Geotechnical Subsurface Investigation

Paducah Downtown City Block Development

Paducah, KY

December 20, 2019

December 20, 2019

Ms. Tammara Tracy
Director of Planning
City of Paducah
P.O. Box 2267
300 South 5th Street
Paducah, KY 42002-2267

Re: Geotechnical Investigation
Paducah Downtown City Block Development

Dear Ms. Tracy,

The Geotechnical Investigation has been completed for the property located near the intersection of North 2nd Street and Broadway, encompassing the city block parking lot bounded by Jefferson St. to the north, Broadway to the south, Water St. to the east, and North 2nd Street to the west.

We appreciate this opportunity to provide geotechnical services to the City of Paducah Planning Department. Please contact my office if you have questions.

Sincerely,

HDR

Kevin E. Walker, PE (AL, GA, NC, PA, TX)
Senior Geotechnical Engineer

Devin Chittenden, PE
Geotechnical Section Manager

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1 Introduction

This geotechnical report provides a characterization of the subsurface conditions and geotechnical recommendations for use in the design and development of the existing parking lot occupying the city block bounded by Broadway Street, Jefferson Street, North 2nd Street, and Water Street. The conceptual plan for the proposed development includes a four story hotel located along Jefferson Street, and two mixed use three story buildings located along Broadway Street. Borings were advanced and soil samples were collected and delivered to the HDR laboratory for further testing and analysis. Geotechnical parameters and foundation recommendations are provided in this report resulting from the evaluations of soil conditions at the proposed site.

2 Geology

The United States Geological Survey (USGS) 7.5-minute quadrangle map for Paducah East, KY indicates that the Subject Property is located at an elevation of approximately 335 - 340 feet above mean sea level (amsl). The topography in the Subject Property is flat, with a very gentle grade toward the north/northeast away from the south-adjacent Tennessee Valley Divide. Surface runoff drains into stormwater inlets that channelize runoff into the Ohio River.

The Subject Property is situated along the northern edge of the East Gulf Coastal Plain Province, which includes most of the lower Mississippi River / Mid-South Delta region. This portion of the coastal plain is characterized by the Mississippi Embayment, which is a large fluvial floodplain with relatively flat to gently sloping topography that provides drainage pathways over much of the central and eastern portions of North America, including the Ohio River valley. The Embayment was initially formed as a topographic low during the Proterozoic, precipitated by crustal weaknesses that created many structural deformities including the Reelfoot Rift of the New Madrid Seismic Zone. By the end of the Paleozoic, much of the regional basin was infilled with shallow marine deposits, forming the base of the Embayment today as limestone, shale, and sandstones. Regional subsidence and deposition following the Paleozoic resulted in the thick accumulation of Mesozoic and younger unconsolidated strata that generally dip towards the Mississippi River, increasing in thickness to as much as 3,000 feet, with strata becoming progressively younger towards the center of the basin. The local vicinity is considered seismically active from the New Madrid Seismic Zone to the west/southwest and the Wabash Valley Fault System situated northeast of the Subject Property.

Geologically, the Subject Property is immediately underlain with Holocene alluvium consisting of reworked clay, silt, sand, and gravel deposits, which are further underlain by a lower confining layer of Eocene marine deposits. These deposits are often characterized with thinly bedded to laminated dark gray to black elastic silt and light to pale gray micaceous fine sand. Buried artificial fill including cinders, bricks, and metallic fragments are not uncommon in this area along the shores of the Ohio River. Depth to Mississippian carbonate bedrock is anticipated to be approximately 100 to 150 feet below grade near the Subject Property. Surface drainage appears to flow towards the Ohio River to the

north/northeast, and groundwater is expected to generally mirror surface drainage. Depth to groundwater within the Subject Property is generally less than 30 feet, and is highly dependent upon the adjoining Ohio River stage.

3 Subsurface Exploration

In October of 2019 a subsurface investigation was conducted at this site by HDR, utilizing Geotechnology, Inc. as a drilling sub-consultant. The exploration program included a total of fifteen (15) Standard Penetration Test (SPT) borings. Seven (7) borings were advanced at the location of the proposed hotel and four (4) borings were advanced at each of the proposed mixed use buildings. Eleven (11) of the borings were advanced to a depths of 40 feet, three were advanced to 80 feet, and one boring was extended to 100 feet in depth. Each boring was advanced with a CME-55 truck-mounted drill rig using three and one quarter (3 ¼) inch hollow stem augers to penetrate cohesive materials, and switching to mud rotary to penetrate the deeper granular materials. A plan sheet depicting the boring locations is provided in Appendix A. The test boring locations are tabulated below:

Table 3-1. Test Boring Locations

Boring No.	Location	Latitude	Longitude	Surface Elevation	Depth
B-1	Proposed Hotel	37.08871°	88.59595°	335.5 ft.	100 ft.
B-2	Proposed Hotel	37.08863°	88.59591°	334.8 ft.	40 ft.
B-3	Proposed Hotel	37.08912°	88.59494°	334.2 ft.	80 ft.
B-4	Proposed Hotel	37.08904°	88.59484°	334.3 ft.	40 ft.
B-5	Proposed Hotel	37.08876°	88.59571°	336.4 ft.	40 ft.
B-6	Proposed Hotel	37.08885°	88.59548°	336.4 ft.	40 ft.
B-7	Proposed Hotel	37.08898°	88.59517°	335.4 ft.	40 ft.
B-8	Mixed Use Building	37.08801°	88.59526°	337.8 ft.	80 ft.
B-9	Mixed Use Building	37.08805°	88.59549°	337.1 ft.	40 ft.
B-10	Mixed Use Building	37.08818°	88.59508°	336.9 ft.	40 ft.
B-11	Mixed Use Building	37.08813°	88.59507°	336.7 ft.	40 ft.
B-12	Mixed Use Building	37.08823°	88.59497°	336.6 ft.	40 ft.
B-13	Mixed Use Building	37.08821°	88.59488°	336.0 ft.	40 ft.
B-14	Mixed Use Building	37.08842°	88.59450°	336.7 ft.	40 ft.
B-15	Mixed Use Building	37.08833°	88.59445°	336.3 ft.	80 ft.

Standard Penetration Tests (SPT) were obtained at five (5) foot intervals until reaching the plan depths. The SPT N values within the advanced borings ranged from 0 to 100 blows per foot, with an overall averages of 34 blows per foot. Shelby tube sampling was also

performed to obtain undisturbed samples for use in unconfined compression and consolidation testing. Groundwater levels were recorded at the completion of the drilling operations within borings B-4, B-5, and B-14 at depths of 8.6 ft. (EL. 325.7), 20.9 ft. (EL. 315.5), and 26.9 ft. (EL. 309.8), respectively. Auger refusal was not encountered. However, traces of construction debris in the form of brick and concrete fragments were encountered from just below the parking lot subgrade material to a depth of up to 12 feet in borings B-1, B-2, B-3, B-4, B-6, B-7, B-8, and B-12. This debris is described as Fill on the borings. Boring logs from borings B-1 through B-15 are provided in Appendix B.

All soil specimens were delivered to HDR for laboratory testing and further analysis, which included the following tests:

Atterberg Limits	AASHTO T-89 and T-90
Sieve Analysis	ASTM D-1140
Natural Moisture Content	AASHTO T-265
Unconfined Compression (Q_u)	AASHTO T-208
Consolidation	AASHTO T-216
pH Testing	AASHTO T-288
Resistivity	ASTM G-187

The materials near the surface to approximately 25 feet in depth primarily classified silty clay with sand (CL-ML) and lean clay with sand (CL). Samples recovered below approximately 25 feet primarily classified as silty sand (SM), poorly graded gravel with sand (GP), well-graded sand with clay and gravel, (SW-SC), and poorly graded sand with clay and gravel (SP-SM). The full laboratory testing results are located in Appendix C.

Based on the results of both the SPT N values and laboratory classification and strength testing, material properties for the soils encountered were determined and representative soil groups were established. Soil Group No. 1 is representative of the northwestern half of the block along Jefferson Street, and Soil Group No. 2 is representative of the southeastern half along Broadway Street. The following table presents recommended material properties for each soil group.

Table 3-2. Recommended Soil Parameters

Location/ Soil Group	Elev. (ft)	Depth (ft)	ASTM Soil Type	Phi Angle	Unit Weight γ (pcf)	Avg. N Values (bpf)	Total Shear Strength (psf)	Effective Shear Strength (psf)	Soil Strain E_{50}	Soil Modulus k (pci)
Soil Group No. 1 (Boring Nos. 1 through 7)	335.3 - 330.0	0.0 - 5.3	CL (Fill)	26	120	12	1200	240	0.007	500
	330.0 - 325.4	5.3 - 9.9	CL, CL-ML (Residual)	24	120	6	600	120	0.01	100
	325.4 - 318.0	9.9 - 17.3	CL, CL-ML (Residual)	26	120	9	1000	200	0.007	300
	318.0 - 307.6	17.3 - 27.7	CL-ML (Residual)	30	120	20	2000	400	0.005	500
	307.6 - 302.3	27.7 - 33.0	GP (Residual)	32	115	19	0	0	-	60
	302.3 - 292.9	33.0 - 42.4	GP (Residual)	38	130	41	0	0	-	125

Table 3-2. Recommended Soil Parameters

Location/ Soil Group	Elev. (ft)	Depth (ft)	ASTM Soil Type	Phi Angle	Unit Weight γ (pcf)	Avg. N Values (bpf)	Total Shear Strength (psf)	Effective Shear Strength (psf)	Soil Strain E_{50}	Soil Modulus k (pci)
	292.9 - 278.3	42.4 - 57.0	GP, SM (Residual)	28	115	6	0	0	-	20
	278.3 - 235.3	57.0 - 100.0	SM (Residual)	38	130	93	0	0	-	125
Soil Group No. 2 (Borings Nos. 8 through 15)	336.8 - 329.8	0.0 - 7.0	CL, CH (Fill)	26	120	15	1200	240	0.007	500
	329.8 - 313.8	7.0 - 23.0	CL, CH (Residual)	26	120	12	1000	200	0.007	300
	313.8 - 308.1	23.0 - 28.7	SP-SC (Residual)	32	115	21	0	0	-	60
	308.1 - 294.4	28.7 - 42.4	SW-SC, SP-SC (Residual)	38	130	65	0	0	-	125
	294.4 - 273.8	42.4 - 63.0	SM (Residual)	28	115	9	0	0	-	20
	273.8 - 236.8	63.0 - 100.0	SM (Residual)	38	130	75	0	0	-	125

In addition to laboratory classifications and strength testing, pH and resistivity tests were also conducted to determine the corrosiveness of the materials encountered. The purpose of corrosion and deterioration testing is to provide soils data for use by a structural engineer to provide any necessary protection to the piling, concrete, reinforcing steel, etc. Corrosion and deterioration protection requirements and guidelines for piling are set forth in LRFD Section 10.7.5. The corrosion and deterioration testing results are summarized in Table 3-3 below and are included in Appendix C.

Table 3-3. Corrosion and Deterioration Test Summary

Boring No.	Sample Depth	pH	Resistivity (ohm·cm)
B-1	9.0 ft. to 20.5 ft.	7.3	2,720
B-3	14.0 ft. to 25.5 ft.	3.9	5,200
B-8	28.3 ft. to 39.8 ft.	5.9	7,600
B-10	24.0 ft. to 35.5 ft.	6.1	8,400

The following soil conditions should be considered as indicative of a potential pile corrosion or deterioration situation:

- Resistivity less than 2,000 ohm-cm
- pH less than 5.5
- pH between 5.5 and 8.5 in soils with high organic content

- Sulfate concentrations greater than 1,000 ppm

The following soil conditions should be considered as indicative of a potential steel reinforcement corrosion or deterioration situation:

- Resistivity less than 3,000 ohm-cm
- Sulfate concentrations greater than 200 ppm
- Chloride concentrations greater than 100 ppm
- The chloride and sulfate testing is waived if the resistivity is greater than or equal to 5000 ohm-cm

Results of the corrosion and deterioration testing indicated that the site has a marginal potential for pile or steel reinforcement deterioration based on the resistivity values and the geographical location of the project site. Interpretation of the data and corrosion protection of the foundation structural components should be discussed with the structural engineer for the project.

4 Seismic Considerations

Due to its relative proximity to the New Madrid Seismic Zone (NMSZ), McCracken County is considered vulnerable to severe ground shaking. The following spectral response acceleration coefficients were obtained from Section 1613 of the 2018 Kentucky Building Code, Second Edition, dated April 2019. Values for S_s (0.2-second spectral acceleration, 2% probability of exceedance in 50 years) and S_1 (1.0 second spectral acceleration, 2% probability of exceedance in 50 years) were obtained through the 2008 US Geological Survey National Seismic Mapping Project database and adjusted for the 2015 International Building Code.

Table 4-1. Seismic Acceleration Parameters

Spectral Response Acceleration Coefficients				
County	S_S	$S_{S,0}$	S_1	$S_{1,0}$
McCracken	2.124	1.068	0.759	0.366

The project site classifies as Site Class D based on the average SPT values obtained to a depth of 100 feet. An acceleration coefficient for this project site was obtained from Applied Technology Council (ATC) Seismic Hazards web site, which utilizes ASCE7-16 methodology. The ATC website resulted a site-modified peak ground acceleration (PGA_M) of 0.669 with a 2% probability of exceedance in 50 years.

Preliminary analyses of the subsurface conditions in the SPT borings were performed to evaluate the likelihood of liquefaction during an extreme seismic event. The screening, identification, and evaluation of the geotechnical seismic hazards at the project site were completed using analyses conducted in accordance with Idriss and Boulanger Soil Liquefaction during Earthquakes (2008). Based on the results of the seismic hazard evaluation, it is believed the soils are susceptible to shear strength loss during the seismic event. A detailed seismic design was not included in the scope of this report. We understand that deep foundations are likely to be considered for the proposed hotel and

the mixed use buildings. If so, further analysis and discussion with the structural engineer will be required to determine the liquefaction intervals and how those intervals will affect the seismic design of the foundations including the estimated downdrag loads. The additional downdrag loads can be included in the foundations or ground mitigation options could be evaluated.

4.1 Shallow Foundations

The minimum footing embedment should be 24 inches in order to protect against frost penetration. A foundation size of four (4) feet by (60) feet was assumed for the proposed hotel and mixed use buildings. The table below summarizes the allowable bearing capacity for shallow foundations without undercut, with two feet of undercut and with three feet of undercut using granular backfill material (No. 57 Stone or equivalent). Backfill shall extend to a minimum of 1.0 feet outside the foundation footprint. The allowable bearing capacity is based on a factor of safety of 3.0. The results of the bearing capacity analysis are presented below in Table 4-2.

Table 4-2. Bearing Capacity

Bearing Layer Soil Type	Foundation Depth (feet)	Undercut w/Granular Bedding Material (feet)	Allowable Bearing Capacity (psf)
CL	2.0	0.0	1,800
No. 57 Stone / CL	2.0	2.0	2,200
No. 57 Stone / CL	2.0	3.0	2,500

Due to the presences of construction debris encountered at shallow depths throughout the site within the advanced borings, and the unknown conditions which may be exists between the boring locations, shallow foundations are only recommended for supporting lightly loaded structures.

4.1.1 Settlement Analyses

Settlement of the existing foundation soils due to increased vertical stresses directly below the proposed structures must be considered. HDR completed settlement analyses utilizing Settle3D 4.0 to estimate the magnitude and time-rate of settlement which may affect the proposed structures. Settlement parameters were derived from data collected during the subsurface investigation and laboratory testing as well as published correlations.

No foundation loading information for the proposed structures was available at the writing of this report. In order to quantify the potential for settlement, a spread footing foundation size of four (4) by twelve (60) founded 2.0 feet below the ground surface has been assumed. This settlement is based on assumed foundation loads. Settlement analyses should be performed utilizing the actual foundation loading when they become available. Sampled borings indicate the foundation soils to consist of clay with sand and lean clay with sand materials. Consolidation settlement of theses soil layers will occur over time,

and estimated times for 90 percent of the settlement to occur have been calculated. The results of the settlement analyses are presented below in Table 4-3.

Table 4-3. Settlement

Foundation Size	Assumed Foundation Load (psf)	Total Settlement (inches)	Time Rate of Consolidation, Uav = 90% (days)
4'x60'	1,000	0.72	222
4'x60'	1,250	0.82	390
4'x60'	1,500	0.91	405
4'x60'	2,000	1.06	438

4.2 Deep Foundations

Deep foundations may be an alternative to shallow foundations and/or be necessary to achieve the required bearing capacities at this site. A number of different deep foundation types could be utilized and analyzed upon request. The likely most cost effective deep foundation for site subsurface conditions is driven piles or auger cast piles.

Allowable capacity curves have been developed for HP12x53 steel piles, 12 inch steel pipe piles, 14 inch steel pipe piles and 12 inch auger cast pile sections. Both open ended and plugged pipe piles were analyzed. The axial pile analysis for driven piles was performed using the computer program APILE Plus v2018 with a factor of safety of 2.75. The auger cast pile sections were performed using Ensoft Shaft v2017 with a factor of safety of 2.5. The allowable pile capacity curves and the tabular results for the analyses are provided in Appendix D. It should be noted that the Kentucky Building Code limits deep foundation allowable pile capacities to 40 tons per foundation element. Greater allowable capacities may be achieved by performing load testing and/or pile dynamic analyzer testing, which permit lower factors of safety.

Center to center pile spacing should not be less than three (3) times the effective pile diameter.

Lateral analyses requires horizontal loading information, which was not available at the time of this report. Therefore, lateral analyses were not performed on the pile foundation alternatives presented.

5 Recommendations for Construction

5.1 Construction Monitoring

The existing nearby underground utilities and buildings should be monitored during construction of the foundations. If the monitoring program demonstrates that the new construction is adversely impacting the adjacent utilities and buildings, then it may be

necessary for the contractor to adjust the construction methods as needed to prevent damage.

Earthmoving operations and soil compaction will likely require aeration of soils to reduce moisture contents. These activities are generally not practical in wet winter and early spring months for this geographic area. In addition, all foundation and sub-grade soils must be protected against unnecessary manipulation under construction equipment which could work them into an unstable condition. A working surface over approved sub-grade for structures is recommended to have a minimum thickness of 4 inches.

Traces of construction debris were encountered during this investigation. Buried structures, miscellaneous fill materials, old utility trenches, unstable soils and other objectionable subsurface features not encountered in the borings may be present at the site. Construction should be monitored carefully to prevent the use of unstable soils within the proposed structure foundations. Foundation excavation should be inspected by a qualified geotechnical engineer or their representative prior to placing concrete to verify design bearing capacity, and to prevent seating foundations on unstable materials. Any unstable material encountered during construction excavation should be undercut to stable soils and replaced with No. 57 Stone or approved equivalent.

Groundwater was encountered during the drilling operations. Season variations in the water table should be anticipated. Foundation excavations may require dewatering and/or temporary shoring in accordance with OSHA requirements during construction.

Compaction of backfill materials should achieve 95% of maximum dry density at optimum moisture content ±2% in accordance with ASTM D 698 or AASHTO T 99, standard proctor. Representative samples of the all backfill materials shall be tested to establish the compaction requirements. Compaction shall be verified with field density tests performed by qualified soil technicians. The same compaction effort is required for pavement sub-grade soils if applicable for a depth of 8 inches.

Final earth grading should be sloped away from the proposed structures and backfilling of foundations should be compacted to the minimum requirements set forth in the specifications. In addition, the frost depth at the project site is 2.0 feet. All foundations shall be founded a minimum of 2.0 feet below finished grade.

The placement of a vapor barrier under the slabs on grade is recommended.

5.2 Excavations and Backfill Materials

During construction, the excavation for foundations should not be left open to allow the accumulation of water. Foundations should be concreted and backfilled as soon as possible after excavation is complete. If this cannot be done, a 6 inch thick slab of lean concrete shall be placed to protect the foundation supporting materials.

Any material brought from off-site borrow areas should be approved prior to delivery at the site, and shall be clean and free of any contaminated and hazardous materials. In general, acceptable materials include crushed rock, well-graded sand and gravel, and lean clay exhibiting a liquid limit of less than 45 percent and a plasticity index of less than 20 percent. Satisfactory soil materials for structural fill are defined as those complying with ASTM D

2487 soil classification groups GW, GM, SM, SW, and CL and may include GP, GC, SP, and SC soils. Soil fill should not include any rocks larger than 4 inches in diameter or any significant amount of organics or debris. Any rocks in a cohesive fill should be completely contained within a soil matrix.

Excavation must be performed in accordance with all applicable federal, state, and local standards, including OSHA 29CFR Part 1926 – Excavations and its appendices. Fill soils are to be considered Type C soil. This document states that excavation safety is the responsibility of the contractor. Reference to this OSHA requirement should be included in the project specification. Slope heights, slope inclinations and/or excavation depths should in no case exceed those specified in local, state, or federal safety regulations, including current OSHA excavation and trench safety standards. According to OSHA regulations, side slopes and/or bracing must be designed by a professional engineer for any excavations extending to a depth greater than 20 feet. Where variable fill and/or groundwater is present, flatter slopes than those required by OSHA could be required to maintain the stability of the excavations(s). It should be noted that the subsurface soil types may vary beyond the boring location.

5.3 Control Surface Water

The control of surface runoff will be necessary to prevent erosion of exposed soils, especially on slopes, and the softening of exposed subgrades in excavations. Surficial drainage of slopes, ditches, trench drains, and pumping from sumps should be used as needed to readily remove any surface water, where needed. A drainage plan to collect and control the flow of surface runoff around the construction area should be carefully thought out and implemented before site grading begins. Throughout the duration of construction, the drainage plan should be periodically reviewed and modified as needed.

6 Limitations to Report

The soil descriptions and indicated boundaries discussed and depicted in this report are based on engineering interpretation of available subsurface information obtained at selected locations and may not necessarily reflect the actual variations in subsurface conditions between borings and samples.

Should such variations become apparent during construction, it will be necessary to re-evaluate the subsurface profile based upon on-site observations of the conditions.

7 References

Kentucky Building Code, 2018; Department of Housing, Buildings, and Construction, Frankfort, Kentucky

Applied Technology Council (ATC); Seismic Hazards. Online. Accessed December 13, 2019.

Boulanger, R.W., et al (2008); Soil Liquefaction during Earthquakes; Earthquake Engineering Research Institute.

Appendix A: Boring Layout

CITY OF PADUCAH BLOCK DEVELOPMENT

KENTUCKY - MCCRACKEN COUNTY

BORING LOCATION PLAN

SUBSURFACE INVESTIGATION

PATH: G:_EBS_HDR PROJECTS\10197216 - PADUCAH CITY BLOCK DEVELOPMENT\ARCGIS\PADUCAH CITY BLOCK DEVELOPMENT - ENVIRONMENTAL BORING LOCATION PLAN.MXD - USER: TLYNN - DATE: 12/5/2019

Appendix B: Boring Logs

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08871 0** Longitude **-88.59595 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **335.5 ft**

Job No. **10197216** Dated Started **11/5/2019** Completed **11/5/2019**

Driller **N. Gonzoles** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-1** Total Depth **100 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 335.5 ft						
		CONCRETE 0.7						
		FILL		SS-1	1.5 / 3.0	1.2	5-4-3	SPT
		Medium stiff, brown, lean **CLAY** with sand						
5		4.8		SS-2	4.0 / 5.5	0.8	0-2-2	SPT
		Soft to stiff, brown, silty **CLAY** with sand		SS-3	6.5 / 8.0	1.4	0-2-4	SPT
10				SS-4	9.0 / 10.5	1.5	2-6-7	SPT
		RESIDUAL SOIL AT 12.5'						
15				SS-5	14.0 / 15.5	1.2	1-2-3	SPT
20				SS-6	19.0 / 20.5	1.5	3-5-7	SPT
		22.3						
		Loose to very dense, brown and gray, poorly graded **GRAVEL** with sand		SS-7	24.0 / 25.5	1.2	15-17-18	SPT
25								
30				SS-8	29.0 / 30.5	1.5	2-3-4	SPT
35				SS-9	33.5 / 35.0	0.5	10-13-14	SPT
40				SS-10	38.5 / 40.0	0.1	1-3-8	SPT
45				SS-11	43.5 / 45.4	0.9	50-50/0.4	SPT
50				SS-12	48.5 / 50.0	0.3	6-5-7	SPT
		51.8						
		Loose to very dense, gray and brown, silty **SAND**		SS-13	53.5 / 55.0	1.5	2-3-4	SPT
55								
60				SS-14	58.5	1.5	8-28-21	SPT

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08871 0** Longitude **-88.59595 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **335.5 ft**

Job No. **10197216** Dated Started **11/5/2019** Completed **11/5/2019**

Driller **N. Gonzoles** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-1** Total Depth **100 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
60		*Continued from previous page*	Elev. = 275.5 ft		60.0			
65				SS-15	63.5 64.4	0.9	50-50/0.4	SPT
70				SS-16	68.5 69.4	0.9	27-50/0.4	SPT
75				SS-17	73.5 74.4	0.9	48-50/0.4	SPT
80								
85				SS-18	83.5 85.0	1.5	16-31-41	SPT
90				SS-19	88.5 89.4	0.8	27-50/0.4	SPT
95				SS-20	93.5 94.8	1.3	39-41- 50/0.3	SPT
100			100.0	SS-21	98.5 100.0	1.5	7-8-18	SPT
		Boring Terminated at 100.0 ft. (Elev. 235.5)						
105		***NOTES*** Boring offset from original location						
110								
115								
120								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08863 0** Longitude **-88.59591 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **334.8 ft**

Job No. **10197216** Dated Started **11/4/2019** Completed **11/4/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-2** Total Depth **40.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 334.8 ft						
		CONCRETE 0.7						
		FILL Soft to stiff, red and brown, lean **CLAY** with sand		SS-1	1.5 – 3.0	0.3	6-2-5	SPT
5				SS-2	4.0 – 5.5	1.1	1-1-3	SPT
		6.0 **RESIDUAL SOIL** Very soft to stiff, gray and brown, silty **CLAY** with sand		SS-3	6.5 – 8.0	1.2	0-0-0	SPT
10				SS-4	9.0 – 10.5	1.2	0-1-4	SPT
15				SS-5	14.0 – 15.5	1.5	2-4-5	SPT
20				SS-6	19.0 – 20.5	1.5	3-4-4	SPT
25				SS-7	24.0 – 25.5	1.5	2-3-4	SPT
30				SS-8	29.0 – 30.5	1.5	1-3-6	SPT
		32.3 Medium dense to dense, brown, poorly graded **GRAVEL** with sand		SS-9	34.0 – 35.5	0.7	18-15-12	SPT
35								
40		40.5		SS-10	39.0 – 40.5	1.0	29-23-17	SPT
		Boring Terminated at 40.5 ft. (Elev. 294.3)						
45								
50								
55								
60								

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08912 0** Longitude **-88.59494 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **334.2 ft**

Job No. **10197216** Dated Started **11/6/2019** Completed **11/6/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-3** Total Depth **80 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 334.2 ft						
		CONCRETE 0.6						
		FILL Very stiff to hard, gray, lean **CLAY** with sand		SS-1	1.5 – 3.0		19-10-7	SPT
5				SS-2	4.0 – 5.5		1-4-12	SPT
				SS-3	6.5 – 8.0		5-4-46	SPT
10		10.0		SS-4	9.0 – 10.5		1-2-3	SPT
		RESIDUAL SOIL Medium stiff to hard, brown, dark brown and gray, silty **CLAY** with sand						
15				SS-5	14.0 – 15.5		6-8-11	SPT
20				SS-6	19.0 – 20.5		7-12-22	SPT
25				SS-7	24.0 – 25.5		6-11-14	SPT
		27.3 Very loose to dense, brown, poorly graded **GRAVEL** with sand						
30				SS-8	29.0 – 30.5		1-0-0	SPT
35				SS-9	33.5 – 35.0		8-16-31	SPT
40				SS-10	38.5 – 40.0		3-5-27	SPT
45				SS-11	43.5 – 45.0		2-0-2	SPT
50				SS-12	48.5 – 50.0		9-0-0	SPT
55				SS-13	53.5 – 55.0		5-4-7	SPT
		57.5 Very dense, light gray and brown, silty **SAND**						
60				SS-14	58.5		8-32-	SPT

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08912 0** Longitude **-88.59494 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **334.2 ft**

Job No. **10197216** Dated Started **11/6/2019** Completed **11/6/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-3** Total Depth **80 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
60		*Continued from previous page*	Elev. = 274.2 ft		59.9		50/0.4	
65				SS-15	63.5 64.4		30-50/0.4	SPT
70				SS-16	68.5 69.3		50-50/0.3	SPT
75				SS-17	73.5 74.4		38-50/0.4	SPT
80			80.0	SS-18	78.5 79.4		32-50/0.4	SPT
85		Boring Terminated at 80.0 ft. (Elev. 254.2)						
90		***NOTES*** Boring offset from original location Split spoons at 3.0', 8.0' and 55.0' resulted in no recovery						
95								
100								
105								
110								
115								
120								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08904 0** Longitude **-88.59484 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **334.3 ft**

Job No. **10197216** Dated Started **10/28/2019** Completed **10/28/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-4** Total Depth **40 ft.** Depth to Water **8.6 ft.** Date Measured **10/29/2019**

Lithology Depth	Lithology Symbol	Description (Overburden / Rock Core)	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 334.3 ft					
		CONCRETE 0.4					
		FILL Medium stiff, brown, lean **CLAY** with sand	SS-1	1.5 / 3.0	1.0	1-2-4	SPT
5			SS-2	4.0 / 6.0	0.4	1-3-3	SPT
		Soft to medium stiff, black and brown, lean **CLAY** with sand	SS-3	6.5 / 8.0	0.2	1-3-2	SPT
10			SS-4	8.5 / 10.0	0.5	1-2-1	SPT
		12.3					
		RESIDUAL SOIL Very stiff to hard, brown, silty **CLAY** with sand	SS-5	14.0 / 15.5	1.5	3-8-11	SPT
20			SS-6	19.0 / 20.5	1.3	4-10-18	SPT
25			SS-7	24.0 / 25.5	1.4	7-15-20	SPT
		27.3					
		Dense to very dense, brown, poorly graded **GRAVEL** with sand	SS-8	29.0 / 30.5	1.5	2-9-21	SPT
35			SS-9	33.5 / 35.0	0.8	15-29-40	SPT
			SS-10	38.5 / 40.0	0.5	15-22-14	SPT
40		40.0					
		Boring Terminated at 40.0 ft. (Elev. 294.3)					
45		***NOTES*** No PID readings identified					
50		Collected sample No. CBPSB04010406 at 1345 on 10/28/2019 from 4.0'-6.0'.					
		Collected sample No. CBPSB04012830 at 1448 on 10/28/2019 from 28.0'-30.0'.					
55							
60							

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 2

State **Kentucky** Latitude **37.08876 0** Longitude **-88.59571 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.4 ft**

Job No. **10197216** Dated Started **10/29/2019** Completed **11/4/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-5** Total Depth **39.9 ft.** Depth to Water **20.9 ft.** Date Measured **11/4/2019**

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 336.4 ft						
		CONCRETE 0.6						
		RESIDUAL SOIL Stiff, brown, lean **CLAY** with sand		SS-1	1.5 3.0	0.0	8-9-5	SPT
5				SS-2	4.0 5.5	0.1	12-8-4	SPT
		6.0 Soft to very stiff, brown, silty **CLAY** with sand		SS-3	6.5 8.0	1.2	1-1-2	SPT
10				SS-4	9.0 10.5	1.5	2-4-6	SPT
15				SS-5	14.0 15.5	1.5	3-3-4	SPT
20				SS-6	19.0 20.5	1.5	4-7-9	SPT
25				SS-7	24.0 25.5	0.9	7-5-4	SPT
		27.3 Medium dense to very dense, brown and dark brown, poorly graded **GRAVEL** with sand		SS-8	29.0 30.5	1.1	4-13-15	SPT
30								
35				SS-9	33.5 35.0	1.5	25-36-41	SPT
40		39.9 Boring Terminated at 39.9 ft. (Elev. 296.5)		SS-10	38.5 39.9	1.1	19-32-50/0.4	SPT
45		***NOTES*** Split spoon at 1.5' resulted in no recovery						
50		No PID readings identified						
		Metals composite 1.5'-7.0'						
55		Collected sample No. CBPSB05010608 at 1505 on 10/29/2019 from 6.0'-8.0'.						
		Collected sample No. CBPSB05012225 at 1029 on						
60								

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08876 0** Longitude **-88.59571 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.4 ft**

Job No. **10197216** Dated Started **10/29/2019** Completed **11/4/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-5** Total Depth **39.9 ft.** Depth to Water **20.9 ft.** Date Measured **11/4/2019**

Lithology			Overburden	Sample No.	Depth	Rec. (ft.)	Blows	Type
Depth	Symbol	Description	Rock Core	Core No.	Run	Rec (ft.)	Rec. (%)	RQD (%)
60		*Continued from previous page* Elev. = 276.4 ft						
		10/29/2019 from 22.0'-25.0'.						
65		Collected sample No. CBPSB0501GW at 0730 on 10/30/2019.						
70								
75								
80								
85								
90								
95								
100								
105								
110								
115								
120								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08885** ⁰ Longitude **-88.59548** ⁰

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.4 ft**

Job No. **10197216** Dated Started **11/4/2019** Completed **11/4/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-6** Total Depth **40.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 336.4 ft						
		CONCRETE 0.5						
		FILL Very soft to hard, dark brown, lean **CLAY** with sand		SS-1	1.5 – 3.0	0.1	14-5-19	SPT
5				SS-2	4.0 – 5.5	0.3	50-9-5	SPT
				SS-3	6.5 – 8.0	0.1	0-0-0	SPT
10				SS-4	9.0 – 10.0	0.1	0-50/0.5	SPT
		12.0						
		RESIDUAL SOIL Soft to hard, brown, silty **CLAY** with sand		SS-5	14.0 – 15.5	1.1	3-2-2	SPT
15								
20				SS-6	19.0 – 20.5	1.5	1-4-6	SPT
25				SS-7	24.0 – 25.5	0.9	5-15-18	SPT
		27.3						
		Medium dense to dense, brown, poorly graded **GRAVEL** with sand		SS-8	29.0 – 30.5	0.8	3-13-31	SPT
30								
35				SS-9	34.0 – 35.5	1.5	1-3-15	SPT
				SS-10	39.0 – 40.5	0.3	2-7-26	SPT
40		40.5						
		Boring Terminated at 40.5 ft. (Elev. 295.9)						
45								
50								
55								
60								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08898 0** Longitude **-88.59517 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **335.4 ft**

Job No. **10197216** Dated Started **10/29/2019** Completed **10/29/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-7** Total Depth **40 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 335.4 ft						
		CONCRETE 0.5						
		FILL Very soft to medium stiff, gray and brown, lean **CLAY** with sand		SS-1	1.5 / 3.0	0.4	2-2-3	SPT
5				SS-2	4.0 / 5.5	0.3	3-1-3	SPT
				SS-3	6.5 / 7.0	0.0	2-1-1	SPT
		8.5						
10		**RESIDUAL SOIL** Medium stiff to very stiff, brown, silty **CLAY** with sand		SS-4	9.0 / 10.5	0.3	50-10-4	SPT
15				SS-5	14.0 / 15.5	1.4	1-3-5	SPT
20				SS-6	19.0 / 20.5	1.2	3-6-10	SPT
25				SS-7	24.0 / 25.5	1.4	4-8-14	SPT
		27.3						
30		Loose to very dense, brown, poorly graded **GRAVEL** with sand		SS-8	29.0 / 30.5	0.9	11-21-43	SPT
35				SS-9	33.5 / 35.0	0.7	11-26-15	SPT
40		40.0		SS-10	38.5 / 40.0	0.9	3-4-5	SPT
		Boring Terminated at 40.0 ft. (Elev. 295.4)						
45		***NOTES*** Split spoon at 6.5' resulted in no recovery						
50								
55								
60								

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08801 0** Longitude **-88.59526 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **337.8 ft**

Job No. **10197216** Dated Started **11/14/2019** Completed **11/15/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-8** Total Depth **79.2 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 337.8 ft						
		CONCRETE 0.7						
		FILL		SS-1	1.5 / 3.0	1.0	2-3-6	SPT
		Stiff, brown, sandy fat **CLAY** 3.5						
5		Very stiff, brown and gray, lean **CLAY** with sand		SS-2	4.0 / 5.5	0.9	2-11-15	SPT
		6.0 **RESIDUAL SOIL**		SS-3	6.5 / 8.0	1.3	4-7-11	SPT
		Stiff to very stiff, brown, lean **CLAY** with sand						
10				SS-4	9.0 / 10.5	1.5	2-6-7	SPT
15				SS-5	14.0 / 15.5	1.5	3-4-8	SPT
20				ST-1	19.0 / 21.0	1.0	50	ST
		22.5 Medium dense, brown, poorly graded **SAND** with clay and gravel (and/or silty clay and gravel)						
25				SS-6	24.0 / 25.5	1.3	7-5-6	SPT
		26.9 Very dense, brown, well-graded **SAND** with clay and gravel (and/or silty clay and gravel)						
30				SS-7	28.3 / 29.8	1.2	18-31-47	SPT
35				SS-8	33.3 / 34.8	0.9	27-26-32	SPT
40				SS-9	38.3 / 39.8	0.4	9-27-33	SPT
		41.6 Very loose to loose, gray and grayish brown, silty **SAND**						
45				SS-10	43.3 / 44.8	0.2	5-4-5	SPT
50				SS-11	48.3 / 49.8	0.5	1-1-2	SPT
55				SS-12	53.3 / 54.8	0.4	2-4-4	SPT
60				SS-13	58.3	1.5	2-4-6	SPT

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08801 0** Longitude **-88.59526 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **337.8 ft**

Job No. **10197216** Dated Started **11/14/2019** Completed **11/15/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-8** Total Depth **79.2 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
60		*Continued from previous page*	Elev. = 277.8 ft		59.8			
			61.6					
		Dense to very dense, gray, silty **SAND**			63.3			
65				SS-14	64.8	1.3	21-25-14	SPT
					68.3			
70				SS-15	69.6	1.3	25-44-50/0.3	SPT
					73.3			
75				SS-16	74.6	0.9	19-49-50/0.3	SPT
			79.2	SS-17	78.3 79.2	0.3	48-50/0.4	SPT
80		Boring Terminated at 79.2 ft. (Elev. 258.6)						
		NOTES Boring offset from original location						
85								
90								
95								
100								
105								
110								
115								
120								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08805 0** Longitude **-88.59549 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **337.1 ft**

Job No. **10197216** Dated Started **11/15/2019** Completed **11/15/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-9** Total Depth **40.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line*	Elev. = 337.1 ft					
		CONCRETE	0.5					
		RESIDUAL SOIL Stiff, brown, gray and black, sandy fat **CLAY**		SS-1	1.5 – 3.0	1.4	2-5-7	SPT
5				SS-2	4.0 – 5.5	1.2	2-6-7	SPT
			6.0	SS-3	6.5 – 8.0	1.4	2-5-4	SPT
		Medium stiff to hard, brown, lean **CLAY** with sand						
10				SS-4	9.0 – 10.5	1.3	1-2-4	SPT
15				SS-5	14.0 – 15.5	1.5	2-3-5	SPT
20				ST-1	19.0 – 19.4	0.4	100	ST
25				SS-6	24.0 – 25.5	1.2	17-29-28	SPT
30				SS-7	29.0 – 30.5	1.5	26-36-35	SPT
			32.3					
35		Medium dense to very dense, brown, poorly graded **SAND** with clay and gravel (and/or silty clay and gravel)		SS-8	34.0 – 34.9	0.9	26-50/0.4	SPT
40			40.5	SS-9	39.0 – 40.5	1.5	20-12-5	SPT
		Boring Terminated at 40.5 ft. (Elev. 296.6)						
45		***NOTES*** Boring offset from original location						
50								
55								
60								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08818 0** Longitude **-88.59508 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.9 ft**

Job No. **10197216** Dated Started **11/11/2019** Completed **11/11/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-10** Total Depth **40.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 336.9 ft						
		CONCRETE 0.5						
		RESIDUAL SOIL Stiff to very stiff, brown and gray, sandy fat **CLAY**		SS-1	2.3 3.8	0.8	3-13-8	SPT
5				SS-2	4.0 5.5	1.0	4-10-15	SPT
				SS-3	7.0 8.5	1.5	2-3-7	SPT
		8.8						
10		Medium stiff to stiff, brown, lean **CLAY** with sand		SS-4	9.0 10.5	1.1	2-5-7	SPT
15				SS-5	14.0 15.5	1.5	1-2-4	SPT
		17.3						
		Medium dense to very dense, brown, poorly graded **SAND** with clay and gravel (and/or silty clay and gravel)		ST-1	19.0 21.0	2.0	100	ST
20								
25				SS-6	24.0 25.5	1.1	1-8-18	SPT
30				SS-7	29.0 30.5	1.5	21-36-50	SPT
		32.8						
		Dense to very dense, brown, well-graded **SAND** with clay and gravel (and/or silty clay and gravel)		SS-8	34.0 35.5	1.2	38-50-42	SPT
35								
40				SS-9	39.0 40.5	1.5	5-18-14	SPT
		40.5						
		Boring Terminated at 40.5 ft. (Elev. 296.4)						
45		***NOTES*** Boring offset from original location						
50								
55								
60								

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08813 0** Longitude **-88.59507 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.7 ft**

Job No. **10197216** Dated Started **11/13/2019** Completed **11/13/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **22 ft.**

Hole Number **B-11** Total Depth **40.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description (Overburden / Rock Core)	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 336.7 ft					
		CONCRETE 1.5'	SS-1	1.5 1.8	0.0		SPT
		RESIDUAL SOIL Stiff to hard, brown and gray, sandy fat **CLAY**	SS-2	2.8	1.3	3-6-8	SPT
5			SS-3	4.3 5.8	1.4	2-6-7	SPT
		6.2' Medium stiff to stiff, brown, lean **CLAY** with sand	SS-4	6.5 8.0	1.4	1-3-4	SPT
10			SS-5	9.0 10.5	1.5	1-3-5	SPT
15			SS-6	14.0 15.5	1.5	2-3-5	SPT
20			SS-7	19.0 20.5	1.4	4-4-11	SPT
		22.3' Dense to very dense, brown, poorly graded **SAND** with clay and gravel (and/or silty clay and gravel)	SS-8	24.0 25.5	1.2	5-20-21	SPT
25							
30			SS-9	29.0 30.5	1.4	21-40-35	SPT
		32.3' Dense to very dense, brown, well-graded **SAND** with clay and gravel (and/or silty clay and gravel)	SS-10	34.0 35.5	1.5	26-38-30	SPT
35							
40		40.5' Boring Terminate at 40.5 ft. (Elev. 296.2)	SS-11	39.0 40.5	1.5	8-18-20	SPT
45		***NOTES*** Boring offset from original location Water well located 60 ft. West of B-11 Currently patched with asphalt pavement, notes settlement issues Collected sample No. CBPSB11010206 at 0830 on 11/13/2019 from 2.0'-6.0'. Collected sample No. CBPSB11020206 at 0830 on					
50							
55							
60							

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08813 0** Longitude **-88.59507 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.7 ft**

Job No. **10197216** Dated Started **11/13/2019** Completed **11/13/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **22 ft.**

Hole Number **B-11** Total Depth **40.5 ft.** Depth to Water **N/A** Date Measured

Lithology		Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
Depth	Symbol							
60		*Continued from previous page* Elev. = 276.7 ft						
		11/13/2019 from 2.0'-6.0'.						
65		Collected sample No. CBPSB11012426 at 0920 on 11/13/2019 from 24.0'-26.0'.						
70		Collected sample No. CBPSB1101GW, VOG, SVOG, F/U Metals at 1130 on 11/13/2019.						
		Collected sample No. CBPSB1102GW, VOG, SVOG at 1130 on 11/13/2019.						
75								
80								
85								
90								
95								
100								
105								
110								
115								
120								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08823 [0]** Longitude **-88.59497 [0]**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.6 ft**

Job No. **10197216** Dated Started **11/12/2019** Completed **11/12/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-12** Total Depth **40.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 336.6 ft						
		CONCRETE 0.6						
		FILL Soft to stiff, brown and brownish gray, lean **CLAY** with sand		SS-1	2.3 – 3.8	0.6	3-6-5	SPT
5				SS-2	4.0 – 5.5	0.5	4-2-1	SPT
		6.5 **RESIDUAL SOIL** Medium stiff to stiff, gray and brownish gray, lean **CLAY** with sand		SS-3	7.4 – 8.9	1.5	2-3-4	SPT
10				SS-4	9.0 – 10.5	1.5	1-2-3	SPT
15				SS-5	14.0 – 15.5	1.5	3-7-7	SPT
		17.3 Medium dense to very dense, brown, poorly graded **SAND** with clay and gravel (and/or silty clay and gravel)		ST-1	19.0 – 21.0	2.0	100	ST
20								
25				SS-6	24.0 – 25.5	0.7	3-8-17	SPT
30				SS-7	29.0 – 30.5	1.1	15-24-36	SPT
		32.3 Dense to very dense, brown, well-graded **SAND** with clay and gravel (and/or silty clay and gravel)		SS-8	34.0 – 34.8	0.8	48-50/0.3	SPT
35								
40				SS-9	39.0 – 40.5	0.8	38-22-11	SPT
		40.5 Boring Terminated at 40.5 ft. (Elev. 296.1)						
45		***NOTES*** Boring offset from original location						
50								
55								
60								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08821** ⁰ Longitude **-88.59488** ⁰
County **McCracken** Location
Project Name **Paducah City Block Development** Surface Elevation **336 ft**
Job No. **10197216** Dated Started **11/12/2019** Completed **11/12/2019**
Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**
Hole Number **B-13** Total Depth **40.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 336.0 ft						
		CONCRETE 0.6						
		RESIDUAL SOIL Stiff to very stiff, brown and brownish gray, lean **CLAY** with sand		SS-1	2.3 – 3.8	1.0	1-4-6	SPT
5				SS-2	4.0 – 5.5	1.1	4-8-10	SPT
		6.4 Very stiff, brown, gray and brownish gray, sandy fat **CLAY**		SS-3	7.3 – 8.8	1.0	5-10-15	SPT
10				SS-4	9.0 – 10.5	1.1	0-10-14	SPT
		12.3 Stiff, brown, lean **CLAY** with sand		SS-5	14.0 – 15.5	1.5	2-5-6	SPT
15								
		17.3 Very dense, brown, poorly graded **SAND** with clay and gravel (and/or silty clay and gravel)		ST-1	19.0 – 21.0	1.6	80	ST
20								
				SS-6	24.0 – 25.5	1.5	17-28-25	SPT
25								
				SS-7	29.0 – 30.5	1.1	13-24-29	SPT
30		32.3 Dense to very dense, brown, well-graded **SAND** with clay and gravel (and/or silty clay and gravel)						
				SS-8	34.0 – 35.5	1.5	30-43-47	SPT
35								
				SS-9	39.0 – 40.5	1.5	10-19-21	SPT
40		40.5 Boring Terminated at 40.5 ft. (Elev. 295.5)						
		NOTES Boring offset from original location						
45								
50								
55								
60								

SUBSURFACE INVESTIGATION
BORING LOG

Sheet No. 1 of 1

State **Kentucky** Latitude **37.08842 0** Longitude **-88.59450 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.7 ft**

Job No. **10197216** Dated Started **11/13/2019** Completed **11/13/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-14** Total Depth **40.5 ft.** Depth to Water **26.9 ft.** Date Measured **11/14/2019**

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 336.7 ft						
		CONCRETE 1.5'						
		RESIDUAL SOIL Very stiff, brown and gray, sandy fat **CLAY**		SS-1	1.5 – 3.0	1.2	2-8-10	SPT
5				SS-2	4.0 – 5.5	1.2	3-8-11	SPT
		6.0' Stiff to very stiff, brown and gray, lean **CLAY** with sand		SS-3	6.5 – 8.0	1.4	2-5-8	SPT
10				SS-4	9.0 – 10.5	1.3	1-5-7	SPT
15				SS-5	14.0 – 15.5	1.5	2-6-6	SPT
20				SS-6	19.0 – 20.5	1.4	2-7-11	SPT
25				SS-7	24.0 – 25.5	1.5	5-8-11	SPT
30				SS-8	29.0 – 30.5	1.3	13-40-46	SPT
		32.3' Very dense, brown, well-graded **SAND** with clay and gravel (and/or silty clay and gravel)		SS-9	34.0 – 35.4	1.4	43-49-50/0.4	SPT
35								
40		40.5' Boring Terminate at 40.5 ft. (Elev. 296.2)		SS-10	39.0 – 40.5	1.2	46-45-40	SPT
45		***NOTES*** Boring offset from original location						
50		Collected sample No. CBPSB14010206 at 1230 on 11/13/2019 from 2.0'-6.0'.						
		Collected sample No. CBPSB14012830 at 1345 on 11/13/2019 from 28.0'-30.0'.						
55		Collected sample No. CBPSB1401GW at 0730 on 11/14/2019.						
60								

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08833 °** Longitude **-88.59445 °**
County **McCracken** Location
Project Name **Paducah City Block Development** Surface Elevation **336.3 ft**
Job No. **10197216** Dated Started **11/13/2019** Completed **11/14/2019**
Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**
Hole Number **B-15** Total Depth **79.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
0		*Ground Line* Elev. = 336.3 ft						
		RESIDUAL SOIL Medium stiff to stiff, brown, sandy fat **CLAY**		SS-1	1.5 3.0	1.3	2-3-5	SPT
5				SS-2	4.0 5.5	1.5	3-7-8	SPT
				SS-3	6.5 8.0	1.4	2-3-7	SPT
		8.5 Medium stiff to very stiff, brown, lean **CLAY** with sand		SS-4	9.0 10.5	1.5	1-3-5	SPT
10								
15				SS-5	14.0 15.5	1.5	2-5-7	SPT
20				ST-1	19.0 21.0	2.0	100	ST
25				SS-6	24.0 25.5	1.4	4-10-12	SPT
		27.3 Medium dense to very dense, brown, poorly graded **SAND** with clay and gravel (and/or silty clay and gravel)		SS-7	29.0 30.5	1.0	7-13-14	SPT
30				SS-8	33.5 35.0	0.9	28-50-47	SPT
35		36.8 Dense to very dense, brown, well-graded **SAND** with clay and gravel (and/or silty clay and gravel)		SS-9	38.5 40.0	0.6	14-18-21	SPT
40				SS-10	43.5 45.0	0.8	4-33-39	SPT
45		46.8 Loose to very dense, gray, silty **SAND**		SS-11	48.5 50.0	0.8	6-4-5	SPT
50				SS-12	53.5 55.0	0.0	3-4-7	SPT
55				SS-13	58.5	1.5	4-6-10	SPT
60								

SUBSURFACE INVESTIGATION
BORING LOG

State **Kentucky** Latitude **37.08833 0** Longitude **-88.59445 0**

County **McCracken** Location

Project Name **Paducah City Block Development** Surface Elevation **336.3 ft**

Job No. **10197216** Dated Started **11/13/2019** Completed **11/14/2019**

Driller **N. Gonzales** Logged by **J. Hilt** Depth to Water: Immediate **N/A**

Hole Number **B-15** Total Depth **79.5 ft.** Depth to Water **N/A** Date Measured

Lithology Depth	Lithology Symbol	Description	Overburden / Rock Core	Sample No. / Core No.	Depth / Run	Rec. (ft.) / Rec (ft.)	Blows / Rec. (%)	Type / RQD (%)
60		*Continued from previous page*	Elev. = 276.3 ft		60.0			
65				SS-14	63.5 65.0	1.1	7-12-14	SPT
70				SS-15	68.5 69.5	1.0	49-50/0.5	SPT
75				SS-16	73.5 75.0	1.3	25-24-29	SPT
80		Boring Terminated at 79.5 ft. (Elev. 256.8)	79.5	SS-17	78.5 79.5	1.0	21-50/0.5	SPT
85		***NOTES*** Split spoon at 53.5' resulted in no recovery						
90								
95								
100								
105								
110								
115								
120								

Appendix C: Laboratory Testing

Project Name : Paducah Downtown Devolopment
Location : McCracken County, Kentucky
Job Number : 10197216

Moisture Data

(AASHTO T255-T265 / ASTM C566-D2216)

Soil No.	Boring No.	Station & Offset	Sample No.	Depth		Description of Soil	pH	Natural Moisture Content (%)
1	B-1		SS-1	1.5	3.0	Brown Lean Clay with Sand		18.6
3			SS-2	6.5	8.0	Brown Silty Clay with Sand		25.5
3			SS-3	6.5	8.0	Brown Silty Clay with Sand		19.2
3			SS-4	9.0	10.5	Brown Silty Clay with Sand		18.7
3			SS-5	14.0	15.5	Brown Silty Clay with Sand		21.7
3			SS-6	19.0	20.5	Brown Silty Clay with Sand		15.5
4			SS-7	24.0	25.5	Brown Poorly Graded Gravel with Sand		17.2
4			SS-8	29.0	30.5	Brown Poorly Graded Gravel with Sand		19.9
4			SS-9	33.5	35.0	Brown Poorly Graded Gravel with Sand		19.5
4			SS-10	38.5	40.0	Brown & Gray Poorly Graded Gravel with Sand		27.5
4			SS-11	43.5	45.0	Brown Poorly Graded Gravel with Sand		14.5
4			SS-12	48.5	50.0	Brown & Gray Poorly Graded Gravel with Sand		35.4
6			SS-13	53.5	55.0	Gray & Brown Silty Sand		31.3
6			SS-14	58.5	60.0	Gray Silty Sand		31.6
6			SS-15	63.5	64.5	Gray Silty Sand		27.5
6			SS-16	68.5	69.5	Gray Silty Sand		39.5
6			SS-17	73.5	74.5	Gray Silty Sand		29.4
6			SS-18	83.5	85.0	Gray Silty Sand		31.4
6			SS-19	88.5	89.5	Gray Silty Sand		32.9
6			SS-20	93.5	95.0	Gray Silty Sand		27.5
6			SS-21	98.5	100.0	Gray Silty Sand		31.4
1	B-2		SS-1	1.5	3.0	Red & Brown Lean Clay with Sand		10.5
1			SS-2	4.0	5.5	Brown Lean Clay with Sand		25.1
3			SS-3	6.5	8.0	Gray Silty Clay with Sand		26.6
3			SS-4	9.0	10.5	Gray Silty Clay with Sand		22.3
3			SS-5	14.0	15.5	Gray Silty Clay with Sand		19.8
3			SS-6	19.0	20.5	Brown Silty Clay with Sand		15.4
3			SS-7	24.0	25.5	Brown Silty Clay with Sand		23.4
3			SS-8	29.0	30.5	Brown Silty Clay with Sand		20.6
4			SS-9	34.0	35.5	Brown Poorly Graded Gravel with Sand		15.2
4			SS-10	39.0	40.5	Brown Poorly Graded Gravel with Sand		17.5
	B-3		SS-1	3.0	4.5	No Sample		
2			SS-2	5.5	7.0	Gray Lean Clay with Sand		22.4
			SS-3	8.0	9.5	No Sample		
3			SS-4	10.5	12.0	Brown Silty Clay with Sand		22.9
3			SS-5	14.0	15.5	Brown, Dark Brown & Gray Silty Clay with Sand		19.5
3			SS-6	19.0	20.5	Brown Silty Clay with Sand		18.6
3			SS-7	24.0	25.5	Brown Silty Clay with Sand		20.0
4			SS-8	29.0	30.5	Brown Poorly Graded Gravel with Sand		23.1
4			SS-9	33.5	35.0	Brown Poorly Graded Gravel with Sand		22.9
4			SS-10	38.5	40.0	Brown Poorly Graded Gravel with Sand		21.5
4			SS-11	43.5	45.0	Brown Poorly Graded Gravel with Sand		18.3
4			SS-12	48.5	50.0	Brown Poorly Graded Gravel with Sand		19.0
			SS-13	55.0	56.5	No Sample		
5			SS-14	58.5	60.0	Light Gray Silty Sand		25.1
5			SS-15	63.5	64.5	Light Gray Silty Sand		21.2
5			SS-16	68.5	69.5	Brown Silty Sand		23.7
5			SS-17	73.5	74.5	Brown Silty Sand		27.7
5			SS-18	78.5	79.5	Brown Silty Sand		27.8
2	B-4		SS-1	1.5	3.0	Brown Lean Clay with Sand		22.0
2			SS-2	4.0	5.5	Brown Lean Clay with Sand		20.9
1			SS-3	6.5	8.0	Black Lean Clay with Sand		26.8
1			SS-4	9.0	10.5	Brown Lean Clay with Sand		25.0
3			SS-5	14.0	15.5	Brown Silty Clay with Sand		19.5
3			SS-6	19.0	20.5	Brown Silty Clay with Sand		16.3

Project Name : Paducah Downtown Devoloment
Location : McCracken County, Kentucky
Job Number : 10197216

Moisture Data

(AASHTO T255-T265 / ASTM C566-D2216)

Soil No.	Boring No.	Station & Offset	Sample No.	Depth		Description of Soil	pH	Natural Moisture Content (%)
3			SS-7	24.0	25.5	Brown Silty Clay with Sand		22.1
4			SS-8	29.0	30.5	Brown Poorly Graded Gravel with Sand		19.2
4			SS-9	33.5	35.0	Brown Poorly Graded Gravel with Sand		16.1
4			SS-10	38.5	40.0	Brown Poorly Graded Gravel with Sand		17.9
	B-5		SS-1	1.5	3.0	No Sample		
2			SS-2	4.0	5.5	Brown Lean Clay with Sand		22.4
3			SS-3	6.5	8.0	Brown Silty Clay with Sand		20.1
3			SS-4	9.0	10.5	Brown Silty Clay with Sand		22.1
3			SS-5	14.0	15.5	Brown Silty Clay with Sand		19.2
3			SS-6	19.0	20.5	Brown Silty Clay with Sand		20.2
3			SS-7	24.0	25.5	Brown Silty Clay with Sand		22.7
4			SS-8	29.0	30.5	Brown Poorly Graded Gravel with Sand		16.9
4			SS-9	33.5	35.0	Brown Poorly Graded Gravel with Sand		16.8
4			SS-10	38.5	39.9	Dark Brown Poorly Graded Gravel with Sand		15.0
1	B-6		SS-1	1.5	3.0	Dark Brown Lean Clay with Sand		15.9
1			SS-2	4.0	5.5	Dark Brown Lean Clay with Sand		18.5
1			SS-3	6.5	8.0	Dark Brown Lean Clay with Sand		19.7
1			SS-4	9.0	10.0	Dark Brown Lean Clay with Sand		27.6
3			SS-5	14.0	15.5	Brown Silty Clay with Sand		22.3
3			SS-6	19.0	20.5	Brown Silty Clay with Sand		20.6
3			SS-7	24.0	25.5	Brown Silty Clay with Sand		12.6
4			SS-8	29.0	30.5	Brown Poorly Graded Gravel with Sand		14.9
4			SS-9	34.0	35.5	Brown Poorly Graded Gravel with Sand		33.8
4			SS-10	39.0	40.5	Brown Poorly Graded Gravel with Sand		15.0
1	B-7		SS-1	1.5	3.0	Gray Lean Clay with Sand		13.1
1			SS-2	4.0	5.5	Brown Lean Clay with Sand		24.7
			SS-3	6.5	8.0	No Sample		
3			SS-4	9.0	10.5	Brown Silty Clay with Sand		20.7
3			SS-5	14.0	15.5	Brown Silty Clay with Sand		21.1
3			SS-6	19.0	20.5	Brown Silty Clay with Sand		19.5
3			SS-7	24.0	25.5	Brown Silty Clay with Sand		19.5
4			SS-8	29.0	30.5	Brown Poorly Graded Gravel with Sand		15.5
4			SS-9	33.5	35.0	Brown Poorly Graded Gravel with Sand		17.7
4			SS-10	38.5	40.0	Brown Poorly Graded Gravel with Sand		22.8
8	B-8		SS-1	1.5	3.0	Brown Sandy Fat Clay		24.8
7			SS-2	4.0	5.5	Brown & Gray Lean Clay with Sand		18.0
9			SS-3	6.5	8.0	Brown Lean Clay with Sand		16.8
9			SS-4	9.0	10.5	Brown Lean Clay with Sand		17.3
9			SS-5	14.0	15.5	Brown Lean Clay with Sand		21.6
9			ST-1	19.0	21.0	Brown Lean Clay with Sand		
10			SS-6	24.0	25.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		20.6
11			SS-7	28.3	29.8	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		16.5
11			SS-8	33.3	34.8	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		15.9
11			SS-9	38.3	39.8	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		25.6
12			SS-10	43.3	44.8	Gray Silty Sand		23.9
12			SS-11	48.3	49.8	Grayish Brown Silty Sand		34.7
12			SS-12	53.3	54.8	Gray Silty Sand		35.3
12			SS-13	58.3	59.8	Gray Silty Sand		43.0
13			SS-14	63.3	64.8	Gray Silty Sand		23.4
13			SS-15	68.3	69.6	Gray Silty Sand		31.1
13			SS-16	73.3	74.6	Gray Silty Sand		28.3
13			SS-17	78.3	79.2	Gray Silty Sand		34.0
8	B-9		SS-1	1.5	3.0	Brown Sandy Fat Clay		24.7
8			SS-2	4.0	5.5	Brown, Gray & Black Sandy Fat Clay		21.6
9			SS-3	6.5	8.0	Brown Lean Clay with Sand		17.7
9			SS-4	9.0	10.5	Brown Lean Clay with Sand		18.1
9			SS-5	14.0	15.5	Brown Lean Clay with Sand		20.3
9			ST-1	19.0	19.4	Brown Lean Clay with Sand		
9			SS-6	24.0	25.5	Brown Lean Clay with Sand		14.6

Project Name : Paducah Downtown Devoloment
Location : McCracken County, Kentucky
Job Number : 10197216

Moisture Data

(AASHTO T255-T265 / ASTM C566-D2216)

Soil No.	Boring No.	Station & Offset	Sample No.	Depth		Description of Soil	pH	Natural Moisture Content (%)
9			SS-7	29.0	30.5	Brown Lean Clay with Sand		13.4
10			SS-8	34.0	34.9	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		16.8
10			SS-9	39.0	40.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		15.8
8	B-10		SS-1	2.3	3.8	Brown Sandy Fat Clay		21.2
8			SS-2	4.0	5.5	Brown & Gray Sandy Fat Clay		19.5
8			SS-3	7.0	8.5	Brown & Gray Sandy Fat Clay		20.1
9			SS-4	9.0	10.5	Brown Lean Clay with Sand		15.3
9			SS-5	14.0	15.5	Brown Lean Clay with Sand		21.1
10			ST-1	19.0	21.0	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		
10			SS-6	24.0	25.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		16.2
10			SS-7	29.0	31.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		15.8
11			SS-8	34.0	35.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		17.8
11			SS-9	39.0	39.8	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		14.5
11			SS-9A	39.8	40.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		26.4
	B-11		SS-1	1.5	2.8	No Sample		
8			SS-2	2.8	4.3	Brown Sandy Fat Clay		24.7
8			SS-3	4.3	5.8	Brown & Gray Sandy Fat Clay		23.2
9			SS-4	6.5	8.0	Brown Lean Clay with Sand		19.2
9			SS-5	9.0	10.5	Brown Lean Clay with Sand		19.0
9			SS-6	14.0	15.5	Brown Lean Clay with Sand		21.8
9			SS-7	19.0	20.5	Brown Lean Clay with Sand		16.2
10			SS-8	24.0	25.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		19.2
10			SS-9	29.0	30.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		19.1
11			SS-10	34.0	35.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		15.9
11			SS-11	39.0	40.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		18.4
7	B-12		SS-1	2.3	3.8	Brown Lean Clay with Sand		23.1
7			SS-2	4.0	5.5	Brownish Gray Lean Clay with Sand		40.4
9			SS-3	7.4	8.9	Gray Lean Clay with Sand		20.3
9			SS-4	9.0	10.5	Gray Lean Clay with Sand		20.0
9			SS-5	14.0	15.5	Brownish Gray Lean Clay with Sand		22.2
10			ST-1	19.0	21.0	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		
10			SS-6	24.0	25.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		17.3
10			SS-7	29.0	30.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		16.4
11			SS-8	34.0	34.8	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		14.5
11			SS-9	39.0	40.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		17.3
7	B-13		SS-1	2.3	3.8	Brown Lean Clay with Sand		22.8
7			SS-2	4.0	5.5	Brownish Gray Lean Clay with Sand		19.6
8			SS-3	7.3	8.8	Brown & Gray Sandy Fat Clay		20.6
8			SS-4	9.0	10.5	Brownish Gray Sandy Fat Clay		14.5
9			SS-5	14.0	15.5	Brown Lean Clay with Sand		16.6
10			ST-1	19.0	21.0	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		
10			SS-6	24.0	25.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		21.7
10			SS-7	29.0	30.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		16.9
11			SS-8	34.0	35.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		17.4
11			SS-9	39.0	40.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		25.8
8	B-14		SS-1	1.5	2.3	Brown Sandy Fat Clay		23.8
8			SS-2	4.0	5.5	Brown & Gray Sandy Fat Clay		20.9
9			SS-3	6.5	8.0	Brown & Gray Lean Clay with Sand		17.8
9			SS-4	14.0	15.5	Brown Lean Clay with Sand		21.6
9			SS-5	14.0	15.5	Brown Lean Clay with Sand		18.5
9			SS-6	19.0	20.5	Brown Lean Clay with Sand		19.7
9			SS-7	29.0	30.5	Brown Lean Clay with Sand		14.9
11			SS-8	34.0	35.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		16.4
11			SS-9	34.0	35.4	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		15.7
11			SS-10	39.0	40.5	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		14.7
8	B-15		SS-1	1.5	3.0	Brown Sandy Fat Clay		24.5
8			SS-2	4.0	5.5	Brown Sandy Fat Clay		20.1
8			SS-3	6.5	8.0	Brown Sandy Fat Clay		19.7

Project Name : Paducah Downtown Devoloment
Location : McCracken County, Kentucky
Job Number : 10197216

Moisture Data

(AASHTO T255-T265 / ASTM C566-D2216)

Soil No.	Boring No.	Station & Offset	Sample No.	Depth		Description of Soil	pH	Natural Moisture Content (%)
9			SS-4	9.0	10.5	Brown Lean Clay with Sand		18.2
9			SS-5	14.0	15.5	Brown Lean Clay with Sand		20.2
9			ST-1	19.0	21.0	Brown Lean Clay with Sand		
9			SS-6	24.0	25.5	Brown Lean Clay with Sand		17.9
10			SS-7	29.0	30.5	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		46.8
10			SS-8	33.5	35.0	Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		13.9
11			SS-9	38.5	40.0	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		21.2
11			SS-10	43.5	45.0	Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		13.9
12			SS-11	48.5	50.0	Gray Silty Sand		31.2
			SS-12	53.5	55.0	No Sample		
12			SS-13	58.5	60.0	Gray Silty Sand		32.5
12			SS-14	63.5	65.0	Gray Silty Sand		30.5
12			SS-15	68.5	69.5	Gray Silty Sand		25.1
12			SS-16	73.5	74.6	Gray Silty Sand		30.4
12			SS-16A	74.6	75.0	Gray Silty Sand		29.8
12			SS-17	78.5	78.7	Gray Silty Sand		34.4
12			SS-17A	78.7	79.5	Gray Silty Sand		24.1

SOIL CLASSIFICATION

Project Name	:	Paducah City Block Development		
Project No.	:	10197216	Sample No.	: SS-4
Project County	:	McCracken	Sample Loc.	: Boring No. B-4
Project State	:	Kentucky	Sample Depth	: 9.0' to 10.5'
Laboratory No.	:	10197216	Date Tested	: 11/18/19
Submitted By	:	HDR	Date Reported	: 11/22/19
Soil Type	:	Brown Lean Clay with Sand		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	100.0
1/4		6.3	mm	
No.4		4.75	mm	98.7
No.6		3.35	mm	
No.10		2	mm	98.1

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	94.3
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	77.6
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.007 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 25.0	
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: 33	
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: 21	
		Plasticity Index	: 12	
AASHTO Composition of Total Sample: M145		Liquidity Index	: 0.36	
Gravel (3in. + No.10)	: 1.9	Activity	: NA	
Coarse Sand (-No.10 + No.40)	: 3.8	Sp. Gr. (AASHTO T100)	: NA	
Fine Sand (-No.40 + No.200)	: 16.7	AASHTO Classification: M145	: A-6 (8)	
Silt + Clay (-No.200)	: 77.6	ASTM Classification: D2487	: CL	

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 1.3
Coarse Sand (-No.4 + No.10)	: 0.6
Medium Sand (-No.10 + No.40)	: 3.8
Fine Sand (-No.40 + No.200)	: 16.7
Silt + Clay (-No.200)	: 77.6

Approved By : Kevin E. Walker

Soil No. 1

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SOIL CLASSIFICATION

Project Name : Paducah City Block Development
Project No. : 10197216
Project County : McCracken
Project State : Kentucky
Laboratory No. : 10197216
Submitted By : HDR
Soil Type : Brown Lean Clay with Sand

Sample No. : SS-1
Sample Loc. : Boring No. B-4
Sample Depth : 1.5' to 3.0'
Date Tested : 11/18/19
Date Reported : 11/22/19

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	100.0
1/4		6.3	mm	
No.4		4.75	mm	99.4
No.6		3.35	mm	
No.10		2	mm	97.6

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	90.4
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	72.7
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.009 mm

CBR : NA
Dry Dens. : NA
Opt. Moist. : NA

Natural Moisture (%) (AASHTO T265) : 22.0
Liquid Limit (AASHTO T89) : 32
Plastic Limit (AASHTO T90) : 21
Plasticity Index : 11
Liquidity Index : 0.06
Activity : NA
Sp. Gr. (AASHTO T100) : NA
AASHTO Classification: M145 : A-6 (7)
ASTM Classification: D2487 : CL

AASHTO Composition of Total Sample: M145
Gravel (3in. + No.10) : 2.4
Coarse Sand (-No.10 + No.40) : 7.2
Fine Sand (-No.40 + No.200) : 17.7
Silt + Clay (-No.200) : 72.7

ASTM Composition of Total Sample: D2487
Coarse Gravel (3in. + 3/4in.) : 0.0
Fine Gravel (-3/4in. + No.4) : 0.6
Coarse Sand (-No.4 + No.10) : 1.8
Medium Sand (-No.10 + No.40) : 7.2
Fine Sand (-No.40 + No.200) : 17.7
Silt + Clay (-No.200) : 72.7

Approved By : Kevin E. Walker

Soil No. 2

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SOIL CLASSIFICATION

Project Name : Paducah City Block Development
Project No. : 10197216
Project County : McCracken
Project State : Kentucky
Laboratory No. : 10197216
Submitted By : HDR
Soil Type : Brown Silty Clay with Sand

Sample No. : SS-5
Sample Loc. : Boring No. B-5
Sample Depth : 14.0' to 15.5'
Date Tested : 11/18/19
Date Reported : 11/22/19

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	100.0
1/4		6.3	mm	
No.4		4.75	mm	99.5
No.6		3.35	mm	
No.10		2	mm	99.4

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	97.7
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	79.1
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.007 mm

CBR : NA
Dry Dens. : NA
Opt. Moist. : NA

Natural Moisture (%) (AASHTO T265) : 19.2
Liquid Limit (AASHTO T89) : 20
Plastic Limit (AASHTO T90) : 14
Plasticity Index : 6
Liquidity Index : 0.84
Activity : NA
Sp. Gr. (AASHTO T100) : NA
AASHTO Classification: M145 : A-4 (2)
ASTM Classification: D2487 : CL-ML

AASHTO Composition of Total Sample: M145
Gravel (3in. + No.10) : 0.6
Coarse Sand (-No.10 + No.40) : 1.7
Fine Sand (-No.40 + No.200) : 18.6
Silt + Clay (-No.200) : 79.1

ASTM Composition of Total Sample: D2487
Coarse Gravel (3in. + 3/4in.) : 0.0
Fine Gravel (-3/4in. + No.4) : 0.5
Coarse Sand (-No.4 + No.10) : 0.1
Medium Sand (-No.10 + No.40) : 1.7
Fine Sand (-No.40 + No.200) : 18.6
Silt + Clay (-No.200) : 79.1

Approved By : Kevin E. Walker

Soil No. 3

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SOIL CLASSIFICATION

Project Name	:	Paducah City Block Development		
Project No.	:	10197216	Sample No.	: SS-10
Project County	:	McCracken	Sample Loc.	: Boring No. B-2
Project State	:	Kentucky	Sample Depth	: 39.0' to 40.5'
Laboratory No.	:	10197216	Date Tested	: 11/18/19
Submitted By	:	HDR	Date Reported	: 11/22/19
Soil Type	:	Brown Poorly Graded Gravel with Sand		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	100.0
3/4	in.	19	mm	85.5
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	49.4
1/4		6.3	mm	
No.4		4.75	mm	26.7
No.6		3.35	mm	
No.10		2	mm	18.8

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	14.1
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	2.4
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 9.61 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	:	17.5
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	:	NP
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	:	NP
		Plasticity Index	:	NP
AASHTO Composition of Total Sample: M145		Liquidity Index	:	NA
Gravel (3in. + No.10)	: 81.2	Activity	:	NA
Coarse Sand (-No.10 + No.40)	: 4.7	Sp. Gr. (AASHTO T100)	:	NA
Fine Sand (-No.40 + No.200)	: 11.7	AASHTO Classification: M145	:	A-1-a (0)
Silt + Clay (-No.200)	: 2.4	ASTM Classification: D2487	:	GP

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 14.5
Fine Gravel (-3/4in. + No.4)	: 58.8
Coarse Sand (-No.4 + No.10)	: 7.9
Medium Sand (-No.10 + No.40)	: 4.7
Fine Sand (-No.40 + No.200)	: 11.7
Silt + Clay (-No.200)	: 2.4

Approved By : Kevin E. Walker

Soil No. 4

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SOIL CLASSIFICATION

Project Name	:	Paducah City Block Development		
Project No.	:	10197216	Sample No.	: SS-15
Project County	:	McCracken	Sample Loc.	: Boring No. B-3
Project State	:	Kentucky	Sample Depth	: 63.5' to 64.5'
Laboratory No.	:	10197216	Date Tested	: 11/18/19
Submitted By	:	HDR	Date Reported	: 11/22/19
Soil Type	:	Light Gray Silty Sand		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	
1/4		6.3	mm	
No.4		4.75	mm	100.0
No.6		3.35	mm	
No.10		2	mm	100.0

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	77.7
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	18.6
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.188 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 21.2
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: NP
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: NP
		Plasticity Index	: NP
AASHTO Composition of Total Sample: M145		Liquidity Index	: NA
Gravel (3in. + No.10)	: 0.0	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 22.3	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 59.1	AASHTO Classification: M145	: A-2-4 (0)
Silt + Clay (-No.200)	: 18.6	ASTM Classification: D2487	: SM

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 0.0
Coarse Sand (-No.4 + No.10)	: 0.0
Medium Sand (-No.10 + No.40)	: 22.3
Fine Sand (-No.40 + No.200)	: 59.1
Silt + Clay (-No.200)	: 18.6

Approved By : Kevin E. Walker

Soil No. 5

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SOIL CLASSIFICATION

Project Name	: Paducah City Block Development		
Project No.	: 10197216	Sample No.	: SS-17
Project County	: McCracken	Sample Loc.	: Boring No. B-1
Project State	: Kentucky	Sample Depth	: 73.5' to 74.5'
Laboratory No.	: 10197216	Date Tested	: 11/18/19
Submitted By	: HDR	Date Reported	: 11/22/19
Soil Type	: Gray Silty Sand		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	100.0
1/4		6.3	mm	
No.4		4.75	mm	99.6
No.6		3.35	mm	
No.10		2	mm	99.4

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	88.8
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	29.1
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.138 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 29.4
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: NP
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: NP
		Plasticity Index	: NP
AASHTO Composition of Total Sample: M145		Liquidity Index	: NA
Gravel (3in. + No.10)	: 0.6	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 10.6	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 59.7	AASHTO Classification: M145	: A-2-4 (0)
Silt + Clay (-No.200)	: 29.1	ASTM Classification: D2487	: SM

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 0.4
Coarse Sand (-No.4 + No.10)	: 0.2
Medium Sand (-No.10 + No.40)	: 10.6
Fine Sand (-No.40 + No.200)	: 59.7
Silt + Clay (-No.200)	: 29.1

Approved By : Kevin E. Walker

Soil No. 6

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SOIL CLASSIFICATION

Project Name	:	Paducah City Block Development		
Project No.	:	10197216	Sample No.	: SS-2
Project County	:	McCracken	Sample Loc.	: Boring No. B-13
Project State	:	Kentucky	Sample Depth	: 4.0' to 5.5'
Laboratory No.	:	10197216	Date Tested	: 11/18/19
Submitted By	:	HDR	Date Reported	: 11/22/19
Soil Type	:	Brownish Gray Lean Clay with Sand		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	100.0
1/4		6.3	mm	
No.4		4.75	mm	99.9
No.6		3.35	mm	
No.10		2	mm	99.1

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	88.6
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	72.5
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.01 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 19.6
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: 34
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: 20
		Plasticity Index	: 14
AASHTO Composition of Total Sample: M145		Liquidity Index	: -0.03
Gravel (3in. + No.10)	: 0.9	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 10.5	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 16.1	AASHTO Classification: M145	: A-6 (9)
Silt + Clay (-No.200)	: 72.5	ASTM Classification: D2487	: CL

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 0.1
Coarse Sand (-No.4 + No.10)	: 0.8
Medium Sand (-No.10 + No.40)	: 10.5
Fine Sand (-No.40 + No.200)	: 16.1
Silt + Clay (-No.200)	: 72.5

Approved By : Kevin E. Walker

Soil No. 7

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SOIL CLASSIFICATION

Project Name	: Paducah City Block Development		
Project No.	: 10197216	Sample No.	: SS-1
Project County	: McCracken	Sample Loc.	: Boring No. B-14
Project State	: Kentucky	Sample Depth	: 1.5' to 2.3'
Laboratory No.	: 10197216	Date Tested	: 11/18/19
Submitted By	: HDR	Date Reported	: 11/22/19
Soil Type	: Brown Sandy Fat Clay		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	100.0
1/4		6.3	mm	
No.4		4.75	mm	99.4
No.6		3.35	mm	
No.10		2	mm	94.6

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	62.2
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	52.6
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.054 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 23.8
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: 51
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: 28
		Plasticity Index	: 23
AASHTO Composition of Total Sample: M145		Liquidity Index	: -0.16
Gravel (3in. + No.10)	: 5.4	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 32.4	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 9.6	AASHTO Classification: M145	: A-7-6 (9)
Silt + Clay (-No.200)	: 52.6	ASTM Classification: D2487	: CH

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 0.6
Coarse Sand (-No.4 + No.10)	: 4.8
Medium Sand (-No.10 + No.40)	: 32.4
Fine Sand (-No.40 + No.200)	: 9.6
Silt + Clay (-No.200)	: 52.6

Approved By : Kevin E. Walker

Soil No. 8

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SOIL CLASSIFICATION

Project Name	: Paducah City Block Development		
Project No.	: 10197216	Sample No.	: SS-4
Project County	: McCracken	Sample Loc.	: Boring No. B-11
Project State	: Kentucky	Sample Depth	: 6.5' to 8.0'
Laboratory No.	: 10197216	Date Tested	: 11/18/19
Submitted By	: HDR	Date Reported	: 11/22/19
Soil Type	: Brown Lean Clay with Sand		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	
1/4		6.3	mm	
No.4		4.75	mm	100.0
No.6		3.35	mm	
No.10		2	mm	100.0

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	98.5
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	81.9
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.006 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 19.2
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: 29
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: 18
		Plasticity Index	: 11
AASHTO Composition of Total Sample: M145		Liquidity Index	: 0.09
Gravel (3in. + No.10)	: 0.0	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 1.5	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 16.6	AASHTO Classification: M145	: A-6 (8)
Silt + Clay (-No.200)	: 81.9	ASTM Classification: D2487	: CL

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 0.0
Coarse Sand (-No.4 + No.10)	: 0.0
Medium Sand (-No.10 + No.40)	: 1.5
Fine Sand (-No.40 + No.200)	: 16.6
Silt + Clay (-No.200)	: 81.9

Approved By : Kevin E. Walker

Soil No. 9

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SOIL CLASSIFICATION

Project Name	: Paducah City Block Development		
Project No.	: 10197216	Sample No.	: SS-6
Project County	: McCracken	Sample Loc.	: Boring No. B-13
Project State	: Kentucky	Sample Depth	: 24.0' to 25.5'
Laboratory No.	: 10197216	Date Tested	: 11/18/19
Submitted By	: HDR	Date Reported	: 11/22/19
Soil Type	: Brown Poorly Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	100.0
3/4	in.	19	mm	88.0
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	78.6
1/4		6.3	mm	
No.4		4.75	mm	66.4
No.6		3.35	mm	
No.10		2	mm	54.2

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	31.4
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	10.5
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 1.504 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 21.7
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: 25
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: 16
		Plasticity Index	: 9
AASHTO Composition of Total Sample: M145		Liquidity Index	: 0.68
Gravel (3in. + No.10)	: 45.8	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 22.8	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 20.9	AASHTO Classification: M145	: A-2-4 (0)
Silt + Clay (-No.200)	: 10.5	ASTM Classification: D2487	: SP-SC

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 12.0
Fine Gravel (-3/4in. + No.4)	: 21.6
Coarse Sand (-No.4 + No.10)	: 12.2
Medium Sand (-No.10 + No.40)	: 22.8
Fine Sand (-No.40 + No.200)	: 20.9
Silt + Clay (-No.200)	: 10.5

Approved By : Kevin E. Walker

Soil No. 10

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SOIL CLASSIFICATION

Project Name	: Paducah City Block Development		
Project No.	: 10197216	Sample No.	: SS-8
Project County	: McCracken	Sample Loc.	: Boring No. B-12
Project State	: Kentucky	Sample Depth	: 34.0' to 34.8'
Laboratory No.	: 10197216	Date Tested	: 11/18/19
Submitted By	: HDR	Date Reported	: 11/22/19
Soil Type	: Brown Well-Graded Sand with Clay and Gravel (and/or Silty Clay and Gravel)		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	100.0
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	89.8
1/4		6.3	mm	
No.4		4.75	mm	69.2
No.6		3.35	mm	
No.10		2	mm	46.3

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	16.1
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	5.5
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 2.3 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 14.5
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: 24
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: 17
		Plasticity Index	: 7
AASHTO Composition of Total Sample: M145		Liquidity Index	: -0.42
Gravel (3in. + No.10)	: 53.7	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 30.2	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 10.6	AASHTO Classification: M145	: A-2-4 (0)
Silt + Clay (-No.200)	: 5.5	ASTM Classification: D2487	: SW-SC

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 30.8
Coarse Sand (-No.4 + No.10)	: 22.9
Medium Sand (-No.10 + No.40)	: 30.2
Fine Sand (-No.40 + No.200)	: 10.6
Silt + Clay (-No.200)	: 5.5

Approved By : Kevin E. Walker

Soil No. 11

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SOIL CLASSIFICATION

Project Name	: Paducah City Block Development		
Project No.	: 10197216	Sample No.	: SS-16
Project County	: McCracken	Sample Loc.	: Boring No. B-15
Project State	: Kentucky	Sample Depth	: 73.5' to 74.6'
Laboratory No.	: 10197216	Date Tested	: 11/18/19
Submitted By	: HDR	Date Reported	: 11/22/19
Soil Type	: Gray Silty Sand		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	
1/4		6.3	mm	
No.4		4.75	mm	100.0
No.6		3.35	mm	
No.10		2	mm	100.0

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	97.2
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	27.4
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.132 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 30.4
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: NP
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: NP
		Plasticity Index	: NP
AASHTO Composition of Total Sample: M145		Liquidity Index	: NA
Gravel (3in. + No.10)	: 0.0	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 2.8	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 69.8	AASHTO Classification: M145	: A-2-4 (0)
Silt + Clay (-No.200)	: 27.4	ASTM Classification: D2487	: SM

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 0.0
Coarse Sand (-No.4 + No.10)	: 0.0
Medium Sand (-No.10 + No.40)	: 2.8
Fine Sand (-No.40 + No.200)	: 69.8
Silt + Clay (-No.200)	: 27.4

Approved By : Kevin E. Walker

Soil No. 12

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SOIL CLASSIFICATION

Project Name	: Paducah City Block Development		
Project No.	: 10197216	Sample No.	: SS-15
Project County	: McCracken	Sample Loc.	: Boring No. B-8
Project State	: Kentucky	Sample Depth	: 68.3' to 69.6'
Laboratory No.	: 10197216	Date Tested	: 11/21/19
Submitted By	: HDR	Date Reported	: 12/04/19
Soil Type	: Gray Silty Sand		

AASHTO T27 :

				% Passing
4	in.	101.6	mm	
3.5	in.	88.9	mm	
3	in.	76.2	mm	
2.5	in.	63.5	mm	
2	in.	50.8	mm	
1 3/4	in.	45	mm	
1 1/2	in.	38.1	mm	
1 1/4	in.	31.5	mm	
1	in.	25	mm	
3/4	in.	19	mm	
1/2	in.	12.5	mm	
3/8	in.	9.5	mm	
1/4		6.3	mm	
No.4		4.75	mm	100.0
No.6		3.35	mm	
No.10		2	mm	100.0

AASHTO T88

				% Passing
No.16		1.18	mm	
No.30		0.6	mm	
No.40		0.425	mm	99.9
No.50		0.3	mm	
No.60		0.25	mm	
No.80		0.18	mm	
No.100		0.15	mm	
No.200		0.075	mm	35.2
No.270		0.053	mm	
Hyd. Rd.	# 1		mm	
Hyd. Rd.	# 2		mm	
Hyd. Rd.	# 3		mm	
Hyd. Rd.	# 4		mm	
Hyd. Rd.	# 5		mm	
Hyd. Rd.	# 6		mm	
Hyd. Rd.	# 7		mm	

**Method B used for #200 Wash with a soaking time of 1440 minutes*

D50 = 0.112 mm

CBR	: NA	Natural Moisture (%) (AASHTO T265)	: 31.1
Dry Dens.	: NA	Liquid Limit (AASHTO T89)	: NP
Opt. Moist.	: NA	Plastic Limit (AASHTO T90)	: NP
		Plasticity Index	: NP
AASHTO Composition of Total Sample: M145		Liquidity Index	: NA
Gravel (3in. + No.10)	: 0.0	Activity	: NA
Coarse Sand (-No.10 + No.40)	: 0.1	Sp. Gr. (AASHTO T100)	: NA
Fine Sand (-No.40 + No.200)	: 64.7	AASHTO Classification: M145	: A-4 (0)
Silt + Clay (-No.200)	: 35.2	ASTM Classification: D2487	: SM

ASTM Composition of Total Sample: D2487

Coarse Gravel (3in. + 3/4in.)	: 0.0
Fine Gravel (-3/4in. + No.4)	: 0.0
Coarse Sand (-No.4 + No.10)	: 0.0
Medium Sand (-No.10 + No.40)	: 0.1
Fine Sand (-No.40 + No.200)	: 64.7
Silt + Clay (-No.200)	: 35.2

Approved By : Kevin E. Walker

Soil No. 13

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UNCONFINED COMPRESSION TEST

AASHTO: T-208

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-15
Project State	: Kentucky	Sample Depth	: 19.5' to 20.0'
Laboratory #	: 10197216	Date Tested	: 11/20/2019
Submitted By	: HDR	Date Reported	: 11/21/2019

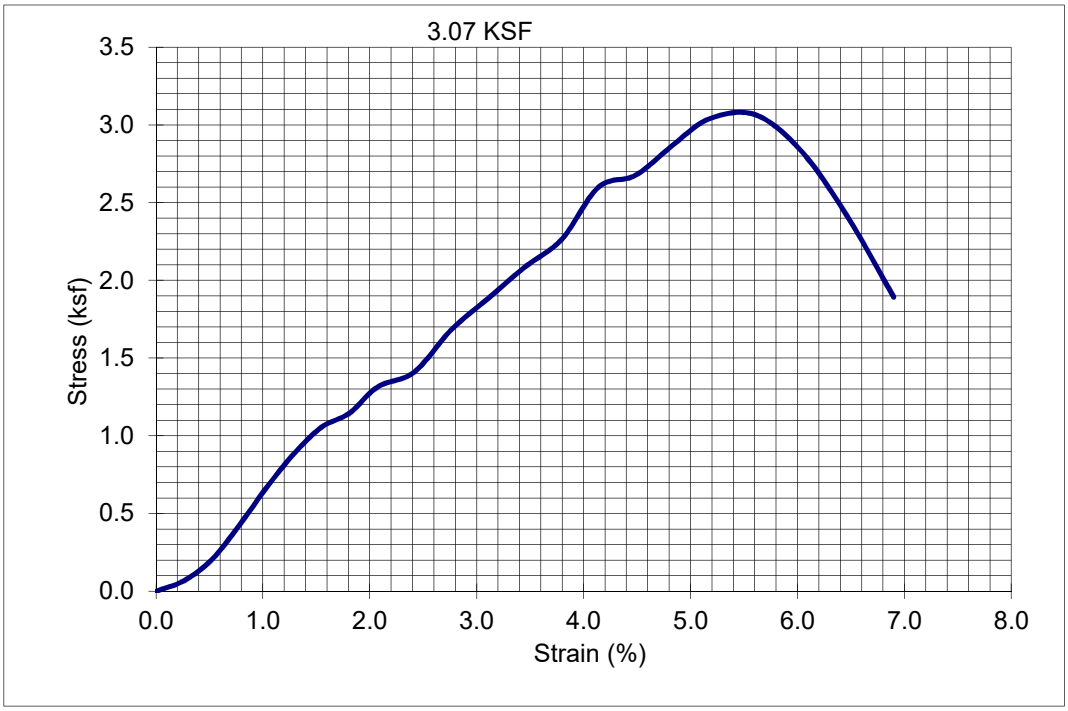
Soil Type	: Garth				
Wet Density	: 130.4	pcf	Initial Height	: 5.80	in
Dry Density	: 110.6	pcf	Initial Diameter	: 2.86	in
Moisture	: 17.8	%	Proving Ring	: #22734	

RESULTS:

#	Axial Load lbs	Corrected Area sf	Unit Strain %	Stress Ksf
1	0.0	0.04	0.0	0.00
2	3.0	0.04	0.3	0.07
3	9.0	0.04	0.5	0.20
4	19.0	0.04	0.8	0.42
5	30.1	0.05	1.0	0.67
6	40.1	0.05	1.3	0.89
7	47.9	0.05	1.6	1.06
8	52.0	0.05	1.8	1.15
9	59.8	0.05	2.1	1.31
10	52.0	0.05	2.4	1.41
11	77.1	0.05	2.8	1.68
12	86.6	0.05	3.1	1.88
13	96.3	0.05	3.4	2.09
14	104.9	0.05	3.8	2.26
15	28.1	0.05	4.1	2.60
16	124.9	0.05	4.5	2.68
17	134.3	0.05	4.8	2.87
18	142.9	0.05	5.2	3.04
19	144.8	0.05	5.6	3.07
20	134.3	0.05	6.0	2.83
21	19.5	0.05	6.5	2.41
22	90.6	0.05	6.9	1.89

UNCONFINED COMPRESSION TEST

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-15
Project State	: Kentucky	Sample Depth	: 19.5' to 20.0'
Laboratory #	: 10197216	Date Tested	: 11/20/2019
Submitted By	: HDR	Date Reported	: 11/21/2019
Soil Type	: Garth		
Wet Density	: 130.4 pcf	Initial Height	: 5.80 in
Dry Density	: 110.6 pcf	Initial Diameter	: 2.86 in
Moisture	: 17.8 %	Proving Ring	: #22734
Deg. of Sat.	: #VALUE! #VALUE!	SPECIFIC GRAVITY	: Garth
Comments	: AASHTO: T-208		



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UNCONFINED COMPRESSION TEST

AASHTO: T-208

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-8
Project State	: Kentucky	Sample Depth	: 20.5' to 21.0'
Laboratory #	: 10197216	Date Tested	: 11/19/2019
Submitted By	: HDR	Date Reported	: 11/21/2019

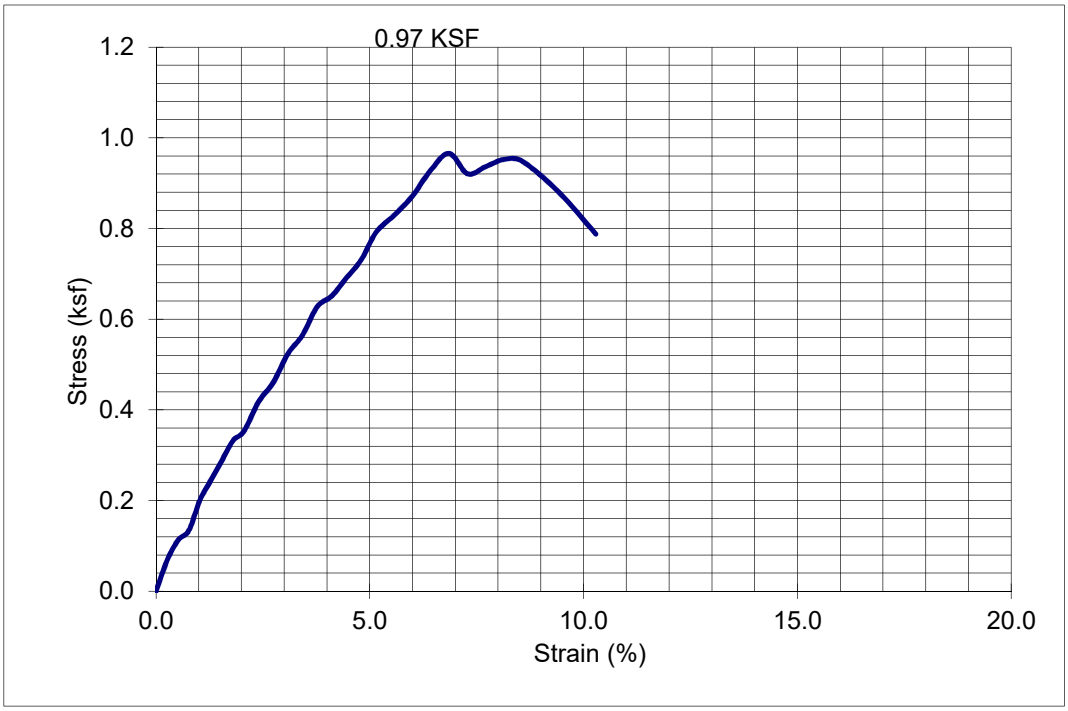
Soil Type	: Garth				
Wet Density	: 132.9	pcf	Initial Height	: 5.84	in
Dry Density	: 114.1	pcf	Initial Diameter	: 2.85	in
Moisture	: 16.4	%	Proving Ring	: #22734	

RESULTS:

#	Axial Load lbs	Corrected Area sf	Unit Strain %	Stress Ksf
1	0.0	0.04	0.0	0.00
2	3.0	0.04	0.3	0.07
3	5.0	0.04	0.5	0.11
4	6.0	0.04	0.8	0.13
5	9.0	0.04	1.0	0.20
6	11.0	0.04	1.3	0.25
7	13.0	0.04	1.5	0.29
8	15.0	0.05	1.8	0.33
9	16.0	0.05	2.1	0.35
10	19.0	0.05	2.4	0.42
11	21.0	0.05	2.7	0.46
12	24.0	0.05	3.1	0.52
13	25.9	0.05	3.4	0.57
14	28.9	0.05	3.8	0.63
15	30.1	0.05	4.1	0.65
16	32.1	0.05	4.5	0.69
17	34.0	0.05	4.8	0.73
18	36.9	0.05	5.1	0.79
19	38.9	0.05	5.6	0.83
20	41.1	0.05	6.0	0.87
21	44.0	0.05	6.4	0.93
22	45.9	0.05	6.9	0.97
23	44.0	0.05	7.3	0.92
24	45.0	0.05	7.7	0.94
25	45.9	0.05	8.1	0.95
26	45.9	0.05	8.6	0.95
27	43.0	0.05	9.4	0.88
28	38.9	0.05	10.3	0.79

UNCONFINED COMPRESSION TEST

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-8
Project State	: Kentucky	Sample Depth	: 20.5' to 21.0'
Laboratory #	: 10197216	Date Tested	: 11/19/2019
Submitted By	: HDR	Date Reported	: 11/21/2019
Soil Type	: Garth		
Wet Density	: 132.9 pcf	Initial Height	: 5.84 in
Dry Density	: 114.1 pcf	Initial Diameter	: 2.85 in
Moisture	: 16.4 %	Proving Ring	: #22734
Deg. of Sat.	: #VALUE! #VALUE!	SPECIFIC GRAVITY	: Garth
Comments	: AASHTO: T-208		



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UNCONFINED COMPRESSION TEST

AASHTO: T-208

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-10
Project State	: Kentucky	Sample Depth	: 20.0' to 20.5'
Laboratory #	: 10197216	Date Tested	: 11/19/2019
Submitted By	: HDR	Date Reported	: 11/21/2019

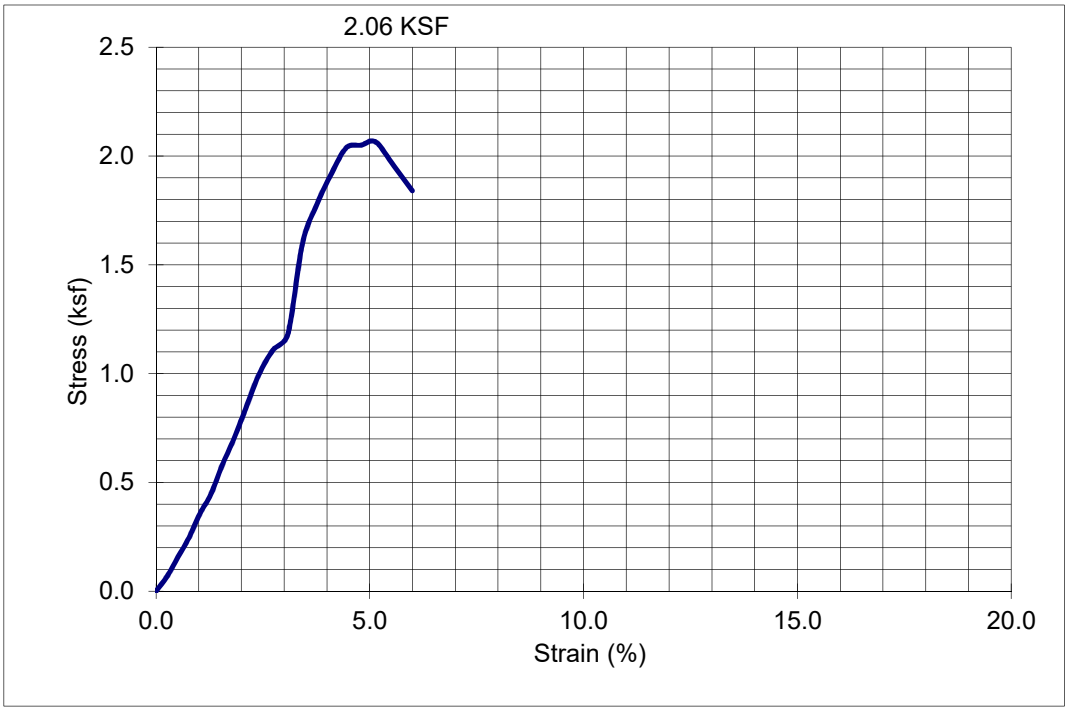
Soil Type	: Garth				
Wet Density	: 132.6	pcf	Initial Height	: 5.84	in
Dry Density	: 111.4	pcf	Initial Diameter	: 2.85	in
Moisture	: 19.0	%	Proving Ring	: #22734	

RESULTS:

#	Axial Load lbs	Corrected Area sf	Unit Strain %	Stress Ksf
1	0.0	0.04	0.0	0.00
2	3.0	0.04	0.3	0.07
3	7.0	0.04	0.5	0.16
4	11.0	0.04	0.8	0.25
5	16.0	0.04	1.0	0.36
6	20.0	0.04	1.3	0.45
7	25.9	0.04	1.5	0.58
8	31.1	0.05	1.8	0.69
9	36.9	0.05	2.1	0.82
10	45.0	0.05	2.4	0.99
11	54.9	0.05	2.7	1.11
12	53.9	0.05	3.1	1.18
13	73.2	0.05	3.4	1.60
14	81.9	0.05	3.8	1.78
15	88.7	0.05	4.1	1.92
16	94.4	0.05	4.5	2.04
17	96.3	0.05	4.8	2.05
18	96.3	0.05	5.1	2.06
19	91.6	0.05	5.6	1.95
20	86.6	0.05	6.0	1.84

UNCONFINED COMPRESSION TEST

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-10
Project State	: Kentucky	Sample Depth	: 20.0' to 20.5'
Laboratory #	: 10197216	Date Tested	: 11/19/2019
Submitted By	: HDR	Date Reported	: 11/21/2019
Soil Type	: Garth		
Wet Density	: 132.6 pcf	Initial Height	: 5.84 in
Dry Density	: 111.4 pcf	Initial Diameter	: 2.85 in
Moisture	: 19.0 %	Proving Ring	: #22734
Deg. of Sat.	: #VALUE! #VALUE!	SPECIFIC GRAVITY	: Garth
Comments	: AASHTO: T-208		



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UNCONFINED COMPRESSION TEST

AASHTO: T-208

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-12
Project State	: Kentucky	Sample Depth	: 20.0' to 20.5'
Laboratory #	: 10197216	Date Tested	: 11/19/2019
Submitted By	: HDR	Date Reported	: 11/21/2019

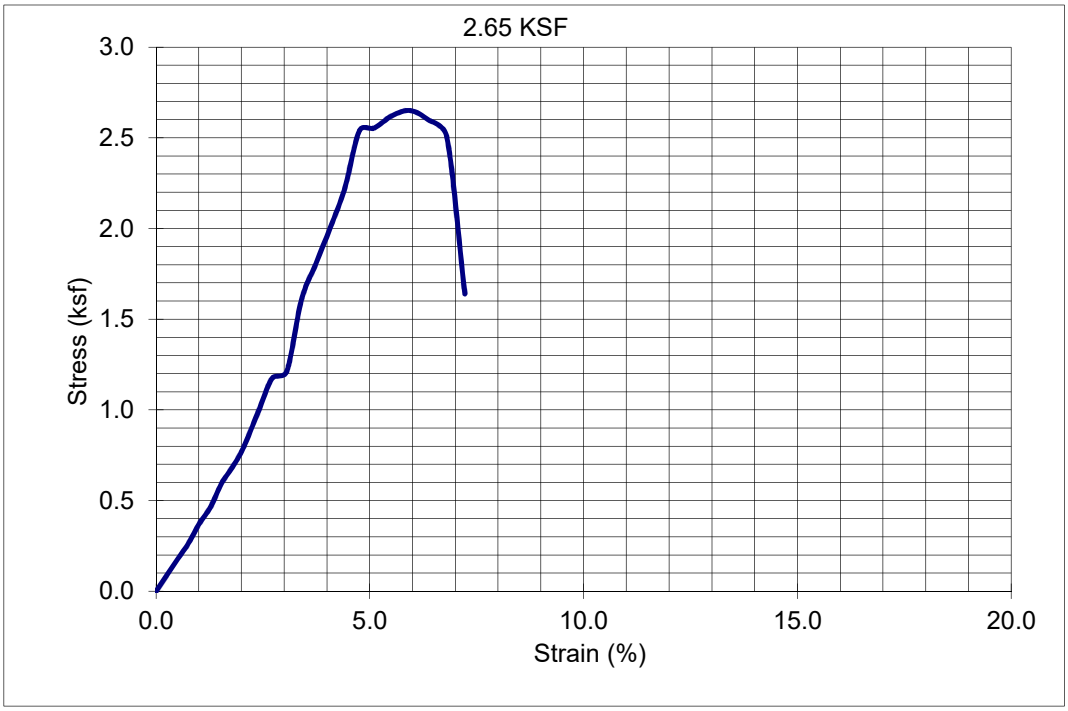
Soil Type	: Garth				
Wet Density	: 130.7	pcf	Initial Height	: 5.89	in
Dry Density	: 110.1	pcf	Initial Diameter	: 2.86	in
Moisture	: 18.8	%	Proving Ring	: #22734	

RESULTS:

#	Axial Load lbs	Corrected Area sf	Unit Strain %	Stress Ksf
1	0.0	0.04	0.0	0.00
2	4.0	0.04	0.3	0.09
3	8.0	0.04	0.5	0.18
4	12.0	0.04	0.8	0.27
5	17.0	0.05	1.0	0.38
6	21.0	0.05	1.3	0.46
7	26.9	0.05	1.5	0.59
8	31.1	0.05	1.8	0.68
9	36.0	0.05	2.0	0.79
10	45.0	0.05	2.4	0.98
11	54.0	0.05	2.7	1.18
12	55.9	0.05	3.1	1.21
13	74.2	0.05	3.4	1.60
14	83.8	0.05	3.7	1.81
15	93.5	0.05	4.1	2.01
16	104.0	0.05	4.4	2.23
17	25.2	0.05	4.8	2.54
18	120.2	0.05	5.1	2.55
19	124.0	0.05	5.5	2.62
20	125.9	0.05	5.9	2.65
21	124.0	0.05	6.4	2.60
22	120.2	0.05	6.8	2.51
23	31.0	0.05	7.2	1.64

UNCONFINED COMPRESSION TEST

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-12
Project State	: Kentucky	Sample Depth	: 20.0' to 20.5'
Laboratory #	: 10197216	Date Tested	: 11/19/2019
Submitted By	: HDR	Date Reported	: 11/21/2019
Soil Type	: Garth		
Wet Density	: 130.7 pcf	Initial Height	: 5.89 in
Dry Density	: 110.1 pcf	Initial Diameter	: 2.86 in
Moisture	: 18.8 %	Proving Ring	: #22734
Deg. of Sat.	: #VALUE! #VALUE!	SPECIFIC GRAVITY	: Garth
Comments	: AASHTO: T-208		



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UNCONFINED COMPRESSION TEST

AASHTO: T-208

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-13
Project State	: Kentucky	Sample Depth	: 20.0' to 20.5'
Laboratory #	: 10197216	Date Tested	: 11/20/2019
Submitted By	: HDR	Date Reported	: 11/21/2019

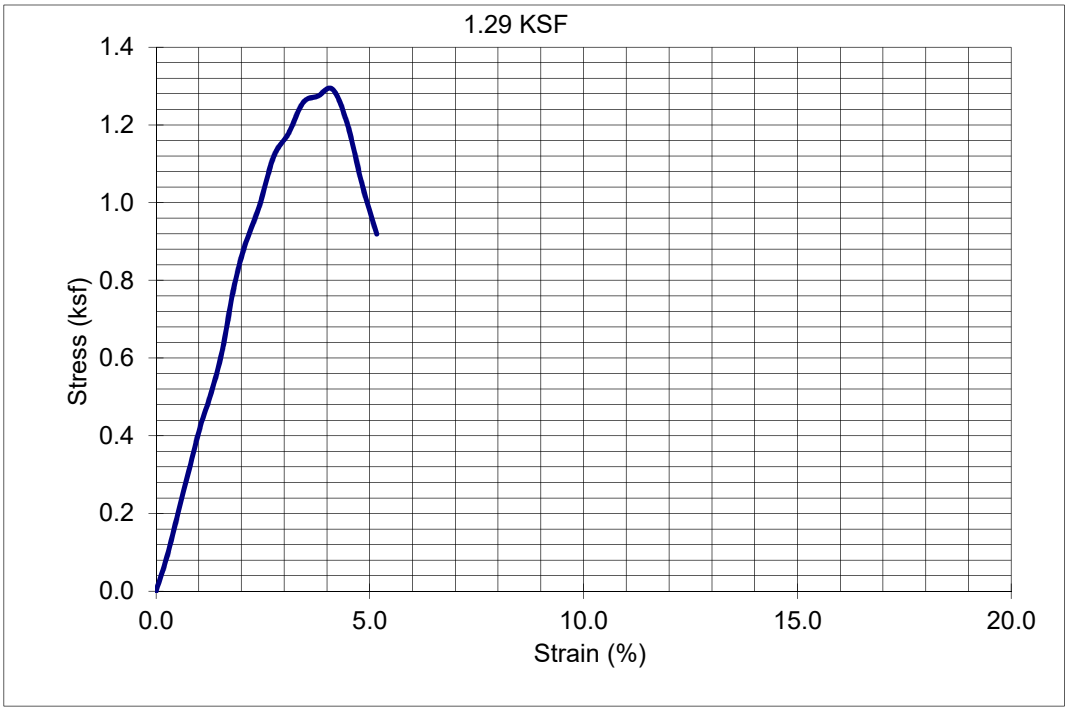
Soil Type	: Garth				
Wet Density	: 129.5	pcf	Initial Height	: 5.81	in
Dry Density	: 109.7	pcf	Initial Diameter	: 2.85	in
Moisture	: 18.1	%	Proving Ring	: #22734	

RESULTS:

#	Axial Load lbs	Corrected Area sf	Unit Strain %	Stress Ksf
1	0.0	0.04	0.0	0.00
2	4.0	0.04	0.3	0.09
3	9.0	0.04	0.5	0.20
4	14.0	0.04	0.8	0.31
5	19.0	0.04	1.0	0.42
6	23.0	0.04	1.3	0.51
7	27.9	0.05	1.5	0.62
8	35.0	0.05	1.8	0.77
9	40.1	0.05	2.1	0.88
10	45.0	0.05	2.4	0.99
11	51.1	0.05	2.8	1.12
12	54.0	0.05	3.1	1.18
13	57.8	0.05	3.4	1.26
14	58.8	0.05	3.8	1.27
15	59.8	0.05	4.1	1.29
16	55.9	0.05	4.5	1.20
17	48.8	0.05	4.8	1.05
18	43.0	0.05	5.2	0.92

UNCONFINED COMPRESSION TEST

Project Name	: Paducah Downtown Development		
Project #	: 10197216	Sample #	: ST-1
Project County	: McCracken	Sample Loc.	: Boring No. B-13
Project State	: Kentucky	Sample Depth	: 20.0' to 20.5'
Laboratory #	: 10197216	Date Tested	: 11/20/2019
Submitted By	: HDR	Date Reported	: 11/21/2019
Soil Type	: Garth		
Wet Density	: 129.5 pcf	Initial Height	: 5.81 in
Dry Density	: 109.7 pcf	Initial Diameter	: 2.85 in
Moisture	: 18.1 %	Proving Ring	: #22734
Deg. of Sat.	: #VALUE! #VALUE!	SPECIFIC GRAVITY	: Garth
Comments	: AASHTO: T-208		



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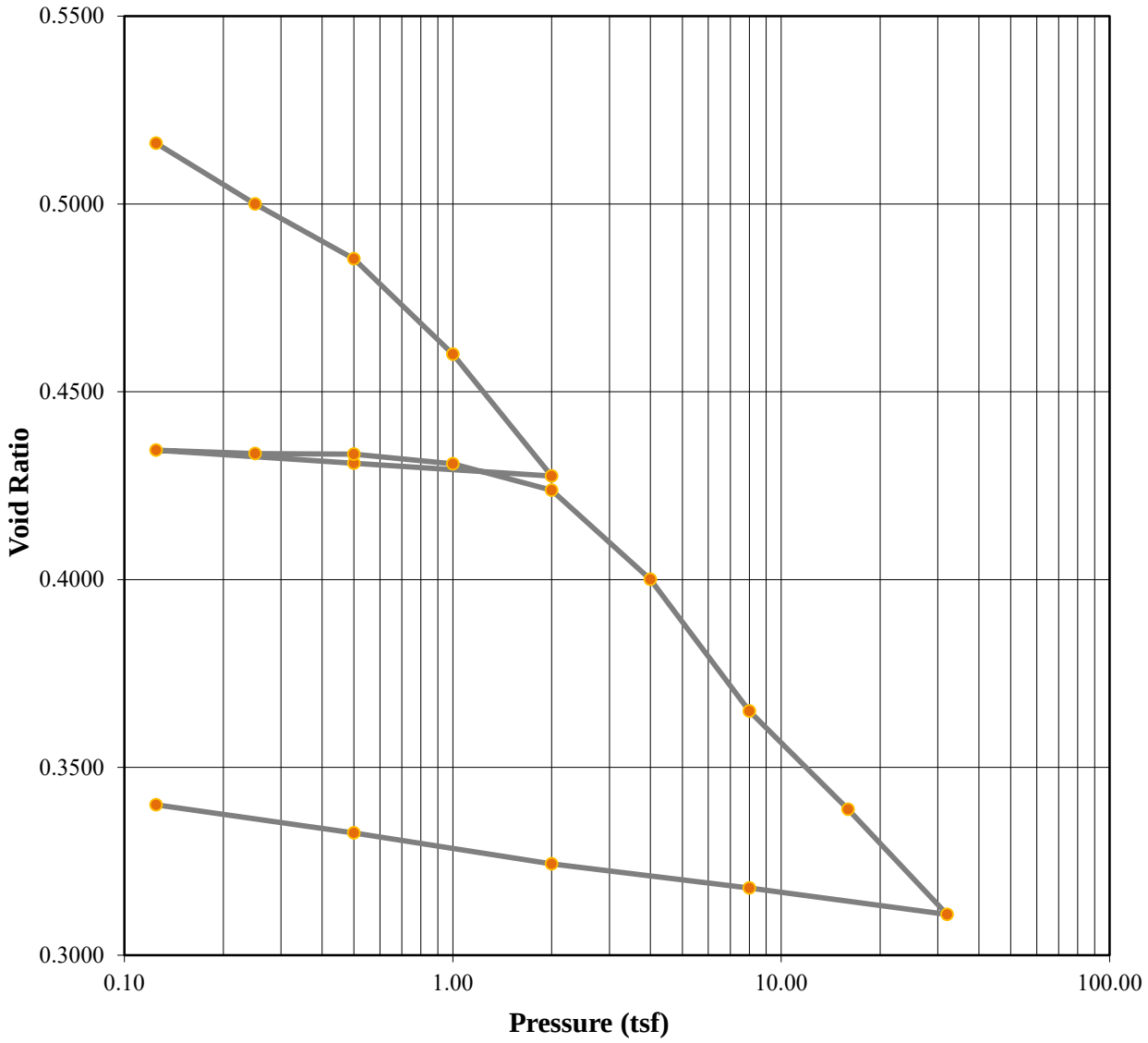
CONSOLIDATION TEST



Summary of Consolidation Test Results				Test Date:
Overburden Press. (tsf)	**0.60**	**Compression Index, C_c**	**0.10**	
Preconsol. Press., P_c (tsf)	**0.60**	**Rebound Index, C_r**	**0.01**	
Over Consolidation Ratio	**1.00**			
Soil Description	Brown Lean Clay with Sand			
Project Number:	10197216	**Depth:** 20.3' to 20.5'	**Remarks:**	
Sample Number:	ST-1	**Boring Number:** B-8	ASTM D2435/D2435M-11	
Project:	Paducah City Block Development			
Client:				
Location:	McCracken Co., Kentucky			

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TRANSMITTAL LETTER

DATE: December 3, 2019

ATTENTION: **Kevin Walker**

TO: HDR, Paducah
4645 Village Square Drive, Suite F
Paducah, KY 42001

SUBJECT: Laboratory Test Data
Paducah City Block Development
Your #10197216, HDR Lab #19-0844LAB

COMMENTS: Enclosed are the results for the subject project.

James T. Keegan, MD
Corrosion and Lab Services Section Manager

431 West Baseline Road · Claremont, CA 91711
Phone: 909.962.5485 · Fax: 909.626.3316

Table 1 - Laboratory Tests on Soil Samples

HDR, Paducah
Paducah City Block Development
Your #10197216, HDR Lab #19-0844LAB
3-Dec-19

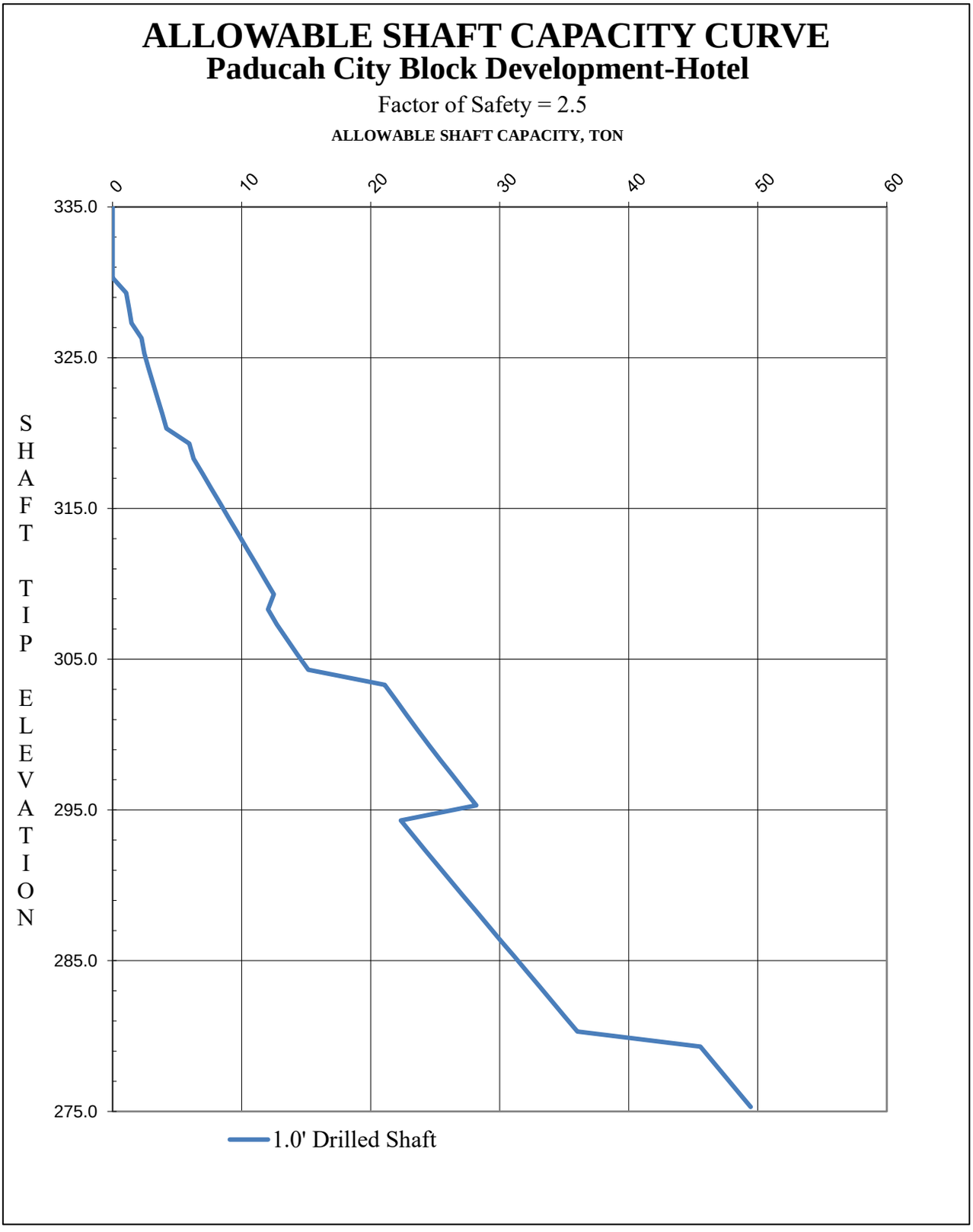
Sample ID			B-1 @ 9-20.5'	B-3 @ 14-25.5'	B-8 @ 28.3-9.8'	B-10 @ 24-35.5'
Resistivity		**Units**				
as-received		ohm-cm	>4,400,000	>4,400,000	>4,400,000	>4,400,000
saturated		ohm-cm	2,720	5,200	7,600	8,400
pH			7.3	3.9	5.9	6.1
Electrical Conductivity		mS/cm	na	na	na	na
Chemical Analyses						
Cations						
calcium	Ca^{2+}	mg/kg	na	na	na	na
magnesium	Mg^{2+}	mg/kg	na	na	na	na
sodium	Na^{1+}	mg/kg	na	na	na	na
potassium	K^{1+}	mg/kg	na	na	na	na
Anions						
carbonate	CO_3^{2-}	mg/kg	na	na	na	na
bicarbonate	HCO_3^{1-}	mg/kg	na	na	na	na
fluoride	F^{1-}	mg/kg	na	na	na	na
chloride	Cl^{1-}	mg/kg	na	na	na	na
sulfate	SO_4^{2-}	mg/kg	na	na	na	na
phosphate	PO_4^{3-}	mg/kg	na	na	na	na
Other Tests						
ammonium	NH_4^{1+}	mg/kg	na	na	na	na
nitrate	NO_3^{1-}	mg/kg	na	na	na	na
sulfide	S^{2-}	qual	na	na	na	na
Redox		mV	na	na	na	na

Resistivity per ASTM G187, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B.
Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

Appendix D: Calculations

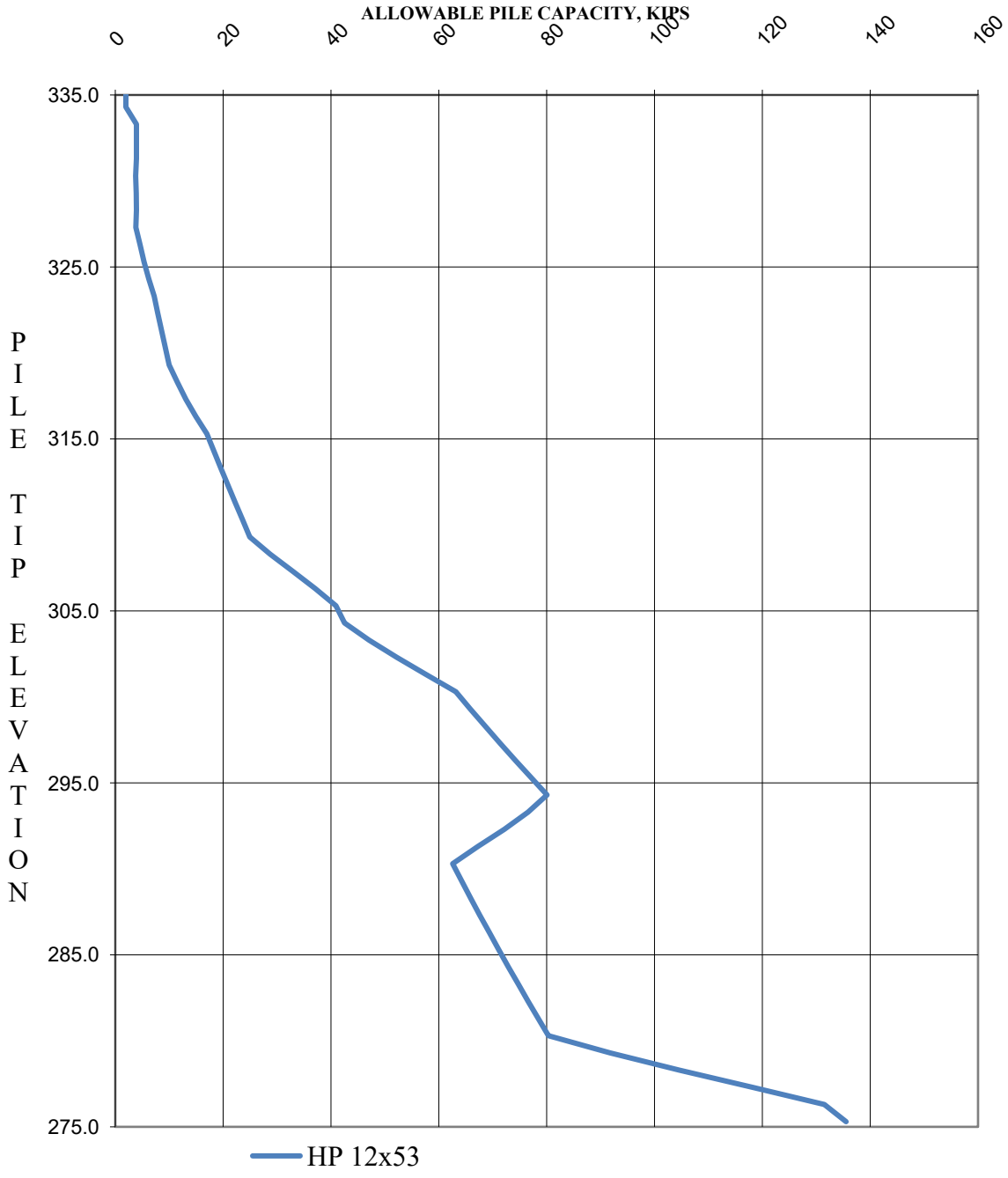
ALLOWABLE SHAFT CAPACITY CURVE
Paducah City Block Development-Hotel

Factor of Safety = 2.5



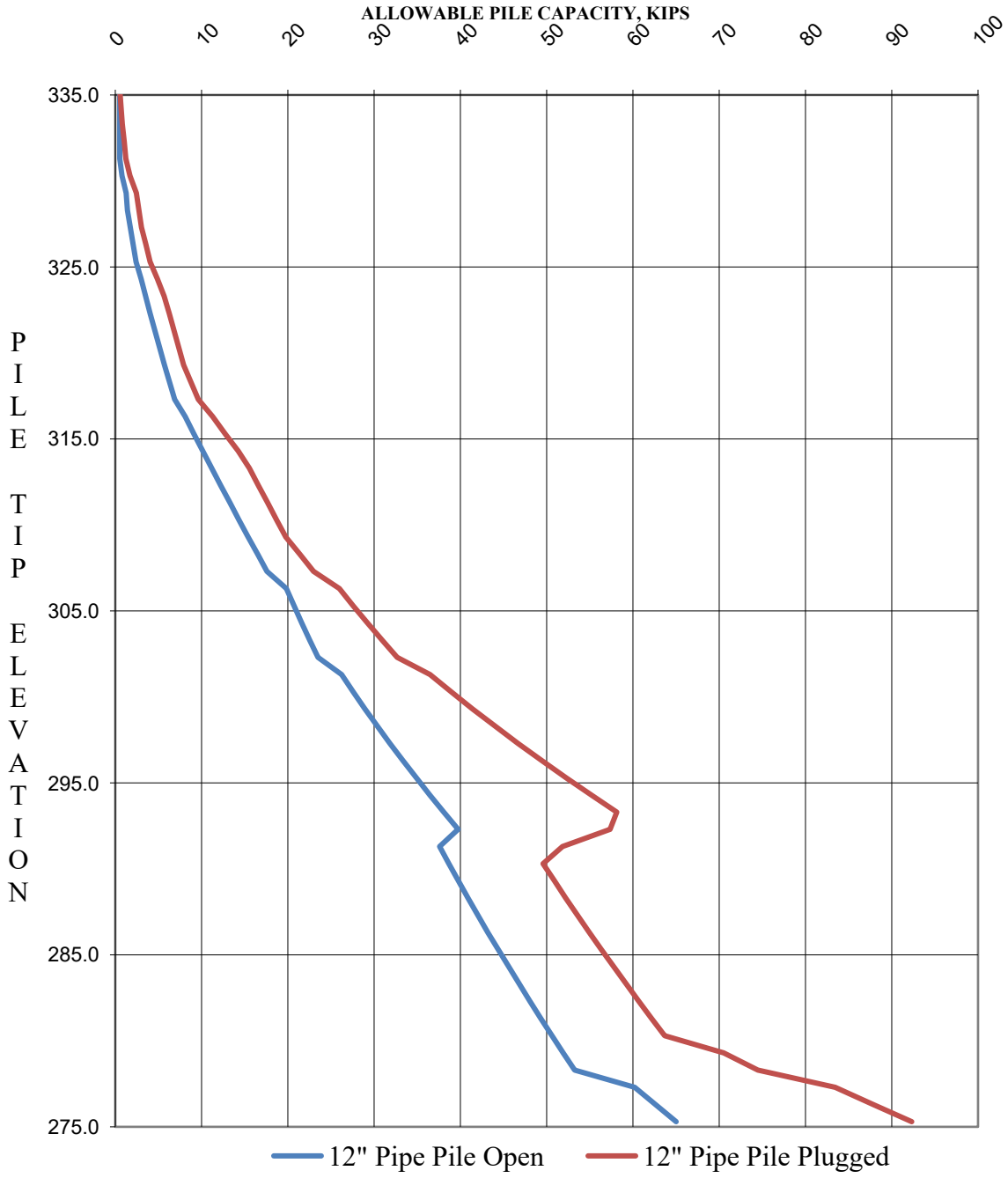
Allowable Pile Capacity Curve
Paducah City Block Development-Hotel

Factor of Safety = 2.75



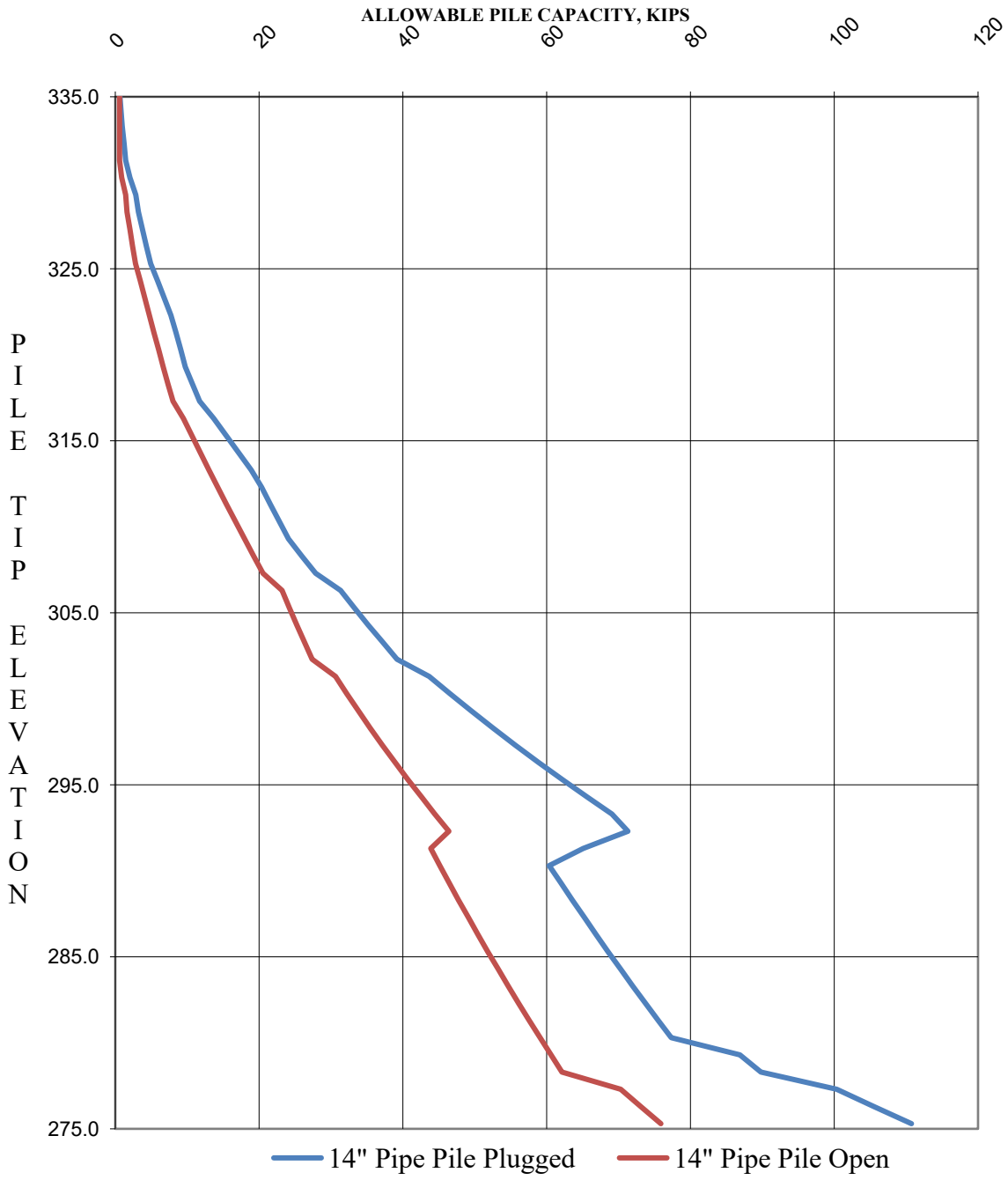
Allowable Pile Capacity Curve
Paducah City Block Development-Hotel

Factor of Safety = 2.75



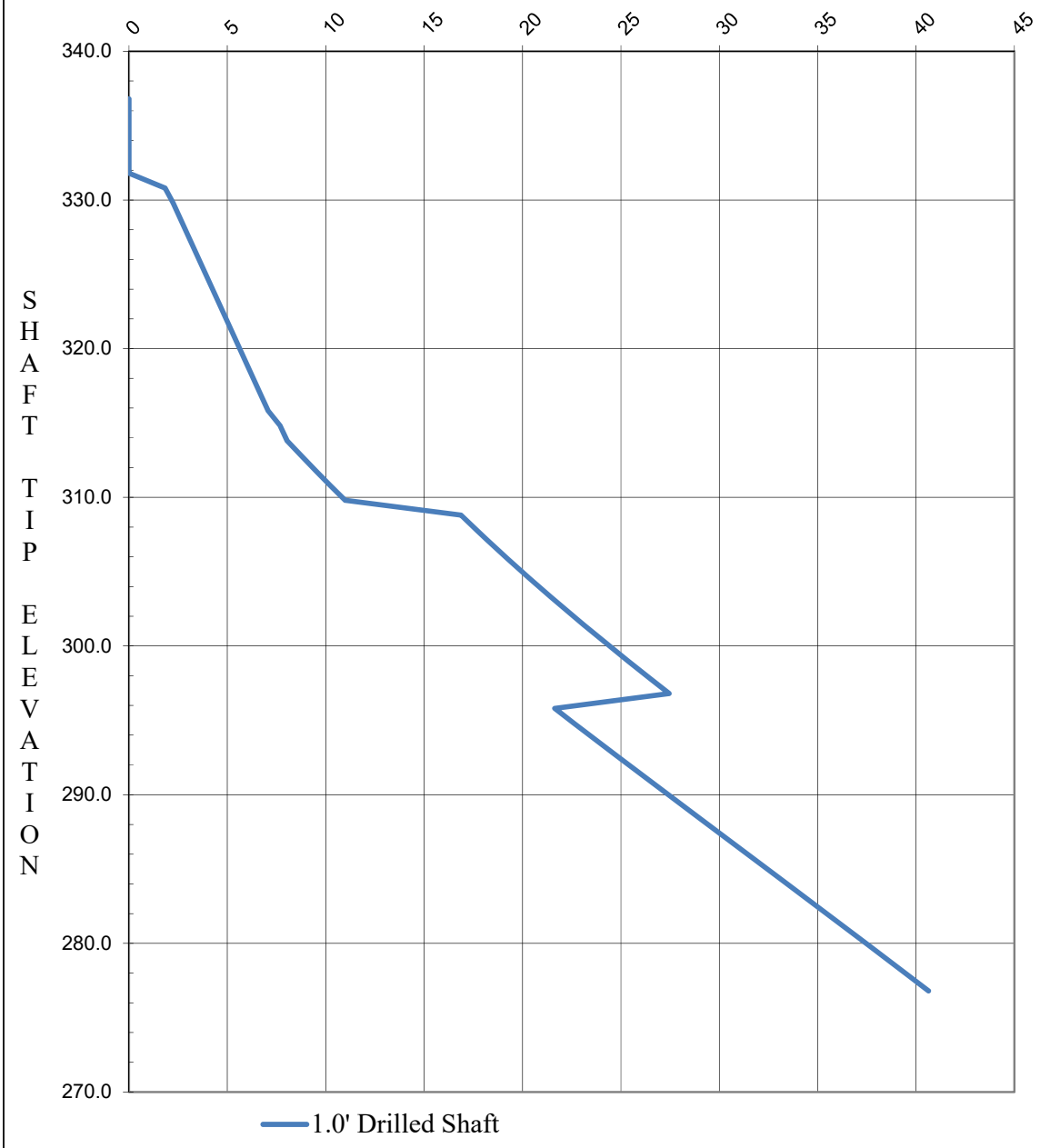
Allowable Pile Capacity Curve
Paducah City Block Development-Hotel

Factor of Safety = 2.75



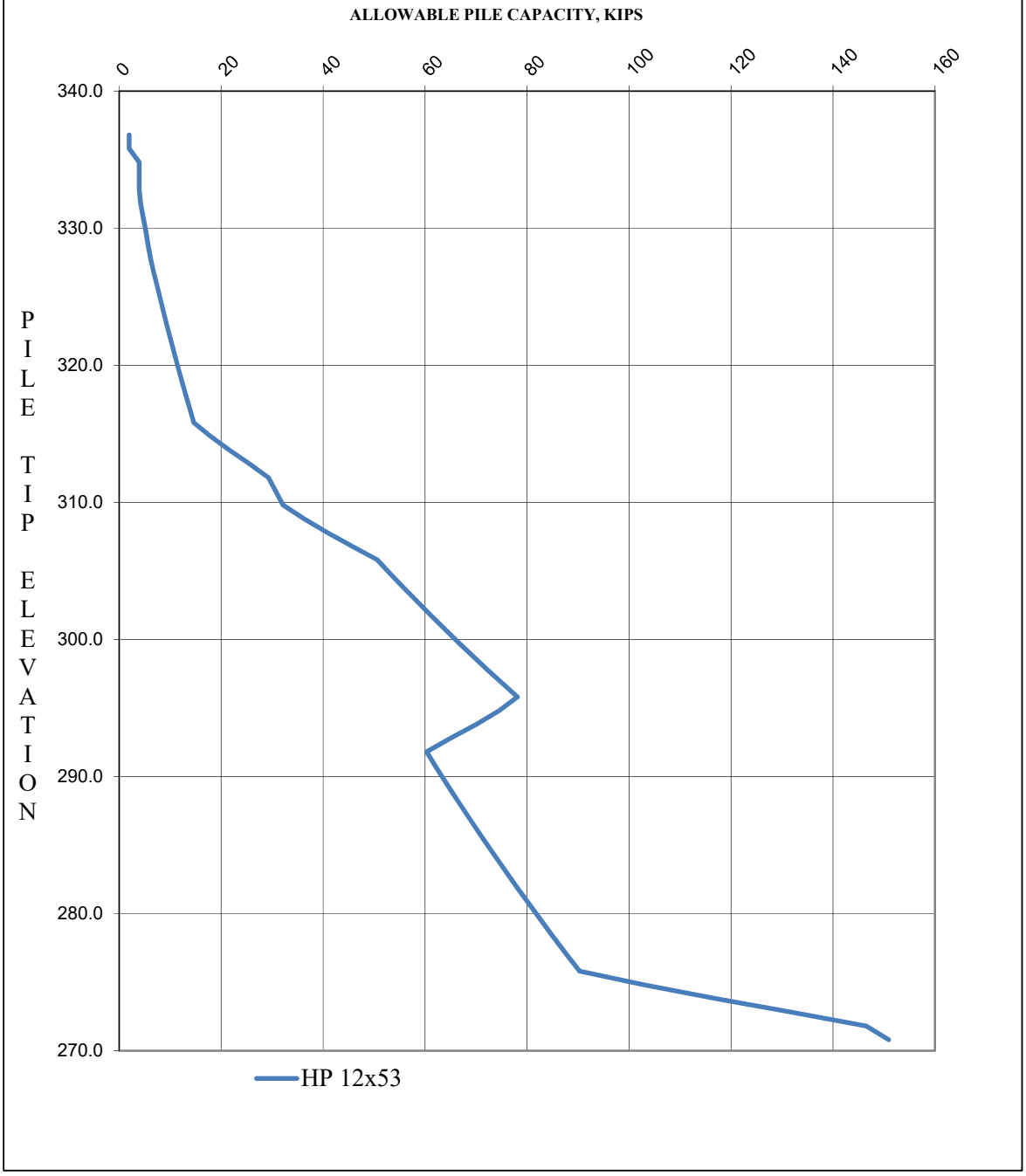
ALLOWABLE SHAFT CAPACITY CURVE
Paducah City Block Development-Mixed Use Buildings

Factor of Safety = 2.5



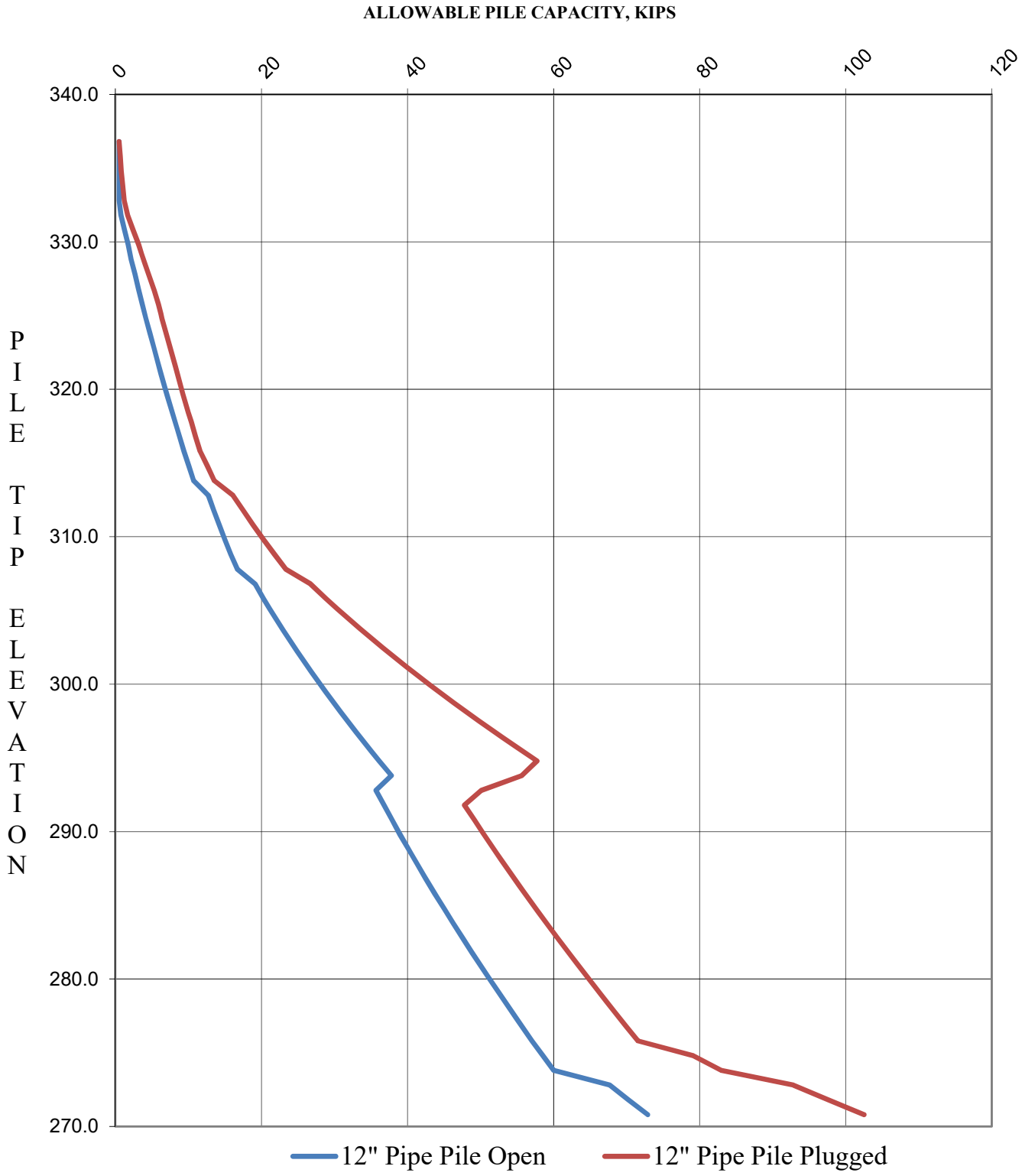
Allowable Pile Capacity Curve
Paducah City Block Development-Mixed Use Buildings

Factor of Safety = 2.75



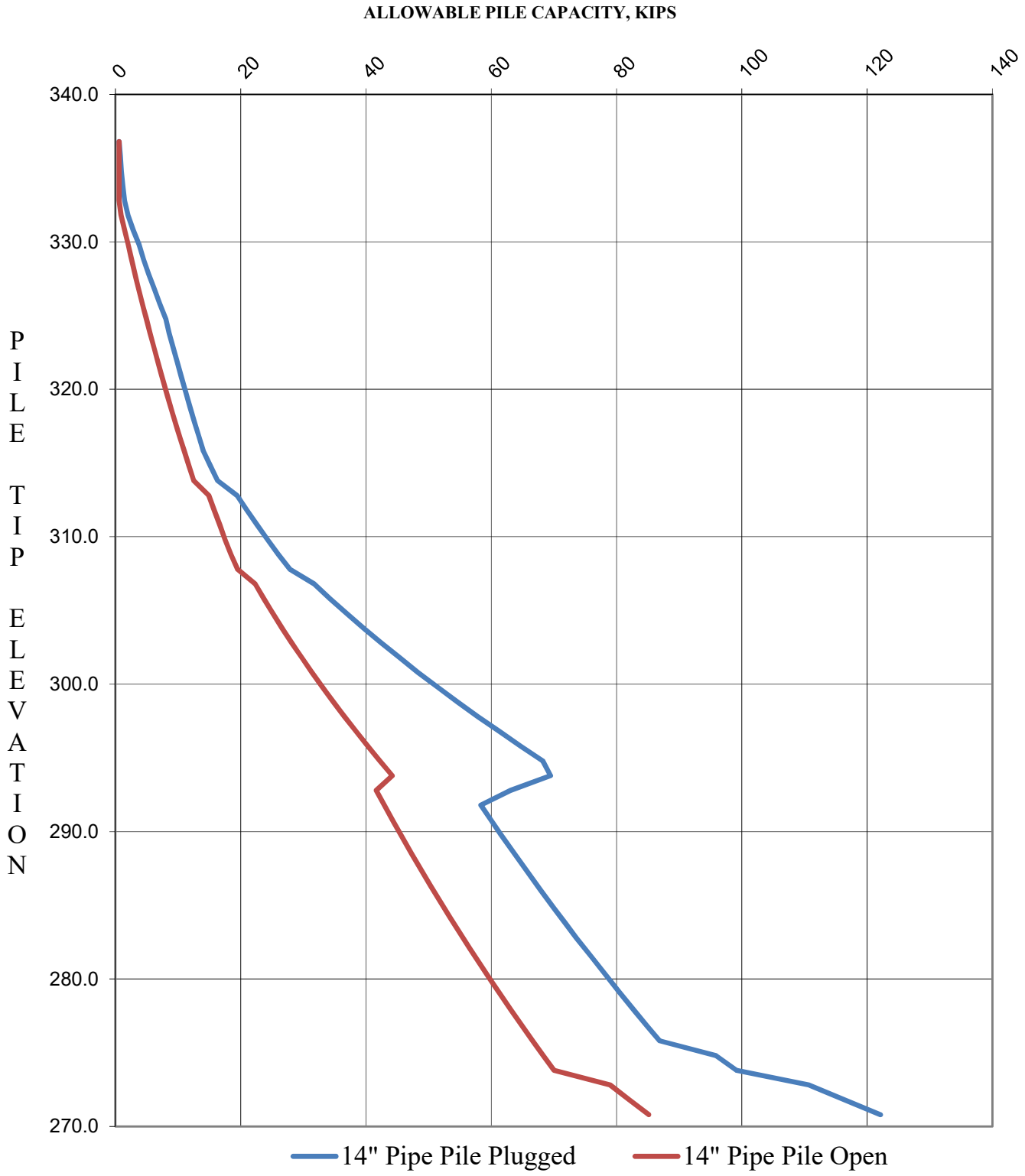
Allowable Pile Capacity Curve
Paducah City Block Development-Mixed Use Buildings

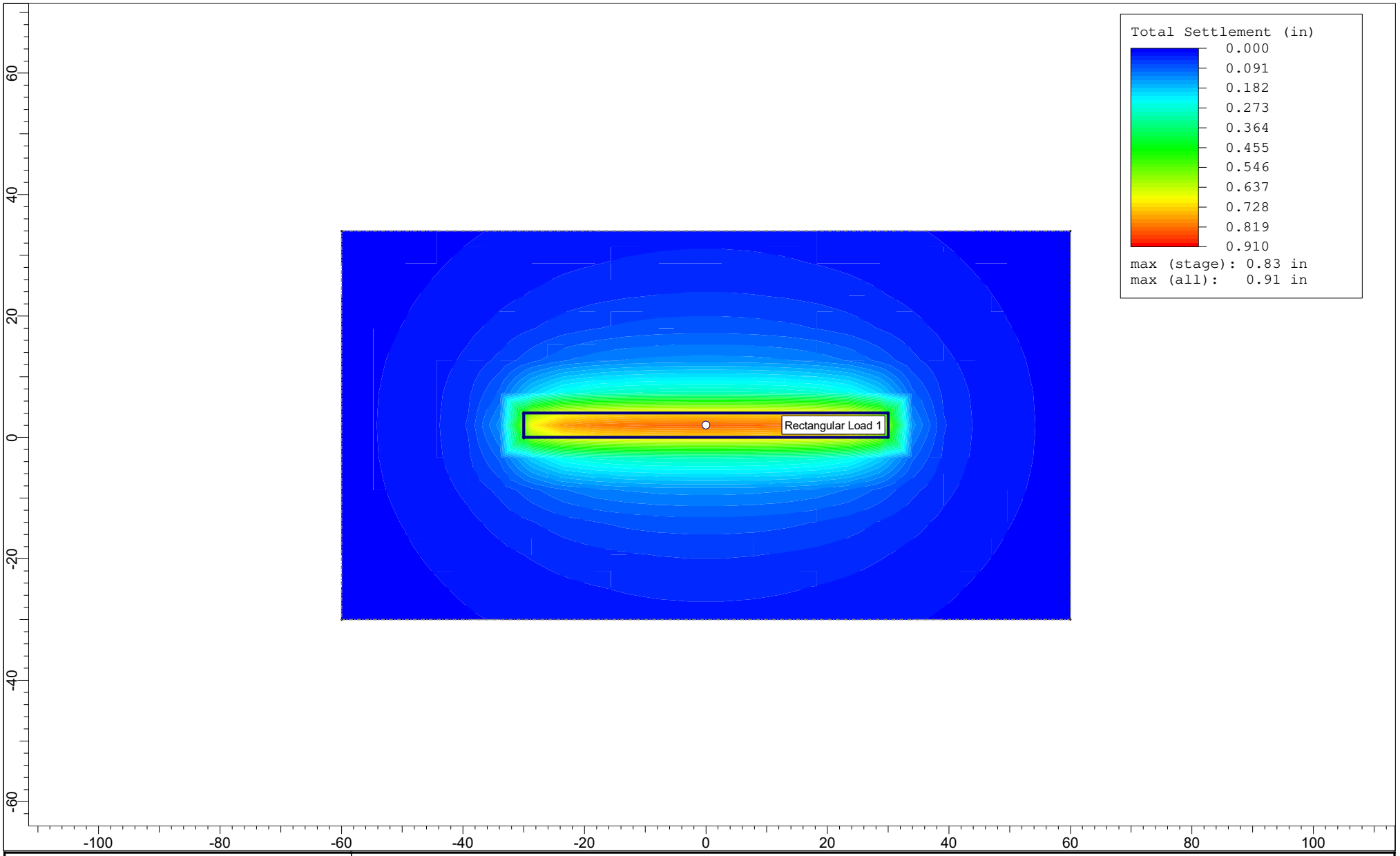
Factor of Safety = 2.75



Allowable Pile Capacity Curve
Paducah City Block Development-Mixed Use Buildings

Factor of Safety = 2.75





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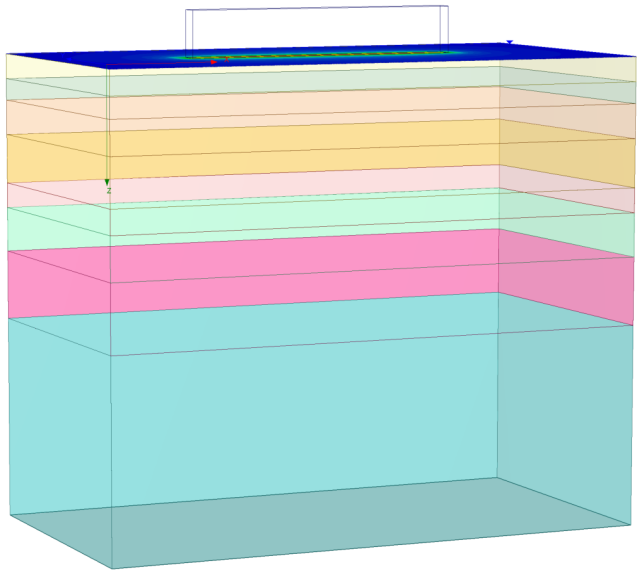
	Analysis Description	Settlement with 1500 PSF Load	
	Drawn By	JRH	*Company* HDR
	Date	12/10/2019, 2:10:42 PM	*File Name* Paducah1500PSF.s3z

SETTLE3D 4.006



rocscience	*Project*	City of Paducah	
	Analysis Description	Settlement with 1500 PSF Load	
	Drawn By	JRH	*Company* HDR
	Date	12/10/2019, 2:10:42 PM	*File Name* Paducah1500PSF.s3z

SETTLE3D 4.006

Settle3D Analysis Information
City of Paducah

Project Settings

Document Name	Paducah1500PSF.s3z
Project Title	City of Paducah
Analysis	Settlement with 1500 PSF Load
Author	JRH
Company	HDR
Date Created	12/10/2019, 2:10:42 PM
Stress Computation Method	Boussinesq
Time-dependent Consolidation Analysis	
Time Units	days
Permeability Units	feet/day
Minimum settlement ratio for subgrade modulus	0.9

Use average properties to calculate layered stresses

Improve consolidation accuracy

Ignore negative effective stresses in settlement calculations

Stage Settings

Stage #	Name	Time [days]
1	Stage 1	0
2	Stage 2	230
3	Stage 3	100000

Results

Time taken to compute: 0 seconds

Stage: Stage 1 = 0 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.0561033
Total Consolidation Settlement [in]	0	0
Virgin Consolidation Settlement [in]	0	0
Recompression Consolidation Settlement [in]	0	0
Immediate Settlement [in]	0	0.0561033
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0	1.5
Loading Stress XX [ksf]	-0.126399	0.894201
Loading Stress YY [ksf]	-0.0638043	1.46157
Effective Stress ZZ [ksf]	0	6.1845
Effective Stress XX [ksf]	-0.126399	2.22718
Effective Stress YY [ksf]	-0.0638043	2.22795
Total Stress ZZ [ksf]	0	12.4405
Total Stress XX [ksf]	-0.126399	8.48083
Total Stress YY [ksf]	-0.0638043	8.48373
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	468.163
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	468.163
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	0
Total Strain	0	0.000194994
Pore Water Pressure [ksf]	0	6.25598
Excess Pore Water Pressure [ksf]	0	1.5
Degree of Consolidation [%]	0	0
Pre-consolidation Stress [ksf]	1.6234	6.18159
Over-consolidation Ratio	1	157.233
Void Ratio	0	0.562
Permeability [ft/d]	0	0.0043195
Coefficient of Consolidation [ft^2/d]	0	0.376
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.2369

Stage: Stage 2 = 230 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.828691
Total Consolidation Settlement [in]	0	0.772588
Virgin Consolidation Settlement [in]	0	0
Recompression Consolidation Settlement [in]	0	0.772588
Immediate Settlement [in]	0	0.0561033
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0	1.5
Loading Stress XX [ksf]	-0.126399	0.894201
Loading Stress YY [ksf]	-0.0638043	1.46157
Effective Stress ZZ [ksf]	0	6.20048
Effective Stress XX [ksf]	-0.126399	2.3942
Effective Stress YY [ksf]	-0.0638043	2.96157
Total Stress ZZ [ksf]	0	12.4405
Total Stress XX [ksf]	-0.126399	8.48083
Total Stress YY [ksf]	-0.0638043	8.48373
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	25.9641
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	468.163
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	27.4886
Total Strain	-3.42045e-006	0.0166054
Pore Water Pressure [ksf]	0	6.24
Excess Pore Water Pressure [ksf]	0	0.124473
Degree of Consolidation [%]	0	99.8637
Pre-consolidation Stress [ksf]	1.62624	6.19759
Over-consolidation Ratio	1	157.367
Void Ratio	0	0.562005
Permeability [ft/d]	0	0.0043195
Coefficient of Consolidation [ft^2/d]	0	0.376
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.23754

Stage: Stage 3 = 100000 d

Data Type	Minimum	Maximum
Total Settlement [in]	0	0.906579
Total Consolidation Settlement [in]	0	0.850475
Virgin Consolidation Settlement [in]	0	0
Recompression Consolidation Settlement [in]	0	0.850475
Immediate Settlement [in]	0	0.0561033
Secondary Settlement [in]	0	0
Loading Stress ZZ [ksf]	0	1.5
Loading Stress XX [ksf]	-0.126399	0.894201
Loading Stress YY [ksf]	-0.0638043	1.46157
Effective Stress ZZ [ksf]	0	6.20048
Effective Stress XX [ksf]	-0.126399	2.3942
Effective Stress YY [ksf]	-0.0638043	2.96157
Total Stress ZZ [ksf]	0	12.4405
Total Stress XX [ksf]	-0.126399	8.48083
Total Stress YY [ksf]	-0.0638043	8.48373
Modulus of Subgrade Reaction (Total) [ksf/ft]	0	24.024
Modulus of Subgrade Reaction (Immediate) [ksf/ft]	0	468.163
Modulus of Subgrade Reaction (Consolidation) [ksf/ft]	0	25.3235
Total Strain	2.39488e-009	0.0166058
Pore Water Pressure [ksf]	0	6.24
Excess Pore Water Pressure [ksf]	-4.49296e-018	9.81696e-018
Degree of Consolidation [%]	0	100
Pre-consolidation Stress [ksf]	1.62624	6.19759
Over-consolidation Ratio	1	157.233
Void Ratio	0	0.562
Permeability [ft/d]	0	0.0043195
Coefficient of Consolidation [ft^2/d]	0	0.376
Hydroconsolidation Settlement [in]	0	0
Average Degree of Consolidation [%]	0	0
Undrained Shear Strength	0	1.23754

Loads

1. Rectangular Load: "Rectangular Load 1"

Length	60 ft
Width	4 ft
Rotation angle	0 degrees
Load Type	Flexible
Area of Load	240 ft^2
Load	1.5 ksf
Depth	0 ft
Installation Stage	Stage 1 = 0 d

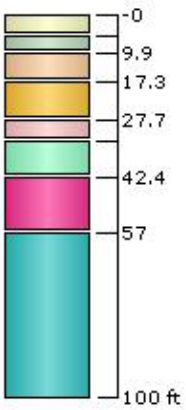
Coordinates

X [ft]	Y [ft]
-30	0
30	0
30	4
-30	4

Soil Layers

Ground Surface Drained: Yes

Layer #	Type	Thickness [ft]	Depth [ft]	Drained at Bottom
1	Lean Clay	5.3	0	No
2	Silty Clay I	4.6	5.3	No
3	Silty Clay II	7.4	9.9	No
4	Silty Clay III	10.4	17.3	Yes
5	Poorly-Graded Gravel I	5.3	27.7	No
6	Poorly-Graded Gravel II	9.4	33	No
7	Poorly-Graded Gravel and Silty Sand	14.6	42.4	No
8	Silty Sand	43	57	No



Soil Properties

Property	Lean Clay	Silty Clay I	Silty Clay II	Silty Clay III
Color				
Unit Weight [kips/ft^3]	0.12	0.12	0.12	0.12
Saturated Unit Weight [kips/ft^3]	0.12	0.12	0.12	0.12
K0	1	1	1	1
Primary Consolidation	Enabled	Enabled	Enabled	Enabled
Material Type	Non-Linear	Non-Linear	Non-Linear	Non-Linear
Cc	0.12	0.12	0.12	0.12
Cr	0.013	0.013	0.013	0.013
e0	0.562	0.562	0.562	0.562
Pc [ksf]	2.4	2.4	2.4	2.4
Cv [ft^2/d]	0.292	0.292	0.376	0.376
Cvr [ft^2/d]	0.292	0.292	0.376	0.376
B-bar	1	1	1	1
Undrained Su A [kips/ft2]	0	0	0	0
Undrained Su S	0.2	0.2	0.2	0.2
Undrained Su m	0.8	0.8	0.8	0.8
Piezo Line ID	1	1	1	1

Property	Poorly-Graded Gravel I	Poorly-Graded Gravel II	Poorly-Graded Gravel and Silty Sand	Silty Sand
Color				
Unit Weight [kips/ft^3]	0.115	0.13	0.115	0.13
Saturated Unit Weight [kips/ft^3]	0.115	0.13	0.115	0.13
K0	0.47	0.38	0.53	0.36
Immediate Settlement	Enabled	Enabled	Enabled	Enabled
Es [ksf]	800	1500	350	1000
Esur [ksf]	800	1500	350	1000
B-bar	-	-	-	-
Undrained Su A [kips/ft2]	0	0	0	0
Undrained Su S	0.2	0.2	0.2	0.2
Undrained Su m	0.8	0.8	0.8	0.8
Piezo Line ID	1	1	1	1

Groundwater

Groundwater method	Piezometric Lines
Water Unit Weight	0.0624 kips/ft^3

Piezometric Line Entities

ID	Depth (ft)
1	0 ft

Field Point Grid

Number of points 342
Expansion Factor 2

Grid Coordinates

X [ft]	Y [ft]
60	34
60	-30
-60	-30
-60	34

Time Points

Point #	(X,Y) Location	Depth	Goal Type	Goal	Time Until Goal
1	0, 2	0 ft	Degree of Consolidation	90%	0 d