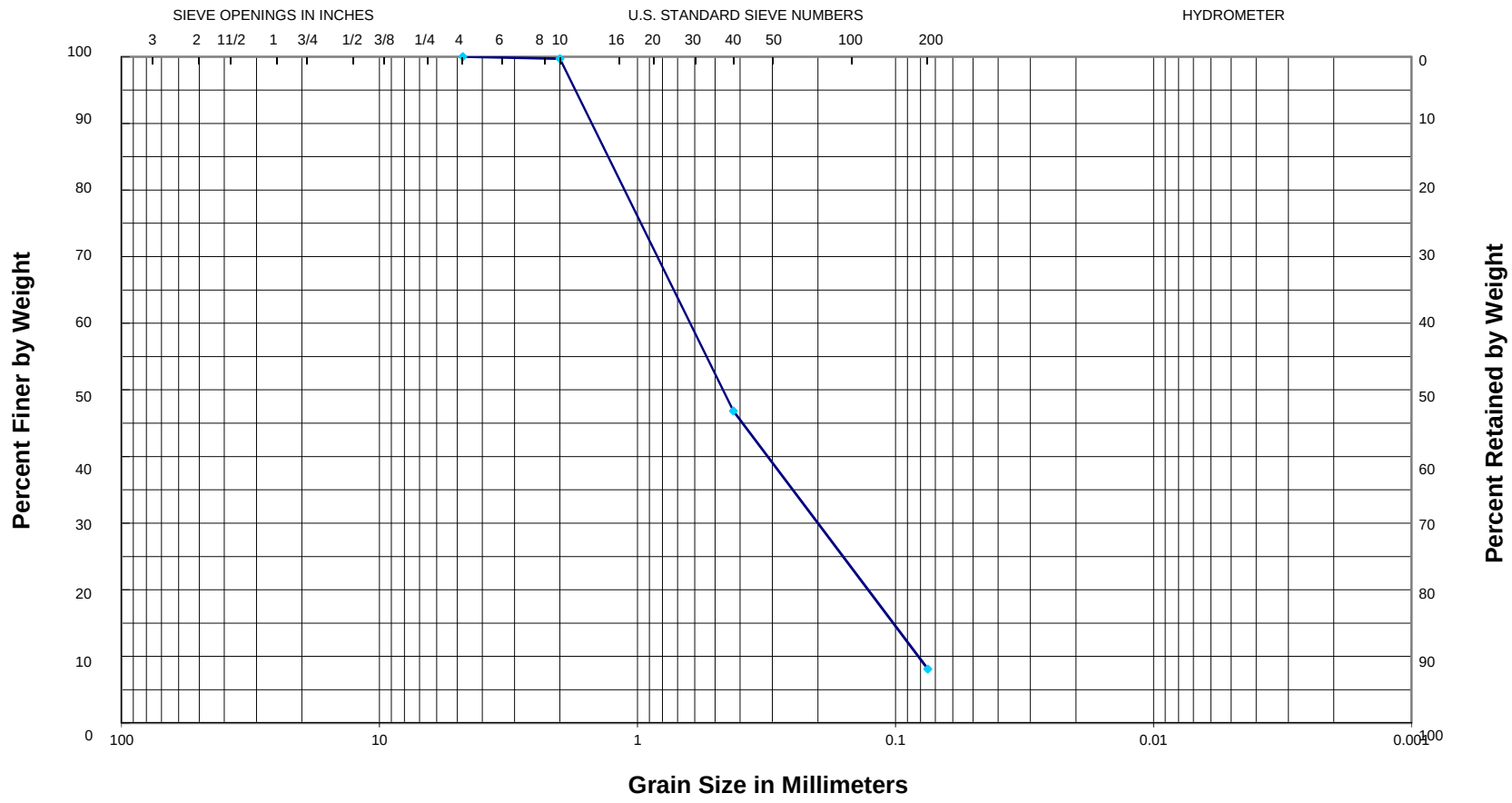
Sample: Boring 1, 89-90 ft; Non-Plastic
Description: Tan and reddish tan fine to medium sand, slightly silty

USCS = SP-SM **AASHTO = A-2-4**

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



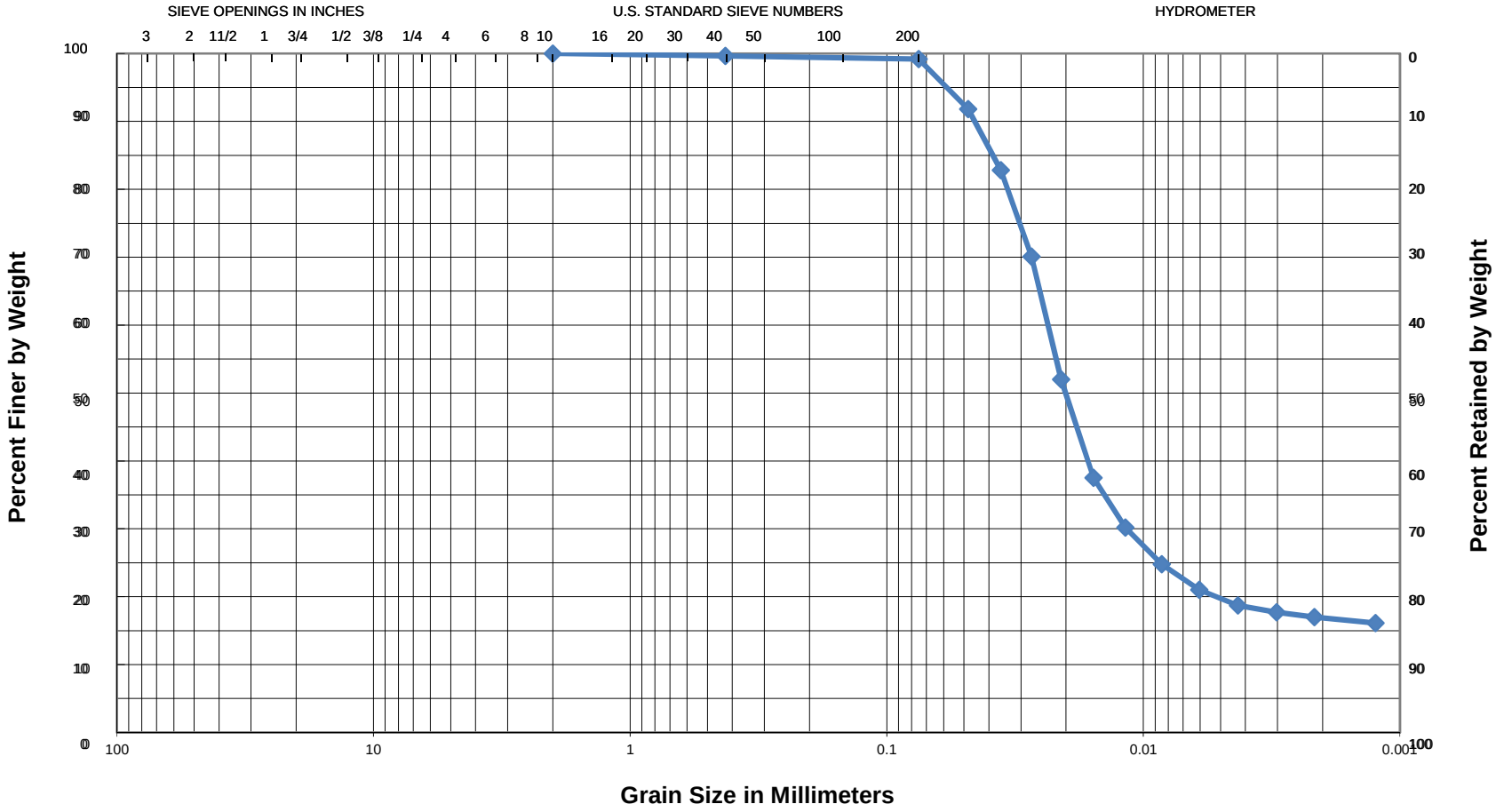
GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: Boring 1, 128.5-129 ft; Non-Plastic
Description: Brownish gray fine to medium sand, slightly silty

USCS = SP-SM **AASHTO = A-2-4**

17-127

GRAIN SIZE CURVE



GRAVEL		SAND			SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE		

Sample: Boring 2, 24-25 ft
Properties: G_s = 2.701; LL = 32, PL = 23, PI = 9;
Description: Grayish brown clayey silt

USCS = CL; AASHTO = A-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: Boring 2, 68.5-69.5 ft; Non-Plastic
Description: Brownish gray and reddish tan silty fine sand with trace fine gravel and medium sand

USCS = SM **AASHTO = A-2-4**

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

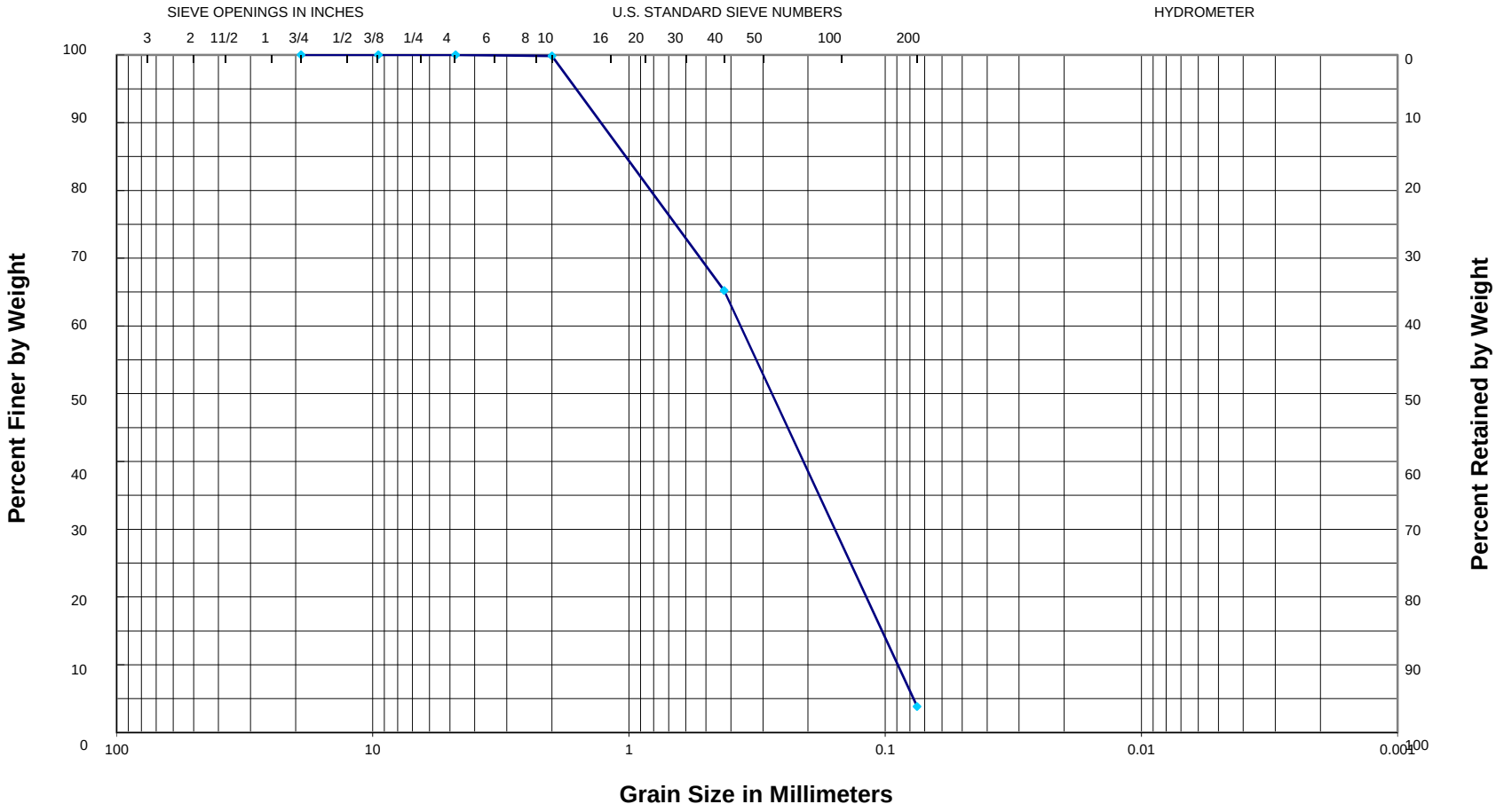
Sample: Boring 2, 83.5-84.5 ft; Non-Plastic
Description: Brownish gray fine to medium sand, trace silt

USCS = SP-SM AASHTO = A-3

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

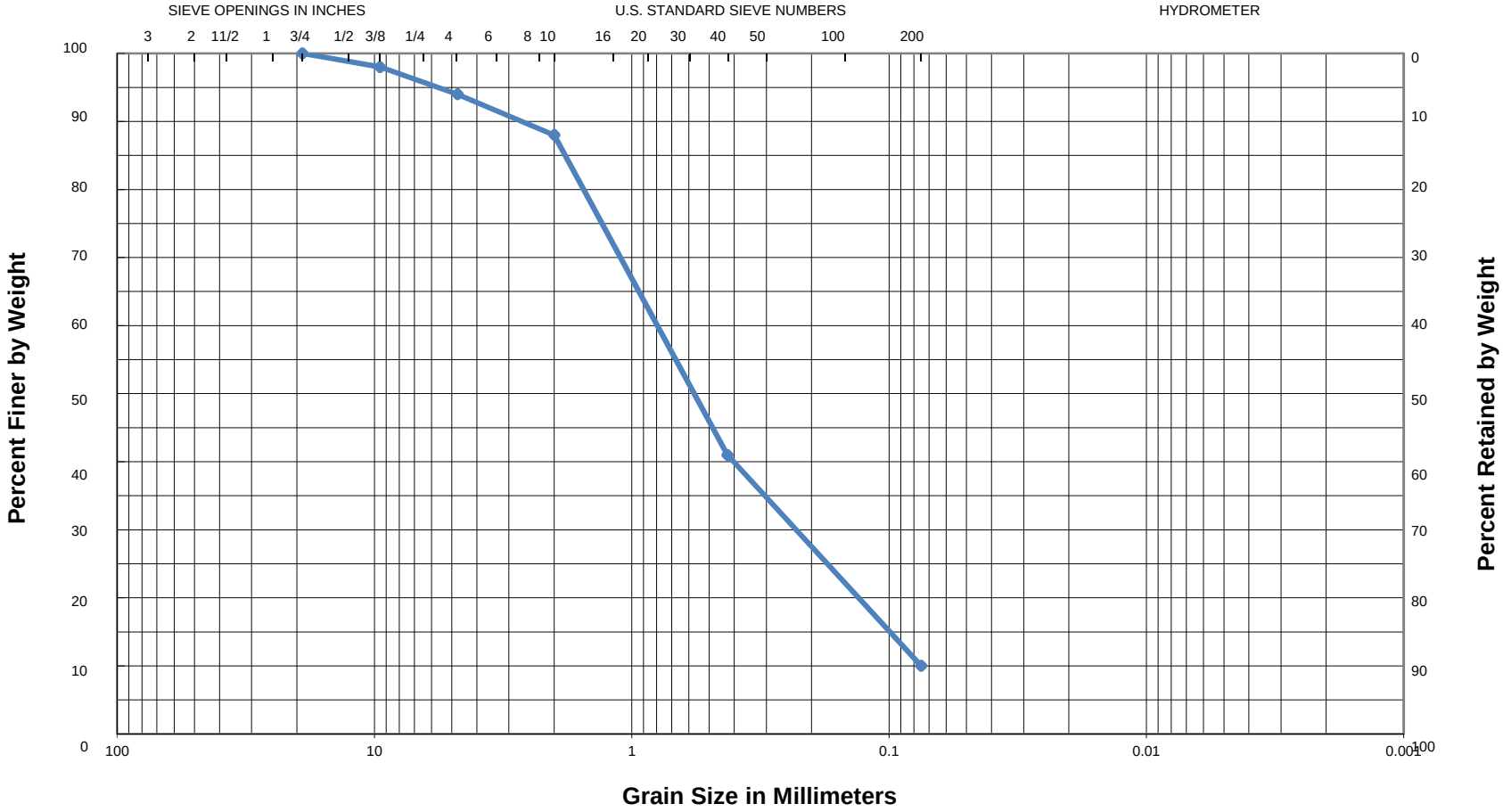
Sample: Boring 2, 108.5-109.5 ft; Non-Plastic
Description: Brownish gray fine to medium sand

USCS = SP **AASHTO = A-3**

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

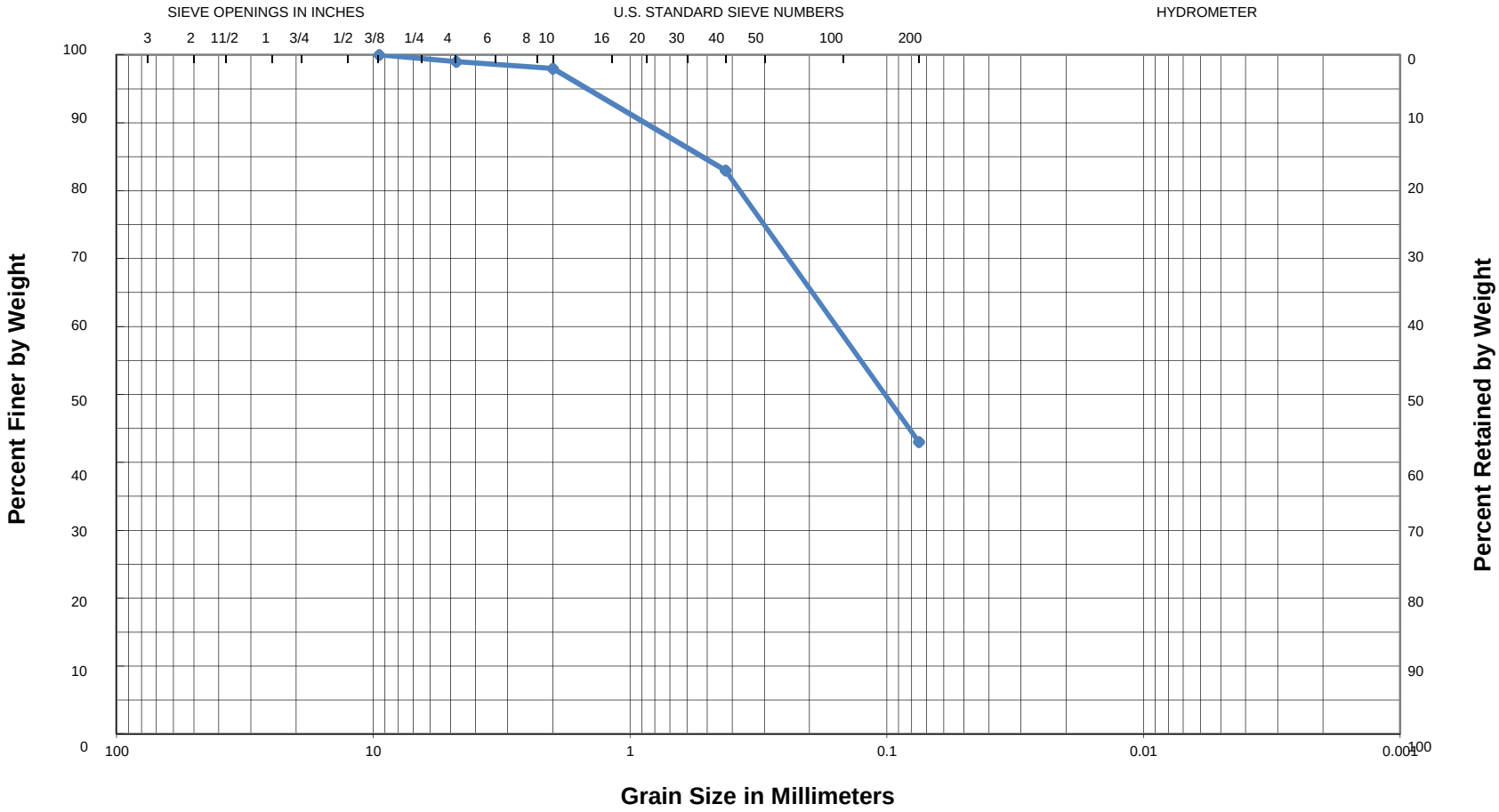
Sample: Boring 19, 68.5-70 ft
Description: Light grayish brown silty fine to medium SAND w/ some fine gravel

USCS Classification = SP-SM
AASHTO Classification = A-1-b

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

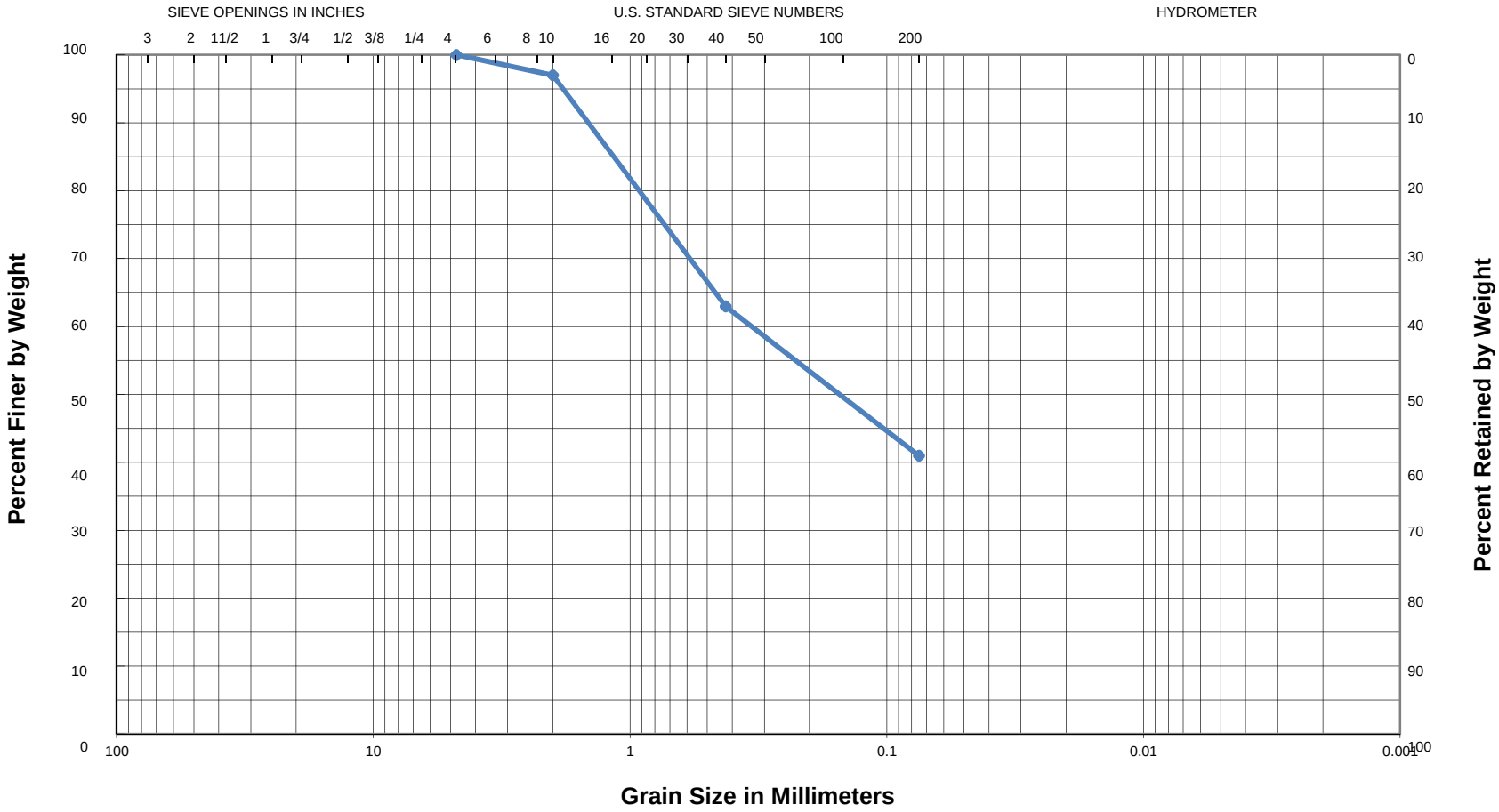
Sample: Boring 19, 109-110 ft
Description: Gray and tan silty fine SAND

USCS Classification = SM
AASHTO Classification = A-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

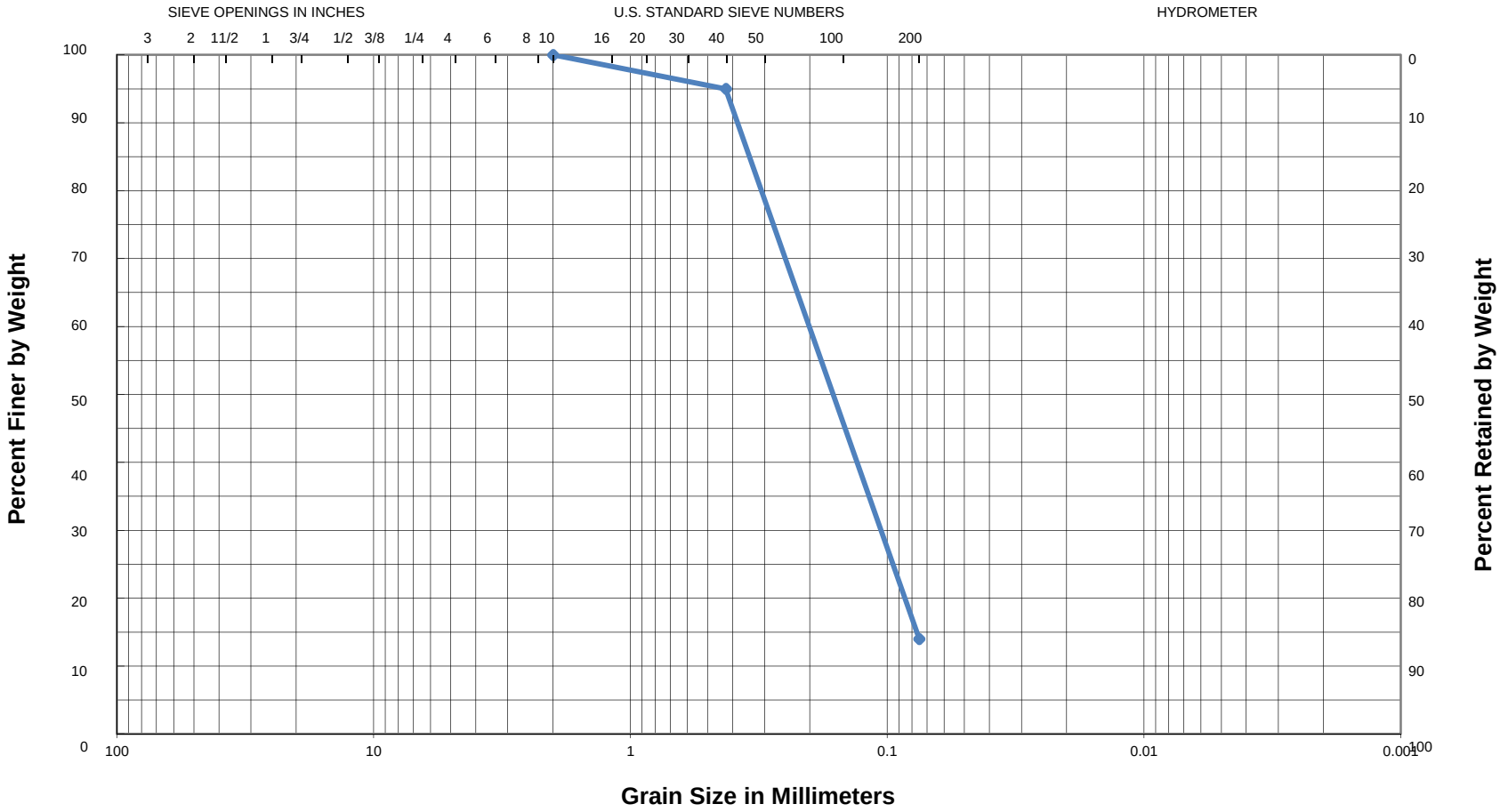
Sample: Boring 20, 109-110 ft
Description: Tan and gray silty fine t omedium SAND w/ clay seams

USCS Classification = SM
AASHTO Classification = A-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

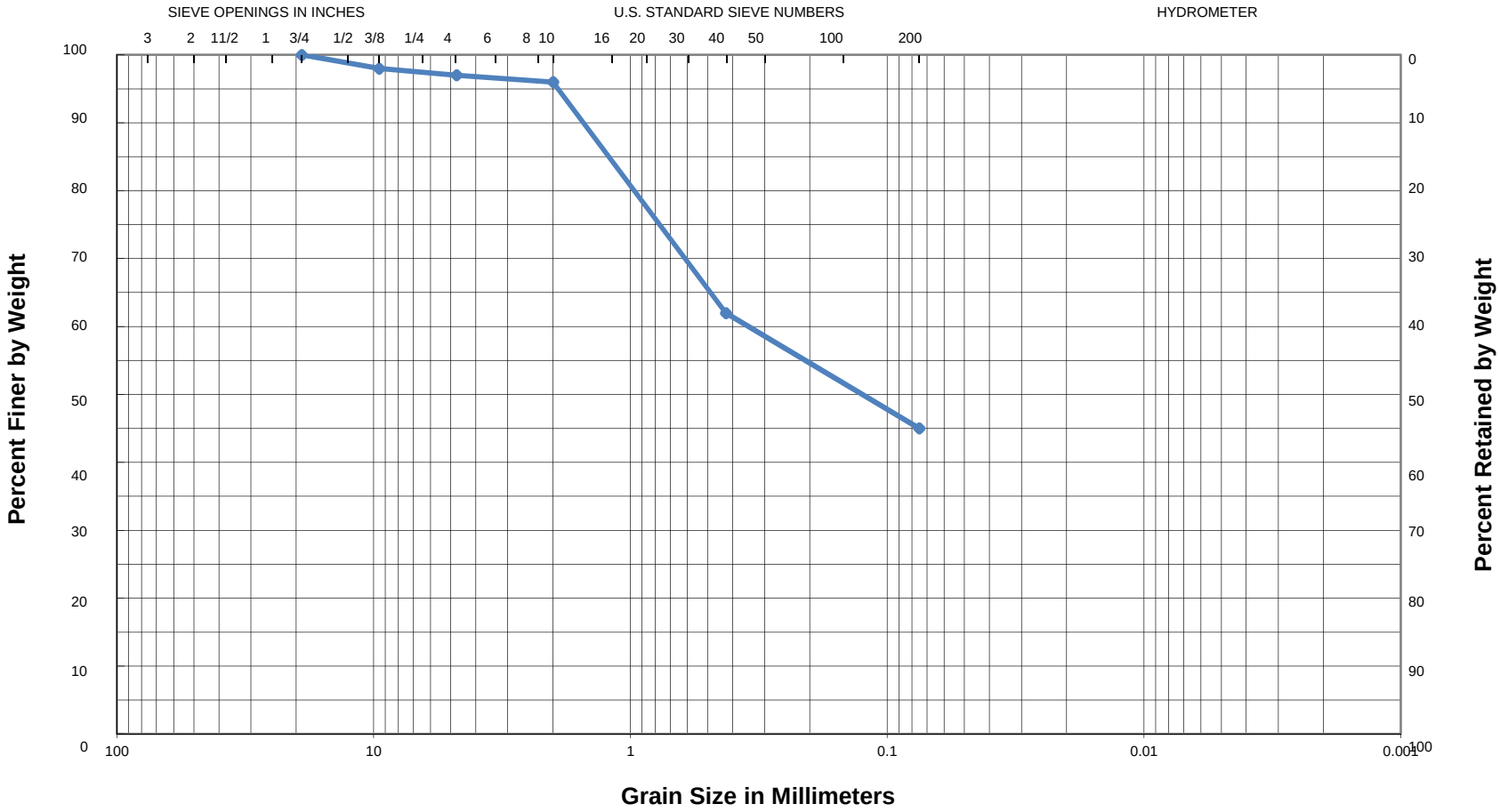
Sample: Boring 21, 79-80 ft
Description: Reddish tan and brown silty fine SAND

USCS Classification = SM
AASHTO Classification = A-2-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

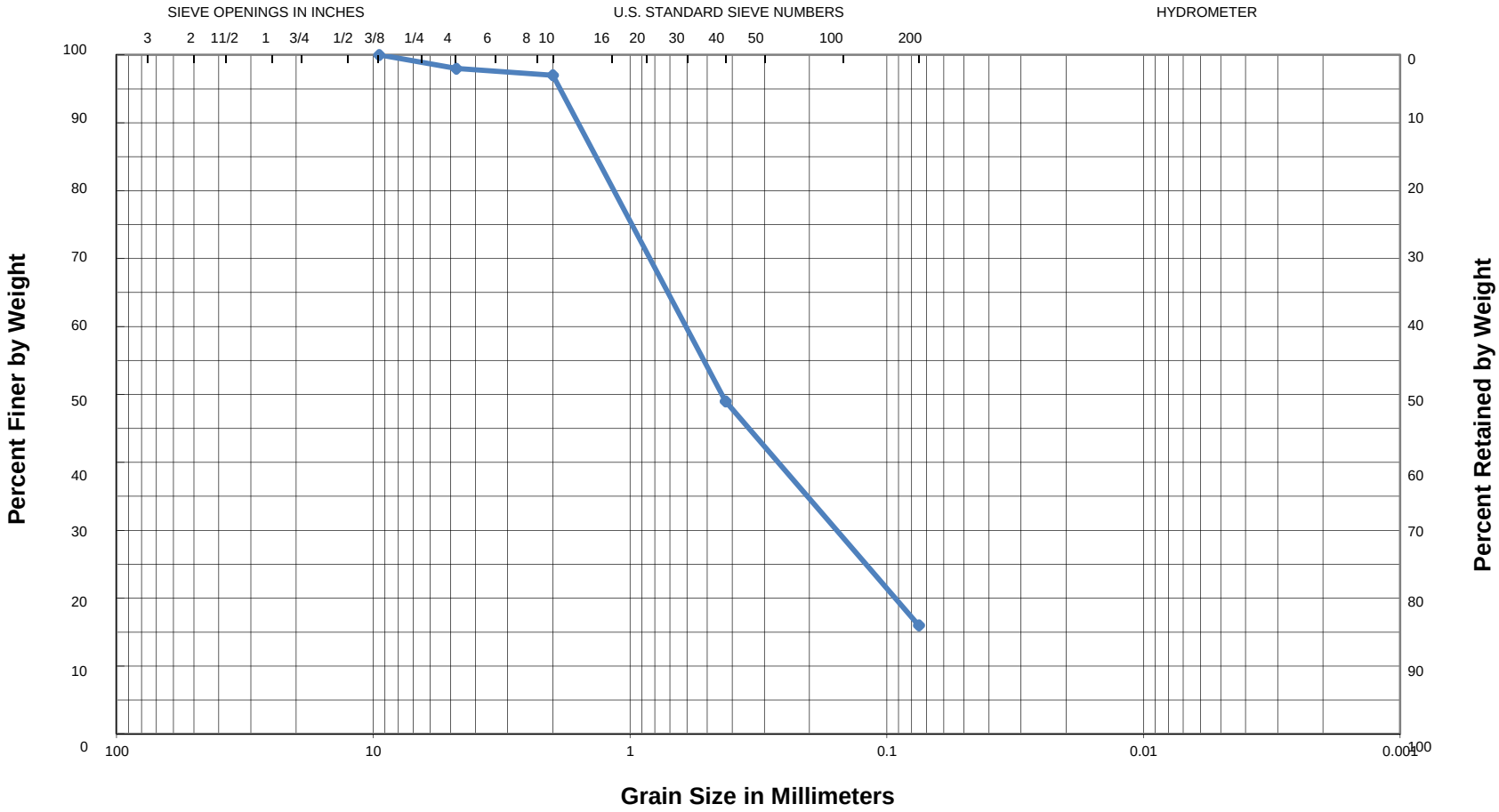
Sample: Boring 21, 109-110 ft
Description: Reddish tan silty fine to medium SAND

USCS Classification = SM
AASHTO Classification = A-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

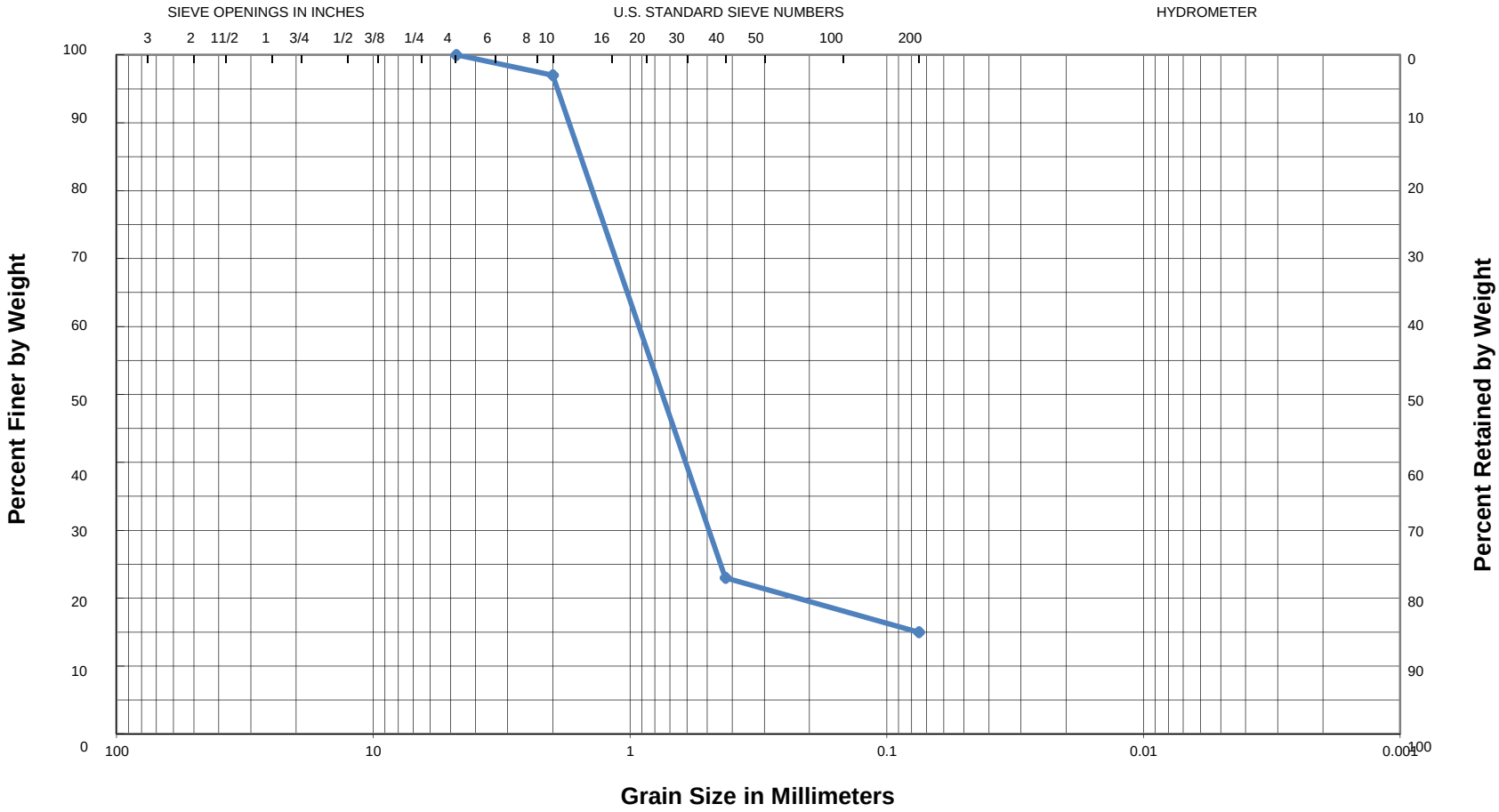
Sample: Boring 21, 119-120 ft
Description: Yellowish brown silty fine to medium SAND

USCS Classification = SM
AASHTO Classification = A-2-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

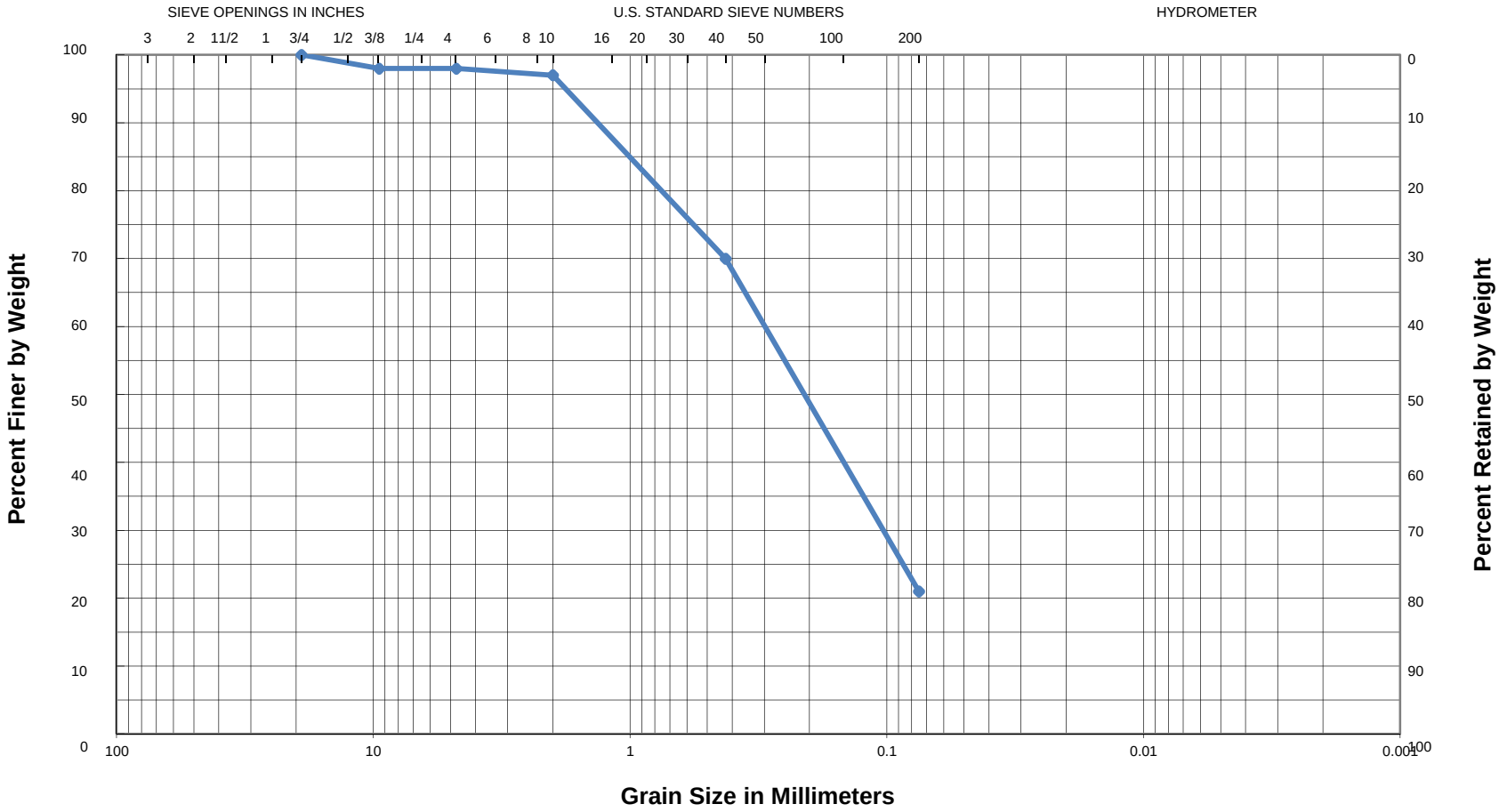
Sample: Boring 23, 69-70 ft
Description: Reddish brown silty fine SAND

USCS Classification = SM
AASHTO Classification = A-1-b

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

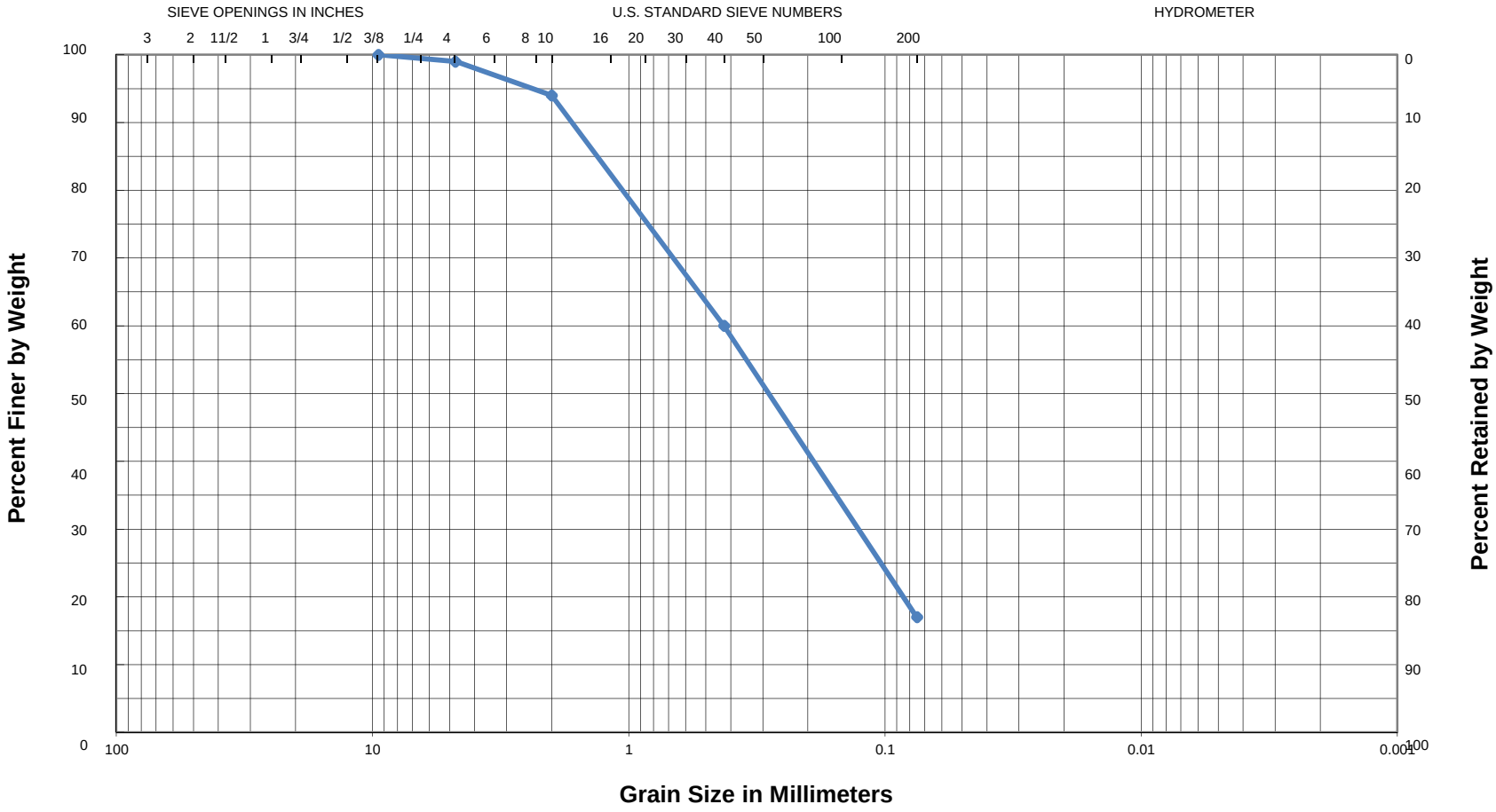
Sample: Boring 23, 99-100 ft
Description: Tan silty fine SAND

USCS Classification = SM
AASHTO Classification = A-2-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

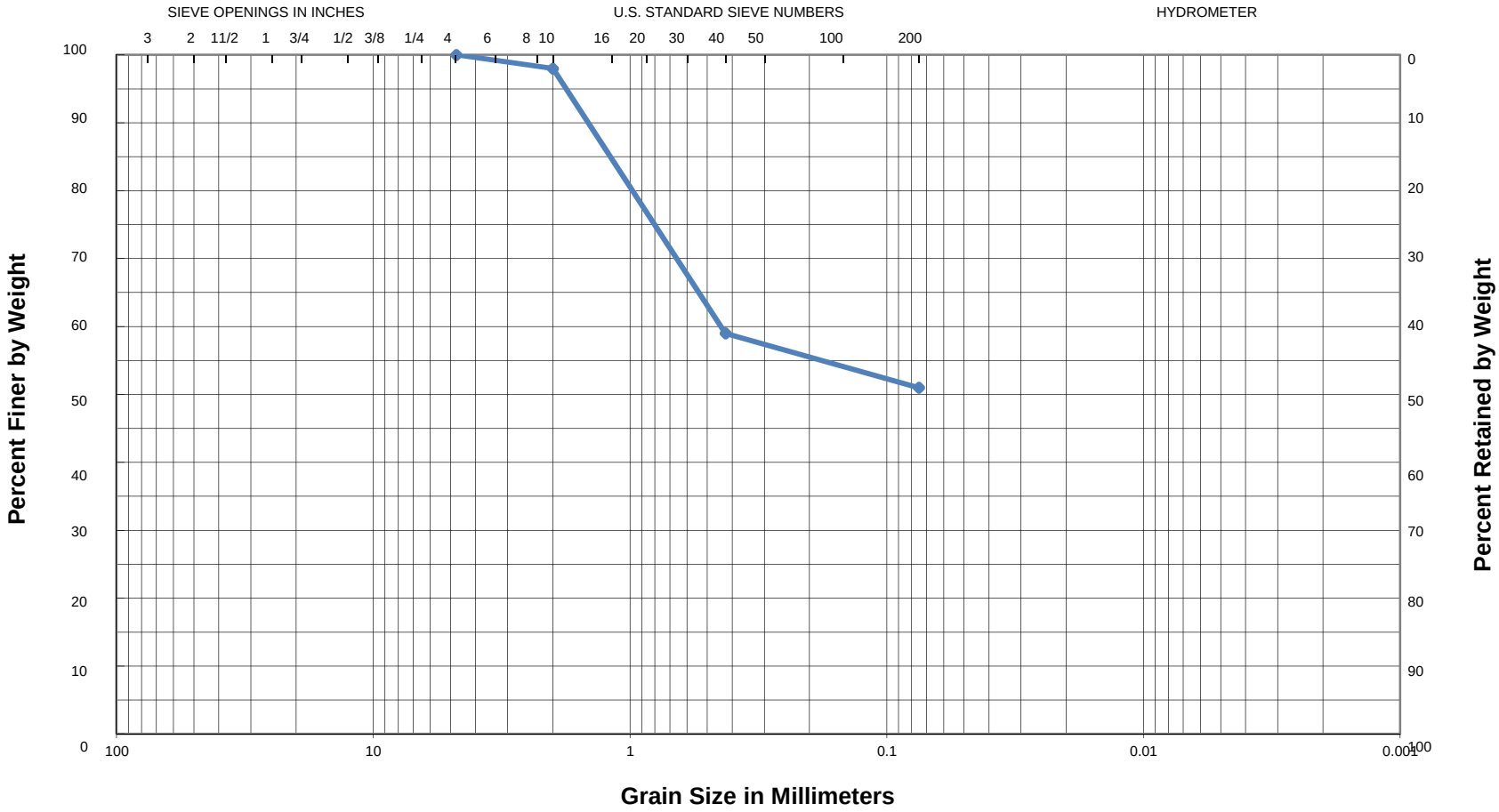
Sample: Boring 23, 109-110 ft
Description: Tan silty fine to medium SAND

USCS Classification = SM
AASHTO Classification = A-2-4

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

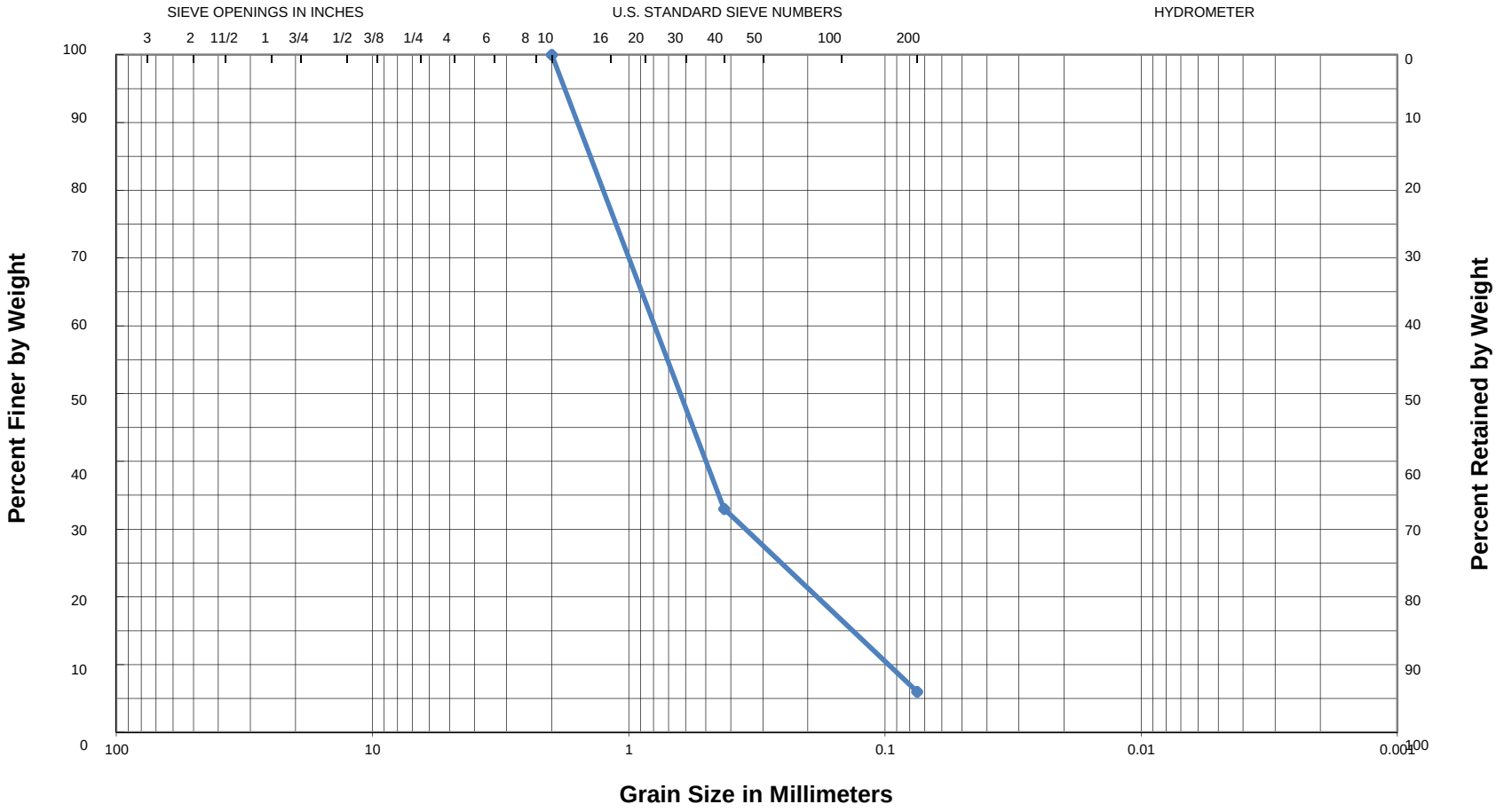
Sample: Boring 26, 94-95 ft
Description: Tan and gray fine to medium SAND w/ clay seams and layers

USCS Classification = CL
AASHTO Classification = A-6

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

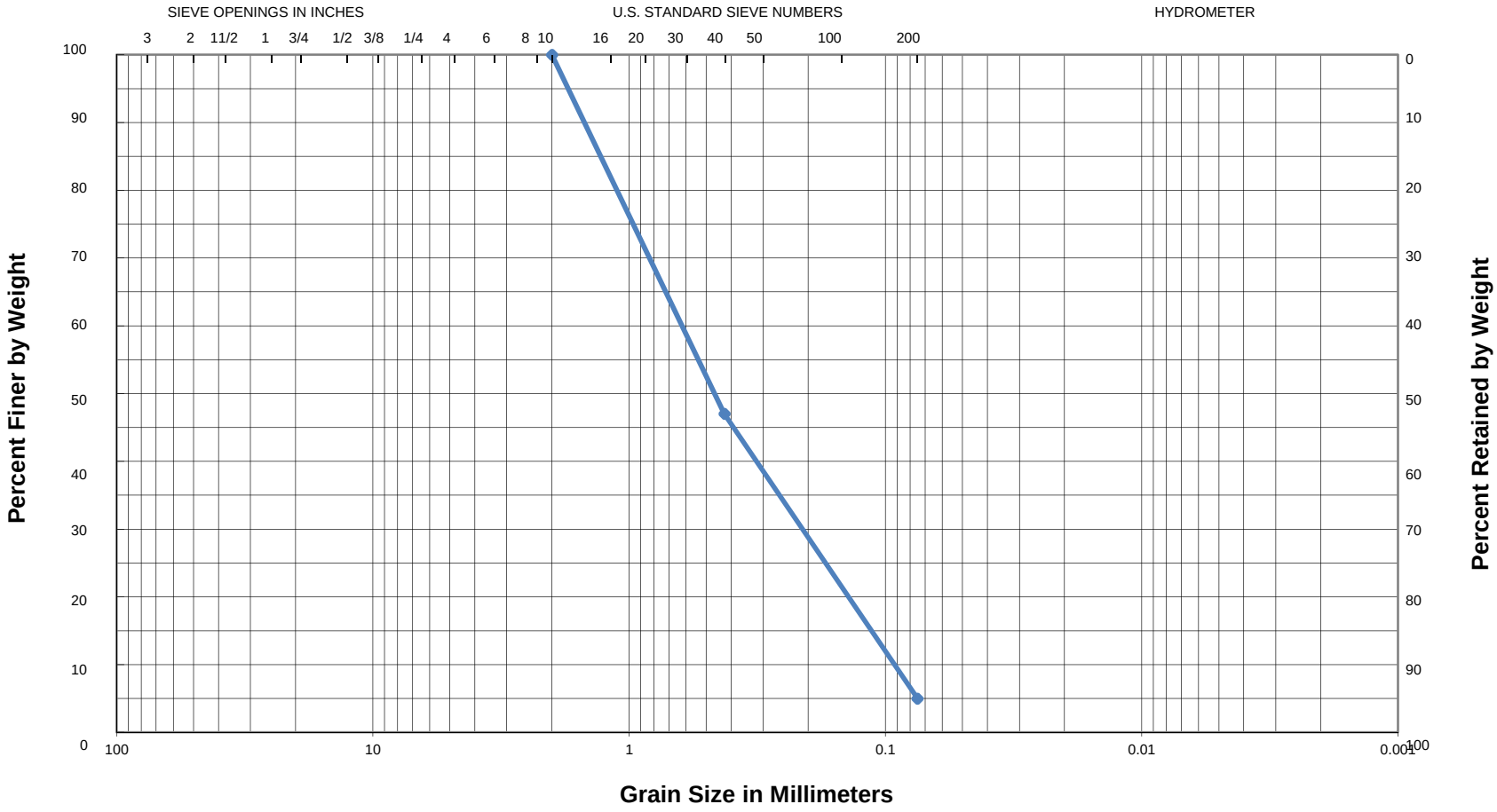
Sample: Boring 27, 98.5-100 ft
Description: Brownish gray fine to medium SAND, slightly silty

USCS Classification = SW-SM
AASHTO Classification = A-1-b

17-127

GRAIN SIZE CURVE

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

Sample: Boring 27, 108.5-108.75 ft
Description: Yellowish brown fine to medium SAND, slightly silty

USCS Classification = SP-SM
AASHTO Classification = A-1-b

APPENDIX C

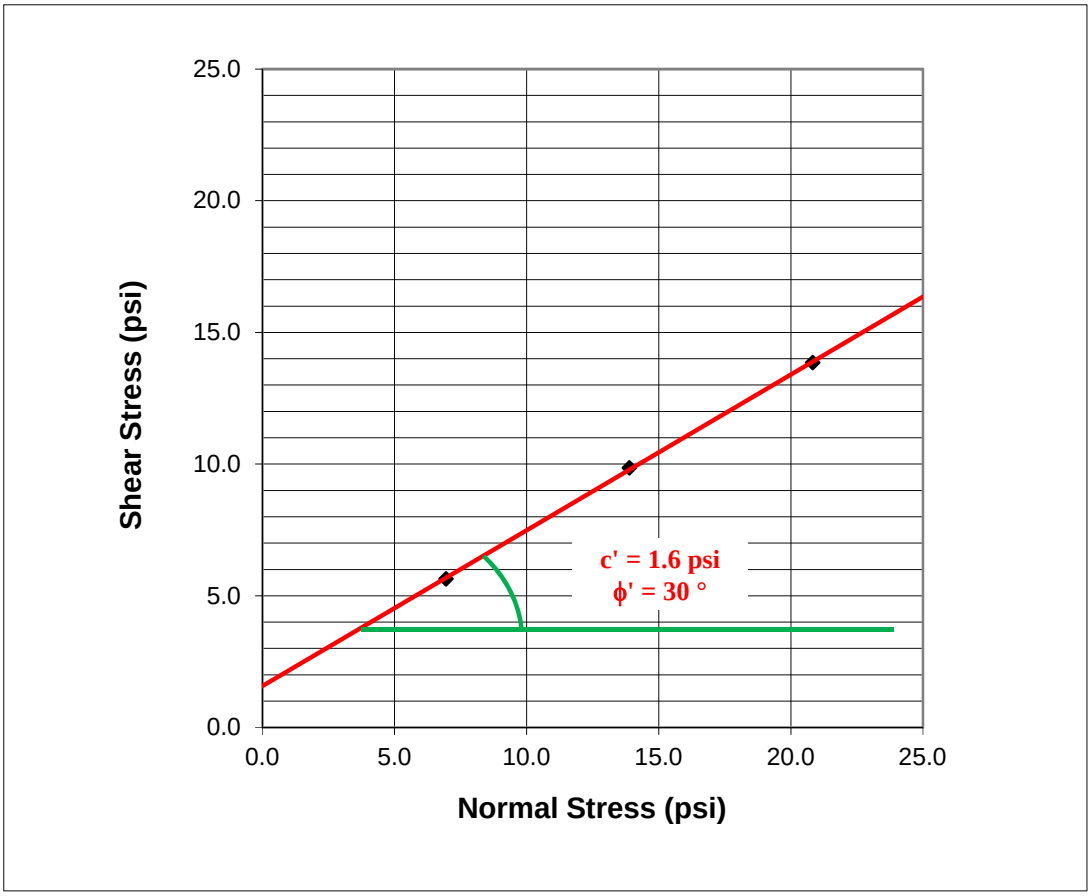
DIRECT SHEAR (AASHTO T-236) TEST RESULTS

(Consolidated Drained)

Job No.:	17-127	Tested By:	MM
Project:	ArDOT 100942 HWY 351 RR Overpass	Reported by:	DGG
	Jonesboro, AR	Test Date:	11/29/2017
Boring No.:	5		
Depth, ft:	19.5-20		
Sample Description:	Tan and brown silty CLAY		

Material Properties: LL = 32, PL = 22, PI = 10; Minus No. 200 Sieve = 99%; USCS = CL; AASHTO = A-4

Specimen	Normal Stress, σ'_v (psi)	Shear at failure, τ_f (psi)	Unit Dry Wt, γ_d (lb/ft^3)	Moisture Content,w (%)
1	6.9	5.6	96.5	26.2
2	13.9	9.9	96.1	26.6
3	20.8	13.9	96.5	26.2



Grubbs, Hoskyn, Barton & Wyatt, Inc.

CONSULTING ENGINEERS

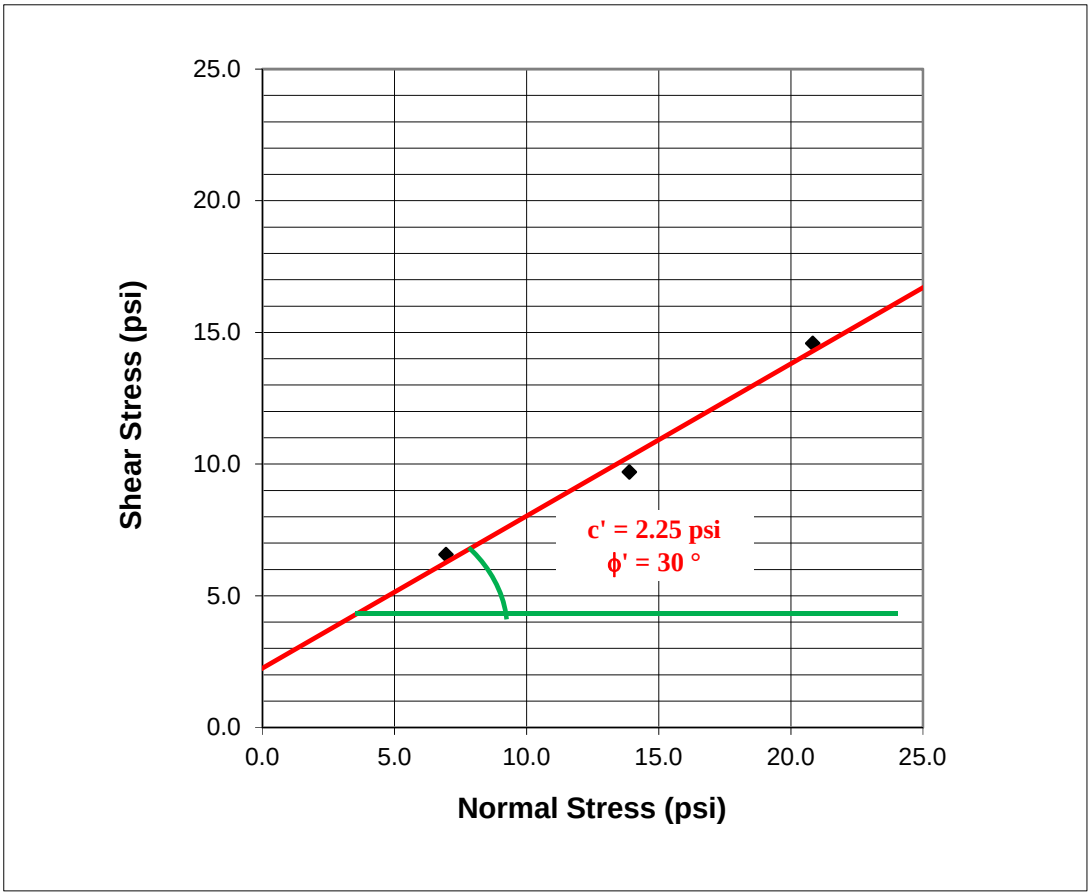
DIRECT SHEAR (AASHTO T-236) TEST RESULTS

(Consolidated Drained)

Job No.:	17-127	Tested By:	MM
Project:	ArDOT 100942 HWY 351 RR Overpass	Reported by:	DGG
	Jonesboro, AR	Test Date:	12/4/2017
Boring No.:	8		
Depth, ft:	29.5-30		
Sample Description:	Grayish brown clayey SILT		

Material Properties: LL = 32, PL = 24, PI = 8; Minus No. 200 Sieve = 99%; USCS = ML; AASHTO = A-4

Specimen	Normal Stress, σ'_v (psi)	Shear at failure, τ_f (psi)	Unit Dry Wt, γ_d (lb/ft^3)	Moisture Content,w (%)
1	6.9	6.6	99.1	24.9
2	13.9	9.7	98.7	25.3
3	20.8	14.6	98.5	25.4



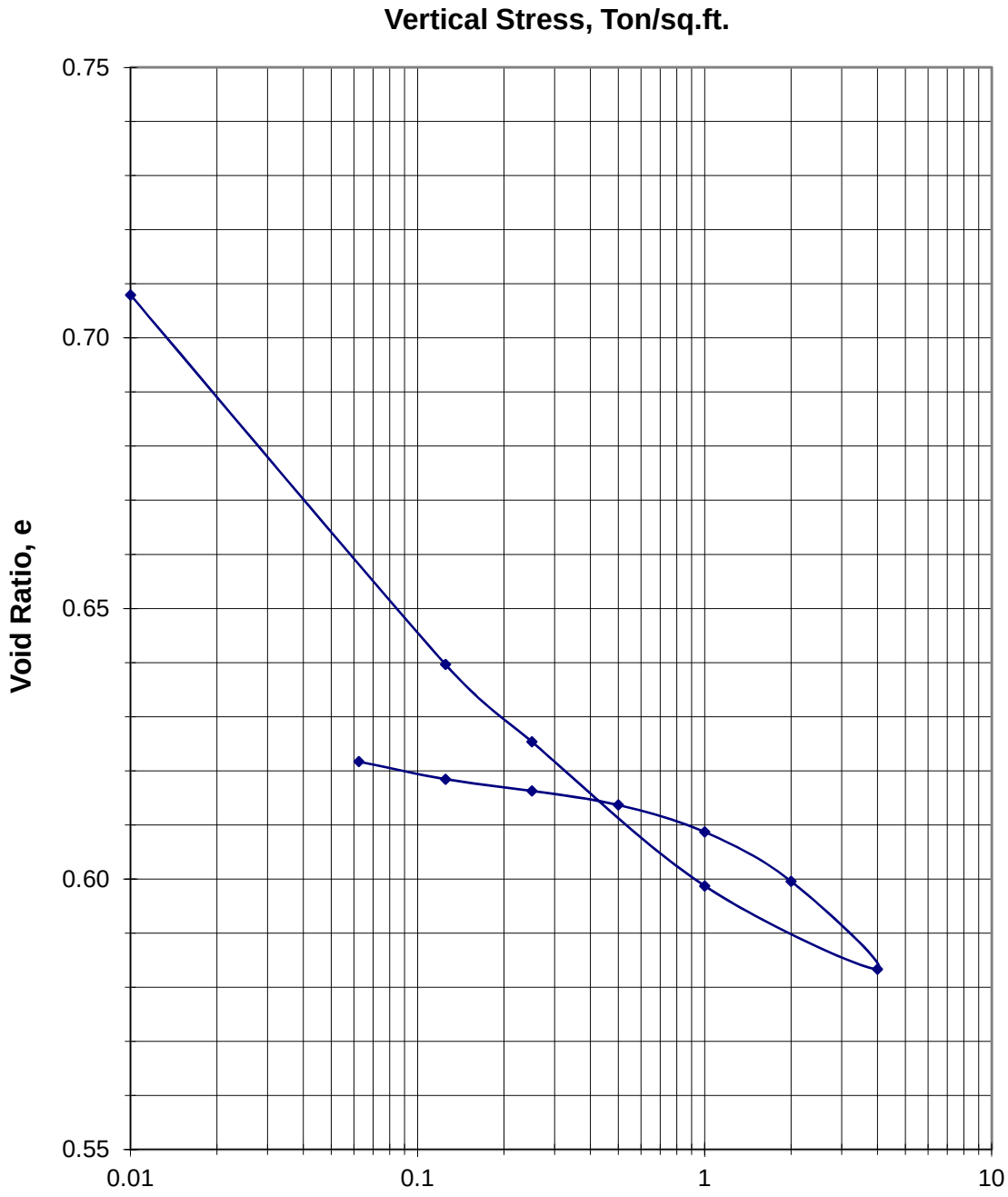
Grubbs, Hoskyn, Barton & Wyatt, Inc.

CONSULTING ENGINEERS

CONSOLIDATION TEST RESULTS
(AASHTO T-216)

GHBW Job No.: 17-127
Project: ArDOT 100942 HWY 351 RR Overpass
Boring: 2
Depth: 3-3.5 ft
Description: Grayish brown and reddish tan silty CLAY
USCS = CL
AASHTO = A-7-6

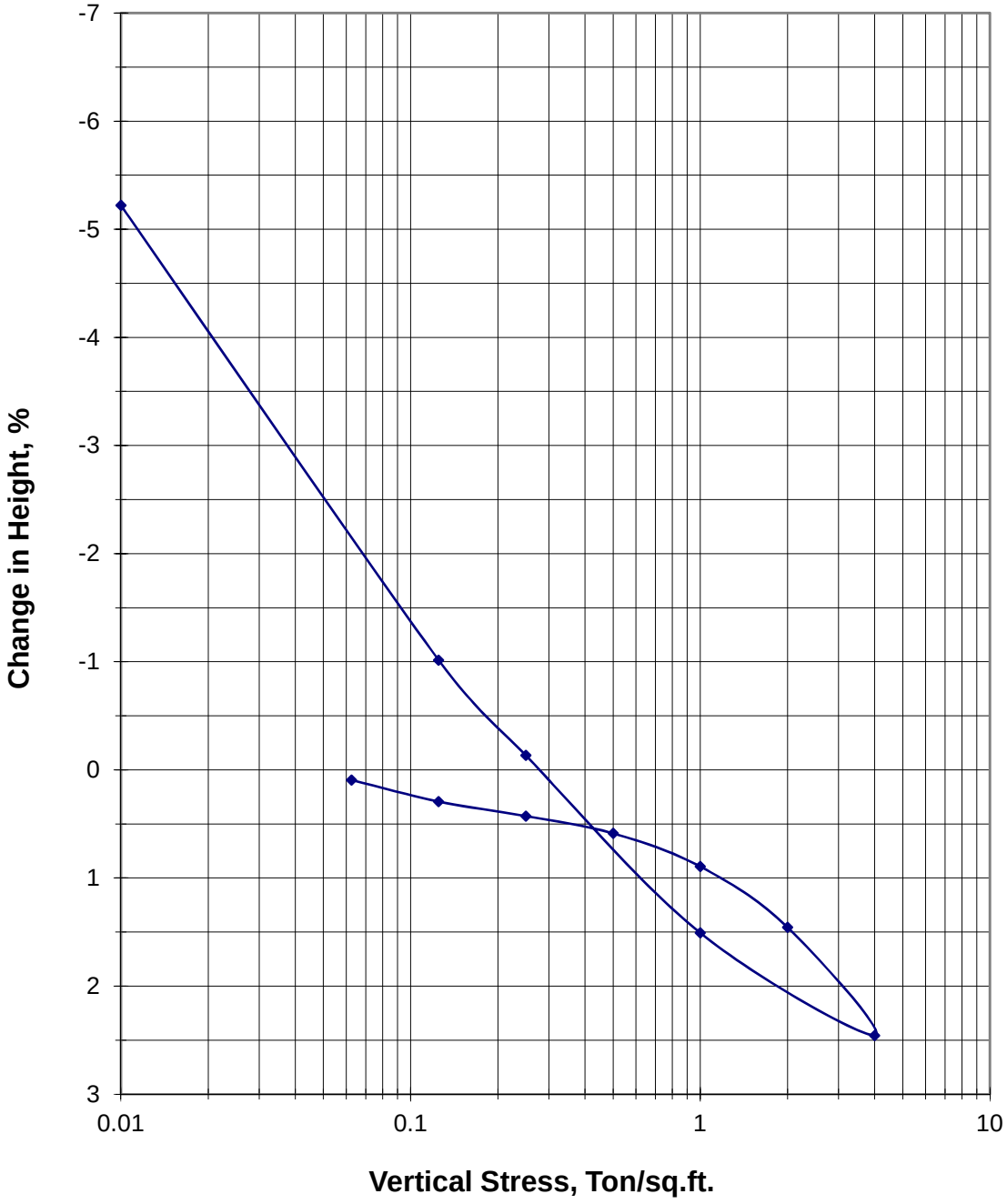
Unit Dry Weight: 103.8 pcf
Initial Water Content: 17.8%
Final Water Content: 30.0%
Liquid Limit: 45
Plastic Limit: 21
Minus #200: 96%



CONSOLIDATION TEST RESULTS
(AASHTO T-216)

GHBW Job No.: 17-127
Project: ArDOT 100942 HWY 351 RR Overpass
Boring: 2
Depth: 3-3.5 ft
Description: Grayish brown and reddish tan silty CLAY
USCS = CL
AASHTO = A-7-6

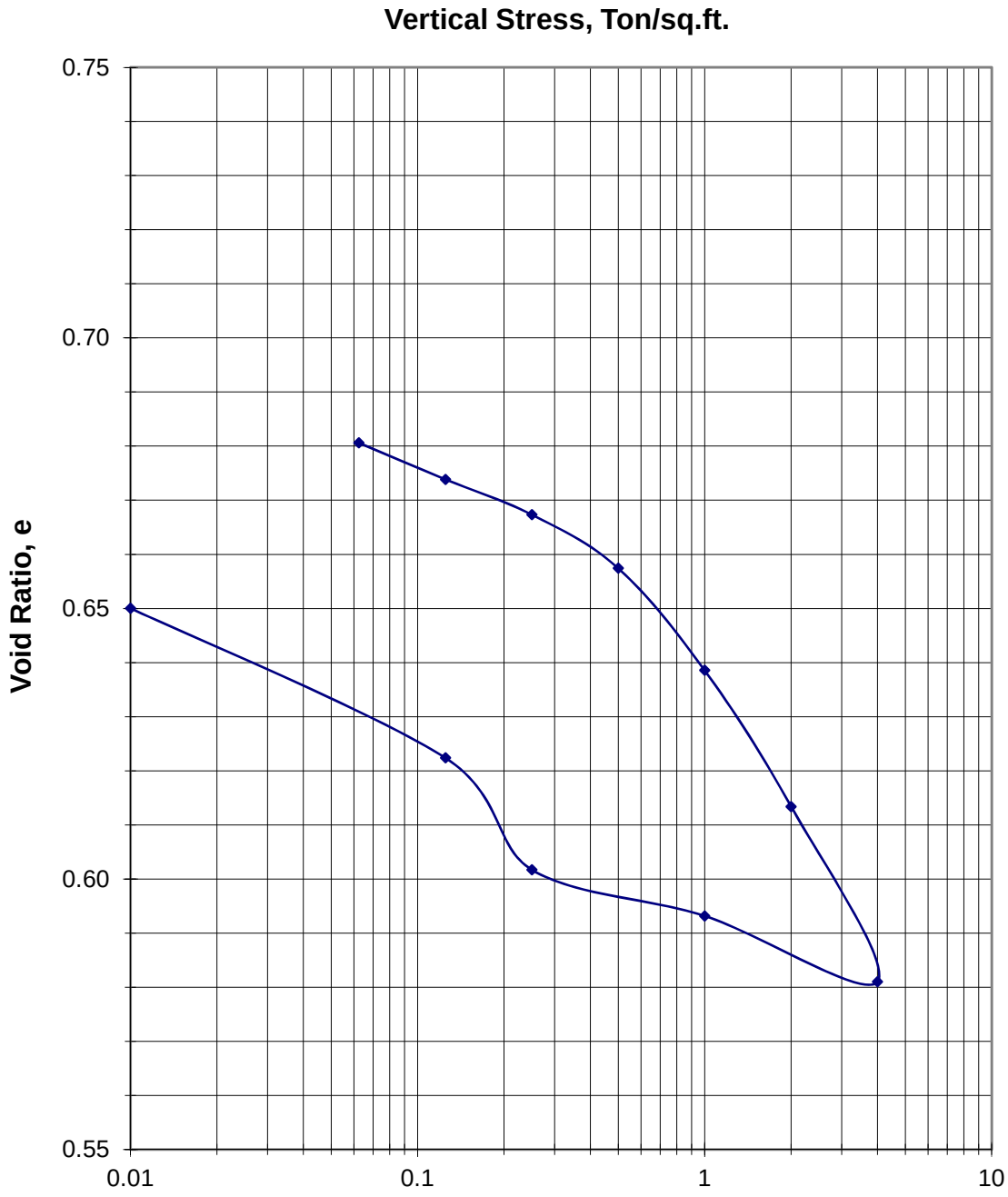
Unit Dry Weight: 103.8 pcf
Initial Water Content: 17.8%
Final Water Content: 30.0%
Liquid Limit: 45
Plastic Limit: 21
Minus #200: 96%



CONSOLIDATION TEST RESULTS
(AASHTO T-216)

GHBW Job No.: 17-127
Project: ArDOT 100942 HWY 351 RR Overpass
Boring: 2
Depth: 14.5-15 ft
Description: Brownish yellow silty CLAY
USCS = CL
AASHTO = A-7-6

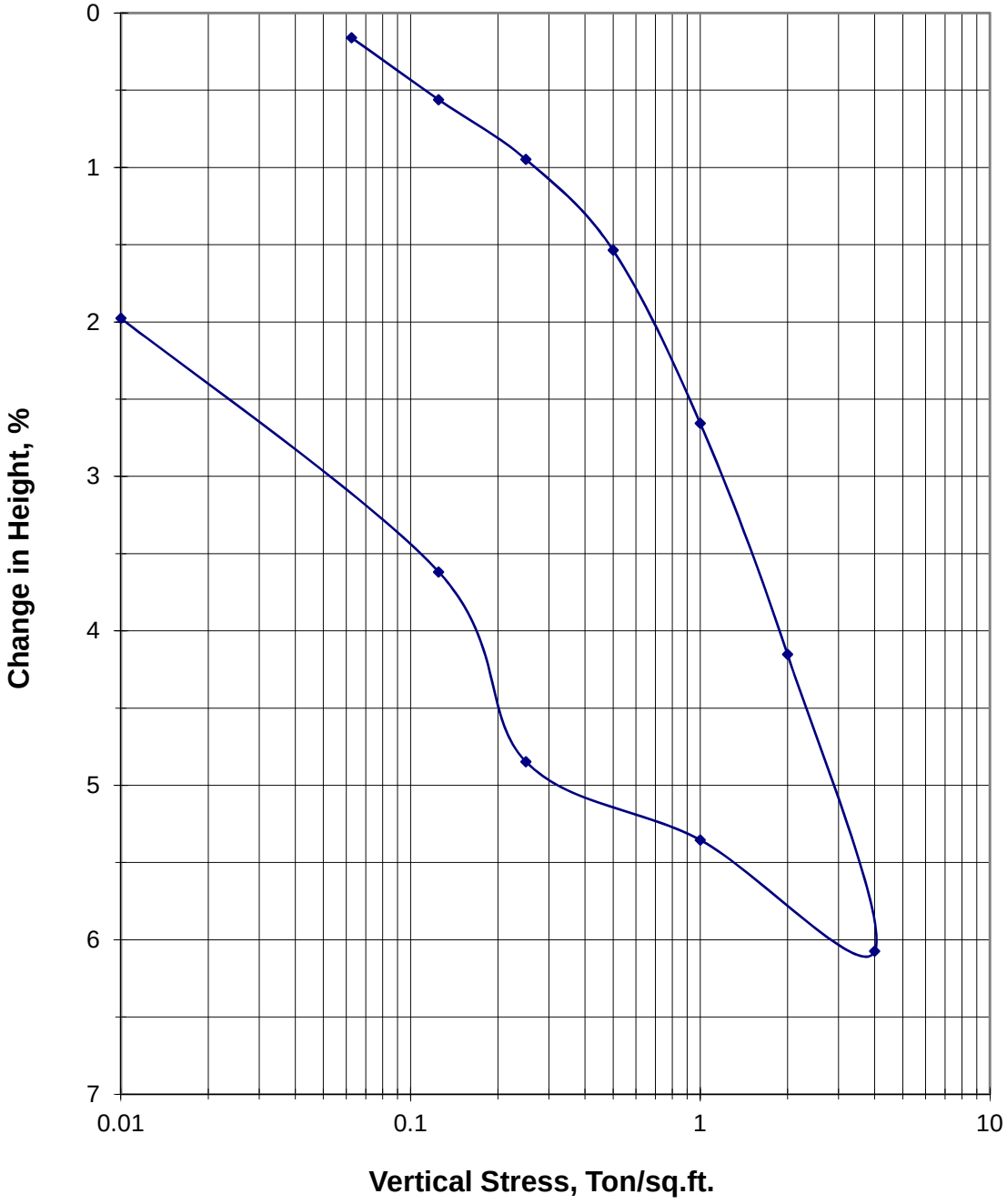
Unit Dry Weight: 100.1 pcf
Initial Water Content: 22.2%
Final Water Content: 25.6%
Liquid Limit: 44
Plastic Limit: 21
Minus #200: 99%



CONSOLIDATION TEST RESULTS
(AASHTO T-216)

GHBW Job No.: 17-127
Project: ArDOT 100942 HWY 351 RR Overpass
Boring: 2
Depth: 14.5-15 ft
Description: Brownish yellow silty CLAY
USCS = CL
AASHTO = A-7-6

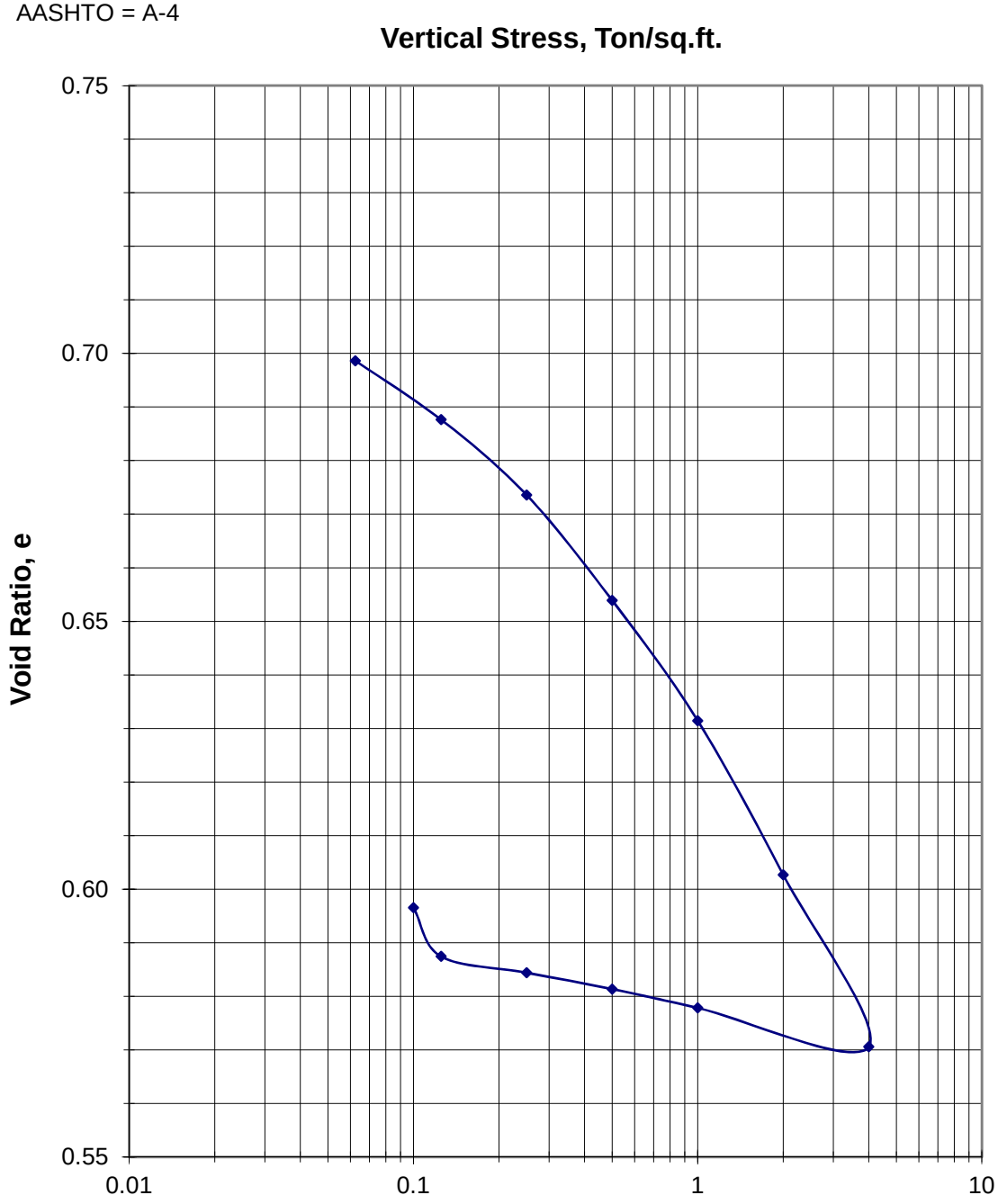
Unit Dry Weight: 100.1 pcf
Initial Water Content: 22.2%
Final Water Content: 25.6%
Liquid Limit: 44
Plastic Limit: 21
Minus #200: 99%



CONSOLIDATION TEST RESULTS
(AASHTO T-216)

GHBW Job No.: 17-127
Project: ArDOT 100942 HWY 351 RR Overpass
Boring: 4
Depth: 24.5-25 ft
Description: Tan and brown silty clay with clayey silt seams and layers
USCS = ML
AASHTO = A-4

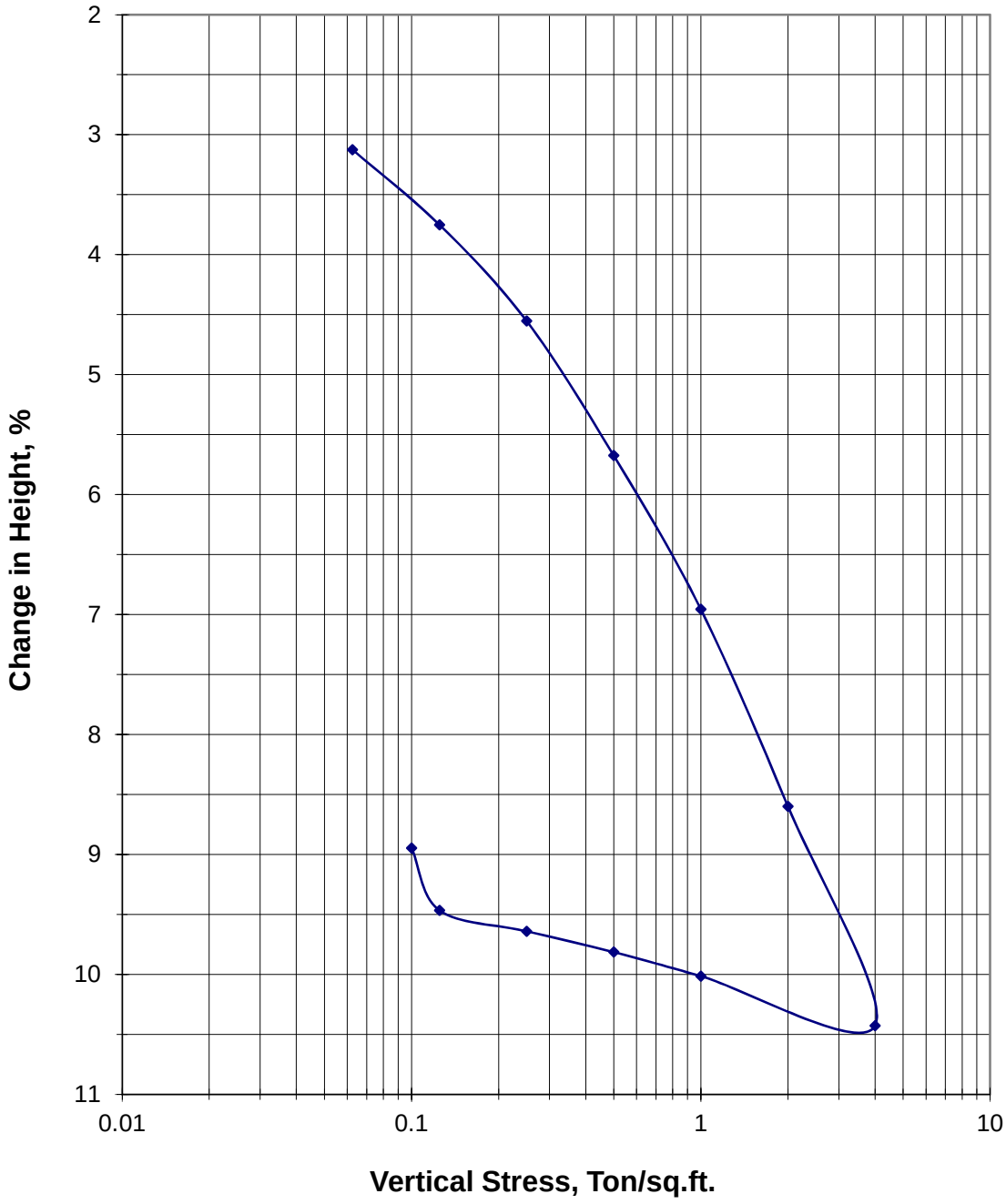
Unit Dry Weight: 95.0 pcf
Initial Water Content: 31.9%
Final Water Content: 26.3%
Liquid Limit: 31
Plastic Limit: 24
Minus #200: 100%



CONSOLIDATION TEST RESULTS
(AASHTO T-216)

GHBW Job No.: 17-127
Project: ArDOT 100942 HWY 351 RR Overpass
Boring: 4
Depth: 24.5-25 ft
Description: Tan and brown silty clay with clayey silt seams and layers
USCS = ML
AASHTO = A-4

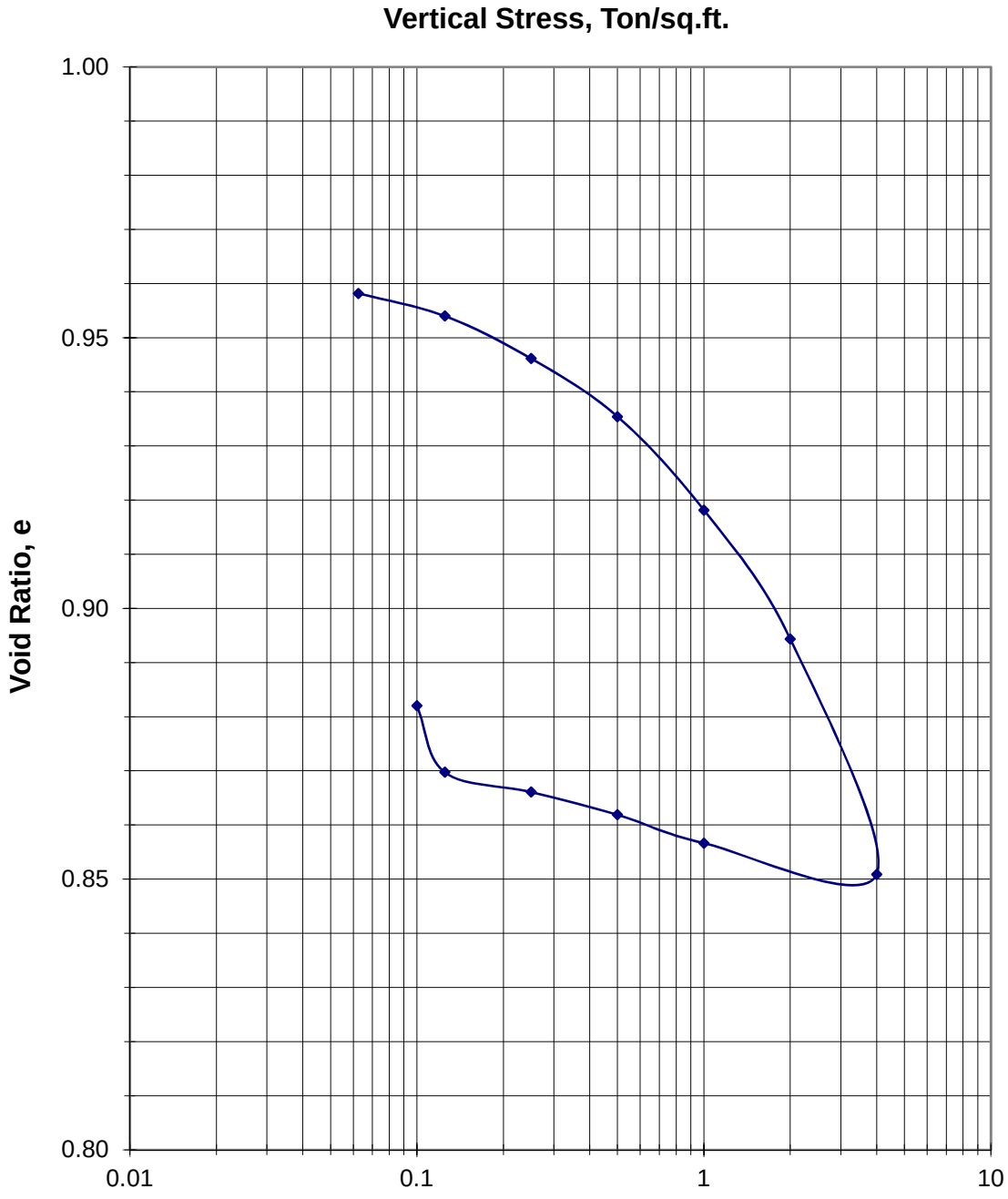
Unit Dry Weight: 95.0 pcf
Initial Water Content: 31.9%
Final Water Content: 26.3%
Liquid Limit: 31
Plastic Limit: 24
Minus #200: 100%



CONSOLIDATION TEST RESULTS
(AASHTO T-216)

GHBW Job No.: 17-127
Project: ArDOT 100942 HWY 351 RR Overpass
Boring: 6
Depth: 24.5-25 ft
Description: Tan and brown clayey SILT
USCS = ML
AASHTO = A-4

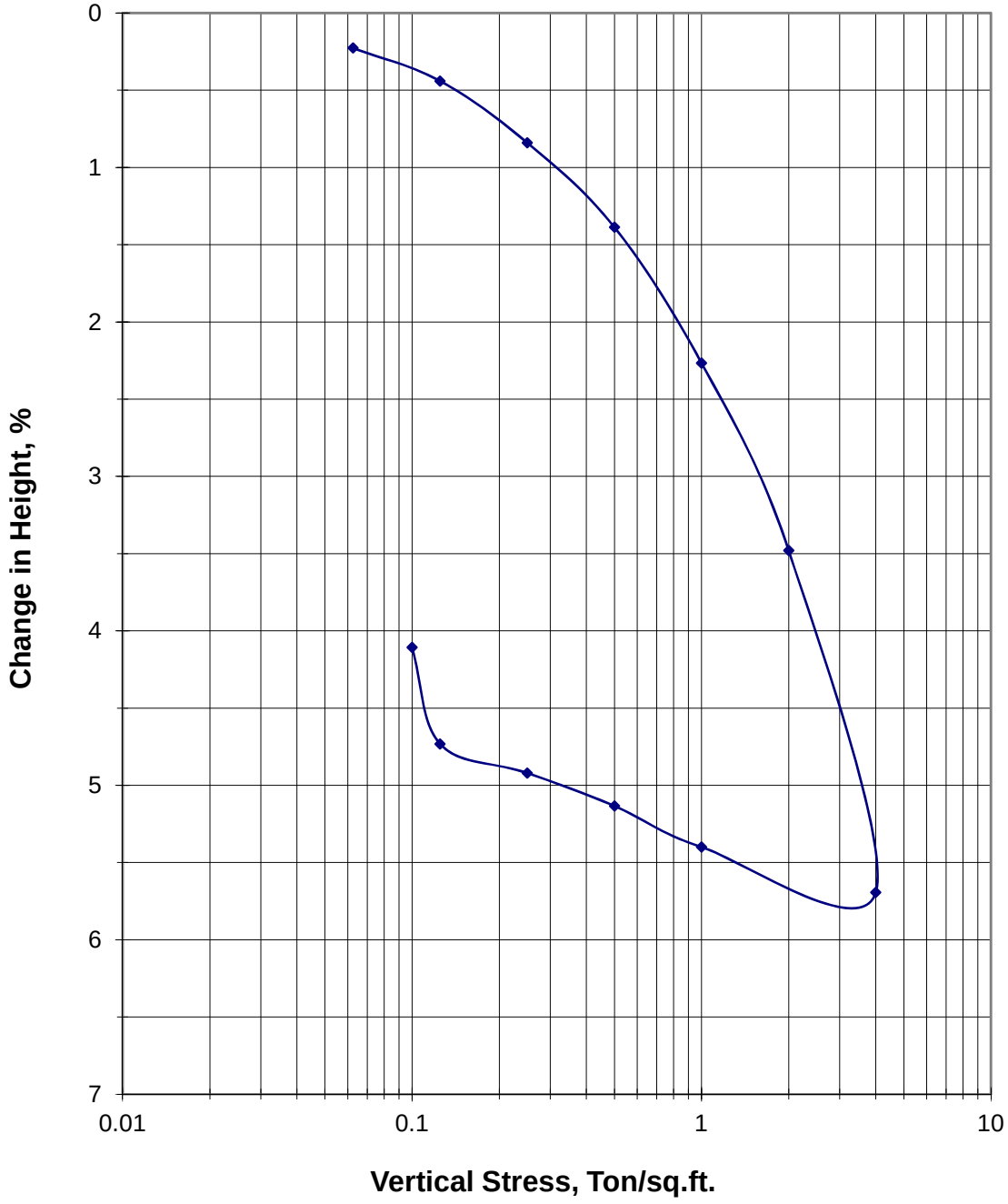
Unit Dry Weight: 84.6 pcf
Initial Water Content: 35.6%
Final Water Content: 33.9%
Liquid Limit: 27
Plastic Limit: 24
Minus #200: 98%



CONSOLIDATION TEST RESULTS
(AASHTO T-216)

GHBW Job No.: 17-127
Project: ArDOT 100942 HWY 351 RR Overpass
Boring: 6
Depth: 24.5-25 ft
Description: Tan and brown clayey SILT
USCS = ML
AASHTO = A-4

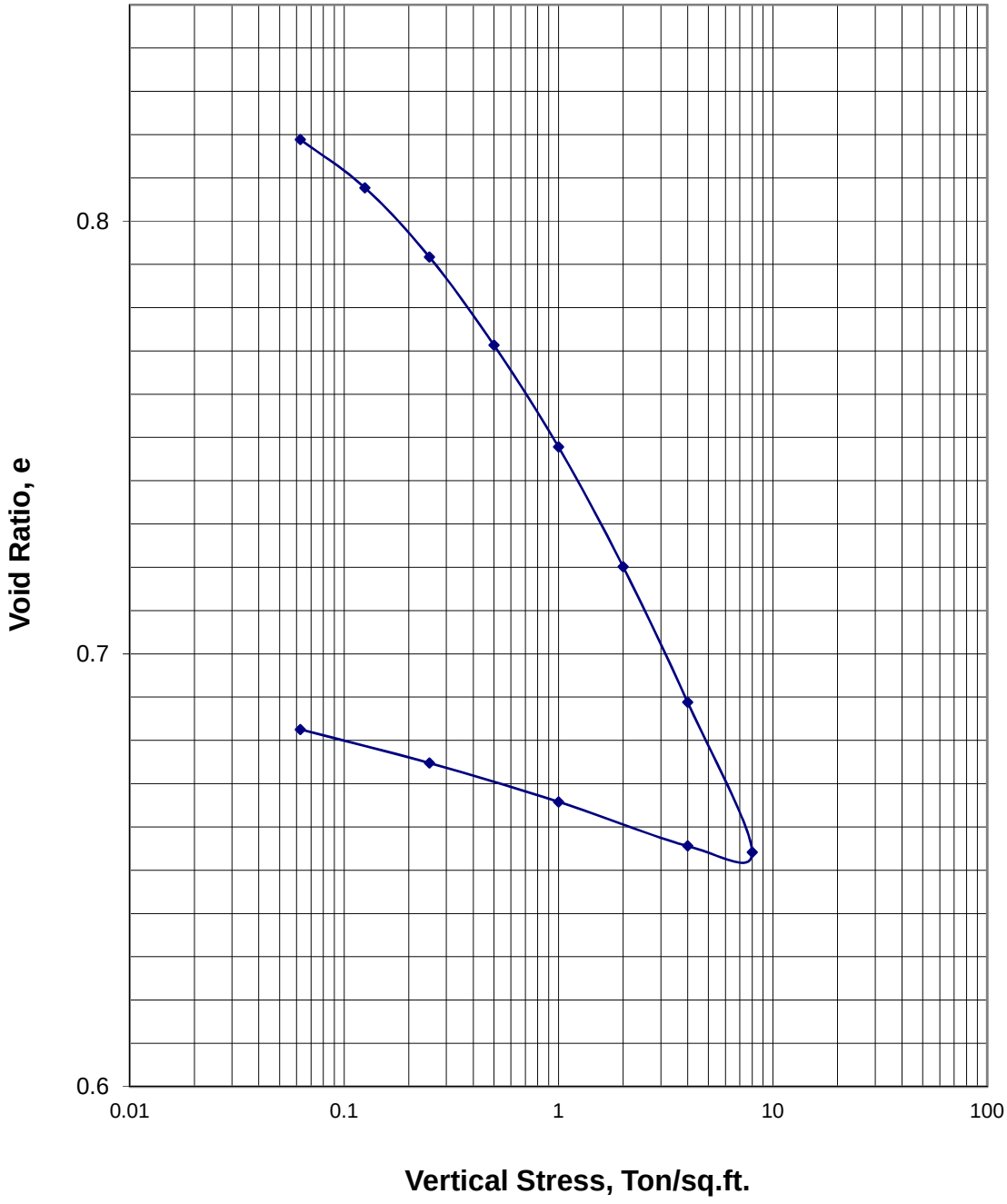
Unit Dry Weight: 84.6 pcf
Initial Water Content: 35.6%
Final Water Content: 33.9%
Liquid Limit: 27
Plastic Limit: 24
Minus #200: 98%



CONSOLIDATION TEST RESULTS
(ASTM D 2435)

Job No.: 17-127
Boring: B-23
Depth: 29.5-30 ft
Description: Yellowish tan and brown clayey SILT
USCS = ML AASHTO = A-4

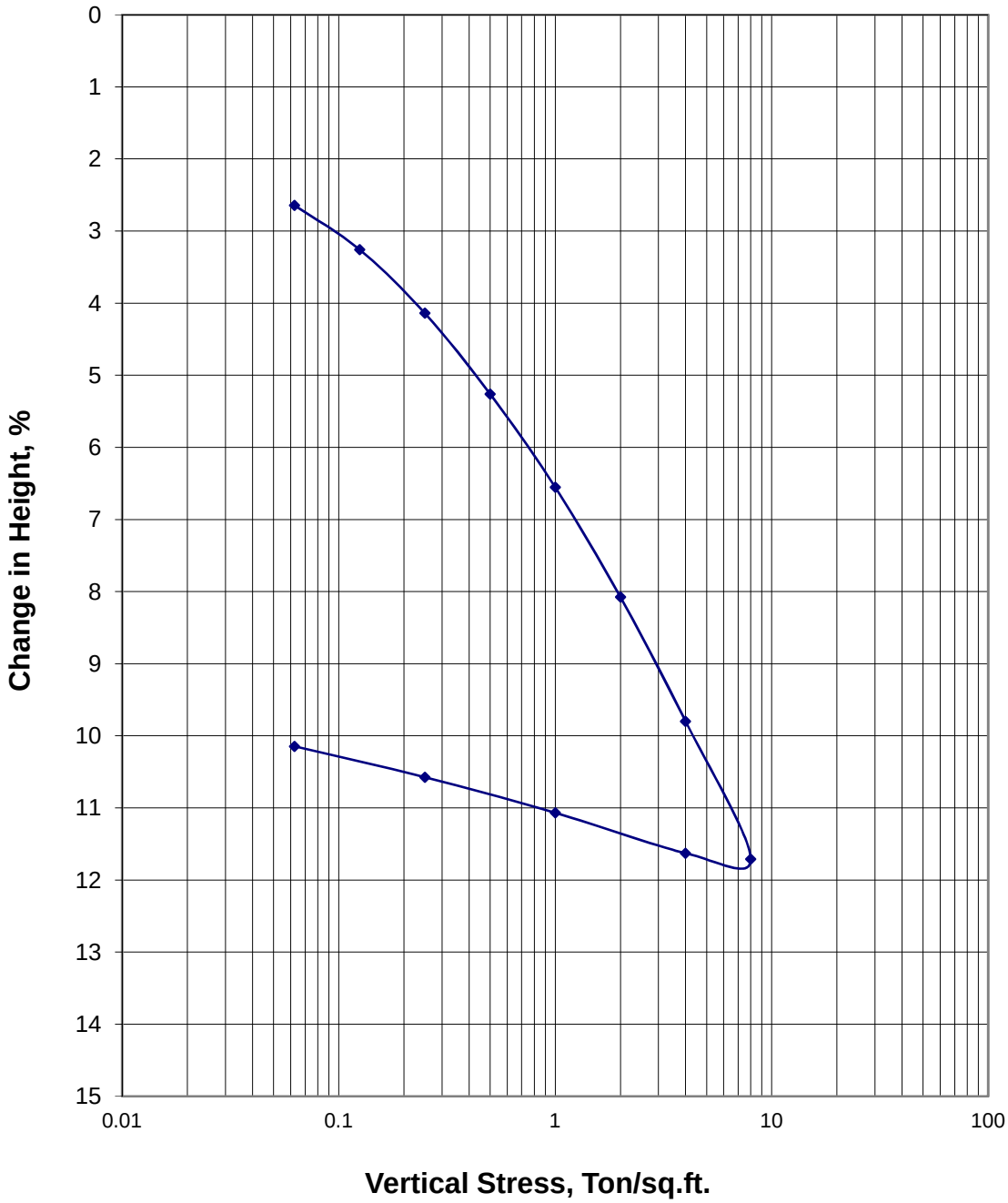
Unit Dry Weight: 92.73 pcf
Initial Water Content: 31.1%
Final Water Content: 25.4%
Liquid Limit: 31
Plastic Limit: 25
Minus #200: 99%



CONSOLIDATION TEST RESULTS
(ASTM D 2435)

Job No.: **17-127**
Boring: B-23
Depth: 29.5-30 ft
Description: Yellowish tan and brown clayey SILT
USCS = ML AASHTO = A-4

Unit Dry Weight: 92.73 pcf
Initial Water Content: 31.1%
Final Water Content: 25.4%
Liquid Limit: 31
Plastic Limit: 25
Minus #200: 99%



APPENDIX D

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

P.O. Box 30970
Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
(501) 455-2536
FAX (501) 455-4137

REPORT OF STANDARD PROCTOR TEST
(AASHTO T-99)

Project: ARDOT 100942 HWY 351 Railroad Overpass Job No: 17-127
Material Description: Brown clayey SILT and silty CLAY
Location Sampled/Source: Boring 10
Sample Depth, ft: 0.5-3.5
Date Sampled: 10/26/2017
Date Tested: 11/2/2017
Tested By: LC
Report Date: 11/8/2017

LAB COMPACTION PROCEDURE: AASHTO T-99 Method: A	
Maximum Unit Dry Wt. (pcf):	101.5
Optimum Water Content (%):	18.5

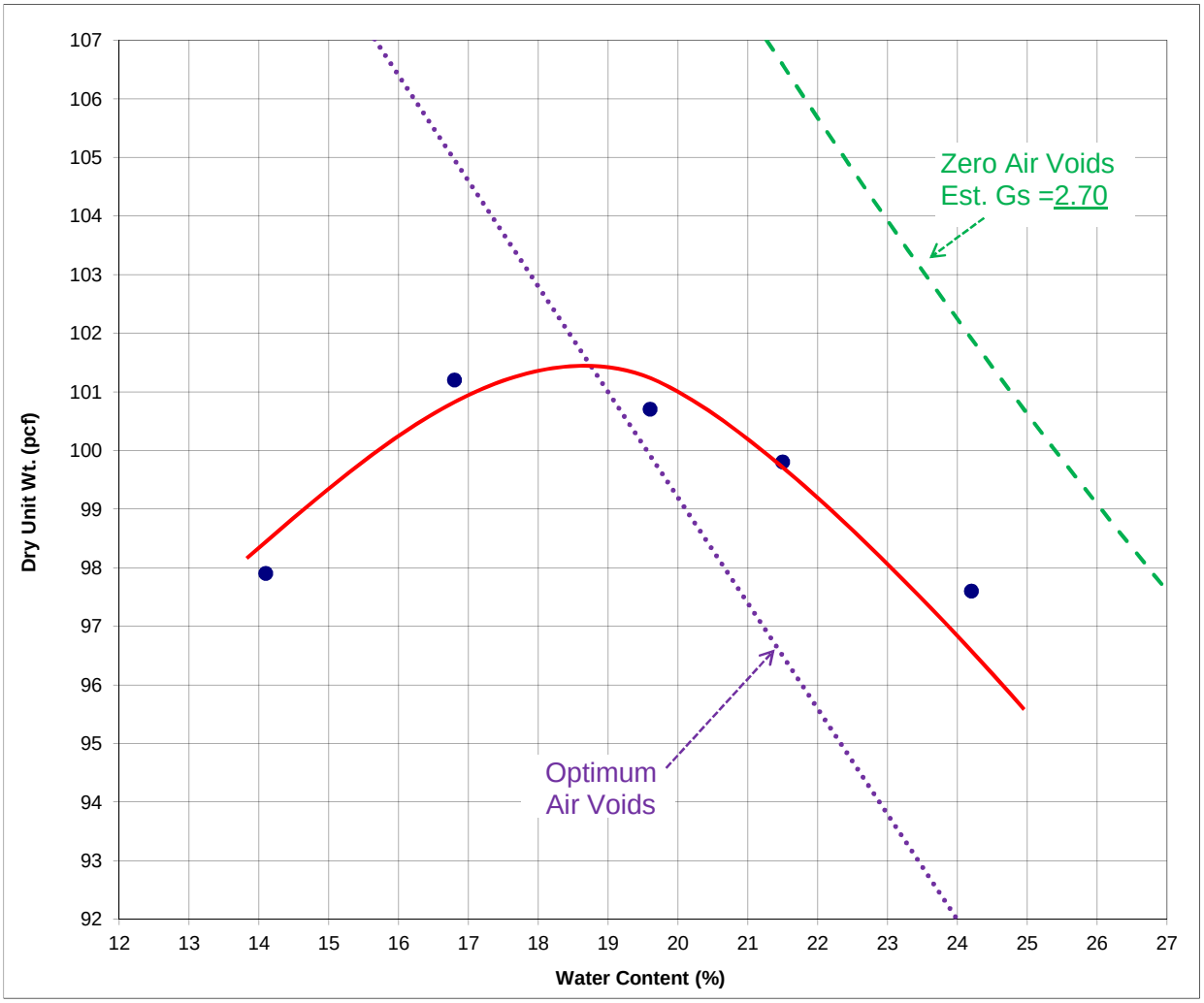
As Recieved Water Content: 13.4 %

ATTERBERG LIMITS AASHTO T-89 & T-90
Liquid Limit: 30
Plastic Limit: 24
Plasticity Index: 6

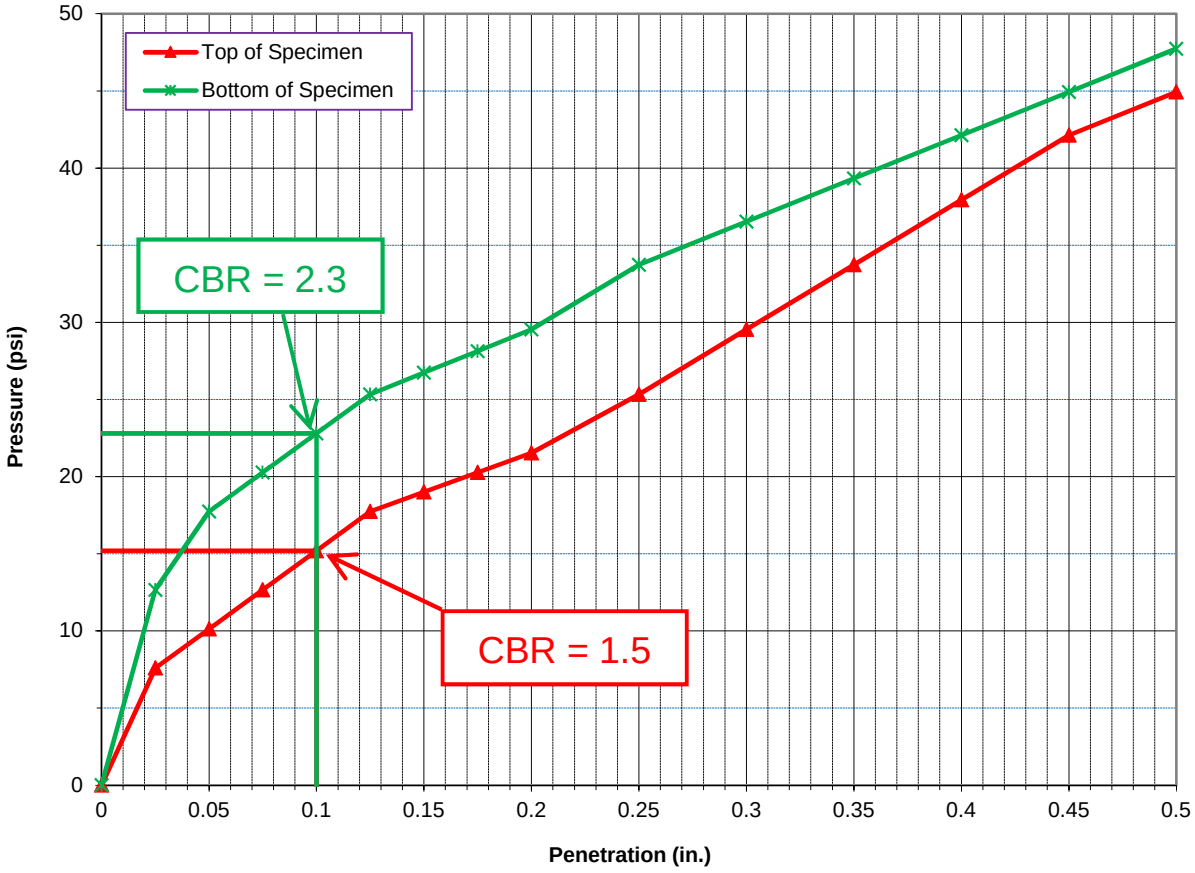
AASHTO Classification:
A-4

USCS Classification:
ML

GRADATION AASHTO T-88	
Sieve Number	Percent Passing
3 in.	100
2 in.	100
3/4 in.	100
3/8 in.	100
#4	100
#10	98
#40	96
#200	95



Laboratory CBR Test Report
(AASHTO T-193)



Boring/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Retained No.4	% Passing No.200
	USCS	AASHTO						
B-10, 0.5-3.5 ft	ML	A-4	13.4	2.7	30	24	0	95

PROCTOR TEST RESULTS (AASHTO T-99)	MATERIAL DESCRIPTION
Optimum Moisture Content = 18.5% Maximum Dry Density = 101.5 pcf	Brown clayey SILT and silty CLAY

Remarks:

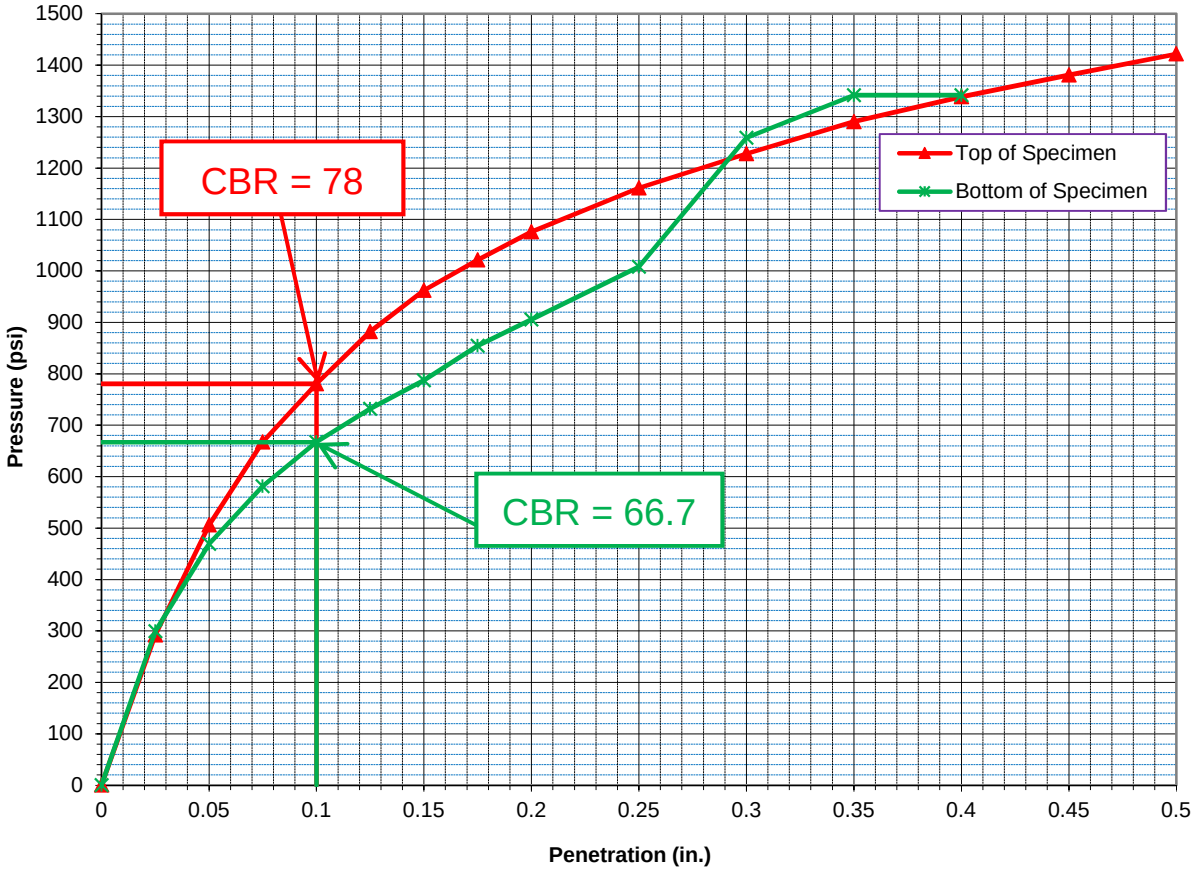
As molded: Dry Unit Weight, γ_d = 94.2 pcf; Moisture Content, w = 18.3%

Surcharge: 10 lbs; Soak for 96 hrs

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: ARDOT 100942 HWY 351 RR Overpass
GHBW Project No.: 17-127
Location: Jonesboro, AR
Sample Date: 10/26/2017
Test Date: 11/7/2017

Laboratory CBR Test Report
(AASHTO T-193)



Boring/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Retained No.4	% Passing No.200
	USCS	AASHTO						
B-10, 0.5-3.5 ft	ML	A-4	13.4	2.7	30	24	0	95

PROCTOR TEST RESULTS (AASHTO T-99)	MATERIAL DESCRIPTION
Optimum Moisture Content = 18.5% Maximum Dry Density = 101.5 pcf	Brown clayey SILT and silty CLAY

Remarks:

As molded: Dry Unit Weight, γ_d = 92.6 pcf; Moisture Content, w = 18.6%

Surcharge: 10 lbs; Soak for 96 hrs; 6% Portland Cement added

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: ARDOT 100942 HWY 351 RR Overpass
GHBW Project No.: 17-127
Location: Jonesboro, AR
Sample Date: 10/26/2017
Test Date: 11/7/2017

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

P.O. Box 30970
Little Rock, Arkansas 72260-0970
#1 Trigon Place 72209
(501) 455-2536
FAX (501) 455-4137

REPORT OF STANDARD PROCTOR TEST
(AASHTO T-99)

Project: ARDOT 100942 HWY 351 Railroad Overpass Job No: 17-127
Material Description: Brown silty CLAY
Location Sampled/Source: Boring 13
Sample Depth, ft: 0.5-3.5
Date Sampled: 10/26/2017
Date Tested: 11/2/2017
Tested By: LC
Report Date: 11/8/2017

LAB COMPACTION PROCEDURE: AASHTO T-99 Method: A	
Maximum Unit Dry Wt. (pcf):	108.3
Optimum Water Content (%):	16.0

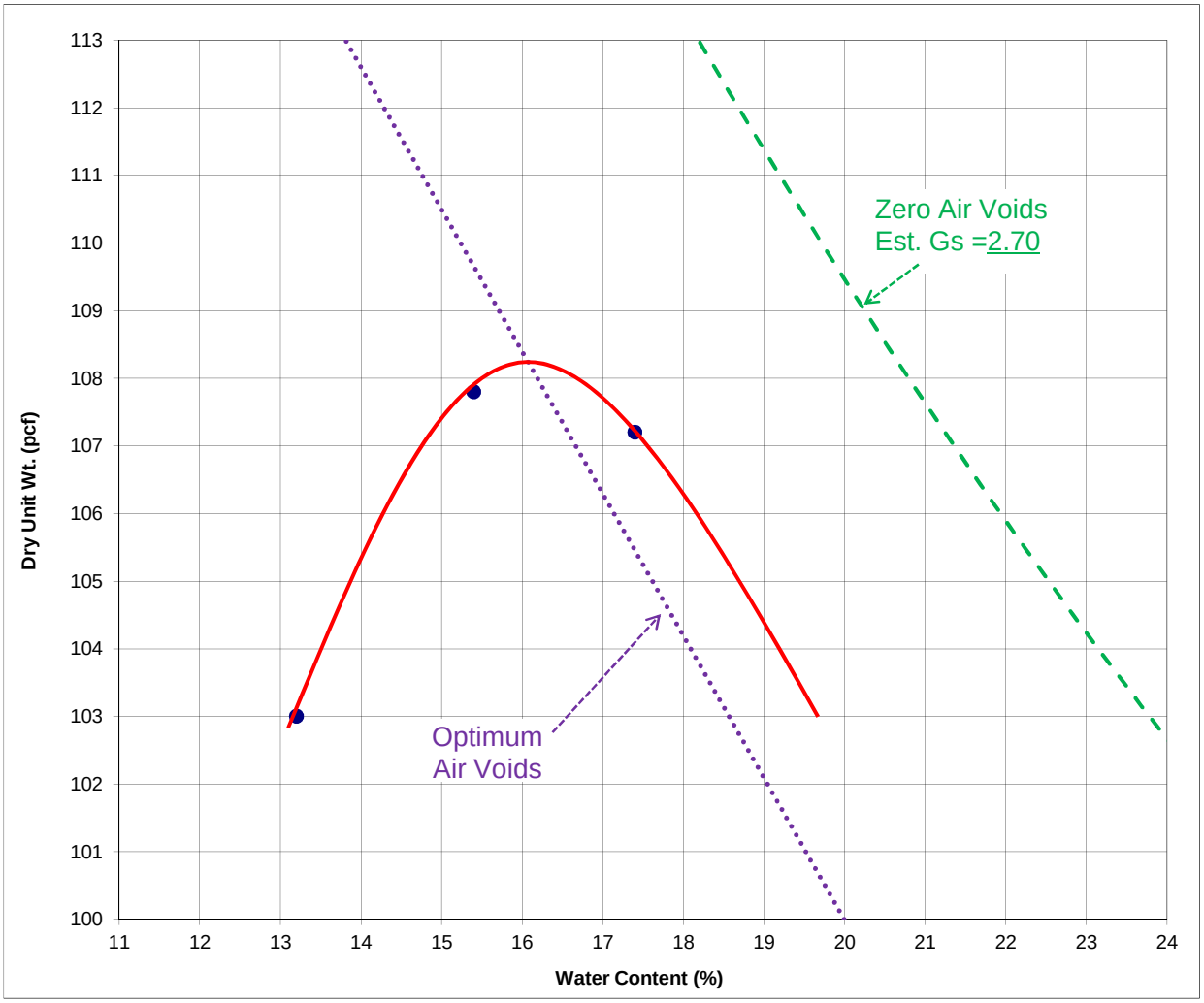
As Recieved Water Content: 13.5 %

ATTERBERG LIMITS AASHTO T-89 & T-90
Liquid Limit: 40
Plastic Limit: 18
Plasticity Index: 22

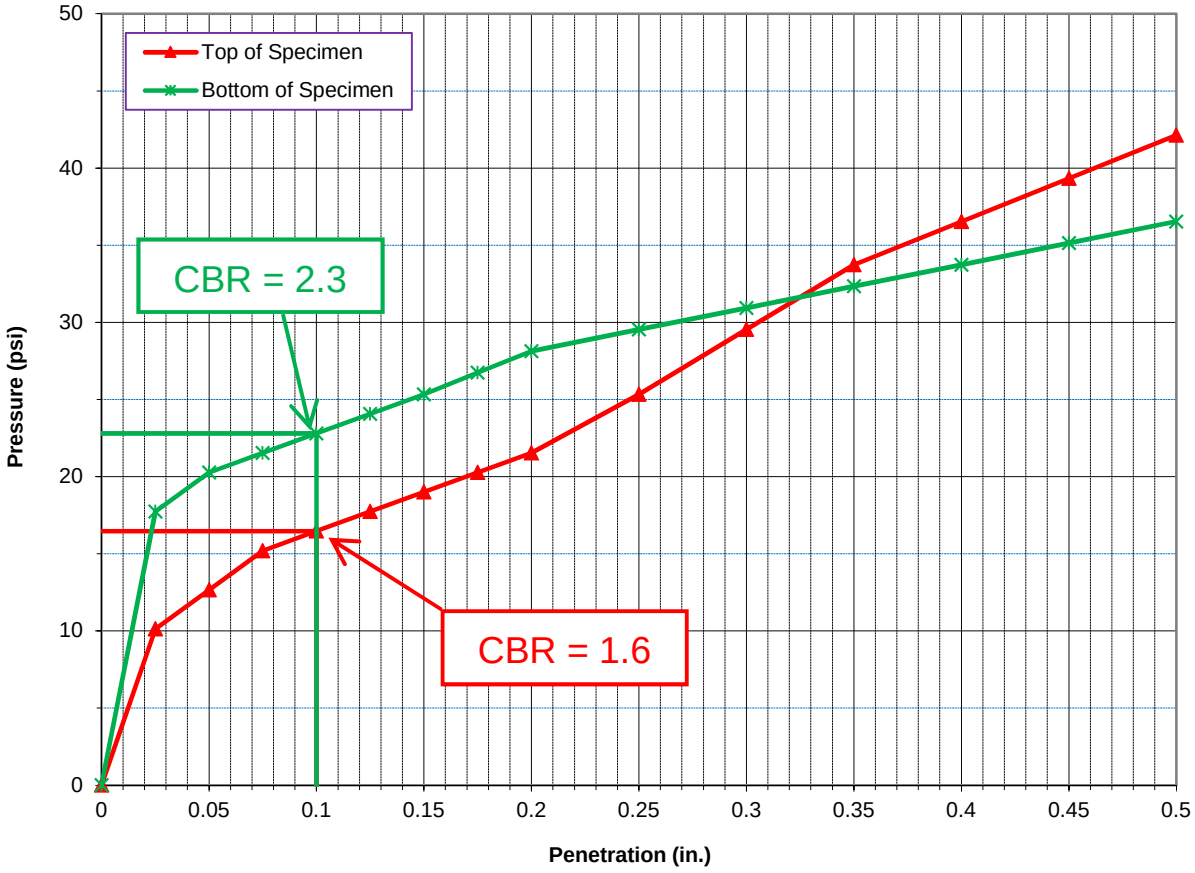
AASHTO Classification:
A-6

USCS Classification:
CL

GRADATION AASHTO T-88	
Sieve Number	Percent Passing
3 in.	100
2 in.	100
3/4 in.	100
3/8 in.	100
#4	100
#10	100
#40	98
#200	97



Laboratory CBR Test Report
(AASHTO T-193)



Boring/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Retained No.4	% Passing No.200
	USCS	AASHTO						
B-13, 0.5-3.5 ft	CL	A-6	13.5	2.55	40	22	0	97
PROCTOR TEST RESULTS (AASHTO T-99)				**MATERIAL DESCRIPTION**				
Optimum Moisture Content = 16.0% Maximum Dry Density = 108.3 pcf				Brown silty CLAY				

Remarks:

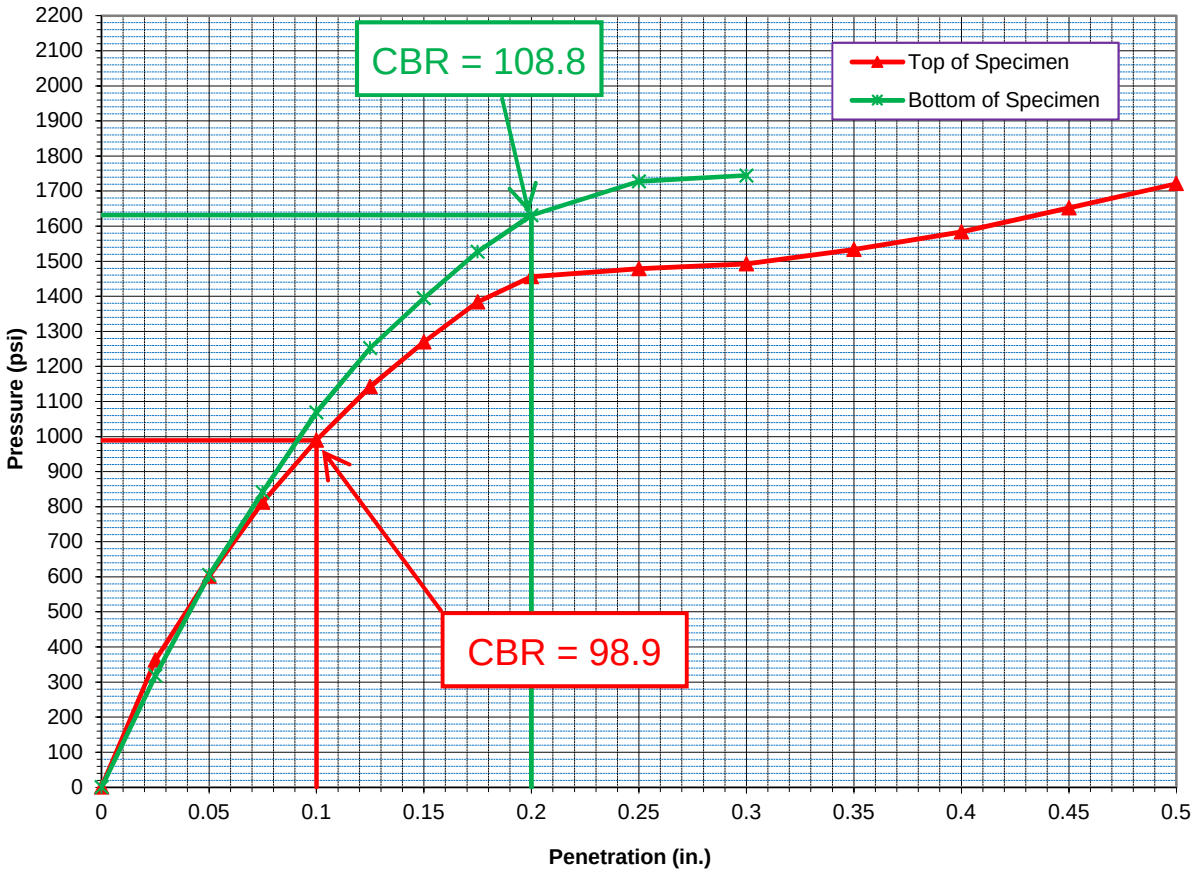
As molded: Dry Unit Weight, γ_d = 100.3 pcf; Moisture Content, w = 15.9%

Surcharge: 10 lbs; Soak for 96 hrs

Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: ARDOT 100942 HWY 351 RR Overpass
GHBW Project No.: 17-127
Location: Jonesboro, AR
Sample Date: 10/26/2017
Test Date: 11/7/2017

Laboratory CBR Test Report
(AASHTO T-193)



Boring/Depth, ft	Classification		Natural Moisture Content, %	Assumed Specific Gravity	Liquid Limit, %	Plastic Limit, %	% Retained No.4	% Passing No.200
	USCS	AASHTO						
B-13, 0.5-3.5 ft	CL	A-6	13.5	2.55	40	22	0	97
PROCTOR TEST RESULTS (AASHTO T-99)				**MATERIAL DESCRIPTION**				
Optimum Moisture Content = 16.0% Maximum Dry Density = 108.3 pcf				Brown silty CLAY				

Remarks:

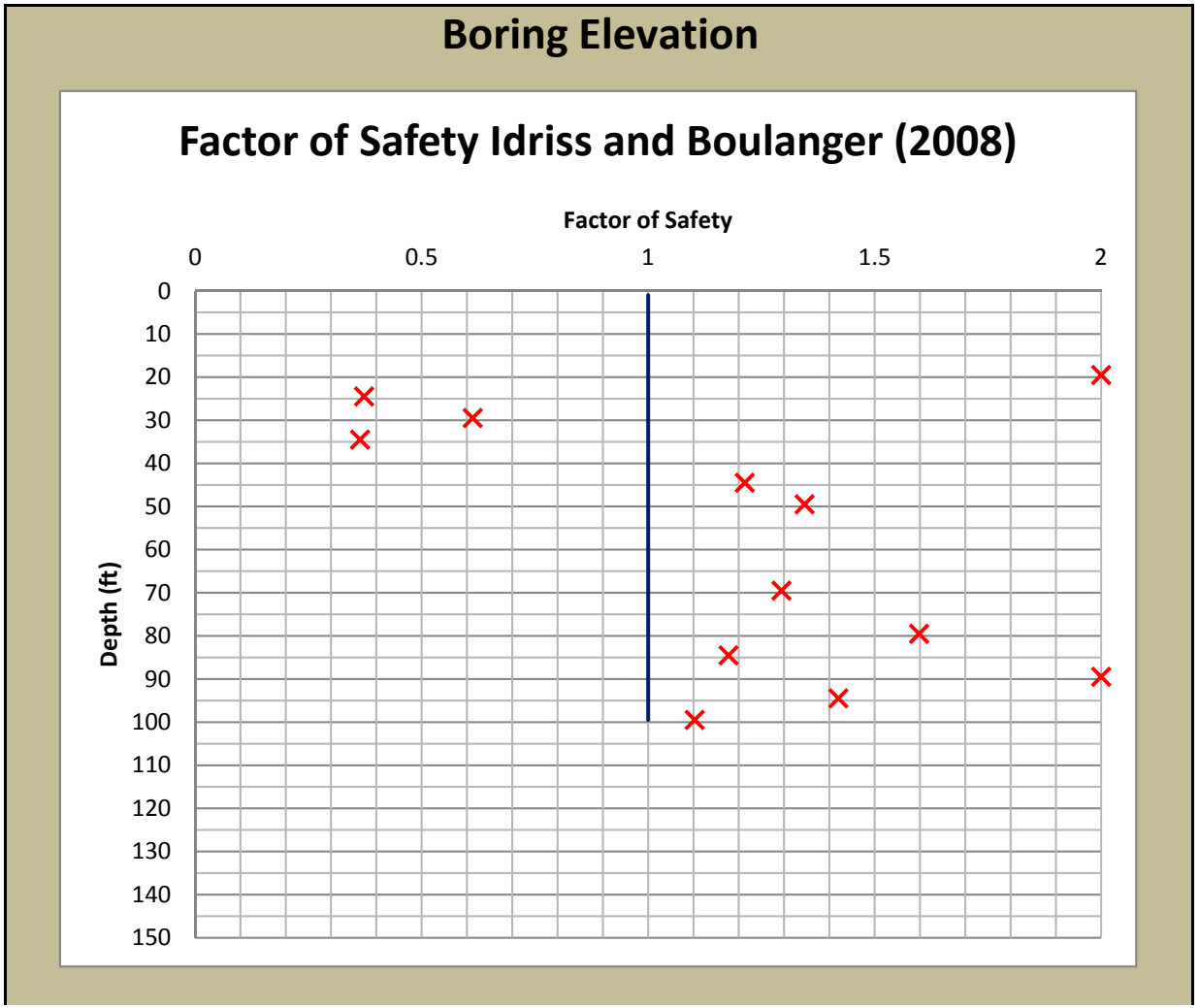
As molded: Dry Unit Weight, γ_d = 100 pcf; Moisture Content, w = 15.5%

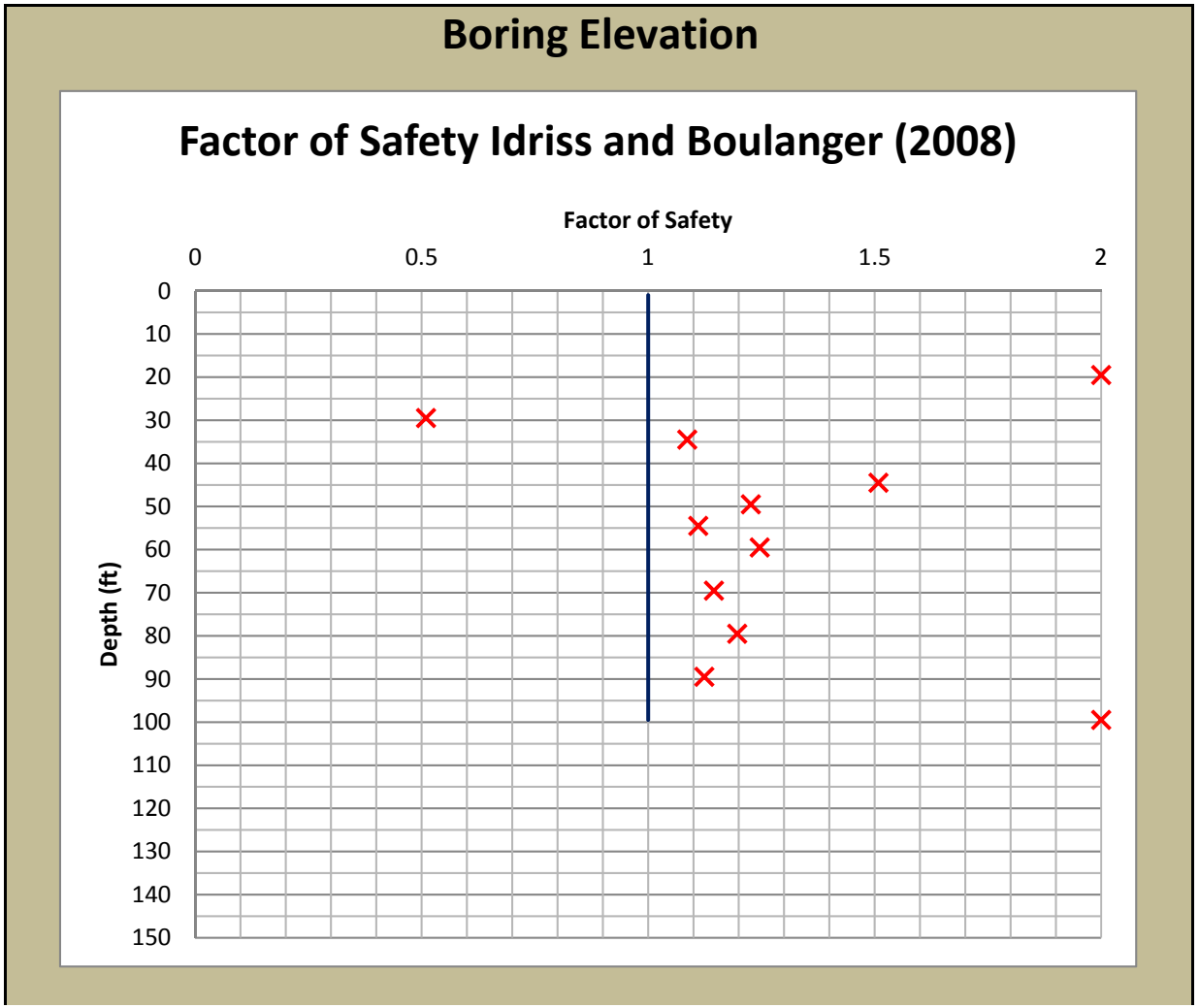
Surcharge: 10 lbs; Soak for 96 hrs; 6% Portland Cement added

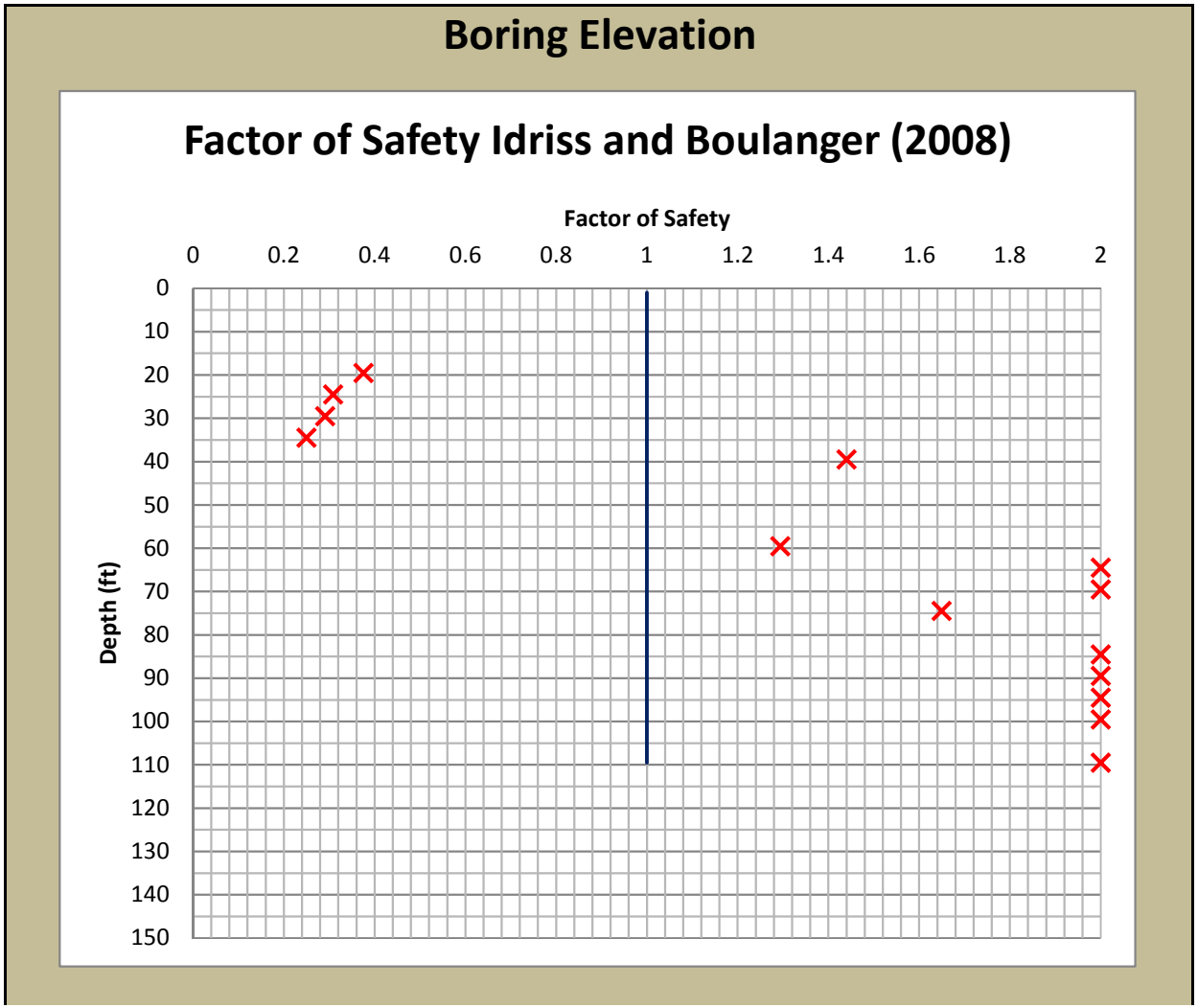
Grubbs, Hoskyn, Barton & Wyatt, INC.
CONSULTING ENGINEERS

Project: ARDOT 100942 HWY 351 RR Overpass
GHBW Project No.: 17-127
Location: Jonesboro, AR
Sample Date: 10/26/2017
Test Date: 11/7/2017

APPENDIX E


Boring Elevation
Factor of Safety Idriss and Boulanger (2008)
Factor of Safety
0
0.5
1
1.5
2
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

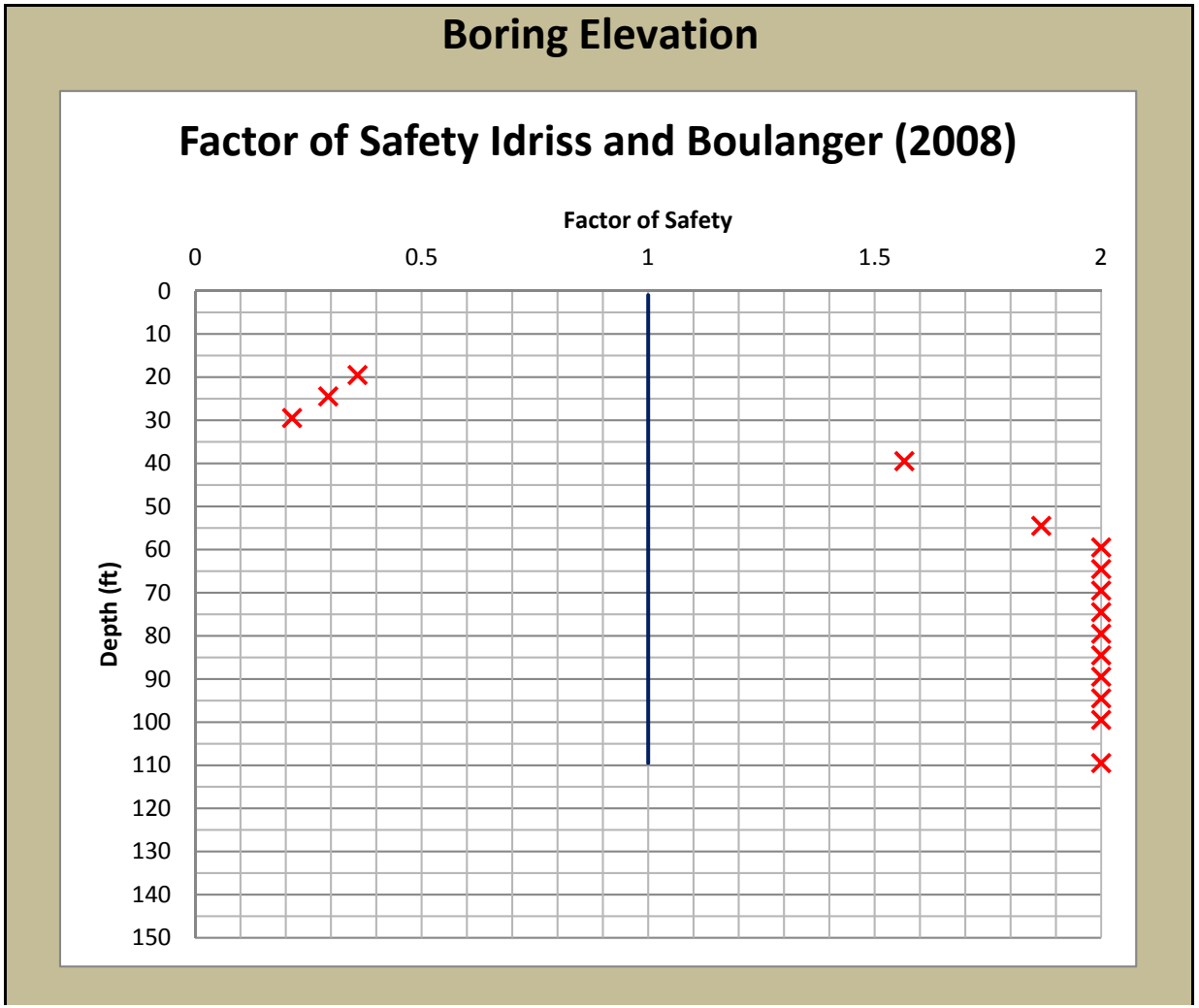

Boring Elevation
Factor of Safety Idriss and Boulanger (2008)
Factor of Safety
0
0.5
1
1.5
2
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150



Grubbs, Hoyksn,
Barton & Wyatt, Inc.
CONSULTING ENGINEERS

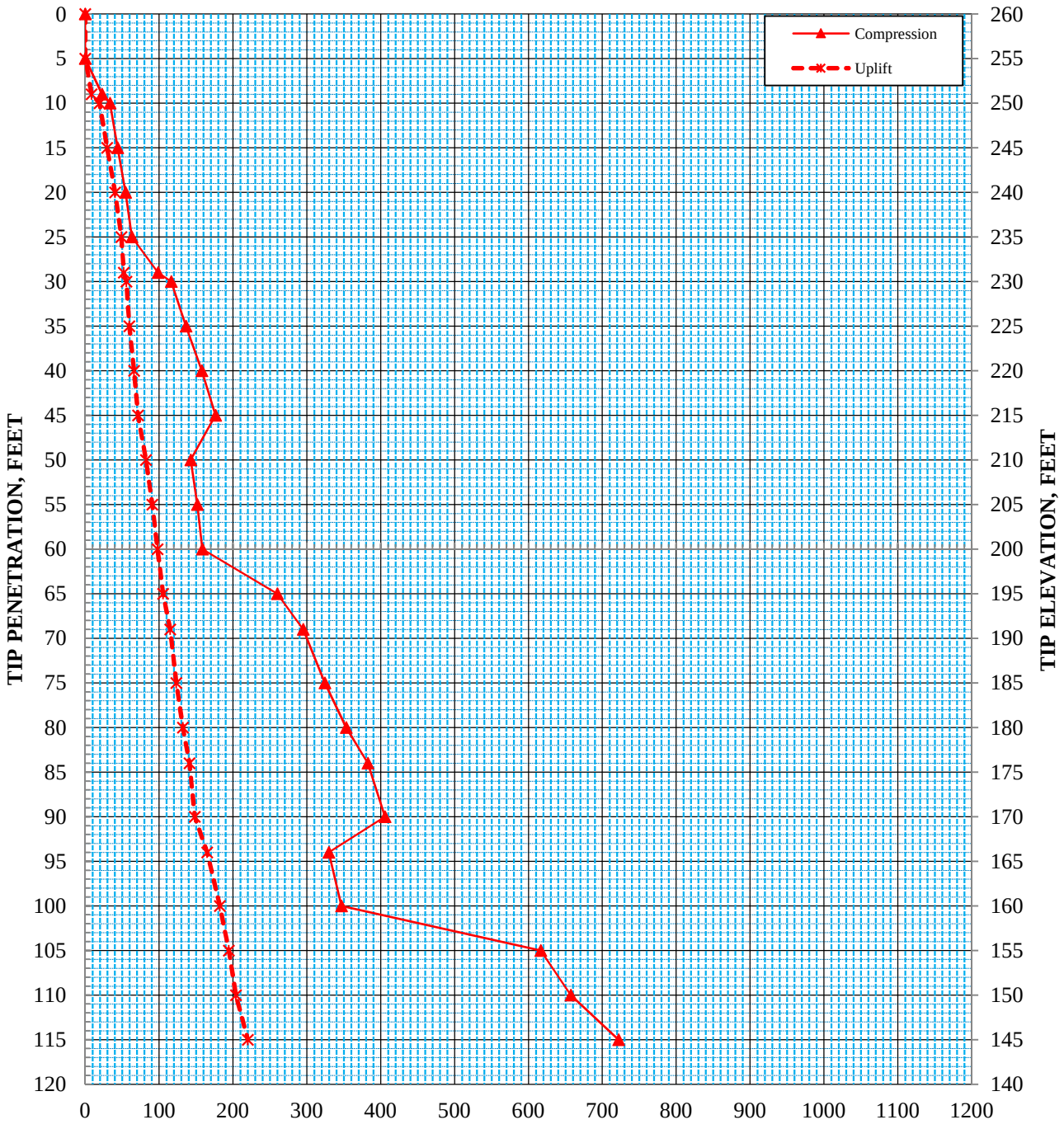
Bent 5

PLATE


Boring Elevation
Factor of Safety Idriss and Boulanger (2008)
Factor of Safety
0
0.5
1
1.5
2
Depth (ft)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

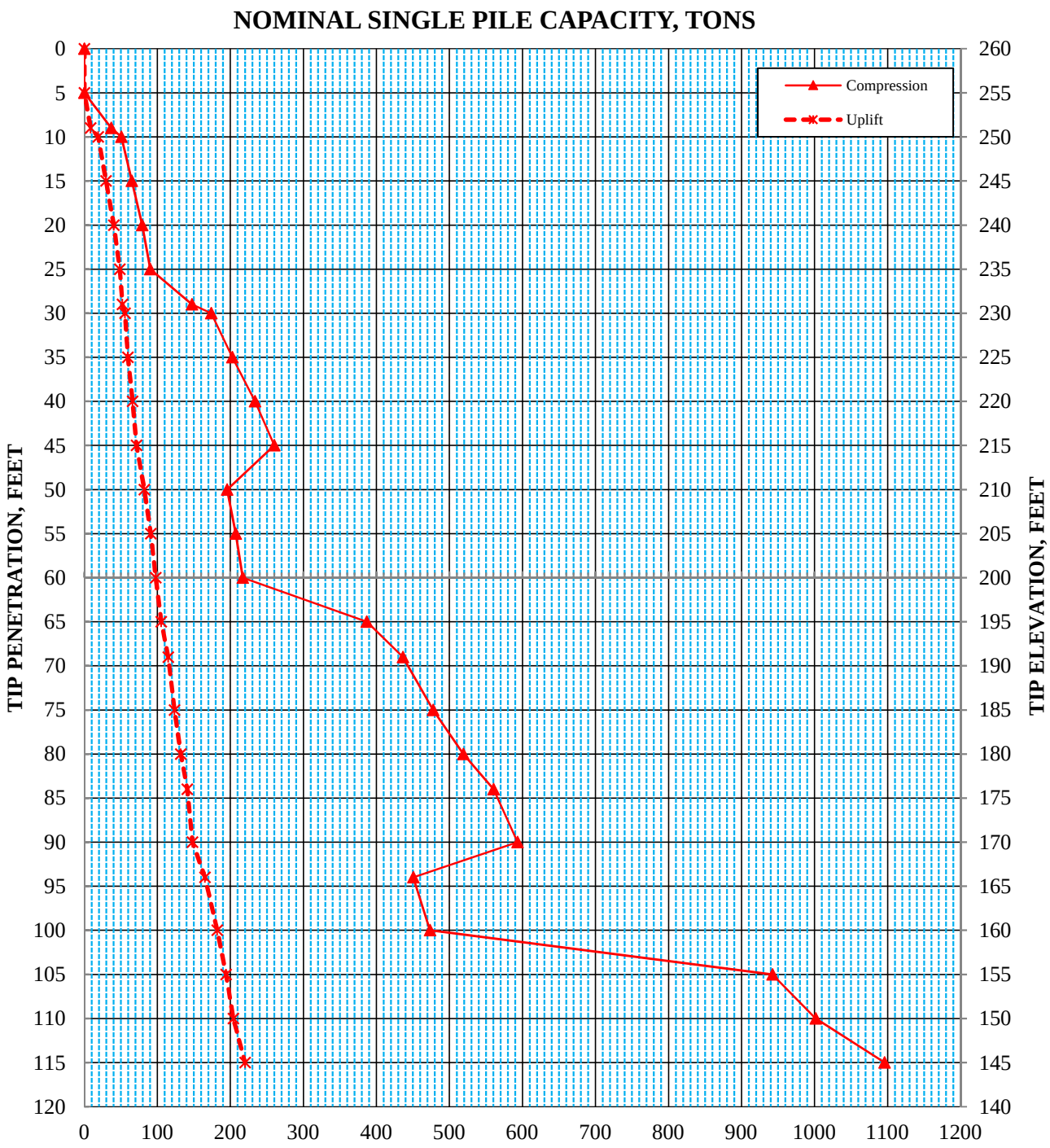
APPENDIX F

NOMINAL SINGLE PILE CAPACITY, TONS



NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
18-in.-diameter Steel Shells
Bent 1
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

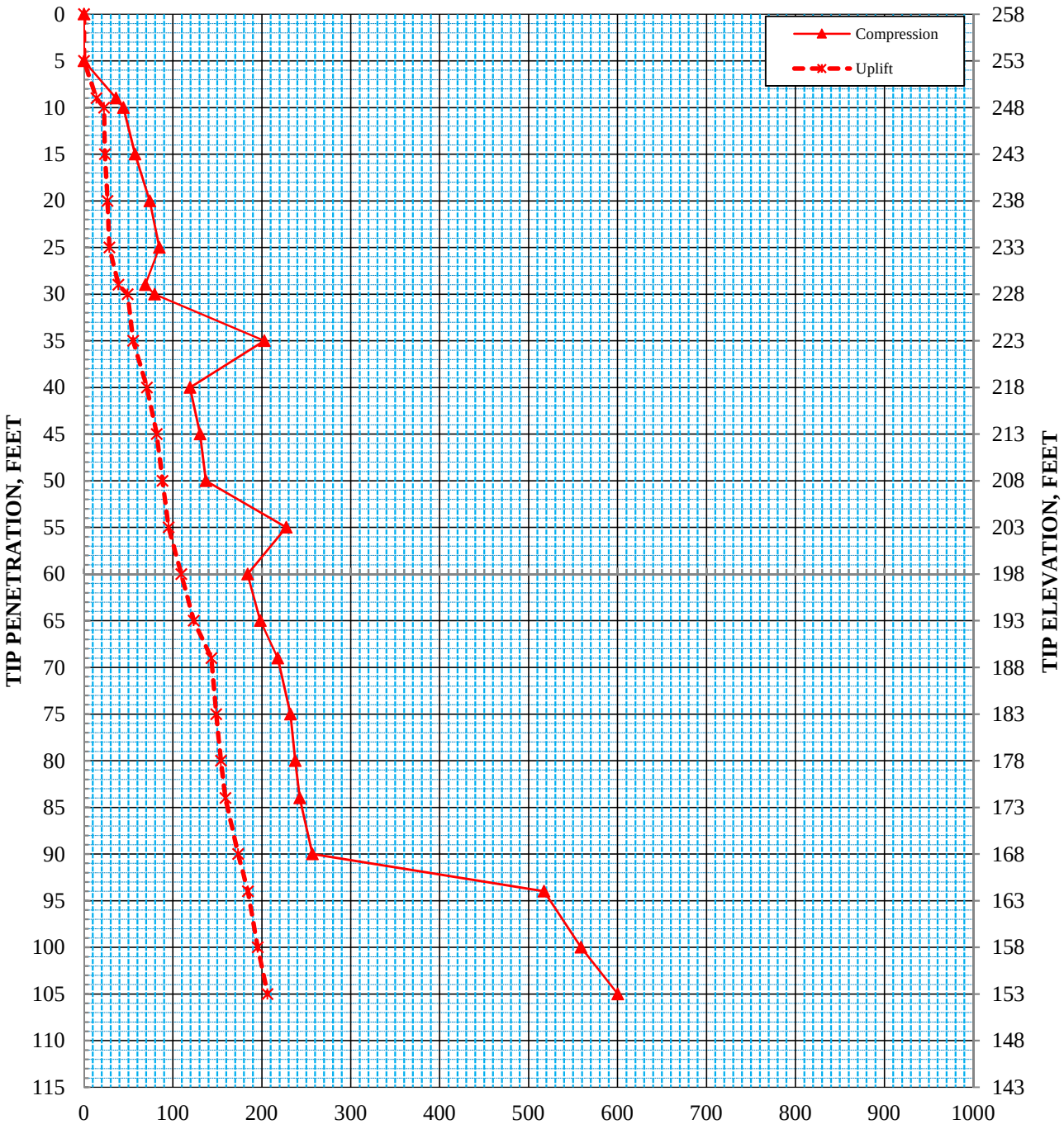
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.



24-in.-diameter Steel Shells
Bent 1
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

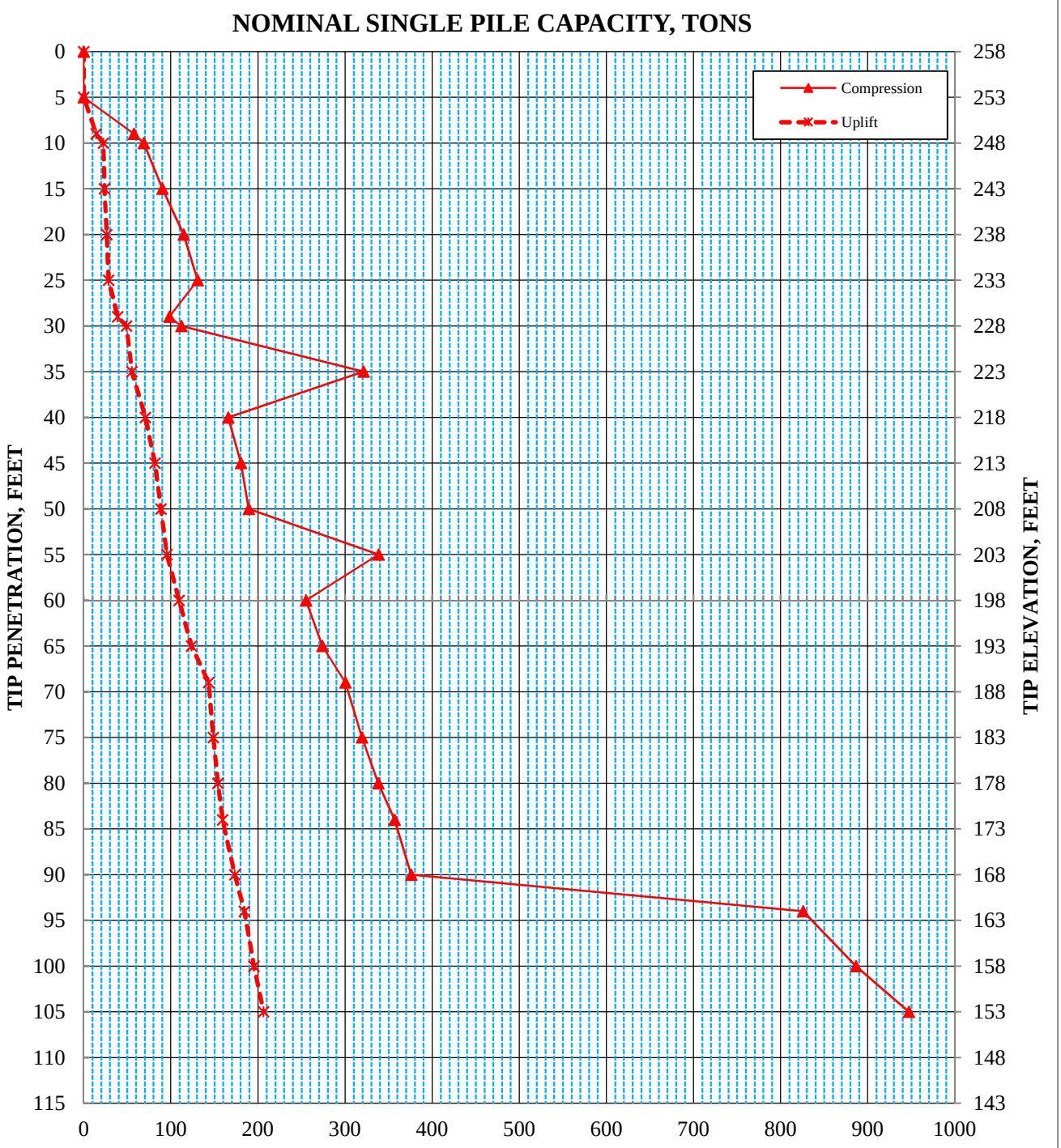
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.

NOMINAL SINGLE PILE CAPACITY, TONS



NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
18-in.-diameter Steel Shells
Bent 2
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

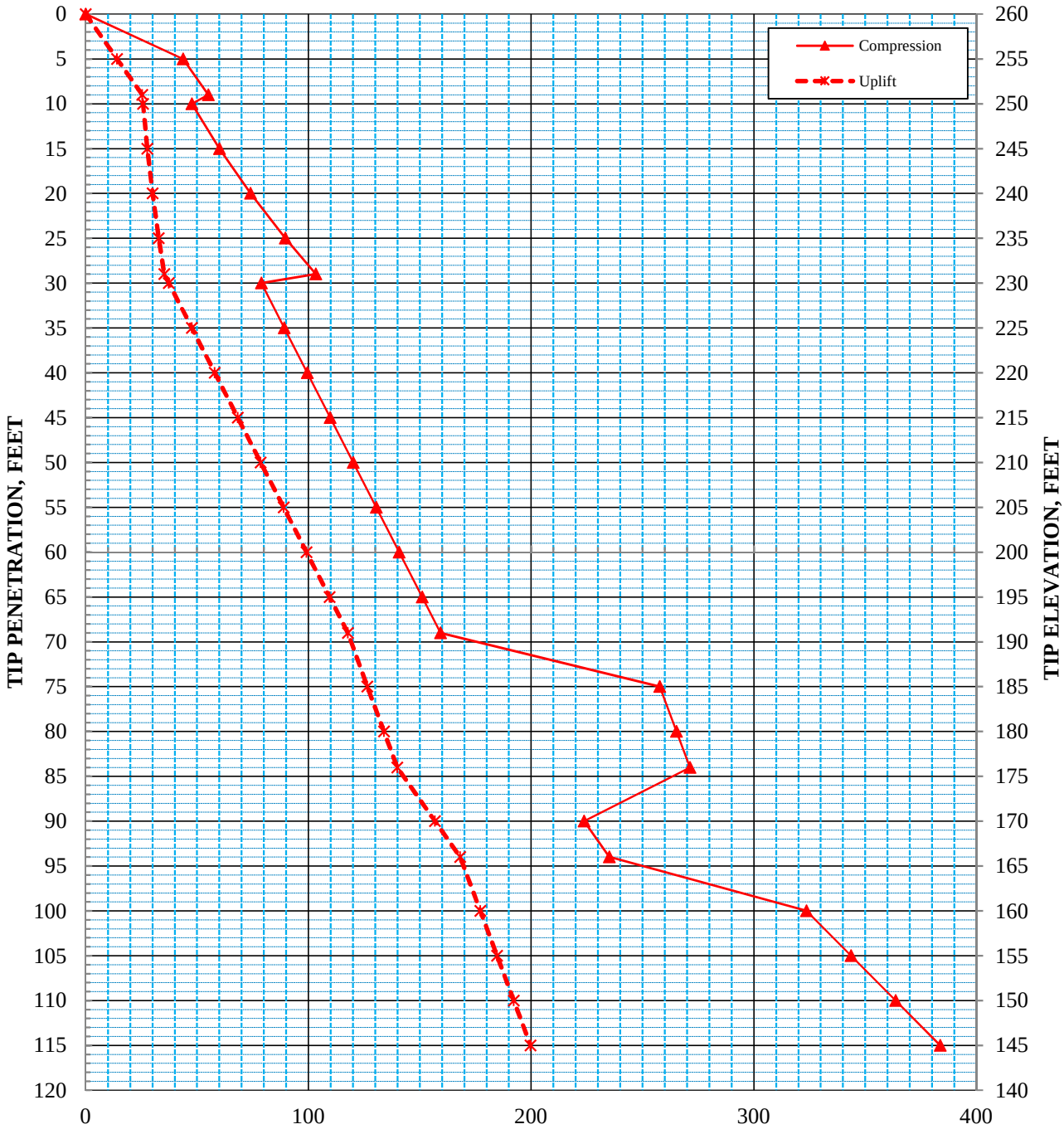
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.



24-in.-diameter Steel Shells
Bent 2
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

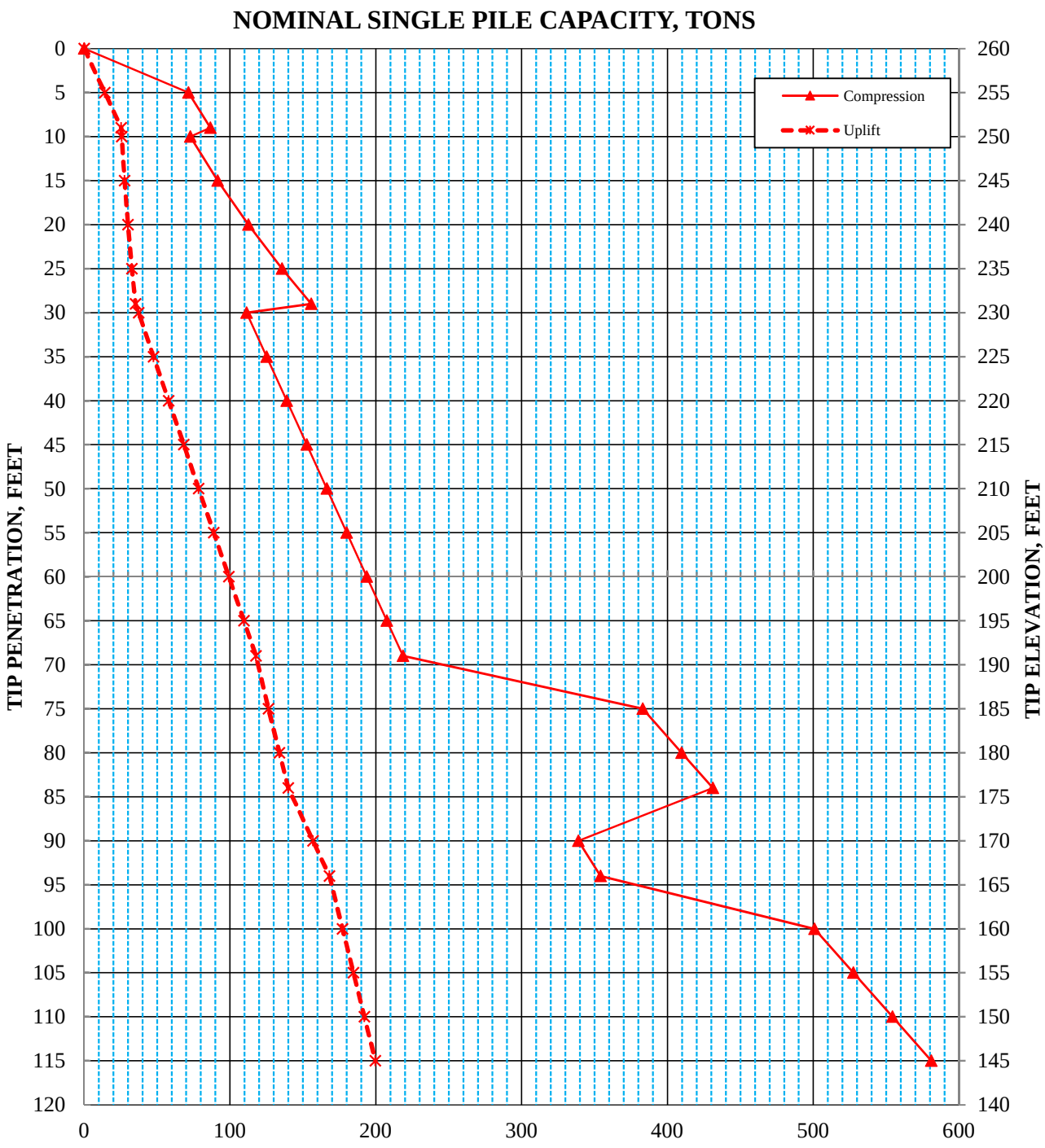
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.

NOMINAL SINGLE PILE CAPACITY, TONS



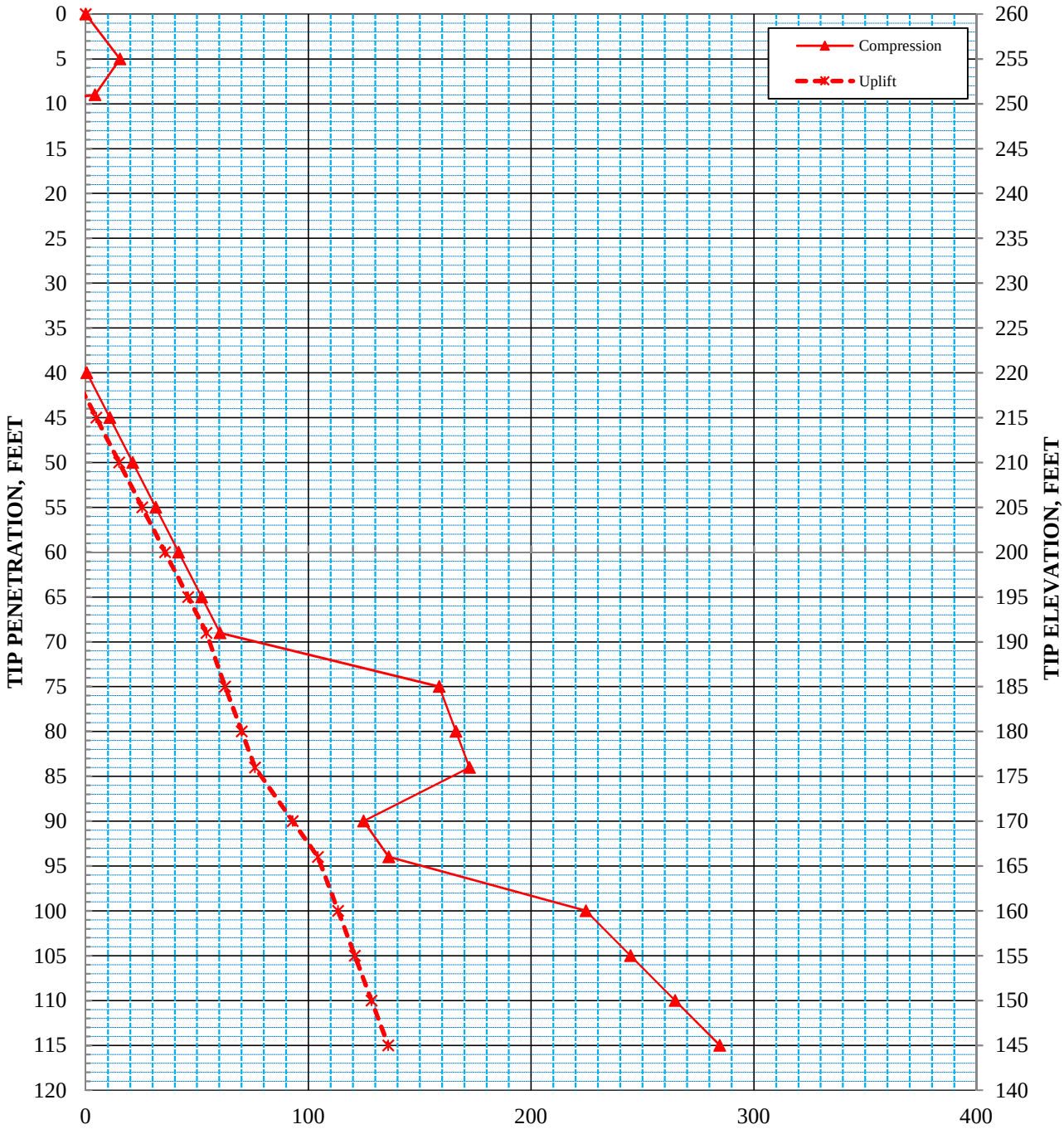
NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
18-in.-diameter Steel Shells
Bent 3
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.



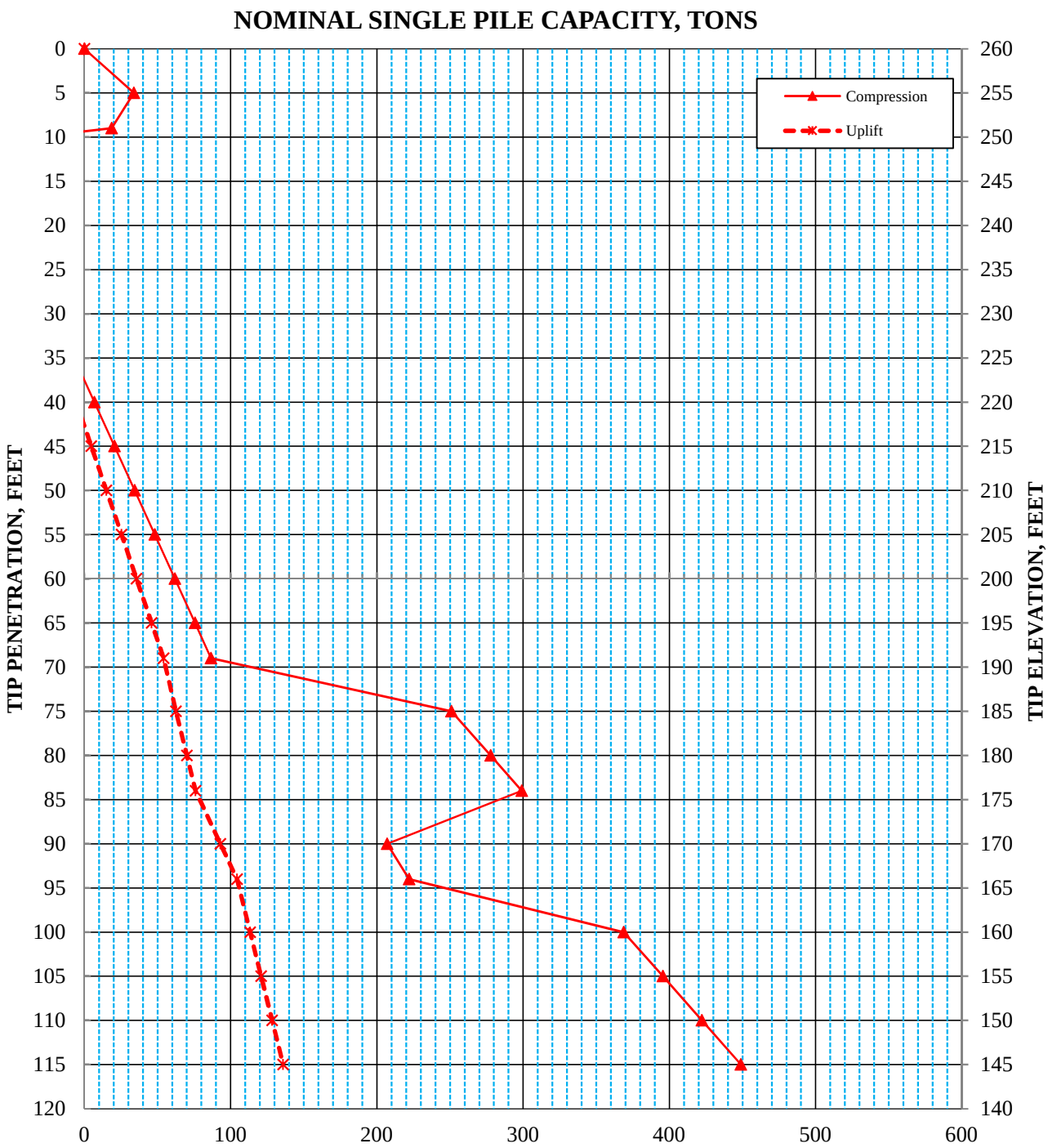
24-in.-diameter Steel Shells
Bent 3
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.



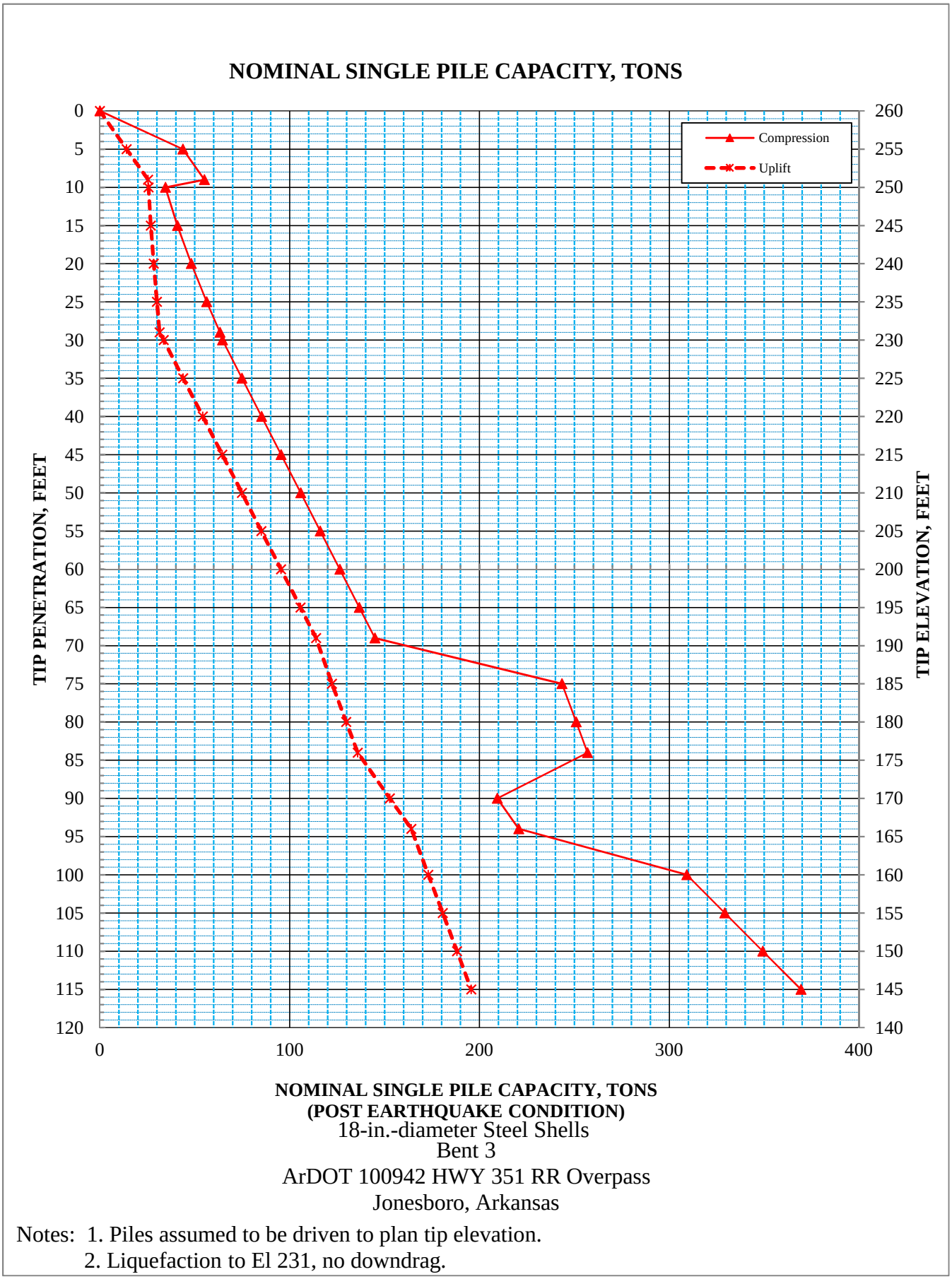
18-in.-diameter Steel Shells
Bent 3
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction downdrag to El 231.



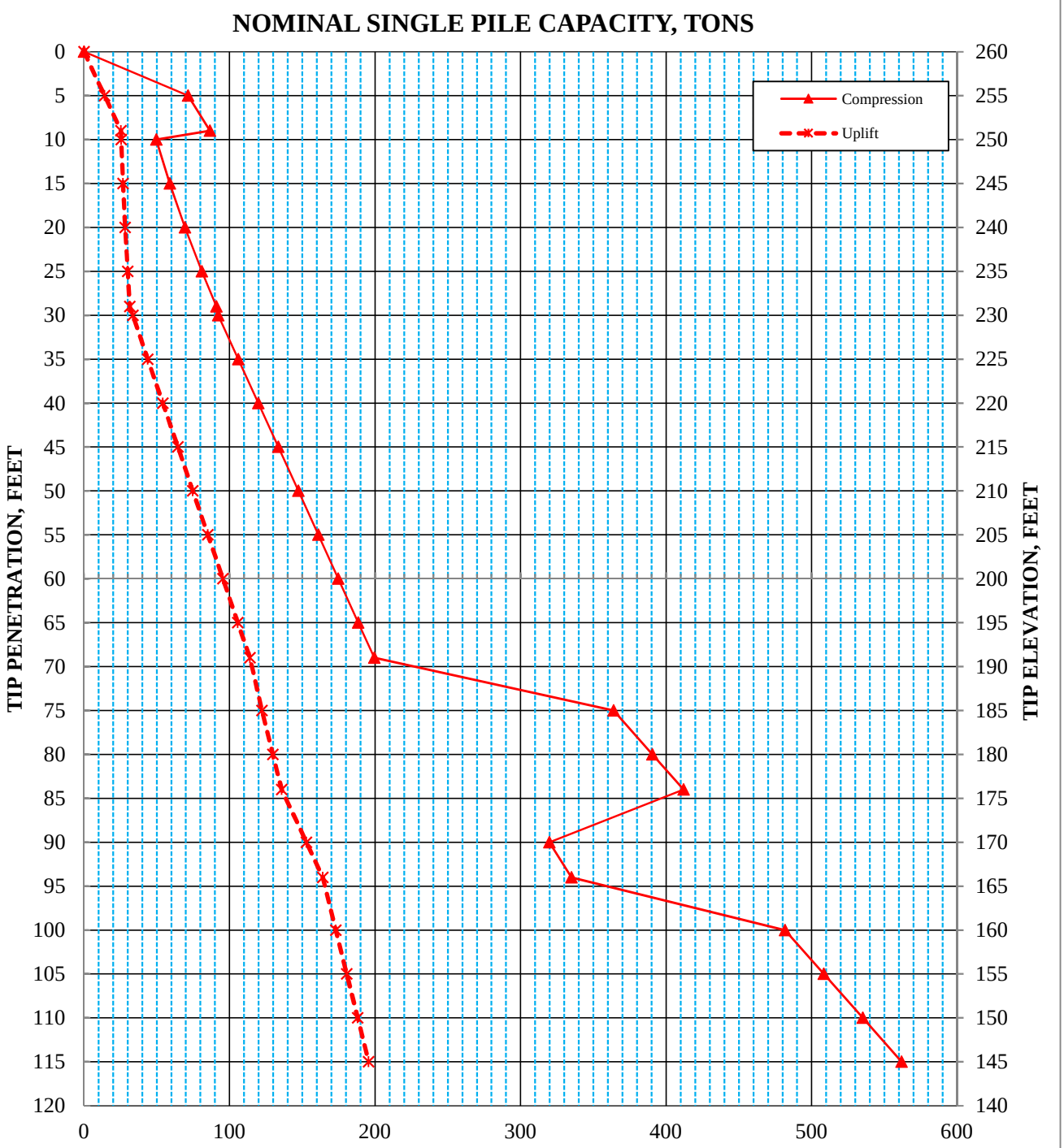
NOMINAL SINGLE PILE CAPACITY, TONS
(END of EARTHQUAKE CONDITION)
24-in.-diameter Steel Shells
Bent 3
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction downdrag to El 231.



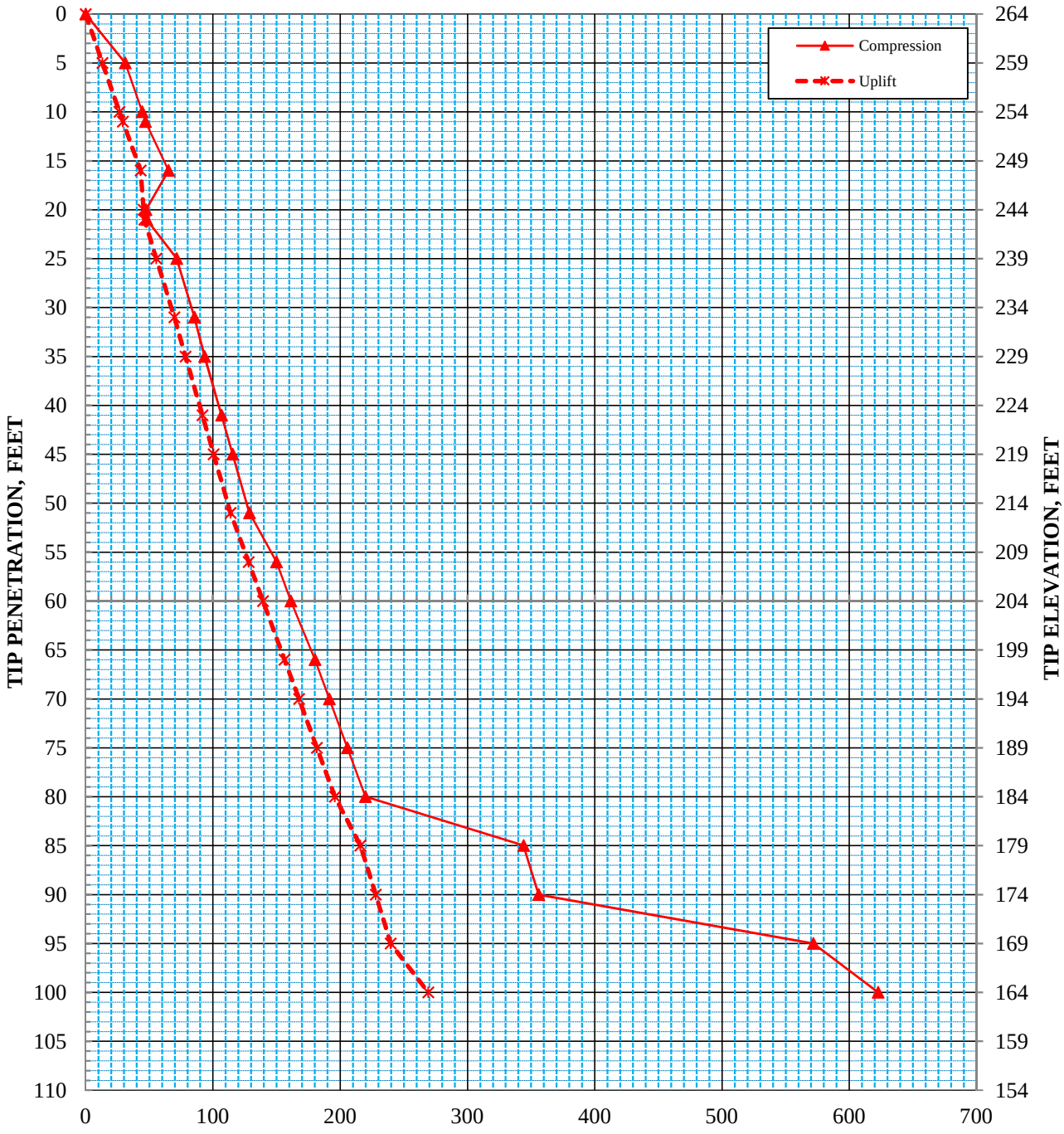
NOMINAL SINGLE PILE CAPACITY, TONS
(POST EARTHQUAKE CONDITION)
18-in.-diameter Steel Shells
Bent 3
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction to El 231, no downdrag.



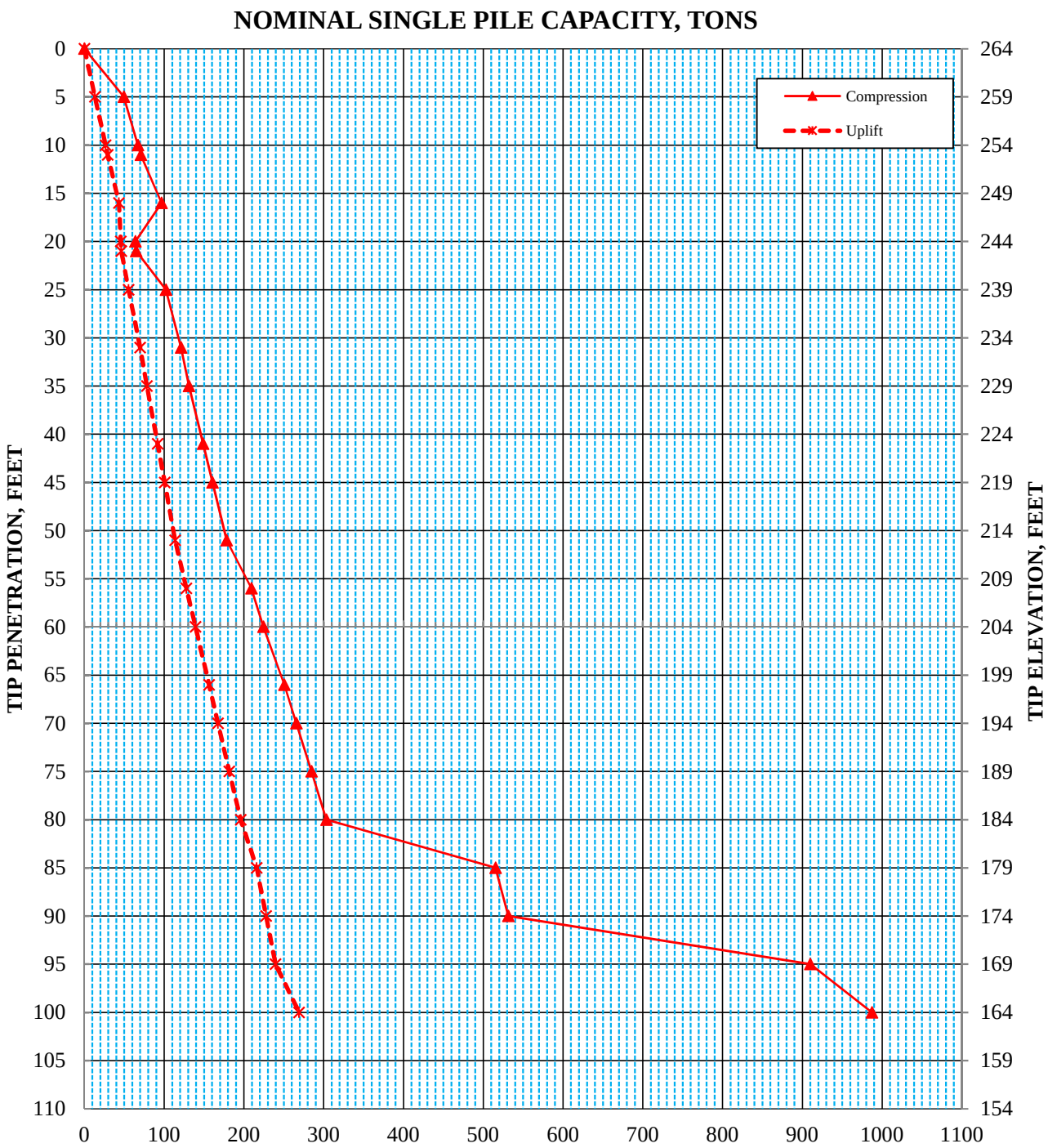
24-in.-diameter Steel Shells
Bent 3
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction to El 231, no downdrag.



NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
18-in.-diameter Steel Shells
Bent 4
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

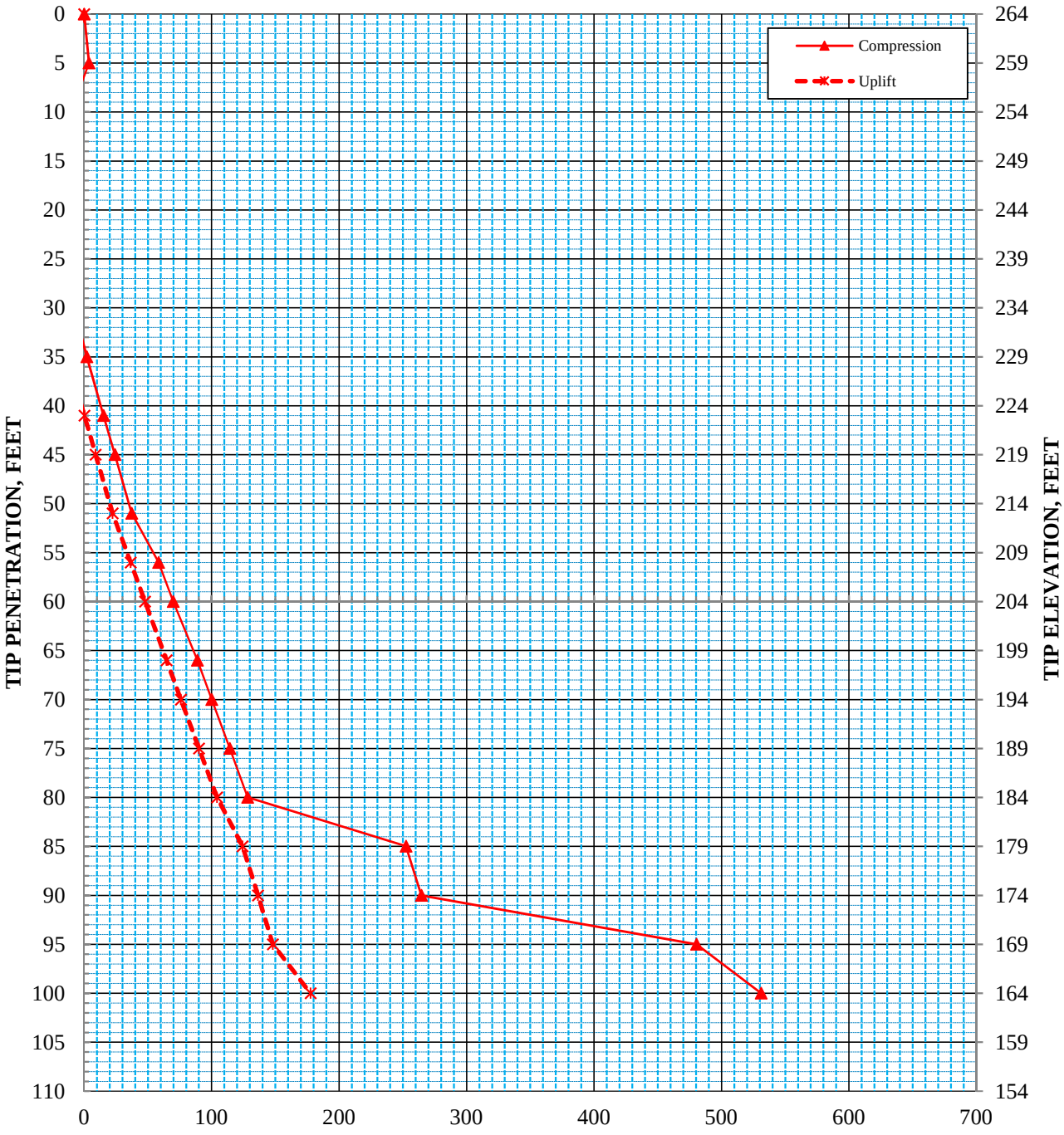
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.



NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
24-in.-diameter Steel Shells
Bent 4
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

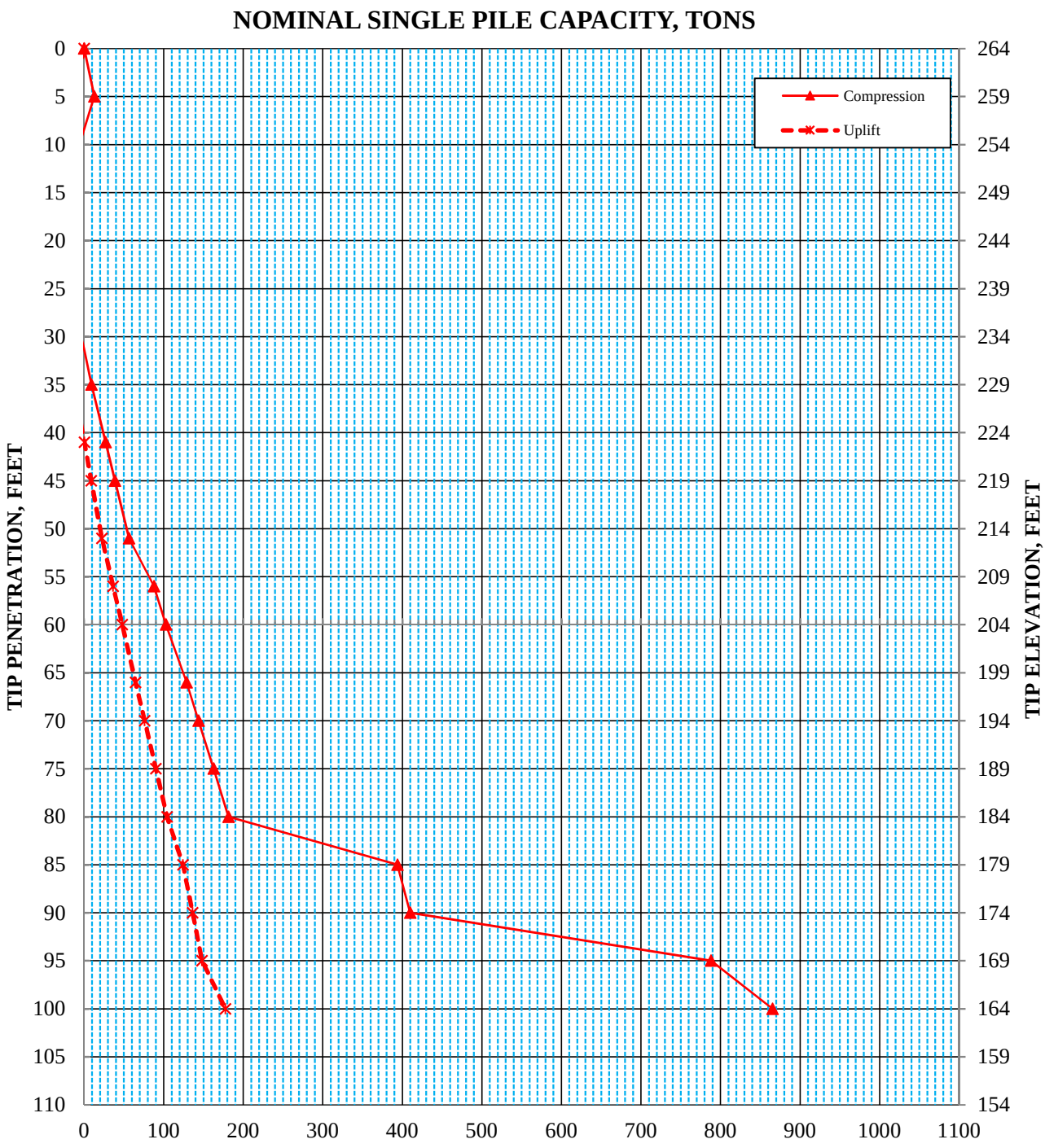
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.

NOMINAL SINGLE PILE CAPACITY, TONS



NOMINAL SINGLE PILE CAPACITY, TONS
(END of EARTHQUAKE CONDITION)
18-in.-diameter Steel Shells
Bent 4
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

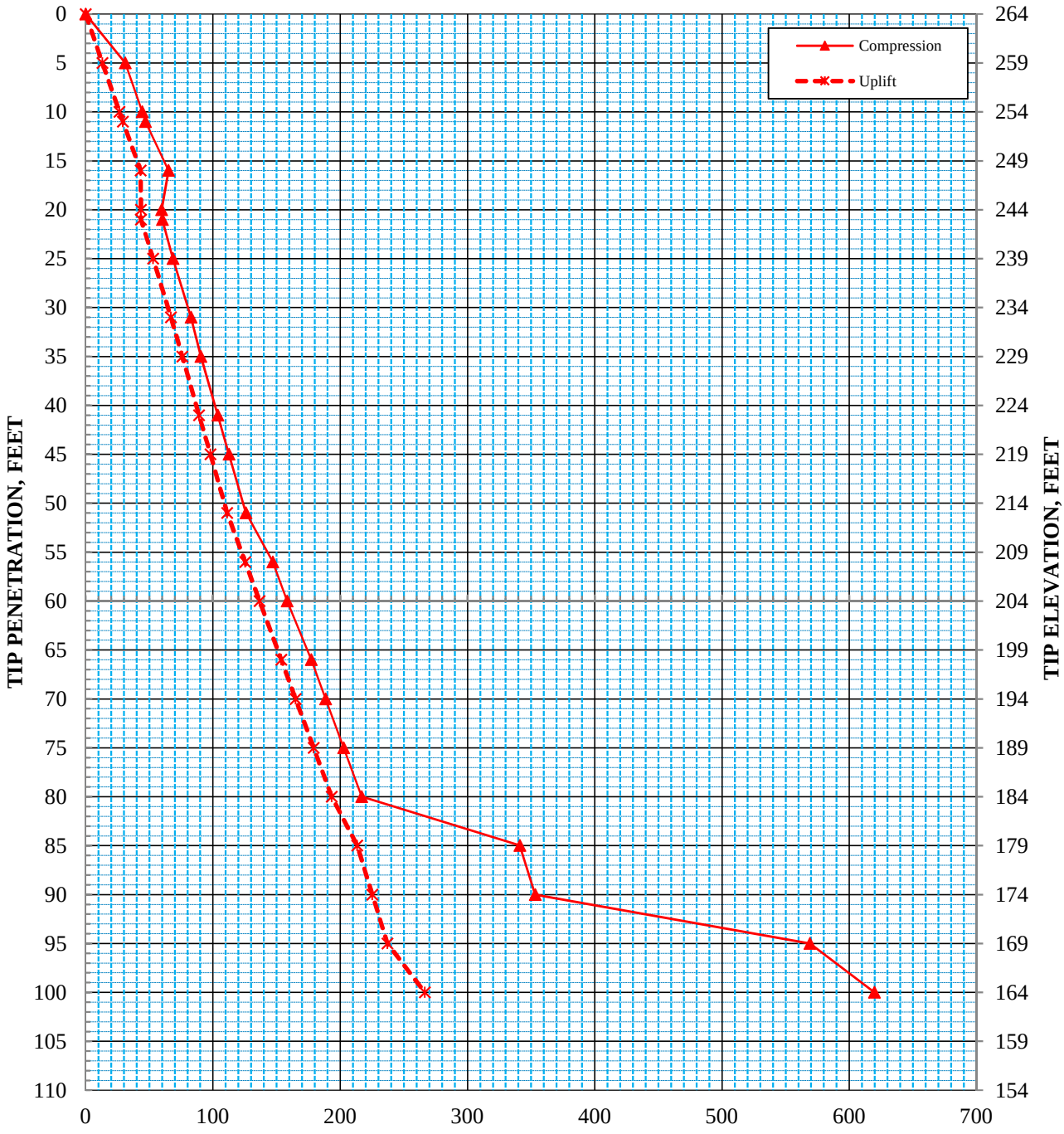
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction downdrag to El 241.



24-in.-diameter Steel Shells
Bent 4
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

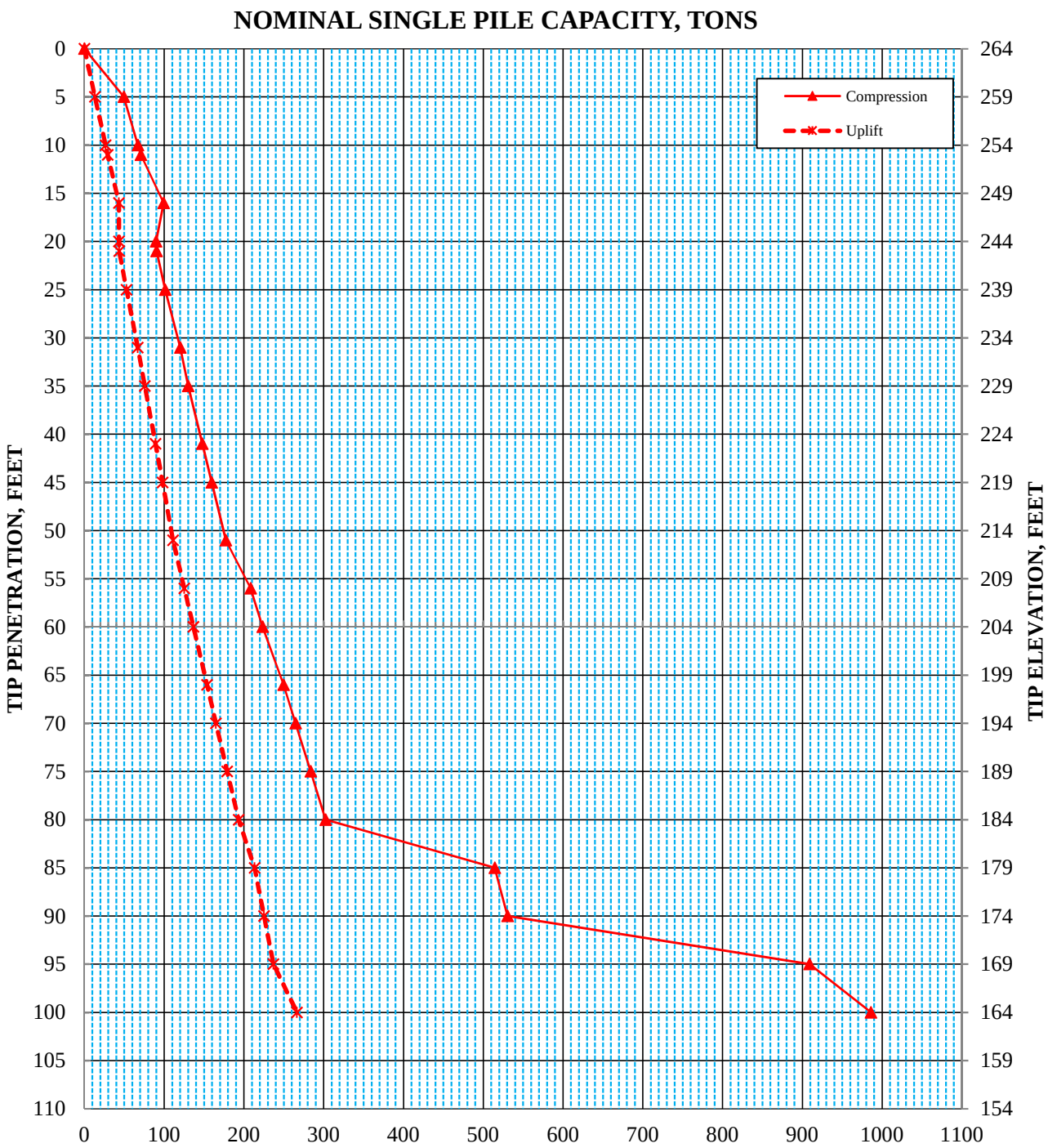
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction downdrag to El 241

NOMINAL SINGLE PILE CAPACITY, TONS



NOMINAL SINGLE PILE CAPACITY, TONS
(POST EARTHQUAKE CONDITION)
18-in.-diameter Steel Shells
Bent 4
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

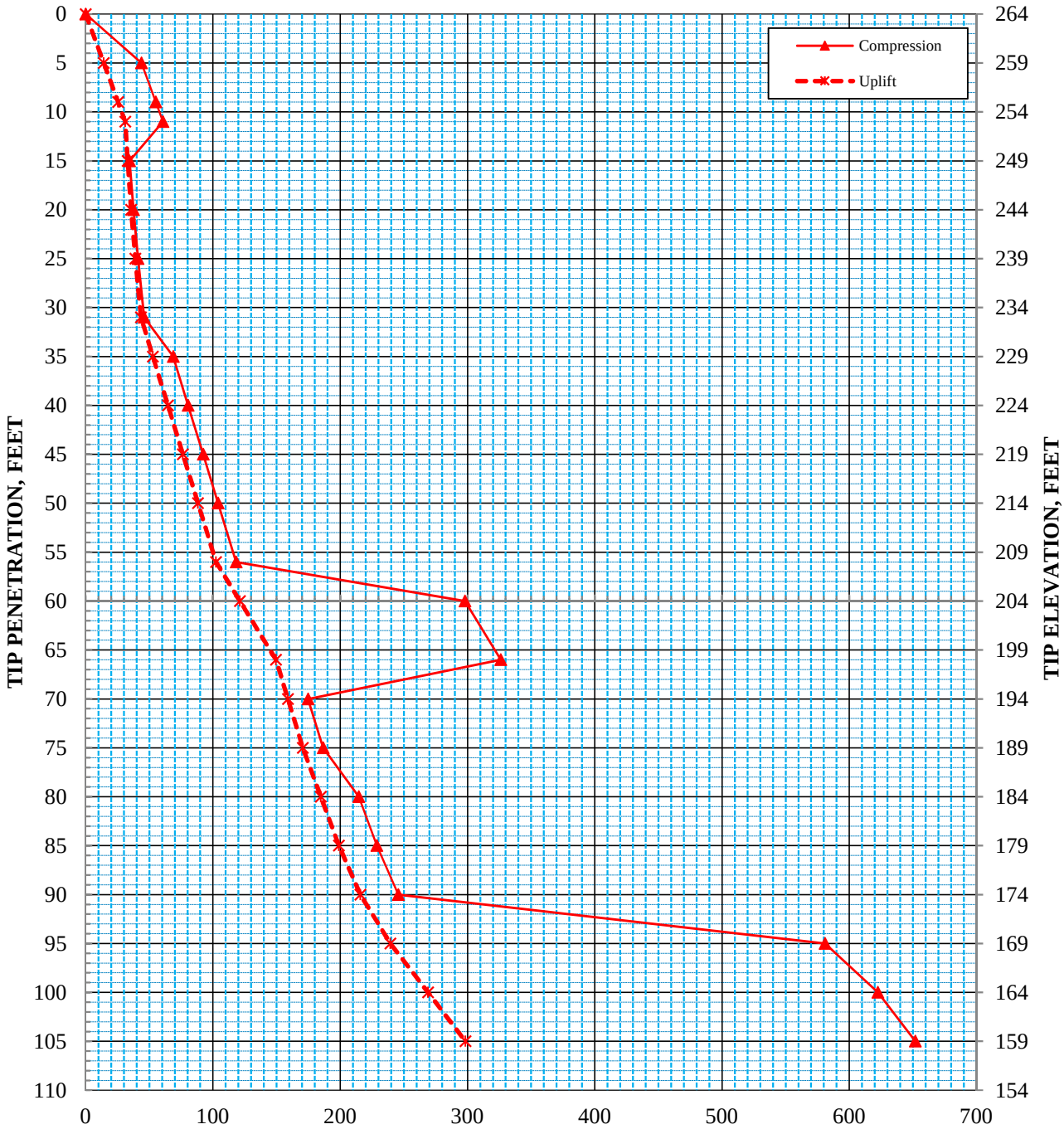
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction to El 241, no downdrag.



NOMINAL SINGLE PILE CAPACITY, TONS
(POST EARTHQUAKE CONDITION)
24-in.-diameter Steel Shells
Bent 4
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

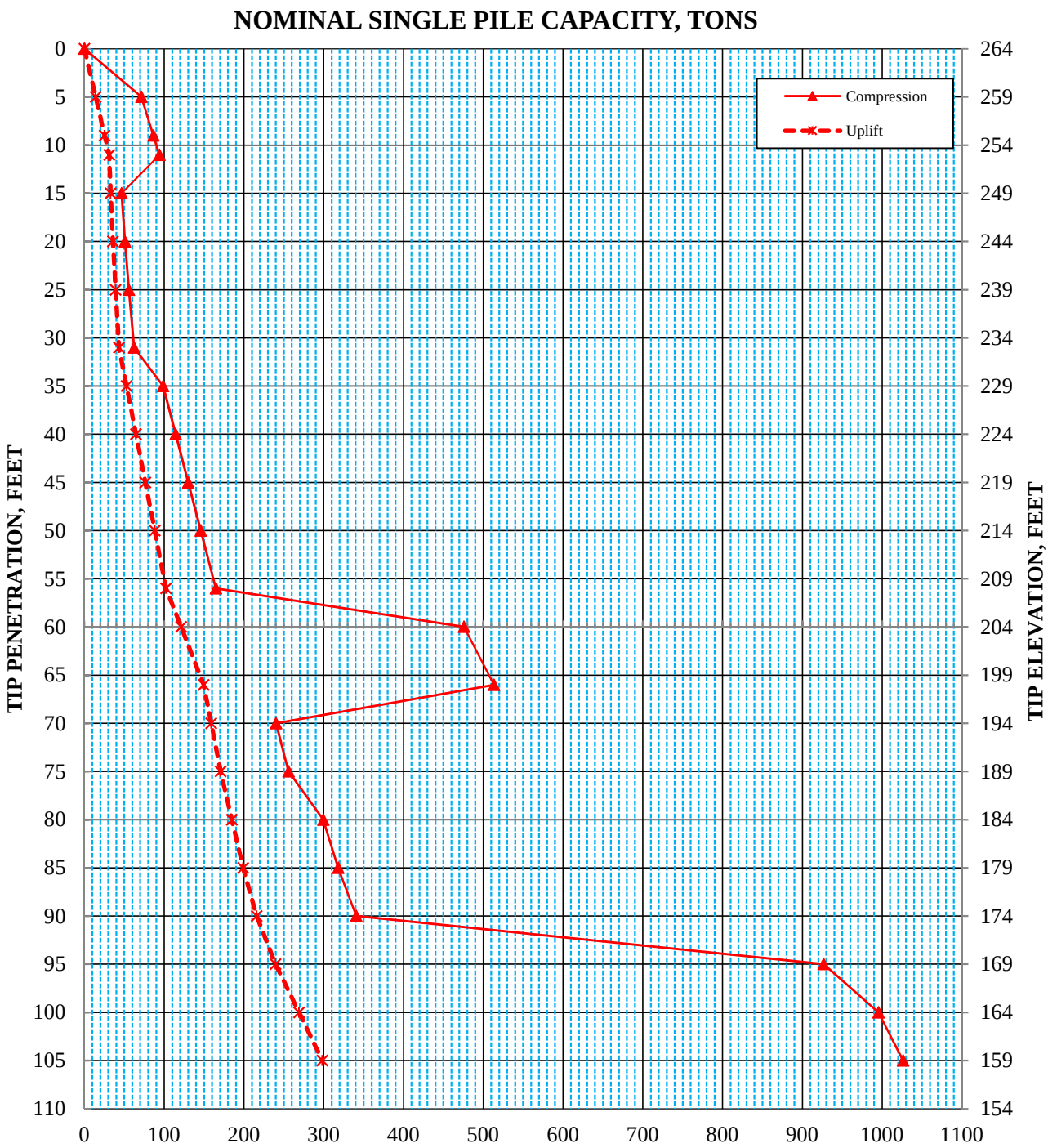
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction to El 241, no downdrag.

NOMINAL SINGLE PILE CAPACITY, TONS



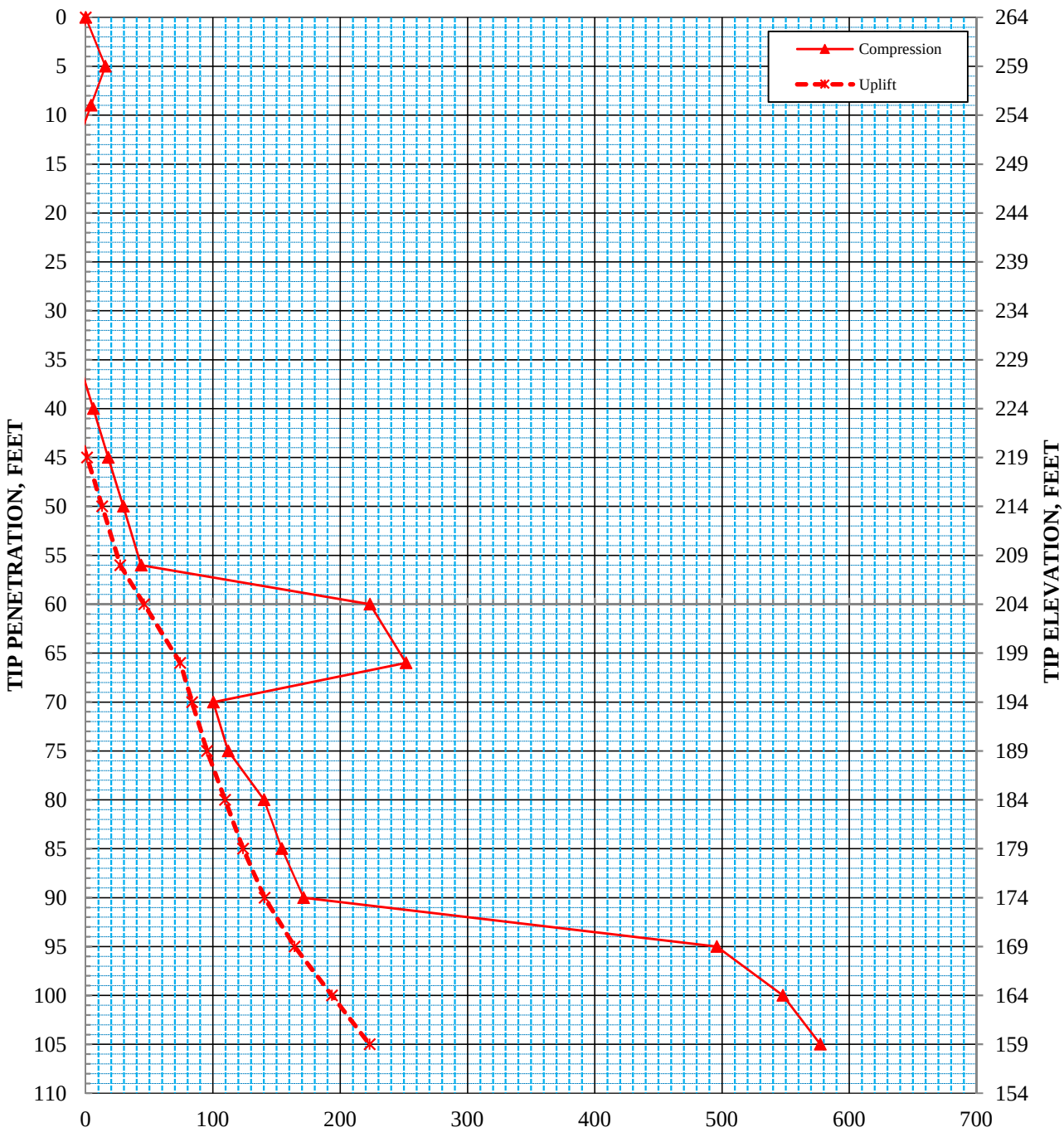
NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
18-in.-diameter Steel Shells
Bent 5
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.



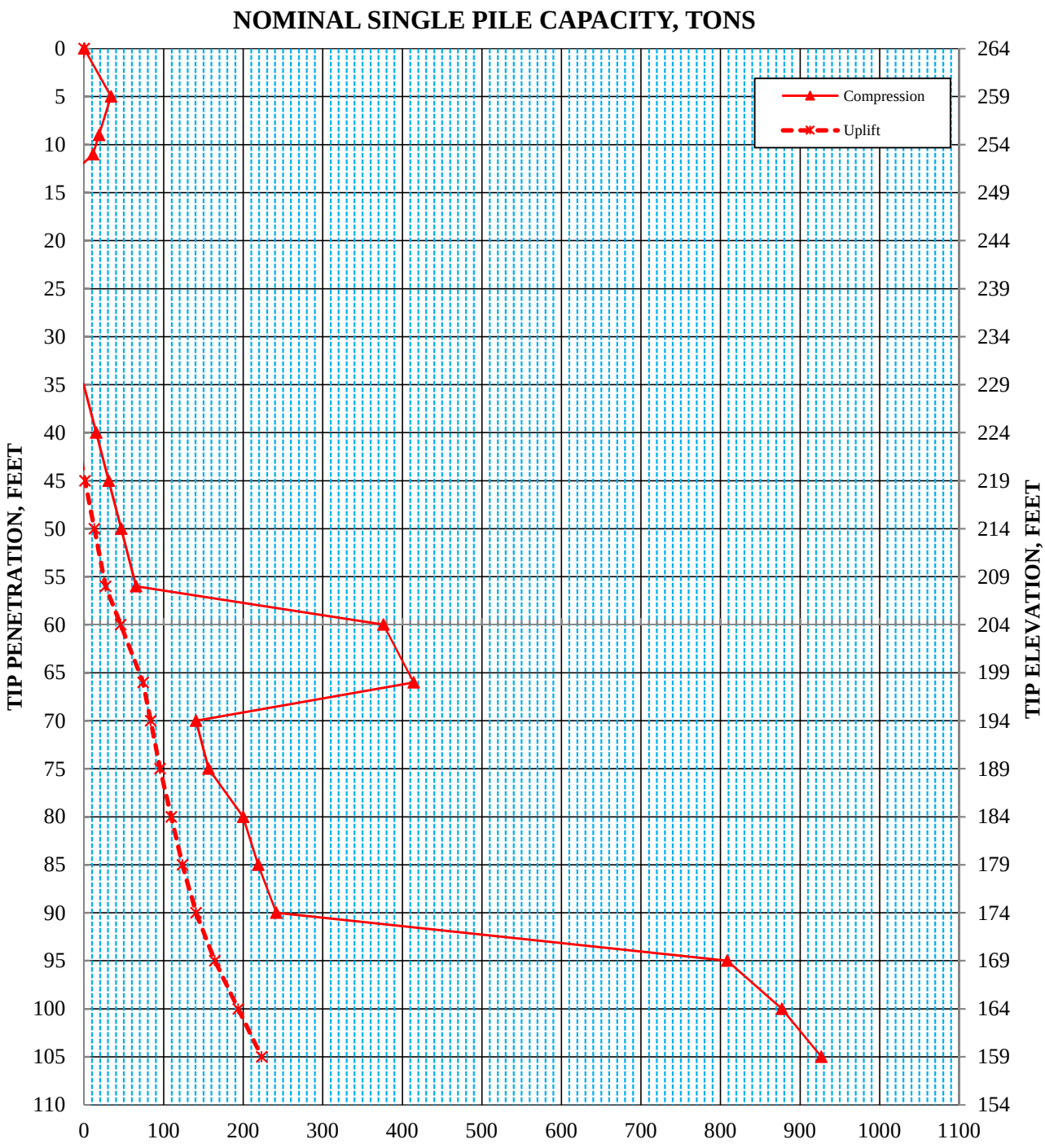
24-in.-diameter Steel Shells
Bent 5
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.



NOMINAL SINGLE PILE CAPACITY, TONS
(END of EARTHQUAKE CONDITION)
18-in.-diameter Steel Shells
Bent 5
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

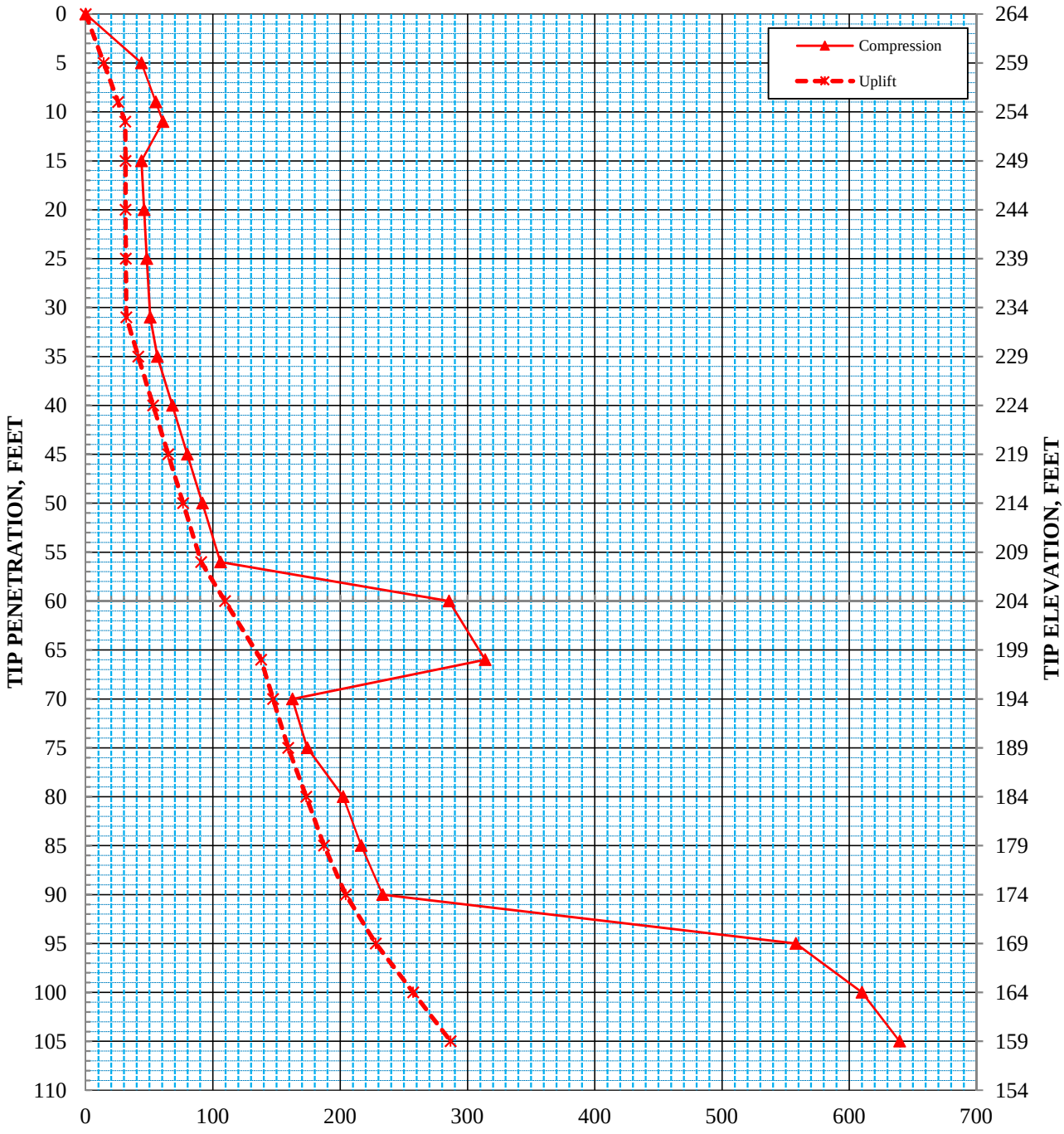
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction downdrag to El 233.



NOMINAL SINGLE PILE CAPACITY, TONS
(END of EARTHQUAKE CONDITION)
24-in.-diameter Steel Shells
Bent 5
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

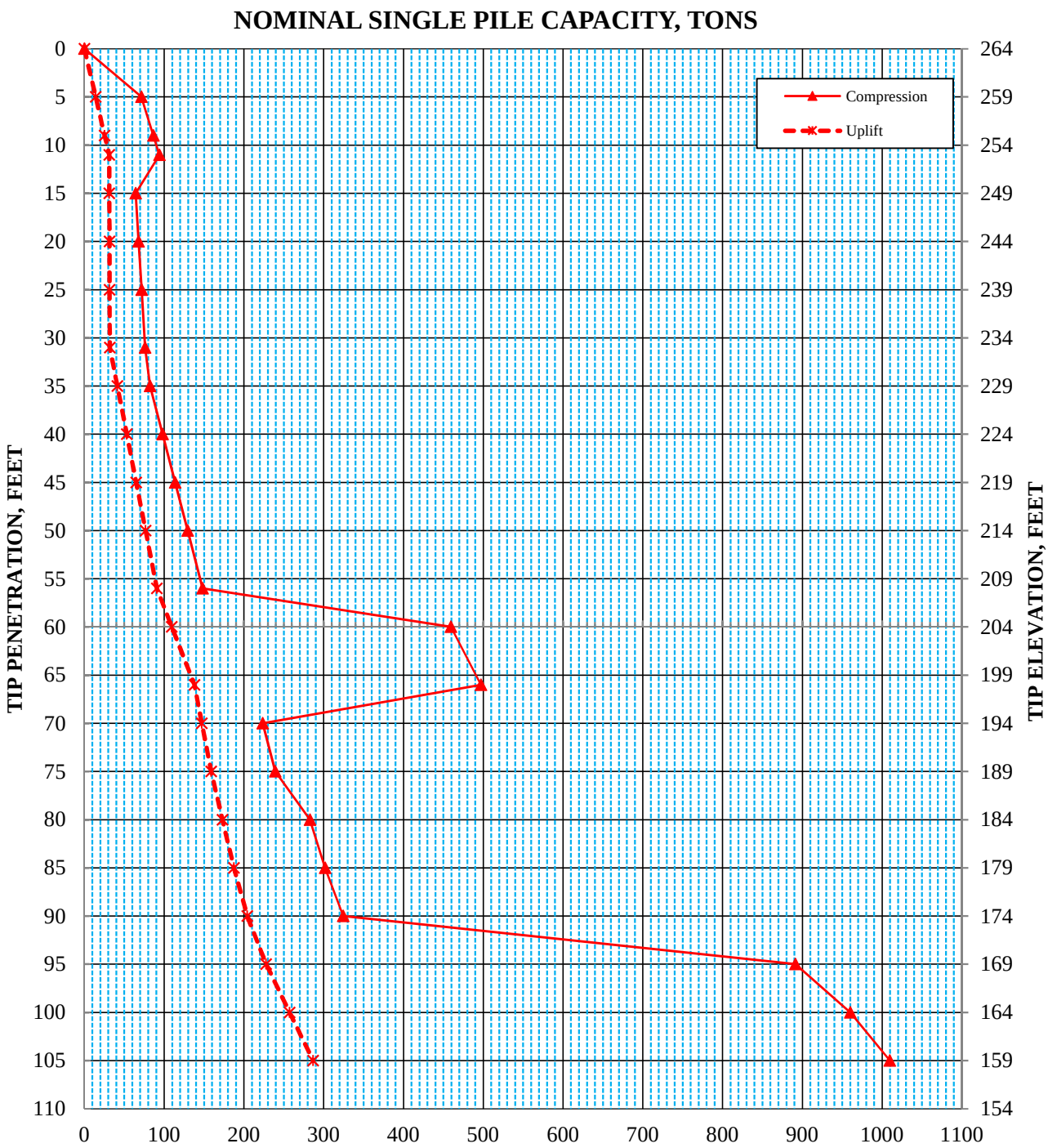
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction downdrag to El 233.

NOMINAL SINGLE PILE CAPACITY, TONS



NOMINAL SINGLE PILE CAPACITY, TONS
(POST EARTHQUAKE CONDITION)
18-in.-diameter Steel Shells
Bent 5
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

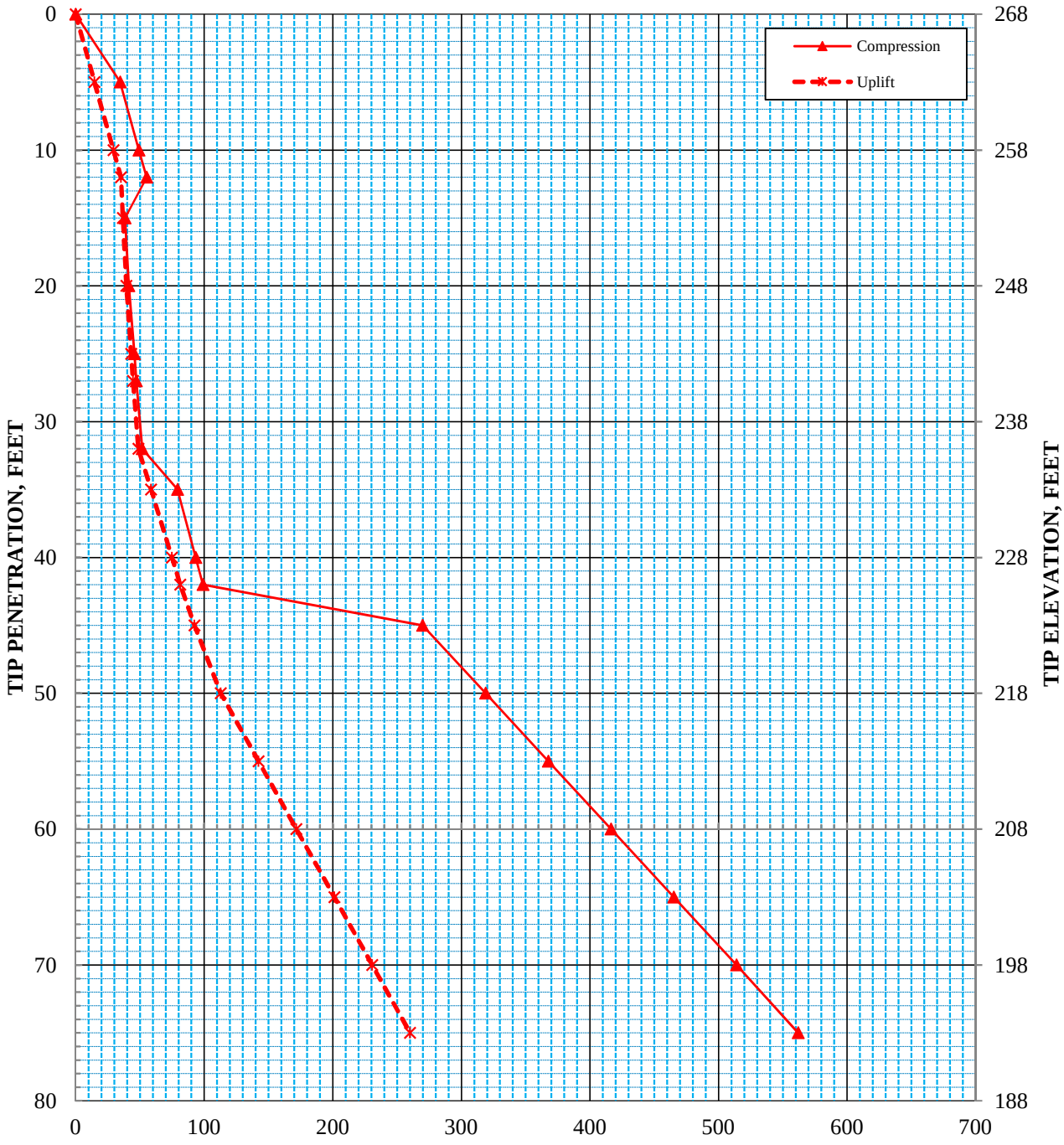
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction to El 233, no downdrag.



NOMINAL SINGLE PILE CAPACITY, TONS
(POST EARTHQUAKE CONDITION)
24-in.-diameter Steel Shells
Bent 5
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

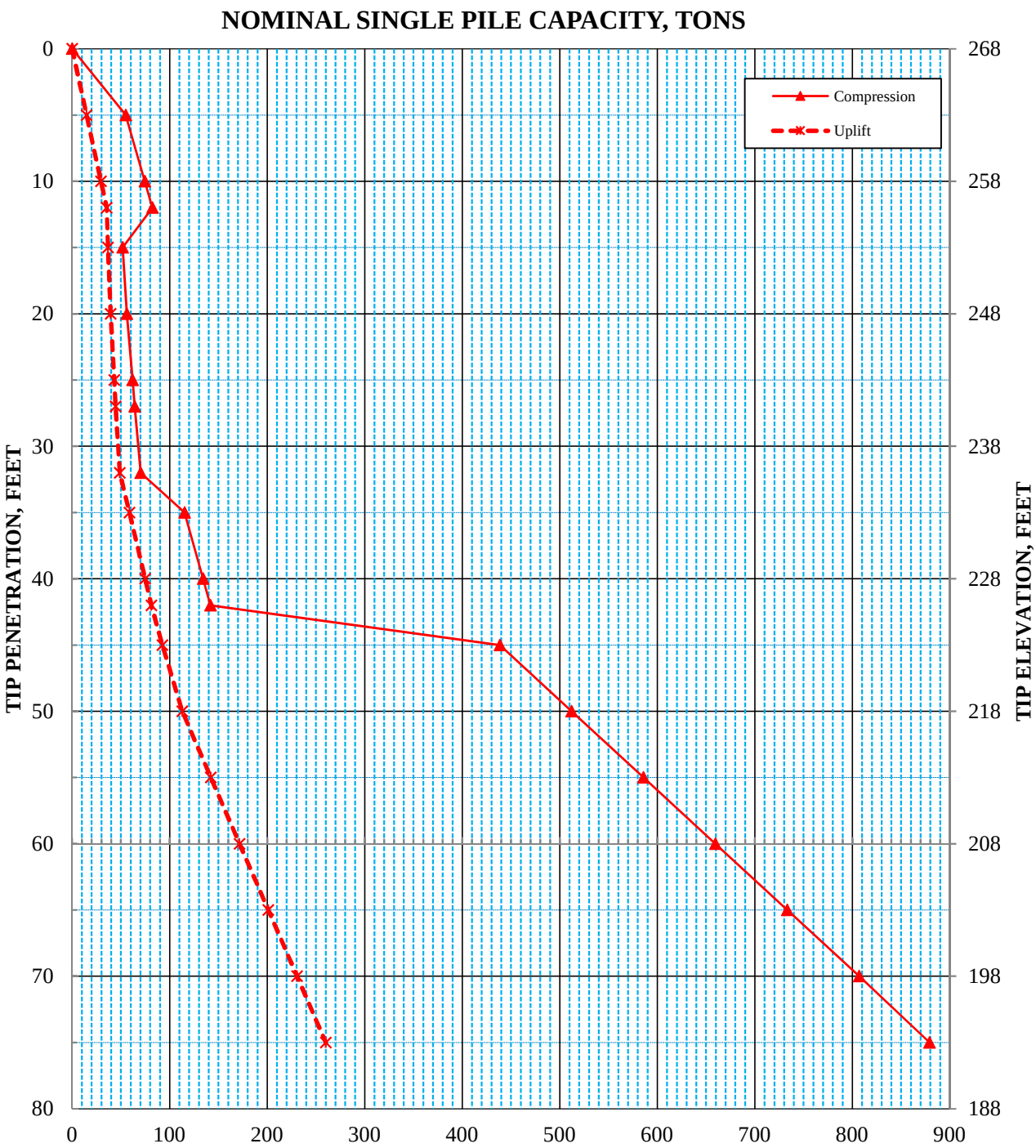
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction to El 233, no downdrag.

NOMINAL SINGLE PILE CAPACITY, TONS



NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
18-in.-diameter Steel Shells
Bent 6 (prior Bent 1)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

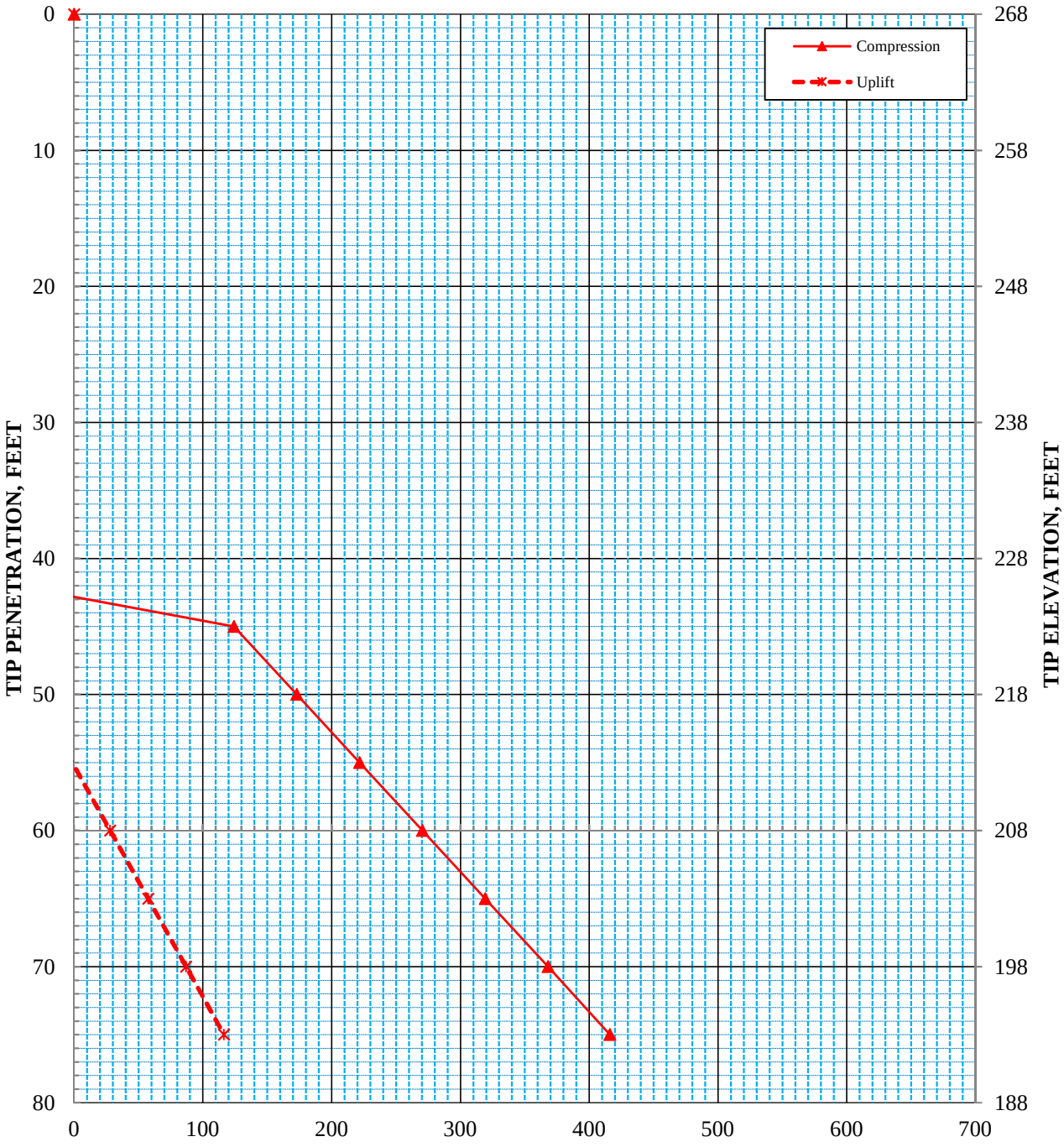
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.



NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
24-in.-diameter Steel Shells
Bent 6 (Prior Bent 1)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

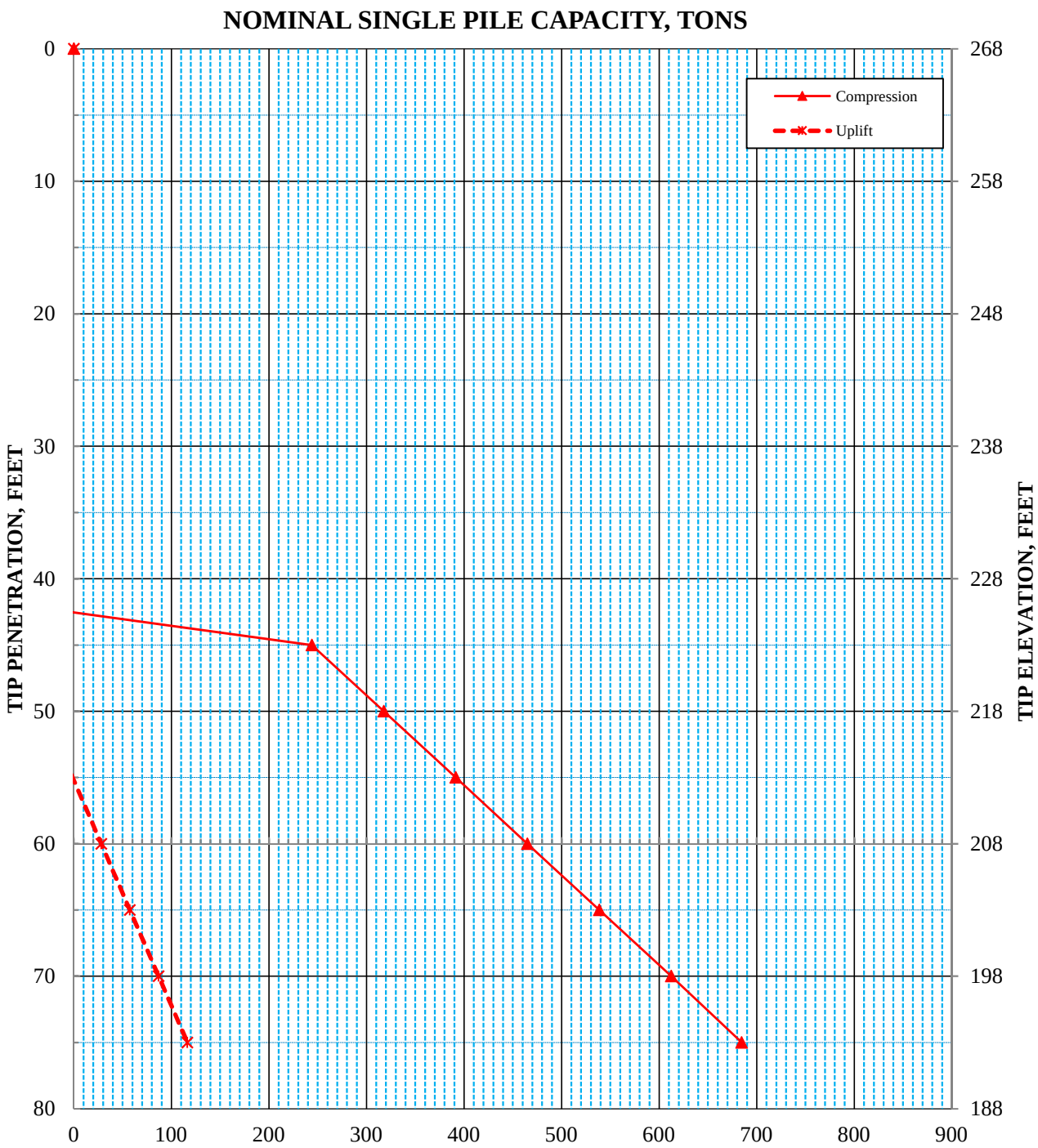
Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag.

NOMINAL SINGLE PILE CAPACITY, TONS



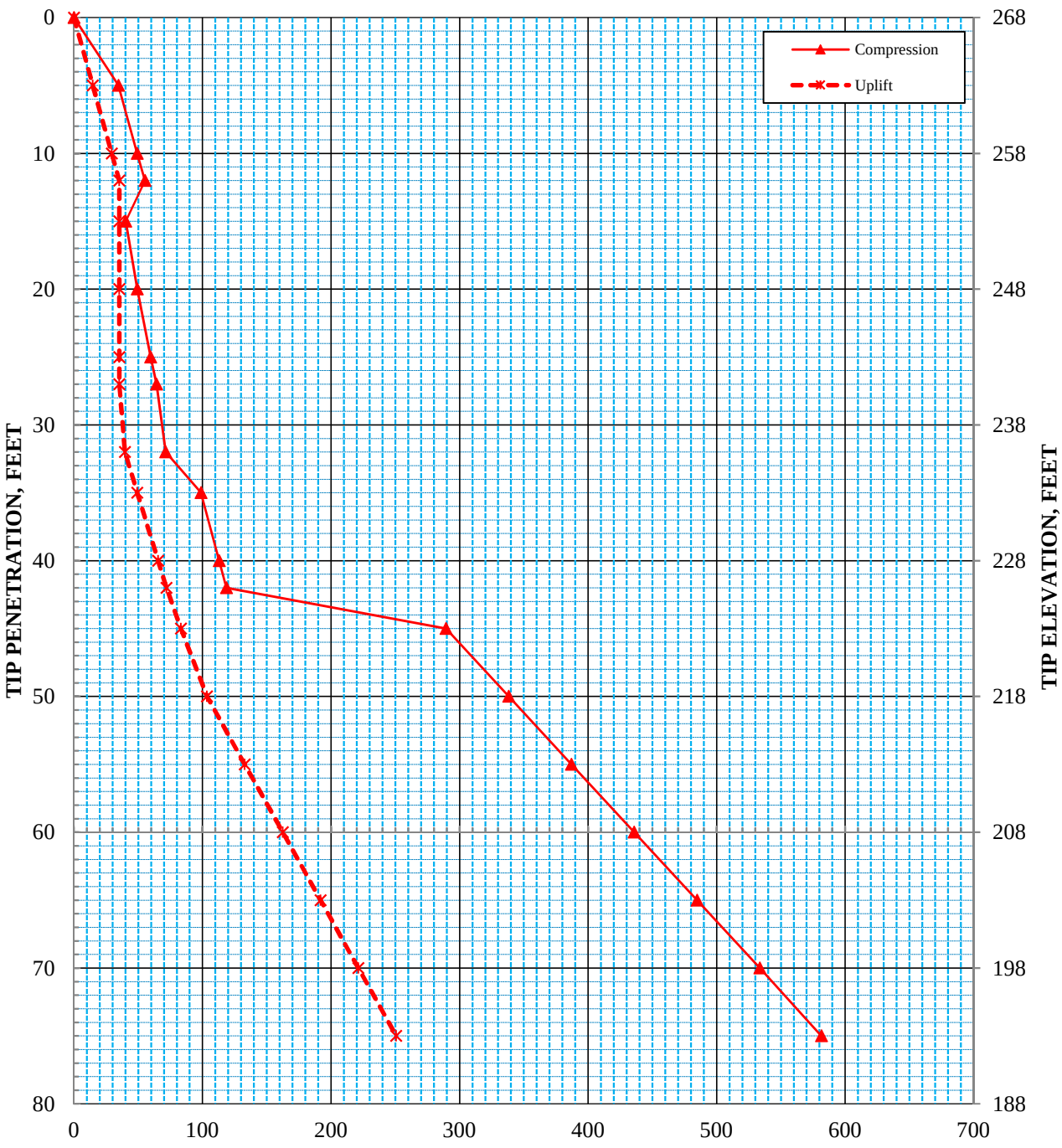
NOMINAL SINGLE PILE CAPACITY, TONS
(END of EARTHQUAKE CONDITION)
18-in.-diameter Steel Shells
Bent 6 (prior Bent 1)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction downdrag to El 241.



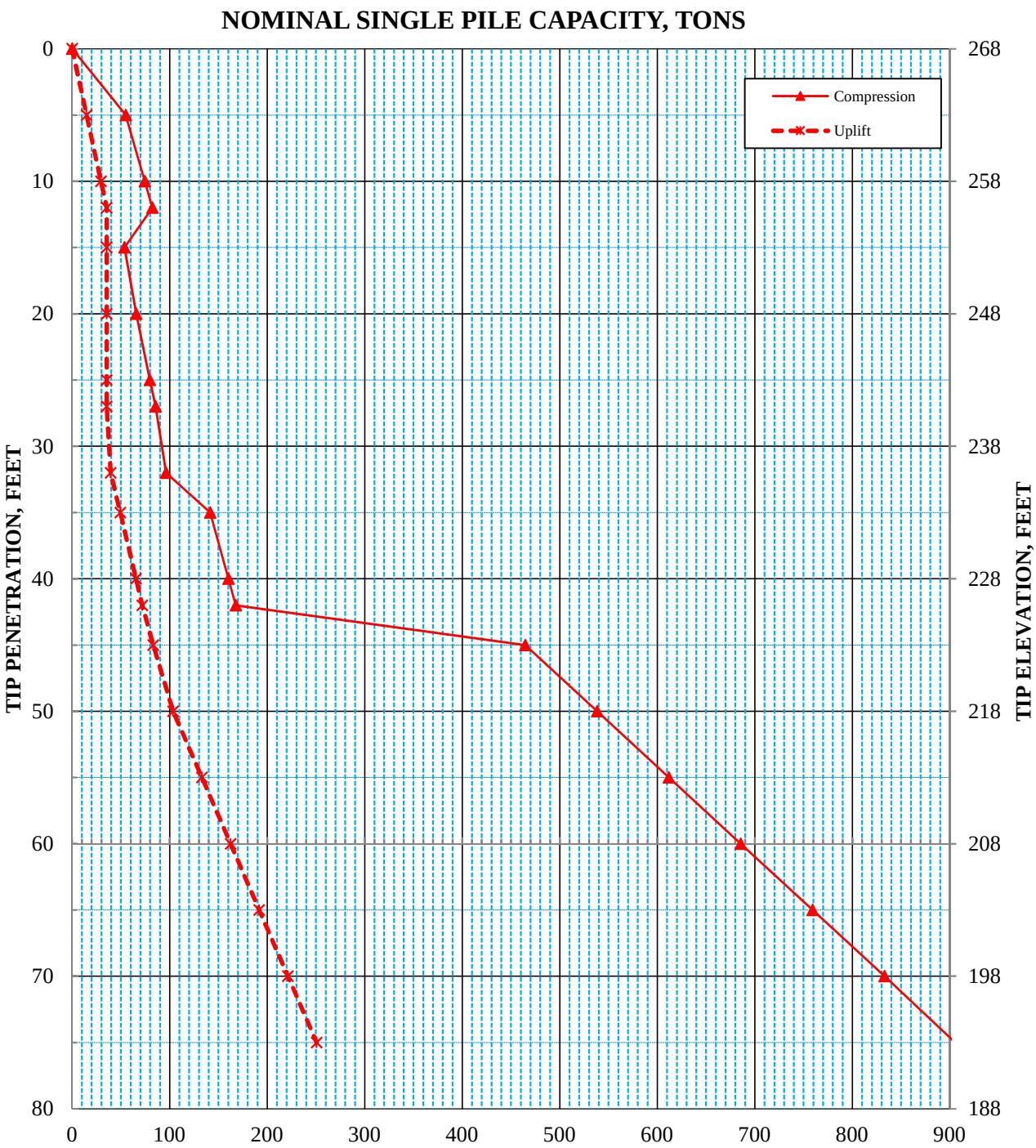
NOMINAL SINGLE PILE CAPACITY, TONS
(END of EARTHQUAKE CONDITION)
24-in.-diameter Steel Shells
Bent 6 (Prior Bent 1)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction downdrag to El 241.



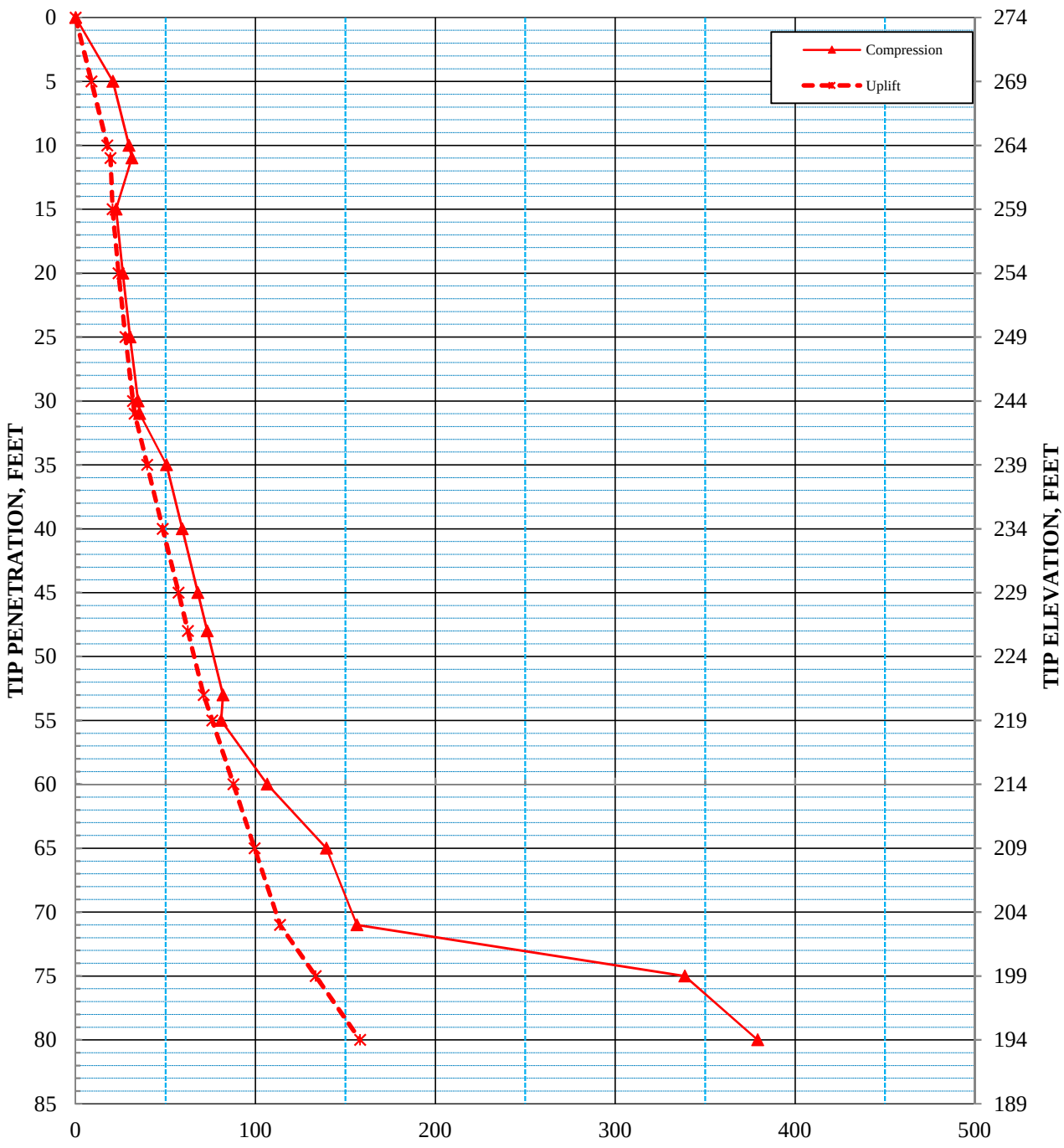
NOMINAL SINGLE PILE CAPACITY, TONS
(POST EARTHQUAKE CONDITION)
18-in.-diameter Steel Shells
Bent 6 (prior Bent 1)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction to El 241, no downdrag.



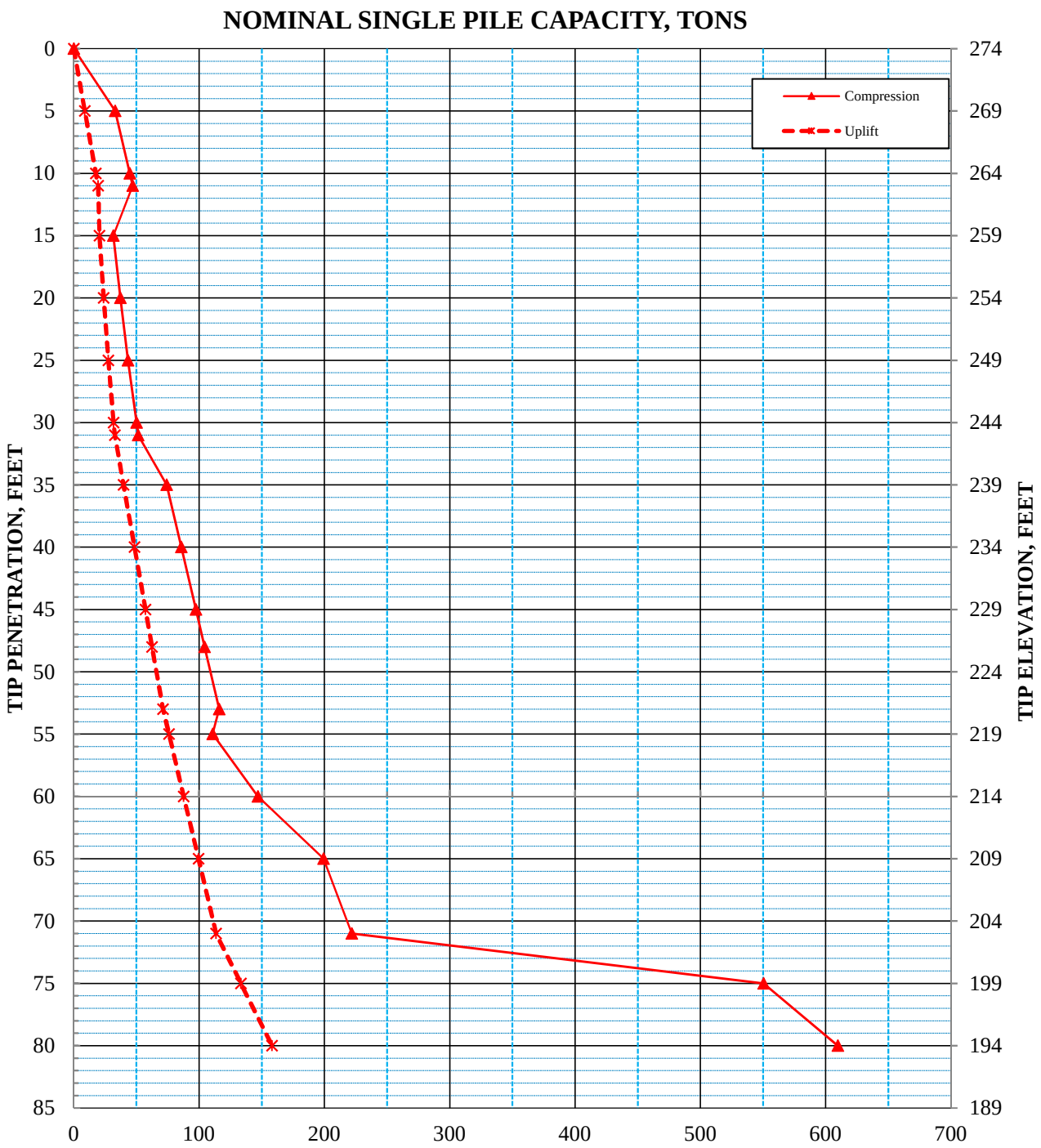
NOMINAL SINGLE PILE CAPACITY, TONS
(POST EARTHQUAKE CONDITION)
24-in.-diameter Steel Shells
Bent 6 (Prior Bent 1)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. Liquefaction to El 241, no downdrag.



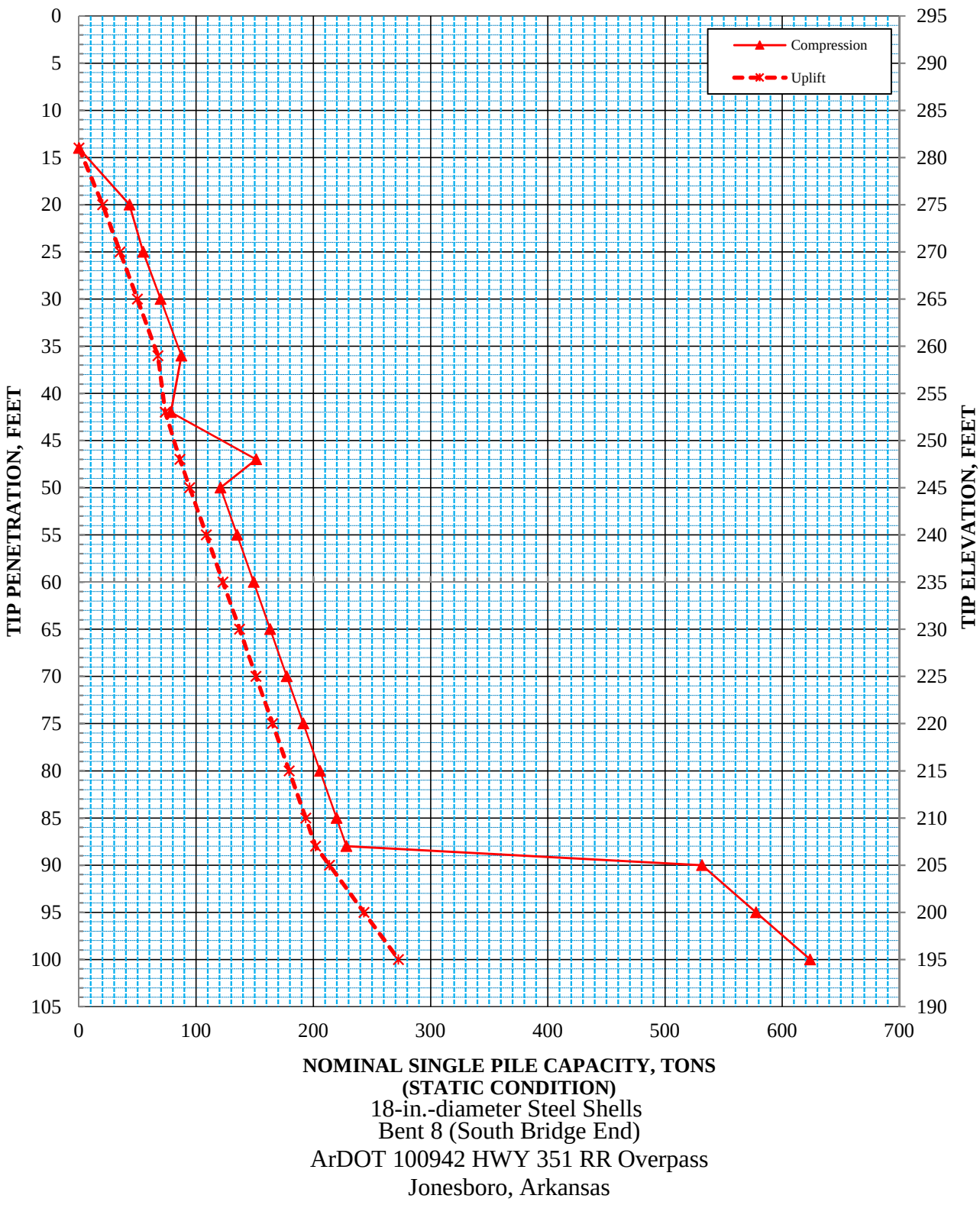
18-in.-diameter Steel Shell Pile
Bent 7 (Prior Bent 1)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag, no liquefaction.



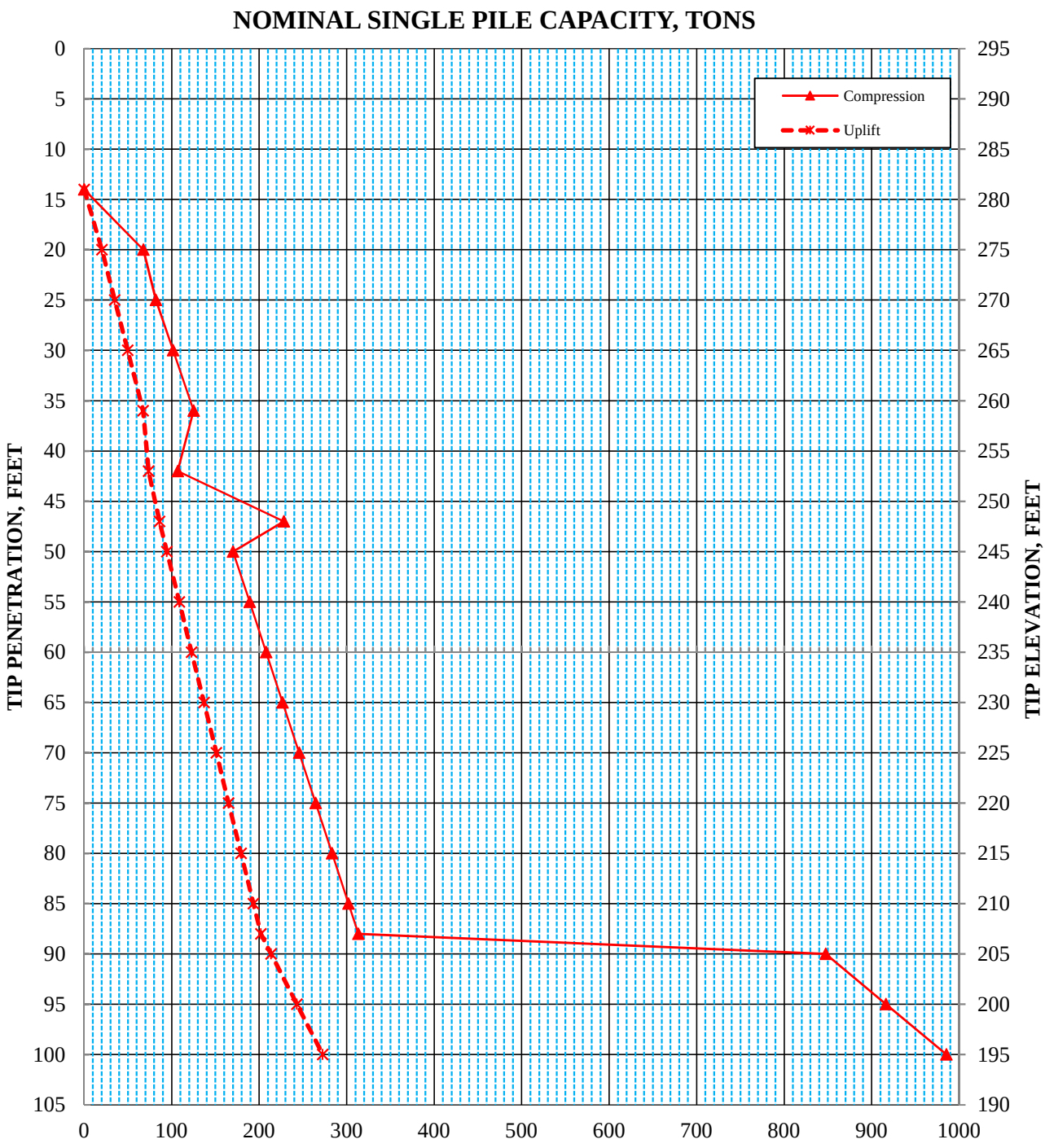
NOMINAL SINGLE PILE CAPACITY, TONS
(STATIC CONDITION)
24-in.-diameter Steel Shell Pile
Bent 7 (Prior Bent 2)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag, no liquefaction.



18-in.-diameter Steel Shells
Bent 8 (South Bridge End)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag, no liquefaction.



24-in.-diameter Steel Shells
Bent 8 (South Bridge End)
ArDOT 100942 HWY 351 RR Overpass
Jonesboro, Arkansas

Notes: 1. Piles assumed to be driven to plan tip elevation.
2. No downdrag, no liquefaction.

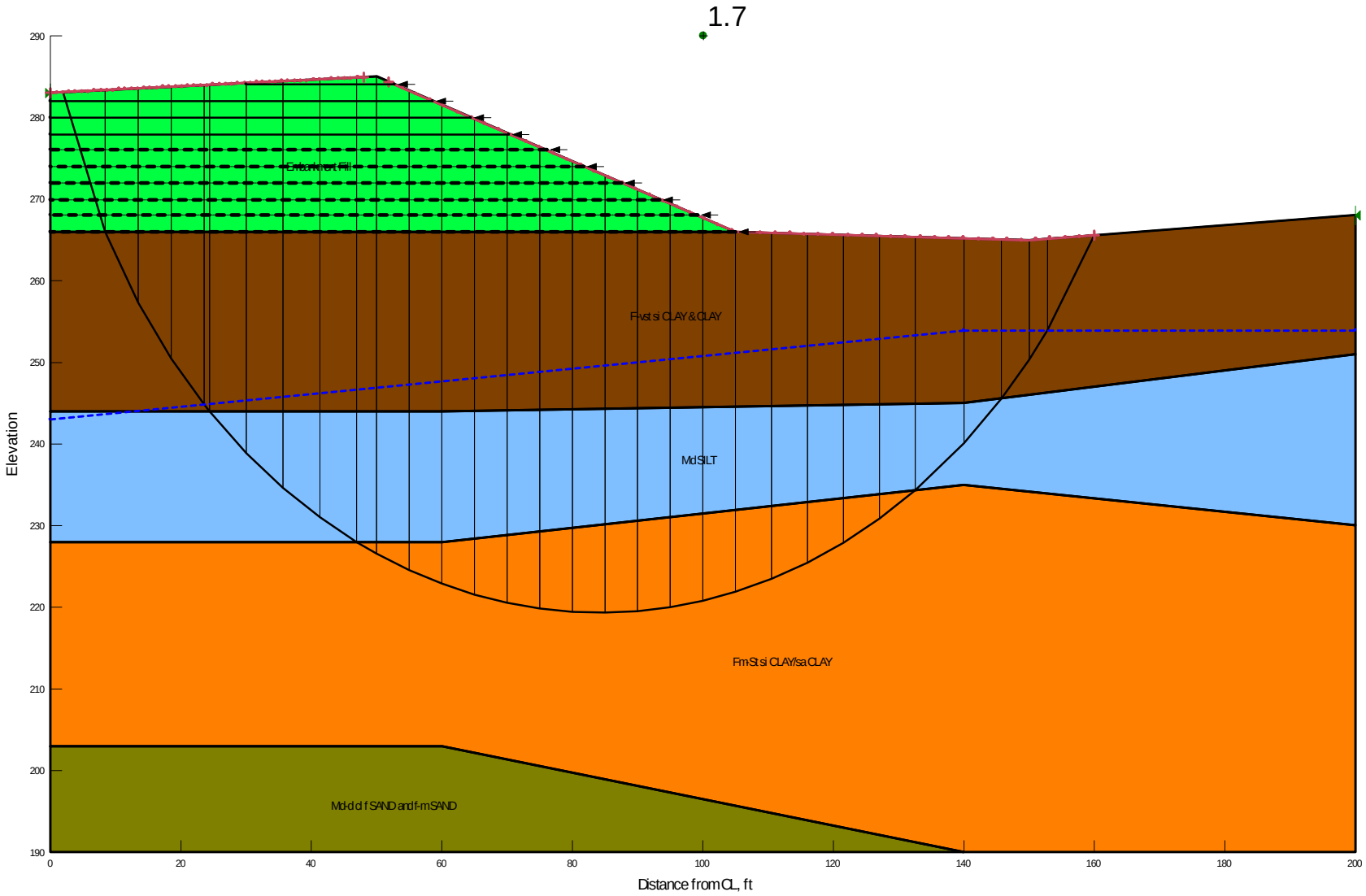
APPENDIX G

Summary of Stability Analysis Results
Bent 1 End Slope at Approximately Sta 94+43
3H:1V Reinforced Slope, H=19 ft ±
ArDOT 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)
GHBW Job No. 17-127

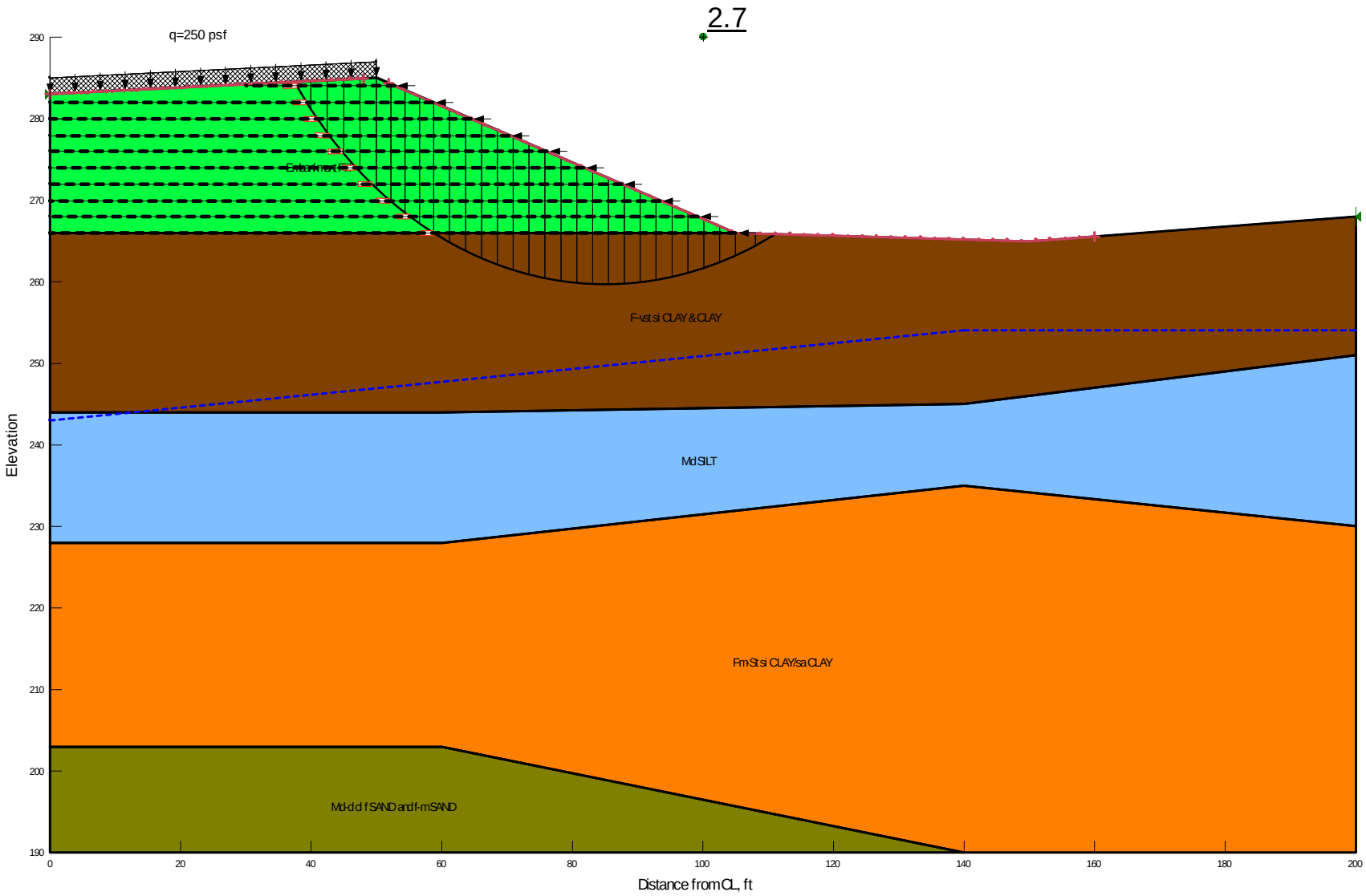
Design Loading Condition	Calculated Minimum Factor of Safety
End of Construction	1.7
Long Term	2.7
Seismic ($k_h = 0.5A_S = 0.312$)	1.3

Summary of Soil Strength Parameters

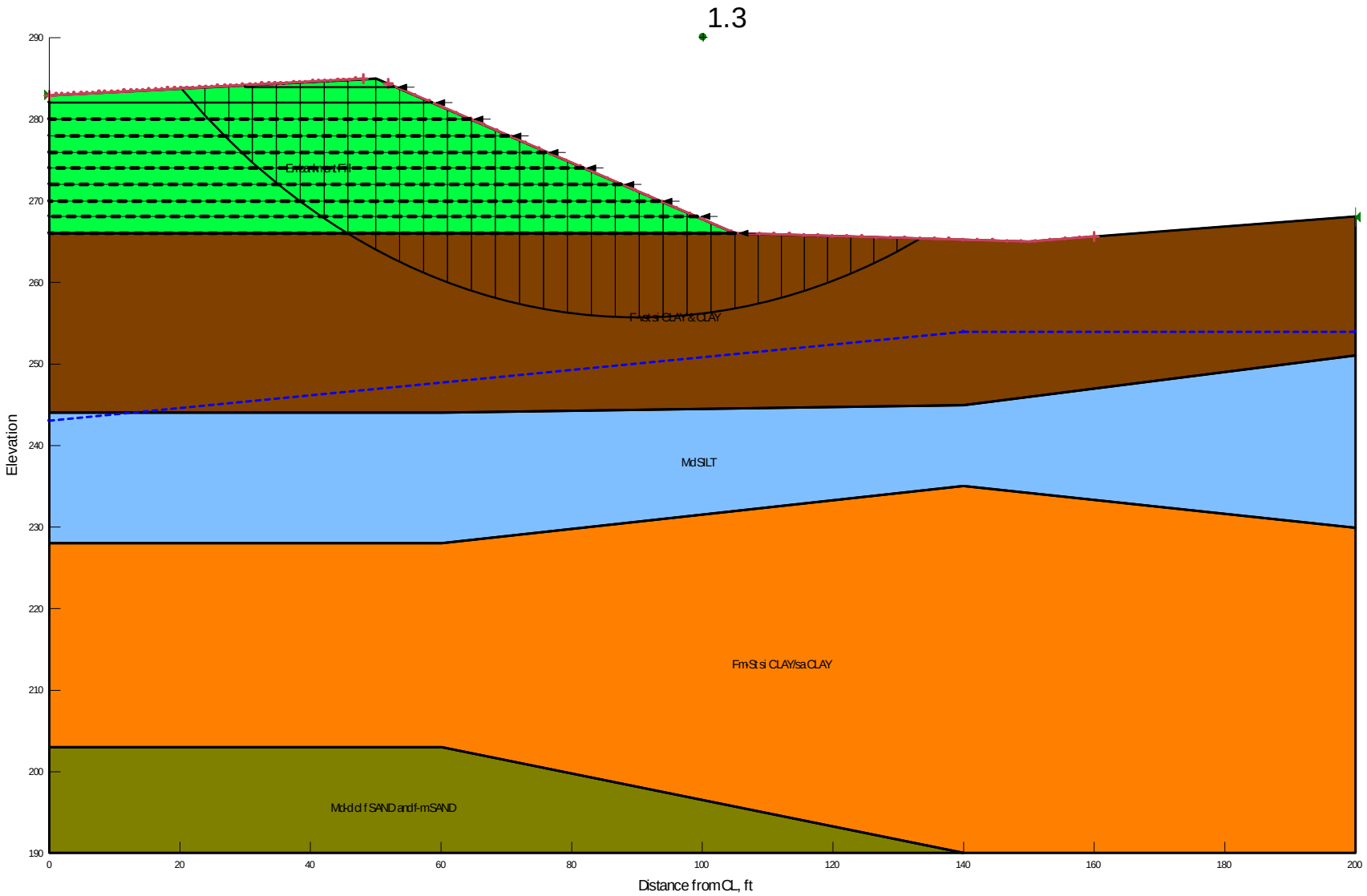
Soil Description	Total Unit Weight (γ) pcf	Undrained Shear Strength (s_u) psf	Effective Cohesion (c') psf	Effective Friction Angle (φ') deg
Embankment Fill	116	1500	200	20
Firm to very stiff silty Clay / Clay	122	2200	200	24
Firm to stiff Clay / fine sandy Clay	122	1500	200	22
Medium dense to dense clayey fine Sand / fine to medium Sand	130	---	---	35
Medium dense Silt	115	---	---	31



Results of Stability Analyses – End of Construction Condition
Bent 1 End Slope at Approximately Sta 94+43
3H:1V Reinforced Slope, H=19 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)



Results of Stability Analyses – Long Term Condition
Bent 1 End Slope at Approximately Sta 94+43
3H:1V Reinforced Slope, H=19 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)



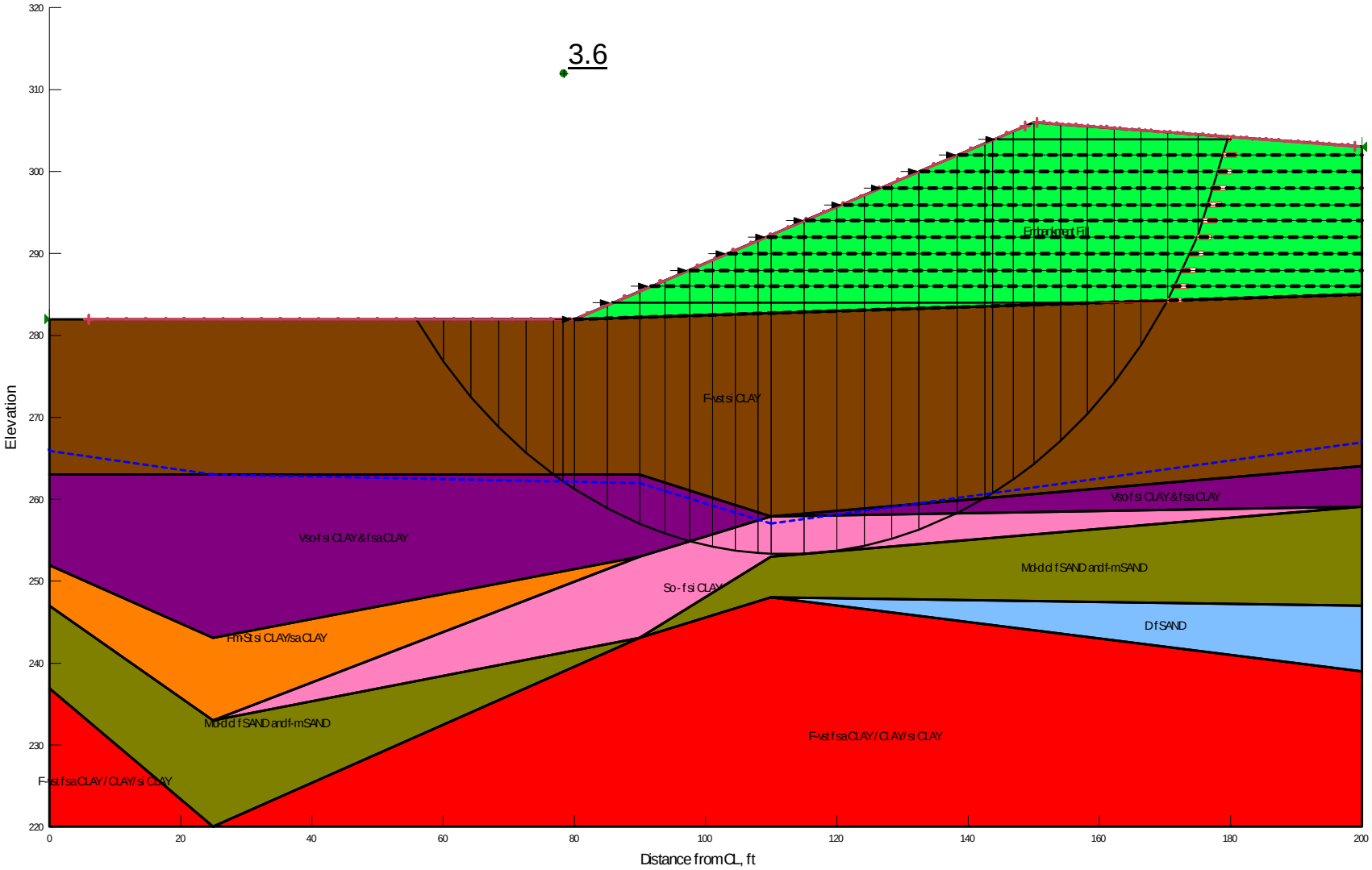
Results of Stability Analyses – Seismic Condition ($k_h = 0.5A_S = 0.312$)
Bent 1 End Slope at Approximately Sta 94+43
3H:1V Reinforced Slope, H=19 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)

Summary of Stability Analysis Results
Bent 8 End Slope at Approximately Sta 102+21
3H:1V Reinforced Slope, H=22 ft ±
ArDOT 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)
GHBW Job No. 17-127

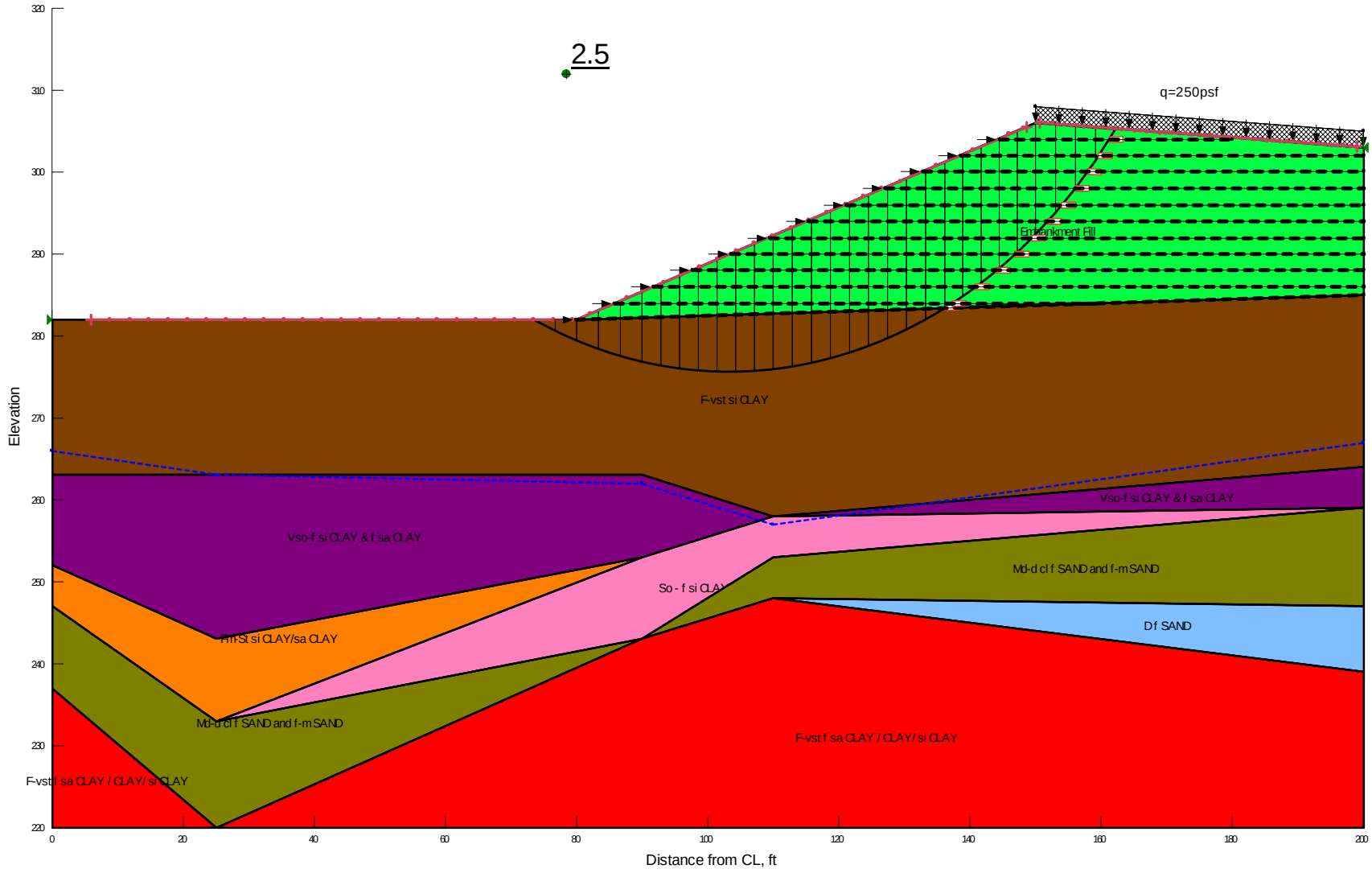
Design Loading Condition	Calculated Minimum Factor of Safety
End of Construction	3.6
Long Term	2.5
Seismic ($k_h = 0.5A_S = 0.312$)	1.3

Summary of Soil Strength Parameters

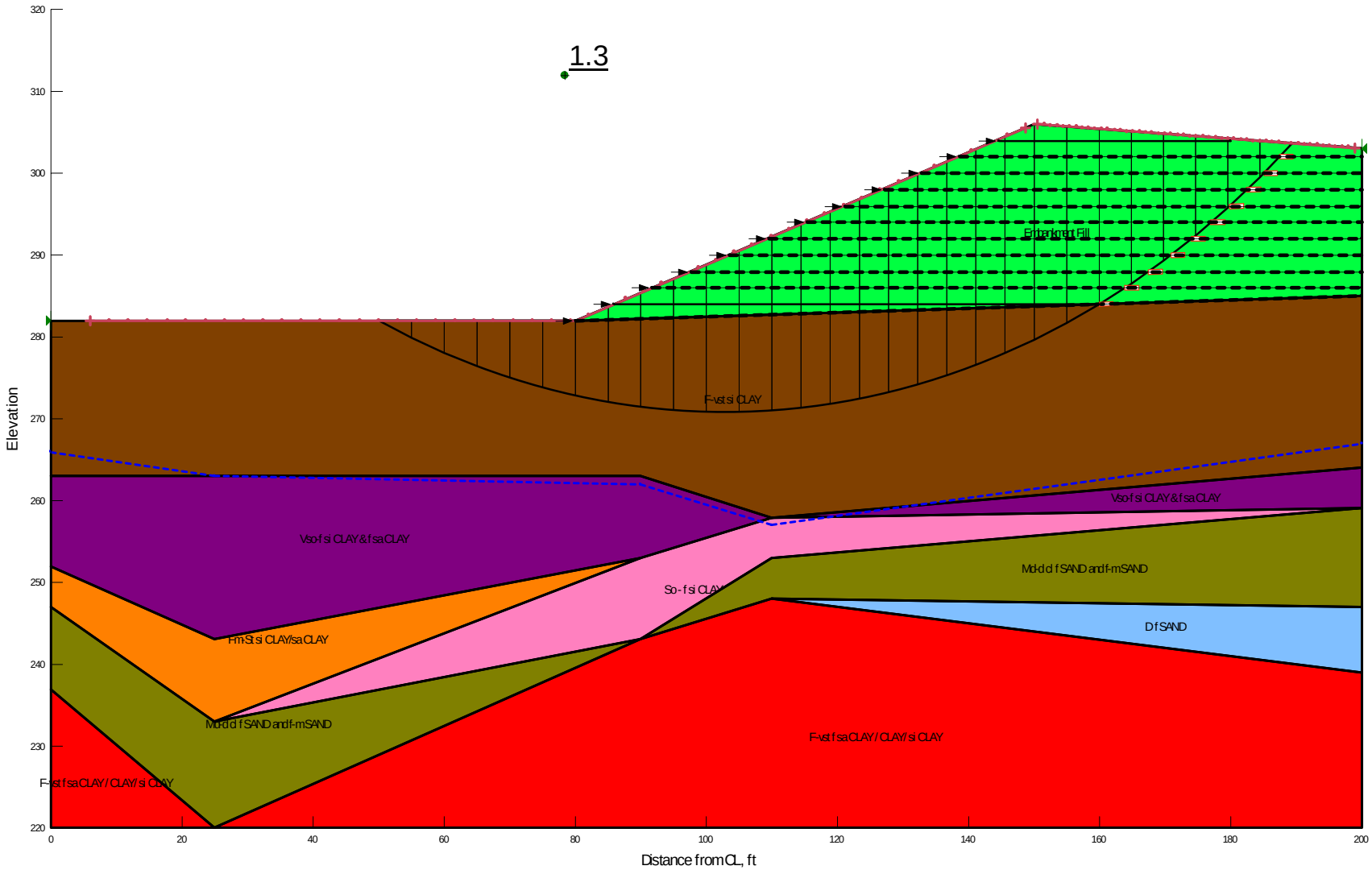
Soil Description	Total Unit Weight (γ), pcf	Undrained Shear Strength (s_u), psf	Effective Cohesion (c'), psf	Effective Friction Angle (φ'), deg
Embankment Fill	116	1500	200	20
Firm to very stiff silty Clay	122	2200	200	24
Firm to stiff Clay / fine sandy Clay	122	1500	200	22
Medium dense to dense clayey fine Sand / fine to medium Sand	130	---	---	35
Dense fine Sand	130	---	---	38
Very soft to firm silty Clay / fine sandy Clay	120	---	---	30
Soft to firm silty Clay	118	600	100	20
Firm to very stiff fine sandy Clay / clay/ silty clay	113	2000	200	24



Results of Stability Analyses – End of Construction Condition
Bent 8 End Slope at Approximately Sta 102+21
3H:1V Reinforced Slope, H=22 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)



Results of Stability Analyses – Long Term Condition
Bent 8 End Slope at Approximately Sta 102+21
3H:1V Reinforced Slope, H=22 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)



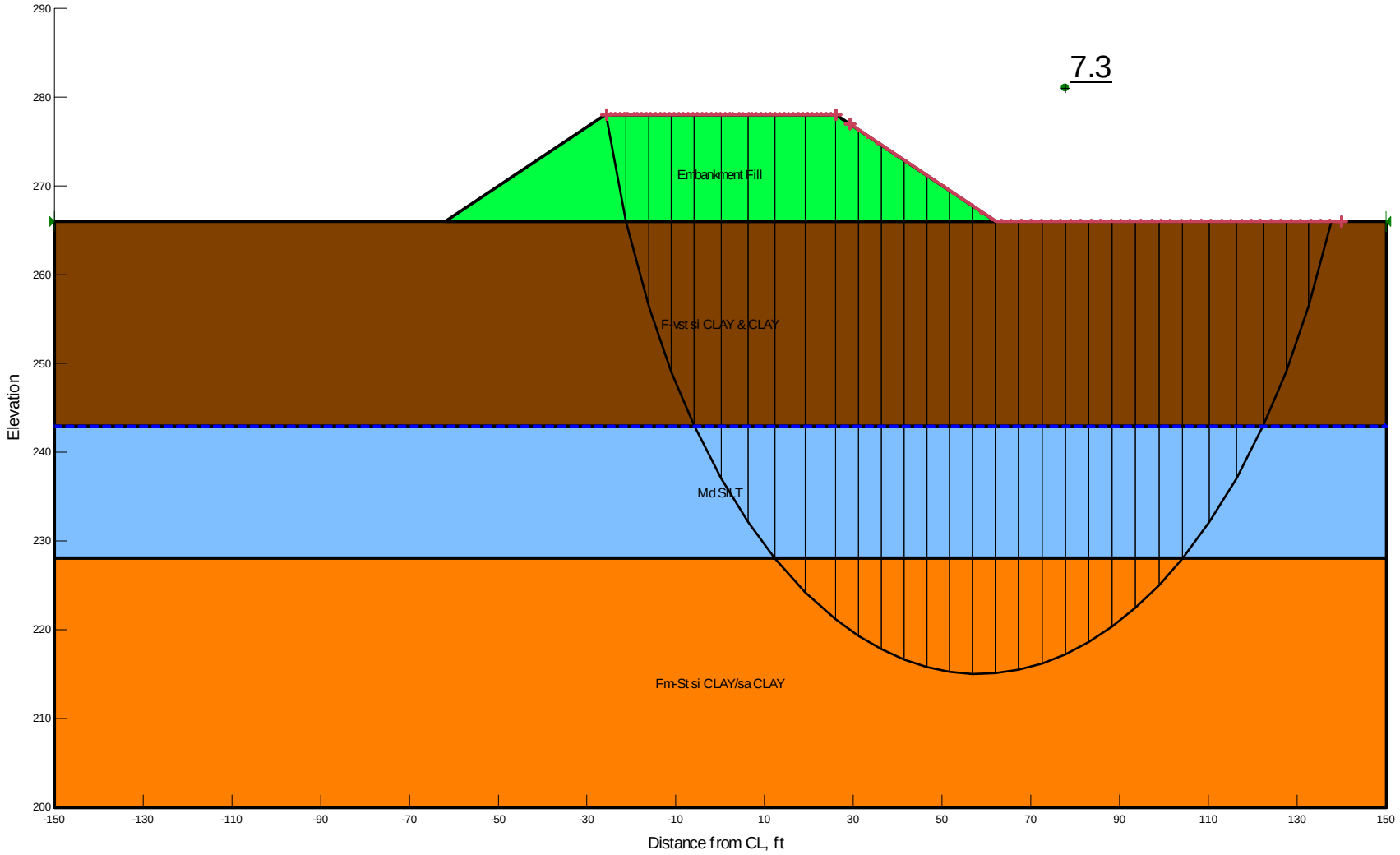
Results of Stability Analyses – Seismic Condition ($k_h = 0.5A_S = 0.312$)
Bent 8 End Slope at Approximately Sta 102+21
3H:1V Reinforced Slope, H=22 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)

Summary of Stability Analysis Results
Side Slope at Approximately Sta 93+20
3H:1V Slope, H=12 ft ±
ArDOT 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)
GHBW Job No. 17-127

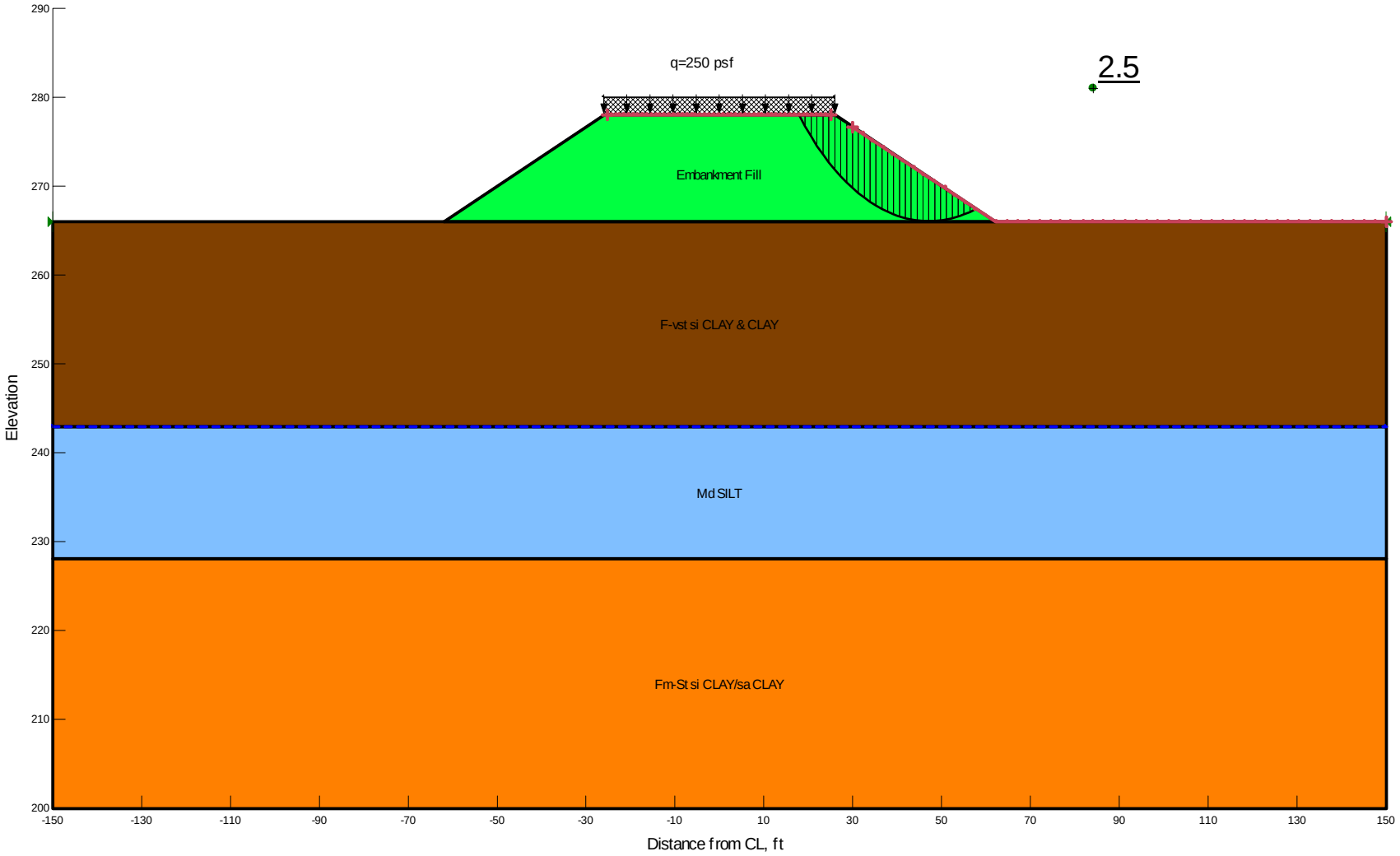
Design Loading Condition	Calculated Minimum Factor of Safety
End of Construction	7.3
Long Term	2.5
Seismic ($k_h = 0.5A_S = 0.312$)	1.3

Summary of Soil Strength Parameters

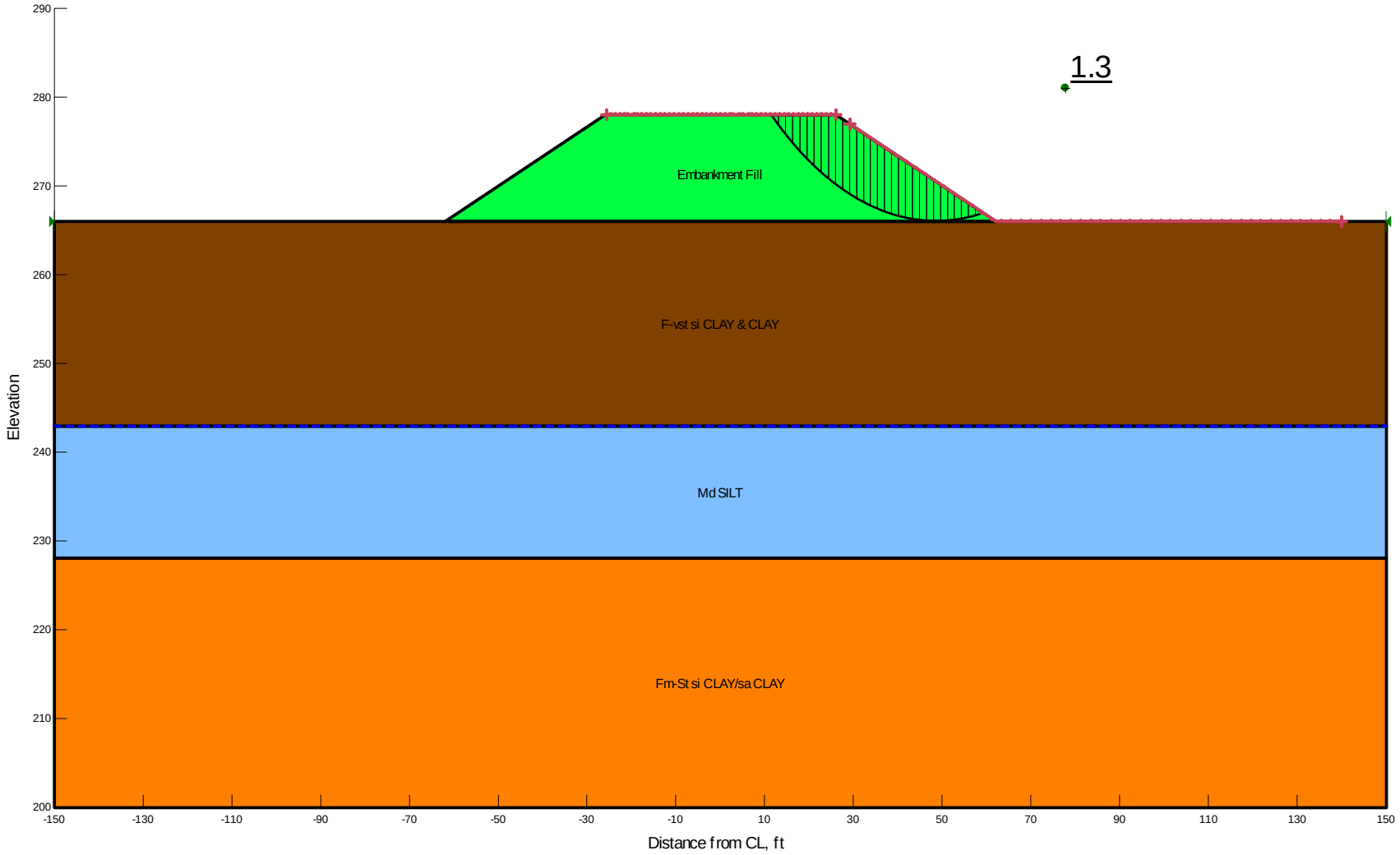
Soil Description	Total Unit Weight (γ) pcf	Undrained Shear Strength (s_u) psf	Effective Cohesion (c') psf	Effective Friction Angle (φ') deg
Embankment Fill	116	1500	200	20
Firm to very stiff silty Clay / Clay	122	2200	200	24
Firm to stiff Clay / fine sandy Clay	122	1500	200	22
Medium dense Silt	115	---	---	31



Results of Stability Analyses – End of Construction Condition
Side Slope at Approximately Sta 93+20
3H:1V Slope, H=12 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)



Results of Stability Analyses – Long Term Condition
Side Slope at Approximately Sta 93+20
3H:1V Slope, H=12 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)



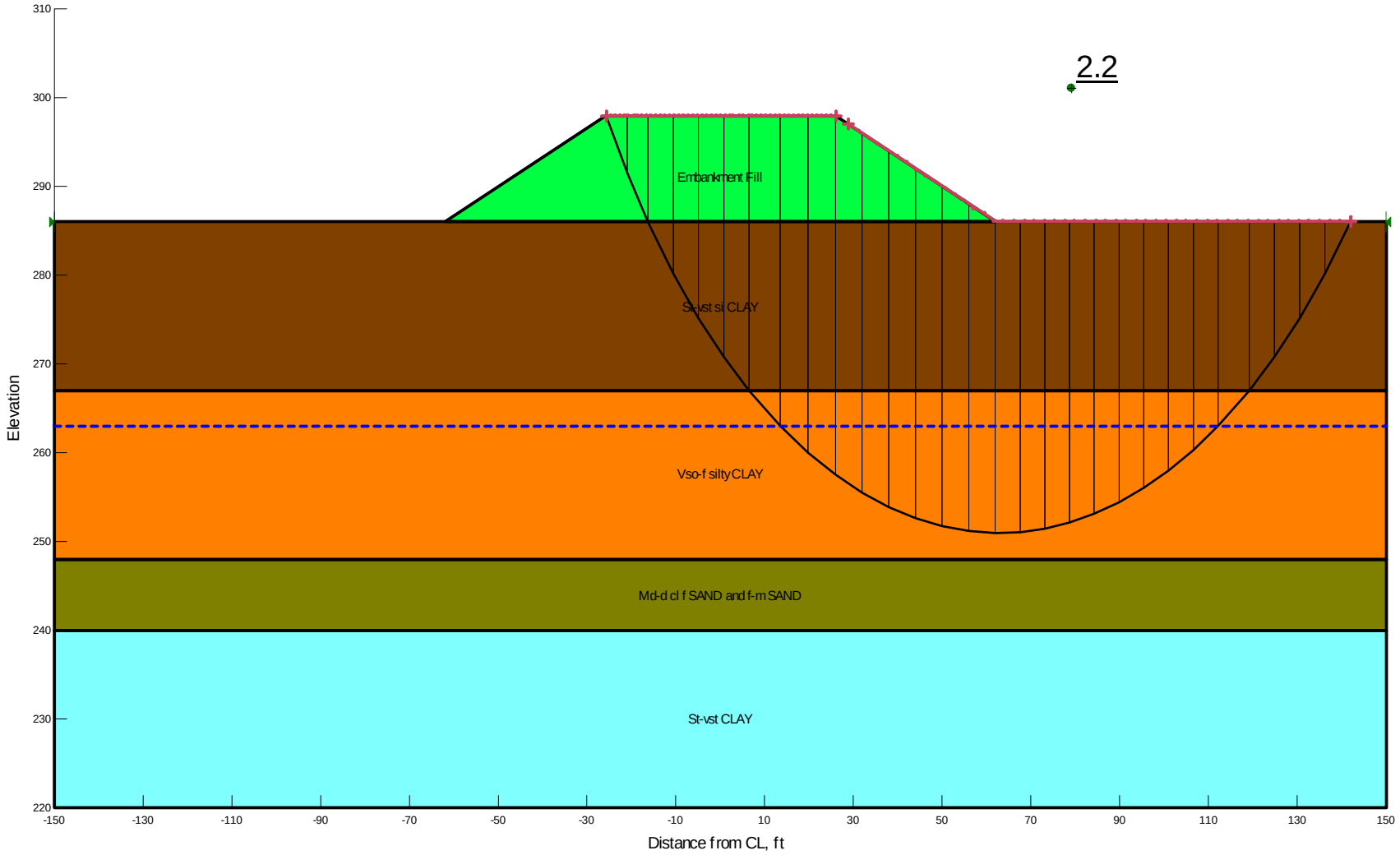
Results of Stability Analyses – Seismic Condition ($k_h = 0.5A_S = 0.312$)
Side Slope at Approximately Sta 93+20
3H:1V Slope, H=12 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)

Summary of Stability Analysis Results
Side Slope at Approximately Sta 103+80
3H:1V Slope, H=12 ft ±
ArDOT 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)
GHBW Job No. 17-127

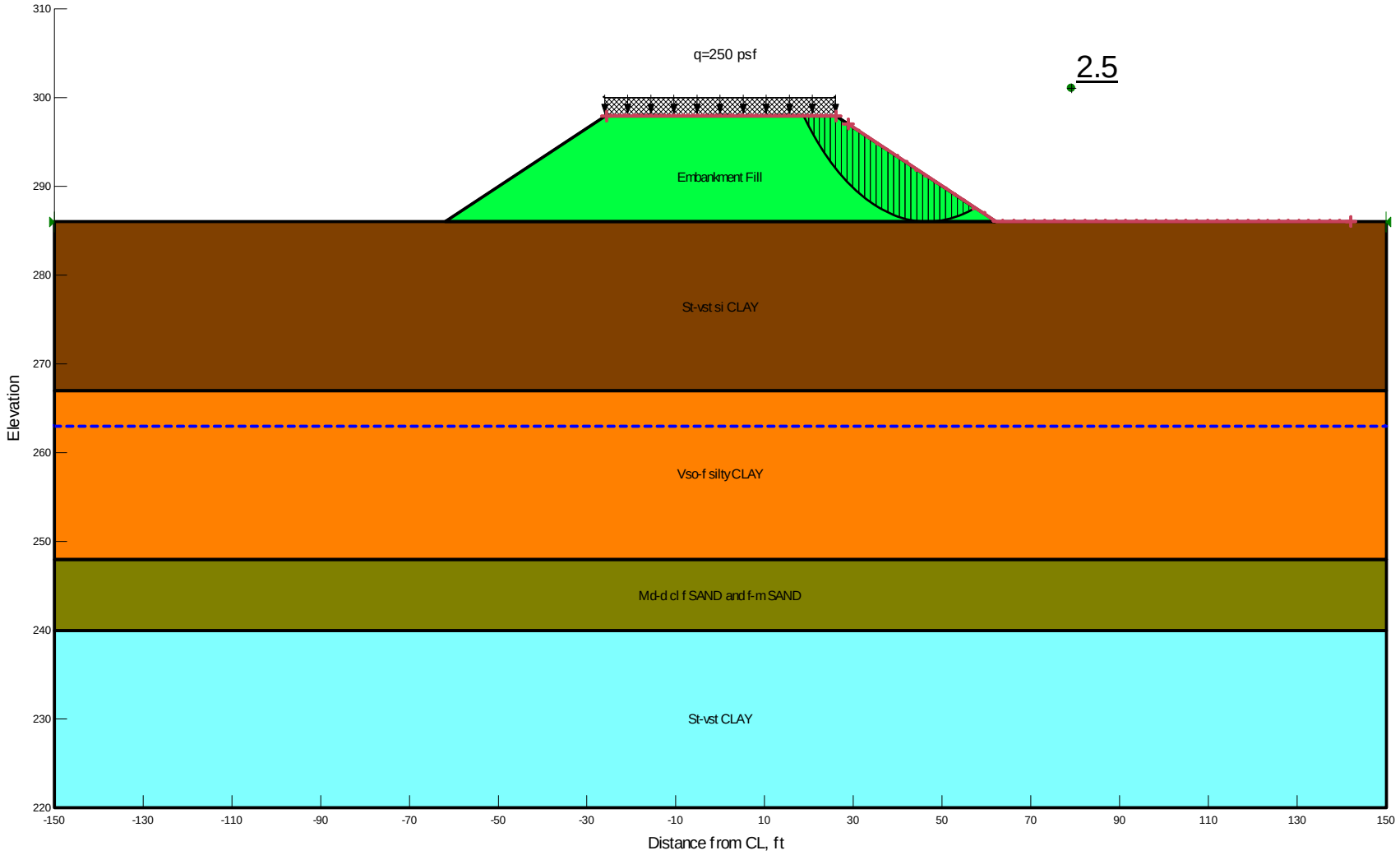
Design Loading Condition	Calculated Minimum Factor of Safety
End of Construction	2.2
Long Term	2.5
Seismic ($k_h = 0.5A_S = 0.312$)	1.3

Summary of Soil Strength Parameters

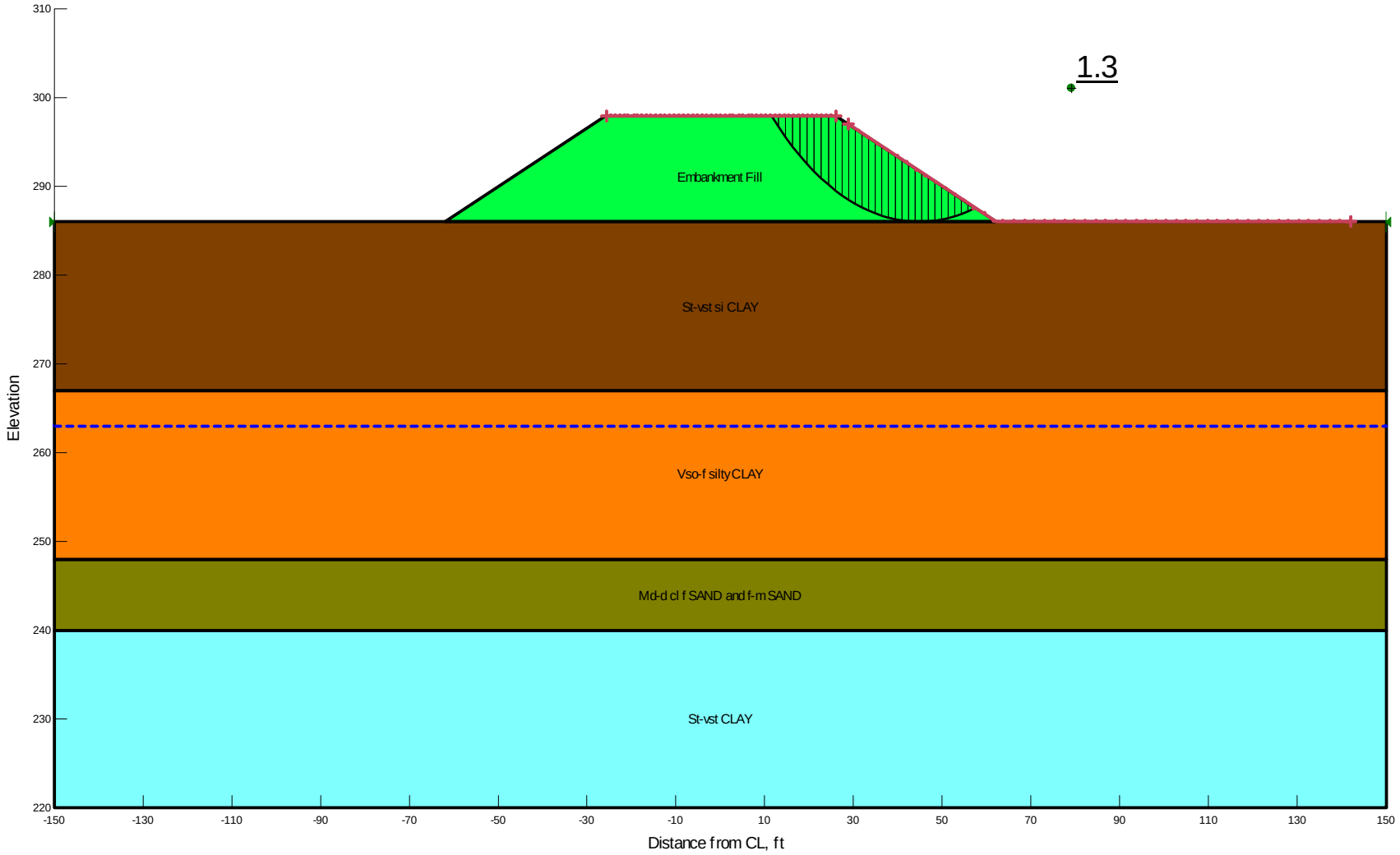
Soil Description	Total Unit Weight (γ), pcf	Undrained Shear Strength (s_u), psf	Effective Cohesion (c'), psf	Effective Friction Angle (φ'), deg
Embankment Fill	116	1500	200	20
Stiff to very stiff silty Clay	122	2200	200	24
Medium dense to dense clayey fine Sand / fine to medium Sand	130	---	---	31
Very soft to firm silty Clay / fine sandy Clay	120	---	---	30
Stiff to very stiff silty clay	113	2500	225	24



Results of Stability Analyses – End of Construction Condition
Side Slope at Approximately Sta 103+80
3H:1V Slope, H=12 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)



Results of Stability Analyses – Long Term Condition
Side Slope at Approximately Sta 103+80
3H:1V Slope, H=12 ft ±
17-127 – ArDOT Job No. 100942 – HWY 351 Railroad Overpass (Jonesboro)(S)



Results of Stability Analyses – Seismic Condition ($k_h = 0.5A_S = 0.312$)
Side Slope at Approximately Sta 103+80
3H:1V Slope, H=12 ft ±
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APPENDIX H

ARKANSAS DEPARTMENT of TRANSPORTATION

SPECIAL PROVISION

JOB NO. 100942

GEOGRID REINFORCED EMBANKMENT

1. **Description – GEOGRID REINFORCED EMBANKMENT.** This work shall consist of placing geogrid reinforcement material between layers of compacted soil in accordance with the details shown on the plans and as specified in Section 210 "Excavation and Embankment", and as directed by the Engineer. Only one (1) type of geogrid reinforcement material shall be used for an entire embankment, except as shown on the plans.

2. **Material Configuration.** The geogrid supplied shall be a synthetic structure meeting the requirements summarized herein. A certificate of compliance verifying the geogrid structure shall be furnished to the Engineer.

   Geosynthetic reinforcement material shall be designed for use in geotechnical slope reinforcement applications. Geosynthetic reinforcement material shall be configured as a geogrid material. Geogrid shall have a regular and defined open area. Geogrid shall obtain pullout resistance from the soil by a combination of soil shearing friction on the plane surfaces parallel to the direction of shearing and soils bearing on transverse grid surfaces normal to the direction of grid movement. The percentage of the open area for geogrids shall range from 50 to 90 percent of the total projection of a section of the material.

   Geosynthetic reinforcement material shall meet the following requirements:

   a) Long Term Design Strength (LTDS) for geosynthetic reinforcement material shall be determined by Geosynthetic Research Institute (GRI) Test Methods. LTDS for geogrid reinforcement and geotextile reinforcement shall be determined by Standard Practice GRI GG4 (a) and (b) and GT7, respectively. These values are minimum average roll values.

   b) Long Term Design Strength is the strength of the geogrid calculated by applying all partial factors of safety in accordance with GRI Standard Practice GG4 (a) and (b) or GRI GT7, except that the product of the partial factors of safety for installation damage (based on a soil gradation possessing a D_{50} between 2.36 and 4.75 mm), chemical degradation, and biological degradation of less than 1.30 shall not be allowed. The factor of safety for creep deformation shall be determined for a 75-year design life as determined by GRI GG4 (a) and (b) for geogrids or GRI GT7 for geotextiles. The 75-year design life strength is determined from the creep curve which becomes asymptotic to a constant strain line of 10 percent or less.

c) In the absence of specific test data, the partial factor of safety default values (installation damage, creep deformation, chemical degradation, biological degradation, and joint) as indicated in the Standard Practice GRI GG4 (a) and (b) and GRI GT7 shall be applied to the calculations of the LTDS.

d) Geosynthetic reinforcement material shall be resistant to naturally occurring alkaline and acidic soil conditions, and to attack by bacteria.

All test results used in the calculations of the LTDS shall be submitted to the Engineer no less than two (2) weeks prior to placement of the geosynthetic reinforced embankment. All test results which contribute to the calculations of the LTDS shall be prepared and signed by an Arkansas-registered Civil Engineer.

4. Materials. Geosynthetic reinforcement material shall consist of primary and secondary reinforcement layers. Geosynthetic reinforcement material shall consist of high density polyethylene and shall meet the following requirements:

a) Be manufactured from high density polyethylene (HDPE) which conforms to ASTM Designation D-1248.

b) Shall have a LTDS in the primary strength direction greater than or equal to 1600 lbs per foot. Secondary geosynthetic reinforcement material shall have a LTDS in the main strength direction greater than or equal to 1600 lbs per foot.

3. Construction Methods. Prepare the subgrade as indicated on the plans or as directed. Install the geogrid in accordance with the lines and grades shown on the plans. Orient the geogrid such that the roll main direction in the plane of the embankment slope. Overlap geogrid sections as indicated on the plans or as directed. Minimum overlap shall be 1 ft in both directions. Unless otherwise directed, use plastic ties at overlaps. Unless otherwise approved, the transverse spacing of the ties shall be 4 to 5 ft and the longitudinal tie spacing shall be 10 to 20 ft. Placement of the geogrid around corners may require cutting and diagonal lapping. Pin the geogrid at the beginning of the backfilling section. The geogrid shall remain taut throughout the backfilling section, but not restrained from stretching or flattening.

Place fill material in lift thicknesses and compact as shown on the plans. No tracked construction equipment shall operate on geogrid without a minimum fill cover of 6 in. Turning of equipment shall be gradual and kept to a minimum to avoid damage to the geogrid. Operate rubber-tired equipment directly on the grid at speeds less than 5 mph if the underlying material is capable of supporting the loads. Sections of geogrid which are damaged by construction activity shall be repaired or replaced at the Contractor's expense. All repaired sections shall contain a minimum 3 ft lap in all directions.

4. Measurement. Geogrid will be measured by the square yard of surface area as shown on the plans. No measurement will be made for lapping of material, ties and grid anchor pins.

5. Payment. The work performed and materials furnished in accordance with this Special Provision and measured as provided under “Measurement” will be paid for at the unit price bid for “Geogrid Reinforcement”. This price is full compensation for furnishing all labor, materials, freight, tools, equipment and incidentals, and for doing all the work involved in placement of the grid.

APPENDIX I

ARKANSAS DEPARTMENT of TRANSPORTATION

SPECIAL PROVISION

JOB NO. 100942

COHESIVE SOIL EMBANKMENT FILL

DESCRIPTION: Work under this item shall consist of embankment fill for use in embankment construction. The lean clay fill shall consist of retained fill and/or mass embankment fill where shown on the drawings.

MATERIALS: The clay embankment fill shall be constructed of on-site or imported clay, silty clay, fine sandy clay, or clayey fine sand complying with the following material properties.

- Maximum liquid limit of 40 as determined by AASHTO T 89
- Minimum plasticity index (PI) of 5 and a maximum PI of 25 as determined by AASHTO T 89 and T 90
- A minimum of 25 percent passing the No. 200 sieve (0.074mm) as determined by AASHTO T 88
- Classification as A-2-6 or A-6 as per AASHTO M 145
- Pre-qualification testing of proposed borrow to verify a minimum effective angle of internal friction (φ′) of 20° and a minimum effective cohesion (c′) value of 200 lbs per sq ft as determined by consolidated-drained direct shear tests (AASHTO T 236) or consolidated-undrained triaxial compression shear tests with pore pressure measurements (AASHTO T 297) performed on a representative sample of the selected fill soil compacted to 95 percent of the AASHTO T 99 maximum dry density at a water content within 2 percent of the optimum water content value. Pre-qualification testing shall be required where the borrow source changes or where requested by the Engineer.

The cohesive fill material shall comply with the properties above. Furthermore, the cohesive fill material shall be approved by the Engineer or Department prior to placement.

Prequalification and approval of fill soils must include the appropriate testing as referenced above.

CONSTRUCTION: Prior to construction of the clay embankment, subgrade preparation shall be performed as per Standard Specifications Section 212. Approved soils for the constructed embankment shall be placed in nominal 6- to 8-in.-loose lifts on the prepared subgrade and on subsequent approved lifts. Each lift of fill soil shall be compacted to a minimum of 95 percent of the AASHTO T 99 maximum dry density within a water content range of 2 percent below to 2 percent above the optimum value.

INSPECTION AND TESTING: Quality control and acceptance testing shall be performed as per the criteria of Standard Specifications Section 210.02. In addition to verifying the compacted density and water content of each lift, acceptance testing will include verification of soil classification (AASHTO

COHESIVE SOIL EMBANKMENT FILL

T 89 and T 90, liquid and plastic limits, and AASHTO T 88, grain-size analysis) on representative samples.

BASIS OF PAYMENT: Compacted clay embankment fill completed and accepted as provided above will be paid for at the contract unit price bid per unit, which price shall be full compensation for providing material prequalification testing, subgrade preparation, placement and compaction of the fill to the thickness and location shown on the plans, quality control and acceptance testing as per the plans including furnishing all materials, disposing of any excess waste material, and for all labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	**Pay Unit**
Compacted clay embankment fill	cu yd