



IFB #18-272
North Outer Road and I-70 / David Hoekel Parkway Interchange Grading
ADDENDUM 1

Addendum issued August 17, 2018

The following information is hereby incorporated into the Invitation for Bids (IFB):

- 1. Bidder Question:** Can you provide the bid form in an excel spreadsheet so I can import into our bidding software?

City Response: An Excel spreadsheet of the line items is provided as a courtesy for bidder use. However, bidder's line item prices must be entered into the City's E-bidding system.

- 2. Bidder Question:** Is there a bid bond form associated with job #18-272 or should we just use the standard one.

City Response: Sample bid bond form from MoDOT EPG 136.9.3, is attached although bidders may use an alternate format that complies with the requirements stated in the IFB document, Bidding Instructions paragraph 4:

4. Bid Bond / Bid Guarantee: Bid bond required if total bid price exceeds \$50,000.00: The bid security (5% of bid amount) submitted with this bid shall be a bid bond from a surety that is authorized to issue bonds in the State of Missouri; or a certified check or cashier's check payable to the City of Wentzville.

Table of Contents, second page, incorrectly lists "Bid Bond, CCA-14 to CCA-15". The correct title of the document is "Contract Bond Form, CCA-14 to CCA-15".

- 3. Performance Bond and Payment Bond:** Clarification for bidders that a performance bond and payment bond will not be necessary at time of award. Instead, the successful bidder will be required to complete the Contract Bond Form listed in the IFB, CCA-14 to CCA-15 within ten (10) days of notification of contract award.

- 4. Bidder Question:** Please provide the geotechnical report alluded to in the MSE Wall plans.

City Response: Geotechnical Report has been added as an Attachment in the E-bidding system.

- 5. General Conditions:** The General Conditions have been added as an Attachment in the E-bidding system.

All other Terms and Conditions as applicable to this Invitation for Bid shall remain as stated.

This addendum forms a part of the contract documents and modifies the original bidding documents dated August 10, 2018. Contractor shall acknowledge this Addendum through the E-bidding software. Failure to do so may subject bidder to disqualification.

End of Addendum 1

SAMPLE BID BOND

BID BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we _____

as principal and _____
as surety, are held and firmly bound unto the (Insert LPA Name) _____ in the penal sum
of _____ Dollars (\$) to be paid to the commission to be credited to the state road fund,
the principal and surety binding themselves, their heirs, executors, administrators, successors, and assigns, jointly and
severally, firmly by these presents.

Sealed with our seals and dated this _____

THE CONDITION OF THIS OBLIGATION is such that

WHEREAS the principal is submitting herewith a bid to the commission on route(s) _____

in _____ County(ies),
project (s) _____

for construction or improvement of state highway as set out in said bid;

NOW THEREFORE, if the commission shall accept the bid of the principal and if the principal shall properly
execute and deliver to the commission the contract, contract bond, and evidence of insurance coverage in compliance with
the requirements of the bid, the specifications, and the provisions of section 227.100 RSMo, to the satisfaction of the
commission, then this obligation shall be void and of no effect, otherwise to remain in full force and effect.

In the event the said principal shall, in the judgment of the commission, fail to comply with any requirement as
set forth in the preceding paragraph, then the state of Missouri, acting by and through the commission, shall immediately and
forthwith be entitled to recover the full penal sum above set out, together with court costs, attorney's fees, and any other
expense of recovery.

The principal and surety hereby certify that the document is the original or a verbatim copy of the bid bond
form furnished by the Commission, in accordance with Sec 102.9 of the Missouri Standard Specifications for Highway
Construction.

Principal

SEAL

By _____
Signature

Surety

SEAL

By _____
Signature of Attorney in Fact

NOTE: This bond must be executed by the principal, and by a corporate surety authorized to conduct surety business in the
state of Missouri.



GEOTECHNOLOGY
INC
FROM THE GROUND UP

**SUBSURFACE EXPLORATION
DAVID HOEKEL PARKWAY
PHASE 2A, B & C
WENTZVILLE, MISSOURI**

Prepared for:

CRAWFORD, MURPHY & TILLY, INC.
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Geotechnology Project No. J024691.01

February 16, 2018
Revision No. 2

St. Louis, MO
Fairview Heights, IL
Overland Park, KS
Memphis, TN
geotechnology.com

QUALITY. INTEGRITY. PARTNERSHIP. OPPORTUNITY. RESPONSIVENESS. SAFETY



February 16, 2018

J024691.01
Revision No. 2

Mr. Brian Eads, P.E., PTOE
Crawford, Murphy & Tilly, Inc.
One Memorial Drive, Suite 500
St. Louis, Missouri 63102

SUBSURFACE EXPLORATION
DAVID HOEKEL PARKWAY
PHASE 2A, B, & C
WENTZVILLE, MISSOURI

Dear Mr. Eads:

Presented in this report are the results of a subsurface exploration performed for the referenced project. This report includes our project understanding, observed site conditions, conclusions and/or recommendations, and support data as given in the Table of Contents.

It has been our pleasure to provide these geotechnical services to you, and we would welcome the opportunity to provide other services during the course of the project. Please contact us if you need further information or clarification about this document.

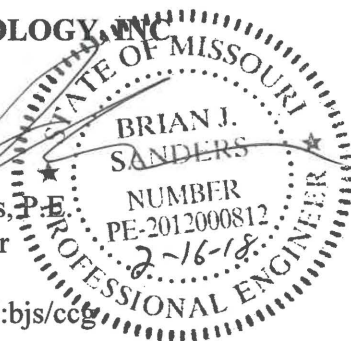
Very truly yours,

GEOTECHNOLOGY, INC.


Brian J. Sanders, P.E.
Project Manager

BJS/CKK/JAW:bjs/ccg

Copies submitted: (2) hardcopies + pdf




Craig K. Kaibel, P.E.
Specialty Testing Manager



J024691.01
Revision No. 2

SUBSURFACE EXPLORATION
DAVID HOEKEL PARKWAY
PHASE 2A, B, & C
WENTZVILLE, MISSOURI

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PHASE 2A, B, & C
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SECTION I - EXECUTIVE SUMMARY

The executive summary is provided solely for the purpose of overview, and a number of details are omitted, any one of which could be crucial to the proper application of this report. Any party who relies on this report must read the full report.

- The project includes design and construction of a new interchange from the planned Interstate Drive extension to Goodfellow Road in Wentzville, Missouri as part of the proposed David Hoekel Parkway. The proposed interchange will include four paved lanes, a new bridge over I-70 (A8514) and a new bridge over the Norfolk Southern Railroad (A8512) to the south of I-70, three associated MSE walls (A8513, A8515, and A8516) for grade separation, and other appurtenances.
- Site soil is comprised of overburden consisting of a cap of cohesive soil underlain by alternating layers of sand and silt or silty clay (i.e., glacial till) to the limestone bedrock. Fill is present in Boring B-821 to a depth of approximately 6 feet. The fill consists of brown silty clay with gravel.
- Groundwater was observed in six of the 77 borings during drilling at depths of approximately 32 to 45 feet (i.e. approximately El 630.0¹ to El 624.5).
- The bridges may be supported on rock bearing driven piles and drilled shafts. Geotechnical design recommendations are provided herein and are in accordance with the Missouri Department of Transportation's (MoDOT) Engineering Policy Guide (EPG).
- Settlement estimates for mechanically stabilized earth (MSE) retaining walls and embankments are included herein.

¹ Elevations herein are in feet and refer to the NAVD 88 datum.

- Global stability analyses were performed on typical sections of the retaining walls based on assumed grid lengths. Results are included herein.
- Based on MoDOT's Table 321.1 Guide for Selection of Slope Inclination for Routine Design, fill side slopes may be as steep as 1V:2.5H for low plasticity clay and 1V:3H for high plasticity clay. Spill slopes less than 20 feet in height may be as steep as 1V:2H for low plasticity clay, spill slopes greater than 20 feet in height may be as steep as 1V:2.5H.
- In accordance with the procedures of the 2012 edition of the AASHTO LRFD Bridge Design Specifications, the bridge site may be seismically classified as Site Class D (Stiff Soil).

SECTION II - PROJECT DATA

AUTHORIZATION

The services documented in this report were provided in general accordance with our proposal P024691.01 and revised cost estimate dated May 26, 2016, and the MoDOT's EPG. The project was authorized by Crawford, Murphy & Tilly's Subcontract agreement dated September 2, 2015.

PURPOSE AND SCOPE OF SERVICES

The purpose of our services was to develop recommendations for geotechnical aspects of the design and construction of the project as described in our proposal. Briefly, services consisted of site reconnaissance, drilling 77 borings, laboratory testing, engineering analyses, and preparation of this report. Important information prepared by The Geotechnical Business Council for studies of this type is presented in Appendix A for your review.

PROJECT AND SITE DESCRIPTION

The project includes design and construction of a new interchange from the planned Interstate Drive extension to Goodfellow Road in Wentzville, Missouri as part of the proposed David Hoekel Parkway. The proposed interchange will include four paved lanes, a new bridge over I-70 (A8514) and a new bridge over the Norfolk Southern Railroad (A8512) to the south of

I-70, three associated MSE walls (A8513, A8515, and A8516) for grade separation, and other appurtenances. The site is approximately 4.3 miles west of the intersection of Interstates 64 and 70. The site location and general topography of the area as per 2012 U.S.G.S. map of the vicinity are shown on Plate 1. Bridge A8514 will be single-span, approximately 125 feet long, 65 feet wide and will be located over I-70. Bridge A8512 will be three-span, approximately 210 feet long, 76 feet wide, and will be located over the Norfolk Southern Railroad. Approach embankments are anticipated to be approximately 25 to 35 feet high and extend approximately 300 to 1,300 feet in length. In addition, we understand the south embankment, north embankment, and Wall A8546 are planned to be constructed as part of a pregrading package. The pregrading package will allow the embankments to settle prior to the bridge and approach slab construction and paving.

We understand that the intermediate and end bents are planned to be supported on either drilled shafts or driven piles. The load-and-resistance factor design (LRFD) method will be used to design the structures in accordance with AASHTO LRFD Bridge Design Specifications (2012) and MoDOT's EPG.

SECTION III - FIELD EXPLORATION AND LABORATORY TESTING

FIELD EXPLORATION

The field exploration consisted of drilling 77 borings, designated as Borings B-1 through B-20, Borings B-101 through -103 (Bent 1), B-201 through -203 (Bent 2), B-301 through -303 (Bent 3), B-401 through -403 (Bent 4) for Bridge A8512, Borings B-501 through -503 (Bent 1) and B-601 through B-603 (Bent 2) for Bridge A8514, Borings B-701 through B-722 for Wall A8513, Borings B-801 through B-821 for Wall A8515, Borings B-901 and B-902 for Wall A8516 and seven pavement cores designated as PC-1 through PC-7 at the approximate locations shown on Plates 2, 3 and 4. Borings B-102, -202, -203, -302, -502, and -602 were not drilled due to access issues or consistent bedrock elevations and are shown on Plates 2, 3, and 4. The borings were located in the field by the project surveyor and the northing, easting, and surface elevation of each boring were provided to Geotechnology. However, some of the borings were moved slightly due to access and possible utilities. The station and offset for these borings has been adjusted to reflect the as drilled locations and are presented on the boring logs. Geotechnology estimated the surface elevations of the relocated borings. The surveyed or estimated elevations and stationing at the boring locations are shown on the boring logs, which are included in Appendix B.

The borings were drilled to auger refusal using CME 55LC, 55TRK, and 750X rotary drill rigs equipped with hollow stem augers. Borings B-401, -402, -501 were advanced with mud rotary techniques from depths of approximately 40, 40, and 20 feet, respectively. Standard penetration tests (SPTs) were performed using an automatic hammer. Split-spoon samples and relatively undisturbed Shelby tube samples were obtained at the depths indicated on the boring

logs presented in Appendix B. Rock was cored in six of the bridge bent borings using double-tube NQ2 wireline methods. Rock core photographs are included in Appendix C. A legend of the terms and symbols used on the borings and rock core descriptions are included in Appendix B.

Geologists and engineers from Geotechnology provided direction during field exploration, observed drilling and sampling, assisted in obtaining samples, and prepared logs of the material encountered. The boring logs represent conditions observed at the time of exploration, and have been edited to incorporate results of the laboratory tests.

Unless noted on the boring logs, the lines designating the changes between various strata represent approximate boundaries. The transition between materials could be gradual or could occur between recovered samples. The stratification given on the boring logs, or described herein, is for use by Geotechnology in its analyses and should not be used as the basis of design or construction cost estimates without realizing that there can be variation from that shown or described.

The boring logs and related information depict subsurface conditions only at the specific locations and times where sampling was performed. The passage of time can result in changes in conditions, interpreted to exist, at or between the locations where sampling was conducted.

LABORATORY TESTING

Laboratory testing was performed on the soil samples to estimate engineering and index properties. Moisture content and Atterberg limits tests were performed on selected cohesive soil samples. Unconsolidated undrained and consolidated undrained triaxial compression tests and consolidation tests were performed on selected Shelby tube samples. Grain size analyses and percent passing No. 200 sieve tests were performed on selected samples. Unconfined compression tests were performed on rock core samples from Borings B-201 and B-303. Index laboratory test results are presented on the boring logs in Appendix B. Swell tests were performed on five samples. Rock Core unconfined compression test results are summarized in Table 1, swell test results are summarized in Table 2, and remaining laboratory test results are provided in Appendices E, F, G, H, and I.

SECTION IV - SUBSURFACE CONDITIONS

STRATIGRAPHY

The pavement section consists of approximately 6 to 15 inches of asphalt. Exceptions are pavement cores at PC-4 and PC-6. In Pavement Cores PC-4 and PC-6, 3.5 to 4.5 inches of concrete is present beneath the asphalt pavement. The pavement section thickness at each boring location is summarized in the following table.

THICKNESS OF PAVEMENT MATERIALS		
Core Location	Asphalt (in.)	Concrete (in)
PC-1	7	-
PC-2	8	-
PC-3	6	-
PC-4	6	3.5
PC-5	6	-
PC-6	7	4.5
PC-7	15	-

The soil overburden consists of a cap of cohesive soil underlain by alternating layers of sand and silt or silty clay (i.e., glacial till) to the refusal depths. Fill is present in Boring B-821 to a depth of approximately 6 feet. The fill consists of brown silty clay with gravel. Soft to stiff, occasionally very stiff, brown and gray, silty clay and clay is present in all borings. The thickness of the silty clay and clay stratum varies between approximately 13 to 52 feet. The interbedded layers of sand and silt or silty clay are typically medium dense to dense and medium stiff to stiff, with thicknesses that vary from 5 to 15 feet.

Auger refusal was encountered in all of the bridge bent borings between depths of approximately 81 to 89 feet (El 589.0 to El 574.0). Drill rig augers can often penetrate several feet into soft or broken rock, and therefore these elevations do not necessarily represent top of rock. Rock generally consists of moderately hard to hard, gray, finely crystalline, thin to thick bedded limestone. Core recovery in the bedrock ranges between 0 and 100 percent but are typically above 25 percent. Rock Quality Designation (RQD)² values are between 0 to 87 percent, but are typically above 25 percent, which is indicative of poor quality rock. Poor recovery and RQD were observed in various runs in each boring. The unconfined compressive strength of the representative limestone rock samples ranged between approximately 880 and 3,300 kips per square foot (ksf).

GROUNDWATER

Groundwater was observed in eight of the 77 borings during drilling at depths of approximately 32 to 45 feet (approximately El 630.0 to El 624.5). Borings B-402, -403, and -501 were completed with mud rotary techniques, which introduce drilling fluid into the borehole, and as such mask groundwater depths below the depth mud rotary techniques begin. Groundwater levels shown on the boring logs might not have stabilized before backfilling, which is typical in less permeable cohesive soil. Consequently, the indicated/lack of observed groundwater levels might not represent present or future levels. Groundwater levels can vary significantly over time due to the effects of seasonal variation in precipitation, recharge, or other factors not evident at the time of exploration. Groundwater often occurs near the top of bedrock.

² RQD is the percentage of intact rock core pieces longer than 4-inches in the total length of the core run.

Free water can be trapped in permeable zones of fill and in utility trenches backfilled with clean rock. Excavations that remain open could collect water.

SECTION V - DESIGN CONSIDERATIONS AND RECOMMENDATIONS

We understand that the intermediate and end bents are planned to be supported on either drilled shafts or driven piles. Design recommendations for both foundation systems are provided herein. We have assumed for design purposes that this bridge will be classified as a bridge on a minor road.

High plasticity soil was encountered at roadway subgrade in 17 of the initial 20 borings which focused on the roadways. High plasticity soil should be remediated within 1 foot of pavement subgrade as discussed herein.

DRILLED SHAFTS

Axial Resistance. The nominal unit side resistance (q_s) of rock sockets constructed in slightly weathered to fresh limestone is 22.5 kips per square foot (ksf). A geotechnical side resistance factor (ϕ_{qs}) of 0.46 may be used in the rock socket design. Side resistance in highly weathered rock should be ignored. We also recommend ignoring the resistance for the upper two feet of competent rock for rock socket design. The two feet of rock, however, should be included in the length of the rock socket. The minimum rock socket length should be greater than the diameter of the shaft and shall be measured from the anticipated tip of the casing.

At shaft locations where end-bearing resistance will also be considered, the factored shaft resistance is equal to the summation of the following: (1) the rock socket surface area multiplied by the factored unit side resistance value and (2) the end area of the shaft multiplied by the factored unit tip resistance. The nominal unit tip resistance (q_p) of drilled shafts bearing a minimum 3 feet below the top of rock in competent limestone is 370 ksf. The drilled shaft design may be based on a geotechnical unit tip resistance factor (ϕ_{qp}) of 0.42.

The axial resistance is based on the inherent strength of the intact rock and on the influence of jointing, fracturing, and weathering. In addition, axial resistance greatly depends on the cleanliness of the rock socket and bottom of the drilled shaft prior to concrete placement, and the integrity of the concrete after concrete placement. Drilled shaft construction and testing shall be performed in accordance with Missouri Standard Specifications for Highway Construction Section 701 - Drilled Shafts. We recommend contingency funds to extend the shafts deeper in the event voids (e.g., Boring B-303) are encountered in the foundation inspection holes within 10 feet below the anticipated bottom of the shafts. In accordance with MoDOT EPG 751.37.1.3, permanent casing is required. The casing should be socketed approximately 1 foot into

competent rock. A summary of the elevation ranges for recommended shaft side friction and tip resistance are presented by bent/boring in the following table.

DRILLED SHAFT SUMMARY					
Bent	Relevant Boring	Ground Surface Elevation (msl-ft)	Anticipated Tip of Casing (msl-ft)	Elevation Range for Tip Resistance (msl-ft)	Elevation Range for Side Friction (msl-ft)*
Bent 2	B-201	674.0	577.0	573.5-561.5	576.0 – 561.5
Bent 3	B-301	668.2	583.7	**	**
	B-303	665.0	575.5	565.0-556.0	573.5 - 556.0

* Based on field rock socket inspection, side friction should not be counted in areas where voids are present and/or where rock is only partially present along the sidewall of the shaft.

** Rock Coring not performed

Uplift Resistance. Uplift resistance for drilled shafts bearing in rock may be computed considering the following: (1) buoyant weight of concrete, (2) factored unit side resistance between the concrete and the rock. The nominal unit uplift resistance (q_{sup}) for rock sockets constructed in slightly weathered to fresh limestone is 22.5 ksf. The geotechnical uplift resistance factor (ϕ_{qsup}) may be calculated by reducing the recommended axial unit side resistance factor (i.e., 0.46) by 10 percent (i.e., 0.42). The top two feet of rock should not be included in the uplift resistance calculations.

Settlement. Settlement of drilled shafts may be approximated based on the magnitude of factored loads relative to the magnitude of factored side and tip resistance. MoDOT EPG 751.37.4.1 provides guidance on estimation of drilled shaft settlement based on the shaft diameter, factored load, factored side and end-bearing resistances, and factored elastic compression.

DRIVEN PILES

Axial Resistance. Piles driven to rock must be fitted with a cast steel driving shoe or point. The preliminary nominal axial resistance for piles driven to rock is controlled by the structural limit state of the pile or pile driveability, whichever is less. Therefore, for fully embedded piles, the structural limit state for piles loaded in compression is $f_y A_s$ and the structural resistance factor to calculate the maximum factored resistance is 0.5 (i.e., ϕ_c).

The nominal axial resistance required for field verification may be calculated by dividing the factored resistance per pile, which equals the factored load per pile, by the appropriate resistance

factor (i.e., $\phi_{\text{dyn}}=0.65, 0.5$, and 0.4 for high-strain dynamic testing, wave equation analysis, and modified Gates formula, respectively). In general, the required nominal axial resistance should be limited to $0.65 f_y A_s$ to reduce pile driving stresses unless a preconstruction wave equation analysis is performed during design. If less than five piles are in the group, the resistance factor should be reduced by 20 percent. We recommend the center-to-center spacing of piles not be less than 30 inches or 2.5 pile diameters, whichever is greater.

Settlement. Based on our experience, settlement of pile foundations, designed and constructed in accordance with MoDOT EPG 751.36 and the recommendations given in this report, is expected to be 0.5-inch or less. However, elastic compression of the piles should be evaluated by the structural engineer.

Uplift Resistance. The nominal uplift resistance (R_s) for a single steel H-pile, based on the SPT-method, is 0.9 ksf applied over the perimeter or “box” area. The factored uplift resistance may be determined using a resistance factor (ϕ_{up}) of 0.25. The upper 3 feet of the pile or predrilled/cased portion, whichever is greater, should be ignored when determining the uplift resistance. If less than five piles are in the group, the resistance factor should be reduced by an additional 20 percent.

Downdrag. Embankment/wall construction at the abutments will result in negative skin friction (i.e., downdrag) on the piles due to the settlement of the underlying cohesive soil. Downdrag occurs as the soil strata move downward relative to the foundations due to settlement of the surrounding soil layers. The AASHTO Bridge Design Specifications suggest that settlement of 0.4-inch or greater could produce downdrag on deep foundations. MoDOT EPG 751.37.1.4 states that downward movements of 0.1- to 0.5-inch are enough to mobilize full downdrag in drilled shafts.

Based on our settlement analysis, this corresponds to downdrag potentially acting on piles down to El 607 based on the AASHTO criteria and ranging from El 611 to 597 based on the MoDOT criteria.

We recommend installing a casing/sleeve around the pile through the wall backfill and backfilling the casing/sleeve with loose sand after pile driving to reduce the downdrag load. Predrilling the piles through the embankment and/or natural soil and backfilling with loose sand after pile driving may also be performed to reduce the downdrag load. The cased or sleeved portion of the pile must subsequently be ignored for uplift resistance. Downdrag loads should be included in the design of piles using a load factor between 0.25 and 1.4, and calculated using a nominal load of 0.9 ksf applied over the perimeter or “box” area of the pile below the casing or sleeve and to El 607.

Construction Considerations. Based on the provided borings, we anticipate the piles will be driven to refusal on limestone bedrock. A summary of the anticipated pile refusal elevations is presented by boring in the following table.

PILE REFUSAL SUMMARY			
Boring Number	Ground Surface Elevation (msl-ft)	Top of Rock Elevation (msl-ft)	Anticipated Pile Refusal Elevation (msl-ft)
B-101	674.3	579.8	579.5
B-103	670.5	582.5	581.0
B-401	669.9	588.9	588.0
B-402	666.5	584.5	584.0
B-403	663.0	574.0	573.5
B-501	664.9	585.9	585.0
B-503	662.6	577.6	577.0
B-601	663.6	575.1	574.5
B-603	661.9	575.9	573.0

LATERAL RESISTANCE OF DEEP FOUNDATIONS

The lateral resistance of drilled shafts and driven piles depends on the shaft/pile lengths and diameters, and the near-surface soil types. The lateral resistance of drilled shafts and driven piles may be computed using a computer program, such as LPILE. This program is used to estimate the shaft/pile deflection by varying the shaft/pile size for factored axial and lateral loads. Per MoDOT EPG 751.37.5, design lateral movements of drilled shafts should not exceed approximately 1.5 inches at the top of the shaft. The following tables list soil and rock parameters that may be used in LPILE.

SOIL PARAMETERS FOR STATIC LATERAL LOAD ANALYSIS						
Soil Type	Soil Model	Cohesion (psf)	Strain Parameter ϵ_{50}	Soil Modulus Parameter, k (pci)	Effective Unit Weight (pcf)	Internal Angle of Friction, Φ (deg)
Predrilled/Cased Backfill with Sand	Sand	--	--	25	120	30
Existing Fill/Soft Silty Clay	Soft Clay	500	0.02	--	115	--
Medium Stiff Silty Clay/Clay	Soft Clay	1,000	0.011	--	58	--
Stiff to Very Stiff Silty Clay/Clay	Stiff Clay without Free Water	1,500	0.016	--	68	--
Sand	Sand	--	--	125	60	30

ROCK PARAMETERS FOR STATIC LATERAL LOAD ANALYSIS							
Rock Type	Soil Model	Effective Unit Weight (pcf)	Moist Unit Weight (pcf)	Young's Modulus, E_r (psi)	Uniaxial Compressive Strength (psi)	RQD (Percent)	k_{rm}
Moderately Weathered to Fresh Rock	Strong Rock	98	160	n/a	10,000	n/a	n/a

The effects of group interaction must be taken into account when evaluating lateral movement of drilled shaft/pile groups. P-multipliers may be used to reduce the lateral resistance of single drilled shaft/pile to account for group effects. P-multipliers should be applied to shaft/pile assemblages with spacings less than five shaft/pile diameters. P-multipliers are provided in Table 10.7.2.4-1 in the AASHTO LRFD Bridge Design Specifications (2012). Alternatively, the lateral resistance of drilled shaft assemblages may be evaluated using the GROUP software.

SITE GRADING

Site grading and fill placement should be performed in accordance with Sections 201 through 213 of the Missouri Standard Specifications for Highway Construction. Soft soils are present to a depth of approximately 3 feet along wall A8513 at Borings B-705, -708, -712, and -720.

Treatment of High Plasticity Soil. Based on the boring data, high plasticity soil will be encountered at or near roadway subgrade. High plasticity soil below the roadway should be removed and replaced as recommended herein to a minimum depth of 1 foot below the proposed roadway subgrade elevation. The overexcavation may be backfilled with low plasticity soil (liquid limit less than 45 percent), excavated high plasticity material stabilized by incorporating hydrated lime, or well-graded, crushed rock. Funds should be provided in the construction budget for remedial treatment of high plasticity clay.

Should lime stabilization be selected for clay treatment, the appropriate dosage should be determined by laboratory testing. Rates of 4 and 6 percent hydrated lime can be used for budget purposes.

Suitable Fill Materials For Embankment Construction. Fill materials should consist of low plasticity, cohesive soils or well-graded granular materials. Acceptable fill soils include non-organic materials designated CL, ML, CL-ML, and GW by ASTM D 2487.

MSE WALLS

MSE retaining walls are planned for grade separation at Ramps 3 and 4 (A8513 and A8515) and at the north abutment (A8516) of the proposed David Hoekel Parkway. Based on provided data, the height of Walls A8513, A8515, and A8516 will vary from 6 to 37 feet, 6 to 38 feet, and 6 to 26 feet, respectively. It is our understanding that the MSE wall design will be performed by others.

The following geotechnical parameters may be used for design of the MSE walls.

- For the natural soil and compacted fill below the wall, friction angles of 28 and 30 degrees, respectively and cohesion of 20 and 30 psf, respectively, may be used for long term conditions. Undrained shear strengths 1,000 and 1,500 pounds per square foot (psf), respectively, may be used for short term conditions.
- MSE walls may be designed to bear on firm, natural soil or new, compacted fill using a maximum net allowable bearing pressure of 5,500 psf.
- A minimum wall embedment of 2-feet is recommended.
- The geogrid lengths used in the global stability analysis described below to obtain a satisfactory factor of safety should be incorporated into the design.

For Wall A8516, we recommend, that the soil beneath the wall and backfill zone be removed to a depth of 5 feet and replaced with compacted MODOT type 5 aggregate to reduce the differential settlement along the wall.

Ground improvement (i.e. stone columns) will be required for walls over 15 feet in height for Walls A8513 and A8515.

GLOBAL STABILITY ANALYSIS

Global stability analyses were performed for typical wall sections at the locations shown on Plate 3 (Section AA', BB', and CC'). The typical sections were analyzed assuming 26- to 37-foot high MSE walls. The preliminary grid lengths behind the walls were assumed as 18- to 27-feet (i.e., 0.7H). The backfill within the reinforced zone was assumed to be select granular backfill material. The soil properties used in our analyses are based on the laboratory tests, our experience, and are summarized in the following table. The analyzed sections with critical failure arcs are presented in Appendix D.

SOIL PROPERTIES FOR GLOBAL STABILITY ANALYSIS			
Soil Type	Density (pcf)	Cohesion (psf)	Friction Angle (°)
Clay	120	30	28
Improved Soil	125	30	30
Select Granular Fill	130	30	34
Silty Clay	115	20	28
Silt	115	20	26

The analyses were performed using allowable stress design methods. Selected embankment/wall sections were analyzed for long-term, drained conditions. Groundwater was assumed to be present at a depth of approximately 40 feet, below existing grade. A surcharge load of 240 psf was included in the analysis to account for the traffic load on the approaches as per MoDOT EPG 751.2.1.3. The Morgenstern-Price procedure was used to compute the factor of safety. The computer program SLOPE/W was used to perform the computations. The calculated factors of safety at typical wall sections are summarized in the table below:

SLOPE STABILITY ANALYSIS RESULTS					
Embankment/ Wall Section	Station	Embankment/ Wall Height (ft)	Grid Length (ft)	Wall Key Depth (ft)	Factor of Safety
AA'	65+00.00 – 67+00.00	28	NA	NA	1.5
BB' A8513	138+50.00	30	21	2	1.5
BB' A8515	138+50.00	38	27	2	1.6
CC' A8516	69+60.00	22	15	2	1.6

MoDOT requires a minimum factor of safety of 1.5 for long-term stability. Our analyses indicate that the factors of safety for the wall sections with the assumed grid lengths are satisfactory. Therefore, the wall sections as a minimum should include geogrid lengths equal to or greater than that shown in the table above.

SLOPES

The stability of a slope depends on many factors, including slope geometry, slope height, soil type, and surface pressures. Based on MoDOT's Table 321.1 Guide for Selection of Slope Inclination for Routine Design, fill side slopes may be as steep as 1V:2.5H for low plasticity clay and 1V:3H for high plasticity clay. In addition, spill slopes less than 20 feet in height may be 1V:2H. Spill slopes greater than 20 feet in height may be 1V:2.5H.

EMBANKMENT/WALL BACKFILL SETTLEMENT

Settlement estimates were performed for the new embankments and ramps and are provided in the following table. The estimated settlements are presented for unimproved ground and are based on the provided plans, boring logs, limited consolidation testing, correlation with consolidation properties, Settle 3D computer software modeling, and our experience. Settle 3D analysis plots without ground improvement in the model are presented in Appendix J.

In general, compression of the embankment soils could be on the order of 1 to 3% of the embankment height. We anticipate the compression of the embankment soil will occur quickly, however, consolidation of the saturated natural cohesive soils will occur relatively slowly.

We used Settle 3D to estimate the rate and magnitude of settlement for the embankments, walls and ramps. Plots with ground improvement in the model are presented in Appendix K. We estimated a 25 percent reduction in total settlement due to the installation of stone columns beneath Walls A8513 and A8515 in excess of 15 feet in height and the associated grid behind the walls.

SETTLEMENT SUMMARY						
Embankment/Wall Fill Height (ft)	Unit Weight of Backfill (lb/ft ³)	Stress Increase (lb/ft ²)	Estimated Settlement* (in)			
			South Embankment Sta 65+50	Wall A8513 (south)	Wall A8515 (north)	Wall A8516
5	130	650	1.7	2.4	1.6	1.7
10		1,300	3.0	3.1	1.8	3.0
15		1,950	4.5	3.9	1.9	4.0
20		2,600	6.0	5.1	3.6	6.0
25		3,250	8.3	6.5	4.6	6.0
30		3,900	11.2	8.3	5.7	NA
35		4,160	NA	8.5	6.9	NA
38		5,200	NA	NA	9.2	NA

* Settlement estimates are based on unimproved ground

Pregrading. The south embankment, north embankment and Wall A8516 will be constructed as part of a pregrading package with the intent to allow the embankments and wall time to settle prior to construction and paving.

The south embankment is planned to be constructed to the railroad right-of-way and sloped at approximately a 1V:2H away from the railroad right-of-way. If the south embankment is allowed to settle for approximately 12-months, we anticipate approximately 7- of the 11-inches of total settlement to occur.

The north embankment Ramps 1 and 2, and Wall A8516 are planned to be constructed. If the north embankment and are constructed per design, and allowed to sit for approximately 12 months, we anticipate approximately 4- of the 6-inches of total settlement along the wall occurring, and approximately 6- of the 9-inches of total settlement for the north embankment occurring over the 12-month time period.

Settlement Monitoring. The magnitude and rate of settlement of the overburden induced by the weight of engineered fill should be monitored. Methods used to monitor settlement include settlement plates and pore pressure measurement devices. We recommend using Section 204-Embankment Monitoring of the Missouri Standard Specifications for Highway Construction for settlement monitoring and construction sequencing. In our professional opinion, vibrating wire pore pressure transducers are an acceptable alternative to the pneumatic devices described in Section 204. In our opinion, pore pressure measuring devices are not needed in areas of ground improvement.

SEISMICITY AND LIQUEFACTION

In accordance with AASHTO LRFD Bridge Design Specifications, a summary of the seismic site class, mapped peak ground acceleration (PGA), mapped acceleration coefficients (i.e., S_s and S_1), design response spectrum coefficients (i.e., A_s , S_{DS} and S_{D1}), and seismic zone for the bridge are provided in the following table. The accelerations given herein correspond to a seismic event with a seven percent probability of not being exceeded in 75 years.

SEISMIC DESIGN PARAMETER SUMMARY							
Seismic Site Class	PGA (g)	S_s (g)	S_1 (g)	A_s (g)	S_{DS} (g)	S_{D1} (g)	Seismic Zone
D (Stiff Soil)	0.102	0.227	0.075	0.163	0.363	0.181	2

Liquefaction. Sand layers are present at the project site (e.g., Borings B-301, B-404, and B-502). Based on our analyses³, it appears that these zones of sand have a factor-of-safety (FOS) less than 1.3 and should be considered potentially liquefiable per MoDOT's Engineering Policy Guide. The FOS against liquefaction was calculated using the Liquefaction Analysis spreadsheet developed and provided by IDOT. Soil layers with an FOS less than 1.0 and soil layers with a FOS between 1.0 and 1.3 are presented in the table below.

LIQUEFACTION ANALYSIS RESULTS		
Boring	Depth Interval with FOS<1.0 Against Liquefaction (feet)	Depth Interval with 1.0<FOS<1.3 Against Liquefaction (feet)
B-101	N/A	47 to 53
B-401	43 to 47	N/A
	N/A	47 to 53
B-503	N/A	37 to 43
	N/A	47 to 53
B-603	N/A	37 to 43

³ Idriss, I. M., and Boulanger, R. W. (2008). "Soil Liquefaction during Earthquakes." Earthquake Engineering Research Institute, MNO- 12.

SECTION VI – RECOMMENDED ADDITIONAL SERVICES

The conclusions and recommendations given in this report are based on: the understanding of the proposed design and construction outlined in this report; site observations; interpretation of the exploration data; and Geotechnology's experience. The client must recognize that variations may occur from conditions observed in the borings, particularly within existing fills or previously developed areas. Design recommendations are based on data from borings, sampling, and related procedures. Actual subsurface conditions may vary from those encountered in the borings; such variations may be gradual, abrupt, and/or nonlinear. Therefore, design recommendations are subject to adjustment in the field based on subsurface conditions encountered during construction. Since the intent of the design recommendations is best understood by Geotechnology, it is imperative to involve Geotechnology in the final design and construction process. Construction observation services are viewed as a continuation of the design process. Geotechnology will not be responsible for improper use of recommendations or failure by others to recognize conditions that may be detrimental to the successful completion of the project or its performance.

We recommend that Geotechnology be retained to review the project plans and specifications to observe that recommendations given in this report have been correctly implemented. We recommend that Geotechnology be retained to participate in prebid and preconstruction conferences to reduce the risk of misinterpretation of the conclusions and recommendations in this report relative to the proposed construction of the subject project.

On-site services are required during site grading since placement techniques can significantly impact performance of the completed project. Foundation and floor slab subgrades should be observed before placing concrete or base course, respectively, to establish that the soil conditions are consistent with conditions encountered during the field exploration. Construction observation is intended to enhance compliance with project plans and specifications. It is not insurance, nor does it constitute a warranty or guarantee of any type. Regardless of construction observation, contractors, suppliers, et al. are solely responsible for the quality of their work and for adhering to plans and specifications.

SECTION VII - LIMITATIONS OF REPORT

This report has been prepared on behalf of and for the exclusive use of the client for specific application to the named project as described herein. If this report is provided to other parties, the report should be provided in its entirety with all supplementary information. In addition, the client should make it clear that the information is provided for factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil or rock conditions may require the expenditure of additional funds to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

Geotechnology has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. The report is not a bidding document and should not be used for that purpose.

Unless specifically stated in our proposal or this report, the scope of our services for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope did not include: any services to investigate or detect the presence of mold or any other biological contaminants (such as spores, fungus, bacteria, viruses, and the by-products of such organisms) on and around the site; or any services, designed or intended, to prevent or lower the risk of the occurrence of an infestation of mold or other biological contaminants.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Discrete sampling cannot be relied on to accurately reflect natural variations in stratigraphy that may exist between sample locations and/or intervals. Unless specifically noted, the scope of our services did not include an assessment of the effects of flooding and natural erosion of creeks or rivers adjacent to or on the project site.

The recommendations included in this report have been based in part on assumptions about natural variations in site stratigraphy that may be evaluated further during earthwork and foundation construction. Accordingly, Geotechnology should be retained to perform construction observation and continue its geotechnical engineering service using observational methods. Geotechnology cannot assume liability for the adequacy of its recommendations when they are used in the field without Geotechnology being retained to observe construction.

The conclusions or recommendations presented in this report should not be used without Geotechnology's review and assessment if the nature, design, or location of the facilities is changed, if there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if there is a substantial interruption or delay during work at the site. If changes are contemplated or delays occur, Geotechnology must be allowed to review them to assess their impact on the findings, conclusions, and/or design recommendations given in this report. Geotechnology will not be responsible for any claims, damages, or liability associated with any other party's interpretations of the subsurface data or reuse of the subsurface data or engineering analyses in this report without our express written authorization.



J024691.01
Revision No. 2

TABLE 1

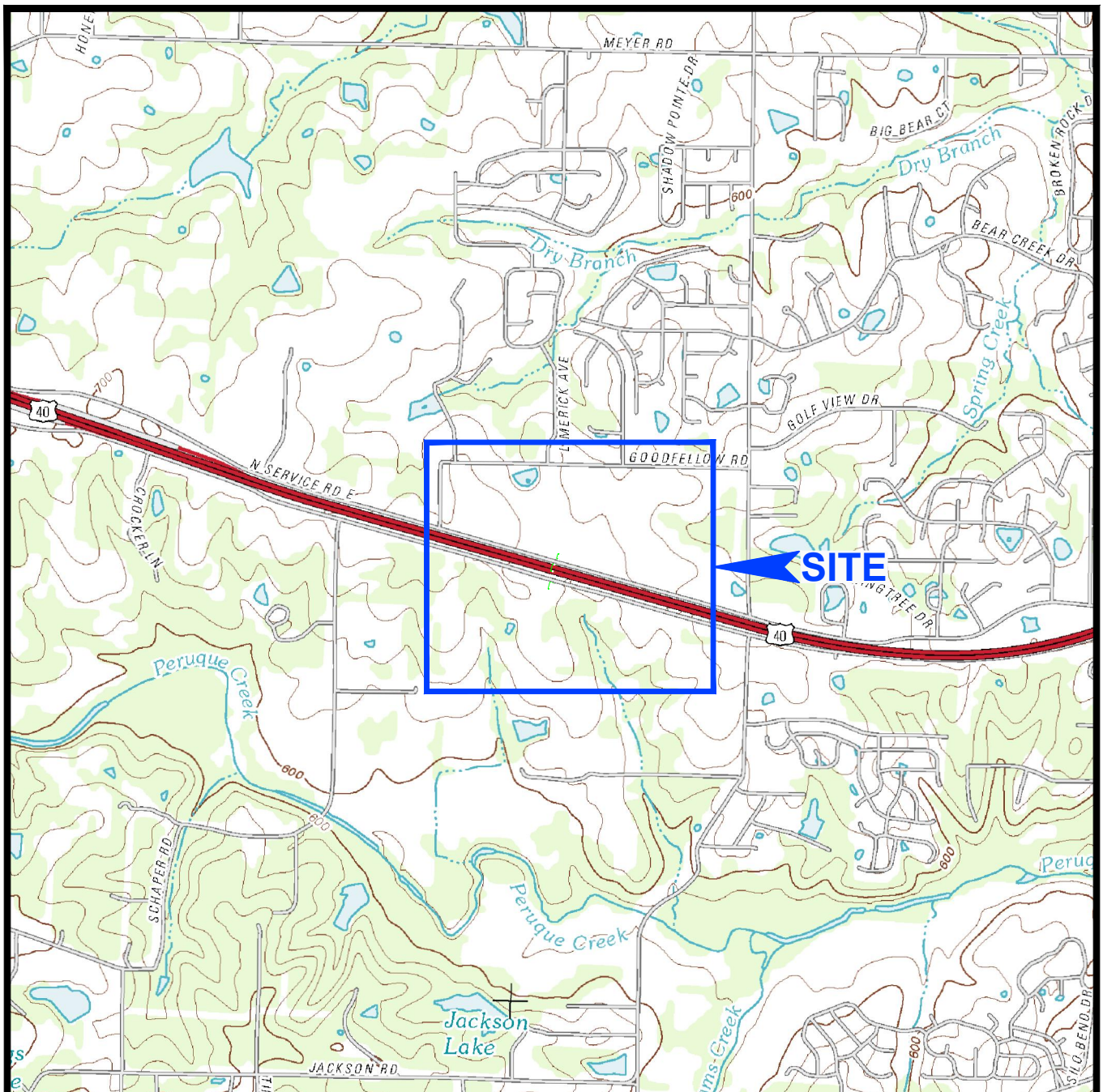
ROCK UNCONFINED COMPRESSION TEST SUMMARY						
Boring No.	Sample		Uniaxial Compressive Strength		Unit Weight (pcf)	Type of Rock
	Depth (ft)	Elevation (msl)	(psi)	(ksf)		
B-201	96.5	577.5	6,132	883	159	Limestone
	101.5	572.5	20,686	3,005	168	Limestone
	103.7	570.3	18,099	2,606	168	Limestone
	104.7	569.3	22,632	3,259	164	Limestone
	107.4	557.6	22,911	3,299	169	Limestone
B-303	93.7	571.3	10,851	1,563	161	Limestone
	103.4	561.6	10,252	1,476	155	Limestone
	110	555	10,291	1,482	167	Limestone
	112.1	552.9	18,050	2,599	166	Limestone



J024691.01
Revision No. 2

TABLE 2

SWELL TEST SUMMARY						
Boring No.	Sample Depth (ft)	Soil Type	Liquid Limit	Plastic Limit	Swell Pressure (tsf)	Swell Strain (%)
B-2	3 to 5	High Plasticity Clay - CH	54	18	0.75	3.54
B-5	1 to 3	High Plasticity Clay - CH	53	19	0.20	0.89
B-10	1 to 3	High Plasticity Clay - CH	73	23	0.81	1.63
B-11	3 to 5	Silty Clay - CL	39	17	0.03	0.17
B-16	1 to 3	Silty Clay - CL	47	17	0.25	0.78
B-18	3 to 5	High Plasticity Clay - CH	84	21	1.42	3.9
B-103	3 to 5	High Plasticity Clay - CH	79	23	1.00	1.00
B-303	18 to 20	High Plasticity Clay - CH	68	21	1.40	1.50
B-720	3 to 5	High Plasticity Clay - CH	95	22	0.70	0.50
B-809	3 to 5	High Plasticity Clay - CH	81	21	1.10	1.90



NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. map for Foristell, Missouri quadrangle, last revised in 2012.

0 2,000 4,000



SCALE IN FEET

Drawn By: WAH	Ck'd By: BJS	App'vd By: CKK
Date: 7-27-16	Date: 10-27-16	Date: 10-27-16



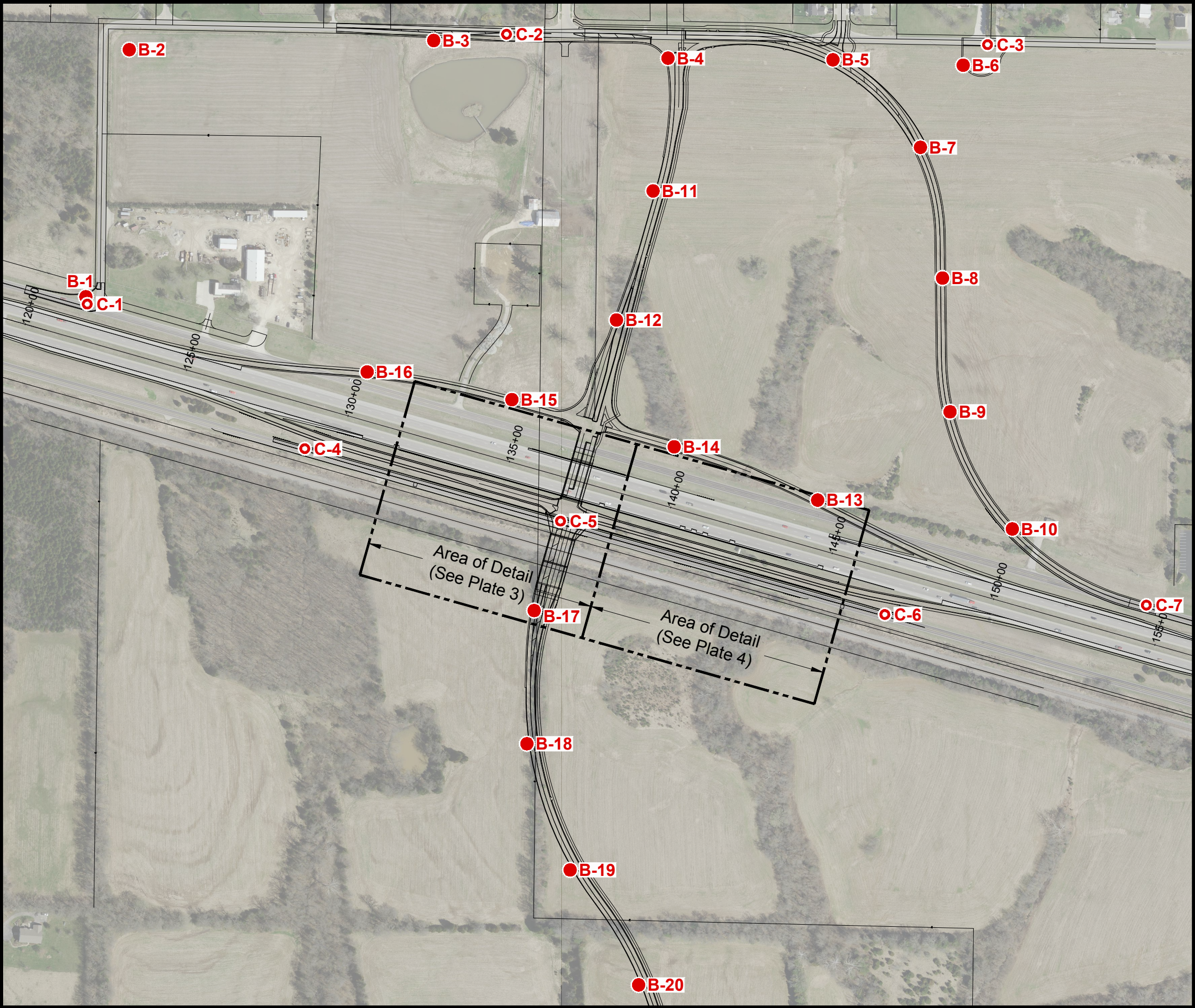
David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

SITE LOCATION AND TOPOGRAPHY

Project Number
J024691.01

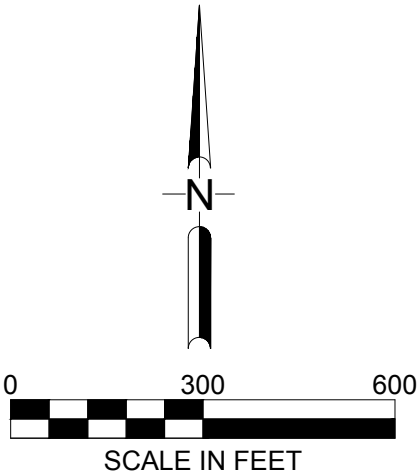
PLATE 1



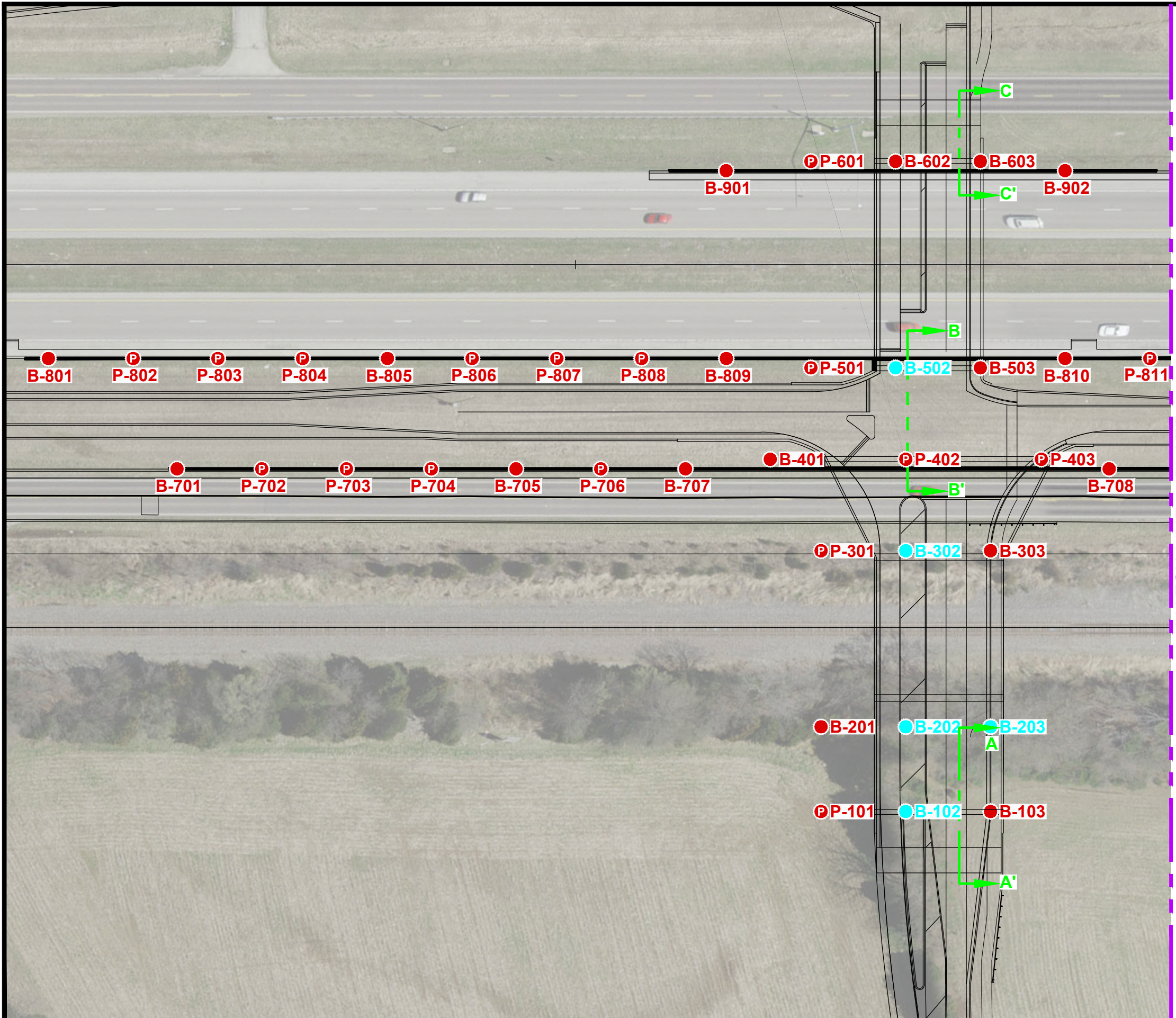


- NOTES**
1. Plan adapted from "2015 Aerial Imagery for the St. Louis Region" supplied by East-West Gateway Council of Governments and drawings prepared by CMT.
 2. Borings were located in the field by the project surveyor.

- LEGEND**
- Boring Location - Completed
 - Boring Location - Not Completed
 - Probe Boring Location
 - Pavement Core Location



Drawn By: WAH	Ck'd By: BJS	App'vd By: CKK
Date: 2-16-18	Date: 2-16-18	Date: 2-16-18
		
David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri		
AERIAL PHOTOGRAPH OF SITE, BORING AND PAVEMENT CORING LOCATIONS		
Project Number J024691.01		PLATE 2

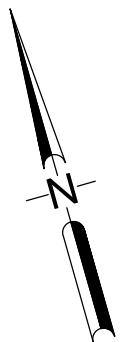


NOTES

1. Plan adapted from "2015 Aerial Imagery for the St. Louis Region" supplied by East-West Gateway Council of Governments and drawings prepared by CMT.
2. Borings were located in the field by the project surveyor.

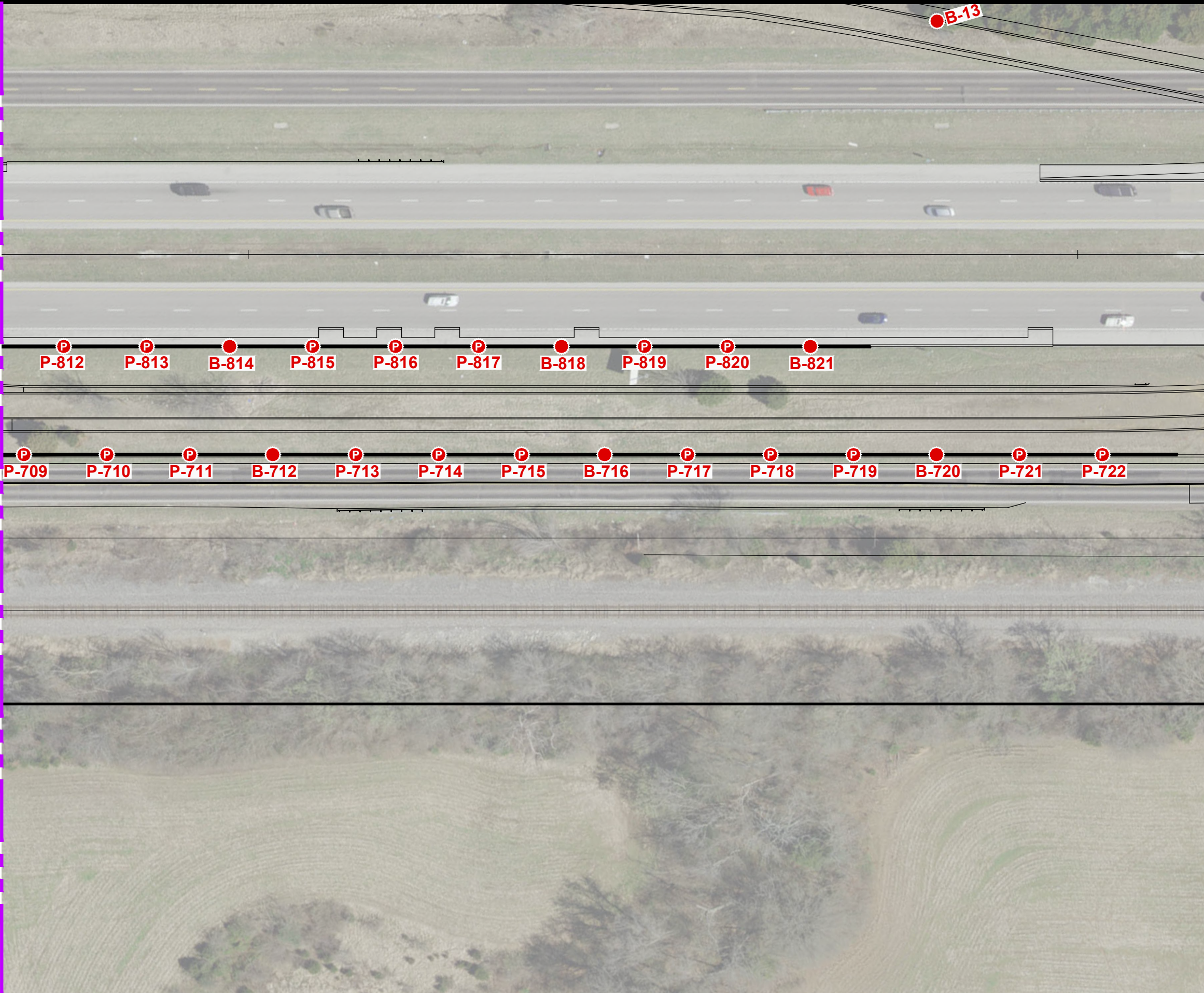
LEGEND

- Boring Location - Completed
- Boring Location - Not Completed
- Probe Boring Location
- Global Stability Cross-Section Locations



Drawn By: WAH	Ck'd By: BJS	App'd By: CKK
Date: 7-27-16	Date: 10-27-16	Date: 10-27-16
		
David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri		
AERIAL PHOTOGRAPH OF SITE, BORING AND PROBE LOCATIONS		
Project Number J024691.01		PLATE 3

MATCH LINE - PLATE 3

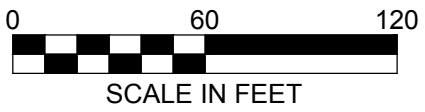
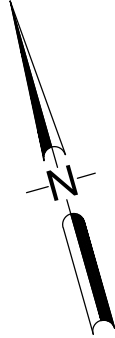


NOTES

- 1. Plan adapted from "2015 Aerial Imagery for the St. Louis Region" supplied by East-West Gateway Council of Governments and drawings prepared by CMT.
- 2. Borings were located in the field by the project surveyor.

LEGEND

- Boring Location - Completed
- Boring Location - Not Completed
- P Probe Boring Location



Drawn By: WAH	Ck'd By: BJS	App'vd By: CKK
Date: 7-27-16	Date: 10-27-16	Date: 10-27-16



David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

**AERIAL PHOTOGRAPH OF SITE,
BORING AND PROBE LOCATIONS**

Project Number J024691.01	PLATE 4
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APPENDIX A

**IMPORTANT INFORMATION ABOUT
THIS GEOTECHNICAL-ENGINEERING REPORT**

Important Information about This Geotechnical-Engineering Report

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

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

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

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

Read the Full Report

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

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

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

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

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

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

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

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

Most Geotechnical Findings Are Professional Opinions

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

A Report's Recommendations Are Not Final

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

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

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

Give Constructors a Complete Report and Guidance

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

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

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

Obtain Professional Assistance To Deal with Mold

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

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.



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APPENDIX B

**LOGS OF BORINGS
BORING LOG: TERMS AND SYMBOLS
ROCK CORE DESCRIPTIONS**

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
OF BORING 2002 WL 1024691.01 - DAVID HOEKEL PARKWAY GP1 00 CI ONE ME GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>685.2</u> Datum: <u>msl</u>		Completion Date: <u>3/23/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5			
DEPTH IN FEET		DESCRIPTION OF MATERIAL					STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)			
							WATER CONTENT, % PL 10 20 30 40 50 LL			
0 5 10 15 20 25 30 35	Topsoil - 12 inches Medium stiff to very stiff, orangish-brown and gray CLAY - (CH)			2-3-3 SS1 2-2-4 SS2 ST3 3-5-7 SS4 7-8-11 SS5	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; height: 100px; vertical-align: top;"> (SPT N-Value Data) </td> <td style="width: 33%; height: 100px; vertical-align: top;"> (Water Content Data) </td> <td style="width: 33%; height: 100px; vertical-align: top;"> (Shear Strength Data) </td> </tr> </table>			(SPT N-Value Data)	(Water Content Data)	(Shear Strength Data)
(SPT N-Value Data)	(Water Content Data)	(Shear Strength Data)								
Boring terminated at 15 feet.										
GROUNDWATER DATA ☒ FREE WATER NOT ENCOUNTERED DURING DRILLING DRILLING DATA ☐ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET <u>BLS</u> DRILLER <u>DWJ</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> % <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;"> Drawn by: AGB Date: 4/15/2016 </td> <td style="padding: 2px;"> Checked by: BJS Date: 1/24/2017 </td> <td style="padding: 2px;"> App'vd. by: CKK Date: 1/24/2017 </td> </tr> </table> GEOTECHNOLOGY FROM THE GROUND UP David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri LOG OF BORING: B-6 Project No. J024691.01							Drawn by: AGB Date: 4/15/2016	Checked by: BJS Date: 1/24/2017	App'vd. by: CKK Date: 1/24/2017	
Drawn by: AGB Date: 4/15/2016	Checked by: BJS Date: 1/24/2017	App'vd. by: CKK Date: 1/24/2017								

REMARKS: Sta 121+85.00

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GROUND. THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 681.6 Datum: msl		Completion Date: 3/24/2016		GRAPHIC LOG DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
DEPTH IN FEET		DESCRIPTION OF MATERIAL						STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)		
								WATER CONTENT, % PL 10 20 30 40 50 LL		
		Topsoil - 12 inches								
		Medium stiff to very stiff, orangish-brown and gray CLAY - (CH)				1-3-3 SS1		▲ ● → 80		
						3-5-6 SS2		▲ ●		
5						2-3-5 SS3		▲ ●		
						4-8-9 SS4		●		
						4-8-11 SS5		● ▲		
10		Boring terminated at 15 feet.								
15										
20										
25										
30										
35										

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM FEET

BLS DRILLER DWJ LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB Checked by: BJS App'vd. by: CKK

Date: 4/15/2016 Date: 1/24/2017 Date: 1/24/2017

REMARKS: Sta 131+00.00

GEOTECHNOLOGY
FROM THE GROUND UP

**David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri**

LOG OF BORING: B-9

Project No. J024691.01

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 684.6 Datum: msl		Completion Date: 3/24/2016		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)												
WATER CONTENT, % PL 10 20 30 40 50 LL												
DEPTH IN FEET	DESCRIPTION OF MATERIAL						93 ST1 2-4-6 SS2 2-3-4 SS3 4-6-8 SS4 3-7-9 SS5		73 >> 30 73 >>			
5	Topsoil - 12 inches Medium stiff to very stiff, orangish-brown and gray CLAY - (CH)											
6												
7												
8												
9												
10												
15	Boring terminated at 15 feet.											
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
30												
35												

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM FEET

BLS DRILLER DWJ LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 4/15/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-10

Project No. J024691.01

REMARKS: Sta 135+00.00

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>674.3</u>		Completion Date: <u>6/11/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf			
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5								
		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)								
DEPTH IN FEET	DESCRIPTION OF MATERIAL						WATER CONTENT, %			
							PL	10 20 30 40 50 LL		
	Gray CLAY - CL									
85										
90										
	rough drilling from 92 to 94.5 feet									
95	Auger refusal at 94.5 feet.									
100										
105										
110										
115										
							Drawn by: AGB		Checked by: BJS	App'vd. by: CKK
							Date: 7/8/2016		Date: 1/24/2017	Date: 1/24/2017
							 GEOTECHNOLOGY FROM THE GROUND UP			
							David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri			
							CONTINUATION OF LOG OF BORING: B-101			
							Project No. J024691.01			

GROUNDWATER DATA

☒ FREE WATER NOT
ENCOUNTERED DURING DRILLING

REMARKS: Sta 65+84.00, Offset 46.75 LT

DRILLING DATA

4" AUGER ☐ HOLLOW STEM
WASHBORING FROM FEET
TPD DRILLER TPD LOGGER
CME 55TRK DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 88 %

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 670.5		Completion Date: 6/11/2016		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: msl		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Topsoil - 12 inches								
	Stiff, brown and gray CLAY - (CH)								
5					109	ST1	●	79	
10	with sand				4-6-7	SS2	●		
15	trace gravel				2-5-8	SS3	●		
20					3-5-8	SS4	●		
25	very stiff				4-12-13	SS5	●		
30					5-11-11	SS6	●		
35					4-8-11	SS7	●		
	Dense, orange and tan, fine to coarse SAND with gravel - SP				8-15-26	SS8	●		
GROUNDWATER DATA					DRILLING DATA				
ENCOUNTERED AT <u>42</u> FEET ∇					AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET BLS DRILLER <u>EER</u> LOGGER CME 750X DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>83</u> %				
REMARKS: Sta 65+82.00, Offset 53.25 RT					LOG OF BORING: B-103				
Project No. J024691.01					Project No. J024691.01				



David Hoekel Parkway
 Phase 2A, B, and C
 Wentzville, Missouri

LOG OF BORING: B-103

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 670.5		Completion Date: 6/11/2016		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5										
Datum: msl										STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)										
										WATER CONTENT, % PLI 10 20 30 40 50 LL										
DEPTH IN FEET	DESCRIPTION OF MATERIAL					GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES										
	Dense, orange and tan, fine to coarse SAND with gravel - SP <i>(continued)</i>																			
45																				
	Medium stiff, brown and gray, sandy CLAY - CL																			
50																				
	Medium dense, brown, fine SAND - SP																			
55																				
	Stiff, brown SILT with sand - ML																			
60																				
	Medium dense, gray, medium SAND - SP																			
65																				
	Medium stiff, gray, silty CLAY with limestone ledges - CL																			
70																				
																				
75																				
																				
																				
																				
GROUNDWATER DATA						DRILLING DATA						Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017								
ENCOUNTERED AT <u>42</u> FEET ∇ REMARKS: Sta 65+82.00, Offset 53.25 RT						___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM ___ FEET <u>BLS</u> DRILLER <u>EER</u> LOGGER <u>CME 750X</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>83</u> %						 GEOTECHNOLOGY FROM THE GROUND UP								
															David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri					
																		CONTINUATION OF LOG OF BORING: B-103		

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02147
NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
AND NOT THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>670.5</u>		Completion Date: <u>6/11/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5							
DEPTH IN FEET		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
DESCRIPTION OF MATERIAL		WATER CONTENT, % PL 10 20 30 40 50 LL							
85	Medium stiff, gray, silty CLAY with limestone ledges - CL (continued)								
90	Hard, gray, finely crystalline, thin bedded, slightly to moderately weathered LIMESTONE with shale seams and chert nodules Core loss - 8 inches	44% 22%	NQ1						
95	shaley - 2 inches shaley - 4 inches	100% 59%	NQ2						
	shaley	100% 88%	NQ3						
100	Boring terminated at 99 feet.								
105									
110									
115									
GROUNDWATER DATA		DRILLING DATA		Drawn by: AGB Checked by: BJS App'vd. by: CKK					
ENCOUNTERED AT <u>42</u> FEET ∇		<u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET		Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017					
		<u>BLS</u> DRILLER <u>EER</u> LOGGER		 GEOTECHNOLOGY FROM THE GROUND UP					
		<u>CME 750X</u> DRILL RIG							
		HAMMER TYPE <u>Auto</u>		David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri					
		HAMMER EFFICIENCY <u>83</u> %							
REMARKS: Sta 65+82.00, Offset 53.25 RT				CONTINUATION OF LOG OF BORING: B-103					
				Project No. J024691.01					

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
OF BORING 2002 WL 1024691.01 - DAVID HOEKEL PARKWAY GP1 00 CI ONE ME GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Project No. J024691.01

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02147 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>661.7</u> Datum: <u>msl</u>		Completion Date: <u>3/24/2016</u>		GRAPHIC LOG DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5				
DEPTH IN FEET		DESCRIPTION OF MATERIAL				STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)				
						WATER CONTENT, % PL 10 20 30 40 50 LL				
		Topsoil - 12 inches								
		Medium stiff to very stiff, orangish-brown CLAY, trace sand and gravel - CH				1-2-4 SS1		▲ ●		
6-8-11 SS2						● ▲				
10-14-18 SS3						● ▲				
6-11-14 SS4						● ▲				
6-9-16 SS5						● ▲				
5										
10										
15		Boring terminated at 15 feet.								
20										
25										
30										
35										

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM FEET

BLS DRILLER DWJ LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB Date: 4/15/2016	Checked by: BJS Date: 1/24/2017	App'vd. by: CKK Date: 1/24/2017
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GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-13

Project No. J024691.01

REMARKS: Sta 6+50.00
 Offset approximately 20 feet north due to overhead branches.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR021147 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>657.9</u> Datum: <u>msl</u>		Completion Date: <u>3/24/2016</u>		GRAPHIC LOG DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
DEPTH IN FEET		DESCRIPTION OF MATERIAL				STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)				
						WATER CONTENT, % PL 10 20 30 40 50 LL				
		Topsoil - 12 inches								
		Medium stiff to stiff, orangish-brown CLAY - (CH)				1-2-3 SS1				
2-3-3 SS2										
3-5-6 SS3										
4-5-7 SS4										
5-5-8 SS5										
5								74		
10										
15		Boring terminated at 15 feet.								
20										
25										
30										
35										

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

BLS DRILLER DWJ LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB Checked by: BJS App'vd. by: CKK

Date: 4/15/2016 Date: 1/24/2017 Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

**David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri**

LOG OF BORING: B-14

Project No. J024691.01

REMARKS: Sta 11+00.00

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>669.8</u> Datum: <u>msl</u>		Completion Date: <u>3/22/2016</u>		GRAPHIC LOG DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5			
DEPTH IN FEET		DESCRIPTION OF MATERIAL						STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)			
								WATER CONTENT, % PL 10 20 30 40 50 LL			
		Topsoil - 12 inches									
		Medium stiff to stiff, orangish-brown CLAY - (CH)				2-3-4		SS1			
5						2-3-3		SS2			
						2-3-5		SS3			
						3-6-6		SS4			
10											
						3-5-7		SS5			
15		Boring terminated at 15 feet.									
20											
25											
30											
35											

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

BLS DRILLER DWJ LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 4/15/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-15

Project No. J024691.01

REMARKS: Sta 2+35.00

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>670.8</u> Datum: <u>msl</u>		Completion Date: <u>3/25/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5 STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586) WATER CONTENT, % PL 10 20 30 40 50 LL		
DEPTH IN FEET	DESCRIPTION OF MATERIAL											
	Topsoil - 12 inches											
	Stiff to hard, orangish-brown and gray CLAY with sand and gravel - (CH)						2-5-7	SS1				
							104	ST2				
5												
							4-7-11	SS3				
							5-10-11	SS4				
10												
15	Boring terminated at 15 feet.											
20												
25												
30												
35												

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

BLS DRILLER DWJ LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB Checked by: BJS App'vd. by: CKK
 Date: 4/15/2016 Date: 1/24/2017 Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-18

Project No. J024691.01

REMARKS: Sta 61+00.00

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>665.8</u>		Completion Date: <u>3/25/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5							
DEPTH IN FEET		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
DESCRIPTION OF MATERIAL		WATER CONTENT, % PL 10 20 30 40 50 LL							
	Topsoil - 12 inches								
	Stiff, orangish-brown and gray, silty CLAY - (CL)					ST1			
	Medium stiff to stiff, orangish-brown and gray CLAY - CH								
5					3-4-5	SS2			
					3-3-5	SS3			
10					3-4-4	SS4			
15	Boring terminated at 15 feet.				3-4-6	SS5			
20									
25									
30									
35									
						Drawn by: AGB		Checked by: BJS	
						Date: 4/15/2016		Date: 1/24/2017	
						App'vd. by: CKK		Date: 1/24/2017	
						 GEOTECHNOLOGY FROM THE GROUND UP			
						David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri			
						LOG OF BORING: B-19			
						Project No. J024691.01			

GROUNDWATER DATA	DRILLING DATA
☒ FREE WATER NOT ENCOUNTERED DURING DRILLING	☐ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET
	<u>BLS</u> DRILLER <u>DWJ</u> LOGGER
	<u>CME 55TRK</u> DRILL RIG
	HAMMER TYPE <u>Auto</u>
	HAMMER EFFICIENCY <u>88</u> %
REMARKS: Sta 57+00.00	

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME 6/10/2016

Surface Elevation: <u>674.0</u>		Completion Date: <u>6/10/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5			
Datum: <u>msl</u>		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)											
		WATER CONTENT, % PL 10 20 30 40 50 LL											
DEPTH IN FEET	DESCRIPTION OF MATERIAL					GRAPHIC LOG		SAMPLES					
	Stiff, brown and gray, silty CLAY - (CL)					[Hatched Pattern]							
5													
	Stiff to very stiff, brown and gray CLAY - (CH)					[Hatched Pattern]							
10													
						[Hatched Pattern]							
15													
						[Hatched Pattern]							
20													
						[Hatched Pattern]							
25													
						[Hatched Pattern]							
30													
	Hard, gray, very finely crystalline, thick bedded, slightly weathered LIMESTONE (boulder)					[Hatched Pattern]							
35													
	Tan CLAY with sand and gravel - CH					[Hatched Pattern]							

GROUNDWATER DATA		DRILLING DATA		Drawn by: AGB Date: 7/8/2016	
☒ FREE WATER NOT ENCOUNTERED DURING DRILLING		☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET		Checked by: BJS Date: 1/24/2017	
		☐ BLS DRILLER ☐ DLD LOGGER		App'vd. by: CKK Date: 1/24/2017	
		☐ CME 750X DRILL RIG		 GEOTECHNOLOGY FROM THE GROUND UP	
		☐ HAMMER TYPE <u>Auto</u>			
		HAMMER EFFICIENCY <u>83</u> %			
REMARKS: Sta 66+09.00, Offset 46.75 LT				LOG OF BORING: B-201	
				Project No. J024691.01	

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 674.0		Completion Date: 6/10/2016		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf △ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5										
Datum: msl		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)																		
		WATER CONTENT, % PL 10 20 30 40 50 LL																		
DEPTH IN FEET	DESCRIPTION OF MATERIAL																			
	Tan CLAY with sand and gravel - CH <i>(continued)</i>					67% 63%			NQ3											
	Core loss - 1.7 feet																			
45	Dense, fine to coarse SAND with gravel - SP																			
						15-18-25			SS8											
50																				
						Dense, tan, fine SAND - SP					15-21-26			SS9						
55																				
	with silt										10-15-15			SS10						
60																				
						Medium stiff, tan to gray, clayey SILT, trace sand - ML					2-4-4			SS11						
65																				
	Medium dense, tan, fine SAND, trace silt - SP										5-8-10			SS12						
70																				
						Stiff, gray, sandy SILT - ML					4-5-6			SS13						
75																				
GROUNDWATER DATA ___ FREE WATER NOT ENCOUNTERED DURING DRILLING						DRILLING DATA ___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET BLS DRILLER DLD LOGGER CME 750X DRILL RIG HAMMER TYPE Auto HAMMER EFFICIENCY 83 %						Drawn by: AGB Date: 7/8/2016			Checked by: BJS Date: 1/24/2017			App'vd. by: CKK Date: 1/24/2017		
REMARKS: Sta 66+09.00, Offset 46.75 LT												GEOTECHNOLOGY FROM THE GROUND UP								
												David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri								
												CONTINUATION OF LOG OF BORING: B-201								
Project No. J024691.01																				

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>674.0</u>		Completion Date: <u>6/10/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: <u>msl</u>		DESCRIPTION OF MATERIAL					STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)		
							WATER CONTENT, % PL 10 20 30 40 50 LL		
DEPTH IN FEET									
	with chert nodules								
	Boring terminated at 122.5 feet.								
-125-									
-130-									
-135-									
-140-									
-145-									
-150-									
-155-									

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

BLS DRILLER DLD LOGGER

CME 750X DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 83 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/8/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

CONTINUATION OF
LOG OF BORING: B-201

Project No. J024691.01

REMARKS: Sta 66+09.00, Offset 46.75 LT

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 668.2 Datum: msl		Completion Date: 6/10/2016		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5																														
DEPTH IN FEET		DESCRIPTION OF MATERIAL					STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)																														
							WATER CONTENT, % PL 10 20 30 40 50 LL																														
42	Brown CLAY - CH <i>(continued)</i>				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; height: 20px;"></td> <td style="width: 33%; height: 20px;"></td> <td style="width: 33%; height: 20px;"></td> </tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> <tr><td style="height: 20px;"></td><td style="height: 20px;"></td><td style="height: 20px;"></td></tr> </table>																																
45	Brown, fine SAND - SP																																				
50																																					
55																																					
60																																					
65																																					
70																																					
75																																					
75						Gray SILT - ML																															
GROUNDWATER DATA ENCOUNTERED AT <u>42</u> FEET ▼		DRILLING DATA ___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM ___ FEET TPD DRILLER <u>EER</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %		Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/8/2016 Date: 1/24/2017 Date: 1/24/2017																																	
REMARKS: Sta 67+52.93, Offset 46.75 LT No soil sampling performed.		GEOTECHNOLOGY FROM THE GROUND UP																																			
		David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri																																			
		CONTINUATION OF LOG OF BORING: B-301																																			
Project No. J024691.01		Project No. J024691.01																																			

Project No. J024691.01

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>665.0</u> Datum: <u>msl</u>		Completion Date: <u>6/9/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5 STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586) WATER CONTENT, % PL 10 20 30 40 50 LL					
DEPTH IN FEET	DESCRIPTION OF MATERIAL														
	Topsoil - 18 inches					[Symbol]									
	Medium stiff to stiff, brown and gray CLAY with lignite nodules - (CH) trace sand and gravel					[Symbol]									
5										HA1		•			
10										2-5-6 SS2		▲ •			
15										4-6-7 SS3		▲ •			
20										103 ST4		•		68 >>	
25										2-4-6 SS5		▲ •			
30			4-6-9 SS6		• ▲										
	Medium dense, brown SAND with clay and gravel - SP fine to medium					[Symbol]									
35										3-7-8 SS7		• ▲			
			9-15-10 SS8		▲										

GROUNDWATER DATA

ENCOUNTERED AT 39 FEET ∇

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
 WASHBORING FROM ___ FEET
 TPD DRILLER EER LOGGER
CME 55TRK DRILL RIG
 HAMMER TYPE Auto
 HAMMER EFFICIENCY 88 %

Drawn by: AGB Date: 7/8/2016	Checked by: BJS Date: 1/24/2017	App'vd. by: CKK Date: 1/24/2017
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GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-303

Project No. J024691.01

REMARKS: Sta 67+49.93, Offset 53.25 RT
 Hand auger to depth of approximately 5 feet.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>665.0</u>		Completion Date: <u>6/9/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf				
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5									
		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)									
DEPTH IN FEET	DESCRIPTION OF MATERIAL	WATER CONTENT, %			PL	10	20	30	40	50	LL
	Medium dense, brown SAND with clay and gravel - SP (continued)										
	Stiff, brown, sandy SILT - ML										
45		2-5-5	SS9	$\blacktriangle$							
	Medium dense, brown, fine SAND - SP										
50		2-4-8	SS10	$\blacktriangle$							
55		5-10-13	SS11	$\blacktriangle$							
	Stiff, sandy SILT - ML										
60		5-5-7	SS12	$\blacktriangle$							
	Medium dense, gray, silty SAND - SP										
65		6-14-18	SS13	$\blacktriangle$							
70		5-7-10	SS14	$\blacktriangle$							
	Very stiff, gray, sandy SILT - ML										
75		4-8-10	SS15	$\blacktriangle$							
	Medium stiff, gray, silty CLAY - CL										
		2-3-5	SS16	$\blacktriangle$							
GROUNDWATER DATA				DRILLING DATA				Drawn by: AGB Checked by: BJS App'vd. by: CKK			
ENCOUNTERED AT <u>39</u> FEET ∇				___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM ___ FEET TPD DRILLER <u>EER</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %				Date: 7/8/2016 Date: 1/24/2017 Date: 1/24/2017			
REMARKS: Sta 67+49.93, Offset 53.25 RT Hand auger to depth of approximately 5 feet.				 GEOTECHNOLOGY FROM THE GROUND UP				David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri			
				CONTINUATION OF LOG OF BORING: B-303							
				Project No. J024691.01							

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>665.0</u>		Completion Date: <u>6/9/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5		
Depth in Feet DESCRIPTION OF MATERIAL		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
85	Medium stiff, gray, silty CLAY - CL <i>(continued)</i> Very stiff, gray CLAY with sand, trace gravel - CH limestone ledges, rough drilling	4-6-10	SS17						
90	Hard, gray to tan, finely crystalline, thin bedded, moderately weathered LIMESTONE Core loss - 7 inches shale seam - 2 inches chert nodule - 2 inches Gray green shale	73% 0%	NQ1						
95	Core loss - 10 inches unconfined compressive strength = 1,563 ksf (10,851 psi) Core loss - 6 inches Core loss - 6 inches Core loss - 7 inches Core loss - 8 inches with chert	67% 22%	NQ2						
100	Core loss - 20 inches Hard, gray and tan, very finely to finely crystalline, medium bedded, slightly to moderately weathered LIMESTONE with chert nodules and clay seams unconfined compressive strength = 1,476 ksf (10,252 psi)	32% 0%	NQ3						
105	Core loss - 25 inches unconfined compressive strength = 1,482 ksf (10,291 psi) unconfined compressive strength = 2,599 ksf (18,050 psi)	100% 50%	NQ4						
110	Core loss - 25 inches unconfined compressive strength = 1,482 ksf (10,291 psi) unconfined compressive strength = 2,599 ksf (18,050 psi)	60% 13%	NQ5						
115	chert nodule	100% 75%	NQ6						
	Boring terminated at 118 feet.	100% 71%	NQ7						
GROUNDWATER DATA ENCOUNTERED AT <u>39</u> FEET ∇ DRILLING DATA <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET TPD DRILLER <u>EER</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> % REMARKS: Sta 67+49.93, Offset 53.25 RT Hand auger to depth of approximately 5 feet.				Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/8/2016 Date: 1/24/2017 Date: 1/24/2017		 GEOTECHNOLOGY FROM THE GROUND UP			
				David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri					
				CONTINUATION OF LOG OF BORING: B-303					
				Project No. J024691.01					

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 669.9		Completion Date: 6/7/2016		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5																																					
Datum: msl						STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)				WATER CONTENT, % PL 10 20 30 40 50 LL																																					
DEPTH IN FEET	DESCRIPTION OF MATERIAL							<table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> <!-- Data points for samples --> <tr> <td style="text-align: center;">2-3-4</td> <td style="text-align: center;">SS1</td> <td style="text-align: center;">$\blacktriangle$</td> <td style="text-align: center;">$\bullet$</td> </tr> <tr> <td style="text-align: center;">2-3-4</td> <td style="text-align: center;">SS2</td> <td style="text-align: center;">$\blacktriangle$</td> <td style="text-align: center;">$\bullet$</td> </tr> <tr> <td style="text-align: center;">2-4-5</td> <td style="text-align: center;">SS3</td> <td style="text-align: center;">$\blacktriangle$</td> <td style="text-align: center;">$\bullet$</td> </tr> <tr> <td style="text-align: center;">3-5-6</td> <td style="text-align: center;">SS4</td> <td style="text-align: center;">$\blacktriangle$</td> <td style="text-align: center;">$\bullet$</td> </tr> <tr> <td style="text-align: center;">3-5-7</td> <td style="text-align: center;">SS5</td> <td style="text-align: center;">$\blacktriangle$</td> <td style="text-align: center;">$\bullet$</td> </tr> <tr> <td style="text-align: center;">4-6-6</td> <td style="text-align: center;">SS6</td> <td style="text-align: center;">$\blacktriangle$</td> <td style="text-align: center;">$\bullet$</td> </tr> <tr> <td style="text-align: center;">4-4-6</td> <td style="text-align: center;">SS7</td> <td style="text-align: center;">$\blacktriangle$</td> <td style="text-align: center;">$\bullet$</td> </tr> <tr> <td style="text-align: center;">6-9-9</td> <td style="text-align: center;">SS8</td> <td style="text-align: center;">$\blacktriangle$</td> <td style="text-align: center;">$\bullet$</td> </tr> </table>								2-3-4	SS1	$\blacktriangle$	$\bullet$	2-3-4	SS2	$\blacktriangle$	$\bullet$	2-4-5	SS3	$\blacktriangle$	$\bullet$	3-5-6	SS4	$\blacktriangle$	$\bullet$	3-5-7	SS5	$\blacktriangle$	$\bullet$	4-6-6	SS6	$\blacktriangle$	$\bullet$	4-4-6	SS7	$\blacktriangle$	$\bullet$	6-9-9	SS8	$\blacktriangle$	$\bullet$
2-3-4	SS1	$\blacktriangle$	$\bullet$																																												
2-3-4	SS2	$\blacktriangle$	$\bullet$																																												
2-4-5	SS3	$\blacktriangle$	$\bullet$																																												
3-5-6	SS4	$\blacktriangle$	$\bullet$																																												
3-5-7	SS5	$\blacktriangle$	$\bullet$																																												
4-6-6	SS6	$\blacktriangle$	$\bullet$																																												
4-4-6	SS7	$\blacktriangle$	$\bullet$																																												
6-9-9	SS8	$\blacktriangle$	$\bullet$																																												
	Topsoil - 12 inches																																														
	Medium stiff, brown, silty CLAY - CL																																														
5	Medium stiff to stiff, brown and gray CLAY, trace gravel - (CH)																																														
10																																															
15																																															
20																																															
25																																															
30																																															
35																																															
				Loose to medium dense, brown, fine to medium SAND - SP																																											

GROUNDWATER DATA

ENCOUNTERED AT 45 FEET ∇

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MVU DRILLER MVL LOGGER
CME 55LC DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 92 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

**David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri**

LOG OF BORING: B-401

Project No. J024691.01

REMARKS: Sta 67+89.92, Offset 76.75LT

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02117 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>669.9</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
Datum: <u>msl</u>		Δ - UU/2 $\bigcirc$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5							
DEPTH IN FEET		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
DESCRIPTION OF MATERIAL		WATER CONTENT, % PL 10 20 30 40 50 LL							
	Stiff, gray SILT, interbedded with fine sand and silty clay - ML (continued)								
	Hard, gray, finely to medium crystalline, thin bedded, moderately weathered, LIMESTONE core loss - 5 inches		90% 10%	NQ1					
85	shale seam								
	Core loss - 34 inches		47% 18%	NQ2					
90			100%/100%	NQ3					
	Boring terminated at 91 feet.								
95									
100									
105									
110									
115									
GROUNDWATER DATA					DRILLING DATA				
ENCOUNTERED AT <u>45</u> FEET ∇					<u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET MVU DRILLER MVL LOGGER CME 55LC DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>92</u> %				
REMARKS: Sta 67+89.92, Offset 76.75LT					Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017				
					 GEOTECHNOLOGY FROM THE GROUND UP				
					David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri				
					CONTINUATION OF LOG OF BORING: B-401				
					Project No. J024691.01				

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRNDZ117 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 669.4		Completion Date: 6/10/2016		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: msl		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Topsoil - 18 inches								
	Stiff, gray CLAY, trace sand and gravel - CH								
5									
10	Boring terminated at 10 feet.				ST1	1	68 >>		
15									
20									
25									
30									
35									

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

TPD DRILLER EER LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/8/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-401A

Project No. J024691.01

REMARKS: Sta 67+89.92, Offset 72.75LT

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>666.5</u> Datum: <u>msl</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)									
WATER CONTENT, % PL 10 20 30 40 50 LL									
DEPTH IN FEET DESCRIPTION OF MATERIAL <!-- Soil Log Representation -->									

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM 40 FEET

TPD DRILLER EER LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-402

Project No. J024691.01

REMARKS: Sta 67+89.92, Offset 76.75LT
 Sta 67+91.92, Offset 3.25 RT
 No soil sampling performed.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>666.5</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf				
Datum: <u>msl</u>		Δ - UU/2 $\bigcirc$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5									
		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)									
DEPTH IN FEET	DESCRIPTION OF MATERIAL						WATER CONTENT, %				
							PL	10 20 30 40 50	LL		
	Orangish-brown CLAY, trace sand - CH (continued)										
45											
50	rough drilling from 50 to 53 feet										
55											
60	Brown, fine SAND - SP										
65	Gray SILT - ML										
70											
75											
GROUNDWATER DATA <u>X</u> FREE WATER NOT ENCOUNTERED DURING DRILLING REMARKS: Sta 67+89.92, Offset 76.75LT Sta 67+91.92, Offset 3.25 RT No soil sampling performed.							DRILLING DATA ___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u>40</u> FEET TPD DRILLER <u>EER</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %		Drawn by: AGB Date: 7/2/2016	Checked by: BJS Date: 1/24/2017	App'vd. by: CKK Date: 1/24/2017
							 GEOTECHNOLOGY FROM THE GROUND UP				
							David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri				
							CONTINUATION OF LOG OF BORING: B-402				
							Project No. J024691.01				

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME GRN2147
NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
AND NOT THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>663.0</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf				
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5									
		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)									
DEPTH IN FEET	DESCRIPTION OF MATERIAL						WATER CONTENT, %				
							PL	10 20 30 40 50 LL			
	Brown CLAY - CH (continued)										
45											
50	rough drilling from 50 to 52 feet										
55											
60	Gray, silty CLAY - CL										
65											
70	Gray SILT - ML										
75											
	rough drilling from 79 to 80 feet										
GROUNDWATER DATA							DRILLING DATA		Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
☒ FREE WATER NOT ENCOUNTERED DURING DRILLING							___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u>40</u> FEET		Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017
							TPD DRILLER <u>EER</u> LOGGER		 GEOTECHNOLOGY FROM THE GROUND UP		
							<u>CME 55TRK</u> DRILL RIG				
							HAMMER TYPE <u>Auto</u>				
							HAMMER EFFICIENCY <u>88</u> %		David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri		
REMARKS: Sta 67+91.92, Offset 83.25 RT No soil sampling performed.									CONTINUATION OF LOG OF BORING: B-403		
									Project No. J024691.01		

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>663.0</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf			
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5								
		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)								
DEPTH IN FEET	DESCRIPTION OF MATERIAL						WATER CONTENT, %			
							PL	10 20 30 40 50	LL	
	Gray SILT - ML (continued)									
85	Gray, silty CLAY with limestone ledges - CL rough drilling from 85 to 89 feet									
90	Auger refusal at 89 feet.									
95										
100										
105										
110										
115										
							Drawn by: AGB		Checked by: BJS	App'vd. by: CKK
							Date: 7/2/2016		Date: 1/24/2017	Date: 1/24/2017
							 GEOTECHNOLOGY FROM THE GROUND UP			
							David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri			
							CONTINUATION OF LOG OF BORING: B-403			
							Project No. J024691.01			

GROUNDWATER DATA	DRILLING DATA
☒ FREE WATER NOT ENCOUNTERED DURING DRILLING	☐ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u>40</u> FEET
	TPD DRILLER <u>EER</u> LOGGER
	<u>CME 55TRK</u> DRILL RIG
	HAMMER TYPE <u>Auto</u>
	HAMMER EFFICIENCY <u>88</u> %
REMARKS: Sta 67+91.92, Offset 83.25 RT No soil sampling performed.	

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02147
 ME.GR02147 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>663.0</u>		Completion Date: <u>6/10/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: <u>msl</u>		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Topsoil - 18 inches					ST1			
	Brown CLAY, trace sand and gravel - CH								
5									
10	Boring terminated at 10 feet.								
15									
20									
25									
30									
35									
<u>GROUNDWATER DATA</u> ☒ FREE WATER NOT ENCOUNTERED DURING DRILLING <u>DRILLING DATA</u> ☐ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET <u>TPD</u> DRILLER <u>EER</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> % REMARKS: Sta 67+91.92, Offset 80.25 RT							Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/8/2016 Date: 1/24/2017 Date: 1/24/2017		
							David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri		
							LOG OF BORING: B-403A		
							Project No. J024691.01		

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>664.9</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf			
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5								
DEPTH IN FEET		DESCRIPTION OF MATERIAL					STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)			
				WATER CONTENT, % PL 10 20 30 40 50 LL						
Topsoil - 3 inches Reddish-brown CLAY, trace sand - CH										
5 rough drilling from 5 to 6 feet										
10										
15										
20										
25										
30 rough drilling from 31 to 32 feet										
35										
GROUNDWATER DATA ☒ FREE WATER NOT ENCOUNTERED DURING DRILLING				DRILLING DATA ☐ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u>20</u> FEET <u>NG</u> DRILLER <u>DLD</u> LOGGER <u>CME 550X</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %				Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017		
REMARKS: Sta 68+35.88, Offset 52.75 LT No soil sampling performed.										
				David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri						
				LOG OF BORING: B-501						
				Project No. J024691.01						

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME GRANDVIEW HWY TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>664.9</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf				
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5									
		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)									
DEPTH IN FEET	DESCRIPTION OF MATERIAL						WATER CONTENT, %				
							PL	10 20 30 40 50 LL			
	Reddish-brown CLAY, trace sand - CH (continued)										
45											
50											
55	Gray, sandy SILT - ML										
60											
65											
70											
75											
	Weathered LIMESTONE rough drilling from 76 to 79 feet										
	Auger refusal at 79 feet.										
GROUNDWATER DATA							DRILLING DATA		Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
☒ FREE WATER NOT ENCOUNTERED DURING DRILLING							☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM 20 FEET		Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017
							NG DRILLER DLD LOGGER		 GEOTECHNOLOGY FROM THE GROUND UP		
							CME 550X DRILL RIG				
							HAMMER TYPE Auto				
							HAMMER EFFICIENCY 88 %		David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri		
REMARKS: Sta 68+35.88, Offset 52.75 LT No soil sampling performed.									CONTINUATION OF LOG OF BORING: B-501		
									Project No. J024691.01		

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 662.6		Completion Date: 6/2/2016		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: msl		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Medium dense, brown and gray, fine to medium SAND - SP <i>(continued)</i>								
	Very stiff, orangish-brown, SILT - ML								
45		5-9-13	SS9	▲					
	Medium dense, brown, fine SAND - SP								
50									8-10-10
	Medium stiff, brown and gray, SILT, trace sand - ML								
55									3-6-8
	Medium dense, gray, fine SAND, trace silt - SP								
60									10-13-16
	Medium stiff, gray, silty CLAY, trace sand - CL								
65									5-4-8
70									3-6-7
75									4-6-7
									6-7-9
GROUNDWATER DATA		DRILLING DATA		Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017					
ENCOUNTERED AT <u>35</u> FEET ▼		___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM ___ FEET <u>BLS</u> DRILLER <u>DWJ</u> LOGGER <u>CME 750X</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>83</u> %		 GEOTECHNOLOGY FROM THE GROUND UP					
REMARKS: Sta 68+35.88, Offset 47.25 LT		CONTINUATION OF LOG OF BORING: B-503							
Project No. J024691.01		David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri							

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAN2147
NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 663.6		Completion Date: 6/24/2016		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: msl		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
5	Brown CLAY, some gravel - CH								
10	Gray CLAY - CH								
15	Tan and gray, silty CLAY - CL								
20	rough drilling								
25									
30									
35	rough drilling								
	rough drilling								
GROUNDWATER DATA ☒ FREE WATER NOT ENCOUNTERED DURING DRILLING REMARKS: Sta 69+67.71, Offset 52.75 No soil sampling performed.		DRILLING DATA ___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM ___ FEET <u>KJB</u> DRILLER <u>KIR</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %		Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/8/2016 Date: 1/24/2017 Date: 1/24/2017					
					David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri				
					LOG OF BORING: B-601				
					Project No. J024691.01				

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 663.6 Datum: msl		Completion Date: 6/24/2016		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)									
WATER CONTENT, % PL 10 20 30 40 50 LL									
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Tan and gray, silty CLAY - CL (continued)								
45	Brown, clayey SAND - SC								
50									
55									
60									
65									
70									
75									

rough drilling

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

KJB DRILLER KIR LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/8/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

CONTINUATION OF
LOG OF BORING: B-601

Project No. J024691.01

REMARKS: Sta 69+67.71, Offset 52.75
No soil sampling performed.

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 661.9		Completion Date: 6/23/2016		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5									
Datum: msl										STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)									
										WATER CONTENT, % PLI 10 20 30 40 50 LL									
DEPTH IN FEET	DESCRIPTION OF MATERIAL																		
	Medium dense, fine to medium SAND, trace gravel - SP <i>(continued)</i>																		
	Medium stiff, brown SILT with sand and gravel - ML																		
45						3-5-7 SS10													
	Very dense, reddish-brown, fine SAND, trace silt - SP																		
50						25-26-28 SS11													
	Dense, brown SAND -SP																		
55						10-17-21 SS12													
	Very stiff, gray SILT with sand - ML																		
60						7-8-13 SS13													
	Very stiff, gray, silty CLAY - CL																		
65						8-7-8 SS14													
	Medium dense, gray SAND with silt - SP																		
70						6-9-12 SS15													
	Very stiff, gray, silty CLAY - CL																		
75						7-8-9 SS16													
	Stiff, gray CLAY - CH																		
						1-4-7 SS17													
GROUNDWATER DATA										DRILLING DATA									
ENCOUNTERED AT <u>32</u> FEET ∇										<u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET TPD DRILLER <u>DWJ</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %									
REMARKS: Sta 69+67.71, Offset 47.25 RT										Drawn by: AGB Date: 7/8/2016 Checked by: BJS Date: 1/24/2017 App'vd. by: CKK Date: 1/24/2017 GEOTECHNOLOGY FROM THE GROUND UP David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri CONTINUATION OF LOG OF BORING: B-603 Project No. J024691.01									

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAN2147
NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>661.9</u>		Completion Date: <u>6/23/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: <u>msl</u>		DESCRIPTION OF MATERIAL								STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)		
										WATER CONTENT, % PL 10 20 30 40 50 LL		
DEPTH IN FEET												
	Stiff, gray CLAY - CH <i>(continued)</i>				[Hatched Pattern]							
	Soft, gray SHALE, with silt seams				[Horizontal Lines]							
85					9-14-35		SS18					
	Core loss - 24 inches				[Vertical Lines]							
	Tan and gray, slightly weathered SHALE with limestone				[Horizontal Lines]							
	Tan and gray, finely crystalline, thin bedded, moderately to slightly weathered LIMESTONE				[Horizontal Lines]							
90	Core loss - 26 inches				[Vertical Lines]							
	Soft, tan and gray, SHALE and CLAY				[Horizontal Lines]							
					58%		NQ2					
	Hard, gray, finely crystalline, thin to medium bedded, slightly weathered LIMESTONE				[Horizontal Lines]							
	clay seam - 2.5 inches				[Horizontal Lines]							
	high angle fracture				[Horizontal Lines]							
	clay seam - 1/8 inch				[Horizontal Lines]							
	clay seam - 1 inch				[Horizontal Lines]							
	becomes thick bedded				[Horizontal Lines]							
95					100%		NQ3					
					87%							
100	Boring terminated at 99.5 feet.											
105												
110												
115												

GROUNDWATER DATA

ENCOUNTERED AT 32 FEET ▼

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
WASHBORING FROM ___ FEET
TPD DRILLER DWJ LOGGER
CME 55TRK DRILL RIG
HAMMER TYPE Auto
HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/8/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

CONTINUATION OF
LOG OF BORING: B-603

Project No. J024691.01

REMARKS: Sta 69+67.71, Offset 47.25 RT

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>678.2</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5				
Datum: <u>msl</u>		DEPTH IN FEET								DESCRIPTION OF MATERIAL		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)		
												WATER CONTENT, % PL 10 20 30 40 50 LL		
				5		Topsoil - 12 inches Medium stiff, brown and gray CLAY - CH Medium stiff, brown and gray CLAY, trace gravel - (CH) Stiff, brown and gray CLAY, trace gravel and sand - CH Boring terminated at 15 feet.				2-3-4 SS1 2-3-4 SS2 94.2 ST3 ST4 3-5-8 SS5 3-4-6 SS6				
		10												
		15												
		20												
		25												
		30												
		35												

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM FEET

TPD DRILLER EER LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB Checked by: BJS App'vd. by: CKK

Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017

REMARKS: Sta 132+64.87, Offset 120.58 RT

GEOTECHNOLOGY
FROM THE GROUND UP

**David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri**

LOG OF BORING: B-701

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: 674.6 Datum: msl		Completion Date: 6/3/2016		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5 STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586) WATER CONTENT, % PL 10 20 30 40 50 LL			
DEPTH IN FEET	DESCRIPTION OF MATERIAL												
	Topsoil - 2 inches												
	Soft, reddish-brown CLAY - CH			1-1-2	SS1								
	Stiff, tan and brown CLAY - (CH)			2-4-6	SS2								
5	Stiff, brown and gray CLAY with gravel - CH			2-4-6	SS3								
				2-2-5	SS4								
10	Medium stiff, brown and gray silty CLAY, trace gravel - CL			105	ST5								
	Brown, silty CLAY - CL				ST6								
15	Boring terminated at 15 feet.												
20													
25													
30													
35													

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM FEET

TPD DRILLER ADP LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-705

Project No. J024691.01

REMARKS: Sta 134+64.87, Offset 120.58 RT

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02147
 NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 ME.GR02147 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>672.2</u>		Completion Date: <u>6/3/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: <u>msl</u>		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Medium stiff, brown CLAY - (CH) Stiff, brown CLAY, trace gravel - (CH)				1-2-4	SS1	▲	●	
					3-4-6	SS2	▲	●	
5									
					101	ST3	●	71	
					102	ST4	●	>>	
10									
	Boring terminated at 15 feet.				3-6-7	SS5	▲	●	
					4-5-8	SS6	▲	●	
15									
20									
25									
30									
35									

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

TPD DRILLER ADP LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB Checked by: BJS App'vd. by: CKK

Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

**David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri**

LOG OF BORING: B-707

Project No. J024691.01

REMARKS: Sta 135+64.87, Offset 120.58 RT

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02147
NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
AND NOT THE GRADUAL TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>655.0</u>		Completion Date: <u>6/6/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5			
Datum: <u>msl</u>										STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)			
										WATER CONTENT, % PL 10 20 30 40 50 LL			
DEPTH IN FEET	DESCRIPTION OF MATERIAL				GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
	Topsoil - 18 inches				GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
	Soft, orange and brown, silty CLAY - CL												
	Stiff, brown and gray CLAY with sand and gravel - CH												
5					GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
10					GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
15					GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
	Boring terminated at 15 feet				GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
20					GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
25					GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
30					GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				
35					GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES				

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM FEET

TPD DRILLER EER LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB Checked by: BJS App'vd. by: CKK

Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017

REMARKS: Sta 140+14.87, Offset 120.58 RT

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-712

Project No. J024691.01

Project No. J024691.01

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME GRAND 2147 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>652.2</u>		Completion Date: <u>6/6/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: <u>msl</u>		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Topsoil - 24 inches								
	Gray CLAY - CH								
5									
	Brown CLAY, trace sand - CH								
10									
15	Boring terminated at 15 feet.								
20									
25									
30									
35									
GROUNDWATER DATA ☒ FREE WATER NOT ENCOUNTERED DURING DRILLING DRILLING DATA ☐ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET <u>TPD</u> DRILLER <u>EER</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> % REMARKS: Sta 141+14.87, Offset 120.58 RT No soil sampling performed.						Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017			
						David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri			
						LOG OF BORING: B-714			
						Project No. J024691.01			

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02147
 ME.GR02147 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>651.3</u>		Completion Date: <u>6/6/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: <u>msl</u>		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
		WATER CONTENT, % PL 10 20 30 40 50 LL							
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Topsoil - 24 inches				[Symbol]				
	Medium stiff, brown CLAY - CH				[Symbol]	2-1-2	SS1	▲	
					[Symbol]				
5					[Symbol]		ST2	●	
	Soft, gray, sandy CLAY - CL				[Symbol]	96.5	ST3	●	
	Medium stiff, brown and gray CLAY, trace gravel - CH				[Symbol]				
10	Stiff, brown and gray CLAY, trace gravel - CH				[Symbol]	3-3-3	SS4	▲	
					[Symbol]	3-5-6	SS5	▲	
					[Symbol]				
					[Symbol]	3-3-6	SS6	▲	
15	Boring terminated at 15 feet.								
20									
25									
30									
35									
GROUNDWATER DATA ☒ FREE WATER NOT ENCOUNTERED DURING DRILLING					DRILLING DATA ☐ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET TPD DRILLER EER LOGGER CME 55TRK DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %				
REMARKS: Sta 142+14.87, Offset 120.58					Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017				
					 GEOTECHNOLOGY FROM THE GROUND UP				
					David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri				
					LOG OF BORING: B-716				
					Project No. J024691.01				

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>653.1</u>		Completion Date: <u>6/6/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf		
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5							
		STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)							
DEPTH IN FEET	DESCRIPTION OF MATERIAL						WATER CONTENT, %		
							PL	10 20 30 40 50	LL
	Topsoil - 10 inches								
	Brown to yellowish-brown, silty CLAY - CL								
5									
10									
15	Boring terminated at 15 feet.								
20									
25									
30									
35									
GROUNDWATER DATA ☒ FREE WATER NOT ENCOUNTERED DURING DRILLING REMARKS: Sta 143+14.87, Offset 120.58 RT No soil sampling performed. DRILLING DATA ☐ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM <u> </u> FEET ☐ DRILLER <u>DWJ</u> LOGGER <u>CME 550X</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %						Drawn by: AGB Checked by: BJS App'vd. by: CKK			
						Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017			
						 GEOTECHNOLOGY FROM THE GROUND UP			
						David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri			
						LOG OF BORING: B-718			
Project No. J024691.01									

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02147
NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
AND NOT THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>656.5</u>		Completion Date: <u>6/6/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5												
Datum: <u>msl</u>										STANDARD PENETRATION RESISTANCE $\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)												
										WATER CONTENT, % PL 10 20 30 40 50 LL												
DEPTH IN FEET	DESCRIPTION OF MATERIAL				GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES													
	Topsoil - 10 inches						1-1-2		SS1		$\blacktriangle$ $\bullet$ 95 >>											
	Soft, brown CLAY - (CH)															101		ST2				
5																						
	Very stiff, brown and gray, silty CLAY, trace gravel - CL						2-8-13		SS4		$\bullet$ $\blacktriangle$											
10														2-8-13		SS5		$\bullet$ $\blacktriangle$				
																					5-11-13	
15	Boring terminated at 15 feet.																					
20																						
25																						
30																						
35																						
GROUNDWATER DATA <u>X</u> FREE WATER NOT ENCOUNTERED DURING DRILLING					DRILLING DATA ___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM ___ FEET <u>NG</u> DRILLER <u>DWJ</u> LOGGER <u>CME 550X</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %					Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017												
REMARKS: Sta 144+14.87, Offset 120.58 RT										 GEOTECHNOLOGY FROM THE GROUND UP												
										David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri												
										LOG OF BORING: B-720												
Project No. J024691.01																						

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Project No. J024691.01

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP. 00 CLONE ME GRASS AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>661.0</u>		Completion Date: <u>6/2/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
Datum: <u>msl</u>		STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)										
		WATER CONTENT, % PL 10 20 30 40 50 LL										
DEPTH IN FEET	DESCRIPTION OF MATERIAL											
	Topsoil - 3 inches Medium stiff to stiff, brown and gray, CLAY - (CH)											
		89	ST1									
		91	ST2									
5												
		2-3-5	SS3									
		3-5-6	SS4									
10												
		2-4-5	SS5									
		3-4-7	SS6									
15	Boring terminated at 15 feet.											
20												
25												
30												
35												

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

TPD DRILLER DLD LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-810

Project No. J024691.01

REMARKS: Sta 137+88.97, Offset 70.42

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR02147 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>659.0</u> Datum: <u>msl</u>		Completion Date: <u>6/2/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)									
WATER CONTENT, % PL 10 20 30 40 50 LL									
DEPTH IN FEET	DESCRIPTION OF MATERIAL								
	Topsoil - 3 inches Brown and tan, CLAY - CH								
5									
10									
15	Boring terminated at 15 feet.								
20									
25									
30									
35									

GROUNDWATER DATA

☒ FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

TPD DRILLER DLD LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-812

Project No. J024691.01

REMARKS: Sta 138+88.97, Offset 71.42
No soil sampling performed.

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>657.0</u>		Completion Date: <u>6/2/2016</u>		GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf			
Datum: <u>msl</u>		Δ - UU/2 $\circ$ - QU/2 $\square$ - SV 0.5 1.0 1.5 2.0 2.5								
DEPT H IN F E E T		STANDARD PENETRATION RESISTANCE								
		$\blacktriangle$ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)								
DESCRIPTION OF MATERIAL		WATER CONTENT, %								
		PL 10 20 30 40 50 LL								
Topsoil - 3 inches Brown and tan, CLAY - CH										
5										
10										
15	Boring terminated at 15 feet.									
20										
25										
30										
35										
GROUNDWATER DATA ☒ FREE WATER NOT ENCOUNTERED DURING DRILLING		DRILLING DATA ___ AUGER <u>3 3/4"</u> HOLLOW STEM WASHBORING FROM ___ FEET <u>TPD</u> DRILLER <u>DLD</u> LOGGER <u>CME 55TRK</u> DRILL RIG HAMMER TYPE <u>Auto</u> HAMMER EFFICIENCY <u>88</u> %								
REMARKS: Sta 139+38.97, Offset 71.42 No soil sampling performed.		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Drawn by: AGB</td> <td style="padding: 2px;">Checked by: BJS</td> <td style="padding: 2px;">App'vd. by: CKK</td> </tr> <tr> <td style="padding: 2px;">Date: 7/2/2016</td> <td style="padding: 2px;">Date: 1/24/2017</td> <td style="padding: 2px;">Date: 1/24/2017</td> </tr> </table> GEOTECHNOLOGY FROM THE GROUND UP David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri LOG OF BORING: B-813 Project No. J024691.01			Drawn by: AGB	Checked by: BJS	App'vd. by: CKK	Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017
Drawn by: AGB	Checked by: BJS	App'vd. by: CKK								
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017								

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>656.0</u> Datum: <u>msl</u>		Completion Date: <u>6/2/2016</u>		GRAPHIC LOG		DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5				
STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)														
WATER CONTENT, % PL 10 20 30 40 50 LL														
DEPTH IN FEET	DESCRIPTION OF MATERIAL						98 ST1 ST2 1-3-3 SS3 2-3-5 SS4 2-3-6 SS5 2-4-6 SS6		Topsoil - 3 inches Medium stiff to stiff, brown and gray, CLAY - (CH) 62 >>					
5														
10														
15	Boring terminated at 15 feet.													
20														
25														
30														
35														
GROUNDWATER DATA X FREE WATER NOT ENCOUNTERED DURING DRILLING						DRILLING DATA AUGER 3 3/4" HOLLOW STEM WASHBORING FROM FEET TPD DRILLER DLD LOGGER CME 55TRK DRILL RIG HAMMER TYPE Auto HAMMER EFFICIENCY 88 %						Drawn by: AGB Checked by: BJS App'vd. by: CKK Date: 7/2/2016 Date: 1/24/2017 Date: 1/24/2017		
REMARKS: Sta 139+88.97, Offset 70.42						GEOTECHNOLOGY FROM THE GROUND UP								
						David Hoekel Parkway Phase 2A, B, and C Wentzville, Missouri								
						LOG OF BORING: B-814								
						Project No. J024691.01								

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>656.0</u> Datum: <u>msl</u>		Completion Date: <u>6/2/2016</u>		GRAPHIC LOG DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SHEAR STRENGTH, tsf △ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
DEPTH IN FEET		DESCRIPTION OF MATERIAL				STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)		
						WATER CONTENT, % PL 10 20 30 40 50 LL		
				GRAPHIC LOG DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD				
5	Topsoil - 3 inches Medium stiff, brown and gray, CLAY - CH		2-2-3 SS1					
			2-4-3 SS2					
	Medium stiff to stiff, gray silty CLAY - (CL)		ST3					
			91 ST4					
10								
			2-3-3 SS5					
15	Boring terminated at 15 feet.		3-4-6 SS6					
20								
25								
30								
35								

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

TPD DRILLER DLD LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-818

Project No. J024691.01

REMARKS: Sta 141+88.97, Offset 70.42

Completion Date: 6/6/2016Datum: msl

GRAPHIC LOG

DRY UNIT WEIGHT (pcf)
SPT BLOW COUNTS
CORE RECOVERY/RQD

SAMPLES

SHEAR STRENGTH, tsf

Δ - UU/2 $\bigcirc$ - QU/2 $\square$ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

▲ N-VALUE (BLOWS PER FOOT)
(ASTM D 1586)

DEPTH
IN FEET

DESCRIPTION OF MATERIAL

Topsoil - 6 inches

Brown and gray, silty CLAY - CL

5.

10-

Gray, sandy CLAY - CH

15-

Boring terminated at 15 feet.

20 -

25-

30 -

35 -

GROUNDWATER DATA

X FREE WATER NOT
ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM
 WASHBORING FROM ___ FEET
TPD DRILLER EER LOGGER
CME 55TRK DRILL RIG
 HAMMER TYPE Auto
 HAMMER EFFICIENCY 88 %

REMARKS: Sta 142+88.97, Offset 67.42
No soil sampling performed.

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017



GEOTECHNOLOGY 
FROM THE GROUND UP

**David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri**

LOG OF BORING: B-820

Project No. J024691.01

LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GP-1 00 CLONE ME GRAD AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 LOG OF BORING 2002 WL J024691.01 - DAVID HOEKEL PARKWAY GPJ 00 CLONE ME.GR024691.01 TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Surface Elevation: <u>661.8</u> Datum: <u>msl</u>		Completion Date: <u>6/7/2016</u>		GRAPHIC LOG DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD		SAMPLES		SHEAR STRENGTH, tsf Δ - UU/2 ○ - QU/2 □ - SV 0.5 1.0 1.5 2.0 2.5		
DEPTH IN FEET		DESCRIPTION OF MATERIAL						STANDARD PENETRATION RESISTANCE ▲ N-VALUE (BLOWS PER FOOT) (ASTM D 1586)		
								WATER CONTENT, % PL 10 20 30 40 50 LL		
		Topsoil - 12 inches								
		FILL: brown, silty clay				2-2-3	SS1	▲	●	
5						2-4-5	SS2	▲	●	
		Stiff, orangish-brown and gray CLAY, trace sand - CH				97	ST3		●	
10						105	ST4		○	●
						2-4-6	SS5	▲	●	
15		Boring terminated at 15 feet.				3-4-6	SS6	▲	●	
20										
25										
30										
35										

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4" HOLLOW STEM WASHBORING FROM ___ FEET

TPD DRILLER EER LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

HAMMER EFFICIENCY 88 %

Drawn by: AGB	Checked by: BJS	App'vd. by: CKK
Date: 7/2/2016	Date: 1/24/2017	Date: 1/24/2017

GEOTECHNOLOGY
FROM THE GROUND UP

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri

LOG OF BORING: B-821

Project No. J024691.01

REMARKS: Sta 143+38.97, Offset 70.42

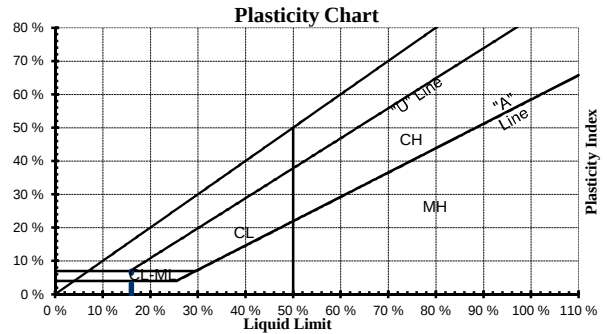
NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES
 AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

Project No. J024691.01

BORING LOG: TERMS AND SYMBOLS

LEGEND

CS	Continuous Sampler
GB	Grab Sample
NQ	NQ Rock Core
PST	Three-Inch Diameter Piston Tube Sample
SS	Split-Spoon Sample (Standard Penetration Test)
ST	Three-Inch Diameter Shelby Tube Sample
*	Sample Not Recovered
PL	Plastic Limit (ASTM D4318)
LL	Liquid Limit (ASTM D4318)
SV	Shear Strength from Field Vane (ASTM D2573)
UU	Shear Strength from Unconsolidated-Undrained Triaxial Compression Test (ASTM D2850)
QU	Shear Strength from Unconfined Compression Test (ASTM D2166)



SOIL GRAIN SIZE

US STANDARD SIEVE

	12"	3"	3/4"	4	10	40	200		
BOULDERS		COBBLES	GRAVEL		SAND			SILT	CLAY
			COARSE	FINE	COARSE	MEDIUM	FINE		
	300	76.2	19.1	4.76	2.00	0.42	0.074	0.005	
SOIL GRAIN SIZE IN MILLIMETERS									

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Symbol	Description
Coarse-Grained Soils (More than 50% Larger than No. 200 Sieve Size)	Gravel and Gravelly Soil	Clean Gravels Little or no Fines	GW	Well-Graded Gravel, Gravel- Sand Mixture
			GP	Poorly-Graded Gravel, Gravel-Sand Mixture
		Gravels with Appreciable Fines	GM	Silty Gravel, Gravel-Sand-Silt Mixture
			GC	Clayey-Gravel, Gravel-Sand-Clay Mixture
	Sand and Sandy Soils	Clean Sands Little or no Fines	SW	Well-Graded Sand, Gravelly Sand
			SP	Poorly-Graded Sand, Gravelly Sand
		Sands with Appreciable Fines	SM	Silty Sand, Sand-Silt Mixture
			SC	Clayey-Sand, Sand-Clay Mixture
Fine-Grained Soils (More than 50% Smaller than No. 200 Sieve Size)	Silts and Clays	Liquid Limit Less Than 50	ML	Silt, Sandy Silt, Clayey Silt, Slight Plasticity
			CL	Lean Clay, Sandy Clay, Silty Clay, Low to Medium Plasticity
			OL	Organic Silts or Lean Clays, Low Plasticity
	Silts and Clays	Liquid Limit Greater Than 50	MH	Silt, High Plasticity
			CH	Fat Clay, High Plasticity
			OH	Organic Clay, Medium to High Plasticity
	Highly Organic Soils		PT	Peat, Humus, Swamp Soil

STRENGTH OF COHESIVE SOILS

DENSITY OF GRANULAR SOILS

Consistency	Undrained Shear Strength (tsf)	Unconfined Comp. Strength (tsf)	Descriptive Term	Approximate N_{60} -Value Range
Very Soft	less than 0.125	less than 0.25	Very Loose	0 to 4
Soft	0.125 to 0.25	0.25 to 0.5	Loose	5 to 10
Medium Stiff	0.25 to 0.5	0.5 to 1.0	Medium Dense	11 to 30
Stiff	0.5 to 1.0	1.0 to 2.0	Dense	31 to 50
Very Stiff	1.0 to 2.0	2.0 to 3.0	Very Dense	>50
Hard	greater than 2.0	greater than 4.0		

N-Value (Blow Count) is the last two, 6-inch drive increments (i.e. 4/7/9, N = 7 + 9 = 16). Values are shown as a summation on the grid plot and shown in the Unit Dry Weight/SPT column.

RELATIVE COMPOSITION

OTHER TERMS

Trace	0 to 10%	Layer - Inclusion greater than 3 inches thick.
Little	10 to 20%	Seam - Inclusion 1/8-inch to 3 inches thick
Some	20 to 35%	Parting - Inclusion less than 1/8-inch thick
And	35 to 50%	Pocket - Inclusion of material that is smaller than sample diameter



Relative composition and Unified Soil Classification System (USCS) designations are based on visual descriptions and are approximate only. If laboratory tests were performed to classify the soil, the USCS designation is shown in parenthesis.

ROCK CORE DESCRIPTIONS

TERM	REFERENCE	
Strength	STRENGTH	
Color	<i>Description</i>	<i>Uniaxial Compressive Strength (psi)</i>
Crystallinity	Extremely Weak	less than 150
Grain Size	Very Weak	150 to 700
Mass Bedding	Weak	700 to 4,000
Weathering	Medium Strong	4,000 to 7,000
Voids	Strong	7,000 to 15,000
Quality	Very Strong	15,000 to 36,000
SEDIMENTARY ROCK TYPE	Extremely Strong	greater than 36,000
<i>Sandstone</i> - Predominantly quartz grains cemented by silica, iron, clay or carbonate material. Color depends on cementing agent; porous and pervious; hard and generally thickly bedded.	COLOR	
	Common colors are gray, brown, black and white. Exotic colors such as green, blue, maroon can be used when necessary.	
<i>Siltstone</i> - Composition similar to sandstone but at least 50% grains 0.002 to 0.02 millimeters in size. Rarely forms thick beds, but often hard.	CRYSTALLINITY	
<i>Shale</i> - Predominant particles are less than 0.002 millimeters with a well defined fissile fabric. Commonly interbedded with sandstone or limestone and relatively soft.	<i>Description</i>	<i>Criteria</i>
<i>Limestone</i> - Contains more than 50% calcium carbonate. The calcite can be precipitated chemically, organically, or it may be detrital in origin. Reacts with dilute HCL.	Aphanitic	Crystals cannot be seen with the naked eye
<i>Dolomite</i> - Harder and heavier than limestone. Forms by alteration of limestone or by direct precipitation from sea water. Reacts with dilute HCL only when powdered.	Very Finely Crystalline	Crystals are barely visible with the naked eye
<i>Coal</i> - Composed of highly altered plant remains and varying amounts of clay, generally black in color.	Finely Crystalline	Crystals are easily visible with the naked eye
<i>Chert</i> - Formed by silica deposited from solution in water. May occur as nodules or relatively thick beds.	Medium Crystalline	Crystals are medium size; up to 1/8-inch diameter
GEOLOGIC DEFINITIONS	Coarsely Crystalline	Crystals are 1/8- to 1/4-inch in diameter
<i>Stylolite</i> - A term applied to parts of certain limestones which have a column like development that is grooved, sutured or striated and irregular in cross-section.	Very Coarsely Crystalline	Crystals are larger than 1/4-inch in diameter
<i>Fissility</i> - A property of splitting along closely spaced parallel planes.	GRAIN SIZE	
<i>Argillaceous</i> - A term applied to rock or substances having a notable portion, greater than 30%, clay in composition.	<i>Description</i>	<i>Criteria</i>
<i>Oolitic</i> - A spherical or ellipsoidal texture, 0.25 to 2.0 mm in diameter, with concentric or radial structure.	Very Finely Grained	Grains cannot be seen with the naked eye
<i>Brecciated</i> - A rock texture which is composed of angular fragments which correspond in size to gravel and/or pebbles.	Fine Grained	Grains are barely visible with the naked eye
<i>Slickenside</i> - A polished or striated surface on or within a rock.	Medium Grained	Grains up to 2 mm in diameter
	Coarse Grained	Grains are larger than 2 mm in diameter
	BEDDING	
	<i>Description</i>	<i>Criteria</i>
	Thin	less than 2 inches
	Medium	2 to 24 inches
	Thick	24 to 48 inches
	Massive	greater than 48 inches
	WEATHERING	
	<i>Description</i>	<i>Criteria</i>
	Unweathered	No visible alteration of rock mass
	Slightly Weathered	Slight discoloration inward from fractures
	Moderately Weathered	Discoloration throughout, slight loss of strength, texture intact
	Highly Weathered	Entire rock mass appears discolored and dull, texture indistinct, fabric intact
	Severely Weathered	Majority of rock mass reduced to soil-like state with relic rock structure
	VOIDS	
	<i>Description</i>	<i>Criteria</i>
	Dense	Usually not visible with the naked eye
	Pitted	Visible to 1/4-inch
	Vuggy	1/4-inch to diameter of the core
	Cavity	Larger than 6 inches in diameter
	QUALITY	
	<i>Percent RQD</i>	<i>Description</i>
	90 to 100	Excellent
	75 to 90	Good
	50 to 75	Fair
	25 to 50	Poor
	0 to 25	Very Poor

APPENDIX C

ROCK CORE PHOTOGRAPHS

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-103
Box 1 of 2**BORING B-103**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
1	88.0-89.5	44	22
2	89.5-93.3	100	59
3	93.3-Cont.	100	88

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-103
Box 2 of 2**BORING B-103**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
3	Cont.-99.0	100	88

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-201
Box 1 of 5**BORING B-201**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
1	32.5-34.5	100	61
2	34.5-39.0	100	92
3	39.0-Cont.	67	63

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-201
Box 2 of 5**BORING B-201**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
3	Cont.-44.0	67	63

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-201
Box 3 of 5**BORING B-201**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
4	96.0-100.5	91	50
5	100.5-105.5	95	72
6	105.5-Cont.	100	22

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-201
Box 4 of 5**BORING B-201**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
6	Cont.-110.5	100	22
7	110.5-115.5	100	20
8	115.5-Cont.	100	45

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-201
Box 5 of 5**BORING B-201**

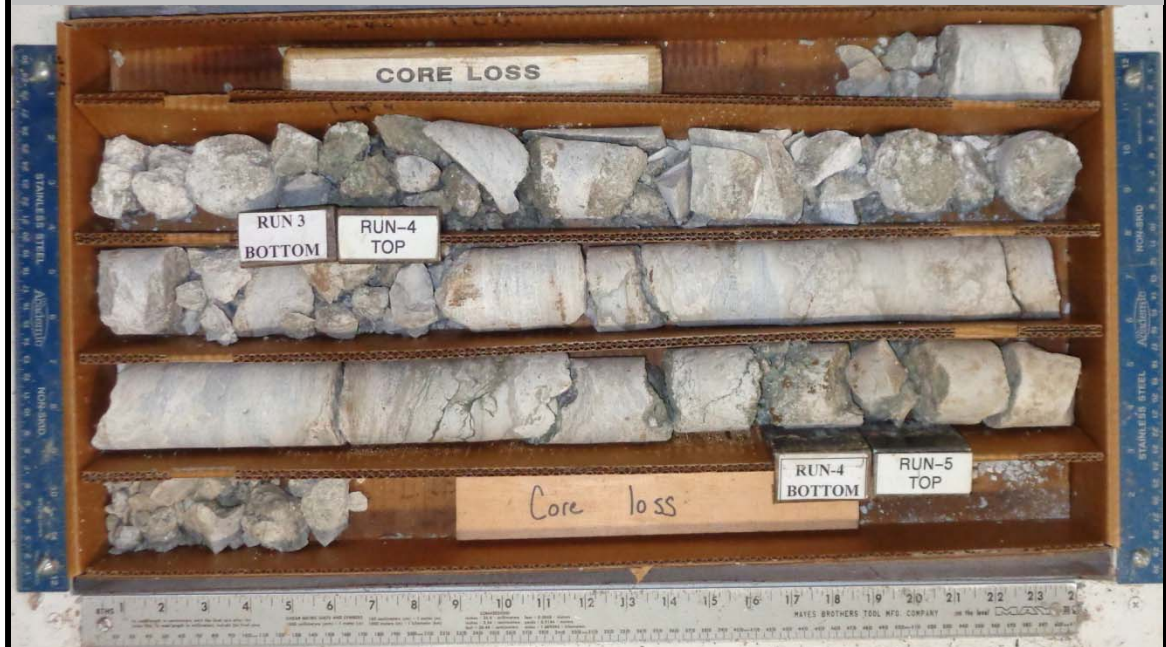
<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
8	Cont.-122.5	100	45

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-303
Box 1 of 3**BORING B-303**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
1	88.5-91.0	73	0
2	91.0-96.0	67	22
3	96.0-Cont.	32	0

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-303
Box 2 of 3**BORING B-303**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
3	Cont.-101.0	32	0
4	101.0-106.0	100	50
5	106.0-Cont.	60	13

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-303
Box 3 of 3**BORING B-303**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
5	Cont.-111.0	60	13
6	111.0-116.0	100	75
7	116.0-118.0	100	71

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-401
Box 1 of 1**BORING B-401**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
1	81.0-85.0	90	10
2	85.0-90.0	47	18
3	90.0-91.0	100	100

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-503
Box 1 of 2**BORING B-503**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
1	83.5-85.0	61	0
2	85.0-90.0	77	0
3	90.0-Cont.	100	27

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-503
Box 2 of 2**BORING B-503**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
3	Cont.-95.0	100	27

J024691.01

David Hoekel Parkway
Wentzville, MissouriB-603
Box 1 of 2**BORING B-603**

<u>RUN</u>	<u>DEPTH, FT</u>	<u>RECOVERY, %</u>	<u>RQD, %</u>
1	86.0-89.5	40	12
2	89.5-94.5	58	8
3	94.5-Cont.	100	87

J024691.01

David Hoekel Parkway
Wentzville, Missouri

B-603
Box 2 of 2



BORING B-603

RUN
3

DEPTH, FT
Cont.-99.5

RECOVERY, %
100

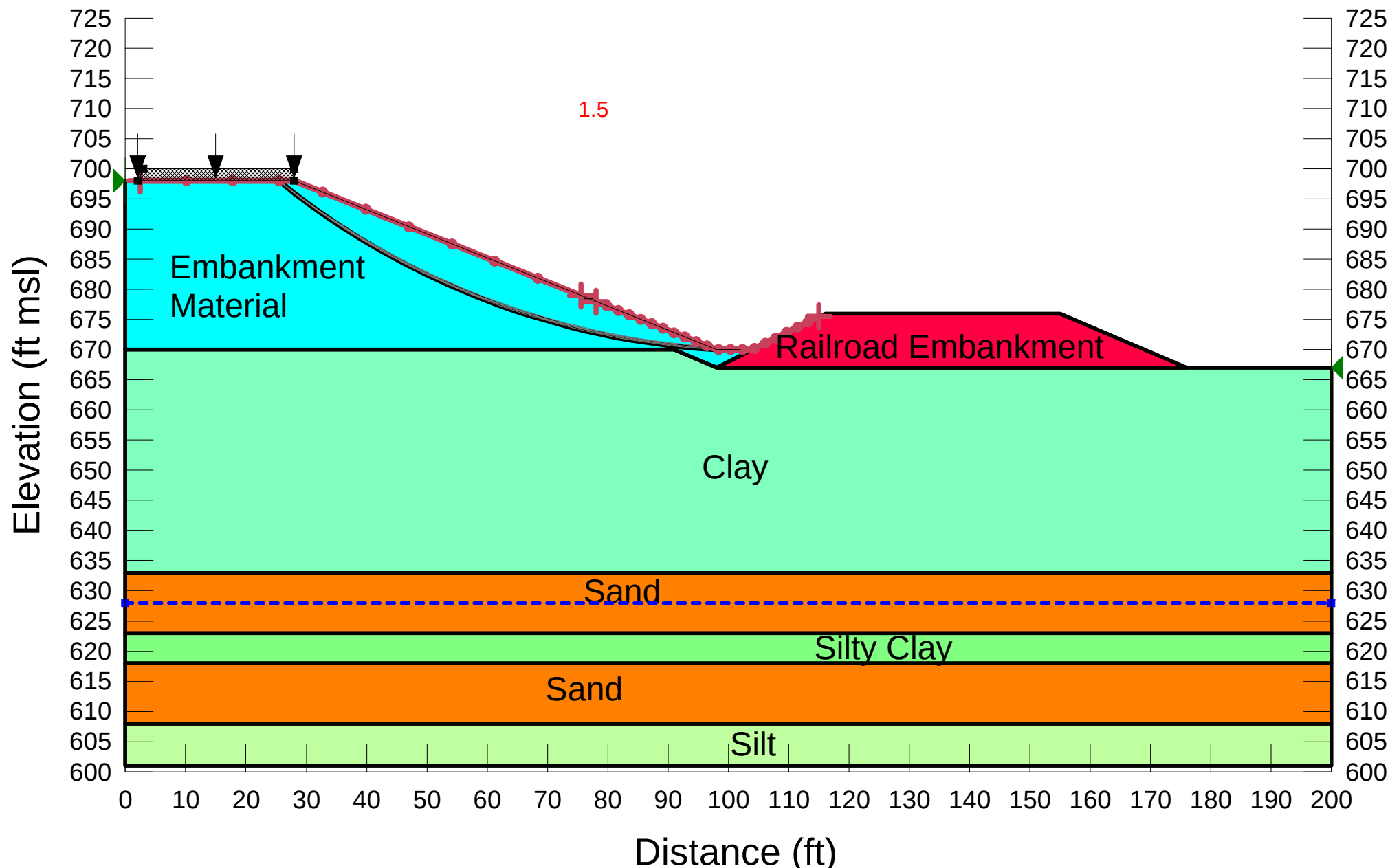
RQD, %
87

APPENDIX D

SLOPE STABILITY ANALYSIS RESULTS

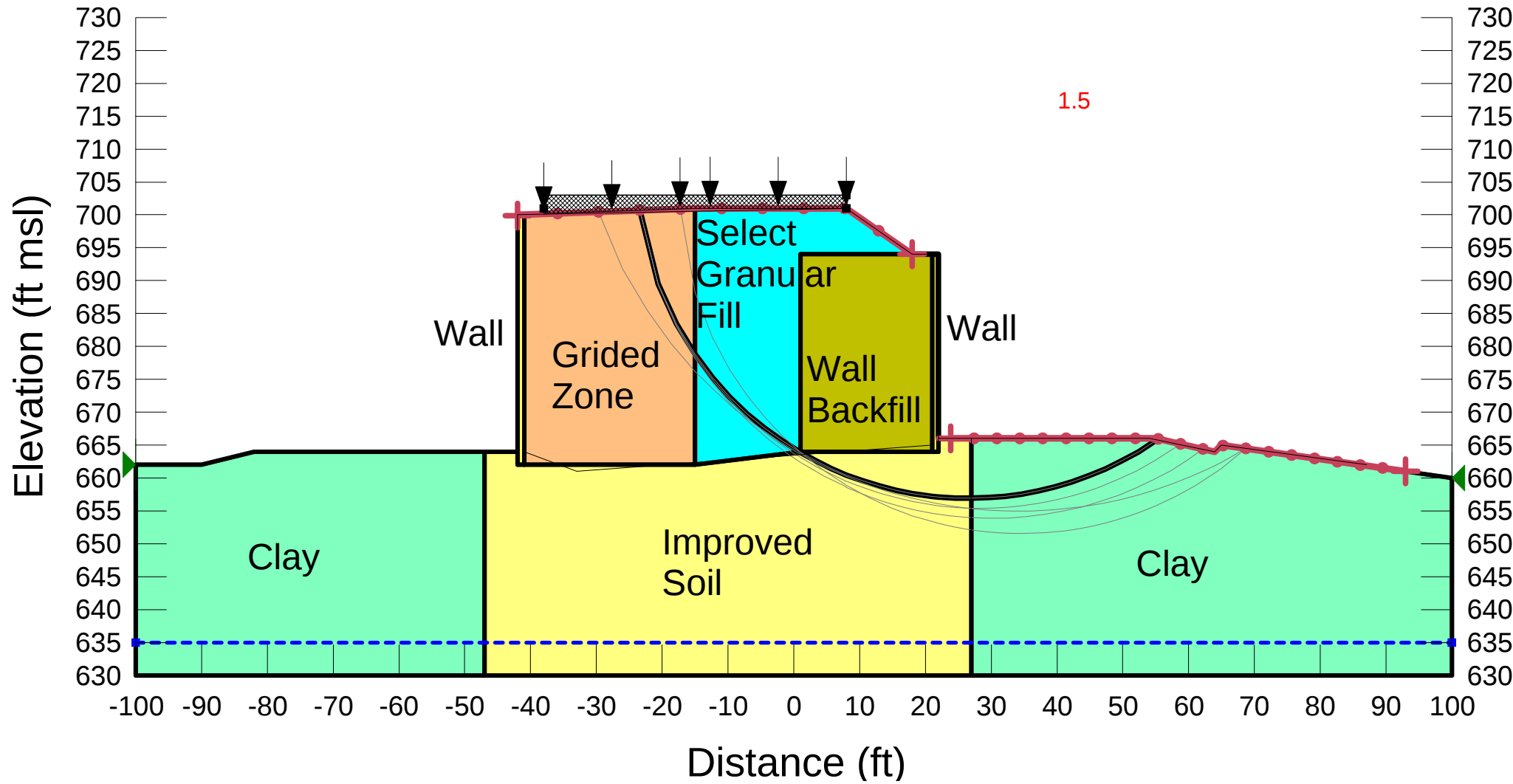
David Hoekel Parkway
Phase 2A, B, and C
J024691.01
Sta 67+00.00
2.5:1 Embankment

Section AA'



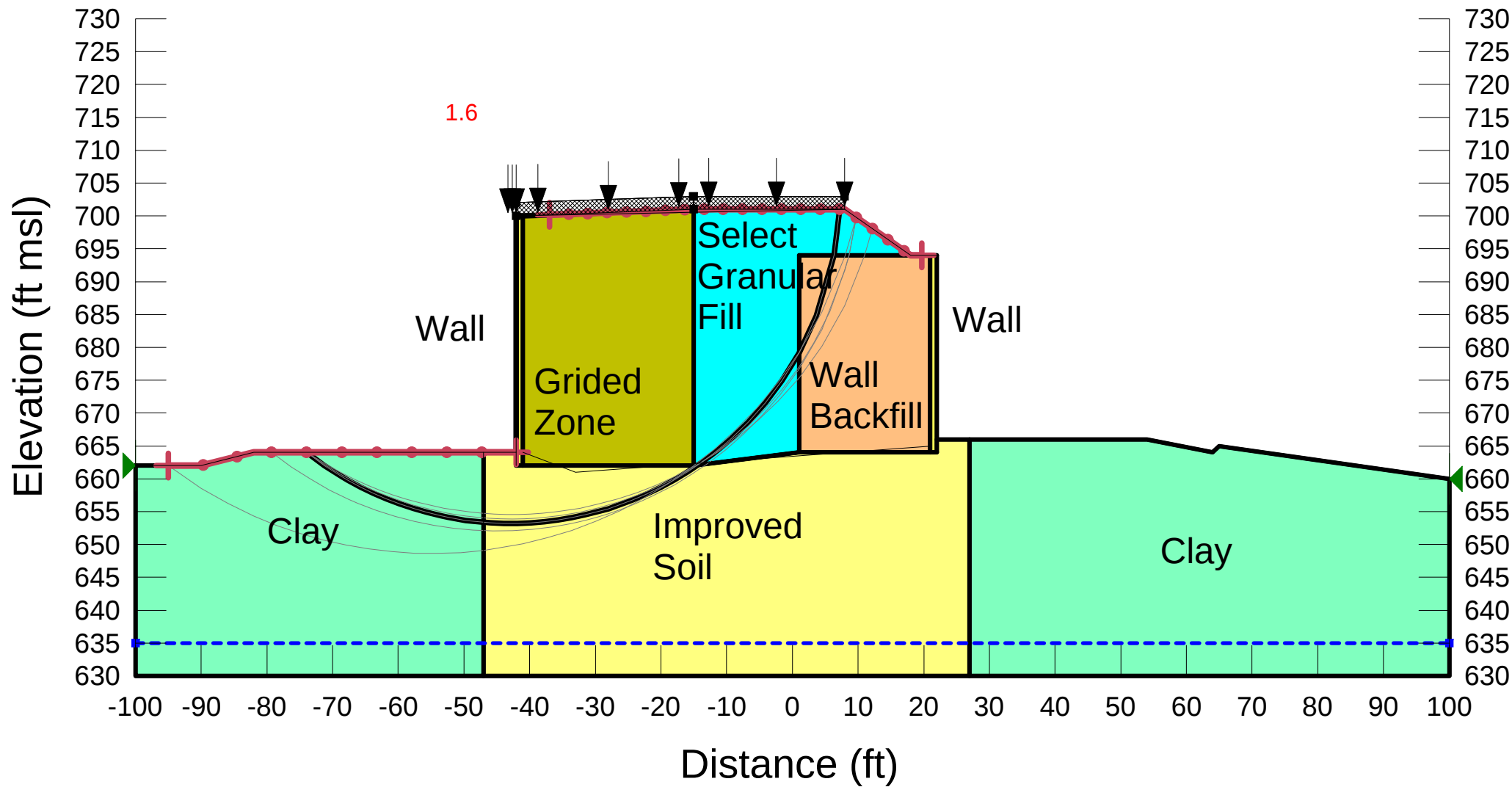
David Hoekel Parkway
Phase 2A, B, and C
J024691.01
Sta 138+50.00
Wall A8513

Section BB'



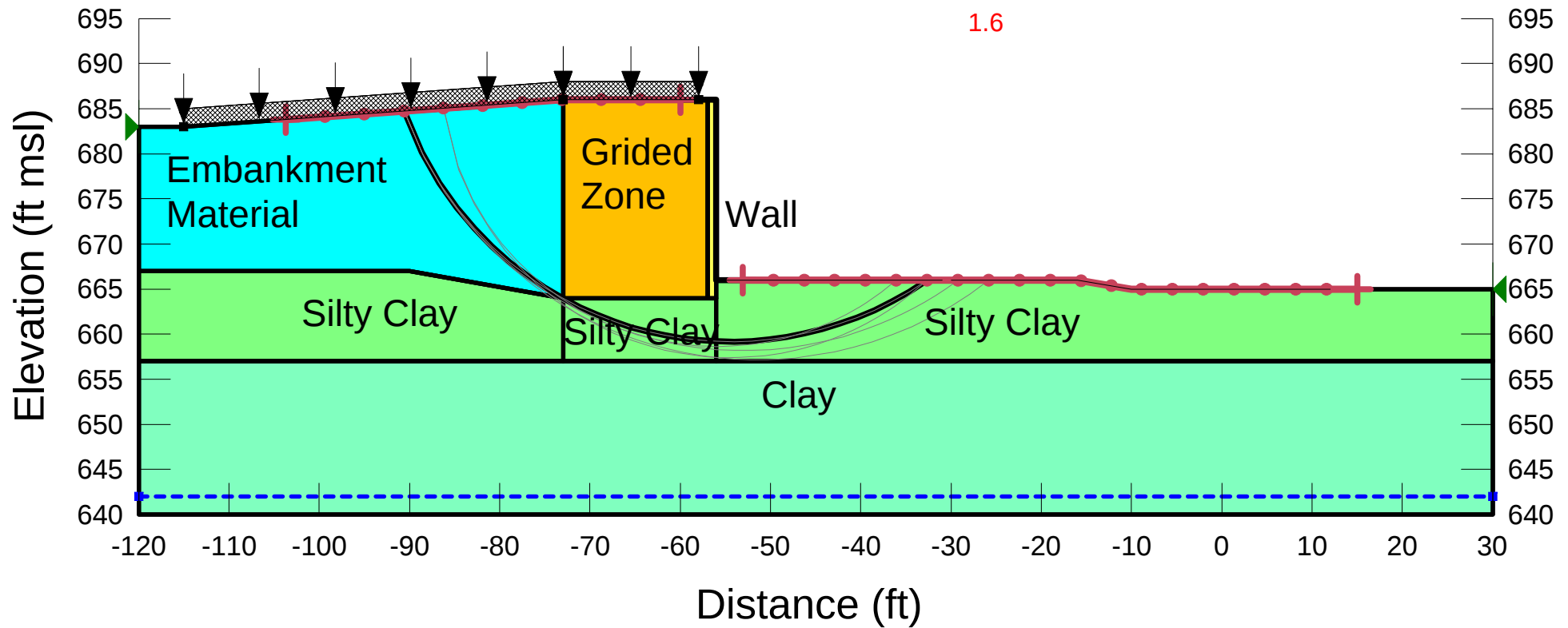
David Hoekel Parkway
Phase 2A, B, and C
J024691.01
Sta 138+50.00
Wall A8515

Section BB'



David Hoekel Parkway
Phase 2A, B, and C
J024691.01
Wall A8516

Section CC'

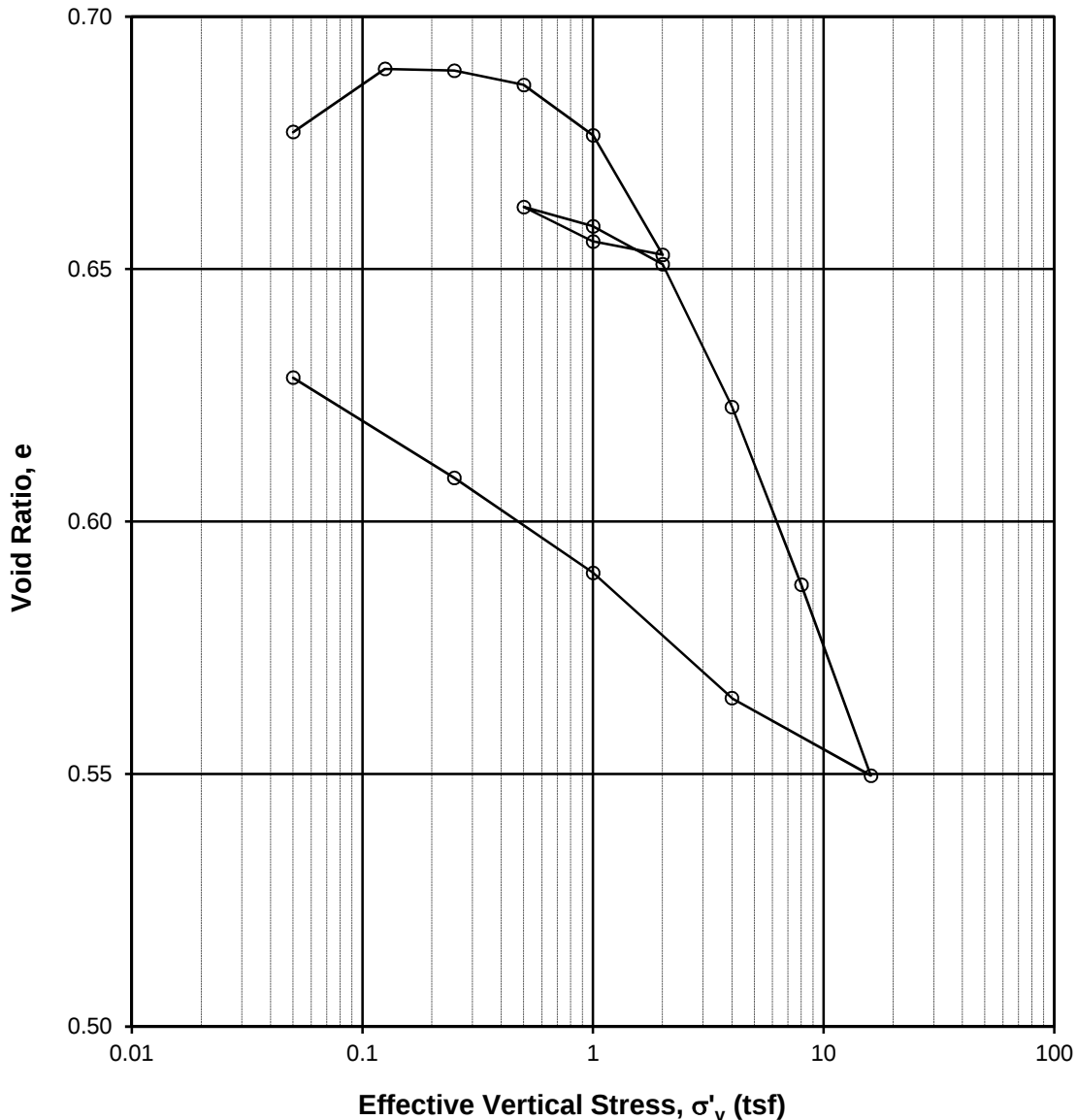


APPENDIX E

CONSOLIDATION TEST RESULTS

Liquid Limit= 79 Plastic Limit= 23 Plastic Index = 56 USCS: CH

Compression Index, C_c = 0.121 Void Ratio, e_0 = 0.68
Recompression Index, C_r = 0.018 Preconsolidation Pressure = 1.7 tsf



1-D CONSOLIDATION TEST: INCREMENTAL

ASTM D 2435

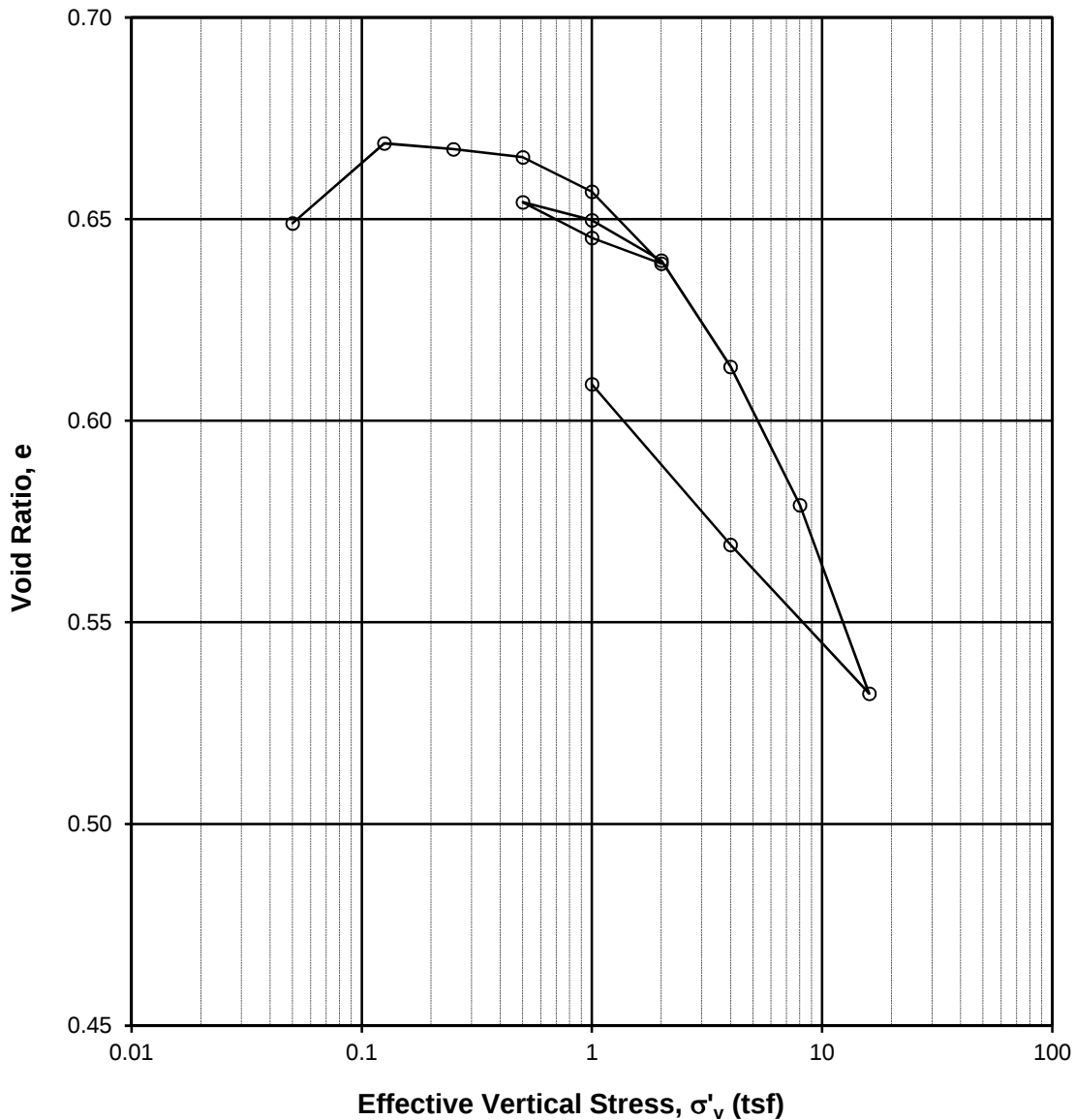
Project No.: J024691.01

Boring: B-103

Sample: ST1 - Depth: 3-5

Liquid Limit= 68 Plastic Limit= 21 Plastic Index = 47 USCS: CH

Compression Index, C_c = 0.135 Void Ratio, e_o = 0.67
 Recompression Index, C_r = 0.02 Preconsolidation Pressure = 2.1 tsf



1-D CONSOLIDATION TEST: INCREMENTAL

ASTM D 2435

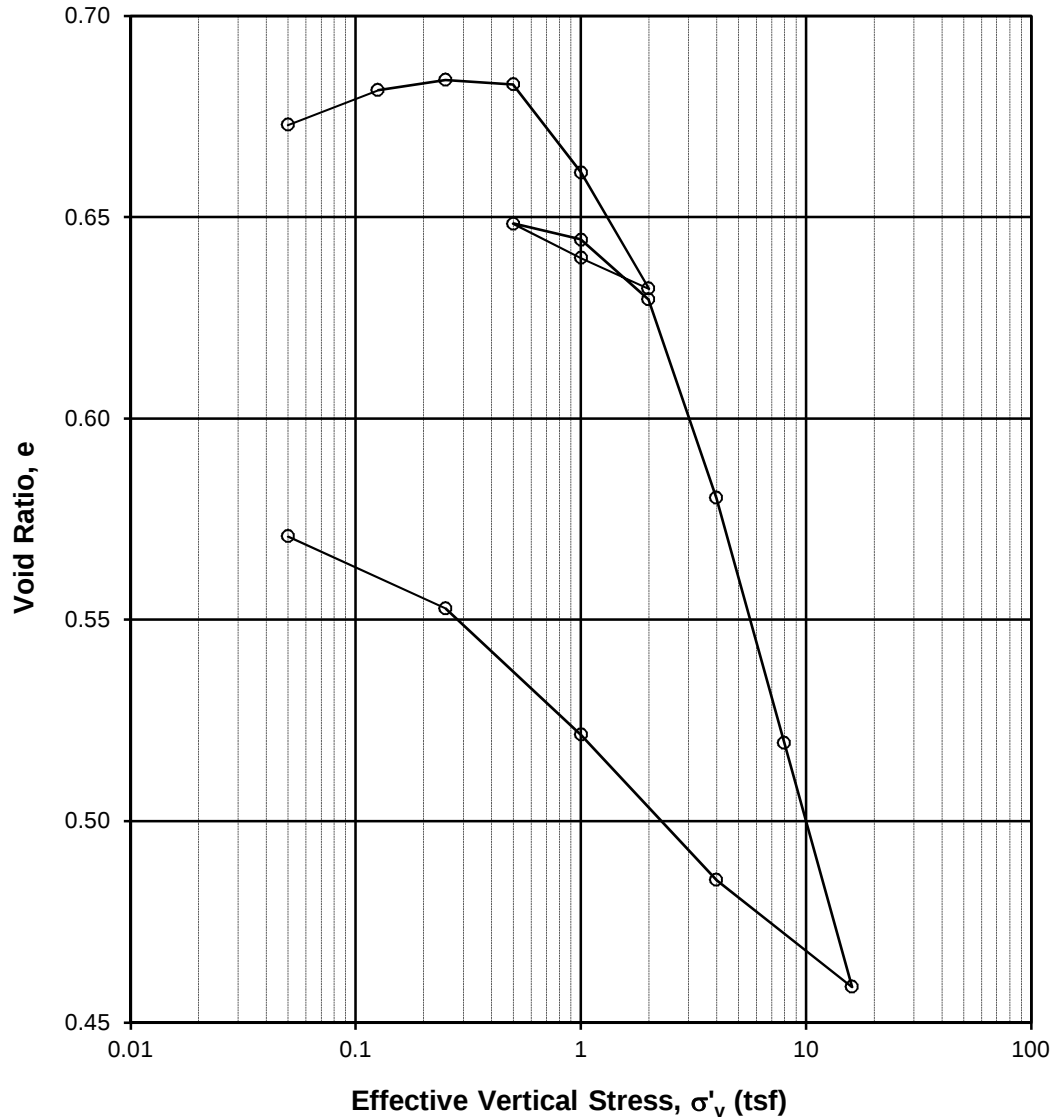
Project No.: J024691.01

Boring: B-303

Sample: ST-4 - Depth: 18-20

Liquid Limit= 95 Plastic Limit= 22 Plastic Index = 73 USCS: CH

Compression Index, C_c = 0.199 Void Ratio, e_0 = 0.67
 Recompression Index, C_r = 0.03 Preconsolidation Pressure = 1.9 tsf



1-D CONSOLIDATION TEST: INCREMENTAL

ASTM D 2435

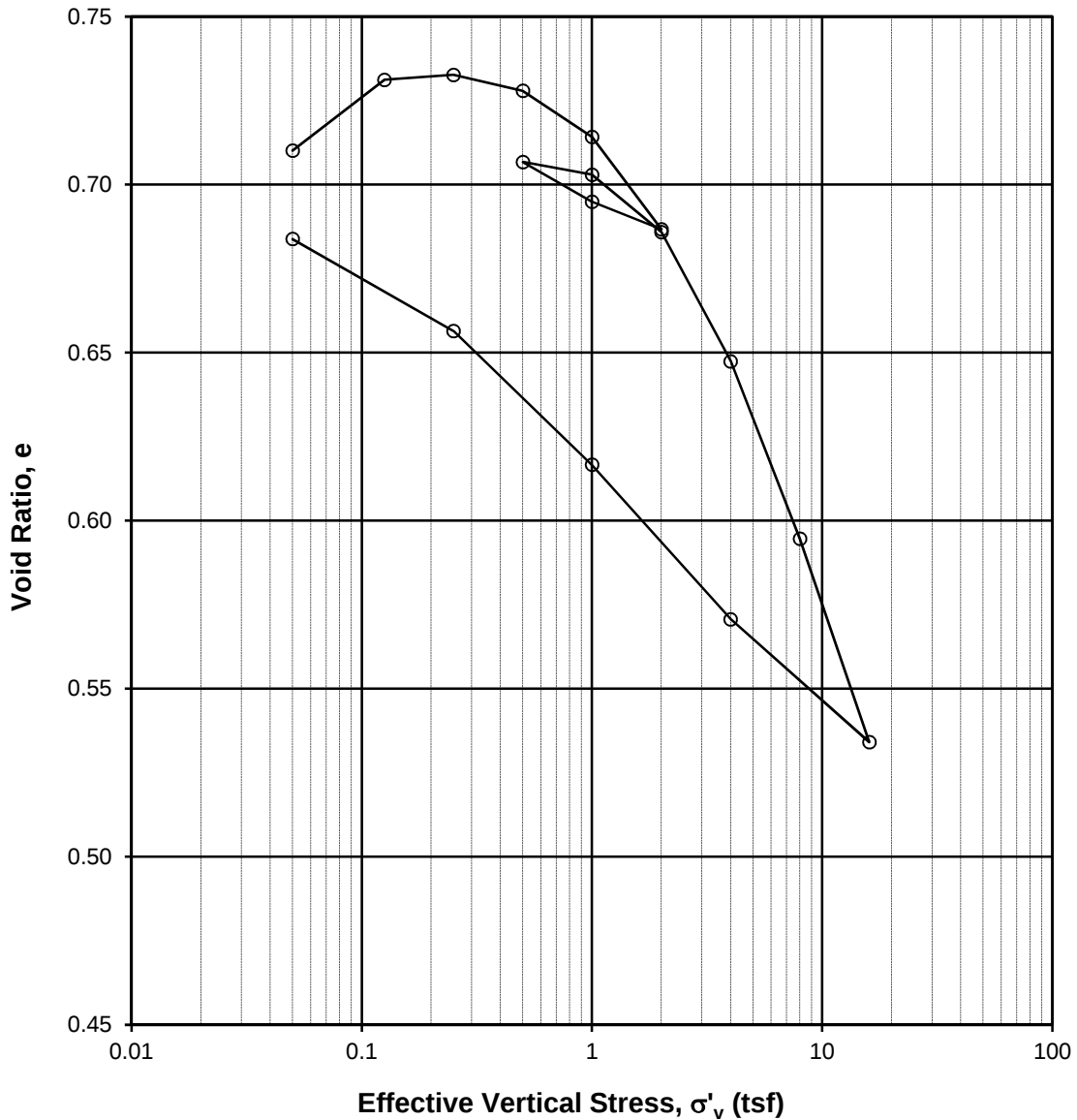
Project No.: J024691.01

Boring: B-720

Sample: ST2 - Depth: 3-5

Liquid Limit= 81 Plastic Limit= 21 Plastic Index = 60 USCS: CH

Compression Index, C_c = 0.203 Void Ratio, e_0 = 0.71
 Recompression Index, C_r = 0.036 Preconsolidation Pressure = 2.8 tsf



1-D CONSOLIDATION TEST: INCREMENTAL

ASTM D 2435

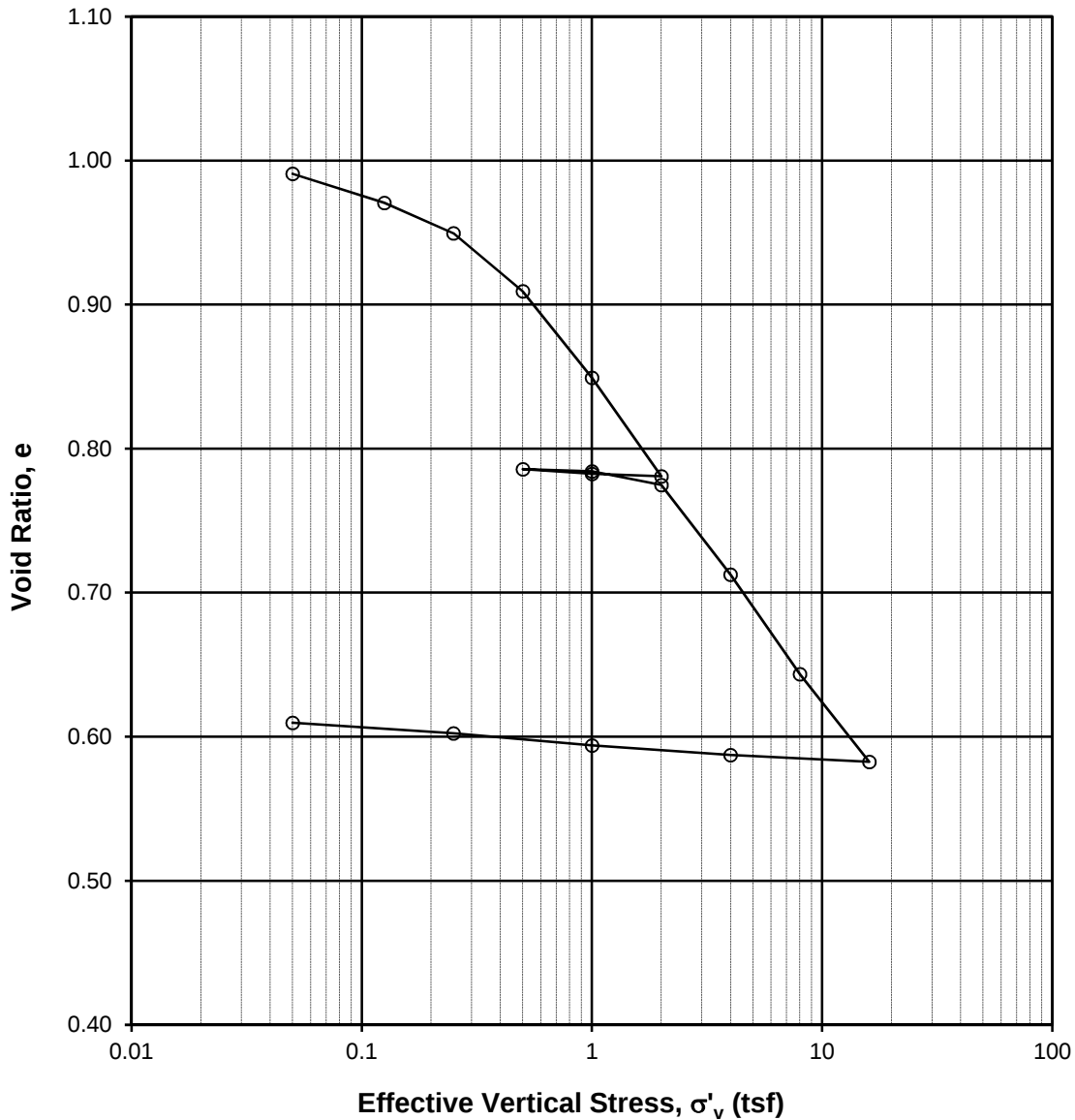
Project No.: J024691.01

Boring: B-809

Sample: ST2 - Depth: 3-5

Liquid Limit= 36 Plastic Limit= 21 Plastic Index = 15 USCS: CL

Compression Index, C_c = 0.214 Void Ratio, e_o = 0.99
Recompression Index, C_r = 0.018 Preconsolidation Pressure = 0.4 tsf



1-D CONSOLIDATION TEST: INCREMENTAL

ASTM D 2435

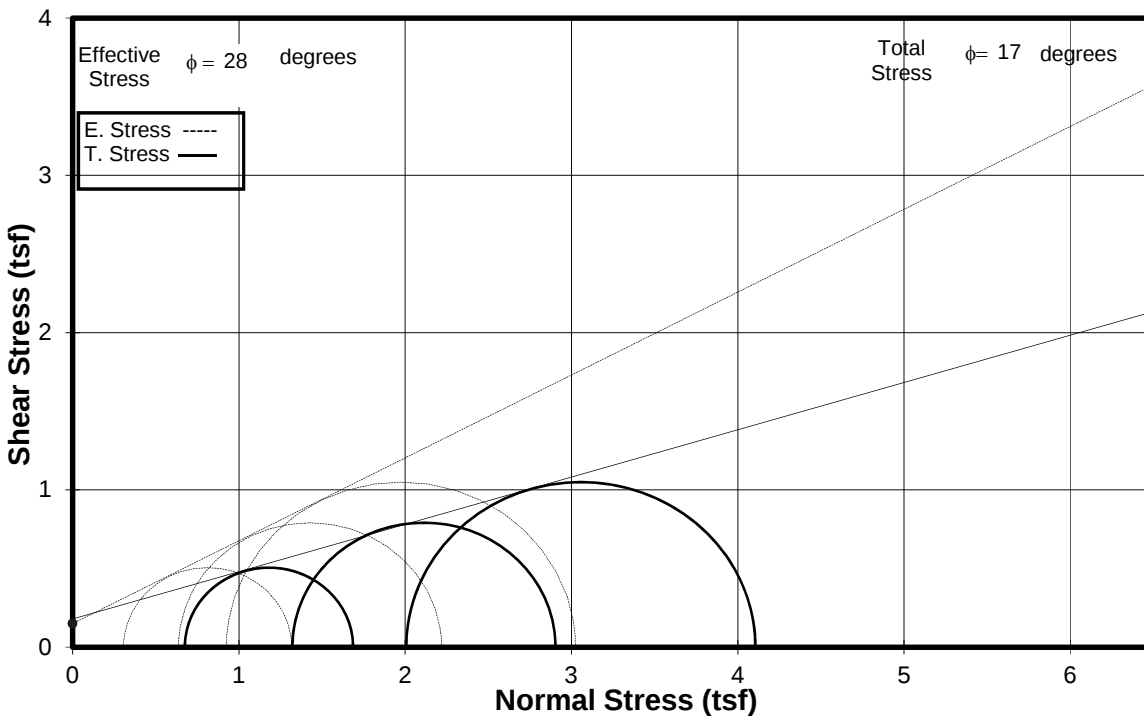
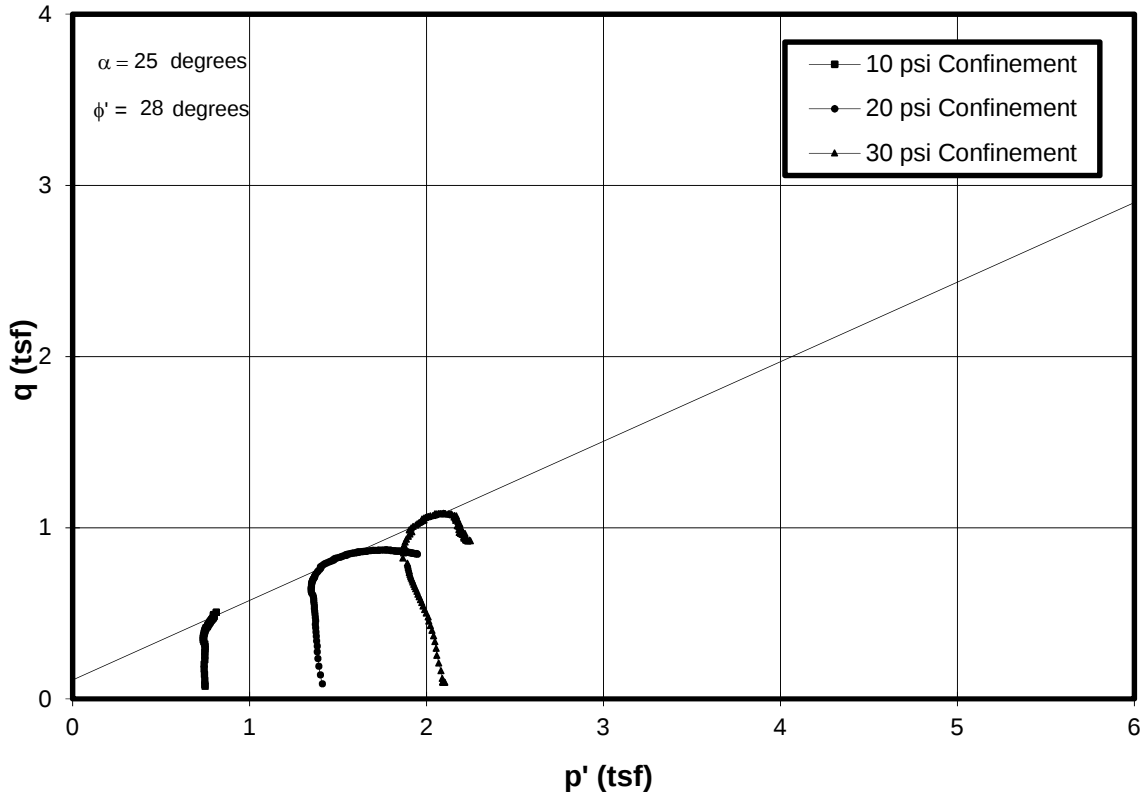
Project No.: J024691.01

Boring: B-901

Sample: ST-2 - Depth: 3-5

APPENDIX F

**CONSOLIDATED UNDRAINED TRIAXIAL
COMPRESSION TEST RESULTS**



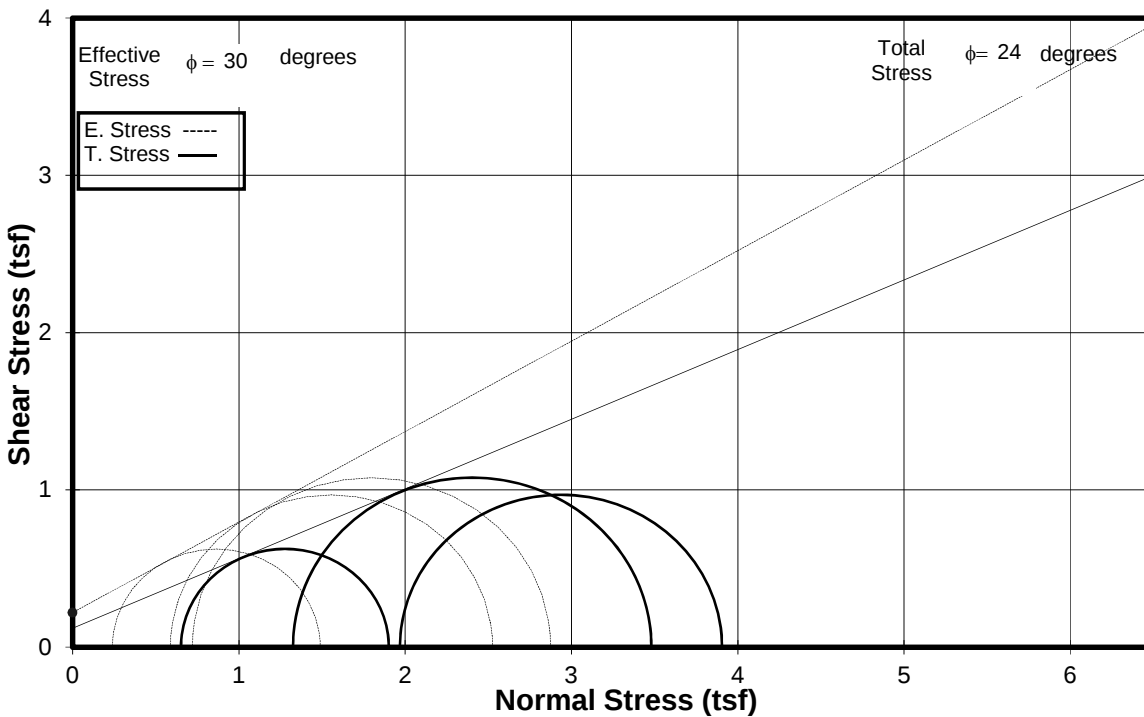
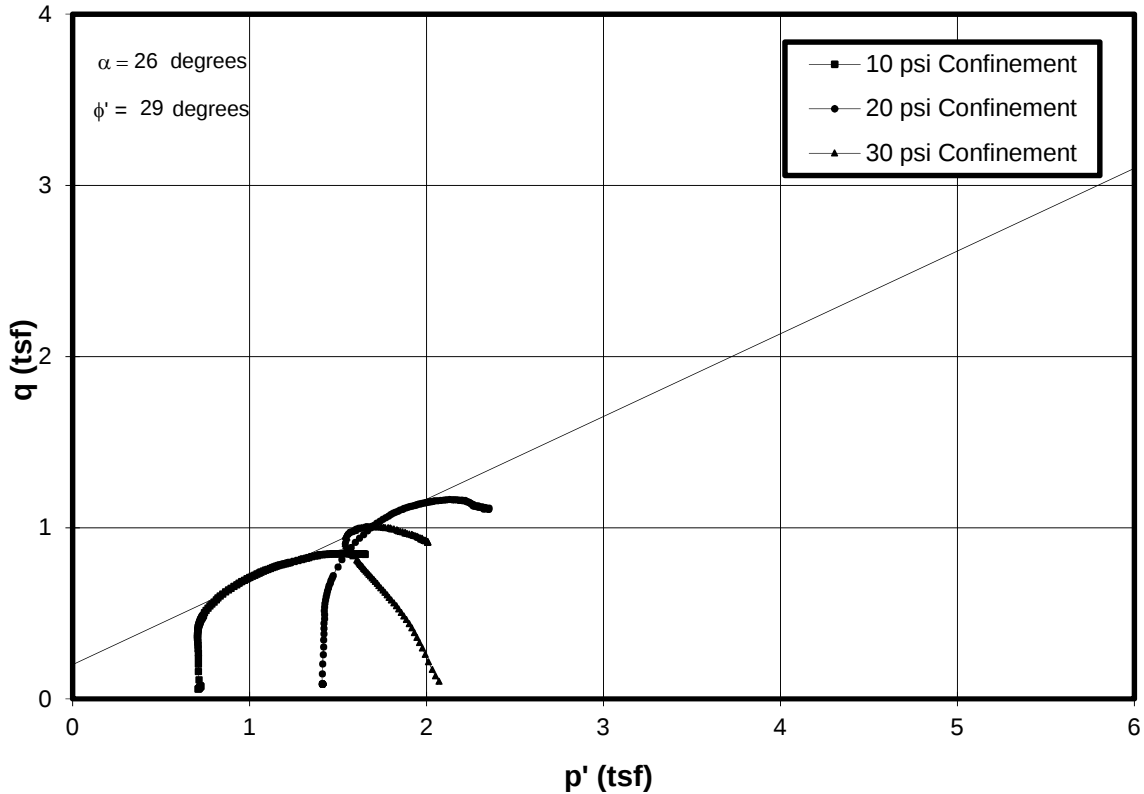
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 4767

Project No.: J024691.01

Boring: B-401A

Sample: ST1 - Depth: 8-10



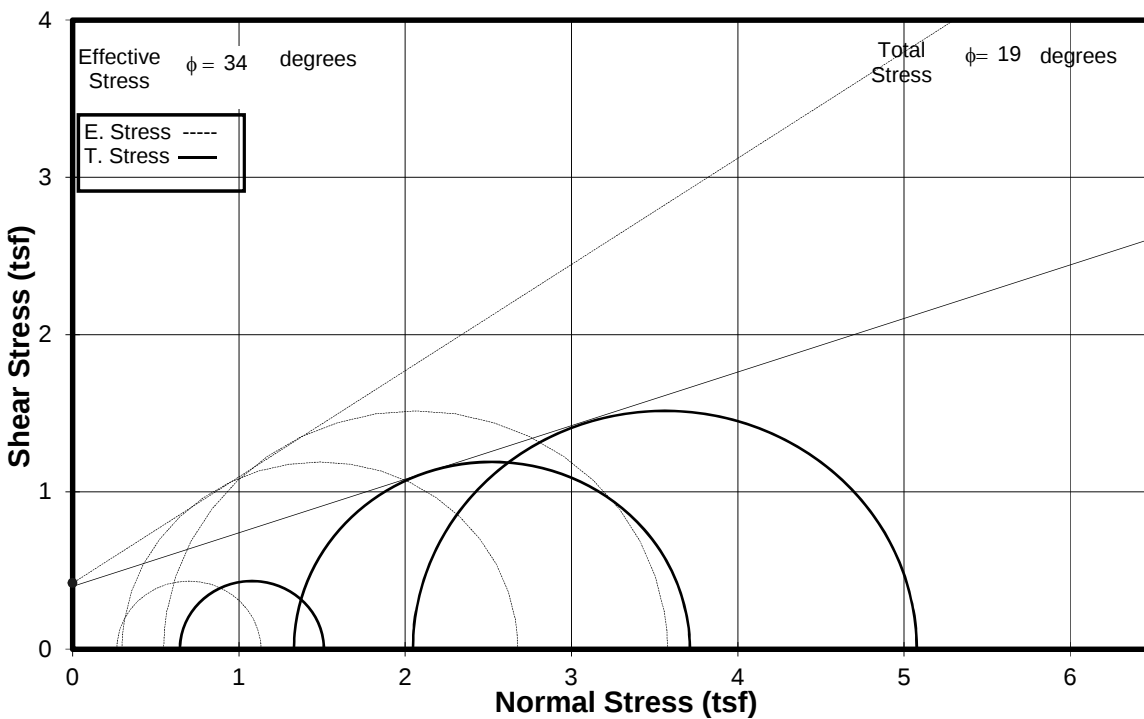
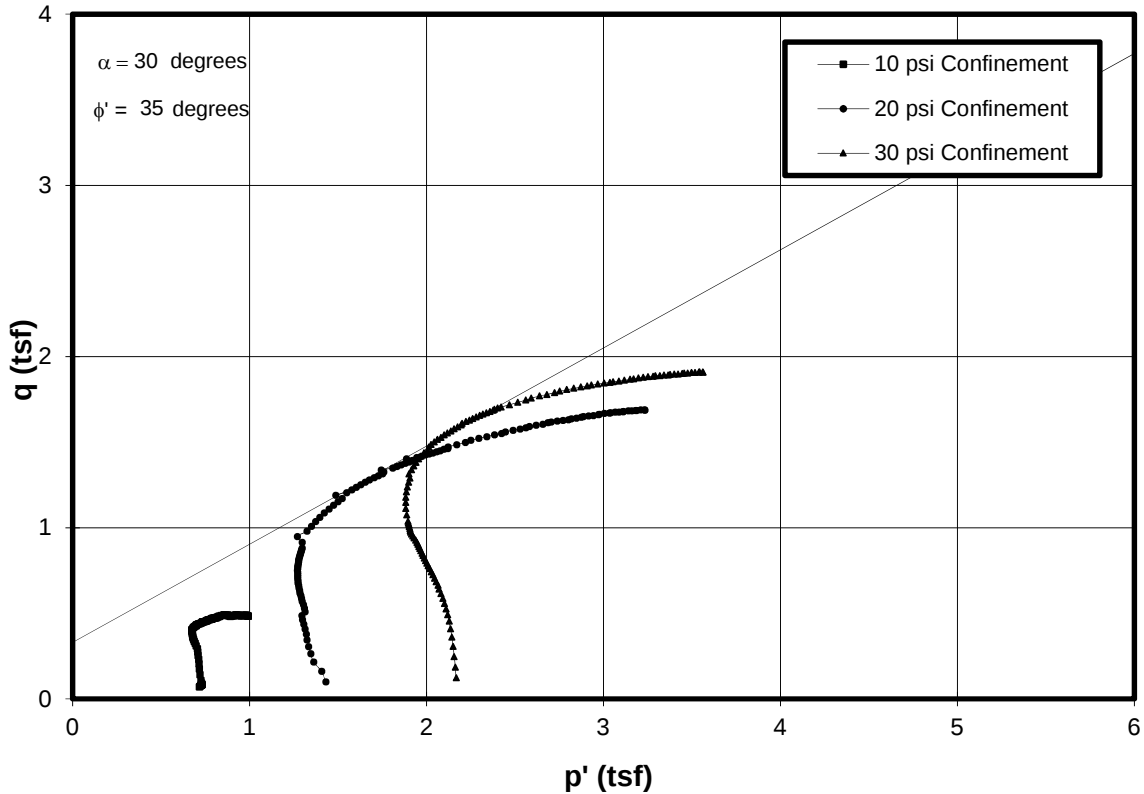
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 4767

Project No.: J024691.01

Boring: B-707, B-707, B-707

Sample: ST3, ST3, ST4 - Depth: 6-8, 6-8, 8-10



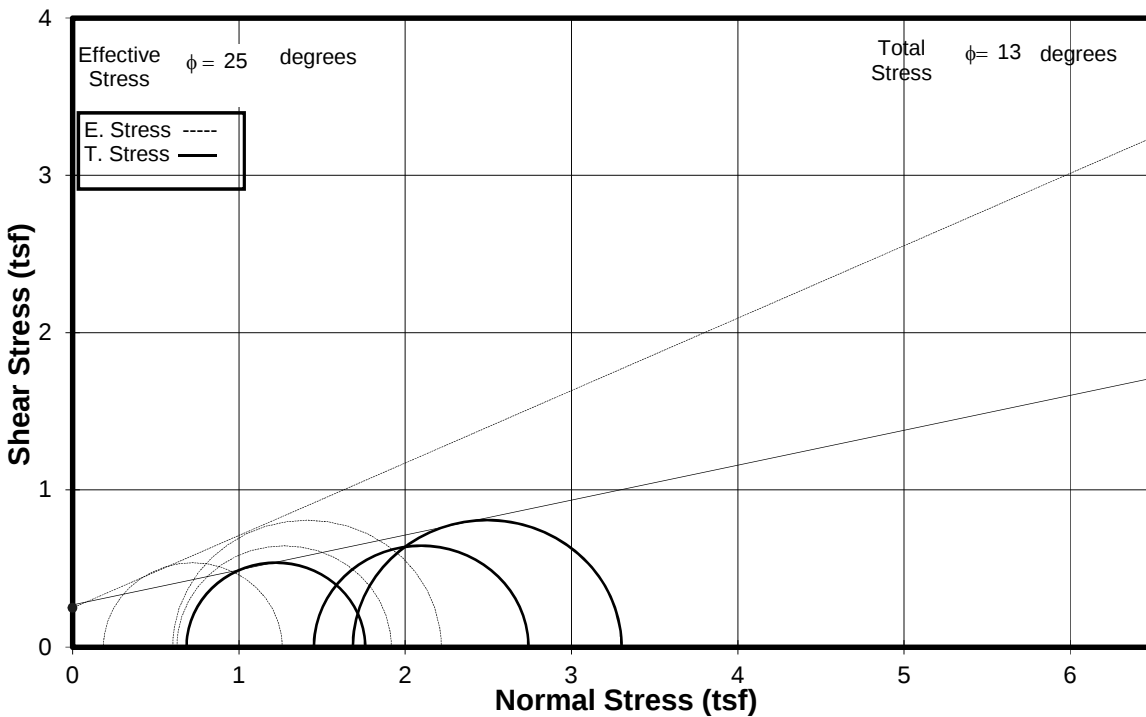
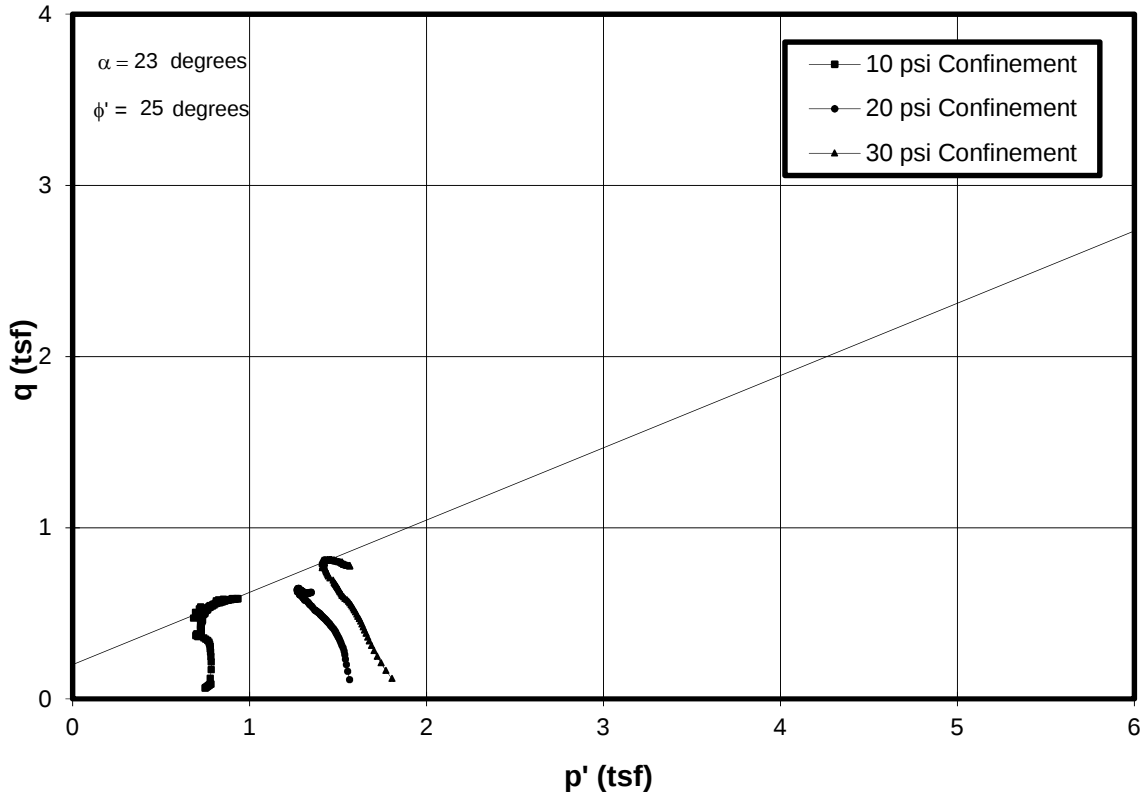
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 4767

Project No.: J024691.01

Boring: B-805, B-805, B-805

Sample: ST2, ST3, ST3 - Depth: 3-5, 6-8, 6-8



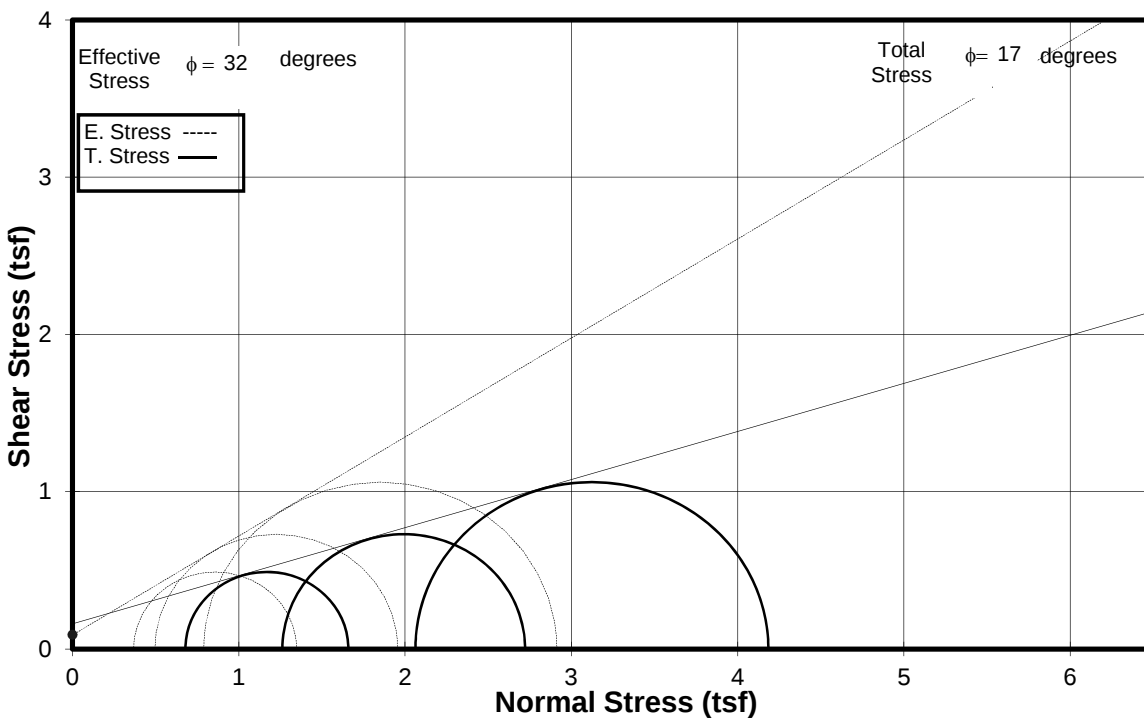
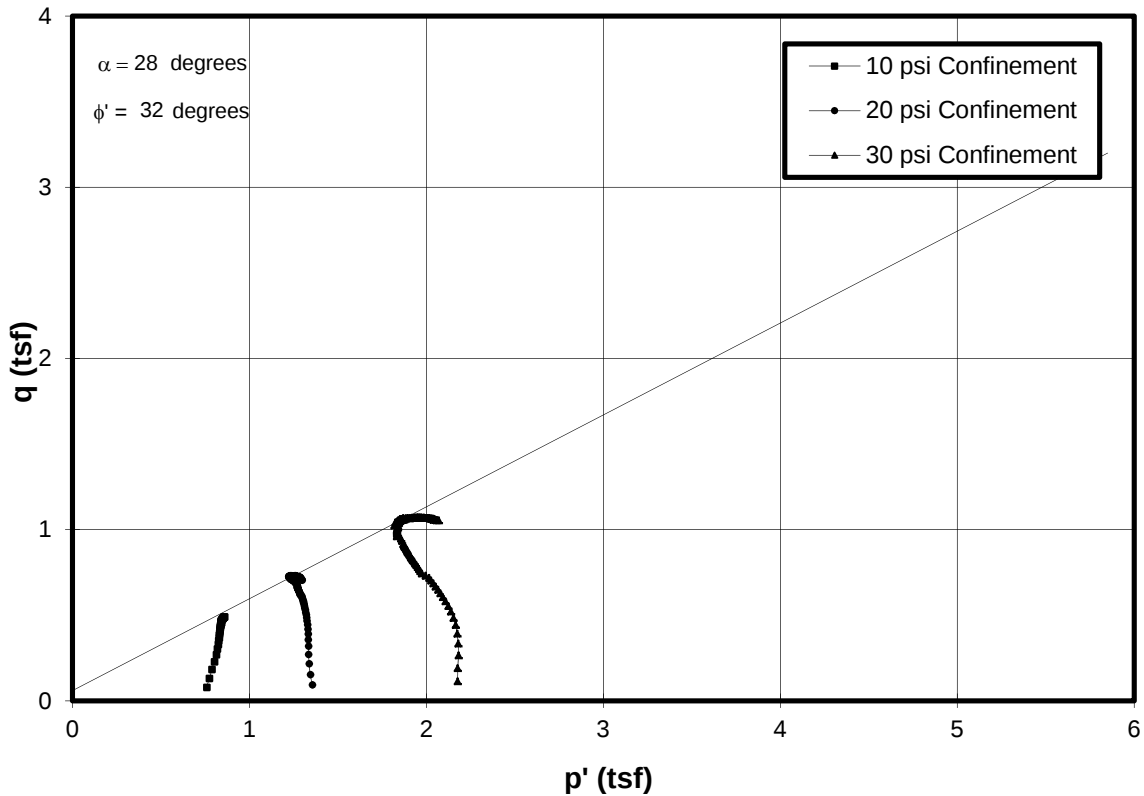
CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 4767

Project No.: J024691.01

Boring: B-810, B-810, B-810

Sample: ST1, ST2, ST2 - Depth: 1-3, 3-5, 3-5



CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 4767

Project No.: J024691.01

Boring: B-902, B-902, B-603

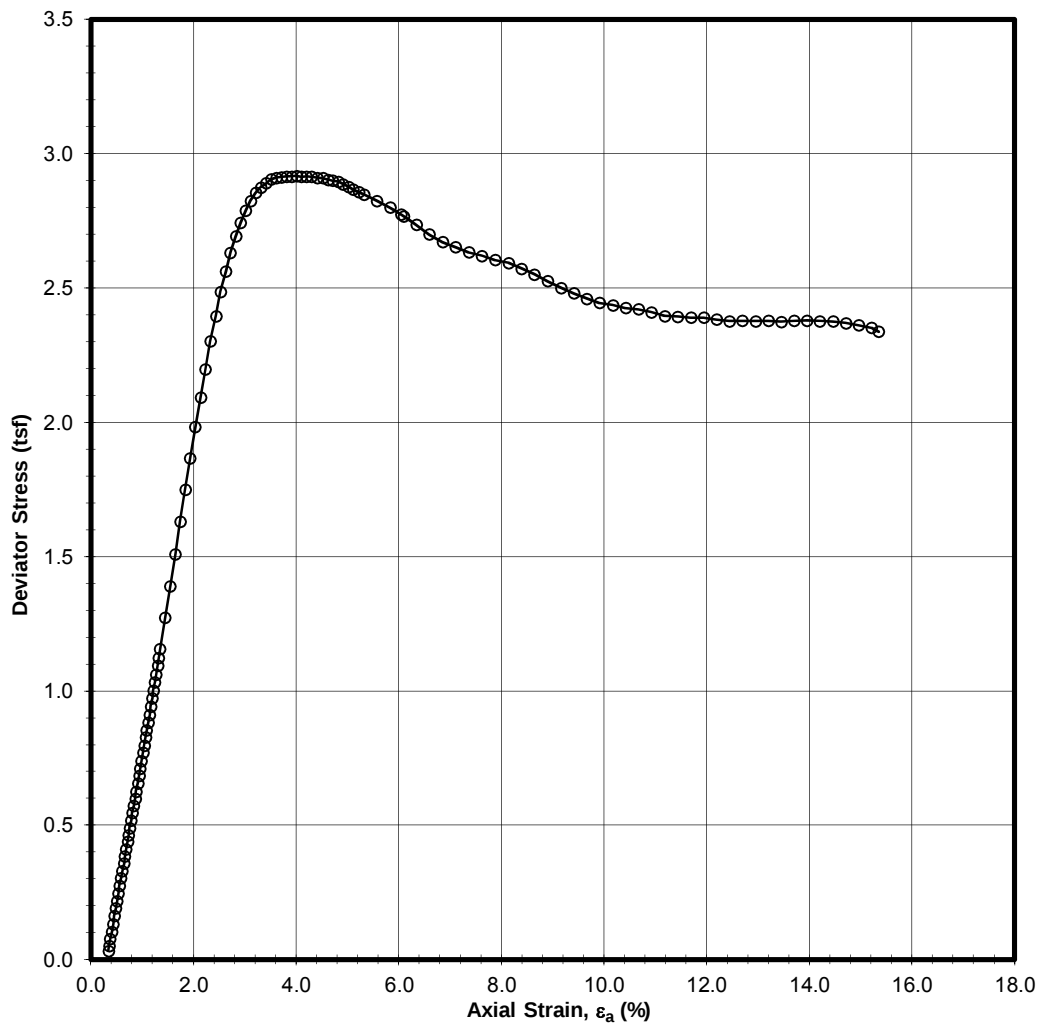
Sample: ST3, ST2, ST2 - Depth: 6-8, 6-8, 6-8

APPENDIX G

**UNCONSOLIDATED UNDRAINED TRIAXIAL
COMPRESSION TEST RESULTS**



Moisture Content (%)	17.9	Wet Density (pcf)	128.5
Shear Strength (tsf)	1.46	Dry Density (pcf)	109.0
Failure Strain (%)	4.0	ϵ_{50}	0.016



UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

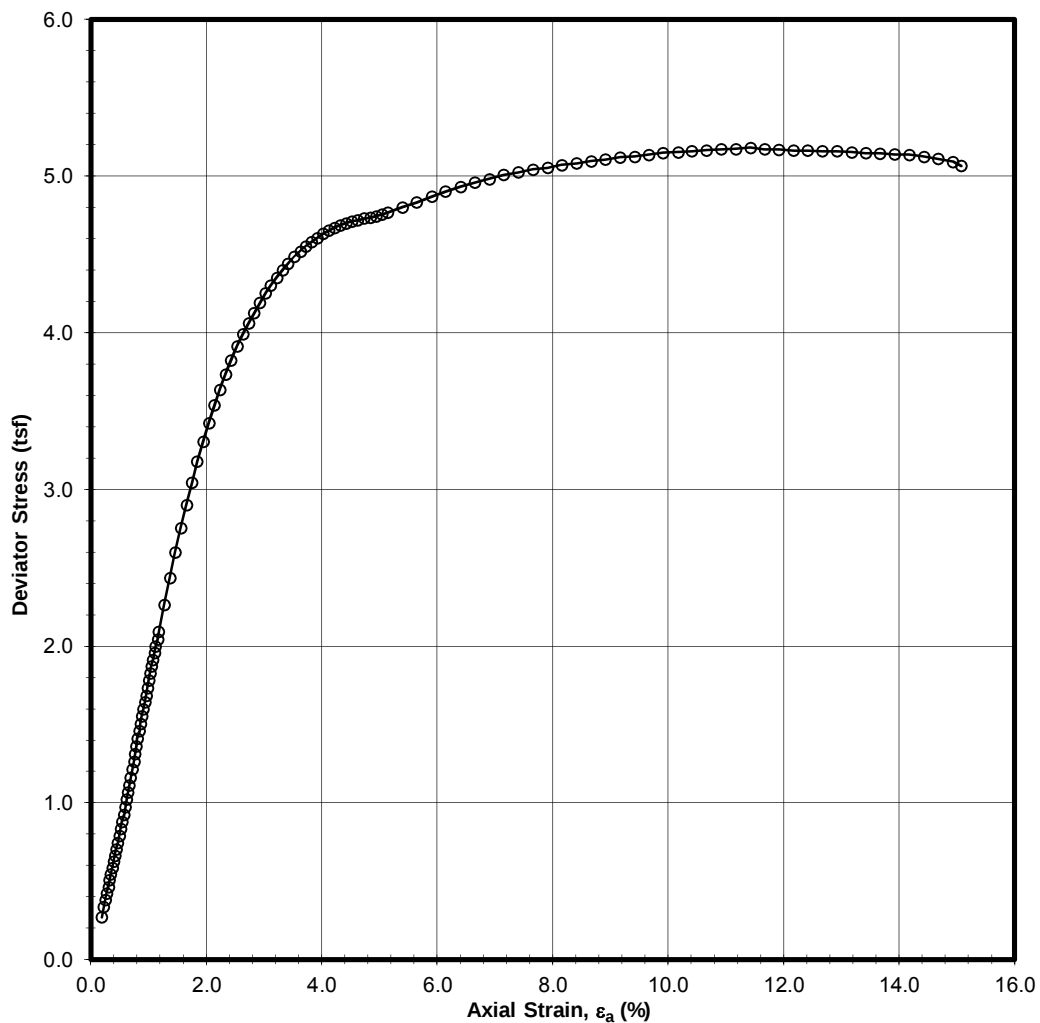
Project No.: J024691.01

Boring: B-103

Sample: ST1 - Depth: 3-5 ft.



Moisture Content (%)	16.0	Wet Density (pcf)	133.0
Shear Strength (tsf)	2.59	Dry Density (pcf)	114.6
Failure Strain (%)	11.4	ϵ_{50}	0.015



UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

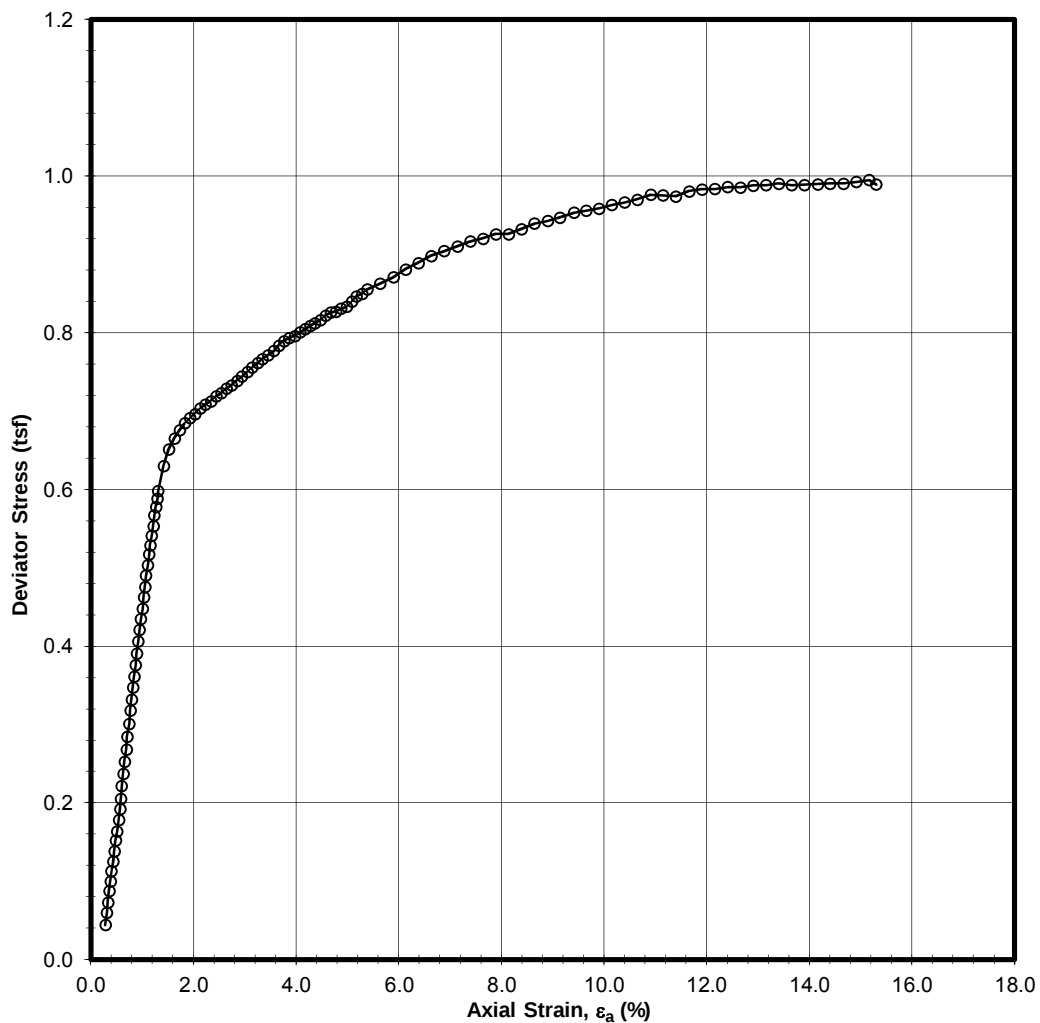
Project No.: J024691.01

Boring: B-801

Sample: ST3 - Depth: 6-8 ft.



Moisture Content (%)	27.7	Wet Density (pcf)	119.3
Shear Strength (tsf)	0.50	Dry Density (pcf)	93.4
Failure Strain (%)	15.0	ϵ_{50}	0.011



UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

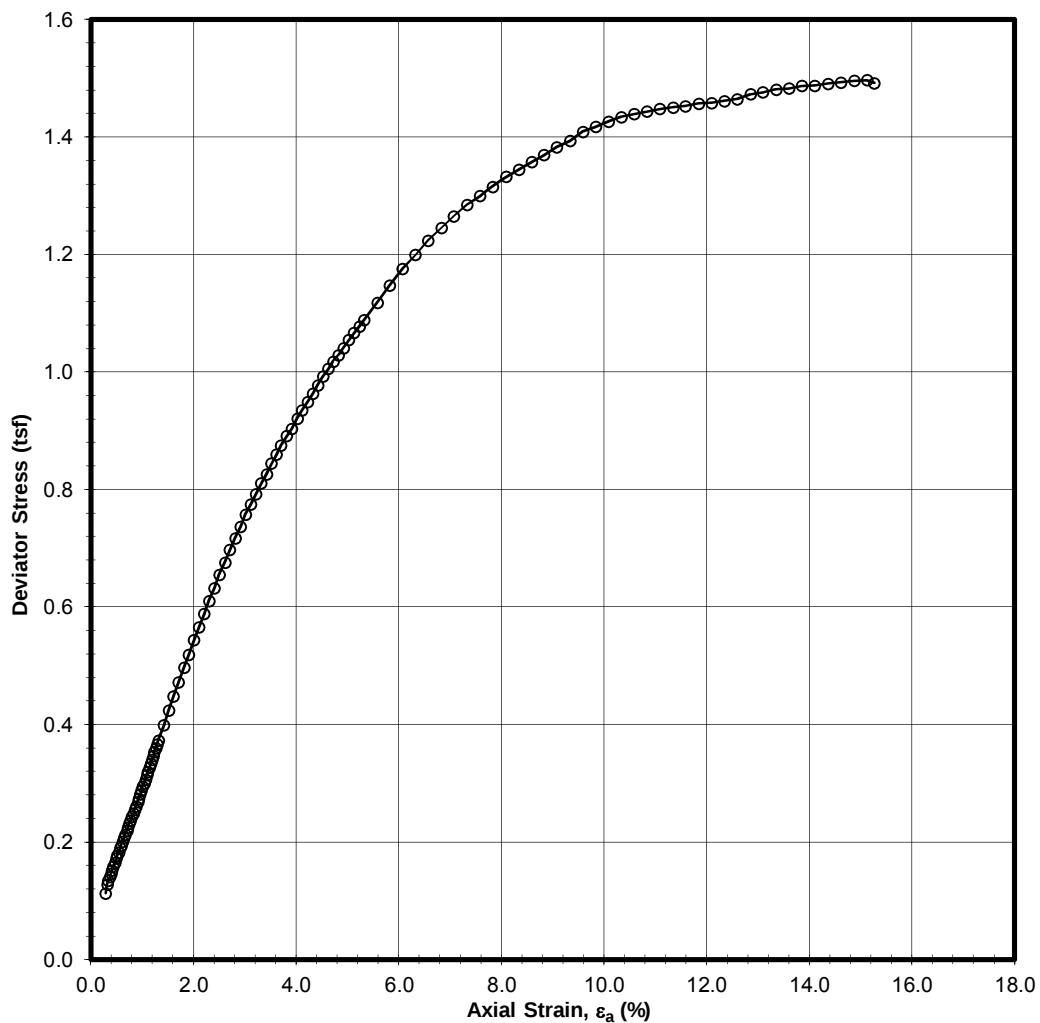
Project No.: J024691.01

Boring: B-809

Sample: ST2 - Depth: 3-5 ft.



Moisture Content (%)	25.5	Wet Density (pcf)	122.4
Shear Strength (tsf)	0.75	Dry Density (pcf)	97.5
Failure Strain (%)	15.0	ϵ_{50}	0.030



UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

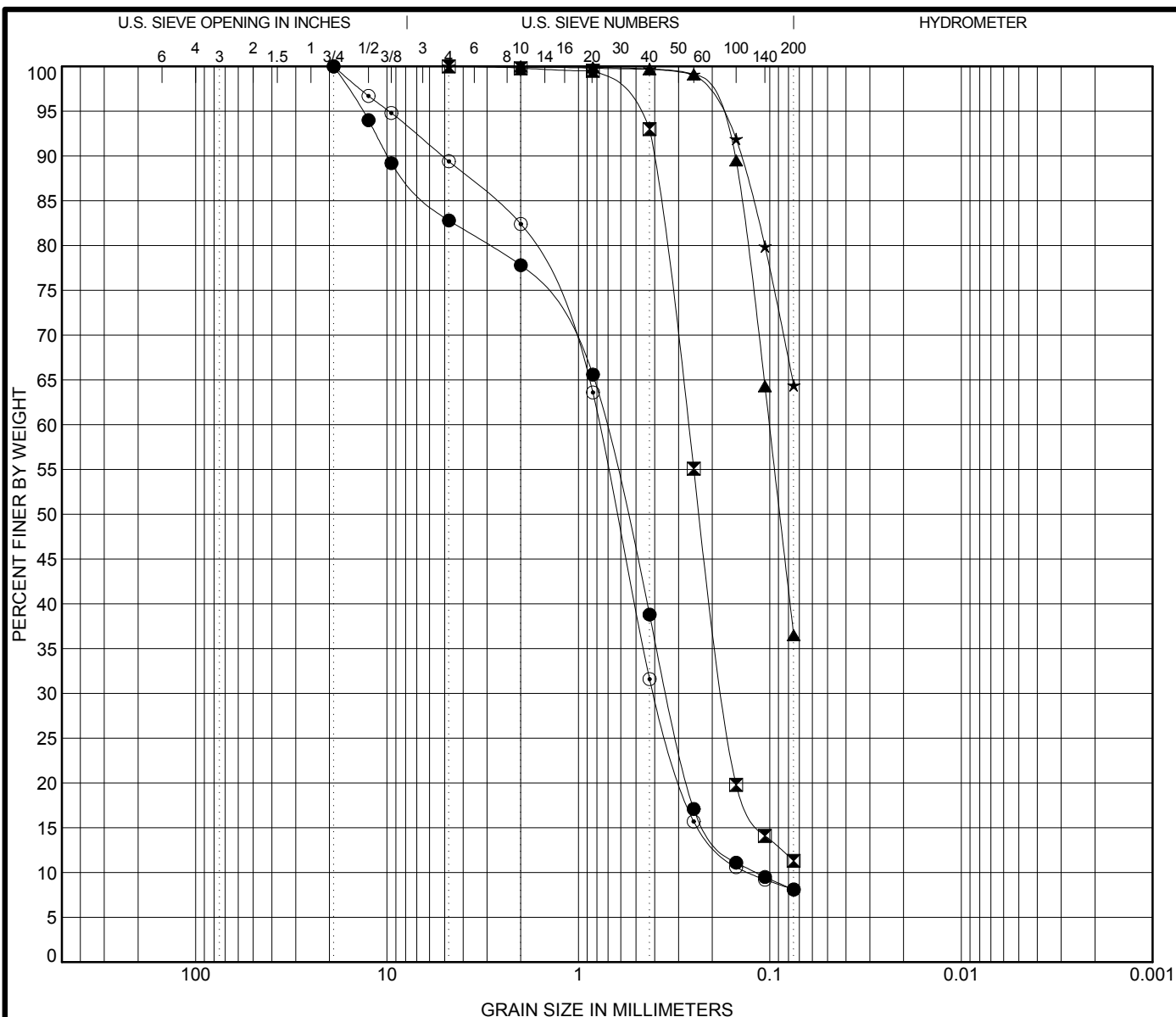
Project No.: J024691.01

Boring: B-814

Sample: ST1 - Depth: 1-3 ft.

APPENDIX H

GRAIN SIZE ANALYSIS RESULTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification					LL	PL	PI	Cc	Cu
●	B-103	38.5	Well graded SAND with clay								1.36	6.17
✕	B-201	53.5	Poorly graded SAND with clay								1.77	4.19
▲	B-303	43.5	Clayey SAND									
★	B-303	58.5	Sandy SILT									
⊙	B-603	33.5	Well graded SAND with clay								1.61	6.02
Specimen Identification			D100	D90	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-103	38.5	19	9.9	0.7	0.6	0.3	0.1	17.2	74.7	8.1	
✕	B-201	53.5	4.75	0.4	0.3	0.2	0.2		0.0	88.7	11.3	
▲	B-303	43.5	2	0.2	0.1	0.1			0.0	63.5	36.5	
★	B-303	58.5	4.75	0.1					0.0	35.6	64.4	
⊙	B-603	33.5	19	5.1	0.8	0.6	0.4	0.1	10.6	81.3	8.1	



GRAIN SIZE DISTRIBUTION

David Hoekel Parkway
Phase 2A, B, and C
Wentzville, Missouri
J024691.01

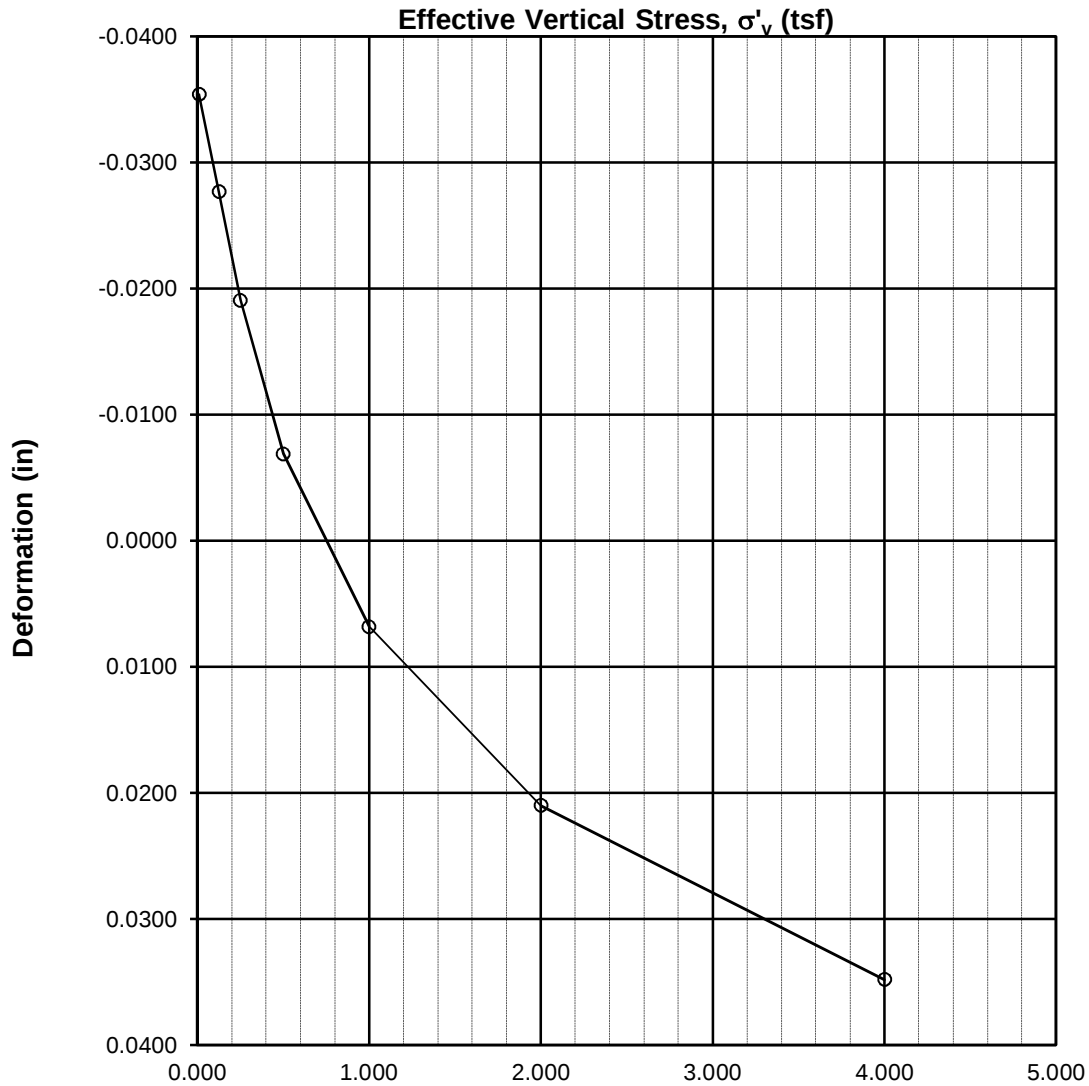
APPENDIX I

SWELL TEST RESULTS

Liquid Limit= 54 Plastic Limit= 18 Plastic Index = 36 USCS: CH

Swell Pressure (tsf) = 0.03

Swell Strain = 3.54%



1-D SWELL OF COHESIVE SOILS

ASTM D 4546

Project No.: J024691.01

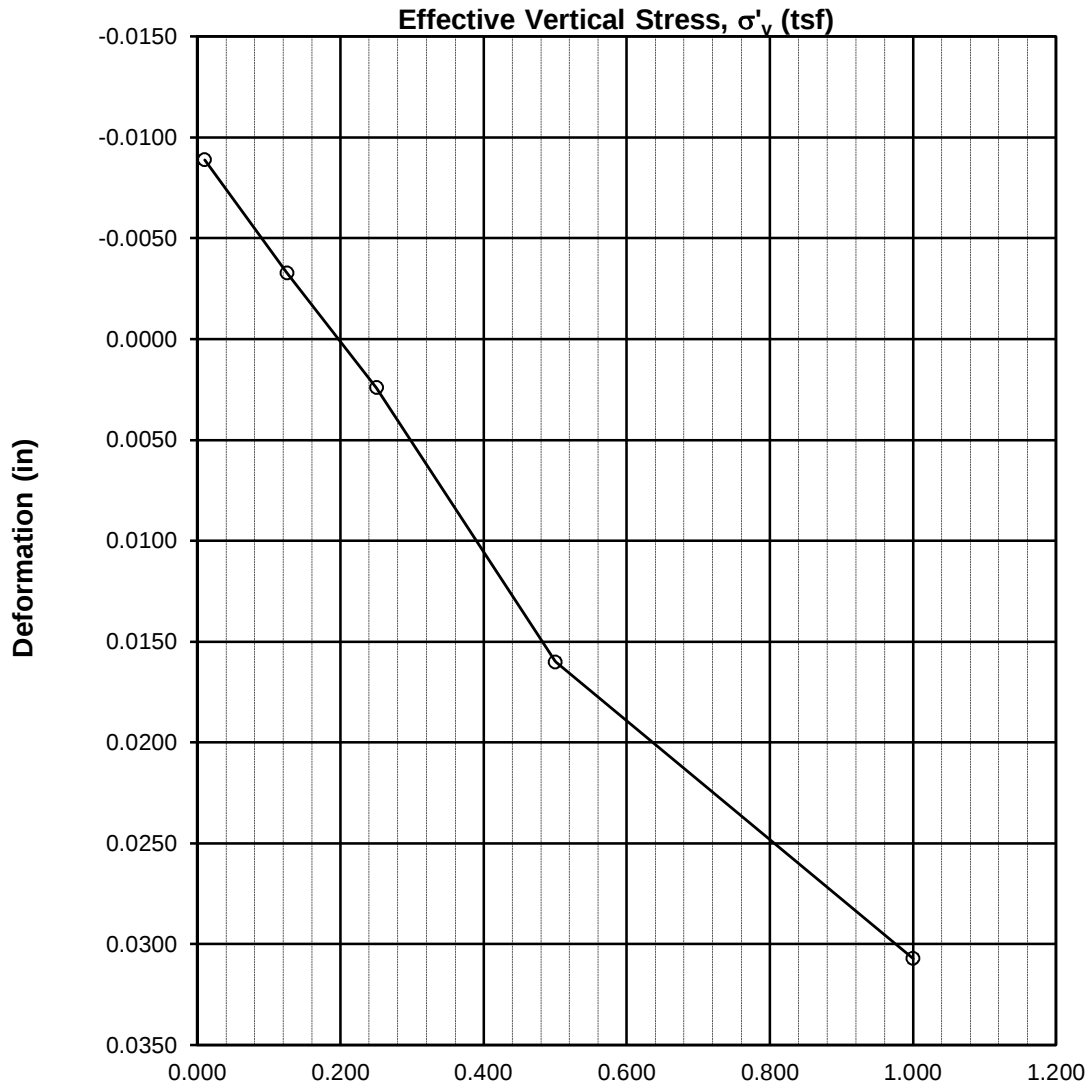
Boring: B-2

Sample: ST2 - Depth: 3-5

Liquid Limit= 53 Plastic Limit= 19 Plastic Index = 34 USCS: CH

Swell Pressure (tsf) = 0.20

Swell Strain = 0.89%



1-D SWELL OF COHESIVE SOILS

ASTM D 4546

Project No.: J024691.01

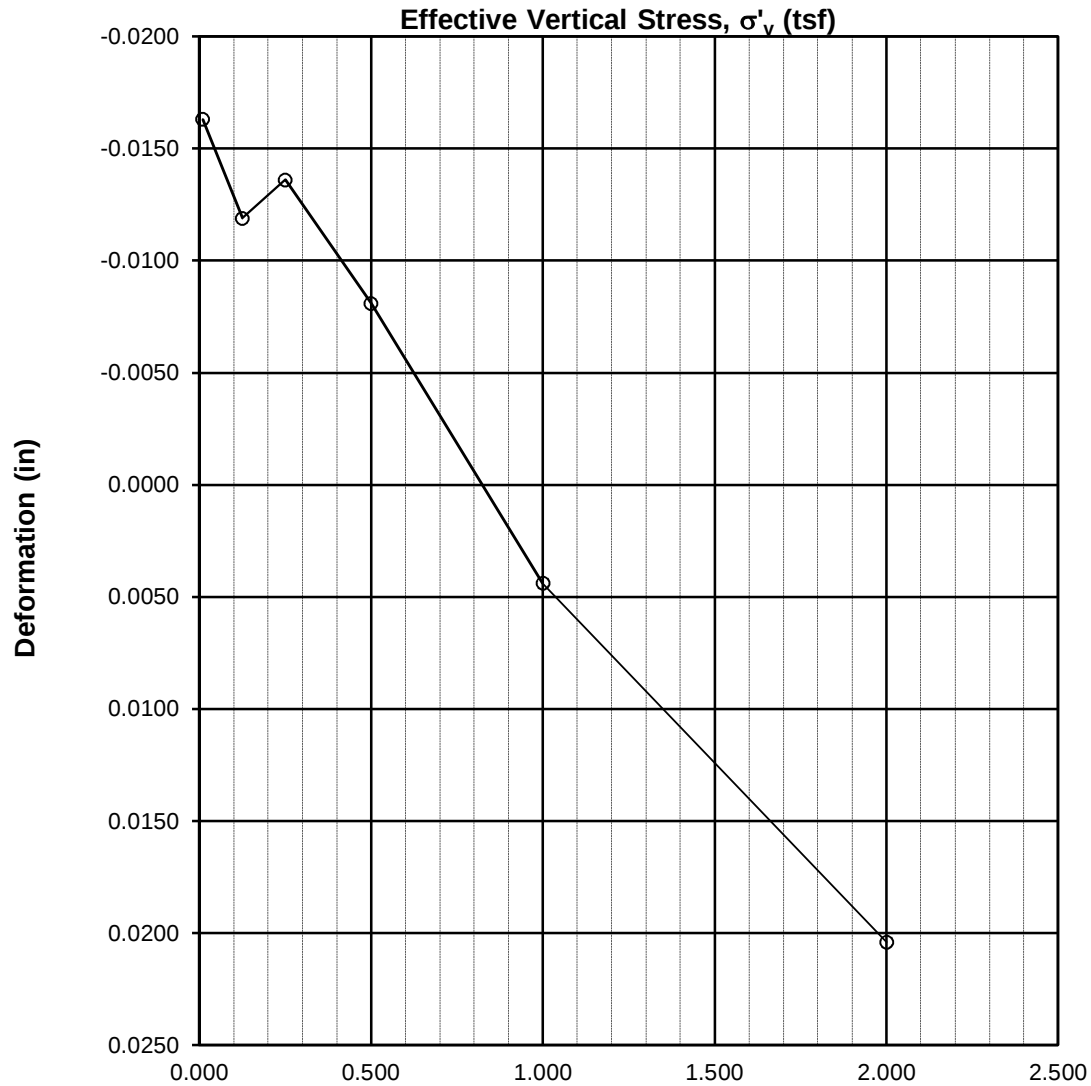
Boring: B-5

Sample: ST1 - Depth: 1-3

Liquid Limit= 73 Plastic Limit= 23 Plastic Index = 50 USCS: CH

Swell Pressure (tsf) = 0.81

Swell Strain = 1.63%



1-D SWELL OF COHESIVE SOILS

ASTM D 4546

Project No.: J024691.01

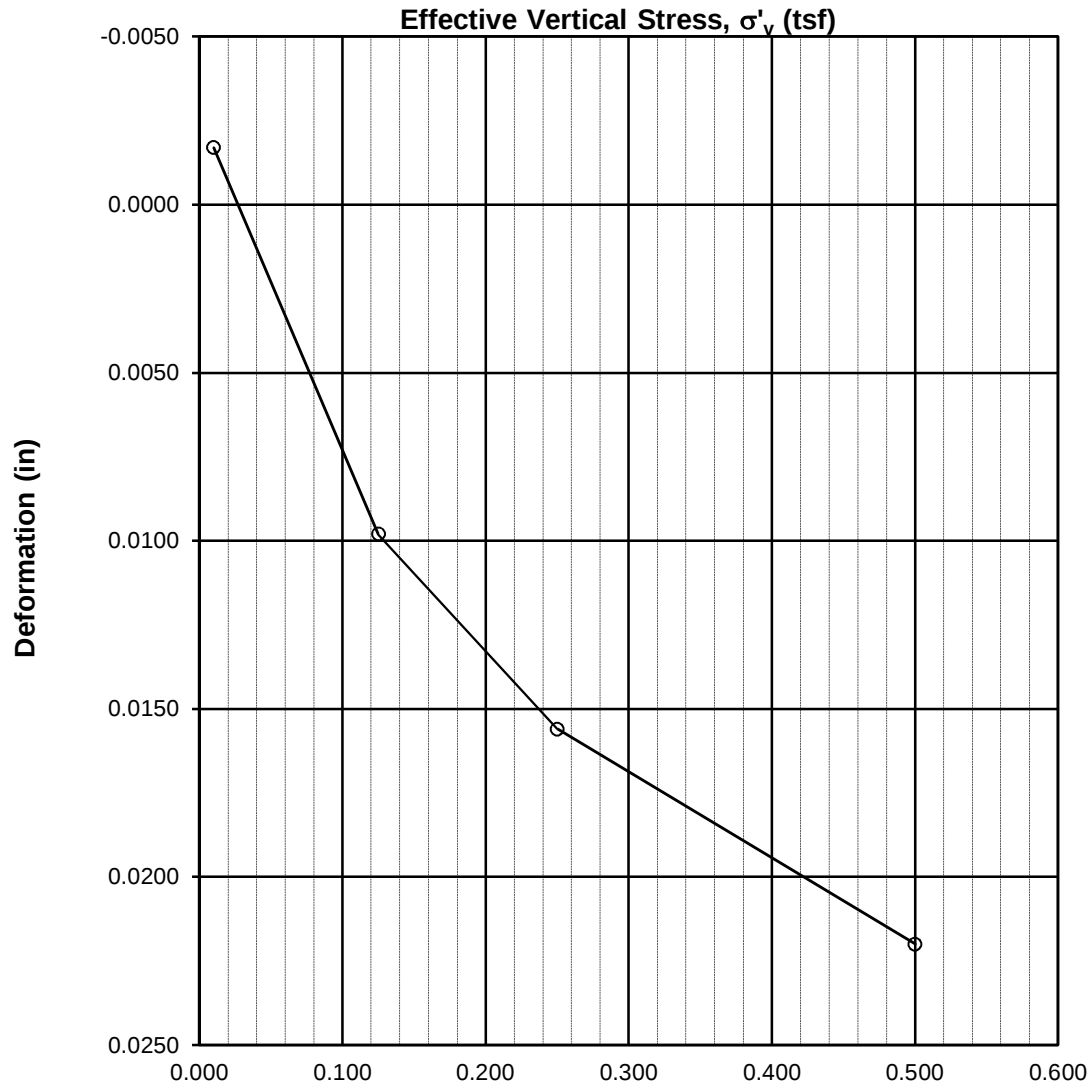
Boring: B-10

Sample: ST1 - Depth: 1-3

Liquid Limit= 39 Plastic Limit= 17 Plastic Index = 22 USCS: CL

Swell Pressure (tsf) = 0.75

Swell Strain = 0.17%



1-D SWELL OF COHESIVE SOILS

ASTM D 4546

Project No.: J024691.01

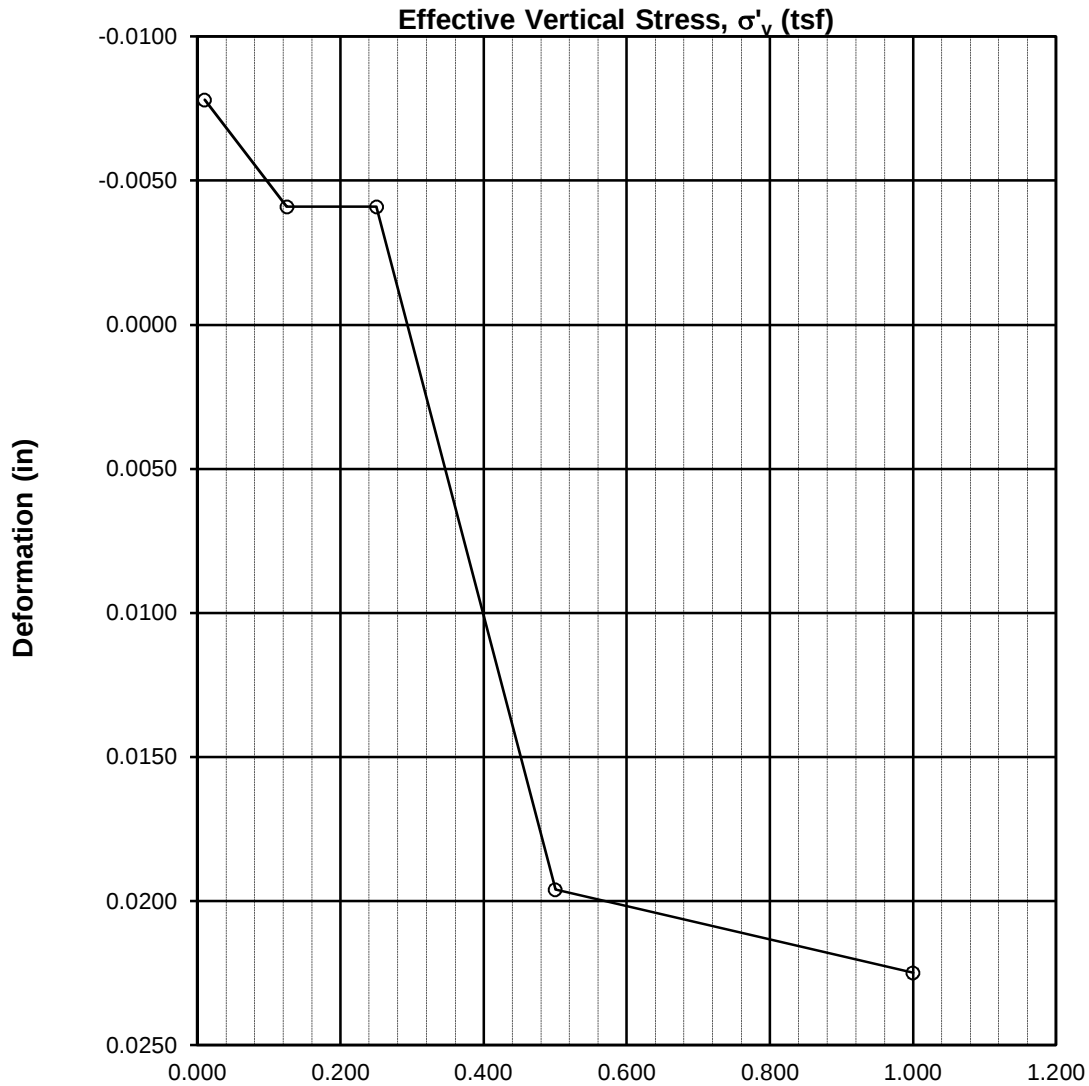
Boring: B-11

Sample: ST2 - Depth: 3-5

Liquid Limit= 47 Plastic Limit= 17 Plastic Index = 30 USCS: CL

Swell Pressure (tsf) = 0.25

Swell Strain = 0.78%



1-D SWELL OF COHESIVE SOILS

ASTM D 4546

Project No.: J024691.01

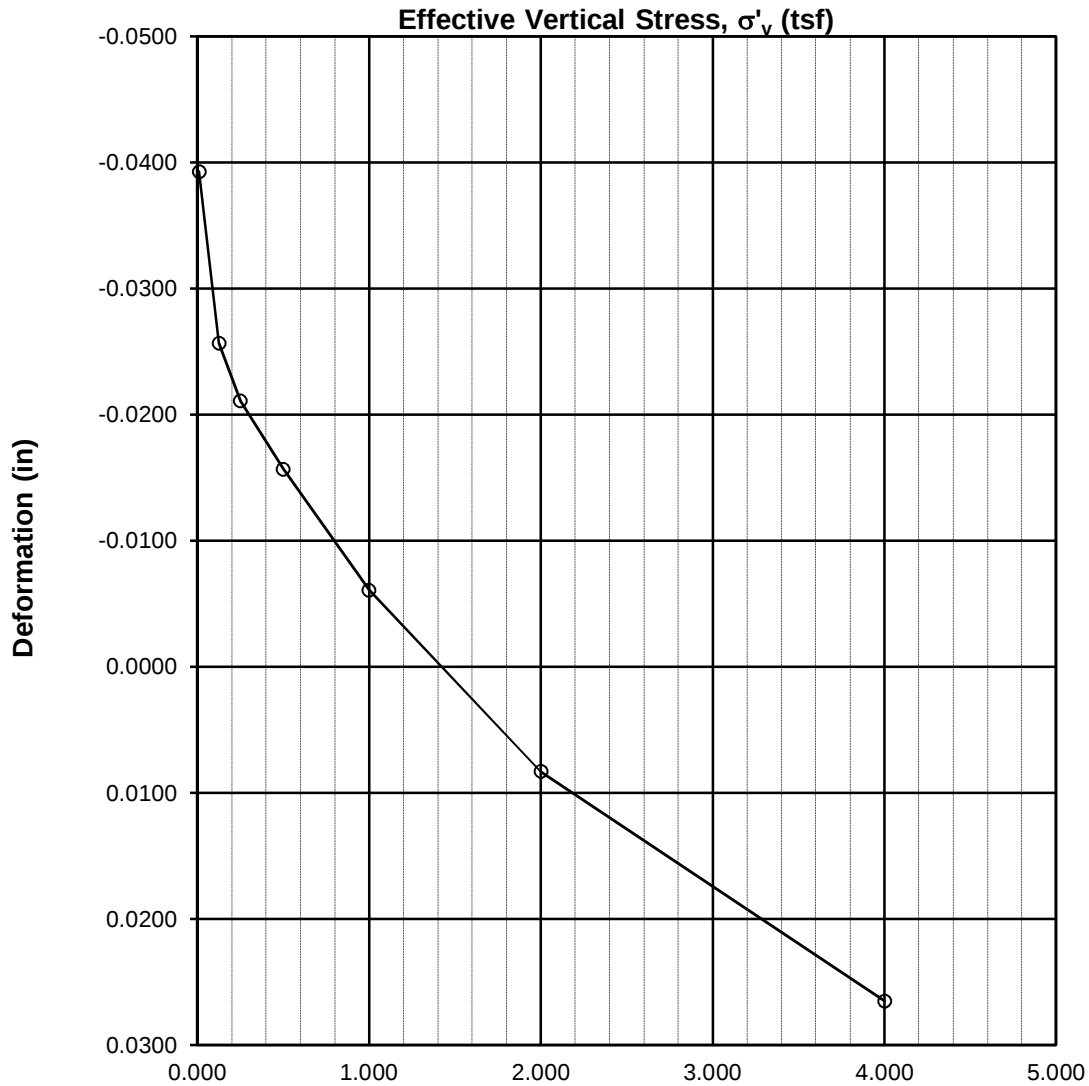
Boring: B-16

Sample: ST1 - Depth: 1-3

Liquid Limit= 84 Plastic Limit= 21 Plastic Index = 63 USCS: CH

Swell Pressure (tsf) = 1.42

Swell Strain = 3.90%



1-D SWELL OF COHESIVE SOILS

ASTM D 4546

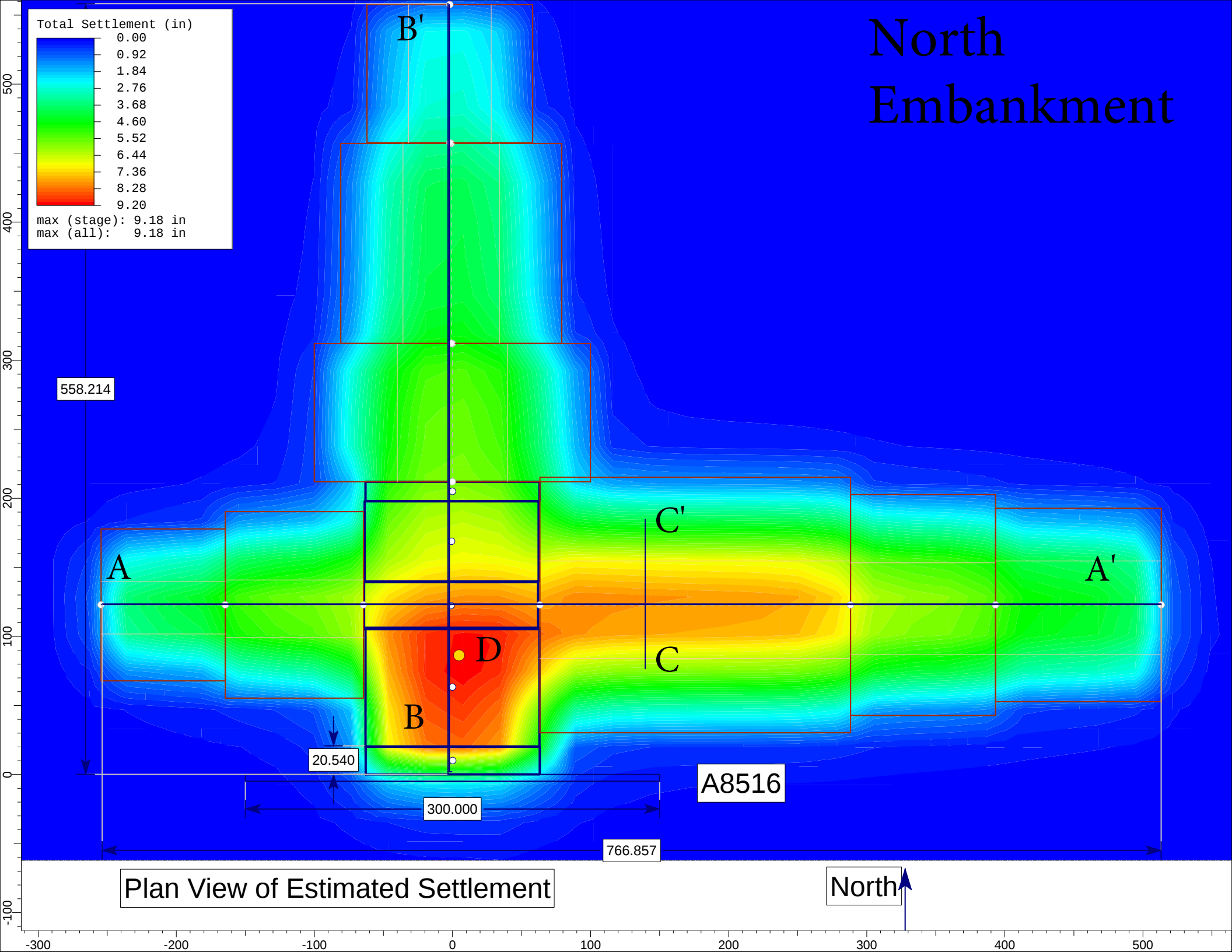
Project No.: J024691.01

Boring: B-18

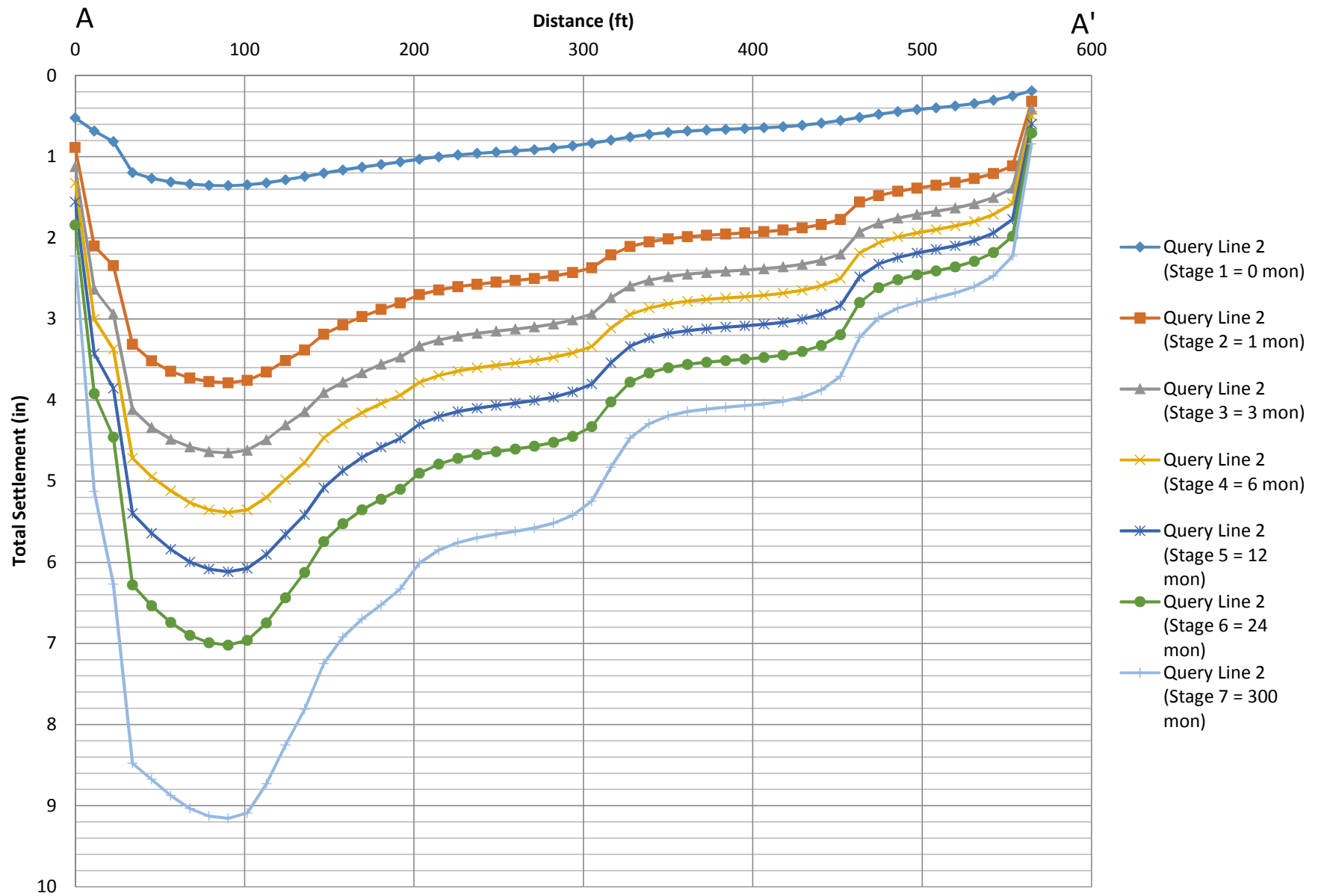
Sample: ST2 - Depth: 3-5

APPENDIX J

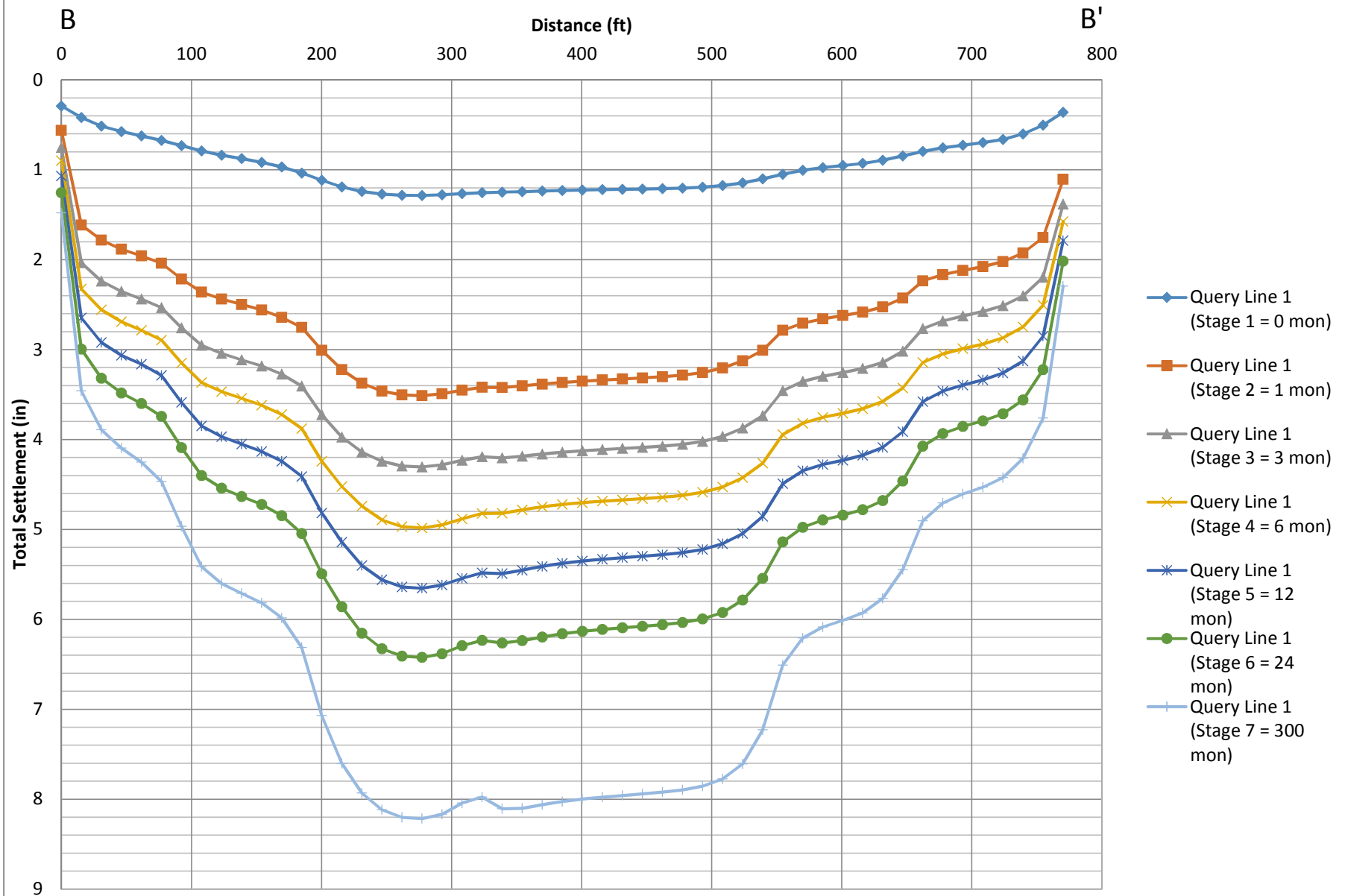
**SETTLEMENT ANALYSIS PLOTS
WITHOUT GROUND IMPROVEMENT**



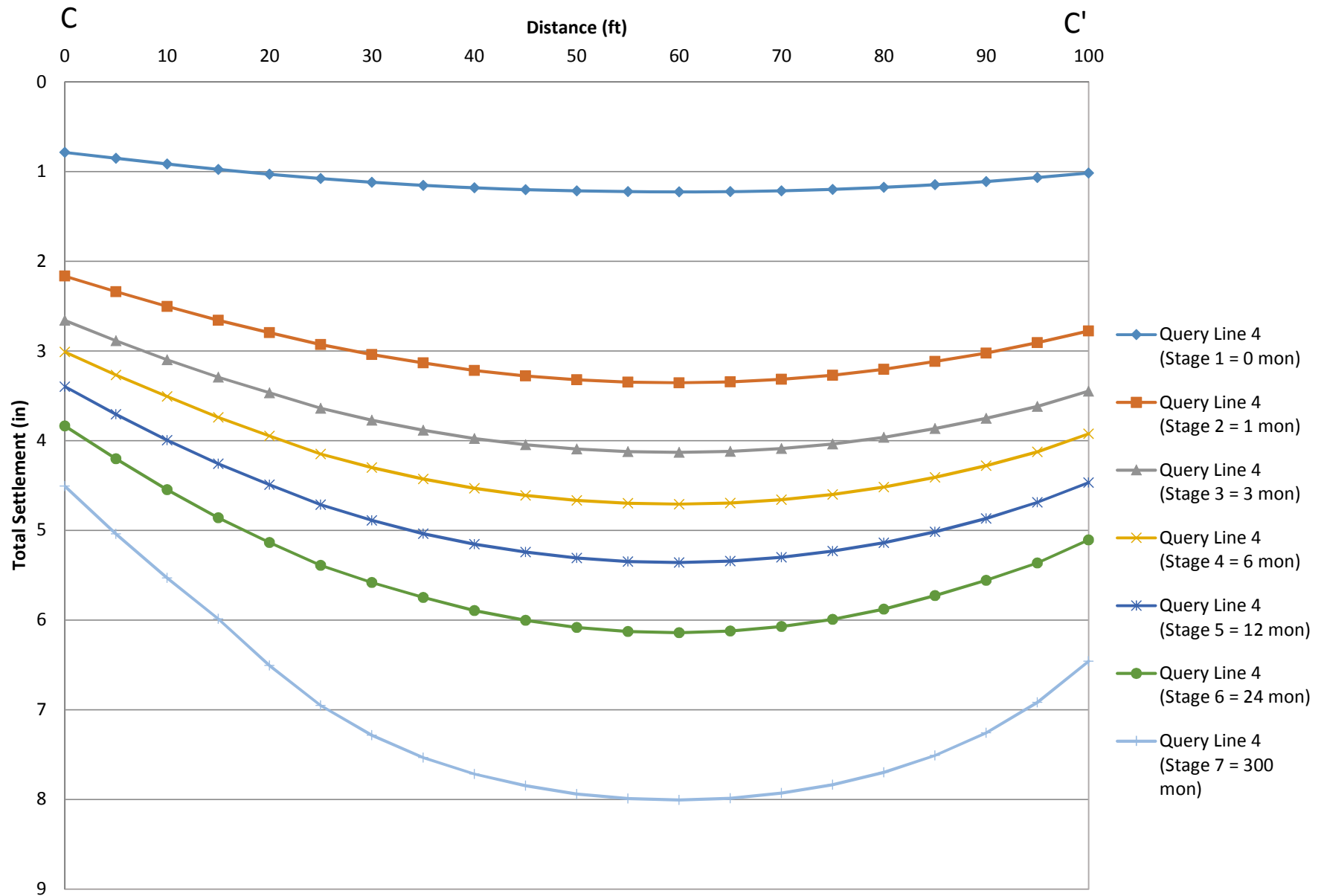
Distance vs. Total Settlement North Embankment



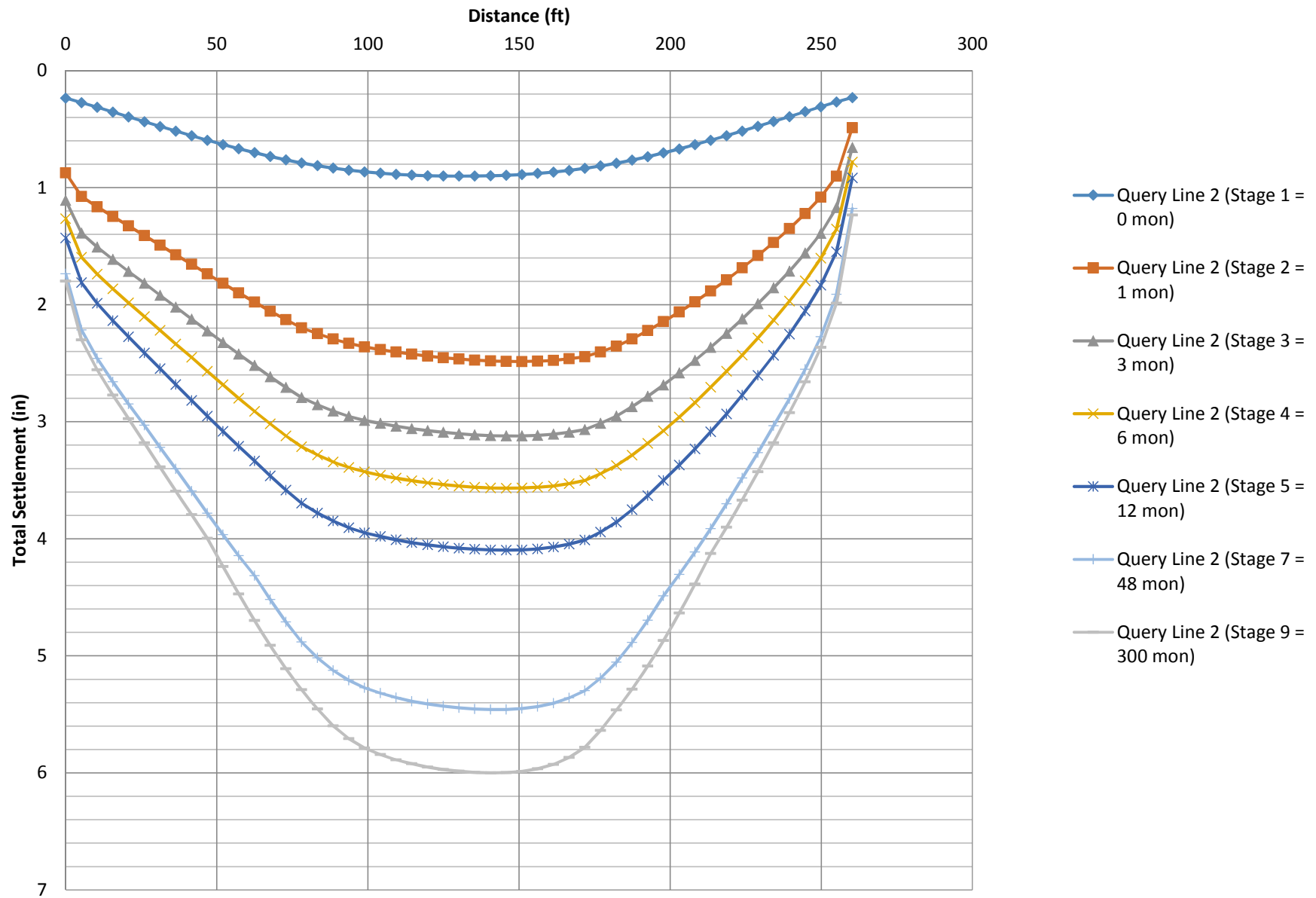
Distance vs. Total Settlement North Embankment



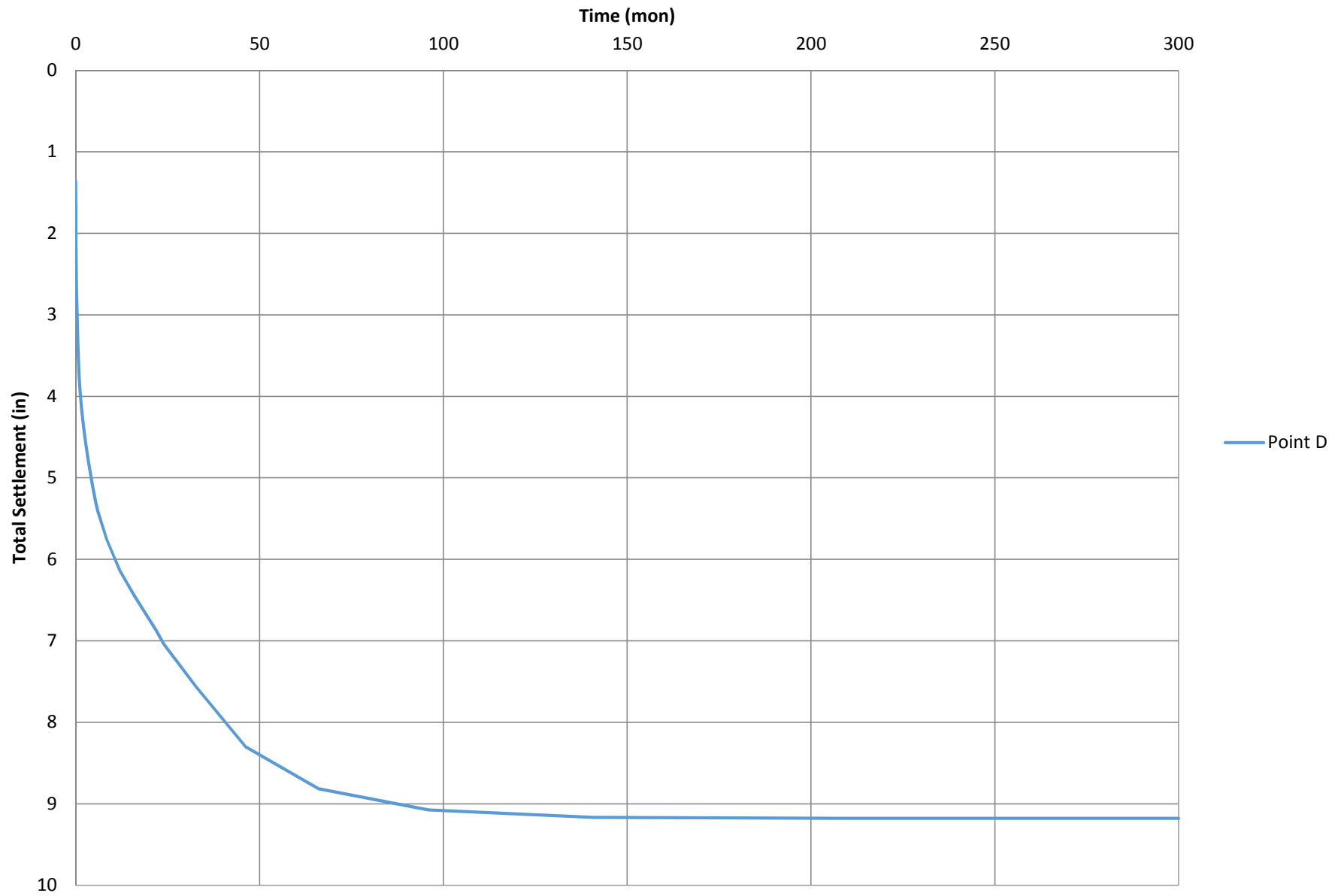
Distance vs. Total Settlement North Embankment



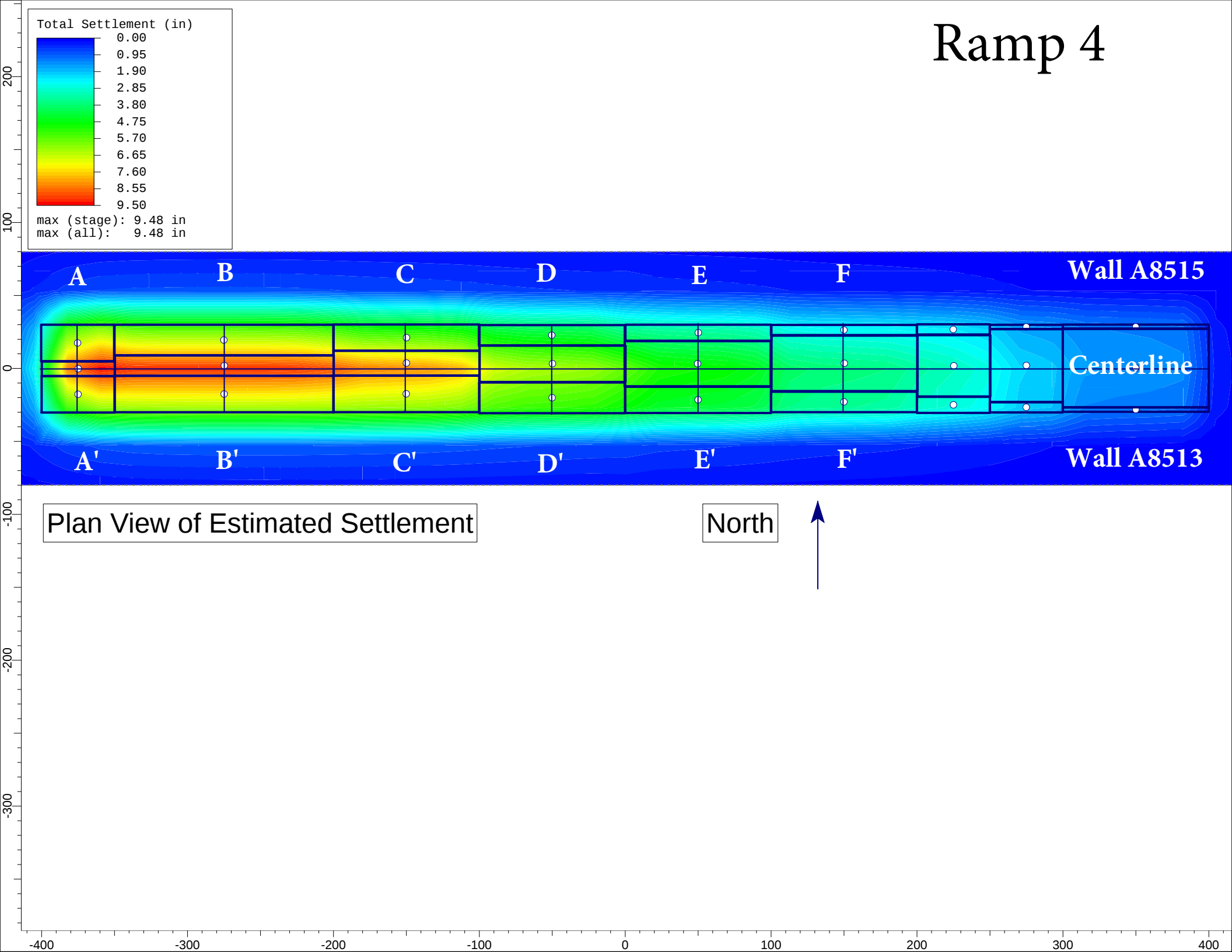
Distance vs. Total Settlement Along Wall A8516



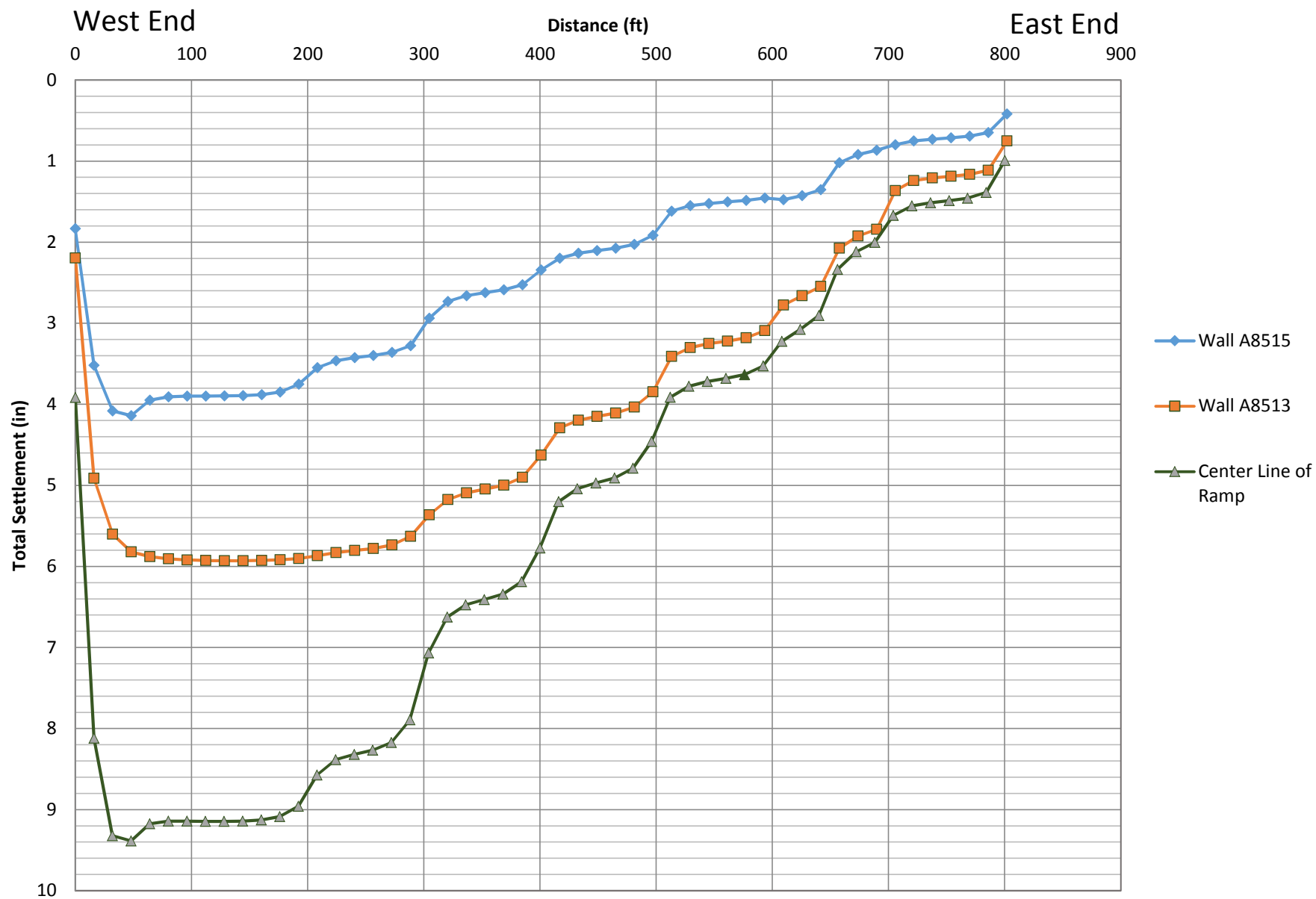
Time vs. Total Settlement North Embankment



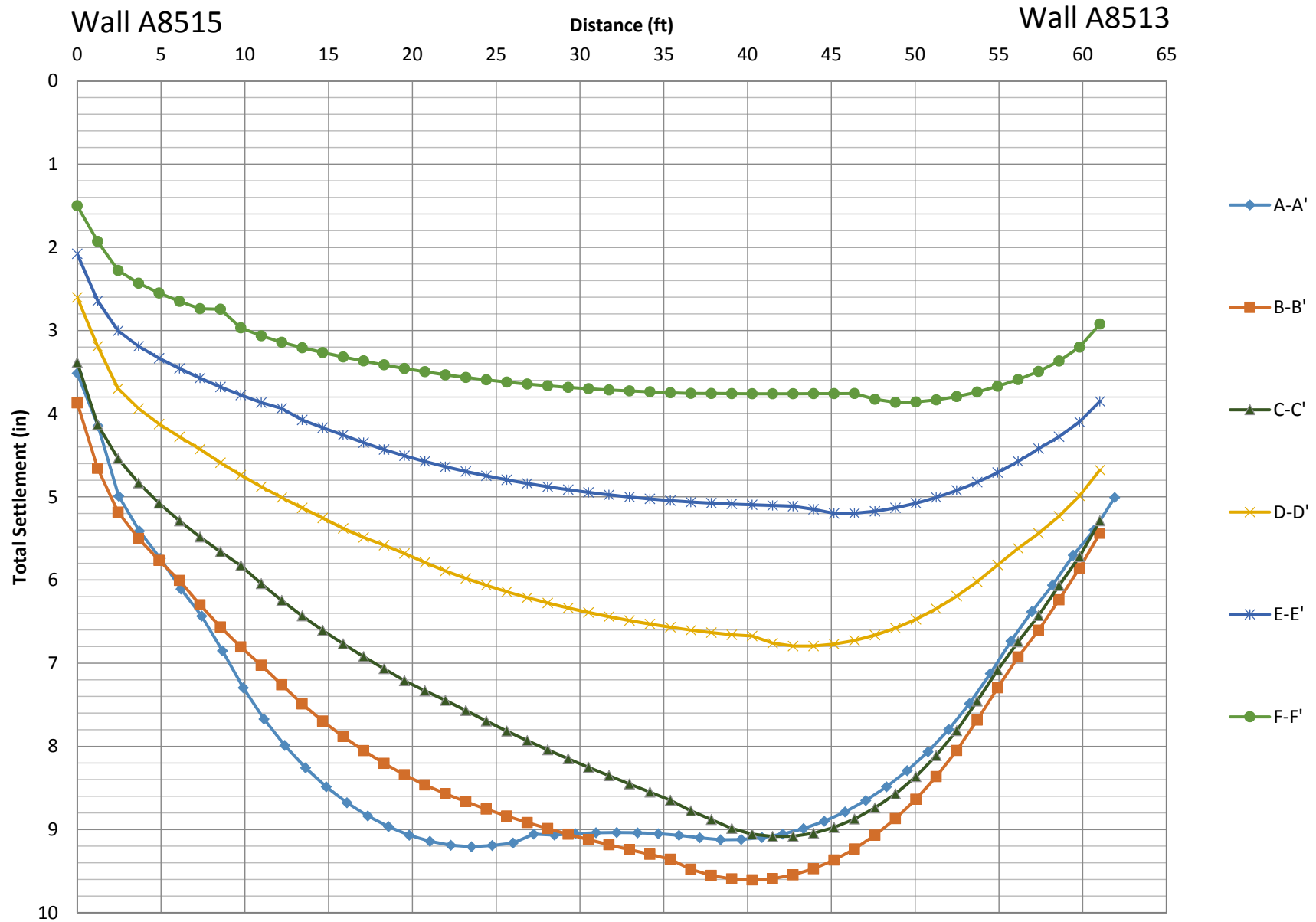
Ramp 4

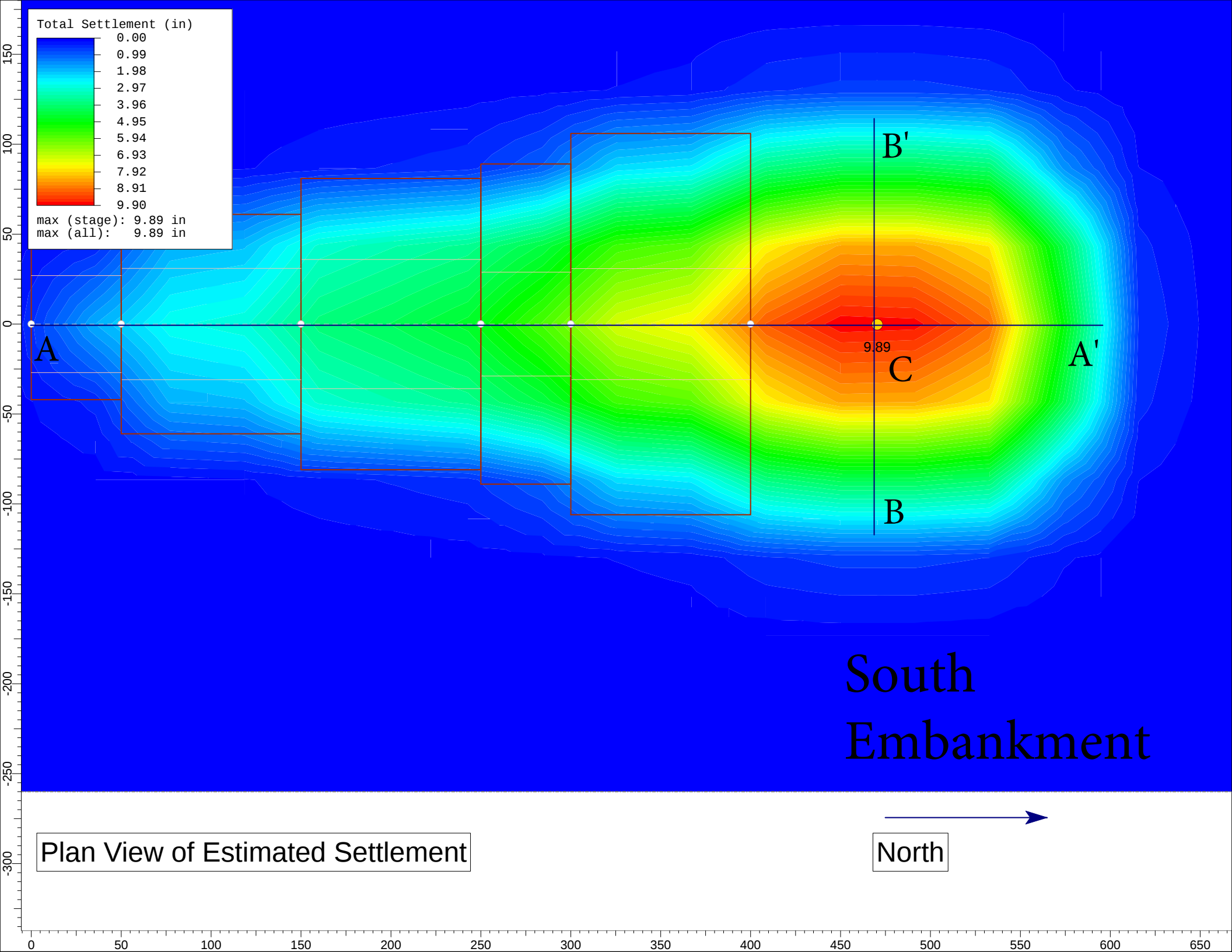


Distance vs. Total Settlement Ramp 4 Lengthwise

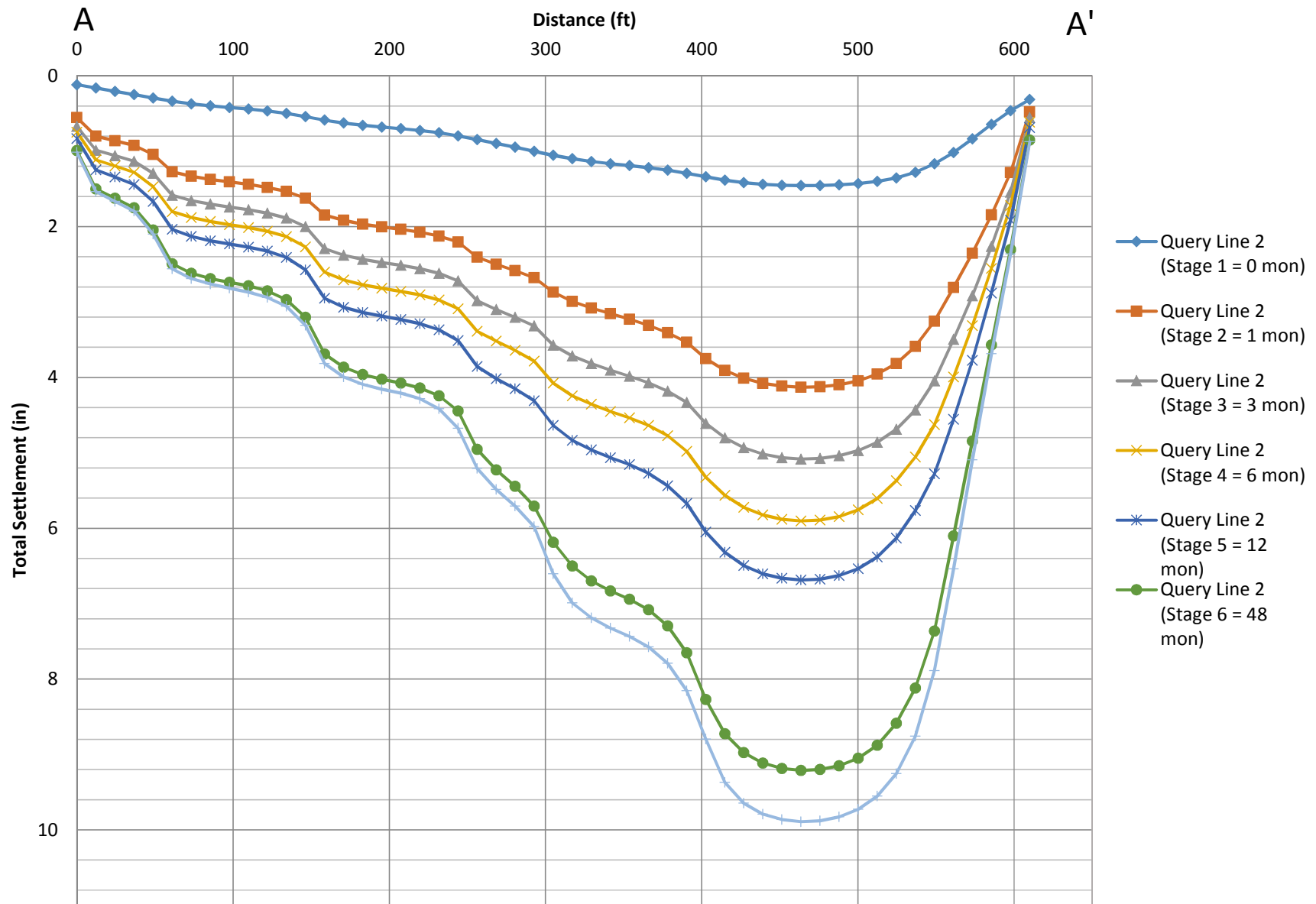


Distance vs. Total Settlement Across Ramp 4

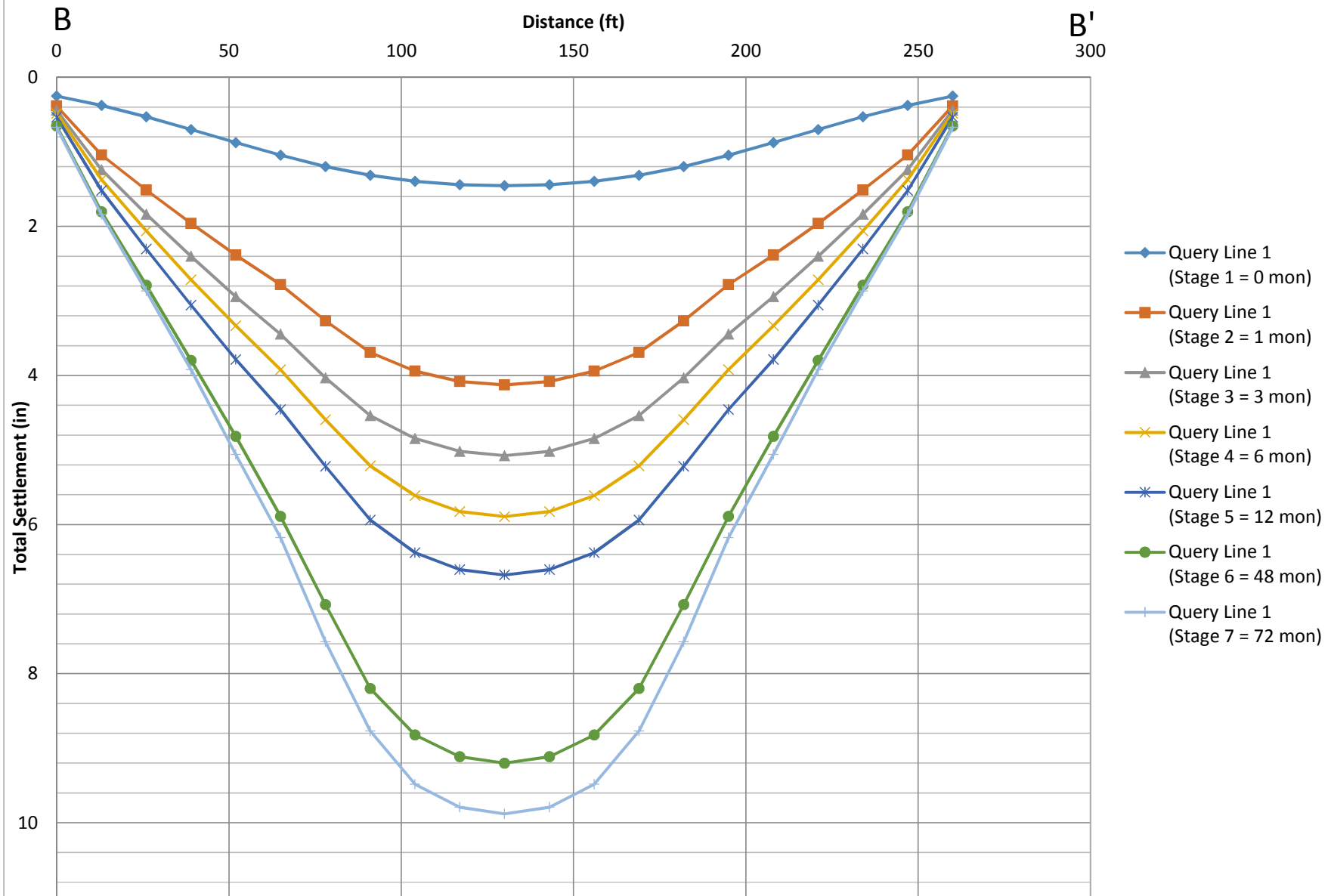




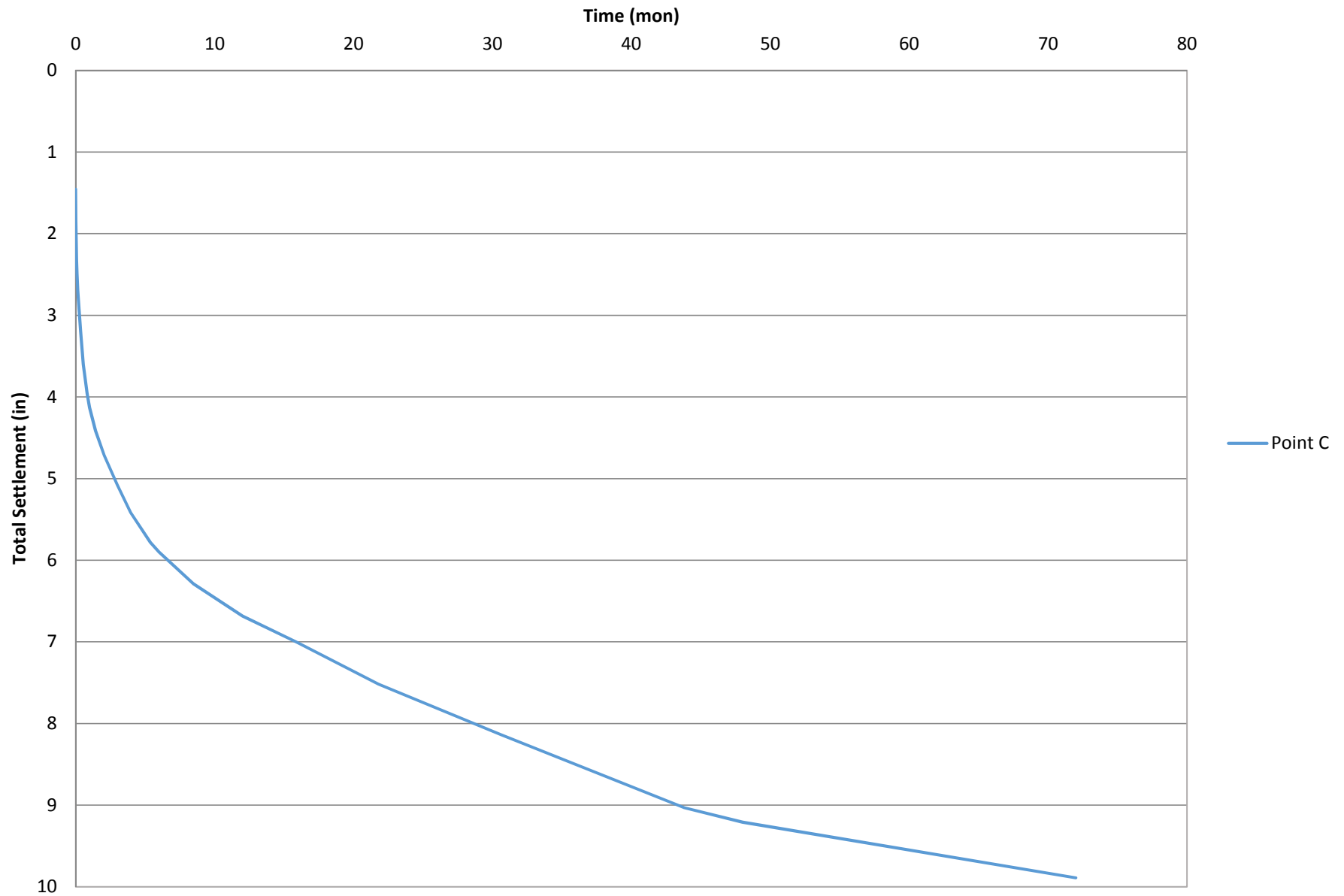
Distance vs. Total Settlement South Embankment



Distance vs. Total Settlement South Embankment

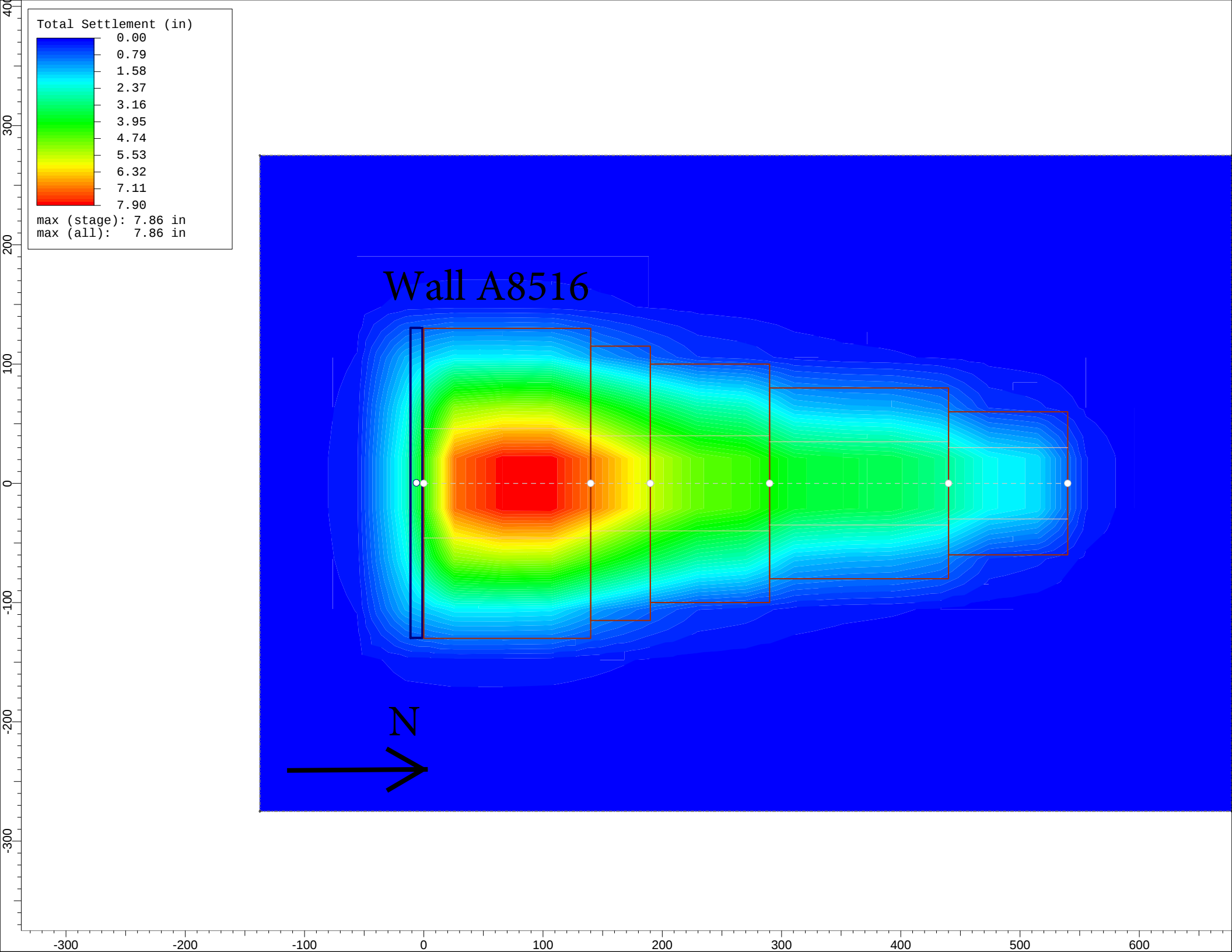


Time vs. Total Settlement South Embankment

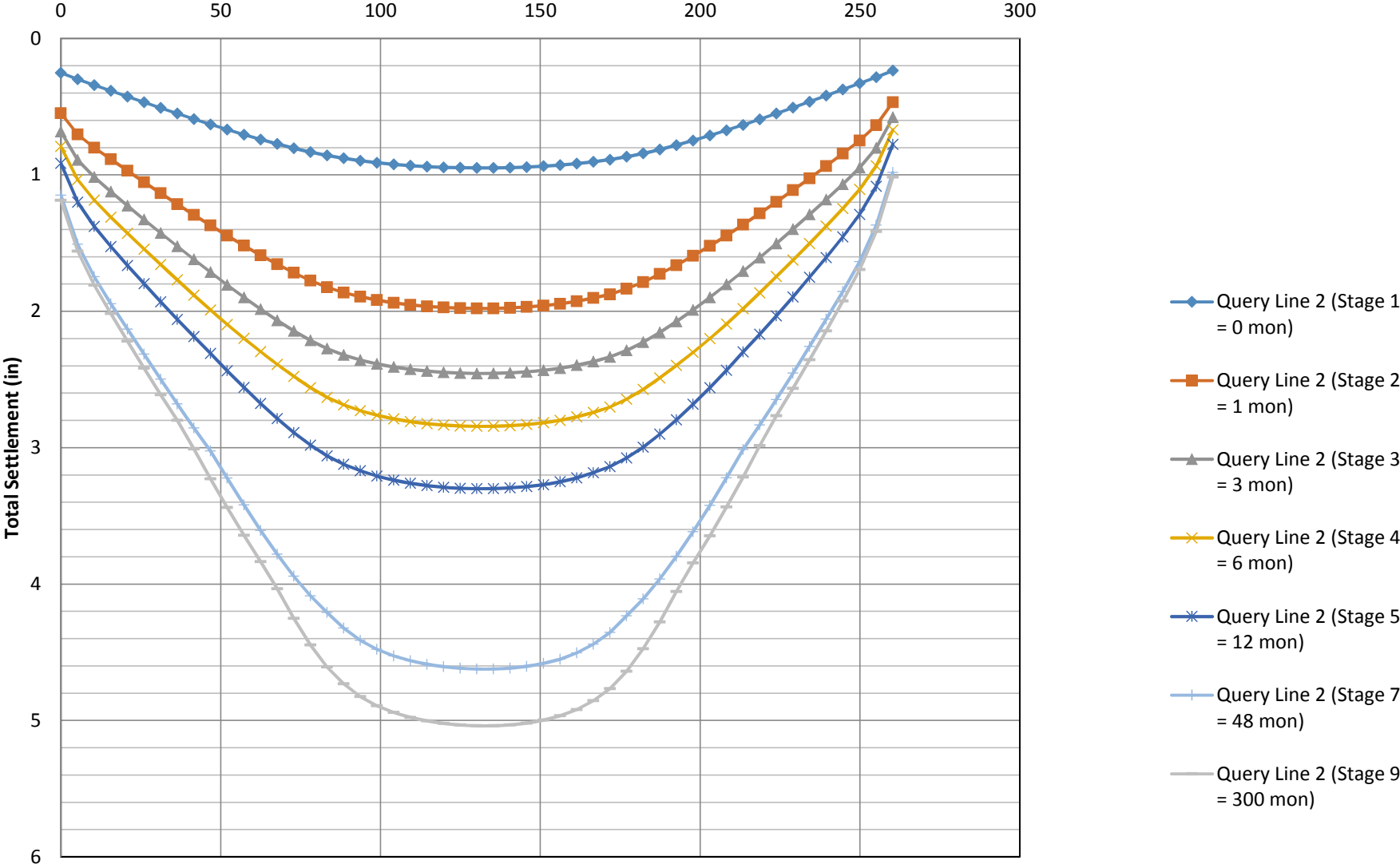


APPENDIX K

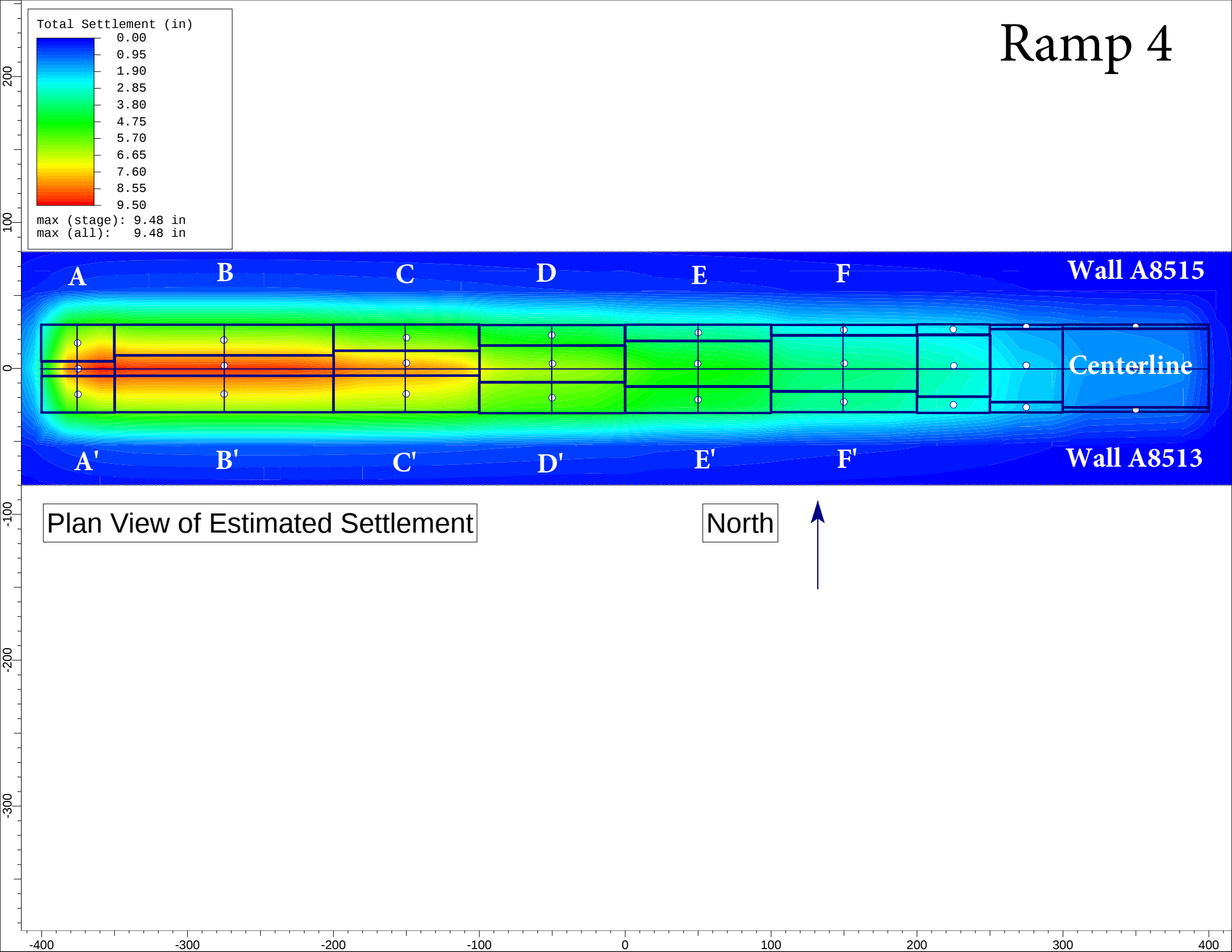
**SETTLEMENT ANALYSIS PLOTS
WITH GROUND IMPROVEMENT**



Distance vs. Total Settlement Along Wall A8516 with Soil Replacement



Ramp 4

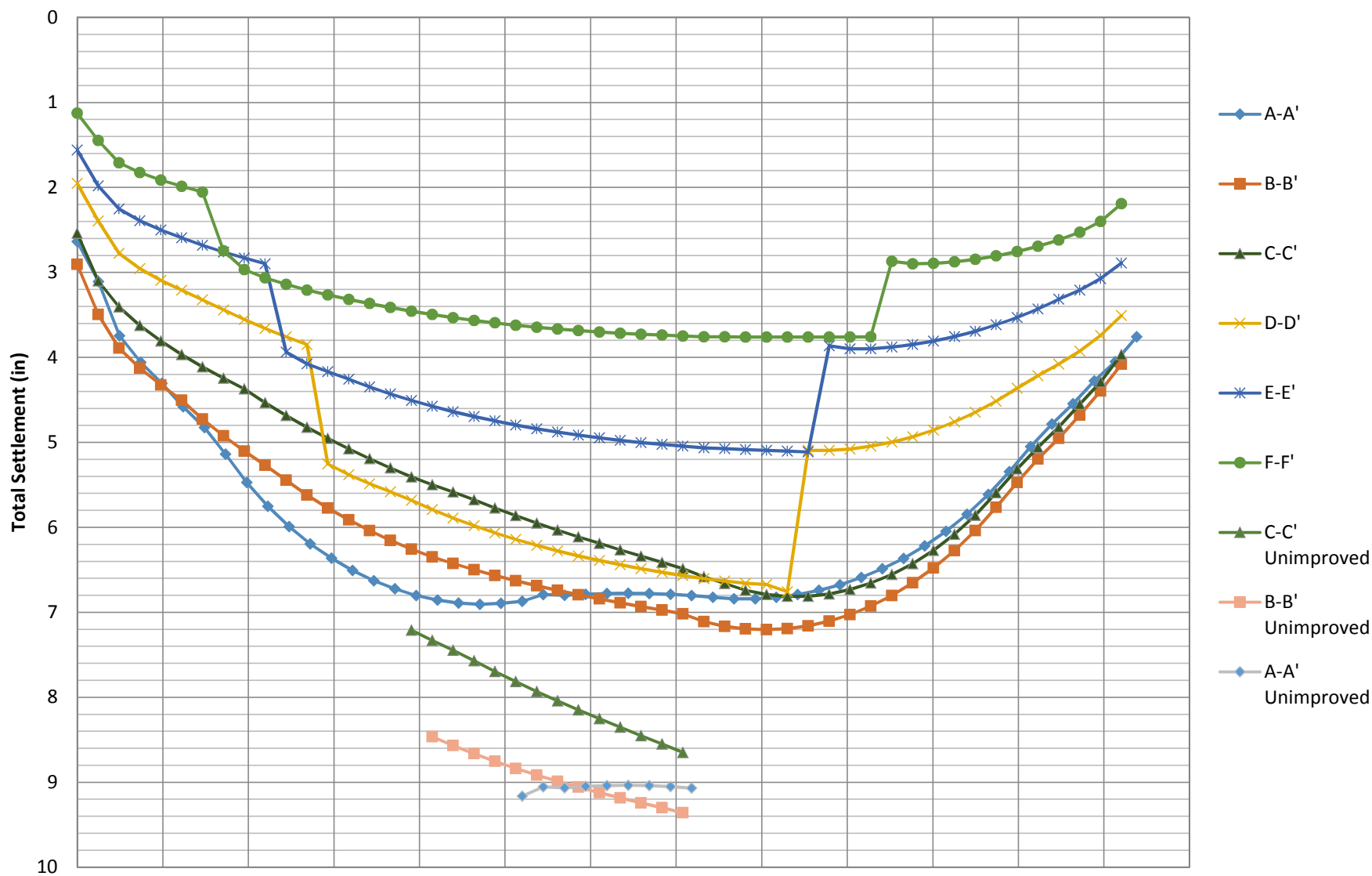


Distance vs. Total Settlement Across Ramp 4 with Stone Columns

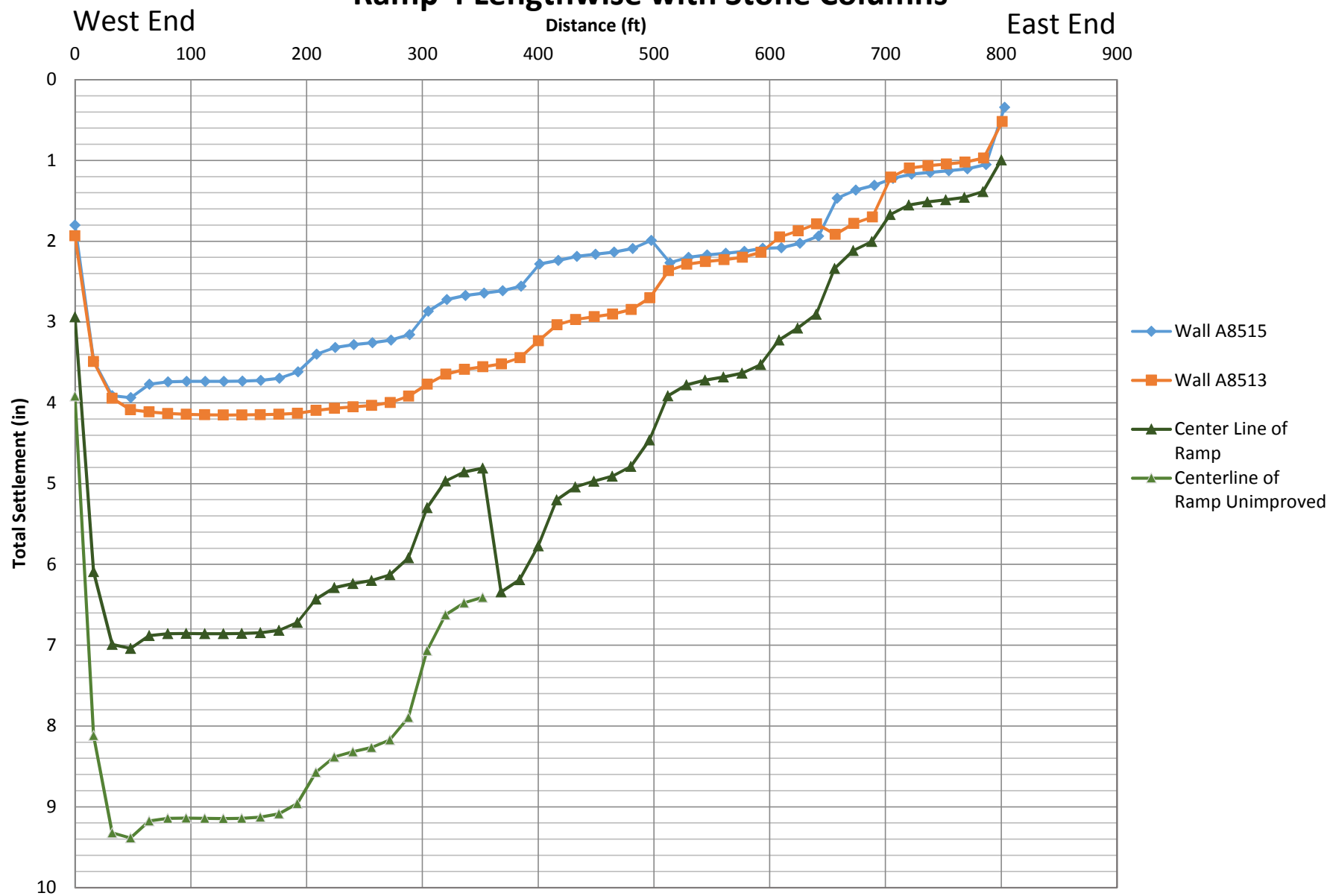
Wall A8515

Wall A8513

Distance (ft)



Distance vs. Total Settlement Ramp 4 Lengthwise with Stone Columns





GENERAL CONDITIONS

SECTION 1 DEFINITIONS

- 1.01 Available for Use (Substantial Completion):** The stage in the progress of the Work when the Work is sufficiently complete so that the City can occupy or use the Work for its intended use. The date on which a Project is deemed Available for Use is in the sole discretion of the City.
- 1.02 Change Order:** A written order to the Contractor signed by the City, issued after the execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Construction Schedule.
- 1.03 City:** City of Wentzville. The City is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term City means the City or its authorized representative. The City may be alternatively referred to as the "Owner."
- 1.04 Contract:** The Contract Documents form the Contract. The Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations or agreements, both written and oral, including the bidding documents. The Contract may be amended or modified only by a modification as defined in Section 1.02.
- 1.05 Contract Documents:** Contract Documents shall include all those documents identified as the Contract Documents in the City-Contractor Agreement. The Contract Documents shall include any and all modifications as defined as (1) a written amendment to the Contract signed by both parties, or (2) an executed Change Order.
- 1.06 Contract Sum:** The total amount payable by the City to the Contractor for the performance of the Work as stated in the City-Contractor Agreement.
- 1.07 Contract Time/Contract Days:** Period of time allotted in the Contract Documents for substantial completion of the Work.
- 1.08 Contractor:** The Contractor is the successful bidder awarded the work of constructing the project identified as such in the City-Contractor Agreement. The Contractor is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative(s).
- 1.09 Date of Commencement of the Work:** Date established in the written Notice to Proceed on which the Contractor is to begin the Work.
- 1.10 Day:** Calendar day.
- 1.11 Director:** Director of Public Works of the City of Wentzville, or his/her authorized representative(s)
- 1.12 Final Acceptance:** Written notice from the City to the Contractor stating that the Project including all Work, any deficiencies as outlined in inspections, and all Project Closeout items and activities have been completed and the City accepts the Project. Said work shall include all punch list items deemed necessary by the City, exclusive of punch list items generated by any public authority

having jurisdiction other than the City. The date of completion of the Contract shall be the date when all work including City punch list items have been approved in writing by the City.

- 1.13 Final Inspection:** Inspection performed and provided by the City to the Contractor upon the Contractor's request and based upon his determination that the Project is ready for final acceptance.
- 1.14 Final Payment:** Last payment made to the Contractor, typically retainage due, upon Final Acceptance of the Project.
- 1.15 Notice to Proceed:** Written notice from the City notifying the Contractor of the date on or before which he is to begin the work.
- 1.16 Project:** The total construction of which the Work performed under the Contract Documents may be the whole or a part.
- 1.17 Project Closeout:** The time period of the Work after Available for Use (Substantial Completion) when the Work and all administrative requirements have been or are being completed in their entirety. The Project Closeout period is typically 90 days.
- 1.18 Removal:** Removal of material and disposal of said material off-site.
- 1.19 Request for Information (RFI):** Written memo from the Contractor to the Engineer collect written information about a question in regards to the Technical Specifications or Plans for Construction. The RFI shall also be used as a means for the Contractor to seek Engineer approval for minor alterations to Plans for Construction or the Technical Specifications that do not result in a change in the Contract Sum or Project Schedule.
- 1.20 Semi-Final Inspection:** Inspection performed and provided by the City to the Contractor upon Contractor's request and based upon his determination that the Project is Available for Use.
- 1.21 Specifications:** City of Wentzville Construction Specifications and Standard Details, latest edition, unless otherwise specified.
- 1.22 Subcontractor:** A Subcontractor is a person or organization who has a direct contract with the Contractor to perform any of the Work. The term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative.
- 1.23 Sub-subcontractor:** A Sub-subcontractor is a person or organization who has a direct or indirect contract with a Subcontractor to perform any of the Work. The term Sub-subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.
- 1.24 Work:** All labor necessary to complete the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.

SECTION 2 CONTRACT DOCUMENTS

2.01 Execution, Correlations, and Intent

2.01.1 The Contract Documents shall be signed by the City and Contractor.

2.01.2 The Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.

2.01.3 The intention of the Contract Documents is to include all labor, materials, equipment and other items necessary for execution and completion of the Work. Words which have well-known technical or trade meanings are used herein in accordance with such recognized meanings.

2.02 Copies Furnished and Ownership

2.02.1 Unless otherwise provided in the Contract Documents, the Contractor will be furnished a maximum of five (5) copies, free of charge, of the Drawings and Specifications, if any, for the execution of the work.

2.02.2 Any Drawings, Specifications and copies thereof furnished by the City are and shall at all times remain property of the City. Such documents shall not be used on any other project. At the conclusion of the job, the Contractor shall submit one (1) set of drawings and specifications marked up throughout the course of work with any and all field changes.

SECTION 3 CITY

3.01 City's Right to Access and Observation

The City shall have access at all times to the Project for the purpose of observation and inspection. The Contractor shall provide proper and adequate facilities, specialized, tool and equipment for such access and observation.

3.02 City's Right to Stop Work

If the Contractor fails to correct defective Work or fails to supply materials or equipment in accordance with the Contract Documents, the City may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated.

3.03 City's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, or fails to perform any provision of the Contract, the City may, after written notice to the Contractor and without prejudice to any other remedy the City may have, make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or hereafter due the Contractor the cost of correcting such deficiencies. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the City promptly upon request.

3.04 City's Right to Award Separate Contracts

The City's reserves the right to award other contracts on other terms and conditions with other portions of the Project.

3.05 City's Right to Clean Up

If a dispute arises between separate contractors as to their responsibility for cleaning up as required by Section 4.08, the City may clean up and charge the cost thereof to the several contractors.

3.06 Status of the Director

The Work shall be subject at all times to the supervision and direction of the Director. To prevent disputes and litigation, it is mutually agreed that the Director shall, in all cases, determine the amount or quantity of the various kinds of work, and the quality of materials and workmanship to be paid for under this Contract, and the Director shall decide all questions which may arise relative to the performance of the work covered by the Contract. Any doubt as to the meaning of the Contract and any obscurity or discrepancy as to their working and intent will be explained by the Director, and this explanation shall be final and binding by both parties of this Contract. The Director may amend or correct any errors or omissions in the Specifications when such amendments or corrections are necessary to make definite the intent indicated by a reasonable interpretation of the Contract.

3.07 Authority of the Engineer

The Engineer will decide all questions that may arise as to the quality, quantity, and acceptability of material furnished and the work performed, and as to the rate of progress of the work; all questions that may arise as to the interpretation of the plans and specification; all questions of classification; quantities for which payment will be made, performance or breach of the contract; and all claims or controversies of any character whatsoever in connection with or growing out of the construction, whether claimed under the contract, under force account, under quantum merit or otherwise. The engineer's estimates and decisions shall be final, binding and conclusive upon all parties to the Contract. The Engineer may suspend any work that is being improperly performed.

3.08 Authority and Duties of Inspector

As the immediate representative of the City, the Inspector has direct charge of the delivery of work and is delegated commensurate authority for the administration of the project. The Inspector may reject defective material and reject any work that is being improperly performed. The Inspector may also make recommendations to the Engineer to suspend work that is being improperly performed. The Inspector will have no authority to modify the Contract except in accordance with the Contract Documents or when expressly authorized by the Engineer.

SECTION 4 CONTRACTOR

4.01 Supervision and Construction Procedures

4.01.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work.

4.01.2 All Work shall be in accordance with the Contract Document and Specifications.

4.01.3 The contractor shall have at the work site at all times, as the contractor's agent, a competent individual capable of reading and thoroughly understanding the plans and specifications and thoroughly experienced in the type of work being performed, whom shall receive instructions from the engineer. That individual shall have full authority to execute orders or directions of the engineer without delay and to promptly supply material, equipment, tools, labor and incidentals as may be required.

4.02 Labor and Materials

4.02.1 Unless otherwise specifically noted, the Contractor shall provide and pay for all labor, materials, equipment, supplies, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.

4.02.2 The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him. If the City reasonably objects to any person employed by the Contractor, the employee shall be immediately dismissed.

4.02.3 The labor provided by the Contractor shall be directed to be a workman-like character with respect to the methods of construction and quality of completed work; and, shall not encumber the premises or adjacent property or streets with materials and/or equipment.

4.02.4 The Contractor shall comply with, and is bound by, the provisions of Missouri law pertaining to the payment of wages on public works projects contained in Sections 290.210 through 290.340 RSMo., and any amendments thereto, including, but not limited to the following:

4.02.4.1 In accordance with Section 290.250 RSMo., as amended, the Contractor shall not pay less than the prevailing hourly rate of wages specified by the Missouri Department of Labor and Industrial Relations Division of Labor Standards to all workmen performing Work under the Contract.

4.02.4.2 In accordance with 290.250 RSMo., as amended, the Contractor shall forfeit as a penalty to the City one hundred dollars (\$100.00) for each workman employed for each calendar day, or portion thereof, such workman is paid less than the said stipulated rates for any Work done under the Contract, by him or by any Subcontractor under him and shall include provisions in all bonds guaranteeing the faithful performance of said prevailing hourly wage clause.

4.02.4.3 In accordance with 290.265 RSMo., as amended, the Contractor and each Subcontractor shall post a clearly legible statement of all prevailing hourly wage rates to be paid to all workmen employed to complete the Work in a prominent and easily accessible place at the site of the Work and such notice shall remain posted during the full time that any workmen shall be employed at the Work.

4.02.4.4 Certified payrolls shall also be submitted prior to final payment for all work completed by the Contractor or Subcontractors.

4.02.4.5 In accordance with Section 290.290 RSMo., as amended, before final payment is made an affidavit must be filed by the Contractor stating that he has fully complied with the prevailing wage law. No payment shall be made unless and until this affidavit is filled in proper form and order.

4.02.5 The Contractor shall execute and complete the Work in such a manner that avoids jurisdictional and other disputes among labor unions.

4.02.6 Except as otherwise required by law, during a period of excessive unemployment in the State of Missouri, the Contractor shall employ only Missouri laborers and laborers from nonrestrictive states on the Project, as provided in Sections 290.550 to 290.580 RSMo.

4.02.7 If the Contract Documents have indicated that the Project is financed in whole or in part from Federal funds, then this Contract shall be subject to all applicable federal statutes, rules and regulations, including provisions of the Davis-Bacon Act, 40 U.S.C. §3141 et seq., and the "Federal Labor Standards Provisions," incorporated into this Contract. Where the Missouri Prevailing Wage Law and the Davis-Bacon Act require payment of different wages for work performed under this Contract, the Contractor and all Subcontractors shall pay the greater of the wages required under either law.

4.02.8 The Contractor shall employ only personnel authorized to work in the United States in accordance with applicable federal and state laws. This certification applies to State of Missouri Immigration Alien Laws and statutes required local government(s) to have proof of a person's lawful presence within the United States before distributing "Public Benefits" (contracts, purchase orders, etc.) to that Bidder.

4.03 Warranty

The Contractor warrants to the City that all materials and equipment furnished under the Contract and incorporated in the Work will be new unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not so conforming to these standards shall be considered defective. The Contractor shall furnish satisfactory evidence as to the kind and quality of all materials and equipment and shall guaranty the Work as provided in the City Contractor Agreement after substantial completion of the work.

4.04 Permits, Fees, Easements, Construction Limits and Notices

4.04.1 The Contractor shall secure and pay for all permits, governmental fees, and licenses necessary for the proper execution and completion of the Work, including those required to be obtained from the City, except fees imposed solely by the City shall be waived at the time of application.

4.04.2 For the purposes of operating and maintaining the Project, the City shall acquire the necessary lands, easements and rights-of-way privileges required for the same. The Contractor shall furnish and construct any necessary access roads or facilities.

4.04.3 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the Work. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the City in writing and any necessary changes shall be adjusted by appropriate Modification. If the Contractor performs any Work knowing it to be contrary to such laws,

ordinances, rules and regulations and without such notice to the City, the Contractor shall assume full responsibility therefor and shall bear all costs attributable thereto.

4.04.4 The construction limits consist of public areas and acquired easement areas, as shown in the Contract Documents. The Contractor shall limit his operations accordingly. No activity outside the public areas or easement areas shall performed without the express written permission of the property owner.

4.04.5 The Contractor shall notify in writing all residents whose property is affected by the Work at least forty-eight (48) hours prior to commencement of any operation that will affect the residents' property. The City, before commencement of work on the Project, shall review and approve the form of all such notices.

4.05 Superintendent

4.05.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance on the Project site at all times during the progress of all work for the duration of the total project.

4.05.2 This person shall be a non-working superintendent who will be responsible for the satisfactory progression of the work and to ensure that all work is being completed in accordance with the plans and specifications. He is also to relay any conflicts or discrepancies that arise in the plans to the City's representative for resolution or interpretation.

4.05.3 The name of the person selected as superintendent and his qualifications shall be submitted and shall be approved in writing by the City. The superintendent shall not be changed except with the written consent or at the request of the City. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor.

4.05.4 The superintendent shall be the contact person whom the City will contact in the event of after-hours and weekend emergencies and the Contractor shall provide the City with the superintendent's contact information for such purpose.

4.06 Responsibility for Those Performing the Work and for the Work

4.06.1 The Contractor shall be responsible to the City for the acts and omissions of all his employees, all Subcontractors, and suppliers their agents and employees and all other persons performing any of the Work under a contract with the Contractor.

4.06.2 The Contractor shall at all times employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by these specifications. All workmen shall have sufficient skill and experience to perform properly the work assigned to them.

4.06.3 Prior to the completion of the work by the Contractor and the acceptance thereof by the Owner, the work shall remain at the risk of the Contractor; and said Contractor shall be required to repair, replace, renew, and make good, at his own expense, all damages caused by force, vandalism, or violence of the elements or any other cause whatsoever provided; however, that in such cases the Contractor shall be entitled to a reasonable extension of time which to complete said work. In case of suspension of work from any cause whatever, the Contractor shall be responsible for the project and shall take such precautions as may be necessary to prevent damage to the project, for normal drainage, and shall erect any necessary warning signs or barricades at his expense. The Contractor shall properly and continuously maintain the roadway for local traffic.

4.07 Drawings and Specifications at the Site

4.07.1 The Contractor shall maintain at the site for the City one copy of any Drawings, Specifications, Addenda, approved Shop Drawings, Requests for Information, Change Orders and other Modifications, in good order and marked to record all changes made during construction.

4.07.2 The Drawings, marked to record all changes made during construction, shall be delivered to the City upon completion of the work. The Contractor shall also maintain on the project site a survey level, legs, and rod at all times, which are deemed adequate by the City.

4.08 Cleaning Up

4.08.1 The Contractor shall at all times keep the premises free from accumulation of waste materials, rubbish, and debris caused by his operations. The Contractor shall not "stockpile" any material on the jobsite and all excavated material shall be hauled off the site at the time of excavation.

4.08.2 Stockpiling of materials delivered and used on the same day will be allowed if all materials are in place or removed at the end of the day. Prior to final payment, Contractor shall restore and replace the surfaces of the project area to match the conditions existing prior to the work.

4.08.3 The Contractor shall be responsible for keeping clean, i.e. free from mud, dirt, rock, and debris at all times all City streets used by the Contractor in connection with the Work and the Project. Should any accumulation be deemed excessive, the City may direct the Contractor to thoroughly wash or remove the debris from the street at no cost to the City.

4.08.4 The Contractor shall make satisfactory arrangements to store material and equipment after delivery and during construction off of the City right-of-way. The City will assume no responsibility for these arrangements.

4.09 Utilities

4.09.1 Interference with Existing Water and Sewer Services and Mains

4.09.1.1 The Contractor shall minimize the outage of water and sewer service to residents. The cutting off of water and sewer service shall be only with the consent of the City. The Contractor shall notify the City and have their approval prior to commencing work on each water or sewer main or connection item.

4.09.1.2 The Contractor shall conduct his work in such a manner as not to endanger existing water or sewer mains, services or appurtenances. Mains and services shall be adequately supported where they cross or are adjacent to the excavation. The Contractor shall bear the cost of all repairs to water or sewer mains or appurtenances damaged because of his own carelessness or neglect.

4.09.1.3 When it becomes necessary to shut down any existing water or sewer main, a representative of the City shall be present during this operation. The total time for the main to be shut down should be held to a minimum and in no case shall any customer be without water or sewer service for more than eight (8) hours. The Contractor shall notify each water or sewer customer whose water or sewer service will be interrupted at least one hour prior to shut down. The Contractor shall assume full responsibility for shutting down the main and notifying the customers.

4.09.2 Coordination with Utilities

The Contractor shall contact and coordinate with all affected utilities prior to commencing any operations. Prior to commencement of any work involving excavation, demolition of facilities or the

erection of posts, it will be the sole responsibility of the Contractor to notify all utilities of the planned work and request that the utilities suitably mark underground installations in the vicinity of the planned work, and arrange for disconnection of any necessary utilities.

4.10 Cash Allowances

The Contractor acknowledges and agrees that the Contract Sum includes all cash allowances as may be specified in the Contract Documents.

4.11 Equal Employment Opportunity

The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or disability. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment; advertising; layoff or termination; rates of pay or other forms of compensation; and selection of training, including apprenticeship. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or disability. The Contractor shall incorporate the foregoing requirements of this paragraph in all of its subcontracts for work performed under the terms and conditions of this Contract. A breach of this provision may be grounds for Contract termination.

4.12 Accident Prevention: OSHA

4.12.1 In the performance of this Contract, the Contractor shall comply with all applicable Federal, State, county and local laws governing safety health and sanitation. The Contractor and any subcontractor shall not require any worker or mechanic employed in performance of this Contract to work in surroundings or other working conditions which are unsanitary, hazardous, or dangerous to his health or safety, as determined under Construction Safety and Health Hazards, Title 29, Code of Federal Regulations, Part 1926.

4.12.2 The Contractor shall require all on-site employees to complete a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program provided by the contractor which includes a course in construction safety and health approved by OSHA or a similar program approved by MoDOLIR which is at least as stringent as an approved OSHA program, as required under Section 292.675 RSMo. All employees are required to complete the program within sixty days of beginning work under this contract. The successful bidder shall also require all subcontractors under the contractor to provide the ten-hour training program required under Section 292.675 RSMo. to such subcontractors' on-site employees.

SECTION 5 SUBCONTRACTORS

5.01 Award of Subcontracts and other Contracts for Portions of the Work

5.01.1 Unless otherwise specified in the Contract Document, the Contractor shall submit a completed Subcontractor Form, naming each Subcontractor and Supplier the Contractor proposes to employ in performing the Work under this Contract and describing the portions of the Work each proposed Subcontractor shall perform or supply, along with other required Contract documents to the City. Contractor shall complete and submit a Subcontractor Form to the City in the event of any substitution or addition of a Subcontractor by the Contractor.

5.01.2 Prior to the award of the Contract, the City will notify the Bidder in writing if the City, after due investigation, objects to any such person or entity proposed by the Bidder pursuant to Section 5.01.1 above. If the City objects to any such proposed person or entity, the Bidder may, at his option, (1) withdraw his Bid, or (2) submit an acceptable substitute person or entity with no adjustment in his bid price.

5.01.3 The City reserves the right to reject a Subcontractor, if in the City's sole discretion, delays may result in the performance of Work as a result of a Subcontractor's other obligations. The Contractor shall be held responsible, in addition to the submission of the Subcontractor Utilization Form, to apprise the City of any additional work which a Subcontractor accrues throughout the duration of the project. This shall include work for the City under a different Contract, or any other person or entity. If such said additional work shall detrimentally impact the progression of the Work under this Contract, the City retains the right to require the Contractor to submit a substitute Subcontractor for this work at no additional cost to the City.

5.01.4 The Contractor shall not contract with any Subcontractor or any person or organization (including those who are to furnish materials or equipment fabricated to a special design), for proposed proportions of the Work designated in the Contract Documents or, if none is so designated, with any Subcontractor proposed for the principal portions of the Work, who has been rejected by the City.

5.01.5 If the City requires a change of any proposed Subcontractor or person or organization during the execution of the Work approved under the Contract, the Contract Sum shall be increased or decreased by the difference in cost resulting from such change and an appropriate Change Order shall be issued.

5.01.6 The Contractor shall not make any substitution for any proposed Subcontractor or person or organization that has not been accepted by the City prior to the Contract Award, unless the substitution is accepted by the City in writing prior to such substitution.

5.02 Subcontractual Relations

5.02.1 All work performed for the Contractor by a Subcontractor shall be pursuant to an appropriate agreement between the Contractor and Subcontractor (and where appropriate between Subcontractors and Sub-subcontractors) which shall contain provisions that:

5.02.1.1 Require the Work to be performed in accordance with the requirements of the Contract Documents;

5.02.1.2 Require submission to the Contractor of applications for payment under each subcontract to which the Contractor is a party, in reasonable time to enable the Contractor to apply for payment in accordance with Section 9 hereof;

5.02.1.3 Require that all claims for additional costs, extensions of time, damages for delays or otherwise with respect to subcontracted portions of the Work shall be

submitted to the Contractor (via any Subcontractor or Sub-subcontractor where appropriate) in sufficient time so that the Contractor may comply in the manner provided in the Contract Documents for like claims by the Contractor upon the City;

5.02.1.4 Waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by the property insurance described in Section 11, except such rights as they may have to the proceeds of such insurance held by the City as trustee under said Section 11;

5.02.1.5 Obligate each Subcontractor specifically to consent to the provisions of this Section 4.03;

5.02.1.6 Require the Subcontractor (and the Sub-subcontractor) to indemnify and hold harmless the City against all claims, damages, losses, expenses and attorneys' fees arising out of or resulting from the performance of the Work by Subcontractor, and its agents and employees, unless such claims, damages or losses are caused solely by the negligent act of the City.

5.03 Payment to Subcontractors

5.03.1 The Contractor shall pay each Subcontractor upon receipt of payment from the City, an amount equal to the percentage of completion allowed to the Contractor on account of such Subcontractor's Work, less the percentage retained from payments to the Contractor. The Contractor shall also require each Subcontractor to make similar payments to his Subcontractors.

5.03.2 If the City withholds payment to the Contractor for any cause which is the fault of the Contractor and not the fault of a particular Subcontractor, the Contractor shall pay that Subcontractor on demand for its Work to the extent completed.

5.03.3 The City shall not have any obligation to pay or to see to the payment of any sum to any Subcontractor or Sub-subcontractor.

SECTION 6 SEPARATE CONTRACTS

6.01 Mutual Responsibility of Contractors

6.01.1 The Contractor shall afford other contractors reasonable opportunity for the delivery and storage of their materials and equipment and the execution of their work, and shall properly connect and coordinate the Work with theirs. The Contractor shall employ, insofar as possible, such methods and means in carrying out the Work as will not cause any interruption or any interference with any other contractor.

6.01.2 If any part of the Work depends for proper execution or results upon the work of any other separate contractor, the Contractor shall inspect and promptly report to the City any apparent discrepancies or defects in such work that render it unsuitable for proper execution of the Work. Failure of the Contractor to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper to receive the Work, except as to defects which may develop in the other contractor's work after the execution of the Contractor's Work that could not have been discovered by the Contractor upon reasonable inspection.

6.01.3 If the Contractor causes damage to the work or property of any other contractor on the Project, and such separate contractor sues the City or initiates an arbitration proceeding on account of any damage alleged to have been so sustained, the City shall notify the Contractor who shall defend such proceedings at his own expense, and if any judgment or award against the City arises therefrom the Contractor shall pay or satisfy it and shall reimburse the City for all attorneys' fees and court arbitration costs which the City has incurred.

SECTION 7 MISCELLANEOUS PROVISIONS

7.01.1 Governing Law. The Contract shall be governed by and construed and interpreted in accordance with the internal laws of the State of Missouri, without regard to its principles of conflict of laws, and shall be deemed to be executed and performed in the County of St. Charles, Missouri. Any legal action arising out of, or relating to this agreement, shall be governed by the laws of the State of Missouri, and the parties agree to the exclusive jurisdiction and venue over them by a court of competent jurisdiction located in the County of St. Charles, Missouri, or the U.S. District Court for the Eastern District of Missouri. The Contractor shall at all times observe and comply with all Federal and State laws, all local laws, ordinances, and regulations existing at the time of or enacted subsequent to the execution of the Contract which, if in any manner, affect the Work.

7.01.2 The Contractor and his surety shall indemnify and save harmless the City and all of its representatives, engineers, consultants, and employees against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself, his employees, or his subcontractors.

7.01.3 Changes may be made to this contract as a result of any ordinance, law and/or directive issued by the City and/or the State of Missouri and/or the Federal Government. Should such a change occur the Contract shall be amended reflecting such change and signed by both parties acknowledging the change(s).

7.02 Successors and Assigns

The City and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract without the prior written consent of the other, nor shall the Contractor assign any sums due or to become due to him hereunder, without the prior written consent of the City.

7.03 Notices

Any notice to any party pursuant to or in relation to the Contract shall be in writing and shall be deemed to have been duly given when delivered in person to the individual or member of the firm or to an officer of the corporation for whom it was intended, or when deposited in the United States mail, registered or certified with postage prepaid addressed to the last business address known to the party giving the notice.

7.04 Rights and Remedies

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

7.05 Royalties and Patents

The Contractor shall pay all royalties and license fees payable on all designs, processes or products used in connection with the work or incorporated therein, unless otherwise agreed upon by the City. The Contractor shall defend all suits or claims for infringement of any patent rights and shall indemnify and hold the City harmless from and against any loss on account thereof.

SECTION 8 TIME

8.01 Progress and Completion

8.01.1 All time limits stated in the Contract Documents are of the essence of the Contract.

8.01.2 The Contractor shall begin the Work on the date of commencement provided in the Notice to Proceed.

8.01.3 The Contractor shall carry the Work forward expeditiously with adequate forces and shall make the Project Available for Use (Substantially Complete) within the allotted number of Days as provided for in the Contract Documents and in accordance with the construction schedule.

8.01.4 The Contractor shall complete Final Acceptance within 90 days of the Project being deemed Available for Use (Substantially Complete). Delay of Final Closeout can result in liquidated damages.

8.02 Hours of Work

The Contractor shall not perform any work nor move any equipment except between 7:00 A.M. and 6:00 P.M. Monday through Friday without the written consent of the City. No work shall be done on Saturday, Sunday, or City holidays, unless approved by the City in advance.

Unauthorized Work done outside of the working hours stated above is subject to rejection and removal and replacement at the Contractor's expense.

8.03 Overtime

If overtime work is authorized, as per Section 8.02, and the Contractor fails to appear as scheduled, the City shall deduct the cost for the City's assigned personnel from the Contract Sum for the time period schedule.

8.04 City Holidays

No Work by the Contractor or Subcontractors shall be performed on City Holidays. Only Work considered "emergency work" shall be allowed, and shall be approved in advance by the Director. The following is a list of City Holidays:

New Year's Day, Martin Luther King Day, Presidents Day, Good Friday, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, Christmas Eve, Christmas Day.

8.05 Delays, Extensions of Time

8.05.1 Should the Contractor be delayed at any time during the execution of the Work by changes in the scope of work, or by strikes, lockouts, fire, unusual transportation delays, unavoidable casualties, or other delay beyond the control of and not reasonably foreseeable by the Contractor and such delay is approved by the City, the time for completion shall be extended for a period commensurate with the period of the delay by Change Order.

8.05.2 In such event, the Contractor shall submit a written request for a time extension within seven (7) calendar days of the occurrence of the event causing the delay.

8.05.3 Inclement weather shall not be considered a valid reason for extension of time, unless abnormal for the season and place of work. The Contractor shall make proper allowance for inclement weather in the bid submitted.

8.05.4 In case of continuing delay, a single request for time extension by the Contractor shall be sufficient.

8.06 Liquidated Damages

Time is of the essence with this Project and delay in the project becoming Available for Use and/or in Final Acceptance will inconvenience the public and increase administrative costs of the City, the costs of which are inherently difficult to quantify and which the City is incapable of ascertaining at this time. Should the Contractor, or in the case of Contractor's default, the surety, fail to complete the Work and/or receive Final Acceptance within the times stipulated in this Contract, or within such extensions of time as may be allowed by the City in the manner set forth in the Contract, the Contractor (or surety, as applicable) shall pay to the City liquidated damages, as chargeable per the Contract, not as a penalty, but rather as a reasonable measure of the damages, based on the City's experience and given the nature of the losses that may result from delay.

8.07 Suspension of Work:

The Engineer may suspend the work or any portion thereof by written notice to the contractor, which notice shall fix the date on which work shall be resumed. The Contractor will resume that work on the date so fixed. The Contractor will be allowed an extension of the contract time, directly attributable to any suspension.

SECTION 9 MEASUREMENT OF QUANTITIES, PAYMENTS, AND COMPLETION

9.01 Measurement of Quantities

9.01.1 Unless otherwise directed within the Job Specific Provisions, Technical Specifications and/or Methods of Measurement and Payment, the quantities for which payment will be made shall be those shown in the Contract for the various items, provided the project is constructed as shown on the plans. Contract quantities shall be used for final payment except when:

9.01.1.1 Errors are found in the original computations in excess of 5% of the contract quantities.

9.01.1.2 An authorized change in grade, slope or typical section is made.

9.01.1.3 Unauthorized deviations decrease the quantities on the plans.

9.01.2 When the above conditions are encountered, the correction or revisions will be computed and added to or deducted from the contract quantity.

9.01.3 When the plans have been altered or when disagreement exists between the Contractor and the City as to the accuracy of the plan quantities of any balance, or the entire project, either party shall have the right to request a recomputation of contract quantities within any area, by hand calculation of the average-end-area method for cubic yard quantities, and standard measurement methods for other quantities, by written notice to the other party. The written notice shall contain evidence that an error exists in the original elevation or in the original computations which will affect the final payment quantity in excess of 15%. When such final measurement is required, it will be made from the latest available ground surface and the design section.

9.01.4 By Weight. These specifications require that the Contractor must furnish the representative of the City, on the job site, with original weight certificates on a daily basis signed by a bonded weigh master for all materials supplied by the Contractor that are incorporated into this work, which payment therefore is based on weight.

9.02 Application for Payment

9.02.1 The Contractor shall submit requests for payment not more than once monthly upon substantial completion of various stages of the Work, and upon final completion of the Work.

9.02.2 The request for payment shall be submitted to the City as an itemized Application for Payment pursuant to the City-Contractor Agreement on such forms and supported by such data substantiating the Contractor's right to payment as the City may require.

9.02.3 If payments are to be made on account of materials or equipment to be incorporated into the Work and delivered and suitably stored at the site, such payments shall be conditioned upon submission by the Contractor of bills of sale, waiver of liens, or such other documents satisfactory to the City to establish the City's title to such materials or equipment or to otherwise protect the City's interest.

9.02.4 By submitting an Application for Payment, the Contractor warrants and guarantees that title to all Work, materials and equipment covered by such Application for Payment, whether incorporated into the Work or not, will pass to the City upon the receipt of such payment by the Contractor, free and clear of all liens, claims, security interests or encumbrances (hereinafter referred to as "liens").

9.03 Payment

9.03.1 If the Contractor has made Application for Payment as above, the City will make payment to the Contractor for such amount as it determines to be properly due pursuant to the Contractor's Application for Payment, or state in writing the City's reasons for withholding all or any portion of such payment within 30 days of the latter of:

9.03.1.1 Delivery of materials or construction services;

9.03.1.2 Date of Request for Payment or date Request for Payment is received; or

9.03.1.3 In those instances in which the Contractor approves the Owner's estimate for payment, the date upon which such notice of approval is duly delivered.

9.03.2 No progress payment, nor any partial or entire use or occupancy of the Work by the City, shall be evidence of the satisfactory performance of the Work, either wholly or in part, or constitute an acceptance of any Work that is defective or improper or not otherwise completed in accordance with the Contract Documents.

9.04 Prompt Payment

9.04.1 All public works contracts shall provide for prompt payment by the City to the Contractor (as well as prompt payment by the Contractor to the subcontractor and material supplier) unless contrary to any federal funding requirements, per RSMo 34.057.

9.04.2 The City shall make progress payments to the Contractor on at least a monthly basis as the work progresses, or, on a lump sum basis according to the terms of the lump sum contract.

9.04.3 If the City determines the work is not substantially completed and accepted, the City must provide written explanation of why the work is not accepted with 14 calendar days of the request for payment of retainage. If a written explanation is not provided, the City is required to release 98% of the retainage withheld within 30 days.

9.04.4 Nothing in this section shall prevent the City from withholding payment or final payment from the Contractor. Reasons for withholding payment or final payment shall include, but not be limited to, the following: liquidated damages; unsatisfactory job progress; defective construction work or material not remedied; disputed work; failure to comply with any material provision of the contract

9.05 Completion and Final Payment

9.05.1 Upon the Contractors determination that the Project is Available for Use, ready for final inspection and acceptance, and upon receipt of a final Application for Payment, the City will promptly make such inspection. Any defects arising out of said inspection will be provided to the Contractor in writing and shall be promptly remedied at no additional cost to the City. When the City finds the Work acceptable under the Contract Documents and the Director has determined the Project is Available for Use, the City will make payment to the Contractor, less the total retainage, any penalties assessed against Contract and authorized by law to be withheld by the City from its payment to the Contractor, and less any moneys which are due and payable to the City as liquidated damages.

9.05.2 Upon the Director's determination that the Project is Available for Use, the Contractor shall complete Project Closeout within 90 days. Retainage payment shall not become due until the Contractor completes the Project Closeout, including addressing any and all deficiencies as noted in the Final Inspection, and submits the following, at a minimum, to the City:

9.05.2.1 An Affidavit that all payrolls, bills for materials and equipment, and other indebtedness incurred in connection with the execution and completion of the Work for

which the City or its property might in any way be responsible, have been paid or otherwise satisfied

9.05.2.2 Consent of the surety, if applicable, to final payment

9.05.2.3 An affidavit stating the Contractor has fully complied with the provisions and requirements of the Prevailing Wage Law, Section 290.210 through 290.340 RSMo., as amended,

9.05.2.4 Other data, as required by the City, establishing payment or satisfaction of all such obligations, such as receipts and releases arising out of the Contract, to the extent and in such form as may be designated by the City

9.05.2.5 Maintenance Bond.

9.05.3 If any Subcontractor refuses to furnish a release or waiver required by the City, the Contractor may furnish a bond or other agreement satisfactory to the Director indemnifying the City against any liability relating to such Subcontractor. If any such claimed liability remains unsatisfied after all payments are made, the Contractor shall refund to the City all moneys that the City incurs or may be compelled to pay in discharging such claimed liability, including all costs and reasonable attorneys' fees.

9.05.4 The acceptance of final payment shall constitute a waiver of all claims by the Contractor, except those previously made in writing and still unsettled.

SECTION 10 PROTECTION OF PERSONS AND PROPERTY

10.01 Safety Precautions and Programs

Public safety is of the utmost importance and is the sole responsibility of the Contractor to provide, erect, and maintain adequate protection throughout the project to protect the public. The Contractor shall initiate, maintain and supervise safety precautions and programs in connection with the performance of the Work.

10.02 Safety of Persons and Property

10.02.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

10.02.1.1 The general public;

10.02.1.2 All employees on the Work and all other persons who may be affected thereby;

10.02.1.3 All the Work, all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors; and

10.02.1.4 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, sprinkler systems, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.02.1.5 All survey monuments and property markers which shall be carefully preserved in place by the Contractor who shall be responsible for the correct replacement of all such monuments and markers disturbed during the work.

10.02.1.6 Any and all channels, swales, pipes, culverts, and all drainage structures in the project area; the Contractor shall provide for normal drainage and shall continuously maintain channels, swales, pipes, culverts, and all drainage structures in the project area. The Contractor is responsible for any damage caused by his failure to provide and maintain normal drainage.

10.02.2 The Contractor shall comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction over the safety of persons or property to protect them from damage, injury or loss. The Contractor shall erect and maintain all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying the City and users of adjacent utilities. The Contractor shall provide signs, barrels, or any other safety devices which the City deems necessary for public safety. No additional payment will be made and this work shall be considered incidental to the Contract. The City will place safety devices as it deems necessary if the Contractor fails to provide the required items within 24 hours of notification. The Contract Sum shall be reduced by the cost of these devices.

10.02.3 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

10.02.4 All damage or loss to any property caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by anyone for whose acts they may be liable, shall be remedied by the Contractor. The City shall document any complaint by any person regarding damage or loss to property caused by Contractor by requesting such complainant to complete a Damage Claim form. A copy of the Damage Claim form shall be

submitted by the City to the Contractor and the Contractor shall correct the problem, repair such damage or otherwise compensate the complainant or file a claim for such damage with Contractor's insurance company within ten (10) days of the receipt of the Damage Claim form from the City. If the City shall have a legitimate basis for believing that such claim is valid, the City shall have the option to withhold payment of funds until (i) such damages are repaired; or (ii) the City has been provided with evidence that that Contractor has made restitution to the complainant.

10.02.5 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the City.

10.02.6 All traffic control devices shall conform to the "Manual on Uniform Traffic Control Devices" for Streets and Highways", Current Edition. At all times until final acceptance of the Work, the Contractor shall provide and maintain at his own expense such signs, lights, watchmen, fences, and barriers as may be necessary to properly protect the work and provide for safe and convenient public travel. The Contractor shall provide the Owner with the name and telephone numbers of an individual who shall be on 24-hour call for erection and maintenance of the protection devices. The cost of any erection or maintenance of the warning or protection devices by City Forces may be filed against the Contractor's monthly or final statement without any notice to the Contractor. The Director shall, in all cases, determine questions which may arise relative to additional traffic control devices. No payment, as such, will be made because of these requirements; but the cost thereof will be considered as fully covered by the prices paid for other items of work. Failure to properly provide traffic control devices in accordance with this section, the City will issue one written warning and a 24-hour grace period for the Contractor to obtain the necessary traffic control devices. The second infraction, the City will place traffic control devices at a cost of thirty-five dollars (\$35) per day per traffic control device. The cost of the traffic control devices will be deducted from the Contractor's monthly invoice.

SECTION 11 INSURANCE

11.01 Contractor's Liability Insurance

11.01.1 The Contractor shall purchase and maintain such insurance required in the Contract Documents to protect him from claims which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

11.01.2 The insurance shall be written for not less than any limits of liability specified in the Contract Documents, or required by law, whichever is greater, and shall include contractual liability insurance as applicable to the Contractor's obligations for indemnification and reimbursement of attorneys' fees and costs under the Contract Documents.

11.01.3 Certificate(s) of Insurance acceptable to the City shall be filed with the City prior to commencement of the Work. Certificate(s) of Insurance must state: "The City of Wentzville, Missouri is additional insured on a primary and non-contributory basis related to the General and Automobile Liability policies, and all insurers have waived their rights to subrogation." These Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least 30 days prior written notice has been given to the City.

11.01.4 Any certificate or other evidence of insurance, submitted to the City, shall be in a form acceptable to the City. In the case of policies written by companies organized in a state other than Missouri, the certificate of insurance, or other evidence submitted, shall be countersigned by a Missouri resident agent of such company.

<u>Insurance Type</u>	<u>Amount</u>
Workers Compensation	An amount and type in full compliance with statutory requirements of Federal and State of Missouri law and Employees Liability coverage.
Comprehensive General Liability	\$1,000,000 each occurrence \$2,804,000 aggregate
Commercial Auto Liability	\$1,000,000 per occurrence

11.02 Property (Builder's Risk) Insurance

11.02.1 Unless otherwise provided, the Contractor shall purchase and maintain property insurance (Builder's Risk Insurance) upon the entire Work at the site to the full insurable value thereof. This insurance shall include the interests of the City, the Contractor, Subcontractors and Sub-subcontractors in the Work and shall insure against the perils of Fire, Extended Coverage, Vandalism and Malicious Mischief.

11.02.2 The Contractor shall purchase and maintain such steam boiler and machinery insurance as may be required by the Contract Documents or by law. This insurance shall include the interests of the City, the Contractor, Subcontractors and Sub-subcontractors in the Work.

11.02.3 Certificate(s) of Insurance acceptable to the City shall be filed with the City prior to commencement of the Work. Certificate(s) of Insurance must state on the Certificate: "The City of Wentzville, Missouri is an additional insured on a primary and non-contributory basis related to the General and Automobile Liability policies, and all insurers have waived their rights to subrogation."

These Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least 30 days prior written notice has been given to the City.

11.02.4 Any loss insured by property insurance maintained by the City shall be adjusted with the City and made payable to the City as trustee for the insured, as their interests may appear, subject to the requirements of any applicable mortgagee clause.

11.02.5 The City and Contractor waive all rights against each other for damages caused by fire or other perils to the extent covered by insurance provided under this Paragraph 11.02 and the Contract Documents, City-Contractor Agreement, except such rights as they may have to the proceeds of such insurance held by the City as trustee. The Contractor shall require similar waivers by Subcontractors and Sub-subcontractors in accordance with Section 5.02 hereof.

SECTION 12 BOND REQUIREMENTS

12.01 Bid Bond

If the total project bid exceeds \$50,000 a Bid Bond shall be included in the Bid Proposal and shall be to five percent (5%) of the bid value. The Bid Bond will be required for the total project bid.

12.02 Performance Bond:

If the Contract Sum is in excess of \$50,000 the Contractor shall procure and maintain a performance bond (the "Bond") for the benefit of the City of Wentzville ("City") as required by the laws of the State of Missouri and in an amount not less than 100% percent of the aggregate amount of the Contract. The Bond shall serve as security for the faithful performance of this Contract.

12.03 Payment Bond

If the Contract Sum is in excess of \$50,000, the Contractor shall procure and maintain a payment bond (the "Bond") as required by the laws of the State of Missouri and in an amount not less than 100% percent of the aggregate amount of the Contract. The Bond shall serve to ensure the payment of all persons performing labor and furnishing materials in connection with this Contract. The Payment Bond shall meet all requirements of Section 107.170 RSMo.

12.04 Maintenance Bond:

The Contractor shall procure and maintain a Maintenance Bond in the amount of 10% of the final Contract Sum after any and all Change Orders and/or formal contract amendments. The Maintenance Bond shall be in full force for a one (1) year guarantee period from the date of final acceptance. Final payment will not be made until the City receives the Maintenance Bond. The Bond shall serve to ensure required maintenance of the Project will be provided throughout the maintenance period.

12.05 Bond Premiums

The premiums on all the Bonds shall be paid by the Contractor. The Bond shall remain in full force and effect during the life of the Contract (Performance and Payment) and during the term of any warranty (Maintenance) as required by the specifications and shall be held by the City.

12.06 Additional Requirements and Compliance

12.06.1 The Contractor represents, warrants, and guarantees, and Contractor shall also furnish to City a certificate of authority or some other evidence as deemed appropriate by the City establishing that the Bond is from a surety that is: authorized to do business in the State of Missouri, authorized to become surety on the bonds or obligations of persons or corporations, solvent with paid-up capital of not less than the applicable amount provided by the laws of Missouri, and, if organized outside the State of Missouri, in compliance with all the provisions of Missouri law relating to insurance companies other than life insurance companies. If, at any time, City shall become dissatisfied with any surety or sureties, or if for any other reason the Bond shall cease to be adequate security for City, Contractor shall, within ten days after notice from the City, substitute an acceptable bond (the "Additional Bond") in form and sum and signed by other sureties as may be satisfactory to City. The premiums on the Additional Bond shall be paid by contractor. All requirements herein applicable to the bond shall also be applicable to the Additional Bond. No further partial payments to Contractor shall be deemed due, nor shall be made until the sureties on the Additional Bond shall have qualified.

12.06.2 Contractor shall furnish to City such Bond together with insurance or other documents required by the Contract. The current power of attorney for the persons who sign for any surety

company shall be attached to the Bond. The power of attorney shall be sealed and certified with the manual signature of an officer of the surety. A facsimile signature will not be accepted.

12.06.3 The failure of the Contractor to supply the required Bond along with the evidence of the required insurance coverage and other documents required by the Contractor within ten days after the executed acceptance is received by the Contractor, or within such extended period as may be granted by the City, the City may grant, based upon reasons determined sufficient by the City, shall constitute a default and the City may either award the contract to the next responsive bidder or re-advertise for bids, and may charge against the Contractor the difference between the amount of his/her bid and the amount for which a contract for the work is subsequently executed. If a more-favorable bid is received by re-advertising, the defaulting Contractor shall have no claim against City for a refund. Because of the difficulty of ascertaining the damages caused to City, said sum shall be considered liquidated damages and shall not constitute a penalty.

12.06.4 The Contractor shall supply the following documents to verify the authenticity of the bonds and bonding company:

12.06.4.1 Provide a certificate of authority from the Secretary of State of Missouri concerning the authority of the bonding company.

12.06.4.2 Provide proof that the bonding company has an "A" rating from BEST'S or Standard and Poor's.

12.06.4.3 Provide written verification from the bonding company that the bond exists and that it is an obligation of the contractor.

SECTION 13 CHANGES IN WORK

13.01 Change Orders

13.01.1 The City, without invalidating the Contract, may order Changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, with the Contract Sum and the Construction Schedule being adjusted in accordance with the City-Contractor Agreement. All such changes in the Work shall be authorized by Change Order, and shall be executed under the applicable conditions of the Contract Documents.

13.01.2 The Contract Sum and the Contract Time may be changed only by Change Order. The Contractor shall make all requests for a Change Order on forms provided by the City upon written request to the City.

13.01.3 The cost or credit to the City resulting from a Change in the Work shall be determined in accordance with the City-Contractor Agreement.

13.01.4 Changes in the Work outside of the general scope of the Contract shall require an amendment to the Contract.

13.02 Claims for Additional Cost

If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the City written notice thereof within twenty (20) days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor and approval granted by the City before proceeding to execute the Work. No such claim shall be valid unless so made. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

13.03 Minor Changes in the Work

The City shall have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or the Construction Schedule and not inconsistent with the intent of the Contract Documents. Such changes may be effected by Field Order or by other written order. Such changes shall be binding on the City and the Contractor.

13.04 Changes in Excavation Work

During construction, it may become necessary to increase the amount of excavation or to utilize a soil stabilization process if unsuitable subgrade conditions are found. The Contractor shall immediately contact the City if this condition occurs. The City and the Contractor shall agree upon the existence of unsuitable subgrade, the depth in which to remove the unsuitable soil, and the extent of the problem area prior to any additional work. No payment will be made for any area which undergoes additional excavation which is not indicated in the above scope of work and has not been approved by the City prior to the excavation. If provided in the Contract Documents, all additional excavation which becomes necessary shall be paid at the unit bid price for such work. The City reserves the right to contract with a separate contractor for the use of a soil stabilization process. No direct payment will be made for delays incurred due to this process and the Contractor's only compensation will be the allotment of additional days for the delay. The number of days shall be from the time the Contractor initially notifies the City of an unsuitable subgrade condition and until two days after the completion of the soil stabilization process.

13.05 Overhead and Profit from Changes in the Work

The combined overhead and profit included in the total cost to the Owner for a change in the Work shall be based on the following schedule:

13.05.1 For the Contractor, for Work performed by the Contractor's own forces, ten (10) percent of the cost.

13.05.2 For the Contractor, for Work performed by the Contractor's Subcontractors, five (5) percent of the amount due the Subcontractors.

13.05.3 For the Subcontractor involved, for Work performed by that Subcontractors own forces, ten (10) percent of the cost.

13.05.4 For each Subcontractor involved, for Work performed by the Subcontractor's Sub-subcontractors, five (5) percent of the amount due the Sub-subcontractor.

13.05.5 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by an complete itemization of costs including labor, materials and Subcontracts. Where major cost items are Subcontracts, they shall be itemized also.

13.06 Altered Quantities

13.06.1 The City reserves the right to make changes in plan details which may vary the accepted quantities from those shown on the Bid Line Items.

13.06.2 The Contractor shall accept, as payment in full, payment at the original Contract unit prices bid for the accepted quantities of work done. No allowance will be made for any increase expense or loss of expected profit suffered by the Contractor resulting directly from such altered quantities or indirectly from expense derived by handling small quantities of materials or performing operations within restricted areas. No allowance shall be made for any increased expense or loss of expected profit suffered because of the anticipated use of specific equipment which was not used.

SECTION 14 UNCOVERING AND CORRECTION OF WORK

14.01 Uncovering of Work

14.01.1 If any Work should be covered contrary to the request of the City, it must, if required by the City, be uncovered for his observation and replaced, at the Contractor's expense.

14.01.2 If any Work has been covered which the City has not specifically requested to observe prior to being covered, the City may request to see such Work and it shall be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, the Cost of uncovering and replacement shall, by appropriate Change Order, be charged to the City. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay the costs of uncovering and replacement.

14.02 Correction of Work

14.02.1 The Contractor shall promptly correct all Work rejected by the City as defective or as failing to conform to the Contract Documents, whether observed before or after substantial completion of the Work, and whether or not fabricated, installed or completed. The Contractor shall bear all cost of correcting such rejected Work.

14.02.2 If, within one year after the date of substantial completion or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents, any of the Work is found by the City to be defective or not in accordance with the Contract Documents, the Contractor shall correct it within 5 days after receipt of a written notice from the City. If the Contractor does not correct such deficiencies within that time, the City shall be entitled to specific performance from a court of equity or money damages in the amount of the reasonable cost of repairs, if adequate, provide that nothing shall limit the City's ability to draw upon the Performance and Maintenance Bond to correct such deficiencies. In all situations in which the City is forced to enforce the terms or specifications of the contract documents, the City shall be entitled to its reasonable attorneys' fees for enforcement of any provision of the contract documents.

14.02.3 All such defective or non-conforming Work under Subparagraphs 14.2.1 and 14.2.2 shall be removed from the site if necessary, and the Work shall be corrected to comply with the Contract Documents without additional cost to the City.

14.02.4 The Contractor shall bear the cost of making good all work of separate contractors destroyed or damaged by such removal or correction.

14.02.5 In the alternative to Section 14.02.3, if the Contractor fails to correct such defective or non-conforming Work, the City may correct it in accordance with Section 3.03 hereof.

14.03 Acceptance of Defective or Non-Conforming Work

14.03.1 If the City prefers to accept defective or non-conforming Work, it may do so instead of requiring removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the Contract sum, or if the amount is determined after final payment, it shall be paid by the Contractor.

SECTION 15 PURCHASE OF MATERIALS AND EQUIPMENT

15.01 Sales Tax Provisions

This project is exempt from all sales taxes for construction materials and supplies used directly in fulfilling contract requirements. Sales tax shall not be included in the unit costs for this project. The Contractor shall follow the regulation as outlined in RSMo 144.062.1.

The City will issue the Contractor a project exempt certificate which is to be given to the applicable suppliers and used only for the specific project identified and will expire on the date indicated unless renewed by the City.

15.01.1 Contractor shall:

15.01.1.1 Order all necessary materials and equipment to complete the Work and the Project in accordance with the Plans and Specifications.

15.01.1.2 Inspect all delivered materials for conformance to specifications, damage, or breakage and subsequently accept materials if found to be satisfactory.

15.01.1.2.1 Purchase of materials on behalf of the City shall not relieve the Contractor of obligations to order, schedule deliveries, inspect, accept, or reject, store, handle or install materials or perform any other duties required by the Contract Documents or customarily performed in conjunction with providing materials to complete the Work.

15.01.1.2.2 Costs of complying with the foregoing Special Sales Tax Provisions shall be included in the Bid Proposal submitted and the Contractor shall not be entitled to receive additional compensation for such compliance.

15.02 Use of American Made Products.

Any manufactured goods or commodities used or supplied in the performance of the Contract Documents or any subcontract thereto shall be manufactured or produced in the United States as required and in accordance with Section 34.353 RSMo.

15.02.1 This section shall not apply when:

15.02.1.1 The purchase, lease, or contract involves an expenditure of less than twenty-five thousand dollars;

15.02.1.2 Only one line of a particular good or product is manufactured or produced in the United States;

15.02.1.3 The specified products are not manufactured or produced in the United States in sufficient quantities to meet the City's requirements or cannot be manufactured or produced in the United States within the necessary time in sufficient quantities to meet the City's requirements;

15.02.1.4 Obtaining the specified products manufactured or produced in the United States would increase the cost of the contract by more than ten percent.

15.02.2 If the goods or commodities are not exempt due to a circumstance described in Section 15.02.1, then the Contractor shall provide the City with the information necessary to make the certifications required under Section 34.353 RSMo.

15.03 Missouri Products

Contractors are encouraged to purchase commodities and tangible property manufactured, produced, or grown within the local area and in the State of Missouri, and from all firms, corporations, or individuals with licensed businesses in the State of Missouri.

SECTION 16 SPECIAL PROVISIONS

16.01 Scheduling of Work and Interference with Traffic

16.01.1 The Contractor's work must be scheduled and accomplished in stages such that local traffic is maintained during construction. It shall be the Contractor's responsibility to provide a traffic way that is usable in all weather conditions. The Contractor shall construct and maintain in a safe condition temporary pavements and connections for local traffic.

16.01.2 Suitable temporary barriers shall be provided to protect traffic from the Work if necessary. At all times until final acceptance of the Work, the Contractor shall provide and maintain such signs, lights, barriers, cones, watchmen or flaggers as may be necessary to properly protect the Work and provide for safe and convenient public travel. In the case of open excavations or other potentially hazardous conditions existing during non-working periods, the traveling public will be protected and advised by signs and flasher barricades. Parking of equipment or storage of materials on or near the Project site will be permitted only if adequate protective devices are provided and then only for the minimum time required for any specific job.

16.01.3 No additional payment shall be made for temporary guardrail, barriers, signs, lights, or other work as may be necessary to maintain traffic and to protect the Work and the public and all labor, equipment and material necessary to accomplish this task shall be considered incidental.

16.02 Access

16.02.1 Areas of intersections and roadways within the construction limits shall be constructed in phases so that at no time will access be denied.

16.02.2 Access to private driveways may be limited by the nature of the Work. The Contractor shall schedule his work such that at no time during the life of this Contract will any driveway be denied access for any reason other than the curing of concrete. All concrete, including curbs, sidewalks and driveway pavements, shall be formed and poured within a two calendar day period for each and every driveway. Excavation for this work shall be accomplished a maximum of one calendar day prior to forming, however, access shall be provided immediately after excavation. At the end of the curing period, access shall be immediately supplied using asphalt or compacted aggregate.

16.02.3 All temporary materials used for access will be the responsibility of the Contractor and shall be included in his unit bid price for each related item. No separate payment will be made for the placement, maintenance or removal of said access.

16.02.4 If said access is not supplied as set out above, the City will supply said access with its own forces, without notification to the Contractor, and will deduct such costs from the sums due the Contractor, notwithstanding any other provisions given this Contract. Wherever excavation affects pedestrian access to houses or public buildings, plank or other suitable bridges shall be placed at convenient intervals.

16.03 Construction Staking and Layout

The Contractor shall be responsible for providing all labor, equipment and materials necessary for construction staking and layout as required, to the grades, elevations and alignment as determined by the City. No separate payment will be made for construction staking and layout. The Contractor shall make his bid accordingly. No payment shall be made for restaking except as expressly authorized due to changes made by the City during construction.

16.04 Pre-Construction Conference

A preconstruction conference may be held prior to the issuance of a notice to proceed with the Work. This meeting will be attended by the Contractor, the City, and representatives of the various utility companies that have facilities in the project area. The meeting date will be established after the taking of bids and at a time convenient to all parties.

16.05 Sequence of Work

16.05.1 A schedule of the Contractor's work shall be submitted to the City for approval. It shall contain a listing of the order in which the Contract items will be constructed and the approximate dates for starting and finishing each Contract item.

16.05.2 The Contractor shall furnish the City his proposed sequence and schedule for the completion of all work for its review and approval prior to the time of the preconstruction conference. The City shall have the right to specify the order of construction as deemed necessary.

16.05.3 The Contractor shall update and provide the City the revised schedule as necessary.

16.06 Control of Materials

16.06.1 The Contractor shall collect all materials tickets to verify the quantity of each item. Material tickets shall be collected and provided to the City in their original form. Photocopy or fax copies will not be accepted. All tickets shall be submitted on the day of delivery, either to the City personnel or the Public Works Department, or they shall not be accepted for payment.

16.06.2 Contractors and subcontractors shall produce letters of certification or certified test reports from materials producers and suppliers in order to determine compliance with specifications for designated materials prior to the incorporation thereof into the work.

16.06.3 The City will determine which materials are to be tested. The form and content of these test reports shall be in accordance with recognized standards and practices for this work or as otherwise determined by the City.

16.07 Termination by the Owner for Cause

16.07.1 In addition to all other remedies available to the Owner, the Owner may terminate the Contract if the Contractor:

16.07.1.1 Refuses or fails to supply enough properly skilled workers or proper materials;

16.07.1.2 Fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

16.07.1.3 Disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

16.07.1.4 Otherwise is guilty of substantial breach of a provision of the Contract Documents.

16.07.2 When any of the above reasons exists, the Owner may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior right of the surety:

16.07.2.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

16.07.2.2 Accept assignment of subcontracts; and

16.07.2.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

16.07.3 When the Owner terminates the Contract for cause, the Contractor shall not be entitled to receive further payment until the Work is finished.

16.07.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for professional services (including architects and engineers) and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the project architect, upon application, and this obligation for payment shall survive termination of the Contract.

16.08 Termination by the Owner for Convenience

16.08.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

16.08.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

16.08.2.1 Cease operations as directed by the Owner in the notice;

16.08.2.2 Take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

16.08.2.3 Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

16.08.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and actual costs incurred by reason of such termination.

SUMMARY OF QUANTITIES

SPECIFICATION	ITEM NUMBER	ITEM DESCRIPTION	UNIT	TOTAL QUANTITY
MoDOT	2013000	CLEARING AND GRUBBING	ACRE	32
MoDOT	2022010	REMOVAL OF IMPROVEMENTS	L.S.	1
MoDOT, JSP	2031000	CLASS A EXCAVATION	CU.YD.	112,924
MoDOT, JSP	2035500	EMBANKMENT IN PLACE	CU.YD.	83,306
MoDOT	2036000	COMPACTING EMBANKMENT	CU.YD.	90,886
MoDOT	2042010	SETTLEMENT GAUGE	EA.	6
MoDOT	2043010	PORE PRESSURE MEASURING DEVICE	EA.	3
MoDOT, JSP	2051010	MODIFIED SUBGRADE	SQ. YD.	22,287
MoDOT	2063000	CLASS 3 EXCAVATION	CU.YD.	1,668
MoDOT	2063300	CLASS 4 EXCAVATION	CU.YD.	108
MoDOT	3030600	FURNISHING ROCK BASE MATERIAL	SQ.YD.	5,812
MoDOT	3030610A	PLACING ROCK BASE	SQ.YD.	5,812
MoDOT	3040163	TYPE 1 AGGREGATE FOR BASE (6 IN. THICK)	SQ.YD.	1,962
MoDOT	3040183	TYPE 1 AGGREGATE FOR BASE (8 IN. THICK)	SQ.YD.	357
MoDOT	3040504	TYPE 5 AGGREGATE FOR BASE (4 IN. THICK)	SQ.YD.	15,310
MoDOT	3040506	TYPE 5 AGGREGATE FOR BASE (6 IN. THICK)	SQ.YD.	1,104
MoDOT	3105003	GRAVEL (A) OR CRUSHED STONE (B)	SQ.YD.	113
MoDOT	4011207	BITUMINOUS PAVEMENT MIXTURE PG70-22, (BP-1)	TONS	648.7
MoDOT	4013010	BITUMINOUS PAVEMENT MIXTURE PG64-22, (BASE WIDENING)	TONS	1,486.4
MoDOT	4071005	TACK COAT	GAL.	643
MoDOT, JSP	5021308	CONCRETE PAVEMENT (8 IN. NON-REINFORCED, 15 FT. JOINTS)	SQ.YD.	10,448.7
MoDOT, JSP	5021309	CONCRETE PAVEMENT (9 IN. NON-REINFORCED, 15 FT. JOINTS)	SQ.YD.	1,896.7
MoDOT, JSP	5021332	CONCRETE PAVEMENT (8 1/2 IN. NON-REINFORCED, 15 FT. JOINTS)	SQ.YD.	1,692.5
MoDOT, JSP	5021340	TYPE A2 SHOULDER	SQ.YD.	2,092.7
MoDOT	6061060	MGS GUARDRAIL	L.F.	763
MoDOT	6061061	MGS GUARDRAIL, 8 FT. POSTS, 6 FT. - 3 IN. SPACING	L.F.	175
MoDOT	6061070	MGS VERTICAL CONCRETE BARRIER TRANSITION	EA.	1
MoDOT	6063014	TYPE A CRASHWORTHY END TERMINAL (MASH)	EA.	3
MoDOT	6071102	MODIFIED CONCRETE GUTTER TYPE B	L.F.	312
MoDOT, JSP	6079902 (1)	FENCE END POST	EA.	4
MoDOT, JSP	6079903(1)	BLACK CHAIN-LINK FENCE (RETAINING WALLS)	L.F.	224
MoDOT, JSP	6079903(2)	TEMPORARY FENCE	L.F.	64
MoDOT, JSP	6081010	CONCRETE CURB RAMP	SQ. YD.	105.3
MoDOT	6081012	TRUNCATED DOMES	SQ. FT.	123
MoDOT, JSP	6083006	6 IN. CONCRETE MEDIAN STRIP	SQ. YD.	22.4
MoDOT, JSP	6085007	PAVED APPROACH, 7 IN.	SQ. YD.	65.0
MoDOT, JSP	6086004	CONCRETE SIDEWALK, 4 IN.	SQ. YD.	751.9
MoDOT, JSP	6099903(1)	MOUNTABLE CURB AND GUTTER TYPE O	L.F.	250
MoDOT, JSP	6099903(2)	INTEGRAL MOUNTABLE CURB AND GUTTER TYPE O	L.F.	1,820
MoDOT, JSP	6099903(3)	MODIFIED CURB TYPE O	L.F.	160
MoDOT, JSP	6099903(4)	INTEGRAL ROLLED CURB	L.F.	124
MoDOT, JSP	6099903(5)	VALLEY GUTTER	L.F.	163



MoDOT	6096020	FURNISHING TYPE 2 ROCK DITCH LINER	CU.YD.	5
MoDOT	6096042	PLACING TYPE 2 ROCK DITCH LINER	CU.YD.	5
MoDOT	6097000	ROCK LINING	CU.YD.	46
MoDOT	6122019	IMPACT ATTENUATOR (19 SAND BARRELS)	EA.	1
MoDOT	6122020	REPLACEMENT SAND BARREL	EA.	10
MoDOT	6143010	MANHOLE FRAME AND COVER, TYPE 1-A	EA.	1
MoDOT	6141022	GRATE AND BEARING PLATE (3FT. X 3 FT. OR 914 MM X 914 MM)	EA.	3
MoDOT	6141024	GRATE AND BEARING PLATE (5FT. X 3 FT. OR 1524 MM X 914 MM)	EA.	1
MoDOT	6141121	CURVED VANE GRATE AND FRAME (4 FT. X 2 FT. OR 1200 MM X 600 MM)	EA.	3
COW, JSP	6143014	MANHOLE FRAME AND COVER, TYPE 4	EA.	1
MoDOT	6161005	CONSTRUCTION SIGNS	SQ. FT.	1,642
MoDOT	6161008	ADVANCED WARNING RAIL SYSTEM	EA.	8
MoDOT	6161009	FLAG ASSEMBLY	EA.	4
MoDOT	6161025	CHANNELIZER (TRIM LINE)	EA.	150
MoDOT	6161030	TYPE III MOVEABLE BARRICADE	EA.	14
MoDOT	6161040	FLASHING ARROW PANEL	EA.	1
MoDOT, JSP	6169902(1)	CHANNELIZER (TRIM LINE), CONTRACTOR FURNISHED / CITY RETAINED	EA.	20
MoDOT, JSP	6169902(2)	TYPE III MOVEABLE BARRICADE, CONTRACTOR FURNISHED / CITY RETAINED	EA.	18
MoDOT	6173100	CONCRETE TRAFFIC BARRIER, TYPE D	L.F.	312
MoDOT	6173600D	TEMPORARY TRAFFIC BARRIER, CONTRACTOR FURNISHED / RETAINED	L.F.	1,300
MoDOT	6173700B	TEMPORARY TRAFFIC BARRIER ANCHORED, CONTRACTOR FURNISHED / RETAINED	L.F.	2,875
MoDOT	6173706	TEMPORARY TRAFFIC BARRIER STIFFNESS TRANSITION SECTION, CONTRACTOR FURNISHED / RETAINED	L.F.	300
MoDOT	6181000	MOBILIZATION	L.S.	1
MoDOT, JSP	6189902	ADDITIONAL MOBILIZATION FOR SEEDING	EA.	4
MoDOT	6191000	PAVEMENT EDGE TREATMENT	L.F.	1,217
MoDOT	6200007	COLD APPLIED TAPE PAVEMENT MARKING, 6 IN. WHITE	L.F.	118
MoDOT	6200013	COLD APPLIED TAPE PAVEMENT MARKING, 24 IN. WHITE	L.F.	63
MoDOT	6200019	COLD APPLIED TAPE PAVEMENT MARKING, LEFT / RIGHT ARROW	EA.	4
MoDOT	6205301B	TEMPORARY REMOVABLE MARKING TAPE 4 IN., WHITE	L.F.	6,107
MoDOT	6205303B	TEMPORARY REMOVABLE MARKING TAPE 4 IN., YELLOW	L.F.	3,772
MoDOT	6205902A	6 IN. WHITE HIGH BUILD WATERBORNE PAVEMENT MARKING PAINT, TYPE L BEADS	L.F.	3,192
MoDOT	6205906A	12 IN. WHITE HIGH BUILD WATERBORNE PAVEMENT MARKING PAINT, TYPE L BEADS	L.F.	626
MoDOT	6206000C	4 IN. WHITE STANDARD WATERBORNE PAVEMENT MARKING PAINT, TYPE P BEADS	L.F.	6,399
MoDOT	6206001C	4 IN. YELLOW STANDARD WATERBORNE PAVEMENT MARKING PAINT, TYPE P BEADS	L.F.	13,588
MoDOT	6206125A	24 IN. YELLOW STANDARD WATERBORNE PAVEMENT MARKING PAINT, TYPE P BEADS	L.F.	311
MoDOT	6207001	PAVEMENT MARKING REMOVAL	L.F.	4,785
MoDOT, JSP	6221001	COLDMILLING BITUMINOUS PAVEMENT FOR REMOVAL OF SURFACING (3 IN. THICK OR LESS)	SQ. YD.	3,013
MoDOT	6261000A	BITUMINOUS SHOULDER RUMBLE STRIP	STA.	0.7
MoDOT	6262000A	PORTLAND CEMENT CONCRETE SHOULDER RUMBLE STRIP	STA.	2.6
MoDOT	6274000	CONTRACTOR FURNISHED SURVEYING AND STAKING	L.S.	1
MoDOT	7034041	CLASS B-1 CONCRETE (CULVERTS)	CU.YD.	44.3
MoDOT	7061030	REINFORCING STEEL (CULVERTS)	LB.	6,500
MoDOT	7110300	CONCRETE AND MASONRY PROTECTION SYSTEM	L.S.	1
MoDOT	7110400	SACRIFICIAL GRAFFITI PROTECTION SYSTEM	L.S.	1
MoDOT, JSP	7201000	MECHANICALLY STABILIZED EARTH WALL SYSTEMS	SQ. FT.	6,177
MoDOT	7201300	PIPE PILE SPACERS	EA.	16
MoDOT, JSP	7209901	GROUND IMPROVEMENT	L.S.	1

COW, JSP	7261012	12 IN. PIPE GROUP A	L.F.	116
COW, JSP	7261015	15 IN. PIPE GROUP A	L.F.	52
MoDOT, COW, JSP	7261018	18 IN. PIPE GROUP A	L.F.	613
MoDOT, COW, JSP	7261024	24 IN. PIPE GROUP A	L.F.	836
MoDOT, COW, JSP	7261030	30 IN. PIPE GROUP A	L.F.	410
MoDOT	7261042	42 IN. PIPE GROUP A	L.F.	251
MoDOT, COW, JSP	7310048	PRECAST CONCRETE MANHOLE - 48 IN.	FT.	6
MoDOT	7311033	PRECAST CONCRETE DROP INLET 3 FT X 3 FT	FT.	13
MoDOT	7311042	PRECAST CONCRETE DROP INLET 4 FT X 2 FT	FT.	10
MoDOT	7311053	PRECAST CONCRETE DROP INLET 5 FT X 3 FT	FT.	4
MoDOT, JSP	7319902(1)	SPECIAL OVERFLOW STRUCTURE	EA.	1
COW, JSP	7319913(1)	SINGLE STREET INLET	FT.	36
COW, JSP	7320612A	12 IN. OR ALLOWED SUBSTITUTE GROUP A FLARED END SECTION	EA.	1
COW, JSP	7320615A	15 IN. OR ALLOWED SUBSTITUTE GROUP A FLARED END SECTION	EA.	1
MoDOT, COW, JSP	7320618A	18 IN. OR ALLOWED SUBSTITUTE GROUP A FLARED END SECTION	EA.	3
MoDOT, COW, JSP	7320624A	24 IN. OR ALLOWED SUBSTITUTE GROUP A FLARED END SECTION	EA.	9
MoDOT, COW, JSP	7320630A	30 IN. OR ALLOWED SUBSTITUTE GROUP A FLARED END SECTION	EA.	4
MoDOT	7320642A	42 IN. OR ALLOWED SUBSTITUTE GROUP A FLARED END SECTION	EA.	2
MoDOT	8032000A	KENTUCKY BLUEGRASS SODDING	SQ. YD.	151
MoDOT, JSP	8051000A	SEEDING - COOL SEASON MIXTURES	ACRE	29.2
MoDOT	8061005	ROCK DITCH CHECK	L.F.	2,991
MoDOT	8061007A	CURB INLET CHECK	EA.	10
MoDOT	8061016	SEDIMENT REMOVAL	CU. YD.	494
MoDOT	8061017	TEMPORARY SEEDING AND MULCHING	ACRE	7.4
MoDOT	8061019	SILT FENCE	L.F.	2,729
MoDOT	8064122	TYPE 3 EROSION CONTROL BLANKET	SQ. YD.	10,815
MoDOT	8064128	TYPE 1 TURF REINFORCEMENT MAT	SQ. YD.	170
MoDOT, JSP	8069903	FIBER ROLLS	L.F.	29,692
MoDOT, JSP	8069928	WATER POLLUTION CONTROL MANAGER	WK.	48
MoDOT	9013002	CONDUIT, 2 IN. RIGID, IN TRENCH	L.F.	80
MoDOT	9013003	CONDUIT, 3 IN. RIGID, IN TRENCH	L.F.	434
MoDOT	9013004	CONDUIT, 4 IN. RIGID, IN TRENCH	L.F.	28
MoDOT	9016110	PULL BOX, PREFORMED CLASS 1	EA.	3
MoDOT	9016111	PULL BOX, PREFORMED CLASS 2	EA.	1
MoDOT	9016112	PULL BOX, PREFORMED CLASS 3	EA.	1
MoDOT	9017110	CABLE, 10 AWG 1 CONDUCTOR, POLE AND BRACKET	L.F.	270
MoDOT	9017407	CABLE-CONDUIT, 1 IN., 2 CONDUCTORS AND 1 BARE NEUTRAL, 8 AWG	L.F.	620
MoDOT	9018245	POLE FOUNDATION (45 FT. OR 13.5 M MOUNTING HEIGHT)	EA.	3
MoDOT, JSP	9019902(1)	TENON MOUNT 45 FT. TYPE AT POLE	EA.	3
MoDOT, JSP	9019902(2)	LED-B TENON MOUNTED LUMINAIRE	EA.	3
MoDOT, JSP	9019902(3)	DUAL METER, COMBINATION PAD MOUNTED POWER SUPPLY & LIGHTING CONTROL STATION, 120/240V	EA.	1
MoDOT	9031010	CONCRETE FOOTINGS, EMBEDDED	CU. YD.	2.6
MoDOT	9031210	STRUCTURAL STEEL POSTS	LB.	1,690
MoDOT, COW, JSP	9031220	PIPE POSTS	LB.	1,670
MoDOT	9031250A	U-CHANNEL POST, 3 LB	L.F.	45
MoDOT	9031256	7 FT. CHANNEL POST DELINEATOR, WHITE	EACH	13
MoDOT	9031270A	2 IN. PSST POST - 12 GA.	L.F.	37

MoDOT	9031273	POST ANCHOR FOR 2 IN. PSST - 7 GA.	L.F.	9
MoDOT, COW, JSP	9035004A	SH - FLAT SHEET	SQ. FT.	190
MoDOT	9103801	DETECTOR POLE FOUNDATION, 30 FT. OR 9.1 M MOUNTING HEIGHT, INSTALLED	EACH	1
MoDOT	9103822	DETECTOR POLE, 30 FT. OR 9.1 M MOUNTING HEIGHT, INSTALLED	EACH	1
MoDOT	9108202	CABLE, 2 AWG, 1 CONDUCTOR, POWER	L.F.	1,480
MoDOT, JSP	9109901 (1)	ITS ASSET MANAGEMENT TOOL	L.S.	1
MoDOT, JSP	9109901 (2)	MoDOT ITS IN-GROUND FACILITY RELOCATION PER SITE	L.S.	1
MoDOT, JSP	9109902 (1)	BURIED CABLE DRIVABLE DELINEATOR POST	EACH	6
MoDOT, JSP	9109902 (2)	ITS CLASS 1 PULL BOX	EACH	1
MoDOT, JSP	9109902 (3)	ITS CLASS 2 PULL BOX	EACH	1
MoDOT, JSP	9109902 (4)	ITS CLASS 5 PULL BOX	EACH	5
MoDOT, JSP	9109902 (5)	UNDERGROUND SPLICE CLOSURE	EACH	1
MoDOT, JSP	9109902 (6)	POLE MOUNT TYPE 7 CABINET	EACH	1
MoDOT, JSP	9109902 (7)	INSTALL RADAR DETECTOR	EACH	1
MoDOT, JSP	9109902 (8)	RACK-MOUNTED INTERCONNECT CENTER	EACH	1
MoDOT, JSP	9109902 (9)	FIBER OPTIC SPLICE	EACH	34
MoDOT, JSP	9109902 (10)	FIBER OPTIC JUMPER, SM	EACH	4
MoDOT, JSP	9109902 (11)	FIBER OPTIC PIGTAIL, SM	EACH	4
MoDOT, JSP	9109902 (12)	ITS PAD MOUNTED POWER SUPPLY, 120V	EACH	1
MoDOT, JSP	9109903 (1)	FIBER OPTIC CABLE, 24 STRAND, SINGLE MODE	L.F.	400
MoDOT, JSP	9109903 (2)	FIBER OPTIC CABLE, 24 STRAND, SINGLE MODE, (REPULLED)	L.F.	2,250
MoDOT, JSP	9109903 (3)	2 IN., HDPE, IN TRENCH	L.F.	334
MoDOT, JSP	9109903 (4)	2 CONDUITS, 2 IN., HDPE, DIRECTIONAL DRILL	L.F.	330
COW, JSP	W5010207	HDPE WATER MAIN, 8 INCH	L.F.	221
COW, JSP	W5010271	HDPE PIPE FITTING	EACH	3
COW, JSP	W5010273	DUCTILE IRON PIPE FITTING	EACH	3
COW, JSP	W5010304	STEEL CASING PIPE, 12 INCH	L.F.	118
COW, JSP	W5010507	GATE VALVE, 8 INCH	EACH	2
COW, JSP	W5010522	VALVE BOX W/ TOP HAT	EACH	5
COW, JSP	W5021501	WATER MAIN CHLORINIZATION AND TESTING	L.S.	1