

## **2018 STRUCTURES WORKSHOP MINUTES**

The 2018 Structures Workshop was held on April 5<sup>th</sup> in the Structures Management Unit Conference Room C in Raleigh, NC. Those in attendance included:

Brian Hanks	State Structures Engineer
Wendy McAbee	FHWA-Division Bridge Engineer
John Pilipchuk	State Geotechnical Engineer
Stephen Morgan	State Hydraulics Engineer
Phil Harris	Environmental Analysis – Unit Head
Chris Kreider	Assistant State Geotechnical Engineer
Jay Twisdale	Assistant State Hydraulics Engineer
Kevin Fischer	Assistant State Structures Engineer
Gichuru Muchane	Assistant State Structures Engineer
Todd Whittington	State Field Operations Manager
Cameron Cochran	Regional Bridge Construction Engineer
Aaron Earwood	Regional Bridge Construction Engineer
Troy Brooks	Area Construction Engineer
David Candela	Area Construction Engineer
Randy Hall	Area Construction Engineer
John Partin	Area Construction Engineer
Aaron Powell	Area Construction Engineer
Brian Skeens	Area Construction Engineer
Darin Waller	Area Construction Engineer
Colin Mellor	Environmental Analysis – ECAP Group Leader
Tom Santee	Geotechnical – Eastern Regional Operations Engineer
Scott Hidden	Geotechnical – Support Services Supervisor
Chris Lewis	Hydraulics – Engineer
Brian Lipscomb	Hydraulics – Engineer
Brian Radakovic	Hydraulics – Engineer
Charles Smith	Hydraulics – Engineer
Cabell Garbee	Materials and Tests – Field Operations Engineer
Aaron Dacey	Materials and Tests – Coatings and Corrosions Engineer
Jason Poppe	Materials and Tests – Concrete Products Engineer
Randy Porter	Materials and Tests – Metals Engineer
David Stark	Priority Projects – Project Engineer
Neil Mastin	Research and Development Manager
Mustan Kadibhai	Research and Development – Research Engineer
Kevin Aldridge	Roadway Design – Engineer
James Bolden	Structures Management – Project Engineer
Dan Muller	Structures Management – Project Engineer
David Snoke	Structures Management – Project Engineer
Bill Goodwin	Structures Management – Staff Engineer
Emmanuel Omile	Structures Management – Engineering Supervisor
Trey Carroll	Structures Management – Engineering Supervisor

The following topics were discussed:

### **WELCOME AND REVIEW OF 2017 STRUCTURES WORKSHOP MINUTES**

Mr. Hanks opened the workshop with welcoming comments. His opening was followed by self-introductions by the attendees.

Mr. Muller briefly summarized topics from the 2017 Structures Workshop minutes and progress of each topic was briefly discussed.

### **FHWA TOPICS**

#### **1) FHWA Updates**

Ms. McAbee discussed the importance of promptly notifying Structures Management once construction of a structure is completed. She noted FHWA requires timely updates of structure data, and any delay in inspection and updating of structure data will result in the structure becoming out-of-compliance.

#### **Action Item:**

Ms. McAbee will discuss with Divisions the importance of submitting required documentation and forms to Structures Management upon completion of a structure.

#### **2) Adhesive Anchors**

Ms. McAbee discussed a recently released Technical Advisory memo entitled *Use and Inspection of Adhesive Anchors in Federal-Aid Projects*. Ms. McAbee noted that a couple of NCHRP studies have been completed and the industry has made significant advances in adhesive anchor systems and installation. She also noted that ACI 318-14 now requires anchors in sustained tension be installed by certified personnel.

#### **Action Item:**

Construction, Materials and Tests, and Structures Management will discuss updating the policy for the use of adhesive anchors.

### **RESEARCH & DEVELOPMENT TOPICS**

#### **1) Upcoming Research Needs Cycle**

Mr. Mastin gave a presentation on the *NCDOT Research Process*. Mr. Mastin discussed the process and timeline from submitting initial research project ideas to how projects are selected and funded. Mr. Mastin encouraged units to submit research ideas and noted the deadline for submitting ideas for the fiscal year 2020 program is July 20, 2018.

#### **Action Item:**

None

### **STRUCTURES MANAGEMENT TOPICS**

#### **1) Unit Updates**

Mr. Hanks discussed Structures Management Unit's organizational chart and gave a brief description of the functions and responsibilities of the various project groups.

Action Item:

None

**2) Bridge Program & SMU Management of Central Bridge Projects**

Mr. Hanks and Mr. Fischer presented an overview of the Bridge Program including anticipated funding amounts and number of projects programmed for each fiscal year. Mr. Hanks shared that tentatively between Central and the Divisions there are approximately 1,000 bridge projects scheduled to be let within the next five years. Mr. Fischer stated that Structures Management is managing central bridge projects on primary routes and has contracted with a consultant to assist with the environmental document and permitting process. Mr. Hanks noted that other units will be involved in the bridge program and Structures Management will continue to keep a few projects in-house in order to maintain design expertise throughout the Department.

Action Item:

None

**3) Notice of Completion of Structure Forms**

Mr. Snoke stated there has been an increase in the number of Notice of Completion of Structure forms submitted and thanked the Construction Unit for their efforts. He discussed the importance of submitting forms prior to opening the structure to traffic to facilitate the benefits of reduced inspection costs and safety. Mr. Snoke stated Structures Management needs approximately a 1 month notice and noted not all Divisions are submitting forms in a timely manner. Mr. Earwood inquired if HiCams could be used to notify Division personnel of when forms should be submitted.

Action Item:

Construction Unit will investigate using HiCams to notify Division personnel of when Notice of Completion forms should be submitted.

Mrs. McAbee will discuss with the Divisions the submittal of Notice of Completion forms and their importance.

**4) Temporary Causeway Removal & Scour**

Mr. Muchane inquired about the process for ensuring temporary causeways located in water are completely removed. He described a recent situation where a bridge experienced scour issues due to the temporary causeway not being removed in its entirety. Area Construction Engineers stated that they coordinate with Division personnel to ensure causeways are removed and indicated the discussed bridge was an isolated situation.

Action Item:

None

**5) Fly Ash in Bridge Decks**

Mr. Hanks discussed the current Structure Management Unit policy which requires fly ash in concrete bridge decks in certain areas of the State as a corrosion protection measure. He added that the Unit is considering applying this policy to all concrete bridge decks across the State.

Mr. Whittington and Mr. Garbee noted potential issues with fly ash supply. Mr. Hanks responded by suggesting provisions and/or plan notes that would waive the fly ash requirement when there is a supply shortage.

Action Item:

Structures Management will revise the Design Manual to require fly ash in all concrete bridge decks across the State and discuss methods for waiving fly ash requirement due to supply shortage.

**6) Integrals & MSE Walls**

Mr. Hanks stated current Structures Management policy does not address integral end bents at MSE walls and he requested feedback on allowing their use. Mr. Hidden stated design build projects have utilized integral end bents at MSE walls, but details have been inconsistent. Mr. Hidden noted for some projects the cap movement is restrained with the use of straps and other projects the MSE wall is designed for cap movement. The discussion resolved to create a workgroup to look into the use of integral end bents at MSE walls.

Action Item:

Workgroup consisting of Construction, Geotechnical, and Structures Management will investigate integral end bents at MSE walls.

**HYDRAULICS TOPICS**

**1) Unit Updates**

Mr. Morgan discussed Hydraulic Unit's organizational chart, which consists of East and West design groups for in-house designs, which are led by Mr. Twisdale and Mr. Lauffer, respectively.

Action Item:

None

**2) Pipe Liners**

Mr. Smith discussed pipe liners and shared design resources that are available on the Hydraulic Unit's webpage. Mr. Smith noted Hydraulics is developing a project special provision to address design and construction inspection criteria for pipe liners.

Action Item:

Hydraulics will continue to develop design criteria and project special provision for pipe liners.

**3) As-Built Certification**

Mr. Twisdale thanked Construction for their effort in ensuring as-built plans are submitted to Hydraulics and requested Construction continue to remind Divisions the importance of submitting as-built plans in a timely manner. Mr. Twisdale stated if significant deviations to excavation limits are anticipated, the Hydraulics Unit should be contacted for review and approval.

Action Item:

None

**4) Culverts – Sill and Baffle Guidance Project**

Mr. Lipscomb discussed a sill and baffle project that is underway to address the limited guidance currently provided on their use. Mr. Lipscomb noted Construction and Structures Management will be involved with the project. Mr. Morgan inquired if there were any concerns with how sills

and baffles are currently detailed. Mr. Hanks described challenges with adequate dowel bar embedment in culverts with thin bottom slabs and large sills.

Action Item:

Hydraulics will continue to work on the sill and baffle guidance project.

**5) Scour Executive Committee**

Ms. McAbee proposed resuming the Scour Executive Committee to address scour related issues. The committee will include representatives from FHWA, Geotechnical, Hydraulics, and Structures Management Units.

Action Item:

Ms. McAbee will coordinate the restarting of the Scour Executive Committee.

**MATERIALS AND TESTS TOPICS**

**1) Unit Updates**

Mr. Whittington discussed Materials and Tests Unit's organizational chart. Mr. Whittington noted that he oversees field personnel; Mr. Brian Hunter is responsible for lab functions, and the pavement group reports directly to Mr. Chris Peoples.

Action Item:

None

**2) Concrete Girder Lead Times**

Mr. Garbee discussed a recent meeting with the prestressed concrete industry in which producers raised a concern with not having adequate lead times to efficiently produce concrete girders. Mr. Hanks noted an upcoming meeting between AGC and PCI to discuss lead times and similar issues.

Action Item:

Construction, Materials and Tests, and Structures Management will discuss lead times at an upcoming meeting between AGC and PCI.

**3) Project Site NCR Process**

Mr. Poppe stated Materials and Tests (M&T) should be notified if there is any issue with a precast/prestressed concrete piece on a project site. Mr. Poppe stated even if the piece is already approved by M&T inspectors, M&T will come out to the site and issue a Non-Conformance Report (NCR). Mr. Hanks noted this process is necessary for documentation purposes.

Action Item:

None

**4) Latex Overlay Certification**

Mr. Garbee stated a draft version of the Latex Overlay Certification program is completed and has been given to Construction for review.

Action Item:

Construction will review proposed Latex Overlay Certification program and provide comments to Materials and Tests.

**5) Rebar Program**

Mr. Dacey stated Materials and Tests is developing a comprehensive rebar program for concrete reinforcing steel products. Currently Materials and Tests maintains a program which addresses only epoxy coated reinforcing steel, but the new program will address all types of reinforcement such as stainless and uncoated steel.

Action Item:

Materials and Tests will continue to develop rebar program.

**6) RFID Updates**

Mr. Garbee stated RFID tags are being used on precast/prestressed concrete elements and the Department is no longer stamping prestressed girders. Materials and Tests is continuing to train Division staff and will begin placing RFID tags on metal, concrete, and plastic pipes soon.

Action Item:

None

**ENVIRONMENTAL ANALYSIS TOPICS**

**1) Unit Updates**

Mr. Mellor discussed Environmental Analysis Unit's organizational chart and noted the former Project Development and Environmental Analysis (PDEA) Unit has been separated into the Environmental Analysis Unit and Project Development Unit.

Action Item:

None

**2) Environmental Planning Process – Project Example**

Mr. Mellor discussed a project that required the construction of a temporary causeway and the resulting environmental planning process. Mr. Mellor highlighted that the project was delivered successfully because of the collaboration between multiple units.

Action Item:

None

**GEOTECHNICAL TOPICS**

**1) Unit Updates**

Mr. Pilipchuk discussed Geotechnical Unit's organizational chart and noted Mr. Chris Kreider was promoted to Assistant State Geotechnical Engineer over the Eastern Region. Mr. Pilipchuk introduced Mr. Santee as Mr. Kreider's replacement as the Eastern Regional Operations Engineer.

Action Item:

None

**2) Footings & Shallow Foundations at MSE Walls**

Mr. Hidden discussed project U-2525C in which several structures consisted of end bents on spread footings at MSE walls and noted all settlements were less than one inch. Mr. Hidden discussed benefits of allowing the bridge end bents to settle with the roadway embankment. Mr. Pilipchuk noted the use of shallow foundations at MSE walls would not be appropriate in the coastal plain. Mr. Hanks noted concerns with differential settlement and excessive end bent settlement if the MSE wall fails. The discussion resolved to monitor construction and performance of U-2525C end bents before allowing the use of end bents on spread footings at MSE walls.

Action Item:

Geotechnical and Structures Management will continue to investigate the use of shallow foundations at MSE walls.

**3) Follow-Up Approach Fills**

Mr. Hidden provided a brief overview of the new approach fill standards that went into effect with the 2018 Standard Specifications and discussed Structures Management Unit's policy for when to detail each fill type.

Action Item:

None

**4) Integral End Bent – Sleeper Slab Detail**

Structures Management is proposing a detail for integral end bent approach slabs that divides the approach slab into two separate slabs with a joint in between and a sleeper slab beneath the joint. Structures Management intends for this detail to address the issues with pushing of the asphalt at the interface of the approach slab and roadway. Mr. Hidden discussed Geotechnical Unit's concerns with the sleeper slab detail and stated that overtime approach slabs will settle due to the material below the approach fills consolidating. He noted the challenge of uniformly jacking an approach slab with a sleeper slab and stated one possible solution would be the use of compaction grouting, but the associated costs are significantly higher. Mr. Cochran suggested adding additional concrete cover to approach slabs in order for the slabs to be milled and paved over in the future if settlement becomes an issue.

Action Item:

Structures Management will continue to investigate details for approach slabs at integral end bents.

**CONSTRUCTION TOPICS**

**1) Unit Updates**

Mr. Cochran and Mr. Earwood discussed the Construction Unit's organizational chart and they noted the roles of Regional Bridge Construction Engineers and Area Construction Engineers.

Action Item:

None

**2) *Low Cover on Decks with Vertical Curve and Skew***

Mr. Cochran discussed low concrete cover issues that result from screeding skewed bridges with vertical curves and noted crest vertical curves typically cause greater cover issues than sag vertical curves. Mr. Cochran and Mr. Hanks agreed that typically a vertical curve ordinate of +/- 0.5" should be the limit. The group noted at 15% roadway plans these issues should be investigated and addressed.

*Action Item:*

*Construction will discuss and provide guidance for projects that require vertical curve ordinates greater than 0.5".*

**3) *Aluminum Culverts with Concrete Headwalls***

Mr. Cochran discussed concerns with not applying an adequate barrier between aluminum culverts and concrete headwalls to protect against the chemical reaction that occurs. He noted the type of barrier to be applied should be addressed in the submittal process. Mr. Morgan inquired if ends of pipes could be coated prior to arrival on a project site.

*Action Item:*

*Mr. Garbee will discuss coating pipes with Mr. Joel Howerton and the Contract Standards and Development Unit.*

**4) *Vehicular Culvert Underpasses***

Mr. Cochran inquired if precast vehicular culverts could be constructed to save time and expedite project delivery. Ms. McAbee noted Massachusetts DOT has utilized precast vehicular culverts previously.

*Action Item:*

*Structures Management will add language to the Design Manual to consider using precast vehicular culverts for low volume roads.*

**5) *Casting Precast Units in Advance of Contracts***

Topic was discussed in conjunction with the Materials and Tests topic "Concrete Girder Lead Times".

*Action Item:*

*None*

**6) *Advanced Work Projections for Precasters***

Mr. Cochran inquired if advanced work projections would give precasters greater opportunity to prepare and plan their work. Mr. Hanks noted a 12 month let list is available for Central let projects and the list provides girder types and span lengths.

*Action Item:*

*None*

**7) *Integral End Bent Detail – Dowels vs. 45 Degree "S" Bars***

Mr. Cochran discussed an integral end bent project where a full depth crack developed at the interface of the approach slab and 10" blockout. He noted the Contractor used a non-standard detail consisting of a dowel with a 90 degree bend projecting out of the blockout. The

Construction Unit is investigating the cause of the crack. Mr. Cochran stated the standard detail with a 45 degree "S" bar is the preferred choice.

Action Item:

Construction will investigate the cause of the crack and advise Structures Management.

**8) Layout of EJS Hold-Down Plates to Ensure Correct Placement**

Mr. Candela stated the Project Special Provision for Expansion Joint Seals states the locations where the hold-down plates should be spliced, but noted instances in the field where plates are spliced incorrectly and that Contractors are missing these details. Mr. Candela inquired if the details are being reviewed and Mr. Bolden responded by stating that his group does review the hold-down plate details.

Action Item:

Structures Management will review the EJS Project Special Provision and Standards and revise as necessary.

**9) CNI in Superstructure of Coastal Bridges**

Mr. Candela stated that projects located in the corrosive coastal environment typically specify calcium nitrite inhibitor (CNI) be included in the superstructure elements. He noted that for barrier rails CNI causes workability issues. Mr. Candela inquired if CNI in the barrier rails is necessary.

Action Item:

Structures Management will review the corrosion protection policy and the use of CNI in barrier rails of coastal bridges.

**10) Mid/High Range Water Reducers to Increase Slump on Coastal Bridges with CNI**

Mr. Earwood noted Contractors are submitting concrete mixes with higher slumps (5"-7") to account for the workability issues that are caused by the addition of CNI into the mix. Mr. Earwood inquired if there is a policy to address this issue.

Action Item:

Materials and Tests will review mix design policies.

**11) Precast Soffits/Precast Forms for Integral End Bents**

Mr. Earwood noted that Contractors are precasting soffits, forms, and other pieces that are permanently left in the structure. He expressed concern with Department personnel being required to travel to the Contractor's yard to ensure quality control. Mr. Garbee stated Materials and Tests is developing a policy to address these items. The discussion resulted in the Construction Unit agreeing to inform Materials and Tests when a Contractor is casting a piece until a policy is implemented.

Action Item:

Materials and Tests, Construction, and Structures Management will develop a policy to address precast soffits, forms and similar items.

**12) Rebar in Parapet of Three Bar Metal Rail - Update**

Mr. Earwood requested a status update from Structures Management Unit concerning detailing rebar in the parapet for the Three Bar Metal Rail. Mr. Carroll stated the revised details are being finalized.

Action Item:

Structures Management will release revised details providing rebar in the parapet for the Three Bar Metal Rail.

**13) CFL Diaphragm Forming**

Mr. Earwood discussed cracking issues with the standard continuous for live load (CFL) diaphragms at exterior girders. Mr. Earwood noted that for the Bonner Bridge replacement project the Contractor is extending the CFL diaphragm beyond the exterior girder in lieu of following the girder profile. Mr. Earwood inquired if the Bonner Bridge detail would address the current cracking issues.

Action Item:

Construction and Structures Management will investigate the Bonner Bridge detail during the Spring Field Review.

**14) Deck Cracking Policy – VDOT**

Mr. Earwood discussed Virginia DOT's policy for addressing cracks in new bridge decks and stated it would be beneficial for NCDOT to have a similar policy. VDOT's policy prescribes different levels of corrective actions depending on a cracks size. Mr. Muller suggested meeting with VDOT to discuss their policy.

Action Item:

Mr. Muller will coordinate a meeting with VDOT to discuss their deck cracking policy. Construction and Structures Management will investigate developing a policy to address cracks in new bridge decks.

**15) Sealing Cracks in Closure Pours**

Mr. Earwood discussed Virginia DOT's practice of sealing cracks in new bridge decks after a bridge has been in-service for approximately 12 months, and he stated it would be beneficial for NCDOT to have a similar practice. Mr. Earwood and Mr. Cochran noted that if Contractors would be required to seal cracks then waiting 12 months would not be feasible because it would be important to ensure the contract is still open.

Action Item:

Construction and Structures Management will investigate developing a policy for sealing new bridge decks.

**16) Cold Weather Concrete Placement – Temperature Monitoring**

Mr. Earwood discussed a project where the Contractor's heaters used to protect curing concrete during cold weather failed. Mr. Earwood noted there was no way of knowing how long the concrete was exposed to low temperatures because the maximum-minimum recording only records the extreme temperature. Mr. Cochran stated that devices are available that monitor and record the entire temperature cycle. Discussion continued on the use of monitoring devices and the decision was made to require the use of monitoring devices.

Action Item:

Construction (Mr. Cochran), Materials and Tests (Mr. Whittington), and Structures Management (Mr. Carroll) will develop a Project Special Provision for temperature monitoring.

**17) Cost of Coring if CSL fails**

Mr. Earwood stated the Department has traditionally paid for extra work associated with coring drilled piers when CSL testing dictates further investigation is necessary. Mr. Cochran inquired why the Department is paying for the extra work when according to Section 411 of the Standard Specifications, no additional payment is to be made for further investigation when CSL testing results indicate a questionable pier.

Action Item:

Construction and Geotechnical will discuss further and address the concern.

**18) Epoxy Anchors in Constant Tension – Policy**

Topic was discussed in conjunction with the FHWA topic "Adhesive Anchors".

Action Item:

Construction, Materials and Tests, and Structures Management will develop a policy for the use of adhesive anchors.

**19) Mechanical Anchors Usage (Permanent and Temporary)**

Mr. Earwood discussed instances where Contractors have proposed the use of mechanical anchors in permanent applications such as pedestrian rails, drainage systems and temporary applications such as temporary falsework. He inquired if mechanical anchors should be approved. Discussion continued and the group consensus was the use of mechanical anchors should be addressed on a case-by-case basis until a policy can be developed.

Action Item:

Construction and Structures Management will investigate the use of mechanical anchors for both permanent and temporary applications.

**20) Silane on New Bridge Decks**

Topic was discussed in conjunction with the Construction topic "Sealing Cracks in Closure Pours".

Action Item:

None

**21) Silane on Substructure**

Mr. Earwood inquired if silane should be applied to the tops of end bent and bent caps at joints to protect the concrete. Mr. Hanks stated that the policy for applying silane to bridge decks could address locations where silane is to be applied to the substructure.

Action Item:

Construction and Structures Management will investigate developing a policy for sealing new bridge decks.

**22) IRI on PPC Overlay**

Mr. Earwood discussed the use of International Roughness Index (IRI) for rideability on bridge decks with Polyester Polymer Concrete (PPC) overlays and a concern with the IRI producing unacceptable results.

Action Item:

Construction (Mr. Earwood) and Structures Management (Mr. Tim Sherrill) will investigate the use of IRI on bridge decks with PPC overlays.

**23) Stirrups in Cored Slabs and Box Beams with Concrete Overlays**

Mr. Earwood discussed Virginia DOT's use of stirrups projecting out of cored slab and box beam units with a concrete overlay and inquired if the Department should consider using a similar detail. Overall consensus was the stirrups would be a benefit to the performance of the concrete overlay. Mr. Hanks stated topic could be discussed further with Contractors in the AGC-DOT Joint Bridge Subcommittee meeting.

Action Item:

Construction and Structures Management will discuss topic with Contractors in the April AGC-DOT Joint Bridge Subcommittee meeting.

**24) Sawtooth Approach Slabs**

Mr. Earwood discussed the construction challenges of a sawtooth approach slab. Mr. Earwood noted that a trapezoidal approach slab would be preferred in lieu of the sawtooth slab.

Action Item:

None

**25) Use of DTIs on Painted Surfaces**

Mr. Earwood discussed challenges with obtaining accurate readings from direct tension indicators (DTIs) used on painted and coated surfaces. He noted instances where initially acceptable readings are obtained on bolted connections with multiple paint layers, but later when the DTIs are checked again the bolt had lost tension due to creep. Mr. Earwood stated this issue typically occurs at diaphragm connections.

Action Item:

Materials and Tests will coordinate meeting with Construction and Structures Management to address the issue of DTIs on painted surfaces.

**26) Use of Type K Cement**

Mr. Earwood discussed Virginia DOT's use of Type K cement to minimize shrinkage cracking in concrete overlays and he discussed the potential use of Type K cement in North Carolina.

Action Item:

Mr. Earwood will organize a meeting for a Type K cement manufacturer to share product information with Construction, Materials & Tests, and Structures Management.

**27) Barrier Rail Bars for Cored Slab & Box Beams on Superelevations**

Mr. Earwood discussed a recent cored slab bridge project in which the Contractor had to manually bend the barrier rail bars projecting from the cored slab units into proper orientation for

adequate concrete cover due to a 3% superelevation. Mr. Earwood inquired if Contractors had to routinely make barrier rail bar adjustments for superelevated cored slab and box beam bridges. Mr. Hanks stated topic could be discussed further with Contractors in the AGC-DOT Joint Bridge Subcommittee meeting.

*Action Item:*

*Construction and Structures Management will discuss topic with Contractors in the April AGC-DOT Joint Bridge Subcommittee meeting.*

**SPRING FIELD REVIEW ITINERARY**

Prior to the Structures Workshop, Structures Management and the Area Construction Engineers (ACEs) discussed possible bridge sites to visit on the Spring Field Review trip. Structures Management prepared a map including all of the suggested bridge locations in the Eastern part of North Carolina. Following the workshop, Mr. Muller and the ACEs reviewed this map and discussed potential routes for the trip. Structures Management and the ACEs will continue to discuss bridge sites and routes to finalize the trip, which is scheduled for April 17<sup>th</sup> – April 19<sup>th</sup>.