


MEMORANDUM

TO: Keith Caudill, PE
Project Management Coordinator
Division of Highway Design

FROM: Bart Asher, PE, PLS
Geotechnical Branch Manager
Division of Structural Design

BY: Erik Scott, PE 
Geotechnical Branch

DATE: January 28, 2016

Subject: Geotechnical Engineering Roadway Report
Mercer/Garrard Counties
Approaches for KY 152 Bridge over Herrington Lake
FD52 084 0152 018-019
Mars No. 8469001D
Item No. 7-1116.00

The geotechnical engineering roadway report for the subject project has been completed by Stantec Consulting Services, Inc. The drilling and sampling for the project was also performed by Stantec. The electronic data files have been forwarded to the Designer, WMB Engineers, Inc., for incorporation into the roadway plans. The electronic files will also be made available on ProjectWise.

If you have any questions or need additional information, please contact the Geotechnical Branch at 502-564-2374.

cc: Division of Design (Plan Processing Section)
Division of Construction
TEBM for Pavement Design
TEBM for Project Delivery & Preservation (District)
TEBM for Project Development (District)
Project Manager (District)
Stantec Consulting Services, Inc.
WMB Engineers, Inc.

Attachment



Report of Geotechnical Exploration

Roadway Relocation
KY 152 Over Herrington Lake
Item No. 7-1116.00
R-011-2015
Mercer-Garrard Counties,
Kentucky



Stantec Consulting Services Inc.
1409 North Forbes Road, Lexington KY 40511-2050

January 7, 2016

rpt_005_175562020

Mr. Charlie Raymer, PE
1950 Haggard Court
Lexington, Kentucky 40509

Re: Report of Geotechnical Exploration
Roadway Relocation
KY 152 Over Herrington Lake
Item No. 7-1116.00
R-011-2015
Mercer-Garrard Counties, Kentucky

Dear Mr. Raymer:

Stantec Consulting Services Inc. (Stantec) is submitting the geotechnical engineering report for the referenced roadway relocation project with this letter. Also included are the soil profile data sheets presenting the logs of borings and applicable laboratory test results, and geotechnical notes for the planned roadway project.

The referenced project also includes replacing the KY 152 Bridge over Herrington Lake. In addition, there are two retaining walls proposed for the project. The geotechnical considerations for the bridge and retaining walls are addressed under separate covers. As always, we enjoy working with your staff and if we can be of further assistance, please contact our office.

Sincerely,

STANTEC CONSULTING SERVICES INC.

A handwritten signature in blue ink, appearing to read "L. Arduz".

Luis J. Arduz, PE
Associate

A handwritten signature in blue ink, appearing to read "Adam Crace".

Adam Crace, PE
Senior Associate

Enclosures: 1

Cc: Mr. Bart Asher, PE (KYTC)

Report of Geotechnical Exploration

Roadway Relocation

KY 152 Over Herrington Lake

Item No. 7-1116.00

R-011-2015

Mercer-Garrard Counties, Kentucky

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Report of Geotechnical Exploration

Roadway Relocation

KY 152 Over Herrington Lake

Item No. 7-1116.00

R-011-2015

Mercer-Garrard Counties, Kentucky

1. Introduction

The Kentucky Transportation Cabinet (KYTC) is planning to replace the Kennedy Bridge, KY 152 over Herrington Lake. It is proposed that a new bridge will be constructed just downstream of the existing bridge. As part of the bridge replacement project, short intervals of roadway will be relocated and/or reconstructed at both ends of the bridge. Two retaining walls are also proposed as part of this project. The geotechnical considerations for the bridge and retaining walls are addressed under separate covers.

This report addresses the geotechnical aspects associated with the approach roadways from approximate KY 152 Station 12+25 to Station 29+28. An approximate 610-foot roadway length is located in Mercer County; back-station of the beginning of the new bridge, and an additional 268 feet are located ahead s-station of the proposed end of the new bridge; within Garrard County. The map provided in Appendix A illustrates the project location.

2. Topography and Drainage

The proposed KY152 bridge replacement and related roadway improvements is situated in Central Kentucky near the juncture of the Inner and Outer Bluegrass topographic regions of the state. The topography of the project area becomes steep and rugged in proximity to the deep valleys associated with Dix River which is the source of the current Herrington Lake. Local reliefs along Herrington Lake are generally between 150 and 200 feet, and exceed 300 feet along the Kentucky River within Garrard County. The maximum natural topographic relief along the centerline of the proposed KY152 roadway realignment is on the order of 280 feet, occurring between the beginning of the project realignment at Station 12+25 and the underwater ground line elevation as reported in February 2014 at Approximate Station 20+60 located under the planned bridge over Lake Herrington. The maximum vertical relief along the proposed finished roadway grade is approximately 27 feet with the lowest point at approximate Station 17+61 (elevation ± 788 feet) and the highest point being at approximate Station 12+25 (elevation ± 815 feet).

Surface drainage along this roadway realignment project is controlled by ground conditions being in close proximity to Herrington Lake.

3. Geology

Available geologic mapping (USGS Geologic Map of the Bryantsville (1971) Quadrangle, Kentucky) indicates the site is underlain by limestone and possibly dolomite bedrock representing the High Bridge Group and which are of Middle Ordovician age. According to the USGS Quadrangle, the limestones are predominantly light gray to gray, micro-crystalline to fine grained, thin to medium bedded, with shale stringers. The dolomite is described as light gray to gray, micro-crystalline grained, and thick bedded.

Karst activity associated with the limestone bedrock exists with the Bluegrass Physiographic Region of Central Kentucky. Based on USGS Geologic mapping, several surface depressions or sinkholes which often are indications of karst activity are depicted on this geologic map quadrangle. However, no specific locations were noted within the limits of the proposed roadway improvements related to this bridge replacement project.

Based on USGS Geologic mapping, several unnamed faults are present within approximately one mile of the project location. The unnamed faults fall to the north, southwest and south of the project. The Kentucky River Fault Zone is also located approximately 3.25 miles southeast of the project limits, at its closest point. None of these faults are known to have been active within recent history.

Residual clayey and silty soils are the predominant soil type mapped within the area of the proposed roadway improvement limits. Soils tend to be fairly thin in the vicinity of the project.

4. Drilling and Sampling

4.1. General

Stantec prepared a boring plan for the roadway portions of this project after a review of available plans, profiles and cross-sections provided by WMB Inc. (WMB). Stantec Consulting Services, Inc. (Stantec) performed the drilling and sampling operations through the Statewide Drilling Contract. The field exploration was conducted in late August, 2015. These activities included soil profile/disturbed sample borings, and one rock core boring previously drilled for a proposed roadway cut (KY 152 Station 27+50). The draft boring plan was initially reviewed and subsequently approved by the KYTC Division of Structural Design - Geotechnical Branch. The final boring plan was provided to the WMB for field staking.

4.2. Soil Profile / Disturbed Sample Borings

Soil profile borings were advanced using six-inch diameter, continuous flight augers powered by a truck-mounted drill rig. The soil cuttings were logged by the field engineer as they were conveyed to the surface during the augering process. The soil was logged based on texture, color, moisture content, plasticity and consistency. A bag sample of the predominant soil material was collected for subsequent classification index, natural moisture content, standard Proctor moisture-density, and California Bearing Ratio (CBR) testing. The results of each soil profile boring drilled during this exploration are provided on their respective profile sheets in Appendix B.

4.3. Rock Core Borings

One rock core boring was drilled within an approximate 166-foot long cut located to the right of KY 152 centerline, ahead station of the planned bridge over Herrington Lake. The rock core were transported to Stantec's office and logged by the project geologist. The geologist determined the depth of the rock disintegration zone (RDZ), and also determined the percent recovery and rock quality designation (RQD) for each core run. As previously noted, the predominant rock type in the project area is limestone, which includes shale partings and stringers. Appendix B contains the cut stability section with a detailed rock core description.

5. Laboratory Testing and Results

5.1. General

All laboratory tests were performed by Stantec in accordance with applicable AASHTO or Kentucky Methods of soil and rock testing specifications. The results of the laboratory tests are depicted graphically on the appropriate soil profile sheets presented in Appendix B.

5.2. Disturbed Soil Drilling and Testing Results

Soil classification index tests, including particle size analyses, Atterberg limits and specific gravity, were performed on a bag sample representing the predominant soil encountered in the soil profile borings. In addition to soil classification testing, standard Proctor moisture-density relationship and California Bearing Ratio (CBR) were determined for this bag sample.

Based upon the information obtained from the borings performed along the planned roadway re-alignment, soil thicknesses vary from approximately 1.1 feet to nearly 15 feet. The predominant soil classifies as CH according to the Unified Soils Classification System (USCS), and as A-7-6 based upon the AASHTO classification system. A summary of laboratory testing of can be found on the soil profile sheets in Appendix B.

The standard Proctor (moisture-density relationship) performed on the bag sample resulted in a maximum dry density of 91.9 pounds per cubic feet at the optimum moisture content of 28.9 percent. A CBR test following Kentucky Method 64-501 resulted in a CBR value of 2.1. Because of the resulting low CBR value, and the estimate that sufficient quantities of durable rock may not be available for roadbed construction, mechanical treatment of subgrade soils will be recommended to improve subgrade support during construction and to increase the life of the pavement. Recommendations for such subgrade treatment are provided in Section 7 of this report.

Natural moisture contents were determined from grab samples of soils obtained from disturbed soil borings. Based on the moisture content test performed for samples obtained in three soil profile borings, the natural moisture content results vary from 17 percent up to 33 percent. In general, the moisture contents of the soil materials encountered were above or near the soil's corresponding plastic limit.

The predominant soil material encountered in the borings along the proposed roadway re-alignment appears to be residual in origin, having been derived in-situ from a weathering process of the parent limestone rock formations. As such, excavations in these soils will encounter occasional bedrock remnants in the form of slabs or rock fragments of varying sizes.

6. Cut Slope Stability

Bedrock encountered in the rock core boring drilled along the project corridor correlates well with the referenced geologic mapping. The recovered rock core consists of a light gray limestone. The limestone is further described as micro-crystalline grained, with shale stringers and partings. Soil thicknesses encountered in the borings varied from 1.1 feet to 15 feet.

It is anticipated that the limestone bedrock encountered within the cut slope interval from Station 27+50 to 29+16 will require pre-splitting to achieve a ½:1 (H:V) slopes below the RDZ. Furthermore, based upon visual observations of exposed bedrock alongside of KY 152 it is noted that the outer portions of the existing rock cuts exhibit significant weathering, including fissures and water stained zones. For this reason, it will be recommended that the proposed pre-split line be setback a minimum of five feet behind the existing cut face of the exposed bedrock. This cut slope setback will require widening of the roadside ditch. The cross-section at Station 27+50, for instance, will require a 7.5-foot wide ditch bench. The width of the ditch bench may be reduced once the 5-foot setback criteria has been met within the proposed cut slope interval.

7. Geotechnical Notes

7.1 Roadway construction clearing and grubbing of embankment areas shall be completed in accordance with Section 202 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.

7.2 Removal of existing structures and other obstructions shall be completed in accordance with Section 203 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.

7.3 Procedures shall be performed as required to control erosion and water pollution in accordance with Sections 212 and 213 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.

7.4 All water wells and/or cisterns within the limits of construction, whether shown on the plans or not, shall be plugged in accordance with Section 708 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.

7.5 All catch basins and manholes shall be filled and capped and all septic tanks shall be filled in accordance with Section 708 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.

7.6 All channel changes and special ditches shall be constructed prior to placement of any embankment materials adjacent to them in accordance with Section 206 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction. Materials excavated from these areas may be utilized in construction of the embankments, but may require aeration to the proper moisture contents prior to compaction operations. No extra payment shall be permitted for re-handling, hauling, stockpiling and/or manipulating these materials.

7.7 In accordance with Section 206 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, the moisture content of embankment and subgrade materials shall not vary from the optimum moisture content, as determined by KM 64-511, by more than plus or minus two percent. This moisture content requirement shall have equal weight with the density requirement when determining the acceptability of embankment or subgrade construction. Refer to the family of curves for moisture-density relationships.

7.8 All soils, whether from roadway excavation or borrow, may require manipulation to obtain proper moisture contents prior to compaction. Direct payment shall not be permitted for re-handling, hauling, stockpiling and/or manipulating soils.

7.9 The Contractor shall conduct grading operations in such a manner that limestone obtained from roadway excavation shall be stockpiled separately or otherwise manipulated so that ample quantities are available for those areas requiring said material. No direct payment will be allowed for such necessary manipulating as stockpiling and/or double handling the material. Limestone shall not be wasted unless prior approval is obtained from the Engineer.

7.10 The Contractor is responsible for conducting any operations necessary to excavate the cut areas to the required typical sections. The cost of these operations shall be incidental to the earthwork.

7.11 As directed by the Engineer, existing bituminous concrete at the following approximate locations that is positioned less than three feet from proposed subgrade level shall be undercut a minimum of two feet beneath proposed subgrade level and backfilled with suitable subgrade material. This work shall be in accordance with Section 206 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.

**Approximate Station Limits
KY 152**

12+25 to 14+00

17+30 to 17+70

27+20 to 29+28

7.12 Any saturated, soft, unstable areas encountered within embankment foundation limits and/or any other areas as directed by the Engineer shall be drained and stabilized using broken rock excavated beneath the RDZ. An estimated 3-foot working platform shall be constructed in such areas.

7.13 If during construction activities, sinkholes / karst features are encountered, the Contractor shall contact the KYTC Division of Structural Design – Geotechnical Branch for mitigation procedures.

7.14 Where limestone (or shale) bedrock is encountered at the top of subgrade in the cuts, the roadbed shall be undercut one (1) foot below the proposed grade and the limits of the roadbed excavation shall be extended to the ditch lines. The refill shall consist of KY Coarse Aggregate Nos. 2, 3 or 23 meeting gradation requirements of Section 805 of the Standard Specifications for Road and Bridge Construction, current edition, and shall be constructed as specified in Section 204 of the Standard Specifications for Road and Bridge Construction, current edition. For Roadway Excavation projects, the excavation of the bedrock material shall be paid at the unit bid price for Roadway Excavation and the placement of coarse aggregate refill shall be paid per ton at the unit bid price for KY Coarse Aggregate Nos. 2, 3 or 23.

7.15 Perforated pipes for subgrade drainage shall be installed at vertical sags and at the upgrade ends of structures, in accordance with Kentucky Department of Highways Standard Drawing RDP-005 and/or as directed by the Engineer. Contrary to Standard Drawing RDP-005, such drains shall be installed even when a rock roadbed is being constructed. These drainage features shall be installed at the following approximate locations:

Approximate Station Limits

KY 152

17+60

27+00

7.16 Mechanical stabilization for the top one foot of the roadbed shall be constructed with KY Coarse Aggregate No. 2, 3 or 23 in accordance with Section 805 of the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, current edition. The aggregate shall be wrapped with Geotextile Fabric Type IV in accordance with Sections 214 & 843 of the current Standard specifications. The platform shall extend from shoulder to shoulder in the fills and ditch line to ditch line in the cuts to assure positive drainage. The Coarse Aggregate will be paid by the ton, and will not be paid as Embankment-in-Place; the Geotextile Fabric will be paid by the square yard.

7.17 The retaining wall segments at the locations listed below will affect the cut slope and embankment construction. For these areas, please refer to the structural plans for specific instructions for cut slope and embankment construction.

Approximate Station Limits

KY 152

14+40 to 15+49, Right

26+70 to 27+39, Left

8. Design Recommendations

The project shall be designed for a soil subgrade utilizing a CBR value of two (2).

8.1 Stantec understands that sufficient quantities of durable rock may not be available from roadway excavation to construct a rock subgrade for a pavement section. Because of the predominant low CBR value, mechanical improvement of the subgrade will need to be implemented for stabilization purposes during construction and to extend pavement life. It is recommended mechanical stabilization may be accomplished using 12 inches (minimum) of coarse aggregate (2s, 3s, or 23s) wrapped with a Type IV geotextile fabric.

8.2 An average soil shrinkage value of three percent is recommended for soil to be excavated on this project. This value is to be used in calculating an "apparent" shrinkage value in accordance with Section 61-03.0400 of the Kentucky Transportation Cabinet Division of Design Guidance Manual. This shrinkage value should be applied only to soil positioned above the top of rock. A shrink/swell value of zero (0) should be applied to Rock Disintegration Zone (RDZ) material.

8.3 The recommended rock swell factor is 10 percent for material excavated below the RDZ.

9. Closing

9.1 General soil and rock descriptions and indicated boundaries are based on an engineering interpretation of all available subsurface information and may not necessarily reflect the actual variation in subsurface conditions between borings and samples. Collected data and field interpretation of conditions encountered in individual borings are shown on the Geotechnical Drawings.

9.2 The observed water levels and/or conditions indicated on the boring logs are as recorded at the time of exploration. These water levels and/or conditions may vary considerably, with time, according to the prevailing climate, rainfall or other factors and are otherwise dependent on the duration of and methods used in the exploration program.

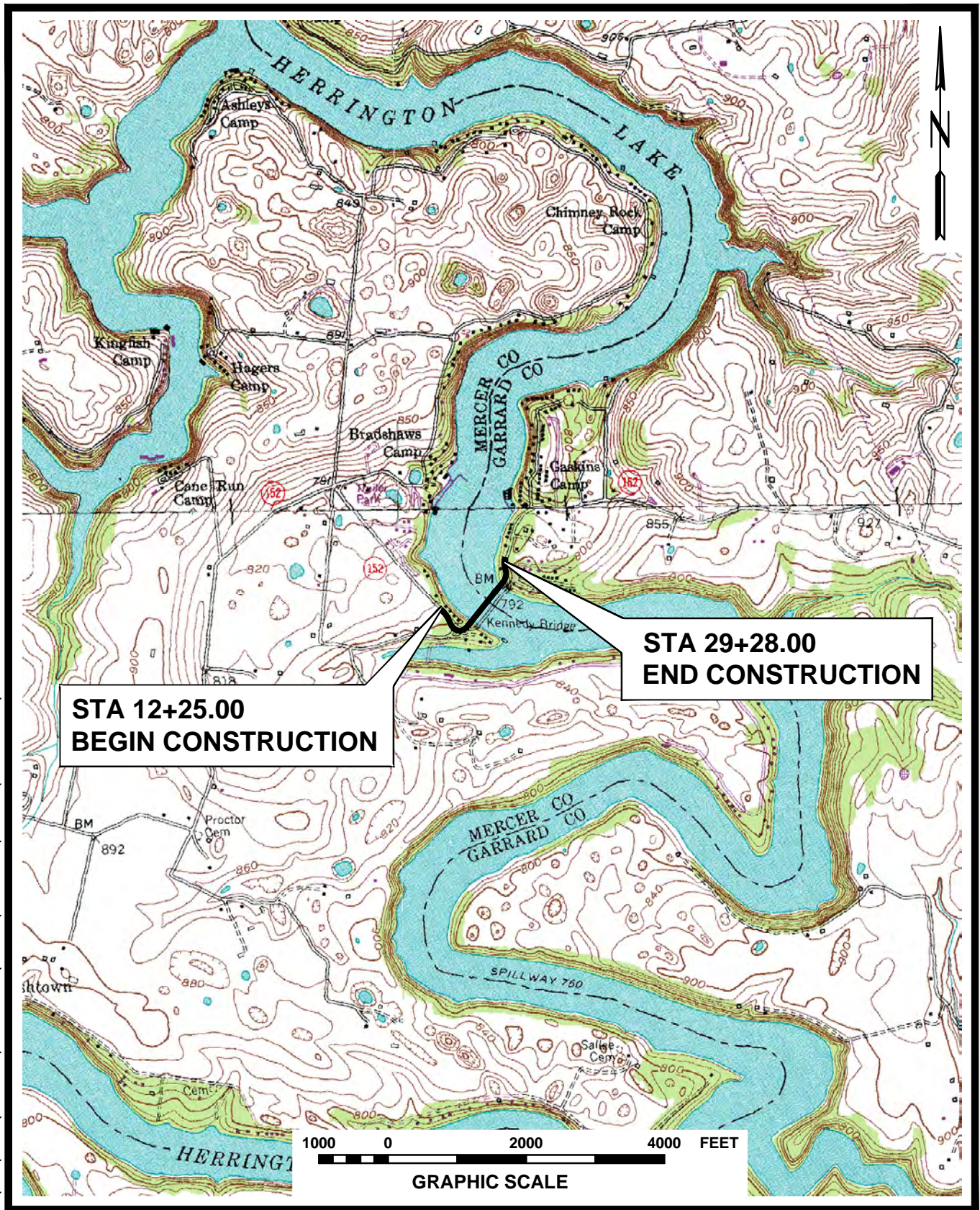
9.3 The project site is underlain by limestone bedrock which is known to be susceptible to solutioning and the subsequent development of karst features such as voids, sinkholes, solution channels, and caves in the soil overburden or the underlying bedrock. Construction in areas underlain by these bedrock types is accompanied by some risk that subsurface soil erosion and ground subsidence could affect new structures in the future. To completely guarantee a site will be free of all possibilities of future solutioning related problems is impossible. We believe, however, that compliance with the recommendations presented herein can help reduce these risks to acceptable levels.

9.4 Sound engineering judgment was exercised in preparing the subsurface information presented herein. This information was prepared and is intended for design and estimating purposes. Its presentation on the plans or elsewhere is for the purpose of providing intended users with access to the same information available to the KYTC. This subsurface information interpretation is presented in good faith and is not intended as a substitute for personal investigations, independent interpretations or judgments of the Contractor.

Appendix A

Location Map

PLOT DATE: 10/21/2015 USER: FLYNN, RENEE
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LOCATION MAP
KY 152 OVER HERRINGTON LAKE
GARRARD/MERCER COUNTIES, KENTUCKY
Portions of USGS 7 1/2-minute Topographic Maps
(BRYANTSVILLE, WILMORE QUADRANGLES) SHOWING PROJECT SITE

Appendix B

Drawings

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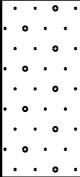
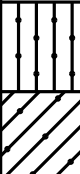
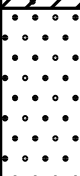
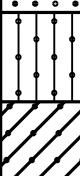



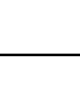
GEOTECHNICAL SYMBOL SHEET

COUNTY OF	ITEM NO.	SHEET NO.
MERCER/ GARRARD	7-1116.0	

AASHTO Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35% or less passing 0.075 mm)							Silt-Clay Materials (More than 35% passing 0.075 mm)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6
Sieve Analyses, percent Passing											
2.00 mm (No. 10)	50 max	---	---	---	---	---	---	---	---	---	---
0.425 mm (No. 40)	30 max	50 max	51 min	---	---	---	---	---	---	---	---
0.075 mm (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of Fraction Passing 0.425 mm (No. 40)											
Liquid Limit	---		---	40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
Plasticity Index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min

Unified Soil Classifications

MAJOR DIVISIONS		SYMBOL		NAME
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW		Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP		Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GM		Silty gravels, gravel-sand-silt mixtures.
		GC		Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW		Well-graded sands or gravelly sands, little or no fines.
		SP		Poorly graded sands or gravelly sands, little or no fines.
		SM		Silty sands, sand-silt mixtures.
		SC		Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS LL IS LESS THAN 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	SILTS AND CLAYS LL IS GREATER THAN 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH		Inorganic clays of high plasticity, fat clays.
UNCLASSIFIED MATERIAL		NONE		Non-classified material (i.e. overburden, pavement, slag, etc.) Include visual description.

- AI Activity Index
- LI Liquidity Index
- S+C Silt + Clay (% finer than No. 200 Sieve)
- Rockline Soundings
- Disturbed Sample Boring
- Undisturbed Sample Boring
- Undisturbed Sample Boring & Rock Core
- Rock Core
- Open Face Log
- Slope Inclinometer Installation
typical applications:
- OW Observation Well
- Approximate Footing Elevation
- (Date) Water Elevation
- VS (psf) Field Vane Shear Strength
- Thin-walled Tube Sample
- Standard Penetration Test Sample
- N Penetration Resistance
- Qu (psf) Unconfined Compressive Strength
- UU (psf) Unconsolidated Undrained Triaxial Strength
- w(%) Moisture Content
- KY RQD Rock Quality Designation (Kentucky Method)
- STD RQD Rock Quality Designation (Standard Method)
- SDI (JS) Slake Durability Index (Jar Slake Test)
- REC Core Recovery
- ϕ Angle of Internal Friction (Total Stress)
- $\bar{\phi}$ Angle of Internal Friction (Effective Stress)
- c (psf) Cohesion (Total Stress)
- \bar{c} (psf) Cohesion (Effective Stress)
- γ (psf) Total Unit Weight
- RDZ Rock Disintegration Zone
- OB Overburden Bench
- IB Intermediate Bench
- R Refusal
- NR Refusal Not Encountered

- LIMESTONE
- SANDSTONE
- DURABLE SHALE
(SDI \geq 95)
- NONDURABLE SHALE
(SDI < 95)
- COAL
- TALUS,
MINE WASTE,
FILL MATERIAL,
BOULDERS, & ETC.
- GRANULAR
EMBANKMENT
- STRUCTURE
GRANULAR
BACKFILL
- SLOPE PROTECTION

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USER: bmsnelton
DATE PLOTTED: January 7, 2016

E-SHEET NAME:

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GEOTECHNICAL NOTES

COUNTY OF	ITEM NO.	SHEET NO.
MERCER/ GARRARD	7-1116.00	

General Roadway Construction

- Roadway construction clearing and grubbing of embankment areas shall be completed in accordance with Section 202 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.
- Removal of existing structures and other obstructions shall be completed in accordance with Section 203 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.
- Procedures shall be performed as required to control erosion and water pollution in accordance with Sections 212 and 213 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.
- All water wells and/or cisterns within the limits of construction, whether shown on the plans or not, shall be plugged in accordance with Section 708 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.
- All catch basins and manholes shall be filled and capped and all septic tanks shall be filled in accordance with Section 708 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.
- All channel changes and special ditches shall be constructed prior to placement of any embankment materials adjacent to them in accordance with Section 206 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction. Materials excavated from these areas may be utilized in construction of the embankments, but may require aeration to the proper moisture contents prior to compaction operations. No extra payment shall be permitted for re-handling, hauling, stockpiling and/or manipulating these materials.
- In accordance with Section 206 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, the moisture content of embankment and subgrade materials shall not vary from the optimum moisture content, as determined by KM 64-511, by more than plus or minus two percent. This moisture content requirement shall have equal weight with the density requirement when determining the acceptability of embankment or subgrade construction. Refer to the family of curves for moisture-density relationships.
- All soils, whether from roadway excavation or borrow, may require manipulation to obtain proper moisture contents prior to compaction. Direct payment shall not be permitted for re-handling, hauling, stockpiling and/or manipulating soils.
- The Contractor shall conduct grading operations in such a manner that limestone obtained from roadway excavation shall be stockpiled separately or otherwise manipulated so that ample quantities are available for those areas requiring said material. No direct payment will be allowed for such necessary manipulating as stockpiling and/or double handling the material. Limestone shall not be wasted unless prior approval is obtained from the Engineer.
- The Contractor is responsible for conducting any operations necessary to excavate the cut areas to the required typical sections. The cost of these operations shall be incidental to the earthwork.
- As directed by the Engineer, existing bituminous concrete at the following approximate locations that is positioned less than three feet from proposed subgrade level shall be undercut a minimum of two feet beneath proposed subgrade level and backfilled with suitable subgrade material. This work shall be in accordance with Section 206 of the current Kentucky Department of Highways Standard Specifications for Road and Bridge Construction.

Approximate Station Limits			
KY 152			
12+25	14+00		
17+30	17+70		
27+20	29+28		

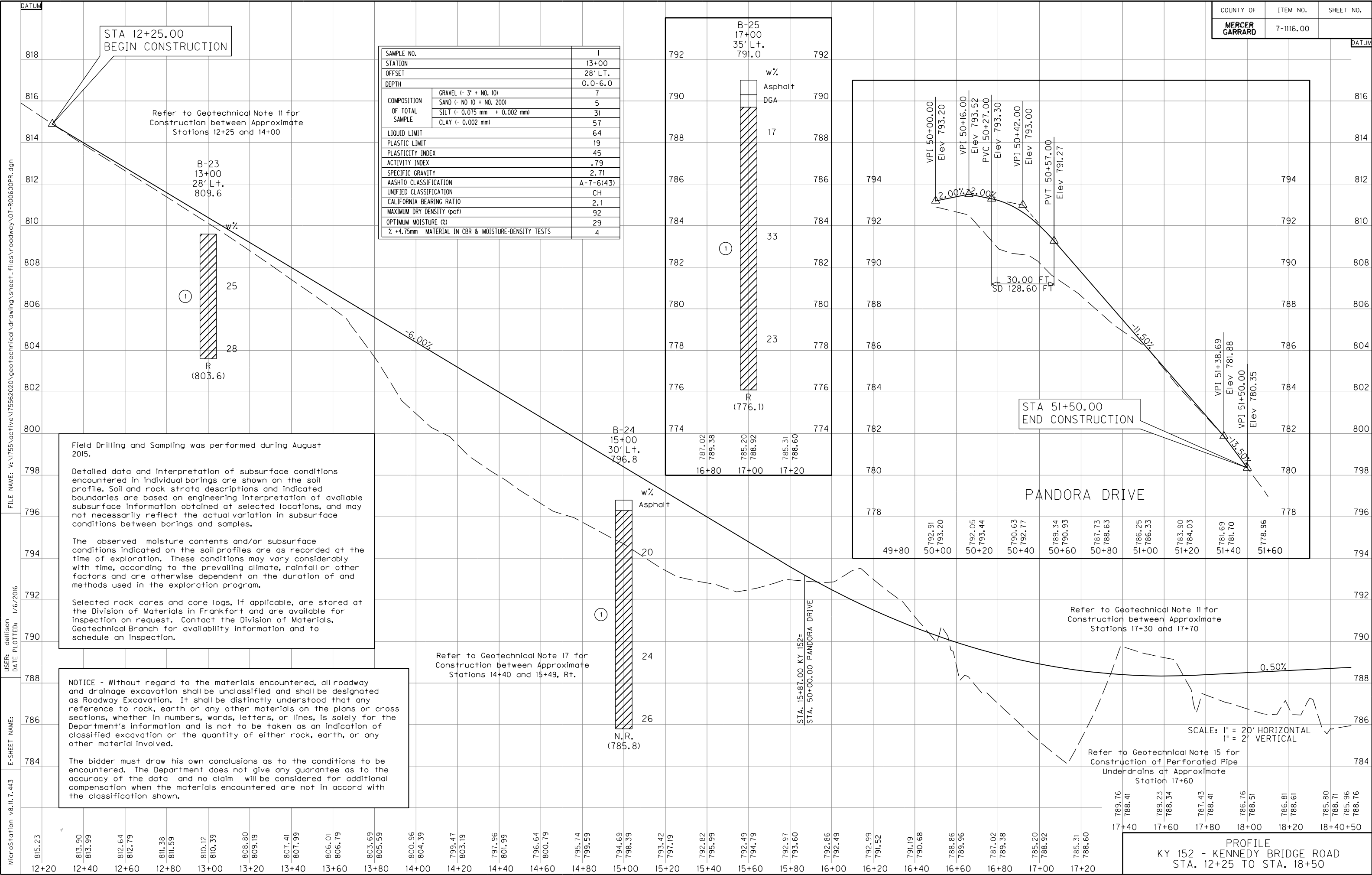
- Any saturated, soft, unstable areas encountered within embankment foundation limits and/or any other areas as directed by the Engineer shall be drained and stabilized using broken rock excavated beneath the RDZ. An estimated 3-foot working platform shall be constructed in such areas.
- If during construction activities, sinkholes / karst features are encountered, the Contractor shall contact the KYTC Division of Structural Design Geotechnical Branch for mitigation procedures.
- Where limestone (or shale) bedrock is encountered at the top of subgrade in the cuts, the roadbed shall be undercut one (1) foot below the proposed grade and the limits of the roadbed excavation shall be extended to the ditch lines. The refill shall consist of KY Coarse Aggregate Nos. 2, 3 or 23 meeting gradation requirements of Section 805 of the Standard Specifications for Road and Bridge Construction, current edition, and shall be constructed as specified in Section 204 of the Standard Specifications for Road and Bridge Construction, current edition. For Roadway Excavation projects, the excavation of the bedrock material shall be paid at the unit bid price for Roadway Excavation and the placement of coarse aggregate refill shall be paid per ton at the unit bid price for KY Coarse Aggregate Nos. 2, 3 or 23.
- Perforated pipes for subgrade drainage shall be installed at vertical sags and at the upgrade ends of structures, in accordance with Kentucky Department of Highways Standard Drawing RDP-005 and/or as directed by the Engineer. Contrary to Standard Drawing RDP-005, such drains shall be installed even when a rock roadbed is being constructed. These drainage features shall be installed at the following approximate locations:

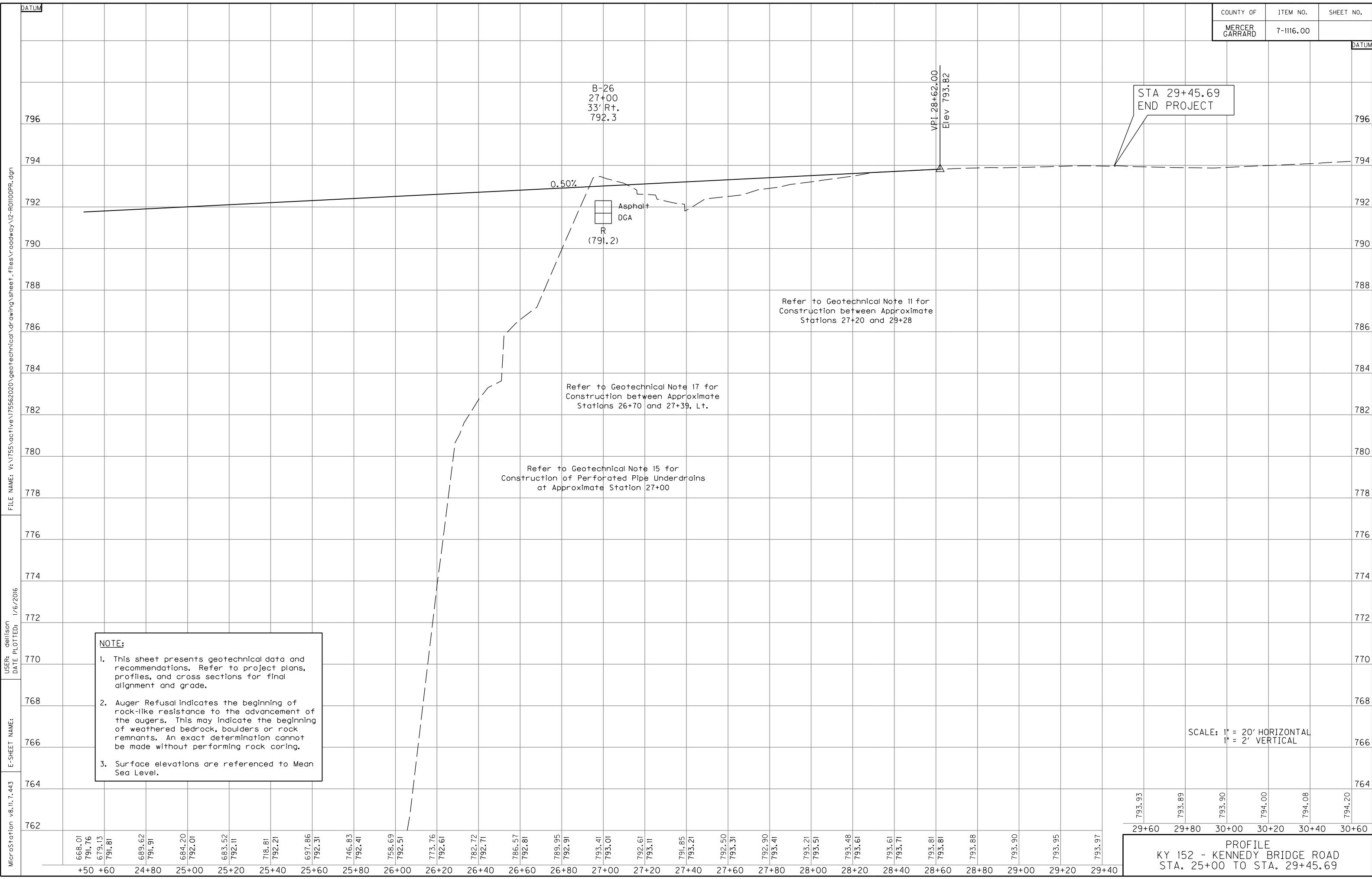
Approximate Station Limits	
KY 152	
17+60	
27+00	

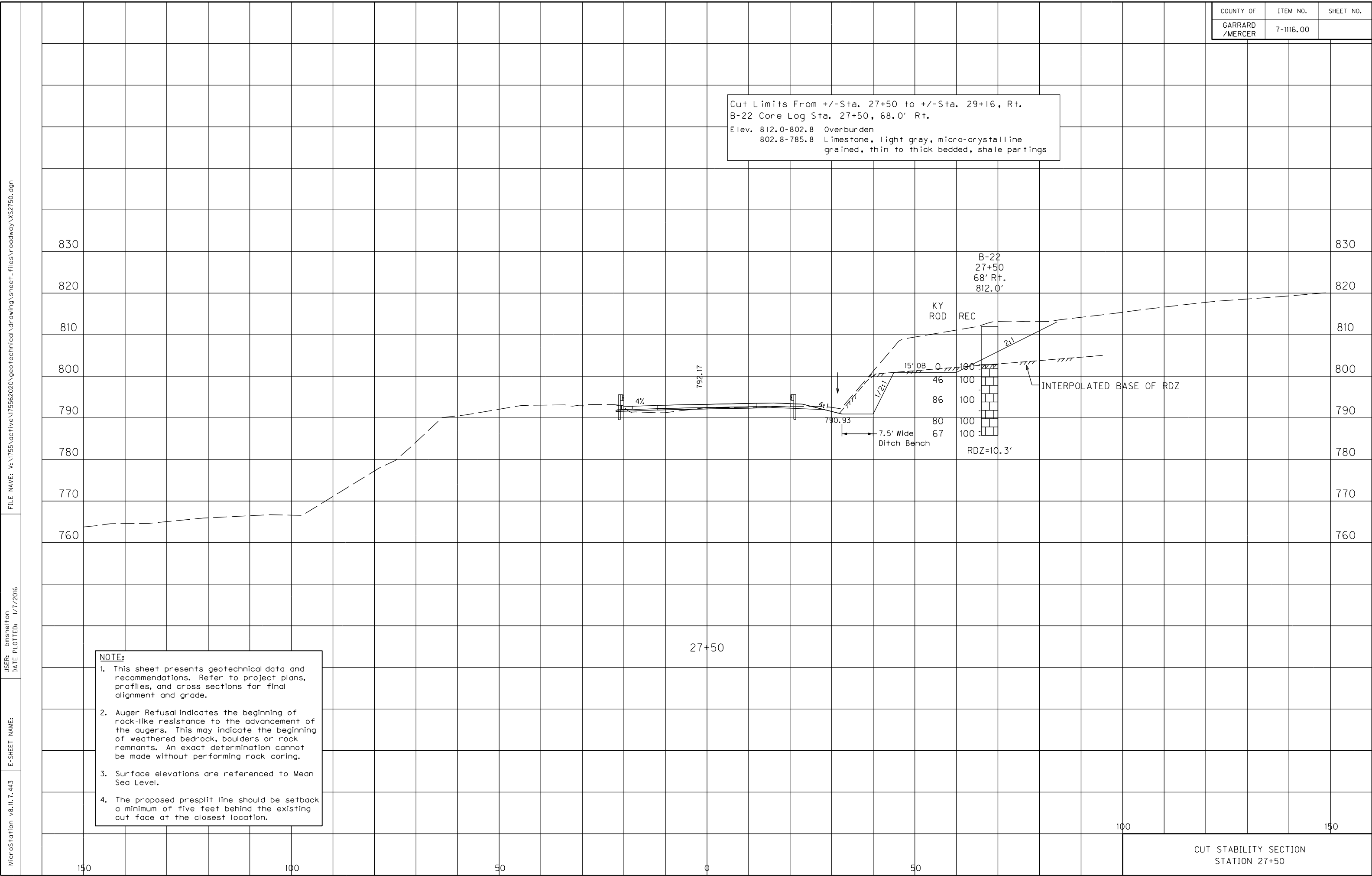
- Mechanical stabilization for the top one foot of the roadbed shall be constructed with KY Coarse Aggregate No. 2, 3 or 23 in accordance with Section 805 of the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction, current edition. The aggregate shall be wrapped with Geotextile Fabric Type IV in accordance with Sections 214 & 843 of the current Standard specifications. The platform shall extend from shoulder to shoulder in the fills and ditchline to ditchline in the cuts to assure positive drainage. The Coarse Aggregate will be paid by the ton, and will not be paid as Embankment-in-Place; the Geotextile Fabric will be paid by the square yard.
- The retaining wall segments at the locations listed below will affect the cut slope and embankment construction. For these areas, please refer to the structural plans for specific instructions for cut slope and embankment construction.

Approximate Station Limits	
KY 152	
14+40 to 15+49, Rt.	
26+70 to 27+39, Lt.	

DESIGNED BY:	
DATE SUBMITTED:	
<div>Commonwealth of Kentucky</div> <div>DEPARTMENT OF HIGHWAYS</div> <div>COUNTY OF</div> <div>GARRARD/MERCER</div>	
PROJECT KY 152 OVER HERRINGTON LAKE	
NUMBERS: --	
GEOTECHNICAL NOTES	







Appendix C

Coordinate Data Submission Form

County	Mercer & Garrard
Road Number	KY 152
Survey Crew / Consultant	WMB, Inc.
Contact Person	James Napier, PE, PLS
Item #	7-1116.00
Mars #	84690
Project #	BRO 5129, FD52 084 0152 018-019, FD 52 040 0152 000-001

All boreholes were staked by WMB, Inc.'s field crew on August 20, 2015.

Elevation Datum NAVD88 (circle one) Assumed

[illegible]