Geotechnical Investigation

Veterans Parkway Bridge Approaches Investigation
Savannah, Georgia

July 20, 2015
Terracon Project No. ES155020

Prepared for:
Chatham County Engineering Department
Savannah, Georgia

Prepared by:
Terracon Consultants, Inc.
Savannah, Georgia

Terracon

July 20, 2015

Chatham County Engineering Department
124 Bull Street, Suite 430
Savannah, Georgia 31401

Attn: Nathaniel Panther P.E.
P: (912) 652 7813
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E: NPanther@chathamcounty.org

Re: Geotechnical Investigation
Veterans Parkway Bridge Approaches Investigation
Chatham County, Georgia
Terracon Project No.: ES155020

Dear Mr. Panther:

Terracon Consultants, Inc. (Terracon) has completed the Geotechnical Engineering Investigation for the above-referenced project. The services were performed in general accordance with our proposal No. PES150078 dated February 16, 2015. This report presents the findings of the subsurface exploration and provides geotechnical recommendations for the design and construction of the project.

We appreciate the opportunity to be of service to you. Should you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Yanbo Huang

No. 21378
GUOMING LIN

Yanbo Huang, Ph.D., E.I.T.
Staff Geotechnical Engineer

Guoming Lin, Ph.D., P.E.
Senior Principal

cc: 1 – Client (PDF)
1 – File

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P (912) 629 4000 F (912) 629 4001 terracon.com/savannah

Geotechnical ■ Environmental ■ Construction Materials ■ Facilities

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APPENDICE

EXECUTIVE SUMMARY

This report presents the findings of our Geotechnical Engineering Investigation for the existing Veterans Parkway Little Ogeechee River Bridges Approaches Investigation located on Veterans Parkway in Chatham County, Georgia. The investigation included a field exploration program and engineering evaluation of the subsurface conditions and repair recommendations. Based on the results of the subsurface exploration and analyses, the following geotechnical considerations were identified:

- The project includes two bridges and four approach slabs. The subsurface conditions of the site are relatively consistent at each end of the bridge. At the south end (begin bridges), the soils in the upper 40 feet are loose to medium dense silty sands to sands with silt interbedded with sandy clays, underlain by medium stiff to very stiff silty / sandy clays with thickness of 33 feet. At the north end (end bridges), the soil in the upper 12 to 13 feet are loose to medium dense silty sands, underlain by a layer of sandy clays with thickness of approximately 8 feet.

- The groundwater was encountered at approximately 30 feet below the existing ground surface (BGS) at the south end of bridges (begin bridges) and 16.5 to 25 feet BGS at the north end (end bridges) based on CPT soundings and SPT borings.

- The expansion joints between the approach slabs and the bridge decks were supposed to be one inch wide according to the design plan but were currently at 2.5 to 3 inches wide. In addition, there were differential settlements of 0.25 to one inch between the approach slabs and the bridge decks at the end bents. In general, the differential settlements were larger at the north ends (end bridges) than at the south ends (begin bridges).

- Both the approach slabs and the bridge decks at the end bents are supported on the same pile foundations, so the mechanisms of joint widening and differential settlements were rather perplexing. There are gaps (voids) as large as three inches beneath the approach slabs to the top of the subgrade. Most likely the slab movements were initially caused by the settlements of the embankment fill. The voids beneath the slabs have reduced the frictional resistance and the forces from the traffic may have caused the slabs to slide. The differential settlements may be attributable to the structural damage at bearing supports by repeated traffic loads.

- We explored the repair options with several contractors and a GDOT engineer and would recommend the following two repair options. The first option, commonly referred as mud jacking, will mainly involve using grouting to densify the loose embankment fill in the upper 10 feet, filling the gaps beneath the slabs and lifting up the slabs. The second option is to demolish the existing approach slabs and reconstruct new slabs after necessary subgrade compaction and repair of bearing supports.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the findings and recommendations contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report's limitations.

GEOTECHNICAL INVESTIGATION

Veterans Parkway Bridges Approaches Investigation
Savannah, Georgia
Terracon Project No. ES155020
July 20, 2015

1.0 INTRODUCTION

Terracon has completed the Geotechnical Engineering Investigation for the existing Veterans Parkway Little Ogeechee River Bridge Approaches located on Veterans Parkway in Savannah, Georgia. The investigation included a field exploration program and engineering evaluation of the subsurface conditions and foundation recommendations. The field exploration program consisted of two (2) cone penetration test (CPT) soundings to a maximum depth of about 73 feet below the existing ground surface (BGS), and two (2) standard penetration test (SPT) borings to a maximum depth of about 80 feet BGS. The CPT sounding and SPT boring logs along with a site location map and exploration location plan are included in **Appendix A** of this report.

The purpose of this study is to provide subsurface information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- Differential Settlement Investigation
- Remediation recommendation for the Differential Settlement

2.0 PROJECT INFORMATION

2.1 Project Description

The construction of the bridges was completed in 1995. The south end (begin bridges) has at least 35 feet of fills and the north end (end bridges) has at least 12 feet of fills. At both ends, 5 feet of surcharge was placed with loading time of 10 to 11 months and both the filter fabric and wick drains were used during the embankment construction.

Item	Description
Proposed Improvements	The repair of widened expansion joints and differential settlement at bridge approaches.
Finished floor elevation	South end (begin bridges): 44.13 feet. North end (end bridges): 27.37 feet.

Item	Description
Design Traffic Data	ADT = 16, 800 (1990) ADT = 28, 600 (2010) Design speed = 60 mile per hour Trucks = 5%.
Maximum allowable settlement	Total settlement: 1 inch (assumed). Differential settlement: ½ inches between approach slabs and bridge decks (assumed).

2.2 Site Location and Description

Item	Description
Location	The site is located on Veterans Parkway over the Little Ogeechee River in Chatham County, Georgia. Latitude: 31.0017°, Longitude: -81.2004°
Current ground cover and access conditions	Existing road with reinforced concrete approach slabs connecting the asphalt pavement and bridge decks.
Existing topography	Relatively level.

Should any of the above information or assumptions be inconsistent with the planned construction, Terracon should be informed so that modifications to this report can be made as necessary.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Profile

Based on the results of the field exploration, the subsurface conditions at the project site are relatively consistent at each end of the bridges and can be generalized as follows:

Subsurface Conditions at South End of Bridges (Begin Bridges)

Description	**Approximate Depth to Bottom of Stratum** (feet, BGS)	**Material Encountered**	**Equivalent SPT - N_{60}**
Pavement	1.5	10 to 11 inches concrete, followed by 2 to 3 inches voids and 2.5 to 5 inches asphalt or piece of concrete.	
Stratum 1	10 to 15	Loose silty sands to sands with silt	4 to 10

Description	**Approximate Depth to Bottom of Stratum** (feet, BGS)	**Material Encountered**	**Equivalent SPT - N_{60}**
Stratum 2	40	Medium dense to dense silty sands interbedded with sandy clays	10 to 35
Stratum 3	71 to 73	Medium stiff to very stiff silty / sandy clays	5 to 22
Stratum 4	80, termination of SPT borings	Hard sandy clays	30 to 50+

Subsurface Conditions at North End of Bridges (End Bridges)

Description	**Approximate Depth to Bottom of Stratum** (feet, BGS)	**Material Encountered**	**Equivalent SPT - N_{60}**
Pavement	1.5	10 to 11 inches concrete, followed by 2.5 inches voids and 4 inches asphalt.	
Stratum 1	12 to 13	Medium dense silty sands.	10 to 30
Stratum 2	20 to 21	Stiff to very stiff sandy clays	8 to 12
Stratum 3	25	Medium dense silty sands	15 to 30
Stratum 4	33 to 34	Soft to stiff silty/sandy clays	4 to 14
Stratum 5	67 to 70	Medium dense to very dense silty sands interbedded with sandy clays	20 to 50+
Stratum 6	80, termination of SPT borings	Very stiff to hard sandy clays	29 to 50+

Details of the subsurface conditions encountered at each boring location are presented on the individual CPT sounding and SPT boring logs in **Appendix A** of this report. Stratification boundaries on the logs represent the approximate depth of changes in soil types; the transition between materials may be gradual.

3.2 Groundwater

Groundwater was measured at approximately 30 feet BGS at the south end of bridges (begin bridges) and 16.5 to 25 feet BGS at the north end (end bridges) during the field exploration. It should be noted that groundwater levels tend to fluctuate with seasonal and climatic variations, as well as with construction activities. As such, the possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project. The groundwater table should be checked prior to construction to assess its effect on site work and other construction activities.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

The subsurface conditions at this site are considered relatively consistent at each end of bridges. The generalized soil profile is presented in **Section 3.1**.

For the approach slabs at the south end of bridges (begin bridges), the expansion joints between approach slabs and bridge decks have been widen from 1 inch to 2.5~3 inches and the differential settlements at these joints are less than 0.25 inch. From the coring results as shown in **Appendix C**, about 2 to 3 inches of voids were found right below the slabs. The subgrade materials below the voids were approximately 5 inches asphalt or 2.5 inches piece of concrete.

For the approach slabs at the north end of bridges (end bridges), the expansion joints between approach slabs and bridge decks also have been widen from 1 inch to 2.5~3 inches but the differential settlements at these joints are as high as 0.5 to one inch. From the coring results as shown in **Appendix C**, approximately 2.5 inches of voids were found right below the slab and below the voids, it is followed by approximately 4 inches asphalt. In addition, signs of erosion were noted found at the bridge abutment as shown in **Appendix C**.

Since both the approach slabs and the bridge deck at the end bents are supported on same piled foundations, the mechanisms of the differential settlements are rather perplexing. We reviewed all the available design details of the bridges, approach slabs and embankment. We also discussed the problem of differential settlement at the expansion joints between approach slab and bridge deck with local Georgia DOT engineer. From our GDOT engineer and local contractors, we learned the problem of widened joints and differential settlements is a common occurrence for bridges in the area with high embankment fill over weak soils.

The approach slab movements were mostly likely caused initially by consolidation settlement of the embankments. The embankments are underlain by one or more layers of relatively soft clays and the weight of the embankment fill has caused the soft clays to consolidate and settle. The fact the voids beneath the slabs were only 2.5 to 3 inches for the last 20 years suggests the initial ground improvement measures, wick drain, surcharge and waiting time, were largely effective. Without these special measures, the settlements would have been much larger.

The soft clays are relatively deep, at depths of 45 to 55 feet at C1 and 25 to 30 feet at C2. It is likely that these soft clay layers would undergo additional consolidation and cause additional settlements. However, the settlements in the next 20 years should be considerably smaller than 2 inches (mostly likely less than 1 inch). As such, we believe the risk of additional settlement would not justify the expense to treat the deep clay layers even though the deep clay layers were considered the root cause of the slab problems.

The investigation also revealed that the embankment fill in the upper 10 feet were relatively loose. This may have been caused by deep consolidation settlements and/or inadequate compaction during the embankment construction. It is very likely that the loose embankment fills have contributed to the embankment settlements and formation of the voids beneath the approach slabs. We recommend the embankment subgrade in the upper ten feet be densified as part of the slab repair work.

The formation of the voids beneath the slabs resulted in reduction of frictional resistance of the approach slabs. The widening of the expansion joints at the end bents was most likely caused by lateral force exerted by the traveling vehicles. We observed the overall bridge for control and expansion joints and concluded the widening of the expansion joints were unlikely caused by thermal expansion of the bridge structure. Based on discussions with GDOT engineer and other local experienced bridge contractors, the differential settlements between the approach slab and the deck at end bents were likely caused by damage/wearing of the supports from the repeated traffic.

4.2 Recommendation for Repair

With the above understandings of the causes of the problem, we discussed the repair options with GDOT engineer and several specialty contractors. Embankment settlements are considered the cause of the slab movements. Embankment settlements were caused primarily by the consolidation settlement of the deep foundation and likely aided by the compression of the loose embankment fill at the upper 10 feet. If a one-time and permanent solution is required to repair the slab, we would recommend grouting be used to improve the deep soft clays as well as the loose embankment fill in the upper 10 feet. However, over a period of 20 years, the embankments have settled up to three inches. Based on the soil consolidation theory and our experience with the soils in this area, we anticipate the embankment will undergo additional settlements but the magnitude of the settlement for the next 20 years should be less than 2 inches and most likely less than one inch. As such, the cost of treating the deep clays may not justify the cost. We recommend the loose sands in the upper 10 feet be improved as part of the repair.

We recommend two repair options for the approach slab. The first option, commonly referred as mud jacking, will mainly involve using grouting to densify the loose embankment fill in the upper 10 feet, filling the gaps beneath the slabs and lifting up the slabs. The second option is to demolish the existing approach slabs and reconstruct new slabs after necessary subgrade compaction and repair of bearing supports.

Grouting work is typically performed by an experienced specialty contractor. The specialty contractor should develop detailed work plan to achieve the required densification, filling and leveling of the approach slab. The contractor should choose the grouting method (jet grouting, compaction ground or chemical grouting) that is suited for the soil conditions and intended repair. It is very likely that the grouting option would not able to move the slabs lateral to narrow the joints. Also based on the experience of the GDOT engineer Mr. Michael Garner, the mud jacking (grouting) option may not offer a permanent fix but should be attempted as the first option.

For the reconstruction option, the slab should be demolished and the subgrade in the upper 10 feet should be improved. The method of improvement may include grouting, stone columns or excavation and recompaction. The new approach slabs should be poured after necessary structural repair of the slab support. The new slab supports should be constructed in accordance with the current GDOT standard details and specifications as shown in Exhibit C-4-3 in Appendix C. The contractor proposing on the repair work should engage a bridge design engineer to develop the repair details.

Regardless the repair option selected, the repair should also include measures to prevent erosion of the subgrade soils. The expansion joints should include proper sealant to minimize infiltration of water into the subgrade.

5.0 GENERAL COMMENTS

Terracon should be consulted to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the project design and specifications. Terracon should also be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analyses and recommendations presented in this report are based upon the data obtained from the explorations performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between exploration locations, across the site, or may be caused due to the modifying effects of construction or weather. Bear in mind that the nature and extent of such variations may not become evident until construction has started or until construction activities have ceased. If variations do appear, Terracon should be notified immediately so that further evaluation and supplemental recommendations can be provided. The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, and bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or hazardous conditions. If the owner is concerned about the potential for such contamination or pollution, please advise so that additional studies may be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project and site discussed, and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended or made. Site safety, excavation support and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes, and then either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION

Exhibit A-1	Site Location Map
Exhibit A-2	Exploration Location Plan
Exhibit A-3	Field Exploration Description
Exhibit A-4	CPT Cross Section
Exhibit A-5	CPT Logs
Exhibit A-6	SPT Cross Section
Exhibit A-7	SPT Logs

Image Courtesy of
Google Earth™

Project Manager: YH
Drawn by: YH
Checked by: GL
Approved by: GL

Project No. ES155020
Scale: N.T.S.
File Name: ES155020-A1
Date: 4-13-15

Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

SITE LOCATION MAP

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

Exhibit:
A-1-1

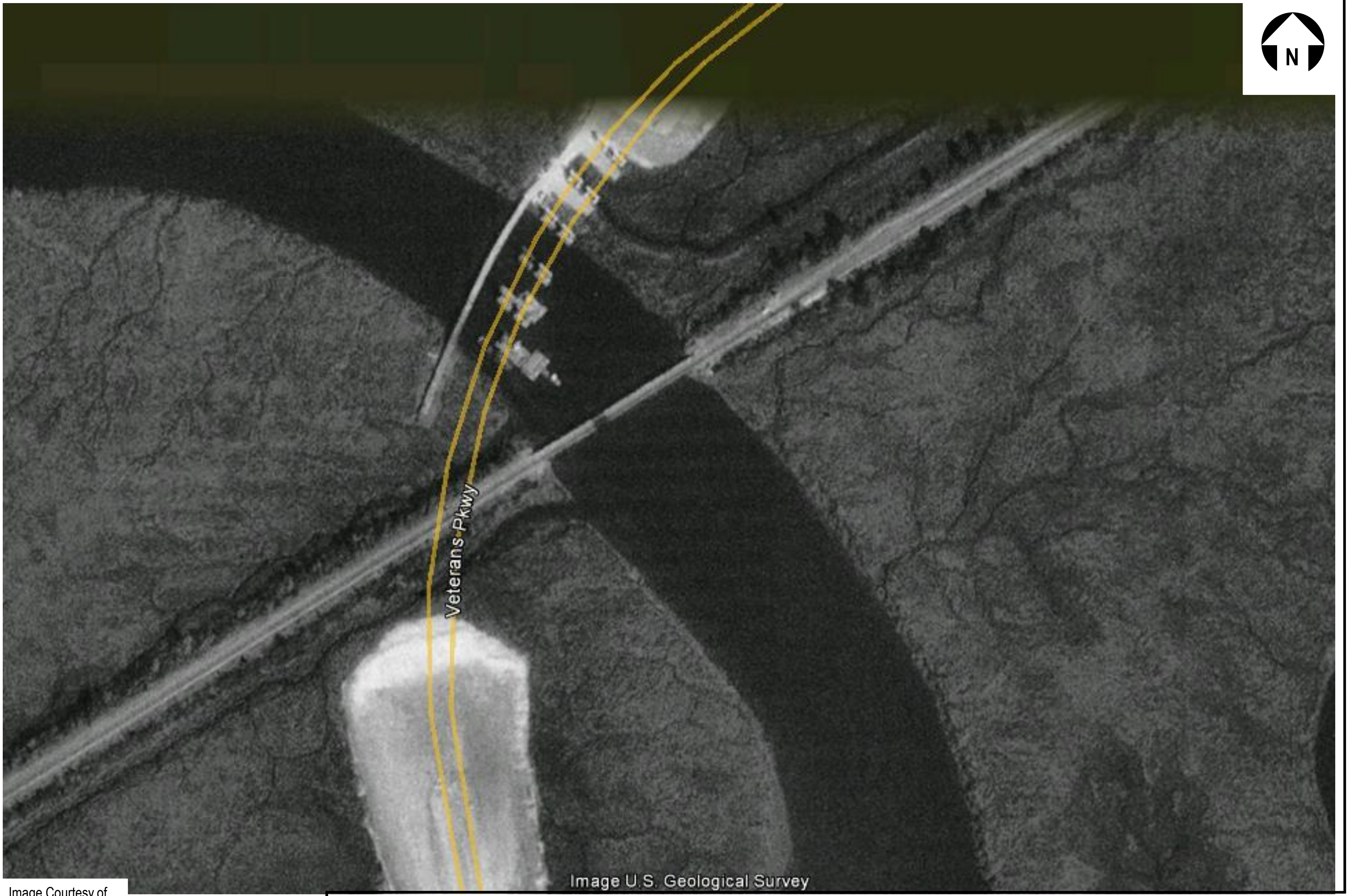

Image Courtesy of
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Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES155020
Scale:	N.T.S.
File Name:	ES155020-A2
Date:	4-13-15

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SITE HISTORICAL VIEW, 2/1993

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

Exhibit:

A-1-2

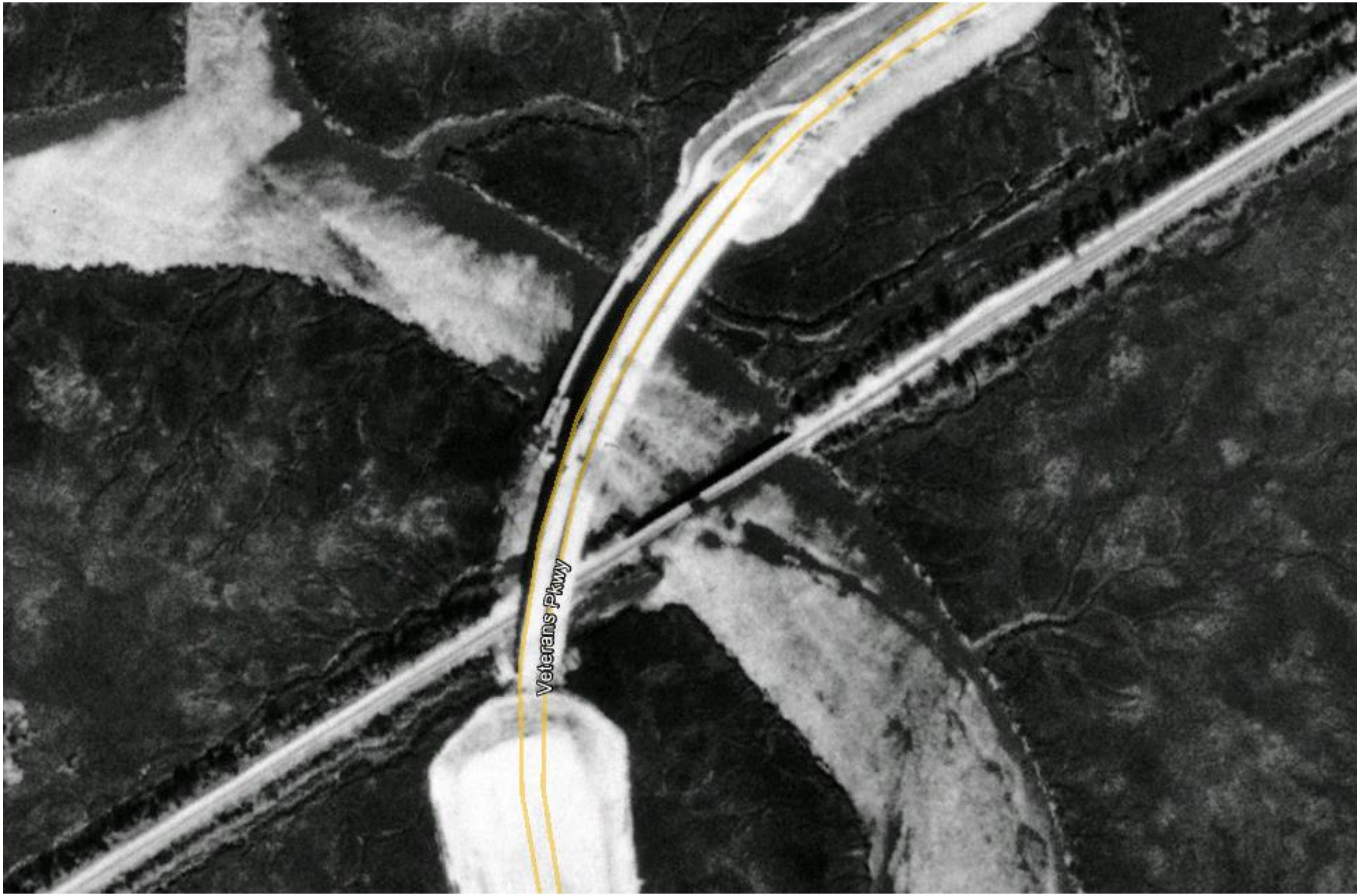

Image Courtesy of
Google Earth™

Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES155020
Scale:	N.T.S.
File Name:	ES155020-A2
Date:	4-13-15

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SITE HISTORICAL VIEW, 2/1995

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

Exhibit:
A-1-3

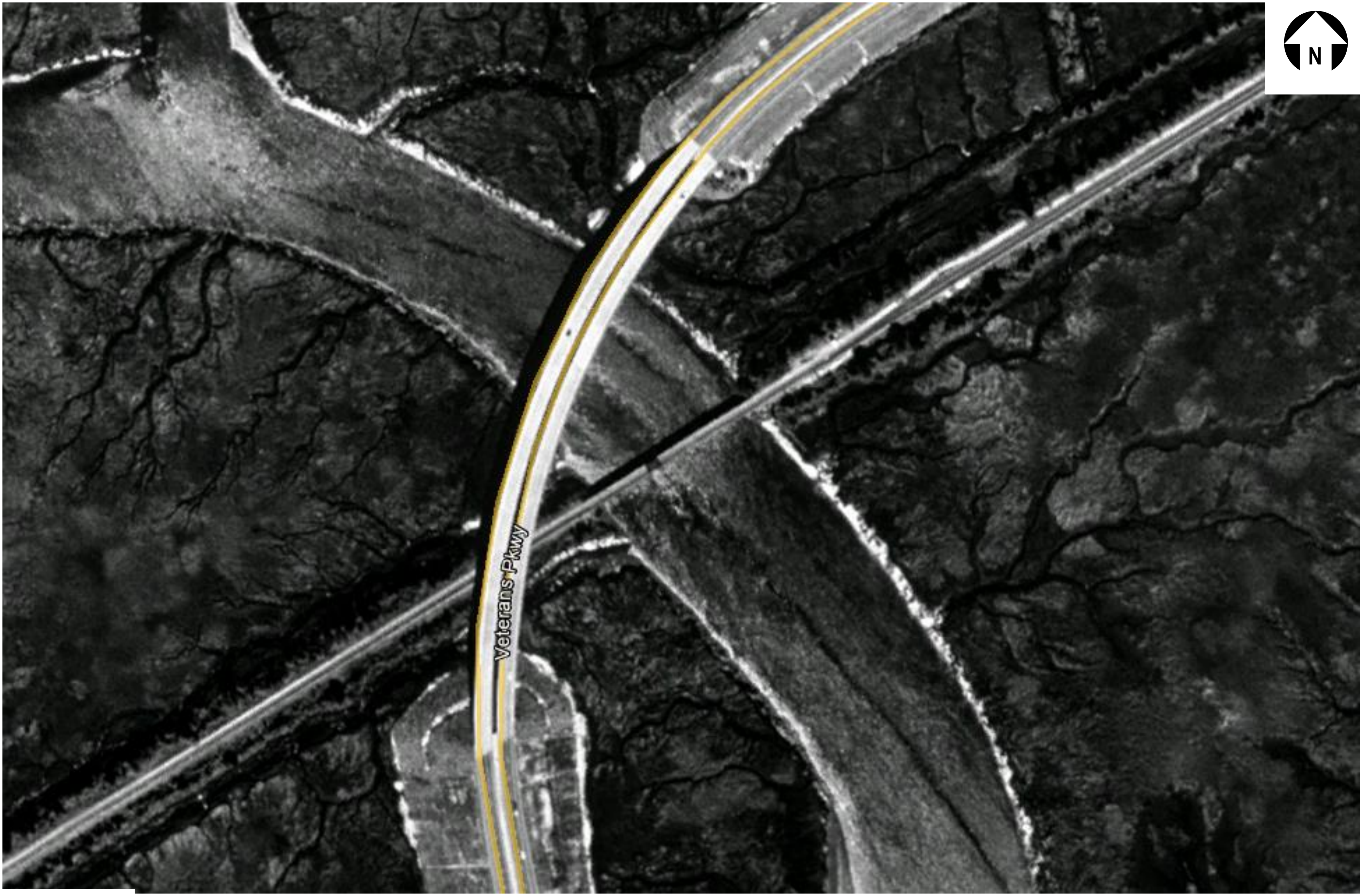

Image Courtesy of
Google Earth™

Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES155020
Scale:	N.T.S.
File Name:	ES155020-A2
Date:	4-13-15

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SITE HISTORICAL VIEW, 2/1999

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

Exhibit:
A-1-4

NOTES:

ALL EXPLORATION LOCATIONS WERE LOCATED IN THE FIELD USING A GPS UNIT AND/OR SITE LANDMARKS. EXPLORATION LOCATIONS SHOULD BE CONSIDERED APPROXIMATE. DIAGRAM IS FOR GENERAL LOCATION ONLY; NOT INTENDED FOR CONSTRUCTION PURPOSES.

Project Manager:	YH	**Project No.**	ES155020
Drawn by:	YH	**Scale:**	N.T.S.
Checked by:	GL	**File Name:**	ES155020-A2
Approved by:	GL	**Date:**	4-13-15

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EXPLORATION LOCATION PLAN

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

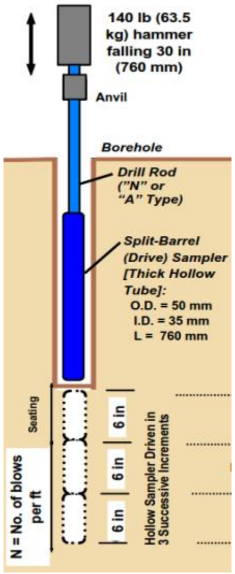
Exhibit:
A-2

Field Exploration Description

The locations of Standard Penetration Test (SPT) borings and Cone Penetration Test (CPT) soundings are determined by Terracon based on the proposed development and were located in the field using hand-held GPS units and in reference to existing features. These locations are shown in the Exploration Location Plan and should be considered approximate.

Standard Penetration Testing

The SPT borings were performed in accordance with ASTM D1586 with an truck-mounted Acker drilling rig using mud rotatory drilling techniques. Samples of the soil encountered in the borings were obtained using split-barrel sampling procedures. In the split barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in situ relative density of cohesionless soils and consistency of cohesive soils. A rope and cathead hammer was used to advance the split-barrel sampler in the borings performed on this site.



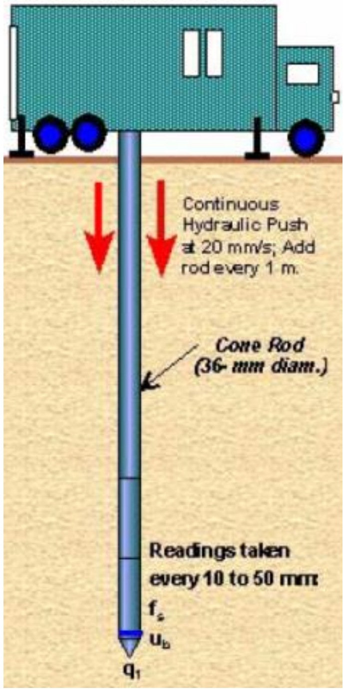
Source: FHWA NHI-06-088

Cone Penetration Testing

The CPT hydraulically pushes an instrumented cone through the soil while nearly continuous readings are recorded to a portable computer. The cone is equipped with electronic load cells to measure tip resistance and sleeve resistance and a pressure transducer to measure the generated ambient pore pressure. The face of the cone has an apex angle of 60° and an area of 10 cm^2. Digital data representing the tip resistance, friction resistance, pore water pressure, and probe inclination angle are recorded about every 2 centimeters while advancing through the ground at a rate between 1½ and 2½ centimeters per second. These measurements are correlated to various soil properties used for geotechnical design. No soil samples are gathered through this subsurface investigation technique.

CPT testing is conducted in general accordance with ASTM D5778 "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils."

Upon completion, the data collected were analyzed and processed by the project engineer.



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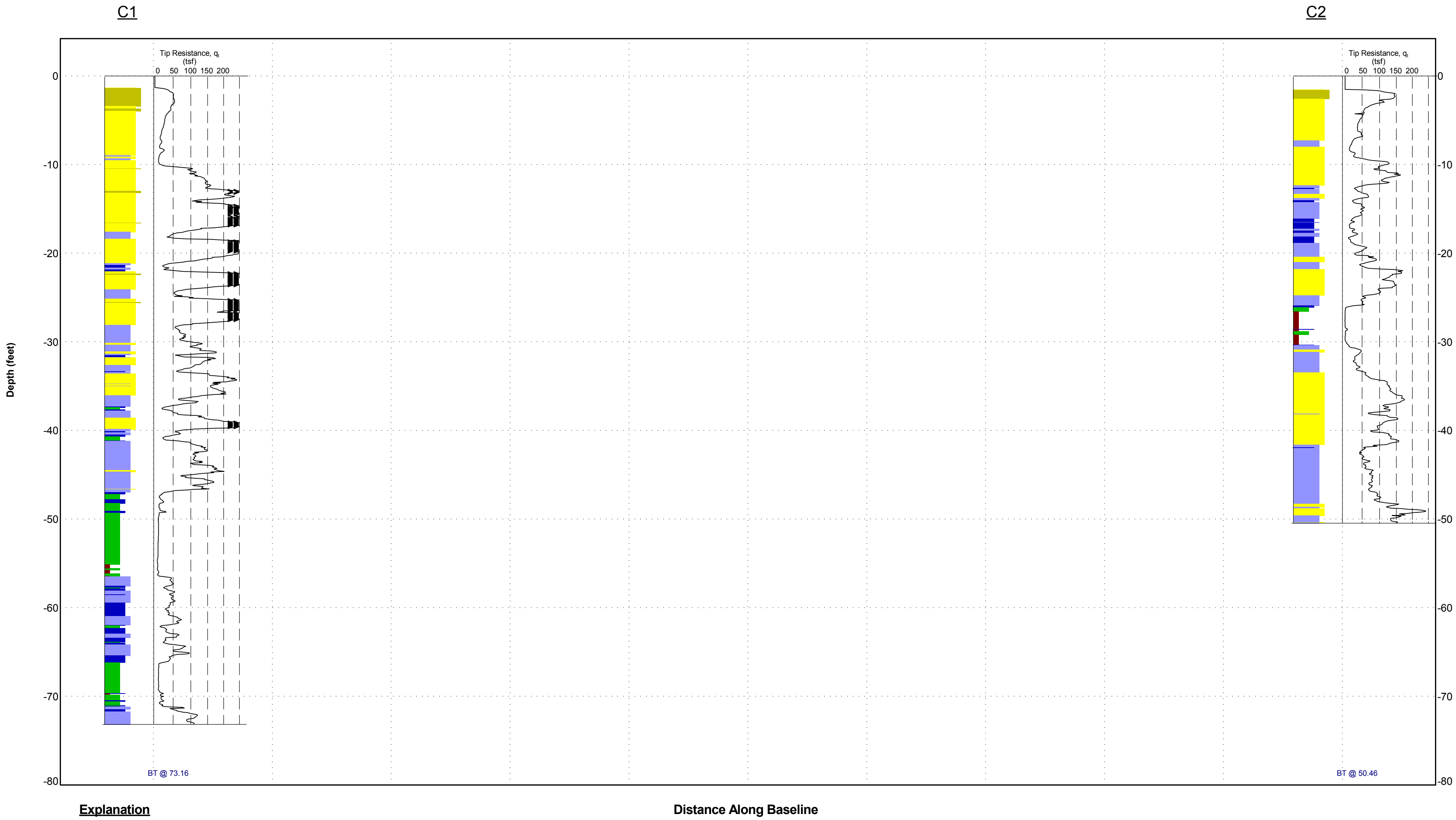

Explanation

- 🟫 1 Sensitive, fine grained
- 🟥 2 Organic soils - clay
- 🟩 3 Clay - silty clay to clay
- 🟦 4 Silt mixtures - clayey silt to silty clay
- 🟪 5 Sand mixtures - silty sand to sandy silt
- 🟨 6 Sands - clean sand to silty sand
- 🟨 7 Gravelly sand to dense sand
- 🟫 8 Very stiff sand to clayey sand
- ⬛ 9 Very stiff fine grained

NOTES:
See Exhibit for orientation of soil profile.
See General Notes in Appendix C for symbols and soil classifications.
Soils profile provide dfor illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project Manager:	Project No.: ES155020
Drawn by: YH	Scale: N.T.S.
Approved by: GL	File Name:
Date: 3/16/2015	

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Savannah, Georgia
PH. 912-629-4000 FAX. 912-629-4001

SUBSURFACE PROFILE

VETERANS PARKWAY BRIDGES APPROACHES INVESTIGATION

CHATHAM COUNTY, GEORGIA

EXHIBIT

A-4

CPT LOG NO. C1

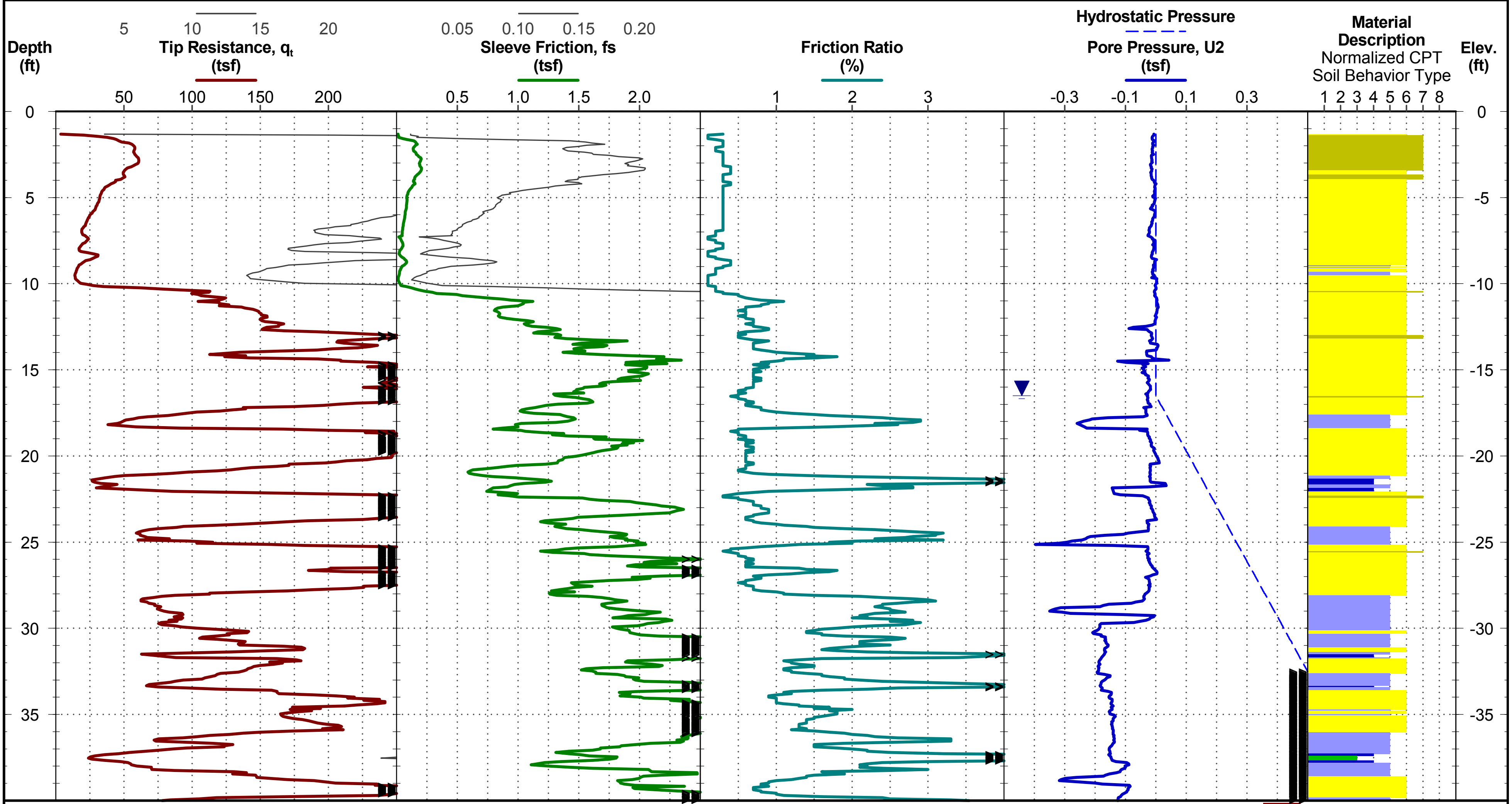
Page 1 of 2

PROJECT: Veterans Parkway Bridges Approaches Investigation

CLIENT: Chatham County Engineering Department
Savannah, Georgia

TEST LOCATION: See Exhibit A-2

SITE: Chatham County, Georgia



See Exhibit A-3 for description of field procedures.

See Appendix C for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

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🟪 5 Sand mixtures - silty sand to sandy silt
🟨 6 Sands - clean sand to silty sand
🟨 7 Gravelly sand to dense sand
🟫 8 Very stiff sand to clayey sand
⬛ 9 Very stiff fine grained

WATER LEVEL OBSERVATION

▼ 16.5 ft estimated water depth
(used in normalizations and correlations; see Appendix C)

Probe no. 4675 with net area ratio of 0.839
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 9/2/2013
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
2201 Rowland Avenue
Savannah, Georgia

CPT Started: 3/10/2015	CPT Completed: 3/10/2015
Rig: Pagani TG73-200	Operator: BR
Project No.: ES155020	Exhibit: A-5-1

THIS TEST RECORD IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT CPT.GPJ TERRACON2012_W INSITU.GDT 3/16/15

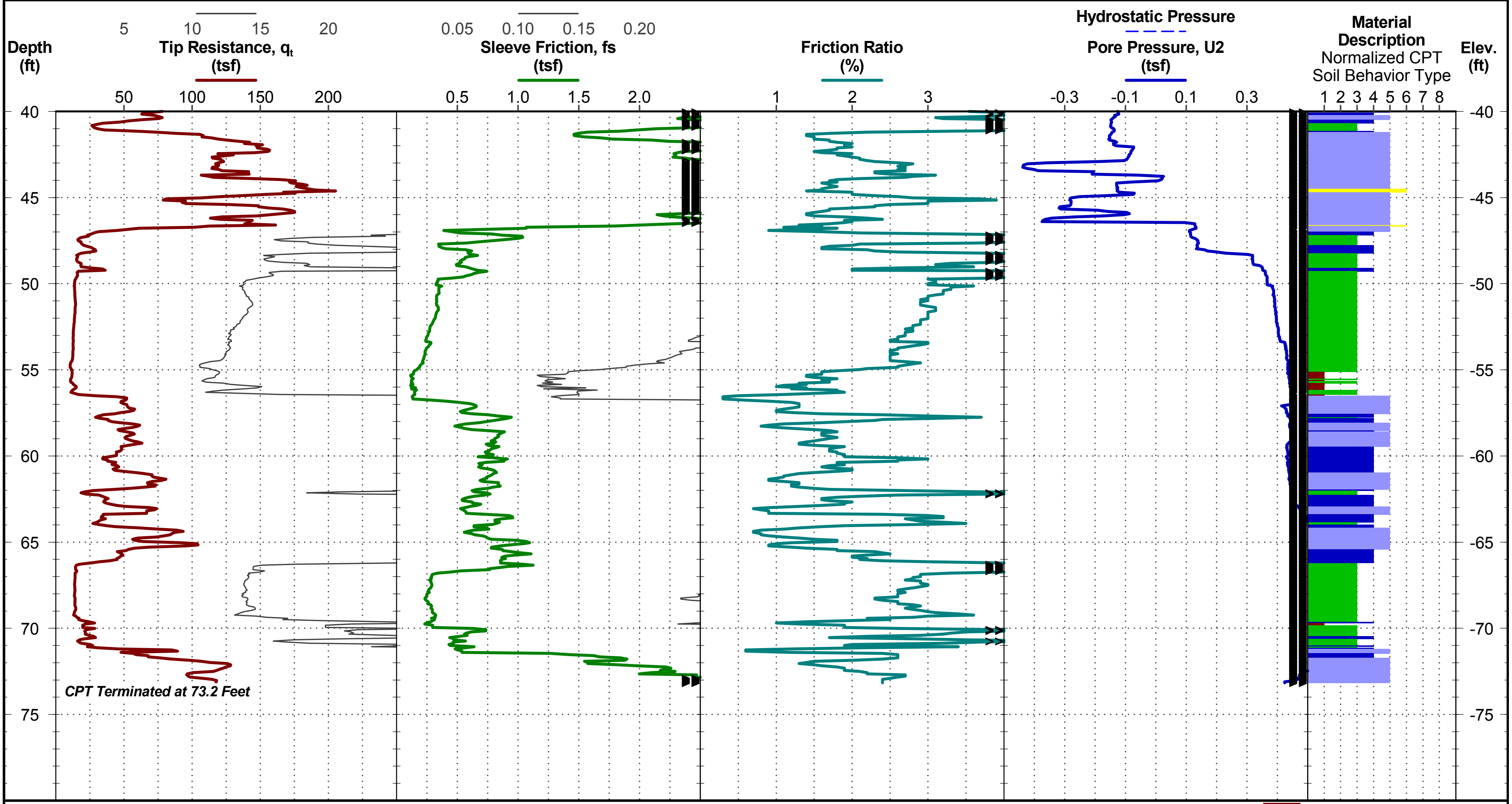
CPT LOG NO. C1

PROJECT: Veterans Parkway Bridges Approaches Investigation

CLIENT: Chatham County Engineering Department
Savannah, Georgia

TEST LOCATION: See Exhibit A-2

SITE: Chatham County, Georgia



CPT Terminated at 73.2 Feet

See Exhibit A-3 for description of field procedures.
See Appendix C for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

- 🟥 1 Sensitive, fine grained
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WATER LEVEL OBSERVATION

▼ 16.5 ft estimated water depth
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Terracon
2201 Rowland Avenue
Savannah, Georgia

CPT Started: 3/10/2015	CPT Completed: 3/10/2015
Rig: Pagani TG73-200	Operator: BR
Project No.: ES155020	Exhibit: A-5-2

CPT LOG NO. C2

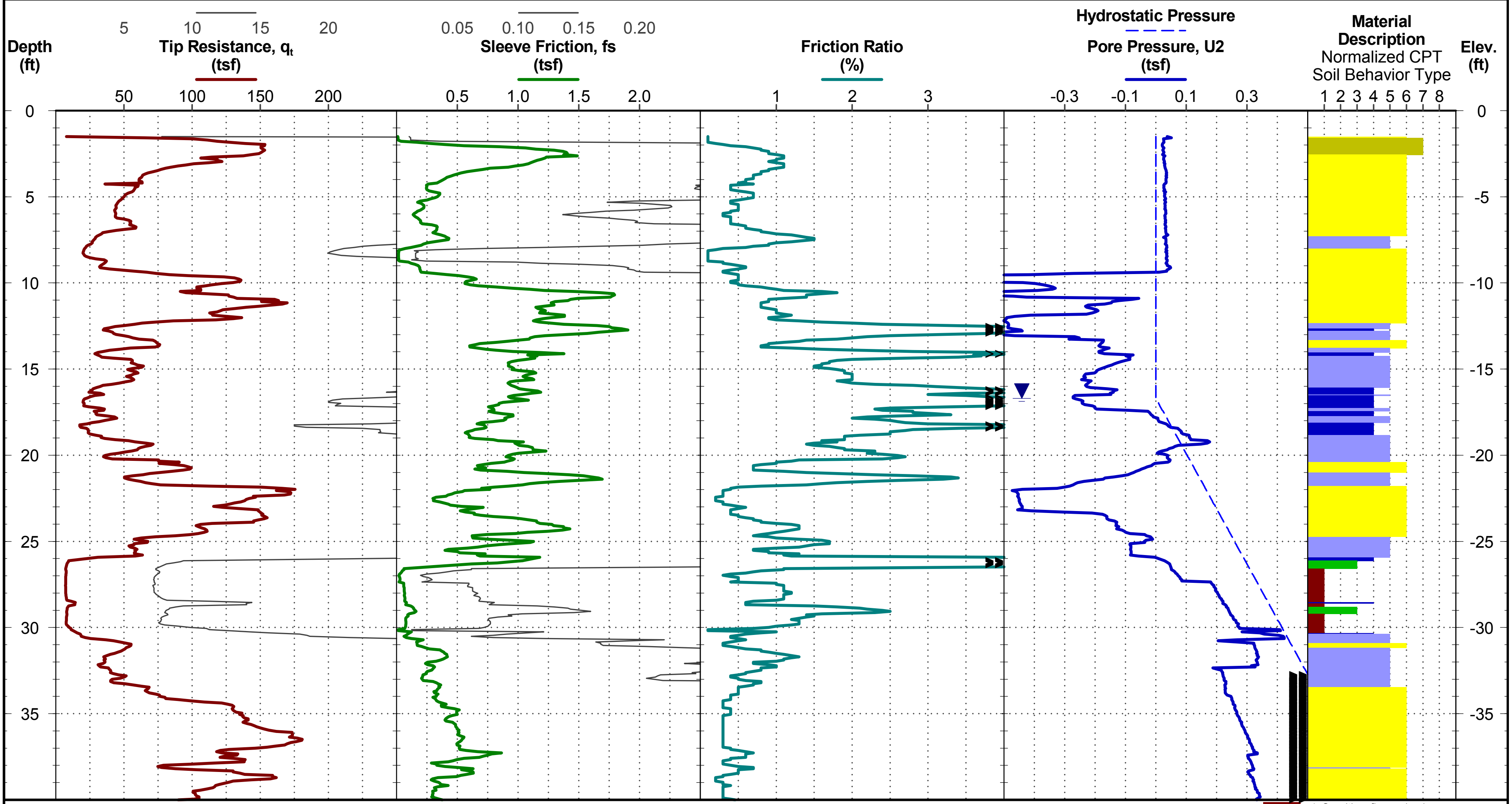
Page 1 of 2

PROJECT: Veterans Parkway Bridges Approaches Investigation

CLIENT: Chatham County Engineering Department
Savannah, Georgia

TEST LOCATION: See Exhibit A-2

SITE: Chatham County, Georgia



See Exhibit A-3 for description of field procedures.

See Appendix C for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

- 🟥 1 Sensitive, fine grained
- 🟧 2 Organic soils - clay
- 🟩 3 Clay - silty clay to clay
- 🟦 4 Silt mixtures - clayey silt to silty clay
- 🟦 5 Sand mixtures - silty sand to sandy silt
- 🟨 6 Sands - clean sand to silty sand
- 🟨 7 Gravelly sand to dense sand
- 🟫 8 Very stiff sand to clayey sand
- ⬛ 9 Very stiff fine grained

WATER LEVEL OBSERVATION

▼ 16.7 ft measured water depth
(used in normalizations and correlations; see Appendix C)

Probe no. 4675 with net area ratio of 0.839
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 9/2/2013
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
2201 Rowland Avenue
Savannah, Georgia

CPT Started: 3/11/2015
Rig: Pagani TG73-200
Project No.: ES155020

CPT Completed: 3/11/2015
Operator: BR
Exhibit: A-5-3

THIS TEST RECORD IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. CPT REPORT CPT.GPJ TERRACON2012_W INSITU.GDT 3/16/15

CPT LOG NO. C2

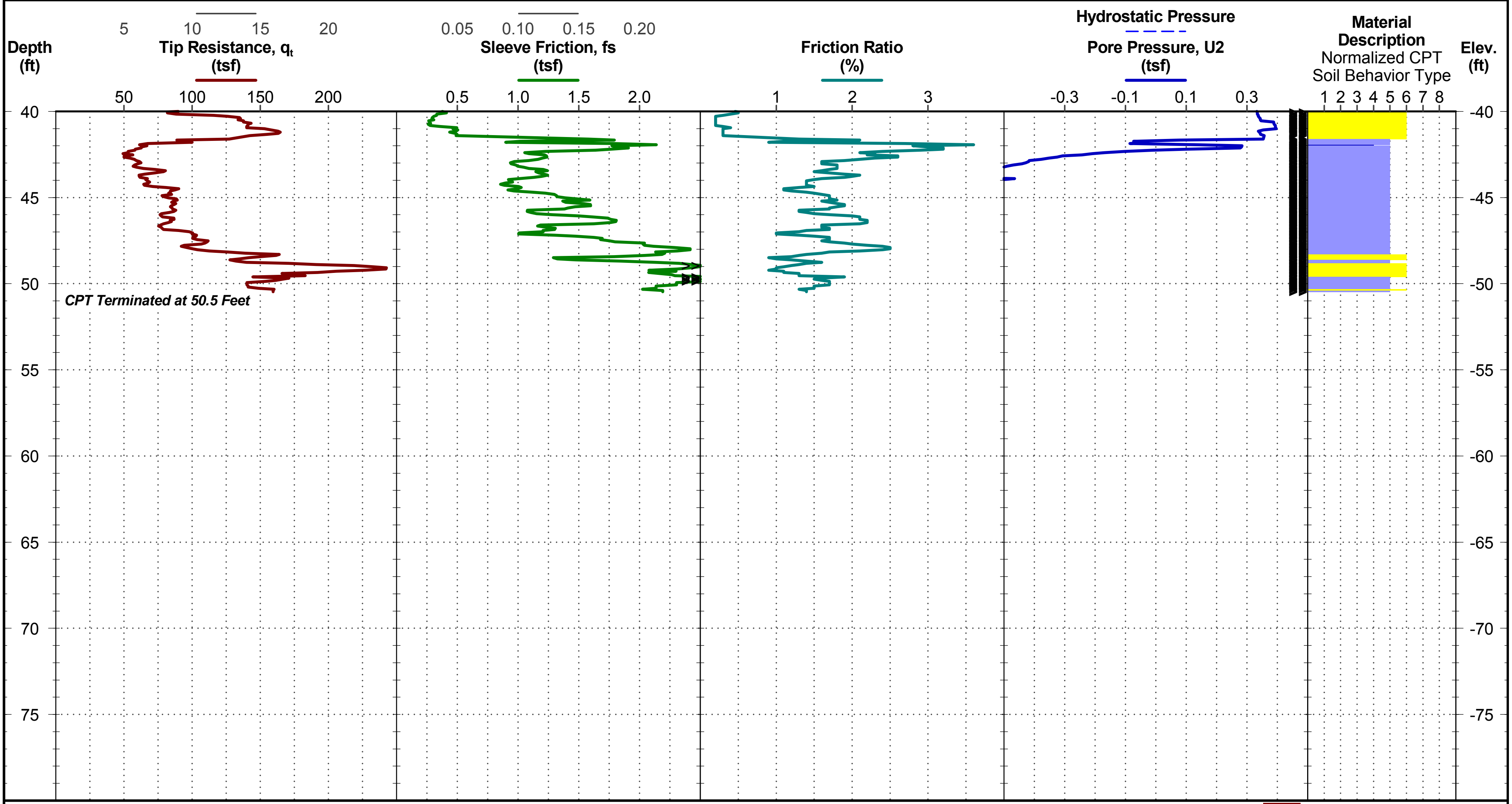
Page 2 of 2

PROJECT: Veterans Parkway Bridges Approaches Investigation

CLIENT: Chatham County Engineering Department
Savannah, Georgia

TEST LOCATION: See Exhibit A-2

SITE: Chatham County, Georgia



See Exhibit A-3 for description of field procedures.
See Appendix C for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

- 🟥 1 Sensitive, fine grained
- 🟧 2 Organic soils - clay
- 🟩 3 Clay - silty clay to clay
- 🟦 4 Silt mixtures - clayey silt to silty clay
- 🟪 5 Sand mixtures - silty sand to sandy silt
- 🟨 6 Sands - clean sand to silty sand
- 🟨 7 Gravelly sand to dense sand
- 🟫 8 Very stiff sand to clayey sand
- ⬛ 9 Very stiff fine grained

WATER LEVEL OBSERVATION

▼ 16.7 ft measured water depth
(used in normalizations and correlations; see Appendix C)

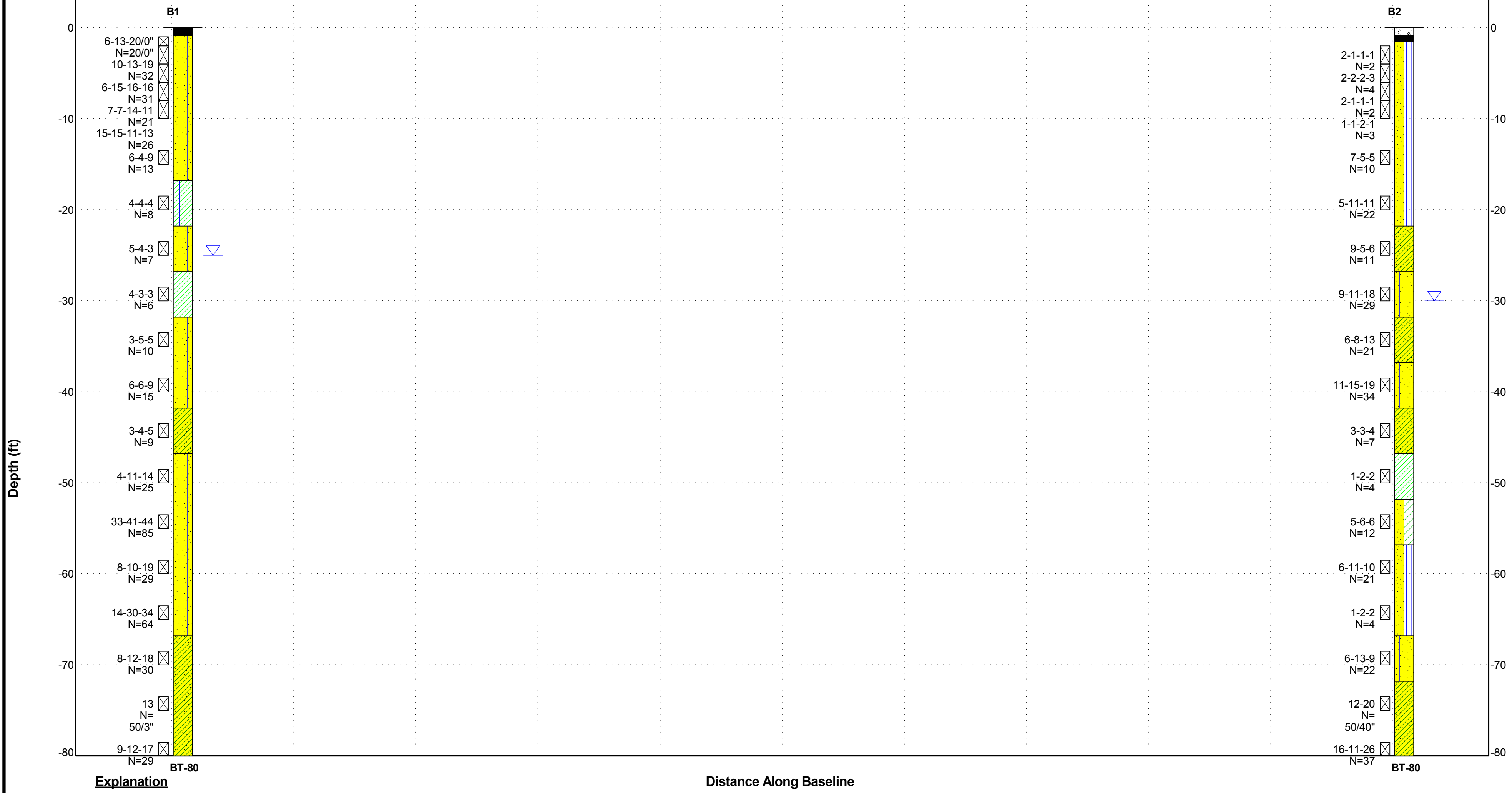
Probe no. 4675 with net area ratio of 0.839
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 9/2/2013
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon
2201 Rowland Avenue
Savannah, Georgia

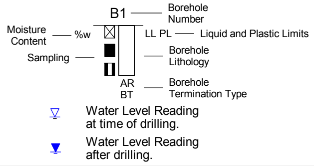
CPT Started: 3/11/2015
Rig: Pagani TG73-200
Project No.: ES155020

CPT Completed: 3/11/2015
Operator: BR
Exhibit: A-5-4

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. 11X17-W-LABS SPT.GPJ 73111048.GPJ 3/20/15



Explanation



NOTES:
See Exhibit for orientation of soil profile.
See General Notes in Appendix A for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project Manager:	Project No.: ES155020	Terracon 2201 Rowland Avenue Savannah, Georgia	**SUBSURFACE PROFILE**	EXHIBIT
Drawn by: YH	Scale: N.T.S.		VETERANS PARKWAY BRIDGES APPROACHES INVESTIGATION	A-6
Approved by: GL	File Name:			
Date: 3/20/2015		PH. 912-629-4000 FAX. 912-629-4001	CHATHAM COUNTY, GEORGIA	

BORING LOG NO. B1

Page 1 of 2

PROJECT: Veterans Parkway Bridges Approaches Investigation

CLIENT: Chatham County Engineering Department
Savannah, Georgia

SITE: Chatham County, Georgia

GRAPHIC LOG	DEPTH	LOCATION See Exhibit A-2	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (psf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
■	0.9	**ASPHALT CONCRETE**, Asphalt and binder	-1											
▤		**SILTY SAND (SM)**, fine grained, brown/gray, medium dense to dense				☒	6-13-20/0"							
						☒	10-13-19 N=32							
				5		☒	6-15-16-16 N=31							
						☒	7-7-14-11 N=21							
				10		☒	15-15-11-13 N=26							
				15		☒	6-4-9 N=13							
▨	16.8	**SILTY CLAY (CL-ML)**, gray, stiff	-17											
				20		☒	4-4-4 N=8							
▤	21.8	**SILTY SAND (SM)**, fine grained, gray, loose, with fabric liner	-22											
				25	▽	☒	5-4-3 N=7							
▨	26.8	**LEAN CLAY (CL)**, dark gray/black, medium stiff, with organics	-27											
				30		☒	4-3-3 N=6							
▤	31.8	**SILTY SAND (SM)**, fine to medium grained, gray, loose to medium dense	-32											
				35		☒	3-5-5 N=10							
				40		☒	6-6-9 N=15							
▨	41.8	**SANDY LEAN CLAY (CL)**, dark gray, stiff	-42											
				45		☒	3-4-5							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud Rotary

Abandonment Method:

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *measured during drilling*

Terracon
2201 Rowland Avenue
Savannah, Georgia

Boring Started: 3/10/2015	Boring Completed: 3/10/2015
Drill Rig: CME-45	Driller: D. Francis and Noel
Project No.: ES155020	Exhibit: A-7-1

BORING LOG NO. B1

Page 2 of 2

PROJECT: **Veterans Parkway Bridges Approaches Investigation**

SITE: **Chatham County, Georgia**

CLIENT: **Chatham County Engineering Department**
Savannah, Georgia

LOCATION See Exhibit A-2

DEPTH		ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (psf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
46.8	**SANDY LEAN CLAY (CL)**, dark gray, stiff *(continued)*	-47				N=9							
	SILTY SAND (SM), fine grained, dark gray, medium dense		50		☒	4-11-14 N=25							
	fine grained, dark gray, very dense		55		☒	33-41-44 N=85							
	dark gray, medium dense, with shells		60		☒	8-10-19 N=29							
66.8	fine grained, dark gray, very dense	-67	65		☒	14-30-34 N=64							
	SANDY LEAN CLAY (CL), dark gray, hard		70		☒	8-12-18 N=30							
	dark gray, hard to very hard, Marl		75		☒	13 N= 50/3"							
80.0		-80	80		☒	9-12-17 N=29							
	Boring Terminated at 80 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud Rotary

Abandonment Method:

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *measured during drilling*

Terracon
2201 Rowland Avenue
Savannah, Georgia

Boring Started: 3/10/2015	Boring Completed: 3/10/2015
Drill Rig: CME-45	Driller: D. Francis and Noel
Project No.: ES155020	Exhibit: A-7-2

BORING LOG NO. B2

PROJECT: Veterans Parkway Bridges Approaches Investigation

CLIENT: Chatham County Engineering Department
Savannah, Georgia

SITE: Chatham County, Georgia

LOCATION See Exhibit A-2

DEPTH		ELEVATION (Ft.)
0.9	**Concrete**, concrete	-1
1.5	**ASPHALT CONCRETE**, 3" gap and 5" asphalt	-1.5
	POORLY GRADED SAND WITH SILT (SP-SM), fine grained, brown, loose fine to medium grained, brown, medium dense	
21.8		-22
	SANDY LEAN CLAY (CL), fine grained, brown, stiff	
26.8		-27
	SILTY SAND (SM), fine grained, brown, medium dense	
31.8		-32
	SANDY LEAN CLAY (CL), brown, very stiff	
36.8		-37
	SILTY SAND (SM), fine grained, brown/gray, dense, with clays	
41.8		-42
	SANDY LEAN CLAY (CL), gray/red, medium stiff, with organics	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (psf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		☒	2-1-1-1 N=2							
5		☒	2-2-2-3 N=4							
		☒	2-1-1-1 N=2							
10		☒	1-1-2-1 N=3							
15		☒	7-5-5 N=10							
20		☒	5-11-11 N=22							
25		☒	9-5-6 N=11							
30	▽	☒	9-11-18 N=29							
35		☒	6-8-13 N=21							
40		☒	11-15-19 N=34							
45		☒	3-3-4							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud Rotary

Abandonment Method:

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *measured during drilling*

Terracon
2201 Rowland Avenue
Savannah, Georgia

Boring Started: 3/11/2015	Boring Completed: 3/11/2015
Drill Rig: CME-45	Driller: D. Francis and Noel
Project No.: ES155020	Exhibit: A-7-3

BORING LOG NO. B2

Page 2 of 2

PROJECT: Veterans Parkway Bridges Approaches Investigation

CLIENT: Chatham County Engineering Department
Savannah, Georgia

SITE: Chatham County, Georgia

LOCATION See Exhibit A-2

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (psf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
						N=7							
	46.8	-47											
	LEAN CLAY (CL), dark gray/black, soft		50		☒	1-2-2 N=4							
	51.8	-52											
	POORLY GRADED SAND WITH CLAY (SP-SC), dark gray, medium dense		55		☒	5-6-6 N=12							
	56.8	-57											
	POORLY GRADED SAND WITH SILT (SP-SM), fine grained, gray, medium dense		60		☒	6-11-10 N=21							
	fine grained, dark gray, loose		65		☒	1-2-2 N=4							
	66.8	-67											
	SILTY SAND (SM), fine grained, dark gray, medium dense		70		☒	6-13-9 N=22							
	71.8	-72											
	SANDY LEAN CLAY (CL), gray, very hard, Marl		75		☒	12-20 N= 50/4"							
	gray, hard, with shell fragments				☒	16-11-26 N=37							
	80.0	-80	80										
	Boring Terminated at 80 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud Rotary

Abandonment Method:

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *measured during drilling*

Terracon
2201 Rowland Avenue
Savannah, Georgia

Boring Started: 3/11/2015	Boring Completed: 3/11/2015
Drill Rig: CME-45	Driller: D. Francis and Noel
Project No.: ES155020	Exhibit: A-7-4

APPENDIX B
SUPPORTING INFORMATION

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

- Auger
- Split Spoon
- Shelby Tube
- Macro Core
- No Recovery
- Rock Core
- Ring Sampler

GROUNDWATER

▽	**Groundwater Initially Encountered**
▽	**Groundwater Level After a Specified Period of Time**
▽	**Static Groundwater Level After a Specified Period of Time**
☒	**No Groundwater Observed**

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	**Hand Penetrometer**
(T)	**Torvane**
(b/f)	**Standard Penetration Test (blows per foot)**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Std. Penetration Resistance (blows per foot)**	**Descriptive Term (Consistency)**	**Undrained Shear Strength (kips per square foot)**	**Std. Penetration Resistance (blows per foot)**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium-Stiff	0.50 to 1.00	5 - 7
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 14
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	above 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Descriptive Term(s) of other constituents	Percent of Dry Weight
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon

Exhibit B-1

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests^{A}					Soil Classification	
					Group Symbol	Group Name^{B}
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines^{C}	Cu ≥ 4 and 1 ≤ Cc ≤ 3^{E}		GW	Well-graded gravel^{F}
			Cu < 4 and/or 1 > Cc > 3^{E}		GP	Poorly graded gravel^{F}
		Gravels with Fines More than 12% fines^{C}	Fines classify as ML or MH		GM	Silty gravel$^{F,G, H}$
			Fines classify as CL or CH		GC	Clayey gravel^{F,G,H}
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines^{D}	Cu ≥ 6 and 1 ≤ Cc ≤ 3^{E}		SW	Well-graded sand^{I}
			Cu < 6 and/or 1 > Cc > 3^{E}		SP	Poorly graded sand^{I}
		Sands with Fines More than 12% fines^{D}	Fines classify as ML or MH		SM	Silty sand^{G,H,I}
			Fines Classify as CL or CH		SC	Clayey sand^{G,H,I}
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line^{J}		CL	Lean clay^{K,L,M}
			PI < 4 or plots below "A" line^{J}		ML	Silt^{K,L,M}
		organic	Liquid limit - oven dried	< 0.75	OL	Organic clay^{K,L,M,N}
			Liquid limit - not dried			Organic silt^{K,L,M,O}
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line		CH	Fat clay^{K,L,M}
			PI plots below "A" line		MH	Elastic Silt^{K,L,M}
		organic	Liquid limit - oven dried	< 0.75	OH	Organic clay^{K,L,M,P}
			Liquid limit - not dried			Organic silt^{K,L,M,Q}
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10} \qquad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

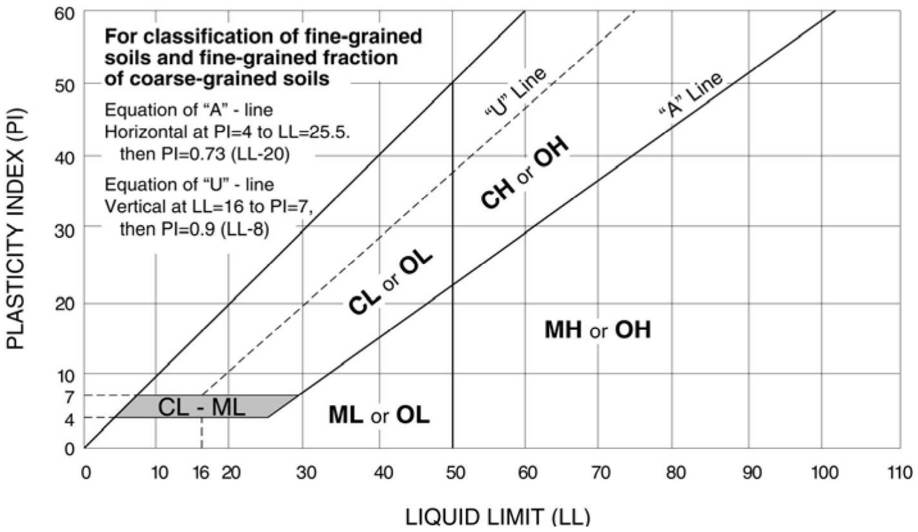
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Terracon

Exhibit B-2

Form 111—6/98

CPT GENERAL NOTES

DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

To be reported per ASTM D5778:

Uncorrected Tip Resistance, q_c
Measured force acting on the cone
divided by the cone's projected area

Corrected Tip Resistance, q_t
Cone resistance corrected for porewater
and net area ratio effects
$q_t = q_c + U2(1 - a)$

Where a is the net area ratio,
a lab calibration of the cone typically
between 0.70 and 0.85

Pore Pressure, U1/U2
Pore pressure generated during penetration
U1 - sensor on the face of the cone
U2 - sensor on the shoulder (more common)

Sleeve Friction, fs
Frictional force acting on the sleeve
divided by its surface area

Normalized Friction Ratio, FR
The ratio as a percentage of fs to q_t,
accounting for overburden pressure

To be reported per ASTM D7400, if collected:

Shear Wave Velocity, Vs
Measured in a Seismic CPT and provides
direct measure of soil stiffness

DESCRIPTION OF GEOTECHNICAL CORRELATIONS

Normalized Tip Resistance, Q_t
$Q_t = (q_t - \sigma_{V0})/\sigma'_{V0}$

Over Consolidation Ratio, OCR
$OCR\ (1) = 0.25(Q_t)^{1.25}$
$OCR\ (2) = 0.33(Q_t)$

Undrained Shear Strength, Su
$Su = Q_t \times \sigma'_{V0}/N_{kt}$
N_{kt} is a geographical factor (shown on Su plot)

Sensitivy, St
$St = (q_t - \sigma_{V0}/N_{kt}) \times (1/fs)$

Effective Friction Angle, ϕ'
$\phi'\ (1) = \tan^{-1}(0.373[\log(q_t/\sigma'_{V0}) + 0.29])$
$\phi'\ (2) = 17.6 + 11[\log(Q_t)]$

Unit Weight
$UW = (0.27[\log(FR)]+0.36[\log(q_t/atm)]+1.236) \times UW_{water}$
σ_{V0} is taken as the incremental sum of the unit weights

SPT N_{60}
$N_{60} = (q_t/atm) / 10^{(1.1268 - 0.2817Ic)}$

Soil Behavior Type Index, Ic
$Ic = [(3.47 - \log(Q_t)^2 + (\log(FR) + 1.22)^2]^{0.5}$

Small Strain Modulus, G_0
$G_0 = \rho Vs^2$

Elastic Modulus, Es (assumes $q/q_{ultimate} \sim 0.3$, i.e. FS = 3)
$Es\ (1) = 2.6\psi G_0$
where $\psi = 0.56 - 0.33\log Q_{t,clean\ sand}$
$Es\ (2) = G_0$
$Es\ (3) = 0.015 \times 10^{(0.55Ic + 1.68)}(q_t - \sigma_{V0})$
$Es\ (4) = 2.5q_t$

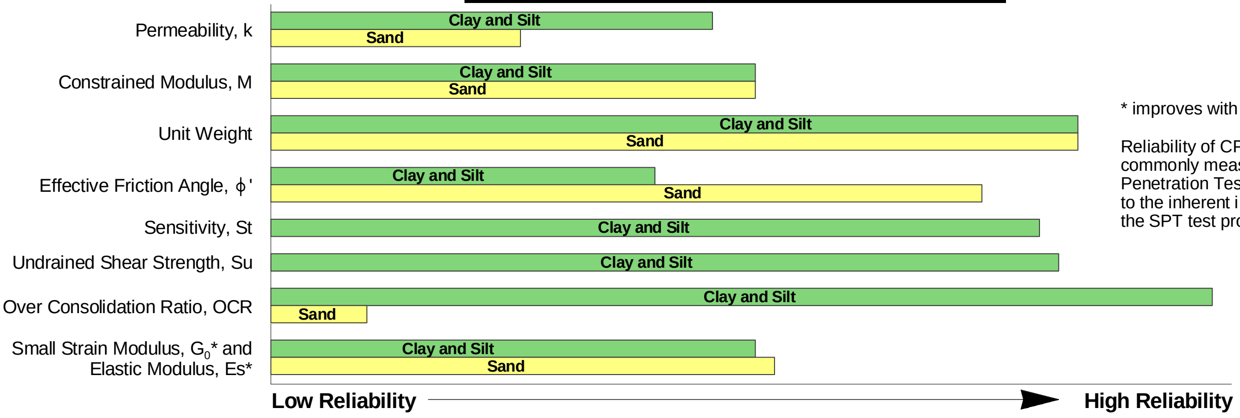
Constrained Modulus, M
$M = \alpha_M(q_t - \sigma_{V0})$
For Ic > 2.2 (fine-grained soils)
$\alpha_M = Q_t$ with maximum of 14
For Ic < 2.2 (coarse-grained soils)
$\alpha_M = 0.0188 \times 10^{(0.55Ic + 1.68)}$

Hydraulic Conductivity, k
For $1.0 < Ic < 3.27$ $k = 10^{(0.952 - 3.04Ic)}$
For $3.27 < Ic < 4.0$ $k = 10^{(-4.52 - 1.37Ic)}$

REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include tip resistance, sleeve resistance, and porewater pressure. Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

RELATIVE RELIABILITY OF CPT CORRELATIONS



* improves with seismic Vs measurements

Reliability of CPT-predicted N_{60} values as commonly measured by the Standard Penetration Test (SPT) is not provided due to the inherent inaccuracy associated with the SPT test procedure.

WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated:"

Measured - Depth to water directly measured in the field

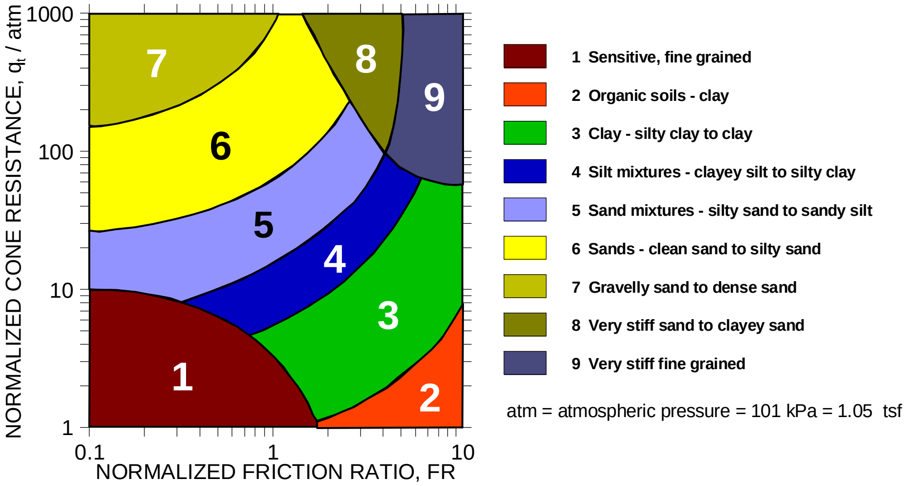
Estimated - Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated," in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

CONE PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance (q_t), friction resistance (fs), and porewater pressure (U2). The normalized friction ratio (FR) is used to classify the soil behavior type.

Typically, silts and clays have high FR values and generate large excess penetration porewater pressures; sands have lower FRs and do not generate excess penetration porewater pressures. Negative pore pressure measurements are indicative of fissured fine-grained material. The adjacent graph (Robertson et al.) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.



REFERENCES

Kulhawy, F.H., Mayne, P.W., (1997). "Manual on Estimating Soil Properties for Foundation Design," Electric Power Research Institute, Palo Alto, CA.
Mayne, P.W., (2013). "Geotechnical Site Exploration in the Year 2013," Georgia Institue of Technology, Atlanta, GA.
Robertson, P.K., Cabal, K.L. (2012). "Guide to Cone Penetration Testing for Geotechnical Engineering," Signal Hill, CA.
Schmertmann, J.H., (1970). "Static Cone to Compute Static Settlement over Sand," *Journal of the Soil Mechanics and Foundations Division*, 96(SM3), 1011-1043.

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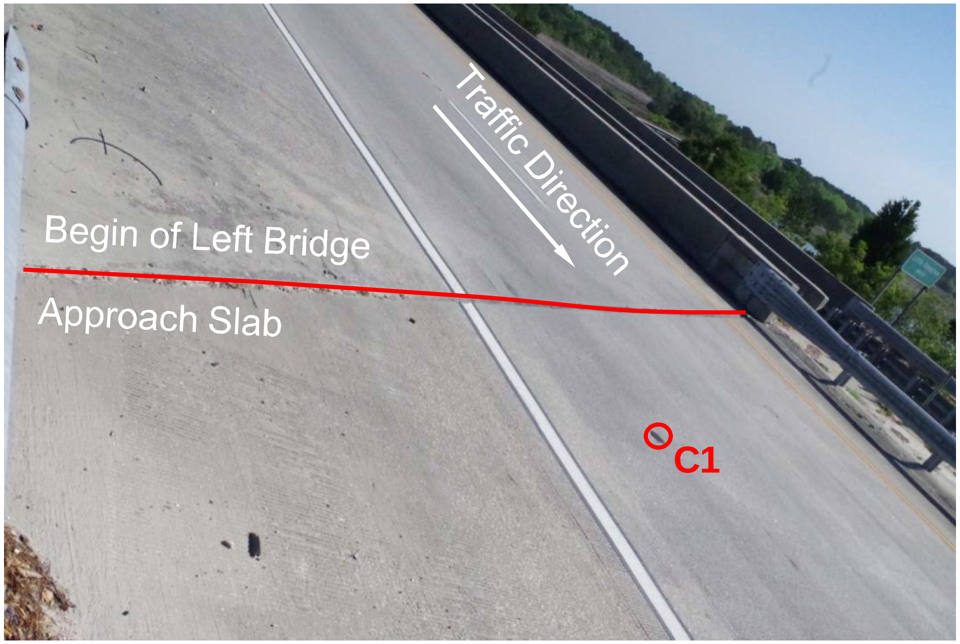
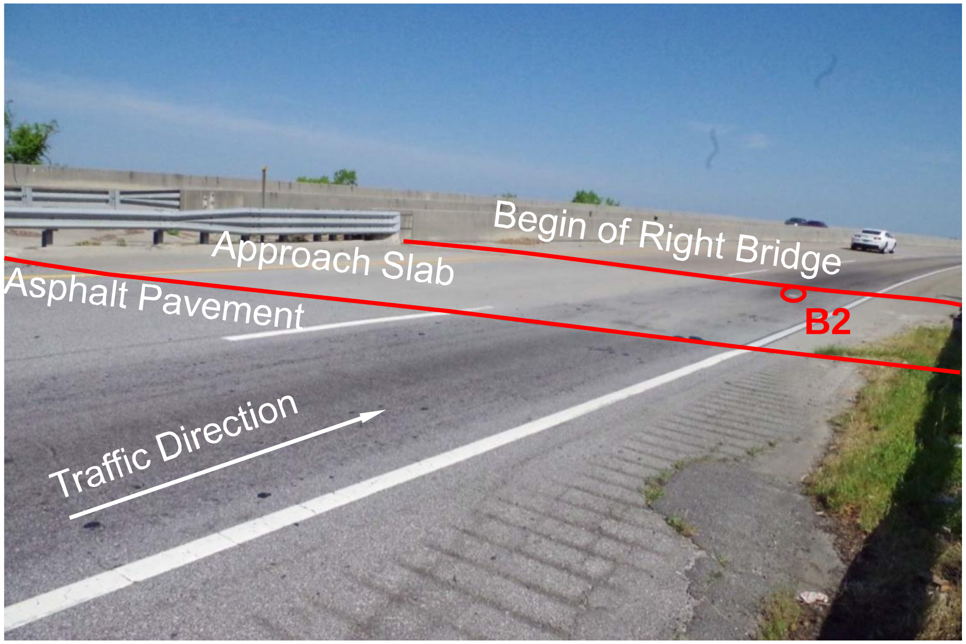
Exhibit B-3

APPENDIX C
SUPPORTING INFORMATION

Exhibit C-1	Differential Settlement Survey
Exhibit C-2	Photo of Pavement Cores
Exhibit C-3	Information of Bridge Design
Exhibit C-4	Information of Approach Slab Design
Exhibit C-5	Information of Embankment Fill





Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES155020
Scale:	N.T.S.
File Name:	
Date:	4-13-2015

Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

BORING LOCATIONS

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

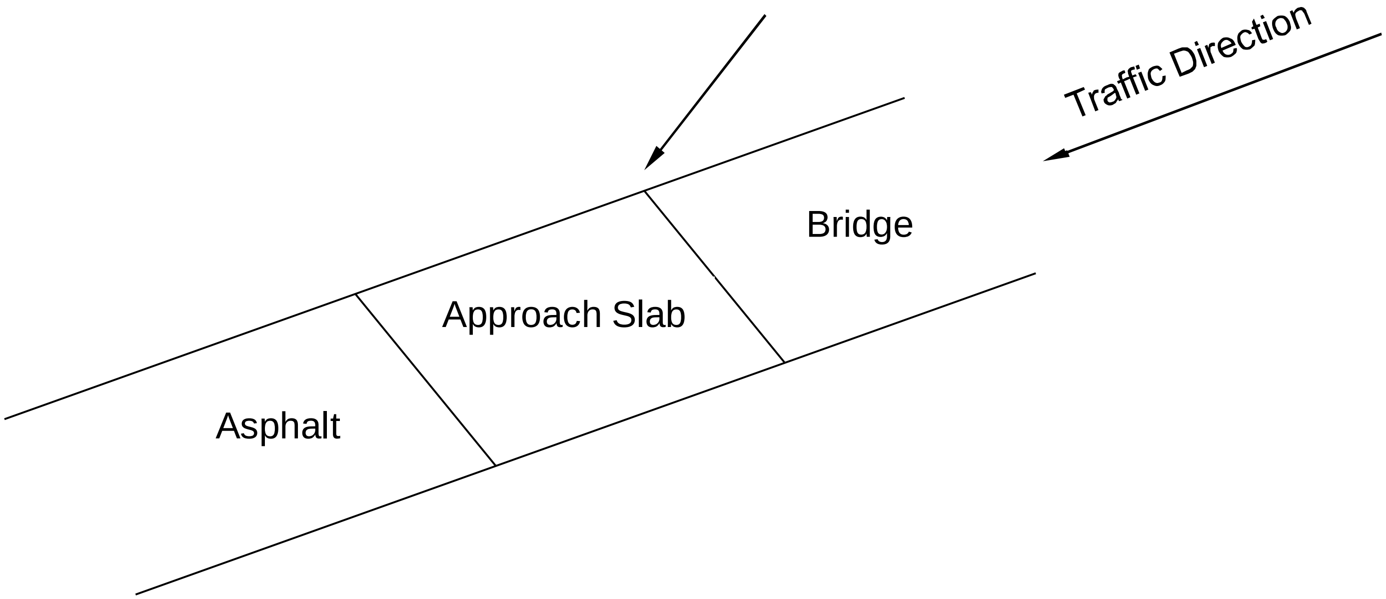
Exhibit:
C-1-1

C1

0 to 10.5”	Concrete
10.5” to 12.5	Gap
12.5” to 15”	Piece of Concrete

Underlain by soils

The joint is about 3 inches wide, and the surface of bridge deck is slightly higher than that of slab (less than 0.25 inch).



Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL
Project No.	ES155020
Scale:	N.T.S.
File Name:	
Date:	4-13-2015

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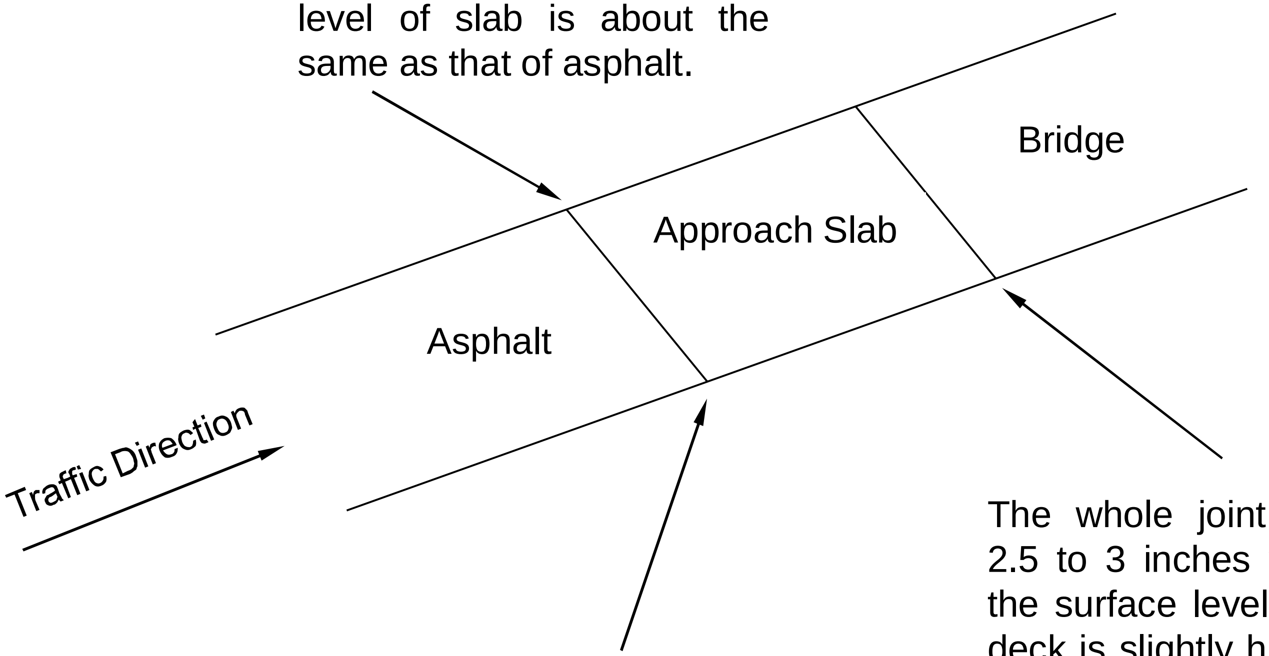
Phone (912) 629 4000 Fax (912) 629 4001

Differential Settlement at C1

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

Exhibit:
C-1-2

B2
0to11C”oncrete
11t”o14Gap
14t”o19As”phalt
Underlainbysoils



Left side of joint is about 0.5 inch wide, and the surface level of slab is about the same as that of asphalt.

The whole joint is about 2.5 to 3 inches wide, and the surface level of bridge deck is slightly higher than that of slab (less than 0.25 inch).

Right side of joint is about 1 inch wide, and the surface level of slab is higher than that of asphalt about 0.25 inch.

Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES155020
Scale:	N.T.S.
File Name:	
Date:	4-13-2015

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Consulting Engineers & Scientists
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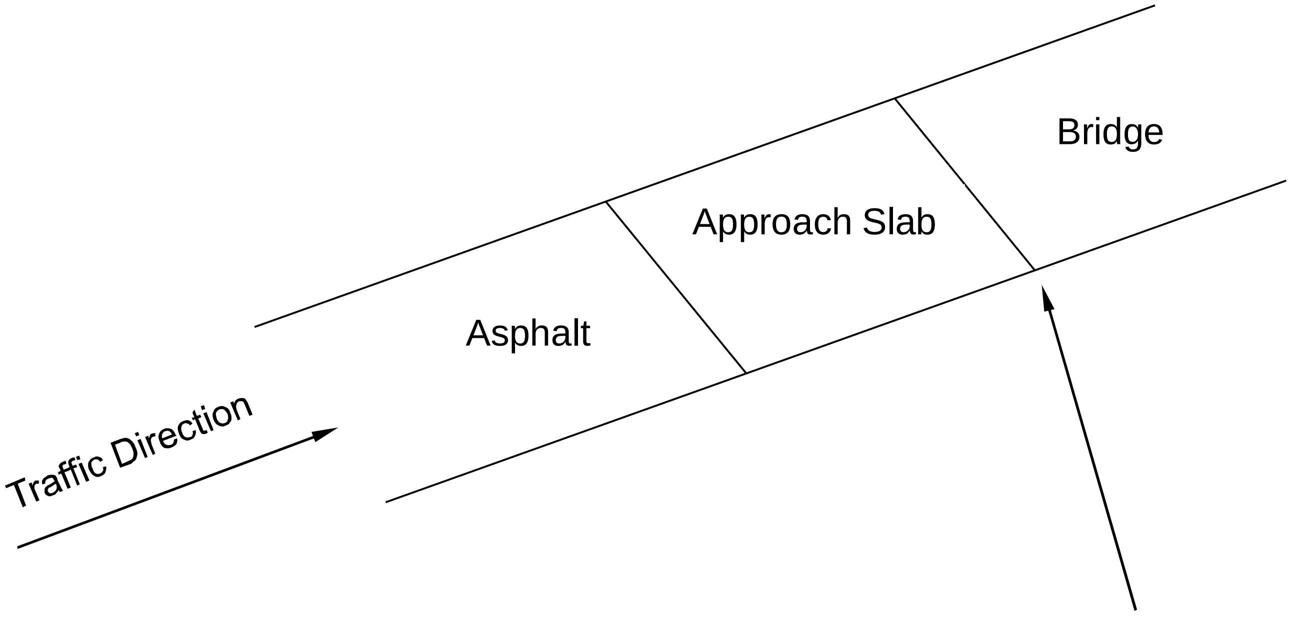
Phone (912) 629 4000 Fax (912) 629 4001

Differential Settlement at B2

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

Exhibit:
C-1-3

B1
0 to 11” Asphalt and binder
Underlain by soils



The joint is about 3 inches wide, and the surface level of bridge deck is about 0.5 inch higher than that of slab.

Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES155020
Scale:	N.T.S.
File Name:	
Date:	4-13-2015

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Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

Differential Settlement at B1

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

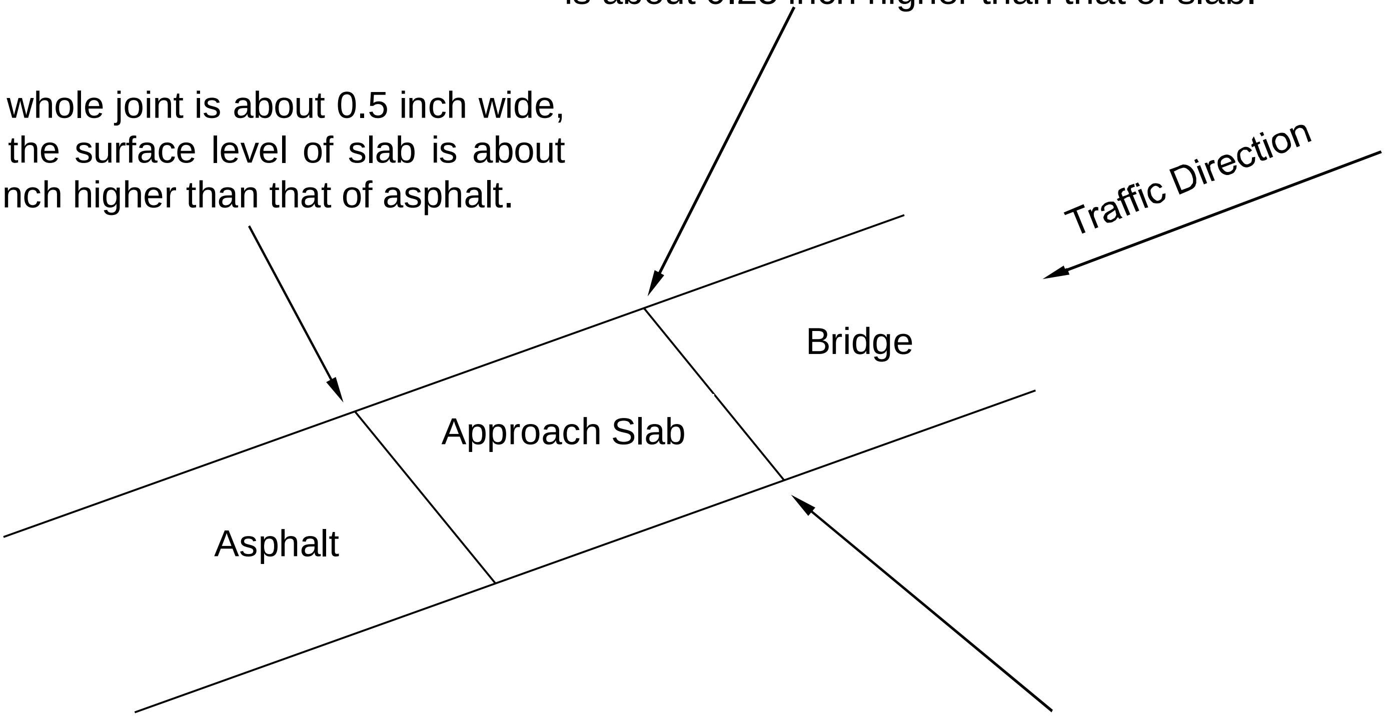
Exhibit:
C-1-4

C2

0 to 11”	Concrete
11” to 13.5	Gap
13.5” to 17.5”	Asphalt
Underlain by soils	

Right side of joint is about 2.5 inches wide, and the surface level of bridge deck is about 0.25 inch higher than that of slab.

The whole joint is about 0.5 inch wide, and the surface level of slab is about 0.5 inch higher than that of asphalt.



Left side of joint is about 2.5 inches wide, and the surface level of bridge deck is about 0.5 inch higher than that of slab.

Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES155020
Scale:	N.T.S.
File Name:	
Date:	4-13-2015

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Phone (912) 629 4000 Fax (912) 629 4001

Differential Settlement at C2

Veterans Parkway Bridges Approaches Investigation
Veterans Parkway
Chatham County, Georgia

Exhibit:
C-1-5

Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES155020
Scale:	N.T.S.
File Name:	
Date:	4-24-2015

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Phone (912) 629 4000 Fax (912) 629 4001

Sign of Erosion Under North End of Left Bridge

Veterans Parkway Bridges Approaches Investigation

Chatham County, Georgia

Exhibit:

C-1-6

Project Manager: YH
Drawn by: YH
Checked by: GL
Approved by: GL

Project No. ES155020
Scale: N.T.S.
File Name:
Date: 4-24-2015

Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

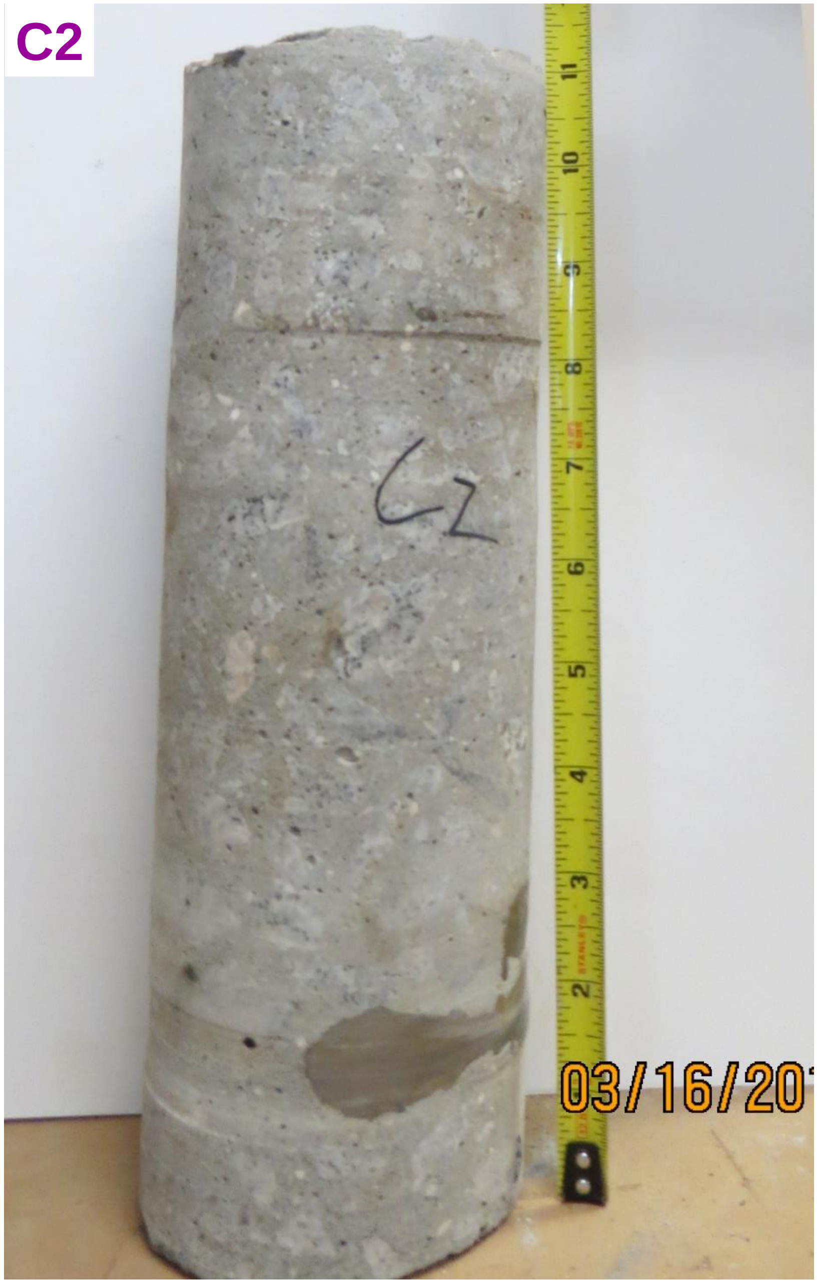
Sign of Erosion Under North End of Right Bridge

Veterans Parkway Bridges Approaches Investigation

Chatham County, Georgia

Exhibit:
C-1-7

C2



Project Manager: YH
Drawn by: YH
Checked by: GL
Approved by: GL

Project No. ES155020
Scale: N.T.S.
File Name:
Date: 4-24-2015

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Consulting Engineers & Scientists
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Phone (912) 629 4000 Fax (912) 629 4001

Pavement Core Sample at C2

Veterans Parkway Bridges Approaches Investigation

Chatham County, Georgia

Exhibit:
C-2-1

Project Manager: YH	**Project No.** ES155020
Drawn by: YH	**Scale:** N.T.S.
Checked by: GL	**File Name:**
Approved by: GL	**Date:** 4-24-2015

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Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

Pavement Core Sample at B2

Veterans Parkway Bridges Approaches Investigation

Chatham County, Georgia

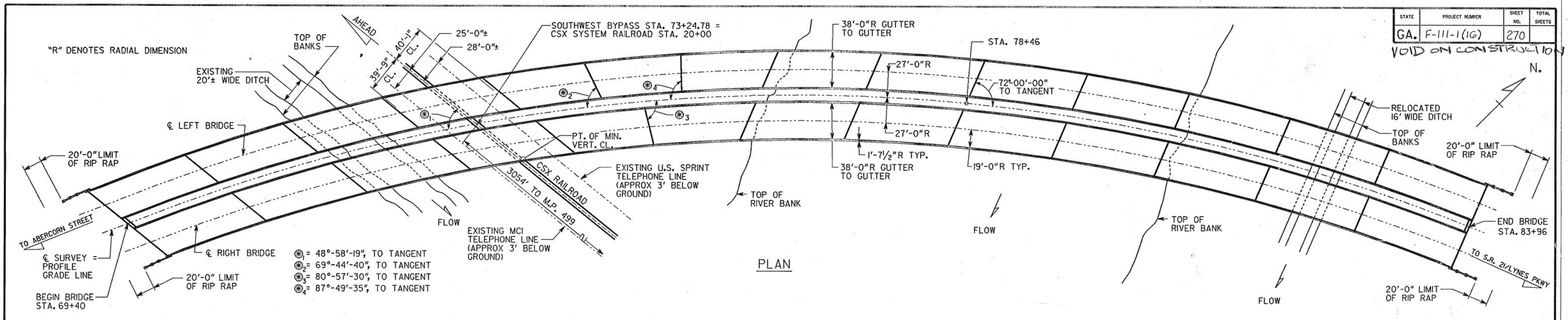
Exhibit:

C-2-2

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	270	

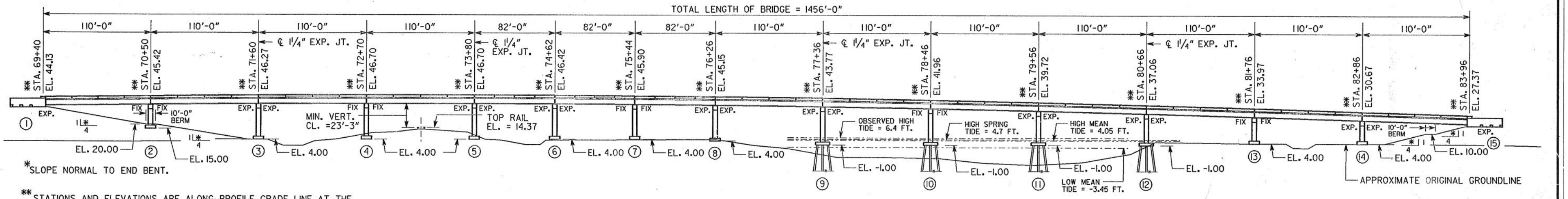
VOID ON CONSTRUCTION

"R" DENOTES RADIAL DIMENSION



(✱)₁= 48°-58'-19", TO TANGENT
(✱)₂= 69°-44'-40", TO TANGENT
(✱)₃= 80°-57'-30", TO TANGENT
(✱)₄= 87°-49'-35", TO TANGENT

PLAN

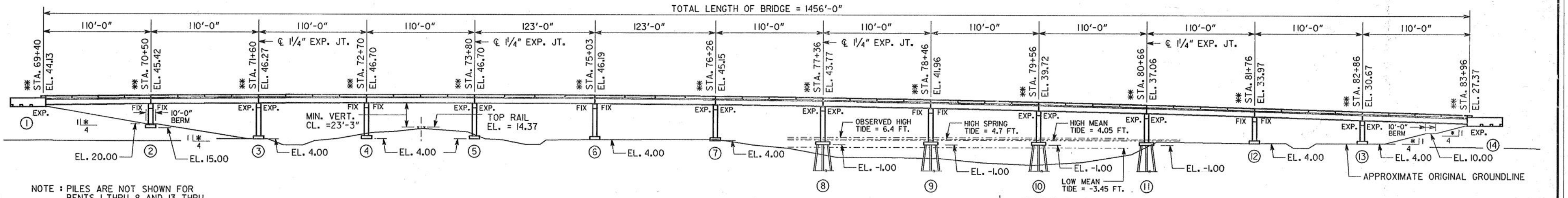


*SLOPE NORMAL TO END BENT.

**STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR ℄ BENTS.

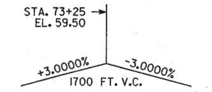
LEFT BRIDGE ELEVATION

NOTE : 50 YEAR STORM EL. = 13.2 FT.
100 YEAR STORM EL. = 15.7 FT.



NOTE : PILES ARE NOT SHOWN FOR BENTS 1 THRU 8 AND 13 THRU 15 ON LEFT BRIDGE AND BENTS 1 THRU 7 AND 12 THRU 14 ON RIGHT BRIDGE.

RIGHT BRIDGE ELEVATION



VERTICAL CURVE DATA

SOUTHWEST BYPASS

P.I. STA. = 79+75.79
Δ = 68°-48'-28.1" RT.
D = 3°-00'-00"
T = 1307.89 FT.
L = 2293.59 FT.
R = 1909.85 FT.
S.E. = 0.06 FT./FT.

HORIZONTAL CURVE DATA

SOUTHWEST BYPASS

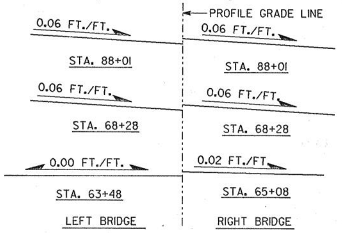
NOTE : BENTS 1 THRU 5 ARE PARALLEL TO CSX SYSTEM RAILROAD.

LEFT BRIDGE

NOTE : BENTS 6 AND 7 ARE FLARED BETWEEN BENTS 5 AND 8
BENTS 8, 9, 11, 12, 13, 14, AND 15 ARE PARALLEL TO BENT 10

RIGHT BRIDGE

NOTE : BENT 6 IS FLARED BETWEEN BENTS 5 AND 7
BENTS 7, 8, 10, 11, 12, 13, AND 14 ARE PARALLEL TO BENT 9



SUPERELEVATION TRANSITION DATA

SOUTHWEST BYPASS
LOOKING AHEAD

VOID ON CONSTRUCTION

PROJECT P.I. NO. 521490

BRIDGE NO. 1 LEFT AND RIGHT

BRIDGE SHEET
1 OF 33

DATE	REVISIONS	BY

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

PLAN AND ELEVATION
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

SCALE : 1" = 50'-0" JUNE 1989

DESIGNED	A.R.C.	CHECKED	E.H.G. - H.W.C.	REVIEWED	B.D.M. - R.J.S.
DRAWN	J.W.C.	DESIGN GROUP	H.W.C.	APPROVED	P.V.L.

Exhibit C-3-1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	271	

VOID ON CONSTRUCTION

LEFT BRIDGE CONSISTS OF

11 - 110'-0" TYPE V PSC BEAM SPANS ---------------------------- SPECIAL DESIGN
3 - 82'-0" TYPE V PSC BEAM SPANS ----------------------------- SPECIAL DESIGN
2 - PSC PILE END BENTS ------------------------------------- SPECIAL DESIGN
9 - CONCRETE INTERMEDIATE BENTS ------------------------------ SPECIAL DESIGN
4 - CONCRETE PEDESTAL INTERMEDIATE BENTS ON PSC PILES --------- SPECIAL DESIGN
4 - END POST AND GUARD RAIL ATTACHMENT DETAIL ----------- GA. STD. 3054 (5-89)
(L = 5'-6"; W = 1'-1"; H = 2'-8")
(L = 4'-0"; W = 1'-1"; H = 2'-8")
△ 16" AND 20" SQ. PSC PILES ----------------------- GA. STD. 3215 (2-22-84)
BAR BENDING DETAILS -------------------------------- GA. STD. 3901 (8-69)
TYPICAL FILL DETAIL AT END OF BRIDGE - SEE ROADWAY PLANS -- SPECIAL DESIGN
TYPICAL FILL DETAIL AT END OF BRIDGE -------------- GA. STD. 9037 (4-2-86)

RIGHT BRIDGE CONSISTS OF

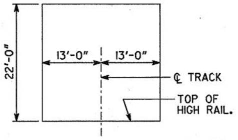
2 - 123'-0" TYPE V PSC BEAM SPANS ---------------------------- SPECIAL DESIGN
11 - 110'-0" TYPE V PSC BEAM SPANS ---------------------------- SPECIAL DESIGN
2 - PSC PILE END BENTS ------------------------------------- SPECIAL DESIGN
8 - CONCRETE INTERMEDIATE BENTS ------------------------------ SPECIAL DESIGN
4 - CONCRETE PEDESTAL INTERMEDIATE BENTS ON PSC PILES --------- SPECIAL DESIGN
4 - END POST AND GUARD RAIL ATTACHMENT DETAIL ----------- GA. STD. 3054 (5-89)
(L = 5'-6"; W = 1'-1"; H = 2'-8")
(L = 4'-0"; W = 1'-1"; H = 2'-8")
△ 16" AND 20" SQ. PSC PILES ----------------------- GA. STD. 3215 (2-22-84)
BAR BENDING DETAILS -------------------------------- GA. STD. 3901 (8-69)
TYPICAL FILL DETAIL AT END OF BRIDGE - SEE ROADWAY PLANS -- SPECIAL DESIGN
TYPICAL FILL DETAIL AT END OF BRIDGE -------------- GA. STD. 9037 (4-2-86)

TRAFFIC DATA

TRAFFIC ----------- ADT = 16,800 (1990)
----------- ADT = 28,600 (2010)
DESIGN SPEED ------------------- 60 MPH
TRUCKS --------------------------- 5 %

UTILITIES

NONE



CONSTRUCTION CLEARANCE DIAGRAM

GENERAL NOTES

SPECIFICATIONS - GEORGIA STANDARD SPECIFICATIONS DATED 1983 AND THE 1989 SUPPLEMENTAL SPECIFICATIONS, AS MODIFIED BY CONTRACT DOCUMENTS.

REINFORCING STEEL - ALL REINFORCING STEEL SHALL BE PLACED AND TIED IN ACCORDANCE WITH THE GEORGIA STANDARD SPECIFICATIONS. WELDING OF REINFORCING STEEL WILL NOT BE PERMITTED.

CHAMFER - ALL EXPOSED CONCRETE EDGES SHALL BE CHAMFERED 3/4 INCH UNLESS OTHERWISE NOTED.

RAILROAD SIDE DITCHES - PRIOR TO THE BEGINNING OF CONSTRUCTION, THE CONTRACTOR SHALL CLEAN THE RAILROAD SIDE DITCHES IN THE CONSTRUCTION AREA IN SUCH A MANNER AS TO PROVIDE POSITIVE DRAINAGE. THE CONTRACTOR SHALL MAINTAIN THE RAILROAD SIDE DITCHES FREE OF SILT AND DEBRIS UNTIL THE FINAL ACCEPTANCE. SEE ROADWAY PLANS FOR EROSION CONTROL AND PAYMENT.

PROTECTIVE PLATFORMS - PROTECTIVE PLATFORMS SHALL BE REQUIRED AT THIS SITE, SEE GEORGIA STANDARD SPECIFICATIONS SECTION 510. CONTRACTOR SHALL MAINTAIN A MINIMUM VERTICAL CLEARANCE OF 22'-0" ABOVE TOP OF RAIL DURING CONSTRUCTION.

WAITING PERIOD - NO WORK SHALL BEGIN AT BENTS 1, 2 AND 15 FOR THE LEFT BRIDGE AND AT BENTS 1, 2 AND 14 FOR THE RIGHT BRIDGE UNTIL THE COMPLETED END FILLS AND THE 5 FOOT SURCHARGE HAVE BEEN IN PLACE FOR AT LEAST 30 DAYS.

PLAN DRIVING OBJECTIVE - SEE SUBSTRUCTURE DETAILS.

TEST PILES - DRIVE TEST PILES AT THE FOLLOWING LOCATIONS:

△ ONE 16" SQ PSC X 50 FT AT BENT 7 - LEFT BRIDGE.
ONE 16" SQ PSC X 50 FT AT BENT 13 - RIGHT BRIDGE.
ONE 20" SQ PSC X 60 FT AT BENT 10 - RIGHT BRIDGE.

DRIVING DATA PILES - ONE DRIVING DATA PILE SHALL BE REQUIRED AT BENTS 10 AND 13 FOR THE LEFT BRIDGE AND AT BENTS 1 AND 7 FOR THE RIGHT BRIDGE.

GROOVING CONCRETE - THE ENTIRE LENGTH OF THE BRIDGE SHALL BE GROOVED TRANSVERSELY AS PER GEORGIA STANDARD SPECIFICATIONS SECTION 500.11.C.6.C.(2).

MODIFY GEORGIA STANDARD - THE 3/4 INCH EXPANSION JOINT BETWEEN THE APPROACH SLAB AND THE BRIDGE ON GEORGIA STANDARD 9017L SHALL BE CHANGED TO 1 INCH.

FOOTINGS - SOFT SURFACE SOILS MAY NECESSITATE SPECIAL FORMING OF THE FOOTINGS IN ORDER TO PREVENT THE INTRUSION OF CONCRETE INTO THE SOFT SOILS. COST OF SPECIAL FORMING SHALL BE INCLUDED IN PRICE BID FOR CU YD CL A CONC.

FOOTING ELEVATIONS - THE FOOTING ELEVATIONS, AS SHOWN ON THE PLANS FOR BENTS 3, 6, 7, 8, 13 AND 14 FOR THE LEFT BRIDGE AND BENTS 3, 6, 7, 12 AND 13 FOR THE RIGHT BRIDGE ARE APPROXIMATE ELEVATIONS. THE BOTTOM OF FOOTING FOR THESE BENTS SHALL BE LOCATED AT THE ORIGINAL GROUNDLINE. FOOTINGS FOR ANY BENT SHALL NOT BE RAISED ABOVE THE ELEVATIONS SHOWN ON THE PLANS. FOOTINGS FOR ANY BENT SHALL NOT BE LOWERED MORE THAN THREE FEET WITHOUT THE APPROVAL OF THE STATE BRIDGE ENGINEER. QUANTITIES ARE BASED ON FOOTING ELEVATIONS, AS SHOWN ON THE PLANS AND SHALL BE ADJUSTED AS NEEDED AT TIME OF CONSTRUCTION BY THE ENGINEER.

△3 WORKING MATS - NO SEPARATE MEASUREMENT OR PAYMENT WILL BE MADE FOR PLACEMENT OR REMOVAL OF WORK MATS. COST IS TO BE INCLUDED IN THE OVERALL BID SUBMITTED. SEE ROADWAY PLANS FOR LOCATIONS AND DETAILS OF EARTH MATS.

INCIDENTAL ITEMS - COST INCIDENTAL TO THE WORK THAT IS NOT SPECIFICALLY COVERED BY THE GEORGIA STANDARD SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS, AND/OR SPECIAL PROVISIONS SHALL BE INCLUDED IN THE OVERALL BID SUBMITTED. THIS INCLUDES THE COST OF NEOPRENE BEARING PADS, DECK DRAINS, 3-PLY WATERPROOFING, AND OTHER INCIDENTAL ITEMS NECESSARY TO COMPLETE THE WORK.

△2 END BENT PILES - A 26" DIAMETER PILOT HOLE SHALL BE DRILLED TO A MINIMUM ELEVATION OF 3.5 AT END BENTS 1 AND 15 FOR THE LEFT BRIDGE AND END BENTS 1 AND 14 FOR THE RIGHT BRIDGE AND SLURRY FILLED. SEE SPECIAL PROVISION. ALL COST TO BE INCLUDED IN PRICE BID FOR LIN FT PILOT HOLES.

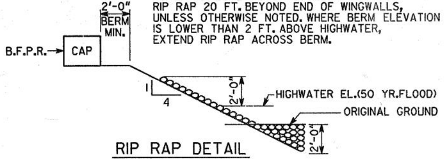
DESIGN DATA

SPECIFICATIONS ------------ AASHTO 1983 WITH 1984 THRU 1988 INTERIMS
TYPICAL HS20-44 AND/OR MILITARY LOADING ------------- IMPACT ALLOWED
FUTURE PAVING ALLOWANCE ------------------------ 30 LBS. PER SQ. FT.
CONCRETE: SUPERSTRUCTURE --------- CLASS A --------- F'C = 3,000 PSI
PSC BEAMS ------------------------------------ F'C = 6,000 PSI
SUBSTRUCTURE ----------- CLASS A --------- F'C = 3,000 PSI
REINFORCEMENT STEEL: SUPERSTRUCTURE ---- GRADE 40 FY = 40,000 PSI
SUBSTRUCTURE ---- GRADE 40 FY = 40,000 PSI
PRETENSIONING STRANDS: -------------------------- F'S = 270,000 PSI

SUMMARY OF QUANTITIES

	PAY ITEM NUMBER	QUANTITY		PAY ITEM
		LEFT BRIDGE	RIGHT BRIDGE	
	211-0300	188	188	CU YD BRIDGE EXCAVATION, STREAM CROSSING
	500-0100	5970	5678	SQ YD GROOVING CONCRETE
	500-1005	LUMP	----	SUPERSTR CONCRETE, CL A, BR NO 1 LT - (2236)
	500-1005	----	LUMP	SUPERSTR CONCRETE, CL A, BR NO 1 RT - (2120)
	500-3102	1433	1307	CU YD CL A CONC
	507-9005	7373	7012	LIN FT PSC BEAMS, AASHTO TYPE V
△	511-1000	312314	281956	LB BAR REINF STEEL
	511-3000	LUMP	----	SUPERSTR REINF STEEL, BR NO 1 LT - (516473)
	511-3000	----	LUMP	SUPERSTR REINF STEEL, BR NO 1 RT - (487607)
△				
	520-2216	6325	5640	LIN FT PILING, PSC, 16 IN SQ
△3 △	520-2220	6690	6460	LIN FT PILING, PSC, 20 IN SQ
△				
	520-3216	1	1	EACH TEST PILE, PSC, 16 IN SQ
	520-3220	----	1	EACH TEST PILE, PSC, 20 IN SQ
△				
	520-4216	1	1	EACH LOAD TEST, PSC, 16 IN SQ (IF REQD)
	520-4220	1	1	EACH LOAD TEST, PSC, 20 IN SQ (IF REQD)
	603-2024	3015	3500	SQ YD STN DUMPED RIP RAP, TP 1, 24 IN
△2	520-5000	460	350	LIN FT PILOT HOLES

RIP RAP FROM 2 FT. BELOW ORIGINAL GROUND TO 2 FT. ABOVE HIGHWATER ELEVATION. EXTEND RIP RAP 20 FT. BEYOND END OF WINGWALLS, UNLESS OTHERWISE NOTED. WHERE BERM ELEVATION IS LOWER THAN 2 FT. ABOVE HIGHWATER, EXTEND RIP RAP ACROSS BERM.



RIP RAP DETAIL

VOID ON CONSTRUCTION

BRIDGE NO. 1 LEFT AND RIGHT

	DATE	REVISIONS	BY
△1	4-12-90	REMOVE 14" PILE PAY ITEM	E.H.G.
△2	4-12-90	ADD PILOT HOLES	E.H.G.
△3	5-4-90	REVISED NOTE	JRC
△3	5-4-90	REVISED 20" PILE QUANTITY	E.H.G.

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

GENERAL NOTES
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

NO SCALE JUNE 1989

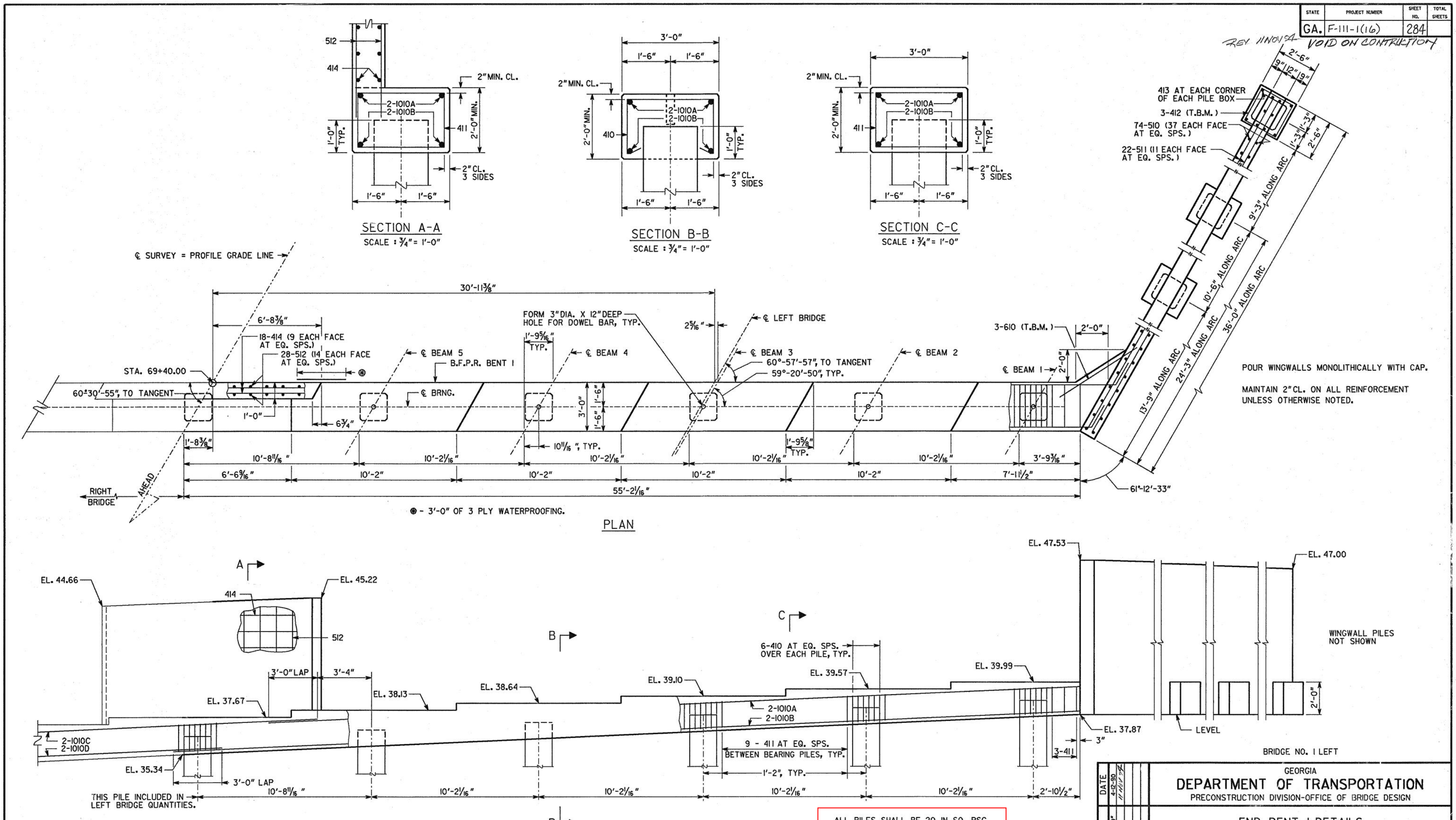
BRIDGE SHEET
2 OF 33

DESIGNED A.R.C.
DRAWN J.W.C.
CHECKED E.H.G. - H.W.C.
DESIGN GROUP H.W.C.
REVIEWED B.D.M. - R.J.S.
APPROVED P.V.L.

Exhibit C-3-2

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	284	

REV 11NOV94 — VOID ON CONTRUCTION



POUR WINGWALLS MONOLITHICALLY WITH CAP.

MAINTAIN 2" CL. ON ALL REINFORCEMENT UNLESS OTHERWISE NOTED.

BRIDGE NO. 1 LEFT

ALL PILES SHALL BE 20 IN SQ. PSC

PLAN DRIVING OBJECTIVE

DRIVE ALL PILES TO A DRIVING RESISTANCE OF 110 TONS AFTER A MINIMUM TIP ELEVATION OF -35 HAS BEEN ACHIEVED.

SUBSTRUCTURE QUANTITIES

ITEM	BENT 1 LT.
CU. YDS. CLASS "A" CONCRETE	28.59
LBS. BAR REINF. STEEL	3322

NOTE : 414 BAR QUANTITIES IN BENT 1 LT.

BRIDGE SHEET
15 OF 33

DATE	REVISIONS	BY
4-12-90	REPLACE 14" PLIES WITH 20"	E.H.G.
11 NOV 94	VOID ON CONST	

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

END BENT 1 DETAILS
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

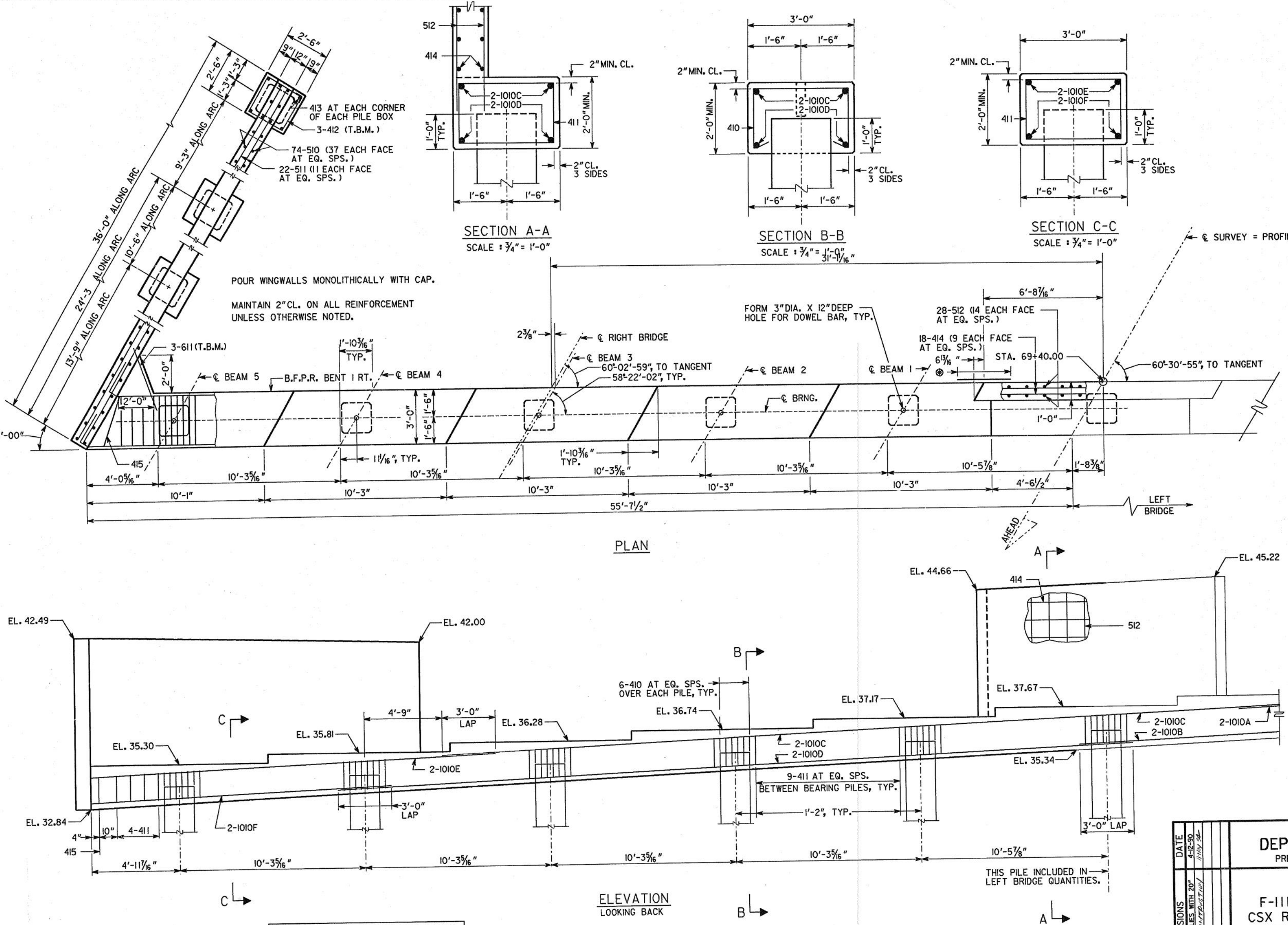
NO SCALE MARCH 1989

DESIGNED A.R.C.
DRAWN J.W.C.
CHECKED E.H.G. - H.W.C.
DESIGN GROUP H.W.C.
REVIEWED B.D.M.- R.J.S.
APPROVED P.V.L.

Exhibit C-3-3

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	285	

REY 11NOV94- VOID ON CONTRUCTION



⊛ - 3'-0" OF 3 PLY WATERPROOFING.

ALL PILES SHALL BE 20 IN SQ. PSC

PLAN DRIVING OBJECTIVE

DRIVE ALL PILES TO A DRIVING RESISTANCE OF 110 TONS AFTER A MINIMUM TIP ELEVATION OF -35 HAS BEEN ACHIEVED.

SUBSTRUCTURE QUANTITIES

ITEM	BENT 1 RT.
CU. YDS. CLASS "A" CONCRETE	28.92
LBS. BAR REINF. STEEL	3320

NOTE : 414 BAR QUANTITIES IN BENT 1 LT.

BRIDGE NO. 1 RIGHT

DATE	REVISIONS	BY
4-12-90	REPLACE 14" PLIES WITH 20"	E.H.G.
11 NOV 94	VOID ON CONTRUSTION	

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

END BENT 1 DETAILS
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

NO SCALE MARCH 1989

DESIGNED A.R.C.
DRAWN J.W.C.
CHECKED E.H.G.-H.W.C.
DESIGN GROUP H.W.C.
REVIEWED B.D.M.- R.J.S.
APPROVED P.V.L.

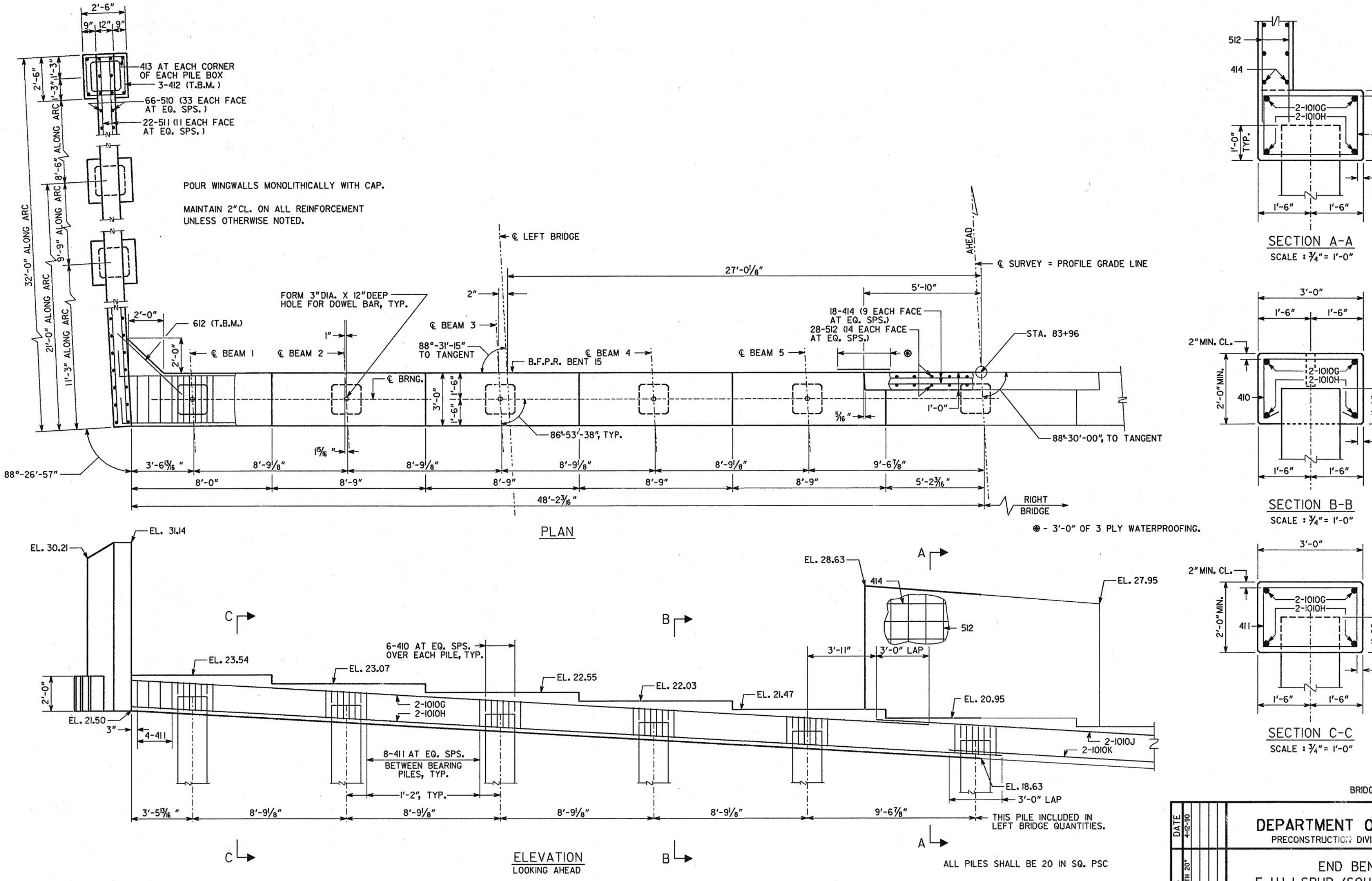
BRIDGE SHEET
16 OF 33

Exhibit C-3-4

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	292	

POUR WINGWALLS MONOLITHICALLY WITH CAP.

MAINTAIN 2" CL. ON ALL REINFORCEMENT UNLESS OTHERWISE NOTED.



ALL PILES SHALL BE 20 IN SQ. PSC

PLAN DRIVING OBJECTIVE

DRIVE ALL PILES TO A DRIVING RESISTANCE OF 110 TONS AFTER A MINIMUM TIP ELEVATION OF -35 HAS BEEN ACHIEVED.

SUBSTRUCTURE QUANTITIES

ITEM	BENT 15 LT.
CU. YDS. CLASS "A" CONCRETE	24.76
LBS. BAR REINF. STEEL	2996

NOTE : 414 BAR QUANTITIES IN BENT 15 LT.

BRIDGE NO. 1 LEFT

DATE	REVISIONS	BY
4-12-90	REPLACE 14" PLIES WITH 20"	E.H.G.

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

END BENT 15 DETAILS
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

NO SCALE MARCH 1989

DESIGNED A.R.C.
DRAWN J.W.C.
CHECKED E.H.G. - H.W.C.
DESIGN GROUP H.W.C.
REVIEWED B.D.M.- R.J.S.
APPROVED P.V.L.

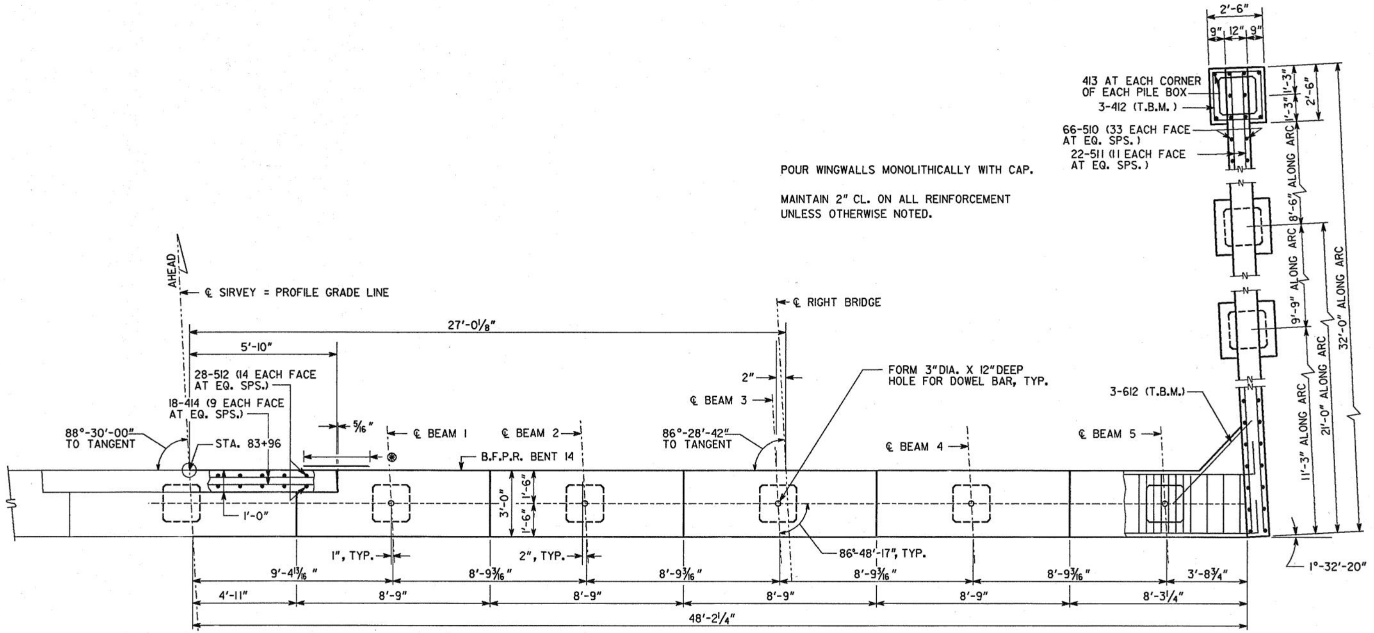
BRIDGE SHEET
23 OF 33

Exhibit C-3-5

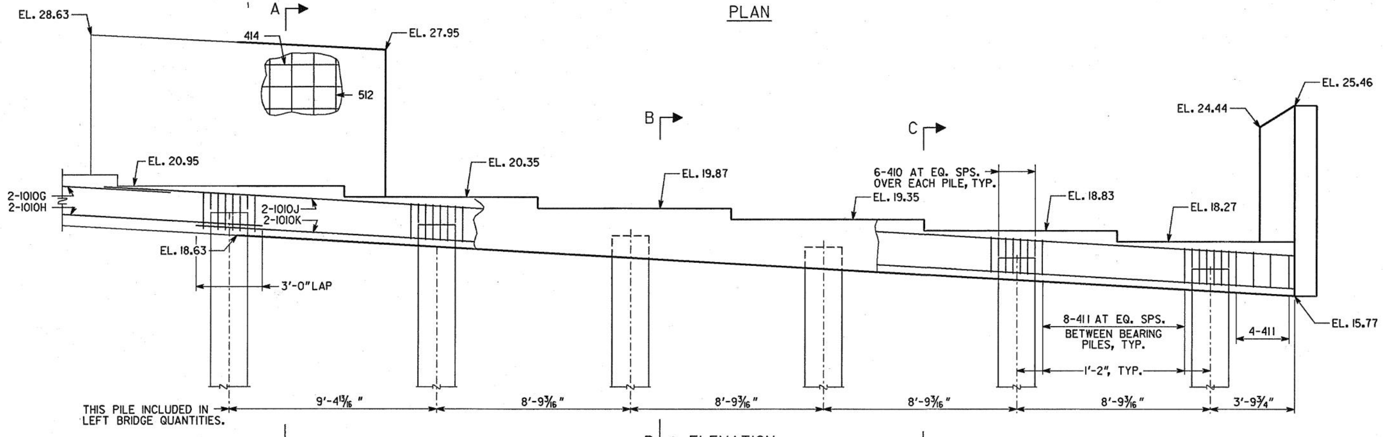
STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	293	

POUR WINGWALLS MONOLITHICALLY WITH CAP.

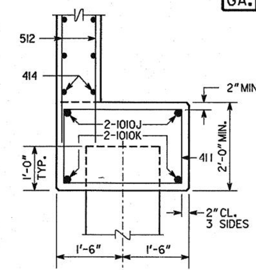
MAINTAIN 2" CL. ON ALL REINFORCEMENT UNLESS OTHERWISE NOTED.



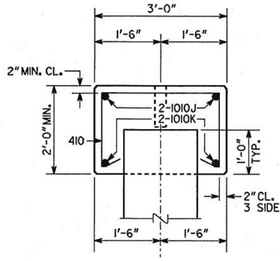
PLAN



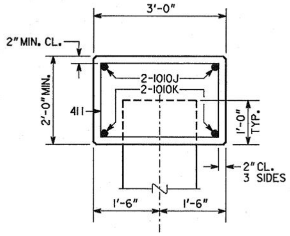
ELEVATION
LOOKING AHEAD



SECTION A-A
SCALE : ¾"= 1'-0"



SECTION B-B
SCALE : ¾"= 1'-0"



SECTION C-C
SCALE : ¾"= 1'-0"

SUBSTRUCTURE QUANTITIES	
ITEM	BENT 14 RT.
CU. YDS. CLASS "A" CONCRETE	25.02
LBS. BAR REINF. STEEL	3010

ALL PILES SHALL BE 20 IN SQ. PSC

PLAN DRIVING OBJECTIVE

DRIVE ALL PILES TO A DRIVING RESISTANCE OF 110 TONS AFTER A MINIMUM TIP ELEVATION OF -35 HAS BEEN ACHIEVED.

BRIDGE SHEET
24 OF 33

DATE	REVISIONS	BY
4-12-90	REPLACE 14" PILES WITH 20"	E.H.G.

BRIDGE NO. 1 RIGHT

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

END BENT 14 DETAILS
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

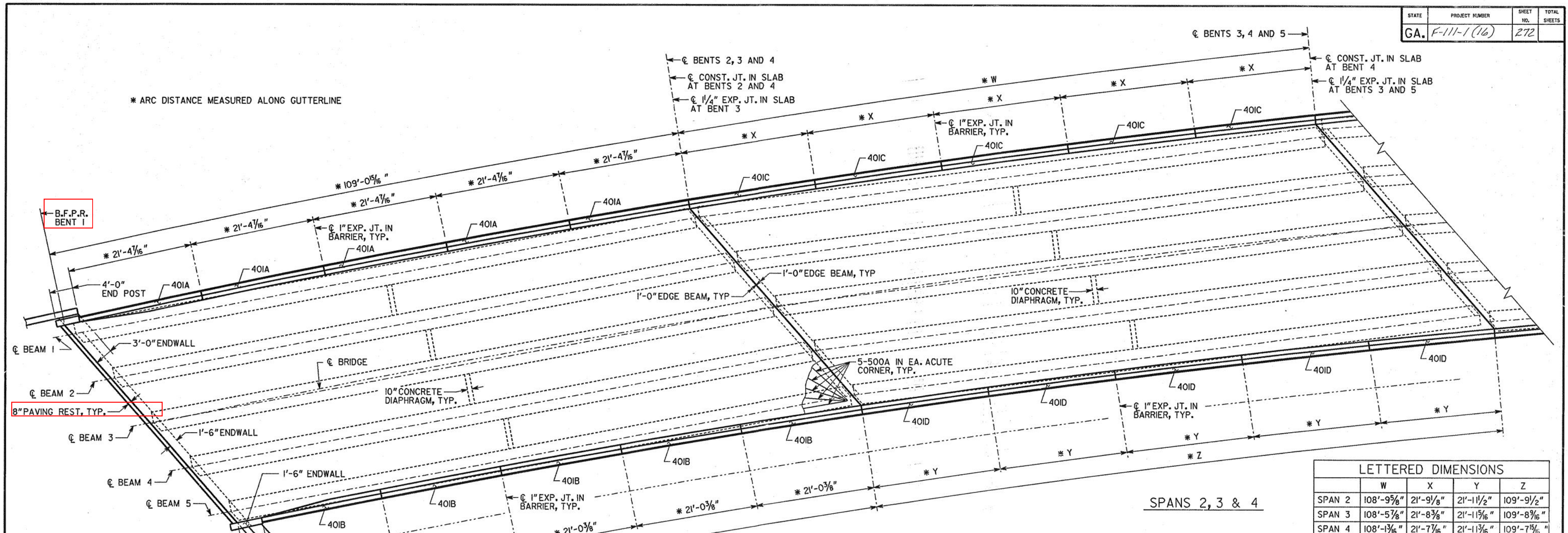
NO SCALE
MARCH 1989

DESIGNED A.R.C.
DRAWN J.W.C.
CHECKED E.H.G. - H.W.C.
DESIGN GROUP H.W.C.
REVIEWED B.D.M.- R.J.S.
APPROVED P.V.L.

Exhibit C-3-6

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	272	

∗ ARC DISTANCE MEASURED ALONG GUTTERLINE

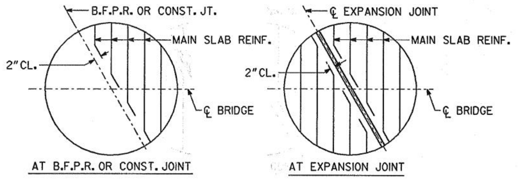


SPAN 1

SPANS 2, 3 & 4

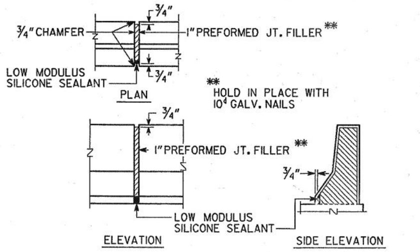
LETTERED DIMENSIONS				
	W	X	Y	Z
SPAN 2	108'-9 5/8"	21'-9 1/8"	21'-11 1/2"	109'-9 1/2"
SPAN 3	108'-5 7/8"	21'-8 3/8"	21'-11 5/16"	109'-8 9/16"
SPAN 4	108'-1 3/16"	21'-7 7/16"	21'-11 3/16"	109'-7 15/16"

NOTE : THE 400A AND 400B BARS SHALL BE ALTERNATED SUCH THAT THE LAP OF THE BARS SHALL ALTERNATE BETWEEN TWO LAP LOCATIONS IN THE SPAN. THE 400A AND 400B BARS SHALL BE APPROXIMATELY 1/3 & 2/3 THE SPAN LENGTH, RESPECTIVELY. THE MINIMUM LAP FOR THE 400A AND 400B BAR SHALL BE 2'-0".

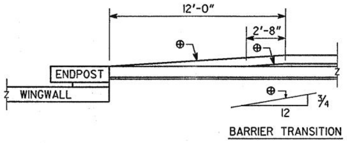


BARS ARE DETAILED IN BAR DETAILS AS EQUIVALENT FULL LENGTH BARS.

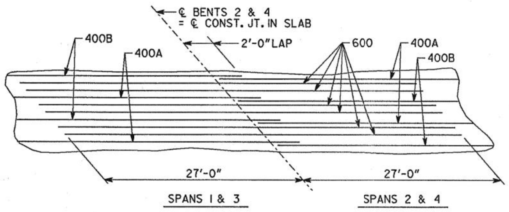
BAR BENDING DETAILS AT SKEWED JOINTS



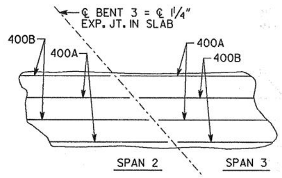
DETAILS OF 1" EXPANSION JOINT IN BARRIER



BARRIER TRANSITION DETAIL



SLAB REINFORCEMENT OVER BENTS 2 & 4



SLAB REINFORCEMENT OVER BENT 3

SUPERSTRUCTURE QUANTITIES															
ITEM	SPAN 1	SPAN 2	SPAN 3	SPAN 4	SPAN 5	SPAN 6	SPAN 7	SPAN 8	SPAN 9	SPAN 10	SPAN 11	SPAN 12	SPAN 13	SPAN 14	TOTAL
LUMP - SUPERSTR. CONCRETE, CU. YDS., CLASS "A"	173.61	162.25	162.91	162.74	148.11	143.47	143.50	161.57	161.74	161.77	161.77	160.72	160.72	171.39	2236.27
LUMP - SUPERSTR. REINF. STEEL, LBS.	41144	34732	39383	34847	35814	34478	34656	34626	39101	39101	34457	38966	38966	36202	516473

END POST CONCRETE AND BAR REINFORCEMENT STEEL INCLUDED IN END SPAN QUANTITIES
600 BARS ARE INCLUDED IN THE QUANTITIES FOR SPANS 1, 3, 5, 6, 7, 9, 10, 12 AND 13

BRIDGE NO. 1 LEFT

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

SUPERSTRUCTURE DETAILS
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

NO SCALE APRIL 1989

DATE	REVISIONS	BY

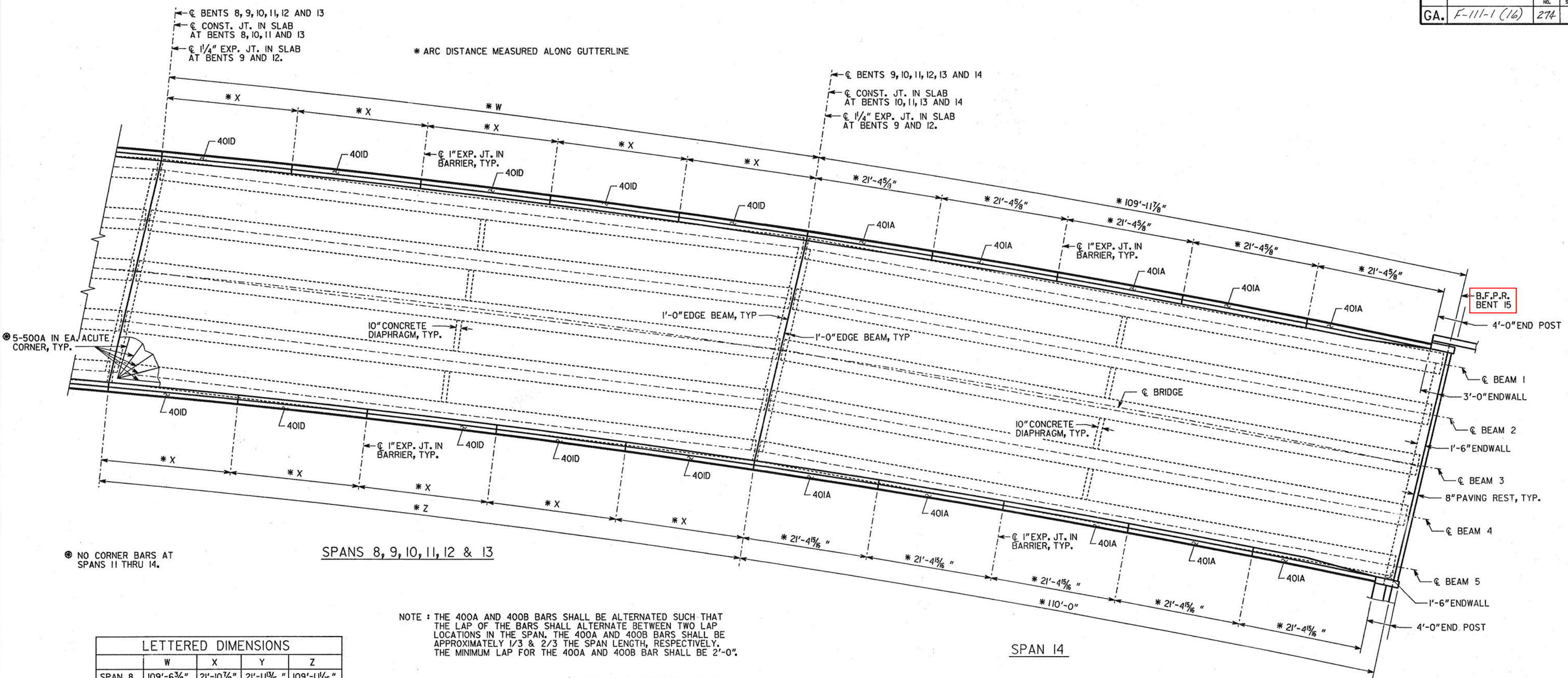
DESIGNED A.R.C.
DRAWN M.B.M. - J.W.C.
CHECKED E.H.G. - H.W.C.
DESIGN GROUP H.W.C.
REVIEWED B.D.M. - R.J.S.
APPROVED P.V.L.

BRIDGE SHEET
3 OF 33

Exhibit C-3-7

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1 (16)	274	

* ARC DISTANCE MEASURED ALONG GUTTERLINE



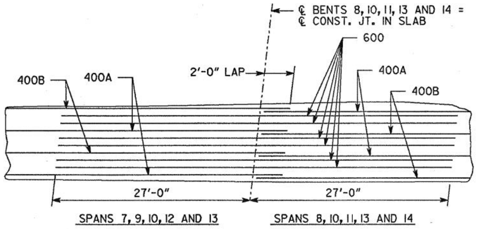
⊛ NO CORNER BARS AT SPANS 11 THRU 14.

SPANS 8, 9, 10, 11, 12 & 13

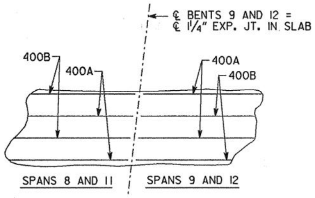
SPAN 14

NOTE : THE 400A AND 400B BARS SHALL BE ALTERNATED SUCH THAT THE LAP OF THE BARS SHALL ALTERNATE BETWEEN TWO LAP LOCATIONS IN THE SPAN. THE 400A AND 400B BARS SHALL BE APPROXIMATELY 1/3 & 2/3 THE SPAN LENGTH, RESPECTIVELY. THE MINIMUM LAP FOR THE 400A AND 400B BAR SHALL BE 2'-0".

LETTERED DIMENSIONS				
	W	X	Y	Z
SPAN 8	109'-6⅜"	21'-10⅞"	21'-11 13/16"	109'-11 1/16"
SPAN 9	109'-7 15/16"	21'-11 3/16"	21'-11⅞"	109'-11⅜"
SPAN 10	109'-9½"	21'-11½"	21'-11⅞"	109'-11⅜"
SPAN 11	109'-10 7/16"	21'-11 11/16"	21'-11 15/16"	109'-11 11/16"
SPAN 12	109'-11 1/16"	21'-11 13/16"	21'-11 15/16"	109'-11 11/16"
SPAN 13	109'-11 11/16"	21'-11 15/16"	22'-0"	110'-0"



SLAB REINFORCEMENT OVER BENTS 8, 10, 11, 13 AND 14



SLAB REINFORCEMENT OVER BENTS 9 AND 12

BRIDGE NO. 1 LEFT

DATE					
REVISIONS					
BY					

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

SUPERSTRUCTURE DETAILS
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

NO SCALE APRIL 1989

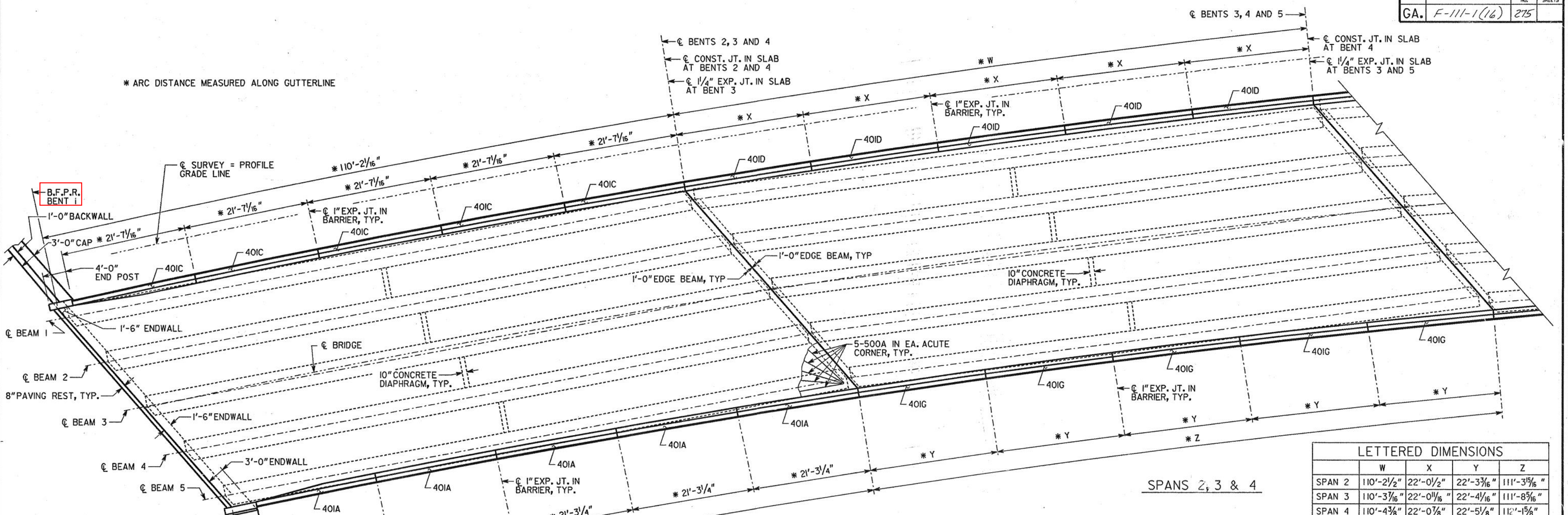
DESIGNED A.R.C.	CHECKED E.H.G. - H.W.C.	REVIEWED B.D.M. - R.J.S.
DRAWN M.B.M. - J.W.C.	DESIGN GROUP H.W.C.	APPROVED P.V.L.

BRIDGE SHEET
5 OF 33

Exhibit C-3-8

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	275	

∗ ARC DISTANCE MEASURED ALONG GUTTERLINE

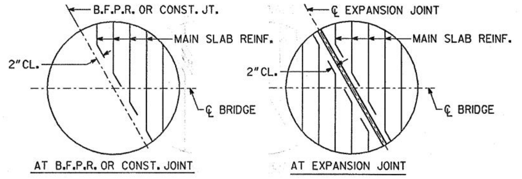


SPAN 1

SPANS 2, 3 & 4

LETTERED DIMENSIONS				
	W	X	Y	Z
SPAN 2	110'-2½"	22'-0½"	22'-3³⁄₁₆"	111'-3¹⁵⁄₁₆"
SPAN 3	110'-3⁷⁄₁₆"	22'-0¹¹⁄₁₆"	22'-4¹⁄₁₆"	111'-8⁵⁄₁₆"
SPAN 4	110'-4⅜"	22'-0⅞"	22'-5⅛"	112'-1⅝"

NOTE : THE 400A AND 400B BARS SHALL BE ALTERNATED SUCH THAT THE LAP OF THE BARS SHALL ALTERNATE BETWEEN TWO LAP LOCATIONS IN THE SPAN. THE 400A AND 400B BARS SHALL BE APPROXIMATELY 1/3 & 2/3 THE SPAN LENGTH, RESPECTIVELY. THE MINIMUM LAP FOR THE 400A AND 400B BAR SHALL BE 2'-0".

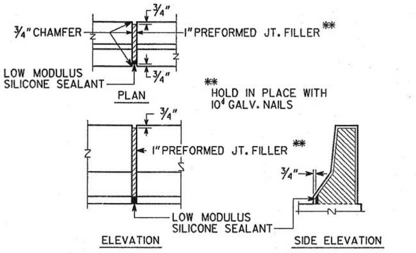


AT B.F.P.R. OR CONST. JOINT

AT EXPANSION JOINT

BARS ARE DETAILED IN BAR DETAILS AS EQUIVALENT FULL LENGTH BARS.

BAR BENDING DETAILS AT SKEWED JOINTS

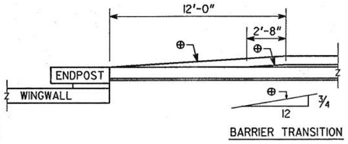


PLAN

ELEVATION

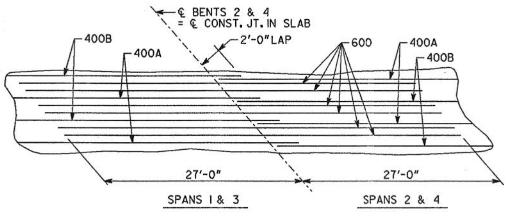
SIDE ELEVATION

DETAILS OF 1" EXPANSION JOINT IN BARRIER



BARRIER TRANSITION

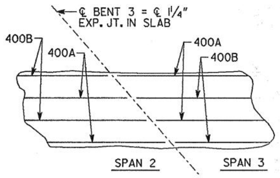
BARRIER TRANSITION DETAIL



SPANS 1 & 3

SPANS 2 & 4

SLAB REINFORCEMENT OVER BENTS 2 & 4



SPAN 2

SPAN 3

SLAB REINFORCEMENT OVER BENT 3

SUPERSTRUCTURE QUANTITIES														
ITEM	SPAN 1	SPAN 2	SPAN 3	SPAN 4	SPAN 5	SPAN 6	SPAN 7	SPAN 8	SPAN 9	SPAN 10	SPAN 11	SPAN 12	SPAN 13	TOTAL
LUMP - SUPERSTR. CONCRETE, CU. YDS., CLASS "A"	175.34	164.19	165.42	165.87	151.20	156.06	162.65	162.00	161.76	161.88	161.26	161.26	171.33	2120.22
LUMP - SUPERSTR. REINF. STEEL, LBS.	41220	34929	39570	35039	36561	37522	34820	39282	39282	34638	39150	39150	36444	487607

END POST CONCRETE AND BAR REINFORCEMENT STEEL INCLUDED IN END SPAN QUANTITIES
600 BARS ARE INCLUDED IN THE QUANTITIES FOR SPANS 1, 3, 5, 6, 8, 9, 11 AND 12

BRIDGE SHEET
6 OF 33

BRIDGE NO. 1 RIGHT

DATE	REVISIONS	BY

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

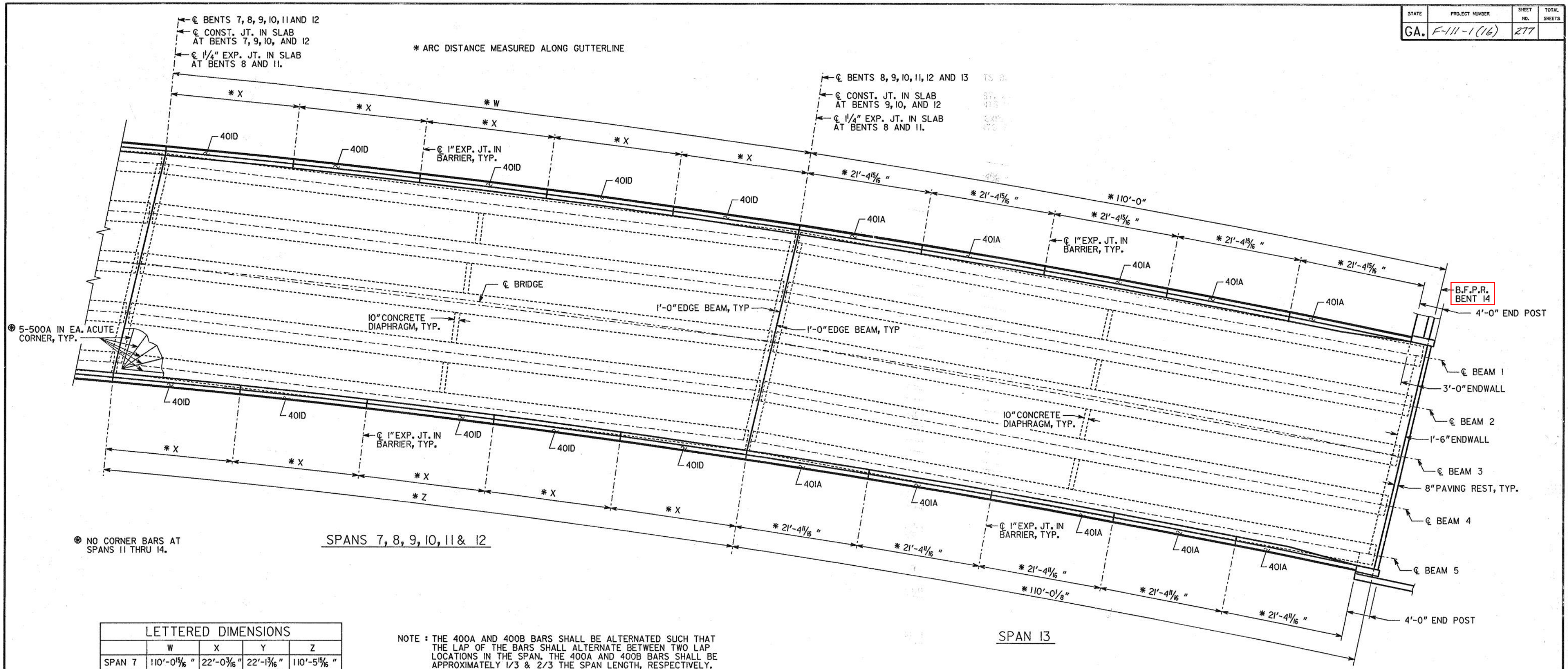
SUPERSTRUCTURE DETAILS
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

NO SCALE APRIL 1989

DESIGNED A.R.C.
DRAWN M.B.M. - J.W.C.
CHECKED E.H.G. - H.W.C.
DESIGN GROUP H.W.C.
REVIEWED B.D.M. - R.J.S.
APPROVED P.V.L.

Exhibit C-3-9

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	277	



SPANS 7, 8, 9, 10, 11 & 12

SPAN 13

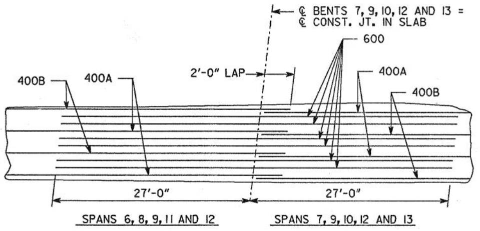
* ARC DISTANCE MEASURED ALONG GUTTERLINE

⊛ NO CORNER BARS AT SPANS 11 THRU 14.

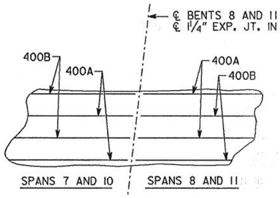
LETTERED DIMENSIONS

	W	X	Y	Z
SPAN 7	110'-0 15/16"	22'-0 3/16"	22'-1 3/16"	110'-5 15/16"
SPAN 8	110'-0 5/8"	22'-0 1/8"	22'-0 7/8"	110'-4 3/8"
SPAN 9	110'-0 5/8"	22'-0 1/8"	22'-0 9/16"	110'-2 13/16"
SPAN 10	110'-0 5/16"	22'-0 1/16"	22'-0 3/8"	110'-1 7/8"
SPAN 11	110'-0 5/16"	22'-0 1/16"	22'-0 3/16"	110'-0 15/16"
SPAN 12	110'-0"	22'-0"	22'-0 1/16"	110'-0 5/16"

NOTE : THE 400A AND 400B BARS SHALL BE ALTERNATED SUCH THAT THE LAP OF THE BARS SHALL ALTERNATE BETWEEN TWO LAP LOCATIONS IN THE SPAN. THE 400A AND 400B BARS SHALL BE APPROXIMATELY 1/3 & 2/3 THE SPAN LENGTH, RESPECTIVELY. THE MINIMUM LAP FOR THE 400A AND 400B BAR SHALL BE 2'-0".



SLAB REINFORCEMENT OVER BENTS 7, 9, 10, 12 AND 13



SLAB REINFORCEMENT OVER BENTS 8 AND 11

BRIDGE NO. 1 RIGHT

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

SUPERSTRUCTURE DETAILS
F-111-1 SPUR (SOUTHWEST BYPASS) OVER
CSX RAILROAD AND LITTLE OGEECHEE RIVER
CHATHAM COUNTY F-111-1(16)

NO SCALE APRIL 1989

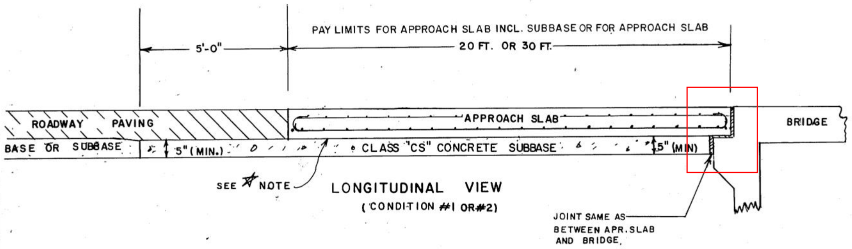
DATE
REVISIONS
BY

BRIDGE SHEET
8 OF 33

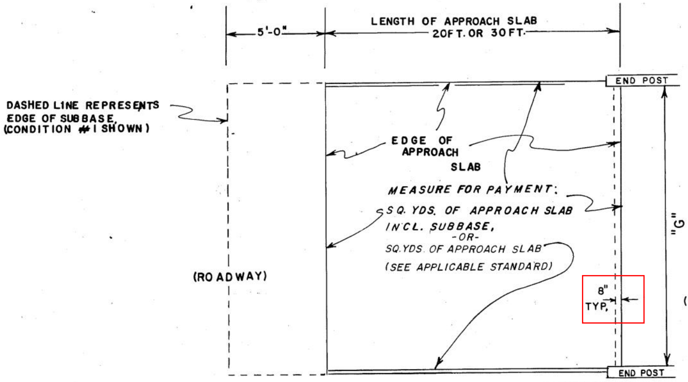
DESIGNED A.R.C.
DRAWN M.B.M. - J.W.C.
CHECKED E.H.G. - H.W.C.
DESIGN GROUP H.W.C.
REVIEWED B.D.M. - R.J.S.
APPROVED P.V.L.

Exhibit C-3-10

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	123	



LONGITUDINAL VIEW
(CONDITION #1 OR #2)



MEASURE FOR PAYMENT:
SQ. YDS. OF APPROACH SLAB INCL. SUBBASE,
-OR-
SQ. YDS. OF APPROACH SLAB
(SEE APPLICABLE STANDARD)

NOTE: PAY LIMITS ARE ALWAYS BASED UPON SURFACE OF APPROACH SLAB ONLY. (EITHER CONDITION)

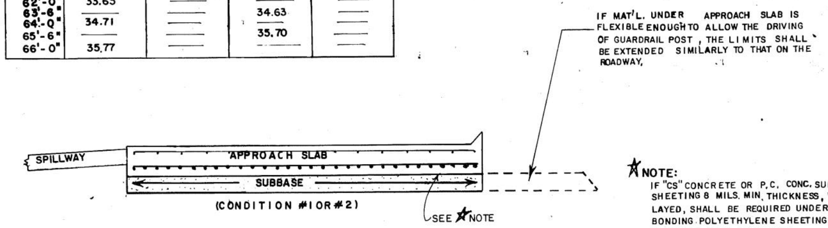
PLAN VIEW

"G"	⊗ CU. YDS OF SUBBASE FOR APPROACH SLAB			
	STD. 9017K	STD. 9017L	STD. 9017P	STD. 9017Q
28'-0"	15.63	11.08	—	—
29'-6"	—	—	16.47	11.67
30'-0"	—	—	—	—
31'-6"	—	—	17.54	12.43
32'-0"	17.75	12.58	—	—
33'-6"	—	—	18.60	13.18
34'-0"	—	—	—	—
35'-6"	—	—	19.67	13.94
36'-0"	19.87	14.08	—	—
37'-6"	—	—	20.74	14.70
38'-0"	—	—	—	—
39'-6"	—	—	21.81	15.46
40'-0"	21.99	15.59	—	—
41'-6"	—	—	22.88	16.21
42'-0"	23.05	16.34	—	—
43'-6"	—	—	23.94	16.97
44'-0"	—	—	—	—
45'-6"	—	—	25.01	17.73
46'-0"	—	17.84	—	—
47'-6"	—	—	26.08	—
48'-0"	26.23	18.59	—	—
49'-6"	—	—	27.15	—
50'-0"	—	—	—	—
51'-6"	—	—	28.22	—
52'-0"	28.35	—	—	—
53'-6"	—	—	29.29	—
54'-0"	—	—	—	—
55'-6"	—	—	30.35	—
56'-0"	—	—	—	—
57'-6"	—	—	31.42	—
58'-0"	31.53	—	—	—
59'-6"	—	—	32.49	—
60'-0"	32.59	—	—	—
61'-6"	—	—	33.56	—
62'-0"	33.65	—	—	—
63'-6"	—	—	34.63	—
64'-0"	34.71	—	—	—
65'-6"	—	—	35.70	—
66'-0"	35.77	—	—	—

⊗ QUANTITIES GIVEN IN THE TABLE ARE BASED UPON MINIMUM DIMENSIONS AND ARE GIVEN FOR INFORMATION ONLY.

CU. YDS. OF SUBBASE FOR USE WITH STD. 9017M, STD. 9017N OR FOR USE WITH SLAB SIZES NOT GIVEN IN TABLE, MAY BE ESTIMATED WITH THE FOLLOWING FORMULAE:

FOR 30' APPROACH SLABS:
CU. YDS. = 0.5298 TIMES SLAB WIDTH (IN FT.)
FOR 20' APPROACH SLABS:
CU. YDS. = 0.3755 TIMES SLAB WIDTH (IN FT.)



(CONDITION #1 OR #2)

CROSS SECTIONAL VIEW

NOTE: SUBBASE SHOWN ABOVE FOR APPROACH SLAB WITH SPILLWAY ON ONE SIDE AND SLOPED EDGE ON OTHER SIDE. SUBBASE DETAILS SIMILAR FOR APPROACH SLAB WITH TRANSITION CURB OR OTHER DRAINAGE STRUCTURES.

☆ **NOTE:**
IF "CS" CONCRETE OR P.C. CONC. SUBBASE IS USED, CLEAR POLYETHYLENE SHEETING 8 MILS. MIN. THICKNESS, WITH A 6" OVERLAP, UNIFORMALLY LAYED, SHALL BE REQUIRED UNDER THE APPROACH SLAB TO PREVENT BONDING. POLYETHYLENE SHEETING SHALL BE NEW, UNUSED AND FREE OF HOLES, RIPS AND TEARS.

PAY ITEMS (FOR CONDITION #1)

REINF. CONC. APPROACH SLAB INCL. SUBBASE	——— SQ. YDS.
REINF. CONC. APPROACH SLAB INCL. CURB & SUBBASE	——— SQ. YDS.
REINF. CONC. APPROACH SLAB INCL. BARRIER & SUBBASE	——— SQ. YDS.
REINF. CONC. APPROACH SLAB INCL. SLOPED EDGE & SUBBASE	——— SQ. YDS.

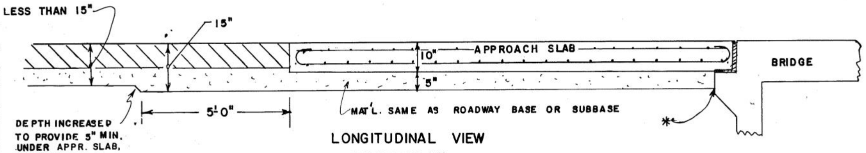
CONDITION #1:
WHERE THE CONTRACT FOR THE BRIDGE AND APPROACH SLABS IS LET SEPARATE FROM THE ROADWAY PAVING CONTRACT, THE SUBBASE FOR THE APPROACH SLAB WILL BE CLASS "CS" CONCRETE ACCORDING TO SECTION 500. IN THIS CASE, PAYMENT FOR THE SUBBASE WILL BE INCLUDED IN THE PAYMENT FOR THE APPROACH SLAB.

PAY ITEMS: (FOR CONDITION #2)

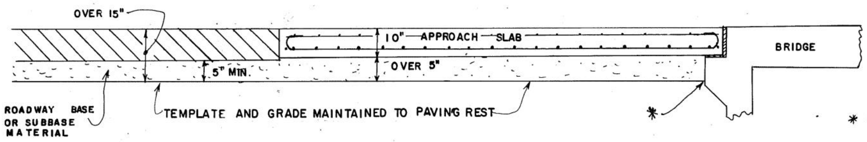
REINF. CONC. APPROACH SLAB	——— SQ. YDS.
REINF. CONC. APPROACH SLAB INCL. CURB	——— SQ. YDS.
REINF. CONC. APPROACH SLAB INCL. BARRIER	——— SQ. YDS.
REINF. CONC. APPROACH SLAB INCL. SLOPED EDGE	——— SQ. YDS.

(SUBBASE MATERIAL IS SEPARATE PAY ITEM)

CONDITION #2:
WHERE THE ROADWAY PAVING AND THE BRIDGE ARE LET UNDER THE SAME CONTRACT, THE APPROACH SLAB SUBBASE MAY BE EITHER CLASS "CS" CONCRETE OR MAY BE THE SAME MATERIAL AS REQUIRED FOR THE ROADWAY BASE OR SUBBASE SUCH AS GRADED AGGREGATE, P.C. CONC. SUBBASE, ETC. IN THIS CASE, PAYMENT FOR THE SUBBASE WILL BE MADE UNDER THE APPROPRIATE BID ITEM FOR BASE MATERIAL EVEN IF THE CONTRACTOR ELECTS TO USE CLASS "CS" CONCRETE. WHEN PAYMENT IS BY THE SQ. YD. FOR THE BASE ITEM NO ADJUSTMENT WILL BE MADE FOR ANY VARIABLE THICKNESS NECESSARY.



LONGITUDINAL VIEW
(CONDITION #2)



LONGITUDINAL VIEW
(CONDITION #2)

* EXPANSION JOINT REQ'D., SAME AS BETWEEN APPROACH SLAB & BRIDGE, IF SUBBASE IS PORTLAND CEMENT CONCRETE OR CLASS "CS" CONCRETE.

PAY ITEM - COND. #2 6-14-88

CONSTRUCTION DETAILS

SUBBASES FOR APPROACH SLABS

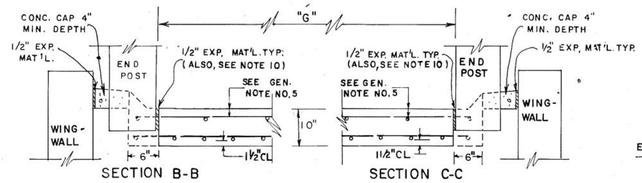
NO SCALE

REV. & REDRAWN OCT., 1985

FORM EF00003

Exhibit C-4-1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	159	



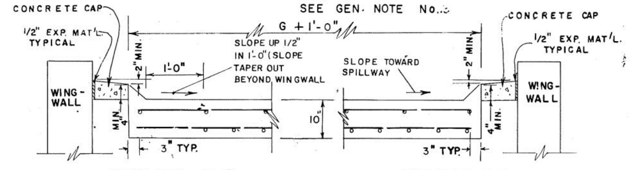
SECTION B-B

SECTION C-C

NOTE : WHERE END POST INTERSECTS APPROACH SLAB, THE INTERCEPTED REINFORCING, BOTH LONGITUDINAL & TRAVERSE, SHALL BE SHORTENED AS NEEDED TO GIVE 3"± CLEARANCE TO END POST.

SEE DETAIL "A"

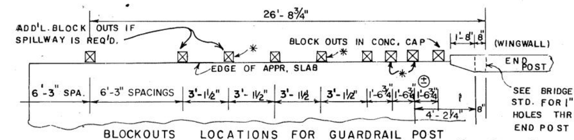
SEE GEN. NOTE No. 3



SECTION D-D
(SHOWN WHERE SPILLWAY IS NOT REQ'D.)

SECTION-EE
(SHOWN WHERE SPILLWAY IS REQ'D)

NOTE: BLOCKOUTS ARE OMITTED WHERE IT HAS BEEN VERIFIED THAT GUARDRAIL WILL NOT BE REQ'D.

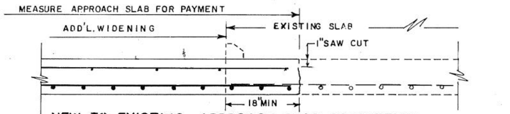


BLOCKOUTS LOCATIONS FOR GUARDRAIL POST

*IF GUARDRAIL IS WARRANTED AT THE TRAILING END OF 4 OR MORE LANES, BLOCKOUTS FLAGED WITH AN ASTERISK ARE OMITTED.

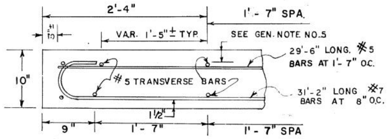
See General Note No. 3

(±) VARIED TO MISS BRIDGE PAV. REST

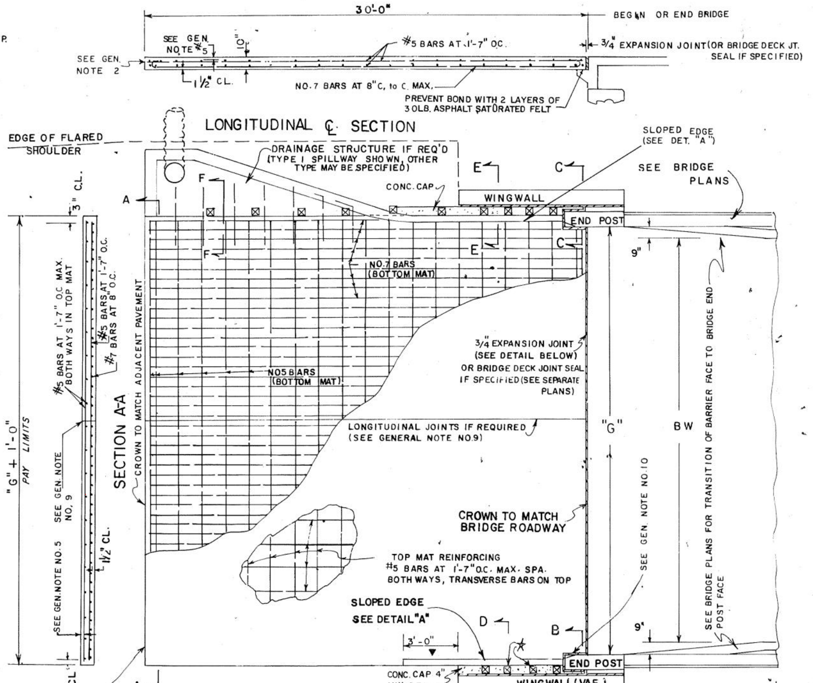


NEW TO EXISTING APPROACH SLAB CONNECTION

REMOVE CONCRETE FROM 18" STRIP WITH CARE TO MAKE CUT AS VERTICAL AS POSSIBLE. EXPOSED BARS TO BE CUT AND BENT TO FIT. ALL SCALE AND RUST REMOVED. EPOXY IS REQUIRED BETWEEN NEW AND EXISTING CONCRETE. EXISTING REINFORCING SHALL EXTEND 15" MIN. INTO SECTION. PAYMENT FOR NEW SLAB INCLUDES ALL WORK HERE DESCRIBED.



TYPICAL LONGITUDINAL END VIEW



SEE GEN. NOTE NO. 2

PLAN

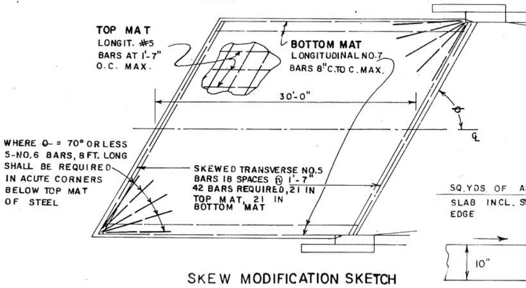
NOTE: PLAN VIEW IS PRESENTED WITH A TYPE 1 SPILLWAY ON ONE SIDE AND NO DRAINAGE STRUCTURE ON THE OTHER SIDE. SPILLWAY, WHERE REQUIRED, MAY BE TYPE 1, 2, 3 OR 4 AND ON BOTH SIDES OF APPROACH SLAB, ON JUST ONE SIDE, OR NO SPILLWAY, AS CONDITIONS WARRANT. APPROACH SLAB QUANTITIES AND PAY ITEM WILL NOT BE EFFECTED BY SPILLWAY REQUIREMENTS. SLOPED EDGE IS REQUIRED BOTH WITH AND WITHOUT SPILLWAY.

▼SLOPED EDGE SHALL BE CONSTRUCTED MONOLITHIC WITH APPROACH SLAB. SLOPED EDGE SHALL BE TAPERED OUT BEYOND WINGWALL, EXCEPT WHERE BRIDGE DRAINAGE MUST BE CARRIED ACROSS SLAB TO ROADWAY STRUCTURE, SLOPED EDGE SHALL THEN RUN FULL LENGTH OF SLAB.

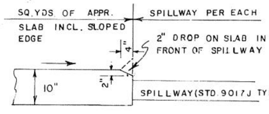
*WITHOUT SPILLWAY, NUMBER OF BLOCKOUTS VARY ACCORDING TO LENGTH OF WINGWALL

SKEWED SLAB : LONGITUDINAL BARS - NOMINAL LENGTH AND NUMBER REQUIRED SAME AS FOR UNSKEWED SLAB.

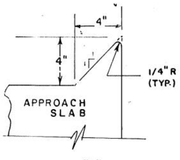
TRANSVERSE BARS - NUMBER REQUIRED SAME AS FOR UNSKEWED SLAB. NOMINAL LENGTH ON SKEW = UNSKEWED NOMINAL LENGTH DIVIDED BY SIN θ ROUNDED TO NEAREST INCH.



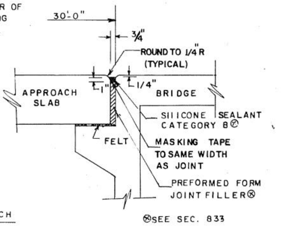
SKEW MODIFICATION SKETCH
NO SCALE



SECTION F-F



DETAIL "A"



⊗ SEE SEC. 833

3/4" EXPANSION JOINT DETAIL
SCALE : 1" = 1'-0"

THE 3/4" EXPANSION JOINT SHOWN ABOVE IS REQUIRED BETWEEN APPROACH SLAB AND BRIDGE AT ALL LOCATIONS, EXCEPT WHERE BRIDGE DECK JOINT SEAL (SEPARATE PLAN DETAILS) IS SPECIFIED

QUANTITIES & REINFORCING FOR TYPICAL SLAB SIZES * *

BW	"G" (= BW + 1'-6")	SQ. YDS. OF APPR. SLAB = (G + 1') x 30 / 9	BOTTOM MAT REINF. 31'-2" LONG #7 LONGIT. BARS -NUMBER- (= 1.5G + 1.75)	BOTTOM MAT REINF. 21 - #5 TRAN. BARS -LENGTH- (= G + 6")	TOP MAT REINF. 29'-6" LONG #5 LONGIT. BARS -NUMBER- = 12/19 (G + 0.5) + 1	TOP MAT REINF. 21 - #5 TRAIL BARS -LENGTH- (= G + 6")
28'-0"	29'-6"	101.67	46	30'-0"	20	30'-0"
30'-0"	31'-6"	108.33	49	32'-0"	22	32'-0"
32'-0"	33'-6"	115.00	52	34'-0"	23	34'-0"
34'-0"	35'-6"	121.67	55	36'-0"	24	36'-0"
36'-0"	37'-6"	128.33	58	38'-0"	25	38'-0"
38'-0"	39'-6"	135.00	61	40'-0"	27	40'-0"
40'-0"	41'-6"	141.67	64	42-0"	28	42'-0"
42'-0"	43'-6"	148.33	67	44'-0"	29	44'-0"
44'-0"	45'-6"	155.00	70	46'-0"	30	46'-0"
46'-0"	47'-6"	161.67	73	48'-0"	32	48'-0"
48'-0"	49'-6"	168.33	76	50'-0"	33	50'-0"
50'-0"	51'-6"	175.00	79	52'-0"	34	52'-0"
52'-0"	53'-6"	181.67	82	54'-0"	36	54'-0"
54'-0"	55'-6"	188.33	85	56'-0"	37	56'-0"
56'-0"	57'-6"	195.00	88	58'-0"	38	58'-0"
58'-0"	59'-6"	201.67	91	60'-0"	39	60'-0"
60'-0"	61'-6"	208.33	94	62'-0"	40	62'-0"

* * DATA IN ABOVE TABLE ARE BASED UPON COMMON SLAB/BRIDGE WIDTHS. WHERE OTHER WIDTHS ARE ENCOUNTERED, THE FORMULAE AT COLUMN TOPS MAY BE USED IN DETERMINING ADDITIONAL DATA NEEDED.

GENERAL NOTES:

1. SPECIFICATIONS: GEORGIA STANDARD, CURRENT EDITION AND SUPPLEMENTS THERETO.
2. WHERE PORTLAND CEMENT CONCRETE PAVEMENT IS TO BE USED FOR ROADWAY PAVING, DOWEL BARS WILL BE INSTALLED IN THE APPROACH SLAB PER STANDARD 5046-H. PAYMENT FOR THE APPROACH SLAB WILL INCLUDE THESE DOWELS, WHEN THE APPROACH SLAB IS CONSTRUCTED BEFORE THE PCC PAVEMENT CONSTRUCTION.
3. THE CONCRETE CAPS ADJACENT TO THE APPROACH SLAB WILL HAVE HOLES APPROXIMATELY 9"x9", BLOCKED OUT FOR GUARDRAIL POST INSTALLATIONS (SEE DETAIL), PAYMENT FOR APPROACH SLAB WILL INCLUDE THE 1/2" EXPANSION MATERIAL AND THE CONCRETE CAPS WITH BLOCKED OUT HOLES. (See Detail at far left),
4. WIDTH OF APPROACH SLAB IS NORMALLY DETERMINED BY DISTANCE BETWEEN FACES OF BRIDGE END POSTS. DETAILS SHOWN ARE BASED UPON THE BRIDGE BARRIER FACE BEING TRANSITIONED 9" TO FACE OF END POST ON EACH SIDE. SEE BRIDGE PLANS IF BARRIER IS CONTINUED ACROSS APPROACH SLAB INSTEAD, SEE STANDARD 9017-M.
5. COVER OVER TOP MAT OF REINFORCING WILL MATCH THAT OF THE BRIDGE DECK.
6. WHERE APPROACH SLAB IS INTERCEPTED BY THE BRIDGE END POST, EXTERIOR BARS WILL BE SHORTENED AS NEEDED TO GIVE A 3" CLEARANCE TO STRUCTURE.
7. PAY AREA FOR APPROACH SLAB SHALL BE COMPUTED AS A PRODUCT OF THE OVERALL SLAB WIDTH $\left(\frac{G + 1'}{3}\right)$ TIMES THE LENGTH $\left(\frac{30}{3}\right)$ WITH NO DEDUCTIONS MADE FOR AREAS OCCUPIED BY THE END POST & EXPANSION JOINTS OR BY DRAINAGE STRUCTURES, AND NO ADDITIONS MADE FOR SIDEWALKS OR OTHER ITEMS WHEN REQUIRED WITH THE APPROACH SLAB.
8. SEE SEPARATE PLAN DETAILS FOR SUBBASE OR OTHER MATERIALS UNDER THE APPROACH SLAB. IF "CS" CONC OR P.C. CONC SUBBASE IS USED, CLEAR POLYETHYLENE SHEETING 8 MILS. MIN. THICKNESS, WITH A 6" OVERLAP, UNIFORMLY LAID, SHALL BE REQUIRED UNDER THE APPROACH SLAB TO PREVENT BONDING. POLYETHYLENE SHEETING SHALL BE NEW, UNUSED AND FREE OF HOLES, RIPS AND TEARS.
9. ALL APPROACH SLABS EXCEEDING 42' IN WIDTH WILL CONTAIN A LONGITUDINAL CONSTRUCTION JOINT. SLABS EXCEEDING 60' AND 90' IN WIDTH SHALL CONTAIN 2 AND 3 LONGITUDINAL CONSTRUCTION JOINTS RESPECTIVELY. SECTIONS BETWEEN JOINTS OR BETWEEN A JOINT AND SLAB EDGE SHALL NOT BE LESS THAN 12' OR MORE THAN 30' WIDE. REINFORCEMENT STEEL REMAINS UNCHANGED AND SHALL EXTEND THRU JOINTS. JOINTS SHALL BE LOCATED AT LANE LINES TO PROVIDE OFFSET FROM WHEELPATHS.
10. IF BRIDGE DECK JOINT SEAL IS USED BETWEEN APPROACH SLAB AND BRIDGE, THE END OF SLAB ADJACENT TO END POST WILL BE SEALED WITH LOW MODULUS SILICONE SEALANT,

NOTE : THIS STANDARD REPLACES STANDARD 9017H.

4-27-89	BLOCKOUT SPA.	K.L.J.
7-8-86	REDUCED A.S. WIDTH TO G+1	R.M.U.

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

STANDARD

REINFORCED CONCRETE APPROACH SLAB
30 FT. LENGTH
TYPICAL USE: WHERE SHOULDER IS ADJACENT TO ROADWAY AND/OR ACROSS BRIDGE

SCALE AS SHOWN
JUNE, 1985

DES. R.M.U.
DRW. R.M.U.
TRA. J.M.E.
CHK. P.K.C.

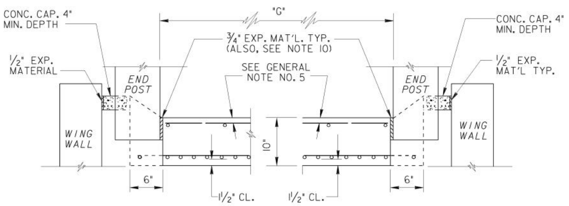
SUBMITTED Floyd E. Hardy
STATE ROAD & AIRPORT DESIGN ENGR
APPROVED Hal Rives
STATE HIGHWAY ENGINEER

NUMBER
9017P

FORM EF00003

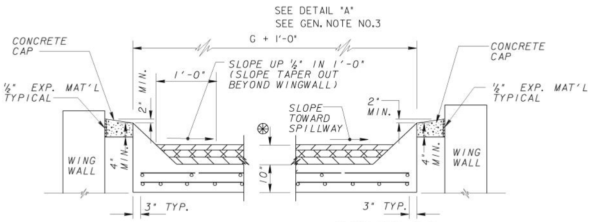
Exhibit C-4-2

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	NH000-0009-02(093)	216	267



SECTION B-B SECTION C-C

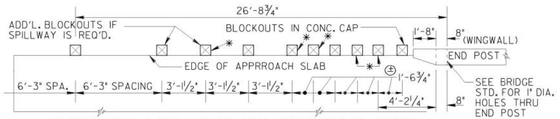
NOTE: WHERE END POST INTERSECTS APPROACH SLAB, THE INTERCEPTED REINFORCING, BOTH LONGITUDINAL & TRAVERSE, SHALL BE SHORTENED AS NEEDED TO GIVE 3"+ CLEARANCE TO END POST.



SECTION D-D (SHOWN WHERE SPILLWAY IS NOT REQ'D.)

SECTION E-E (SHOWN WHERE SPILLWAY IS REQ'D.)

NOTE: BLOCKOUTS ARE OMITTED WHERE IT HAS BEEN VERIFIED THAT GUARDRAIL WILL NOT BE REQ'D.

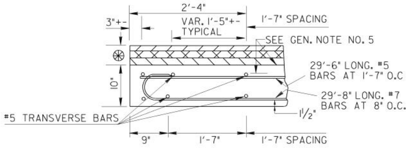


BLOCKOUTS LOCATIONS FOR GUARDRAIL POST

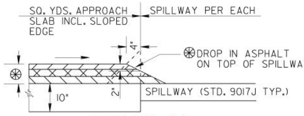
SEE GENERAL NOTE NO. 3

✳ IF GUARDRAIL IS WARRANTED AT THE TRAILING END OF 4 OR MORE LANES, BLOCKOUTS FLAGGED WITH AN ASTERISK ARE OMITTED.

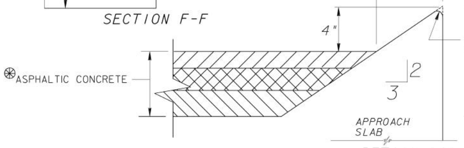
⊕ VARIED TO MISS BRIDGE PAV. REST



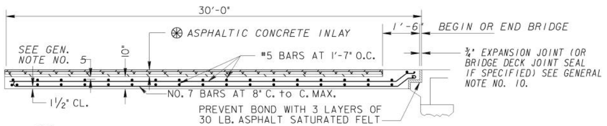
TYPICAL LONGITUDINAL END VIEW



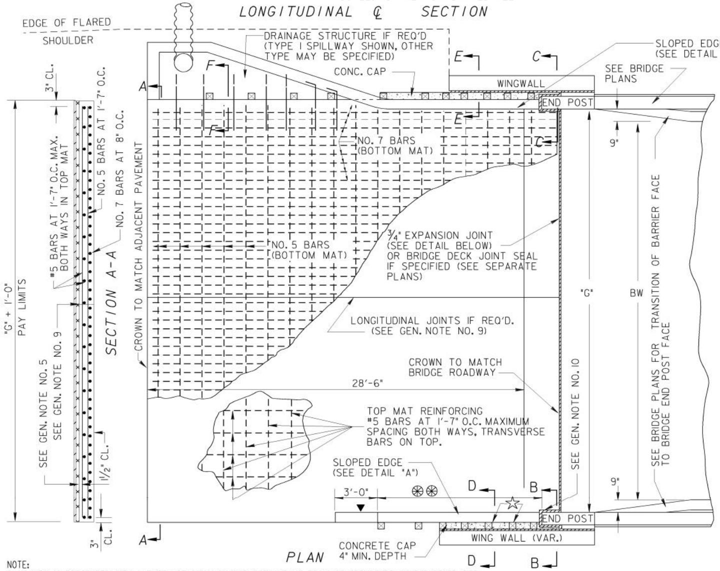
SECTION F-F



DETAIL "A"



LONGITUDINAL ℄ SECTION



PLAN

NOTE:
PLAN VIEW IS PRESENTED WITH A TYPE I SPILLWAY ON ONE SIDE AND NO DRAINAGE STRUCTURE ON THE OTHER SIDE. SPILLWAY, WHERE REQUIRED, MAY BE TYPE 1, 2, 3 OR 4 AND ON BOTH SIDES OF APPROACH SLAB, ON JUST ONE SIDE, OR NO SPILLWAY, AS CONDITIONS WARRANT. APPROACH SLAB QUANTITIES AND PAY ITEM WILL NOT BE EFFECTED BY SPILLWAY REQUIREMENTS. SLOPED EDGE IS REQUIRED BOTH WITH AND WITHOUT SPILLWAY.

▼ SLOPED EDGE SHALL BE CONSTRUCTED MONOLITHIC WITH APPROACH SLAB. SLOPED EDGE SHALL BE TAPERED OUT BEYOND WINGWALL, EXCEPT WHERE BRIDGE DRAINAGE MUST BE CARRIED ACROSS SLAB TO ROADWAY STRUCTURE. SLOPED EDGE SHALL THEN RUN FULL LENGTH OF SLAB.

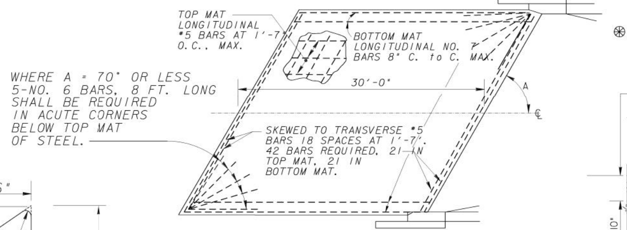
☆ WITHOUT SPILLWAY, NUMBER OF BLOCKOUTS VARY ACCORDING TO LENGTH OF WINGWALL.

⊛⊛ SLOPED EDGE LENGTH SHALL EXTEND TO END OF WINGWALL OR SHALL BE 12'-0" IN LENGTH, WHICHEVER IS GREATER.

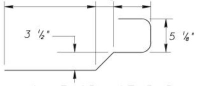
⊛ 3½". SEE TYPICAL SECTION OR GENERAL NOTE NO. 2.

SKEWED SLAB: LONGITUDINAL BARS - NOMINAL LENGTH AND NUMBER REQUIRED SAME AS FOR UNSKEWED SLAB.

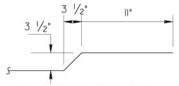
TRANSVERSE BARS - NUMBER REQUIRED SAME AS FOR UNSKEWED SLAB. NOMINAL LENGTH OF SKEWED = UNSKEWED NOMINAL LENGTH DIVIDED BY SIN A ROUNDED TO NEAREST INCH.



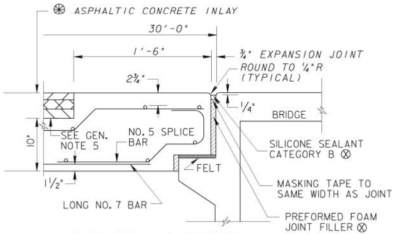
SKEW MODIFICATION SKETCH
NO SCALE



NO. 5 SPLICE BAR
ONE REQ'D AT EACH LONG #7 BAR AND BETWEEN



NO. 5 TOP MAT BAR BENDING DETAIL



EXPANSION JOINT DETAIL

⊗ SEE SECTION 833, THICKNESS SHALL BE AS PER MANUFACTURER'S RECOMMENDATIONS BASED ON JOINT WIDTH.

	QUANTITIES & REINFORCEMENT FOR TYPICAL SLAB SIZES ✱✱					
			BOTTOM MAT REINF.		TOP MAT REINF.	
BW	"G" (= BW + 1'-6")	SQ. YDS. OF APPR. SLAB = (G+1')x 30 / 9	29'-8" LONG #7 LONGIT. BARS -NUMBER- (= 1.5G + 1.75)	21 - # 5 TRAN. BARS -LENGTH- (= G + 6")	29'-6" LONG #5 LONGIT. BARS -NUMBER- = 12/19(G+0.5)+1	21 - # 5 TRAN. BARS -LENGTH- (= G + 6")
28'-0"	29'-6"	101.67	46	30'-0"	20	30'-0"
30'-0"	31'-6"	108.33	49	32'-0"	22	32'-0"
32'-0"	33'-6"	115.00	52	34'-0"	23	34'-0"
34'-0"	35'-6"	121.67	55	36'-0"	24	36'-0"
36'-0"	37'-6"	128.33	58	38'-0"	25	38'-0"
38'-0"	39'-6"	135.00	61	40'-0"	27	40'-0"
40'-0"	41'-6"	141.67	64	42'-0"	28	42'-0"
42'-0"	43'-6"	148.33	67	44'-0"	29	44'-0"
44'-0"	45'-6"	155.00	70	46'-0"	30	46'-0"
46'-0"	47'-6"	161.67	73	48'-0"	32	48'-0"
48'-0"	49'-6"	168.33	76	50'-0"	33	50'-0"
50'-0"	51'-6"	175.00	79	52'-0"	34	52'-0"
52'-0"	53'-6"	181.67	82	54'-0"	36	54'-0"
54'-0"	55'-6"	188.33	85	56'-0"	37	56'-0"
56'-0"	57'-6"	195.00	88	58'-0"	38	58'-0"
58'-0"	59'-6"	201.67	91	60'-0"	39	60'-0"
60'-0"	61'-6"	208.33	94	62'-0"	40	62'-0"

✱✱ DATA IN ABOVE TABLE ARE BASED UPON COMMON SLAB / BRIDGE WIDTHS. WHERE OTHER WIDTHS ARE ENCOUNTERED, THE FORMULAE AT COLUMN TOPS MAY BE USED IN DETERMINING ADDITIONAL DATA NEEDED.

NO. 5 SPLICE BARS NOT INCLUDED. NUMBER REQUIRED IS DOUBLE THAT FOR #7 LONGITUDINAL BARS SHOWN ABOVE. SEE NO. 5 TOP MAT BAR BENDING DETAIL BELOW.

GENERAL NOTES:

1. SPECIFICATIONS: GEORGIA STANDARD, CURRENT EDITION, AND SUPPLEMENTS THERETO.
2. USE THIS STANDARD WHERE THE ROADWAY PAVING IS ASPHALTIC CONCRETE.
3. THE CONCRETE CAPS ADJACENT TO THE APPROACH SLAB WILL HAVE HOLES APPROXIMATELY 9"x9", BLOCKED OUT FOR GUARDRAIL POST INSTALLATIONS (SEE DETAIL). PAYMENT FOR APPROACH SLAB WILL INCLUDE THE ½" EXPANSION MATERIAL & CONCRETE CAPS WITH BLOCKED OUT HOLES. (SEE DETAIL AT FAR LEFT).
4. WIDTH OF APPROACH SLAB IS NORMALLY DETERMINED BY DISTANCE BETWEEN FACES OF BRIDGE END POSTS. DETAILS SHOWN ARE BASED UPON THE BRIDGE BARRIER FACE BEING TRANSITIONED 9" TO FACE OF END POST ON EACH SIDE. SEE BRIDGE PLANS IF BARRIER IS CONTINUED ACROSS APPROACH SLAB INSTEAD, SEE STANDARD 9017M.
5. MINIMUM COVER OVER TOP MAT OF REINFORCING SHALL BE 2".
6. WHERE APPROACH SLAB IS INTERCEPTED BY THE BRIDGE END POST, EXTERIOR BARS WILL BE SHORTENED AS NEEDED TO GIVE A 3" CLEARANCE TO STRUCTURE.
7. PAY AREA FOR APPROACH SLAB SHALL BE COMPUTED AS A PRODUCT OF THE OVERALL SLAB WIDTH [(G+1')/3] TIMES THE LENGTH (30/3) WITH NO DEDUCTIONS MADE FOR AREAS OCCUPIED BY THE END POST & EXPANSION JOINTS OR BY DRAINAGE STRUCTURES, AND NO ADDITIONS MADE FOR SIDEWALKS OR OTHER ITEMS WHEN REQUIRED WITH THE APPROACH SLAB.
8. "CS" CONC. OR P.C. CONC. SUBBASE SHALL BE USED. CLEAR POLYETHYLENE SHEETING 8 MILS MIN. THICKNESS, WITH A 6" OVERLAP, UNIFORMLY LAID, SHALL BE REQUIRED UNDER THE APPROACH SLAB TO PREVENT BONDING. POLYETHYLENE SHEETING SHALL BE NEW, UNUSED AND FREE OF HOLES, RIPS AND TEARS. PRICE FOR SUBBASE SHALL BE INCLUDED IN OVERALL PRICE BID FOR APPROACH SLAB.
9. ALL APPROACH SLABS EXCEEDING 42' IN WIDTH WILL CONTAIN A LONGITUDINAL CONSTRUCTION JOINT. SLABS EXCEEDING 60' AND 90' IN WIDTH SHALL CONTAIN 2 AND 3 LONGITUDINAL CONSTRUCTION JOINTS RESPECTIVELY. SECTIONS BETWEEN JOINTS OR BETWEEN A JOINT AND SLAB EDGE SHALL NOT BE LESS THAN 12' OR MORE THAN 30' WIDE. REINFORCEMENT STEEL REMAINS UNCHANGED AND SHALL EXTEND THRU JOINTS. JOINTS SHALL BE LOCATED AT LANE LINES TO PROVIDE OFFSET FROM WHEELPATHS.
10. SEAL JOINT BETWEEN APPROACH SLAB AND END POST WITH LOW MODULUS SILICONE SEALANT. JOINT WIDTH BEHIND ENDPOST SHALL MATCH JOINT WIDTH BETWEEN APPROACH SLAB AND BRIDGE.
11. ASPHALTIC CONCRETE INLAY SHALL BE PAID UNDER ROADWAY PAY ITEM FOR ASPHALTIC CONCRETE.

DATE	REVISION	BY
9-20-02	DIM. SLOPED EDGE	S.V.M.
9-18-01	GEN. REV.	
6-14-01	REV. ASPH. CONC. INLAY	

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

STANDARD
REINFORCED CONCRETE APPROACH SLAB
WITH ASPHALT INLAY
30 FT. LENGTH
TYPICAL USE : WHERE SHOULDER IS ADJACENT TO
ROADWAY AND/OR BRIDGE

SCALE AS SHOWN AUG. 1999

DES. ____
DRW. ____
TRA. ____
CHK. ____

(SUBMITTED) James A. Kennel
STATE ROAD & AIRPORT DESIGN ENGR.
(APPROVED)
CHIEF ENGINEER

NUMBER
9017R

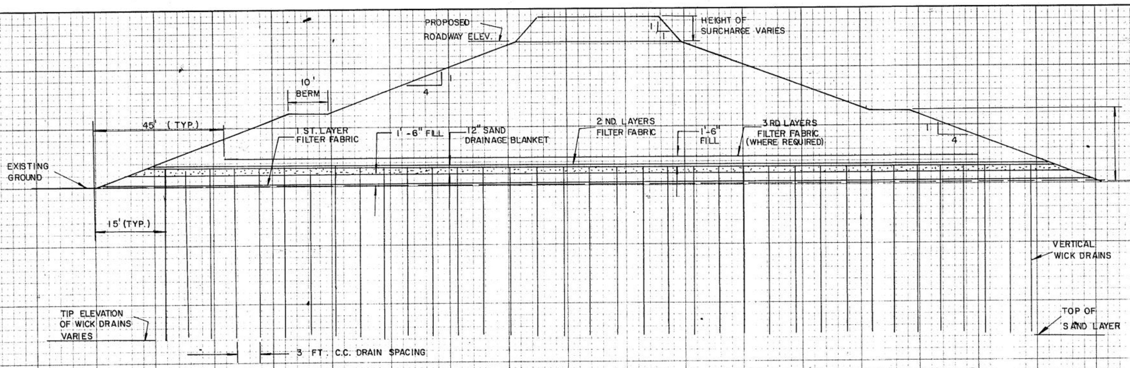
Exhibit C-4-3

R-55

AF 47045A

REVISED 12-11-90

STATE	PROJECT NUMBER	SHEET NO	TOTAL SHEETS
GA.	F-111-1(16)	130	

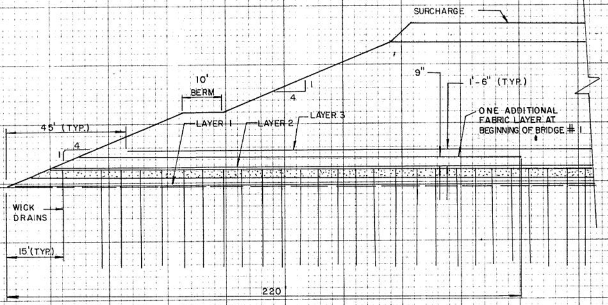


TYPICAL SECTION – WICK DRAIN, FILTER FABRIC & DRAINAGE BLANKET DETAILS

NO SCALE

NOTES

1. Vertical wick drains, filter fabric and drainage blanket should be installed in accordance with the special provisions, and with the following sequence:
   - A. Place the first layer of fabric, 1'-6" embankment fill and 12" sand drainage blanket. The drainage blanket should exit the fill slope as shown to allow open flow of water.
   - B. Install wick drains to the specified elevations.
   - C. Place the second layer of filter fabric and 1'-6" fill.
   - D. Place the third layer of filter fabric approximately 45' from the toe of slope and remaining fill as specified.
2. This section applies from Station 62+00 to 63+50 as follows:
   - A. Two layers of low strength filter fabric are required.
   - B. No wick drains are required. The sand drainage blanket is not required.
   - C. The 10' berm is not required.
   - D. Required construction sequence is to place 18 feet of fill and after a 30 day waiting period, place fill to plan grade plus a surcharge of 5 feet. The surcharge will remain for 270 days.
3. This section applies from Station 63+50 to 71+00 (begin bridge #1) as follows:
   - A. The first layer of filter fabric is low strength fabric.
   - B. The second and third layers are high strength fabric. Refer to the Special Provisions. One additional layer of high strength fabric is required at endroll area; refer to endfill typical section.
   - C. Wick drains will be installed to the top of the sand layer which varies from elevation -8 to -24. Refer to soil survey notes.
   - D. Required construction sequence is:
     - i. Place 15 feet of fill and wait 45 days
     - ii. Place additional 10 feet of fill and wait 45 days
     - iii. Place additional 10 feet of fill and wait 45 days
     - iv. Place fill to profile grade and wait 30 days
     - v. Place a surcharge of 5 feet and wait 11 months.
4. This section applies from Station 84+00 (end bridge #1) to 90+00 as follows:
   - A. Three layers of low strength filter fabric are required here.
   - B. Wick drains will be required to elevation -5 to -8. Refer to soil survey notes.
   - C. Required construction sequence is to place 12 feet of fill and after a 30 day waiting period, place fill to plan grade. After an additional 30 day period, a surcharge of 5 feet should be added which will remain for 10 months.
5. This section applies from Station 90+00 to 93+80± as follows:
   - A. Two layers of low strength filter fabric are required.
   - B. The 10' berm is not required.
   - C. Wick drains will be required to elevation -5 to -8. Refer to soil survey notes.
   - D. Required construction sequence is to place 10 feet of fill and after a 30 day waiting period, place fill to plan grade. After an additional 30 day period, a surcharge of 4 feet should be added. This surcharge will remain for 270 days.
6. Refer to fabric placement details for the direction that fabric is to be placed.
7. Vertical wick drains are placed at 3 feet centers on a triangular spacing pattern as shown.
8. The first 12" of all surcharges shall be compacted to normal compaction requirements for that section.
9. Construction of berms shall be accomplished concurrent with fill construction.

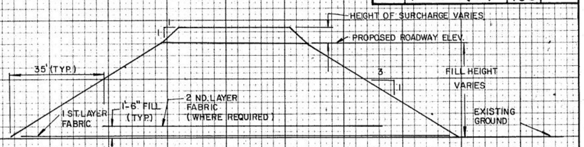


ENDFILL TYPICAL SECTION

NO SCALE

NOTES

1. At the beginning of bridge #1 endfill, the 1st layer of fabric is low strength, and layers 2 and 3 are high strength fabric. This fabric is unrolled perpendicular to the roadway direction. The one additional layer is high strength fabric and is unrolled parallel to the roadway. Refer to fabric placement details. Refer to typical section for fill placement sequence.
2. At the end of bridge #1 endfill, layers 1, 2 and 3 are low strength fabric. These layers are unrolled perpendicular to the roadway direction. No additional layers are required. Refer to typical section for fill placement sequence.

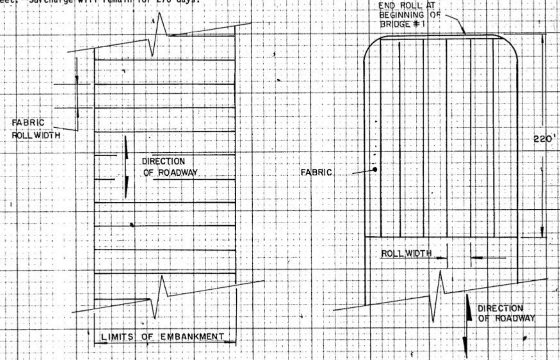


TYPICAL SECTION – 3 : 1 SLOPES

NO SCALE

NOTES

1. This section applies from Station 16+50 to 26+00 as follows:
   - A. One layer of low strength filter fabric is required.
   - B. Fills should be placed to plan grade, and after a 30 day waiting period, a surcharge of 3 feet will be placed. Surcharge will remain for 220 days.
2. This section applies from Station 51+50 to 62+00 as follows:
   - A. Two layers of low strength filter fabric are required.
   - B. Required construction sequence is to place 16 feet of fill and after a 30 day waiting period, place fills to plan grade and add a surcharge of 4 feet. Surcharge will remain for 270 days.

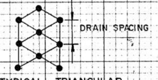


NOTE: Fabric layers are placed with the roll width perpendicular to the roadway direction as shown and field sewn.

NOTE: One additional fabric layer at the beginning of bridge #1 endroll is placed with the roll width parallel to the roadway direction as shown and sewn.

FABRIC PLACEMENT DETAILS

NO SCALE



TYPICAL TRIANGULAR DRAIN SPACING

F-111-1(16) CHATHAM SOUTHWEST BYPASS MARSH SOIL STABILIZATION

EP 00061

Exhibit C-5-1

R-55

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	F-111-1(16)	130A	

REVISED 2-6-90
REVISED 2-21-90
REVISED 3-29-90
REVISED 4-12-90
REV 5-1-91

Unsuitable Material

Material Unsuitable For Embankment Construction, Very Soft Organic Muck Requiring Removal, Was Encountered At The Following Locations To The Maximum Depths Indicated On This Project:

Station to Station	Location	Depth
19+50± - 20+00±	Centerline, Right & Left	4'
93+65±	In Ditch	3'

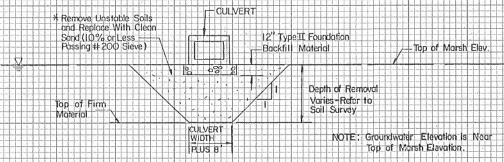
Removal of Unsuitable Material Shall Be Paid For As "Unclassied Excavation - Per Cubic Yard." Replacement Shall Be With A Material Having 10% Or Less Passing The No. 200 Sieve. Tidal Ditches Shall Be Filled In With The Same Type Material Prior To Fabric And Fill Placement. This Material Shall Be Paid For As "Borrow Excavation - Per Cubic Yard". Class III-B And Class III-C Materials Shall Not Be Placed Within 12" Of The Subgrade.

Special Problems - Culverts & Drainage Pipes

To Avoid Severe Settlement Problems With Culverts And Drainage Pipes Placed In Marsh Areas It Is Required That Unstable Soils Beneath The Culverts Be Removed As Shown.

Culvert Areas Requiring Removal Are:

Station	Culvert	Removal Depth
20+95	Dbl. 6'x5'	7'±
54+40	Dbl. 5'x4'	6'±
62+75	48" Pipe	7'±



NOTE: Groundwater Elevation is Near Top of Marsh Elevation.

REMOVAL TRENCH FOR CULVERTS IN MARSH AREAS

NO SCALE

*See notes for "Unsuitable Material".

Fill Construction Sequence

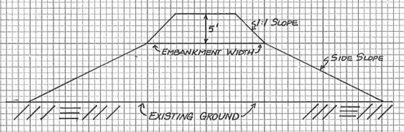
At The Locations Shown Below Stage Construction Shall Be Required. Waiting Periods Are Required To Allow Subsurface Soils To Consolidate And Gain Strength Before Additional Fill Can Be Placed. These Fills Will Be Instrumented And Waiting Periods May Be Adjusted In The Field. During Fill Placement, Temporary Construction Slopes In Marsh Areas Should Be No Steeper Than The Permanent Slopes Proposed For Those Areas At Any Time.

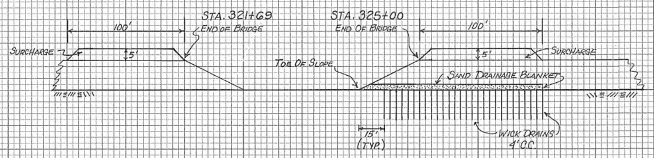
1. Sta. 16+50± to 26+00±
   Fills Shall Be Placed On A 3:1 Slope Using 2 Layers Of Filter Fabric. A Surcharge Of 3 Ft. Shall Be Placed On The Fill To Increase The Rate Of Settlement; This Surcharge Shall Remain For 240 Days.
2. Sta. 51+50± to 62+00±
   Fills Shall Be Placed On A 3:1 Slope Using The Following Sequence: Place 18 Ft. Of Fill And After A 30 Day Waiting Period, Place Fill Up To Grade Plus A 4 Ft. Surcharge. The Surcharge Should Remain For 270 Days.
3. Sta. 62+00 to 69+39
   Stage 1 - Place 15' Fill And Wait 45 Days.
   Stage 2 - Add 10' Fill And Wait 45 Days.
   Stage 3 - Add Another 10' Fill And Wait 45 Days.
   Stage 4 - Add 8' Fill (Up To Profile Grade) And Wait 30 Days.
   Stage 5 - Place 5' Surcharge And Wait 11 Months.
4. Sta. 84+00± to 90+00±
   Stage 1 - Place 12' Fill And Wait 30 Days.
   Stage 2 - Place Fill To Plan Grade And Wait 30 Days.
   Stage 3 - Place 5' Surcharge And Wait 10 Months.
5. Sta. 90+00± to 93+80±
   Stage 1 - Place 12' Fill And Wait 30 Days.
   Stage 2 - Place Fill To Plan Grade Plus 4' Surcharge. Surcharge Shall Remain For 10 Months.

Bridge Endfills Bridge 5

Notes: Endfill Areas At Bridge Site No. 5 Will Require Wick Drains To Speed Settlement Of Soft Underlying Clay Layers To Prevent Pile Dragdown And Differential Settlement Between Bridge And Roadway.

1. Wick Drains At 4 Ft. Centers To Elev. 0 Will Be Required As Shown.
2. A 12" Sand Drainage Blanket Shall Be Located As Shown.
3. Surcharge Of 5' Placed In The Designated Areas Shown Will Remain For 270 Days.





Other Notes:

1. Any Necessary Stripping Shall Be Done In Accordance With D.O.T. Specifications.
2. ~~At Those Locations Where Fill Material Is To Be Placed In Existing Ponds, Either Rock Embankment Or Clean Sand (10% Or Less Passing #200 Sieve) Shall Be Placed Up To The Water Level Before Normal Fill Construction Begins. This Material Shall Be Paid For As "Borrow Excavation - Per Cubic Yard".~~
3. Prior To Paving, All Excess In-Place Surcharge Shall Be Removed. This Material, If Suitable, May Then Be Used In Permanent Embankment Construction.
4. Waste Material May, With The Approval Of The Engineer, Be Used To Flatten Or Dress Slopes.

Construction Details & Notes

Earthwork Operations

FORM EF6

Exhibit C-5-2