Exhibit Z. Harvey Site Preliminary Geotechnical Engineering Report

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Harvey Site Preliminary Geotechnical Engineering Report

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SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

April 25, 2018

Baton Rouge Area Chamber
564 Laurel Street
Baton Rouge, Louisiana 70801

Attention: Mr. Russell Richardson

Re: Geotechnical Subsurface Exploration
Harvey Site LED Investigation
West Feliciana Parish, Louisiana
SESI File No.: B18-058

Dear Mr. Richardson:

Southern Earth Sciences, Inc. (SESI) is pleased to submit our geotechnical subsurface exploration data report for the above referenced project. This report includes the results of the soil boring, general discussion of the subsurface soils encountered, and pile capacities for informational purposes only.

The analyses and data presented in this report are based on the existing field conditions at the time of the investigation and should not be used for design or construction purposes. Furthermore, they assume that the exploratory soil boring is a representation of the subsoil conditions across the site. Please note that variations in the subsoil conditions may occur between and beyond the soil borings.

We appreciate the opportunity to perform this Geotechnical Subsurface Exploration report and look forward to continued participation during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,
SOUTHERN EARTH SCIENCES, INC.

Leigh Brister
Project Manager
Geotechnical Engineering Department

Josh Story
Assistant Project Manager
Geotechnical Engineering Department

STATE OF LOUISIANA
MICHAEL J. JUNEAU, JR.
License No. 37242
PROFESSIONAL ENGINEER IN CIVIL ENGINEERING
4/25/2018

Mike Juneau, P.E., MBA
Vice President

Project Description

It is understood that the proposed Harvey Site LED investigation will be marketed in the Louisiana Economic Development Program for future industrial development, which is unknown at this time. The project site is located along Highway 964 just south of the intersection of Highway 61 in West Feliciana Parish. Based on the provided information, the proposed site will encompass approximately 339 acres.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site in order to identify the type(s) of subsurface soils in order to develop preliminary geotechnical recommendations to guide others in the design of any future industrial developments. For this purpose, five (5) soil borings were performed; one (1) boring to a depth of about 100 feet below existing grade and four (4) borings to a depth of about 25 feet below grade were drilled and sampled for this project at various locations across the project site.

The scope of our geotechnical services did not include an environmental site assessment for determining the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or around the site. Any statement in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes. SESI can provide these services if requested.

In addition, SESI did not provide any service to investigate or detect the presence of moisture, mold, or other biological contaminates in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or amplification of the same. The client acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. The client further acknowledges that site conditions are outside of SESI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, SESI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

Field Exploration

The field exploration was performed by drilling one (1) soil boring to a depth of about 100 feet and four (4) soil borings to a depth of about 25 feet below the existing ground surface. The test locations and depths were as proposed by SESI and understood by the design team. The Test Location Plan sheet, in the Appendix of this report, presents the approximate location of the soil borings.

Subsurface Conditions

Natural Soil Conditions

The soil conditions encountered on the site are a mix of lean and fat clays and fine to coarse grain sands. Generally, the test locations on the west side of the project site revealed that the natural soils in the upper 25 feet are considered to be in a fairly wet state and consist of predominantly medium to stiff lean and fat clays. The test locations on the east side of the project site predominantly consist of medium dense to very dense fine and coarse sands to a depth of about 30 feet below existing grade. Beneath this layer, stiff lean and fat clays were encountered to a depth of about 43 feet below existing grade, followed by a layer of dense to very dense fine and course sand to a depth of about 83 feet below grade. Underlying the sand layer, predominantly stiff to hard lean and fat clays were encountered to a depth of about 100 feet below existing grade, the maximum depth explored during this subsurface exploration.

The general subsurface description above is generalized in nature to highlight the major subsurface materials features and characteristics. The boring logs, included in the Appendix, present specific information at individual test location including: soil description, stratification, ground water level, tests' location, and laboratory tests results. This information represents the actual conditions at the test locations. Variations may occur and should be expected between test locations. The stratification represents the approximate boundary between subsurface materials and the actual transition may be gradual.

Descriptions of soil and groundwater conditions encountered in the test locations are shown on their respective logs in the Appendix. The boring logs are labeled with their initial letter followed by boring number. For example, log "B-1" represents boring '1' drilled for this project.

Discussion

Generally, the subsurface soils encountered provided good strength parameters. The subsurface clay soils encountered were generally medium to stiff in consistency, and the subsurface sand encountered were generally dense to very dense.

Based on this information, a deep foundation system is suitable and should be considered to support structures typically associated with industrial facilities and structural column loads exceeding 60 kips. In addition, a shallow foundation system consisting of traditional spread and strip footings is considered feasible for lightly loaded structures and structural column and wall loads less than 60 kips and 2.5 kips per linear foot. **Additional analysis will be required to verify and will depend on the project specifics. SESI should be contacted to perform these analyses when required.**

Seismicity

The seismic site classification of the proposed site was assessed with reference to Section 1613.5.5 in Chapter 16 of the 2009 Edition of the International Building Code (IBC). For this purpose, boring B-1 to a depth of 100 feet was used. Review of soil profile from this boring and laboratory test results revealed the presence of cohesive layers with average undrained shear strength (su) between 1000 psf and 2000 psf, and the cohesionless layers with an average SPT N-value between 15 and 50. Considering these observations and per IBC 2009 Table 1613.5.5, the project site would best be categorized as **Site Class D.**

Suitability of On-Site Soil for Structural Fill Material

Soil with a Liquid Limit (LL) less than 40 and a Plasticity Index (PI) between 12-22 is typically considered suitable for structural fill material. The subsurface soil disclosed in the test locations have LL's ranging from 18 to 52, and PI's ranging from 5 to 35. **Portions of the site, based on the limited number of test locations, are suitable for structural fill material. However, additional testing should be performed to identify these isolated areas due to the varying soil stratums encountered in the soil borings.**

If the plasticity index and liquid limit exceed the requirements, treatment with lime or class "C" flyash can be used to lower these values to an acceptable range. This is an option regarding test locations B-2,3 and 5 at depths ranging from existing grade to a depth of about 18 feet below ground surface. Additional lab testing will be required to determine the feasibility and optimum lime to soil quantities. If the addressee would like to discuss this as an option for this project, please contact SESI for more information.

Shallow Foundation Recommendations

For lightly loaded structures with structural column and wall loads less than 60 kips and 2.5 kips per linear foot, a shallow foundation system may be viable but additional design information is required in order to determine the most economical foundation system. **For general consideration, isolated spread and continuous footings bearing at least 24 inches below the finished grade elevation within the compacted structural fill may be designed using net allowable bearing pressures of 1,300 psf and 1,050 psf, respectively.** Minimum spread and continuous footing dimensions should be at least 24 inches. The anticipated settlements for the shallow foundations should be less than one (1) inch based on the allowable bearing capacities and for up to two (2) feet of fill material.

Deep Foundation Recommendations

Based on our experience with industrial-type developments in this area, open-ended steel pipe piles (OPP) and prestressed precast concrete (PCC) pile foundation systems are typically used and were evaluated for this preliminary geotechnical engineering purpose. Analyses were made based on the field and laboratory test data to estimate axial pile capacities for support of structures associated with industrial-type facilities. The PCC and OPP piles analyzed for will derive the majority of their support through "skin friction" along their embedded lengths and some end bearing.

The pile capacities and settlement estimates were estimated using the APILE software from Ensoft using the API method. Ultimate pile capacities vs depth and load vs settlement curves for 14" and 24" PCC piles, and 16" and 20" OPP single piles are provided in the appendix of this report. **A Factor of Safety (FS) of 2.0 in compression and 3.0 in tension MUST be applied to the capacities shown in the *Ultimate Capacity vs. Depth* curves to determine allowable capacities.**

The pile capacities presented in this report are for informational purposes only and shall not be used for design and/or construction. Additional subsurface exploration and engineering analysis will be required.

Pile Settlement

Settlement of individual piles are shown on the *Load vs. Settlement* curves provided in the appendix of this report. **Estimated settlement assumes that there will be less than two (2) feet of fill material placed above existing grade and therefore will be no 'drown drag' effect on the piles. If the project site is raised more than two (2) feet above existing grade, SESI must be notified and allowed to reevaluate the estimated settlements and pile capacities.**

Group Efficiency

The ultimate capacity of a pile cluster depends on the characteristics of the supporting soil, pile length, pile spacing, pile shape, and the effects of pile installation. The most frequently used method to evaluate group capacity is that proposed by Terzaghi. This procedure is based on the premise that a pile cluster fails as a unit and may be treated as an equivalent pier. Experience, particularly the results of model tests, has shown that this method is applicable only to clusters of closely spaced piles in clay. The efficiency of pile groups in clay is always equal to or less than one. At relatively close pile spacing, groups in clay fail as blocks.

At a minimum, we recommend installing piles at a minimum center to center spacing of 3 pile diameters (3d). For this spacing and with the pile cap in firm contact with the soil, a reduction in capacity due to group effects should not be required. We recommend using a group efficiency factor of 1.0.

If the pile cap will not be in firm contact with the soil, group effects could reduce the pile capacities and should be evaluated accordingly when the actual pile length and layout are known.

Lateral Load Analysis

For deep foundations, the lateral loads are resisted by the soil as well as the rigidity of the pile. If deemed necessary, SESI can perform lateral capacity analyses by methods ranging from chart solutions to finite difference methods once the pile type, length and group dimensions are determined. If desired, please contact SESI to provide those services.

Pile Installation

All pile driving operations shall be performed under experienced supervision and with efficiently operating mechanical equipment. Hammers with minimum rated energy of 19,500 ft-lbs for OPP piles and square PCC piles shall be considered. However, the hammer selection is the responsibility of the contractor and shall be adequately large enough to reach proposed tip elevations and develop the required capacities, but consider the potential vibrations resulting from pile driving operations.

Piles in large groups should be driven from the center outward. Any piles which have heaved a quarter of an inch (¼") or more during driving of subsequent piles shall be re-driven to their original final resistance or their original embedment if originally driven to full penetration.

In no case shall the contractor be allowed to change pile driving equipment, pile types and/or sizes without written approval from SESI's Geotechnical Engineer.

Pile Driving Monitoring

Records of pile size and length, driving equipment, driving resistance versus depth, tip evaluation of piles, etc. shall be kept for an extended period of time.

Sometimes premature refusal occurs due to poor performance of the hammer rather than from soil resistance. Any changes in hammer blow counts shall be carefully examined before making any decisions about the pile penetration. In addition, for diesel hammers, this can be influenced by the stroke height of hammer. Therefore, it is strongly recommended to monitor hammer stroke height using Saximeter.

Since testing and inspection services are within SESI's scope of work, we recommend that our firm be retained to assist you to monitor the driving of test piles, select the piles to be tested, monitor the pile load test, evaluate the results of the load test, establish final pile lengths, and maintain vibration and driving records of all piles installed.

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

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Construction Materials Testing

Full Range of Services and Unparalleled Response

Southern Earth Sciences, Inc. laboratories are certified by AASHTO, AMRL, CMEC and the U.S. Army Corps of Engineers to perform soil, concrete, asphalt and materials testing. Our professional inspectors and technicians continually participate in proficiency testing programs to ensure internal quality control.

FIELD TESTING AND INSPECTION

In addition to our laboratory testing facilities, SESI maintains a fully outfitted mobile field laboratory available for on-site testing. This allows our OSHA safety certified technicians to perform both call-out services on small projects or full-time quality control testing and inspection on major projects. The on-site testing lab offers a full range of services.

Services

- Dipstick technology for flatness testing of concrete slabs
- Soil testing—compaction, pile load testing, pile and caisson inspection, plate load bearing tests
- Asphaltic concrete testing—core density and thickness, evaluation of aggregates, mix designs, plant and field control
- Portland cement concrete—batch plant and field control, core drilling, molding, curing and testing cylinders
- Slump testing, air content and unit weight
- Pipe and block inspection
- Soundness and abrasion of aggregates
- Bridge inspection
- Pile integrity testing
- Pile dynamic analysis (PDA)
- Vibration monitoring
- Rebar location/depth of cover
- Post tensioning inspection
- Welding and steel framing inspections

LABORATORY TESTING OF MATERIALS

Strategically located laboratories make testing of soils, concrete, asphalt and metals quick and convenient. Branch managers supervise all lab operations in accordance with ASTM Specifications E-329 and E-699. All equipment is calibrated annually to ensure accurate data. SESI technicians are certified by appropriate accrediting agencies on a routine basis.

Services

- Consolidation testing
- Flexible wall permeability testing
- Triaxial testing
- Soil classification testing
- Concrete strength testing
- Steel strength testing

APPENDIX

APPENDIX A
FIELD AND LABORATORY PROCEDURES

Drilling Methods and Sampling Procedures

The borings were drilled with an ATV (all-terrain vehicle) mounted drill rig using hollow-stem auger or wet rotary drilling techniques to advance the borehole. Undisturbed samples were obtained using three (3) inch diameter thin-walled Shelby tube sampling procedures in general accordance with ASTM D-1587 *Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes*. These samples were extruded in the field with a hydraulic ram, and were identified according to project number, boring number and depth, wrapped in aluminum foil and placed in plastic bags to preserve the natural moisture condition; then, they were transported to the laboratory in containers to minimize disturbance.

When undisturbed samples could not be recovered, disturbed samples were obtained in accordance to the procedures of ASTM D-1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*. These samples were also identified according to project number, boring number and depth, and were placed in plastic bags and transported to the laboratory for testing. The depths at which undisturbed and/or disturbed samples were obtained are shown on the attached boring logs in Appendix E of this report.

Laboratory Testing Program

A supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of the subsurface materials. This program may have included the following procedures:

- Visual description and classification and determination of the moisture content on all samples.

- ASTM D2216 *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*: This test is performed to determine the water (moisture) content of soils obtained from the field exploration. The water content is the ratio, expressed as a percentage, of the mass of “free” water in a given mass of soil to the mass of the dry soil solids.

- ASTM D4318 *Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils:* These test methods cover the determination of the liquid limit, plastic limit, and the plasticity index of soils which are used to classify the soil and evaluate index properties and residual strength characteristics of the soils.

- ASTM D2166 *Standard Test Method for Unconfined Compressive Strength of Cohesive Soils*: Unconfined Compressive Strength (UC) tests are used to evaluate the shear strength characteristics of soils.

- ASTM D-422 *Standard Test Method for Particle-Size Analysis of Soils:* This test method covers the quantitative determination of the distribution of particle sizes in soils. The distribution of larger particles is determined by sieving (No. 200 sieve), while the distribution of smaller particles is determined by a sedimentation process, using a hydrometer.

The results of these tests are found in the accompanying boring logs located in the Appendix. Please note that the samples obtained and not tested will be retained for a period of thirty (30) days; if further instructions are not received, SESI will dispose the samples at that time.

APPENDIX B
STRUCTURAL FILL SPECIFICATIONS AND CONSIDERATIONS

Structural Fill Materials

After subgrade preparation and observation has been completed, structural fill placement, if necessary, may begin. The structural fill should consist of lean clays and sandy lean clays (CL) or clayey sands (SC) having the following recommended material properties:

a. Liquid Limit: 40 maximum
b. Plasticity Index: 12 to 22 maximum
c. Inert Material (Non-Expansive)
d. Free of Organics
e. Maximum Particle Size: 2-in

This material must be certified and approved by the Geotechnical Engineer prior to its use.

Structural Fill Deposit Construction

After all surface preparation and observation has been completed, the structural fill activities may begin. These activities must be performed in a sequential order where lower elevations must be worked before higher ones. The structural fill shall be deposited in lifts of eight (8) inches of loose material. Each lift shall be compacted and certified by the Geotechnical Engineer or a representative prior to placement of other lifts. The passing criteria shall be a 95% of the maximum dry density as determined by ASTM D-698, *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))*, and a moisture content between one (1) below and three (3) above percentages of the optimum moisture content. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. As a guideline, it is recommended that field density tests be performed at a frequency of not less than one test per 2,500 square feet.

It is important to maintain the structural fill thickness as uniform as possible. Uneven fill thicknesses under a structure may cause differential soil responses to the applied loads which can produce cracking, settling, or tilting of the structure. Uniform fill areas shall consider the footprint of the structure plus a five (5) feet strip around its perimeter.

Fill slopes shall be maintained at a maximum 2 Horizontal: 1 Vertical steepness. The runoff of water across the faces of the slopes shall be avoided by appropriate drainage ways. In addition, appropriate drainage ways shall be maintained at all earthwork surface areas in order to not affect compaction.

Proof Rolling

Upon completion of the stripping activities, the exposed areas shall be properly proof rolled in order to prepare the natural terrain to receive the design structural fill and traffic loads. The proof roll consists of compacting the exposed surface with a 20- to 25-ton loaded dump truck. Surface soils that are observed to rut or deflect under the truck load should be undercut and replaced with the proper structural fill. These activities should be performed during a period of dry weather and should be supervised by a Geotechnical Engineer or a representative.

APPENDIX C
CONSTRUCTION CONSIDERATIONS

Observation and Testing

The preceding recommendations require a close supervision of the Geotechnical Engineer or representative; therefore, it is recommended that SESI be retained to provide observation and testing for the complete duration of all earthwork and foundation activities for this project. SESI cannot accept responsibility for any conditions deviated from those described in this report, nor for the performance of the foundation if not engaged to provide construction observation and testing.

Moisture Sensitive Soils/Weather Related Concerns

Most of the subsurface materials encountered at this site are expected to be sensitive to disturbances caused by changes in moisture content. During wet weather periods, the increment of the moisture content of the soil may cause a significant reduction of the soil strength and support capabilities. Furthermore, soils that become wet may be slow to dry, thus significantly retarding the progress of grading and compaction activities. For these reasons, it will be advantageous to perform earthwork and foundation construction activities during dry weather.

Foundation Maintenance

Water shall be kept from ponding adjacent to the structure at all times in order to prevent reductions of the soil strength and support capabilities. For this, the following measures shall be implemented:

a) Surface Drainage – always drain away from the foundation; on vegetated ground, a minimum slope of 5% is required. Never allow water to accumulate close to or around the foundation.

b) Landscaping:

- Avoid placing plants immediately adjacent to the foundation.
- Avoid placing sprinkler system pipes near the foundation (they could leak).
- Direct sprinkler heads away from the foundation.

Trees shall be planted at a minimum distance of half the anticipated canopy diameter or twenty (20) feet, whichever is larger, from the foundation edge. If existing trees are closer than this, they should be thoroughly soaked at least twice a week during dry periods and once a week during moderate rainfall periods.

Excavations Regulations

In the Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated, by this federal regulation, that excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the new OSHA guidelines.

The contractor is solely responsible for designing and constructing stable, temporary excavations and shall shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. SESI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

APPENDIX D

SUPPORTING DOCUMENTS

SOUTHERN EARTH SCIENCES, INC.

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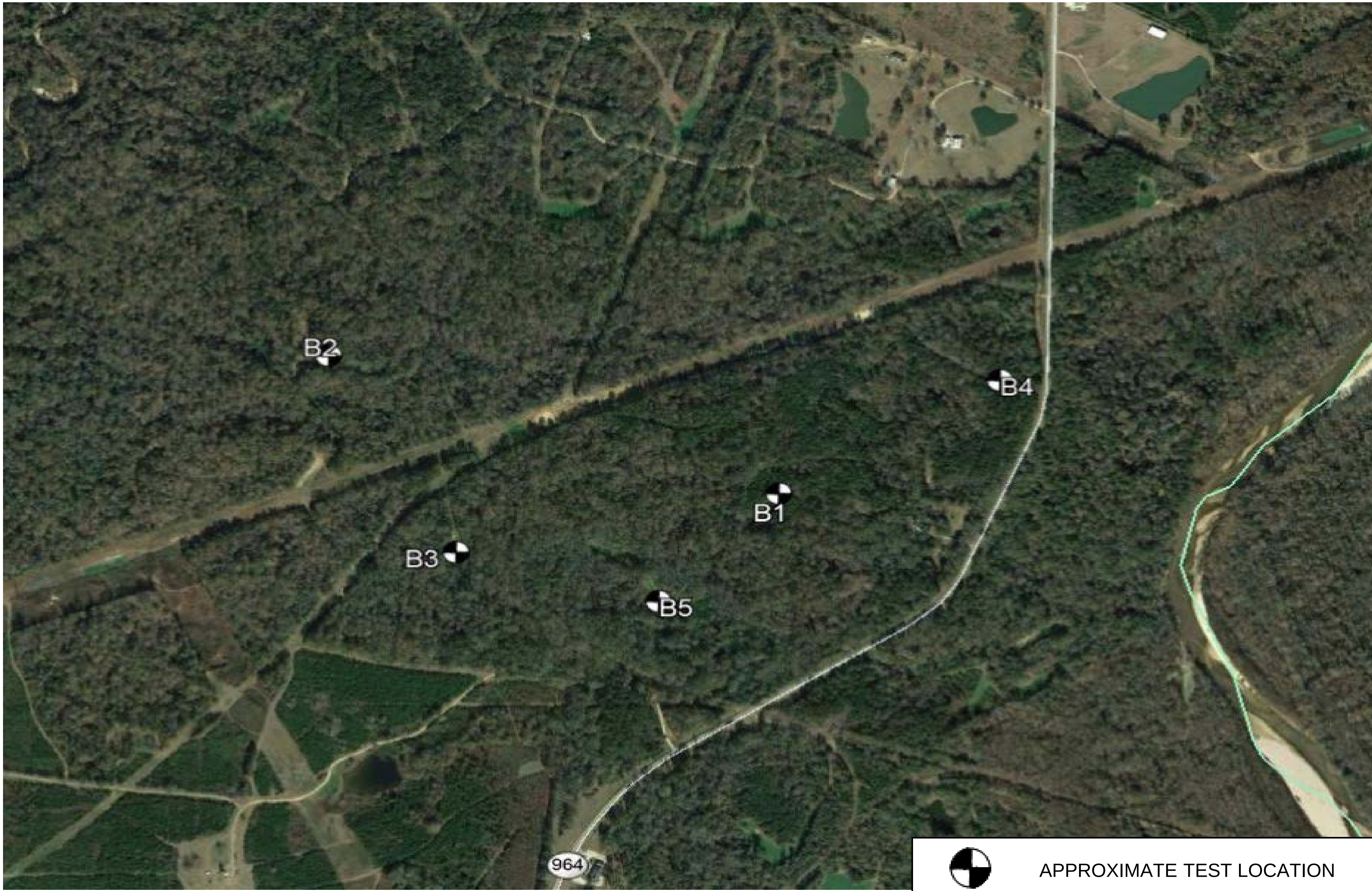

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PROPOSED HARVEY SITE LED INVESTIGATION
WEST FELICIANA PARISH, LOUISIANA
SESI FILE NO.: B18-058

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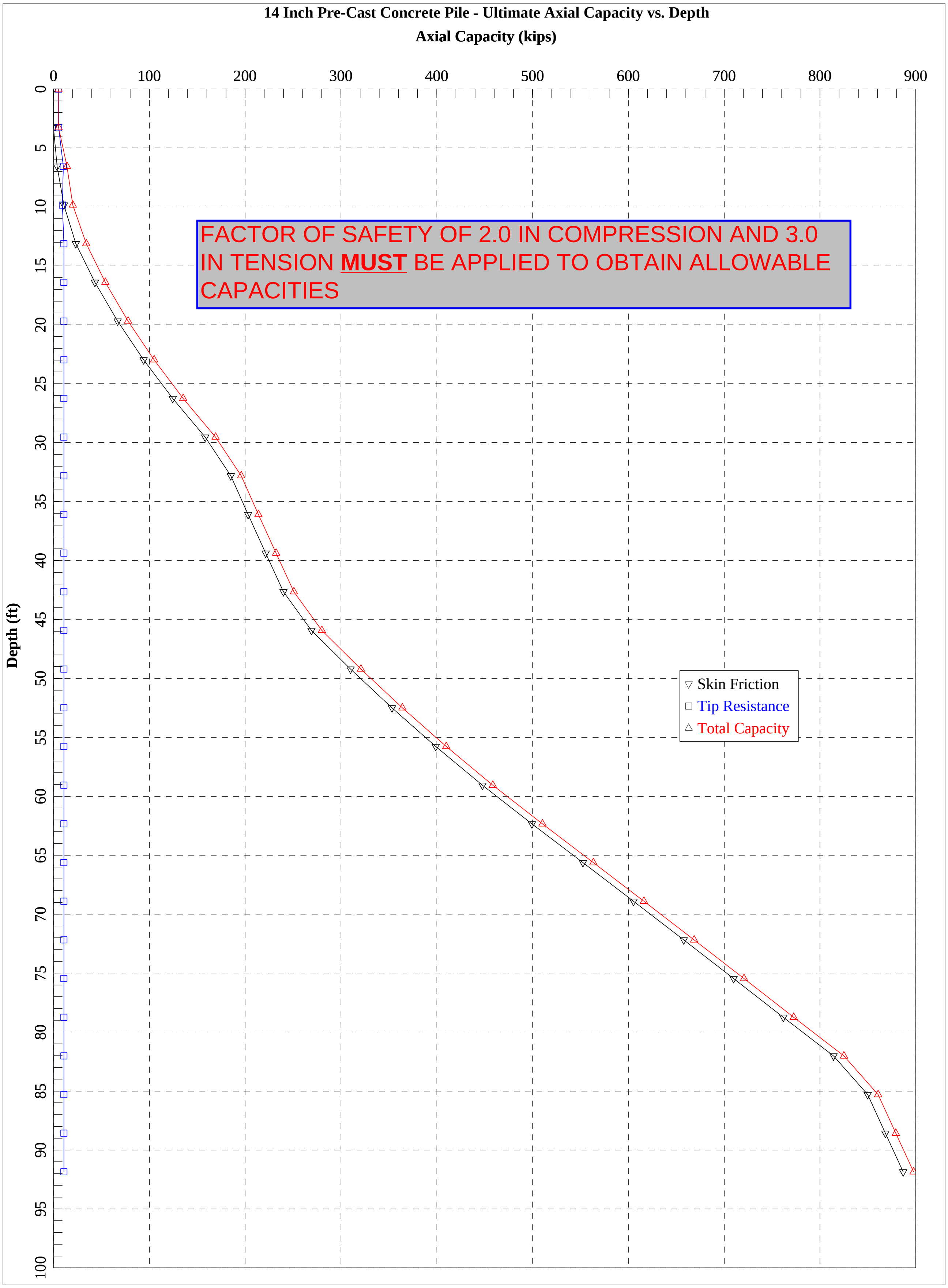
FIGURE 1
TEST LOCATION PLAN

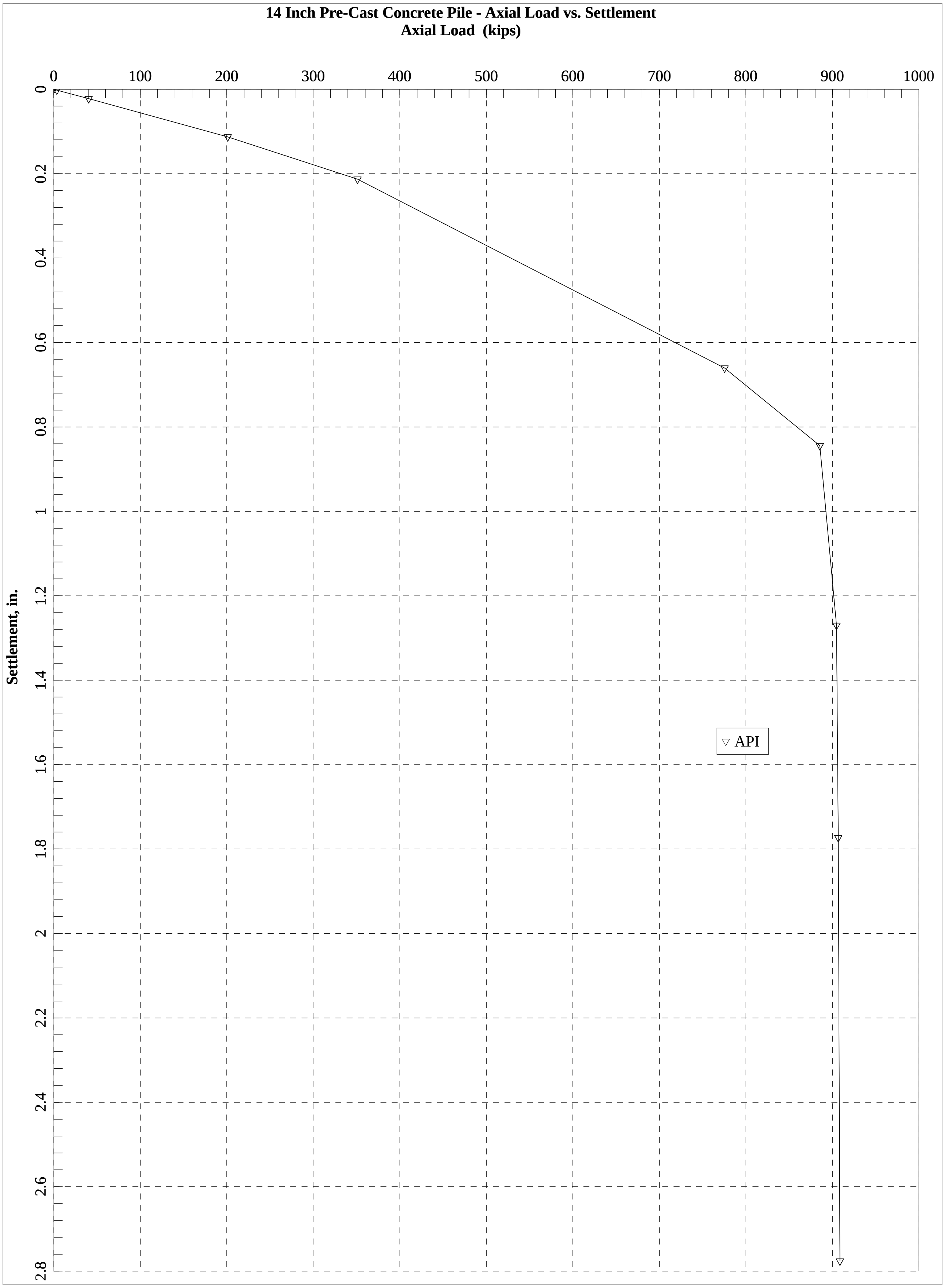
Estimated Capacities for Driven Piles[1]				
Pile Type	**Size**	**Pile Length[2] (feet)**	**Allowable Compression Capacity (Tons)**	**Allowable Tension Capacity (Tons)**
			FS = 2.0	**FS = 3.0**
Open-Ended Steel Pipe Pile	16-in	75	155	105
		80	175	115
		85	190	125
	20-in	75	195	130
		80	215	145
		85	245	160
Prestressed Precast Concrete (PCC) Pile	14-in	75	175	115
		80	195	130
		85	215	140
	24-in	75	300	200
		80	345	230
		85	370	245

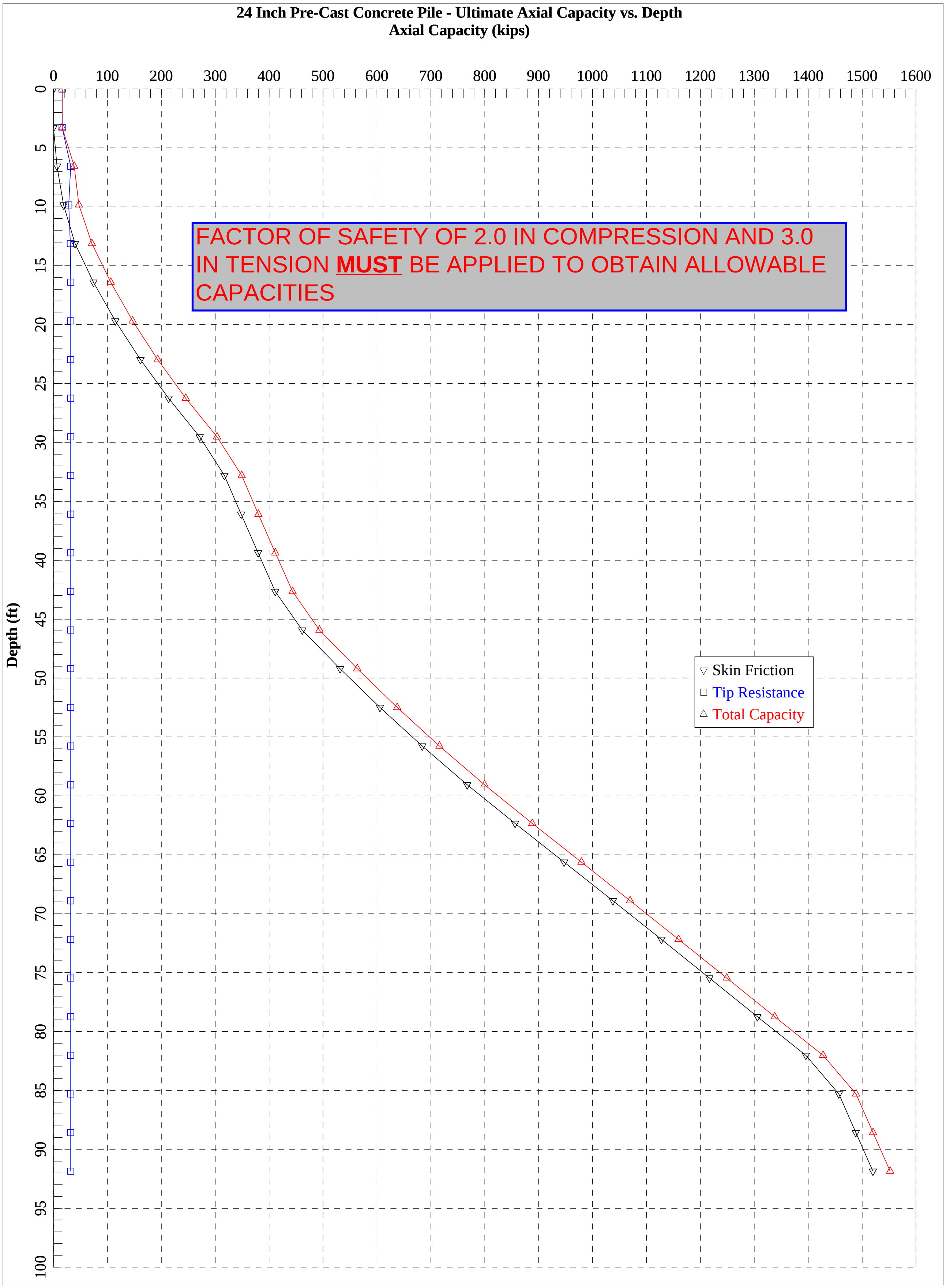
Notes: 1. These are soil-pile related capacities. The structural capacity of the piles to support design loads is beyond our scope of services and must be verified by others. 2. Pile lengths are referenced from the existing ground surface at the time of field exploration. Additional pile length should be added depending on the design grade.

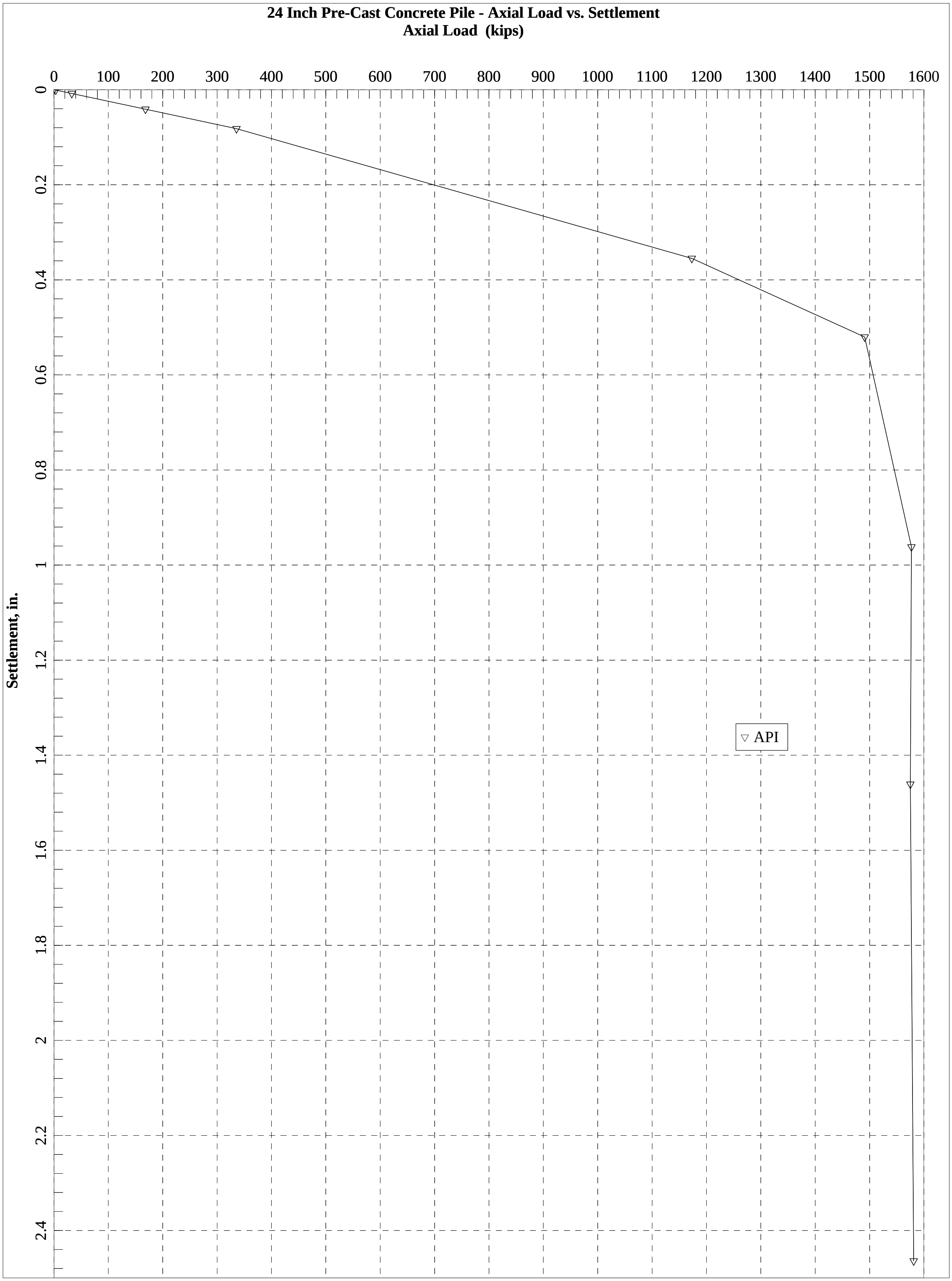
Pile Settlement

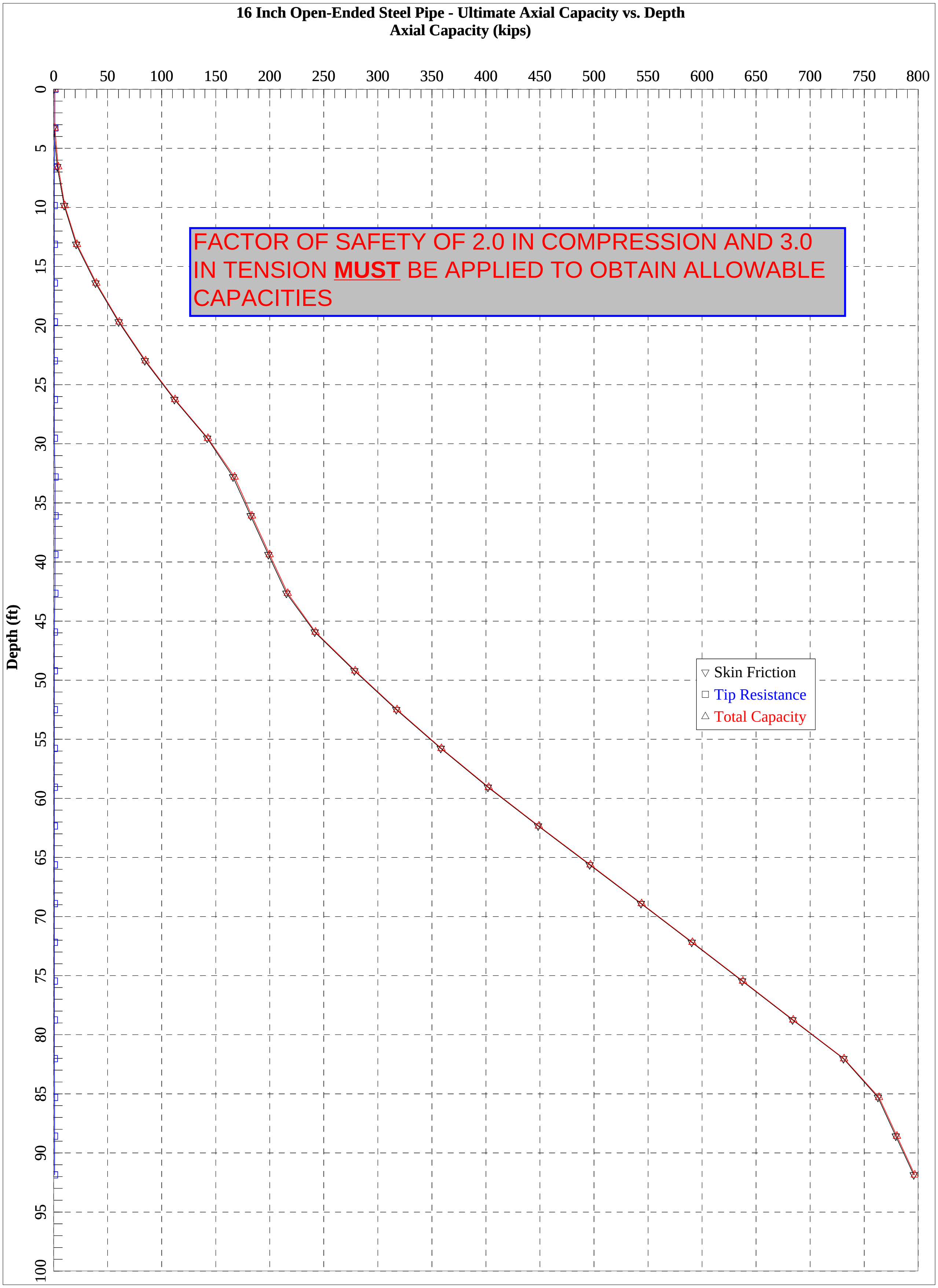
Settlement of individual piles properly driven to the design depths, and loaded to the allowable design capacities as described in this report are estimated to be approximately one (1) inch or less. **Estimated settlement is based on the assumption that there will be minimal fill placed above existing grade and therefore will be no 'drown drag' effect on the piles. If the finished grade of any area of project site is raised more than two (2) feet above existing grade, SESI must be notified and allowed to reevaluate the estimated settlements and pile capacities.**

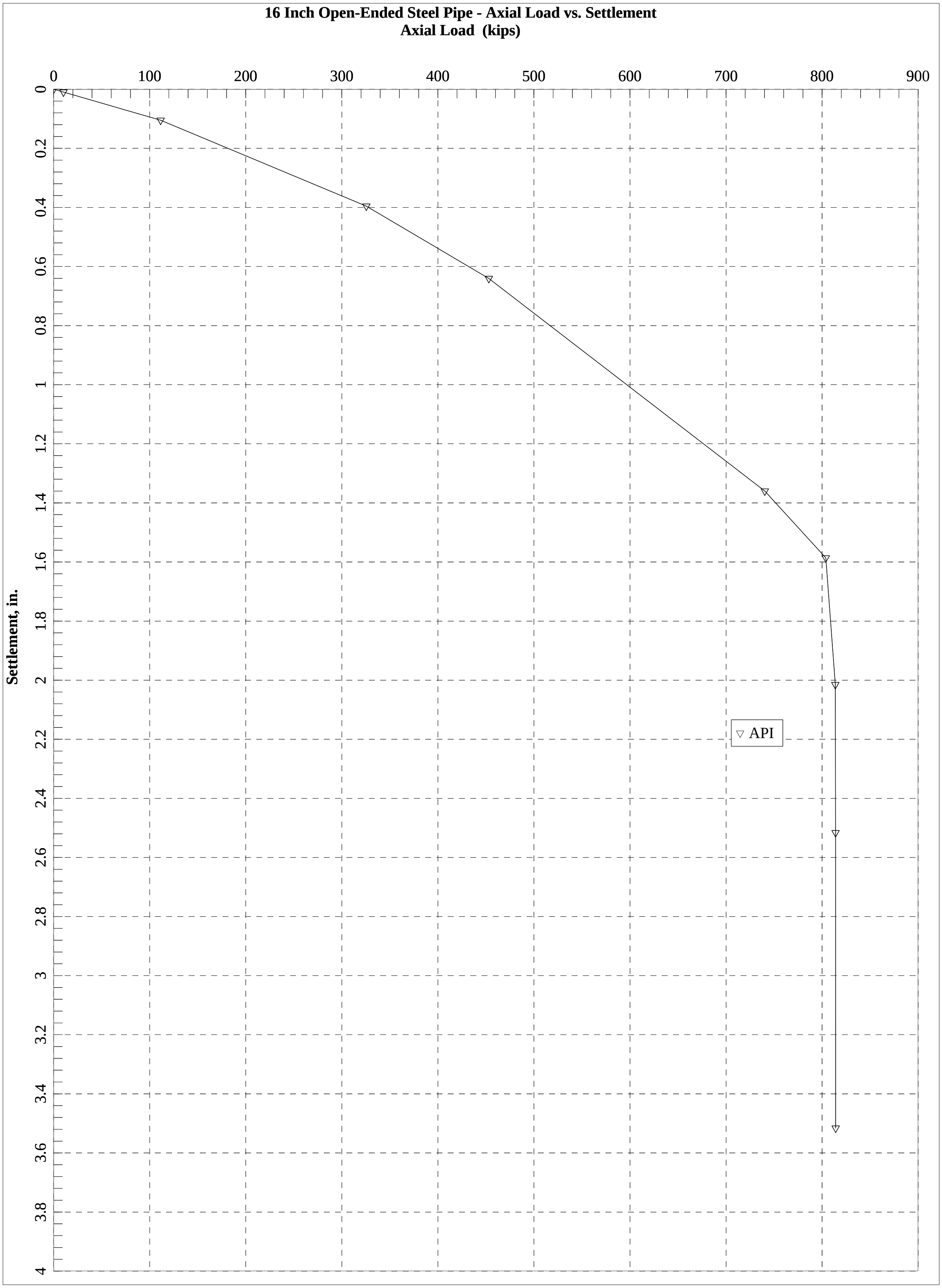

14 Inch Pre-Cast Concrete Pile - Ultimate Axial Capacity vs. Depth
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
FACTOR OF SAFETY OF 2.0 IN COMPRESSION AND 3.0 IN TENSION MUST BE APPLIED TO OBTAIN ALLOWABLE CAPACITIES
Skin Friction
Tip Resistance
Total Capacity

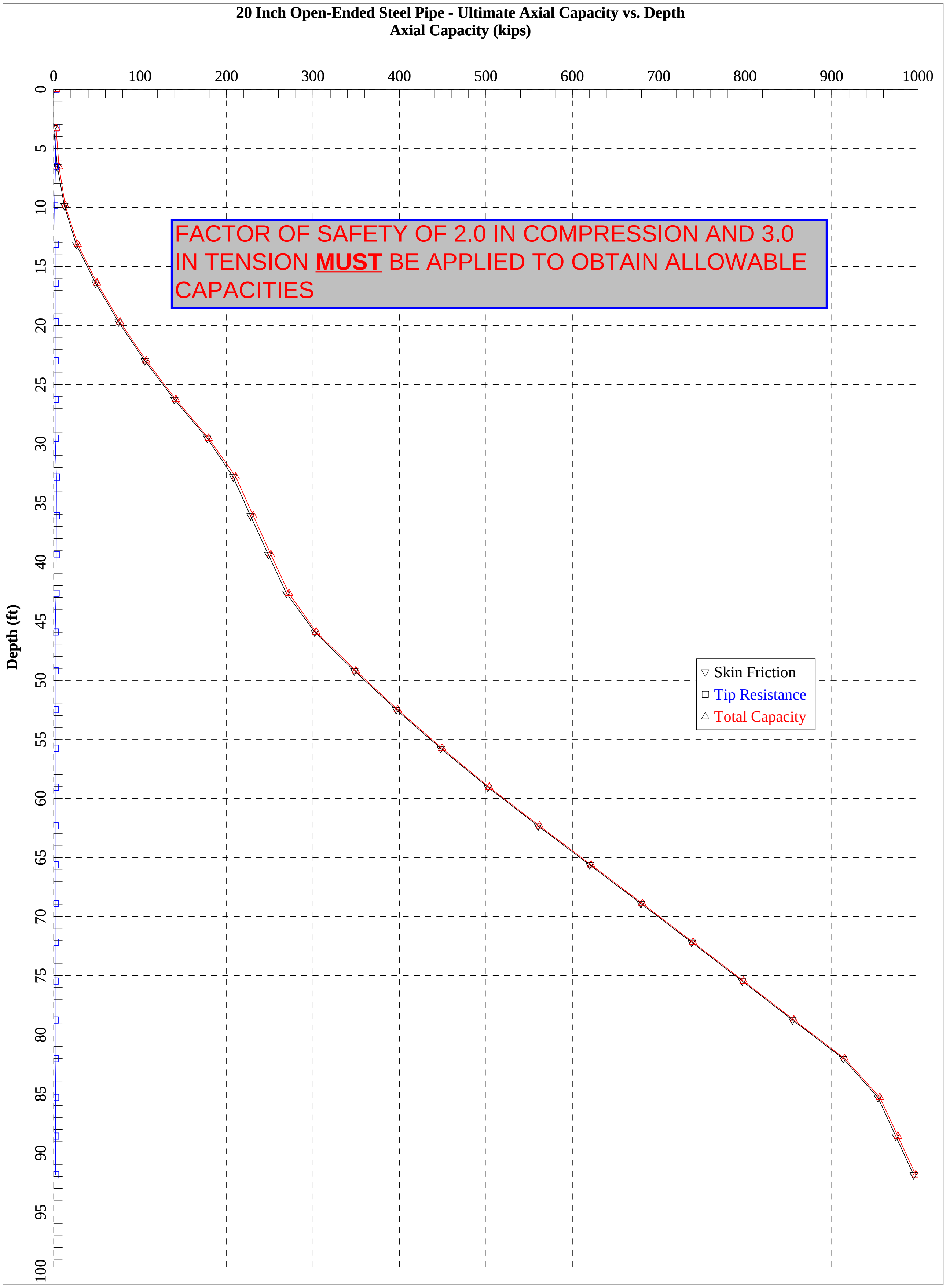

14 Inch Pre-Cast Concrete Pile - Axial Load vs. Settlement
Axial Load (kips)
0
100
200
300
400
500
600
700
800
900
1000
Settlement, in.
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
API

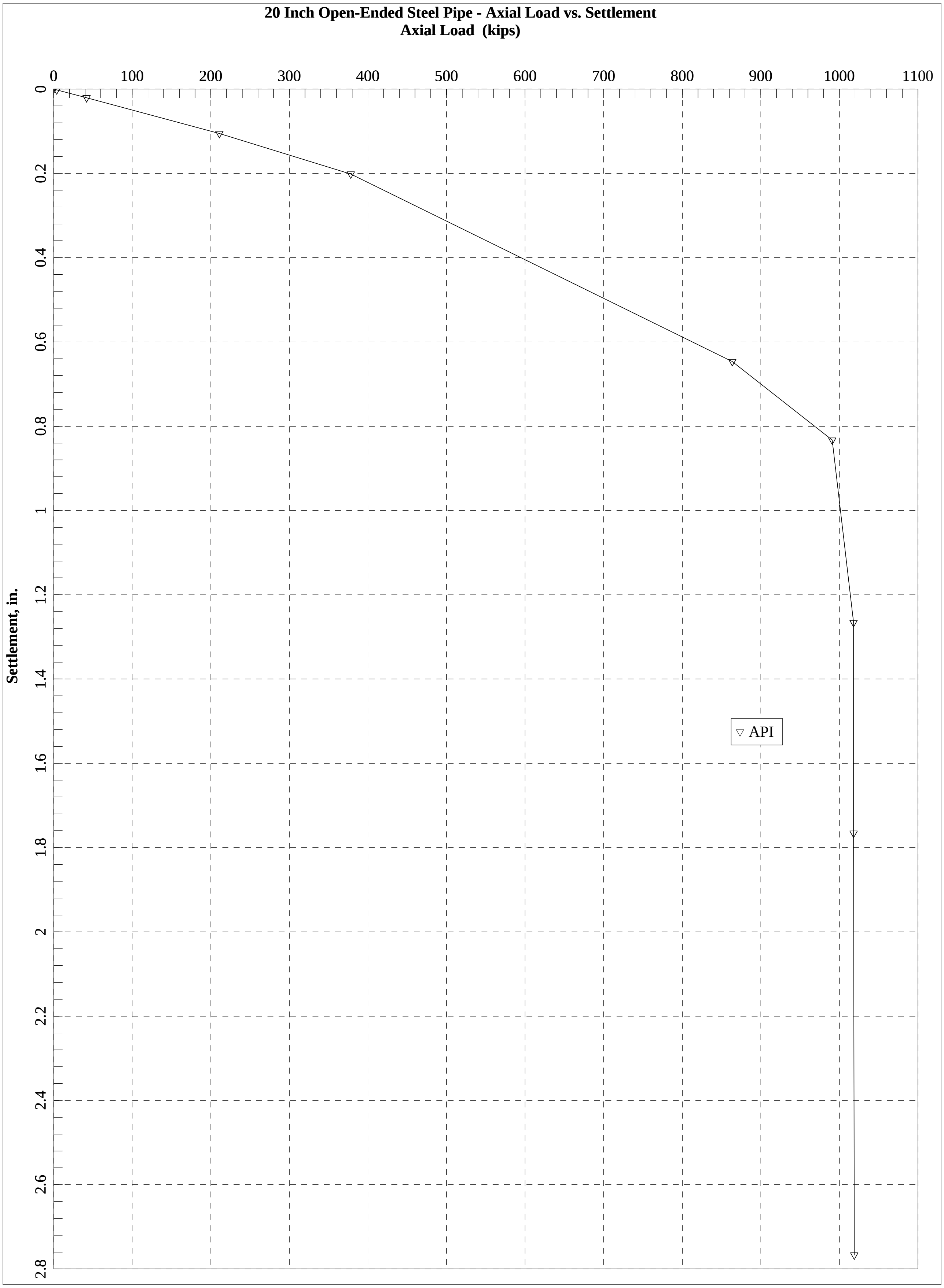

24 Inch Pre-Cast Concrete Pile - Ultimate Axial Capacity vs. Depth
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
FACTOR OF SAFETY OF 2.0 IN COMPRESSION AND 3.0 IN TENSION MUST BE APPLIED TO OBTAIN ALLOWABLE CAPACITIES
Skin Friction
Tip Resistance
Total Capacity


24 Inch Pre-Cast Concrete Pile - Axial Load vs. Settlement
Axial Load (kips)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
Settlement, in.
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
API


16 Inch Open-Ended Steel Pipe - Ultimate Axial Capacity vs. Depth
Axial Capacity (kips)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
FACTOR OF SAFETY OF 2.0 IN COMPRESSION AND 3.0 IN TENSION MUST BE APPLIED TO OBTAIN ALLOWABLE CAPACITIES
Skin Friction
Tip Resistance
Total Capacity


16 Inch Open-Ended Steel Pipe - Axial Load vs. Settlement
Axial Load (kips)
0
100
200
300
400
500
600
700
800
900
Settlement, in.
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
API


20 Inch Open-Ended Steel Pipe - Ultimate Axial Capacity vs. Depth
Axial Capacity (kips)
0
100
200
300
400
500
600
700
800
900
1000
Depth (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
FACTOR OF SAFETY OF 2.0 IN COMPRESSION AND 3.0 IN TENSION MUST BE APPLIED TO OBTAIN ALLOWABLE CAPACITIES
Skin Friction
Tip Resistance
Total Capacity


20 Inch Open-Ended Steel Pipe - Axial Load vs. Settlement
Axial Load (kips)
0
100
200
300
400
500
600
700
800
900
1000
1100
Settlement, in.
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
API

BORING LOG

BORING NO.:
PROJECT:
PROJECT LOCATION:
BORING LOCATION:
BORING ELEVATION:
GEOL/ENGR:
METHOD:

PROJECT NO.:
DATE DRILLED:
DATE COMPLETED:
WATER LEVEL:
WATER LEVEL DATE:
LOGGED BY:
DRILLER:

DEPTH (FEET)	SAMPLE	Standard Penetration (Blows/Ft.) or Penetrometer (TSF)	Unconfined Compressive Strength (TSF)	Moisture Content (%)	Dry Unit Weight (PCF)	LL	PI	Symbol	MATERIAL CLASSIFICATION
5									
10									
15									
20									
25									
30									
35									
40									

Description of strata as follows:
Strength (or Consistency), Color, Minor Constituent, Major Constituent, additional observations, etc.

Field evaluation of shear strength/relative density:
Standard Penetration Test (ASTM D-1586) in Blows/Ft.
Pocket penetrometer readings in Tons/Sq. Ft.

Groundwater second reading

Groundwater first encountered

Graphical presentation of material type:

Fat CLAY	SILT	SAND	FILL
Lean CLAY	CLAYEY SILT	CLAYEY SAND	GRAVEL
ORGANIC CLAY	SANDY SILT	SILTY SAND	GRAVELLY SAND
PEAT	ORGANIC SILT	SANDY CLAY	

Laboratory Information

As determined by Unconfined Compression (ASTM D-2166) or Unconsolidated Undrained Triaxial (ASTM D-2850), if noted.

Determined using applicable portions of ASTM D-2166 and ASTM D-2216.

Determined using ASTM D-2216 or D-4959.

Determined using ASTM D-4318. Provides data for application of Unified Classification System (UCS).

COMMENTS:

Shelby Tube Sample
Auger Sample
Split-spoon Sample
No Recovery

Sample recovery method.

GENERAL NOTES FROM LITERATURE

Unified Soil Classification System

Coarse-grained soils. More than 50% retained on US # 200 Sieve	***Gravels: More than 50% retained on US # 4 Sieve***	*Clean Gravel (little or no fines)*	*GW*	*Well graded gravels and gravel-sand mixtures with little or no fines*
			GP	*Poorly graded gravels and gravel-sand mixtures with little or no fines*
		Gravels with fines	*GM*	*Silty gravels, gravel-sand-silt mixtures*
			GC	*Clayey gravels, gravel-sand-clay mixtures*
	Gravels: More than 50% passing through US # 4 Sieve	*Clean sand (little or no fines)*	*SW*	*Well graded sands and gravelly sands, little or no fines*
			SP	*Poorly graded sands and gravelly sands, little or no fines*
		Sands with fines	*SM*	*Silty sands, sand-silt mixtures*
			SC	*Clayey sands, sand-clay mixtures*
Fine-grained soils. More than 50% passed through US Sieve # 200	***Silts and Clays with liquid limit (LL) less than 50***		*ML*	*Inorganic silts, very fine sands, rock flour, silty or clayey fine sands*
			CL	*Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays*
			OL	*Organic silts and organic silty clays of low plasticity*
	Silts and Clays with liquid limit (LL) greater than 50		*MH*	*Inorganic silts, micaceous diatomaceous fine sand or silty soil, elastic silts*
			CH	*Inorganic clays of high plasticity, fat clays*
			OH	*Organic clays of medium to high plasticity*
High organic soils			*PT*	*Peat, muck and other highly organic soils*

Classification of Granular Soils as per U.S. Standard Sieve Analysis

Description	*Boulders*	*Cobbles*	*Gravel*		*Sand*			*Silt or Clay*
			Coarse	*Fine*	*Coarse*	*Medium*	*Fine*	
Sieve Size	*>12 inches*	*3-12 inches*	*0.75 to 3inches*	*#4 to 0.75 iches*	*#10-#4*	*#40-#10*	*#200-#40*	*<#200*

Note:#4=5mm, #10=5mm, #40=0.4mm,#200=0.8mm

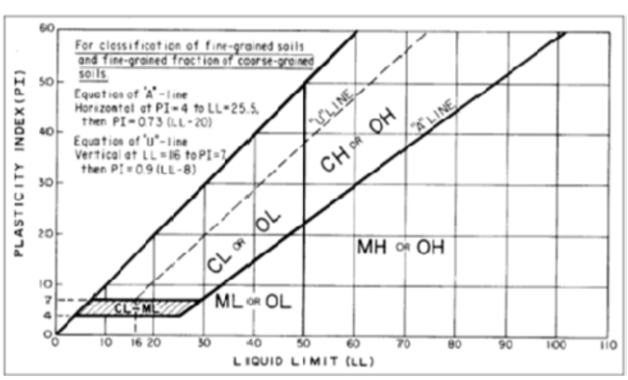
Consistency of Cohesive Soils

Consistency	**Unconfined Compressive Strength, (tsf)**	**SPT* (N)**
Very Soft	<0.25	<2
Soft	0.25 to 0.50	2 to 4
Medium Stiff	0.50 to 1.0	5 to 8
Stiff	1.0 to 2.0	9 to 15
Very Stiff	2.0 to 4.0	16 to 30
Hard	>4.0	>30

Relative Density of Granular Soils

Relative Density	**SPT* (N)**
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 24
Dense	25 to 50
Very Dense	>50

**Standard Penetration test (SPT) value (N-value) is a number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18 inches penetration with a 140-pound hammer falling from 30 in. height.*



Plasticity Characteristics

Plasticity	**Plasticity Index (PI)**
Non-Plastic	0
Slight	1 to 5
Low	5 to 10
Medium	11 to 20
High	21 to 40
Very high	> 40

BORING LOG

BORING NO.: B-1
PROJECT: HARVEY SITE LED INVESTIGATION
PROJECT LOCATION: WEST FELECIANA, LA
BORING LOCATION: 30°43'36.59"N, 91°18'15.64"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER / WET

PROJECT NO.: B18-058
DATE DRILLED: 03/07/18
DATE COMPLETED: 03/07/18
DEPTH TO WATER LEVEL: 22 ft
WATER LEVEL DATE: 03/07/18
LOGGED BY: WW
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Standard Penetration (Blows/Ft.)	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (PCF)	LL	PI	MATERIAL CLASSIFICATION
	Shelby tube			27				Medium to Stiff, Brown and Reddish Brown Lean CLAY with trace fine sand and roots (CL)
	Shelby tube			26		48	24	
	Shelby tube		1.25 (1)	26	97			
	Shelby tube		0.89 (2)	26	101			
	Shelby tube			13		18	5	Brown Clayey SILT (CL-ML)
10								
	Split spoon	24b/ft 7/12/12		5				Medium Dense, Tan Fine SAND with trace silt (SP)
	Split spoon	40b/ft 12/15/25	(3)	15				Dense, Tan and White Fine to Coarse SAND with clay, trace fine gravel, and silt (SP-SM)
20								
▽								
	Split spoon	50+b/ft 20/38/22		15				Very Dense, Tan and White Fine to Coarse SAND with fine gravel (SW)
	Shelby tube		1.75	20	112			Stiff, Light Gray Brittle Fat CLAY with ferrous staining and silt pockets (CH)
30								
	Shelby tube			19		32	18	Stiff, White and Light Gray Sandy Lean CLAY (CL)
	Shelby tube		1.50	13	115			
40								
	Split spoon	26b/ft 13/13/13		21				Dense, White Clayey SAND with silt (SC)
	Split spoon	38b/ft 15/20/18	(4)	18				Dense to Very Dense, White Fine to Medium SAND with trace clay, gravel, and silt (SM)
50								
	Split spoon	50+b/ft 25/50 in 4"		19				

COMMENTS:

SHELBY TUBE   SPLIT SPOON

BORING LOG

BORING NO.: B-1
PROJECT: HARVEY SITE LED INVESTIGATION
PROJECT LOCATION: WEST FELECIANA, LA
BORING LOCATION: 30°43'36.59"N, 91°18'15.64"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER / WET

PROJECT NO.: B18-058
DATE DRILLED: 03/07/18
DATE COMPLETED: 03/07/18
DEPTH TO WATER LEVEL: 22 ft
WATER LEVEL DATE: 03/07/18
LOGGED BY: WW
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Standard Penetration (Blows/Ft.)	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (PCF)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
60	SPLIT SPOON	40b/ft 14/20/20		18					Dense, White Fine SAND with silt (SP-SM)
	SPLIT SPOON	53b/ft 24/26/27		18					Dense to Very Dense, Tan, Reddish Tan, and White Fine to Coarse SAND with clay, trace gravel, and silt (SP)
70	SPLIT SPOON	50+b/ft 50/50 in 2"		16					
	SPLIT SPOON	35b/ft 15/17/18		19					
80	SPLIT SPOON	28b/ft 10/14/14	(5)	20					Dense, Red and Tan Fine SAND with clay, trace gravel, and silt (SM)
	SHELBY TUBE		1.22	36	87	34	14		Stiff, Light Tan Lean CLAY with fine sand (CL)
90	SHELBY TUBE		1.24	39	87				Stiff, Light Tan Fat CLAY with silt (CH)
									Hard, Light Tan and Tan Sandy Lean CLAY (CL)
	SPLIT SPOON	50+b/ft 30/40/10 in 2"	(6)	24					
100	SPLIT SPOON	44b/ft 18/20/24		27					Hard, Tan and Light Gray Fat CLAY with trace silt (CH)
									Bottom at 100 Feet
110									

(1) UU Triaxial Test at 4.2 psi
(2) UU Triaxial Test at 5.8 psi
(3) % Passing # 200 = 14.3%
(4) % Passing # 200 = 18.6%
(5) % Passing # 200 = 15.0%
(6) % Passing # 200 = 67.1%%

COMMENTS:

SHELBY TUBE   SPLIT SPOON

BORING LOG

BORING NO.: B-2
PROJECT: HARVEY SITE LED INVESTIGATION
PROJECT LOCATION: WEST FELECIANA, LA
BORING LOCATION: 30°43'46.21"N, 91°18'46.51"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER / WET

PROJECT NO.: B18-058
DATE DRILLED: 03/07/18
DATE COMPLETED: 03/07/18
DEPTH TO WATER LEVEL: NE
WATER LEVEL DATE: 03/07/18
LOGGED BY: WW
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (PCF)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
			26					Brown, Tan, and Red Lean CLAY with roots (CL)
			26					
		0.21 (1)	27	92	41	16		-- very soft
			22		37	14		
			19					
10								
			19					
		4.91 (2)	19	111	52	35		Hard, Brown, Tan, and Reddish Brown, Red, and Light Gray Fat CLAY with silt (CH)
20								
			19					
								Bottom at 25 Feet (1) UU Triaxial Test at 4.2 psi (2) UU Triaxial Test at 15.8 psi
30								
40								
50								

COMMENTS:

SHELBY TUBE

BORING LOG

BORING NO.: B-3
PROJECT: HARVEY SITE LED INVESTIGATION
PROJECT LOCATION: WEST FELECIANA, LA
BORING LOCATION: 30°43'32.51"N, 91°18'37.78"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER / WET

PROJECT NO.: B18-058
DATE DRILLED: 03/07/18
DATE COMPLETED: 03/07/18
DEPTH TO WATER LEVEL: NE
WATER LEVEL DATE: 03/07/18
LOGGED BY: WW
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (PCF)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
			26					Brown Fat CLAY with silt (CH)
		0.61	27	97	46	23		Medium to Stiff, Brown and Tan Lean CLAY with ferrous nodules/staining, and trace fine sand (CL)
			22					
			20					
		1.71	18	109	35	16		
10								
			18					
			21					Tan and Red Fat CLAY with silt (CH)
20								
			15					Reddish Tan Sandy Lean CLAY (CL)
								Bottom at 25 Feet
30								
40								
50								

COMMENTS:

■ SHELBY TUBE

BORING LOG

BORING NO.: B-4
PROJECT: HARVEY SITE LED INVESTIGATION
PROJECT LOCATION: WEST FELECIANA, LA
BORING LOCATION: 30°43'44.49"N, 91°18'0.47"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER / WET

PROJECT NO.: B18-058
DATE DRILLED: 03/07/18
DATE COMPLETED: 03/07/18
DEPTH TO WATER LEVEL: NE
WATER LEVEL DATE: 03/07/18
LOGGED BY: WW
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Standard Penetration (Blows/Ft.)	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (PCF)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
			1.72	14	113	29	15		Stiff, Tan, Brown, and Red Sandy Lean CLAY with small roots (CL)
		50+b/ft 50 in 5"		11					Very Dense to Dense, Red Clayey SAND with clay pockets, trace gravel, and silt (SC)
		50+b/ft 16/37/13 in 4"	(1)	8					
		50+b/ft 25/33/17 in 3"		7					
		50+b/ft 26/28/22 in 5"		8					
10									
		50b/ft 15/25/25		8					
		50+b/ft 18/23/27 in 3"		10					
20									
		47b/ft 16/26/21	(1)	9					
									Bottom at 25 Feet (1) % Passing # 200 = 37.5% (2) % Passing # 200 = 21.4%
30									
40									
50									

COMMENTS:

SHELBY TUBE   SPLIT SPOON

SOUTHERN EARTH SCIENCES, INC.

BORING LOG

BORING NO.: B-5
PROJECT: HARVEY SITE LED INVESTIGATION
PROJECT LOCATION: WEST FELECIANA, LA
BORING LOCATION: 30°43'29.09"N, 91°18'23.89"W
BORING ELEVATION: EXISTING GRADE
GEOL/ENGR: MJ
METHOD: AUGER / WET

PROJECT NO.: B18-058
DATE DRILLED: 03/07/18
DATE COMPLETED: 03/07/18
DEPTH TO WATER LEVEL: 2 ft
WATER LEVEL DATE: 03/07/18
LOGGED BY: WW
DRILLER: SESI

DEPTH (FEET)	SAMPLE	Unconfined Compressive Strength (tsf)	Moisture Content (%)	Dry Unit Weight (PCF)	LL	PI	SYMBOL	MATERIAL CLASSIFICATION
∇			28					Medium, Gray and Brown Clayey SILT (ML)
		0.68 (1)	27	96	33	9		
			27					Medium to Stiff, Brown, Tan, and Light Gray Lean CLAY with trace ferrous nodules/staining, and fine sand (CL)
			27					
			25					
10								
		1.08	27	100	46	23		
20			21					
		0.73	25	102				
								Bottom at 25 Feet
								(1) UU Triaxial Test at 2.5 psi
30								
40								
50								

COMMENTS:

■ SHELBY TUBE

Laboratory Test Results

Harvey Site LED Investigation, West Feleciana, LA — **Technical Responsibility:** MJ — **Quality Assurance Officer:** RLJ

Client: Greater Baton Rouge Economic Partnership — Project No.: **B18-058** — PM: MJ — Date of Issue: 3/27/2018

			ASTM DESIGNATION																
			D2216	D4318			D2166		D2166	D2850		D422, C136 or C117					D2974		
				Atterberg Limits					Cohesion			Grain Size (%)							
Boring No.	Depth (ft)	Classification	ω %	LL	PL	PI	γ_{wet} pcf	γ_{dry} pcf	U psf	UU psf	Confining Pressure psi	Gravel	Sand	Silt	Clay	% Passing #200	Organic Congent	USCS	Remarks
B-1	0-2	Brown Lean CLAY with roots	27.1															(CL)	
B-1	2-4	Brown Lean CLAY	26.1	48	24	24												(CL)	
B-1	4-6	Stiff, Reddish Brown Lean CLAY with trace fine sand	26.1				122.7	97.2		1246.6	4.2							(CL)	
B-1	6-8	Medium, Brown Lean CLAY with trace fine sand	25.6				127.1	101.2		886.0	5.8							(CL)	
B-1	8-10	Brown Clayey SILT	12.6	18	13	5												(CL-ML)	
B-1	13-15	Medium Dense, Tan Fine SAND with trace silt	4.6															(SP)	24b/ft
B-1	18-20	Dense, Tan and White Fine to Coarse SAND with clay, trace fine gravel, and silt	14.5													14.3		(SP-SM)	40b/ft Water Level = 22'
B-1	23-25	Very Dense, Tan and White Fine to Coarse SAND with fine gravel	15.4															(SW)	50+b/ft
B-1	28-30	Stiff, Light Gray Brittle Fat CLAY with ferrous staining and silt pockets	19.5				133.7	111.9	1745.6									(CH)	
B-1	33-35	White Sandy Lean CLAY	19.3	32	14	18												(CL)	
B-1	38-40	Stiff, Light Gray Sandy Lean CLAY	13.0				130.1	114.9	1497.8									(CL)	
B-1	43-45	Dense, White Clayey SAND with silt	21.4															(SC)	26b/ft
B-1	48-50	Dense, White Fine SAND with trace clay, gravel, and silt	18.1													18.6		(SM)	38b/ft
B-1	53-55	Very Dense, White Fine to Medium SAND with trace clay and silt	18.5															(SM)	50+b/ft
B-1	58-60	Dense, White Fine SAND with silt	18.4															(SP-SM)	40b/ft
B-1	63-65	Very Dense, Tan and White Fine to Coarse SAND	18.0															(SP)	53b/ft
B-1	68-70	Very Dense, Reddish Tan and White Fine to Coarse SAND	16.3															(SP)	50+b/ft

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

Laboratory Test Results

Harvey Site LED Investigation, West Feleciana, LA

Technical Responsibility: MJ

Quality Assurance Officer: RLJ

Client: Greater Baton Rouge Economic Partnership

Project No.: **B18-058**

PM: MJ

Date of Issue: 3/27/2018

Boring No.	Depth (ft)	Classification	D2216 ω %	D4318 Atterberg Limits LL	PL	PI	D2166 γ_{wet} pcf	γ_{dry} pcf	D2166 Cohesion U psf	D2850 UU psf	Confining Pressure psi	D422, C136 or C117 Grain Size (%) Gravel	Sand	Silt	Clay	% Passing #200	D2974 Organic Congent	USCS	Remarks
B-1	73-75	Dense, Reddish Tan and White Fine to Coarse SAND with clay, trace gravel, and silt	19.2															(SP)	35b/ft
B-1	78-80	Dense, Red and Tan Fine SAND with clay, trace gravel, and silt	19.9													15.0		(SM)	28b/ft
B-1	83-85	Stiff, Light Tan Lean CLAY with fine sand	36.3	34	20	14	118.9	87.1	1216.5									(CL)	
B-1	88-90	Stiff, Light Tan Fat CLAY with silt becoming Stiff, Light Tan Sandy Lean CLAY	38.8				120.2	86.7	1235.7									(CH)(CL)	
B-1	93-95	Hard, Tan Sandy Lean CLAY	24.4													67.1		(CL)	50+b/ft
B-1	98-100	Hard, Tan and Light Gray Fat CLAY with trace silt	27.1															(CH)	44b/ft
B-2	0-2	Brown Lean CLAY	25.9															(CL)	
B-2	2-4	Brown Lean CLAY	26.0															(CL)	Water Level = NE
B-2	4-6	Very Soft, Brown Lean CLAY with roots	27.4	41	25	16	117.5	92.3		213.5	4.2							(CL)	
B-2	6-8	Brown Lean CLAY	21.6	37	23	14												(CL)	
B-2	8-10	Tan and Brown Lean CLAY	19.3															(CL)	
B-2	13-15	Tan and Red Lean CLAY	18.6															(CL)	
B-2	18-20	Hard, Brown, Tan, and Reddish Brown Fat CLAY	18.7	52	17	35	131.8	111.0		4909.6	15.8							(CH)	
B-2	23-25	Tan, Red, and Light Gray Fat CLAY with silt	18.9															(CH)	

Laboratory Test Results

Harvey Site LED Investigation, West Feleciana, LA

Technical Responsibility: MJ

Quality Assurance Officer: RLJ

Client: Greater Baton Rouge Economic Partnership

Project No.: **B18-058**

PM: MJ

Date of Issue: 3/27/2018

			ASTM DESIGNATION																
			D2216	D4318			D2166		D2166	D2850		D422, C136 or C117					D2974		
				Atterberg Limits					Cohesion			Grain Size (%)							
Boring No.	Depth (ft)	Classification	ω %	LL	PL	PI	γ_{wet} pcf	γ_{dry} pcf	U psf	UU psf	Confining Pressure psi	Gravel	Sand	Silt	Clay	% Passing #200	Organic Congent	USCS	Remarks
B-3	0-2	Brown Fat CLAY with silt	26.1															(CH)	
B-3	2-4	Medium, Brown Lean CLAY with ferrous staining	26.6	46	23	23	122.3	96.7	608.9									(CL)	Water Level = NE
B-3	4-6	Brown Lean CLAY	22.2															(CL)	
B-3	6-8	Brown Lean CLAY with ferrous nodules	20.4															(CL)	
B-3	8-10	Stiff, Tan Lean CLAY with ferrous nodules	18.3	35	19	16	129.1	109.2	1706.0									(CL)	
B-3	13-15	Tan and Brown Lean CLAY with trace fine sand	18.3															(CL)	
B-3	18-20	Tan and Red Fat CLAY with silt	21.4															(CH)	
B-3	23-25	Reddish Tan Sandy Lean CLAY	14.7															(CL)	
B-4	0-2	Stiff, Tan, Brown, and Red Sandy Lean CLAY with small roots	13.9	29	14	15	129.3	113.4	1717.5									(CL)	
B-4	2-4	Very Dense, Red Clayey SAND with clay pockets and silt	10.5															(SC)	Water Level - NE 50+b/ft
B-4	4-6	Very Dense, Red Clayey SAND with trace gravel and silt	7.9													37.5		(SC)	50+b/ft
B-4	6-8	Very Dense, Red Clayey SAND with silt	6.6															(SC)	50+b/ft
B-4	8-10	Very Dense, Red Clayey SAND with trace gravel and silt	8.4															(SC)	50+b/ft
B-4	13-15	Very Dense, Red Clayey SAND with trace gravel and silt	8.4															(SC)	50b/ft
B-4	18-20	Very Dense, Red Clayey SAND with trace gravel and silt	9.6															(SC)	50+b/ft
B-4	23-25	Dense, Red Clayey SAND with silt	9.2													21.4		(SC)	47b/ft

SOUTHERN EARTH SCIENCES, INC.

Geotechnical, Environmental & Construction Materials Testing

Laboratory Test Results

Harvey Site LED Investigation, West Feleciana, LA | **Technical Responsibility:** MJ | **Quality Assurance Officer:** RLJ

Client: Greater Baton Rouge Economic Partnership | Project No.: **B18-058** | PM: MJ | Date of Issue: 3/27/2018

Boring No.	Depth (ft)	Classification	ω % (D2216)	LL (D4318 Atterberg Limits)	PL (D4318 Atterberg Limits)	PI (D4318 Atterberg Limits)	γ_{wet} pcf (D2166)	γ_{dry} pcf (D2166)	U psf (D2166 Cohesion)	UU psf (D2850 Cohesion)	Confining Pressure psi (D2850)	Gravel (D422, C136 or C117 Grain Size (%))	Sand (D422, C136 or C117 Grain Size (%))	Silt (D422, C136 or C117 Grain Size (%))	Clay (D422, C136 or C117 Grain Size (%))	% Passing #200 (D422, C136 or C117)	Organic Congent (D2974)	USCS	Remarks
B-5	0-2	Gray Clayey SILT	28.3															(ML)	
B-5	2-4	Medium, Brown SILT with clay	27.0	33	24	9	121.7	95.8		676.7	2.5							(ML)	Water Level = 2'
B-5	4-6	Brown and Tan Lean CLAY with trace ferrous nodules	26.5															(CL)	
B-5	6-8	Brown, Tan, and Light Gray Lean CLAY with ferrous staining	26.8															(CL)	
B-5	8-10	Brown and Tan Lean CLAY	25.1															(CL)	
B-5	13-15	Stiff, Brown Lean CLAY with fine sand	27.4	46	23	23	127.4	100.2	1079.2									(CL)	
B-5	18-20	Light Gray and Tan Lean CLAY with ferrous staining	21.4															(CL)	
B-5	23-25	Medium, Tan Lean CLAY with ferrous nodules	24.9				126.8	101.6	728.5									(CL)	

Important Information about Your

Geotechnical Engineering Report

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

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

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

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

Read the Full Report

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

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

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

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

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

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

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

Subsurface Conditions Can Change

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

Most Geotechnical Findings Are Professional Opinions

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

A Report's Recommendations Are *Not* Final

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

A Geotechnical Engineering Report Is Subject to Misinterpretation

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

Do Not Redraw the Engineer's Logs

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

Give Contractors a Complete Report and Guidance

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

Read Responsibility Provisions Closely

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

Geoenvironmental Concerns Are Not Covered

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

Obtain Professional Assistance To Deal with Mold

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

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

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

ASFE THE GEOPROFESSIONAL BUSINESS ASSOCIATION

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