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AMEREN MISSOURI LABADIE ENERGY CENTER
UTILITY WASTE LANDFILL (UWL)
SOLID WASTE DISPOSAL AREA
FRANKLIN COUNTY, MISSOURI

APPENDIX J
GEOTECHNICAL INVESTIGATION FOR CONSTRUCTION PERMIT APPLICATION

Prepared for

Ameren
MISSOURI

Prepared by

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AMEREN MISSOURI LABADIE ENERGY CENTER
UTILITY WASTE LANDFILL (UWL) SOLID WASTE DISPOSAL AREA
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GEOTECHNICAL ENGINEERING REPORT FOR CONSTRUCTION PERMIT APPLICATION
(Revised August 2013; Revised November 2013)

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1.0 SCOPE OF GEOTECHNICAL INVESTIGATION

Reitz & Jens, Inc. (R&J) completed a geotechnical investigation for the design of the proposed Utility Waste Landfill (UWL) for the Ameren Missouri Labadie Energy Center in Franklin County, Missouri. The UWL will be used for disposal of coal combustion products (CCP) from the Labadie Energy Center in a utility waste landfill as defined in 10 CSR 80-2.020(119). R&J leads the design team for the UWL that includes GREDELL Engineering Resources, Inc. (GER). This investigation provides supporting geotechnical information, testing results, results of analyses, and documentation to be incorporated with the Construction Permit Application for this UWL. The scope of this geotechnical investigation included the following main tasks which are described in detail in this report.

1.1 Field Investigation

The field investigation was completed in conjunction with the Detailed Site Investigation, using drilled exploratory borings and cone penetrometer testing (CPT), and laboratory testing to characterize the geotechnical engineering properties of the subsurface soils strata at the site. It is not feasible to obtain suitable clay on site for the compacted clay liner. Therefore, most, if not all, of the clay liner material will be obtained from an off-site borrow source(s) that will be identified prior to construction. A preliminary field investigation with laboratory testing was completed to characterize the subsurface soils at a borrow site on Ameren Missouri's Callaway Energy Center property proposed for use as clay materials for the liner and cap construction at the Labadie UWL. Appropriate engineering properties were assumed for the compacted clay liner in our analyses. These properties will be confirmed after the borrow source(s) are identified and prior to construction.

1.2 Laboratory Testing of CCP

Laboratory tests were run on samples of CCP materials from the Labadie Energy Center to determine parameters for use in the design of the UWL. The materials tested included fly ash from the existing pond at the Labadie Energy Center, dry fly ash collected from the precipitators ("non-ponded fly ash"), and bottom ash. The CCP placed in the UWL may be a mixture of fly ash, bottom ash and flue gas desulphurization gypsum in the future. Since gypsum is not available from the Labadie Plant, a sample of dry gypsum from Ameren's Duck Creek Plant was used in our testing.

1.3 Seismic Risk Assessment and Analyses

The peak horizontal ground acceleration (PHGA) for the Labadie site was analyzed by two methods: 1) the PHGA obtained from the latest available USGS hazard map; and 2) a site specific seismic analysis using the seismic model program SHAKE2000. The PHGA from the USGS map was higher.

than that from our site-specific seismic analysis. Therefore, the PHGA from the USGS map was used in analyses of embankment stability under seismic load, potential for liquefaction, the potential effect of liquefaction on embankment stability, and potential for settlement induced by liquefaction. The derived time-histories of seismic accelerations for the St. Louis area that are built into SHAKE2000 were used for deformation analyses, to satisfy the requirements of Missouri sold-waste regulations.

We analyzed the potential of liquefaction of the subsurface strata at each boring and CPT sounding using the latest published method (Idress and Boulanger, 2008). We mapped areas of potential liquefaction under the existing site. Our analyses demonstrate that the potential for liquefaction beneath the UWL becomes negligible after the CCP fill is 20 feet thick. We also determined the residual shear strengths of potentially liquefiable natural strata using several published methods, for slope stability analyses and the horizontal ground accelerations that result in the onset of liquefaction.

Where only a Peak Horizontal Ground Acceleration (PHGA) was needed for our analyses, such as slope stability or liquefaction, we used the more conservative PHGA from the published USGS hazard maps. We used several derived time-histories of ground accelerations from our SHAKE2000 analyses for the deformation analyses to obtain more accurate estimates of the probable horizontal deformation using site specific data. This resulted in the UWL being designed to accommodate the design seismic event for this site in accordance with MDNR requirements and generally accepted engineering practices.

1.4 Slope Stability Analyses

We analyzed the stability of the side slopes of the perimeter berms and the CCP fill at five sections which had slightly varying subsurface soil profiles. We analyzed each section for the intermediate height of CCP fill using both short-term and long-term soil properties, and with the potential liquefaction; and for the full height of CCP fill using long-term soil properties, and with potential liquefaction. We also analyzed potential sliding block failures along the interface with the composite liner, and the stability of the final cover. All of these analyses demonstrate that the proposed design meets or exceeds the slope stability requirements.

The Missouri solid-waste regulations do not state a minimum factor of safety for the stability of the slopes under seismic load. Rather, the regulations state that the expected deformation cannot exceed a maximum of 6 inches (for a sanitary landfill). Our analyses demonstrate that the maximum anticipated lateral deformation due to the design PHGA would be negligible.

The stability analyses included the calculation of bearing capacity of the foundation soils in accordance with 80-11.010(5)(A)(4.A).

1.5 Settlement Analyses

The settlement of the subsurface soils under the final CCP landfill was estimated for the subsurface strata at groups of borings and CPT soundings. The results were graphed to produce the estimated settlement of the subgrade along four cross-sections of the completed landfill and along the existing Explorer pipeline. These estimates of settlement were used for the design of the leachate collection system. The results also demonstrate that the composite liner will not be subjected to damaging strains due to settlement.

1.6 Impacts Due to Flooding

Because the site is located in a floodplain, the Missouri solid-waste regulations require that the design of the UWL prevent damage to the composite liner that could result from hydrostatic uplift due to flooding. This requirement is satisfied by the initial operation of the UWL, during which sufficient CCP fill will be placed in each cell to resist the hydrostatic uplift. Also, we provide a design for a fabric-formed concrete mat (FCM) for the exterior berms to prevent erosion of the slopes due to the velocity of flows that may occur if the existing agricultural levee along the Missouri River were to be overtopped or fail during a flood event. The design of the exterior berms prevents flood water from contacting the CCP in the cells up to the 500-year flood in accordance with Franklin County ordinances.

1.7 Recommendations

Other recommendations are presented in this report for bearing capacity of subsurface soils, construction quality assurance procedures, impact of ground water in contact with the bottom composite liner, and the investigation and remediation of potential liquefaction damage during the initial operation of the UWL, in fulfillment of the requirements of the Missouri UWL regulations.

Our professional engineering judgment is that the Labadie UWL design and operating procedures described in this geotechnical report for the CPA are in accordance with generally accepted engineering practice and utilize conservative assumptions where necessary, and therefore meet or exceed all of the requirements of the Missouri Solid Waste Management Law and Regulations, as well as those of applicable Franklin County ordinances.

2.0 EXPLORATORY FIELD INVESTIGATION

2.1 Detailed Site Investigation (DSI)

The field and laboratory work for this investigation was completed as a component of the Detailed Site Investigation (DSI) for the proposed Labadie UWL. The DSI workplan utilized the 100 “temporary” or non-piezometer borings required for the DSI to provide data of subsurface conditions for the subsequent geotechnical analyses and design of the UWL. This work was completed in accordance with the workplan entitled, *Ameren Missouri Labadie Power Plant Utility Waste Landfill Detailed Site Investigation Work Plan*. The workplan was originally submitted to the Missouri Department of Natural Resources-Division of Geology and Land Survey (MDNR-DGLS) on May 14, 2009, and was approved on June 15, 2009. The results of the field and laboratory work are presented in Appendix 2, “Geotechnical Investigation Report,” of the report *Detailed Site Investigation Report for Ameren Missouri Labadie Power Plant Proposed Utility Waste Disposal Area*, *Franklin County*, *Missouri*, dated February 4, 2011. The DSI report was subsequently revised on March 30, 2011, in response to questions from the Geological Survey Program (GSP). The GSP approved the DSI and report in a letter dated April 8, 2011.

The field investigation consisted of 119 borings and 93 Cone Penetrometer Test (CPT) soundings for a total of 212 test locations. Of the 119 borings, 22 were temporary geotechnical borings (labeled “B-“), and 97 were piezometer borings (labeled “P-“). The CPT soundings (labeled “C-“) were alternated with the piezometer borings on a regular grid-like pattern. The plan of the borings and CPT soundings is shown in **Figure 1**. Some locations were moved from a linear pattern due to geographic restrictions or to better characterize the subsurface conditions. Confirmation borings were made for some of the CPT soundings. Confirmation CPT soundings were also made at randomly selected locations. The 119 borings were in addition to the preliminary geotechnical investigation by Reitz & Jens in 2007, which included the installation of three piezometers and five temporary geotechnical borings. The report of this investigation was included in the Preliminary Site Investigation (PSI) request submitted to MDNR-DGLS in December 2008, and in the approved DSI workplan.

The CPT soundings were made using a 1.5-inch diameter, 100-MPa capacity, electronic piezocone, which records tip pressure, sleeve friction and porewater pressure every 20 millimeters as the cone is hydraulically pushed into the ground at a specified rate. The testing was carried out according to ASTM D5778 “Electronic Friction Cone and Piezocone Penetration Testing of Soils”. The final CPT sounding logs are presented in the DSI report. The analysis of the raw data from the CPT soundings is presented in Appendix D of the DSI report, which includes the side by side comparisons between the CPT soundings and other borings to validate the classification of subsurface soil strata developed from the CPT soundings, and comparisons between CPT soundings performed side-by-side in the field to demonstrate the reproducibility of the CPT results.

Details of the field work completed for the DSI and all of the results are presented in the DSI report referenced above.

2.2 Preliminary Investigation of Off-Site Borrow Material at Callaway Plant

Twelve borings made at the potential clay borrow site located at Ameren Missouri's Callaway Power Plant. The borrow site is located in Callaway County approximately one mile east of the Callaway Power Plant on County Road 448 (see **Figure 1** in **Appendix A**). The borrow site was subdivided into areas based upon the present land use and topography. The purpose of these borings was to provide data on the subsurface conditions and to quantify the clay borrow that could be used for construction of clay liner and cover at Labadie UWL. Details of the field investigation and laboratory testing are presented in **Appendix A**. The borings were drilled to termination depths ranging from 14 feet to 31 feet, with some borings terminating on intact bedrock.

Reitz & Jens' report of the preliminary investigation for Ameren Missouri, dated May 25, 2011, is reproduced in **Appendix A**. Subsequent to submittal of our report to Ameren Missouri, Reitz & Jens' performed additional laboratory testing of the high plastic clay to obtain properties for the stability analyses of the liner and perimeter berm. The additional tests included consolidated-undrained (CU) triaxial compression tests with pore pressure measurements on composite samples of the clay compacted to 89% of the maximum dry unit weight obtained from a standard Proctor moisture-density test (ASTM D698-00a), and a direct shear test of the compacted clay with a double-textured 60-mil HDPE membrane. The results of these tests are included in **Appendix A-1**. The results of the CU triaxial tests were: a total cohesion (c) of 420 psf and total internal friction angle (ϕ) of 9.6º; and an effective cohesion (c') of 440 psf and an effective internal friction angle (ϕ') of 14.6º.

We ran direct shear tests of a molded sample of the clay, at a dry unit weight of 99 pcf, with a sample of textured HDPE liner on the bottom plate. This was run in a standard direct shear apparatus with a sample diameter of 2 inches. The peak shear strength properties were: c of 320 psf and ϕ of 29º. The residual shear strength properties were: c of 290 psf and ϕ of 26.9º (see results in **Appendix A-1**).

3.0 LABORATORY TESTING

3.1 Tests on Natural Soil Deposits

All laboratory testing was completed in accordance with the latest applicable ASTM procedures as contained in Reitz & Jens' Quality Manual. Reitz & Jens' soils laboratory maintains an AASHTO Materials Research Laboratory (AMRL) certification from National Institute for Standards and Technology (NIST). Details of the laboratory testing program on soil samples from the site of the proposed UWL and all of the results are presented in the DSI report.

The general purpose of the testing program was to obtain soil properties for the determination of: bearing capacity, short-term and long-term slope stability, seepage characteristics of the top stratum fine-grain soils and the underlying sand strata, liquefaction potential, settlement characteristics, and soil classifications for the potential use of soils for fill materials.

Grain-size analyses (ASTM D422) were performed on selected cohesionless samples (Unified Soil Classifications of SW, SP, SM, GW, GP, or GP-SP). Hydrometer analyses (ASTM D422) were run on 3 selected samples which had a high percentage of fine-grain soils (passing U.S. #200 sieve).

The shear strength properties of a soil mass are dependent about the mineralogy, size and shape of the particles; the density of the soil particles; and the pressure of the water in the pores of the soil mass. When the dry density of a soil is increased, the shear strength generally increases – more for a granular soil (gravels, sands and silts) and less for clays. If a laboratory test is performed on the soil sample at the dry density under existing field conditions, then sample is "unconsolidated." If the first step of a laboratory test is to apply a known pressure to densify the soil sample while draining off the increase in pore pressure under the applied load, then the soil is "consolidated" which more accurately estimates the properties in the field after a period of time under the added weight of the landfill. Pore water pressures in a soil mass also generally increase as the soil is sheared if the soil densifies or consolidates during shearing. If the shear stress is applied quickly, or the pore pressures are not allowed to dissipate, then the measured shear strength properties are "undrained." If the shear stress is applied slowly such that the pore pressures can dissipate during shearing, then the shear strength properties are "drained." This type of test represents the shear strength properties of the soil mass over a long time. Pore pressures dissipate very rapidly in large-grain soils (gravels and sands), so the measured shear strength is always considered to be "drained." If the pore water pressures are measured during shearing, then the pore pressure can be subtracting from the measured stress on the soil mass (called "total" stress) resulting in the "effective" stress. The "effective" shear strength properties are essentially the same as the drained or long-term properties, and are the actual shear strength properties of the soil mass.

Unconsolidated-undrained (UU) triaxial shear strength tests, ASTM D2850 "Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils", were performed on selected Shelby tube samples from each major cohesive soil stratum. The UU tests were performed at the estimated confining pressure of the sample in the field conditions, to measure the *in situ* undrained shear strength of the soil. Nine UU tests were performed.

Series of consolidated-undrained (CU) triaxial compression tests, ASTM D4767 "Consolidated Undrained Triaxial Compression Test for Cohesive Soils," were performed on each major cohesive soil stratum from different locations around the proposed disposal area. The tests were performed with the measurement of internal pore water pressures so that the effective strength properties of the soil could be determined. Each series has a minimum of two points, and three points where possible. Five series of CU tests were performed.

Three one-dimensional consolidation tests, ASTM D2435 "One-Dimensional Consolidation Properties of Soil Using Incremental Loading," were performed on selected relatively undisturbed Shelby tube samples from each major cohesive soil stratum beneath the UWL.

Two flexible-wall hydraulic conductivity tests, ASTM D5084 "Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter," were performed on selected relatively undisturbed Shelby tube samples of the upper clays. Also, two flexible-wall hydraulic conductivity tests were performed on samples from the preliminary Boring B-4: one on high plastic clay and one on sandy silt, both of which were obtained from 3.5 to 5.5 feet deep. The data from the hydraulic conductivity tests are included in Appendix B of the DSI Report and are summarized in the following table:

Boring No.	Sample	Depth, feet	Soil Description	k, cm/sec
B-4	ST-2	3.5 – 5.5	High Plastic Clay (CH)	1.2×10^{-8}
B-4	ST-2	3.5 – 5.5	Sandy Silt (SM)	2.0×10^{-3}
B-52	ST-2	4 – 6	High Plastic Clay (CH)	5.6×10^{-9}
P-175	ST-0	1 – 3	High Plastic Clay (CH)	5.5×10^{-8}

The appropriate physical properties that were measured by the field and laboratory testing of the natural soil strata found on this site were used in all of our geotechnical analyses.

3.2 Tests on CCP from Labadie Energy Center

We tested different samples of CCP from the Labadie Energy Center to determine engineering properties to use in the design of the UWL. Samples included: CCP (fly ash) which was collected from the precipitators prior to wetting; CCP from the fly ash pond which had been mixed with water to form a slurry and then was deposited in the pond by sedimentation; and bottom ash. These were tested because the method of transporting the CCP to the UWL may change over time. Initially, the CCP from the existing pond will be excavated, partially dried, and then hauled to the UWL by truck. In the future, Ameren may choose to convey dry CCPs directly to the UWL for moisture conditioning and disposal. The results of the lab testing are reproduced in **Appendix B**.

3.2.1 Tests on Non-Ponded Fly Ash

Bucket samples of dry fly ash were collected at the Labadie Energy Center on December 13, 2008, and again on February 2, 2009. The particle-size distribution was determined using ASTM D422 "Standard Test Method for Particle-Size Analysis of Soils." The fly ash tended to form clumps (i.e. flocculate) in the hydrometer test, so a second sample was mixed with sodium hexametaphosphate (SHMP) which is a dispersing agent to prevent the flocculation of particles. We ran the fly ash with SHMP and without SHMP, to determine the effect on the particle-size distribution. The reports of particle-size distribution results are presented in **Appendix B.** The reports give the uniformity coefficient (c_u) which is defined at D_{60}/D_{10}, where D_{60} is the particle-size or diameter for which 60% of the dry material by weight is smaller, and D_{10} is the diameter for which 10% of the material by weight is smaller. A c_u of 1 is perfectly uniform, and a c_u greater than 6 may be well-graded by the Unified Soil Classification System (USCS). The reports also give the percentage by weight finer than a U.S. #30 sieve (0.60mm). The plots of particle-size distribution clearly show the flocculation of the sample: without SHMP, the distribution is almost uniform ($c_u = 1.69$); with SHMP, the distribution is well-graded ($c_u = 10.86$). The fly ash sample had about 93% finer than a #200 sieve (0.075 mm).

The bulk specific gravity (SG) was determined using ASTM D854 “Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer.” The SG of the non-ponded fly ash sample was 2.87.

The fly ash sample was very pozzolanic and hardened in a few minutes after it was mixed with water. To run a standard Proctor Moisture-Density Test (ASTM D698), we mixed five samples of the fly ash at selected moisture contents (MC) between 8.5% and 20%, and then grated the moistened fly ash before it had completely hardened. Thus, the methodology does not mimic field procedures, and would be expected to create a sample with lower measured strength than will occur in the field. The results are presented in **Appendix B**. The maximum dry unit weight ($\gamma_{d,max}$) was 107.9 lbs/ft^3 (pcf) and the optimum moisture content (w_{opt}) was 17.3%. The cylinders molded from the Proctor test were trimmed immediately to a diameter of 2 inches and appropriate height, and then were broken the next day in unconfined compression tests. The results are presented in **Appendix B**. The moist unit weights and 24-hour unconfined compressive strengths (Q_u) were:

Molded Moisture Content %	Moist Unit Weight lbs/ft^3	Unconfined Compressive Strength, Q_u Psi
11.3	116	158
15.5	127	156
16.3	127	108
20.0	127	71

This testing shows that the non-ponded fly ash when wetted and semi-compacted will achieve much greater cohesive shear strength than soil. However, a lower strength was used for the non-ponded fly ash in the analyses for the UWL to eliminate the need for construction quality control during routine placement of non-ponded fly ash in the UWL. Also, this means that the stability and seismic analyses completed for the UWL and reported herein are very conservative with regard to the placement of non-ponded fly ash in the UWL.

We ran a flexible-wall hydraulic conductivity test on the non-ponded fly ash. A sample was molded at 22.5% moisture, that is about 5% wetter than optimum. The initial dry unit weight of the sample was

101.4 pcf, or a moist unit weight of 124.2 pcf. The results of the hydraulic conductivity test are presented in **Figure B-5** in **Appendix B**. The hydraulic conductivity (k) was 8.3x10^{-6} cm/sec.

A one-dimensional consolidation test was run on a molded sample of the non-ponded fly ash to determine its compressibility. The moist unit weight of the sample was 117.5 pcf. The fly ash was mixed at a moisture content of 22.5%; however, due to the pozzolanic action the measured moisture content after molding was 8.2%. The coefficient of consolidation (C_c) was 0.02. The calculated previous consolidation pressure (P_c) was 1.0 tons/ft^2. The results are presented in **Appendix B, Figure B-6.**

To estimate the probable moist unit weight of the non-ponded fly ash if it were wetted and lightly compacted in the UWL, we determined the dry unit weight of a sample of non-ponded fly ash that was densified in a mold using a vibratory table similar to the maximum density test (ASTM D4254) but without using a confining weight. The dry unit weight was 92 pcf. We then determined the maximum moisture content that would pass the paint filter test (Environmental Protection Agency Method 9095B, Rev. 2, November 2004), which was 21.6%. It would not be necessary nor desirable to add this much water to the dry fly ash for handling and placement in the UWL. However, this represents the probable moist unit weight (112 pcf) that might be achieved in the UWL without applying a controlled compaction effort. Therefore, this moist unit weight was used for the non-ponded fly ash in the various analyses.

3.2.2 Tests on Ponded Fly Ash

We ran a series of tests on a bucket sample of fly ash from the operating pond at the Labadie Energy Center. The sample was saturated when it arrived at our lab. The sample was air dried to a moisture content of 8%. We assumed that the fly ash would be excavated and dried at the pond until it would pass the paint filter test. A dry sample of fly ash was run through a U.S. #4 sieve (4.75mm opening). Water was added to achieve a specific moisture content. The water and dry sample were mixed by hand to obtain a uniform consistency. The duration of mixing was not more than 1 minute. Then, a 100-gram sample was placed in the #60-mesh conical paint filter and a timer was started. If no water dripped from the filter in 5 minutes, then the wetted sample passed the test. We determined that the ponded fly ash could pass the paint filter test if dried to a moisture content of 55%.

A sample of ponded fly ash was molded with light compaction to a dry unit weight of 60 pcf and at a moisture content of 55%. The light compaction was to simulate placing the fly ash in the UWL using only compaction by tracked earth moving equipment that is not compacting the fly ash to a specified dry unit weight. We determined that the minimum dry unit weight is about 60 pcf (moist unit weight of about 90 pcf). A staged consolidated-undrained triaxial compression tests with pore pressure measurements was run on the molded sample. The results are presented in **Figure B-7**. The effective friction angle (ϕ') was 36.4°.

Each cell of the UWL will be filled initially using fly ash from the existing pond. Therefore, the ponded fly ash will be in contact with a portion of the HDPE membrane of the top cover. We ran direct shear tests of a molded sample of the fly ash, at a dry unit weight of 60 pcf, with a sample of textured HDPE liner on the bottom plate. This was run in a standard direct shear apparatus with a sample diameter of 2 inches. We also ran direct shear tests of a molded fly ash sample against smooth HDPE liner. The peak interface friction angles (δ) were 35.2° against the textured HDPE liner, and 21.0° against the smooth

HDPE liner. The residual interface friction angles were 35.2° against the textured HDPE liner, and 17.5° against the smooth HDPE liner (see results in **Appendix B**). The peak and residual interface friction angles are similar to those reported by Koerner and Narejo (2005) for granular soil and textured HDPE liner from numerous direct shear tests:

Interface	Peak Shear Strength		Residual Shear Strength	
	Interface Friction Angle	Cohesive Shear Strength	Interface Friction Angle	Cohesive Shear Strength
Textured HDPE / Granular Soil	34º	0	31º	0
Textured HDPE / Cohesive Soil	18º	200 psf	16º	0
Textured HDPE / NW-NP* Geotextile	25º	160 psf	17º	0
NW-NP Geotextile / Granular Soil	33º	0	33º	0
NW-NP Geotextile / Cohesive Soil	30º	100 psf	21º	0

*Non-woven – Needle-punched

We ran a flexible-wall hydraulic conductivity test on the ponded fly ash. A sample was molded at 55% moisture content (the maximum moisture content that will pass the paint filter test). The initial dry unit weight of the sample was 59.2 pcf, or a moist unit weight of 90.4 pcf. The results of the hydraulic conductivity test are presented in **Figure B-10**. The hydraulic conductivity (k) was 4.5×10^{-5} cm/sec.

A one-dimensional consolidation test was run on a molded sample of the ponded fly ash to determine its compressibility. The moist unit weight of the sample was 94.9 pcf. The coefficient of consolidation (C_c) was 0.25, with an apparent pre-consolidation pressure (P_c) of 2.46 tons/ft^2. The results are presented in **Figure B-11.**

The appropriate physical properties measured by the laboratory testing on the ponded fly ash from the Labadie Energy Center that is to be incorporated in the UWL were used in all of our geotechnical analyses.

3.2.3 Tests on Bottom Ash

A sample of the bottom ash from the Labadie Energy Center was collected from the pond on December 17, 2009. The particle-size distribution results are presented in **Appendix B**. The bottom ash is poorly-graded with particle-sizes ranging from fine gravel to fine sand, with only 1% fines (passing a #200 sieve or 0.075 mm). The Specific Gravity of the bottom ash sample was 2.80.

The compaction of granular materials is based on the minimum and maximum densities determined by laboratory tests (ASTM D4253 and D4254). The minimum dry unit weight of the bottom ash is 83.6 pcf, and the maximum dry unit weight is 109.6 pcf, based upon our tests. Relative densities (D_r) of compacted granular fill in the field typically range from about 55% to 75%, which for the bottom ash sample would be dry unit weights of about 96 pcf to 102 pcf.

A staged unconsolidated-undrained triaxial compression test was run using an applied vacuum to hold the sample until the triaxial cell could be assembled. The results are presented in **Figure B-15**. The bottom ash had a ϕ' of 40.3° at a dry unit weight of about 90 pcf (D_r = 30%). There was no cohesion.

A constant-head permeability test was run on a sample of bottom ash molded at a dry unit weight of 81.7 pcf. The permeability (K) at 20°C was 0.50 cm/sec. A second sample molded at a dry unit weight of 96.3 pcf had a K at 20°C of 0.07 to 0.10 cm/sec.

3.2.4 Tests on Mixtures of CCP

We ran tests on possible combinations of fly ash, FGD gypsum and bottom ash. The ponded fly ash and bottom ash were from Ameren's Labadie Energy Center. Because it is not currently produced at the Labadie Energy Center, the gypsum was obtained from Ameren's Duck Creek Energy Center. We made cylinders of 3 different ratios of materials in the same manner described above for the fly ash alone. The 3 ratios were: 1) 46% fly ash, 20% bottom ash, 34% gypsum; 2) 30% fly ash, 25% bottom ash, 45% gypsum; and 3) 36% fly ash and 64% gypsum. The dry unit weights of the mixtures varied from 99 pcf to 87 pcf – compared to the 92 pcf dry unit weight which we determined for the non-ponded fly ash alone. The primary assumption that impacts the moist unit weight is how much water will be added to the mix prior to placement in the UWL. If only 13% water were added – which is reasonable – then the 112 pcf for the moist unit weight is appropriate for the heaviest dry mix (46% fly ash, 20% bottom ash and 34% gypsum). If we were to assume that Ameren added as much water as possible to the heaviest dry mix, then the maximum moist unit weight is estimated to be 120.4 pcf. The addition of more water to the CCP than is necessary is a time-consuming and costly activity. Therefore, it is unlikely that the in-place moist unit weight will reach 120.4 pcf and is not representative of what will occur during landfilling operations. Therefore, we used a moist unit weight of 112 pcf for the non-ponded CCP in our analyses, but ran sensitivity stability and settlement analyses to determine the possible impact of this extreme maximum moist unit weight for the combined CCP.

Gypsum and bottom ash both have larger grain-size particles than fly ash. The addition of gypsum or bottom ash to the CCP will increase the shear strength properties of the mixed CCP. Therefore, we used the shear strength properties of the fly ash alone in our stability analyses, which is conservative.

3.3 Tests on Samples from Callaway Plant Borrow Site

Details of the laboratory testing on samples from the clay borrow site at the Callaway Plant are presented in **Appendix A.** Geotechnical soil tests performed included water content (ASTM D2216) and dry unit weight, Atterberg Limits (ASTM D4318), soil finer than the #200 sieve (ASTM D1140), and grain size analysis of soil (ASTM D422). The grain size analyses were performed on samples where more than 10% by weight was retained on the #200 sieve. The results of the sieve analyses are reported in **Appendix A**. Additional tests for shear strength properties were run as described in Section 2.2 and presented in **Appendix A-1**.

3.3.1 Regulatory Requirements for Clay Liner Material

Soils for the liner must have the following properties from 10 CSR 80-11.01(10):

- Have particles with 30% or more passing a #200 U.S. sieve
- Have a liquid limit $\geq$ 20%
- Have a plasticity index $\geq$ 10%
- USCS Soil Classification of CL, CH or SC

3.3.2 Hydraulic Conductivity Tests

We collected the leftover materials from the Shelby tubes and produced two composite samples for further laboratory testing. The first composite contains silt and low plastic silty clay, and the second contained high plastic clay. Compaction tests were performed on both composites using the Standard Proctor procedure according to ASTM D698. A hydraulic conductivity test according to ASTM 5084 was completed using the silty clay Proctor point compacted nearest to 95% of the maximum dry unit weight and on the wet side of the optimum moisture content. We selected the sample with the lower liquid limit of the two clays that were compacted. The test results determined that the silty clay sample had a hydraulic conductivity (k) of $1.1\text{x}10^{-8}$ cm/sec. Clays with liquid limits greater than that tested (37%) and compacted to a similar degree will have hydraulic conductivities equal to or less than the composite sample that was tested.

3.3.3 Suitability of Callaway Plant Borrow Site

The results of the laboratory testing are summarized in **Figure 3** in **Appendix A**. Liquid Limits ranged from 28% to 101%. Plasticity indices ranged from 16% to 33%. All of the samples had 40% or more passing the #200 sieve. Therefore, all the soils described in the boring logs as low plastic silty clay, low plastic clay, medium to high plastic clay, and high plastic clay without significant amounts of sand and gravel, satisfy the requirements to be used for the compacted clay liner at the Labadie UWL.

3.3.4 Estimate of Quantities of Borrow Materials

Calculations of the estimated quantities of borrow materials are presented in **Appendix A**. The linear footage of liner quality clay in each boring was estimated using only clay with a liquid limit greater than 40 and which did <u>not</u> have a significant amount of sand and gravel. We estimated that clays with these parameters will result in hydraulic conductivities of less than $1\text{x}10^{-7}$ cm/sec when compacted. The total estimated amount of liner quality clay available is roughly 4.5 million cubic yards.

A second calculation was made in the same manner as the first, but using all fine-grain soils (silts and low plastic clays) that did <u>not</u> have significant amounts of sand and gravel. The total estimated amount of available fine-grain soil is roughly 5.7 million cubic yards. All of the fine-grain soils that do not have significant amounts of sand and gravel are expected to be suitable for the compacted clay liner; however, the additional 1.2 million cubic yards would also be suitable for final cover.

4.0 DESCRIPTION OF SUBSURFACE CONDITIONS

4.1 General Stratigraphy

The site of the UWL is located in the flood plain of the Missouri River. Soil deposition in the flood plain of a river is dependent on the velocity of the water – as the flood waters slow the larger size particles are deposited first, and then the finer particles. The velocities of the water vary over the flood plain and with each flood as the topography changes. Therefore, soil deposits in a flood plain ("alluvial" deposits) vary greatly both with depth and in horizontal extent. The borings and CPT soundings at the site revealed a typical alluvial stratigraphy.

The generalized logs are illustrated in the profiles in **Figures 2 through 5**. The graphic logs for the CPT soundings were derived from the detailed logs in the DSI Report. The surface soils are generally clays and silty clays with scattered seams and layers of low plastic silt, underlain by silts. The thicknesses of these fine-grain deposits ranged from 2 to 13 feet. Profile D-D' (**Figure 5**) is from the Missouri River to the southern boundary of the site. There is not an overall pattern to the stratification of the upper fine-grain soils, except for the presence of clayey sandy silt at the surface near the southern end. Section B-B' (**Figure 3**) is west to east across the site. Section B-B' also does not show an overall pattern in the upper fine-grain soils.

The upper fine-grain soils are underlain by sandy silts, silty fine sands, and fine sands, generally to depths of 22 to 36 feet. These upper sandy soils are generally loose to medium-dense. The upper sandy soils are underlain by fine to coarse, poorly-graded sands (SP), with some silty sands (SM) and gravelly sands at greater depths. These lower sands generally ranged from medium dense to very dense, increasing in density with increasing depth.

Three deep borings were extended to drilling or sampler refusal on bedrock or boulders. The final depths of the deep borings were: 91.5 feet in P-1, 104.5 feet in B-7, and 107.6 feet in B-100.

The stratigraphy of the natural soils determined by the Detailed Site Investigation was used in all of our geotechnical analyses. The UWL has been designed for the site specific subsurface conditions in accordance with MDNR requirements and generally accepted engineering practices.

4.2 On-Site Materials Available for Liner and Final Cover

The stratification of the upper fine-grain soils makes it very problematic to consistently obtain suitable clay liner material within the DSI boundaries. We judge that there is a low probability of obtaining sufficient quantity of clay liner material.

The surface fine-grain soils are suitable for intermediate or final cover material even though it would contain some fine sand. However, the high ground water levels will hinder deep borrow excavations.

4.3 Materials for Berm Construction

The surface soils within the DSI limits would be suitable for the construction of the perimeter berms. The only requirements for the perimeter berms would be the shear strength properties that were used for design, which are presented in **Table E-1** and summarized in Section 10.1.

4.4 Groundwater Levels

The existing ground surface ranges from about el. 471 to el. 465[1] below the current planned footprint of the bottom of the UWL. The areas of lower ground surface elevations (below about el. 464) located in the southeast region of the site have been excluded from the proposed developed area of the UWL.

The ground water levels at the site were monitored monthly for the DSI from December 2009 through November 2010. The data show that the alluvial aquifer discharges toward the Missouri River during periods of relatively low flow, during which time the ground water levels below the site will be 1 to 3 feet above the Missouri River level. However, when the Missouri River is above about el. 461 for a sustained period, the ground water flow reverses and the ground water levels approach the level of the Missouri River near the river (in the northwest portion of the site) and about 5 feet or more below the river level over the majority of the site. There is still a slight downward gradient toward the northeast, that is downstream.

An analysis of the observed ground water levels correlated with the Missouri River levels at the Labadie Energy Center is presented in Appendix Z of the Construction Permit Application. Based upon the 12 months of monitoring of ground water levels at the site and almost 11 years of daily Missouri River level readings at the Labadie Energy Center, using el. 464 as the average "Natural Water Table" at the site would appear to be an extreme event that occurs for a relatively short duration only about two times in a 10-year period. While it is rare that groundwater levels will ever reach the existing ground surface beneath the UWL, due to the variability of the ground water levels and to be conservative, the ground water was assumed to be at the ground surface in our stability analyses.

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[1] Elevations herein refer to the North American Vertical Datum of 1988 (NAVD88) which is the datum used in FEMA's new Flood Insurance Rate Maps (FIRM). NAVD88 corrects many of the problems with the earlier NGVD of 1929.

5.0 SEISMIC RISK ANALYSES

5.1 Peak Horizontal Ground Acceleration (PHGA)

Several approaches were taken to determine the peak horizontal ground acceleration (PHGA) for the proposed UWL. The PHGA is critical for determination of slope stability under seismic loading, liquefaction potential, liquefaction settlement, potential of lateral spreading, and slope deformation. The design earthquake for this project is a 2475-year reoccurrence earthquake, or 2% probability of exceedance in 50 years (approximately equivalent to 10% probability of exceedance in 250 years). The procedure that was used followed EPA 1995 Manual *RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities*, and the 1998 *Draft Technical Guidance Document on Static and Seismic Slope Stability for Solid Waste Containment Facilities* produced by the MDNR Solid Waste Management Program and Timothy Stark, Ph.D., P.E. of the University of Illinois at Urbana-Champaign.

5.1.1 PHGA from USGS Maps

The published 2008 USGS hazard map for the project site is reproduced in **Figure C-1** in **Appendix C**. This is the latest map available from the USGS website. The probabilistic PHGA for the design earthquake at the Labadie site is 0.179g (that is, 17.9% of standard gravity acceleration of 32.2 feet/sec^2). This value takes into account attenuation of bedrock shaking with distance from the probable sources and general soil interactions such as damping for a hypothetical soil profile. This value is meant to be a conservative estimate.

USGS deaggregation data were used to determine the approximate hard bedrock "outcrop" acceleration and earthquake magnitude. These data were found on the USGS website and are shown in **Figures C-2 and C-3** for St. Louis and for Labadie, respectively. The 2475-year earthquake peak hard bedrock acceleration for St. Louis and Labadie are 0.153g and 0.111g, respectively. The peak hard bedrock acceleration at Labadie is less than that for St. Louis due to attenuation of the wave from the epicenter of the probable earthquakes. Based upon the data, the most probable earthquake magnitudes (M_w) for these accelerations are between 7.0 and 8.0.

The design earthquake for this site has a PHGA of 0.179g, which has a 2% probability of being exceeded in 50 years based upon the 2008 USGS hazard maps. The corresponding peak bedrock acceleration at the site is 0.111g, and the most probable earthquake magnitudes (Mw) are between 7.0 and 8.0. This conservative PHGA (0.179g) was used in our analyses of slope stability, liquefaction, and settlement resulting from liquefaction. The Mw used for liquefaction analyses was 7.5.

5.1.2 PHGA from SHAKE2000 Analyses

A site-specific seismic analysis was completed using the program SHAKE2000. Whereas the other procedures use generalized parameters for the soil properties and earthquake motions, this procedure is more site-specific because it uses lab and field data for the soils, coupled with earthquake acceleration time histories. A site-specific seismic analysis has two components – to determine the probable seismic acceleration (or "time history") for the bedrock beneath the site, and to determine the impact or amplification of the seismic acceleration at the ground surface due to the soils.

Ten pseudo bedrock acceleration time-histories specific to St. Louis were used in the analyses. These bedrock time-histories are provided with SHAKE2000 and illustrate the variety of earthquakes that affect this area. The development of these pseudo earthquakes is documented in the Chiun-Lin Wu and Y.K. Wen (1999) report "Uniform Hazard Ground Motions and Response Spectra for Mid-American Cities." Their method of simulation is based on the latest seismicity information in the region, and the most recent ground motion and simulation models that are appropriate for engineering applications in this region. The seismological data are mainly from the USGS open-file Report 96-532. The sets of ground motions were selected from a large pool of simulated ground motions such that the median of the response spectra matched those of the 10% and 2% exceedance in 50 years. Wu and Wen generated 8290 ground motions for St. Louis centered at 38.667º north latitude and -90.190º east longitude, which corresponds to about 6000 years of records. This point is about 35 miles closer to the probable sources of seismic events than is the Labadie UWL site. Therefore, this is considered a conservative assumption in that the bedrock accelerations at the site are expected to be less than those in the pseudo time-histories generated by Wu and Wen. All 10 provided pseudo earthquakes that had a 2% probability of exceedance in 50 years were used in our analyses. The earthquake magnitudes ranged from 5.9 to 8.0, with most being of magnitude 8. Bedrock peak accelerations averaged 0.104g, which is approximately equal to the deaggregated peak bedrock acceleration of 0.111g from the USGS data for the Labadie site. Plots of the earthquake pseudo bedrock acceleration time histories from Wu and Wen are shown in **Appendix C**.

The second step in the site specific seismic analyses – determination of the impact or amplification of the seismic acceleration at the ground surface due to the soils – was completed using the SHAKE2000 computer program. The seismic soil properties were determined based upon Boring B-100 and CPT sounding C-100. Boring B-100 was chosen because it is centrally located on the site and it extended to refusal on firm bedrock. The CPT data from C-100 were used for the top 5 feet of silts and clays. The seismic properties (shear wave velocities, damping and shear modulus) were derived from SHAKE2000 using input soil classifications, unit weights and shear strength properties from Boring B-100 and CPT sounding C-100. The inputs and outputs are included in **Appendix C**. From the analysis of these 10 pseudo bedrock time-histories, the calculated average PHGA is 0.144g for the existing site conditions, compared to 0.179g from the USGS website. Because the PHGA from the USGS hazard map is greater than that derived from our SHAKE2000 analyses for the existing site conditions, we chose to use the more conservative published USGS PHGA of 0.179g in our analyses. The SHAKE2000 time-histories were used in the Newmark analyses of deformation as described in Section 5.3.

Subsequent SHAKE2000 analyses were performed using a long-duration and a short-duration earthquake in order to determine the PHGA of the proposed landfill. These analyses were run for a 24-foot high embankment placed on the native soil, and for 100 feet of compacted CCP fill placed on the native soil. In both cases, the PHGA was found to be significantly less than the existing site conditions. This was anticipated due to the additional vertical compressive stresses in the soils created by the imposed weight of the landfill. These analyses are conservative in that they do not take into consideration the densification of the soils and the resultant increase in shear strength properties. After placement of the earthen embankment, PHGA was estimated to be 0.08g at the top of the berm and 0.12g at the bottom. After completion of the CCP fill, PHGA are anticipated to be 0.07g to 0.08g at the top of the fill and 0.10g to 0.11g at the bottom.

Our site specific seismic analyses confirmed that the PHGA based on the 2008 USGS hazard maps is conservative for this site and the configuration of the completed UWL. This PHGA was used in our analyses of slope stability, liquefaction, and settlement resulting from liquefaction. Several derived time-histories of ground accelerations from the SHAKE2000 analyses were used for the deformation analyses to obtain more accurate estimates of the probable horizontal deformation using site specific data.

5.2 Liquefaction Analyses

Liquefaction occurs when ground shaking is sufficient to produce cyclic particle movements that cause excess pore water pressures to build to the point that nearly all the strength of the soil is lost. After ground shaking has stopped, the soil will potentially reconsolidate to denser configuration, which results in settlement. Liquefaction is most problematic in loose sandy soils with less than about 35 percent fines (soils which are finer than standard sieve size #200), but can occur in very loose soils with up to 50 percent fines, and soils up to the size of fine gravel. Because these types of soils are present throughout the site, analyses were run on every geotechnical boring and CPT hole made on site. These results are included in **Appendix D**.

Factors of Safety (FS) against liquefaction were calculated for both CPT and SPT borings using the cyclic stress approach outlined in Idress and Boulanger (2008). The SPT borings were analyzed using N-values for clean sand and corrected for vertical overburden stress, termed $(N_1)_{60\text{-cs}}$ and the fines contents of the soils determined from laboratory grain size tests. The CPT soundings were analyzed using the cone tip pressure, which was corrected for overburden pressure and fines content, termed $(q_{1N})_{CS}$. The content of fine-grain soils in the CPT soundings were determined from correlation soundings and borings that were performed at the same location. We conservatively determined from these tests the following fines contents associated with the descriptions used on the CPT Logs:

CPT Log Descriptive Phrase	Fines Content (%)
Sand	1
Sand to Silty Sand	10
Silty Sand to Sandy Silt	36

The above values were the smallest fines contents found in a boring adjacent to the CPT sounding for the same CPT description, in all cases.

The design earthquake used for the calculations had a PHGA of 0.179g and magnitude (M_w) of 7.5. We used the PHGA from the USGS for the existing conditions, rather than 0.144g, because this is more conservative.

The borings and CPTs were analyzed for current ground surface conditions and for cases involving the addition of CCP fill up to 100 feet. For the cases with this additional overburden, only the effective and total overburden stresses were modified on the cyclic stress side of the liquefaction equation. We conservatively did not consider the higher resistance to liquefaction that would be gained by densification of the underlying sands due to consolidation. For each boring, in order to quantify the boring's liquefaction potential as a whole; the incremental depth factors of safety were inverse averaged together.

The inverse average weighs the factors of safety with much greater weight placed on the lower values. (This same averaging procedure is used in the International Building Code 2009 for the development of the seismic site classification.) The borings and CPTs with factors of safety less than or equal to 1.0 are shown in **Figure D-3** along with those with factors of safety less than 1.0 after 10 feet of CCP fill is placed. This figure shows the effectiveness of adding fill to decrease liquefaction potential. After 20 feet of CCP has been placed, there are no cases which still have an inverse average factor of safety less than or equal to 1.0. Additionally for demonstration purposes, the inverse averaged factors of safety were averaged together across the site, and plotted versus the height of CCP fill. This is shown in **Figure D-1**.

5.3 Estimate of Yield Acceleration and Lateral Spreading

The criterion for the seismic stability analyses of a landfill is based upon the estimated lateral deformation or spreading that may occur, rather than a factor of safety against failure with a pseudo-static seismic load (MDNR-SWMP and Stark, 1998). The procedure described by MDNR-SWMP and Stark is to calculate the yield acceleration (K_y) for the landfill geometry for which the pseudo-static seismic load results in a minimum factor of safety against slope failure of 1.0. The K_y is compared to the ground accelerations in a time-history. When the ground acceleration exceeds the K_y the associated lateral displacement is calculated using the empirical relationship developed by Makdisi and Seed (1978). Therefore, the lower the K_y of the landfill geometry with respect to the PHGA, the greater the deformation or displacement. The guidance document (MDNR-SWMP and Stark, 1998) provides an empirical graph of displacement versus the ratio of PHGA to K_y. The lateral displacement is more accurately calculated by summing over the time-history all of the displacements in the same direction. The procedure, developed by Newmark (1965), is part of the SHAKE2000 program. The proposed geometry of the berm and CCP fill was analyzed in SHAKE2000 for both a short-duration time-history (#10, M_w = 5.9, Peak rock acceleration = 0.17g, PHGA = 0.19g) and a long-duration time-history (#3, M_w = 7.1, Peak rock acceleration = 0.08g, PHGA = 0.16g). The estimated cumulative displacements for a range of yield accelerations are given in the following table:

Calculated Cumulative Lateral Deformations from SHAKE2000 Analyses

Yield Acceleration K_y	Deformation for Short-Duration Event, inch	Deformation for Long-Duration Event, inch
0.165g	0.0004	0.0
0.15g	--	0.001
0.10g	0.02	0.05
0.05g	0.73	1.02
0.04g	1.28	2.16
0.03g	2.32	4.43
0.025g	3.14	6.12

When the calculated K_y is greater than the ground acceleration in the time-history, there is no deformation. The Missouri regulations for a utility waste landfill (10 CFR 80-11.010) do not specify the maximum allowed deformation. The regulations for a sanitary landfill (10 CFR 80-3.010) stipulate that the cumulative lateral deformation must be less than 6 inches. From the above SHAKE2000 analyses, the maximum allowable cumulative lateral deformation is estimated to occur when the calculated K_y is about 0.025g.

Our analyses estimated the probable horizontal deformation due to a seismic event for a range of yield accelerations (Ky) to satisfy MDNR guidance. These analyses demonstrated that the estimated probable horizontal deformations of the UWL are much less than the maximum deformation of 6 inches allowed by MDNR for a sanitary landfill.

6.0 STABILITY ANALYSES

6.1 Stability of Final CCP Landfill

Slope stability analyses were performed on the proposed UWL profile. Generalized soil profiles were developed for 5 widely-spaced sections, the locations of which are shown in **Figure E-1** in **Appendix E**. The soil and CCP properties used in the slope stability analyses are shown in **Table E-1** and depicted graphically in **Figures 6** and **7**. These were based upon the laboratory soil testing and field testing (SPT N-values and CPT soundings) described in the DSI Report, and the laboratory testing of the CCP summarized in Section 3.2.

The slope stability analyses were performed using the computer program SLIDE 5.0. This program uses the Spencer method, which resolves the static forces on each vertical slice of soil profile along a given circular or irregular assumed failure surface. The program searches for the minimum factor of safety (FS) against slope failure for each center point in the grid by incrementally varying the radius of the failure surface. The plotted results from the program show the minimum FS, the center and radius of the failure surface with the minimum FS. The output of the program also plots contours of equal FS within the grid of possible center points. The input to the slope stability analyses and graphical representations of the results are included in **Appendix E**. The results of the stability analyses are summarized in **Table E-2**.

6.1.1 Static Analyses

Stability analyses were run for each of the five cross-sections of the UWL and subsurface soil stratification for the initial filling of the CCP and for the final configuration of the CCP, for: 1) static, 2) with seismic load (horizontal pseudo-static seismic load) and 3) with residual shear strength in potential liquefied subsurface soil strata. The appropriate shear strength properties for the CCP, compacted liner, and subsurface soils were used for each case, as previously discussed and as listed in **Table E-1**.

The DSI determined that clay will have to be imported for the compacted clay liner. Therefore, the properties of the clay liner will have to be determined by laboratory testing after the clay borrow sources are identified. For these analyses, we used conservative properties for the compacted clay liner, and interface shear properties, based upon previous testing on appropriate clays and representative published values. We used a minimum moist unit weight for the clay liner of 115 pcf, an unconsolidated-undrained cohesive shear strength (c) of 600 psf and a $\phi = 0$, and an effective ϕ' of 25° for drained conditions. We did not include the slightly higher unit weight and ϕ of the leachate collection layer (if used) and the protective aggregate layer for the global stability analyses because we used circular failure surfaces for the global stability analyses and the impact of an interface plane in the composite liner would be insignificant for a circular failure surface.

To analyze the impact of the interfaces of the HDPE and geocomposite on the slope stability, we also ran "sliding block" analyses. For the minimum shear strength along an interface in the composite liner or the geocomposite, we used a ϕ of 15° along the base of the block and no cohesion. We used a slightly higher unit weight of 120 pcf for the leachate collection layer (if used) or the protective aggregate layer that would be above the composite liner. These minimum design values should be confirmed by laboratory testing on the identified borrow clays, HDPE and geocomposite at the time of construction.

The MDNR-SWMP regulations do not specify a minimum factor of safety. The guidance document (MDNR-SWMP and Stark, 1998) recommends a minimum factor of safety of 1.5 for static stability analyses.

When each phase is constructed and authorized to accept CCP, it will be initially filled with about 18 feet of ponded CCP (approximately el. 483), for protection against heave of the liner during Missouri River flooding. This "initial" configuration was analyzed using short-term (i.e. "undrained") shear strength properties. The minimum FS ranged from 2.30 to 3.19, which is greater than the minimum required factor of safety (FS) of 1.5. The initial configuration was also analyzed using long-term (i.e. "drained") shear strength properties. The minimum FS ranged from 1.45 to 2.70, which are essentially 1.5 or greater. The actual FS in the long-term will be greater because the "initial" configuration is temporary and the fully drained shear strength properties are conservative.

It may happen in later phases of the project that previously-ponded fly ash will not be available. The laboratory tests on non-ponded fly ash described in Section 3.2.1 show that the shear strength properties of the non-ponded, moisture-conditioned fly ash are greater than that of the previously-ponded fly ash. Therefore, using the lower shear strength properties of the previously-ponded fly ash is conservative. A greater moist unit weight of 112 pcf was used for the CCP above the initial height of 18 feet in anticipation of the use of non-ponded CCP in the future.

The global stability of the completed UWL was analyzed using drained strength properties. The FS of the global stability of the CCP and berm varied from 1.46 to 2.27. The actual FS would be greater because these analyses did not incorporate the compressive strength of the CCP due to cementation, nor the gain in shear strength of the foundation soils due to consolidation.

The static analyses of a non-circular failure surface along the composite liner had a static FS of 1.99. A interface friction angle (δ) of 15º was used, to represent the minimum shear strength properties of the clay liner and textured HDPE interface, the HDPE-drainage layer interface, or the interface between the lightly-compacted CCP and the drainage layer.

Our analyses of the static slope stability of both the partially-completed and completed UWL using the various natural soil stratigraphies found on the site demonstrated that the design of the UWL satisfies the requirements of MDNR and is in accordance with generally accepted engineering practice.

6.1.2 Seismic Analyses

Numerous stability analyses were completed to determine the yield acceleration (K_y) for both the initial configuration and the final or full configuration of the landfill, as well as failure along the interface of the composite liner. For seismic analyses, we used the consolidated-undrained shear strengths of the CCP and the compacted clay liner because seismic loading is an undrained condition. The results of the stability analyses are shown in **Appendix E** and the calculated yield accelerations are summarized in **Table E-2**. The calculated K_y ranged from 0.13g to 0.17g for the full cell. The minimum K_y of 0.13g was found for the long-term conditions for the full landfill at Section B-B' and for sliding along the interface of the composite liner. From the table in Section 5.3, the calculated cumulative deformation is less than 0.05 inch, much less than the maximum of 6 inches allowed under 10 CFR 80-3.010. As a check, we also determined the lateral deformation for this section and K_y utilizing the pseudo bedrock short time-history #2 (see **Appendix C**), which had a lower magnitude than pseudo bedrock short time-history #3 but a slightly higher peak bedrock acceleration. The calculated cumulative deformation was 0.016 inch. For comparison, MDNR-SWMP and Stark (1998) state that when the K_y is equal to or greater than 80% of the PHGA, then the lateral spreading should be less than 1 cm (approximately 0.4 inch).

Our analyses of the seismic slope stability of both the partially-completed and completed UWL using the various natural soil stratigraphies found on the site demonstrated that the design of the UWL satisfies the requirements of MDNR and is in accordance with generally accepted engineering practice.

6.1.3 Impact of Potential Liquefaction

At the locations where the liquefaction analyses indicated a high potential for liquefaction in existing soil strata prior to the construction of the berm and CCP fill, residual cohesive shear strengths were input for the liquefied soil strata. The residual cohesive shear strengths were interpolated from the empirical relationships recommended by Gutierrez, et al (2004), Stark and Mesri (1992), H. Bolton Seed (1987), and Seed and Harder (1990), based on corrected N-values with corrections for fines content.

Both the initial configuration of the CCP and perimeter berm and that of the full UWL were analyzed using the post-liquefied shear strengths of the subject soil strata and no applied horizontal acceleration in accordance with the draft technical guidance document from MDNR-SWMP and Stark (1998). The results are summarized in **Table E-2**. The minimum factor of safety against the onset of liquefaction (FS_{liq}) ranged from 1.76 to 1.98 for the initial configuration, and from 1.46 to 1.77 for the completed UWL. A minimum FS_{liq} of 1.2 to 1.3 is recommended by Idriss and Boulanger (2008) to allow for errors in estimation of residual shear strengths and to limit shear strains. MDNR-SWMP and Stark (1998) suggest the same minimum FS_{liq}. Therefore, the stability of the UWL is shown to be adequate when anticipated liquefaction is present. As a sensitivity check of the conservative nature of our assumptions, we also ran the stability analyses of the five UWL sections with the fully liquefied soil strata without consideration of the impact of the overburden stress due to construction of the berms and CCP fill, as shown in Figure D-3. The FS_{liq} for this conservative assumption ranged from 1.13 to 1.72, which are slightly less than the above criterion but greater than 1.0 which is acceptable.

Before sufficient CCP fill has been placed in the UWL to eliminate the risk of liquefaction, there may be a slight risk of damage to the partially completed berms and composite liner as a result of lateral spreading, settlement or formation of sand boils. We back-calculated the "threshold" ground acceleration for the onset of liquefaction for select critical locations. The minimum back-calculated threshold ground acceleration is 0.10g. Therefore, if a seismic event would occur with a ground acceleration greater than 0.10 g before sufficient berm or CCP fill had been placed, then an investigation would have to be completed to determine whether the composite liner had been damaged. This investigation could be completed in stages. The initial stage would be a survey of the perimeter berms in those areas indicated in **Figure D-3** as the highest potential areas of liquefaction. The survey would determine whether settlement or lateral movement had occurred. Also, the area outside of the perimeter berms should be visually examined for evidence of settlement, lateral movement or sand boils. If there were evidence of liquefaction from the initial investigation, then the adjacent storm water pond would be drained for visual examination, and the bottom composite liner would be surveyed to compare with the final survey of the completed liner. If there were evidence of heave (due to sand boils), water under the HDPE liner, differential settlement, or damage to the liner, then the final stage would be to remove CCP in the affected area of the cell to examine the composite liner for similar evidence of damage. Any damaged area of the composite liner in either the storm water pond or the cells would have to be removed and replaced.

6.1.4 Stability Analyses with Potential Clay Liner Material from Callaway Plant

The potential borrow source for clay liner material at the Callaway Energy Center was identified after the initial stability analyses were completed. Subsequently, we used the shear strength properties for the Callaway clay liner material to check our stability analyses. The shear strength properties are summarized in Section 2.2 and are presented in **Appendix A-1**. The impact of the shear strength properties on the global circular stability analyses is minimal due to the thickness of the compacted clay liner. We ran a sliding block stability analysis with a failure surface through the clay liner. The results are presented in **Figure E-44**. The minimum global stability FS is 1.98, compared to the FS of 1.99 for the assumed clay liner material properties. The minimum K_y for the Callaway clay liner material is 0.145g (see Figure E-45) compared to K_y of 0.13g for the assumed clay liner material properties. Therefore, the use of the clay liner material from the Callaway Energy Center would result in the same calculated FS and greater K_y compared to the assumed clay liner material properties.

6.2 Stability of Interior CCP Berms

Interior berms are proposed to be constructed using compacted CCP from the existing ash pond. These berms would be temporary and between cells, and will eventually be buried by the CCP fill. The composite clay liner and drainage layer would extend under the interior berm, to permit extension of the liner and drainage layer for the next cell. The FS for the slope stability of the interior berm was analyzed using the drained shear strength properties of compacted CCP. The CCP should be compacted to a minimum 95% of the maximum dry unit weight from a standard Proctor moisture-density test. The minimum FS for a global circular slope failure and the full height of CCP fill is 1.91. The minimum FS for a sliding block failure along the extension of the composite clay liner and drainage layer beneath the interior berm is 1.59. The K_y is 0.06g for a sliding block failure. From the table in Section 5.3, the calculated lateral deformation is about 1 inch, which is less than the maximum allowable 6 inches.

6.3 Stability of Final Cover

The stability analysis of the final cover on the side slopes is shown in **Appendix E**, using 2 foot of nominally compacted soil over a double-textured HDPE membrane. The shear strength along the interface between the soil cover and the HDPE is based upon an interface friction angle of 15° and an adhesion of 246 psf, which governs the minimum FS. The calculated FS for the saturated soil cover with seepage parallel to the slope is 3.78. The FS with a pseudo-static horizontal force of 0.179g is 2.61.

6.4 Bearing Capacity Analysis

The bearing capacity of the stratified foundation soils was analyzed using SLIDE 5.0 with an uniform load applied to the surface and assuming a circular failure surface. The results of the analysis are shown in **Figure E-43**. The ultimate bearing capacity of a semi-infinite continuous load on the surface is 5000 psf. For a factor of safety of 2.0, the allowable bearing pressure is 2500 psf. This bearing capacity is applicable to the unconfined, original (unconsolidated) soil strata at the end of the perimeter berm. The bearing capacity below the CCP fill is much greater due to the confinement of the soil strata by the perimeter berms. Our analysis of the ultimate bearing capacity of the surface soil strata represents the "worst case" condition because it did not include the effect of consolidation of the soil strata and confinement under the weight of the CCP fill. Therefore, the ultimate bearing capacity of 5000 psf is applicable to the edge of the perimeter berm.

To estimate the bearing capacity beneath the completed CCP fill, we used the consolidated-undrained shear strength properties of the surface silty clay. The undrained shear strength (s_u) of the silty clay beneath the completed CCP fill would be about 2800 psf. If the consolidated natural soil beneath the completed CCP fill were homogeneous silty clay, then the ultimate undrained bearing capacity would be 9 times s_u or about 25000 psf. If the maximum pressure beneath the completed CCP fill is about 10,800 psf, then the factor of safety against a bearing capacity failure in the natural soil would be about 2.3, which is in accordance with generally accepted engineering practice.

6.5 Stability Analyses with Maximum Unit Weight of Non-Ponded CCP

As explained under Section 3.2.1 and 3.2.4, our analyses used an average in-place unit weight of the non-ponded CCP of 112 pcf, whether for wetted fly ash or moistened combined CCP. If the combined CCP were mixed with as much water as possible without failing the paint filter test, an unlikely and more costly option, the maximum unit weight of the combined CCP could be as high as 120.4 pcf (see Section 3.2.4). To check the sensitivity of our assumed unit weight of 112 pcf, we ran the stability analyses for the full CCP fill with 120.4 pcf for the non-ponded mixed CCP above el. 483. These results are shown in **Table E-2**. The factors of safety were 0.04 lower for profiles B-B' and D-D', but were unchanged for the other sections.

The unit weight of the CCP fill can only be estimated at this time, because the composition and method of placement (wet ponded CCP or dry non-ponded CCP) may vary. Our analyses using the range of probable unit weights demonstrates that the design of the UWL, and resultant factors of safety, satisfy the requirements of MDNR and are in accordance with generally accepted engineering practice regardless of the probable range of unit weights of the CCP.

7.0 SETTLEMENT ANALYSES

7.1 Estimated Settlements

Settlement analyses were completed using one-dimensional consolidation theory (Terzaghi and Peck, 1948) using the computer program SETTLE3D. The program calculates the effective vertical stress at depths for a uniform surface load on an assumed elastic half-space using the Boussinesq stress distribution. SETTLE3D does not allow for variations in subsurface soil conditions. Therefore, the program was run for multiple soil profiles. The soil profiles were developed for circles as shown in **Figure F-1,** combining the data from the pertinent borings and CPT soundings for each circle. The development of the soil profile for each circle is shown in hand calculations in **Appendix F**. The settlement values were calculated at the circles for the final configurations of full Cells 1 and 2, and full Cells 3 and 4. The configuration of the CCP fill is represented by a combination of uniform surface loads of varying dimensions. The profile used to calculate the surface loads is illustrated in **Figure 8**. The input loads are presented in the output for each circle in **Appendix F.** The plan view of the cumulative surface loads are depicted in the output from SETTLE3D in **Figure F-8**. The soil stratification at a given circle is modeled, and the settlement at the surface is computed for each load configuration. The results were graphed to produce the estimated settlement of the subgrade along four cross-sections of the completed landfill and along the existing Explorer pipeline.

Consolidation coefficients (C_C and C_R) for cohesive materials were obtained from load increment consolidation tests run on representative undisturbed samples from the DSI. The stress-strain modulus (E_S) for granular materials was estimated using cone penetration test (CPT) data obtained from the DSI. E_S is approximately 4 times the measured CPT q_c-value of resistance (Lunne et al, 1997). This multiplier of 4 was the minimum that was applicable for recent normally-consolidated sands or “aged” normally-consolidated sands for an average axial strain of 0.1%, which is applicable to this site. The calculated values of Es from the CPT data and the range of values used in the settlement analyses are plotted in **Figure F-6** in **Appendix F.**

Settlements of the natural subsurface soils were calculated along four profile lines, as shown in **Figures F-2 through F-5**. Generally, the calculated settlement at the top of the perimeter berms varied from 5.5 inches to 9 inches. The calculated settlement at the inside toe of the perimeter berms, where the leachate collection sumps will be located, ranged from 10 to 17 inches.

The calculated settlements at the midpoint of the CCP slope ranged from 14 to 20 inches, and at the top of the 1(v)-to-3(h) slope ranged from 18 to 26 inches. The maximum calculated settlement in the center of the CCP fill was 26 inches.

7.2 Liquefaction-Induced Settlement

Liquefaction settlement for the SPT borings was determined using the procedure outlined in Idress and Boulanger 2008, which determines the post-liquefaction volumetric strain based upon the corrected-normalized N-value $(N_1)_{60}$ and the calculated factor of safety against liquefaction. For CPT soundings, volumetric strain was determined using the procedure outlined in Zhang et. al. (2004) which uses the corrected-normalized-clean sand equivalent-point resistance $(q_{C1N})_{CS}$. The average liquefaction-induced settlement associated with different quantities of fly ash fill are shown in **Figure D-2**. These values do not account for settlement and are in addition to the normal consolidation settlement or immediate settlement. As can be seen in this figure, the addition of fill significantly reduces the estimated liquefaction induced settlement. There is one location along the southern edge of Cell 1 where there is a potential for liquefaction beneath the perimeter berm with the addition of 10 feet of CCP fill. The estimated liquefaction-induced settlement is 3 inches. This amount of settlement creates inconsequential additional strain on the HDPE liner. After 20 feet of CCP fill has been placed, there are no potential areas of liquefaction beneath the landfill, so there is no potential liquefaction-induced settlement.

Prior to the placement of sufficient CCP to mitigate the liquefaction potential, an investigation would be completed if a seismic event with a PHGA of 0.10g or greater would occur, as explained in Section 6.1.3.

7.3 Strain of HDPE Liner and Leachate Collection System

The estimated settlements will occur over long distances, such that the differential settlement will be small, at a slope of about 1%. The liner will undergo a maximum differential settlement of about 5 inches between the crest of the perimeter berm to the inside toe of the berm (a horizontal distance of 69 feet), and about 11 inches from the inside toe of the berm to a point below the crest of the CCP fill (206 feet). The increase in lengths of the slopes after full settlement has occurred compared to the initial lengths will be 0.002% and 0.001%, respectively. A strain of less than 1% is acceptable since the yield strength of most HDPE liners occurs at more than 12%. Therefore, the strain in the HDPE liner resulting from the estimated differential settlements will not negatively impact the liner.

7.4 Impact of Settlement on Existing Explorer Pipeline

Cells 1 and 2 will be constructed along the west side of the existing Explorer pipeline. Cells 3 and 4 will be constructed along the east side of the pipeline. The plan leaves a 100-foot buffer between the pipeline and the toe of the berms. We calculated the settlement along the pipeline that would result from completing the CCP fill for Cells 1 through 4, and from construction of the two roadway berms if nothing were done to mitigate the settlement. The calculated settlements are plotted in **Figure F-7** in **Appendix F.** The maximum calculated settlement is less than about ¼-inch except in the vicinity of the two roadway berms, which is within the error of the method of analysis. We judge that this amount of settlement is inconsequential. The maximum calculated settlement beneath the two roadway berms is about 4.5 inches, over a distance of about 140 feet, which is a rotation of about 0.3º. As stated in the CPA Report, this issue will be resolved with Explorer Pipeline during the final design of the future expansion to Cells 3 and 4.

7.5 Settlement Analyses with Maximum Unit Weight of Non-Ponded CCP

As explained under Section 3.2.1, our analyses used an average in-place unit weight of the non-ponded CCP of 112 pcf, whether for wetted fly ash or moistened combined CCP. If the combined CCP were mixed with as much water as possible, an unlikely and more costly option, the maximum unit weight of the combined CCP could be as high as120.4 pcf (see Section 3.2.4). To check the sensitivity of our assumed unit weight of 112 pcf, we ran settlement analyses for the full CCP fill with 120.4 pcf for the non-ponded CCP above el. 483. For the settlement in the central area of a given cell, the increase in the anticipated settlement is an average of 1 to 1.5 inches, or about 4.5% to 6.6%. The maximum increase in settlement is 1.3 to 2 inches, or about 4.9% to 7.1%. Given the inherent variations in properties of both the CCP and the natural soils, and the accepted method of estimating settlement, no revision to our original settlement estimates is necessary to accommodate the unexpectedly higher unit weight of mixed, saturated CCP.

8.0 HYDROSTATIC PRESSURES

8.1 Flood Levels for Design

The UWL site is currently protected from regular Missouri River flooding by the Labadie Bottom Levee District agricultural levee with heights at or near the 100-year flood elevation. In the unlikely event that the agricultural levee is overtopped or breached, the UWL site is further protected from direct Missouri River flood currents by the Labadie Energy Center itself which is upstream and higher than the 500-year flood elevation, creating a low velocity shadow, or ineffective flow area, over the entire UWL site. The regulatory 100-year base flood elevation (BFE) of 483.98 at the upstream end of the UWL site became effective on October 18, 2011. The 500-year flood elevation at this river station is reported by FEMA to be 487.55. By comparison, the flood crest at this location in August 1993 was about el. 483.6. The planned top of the constructed perimeter berms of the Labadie UWL will be at el. 488.

8.2 Protection of Liner from Hydrostatic Uplift

A flood condition surrounding the UWL would impose a hydrostatic uplift pressure on the bottom of the composite liner. This uplift pressure is initially only resisted by the weight of the composite liner, specifically the compacted clay, before the leachate collection layer or any fill is placed in the cell. To maintain a factor of safety (FS) of 1.1 against upward displacement and rupture of the liner, the 2 feet of clay can resist an upward pressure equal to about 3.3 feet of water. Therefore, the level of the flood water surrounding the cell must remain no more than 3.3 feet above the clay liner before CCP fill is placed. If the 12-inch gravel leachate collection layer is used, then the flood water surrounding the cell must remain no more than 5.25 feet above the gravel layer before CCP fill is placed. Once the 12-inch thick protective sand layer is in place, the maximum allowable difference in height between the water level outside of the berm and top of the protective sand layer is 7.0 feet for a FS of 1.1.

CCPs from the existing ash pond will be placed immediately after receipt of authorization to operate the UWL to protect the compacted clay liner against heave from hydrostatic uplift. The required height of the CCP fill may be calculated using the equation illustrated in **Figure 10**. We have assumed that the initial CCPs will be placed at a moist unit weight of 90 pcf. For simplicity in the calculation, we assumed that the bottom of the clay liner is at the top of the sand or permeable layer. For example, if the base of the clay liner were at el. 466 at the lowest point, then the uplift hydrostatic head (H_w) for the 100-year flood level (el. 484) would be 18 feet. The required height of the CCP (H_{CCP}) for a FS of 1.1 is 8.1 (el. 478.1) feet with the 12-inch gravel leachate collection layer, or 9.5 (478.5) feet if a light weight geo-composite is used in lieu of the gravel layer. These are examples to illustrate the calculation; the actual calculations of the heights of CCP required are included in **Appendix Y.**

9.0 EROSION PROTECTION FROM LEVEE OVERTOPPING OR FAILURE

Franklin County amended their Unified Land Use Regulations on October 25, 2011 to add regulations concerning Non-Utility Waste and Utility Waste Landfills (UWL) in Franklin County, Missouri. Article 10, Section 238(C)(3) of these amended regulations requires in part that:

> *d.) All "cells" shall be designed and constructed so that they shall be protected by an exterior berm meeting the following criteria:*
>
> *i.) The top of the berm at a minimum shall be equal to the five hundred (500) year flood level in the area of the proposed Utility Waste Landfill.*
>
> *ii) … All berms shall be constructed of concrete or cement-based material sufficiently thick for the purpose intended and approved by the Independent Registered Professional Engineer.*

Some exterior berms may infrequently be in contact with flood water from the Missouri River, but only if the Labadie Bottom Levee District levee is overtopped or breached. A floodplain analysis performed by CDG for Ameren Missouri estimated that the maximum velocity that may occur is less than 2 feet/second along the west berm of Cells 1 and 2. The interior berms may also infrequently come in contact with flood water, but the water velocities will be too low to cause erosion. In both instances a vegetated cover alone would provide sufficient erosion protection, as with standard levee design. To meet Franklin County regulations, concrete and/or cement-based material will be used to prevent possible erosion of the exposed slopes of perimeter berms that may be subject to the flow of flood water.

The exterior slopes of all perimeter berms will be covered with a fabric-formed concrete mat (FCM) as illustrated in **Figure 9**. The design of the FCM is presented in **Appendix G**. A 56mm thick FCM, such as Hydrotex FP220, will provide adequate protection for flows up to 11.4 feet/second when placed on a 1(v)-to-3(h) slope of cohesive soil. A non-woven filter geofabric will be placed between the FCM and the compacted soil of the berm to prevent loss of soil through the drainage openings in the FCM. The 56mm thickness is the minimum required for the anticipated velocity of flow. However, a thicker FCM may be used for constructability and durability. The final design of the FCM may include anchor rods.

10.0 CONSTRUCTION RECOMMENDATIONS

10.1 Field and Laboratory Classification of Soils

As discussed previously, the clay for the liner and top cover will be imported. While preliminary tests have been completed on the clay borrow material from Ameren's Callaway Plant, additional tests will be needed before these soils can be placed as the clay soil component of the composite liner system. As an alternate, the contractor for each phase may be permitted to import clay liner material from another off site source. If this alternate is accepted, the contractor will be required to identify and provide access to the off-site borrow sites for geotechnical materials testing of the proposed clay liner quality soils with sufficient lead time to complete exploratory investigation, sampling and testing prior to transporting the off-site soil materials onto the UWL site. Hydraulic conductivity tests on compacted clay samples may require 2 months to complete. We suggest stockpiling an adequate volume of clay liner material for each phase on site prior to the start of the clay liner construction. This would provide adequate time to perform the required test pad construction and testing prior to the start of construction, and would help ensure that an adequate supply is on hand throughout the liner construction. Clay soil materials to be used for clay liner construction must be tested and subsequently placed in accordance with the site specific state-approved CQA Plan for the UWL. Section 10.2 below describes the testing and placement criteria. To verify that future, constructed compacted clay liners meet the minimum criteria used in our above analyses, the clay should have a minimum undrained shear strength of 600 psf, a moist unit weight of 115 pcf, a drained internal friction angle of 25º, and a minimum interface friction angle with the HDPE liner of 15º, in addition to meeting the other requirements established in 10 CSR 80-11.01(10).

The requirements for the soil to be used to construct the perimeter berm are less stringent. Off-site sources may be tested several days prior to use of the fill material on site. Continuous monitoring by a geotechnical engineer or a qualified soils technician working under the direction of a geotechnical engineer will be required to ensure that the imported soil fill has consistent properties, such as grain-size, plasticity, and compaction characteristics. The general berm fill when compacted should have a minimum undrained shear strength of 1000 psf, an approximate moist unit weight of 120 pcf, and a drained internal friction angle of 30º or greater.

10.2 Compaction Criteria

Grab samples of liner material will be tested for grain-size distribution (i.e. hydrometer test), and liquid and plastic limits. If any volume of the stockpile differs significantly in these index properties, then that volume can be delineated, and a separate compaction criteria can be developed for that material, or it can be rejected as liner material. Compaction criteria for clay liner material will be developed using the "Daniel Method." Daniel and Benson (1990) have determined that compaction criterion as a percentage of the maximum dry unit weight alone is not sufficient to assure the required minimum hydraulic conductivity. They recommend a series of compaction tests and hydraulic conductivity tests on each soil type to determine the acceptable "window" of dry density and moisture content that will meet the hydraulic conductivity requirements which will require up to 3 months to complete.

The stability of the perimeter berm requires higher shear strength than for the liner. Therefore, the average compaction of the materials in the perimeter berm should be no less than 95% of the maximum dry unit weight determined by the standard Proctor moisture-density test, with no tests less than 92% of the same maximum dry unit weight. The moisture content at the time of compaction should be at optimum or a maximum of 4% above optimum. The engineering properties of the berm materials compacted to the above minimum criterion must meet or exceed the following: moist unit weight of 120 pcf, undrained shear strength of 1000 psf, drained cohesion of 0, and a drained internal friction angle of 30º.

Fills should be placed in horizontal lifts not exceeding 8 inches in loose thickness and compacted by uniform coverage with a suitable compactor. Cohesive fill should be compacted using a heavy tapered-foot compactor, with or without vibration. The final lift of cohesive fill should be compacted by a smooth-drum roller. Cohesionless fill, if any, such as the silty sand or fly ash, should be compacted by a heavy vibratory compactor.

10.3 Construction Quality Assurance

10.3.1 Test Pad

The plasticity index of some of the clay liner material from the Callaway Plant exceeded 30%. Therefore, a test pad will be required prior to construction to test the materials to be used for the liner, and the construction methods. The test pad must be large enough to accommodate the actual construction methods and equipment that will be used for the construction of the liner. The compaction criteria previously developed for the liner material will be used to construct the test pad. In accordance with MDNR-SWMP regulations, the geotechnical testing agency is required to take undisturbed samples of the fill to measure the density and hydraulic conductivity. Bulk samples of the fill material must be taken to perform LL and PI tests and standard Proctor tests. Also, a minimum of two test pits are required to examine the interface between lifts of materials, to verify bonding of the lifts. A field permeability test is also required. A test pad is not necessary for the fill to be placed in other areas, such as the perimeter berm.

10.3.2 Quality Assurance during Construction

The successful completion of the test pad will verify the acceptable construction methods for the liner for the known material from the liner materials stockpiled on site. **Appendix P** of the CPA Engineering Report provides a construction quality assurance plan for the composite liner system which will be followed to document adequate minimum construction of the composite liner system.

10.4 Investigation and Remediation of Possible Liquefaction Damage

As discussed in 6.1.3, there is potential for damage to the composite liner during construction before a sufficient amount of CCP fill had been placed in the UWL, which is about 20 feet. A procedure for an investigation is presented in Section 6.1.3. A topographic survey of the liner will have been completed for the CQA of the liner. Permanent benchmarks will need to be installed along the perimeter berms to perform an accurate horizontal survey to detect movements that may have occurred, since the calculated lateral deformations are very small.

11.0 RECOMMENDATIONS FOR INITIAL OPERATION

The initial filling of each cell must take into consideration protection against heave of the bottom composite liner due to flooding outside of the cell, and possible damage to the liner due to liquefaction resulting from a seismic event with a PHGA of 0.10g or greater.

Protection against heave of the bottom composite liner due to flooding has been discussed in Section 8.2. The placement of CCP in each cell will have to be expedited to minimize the risk of a significant flood or high water event occurring before the cell has sufficient CCP fill. This will include a stand-by plan to flood the cell with flood water pumped over the perimeter berm.

The potential for damage due to a seismic event has been discussed in Section 6.1.3. The initial filling of Cell 1 should begin on the west side where liquefaction potential remains after the construction of the berm, and on the east aide (see **Figure D-3**). Similarly, the initial filling of Cells 3 and 4 should begin on the west and south sides, respectively, to mitigate the potential for liquefaction.

There is risk of liquefaction beneath storm water Ponds 1 and 3 after completion of the berms for Cells 1 and 4, unless the ponds are filled with water at the time of a significant seismic event. This would not impact the stability of the CCPs in Cells 1 and 4 or the composite liner. If this occurs, an investigation of Ponds 1 and 3 should be completed, as outlined in Section 6.1.3.

12.0 REFERENCES

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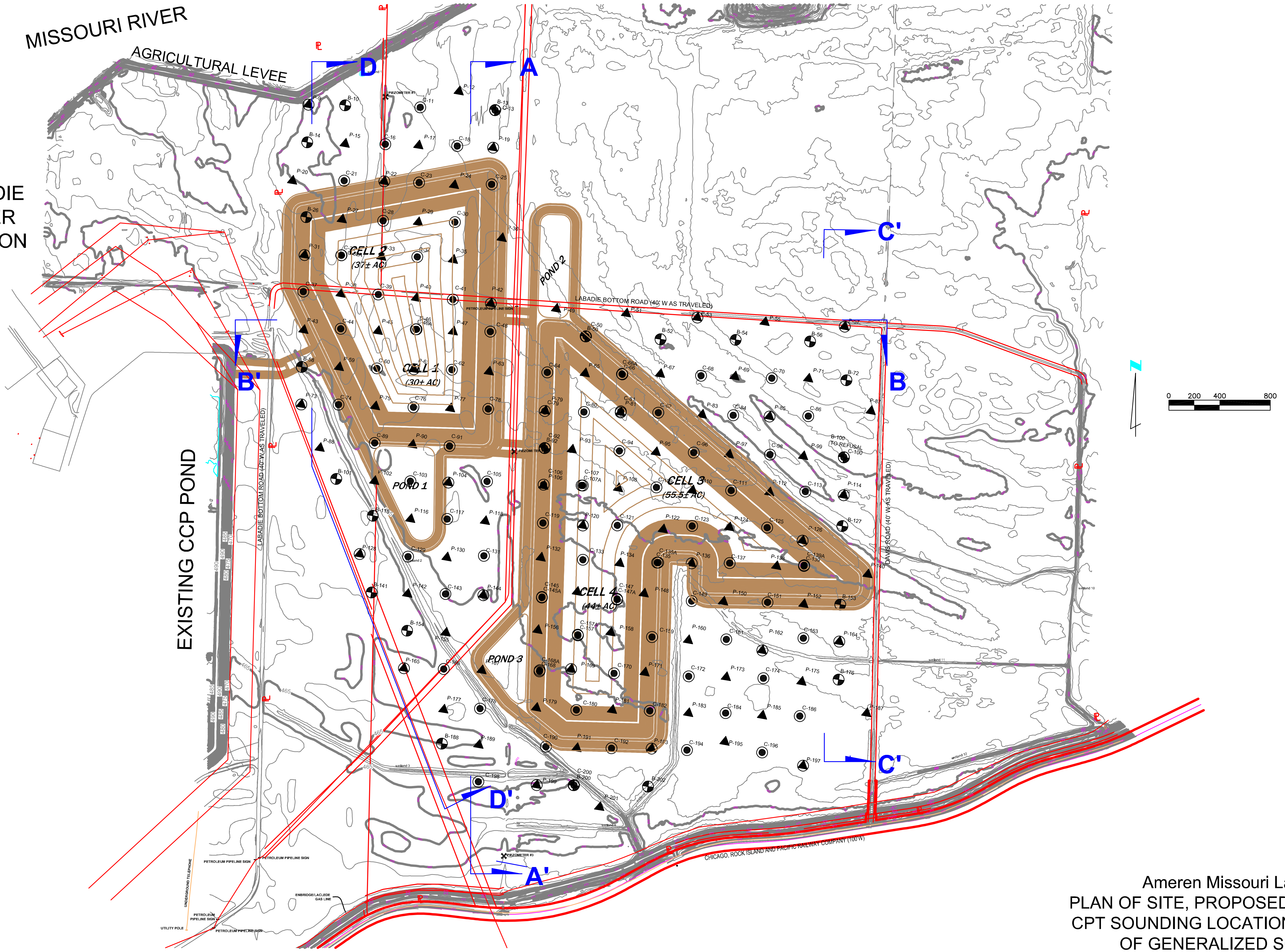
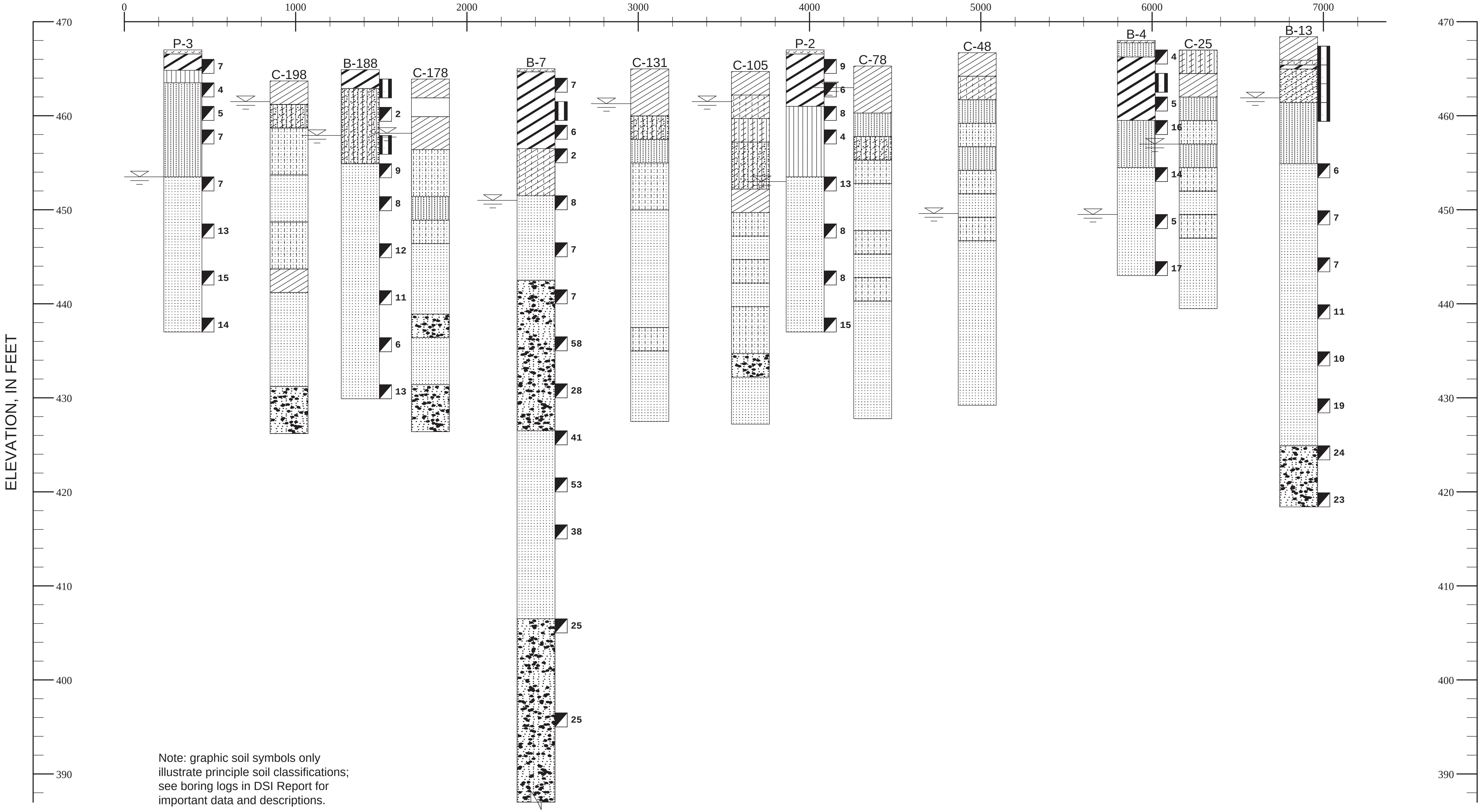


Ameren Missouri Labadie UWL
PLAN OF SITE, PROPOSED UWL, BORING AND
CPT SOUNDING LOCATIONS AND LOCATIONS
OF GENERALIZED SOIL PROFILES

REITZ & JENS, INC.

Figure 1

SCHEDULE CJG-ST1



Note: graphic soil symbols only
illustrate principle soil classifications;
see boring logs in DSI Report for
important data and descriptions.

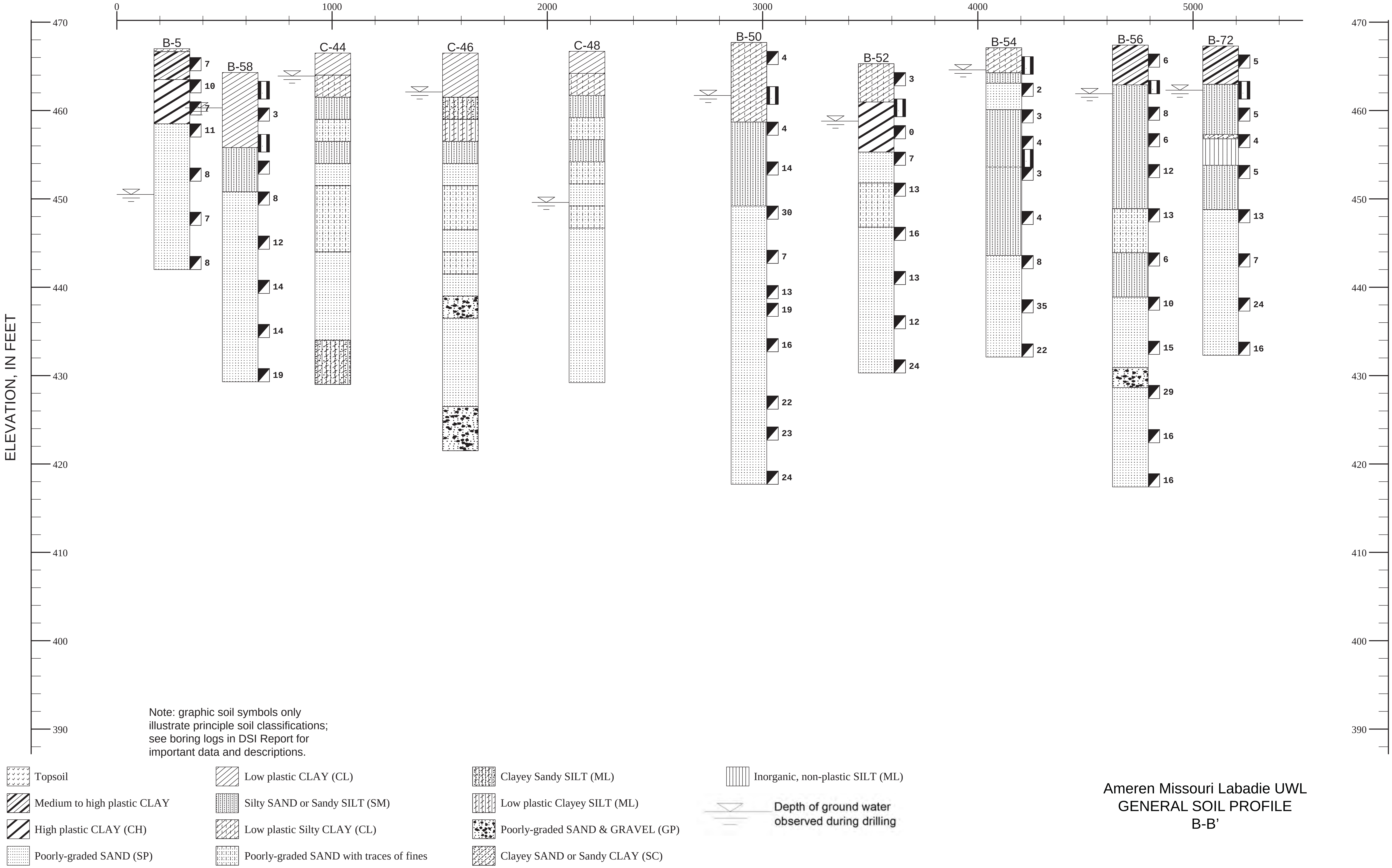
- Topsoil
- High plastic CLAY (CH)
- Inorganic, non-plastic SILT (ML)
- Silty SAND or Sandy SILT (SM)
- Poorly-graded SAND (SP)
- Low plastic CLAY (CL)
- Clayey Sandy SILT (ML)
- Poorly-graded SAND with traces of fines
- Poorly-graded SAND & GRAVEL (GP)
- Interval not sampled
- Low plastic Silty CLAY (CL)
- Low plastic Clayey SILT (ML)
- Clayey SAND or Sandy CLAY (SC)
- Depth of ground water observed during drilling

Ameren Missouri Labadie UWL
GENERAL SOIL PROFILE
A-A'

REITZ & JENS, INC.

SCHEDULE CJG-ST1

Figure 2

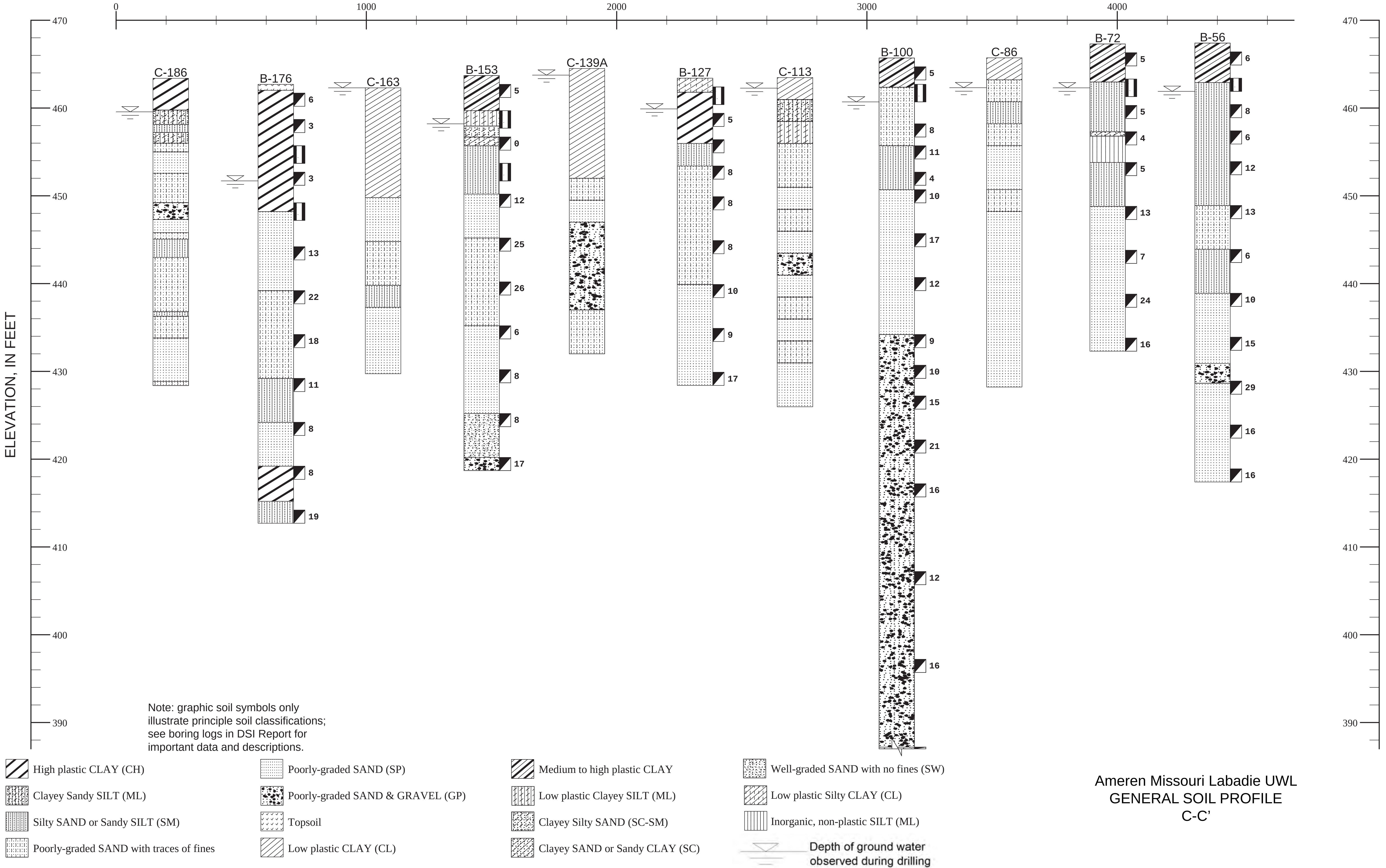


Note: graphic soil symbols only
illustrate principle soil classifications;
see boring logs in DSI Report for
important data and descriptions.

Ameren Missouri Labadie UWL
GENERAL SOIL PROFILE
B-B’

REITZ & JENS, INC.

SCHEDULE CJG-ST1 Figure 3



Note: graphic soil symbols only illustrate principle soil classifications; see boring logs in DSI Report for important data and descriptions.

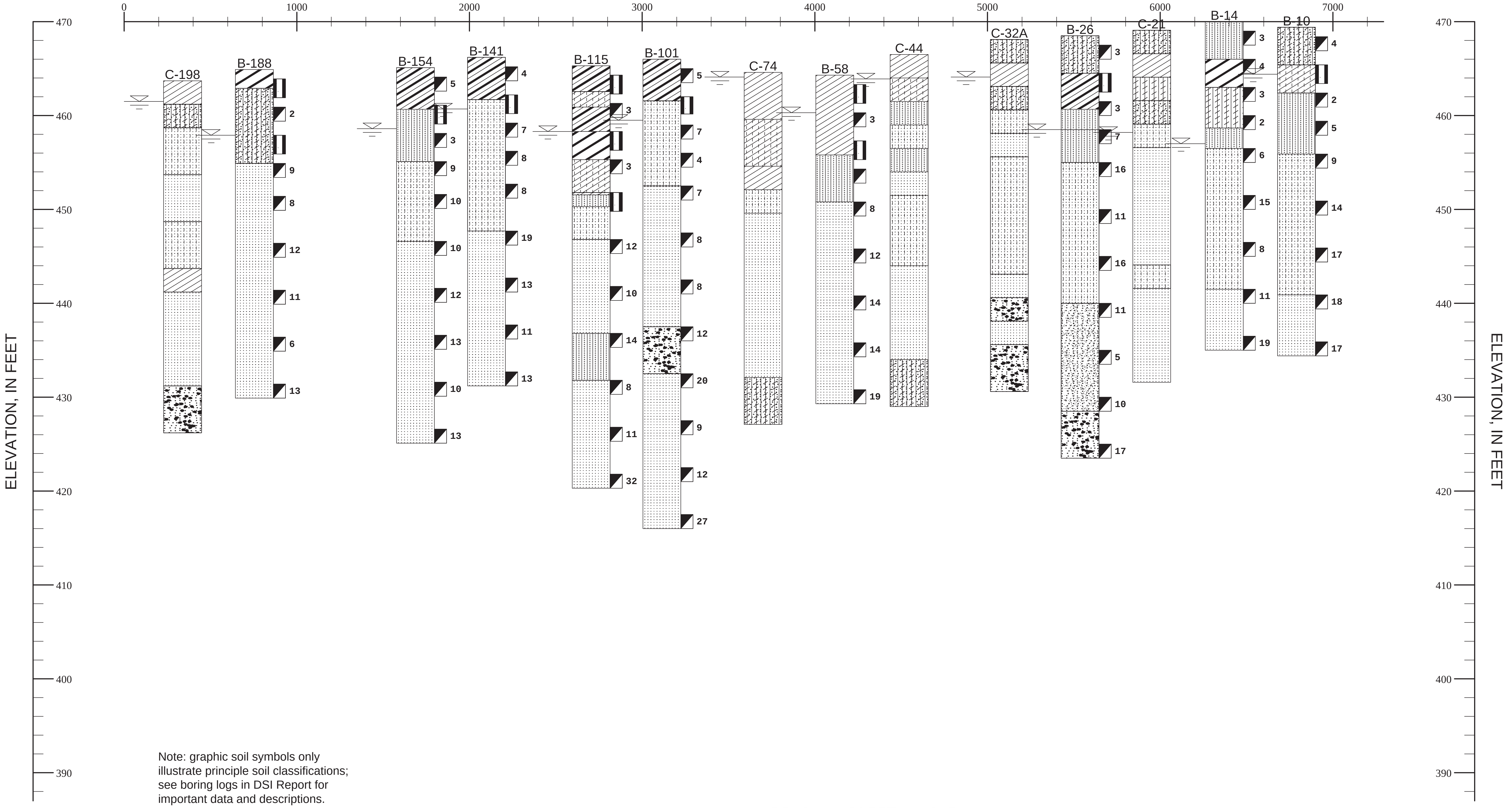
Ameren Missouri Labadie UWL
GENERAL SOIL PROFILE
C-C’

REITZ & JENS, INC.

SCHEDULE CJG-ST1

Figure 4

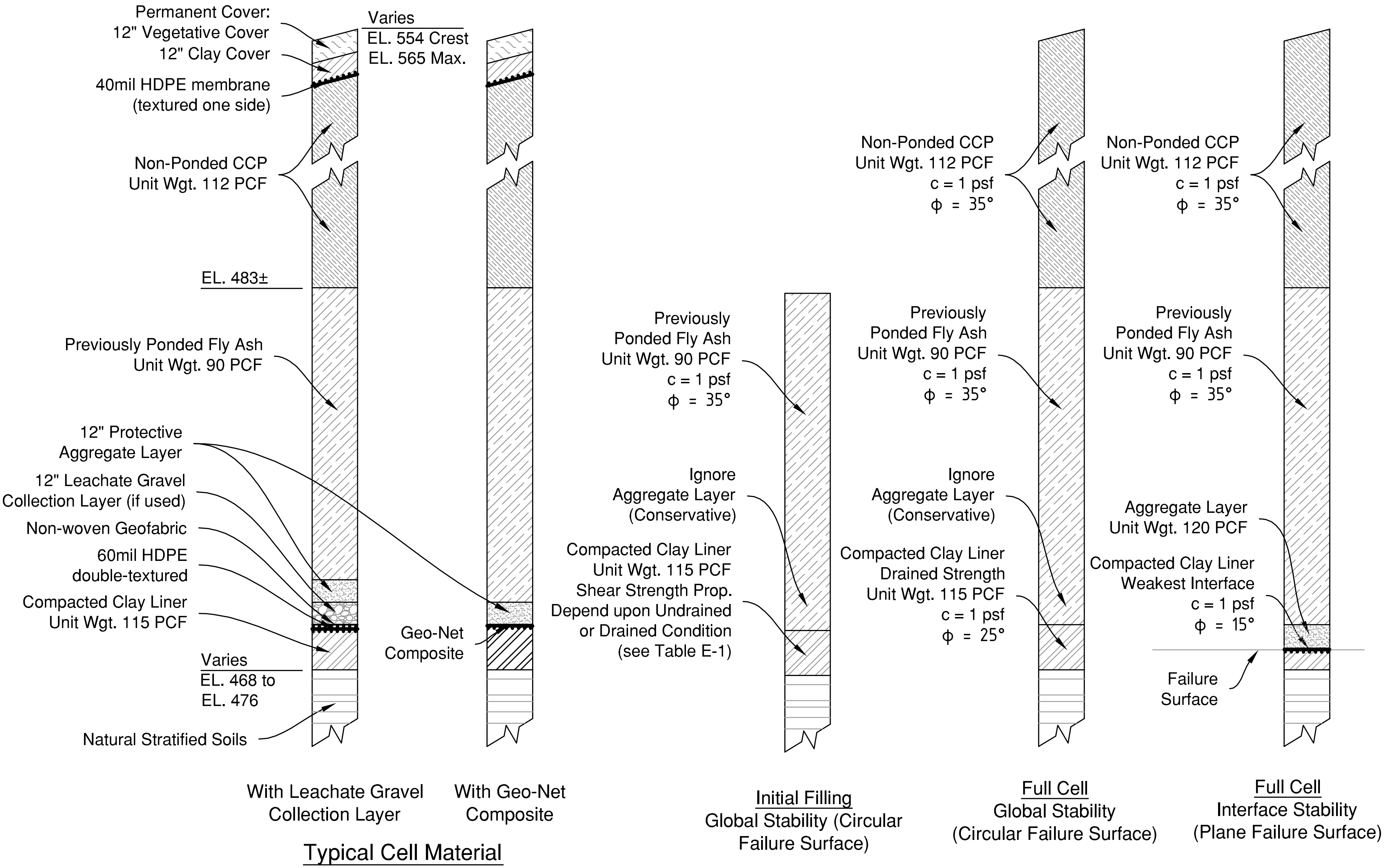
SCHEDULE CJG-ST1



Note: graphic soil symbols only
illustrate principle soil classifications;
see boring logs in DSI Report for
important data and descriptions.

- ▨ Low plastic CLAY (CL)
- ▨ Clayey Sandy SILT (ML)
- ▨ Poorly-graded SAND with traces of fines
- ▨ Poorly-graded SAND (SP)
- ▨ Poorly-graded SAND & GRAVEL (GP)
- ▨ High plastic CLAY (CH)
- ▨ Medium to high plastic CLAY
- ▨ Silty SAND or Sandy SILT (SM)
- ▨ Low plastic Silty CLAY (CL)
- ▨ Clayey SAND or Sandy CLAY (SC)
- ▨ Well-graded SAND with no fines (SW)
- ▨ Low plastic Clayey SILT (ML)
- ▽ Depth of ground water observed during drilling

Ameren Missouri Labadie UWL
GENERAL SOIL PROFILE
D-D’



With Leachate Gravel
Collection Layer

With Geo-Net
Composite

Initial Filling
Global Stability (Circular
Failure Surface)

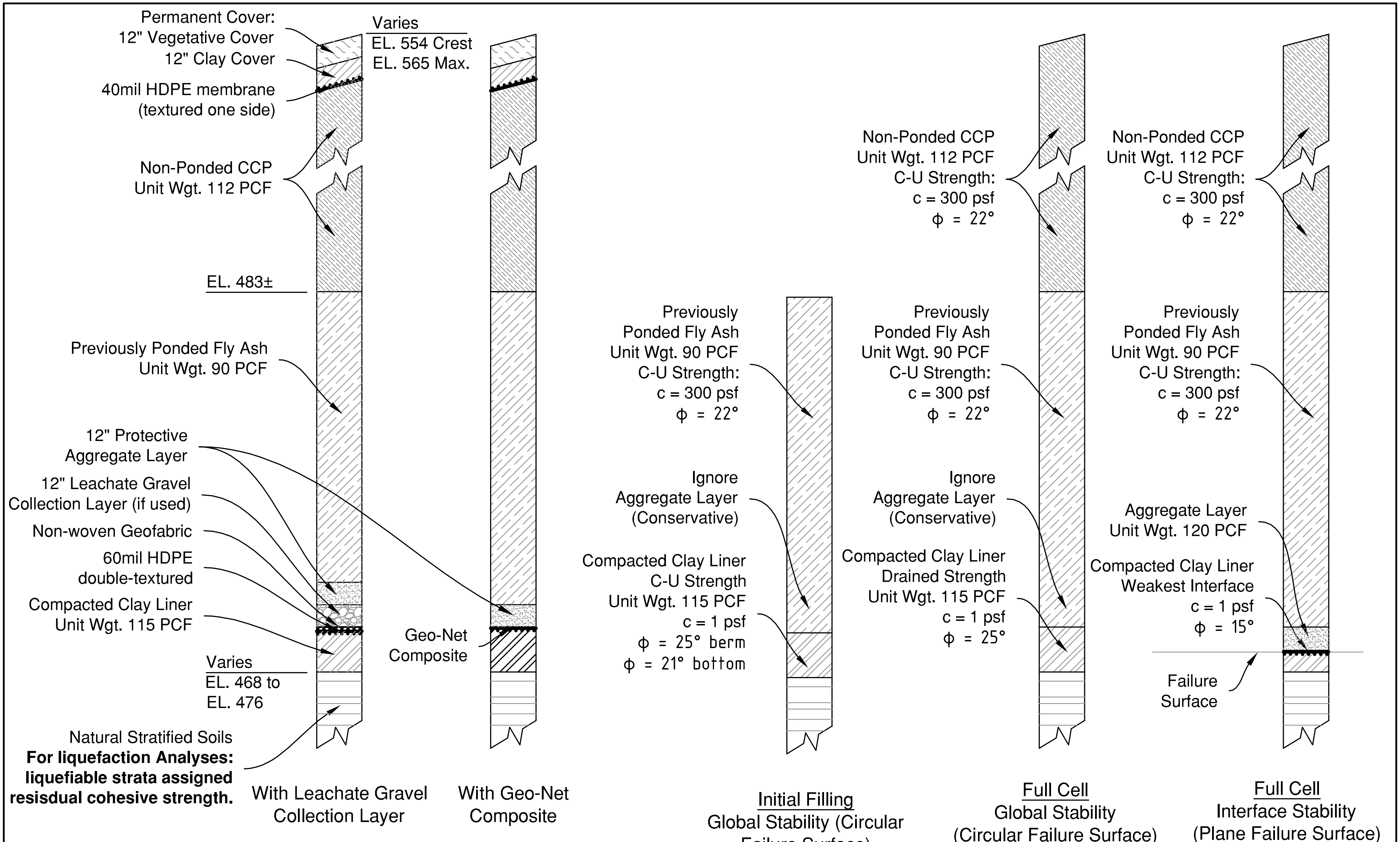
Full Cell
Global Stability
(Circular Failure Surface)

Full Cell
Interface Stability
(Plane Failure Surface)

Typical Cell Material
Profile
NOT TO SCALE

Ameren Labadie UWL
GRAPHIC DEPICTION OF MATERIALS FOR
STABILITY ANALYSES

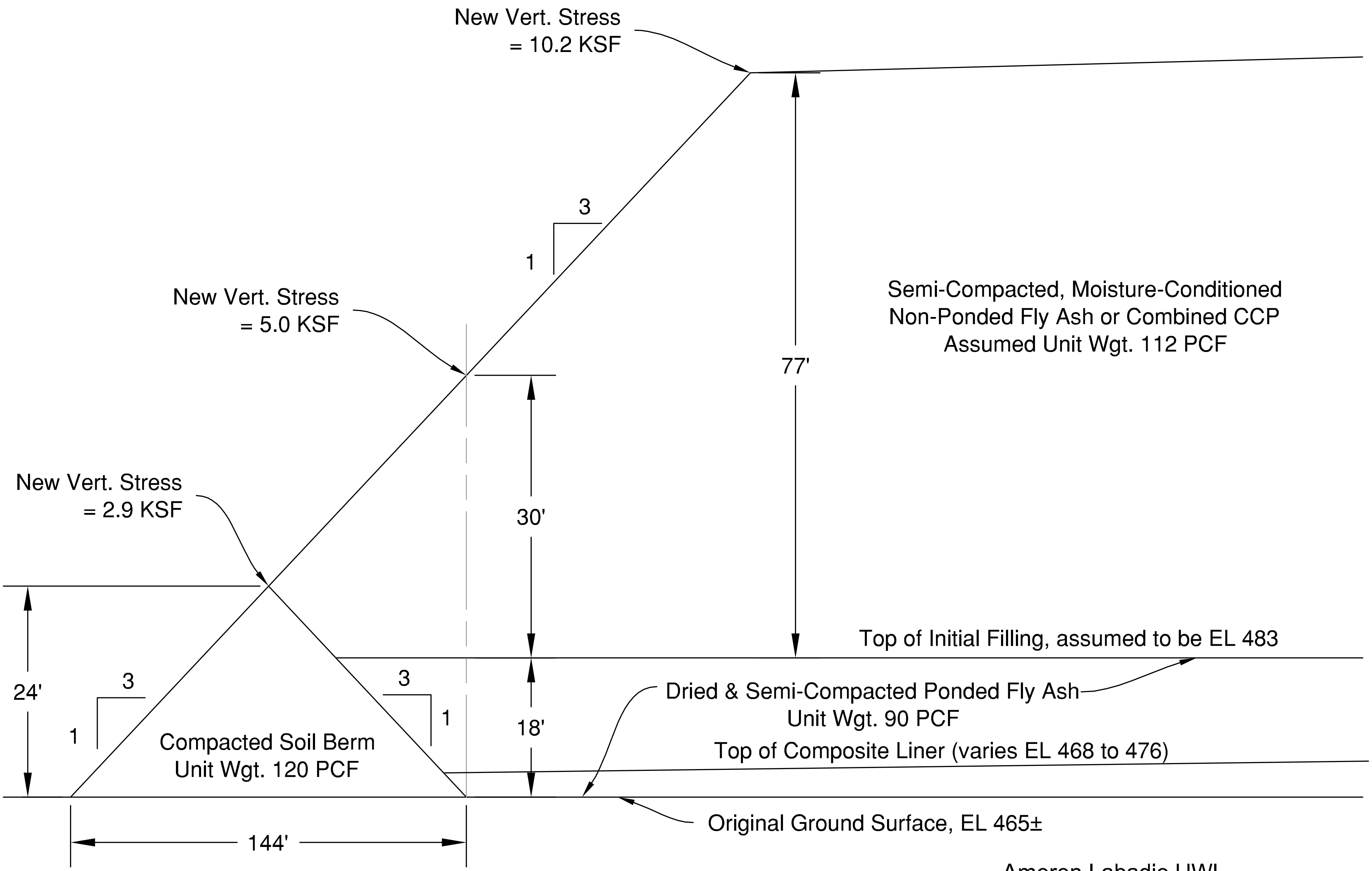
Figure 6



Typical Cell Material Profile
NOT TO SCALE

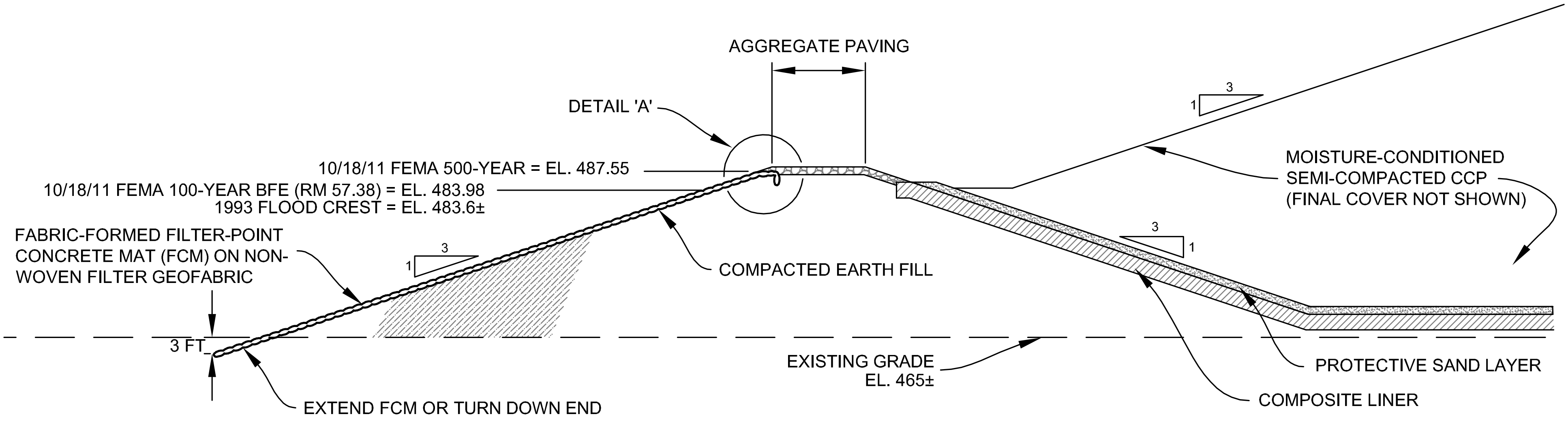
Ameren Labadie UWL
GRAPHIC DEPICTION OF MATERIALS
FOR SEISMIC ANALYSES

Figure 7

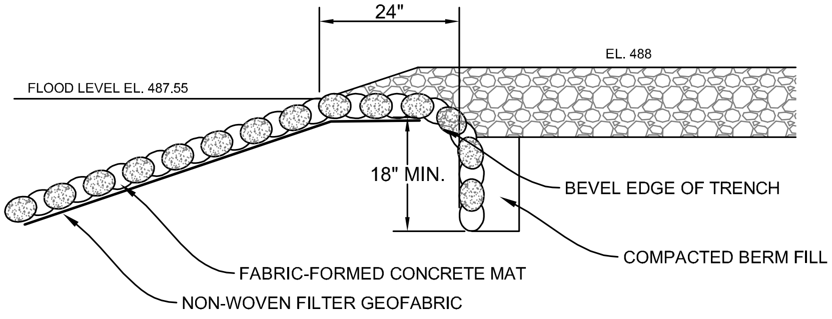


Ameren Labadie UWL
MODEL FOR CALCULATION OF VERT. STRESSES
FOR SETTLEMENT ANALYSES

Figure 8



GENERAL CROSS-SECTION OF PERMANENT EXTERIOR BERM

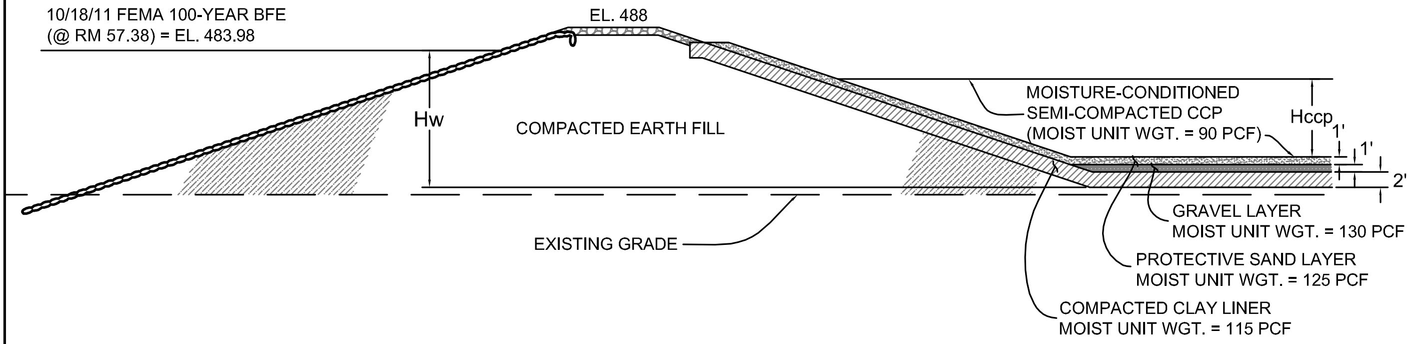


DETAIL 'A' - FCM ANCHOR TRENCH

Ameren Missouri Labadie UWL
PROPOSED CONCRETE EROSION
PROTECTION FOR EXTERIOR BERMS

Reitz & Jens, Inc.

Figure 9



Factor of Safety Against Hydrostatic Uplift of Bottom Clay Liner (FS_{uplift}):

FS_{uplift} = (Hccp x 90 PCF + 1' x 125 PCF + 1' x 130 PCF + 2' x 115 PCF) / (Hw x 62.4 PCF)

with a 12" thick protective sand layer, 12" thick gravel leachate collection layer, and a 24" thick compacted clay liner, where:

Hw = difference in height from flood level to bottom of clay liner (based upon the assumption that the subgrade of the clay liner is permeable)
Hccp = height of CCP above sand layer (with CCP moist unit weight = 93 PCF)

The required height of the CCP for a FS_{uplift} of 1.1 and with a gravel collection layer:

Required Hccp = [(Hw x 62.4 PCF x 1.1) - 485 PSF] / 90 PCF

Example: for 100-year flood at el. 484 and bottom of clay liner at el. 466, Hw = 484 - 466 = 18 feet, and required Hccp = 8.3 feet for FS_{uplift} = 1.1, or a vertical difference of 5.7 feet between the 100-year flood level and the top of the CCP fill.

If a geonet is substituted for the 12" thick gravel collection layer, and the geonet is considered to be weightless, then:

FS_{uplift} = (Hccp x 93 PCF + 1' x 125 PCF + 2' x 115 PCF) / (Hw x 62.4 PCF)

and the required height of the CCP is:

Required Hccp = [(Hw x 62.4 PCF x 1.1) - 355 PSF] / 90 PCF

where Hccp is the height of CCP above the protective sand layer. This equation applies to any point on the side slope of the berm where the geonet will be used, but only if the berm is constructed with permeable fill (sands and silts).

Ameren Missouri Labadie UWL
CALCULATION OF RESISTANCE
TO HYDROSTATIC UPLIFT ON CLAY LINER

Reitz & Jens, Inc.

Figure 10

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Appendix A

INVESTIGATION OF POTENTIAL CLAY LINER BORROW SITE AT AMEREN CALLAWAY PLANT

Revised August 2013

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REITZ & JENS, INC.
CONSULTING ENGINEERS

1055 corporate square drive
st. louis, missouri 63132
phone: 314.993.4132
fax: 314.993.4177
www.reitzjens.com

May 25, 2011

Mr. Kevin Gerhardt, P.E.
Ameren Missouri
3700 S Lindbergh Blvd., Mail Code F-604
St. Louis, Missouri 63127

RE: Report of Callaway Clay Borrow Site for
Labadie Plant Utility Waste Landfill
Franklin County, Missouri

Dear Mr. Gerhardt:

This report presents our findings and estimated quantity of available clay borrow based on the twelve (12) boring made at the Callaway borrow site. This borrow site is located in Callaway County approximately one mile east of the Callaway Power Plant on County Road 448 (see Figure 1). The purpose of these borings is to provide data on the subsurface conditions, which was used to quantify the clay borrow that could be used for the installation of clay liner and cover at the Labadie Plant Utility Waste Landfill.

Field Investigation

The borings were made at the approximate locations shown in Figure 1. The borings were located along existing gravel roads or existing farm roads so damage would be limited. The borings were located in the field using a hand-held GPS unit. The elevations at the borings were taken from GoogleEarth™ at the locations of the borings.

The borings were made on March 17 and 18, 2011, by Midwest Drilling, Inc. of Florissant, Missouri, under subcontract to Reitz & Jens. The borings were advanced using 4.25-in. outside diameter solid-stem continuous flight augers (CFA). The borings were drilled to termination depths ranging from 14 feet to 31 feet, with some borings terminating on intact bedrock. The borings were backfilled with cuttings, gravel, and Bentonite chips. The top 5 feet of each boring was backfilled with Bentonite chips to limit direct infiltration from the surface. Any remaining cuttings were mounded on the boring in anticipation of some subsequent settling.

Samples of subsurface soils were obtained at about 2.5-foot intervals in the top 10 feet, and at 5-foot intervals below 10 feet. Samples were taken using either: 1) a hydraulically pushed, 3-inch O.D., thin-wall Shelby tube sampler in general accordance with ASTM D1587 “Thin-Walled Tube Sampling for Geotechnical Purposes”; or 2) a 2-inch O.D., split-spoon sampler driven by an automatic SPT hammer in conjunction with a Standard Penetration Test, in general accordance with

ASTM D1586 “Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils”. 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 the 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 the laboratory. The Shelby tubes were extruded in our lab immediately prior to testing.

The field investigation was completed under the direction of a Reitz & Jens geologist, with instructions from a geotechnical engineer, who determined the sampling intervals, termination depth, and logged the borings. The borings were logged in the field based upon cuttings, drilling characteristics and recovered samples. The boring logs were subsequently modified as appropriate based on laboratory test results. The boring logs are attached in Figure 2-1 through 2-12. The key and notes for the boring log are shown in Figure 2-0.

Ground water measurements were made during drilling, and some borings were left open to obtain a water measurement the following day. The ground water levels observed during drilling are only representative of the time during sampling. The ground water level will fluctuate with precipitation and seasonally. Water levels were as shallow as 8.5 feet in Boring B-5; but many of the borings were completely dry after drilling. This may be an indication of pockets of perched water.

Laboratory Testing

All recovered samples were visually described in general accordance with the ASTM procedures. Geotechnical soil tests performed included water content and density (ASTM D2216), Atterberg Limits (ASTM D4318), soil finer than the #200 sieve (ASTM D1140), and sieve size analysis of soil (ASTM D422). The results of these tests appear on the individual boring logs, and a summary of the data is shown in Figure 3. The sieve size analyses were performed on samples where more than 10% by weight was retained on the #200 sieve. The results of the sieve analyses are reported in Figures 4-1 through 4-21.

We collected the left-over materials from the Shelby tubes and produced two composite samples for further laboratory testing. The first composite contains silt and low plastic silty clay, and the second contained high plastic clay. Compaction tests were performed on both composites using the Standard Proctor procedure according to ASTM D698. The results are presented in Figures 5-1 and 5-2. Atterberg Limits were also performed and reported on Figures 5-1 and 5-2. A hydraulic conductivity test according to ASTM 5084 was completed using the silty clay Proctor point compacted nearest to 95% of the maximum dry unit weight and on the wet side of the optimum moisture content. This sample had a hydraulic conductivity of $1.1x10^{-8}$ cm/sec. This result is presented in Figure 6. The measured hydraulic conductivity is below the required $1x10^{-7}$ cm/sec, thus qualifying this material as liner quality clay. We expect clays with liquid limits greater than that tested (37%) and compacted to a similar degree would have hydraulic conductivities equal to or less than composite sample that was tested. This would qualify nearly all materials described in the boring logs as low plastic silty clay, low plastic clay, medium to high plastic clay, and high plastic clay without significant amounts of sand and gravel, as suitable for liner material.

Estimate of Available Clay Borrow

The potential borrow area was broken down into five smaller borrow areas denoted as "BA #" in Figure 1. Two of the borrow areas, BA-1 and BA-4, were split due to shallow rock and thin deposits of clay. These areas which have little to no available clay are denoted as BA-1A and BA-4A and were not included in our calculations.

The linear footage of liner quality clay in each boring was estimated using only clay with a liquid limit greater than 40 and which did not have a significant amount of sand and gravel. We judge that clays with these parameters will result in hydraulic conductivities of less than $1x10^{-7}$ cm/sec when compacted. The linear footage of liner quality clay is shown parentheses on Figure 1 next to the individual boring number. The calculation for the individual borrow areas is presented in Figure 7 (top). The total estimated amount of liner quality clay in all five borrow areas is roughly 4.4 million cubic yards. This calculation is based on the assumption that the borrow area is flat and that the clay extends horizontally throughout each borrow area. These assumptions were used because of the lack of topographic survey data and the limited number of borings.

A second calculation was made in the same manner as the first, but using all fine-grain soils (silts and low plastic clays) that did not have significant amounts of sand and gravel. The calculation for the individual borrow areas is presented in Figure 7 (bottom). The total estimated amount of fine-grain soil in all five borrow areas is roughly 5.6 million cubic yards. We believe that almost all of the fine-grain soil would be suitable for compacted clay liner, or the additional 1.2 million cubic yards would definitely be suitable for top cover.

Please let us know if you have any questions regarding this report. We appreciate this opportunity to continue our working relationship you and Ameren Missouri.

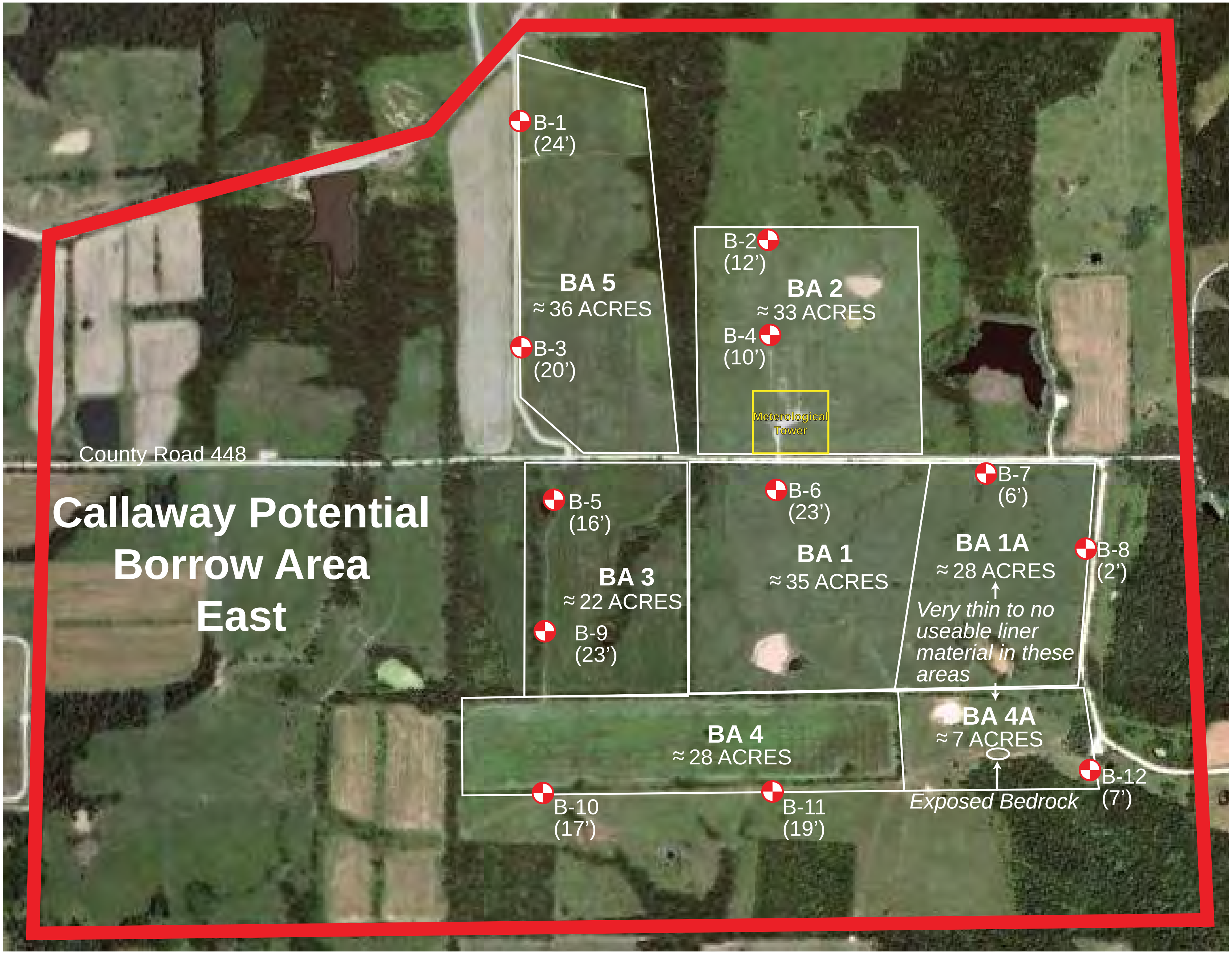
Sincerely,
REITZ & JENS, Inc.

Kyle E. Kocher
Kyle E Kocher, P.E.
Project Engineer

Jeffrey L Fouse
Jeff L. Fouse, P.E.
Project Manager

The following figures are attached and complete this report:

Figure 1	Callaway Borrow Area
Figure 2-0	Key to Boring Logs
Figures 2-1 to 2-12	Log of Borings B-1 to B-12
Figure 3	Laboratory Test Summary
Figures 4-1 to 4-21	Sieve Analyses
Figures 5-1 and 5-2	Standard Proctors
Figure 6	Hydraulic Conductivity
Figure 7	Clay Volume Calculation



Callaway Borrow Area

⊕ Boring Number
(L.F. of liner quality clay)

Figure 1

KEY TO BORING LOGS

Strata symbols

Symbol	Description
▒	Gravel frac
▨	Low-high plasticity clays
▥	Description not given for: "OZ"
▨	High plasticity clay
▨	Description not given for: "O:"
▒	Topsoil
▨	Description not given for: "O="
▩	Description not given for: "NR"
▨	Low plasticity clay
▩	Description not given for: "C-3"
▥	Silty sand
▤	Shale

Symbol	Description
▨	Description not given for: "OY"
▩	Description not given for: "LWU"

Misc. Symbols

Symbol	Description
▲	Description not given for: "FTRANGLE"
■	Description not given for: "FSQUARE"
▽	Water table during drilling
▼	Water table at boring completion

Soil Samplers

Symbol	Description
◩	Standard penetration test
▯	Undisturbed thin wall Shelby tube

Notes:

1. Exploratory borings were drilled on 03-17-11 using a 4-inch diameter continuous flight power auger.

2. No free water was encountered at the time of drilling or when re-checked the following day.

3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.

SCHEDULE CJG-ST1

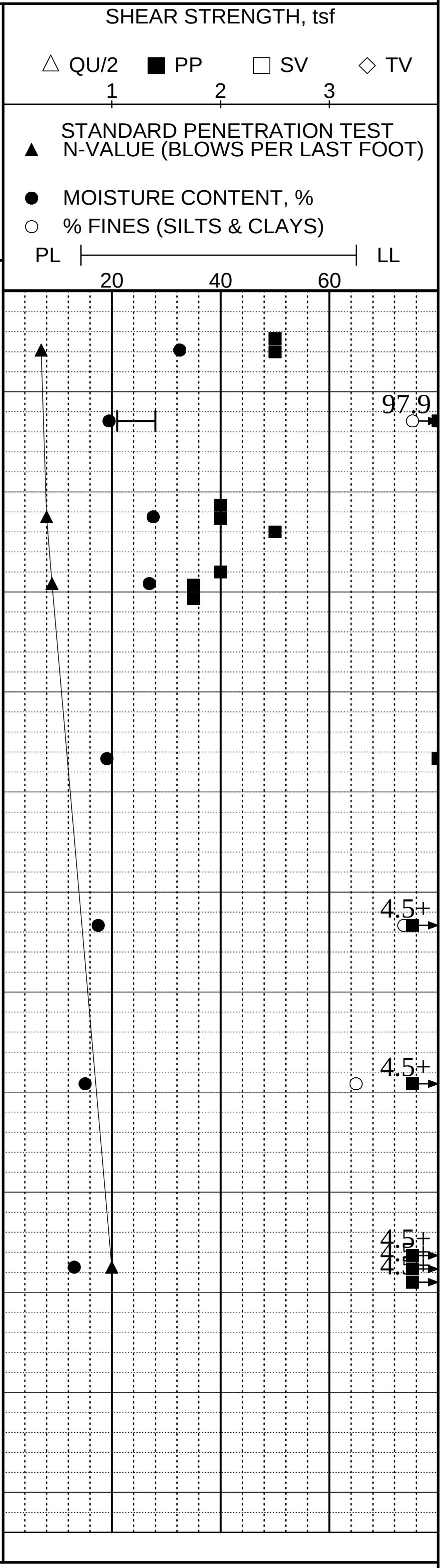
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-1

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1070025 E 1850593
ELEVATION: 821 DATUM:
DATE DRILLED: 03-17-11

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						8-inches of crushed limestone		
					78	CLAY (CL-CH), brown and gray, moderately plastic, slightly silty, stiff, moist	3-3-4	32.5
	816				95	Silty CLAY (CL-ML), brown and tan, with lignite and limonite, dry	110.5	19.5
6					100	CLAY (CH), light brown and gray, high plastic, moist, dry	3-3-5	27.6
					94	With trace fine sand and fine gravel	3-4-5	26.9
	810							
12								
					100	Becoming gray	110.3	19.1
	804							
18					100	With fine sand	113.2	17.5
	798							
24					100	Becoming gray and orange brown, with medium to fine sand	117.7	15.1
	792				100	Sandy CLAY (CH), golden brown, high plastic, fine grain sand, with silt lenses, very stiff	4-9-11	13.1
30						Boring terminated in sandy clay at 30'- 0" NOTE: Bulk sample taken at 13'-20'		
	786							
36								



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

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

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

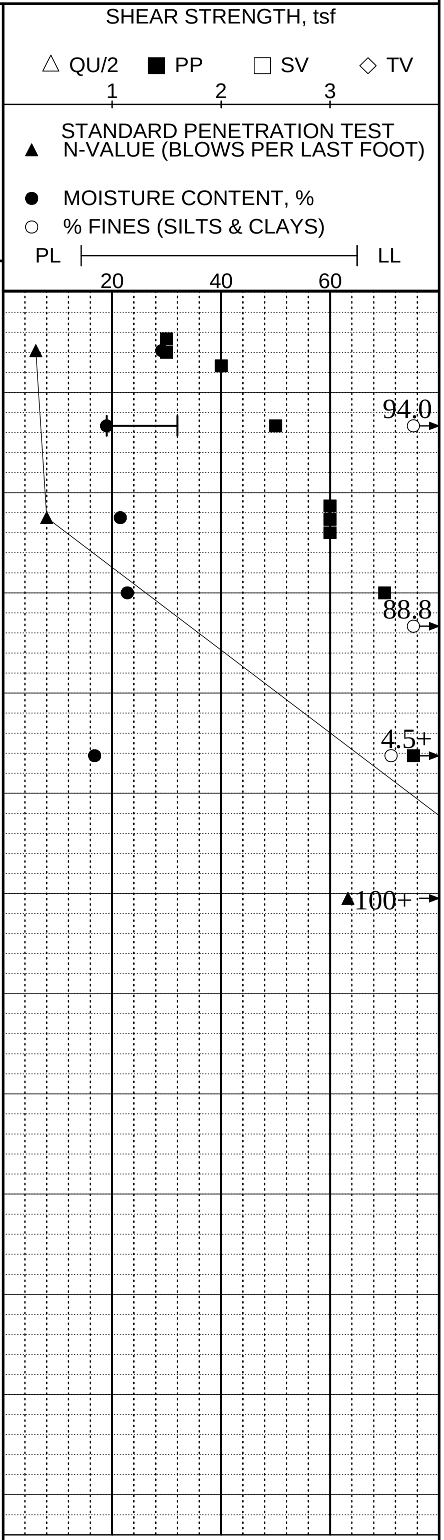
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-2

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1069272 E 1852010
ELEVATION: 813 DATUM:
DATE DRILLED: 03-17-11

DEPTH (FEET)	ELEVATION	WATER TABLE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0				5-inches of topsoil		
			83	Silty CLAY (CL), brown and gray, trace lignite and limonite, firm, moist	2-2-4	29.1
	810		92	Becoming dry	106.7	19.0
6			100	CLAY (CH), red-brown, high plastic, with lignite and limonite, stiff	3-3-5	21.5
	804		71	Becoming gray brown	102.9	22.8
12						
			100	With fine sand, trace medium sand	110.5	16.8
	798					
18			100	Highly weathered sandstone with chert gravel	50/3.5"	
	792			Boring terminated in weathered sandstone at 18'-9.5" NOTE: Bulk sample taken 10'-13'		
24						
	786					
30						
	780					
36						



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

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

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

File: 2008012455

SCHEDULE CJG-ST1
Figure 2-2

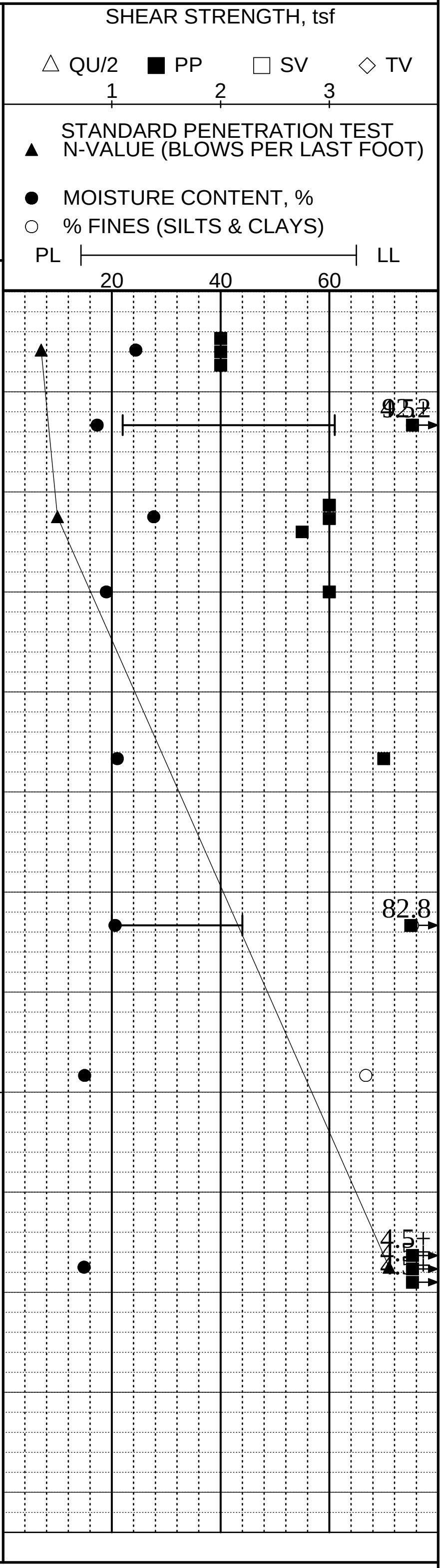
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-3

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1068835 E 1850564
ELEVATION: 822 DATUM:
DATE DRILLED: 03-17-11

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	822					8-inches of gravel and topsoil		
					100	Silty CLAY (CL), brown and gray, trace lignite and limonite, stiff, moist	2-3-4	24.4
					100	CLAY (CH), brown and gray, high plastic, slightly silty, dry	107.3	17.3
6	816				100		3-4-6	27.7
					38	Becoming tannish gray	107.8	19.0
12	810							
					100		107.2	21.0
18	804				100	CLAY (CL), gray, with fine sand, trace fine gravel	107.4	20.6
24	798				100	Becoming very sandy and gravelly	115.0	15.0
						Shaley CLAY, golden, with chert gravel and rock residuum		
30	792				100		17-32-39	14.9
						Boring terminated in shaley clay at 30'- 0" NOTE: Bulk sample taken 1'-10'		
36	786							



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

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

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

File: 2008012455

REITZ & JENS, INC.
CONSULTING ENGINEERS

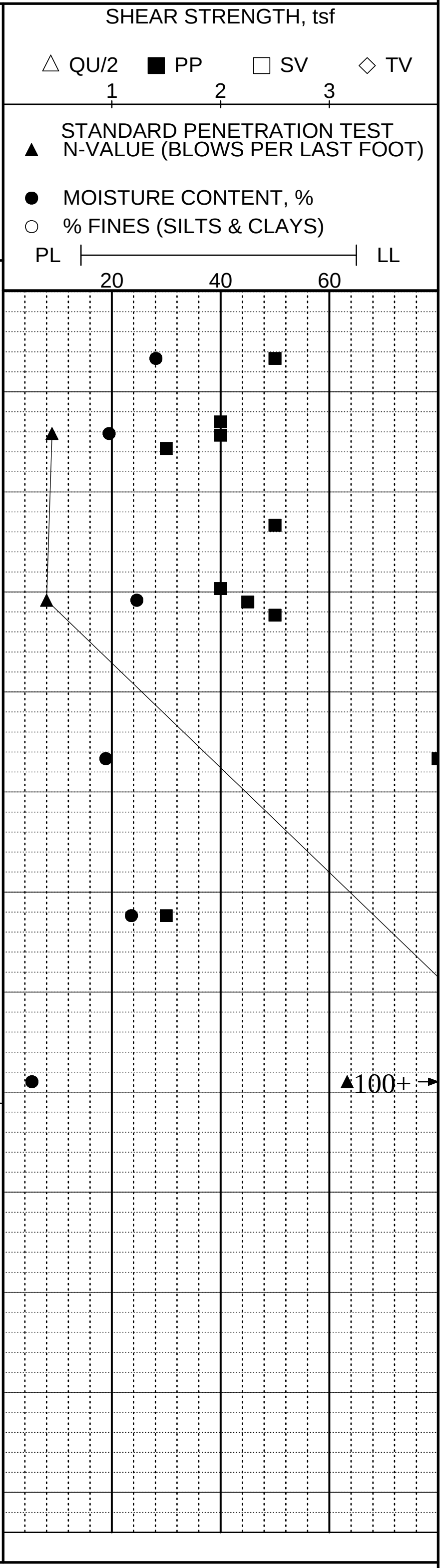
B O R I N G   L O G   B-4

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1068562 E 1852007
ELEVATION: 821 DATUM:
DATE DRILLED: 03-17-11

DEPTH (FEET)	ELEVATION
0	
	816
6	
	810
12	
	804
18	
	798
24	
	792
30	
	786
36	

WATER TABLE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
		5-inches of topsoil		
	92	Silty CLAY (CL), gray-brown, with lignite and limonite, stiff, moist	95.6	28.1
	100	Becoming dry	4-4-5	19.5
	21	No recovery		
	100	CLAY (CH), gray and golden, high plastic	2-3-5	24.6
	100	With sand and trace fine gravel	111.4	18.9
	100	Silty SAND (SM), golden and gray, trace clay, with layers of clayey silt, dry, hard	100.2	23.6
		Shale, maroon		
	100		50/4.5"	5.3
		Boring terminated in shale at 24'-0" NOTE: Bulk sample taken 15'-24'		



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

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

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

File: 2008012455

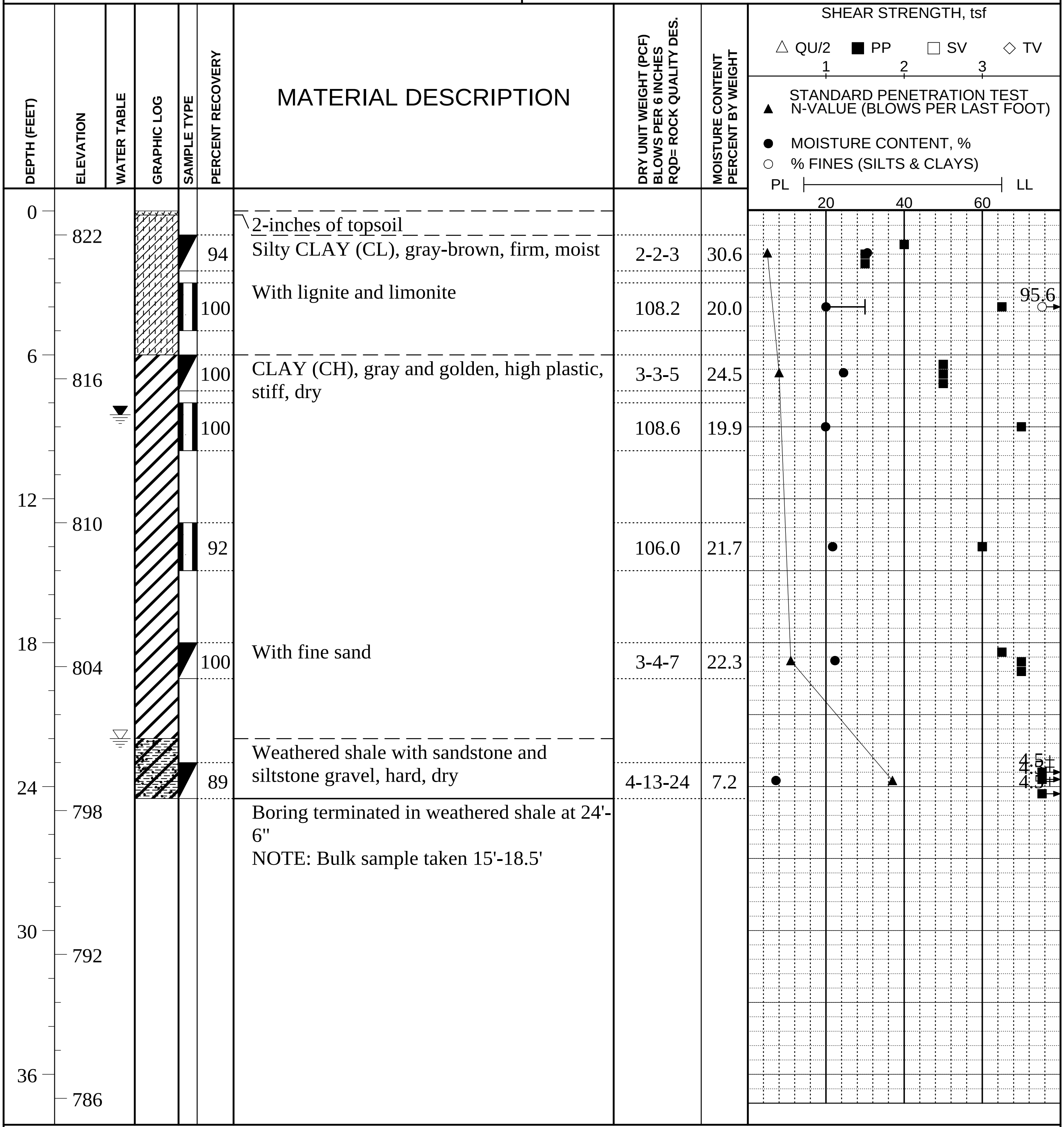
SCHEDULE CJG-ST1

REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-5

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1068017 E 1850704
ELEVATION: 823 DATUM:
DATE DRILLED: 03-17-11



PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
	2-inches of topsoil		
94	Silty CLAY (CL), gray-brown, firm, moist	2-2-3	30.6
100	With lignite and limonite	108.2	20.0
100	CLAY (CH), gray and golden, high plastic, stiff, dry	3-3-5	24.5
100		108.6	19.9
92		106.0	21.7
100	With fine sand	3-4-7	22.3
	Weathered shale with sandstone and siltstone gravel, hard, dry		
89		4-13-24	7.2
	Boring terminated in weathered shale at 24'-6" NOTE: Bulk sample taken 15'-18.5'		

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

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

WATER LEVELS: DURING DRILLING 22 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT 8.5 FEET AFTER 24 HOURS
AT ______ FEET AFTER ____ HOURS
PIEZOMETER: INSTALLED AT ___ FEET

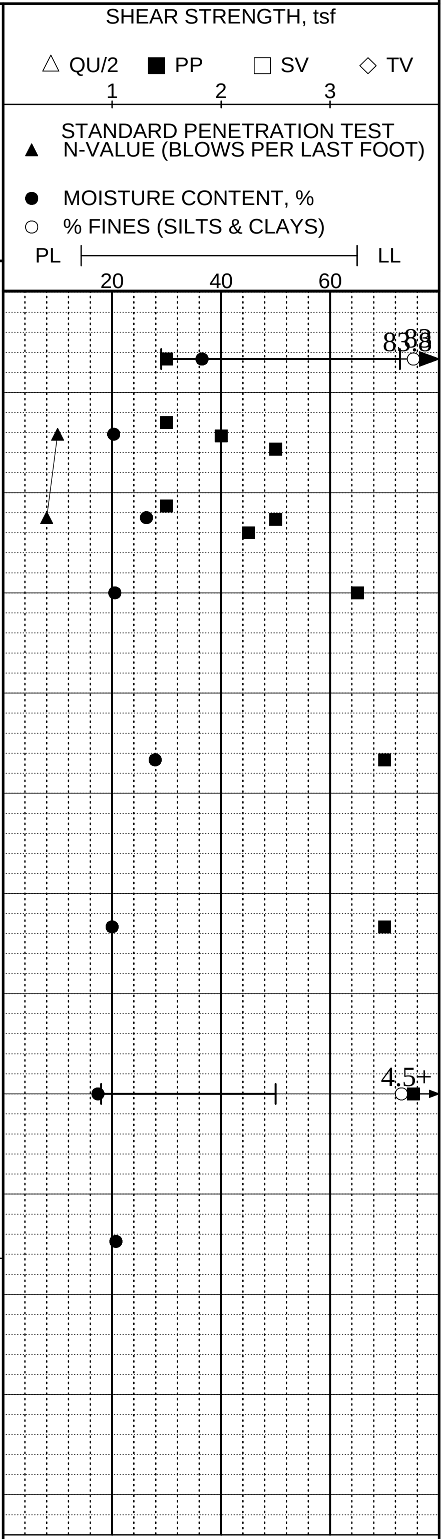
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-6

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1067907 E 1852069
ELEVATION: 822 DATUM:
DATE DRILLED: 03-18-11

DEPTH (FEET)	ELEVATION	WATER TABLE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0	822			4-inches of topsoil		
			46	CLAY (CH), golden and red-brown, high plastic, with fine sand, stiff, moist	85.1	36.5
			100	Silty CLAY (CL), gray-brown, with lignite	2-5-5	20.3
6	816					
			100		2-4-4	26.3
				CLAY (CH), gray-brown, high plastic, dry		
			100		108.8	20.5
12	810					
			100		95.5	27.9
18	804					
			100		110.9	20.0
				With fine sand, dry		
24	798		100		114.8	17.4
		▽	100	With fine gravel	103.7	20.7
				Boring terminated at tube refusal on rock at 28'-10" NOTE: Bulk sample taken 10'-13.5'		
30	792					
36	786					



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

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

WATER LEVELS: DURING DRILLING 28.5 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT ______ FEET AFTER ____ HOURS
AT ______ FEET AFTER ____ HOURS
PIEZOMETER: INSTALLED AT ___ FEET

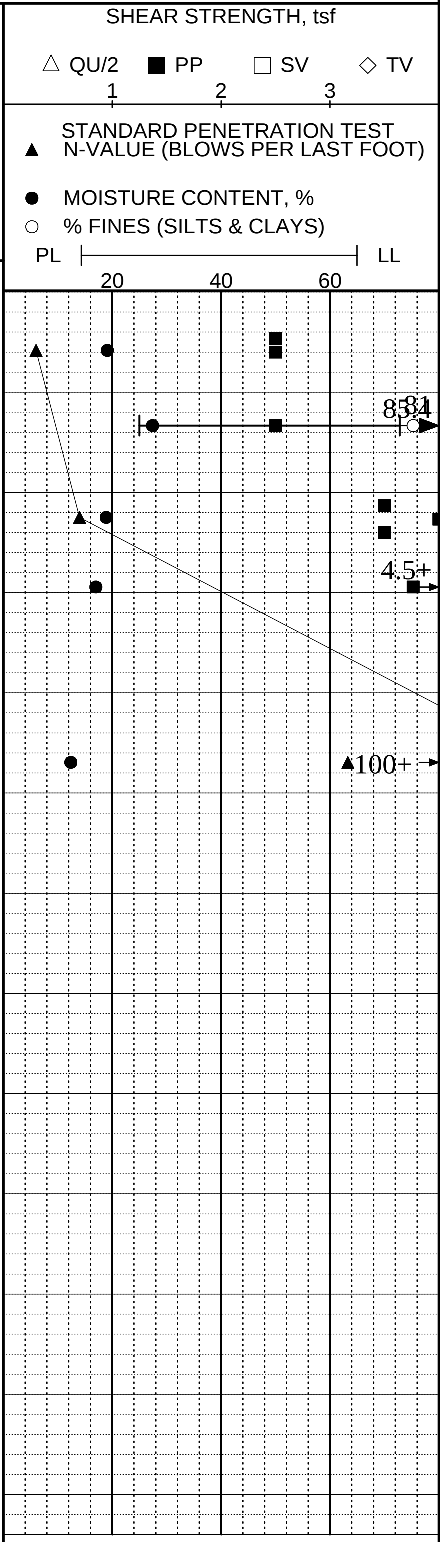
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-7

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1068084 E 1852942
ELEVATION: 809 DATUM:
DATE DRILLED: 03-18-11

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						7.5-inches of crushed limestone		
					83	Silty CLAY (CL), gray-brown, firm, dry	3-3-3	19.1
						CLAY (CH), gray and tan, trace fine sand		
					67		95.6	27.4
	804							
6					100	Becoming golden, trace fine gravel, dry, very stiff	3-6-8	18.9
					80	Shaley CLAY (CH), golden and maroon, with chert gravel	121.0	17.0
	798							
12								
					100		17-50/5.5"	12.4
						Boring terminated at auger refusal on limestone at 15'-0" NOTE: Bulk sample taken 10'-13.5'		
	792							
18								
	786							
24								
	780							
30								
	774							
36								



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

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

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

File: 2008012455

SCHEDULE CJG-ST1
Figure 2-7

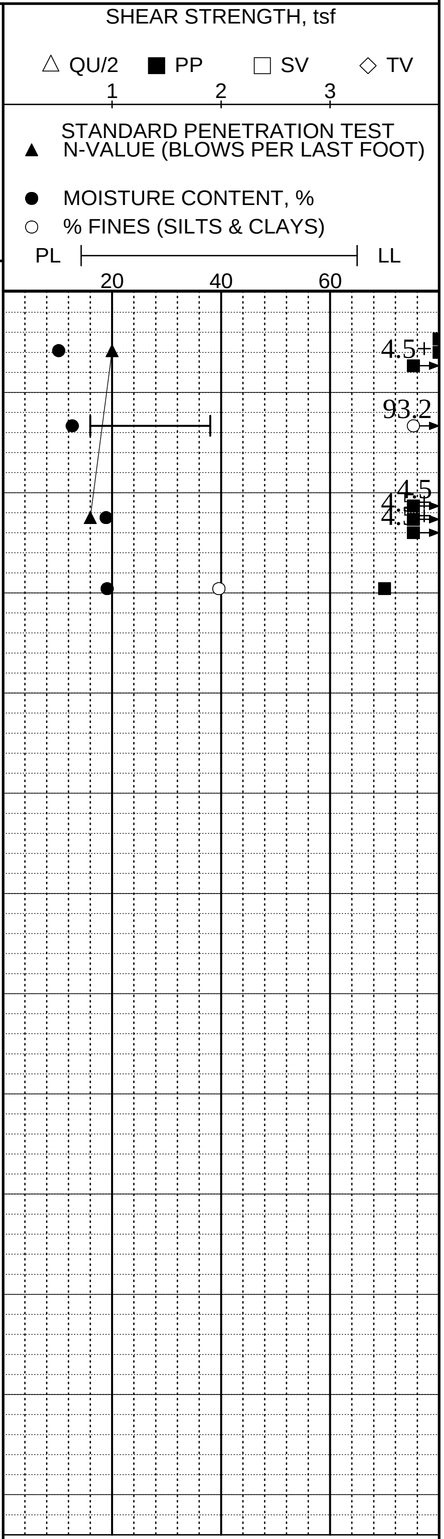
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-8

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1067429 E 1853784
ELEVATION: 816 DATUM:
DATE DRILLED: 03-18-11

DEPTH (FEET)	ELEVATION	WATER TABLE	PERCENT RECOVERY	MATERIAL DESCRIPTION	DRY UNIT WEIGHT (PCF) BLOWS PER 6 INCHES RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0	816			5-inches of crushed limestone		
			83	Silty CLAY (CL), gray-brown, very stiff, dry	3-6-14	10.2
			54		106.8	12.7
6	810		89	CLAY (CH), golden and gray, high plastic, with fine gravel	4-6-10	18.9
			86	Gravelly CLAY (GC), brown and tan, high plastic, coarse to fine gravel, with fine sand	100.4	19.1
12	804		100	No recovery From 14.5' to 15.5' heavy rocky drilling		
18	798			Boring terminated at auger refusal on limestone at 17'-0" NOTE: Bulk sample taken 1'-15'		
24	792					
30	786					
36	780					



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

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

WATER LEVELS: DURING DRILLING ____ FEET
Y BORING DRY AT COMPLETION OF DRILLING
AT ______ FEET AFTER ____ HOURS
AT ______ FEET AFTER ____ HOURS

PIEZOMETER: INSTALLED AT ___ FEET

File: 2008012455

SCHEDULE CJG-ST1

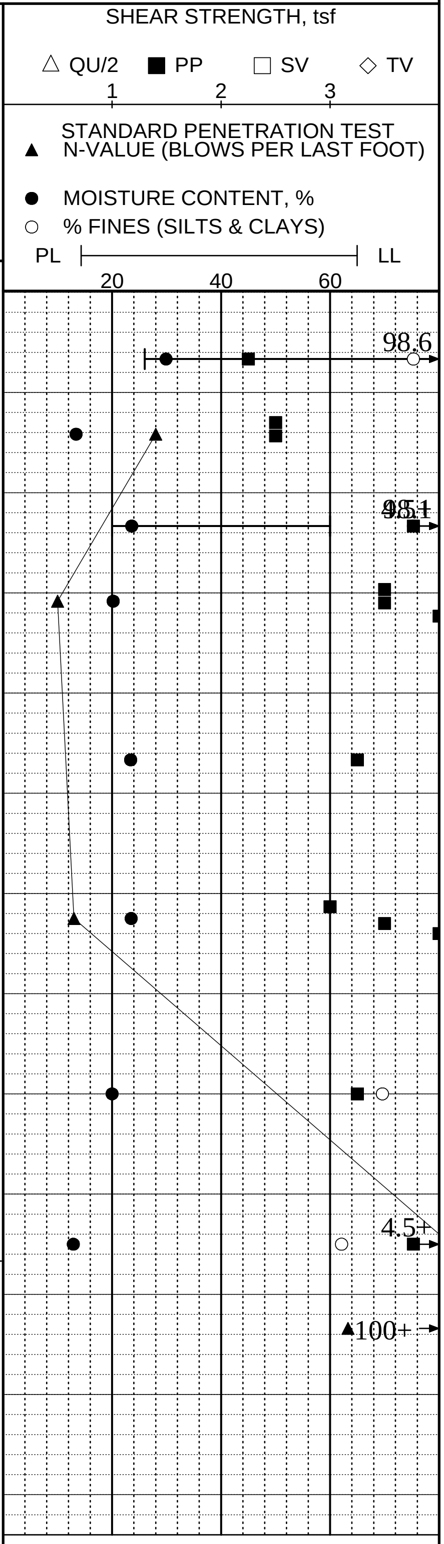
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-9

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1067143 E 1850654
ELEVATION: 834 DATUM:
DATE DRILLED: 03-17-11

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	834					CLAY (CH), reddish brown and gray, high plastic, with lignite and limonite, moist		
					58		91.0	29.9
					100	Silty CLAY (CL), gray brown, dry, hard	5-12-16	13.4
6	828				100		100.0	23.6
					100	CLAY (CH), brown and gray, high plastic, slightly silty, stiff	4-4-6	20.2
		▼						
12	822							
					100		104.3	23.4
18	816				100	Becoming golden	3-5-8	23.5
						With fine to medium sand		
24	810				100		109.3	20.0
					100	Shaley CLAY (CH), brown gray and purple, with weathered limestone, with fine to medium sand	125.9	12.9
30	804							
		▽			100	Boring terminated at auger refusal on limestone at 31'-1" NOTE: Bulk sample taken 10'-13'	50/.5"	
36	798							



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

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

WATER LEVELS: DURING DRILLING 31 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT 11.1 FEET AFTER 24 HOURS
AT ______ FEET AFTER ____ HOURS
PIEZOMETER: INSTALLED AT ___ FEET

SCHEDULE CJG-ST1

Figure 2-9

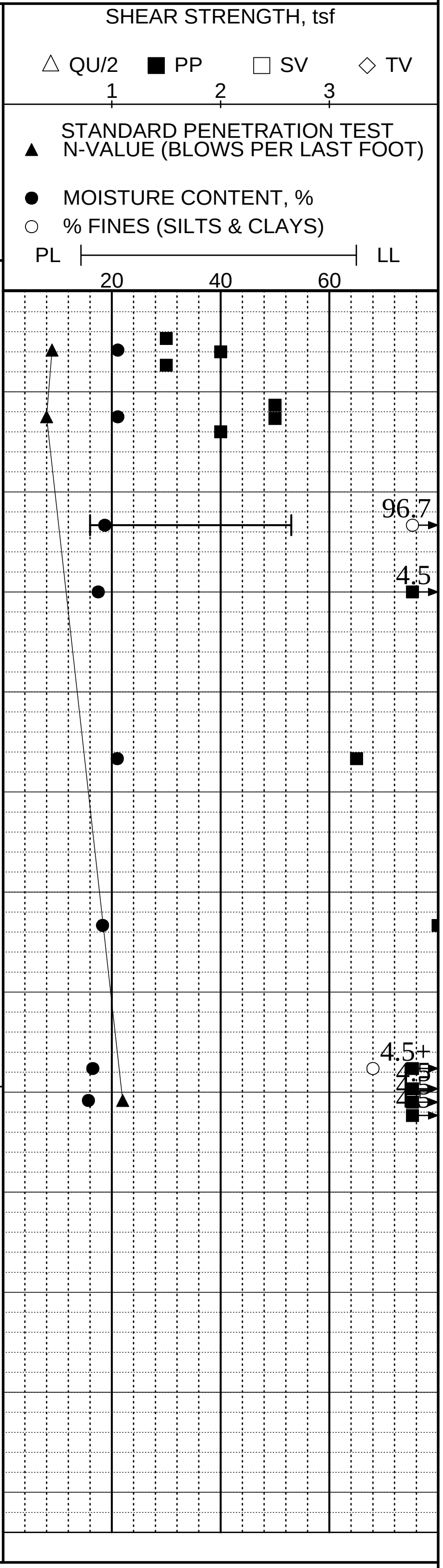
REITZ & JENS, INC.
CONSULTING ENGINEERS

B O R I N G   L O G   B-10

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1066225 E 1850478
ELEVATION: 833 DATUM:
DATE DRILLED: 03-17-11

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						4-inches of topsoil		
					100	Silty CLAY (CL), brown and tan, with lignite and limonite, moist, stiff	2-4-5	21.1
					100		3-3-5	21.1
	828					CLAY (CH), gray and tan, high plastic, dry		
6					100		107.5	18.7
					100	Becoming golden	113.0	17.5
12	822							
					100	Becoming gray	105.7	21.0
	816	▼						
18					100	Becoming orangish brown, trace fine sand	112.9	18.3
	810	▽			100	Gravelly drilling at 22.5' With fine to medium sand	116.0	16.5
24					100	With fine gravel, very stiff	7-9-13	15.7
						Boring terminated in high plastic clay at 25'-0" NOTE: Bulk sample taken 15'-18.5'		
30	804							
36	798							



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

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

WATER LEVELS: DURING DRILLING 23.5 FEET
N BORING DRY AT COMPLETION OF DRILLING
AT 16.5 FEET AFTER 18 HOURS
AT ______ FEET AFTER ____ HOURS
PIEZOMETER: INSTALLED AT ___ FEET

SCHEDULE CJG-ST1
Figure 2-10 Sheet 1 of 1

File: 2008012455

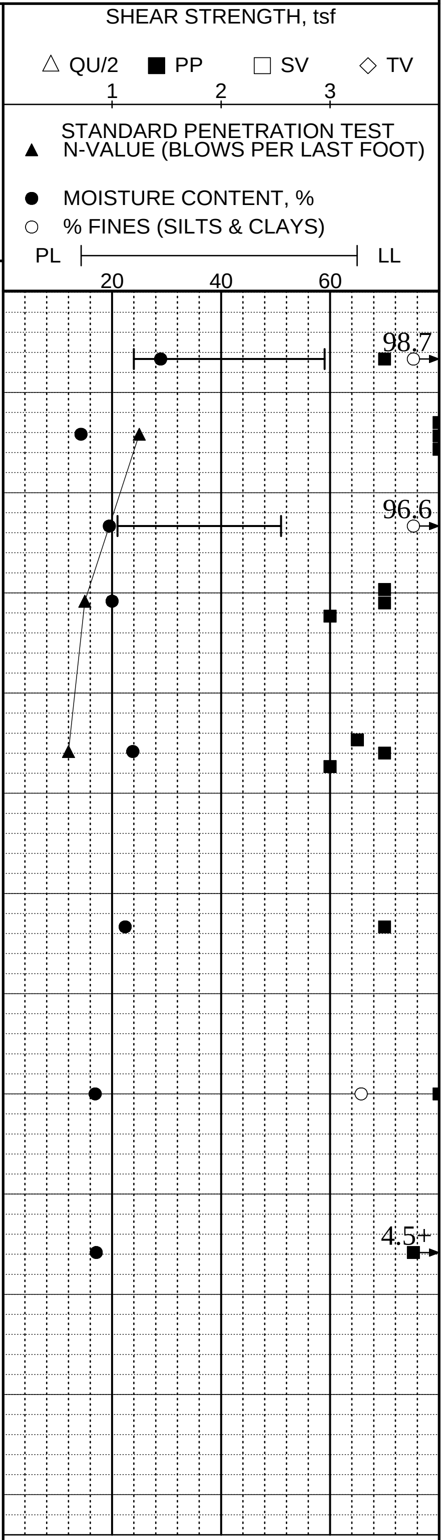
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-11

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1066268 E 1852244
ELEVATION: 836 DATUM:
DATE DRILLED: 03-17-11

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						6-inches of topsoil		
	834				100	CLAY (CH), gray and reddish brown, high plastic, silty, moist	95.2	28.9
					100	Silty CLAY (CL), gray-brown, dry, hard	5-10-15	14.3
6					50	CLAY (CH), tan and gray, high plastic, very stiff	101.0	19.5
	828				100	Becoming gray	3-6-9	20.0
12								
	822				100	Becoming gray red-brown and golden, trace fine gravel	3-5-7	23.8
18					100	Becoming gray-tan	105.1	22.4
	816							
24					100	Sandy CLAY (CH), tan gray and orangish brown, fine to medium grain sand	117.4	16.9
	810							
					100		116.4	17.1
30						Boring terminated in sandy clay at 29'- 6" NOTE: Bulk sample taken 10'-13.5'		
	804							
36								



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

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

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

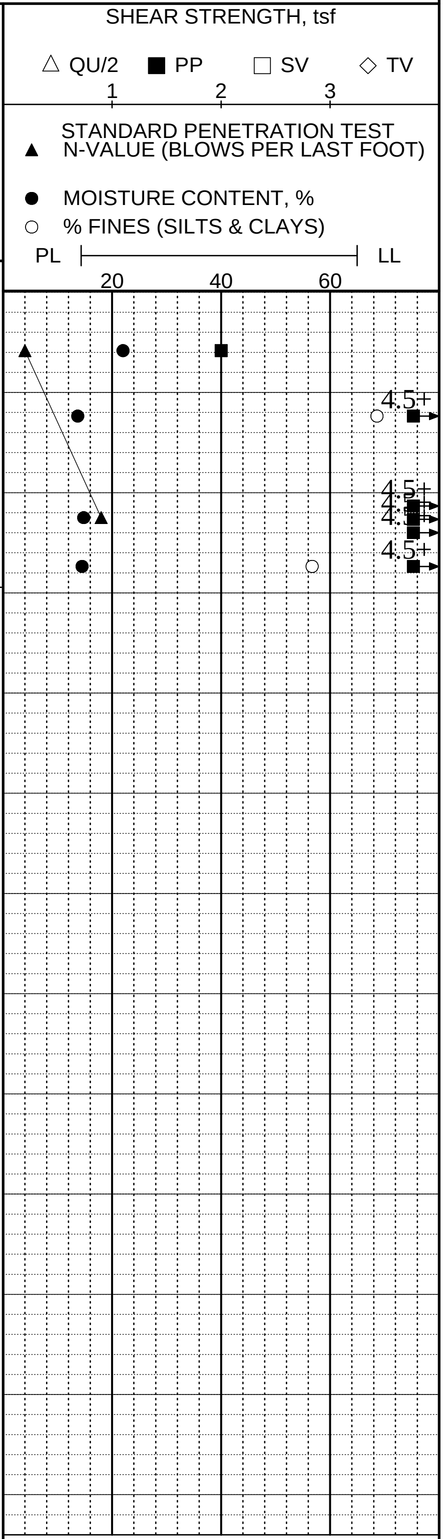
REITZ & JENS, INC.
CONSULTING ENGINEERS

BORING LOG B-12

Labadie Plant Utility Waste Landfill
Potential Clay Borrow at Callaway Plant
CLIENT: **Ameren Missouri**

LOCATION: N 1066354 E 1853688
ELEVATION: 812 DATUM:
DATE DRILLED: 03-17-11

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						1-inch of topsoil		
	810				33	CLAY (CH), brown and gray, high plastic, slightly silty, firm, moist	1-2-2	22.0
					100	With fine to medium sand, dry	116.2	13.7
6					89	Trace weathered limestone, very stiff	5-8-10	14.8
	804				100	Sandy CLAY (CH), brown tan gray and orange-brown, high plastic, fine to medium grain sand, with fine to coarse gravel	115.0	14.5
12						Becoming very rocky drilling below 11.5'		
	798					Weathered limestone		
						Boring terminated at auger refusal on limestone at 14'-0" NOTE: Bulk sample taken 6'-14'		
18								
	792							
24								
	786							
30								
	780							
36								



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

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

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

File: 2008012455

LABORATORY TEST SUMMARY

Client: Ameren Missouri
Project: Labadie UWL
Location: Callaway Borrow Site

Sample Identification				Index Properties							
Boring Number	Sample Number	Depth (ft)	Sample Recovery (inches)	Visual Classification ASTM D2488	Water Content (%) ASTM D2216	Dry Density (pcf)	Liquid Limit ASTM D4318	Plastic Limit ASTM D4318	#200 Wash (Fines Content %) ASTM D2488 If greater than 10% remains on #200 sieve, dry shake with full nest of sieves	Penetrometer (tsf)	Remarks
B-1	SPT-1	1-2.5	14	CL-CH	32.5					2.5	
B-1	ST-2	3-5	20	CL-ML	19.5	110.5	28	21	97.9	4.0	
B-1	SPT-3	6-7.5	18	CH	27.7					2.2	
B-1	SPT-4	8-10	17	CH	26.9					1.8	
B-1	BULK	13-20		CH			69	22	95.7		
B-1	ST-5	13-15	24	CH	19.1	110.3				4.0	
B-1	ST-6	18-20	24	CH, sandy	17.5	113.2			Figure 4-1	4.5+	
B-1	ST-7	23-25	24	CH, sandy	15.1	117.7			Figure 4-2	4.5+	
B-1	SPT-8	28.5-30	18	CH, sandy	13.1					4.5+	
B-2	SPT-1	1-2.5	15	CL, silty	29.1					1.7	
B-2	ST-2	3-5	22	CL, silty	19.0	106.7	32	19	94.0	2.5	
B-2	SPT-3	6-7.5	18	CH	31.5					3.0	
B-2	ST-4	8-10	17	CH	50.6	83.9				3.5	
B-2	BULK	10-13		CH, trace sand			78	22	Figure 4-3		
B-2	ST-5	13-15	24	CH, sandy	16.8	110.5			Figure 4-4	4.5+	Bent Tube
B-2	SPT-6	18.5-20	1.5	Weathered rock							
B-3	SPT-1	1-2.5	18	CL, silty	24.4					2.0	
B-3	ST-2	3-5	24	CH	17.3	107.3	61	22	92.2	4.5+	
B-3	SPT-3	6-7.5	18	CH	27.7					2.9	
B-3	ST-4	8-10	9	CH	19.0	107.8				3.0	
B-3	BULK	1-10		CH			101	33	97.8		
B-3	ST-5	13-15	24	CH	21.0	107.2				3.5	
B-3	ST-6	18-20	24	CL, sandy, trace gravel	20.6	107.4	44	20	Figure 4-5	3.8	
B-3	ST-7	23-25	18	CL, sandy, gravelly	15.0	115.0			Figure 4-6		
B-3	SPT-8	28.5-30	18	Shaley clay	14.9					4.5+	
B-4	ST-1	1-3	22	CL, silty	28.1	95.6				2.5	
B-4	SPT-2	3.5-5	18	CL, silty	19.5					1.8	
B-4	ST-3	6-8	5	CL, silty						2.5	Sample was all fall in, no virgin material
B-4	SPT-4	8.5-10	18	CH	24.7					2.3	
B-4	ST-5	13-15	24	CH, sandy, trace gravel	18.9	111.4				4.0	
B-4	BULK	15-24		CH, sandy			56	21	Figure 4-7		
B-4	ST-6	18-20	21	SM	23.6	100.2				1.5	Not acceptable liner material
B-4	SPT-7	23.5-24	4.5	SHALE	5.3						
B-5	SPT-1	1-2.5	17	CL, silty	30.6					1.7	
B-5	ST-2	3-5	24	CL, silty	20.0	108.2	30	20	95.6	3.3	
B-5	SPT-3	6-7.5	18	CH	24.5					2.5	
B-5	ST-4	8-10	24	CH	19.9	108.6				3.5	
B-5	ST-5	13-15	22	CH	21.7	106.0				3.0	
B-5	BULK	15-18		CH			67	21	93.3		
B-5	SPT-6	18-19.5	18	CH, sandy	22.3					3.4	
B-5	SPT-7	23-24.5	16	Weathered rock	7.2					4.5+	
B-6	ST-1	1-3	11	CH, sandy	36.5	85.1	83	29	Figure 4-8	1.5	
B-6	SPT-2	3.5-5	18	CL	20.3					2.0	
B-6	SPT-3	6-7.5	18	CH	26.3					2.1	
B-6	ST-4	8-10	24	CH	20.5	108.8				3.3	
B-6	BULK	10-13		CH			86	22	96.5		
B-6	ST-5	13-15	24	CH	27.9	95.5				3.5	
B-6	ST-6	18-20	24	CH	20.0	110.9				3.5	
B-6	ST-7	23-25	24	CH, sandy	17.5	114.8	50	18	Figure 4-9	4.5+	
B-6	ST-8	28-30	10	CH, sandy, gravelly	20.7	103.7					Bent Tube

Figure 3

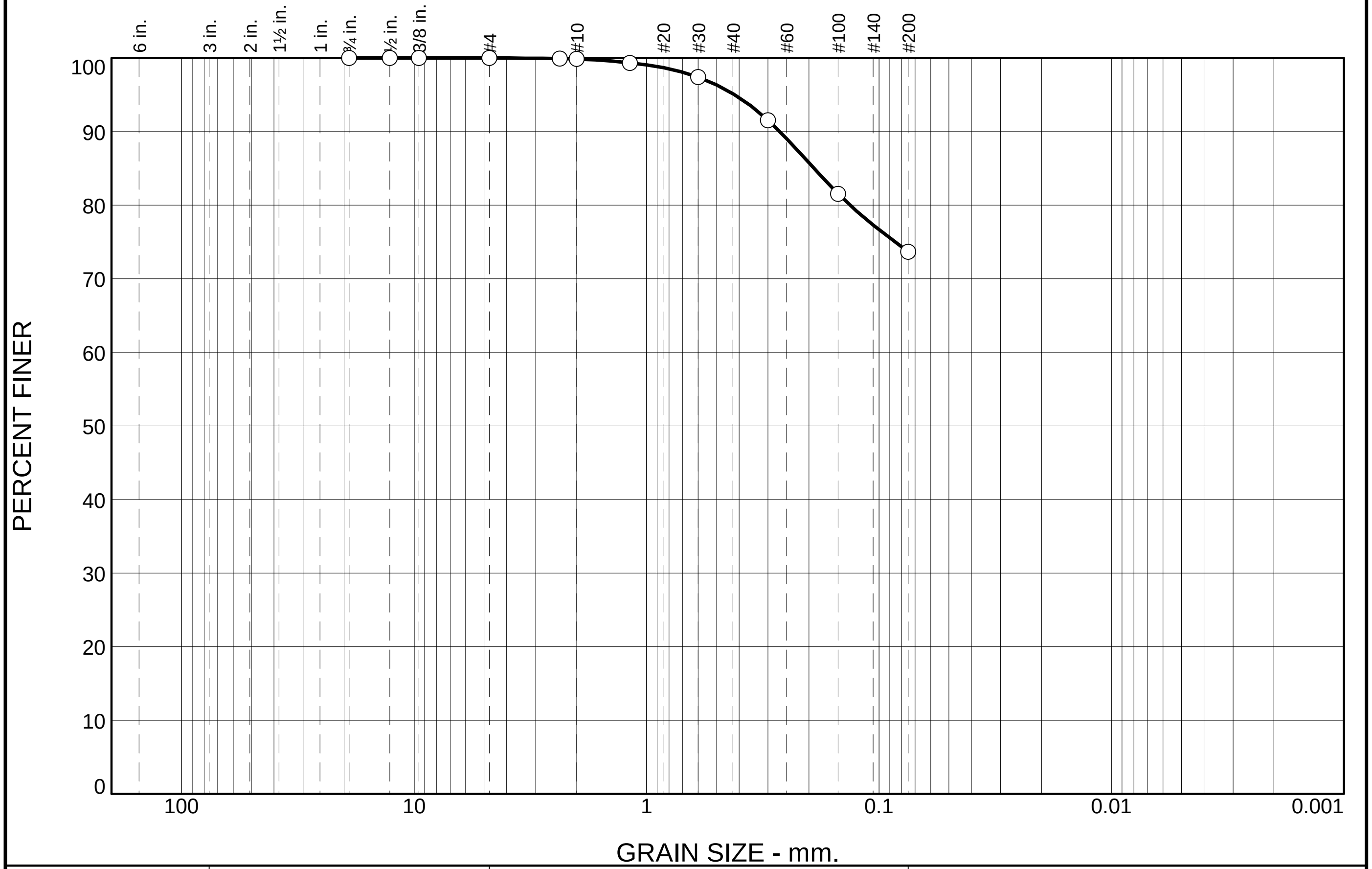
LABORATORY TEST SUMMARY

Client: Ameren Missouri
Project: Labadie UWL
Location: Callaway Borrow Site

Sample Identification				Index Properties							
Boring Number	Sample Number	Depth (ft)	Sample Recovery (inches)	Visual Classification ASTM D2488	Water Content (%) ASTM D2216	Dry Density (pcf)	Liquid Limit ASTM D4318	Plastic Limit ASTM D4318	#200 Wash (Fines Content %) ASTM D2488 If greater than 10% remains on #200 sieve, dry shake with full nest of sieves	Penetrometer (tsf)	Remarks
B-7	SPT-1	1-2.5	15	CL, silty	19.2					2.5	
B-7	ST-2	3-5	16	CH, trace sand	27.4	95.6	81	25	Figure 4-10	2.5	
B-7	SPT3	6-7.5	18	CH, trace sand & gravel	19.0					3.7	
B-7	ST-4	8-10	16	Shaley clay	17.0	121.0				4.5+	
B-7	BULK	8-15		CH, sandy, trace gravel			54	20	Figure 4-11		
B-7	SPT-5	13.5-15	14	Shaley clay	12.4						
B-8	SPT-1	1-2.5	15	CL, silty	10.2					4.2	
B-8	ST-2	3-5	13	CL, silty	12.7	106.8	38	16	93.2		
B-8	SPT-3	6-7.5	16	CH, sandy, gravelly	18.9					4.5+	
B-8	ST-4	8-10	18	GC, sandy	19.1	100.4			Figure 4-12	3.5	
B-8	BULK	1-15		CH, sandy			52	17	Figure 4-13		
B-8	ST-5	13-15	9	GC, sandy							Bent Tube, All Fall-in
B-9	ST-1	1-3	14	CH	29.9	91.0	80	26	99.9	2.3	
B-9	SPT-2	3.5-5	18	CL, silty	13.4					2.5	
B-9	ST-3	6-8	24	CL, silty	19.7	100.0	60	20	98.1	4.5+	
B-9	SPT-4	8.5-10	18	CH	20.2					3.7	
B-9	BULK	10-13		CH			52	18	95.7		
B-9	ST-5	13-15	24	CH	23.4	104.3				3.3	
B-9	SPT-6	18-19.5	18	CH	23.5					3.5	
B-9	ST-7	23-25	24	CH, sandy	20.0	109.3			Figure 4-14	3.3	
B-9	ST-8	28-30	15	Shaley clay, sandy	12.9	125.9			Figure 4-15	4.5+	Bent Tube
B-9	SPT-9	31-32.5	0.5	Limestone							
B-10	SPT-1	1-2.5	18	CL, silty	21.1					1.7	
B-10	SPT-2	3-4.5	18	CL, silty	21.1					2.3	
B-10	ST-3	6-8	24	CH	18.7	107.5	53	16	96.7		
B-10	ST-4	8-10	24	CH	17.5	113.0				4.5	
B-10	ST-5	13-15	24	CH	21.0	105.7				3.3	
B-10	BULK	15-18		CH, sandy			65	18	Figure 4-16		
B-10	ST-6	18-20	24	CH, trace sand	18.3	112.9				4.0	
B-10	ST-7	23-23.6	7	CH, sandy	16.5	116.0			Figure 4-17	4.5+	Bent Tube
B-10	SPT-8	23.6-25.1	18	CH, sandy, gravelly	15.7					4.5	
B-11	ST-1	1-3	24	CH	28.9	95.2	59	24	98.7	3.5	
B-11	SPT-2	3.5-5	18	CL, silty	14.3					4.0	
B-11	ST-3	6-8	12	CH	19.5	101.0	51	21	96.5		
B-11	SPT-4	8.5-10	18	CH	20.0					3.3	
B-11	BULK	10-13		CH			63	16	98.5		
B-11	SPT-5	13-15	18	CH, trace gravel	23.8					3.3	
B-11	ST-6	18-20	24	CH	22.4	105.1				3.5	
B-11	ST-7	23-25	24	CH, sandy	16.9	117.4			Figure 4-18	4.0	
B-11	ST-8	28-29.5	18	CH, sandy	17.1	116.4				4.5+	
B-12	SPT-1	1-2.5	6	CH	22.0					2.0	
B-12	BULK	2.5-10		CH, sandy			74	22	Figure 4-19		
B-12	ST-2	3-5	18	CH, sandy	13.7	116.2			Figure 4-20	4.5+	
B-12	SPT-3	6-7.5	16	CH, sandy, trace gravel	14.8					4.5+	
B-12	ST-4	8-10	10	CH, sandy, gravelly	14.5	115.0			Figure 4-21	4.5+	

Figure 3

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	4.8	21.4	73.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.3		
#30	97.4		
#50	91.5		
#100	81.6		
#200	73.7		

* (no specification provided)

Material Description

CLAY (CH), gray and orangish brown, high plastic, with fine sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.1902 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Sample No.: ST-6 **Source of Sample:** B-1 **Date Sampled:**
Location: **Elev./Depth:** 18
Checked By: K. Kocher **Title:** Engineer

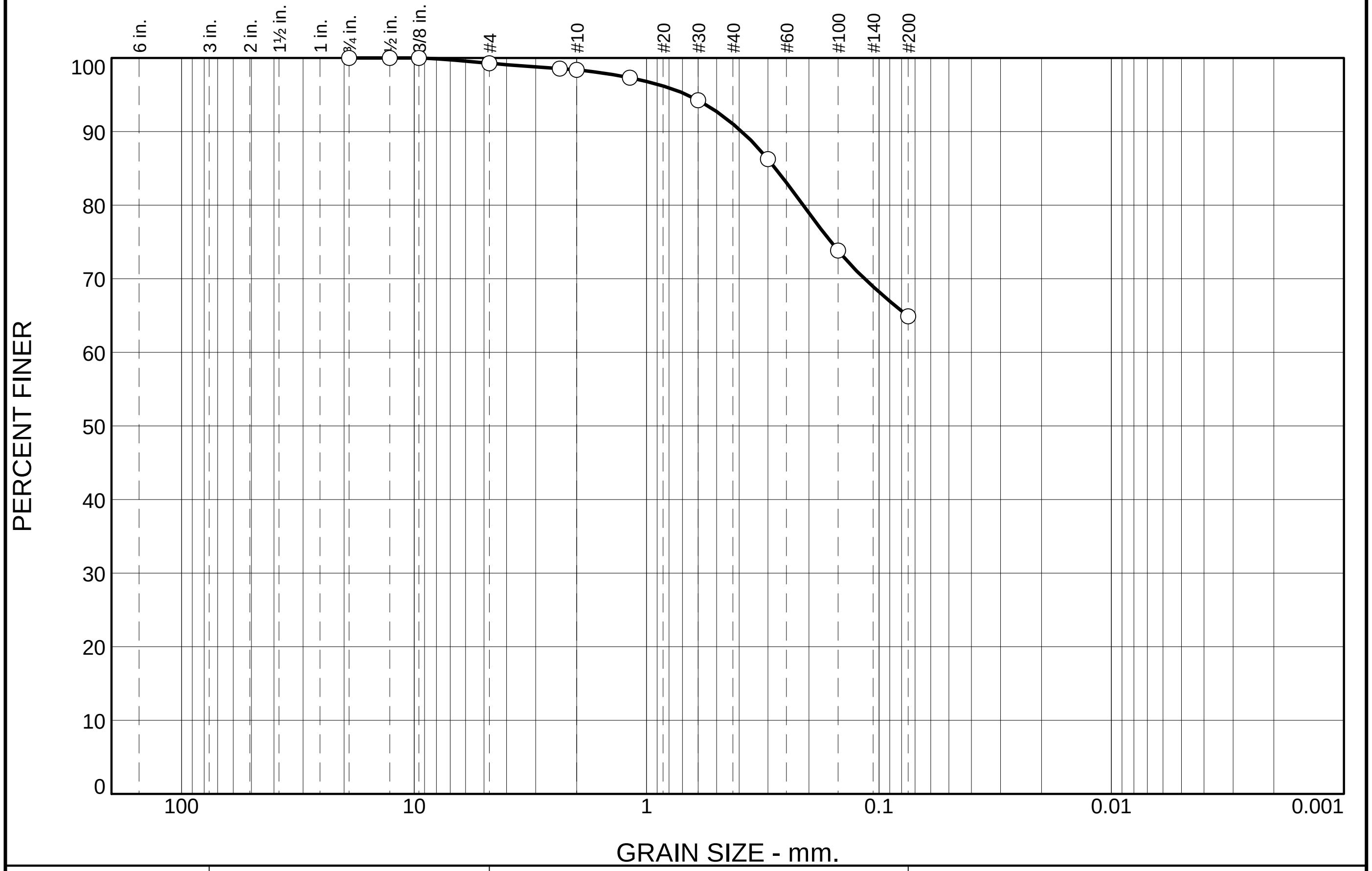
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-1

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.9	7.4	26.1	64.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	99.3		
#8	98.6		
#10	98.4		
#16	97.3		
#30	94.3		
#50	86.2		
#100	73.8		
#200	64.9		

* (no specification provided)

Material Description

CLAY (CH), gray and orangish brown, high plastic, with medium to fine grain sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.2785	D_{60}=	D_{50}=
D_{30}=	D_{15}=	D_{10}=
C_u=	C_c=	

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Sample No.: ST-7 **Source of Sample:** B-1 **Date Sampled:**

Location: **Elev./Depth:** 23

Checked By: K. Kocher **Title:** Engineer

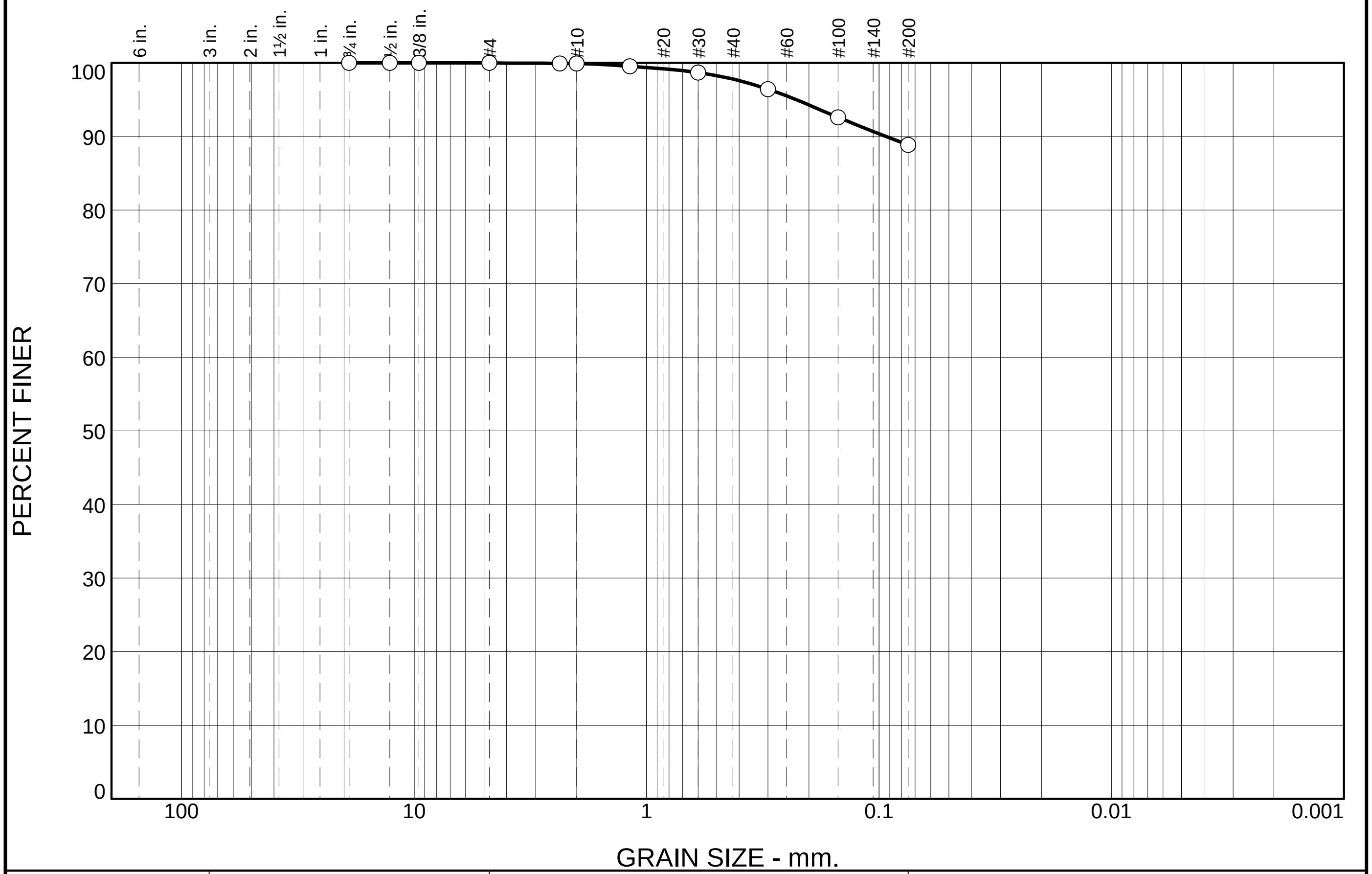
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri

Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-2

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.1	9.0	88.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.5		
#30	98.7		
#50	96.4		
#100	92.6		
#200	88.8		

* (no specification provided)

Material Description

CLAY (CH), golden and grayish tan, high plastic, trace fine sand

Atterberg Limits (ASTM D 4318)

PL= 22 LL= 78 PI= 56

Classification

USCS= CH AASHTO=

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Bag Sample
10'-13'

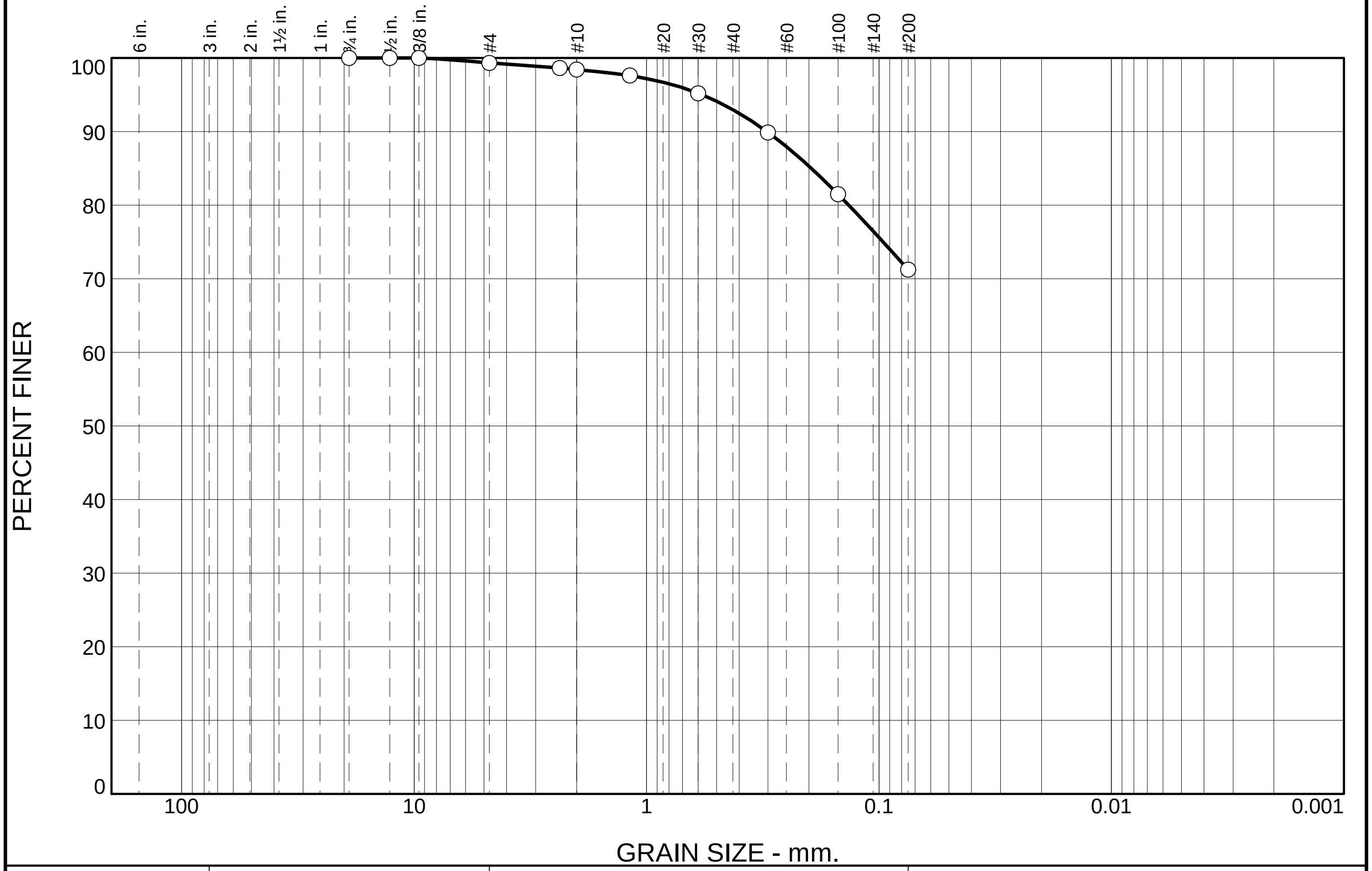
Sample No.: Bulk **Source of Sample:** **Date Sampled:**
Location: B-2 **Elev./Depth:** 10-13
Checked By: K. Kocher **Title:** Engineer

REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-3

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.7	0.9	5.4	21.8	71.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	99.3		
#8	98.6		
#10	98.4		
#16	97.6		
#30	95.2		
#50	89.9		
#100	81.5		
#200	71.2		

* (no specification provided)

Material Description

CLAY (CH), brown and tan, high plastic, with fine sand, trace medium sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.1953 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Sample No.: ST-5 **Source of Sample:** B-2 **Date Sampled:**
Location: **Elev./Depth:** 13
Checked By: K. Kocher **Title:** Engineer

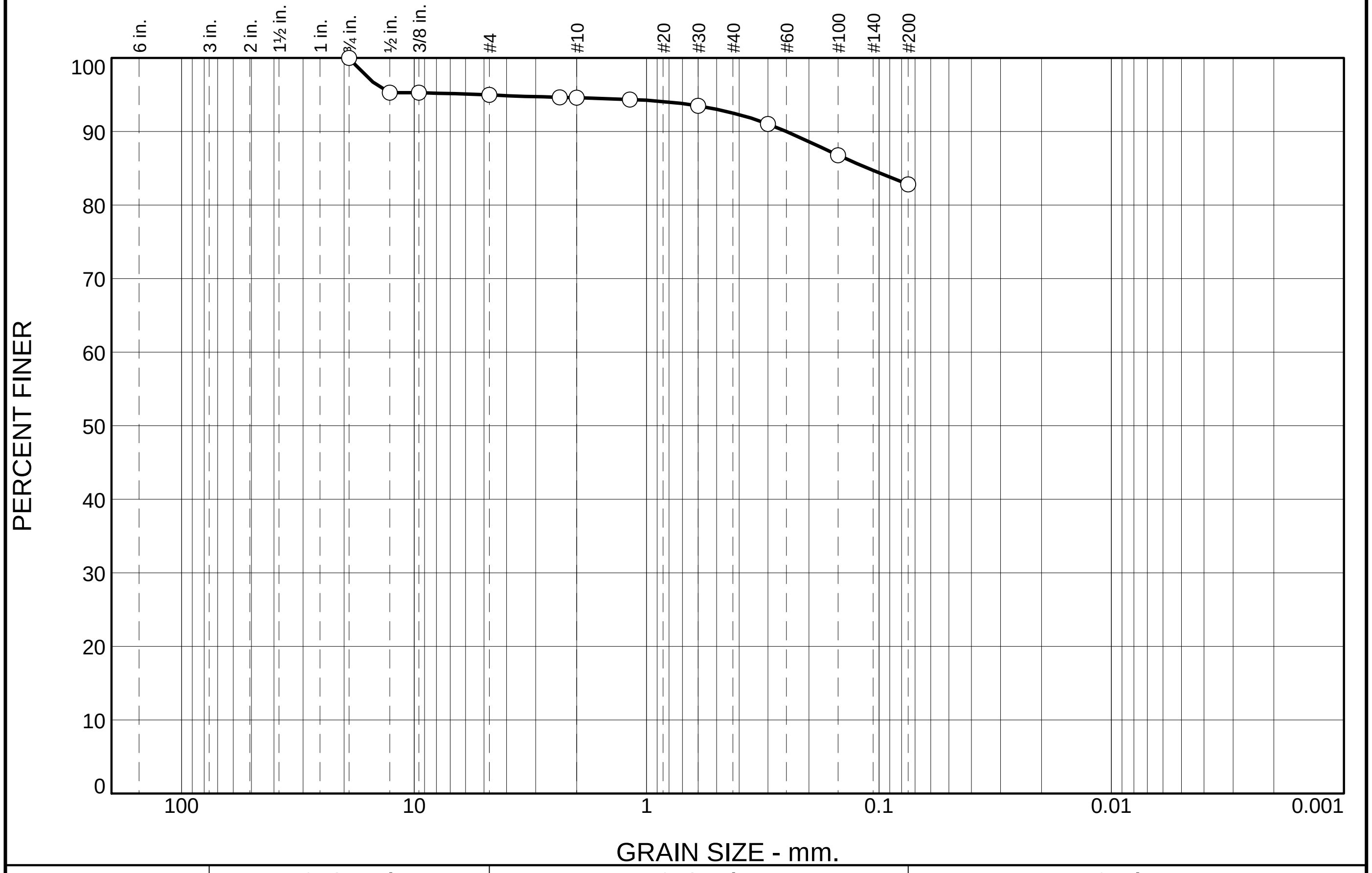
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-4

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.0	0.4	2.1	9.7	82.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	95.3		
3/8	95.3		
#4	95.0		
#8	94.7		
#10	94.6		
#16	94.4		
#30	93.5		
#50	91.0		
#100	86.8		
#200	82.8		

* (no specification provided)

Material Description

CLAY (CL), gray, with fine sand, trace fine gravel

Atterberg Limits (ASTM D 4318)

PL= 20 LL= 44 PI= 24

Classification

USCS= CL AASHTO=

Coefficients

D_{85}= 0.1111 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Sample No.: ST-6 **Source of Sample:** B-3 **Date Sampled:**
Location: **Elev./Depth:** 18
Checked By: K. Kocher **Title:** Engineer

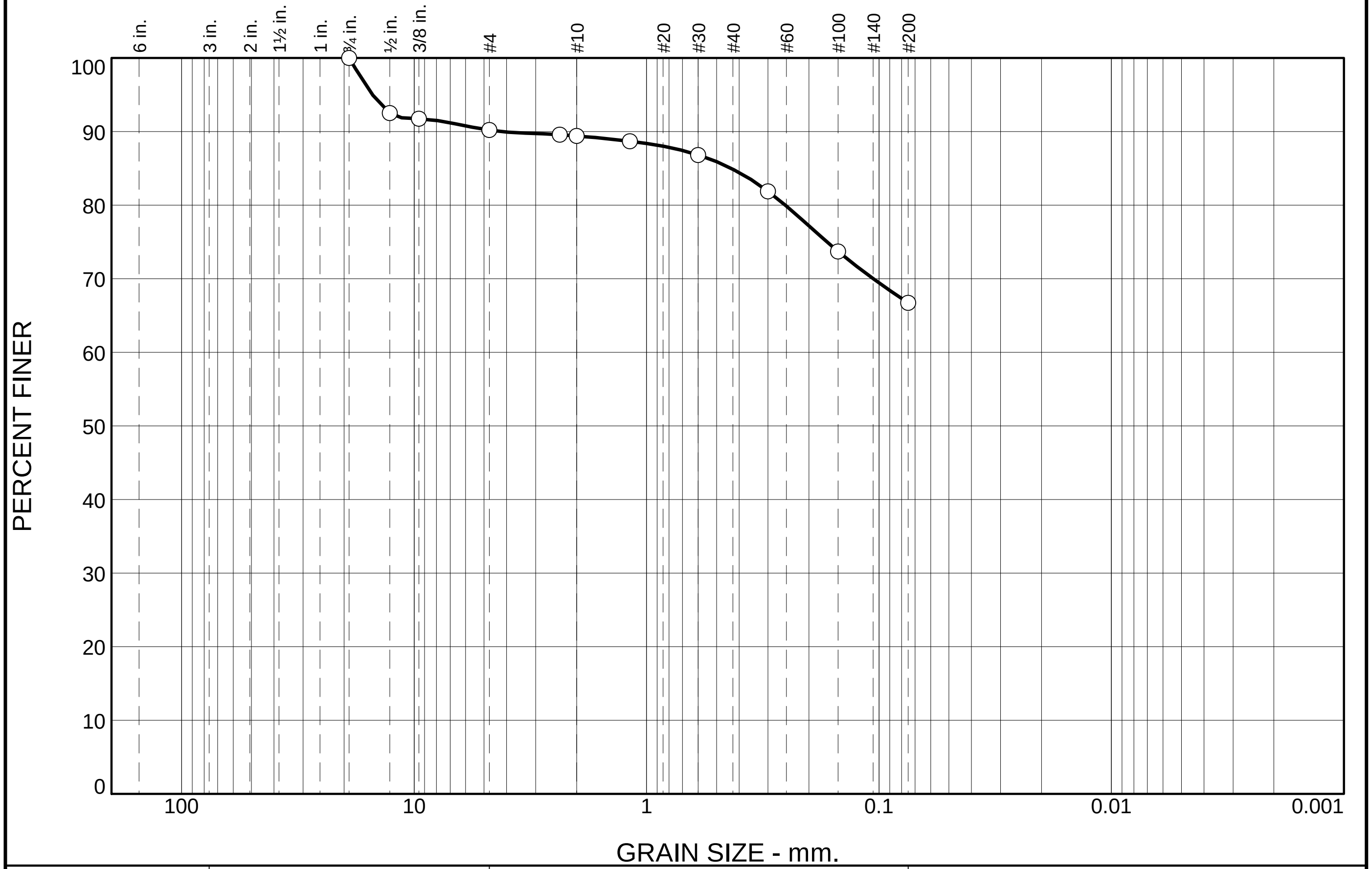
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-5

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.8	0.8	4.5	18.2	66.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	92.5		
3/8	91.7		
#4	90.2		
#8	89.6		
#10	89.4		
#16	88.7		
#30	86.8		
#50	81.9		
#100	73.7		
#200	66.7		

* (no specification provided)

Material Description

CLAY (CL), golden tan and pinkish gray, with fine sand, trace fine gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.4333 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Sample No.: ST-7 **Source of Sample:** B-3 **Date Sampled:**
Location: **Elev./Depth:** 23
Checked By: K. Kocher **Title:** Engineer

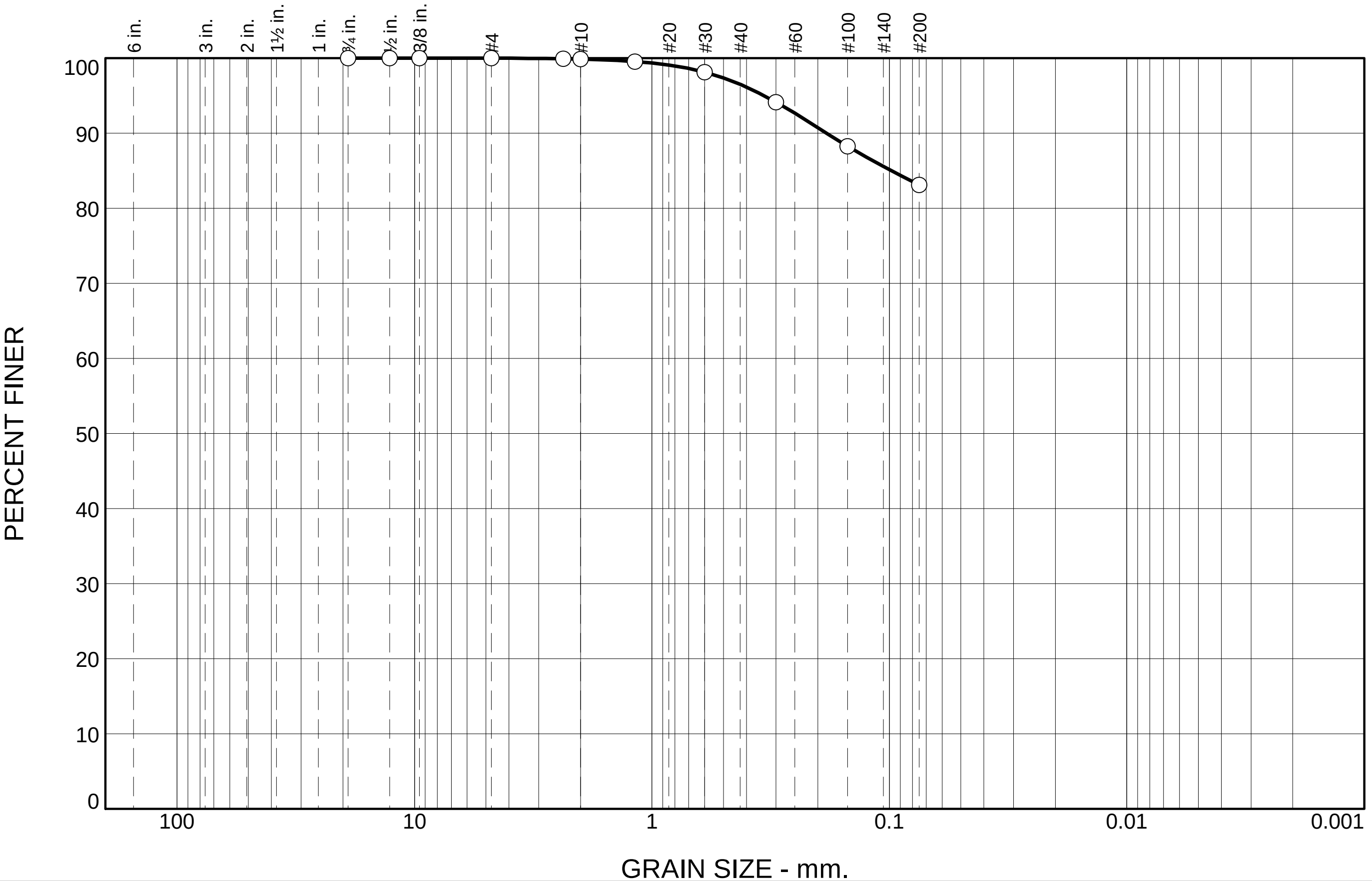
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-6

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	3.4	13.4	83.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#8	99.9		
#10	99.9		
#16	99.6		
#30	98.1		
#50	94.2		
#100	88.3		
#200	83.1		

* (no specification provided)

Material Description

CLAY (CH), golden and tan, high plastic, with fine sand

Atterberg Limits (ASTM D 4318)

PL= 21 LL= 56 PI= 35

Classification

USCS= CH AASHTO=

Coefficients

D_{85}= 0.0979 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Bag Sample
15' - 25'

Sample No.: Bulk **Source of Sample:** **Date Sampled:**
Location: B-4 **Elev./Depth:** 15-25
Checked By: K. Kocher **Title:** Engineer

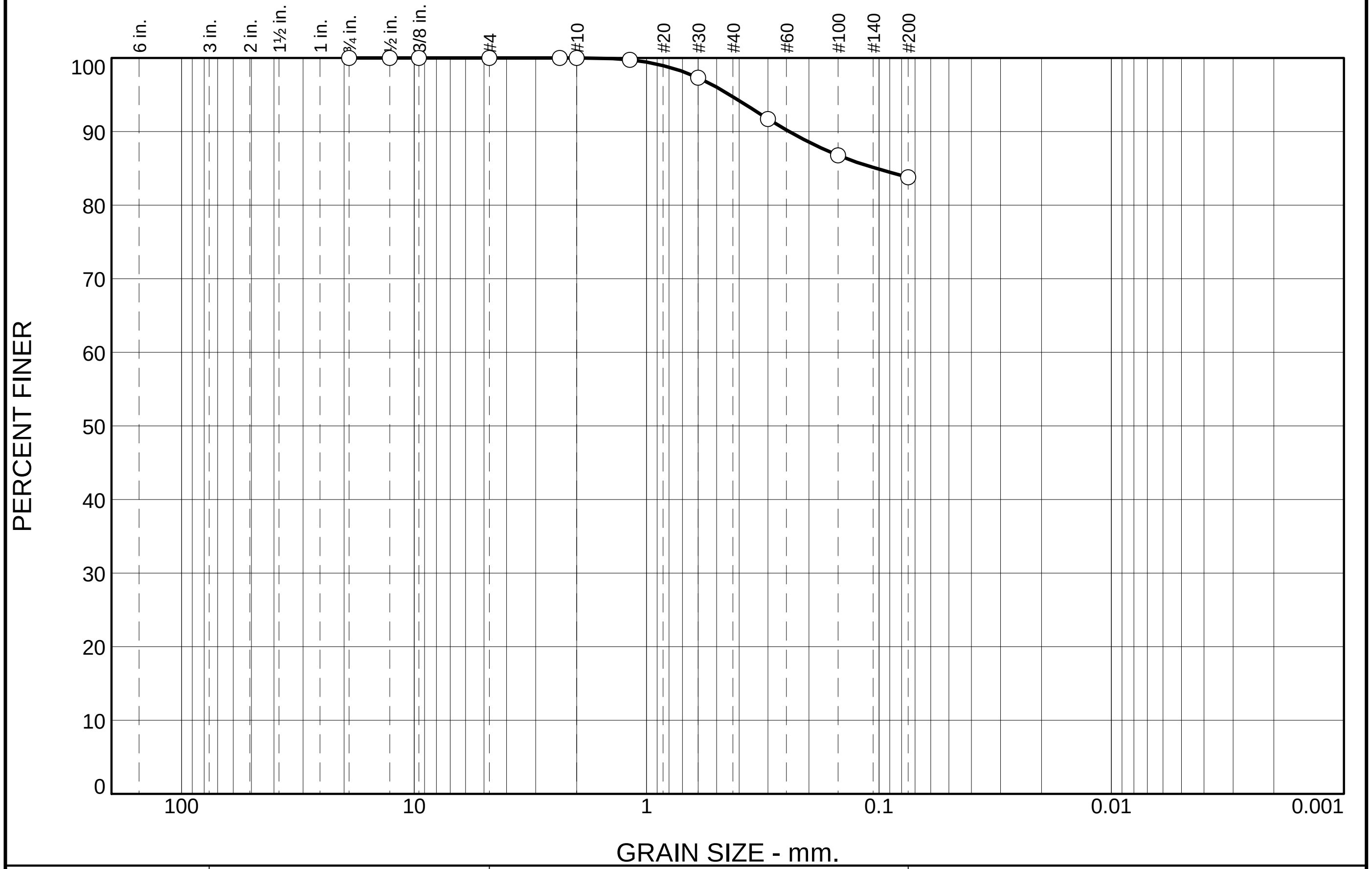
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-7

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	5.3	10.9	83.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#8	100.0		
#10	100.0		
#16	99.7		
#30	97.3		
#50	91.7		
#100	86.8		
#200	83.8		

* (no specification provided)

Material Description

CLAY (CH), golden tan and reddish brown, high plastic, with fine sand

Atterberg Limits (ASTM D 4318)

PL= 29 LL= 83 PI= 58

Classification

USCS= CH AASHTO=

Coefficients

D_{85}= 0.1029 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Crose/C. Cook

Remarks

Sample No.: ST-1 **Source of Sample:** B-6 **Date Sampled:**
Location: **Elev./Depth:** 1
Checked By: K. Kocher **Title:** Engineer

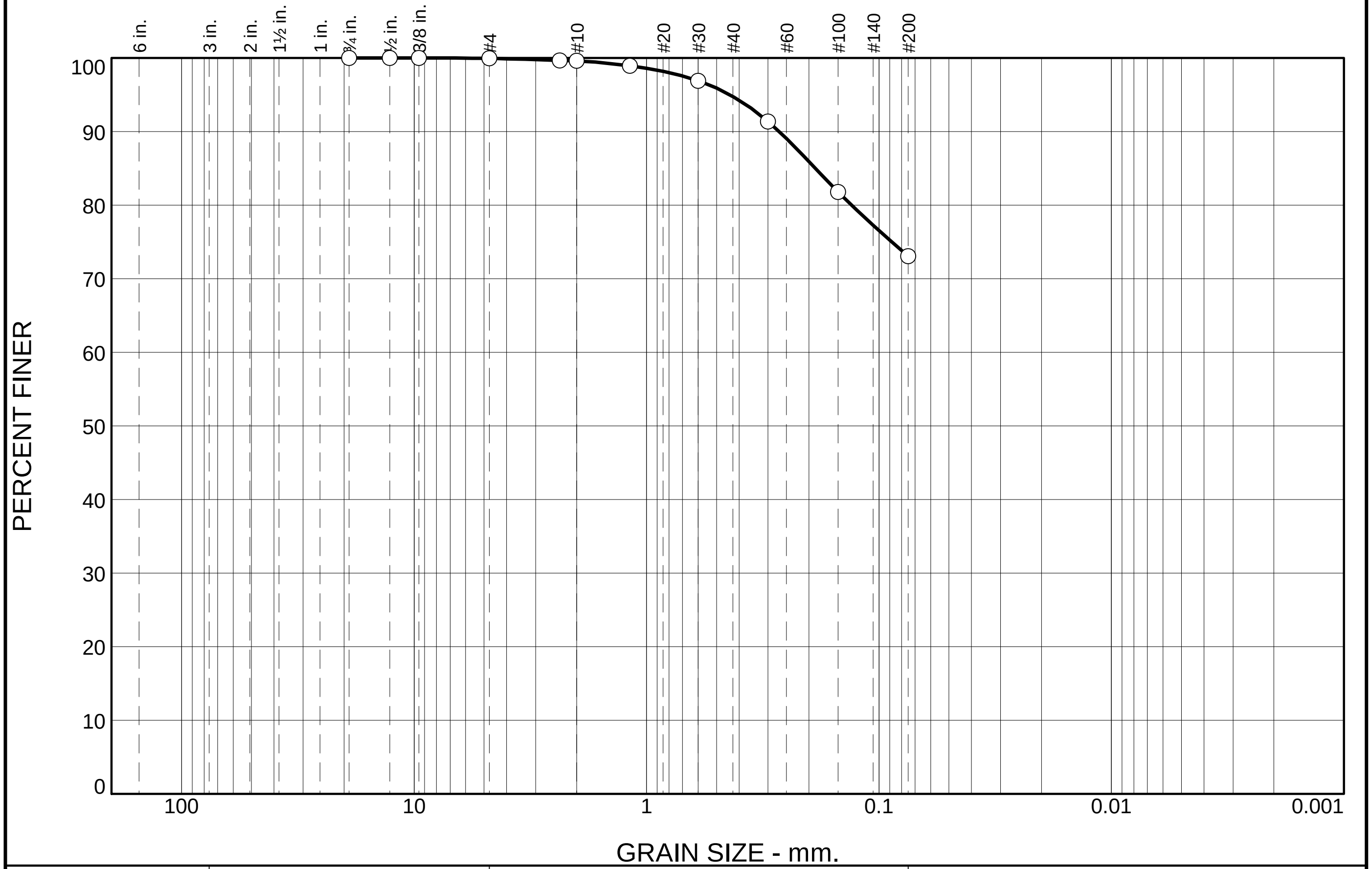
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-8

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	4.8	21.7	73.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#8	99.7		
#10	99.6		
#16	98.9		
#30	96.9		
#50	91.4		
#100	81.8		
#200	73.1		

* (no specification provided)

Material Description

CLAY (CH), gray, high plastic, with fine sand

Atterberg Limits (ASTM D 4318)

PL= 18 LL= 50 PI= 34

Classification

USCS= CH AASHTO=

Coefficients

D_{85}= 0.1875 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Crose/C. Cook

Remarks

Sample No.: ST-7 **Source of Sample:** B-6 **Date Sampled:**
Location: **Elev./Depth:** 23
Checked By: K. Kocher **Title:** Engineer

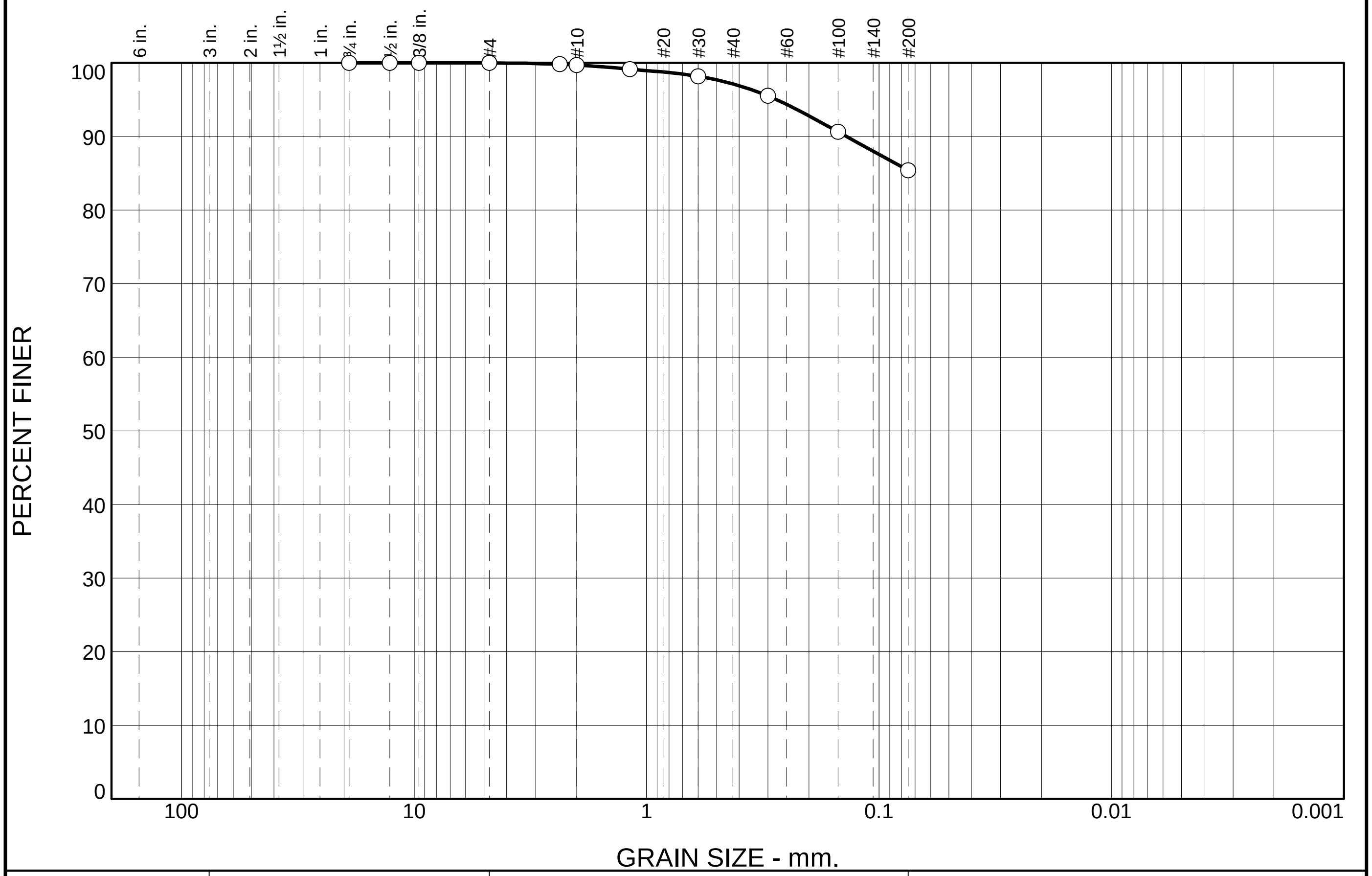
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-9

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	2.5	11.8	85.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#8	99.8		
#10	99.7		
#16	99.1		
#30	98.2		
#50	95.5		
#100	90.6		
#200	85.4		

* (no specification provided)

Material Description

CLAY (CH), gray and tan, high plastic, trace fine sand

Atterberg Limits (ASTM D 4318)

PL= 25 LL= 81 PI= 52

Classification

USCS= CH AASHTO=

Coefficients

D_{85}= D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-15-11 **Tested By:** C. Cook

Remarks

Sample No.: ST-2 **Source of Sample:** B-7 **Date Sampled:**
Location: **Elev./Depth:** 3
Checked By: K. Kocher **Title:** Engineer

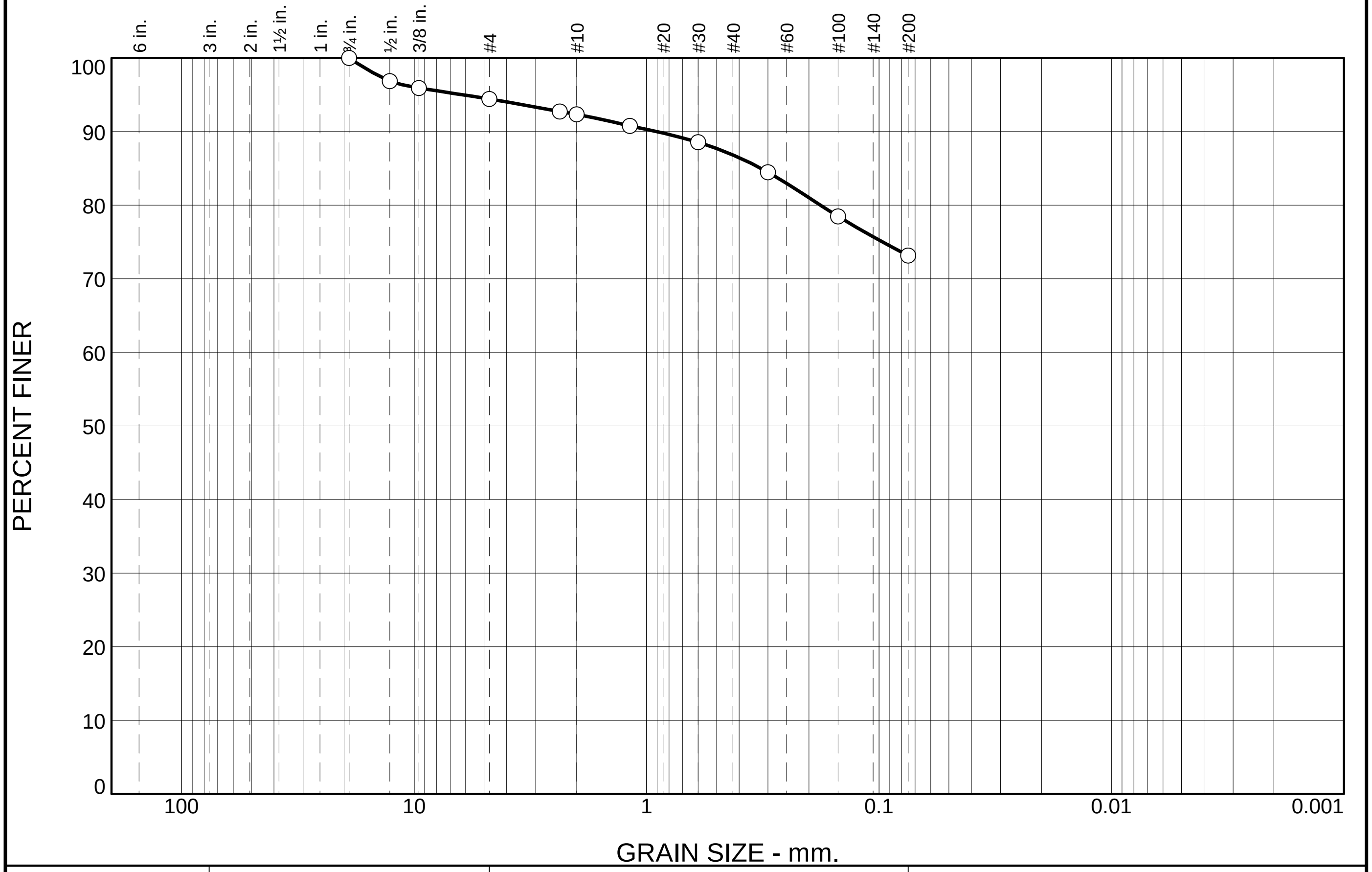
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-10

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	5.6	2.1	5.5	13.6	73.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	96.9		
3/8	95.9		
#4	94.4		
#8	92.7		
#10	92.3		
#16	90.8		
#30	88.6		
#50	84.5		
#100	78.5		
#200	73.2		

* (no specification provided)

Material Description

CLAY (CH), golden, high plastic, with maroon shaley clay, with fine sand, trace medium sand and fine gravel

Atterberg Limits (ASTM D 4318)

PL= 20 LL= 54 PI= 26

Classification

USCS= CH AASHTO=

Coefficients

D_{85}= 0.3215 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Sample No.: Bulk **Source of Sample:** **Date Sampled:**
Location: B-7 **Elev./Depth:** 8-15
Checked By: K. Kocher **Title:** Engineer

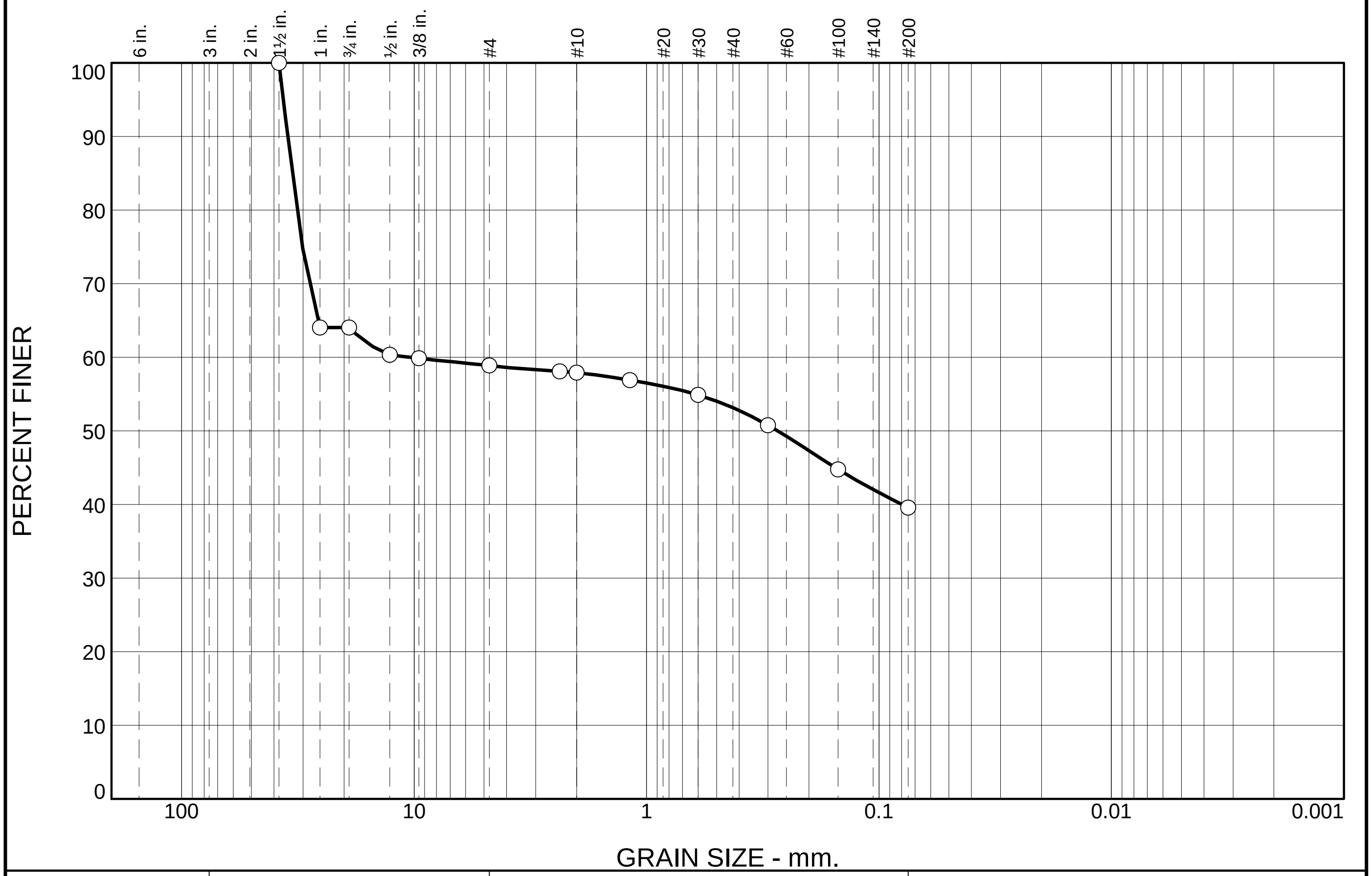
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-11

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	36.0	5.1	1.0	4.7	13.6	39.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	64.0		
3/4	64.0		
1/2	60.3		
3/8	59.9		
#4	58.9		
#8	58.1		
#10	57.9		
#16	56.9		
#30	54.9		
#50	50.8		
#100	44.8		
#200	39.6		

* (no specification provided)

Material Description

Clayey GRAVEL (GC), brown gray and tan, high plastic, coarse grain gravel, with fine grain sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 33.3923 D_{60}= 10.3573 D_{50}= 0.2723
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Crose/C. Cook

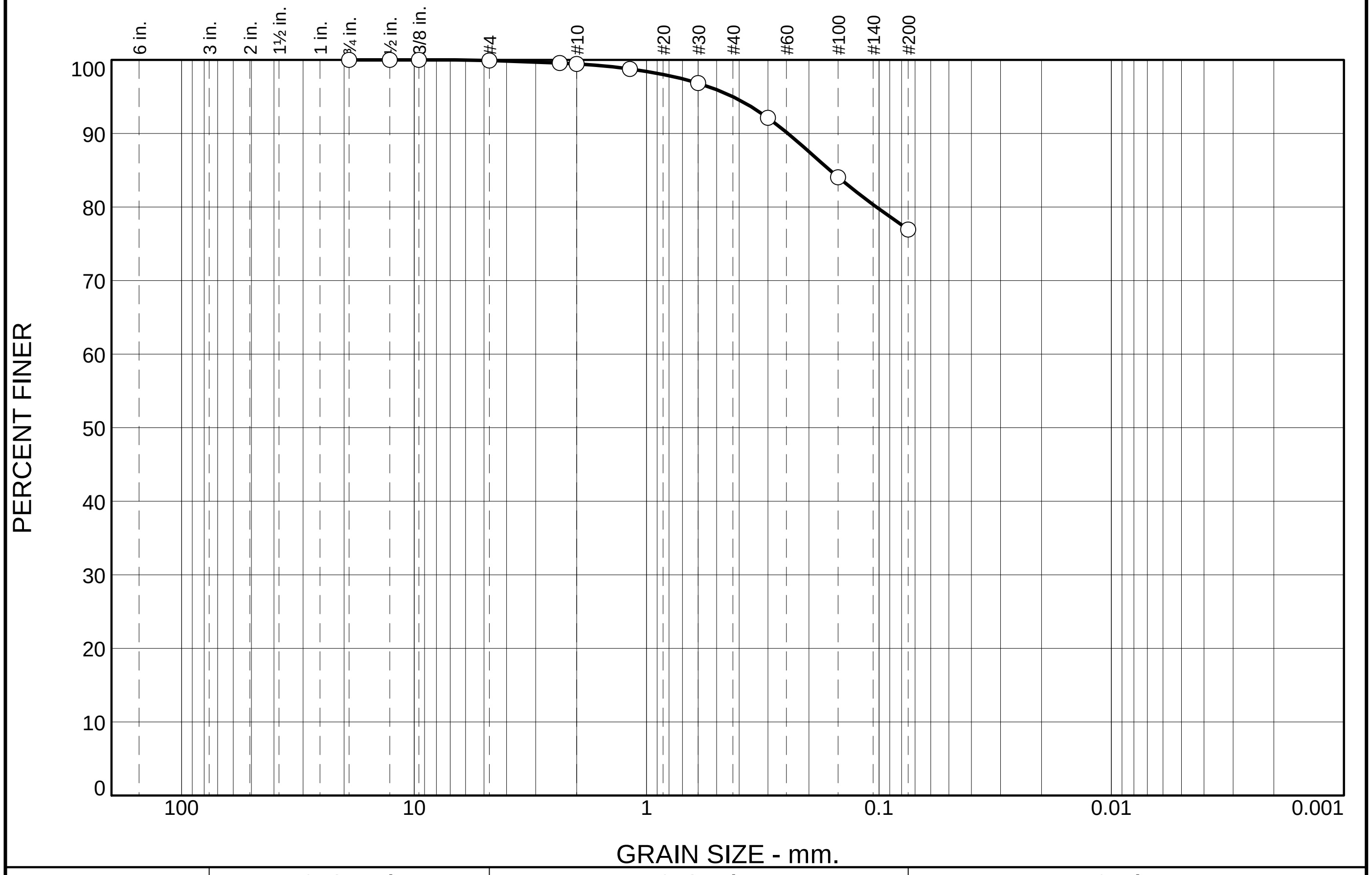
Remarks

Sample No.: ST-4 **Source of Sample:** B-8 **Date Sampled:**
Location: **Elev./Depth:** 8
Checked By: K. Kocher **Title:** Engineer

REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill
Project No: 2008012455 **Figure** 4-12

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.4	4.5	18.1	76.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	99.9		
#8	99.6		
#10	99.5		
#16	98.8		
#30	96.8		
#50	92.1		
#100	84.1		
#200	76.9		

* (no specification provided)

Material Description

CLAY (CH), golden and tan, high plastic, with fine sand

Atterberg Limits (ASTM D 4318)

PL= 17 LL= 52 PI= 35

Classification

USCS= CH AASHTO=

Coefficients

D_{85}= 0.1625 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Bag Sample
1' - 15'

Sample No.: Bulk **Source of Sample:** **Date Sampled:**
Location: B-8 **Elev./Depth:** 1-15
Checked By: K. Kocher **Title:** Engineer

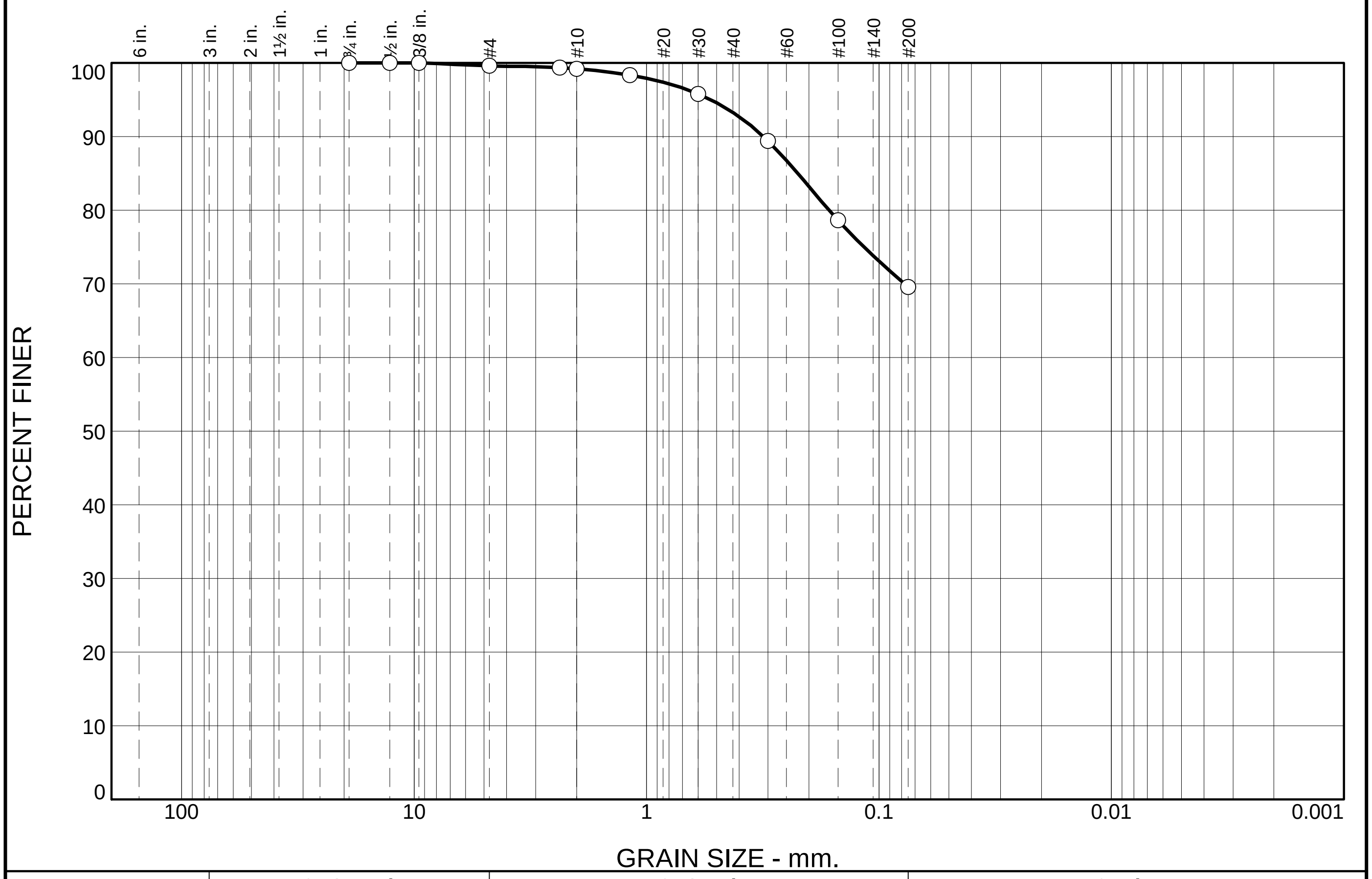
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-13

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	0.4	5.9	23.7	69.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	99.6		
#8	99.4		
#10	99.2		
#16	98.3		
#30	95.8		
#50	89.4		
#100	78.6		
#200	69.6		

* (no specification provided)

Material Description

CLAY (CH), gray and orangish brown, with fine to medium grain sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.2233 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-11-11 **Tested By:** J. Crose

Remarks

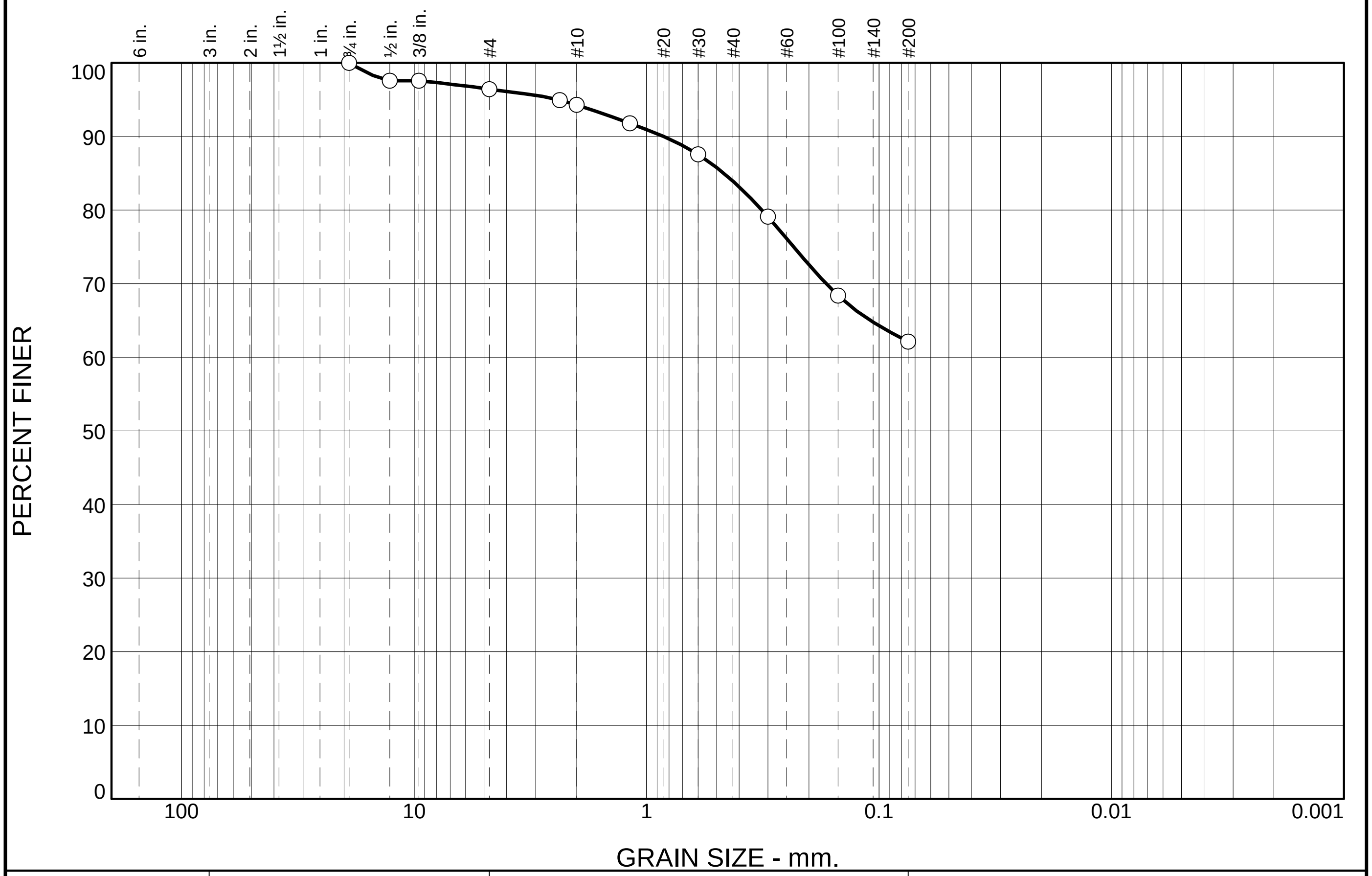
Sample No.: ST-7 **Source of Sample:** B-9 **Date Sampled:**
Location: **Elev./Depth:** 23
Checked By: K. Kocher **Title:** Engineer

REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill
Project No: 2008012455 **Figure** 4-14

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.6	2.1	10.4	21.8	62.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	97.6		
3/8	97.6		
#4	96.4		
#8	94.9		
#10	94.3		
#16	91.8		
#30	87.6		
#50	79.1		
#100	68.4		
#200	62.1		

* (no specification provided)

Material Description

Shaley CLAY (CH), brown gray and purple, with weathered limestone, with fine to medium sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.4651 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-11-11 **Tested By:** J. Crose

Remarks

Sample No.: ST-8 **Source of Sample:** B-9 **Date Sampled:**
Location: **Elev./Depth:** 28
Checked By: K. Kocher **Title:** Engineer

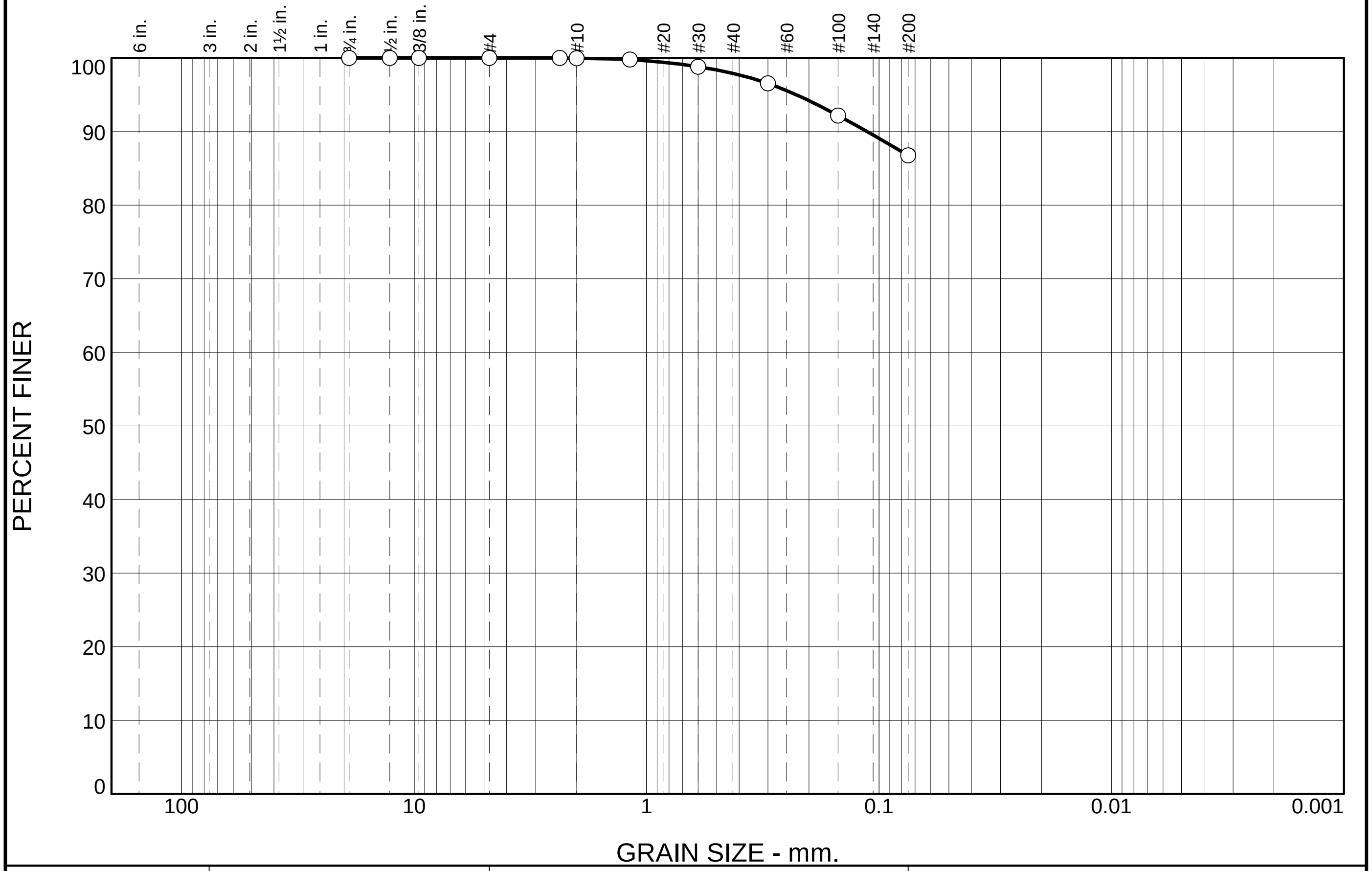
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-15

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.0	11.1	86.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#8	100.0		
#10	99.9		
#16	99.8		
#30	98.8		
#50	96.6		
#100	92.2		
#200	86.8		

* (no specification provided)

Material Description

CLAY (CH), golden and gray brown, high plastic, trace fine sand

Atterberg Limits (ASTM D 4318)

PL= 18 LL= 65 PI= 46

Classification

USCS= CH AASHTO=

Coefficients

$D_{85}=$ $D_{60}=$ $D_{50}=$
$D_{30}=$ $D_{15}=$ $D_{10}=$
$C_u=$ $C_c=$

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Sample No.: Bulk **Source of Sample:** **Date Sampled:**
Location: B-10 **Elev./Depth:** 15-18
Checked By: K. Kocher **Title:** Engineer

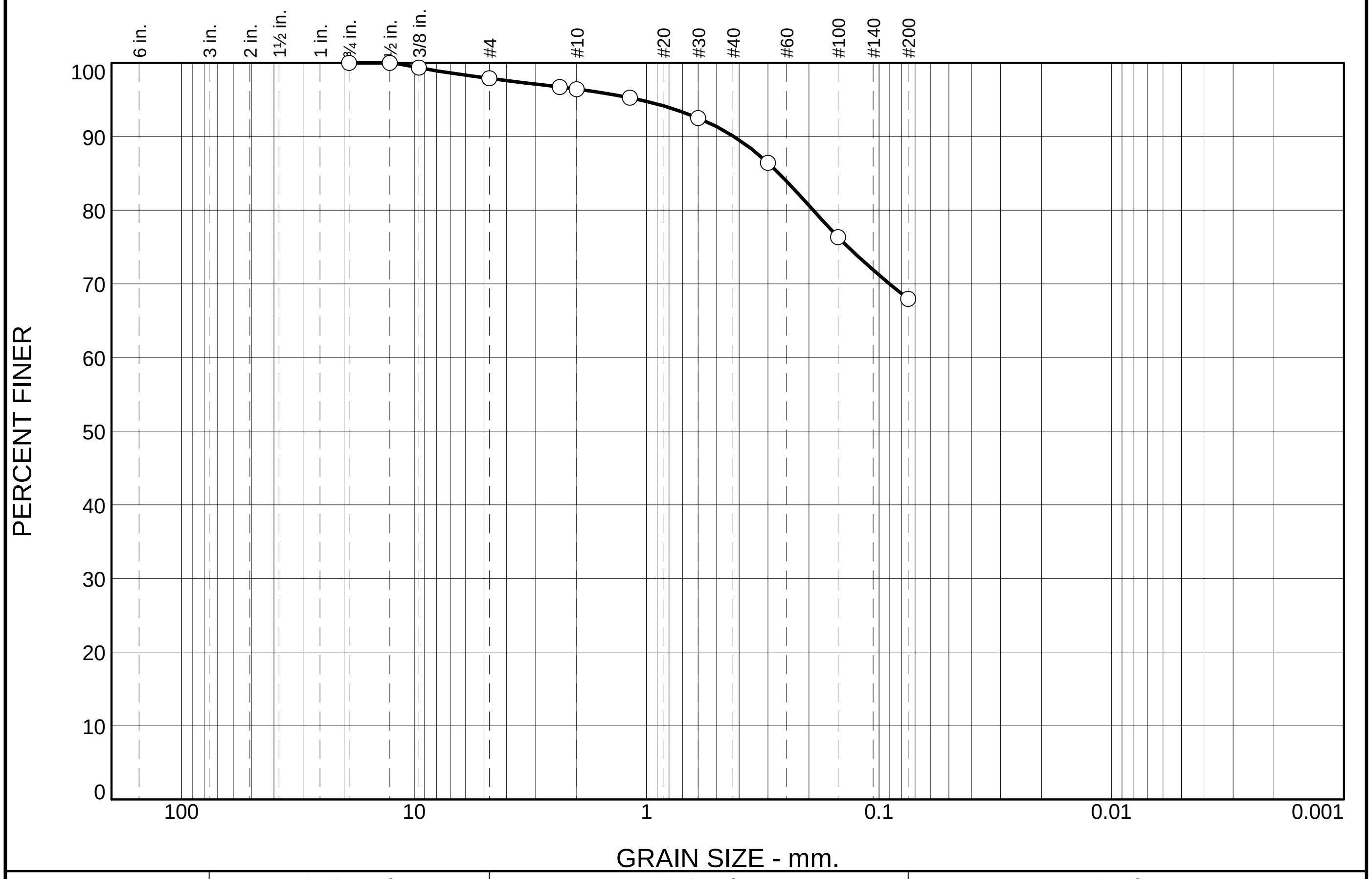
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-16

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.1	1.4	6.4	22.1	68.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	99.4		
#4	97.9		
#8	96.7		
#10	96.5		
#16	95.3		
#30	92.5		
#50	86.4		
#100	76.3		
#200	68.0		

* (no specification provided)

Material Description

CLAY (CH), golden and gray, with fine to medium sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.2690 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-11-11 **Tested By:** J. Crose

Remarks

Sample No.: ST-7 **Source of Sample:** B-10 **Date Sampled:**
Location: **Elev./Depth:** 23
Checked By: K. Kocher **Title:** Engineer

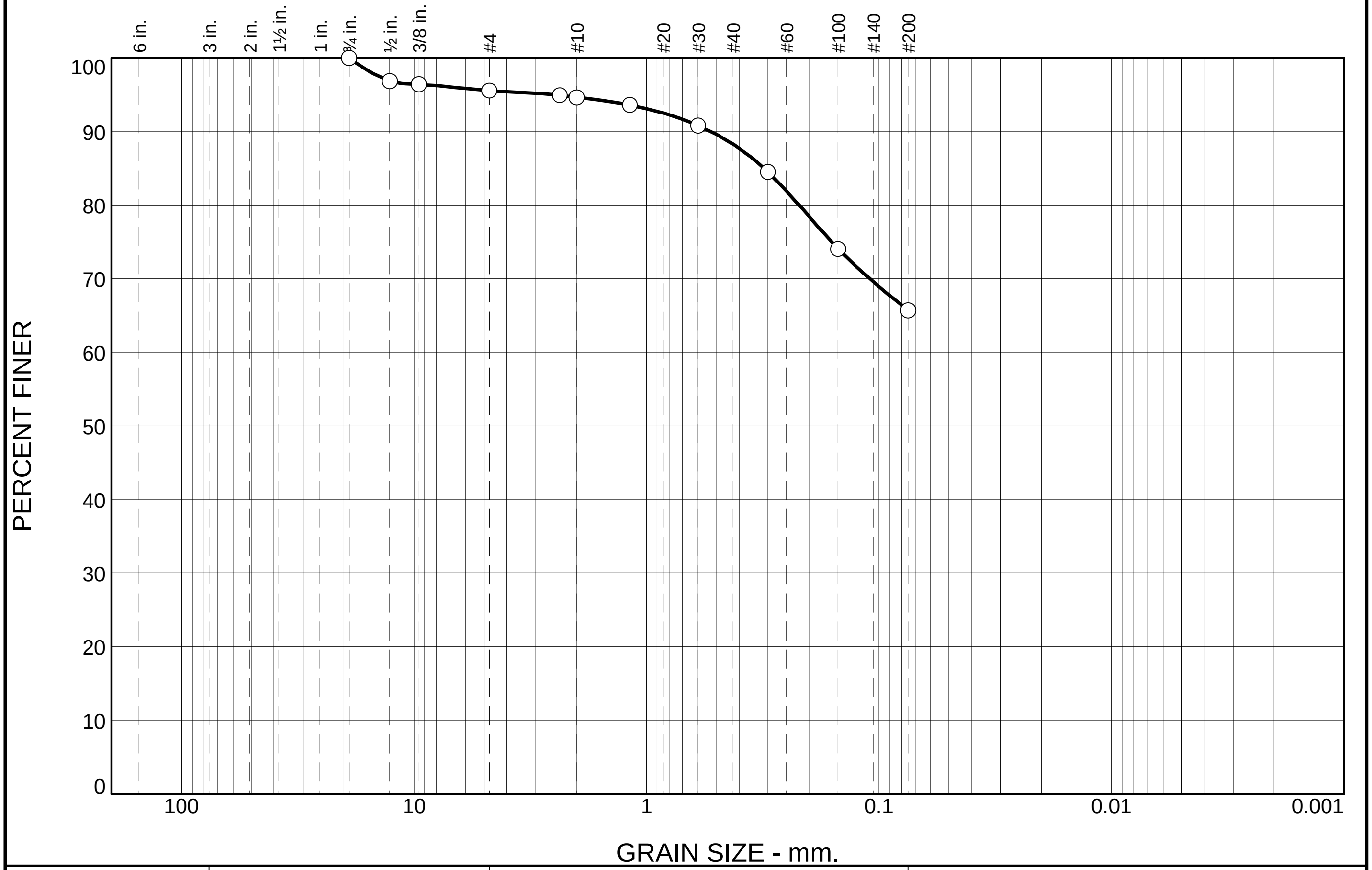
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-17

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.4	0.9	6.4	22.6	65.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	96.9		
3/8	96.4		
#4	95.6		
#8	94.9		
#10	94.7		
#16	93.6		
#30	90.8		
#50	84.5		
#100	74.1		
#200	65.7		

* (no specification provided)

Material Description

Sandy CLAY (CH), brown tan gray and orangish brown, high plastic, fine to medium grain sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.3117 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-11-11 **Tested By:** J. Crose

Remarks

Sample No.: ST-7 **Source of Sample:** B-11 **Date Sampled:**
Location: **Elev./Depth:** 23
Checked By: K. Kocher **Title:** Engineer

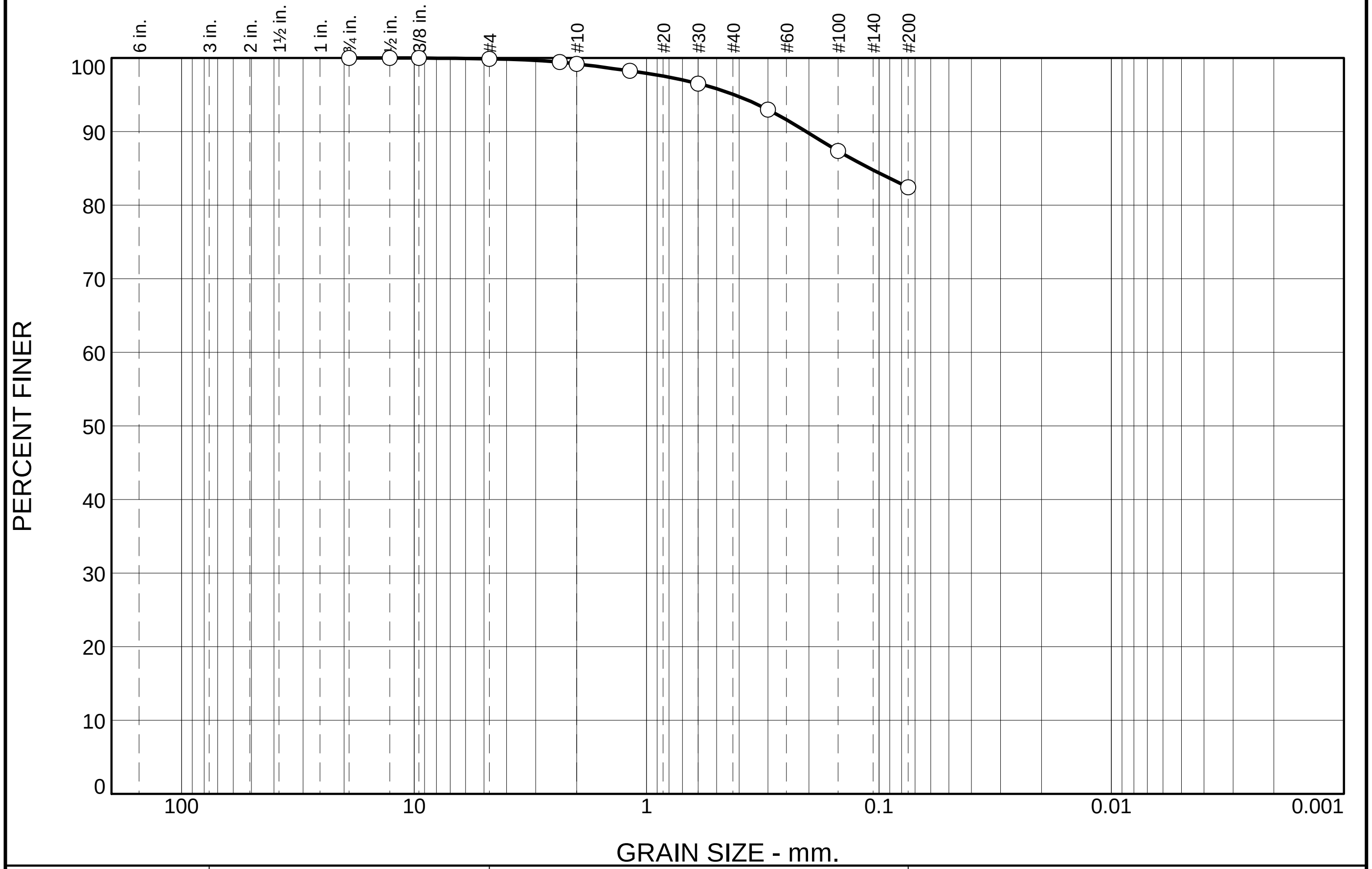
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-18

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.7	4.1	12.7	82.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	99.9		
#8	99.4		
#10	99.2		
#16	98.2		
#30	96.5		
#50	93.0		
#100	87.4		
#200	82.4		

* (no specification provided)

Material Description

CLAY (CH), golden, high plastic, trace fine sand

Atterberg Limits (ASTM D 4318)

PL= 22 LL= 74 PI= 52

Classification

USCS= CH AASHTO=

Coefficients

D_{85}= 0.1095 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-07-11 **Tested By:** J. Pruett/C. Cook

Remarks

Sample No.: Bulk **Source of Sample:** **Date Sampled:**
Location: B-12 **Elev./Depth:** 2.5-10
Checked By: K. Kocher **Title:** Engineer

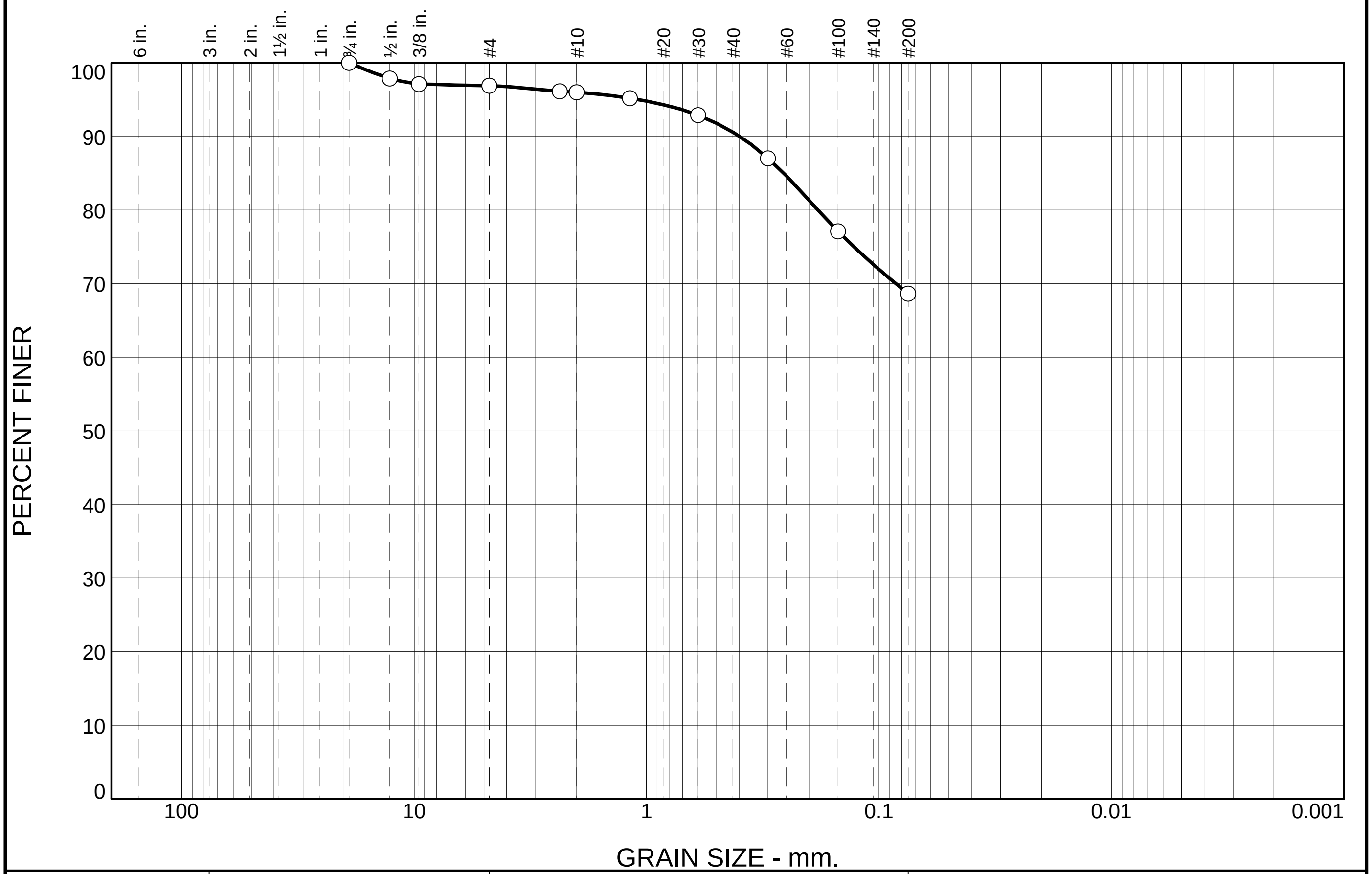
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-19

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	0.9	5.4	22.0	68.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	97.9		
3/8	97.1		
#4	96.9		
#8	96.2		
#10	96.0		
#16	95.2		
#30	92.9		
#50	87.0		
#100	77.1		
#200	68.6		

* (no specification provided)

Material Description

CLAY (CH), brownish gray and orange-brown, high plastic, with fine to medium grain sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.2567 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-11-11 **Tested By:** J. Crose

Remarks

Sample No.: ST-2 **Source of Sample:** B-12 **Date Sampled:**
Location: **Elev./Depth:** 3
Checked By: K. Kocher **Title:** Engineer

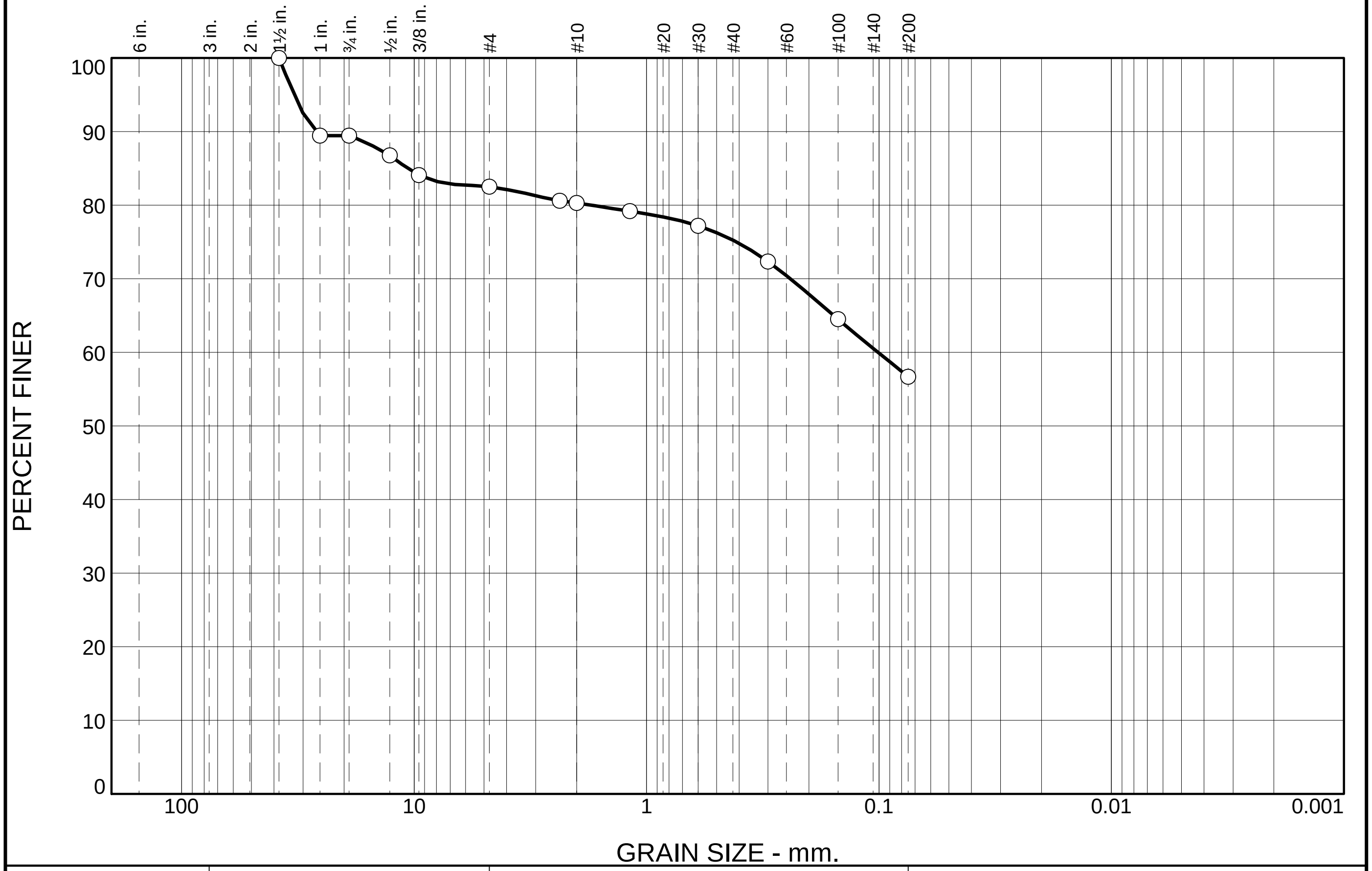
REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-20

SCHEDULE CJG-ST1

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.5	7.0	2.2	5.1	18.5	56.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	89.5		
3/4	89.5		
1/2	86.8		
3/8	84.1		
#4	82.5		
#8	80.6		
#10	80.3		
#16	79.2		
#30	77.2		
#50	72.3		
#100	64.5		
#200	56.7		

* (no specification provided)

Material Description

Sandy CLAY (CH), brown tan gray and orange-brown, high plastic, fine to medium grain sand, with fine to coarse gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= SC AASHTO=

Coefficients

D_{85}= 10.6353 D_{60}= 0.1011 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Date Tested: 04-11-11 **Tested By:** J. Crose

Remarks

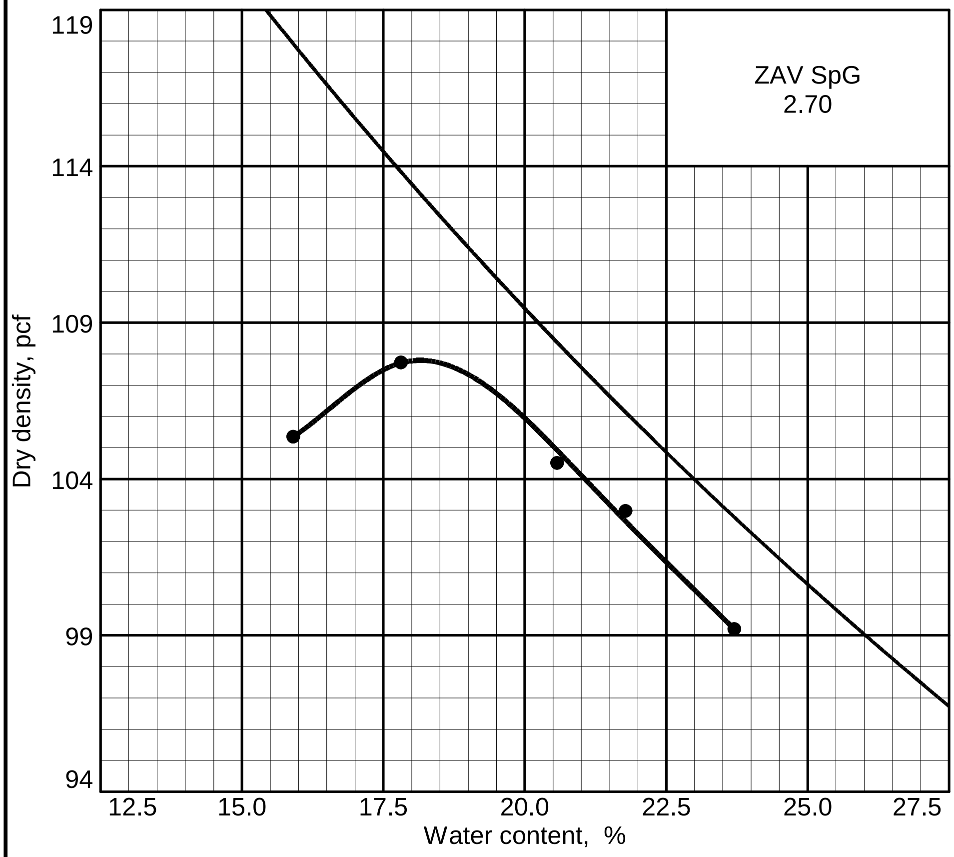
Sample No.: ST-4 **Source of Sample:** B-12 **Date Sampled:**
Location: **Elev./Depth:** 8
Checked By: K. Kocher **Title:** Engineer

REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

Project No: 2008012455 **Figure** 4-21

MOISTURE-DENSITY TEST REPORT



Curve No.

Test Specification:
ASTM D 698-00a Method A Standard

Preparation Method ASTM
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size .03333 cu.ft.
Test Performed on Material Passing No.4 **Sieve**

NM ______ **LL** 37 **PI** 17
Sp.G. (ASTM D 854) ______
%>No.4 0.0 **%<No.200** 93.3
USCS CL **AASHTO** ______
Date Sampled ______
Date Tested 4/28/11
Tested By J. Crose

TESTING DATA

	1	2	3	4	5	6
WM + WS	8.63	8.79	8.76	8.74	8.65	
WM	4.56	4.56	4.56	4.56	4.56	
WW + T #1	247.88	261.81	338.07	328.92	317.90	
WD + T #1	218.69	228.26	286.71	276.49	263.53	
TARE #1	34.62	40.71	36.76	36.34	34.57	
WW + T #2	317.87	309.88	318.73	328.11	328.19	
WD + T #2	279.71	269.28	271.07	276.81	272.52	
TARE #2	40.63	40.50	39.77	40.84	37.25	
MOISTURE	15.9	17.8	20.6	21.8	23.7	
DRY DENSITY	105.4	107.7	104.5	103.0	99.2	

TEST RESULTS

Maximum dry density = 107.8 pcf

Optimum moisture = 18.1 %

Material Description

Silty CLAY (CL), brown to tan

Remarks:
Sample is a composite of material left over from the Shelby tubes. This material was visually classified as silty clay or clayey silt

Project No. 2008012455 **Client:** Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

● **Location:** Composite: silty clay material

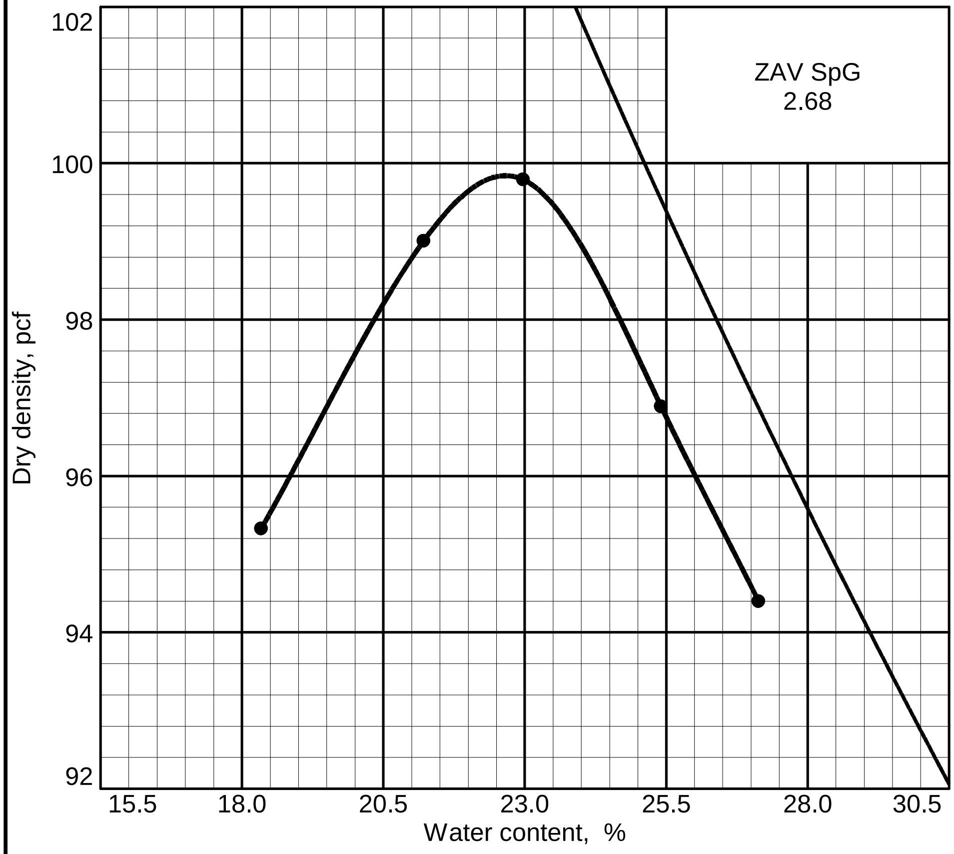
REITZ & JENS, INC.
CONSULTING ENGINEERS

Checked by: K. Kocher
Title: P.E.

Figure 5-1

SCHEDULE CJG-ST1

MOISTURE-DENSITY TEST REPORT



Curve No.

Test Specification:
ASTM D 698-00a Method A Standard

Preparation Method ASTM
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size .03333 cu.ft.

Test Performed on Material Passing No.4 **Sieve**

NM ______ **LL** 62 **PI** 43
Sp.G. (ASTM D 854) ______
%>No.4 ______ **%<No.200** 91.3
USCS CH **AASHTO** ______
Date Sampled ______
Date Tested 5/3/2011
Tested By J. Crose

TESTING DATA

	1	2	3	4	5	6
WM + WS	8.32	8.56	8.65	8.61	8.56	
WM	4.56	4.56	4.56	4.56	4.56	
WW + T #1	218.80	211.58	293.31	286.21	266.97	
WD + T #1	191.11	181.41	245.76	235.19	217.38	
TARE #1	40.69	40.50	37.73	33.99	32.74	
WW + T #2	254.74	229.19	280.98	300.29	282.30	
WD + T #2	221.77	195.94	235.74	246.67	229.18	
TARE #2	41.32	37.73	39.70	36.07	35.34	
MOISTURE	18.3	21.2	23.0	25.4	27.1	
DRY DENSITY	95.3	99.0	99.8	96.9	94.4	

TEST RESULTS

Maximum dry density = 99.8 pcf

Optimum moisture = 22.7 %

Material Description

CLAY (CH), grey-brown-tan-orangish brown, high platic, with trace fine chert fragments

Remarks:
Sample is a composite of material left over from the Shelby tubes. This material wwas visually classified as high plastic clay

Project No. 2008012455 **Client:** Ameren Missouri
Project: Labadie Plant Utility Waste Landfill

● **Location:** Composite: high plastic clay material

REITZ & JENS, INC.
CONSULTING ENGINEERS

Checked by:
Title:

Figure 5-2

SCHEDULE CJG-ST1

Ameren Missouri; Labadie Power Plant UWL

Calaway Borrow Site
Silty CLAY Composite
Compacted Proctor point 103.0pcf at 21.8% moisture
Hydraulic Conductivity

Soil Conditions	
Pre-test conditions	**Post-test Conditions**
Wet Density = 125.7 (lbs/ft^3)	Wet Density = 128.1 (lbs/ft^3)
% Moisture = 21.7%	% Moisture = 22.9%
Dry Density = 103.3 (lbs/ft^3)	Dry Density = 104.2 (lbs/ft^3)

Test Information	
a (cm^2)=	0.1969
L (cm)=	4.8061
A (cm^2)=	19.4194

Trial 1

Date and Time	Elapsed Time (seconds)	Cell Burette Reading (ml)	Base Burette		Top Burette		Total Head Across Sample (cm of water)	Temperature (℃)	Weighted Average Temp. (℃)	Uncorrected Hydraulic Conductivity (cm/sec)	Correction Factor	Cumulative Time (sec)	Corrected Hydraulic Conductivity (cm/sec)
			Reading (ml)	Distance from Datum (cm)	Reading (ml)	Distance from Datum (cm)							
5/4/11 7:55	0	8.5	10.00	27.200	0.00	78.000	85.979	18.1					
5/4/11 14:25	23400	8.4	9.92	27.606	0.13	77.340	84.912	21.5	19.80	1.30E-08	1.0051515	23400	1.31E-08
5/5/11 9:10	90900	8.7	9.67	28.876	0.44	75.765	82.067	19.8	20.43	1.25E-08	0.9897973	90900	1.24E-08
5/6/11 8:10	173700	8.7	9.38	30.350	0.80	73.936	78.765	19.5	20.06	1.23E-08	0.9988069	173700	1.23E-08
5/9/11 7:15	429600	8.9	8.61	34.261	1.83	68.704	69.621	22.9	20.74	1.20E-08	0.9824633	429600	1.18E-08

Trial 2

Date and Time	Elapsed Time (seconds)	Cell Burette Reading (ml)	Base Burette		Top Burette		Total Head Across Sample (cm of water)	Temperature (℃)	Weighted Average Temp. (℃)	Uncorrected Hydraulic Conductivity (cm/sec)	Correction Factor	Cumulative Time (sec)	Corrected Hydraulic Conductivity (cm/sec)
			Reading (ml)	Distance from Datum (cm)	Reading (ml)	Distance from Datum (cm)							
5/9/11 7:45	0	8.9	10.00	27.200	0.00	78.000	85.979	22.6					
5/10/11 7:30	85500	9.2	9.67	28.876	0.37	76.120	82.423	22.4	22.50	1.20E-08	0.9421229	85500	1.13E-08
5/11/11 8:30	175500	9.2	9.35	30.502	0.77	74.088	78.765	22.4	22.45	1.22E-08	0.9432589	175500	1.15E-08
5/12/11 8:05	260400	9.3	9.07	31.924	1.10	72.412	75.667	22	22.37	1.20E-08	0.9450598	260400	1.13E-08
5/13/11 8:15	347400	9.3	8.79	33.347	1.42	70.786	72.619	22.1	22.29	1.18E-08	0.9468317	347400	1.12E-08

Trial 3

Date and Time	Elapsed Time (seconds)	Cell Burette Reading (ml)	Base Burette		Top Burette		Total Head Across Sample (cm of water)	Temperature (℃)	Weighted Average Temp. (℃)	Uncorrected Hydraulic Conductivity (cm/sec)	Correction Factor	Cumulative Time (sec)	Corrected Hydraulic Conductivity (cm/sec)
			Reading (ml)	Distance from Datum (cm)	Reading (ml)	Distance from Datum (cm)							
5/16/11 7:55	0	10.1	10.00	27.200	0.00	78.000	85.979	19					
5/17/11 7:50	86100	9.9	9.71	28.673	0.32	76.374	82.880	19.2	19.10	1.04E-08	1.0226658	86100	1.06E-08
5/18/11 8:00	173100	9.9	9.43	30.096	0.66	74.647	79.731	20.5	19.48	1.06E-08	1.0131690	173100	1.08E-08
5/19/11 8:00	259500	9.9	9.16	31.467	0.98	73.022	76.733	21.7	20.02	1.07E-08	0.9998188	259500	1.07E-08
5/20/11 8:30	347700	10.0	8.91	32.737	1.28	71.498	73.939	21.8	20.46	1.06E-08	0.9891813	347700	1.05E-08
												H.C.=	**1.1E-08**

CLAY VOLUME CALCULATION

Client: Ameren Missouri
Project: Labadie UWL
Location: Callaway Borrow Site

USING ONLY MODERATE TO HIGH PLASTIC CLAY MATERIAL WITH LOW SAND/GRAVEL CONTENT

Borrow Area No.	Surface Area (acres)	Thickness of Useable Liner Material (feet)	Volume (acre-ft)	Volume (cubic yards)
1	35	20	700	1130000
2	33	11	363	590000
3	22	19	418	670000
4	28	18	504	810000
5	36	22	792	1280000
		TOTAL	**2777**	**4480000**

USING ALL SILT, LOW PLASTIC CLAY, AND HIGH PLASTIC CLAY MATERIAL WITH LOW SAND/GRAVEL CONTENT

Borrow Area No.	Surface Area (acres)	Thickness of Useable Liner Material (feet)	Volume (acre-ft)	Volume (cubic yards)
1	35	27	945	1520000
2	33	17	561	910000
3	22	24	528	850000
4	28	21	588	950000
5	36	25	900	1450000
		TOTAL	**3522**	**5680000**

Figure 7

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Appendix A-1

POTENTIAL HAUL ROUTE FOR CLAY BORROW
AND
SUPPLEMENTAL LABORATORY TESTING

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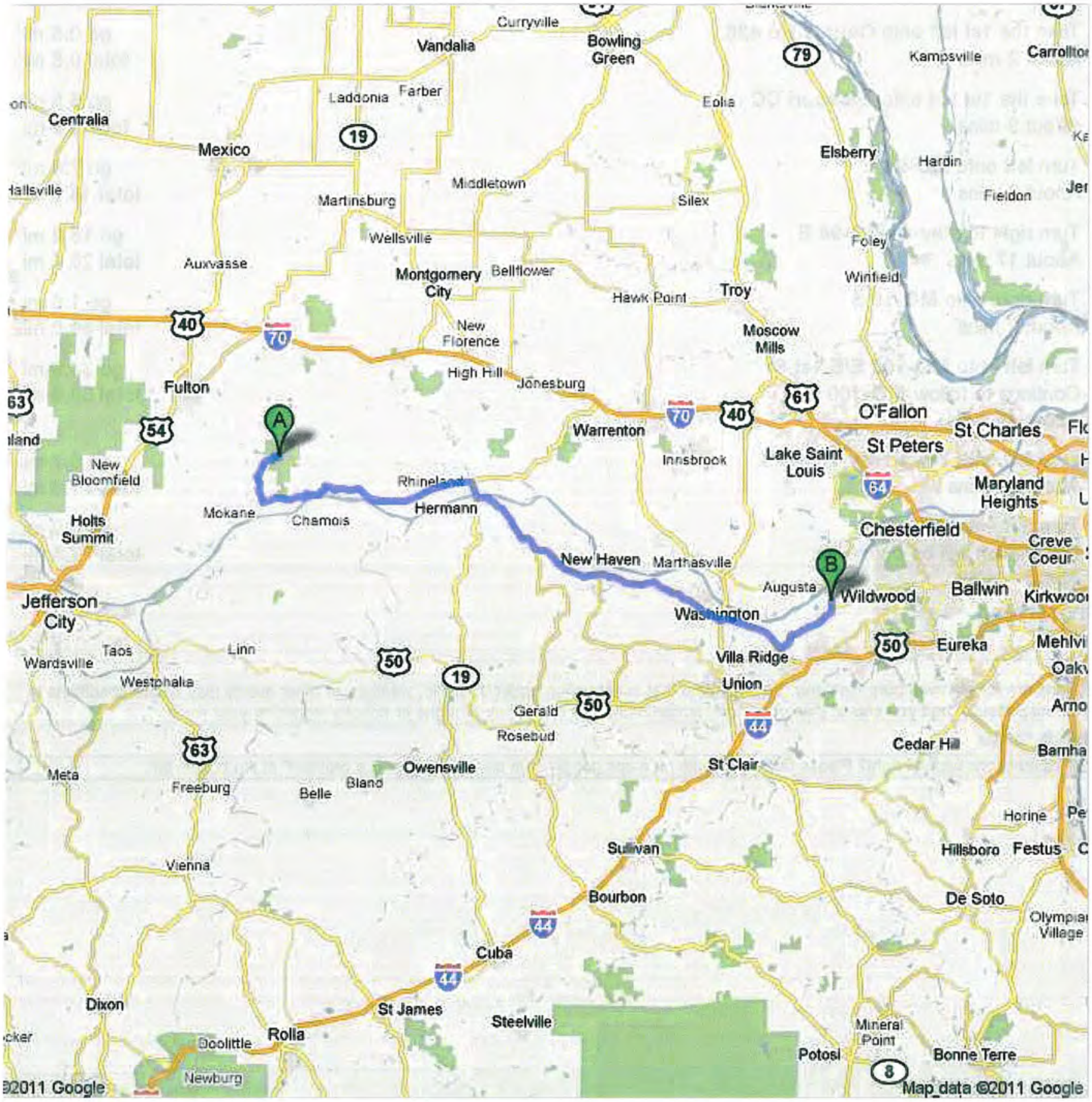
Google maps

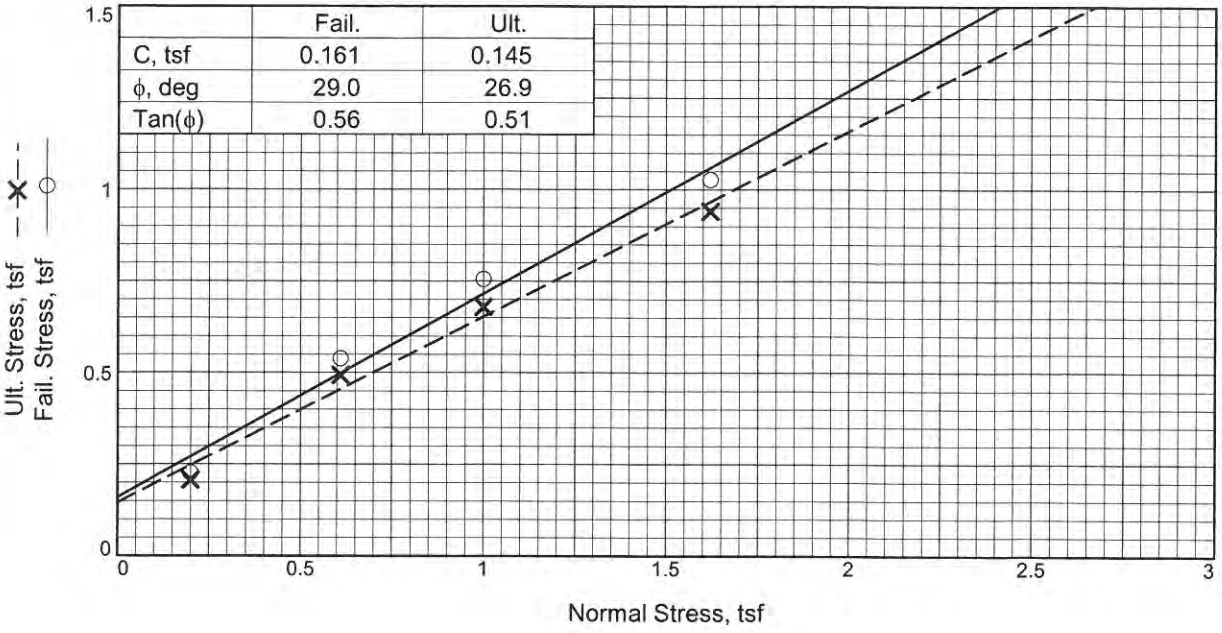
Directions to Unknown road
72.5 mi – about **1 hour 40 mins**
Callaway to UWL (Davis RD at Labadie Bottom Rd)



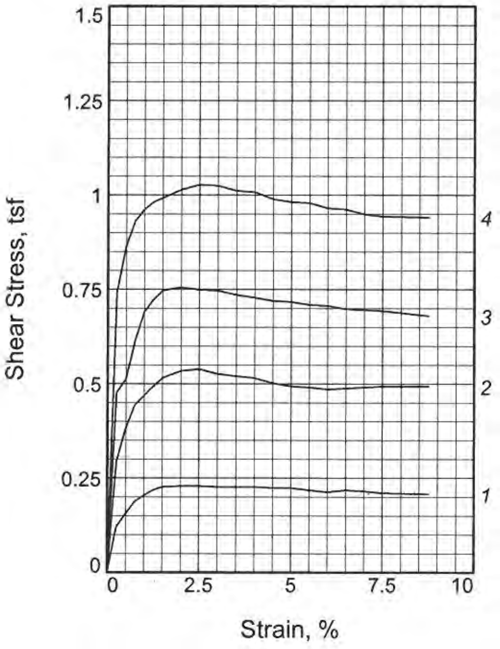
Ameren Missouri Labadie UWL
POSSIBLE ROUTE FROM CALLAWAY PLANT
CLAY BORROW SITE TO LABADIE UWL

REITZ & JENS, INC. *Consulting Engineers*

Figure A-1



	Fail.	Ult.
C, tsf	0.161	0.145
ϕ, deg	29.0	26.9
Tan(ϕ)	0.56	0.51



	Sample No.	1	2	3	4
Initial	Water Content, %	24.9	24.9	24.9	24.9
	Dry Density, pcf	98.8	98.8	98.8	98.8
	Saturation, %	96.2	96.2	96.2	96.2
	Void Ratio	0.6933	0.6933	0.6933	0.6933
	Diameter, in.	2.00	2.00	2.00	2.00
	Height, in.	1.28	1.28	1.28	1.28
At Test	Water Content, %	24.9	24.9	24.9	24.9
	Dry Density, pcf	98.8	98.8	98.8	98.8
	Saturation, %	96.2	96.2	96.2	96.2
	Void Ratio	0.6933	0.6933	0.6933	0.6933
	Diameter, in.	2.00	2.00	2.00	2.00
	Height, in.	1.28	1.28	1.28	1.28
	Normal Stress, tsf	0.200	0.610	1.000	1.620
	Fail. Stress, tsf	0.226	0.539	0.755	1.027
	Strain, %	1.5	2.5	2.0	2.5
	Ult. Stress, tsf	0.208	0.493	0.679	0.941
	Strain, %	8.8	8.8	8.8	8.8
	Strain rate, %/min.	0.80	0.80	0.80	0.80

Sample Type: Compacted

Description: CLAY (CH), grey-brown-tan-orangish brown, high platic, with trace fine

LL= 62 **PL=** 19 **PI=** 43

Assumed Specific Gravity= 2.68

Remarks: High plastic clay was sheared against the textured liner from Sioux UWL

Figure A1-2

Client: Ameren Missouri

Project: Labadie Plant Utility Waste Landfill

Location: Composite: high plastic clay material

Proj. No.: 2008012455 **Date Sampled:**

REITZ & JENS, INC.
CONSULTING ENGINEERS

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

DIRECT SHEAR TEST

11/20/2012

Date:
Client: Ameren Missouri
Project: Labadie Plant Utility Waste Landfill
Project No.: 2008012455
Location: Composite: high plastic clay material
Description: CLAY (CH), grey-brown-tan-orangish brown, high platic, with trace fine chert fragments Sample is a composite of material left over from shelby tubes that was visually classified as high plastic clay.
Remarks: High plastic clay was sheared against the textured liner from Sioux UWL
Type of Sample: Compacted
Assumed Specific Gravity=2.68 **LL=**62 **PL=**19 **PI=**43

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	329.350		329.350
Moisture content: Dry soil+tare, gms.	271.510		271.510
Moisture content: Tare, gms.	39.160		39.160
Moisture, %	24.9	24.9	24.9
Moist specimen weight, gms.	129.8		
Diameter, in.	2.00	2.00	
Area, in.^{2}	3.14	3.14	
Height, in.	1.28	1.28	
Net decrease in height, in.		0.00	
Wet density, pcf	123.4	123.4	
Dry density, pcf	98.8	98.8	
Void ratio	0.6933	0.6933	
Saturation, %	96.2	96.2	

Test Readings for Specimen No. 1

Primary load ring constant = .1176 lbs. per input unit
Normal stress = 0.2 tsf
Strain rate, %/min. = 0.80
Fail. Stress = 0.226 tsf **at reading no.** 6
Ult. Stress = 0.208 tsf **at reading no.** 19

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	0.00	0.0	0.0	0.000
1	0.0050	45.00	5.3	0.3	0.121
2	0.0100	58.00	6.8	0.5	0.156
3	0.0150	70.00	8.2	0.8	0.189
4	0.0200	76.00	8.9	1.0	0.205
5	0.0250	81.00	9.5	1.3	0.218
6	0.0300	84.00	9.9	1.5	0.226
7	0.0400	85.00	10.0	2.0	0.229
8	0.0500	85.00	10.0	2.5	0.229
9	0.0600	84.00	9.9	3.0	0.226
10	0.0700	84.00	9.9	3.5	0.226
11	0.0800	84.00	9.9	4.0	0.226

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
12	0.0900	83.00	9.8	4.5	0.224
13	0.1000	83.00	9.8	5.0	0.224
14	0.1100	81.00	9.5	5.5	0.218
15	0.1200	79.00	9.3	6.0	0.213
16	0.1300	81.00	9.5	6.5	0.218
17	0.1400	80.00	9.4	7.0	0.216
18	0.1500	78.00	9.2	7.5	0.210
19	0.1750	77.00	9.1	8.8	0.208

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	329.350		329.350
Moisture content: Dry soil+tare, gms.	271.510		271.510
Moisture content: Tare, gms.	39.160		39.160
Moisture, %	24.9	24.9	24.9
Moist specimen weight, gms.	129.8		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.28	1.28	
Net decrease in height, in.		0.00	
Wet density, pcf	123.4	123.4	
Dry density, pcf	98.8	98.8	
Void ratio	0.6933	0.6933	
Saturation, %	96.2	96.2	

Test Readings for Specimen No. 2

Primary load ring constant = .1176 lbs. per input unit

Normal stress = 0.61 tsf

Strain rate, %/min. = 0.80

Fail. Stress = 0.539 tsf **at reading no.** 8

Ult. Stress = 0.493 tsf **at reading no.** 19

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	0.00	0.0	0.0	0.000
1	0.0050	109.00	12.8	0.3	0.294
2	0.0100	142.00	16.7	0.5	0.383
3	0.0150	165.00	19.4	0.8	0.445
4	0.0200	174.00	20.5	1.0	0.469
5	0.0250	183.00	21.5	1.3	0.493
6	0.0300	191.00	22.5	1.5	0.515
7	0.0400	198.00	23.3	2.0	0.534
8	0.0500	200.00	23.5	2.5	0.539
9	0.0600	195.00	22.9	3.0	0.526
10	0.0700	193.00	22.7	3.5	0.520
11	0.0800	191.00	22.5	4.0	0.515
12	0.0900	186.00	21.9	4.5	0.501
13	0.1000	183.00	21.5	5.0	0.493
14	0.1100	182.00	21.4	5.5	0.491

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
15	0.1200	180.00	21.2	6.0	0.485
16	0.1300	181.00	21.3	6.5	0.488
17	0.1400	182.00	21.4	7.0	0.491
18	0.1500	183.00	21.5	7.5	0.493
19	0.1750	183.00	21.5	8.8	0.493

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	329.350		329.350
Moisture content: Dry soil+tare, gms.	271.510		271.510
Moisture content: Tare, gms.	39.160		39.160
Moisture, %	24.9	24.9	24.9
Moist specimen weight, gms.	129.8		
Diameter, in.	2.00	2.00	
Area, in.^{2}	3.14	3.14	
Height, in.	1.28	1.28	
Net decrease in height, in.		0.00	
Wet density, pcf	123.4	123.4	
Dry density, pcf	98.8	98.8	
Void ratio	0.6933	0.6933	
Saturation, %	96.2	96.2	

Test Readings for Specimen No. 3

Primary load ring constant = .1176 lbs. per input unit

Normal stress = 1 tsf

Strain rate, %/min. = 0.80

Fail. Stress = 0.755 tsf **at reading no.** 7

Ult. Stress = 0.679 tsf **at reading no.** 19

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	0.00	0.0	0.0	0.000
1	0.0050	177.00	20.8	0.3	0.477
2	0.0100	190.00	22.3	0.5	0.512
3	0.0150	228.00	26.8	0.8	0.615
4	0.0200	256.00	30.1	1.0	0.690
5	0.0250	268.00	31.5	1.3	0.722
6	0.0300	277.00	32.6	1.5	0.747
7	0.0400	280.00	32.9	2.0	0.755
8	0.0500	278.00	32.7	2.5	0.749
9	0.0600	277.00	32.6	3.0	0.747
10	0.0700	273.00	32.1	3.5	0.736
11	0.0800	270.00	31.8	4.0	0.728
12	0.0900	267.00	31.4	4.5	0.720
13	0.1000	266.00	31.3	5.0	0.717
14	0.1100	263.00	30.9	5.5	0.709
15	0.1200	262.00	30.8	6.0	0.706
16	0.1300	259.00	30.5	6.5	0.698
17	0.1400	258.00	30.3	7.0	0.695

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
18	0.1500	257.00	30.2	7.5	0.693
19	0.1750	252.00	29.6	8.8	0.679

Parameters for Specimen No. 4

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	329.350		329.350
Moisture content: Dry soil+tare, gms.	271.510		271.510
Moisture content: Tare, gms.	39.160		39.160
Moisture, %	24.9	24.9	24.9
Moist specimen weight, gms.	129.8		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.28	1.28	
Net decrease in height, in.		0.00	
Wet density, pcf	123.4	123.4	
Dry density, pcf	98.8	98.8	
Void ratio	0.6933	0.6933	
Saturation, %	96.2	96.2	

Test Readings for Specimen No. 4

Primary load ring constant = .1176 lbs. per input unit

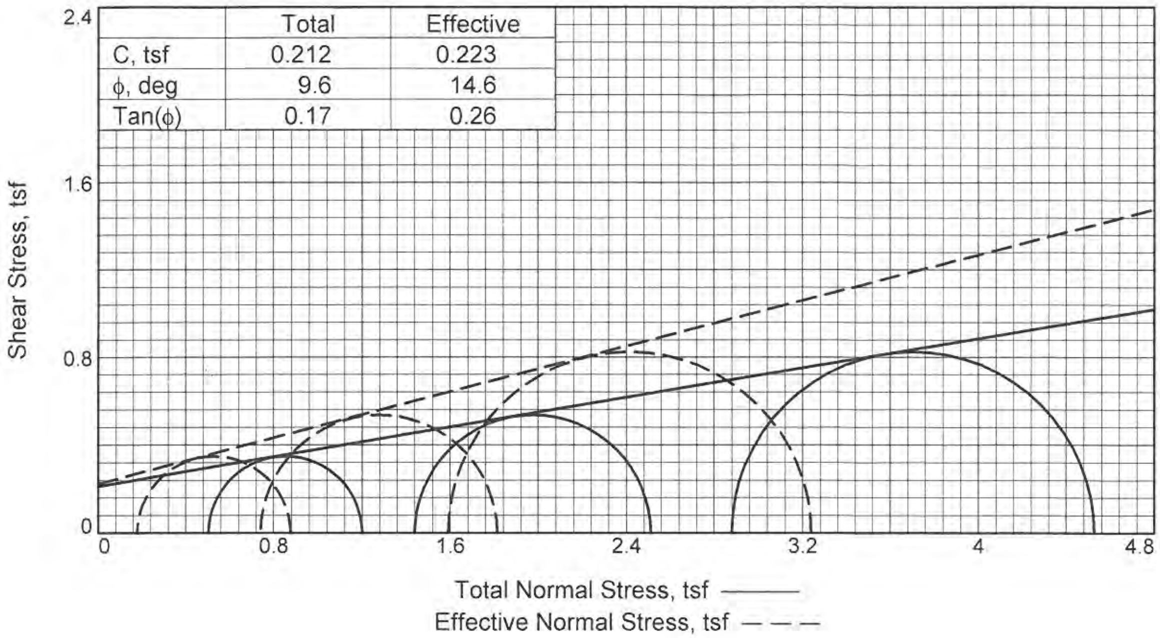
Normal stress = 1.62 tsf

Strain rate, %/min. = 0.80

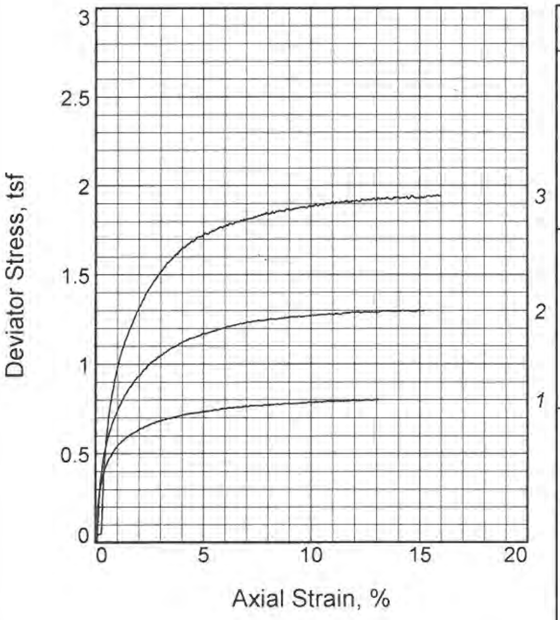
Fail. Stress = 1.027 tsf **at reading no.** 7

Ult. Stress = 0.941 tsf **at reading no.** 18

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	0.00	0.0	0.0	0.000
1	0.0050	275.00	32.3	0.3	0.741
2	0.0100	321.00	37.7	0.5	0.865
3	0.0150	346.00	40.7	0.8	0.933
4	0.0200	357.00	42.0	1.0	0.962
5	0.0250	364.00	42.8	1.3	0.981
6	0.0400	376.00	44.2	2.0	1.013
7	0.0500	381.00	44.8	2.5	1.027
8	0.0600	380.00	44.7	3.0	1.024
9	0.0700	375.00	44.1	3.5	1.011
10	0.0800	374.00	44.0	4.0	1.008
11	0.0900	367.00	43.2	4.5	0.989
12	0.1000	364.00	42.8	5.0	0.981
13	0.1100	363.00	42.7	5.5	0.978
14	0.1200	358.00	42.1	6.0	0.965
15	0.1300	357.00	42.0	6.5	0.962
16	0.1400	352.00	41.4	7.0	0.949
17	0.1500	350.00	41.2	7.5	0.943
18	0.1750	349.00	41.0	8.8	0.941



	Total	Effective
C, tsf	0.212	0.223
ϕ, deg	9.6	14.6
Tan(ϕ)	0.17	0.26



	Sample No.	1	2	3
Initial	Water Content, %	26.5	26.6	26.7
	Dry Density, pcf	95.4	95.7	95.8
	Saturation, %	94.4	95.4	95.9
	Void Ratio	0.7535	0.7482	0.7466
	Diameter, in.	2.00	2.00	1.99
	Height, in.	4.08	4.33	4.04
At Test	Water Content, %	27.1	24.4	22.4
	Dry Density, pcf	97.0	101.2	104.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.7252	0.6536	0.6003
	Diameter, in.	1.99	1.96	1.93
	Height, in.	4.06	4.25	3.92
	Strain rate, %/min.	0.02	0.02	0.02
	Back Pressure, tsf	3.96	3.96	3.96
	Cell Pressure, tsf	4.46	5.40	6.84
	Fail. Stress, tsf	0.70	1.07	1.65
	Total Pore Pr., tsf	4.28	4.66	5.25
	Ult. Stress, tsf	0.80	1.29	1.92
	Total Pore Pr., tsf	4.15	4.60	5.26
	$\bar{\sigma}_1$ Failure, tsf	0.88	1.81	3.24
	$\bar{\sigma}_3$ Failure, tsf	0.18	0.74	1.59

Type of Test:
CU with Pore Pressures

Sample Type: Compacted (Standard Proctor)

Description: CLAY (CH), grey-brown-tan-orangish brown, high platic, with trace fine chert fragments

Assumed Specific Gravity= 2.68

Remarks: Samples were compacted using the standard proctor between the 25% and 27% moisture. Samples were then trimmed to 2" diameter by 4.0"+ length and tested

Figure A1-3

Client: Ameren Missouri

Project: Labadie Plant Utility Waste Landfill

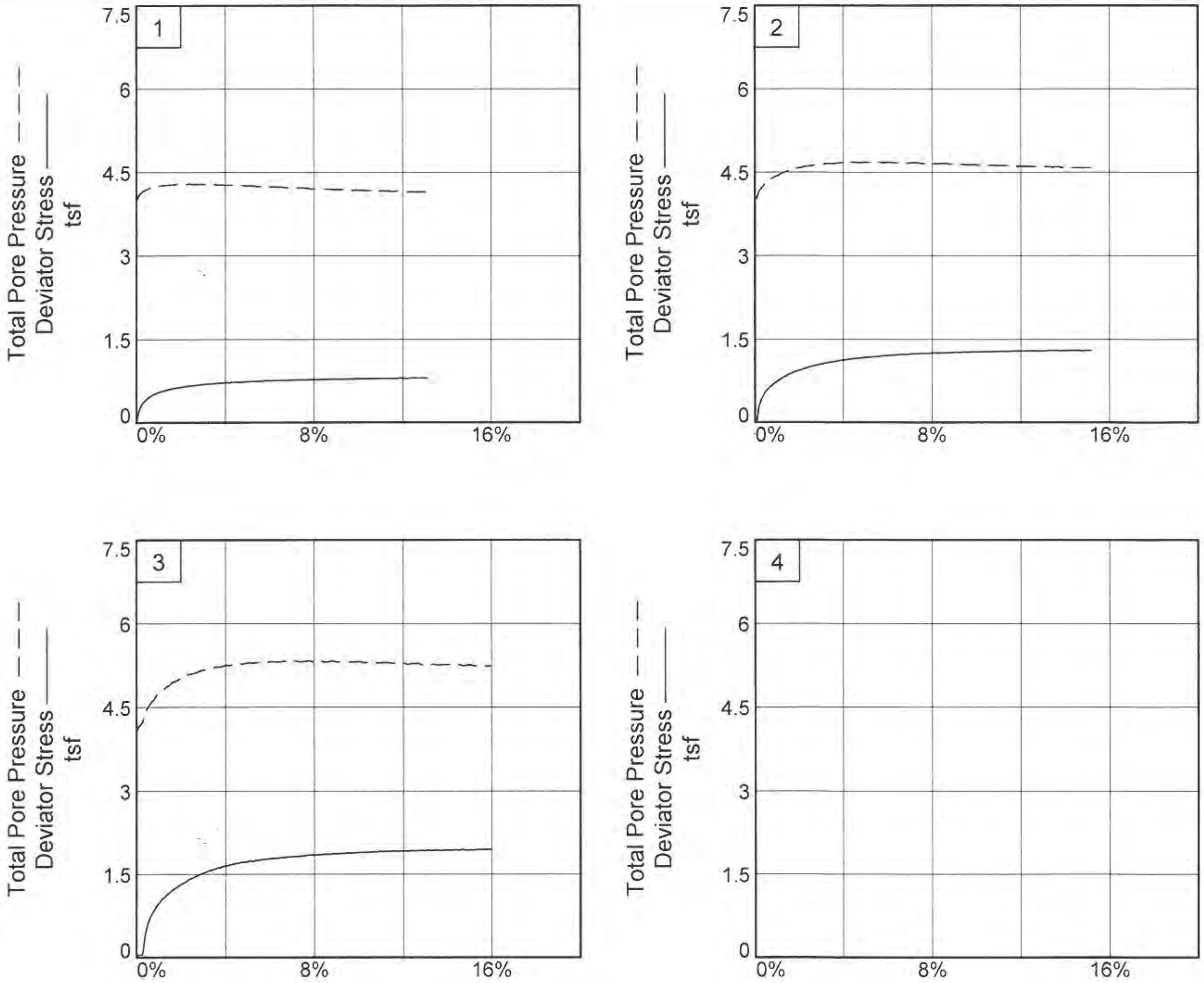
Location: Composite: high plastic clay material (Standard Proctor)

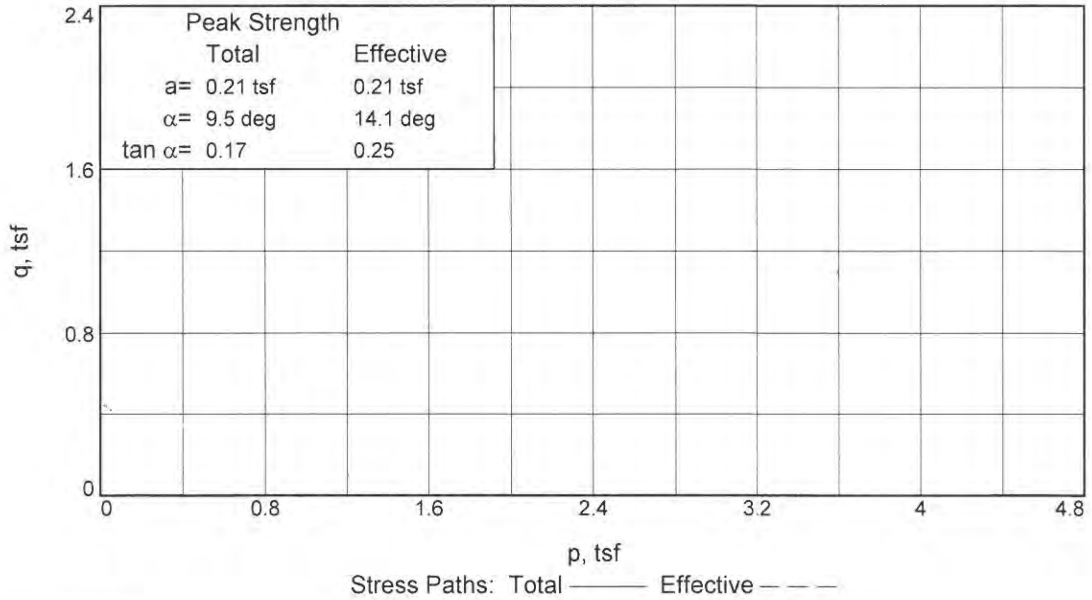
Proj. No.: 2008012455 **Date Sampled:** 7/6/12

REITZ & JENS, INC.
CONSULTING ENGINEERS

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

SCHEDULE CJG-ST1





Peak Strength

	Total	Effective
a=	0.21 tsf	0.21 tsf
α=	9.5 deg	14.1 deg
tan α=	0.17	0.25

Client: Ameren Missouri

Project: Labadie Plant Utility Waste Landfill

Location: Composite: high plastic clay material (Standard Proctor)

Project No.: 2008012455 **Figure** ______

REITZ & JENS, INC.

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

SCHEDULE CJG-ST1

TRIAXIAL CELL SETUP & TAKEDOWN

Project Ameren UE - Callaway Clay Date 6/27/12

Sample ± 25-27% M Depth Compacted using Standard Proctor Method

Description tan + golden HP Clay

Type of Test CU Confining Pressure Differential 7 psi

Cell Number 1 Saturate [✓ before] after Consolidation

Number of Membranes 2 Filter Strips [✓ Yes] No

MOISTURE CONTENT

	INITIAL		FINAL
Tare No.	56	22	Bowl 1
Wet Wt. + Tare	117.37	129.51	605.78
Dry Wt. + Tare	97.08	107.16	513.96
Wt. Water			
Tare Wt.	21.55	22.06	195.04
Dry Soil Wt.			
Moisture %	26.863	26.263	28.791
Avg. w %			

LENGTH CHANGE

STRAIN GAUGE at setup 500

at saturation start 500

at consolidation start 583 (483?

at axial load start 522

MASS PROPERTIES

Wt. Tube + Soil		gm.
Wt. Tube		gm.
Wt. Soil	404.81	gm.
Tube Diameter		in.
Sample Length		in
tube length		in.
top trim		in.
bottom trim		in.
total trim		in.
sample length		in.
Density constant 4.85/(D^2 * L)		
Wet Density		pcf.
Dry Density		pcf.

SPECIMEN DIMENSIONS in. / mm.

	HEIGHT		DIAMETER	
	Initial	Final	Initial	Final
1	4.0795		T 1.9775	
2	4.0825		M 1.9920	
3	4.0815		B 2.0190	
Avg.	4.08117		1.99617	

Description After Test

Remarks

Failure Sketch

Trimmed By JRL
Trimmed Date 6/27/12

Setup By JRL
Setup Date 6/27/12

Taken Down By KLK
Take Down Date 6-5-12

REITZ & JENS, INC. Consulting Engineers

SCHEDULE CJG-ST1

Sheet ____ of ____

TRIAXIAL CELL SATURATION & BETA FACTOR

PROJECT Ameren Callaway Clay borrom

SAMPLE ≈ 25-276 M DEPTH

INITIAL CELL PRESSURE 51.0 START DATE 6/27/12

INITIAL PORE PRESSURE 50.0 CELL NUMBER 1

INITIAL TRANSDUCER READING 51.8 TRANSDUCER NUMBER 1

TRIAL DATE	TRIAL TIME	BASE BURETTE READING	CELL PRESSURE	TRANS-DUCER READING	CHANGE IN PRESSURE Transducer Constant			
					CELL DELTA (1)	TRANSDUCER		BETA FACTOR (2/1)
						READING CHANGE	PRESSURE CHANGE (2)	
6/29/12	0	7.90	50.0	51.1				
	1	↓	56.0	56.1	5.0		5.0	1.00
	2			56.1	5.0		5.0	1.00
	4			56.1	5.0		5.0	1.00
	8			56.1	5.0		5.0	1.00

OK

TRIAXIAL CELL CONSOLIDATION TEST

PROJECT Ameren Callaway Clay Borrow

SAMPLE ≈ 25-2790M DEPTH 7 psi

CONSOLIDATION CELL PRESSURE 62.0 CELL NUMBER 1

CONSOLIDATION PORE PRESSURE 55.0

DATE	Δ TIME	BURETTE READING	DELTA VOLUME	SUM DELTA VOLUME	~~DELTA~~ TIME	TEMP	REMARKS
7/2/12	0	10.00			10:00		
	6sec	9.48					
	15sec	9.34					
	30sec	9.25					
	1 min	9.13			10:01		
	2	9.01			10:02		
	4	8.87			10:04		
	8	8.70			10:08		
	15	8.52			10:15		
	30	8.25			10:30		
	60	7.90			11:00		
	90	7.63			11:30		
	120	7.41			12:00		
	150	7.23			12:30		
	185	7.03			13:05		
	240	6.77			14:00		
	300	6.54			15:00		
395	~~360~~	6.25			~~16:00~~	1635	
7/3/12	1280	5.28			7:20		
7/3/12	1725	5.18			13:05		
7/4/12	2786	4.99			8:26		
7/5/12	4160	4.92			7:20		

1440
160
1280

+1440
185
1725

17
2880
-94
2786

REITZ & JENS, INC. Consulting Engineers Sheet SCHEDULE CJG-ST1 of

TRIAXIAL CELL AXIAL LOADING TEST

DATE 7-5-12

PROVING RING ________

PROJECT Ameren

SAMPLE Callaway Clay Borrow

DEPTH ≈25% to 27% Moisture Compacted to Standard Proctor

INITIAL CELL PRESSURE 62.0

CELL NUMBER 1

INITIAL PORE PRESSURE 55.0

START DATE 7-5-12

SAMPLE HEIGHT: AT SETUP ≈4.06 inches

AT START OF LOADING ________

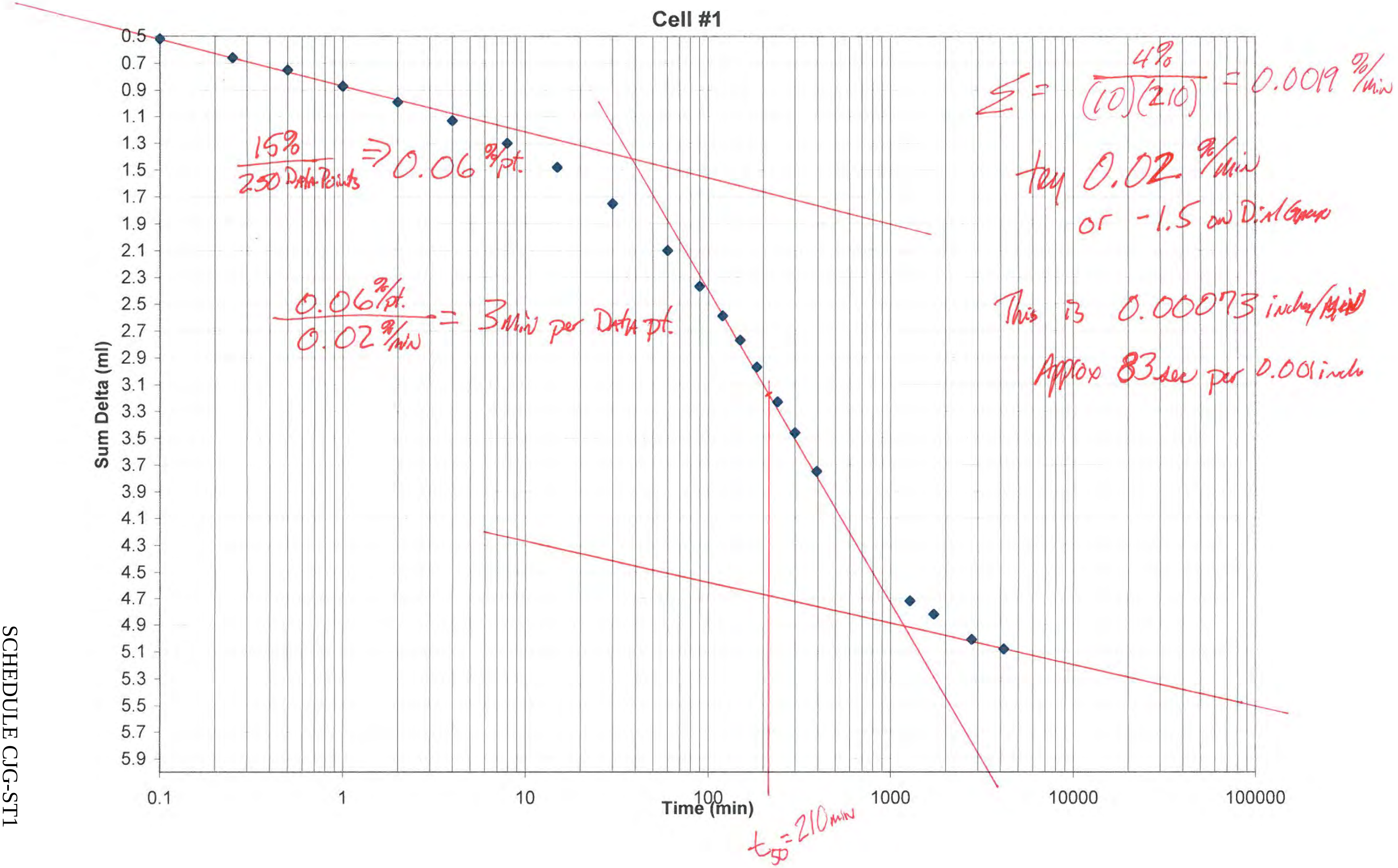
STRAIN RATE ≈ 0.02 %/min

TYPE OF TEST CU

58

TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING	TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING
8:31 AM	10	19.0	55.7				

MASS OF TOP CAP & POROUS STONE: ________ g.



$\frac{15\%}{250 \text{ Data Points}} \Rightarrow 0.06 \%/\text{pt.}$

$\frac{0.06 \%/\text{pt.}}{0.02 \%/\text{min}} = 3 \text{min per Data pt.}$

$t_{50} = 210 \text{min}$

$\Sigma = \frac{4\%}{(10)(210)} = 0.0019 \%/\text{min}$

try 0.02 %/min

or -1.5 on Dial Gauge

This is 0.00073 inches/min

Approx 83 sec per 0.001 inch

TRIAXIAL CELL SETUP & TAKEDOWN

Project Ameren Callaway Borrow

Date 7-6-12

Sample CLAY @ 25-27%

Depth Compacted @ Standard Proctor

Description HP CLAY Grey & golden tan, Trace Lignite & Limonite

Type of Test CW

Confining Pressure Differential 20 psi

Cell Number 2

Saturate [✓ before] after Consolidation

Number of Membranes 2

Filter Strips [✓ Yes] No

LENGTH CHANGE

STRAIN GAUGE at setup 500

at saturation start 500

at consolidation start 491

at axial load start 579

MOISTURE CONTENT

	INITIAL		FINAL
Tare No.	R-123	L-77	Bowl C
Wet Wt. + Tare	333.79	307.97	987.93
Dry Wt. + Tare	270.53	250.95	896.40
Wt. Water			
Tare Wt.	33.06	36.78	554.94
Dry Soil Wt.			
Moisture %	26.639	26.624	26.305
Avg. w %			

MASS PROPERTIES

Wt. Tube + Soil		gm.
Wt. Tube		gm.
Wt. Soil	432.73	gm.
Tube Diameter		in.
Sample Length		in
tube length		in.
top trim		in.
bottom trim		in.
total trim		in.
sample length		in.
Density constant		
4.85/(D^2 * L)		
Wet Density		pcf.
Dry Density		pcf.

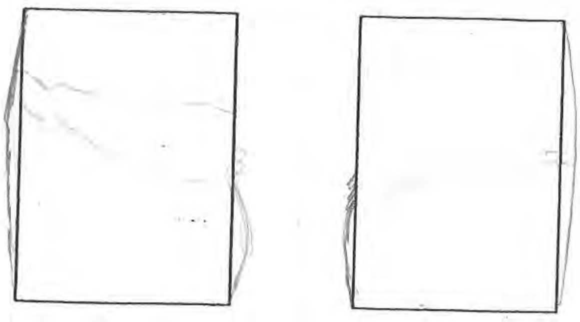
SPECIMEN DIMENSIONS in. / mm.

	HEIGHT		DIAMETER	
	Initial	Final	Initial	Final
1	4.3280		T 2.0025	
2	4.3240		M 1.9985	
3	4.3310		B 2.0065	
Avg.	4.32767		2.0005	

Description After Test

Remarks

Failure Sketch



Trimmed By KEK
Trimmed Date 7-6-12

Setup By KEK
Setup Date 7-6-12

Taken Down By KEK
Take Down Date 7-11-12

revised 2/12/98

REITZ & JENS, INC. Consulting Engineers

Sheet ________ of ________

TRIAXIAL CELL SATURATION & BETA FACTOR

PROJECT Ameren Callaway Borrow

SAMPLE HP CLAY @ 25% to 27% Moisture DEPTH Compacted to Standard Proctor

INITIAL CELL PRESSURE 51.0 START DATE 7-6-12

INITIAL PORE PRESSURE 50.0 CELL NUMBER 2

INITIAL TRANSDUCER READING 51.0 TRANSDUCER NUMBER 2

TRIAL DATE	TRIAL TIME	BASE BURETTE READING	CELL PRESSURE	TRANS-DUCER READING	CHANGE IN PRESSURE Transducer Constant ____			
					CELL DELTA (1)	TRANSDUCER		BETA FACTOR (2/1)
						READING CHANGE	PRESSURE CHANGE (2)	
7-9-12	0	8.70	51.0	50.6				
	1		56.0	55.6	5.0		5.0	1.0
	2		"	55.6	5.0		5.0	1.0
	4 min		"	55.6	5.0		5.0	1.0

OK

REITZ & JENS, INC. Consulting Engineers Sheet ____ of ____

SCHEDULE CJG-ST1

TRIAXIAL CELL CONSOLIDATION TEST

PROJECT Ameren Callaway Burrow

SAMPLE HP CLAY @ 25% to 27% Moisture DEPTH Compacted to Standard Proctor

CONSOLIDATION CELL PRESSURE 75.0 CELL NUMBER 2

CONSOLIDATION PORE PRESSURE 55.0

DATE	TIME	BURETTE READING	DELTA VOLUME	SUM DELTA VOLUME	DELTA TIME	TEMP	REMARKS
7-9-12	7:45	10.00			0		
		8.93			.1		
		8.72			.25		
		8.50			.5		
	7:46	8.28			1		
	7:47	8.05			2		
	7:49	7.77			4		
	7:53	7.44			8		
	~~8:00~~				~~15~~		
	8:15	6.47			30		
	8:45	5.68			60		
	9:15	5.08			90		
	9:45	4.58			120		
	10:45	3.76			180		
	11:45	3.10			240		
	13:46	2.10			360		
	16:06	1.24			500		
	16:28	1.15/10.00			520		
7-10-12	8:11	7.44			1465		1 min Loss during Adjustment
	12:24	7.20			1718		
	15:37	7.07			1911		

120
20
140

1440,
25
1465

REITZ & JENS, INC. Consulting Engineers Sheet ______ of ______

SCHEDULE CJG-ST1

TRIAXIAL CELL AXIAL LOADING TEST

DATE 7-10-12

PROVING RING

PROJECT Ameren Callaway CLAY Borrow

SAMPLE CLAY @ 25% to 27% Compacted @ DEPTH the Standard Proctor

INITIAL CELL PRESSURE 75.0

CELL NUMBER 2

INITIAL PORE PRESSURE 55.0

START DATE

SAMPLE HEIGHT: AT SETUP

AT START OF LOADING

STRAIN RATE ≈ 0.02 %/min

TYPE OF TEST CU

TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING	TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING
16:19:30	6	22.8	55.6				

MASS OF TOP CAP & POROUS STONE: ________ g.

REITZ & JENS, INC. Consulting Engineers

SCHEDULE CJG-ST1

Sheet ________ of ________

TRIAXIAL CELL SETUP & TAKEDOWN

Project Ameren Callaway CLAY Borrow Date 7-6-12

Sample CLAY @ 25% -27% M Depth Compacted with Standard Proctor

Description CLAY (CH), Gray & Goldenbrown, with Lig & Lim.

Type of Test CIU Confining Pressure Differential 40 psi

Cell Number 1 Saturate [✓ before] after Consolidation

Number of Membranes 2 Filter Strips [✓ Yes] No

LENGTH CHANGE

STRAIN GAUGE at setup 500

at saturation start 500

at consolidation start 488

at axial load start 615

MOISTURE CONTENT

	INITIAL		FINAL
Tare No.	R 32	B 38	Bowl 3A
Wet Wt. + Tare	311.62	345.24	592.19
Dry Wt. + Tare	254.90	280.92	513.60
Wt. Water			
Tare Wt.	41.30	41.29	197.02
Dry Soil Wt.			
Moisture %	26.554	26.841	
Avg. w %			

MASS PROPERTIES

Wt. Tube + Soil		gm.
Wt. Tube		gm.
Wt. Soil	400.99	gm.
Tube Diameter		in.
Sample Length		in
tube length		in.
top trim		in.
bottom trim		in.
total trim		in.
sample length		in.
Density constant 4.85/(D^2 * L)		
Wet Density		pcf.
Dry Density		pcf.

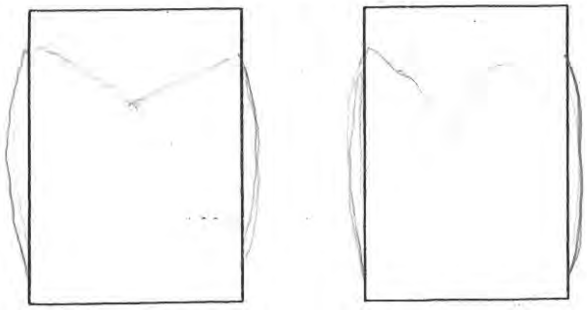
SPECIMEN DIMENSIONS in. / mm.

	HEIGHT		DIAMETER		
	Initial	Final		Initial	Final
1	4.0340		T	1.9955	
2	4.0420		M	1.9895	
3	4.0435		B	1.9900	
Avg.	4.03983			1.99167	

Description After Test

Remarks

Failure Sketch



Trimmed By KEK
Trimmed Date 7-6-12

Setup By KEK
Setup Date 7-6-12

Taken Down By KEK
Take Down Date 7-12-12

revised 2/12/98

REITZ & JENS, INC. Consulting Engineers

SCHEDULE CJG-ST1

Sheet ______ of ______

TRIAXIAL CELL SATURATION & BETA FACTOR

PROJECT Callaway CLAY

SAMPLE CLAY CH 25%-27% Moisture DEPTH Compacted with Standard Proctor

INITIAL CELL PRESSURE 51.0 START DATE 7-6-12

INITIAL PORE PRESSURE 50.0 CELL NUMBER 1

INITIAL TRANSDUCER READING 51.4 TRANSDUCER NUMBER 1

CHANGE IN PRESSURE

Transducer Constant ____

TRIAL DATE	TRIAL TIME	BASE BURETTE READING	CELL PRESSURE	TRANS-DUCER READING	CELL DELTA (1)	TRANSDUCER READING CHANGE	TRANSDUCER PRESSURE CHANGE (2)	BETA FACTOR (2/1)
7-9-12	0	8.04	50.0	50.8				
	1		56.0	55.8	5.0		5.0	1.0
	2		"	55.8	5.0		5.0	1.0
	4 min		"	55.8	5.0		5.0	1.0

OK

ReSat. After Leak.

TRIAL DATE	TRIAL TIME	BASE BURETTE READING	CELL PRESSURE	TRANS-DUCER READING	CELL DELTA (1)	TRANSDUCER READING CHANGE	TRANSDUCER PRESSURE CHANGE (2)	BETA FACTOR (2/1)
7-9-12	0	1.87	51.0	51.1				
	1		56.0	56.1	5.0		5.0	1.0
	2		"	56.1	5.0		5.0	1.0
	4		"	56.1	5.0		5.0	1.0

TRIAXIAL CELL CONSOLIDATION TEST

PROJECT Ameren Callaway Borrow

SAMPLE HP CLAY @ 25% to 27% Moisture DEPTH Compacted to Standard Proctor

CONSOLIDATION CELL PRESSURE 95.0 CELL NUMBER 1

CONSOLIDATION PORE PRESSURE 55.0

DATE	TIME	BURETTE READING	DELTA VOLUME	SUM DELTA VOLUME	DELTA TIME	TEMP	REMARKS
7-9-12	7:50	10.00			0		
		9.20			.1		
		8.65			.25		
		8.41			.5		
	7:51	8.16			1		
	7:52				2		
	7:54				4		
	7:58				8		
	8:05				15		
	8:20				30		
	8:50				60		
	9:20				90		
	9:50				120		

Stop! Leaking

ReSaturation

DATE	TIME	BURETTE READING	DELTA VOLUME	SUM DELTA VOLUME	DELTA TIME	TEMP	REMARKS
7-10-12	8:25	10.00			0		
		9.13			.1		
		8.95			.25		
		8.78			.5		
	8:26	8.58			1		
	8:27	8.34			2		
	8:29	8.02			4		
	8:33	7.59			8		
	8:40	7.08			15		
	8:55	6.30			30		
	9:25	5.23			60		
	9:55	4.41			90		
	10:25	3.74			120		
	11:25	2.62			180		
	12:25	1.71			240		

Ran water out top of burette will Run test at slowest Rate same As 20psi Sample

REITZ & JENS, INC. Consulting Engineers Sheet SCHEDULE CJG-ST1 of

TRIAXIAL CELL AXIAL LOADING TEST

DATE ____________

PROVING RING ____________

PROJECT ____________

SAMPLE ____________ DEPTH ____________

INITIAL CELL PRESSURE 95.0 CELL NUMBER 1

INITIAL PORE PRESSURE 55.0 START DATE ____________

SAMPLE HEIGHT: AT SETUP ____________ AT START OF LOADING ____________

STRAIN RATE ≈0.02 TYPE OF TEST CU

TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING	TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING
16:14:30	4	27.4	55.5				

MASS OF TOP CAP & POROUS STONE: ________ g.

REITZ & JENS, INC. Consulting Engineers Sheet ________ of ________

SCHEDULE CJG-ST1

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Appendix B

LABORATORY TESTING OF
COAL COMBUSTION PRODUCTS
FROM LABADIE ENERGY CENTER
Revised August 2013

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APPENDIX B
LABORATORY TESTING OF LABADIE CCP MATERIALS
TABLE OF CONTENTS

NON-PONDED DRY FLY ASH FROM PRECIPITATORS

PONDED FLY ASH FROM EXISTING OPERATION

BOTTOM ASH FROM EXISTING OPERATION

COMBINATIONS OF FLY ASH, BOTTOM ASH, AND GYPSUM

SPECIFIC GRAVITY OF SOLIDS

Pycnometer Method

JOB: Ameren; Labadie CCP Testing
DATE: 8/13/10
BORING: Labadie Dry Fly Ash
TEST BY: J. David
SAMPLE: Bulk
COMPUTED BY: K: Kocher

Sample or Specimen No.			1	2	
Flask No.			7	7	
Temperature of water and soil, T, °C			21.5	21.5	
Dish No.					
Weight in Grams	Dish + Dry Soil				
	Dish				
	Dry soil	W_s	50.05	50.05	
	Flask + water at T, °C	W_{bw}	679.33	679.28	
	$W_s + W_{bw}$		729.38	729.33	
	Flask + water + immersed soil	W_{bws}	729.38	711.88	
	Displaced water, $W_s + W_{bw} - W_{bws}$		17.50	17.45	
Correction factor		K	.99968	.99968	
$(W_sK) / (W_s + W_{bw} - W_{bws})$		G_s	2.86	2.87	

Sample Description

#1 Dry fly ash, tan, from precipitators

#2 Dry fly ash, tan, from precipitators

Flask Calibration	Trial				
Weight	Completed				
Temp.	Annually				

REITZ & JENS, INC.

SPECIFIC GRAVITY OF SOLIDS

Pycnometer Method

JOB: Ameren CCP Ash Study
BORING: Labadie
SAMPLE: Fly Ash

DATE: 8/13/10
TEST BY: JR
COMPUTED BY: K. Kocher & J. David

Sample or Specimen No.		—			
Flask No.		7			
Temperature of water and soil, T, °C		21.5	[illegible]		
Dish No.		—			
Weight in Grams: Dish + Dry Soil					
Dish					
Dry soil	W_s	50.05		50.05	
Flask + water at T, °C	W_{bw}	~~679.33~~	[illegible]	~~679.28~~	[illegible]
$W_s + W_{bw}$		~~729.38~~	[illegible]	~~729.33~~	[illegible]
Flask + water + immersed soil	W_{bws}	711.88		711.88	
Displaced water, $W_s + W_{bw} - W_{bws}$		~~17.50~~	[illegible]	~~17.45~~	17.384
Correction factor	K	~~.99968~~	[illegible]	~~.99968~~	0.99945
$(W_sK) / (W_s + W_{bw} - W_{bws})$	G_s	~~2.866~~	2.873	2.87	2.884

50.03398/

2010
OK

Average
OK

Sample Description

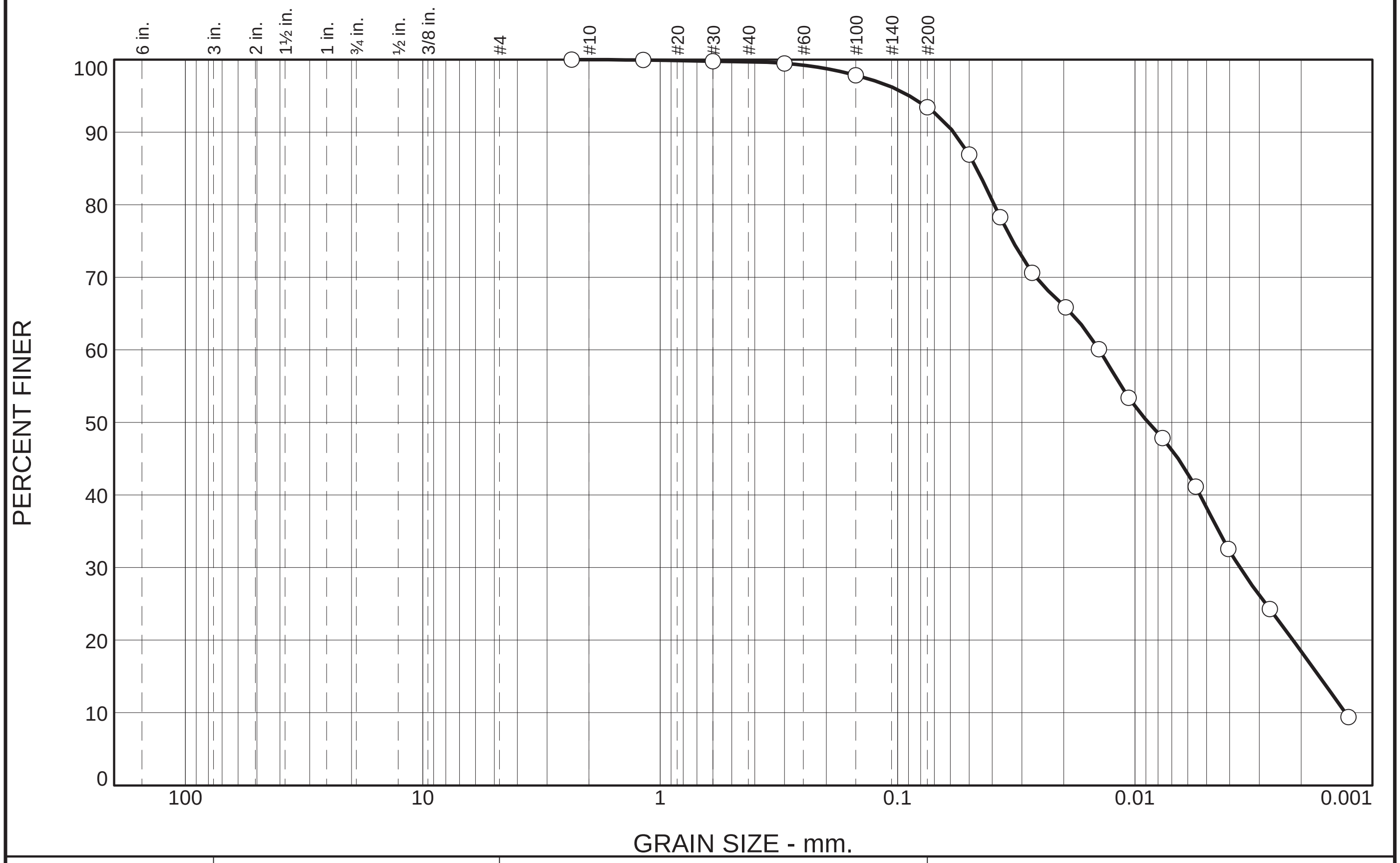
#1

#2 Tan Fly Ash (Non-Ponded)

Flask Calibration	Trial				
Weight					
Temp.					

REITZ & JENS, INC.

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.3	6.3	55.1	38.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#16	100.0		
#30	99.8		
#50	99.5		
#100	97.9		
#200	93.4		

* (no specification provided)

Material Description

Tan, dry fly ash, with SHMP

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.0464 D_{60}= 0.0141 D_{50}= 0.0088
D_{30}= 0.0036 D_{15}= 0.0017 D_{10}= 0.0013
C_u= 10.86 C_c= 0.71

Date Tested: 1/15/09 **Tested By:** C. Cook

Remarks

Sample No.: Bulk **Source of Sample:** Non-Ponded Dry Fly Ash from Precipitator **Date Sampled:** 12/13/2008
Location: Labadie Fly Ash **Elev./Depth:**
Checked By: K. Kocher **Title:** P.E.

REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project No: 2008012455 **Figure**

Tested By: CWC **Checked By:** KEK

GRAIN SIZE DISTRIBUTION TEST DATA

5/20/2011

Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project Number: 2008012455
Location: Labadie Fly Ash
Sample Number: Bulk
Material Description: Tan, dry fly ash, with SHMP
Sample Date: 12/13/2008
Tested By: C. Cook **Test Date:** 1/15/09
Checked By: K. Kocher **Title:** P.E.
Sieve opening list: (Default opening sizes)

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 174.51
Tare Wt. = 171.18
Minus #200 from wash = 93.3%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
49.99	0.00	0.00	#8	0.00	100.0
			#16	0.01	100.0
			#30	0.11	99.8
			#50	0.25	99.5
			#100	1.07	97.9
			#200	3.28	93.4

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 100.0
Weight of hydrometer sample =49.99
Hygroscopic moisture correction:
Moist weight and tare = 0.10
Dry weight and tare = 0.10
Tare weight = 0.00
Hygroscopic moisture = 0.0%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -5
Meniscus correction only = 1.0
Specific gravity of solids = 2.86
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
0.50	21.9	50.0	45.4	0.0126	51.0	7.9	0.0500	86.9
1.00	21.9	45.5	40.9	0.0126	46.5	8.7	0.0370	78.3
2.00	21.9	41.5	36.9	0.0126	42.5	9.3	0.0271	70.6
4.00	21.9	39.0	34.4	0.0126	40.0	9.7	0.0196	65.9
8.00	21.9	36.0	31.4	0.0126	37.0	10.2	0.0142	60.1
15.00	21.9	32.5	27.9	0.0126	33.5	10.8	0.0107	53.4
30.00	22.3	29.5	25.0	0.0125	30.5	11.3	0.0077	47.8
60.00	22.3	26.0	21.5	0.0125	27.0	11.9	0.0056	41.1
120.00	22.4	21.5	17.0	0.0125	22.5	12.6	0.0040	32.6
278.00	23.4	16.9	12.7	0.0123	17.9	13.4	0.0027	24.3
1439.00	22.0	9.5	4.9	0.0125	10.5	14.6	0.0013	9.4

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	0.3	6.3	6.6	55.1	38.3	93.4

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0013	0.0017	0.0022	0.0036	0.0088	0.0141	0.0392	0.0464	0.0580	0.0889

Fineness Modulus	C_u	C_c
0.03	10.86	0.71

Reitz & Jens, Inc.

GRAIN SIZE ANALYSIS

(Hydrometer Method)

CWL 1/15/09

Job AMEREN ASH TESTING

Boring No. LABADIE Dry ASH w/ NAX

Depth Bulk

Sample No.

Meniscus Correction (Cm) 1.0

$\% \text{ finer} = \frac{Rc \times A}{Wo} \times 100$

Lab test by CWL Date 1/15/09

Computed by KEK Date 1/19/09

Checked by KEK Date 1/19/09

Hydrometer No. RJ-1

Graduate No. 3

Date	Time	*Elapsed Time Min.	Temp C	Hydro Reading (R)	$R^1 = R + C_m$	Particle Diameter (D) MM.	Composite Correction C_c	$Rc = R - C_c$	Percent* Finer	
									Partial	Total
1/19/09	0857		21.9							
		0.5		50						
	58	1.0		45.5						
	59	2.0		41.5						
	0901	4.0		39.0						
	0905	8.0		36.0						
	0912	15		32.5						
	0927	30	22.3	29.5						
	0957	60.		26.0						
	10:57	120	22.4	21.5						
	[illegible]	[illegible]	23.4							
	13:35	278	[illegible]	16.9						
1-20-09	08:56	1439	22.0	9.5						

Weight In Grams	Dish + Dry Soil	(gm)	
	Dish	(gm)	
	Dry Soil	(gm)	

Notes on ASTM Procedure:

1. Cylinder and contents to be turned upside down and back for 60 turns in 60 seconds (counting turn upside down and back as two turns).
2. Hydrometer to be removed from suspension between readings and placed in clean water (spin).

Sample description & Remarks SOIL: 49.99g NAX: 5.03g

REITZ & JENS, INC.

GRAIN SIZE ANALYSIS

(Sieve or Screen Method)

Project: Ameren Ash Testing
Boring No.: Labadie Ash w/Hex
Sample No.: Bulk
Depth:

Test by: CWK 1/16/09
Entered by: KEK 1/19/09
Checked by: KEK 1/19/09
Testing Date: 1/16/09

U.S. Standard Sieve Size	Sieve Opening (mm)	Sieve Wgt. + Soil (grams)	Sieve Weight (grams)	Weight Retained (grams)	Cumulative Weight Retained (grams)	Percent Finer by Weight
3-in.	**75**					
2-in.	**50**					
1-1/2 in.	**37.5**					
1 in	**25.4**					
3/4-in.	**19.0**					
1/2-in.	**12.7**					
3/8-in.	**9.5**					
#3	6.35					
#4	**4.75**					
#6	3.35					
#8	**2.36**				0.00	
#10	2.00					
#16	**1.18**				0.01	
#18	1.00					
#20	0.85					
#30	**0.60**				0.11	
#35	0.50					
#40	0.425					
#50	**0.300**				0.25	
#60	0.250					
#70	0.212					
#100	**0.150**				1.07	
#120	0.125					
#140	0.106					
#200	**0.075**				3.28	
Pan					3.33 (total)	
Sample Lost in #200 Wash						
Total Weight in Grams						

Pre #200 wash Weights

Soil + Tare:
Tare:
Soil:

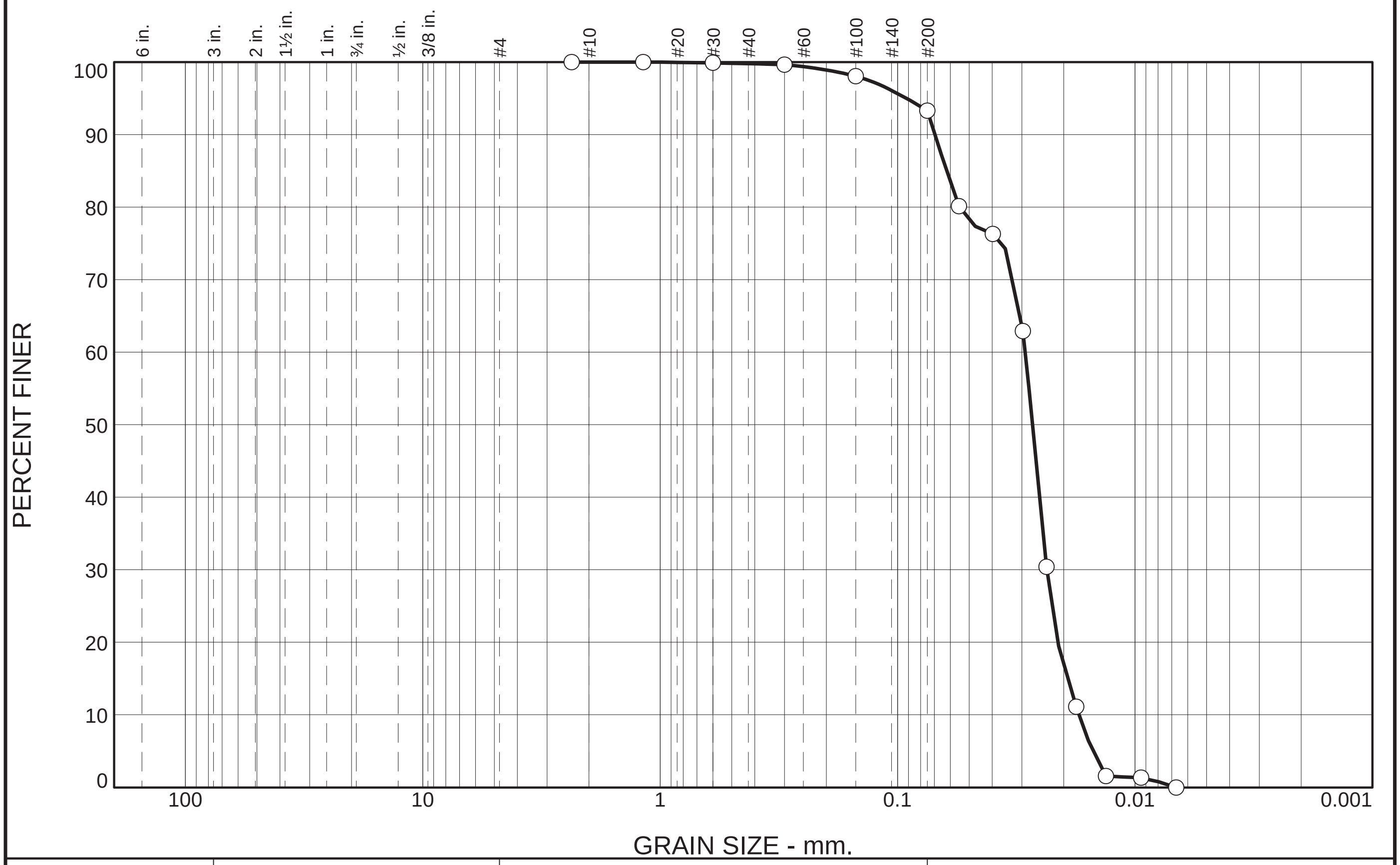
5

Post #200 wash Weights

Soil + Tare: 174.51
Tare: 171.18
Soil: 3.33

Sample Description & Remarks: Labadie Dry Fly Ash

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	6.5	93.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#16	100.0		
#30	99.9		
#50	99.7		
#100	98.1		
#200	93.3		

* (no specification provided)

Material Description

Tan, dry fly ash, without SHMP

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 0.0625 D_{60}= 0.0290 D_{50}= 0.0270

D_{30}= 0.0235 D_{15}= 0.0194 D_{10}= 0.0172

C_u= 1.69 C_c= 1.11

Date Tested: 1/15/09 **Tested By:** C. Cook

Remarks

Sample No.: Bulk **Source of Sample:** Non-Ponded Dry Fly Ash from Precipitators **Date Sampled:** 12/13/08

Location: Labadie Fly Ash **Elev./Depth:**

Checked By: K. Kocher **Title:** P.E.

REITZ & JENS, INC.
CONSULTING ENGINEERS

Client: Ameren Missouri

Project: CCP Properties, Labadie Plant

Project No: 2008012455 **Figure**

Tested By: CWC **Checked By:** KEK

GRAIN SIZE DISTRIBUTION TEST DATA

5/20/2011

Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project Number: 2008012455
Location: Labadie Fly Ash
Sample Number: Bulk
Material Description: Tan, dry fly ash, without SHMP
Sample Date: 12/13/08
Tested By: C. Cook **Test Date:** 1/15/09
Checked By: K. Kocher **Title:** P.E.
Sieve opening list: (Default opening sizes)

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 173.76
Tare Wt. = 170.11
Minus #200 from wash = 92.7%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
50.05	0.00	0.00	#8	0.00	100.0
			#16	0.00	100.0
			#30	0.05	99.9
			#50	0.17	99.7
			#100	0.96	98.1
			#200	3.35	93.3

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 100.0
Weight of hydrometer sample =49.99
Hygroscopic moisture correction:
Moist weight and tare = 0.10
Dry weight and tare = 0.10
Tare weight = 0.00
Hygroscopic moisture = 0.0%
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = 0
Meniscus correction only = 1.0
Specific gravity of solids = 2.87
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
0.50	19.8	42.0	41.9	0.0129	43.0	9.2	0.0553	80.1
1.00	19.8	40.0	39.9	0.0129	41.0	9.6	0.0398	76.3
2.00	19.8	33.0	32.9	0.0129	34.0	10.7	0.0297	62.9
4.00	19.8	16.0	15.9	0.0129	17.0	13.5	0.0236	30.4
8.00	19.8	5.9	5.8	0.0129	6.9	15.2	0.0177	11.1
15.00	19.8	0.9	0.8	0.0129	1.9	16.0	0.0133	1.6
30.00	19.2	0.9	0.7	0.0129	1.9	16.0	0.0095	1.3
60.00	19.2	0.2	0.0	0.0129	1.2	16.1	0.0067	0.0

REITZ & JENS, INC.

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	0.2	6.5	6.7			93.3

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0172	0.0194	0.0211	0.0235	0.0270	0.0290	0.0550	0.0625	0.0694	0.0915

Fineness Modulus	C_u	C_c
0.02	1.69	1.11

Reitz & Jens, Inc.

GRAIN SIZE ANALYSIS

(Hydrometer Method)

Cak 1/15/09

Job Ameren - Ash Testing

Boring No. Labadie w/o WAX

Depth Bulk

Sample No.

Meniscus Correction (Cm) 1

% finer $= \frac{Rc \times A}{Wo} \times 100$

Not entered

Lab test by JLC Date 1/16/09

Computed by KEK Date 1/20/09

Checked by KEK Date 1/20/09

Hydrometer No. RJ-1

Graduate No. C

Date	Time	Elapsed Time Min.	Temp C	Hydro Reading (R)	$R^1 = R + C_m$	Particle Diameter (D) MM	Composite Correction C_c	$R_c = R - C_c$	Percent Finer	
									Partial	Total
1/16/09	0915			~~[illegible]~~						
		.5	19^{8}	42						
	0916	1	19^{8}	40						
	0918	2	19^{8}	33						
	0919	4	19^{8}	16						
	0923	8	19^{8}	5.9						
	0930	15	19^{8}	0.9						
	0945	30	19^{2}	0.9						
	1015	60	19^{2}	0.2						

Weight In Grams	Dish + Dry Soil	(gm)	
	Dish	(gm)	
	Dry Soil	(gm)	

Notes on ASTM Procedure:

1. Cylinder and contents to be turned upside down and back for 60 turns in 60 seconds (counting turn upside down and back as two turns).
2. Hydrometer to be removed from suspension between readings and placed in clean water (spin).

Sample description & Remarks 50.04 g Soil / 0g WAX

Labadie Dry Fly Ash

REITZ & JENS, INC.

GRAIN SIZE ANALYSIS

(Sieve or Screen Method)

Project Ameren

Boring No. Labadie Ash w/o NA Hex

Sample No. Bulk

Depth

Test by CWC 1/16/09

Entered by KEK 1/20/09

Checked by KEK 1/20/09

Testing Date 1/16/09

U.S. Standard Sieve Size	Sieve Opening (mm)	Sieve Wgt. + Soil (grams)	Sieve Weight (grams)	Weight Retained (grams)	Cumulative Weight Retained (grams)	Percent Finer by Weight
3-in.	**75**					
2-in.	**50**					
1-1/2 in.	**37.5**					
1 in	**25.4**					
3/4-in.	**19.0**					
1/2-in.	**12.7**					
3/8-in.	**9.5**					
#3	6.35					
#4	**4.75**					
#6	3.35					
#8	**2.36**					
#10	2.00					
#16	**1.18**				0.00	
#18	1.00					
#20	0.85					
#30	**0.60**				0.05	
#35	0.50					
#40	0.425					
#50	**0.300**				0.17	
#60	0.250					
#70	0.212					
#100	**0.150**				0.96	
#120	0.125					
#140	0.106					
#200	**0.075**				3.35	
Pan					3.65 (total)	
Sample Lost in #200 Wash						
Total Weight in Grams						

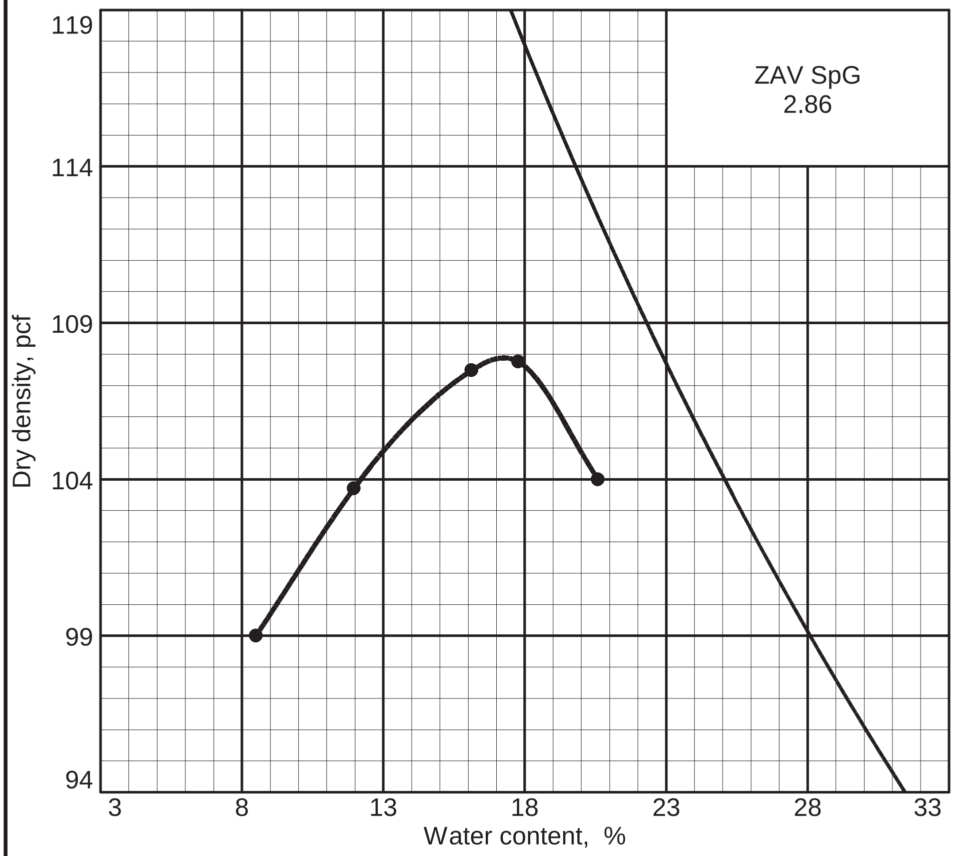
Pre #200 wash Weights	
Soil + Tare	
Tare	170.11
Soil	

11

Post #200 wash Weights	
Soil + Tare	173.76
Tare	170.11
Soil	3.65

Sample Description & Remarks Labadie Dry Fly Ash

MOISTURE-DENSITY TEST REPORT



Curve No.

Test Specification:
ASTM D 698-91 Procedure A Standard

Preparation Method ASTM
Hammer Wt. 5.5 lb.
Hammer Drop 12 in.
Number of Layers three
Blows per Layer 25
Mold Size .03333 cu.ft.
Test Performed on Material Passing No.4 **Sieve**

NM ______ **LL** ______ **PI** ______
Sp.G. (ASTM D 854) 2.86
%>No.4 ______ **%<No.200** ______
USCS ______ **AASHTO** ______
Date Sampled ______
Date Tested 1/16/2009
Tested By J. David

TESTING DATA

	1	2	3	4	5	6
WM + WS	8.16	8.45	8.74	8.81	8.76	
WM	4.58	4.58	4.58	4.58	4.58	
WW + T #1	194.80	196.98	238.09	252.30	268.45	
WD + T #1	182.39	179.70	210.96	220.27	229.54	
TARE #1	34.62	37.09	41.04	40.28	40.80	
WW + T #2	230.09	240.59	229.53	271.67	355.14	
WD + T #2	215.11	219.44	203.11	236.85	301.54	
TARE #2	40.76	40.18	40.83	40.71	40.82	
MOISTURE	8.5	12.0	16.1	17.8	20.6	
DRY DENSITY	99.0	103.7	107.5	107.8	104.0	

TEST RESULTS

Maximum dry density = 107.9 pcf

Optimum moisture = 17.3 %

Material Description

Tan, dry fly ash

Remarks:

Project No. 2008012455 **Client:** Ameren Missouri
Project: CCP Properties, Labadie Plant

● **Location:** Labadie Fly Ash

REITZ & JENS, INC.
CONSULTING ENGINEERS

Checked by: K. Kocher
Title: P.E.

Figure

SCHEDULE CJG-ST1

MOISTURE DENSITY TEST DATA

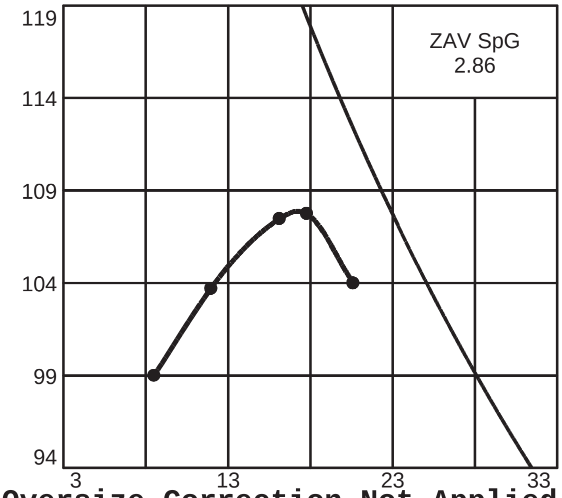
Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project Number: 2008012455

Specimen Data

Source: Non-Ponded Dry Fly Ash from Precipitators
Sample No.: Bulk
Elev. or Depth: **Sample Length(in./cm.):**
Location: Labadie Fly Ash
Description: Tan, dry fly ash
Sample Date:
Preparation Method: ASTM
USCS: **AASHTO:**
NM: **LL:** **PI:**
Testing Remarks:
Tested By: J. David **Test Date:** 1/16/2009
Checked By: K. Kocher **Title:** P.E.
Percent retained on No.4 sieve:
Percent passing No. 200 sieve: **Specific gravity:** 2.86

Test Data And Results

Type of test: ASTM D 698-91 Procedure A Standard
Mold Dia.: 4.00 in. **Hammer Wt.:** 5.5 lb. **Drop:** 12 in.
Layers: three **Blows per Layer:** 25



Oversize Correction Not Applied

POINT NO.	**1**	**2**	**3**	**4**	**5**
WM + WS	8.16	8.45	8.74	8.81	8.76
WM	4.58	4.58	4.58	4.58	4.58
WW+T #1	194.80	196.98	238.09	252.30	268.45
WD+T #1	182.39	179.70	210.96	220.27	229.54
TARE #1	34.62	37.09	41.04	40.28	40.80
MOIST #1	8.4	12.1	16.0	17.8	20.6
WW+T #2	230.09	240.59	229.53	271.67	355.14
WD+T #2	215.11	219.44	203.11	236.85	301.54
TARE #2	40.76	40.18	40.83	40.71	40.82
MOIST #2	8.6	11.8	16.3	17.8	20.6
MOISTURE	8.5	12.0	16.1	17.8	20.6
DRY DEN	99.0	103.7	107.5	107.8	104.0

Max dry den= 107.9 pcf **Opt moisture=** 17.3 %

REITZ & JENS, INC.

MOISTURE DENSITY RELATIONSHIP TEST

(Compaction Curve)

Job Ameren UE Ash Study
Lab Test by JRL Date 1/16/09
Boring No.
Computed by KEK & CWL Date 1/19/09
Depth Bulk
Checked by KEK Date 1/19/09
Sample No. Labadie Fly Ash
Mold Diam. 4" (in)
Mold Vol. 1/30 (cu. ft.) (Vm)
Mold Height 6 (in)

Method of Compaction Standard ASTM

Notes on ASTM Procedure:

1. To obtain moisture content sample, slice molded soil vertically through the center, and immediately take moisture content sample from one face of cut by taking a thin slice from top to bottom. See procedure in Quality Manual.
2. Moisture content sample mass to be: ≥ 100g (A/B) or ≥ 500g (C/D).
3. Only use ram with circular face in compactor for tests on soil.

Test No.	+10%	+13	+16%
Weight of Cylinder & Soil	8.16	8.45	8.74
Weight of Cylinder	4.58	4.58	4.58
Wet Weight of Compacted Soil	3.58	3.87	4.16
Wet Unit Weight - PCF	107.4	116.1	124.8

Moisture Content Determination

Tare No.	R140	B37.	R50	R70	B32	R61
Weight of Sample Wet + Tare	194.80	230.09	196.98	240.59	238.09	229.5
Weight of Sample Dry + Tare	182.36	215.11	179.70	219.44	210.96	203.11
Weight of Water						
Weight of Tare	34.62	40.76	37.09	40.18	41.04	40.83
Weight of Dry Soil						
Moisture Content (%)	8.4	8.6	12.1	11.8	16.0	16.3
Average Moisture Content (%)	8.5		12.0		16.1	
Dry Unit Weight - PCF	99.0		103.7		107.5	

Sample Description & Remarks Raw Dry Fly Ash From Precipitators

REITZ & JENS, INC.

MOISTURE DENSITY RELATIONSHIP TEST

(Compaction Curve)

Job Ameren UE Ash Study

Lab Test by JRD Date 1/16/09

Boring No.

Computed by KEK & CWC Date 1/19/09

Depth Bulk

Checked by KEK Date 1/19/09

Sample No. Labadie Fly Ash dry

Mold Diam. 4" (in)

Mold Vol. 1/30 (cu. ft.) (Vm)

Mold Height 6" (in)

Method of Compaction Standard ASTM

Notes on ASTM Procedure:

1. To obtain moisture content sample, slice molded soil vertically through the center, and immediately take moisture content sample from one face of cut by taking a thin slice from top to bottom. See procedure in Quality Manual.
2. Moisture content sample mass to be: ≥ 100g (A/B) or ≥ 500g (C/D).
3. Only use ram with circular face in compactor for tests on soil.

Test No.	+19	+22	
Weight of Cylinder & Soil	8.81	8.76	
Weight of Cylinder	4.58	4.58	
Wet Weight of Compacted Soil	4.23	4.18	
Wet Unit Weight - PCF	126.9	125.4	

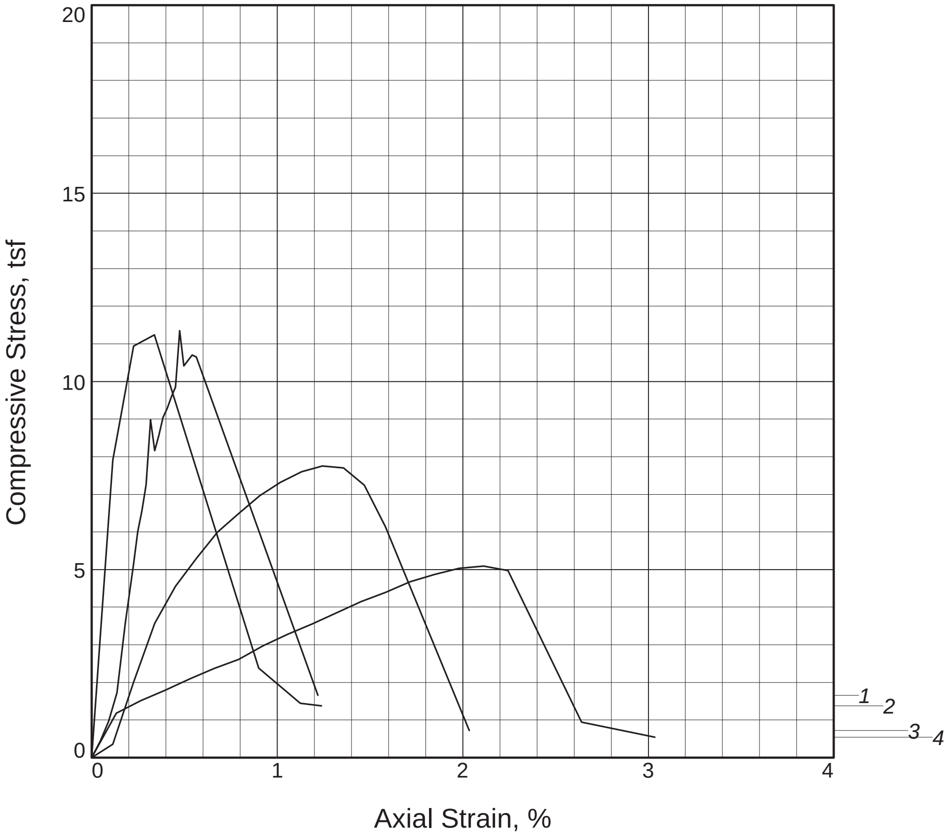
Moisture Content Determination

Tare No.	B-40	B-14	B19	B6		
Weight of Sample Wet + Tare	252.30	271.67	268.45	355.14		
Weight of Sample Dry + Tare	220.27	236.85	229.54	301.54		
Weight of Water						
Weight of Tare	40.28	40.71	40.80	40.82		
Weight of Dry Soil						
Moisture Content (%)	17.8	17.8	20.6	20.6		
Average Moisture Content (%)	17.8		20.6			
Dry Unit Weight - PCF	107.8		104.0			

Sample Description & Remarks oozed out of cylinder

TAN Dry Fly Ash from Precipitators

UNCONFINED COMPRESSION TEST



Sample No.	1	2	3	4
Unconfined strength, tsf	11.351	11.235	7.750	5.092
Undrained shear strength, tsf	5.675	5.618	3.875	2.546
Failure strain,	0.5	0.3	1.2	2.1
Strain rate, %/min.	0.51	0.82	0.92	0.85
Water content, %	11.3	15.5	16.3	20.0
Wet density, pcf	116.1	126.8	127.2	126.8
Dry density, pcf	104.3	109.8	109.4	105.6
Saturation, %	50.1	79.4	82.5	91.8
Void ratio	0.6042	0.5239	0.5295	0.5836
Specimen diameter, in.	1.95	1.96	1.99	2.04
Specimen height, in.	4.43	4.45	4.42	3.79
Height/diameter ratio	2.27	2.27	2.22	1.86

Description: Tan, dry fly ash, from precipitators

LL =	PL =	PI =	Assumed GS= 2.68	Type: Lab Molded Samples

Project No.: 2008012455
Date: 12/13/2008

Remarks:
testing on 01/20/09, samples from standard proctor

Figure _______

Client: Ameren Missouri

Project: CCP Properties, Labadie Plant

Location: Labadie Fly Ash
Sample Number: Bulk

REITZ & JENS, INC.
CONSULTING ENGINEERS

Tested By: CWC & JJP **Checked By:** KEK

SCHEDULE CJG-ST1

UNCONFINED COMPRESSION TEST

5/20/2011

Date: 12/13/2008
Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project No.: 2008012455
Location: Labadie Fly Ash
Sample Number: Bulk
Description: Tan, dry fly ash, from precipitators
Remarks: testing on 01/20/09, samples from standard proctor
Type of Sample: Lab Molded Samples
Assumed Specific Gravity=2.68 **LL=** **PL=** **PI=**

Parameters for Specimen No. 1

Specimen Parameter	Initial
Moisture content: Moist soil+tare, gms.	261.010
Moisture content: Dry soil+tare, gms.	239.040
Moisture content: Tare, gms.	44.560
Moisture, %	11.3
Moist specimen weight, gms.	404.8
Diameter, in.	1.95
Area, in.²	3.00
Height, in.	4.43
Wet Density, pcf	116.1
Dry density, pcf	104.3
Void ratio	0.6042
Saturation, %	50.1

Test Readings for Specimen No. 1

Strain rate, %/min. = 0.51

Unconfined compressive strength = 11.351 tsf **at reading no.** 16

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf
0	0.0000	0.00	0.0	0.0	0.000
1	0.0020	18.50	18.5	0.0	0.444
2	0.0040	40.30	40.3	0.1	0.967
3	0.0060	72.00	72.0	0.1	1.726
4	0.0080	149.00	149.0	0.2	3.571
5	0.0100	215.00	215.0	0.2	5.151
6	0.0110	251.00	251.0	0.2	6.012
7	0.0120	274.00	274.0	0.3	6.561
8	0.0130	303.00	303.0	0.3	7.254
9	0.0140	375.00	375.0	0.3	8.975
10	0.0150	341.00	341.0	0.3	8.160
11	0.0160	358.00	358.0	0.4	8.565
12	0.0170	378.00	378.0	0.4	9.041
13	0.0180	388.00	388.0	0.4	9.278
14	0.0190	401.00	401.0	0.4	9.587
15	0.0200	412.00	412.0	0.5	9.847
16	0.0210	475.00	475.0	0.5	11.351

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf
17	0.0220	436.00	436.0	0.5	10.416
18	0.0230	442.00	442.0	0.5	10.557
19	0.0240	448.00	448.0	0.5	10.698
20	0.0250	446.00	446.0	0.6	10.648
21	0.0540	70.00	70.0	1.2	1.660

Parameters for Specimen No. 2

Specimen Parameter	Initial
Moisture content: Moist soil+tare, gms.	180.510
Moisture content: Dry soil+tare, gms.	162.270
Moisture content: Tare, gms.	44.790
Moisture, %	15.5
Moist specimen weight, gms.	444.3
Diameter, in.	1.96
Area, in.²	3.00
Height, in.	4.45
Wet Density, pcf	126.8
Dry density, pcf	109.8
Void ratio	0.5239
Saturation, %	79.4

Test Readings for Specimen No. 2

Strain rate, %/min. = 0.82

Unconfined compressive strength = 11.235 tsf **at reading no.** 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf
0	0.0000	0.00	0.0	0.0	0.000
1	0.0050	330.00	330.0	0.1	7.906
2	0.0100	457.00	457.0	0.2	10.937
3	0.0150	470.00	470.0	0.3	11.235
4	0.0400	100.00	100.0	0.9	2.377
5	0.0500	61.00	61.0	1.1	1.447
6	0.0550	58.00	58.0	1.2	1.374

Parameters for Specimen No. 3

Specimen Parameter	Initial
Moisture content: Moist soil+tare, gms.	194.690
Moisture content: Dry soil+tare, gms.	173.490
Moisture content: Tare, gms.	43.420
Moisture, %	16.3
Moist specimen weight, gms.	460.4
Diameter, in.	1.99
Area, in.²	3.12
Height, in.	4.42
Wet Density, pcf	127.2
Dry density, pcf	109.4
Void ratio	0.5295
Saturation, %	82.5

Test Readings for Specimen No. 3

Strain rate, %/min. = 0.92

Unconfined compressive strength = 7.750 tsf **at reading no.** 11

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf
0	0.0000	0.00	0.0	0.0	0.000
1	0.0050	15.50	15.5	0.1	0.358
2	0.0100	87.00	87.0	0.2	2.005
3	0.0150	155.00	155.0	0.3	3.569
4	0.0200	198.00	198.0	0.5	4.554
5	0.0250	231.00	231.0	0.6	5.307
6	0.0300	261.00	261.0	0.7	5.989
7	0.0350	283.00	283.0	0.8	6.486
8	0.0400	304.00	304.0	0.9	6.960
9	0.0450	320.00	320.0	1.0	7.318
10	0.0500	332.80	332.8	1.1	7.602
11	0.0550	339.70	339.7	1.2	7.750
12	0.0600	337.90	337.9	1.4	7.701
13	0.0650	318.00	318.0	1.5	7.239
14	0.0700	270.00	270.0	1.6	6.139
15	0.0900	32.00	32.0	2.0	0.724

Parameters for Specimen No. 4

Specimen Parameter	Initial
Moisture content: Moist soil+tare, gms.	217.920
Moisture content: Dry soil+tare, gms.	189.020
Moisture content: Tare, gms.	44.510
Moisture, %	20.0
Moist specimen weight, gms.	410.0
Diameter, in.	2.04
Area, in.²	3.25
Height, in.	3.79
Wet Density, pcf	126.8
Dry density, pcf	105.6
Void ratio	0.5836
Saturation, %	91.8

Test Readings for Specimen No. 4

Strain rate, %/min. = 0.85

Unconfined compressive strength = 5.092 tsf **at reading no.** 15

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf
0	0.0000	0.00	0.0	0.0	0.000
1	0.0050	53.60	53.6	0.1	1.185
2	0.0100	68.70	68.7	0.3	1.517
3	0.0150	81.40	81.4	0.4	1.795
4	0.0200	94.90	94.9	0.5	2.090
5	0.0250	107.90	107.9	0.7	2.373
6	0.0300	118.70	118.7	0.8	2.607
7	0.0350	135.50	135.5	0.9	2.972
8	0.0400	149.70	149.7	1.1	3.279
9	0.0450	162.60	162.6	1.2	3.557
10	0.0550	190.00	190.0	1.5	4.145
11	0.0600	201.90	201.9	1.6	4.399
12	0.0650	214.80	214.8	1.7	4.673
13	0.0700	224.20	224.2	1.8	4.871
14	0.0750	231.80	231.8	2.0	5.030
15	0.0800	235.00	235.0	2.1	5.092
16	0.0850	230.00	230.0	2.2	4.977
17	0.1000	44.00	44.0	2.6	0.948
18	0.1150	25.20	25.2	3.0	0.541

REITZ & JENS, INC.

Unconsolidated Undrained or Unconfined Test

Project Ameren Labadie

Boring No. Am Labadie

Sample No. Labadie Ash

Depth +10% H2O of DRY

Compacted 1/16/09

Test by CWC/JSP

Entered by CWC

Checked by KER

Testing Date 1/20/09

Description of Entire Tube Broke During Trimming

Description of Test Sample Compacted ash sample from Standard Proctor at 99.0pcf & 8.5%M

Moisture Contents		
	Trial 1	Trial 2
Tare #	m-19	m-30
Wet Wt.+Tare	127.52	106.07
Dry Wt.+Tare	119.71	99.83
Wt. of Water		
Tare Wt.	21.66	22.06
Wt. of Soil		
% Moisture	7.97	8.02
Average % Moisture=		7.99

Sample Density	
Wet Wt. of Sample (grams)	
Diameter of Sample (Inches)	D=
Length of Sample (Inches)	L=
Density Constant C = (4.85 / (D^2 * L)	
Wet Density (pcf)	
Dry Density (pcf)	

Failure Sketch

Load: #14

Rate of Load Application 0.5 %/min

Confining Pressure psi

Mass of Top Cap gms

Strain (.001")	Load (lbs)
0	
~~10~~ 1	
~~20~~ 2	
~~30~~ 3	
~~40~~ 4	
~~50~~ 5	
~~60~~ 6	
~~70~~ 7	
~~80~~ 8	
~~90~~ 9	
~~100~~ 10	
~~120~~ 11	
~~140~~ 12	
~~160~~ 13	
~~180~~ 14	
~~200~~ 15	
~~220~~ 16	

Notes:

Strain (.001")	Load (lbs)
~~240~~ 17	
~~260~~ 18	
~~280~~ 19	
~~300~~ 20	
~~350~~ 21	
~~400~~ 22	
~~450~~ 23	
~~500~~ 24	
~~550~~ 25	
600	
650	
700	
750	
800	
850	
900	
1000	

Notes:

REITZ & JENS, INC.

Unconsolidated Undrained or Unconfined Test

Project Ameren - LABADIE
Boring No. Am- Labadie
Sample No. Ash Testing
Depth Nat +13%

COMPACTED
1/16/09

Test by CWC /JJP
Entered by CWC
Checked by KEK
Testing Date 1/20/09

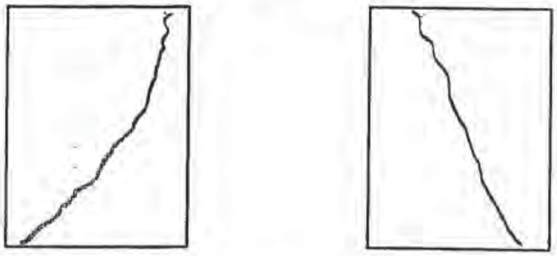
Description of Entire Tube Spec. #1

Description of Test Sample Compacted Ash Sample from Standard Proctor At 103.7 pcf ± 12.0%M

Moisture Contents		
	Trial 1	Trial 2
Tare #	m-27	m-35
Wet Wt.+Tare	127.50	134.01
Dry Wt.+Tare	116.58	122.46
Wt. of Water		
Tare Wt.	22.25	22.31
Wt. of Soil		
% Moisture		
Average % Moisture=	11.3	

Sample Density	
Wet Wt. of Sample (grams)	404.76
Diameter of Sample (Inches)	D= 1.954
Length of Sample (Inches)	L= 4.430
Density Constant C = (4.85 / (D^2 * L)	
Wet Density (pcf)	116.1
Dry Density (pcf)	104.3

Failure Sketch



load: #14

Rate of Load Application 0.513 %/min
Confining Pressure — psi
Mass of Top Cap ____ gms

Strain (.001")	Load (lbs)
0	0
~~10~~ 2	18.5
~~20~~ 4	40.3
~~30~~ 6	72.1
~~40~~ 8	149
~~50~~ 10	215
~~60~~ 11	251
~~70~~ 12	274
~~80~~ 13	303
~~90~~ 14	325
~~100~~ 15	341
~~120~~ 16	358
~~140~~ 17	375
~~160~~ 18	388
~~180~~ 19	401
~~200~~ 20	412
~~220~~ 21	425

Notes:

Strain (.001")	Load (lbs)
~~240~~ 22	436
~~260~~ 23	442
~~280~~ 24	448
~~300~~ 25	446
~~350~~ 54	20
400	
450	
500	
550	
600	
650	
700	
750	
800	
850	
900	
1000	

Notes:

SCHEDULE CJG-ST1

REITZ & JENS, INC.

Unconsolidated Undrained or Unconfined Test

Project AmEREN- LABADIE
Boring No. Am Labadie
Sample No. Ash Testing
Depth Nat + 16%

COMPACTED 1/16/09

Test by CWC / JJP
Entered by CWC
Checked by KEK
Testing Date 1/20/09

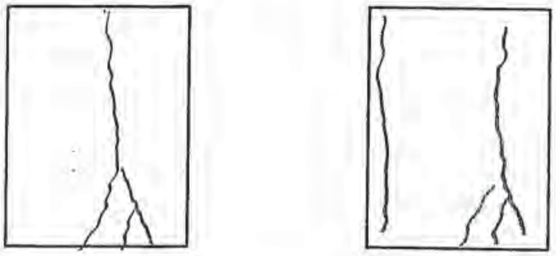
Description of Entire Tube Spec #2

Description of Test Sample Compacted Ash Sample from Standard Proctor at 107.5 pcf & 16.1% M

Moisture Contents		
	Trial 1	Trial 2
Tare #	m-17	m-48
Wet Wt.+Tare	79.67	100.84
Dry Wt.+Tare	71.94	90.30
Wt. of Water		
Tare Wt.	22.49	22.30
Wt. of Soil		
% Moisture		
Average % Moisture=		15.5

Sample Density	
Wet Wt. of Sample (grams)	444.25
Diameter of Sample (Inches)	D= 1.955
Length of Sample (Inches)	L= 4.445
Density Constant C = (4.85 / (D^2 * L)	
Wet Density (pcf)	126.8
Dry Density (pcf)	109.8

Failure Sketch



Load #24

Rate of Load Application 0.8244 %/min
Confining Pressure 0 psi
Mass of Top Cap ______ gms

Strain (.001")	Load (lbs)	Notes:
0	0	
~~10~~ 5	330	
~~20~~ 10	457	
~~30~~ 15	470	Peak
~~40~~ 20		
~~50~~ 25		
~~60~~ 30		
~~70~~ 35		
~~80~~ 40	100	
~~90~~ 45		
~~100~~ 50	61.	
~~120~~ 55	58	
~~140~~ 60		
~~160~~ 65		
~~180~~ 70		
~~200~~ 75		
~~220~~ 80		

Strain (.001")	Load (lbs)	Notes:
~~240~~ 85		
~~260~~ 90		
~~280~~ 95		
~~300~~ 100		
~~350~~ [illegible]		
400		
450		
500		
550		
600		
650		
700		
750		
800		
850		
900		
1000		

N:\Lab Cert\Lab Forms\UU and QU Data Sheet.xls

REITZ & JENS, INC.

Unconsolidated Undrained or Unconfined Test

Project Ameren - Labadie
Test by Cwc / J P
Boring No. Am Labadie
Entered by CWC
Sample No. Ash Testing
Compacted 1/16/09
Checked by KEK
Depth Nat +19%.
Testing Date 1/20/09

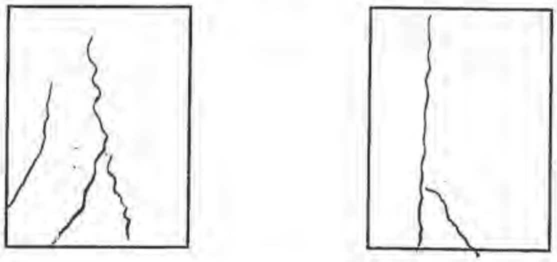
Description of Entire Tube Spec #3

Description of Test Sample Compaction Ash sample from Standard Proctor at 107.8 pcf & 17.8% M

Moisture Contents		
	Trial 1	Trial 2
Tare #	m-41	m-20
Wet Wt.+Tare	95.02	99.67
Dry Wt.+Tare	84.78	88.71
Wt. of Water		
Tare Wt.	21.82	21.60
Wt. of Soil		
% Moisture		
Average % Moisture=		16.3

Sample Density	
Wet Wt. of Sample (grams)	460.40
Diameter of Sample (Inches)	D= 1.992
Length of Sample (Inches)	L= 4.424
Density Constant C = (4.85 / (D^2 * L)	1
Wet Density (pcf)	127.2
Dry Density (pcf)	109.4

Failure Sketch



load*2.4

Rate of Load Application 0.92 %/min
Confining Pressure — psi
Mass of Top Cap ______ gms

Strain (.001")	Load (lbs)
0	0
~~10~~ 5	15.5
~~20~~ 10	87.
~~30~~ 15	155
~~40~~ 20	198
~~50~~ 25	231
~~60~~ 30	261
~~70~~ 35	283
~~80~~ 40	304
~~90~~ 45	320
~~100~~ 50	332.8
~~120~~ 55	339.7
~~140~~ 60	337.9
~~160~~ 65	318
~~180~~ 70	270
~~200~~ 75	
~~220~~ 80	

Notes:

Strain (.001")	Load (lbs)
~~240~~ 85	
~~260~~ 90	32
~~280~~ 95	
~~300~~ 100	
350	
400	
450	
500	
550	
600	
650	
700	
750	
800	
850	
900	
1000	

Notes:

REITZ & JENS, INC.

Unconsolidated Undrained or Unconfined Test

Project AMEREN LABADIE

Boring No. LABADIE ASH +22% MOISTURE

Sample No. COMPACTED 1/16/09

Depth Natural +22% M

Test by CWC / KEK

Entered by CWC

Checked by KEK

Testing Date 1/20/09

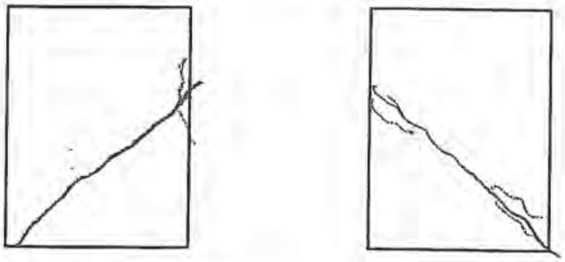
Description of Entire Tube Spec #4

Description of Test Sample Compacted Ash Sample from Standard Proctor at 104.0pcf & 20.6% M

Moisture Contents		
	Trial 1	Trial 2
Tare #	M-8	M-11
Wet Wt.+Tare	104.48	113.44
Dry Wt.+Tare	90.78	98.24
Wt. of Water		
Tare Wt.	22.21	22.30
Wt. of Soil		
% Moisture		
Average % Moisture=	20%	

Sample Density	
Wet Wt. of Sample (grams)	410.01
Diameter of Sample (Inches)	D= 2.035
Length of Sample (Inches)	L= 3.788
Density Constant C = (4.85 / (D^2 * L)	
Wet Density (pcf)	126.8
Dry Density (pcf)	105.6

Failure Sketch



Rate of Load Application 0.85 %/min

Confining Pressure 0 psi

Mass of Top Cap ____ gms

Strain (.001")	Load (lbs)
0	0
~~10~~ 5	53.6
~~20~~ 10	68.7
~~30~~ 15	81.4
~~40~~ 20	94.9
~~50~~ 25	107.9
60 30	118.7
~~70~~ 35	135.5
80 40	149.7
~~90~~ 45	162.6
~~100 [illegible]~~	~~[illegible]~~
~~120~~ 55	190.0
~~140~~ 60	201.9
~~160~~ 65	214.8
~~180~~ 70	224.2
~~200~~ 75	231.8
~~220~~ 80	235.0

Notes:

Strain (.001")	Load (lbs)
~~240~~ 85	230.0
~~260~~ 100	44.0
280 115	25.2
300	
350	
400	
450	
500	
550	
600	
650	
700	
750	
800	
850	
900	
1000	

Notes:

Ameren Missouri; Labadie Power Plant UWL

Utility Waste Landfill, CCP Properties

Material: 100% non-ponded fly ash, material was molded at 22.5% moisture

Hydraulic Conductivity

Soil Conditions	
Pre-test conditions	**Post-test Conditions**
Wet Density = 124.2 (lbs/ft^3)	Wet Density = 128.8 (lbs/ft^3)
% Moisture = 22.5%	% Moisture = 20.1%
Dry Density = 101.4 (lbs/ft^3)	Dry Density = 107.2 (lbs/ft^3)

Test Information	
a (cm^2)=	0.1969
L (cm)=	4.9043
A (cm^2)=	19.4657

Trial 1													
			Base Burette		Top Burette								
Date and Time	Elapsed Time (seconds)	Cell Burette Reading (ml)	Reading (ml)	Distance from Datum (cm)	Reading (ml)	Distance from Datum (cm)	Total Head Across Sample (cm of water)	Temperature (℃)	Weighted Average Temp. (℃)	Uncorrected Hydraulic Conductivity (cm/sec)	Correction Factor	Cumulative Time (sec)	Corrected Hydraulic Conductivity (cm/sec)
3/11/11 11:05	0	16.5	10.00	27.200	0.40	75.968	83.947	21.2					
3/11/11 11:10	300	16.5	9.18	31.366	1.26	71.599	75.413	21.2	21.20	8.86E-06	0.9716241	300	8.61E-06
3/11/11 11:15	600	16.5	8.45	35.074	1.98	67.942	68.047	21.2	21.20	8.68E-06	0.9716241	600	8.43E-06
3/11/11 11:20	900	16.5	7.78	38.478	2.64	64.589	61.290	21.2	21.20	8.67E-06	0.9716241	900	8.42E-06
3/11/11 11:25	1200	16.5	7.21	41.373	3.20	61.744	55.550	21.2	21.20	8.53E-06	0.9716241	1200	8.29E-06
3/11/11 11:30	1500	16.5	6.66	44.167	3.74	59.001	50.013	21.2	21.20	8.56E-06	0.9716241	1500	8.32E-06
3/11/11 11:35	1800	16.5	6.20	46.504	4.20	56.664	45.339	21.2	21.20	8.49E-06	0.9716241	1800	8.25E-06

H.C.= **8.3E-06**

Hydraulic Conductivity (ASTM-D 5084)
Flow Rate Calculation

Job------- Labadie UWL
Location- Fly Ash Study
Sample--- Non-Ponded Fly Ash
Depth----- Air Dried
22½% M added #2

a= 0.1969
A= 4.9043
L= 19.4657

Cell No. 3

run water thru 3/10/14

Cell Pressure (p.s.i.)	Base Pressure (p.s.i.)	Top Pressure (p.s.i.)
56.0	55.0	55.5

Date	Time	Elapsed Time Minutes	Cell Reading ML	Base Reading ML	Top Reading ML	Top Head CM	Base Head CM	h CM	Temp.	Hyd. Gradient
3/11/11	11:05	0	16.5	10.00	0.40				21.2	
	11:10	5	16.5	9.18	1.26				21.2	
	11:15	10	16.5	8.45	1.98				21.2	
	11:20	15	16.5	7.78	2.64				21.2	
	11:25	20	16.5	7.21	3.20				21.2	
	11:30	25	16.5	6.66	3.74				21.2	
	11:35	30	16.5	6.20	4.20				21.2	
									21.2	

a x L	t (sec)	2 x A x t	aL/2At	h1	h2	ln(h1/h2)	K	Temp. Cor.	K -Cor.	Hyd. Gradient

TRIAXIAL CELL SETUP & TAKEDOWN

Project Labadie UWL - Fly Ash Study Date 3/9/11

Sample Depth

Description Non-Ponded air dried fly ash
w/ 22½% M added (#2)

Type of Test perm Confining Pressure Differential

Cell Number 3 Saturate [✓ before] after Consolidation

Number of Membranes 1 doubled Filter Strips Yes [✓ No]

MOISTURE CONTENT

	INITIAL		FINAL
Tare No.			Bowl 10 R
Wet Wt. + Tare	Moisture added 22½%		394.31
Dry Wt. + Tare			361.32
Wt. Water			32.99
Tare Wt.			197.34
Dry Soil Wt.			163.98
Moisture %			20.12
Avg. w %			

LENGTH CHANGE

STRAIN GAUGE at setup N/A

at saturation start

at consolidation start

at axial load start

MASS PROPERTIES

Wt. Tube + Soil		gm.
Wt. Tube		gm.
Wt. Soil	189.39	gm.
Tube Diameter		in.
Sample Length		in
tube length		in.
top trim		in.
bottom trim		in.
total trim		in.
sample length		in.
Density constant 4.85/(D^2 * L)		
Wet Density		pcf.
Dry Density		pcf.

SPECIMEN DIMENSIONS in. / mm.

	HEIGHT		DIAMETER	
	Initial	Final	Initial	Final
1	1.9275	1.9295	T 1.9505	1.9610
2	1.9310	1.9240	M 1.9565	1.9535
3	1.9285	1.9390	B 1.9665	1.9655
Avg.	1.929	1.930833	1.95783	1.9600

Description After Test Initial $\gamma_m = 124.2$ Final $\gamma_m = 128.8$

$\%M = 22.5$ $\%M = 20.1$

$\gamma_d = 101.4$ $\gamma_d = 107.2$

Remarks

Failure Sketch

Trimmed By JR
Trimmed Date 3/9/11

Setup By JR
Setup Date 3/9/11

Taken Down By JR
Take Down Date 3/11/11

TRIAXIAL CELL SATURATION & BETA FACTOR

PROJECT American Labadie Fly Ash Study

SAMPLE 100% Non-Ponded Fly Ash mixed at 225%M DEPTH

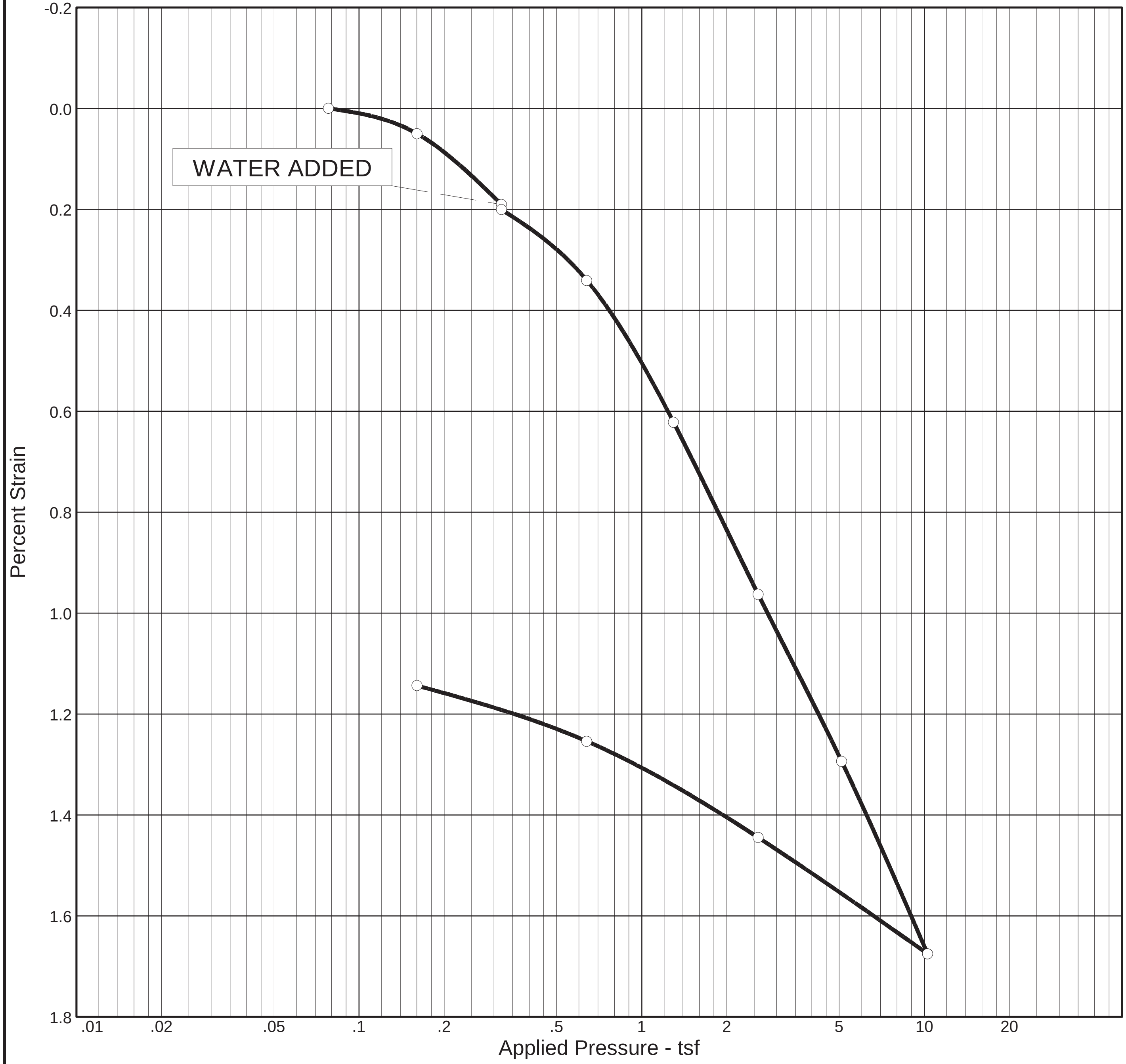
INITIAL CELL PRESSURE 51.0 START DATE 3/9/11

INITIAL PORE PRESSURE 50.0 CELL NUMBER 3

INITIAL TRANSDUCER READING 50.9 TRANSDUCER NUMBER

TRIAL DATE	TRIAL TIME	BASE BURETTE READING	CELL PRESSURE	TRANS-DUCER READING	CHANGE IN PRESSURE Transducer Constant			
					CELL DELTA (1)	TRANSDUCER READING CHANGE	TRANSDUCER PRESSURE CHANGE (2)	BETA FACTOR (2/1)
3/10/11	0	2.74	51.0	50.6				
	1		56.0	55.3	5.0		4.7	0.94
	2		"	55.3	5.0		4.7	0.94
	4		"	55.3	5.0		4.7	0.94

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_s	Swell Press. (tsf)	Swell %	e_o
Sat.	Moist.											
33.9 %	8.2 %	108.6			2.87		1.03	0.02	0.00			0.697

MATERIAL DESCRIPTION	USCS	AASHTO
Tan, dry fly ash		

Project No. 2008012455 **Client:** Ameren Missouri

Project: CCP Properties, Labadie Plant

Source: Non-Ponded Dry Fly Ash from **Sample No.:** Bulk

REITZ & JENS, INC.
CONSULTING ENGINEERS

Remarks:

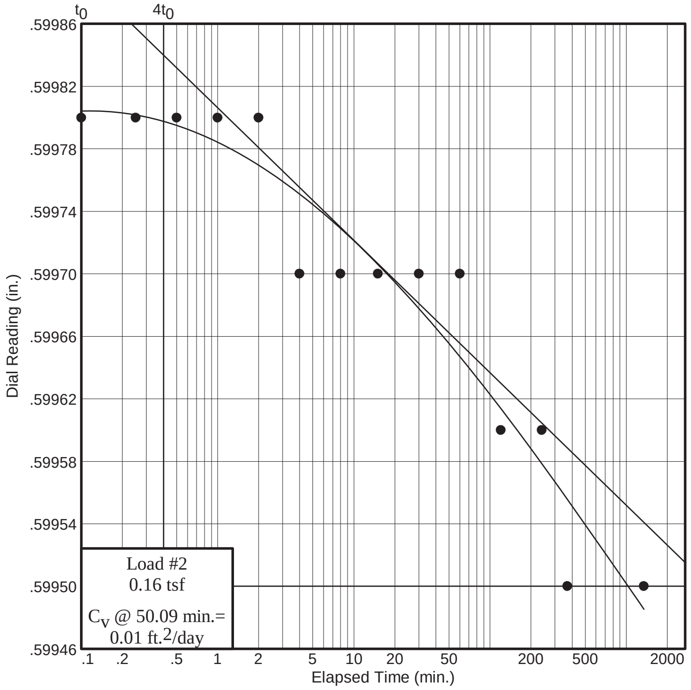
Non-ponded fly ash mixed at 22.5% moisture

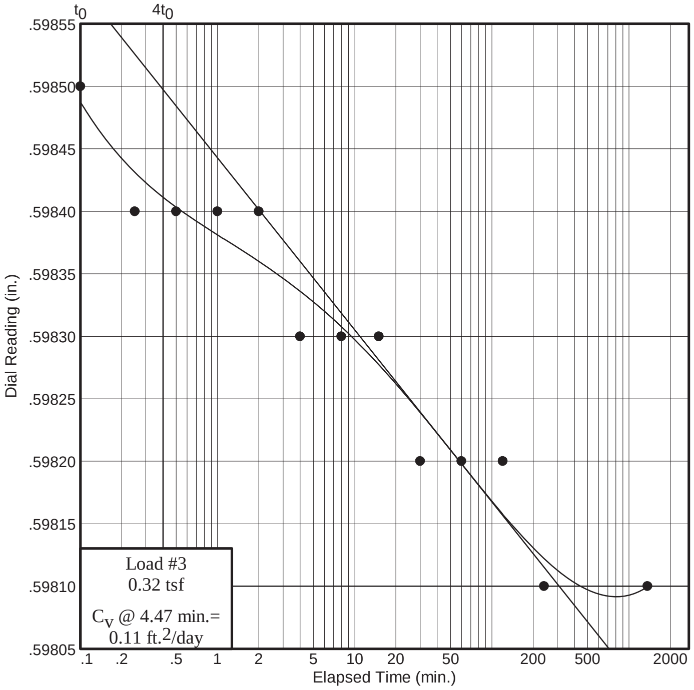
Figure

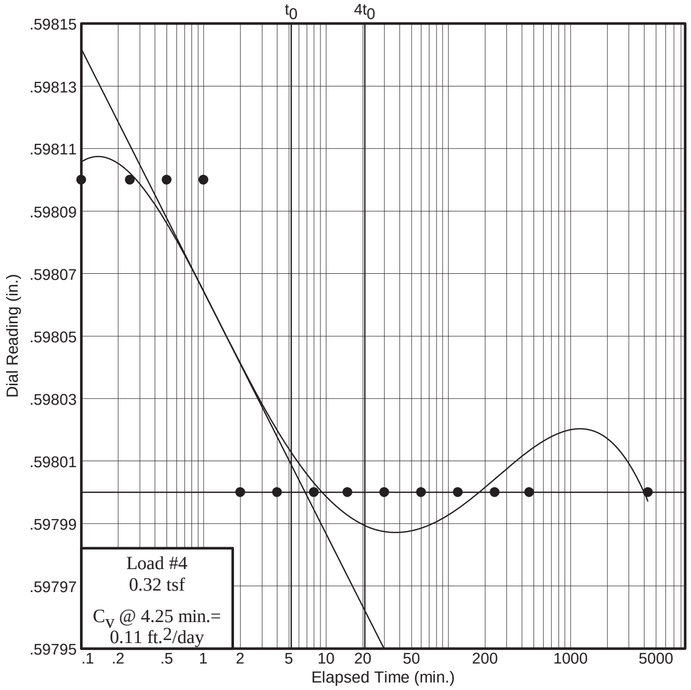
Dial Reading vs. Time

Project No.: 2008012455
Project: CCP Properties, Labadie Plant

Source: Non-Ponded Dry Fly Ash from Precipitators   Sample No.: Bulk







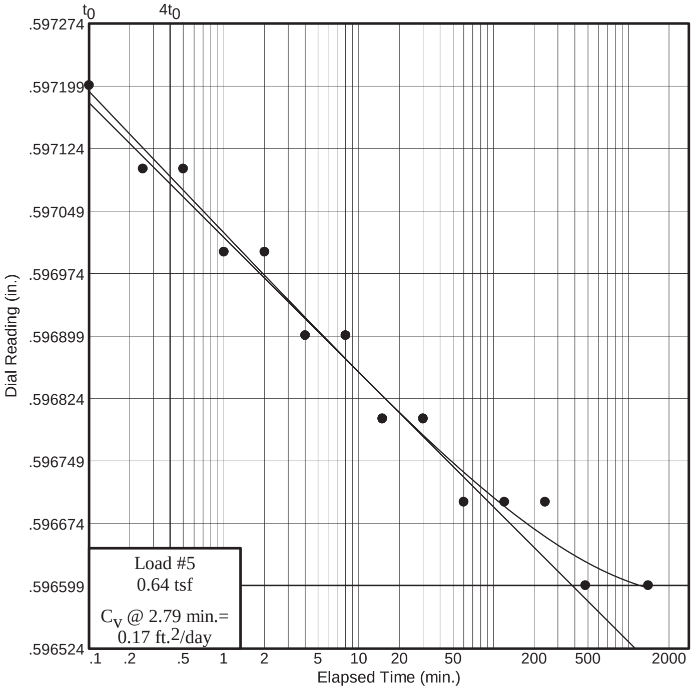


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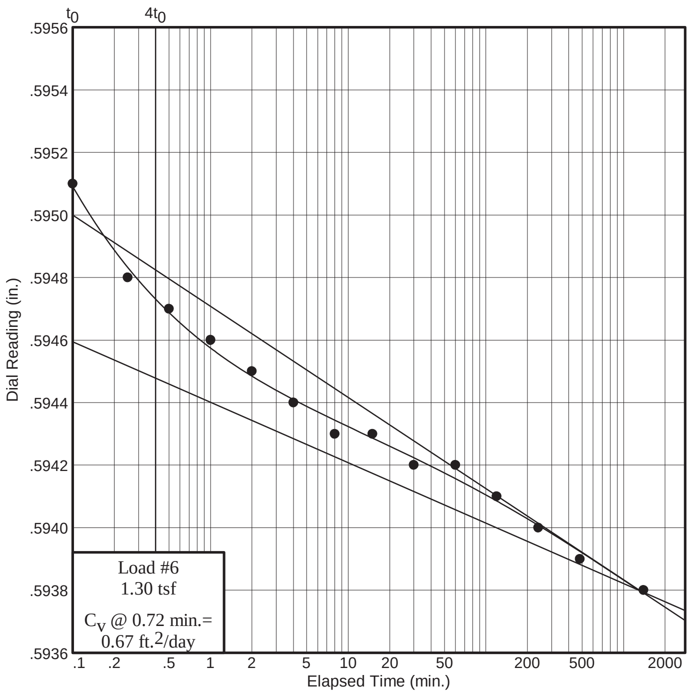
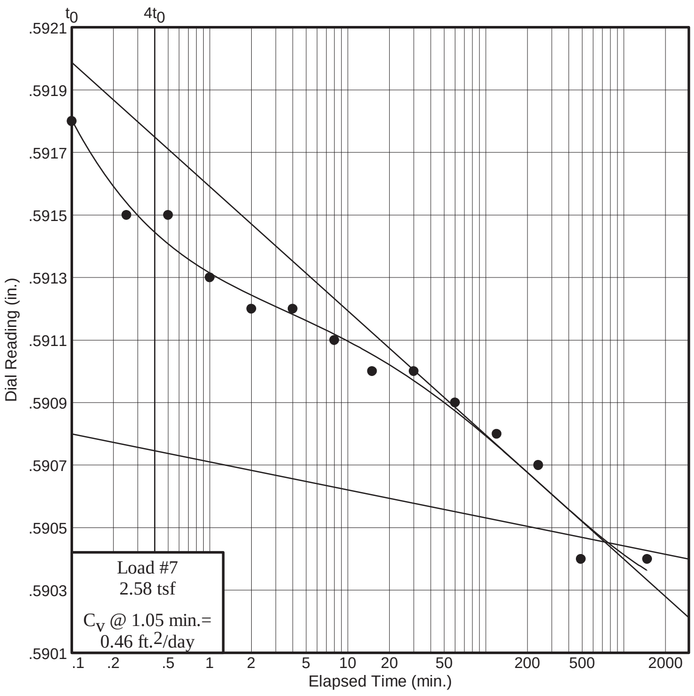
Figure

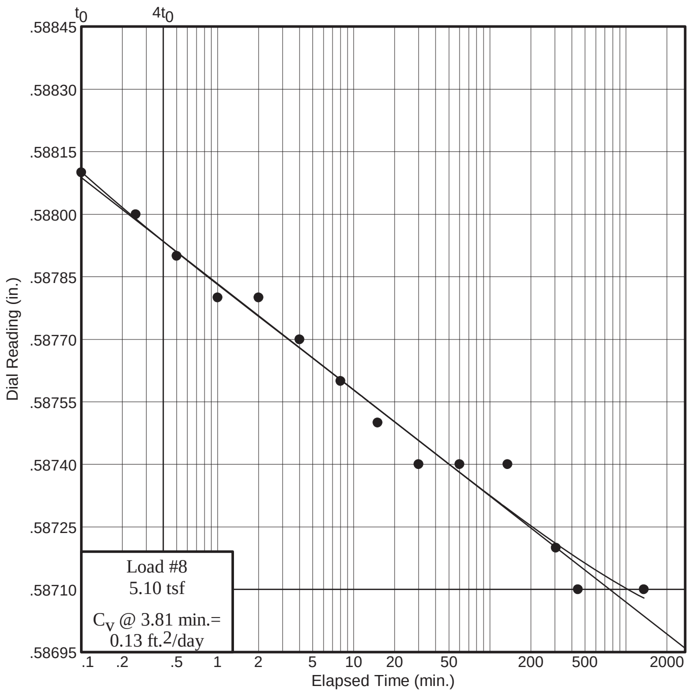
Dial Reading vs. Time

Project No.: 2008012455
Project: CCP Properties, Labadie Plant

Source: Non-Ponded Dry Fly Ash from Precipitators   Sample No.: Bulk







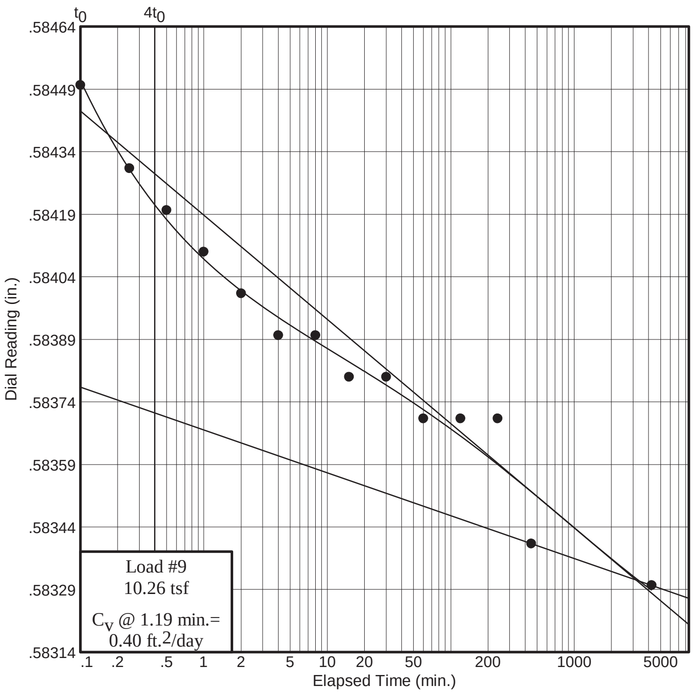


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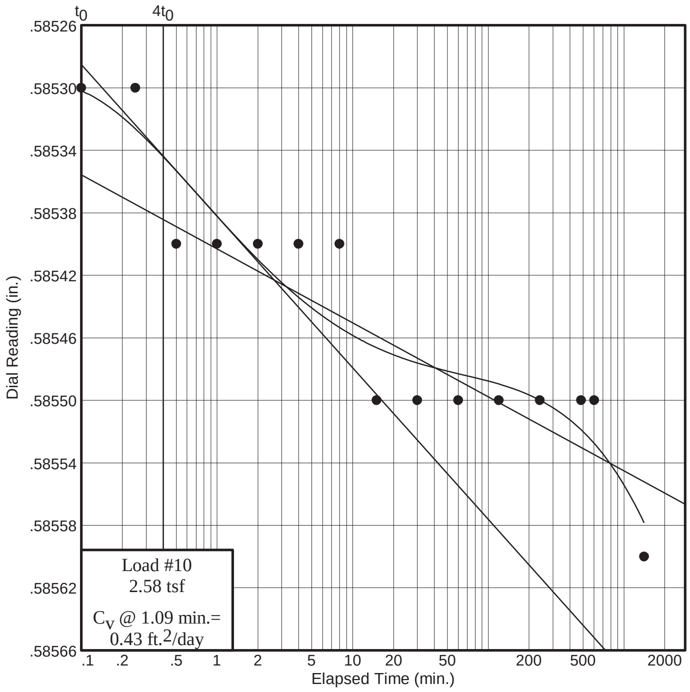
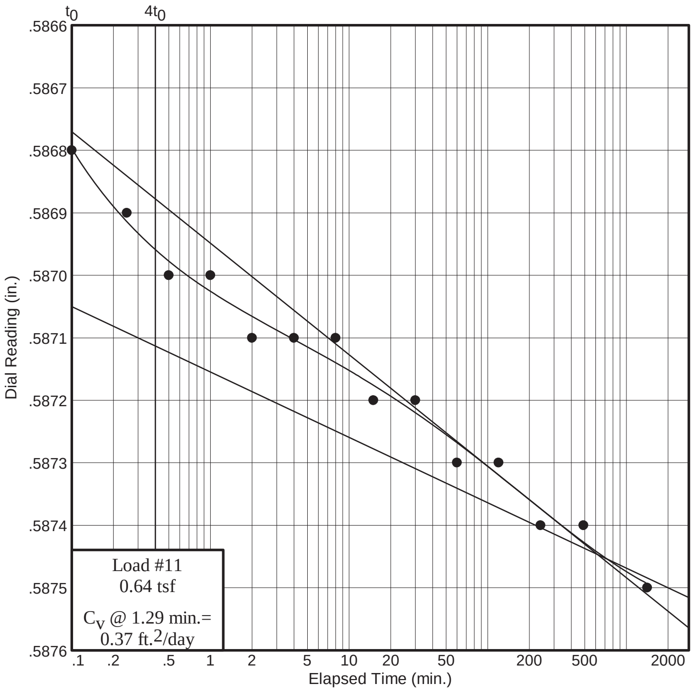
Figure

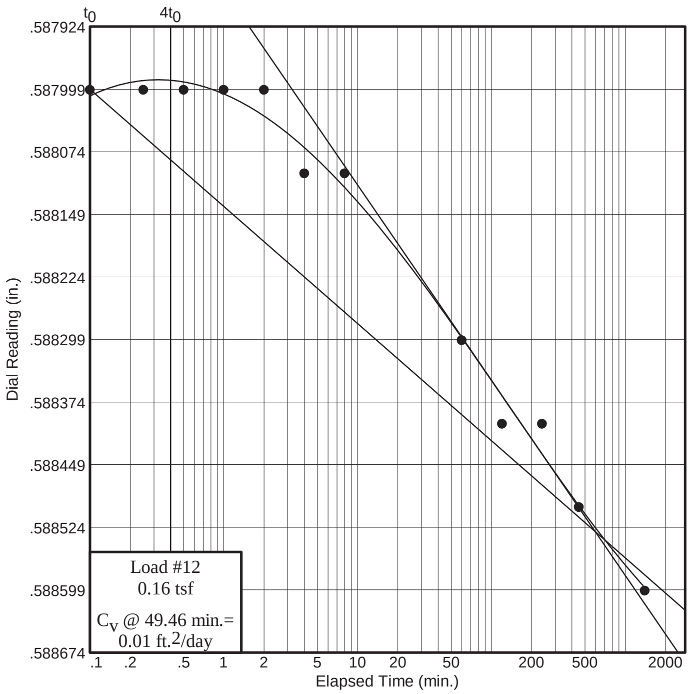
Dial Reading vs. Time

Project No.: 2008012455
Project: CCP Properties, Labadie Plant

Source: Non-Ponded Dry Fly Ash from Precipitators Sample No.: Bulk







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SWELL/CONSOLIDATION TEST DATA

Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project Number: 2008012455

Sample Data

Source: Non-Ponded Dry Fly Ash from Precipitators
Sample No.: Bulk
Elev. or Depth: **Sample Length(in./cm.):**
Location:
Description: Tan, dry fly ash
Liquid Limit: **Plasticity Index:**
USCS: **AASHTO:** **Figure No.:**
Testing Remarks: Non-ponded fly ash mixed at 22.5% moisture

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 259.16 g.	**Consolidometer # =** 1	**Wet w+t =** 864.23 g.
Dry w+t = 242.48 g.		**Dry w+t =** 837.80 g.
Tare Wt. = 39.47 g.	**Spec. Gravity =** 2.87	**Tare Wt. =** 700.55 g.
Height = 1.00 in.	**Height =** 1.00 in.	
Diameter = 2.50 in.	**Diameter =** 2.52 in.	
Weight = 150.72 g.	**Defl. Table =** Labadie 100% Fly Ash at 65%M	
Moisture = 8.2 %	**Ht. Solids =** 0.5874 in.	**Moisture =** 19.3 %
Wet Den. = 117.6 pcf	**Dry Wt. =** 141.18 g.	**Dry Wt. =** 137.25 g.*
Dry Den. = 108.6 pcf	**Void Ratio =** 0.697	**Void Ratio =** 0.677
	Saturation = 33.9 %	

*** Final dry weight used in calculations**

End-of-Load Summary

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_V (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	0.60000				0.697	
0.08	0.60000	0.00000			0.697	0.0 Swell
0.16	0.59950	0.00000	0.01	0.000	0.696	0.1 Comprs.
0.32	0.59810	0.00000	0.11	0.000	0.693	0.2 Comprs.
water	0.59800	0.00000	0.11		0.693	0.2 Comprs.
0.64	0.59660	0.00000	0.17	0.000	0.691	0.3 Comprs.
1.30	0.59380	0.00000	0.67	0.000	0.686	0.6 Comprs.
2.58	0.59040	0.00000	0.46	0.000	0.680	1.0 Comprs.
5.10	0.58710	0.00000	0.13	0.000	0.675	1.3 Comprs.
10.26	0.58330	0.00000	0.40	0.000	0.668	1.7 Comprs.
2.58	0.58560	0.00000	0.43		0.672	1.4 Comprs.
0.64	0.58750	0.00000	0.37		0.675	1.3 Comprs.
0.16	0.58860	0.00000	0.01		0.677	1.1 Comprs.

C_C = 0.02 **P_C =** 1.03 tsf **C_S =** 0.00
Collapse percentage = 0.0

CONSOLIDATION TEST

Rev. 4/2000

† – to be completed by Project Engineer

Date 2/22/11 Set-up by JJC

Sample Description:
Dry Non-Bonded
Fly Ash @ 22½% m
(molded @ 22½%m)

USCS: ______ AASHTO: ______

†Project Number ______
†Job Ameren UE, LABADIE UWL
†Test Hole ASH STUDY
†Sample 22½% †Depth ______
†Sample Type FLY ASH @ 22½%m
†S.G.=2.86 ☒ Measured ☐ Assumed
L.L.=______ PP=______ TSF
P.L.=______ Torvane=______ TSF

†Testing Remarks: ______

Test Specific Data
†Deflection Table: ______
Rig No. I Ring I
†Overburden Pressure=______ kg/cm²

†☐ Check if sample is to be undercut.
Sample Undercut= NONE inch
Sample Height at Test Start= 0.9966 inch

.9799

Untrimmed Sample Data
Wgt. Tube+ Soil=______ g
Wgt. Tube=______ g
Wgt. Soil=______ g
Sample Lgth. (L)=______ in.
Sample Dia. (D)= 2.493 in.
Tube Constant (k)=______
k= 4.85/(D^2L)
Wet Unit Wgt.=______ PCF

Initial Moisture Content
Tare No.: R111
Wet Wgt.+Tare= 259.16 g
Dry Wgt.+Tare= 242.48 g
Wgt. Water= 16.68 g
Wgt. Tare= 39.46 g
Wgt. Dry Soil= 203.02 g
Water Content= 8.22 %
Dry Unit Wgt.= 108.6 PCF

Initial Trimmed Sample Data
Trimmed sample in ring without dish.
Wgt. Ring=______ g
Wet Wgt.+Ring= 650.07 g
Wgt. Wet Soil= 499.35 g
Wt. Wet Soil = 150.72

START 0 = .5567

Hanger Load / †☒ **Run Mach. Deflections**

†Sequence	†Instructions	Reading	Difference
? 0.25 kg		.5553	0.0014 in.
✓ 0.5 kg		.5547	0.0020 in.
✓ 1.0 kg		.5542	0.0025 in.
✓ 1.0 kg	ADD WATER	.5535	0.0032 in.
✓ 2.0 kg		.5527	0.0040 in.
✓ 4.0 kg		.5512	0.0055 in.
✓ 8.0 kg		.5495	0.0072 in.
✓ 16.0 kg		.5472	0.0095 in.
✓ 32.0 kg		.5449	0.0118 in.
✓ 8.0 kg		.5469	0.0098 in.
✓ 2.0 kg		.5486	0.0081 in.
✓ 0.5 kg		.5499	0.0068 in.
kg			in.
kg			in.
kg			in.
kg			in.
kg			in.
kg			in.
kg			in.

Post-Test Sample Data
Dish No.: 2
Wgt. Dish= 201.20 g
Tare (Ring+Dish)= 700.55 g
Wet Wgt.+Tare= 864.23 g
Dry Wgt.+Tare= 837.80 g
Wgt. Water= 26.43 g
Wgt. Dry Soil= 137.25 g
Water Content= 19.26 %

Squeezings ☒ Check if none.
Tare No.: ______
Dry Wgt.+Tare=______ g
Wgt. Tare=______ g
Wgt. Dry Squeezings=______ g

Total Dry Wgt. Soil=______ g

†Use final weight of solids? –

†PROJ.ENGR. JCF

SCHEDULE CJG-ST1

REITZ & JENS, INC.
Consulting Engineers

CONSOLIDATION TEST-TIME SHEET

R&J Project: Ameren UE Labadie UWL Sheet 1 of 5
Boring: FLY ASHE 22 1/2% #2 Sample: 1 Depth: ______ Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
2/23/11	0.25	JfL	0900	0	0 .6000	
				.1	0	
				.25	0	
				.5	0	
			01	1	0	
			02	2	0	
			04	4	0	
			08	8	0	
			15	15	0	
			30	30	0	
			0956	56	0	Re set gauge
	0.50		1000	0	.5999	
				.1	.5998	
				.25	.5998	
				.5	.5998	
			01	1	.5998	
			02	2	.5998	
			04	4	.5997	
			08	8	.5997	
			15	15	.5997	
			30	30	.5997	
			1100	60	.5997	
			1200	120	.5996	
			1400	240	.5996	
			1630	370	.5995	
2/24/11		JRz	8:30	1350	.5995	
	1.0	VSSP	9:45	0	.5995	
				.1	.5985	
				.25	.5984	
				.5	.5984	
			46	1	.5984	
			47	2	.5984	
			49	4	.5983	
			53	8	.5983	
			10:00	15	.5983	
			15	30	.5982	
			45	60	.5982	
			11:45	120	.5982	
			13:45	240	.5981	
			8:30	1365	.5981	

REITZ & JENS, INC.
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CONSOLIDATION TEST-TIME SHEET

R&J Project: Am UE Labadie UWL
Sheet 2 of 25
Boring: FlyASH 22V27. #2
Sample: 1
Depth:
Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
2/25/10	1.0+H₂O	JJP	8:44	0	.5981	added water
				.1	.5981	
				.25	.5981	
				.5	.5981	
			45	1	.5981	
			46	2	.5980	
			48	4	.5980	
			52	8	.5980	
			59	15	.5980	
			9:14	30	.5980	
			9:44	60	.5980	
			10:44	120	.5980	
			12:44	240	.5980	
			16:24	460	.5980	
2/28/11			8:44	4320	.5980	
	2kg		8:56	0	.5980	
				.1	.5972	
				.25	.5971	
				.5	.5971	
			57	1	.5970	
			58	2	.5970	
			9:00	4	.5969	
			04	8	.5969	
			11	15	.5968	
			26	30	.5968	
			56	60	.5967	
			10:56	120	.5967	
			12:56	240	.5967	
			16:56	480	.5966	
3/1/11			8:16	1400	.5966	
	4kg		8:25	0	.5966	
				.1	.5951	
				.25	.5948	
				.5	.5947	
			26	1	.5946	
			27	2	.5945	
			29	4	.5944	
			33	8	.5943	
			40	15	.5943	
			55	30	.5942	
			9:25	60	.5942	
			10:25	120	.5941	
			12:25	240	.5940	
			16:35	480	[illegible]	

REITZ & JENS, INC.
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CONSOLIDATION TEST-TIME SHEET

R&J Project: Am UE Labadie UWL
Fly Ash 22X27 #2
Boring: ______ Sample: 1 Depth: ______

Sheet 3 of 5
Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
3/2/11	4 kg	JJP	7:40	1395	.5938	
	8 kg		7:55	0	.5938	
				.1	.5918	
				.25	.5915	
				.5	.5915	
			56	1	.5913	
			57	2	.5912	
			59	4	.5912	
			8:03	8	.5911	
			10	15	.5910	
			25	30	.5910	
			55	60	.5909	
			9:55	120	.5908	
			11:55	240	.5907	
			16:05	490	.5904	
3/3/11		JR	8:35	1480	.5904	
3/3/11	16.0	JR	9:15	0	0.5904	
				.1	0.5881	
				.25	0.5880	
				.5	0.5879	
			9:16	1	0.5878	
			9:17	2	0.5878	
			9:19	4	0.5877	
			9:23	8	0.5876	
			9:30	15	0.5875	
			9:45	30	0.5874	
			10:15	60	0.5874	
			11:30	125	0.5874	
			[illegible]	[illegible]		
			14:20	305	0.5872	
			16:40	445	0.5871	
3/4/11		JJP	07:52	1357	.5871	
	32Kg		8:35	0	.5871	
				.1	.5845	
				.25	.5843	
				.5	.5842	
			36	1	.5841	
			37	2	.5840	
			39	4	.5839	
			43	8	.5839	
			50	15	.5838	
			9:05	30	.5838	
			9:35	60	.5837	

REITZ & JENS, INC.
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CONSOLIDATION TEST-TIME SHEET

R&J Project: Am UE Labadie UWL
Sheet 4 of 5
Fly Ash 22'12 ½ m #2
Boring: ______ Sample: 1 Depth: ______ Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
3/4/11	32kg	JJP	10:35	120	.5837	
			12:35	240	.5836	
			16:05	450	.5834	
3/7/11			7:15	4240	.5833	
	8kg	JRD	8:35	0	.5833	
				.1	.5853	
				.25	.5853	
				.5	.5854	
			8:36	1	.5854	
			8:37	2	.5854	
			8:39	4	.5854	
			8:43	8	.5854	
			8:50	15	.5855	
			9:05	30	.5855	
			9:35	60	.5855	
			10:35	120	.5855	
			12:35	240	.5855	
			16:40	485	.5855	
			18:40	605	.5855	
3/8/11	"	JRD	8:05	1410	.5856	
	2kg		8:40	0	0.5856	
				.1	.5868	
				.25	.5869	
				.5	.5870	
			8:41	1	.5870	
			8:42	2	.5871	
			8:44	4	.5871	
			8:48	8	.5871	
			8:55	15	.5872	
			9:10	30	.5872	
			9:40	60	.5873	
			10:40	120	.5873	
			12:40	240	.5874	
			16:50	490	.5874	
3/9/11			8:10	1410	.5875	

REITZ & JENS, INC.
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CONSOLIDATION TEST-TIME SHEET

R&J Project: Ameren Labadie UWL

Sheet 5 of 5

Boring: Fly Ash C@28'6"

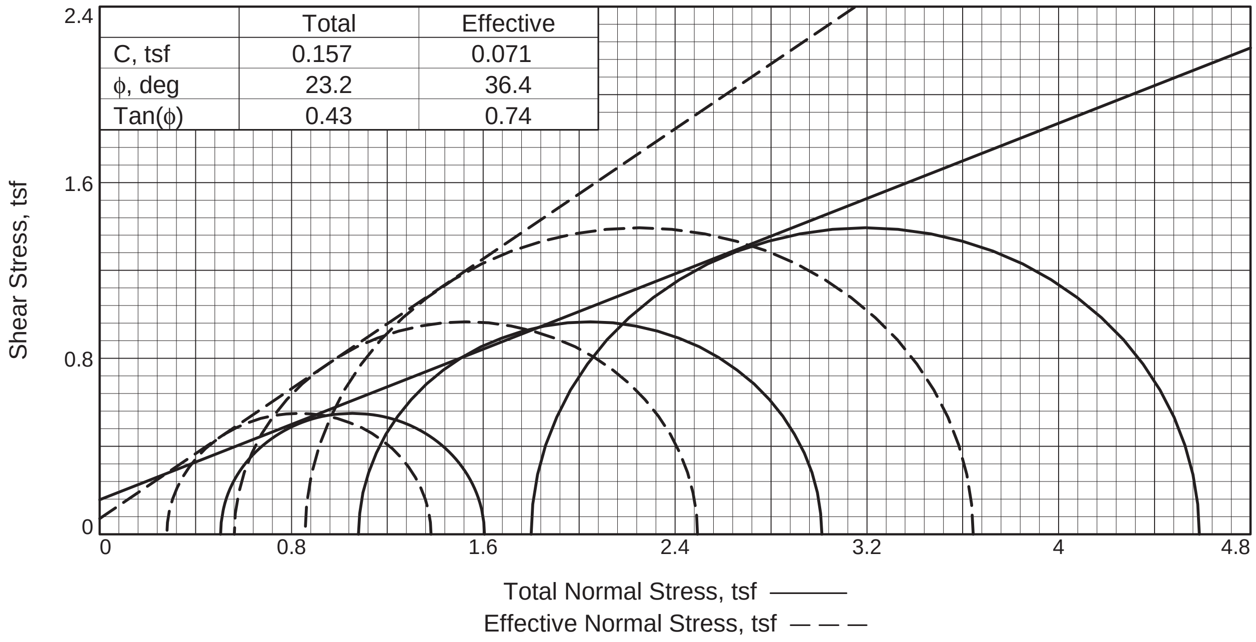
Sample: [illegible] #2

Depth: ______

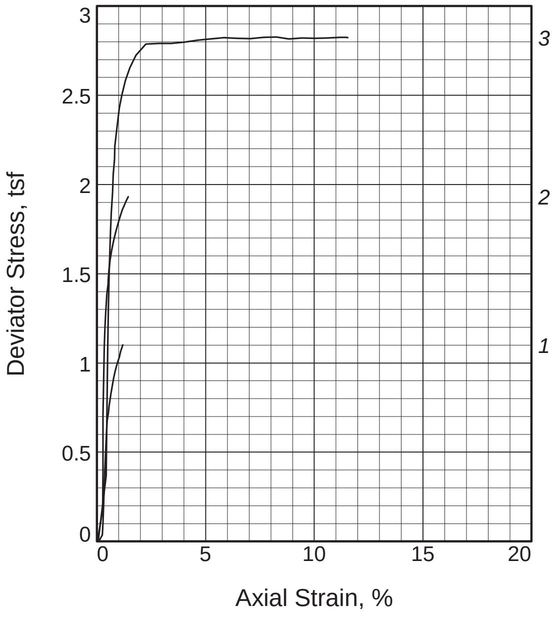
Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
3/9/11	0.5	JRL	9:00	0	0.5875	
				.1	5880	
				.25	5880	
				.5	5880	
			9:01	1	5880	
			9:02	2	5880	
			9:04	4	5881	
			9:08	8	5881	
			9:15	15	—	
			9:30	30	—	
			10:00	60	5883	
			11:00	120	5884	
			13:00	240	5884	
			16:30	450	5885	
3/10/11			8:20	1400	5886	

Break Down



	Total	Effective
C, tsf	0.157	0.071
ϕ, deg	23.2	36.4
Tan(ϕ)	0.43	0.74



	Sample No.	1	2	3
Initial	Water Content,	55.3	55.3	55.3
	Dry Density, pcf	58.3	58.3	58.3
	Saturation,	76.5	76.5	76.5
	Void Ratio	2.0726	2.0726	2.0726
	Diameter, in.	1.96	1.96	1.96
	Height, in.	3.65	3.65	3.65
At Test	Water Content,	69.0	68.7	68.7
	Dry Density, pcf	60.1	60.3	60.3
	Saturation,	100.0	100.0	100.0
	Void Ratio	1.9796	1.9721	1.9721
	Diameter, in.	1.94	1.95	1.97
	Height, in.	3.61	3.56	3.51
	Strain rate, %/min.	0.20	0.10	0.08
	Back Pressure, tsf	3.96	4.25	4.82
	Cell Pressure, tsf	4.46	5.33	6.62
	Fail. Stress, tsf	1.10	1.93	2.79
	Total Pore Pr., tsf	4.18	4.77	5.77
	Ult. Stress, tsf			
	Total Pore Pr., tsf			
	$\bar{\sigma}_1$ Failure, tsf	1.38	2.49	3.64
	$\bar{\sigma}_3$ Failure, tsf	0.28	0.56	0.86

Type of Test:
CU with Pore Pressures
Sample Type: Hand Molded
Description: Ponded fly ash, air dried to 8% and molded at 55%

Assumed Specific Gravity= 2.87
Remarks: Staged Test

Figure _______

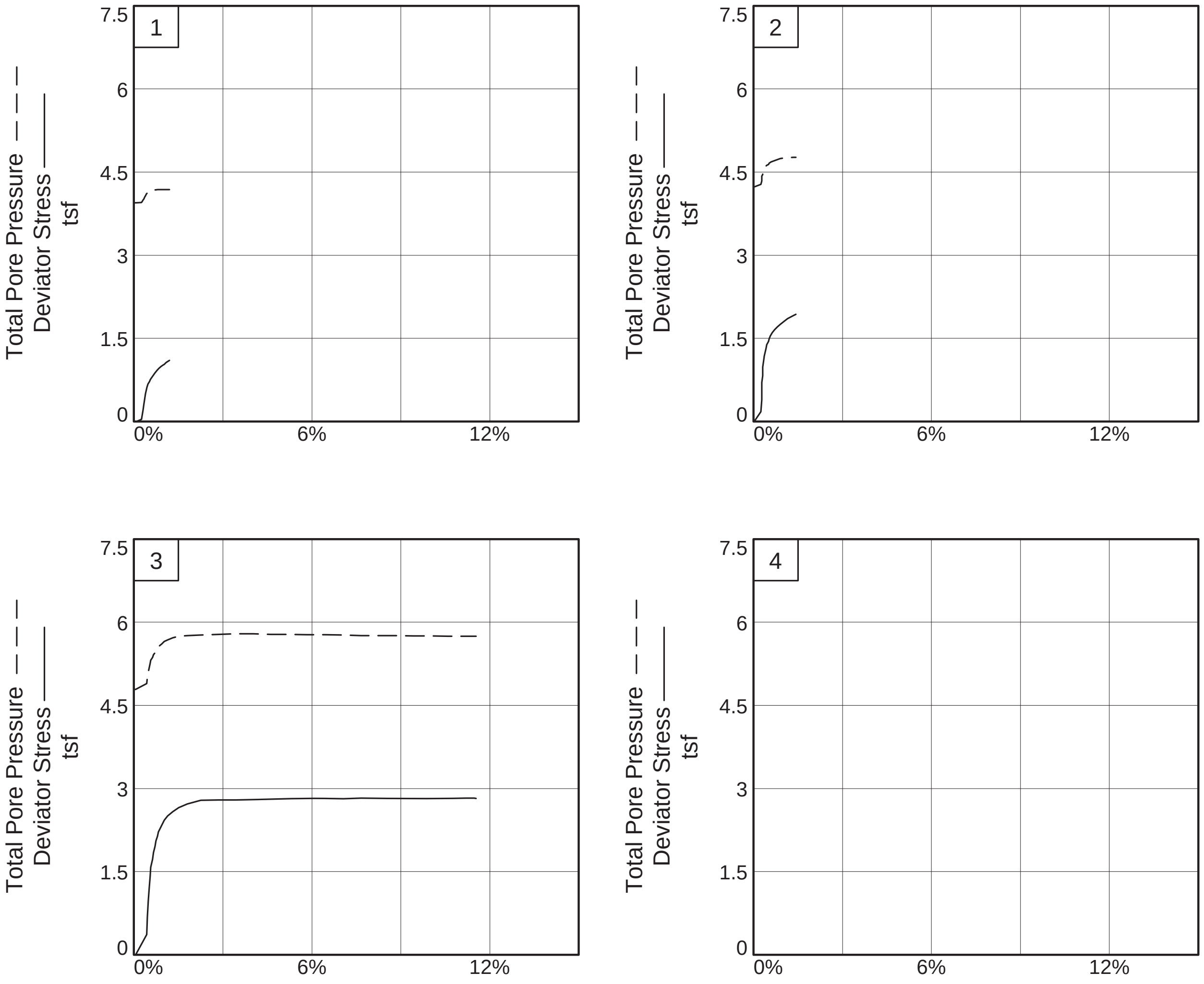
Client: Ameren Missouri

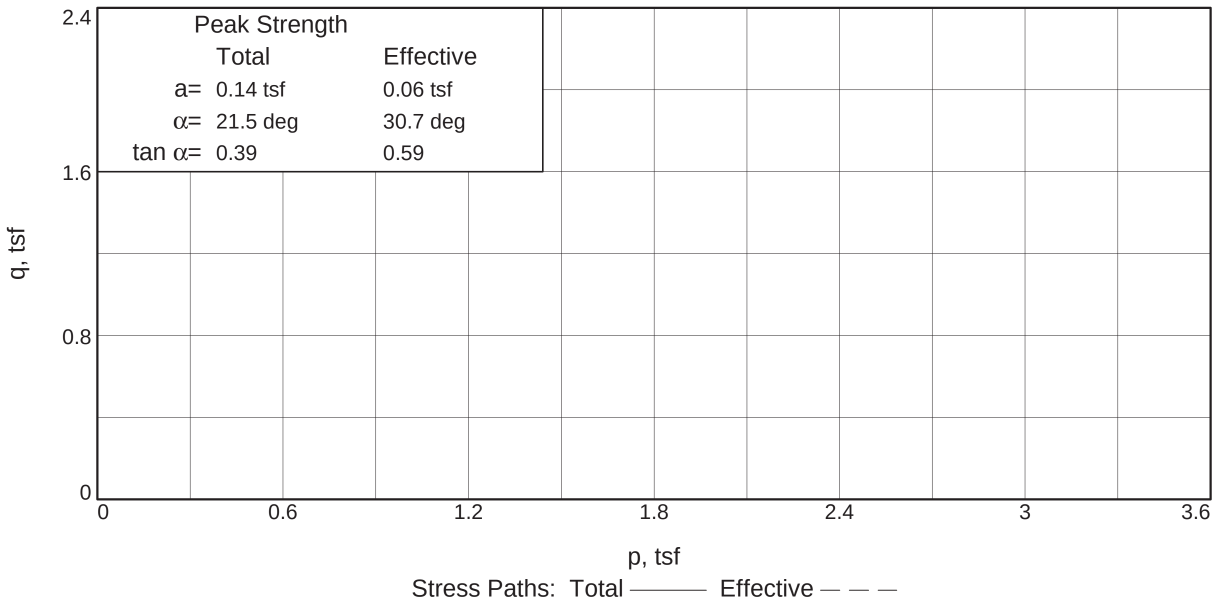
Project: CCP Properties, Labadie Plant

Source of Sample: Ponded Fly Ash
Sample Number: Bulk
Proj. No.: 2008012455 **Date:** 4/7/2011

REITZ & JENS, INC.
CONSULTING ENGINEERS

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





Peak Strength

	Total	Effective
a=	0.14 tsf	0.06 tsf
α=	21.5 deg	30.7 deg
tan α=	0.39	0.59

Client: Ameren Missouri

Project: CCP Properties, Labadie Plant

Source of Sample: Ponded Fly Ash **Sample Number:** Bulk

Project No.: 2008012455 **Figure** _______

REITZ & JENS, INC.

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

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

5/23/2011
1:21 PM

Date: 4/7/2011
Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project No.: 2008012455
Location: Ponded Fly Ash
Sample Number: Bulk
Description: Ponded fly ash, air dried to 8% and molded at 55%
Remarks: Staged Test
Type of Sample: Hand Molded
Assumed Specific Gravity=2.87 **LL=** **PL=** **PI=**
Test Method: COE uniform strain (staged method triaxial test)

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	342.950			487.550
Moisture content: Dry soil+tare, gms.	247.420			376.760
Moisture content: Tare, gms.	74.600			210.870
Moisture, %	55.3	69.7	69.0	66.8
Moist specimen weight, gms.	262.3			
Diameter, in.	1.96	1.95	1.94	
Area, in.²	3.03	2.98	2.97	
Height, in.	3.65	3.62	3.61	
Net decrease in height, in.		0.03	0.01	
Wet Density, pcf	90.5	101.3	101.6	
Dry density, pcf	58.3	59.7	60.1	
Void ratio	2.0726	1.9996	1.9796	
Saturation, %	76.5	100.0	100.0	

Test Readings for Specimen No. 1

Consolidation cell pressure = 62.00 psi (4.464 tsf)
Consolidation back pressure = 55.00 psi (3.960 tsf)
Consolidation effective confining stress = 0.504 tsf
Strain rate, %/min. = 0.20
Fail. Stress = 1.101 tsf **at reading no.** 22

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Eff. Stress tsf	Major Eff. Stress tsf	1:3 Ratio	Pore Press. psi	P tsf	Q tsf
0	0.0040	16.00	0.0	0.0	0.000	0.518	0.518	1.00	54.80	0.518	0.000
1	0.0060	16.00	0.0	0.1	0.000	0.518	0.518	1.00	54.80	0.518	0.000
2	0.0070	16.00	0.0	0.1	0.000	0.518	0.518	1.00	54.80	0.518	0.000
3	0.0130	17.50	1.5	0.2	0.036	0.511	0.548	1.07	54.90	0.529	0.018
4	0.0140	20.30	4.3	0.3	0.104	0.497	0.601	1.21	55.10	0.549	0.052
5	0.0150	24.50	8.5	0.3	0.206	0.468	0.674	1.44	55.50	0.571	0.103
6	0.0160	28.80	12.8	0.3	0.310	0.446	0.756	1.69	55.80	0.601	0.155
7	0.0170	33.30	17.3	0.4	0.418	0.418	0.836	2.00	56.20	0.627	0.209
8	0.0180	36.40	20.4	0.4	0.493	0.389	0.882	2.27	56.60	0.635	0.247
9	0.0190	39.60	23.6	0.4	0.571	0.360	0.931	2.58	57.00	0.645	0.285
10	0.0200	42.20	26.2	0.4	0.633	0.346	0.979	2.83	57.20	0.662	0.317
11	0.0210	44.00	28.0	0.5	0.677	0.324	1.001	3.09	57.50	0.662	0.338
12	0.0230	45.90	29.9	0.5	0.722	0.310	1.032	3.33	57.70	0.671	0.361
13	0.0240	47.40	31.4	0.6	0.758	0.302	1.060	3.51	57.80	0.681	0.379
14	0.0250	48.70	32.7	0.6	0.789	0.295	1.084	3.67	57.90	0.690	0.395
15	0.0280	51.00	35.0	0.7	0.844	0.288	1.132	3.93	58.00	0.710	0.422
16	0.0300	53.00	37.0	0.7	0.892	0.288	1.180	4.10	58.00	0.734	0.446
17	0.0330	54.70	38.7	0.8	0.932	0.281	1.213	4.32	58.10	0.747	0.466
18	0.0350	56.30	40.3	0.9	0.970	0.281	1.251	4.45	58.10	0.766	0.485
19	0.0380	57.60	41.6	0.9	1.000	0.281	1.281	4.56	58.10	0.781	0.500
20	0.0410	58.90	42.9	1.0	1.031	0.281	1.312	4.67	58.10	0.796	0.515
21	0.0430	60.30	44.3	1.1	1.064	0.281	1.345	4.79	58.10	0.813	0.532
22	0.0470	61.90	45.9	1.2	1.101	0.281	1.382	4.92	58.10	0.831	0.550

Parameters for Specimen No. 2

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	342.950			487.550
Moisture content: Dry soil+tare, gms.	247.420			376.760
Moisture content: Tare, gms.	74.600			210.870
Moisture, %	55.3		68.7	66.8
Moist specimen weight, gms.	262.3			
Diameter, in.	1.96		1.95	
Area, in.²	3.03		3.00	
Height, in.	3.65		3.56	
Net decrease in height, in.		0.08	0.00	
Wet Density, pcf	90.5		101.7	
Dry density, pcf	58.3		60.3	
Void ratio	2.0726		1.9721	
Saturation, %	76.5		100.0	

Test Readings for Specimen No. 2

Consolidation cell pressure = 74.00 psi (5.328 tsf)

Consolidation back pressure = 59.00 psi (4.248 tsf)

Consolidation effective confining stress = 1.080 tsf

Strain rate, %/min. = 0.10

Fail. Stress = 1.932 tsf **at reading no.** 22

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Eff. Stress tsf	Major Eff. Stress tsf	1:3 Ratio	Pore Press. psi	P tsf	Q tsf
0	0.0040	19.10	0.0	0.0	0.000	1.094	1.094	1.00	58.80	1.094	0.000
1	0.0050	19.30	0.2	0.0	0.005	1.094	1.099	1.00	58.80	1.097	0.002
2	0.0130	26.50	7.4	0.3	0.177	1.051	1.229	1.17	59.40	1.140	0.089
3	0.0140	35.40	16.3	0.3	0.391	0.986	1.377	1.40	60.30	1.182	0.195
4	0.0140	42.70	23.6	0.3	0.565	0.943	1.509	1.60	60.90	1.226	0.283
5	0.0140	48.50	29.4	0.3	0.704	0.900	1.604	1.78	61.50	1.252	0.352
6	0.0150	53.60	34.5	0.3	0.826	0.871	1.698	1.95	61.90	1.284	0.413
7	0.0150	60.00	40.9	0.3	0.980	0.828	1.808	2.18	62.50	1.318	0.490
8	0.0160	64.80	45.7	0.3	1.094	0.792	1.886	2.38	63.00	1.339	0.547
9	0.0170	68.40	49.3	0.4	1.180	0.763	1.943	2.55	63.40	1.353	0.590
10	0.0180	71.40	52.3	0.4	1.252	0.742	1.993	2.69	63.70	1.367	0.626
11	0.0190	74.40	55.3	0.4	1.323	0.720	2.043	2.84	64.00	1.382	0.662
12	0.0200	77.00	57.9	0.4	1.385	0.706	2.090	2.96	64.20	1.398	0.692
13	0.0220	79.50	60.4	0.5	1.444	0.691	2.135	3.09	64.40	1.413	0.722
14	0.0230	81.60	62.5	0.5	1.494	0.670	2.163	3.23	64.70	1.416	0.747
15	0.0250	84.70	65.6	0.6	1.567	0.648	2.215	3.42	65.00	1.431	0.783
16	0.0280	87.40	68.3	0.7	1.630	0.626	2.256	3.60	65.30	1.441	0.815
17	0.0320	90.20	71.1	0.8	1.695	0.605	2.300	3.80	65.60	1.452	0.847
18	0.0360	92.80	73.7	0.9	1.755	0.583	2.338	4.01	65.90	1.461	0.877
19	0.0410	95.10	76.0	1.0	1.807	0.576	2.383	4.14	66.00	1.480	0.904
20	0.0450	97.30	78.2	1.2	1.857	0.569	2.426	4.27	66.10	1.497	0.929
21	0.0520	99.70	80.6	1.3	1.910	0.562	2.472	4.40	66.20	1.517	0.955
22	0.0550	100.70	81.6	1.4	1.932	0.562	2.494	4.44	66.20	1.528	0.966

Parameters for Specimen No. 3

Specimen Parameter	Initial	Cum. for Test	Consolidated	Final
Moisture content: Moist soil+tare, gms.	342.950			487.550
Moisture content: Dry soil+tare, gms.	247.420			376.760
Moisture content: Tare, gms.	74.600			210.870
Moisture, %	55.3		68.7	66.8
Moist specimen weight, gms.	262.3			
Diameter, in.	1.96		1.97	
Area, in.²	3.03		3.04	
Height, in.	3.65		3.51	
Net decrease in height, in.		0.13	0.00	
Wet Density, pcf	90.5		101.7	
Dry density, pcf	58.3		60.3	
Void ratio	2.0726		1.9721	
Saturation, %	76.5		100.0	

Test Readings for Specimen No. 3

Consolidation cell pressure = 92.00 psi (6.624 tsf)

Consolidation back pressure = 67.00 psi (4.824 tsf)

Consolidation effective confining stress = 1.800 tsf

Strain rate, %/min. = 0.08

Fail. Stress = 2.787 tsf **at reading no.** 20

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Eff. Stress tsf	Major Eff. Stress tsf	1:3 Ratio	Pore Press. psi	P tsf	Q tsf
0	0.0040	23.80	0.0	0.0	0.000	1.836	1.836	1.00	66.50	1.836	0.000
1	0.0060	23.80	0.0	0.1	0.000	1.836	1.836	1.00	66.50	1.836	0.000
2	0.0190	39.40	15.6	0.4	0.368	1.728	2.096	1.21	68.00	1.912	0.184
3	0.0200	52.50	28.7	0.5	0.677	1.620	2.297	1.42	69.50	1.958	0.338
4	0.0210	64.90	41.1	0.5	0.969	1.526	2.495	1.63	70.80	2.011	0.484
5	0.0220	74.70	50.9	0.5	1.199	1.447	2.646	1.83	71.90	2.047	0.600
6	0.0230	83.40	59.6	0.5	1.404	1.368	2.772	2.03	73.00	2.070	0.702
7	0.0240	90.80	67.0	0.6	1.578	1.310	2.888	2.20	73.80	2.099	0.789
8	0.0260	97.10	73.3	0.6	1.725	1.260	2.985	2.37	74.50	2.123	0.863
9	0.0270	102.20	78.4	0.7	1.845	1.210	3.054	2.52	75.20	2.132	0.922
10	0.0290	107.00	83.2	0.7	1.956	1.174	3.130	2.67	75.70	2.152	0.978
11	0.0300	111.30	87.5	0.7	2.057	1.130	3.187	2.82	76.30	2.159	1.028
12	0.0320	114.90	91.1	0.8	2.140	1.102	3.242	2.94	76.70	2.172	1.070
13	0.0330	118.10	94.3	0.8	2.215	1.066	3.280	3.08	77.20	2.173	1.107
14	0.0370	123.50	99.7	0.9	2.339	1.015	3.354	3.30	77.90	2.185	1.169
15	0.0400	127.40	103.6	1.0	2.428	0.972	3.400	3.50	78.50	2.186	1.214
16	0.0440	130.70	106.9	1.1	2.503	0.943	3.446	3.65	78.90	2.195	1.251
17	0.0500	134.30	110.5	1.3	2.583	0.907	3.490	3.85	79.40	2.199	1.291
18	0.0570	137.60	113.8	1.5	2.654	0.878	3.533	4.02	79.80	2.206	1.327
19	0.0670	140.90	117.1	1.8	2.723	0.864	3.587	4.15	80.00	2.226	1.362
20	0.0830	144.20	120.4	2.2	2.787	0.857	3.644	4.25	80.10	2.250	1.394
21	0.1040	145.10	121.3	2.8	2.791	0.842	3.633	4.31	80.30	2.238	1.395
22	0.1240	145.80	122.0	3.4	2.791	0.835	3.626	4.34	80.40	2.230	1.395
23	0.1450	146.90	123.1	4.0	2.798	0.835	3.633	4.35	80.40	2.234	1.399
24	0.1660	148.10	124.3	4.6	2.808	0.842	3.650	4.33	80.30	2.246	1.404
25	0.1870	149.20	125.4	5.2	2.815	0.842	3.657	4.34	80.30	2.250	1.407
26	0.2090	150.40	126.6	5.8	2.823	0.850	3.673	4.32	80.20	2.261	1.412

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Eff. Stress tsf	Major Eff. Stress tsf	1:3 Ratio	Pore Press. psi	P tsf	Q tsf
27	0.2300	151.00	127.2	6.4	2.819	0.850	3.668	4.32	80.20	2.259	1.409
28	0.2520	151.80	128.0	7.1	2.817	0.857	3.674	4.29	80.10	2.265	1.409
29	0.2730	153.00	129.2	7.7	2.825	0.864	3.689	4.27	80.00	2.277	1.413
30	0.2940	153.90	130.1	8.3	2.827	0.864	3.691	4.27	80.00	2.277	1.413
31	0.3140	154.20	130.4	8.8	2.816	0.864	3.680	4.26	80.00	2.272	1.408
32	0.3350	155.30	131.5	9.4	2.821	0.871	3.692	4.24	79.90	2.282	1.410
33	0.3560	156.10	132.3	10.0	2.819	0.871	3.690	4.24	79.90	2.281	1.410
34	0.3760	157.00	133.2	10.6	2.820	0.878	3.699	4.21	79.80	2.289	1.410
35	0.3970	158.10	134.3	11.2	2.825	0.878	3.703	4.22	79.80	2.291	1.412
36	0.4070	158.50	134.7	11.5	2.824	0.878	3.702	4.21	79.80	2.290	1.412
37	0.4090	158.50	134.7	11.5	2.822	0.878	3.700	4.21	79.80	2.289	1.411

TRIAXIAL CELL SETUP & TAKEDOWN

Project Ameren Labadie UWL Date 4-11-11

Sample Labadie Ponded Ash Depth

Description 100% Labadie Ponded Ash Air dried to ≈8%, then molded at 65% M

Type of Test Staged CW Confining Pressure Differential 7, 15, 25 psi

Cell Number 2 Saturate [✓ before] after Consolidation

Number of Membranes 2 Filter Strips [✓ Yes] No

MOISTURE CONTENT

	INITIAL		FINAL
Tare No.	R 44	B-3	Bowl 2
Wet Wt. + Tare	155.26	187.69	487.55
Dry Wt. + Tare	111.74	135.66	379.76
Wt. Water			
Tare Wt.	33.97	40.63	210.87
Dry Soil Wt.			*168.89
Moisture %	55.920	54.751	63.823
Avg. w %	55.3		63.8

LENGTH CHANGE

STRAIN GAUGE at setup 500

at saturation start 500

at consolidation start 529

at axial load start 537

MASS PROPERTIES

Wt. Tube + Soil		gm.
Wt. Tube		gm.
Wt. Soil	262.29	gm.
Tube Diameter		in.
Sample Length		in
tube length		in.
top trim		in.
bottom trim		in.
total trim		in.
sample length		in.
Density constant 4.85/(D^2 * L)		
Wet Density		pcf.
Dry Density		pcf.

SPECIMEN DIMENSIONS in. / mm.

	HEIGHT		DIAMETER	
	Initial	Final	Initial	Final
1	3.6380		T 1.9630	
2	3.6445		M 1.9620	
3	3.6530		B 1.9650	
Avg.	3.64517		1.96333	

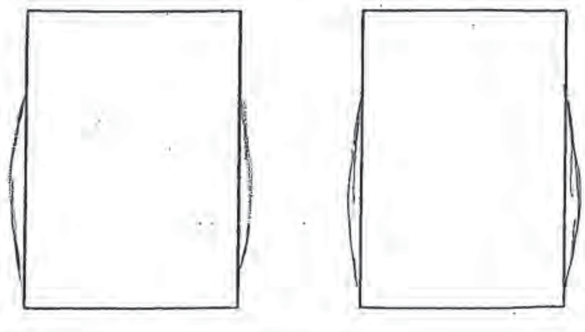
Description After Test Initial $\gamma_m = 90.5$

%M = 55.3

$\gamma_D = 58.3$

Remarks *Sample is very fragile will use dry wt after test to determine Density

Failure Sketch



Trimmed By KBK
Trimmed Date 4-11-2011

Setup By KBK
Setup Date 4-11-2011

Taken Down By KBK
Take Down Date 4-21-11

TRIAXIAL CELL SATURATION & BETA FACTOR

PROJECT Ameren Labadie Ponded Fly Ash

SAMPLE Ponded Fly Ash DEPTH

INITIAL CELL PRESSURE 51.0 START DATE 4-11-11

INITIAL PORE PRESSURE 50.0 CELL NUMBER 2

INITIAL TRANSDUCER READING 50.3 TRANSDUCER NUMBER 2

TRIAL DATE	TRIAL TIME	BASE BURETTE READING	CELL PRESSURE	TRANSDUCER READING	CHANGE IN PRESSURE Transducer Constant			
					CELL DELTA (1)	TRANSDUCER		BETA FACTOR (2/1)
						READING CHANGE	PRESSURE CHANGE (2)	
4-13-11	0	2.95	51.0	50.6				
	1		56.0	55.4	5.0		4.8	0.96
	2		"	55.4	5.0		4.8	0.96
	4		"	55.4	5.0		4.8	0.96

OK
KER

TRIAXIAL CELL CONSOLIDATION TEST

PROJECT Ameren Labadie UWL Ponded Fly Ash

SAMPLE Ponded Fly Ash DEPTH

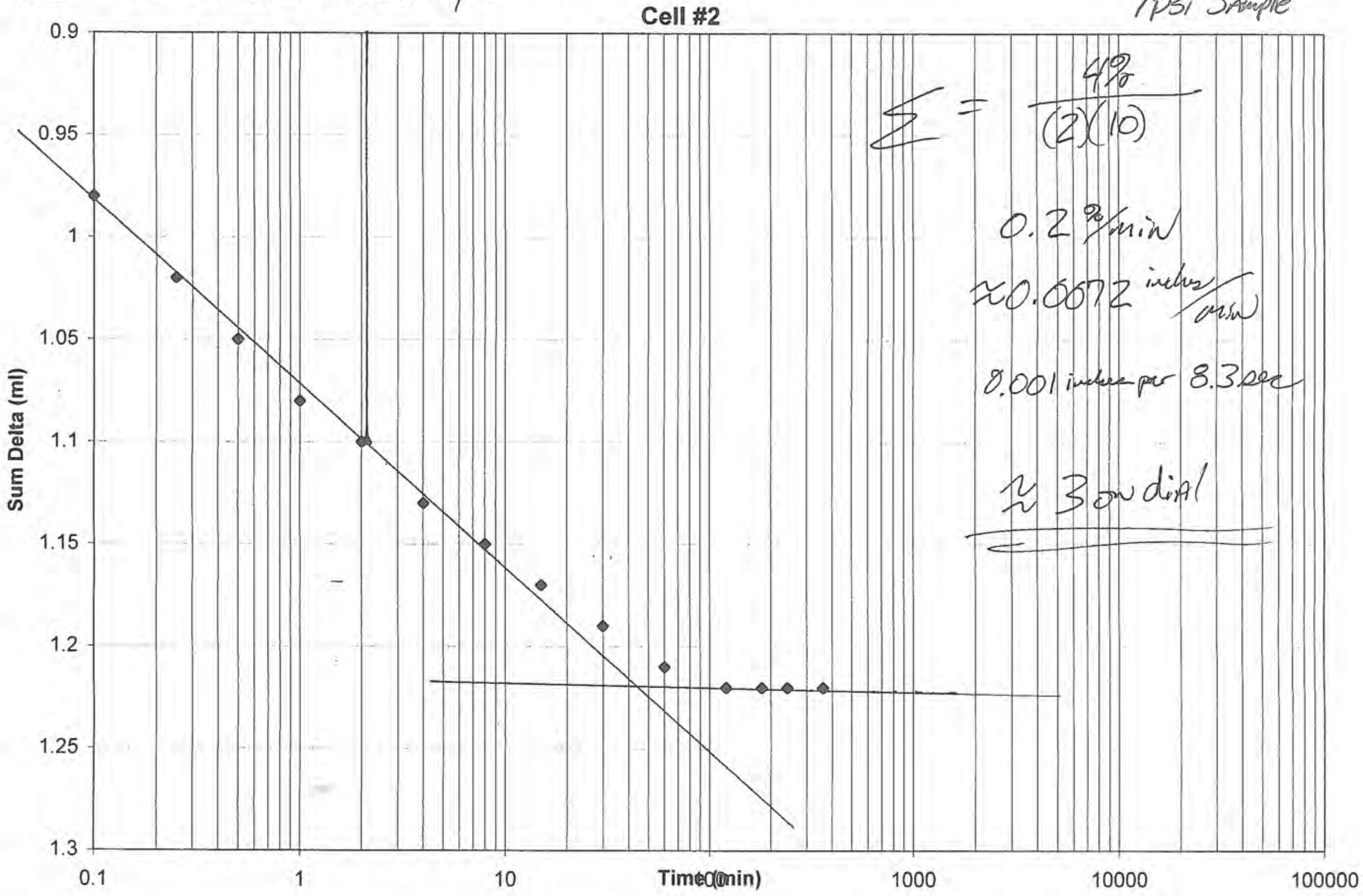
CONSOLIDATION CELL PRESSURE 62.0 CELL NUMBER 2

CONSOLIDATION PORE PRESSURE 55.0

DATE	TIME	BURETTE READING	DELTA VOLUME	SUM DELTA VOLUME	DELTA TIME	TEMP	REMARKS
4-14-11	7:42	10.00			0		
		9.02			.1		
		8.98			.25		
		8.95			.5		
	7:43	8.92			1		
	7:44	8.90			2		
	7:46	8.87			4		
	7:50	8.85			8		
	7:57	8.83			15		
	8:12	8.81			30		
	8:42	8.79			60		
	9:42	8.78			120		
	10:42	8.78			180		
	11:42	8.78			240		
	13:42	8.78			360		

Ameren Labadie UWL Ponded Fly Ash

7psi Sample



$\Sigma = \frac{4\%}{(2)(10)}$

0.2 %/min

≈0.0072 inches/min

0.001 inches per 8.3 sec

≈ 3 on dial

TRIAXIAL CELL AXIAL LOADING TEST

DATE 4-15-11

PROVING RING ______

PROJECT Ameren Labadie UWL

SAMPLE Ponded Flyash DEPTH ______

INITIAL CELL PRESSURE 62.0 CELL NUMBER 2

INITIAL PORE PRESSURE 55.0 START DATE 4-15-11

SAMPLE HEIGHT: AT SETUP ______ AT START OF LOADING ≈3.6082

STRAIN RATE 0.2 %/min TYPE OF TEST Staged CU

50 is 1%

TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING	TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING
Data Collected Electronically							

MASS OF TOP CAP & POROUS STONE: ______ g.

SCHEDULE CJG-ST1

B-7

REITZ & JENS, INC. Consulting Engineers Sheet ______ of ______

TRIAXIAL CELL CONSOLIDATION TEST

Strain @ Consol Start 506
@ Axial Loading 503

PROJECT Ameren LaBadie UWL

SAMPLE Ponded Fly Ash DEPTH

CONSOLIDATION CELL PRESSURE 74.0 CELL NUMBER 2

CONSOLIDATION PORE PRESSURE 59.0

15 psi Stage

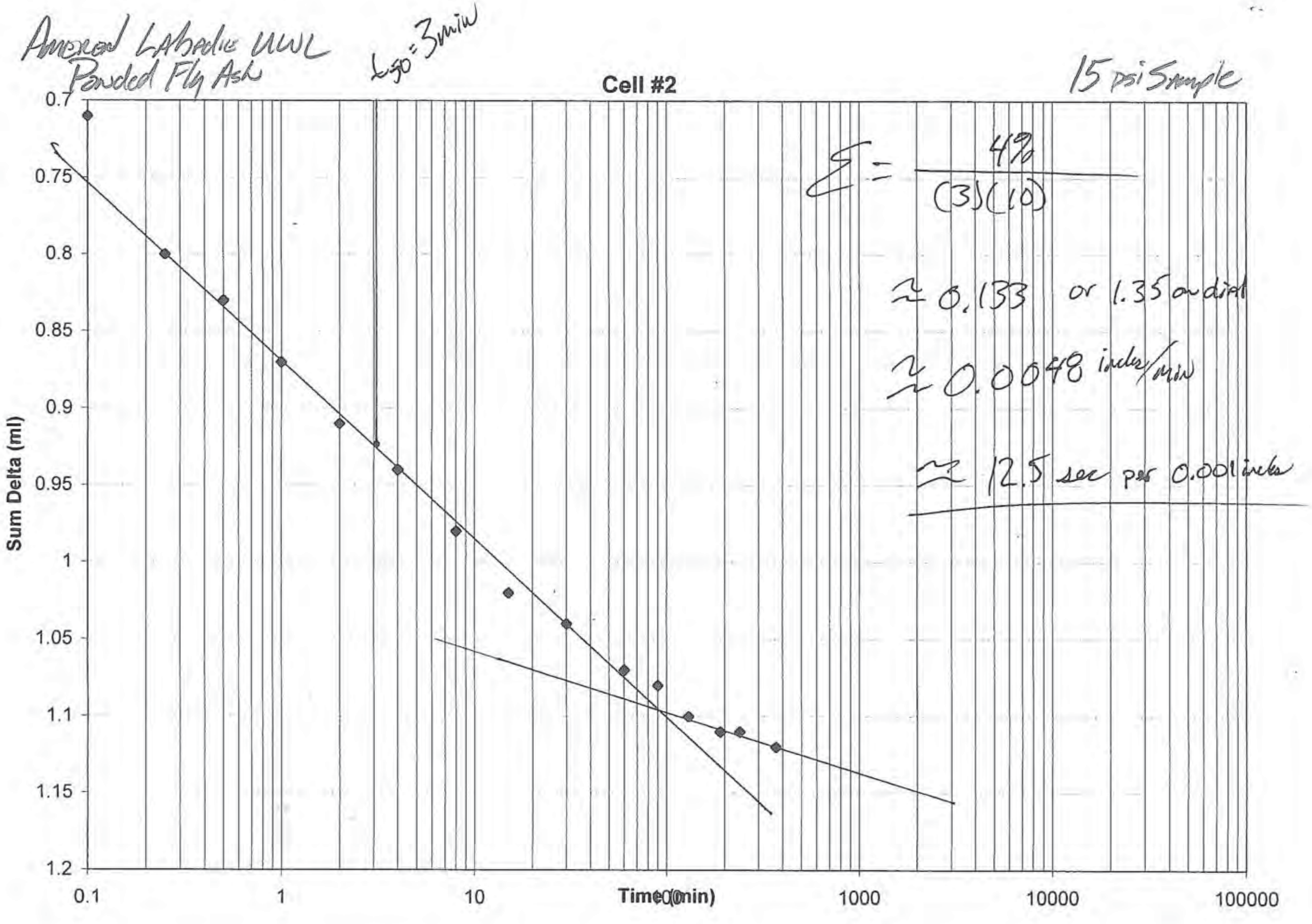
DATE	TIME	BURETTE READING	DELTA VOLUME	SUM DELTA VOLUME	DELTA TIME	TEMP	REMARKS
4-15-11	9:00	10.00			0		
		9.29			.1		
		9.20			.25		
		9.17			.5		
	9:01	9.13			1		
	9:02	9.09			2		
	9:04	9.06			4		
	9:08	9.02			8		
	9:15	8.98			15		
	9:30	8.96			30		
	10:00	8.93			60		
	10:30	8.92			90		
	11:10	8.90			130		
	12:10	8.89			190		
	13:00	8.89			240		
	15:10	8.88			370		
4-18-11	7:10	8.88					

SCHEDULE CJG-ST1

Ameren Labadie UWL
Ponded Fly Ash

t_{50} = 3min

15 psi Sample



$\varepsilon = \frac{4\%}{(3)(10)}$

≈ 0.133 or 1.35 on dial

≈ 0.0048 inches/min

≈ 12.5 sec per 0.001 inches

TRIAXIAL CELL AXIAL LOADING TEST DATE 4-20-11

PROVING RING ____________

PROJECT Ameren Labadie UWL

SAMPLE Ponded Fly Ash DEPTH ____________

INITIAL CELL PRESSURE 74.0 CELL NUMBER 2

INITIAL PORE PRESSURE 59.0 START DATE 4-20-2011

SAMPLE HEIGHT: AT SETUP ____________ AT START OF LOADING ≈3.60

STRAIN RATE 0.13 TYPE OF TEST Staged CU

TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING	TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING
Data Collected Electronically							

MASS OF TOP CAP & POROUS STONE: ________ g.

REITZ & JENS, INC. Consulting Engineers Sheet ________ of ________

TRIAXIAL CELL CONSOLIDATION TEST

Strain @ Consol Start 500
@ Axial Loading 500

PROJECT Ameren Labadie UWL

SAMPLE Ponded Fly Ash DEPTH

CONSOLIDATION CELL PRESSURE 92.0 CELL NUMBER 2

CONSOLIDATION PORE PRESSURE 67.0

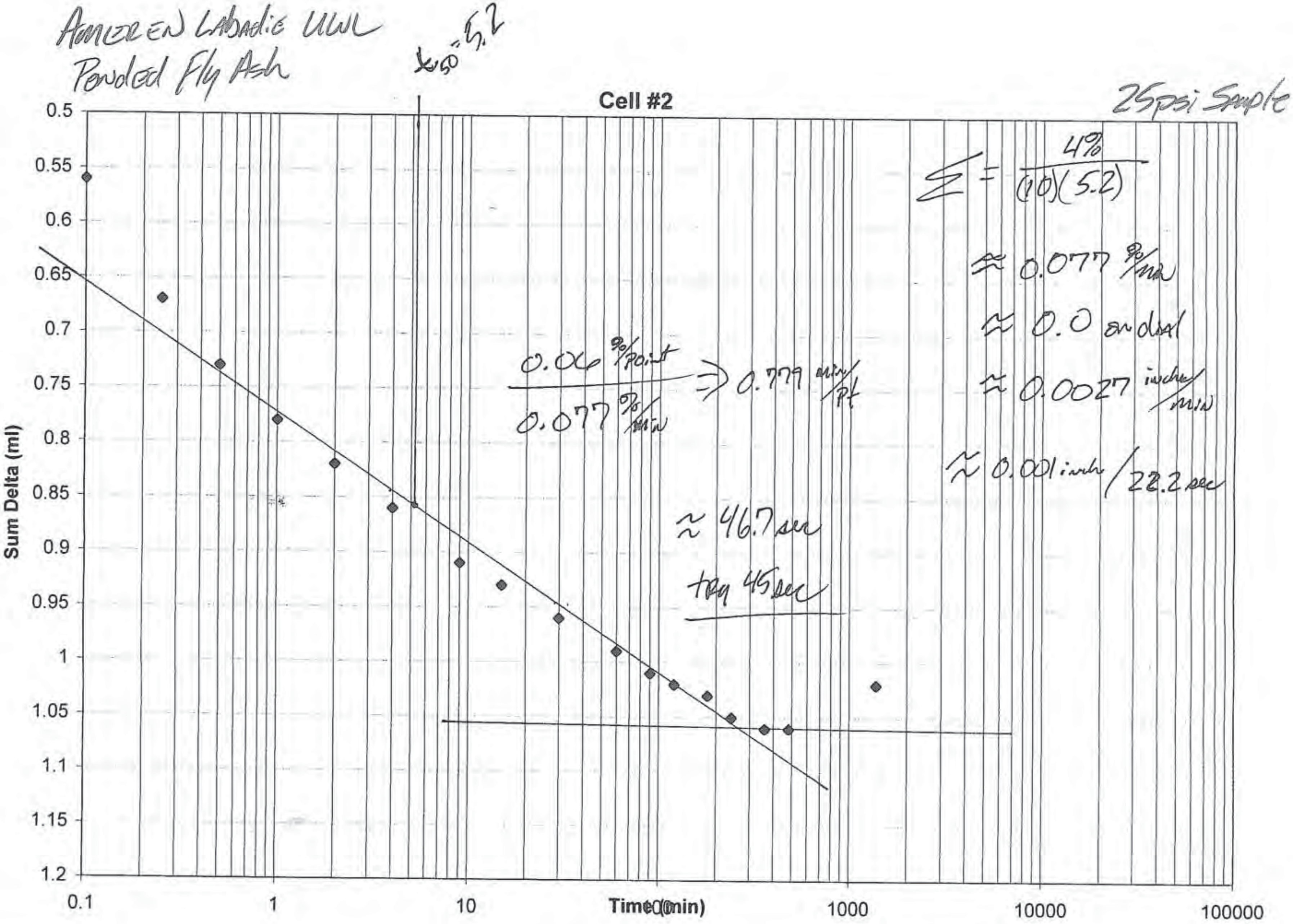
25 psi Stage

DATE	TIME	BURETTE READING	DELTA VOLUME	SUM DELTA VOLUME	DELTA TIME	TEMP	REMARKS
4-20	8:55	10.00		0			
		9.44		.1			
		9.33		.25			
		9.27		.5			
	8:56	9.22		1			
	8:57	9.18		2			
	8:59	9.14		4			
	9:09	9.09		8			
	9:10	9.07		15			
	9:25	9.04		30			
	9:55	9.01		60			
	10:25	8.99		90			
	10:55	8.98		120			
	11:55	8.97		180			
	12:55	8.95		240			
	14:55	8.94		360			
	16:55	8.94		480			
4-21-11	7:50	8.98		1375			

1440
-65
1375

SCHEDULE CJG-ST1

Ameren Labadie UWL
Ponded Fly Ash



TRIAXIAL CELL AXIAL-LOADING TEST

DATE 4-21-11

PROVING RING ______

PROJECT AMEREN Labadie UWL

SAMPLE Powdered Fly Ash DEPTH ______

INITIAL CELL PRESSURE 92.0 CELL NUMBER 2

INITIAL PORE PRESSURE 67.0 START DATE 4-21-11

SAMPLE HEIGHT: AT SETUP ______ AT START OF LOADING ≈ 3.58"

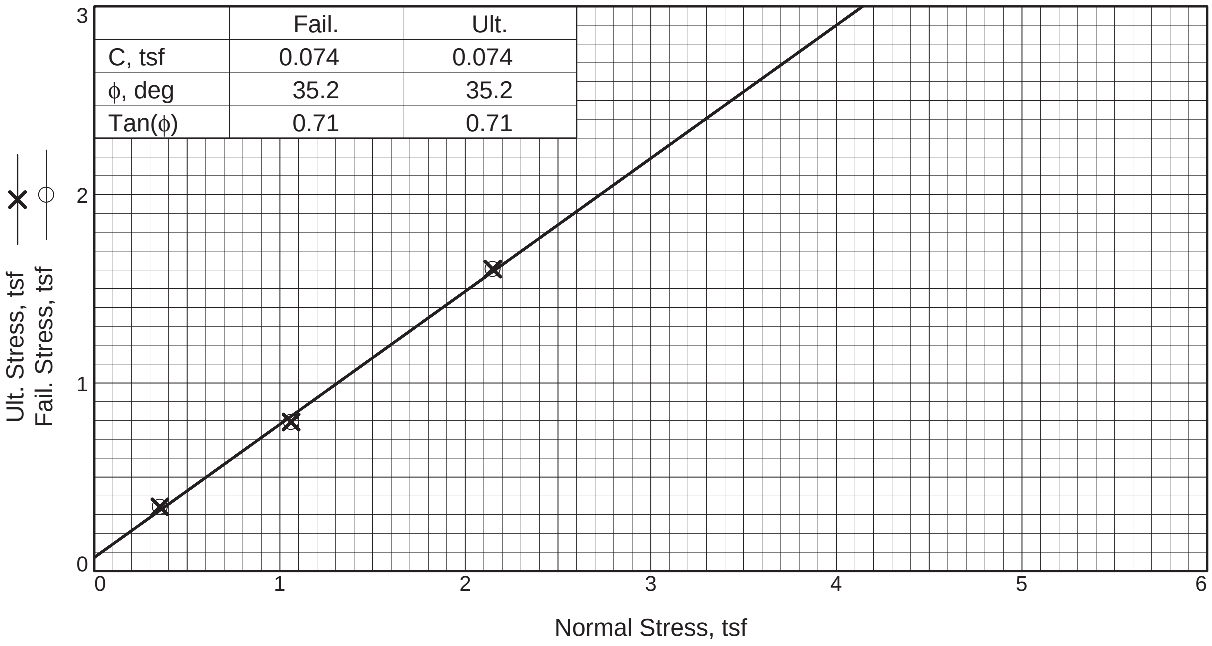
STRAIN RATE 0.077 %/min TYPE OF TEST Staged CU test

TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING	TIME	STRAIN DIAL (.001) IN	LOAD DIAL (.0001) IN	PORE PRESSURE READING
Data Collected Electronically							

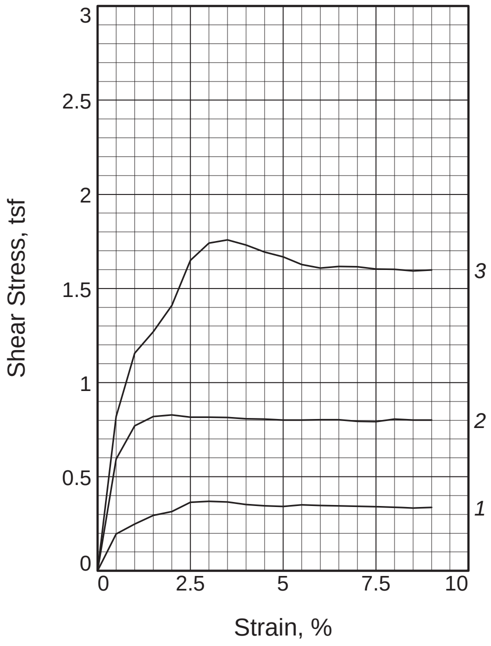
MASS OF TOP CAP & POROUS STONE: ______ g.

SCHEDULE CJG-ST1

REITZ & JENS, INC. Consulting Engineers Sheet ______ of



	Fail.	Ult.
C, tsf	0.074	0.074
ϕ, deg	35.2	35.2
Tan(ϕ)	0.71	0.71



	Sample No.	1	2	3
Initial	Water Content, %	58.8	58.8	58.8
	Dry Density, pcf	59.8	60.7	62.7
	Saturation, %	84.7	86.6	90.9
	Void Ratio	1.9947	1.9496	1.8577
	Diameter, in.	2.00	2.00	2.00
	Height, in.	1.31	1.31	1.31
At Test	Water Content, %	57.0	56.2	55.2
	Dry Density, pcf	59.8	60.7	62.7
	Saturation, %	82.1	82.8	85.3
	Void Ratio	1.9947	1.9496	1.8577
	Diameter, in.	2.00	2.00	2.00
	Height, in.	1.31	1.31	1.31
	Normal Stress, tsf	0.354	1.061	2.148
	Fail. Stress, tsf	0.342	0.792	1.604
	Strain, %	7.5	7.5	7.5
	Ult. Stress, tsf	0.342	0.792	1.604
	Strain, %	7.5	7.5	7.5
	Strain rate, %/min.	0.80	0.80	0.80

Sample Type: Hand Compacted

Description: Ponded fly-ash, air dried to 8% and molded at 55%

Specific Gravity= 2.87

Remarks: Direct shear with textured liner material

Figure _______

Client: Ameren Missouri

Project: CCP Properties, Labadie Plant

Source of Sample: Ponded Fly Ash

Sample Number: Bulk

Proj. No.: 2008012455 **Date:** 4/26/11

REITZ & JENS, INC.
CONSULTING ENGINEERS

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

DIRECT SHEAR TEST

Date: 4/26/11
Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project No.: 2008012455
Location: Ponded Fly Ash
Sample Number: Bulk
Description: Ponded fly-ash, air dried to 8% and molded at 55%
Remarks: Direct shear with textured liner material
Type of Sample: Hand Compacted
Specific Gravity=2.87 **LL=** **PL=** **PI=**

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	108.330		123.830
Moisture content: Dry soil+tare, gms.	76.200		86.810
Moisture content: Tare, gms.	21.590		21.900
Moisture, %	58.8	57.0	57.0
Moist specimen weight, gms.	102.7		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.31	1.31	
Net decrease in height, in.		0.00	
Wet Density, pcf	95.0	94.0	
Dry density, pcf	59.8	59.8	
Void ratio	1.9947	1.9947	
Saturation, %	84.7	82.1	

Test Readings for Specimen No. 1

Primary load ring constant = .1176 lbs. per input unit
Normal stress = 0.3537 tsf
Strain rate, %/min. = 0.80
Fail. Stress = 0.342 tsf **at reading no.** 15
Ult. Stress = 0.342 tsf **at reading no.** 15

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	2.0	0.0	0.0	0.000
1	0.0100	75.0	8.6	0.5	0.197
2	0.0200	94.0	10.8	1.0	0.248
3	0.0300	111.0	12.8	1.5	0.294
4	0.0400	119.0	13.8	2.0	0.315
5	0.0500	137.0	15.9	2.5	0.364
6	0.0600	139.0	16.1	3.0	0.369
7	0.0700	138.0	16.0	3.5	0.367
8	0.0800	133.0	15.4	4.0	0.353
9	0.0900	130.0	15.1	4.5	0.345
10	0.1000	129.0	14.9	5.0	0.342
11	0.1100	132.0	15.3	5.5	0.350
12	0.1200	131.0	15.2	6.0	0.348

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
13	0.1300	130.0	15.1	6.5	0.345
14	0.1400	129.0	14.9	7.0	0.342
15	0.1500	129.0	14.9	7.5	0.342
16	0.1600	127.0	14.7	8.0	0.337
17	0.1700	126.0	14.6	8.5	0.334
18	0.1800	127.0	14.7	9.0	0.337

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	108.330		124.010
Moisture content: Dry soil+tare, gms.	76.200		87.360
Moisture content: Tare, gms.	21.590		22.180
Moisture, %	58.8	56.2	56.2
Moist specimen weight, gms.	104.2		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.31	1.31	
Net decrease in height, in.		0.00	
Wet Density, pcf	96.5	94.9	
Dry density, pcf	60.7	60.7	
Void ratio	1.9496	1.9496	
Saturation, %	86.6	82.8	

Test Readings for Specimen No. 2

Primary load ring constant = .1176 lbs. per input unit

Normal stress = 1.061 tsf

Strain rate, %/min. = 0.80

Fail. Stress = 0.792 tsf **at reading no.** 15

Ult. Stress = 0.792 tsf **at reading no.** 15

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	1.0	0.0	0.0	0.000
1	0.0100	221.0	25.9	0.5	0.593
2	0.0200	287.0	33.6	1.0	0.771
3	0.0300	305.0	35.8	1.5	0.819
4	0.0400	308.0	36.1	2.0	0.827
5	0.0500	304.0	35.6	2.5	0.817
6	0.0600	304.0	35.6	3.0	0.817
7	0.0700	303.0	35.5	3.5	0.814
8	0.0800	301.0	35.3	4.0	0.809
9	0.0900	300.0	35.2	4.5	0.806
10	0.1000	298.0	34.9	5.0	0.800
11	0.1100	298.0	34.9	5.5	0.800
12	0.1200	299.0	35.0	6.0	0.803
13	0.1300	299.0	35.0	6.5	0.803
14	0.1400	296.0	34.7	7.0	0.795
15	0.1500	295.0	34.6	7.5	0.792
16	0.1600	300.0	35.2	8.0	0.806

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
17	0.1700	298.0	34.9	8.5	0.800
18	0.1800	298.0	34.9	9.0	0.800

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	108.330		126.110
Moisture content: Dry soil+tare, gms.	76.200		88.940
Moisture content: Tare, gms.	21.590		21.600
Moisture, %	58.8	55.2	55.2
Moist specimen weight, gms.	107.6		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.31	1.31	
Net decrease in height, in.		0.00	
Wet Density, pcf	99.6	97.3	
Dry density, pcf	62.7	62.7	
Void ratio	1.8577	1.8577	
Saturation, %	90.9	85.3	

Test Readings for Specimen No. 3

Primary load ring constant = .1176 lbs. per input unit

Normal stress = 2.148 tsf

Strain rate, %/min. = 0.80

Fail. Stress = 1.604 tsf **at reading no.** 15

Ult. Stress = 1.604 tsf **at reading no.** 15

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	1.0	0.0	0.0	0.000
1	0.0100	305.0	35.8	0.5	0.819
2	0.0200	430.0	50.5	1.0	1.156
3	0.0300	472.0	55.4	1.5	1.269
4	0.0400	524.0	61.5	2.0	1.410
5	0.0500	613.0	72.0	2.5	1.649
6	0.0600	647.0	76.0	3.0	1.741
7	0.0700	653.0	76.7	3.5	1.757
8	0.0800	643.0	75.5	4.0	1.730
9	0.0900	629.0	73.9	4.5	1.693
10	0.1000	620.0	72.8	5.0	1.668
11	0.1100	605.0	71.0	5.5	1.628
12	0.1200	598.0	70.2	6.0	1.609
13	0.1300	601.0	70.6	6.5	1.617
14	0.1400	600.0	70.4	7.0	1.614
15	0.1500	596.0	70.0	7.5	1.604
16	0.1600	595.0	69.9	8.0	1.601
17	0.1700	592.0	69.5	8.5	1.593
18	0.1800	594.0	69.7	9.0	1.598

DIRECT SHEAR

job Ameren Labadie UWL
date 4-26-11

Sample Description lightly compacted "ponded" Fly Ash

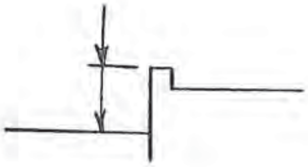
Sample + Tare Start 4183.63
Sample + Tare Finish 4183.63
Sample Used 102.66

TARE 4080.97

Diam = 2.0"
L = 1.31"

BLOCK MEASUREMENT

Projection Start
Projection Finish



Volume of Sample Dry Density

CONFINING (Vertical) LOAD 7.0 Kg

$P = 45 \times \frac{N}{840} + \left[(N-840) \times 0.353\right]$

LOAD DIAL	HZ. STRAIN DIAL	VERT. STRAIN DIAL	
002	0		
085	10		
094	20		
111	30		
119	40		
137	50		
139	60		
138	70		
133	80		
130	90		
129	100		
132	110		
131	120		
130	130		
129	140		
129	150		
127	160		
124	170		
127	180		

DIRECT SHEAR

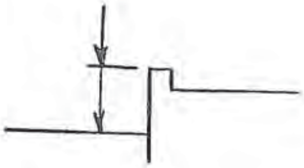
job Ameren LABADIE UWL
date 4/26/11
Sample Description lightly compacted "ponded" Fly ash

Φ= 8"
r= 1.31"

Sample + Tare Start 4185.20 TARE 4080.97
Sample + Tare Finish
Sample Used 104.23

BLOCK MEASUREMENT

Projection Start
Projection Finish



Volume of Sample Dry Density

CONFINING (Vertical) LOAD 21 Kg

$P = 45 \times \frac{N}{840} + \left[(N-840) \times 0.353\right]$

LOAD DIAL	HZ. STRAIN DIAL	VERT. STRAIN DIAL	
001	0		
221	10		
287	20		
305	30		
308	40		
304	50		
304	60		
303	70		
301	80		
300	90		
298	100		
298	110		
299	120		
299	130		
296	140		
295	150		
300	160		
298	170		
298	180		

JJC
KEK

DIRECT SHEAR

job Ameren Labadie UWL

date 4/24/11

Sample Description lightly compacted "ponded" fly ash

Φ = 2"
= 1.31"

Sample + Tare Start 4188.55

Sample + Tare Finish

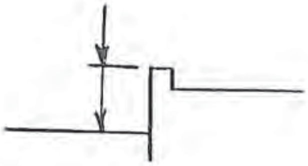
Sample Used 107.58

Tare 4080.97

BLOCK MEASUREMENT

Projection Start N/A

Projection Finish N/A



Volume of Sample   Dry Density

CONFINING (Vertical) LOAD 42.5 Kg

$P = 45 \times \frac{N}{840} + \left[(N-840) \times 0.353\right]$

LOAD DIAL	HZ. STRAIN DIAL	VERT. STRAIN DIAL	
001	0		
305	10		
430	20		
472	30		
524	40		
613	50		
647	60		
653	70		
643	80		
629	90		
620	100		
605	110		
598	120		
601	130		
600	140		
596	150		
595	160		
592	170		
594	180		

Reitz & Jens, Inc.

ATTERBERG LIMITS & MOISTURE CONTENT

Job: Ameren Labadie UWL Date: 4/26/11
Location: Ponded Flyash @ +45%OM Test By:
Checked: KOK Date: 4-27-11

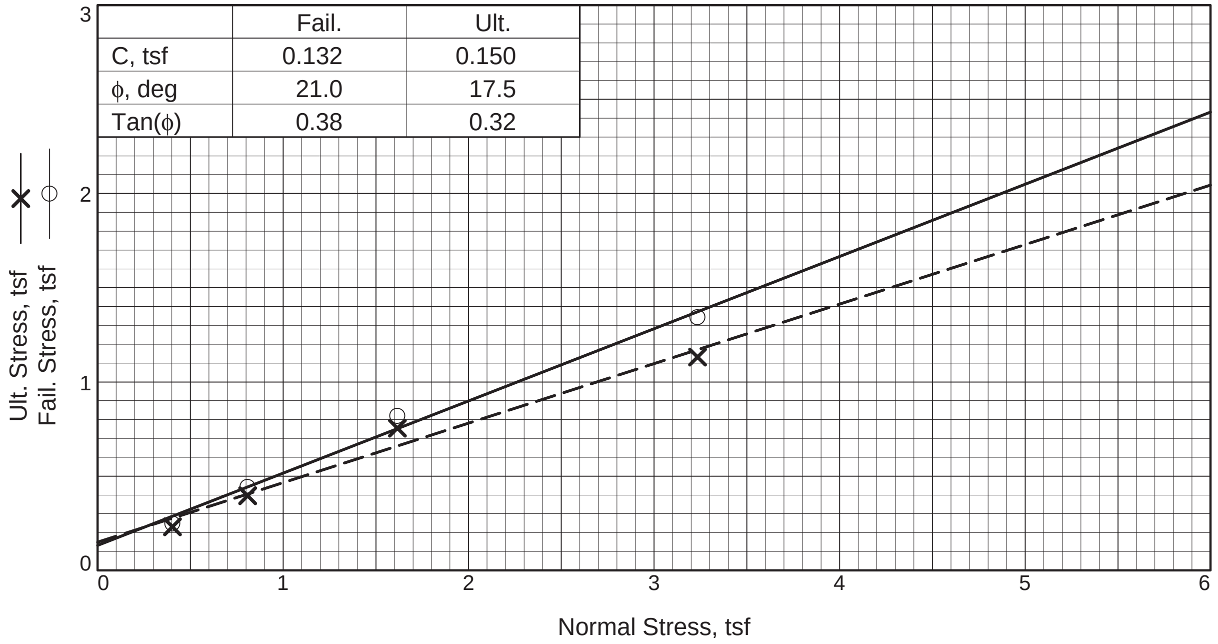
Test Hole		7Kg	21Kg	42.5Kg		
Depth						
Type of Test						
Container No.	75	12	30	79		
No. of Blows						
Wt. Wet + Tare	108.33	123.83	124.01	126.11		
Wt. Dry + Tare	76.20	86.81	87.36	88.94		
Wt. Water						
Tare	21.57	21.90	22.18	21.60		
Wt. Dry Soil						
% Moisture						
Liquid Limit						
Average Limits						

Test Hole						
Depth						
Type of Test						
Container No.						
No. of Blows						
Wt. Wet + Tare						
Wt. Dry + Tare						
Wt. Water						
Tare						
Wt. Dry Soil						
% Moisture						
Liquid Limit						
Average Limits						

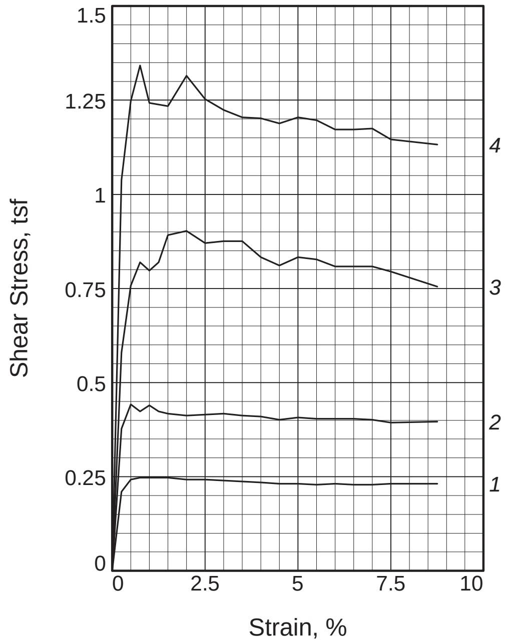
Test Hole						
Depth						
Type of Test						
Container No.						
No. of Blows						
Wt. Wet + Tare						
Wt. Dry + Tare						
Wt. Water						
Tare						
Wt. Dry Soil						
% Moisture						
Liquid Limit						
Average Limits						

Remarks:

NO. 114



	Fail.	Ult.
C, tsf	0.132	0.150
ϕ, deg	21.0	17.5
Tan(ϕ)	0.38	0.32



	Sample No.	1	2	3	4
Initial	Water Content, %	56.5	56.6	56.6	55.8
	Dry Density, pcf	59.5	59.6	59.4	60.4
	Saturation, %	80.6	80.9	80.5	81.3
	Void Ratio	2.0116	2.0080	2.0178	1.9675
	Diameter, in.	2.00	2.00	2.00	2.00
	Height, in.	1.31	1.31	1.31	1.31
At Test	Water Content, %	56.5	56.6	58.4	55.8
	Dry Density, pcf	59.5	59.6	59.4	60.4
	Saturation, %	80.6	80.9	83.1	81.3
	Void Ratio	2.0116	2.0080	2.0178	1.9675
	Diameter, in.	2.00	2.00	2.00	2.00
	Height, in.	1.31	1.31	1.31	1.31
	Normal Stress, tsf	0.404	0.808	1.617	3.234
	Fail. Stress, tsf	0.248	0.442	0.819	1.342
	Strain, %	0.8	0.5	0.8	0.8
	Ult. Stress, tsf	0.232	0.396	0.755	1.132
	Strain, %	8.8	8.8	8.8	8.8
	Strain rate, %/min.	0.80	0.80	0.80	0.80

Sample Type: Hand Compacted

Description: Ponded fly-ash, air dried to 8% and molded at 55%

Assumed Specific Gravity= 2.87

Remarks: Direct shear with smooth liner material

Figure _______

Client: Ameren Missouri

Project: CCP Properties, Labadie Plant

Source of Sample: Ponded Fly Ash

Sample Number: Bulk

Proj. No.: 2008012455 **Date:** 5/16/11

REITZ & JENS, INC.
CONSULTING ENGINEERS

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

SCHEDULE CJG-ST1

DIRECT SHEAR TEST

5/23/2011

Date: 5/16/11
Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project No.: 2008012455
Location: Ponded Fly Ash
Sample Number: Bulk
Description: Ponded fly-ash, air dried to 8% and molded at 55%
Remarks: Direct shear with smooth liner material
Type of Sample: Hand Compacted
Assumed Specific Gravity=2.87 **LL=** **PL=** **PI=**

Parameters for Specimen No. 1

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	137.620		137.620
Moisture content: Dry soil+tare, gms.	101.600		101.600
Moisture content: Tare, gms.	37.810		37.810
Moisture, %	56.5	56.5	56.5
Moist specimen weight, gms.	100.6		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.31	1.31	
Net decrease in height, in.		0.00	
Wet Density, pcf	93.1	93.1	
Dry density, pcf	59.5	59.5	
Void ratio	2.0116	2.0116	
Saturation, %	80.6	80.6	

Test Readings for Specimen No. 1

Primary load ring constant = .1176 lbs. per input unit
Normal stress = 0.4042 tsf
Strain rate, %/min. = 0.80
Fail. Stress = 0.248 tsf **at reading no.** 3
Ult. Stress = 0.232 tsf **at reading no.** 19

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	0.0	0.0	0.0	0.000
1	0.0050	78.0	9.2	0.3	0.210
2	0.0100	90.0	10.6	0.5	0.243
3	0.0150	92.0	10.8	0.8	0.248
4	0.0200	92.0	10.8	1.0	0.248
5	0.0250	92.0	10.8	1.3	0.248
6	0.0300	92.0	10.8	1.5	0.248
7	0.0400	90.0	10.6	2.0	0.243
8	0.0500	90.0	10.6	2.5	0.243
9	0.0600	89.0	10.5	3.0	0.240
10	0.0700	88.0	10.3	3.5	0.237
11	0.0800	87.0	10.2	4.0	0.234
12	0.0900	86.0	10.1	4.5	0.232

Test Readings for Specimen No. 1

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
13	0.1000	86.0	10.1	5.0	0.232
14	0.1100	85.0	10.0	5.5	0.229
15	0.1200	86.0	10.1	6.0	0.232
16	0.1300	85.0	10.0	6.5	0.229
17	0.1400	85.0	10.0	7.0	0.229
18	0.1500	86.0	10.1	7.5	0.232
19	0.1750	86.0	10.1	8.8	0.232

Parameters for Specimen No. 2

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	139.440		139.440
Moisture content: Dry soil+tare, gms.	103.290		103.290
Moisture content: Tare, gms.	39.460		39.460
Moisture, %	56.6	56.6	56.6
Moist specimen weight, gms.	100.8		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.31	1.31	
Net decrease in height, in.		0.00	
Wet Density, pcf	93.3	93.3	
Dry density, pcf	59.6	59.6	
Void ratio	2.0080	2.0080	
Saturation, %	80.9	80.9	

Test Readings for Specimen No. 2

Primary load ring constant = .1176 lbs. per input unit

Normal stress = 0.8084 tsf

Strain rate, %/min. = 0.80

Fail. Stress = 0.442 tsf **at reading no.** 2

Ult. Stress = 0.396 tsf **at reading no.** 19

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	0.0	0.0	0.0	0.000
1	0.0050	140.0	16.5	0.3	0.377
2	0.0100	164.0	19.3	0.5	0.442
3	0.0150	157.0	18.5	0.8	0.423
4	0.0200	163.0	19.2	1.0	0.439
5	0.0250	157.0	18.5	1.3	0.423
6	0.0300	155.0	18.2	1.5	0.418
7	0.0400	153.0	18.0	2.0	0.412
8	0.0500	154.0	18.1	2.5	0.415
9	0.0600	155.0	18.2	3.0	0.418
10	0.0700	153.0	18.0	3.5	0.412
11	0.0800	152.0	17.9	4.0	0.410
12	0.0900	149.0	17.5	4.5	0.402
13	0.1000	151.0	17.8	5.0	0.407
14	0.1100	150.0	17.6	5.5	0.404
15	0.1200	150.0	17.6	6.0	0.404

Test Readings for Specimen No. 2

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
16	0.1300	150.0	17.6	6.5	0.404
17	0.1400	149.0	17.5	7.0	0.402
18	0.1500	146.0	17.2	7.5	0.393
19	0.1750	147.0	17.3	8.8	0.396

Parameters for Specimen No. 3

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	136.700		136.700
Moisture content: Dry soil+tare, gms.	100.790		100.790
Moisture content: Tare, gms.	37.310		39.310
Moisture, %	56.6	58.4	58.4
Moist specimen weight, gms.	100.4		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.31	1.31	
Net decrease in height, in.		0.00	
Wet Density, pcf	93.0	94.0	
Dry density, pcf	59.4	59.4	
Void ratio	2.0178	2.0178	
Saturation, %	80.5	83.1	

Test Readings for Specimen No. 3

Primary load ring constant = .1176 lbs. per input unit

Normal stress = 1.6168 tsf

Strain rate, %/min. = 0.80

Fail. Stress = 0.819 tsf **at reading no.** 3

Ult. Stress = 0.755 tsf **at reading no.** 19

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	0.0	0.0	0.0	0.000
1	0.0050	215.0	25.3	0.3	0.579
2	0.0100	281.0	33.0	0.5	0.757
3	0.0150	304.0	35.8	0.8	0.819
4	0.0200	296.0	34.8	1.0	0.798
5	0.0250	304.0	35.8	1.3	0.819
6	0.0300	331.0	38.9	1.5	0.892
7	0.0400	335.0	39.4	2.0	0.903
8	0.0500	323.0	38.0	2.5	0.871
9	0.0600	325.0	38.2	3.0	0.876
10	0.0700	325.0	38.2	3.5	0.876
11	0.0800	309.0	36.3	4.0	0.833
12	0.0900	301.0	35.4	4.5	0.811
13	0.1000	309.0	36.3	5.0	0.833
14	0.1100	307.0	36.1	5.5	0.827
15	0.1200	300.0	35.3	6.0	0.809
16	0.1300	300.0	35.3	6.5	0.809
17	0.1400	300.0	35.3	7.0	0.809
18	0.1500	295.0	34.7	7.5	0.795

Test Readings for Specimen No. 3

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
19	0.1750	280.0	32.9	8.8	0.755

Parameters for Specimen No. 4

Specimen Parameter	Initial	Consolidated	Final
Moisture content: Moist soil+tare, gms.	140.880		140.880
Moisture content: Dry soil+tare, gms.	105.060		105.060
Moisture content: Tare, gms.	40.830		40.830
Moisture, %	55.8	55.8	55.8
Moist specimen weight, gms.	101.6		
Diameter, in.	2.00	2.00	
Area, in.²	3.14	3.14	
Height, in.	1.31	1.31	
Net decrease in height, in.		0.00	
Wet Density, pcf	94.0	94.0	
Dry density, pcf	60.4	60.4	
Void ratio	1.9675	1.9675	
Saturation, %	81.3	81.3	

Test Readings for Specimen No. 4

Primary load ring constant = .1176 lbs. per input unit

Normal stress = 3.2336 tsf

Strain rate, %/min. = 0.80

Fail. Stress = 1.342 tsf **at reading no.** 3

Ult. Stress = 1.132 tsf **at reading no.** 18

No.	Horizontal Def. Dial in.	Load Dial	Load lbs.	Strain %	Shear Stress tsf
0	0.0000	0.0	0.0	0.0	0.000
1	0.0050	385.0	45.3	0.3	1.038
2	0.0100	463.0	54.4	0.5	1.248
3	0.0150	498.0	58.6	0.8	1.342
4	0.0200	461.0	54.2	1.0	1.242
5	0.0300	458.0	53.9	1.5	1.234
6	0.0400	488.0	57.4	2.0	1.315
7	0.0500	465.0	54.7	2.5	1.253
8	0.0600	454.0	53.4	3.0	1.224
9	0.0700	447.0	52.6	3.5	1.205
10	0.0800	446.0	52.4	4.0	1.202
11	0.0900	441.0	51.9	4.5	1.189
12	0.1000	447.0	52.6	5.0	1.205
13	0.1100	444.0	52.2	5.5	1.197
14	0.1200	435.0	51.2	6.0	1.172
15	0.1300	435.0	51.2	6.5	1.172
16	0.1400	436.0	51.3	7.0	1.175
17	0.1500	425.0	50.0	7.5	1.145
18	0.1750	420.0	49.4	8.8	1.132

A1 -

DIRECT SHEAR

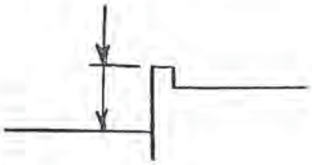
job Ameren Labadie UWL
date 5/14/11

Sample Description AIR DRIED PONDED fly ASH w/ 45% WATER ADDED, COMPACTED = TO REDUCED proctor

Sample + Tare Start 4182.94
~~Sample +~~ Tare ~~Finish~~ 4082.38
Sample Used 100.56

Diam = 2.0"
Length = 1.31"

BLOCK MEASUREMENT



Projection Start
Projection Finish

Volume of Sample   Dry Density

CONFINING (Vertical) LOAD 8 Kg 0.4642 tsf

LOAD DIAL	HZ. STRAIN DIAL	VERT. STRAIN DIAL	
000	0		
	5		
90	10		
92	15		
92	20		
92	25		
92	30		
90	40		
90	50		
89	60		
88	70		
87	80		
86	90		
86	100		
85	110		
86	120		
85	130		
85	140		
86	150		
86	175		

$$P = 45 \times \frac{N}{840} + \left[(N-840) \times 0.353\right]$$

1-2

DIRECT SHEAR

job Ameren Labadie UWL

date 5/16/4

Sample Description Same As 8 Kg Sample

Sample + Tare Start 4183.17

~~Sample~~ + Tare ~~Finish~~ 4082.38

Sample Used 100.79

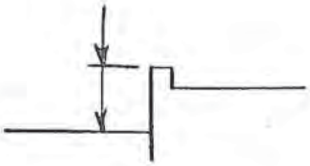
Dia = 2.0"

L = 1.31"

BLOCK MEASUREMENT

Projection Start

Projection Finish



Volume of Sample Dry Density

CONFINING (Vertical) LOAD 16Kg 0.8084 tsf

LOAD DIAL	HZ. STRAIN DIAL	VERT. STRAIN DIAL	
000	0		
140	5		
144	10		
157	15		
143	20		
157	25		
155	30		
153	40		
154	50		
155	60		
153	70		
152	80		
149	90		
151	100		
150	110		
150	120		
150	130		
149	140		
146	150		
147	175		

$P = 45 \times \frac{N}{840} + \left[(N-840) \times 0.353\right]$

P3

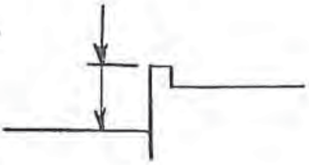
DIRECT SHEAR

job Ameren Labadie UWL
date 5/16/11
Sample Description Same As 8Kg Sample

Sample + Tare Start 4182.80
~~Sample~~ + Tare ~~Finish~~ 4082.38
Sample Used 100.42

Diam = 2.0"
L = 1.31"

BLOCK MEASUREMENT



Projection Start
Projection Finish

Volume of Sample Dry Density

CONFINING (Vertical) LOAD 32 Kg 1.6168 tsf

$P = 45 \times \frac{N}{840} + \left[(N-840) \times 0.353\right]$

LOAD DIAL	HZ. STRAIN DIAL	VERT. STRAIN DIAL	
000	0		
215	5		
281	10		
304	15		
296	20		
304	25		
331	30		
335	40		
323	50		
325	60		
325	70		
309	80		
301	90		
309	100		
307	110		
300	120		
300	130		
300	140		
295	150		
280	175		

P4

DIRECT SHEAR

job Ameren Labadie UWL
date 3/16/11

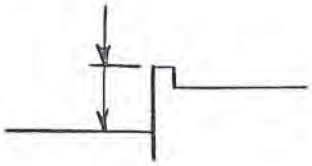
Sample Description Same As 8Kg Sample

Sample + Tare Start 4183.98
~~Sample~~ + Tare ~~Finish~~ 4082.38
Sample Used 101.60

DiA = 2.0"
L = 1.31"

BLOCK MEASUREMENT

Projection Start
Projection Finish



Volume of Sample Dry Density

CONFINING (Vertical) LOAD 64 Kg 3.2336 tsf

$P = 45 \times \frac{N}{840} + \left[(N-840) \times 0.353\right]$

LOAD DIAL	HZ. STRAIN DIAL	VERT. STRAIN DIAL	
000	0		
385	5		
463	10		
498	15		
461	20		
	25		
458	30		
488	40		
465	50		
454	60		
447	70		
446	80		
441	90		
447	100		
444	110		
435	120		
435	130		
436	140		
425	150		
420	175		

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ATTERBERG LIMITS & MOISTURE CONTENT

Job: Direct Shear
Date: 5/16/11

Location: Labadie Ponded Fly Ash
Air Dry @ 45% added
on smooth liner
Test By: JRW + JLC

Checked: KER Date: 5-17-11

Test Hole	8kg		16kg			
Depth						
Type of Test						
Container No.	R55		R111			
No. of Blows						
Wt. Wet + Tare	137.62		139.44			
Wt. Dry + Tare	101.60		103.29			
Wt. Water						
Tare	37.81		39.46			
Wt. Dry Soil						
% Moisture	56.5		56.6			
Liquid Limit						
Average Limits						

Test Hole	32kg		64kg			
Depth						
Type of Test						
Container No.	R33		13			
No. of Blows						
Wt. Wet + Tare	136.70		140.88			
Wt. Dry + Tare	100.79		105.06			
Wt. Water						
Tare	37.31		40.83			
Wt. Dry Soil						
% Moisture	56.6		55.8			
Liquid Limit						
Average Limits						

Test Hole						
Depth						
Type of Test						
Container No.						
No. of Blows						
Wt. Wet + Tare						
Wt. Dry + Tare						
Wt. Water						
Tare						
Wt. Dry Soil						
% Moisture						
Liquid Limit						
Average Limits						

Remarks:

Ameren Missouri; Labadie Power Plant UWL

Utility Waste Landfill, CCP Properties

Material: 100% ponded fly ash, material was air dried to 8% moisture then molded at 55% moisture

Hydraulic Conductivity

Soil Conditions	
Pre-test conditions	**Post-test Conditions**
Wet Density = 90.4 (lbs/ft^3)	Wet Density = 99.6 (lbs/ft^3)
% Moisture = 52.6%	% Moisture = 65.9%
Dry Density = 59.2 (lbs/ft^3)	Dry Density = 60.1 (lbs/ft^3)

Test Information	
a (cm^2)=	0.1969
L (cm)=	4.8138
A (cm^2)=	19.3625

Trial 1													
			Base Burette		Top Burette								
Date and Time	Elapsed Time (seconds)	Cell Burette Reading (ml)	Reading (ml)	Distance from Datum (cm)	Reading (ml)	Distance from Datum (cm)	Total Head Across Sample (cm of water)	Temperature (℃)	Weighted Average Temp. (℃)	Uncorrected Hydraulic Conductivity (cm/sec)	Correction Factor	Cumulative Time (sec)	Corrected Hydraulic Conductivity (cm/sec)
3/20/11 10:05	0	9.2	10.00	27.200	0.00	78.000	85.979	21.4					
3/20/11 10:06	60	9.2	9.05	32.026	0.97	73.072	76.225	21.4	21.40	4.91E-05	0.9669876	60	4.75E-05
3/20/11 10:07	120	9.2	8.24	36.141	1.75	69.110	68.148	21.4	21.40	4.74E-05	0.9669876	120	4.58E-05
3/20/11 10:09	240	9.2	6.84	43.253	3.13	62.100	54.026	21.4	21.40	4.74E-05	0.9669876	240	4.58E-05
3/20/11 10:13	480	9.2	4.88	53.210	5.12	51.990	33.960	21.4	21.40	4.74E-05	0.9669876	480	4.58E-05
3/20/11 10:20	900	9.2	3.04	62.557	6.94	42.745	15.367	21.4	21.40	4.68E-05	0.9669876	900	4.53E-05
3/20/11 10:35	1800	9.2	1.85	68.602	8.13	36.700	3.277	21.4	21.40	4.44E-05	0.9669876	1800	4.30E-05

H.C.= 4.5E-05

Hydraulic Conductivity (ASTM-D 5084)
Flow Rate Calculation

Job------- Ameren Labadie UWL
Location-
Sample--- 100% Ponded Ash, Air dried to 8% then Molded at 55% Moisture
Depth-----

a= 0,1969
A= 19.3625
L= 4.8138

Cell No. 3

Cell Pressure (p.s.i.)	Base Pressure (p.s.i.)	Top Pressure (p.s.i.)
66.5	65.0	65.5

Date	Time	Elapsed Time Minutes	Cell Reading ML	Base Reading ML	Top Reading ML	Top Head CM	Base Head CM	h CM	Temp.	Hyd. Gradient
4-20-11	10:05	0	9.15	10.00	0.00				21.4	
	10:06	1	9.15	9.05	0.97				21.4	
	10:07	2	9.15	8.24	1.75				21.4	
	10:09	4	9.15	6.84	3.13				21.4	
	10:13	8	9.15	4.88	5.12				21.4	
	10:20	15	9.15	3.04	6.94				21.4	
	10:35	30	9.15	1.85	8.13				21.4	
	12:35	150	9.15	1.78	8.21				21.9	
	14:35	270	9.05	1.90	8.09				21.9	

a x L	t (sec)	2 x A x t	aL/2At	h1	h2	ln(h1/h2)	K	Temp. Cor.	K -Cor.	Hyd. Gradient

TRIAXIAL CELL SETUP & TAKEDOWN

Project Ameren Labadie UWL Date 4-11-2011

Sample Labadie Ponded Fly Ash Depth

Description 100% Labadie Ponded Ash Air dried to ≈ 8%, Then molded at 55% M

Type of Test HC Confining Pressure Differential

Cell Number 3 Saturate [✓ before] after Consolidation

Number of Membranes 2 Filter Strips Yes [✓ No]

LENGTH CHANGE

STRAIN GAUGE at setup N/A

at saturation start

at consolidation start

at axial load start

MOISTURE CONTENT

	INITIAL		FINAL
Tare No.	36	2	Bowl 1
Wet Wt. + Tare	129.30	107.23	343.78
Dry Wt. + Tare	99.03	84.19	284.71
Wt. Water			
Tare Wt.	41.34	40.52	195.03
Dry Soil Wt.			89.68
Moisture %	52.470	52.759	65.868
Avg. w %	52.6		65.9

MASS PROPERTIES

Wt. Tube + Soil		gm.
Wt. Tube		gm.
Wt. Soil	137.09	gm.
Tube Diameter		in.
Sample Length		in
tube length		in.
top trim		in.
bottom trim		in.
total trim		in.
sample length		in.
Density constant 4.85/(D^2 * L)		
Wet Density		pcf.
Dry Density		pcf.

SPECIMEN DIMENSIONS in. / mm.

	HEIGHT		DIAMETER	
	Initial	Final	Initial	Final
1	1.9060	1.8925	T 1.9600	1.9655
2	1.9140	1.8940	M 1.9680	1.9540
3	1.9045	1.8990	B 1.9700	1.9450
Avg.	1.9082	1.8952	1.9660	1.9548

Description After Test Initial $\gamma_M = 90.4$ Final $\gamma_m = 99.6$

%M = 52.6 %M = 65.9

$\gamma_D = 59.2$ $\gamma_D = 60.1$

Remarks

Failure Sketch

Trimmed By KEK

Trimmed Date 4-4-11

Setup By KEK

Setup Date 4-11-11

Taken Down By KEK

Take Down Date 4-21-11

TRIAXIAL CELL SATURATION & BETA FACTOR

PROJECT Ameren Labadie UWL

SAMPLE Ponded Fly Ash DEPTH

INITIAL CELL PRESSURE 51.0 START DATE 4-11-11

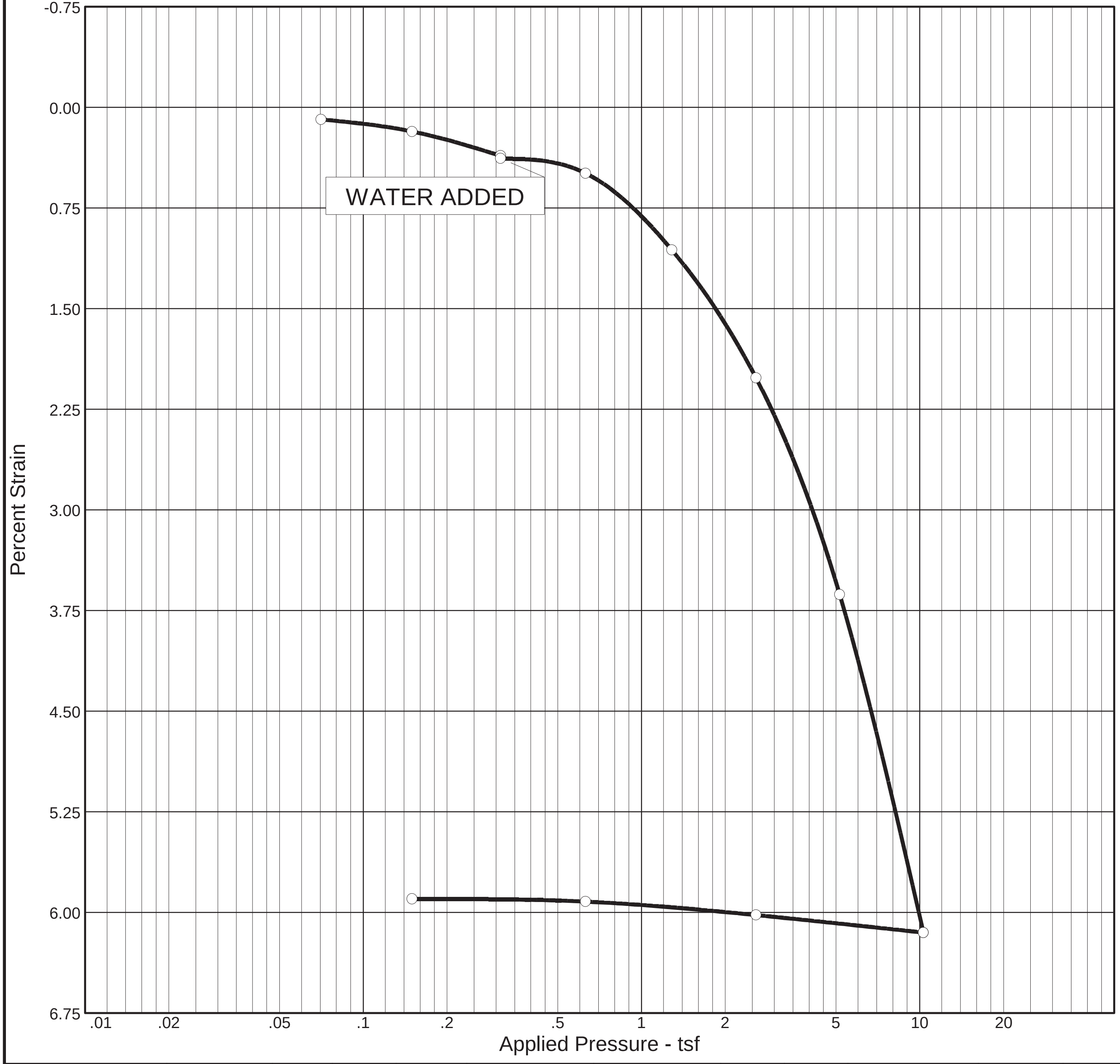
INITIAL PORE PRESSURE 50.0 CELL NUMBER 3

INITIAL TRANSDUCER READING 50.5 TRANSDUCER NUMBER 3

TRIAL DATE	TRIAL TIME	BASE BURETTE READING	CELL PRESSURE	TRANS-DUCER READING	CHANGE IN PRESSURE Transducer Constant			
					CELL DELTA (1)	TRANSDUCER READING CHANGE	TRANSDUCER PRESSURE CHANGE (2)	BETA FACTOR (2/1)
4-13-11	0	2.11	51.0	50.5				
	1		56.0	54.9	5.0		4.4	0.88
	2		"	54.8	5.0		4.3	0.86
	4		"	54.8	5.0		4.3	0.86
4-15-11	0	2.62	56.0	55.5				
	1		61.0	60.2	5.0		4.7	0.94
	2		"	60.2	5.0		4.7	0.94
	4		"	60.2	5.0		4.7	0.94
	8		"	60.2	5.0		4.7	0.94
4-20-11	0	2.97	61.0	60.4				
	1		66.0	65.2	5.0		4.8	0.96
	2		"	65.2	5.0		4.8	0.96
	4		"	65.2	5.0		4.8	0.96
	8		"	65.2	5.0		4.8	0.96
			"		5.0			

OK

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_s	Swell Press. (tsf)	Swell %	e_o
Sat.	Moist.											
82.7 %	56.1 %	60.8			2.87		2.46	0.25	0.00			1.946

MATERIAL DESCRIPTION	USCS	AASHTO
Ponded fly-ash, air dried to 8% and molded at 55%		

Project No. 2008012455 **Client:** Ameren Missouri

Project: CCP Properties, Labadie Plant

Source: Ponded Fly Ash **Sample No.:** Bulk

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Remarks:

Figure

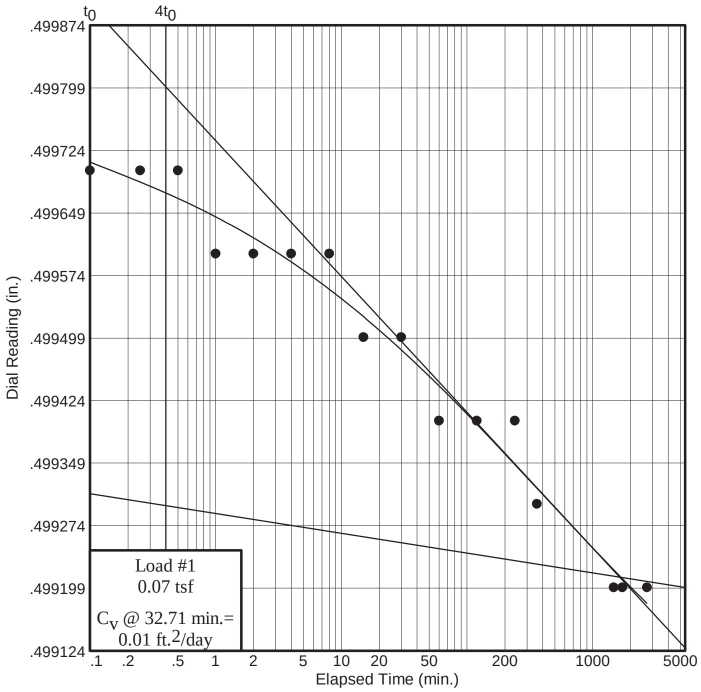
SCHEDULE CJG-ST1

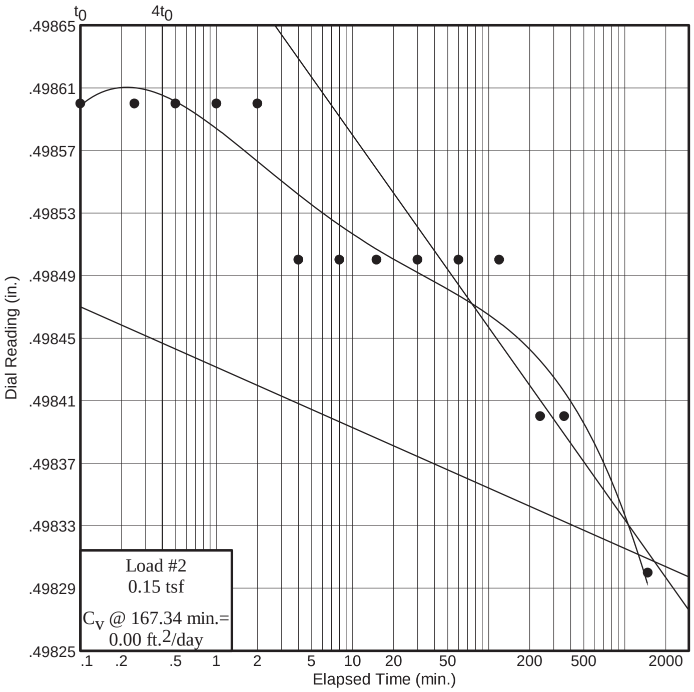
Dial Reading vs. Time

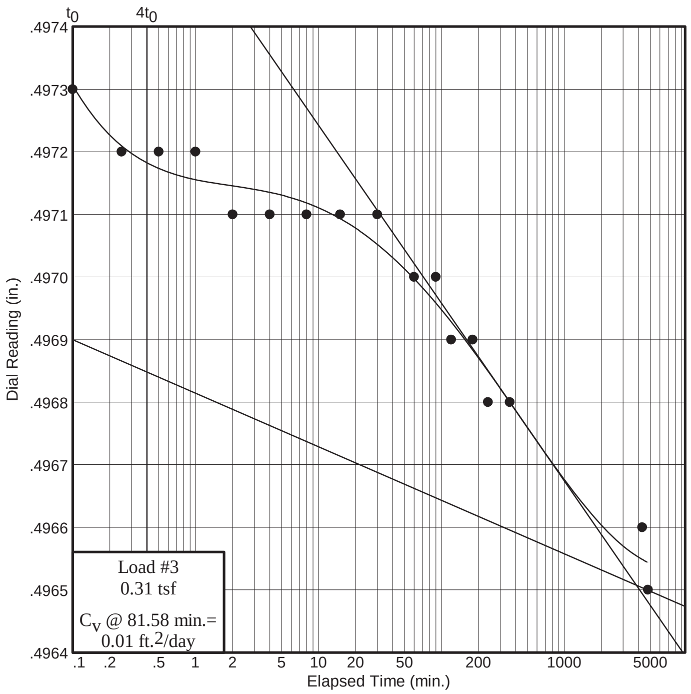
Project No.: 2008012455
Project: CCP Properties, Labadie Plant

Source: Ponded Fly Ash

Sample No.: Bulk







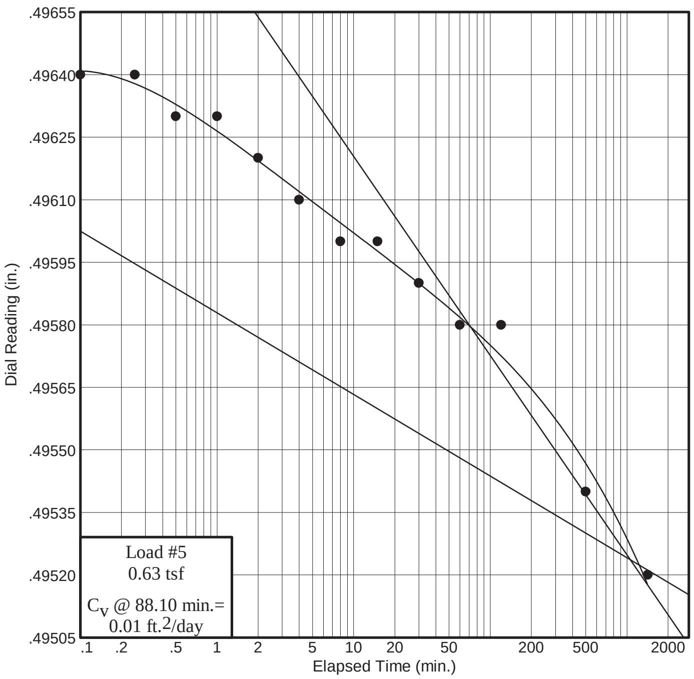


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Figure

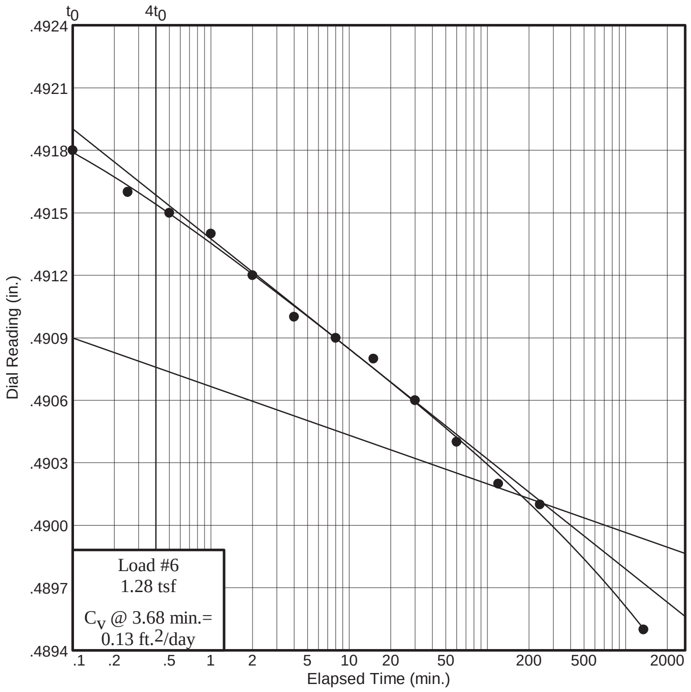
SCHEDULE CJG-ST1

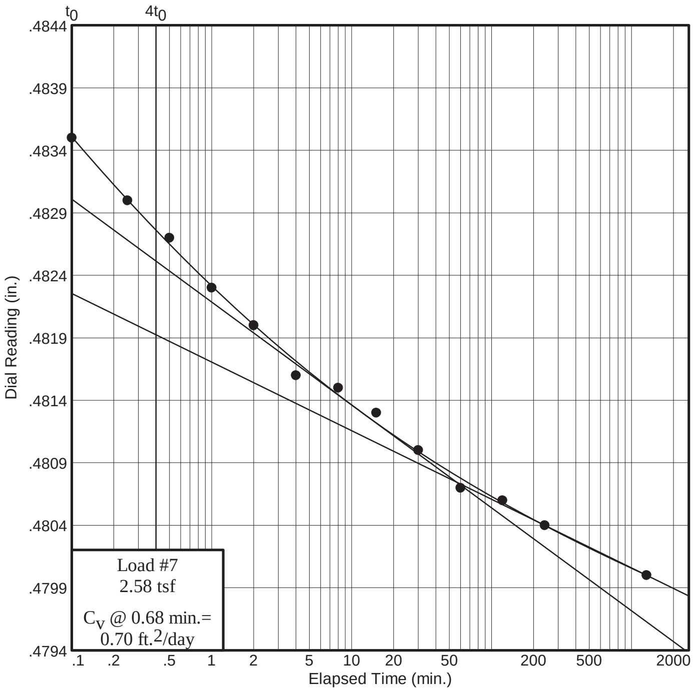
Dial Reading vs. Time

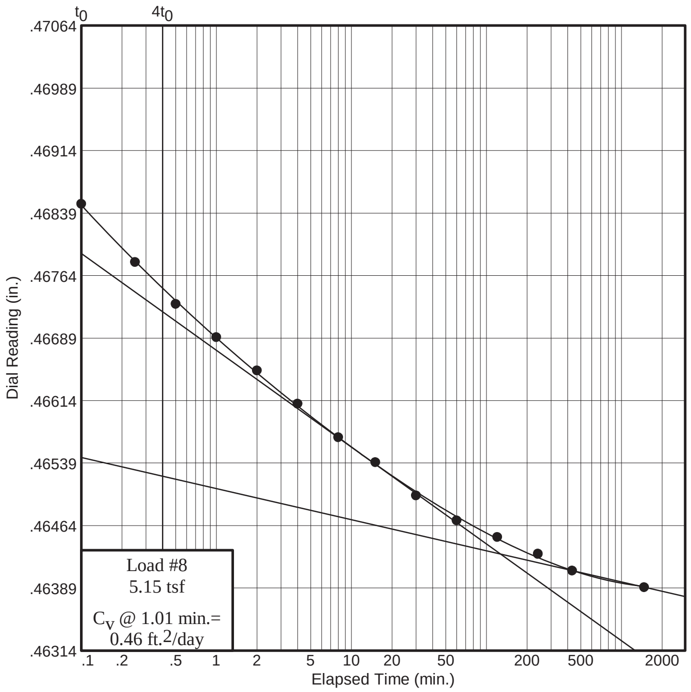
Project No.: 2008012455
Project: CCP Properties, Labadie Plant

Source: Ponded Fly Ash

Sample No.: Bulk







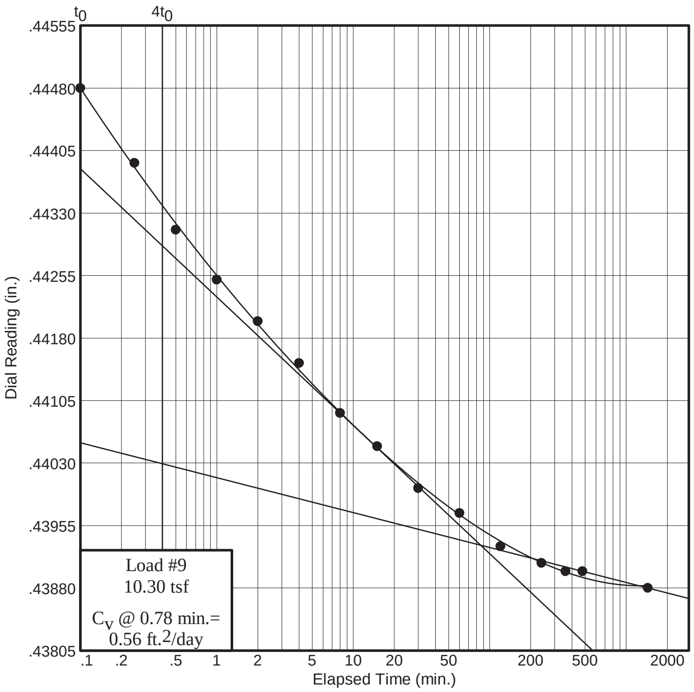


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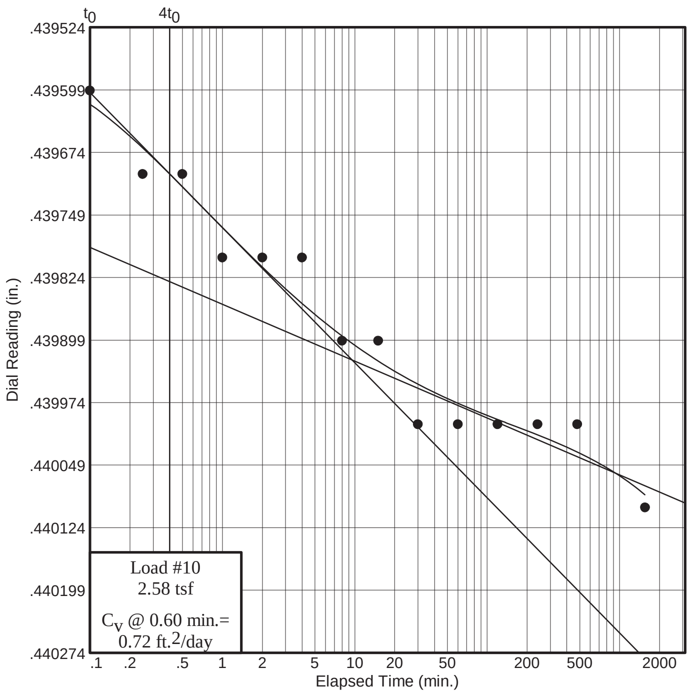
Figure

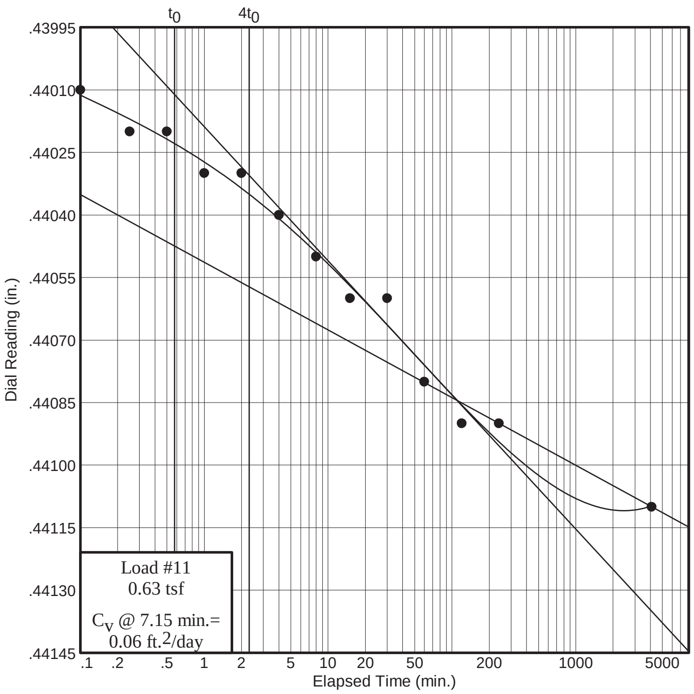
Dial Reading vs. Time

Project No.: 2008012455
Project: CCP Properties, Labadie Plant

Source: Ponded Fly Ash

Sample No.: Bulk





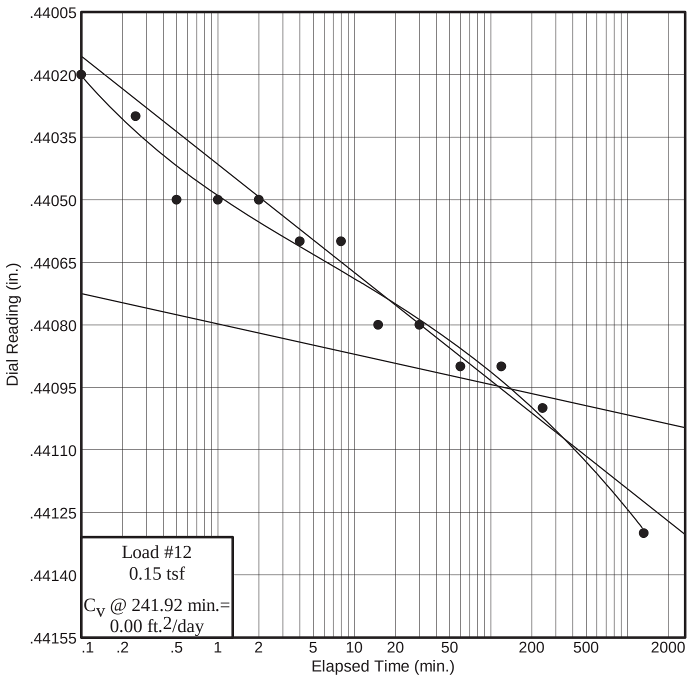


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Figure

CONSOLIDATION TEST DATA

Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project Number: 2008012455

Sample Data

Source: Ponded Fly Ash
Sample No.: Bulk
Elev. or Depth: **Sample Length(in./cm.):**
Location:
Description: Ponded fly-ash, air dried to 8% and molded at 55%
Liquid Limit: **Plasticity Index:**
USCS: **AASHTO:** **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 259.37 g.	**Consolidometer # =** 1	**Wet w+t =**
Dry w+t = 180.45 g.		**Dry w+t =**
Tare Wt. = 39.71 g.	**Spec. Gravity =** 2.87	**Tare Wt. =**
Height = 1.00 in.	**Height =** 1.00 in.	
Diameter = 2.50 in.	**Diameter =** 2.52 in.	
Weight = 121.70 g.	**Defl. Table =** Labadie 100% Fly Ash at 65%M	
Moisture = 56.1 %	**Ht. Solids =** 0.3383 in.	**Moisture =** %
Wet Den. = 94.9 pcf	**Dry Wt. =** 79.04 g.*	**Dry Wt. =** n/a
Dry Den. = 60.8 pcf	**Void Ratio =** 1.946	**Void Ratio =** 1.772
	Saturation = 82.7 %	

*** Initial dry weight used in calculations**

End-of-Load Summary

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_V (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	0.50010				1.946	
0.07	0.49880	0.00040	0.01	0.000	1.943	0.1 Comprs.
0.15	0.49720	0.00110	0.00	0.000	1.941	0.2 Comprs.
0.31	0.49450	0.00200	0.01	0.000	1.935	0.4 Comprs.
water	0.49430	0.00200			1.935	0.4 Comprs.
0.63	0.49200	0.00320	0.01	0.000	1.931	0.5 Comprs.
1.28	0.48410	0.00540	0.13	0.000	1.915	1.1 Comprs.
2.58	0.47290	0.00710	0.70	0.001	1.887	2.0 Comprs.
5.15	0.45440	0.00950	0.46	0.000	1.839	3.6 Comprs.
10.30	0.42670	0.01210	0.56	0.000	1.765	6.2 Comprs.
2.58	0.43030	0.00980	0.72		1.769	6.0 Comprs.
0.63	0.43350	0.00760	0.06		1.772	5.9 Comprs.
0.15	0.43540	0.00590	0.00		1.772	5.9 Comprs.

C_C = 0.25 P_C = 2.46 tsf C_S = 0.00
Collapse percentage = 0.0

94
57

CONSOLIDATION TEST

Rev. 4/2000

† – to be completed by Project Engineer

Date 4-11-11 Set-up by KEK

Sample Description: 100% Labadie Ponded Ash Airdried to ≈8%, then molded At 55% Moisture

USCS: ______ AASHTO: ______

†Project Number ______

†Job Ameren Labadie UWL

†Test Hole ______

†Sample Labadie Ponded Ash †Depth ______

†Sample Type Molded

†S.G.=2.87 ☒ Measured ▨ Assumed

L.L.=______ PP=______ TSF

P.L.=______ Torvane=______ TSF

†Testing Remarks: ______

Test Specific Data

†Deflection Table: ______

Rig No. 1 Ring I

†Overburden Pressure=______ kg/cm²

†☐ Check if sample is to be undercut.

Sample Undercut= None inch

Sample Height at Test Start= 0.9966 inch

Untrimmed Sample Data

Wgt. Tube+ Soil=______ g

Wgt. Tube=______ g

Wgt. Soil=______ g

Sample Lgth. (L)=______ in.

Sample Dia. (D)=______ in.

Tube Constant (k)=______

k= 4.85/(D²L)

Wet Unit Wgt.=______ PCF

Initial Moisture Content

Tare No.: 3

Wet Wgt.+Tare= 259.37 g

Dry Wgt.+Tare= 180.45 g

Wgt. Water= 78.92 g

Wgt. Tare= 39.71 g

Wgt. Dry Soil= 140.74 g

Water Content= 56.07 %

Dry Unit Wgt.= 90.18 PCF

Initial Trimmed Sample Data

Trimmed sample in ring without dish.

Wgt. Ring= 499.18 g

Wet Wgt.+Ring= 620.91 g

Wgt. Wet Soil= 121.7 g

Hanger Load Seating Load of 0.125 Kg

†☒ **Run Mach. Deflections**

†Sequence		†Instructions	Reading	Difference	
0.25	kg	0.0705 TSF	.5996	0.0004	in.
0.5	kg	0.1499 TSF	.5989	0.0011	in.
1.0	kg	0.3116 TSF	.5980	0.0020	in.
1.0	kg	Add Water	.5977	0.0023	in.
2.0	kg	0.6290	.5968	0.0032	in.
4.0	kg	1.2844	.5946	0.0054	in.
8.0	kg	2.5777	.5929	0.0071	in.
16.0	kg	5.1524	.5905	0.0095	in.
32.0	kg	10.3004	.5879	0.0121	in.
8.0	kg	2.5777	.5902	0.0098	in.
2.0	kg	0.6290	.5924	0.0076	in.
0.5	kg	0.1499	.5941	0.0059	in.
	kg				in.
	kg				in.
	kg				in.
	kg				in.
	kg				in.
	kg				in.
	kg				in.

Post-Test Sample Data

Dish No.: 3A

Wgt. Dish= 197.03 g

Tare (Ring+Dish)= 696.21 g

Wet Wgt.+Tare= 818.67 g

Dry Wgt.+Tare= 772.56 g

Wgt. Water=______ g

Wgt. Dry Soil=______ g

Water Content=______ %

Squeezings ☑ Check if none.

Tare No.: ______

Dry Wgt.+Tare=______ g

Wgt. Tare=______ g

Wgt. Dry Squeezings=______ g

Total Dry Wgt. Soil=______ g

†Use final weight of solids? ______

†PROJ.ENGR. ______

START DEFLEK = .6000

SCHEDULE CJG-ST1

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CONSOLIDATION TEST-TIME SHEET

R&J Project: Ameren Labadie UWL Sheet 1 of 5

Boring: 100% PONDED ASH Sample: 55% M Depth: N/A Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
4/12	0.25	JJL	1015	0	.5001	SEATED 4/11 w/ .125 kg
				.1	.4993	
				.25	.4993	
				.5	.4993	
			16	1	.4992	
			17	2	.4992	
			19	4	.4992	
			23	8	.4992	
			30	15	.4991	
			45	30	.4991	
			1115	60	.4990	
			1215	120	.4990	
			1415	240	.4990	
			1615	360	.4989	
4-13-11		KEK	10:50	1475	.4988	
"		"	15:00	1725	.4988	
4-14-11		"	7:30	2715	.4988	
	0.50 kg	"	7:30	0	.4988	
				.1	.4975	
				.25	.4975	
				.5	.4975	
			7:31	1	.4975	
			7:32	2	.4975	
			7:34	4	.4974	
			7:38	8	.4974	
			7:45	15	.4974	
			8:00	30	.4974	
			8:30	60	.4974	
			9:30	120	.4974	
			11:30	240	.4973	
			13:30	360	.4973	
4-15-11			8:10	1480	.4972	
	1.0 Kg	KEK	8:10	0	.4972	
				.1	.4953	
				.25	.4952	
				.5	.4952	
			8:11	1	.4952	
			8:12	2	.4951	
			8:14	4	.4951	
			8:18	8	.4951	
			8:25	15	.4951	

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CONSOLIDATION TEST-TIME SHEET

R&J Project: Ameren Labadie UWL
Sheet 2 of 5
Boring: 100% Ponded ASH
Sample: 55% M
Depth: N/A
Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
4-15-11	1.0	KEK	8:40	30	.4951	
			9:10	60	.4950	
			9:40	90	.4950	
			10:10	120	.4949	
			11:10	180	.4949	
			12:10	240	.4948	
			14:10	360	.4948	
4-18-11		KEK	8:00	4310	.4946	
			4:10 pm	4800	.4945	
4-19-11	1.0	JJC	10:35	0	.4945	ADD H_2O
				.1	43	
				.25	43	
				.5	43	
			36	1	44	
			37	2	43	
			39	4	43	
			43	8	43	
			50	15	43	
			1105	30	43	
			1135	60	42	
4/20	1.0	JJC	0835	0	.4943	
	2.0			.1	.4932	
				.25	32	
				.5	31	
			36	1	31	
			37	2	30	
			39	4	29	
			43	8	28	
			50	15	28	
			0905	30	27	
			0935	60	26	
			1035	120	26	
			~~1235~~	~~240~~		
		KEK	1655	500	4922	
4-21-11		KEK	8:15	1420	4920	
4/22/11		JJC	10:30	0	.4919	
	4Kg		10:35	.1	4864	
				.25	62	
				.5	61	
			36	1	60	
			37	2	58	
			39	4	56	

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CONSOLIDATION TEST-TIME SHEET

R&J Project: Ameren Labadie UWL Sheet 3 of 5

Boring: 100% Pond Ash Sample: 55%M Depth: N/A Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
4/22	4Kg	JJC	1043	8	.4855	
			1050	15	.4854	
			1105	30	.4852	
			1135	40	.4850	
		(cwc)	1235	120	.4848	
			1435	240	.4847	
4-25	4		8:55	1345 10	.4841	
11	8	JJC	1020	.1	.4764	
				.25	.4759	
				5	.4756	
			21	1	.4752	
			22	2	.4749	
			24	4	.4745	
			28	8	.4744	
			35	15	.4742	
			50	30	.4739	
			1120	60	.4736	
			1220	120	.4735	
			1420	240	.4733	
4/26	8	JJC	0805	1285 10	4729	
	16		0820	.1	4590	
				.25	4583	
				.5	4578	
			21	1	.4574	
			22	2	.4570	
			24	4	.4566	
			28	8	.4562	
			35	15	.4559	
			50	30	.4555	
			0920	60	.4552	
			1020	120	.4550	
			1220	240	.4598	
			1530	430	.4546	
			1620	480	.4546	
4/27	16	JJC	0840	1455 10	.4544	
	32			.1	.4327	
				.25	.4318	
				.5	.4310	
			41	1	.4304	
			42	2	.4299	
			44	4	.4294	
			48	8	.4288	

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CONSOLIDATION TEST-TIME SHEET

R&J Project: Ameren Labadie UWL
Sheet 4 of 5
Boring: 100% Pond Ash
Sample: 55%M
Depth: N/A
Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
4/27	32	jfc	0855	15	.4284	
↓	↓	↓	0910	30	.4279	
			0940	60	.4276	
			1040	120	.4272	
			1240	240	.4270	
			1440	360	.4269	
			1640	480	.4269	
4/28	32	jfc	0840	1440	.4267	
	8		0850	.1	.4298	
↓	↓	↓		.25	.4299	
				.5	.4299	
			51	1	.4300	
			52	2	.4300	
			54	4	.4300	
			58	8	.4301	
			0905	15	.4301	
			0920	30	.4302	
			0950	60	.4302	
			1050	120	.4302	
		KEK	1250	240	.4302	
		jfc	1650	480	.4302	
4/29	8	↓	1050	1560/0	.4303	
↓	2		1100	.1	.4325	
	↓			.25	.4326	
				.5	.4326	
			01	1	.4327	
			02	2	.4327	
			04	4	.4328	
			08	8	.4329	
			15	15	.4330	
			30	30	.4330	
			1200	60	.4332	
			1300	120	.4333	
			1500	240	.4333	
5-2-11	2	KEK	8:30	4090	.4335	
↓	0.5	jfc	0950	.1	.4343	
	↓	↓		.25	.4344	
				.5	.4346	
			51	1	.4346	
			52	2	.4346	
			54	4	.4347	
			58	8	.4347	

1440
- 115
1325

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CONSOLIDATION TEST-TIME SHEET

R&J Project: AMEREN LABADIE UWL Sheet 5 of 5

Boring: 100% POND ASH Sample: 55%M Depth: N/A Rig: 1

DATE	LOAD kg	TESTER'S INITIALS	TIME	ELAPSED TIME, min.	DIAL READING	NOTES
5/2	0.5	JGL	1005	15	.4349	
			1020	30	.4349	
			1050	60	.4350	
			1150	120	.4350	
			1350	240	.4351	
5-3-11		KEK	07:55	1325	.4354	
		JGL	1435	1725	.4354	
5/9/11		JGL	1330		.4355	TERMINATED TEST

SPECIFIC GRAVITY OF SOLIDS

Pycnometer Method

JOB: Ameren; Labadie CCP Testing

DATE: 8/13/10

BORING: Labadie Bottom Ash

TEST BY: J. David

SAMPLE: Bulk

COMPUTED BY: K: Kocher

Sample or Specimen No.			1	2	
Flask No.			8	8	
Temperature of water and soil, T, °C			22.5	22.5	
Dish No.					
Weight in Grams	Dish + Dry Soil				
	Dish				
	Dry soil	W_s	100.11	100.11	
	Flask + water at T, °C	W_{bw}	678.23	678.21	
	$W_s + W_{bw}$		778.34	778.32	
	Flask + water + immersed soil	W_{bws}	742.64	742.64	
	Displaced water, $W_s + W_{bw} - W_{bws}$		35.70	35.68	
Correction factor		K	.99945	.99945	
$(W_s K) / (W_s + W_{bw} - W_{bws})$		G_s	2.80	2.80	

Sample Description

#1 Bottom ash, tan and grey, fine sand to coarse gravel size particles, pitted

#2 Same

Flask Calibration	Trial				
Weight					
Temp.					

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SPECIFIC GRAVITY OF SOLIDS

Pycnometer Method

JOB: Ameren UE CCP Ash Study DATE: 8/13/10
BORING: Labadie TEST BY:
SAMPLE: Bottom Ash COMPUTED BY: JRD & KEK

Sample or Specimen No.		—		
Flask No.		8		8
Temperature of water and soil, T, °C		22.5		22.5
Dish No.		—		
Weight in Grams: Dish + Dry Soil				
Dish				
Dry soil	W_s	100.11		100.11
Flask + water at T, °C	W_{bw}	678.23		678.21
$W_s + W_{bw}$		778.34		778.32
Flask + water + immersed soil	W_{bws}	742.64		742.64
Displaced water, $W_s + W_{bw} - W_{bws}$		35.70		35.68
Correction factor	K	.99945		.99945
$(W_s K) / (W_s + W_{bw} - W_{bws})$	G_s	2.802		2.804

100.0549/35.70 = 2.8027 2010 flask data Av. flask data 2.804

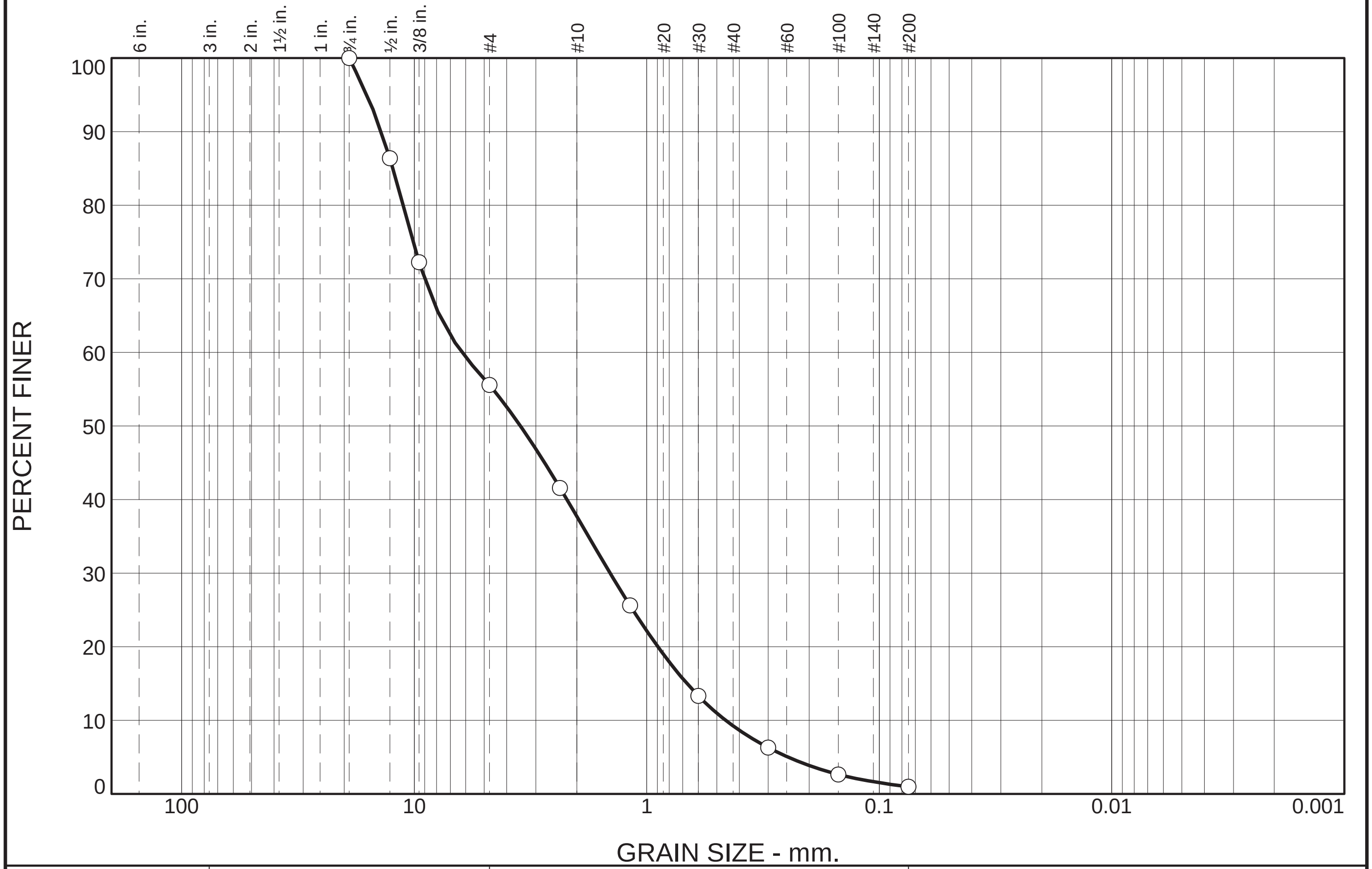
Sample Description

#1 Flask #8 179.98 g.
material passing #4 per ASTM

#2 Tan & Grey fine sand to coarse
gravel size, pitted

Flask Calibration	Trial				
Weight					
Temp.					

Particle Size Distribution Report - ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	44.4	17.8	28.6	8.2	1.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4	100.0		
1/2	86.4		
3/8	72.3		
#4	55.6		
#8	41.6		
#16	25.6		
#30	13.3		
#50	6.3		
#100	2.6		
#200	1.0		

* (no specification provided)

Material Description

Bottom Ash, grey and tan, fine sand to coarse gravel size particles, pitted, from pond

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS= AASHTO=

Coefficients

D_{85}= 12.3294 D_{60}= 6.2300 D_{50}= 3.4902
D_{30}= 1.4347 D_{15}= 0.6720 D_{10}= 0.4577
C_u= 13.61 C_c= 0.72

Date Tested: 12/17/09 **Tested By:** M. Tierney

Remarks

Sample No.: Bulk **Source of Sample:** Bottom Ash **Date Sampled:** 12/17/09
Location: **Elev./Depth:**
Checked By: K. Kocher **Title:** Engineer

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Client: Ameren Missouri
Project: CCP Properties, Labadie Plant

Project No: 2008012455 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

5/24/2011

Client: Ameren Missouri
Project: CCP Properties, Labadie Plant
Project Number: 2008012455
Location: Bottom Ash
Sample Number: Bulk
Material Description: Bottom Ash, grey and tan, fine sand to coarse gravel size particles, pitted, from pond
Sample Date: 12/17/09
Tested By: M. Tierney **Test Date:** 12/17/09
Checked By: K. Kocher **Title:** Engineer

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 1524.36
Tare Wt. = 505.91
Minus #200 from wash = 0.6%

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
1530.79	505.91	0.00	3/4	0.00	100.0
			1/2	139.63	86.4
			3/8	284.25	72.3
			#4	455.21	55.6
			#8	598.54	41.6
			#16	762.30	25.6
			#30	888.37	13.3
			#50	960.17	6.3
			#100	997.77	2.6
			#200	1014.72	1.0

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	44.4	44.4	17.8	28.6	8.2	54.6			1.0

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.4577	0.6720	0.8961	1.4347	3.4902	6.2300	11.1539	12.3294	13.8504	16.0171

Fineness Modulus	C_u	C_c
4.83	13.61	0.72

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GRAIN SIZE ANALYSIS

(Sieve or Screen Method)

Project Labadie CCP Properties
Boring No. Btm Ash
Sample No.
Depth

Test by MPT
Entered by KEK
Checked by KEK
Testing Date 12·17·09

U.S. Standard Sieve Size	Sieve Opening (mm)	Sieve Wgt. + Soil (grams)	Sieve Weight (grams)	Weight Retained (grams)	Cumulative Weight Retained (grams)	Percent Finer by Weight
3-in.	**75**					
2-in.	**50**					
1-1/2 in.	**37.5**					
1 in	**25.4**					
3/4-in.	**19.0**				0	
1/2-in.	**12.7**				139.63	
3/8-in.	**9.5**				284.25	
#3	6.35					
#4	**4.75**				455.21	
#6	3.35					
#8	**2.36**				598.54	
#10	2.00					
#16	**1.18**				762.30	
#18	1.00					
#20	0.85					
#30	**0.60**				888.37	
#35	0.50					
#40	0.425					
#50	**0.300**				960.17	
#60	0.250					
#70	0.212					
#100	**0.150**				997.77	
#120	0.125					
#140	0.106					
#200	**0.075**				1014.72	
Pan					1018.66	
Sample Lost in #200 Wash						
Total Weight in Grams						

Pre #200 wash Weights

S1

Soil + Tare 1530.79
Tare 505.91
Soil 1024.88

Post #200 wash Weights

Soil + Tare 1524.36
Tare 505.91
Soil 1018.45

Sample Description & Remarks Bottom Ash, tan & grey, fine sand to coarse gravel, pitted

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RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

$$\text{Relative Density} = \frac{\gamma \text{max.} \ (\gamma \text{field} - \gamma \text{min.})}{\gamma \text{field} \ (\gamma \text{max.} - \gamma \text{min.})} \times 100$$

Job Ameren; Labadie CCP Testing

Boring No. Bottom Ash

Depth

Sample No. Bulk

Mold Vol. 0.09995 (cu. ft.) (Vm)

Mold End Area 0.1961 (sq. ft.) (Am)

Lab Test by MPT Date 12/17/09

Computed by JLC Date 12/17/09

Checked by KEK Date 12/17/09

Mold No. Blue Mold

Mold Diam. 6.0 (in)

Mold Wt. 7.98 (lb.)

			MINIMUM DENSITY			
Trial No.			Trial 1			
Weight	Tare + Soil Dry	W	16.34			
	Tare	W	7.98			
Lb.	Soil Dry	W s	8.36			
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf			83.64			
			MAXIMUM DENSITY			
Method Used			Near Saturation			
Trial No.			Trial 1			
Height	Initial Dial Reading	h o		0.00		
	Left Dial Reading	h l	1.47			
Inches	Right Dial Reading	h r	1.43			
	Sum	h l + h r	2.9			
	Average Dial Reading	h a		1.45		
	Height Change	Δ h		1.45		
Volume	Mold Initial Volume	V m		0.09995		
cu. ft.	Volume Change *	Δ V		0.02369		
	Volume of Soil	V s		0.07626		
Weight	Tare + Soil Dry	W	16.34			
Lb.	Tare	W m	7.98			
	Soil Dry	W s	8.36			
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			109.62			

$$^{*} \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks Bottom ash, tan and grey, fine sand to coarse gravel in size, pitted

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

$$\text{Relative Density} = \frac{\gamma\text{max.}\ (\gamma\text{ field} - \gamma\text{ min.})}{\gamma\text{ field}\ (\gamma\text{ max.} - \gamma\text{ min.})} \times 100$$

Job Labadie
Boring No. Btm Ash
Depth
Sample No.
Mold Vol. 0.09995 (cu. ft.) (Vm)
Mold End Area 0.1961 (sq. ft.) (Am)

Lab Test by MPT Date 12/17/09
Computed by JLC Date 12/17/09
Checked by KGL Date 12/18/09
Mold No. Blue
Mold Diam. 6 (in)
Mold Wt. 7.98 (lb.)

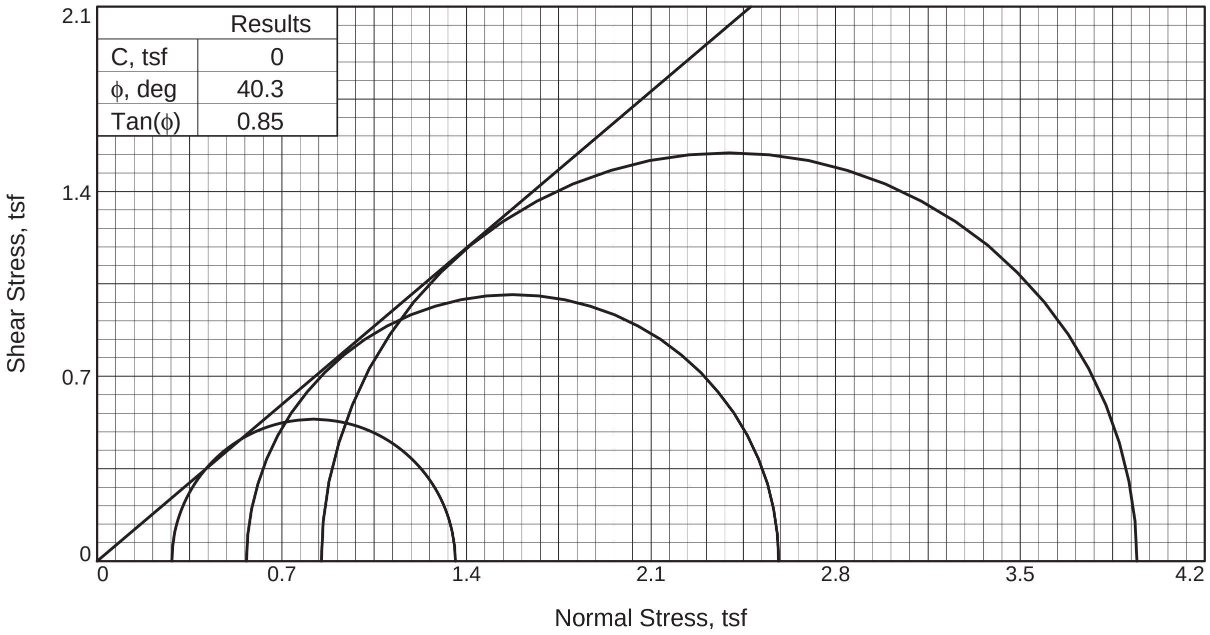
MINIMUM DENSITY						
Trial No.			1			
Weight	Tare + Soil Dry	W	16.34			
	Tare	W	7.98			
Lb.	Soil Dry	W s	8.36			
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf			83.64			
MAXIMUM DENSITY						
Method Used						
Trial No.						
Height Inches	Initial Dial Reading	h o	▨		▨	
	Left Dial Reading	h l	1.47	▨		▨
	Right Dial Reading	h r	1.43	▨		▨
	Sum	h l + h r		▨		▨
	Average Dial Reading	h a	▨	1.45	▨	
	Height Change	Δ h	▨	1.45	▨	
Volume cu. ft.	Mold Initial Volume	V m	▨	0.09995	▨	
	Volume Change *	Δ V	▨	0.02369	▨	
	Volume of Soil	V s	▨	0.07626	▨	
Weight Lb.	Tare + Soil Dry	W	16.34			
	Tare	W m	7.98			
	Soil Dry	W s	8.36			
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			109.42			

$$\frac{0.284345}{12}$$

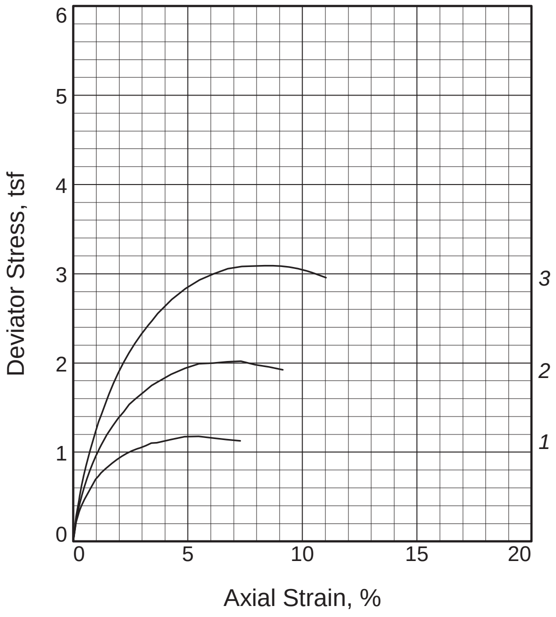
$$* \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks Bottom Ash

SCHEDULE CJG-ST1



	Results
C, tsf	0
ϕ, deg	40.3
Tan(ϕ)	0.85



	Sample No.	1	2	3
Initial	Water Content,	0.0	0.0	0.0
	Dry Density, pcf	89.2	89.0	90.9
	Saturation,	0.0	0.0	0.0
	Void Ratio	0.9596	0.9631	0.9226
	Diameter, in.	3.79	3.78	3.78
	Height, in.	8.23	8.20	8.16
At Test	Water Content,	0.0	0.0	0.0
	Dry Density, pcf	89.2	89.0	90.9
	Saturation,	0.0	0.0	0.0
	Void Ratio	0.9596	0.9631	0.9226
	Diameter, in.	3.79	3.78	3.78
	Height, in.	8.23	8.20	8.16
	Strain rate, %/min.	0.40	0.40	0.40
	Back Pressure, tsf	0.00	0.00	0.00
	Cell Pressure, tsf	0.28	0.57	0.85
	Fail. Stress, tsf	1.07	2.02	3.09
	Ult. Stress, tsf	1.18	2.02	3.09
	σ_1 Failure, tsf	1.36	2.58	3.94
	σ_3 Failure, tsf	0.28	0.57	0.85

Type of Test:
Unconsolidated Undrained
Sample Type: Hand compacted
Description: Bottom Ash, grey and tan, fine sand to coarse gravel size particles, pitted, from pond

Assumed Specific Gravity= 2.80
Remarks: Vacuum Triaxial Test on dry sample

Figure _______

Client: Ameren Missouri

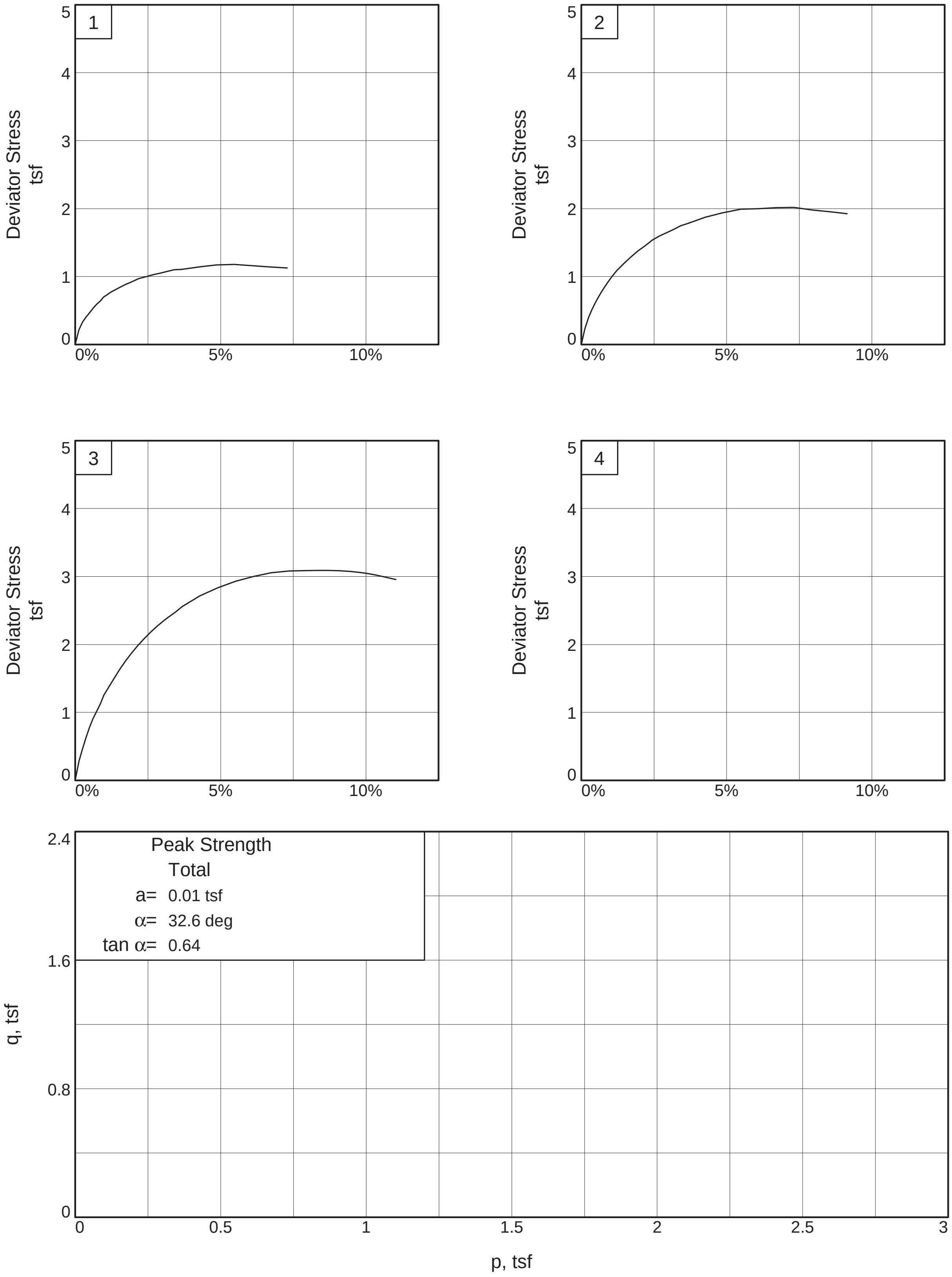
Project: CCP Properties, Labadie Plant

Source of Sample: Bottom Ash
Sample Number: Bulk
Proj. No.: 2008012455 **Date:** 12/17/09

REITZ & JENS, INC.
CONSULTING ENGINEERS

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

SCHEDULE CJG-ST1



Client: Ameren Missouri

Project: CCP Properties, Labadie Plant

Source of Sample: Bottom Ash **Sample Number:** Bulk

Project No.: 2008012455 **Figure** _______

REITZ & JENS, INC.

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

SCHEDULE CJG-ST1

TRIAXIAL COMPRESSION TEST

Unconsolidated Undrained

5/24/2011
9:40 AM

Date: 12/17/09

Client: Ameren Missouri

Project: CCP Properties, Labadie Plant

Project No.: 2008012455

Location: Bottom Ash

Sample Number: Bulk

Description: Bottom Ash, grey and tan, fine sand to coarse gravel size particles, pitted, from pond

Remarks: Vacuum Triaxial Test on dry sample

Type of Sample: Hand compacted

Assumed Specific Gravity=2.80 **LL=** **PL=** **PI=**

Test Method: ASTM D 2850

Parameters for Specimen No. 1

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	0.100	0.100
Moisture content: Dry soil+tare, gms.	0.100	0.100
Moisture content: Tare, gms.	0.000	0.000
Moisture, %	0.0	0.0
Moist specimen weight, gms.	2172.8	
Diameter, in.	3.79	
Area, in.²	11.28	
Height, in.	8.23	
Wet Density, pcf	89.2	
Dry density, pcf	89.2	
Void ratio	0.9596	
Saturation, %	0.0	

Test Readings for Specimen No. 1

Cell pressure = 3.93 psi (0.283 tsf)

Back pressure = 0.00 psi (0.000 tsf)

Strain rate, %/min. = 0.40

Fail. Stress = 1.075 tsf **at reading no.** 18

Ult. Stress = 1.178 tsf **at reading no.** 23

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
0	0.0000	1.90	0.0	0.0	0.000	0.283	0.283	1.00	0.283	0.000
1	0.0100	36.00	34.1	0.1	0.217	0.283	0.500	1.77	0.392	0.109
2	0.0200	53.50	51.6	0.2	0.329	0.283	0.612	2.16	0.447	0.164
3	0.0300	65.30	63.4	0.4	0.403	0.283	0.686	2.43	0.484	0.202
4	0.0400	75.20	73.3	0.5	0.466	0.283	0.749	2.65	0.516	0.233
5	0.0500	85.80	83.9	0.6	0.532	0.283	0.815	2.88	0.549	0.266
6	0.0600	94.90	93.0	0.7	0.590	0.283	0.872	3.08	0.578	0.295
7	0.0700	102.40	100.5	0.9	0.636	0.283	0.919	3.25	0.601	0.318
8	0.0800	112.00	110.1	1.0	0.696	0.283	0.979	3.46	0.631	0.348
9	0.0900	117.70	115.8	1.1	0.731	0.283	1.014	3.59	0.648	0.366
10	0.1000	123.90	122.0	1.2	0.770	0.283	1.052	3.72	0.668	0.385
11	0.1200	133.00	131.1	1.5	0.825	0.283	1.108	3.92	0.695	0.412
12	0.1400	141.90	140.0	1.7	0.879	0.283	1.162	4.11	0.722	0.439
13	0.1600	149.10	147.2	1.9	0.922	0.283	1.204	4.26	0.744	0.461
14	0.1800	157.20	155.3	2.2	0.970	0.283	1.253	4.43	0.768	0.485
15	0.2000	162.00	160.1	2.4	0.997	0.283	1.280	4.53	0.782	0.499
16	0.2200	167.10	165.2	2.7	1.027	0.283	1.309	4.63	0.796	0.513
17	0.2400	171.20	169.3	2.9	1.050	0.283	1.332	4.71	0.808	0.525
18	0.2600	175.70	173.8	3.2	1.075	0.283	1.358	4.80	0.820	0.537
19	0.2800	180.50	178.6	3.4	1.102	0.283	1.384	4.90	0.834	0.551
20	0.3000	181.60	179.7	3.6	1.106	0.283	1.388	4.91	0.836	0.553
21	0.3500	188.40	186.5	4.3	1.140	0.283	1.423	5.03	0.853	0.570
22	0.4000	194.90	193.0	4.9	1.172	0.283	1.455	5.15	0.869	0.586
23	0.4500	197.10	195.2	5.5	1.178	0.283	1.461	5.17	0.872	0.589
24	0.5000	195.10	193.2	6.1	1.159	0.283	1.442	5.10	0.862	0.579
25	0.5500	193.30	191.4	6.7	1.141	0.283	1.423	5.03	0.853	0.570
26	0.6000	192.10	190.2	7.3	1.126	0.283	1.409	4.98	0.846	0.563

Parameters for Specimen No. 2

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	0.100	0.100
Moisture content: Dry soil+tare, gms.	0.100	0.100
Moisture content: Tare, gms.	0.000	0.000
Moisture, %	0.0	0.0
Moist specimen weight, gms.	2154.2	
Diameter, in.	3.78	
Area, in.²	11.24	
Height, in.	8.20	
Wet Density, pcf	89.0	
Dry density, pcf	89.0	
Void ratio	0.9631	
Saturation, %	0.0	

Test Readings for Specimen No. 2

Cell pressure = 7.86 psi (0.566 tsf)

Back pressure = 0.00 psi (0.000 tsf)

Strain rate, %/min. = 0.40

Fail. Stress = 2.019 tsf **at reading no.** 26

Ult. Stress = 2.019 tsf **at reading no.** 26

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
0	0.0000	1.60	0.0	0.0	0.000	0.566	0.566	1.00	0.566	0.000
1	0.0100	37.30	35.7	0.1	0.228	0.566	0.794	1.40	0.680	0.114
2	0.0200	62.50	60.9	0.2	0.389	0.566	0.955	1.69	0.760	0.195
3	0.0300	81.20	79.6	0.4	0.508	0.566	1.074	1.90	0.820	0.254
4	0.0400	99.40	97.8	0.5	0.623	0.566	1.189	2.10	0.878	0.312
5	0.0500	113.90	112.3	0.6	0.715	0.566	1.281	2.26	0.923	0.357
6	0.0600	127.30	125.7	0.7	0.799	0.566	1.365	2.41	0.966	0.400
7	0.0700	140.30	138.7	0.9	0.881	0.566	1.447	2.56	1.006	0.440
8	0.0800	151.90	150.3	1.0	0.953	0.566	1.519	2.68	1.043	0.477
9	0.0900	162.90	161.3	1.1	1.022	0.566	1.588	2.81	1.077	0.511
10	0.1000	173.00	171.4	1.2	1.085	0.566	1.650	2.92	1.108	0.542
11	0.1200	190.70	189.1	1.5	1.194	0.566	1.760	3.11	1.163	0.597
12	0.1400	206.60	205.0	1.7	1.291	0.566	1.857	3.28	1.211	0.645
13	0.1600	220.90	219.3	2.0	1.377	0.566	1.943	3.43	1.255	0.689
14	0.1800	233.60	232.0	2.2	1.454	0.566	2.019	3.57	1.293	0.727
15	0.2000	247.30	245.7	2.4	1.536	0.566	2.101	3.71	1.334	0.768
16	0.2200	257.40	255.8	2.7	1.595	0.566	2.161	3.82	1.363	0.797
17	0.2400	266.20	264.6	2.9	1.645	0.566	2.211	3.91	1.389	0.823
18	0.2600	274.60	273.0	3.2	1.693	0.566	2.259	3.99	1.413	0.847
19	0.2800	283.90	282.3	3.4	1.747	0.566	2.313	4.09	1.439	0.873
20	0.3000	290.30	288.7	3.7	1.782	0.566	2.348	4.15	1.457	0.891
21	0.3500	307.00	305.4	4.3	1.873	0.566	2.439	4.31	1.502	0.936
22	0.4000	320.00	318.4	4.9	1.940	0.566	2.506	4.43	1.536	0.970
23	0.4500	330.60	329.0	5.5	1.992	0.566	2.558	4.52	1.562	0.996
24	0.5000	333.90	332.3	6.1	1.999	0.566	2.565	4.53	1.565	0.999
25	0.5500	338.40	336.8	6.7	2.013	0.566	2.579	4.56	1.572	1.006
26	0.6000	341.60	340.0	7.3	2.019	0.566	2.585	4.57	1.575	1.009
27	0.6500	337.50	335.9	7.9	1.981	0.566	2.547	4.50	1.556	0.991

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
28	0.7000	335.40	333.8	8.5	1.956	0.566	2.522	4.46	1.544	0.978
29	0.7500	332.20	330.6	9.1	1.924	0.566	2.490	4.40	1.528	0.962

Parameters for Specimen No. 3

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	0.100	0.100
Moisture content: Dry soil+tare, gms.	0.100	0.100
Moisture content: Tare, gms.	0.000	0.000
Moisture, %	0.0	0.0
Moist specimen weight, gms.	2183.1	
Diameter, in.	3.78	
Area, in.²	11.21	
Height, in.	8.16	
Wet Density, pcf	90.9	
Dry density, pcf	90.9	
Void ratio	0.9226	
Saturation, %	0.0	

Test Readings for Specimen No. 3

Cell pressure = 11.80 psi (0.850 tsf)

Back pressure = 0.00 psi (0.000 tsf)

Strain rate, %/min. = 0.40

Fail. Stress = 3.093 tsf **at reading no.** 28

Ult. Stress = 3.093 tsf **at reading no.** 28

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
0	0.0000	1.30	0.0	0.0	0.000	0.850	0.850	1.00	0.850	0.000
1	0.0100	44.80	43.5	0.1	0.279	0.850	1.129	1.33	0.989	0.140
2	0.0200	73.20	71.9	0.2	0.461	0.850	1.310	1.54	1.080	0.230
3	0.0300	99.60	98.3	0.4	0.629	0.850	1.479	1.74	1.164	0.315
4	0.0400	123.50	122.2	0.5	0.781	0.850	1.631	1.92	1.240	0.391
5	0.0500	143.90	142.6	0.6	0.910	0.850	1.760	2.07	1.305	0.455
6	0.0600	161.20	159.9	0.7	1.019	0.850	1.869	2.20	1.359	0.510
7	0.0700	177.80	176.5	0.9	1.124	0.850	1.973	2.32	1.412	0.562
8	0.0800	198.10	196.8	1.0	1.252	0.850	2.101	2.47	1.475	0.626
9	0.0900	211.80	210.5	1.1	1.337	0.850	2.187	2.57	1.518	0.669
10	0.1000	225.50	224.2	1.2	1.422	0.850	2.272	2.67	1.561	0.711
11	0.1200	253.60	252.3	1.5	1.597	0.850	2.446	2.88	1.648	0.798
12	0.1400	278.60	277.3	1.7	1.750	0.850	2.600	3.06	1.725	0.875
13	0.1600	300.80	299.5	2.0	1.886	0.850	2.735	3.22	1.793	0.943
14	0.1800	321.70	320.4	2.2	2.012	0.850	2.862	3.37	1.856	1.006
15	0.2000	340.00	338.7	2.5	2.122	0.850	2.972	3.50	1.911	1.061
16	0.2200	356.90	355.6	2.7	2.222	0.850	3.072	3.62	1.961	1.111
17	0.2400	372.70	371.4	2.9	2.315	0.850	3.165	3.73	2.007	1.158
18	0.2600	387.00	385.7	3.2	2.398	0.850	3.248	3.82	2.049	1.199
19	0.2800	399.80	398.5	3.4	2.472	0.850	3.321	3.91	2.085	1.236
20	0.3000	414.40	413.1	3.7	2.556	0.850	3.405	4.01	2.127	1.278
21	0.3500	442.80	441.5	4.3	2.714	0.850	3.564	4.19	2.207	1.357

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
22	0.4000	465.40	464.1	4.9	2.835	0.850	3.684	4.34	2.267	1.417
23	0.4500	484.40	483.1	5.5	2.932	0.850	3.781	4.45	2.315	1.466
24	0.5000	498.80	497.5	6.1	3.000	0.850	3.849	4.53	2.349	1.500
25	0.5500	511.50	510.2	6.7	3.056	0.850	3.906	4.60	2.378	1.528
26	0.6000	519.00	517.7	7.4	3.081	0.850	3.930	4.63	2.390	1.540
27	0.6500	523.40	522.1	8.0	3.086	0.850	3.936	4.63	2.393	1.543
28	0.7000	528.00	526.7	8.6	3.093	0.850	3.942	4.64	2.396	1.546
29	0.7500	529.40	528.1	9.2	3.080	0.850	3.930	4.63	2.390	1.540
30	0.8000	529.10	527.8	9.8	3.058	0.850	3.907	4.60	2.378	1.529
31	0.8500	525.20	523.9	10.4	3.014	0.850	3.864	4.55	2.357	1.507
32	0.9000	518.80	517.5	11.0	2.957	0.850	3.807	4.48	2.328	1.479

REITZ & JENS, INC.

~~Unconsolidated Undrained or Unconfined Test~~ Vacuum Triaxial Test

Project Ameren Labadie UWL

Boring No. —

Sample No. —

Depth —

Test by K. Kaher

Entered by K. Kaher

Checked by J. Fouse

Testing Date 4-26-11

Description of Entire Tube

Description of Test Sample Dry Labadie Bottom Ash, Lightly compacted into mold

Moisture Contents		
	Trial 1	Trial 2
Tare #		
Wet Wt.+Tare		
Dry Wt.+Tare		
Wt. of Water		
Tare Wt.		
Wt. of Soil		
% Moisture		
Average % Moisture=	0.0	

Sample Density	
Wet Wt. of Sample (grams)	2172.81
Diameter of Sample (Inches)	D= 3.789
Length of Sample (Inches)	L= 8.23
Density Constant C = (4.85 / (D^2 * L)	
Wet Density (pcf)	
Dry Density (pcf)	

4472.17
2299.36

Failure Sketch

Rate of Load Application 20 on dial %/min

Confining Pressure 8.0 inches of Merc. Vacuum

Mass of Top Cap gms

Strain (.001")	Load (lbs)
0	1.9
10	36.0
20	53.5
30	65.3
40	95.2
50	85.8
60	94.9
70	102.4
80	112.0
90	117.7
100	123.9
120	133.0
140	141.9
160	149.1
180	157.2
200	162.0
220	167.1

Notes:

Strain (.001")	Load (lbs)
240	171.2
260	175.7
280	180.5
300	181.6
350	188.4
400	194.9
450	197.1
500	195.1
550	193.3
600	192.1
650	
700	
750	
800	
850	
900	
1000	

Notes:

SCHEDULE CJG-ST1

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REITZ & JENS, INC.

Unconsolidated Undrained or Unconfined Test

Project: Ameren Labadie UWL
Boring No.: –
Sample No.: –
Depth: –

Test by: K. Koch
Entered by: K. Koch
Checked by: J. Fouse
Testing Date: 4-26-11

3.784
.784
.782

Description of Entire Tube:

Description of Test Sample: Same as 8.0 inches of Merc.

Moisture Contents		
	Trial 1	Trial 2
Tare #		
Wet Wt.+Tare		
Dry Wt.+Tare		
Wt. of Water		
Tare Wt.		
Wt. of Soil		
% Moisture		
Average % Moisture=	0.0	

Sample Density	
Wet Wt. of Sample (grams)	2154.20
Diameter of Sample (Inches)	D= 3.783
Length of Sample (Inches)	L= 8.20
Density Constant $C = (4.85 / (D^2 * L)$	
Wet Density (pcf)	
Dry Density (pcf)	

4467.25
2313.05

Failure Sketch

Rate of Load Application: ______ %/min
7.84 Confining Pressure: 16 ~~psi~~ vacuum inches of merc
Mass of Top Cap: ______ gms

Strain (.001")	Load (lbs)
0	1.6
10	37.3
20	62.5
30	81.2
40	99.4
50	113.9
60	127.3
70	140.3
80	151.9
90	162.9
100	173.0
120	190.7
140	206.6
160	220.9
180	233.6
200	247.3
220	257.4

Notes:

Strain (.001")	Load (lbs)
240	266.2
260	274.6
280	283.9
300	290.3
350	307.0
400	320.0
450	330.6
500	333.9
550	338.4
600	341.6
650	337.5
700	335.4
750	332.2
800	
850	
900	
1000	

Notes:

SCHEDULE CJG-ST1

REITZ & JENS, INC.

Unconsolidated Undrained or Unconfined Test

Project Ameren Labadie UWL

Boring No. —

Sample No. —

Depth —

Test by K. Kocher

Entered by K. Kocher

Checked by J. Fouse

Testing Date 4-26-11

Description of Entire Tube

Description of Test Sample Same AS 8 inches of merc.

4464.89
2281.78

Moisture Contents		
	Trial 1	Trial 2
Tare #		
Wet Wt.+Tare		
Dry Wt.+Tare		
Wt. of Water		
Tare Wt.		
Wt. of Soil		
% Moisture		
Average % Moisture=	0.0	

Sample Density	
Wet Wt. of Sample (grams)	2183.11
Diameter of Sample (Inches)	D= 3.778
Length of Sample (Inches)	L= 8.16
Density Constant C = (4.85 / (D^2 * L)	
Wet Density (pcf)	
Dry Density (pcf)	

Failure Sketch

Rate of Load Application %/min

11.8 Confining Pressure 24.0 Vac inches of merc.

Mass of Top Cap gms

Strain (.001")	Load (lbs)
0	1.3
10	44.8
20	73.2
30	99.6
40	123.5
50	143.9
60	161.2
70	177.8
80	193.1
90	211.8
100	225.5
120	253.6
140	278.6
160	300.8
180	321.7
200	340.0
220	356.9

Notes:

Strain (.001")	Load (lbs)
240	372.7
260	387.0
280	399.8
300	414.4
350	442.8
400	465.4
450	484.4
500	498.8
550	511.5
600	518.0
650	523.4
700	528.0
750	529.4
800	529.1
850	525.2
900	518.8
1000	

Notes:

SCHEDULE CJG-ST1

CONSTANT HEAD PERMEABILITY TEST

Project Ameren; Labadie CCP Testing

Date 04/15/11

SoilDescription Bottom Ash, loosely placed in the cylinder

Test Cylinder Diameter 3.0" Area 45.6 (sq cm)

Sample Length To Bottom 11.6" To Top 2.9" Length 8.70" (in)

Weight Dry Material Used
Initial Tare + Sample 4529.89 (gms)
Final Tare + Sample 3210.41 (gms)
Material Weight 1319.48 (gms)

Sample Density K x Material Weight = 81.7 **(pcf)**
$K = 4.85/(D^2 \text{ x } L)$
D in inches, L in inches

Trial No.	top mano- meter	Bottom Mano- meter	Head Loss	Length between ports	Water Wt + Tare (gms)	Tare (gms)	volume of flow (gms=cc)	time (sec)	Temp (C)
1	-	-	2.79 cm	10.3 cm			1000 cc	89 sec	26.35
2	-	-	9.02 cm	10.3 cm			1000 cc	49 sec	27.97
3	-	-	9.53 cm	10.3 cm			1000 cc	40 sec	29.68
4	-	-	5.51 cm	10.3 cm			1000 cc	64 sec	30.98

Trial	K for test temp K= Flow / ((h/l) x area x time)	K for 20 C. Mu_t / Mu_{20}
1	K = 0.910 cm/sec	K for 20C = 0.785 cm/sec
2	K = 0.511 cm/sec	K for 20C = 0.425 cm/sec
3	K = 0.593 cm/sec	K for 20C = 0.476 cm/sec
4	K = 0.641 cm/sec	K for 20C = 0.500 cm/sec

Mu_{20} = 1.005 centipoises

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rev. Sept. 09, 2002

CONSTANT HEAD PERMEABILITY TEST

Project Ameren Labadie Utility

Date 4-15-11

SoilDescription Labadie bottom ash (Minimum density possible)

Test Cylinder Diameter 3.0 inches Area 45.6 cm² (sq cm)

Sample Length To Bottom 11.6" To Top 2.9" Length 8.70" (in)

Weight Dry Material Used
Initial Tare + Sample 4529.89g (gms)
Final Tare + Sample 3210.41g (gms)
Material Weight 1319.48g (gms)

Sample Density K x Material Weight = 81.7 pcf (pcf)
$K = 4.85/(D^2 \times L)$
D in inches, L in inches

Trial No.	top mano-meter	Bottom Mano-meter	Head Loss cm	Length between ports (cm)	Water Wt + Tare (gms)	Tare (gms)	volume of flow (gms=cc)	time (sec)	Temp (C)
1			2.79cm	10.3			1000cm	89sec	26.35
2			9.02	10.3			1000cm	49sec	27.97
3			9.53	10.3			1000cm	40sec	29.68
4			5.51	10.3			1000cm	64sec	30.98

Trial	K for test temp K= Flow / ((h/l) x area x time)	K for 20 C. Mu_t / Mu_{20}
1	$K = \frac{(1000)(10.3)}{(45.6)(89)(2.79)} = 0.910$ cm/sec	$K_{20°C} = \left(\frac{0.8670}{1.005}\right)(0.910) \Rightarrow K_{20°C} = 0.785$ cm/sec
2	$K = \frac{(1000)(10.3)}{(45.6)(49)(9.02)} = 0.511$ cm/sec	$K_{20°C} = \left(\frac{0.8360}{1.005}\right)(0.511) \Rightarrow K_{20°C} = 0.425$ cm/sec
3	$K = \frac{(1000)(10.3)}{(45.6)(40)(9.53)} = 0.593$ cm/sec	$K_{20°C} = \left(\frac{0.806}{1.005}\right)(0.593) \Rightarrow K_{20°C} = 0.476$ cm/sec
4	$K = \frac{(1000)(10.3)}{(45.6)(64)(5.51)} = 0.641$ cm/sec	$K_{20°C} = \left(\frac{0.7840}{1.005}\right)(0.641) \Rightarrow K_{20°C} = 0.500$ cm/sec

$Mu_{20} = 1.005$ centipoises

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rev. Sept. 09, 2002

CONSTANT HEAD PERMEABILITY TEST

Project Ameren; Labadie CCP Testing

Date 04/15/11

SoilDescription Bottom Ash, densified in the cylinder

Test Cylinder Diameter 3.0" Area 45.6 (sq cm)

Sample Length To Bottom 11.5" To Top 3.05" Length 8.45" (in)_

Weight Dry Material Used
Initial Tare + Sample 3210.41 (gms)_
Final Tare + Sample 1700.86 (gms)
Material Weight 1509.55 (gms)

Sample Density K x Material Weight = 96.3 **(pcf)_**
K= 4.85/(D^2 x L)
D in inches, L in inches

Trial No.	top mano-meter	Bottom Mano-meter	Head Loss	Length between ports	Water Wt + Tare (gms)	Tare (gms)	volume of flow (gms=cc)	time (sec)	Temp (C)
1	-	-	6.99 cm	10.3 cm			1000 cc	290 sec	24.25
2	-	-	13.2 cm	10.3 cm			1000 cc	155 sec	24.79
3*	-	-	21.2 cm	10.3 cm			1000 cc	139 sec	22.30

Trial	K for test temp K= Flow / ((h/l) x area x time)	K for 20 C. $\text{Mu}_t / \text{Mu}_{20}$
1	K = 0.111 cm/sec	K for 20C = 0.100 cm/sec
2	K = 0.110 cm/sec	K for 20C = 0.098 cm/sec
3*	K = 0.077 cm/sec	K for 20C = 0.073 cm/sec
	* May have had clogging or migration of material during test	

Mu_{20} = 1.005 centipoises

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rev. Sept. 09, 2002

CONSTANT HEAD PERMEABILITY TEST

Project Ameren Labadie UWL

Date 4-15-2011

SoilDescription Labadie Bottom Ash (Densified in cylinder)

Test Cylinder Diameter 3" = 7.62 cm Area 45.6 (sq cm)

Sample Length To Bottom 11.5" To Top 3.05" Length 8.45 (in)

Weight Dry Material Used	Initial Tare + Sample	3210.41	(gms)
	Final Tare + Sample	1700.86	(gms)
	Material Weight	1509.55	(gms)

Sample Density K x Material Weight = 96.3 pcf (pcf)

$K = 4.85/(D^2 \times L)$

D in inches, L in inches

Trial No.	top mano-meter	Bottom Mano-meter	Head Loss (cm)	Length between ports (cm)	Water Wt + Tare (gms)	Tare (gms)	volume of flow (gms=cc)	time (sec)	Temp (C)
1			6.99	10.3 cm			1000 cc	290 sec	24.25
2			13.2	10.3 cm			1000 cc	155 sec	24.79
3*			21.2	10.3 cm			1000 cc	139 sec	22.30
4									

*clogging? or migration?

Trial	K for test temp K= Flow / ((h/l) x area x time)	K for 20 C. Mu_t / Mu_{20}
1	$K = \frac{(1000)(10.3)}{(45.6)(290)(6.99)} = 0.111$ cm/sec	$K_{20°} = (0.111)\left(\frac{0.909}{1.005}\right) \Rightarrow K_{20°C} = 0.100$ cm/sec
2	$K = \frac{(1000)(10.3)}{(45.6)(155)(13.2)} = 0.110$ cm/sec	$K_{20°C} - (0.110)\left(\frac{0.898}{1.005}\right) \Rightarrow K_{20°C} = 0.098$ cm/sec
3*	$K = \frac{(1000)(10.3)}{(45.6)(139)(21.2)} = 0.077$ cm/sec	$K_{20°C} = (0.077)\left(\frac{0.951}{1.005}\right) \Rightarrow K_{20°C} = 0.073$ cm/sec

$Mu_{20} = 1.005$ centipoises

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rev. Sept. 09, 2002

REITZ & JENS, INC.
Consulting Engineers

PAINT FILTER LIQUIDS TEST

R&J Project: AmerenUE - CCP Ash Study
Sheet
Boring: Labadie Fly Ash
Sample:
Depth:
Date: 8/16/10
Test By:

100% Fly Ash

Sample Wt:	Added % Moisture	5 minutes Static	2 minutes Vibratory
100g	30%	FAIL	N/A
100g	27½%	PASS	Pass (Cemented)

EPA Method 9095B Paint Filter Liquids Test
Equip: Conical paint filter (mesh #60 +/-5% fine meshed size)
Fluted Glass Funnel
Rings and Ring Stand
Glass Beaker

Procedure: Add water to sample, mix thoroughly and place in paper paint funnel. Allow to sit statically for 5 minutes. If it drips then it has free liquids, if not run immediately run 2 minutes on vibratory table on desired frequency. Document after each process of passing or failing the test time limit at the given moistures.

REITZ & JENS, INC.
Consulting Engineers

PAINT FILTER LIQUIDS TEST

R&J Project: Ameren UE - CCP Ash Study

Sheet ________

Boring: Labadie Blend

Sample: ________

Depth: ________

Date: 8/18/10

46% Fly
20% Btm
34% Gyp.

Test By: ________

Sample Wt:	Added % Moisture	5 minutes Static	2 minutes Vibratory
100g	30%	FAIL	N/A
100g	27.5%	PASS	Pass (cemented)
100g	25.0%	PASS	Pass (cemented)
100g			

EPA Method 9095B Paint Filter Liquids Test

Equip: Conical paint filter (mesh #60 +/-5% fine meshed size)
Fluted Glass Funnel
Rings and Ring Stand
Glass Beaker

Procedure: Add water to sample, mix thoroughly and place in paper paint funnel. Allow to sit statically for 5 minutes. If it drips then it has free liquids, if not run immediately run 2 minutes on vibratory table on desired frequency. Document after each process of passing or failing the test time limit at the given moistures.

REITZ & JENS, INC.
Consulting Engineers

PAINT FILTER LIQUIDS TEST

R&J Project: Ameren UE - CCP Ash Study

Sheet ______

Boring: Labadie Blend

Sample: ______

Depth: ______

Date: 8/18/10

30% Fly
25% Btm
45% GYP

Test By:

Sample Wt:	Added % Moisture	5 minutes Static	2 minutes Vibratory
100g	30%	FAIL	N/A
100g	27.5%	Pass	Pass(cemented)
100g	25.0%	Pass	Pass (cemented)
100g			

EPA Method 9095B Paint Filter Liquids Test

Equip: Conical paint filter (mesh #60 +/-5% fine meshed size)
Fluted Glass Funnel
Rings and Ring Stand
Glass Beaker

Procedure: Add water to sample, mix thoroughly and place in paper paint funnel. Allow to sit statically for 5 minutes. If it drips then it has free liquids, if not run immediately run 2 minutes on vibratory table on desired frequency. Document after each process of passing or failing the test time limit at the given moistures.

REITZ & JENS, INC.
Consulting Engineers

PAINT FILTER LIQUIDS TEST

R&J Project: AmerenUE - CCP Ash Study

Sheet ____________

Boring: Labadie Blend

Sample: ________

Depth: ______

Date: 8/18/10

36% Fly
64% Gyp.

Test By:

Sample Wt:	Added % Moisture	5 minutes Static	2 minutes Vibratory
100g	30%	PASS	Pass (cemented)
100g	40%	PASS	Pass (cemented)
100g	45%	FAIL	N/A
100g	42.5%	FAIL	N/A

EPA Method 9095B Paint Filter Liquids Test

Equip: Conical paint filter (mesh #60 +/-5% fine meshed size)
Fluted Glass Funnel
Rings and Ring Stand
Glass Beaker

Procedure: Add water to sample, mix thoroughly and place in paper paint funnel. Allow to sit statically for 5 minutes. If it drips then it has free liquids, if not run immediately run 2 minutes on vibratory table on desired frequency. Document after each process of passing or failing the test time limit at the given moistures.

Labadie 46% Fly Ash 20% Bottom Ash 34% Pre-Pump Duck Creek Gypsum

Trial #	1	2	3	4	5	6		
			Minimum Density					
Tare + Material (g)	933.56	943.03	931.54	929.15	927.91	944.08		
Tare (g)	67.76	68.09	67.24	68.39	67.26	67.18		
Material (g)	865.8	874.94	864.3	860.76	860.65	876.9		
Diameter (in)	3.057	3.0595	3.0678	3.056	3.0588	3.0618		
Length (in)	5.9404	5.9383	5.9375	5.9466	5.9411	5.9436		
X-Section Area (in^2)	7.339741	7.351751	7.391694	7.33494	7.348387	7.362809		
Volume (in^3)	43.601	43.6569	43.88818	43.61796	43.6575	43.76159		
Density (g/in^3)	19.85734	20.04127	19.69323	19.73407	19.71368	20.03812		
Density (pcf)	75.64829	76.349	75.02309	75.17869	75.10099	76.33698	Average= 75.60617	Stand. Dev.= 0.610833
			Density After 8 Minutes of Vibration					
Change in Length	1.502	1.165	1.3625	1.101	1.2955	1.063		
Change in Length	1.449	1.379	1.1685	1.421	1.472	1.3405		
Change in Length	1.406	1.597	1.2955	1.5865	1.437	1.644		
Change in Length	1.2335	1.51	1.5305	1.453	1.3085	1.5755		
Average Change in Length	1.397625	1.41275	1.33925	1.390375	1.37825	1.40575		
Change in Volume	10.25821	10.38619	9.899326	10.19832	10.12791	10.35027		
New Volume	33.34279	33.27072	33.98886	33.41964	33.52959	33.41132		
Density (g/in^3)	25.96663	26.2976	25.42892	25.75611	25.66837	26.24559		
Density (pcf)	98.92216	100.183	96.87372	98.12018	97.78592	99.9849	Average= 98.64498	Stand. Dev.= 1.295264

Figure B-21

SCHEDULE CJG-ST1

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job Ameren UE - CCP Ash Study

Boring No. Labadie Fly Ash 46%

Depth + Bottom Ash 20%

Sample No. + O.C. Prepump "Dry" Gyp 34%

Mold Vol. .0252 / .0253 (cu. ft.) (Vm)

Mold End Area .05097/ .05107 (sq. ft.) (Am)

Lab Test by JA Date 8/17/10

Computed by ______ Date ___

Checked by ______ Date ___

Mold No. ______

Mold Diam. ______ (in)

Mold Wt. ______ (lb.)

Relative Density $= \frac{\gamma \text{max.}}{\gamma \text{field}} \frac{(\gamma \text{field} - \gamma \text{min.})}{(\gamma \text{max.} - \gamma \text{min.})} \times 100$

MINIMUM DENSITY						
Trial No.			1		2	
Weight Lb.	Tare + Soil Dry	W	933.56		943.03	
	Tare	W	67.76		68.09	
	Soil Dry	W s	865.80	1.9088	874.94	1.9289
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf			75.75		76.24	
	(8 min) Vibrated	~~MAXIMUM~~ DENSITY				
Method Used						
Trial No.						
Height Inches	~~Initial Dial Reading~~	h o	1.5020		1.1650	
	~~Left Dial Reading~~	h l	1.4490		1.3790	
	~~Right Dial Reading~~	h r	1.4060		1.5970	
	~~Sum~~	h l + h r	1.2335		1.5100	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h		1.39976		1.41275
Volume cu. ft.	Mold Initial Volume	V m		.0252		.0253
	Volume Change *	Δ V		0.0059366		0.00601
	Volume of Soil	V s		0.01926		0.01929
Weight Lb.	Tare + Soil Dry	W				
	Tare	W m				
	Soil Dry	W s		1.9088		1.9289
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			99.11		99.99	

$$* \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks Ave. Minimum = 75.573 pcf

Ave. Vibrated Density after 8 min = 98.587 pcf

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Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job ______

Boring No. Laladie Blend

Depth 46% Fly + 20% Btm + 34% P.C. "Dry" prepump gypsum

Sample No. ______

Mold Vol. .0254 / .0253 (cu. ft.) (Vm)

Mold End Area .05133 / .0509 (sq. ft.) (Am)

Lab Test by ______ Date ______

Computed by ______ Date ______

Checked by ______ Date ______

Mold No. ______

Mold Diam. ______ (in)

Mold Wt. ______ (lb.)

Relative Density $= \frac{\gamma \text{max.} \; (\gamma \text{field} - \gamma \text{min.})}{\gamma \text{field} \; (\gamma \text{max.} - \gamma \text{min.})} \times 100$

MINIMUM DENSITY						
Trial No.			3		4	
Weight	Tare + Soil Dry	W	931.94		929.15	
	Tare	W	67.24		68.39	
Lb.	Soil Dry	W s	864.30	1.9055	860.76	1.8977
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf			75.02		75.01	
MAXIMUM DENSITY						
Method Used						
Trial No.						
Height Inches	~~Initial Dial Reading~~	h o	1.3625		1.1010	
	~~Left Dial Reading~~	h l	1.1685		1.4210	
	~~Right Dial Reading~~	h r	1.2955		1.5865	
	~~Sum~~	h l + h r	1.5305		1.4930	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h		1.33925		1.3904
Volume cu. ft.	Mold Initial Volume	V m		.0254		.0253
	Volume Change *	Δ V		0.005729		0.00590
	Volume of Soil	V s		0.01967		0.0194
Weight Lb.	Tare + Soil Dry	W				
	Tare	W m				
	Soil Dry	W s		1.9055		1.8977
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			96.87		97.82	

$* \Delta V = \frac{\Delta h \times A m}{12}$

Sample Description & Remarks ______

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job ____________

Boring No. Labadie Blend

Depth 46% Fly + 20% Btm

Sample No. + 34% P.C. Prepump "Dry" Gyp

Mold Vol. .0253/.0253 (cu. ft.) (Vm)

Mold End Area .0510/.0511 (sq. ft.) (Am)

Lab Test by ______ Date ____

Computed by ______ Date ____

Checked by ______ Date ____

Mold No. ____________

Mold Diam. ____________ (in)

Mold Wt. ____________ (lb.)

$$\text{Relative Density} = \frac{\gamma\,\text{max.}\ (\gamma\,\text{field} - \gamma\,\text{min.})}{\gamma\,\text{field}\ (\gamma\,\text{max.} - \gamma\,\text{min.})} \times 100$$

MINIMUM DENSITY						
Trial No.			5		6	
Weight	Tare + Soil Dry	W	927.91		944.08	
	Tare	W	67.26		67.18	
Lb.	Soil Dry	W s	860.65	1.8978	876.90	1.9332
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf			75.01		76.41	
MAXIMUM DENSITY						
Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	1.2955		1.0630	
Inches	~~Left Dial Reading~~	h l	1.4720		1.3405	
	~~Right Dial Reading~~	h r	1.4370		1.6440	
	~~Sum~~	h l + h r	1.3085		1.5755	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h		1.37825		1.40575
Volume cu. ft.	Mold Initial Volume	V m		.0253		.0253
	Volume Change *	Δ V		0.005858		0.005986
	Volume of Soil	V s		0.01944		0.01931
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s		1.8978		1.9332
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			97.62		100.11	

$$* \Delta V = \frac{\Delta h \times A\,m}{12}$$

Sample Description & Remarks ____________

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Labadie 30% Fly Ash 25% Bottom Ash 45% Pre-Pump Duck Creek Gypsum

Trial #	1	2	3	4	5	6		
			Minimum Density					
Tare + Material (g)	938.32	968.87	944.79	970.5	954.38	970.48		
Tare (g)	67.76	68.09	67.24	68.39	67.26	67.18		
Material (g)	870.56	900.78	877.55	902.11	887.12	903.3		
Diameter (in)	3.057	3.0595	3.0678	3.056	3.0588	3.0618		
Length (in)	5.9404	5.9383	5.9375	5.9466	5.9411	5.9436		
X-Section Area (in^2)	7.339741	7.351751	7.391694	7.33494	7.348387	7.362809		
Volume (in^3)	43.601	43.6569	43.88818	43.61796	43.6575	43.76159		
Density (g/in^3)	19.96651	20.63316	19.99513	20.68208	20.31999	20.64139		
Density (pcf)	76.06419	78.60385	76.17321	78.7902	77.41078	78.63519	Average= 77.6129	Stand. Dev.= 1.258977
			Density After 8 Minutes of Vibration					
Change in Length	1.0455	0.9965	1.3665	1.03	1.2495	1.4315		
Change in Length	1.2555	1.359	0.995	1.195	1.112	1.334		
Change in Length	1.5755	1.601	1.238	1.404	1.336	1.187		
Change in Length	1.4545	1.397	1.6575	1.311	1.427	1.218		
Average Change in Length	1.33275	1.338375	1.31425	1.235	1.281125	1.292625		
Change in Volume	9.78204	9.8394	9.714534	9.058651	9.414203	9.517351		
New Volume	33.81896	33.8175	34.17365	34.5593	34.2433	34.24424		
Density (g/in^3)	25.74177	26.6365	25.67914	26.10325	25.90638	26.37816		
Density (pcf)	98.06555	101.4741	97.82695	99.44261	98.69263	100.4899	Average= 99.33196	Stand. Dev.= 1.429645

Figure B-22

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Relative Density $= \frac{\gamma \max. \ (\gamma \text{ field} - \gamma \min.)}{\gamma \text{ field} \ (\gamma \max. - \gamma \min.)} \times 100$

Job Ameren UE - CCP Ash Study

Boring No. Labadie Fly Ash 30%

Depth + Btm Ash 25%

Sample No. + Duck Creek Prepump "Dry" Gyp @ 45%

Mold Vol. .0252 | .0253 (cu. ft.) (Vm)

Mold End Area .05097 / .05105 (sq. ft.) (Am)

Lab Test by ______ Date ____

Computed by ______ Date ____

Checked by ______ Date ____

Mold No. ______

Mold Diam. ______ (in)

Mold Wt. ______ (lb.)

			MINIMUM DENSITY			
Trial No.			1		2	
Weight	Tare + Soil Dry	W	938.32		968.87	
	Tare	W	67.76		68.09	
Lb.	Soil Dry	W s	870.56	1.9193	900.78	1.9859
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf			76.16		78.49	

	Vibrated (8min.) ~~MAXIMUM~~ DENSITY					
Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	1.0455		0.9965	
Inches	~~Left Dial Reading~~	h l	1.2555		1.3590	
	~~Right Dial Reading~~	h r	1.5755		1.6010	
	~~Sum~~	h l + h r	1.4545		1.3970	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h		1.33275		1.33838
Volume	Mold Initial Volume	V m		.0252		.0253
cu. ft.	Volume Change *	Δ V		0.005661		0.005694
	Volume of Soil	V s		0.01954		0.01961
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s		1.9193		1.9859
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			98.22		101.27	

$$* \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks Ave. Minimum Density = 77.573 pcf

Average Density after 8 min. Vibration = 99.257 pcf

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SCHEDULE CJG-ST1

Figure B-122

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

$$\text{Relative Density} = \frac{\gamma\,\text{max.}\ (\gamma\,\text{field} - \gamma\,\text{min.})}{\gamma\,\text{field}\ (\gamma\,\text{max.} - \gamma\,\text{min.})} \times 100$$

Job Labadie Blend

Boring No. 30% Fly

Depth 25% Btm

Sample No. +4.5% O.C. "Dy" Gyp.

Mold Vol. .0254 / .0253 (cu. ft.) (Vm)

Mold End Area .05133/.0509 (sq. ft.) (Am)

Lab Test by ______ Date ____

Computed by ______ Date ____

Checked by ______ Date ____

Mold No. ____________

Mold Diam. ____________ (in)

Mold Wt. ____________ (lb.)

MINIMUM DENSITY

Trial No.			3		4	
Weight	Tare + Soil Dry	W	944.79		970.50	
	Tare	W	67.24		68.39	
Lb.	Soil Dry	W s	877.55	1.9347	902.11	1.9888
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf			76.17		78.61	

MAXIMUM DENSITY

Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	1.3665		1.0300	
Inches	~~Left Dial Reading~~	h l	0.9950		1.1950	
	~~Right Dial Reading~~	h r	1.2380		1.4040	
	~~Sum~~	h l + h r	1.6575		1.3110	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h		1.3140		1.2350
Volume	Mold Initial Volume	V m		.0254		.0253
cu. ft.	Volume Change *	Δ V		0.005621		0.005238
	Volume of Soil	V s		0.01978		0.02006
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s		1.9347		1.9888
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			97.81		99.14	

$$^{*}\ \Delta V = \frac{\Delta h \times A\,m}{12}$$

Sample Description & Remarks ____________

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

$$\text{Relative Density} = \frac{\gamma\max.\ (\gamma\text{ field} - \gamma\min.)}{\gamma\text{ field}\ (\gamma\max. - \gamma\min.)} \times 100$$

Job Labadie Blend

Boring No. 30% Fly

Depth 25% Btm

Sample No. + 45% O.C. "Dry" Prepump G.H.P.

Mold Vol. .0253 / .0253 (cu. ft.) (Vm)

Mold End Area .0910 / .0911 (sq. ft.) (Am)

Lab Test by ______ Date ____

Computed by ______ Date ____

Checked by ______ Date ____

Mold No. ______

Mold Diam. ______ (in)

Mold Wt. ______ (lb.)

MINIMUM DENSITY						
Trial No.			5		6	
Weight	Tare + Soil Dry	W	954.38		970.48	
	Tare	W	67.26		67.18	
Lb.	Soil Dry	W s	887.12	1.95576	903.30	1.9914
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf			77.30		78.71	
MAXIMUM DENSITY						
Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	1.2495		1.4315	
Inches	~~Left Dial Reading~~	h l	1.1120		1.3340	
	~~Right Dial Reading~~	h r	1.3360		1.1870	
	~~Sum~~ h l + h r		1.4270		1.2180	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h		1.2811		1.2926
Volume	Mold Initial Volume	V m		.0253		.0253
cu. ft.	Volume Change *	Δ V		0.005445		0.005504
	Volume of Soil	V s		0.019855		0.019796
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s		1.95576		1.9914
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			98.50		100.60	

$$^{*}\ \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks ______

Labadie 36% Fly Ash 64% Pre-Pump Duck Creek Gypsum (Trail 2)

Trial #	1	2	3	4	5	6		
			Minimum Density					
Tare + Material (g)	835.58	838.48	832.77	844.1	819.26	826.22		
Tare (g)	67.76	68.09	67.24	68.39	67.26	67.18		
Material (g)	767.82	770.39	765.53	775.71	752	759.04		
Diameter (in)	3.057	3.0595	3.0678	3.056	3.0588	3.0618		
Length (in)	5.9404	5.9383	5.9375	5.9466	5.9411	5.9436		
X-Section Area (in^2)	7.339741	7.351751	7.391694	7.33494	7.348387	7.362809		
Volume (in^3)	43.601	43.6569	43.88818	43.61796	43.6575	43.76159		
Density (g/in^3)	17.61015	17.64646	17.44274	17.78419	17.22499	17.34489		
Density (pcf)	67.0874	67.22576	66.44964	67.75043	65.62011	66.07689	Average= 66.7017	Stand. Dev.= 0.793349
			Density After 8 Minutes of Vibration					
Change in Length	1.2545	1.2705	1.2145	1.3575	1.723	1.823		
Change in Length	1.461	1.516	1.3225	1.779	1.3845	1.498		
Change in Length	1.724	1.82	1.9	1.4168	1.385	1.3025		
Change in Length	1.419	1.584	1.6525	1.207	1.6145	1.438		
Average Change in Length	1.464625	1.547625	1.522375	1.440075	1.52675	1.515375		
Change in Volume	10.74997	11.37775	11.25293	10.56286	11.21915	11.15742		
New Volume	32.85103	32.27915	32.63525	33.05509	32.43835	32.60417		
Density (g/in^3)	23.37278	23.86649	23.45715	23.46719	23.18243	23.28046		
Density (pcf)	89.04067	90.92149	89.36207	89.40031	88.31552	88.68894	Average= 89.28817	Stand. Dev.= 0.900239

Figure B-23

$$\text{Relative Density} = \frac{\gamma \text{max.} \ (\gamma \text{field} - \gamma \text{min.})}{\gamma \text{field} \ (\gamma \text{max.} - \gamma \text{min.})} \times 100$$

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job Am UE CCP Studies
Boring No. LAB FlyAsh 36%
Depth D.C. Pre Pump 64%
Sample No.
Mold Vol. .0252/.0253 (cu. ft.) (Vm)
Mold End Area .05097/.05105 (sq. ft.) (Am)

Lab Test by JSP Date 8/23/10
Computed by Date
Checked by Date
Mold No.
Mold Diam. (in)
Mold Wt. (lb.)

new material

Retrial

Trial #2

MINIMUM DENSITY

Trial No.			1		2	
Weight	Tare + Soil Dry	W	835.58		838.48	
	Tare	W	67.76		68.09	
Lb.	Soil Dry	W s	767.82		770.39	
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						

MAXIMUM DENSITY

Method Used						
Trial No.						
Height Inches	~~Initial Dial Reading~~	h o	1.2545		1.2705	
	~~Left Dial Reading~~	h l	1.4610		1.5160	
	~~Right Dial Reading~~	h r	1.7240		1.8200	
	~~Sum~~	h l + h r	1.4190		1.5840	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h				
Volume cu. ft.	Mold Initial Volume	V m				
	Volume Change *	Δ V				
	Volume of Soil	V s				
Weight Lb.	Tare + Soil Dry	W				
	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.						

$$* \ \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks

Figure B-23
SCHEDULE CJG-ST1

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RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

$$\text{Relative Density} = \frac{\gamma\,\text{max.}\ (\gamma\,\text{field} - \gamma\,\text{min.})}{\gamma\,\text{field}\ (\gamma\,\text{max.} - \gamma\,\text{min.})} \times 100$$

Job ______

Boring No. LAB Fly Ash 36%

Depth D.C. PrePump 64%

Sample No. ______

Mold Vol. .0254/.0253 (cu. ft.) (Vm)

Mold End Area .05133/.0509 (sq. ft.) (Am)

Lab Test by ______ Date ______

Computed by ______ Date ______

Checked by ______ Date ______

Mold No. ______

Mold Diam. ______ (in)

Mold Wt. ______ (lb.)

MINIMUM DENSITY					4	
Trial No.			3			
Weight Lb.	Tare + Soil Dry	W	832.77		844.10	
	Tare	W	67.24		68.39	
	Soil Dry	W s	765.53		775.71	
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						

	MAXIMUM DENSITY					
Method Used						
Trial No.						
Height Inches	~~Initial Dial Reading~~	h o	1.2145		1.3575	
	~~Left Dial Reading~~	h l	1.3225		1.7790	
	~~Right Dial Reading~~	h r	1.9000		1.4168	
	~~Sum~~	h l + h r	1.6525		1.2070	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h				
Volume cu. ft.	Mold Initial Volume	V m				
	Volume Change *	Δ V				
	Volume of Soil	V s				
Weight Lb.	Tare + Soil Dry	W				
	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.						

$$^{*}\Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks ______

$$\text{Relative Density} = \frac{\gamma \text{max.} \; (\gamma \text{field} - \gamma \text{min.})}{\gamma \text{field} \; (\gamma \text{max.} - \gamma \text{min.})} \times 100$$

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job ______

Boring No. LAB Fly Ash 36%

Depth D. C. Prepump 64%

Sample No. ______

Mold Vol. .0253/.0253 (cu. ft.) (Vm)

Mold End Area .0510/.0511 (sq. ft.) (Am)

Lab Test by ______ Date ______

Computed by ______ Date ______

Checked by ______ Date ______

Mold No. ______

Mold Diam. ______ (in)

Mold Wt. ______ (lb.)

MINIMUM DENSITY

Trial No.			5		6	
Weight Lb.	Tare + Soil Dry	W	819.26		826.22	
	Tare	W	67.26		67.18	
	Soil Dry	W s	752.00		759.04	
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						

MAXIMUM DENSITY

Method Used						
Trial No.						
Height Inches	~~Initial Dial Reading~~	h o	1.7230		1.8230	
	~~Left Dial Reading~~	h l	1.3845		1.4980	
	~~Right Dial Reading~~	h r	1.3850		1.3025	
	~~Sum~~	h l + h r	1.6145		1.4380	
	~~Average Dial Reading~~	h a				
	Height Change	Δ h				
Volume cu. ft.	Mold Initial Volume	V m				
	Volume Change *	Δ V				
	Volume of Soil	V s				
Weight Lb.	Tare + Soil Dry	W				
	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.						

$$^{*}\ \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks ______

Figure B-23
SCHEDULE CJG-ST1

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Project: Ameren UE – CCP Ash Study Date: 08/25/2010
R&J Personnel: James R. David / Jason J. Pruett R&J No.: 2008012455

Ameren UE – CCP Ash Study Set-up Time and Dry Unit Weight

Dry Sample Components: **Testing Date:** 8/20/2010
46% Labadie Fly Ash + 20% Labadie Bottom Ash
+ 34% Duck Creek "Pre-pumped" Gypsum

Dry Components: 500 grams **Water Added to Dry Components:** 137.5 grams
Percent Moisture (by weight): 27.5%

After thoroughly mixing at 0 min: wet, shiny, slurry, soft

5 min set time: dull appearance, becoming warm, imprintable with finger, water on surface during imprint, "silt like", starting to cement

10 min set time: dull, hard, very slightly imprintable, slightly warm

Dry Unit Weight: 95 pcf

Dry Components: 500 grams **Water Added to Dry Components:** 112.5 grams
Percent Moisture (by weight): 22.5%

After thoroughly mixing at 0 min: wet, shiny appearance, slurry to pudding texture

5 min set time: dull, hard, very slightly imprintable, slightly warm

10 min set time: not imprintable, dull, hard, slightly warm

Dry Unit Weight: 100 pcf

Ameren UE – CCP Ash Study Set-up Time and Dry Unit Weight

Dry Sample Components: **Testing Date:** 8/20/2010

46% Labadie Fly Ash + 20% Labadie Bottom Ash
+ 34% Duck Creek "Pre-pumped" Gypsum

Dry Components: 500 grams **Water Added to Dry Components:** 87.5 grams
Percent Moisture (by weight): 17.5%

After thoroughly mixing at 0 min: wetted powder, dull, wet clumps or balls, soft "bread like" texture, imprintable, trace dry material

5 min set time: slightly imprintable, slightly warm, cementing

10 min set time: not imprintable, hard, slightly warm, cemented

Dry Unit Weight: 79 pcf

Figure B-24
SCHEDULE CJG-ST1

Relative Density $= \frac{\gamma \text{max.} \; (\gamma \text{field} - \gamma \text{min.})}{\gamma \text{field} \; (\gamma \text{max.} - \gamma \text{min.})} \times 100$

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job Ameren UE - CCP Ash Study

Boring No. Labadie Blend

Depth 46% Fly + 20% Btm + 34% D.C. "dry" JJP.

Sample No.

Mold Vol. .0253 (cu. ft.) (Vm)

Mold End Area .05106 (sq. ft.) (Am)

Lab Test by JR Date 8/25/10

Computed by Date

Checked by Date

Mold No.

Mold Diam. (in)

Mold Wt. (lb.)

MINIMUM DENSITY						
Trial No.			27½		22½	
Weight	Tare + Soil Dry	W				
	Tare	W				
Lb.	Soil Dry	W s	500.0g	1.10231 #	500.0g	1.10231 #
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						
MAXIMUM DENSITY						
Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	3.2265		3.5065	
	~~Left Dial Reading~~	h l	3.2270		3.2435	
Inches	~~Right Dial Reading~~	h r	3.2165		3.1935	
	~~Sum~~	h l + h r	3.2130		3.5010	
	~~Average Dial Reading~~	h a		3.2208		3.3611
	Height Change	Δ h				
Volume	Mold Initial Volume	V m		.0253		.0253
cu. ft.	Volume Change *	Δ V		.01370		.01430
	Volume of Soil	V s		.01160		.0110
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			95.03		100.21	

$$* \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

$$\text{Relative Density} = \frac{\gamma\,\text{max.}\ (\gamma\,\text{field} - \gamma\,\text{min.})}{\gamma\,\text{field}\ (\gamma\,\text{max.} - \gamma\,\text{min.})} \times 100$$

Job ______________________

Boring No. ______________________

Depth ______________________

Sample No. ______________________

Mold Vol. ____________(cu. ft.) (Vm)

Mold End Area ____________(sq. ft.) (Am)

Lab Test by ________ Date ____

Computed by ________ Date ____

Checked by ________ Date ____

Mold No. ______________________

Mold Diam. ____________(in)

Mold Wt. ____________(lb.)

MINIMUM DENSITY

Trial No.			17½%			
Weight	Tare + Soil Dry	W				
	Tare	W				
Lb.	Soil Dry	W s	300.0	1.10231 #		
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						

MAXIMUM DENSITY

Method Used						
Trial No.						
Height Inches	~~Initial Dial Reading~~	h o	2.6010			
	~~Left Dial Reading~~	h l	2.6770			
	~~Right Dial Reading~~	h r	2.7265			
	~~Sum~~	h l + h r	2.6530			
	~~Average Dial Reading~~	h a		2.6644		
	Height Change	Δ h				
Volume cu. ft.	Mold Initial Volume	V m		10253		
	Volume Change *	Δ V		.01134		
	Volume of Soil	V s		.01396		
Weight Lb.	Tare + Soil Dry	W				
	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			78.96			

$$^{*}\ \Delta V = \frac{\Delta h \times A\,m}{12}$$

Sample Description & Remarks ______________________

Set-up / Unit wt.

/ JJP
8/20/10

Ameren UE - CCP Fly Ash Study
Labadie Blend

500g soil
46% Fly 2/2/09 collect
20% Btm 2/2/09 "
34% D.C. "Dry" Gypsum 6/10-7/10 collect

27½% ⇒ 137.5
9:33 = 0 min ⇒ Wet, Shiney, Slurry, Soft,
9:38 = 5 min ⇒ dull appearance, becoming warm imprintable w/ finger, water@surface during imprint, (silt like), cementing
9:43 = 10 min ⇒ hard, very slightly imprintable dull, slightly warm

22½% ⇒ 112.5
9:46 = 0 min ⇒ Wet, Shiney surface, pudding texture
9:51 5 min ⇒ dull, hard, very slight imprint, Slightly warm
9:56 10 min ⇒ Same, non-imprintable

17½% ⇒ 87.5
10:12 0 min ⇒ wetted powder, dull, wet clumps or balls, ~~soft powder~~ soft bread like texture, imprintable, trace dry particles
10:17 5 min ⇒ Slightly imprintable, rest Same slightly warm

10:22 10 min ⇒ non-imprintable, rest Same

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Project: Ameren UE – CCP Ash Study Date: 08/25/2010
R&J Personnel: James R. David / Jason J. Pruett R&J No.: 2008012455

Ameren UE – CCP Ash Study Set-up Time and Dry Unit Weight

Dry Sample Components: **Testing Date:** 8/19/2010

30% Labadie Fly Ash + 25% Labadie Bottom Ash
+ 45% Duck Creek "Pre-pumped" Gypsum

Dry Components: 500 grams **Water Added to Dry Components:** 137.5 grams
Percent Moisture (by weight): 27.5%

After thoroughly mixing at 0 min: wet, shiny, slurry, soft

5 min set time: dull, tacky surface, imprintable, moisture to surface during imprint, "silt like"

10 min set time: dull, cemented, not imprintable,

Dry Unit Weight: 95 pcf

Dry Components: 500 grams **Water Added to Dry Components:** 112.5 grams
Percent Moisture (by weight): 22.5%

After thoroughly mixing at 0 min: wet, satin appearance, paste

5 min set time: slightly warm, slightly imprintable, dull, stiff to firm

10 min set time: dull, hard, not imprintable, cemented, slightly warm

Dry Unit Weight: 94 pcf

Ameren UE – CCP Ash Study Set-up Time and Dry Unit Weight

Dry Sample Components: **Testing Date:** 8/19/2010

30% Labadie Fly Ash + 25% Labadie Bottom Ash
+ 45% Duck Creek "Pre-pumped" Gypsum

Dry Components: 500 grams **Water Added to Dry Components:** 87.5 grams
Percent Moisture (by weight): 17.5%

After thoroughly mixing at 0 min: wet powder, small clumps, dull, imprintable, slightly warm, lightly tamped flat

5 min set time: firm, slightly imprintable, slightly warm, dull in appearance

10 min set time: not imprintable, dull, cemented, slightly warm

Dry Unit Weight: 93 pcf

Figure B-25

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job Ameren UE - CCP Ash Study

Boring No. Labadie Blend

Depth 30% Fly + 25% Btm + 45% D.C "Dry" Gyp.

Sample No.

Mold Vol. .0253 (cu. ft.) (Vm)

Mold End Area .05106 (sq. ft.) (Am)

Lab Test by JR Date 8/25/10

Computed by ______ Date ___

Checked by ______ Date ___

Mold No. ______

Mold Diam. ______ (in)

Mold Wt. ______ (lb.)

MINIMUM DENSITY						
Trial No.			27½ %		22½%	
Weight	Tare + Soil Dry	W				
	Tare	W				
Lb.	Soil Dry	W s	500.0g	1.10231 #	500.0g	1.10231
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						
MAXIMUM DENSITY						
Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	3.2495		3.1545	
Inches	~~Left Dial Reading~~	h l	3.2130		3.1405	
	~~Right Dial Reading~~	h r	3.1620		3.1460	
	~~Sum~~	h l + h r	3.2165		3.2775	
	~~Average Dial Reading~~	h a		3.21025		3.1796
	Height Change	Δ h				
Volume	Mold Initial Volume	V m		.0253		.0253
cu. ft.	Volume Change *	Δ V		.01366		.01353
	Volume of Soil	V s		.01164		.01177
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			94.70		93.65	

$$* \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks

$$\text{Relative Density} = \frac{\gamma max. (\gamma field - \gamma min.)}{\gamma field (\gamma max. - \gamma min.)} \times 100$$

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$$\text{Relative Density} = \frac{\gamma\,\text{max.}\ (\gamma\,\text{field} - \gamma\,\text{min.})}{\gamma\,\text{field}\ (\gamma\,\text{max.} - \gamma\,\text{min.})} \times 100$$

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job ______________________

Boring No. ______________________

Depth ______________________

Sample No. ______________________

Mold Vol. ______________(cu. ft.) (Vm)

Mold End Area ______________(sq. ft.) (Am)

Lab Test by ________ Date ____

Computed by ________ Date ____

Checked by ________ Date ____

Mold No. ______________

Mold Diam. ______________(in)

Mold Wt. ______________(lb.)

MINIMUM DENSITY						
Trial No.			17.12%			
Weight	Tare + Soil Dry	W				
	Tare	W	g			
Lb.	Soil Dry	W s	500.0g	1.10231		
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						
	MAXIMUM DENSITY					
Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	3.0850			
Inches	~~Left Dial Reading~~	h l	3.1735			
	~~Right Dial Reading~~	h r	3.1980			
	~~Sum~~	h l + h r	3.1370			
	~~Average Dial Reading~~	h a		3.14838		
	Height Change	Δ h				
Volume	Mold Initial Volume	V m		.0253		
cu. ft.	Volume Change *	Δ V		.013396		
	Volume of Soil	V s		.01190		
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			92.63			

$$* \Delta V = \frac{\Delta h \times A\,m}{12}$$

Sample Description & Remarks ____

____

____

____

____

Figure B-25

SCHEDULE CJG-ST1

Set-Time / Unit wt

JRD + JJP
8/19/10

Ameren UE - CCP Ash Study

500g

Labadie Blend
30% Fly 2/2/09 collect
25% Btm " "
45% O.C. "Dry" Gyp. 6/10-7/10 collect

27½% ⇒ 3:35 0 min = wet, shiney, slurry,
137.5g. H_2O
3:40 5 min = dull, tacky surface, imprintable
moisture to surface during imprint
3:45 10 min = cemented, non-imprint, dull

22½% ⇒ 3:50 0 min = wet, satin appearance,
112.5g H_2O
paste,
3:55 5 min = slightly warm, slight imprint,
dull, firm to stiff
4:00 10 min = non-imprint, dull, hard
cemented, slightly warm

17½% ⇒ 4:05 0 min = wet powder, small clumps, dull
87.5g H_2O
imprintable, slightly warm

4:10 5 min = same, firm, slightly imprint

4:15 10 min = non-imprint, dull, cemented,
slightly warm

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Project: Ameren UE – CCP Ash Study Date: 08/25/2010
R&J Personnel: James R. David / Jason J. Pruett R&J No.: 2008012455

Ameren UE – CCP Ash Study Set-up Time and Dry Unit Weight

Dry Sample Components: **Testing Date:** 8/19/2010

36% Labadie Fly Ash
+ 64% Duck Creek "Pre-pumped" Gypsum

Dry Components: 500 grams **Water Added to Dry Components:** 200 grams
Percent Moisture (by weight): 40%

After thoroughly mixing at 0 min: wet, shiny, liquid to thin slurry, warm

5 min set time: dull appearance, warm, very slightly imprintable

10 min set time: same as above

18 min set time: no longer imprintable, hard, warm

Dry Unit Weight: 82 pcf

Dry Components: 500 grams **Water Added to Dry Components:** 175 grams
Percent Moisture (by weight): 35%

After thoroughly mixing at 0 min: wet, shiny appearance, slurry, warm

5 min set time: dull, very slightly imprintable, warm

10 min set time: dull, not imprintable, hard, cemented, warm

Dry Unit Weight: 89 pcf

Ameren UE – CCP Ash Study Set-up Time and Dry Unit Weight

Dry Sample Components: **Testing Date:** 8/19/2010

36% Labadie Fly Ash
+ 64% Duck Creek "Pre-pumped" Gypsum

Dry Components: 500 grams **Water Added to Dry Components:** 150 grams
Percent Moisture (by weight): 30%

After thoroughly mixing at 0 min: moist powder, large clumps, warm, easily imprinted, trace dry material

5 min set time: slightly imprintable, dull, warm, clumpy appearance

10 min set time: not imprintable, dull, warm, hard

Dry Unit Weight: 72 pcf

Figure B-26

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job Ameren UE - CCP Ash Study

Boring No. Labadie Blend

Depth 36% Fly + 64% O.C. "Dry" Gyp

Sample No. ____

Mold Vol. .0253 (cu. ft.) (Vm)

Mold End Area .05106 (sq. ft.) (Am)

Lab Test by JRL Date 8/25/10

Computed by ____ Date ____

Checked by ____ Date ____

Mold No. ____

Mold Diam. ____ (in)

Mold Wt. ____ (lb.)

Relative Density $= \frac{\gamma \text{max.} \ (\gamma \text{field} - \gamma \text{min.})}{\gamma \text{field} \ (\gamma \text{max.} - \gamma \text{min.})} \times 100$

MINIMUM DENSITY

Trial No.			40%		35%	
Weight	Tare + Soil Dry	W				
	Tare	W				
Lb.	Soil Dry	W s	500.0g	1.10231#	500.0g	1.10231#
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						

MAXIMUM DENSITY

Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	2.7410		3.0420	
	~~Left Dial Reading~~	h l	2.7410		3.0610	
Inches	~~Right Dial Reading~~	h r	2.8010		3.0085	
	~~Sum~~	h l + h r	2.8290		3.0000	
	~~Average Dial Reading~~	h a		2.7780		3.0279
	Height Change	Δ h				
Volume	Mold Initial Volume	V m		.0253		.0253
cu. ft.	Volume Change *	Δ V		.01182		.01288
	Volume of Soil	V s		.01348		.01242
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			81.77		88.75	

$$^{*}\Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks ____

Reitz & Jens, Inc.

RELATIVE DENSITY TEST

(Minimum & Maximum Density Determinations)

Job ____________________
Boring No. ____________________
Depth ____________________
Sample No. ____________________
Mold Vol. ____________(cu. ft.) (Vm)
Mold End Area ____________(sq. ft.) (Am)

Lab Test by ______ Date ____
Computed by ______ Date ____
Checked by ______ Date ____
Mold No. ____________
Mold Diam. ____________(in)
Mold Wt. ____________(lb.)

$$\text{Relative Density} = \frac{\gamma \max. \ (\gamma \text{ field} - \gamma \min.)}{\gamma \text{ field} \ (\gamma \max. - \gamma \min.)} \times 100$$

MINIMUM DENSITY						
Trial No.			30%			
Weight	Tare + Soil Dry	W				
	Tare	W				
Lb.	Soil Dry	W s	500.0g	1.10231 *		
Min. Dry Density pcf.		γ d				
Min. Dry Density Average pcf						
MAXIMUM DENSITY						
Method Used						
Trial No.						
Height	~~Initial Dial Reading~~	h o	2.2980			
	~~Left Dial Reading~~	h l	2.3470			
Inches	~~Right Dial Reading~~	h r	2.5120			
	~~Sum~~	h l + h r	2.3530			
	~~Average Dial~~ Reading	h a		2.3675		
	Height Change	Δ h				
Volume	Mold Initial Volume	V m		.0253		
cu. ft.	Volume Change *	Δ V		.01007		
	Volume of Soil	V s		.01523		
Weight	Tare + Soil Dry	W				
Lb.	Tare	W m				
	Soil Dry	W s				
Max. Dry Density pcf.		γ d				
Max. Dry Density Average pcf.			72.38			

$$* \Delta V = \frac{\Delta h \times A m}{12}$$

Sample Description & Remarks ______________________________

500g sample

Set time / unit wt.

Labadie Plant

36% Fly collect 2/2/10

+ 64% O.C. "dry" gypsum collect 6/10-7/10

JRC / JJP
8/19/10

2:52 40% M ⇒ 0 min = wet, Shiney, liquid, warm
200g H2O
2:57 5 min = dull, warm, very Slightly imprintable
3:02 10 min = Same
3:10 no longer imprintable, warm

3:08 35% M ⇒ 0 = wet, Shiney, Slurry, warm
175g H2O
3:13 5 min = dull, v. Slight imprint, warm
3:18 10 min = dull, cemented, non-imprint, warm

3:20 30% ⇒ 0 = mixture has large clumps, warm, easily imprinted by hand, not evenly mixed, dry pockets (speed to high for a while)
150g H2O
3:25 5 min = Slightly imprintable, dull, warm, clumpy appearance
3:30 10 min = no longer imprintable, same

SCHEDULE CJG-ST1

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Appendix C

RESULTS OF SEISMIC RISK ANALYSES
Revised November 2013

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APPENDIX C
SEISMIC ANALYSES
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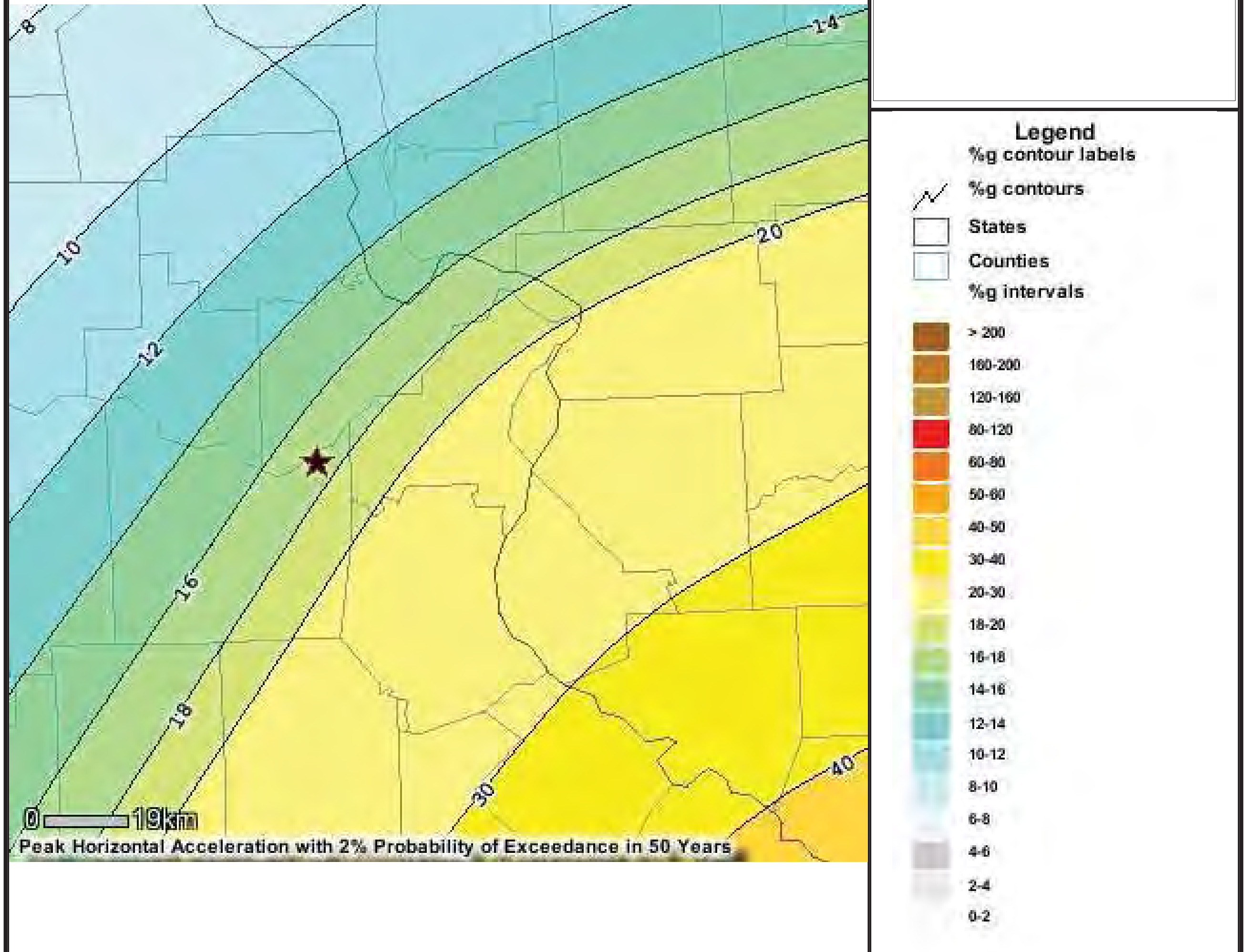
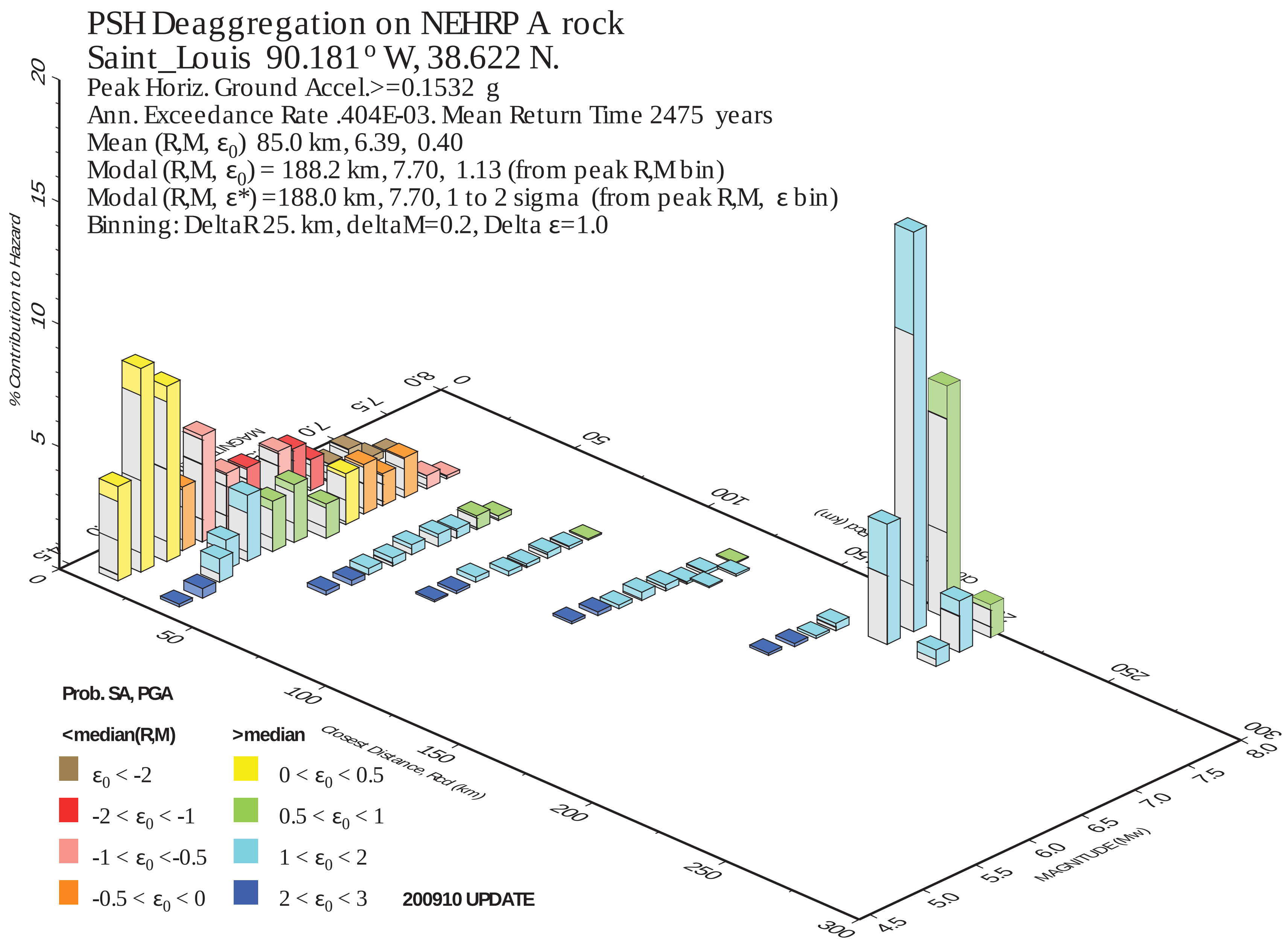
USGS Seismic Hazard Maps: Labadie, MO



Peak Horizontal Acceleration with 2% Probability of Exceedance in 50 Years

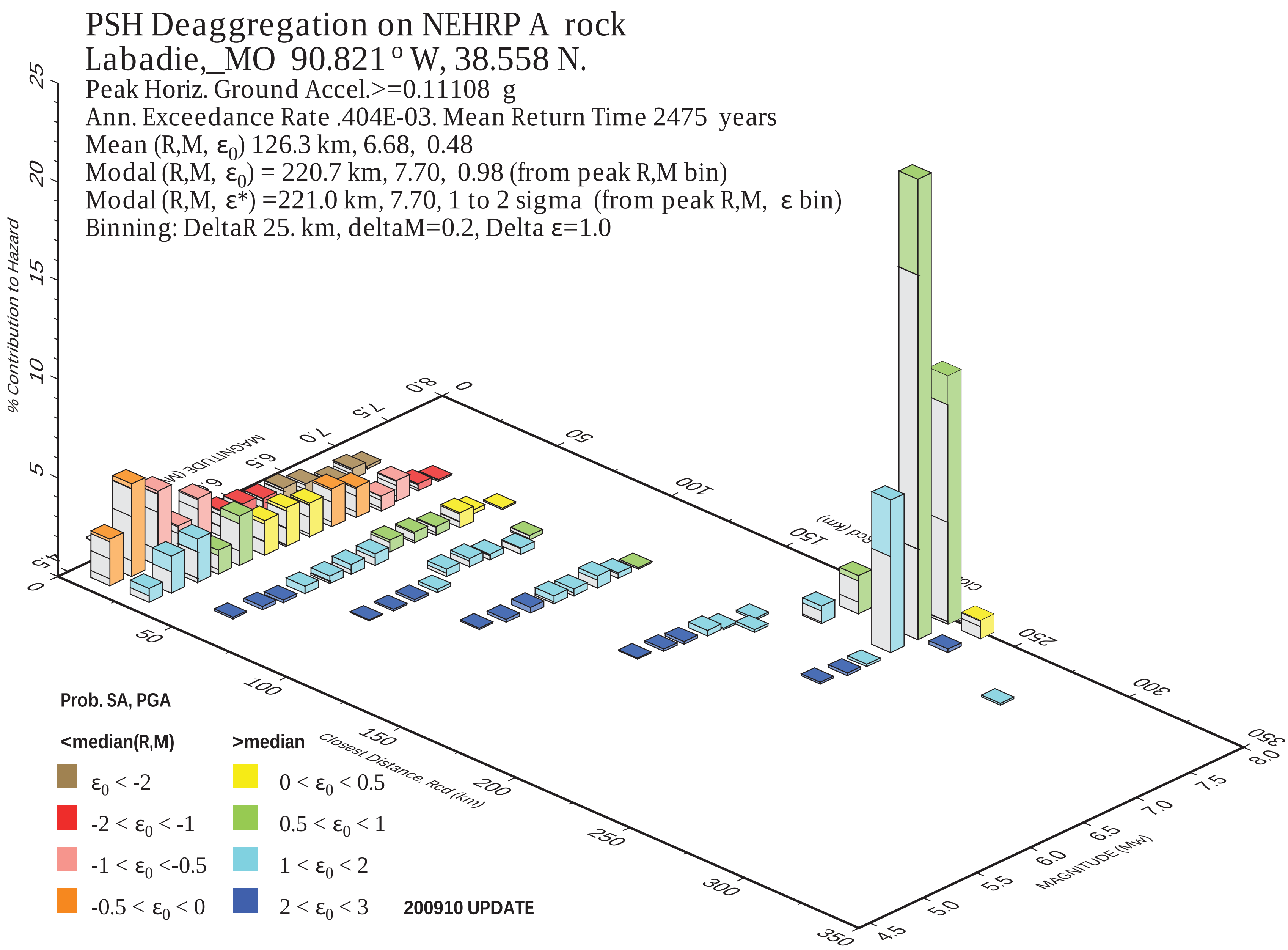
http://gldims.cr.usgs.gov/servlet/com.esri.esrimap.Esrimap?ServiceName=redirect&Form=Tr... 4/15/2011



PSH Deaggregation on NEHRP A rock
Saint_Louis 90.181 ° W, 38.622 N.
Peak Horiz. Ground Accel.>=0.1532 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 years
Mean (R,M, ε_0) 85.0 km, 6.39, 0.40
Modal (R,M, ε_0) = 188.2 km, 7.70, 1.13 (from peak R,M bin)
Modal (R,M, ε^*) =188.0 km, 7.70, 1 to 2 sigma (from peak R,M, ε bin)
Binning: DeltaR 25. km, deltaM=0.2, Delta ε=1.0

GMT 2011 Apr 26 17:21:12 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs=2000. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

Figure C-2



PSH Deaggregation on NEHRP A rock
Labadie,_MO 90.821 ° W, 38.558 N.
Peak Horiz. Ground Accel.>=0.11108 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 years
Mean (R,M, ε_0) 126.3 km, 6.68, 0.48
Modal (R,M, ε_0) = 220.7 km, 7.70, 0.98 (from peak R,M bin)
Modal (R,M, ε^*) =221.0 km, 7.70, 1 to 2 sigma (from peak R,M, ε bin)
Binning: DeltaR 25. km, deltaM=0.2, Delta ε=1.0

GMT 2011 Apr 26 19:04:54 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs=2000. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

Figure C-3

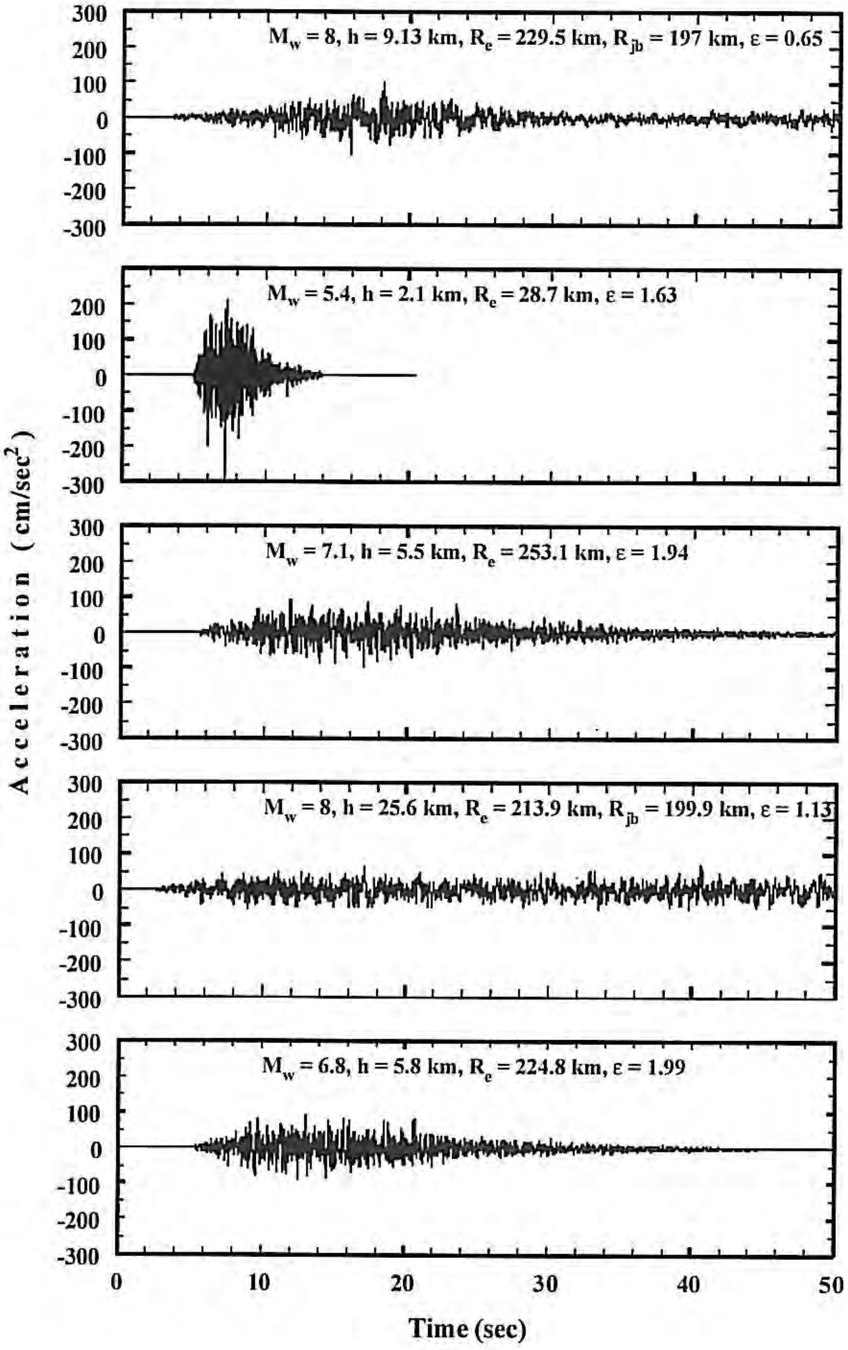


Figure 30. Suite of 2% in 50 years Ground Motions for Bedrock (Hard Rock), St. Louis, MO.

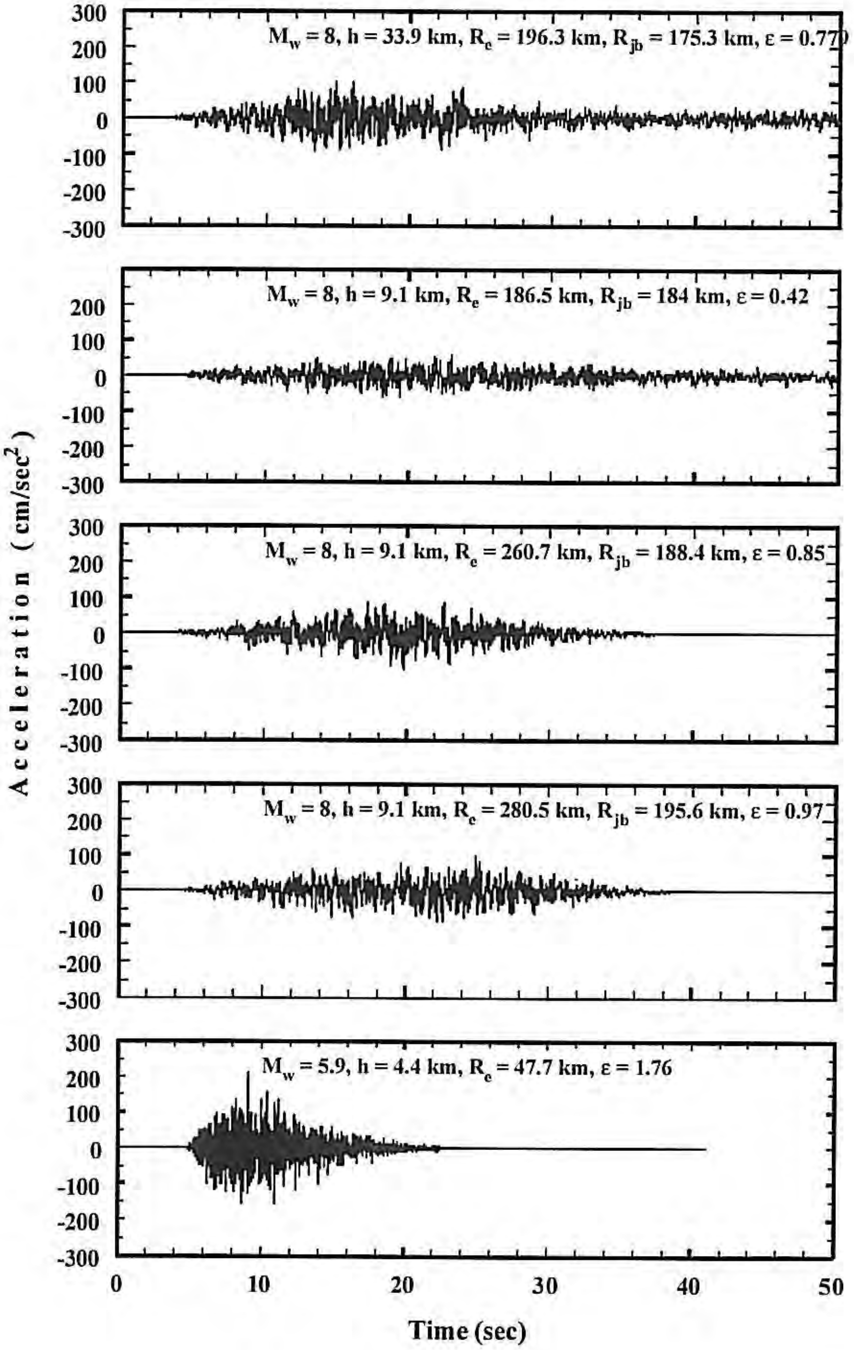


Figure 30 (continued).

Option 1 - Set No. 1 - Material No.: 1
G/Gmax - C3 (CLAY PI =20-40, Sun et al. 198)
Damping - Soil with PI=30, OCR=1-8 (Vucetic & Dobry, JGE 1/91)

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.002	1.7
2	.001	.999	2	.003	2.1
3	.00316	.98	3	.004	2.5
4	.01	.92	4	.005	2.6
5	.0316	.78	5	.006	2.9
6	.1	.532	6	.008	3.3
7	.316	.293	7	.01	3.7
8	1	.137	8	.02	5.05
9	3.16	.075	9	.03	5.7
10	10	.025	10	.04	6.4
			11	.05	6.9
			12	.06	7.3
			13	.08	8.1
			14	.1	8.7
			15	.2	10.8
			16	.3	12.3
			17	.4	13.3
			18	.5	14.1
			19	.7	15.6
			20	1	16.9

Option 1 - Set No. 1 - Material No.: 2
G/Gmax - SAND, Average (Seed & Idriss 1970)
Damping for SAND, February 1971

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.0001	1
2	.0003	.98	2	.001	1.6
3	.001	.95	3	.003	3.12
4	.003	.89	4	.01	5.8
5	.01	.73	5	.03	9.5
6	.03	.52	6	.1	15.4
7	.1	.29	7	.3	20.9
8	.3	.14	8	1	25
9	1	.06	9	10	30

Option 1 - Set No. 1 - Material No.: 3
G/Gmax - ROCK (Schnabel 1973)
Damping for ROCK (Schnabel 1973)

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.0001	.4
2	.0003	1	2	.001	.8
3	.001	.99	3	.01	1.5
4	.003	.95	4	.1	3
5	.01	.9	5	1	4.6
6	.03	.81			
7	.1	.725			
8	1	.55			

Option 2 - Set No. 1
Option 2 -Soil Profile B/C-100
Soil Deposit No.: 1 - Soil Profile No. 2

Layer	Soil Type	Thickness (ft)	Shear Modulus (ksf)	Damping	Unit Weight (kcf)	Shear Wave Velocity (fps)
Layer	Soil Type	Thickness	Shear Modulus	Damping	Unit Weight	Shear Wave Velocity
		(ft)	(ksf)		(kcf)	(fps)
1	1	2.5	257	.05	.118	
2	2	2.5	715	.05	.108	
3	2	5	896	.05	.122	
4	2	5	1044	.05	.122	
5	2	5	1150	.05	.122	
6	2	5	1331	.05	.122	
7	2	5	1786	.05	.122	
8	2	5	1711	.05	.122	
9	2	5	1659	.05	.122	
10	2	5	1805	.05	.122	
11	2	5	2198	.05	.122	
12	2	5	2576	.05	.122	
13	2	10	2477	.05	.122	
14	2	10	2414	.05	.122	
15	2	10	2804	.05	.122	
16	2	10	3085	.05	.122	
17	2	10	3439	.05	.122	
18	2	6	3378	.05	.122	
19	3			.02	.145	2500

Option 3 - Set No. 1
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 229.5
No. of acceleration values to be read for input motion: 15000
No. of values for use in Fourier Transform: 32768
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_01r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 3 - Set No. 2
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 5.4, h: 2.1 km, Re: 28.7
No. of acceleration values to be read for input motion: 2048
No. of values for use in Fourier Transform: 4096
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_02r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 3 - Set No. 3
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 7.1, h: 5.5 km, Re: 253.
No. of acceleration values to be read for input motion: 8192
No. of values for use in Fourier Transform: 16384
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_03r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25

```
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 4
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 25.6 km, Re: 213.9
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_04r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 5
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 6.8, h: 5.8 km, Re: 224.
 No. of acceleration values to be read for input motion: 8192
 No. of values for use in Fourier Transform:  16384
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_05r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 6
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 33.9 km, Re: 196.3
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_06r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 7
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 186.5
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_07r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 8
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 260.7
 No. of acceleration values to be read for input motion: 15000
```

No. of values for use in Fourier Transform: 32768
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_08r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 3 - Set No. 9
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 280.5
No. of acceleration values to be read for input motion: 15000
No. of values for use in Fourier Transform: 32768
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_09r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 3 - Set No. 10
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 5.9, h: 4.4 km, Re: 47.7
No. of acceleration values to be read for input motion: 4096
No. of values for use in Fourier Transform: 8192
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_10r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 4 - Set No. 1
Option 4 - Input Motion at Layer 19 - Outcrop
No. of sublayer at the top of which the object motion is assigned: 19
Object motion is assigned as outcrop motion.

Option 5 - Set No. 1
Option 5 - Number of Iterations & Strain Ratio Set No. 2
Strain-compatible soil properties are not saved after the final iteration.
Number of Iterations: 10
Ratio of equivalent uniform strain divided by maximum strain: .65

Option 6 - Set No. 1
Option 6 - Soil Profile No. 2 - Layers 1 to 15

Layer	Type	Maximum Acceleration	Time History of Acceleration
1	Outcrop	x	x
2	Within	x	
3	Within	x	
4	Within	x	
5	Within	x	
6	Within	x	

Layer	Type	Maximum Acceleration	Time History of Acceleration
7	Within	x	
8	Within	x	
9	Within	x	
10	Within	x	
11	Within	x	
12	Within	x	
13	Within	x	
14	Within	x	
15	Within	x	

Option 6 - Set No. 2
Option 6 - Soil Profile No. 2 - Layers 16 to 19

Layer	Type	Maximum Acceleration	Time History of Acceleration
16	Within	x	
17	Within	x	
18	Within	x	
19	Within	x	x

Option 1 - Set No. 1 - Material No.: 1
G/Gmax - C3 (CLAY PI =20-40, Sun et al. 198)
Damping - Soil with PI=30, OCR=1-8 (Vucetic & Dobry, JGE 1/91)

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.002	1.7
2	.001	.999	2	.003	2.1
3	.00316	.98	3	.004	2.5
4	.01	.92	4	.005	2.6
5	.0316	.78	5	.006	2.9
6	.1	.532	6	.008	3.3
7	.316	.293	7	.01	3.7
8	1	.137	8	.02	5.05
9	3.16	.075	9	.03	5.7
10	10	.025	10	.04	6.4
			11	.05	6.9
			12	.06	7.3
			13	.08	8.1
			14	.1	8.7
			15	.2	10.8
			16	.3	12.3
			17	.4	13.3
			18	.5	14.1
			19	.7	15.6
			20	1	16.9

Option 1 - Set No. 1 - Material No.: 2
G/Gmax - SAND, Average (Seed & Idriss 1970)
Damping for SAND, February 1971

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.0001	1
2	.0003	.98	2	.001	1.6
3	.001	.95	3	.003	3.12
4	.003	.89	4	.01	5.8
5	.01	.73	5	.03	9.5
6	.03	.52	6	.1	15.4
7	.1	.29	7	.3	20.9
8	.3	.14	8	1	25
9	1	.06	9	10	30

Option 1 - Set No. 1 - Material No.: 3
G/Gmax - ROCK (Schnabel 1973)
Damping for ROCK (Schnabel 1973)

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.0001	.4
2	.0003	1	2	.001	.8
3	.001	.99	3	.01	1.5
4	.003	.95	4	.1	3
5	.01	.9	5	1	4.6
6	.03	.81			
7	.1	.725			
8	1	.55			

Option 2 - Set No. 1
Option 2 -Soil Profile B/C-100 w Ash
Soil Deposit No.: 1 - Soil Profile No. 2

Layer	Soil Type	Thickness (ft)	Shear Modulus (ksf)	Damping	Unit Weight (kcf)	Shear Wave Velocity (fps)
Layer	Soil Type	Thickness	Shear Modulus	Damping	Unit Weight	Shear Wave Velocity
		(ft)	(ksf)		(kcf)	(fps)
1	2	10	827	.05	.09	
2	2	10	1170	.05	.09	
3	2	10	1433	.05	.09	
4	2	10	1655	.05	.09	
5	2	10	1850	.05	.09	
6	2	10	2027	.05	.09	
7	2	10	2189	.05	.09	
8	2	10	2341	.05	.09	
9	2	10	2483	.05	.09	
10	2	10	2617	.05	.09	
11	1	2.5	257	.05	.118	
12	2	2.5	715	.05	.108	
13	2	5	896	.05	.122	
14	2	5	1044	.05	.122	
15	2	5	1150	.05	.122	
16	2	5	1331	.05	.122	
17	2	5	1786	.05	.122	
18	2	5	1711	.05	.122	
19	2	5	1659	.05	.122	
20	2	5	1805	.05	.122	
21	2	5	2198	.05	.122	
22	2	5	2576	.05	.122	
23	2	10	2477	.05	.122	
24	2	10	2414	.05	.122	
25	2	10	2804	.05	.122	
26	2	10	3085	.05	.122	
27	2	10	3439	.05	.122	
28	2	6	3378	.05	.122	
29	3			.02	.145	2500

Option 3 - Set No. 1
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 229.5
No. of acceleration values to be read for input motion: 15000
No. of values for use in Fourier Transform: 32768
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_01r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 3 - Set No. 2
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 5.4, h: 2.1 km, Re: 28.7
No. of acceleration values to be read for input motion: 2048
No. of values for use in Fourier Transform: 4096
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_02r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

```
Option 3 - Set No. 3
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 7.1, h: 5.5 km, Re: 253.
 No. of acceleration values to be read for input motion: 8192
 No. of values for use in Fourier Transform:  16384
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_03r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 4
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 25.6 km, Re: 213.9
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_04r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 5
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 6.8, h: 5.8 km, Re: 224.
 No. of acceleration values to be read for input motion: 8192
 No. of values for use in Fourier Transform:  16384
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_05r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 6
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 33.9 km, Re: 196.3
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_06r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 7
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 186.5
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_07r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
```

Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 3 - Set No. 8
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 260.7
No. of acceleration values to be read for input motion: 15000
No. of values for use in Fourier Transform: 32768
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_08r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 3 - Set No. 9
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 280.5
No. of acceleration values to be read for input motion: 15000
No. of values for use in Fourier Transform: 32768
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_09r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 3 - Set No. 10
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 5.9, h: 4.4 km, Re: 47.7
No. of acceleration values to be read for input motion: 4096
No. of values for use in Fourier Transform: 8192
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_10r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 4 - Set No. 1
Option 4 - Input Motion at Layer 29 - Outcrop
No. of sublayer at the top of which the object motion is assigned: 29
Object motion is assigned as outcrop motion.

Option 5 - Set No. 1
Option 5 - Number of Iterations & Strain Ratio Set No. 2
Strain-compatible soil properties are not saved after the final iteration.
Number of Iterations: 10
Ratio of equivalent uniform strain divided by maximum strain: .65

Option 6 - Set No. 1

Option 6 - Soil Profile No. 2 - Layers 1 to 15

Layer	Type	Maximum Acceleration	Time History of Acceleration
1	Outcrop	x	x
2	Within	x	
3	Within	x	
4	Within	x	
5	Within	x	
6	Within	x	
7	Within	x	
8	Within	x	
9	Within	x	
10	Within	x	
11	Within	x	x
12	Within	x	
13	Within	x	
14	Within	x	
15	Within	x	

Option 6 - Set No. 2
Option 6 - Soil Profile No. 2 - Layers 16 to 29

Layer	Type	Maximum Acceleration	Time History of Acceleration
16	Within	x	
17	Within	x	
18	Within	x	
19	Within	x	
20	Within	x	
21	Within	x	
22	Within	x	
23	Within	x	
24	Within	x	
25	Within	x	
26	Within	x	
27	Within	x	
28	Within	x	
29	Within	x	

Option 1 - Set No. 1 - Material No.: 1
G/Gmax - C3 (CLAY PI =20-40, Sun et al. 198)
Damping - Soil with PI=30, OCR=1-8 (Vucetic & Dobry, JGE 1/91)

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.002	1.7
2	.001	.999	2	.003	2.1
3	.00316	.98	3	.004	2.5
4	.01	.92	4	.005	2.6
5	.0316	.78	5	.006	2.9
6	.1	.532	6	.008	3.3
7	.316	.293	7	.01	3.7
8	1	.137	8	.02	5.05
9	3.16	.075	9	.03	5.7
10	10	.025	10	.04	6.4
			11	.05	6.9
			12	.06	7.3
			13	.08	8.1
			14	.1	8.7
			15	.2	10.8
			16	.3	12.3
			17	.4	13.3
			18	.5	14.1
			19	.7	15.6
			20	1	16.9

Option 1 - Set No. 1 - Material No.: 2
G/Gmax - SAND, Average (Seed & Idriss 1970)
Damping for SAND, February 1971

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.0001	1
2	.0003	.98	2	.001	1.6
3	.001	.95	3	.003	3.12
4	.003	.89	4	.01	5.8
5	.01	.73	5	.03	9.5
6	.03	.52	6	.1	15.4
7	.1	.29	7	.3	20.9
8	.3	.14	8	1	25
9	1	.06	9	10	30

Option 1 - Set No. 1 - Material No.: 3
G/Gmax - ROCK (Schnabel 1973)
Damping for ROCK (Schnabel 1973)

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
1	.0001	1	1	.0001	.4
2	.0003	1	2	.001	.8
3	.001	.99	3	.01	1.5
4	.003	.95	4	.1	3
5	.01	.9	5	1	4.6
6	.03	.81			
7	.1	.725			
8	1	.55			

Option 1 - Set No. 1 - Material No.: 4
G/Gmax - C2 (CLAY PI =10-20, Sun et al. 198)
Damping - Soil with PI=15, OCR=1-8 (Vucetic & Dobry, JGE 1/91)

Point No.	Shear Strain (%)	G/Gmax	Point No.	Shear Strain (%)	Damping Ratio (%)
Point No.	Shear Strain	G/Gmax	Point No.	Shear Strain	Damping Ratio
	(%)			(%)	(%)
1	.0001	1	1	.003	2.5
2	.001	.997	2	.004	2.8
3	.00316	.974	3	.005	3.2
4	.01	.881	4	.006	3.5
5	.0316	.674	5	.008	4.1
6	.1	.425	6	.01	4.5
7	.316	.22	7	.02	6.4
8	1	.076	8	.03	7.6
9	3.16	.03	9	.04	8.4
10	10	.01	10	.05	9.2
			11	.07	10.3
			12	.1	11.5
			13	.2	14.3
			14	.3	15.9
			15	.4	17
			16	.5	17.6
			17	.6	18.3
			18	.7	18.8
			19	.8	19.3
			20	1	19.9

Option 2 - Set No. 1
Option 2 -Soil Profile B/C-100 w 24ft berm
Soil Deposit No.: 1 - Soil Profile No. 2

Layer	Soil Type	Thickness (ft)	Shear Modulus (ksf)	Damping	Unit Weight (kcf)	Shear Wave Velocity (fps)
1	4	1.5	2000	.05	.12	
2	4	2.5	2000	.05	.12	
3	4	2.5	2000	.05	.12	
4	4	2.5	2000	.05	.12	
5	4	2.5	2000	.05	.12	
6	4	2.5	2000	.05	.12	
7	4	2.5	2000	.05	.12	
8	4	2.5	2000	.05	.12	
9	4	2.5	2000	.05	.12	
10	4	2.5	2000	.05	.12	
11	1	2.5	257	.05	.118	
12	2	2.5	715	.05	.108	
13	2	5	896	.05	.122	
14	2	5	1044	.05	.122	
15	2	5	1150	.05	.122	
16	2	5	1331	.05	.122	
17	2	5	1786	.05	.122	
18	2	5	1711	.05	.122	
19	2	5	1659	.05	.122	
20	2	5	1805	.05	.122	
21	2	5	2198	.05	.122	
22	2	5	2576	.05	.122	
23	2	10	2477	.05	.122	
24	2	10	2414	.05	.122	
25	2	10	2804	.05	.122	
26	2	10	3085	.05	.122	
27	2	10	3439	.05	.122	
28	2	6	3378	.05	.122	
29	3			.02	.145	2500

Option 3 - Set No. 1

```
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 229.5
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_01r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 2
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 5.4, h: 2.1 km, Re: 28.7
 No. of acceleration values to be read for input motion: 2048
 No. of values for use in Fourier Transform:  4096
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_02r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 3
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 7.1, h: 5.5 km, Re: 253.
 No. of acceleration values to be read for input motion: 8192
 No. of values for use in Fourier Transform:  16384
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_03r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 4
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 25.6 km, Re: 213.9
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_04r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 5
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 6.8, h: 5.8 km, Re: 224.
 No. of acceleration values to be read for input motion: 8192
 No. of values for use in Fourier Transform:  16384
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_05r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
```

```
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 6
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 33.9 km, Re: 196.3
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_06r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 7
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 186.5
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_07r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 8
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 260.7
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_08r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 9
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 8, h: 9.1 km, Re: 280.5
 No. of acceleration values to be read for input motion: 15000
 No. of values for use in Fourier Transform:  32768
 Time interval between acceleration values (sec):  .01
 Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_09r.eq
 Format for reading acceleration values: (8F9.6)
 Multiplication factor for adjusting acceleration values:  1
 Maximum acceleration to be used (g's): -----
 Maximum frequency to be used in the analysis:  25
 Number of header lines in object motion file:  4
 Number of acceleration values per line in object motion file:  8



Option 3 - Set No. 10
Option 3 - St. Louis, MO; 2% in 50 years, Bedrock (Hard Rock); Mw: 5.9, h: 4.4 km, Re: 47.7
```

No. of acceleration values to be read for input motion: 4096
No. of values for use in Fourier Transform: 8192
Time interval between acceleration values (sec): .01
Name of file for input motion: c:\Program Files\GeoMotions\Quakes\SHAKE\Simulated\l02_10r.eq
Format for reading acceleration values: (8F9.6)
Multiplication factor for adjusting acceleration values: 1
Maximum acceleration to be used (g's): -----
Maximum frequency to be used in the analysis: 25
Number of header lines in object motion file: 4
Number of acceleration values per line in object motion file: 8

Option 4 - Set No. 1
Option 4 - Input Motion at Layer 29 - Outcrop
No. of sublayer at the top of which the object motion is assigned: 29
Object motion is assigned as outcrop motion.

Option 5 - Set No. 1
Option 5 - Number of Iterations & Strain Ratio Set No. 2
Strain-compatible soil properties are not saved after the final iteration.
Number of Iterations: 10
Ratio of equivalent uniform strain divided by maximum strain: .65

Option 6 - Set No. 1
Option 6 - Soil Profile No. 2 - Layers 1 to 15

Layer	Type	Maximum Acceleration	Time History of Acceleration
1	Outcrop	x	
2	Within	x	
3	Within	x	
4	Within	x	
5	Within	x	
6	Within	x	
7	Within	x	
8	Within	x	
9	Within	x	
10	Within	x	
11	Within	x	
12	Within	x	
13	Within	x	
14	Within	x	
15	Within	x	

Option 6 - Set No. 2
Option 6 - Soil Profile No. 2 - Layers 16 to 29

Layer	Type	Maximum Acceleration	Time History of Acceleration
16	Within	x	
17	Within	x	
18	Within	x	
19	Within	x	
20	Within	x	
21	Within	x	
22	Within	x	
23	Within	x	
24	Within	x	
25	Within	x	
26	Within	x	
27	Within	x	

Layer	Type	Maximum Acceleration	Time History of Acceleration
28	Within	x	
29	Within	x	

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_01R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	2.9	243.5	.00906	22.06	257.7724	0	.14737	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	5.2	547.4	.01177	64.42	403.988	2.5	.14498	Sand Avg.	Sand	Within
3	7.5	.122	6.9	596.4	.02154	128.48	396.7499	5	.14138	Sand Avg.	Sand	Within
4	12.5	.122	8.6	598.3	.03497	209.2	397.3814	10	.12519	Sand Avg.	Sand	Within
5	17.5	.122	9.4	601.6	.04541	273.19	398.4758	15	.10383	Sand Avg.	Sand	Within
6	22.5	.122	9.4	696.7	.04533	315.83	428.8159	20	.11127	Sand Avg.	Sand	Within
7	27.5	.122	8.4	1038.2	.03349	347.73	523.4661	25	.12279	Sand Avg.	Sand	Within
8	32.5	.122	9.2	915.6	.04264	390.44	491.5876	30	.12384	Sand Avg.	Sand	Within
9	37.5	.122	10.4	805	.05537	445.74	460.9417	35	.1215	Sand Avg.	Sand	Within
10	42.5	.122	10.7	854.1	.05898	503.74	474.7909	40	.11608	Sand Avg.	Sand	Within
11	47.5	.122	9.9	1106.6	.05033	556.97	540.4349	45	.10903	Sand Avg.	Sand	Within
12	52.5	.122	9.4	1357.4	.04451	604.14	598.5521	50	.109	Sand Avg.	Sand	Within
13	60	.122	10.4	1202.3	.05532	665.13	563.3191	55	.11236	Sand Avg.	Sand	Within
14	70	.122	11.4	1072.1	.06868	736.28	531.9437	65	.11131	Sand Avg.	Sand	Within
15	80	.122	11	1298.1	.06222	807.69	585.3318	75	.1056	Sand Avg.	Sand	Within
16	90	.122	10.7	1459.7	.05897	860.8	620.6973	85	.0944	Sand Avg.	Sand	Within
17	100	.122	10.1	1708.6	.0521	890.18	671.5344	95	.08462	Sand Avg.	Sand	Within
18	108	.122	10.3	1652.5	.05423	896.08	660.4178	105	.08484	Sand Avg.	Sand	Within
19	Base							111	.08729			Within

Notes:
Period for Soil Column: .84 sec
Average Shear Wave Velocity for Soil Column: 531 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_10R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	3.2	240.4	.01145	27.53	256.1263	0	.18732	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	5.5	534.9	.01342	71.81	399.3488	2.5	.14461	Sand Avg.	Sand	Within
3	7.5	.122	6.5	619.7	.0188	116.53	404.4257	5	.11592	Sand Avg.	Sand	Within
4	12.5	.122	7.1	686.5	.02247	154.27	425.6653	10	.11421	Sand Avg.	Sand	Within
5	17.5	.122	7.7	714.9	.02712	193.87	434.3809	15	.1151	Sand Avg.	Sand	Within
6	22.5	.122	7.8	819.8	.02794	229.06	465.1596	20	.10994	Sand Avg.	Sand	Within
7	27.5	.122	6.9	1188.1	.02159	256.5	559.9826	25	.11351	Sand Avg.	Sand	Within
8	32.5	.122	7.7	1068.4	.02672	285.52	531.025	30	.1199	Sand Avg.	Sand	Within
9	37.5	.122	8.299999	971	.0328	318.5	506.2414	35	.11349	Sand Avg.	Sand	Within
10	42.5	.122	8.299999	1064.9	.032	340.82	530.1545	40	.11594	Sand Avg.	Sand	Within
11	47.5	.122	7.6	1382.7	.02609	360.69	604.1044	45	.12018	Sand Avg.	Sand	Within
12	52.5	.122	7.1	1684.5	.02291	385.84	666.7815	50	.12776	Sand Avg.	Sand	Within
13	60	.122	7.8	1527.4	.02784	425.24	634.9279	55	.12436	Sand Avg.	Sand	Within
14	70	.122	8.1	1441.7	.03081	444.24	616.8584	65	.11424	Sand Avg.	Sand	Within
15	80	.122	7.900001	1717.6	.02844	488.48	673.3007	75	.1481	Sand Avg.	Sand	Within
16	90	.122	7.8	1897.8	.02806	532.42	707.7392	85	.16744	Sand Avg.	Sand	Within
17	100	.122	7.6	2153.3	.02649	570.36	753.8766	95	.17134	Sand Avg.	Sand	Within
18	108	.122	7.900001	2062.1	.02876	592.96	737.7393	105	.14743	Sand Avg.	Sand	Within
19	Base							111	.17222			Within

Notes:
Period for Soil Column: .75 sec
Average Shear Wave Velocity for Soil Column: 591 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_02R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	3.6	237.1	.01468	34.8	254.3623	0	.23831	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	6.2	504.7	.01745	88.06	387.9116	2.5	.18558	Sand Avg.	Sand	Within
3	7.5	.122	7.3	579.7	.02375	137.7	391.1557	5	.14486	Sand Avg.	Sand	Within
4	12.5	.122	7.7	649.2	.02709	175.88	413.9399	10	.12216	Sand Avg.	Sand	Within
5	17.5	.122	8.4	670.8	.03314	222.3	420.7698	15	.10335	Sand Avg.	Sand	Within
6	22.5	.122	8.4	777.2	.03303	256.72	452.9126	20	.13607	Sand Avg.	Sand	Within
7	27.5	.122	7.6	1117.2	.02657	296.83	543.0171	25	.12979	Sand Avg.	Sand	Within
8	32.5	.122	8.7	967.7	.03636	351.85	505.3804	30	.12849	Sand Avg.	Sand	Within
9	37.5	.122	9.3	881.6	.04348	383.33	482.3739	35	.11804	Sand Avg.	Sand	Within
10	42.5	.122	9.5	938.4	.04618	433.4	497.6707	40	.13242	Sand Avg.	Sand	Within
11	47.5	.122	8.900001	1217.1	.03869	470.88	566.7756	45	.16872	Sand Avg.	Sand	Within
12	52.5	.122	8.4	1506.1	.03291	495.6	630.4852	50	.18004	Sand Avg.	Sand	Within
13	60	.122	8.6	1421.3	.03483	495.03	612.4786	55	.16736	Sand Avg.	Sand	Within
14	70	.122	8.299999	1418	.03244	459.96	611.7672	65	.14145	Sand Avg.	Sand	Within
15	80	.122	7.3	1801.9	.0243	437.84	689.6256	75	.18078	Sand Avg.	Sand	Within
16	90	.122	7.2	2014	.02303	463.92	729.0843	85	.20159	Sand Avg.	Sand	Within
17	100	.122	7.6	2164.1	.02606	563.9	755.7648	95	.21307	Sand Avg.	Sand	Within
18	108	.122	8.1	2016.8	.03085	622.12	729.5909	105	.21864	Sand Avg.	Sand	Within
19	Base							111	.25238			Within

Notes:
Period for Soil Column: .76 sec
Average Shear Wave Velocity for Soil Column: 581 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_03R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	3	242.4	.00983	23.82	257.1895	0	.16146	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	5.3	541.5	.01252	67.8	401.805	2.5	.15403	Sand Avg.	Sand	Within
3	7.5	.122	7	592.9	.02199	130.36	395.584	5	.14471	Sand Avg.	Sand	Within
4	12.5	.122	8.4	610.9	.03282	200.5	401.5439	10	.11477	Sand Avg.	Sand	Within
5	17.5	.122	8.900001	634.1	.03917	248.37	409.0976	15	.09705	Sand Avg.	Sand	Within
6	22.5	.122	8.8	747.7	.0371	277.36	444.2339	20	.08879	Sand Avg.	Sand	Within
7	27.5	.122	7.7	1114.7	.02677	298.4	542.4092	25	.08965	Sand Avg.	Sand	Within
8	32.5	.122	8.1	1024.7	.03055	313.02	520.0515	30	.09197	Sand Avg.	Sand	Within
9	37.5	.122	8.4	963.2	.03362	323.81	504.204	35	.08884	Sand Avg.	Sand	Within
10	42.5	.122	8.1	1078.1	.0308	332.09	533.4301	40	.08065	Sand Avg.	Sand	Within
11	47.5	.122	7.3	1416.1	.02409	341.16	611.3571	45	.0739	Sand Avg.	Sand	Within
12	52.5	.122	7	1709.5	.02177	372.19	671.7112	50	.0713	Sand Avg.	Sand	Within
13	60	.122	7.5	1563.5	.0258	403.31	642.3873	55	.07548	Sand Avg.	Sand	Within
14	70	.122	8	1457.8	.02976	433.82	620.2932	65	.07601	Sand Avg.	Sand	Within
15	80	.122	7.7	1743.3	.02711	472.61	678.3192	75	.0827	Sand Avg.	Sand	Within
16	90	.122	7.5	1946.7	.02582	502.66	716.7993	85	.0873	Sand Avg.	Sand	Within
17	100	.122	7.3	2211.8	.02423	535.99	764.0485	95	.0826	Sand Avg.	Sand	Within
18	108	.122	7.6	2129.4	.02591	551.68	749.6812	105	.08033	Sand Avg.	Sand	Within
19	Base							111	.07957			Within

Notes:
Period for Soil Column: .75 sec
Average Shear Wave Velocity for Soil Column: 590 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_04R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	2.4	250.1	.00555	13.89	261.2425	0	.09404	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	3.9	602.8	.00657	39.59	423.9383	2.5	.09084	Sand Avg.	Sand	Within
3	7.5	.122	5.1	689.5	.01142	78.77	426.5944	5	.09099	Sand Avg.	Sand	Within
4	12.5	.122	6.4	729	.01816	132.38	438.6436	10	.0893	Sand Avg.	Sand	Within
5	17.5	.122	7.4	737.2	.0245	180.61	441.1037	15	.08199	Sand Avg.	Sand	Within
6	22.5	.122	7.7	830.5	.02678	222.46	468.1854	20	.07482	Sand Avg.	Sand	Within
7	27.5	.122	7	1182.3	.02196	259.62	558.6141	25	.07027	Sand Avg.	Sand	Within
8	32.5	.122	7.8	1059.6	.02745	290.89	528.8336	30	.07062	Sand Avg.	Sand	Within
9	37.5	.122	8.4	970.5	.03285	318.81	506.111	35	.07159	Sand Avg.	Sand	Within
10	42.5	.122	8.299999	1058.1	.03264	345.37	528.4591	40	.07045	Sand Avg.	Sand	Within
11	47.5	.122	7.7	1363.1	.02733	372.54	599.8075	45	.06761	Sand Avg.	Sand	Within
12	52.5	.122	7.3	1658.8	.02413	400.27	661.6755	50	.06728	Sand Avg.	Sand	Within
13	60	.122	7.900001	1510.6	.02885	435.73	631.4265	55	.066	Sand Avg.	Sand	Within
14	70	.122	8.6	1384.1	.03491	483.2	604.4102	65	.06073	Sand Avg.	Sand	Within
15	80	.122	8.299999	1647.6	.03241	534.01	659.4379	75	.06526	Sand Avg.	Sand	Within
16	90	.122	8.299999	1807.7	.03269	590.87	690.7346	85	.06249	Sand Avg.	Sand	Within
17	100	.122	8.2	2038.2	.03156	643.28	733.4515	95	.06023	Sand Avg.	Sand	Within
18	108	.122	8.6	1929.4	.03532	681.4	713.6071	105	.05591	Sand Avg.	Sand	Within
19	Base							111	.05741			Within

Notes:
Period for Soil Column: .76 sec
Average Shear Wave Velocity for Soil Column: 585 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_05R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	2.6	246.7	.00717	17.69	259.4607	0	.12156	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	4.5	576.9	.00863	49.77	414.7308	2.5	.11449	Sand Avg.	Sand	Within
3	7.5	.122	5.6	663.1	.01427	94.6	418.3478	5	.10652	Sand Avg.	Sand	Within
4	12.5	.122	6.7	709.6	.02001	142.01	432.7677	10	.09428	Sand Avg.	Sand	Within
5	17.5	.122	7.3	743.5	.02381	177.03	442.9845	15	.08422	Sand Avg.	Sand	Within
6	22.5	.122	7.3	861	.02376	204.6	476.7049	20	.08382	Sand Avg.	Sand	Within
7	27.5	.122	6.6	1218.6	.01974	240.6	567.1248	25	.09074	Sand Avg.	Sand	Within
8	32.5	.122	7.7	1062.8	.02719	288.96	529.6315	30	.07979	Sand Avg.	Sand	Within
9	37.5	.122	8.4	966.5	.03326	321.51	505.067	35	.08079	Sand Avg.	Sand	Within
10	42.5	.122	8.2	1073.5	.03122	335.15	532.2909	40	.08361	Sand Avg.	Sand	Within
11	47.5	.122	7.3	1415.1	.02415	341.72	611.1412	45	.0809	Sand Avg.	Sand	Within
12	52.5	.122	6.9	1722.7	.0212	365.16	674.2995	50	.07956	Sand Avg.	Sand	Within
13	60	.122	7.6	1550.4	.02652	411.18	639.6905	55	.08153	Sand Avg.	Sand	Within
14	70	.122	8.2	1431.5	.0315	450.97	614.6724	65	.08391	Sand Avg.	Sand	Within
15	80	.122	7.6	1755.8	.02648	465.01	680.7467	75	.08576	Sand Avg.	Sand	Within
16	90	.122	7.5	1960.2	.02524	494.69	719.2804	85	.0787	Sand Avg.	Sand	Within
17	100	.122	7.1	2255.4	.02268	511.48	771.5424	95	.06712	Sand Avg.	Sand	Within
18	108	.122	7.6	2127	.026	553.1	749.2587	105	.07488	Sand Avg.	Sand	Within
19	Base							111	.0772			Within

Notes:
Period for Soil Column: .74 sec
Average Shear Wave Velocity for Soil Column: 598 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_06R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	2.7	245	.00813	19.91	258.5652	0	.13612	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	4.8	563.1	.00998	56.19	409.7404	2.5	.12969	Sand Avg.	Sand	Within
3	7.5	.122	6.2	634.3	.01727	109.54	409.1621	5	.12381	Sand Avg.	Sand	Within
4	12.5	.122	7.900001	639.3	.02847	182.02	410.7716	10	.11906	Sand Avg.	Sand	Within
5	17.5	.122	8.900001	635.8	.03887	247.11	409.6456	15	.11376	Sand Avg.	Sand	Within
6	22.5	.122	9.3	708.9	.0432	306.3	432.5542	20	.10436	Sand Avg.	Sand	Within
7	27.5	.122	8.6	1023	.03501	358.22	519.62	25	.10418	Sand Avg.	Sand	Within
8	32.5	.122	9.5	894	.04556	407.29	485.7545	30	.1004	Sand Avg.	Sand	Within
9	37.5	.122	10.5	799.2	.0564	450.75	459.2781	35	.09388	Sand Avg.	Sand	Within
10	42.5	.122	10.5	870.4	.05625	489.61	479.3	40	.08252	Sand Avg.	Sand	Within
11	47.5	.122	9.4	1149.3	.04546	522.5	550.763	45	.07888	Sand Avg.	Sand	Within
12	52.5	.122	8.900001	1434.2	.03808	546.12	615.2518	50	.08356	Sand Avg.	Sand	Within
13	60	.122	9.6	1274.3	.04752	605.48	579.9411	55	.08791	Sand Avg.	Sand	Within
14	70	.122	10.8	1135.4	.05986	679.6	547.4223	65	.0815	Sand Avg.	Sand	Within
15	80	.122	10.1	1394.3	.05199	724.86	606.6332	75	.07876	Sand Avg.	Sand	Within
16	90	.122	9.6	1591	.0472	750.89	648.0121	85	.08153	Sand Avg.	Sand	Within
17	100	.122	9.2	1849.1	.04208	778.03	698.5994	95	.07636	Sand Avg.	Sand	Within
18	108	.122	9.6	1746	.04691	819.15	678.8442	105	.08382	Sand Avg.	Sand	Within
19	Base							111	.09626			Within

Notes:
Period for Soil Column: .82 sec
Average Shear Wave Velocity for Soil Column: 544 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_07R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	2.4	249.8	.00567	14.16	261.0858	0	.09489	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	4	599.3	.00682	40.85	422.7058	2.5	.09147	Sand Avg.	Sand	Within
3	7.5	.122	5.2	685.8	.01179	80.84	425.4483	5	.08833	Sand Avg.	Sand	Within
4	12.5	.122	6.4	725	.01853	134.32	437.4385	10	.08246	Sand Avg.	Sand	Within
5	17.5	.122	7.5	730.9	.02522	184.31	439.2148	15	.07831	Sand Avg.	Sand	Within
6	22.5	.122	7.8	819.2	.02801	229.46	464.9893	20	.07265	Sand Avg.	Sand	Within
7	27.5	.122	7.2	1164.3	.02315	269.51	554.3455	25	.06542	Sand Avg.	Sand	Within
8	32.5	.122	8	1031.8	.02989	308.41	521.8502	30	.06672	Sand Avg.	Sand	Within
9	37.5	.122	8.7	937.2	.03649	341.98	497.3523	35	.07045	Sand Avg.	Sand	Within
10	42.5	.122	8.6	1031.3	.03528	363.82	521.7237	40	.07841	Sand Avg.	Sand	Within
11	47.5	.122	7.8	1355.1	.02785	377.45	598.0447	45	.0794	Sand Avg.	Sand	Within
12	52.5	.122	7.2	1678	.02321	389.45	665.4938	50	.07628	Sand Avg.	Sand	Within
13	60	.122	7.8	1522.7	.02812	428.14	633.9503	55	.07453	Sand Avg.	Sand	Within
14	70	.122	8.8	1352	.03743	506.05	597.3603	65	.06605	Sand Avg.	Sand	Within
15	80	.122	8.6	1595.9	.03569	569.57	649.0092	75	.05944	Sand Avg.	Sand	Within
16	90	.122	8.6	1769.3	.03488	617.21	683.3588	85	.05412	Sand Avg.	Sand	Within
17	100	.122	8.299999	2026.5	.03213	651	731.3434	95	.05515	Sand Avg.	Sand	Within
18	108	.122	8.5	1953.7	.03401	664.45	718.0868	105	.05402	Sand Avg.	Sand	Within
19	Base							111	.05358			Within

Notes:
Period for Soil Column: .76 sec
Average Shear Wave Velocity for Soil Column: 582 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_08R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	2.6	245.5	.00782	19.19	258.8289	0	.12957	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	4.8	566.1	.00967	54.72	410.8304	2.5	.12276	Sand Avg.	Sand	Within
3	7.5	.122	6	642.3	.01648	105.86	411.7342	5	.12091	Sand Avg.	Sand	Within
4	12.5	.122	7.7	648.9	.02714	176.09	413.8442	10	.11751	Sand Avg.	Sand	Within
5	17.5	.122	8.8	642.4	.03771	242.26	411.7663	15	.10941	Sand Avg.	Sand	Within
6	22.5	.122	9.2	714.1	.04234	302.33	434.1377	20	.09774	Sand Avg.	Sand	Within
7	27.5	.122	8.5	1027.9	.03451	354.79	520.8629	25	.09419	Sand Avg.	Sand	Within
8	32.5	.122	9.3	905.6	.04396	398.13	488.8957	30	.09496	Sand Avg.	Sand	Within
9	37.5	.122	10.1	823.7	.05219	429.92	466.2647	35	.09464	Sand Avg.	Sand	Within
10	42.5	.122	9.8	917.7	.04904	450.01	492.151	40	.09214	Sand Avg.	Sand	Within
11	47.5	.122	8.8	1227.6	.03773	463.16	569.2151	45	.08941	Sand Avg.	Sand	Within
12	52.5	.122	8.2	1527.4	.03151	481.29	634.9279	50	.08797	Sand Avg.	Sand	Within
13	60	.122	8.8	1384.6	.03764	521.14	604.5193	55	.08687	Sand Avg.	Sand	Within
14	70	.122	9.5	1251.1	.04657	582.64	574.6376	65	.08707	Sand Avg.	Sand	Within
15	80	.122	9.3	1487.2	.04371	650.05	626.5168	75	.086	Sand Avg.	Sand	Within
16	90	.122	9.2	1655.1	.04234	700.72	660.9371	85	.08896	Sand Avg.	Sand	Within
17	100	.122	9.099999	1868.5	.04085	763.36	702.2546	95	.08907	Sand Avg.	Sand	Within
18	108	.122	9.5	1758.5	.04602	809.22	681.2699	105	.09174	Sand Avg.	Sand	Within
19	Base							111	.09083			Within

Notes:
Period for Soil Column: .8 sec
Average Shear Wave Velocity for Soil Column: 556 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
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Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	1.25	.118	2.6	246.9	.00706	17.43	259.5658	0	.12078	Clay PI=20	Soil PI=30	Outcrop
2	3.75	.108	4.5	578.8	.00846	48.97	415.4132	2.5	.11495	Sand Avg.	Sand	Within
3	7.5	.122	5.5	667.8	.01371	91.55	419.8278	5	.10767	Sand Avg.	Sand	Within
4	12.5	.122	6.7	706	.02038	143.87	431.6685	10	.08815	Sand Avg.	Sand	Within
5	17.5	.122	7.6	721.2	.02635	190.06	436.2906	15	.0832	Sand Avg.	Sand	Within
6	22.5	.122	7.900001	812.3	.02878	233.75	463.0269	20	.08748	Sand Avg.	Sand	Within
7	27.5	.122	7.3	1156.1	.02371	274.15	552.3899	25	.0891	Sand Avg.	Sand	Within
8	32.5	.122	8.1	1029.8	.03008	309.75	521.3441	30	.08987	Sand Avg.	Sand	Within
9	37.5	.122	8.6	943.8	.03574	337.32	499.1005	35	.08703	Sand Avg.	Sand	Within
10	42.5	.122	8.8	1006.3	.03793	381.68	515.3613	40	.09109	Sand Avg.	Sand	Within
11	47.5	.122	8.5	1273.4	.03384	430.89	579.7363	45	.09441	Sand Avg.	Sand	Within
12	52.5	.122	8.2	1536.5	.03094	475.33	636.8165	50	.09365	Sand Avg.	Sand	Within
13	60	.122	9	1364	.03931	536.25	600.0055	55	.09207	Sand Avg.	Sand	Within
14	70	.122	9.700001	1235.7	.04816	595.12	571.09	65	.08688	Sand Avg.	Sand	Within
15	80	.122	9.3	1496.3	.04298	643.05	628.4307	75	.09275	Sand Avg.	Sand	Within
16	90	.122	9.2	1663.9	.04171	693.98	662.6918	85	.0911	Sand Avg.	Sand	Within
17	100	.122	8.900001	1910.6	.03832	732.06	710.1219	95	.08734	Sand Avg.	Sand	Within
18	108	.122	9.099999	1837.1	.04074	748.4	696.3289	105	.0823	Sand Avg.	Sand	Within
19	Base							111	.08248			Within

Notes:
Period for Soil Column: .78 sec
Average Shear Wave Velocity for Soil Column: 566 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
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Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	5	.09	3.8	704.4	.00616	43.37	502.0146	0	.09658	Sand Avg.	Sand	Outcrop
2	15	.09	5.3	889.5	.01225	109	564.1306	10	.07779	Sand Avg.	Sand	Within
3	25	.09	5.6	1060	.0143	151.56	615.8282	20	.06757	Sand Avg.	Sand	Within
4	35	.09	5.8	1209.8	.01527	184.69	657.9055	30	.06464	Sand Avg.	Sand	Within
5	45	.09	5.9	1340.8	.01581	211.99	692.6099	40	.06682	Sand Avg.	Sand	Within
6	55	.09	6	1458.6	.01625	236.97	722.3951	50	.05828	Sand Avg.	Sand	Within
7	65	.09	5.9	1579.8	.01607	253.83	751.8094	60	.06301	Sand Avg.	Sand	Within
8	75	.09	5.9	1690.9	.01601	270.8	777.7959	70	.05968	Sand Avg.	Sand	Within
9	85	.09	5.8	1808.1	.01553	280.81	804.2997	80	.04794	Sand Avg.	Sand	Within
10	95	.09	5.6	1937.9	.01422	275.51	832.6689	90	.05804	Sand Avg.	Sand	Within
11	101.25	.118	9.9	115.9	.22709	263.29	177.8397	100	.06842	Clay PI=20	Soil PI=30	Within
12	103.75	.108	12.5	287.7	.08545	245.85	292.8775	102.5	.11404	Sand Avg.	Sand	Within
13	107.5	.122	10.5	431.8	.05633	243.23	337.5898	105	.1167	Sand Avg.	Sand	Within
14	112.5	.122	9.700001	535.7	.04786	256.35	376.0182	110	.11177	Sand Avg.	Sand	Within
15	117.5	.122	9.3	609.8	.04373	266.7	401.1823	115	.1191	Sand Avg.	Sand	Within
16	122.5	.122	8.900001	734.9	.03901	286.7	440.415	120	.12687	Sand Avg.	Sand	Within
17	127.5	.122	7.900001	1091.5	.02865	312.72	536.735	125	.11852	Sand Avg.	Sand	Within
18	132.5	.122	8.4	996.2	.03333	332	512.7684	130	.11558	Sand Avg.	Sand	Within
19	137.5	.122	8.7	941.3	.03602	339.06	498.439	135	.11652	Sand Avg.	Sand	Within
20	142.5	.122	8.2	1066.8	.03183	339.53	530.6273	140	.11977	Sand Avg.	Sand	Within
21	147.5	.122	7.3	1412.8	.02428	343.07	610.6444	145	.12428	Sand Avg.	Sand	Within
22	152.5	.122	6.7	1746.3	.0202	352.81	678.9026	150	.12527	Sand Avg.	Sand	Within
23	160	.122	7.1	1625.5	.02263	367.86	655.0003	155	.12143	Sand Avg.	Sand	Within
24	170	.122	7.1	1579.5	.02286	361.05	645.6659	165	.12993	Sand Avg.	Sand	Within
25	180	.122	6.8	1882.1	.02092	393.81	704.8057	175	.13285	Sand Avg.	Sand	Within
26	190	.122	6.8	2076.7	.02071	430.14	740.3463	185	.16175	Sand Avg.	Sand	Within
27	200	.122	6.5	2368.7	.01909	452.11	790.6842	195	.17664	Sand Avg.	Sand	Within
28	208	.122	6.8	2273.5	.02073	471.21	774.6321	205	.15768	Sand Avg.	Sand	Within
29	Base							211	.17013			Within

Notes:
Period for Soil Column: 1.32 sec
Average Shear Wave Velocity for Soil Column: 640 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_03R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	5	.09	3	741	.00413	30.64	514.8915	0	.06945	Sand Avg.	Sand	Outcrop
2	15	.09	4.5	945.9	.00852	80.57	581.7405	10	.05618	Sand Avg.	Sand	Within
3	25	.09	5.1	1109.3	.01103	122.41	629.9865	20	.05123	Sand Avg.	Sand	Within
4	35	.09	5.4	1243.3	.01311	162.95	666.9521	30	.04656	Sand Avg.	Sand	Within
5	45	.09	5.6	1372	.01409	193.35	700.6219	40	.04084	Sand Avg.	Sand	Within
6	55	.09	5.6	1501.3	.0142	213.19	732.8928	50	.04328	Sand Avg.	Sand	Within
7	65	.09	5.6	1619.6	.01428	231.34	761.2206	60	.04639	Sand Avg.	Sand	Within
8	75	.09	5.6	1730.1	.01437	248.64	786.76	70	.05034	Sand Avg.	Sand	Within
9	85	.09	5.7	1826.4	.01476	269.48	808.3597	80	.05241	Sand Avg.	Sand	Within
10	95	.09	5.8	1914.5	.0152	291.05	827.6265	90	.0554	Sand Avg.	Sand	Within
11	101.25	.118	10.9	98.1	.31769	311.52	163.6144	100	.05468	Clay PI=20	Soil PI=30	Within
12	103.75	.108	15.2	212.6	.14858	315.94	251.7664	102.5	.07969	Sand Avg.	Sand	Within
13	107.5	.122	12.9	346.5	.09268	321.18	302.4124	105	.08735	Sand Avg.	Sand	Within
14	112.5	.122	11.9	445.5	.07515	334.84	342.9035	110	.08438	Sand Avg.	Sand	Within
15	117.5	.122	11.2	520.4	.06565	341.65	370.6096	115	.08067	Sand Avg.	Sand	Within
16	122.5	.122	9.9	669.8	.05036	337.26	420.456	120	.09029	Sand Avg.	Sand	Within
17	127.5	.122	8.1	1067.4	.03073	327.99	530.7764	125	.09424	Sand Avg.	Sand	Within
18	132.5	.122	8.5	982.4	.03477	341.61	509.2045	130	.09449	Sand Avg.	Sand	Within
19	137.5	.122	9	913.3	.03935	359.36	490.9698	135	.09319	Sand Avg.	Sand	Within
20	142.5	.122	8.7	1016	.03688	374.71	517.8392	140	.09439	Sand Avg.	Sand	Within
21	147.5	.122	7.900001	1339.8	.02889	387.09	594.6591	145	.09516	Sand Avg.	Sand	Within
22	152.5	.122	7.4	1651.6	.02449	404.46	660.2379	150	.09124	Sand Avg.	Sand	Within
23	160	.122	7.900001	1509.4	.02891	436.45	631.1756	155	.08791	Sand Avg.	Sand	Within
24	170	.122	8.4	1400.1	.03372	472.05	607.8936	165	.07892	Sand Avg.	Sand	Within
25	180	.122	8	1690.2	.02992	505.75	667.9086	175	.08424	Sand Avg.	Sand	Within
26	190	.122	7.8	1910.1	.02746	524.56	710.029	185	.08702	Sand Avg.	Sand	Within
27	200	.122	7.2	2228.5	.02361	526.21	766.9276	195	.07981	Sand Avg.	Sand	Within
28	208	.122	7.3	2178.4	.02401	522.94	758.2577	205	.07571	Sand Avg.	Sand	Within
29	Base							211	.07564			Within

Notes:
Period for Soil Column: 1.34 sec
Average Shear Wave Velocity for Soil Column: 631 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_10R.EQ

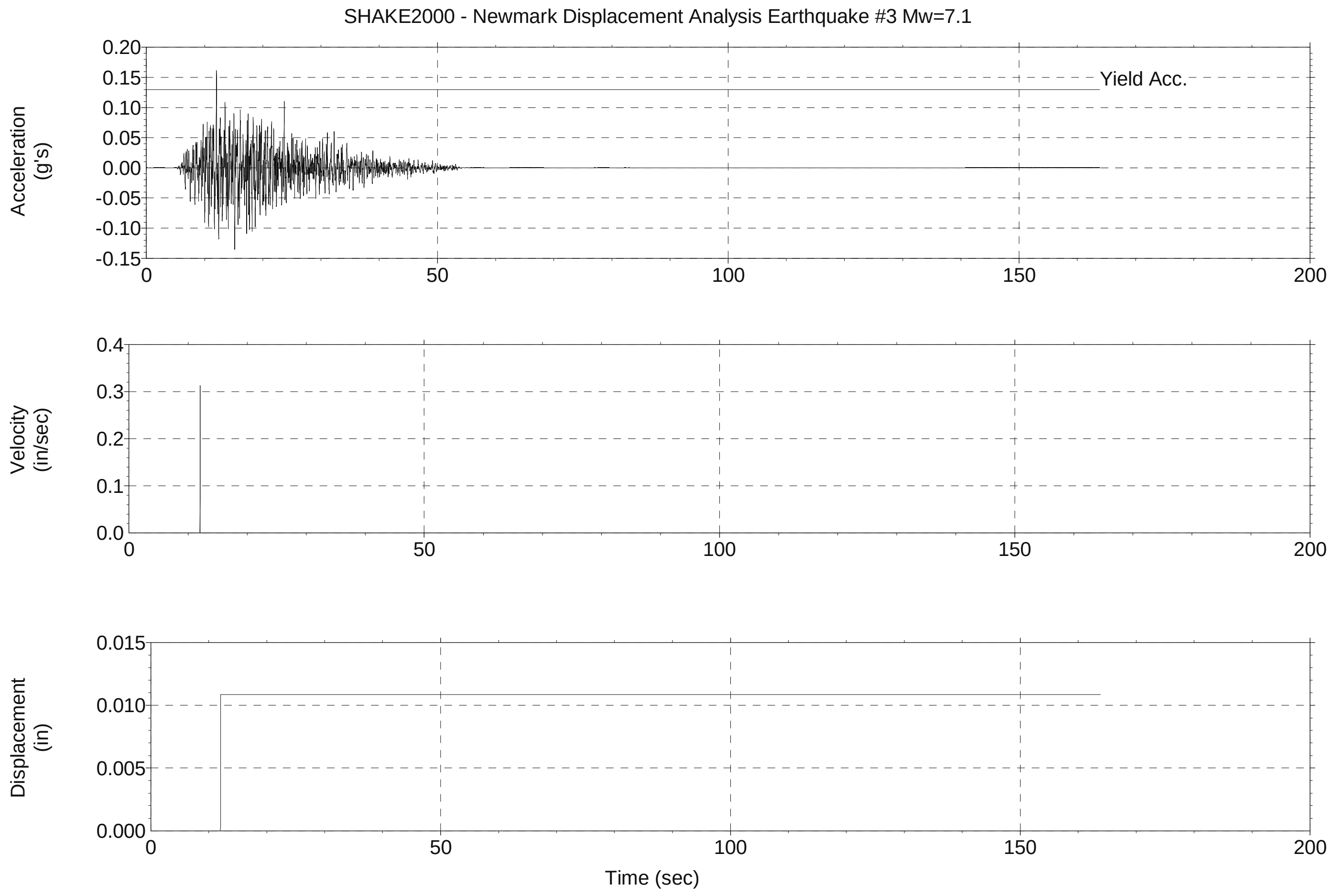
Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	.75	.12	.2	1996.8	.00053	10.58	731.9891	0	.11749	Clay PI=10	Soil PI=15	Outcrop
2	2.75	.12	1.6	1984.4	.00196	38.84	729.7128	1.5	.11681	Clay PI=10	Soil PI=15	Within
3	5.25	.12	2.3	1958.5	.00374	73.16	724.9351	4	.11276	Clay PI=10	Soil PI=15	Within
4	7.75	.12	2.7	1929.3	.00546	105.33	719.5106	6.5	.10531	Clay PI=10	Soil PI=15	Within
5	10.25	.12	3.1	1886.1	.00714	134.57	711.4095	9	.09505	Clay PI=10	Soil PI=15	Within
6	12.75	.12	3.4	1855.2	.00864	160.23	705.5579	11.5	.08651	Clay PI=10	Soil PI=15	Within
7	15.25	.12	3.7	1832.7	.00993	181.99	701.2664	14	.0816	Clay PI=10	Soil PI=15	Within
8	17.75	.12	3.9	1816.1	.01101	199.89	698.0832	16.5	.08035	Clay PI=10	Soil PI=15	Within
9	20.25	.12	4	1803.7	.01188	214.28	695.6959	19	.08349	Clay PI=10	Soil PI=15	Within
10	22.75	.12	4.2	1791.8	.01279	229.22	693.3972	21.5	.08503	Clay PI=10	Soil PI=15	Within
11	25.25	.118	9.4	124.3	.19409	241.29	184.1715	24	.08407	Clay PI=20	Soil PI=30	Within
12	27.75	.108	12.1	299.6	.07829	234.61	298.8732	26.5	.10852	Sand Avg.	Sand	Within
13	31.5	.122	10.2	442.5	.05293	234.19	341.7469	29	.1062	Sand Avg.	Sand	Within
14	36.5	.122	9.700001	533.1	.04848	258.43	375.1046	34	.11496	Sand Avg.	Sand	Within
15	41.5	.122	9.4	604.7	.04477	270.73	399.5011	39	.11573	Sand Avg.	Sand	Within
16	46.5	.122	9.099999	724.8	.04059	294.19	437.3782	44	.117	Sand Avg.	Sand	Within
17	51.5	.122	8	1076.1	.02998	322.56	532.9351	49	.12256	Sand Avg.	Sand	Within
18	56.5	.122	8.7	967.2	.03641	352.22	505.2498	54	.11973	Sand Avg.	Sand	Within
19	61.5	.122	9.099999	897.3	.04139	371.34	486.6501	59	.11834	Sand Avg.	Sand	Within
20	66.5	.122	8.900001	1000.4	.03859	386.02	513.8483	64	.12849	Sand Avg.	Sand	Within
21	71.5	.122	8.2	1306.5	.03127	408.58	587.2225	69	.13454	Sand Avg.	Sand	Within
22	76.5	.122	7.7	1598.5	.02728	436.04	649.5377	74	.14187	Sand Avg.	Sand	Within
23	84	.122	8.4	1446.4	.03303	477.81	617.863	79	.14217	Sand Avg.	Sand	Within
24	94	.122	8.7	1365	.03639	496.68	600.2253	89	.12803	Sand Avg.	Sand	Within
25	104	.122	7.8	1723.1	.02815	485.06	674.3778	99	.14241	Sand Avg.	Sand	Within
26	114	.122	7.5	1958.9	.02529	495.47	719.0418	109	.16544	Sand Avg.	Sand	Within
27	124	.122	7.3	2212.3	.02421	535.67	764.1349	119	.168	Sand Avg.	Sand	Within
28	132	.122	7.4	2151.7	.02503	538.53	753.5965	129	.14751	Sand Avg.	Sand	Within
29	Base							135	.1656			Within

Notes:
Period for Soil Column: .9 sec
Average Shear Wave Velocity for Soil Column: 598 ft/sec

Soil Profile No. 2
Analysis No. 1 - Profile No. 1 - Soil Pro-TUJ352
C:\PROGRAM FILES\GEOMOTIONS\QUAKES\SHAKE\SIMULATED\L02_03R.EQ

Layer	Depth to Middle of Layer (ft)	Total Unit Weight (kcf)	Damping Used (%)	Shear Modulus (ksf)	Maximum Shear Strain (%)	Maximum Shear Stress (psf)	Shear Wave Velocity (fps)	Depth to Top of Layer (ft)	Peak Acceleration (g)	G/Gmax Curve	Damping Curve	Type of Motion
1	.75	.12	------	1997.6	.00039	7.77	732.1357	0	.0863	Clay PI=10	Soil PI=15	Outcrop
2	2.75	.12	1.3	1994.2	.00142	28.25	731.5124	1.5	.08615	Clay PI=10	Soil PI=15	Within
3	5.25	.12	1.9	1971.3	.00271	53.47	727.3002	4	.08526	Clay PI=10	Soil PI=15	Within
4	7.75	.12	2.3	1955.9	.00399	78.1	724.4537	6.5	.08358	Clay PI=10	Soil PI=15	Within
5	10.25	.12	2.6	1935	.00527	101.97	720.5727	9	.08119	Clay PI=10	Soil PI=15	Within
6	12.75	.12	2.9	1898.6	.0066	125.34	713.7631	11.5	.07883	Clay PI=10	Soil PI=15	Within
7	15.25	.12	3.3	1868.9	.00793	148.26	708.1583	14	.07766	Clay PI=10	Soil PI=15	Within
8	17.75	.12	3.5	1843.7	.00927	170.99	703.3677	16.5	.07681	Clay PI=10	Soil PI=15	Within
9	20.25	.12	3.8	1821.6	.01064	193.74	699.1395	19	.07577	Clay PI=10	Soil PI=15	Within
10	22.75	.12	4	1802.4	.01198	215.92	695.4452	21.5	.07415	Clay PI=10	Soil PI=15	Within
11	25.25	.118	9.4	125	.19169	239.59	184.6894	24	.07196	Clay PI=20	Soil PI=30	Within
12	27.75	.108	12.8	279.3	.09088	253.87	288.5702	26.5	.07825	Sand Avg.	Sand	Within
13	31.5	.122	11.2	406.2	.06542	265.75	327.4296	29	.08417	Sand Avg.	Sand	Within
14	36.5	.122	10.2	512.5	.05373	275.4	367.7858	34	.08524	Sand Avg.	Sand	Within
15	41.5	.122	10	575.1	.05123	294.6	389.6007	39	.0768	Sand Avg.	Sand	Within
16	46.5	.122	9.6	686.9	.04712	323.64	425.7893	44	.07675	Sand Avg.	Sand	Within
17	51.5	.122	8.4	1035.4	.03376	349.61	522.7597	49	.08324	Sand Avg.	Sand	Within
18	56.5	.122	8.900001	945.7	.03889	367.82	499.6026	54	.08268	Sand Avg.	Sand	Within
19	61.5	.122	9.2	887.5	.04268	378.75	483.9854	59	.07797	Sand Avg.	Sand	Within
20	66.5	.122	8.900001	1000.8	.03854	385.68	513.9509	64	.07772	Sand Avg.	Sand	Within
21	71.5	.122	8	1326.8	.02979	395.33	591.767	69	.07634	Sand Avg.	Sand	Within
22	76.5	.122	7.4	1642.4	.02495	409.76	658.3965	74	.07616	Sand Avg.	Sand	Within
23	84	.122	7.900001	1517.7	.02841	431.24	632.9086	79	.0733	Sand Avg.	Sand	Within
24	94	.122	8.2	1434.5	.0313	448.96	615.3161	89	.07755	Sand Avg.	Sand	Within
25	104	.122	7.7	1750.2	.02676	468.35	679.6602	99	.07438	Sand Avg.	Sand	Within
26	114	.122	7.4	1979.3	.02443	483.53	722.7762	109	.08411	Sand Avg.	Sand	Within
27	124	.122	7.1	2265.3	.02234	506.03	773.2339	119	.08319	Sand Avg.	Sand	Within
28	132	.122	7.3	2171.5	.02427	527.06	757.0559	129	.08225	Sand Avg.	Sand	Within
29	Base							135	.08006			Within

Notes:
Period for Soil Column: .9 sec
Average Shear Wave Velocity for Soil Column: 600 ft/sec


SHAKE2000 - Newmark Displacement Analysis Earthquake #3 Mw=7.1

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Notes:
      Displacement Analysis - Newmark Method
      Project: SHAKE2000 - Newmark Displacement Analysis Earthquake #3 Mw=7.1

      Newmark Method by Kavazanjian & Matasovic
      Constant Yield Acceleration:      .13 (g)
      Acceleration Time History: Outcrop - Soil Profile No.  2 - AHL - Layer:
                           1 - Analysis: 1 - Soil Deposit: 1
      Acceleration Time History File: C:\Shake\Shake Analysis\Labadie test 3-L1A1D1-1-Soil Pro-TUJ352.ahl
      Peak Acceleration Value:  .161461 (g)
      Upslope Movement not Included in Analysis
      Acceleration due to gravity:   386.4 (in/sec^2)

      Displacement computed: 1.084597E-02 in
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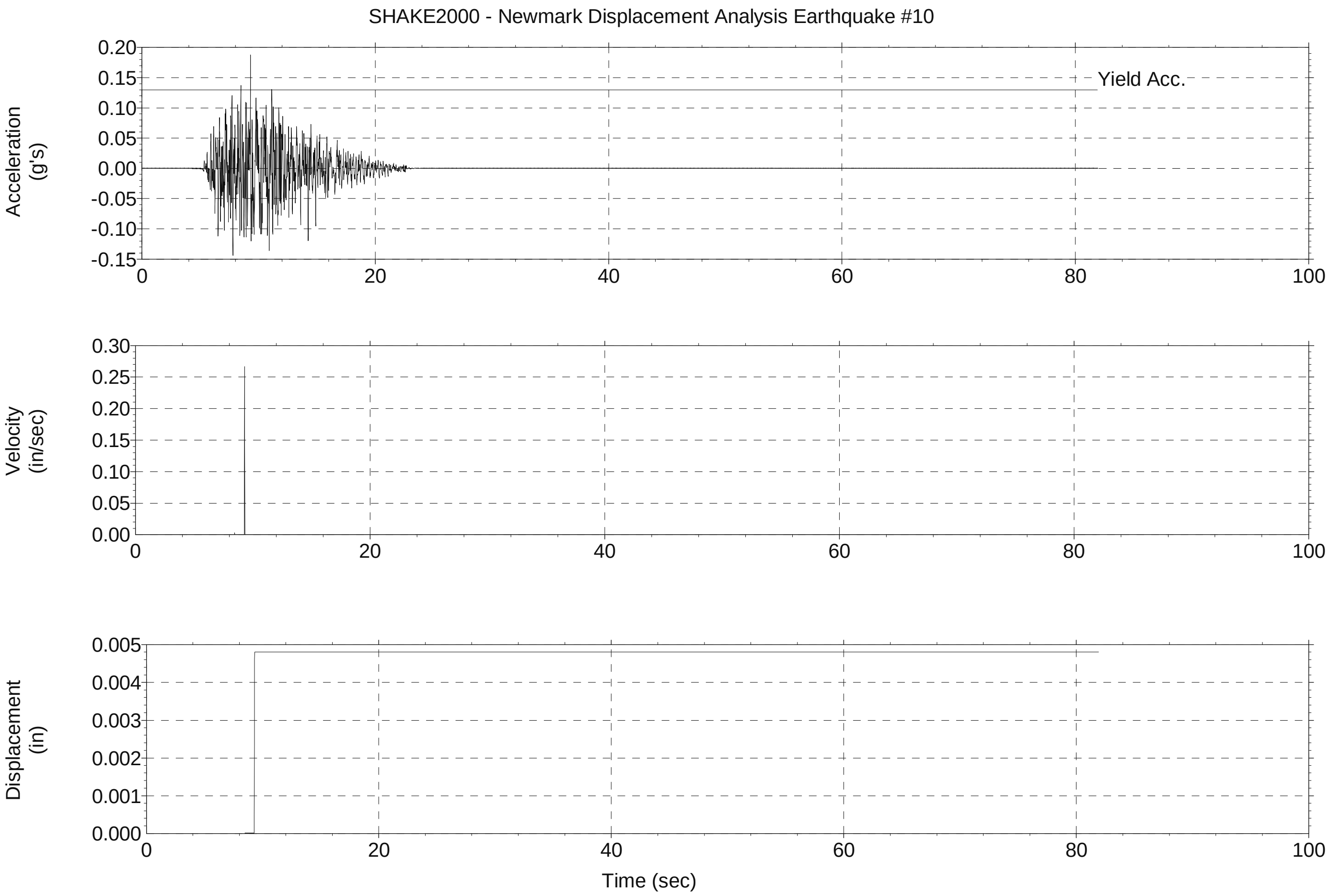

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Notes:
     Displacement Analysis - Newmark Method
     Project: SHAKE2000 - Newmark Displacement Analysis Earthquake #10

     Newmark Method by Kavazanjian & Matasovic
     Constant Yield Acceleration:      .13 (g)
     Acceleration Time History: Outcrop - Soil Profile No.  2 - AHL - Layer:
                           1 - Analysis: 1 - Soil Deposit: 1
     Acceleration Time History File: C:\Shake\Shake Analysis\Labadie test 10-L1A1D1-1-Soil Pro-TUJ352.ahl
     Peak Acceleration Value:  .187322 (g)
     Upslope Movement not Included in Analysis
     Acceleration due to gravity:   386.4 (in/sec^2)

     Displacement computed: 4.802381E-03 in
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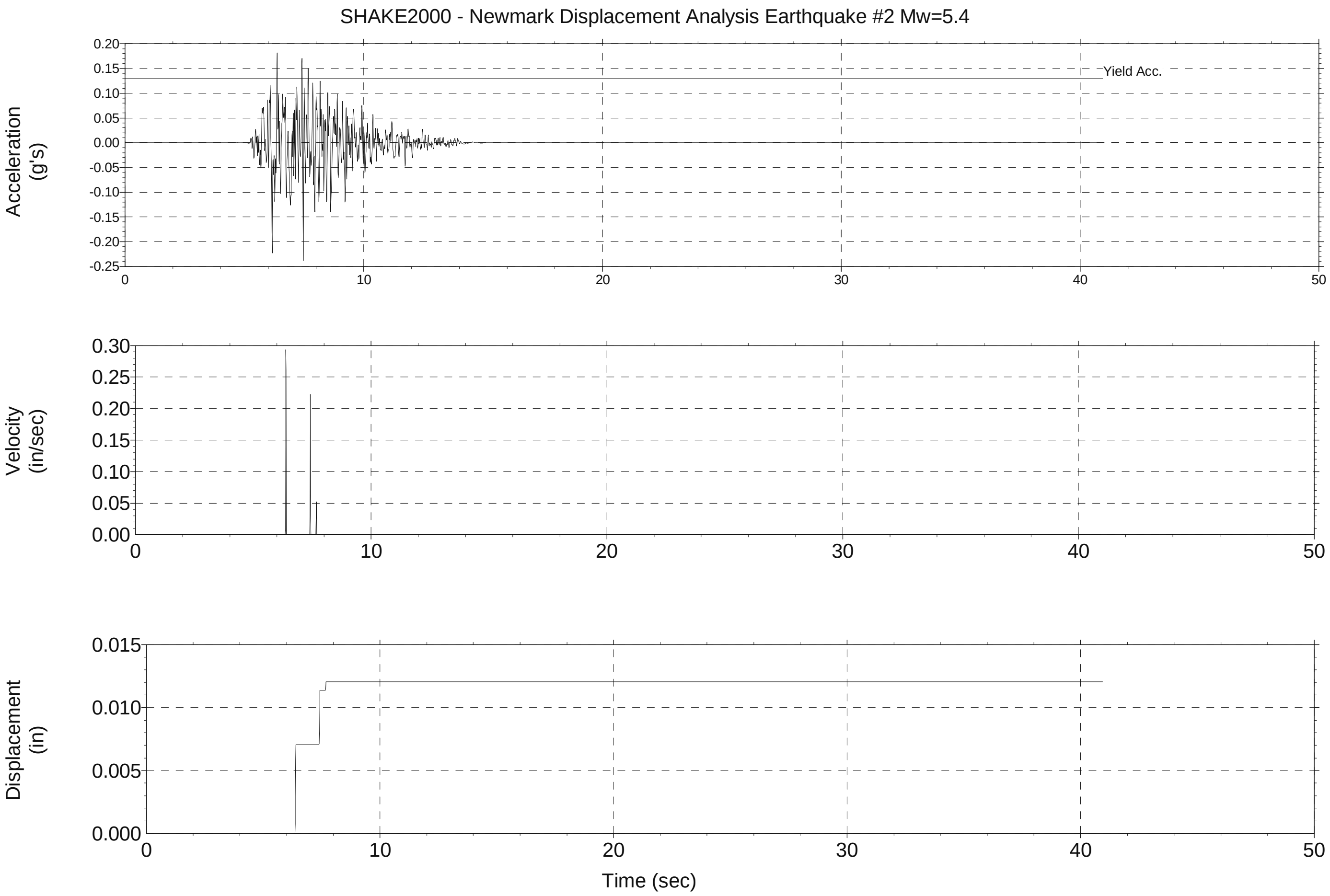

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Notes:
     Displacement Analysis - Newmark Method
     Project: SHAKE2000 - Newmark Displacement Analysis

     Newmark Method by Kavazanjian & Matasovic
     Constant Yield Acceleration:      .13 (g)
     Acceleration Time History: Outcrop - Soil Profile No.  2 - AHL - Layer:
                           1 - Analysis: 1 - Soil Deposit: 1
     Acceleration Time History File: C:\Shake\02-L1A1D1-1-Soil Pro-TUJ352.ahl
     Peak Acceleration Value:  .238308 (g)
     Upslope Movement not Included in Analysis
     Acceleration due to gravity:   386.4 (in/sec^2)

     Displacement computed: 1.205906E-02 in
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Appendix D

RESULTS OF LIQUEFACTION ANALYSES
Revised August 2013

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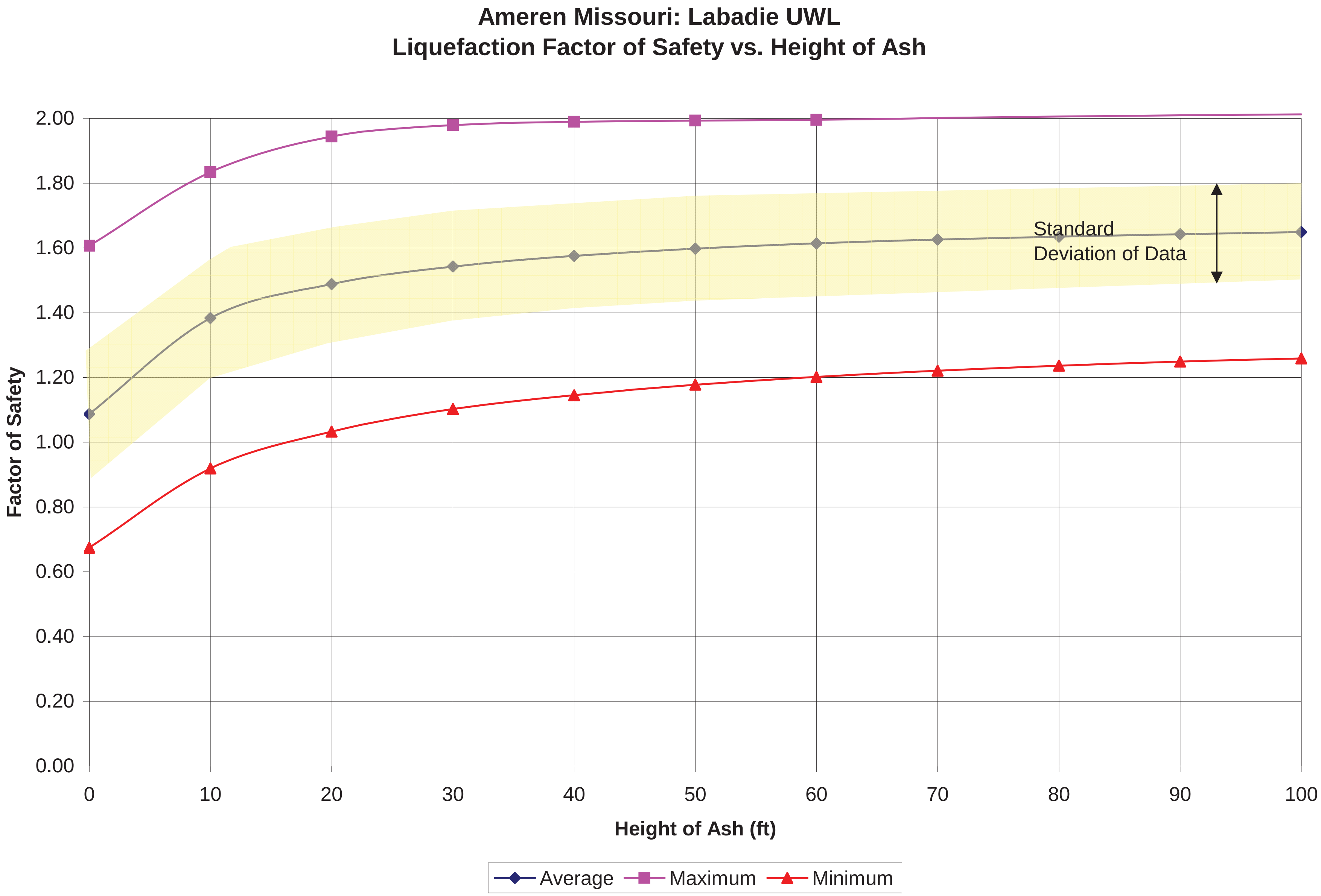
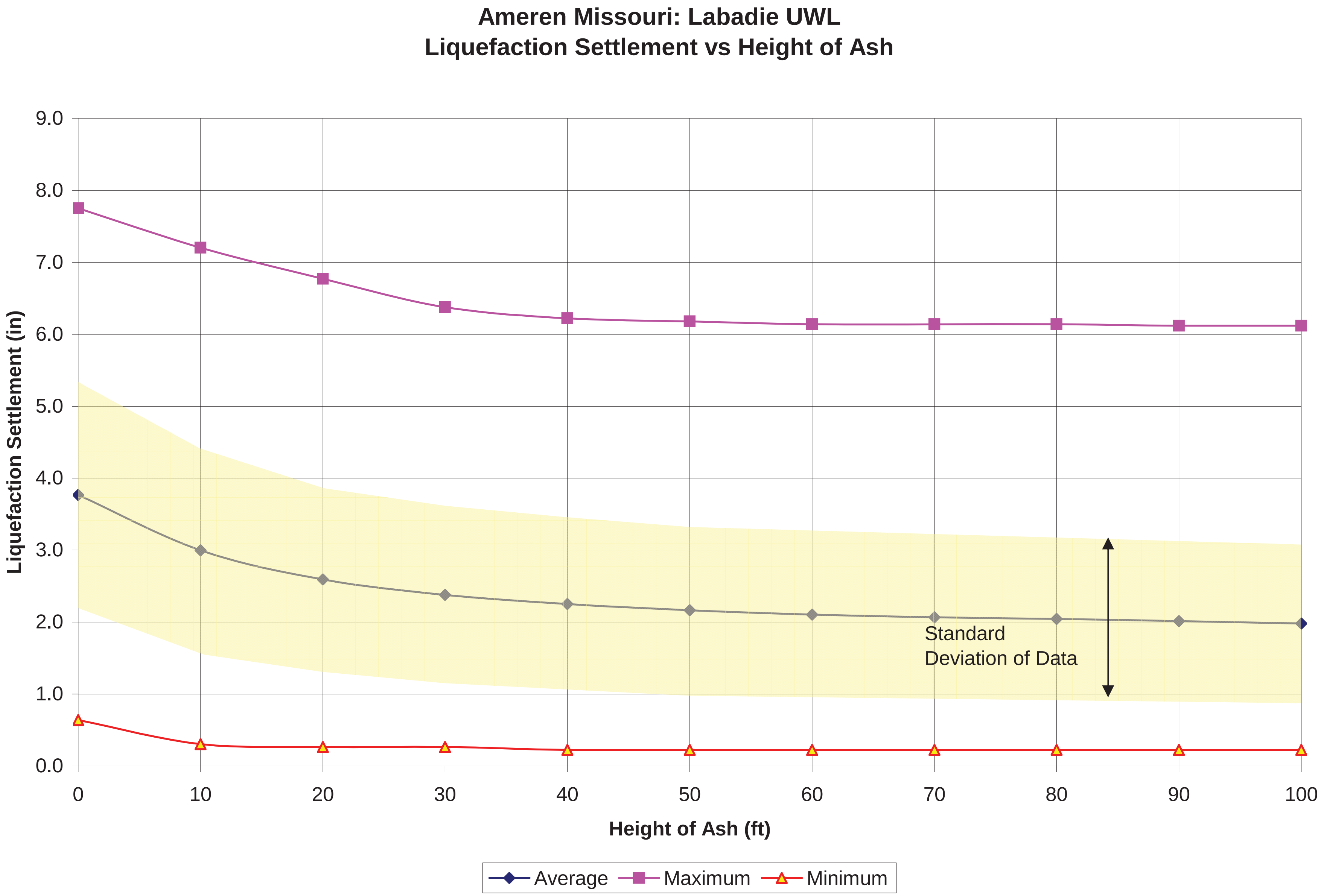
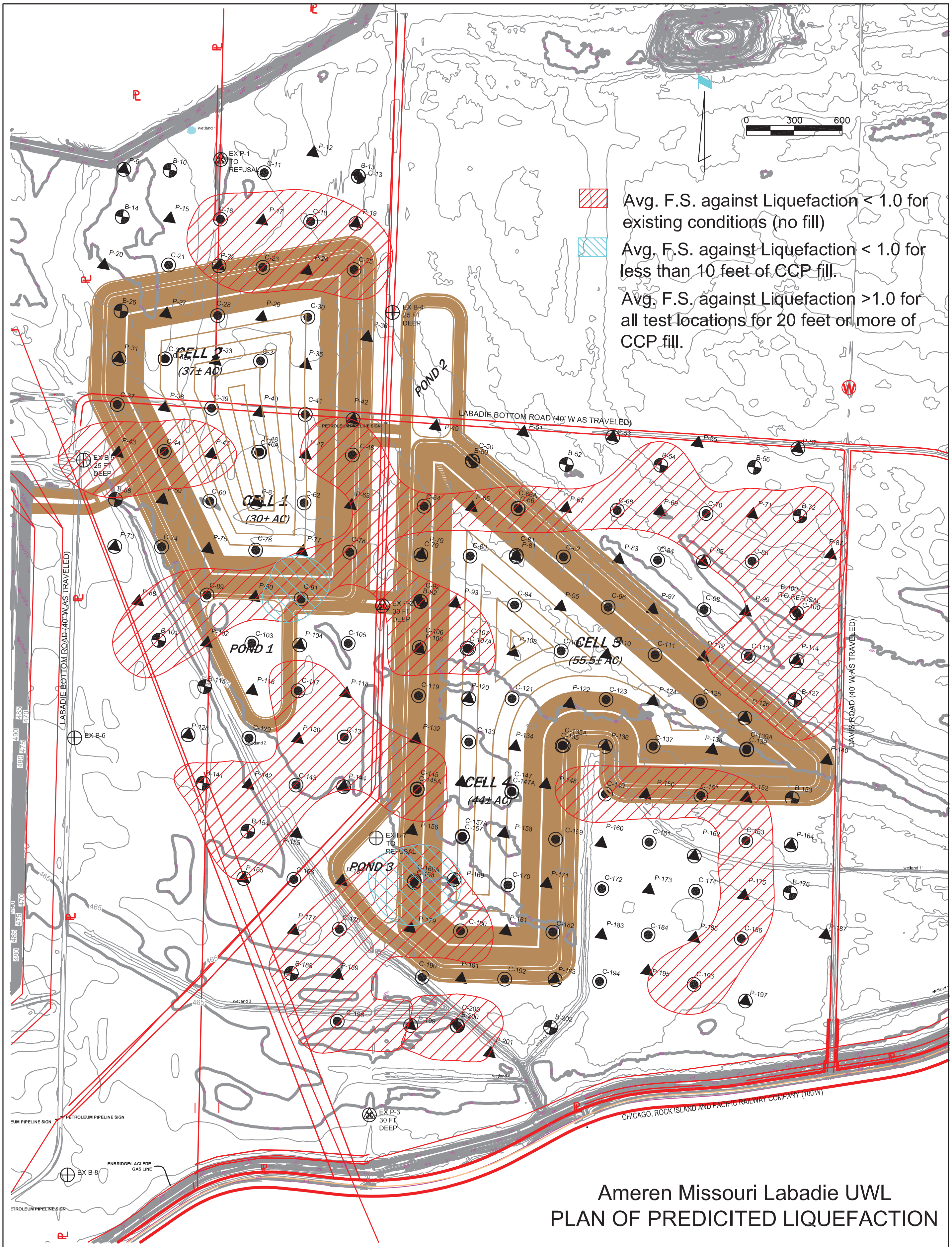

Ameren Missouri: Labadie UWL
Liquefaction Factor of Safety vs. Height of Ash
Factor of Safety
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
10
20
30
40
50
60
70
80
90
100
Height of Ash (ft)
Standard
Deviation of Data
Average
Maximum
Minimum

Figure D-1



Ameren Missouri: Labadie UWL
Liquefaction Settlement vs Height of Ash

Figure D-2



Ameren Missouri Labadie UWL
PLAN OF PREDICITED LIQUEFACTION

REITZ & JENS, INC.

Figure D-3

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
0' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.32	S (ft)	0.19	S (ft)	0.40	S (ft)	0.51	S (ft)	0.28	S (ft)	0.45	S (ft)	0.42	S (ft)	0.35	S (ft)	0.33	S (ft)	0.26	S (ft)	0.27	S (ft)	0.31	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.39	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.45	6.25	0.26	6.25	n.a	6.25	0.53	6.25	0.59	6.25	n.a	6.25	0.31	6.25	n.a	6.25	0.37	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.66	8.75	0.55	8.75	n.a	8.75	n.a	8.75	0.48	8.75	0.42	8.75	0.32	8.75	0.81	8.75	0.51	8.75	n.a	8.75	0.40	8.75	n.a
11.25	0.26	11.25	2.00	11.25	0.34	11.25	0.47	11.25	0.54	11.25	0.63	11.25	1.97	11.25	n.a	11.25	1.82	11.25	1.39	11.25	n.a	11.25	1.47	11.25	0.60
13.75	n.a	13.75	2.00	13.75	0.53	13.75	0.92	13.75	2.00	13.75	1.03	13.75	0.47	13.75	n.a	13.75	2.00	13.75	1.12	13.75	0.46	13.75	0.97	13.75	1.08
16.25	0.28	16.25	2.00	16.25	0.79	16.25	0.98	16.25	2.00	16.25	1.00	16.25	1.23	16.25	0.76	16.25	0.86	16.25	0.55	16.25	2.11	16.25	2.00	16.25	1.56
18.75	2.00	18.75	2.00	18.75	0.84	18.75	0.61	18.75	1.92	18.75	0.44	18.75	0.69	18.75	0.79	18.75	1.06	18.75	1.27	18.75	1.20	18.75	2.00	18.75	0.82
21.25	1.64	21.25	1.28	21.25	1.42	21.25	0.48	21.25	0.75	21.25	1.08	21.25	1.24	21.25	0.89	21.25	0.93	21.25	1.22	21.25	2.00	21.25	1.07	21.25	2.00
23.75	1.29	23.75	2.00	23.75	2.00	23.75	0.84	23.75	0.96	23.75	2.00	23.75	0.63	23.75	1.34	23.75	1.05	23.75	0.76	23.75	2.00	23.75	0.58	23.75	0.82
26.25	2.00	26.25	0.83	26.25	1.32	26.25	2.00	26.25	0.98	26.25	2.00	26.25	0.67	26.25	1.27	26.25	2.00	26.25	0.74	26.25	2.00	26.25	0.71	26.25	1.40
28.75	2.00	28.75	1.96	28.75	2.00	28.75	2.00	28.75	0.94	28.75	0.84	28.75	0.95	28.75	1.18	28.75	2.00	28.75	2.00	28.75	0.99	28.75	2.00	28.75	2.00
31.25	2.12	31.25	0.84	31.25	2.00	31.25	0.87	31.25	1.43	31.25	2.00	31.25	1.52	31.25	0.86	31.25	1.52	31.25	2.00	31.25	1.78	31.25	0.73	31.25	2.00
33.75	2.00	33.75	0.92	33.75	2.00	33.75	2.00	33.75	0.96	33.75	2.00	33.75	1.71	33.75	2.00	33.75	0.63	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.07
		36.25	2.00	36.25	2.00	36.25	1.12	36.25	0.87	36.25	2.00	36.25	2.00	36.25	0.74	36.25	2.00	36.25	2.00	36.25	0.60	36.25	2.00	36.25	1.92
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.02	Inv Avg	1.44	Inv Avg	0.92	Inv Avg	0.83	Inv Avg	1.18	Inv Avg	0.86	Inv Avg	0.90	Inv Avg	1.02	Inv Avg	1.04	Inv Avg	1.14	Inv Avg	1.11	Inv Avg	1.16	Inv Avg	1.38
Risk	Moderate	Risk	Low	Risk	High	Risk	High	Risk	Moderate	Risk	High	Risk	High	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	Low

Figure D-4

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.24	S (ft)	0.44	S (ft)	0.30	S (ft)	0.34	S (ft)	0.45	S (ft)	0.31	S (ft)	0.21	S (ft)	0.18	S (ft)	0.50	S (ft)	0.05	S (ft)	0.32	S (ft)	0.38	S (ft)	0.41
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.38	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.47	6.25	n.a	6.25	n.a	6.25	0.38	6.25	0.28	6.25	n.a	6.25	0.39	6.25	n.a	6.25	n.a	6.25	0.39	6.25	0.33	6.25	0.73
8.75	n.a	8.75	0.47	8.75	n.a	8.75	n.a	8.75	0.47	8.75	1.13	8.75	0.35	8.75	n.a	8.75	0.29	8.75	n.a	8.75	0.41	8.75	0.67	8.75	0.78
11.25	0.36	11.25	0.83	11.25	0.93	11.25	0.75	11.25	0.71	11.25	0.48	11.25	0.72	11.25	n.a	11.25	0.62	11.25	2.00	11.25	2.05	11.25	0.56	11.25	0.81
13.75	0.58	13.75	0.70	13.75	0.53	13.75	0.54	13.75	0.58	13.75	1.91	13.75	0.83	13.75	0.72	13.75	0.59	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.57
16.25	0.58	16.25	0.74	16.25	1.09	16.25	1.00	16.25	0.37	16.25	2.00	16.25	1.43	16.25	2.00	16.25	0.31	16.25	0.93	16.25	0.78	16.25	2.00	16.25	n.a
18.75	1.50	18.75	0.78	18.75	1.16	18.75	1.83	18.75	2.00	18.75	2.00	18.75	1.26	18.75	2.00	18.75	0.98	18.75	1.25	18.75	1.00	18.75	2.14	18.75	0.55
21.25	1.51	21.25	0.58	21.25	0.60	21.25	0.78	21.25	0.67	21.25	2.00	21.25	1.88	21.25	2.00	21.25	1.14	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.39
23.75	1.12	23.75	0.72	23.75	0.84	23.75	0.88	23.75	1.88	23.75	1.17	23.75	2.00	23.75	1.05	23.75	2.00	23.75	1.18	23.75	2.00	23.75	0.65	23.75	1.12
26.25	1.40	26.25	2.00	26.25	0.75	26.25	0.90	26.25	2.00	26.25	2.00	26.25	2.14	26.25	1.18	26.25	2.00			26.25	2.00	26.25	0.67	26.25	1.23
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.14	28.75	2.00	28.75	2.00	28.75	2.00			28.75	1.67	28.75	2.00	28.75	0.74
31.25	1.74	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.91	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.15			31.25	0.98	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	1.73	33.75	2.00	33.75	2.12	33.75	2.00			33.75	1.83	33.75	0.78			33.75	n.a	33.75	1.37	33.75	1.63
36.25	2.00	36.25	n.a	36.25	1.02	36.25	0.55	36.25	0.95	36.25	0.75			36.25	2.00	36.25	0.60					36.25	0.85	36.25	0.47
				38.75	1.22	38.75	1.73			38.75	2.00														
				41.25	2.13	41.25	1.64			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.14	Inv Avg	0.93	Inv Avg	1.18	Inv Avg	1.18	Inv Avg	0.87	Inv Avg	1.13	Inv Avg	1.19	Inv Avg	1.33	Inv Avg	0.82	Inv Avg	1.61	Inv Avg	0.93	Inv Avg	0.99	Inv Avg	0.94
Risk	Moderate	Risk	High	Risk	Moderate	Risk	Moderate	Risk	High	Risk	Moderate	Risk	Moderate	Risk	Low	Risk	High	Risk	Low	Risk	High	Risk	High	Risk	High

Figure D-4

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.32	S (ft)	0.16	S (ft)	0.42	S (ft)	0.27	S (ft)	0.28	S (ft)	0.27	S (ft)	0.10	S (ft)	0.26	S (ft)	0.39	S (ft)	0.46	S (ft)	0.65	S (ft)	0.22	S (ft)	0.23
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.41	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.40	6.25	0.47	6.25	0.34	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.85	6.25	n.a	6.25	n.a	6.25	0.41	6.25	0.41
8.75	n.a	8.75	n.a	8.75	n.a	8.75	0.62	8.75	n.a	8.75	0.46	8.75	n.a	8.75	0.58	8.75	0.43	8.75	0.50	8.75	0.32	8.75	0.61	8.75	0.70
11.25	n.a	11.25	n.a	11.25	0.30	11.25	n.a	11.25	n.a	11.25	0.32	11.25	n.a	11.25	0.82	11.25	0.59	11.25	0.59	11.25	0.43	11.25	0.43	11.25	n.a
13.75	0.29	13.75	0.40	13.75	0.38	13.75	0.56	13.75	0.39	13.75	1.21	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.62	13.75	0.34	13.75	1.74	13.75	n.a
16.25	0.55	16.25	0.75	16.25	2.00	16.25	1.03	16.25	0.59	16.25	1.92	16.25	2.00	16.25	1.15	16.25	1.29	16.25	0.55	16.25	0.62	16.25	2.00	16.25	0.74
18.75	1.13	18.75	1.13	18.75	1.70	18.75	2.00	18.75	2.00	18.75	0.68	18.75	1.23	18.75	1.37	18.75	1.96	18.75	0.44	18.75	0.78	18.75	2.00	18.75	1.03
21.25	0.68	21.25	2.00	21.25	0.73	21.25	1.43	21.25	1.03	21.25	1.15	21.25	2.00	21.25	1.16	21.25	2.00	21.25	0.85	21.25	1.69	21.25	2.00	21.25	2.00
23.75	1.75	23.75	2.00	23.75	2.00	23.75	0.67	23.75	2.00	23.75	1.88	23.75	2.00	23.75	0.91	23.75	0.66	23.75	0.84	23.75	1.26	23.75	2.00	23.75	1.37
26.25	1.29	26.25	2.00	26.25	0.92	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.08	26.25	0.43			26.25	2.00
28.75	1.11	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.95	28.75	1.23	28.75	1.06	28.75	0.57			28.75	2.00
31.25	0.78	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.16	31.25	2.00	31.25	2.11	31.25	2.00	31.25	0.97	31.25	0.78	31.25	0.51			31.25	1.28
33.75	n.a	33.75	2.00	33.75	0.87	33.75	2.00	33.75	1.78	33.75	1.20	33.75	1.43	33.75	2.00	33.75	1.09	33.75	2.00	33.75	1.07			33.75	1.13
36.25	n.a	36.25	2.00	36.25	1.75	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.48	36.25	0.38	36.25	1.05	36.25	1.96	36.25	0.88			36.25	2.00
Inv Avg	1.03	Inv Avg	1.40	Inv Avg	0.90	Inv Avg	1.14	Inv Avg	1.06	Inv Avg	1.09	Inv Avg	1.57	Inv Avg	1.14	Inv Avg	0.93	Inv Avg	0.88	Inv Avg	0.67	Inv Avg	1.00	Inv Avg	1.19
Risk	Moderate	Risk	Low	Risk	High	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	Low	Risk	Moderate	Risk	High	Risk	High	Risk	High	Risk	Moderate	Risk	Moderate

Figure D-4

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.23	S (ft)	0.30	S (ft)	0.28	S (ft)	0.28	S (ft)	0.15	S (ft)	0.48	S (ft)	0.28	S (ft)	0.25	S (ft)	0.30	S (ft)	0.24	S (ft)	0.42	S (ft)	0.44	S (ft)	0.17
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.37	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	1.31	6.25	n.a	6.25	n.a	6.25	0.47	6.25	0.36	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.27	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.38	8.75	0.38	8.75	0.57	8.75	n.a	8.75	n.a	8.75	0.38	8.75	0.24	8.75	0.37
11.25	n.a	11.25	0.59	11.25	1.25	11.25	0.47	11.25	n.a	11.25	0.61	11.25	0.45	11.25	0.64	11.25	0.25	11.25	0.34	11.25	1.08	11.25	1.36	11.25	0.74
13.75	0.36	13.75	1.27	13.75	0.91	13.75	1.72	13.75	n.a	13.75	1.29	13.75	1.02	13.75	0.91	13.75	1.08	13.75	0.43	13.75	0.39	13.75	0.62	13.75	1.14
16.25	0.59	16.25	1.97	16.25	1.04	16.25	1.35	16.25	1.49	16.25	0.89	16.25	1.81	16.25	2.00	16.25	2.00	16.25	0.78	16.25	1.03	16.25	0.55	16.25	1.74
18.75	0.63	18.75	1.83	18.75	2.00	18.75	0.49	18.75	2.00	18.75	0.47	18.75	1.78	18.75	2.00	18.75	0.87	18.75	2.00	18.75	0.64	18.75	0.56	18.75	2.00
21.25	1.70	21.25	2.00	21.25	1.70	21.25	0.54	21.25	2.05	21.25	0.51	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.10	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	1.31	23.75	1.08	23.75	0.89	23.75	1.35	23.75	1.12	23.75	2.00	23.75	0.84	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	1.34	26.25	2.00	26.25	1.64	26.25	0.88	26.25	2.00	26.25	0.93			26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.83	26.25	2.00	26.25	2.00
28.75	2.00	28.75	0.78	28.75	0.50	28.75	n.a	28.75	0.49	28.75	2.00			28.75	0.78	28.75	1.14	28.75	2.00	28.75	0.77	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.05	31.25	0.83	31.25	n.a	31.25	1.70	31.25	2.00			31.25	2.00	31.25	1.65	31.25	2.00	31.25	1.42	31.25	2.00	31.25	2.00
33.75	1.63	33.75	2.00			33.75	n.a	33.75	2.00	33.75	0.80			33.75	2.00	33.75	1.29	33.75	2.00	33.75	0.81	33.75	1.47	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	0.74	36.25	1.21			36.25	2.00	36.25	0.92			36.25	0.93	36.25	1.16		
Inv Avg	1.16	Inv Avg	1.09	Inv Avg	0.99	Inv Avg	1.10	Inv Avg	1.44	Inv Avg	0.81	Inv Avg	0.85	Inv Avg	1.26	Inv Avg	1.12	Inv Avg	1.16	Inv Avg	0.90	Inv Avg	0.96	Inv Avg	1.33
Risk	Moderate	Risk	Moderate	Risk	High	Risk	Moderate	Risk	Low	Risk	High	Risk	High	Risk	Low	Risk	Moderate	Risk	Moderate	Risk	High	Risk	High	Risk	Low

Figure D-4

SCHEDULE CJG-ST1

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.22	S (ft)	0.24	S (ft)	0.30	S (ft)	0.38	S (ft)	0.48	S (ft)	0.18	S (ft)	0.07	S (ft)	0.14	S (ft)	0.08	S (ft)	0.13	S (ft)	0.15	S (ft)	0.40	S (ft)	0.28
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.29	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.37	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.27	6.25	0.32
8.75	n.a	8.75	1.99	8.75	n.a	8.75	n.a	8.75	0.32	8.75	0.57	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	0.80	8.75	0.83
11.25	0.58	11.25	1.13	11.25	n.a	11.25	n.a	11.25	0.28	11.25	1.12	11.25	0.54	11.25	0.54	11.25	n.a	11.25	n.a	11.25	n.a	11.25	0.96	11.25	0.51
13.75	2.00	13.75	2.00	13.75	0.47	13.75	n.a	13.75	0.59	13.75	1.30	13.75	2.00	13.75	2.00	13.75	1.19	13.75	0.30	13.75	0.38	13.75	1.44	13.75	2.00
16.25	2.00	16.25	1.79	16.25	0.93	16.25	0.26	16.25	0.72	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.95	16.25	2.00	16.25	1.31	16.25	1.64	16.25	2.00
18.75	2.00	18.75	1.00	18.75	2.00	18.75	2.00	18.75	0.94	18.75	0.99	18.75	2.00	18.75	2.00	18.75	1.30	18.75	2.00	18.75	2.00	18.75	0.69	18.75	0.66
21.25	2.00	21.25	0.97	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.11			21.25	2.00	21.25	1.08	21.25	2.00	21.25	2.00	21.25	1.05	21.25	2.00
23.75	1.65	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.54	23.75	0.75			23.75	2.00	23.75	2.00			23.75	2.00	23.75	0.76	23.75	2.00
26.25	0.64	26.25	2.00	26.25	2.00	26.25	0.62	26.25	1.08	26.25	1.34			26.25	1.91	26.25	1.26			26.25	2.00	26.25	1.41	26.25	2.00
28.75	0.95	28.75	1.62	28.75	2.00	28.75	0.70	28.75	0.66	28.75	1.30			28.75	0.57	28.75	1.40			28.75	2.00	28.75	1.10		
31.25	0.58	31.25	0.60	31.25	0.71	31.25	2.00	31.25	1.57	31.25	2.00			31.25	1.52	31.25	2.00			31.25	0.76	31.25	0.86		
33.75	2.00	33.75	1.39	33.75	1.38	33.75	0.73	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	1.51	36.25	1.69	36.25	0.68	36.25	1.33	36.25	2.00											36.25	2.00		
Inv Avg	1.25	Inv Avg	1.17	Inv Avg	1.08	Inv Avg	1.02	Inv Avg	0.84	Inv Avg	1.29	Inv Avg	1.50	Inv Avg	1.40	Inv Avg	1.54	Inv Avg	1.23	Inv Avg	1.34	Inv Avg	0.95	Inv Avg	0.97
Risk	Low	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	High	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	High	Risk	High

Figure D-4

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.36	S (ft)	0.17	S (ft)	0.45	S (ft)	0.50	S (ft)	0.23	S (ft)	0.26	S (ft)	0.37	S (ft)	0.20	S (ft)	0.65	S (ft)	0.28	S (ft)	0.41	S (ft)	0.62	S (ft)	0.32
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.31	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.40	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	1.15	6.25	n.a	6.25	n.a	6.25	0.26	6.25	0.26	6.25	2.00	6.25	0.39	6.25	n.a	6.25	0.63	6.25	0.39	6.25	0.32	6.25	n.a
8.75	0.54	8.75	2.00	8.75	0.40	8.75	n.a	8.75	1.70	8.75	1.56	8.75	0.80	8.75	0.51	8.75	n.a	8.75	2.00	8.75	0.61	8.75	0.60	8.75	0.28
11.25	0.56	11.25	0.60	11.25	0.64	11.25	0.23	11.25	0.84	11.25	0.57	11.25	0.74	11.25	1.46	11.25	n.a	11.25	2.00	11.25	0.66	11.25	0.46	11.25	0.86
13.75	2.00	13.75	1.48	13.75	1.04	13.75	0.56	13.75	2.00	13.75	2.00	13.75	1.16	13.75	1.29	13.75	0.22	13.75	0.93	13.75	0.75	13.75	0.50	13.75	0.81
16.25	2.00	16.25	0.84	16.25	1.64	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.89	16.25	1.13	16.25	1.07	16.25	1.47	16.25	0.48	16.25	0.59	16.25	2.00
18.75	0.55	18.75	2.00	18.75	2.00	18.75	0.65	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.30	18.75	0.91	18.75	2.00	18.75	0.61	18.75	0.70	18.75	2.00
21.25	2.00	21.25	0.75	21.25	1.82	21.25	0.96	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.13	21.25	0.63	21.25	2.00	21.25	0.86	21.25	0.71	21.25	0.67
23.75	2.00	23.75	2.00	23.75	2.12	23.75	0.87	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.58	23.75	0.66	23.75	2.00	23.75	1.93	23.75	1.64	23.75	1.02
26.25	2.00			26.25	0.67	26.25	1.78			26.25	2.00	26.25	0.66	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.70			28.75	0.57	28.75	1.46			28.75	1.18	28.75	0.68	28.75	2.00	28.75	1.27	28.75	2.00	28.75	2.00	28.75	n.a	28.75	1.50
31.25	0.78			31.25	0.59	31.25	2.00			31.25	1.97	31.25	0.87	31.25	2.00	31.25	1.91	31.25	0.45	31.25	2.00	31.25	0.37	31.25	1.58
33.75	0.57			33.75	2.00	33.75	2.00					33.75	0.79					32.25	0.71	32.25	2.00	33.75	0.55	33.75	2.00
36.25	0.63			36.25	2.00							36.25	0.59					33.25	1.46					36.25	1.05
Inv Avg	1.03	Inv Avg	1.21	Inv Avg	0.87	Inv Avg	0.96	Inv Avg	1.09	Inv Avg	1.12	Inv Avg	1.06	Inv Avg	1.11	Inv Avg	0.93	Inv Avg	1.06	Inv Avg	0.91	Inv Avg	0.68	Inv Avg	1.06
Risk	Moderate	Risk	Low	Risk	High	Risk	High	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	High	Risk	Moderate	Risk	High	Risk	High	Risk	Moderate

Figure D-4

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.33	S (ft)	0.14	S (ft)	0.35	S (ft)	0.55	S (ft)	0.17	S (ft)	0.37	S (ft)	0.44	S (ft)	0.18	S (ft)	0.23	S (ft)	0.34	S (ft)	0.36	S (ft)	0.46	S (ft)	0.60
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.28	6.25	0.62	6.25	n.a	6.25	0.34	6.25	n.a	6.25	n.a	6.25	0.30	6.25	n.a	6.25	0.32	6.25	0.35	6.25	n.a	6.25	0.37	6.25	0.44
8.75	0.70	8.75	1.20	8.75	0.37	8.75	0.90	8.75	0.59	8.75	0.30	8.75	1.70	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.45	8.75	0.41	8.75	n.a
11.25	1.07	11.25	2.00	11.25	0.84	11.25	0.54	11.25	0.74	11.25	0.71	11.25	1.78	11.25	n.a	11.25	1.25	11.25	0.70	11.25	0.75	11.25	0.67	11.25	n.a
13.75	2.00	13.75	2.00	13.75	0.83	13.75	0.45	13.75	1.15	13.75	1.85	13.75	1.98	13.75	n.a	13.75	2.06	13.75	0.51	13.75	1.65	13.75	2.00	13.75	0.56
16.25	1.73	16.25	1.03	16.25	0.46	16.25	0.42	16.25	1.30	16.25	0.80	16.25	2.00	16.25	0.31	16.25	2.00	16.25	1.02	16.25	0.67	16.25	2.00	16.25	0.62
18.75	2.00	18.75	0.88	18.75	1.32	18.75	0.65	18.75	1.36	18.75	0.82	18.75	0.72	18.75	1.39	18.75	0.45	18.75	0.59	18.75	0.99	18.75	0.93	18.75	1.67
21.25	0.81	21.25	2.05	21.25	0.86	21.25	0.59	21.25	1.08	21.25	2.00	21.25	0.57	21.25	0.81	21.25	2.00	21.25	2.00	21.25	1.04	21.25	n.a	21.25	0.79
23.75	0.84	23.75	1.48	23.75	0.64	23.75	0.62	23.75	2.00	23.75	2.00	23.75	0.67	23.75	1.84	23.75	2.00	23.75	2.00	23.75	1.12	23.75	0.43	23.75	1.06
26.25	1.09	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.49	26.25	2.00	26.25	1.45	26.25	2.00	26.25	2.00	26.25	0.98	26.25	0.84
28.75	1.52	28.75	1.91	28.75	1.21	28.75	2.00	28.75	2.00	28.75	1.21	28.75	0.50	28.75	2.16	28.75	1.55	28.75	2.00	28.75	2.00	28.75	0.72	28.75	2.00
31.25	1.11	31.25	2.14	31.25	2.00	31.25	1.02	31.25	1.68	31.25	0.99	31.25	2.00	31.25	2.00	31.25	1.80	31.25	1.10	31.25	n.a	31.25	0.77	31.25	2.00
33.75	1.64	33.75	2.00	33.75	2.00	33.75	1.03	33.75	1.16	33.75	1.06	33.75	1.33	33.75	2.00	33.75	1.33	33.75	0.97	33.75	0.30	33.75	1.87	33.75	0.80
36.25	2.00			36.25	2.00	36.25	2.00			36.25	0.73			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	1.52
																								46.25	0.92
																								48.75	0.70
																								51.25	0.84
																								53.75	0.76
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	0.83
Inv Avg	1.03	Inv Avg	1.44	Inv Avg	0.99	Inv Avg	0.76	Inv Avg	1.30	Inv Avg	1.01	Inv Avg	0.85	Inv Avg	1.34	Inv Avg	1.17	Inv Avg	1.01	Inv Avg	0.95	Inv Avg	0.87	Inv Avg	1.11
Risk	Moderate	Risk	Low	Risk	High	Risk	High	Risk	Low	Risk	Moderate	Risk	High	Risk	Low	Risk	Moderate	Risk	Moderate	Risk	High	Risk	High	Risk	Moderate

Figure D-4

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
10' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.32	S (ft)	0.09	S (ft)	0.33	S (ft)	0.40	S (ft)	0.14	S (ft)	0.37	S (ft)	0.34	S (ft)	0.22	S (ft)	0.22	S (ft)	0.21	S (ft)	0.25	S (ft)	0.24	S (ft)	0.10
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.75	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.79	6.25	0.46	6.25	n.a	6.25	0.93	6.25	1.04	6.25	n.a	6.25	0.54	6.25	n.a	6.25	0.64	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.08	8.75	0.89	8.75	n.a	8.75	n.a	8.75	0.78	8.75	0.69	8.75	0.53	8.75	1.32	8.75	0.84	8.75	n.a	8.75	0.66	8.75	n.a
11.25	0.41	11.25	2.00	11.25	0.53	11.25	0.73	11.25	0.84	11.25	0.97	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.16	11.25	n.a	11.25	2.00	11.25	0.94
13.75	n.a	13.75	2.00	13.75	0.80	13.75	1.37	13.75	2.00	13.75	1.53	13.75	0.71	13.75	n.a	13.75	2.00	13.75	1.67	13.75	0.68	13.75	1.45	13.75	1.61
16.25	0.40	16.25	2.00	16.25	1.14	16.25	1.42	16.25	2.00	16.25	1.44	16.25	1.78	16.25	1.09	16.25	1.23	16.25	0.80	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.18	18.75	0.85	18.75	2.00	18.75	0.61	18.75	0.97	18.75	1.10	18.75	1.48	18.75	1.78	18.75	1.67	18.75	2.00	18.75	1.14
21.25	2.00	21.25	1.75	21.25	1.93	21.25	0.66	21.25	1.02	21.25	1.47	21.25	1.69	21.25	1.22	21.25	1.27	21.25	1.66	21.25	2.00	21.25	1.46	21.25	2.00
23.75	1.72	23.75	2.00	23.75	2.00	23.75	1.12	23.75	1.29	23.75	2.00	23.75	0.84	23.75	1.79	23.75	1.41	23.75	1.02	23.75	2.00	23.75	0.78	23.75	1.10
26.25	2.00	26.25	1.09	26.25	1.74	26.25	2.00	26.25	1.29	26.25	2.00	26.25	0.88	26.25	1.67	26.25	2.00	26.25	0.97	26.25	2.00	26.25	0.93	26.25	1.84
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.22	28.75	1.09	28.75	1.23	28.75	1.52	28.75	2.00	28.75	2.00	28.75	1.28	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.07	31.25	2.00	31.25	1.11	31.25	1.83	31.25	2.00	31.25	1.93	31.25	1.10	31.25	1.94	31.25	2.00	31.25	2.00	31.25	0.93	31.25	2.00
33.75	2.00	33.75	1.15	33.75	2.00	33.75	2.00	33.75	1.21	33.75	2.00	33.75	2.15	33.75	2.00	33.75	0.79	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	1.39	36.25	1.08	36.25	2.00	36.25	2.00	36.25	0.92	36.25	2.00	36.25	2.00	36.25	0.75	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.27	Inv Avg	1.66	Inv Avg	1.27	Inv Avg	1.14	Inv Avg	1.45	Inv Avg	1.22	Inv Avg	1.24	Inv Avg	1.32	Inv Avg	1.38	Inv Avg	1.47	Inv Avg	1.40	Inv Avg	1.44	Inv Avg	1.66
Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-5

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.22	S (ft)	0.31	S (ft)	0.21	S (ft)	0.20	S (ft)	0.38	S (ft)	0.28	S (ft)	0.13	S (ft)	0.13	S (ft)	0.45	S (ft)	0.03	S (ft)	0.24	S (ft)	0.32	S (ft)	0.27
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.82	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.82	6.25	n.a	6.25	n.a	6.25	0.66	6.25	0.50	6.25	n.a	6.25	0.68	6.25	n.a	6.25	n.a	6.25	0.69	6.25	0.57	6.25	1.27
8.75	n.a	8.75	0.77	8.75	n.a	8.75	n.a	8.75	0.77	8.75	1.85	8.75	0.57	8.75	n.a	8.75	0.48	8.75	n.a	8.75	0.67	8.75	1.10	8.75	1.27
11.25	0.56	11.25	1.29	11.25	1.44	11.25	1.17	11.25	1.10	11.25	0.75	11.25	1.13	11.25	n.a	11.25	0.97	11.25	2.00	11.25	2.00	11.25	0.88	11.25	1.26
13.75	0.87	13.75	1.04	13.75	0.78	13.75	0.80	13.75	0.87	13.75	2.00	13.75	1.23	13.75	1.07	13.75	0.87	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.85
16.25	0.84	16.25	1.07	16.25	1.57	16.25	1.44	16.25	0.53	16.25	2.00	16.25	2.06	16.25	2.00	16.25	0.44	16.25	1.33	16.25	1.13	16.25	2.00	16.25	n.a
18.75	2.10	18.75	1.10	18.75	1.62	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.76	18.75	2.00	18.75	1.37	18.75	1.75	18.75	1.40	18.75	2.00	18.75	0.76
21.25	2.06	21.25	0.79	21.25	0.82	21.25	1.07	21.25	0.92	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.55	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.90
23.75	1.50	23.75	0.96	23.75	1.12	23.75	1.18	23.75	2.00	23.75	1.56	23.75	2.00	23.75	1.40	23.75	2.00	23.75	1.58	23.75	2.00	23.75	0.87	23.75	1.50
26.25	1.83	26.25	2.00	26.25	0.99	26.25	1.18	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.55	26.25	2.00			26.25	2.00	26.25	0.88	26.25	1.61
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.47	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.15	28.75	2.00	28.75	0.96
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.25	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.17	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	0.98			33.75	n.a	33.75	1.72	33.75	2.05
36.25	2.00	36.25	n.a	36.25	1.27	36.25	0.68	36.25	1.18	36.25	0.93			36.25	2.00	36.25	0.74					36.25	1.05	36.25	0.58
				38.75	1.50	38.75	2.13			38.75	2.00														
				41.25	2.00	41.25	1.99			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.46	Inv Avg	1.26	Inv Avg	1.47	Inv Avg	1.45	Inv Avg	1.18	Inv Avg	1.44	Inv Avg	1.53	Inv Avg	1.62	Inv Avg	1.09	Inv Avg	1.83	Inv Avg	1.33	Inv Avg	1.29	Inv Avg	1.26
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-5

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.28	S (ft)	0.12	S (ft)	0.36	S (ft)	0.22	S (ft)	0.26	S (ft)	0.25	S (ft)	0.10	S (ft)	0.18	S (ft)	0.30	S (ft)	0.36	S (ft)	0.58	S (ft)	0.19	S (ft)	0.14
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.77	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.70	6.25	0.83	6.25	0.59	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.49	6.25	n.a	6.25	n.a	6.25	0.72	6.25	0.71
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.02	8.75	n.a	8.75	0.75	8.75	n.a	8.75	0.95	8.75	0.70	8.75	0.82	8.75	0.53	8.75	1.00	8.75	1.15
11.25	n.a	11.25	n.a	11.25	0.47	11.25	n.a	11.25	n.a	11.25	0.50	11.25	n.a	11.25	1.27	11.25	0.92	11.25	0.92	11.25	0.67	11.25	0.66	11.25	n.a
13.75	0.44	13.75	0.60	13.75	0.57	13.75	0.84	13.75	0.58	13.75	1.80	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.93	13.75	0.50	13.75	2.00	13.75	n.a
16.25	0.79	16.25	1.07	16.25	2.00	16.25	1.48	16.25	0.85	16.25	2.00	16.25	2.00	16.25	1.65	16.25	1.85	16.25	0.79	16.25	0.89	16.25	2.00	16.25	1.07
18.75	1.59	18.75	1.59	18.75	2.00	18.75	2.00	18.75	2.00	18.75	0.95	18.75	1.73	18.75	1.92	18.75	2.00	18.75	0.62	18.75	1.09	18.75	2.00	18.75	1.43
21.25	0.93	21.25	2.00	21.25	1.00	21.25	1.95	21.25	1.41	21.25	1.57	21.25	2.00	21.25	1.59	21.25	2.00	21.25	1.16	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	0.89	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.22	23.75	0.88	23.75	1.12	23.75	1.68	23.75	2.00	23.75	1.83
26.25	1.70	26.25	2.00	26.25	1.21	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.57			26.25	2.00
28.75	1.44	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.59	28.75	1.37	28.75	0.73			28.75	2.00
31.25	0.99	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.48	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.23	31.25	0.99	31.25	0.65			31.25	1.63
33.75	n.a	33.75	2.00	33.75	1.09	33.75	2.00	33.75	2.00	33.75	1.51	33.75	1.79	33.75	2.00	33.75	1.37	33.75	2.00	33.75	1.34			33.75	1.42
36.25	n.a	36.25	2.00	36.25	2.17	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.60	36.25	0.47	36.25	1.31	36.25	2.00	36.25	1.09			36.25	2.00
Inv Avg	1.30	Inv Avg	1.63	Inv Avg	1.20	Inv Avg	1.47	Inv Avg	1.37	Inv Avg	1.40	Inv Avg	1.70	Inv Avg	1.42	Inv Avg	1.29	Inv Avg	1.18	Inv Avg	0.92	Inv Avg	1.35	Inv Avg	1.54
Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	High	Risk	Low	Risk	Low

Figure D-5

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.21	S (ft)	0.24	S (ft)	0.21	S (ft)	0.23	S (ft)	0.13	S (ft)	0.39	S (ft)	0.27	S (ft)	0.14	S (ft)	0.24	S (ft)	0.20	S (ft)	0.32	S (ft)	0.42	S (ft)	0.13
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.71	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.81	6.25	0.62	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.45	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.62	8.75	0.62	8.75	0.92	8.75	n.a	8.75	n.a	8.75	0.62	8.75	0.39	8.75	0.60
11.25	n.a	11.25	0.92	11.25	1.95	11.25	0.73	11.25	n.a	11.25	0.95	11.25	0.70	11.25	0.99	11.25	0.39	11.25	0.52	11.25	1.68	11.25	2.12	11.25	1.16
13.75	0.53	13.75	1.89	13.75	1.36	13.75	2.00	13.75	n.a	13.75	1.93	13.75	1.51	13.75	1.36	13.75	1.61	13.75	0.63	13.75	0.58	13.75	0.92	13.75	1.70
16.25	0.85	16.25	2.00	16.25	1.50	16.25	1.95	16.25	2.14	16.25	1.28	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.12	16.25	1.48	16.25	0.79	16.25	2.00
18.75	0.88	18.75	2.00	18.75	2.00	18.75	0.69	18.75	2.00	18.75	0.66	18.75	2.00	18.75	2.00	18.75	1.22	18.75	2.00	18.75	0.89	18.75	0.79	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.74	21.25	2.00	21.25	0.69	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	1.74	23.75	1.45	23.75	1.19	23.75	1.80	23.75	1.50	23.75	2.00	23.75	1.13	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	1.75	26.25	2.00	26.25	2.15	26.25	1.16	26.25	2.00	26.25	1.22			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.09	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.00	28.75	0.65	28.75	n.a	28.75	0.63	28.75	2.00			28.75	1.00	28.75	1.47	28.75	2.00	28.75	0.99	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.33	31.25	1.06	31.25	n.a	31.25	2.16	31.25	2.00			31.25	2.00	31.25	2.11	31.25	2.00	31.25	1.81	31.25	2.00	31.25	2.00
33.75	2.04	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.01			33.75	2.00	33.75	1.62	33.75	2.00	33.75	1.02	33.75	1.85	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	0.91	36.25	1.51			36.25	2.00	36.25	1.15			36.25	1.16	36.25	1.45		
Inv Avg	1.43	Inv Avg	1.40	Inv Avg	1.37	Inv Avg	1.38	Inv Avg	1.64	Inv Avg	1.13	Inv Avg	1.20	Inv Avg	1.54	Inv Avg	1.41	Inv Avg	1.42	Inv Avg	1.20	Inv Avg	1.26	Inv Avg	1.62
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low

Figure D-5

SCHEDULE CJG-ST1

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.19	S (ft)	0.19	S (ft)	0.26	S (ft)	0.34	S (ft)	0.40	S (ft)	0.11	S (ft)	0.07	S (ft)	0.14	S (ft)	0.04	S (ft)	0.13	S (ft)	0.14	S (ft)	0.26	S (ft)	0.23
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.55	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.64	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.48	6.25	0.56
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.52	8.75	0.93	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.31	8.75	1.36
11.25	0.90	11.25	1.76	11.25	n.a	11.25	n.a	11.25	0.43	11.25	1.74	11.25	0.84	11.25	0.84	11.25	n.a	11.25	n.a	11.25	n.a	11.25	1.49	11.25	0.79
13.75	2.00	13.75	2.00	13.75	0.70	13.75	n.a	13.75	0.88	13.75	1.94	13.75	2.00	13.75	2.00	13.75	1.78	13.75	0.45	13.75	0.57	13.75	2.15	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.34	16.25	0.38	16.25	1.04	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.37	16.25	2.00	16.25	1.89	16.25	2.00	16.25	2.00
18.75	2.00	18.75	1.40	18.75	2.00	18.75	2.00	18.75	1.32	18.75	1.39	18.75	2.00	18.75	2.00	18.75	1.82	18.75	2.00	18.75	2.00	18.75	0.97	18.75	0.93
21.25	2.00	21.25	1.32	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.52			21.25	2.00	21.25	1.47	21.25	2.00	21.25	2.00	21.25	1.43	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.05	23.75	1.01			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.01	23.75	2.00
26.25	0.84	26.25	2.00	26.25	2.00	26.25	0.81	26.25	1.42	26.25	1.76			26.25	2.00	26.25	1.66			26.25	2.00	26.25	1.85	26.25	2.00
28.75	1.22	28.75	2.09	28.75	2.00	28.75	0.91	28.75	0.85	28.75	1.67			28.75	0.73	28.75	1.81			28.75	2.00	28.75	1.42		
31.25	0.73	31.25	0.76	31.25	0.91	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.94	31.25	2.00			31.25	0.97	31.25	1.09		
33.75	2.00	33.75	1.75	33.75	1.73	33.75	0.92	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	1.88	36.25	2.10	36.25	0.85	36.25	1.65	36.25	2.00											36.25	2.00		
Inv Avg	1.47	Inv Avg	1.50	Inv Avg	1.41	Inv Avg	1.23	Inv Avg	1.15	Inv Avg	1.63	Inv Avg	1.71	Inv Avg	1.61	Inv Avg	1.82	Inv Avg	1.44	Inv Avg	1.56	Inv Avg	1.32	Inv Avg	1.31
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-5

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.34	S (ft)	0.08	S (ft)	0.42	S (ft)	0.43	S (ft)	0.20	S (ft)	0.25	S (ft)	0.24	S (ft)	0.18	S (ft)	0.60	S (ft)	0.22	S (ft)	0.28	S (ft)	0.57	S (ft)	0.22
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.59	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.76	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.01	6.25	n.a	6.25	n.a	6.25	0.45	6.25	0.46	6.25	2.00	6.25	0.67	6.25	n.a	6.25	1.09	6.25	0.69	6.25	0.56	6.25	n.a
8.75	0.89	8.75	2.00	8.75	0.65	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.31	8.75	0.84	8.75	n.a	8.75	2.00	8.75	1.00	8.75	0.99	8.75	0.46
11.25	0.87	11.25	0.94	11.25	0.99	11.25	0.36	11.25	1.30	11.25	0.88	11.25	1.15	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.03	11.25	0.72	11.25	1.34
13.75	2.00	13.75	2.00	13.75	1.56	13.75	0.83	13.75	2.00	13.75	2.00	13.75	1.73	13.75	1.92	13.75	0.33	13.75	1.38	13.75	1.11	13.75	0.74	13.75	1.21
16.25	2.00	16.25	1.20	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.63	16.25	1.54	16.25	2.12	16.25	0.70	16.25	0.84	16.25	2.00
18.75	0.78	18.75	2.00	18.75	2.00	18.75	0.91	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.81	18.75	1.28	18.75	2.00	18.75	0.86	18.75	0.98	18.75	2.00
21.25	2.00	21.25	1.02	21.25	2.00	21.25	1.32	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.55	21.25	0.86	21.25	2.00	21.25	1.17	21.25	0.97	21.25	0.91
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.16	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.12	23.75	0.88	23.75	2.00	23.75	2.00	23.75	2.20	23.75	1.36
26.25	2.00			26.25	0.88	26.25	2.00			26.25	2.00	26.25	0.86	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.19			28.75	0.73	28.75	1.89			28.75	1.53	28.75	0.87	28.75	2.00	28.75	1.64	28.75	2.00	28.75	2.00	28.75	n.a	28.75	1.93
31.25	1.00			31.25	0.76	31.25	2.00			31.25	2.00	31.25	1.11	31.25	2.00	31.25	2.00	31.25	0.57	31.25	2.00	31.25	0.47	31.25	2.01
33.75	0.71			33.75	2.00	33.75	2.00					33.75	0.99					32.25	0.90	32.25	2.00	33.75	0.69	33.75	2.00
36.25	0.79			36.25	2.00							36.25	0.73					33.25	1.84					36.25	1.30
Inv Avg	1.28	Inv Avg	1.57	Inv Avg	1.18	Inv Avg	1.24	Inv Avg	1.43	Inv Avg	1.45	Inv Avg	1.33	Inv Avg	1.53	Inv Avg	1.19	Inv Avg	1.38	Inv Avg	1.24	Inv Avg	0.95	Inv Avg	1.38
Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	High	Risk	Low

Figure D-5

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.21	S (ft)	0.07	S (ft)	0.26	S (ft)	0.48	S (ft)	0.10	S (ft)	0.23	S (ft)	0.40	S (ft)	0.15	S (ft)	0.22	S (ft)	0.26	S (ft)	0.27	S (ft)	0.36	S (ft)	0.45
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.49	6.25	1.08	6.25	n.a	6.25	0.60	6.25	n.a	6.25	n.a	6.25	0.52	6.25	n.a	6.25	0.55	6.25	0.61	6.25	n.a	6.25	0.64	6.25	0.76
8.75	1.15	8.75	1.96	8.75	0.60	8.75	1.47	8.75	0.97	8.75	0.50	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.74	8.75	0.67	8.75	n.a
11.25	1.67	11.25	2.00	11.25	1.30	11.25	0.84	11.25	1.14	11.25	1.10	11.25	2.00	11.25	n.a	11.25	1.93	11.25	1.09	11.25	1.17	11.25	1.04	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.24	13.75	0.67	13.75	1.71	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	0.75	13.75	2.00	13.75	2.00	13.75	0.83
16.25	2.00	16.25	1.49	16.25	0.66	16.25	0.60	16.25	1.87	16.25	1.15	16.25	2.00	16.25	0.44	16.25	2.00	16.25	1.47	16.25	0.96	16.25	2.00	16.25	0.89
18.75	2.00	18.75	1.23	18.75	1.85	18.75	0.92	18.75	1.90	18.75	1.14	18.75	1.00	18.75	1.95	18.75	0.62	18.75	0.82	18.75	1.38	18.75	1.30	18.75	2.00
21.25	1.11	21.25	2.00	21.25	1.18	21.25	0.80	21.25	1.47	21.25	2.00	21.25	0.77	21.25	1.11	21.25	2.00	21.25	2.00	21.25	1.42	21.25	n.a	21.25	1.08
23.75	1.12	23.75	1.98	23.75	0.85	23.75	0.82	23.75	2.00	23.75	2.00	23.75	0.90	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.50	23.75	0.57	23.75	1.42
26.25	1.43	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.65	26.25	2.00	26.25	1.90	26.25	2.00	26.25	2.00	26.25	1.29	26.25	1.10
28.75	1.96	28.75	2.00	28.75	1.56	28.75	2.00	28.75	2.00	28.75	1.56	28.75	0.65	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	0.93	28.75	2.00
31.25	1.41	31.25	2.00	31.25	2.00	31.25	1.30	31.25	2.14	31.25	1.25	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.40	31.25	n.a	31.25	0.97	31.25	2.00
33.75	2.07	33.75	2.00	33.75	2.00	33.75	1.30	33.75	1.46	33.75	1.33	33.75	1.67	33.75	2.00	33.75	1.67	33.75	1.22	33.75	0.38	33.75	2.00	33.75	1.00
36.25	2.00			36.25	2.00	36.25	2.00			36.25	0.90			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	1.83
																								46.25	1.11
																								48.75	0.83
																								51.25	0.99
																								53.75	0.89
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	0.95
Inv Avg	1.40	Inv Avg	1.77	Inv Avg	1.31	Inv Avg	1.05	Inv Avg	1.67	Inv Avg	1.31	Inv Avg	1.12	Inv Avg	1.55	Inv Avg	1.49	Inv Avg	1.33	Inv Avg	1.22	Inv Avg	1.16	Inv Avg	1.35
Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low

Figure D-5

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
20' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.32	S (ft)	0.06	S (ft)	0.28	S (ft)	0.39	S (ft)	0.10	S (ft)	0.30	S (ft)	0.26	S (ft)	0.17	S (ft)	0.21	S (ft)	0.15	S (ft)	0.24	S (ft)	0.21	S (ft)	0.06
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.82	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.88	6.25	0.51	6.25	n.a	6.25	1.04	6.25	1.16	6.25	n.a	6.25	0.60	6.25	n.a	6.25	0.71	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.23	8.75	1.01	8.75	n.a	8.75	n.a	8.75	0.89	8.75	0.79	8.75	0.60	8.75	1.50	8.75	0.95	8.75	n.a	8.75	0.75	8.75	n.a
11.25	0.47	11.25	2.00	11.25	0.61	11.25	0.83	11.25	0.97	11.25	1.11	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.08
13.75	n.a	13.75	2.00	13.75	0.91	13.75	1.58	13.75	2.00	13.75	1.76	13.75	0.81	13.75	n.a	13.75	2.00	13.75	1.92	13.75	0.79	13.75	1.66	13.75	1.85
16.25	0.46	16.25	2.00	16.25	1.31	16.25	1.63	16.25	2.00	16.25	1.66	16.25	2.05	16.25	1.26	16.25	1.42	16.25	0.92	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.36	18.75	0.98	18.75	2.00	18.75	0.71	18.75	1.11	18.75	1.27	18.75	1.71	18.75	2.05	18.75	1.93	18.75	2.00	18.75	1.32
21.25	2.00	21.25	2.02	21.25	2.00	21.25	0.76	21.25	1.18	21.25	1.69	21.25	1.95	21.25	1.40	21.25	1.47	21.25	1.91	21.25	2.00	21.25	1.68	21.25	2.00
23.75	1.98	23.75	2.00	23.75	2.00	23.75	1.29	23.75	1.48	23.75	2.00	23.75	0.96	23.75	2.05	23.75	1.62	23.75	1.17	23.75	2.00	23.75	0.90	23.75	1.26
26.25	2.00	26.25	1.25	26.25	1.99	26.25	2.00	26.25	1.48	26.25	2.00	26.25	1.01	26.25	1.91	26.25	2.00	26.25	1.11	26.25	2.00	26.25	1.06	26.25	2.11
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.39	28.75	1.24	28.75	1.40	28.75	1.74	28.75	2.00	28.75	2.00	28.75	1.46	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.22	31.25	2.00	31.25	1.26	31.25	2.08	31.25	2.00	31.25	2.00	31.25	1.25	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.06	31.25	2.00
33.75	2.00	33.75	1.31	33.75	2.00	33.75	2.00	33.75	1.38	33.75	2.00	33.75	2.00	33.75	2.00	33.75	0.90	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	1.57	36.25	1.23	36.25	2.00	36.25	2.00	36.25	1.04	36.25	2.00	36.25	2.00	36.25	0.85	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.36	Inv Avg	1.75	Inv Avg	1.38	Inv Avg	1.25	Inv Avg	1.58	Inv Avg	1.34	Inv Avg	1.36	Inv Avg	1.46	Inv Avg	1.50	Inv Avg	1.59	Inv Avg	1.49	Inv Avg	1.54	Inv Avg	1.77
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-6

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.21	S (ft)	0.23	S (ft)	0.16	S (ft)	0.16	S (ft)	0.34	S (ft)	0.26	S (ft)	0.13	S (ft)	0.12	S (ft)	0.36	S (ft)	0.02	S (ft)	0.24	S (ft)	0.23	S (ft)	0.24
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.85	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.91	6.25	n.a	6.25	n.a	6.25	0.74	6.25	0.55	6.25	n.a	6.25	0.76	6.25	n.a	6.25	n.a	6.25	0.77	6.25	0.64	6.25	1.42
8.75	n.a	8.75	0.88	8.75	n.a	8.75	n.a	8.75	0.88	8.75	2.10	8.75	0.65	8.75	n.a	8.75	0.55	8.75	n.a	8.75	0.76	8.75	1.24	8.75	1.45
11.25	0.65	11.25	1.48	11.25	1.65	11.25	1.34	11.25	1.26	11.25	0.86	11.25	1.29	11.25	n.a	11.25	1.11	11.25	2.00	11.25	2.00	11.25	1.00	11.25	1.44
13.75	1.00	13.75	1.20	13.75	0.90	13.75	0.92	13.75	1.00	13.75	2.00	13.75	1.42	13.75	1.23	13.75	1.01	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.98
16.25	0.97	16.25	1.23	16.25	1.81	16.25	1.66	16.25	0.61	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.51	16.25	1.54	16.25	1.30	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.26	18.75	1.86	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.03	18.75	2.00	18.75	1.57	18.75	2.02	18.75	1.61	18.75	2.00	18.75	0.88
21.25	2.00	21.25	0.91	21.25	0.94	21.25	1.23	21.25	1.05	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.79	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.19
23.75	1.72	23.75	1.11	23.75	1.29	23.75	1.36	23.75	2.00	23.75	1.79	23.75	2.00	23.75	1.61	23.75	2.00	23.75	1.82	23.75	2.00	23.75	1.00	23.75	1.72
26.25	2.10	26.25	2.00	26.25	1.13	26.25	1.35	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.78	26.25	2.00			26.25	2.00	26.25	1.01	26.25	1.85
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.68	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.10
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.42	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.12			33.75	n.a	33.75	1.95	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.44	36.25	0.77	36.25	1.34	36.25	1.06			36.25	2.00	36.25	0.84					36.25	1.20	36.25	0.66
				38.75	1.70	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.56	Inv Avg	1.38	Inv Avg	1.59	Inv Avg	1.56	Inv Avg	1.29	Inv Avg	1.54	Inv Avg	1.62	Inv Avg	1.70	Inv Avg	1.20	Inv Avg	1.92	Inv Avg	1.41	Inv Avg	1.40	Inv Avg	1.39
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-6

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.22	S (ft)	0.11	S (ft)	0.32	S (ft)	0.17	S (ft)	0.25	S (ft)	0.22	S (ft)	0.10	S (ft)	0.15	S (ft)	0.24	S (ft)	0.26	S (ft)	0.53	S (ft)	0.18	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.84	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.79	6.25	0.92	6.25	0.66	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.66	6.25	n.a	6.25	n.a	6.25	0.80	6.25	0.80
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.16	8.75	n.a	8.75	0.85	8.75	n.a	8.75	1.08	8.75	0.79	8.75	0.93	8.75	0.60	8.75	1.14	8.75	1.31
11.25	n.a	11.25	n.a	11.25	0.53	11.25	n.a	11.25	n.a	11.25	0.58	11.25	n.a	11.25	1.45	11.25	1.05	11.25	1.05	11.25	0.77	11.25	0.76	11.25	n.a
13.75	0.50	13.75	0.69	13.75	0.65	13.75	0.96	13.75	0.67	13.75	2.07	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.06	13.75	0.58	13.75	2.00	13.75	n.a
16.25	0.91	16.25	1.24	16.25	2.00	16.25	1.70	16.25	0.98	16.25	2.00	16.25	2.00	16.25	1.90	16.25	2.13	16.25	0.91	16.25	1.03	16.25	2.00	16.25	1.24
18.75	1.83	18.75	1.83	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.10	18.75	1.99	18.75	2.00	18.75	2.00	18.75	0.72	18.75	1.25	18.75	2.00	18.75	1.65
21.25	1.07	21.25	2.00	21.25	1.15	21.25	2.00	21.25	1.62	21.25	1.81	21.25	2.00	21.25	1.83	21.25	2.00	21.25	1.33	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.02	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.40	23.75	1.02	23.75	1.29	23.75	1.93	23.75	2.00	23.75	2.11
26.25	1.94	26.25	2.00	26.25	1.38	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.65			26.25	2.00
28.75	1.64	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.82	28.75	1.56	28.75	0.84			28.75	2.00
31.25	1.13	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.68	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.40	31.25	1.13	31.25	0.75			31.25	1.86
33.75	n.a	33.75	2.00	33.75	1.24	33.75	2.00	33.75	2.00	33.75	1.72	33.75	2.04	33.75	2.00	33.75	1.55	33.75	2.00	33.75	1.52			33.75	1.61
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.68	36.25	0.54	36.25	1.48	36.25	2.00	36.25	1.24			36.25	2.00
Inv Avg	1.42	Inv Avg	1.70	Inv Avg	1.30	Inv Avg	1.57	Inv Avg	1.46	Inv Avg	1.51	Inv Avg	1.77	Inv Avg	1.54	Inv Avg	1.42	Inv Avg	1.30	Inv Avg	1.03	Inv Avg	1.44	Inv Avg	1.65
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low

Figure D-6

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.17	S (ft)	0.21	S (ft)	0.19	S (ft)	0.21	S (ft)	0.10	S (ft)	0.35	S (ft)	0.27	S (ft)	0.08	S (ft)	0.23	S (ft)	0.20	S (ft)	0.25	S (ft)	0.37	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.77	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.91	6.25	0.69	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.51	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.70	8.75	0.70	8.75	1.05	8.75	n.a	8.75	n.a	8.75	0.71	8.75	0.45	8.75	0.68
11.25	n.a	11.25	1.05	11.25	2.00	11.25	0.84	11.25	n.a	11.25	1.09	11.25	0.80	11.25	1.13	11.25	0.45	11.25	0.60	11.25	1.93	11.25	2.00	11.25	1.32
13.75	0.61	13.75	2.18	13.75	1.56	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.74	13.75	1.57	13.75	1.86	13.75	0.73	13.75	0.66	13.75	1.06	13.75	1.96
16.25	0.98	16.25	2.00	16.25	1.72	16.25	2.00	16.25	2.00	16.25	1.48	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.29	16.25	1.71	16.25	0.91	16.25	2.00
18.75	1.01	18.75	2.00	18.75	2.00	18.75	0.79	18.75	2.00	18.75	0.76	18.75	2.00	18.75	2.00	18.75	1.40	18.75	2.00	18.75	1.03	18.75	0.91	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.85	21.25	2.00	21.25	0.80	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	1.66	23.75	1.36	23.75	2.07	23.75	1.73	23.75	2.00	23.75	1.29	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.01	26.25	2.00	26.25	2.00	26.25	1.33	26.25	2.00	26.25	1.40			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.25	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.14	28.75	0.74	28.75	n.a	28.75	0.72	28.75	2.00			28.75	1.14	28.75	1.68	28.75	2.00	28.75	1.14	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.52	31.25	1.21	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.06	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.15			33.75	2.00	33.75	1.84	33.75	2.00	33.75	1.16	33.75	2.10	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.04	36.25	1.71			36.25	2.00	36.25	1.30			36.25	1.32	36.25	1.64		
Inv Avg	1.53	Inv Avg	1.51	Inv Avg	1.48	Inv Avg	1.48	Inv Avg	1.70	Inv Avg	1.26	Inv Avg	1.30	Inv Avg	1.64	Inv Avg	1.51	Inv Avg	1.50	Inv Avg	1.33	Inv Avg	1.37	Inv Avg	1.70
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-6

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.14	S (ft)	0.18	S (ft)	0.24	S (ft)	0.29	S (ft)	0.35	S (ft)	0.07	S (ft)	0.06	S (ft)	0.13	S (ft)	0.03	S (ft)	0.13	S (ft)	0.11	S (ft)	0.21	S (ft)	0.20
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.60	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.72	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.54	6.25	0.62
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.59	8.75	1.06	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.49	8.75	1.55
11.25	1.03	11.25	2.01	11.25	n.a	11.25	n.a	11.25	0.49	11.25	1.99	11.25	0.96	11.25	0.96	11.25	n.a	11.25	n.a	11.25	n.a	11.25	1.71	11.25	0.90
13.75	2.00	13.75	2.00	13.75	0.81	13.75	n.a	13.75	1.02	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.05	13.75	0.51	13.75	0.65	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.54	16.25	0.44	16.25	1.20	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.58	16.25	2.00	16.25	2.18	16.25	2.00	16.25	2.00
18.75	2.00	18.75	1.62	18.75	2.00	18.75	2.00	18.75	1.52	18.75	1.60	18.75	2.00	18.75	2.00	18.75	2.09	18.75	2.00	18.75	2.00	18.75	1.11	18.75	1.07
21.25	2.00	21.25	1.52	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.75			21.25	2.00	21.25	1.69	21.25	2.00	21.25	2.00	21.25	1.65	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.16			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.16	23.75	2.00
26.25	0.96	26.25	2.00	26.25	2.00	26.25	0.93	26.25	1.62	26.25	2.02			26.25	2.00	26.25	1.90			26.25	2.00	26.25	2.12	26.25	2.00
28.75	1.40	28.75	2.00	28.75	2.00	28.75	1.04	28.75	0.98	28.75	1.92			28.75	0.84	28.75	2.07			28.75	2.00	28.75	1.63		
31.25	0.84	31.25	0.86	31.25	1.03	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.11	31.25	1.24		
33.75	2.00	33.75	1.99	33.75	1.97	33.75	1.04	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.13	36.25	2.00	36.25	0.96	36.25	1.87	36.25	2.00											36.25	2.00		
Inv Avg	1.57	Inv Avg	1.61	Inv Avg	1.50	Inv Avg	1.32	Inv Avg	1.26	Inv Avg	1.76	Inv Avg	1.76	Inv Avg	1.68	Inv Avg	1.94	Inv Avg	1.51	Inv Avg	1.65	Inv Avg	1.44	Inv Avg	1.41
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-6

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.27	S (ft)	0.05	S (ft)	0.36	S (ft)	0.40	S (ft)	0.20	S (ft)	0.22	S (ft)	0.19	S (ft)	0.17	S (ft)	0.56	S (ft)	0.20	S (ft)	0.24	S (ft)	0.48	S (ft)	0.20
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.65	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.82	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.50	6.25	0.51	6.25	2.00	6.25	0.75	6.25	n.a	6.25	1.22	6.25	0.77	6.25	0.63	6.25	n.a
8.75	1.01	8.75	2.00	8.75	0.74	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.48	8.75	0.95	8.75	n.a	8.75	2.00	8.75	1.14	8.75	1.12	8.75	0.52
11.25	1.00	11.25	1.07	11.25	1.13	11.25	0.41	11.25	1.49	11.25	1.01	11.25	1.32	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.18	11.25	0.82	11.25	1.53
13.75	2.00	13.75	2.00	13.75	1.79	13.75	0.96	13.75	2.00	13.75	2.00	13.75	1.99	13.75	2.00	13.75	0.38	13.75	1.59	13.75	1.28	13.75	0.85	13.75	1.39
16.25	2.00	16.25	1.39	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.88	16.25	1.78	16.25	2.00	16.25	0.80	16.25	0.97	16.25	2.00
18.75	0.89	18.75	2.00	18.75	2.00	18.75	1.05	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.09	18.75	1.47	18.75	2.00	18.75	0.99	18.75	1.13	18.75	2.00
21.25	2.00	21.25	1.17	21.25	2.00	21.25	1.51	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.78	21.25	0.99	21.25	2.00	21.25	1.34	21.25	1.12	21.25	1.05
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.33	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.01	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.57
26.25	2.00			26.25	1.01	26.25	2.00			26.25	2.00	26.25	0.99	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	0.84	28.75	2.16			28.75	1.75	28.75	1.00	28.75	2.00	28.75	1.88	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.14			31.25	0.86	31.25	2.00			31.25	2.00	31.25	1.27	31.25	2.00	31.25	2.00	31.25	0.65	31.25	2.00	31.25	0.54	31.25	2.00
33.75	0.81			33.75	2.00	33.75	2.00					33.75	1.13					32.25	1.02	32.25	2.00	33.75	0.78	33.75	2.00
36.25	0.89			36.25	2.00							36.25	0.82					33.25	2.09					36.25	1.47
Inv Avg	1.38	Inv Avg	1.66	Inv Avg	1.28	Inv Avg	1.36	Inv Avg	1.50	Inv Avg	1.52	Inv Avg	1.45	Inv Avg	1.64	Inv Avg	1.31	Inv Avg	1.48	Inv Avg	1.36	Inv Avg	1.05	Inv Avg	1.49
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low

Figure D-6

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.19	S (ft)	0.04	S (ft)	0.24	S (ft)	0.43	S (ft)	0.06	S (ft)	0.19	S (ft)	0.36	S (ft)	0.14	S (ft)	0.21	S (ft)	0.24	S (ft)	0.24	S (ft)	0.31	S (ft)	0.33
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.55	6.25	1.21	6.25	n.a	6.25	0.67	6.25	n.a	6.25	n.a	6.25	0.59	6.25	n.a	6.25	0.62	6.25	0.69	6.25	n.a	6.25	0.72	6.25	0.85
8.75	1.31	8.75	2.00	8.75	0.68	8.75	1.67	8.75	1.10	8.75	0.56	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.84	8.75	0.76	8.75	n.a
11.25	1.91	11.25	2.00	11.25	1.49	11.25	0.96	11.25	1.31	11.25	1.26	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.24	11.25	1.34	11.25	1.19	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.42	13.75	0.77	13.75	1.97	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	0.87	13.75	2.00	13.75	2.00	13.75	0.95
16.25	2.00	16.25	1.72	16.25	0.75	16.25	0.69	16.25	2.16	16.25	1.33	16.25	2.00	16.25	0.51	16.25	2.00	16.25	1.69	16.25	1.11	16.25	2.00	16.25	1.03
18.75	2.00	18.75	1.41	18.75	2.13	18.75	1.05	18.75	2.19	18.75	1.32	18.75	1.15	18.75	2.00	18.75	0.72	18.75	0.94	18.75	1.59	18.75	1.49	18.75	2.00
21.25	1.27	21.25	2.00	21.25	1.36	21.25	0.92	21.25	1.70	21.25	2.00	21.25	0.89	21.25	1.28	21.25	2.00	21.25	2.00	21.25	1.64	21.25	n.a	21.25	1.24
23.75	1.28	23.75	2.00	23.75	0.98	23.75	0.95	23.75	2.00	23.75	2.00	23.75	1.03	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.72	23.75	0.66	23.75	1.63
26.25	1.63	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.74	26.25	2.00	26.25	2.18	26.25	2.00	26.25	2.00	26.25	1.48	26.25	1.26
28.75	2.00	28.75	2.00	28.75	1.79	28.75	2.00	28.75	2.00	28.75	1.79	28.75	0.74	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.07	28.75	2.00
31.25	1.61	31.25	2.00	31.25	2.00	31.25	1.48	31.25	2.00	31.25	1.43	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.60	31.25	n.a	31.25	1.11	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.48	33.75	1.66	33.75	1.51	33.75	1.90	33.75	2.00	33.75	1.90	33.75	1.39	33.75	0.43	33.75	2.00	33.75	1.14
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.02			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.06
																								46.25	1.24
																								48.75	0.93
																								51.25	1.10
																								53.75	0.99
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.05
Inv Avg	1.51	Inv Avg	1.84	Inv Avg	1.44	Inv Avg	1.17	Inv Avg	1.80	Inv Avg	1.43	Inv Avg	1.23	Inv Avg	1.62	Inv Avg	1.58	Inv Avg	1.44	Inv Avg	1.34	Inv Avg	1.28	Inv Avg	1.46
Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-6

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
30' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.31	S (ft)	0.05	S (ft)	0.27	S (ft)	0.36	S (ft)	0.07	S (ft)	0.29	S (ft)	0.23	S (ft)	0.16	S (ft)	0.20	S (ft)	0.11	S (ft)	0.23	S (ft)	0.18	S (ft)	0.05
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.84	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.93	6.25	0.54	6.25	n.a	6.25	1.09	6.25	1.22	6.25	n.a	6.25	0.63	6.25	n.a	6.25	0.75	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.30	8.75	1.08	8.75	n.a	8.75	n.a	8.75	0.94	8.75	0.83	8.75	0.64	8.75	1.59	8.75	1.01	8.75	n.a	8.75	0.79	8.75	n.a
11.25	0.50	11.25	2.00	11.25	0.65	11.25	0.89	11.25	1.03	11.25	1.19	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.15
13.75	n.a	13.75	2.00	13.75	0.98	13.75	1.70	13.75	2.00	13.75	1.89	13.75	0.87	13.75	n.a	13.75	2.00	13.75	2.06	13.75	0.85	13.75	1.79	13.75	1.99
16.25	0.50	16.25	2.00	16.25	1.41	16.25	1.76	16.25	2.00	16.25	1.79	16.25	2.00	16.25	1.36	16.25	1.53	16.25	0.99	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.47	18.75	1.06	18.75	2.00	18.75	0.77	18.75	1.21	18.75	1.38	18.75	1.85	18.75	2.00	18.75	2.09	18.75	2.00	18.75	1.43
21.25	2.00	21.25	2.19	21.25	2.00	21.25	0.82	21.25	1.27	21.25	1.83	21.25	2.11	21.25	1.52	21.25	1.59	21.25	2.08	21.25	2.00	21.25	1.82	21.25	2.00
23.75	2.15	23.75	2.00	23.75	2.00	23.75	1.40	23.75	1.60	23.75	2.00	23.75	1.04	23.75	2.00	23.75	1.75	23.75	1.27	23.75	2.00	23.75	0.98	23.75	1.37
26.25	2.00	26.25	1.36	26.25	2.17	26.25	2.00	26.25	1.61	26.25	2.00	26.25	1.10	26.25	2.08	26.25	2.00	26.25	1.21	26.25	2.00	26.25	1.15	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.51	28.75	1.35	28.75	1.53	28.75	1.89	28.75	2.00	28.75	2.00	28.75	1.59	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.32	31.25	2.00	31.25	1.37	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.36	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.15	31.25	2.00
33.75	2.00	33.75	1.43	33.75	2.00	33.75	2.00	33.75	1.50	33.75	2.00	33.75	2.00	33.75	2.00	33.75	0.98	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	1.71	36.25	1.34	36.25	2.00	36.25	2.00	36.25	1.13	36.25	2.00	36.25	2.00	36.25	0.92	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.40	Inv Avg	1.80	Inv Avg	1.44	Inv Avg	1.32	Inv Avg	1.65	Inv Avg	1.40	Inv Avg	1.43	Inv Avg	1.53	Inv Avg	1.56	Inv Avg	1.65	Inv Avg	1.54	Inv Avg	1.60	Inv Avg	1.81
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-7

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.16	S (ft)	0.21	S (ft)	0.13	S (ft)	0.16	S (ft)	0.30	S (ft)	0.24	S (ft)	0.13	S (ft)	0.12	S (ft)	0.35	S (ft)	0.02	S (ft)	0.24	S (ft)	0.20	S (ft)	0.19
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.86	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.96	6.25	n.a	6.25	n.a	6.25	0.78	6.25	0.58	6.25	n.a	6.25	0.80	6.25	n.a	6.25	n.a	6.25	0.81	6.25	0.67	6.25	1.49
8.75	n.a	8.75	0.93	8.75	n.a	8.75	n.a	8.75	0.93	8.75	2.00	8.75	0.69	8.75	n.a	8.75	0.58	8.75	n.a	8.75	0.80	8.75	1.32	8.75	1.53
11.25	0.69	11.25	1.58	11.25	1.76	11.25	1.43	11.25	1.34	11.25	0.92	11.25	1.38	11.25	n.a	11.25	1.18	11.25	2.00	11.25	2.00	11.25	1.07	11.25	1.54
13.75	1.07	13.75	1.29	13.75	0.97	13.75	0.99	13.75	1.07	13.75	2.00	13.75	1.52	13.75	1.32	13.75	1.08	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.05
16.25	1.04	16.25	1.33	16.25	1.95	16.25	1.80	16.25	0.66	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.55	16.25	1.66	16.25	1.40	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.37	18.75	2.02	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.20	18.75	2.00	18.75	1.70	18.75	2.18	18.75	1.74	18.75	2.00	18.75	0.95
21.25	2.00	21.25	0.99	21.25	1.02	21.25	1.34	21.25	1.14	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.94	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	1.87	23.75	1.20	23.75	1.40	23.75	1.47	23.75	2.00	23.75	1.94	23.75	2.00	23.75	1.75	23.75	2.00	23.75	1.97	23.75	2.00	23.75	1.08	23.75	1.87
26.25	2.00	26.25	2.00	26.25	1.23	26.25	1.47	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.93	26.25	2.00			26.25	2.00	26.25	1.09	26.25	2.01
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.82	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.19
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.55	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.21			33.75	n.a	33.75	2.12	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.56	36.25	0.84	36.25	1.46	36.25	1.15			36.25	2.00	36.25	0.91					36.25	1.30	36.25	0.72
				38.75	1.84	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.60	Inv Avg	1.45	Inv Avg	1.67	Inv Avg	1.63	Inv Avg	1.35	Inv Avg	1.58	Inv Avg	1.67	Inv Avg	1.75	Inv Avg	1.27	Inv Avg	1.97	Inv Avg	1.46	Inv Avg	1.46	Inv Avg	1.46
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-7

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.21	S (ft)	0.11	S (ft)	0.32	S (ft)	0.13	S (ft)	0.23	S (ft)	0.21	S (ft)	0.09	S (ft)	0.14	S (ft)	0.22	S (ft)	0.24	S (ft)	0.50	S (ft)	0.18	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.87	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.82	6.25	0.97	6.25	0.70	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.75	6.25	n.a	6.25	n.a	6.25	0.84	6.25	0.84
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.23	8.75	n.a	8.75	0.90	8.75	n.a	8.75	1.14	8.75	0.84	8.75	0.99	8.75	0.63	8.75	1.21	8.75	1.39
11.25	n.a	11.25	n.a	11.25	0.57	11.25	n.a	11.25	n.a	11.25	0.62	11.25	n.a	11.25	1.55	11.25	1.13	11.25	1.12	11.25	0.82	11.25	0.81	11.25	n.a
13.75	0.54	13.75	0.74	13.75	0.70	13.75	1.03	13.75	0.72	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.14	13.75	0.62	13.75	2.00	13.75	n.a
16.25	0.99	16.25	1.33	16.25	2.00	16.25	1.84	16.25	1.06	16.25	2.00	16.25	2.00	16.25	2.05	16.25	2.00	16.25	0.98	16.25	1.11	16.25	2.00	16.25	1.33
18.75	1.98	18.75	1.98	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.19	18.75	2.15	18.75	2.00	18.75	2.00	18.75	0.78	18.75	1.36	18.75	2.00	18.75	1.79
21.25	1.16	21.25	2.00	21.25	1.24	21.25	2.00	21.25	1.76	21.25	1.96	21.25	2.00	21.25	1.98	21.25	2.00	21.25	1.44	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.11	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.52	23.75	1.10	23.75	1.40	23.75	2.10	23.75	2.00	23.75	2.00
26.25	2.11	26.25	2.00	26.25	1.50	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.71			26.25	2.00
28.75	1.78	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.98	28.75	1.70	28.75	0.91			28.75	2.00
31.25	1.23	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.83	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.53	31.25	1.23	31.25	0.81			31.25	2.02
33.75	n.a	33.75	2.00	33.75	1.34	33.75	2.00	33.75	2.00	33.75	1.87	33.75	2.00	33.75	2.00	33.75	1.69	33.75	2.00	33.75	1.65			33.75	1.75
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.73	36.25	0.58	36.25	1.61	36.25	2.00	36.25	1.35			36.25	2.00
Inv Avg	1.49	Inv Avg	1.74	Inv Avg	1.35	Inv Avg	1.62	Inv Avg	1.52	Inv Avg	1.56	Inv Avg	1.80	Inv Avg	1.60	Inv Avg	1.49	Inv Avg	1.38	Inv Avg	1.10	Inv Avg	1.48	Inv Avg	1.71
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low

Figure D-7

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.15	S (ft)	0.19	S (ft)	0.19	S (ft)	0.20	S (ft)	0.10	S (ft)	0.33	S (ft)	0.27	S (ft)	0.06	S (ft)	0.23	S (ft)	0.20	S (ft)	0.22	S (ft)	0.36	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.79	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.96	6.25	0.73	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.54	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.74	8.75	0.74	8.75	1.11	8.75	n.a	8.75	n.a	8.75	0.75	8.75	0.47	8.75	0.72
11.25	n.a	11.25	1.12	11.25	2.00	11.25	0.89	11.25	n.a	11.25	1.16	11.25	0.85	11.25	1.21	11.25	0.48	11.25	0.64	11.25	2.06	11.25	2.00	11.25	1.42
13.75	0.65	13.75	2.00	13.75	1.68	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.87	13.75	1.68	13.75	1.99	13.75	0.78	13.75	0.71	13.75	1.13	13.75	2.10
16.25	1.06	16.25	2.00	16.25	1.86	16.25	2.00	16.25	2.00	16.25	1.59	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.39	16.25	1.84	16.25	0.98	16.25	2.00
18.75	1.09	18.75	2.00	18.75	2.00	18.75	0.86	18.75	2.00	18.75	0.82	18.75	2.00	18.75	2.00	18.75	1.52	18.75	2.00	18.75	1.11	18.75	0.98	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.92	21.25	2.00	21.25	0.87	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.18	23.75	1.81	23.75	1.48	23.75	2.00	23.75	1.88	23.75	2.00	23.75	1.40	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.19	26.25	2.00	26.25	2.00	26.25	1.44	26.25	2.00	26.25	1.52			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.36	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.24	28.75	0.81	28.75	n.a	28.75	0.78	28.75	2.00			28.75	1.24	28.75	1.83	28.75	2.00	28.75	1.24	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.65	31.25	1.32	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.24			33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.26	33.75	2.00	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.13	36.25	1.85			36.25	2.00	36.25	1.41			36.25	1.43	36.25	1.78		
Inv Avg	1.58	Inv Avg	1.56	Inv Avg	1.54	Inv Avg	1.54	Inv Avg	1.73	Inv Avg	1.33	Inv Avg	1.35	Inv Avg	1.70	Inv Avg	1.58	Inv Avg	1.55	Inv Avg	1.40	Inv Avg	1.42	Inv Avg	1.74
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-7

SCHEDULE CJG-ST1

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.11	S (ft)	0.17	S (ft)	0.23	S (ft)	0.24	S (ft)	0.33	S (ft)	0.05	S (ft)	0.03	S (ft)	0.09	S (ft)	0.03	S (ft)	0.13	S (ft)	0.11	S (ft)	0.21	S (ft)	0.19
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.62	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.76	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.56	6.25	0.65
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.62	8.75	1.12	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.58	8.75	1.64
11.25	1.10	11.25	2.15	11.25	n.a	11.25	n.a	11.25	0.52	11.25	2.12	11.25	1.03	11.25	1.03	11.25	n.a	11.25	n.a	11.25	n.a	11.25	1.82	11.25	0.97
13.75	2.00	13.75	2.00	13.75	0.87	13.75	n.a	13.75	1.09	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.20	13.75	0.55	13.75	0.70	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.67	16.25	0.47	16.25	1.29	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.70	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	1.75	18.75	2.00	18.75	2.00	18.75	1.65	18.75	1.73	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.21	18.75	1.16
21.25	2.00	21.25	1.65	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.90			21.25	2.00	21.25	1.83	21.25	2.00	21.25	2.00	21.25	1.79	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.26			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.26	23.75	2.00
26.25	1.04	26.25	2.00	26.25	2.00	26.25	1.01	26.25	1.76	26.25	2.20			26.25	2.00	26.25	2.06			26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.52	28.75	2.00	28.75	2.00	28.75	1.13	28.75	1.06	28.75	2.08			28.75	0.91	28.75	2.00			28.75	2.00	28.75	1.77		
31.25	0.91	31.25	0.94	31.25	1.12	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.20	31.25	1.35		
33.75	2.00	33.75	2.16	33.75	2.14	33.75	1.13	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.00	36.25	2.00	36.25	1.05	36.25	2.03	36.25	2.00											36.25	2.00		
Inv Avg	1.62	Inv Avg	1.67	Inv Avg	1.54	Inv Avg	1.38	Inv Avg	1.33	Inv Avg	1.83	Inv Avg	1.79	Inv Avg	1.72	Inv Avg	1.98	Inv Avg	1.55	Inv Avg	1.68	Inv Avg	1.51	Inv Avg	1.46
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-7

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.22	S (ft)	0.04	S (ft)	0.34	S (ft)	0.36	S (ft)	0.20	S (ft)	0.22	S (ft)	0.14	S (ft)	0.14	S (ft)	0.53	S (ft)	0.19	S (ft)	0.21	S (ft)	0.44	S (ft)	0.19
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.67	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.85	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.52	6.25	0.54	6.25	2.00	6.25	0.79	6.25	n.a	6.25	1.28	6.25	0.81	6.25	0.66	6.25	n.a
8.75	1.07	8.75	2.00	8.75	0.79	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.57	8.75	1.01	8.75	n.a	8.75	2.00	8.75	1.21	8.75	1.19	8.75	0.55
11.25	1.07	11.25	1.15	11.25	1.21	11.25	0.44	11.25	1.60	11.25	1.08	11.25	1.41	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.26	11.25	0.88	11.25	1.64
13.75	2.00	13.75	2.00	13.75	1.92	13.75	1.03	13.75	2.00	13.75	2.00	13.75	2.14	13.75	2.00	13.75	0.40	13.75	1.71	13.75	1.37	13.75	0.92	13.75	1.50
16.25	2.00	16.25	1.50	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.03	16.25	1.92	16.25	2.00	16.25	0.87	16.25	1.05	16.25	2.00
18.75	0.97	18.75	2.00	18.75	2.00	18.75	1.14	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.59	18.75	2.00	18.75	1.07	18.75	1.22	18.75	2.00
21.25	2.00	21.25	1.27	21.25	2.00	21.25	1.64	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.93	21.25	1.07	21.25	2.00	21.25	1.46	21.25	1.21	21.25	1.14
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.44	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.10	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.70
26.25	2.00			26.25	1.09	26.25	2.00			26.25	2.00	26.25	1.07	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	0.91	28.75	2.00			28.75	1.90	28.75	1.08	28.75	2.00	28.75	2.04	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.24			31.25	0.94	31.25	2.00			31.25	2.00	31.25	1.38	31.25	2.00	31.25	2.00	31.25	0.71	31.25	2.00	31.25	0.59	31.25	2.00
33.75	0.88			33.75	2.00	33.75	2.00					33.75	1.23					32.25	1.11	32.25	2.00	33.75	0.85	33.75	2.00
36.25	0.97			36.25	2.00							36.25	0.90					33.25	2.00					36.25	1.60
Inv Avg	1.45	Inv Avg	1.72	Inv Avg	1.34	Inv Avg	1.41	Inv Avg	1.53	Inv Avg	1.56	Inv Avg	1.53	Inv Avg	1.67	Inv Avg	1.37	Inv Avg	1.52	Inv Avg	1.42	Inv Avg	1.11	Inv Avg	1.55
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low

Figure D-7

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.19	S (ft)	0.04	S (ft)	0.22	S (ft)	0.35	S (ft)	0.05	S (ft)	0.18	S (ft)	0.34	S (ft)	0.14	S (ft)	0.21	S (ft)	0.21	S (ft)	0.24	S (ft)	0.29	S (ft)	0.24
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.58	6.25	1.27	6.25	n.a	6.25	0.70	6.25	n.a	6.25	n.a	6.25	0.61	6.25	n.a	6.25	0.65	6.25	0.72	6.25	n.a	6.25	0.76	6.25	0.89
8.75	1.39	8.75	2.00	8.75	0.72	8.75	1.77	8.75	1.16	8.75	0.60	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.89	8.75	0.81	8.75	n.a
11.25	2.04	11.25	2.00	11.25	1.59	11.25	1.03	11.25	1.40	11.25	1.34	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.33	11.25	1.43	11.25	1.28	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.53	13.75	0.83	13.75	2.12	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	0.93	13.75	2.00	13.75	2.00	13.75	1.02
16.25	2.00	16.25	1.85	16.25	0.81	16.25	0.75	16.25	2.00	16.25	1.43	16.25	2.00	16.25	0.55	16.25	2.00	16.25	1.82	16.25	1.19	16.25	2.00	16.25	1.11
18.75	2.00	18.75	1.53	18.75	2.00	18.75	1.14	18.75	2.00	18.75	1.43	18.75	1.25	18.75	2.00	18.75	0.78	18.75	1.02	18.75	1.73	18.75	1.62	18.75	2.00
21.25	1.38	21.25	2.00	21.25	1.47	21.25	1.00	21.25	1.84	21.25	2.00	21.25	0.96	21.25	1.39	21.25	2.00	21.25	2.00	21.25	1.77	21.25	n.a	21.25	1.35
23.75	1.39	23.75	2.00	23.75	1.06	23.75	1.03	23.75	2.00	23.75	2.00	23.75	1.12	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.87	23.75	0.71	23.75	1.77
26.25	1.78	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.81	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.60	26.25	1.37
28.75	2.00	28.75	2.00	28.75	1.95	28.75	2.00	28.75	2.00	28.75	1.94	28.75	0.81	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.16	28.75	2.00
31.25	1.75	31.25	2.00	31.25	2.00	31.25	1.61	31.25	2.00	31.25	1.56	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.73	31.25	n.a	31.25	1.21	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.61	33.75	1.80	33.75	1.64	33.75	2.07	33.75	2.00	33.75	2.06	33.75	1.51	33.75	0.47	33.75	2.00	33.75	1.24
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.11			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.00
																								46.25	1.35
																								48.75	1.00
																								51.25	1.19
																								53.75	1.07
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.12
Inv Avg	1.57	Inv Avg	1.87	Inv Avg	1.50	Inv Avg	1.24	Inv Avg	1.83	Inv Avg	1.50	Inv Avg	1.29	Inv Avg	1.66	Inv Avg	1.61	Inv Avg	1.50	Inv Avg	1.41	Inv Avg	1.34	Inv Avg	1.52
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-7

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
40' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.31	S (ft)	0.05	S (ft)	0.23	S (ft)	0.35	S (ft)	0.07	S (ft)	0.27	S (ft)	0.20	S (ft)	0.15	S (ft)	0.18	S (ft)	0.09	S (ft)	0.23	S (ft)	0.15	S (ft)	0.05
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.86	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.95	6.25	0.55	6.25	n.a	6.25	1.12	6.25	1.25	6.25	n.a	6.25	0.65	6.25	n.a	6.25	0.77	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.35	8.75	1.11	8.75	n.a	8.75	n.a	8.75	0.98	8.75	0.86	8.75	0.66	8.75	1.65	8.75	1.05	8.75	n.a	8.75	0.82	8.75	n.a
11.25	0.52	11.25	2.00	11.25	0.67	11.25	0.92	11.25	1.08	11.25	1.24	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.20
13.75	n.a	13.75	2.00	13.75	1.03	13.75	1.78	13.75	2.00	13.75	1.98	13.75	0.91	13.75	n.a	13.75	2.00	13.75	2.16	13.75	0.88	13.75	1.87	13.75	2.08
16.25	0.52	16.25	2.00	16.25	1.48	16.25	1.85	16.25	2.00	16.25	1.88	16.25	2.00	16.25	1.43	16.25	1.61	16.25	1.04	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.54	18.75	1.11	18.75	2.00	18.75	0.81	18.75	1.27	18.75	1.45	18.75	1.95	18.75	2.00	18.75	2.20	18.75	2.00	18.75	1.50
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.86	21.25	1.34	21.25	1.93	21.25	2.00	21.25	1.60	21.25	1.68	21.25	2.19	21.25	2.00	21.25	1.92	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.48	23.75	1.69	23.75	2.00	23.75	1.10	23.75	2.00	23.75	1.85	23.75	1.34	23.75	2.00	23.75	1.03	23.75	1.45
26.25	2.00	26.25	1.43	26.25	2.00	26.25	2.00	26.25	1.70	26.25	2.00	26.25	1.16	26.25	2.20	26.25	2.00	26.25	1.28	26.25	2.00	26.25	1.22	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.60	28.75	1.43	28.75	1.62	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.68	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.40	31.25	2.00	31.25	1.46	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.44	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.22	31.25	2.00
33.75	2.00	33.75	1.51	33.75	2.00	33.75	2.00	33.75	1.59	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.04	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	1.81	36.25	1.42	36.25	2.00	36.25	2.00	36.25	1.20	36.25	2.00	36.25	2.00	36.25	0.98	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.42	Inv Avg	1.83	Inv Avg	1.47	Inv Avg	1.37	Inv Avg	1.70	Inv Avg	1.44	Inv Avg	1.47	Inv Avg	1.58	Inv Avg	1.60	Inv Avg	1.69	Inv Avg	1.58	Inv Avg	1.64	Inv Avg	1.84
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-8

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.15	S (ft)	0.19	S (ft)	0.10	S (ft)	0.14	S (ft)	0.28	S (ft)	0.23	S (ft)	0.13	S (ft)	0.12	S (ft)	0.33	S (ft)	0.02	S (ft)	0.24	S (ft)	0.17	S (ft)	0.16
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.86	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.99	6.25	n.a	6.25	n.a	6.25	0.80	6.25	0.60	6.25	n.a	6.25	0.82	6.25	n.a	6.25	n.a	6.25	0.83	6.25	0.69	6.25	1.53
8.75	n.a	8.75	0.96	8.75	n.a	8.75	n.a	8.75	0.96	8.75	2.00	8.75	0.71	8.75	n.a	8.75	0.60	8.75	n.a	8.75	0.83	8.75	1.37	8.75	1.59
11.25	0.72	11.25	1.65	11.25	1.83	11.25	1.49	11.25	1.40	11.25	0.96	11.25	1.43	11.25	n.a	11.25	1.23	11.25	2.00	11.25	2.00	11.25	1.11	11.25	1.60
13.75	1.12	13.75	1.34	13.75	1.01	13.75	1.03	13.75	1.12	13.75	2.00	13.75	1.59	13.75	1.38	13.75	1.13	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.10
16.25	1.10	16.25	1.40	16.25	2.05	16.25	1.88	16.25	0.69	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.58	16.25	1.74	16.25	1.47	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.44	18.75	2.12	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.79	18.75	2.00	18.75	1.83	18.75	2.00	18.75	1.00
21.25	2.00	21.25	1.04	21.25	1.08	21.25	1.41	21.25	1.21	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.04	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	1.98	23.75	1.27	23.75	1.48	23.75	1.56	23.75	2.00	23.75	2.05	23.75	2.00	23.75	1.85	23.75	2.00	23.75	2.08	23.75	2.00	23.75	1.14	23.75	1.97
26.25	2.00	26.25	2.00	26.25	1.30	26.25	1.55	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.05	26.25	2.00			26.25	2.00	26.25	1.16	26.25	2.13
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.93	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.26
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.64	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.29			33.75	n.a	33.75	2.00	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.66	36.25	0.89	36.25	1.54	36.25	1.22			36.25	2.00	36.25	0.97					36.25	1.38	36.25	0.76
				38.75	1.96	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.63	Inv Avg	1.49	Inv Avg	1.72	Inv Avg	1.67	Inv Avg	1.39	Inv Avg	1.61	Inv Avg	1.68	Inv Avg	1.77	Inv Avg	1.31	Inv Avg	1.98	Inv Avg	1.49	Inv Avg	1.49	Inv Avg	1.52
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-8

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81	
S (ft)	0.18	S (ft)	0.11	S (ft)	0.32	S (ft)	0.13	S (ft)	0.22	S (ft)	0.20
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.85	6.25	1.00	6.25	0.72	6.25	n.a
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.27	8.75	n.a	8.75	0.93
11.25	n.a	11.25	n.a	11.25	0.59	11.25	n.a	11.25	n.a	11.25	0.64
13.75	0.57	13.75	0.78	13.75	0.74	13.75	1.08	13.75	0.75	13.75	2.00
16.25	1.03	16.25	1.40	16.25	2.00	16.25	1.93	16.25	1.11	16.25	2.00
18.75	2.08	18.75	2.08	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.25
21.25	1.23	21.25	2.00	21.25	1.31	21.25	2.00	21.25	1.85	21.25	2.07
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.17	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.59	26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.89	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00
31.25	1.30	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.94	31.25	2.00
33.75	n.a	33.75	2.00	33.75	1.42	33.75	2.00	33.75	2.00	33.75	1.98
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00
Inv Avg	1.53	Inv Avg	1.77	Inv Avg	1.39	Inv Avg	1.65	Inv Avg	1.55	Inv Avg	1.59
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.09	S (ft)	0.13	S (ft)	0.22	S (ft)	0.18	S (ft)	0.50	S (ft)	0.18	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.89	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	1.79	6.25	n.a	6.25	n.a	6.25	0.86	6.25	0.86
8.75	n.a	8.75	1.18	8.75	0.87	8.75	1.02	8.75	0.66	8.75	1.25	8.75	1.44
11.25	n.a	11.25	1.62	11.25	1.17	11.25	1.17	11.25	0.86	11.25	0.84	11.25	n.a
13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.20	13.75	0.65	13.75	2.00	13.75	n.a
16.25	2.00	16.25	2.15	16.25	2.00	16.25	1.03	16.25	1.16	16.25	2.00	16.25	1.40
18.75	2.00	18.75	2.00	18.75	2.00	18.75	0.82	18.75	1.43	18.75	2.00	18.75	1.88
21.25	2.00	21.25	2.09	21.25	2.00	21.25	1.52	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	1.61	23.75	1.17	23.75	1.48	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.75			26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.09	28.75	1.80	28.75	0.96			28.75	2.00
31.25	2.00	31.25	2.00	31.25	1.62	31.25	1.30	31.25	0.86			31.25	2.14
33.75	2.00	33.75	2.00	33.75	1.79	33.75	2.00	33.75	1.75			33.75	1.86
36.25	0.78	36.25	0.62	36.25	1.71	36.25	2.00	36.25	1.43			36.25	2.00
Inv Avg	1.81	Inv Avg	1.64	Inv Avg	1.53	Inv Avg	1.43	Inv Avg	1.15	Inv Avg	1.51	Inv Avg	1.74
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low

Figure D-8

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.13	S (ft)	0.19	S (ft)	0.19	S (ft)	0.19	S (ft)	0.10	S (ft)	0.32	S (ft)	0.27	S (ft)	0.06	S (ft)	0.22	S (ft)	0.20	S (ft)	0.22	S (ft)	0.31	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.81	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.98	6.25	0.75	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.56	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.77	8.75	0.77	8.75	1.15	8.75	n.a	8.75	n.a	8.75	0.78	8.75	0.49	8.75	0.75
11.25	n.a	11.25	1.17	11.25	2.00	11.25	0.93	11.25	n.a	11.25	1.21	11.25	0.89	11.25	1.26	11.25	0.50	11.25	0.67	11.25	2.14	11.25	2.00	11.25	1.47
13.75	0.68	13.75	2.00	13.75	1.75	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.96	13.75	1.76	13.75	2.08	13.75	0.82	13.75	0.74	13.75	1.19	13.75	2.20
16.25	1.11	16.25	2.00	16.25	1.95	16.25	2.00	16.25	2.00	16.25	1.67	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.46	16.25	1.93	16.25	1.03	16.25	2.00
18.75	1.15	18.75	2.00	18.75	2.00	18.75	0.90	18.75	2.00	18.75	0.86	18.75	2.00	18.75	2.00	18.75	1.60	18.75	2.00	18.75	1.17	18.75	1.03	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.97	21.25	2.00	21.25	0.91	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	1.91	23.75	1.56	23.75	2.00	23.75	1.98	23.75	2.00	23.75	1.48	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.53	26.25	2.00	26.25	1.61			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.44	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.32	28.75	0.86	28.75	n.a	28.75	0.83	28.75	2.00			28.75	1.32	28.75	1.93	28.75	2.00	28.75	1.31	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.75	31.25	1.40	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.32			33.75	2.00	33.75	2.12	33.75	2.00	33.75	1.34	33.75	2.00	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.20	36.25	1.97			36.25	2.00	36.25	1.50			36.25	1.52	36.25	1.89		
Inv Avg	1.60	Inv Avg	1.58	Inv Avg	1.58	Inv Avg	1.58	Inv Avg	1.76	Inv Avg	1.38	Inv Avg	1.37	Inv Avg	1.73	Inv Avg	1.62	Inv Avg	1.57	Inv Avg	1.45	Inv Avg	1.45	Inv Avg	1.76
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-8

SCHEDULE CJG-ST1

C-121		**C-123**		**C-125**		**C-129**		**C-131**		**C-133**		**C-135**		**C-135A**		**C-137**		**C-139**		**C-139A**		**C-143**		**C-145**	
S (ft)	0.10	S (ft)	0.17	S (ft)	0.22	S (ft)	0.22	S (ft)	0.31	S (ft)	0.05	S (ft)	0.03	S (ft)	0.09	S (ft)	0.03	S (ft)	0.13	S (ft)	0.11	S (ft)	0.21	S (ft)	0.16
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.63	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.78	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.58	6.25	0.67
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.64	8.75	1.16	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.63	8.75	1.70
11.25	1.14	11.25	2.00	11.25	n.a	11.25	n.a	11.25	0.54	11.25	2.00	11.25	1.07	11.25	1.07	11.25	n.a	11.25	n.a	11.25	n.a	11.25	1.90	11.25	1.01
13.75	2.00	13.75	2.00	13.75	0.91	13.75	n.a	13.75	1.14	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.58	13.75	0.73	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.75	16.25	0.49	16.25	1.36	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.78	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	1.84	18.75	2.00	18.75	2.00	18.75	1.73	18.75	1.82	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.27	18.75	1.22
21.25	2.00	21.25	1.74	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00			21.25	2.00	21.25	1.93	21.25	2.00	21.25	2.00	21.25	1.89	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.33			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.33	23.75	2.00
26.25	1.10	26.25	2.00	26.25	2.00	26.25	1.07	26.25	1.87	26.25	2.00			26.25	2.00	26.25	2.18			26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.61	28.75	2.00	28.75	2.00	28.75	1.20	28.75	1.12	28.75	2.00			28.75	0.96	28.75	2.00			28.75	2.00	28.75	1.87		
31.25	0.96	31.25	1.00	31.25	1.19	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.28	31.25	1.43		
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.20	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.00	36.25	2.00	36.25	1.11	36.25	2.16	36.25	2.00											36.25	2.00		
Inv Avg	1.66	Inv Avg	1.68	Inv Avg	1.56	Inv Avg	1.42	Inv Avg	1.37	Inv Avg	1.84	Inv Avg	1.80	Inv Avg	1.74	Inv Avg	1.99	Inv Avg	1.57	Inv Avg	1.70	Inv Avg	1.55	Inv Avg	1.49
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-8

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.14	S (ft)	0.04	S (ft)	0.33	S (ft)	0.36	S (ft)	0.20	S (ft)	0.20	S (ft)	0.11	S (ft)	0.13	S (ft)	0.52	S (ft)	0.19	S (ft)	0.19	S (ft)	0.42	S (ft)	0.19
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.68	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.87	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.54	6.25	0.55	6.25	2.00	6.25	0.81	6.25	n.a	6.25	1.32	6.25	0.83	6.25	0.68	6.25	n.a
8.75	1.11	8.75	2.00	8.75	0.81	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.63	8.75	1.05	8.75	n.a	8.75	2.00	8.75	1.25	8.75	1.23	8.75	0.57
11.25	1.11	11.25	1.19	11.25	1.26	11.25	0.45	11.25	1.66	11.25	1.12	11.25	1.46	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.31	11.25	0.91	11.25	1.71
13.75	2.00	13.75	2.00	13.75	2.01	13.75	1.08	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.42	13.75	1.79	13.75	1.43	13.75	0.96	13.75	1.57
16.25	2.00	16.25	1.57	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.13	16.25	2.01	16.25	2.00	16.25	0.91	16.25	1.10	16.25	2.00
18.75	1.02	18.75	2.00	18.75	2.00	18.75	1.20	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.68	18.75	2.00	18.75	1.13	18.75	1.28	18.75	2.00
21.25	2.00	21.25	1.34	21.25	2.00	21.25	1.73	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.04	21.25	1.13	21.25	2.00	21.25	1.54	21.25	1.28	21.25	1.20
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.52	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.16	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.79
26.25	2.00			26.25	1.16	26.25	2.00			26.25	2.00	26.25	1.13	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	0.97	28.75	2.00			28.75	2.01	28.75	1.15	28.75	2.00	28.75	2.16	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.31			31.25	0.99	31.25	2.00			31.25	2.00	31.25	1.46	31.25	2.00	31.25	2.00	31.25	0.75	31.25	2.00	31.25	0.62	31.25	2.00
33.75	0.93			33.75	2.00	33.75	2.00					33.75	1.30					32.25	1.18	32.25	2.00	33.75	0.90	33.75	2.00
36.25	1.03			36.25	2.00							36.25	0.95					33.25	2.00					36.25	1.70
Inv Avg	1.49	Inv Avg	1.75	Inv Avg	1.38	Inv Avg	1.44	Inv Avg	1.55	Inv Avg	1.58	Inv Avg	1.57	Inv Avg	1.70	Inv Avg	1.42	Inv Avg	1.55	Inv Avg	1.46	Inv Avg	1.16	Inv Avg	1.59
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low

Figure D-8

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.19	S (ft)	0.04	S (ft)	0.21	S (ft)	0.35	S (ft)	0.05	S (ft)	0.17	S (ft)	0.31	S (ft)	0.14	S (ft)	0.21	S (ft)	0.21	S (ft)	0.23	S (ft)	0.29	S (ft)	0.22
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.59	6.25	1.31	6.25	n.a	6.25	0.72	6.25	n.a	6.25	n.a	6.25	0.63	6.25	n.a	6.25	0.66	6.25	0.74	6.25	n.a	6.25	0.78	6.25	0.92
8.75	1.44	8.75	2.00	8.75	0.75	8.75	1.83	8.75	1.21	8.75	0.62	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.92	8.75	0.83	8.75	n.a
11.25	2.12	11.25	2.00	11.25	1.66	11.25	1.07	11.25	1.46	11.25	1.40	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.38	11.25	1.49	11.25	1.33	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.60	13.75	0.87	13.75	2.00	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	0.97	13.75	2.00	13.75	2.00	13.75	1.07
16.25	2.00	16.25	1.94	16.25	0.85	16.25	0.79	16.25	2.00	16.25	1.50	16.25	2.00	16.25	0.57	16.25	2.00	16.25	1.91	16.25	1.25	16.25	2.00	16.25	1.16
18.75	2.00	18.75	1.61	18.75	2.00	18.75	1.20	18.75	2.00	18.75	1.50	18.75	1.31	18.75	2.00	18.75	0.82	18.75	1.07	18.75	1.82	18.75	1.70	18.75	2.00
21.25	1.46	21.25	2.00	21.25	1.55	21.25	1.06	21.25	1.94	21.25	2.00	21.25	1.02	21.25	1.46	21.25	2.00	21.25	2.00	21.25	1.87	21.25	n.a	21.25	1.42
23.75	1.47	23.75	2.00	23.75	1.12	23.75	1.08	23.75	2.00	23.75	2.00	23.75	1.18	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.97	23.75	0.75	23.75	1.86
26.25	1.88	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.85	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.70	26.25	1.45
28.75	2.00	28.75	2.00	28.75	2.06	28.75	2.00	28.75	2.00	28.75	2.06	28.75	0.85	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.23	28.75	2.00
31.25	1.86	31.25	2.00	31.25	2.00	31.25	1.70	31.25	2.00	31.25	1.65	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.84	31.25	n.a	31.25	1.28	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.70	33.75	1.91	33.75	1.74	33.75	2.19	33.75	2.00	33.75	2.19	33.75	1.60	33.75	0.50	33.75	2.00	33.75	1.31
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.18			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.00
																								46.25	1.43
																								48.75	1.06
																								51.25	1.27
																								53.75	1.13
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.19
Inv Avg	1.61	Inv Avg	1.89	Inv Avg	1.54	Inv Avg	1.28	Inv Avg	1.85	Inv Avg	1.55	Inv Avg	1.34	Inv Avg	1.68	Inv Avg	1.63	Inv Avg	1.54	Inv Avg	1.45	Inv Avg	1.38	Inv Avg	1.57
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-8

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
50' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.31	S (ft)	0.05	S (ft)	0.23	S (ft)	0.35	S (ft)	0.06	S (ft)	0.27	S (ft)	0.19	S (ft)	0.15	S (ft)	0.18	S (ft)	0.08	S (ft)	0.20	S (ft)	0.15	S (ft)	0.04
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.87	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.97	6.25	0.56	6.25	n.a	6.25	1.14	6.25	1.27	6.25	n.a	6.25	0.66	6.25	n.a	6.25	0.78	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.38	8.75	1.14	8.75	n.a	8.75	n.a	8.75	1.00	8.75	0.88	8.75	0.68	8.75	1.68	8.75	1.07	8.75	n.a	8.75	0.84	8.75	n.a
11.25	0.53	11.25	2.00	11.25	0.69	11.25	0.95	11.25	1.10	11.25	1.27	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.23
13.75	n.a	13.75	2.00	13.75	1.06	13.75	1.83	13.75	2.00	13.75	2.04	13.75	0.94	13.75	n.a	13.75	2.00	13.75	2.00	13.75	0.91	13.75	1.92	13.75	2.14
16.25	0.54	16.25	2.00	16.25	1.53	16.25	1.91	16.25	2.00	16.25	1.94	16.25	2.00	16.25	1.48	16.25	1.66	16.25	1.07	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.60	18.75	1.15	18.75	2.00	18.75	0.83	18.75	1.31	18.75	1.50	18.75	2.02	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.56
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.90	21.25	1.39	21.25	2.01	21.25	2.00	21.25	1.66	21.25	1.74	21.25	2.00	21.25	2.00	21.25	1.99	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.54	23.75	1.76	23.75	2.00	23.75	1.15	23.75	2.00	23.75	1.93	23.75	1.39	23.75	2.00	23.75	1.07	23.75	1.51
26.25	2.00	26.25	1.49	26.25	2.00	26.25	2.00	26.25	1.77	26.25	2.00	26.25	1.21	26.25	2.00	26.25	2.00	26.25	1.33	26.25	2.00	26.25	1.27	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.67	28.75	1.49	28.75	1.69	28.75	2.09	28.75	2.00	28.75	2.00	28.75	1.75	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.46	31.25	2.00	31.25	1.52	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.50	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.27	31.25	2.00
33.75	2.00	33.75	1.58	33.75	2.00	33.75	2.00	33.75	1.66	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.08	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	1.89	36.25	1.48	36.25	2.00	36.25	2.00	36.25	1.25	36.25	2.00	36.25	2.00	36.25	1.02	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.44	Inv Avg	1.85	Inv Avg	1.49	Inv Avg	1.40	Inv Avg	1.74	Inv Avg	1.47	Inv Avg	1.49	Inv Avg	1.60	Inv Avg	1.63	Inv Avg	1.70	Inv Avg	1.59	Inv Avg	1.66	Inv Avg	1.85
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-9

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.13	S (ft)	0.15	S (ft)	0.08	S (ft)	0.13	S (ft)	0.28	S (ft)	0.23	S (ft)	0.13	S (ft)	0.12	S (ft)	0.31	S (ft)	0.02	S (ft)	0.24	S (ft)	0.17	S (ft)	0.15
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.87	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	1.00	6.25	n.a	6.25	n.a	6.25	0.81	6.25	0.61	6.25	n.a	6.25	0.84	6.25	n.a	6.25	n.a	6.25	0.84	6.25	0.70	6.25	1.55
8.75	n.a	8.75	0.98	8.75	n.a	8.75	n.a	8.75	0.99	8.75	2.00	8.75	0.73	8.75	n.a	8.75	0.61	8.75	n.a	8.75	0.85	8.75	1.40	8.75	1.62
11.25	0.74	11.25	1.69	11.25	1.88	11.25	1.53	11.25	1.44	11.25	0.98	11.25	1.47	11.25	n.a	11.25	1.26	11.25	2.00	11.25	2.00	11.25	1.14	11.25	1.64
13.75	1.15	13.75	1.38	13.75	1.04	13.75	1.06	13.75	1.16	13.75	2.00	13.75	1.64	13.75	1.42	13.75	1.16	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.13
16.25	1.13	16.25	1.44	16.25	2.12	16.25	1.95	16.25	0.71	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.60	16.25	1.80	16.25	1.52	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.49	18.75	2.20	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.85	18.75	2.00	18.75	1.90	18.75	2.00	18.75	1.04
21.25	2.00	21.25	1.08	21.25	1.12	21.25	1.46	21.25	1.25	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.12	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.05	23.75	1.32	23.75	1.54	23.75	1.62	23.75	2.00	23.75	2.13	23.75	2.00	23.75	1.92	23.75	2.00	23.75	2.17	23.75	2.00	23.75	1.19	23.75	2.05
26.25	2.00	26.25	2.00	26.25	1.36	26.25	1.61	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.13	26.25	2.00			26.25	2.00	26.25	1.20	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.01	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.31
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.71	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.34			33.75	n.a	33.75	2.00	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.73	36.25	0.93	36.25	1.61	36.25	1.28			36.25	2.00	36.25	1.01					36.25	1.44	36.25	0.80
				38.75	2.05	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.65	Inv Avg	1.52	Inv Avg	1.75	Inv Avg	1.70	Inv Avg	1.41	Inv Avg	1.63	Inv Avg	1.70	Inv Avg	1.79	Inv Avg	1.34	Inv Avg	1.99	Inv Avg	1.51	Inv Avg	1.52	Inv Avg	1.54
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-9

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.18	S (ft)	0.11	S (ft)	0.32	S (ft)	0.08	S (ft)	0.22	S (ft)	0.20	S (ft)	0.09	S (ft)	0.13	S (ft)	0.21	S (ft)	0.18	S (ft)	0.47	S (ft)	0.18	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.90	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.86	6.25	1.01	6.25	0.73	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.83	6.25	n.a	6.25	n.a	6.25	0.88	6.25	0.87
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.30	8.75	n.a	8.75	0.95	8.75	n.a	8.75	1.21	8.75	0.89	8.75	1.05	8.75	0.67	8.75	1.28	8.75	1.47
11.25	n.a	11.25	n.a	11.25	0.61	11.25	n.a	11.25	n.a	11.25	0.66	11.25	n.a	11.25	1.66	11.25	1.20	11.25	1.20	11.25	0.88	11.25	0.86	11.25	n.a
13.75	0.58	13.75	0.80	13.75	0.76	13.75	1.11	13.75	0.77	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.23	13.75	0.67	13.75	2.00	13.75	n.a
16.25	1.07	16.25	1.45	16.25	2.00	16.25	1.99	16.25	1.15	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.06	16.25	1.20	16.25	2.00	16.25	1.44
18.75	2.15	18.75	2.16	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.30	18.75	2.00	18.75	2.00	18.75	2.00	18.75	0.85	18.75	1.48	18.75	2.00	18.75	1.95
21.25	1.27	21.25	2.00	21.25	1.36	21.25	2.00	21.25	1.92	21.25	2.15	21.25	2.00	21.25	2.17	21.25	2.00	21.25	1.58	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.22	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.67	23.75	1.21	23.75	1.54	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.66	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.78			26.25	2.00
28.75	1.97	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.18	28.75	1.87	28.75	1.00			28.75	2.00
31.25	1.36	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.02	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.69	31.25	1.36	31.25	0.90			31.25	2.00
33.75	n.a	33.75	2.00	33.75	1.49	33.75	2.00	33.75	2.00	33.75	2.07	33.75	2.00	33.75	2.00	33.75	1.87	33.75	2.00	33.75	1.83			33.75	1.94
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.81	36.25	0.65	36.25	1.79	36.25	2.00	36.25	1.49			36.25	2.00
Inv Avg	1.56	Inv Avg	1.79	Inv Avg	1.41	Inv Avg	1.67	Inv Avg	1.57	Inv Avg	1.61	Inv Avg	1.82	Inv Avg	1.66	Inv Avg	1.56	Inv Avg	1.46	Inv Avg	1.18	Inv Avg	1.52	Inv Avg	1.75
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low

Figure D-9

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.13	S (ft)	0.19	S (ft)	0.19	S (ft)	0.16	S (ft)	0.09	S (ft)	0.31	S (ft)	0.26	S (ft)	0.06	S (ft)	0.22	S (ft)	0.20	S (ft)	0.22	S (ft)	0.31	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.82	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	1.00	6.25	0.76	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.57	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.79	8.75	0.79	8.75	1.18	8.75	n.a	8.75	n.a	8.75	0.79	8.75	0.50	8.75	0.76
11.25	n.a	11.25	1.20	11.25	2.00	11.25	0.96	11.25	n.a	11.25	1.24	11.25	0.91	11.25	1.29	11.25	0.51	11.25	0.69	11.25	2.00	11.25	2.00	11.25	1.51
13.75	0.70	13.75	2.00	13.75	1.81	13.75	2.00	13.75	n.a	13.75	2.00	13.75	2.02	13.75	1.81	13.75	2.15	13.75	0.84	13.75	0.77	13.75	1.22	13.75	2.00
16.25	1.14	16.25	2.00	16.25	2.02	16.25	2.00	16.25	2.00	16.25	1.72	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.50	16.25	2.00	16.25	1.06	16.25	2.00
18.75	1.19	18.75	2.00	18.75	2.00	18.75	0.94	18.75	2.00	18.75	0.89	18.75	2.00	18.75	2.00	18.75	1.65	18.75	2.00	18.75	1.21	18.75	1.07	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.00	21.25	2.00	21.25	0.95	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	1.98	23.75	1.63	23.75	2.00	23.75	2.06	23.75	2.00	23.75	1.54	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.59	26.25	2.00	26.25	1.68			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.50	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.37	28.75	0.89	28.75	n.a	28.75	0.86	28.75	2.00			28.75	1.37	28.75	2.02	28.75	2.00	28.75	1.36	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.83	31.25	1.46	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.38			33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.40	33.75	2.00	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.25	36.25	2.06			36.25	2.00	36.25	1.57			36.25	1.58	36.25	1.98		
Inv Avg	1.62	Inv Avg	1.60	Inv Avg	1.61	Inv Avg	1.60	Inv Avg	1.77	Inv Avg	1.41	Inv Avg	1.39	Inv Avg	1.75	Inv Avg	1.64	Inv Avg	1.59	Inv Avg	1.48	Inv Avg	1.47	Inv Avg	1.76
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-9

SCHEDULE CJG-ST1

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.07	S (ft)	0.15	S (ft)	0.22	S (ft)	0.21	S (ft)	0.31	S (ft)	0.05	S (ft)	0.02	S (ft)	0.07	S (ft)	0.02	S (ft)	0.13	S (ft)	0.11	S (ft)	0.20	S (ft)	0.16
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.64	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.79	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.59	6.25	0.68
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.66	8.75	1.19	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.67	8.75	1.74
11.25	1.17	11.25	2.00	11.25	n.a	11.25	n.a	11.25	0.56	11.25	2.00	11.25	1.10	11.25	1.10	11.25	n.a	11.25	n.a	11.25	n.a	11.25	1.95	11.25	1.03
13.75	2.00	13.75	2.00	13.75	0.93	13.75	n.a	13.75	1.18	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.59	13.75	0.76	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.80	16.25	0.51	16.25	1.40	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.84	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	1.90	18.75	2.00	18.75	2.00	18.75	1.79	18.75	1.88	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.31	18.75	1.26
21.25	2.00	21.25	1.80	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.08			21.25	2.00	21.25	2.01	21.25	2.00	21.25	2.00	21.25	1.96	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.38			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.38	23.75	2.00
26.25	1.15	26.25	2.00	26.25	2.00	26.25	1.12	26.25	1.94	26.25	2.00			26.25	2.00	26.25	2.00			26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.67	28.75	2.00	28.75	2.00	28.75	1.25	28.75	1.17	28.75	2.00			28.75	1.01	28.75	2.00			28.75	2.00	28.75	1.95		
31.25	1.00	31.25	1.04	31.25	1.24	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.33	31.25	1.50		
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.26	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.00	36.25	2.00	36.25	1.16	36.25	2.00	36.25	2.00											36.25	2.00		
Inv Avg	1.68	Inv Avg	1.70	Inv Avg	1.58	Inv Avg	1.45	Inv Avg	1.39	Inv Avg	1.86	Inv Avg	1.81	Inv Avg	1.76	Inv Avg	1.99	Inv Avg	1.58	Inv Avg	1.72	Inv Avg	1.58	Inv Avg	1.51
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-9

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.14	S (ft)	0.03	S (ft)	0.27	S (ft)	0.35	S (ft)	0.20	S (ft)	0.20	S (ft)	0.11	S (ft)	0.13	S (ft)	0.52	S (ft)	0.19	S (ft)	0.19	S (ft)	0.41	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.69	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.88	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.55	6.25	0.56	6.25	2.00	6.25	0.83	6.25	n.a	6.25	1.34	6.25	0.84	6.25	0.69	6.25	n.a
8.75	1.13	8.75	2.00	8.75	0.83	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.66	8.75	1.07	8.75	n.a	8.75	2.00	8.75	1.27	8.75	1.26	8.75	0.58
11.25	1.14	11.25	1.22	11.25	1.30	11.25	0.46	11.25	1.70	11.25	1.15	11.25	1.50	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.35	11.25	0.94	11.25	1.75
13.75	2.00	13.75	2.00	13.75	2.07	13.75	1.11	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.43	13.75	1.84	13.75	1.48	13.75	0.99	13.75	1.61
16.25	2.00	16.25	1.62	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.20	16.25	2.08	16.25	2.00	16.25	0.94	16.25	1.14	16.25	2.00
18.75	1.05	18.75	2.00	18.75	2.00	18.75	1.24	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.74	18.75	2.00	18.75	1.17	18.75	1.33	18.75	2.00
21.25	2.00	21.25	1.39	21.25	2.00	21.25	1.80	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.12	21.25	1.17	21.25	2.00	21.25	1.59	21.25	1.33	21.25	1.24
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.58	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.21	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.87
26.25	2.00			26.25	1.20	26.25	2.00			26.25	2.00	26.25	1.18	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	1.01	28.75	2.00			28.75	2.09	28.75	1.20	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.37			31.25	1.04	31.25	2.00			31.25	2.00	31.25	1.53	31.25	2.00	31.25	2.00	31.25	0.79	31.25	2.00	31.25	0.65	31.25	2.00
33.75	0.98			33.75	2.00	33.75	2.00					33.75	1.36					32.25	1.23	32.25	2.00	33.75	0.94	33.75	2.00
36.25	1.08			36.25	2.00							36.25	0.99					33.25	2.00					36.25	1.77
Inv Avg	1.52	Inv Avg	1.77	Inv Avg	1.40	Inv Avg	1.47	Inv Avg	1.56	Inv Avg	1.60	Inv Avg	1.60	Inv Avg	1.72	Inv Avg	1.44	Inv Avg	1.58	Inv Avg	1.48	Inv Avg	1.18	Inv Avg	1.61
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low

Figure D-9

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.19	S (ft)	0.04	S (ft)	0.21	S (ft)	0.34	S (ft)	0.04	S (ft)	0.17	S (ft)	0.31	S (ft)	0.21	S (ft)	0.14	S (ft)	0.17	S (ft)	0.23	S (ft)	0.29	S (ft)	0.19
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.60	6.25	1.33	6.25	n.a	6.25	0.73	6.25	n.a	6.25	n.a	6.25	0.64	6.25	n.a	6.25	0.67	6.25	0.75	6.25	n.a	6.25	0.79	6.25	0.93
8.75	1.47	8.75	2.00	8.75	0.77	8.75	1.87	8.75	1.23	8.75	0.63	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.94	8.75	0.85	8.75	n.a
11.25	2.18	11.25	2.00	11.25	1.70	11.25	1.10	11.25	1.50	11.25	1.43	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.42	11.25	1.53	11.25	1.36	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.65	13.75	0.89	13.75	2.00	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.00	13.75	2.00	13.75	2.00	13.75	1.10
16.25	2.00	16.25	2.01	16.25	0.88	16.25	0.81	16.25	2.00	16.25	1.55	16.25	2.00	16.25	0.59	16.25	2.00	16.25	1.97	16.25	1.29	16.25	2.00	16.25	1.20
18.75	2.00	18.75	1.67	18.75	2.00	18.75	1.24	18.75	2.00	18.75	1.55	18.75	1.36	18.75	2.00	18.75	0.85	18.75	1.11	18.75	1.88	18.75	1.76	18.75	2.00
21.25	1.51	21.25	2.00	21.25	1.61	21.25	1.10	21.25	2.01	21.25	2.00	21.25	1.06	21.25	1.52	21.25	2.00	21.25	2.00	21.25	1.94	21.25	n.a	21.25	1.47
23.75	1.53	23.75	2.00	23.75	1.17	23.75	1.13	23.75	2.00	23.75	2.00	23.75	1.23	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.05	23.75	0.78	23.75	1.94
26.25	1.96	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.89	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.77	26.25	1.51
28.75	2.00	28.75	2.00	28.75	2.15	28.75	2.00	28.75	2.00	28.75	2.14	28.75	0.89	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.28	28.75	2.00
31.25	1.94	31.25	2.00	31.25	2.00	31.25	1.78	31.25	2.00	31.25	1.72	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.92	31.25	n.a	31.25	1.34	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.78	33.75	1.99	33.75	1.82	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.67	33.75	0.52	33.75	2.00	33.75	1.37
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.23			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.00
																								46.25	1.49
																								48.75	1.11
																								51.25	1.32
																								53.75	1.19
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.25
Inv Avg	1.64	Inv Avg	1.90	Inv Avg	1.57	Inv Avg	1.32	Inv Avg	1.87	Inv Avg	1.58	Inv Avg	1.36	Inv Avg	1.70	Inv Avg	1.64	Inv Avg	1.57	Inv Avg	1.48	Inv Avg	1.41	Inv Avg	1.60
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-9

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
60' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.31	S (ft)	0.05	S (ft)	0.23	S (ft)	0.34	S (ft)	0.06	S (ft)	0.24	S (ft)	0.19	S (ft)	0.15	S (ft)	0.17	S (ft)	0.07	S (ft)	0.20	S (ft)	0.14	S (ft)	0.04
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.88	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.98	6.25	0.57	6.25	n.a	6.25	1.15	6.25	1.29	6.25	n.a	6.25	0.67	6.25	n.a	6.25	0.79	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.40	8.75	1.16	8.75	n.a	8.75	n.a	8.75	1.01	8.75	0.90	8.75	0.69	8.75	1.71	8.75	1.09	8.75	n.a	8.75	0.85	8.75	n.a
11.25	0.54	11.25	2.00	11.25	0.71	11.25	0.97	11.25	1.13	11.25	1.30	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.25
13.75	n.a	13.75	2.00	13.75	1.08	13.75	1.87	13.75	2.00	13.75	2.08	13.75	0.96	13.75	n.a	13.75	2.00	13.75	2.00	13.75	0.93	13.75	1.97	13.75	2.18
16.25	0.55	16.25	2.00	16.25	1.57	16.25	1.95	16.25	2.00	16.25	1.98	16.25	2.00	16.25	1.51	16.25	1.70	16.25	1.10	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.64	18.75	1.18	18.75	2.00	18.75	0.86	18.75	1.35	18.75	1.54	18.75	2.07	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.60
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.92	21.25	1.43	21.25	2.06	21.25	2.00	21.25	1.71	21.25	1.79	21.25	2.00	21.25	2.00	21.25	2.05	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.59	23.75	1.81	23.75	2.00	23.75	1.18	23.75	2.00	23.75	1.98	23.75	1.43	23.75	2.00	23.75	1.10	23.75	1.55
26.25	2.00	26.25	1.54	26.25	2.00	26.25	2.00	26.25	1.83	26.25	2.00	26.25	1.25	26.25	2.00	26.25	2.00	26.25	1.37	26.25	2.00	26.25	1.31	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.72	28.75	1.54	28.75	1.74	28.75	2.16	28.75	2.00	28.75	2.00	28.75	1.81	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.51	31.25	2.00	31.25	1.57	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.55	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.32	31.25	2.00
33.75	2.00	33.75	1.63	33.75	2.00	33.75	2.00	33.75	1.71	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.12	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	1.96	36.25	1.53	36.25	2.00	36.25	2.00	36.25	1.29	36.25	2.00	36.25	2.00	36.25	1.06	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.45	Inv Avg	1.86	Inv Avg	1.50	Inv Avg	1.42	Inv Avg	1.76	Inv Avg	1.49	Inv Avg	1.52	Inv Avg	1.62	Inv Avg	1.65	Inv Avg	1.71	Inv Avg	1.61	Inv Avg	1.68	Inv Avg	1.87
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-10

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.13	S (ft)	0.14	S (ft)	0.08	S (ft)	0.13	S (ft)	0.25	S (ft)	0.20	S (ft)	0.13	S (ft)	0.12	S (ft)	0.31	S (ft)	0.02	S (ft)	0.24	S (ft)	0.17	S (ft)	0.15
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.87	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	1.01	6.25	n.a	6.25	n.a	6.25	0.82	6.25	0.61	6.25	n.a	6.25	0.85	6.25	n.a	6.25	n.a	6.25	0.85	6.25	0.71	6.25	1.57
8.75	n.a	8.75	1.00	8.75	n.a	8.75	n.a	8.75	1.00	8.75	2.00	8.75	0.74	8.75	n.a	8.75	0.62	8.75	n.a	8.75	0.86	8.75	1.42	8.75	1.65
11.25	0.75	11.25	1.72	11.25	1.92	11.25	1.56	11.25	1.46	11.25	1.00	11.25	1.50	11.25	n.a	11.25	1.29	11.25	2.00	11.25	2.00	11.25	1.17	11.25	1.68
13.75	1.18	13.75	1.41	13.75	1.07	13.75	1.09	13.75	1.18	13.75	2.00	13.75	1.67	13.75	1.45	13.75	1.19	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.16
16.25	1.16	16.25	1.48	16.25	2.17	16.25	1.99	16.25	0.73	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.61	16.25	1.84	16.25	1.56	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.53	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.90	18.75	2.00	18.75	1.95	18.75	2.00	18.75	1.06
21.25	2.00	21.25	1.11	21.25	1.15	21.25	1.50	21.25	1.29	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.18	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.11	23.75	1.36	23.75	1.58	23.75	1.66	23.75	2.00	23.75	2.20	23.75	2.00	23.75	1.98	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.22	23.75	2.11
26.25	2.00	26.25	2.00	26.25	1.40	26.25	1.66	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.20	26.25	2.00			26.25	2.00	26.25	1.24	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.08	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.36
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.77	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.39			33.75	n.a	33.75	2.00	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.79	36.25	0.96	36.25	1.67	36.25	1.32			36.25	2.00	36.25	1.04					36.25	1.49	36.25	0.82
				38.75	2.12	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.66	Inv Avg	1.54	Inv Avg	1.77	Inv Avg	1.72	Inv Avg	1.43	Inv Avg	1.65	Inv Avg	1.71	Inv Avg	1.80	Inv Avg	1.36	Inv Avg	1.98	Inv Avg	1.52	Inv Avg	1.54	Inv Avg	1.57
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-10

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.17	S (ft)	0.11	S (ft)	0.32	S (ft)	0.08	S (ft)	0.22	S (ft)	0.20	S (ft)	0.09	S (ft)	0.13	S (ft)	0.20	S (ft)	0.17	S (ft)	0.47	S (ft)	0.18	S (ft)	0.11
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.90	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.87	6.25	1.02	6.25	0.74	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.85	6.25	n.a	6.25	n.a	6.25	0.89	6.25	0.88
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.32	8.75	n.a	8.75	0.97	8.75	n.a	8.75	1.23	8.75	0.90	8.75	1.06	8.75	0.68	8.75	1.30	8.75	1.49
11.25	n.a	11.25	n.a	11.25	0.62	11.25	n.a	11.25	n.a	11.25	0.67	11.25	n.a	11.25	1.69	11.25	1.23	11.25	1.22	11.25	0.90	11.25	0.88	11.25	n.a
13.75	0.60	13.75	0.82	13.75	0.77	13.75	1.14	13.75	0.79	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.26	13.75	0.68	13.75	2.00	13.75	n.a
16.25	1.09	16.25	1.48	16.25	2.00	16.25	2.04	16.25	1.17	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.09	16.25	1.23	16.25	2.00	16.25	1.48
18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.33	18.75	2.00	18.75	2.00	18.75	2.00	18.75	0.87	18.75	1.52	18.75	2.00	18.75	2.00
21.25	1.31	21.25	2.00	21.25	1.40	21.25	2.00	21.25	1.97	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.62	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.26	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.72	23.75	1.25	23.75	1.58	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.71	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.81			26.25	2.00
28.75	2.03	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.93	28.75	1.03			28.75	2.00
31.25	1.41	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.09	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.74	31.25	1.41	31.25	0.93			31.25	2.00
33.75	n.a	33.75	2.00	33.75	1.54	33.75	2.00	33.75	2.00	33.75	2.14	33.75	2.00	33.75	2.00	33.75	1.93	33.75	2.00	33.75	1.89			33.75	2.00
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.84	36.25	0.67	36.25	1.85	36.25	2.00	36.25	1.54			36.25	2.00
Inv Avg	1.57	Inv Avg	1.79	Inv Avg	1.43	Inv Avg	1.69	Inv Avg	1.59	Inv Avg	1.62	Inv Avg	1.83	Inv Avg	1.67	Inv Avg	1.58	Inv Avg	1.48	Inv Avg	1.20	Inv Avg	1.53	Inv Avg	1.77
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-10

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.13	S (ft)	0.19	S (ft)	0.18	S (ft)	0.16	S (ft)	0.09	S (ft)	0.27	S (ft)	0.26	S (ft)	0.06	S (ft)	0.22	S (ft)	0.20	S (ft)	0.21	S (ft)	0.31	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.82	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	1.01	6.25	0.77	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.58	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.80	8.75	0.80	8.75	1.20	8.75	n.a	8.75	n.a	8.75	0.81	8.75	0.51	8.75	0.78
11.25	n.a	11.25	1.22	11.25	2.00	11.25	0.97	11.25	n.a	11.25	1.27	11.25	0.93	11.25	1.32	11.25	0.52	11.25	0.70	11.25	2.00	11.25	2.00	11.25	1.54
13.75	0.72	13.75	2.00	13.75	1.84	13.75	2.00	13.75	n.a	13.75	2.00	13.75	2.06	13.75	1.85	13.75	2.19	13.75	0.86	13.75	0.78	13.75	1.25	13.75	2.00
16.25	1.17	16.25	2.00	16.25	2.07	16.25	2.00	16.25	2.00	16.25	1.77	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.54	16.25	2.04	16.25	1.09	16.25	2.00
18.75	1.22	18.75	2.00	18.75	2.00	18.75	0.96	18.75	2.00	18.75	0.91	18.75	2.00	18.75	2.00	18.75	1.70	18.75	2.00	18.75	1.24	18.75	1.10	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.03	21.25	2.00	21.25	0.97	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.04	23.75	1.67	23.75	2.00	23.75	2.12	23.75	2.00	23.75	1.59	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.64	26.25	2.00	26.25	1.73			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.54	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.42	28.75	0.92	28.75	n.a	28.75	0.89	28.75	2.00			28.75	1.42	28.75	2.08	28.75	2.00	28.75	1.41	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.89	31.25	1.50	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.43			33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.44	33.75	2.00	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.29	36.25	2.13			36.25	2.00	36.25	1.62			36.25	1.64	36.25	2.04		
Inv Avg	1.64	Inv Avg	1.62	Inv Avg	1.63	Inv Avg	1.62	Inv Avg	1.79	Inv Avg	1.44	Inv Avg	1.41	Inv Avg	1.77	Inv Avg	1.65	Inv Avg	1.60	Inv Avg	1.50	Inv Avg	1.49	Inv Avg	1.76
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-10

SCHEDULE CJG-ST1

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.07	S (ft)	0.15	S (ft)	0.22	S (ft)	0.21	S (ft)	0.30	S (ft)	0.04	S (ft)	0.02	S (ft)	0.06	S (ft)	0.02	S (ft)	0.13	S (ft)	0.11	S (ft)	0.20	S (ft)	0.16
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.64	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.80	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.59	6.25	0.69
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.67	8.75	1.21	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.69	8.75	1.76
11.25	1.19	11.25	2.00	11.25	n.a	11.25	n.a	11.25	0.57	11.25	2.00	11.25	1.12	11.25	1.12	11.25	n.a	11.25	n.a	11.25	n.a	11.25	1.99	11.25	1.05
13.75	2.00	13.75	2.00	13.75	0.95	13.75	n.a	13.75	1.20	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.61	13.75	0.77	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.85	16.25	0.52	16.25	1.44	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.89	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	1.95	18.75	2.00	18.75	2.00	18.75	1.84	18.75	1.93	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.35	18.75	1.29
21.25	2.00	21.25	1.85	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.14			21.25	2.00	21.25	2.06	21.25	2.00	21.25	2.00	21.25	2.01	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.42			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.43	23.75	2.00
26.25	1.18	26.25	2.00	26.25	2.00	26.25	1.15	26.25	2.00	26.25	2.00			26.25	2.00	26.25	2.00			26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.73	28.75	2.00	28.75	2.00	28.75	1.29	28.75	1.21	28.75	2.00			28.75	1.04	28.75	2.00			28.75	2.00	28.75	2.02		
31.25	1.04	31.25	1.07	31.25	1.29	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.38	31.25	1.55		
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.30	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.00	36.25	2.00	36.25	1.20	36.25	2.00	36.25	2.00											36.25	2.00		
Inv Avg	1.70	Inv Avg	1.72	Inv Avg	1.59	Inv Avg	1.48	Inv Avg	1.41	Inv Avg	1.87	Inv Avg	1.82	Inv Avg	1.77	Inv Avg	2.00	Inv Avg	1.59	Inv Avg	1.73	Inv Avg	1.60	Inv Avg	1.52
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-10

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.11	S (ft)	0.03	S (ft)	0.27	S (ft)	0.35	S (ft)	0.20	S (ft)	0.20	S (ft)	0.08	S (ft)	0.13	S (ft)	0.51	S (ft)	0.19	S (ft)	0.19	S (ft)	0.38	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.69	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.88	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.56	6.25	0.57	6.25	2.00	6.25	0.84	6.25	n.a	6.25	1.35	6.25	0.85	6.25	0.70	6.25	n.a
8.75	1.15	8.75	2.00	8.75	0.85	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.69	8.75	1.09	8.75	n.a	8.75	2.00	8.75	1.29	8.75	1.28	8.75	0.59
11.25	1.16	11.25	1.25	11.25	1.32	11.25	0.47	11.25	1.74	11.25	1.17	11.25	1.53	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.37	11.25	0.95	11.25	1.78
13.75	2.00	13.75	2.00	13.75	2.12	13.75	1.13	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.44	13.75	1.88	13.75	1.51	13.75	1.01	13.75	1.65
16.25	2.00	16.25	1.66	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.13	16.25	2.00	16.25	0.96	16.25	1.16	16.25	2.00
18.75	1.08	18.75	2.00	18.75	2.00	18.75	1.27	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.78	18.75	2.00	18.75	1.20	18.75	1.36	18.75	2.00
21.25	2.00	21.25	1.43	21.25	2.00	21.25	1.85	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.17	21.25	1.20	21.25	2.00	21.25	1.64	21.25	1.37	21.25	1.28
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.63	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.24	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.92
26.25	2.00			26.25	1.24	26.25	2.00			26.25	2.00	26.25	1.22	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	1.04	28.75	2.00			28.75	2.16	28.75	1.24	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.41			31.25	1.07	31.25	2.00			31.25	2.00	31.25	1.58	31.25	2.00	31.25	2.00	31.25	0.81	31.25	2.00	31.25	0.67	31.25	2.00
33.75	1.01			33.75	2.00	33.75	2.00					33.75	1.41					32.25	1.27	32.25	2.00	33.75	0.97	33.75	2.00
36.25	1.11			36.25	2.00							36.25	1.03					33.25	2.00					36.25	1.84
Inv Avg	1.54	Inv Avg	1.78	Inv Avg	1.42	Inv Avg	1.48	Inv Avg	1.57	Inv Avg	1.61	Inv Avg	1.63	Inv Avg	1.72	Inv Avg	1.46	Inv Avg	1.59	Inv Avg	1.50	Inv Avg	1.21	Inv Avg	1.63
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-10

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.18	S (ft)	0.04	S (ft)	0.19	S (ft)	0.31	S (ft)	0.04	S (ft)	0.17	S (ft)	0.29	S (ft)	0.14	S (ft)	0.21	S (ft)	0.17	S (ft)	0.22	S (ft)	0.29	S (ft)	0.19
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.61	6.25	1.35	6.25	n.a	6.25	0.74	6.25	n.a	6.25	n.a	6.25	0.65	6.25	n.a	6.25	0.68	6.25	0.76	6.25	n.a	6.25	0.80	6.25	0.94
8.75	1.49	8.75	2.00	8.75	0.78	8.75	1.90	8.75	1.25	8.75	0.64	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.96	8.75	0.87	8.75	n.a
11.25	2.00	11.25	2.00	11.25	1.73	11.25	1.12	11.25	1.52	11.25	1.46	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.45	11.25	1.56	11.25	1.39	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.68	13.75	0.91	13.75	2.00	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.02	13.75	2.00	13.75	2.00	13.75	1.12
16.25	2.00	16.25	2.05	16.25	0.90	16.25	0.83	16.25	2.00	16.25	1.59	16.25	2.00	16.25	0.61	16.25	2.00	16.25	2.02	16.25	1.32	16.25	2.00	16.25	1.23
18.75	2.00	18.75	1.71	18.75	2.00	18.75	1.28	18.75	2.00	18.75	1.59	18.75	1.40	18.75	2.00	18.75	0.87	18.75	1.14	18.75	1.93	18.75	1.81	18.75	2.00
21.25	1.55	21.25	2.00	21.25	1.66	21.25	1.13	21.25	2.07	21.25	2.00	21.25	1.09	21.25	1.56	21.25	2.00	21.25	2.00	21.25	2.00	21.25	n.a	21.25	1.52
23.75	1.58	23.75	2.00	23.75	1.20	23.75	1.16	23.75	2.00	23.75	2.00	23.75	1.27	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.11	23.75	0.81	23.75	2.00
26.25	2.02	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.92	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.82	26.25	1.56
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	0.92	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.32	28.75	2.00
31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.84	31.25	2.00	31.25	1.78	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.98	31.25	n.a	31.25	1.38	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.84	33.75	2.06	33.75	1.88	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.73	33.75	0.54	33.75	2.00	33.75	1.42
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.28			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.00
																								46.25	1.55
																								48.75	1.16
																								51.25	1.37
																								53.75	1.23
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.29
Inv Avg	1.65	Inv Avg	1.91	Inv Avg	1.58	Inv Avg	1.34	Inv Avg	1.89	Inv Avg	1.60	Inv Avg	1.38	Inv Avg	1.71	Inv Avg	1.65	Inv Avg	1.59	Inv Avg	1.51	Inv Avg	1.44	Inv Avg	1.63
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-10

Ameren Missouri: Labadie UWL
Liquefaction Analysis
70' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.31	S (ft)	0.05	S (ft)	0.23	S (ft)	0.33	S (ft)	0.06	S (ft)	0.23	S (ft)	0.18	S (ft)	0.15	S (ft)	0.17	S (ft)	0.06	S (ft)	0.20	S (ft)	0.14	S (ft)	0.04
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.88	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.99	6.25	0.57	6.25	n.a	6.25	1.16	6.25	1.30	6.25	n.a	6.25	0.68	6.25	n.a	6.25	0.80	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.41	8.75	1.17	8.75	n.a	8.75	n.a	8.75	1.03	8.75	0.91	8.75	0.69	8.75	1.73	8.75	1.10	8.75	n.a	8.75	0.86	8.75	n.a
11.25	0.55	11.25	2.00	11.25	0.72	11.25	0.98	11.25	1.14	11.25	1.31	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.27
13.75	n.a	13.75	2.00	13.75	1.10	13.75	1.90	13.75	2.00	13.75	2.12	13.75	0.98	13.75	n.a	13.75	2.00	13.75	2.00	13.75	0.95	13.75	2.00	13.75	2.00
16.25	0.57	16.25	2.00	16.25	1.60	16.25	1.99	16.25	2.00	16.25	2.02	16.25	2.00	16.25	1.54	16.25	1.73	16.25	1.12	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.67	18.75	1.21	18.75	2.00	18.75	0.87	18.75	1.37	18.75	1.57	18.75	2.11	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.63
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.94	21.25	1.46	21.25	2.11	21.25	2.00	21.25	1.74	21.25	1.83	21.25	2.00	21.25	2.00	21.25	2.09	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.62	23.75	1.86	23.75	2.00	23.75	1.21	23.75	2.00	23.75	2.03	23.75	1.47	23.75	2.00	23.75	1.13	23.75	1.59
26.25	2.00	26.25	1.58	26.25	2.00	26.25	2.00	26.25	1.87	26.25	2.00	26.25	1.28	26.25	2.00	26.25	2.00	26.25	1.41	26.25	2.00	26.25	1.34	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.77	28.75	1.58	28.75	1.78	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.85	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.55	31.25	2.00	31.25	1.61	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.59	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.35	31.25	2.00
33.75	2.00	33.75	1.68	33.75	2.00	33.75	2.00	33.75	1.76	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.15	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	2.01	36.25	1.58	36.25	2.00	36.25	2.00	36.25	1.33	36.25	2.00	36.25	2.00	36.25	1.08	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.46	Inv Avg	1.87	Inv Avg	1.52	Inv Avg	1.44	Inv Avg	1.79	Inv Avg	1.51	Inv Avg	1.53	Inv Avg	1.63	Inv Avg	1.66	Inv Avg	1.73	Inv Avg	1.62	Inv Avg	1.70	Inv Avg	1.87
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-11

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.13	S (ft)	0.11	S (ft)	0.08	S (ft)	0.11	S (ft)	0.25	S (ft)	0.20	S (ft)	0.13	S (ft)	0.11	S (ft)	0.30	S (ft)	0.02	S (ft)	0.24	S (ft)	0.17	S (ft)	0.15
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.87	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	1.02	6.25	n.a	6.25	n.a	6.25	0.83	6.25	0.62	6.25	n.a	6.25	0.86	6.25	n.a	6.25	n.a	6.25	0.86	6.25	0.72	6.25	1.59
8.75	n.a	8.75	1.01	8.75	n.a	8.75	n.a	8.75	1.01	8.75	2.00	8.75	0.75	8.75	n.a	8.75	0.63	8.75	n.a	8.75	0.87	8.75	1.43	8.75	1.67
11.25	0.76	11.25	1.75	11.25	1.94	11.25	1.58	11.25	1.48	11.25	1.02	11.25	1.52	11.25	n.a	11.25	1.31	11.25	2.00	11.25	2.00	11.25	1.18	11.25	1.70
13.75	1.20	13.75	1.44	13.75	1.08	13.75	1.10	13.75	1.20	13.75	2.00	13.75	1.70	13.75	1.48	13.75	1.21	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.18
16.25	1.18	16.25	1.50	16.25	2.00	16.25	2.03	16.25	0.74	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.63	16.25	1.87	16.25	1.58	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.56	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.94	18.75	2.00	18.75	1.99	18.75	2.00	18.75	1.09
21.25	2.00	21.25	1.14	21.25	1.17	21.25	1.54	21.25	1.31	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.16	23.75	1.39	23.75	1.62	23.75	1.70	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.02	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.25	23.75	2.16
26.25	2.00	26.25	2.00	26.25	1.43	26.25	1.70	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00			26.25	2.00	26.25	1.27	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.13	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.39
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.81	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.43			33.75	n.a	33.75	2.00	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.84	36.25	0.99	36.25	1.72	36.25	1.36			36.25	2.00	36.25	1.07					36.25	1.53	36.25	0.85
				38.75	2.18	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.67	Inv Avg	1.56	Inv Avg	1.78	Inv Avg	1.74	Inv Avg	1.44	Inv Avg	1.65	Inv Avg	1.71	Inv Avg	1.80	Inv Avg	1.37	Inv Avg	1.99	Inv Avg	1.53	Inv Avg	1.55	Inv Avg	1.59
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-11

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.16	S (ft)	0.11	S (ft)	0.32	S (ft)	0.08	S (ft)	0.21	S (ft)	0.20	S (ft)	0.09	S (ft)	0.13	S (ft)	0.20	S (ft)	0.16	S (ft)	0.46	S (ft)	0.17	S (ft)	0.11
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.91	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.88	6.25	1.03	6.25	0.74	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.86	6.25	n.a	6.25	n.a	6.25	0.90	6.25	0.89
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.34	8.75	n.a	8.75	0.98	8.75	n.a	8.75	1.24	8.75	0.91	8.75	1.08	8.75	0.69	8.75	1.31	8.75	1.51
11.25	n.a	11.25	n.a	11.25	0.63	11.25	n.a	11.25	n.a	11.25	0.68	11.25	n.a	11.25	1.72	11.25	1.24	11.25	1.24	11.25	0.91	11.25	0.89	11.25	n.a
13.75	0.61	13.75	0.83	13.75	0.79	13.75	1.15	13.75	0.80	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.28	13.75	0.69	13.75	2.00	13.75	n.a
16.25	1.11	16.25	1.51	16.25	2.00	16.25	2.07	16.25	1.19	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.11	16.25	1.25	16.25	2.00	16.25	1.51
18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.36	18.75	2.00	18.75	2.00	18.75	2.00	18.75	0.88	18.75	1.55	18.75	2.00	18.75	2.04
21.25	1.34	21.25	2.00	21.25	1.43	21.25	2.00	21.25	2.02	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.66	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.29	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.76	23.75	1.28	23.75	1.62	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.75	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.82			26.25	2.00
28.75	2.08	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.98	28.75	1.06			28.75	2.00
31.25	1.44	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.15	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.79	31.25	1.44	31.25	0.95			31.25	2.00
33.75	n.a	33.75	2.00	33.75	1.58	33.75	2.00	33.75	2.00	33.75	2.19	33.75	2.00	33.75	2.00	33.75	1.98	33.75	2.00	33.75	1.95			33.75	2.06
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.86	36.25	0.69	36.25	1.90	36.25	2.00	36.25	1.59			36.25	2.00
Inv Avg	1.58	Inv Avg	1.79	Inv Avg	1.44	Inv Avg	1.70	Inv Avg	1.60	Inv Avg	1.63	Inv Avg	1.84	Inv Avg	1.68	Inv Avg	1.59	Inv Avg	1.50	Inv Avg	1.22	Inv Avg	1.54	Inv Avg	1.78
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-11

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.13	S (ft)	0.19	S (ft)	0.18	S (ft)	0.16	S (ft)	0.08	S (ft)	0.27	S (ft)	0.26	S (ft)	0.05	S (ft)	0.22	S (ft)	0.20	S (ft)	0.21	S (ft)	0.28	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.83	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	1.02	6.25	0.78	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.58	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.81	8.75	0.81	8.75	1.21	8.75	n.a	8.75	n.a	8.75	0.82	8.75	0.52	8.75	0.79
11.25	n.a	11.25	1.24	11.25	2.00	11.25	0.99	11.25	n.a	11.25	1.29	11.25	0.94	11.25	1.34	11.25	0.53	11.25	0.71	11.25	2.00	11.25	2.00	11.25	1.56
13.75	0.73	13.75	2.00	13.75	1.87	13.75	2.00	13.75	n.a	13.75	2.00	13.75	2.09	13.75	1.88	13.75	2.00	13.75	0.88	13.75	0.80	13.75	1.27	13.75	2.00
16.25	1.19	16.25	2.00	16.25	2.10	16.25	2.00	16.25	2.00	16.25	1.80	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.57	16.25	2.08	16.25	1.11	16.25	2.00
18.75	1.25	18.75	2.00	18.75	2.00	18.75	0.98	18.75	2.00	18.75	0.93	18.75	2.00	18.75	2.00	18.75	1.73	18.75	2.00	18.75	1.27	18.75	1.12	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.05	21.25	2.00	21.25	0.99	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.09	23.75	1.71	23.75	2.00	23.75	2.17	23.75	2.00	23.75	1.62	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.68	26.25	2.00	26.25	1.77			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.58	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.45	28.75	0.94	28.75	n.a	28.75	0.91	28.75	2.00			28.75	1.45	28.75	2.13	28.75	2.00	28.75	1.44	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.94	31.25	1.54	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.46			33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.48	33.75	2.00	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.33	36.25	2.19			36.25	2.00	36.25	1.67			36.25	1.68	36.25	2.10		
Inv Avg	1.65	Inv Avg	1.63	Inv Avg	1.65	Inv Avg	1.64	Inv Avg	1.80	Inv Avg	1.46	Inv Avg	1.42	Inv Avg	1.78	Inv Avg	1.66	Inv Avg	1.61	Inv Avg	1.52	Inv Avg	1.50	Inv Avg	1.77
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-11

SCHEDULE CJG-ST1

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.06	S (ft)	0.14	S (ft)	0.22	S (ft)	0.20	S (ft)	0.30	S (ft)	0.04	S (ft)	0.02	S (ft)	0.06	S (ft)	0.02	S (ft)	0.13	S (ft)	0.11	S (ft)	0.19	S (ft)	0.16
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.65	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.81	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.60	6.25	0.70
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.68	8.75	1.22	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.71	8.75	1.78
11.25	1.21	11.25	2.00	11.25	n.a	11.25	n.a	11.25	0.58	11.25	2.00	11.25	1.14	11.25	1.14	11.25	n.a	11.25	n.a	11.25	n.a	11.25	2.01	11.25	1.07
13.75	2.00	13.75	2.00	13.75	0.97	13.75	n.a	13.75	1.22	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.62	13.75	0.79	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.88	16.25	0.53	16.25	1.46	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.92	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	1.99	18.75	2.00	18.75	2.00	18.75	1.88	18.75	1.97	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.37	18.75	1.32
21.25	2.00	21.25	1.89	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.18			21.25	2.00	21.25	2.11	21.25	2.00	21.25	2.00	21.25	2.06	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.45			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.46	23.75	2.00
26.25	1.21	26.25	2.00	26.25	2.00	26.25	1.18	26.25	2.05	26.25	2.00			26.25	2.00	26.25	2.00			26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.77	28.75	2.00	28.75	2.00	28.75	1.32	28.75	1.24	28.75	2.00			28.75	1.06	28.75	2.00			28.75	2.00	28.75	2.07		
31.25	1.07	31.25	1.10	31.25	1.32	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.41	31.25	1.59		
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.33	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.00	36.25	2.00	36.25	1.23	36.25	2.00	36.25	2.00											36.25	2.00		
Inv Avg	1.72	Inv Avg	1.73	Inv Avg	1.60	Inv Avg	1.49	Inv Avg	1.42	Inv Avg	1.88	Inv Avg	1.83	Inv Avg	1.78	Inv Avg	2.00	Inv Avg	1.60	Inv Avg	1.74	Inv Avg	1.62	Inv Avg	1.53
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-11

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.10	S (ft)	0.03	S (ft)	0.27	S (ft)	0.35	S (ft)	0.20	S (ft)	0.20	S (ft)	0.08	S (ft)	0.13	S (ft)	0.51	S (ft)	0.19	S (ft)	0.19	S (ft)	0.35	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.70	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.89	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.56	6.25	0.57	6.25	2.00	6.25	0.84	6.25	n.a	6.25	1.37	6.25	0.86	6.25	0.71	6.25	n.a
8.75	1.16	8.75	2.00	8.75	0.86	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.71	8.75	1.10	8.75	n.a	8.75	2.00	8.75	1.31	8.75	1.29	8.75	0.60
11.25	1.18	11.25	1.27	11.25	1.34	11.25	0.48	11.25	1.76	11.25	1.19	11.25	1.55	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.39	11.25	0.97	11.25	1.81
13.75	2.00	13.75	2.00	13.75	2.15	13.75	1.15	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.45	13.75	1.91	13.75	1.53	13.75	1.02	13.75	1.68
16.25	2.00	16.25	1.69	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.17	16.25	2.00	16.25	0.98	16.25	1.18	16.25	2.00
18.75	1.10	18.75	2.00	18.75	2.00	18.75	1.30	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.82	18.75	2.00	18.75	1.22	18.75	1.39	18.75	2.00
21.25	2.00	21.25	1.46	21.25	2.00	21.25	1.89	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.23	21.25	2.00	21.25	1.67	21.25	1.39	21.25	1.31
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.67	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.27	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.97
26.25	2.00			26.25	1.27	26.25	2.00			26.25	2.00	26.25	1.25	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	1.07	28.75	2.00			28.75	2.00	28.75	1.27	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.45			31.25	1.10	31.25	2.00			31.25	2.00	31.25	1.62	31.25	2.00	31.25	2.00	31.25	0.83	31.25	2.00	31.25	0.69	31.25	2.00
33.75	1.04			33.75	2.00	33.75	2.00					33.75	1.45					32.25	1.30	32.25	2.00	33.75	1.00	33.75	2.00
36.25	1.15			36.25	2.00							36.25	1.06					33.25	2.00					36.25	1.89
Inv Avg	1.56	Inv Avg	1.80	Inv Avg	1.44	Inv Avg	1.50	Inv Avg	1.57	Inv Avg	1.61	Inv Avg	1.65	Inv Avg	1.71	Inv Avg	1.47	Inv Avg	1.60	Inv Avg	1.52	Inv Avg	1.22	Inv Avg	1.65
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-11

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.18	S (ft)	0.04	S (ft)	0.19	S (ft)	0.31	S (ft)	0.04	S (ft)	0.17	S (ft)	0.28	S (ft)	0.14	S (ft)	0.21	S (ft)	0.16	S (ft)	0.22	S (ft)	0.29	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.61	6.25	1.36	6.25	n.a	6.25	0.75	6.25	n.a	6.25	n.a	6.25	0.66	6.25	n.a	6.25	0.69	6.25	0.77	6.25	n.a	6.25	0.81	6.25	0.95
8.75	1.51	8.75	2.00	8.75	0.79	8.75	1.92	8.75	1.27	8.75	0.65	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.97	8.75	0.88	8.75	n.a
11.25	2.00	11.25	2.00	11.25	1.76	11.25	1.13	11.25	1.55	11.25	1.48	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.47	11.25	1.58	11.25	1.41	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.71	13.75	0.93	13.75	2.00	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.04	13.75	2.00	13.75	2.00	13.75	1.14
16.25	2.00	16.25	2.09	16.25	0.92	16.25	0.85	16.25	2.00	16.25	1.62	16.25	2.00	16.25	0.62	16.25	2.00	16.25	2.06	16.25	1.35	16.25	2.00	16.25	1.25
18.75	2.00	18.75	1.75	18.75	2.00	18.75	1.30	18.75	2.00	18.75	1.63	18.75	1.42	18.75	2.00	18.75	0.89	18.75	1.16	18.75	1.97	18.75	1.84	18.75	2.00
21.25	1.59	21.25	2.00	21.25	1.69	21.25	1.15	21.25	2.11	21.25	2.00	21.25	1.11	21.25	1.59	21.25	2.00	21.25	2.00	21.25	2.04	21.25	n.a	21.25	1.55
23.75	1.61	23.75	2.00	23.75	1.23	23.75	1.19	23.75	2.00	23.75	2.00	23.75	1.30	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.16	23.75	0.82	23.75	2.04
26.25	2.07	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.94	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.86	26.25	1.59
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	0.94	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.35	28.75	2.00
31.25	2.06	31.25	2.00	31.25	2.00	31.25	1.88	31.25	2.00	31.25	1.82	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.03	31.25	n.a	31.25	1.42	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.89	33.75	2.12	33.75	1.93	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.78	33.75	0.55	33.75	2.00	33.75	1.46
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.31			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.00
																								46.25	1.60
																								48.75	1.19
																								51.25	1.42
																								53.75	1.27
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.33
Inv Avg	1.66	Inv Avg	1.92	Inv Avg	1.59	Inv Avg	1.36	Inv Avg	1.90	Inv Avg	1.62	Inv Avg	1.40	Inv Avg	1.72	Inv Avg	1.65	Inv Avg	1.61	Inv Avg	1.53	Inv Avg	1.45	Inv Avg	1.65
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-11

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
80' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.31	S (ft)	0.05	S (ft)	0.22	S (ft)	0.33	S (ft)	0.06	S (ft)	0.23	S (ft)	0.18	S (ft)	0.15	S (ft)	0.17	S (ft)	0.06	S (ft)	0.19	S (ft)	0.13	S (ft)	0.04
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.89	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.99	6.25	0.58	6.25	n.a	6.25	1.17	6.25	1.31	6.25	n.a	6.25	0.68	6.25	n.a	6.25	0.80	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.43	8.75	1.18	8.75	n.a	8.75	n.a	8.75	1.04	8.75	0.92	8.75	0.70	8.75	1.74	8.75	1.11	8.75	n.a	8.75	0.87	8.75	n.a
11.25	0.56	11.25	2.00	11.25	0.72	11.25	0.99	11.25	1.15	11.25	1.33	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.28
13.75	n.a	13.75	2.00	13.75	1.11	13.75	1.92	13.75	2.00	13.75	2.14	13.75	0.99	13.75	n.a	13.75	2.00	13.75	2.00	13.75	0.96	13.75	2.02	13.75	2.00
16.25	0.57	16.25	2.00	16.25	1.62	16.25	2.02	16.25	2.00	16.25	2.05	16.25	2.00	16.25	1.56	16.25	1.76	16.25	1.14	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.70	18.75	1.23	18.75	2.00	18.75	0.89	18.75	1.40	18.75	1.59	18.75	2.14	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.65
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.96	21.25	1.49	21.25	2.14	21.25	2.00	21.25	1.77	21.25	1.86	21.25	2.00	21.25	2.00	21.25	2.13	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.65	23.75	1.89	23.75	2.00	23.75	1.23	23.75	2.00	23.75	2.07	23.75	1.49	23.75	2.00	23.75	1.15	23.75	1.62
26.25	2.00	26.25	1.61	26.25	2.00	26.25	2.00	26.25	1.91	26.25	2.00	26.25	1.30	26.25	2.00	26.25	2.00	26.25	1.43	26.25	2.00	26.25	1.37	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.80	28.75	1.61	28.75	1.82	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.89	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.58	31.25	2.00	31.25	1.65	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.63	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.38	31.25	2.00
33.75	2.00	33.75	1.72	33.75	2.00	33.75	2.00	33.75	1.80	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.18	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	2.06	36.25	1.61	36.25	2.00	36.25	2.00	36.25	1.36	36.25	2.00	36.25	2.00	36.25	1.11	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.47	Inv Avg	1.88	Inv Avg	1.52	Inv Avg	1.45	Inv Avg	1.80	Inv Avg	1.52	Inv Avg	1.54	Inv Avg	1.65	Inv Avg	1.68	Inv Avg	1.73	Inv Avg	1.63	Inv Avg	1.71	Inv Avg	1.87
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-12

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.13	S (ft)	0.11	S (ft)	0.08	S (ft)	0.09	S (ft)	0.25	S (ft)	0.20	S (ft)	0.13	S (ft)	0.11	S (ft)	0.30	S (ft)	0.02	S (ft)	0.23	S (ft)	0.17	S (ft)	0.14
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.87	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	1.03	6.25	n.a	6.25	n.a	6.25	0.83	6.25	0.62	6.25	n.a	6.25	0.86	6.25	n.a	6.25	n.a	6.25	0.87	6.25	0.72	6.25	1.60
8.75	n.a	8.75	1.02	8.75	n.a	8.75	n.a	8.75	1.02	8.75	2.00	8.75	0.75	8.75	n.a	8.75	0.64	8.75	n.a	8.75	0.88	8.75	1.45	8.75	1.68
11.25	0.77	11.25	1.77	11.25	1.96	11.25	1.60	11.25	1.50	11.25	1.03	11.25	1.54	11.25	n.a	11.25	1.32	11.25	2.00	11.25	2.00	11.25	1.20	11.25	1.72
13.75	1.21	13.75	1.46	13.75	1.10	13.75	1.12	13.75	1.22	13.75	2.00	13.75	1.72	13.75	1.50	13.75	1.22	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.19
16.25	1.20	16.25	1.53	16.25	2.00	16.25	2.06	16.25	0.75	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.63	16.25	1.90	16.25	1.61	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.58	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.97	18.75	2.00	18.75	2.02	18.75	2.00	18.75	1.10
21.25	2.00	21.25	1.15	21.25	1.19	21.25	1.56	21.25	1.34	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	1.41	23.75	1.65	23.75	1.73	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.06	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.28	23.75	2.20
26.25	2.00	26.25	2.00	26.25	1.46	26.25	1.74	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00			26.25	2.00	26.25	1.30	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.17	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.42
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.85	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.46			33.75	n.a	33.75	2.00	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.88	36.25	1.01	36.25	1.76	36.25	1.39			36.25	2.00	36.25	1.10					36.25	1.57	36.25	0.87
				38.75	2.00	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.67	Inv Avg	1.57	Inv Avg	1.79	Inv Avg	1.75	Inv Avg	1.45	Inv Avg	1.66	Inv Avg	1.72	Inv Avg	1.80	Inv Avg	1.39	Inv Avg	1.99	Inv Avg	1.54	Inv Avg	1.56	Inv Avg	1.60
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-12

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.16	S (ft)	0.11	S (ft)	0.32	S (ft)	0.08	S (ft)	0.21	S (ft)	0.20	S (ft)	0.09	S (ft)	0.13	S (ft)	0.20	S (ft)	0.16	S (ft)	0.46	S (ft)	0.16	S (ft)	0.11
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.91	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.89	6.25	1.04	6.25	0.75	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.88	6.25	n.a	6.25	n.a	6.25	0.90	6.25	0.90
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.35	8.75	n.a	8.75	0.99	8.75	n.a	8.75	1.25	8.75	0.92	8.75	1.09	8.75	0.70	8.75	1.33	8.75	1.52
11.25	n.a	11.25	n.a	11.25	0.64	11.25	n.a	11.25	n.a	11.25	0.69	11.25	n.a	11.25	1.73	11.25	1.26	11.25	1.25	11.25	0.92	11.25	0.90	11.25	n.a
13.75	0.61	13.75	0.84	13.75	0.80	13.75	1.17	13.75	0.81	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.29	13.75	0.70	13.75	2.00	13.75	n.a
16.25	1.13	16.25	1.53	16.25	2.00	16.25	2.10	16.25	1.21	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.12	16.25	1.27	16.25	2.00	16.25	1.53
18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.38	18.75	2.00	18.75	2.00	18.75	2.00	18.75	0.90	18.75	1.57	18.75	2.00	18.75	2.07
21.25	1.36	21.25	2.00	21.25	1.45	21.25	2.00	21.25	2.05	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.69	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.31	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.79	23.75	1.30	23.75	1.65	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.78	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.84			26.25	2.00
28.75	2.13	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.02	28.75	1.08			28.75	2.00
31.25	1.47	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.19	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.83	31.25	1.47	31.25	0.97			31.25	2.00
33.75	n.a	33.75	2.00	33.75	1.62	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.03	33.75	2.00	33.75	1.99			33.75	2.10
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.88	36.25	0.70	36.25	1.94	36.25	2.00	36.25	1.62			36.25	2.00
Inv Avg	1.60	Inv Avg	1.80	Inv Avg	1.45	Inv Avg	1.70	Inv Avg	1.61	Inv Avg	1.63	Inv Avg	1.84	Inv Avg	1.69	Inv Avg	1.61	Inv Avg	1.52	Inv Avg	1.24	Inv Avg	1.55	Inv Avg	1.79
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-12

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.12	S (ft)	0.19	S (ft)	0.18	S (ft)	0.16	S (ft)	0.08	S (ft)	0.24	S (ft)	0.26	S (ft)	0.05	S (ft)	0.22	S (ft)	0.20	S (ft)	0.21	S (ft)	0.28	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.83	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	1.03	6.25	0.78	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.59	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.82	8.75	0.82	8.75	1.22	8.75	n.a	8.75	n.a	8.75	0.82	8.75	0.52	8.75	0.79
11.25	n.a	11.25	1.25	11.25	2.00	11.25	1.00	11.25	n.a	11.25	1.30	11.25	0.95	11.25	1.35	11.25	0.53	11.25	0.72	11.25	2.00	11.25	2.00	11.25	1.58
13.75	0.74	13.75	2.00	13.75	1.90	13.75	2.00	13.75	n.a	13.75	2.00	13.75	2.12	13.75	1.91	13.75	2.00	13.75	0.89	13.75	0.81	13.75	1.28	13.75	2.00
16.25	1.21	16.25	2.00	16.25	2.13	16.25	2.00	16.25	2.00	16.25	1.82	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.59	16.25	2.11	16.25	1.12	16.25	2.00
18.75	1.27	18.75	2.00	18.75	2.00	18.75	1.00	18.75	2.00	18.75	0.95	18.75	2.00	18.75	2.00	18.75	1.76	18.75	2.00	18.75	1.29	18.75	1.14	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.07	21.25	2.00	21.25	1.01	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.13	23.75	1.74	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.65	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.71	26.25	2.00	26.25	1.81			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.61	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.48	28.75	0.96	28.75	n.a	28.75	0.93	28.75	2.00			28.75	1.48	28.75	2.18	28.75	2.00	28.75	1.47	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.98	31.25	1.58	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.50			33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.51	33.75	2.00	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.36	36.25	2.00			36.25	2.00	36.25	1.70			36.25	1.72	36.25	2.15		
Inv Avg	1.65	Inv Avg	1.64	Inv Avg	1.66	Inv Avg	1.65	Inv Avg	1.80	Inv Avg	1.46	Inv Avg	1.42	Inv Avg	1.79	Inv Avg	1.67	Inv Avg	1.62	Inv Avg	1.54	Inv Avg	1.51	Inv Avg	1.77
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-12

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.06	S (ft)	0.13	S (ft)	0.22	S (ft)	0.20	S (ft)	0.30	S (ft)	0.04	S (ft)	0.02	S (ft)	0.06	S (ft)	0.02	S (ft)	0.13	S (ft)	0.11	S (ft)	0.19	S (ft)	0.16
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.65	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.81	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.60	6.25	0.70
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.68	8.75	1.23	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.73	8.75	1.80
11.25	1.22	11.25	2.00	11.25	n.a	11.25	n.a	11.25	0.58	11.25	2.00	11.25	1.15	11.25	1.15	11.25	n.a	11.25	n.a	11.25	n.a	11.25	2.04	11.25	1.08
13.75	2.00	13.75	2.00	13.75	0.98	13.75	n.a	13.75	1.24	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.62	13.75	0.80	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.91	16.25	0.54	16.25	1.48	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.95	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.03	18.75	2.00	18.75	2.00	18.75	1.91	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.40	18.75	1.34
21.25	2.00	21.25	1.93	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00			21.25	2.00	21.25	2.14	21.25	2.00	21.25	2.00	21.25	2.09	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.48			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.49	23.75	2.00
26.25	1.24	26.25	2.00	26.25	2.00	26.25	1.20	26.25	2.09	26.25	2.00			26.25	2.00	26.25	2.00			26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.81	28.75	2.00	28.75	2.00	28.75	1.35	28.75	1.26	28.75	2.00			28.75	1.09	28.75	2.00			28.75	2.00	28.75	2.11		
31.25	1.09	31.25	1.13	31.25	1.35	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.44	31.25	1.62		
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.36	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.00	36.25	2.00	36.25	1.26	36.25	2.00	36.25	2.00											36.25	2.00		
Inv Avg	1.73	Inv Avg	1.74	Inv Avg	1.61	Inv Avg	1.51	Inv Avg	1.43	Inv Avg	1.88	Inv Avg	1.83	Inv Avg	1.78	Inv Avg	2.01	Inv Avg	1.61	Inv Avg	1.75	Inv Avg	1.63	Inv Avg	1.54
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-12

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.10	S (ft)	0.03	S (ft)	0.26	S (ft)	0.35	S (ft)	0.20	S (ft)	0.20	S (ft)	0.08	S (ft)	0.12	S (ft)	0.51	S (ft)	0.19	S (ft)	0.19	S (ft)	0.35	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.70	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.89	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.56	6.25	0.58	6.25	2.00	6.25	0.85	6.25	n.a	6.25	1.38	6.25	0.87	6.25	0.71	6.25	n.a
8.75	1.17	8.75	2.00	8.75	0.86	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.72	8.75	1.11	8.75	n.a	8.75	2.00	8.75	1.32	8.75	1.30	8.75	0.61
11.25	1.19	11.25	1.28	11.25	1.35	11.25	0.49	11.25	1.78	11.25	1.20	11.25	1.57	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.41	11.25	0.98	11.25	1.83
13.75	2.00	13.75	2.00	13.75	2.18	13.75	1.17	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.46	13.75	1.94	13.75	1.55	13.75	1.04	13.75	1.70
16.25	2.00	16.25	1.72	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.99	16.25	1.20	16.25	2.00
18.75	1.12	18.75	2.00	18.75	2.00	18.75	1.32	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.84	18.75	2.00	18.75	1.24	18.75	1.41	18.75	2.00
21.25	2.00	21.25	1.48	21.25	2.00	21.25	1.92	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.25	21.25	2.00	21.25	1.70	21.25	1.42	21.25	1.33
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.70	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.30	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00			26.25	1.30	26.25	2.00			26.25	2.00	26.25	1.27	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	1.09	28.75	2.00			28.75	2.00	28.75	1.29	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.48			31.25	1.12	31.25	2.00			31.25	2.00	31.25	1.65	31.25	2.00	31.25	2.00	31.25	0.85	31.25	2.00	31.25	0.70	31.25	2.00
33.75	1.06			33.75	2.00	33.75	2.00					33.75	1.48					32.25	1.33	32.25	2.00	33.75	1.02	33.75	2.00
36.25	1.17			36.25	2.00							36.25	1.08					33.25	2.00					36.25	1.93
Inv Avg	1.57	Inv Avg	1.81	Inv Avg	1.45	Inv Avg	1.51	Inv Avg	1.58	Inv Avg	1.61	Inv Avg	1.67	Inv Avg	1.72	Inv Avg	1.48	Inv Avg	1.61	Inv Avg	1.53	Inv Avg	1.24	Inv Avg	1.66
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-12

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.18	S (ft)	0.04	S (ft)	0.19	S (ft)	0.31	S (ft)	0.04	S (ft)	0.17	S (ft)	0.28	S (ft)	0.14	S (ft)	0.20	S (ft)	0.16	S (ft)	0.22	S (ft)	0.29	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.62	6.25	1.37	6.25	n.a	6.25	0.75	6.25	n.a	6.25	n.a	6.25	0.66	6.25	n.a	6.25	0.69	6.25	0.77	6.25	n.a	6.25	0.81	6.25	0.96
8.75	1.52	8.75	2.00	8.75	0.79	8.75	1.94	8.75	1.28	8.75	0.65	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.98	8.75	0.88	8.75	n.a
11.25	2.00	11.25	2.00	11.25	1.78	11.25	1.15	11.25	1.56	11.25	1.50	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.48	11.25	1.60	11.25	1.42	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.73	13.75	0.94	13.75	2.00	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.05	13.75	2.00	13.75	2.00	13.75	1.16
16.25	2.00	16.25	2.12	16.25	0.93	16.25	0.86	16.25	2.00	16.25	1.64	16.25	2.00	16.25	0.63	16.25	2.00	16.25	2.09	16.25	1.37	16.25	2.00	16.25	1.27
18.75	2.00	18.75	1.77	18.75	2.00	18.75	1.32	18.75	2.00	18.75	1.65	18.75	1.45	18.75	2.00	18.75	0.90	18.75	1.18	18.75	2.00	18.75	1.87	18.75	2.00
21.25	1.61	21.25	2.00	21.25	1.72	21.25	1.17	21.25	2.15	21.25	2.00	21.25	1.13	21.25	1.62	21.25	2.00	21.25	2.00	21.25	2.07	21.25	n.a	21.25	1.57
23.75	1.64	23.75	2.00	23.75	1.25	23.75	1.21	23.75	2.00	23.75	2.00	23.75	1.32	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	0.84	23.75	2.08
26.25	2.11	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.96	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.90	26.25	1.63
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	0.96	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.38	28.75	2.00
31.25	2.10	31.25	2.00	31.25	2.00	31.25	1.92	31.25	2.00	31.25	1.86	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.08	31.25	n.a	31.25	1.45	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.93	33.75	2.16	33.75	1.97	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.82	33.75	0.57	33.75	2.00	33.75	1.49
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.34			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.00
																								46.25	1.64
																								48.75	1.22
																								51.25	1.45
																								53.75	1.30
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.37
Inv Avg	1.67	Inv Avg	1.93	Inv Avg	1.60	Inv Avg	1.37	Inv Avg	1.90	Inv Avg	1.63	Inv Avg	1.41	Inv Avg	1.72	Inv Avg	1.66	Inv Avg	1.62	Inv Avg	1.53	Inv Avg	1.47	Inv Avg	1.67
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-12

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
90' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.31	S (ft)	0.05	S (ft)	0.22	S (ft)	0.33	S (ft)	0.06	S (ft)	0.23	S (ft)	0.18	S (ft)	0.15	S (ft)	0.17	S (ft)	0.06	S (ft)	0.19	S (ft)	0.13	S (ft)	0.04
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.89	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	1.00	6.25	0.58	6.25	n.a	6.25	1.18	6.25	1.31	6.25	n.a	6.25	0.69	6.25	n.a	6.25	0.81	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.44	8.75	1.19	8.75	n.a	8.75	n.a	8.75	1.04	8.75	0.92	8.75	0.71	8.75	1.76	8.75	1.12	8.75	n.a	8.75	0.87	8.75	n.a
11.25	0.56	11.25	2.00	11.25	0.73	11.25	1.00	11.25	1.16	11.25	1.34	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.29
13.75	n.a	13.75	2.00	13.75	1.12	13.75	1.94	13.75	2.00	13.75	2.17	13.75	1.00	13.75	n.a	13.75	2.00	13.75	2.00	13.75	0.97	13.75	2.04	13.75	2.00
16.25	0.58	16.25	2.00	16.25	1.64	16.25	2.04	16.25	2.00	16.25	2.07	16.25	2.00	16.25	1.58	16.25	1.78	16.25	1.15	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.72	18.75	1.24	18.75	2.00	18.75	0.90	18.75	1.41	18.75	1.61	18.75	2.17	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.68
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.97	21.25	1.51	21.25	2.17	21.25	2.00	21.25	1.80	21.25	1.88	21.25	2.00	21.25	2.00	21.25	2.16	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.68	23.75	1.92	23.75	2.00	23.75	1.25	23.75	2.00	23.75	2.10	23.75	1.52	23.75	2.00	23.75	1.17	23.75	1.64
26.25	2.00	26.25	1.63	26.25	2.00	26.25	2.00	26.25	1.94	26.25	2.00	26.25	1.32	26.25	2.00	26.25	2.00	26.25	1.46	26.25	2.00	26.25	1.39	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.83	28.75	1.64	28.75	1.85	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.92	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.61	31.25	2.00	31.25	1.67	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.66	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.40	31.25	2.00
33.75	2.00	33.75	1.75	33.75	2.00	33.75	2.00	33.75	1.83	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.20	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	2.10	36.25	1.64	36.25	2.00	36.25	2.00	36.25	1.39	36.25	2.00	36.25	2.00	36.25	1.13	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.47	Inv Avg	1.89	Inv Avg	1.53	Inv Avg	1.47	Inv Avg	1.82	Inv Avg	1.53	Inv Avg	1.55	Inv Avg	1.66	Inv Avg	1.69	Inv Avg	1.74	Inv Avg	1.63	Inv Avg	1.72	Inv Avg	1.88
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-13

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.13	S (ft)	0.11	S (ft)	0.07	S (ft)	0.09	S (ft)	0.25	S (ft)	0.20	S (ft)	0.13	S (ft)	0.11	S (ft)	0.29	S (ft)	0.02	S (ft)	0.23	S (ft)	0.16	S (ft)	0.13
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.87	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	1.04	6.25	n.a	6.25	n.a	6.25	0.84	6.25	0.63	6.25	n.a	6.25	0.87	6.25	n.a	6.25	n.a	6.25	0.87	6.25	0.73	6.25	1.61
8.75	n.a	8.75	1.03	8.75	n.a	8.75	n.a	8.75	1.03	8.75	2.00	8.75	0.76	8.75	n.a	8.75	0.64	8.75	n.a	8.75	0.88	8.75	1.46	8.75	1.69
11.25	0.78	11.25	1.78	11.25	1.98	11.25	1.61	11.25	1.51	11.25	1.04	11.25	1.55	11.25	n.a	11.25	1.33	11.25	2.00	11.25	2.00	11.25	1.21	11.25	1.73
13.75	1.22	13.75	1.47	13.75	1.11	13.75	1.13	13.75	1.23	13.75	2.00	13.75	1.74	13.75	1.51	13.75	1.24	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.20
16.25	1.21	16.25	1.54	16.25	2.00	16.25	2.08	16.25	0.76	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.64	16.25	1.92	16.25	1.63	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.60	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.04	18.75	2.00	18.75	1.12
21.25	2.00	21.25	1.17	21.25	1.21	21.25	1.58	21.25	1.35	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	1.44	23.75	1.67	23.75	1.76	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.09	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.29	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.48	26.25	1.77	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00			26.25	2.00	26.25	1.32	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.44
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.88	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.48			33.75	n.a	33.75	2.00	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.92	36.25	1.03	36.25	1.79	36.25	1.42			36.25	2.00	36.25	1.12					36.25	1.60	36.25	0.88
				38.75	2.00	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.68	Inv Avg	1.58	Inv Avg	1.79	Inv Avg	1.76	Inv Avg	1.46	Inv Avg	1.66	Inv Avg	1.72	Inv Avg	1.81	Inv Avg	1.40	Inv Avg	1.99	Inv Avg	1.55	Inv Avg	1.57	Inv Avg	1.61
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-13

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.16	S (ft)	0.11	S (ft)	0.32	S (ft)	0.08	S (ft)	0.21	S (ft)	0.20	S (ft)	0.09	S (ft)	0.13	S (ft)	0.20	S (ft)	0.15	S (ft)	0.44	S (ft)	0.16	S (ft)	0.11
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.92	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.89	6.25	1.05	6.25	0.75	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.89	6.25	n.a	6.25	n.a	6.25	0.91	6.25	0.90
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.36	8.75	n.a	8.75	1.00	8.75	n.a	8.75	1.26	8.75	0.93	8.75	1.09	8.75	0.70	8.75	1.34	8.75	1.53
11.25	n.a	11.25	n.a	11.25	0.64	11.25	n.a	11.25	n.a	11.25	0.69	11.25	n.a	11.25	1.75	11.25	1.27	11.25	1.26	11.25	0.93	11.25	0.91	11.25	n.a
13.75	0.62	13.75	0.85	13.75	0.80	13.75	1.18	13.75	0.82	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.31	13.75	0.71	13.75	2.00	13.75	n.a
16.25	1.14	16.25	1.55	16.25	2.00	16.25	2.13	16.25	1.23	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.14	16.25	1.29	16.25	2.00	16.25	1.55
18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.40	18.75	2.00	18.75	2.00	18.75	2.00	18.75	0.91	18.75	1.59	18.75	2.00	18.75	2.10
21.25	1.38	21.25	2.00	21.25	1.47	21.25	2.00	21.25	2.08	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.71	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.33	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.82	23.75	1.32	23.75	1.67	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.81	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.85			26.25	2.00
28.75	2.16	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.06	28.75	1.10			28.75	2.00
31.25	1.50	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.86	31.25	1.50	31.25	0.99			31.25	2.00
33.75	n.a	33.75	2.00	33.75	1.64	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.07	33.75	2.00	33.75	2.02			33.75	2.14
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.90	36.25	0.72	36.25	1.98	36.25	2.00	36.25	1.65			36.25	2.00
Inv Avg	1.61	Inv Avg	1.80	Inv Avg	1.46	Inv Avg	1.71	Inv Avg	1.60	Inv Avg	1.64	Inv Avg	1.85	Inv Avg	1.70	Inv Avg	1.62	Inv Avg	1.53	Inv Avg	1.25	Inv Avg	1.55	Inv Avg	1.80
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-13

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.12	S (ft)	0.18	S (ft)	0.18	S (ft)	0.10	S (ft)	0.08	S (ft)	0.24	S (ft)	0.26	S (ft)	0.05	S (ft)	0.22	S (ft)	0.20	S (ft)	0.21	S (ft)	0.28	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.84	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	1.03	6.25	0.79	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.59	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.82	8.75	0.82	8.75	1.23	8.75	n.a	8.75	n.a	8.75	0.83	8.75	0.52	8.75	0.80
11.25	n.a	11.25	1.27	11.25	2.00	11.25	1.01	11.25	n.a	11.25	1.31	11.25	0.96	11.25	1.36	11.25	0.54	11.25	0.72	11.25	2.00	11.25	2.00	11.25	1.59
13.75	0.75	13.75	2.00	13.75	1.92	13.75	2.00	13.75	n.a	13.75	2.00	13.75	2.14	13.75	1.93	13.75	2.00	13.75	0.90	13.75	0.81	13.75	1.30	13.75	2.00
16.25	1.22	16.25	2.00	16.25	2.16	16.25	2.00	16.25	2.00	16.25	1.85	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.61	16.25	2.14	16.25	1.14	16.25	2.00
18.75	1.28	18.75	2.00	18.75	2.00	18.75	1.01	18.75	2.00	18.75	0.96	18.75	2.00	18.75	2.00	18.75	1.78	18.75	2.00	18.75	1.30	18.75	1.15	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.09	21.25	2.00	21.25	1.03	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.16	23.75	1.77	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.68	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.74	26.25	2.00	26.25	1.84			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.64	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.51	28.75	0.98	28.75	n.a	28.75	0.95	28.75	2.00			28.75	1.51	28.75	2.00	28.75	2.00	28.75	1.50	28.75	2.00	28.75	2.00
31.25	2.00	31.25	2.02	31.25	1.60	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.52			33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.54	33.75	2.00	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.39	36.25	2.00			36.25	2.00	36.25	1.74			36.25	1.76	36.25	2.19		
Inv Avg	1.66	Inv Avg	1.64	Inv Avg	1.67	Inv Avg	1.66	Inv Avg	1.81	Inv Avg	1.47	Inv Avg	1.43	Inv Avg	1.80	Inv Avg	1.67	Inv Avg	1.62	Inv Avg	1.55	Inv Avg	1.52	Inv Avg	1.78
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-13

SCHEDULE CJG-ST1

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.05	S (ft)	0.13	S (ft)	0.22	S (ft)	0.20	S (ft)	0.30	S (ft)	0.04	S (ft)	0.02	S (ft)	0.04	S (ft)	0.02	S (ft)	0.13	S (ft)	0.11	S (ft)	0.19	S (ft)	0.16
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.65	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.82	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.61	6.25	0.70
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.69	8.75	1.24	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.74	8.75	1.81
11.25	1.23	11.25	2.00	11.25	n.a	11.25	n.a	11.25	0.59	11.25	2.00	11.25	1.16	11.25	1.16	11.25	n.a	11.25	n.a	11.25	n.a	11.25	2.05	11.25	1.09
13.75	2.00	13.75	2.00	13.75	0.99	13.75	n.a	13.75	1.25	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.63	13.75	0.80	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.93	16.25	0.54	16.25	1.50	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.97	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.05	18.75	2.00	18.75	2.00	18.75	1.93	18.75	2.03	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.41	18.75	1.36
21.25	2.00	21.25	1.95	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00			21.25	2.00	21.25	2.17	21.25	2.00	21.25	2.00	21.25	2.12	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.50			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.51	23.75	2.00
26.25	1.26	26.25	2.00	26.25	2.00	26.25	1.22	26.25	2.12	26.25	2.00			26.25	2.00	26.25	2.00			26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.84	28.75	2.00	28.75	2.00	28.75	1.37	28.75	1.29	28.75	2.00			28.75	1.10	28.75	2.00			28.75	2.00	28.75	2.14		
31.25	1.11	31.25	1.14	31.25	1.37	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.47	31.25	1.65		
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.39	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.00	36.25	2.00	36.25	1.29	36.25	2.00	36.25	2.00											36.25	2.00		
Inv Avg	1.74	Inv Avg	1.74	Inv Avg	1.61	Inv Avg	1.52	Inv Avg	1.44	Inv Avg	1.88	Inv Avg	1.83	Inv Avg	1.79	Inv Avg	2.01	Inv Avg	1.61	Inv Avg	1.75	Inv Avg	1.64	Inv Avg	1.54
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-13

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.10	S (ft)	0.03	S (ft)	0.25	S (ft)	0.35	S (ft)	0.20	S (ft)	0.20	S (ft)	0.07	S (ft)	0.12	S (ft)	0.51	S (ft)	0.19	S (ft)	0.16	S (ft)	0.35	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.70	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.90	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.57	6.25	0.58	6.25	2.00	6.25	0.85	6.25	n.a	6.25	1.38	6.25	0.87	6.25	0.72	6.25	n.a
8.75	1.18	8.75	2.00	8.75	0.87	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.74	8.75	1.12	8.75	n.a	8.75	2.00	8.75	1.33	8.75	1.31	8.75	0.61
11.25	1.20	11.25	1.29	11.25	1.36	11.25	0.49	11.25	1.80	11.25	1.21	11.25	1.58	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.42	11.25	0.99	11.25	1.84
13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.18	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.46	13.75	1.96	13.75	1.57	13.75	1.05	13.75	1.71
16.25	2.00	16.25	1.74	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.01	16.25	1.22	16.25	2.00
18.75	1.13	18.75	2.00	18.75	2.00	18.75	1.34	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.87	18.75	2.00	18.75	1.26	18.75	1.43	18.75	2.00
21.25	2.00	21.25	1.51	21.25	2.00	21.25	1.95	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.27	21.25	2.00	21.25	1.73	21.25	1.44	21.25	1.35
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.72	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.32	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.03
26.25	2.00			26.25	1.32	26.25	2.00			26.25	2.00	26.25	1.29	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	1.11	28.75	2.00			28.75	2.00	28.75	1.31	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.51			31.25	1.14	31.25	2.00			31.25	2.00	31.25	1.68	31.25	2.00	31.25	2.00	31.25	0.87	31.25	2.00	31.25	0.71	31.25	2.00
33.75	1.08			33.75	2.00	33.75	2.00					33.75	1.50					32.25	1.35	32.25	2.00	33.75	1.04	33.75	2.00
36.25	1.19			36.25	2.00							36.25	1.10					33.25	2.00					36.25	1.97
Inv Avg	1.58	Inv Avg	1.81	Inv Avg	1.45	Inv Avg	1.52	Inv Avg	1.58	Inv Avg	1.61	Inv Avg	1.68	Inv Avg	1.72	Inv Avg	1.49	Inv Avg	1.62	Inv Avg	1.54	Inv Avg	1.25	Inv Avg	1.67
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-13

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.18	S (ft)	0.04	S (ft)	0.19	S (ft)	0.31	S (ft)	0.04	S (ft)	0.17	S (ft)	0.28	S (ft)	0.14	S (ft)	0.20	S (ft)	0.16	S (ft)	0.22	S (ft)	0.29	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.62	6.25	1.37	6.25	n.a	6.25	0.75	6.25	n.a	6.25	n.a	6.25	0.66	6.25	n.a	6.25	0.70	6.25	0.78	6.25	n.a	6.25	0.82	6.25	0.96
8.75	1.53	8.75	2.00	8.75	0.80	8.75	1.95	8.75	1.29	8.75	0.66	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.98	8.75	0.89	8.75	n.a
11.25	2.00	11.25	2.00	11.25	1.79	11.25	1.16	11.25	1.58	11.25	1.51	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.50	11.25	1.61	11.25	1.44	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.75	13.75	0.95	13.75	2.00	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.07	13.75	2.00	13.75	2.00	13.75	1.17
16.25	2.00	16.25	2.15	16.25	0.94	16.25	0.87	16.25	2.00	16.25	1.66	16.25	2.00	16.25	0.63	16.25	2.00	16.25	2.11	16.25	1.38	16.25	2.00	16.25	1.28
18.75	2.00	18.75	1.80	18.75	2.00	18.75	1.34	18.75	2.00	18.75	1.67	18.75	1.46	18.75	2.00	18.75	0.91	18.75	1.20	18.75	2.02	18.75	1.90	18.75	2.00
21.25	1.64	21.25	2.00	21.25	1.74	21.25	1.19	21.25	2.18	21.25	2.00	21.25	1.14	21.25	1.64	21.25	2.00	21.25	2.00	21.25	2.10	21.25	n.a	21.25	1.60
23.75	1.67	23.75	2.00	23.75	1.27	23.75	1.23	23.75	2.00	23.75	2.00	23.75	1.34	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	0.85	23.75	2.11
26.25	2.14	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.97	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.93	26.25	1.65
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	0.98	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.41	28.75	2.00
31.25	2.14	31.25	2.00	31.25	2.00	31.25	1.96	31.25	2.00	31.25	1.89	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.11	31.25	n.a	31.25	1.47	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.96	33.75	2.00	33.75	2.01	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.85	33.75	0.58	33.75	2.00	33.75	1.52
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.37			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.00
																								46.25	1.67
																								48.75	1.25
																								51.25	1.48
																								53.75	1.33
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.40
Inv Avg	1.68	Inv Avg	1.93	Inv Avg	1.61	Inv Avg	1.39	Inv Avg	1.90	Inv Avg	1.64	Inv Avg	1.42	Inv Avg	1.73	Inv Avg	1.66	Inv Avg	1.63	Inv Avg	1.55	Inv Avg	1.48	Inv Avg	1.68
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-13

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
100' of ASH M: 7.5
PGA: 2% probability of exceedence in 50 yrs: 0.1792 GW: 0.0'

C-11		C-13		C-16		C-18		C-21		C-23		C-25		C-28		C-30		C-32		C-34		C-37		C-39	
S (ft)	0.31	S (ft)	0.05	S (ft)	0.18	S (ft)	0.30	S (ft)	0.06	S (ft)	0.22	S (ft)	0.15	S (ft)	0.15	S (ft)	0.16	S (ft)	0.06	S (ft)	0.19	S (ft)	0.13	S (ft)	0.04
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.89	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	1.00	6.25	0.58	6.25	n.a	6.25	1.18	6.25	1.32	6.25	n.a	6.25	0.69	6.25	n.a	6.25	0.81	6.25	n.a	6.25	n.a
8.75	n.a	8.75	1.45	8.75	1.20	8.75	n.a	8.75	n.a	8.75	1.05	8.75	0.93	8.75	0.71	8.75	1.77	8.75	1.12	8.75	n.a	8.75	0.88	8.75	n.a
11.25	0.56	11.25	2.00	11.25	0.73	11.25	1.01	11.25	1.17	11.25	1.35	11.25	2.00	11.25	n.a	11.25	2.00	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.30
13.75	n.a	13.75	2.00	13.75	1.13	13.75	1.96	13.75	2.00	13.75	2.18	13.75	1.01	13.75	n.a	13.75	2.00	13.75	2.00	13.75	0.98	13.75	2.06	13.75	2.00
16.25	0.59	16.25	2.00	16.25	1.66	16.25	2.06	16.25	2.00	16.25	2.09	16.25	2.00	16.25	1.59	16.25	1.80	16.25	1.16	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.00	18.75	1.74	18.75	1.25	18.75	2.00	18.75	0.91	18.75	1.43	18.75	1.63	18.75	2.19	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.69
21.25	2.00	21.25	2.00	21.25	2.00	21.25	0.98	21.25	1.53	21.25	2.20	21.25	2.00	21.25	1.82	21.25	1.90	21.25	2.00	21.25	2.00	21.25	2.18	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.70	23.75	1.94	23.75	2.00	23.75	1.26	23.75	2.00	23.75	2.12	23.75	1.53	23.75	2.00	23.75	1.18	23.75	1.66
26.25	2.00	26.25	1.66	26.25	2.00	26.25	2.00	26.25	1.96	26.25	2.00	26.25	1.34	26.25	2.00	26.25	2.00	26.25	1.48	26.25	2.00	26.25	1.41	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.86	28.75	1.66	28.75	1.88	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.95	28.75	2.00	28.75	2.00
31.25	2.00	31.25	1.64	31.25	2.00	31.25	1.70	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.68	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.42	31.25	2.00
33.75	2.00	33.75	1.77	33.75	2.00	33.75	2.00	33.75	1.86	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.22	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00
		36.25	2.00	36.25	2.00	36.25	2.13	36.25	1.67	36.25	2.00	36.25	2.00	36.25	1.41	36.25	2.00	36.25	2.00	36.25	1.15	36.25	2.00	36.25	2.00
		38.75	2.00																			38.75	2.00		
		41.25	2.00																			41.25	2.00		
Inv Avg	1.48	Inv Avg	1.89	Inv Avg	1.54	Inv Avg	1.47	Inv Avg	1.83	Inv Avg	1.54	Inv Avg	1.56	Inv Avg	1.67	Inv Avg	1.69	Inv Avg	1.75	Inv Avg	1.64	Inv Avg	1.73	Inv Avg	1.88
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-14

SCHEDULE CJG-ST1

C-41		C-44		C-46		C-46A		C-48		C-50		C-60		C-62		C-64		C-66		C-66A		C-68		C-70	
S (ft)	0.13	S (ft)	0.11	S (ft)	0.07	S (ft)	0.09	S (ft)	0.25	S (ft)	0.20	S (ft)	0.13	S (ft)	0.11	S (ft)	0.29	S (ft)	0.02	S (ft)	0.23	S (ft)	0.16	S (ft)	0.13
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	0.87	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	1.04	6.25	n.a	6.25	n.a	6.25	0.84	6.25	0.63	6.25	n.a	6.25	0.87	6.25	n.a	6.25	n.a	6.25	0.88	6.25	0.73	6.25	1.61
8.75	n.a	8.75	1.03	8.75	n.a	8.75	n.a	8.75	1.04	8.75	2.00	8.75	0.76	8.75	n.a	8.75	0.64	8.75	n.a	8.75	0.89	8.75	1.47	8.75	1.70
11.25	0.78	11.25	1.79	11.25	2.00	11.25	1.63	11.25	1.52	11.25	1.04	11.25	1.56	11.25	n.a	11.25	1.34	11.25	2.00	11.25	2.00	11.25	1.21	11.25	1.74
13.75	1.23	13.75	1.48	13.75	1.12	13.75	1.14	13.75	1.24	13.75	2.00	13.75	1.75	13.75	1.52	13.75	1.25	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.21
16.25	1.22	16.25	1.56	16.25	2.00	16.25	2.10	16.25	0.77	16.25	2.00	16.25	2.00	16.25	2.00	16.25	0.65	16.25	1.94	16.25	1.64	16.25	2.00	16.25	n.a
18.75	2.00	18.75	1.62	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.02	18.75	2.00	18.75	2.07	18.75	2.00	18.75	1.13
21.25	2.00	21.25	1.18	21.25	1.22	21.25	1.60	21.25	1.37	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	1.45	23.75	1.69	23.75	1.78	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.11	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.31	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.50	26.25	1.79	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00			26.25	2.00	26.25	1.33	26.25	2.00
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00			28.75	2.00	28.75	2.00	28.75	1.46
31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00			31.25	1.91	31.25	2.00	31.25	2.00
33.75	2.00	33.75	n.a	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00			33.75	2.00	33.75	1.51			33.75	n.a	33.75	2.00	33.75	2.00
36.25	2.00	36.25	n.a	36.25	1.95	36.25	1.04	36.25	1.82	36.25	1.44			36.25	2.00	36.25	1.14					36.25	1.62	36.25	0.90
				38.75	2.00	38.75	2.00			38.75	2.00														
				41.25	2.00	41.25	2.00			41.25	2.00														
				43.75	2.00	43.75	2.00																		
Inv Avg	1.68	Inv Avg	1.59	Inv Avg	1.80	Inv Avg	1.77	Inv Avg	1.47	Inv Avg	1.66	Inv Avg	1.73	Inv Avg	1.81	Inv Avg	1.40	Inv Avg	1.99	Inv Avg	1.55	Inv Avg	1.58	Inv Avg	1.61
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-14

SCHEDULE CJG-ST1

C-74		C-76		C-78		C-79		C-80		C-81		C-82		C-84		C-86		C-89		C-91		C-92		C-94	
S (ft)	0.16	S (ft)	0.11	S (ft)	0.32	S (ft)	0.08	S (ft)	0.21	S (ft)	0.16	S (ft)	0.09	S (ft)	0.13	S (ft)	0.19	S (ft)	0.15	S (ft)	0.42	S (ft)	0.16	S (ft)	0.11
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.92	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	0.89	6.25	1.05	6.25	0.76	6.25	n.a	6.25	n.a	6.25	n.a	6.25	1.89	6.25	n.a	6.25	n.a	6.25	0.91	6.25	0.91
8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.36	8.75	n.a	8.75	1.00	8.75	n.a	8.75	1.27	8.75	0.93	8.75	1.10	8.75	0.71	8.75	1.34	8.75	1.54
11.25	n.a	11.25	n.a	11.25	0.65	11.25	n.a	11.25	n.a	11.25	0.70	11.25	n.a	11.25	1.76	11.25	1.28	11.25	1.27	11.25	0.93	11.25	0.92	11.25	n.a
13.75	0.62	13.75	0.86	13.75	0.81	13.75	1.19	13.75	0.82	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.32	13.75	0.72	13.75	2.00	13.75	n.a
16.25	1.15	16.25	1.56	16.25	2.00	16.25	2.15	16.25	1.24	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.15	16.25	1.30	16.25	2.00	16.25	1.56
18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.41	18.75	2.00	18.75	2.00	18.75	2.00	18.75	0.92	18.75	1.61	18.75	2.00	18.75	2.12
21.25	1.40	21.25	2.00	21.25	1.49	21.25	2.00	21.25	2.10	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.73	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.35	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.84	23.75	1.34	23.75	1.70	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	1.84	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.87			26.25	2.00
28.75	2.19	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.09	28.75	1.12			28.75	2.00
31.25	1.52	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	1.89	31.25	1.52	31.25	1.00			31.25	2.00
33.75	n.a	33.75	2.00	33.75	1.67	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.00	33.75	2.10	33.75	2.00	33.75	2.06			33.75	2.18
36.25	n.a	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	2.00	36.25	0.92	36.25	0.73	36.25	2.01	36.25	2.00	36.25	1.68			36.25	2.00
Inv Avg	1.61	Inv Avg	1.81	Inv Avg	1.47	Inv Avg	1.72	Inv Avg	1.61	Inv Avg	1.64	Inv Avg	1.85	Inv Avg	1.71	Inv Avg	1.63	Inv Avg	1.54	Inv Avg	1.26	Inv Avg	1.56	Inv Avg	1.80
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-14

SCHEDULE CJG-ST1

C-96		C-98		C-100		C-103		C-105		C-106		C-107		C-107A		C-109		C-111		C-113		C-117		C-119	
S (ft)	0.12	S (ft)	0.18	S (ft)	0.18	S (ft)	0.10	S (ft)	0.08	S (ft)	0.24	S (ft)	0.26	S (ft)	0.05	S (ft)	0.22	S (ft)	0.19	S (ft)	0.21	S (ft)	0.28	S (ft)	0.12
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.84	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	1.04	6.25	0.79	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a
8.75	n.a	8.75	0.60	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.83	8.75	0.83	8.75	1.24	8.75	n.a	8.75	n.a	8.75	0.83	8.75	0.53	8.75	0.80
11.25	n.a	11.25	1.27	11.25	2.00	11.25	1.01	11.25	n.a	11.25	1.32	11.25	0.97	11.25	1.37	11.25	0.54	11.25	0.73	11.25	2.00	11.25	2.00	11.25	1.61
13.75	0.75	13.75	2.00	13.75	1.93	13.75	2.00	13.75	n.a	13.75	2.00	13.75	2.16	13.75	1.94	13.75	2.00	13.75	0.91	13.75	0.82	13.75	1.31	13.75	2.00
16.25	1.24	16.25	2.00	16.25	2.18	16.25	2.00	16.25	2.00	16.25	1.86	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.62	16.25	2.16	16.25	1.15	16.25	2.00
18.75	1.30	18.75	2.00	18.75	2.00	18.75	1.02	18.75	2.00	18.75	0.97	18.75	2.00	18.75	2.00	18.75	1.80	18.75	2.00	18.75	1.32	18.75	1.17	18.75	2.00
21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.10	21.25	2.00	21.25	1.04	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.19	23.75	1.79	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.70	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00
26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.76	26.25	2.00	26.25	1.86			26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.66	26.25	2.00	26.25	2.00
28.75	2.00	28.75	1.53	28.75	0.99	28.75	n.a	28.75	0.96	28.75	2.00			28.75	1.53	28.75	2.00	28.75	2.00	28.75	1.52	28.75	2.00	28.75	2.00
31.25	2.00	31.25	2.05	31.25	1.63	31.25	n.a	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.00
33.75	2.00	33.75	2.00			33.75	n.a	33.75	2.00	33.75	1.55			33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.57	33.75	2.00	33.75	2.00
		36.25	2.00			36.25	n.a	36.25	1.41	36.25	2.00			36.25	2.00	36.25	1.76			36.25	1.78	36.25	2.00		
Inv Avg	1.67	Inv Avg	1.65	Inv Avg	1.68	Inv Avg	1.67	Inv Avg	1.82	Inv Avg	1.48	Inv Avg	1.43	Inv Avg	1.81	Inv Avg	1.67	Inv Avg	1.63	Inv Avg	1.56	Inv Avg	1.52	Inv Avg	1.78
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-14

SCHEDULE CJG-ST1

C-121		C-123		C-125		C-129		C-131		C-133		C-135		C-135A		C-137		C-139		C-139A		C-143		C-145	
S (ft)	0.05	S (ft)	0.13	S (ft)	0.19	S (ft)	0.20	S (ft)	0.29	S (ft)	0.04	S (ft)	0.02	S (ft)	0.04	S (ft)	0.02	S (ft)	0.13	S (ft)	0.11	S (ft)	0.19	S (ft)	0.16
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.65	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	0.82	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	n.a	6.25	0.61	6.25	0.71
8.75	n.a	8.75	2.00	8.75	n.a	8.75	n.a	8.75	0.69	8.75	1.25	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	n.a	8.75	1.75	8.75	1.82
11.25	1.24	11.25	2.00	11.25	n.a	11.25	n.a	11.25	0.59	11.25	2.00	11.25	1.17	11.25	1.17	11.25	n.a	11.25	n.a	11.25	n.a	11.25	2.07	11.25	1.10
13.75	2.00	13.75	2.00	13.75	1.00	13.75	n.a	13.75	1.26	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.64	13.75	0.81	13.75	2.00	13.75	2.00
16.25	2.00	16.25	2.00	16.25	1.95	16.25	0.55	16.25	1.52	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.99	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00
18.75	2.00	18.75	2.07	18.75	2.00	18.75	2.00	18.75	1.95	18.75	2.05	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.43	18.75	1.37
21.25	2.00	21.25	1.98	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00			21.25	2.00	21.25	2.20	21.25	2.00	21.25	2.00	21.25	2.15	21.25	2.00
23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.52			23.75	2.00	23.75	2.00			23.75	2.00	23.75	1.53	23.75	2.00
26.25	1.27	26.25	2.00	26.25	2.00	26.25	1.24	26.25	2.15	26.25	2.00			26.25	2.00	26.25	2.00			26.25	2.00	26.25	2.00	26.25	2.00
28.75	1.86	28.75	2.00	28.75	2.00	28.75	1.39	28.75	1.30	28.75	2.00			28.75	1.12	28.75	2.00			28.75	2.00	28.75	2.17		
31.25	1.12	31.25	1.16	31.25	1.39	31.25	2.00	31.25	2.00	31.25	2.00			31.25	2.00	31.25	2.00			31.25	1.49	31.25	1.67		
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.41	33.75	2.00	33.75	2.00					32.25	2.00					33.75	2.00		
		36.25	2.00	36.25	2.00	36.25	1.31	36.25	2.00	36.25	2.00											36.25	2.00		
Inv Avg	1.75	Inv Avg	1.75	Inv Avg	1.62	Inv Avg	1.53	Inv Avg	1.45	Inv Avg	1.89	Inv Avg	1.84	Inv Avg	1.79	Inv Avg	2.01	Inv Avg	1.62	Inv Avg	1.76	Inv Avg	1.65	Inv Avg	1.55
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-14

SCHEDULE CJG-ST1

C-145A		C-147		C-149		C-151		C-157		C-157A		C-159		C-161		C-163		C-166		C-168		C-168A		C-170	
S (ft)	0.09	S (ft)	0.03	S (ft)	0.25	S (ft)	0.35	S (ft)	0.20	S (ft)	0.20	S (ft)	0.07	S (ft)	0.12	S (ft)	0.51	S (ft)	0.19	S (ft)	0.16	S (ft)	0.35	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	0.70	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	0.90	3.75	n.a	3.75	n.a	3.75	n.a
6.25	n.a	6.25	2.00	6.25	n.a	6.25	n.a	6.25	0.57	6.25	0.58	6.25	2.00	6.25	0.86	6.25	n.a	6.25	1.39	6.25	0.87	6.25	0.72	6.25	n.a
8.75	1.19	8.75	2.00	8.75	0.87	8.75	n.a	8.75	2.00	8.75	2.00	8.75	1.75	8.75	1.12	8.75	n.a	8.75	2.00	8.75	1.34	8.75	1.32	8.75	0.61
11.25	1.21	11.25	1.30	11.25	1.37	11.25	0.49	11.25	1.81	11.25	1.22	11.25	1.60	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.43	11.25	0.99	11.25	1.86
13.75	2.00	13.75	2.00	13.75	2.00	13.75	1.19	13.75	2.00	13.75	2.00	13.75	2.00	13.75	2.00	13.75	0.47	13.75	1.97	13.75	1.58	13.75	1.06	13.75	1.73
16.25	2.00	16.25	1.75	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	2.00	16.25	1.02	16.25	1.23	16.25	2.00
18.75	1.15	18.75	2.00	18.75	2.00	18.75	1.35	18.75	2.00	18.75	2.00	18.75	2.00	18.75	2.00	18.75	1.89	18.75	2.00	18.75	1.27	18.75	1.45	18.75	2.00
21.25	2.00	21.25	1.52	21.25	2.00	21.25	1.97	21.25	2.00	21.25	2.00	21.25	2.00	21.25	2.00	21.25	1.28	21.25	2.00	21.25	1.75	21.25	1.46	21.25	1.36
23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.75	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	1.33	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.06
26.25	2.00			26.25	1.33	26.25	2.00			26.25	2.00	26.25	1.31	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00
28.75	2.00			28.75	1.12	28.75	2.00			28.75	2.00	28.75	1.33	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	n.a	28.75	2.00
31.25	1.53			31.25	1.16	31.25	2.00			31.25	2.00	31.25	1.71	31.25	2.00	31.25	2.00	31.25	0.88	31.25	2.00	31.25	0.72	31.25	2.00
33.75	1.10			33.75	2.00	33.75	2.00					33.75	1.53					32.25	1.37	32.25	2.00	33.75	1.06	33.75	2.00
36.25	1.21			36.25	2.00							36.25	1.12					33.25	2.00					36.25	2.00
Inv Avg	1.59	Inv Avg	1.82	Inv Avg	1.46	Inv Avg	1.52	Inv Avg	1.58	Inv Avg	1.62	Inv Avg	1.69	Inv Avg	1.72	Inv Avg	1.49	Inv Avg	1.63	Inv Avg	1.54	Inv Avg	1.26	Inv Avg	1.67
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-14

SCHEDULE CJG-ST1

C-172		C-174		C-178		C-180		C-182		C-184		C-186		C-190		C-192		C-194		C-196		C-198		C-200	
S (ft)	0.18	S (ft)	0.04	S (ft)	0.19	S (ft)	0.30	S (ft)	0.04	S (ft)	0.17	S (ft)	0.28	S (ft)	0.14	S (ft)	0.20	S (ft)	0.16	S (ft)	0.22	S (ft)	0.29	S (ft)	0.18
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a	1.25	n.a
3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a	3.75	n.a
6.25	0.62	6.25	1.38	6.25	n.a	6.25	0.76	6.25	n.a	6.25	n.a	6.25	0.67	6.25	n.a	6.25	0.70	6.25	0.78	6.25	n.a	6.25	0.82	6.25	0.97
8.75	1.54	8.75	2.00	8.75	0.81	8.75	1.96	8.75	1.29	8.75	0.66	8.75	2.00	8.75	n.a	8.75	2.00	8.75	n.a	8.75	0.99	8.75	0.89	8.75	n.a
11.25	2.00	11.25	2.00	11.25	1.80	11.25	1.17	11.25	1.59	11.25	1.52	11.25	2.00	11.25	n.a	11.25	2.00	11.25	1.51	11.25	1.63	11.25	1.45	11.25	n.a
13.75	2.00	13.75	2.00	13.75	1.76	13.75	0.96	13.75	2.00	13.75	2.00	13.75	2.00	13.75	n.a	13.75	2.00	13.75	1.07	13.75	2.00	13.75	2.00	13.75	1.18
16.25	2.00	16.25	2.17	16.25	0.95	16.25	0.88	16.25	2.00	16.25	1.68	16.25	2.00	16.25	0.64	16.25	2.00	16.25	2.13	16.25	1.40	16.25	2.00	16.25	1.30
18.75	2.00	18.75	1.82	18.75	2.00	18.75	1.35	18.75	2.00	18.75	1.69	18.75	1.48	18.75	2.00	18.75	0.92	18.75	1.21	18.75	2.05	18.75	1.92	18.75	2.00
21.25	1.66	21.25	2.00	21.25	1.76	21.25	1.20	21.25	2.00	21.25	2.00	21.25	1.16	21.25	1.66	21.25	2.00	21.25	2.00	21.25	2.13	21.25	n.a	21.25	1.62
23.75	1.69	23.75	2.00	23.75	1.29	23.75	1.24	23.75	2.00	23.75	2.00	23.75	1.36	23.75	2.00	23.75	2.00	23.75	2.00	23.75	2.00	23.75	0.86	23.75	2.14
26.25	2.17	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	0.98	26.25	2.00	26.25	2.00	26.25	2.00	26.25	2.00	26.25	1.96	26.25	1.67
28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	0.99	28.75	2.00	28.75	2.00	28.75	2.00	28.75	2.00	28.75	1.42	28.75	2.00
31.25	2.17	31.25	2.00	31.25	2.00	31.25	1.99	31.25	2.00	31.25	1.92	31.25	2.00	31.25	2.00	31.25	2.00	31.25	2.14	31.25	n.a	31.25	1.49	31.25	2.00
33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.99	33.75	2.00	33.75	2.04	33.75	2.00	33.75	2.00	33.75	2.00	33.75	1.88	33.75	0.59	33.75	2.00	33.75	1.54
36.25	2.00			36.25	2.00	36.25	2.00			36.25	1.39			36.25	2.00	36.25	2.00	36.25	2.00			36.25	2.00	36.25	2.00
																								38.75	2.00
																								41.25	2.00
																								43.75	2.00
																								46.25	1.70
																								48.75	1.27
																								51.25	1.51
																								53.75	1.36
																								56.25	2.00
																								58.75	2.00
																								61.25	2.00
																								63.75	2.00
																								66.25	1.43
Inv Avg	1.69	Inv Avg	1.93	Inv Avg	1.62	Inv Avg	1.39	Inv Avg	1.89	Inv Avg	1.65	Inv Avg	1.43	Inv Avg	1.73	Inv Avg	1.66	Inv Avg	1.64	Inv Avg	1.55	Inv Avg	1.49	Inv Avg	1.69
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-14

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
Borings As Are, 0' Ash
PGA: 2% probability of exceedence in 50 yrs: 0.1792

M: 7.5
GW: 0.0'

Old Borings
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New Borings
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B-4		B-5		B-6		B-7		B-8		B-10		B-13		B-14		B-26	
LDI (ft)	2.64	LDI (ft)	4.14	LDI (ft)	2.29	LDI (ft)	7.42	LDI (ft)	6.11	LDI (ft)	2.74	LDI (ft)	6.38	LDI (ft)	5.09	LDI (ft)	4.71
S (ft)	0.23	S (ft)	0.44	S (ft)	0.35	S (ft)	0.87	S (ft)	0.60	S (ft)	0.34	S (ft)	0.71	S (ft)	0.55	S (ft)	0.59
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	0.59	2.50	n.a.	2.50	n.a.	2.50	0.48	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	0.81	5.00	n.a.	5.00	0.61	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	1.86	7.50	n.a.	7.50	0.90	8.00	0.47	7.50	n.a.	7.50	n.a.	7.50	n.a.
10.00	2.00	10.00	0.85	10.00	0.85	10.00	n.a.	10.00	0.70	11.00	0.69	10.00	n.a.	10.00	n.a.	10.00	0.87
15.00	1.28	15.00	0.70	15.00	0.76	15.00	0.70	15.00	0.56	14.00	0.80	15.00	0.62	15.00	0.64	15.00	2.00
20.00	0.47	20.00	0.58	20.00	0.47	20.00	0.58	20.00	0.42	20.00	1.38	20.00	0.64	20.00	1.66	20.00	0.95
25.00	1.31	25.00	0.58			25.00	0.54			25.00	1.84	25.00	0.59	25.00	0.65	25.00	1.56
						30.00	2.00			30.00	2.10	30.00	0.83	30.00	0.83	30.00	0.83
						35.00	2.00			35.00	1.48	35.00	0.71	35.00	2.07	35.00	0.45
						40.00	2.00					40.00	1.76			40.00	0.68
						45.00	2.00					45.00	2.00			45.00	1.21
						50.00	2.00					50.00	2.00				
						60.00	1.72										
						70.00	1.50										
						80.00	0.87										
						90.00	2.00										
						100.00	0.80										
Average	1.24	Average	0.93	Average	0.87	Average	1.24	Average	0.60	Average	1.09	Average	1.09	Average	1.00	Average	1.04
Risk	Low	Risk	High	Risk	High	Risk	Low	Risk	High	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	Moderate

Figure D-15

B-50		B-52		B-54		B-56		B-58		B-72		B-92		B-100		B-101	
LDI (ft)	2.66	LDI (ft)	1.34	LDI (ft)	8.24	LDI (ft)	3.03	LDI (ft)	2.79	LDI (ft)	5.07	LDI (ft)	6.00	LDI (ft)	8.71	LDI (ft)	9.06
S (ft)	0.28	S (ft)	0.18	S (ft)	0.51	S (ft)	0.51	S (ft)	0.39	S (ft)	0.55	S (ft)	0.58	S (ft)	1.24	S (ft)	1.00
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	0.33	5.00	n.a.	5.00	n.a.	5.00	?	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	0.53	7.50	0.91	7.50	n.a.	7.50	0.63	7.50	0.59	7.50	0.75	7.50	0.60
10.00	0.61	10.00	0.64	10.00	0.61	11.00	0.76	10.00	0.43	10.00	0.59	10.00	0.68	10.00	1.20	10.00	0.44
15.00	2.00	15.00	1.82	15.00	0.58	15.00	2.00	15.00	0.78	15.00	0.73	15.00	1.75	14.00	0.51	15.00	0.70
20.00	2.00	20.00	2.00	20.00	0.62	20.00	1.20	20.00	1.06	20.00	0.95	20.00	1.61	16.00	0.94	20.00	0.70
25.00	0.59	25.00	1.25	25.00	0.65	25.00	0.70	25.00	1.18	25.00	0.59	22.50	2.00	20.00	2.00	25.00	0.65
27.50	0.99	30.00	1.04	30.00	2.00	30.00	0.76	30.00	1.13	30.00	2.00	25.00	2.00	25.00	0.94	30.00	0.91
30.00	2.00	35.00	2.00	35.00	2.00	35.00	1.15	35.00	2.07	35.00	1.29	30.00	1.28	32.00	0.67	35.00	2.00
35.00	1.29					40.00	2.00					35.00	0.60	35.00	0.71	40.00	0.63
40.00	2.00					45.00	1.09					40.00	0.52	40.00	1.05	45.00	0.77
45.00	2.00					50.00	1.03					45.00	1.09	45.00	2.15	50.00	2.00
50.00	2.00													50.00	1.26		
														60.00	0.72		
														70.00	0.91		
														80.00	1.01		
														90.00	1.31		
Average	1.35	Average	1.41	Average	0.70	Average	1.12	Average	1.09	Average	0.93	Average	1.03	Average	1.00	Average	0.84
Risk	Low	Risk	Low	Risk	High	Risk	Moderate	Risk	Moderate	Risk	High	Risk	Moderate	Risk	High	Risk	High

Figure D-15

SCHEDULE CJG-ST1

B-115		B-127		B-141		B-153		B-154		B-176		B-188		B-200		B-202	
LDI (ft)	3.68	LDI (ft)	4.07	LDI (ft)	2.63	LDI (ft)	5.94	LDI (ft)	3.58	LDI (ft)	1.57	LDI (ft)	3.59	LDI (ft)	17.58	LDI (ft)	2.10
S (ft)	0.49	S (ft)	0.62	S (ft)	0.47	S (ft)	0.54	S (ft)	0.59	S (ft)	0.20	S (ft)	0.55	S (ft)	1.89	S (ft)	0.26
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	0.67	7.50	?	7.50	0.51	7.50	n.a.	7.50	n.a.	7.50	0.59	7.50	n.a.
10.00	n.a.	10.00	0.74	10.00	0.71	10.00	?	10.00	0.80	10.00	n.a.	10.00	0.80	10.00	n.a.	10.00	?
15.00	n.a.	15.00	0.80	15.00	0.78	15.00	1.25	15.00	0.97	15.00	n.a.	15.00	0.78	15.00	0.27	15.00	0.97
20.00	1.06	20.00	0.73	20.00	2.00	20.00	2.00	20.00	0.86	20.00	1.20	20.00	1.06	20.00	0.67	20.00	1.95
25.00	0.78	25.00	0.78	25.00	1.05	25.00	2.00	25.00	0.94	25.00	2.00	25.00	0.86	25.00	0.83	25.00	0.59
30.00	1.13	30.00	0.69	30.00	0.83	30.00	0.52	30.00	1.01	30.00	2.14	30.00	0.52	30.00	0.57	30.00	1.14
35.00	0.60	35.00	1.48	35.00	0.93	35.00	0.60	35.00	0.71	35.00	1.09	35.00	0.93	35.00	0.50	35.00	1.16
40.00	0.74					40.00	0.58	40.00	0.88	40.00	0.69			40.00	0.58		
45.00	2.00					45.00	1.21			45.00	n.a.			45.00	0.48		
										50.00	2.00			50.00	0.40		
														60.00	0.96		
Average	1.21	Average	1.01	Average	1.01	Average	1.07	Average	0.91	Average	1.57	Average	0.98	Average	0.63	Average	1.29
Risk	Low	Risk	Moderate	Risk	Moderate	Risk	Moderate	Risk	High	Risk	Low	Risk	High	Risk	High	Risk	Low

Figure D-15

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
Borings As Are
PGA: 2% probability of exceedence in 50 yrs: 0.1792
With 10.4' Ash (100-yr flood)

M: 7.5
GW: 0.0' (100 yr)

Old Borings
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New Borings
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B-4		B-5		B-6		B-7		B-8		B-10		B-13		B-14		B-26	
LDI (ft)	2.50	LDI (ft)	2.39	LDI (ft)	1.39	LDI (ft)	2.30	LDI (ft)	2.08	LDI (ft)	1.62	LDI (ft)	1.32	LDI (ft)	0.38	LDI (ft)	1.53
S (ft)	0.20	S (ft)	0.29	S (ft)	0.14	S (ft)	0.38	S (ft)	0.32	S (ft)	0.16	S (ft)	0.24	S (ft)	0.14	S (ft)	0.19
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	1.25	2.50	n.a.	2.50	n.a.	2.50	1.02	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	1.56	5.00	n.a.	5.00	1.18	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	2.00	7.50	n.a.	7.50	1.63	8.00	0.85	7.50	n.a.	7.50	n.a.	7.50	n.a.
10.00	2.00	10.00	1.46	10.00	1.46	10.00	n.a.	10.00	1.20	11.00	1.16	10.00	n.a.	10.00	n.a.	10.00	1.49
15.00	2.04	15.00	1.11	15.00	1.21	15.00	1.11	15.00	0.90	14.00	1.29	15.00	0.99	15.00	1.01	15.00	2.00
20.00	0.71	20.00	0.87	20.00	0.71	20.00	0.87	20.00	0.64	20.00	2.07	20.00	0.96	20.00	2.00	20.00	1.44
25.00	1.89	25.00	0.84			25.00	0.77			25.00	2.00	25.00	0.85	25.00	0.93	25.00	2.00
						30.00	2.00			30.00	2.00	30.00	1.16	30.00	1.16	30.00	1.16
						35.00	2.00			35.00	2.02	35.00	0.97	35.00	2.00	35.00	0.62
						40.00	2.00					40.00	2.00			40.00	0.91
						45.00	2.00					45.00	2.00			45.00	1.59
						50.00	2.00					50.00	2.00				
						60.00	2.16										
						70.00	1.84										
						80.00	1.05										
						90.00	2.00										
						100.00	0.92										
Inv Avg	1.58	Inv Avg	1.29	Inv Avg	1.32	Inv Avg	1.49	Inv Avg	1.04	Inv Avg	1.55	Inv Avg	1.39	Inv Avg	1.41	Inv Avg	1.36
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low

B-50		B-52		B-54		B-56		B-58		B-72		B-92		B-100		B-101	
LDI (ft)	1.00	LDI (ft)	0.12	LDI (ft)	2.13	LDI (ft)	0.32	LDI (ft)	2.01	LDI (ft)	1.17	LDI (ft)	2.18	LDI (ft)	2.39	LDI (ft)	2.92
S (ft)	0.12	S (ft)	0.04	S (ft)	0.50	S (ft)	0.10	S (ft)	0.20	S (ft)	0.19	S (ft)	0.23	S (ft)	0.44	S (ft)	0.40
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	0.64	5.00	n.a.	5.00	n.a.	5.00	?	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	0.96	7.50	1.65	7.50	n.a.	7.50	1.15	7.50	1.07	7.50	1.36	7.50	1.09
10.00	1.05	10.00	1.10	10.00	1.05	11.00	1.29	10.00	0.73	10.00	1.01	10.00	1.18	10.00	2.07	10.00	0.76
15.00	2.00	15.00	2.00	15.00	0.92	15.00	2.00	15.00	1.23	15.00	1.17	15.00	2.00	14.00	0.82	15.00	1.11
20.00	2.00	20.00	2.00	20.00	0.93	20.00	1.81	20.00	1.60	20.00	1.44	20.00	2.00	16.00	1.48	20.00	1.06
25.00	0.85	25.00	1.81	25.00	0.93	25.00	1.01	25.00	1.71	25.00	0.85	22.50	2.00	20.00	2.00	25.00	0.93
27.50	1.41	30.00	1.45	30.00	2.00	30.00	1.06	30.00	1.59	30.00	2.00	25.00	2.00	25.00	1.37	30.00	1.28
30.00	2.00	35.00	2.00	35.00	2.00	35.00	1.56	35.00	2.00	35.00	1.77	30.00	1.80	32.00	0.93	35.00	2.00
35.00	1.77					40.00	2.00					35.00	0.82	35.00	0.97	40.00	0.84
40.00	2.00					45.00	1.43					40.00	0.69	40.00	1.41	45.00	1.01
45.00	2.00					50.00	1.33					45.00	1.43	45.00	2.00	50.00	2.00
50.00	2.00													50.00	1.63		
														60.00	0.91		
														70.00	1.13		
														80.00	1.22		
														90.00	1.54		
Inv Avg	1.64	Inv Avg	1.75	Inv Avg	1.09	Inv Avg	1.51	Inv Avg	1.50	Inv Avg	1.35	Inv Avg	1.38	Inv Avg	1.34	Inv Avg	1.19
Risk	Low	Risk	Low	Risk	Moderate	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate

B-115		B-127		B-141		B-153		B-154		B-176		B-188		B-200		B-202	
LDI (ft)	1.04	LDI (ft)	0.35	LDI (ft)	0.30	LDI (ft)	2.92	LDI (ft)	0.61	LDI (ft)	0.17	LDI (ft)	1.33	LDI (ft)	8.35	LDI (ft)	0.84
S (ft)	0.14	S (ft)	0.11	S (ft)	0.09	S (ft)	0.26	S (ft)	0.19	S (ft)	0.06	S (ft)	0.16	S (ft)	0.99	S (ft)	0.10
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	1.22	7.50	?	7.50	0.93	7.50	n.a.	7.50	n.a.	7.50	1.08	7.50	n.a.
10.00	n.a.	10.00	1.27	10.00	1.22	10.00	?	10.00	1.38	10.00	n.a.	10.00	1.37	10.00	n.a.	10.00	?
15.00	n.a.	15.00	1.28	15.00	1.23	15.00	1.99	15.00	1.55	15.00	n.a.	15.00	1.23	15.00	0.43	15.00	1.54
20.00	1.60	20.00	1.10	20.00	2.00	20.00	2.00	20.00	1.30	20.00	1.81	20.00	1.60	20.00	1.02	20.00	2.00
25.00	1.12	25.00	1.12	25.00	1.52	25.00	2.00	25.00	1.37	25.00	2.00	25.00	1.24	25.00	1.19	25.00	0.85
30.00	1.59	30.00	0.97	30.00	1.16	30.00	0.73	30.00	1.42	30.00	2.00	30.00	0.73	30.00	0.80	30.00	1.60
35.00	0.82	35.00	2.02	35.00	1.27	35.00	0.82	35.00	0.97	35.00	1.48	35.00	1.27	35.00	0.68	35.00	1.58
40.00	0.99					40.00	0.78	40.00	1.17	40.00	0.93			40.00	0.78		
45.00	2.00					45.00	1.59			45.00	n.a.			45.00	0.63		
										50.00	2.00			50.00	0.51		
														60.00	1.20		
Inv Avg	1.49	Inv Avg	1.41	Inv Avg	1.44	Inv Avg	1.37	Inv Avg	1.33	Inv Avg	1.76	Inv Avg	1.36	Inv Avg	0.87	Inv Avg	1.61
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	High	Risk	Low

Ameren Missouri: Labadie UWL
Liquefaction Analysis
PGA: 2% probability of exceedence in 50 yrs: 0.1792 M: 7.5
With 20' Ash (top of embankment) GW: 0.0'

Old Borings <---------
New Borings ---------->

B-4		B-5		B-6		B-7		B-8		B-10		B-13		B-14		B-26	
LDI (ft)	2.50	LDI (ft)	0.28	LDI (ft)	1.32	LDI (ft)	0.62	LDI (ft)	1.43	LDI (ft)	0.20	LDI (ft)	0.27	LDI (ft)	0.17	LDI (ft)	1.36
S (ft)	0.20	S (ft)	0.11	S (ft)	0.12	S (ft)	0.23	S (ft)	0.18	S (ft)	0.08	S (ft)	0.10	S (ft)	0.06	S (ft)	0.14
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	1.36	2.50	n.a.	2.50	n.a.	2.50	1.11	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	1.77	5.00	n.a.	5.00	1.34	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	2.00	7.50	n.a.	7.50	1.88	8.00	0.98	7.50	n.a.	7.50	n.a.	7.50	n.a.
10.00	2.00	10.00	1.72	10.00	1.72	10.00	n.a.	10.00	1.40	11.00	1.37	10.00	n.a.	10.00	n.a.	10.00	1.74
15.00	2.00	15.00	1.32	15.00	1.44	15.00	1.32	15.00	1.07	14.00	1.53	15.00	1.18	15.00	1.21	15.00	2.00
20.00	0.85	20.00	1.04	20.00	0.85	20.00	1.04	20.00	0.77	20.00	2.00	20.00	1.15	20.00	2.00	20.00	1.72
25.00	2.00	25.00	1.01			25.00	0.93			25.00	2.00	25.00	1.02	25.00	1.12	25.00	2.00
						30.00	2.00			30.00	2.00	30.00	1.39	30.00	1.39	30.00	1.39
						35.00	2.00			35.00	2.00	35.00	1.17	35.00	2.00	35.00	0.74
						40.00	2.00					40.00	2.00			40.00	1.09
						45.00	2.00					45.00	2.00			45.00	1.89
						50.00	2.00					50.00	2.00				
						60.00	2.00										
						70.00	2.12										
						80.00	1.19										
						90.00	2.00										
						100.00	1.01										
Inv Avg	1.68	Inv Avg	1.46	Inv Avg	1.50	Inv Avg	1.60	Inv Avg	1.21	Inv Avg	1.67	Inv Avg	1.54	Inv Avg	1.54	Inv Avg	1.53
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-17

SCHEDULE CJG-ST1

B-50		B-52		B-54		B-56		B-58		B-72		B-92		B-100		B-101	
LDI (ft)	0.13	LDI (ft)	1.52	LDI (ft)	1.53	LDI (ft)	0.14	LDI (ft)	1.92	LDI (ft)	0.21	LDI (ft)	1.34	LDI (ft)	0.66	LDI (ft)	2.19
S (ft)	0.05	S (ft)	0.26	S (ft)	0.26	S (ft)	0.04	S (ft)	0.18	S (ft)	0.08	S (ft)	0.16	S (ft)	0.23	S (ft)	0.27
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	0.72	5.00	n.a.	5.00	n.a.	5.00	?	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	1.11	7.50	1.91	7.50	n.a.	7.50	1.33	7.50	1.24	7.50	1.57	7.50	1.26
10.00	1.23	10.00	2.00	10.00	1.23	11.00	1.52	10.00	0.86	10.00	1.19	10.00	1.38	10.00	2.00	10.00	0.90
15.00	2.00	15.00	2.00	15.00	1.10	15.00	2.00	15.00	1.47	15.00	1.39	15.00	2.00	14.00	0.98	15.00	1.32
20.00	2.00	20.00	2.00	20.00	1.12	20.00	2.17	20.00	1.92	20.00	1.72	20.00	2.00	16.00	1.76	20.00	1.27
25.00	1.02	25.00	2.00	25.00	1.12	25.00	1.21	25.00	2.05	25.00	1.02	22.50	2.00	20.00	2.00	25.00	1.12
27.50	1.69	30.00	2.00	30.00	2.00	30.00	1.27	30.00	1.90	30.00	2.00	25.00	2.00	25.00	1.64	30.00	1.53
30.00	2.00	35.00	2.00	35.00	2.00	35.00	1.87	35.00	2.00	35.00	2.11	30.00	2.16	32.00	1.12	35.00	2.00
35.00	2.11					40.00	2.00					35.00	0.98	35.00	1.17	40.00	1.00
40.00	2.00					45.00	1.70					40.00	0.83	40.00	1.68	45.00	1.20
45.00	2.00					50.00	1.58					45.00	1.70	45.00	2.00	50.00	2.00
50.00	2.00													50.00	1.92		
														60.00	1.06		
														70.00	1.30		
														80.00	1.38		
														90.00	1.72		
Inv Avg	1.77	Inv Avg	2.00	Inv Avg	1.23	Inv Avg	1.71	Inv Avg	1.67	Inv Avg	1.54	Inv Avg	1.54	Inv Avg	1.51	Inv Avg	1.36
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-17

B-115		B-127		B-141		B-153		B-154		B-176		B-188		B-200		B-202	
LDI (ft)	0.16	LDI (ft)	0.17	LDI (ft)	0.15	LDI (ft)	1.41	LDI (ft)	0.20	LDI (ft)	0.07	LDI (ft)	1.12	LDI (ft)	6.68	LDI (ft)	0.09
S (ft)	0.07	S (ft)	0.06	S (ft)	0.05	S (ft)	0.21	S (ft)	0.07	S (ft)	0.02	S (ft)	0.12	S (ft)	0.91	S (ft)	0.03
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	1.41	7.50	?	7.50	1.07	7.50	n.a.	7.50	n.a.	7.50	1.24	7.50	n.a.
10.00	n.a.	10.00	1.49	10.00	1.43	10.00	?	10.00	1.62	10.00	n.a.	10.00	1.60	10.00	n.a.	10.00	?
15.00	n.a.	15.00	1.52	15.00	1.47	15.00	2.00	15.00	1.85	15.00	n.a.	15.00	1.47	15.00	0.51	15.00	1.83
20.00	1.92	20.00	1.32	20.00	2.00	20.00	2.00	20.00	1.55	20.00	2.17	20.00	1.92	20.00	1.22	20.00	2.00
25.00	1.35	25.00	1.35	25.00	1.83	25.00	2.00	25.00	1.64	25.00	2.00	25.00	1.48	25.00	1.44	25.00	1.03
30.00	1.90	30.00	1.16	30.00	1.39	30.00	0.87	30.00	1.70	30.00	2.00	30.00	0.87	30.00	0.96	30.00	1.92
35.00	0.98	35.00	2.00	35.00	1.52	35.00	0.98	35.00	1.17	35.00	1.77	35.00	1.52	35.00	0.82	35.00	1.89
40.00	1.18					40.00	0.92	40.00	1.40	40.00	1.10			40.00	0.92		
45.00	2.00					45.00	1.89			45.00	n.a.			45.00	0.74		
										50.00	2.00			50.00	0.61		
														60.00	1.41		
Inv Avg	1.65	Inv Avg	1.58	Inv Avg	1.63	Inv Avg	1.51	Inv Avg	1.54	Inv Avg	1.87	Inv Avg	1.55	Inv Avg	1.01	Inv Avg	1.78
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Moderate	Risk	Low

Figure D-17

SCHEDULE CJG-ST1

Ameren Missouri: Labadie UWL
Liquefaction Analysis
Borings As Are
PGA: 2% probability of exceedence in 50 yrs: 0.1792
With 100' Ash (design height)

M: 7.5
GW: 0.0'

Old Borings
<---------

New Borings
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B-4		B-5		B-6		B-7		B-8		B-10		B-13		B-14		B-26	
LDI (ft)	0.01	LDI (ft)	0.01	LDI (ft)	0.00	LDI (ft)	0.30	LDI (ft)	0.01	LDI (ft)	0.00	LDI (ft)	0.00	LDI (ft)	0.00	LDI (ft)	0.01
S (ft)	0.00	S (ft)	0.00	S (ft)	0.00	S (ft)	0.11	S (ft)	0.00	S (ft)	0.00	S (ft)	0.00	S (ft)	0.00	S (ft)	0.01
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	2.13	2.50	n.a.	2.50	n.a.	2.50	1.74	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	2.00	5.00	n.a.	5.00	2.18	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	2.00	7.50	n.a.	7.50	2.00	8.00	1.66	7.50	n.a.	7.50	n.a.	7.50	n.a.
10.00	2.00	10.00	2.00	10.00	2.00	10.00	n.a.	10.00	2.00	11.00	2.00	10.00	n.a.	10.00	n.a.	10.00	2.00
15.00	2.00	15.00	2.00	15.00	2.00	15.00	2.00	15.00	1.89	14.00	2.00	15.00	2.09	15.00	2.13	15.00	2.00
20.00	1.53	20.00	1.87	20.00	1.53	20.00	1.87	20.00	1.37	20.00	2.00	20.00	2.06	20.00	2.00	20.00	2.00
25.00	2.00	25.00	1.82			25.00	1.67			25.00	2.00	25.00	1.82	25.00	2.01	25.00	2.00
						30.00	2.00			30.00	2.00	30.00	2.00	30.00	2.00	30.00	2.00
						35.00	2.00			35.00	2.00	35.00	2.02	35.00	2.00	35.00	1.28
						40.00	2.00					40.00	2.00			40.00	1.84
						45.00	2.00					45.00	2.00			45.00	2.00
						50.00	2.00					50.00	2.00				
						60.00	2.00										
						70.00	2.00										
						80.00	1.37										
						90.00	2.00										
						100.00	0.95										
Inv Avg	1.92	Inv Avg	1.95	Inv Avg	1.90	Inv Avg	1.80	Inv Avg	1.88	Inv Avg	1.96	Inv Avg	2.00	Inv Avg	1.98	Inv Avg	1.89
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

B-50		**B-52**		**B-54**		**B-56**		**B-58**		**B-72**		**B-92**		**B-100**		**B-101**	
LDI (ft)	0.00	LDI (ft)	0.00	LDI (ft)	0.02	LDI (ft)	0.00	LDI (ft)	0.01	LDI (ft)	0.00	LDI (ft)	0.02	LDI (ft)	0.20	LDI (ft)	0.01
S (ft)	0.00	S (ft)	0.00	S (ft)	0.01	S (ft)	0.00	S (ft)	0.00	S (ft)	0.00	S (ft)	0.01	S (ft)	0.06	S (ft)	0.01
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	1.17	5.00	n.a.	5.00	n.a.	5.00	?	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	1.86	7.50	2.00	7.50	n.a.	7.50	2.00	7.50	2.08	7.50	2.00	7.50	2.12
10.00	2.11	10.00	2.00	10.00	2.12	11.00	2.00	10.00	1.47	10.00	2.04	10.00	2.00	10.00	2.00	10.00	1.54
15.00	2.00	15.00	2.00	15.00	1.94	15.00	2.00	15.00	2.00	15.00	2.00	15.00	2.00	14.00	1.72	15.00	2.00
20.00	2.00	20.00	2.00	20.00	2.01	20.00	2.00	20.00	2.00	20.00	2.00	20.00	2.00	16.00	2.00	20.00	2.00
25.00	1.82	25.00	2.00	25.00	2.01	25.00	2.17	25.00	2.00	25.00	1.82	22.50	2.00	20.00	2.00	25.00	2.01
27.50	2.00	30.00	2.00	30.00	2.00	30.00	2.00	30.00	2.00	30.00	2.00	25.00	2.00	25.00	2.00	30.00	2.00
30.00	2.00	35.00	2.00	35.00	2.00	35.00	2.00	35.00	2.00	35.00	2.00	30.00	2.00	32.00	1.97	35.00	2.00
35.00	2.00					40.00	2.00					35.00	1.70	35.00	2.02	40.00	1.69
40.00	2.00					45.00	2.00					40.00	1.39	40.00	2.00	45.00	1.96
45.00	2.00					50.00	2.00					45.00	2.00	45.00	2.00	50.00	2.00
50.00	2.00													50.00	2.00		
														60.00	1.51		
														70.00	1.67		
														80.00	1.60		
														90.00	1.79		
Inv Avg	1.99	Inv Avg	2.00	Inv Avg	1.85	Inv Avg	2.01	Inv Avg	1.92	Inv Avg	1.98	Inv Avg	1.91	Inv Avg	1.88	Inv Avg	1.93
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

B-115		B-127		B-141		B-153		B-154		B-176		B-188		B-200		B-202	
LDI (ft)	0.01	LDI (ft)	0.00	LDI (ft)	0.00	LDI (ft)	0.02	LDI (ft)	0.00	LDI (ft)	0.00	LDI (ft)	0.01	LDI (ft)	3.79	LDI (ft)	0.00
S (ft)	0.00	S (ft)	0.00	S (ft)	0.00	S (ft)	0.01	S (ft)	0.00	S (ft)	0.00	S (ft)	0.00	S (ft)	0.55	S (ft)	0.00
Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.	Depth	F.S.
2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.	2.50	n.a.
5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.	5.00	n.a.
7.50	n.a.	7.50	n.a.	7.50	2.00	7.50	?	7.50	1.80	7.50	n.a.	7.50	n.a.	7.50	2.08	7.50	n.a.
10.00	n.a.	10.00	2.00	10.00	2.00	10.00	?	10.00	2.00	10.00	n.a.	10.00	2.00	10.00	n.a.	10.00	?
15.00	n.a.	15.00	2.00	15.00	2.00	15.00	2.00	15.00	2.00	15.00	n.a.	15.00	2.00	15.00	0.91	15.00	2.00
20.00	2.00	20.00	2.00	20.00	2.00	20.00	2.00	20.00	2.00	20.00	2.00	20.00	2.00	20.00	2.18	20.00	2.00
25.00	2.00	25.00	2.00	25.00	2.00	25.00	2.00	25.00	2.00	25.00	2.00	25.00	2.00	25.00	2.00	25.00	1.84
30.00	2.00	30.00	2.05	30.00	2.00	30.00	1.55	30.00	2.00	30.00	2.00	30.00	1.55	30.00	1.70	30.00	2.00
35.00	1.70	35.00	2.00	35.00	2.00	35.00	1.70	35.00	2.02	35.00	2.00	35.00	2.00	35.00	1.42	35.00	2.00
40.00	1.99					40.00	1.56	40.00	2.00	40.00	1.86			40.00	1.56		
45.00	2.00					45.00	2.00			45.00	n.a.			45.00	1.21		
										50.00	2.00			50.00	0.95		
														60.00	2.01		
Inv Avg	1.97	Inv Avg	2.01	Inv Avg	2.00	Inv Avg	1.85	Inv Avg	1.98	Inv Avg	1.99	Inv Avg	1.94	Inv Avg	1.56	Inv Avg	1.98
Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low	Risk	Low

Figure D-18