REPORT
2017012415

GEOTECHNICAL INVESTIGATION FOR LAMBERT COMMUNITY SOLAR PROJECT ON MISSOURI BOTTOM ROAD BRIDGETON, MISSOURI

Prepared for

Ameren

AMEREN SERVICES
St. Louis, Missouri

Prepared by

REITZ & JENS, INC.
CONSULTING ENGINEERS

June 28, 2017

The Professional whose signature and personal seal appear hereon assumes responsibility only for what appears in the attached report and disclaims (pursuant to Section 327.411 RSMo) any responsibility for all other plans, estimates, specifications, reports, or other documents or instruments not sealed by the undersigned Professional relating to or intended to be used for any part or parts of the project to which this report refers.

ATTACHMENT D

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June 28, 2017

Ameren Services
1901 Chouteau Ave., Mail Code 645
St. Louis, Missouri 63103

Attention: Mr. Chad Raley, PMP, P.E.

RE: Report of Geotechnical Investigation for
Lambert Community Solar Project, Bridgeton, Missouri

Introduction

This report summarizes our findings and recommendations from the geotechnical investigation which we completed for the planned Lambert Community Solar Project at Lambert St. Louis International Airport, on Missouri Bottom Road in Bridgeton, Missouri. This investigation was done in general accordance with P.O. 791264, dated May 19, 2017, to our Contract Agreement 491572, and our revised proposal dated May 15, 2017. The purpose of this geotechnical investigation was to provide foundation design parameters for the solar arrays. Because the scope of services and level of effort are specific to the needs of this project, the contents of this report may not address items critical to other projects. Therefore, this report is not to be used for other projects or by third parties without Reitz & Jens' written authorization.

Project Description

The 9.5-acre site is located about ¼-mile west of the intersection of Missouri Bottom Road and Lindbergh Boulevard. The site is on the north side of Missouri Bottom Road, as shown in Figure 1. Ameren proposes to install solar panels on the slope and the terrace (shown by the magenta outline in Figure 1). We anticipate that the foundations will consist of partially-embedded, steel piles that will be installed by a hydraulic or impact hammer.

Our findings and recommendations are based in part upon our understanding of this project as described above. Changes or discrepancies in loads, geometry, location, or the scope of the project from the above description should be considered to invalidate our findings and recommendations until we have reviewed the differences and, if necessary, modified our recommendations accordingly.

Site Description

The site has been cleared of trees and apparently re-graded to form a terrace that runs east to west. There is evidence of previous roads across the site, and leading up to a former structure or road near the center of the site just south of the railroad tracks, which is at about el. 700.[1]

[1] Elevations stated in this report are based upon a Google Earth™ photo with elevation contours furnished by Ameren Services, and are approximate.

The northern portion of the site slopes down to the south to a terrace which is at about el. 584 to el. 580. This area was excavated in 2003 to 2004 for the relocation of Missouri Bottom Road, as part of the Airport Expansion and the relocation of U.S. 67. There is an excavated roadway slope from the terrace down to Missouri Bottom Road. The road is at about el. 500 at the west end of the site, rising to el. 565 at the east end. The crest of the southern roadway slope is shown in yellow in Figure 1. The planned area of the solar array is at about el. 570 at the west end, rising to the level of the terrace, and extending down the southern roadway slope. Concrete of an abandoned pavement or foundation is exposed in the vicinity of Boring B-3. Limestone outcrops are visible at the bottom of the slope near Missouri Bottom Road.

There is a structure that houses an emergency generator for Lambert St. Louis International Airport located to the east of the planned project area (see Figure 1).

Reitz & Jens performed a preliminary geotechnical investigation for the expansion of the Lambert St. Louis International Airport in 1998. Three borings made for that investigation were located in the project area. The approximate locations of these borings are shown in Figure 1. The Boring Logs for these borings are included in Appendix A.

Field Investigation

The subsurface investigation consisted of three borings, as shown in Figure 1. The number and locations of borings were selected by Reitz & Jens. The borings were located in the field using hand-held GPS. The elevations of the ground surface at the borings were estimated from the topographic contours in the Google Earth™ aerial photo furnished by Ameren Services. The borings were made on May 31, 2017, by Midwest Drilling, Inc. under a subcontract with Reitz & Jens. The borings were advanced by a 550X drill rig mounted on an all-terrain vehicle and using 4.25-inch O.D. solid stem continuous-flight augers (CFA). The ground water levels were measured in each boring at the end of the day before the borings were backfilled with cuttings. No 24-hours delayed water level readings were made.

Samples of subsurface soils were obtained at about 2.5-foot intervals from 0 to 10 feet, and at 5-foot intervals from 10 to 35 feet. The borings were then continued without sampling until auger refusal occurred or a maximum depth of 60 feet was reached. Samples were taken using either: 1) a hydraulically pushed, 3-inch O.D., thin-wall Shelby tube sampler in general accordance with ASTM D1587; or 2) a 2-inch O.D., split-spoon sampler driven by an automatic Standard Penetration Test (SPT) hammer in conjunction with a SPT, in general accordance with ASTM D1586. The Shelby tube samples were trimmed and then sealed with a tight-fitting plastic cap and duct tape. Loose materials were removed from the upper end of each tube and the length of the recovered sample was measured. The top end of the tube was then sealed with a tight-fitting plastic cap and duct tape. The disturbed split-spoon samples obtained were visually classified in the field and sealed in glass jars to prevent loss of moisture, for later testing in our laboratory. The Shelby tubes were extruded in our lab immediately prior to testing.

Published tests have shown that the blow counts from a SPT using an automatic hammer are about 75% of the blow counts obtained using a manual drop hammer and cathead. Manual hammers have been used to develop correlations between SPT's and soil properties. Therefore, N-values from an automatic hammer typically should

be increased by about one-third in order to use such correlations. The blow counts and N-values on the individual boring logs have not been corrected for the energy of the automatic SPT hammer (termed "N_{60}").

Three pocket penetrometer readings were made on each split-spoon sample of cohesive soil, in accordance with Ameren Services' standard request. The pocket penetrometer readings appear on the boring logs. However, split-spoon samples are highly disturbed, so the pocket penetrometer readings have questionable value except perhaps for general soil classification.

The field investigation was completed under the direction of a Reitz & Jens' Registered Geologist or a soils technician, who determined the sampling intervals, termination depths, and logged the borings. The borings were logged in the field based upon cuttings, drilling characteristics and recovered samples. The logs were subsequently modified as appropriate based on laboratory test results. The key and notes for the boring logs are shown in Figure 2-0. The boring logs are included as Figures 2-1, 2-2 and 2-3.

Laboratory Testing

All recovered samples were visually described in general accordance with the ASTM procedures. Index tests performed included water contents and dry density of the Shelby tube samples (ASTM D2216) and an Atterberg liquid and plastic limits test (ASTM D4318). The results of these index tests appear on the boring logs. A single-point Unconsolidated-Undrained (UU) triaxial compression test (ASTM D2850) was performed on the Shelby tube sample from Boring B-3 to determine the undrained shear strength (s_u). The UU-test was run with a confining pressure equal to the existing overburden pressure at the depth of the sample. The results of this test are shown in Figure 3-3.

Consolidated-Undrained triaxial compression tests with pore pressure measurements (ASTM D4767) were performed on the Shelby tube samples from Borings B-1 and B-2 to measure the effective shear strength properties of these soils, which are primarily for slope stability analyses, if requested by Ameren Services. The results of these tests are shown in Figures 3-1 and 3-2.

Summary of Subsurface Conditions

The near-surface soils in all three borings consist of low plastic, silty clays and clayey silts. Boring B-1 revealed about 3 feet of medium-dense clayey silt, followed by firm silty clay to 13.5 feet. Uncorrected N-values in the upper 13.5 feet ranged from 6 to 10 blows per foot (bpf). There is very loose, slightly clayey silt from 13.5 feet to 23.5 feet, with uncorrected N-values of 3 and 5 bpf. From 23.5 feet to 53.5 feet, B-1 revealed stiff silty clay, with uncorrected N-values of 8 to 13 bpf. Boring B-1 encountered very weathered, hard shale from 53.5 feet to 59 feet, where a thin layer of highly weathered limestone was encountered. Auger refusal in unweathered limestone was reached at 59.5 feet (about el. 512). Boring B-1 may be located in an old creek channel, which would explain the stratum of loose silt and the greater depth to rock compared to the other two borings.

Boring B-2 revealed about 8.5 feet of clayey silt, with uncorrected N-values of 6 and 7 bpf, over firm silty clay to 14 feet. There stiff, lows plastic clay from 14 feet to 26.5 feet, with uncorrected N-values of 7 and 16 bpf. From 26.5 feet to 37.5 feet is stiff to very stiff, weathered clayey shale, with uncorrected N-values of 17 and 9 bpf.

Boring B-2 encountered weathered limestone at 37.5 feet, and auger refusal on unweathered limestone at 39 feet (about el. 545).

Boring B-3 revealed about 6 feet of stiff silty clay, the upper 3 feet of which may be compacted fill. From 6 feet to 10 feet is medium-dense clayey silt. The UU-test on the sample at 8 to 10 feet measured an undrained shear strength (s_u) of 1330 psf. From 10 feet to 28.5 feet is loose clayey silt, with uncorrected N-values of 3 to 5 bpf. From 28.5 feet to 47 feet is firm, very silty clay. Boring B-3 encountered weathered clayey shale from 47 feet to the bottom of the boring at 60 feet.

Ground water was encountered at 16 feet deep in Boring B-1. The ground water level rose to 11 feet deep (about el. 560) after 4 hours. The ground water level in B-2 rose to 26 feet deep (about el. 558) after 2 hours. Ground water was first observed at 27.5 feet in B-3 (about el. 562), and the boring was immediately backfilled. The depth of ground water will vary seasonally and with precipitation.

IBC Seismic Site Classification

The Seismic Site Class is based on the 2009 International Building Code (IBC). We analyzed the site profile using the average properties in the top 100 feet in accordance with Section 1613.5.5; using the average N60 for cohesionless layers (average N_{ch}) and the average s_u for cohesive layers. We used the maximum s_u of 5000 psf for the shale and limestone. The Site Classification based on IBC 2009 is "D" based upon the average s_u. However, the non-plastic clayey silt from 10 to 28.5 feet in Boring B-3 results in an average N_{ch} less than 15 bpf; so, Site Classification is "E", which governs. There is essentially no risk of liquefaction. We did not analyze the risk of slope instability for a seismic event.

Design of Driven Steel Pipe Piles

The abandoned pavements and observed abandoned concrete slabs or foundations on the site would be obstructions for the installation of driven piles. The surface of the site probably will need to be stripped in places to uncover and remove obstructions.

The partially-embedded steel piles supporting the solar panels will be subject to lateral loads as well as vertical loads, in particular uplift. We recommend the following parameters for input to the LPILE 2016 program for lateral load analyses for piles up to 35 feet deep.

B-1		Depth (feet)		Effective Unit Weight	Undrained Cohesion	Uniaxial Compressive Strength	Strain Factor	Friction Angle	p-y Modulus k
Stratum	LPILE Soil Type	Top	Bottom	(pcf)	(psf)	(psi)	E_{50}	(deg)	(pci)
Freeze-Thaw	Soft Clay	0	2.5	115	1	-	0.023	-	-
Clayey SILT	Silt (c-phi)	2.5	4	115	100	-	0.023	30	100
Silty CLAY	Soft Clay	4	11	120	1,000	-	0.010	-	-
Silty CLAY	Soft Clay	11	14	58	1,000	-	0.010	-	-
Clayey SILT	Silt (c-phi)	14	24	58	100	-	0.023	30	100
Silty CLAY	Soft Clay	24	35	60	1,700	-	0.008	-	-

B-2		Depth (feet)		Effective Unit Weight	Undrained Cohesion	Uniaxial Compressive Strength	Strain Factor	Friction Angle	p-y Modulus k
Stratum	LPILE Soil Type	Top	Bottom	(pcf)	(psf)	(psi)	E_{50}	(deg)	(pci)
Freeze-Thaw	Soft Clay	0	2.5	115	1	-	0.023	-	-
Clayey SILT	Silt (c-phi)	2.5	8	115	100	-	0.023	30	100
Silty CLAY	Soft Clay	8	24	120	1,200	-	0.008	-	-
CLAY/Shale	Stiff Clay w/o F.W.	24	35	120	2,000	-	0.006	-	-

B-3		Depth (feet)		Effective Unit Weight	Undrained Cohesion	Uniaxial Compressive Strength	Strain Factor	Friction Angle	p-y Modulus k
Stratum	LPILE Soil Type	Top	Bottom	(pcf)	(psf)	(psi)	E_{50}	(deg)	(pci)
Freeze-Thaw	Soft Clay	0	2.5	115	1	-	0.023	-	-
Silty CLAY	Soft Clay	2.5	10	115	1,200	-	0.008	-	-
Clayey SILT	Silt (c-phi)	10	28.5	115	100	-	0.023	30	100
Silty CLAY	Soft Clay	28.5	35	120	900	-	0.010	-	-

Cycles of freeze-thaw and desiccation will often create cracking in the soil and a gap between the top of the pile and the surrounding soil. Therefore, the cohesive or undrained shear strength of the surface soil should be neglected in the LPILE analyses in the freeze-thaw or desiccation zone, which is assumed to be 2.5 feet deep in the St. Louis area. The weight of the soil in the top 2.5 feet should still be entered into LPILE. We suggest using the "Soft Clay" soil type in the freeze-thaw zone, with an s_u of 1 psf and a E_{50} of 0.023. The slope of the ground surface in the direction of loading must be entered into the LPILE analysis.

For the design for axial loads, we used the API Method for driven small diameter pipe piles. We recommend the following design values for ultimate side load transfer (f_s) and ultimate end bearing (q_p):

Design Parameters for Axial Load Capacity for Drive Pipe Piles

Boring 1		
Depth (ft)	f_s (ksf)	q_p (ksf)
0-3	0.07	-----
4-13	0.5	9
14-23	0.4	12-16
24-30	0.9	13

Boring 2 and 3		
Depth (ft)	f_s (ksf)	q_p (ksf)
0-5	0-0.2	-----
6-14	0.2-0.5	10
15-18	0.3	10
19-23	0.6-0.80	10
24-29	0.8-1.0	24
30	0.8	7

We combined the design parameters for Borings B-2 and B-3, to simplify the design. The design parameters for Boring B-1 should be used for piles in the vicinity of B-1 up to midway between B-1 and B-2. Where two values are shown in the above tables, the f_s or q_p varies linearly over the corresponding depths. These design parameters are for calculating the ultimate capacity of the pile. An appropriate factor of safety must be applied for the load case. The values for f_s may be used for uplift.

Corrosion Potential for Steel Piles

Three samples of the subsurface soils were selected and were delivered to PDC Laboratories in St. Louis for pH and resistivity testing, to determine the corrosive potential of the soils. The results from PDC are included in Appendix B. The values of pH ranged from 7.64 to 8.49. The values of resistivity ranged from 20,000 to 32,000 ohm-cm. Based upon the results of the pH and resistivity testing, and following the flowcharts in section 6.12 of the FHWA design manual "Design and Construction of Driven Pile Foundations – Volume 1", the risk of corrosion on driven steel piles is low. The chloride and sulfates contents of the soil samples were not measured.

Fill Materials and Placement

We are not aware that significant earthwork is planned for this site. The following are general guidelines for placement of fill, if required. The existing soils may be used for fill if the soil does not contain roots or other similar organic matter, trash, frozen material, chemical contamination, or rock or concrete fragments larger than 6 inches in the maximum dimension.

Fill materials should be placed in uniform, horizontal lifts, and compacted in systematic coverages of the entire lift. The thickness of the loose lift (prior to compaction) should not exceed 12 inches where large, self-propelled compaction equipment can be used. In confined areas, where manual compactors are required, the lift thickness should not exceed 6 inches prior to compaction.

The compaction characteristics of fine-grain soils, such as clays or clayey silts, are dependent upon water content. For these materials, the water content should be adjusted prior to compaction, either by sprinkling additional water, or by scarifying, discing and drying to lower the water content. Normally, the soils on site will have to be dried prior to compaction.

Where fill is placed below footings, slabs or pavements, the fill should be compacted to a dry unit weight equal to at least 90 percent of the maximum dry unit weight determined by the modified Proctor method (ASTM D1557). Fill in other areas may be compacted to 85 percent of the maximum dry unit weight.

Analyses of Existing Slopes

Analyses of the stability of the existing slopes were not included in our Scope of Services for this investigation. However, since the solar array will be constructed on the roadway slope and close to the top of the slope, we recommend analyses of the long-term stability of the slope, including seismic analysis. We made the borings to 60 feet deep or to auger refusal to obtain information on the soil stratification and top of rock for such slope stability analyses. Also, the effective shear strength properties from the CU-tests are intended primarily for slope stability analyses. If Ameren requests such analyses, then we will need accurate topographic data to construct the models.

Construction Observation and Testing

All phases of the foundation- and soils-related construction should be tested and documented by Reitz & Jens to verify that subsurface conditions anticipated are, in fact, those found during construction. These quality control services are part of the geotechnical design process. We recommend pile load tests, both for axial compression

and tension. The number of pile load tests will depend upon the number of production piles. We would like to work with Ameren Services to develop the pile load testing plan and to assist in evaluating the results.

Limitations of this Report

The recommendations presented in this report include our judgment of possible significant variations in subsurface conditions. Non-uniform conditions, however, often cannot be determined by the procedures described. We recommend that a contingency fund be budgeted to accommodate such possible variations.

Closure

We welcome any questions or comments that you may have regarding this preliminary report or any other soils-related aspects of the project. We appreciate the opportunity to continue our close working relationship with Ameren Services.

Sincerely,
REITZ & JENS, Inc.

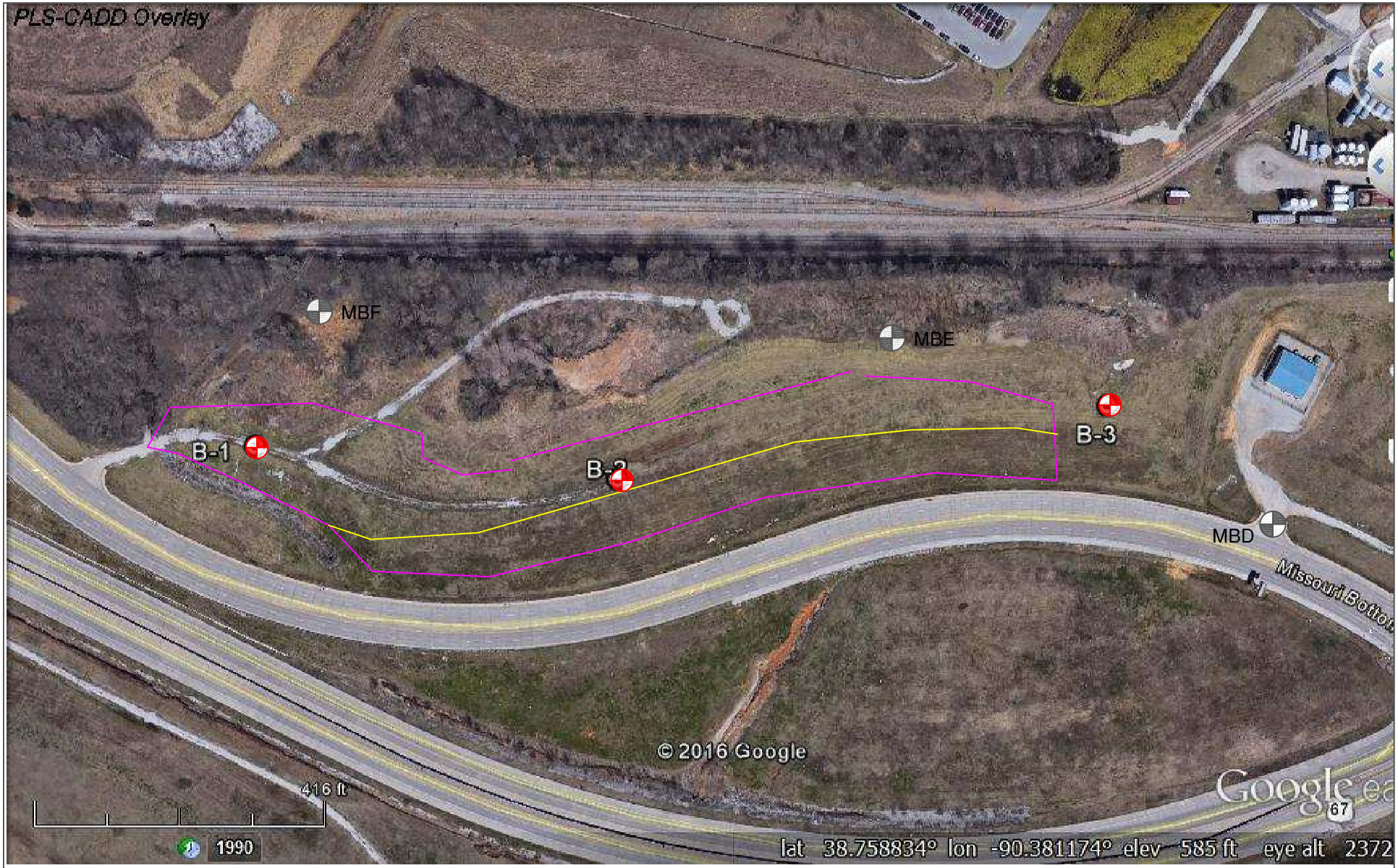
Jeffrey L. Fouse, P.E.
Principal
Email: jfouse@reitzjens.com
Cell phone: 314-852-1110

The following attachments complete this report:

Figure 1	Boring Location Plan
Figure 2-0	Key to Boring Log
Figures 2-1 to 2-3	Individual Boring Logs
Figure 3-1	Results of CU-Test from Boring B-1
Figure 3-2	Results of CU-Test from Boring B-2
Figure 3-3	Results of UU-Test from Boring B-3
Appendix A	Logs of Borings from Airport Expansion, 1998
Appendix B	Results of PDC Laboratory Analyses

Copies submitted: 2

ATTACHMENT D



Boring Completed May 2017

Boring for Airport Expansion

Ameren Lambert Community Solar Project
PLAN OF SITE AND APPROXIMATE
LOCATIONS OF BORINGS

REITZ & JENS, INC.

Figure 1

ATTACHMENT D

KEY TO BORING LOGS

Symbol	Description
KEY TO SOIL SYMBOLS	
	Low plastic Clayey SILT (ML)
	Low plastic Silty CLAY/ Clayey SILT (CL-ML)
	High plastic Clay or very weathered Shale with Limestone fragments
	Very Weathered LIMESTONE
	Inorganic, non-plastic SILT (ML)
	Low plastic CLAY (CL)
	Very Weathered Shale or high plastic Shaley CLAY (CH)
	Weathered Limestone and Shale with high plastic Clay
MISCELLANEOUS SYMBOLS	
	Water table during drilling
	Delayed Reading of Water table

Symbol	Description
	Boring continues
	Moisture content (%)
	N-value from Standard Penetration Test, ASTM D-1586 (blows/ft)
	Shear strength from Pocket Penetrometer (tsf)
SOIL SAMPLERS	
	2-in. O.D. Split-Spoon
	3-in. O.D. Shelby Tube

Notes:

1. Borings were made on May 31, 2017, by Midwest Drilling, Inc., under subcontract with Reitz & Jens. The borings were advanced with a CME 550X ATV-mounted drill rig using 4.25-inch solid continuous-flight augers (CFA). The borings were backfilled with cuttings at the end of the day.

2. Borings were located by Reitz & Jens using a hand-held GPS. The elevations of the borings were estimated based upon a Google Earth aerial photo with approximate elevation contours provided by Ameren Services.

3. The borings were logged in the field by a Reitz & Jens' registered geologist or qualified soils technician, based upon the recovered samples, cuttings and drilling characteristics. Samples were transported to Reitz & Jens' lab for testing. Field logs were revised, if needed, based upon laboratory classification and testing.

4. Stratification lines shown on the logs represent approximate soil boundaries; actual changes in strata may be gradual or occur between samples.

Figure 2-0

ATTACHMENT D

REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-1

Lambert Community Solar Project
Bridgeton, Missouri
CLIENT: **Ameren Services**

LOCATION: See Figure 1
ELEVATION: 571 DATUM: NAVD88
DATE DRILLED: 05-31-2017

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0	570				6	Clayey SILT (ML), dark brown, medium-dense, moist, with trace fine roots and crushed limestone	5-6-4	24.3
					100	Silty CLAY (CL-ML), brown, firm, moist, with lignite and trace limonite	3-2-4	26.5
5	565				83	Becoming mottled gray/brown	2-3-3	28.0
					100			
10	560	▼						
					100	SILT (ML), gray, very loose, very moist, with trace carbon	2-1-2	32.5
15	555	▽						
					100	Becoming loose, slightly clayey, moist	2-2-3	27.1
20	550							
					100	Silty CLAY (CL-ML), gray, stiff, very silty, moist	4-4-6	23.3
25	545							
					100	Becoming less silty, blue-gray & olive	3-3-5	27.2
30	540							

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ◇ TV
1 2 3
▲ STANDARD PENETRATION TEST N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (SILTS & CLAYS)
PL LL
20 40 60

4.5

DRILLER: Midwest Drilling
METHOD: 4.25" CFA
TYPE OF SPT HAMMER: Automatic
HAMMER EFFICIENCY (%):
LOGGED BY: D. Binz

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING 16 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT 11 FEET AFTER 4 HOURS
AT ____ FEET AFTER ____ HOURS
PIEZOMETER: INSTALLED AT ___ FEET

File: 2017012415

REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-1

Lambert Community Solar Project

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
35	535				100	Becoming medium gray	3-6-7	23.2
50	520					With rock fragments		
						SHALE, very weathered, hard		
60	510					LIMESTONE, weathered Boring terminated at auger refusal on limestone at 59'-6"		

SHEAR STRENGTH, tsf

△ QU/2 ■ PP □ SV ◇ TV

1 2 3

STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)

● MOISTURE CONTENT, %
○ % FINES (SILTS & CLAYS)

PL LL

20 40 60

4.5+

File: 2017012415

Figure 2-1 Sheet 2 of 2

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BORING LOG B-2

Lambert Community Solar Project
Bridgeton, Missouri
CLIENT: **Ameren Services**

LOCATION: See Figure 1
ELEVATION: 584 DATUM: NAVD88
DATE DRILLED: 05-31-2017

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0						Clayey SILT (ML), brown, loess, loose, moist		
					100		2-3-3	26.7
	580				100		2-3-3	25.5
5					100		3-3-4	23.7
	575				100	Silty CLAY (CL-ML), brown, firm, moist	2-3-4	24.4
10								
	570				100	CLAY (CL), tan/brown, firm, moist, trace lignite, silt and sand	3-3-4	25.0
15								
	565				100			
20								
	560				100	Becoming very stiff with lignite and limonite	4-7-9	21.6
25								
						Clayey SHALE, yellow/brown/gray, very stiff, moist		
	555				83		4-7-10	23.4
30								

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ◇ TV
1 2 3
STANDARD PENETRATION TEST N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (SILTS & CLAYS)
PL LL
20 40 60

4.5+
4.5+
4.5+

DRILLER: Midwest Drilling
METHOD: 4.25" CFA
TYPE OF SPT HAMMER: Automatic
HAMMER EFFICIENCY (%):
LOGGED BY: D. Binz

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING 36 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT 26 FEET AFTER 2 HOURS
AT ____ FEET AFTER ____ HOURS
PIEZOMETER: INSTALLED AT ___ FEET

File: 2017012415

Figure 2-2 Sheet 1 of 2

REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-2

Lambert Community Solar Project

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
35	550	▽			50	Becoming stiff	4-4-5	27.4
						LIMESTONE, weathered		
40	545					Boring terminated at auger refusal on limestone at 39'-0"		
45	540							
50	535							
55	530							
60	525							
65	520							

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ◇ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (SILTS & CLAYS)
PL LL
20 40 60

File: 2017012415

Figure 2-2 Sheet 2 of 2

REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-3

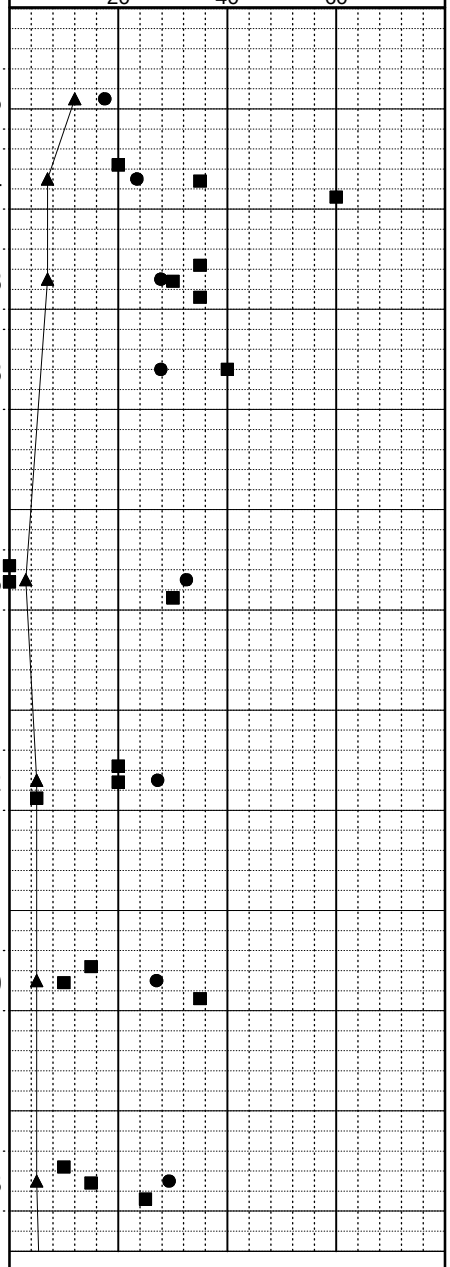
Lambert Community Solar Project
Bridgeton, Missouri
CLIENT: **Ameren Services**

LOCATION: See Figure 1
ELEVATION: 590 DATUM: NAVD88
DATE DRILLED: 05-31-2017

DEPTH (FEET)	ELEVATION	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0	590			Silty CLAY (CL-ML), brown, stiff, dry, with trace fine roots (possible fill in top 3 feet)		
			39		5-6-6	17.5
				Becoming firm, moist and more plastic		
5	585		100		4-3-4	23.4
			100	Clayey SILT (ML), brown, loose, moist with lignite	3-3-4	27.8
				Becoming medium-dense or stiff		
10	580		92		94.3	27.8
			78	Becoming very loose and very moist	2-1-2	32.5
15	575					
			67	Becoming gray-brown, loose. moist, with lignite and limonite	3-2-3	27.2
20	570					
				With limonite, iron stains		
			100		2-2-3	27.0
25	565					
			100	Silty CLAY (CL-ML), light brown, firm, very silty, moist	2-2-3	29.3
30	560					

WATER TABLE ▽

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ◇ TV
1 2 3
STANDARD PENETRATION TEST N-VALUE (BLOWS PER LAST FOOT) ▲
MOISTURE CONTENT, % ●
% FINES (SILTS & CLAYS) ○
PL LL
20 40 60



DRILLER: Midwest Drilling
METHOD: 4.25" CFA
TYPE OF SPT HAMMER: Automatic
HAMMER EFFICIENCY (%):
LOGGED BY: D. Binz

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING 27.5 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT ____ FEET AFTER ____ HOURS
AT ____ FEET AFTER ____ HOURS
PIEZOMETER: INSTALLED AT ___ FEET

File: 2017012415

Figure 2-3 Sheet 1 of 2

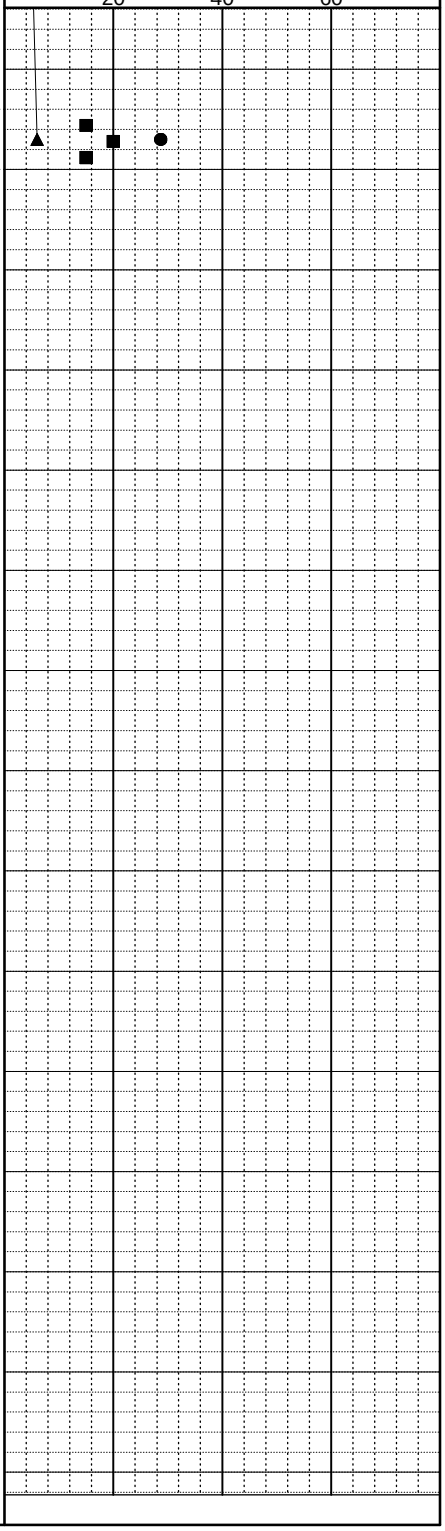
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-3

Lambert Community Solar Project

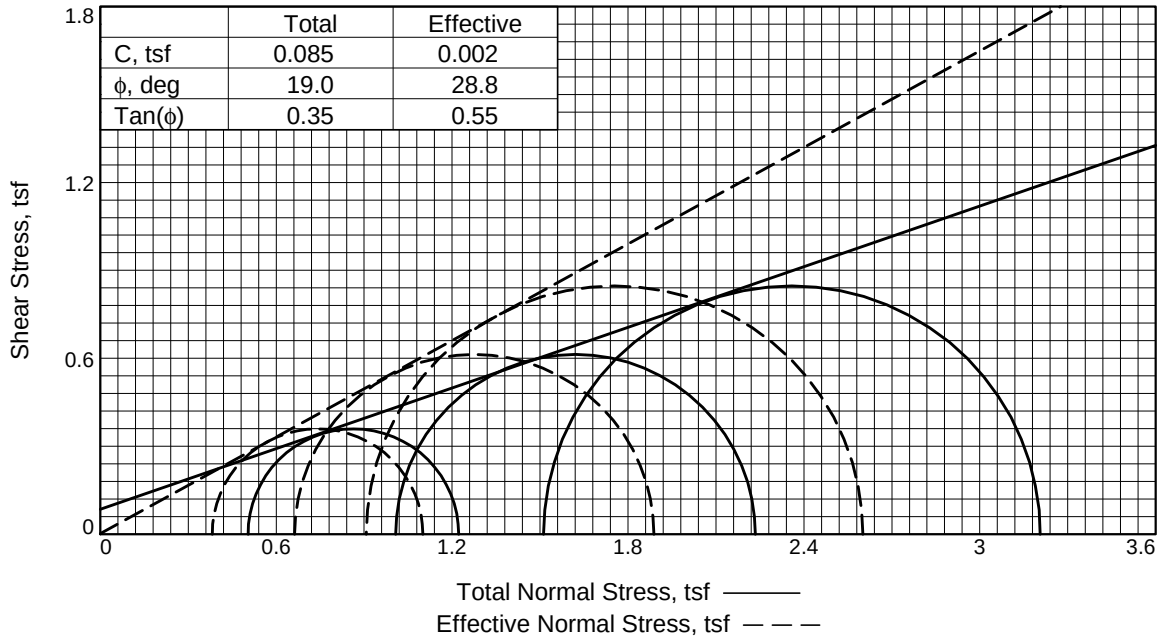
DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
35	555				100	Becoming, brown, more silty, firm, with trace lignite	2-3-3	28.7
40	550							
45	545							
						Clayey SHALE, weathered		
50	540					With rock fragments		
55	535							
60	530					Boring terminated in shale at 60'-0"		
65	525							

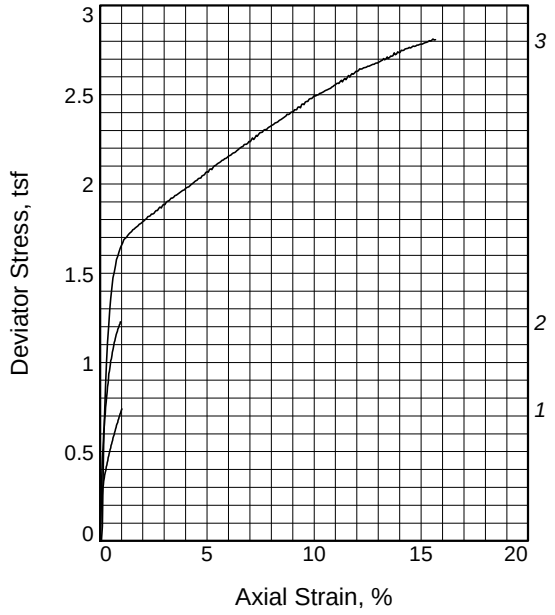
SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ◇ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (SILTS & CLAYS)
PL LL
20 40 60



File: 2017012415

Figure 2-3 Sheet 2 of 2





Sample No.		1	2	3
Initial	Water Content, %	29.7	29.7	29.7
	Dry Density, pcf	93.4	93.4	93.4
	Saturation, %	99.5	99.5	99.5
	Void Ratio	0.8046	0.8046	0.8046
	Diameter, in.	2.85	2.85	2.85
	Height, in.	5.82	5.82	5.82
At Test	Water Content, %	28.7	28.4	28.4
	Dry Density, pcf	94.9	95.4	95.5
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.7759	0.7675	0.7656
	Diameter, in.	2.83	2.84	2.86
	Height, in.	5.79	5.72	5.66
Strain rate, %/min.		0.10	0.10	0.10
Back Pressure, tsf		4.32	4.61	5.04
Cell Pressure, tsf		4.82	5.62	6.55
Fail. Stress, tsf		0.72	1.23	1.69
Total Pore Pr., tsf		4.44	4.95	5.64
Ult. Stress, tsf				
Total Pore Pr., tsf				
$\bar{\sigma}_1$ Failure, tsf		1.10	1.89	2.60
$\bar{\sigma}_3$ Failure, tsf		0.38	0.66	0.91

Type of Test: CU with Pore Pressures

Sample Type: Shelby Tube

Description: Clayey SILT to Silty CLAY (ML-CL), gray, with lignite and limonite

Assumed Specific Gravity= 2.70

Remarks:

Client: Ameren Services

Project: Lambert Community Solar Project

Source of Sample: B-1 **Depth:** 8

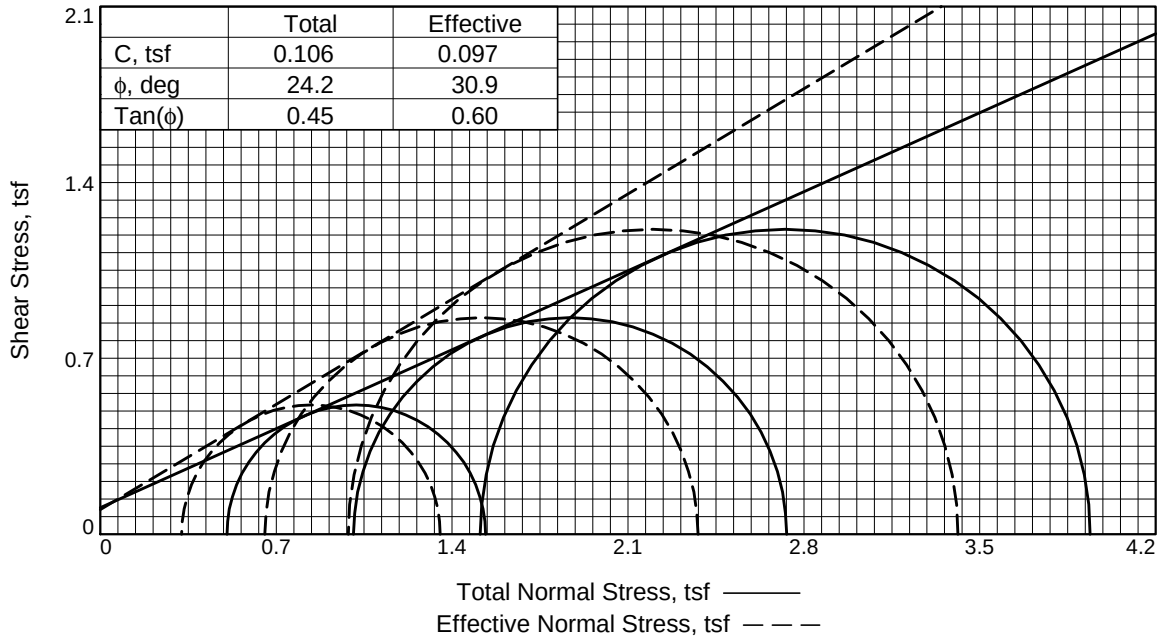
Sample Number: ST-4

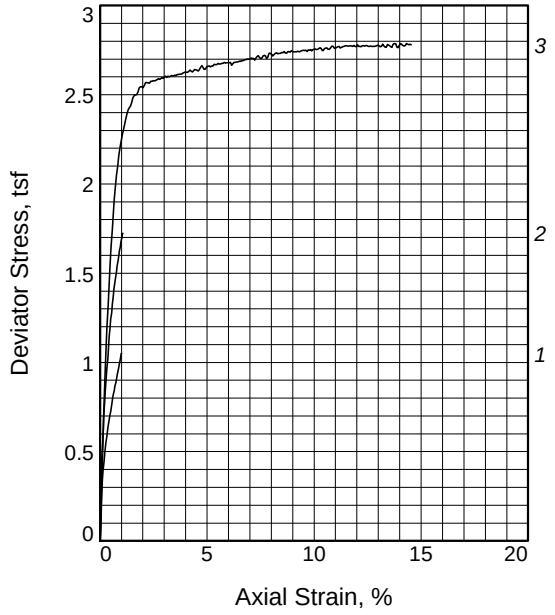
Proj. No.: 2017012415 **Date Sampled:** 6/2/2017

REITZ & JENS, INC.
CONSULTING ENGINEERS

Figure 3-1

Tested By: K. Kocher **Checked By:** J. Fouse





Sample No.		1	2	3
Initial	Water Content, %	25.9	25.9	25.9
	Dry Density, pcf	99.0	99.0	99.0
	Saturation, %	99.4	99.4	99.4
	Void Ratio	0.7026	0.7026	0.7026
	Diameter, in.	2.00	2.00	2.00
	Height, in.	4.29	4.29	4.29
At Test	Water Content, %	24.7	24.3	23.8
	Dry Density, pcf	101.1	101.8	102.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6671	0.6552	0.6433
	Diameter, in.	1.99	1.99	2.00
	Height, in.	4.26	4.21	4.15
Strain rate, %/min.		0.10	0.10	0.10
Back Pressure, tsf		3.96	4.18	4.68
Cell Pressure, tsf		4.46	5.18	6.19
Fail. Stress, tsf		1.03	1.72	2.43
Total Pore Pr., tsf		4.14	4.53	5.21
Ult. Stress, tsf				
Total Pore Pr., tsf				
$\bar{\sigma}_1$ Failure, tsf		1.35	2.38	3.41
$\bar{\sigma}_3$ Failure, tsf		0.32	0.66	0.99

Type of Test: CU with Pore Pressures

Sample Type: Shelby Tube

Description: CLAY (CL), brown, slightly silty, with traces of lignite

LL= 43.3 **PL=** 16.9 **PI=** 26.4

Assumed Specific Gravity= 2.70

Remarks:

Client: Ameren Services

Project: Lambert Community Solar Project

Source of Sample: B-2 **Depth:** 18

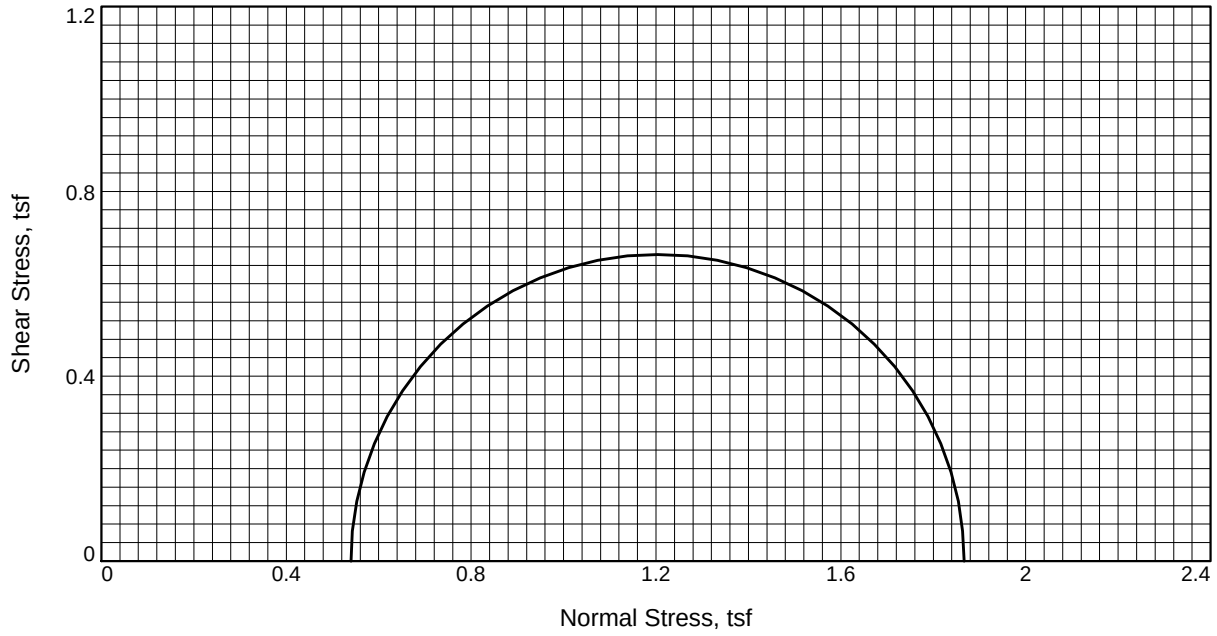
Sample Number: ST-6

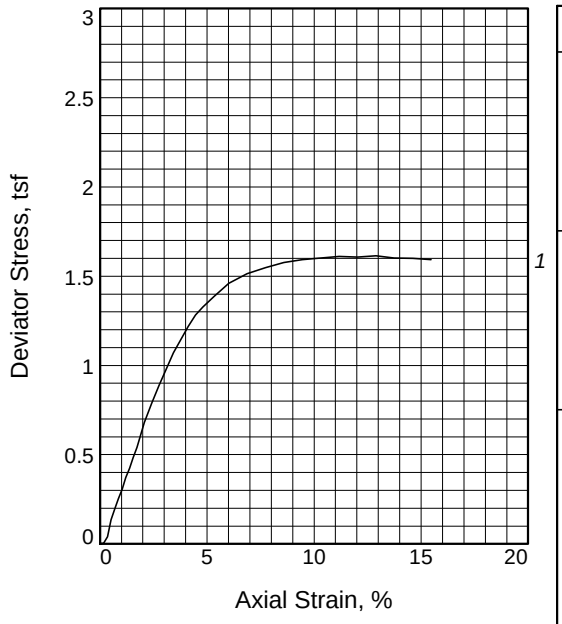
Proj. No.: 2017012415 **Date Sampled:** 06/02/2017

REITZ & JENS, INC.
CONSULTING ENGINEERS

Figure 3-2

Tested By: K. Kocher **Checked By:** J. Fouse





Sample No.		1
Initial	Water Content, %	27.8
	Dry Density, pcf	94.3
	Saturation, %	96.2
	Void Ratio	0.7733
	Diameter, in.	2.85
	Height, in.	5.82
At Test	Water Content, %	42.3
	Dry Density, pcf	94.3
	Saturation, %	146.8
	Void Ratio	0.7733
	Diameter, in.	2.85
	Height, in.	5.82
Strain rate, %/min.		0.80
Back Pressure, tsf		0.00
Cell Pressure, tsf		0.54
Fail. Stress, tsf		1.33
Ult. Stress, tsf		1.61
σ_1 Failure, tsf		1.87
σ_3 Failure, tsf		0.54

Type of Test:
Unconsolidated Undrained

Sample Type: Shelby Tube

Description: Clayey SILT (ML), brown, stiff, moist with trace lignite

Assumed Specific Gravity= 2.68

Remarks:

Client: Ameren Services

Project: Lambert Community Solar Project

Source of Sample: B-3 **Depth:** 8

Sample Number: ST-4

Proj. No.: 2017012415 **Date Sampled:** 06-01-2017

REITZ & JENS, INC.
CONSULTING ENGINEERS

Figure 3-3

Tested By: J. David **Checked By:** K. Kocher, P.E.

ATTACHMENT D

Appendix A

LOGS OF BORINGS FROM AIRPORT EXPANSION, 1998
BORINGS MB-D, MB-E AND MB-F

ATTACHMENT D

Reitz & Jens, Inc.
Consulting Engineers

BORING LOG

PSA 904

PRELIMINARY GEOTECHNICAL SURVEY
CITY OF ST. LOUIS

DATE DRILLED: 2/8/98

BORING NUMBER: MB-D
LOCATION: N-1065006 , E-854816
ELEVATION: 586.7 **DATUM:** USGS
FIGURE: A-36 **SHEET** 1 **OF** 2

DEPTH (FEET)	ELEVATION	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES	MOISTURE CONTENT PERCENT BY WEIGHT
0	585				6.5" CONCRETE SILTY CLAY,black		
5	580			100	CLAYEY SILT,brown,greenish grey, with traces of lignite,soft to medium, moist to wet (Eolian) (CL)	2-2-3	30.4
10	575			94		2-1-2	30.9
15	570			100	SILTY CLAY, reddish brown,medium stiff,moist (Residual) (CL)	1-2-3	29.4
20	565			100		95.5	27.8
25	560			100		1-2-2	27.0
30							

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
MOISTURE CONTENT, %
PL LL
20 40 60

THE STRATIFICATION LINES REPRESENT APPROXIMATE SOIL BOUNDARIES: ACTUAL STRATIFICATION MAY BE GRADUAL.

DRILLER: LAYNE WESTERN
METHOD: 4 1/2" HOLLOW AUGER
LOGGED BY: DAN BINZ

WATER LEVELS: DURING DRILLING 29 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT ____ FEET AFTER ____ HOURS
AT ____ FEET AFTER ____ HOURS

PIEZOMETER: INSTALLED AT ____ FEET

File: LAMBERT Date Printed: April 3, 1998

Reitz & Jens, Inc.
Consulting Engineers

BORING LOG

PSA 904

PRELIMINARY GEOTECHNICAL SURVEY
CITY OF ST. LOUIS

DATE DRILLED: 2/8/98

BORING NUMBER: MB-D
LOCATION: N-1065006 , E-854816
ELEVATION: 586.7 **DATUM:** USGS
FIGURE: A-36 **SHEET** 2 **OF** 2

DEPTH (FEET)	ELEVATION	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES	MOISTURE CONTENT PERCENT BY WEIGHT
					SILTY CLAY,reddish brown with yellow brown and grey,traces of lignite, medium to stiff,moist to wet (Residual) (CL)	2-3-3	28.6
35	555			100			
	550			100		3-3-4	28.4
40							
	545			100		3-5-4	27.4
45							
	540			100	CLAY,yellow brown,grey,and reddish brown,high plastic,stiff,moist (Residual) (CH)	4-5-7	21.3
50							
	535			94	CLAYEY SHALE,grey and yellow brown,with traces of fine sand,hard,dry (Residual) (CH)	19-44-30	14.2
					AUGER REFUSAL AT 51.1'		
55	530						
60							

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
MOISTURE CONTENT, %
PL LL
20 40 60

THE STRATIFICATION LINES REPRESENT APPROXIMATE SOIL BOUNDARIES. ACTUAL STRATIFICATION MAY BE GRADUAL.

DRILLER: LAYNE WESTERN
METHOD: 4 1/2" HOLLOW AUGER
LOGGED BY: DAN BINZ

WATER LEVELS: DURING DRILLING 29 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT ____ FEET AFTER ____ HOURS
AT ____ FEET AFTER ____ HOURS

PIEZOMETER: INSTALLED AT ____ FEET

File: LAMBERT Date Plotted: April 3, 1998

Reitz & Jens, Inc.
Consulting Engineers

BORING LOG

PSA 904

PRELIMINARY GEOTECHNICAL SURVEY
CITY OF ST. LOUIS

DATE DRILLED: 2/4/98

BORING NUMBER: MB-E
LOCATION: N-1065196 , E-854293
ELEVATION: 597.6 **DATUM:** USGS
FIGURE: A-37 **SHEET** 1 **OF** 2

DEPTH (FEET)	ELEVATION	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES	MOISTURE CONTENT PERCENT BY WEIGHT
0					TOPSOIL		
	595				SILTY CLAY, brown, with limestone and chert gravel, and asphalt (Fill)		
					CLAYEY SILT, brown with grey, (Fill)		
5				83		2-2-2	29.1
	590				CLAYEY SILT, grey and brown, with traces of lignite, medium stiff, moist (Eolian) (CL)		
10				100		2-2-5	26.7
	585						
15				94		96.8	26.1
	580				SILTY CLAY, brown, reddish brown, with grey, with traces of lignite and limonite, medium stiff, moist (Residual) (CL)		
20				100		2-2-2	25.2
	575						
25				100		1-3-3	28.7
	570						
30							

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV
1 2 3

STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)

MOISTURE CONTENT, %
PL ⊢●⊣ LL
20 40 60

THE STRATIFICATION LINES REPRESENT APPROXIMATE SOIL BOUNDARIES. ACTUAL STRATIFICATION MAY BE GRADUAL.

DRILLER: LAYNE WESTERN
METHOD: 4 1/2" HOLLOW AUGER
LOGGED BY: DAN BINZ

WATER LEVELS: DURING DRILLING DRY FEET
Y BORING DRY AT COMPLETION OF DRILLING
AT 40.7 FEET AFTER 24 HOURS
AT _____ FEET AFTER _____ HOURS

PIEZOMETER: INSTALLED AT _____ FEET

File: LAMBERT Date Printed: April 3, 1998

Reitz & Jens, Inc.
Consulting Engineers

BORING LOG

PSA 904

PRELIMINARY GEOTECHNICAL SURVEY
CITY OF ST. LOUIS

DATE DRILLED: 2/4/98

BORING NUMBER: MB-E
LOCATION: N-1065196 , E-854293
ELEVATION: 597.6 **DATUM:** USGS
FIGURE: A-37 **SHEET** 2 **OF** 2

DEPTH (FEET)	ELEVATION	GRAPHIC LOG	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES	MOISTURE CONTENT PERCENT BY WEIGHT
				100		2-3-5	26.3
	565				CLAY, brown, yellow brown, with grey, high plastic, with some gravel, stiff, moist (Residual) (CH)		
35				100		5-5-10	25.7
	560						
40				100	SHALEY CLAY, grey with yellow brown, with lignite and limonite, very stiff, moist (Residual) (CH)	4-6-10	27.7
	555						
45					AUGER REFUSAL AT 43.6'		
	550						
50							
	545						
55							
	540						
60							

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV
1 2 3

STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)

MOISTURE CONTENT, %
PL ⊢●⊣ LL
20 40 60

THE STRATIFICATION LINES REPRESENT APPROXIMATE SOIL BOUNDARIES. ACTUAL STRATIFICATION MAY BE GRADUAL.

DRILLER: LAYNE WESTERN
METHOD: 4 1/2" HOLLOW AUGER
LOGGED BY: DAN BINZ

WATER LEVELS: DURING DRILLING DRY FEET
Y BORING DRY AT COMPLETION OF DRILLING
AT 40.7 FEET AFTER 24 HOURS
AT _____ FEET AFTER _____ HOURS

PIEZOMETER: INSTALLED AT _____ FEET

File: LAMBERT Date Printed: April 3, 1998

Reitz & Jens, Inc.
Consulting Engineers

BORING LOG

PSA 904

PRELIMINARY GEOTECHNICAL SURVEY
CITY OF ST. LOUIS

DATE DRILLED: 2/16/98

BORING NUMBER: MB-F
LOCATION: N-1065314 , E-853575
ELEVATION: 576.9 **DATUM:** USGS
FIGURE: A-38 **SHEET** 1 **OF** 2

DEPTH (FEET)	ELEVATION	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES	MOISTURE CONTENT PERCENT BY WEIGHT
0	575			8" TOPSOIL CLAYEY SILT, grey and brown, with lignite and limonite, medium stiff, wet (Eolian) (CL)		
5	570		98		89.4	30.3
10	565		100		1-2-3	28.8
15	560		100		1-2-3	28.4
20	555		100	SILTY CLAY, grey, medium stiff, moist (Residual) (CL)	1-2-3	28.0
25	550		100	SILTY CLAY, grey and brown, with traces of fine sand, lignite and limonite, stiff, moist (Residual) (CL)	1-2-4	24.5
30				THE STRATIFICATION LINES REPRESENT APPROXIMATE SOIL BOUNDARIES: ACTUAL STRATIFICATION MAY BE GRADUAL.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
MOISTURE CONTENT, %
PL LL
20 40 60

DRILLER: LAYNE WESTERN
METHOD: 4 1/2" HOLLOW AUGER
LOGGED BY: DAN BINZ

WATER LEVELS: DURING DRILLING 24.5 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT ____ FEET AFTER ____ HOURS
AT ____ FEET AFTER ____ HOURS

PIEZOMETER: INSTALLED AT ____ FEET

File: LAMBERT Date Printed: April 3, 1998

Reitz & Jens, Inc.
Consulting Engineers

BORING LOG

PSA 904

PRELIMINARY GEOTECHNICAL SURVEY
CITY OF ST. LOUIS

DATE DRILLED: 2/16/98

BORING NUMBER: MB-F
LOCATION: N-1065314 , E-853575
ELEVATION: 576.9 **DATUM:** USGS
FIGURE: A-38 **SHEET** 2 **OF** 2

DEPTH (FEET)	ELEVATION	SAMPLE TYPE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES	MOISTURE CONTENT PERCENT BY WEIGHT
	545		100	SILTY CLAY,grey and brown,with traces of fine sand,lignite and limonite, stiff, moist (Residual) (CL)	2-4-6	25.6
35			100		3-5-6	24.7
	540					
40			100	CLAY,yellow brown with grey,with traces of lignite,limonite,and chert gravel,high plastic,stiff,moist (Residual) (CH)	3-4-6	30.4
	535			CLAY,reddish brown with black,high plastic,soft to medium,wet (Residual) (CH)		
45			100		1-1-3	57.0
	530			LIMESTONE,dark grey, (Sedimentary)		
				BORING STOPPED AT 47'		
50	525					
55						
	520					
60						

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV
1 2 3

STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)

MOISTURE CONTENT, %
PL — LL
20 40 60

THE STRATIFICATION LINES REPRESENT APPROXIMATE SOIL BOUNDARIES. ACTUAL STRATIFICATION MAY BE GRADUAL.

DRILLER: LAYNE WESTERN
METHOD: 4 1/2" HOLLOW AUGER
LOGGED BY: DAN BINZ

WATER LEVELS: DURING DRILLING 24.5 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT ____ FEET AFTER ____ HOURS
AT ____ FEET AFTER ____ HOURS

PIEZOMETER: INSTALLED AT ____ FEET

File: LAMBERT Date Printed: April 3, 1998

Appendix B

RESULTS OF ANALYSES BY PDC LABORATORIES

ATTACHMENT D

PDC Laboratories, Inc.

PROFESSIONAL • DEPENDABLE • COMMITTED

June 06, 2017

Christopher Cook
Reitz & Jens, Inc.
1055 Corporate Square Drive
St. Louis, MO 63132

Dear Christopher Cook:

Please find enclosed the analytical results for the sample(s) the laboratory received on **5/31/17 2:05 pm** and logged in under work order **7055186**. All testing is performed according to our current TNI certifications unless otherwise noted. This report cannot be reproduced, except in full, without the written permission of PDC Laboratories, Inc.

If you have any questions regarding your report, please contact your project manager. Quality and timely data is of the utmost importance to us.

PDC Laboratories, Inc. appreciates the opportunity to provide you with analytical expertise. We are always trying to improve our customer service and we welcome you to contact the Vice President , John LaPayne with any feedback you have about your experience with our laboratory.

Sincerely,

Roxann Shull

Roxann Shull
Client Services Supervisor
(314) 432-0550
rshull@pdclab.com

NELAP ACCREDITED TNI LABORATORY

PDC Laboratories, Inc.
3278 North Highway 67
Florissant, MO 63033
(800) 333-3278

ANALYTICAL RESULTS

Sample: 7055186-01 **Sampled:** 05/31/17 09:45
Name: Lambert Solar Project **Received:** 05/31/17 14:05
Alias: B-1 Depth 10 **Matrix:** Solid

Parameter	Result	Unit	Qualifier	Analyzed	Analyst	Method
General Chemistry - PIA						
Solids - total solids (TS)	79	%		06/02/17 12:55	KLA	SM 2540G*
General Chemistry - STL						
pH	8.49	pH Units	H	06/02/17 09:00	SCI	SW 9045
Resistivity	0.027	MOhm-cm		06/01/17 15:35	MEG	SM 2510B*

Sample: 7055186-02 **Sampled:** 05/31/17 11:15
Name: Lambert Solar Project **Received:** 05/31/17 14:05
Alias: B-2 Depth 20 **Matrix:** Solid

Parameter	Result	Unit	Qualifier	Analyzed	Analyst	Method
General Chemistry - PIA						
Solids - total solids (TS)	84	%		06/02/17 12:55	KLA	SM 2540G*
General Chemistry - STL						
pH	8.1	pH Units	H	06/02/17 09:00	SCI	SW 9045
Resistivity	0.032	MOhm-cm		06/01/17 15:35	MEG	SM 2510B*

Sample: 7055186-03 **Sampled:** 05/31/17 13:05
Name: Lambert Solar Project **Received:** 05/31/17 14:05
Alias: B-3 Depth 30 **Matrix:** Solid

Parameter	Result	Unit	Qualifier	Analyzed	Analyst	Method
General Chemistry - PIA						
Solids - total solids (TS)	78	%		06/02/17 12:55	KLA	SM 2540G*
General Chemistry - STL						
pH	7.64	pH Units	H	06/02/17 09:00	SCI	SW 9045
Resistivity	0.020	MOhm-cm		06/01/17 15:35	MEG	SM 2510B*

PDC Laboratories, Inc.
3278 North Highway 67
Florissant, MO 63033
(800) 333-3278

NOTES

Specific method revisions used for analysis are available upon request.

Memos

Resistivity method modified for soil sample with a 10% slurry

Certifications

CHI - McHenry, IL
TNI Accreditation for Drinking Water, Wastewater, Hazardous and Solid Wastes Fields of Testing through IL EPA Lab No. 100279
Illinois Department of Public Health Bacteriological Analysis in Drinking Water Approved Laboratory Registry No. 17556

PIA - Peoria, IL
TNI Accreditation for Drinking Water, Wastewater, Hazardous and Solid Wastes Fields of Testing through IL EPA Lab No. 100230
Illinois Department of Public Health Bacteriological Analysis in Drinking Water Approved Laboratory Registry No. 17553
Drinking Water Certifications: Iowa (240); Kansas (E-10338); Missouri (870)
Wastewater Certifications: Arkansas (88-0677); Iowa (240); Kansas (E-10338)
Hazardous/Solid Waste Certifications: Arkansas (88-0677); Iowa (240); Kansas (E-10338)

SPMO - Springfield, MO
USEPA DMR-QA Program

STL - St. Louis, MO
TNI Accreditation for Wastewater, Hazardous and Solid Wastes Fields of Testing through KS Lab No. E-10389
Illinois Department of Public Health Bacteriological Analysis in Drinking Water Approved Laboratory Registry No. 171050
Drinking Water Certifications: Missouri (1050)
Missouri Department of Natural Resources

* Not a TNI accredited analyte

Qualifiers

H Test performed after the expiration of the appropriate regulatory/advisory maximum allowable hold time.

Certified by: Roxann Shull, Client Services Supervisor

ATTACHMENT D

PDC Laboratories, Inc. – St. Louis
3278 N. Highway 67 (Lindbergh)
Florissant, MO 63033
www.pdclab.com www.environmetrics.net

CHAIN OF CUSTODY RECORD

Phone (314) 432-0550 or (314) 921-4488
Fax (314) 432-4977 or (314) 921-4494

State where samples collected _____

(Instructions/Sample Acceptance Policy on Reverse)

ALL SHADED AREAS MUST BE COMPLETED BY CLIENT (PLEASE PRINT)

1 CLIENT	PROJECT NUMBER	P.O. NUMBER	MEANS SHIPPED
Reitzel Envs			
ADDRESS 1055 Corporate Square DR	PHONE NUMBER 314 993 4132	FAX NUMBER 993-4177	EMAIL ADDRESS
CITY STATE ZIP St Louis MO 63132	SAMPLER Don Binz		MATRIX TYPES: WW-WASTEWATER, DW-DRINKING WATER, GW-GROUND WATER, WWSL-SLUDGE, NAS-SOLID, L'CHT-LEACHATE, NAL-NONAQUEOUS, SOIL-SOILS
CONTACT PERSON Christopher Cook	SAMPLER'S SIGNATURE Don Binz		

2 SAMPLE DESCRIPTION AS YOU WANT ON REPORT	DATE COLLECTED	TIME COLLECTED	SAMPLE TYPE GRAB	SAMPLE TYPE COMP	MATRIX TYPE	Bottle Count	3 ANALYSIS REQUESTED: PH	Corrosivity	REMARKS
Lambert Solar Project	5/31/17	945AM					X	X	
B-1 Depth 10									
" " "									
B-2 Depth 20	5/31/17	1:15 AM					X	X	
" " "									
B-3 Depth 30	5/31/17	105PM					X	X	

4 (FOR LAB USE ONLY) 705186
LOGIN # _____
LOGGED BY: DS
LAB PROJ. #
TEMPLATE:
PROJ. MGR.: KS

5 TURNAROUND TIME (RUSH TAT IS SUBJECT TO PDC LABS APPROVAL AND SURCHARGE)
NORMAL (8-10 Bus. Days) RUSH (5 Bus. Days) *Fastrak*™ (3 Bus. Days) 1-2 Bus. Days Same Day
DATE DUE _____
RESULTS BY: E-MAIL FAX PHONE CALL PHONE/FAX# IF DIFFERENT FROM ABOVE

6 The sample temperature will be measured upon receipt at the lab. By initialing this area, you request that the lab notify you, before proceeding with analysis, if the sample temperature is outside of the range of 0.1-6.0°C. By not initialing this area, you allow the lab to proceed with analytical testing regardless of the sample temperature. _____

7	DATE	TIME	RECEIVED BY:	DATE	TIME
RELINQUISHED BY: (SIGNATURE) Don Binz	5/31	205	Emily Farmer	5-31-17	1405
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY:	DATE	TIME
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY:	DATE	TIME
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY:	DATE	TIME

8 COMMENTS:(FOR LAB USE ONLY)

SAMPLE TEMPERATURE UPON RECEIPT	1.5 °C
CHILL PROCESS STARTED PRIOR TO RECEIPT	Y OR N
SAMPLES(S) RECEIVED ON ICE	Y OR N
PROPER BOTTLES RECEIVED IN GOOD CONDITION	Y OR N
BOTTLES FILLED WITH ADEQUATE VOLUME	Y OR N
SAMPLES RECEIVED WITHIN HOLD TIME(S) (EXCLUDES TYPICAL FIELD PARAMETERS)	Y OR N
DATE AND TME TAKEN FROM SAMPLE BOTTOM	_____