

TED L. BARTELT, PE

President



Education: Bachelor of Science 1983, Civil Engineering
North Carolina State University

Registrations: Professional Engineer: North Carolina License 14455
FHWA NBIS Program Manager / Team Lead Bridge Inspector

Affiliations: American Society of Civil Engineers
American Council of Engineering Companies
American Society of Highway Engineers
International Concrete Repair Institute

Professional Summary: Ted founded Alpha & Omega Group in 1998 and is the president and principal-in-charge of civil and structural engineering projects. His 38 years of experience range from investigations of buildings, bridges, dams, and other types of structures to bridge design, building design, industrial facilities, equipment supports, concrete tilt-up design, flood studies, storm water impoundment design, erosion control design, water and sanitary system design, retaining wall design, concrete repair, parking lot design, general site development, project specifications, cost estimates, and construction administration.

Experience: Bridges:

Rumbling Bald Bridge Replacements, Rumbling Bald Resort, Lake Lure, NC, 2019

Principal-in-Charge for the replacement of the Quail Bridge and the Gateway Drive Bridge at Rumbling Bald Resort. The routine bridge inspection identified deteriorated members and the need to replace both bridges. The scope included civil and structural design, construction documents, assistance with bidding, and providing construction administration. The work required coordination with utilities, geotechnical, and environmental permitting.

Lake Royale Sagamore Drive Bridge Replacement, Louisburg, NC 2018 Principal-in-Charge for the inspection, repairs, design and plan preparation of the bridge Sagamore Drive bridge replacement over Lake Royale. A two span prestressed concrete cored slab bridge was designed to replace a failing prestressed channel beam, multi-span bridge that was load posted below emergency vehicle weights. The project included bridge design, roadway design, utility relocation, erosion control design, cost estimate, and construction administration.

City of Fayetteville Bridge Management Program, Cumberland County, City of Fayetteville, 2018

Principal-in-charge for development of a bridge program for the City of Fayetteville to address priority maintenance repairs from the biannual inspection. The program also creates a database of the bridge inventory and defines a direction to continue to improve the bridges and extend their useful life.

Winston Salem Bridge Repair, Winston Salem, NC, 2020

Project Manager for proposed repairs to steel beams of bridge superstructure for bridge 330330. A&O provided structural engineering services to Smith-Rowe for the repairs to the four steel beams that had developed holes in the webs from corrosion. Special H-pile supports were designed and attached to the interior bent to support two of the damaged beams.

NCDOT Division 12 Bridge Preservation Plans, Southwest NC Principal-in-charge for providing engineered repair plans for 21 structures in five counties. Conducted in-depth field assessments to identify and quantify all defects. Repairs include latex-modified concrete deck rehabilitation, structural steel repairs, bearing replacement and concrete repairs to the substructure.

Bonner Bridge Repair Plans, NCDOT, Dare County NC Structural engineer of record for the \$14.7 million Bonner Bridge repair project completed in November, 2010. Responsible for the development of 166 pages of plans and special provisions for concrete repairs using shotcrete, epoxy mortar, concrete and additional reinforcing. The project achieved a Merit Award for the International Concrete Repair Institute's 2011 project of the year.

Victoria Bridge, Biltmore Estates, NC Senior structural engineer for the in-depth assessment and development of repair plans for the pre-1900 Victoria bridge. The work required non-destructive testing of the structural steel plate through-girders, load rating and analysis of the bridge for legal truck loadings, and the development of repairs to the structural plate girders. The discovery of severely corroded steel column components required the development of emergency repairs by the encapsulation of the steel columns with reinforced concrete.

NCDOT Division 6 Replacement of Bridge 175, Bladen County, NC, 2018 Project manager and Engineer of Record for the hydraulic, erosion control, and structural design of bridge on Singletary Mill Pond Road over Boots Swamp. Completed a bridge survey report and drainage plans according to NCDOT guidelines. Structural design included a two-span cored slab bridge on a horizontal curve with a 0.04 super elevation.

NCDOT R-1015 Bridge Design, Craven County, NC, 2018 Principal-in-charge and Engineer of Record for the design of dual bridges on US 17 over Slocum Creek. Bridge design met Interstate highway standards and included 12 spans, 135 feet long with 40 feet clear roadway on tangent alignment and 90-degree skew. A third structure included was designed with two spans, about 100 feet long, with 52 feet clearance for roadway on tangent alignment and 66-degree skew.

NCDOT B4620 and B4624, Robeson and Rockingham Counties, NC, 2016 Principal-in-charge and engineer of record for the replacement of three bridges. TIP project 4620 included dual bridges 121 and 123 over Ashpole Swamp on state road 2455 (White Pond Road) in Robeson County. TIP project 4624 included bridge 80 over Wolf Creek on state road 1929 (Estes Road) in Rockingham County. Each bridge was designed with three spans of cored slabs, end bents on piles, tangent 90 degrees skew, and roadway clearance of 30 feet, 10 inches.

NCDOT U-6003, Forsyth County, NC, 2019 (suspended) Project manager for the design of two RCBC culverts in Forsyth County. As a sub-consultant to HDR, we coordinated with hydraulics and roadway to determine the lengths and design criteria for a 14'x7' and a 7'x7' RCBC with a 105 degree and 64 degree skew respectively. The 7'x7' RCBC was located in a horizontal curve with a changing rate of super-elevation.

Hydraulics:

Wake County Dams #1 & #2 Wake County, NC

Principal-in-Charge for the design and construction administration of 12" siphons in-lieu-of underwater slide gate replacements. Proper sizing of the siphon was needed to draw down the lake in a safe and timely manner.

Emergency Action Plans for North Carolina State Parks, various locations, NC

Principal-in-Charge for preparation of hydraulic models, inundation mapping, and EAPs for Hanging Rock State Park Dam, Merchants Millpond Dam, Morganton Watershed Dam, Shorts Lake Dam, and South Mountain Lake Dam. EAP work included coordination with NCDEQ to obtain relevant information.

Emergency Action Plans for City of Wilson Dams, Wilson, NC

Principal-in-Charge for preparation of hydraulic models, inundation mapping, and EAPs for Lake Wilson Dam and Wiggins Mill Dam in Wilson, NC. EAP work includes coordination with NCDEQ and the City of Wilson to obtain relevant information.

Emergency Action Plan for City of Jacksonville Storage Lagoon, Wake County, NC

Principal-in-Charge for developing an EAP for the Land Treatment System South Storage Lagoons in Jacksonville, NC, located on the banks of Southwest Creek. The stream is part of a FEMA/NCFMP limited detail flood study with four major crossings.

Hydrologic and Hydraulic Analysis – Neuse River Basin, NC 2019

Principal-in-charge for H&H analysis of 25 dams located within the Neuse River Basin for the NC Department of Environmental Quality (DEQ) Division of Energy, Mineral and Land Resources (DEMLR). Provided technical guidance for hydraulic parameters and assumptions for riser/barrels, primary spillways, and auxiliary spillways needed to perform the work. Analysis was performed utilizing a simplified HEC-HMS rainfall-runoff hydrologic analysis and reservoir routing models for 6 frequency-based storms per dam; Stream Stats reports; calculation of watershed hydrologic and hydraulic parameters; reservoir stage and storage relationships and calculation of dam spillway stage-discharge relationships for all spillways.

Water Level Monitoring Feasibility Study, Wake County, 2017 Principal-in-charge of a feasibility study to evaluate various methods for determining lake levels for the 10 stormwater impoundments maintained by Wake County and to evaluate the applicability of using drones to capture a major storm event.

W-5107A, 60" WSP Bore and Jack, Johnson County, NC Served as engineer of record for hydraulic engineering and structural engineering of a 60" welded steel pipe bore and jack under US 70 Bypass to supplement the existing double 6'x6' RCBC. The project required utility coordination to determine that there were no utility conflicts.

NCDOT Division 6 17BP.6.R.73 Bridge 175 Replacement, Bladen County, NC Project manager for the hydraulics, erosion control and structural design of NCDOT bridge 175. Included FEMA approval of memorandum of agreement; hydraulic BSR, drainage calculations; permit impact drawings; drainage summary sheet; clearing and grubbing and final phase erosion and sediment control design plans, calculations, and quantities.

NCDOT Division 13 Group Q Bridge Replacements, McDowell and Rutherford Counties, NC Project manager and lead hydraulic engineer for the development of three culvert survey reports, one pipe data sheet and erosion control plans. One location was within a FEMA detailed study and required an memorandum of agreement.

NCDOT Division 14 Hydraulic Modeling and Bridge Replacements, Western NC Project manager for hydraulic modeling and bridge replacements for two Group 1 bridges in Division 14. Services included geotechnical borings and foundation recommendations. Provided design recommendations to NCDOT and submitted models ensuring no adverse effects to FEMA regulated floodplains.

Carpenter Fire Station Road Anchored Wall Design, Cary, NC 2019 Principal-in-charge for the anchor wall design and development of plans for two permanent tie-back anchored walls and one temporary tie-back anchored wall. The permanent walls were for the roadway underpass to be constructed below the existing CSX railroad to allow a railroad bridge to be constructed. The temporary wall was to support a railroad detour bridge adjacent to the proposed roadway cut to keep the railroad operational during the bridge construction. The walls were steel soldier piles with lagging supported by tie-back anchors.

Boonville Wastewater Treatment Plant, Boonville, NC, 2018 Principal-in-charge. Assisted with the structural investigation of tank #2 at Boonville WWTP. Conducted field measurements and ultrasonic testing, QA/QC on welding details, and construction administration for repairs.

Camp Creek Sewer Pipe Foundation Repair, Town of Cary, NC, 2017 Project manager for emergency repair project for supports to a 48-inch aerial sewer line that serves as the main interceptor leading to the Town's water reclamation facility. Investigated three foundation supports for scour, cracks and spalls that were damaged when a tree fell on the sewer line during Hurricane Matthew. Documented all damage in a summary report and developed repair plans and an engineer's opinion of construction cost. During construction, A&O conducted site visits and provided construction administration.

Fort Gordon Back Hall Concrete Supports, Fort Gordon Army Base, Augusta, Georgia, 2016 Project manager, as subconsultant to Eaton Corporation, to oversee structural engineering and design of concrete pads and piers to support generators, walk-in switchgear, UPS enclosures, and other heavy equipment. Conducted field investigation to analyze the existing structural elements, designed and developed construction documents for new supports, and developed as-built drawings to include any field modifications during construction.

Dam Inspection and Repair, US Forest Service, Highlands, NC, 2015 Project manager. Inspected and designed repair plans for the high-hazard Cliffside Lake Dam on Skitty Creek in Macon County. After reviewing previous inspection reports, EAP, and other documents, developed a written report detailing the condition of the dam, recording deficiencies, and documented conditions with photographs. Produced final design plans that quantified and detailed removal of deteriorated concrete, crack repair, concrete cleaning, and shotcrete finish.

Waterproofing Repairs on Taxiway Tunnels C and D, RDU Airport, Raleigh-Durham, NC Structural investigation and development of contract documents and construction administration of concrete repairs to Taxiway C and D Tunnels. These tunnels provide vehicular underpassage of two aircraft taxiways. The work consisted of concrete crack pressure grouting to prevent ground water infiltration through the structures.

Enplane Deck Concrete Repairs at Terminal C, RDU Airport, Raleigh-Durham, NC

Structural investigation and development of contract documents as well as construction administration of concrete repairs to the Enplane Deck at terminal C. The work involved concrete spall repairs, expansion joint repairs, and application of a waterproofing coating to the concrete surface to prevent moisture intrusion into the concrete. The work occurred at night to minimize disruption to the airport's normal service operations.

Cherry Point Marine Corps Air Station, Structural Integrity Study, Cherry Point, NC

Structural investigation of 18 buildings and warehouses at Cherry Point Marine Corps Air Station, Cherry Point, NC. The buildings were constructed of timber, concrete, and steel. Work involved inspection, analysis, report, and recommendations for repair.

Alcatel Network Systems, Raleigh, NC Investigation, design, and rating of hoist systems, mezzanines, roof-mounted satellite dish antennae, and air handling units for various buildings at Alcatel in Raleigh, North Carolina. The investigations required evaluation of roof structural system for placement of steel supports. Field investigation involved field measurements and verification of building as-built drawings. Analysis and preparation of structural steel drawings for construction bidding.

Polymer Group, Inc. Plant Expansion, Little Rock, Arkansas, 1999 Structural engineer for a fast-track, design-build project requiring structural design to be performed on-site during construction of the project. An existing warehouse facility was gutted and two new process lines were installed. The work involved the removal of many existing columns, thus requiring the installation of temporary shoring. New columns were installed with more spacing to allow for the installation of new heavy foundations. Provided on-site design and construction observation.

Polymer Group, Inc. Building Addition, Benson, NC, 1998 Design of the foundations, structural steel, mezzanines, and HVAC roof support system for the Air Wash Building at PGI in Benson, North Carolina. The work included conflicts with existing building foundations requiring the use of cantilevered roof girders and roof beams to separate the proposed foundations from the existing building foundation.

Morton International, Wytheville Plant, Wytheville, VA, 1998 Design of several equipment mezzanines, support platforms, penthouse addition and service platforms for renovation and production improvements to existing manufacturing facility. The work involved structural steel framing utilizing both I-shapes and tube sections, matching existing equipment and coordination with existing framing and foundations under fast-track conditions while plant was in operation.

Rexam Beverage Can 24-Ounce Upfit, Winston Salem, NC Structural analysis and design for improvements to this 390,000 square-foot aluminum can manufacturing plant. Modifications included foundations and pit for a new can washer and drying oven, a new concrete ramp at a railroad loading dock, and an extension of a metal building which houses vacuum pumps. Scope was later increased to include analysis of the existing roof framing and modifications to an existing mezzanine to accommodate revisions to material handling processes necessitated by the upfit. The project also required the repair of a concrete column that was damaged from improper construction loading.

IcePlex Skating Facility, Raleigh, NC Structural engineering for a segmental retaining wall which was approximately 150 feet in length and varied in height from four to nine feet. The wall, having a radius, provided support for vehicular loads in the parking lot and a front slope. The work included development of construction contract documents.

Pulte Home Corporation, Raleigh, NC North Carolina structural engineer for Pulte Home Corporation. Work involved design and plan preparation of structural framing plans. Work also included field investigations of foundations and structural framing for modifications made on job site.

Rexwoods IV Office Building, Raleigh, NC Provided structural engineering services for segmental retaining wall. The wall geometry is linear with a ninety-degree turn at the high end. The wall is approximately 180 feet in

length and varies in height from four feet to thirteen feet. It was designed to carry vehicular loads and for storm water runoff by means of a swale at the top. The work included development of construction contract documents.

Bridges:

Rumbling Bald Bridge Replacements, *Rumbling Bald Resort, Lake Lure, NC, 2019* Principal-in-Charge for the replacement of the Quail Bridge and the Gateway Drive Bridge at Rumbling Bald Resort. The routine bridge inspection identified deteriorated members and the need to replace both bridges. The scope included civil and structural design, construction documents, assistance with bidding, and providing construction administration. The work required coordination with utilities, geotechnical, and environmental permitting.

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NCDOT B-4620 and B-4624, *Robeson and Rockingham Counties, NC, 2017* Project manager and Engineer of Record for the design of the replacement of bridges 80, 121, and 123. Two bridges were located in Robeson County and one in Rockingham County. The bridge design accommodated top-down construction methods.

NCDOT 2514 – D Dual Bridges, *Jones and Craven Counties, NC, 2014* Principal-in-charge for the structural design of dual roadway bridges on the Wilmington Bypass/US17 over Simmons Loop Road (SR 1330). Included design, plan preparation, and special provisions for the superstructure and substructure integral end bent dual structures.

Manns Harbor Bridge NBIS Inspection and sUAS flight, *Manteo, NC, 2017* Performed field inspections, analysis, rating and report preparation for three-mile, 312-span concrete and steel bridge built in 1955. Assisted with flight of small unmanned aerial system flight as a test to determine feasibility of using the technology as a tool for bridge inspections.

Emerald Isle Bridge In-Depth Assessment and Repair Plans NCDOT, *Bogue Banks, NC* Lead engineer of the in-depth condition assessment to determine deficiencies and recommend repairs to the 4,612-foot Emerald Isle Bridge, which crosses the Intracoastal Waterway. Structural engineer of record for the repair plans. Responsible for the development of plans and special provisions for concrete repairs using shotcrete, epoxy mortar, concrete and additional reinforcing.

NCDOT Division 12 Bridge Preservation Plans, *Southwest NC* Principal-in-charge for providing engineered repair plans for 21 structures in five counties. Conducted in-depth field assessments to identify and quantify all

defects. Repairs include latex-modified concrete deck rehabilitation, structural steel repairs, bearing replacement and concrete repairs to the substructure.

Victoria Bridge, Biltmore Estates, NC Senior structural engineer for the in-depth assessment and development of repair plans for the pre-1900 Victoria bridge. The work required non-destructive testing of the structural steel plate through-girders, load rating and analysis of the bridge for legal truck loadings, and the development of repairs to the structural plate girders. The discovery of severely corroded steel column components required the development of emergency repairs by the encapsulation of the steel columns with reinforced concrete.

Division 7 Express Design Build, Guilford, Alamance, Orange, Caswell, and Rockingham Counties, NC Principal-in-charge and Engineer of Record responsible for overseeing all aspects of structural and hydraulic engineering including conducting bridge design and plans as well as construction services. As on every project, ensured quality assurance and quality control.

Bonner Bridge Repair Plans, NCDOT Structural engineer of record for the \$14.7 million Bonner Bridge repair project completed in November, 2010. Responsible for the development of 166 pages of plans and special provisions for concrete repairs using shotcrete, epoxy mortar, concrete and additional reinforcing. The project achieved a Merit Award for the International Concrete Repair Institute's 2011 project of the year.

Bonner Bridge Inspection and In-depth Assessment (2006), NCDOT, Dare County, NC One of three team leaders who performed field inspections, detailed field sketches and report preparation for the National Bridge Inspection Standards inspection of the Bonner Bridge. Project manager for the in-depth condition assessment to determine deficiencies and recommend repairs to maintain current functionality of the bridge until 2016.

Bridge Replacement Planning Report, B-2225, Pitt County Assisted with the planning document for replacement of a 200-foot span historic Parker steel truss bridge over the Tar River. Provided structural engineering services to determine if the truss bridge could be rehabilitated to current service levels and AASHTO standards. The effort included field reconnaissance, analysis of existing member capacity, developing methods to strengthen or replace structural members, evaluating condition and capacity of existing substructure, developing methods to replace or rehabilitate the existing bridge deck, and preparing construction cost estimates.

Dismal Swamp Floating Swing Span Bridge, Camden County, NC Structural engineer of record for the Dismal Swamp floating swing span bridge project in Camden County, North Carolina. The floating swing-span bridge provides an innovative and economical solution to crossing the Dismal Swamp Canal for pedestrian and vehicular access to the Dismal Swamp Visitor Center. The combination 85-foot floating swing span, two 15-foot bascules and a two-span continuous approach section allowed for an ADA accessible crossing with variable water surface elevations at a cost of 1.3 million dollars. In addition to construction administration services, special inspection services were provided.

West Back Creek Bridge, Burlington, NC Structural engineer of record for a 180-foot (three 60-foot spans) vehicular bridge with pedestrian sidewalks. The project included H-pile end bents, drilled shaft interior bents, prestressed concrete cored slab superstructure, with two 6-foot sidewalks and aluminum pedestrian rails. Coordination was required for a FEMA flood study and geotechnical recommendations for foundation supports.

Buck Hill Creek Bridge, Burlington, NC Structural engineer of record for the single-span cored slab bridge with concrete abutments. The project included superstructure and substructure design and plan preparation of a 53-foot, simple span, prestressed, precast, concrete cored slab bridge on reinforced concrete abutments for a private developer.

NCDOT Municipal Bridge Inspections (since 1984), throughout NC Performed field inspections, analysis, rating and report preparation in the third, fourth, fifth, seventh, eighth and ninth cycle bridge inspection program while employed with TGS Engineers and Dennis K. Hoyle and Associates. Evaluated hundreds of bridges and prepared reports with inspection notes, photographs and analysis to describe the existing physical condition of bridges and recommended maintenance needs. The bridges were located throughout North Carolina.

B-3059, SR3007 (Morgan Street) over Norfolk Southern and CSX Railroad, Wake County, NC Planning documents and bridge design for the replacement of an urban bridge over a railroad in downtown Raleigh. Structure planning and design services included field reconnaissance, establishing railroad clearances, determining bridge span

arrangement and lengths, evaluating phased construction and developing bridge type alternatives for the five-span steel plate girder structure.

U-3408, Cary Parkway Extension over Norfolk Southern Railway, Wake County, NC

Sub-consultant bridge engineer for WithersRavenel for the dual, three-span continuous bridges over North Carolina Railroad. Design involved a severely skewed plate girder bridge with post and beam interior bents on drilled shafts and end bents on piles and required coordination with NCDOT, Town of Cary, and the railroad company.

B-2248AB, SR 1143 over I-485 (Charlotte Outer Loop), Mecklenburg County, NC Design engineer of record for the 77-meter, two-span continuous structural steel girder superstructure supported by pile end bents and post and beam interior bent with spread footing foundations. Horizontal alignment of 91 degree skew, tangent over curve.

B-2659, SR 1212 and SR 1200 over Mill Creek, Johnston and Wayne Counties, NC

Design engineer of record for the bridge replacement on SR 1212 and SR 1200 over Mill Creek. Design involved hydrologic study, design, plan preparation, and review of a four-span cored slab superstructure with a post and beam substructure on piles.

Pedestrian Bridges:

Shelley Lake Bridge 17 Repair, City of Raleigh Parks, Recreation and Cultural Resources, 2017

Principal-in-charge for this project to repair an existing pedestrian bridge at Shelley Lake Park. Oversaw the assessment and scope of work to replace 2x6 decking with concrete; remove and replace railing with code compliant mesh railing; and repairs to the existing glu-lam beams. The project required surveying and environmental services.

Shelley Lake Bridge 19 Replacement, City of Raleigh Parks, Recreation and Cultural Resources, 2017

Principal-in-charge for this project to replace an existing pedestrian Bridge No. 19 at Shelley Lake park in Raleigh. The project required the re-alignment of the trail and the avoidance of existing utilities so that a pre-engineered bridge could be utilized. Surveying, environmental services, and geotechnical subsurface investigation were needed. A flood study was needed to document that no 100-yr base flood elevations were affected by the proposed bridge.

WF EL-5100AD Pedestrian Study, Wake Forest, NC Project manager for the design and preparation of construction documents of a proposed multi-use trail in the Wake Forest Priority Pedestrian Corridors. A stream crossing made a FEMA flood study necessary. A&O saved the Town approximately \$300,000 by re-routing the proposed trail and eliminating a 150-foot pedestrian bridge crossing, using an existing culvert instead.

Cross City Trail, Creedmoor, NC Project manager for the foundation design of a pre-engineered, pre-fabricated bridge to cross a 140-foot floodway over Robertson Creek. Provided design development, construction drawings and specifications for the bridge foundations, along with scour analysis and erosion control. Provided hydraulic analysis for the stream crossing and developed a FEMA flood study inclusive of the bridge and approaches.

Bearskin Creek Greenway Structures Design, City of Monroe, NC, 2015 Principal-in-charge, overseeing structural engineering, geometric layout, data collection and field investigation and reconnaissance for the design of a pre-engineered pedestrian bridge and four retaining walls. Coordinated with bridge manufacturer for the approximate bridge loads and coordinated with the geotechnical engineer for foundation recommendations for the bridge, and for soil loads and parameters needed for the retaining wall design.

River Link Greenway, Town of Cramerton, NC, 2016 As sub-consultant to WithersRavenel, served as principal-in-charge overseeing structural design of 135-foot timber boardwalk with 10-foot clearance, average spans of 12 feet, with 10-inch diameter pile foundations. Provided preliminary engineering, data collection, and field investigation and reconnaissance for the boardwalk; coordinated with the team's geotechnical engineer for foundations recommendations; and consulted with a contractor for constructibility issues. Provided design development and construction drawings showing plan, profile, and details for the boardwalk and developed a preliminary engineer's opinion of probable construction cost.

Walnut Creek Feasibility Study, Structures 6, 7, 88, 89, 90, City of Raleigh, NC, 2019

Principal-in-charge for feasibility study to replace five pedestrian bridges. Included coordination of paving assessment, construction estimates for each structure, including fee for topographic survey, hydraulics, environmental permitting, geotechnical investigation, development of construction documents, and construction administration. Deliverable is a report for the evaluation of recommendations for budgeting and construction project in upcoming years.

Structure 37 Replacement Project, City of Raleigh, NC, 2018 Principal-in-charge for feasibility study, overseeing professional services including surveying, subsurface utility engineering (SUE), wetland delineation, geotechnical investigations, and public involvement to replace the existing timber bridge with 60-foot prefabricated bridge as part of the Lake Crabtree trail system. Also provided structural engineering, preliminary flood study, environmental agency coordination, compliance with the City of Raleigh's Environmental Ordinance related to the floodway and floodway fringe regulations, and construction administration.

Yates Mill Boardwalk Assessment, Wake County, 2016 Principal-in-charge for a feasibility study for the repairs of existing boardwalks in this Wake County Park. Included the structural condition assessment and load rating analysis. Examined as-built drawings; determined repair options, along with timelines and an engineer's opinion of construction cost; and prepared an assessment report for Wake County.

Meadowmont Bridge Replacements, Chapel Hill, NC, 2016 Project manager for the replacement of two pedestrian bridges in Chapel Hill's Meadowmont Park. Oversaw professional services including surveying, subsurface utility engineering, wetland delineation, geotechnical investigations, hydraulics, and structural engineering.

Honeycutt Creek Greenway, City of Raleigh, NC, 2015 Project manager to design nearly five miles of new greenway. Oversaw hydraulic and structural engineering services, including hydraulic studies, a CLOMR preparation and submittal, and design and construction drawings for three pre-engineered bridges, 16 bridges and boardwalks, and nine retaining walls. A&O also provided construction administration for this project.

Yates Mill County Park – Phase III, Yates Mill Pond, Wake County, NC Sub-consultant bridge engineer for Sungate Design Group. Design, plan preparation, specifications, and construction observation for two 400-foot timber pedestrian bridges. The lake crossing required timber piles and the upstream crossing required the use of helical piers to support the superstructure. In addition to the two pedestrian bridges, a timber overlook was also designed for the project.

Yates Mill Low Water Bridge, Yates Mill Pond, Wake County, NC Design of a low-water bridge for park maintenance access, located 100 feet downstream of the dam. Existing abandoned bridge foundations were used to support the proposed low water pedestrian bridge. A flood study was performed and conditional letter of map revision (CLOMR) was prepared for this project. The flood study was performed through use of the Army Corps of Engineers HEC-RAS computer program.

Pedestrian Bridge, City of Greenville, NC Sub-consultant engineer for Greenways, Inc. to design a pedestrian bridge and perform a hydraulic analysis for crossing over Green Mill Run. Designed and prepared construction documents for precast prestressed concrete bridge with special railing for low water flow condition. Prepared documentation for submittal of flood study for a CLOMR to the Federal Emergency Management Agency (FEMA).

Mayo River State Interim Park Facilities, Mayodan, NC Performed structural investigation, condition assessment, load rating, and repair recommendations for picnic shelter, barbecue pit, contact station, and garage. Designed and prepared plans and construction specifications for foundation of toilet building. Scope of work included the design of park roadways, storm drainage, erosion control plan, public waterline extension, domestic water service for new buildings, and onsite septic system.

City of Raleigh Greenway System, Raleigh, NC Sub-consultant bridge and hydraulic engineer for WithersRavenel. Design involved hydrologic study, CLOMR preparation and submittal, design of pedestrian bridges, boardwalks and retaining walls, plan preparation,

specification, and review for new asphalt trail system. The project included greenway trails along Rocky Branch, Walnut Creek, and Crabtree Creek.

Salisbury Pedestrian Bridge, Salisbury, NC Sub-consultant bridge engineer for WithersRavenel for the pedestrian bridge over Jumping Run Creek. Design involved field investigation for appropriate bridge location, assistance in determination of bridge length, analysis of bridge scour, and the design and plan preparation of bridge abutments.

Metal Traffic Signal Pole Inspection

- NCDOT Division 8
- NCDOT Division 7 & 9 (318 poles)
- NCDOT Division 4 (99 poles)
- NCDOT Division 2 (193 poles)

Bridge Inspection:

Bonner Bridge Inspection and In-depth Assessment (2006), NCDOT, Dare County, NC

One of three team leaders that performed field inspections, detailed field sketches and report preparation for the NBIS inspection of the Bonner Bridge. Project manager for the in-depth condition assessment to determine deficiencies and recommend repairs to maintain current functionality of the bridge until 2016.

Bridge and Tunnel Condition Inspection, RDU Airport, NC Three cycles of inspection and evaluation of six bridges structures at the airport facility. The work included a condition survey with a description of the structural members. Based upon the inspection, required repairs were recommended. A general recommendation of a preventative maintenance program for the structures was also provided.

Municipal Bridge Inspection, (since 1984), NCDOT, throughout NC Performed field inspections, analysis, rating and report preparation. Evaluated hundreds of bridges and prepared reports with inspection notes, photographs and analysis to describe the existing physical condition of bridges and recommended maintenance needs.

Hydraulics

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W-5107A, 60" WSP Bore and Jack, Johnson County, NC Project manager and lead hydraulic engineer for the development of three culvert survey reports, one pipe data sheet and erosion control plans. One location was within a FEMA detailed study and required a memorandum of agreement.

NCDOT Division 14 Hydraulic Modeling and Bridge Replacements, *Western NC*

Project manager for hydraulic modeling and bridge replacements for two Group 1 bridges in Division 14. Services included geotechnical borings and foundation recommendations. Provided design recommendations to NCDOT and submitted models ensuring no adverse effects to FEMA regulated floodplains.

Hydraulic Design and Flood Studies:

- Division 13 Group Q Bridge Replacements
- Division 7B Express Design Build - five culverts
- Division 14 Group I - two culverts
- Division 6 080175 bridge replacement
- W-5107, US 70 Culverts
- Honeycutt Creek CLOMR/LOMR
- Eno River CLOMR/LOMR
- 10 EAPs / Dam Breach for Wake County
- B-1181, *Forsyth County, NC*
- B-2020, *Craven County, NC*
- B-2875, *Durham County, NC*
- B-2659, *Wayne County, NC*
- B-2509, *Avery County, NC*
- NC 49 Planning, *NC*
- B-2876, *Durham County, NC*
- B-2174, *Wake County, NC*
- B-2578, *Iredell County, NC*
- B-2879, *Iredell County, NC*
- *Greenville Greenway, Greenville, NC*
- *Little Sugar Creek, Charlotte, NC*
- *Bolin Creek, Chapel Hill, NC*
- *Black Creek, Wake County, NC*
- *Campbell Creek, Harnett County, NC*
- *North Flat River, Person County, NC*

Wake County Emergency Action Plans, *Wake County, NC* Project manager. Oversaw water resources engineering services to Wake County for emergency action plans for flood control of seven dam sites. Obtained the most recent information from NC Floodplain Management for local streams and collected data via Geographic Information System (GIS) of Wake County LIDAR contours, aerials and other pertinent information. Field-verified existing conditions; developed hydrologic and hydraulic models using the data obtained from NRCS and Dam Safety and the HEC-RAS model to develop the FEMA flood elevations. Developed an emergency action plan for each site using the EAP template and assisted Wake County with other agency input, including dam safety, NRCS, risk management, public safety, and GIS.

B-2659, SR 1212 and SR 1200 over Mill Creek, *Johnston/Wayne County, NC* Design engineer of record for the bridge replacement on SR 1212 and SR 1200 over Mill Creek. Design involved hydrologic study, design, plan preparation, and review of a four-span cored slab superstructure with a post and beam substructure on piles.

Raven Rock and Campbell Creek Pedestrian Bridge and Flood Study, *Harnett County, NC* Project manager for flood study, structural plans, specifications, and construction administration of a pedestrian replacement bridge, approximately 184 feet in length, with a span of 50 feet over Campbell Creek, supported by concrete footings and timber posts.

Black Creek Pedestrian Bridge Replacement and Flood Study, *Wake County, NC* Served as principal-in-charge responsible for overseeing all aspects of structural and hydraulic engineering including removal of the existing bridge along with the installation of concrete footings and timber posts, which support the timber-framed bridge. As on every project, ensured quality assurance and quality control.

Riverwalk Phase II Flood Study for Four Pedestrian Bridges, *Hillsborough, NC* Served as principal-in-charge responsible for overseeing all aspects of structural and hydraulic engineering, including preliminary engineering and final design for three bridges, data collection and field investigation/reconnaissance, and hydraulic analysis. Developed one FEMA flood study inclusive of all four bridge locations, developed CLOMR, provided conceptual design of the four bridges, and provided conceptual bridge alignments. As on every project, ensured quality assurance and quality control.

Mortimer Campground Bridge Replacement, *Caldwell County, NC* Served as principal-in-charge responsible for overseeing all aspects of structural and hydraulic engineering including replacement of a low water ford crossing of this creek for safety purposes, required by the US Forest Service. Ensured quality assurance and quality control.

W-5107, US 70 Culverts, *Johnson County, NC* Served as principal-in-charge responsible for overseeing all aspects of hydraulic engineering, including developing culvert survey reports for replacing a triple 60" circular pipe culvert under Davis Mill Road, constructing a new culvert for a proposed exit ramp/service road, and evaluating the impacts to the existing double box culvert under US 70. Ensured quality assurance and quality control.

Division 7B Express Design Build Bridge Replacements, Wake County, NC Served as principal-in-charge responsible for overseeing all aspects of structural and hydraulic engineering including conducting bridge design and plans as well as construction services. Ensured quality assurance and quality control.

Group Q Bridge Replacements, McDowell & Rutherford Counties, NC Provided hydraulic and structural engineering services for replacement of four bridges. Hydraulic scope included development of three culvert survey reports, one pipe data sheet, and erosion control plans. The structural scope included development of plans and specifications for a single 10-foot by five-foot reinforced concrete box culvert and concrete headwalls for two aluminized corrugated metal pipe culverts. Part of the CH Engineering team.

Honeycutt Creek Greenway, Raleigh, NC Sub-consultant bridge engineer for WSP Sells. The project involved preliminary alternatives, design of pedestrian bridges, timber boardwalks and segmental concrete retaining walls, plan preparation, specifications, and review for a new asphalt trail and natural hiking trail system.

R-1017, Iredell County, NC Roadway on new location for four-lane divided facility. Drainage involved design of two box culverts, roadway median system drainage, cross pipes, lateral ditches and erosion control. Special project requirement involved design for four-lane facility with only two lanes to be constructed at this time.

Buncombe County, NC Roadway widening for approximately 1.2 miles of Broadway Avenue in Asheville, North Carolina. Task included two culvert survey reports, approximately 400 feet of a major channel change, berm ditches, roadway inlets and piping system along the curb and gutter project. Erosion control plans were also required.

Duplin County, NC Roadway improvements for approximately 3.6 miles of rural US 117 near Faison. Project included backwater analysis, two box culvert extensions, special ditches, erosion control and cross drainage.

Tip R-2244, Pasquotank County, NC Improvements to NC 34 in Elizabeth City for two miles of existing two-lane roadway to five-lane curb and gutter section. Drainage work included design of extensive inlet and pipe system, special ditches and tailditches. Work also included culvert survey and hydraulic design report for an eight-foot by four-foot reinforced concrete box culvert.

Tip R-2406A, Onslow County, NC Roadway improvements for approximately seven miles of US 17 from existing multi-lane section north of NC 50 at Holly Ridge to south of SR 1526 near Dixon. Drainage work included extensive wetland limits, special ditches and two culvert survey reports.

NC 49, Tip Number R-2533, Cabarrus and Stanly Counties, NC Hydraulic design aspects for environmental planning document for 28-mile roadway project. The project impacted several major drainage structures including thirty-two box culverts, seven bridges and one crossing the Tuckertown Reservoir, a deep-water crossing.

Monroe Road Improvements, Charlotte, NC Widening of existing two-lane road to four lanes. Work included roadway surveying, roadway widening, curb and gutter, storm drainage, utility relocation, traffic control, erosion control, pavement markings, and specification preparation.

City of Raleigh Greenway System, Raleigh, NC Sub-consultant bridge and hydraulic engineer for WithersRavenel. Design involved hydrologic study, CLOMR preparation and submittal, design of pedestrian bridges, boardwalk and retaining walls, plan preparation, specification, and review for new asphalt trail system.

Recreation Facilities:

Dismal Swamp Visitor Center, Camden County, NC This project was for the NCDNR Division of State Parks located at the Dismal Swamp on the west side of the Dismal Swamp Canal. The Dismal Swamp is on the National Historical Record. The design elements of the project included grading, erosion control, parking, domestic water service, sanitary septic system, building design, and a floating barge swing span bridge design for vehicular and pedestrian traffic across the canal.

Crabtree Lake Fishing Pier and Floating Dock Repairs, Wake County, NC Investigation, design and construction administration for the repairs to the Crabtree Lake floating fishing pier, boat launch, and access ramp. The work included replacement of the existing timber decking with composite decking, removal of the

railing pickets and replacement with galvanized pickets, and modifying the access railing to conform to ADA code requirements.

City of Raleigh Greenway System, Raleigh, NC Sub-consultant bridge and hydraulic engineer for WithersRavenel for greenway trails along Rocky Branch, Crabtree Creek, and Walnut Creek. Design involved hydrologic study, CLOMR preparation and submittal, design of pedestrian bridges, timber boardwalks and segmental concrete retaining walls, plan preparation, specification, and review for new asphalt trail system.

Bolin Creek Greenway Phase II, Chapel Hill, NC Structural and hydrologic engineering services were provided for this concrete segmental retaining wall. The wall geometry contains large radii with the base of the wall embedded below the creek floor elevation. A hydrologic study of the creek was required by FEMA to allow the creek to be re-channeled.

Pettigrew State Park Maintenance Buildings, Creswell, NC Design and preparation of plans for foundation, floor slab, and roof framing. Assisted with bidding, construction administration, and closeout.

Charlotte Hawkins Brown Museum Structural Assessment and Repairs, Sedalia, NC

Provided conditions assessment and floor load calculations for Eliot and Kimball Halls at the historic Palmer Institute. Designed upgrade to roof structure, new interior stairs and new elevator shaft, wheelchair ramp, and other modifications. A year later, conducted structural assessment of Massachusetts Cottage and Galen Stone Hall. Designed an air handling units support in the attic of Massachusetts Hall. Designed a new masonry elevator shaft and a concrete and steel joist floor in the bathroom of Galen Stone Hall.

Other Parks and Recreation Projects, Throughout NC

Cliffs of the Neuse Toilet Building, Bathhouse and Park Office

Henderson Point Group Use Facility

Satterwhite Point Bathhouse

Goose Creek Toilet Facilities

Educational Facilities:

NCSU Research II Building HVAC platform, Raleigh, NC, 2015 Project manager to provide the necessary structural engineering support services for the placement of new roof top air handling units and duct penetrations. Included an in-depth field investigation to verify existing conditions and as-built documentation, coordination with the mechanical engineer, structural analysis, and structural design. Prepared construction documents for new framing system to support the equipment.

Carter-Finley Stadium Repairs, NC State University, Raleigh, NC Investigation, design and construction administration for the Carter-Finley Stadium facilities to prioritize and quantify restorations and repairs of concrete stadium, field house, and auxiliary facilities. The work included concrete repairs, repairs to asphalt concourse, replacement of structure drainage systems, and improvements to field drainage systems.

Repairs to Bragaw Dormitory, NC State University, Raleigh, NC Structural investigation and development of contract documents and construction administration of concrete repairs to Bragaw Dormitory. The work included concrete and brick repairs, testing of concrete products, installation of a pedestrian traffic membrane system, and spall repairs to six stairwells.

NCSU Dormitory Repairs, NC State University, Raleigh, NC Structural investigation of Lee, Sullivan, and Bragaw Dormitories to determine condition and repairs needed. The work included concrete and brick repairs, attachments of concrete railings, analysis of lightweight concrete, cost estimates and prioritization of repairs.

Ricks Hall Parapet Wall Restoration, NC State University, Raleigh, NC Structural investigation, condition survey, the preparation of plans and specifications and construction administration for the repair of Ricks Hall parapet wall. The work included the design of a steel support structure for a non-reinforced masonry parapet wall eight to 10 feet high, 26 roof penetrations, application of a cementitious structural skin, and the re-painting of the entire building.

UNC Old East/Old West Building Systems Assessment Study, UNC – Chapel Hill, NC

Condition assessment and development of repair recommendations and construction documents for repairs to two historic university structures. Old East dates to the 1790s and is the oldest public University building in the United States. Structural engineer and team leader for the structural investigations, analysis and development of repair construction documents.

East Garner Middle School Addition, Wake County Public Schools Engineering services for a 44,000 square-foot classroom and cafeteria addition and outdoor athletic facilities. Site work included traffic analysis, public roadway improvements, building demolition, water and sewer utilities, grading and parking. The outdoor athletic facilities included a 300-meter track and combination football/baseball field. The site consisted of approximately fourteen acres.

Garages/Parking Decks:

McKimmon Center Parking Lot Expansion, North Carolina State University Investigation, design and construction administration for the expansion of the McKimmon Center parking lot. The work included design of a one-way circulating parking area with angled parking, removal of existing parking islands, installation of new curb and gutter, paving, resurfacing and striping of the new parking area.

Parking Deck Inspections, City of High Point, NC Structural investigation of two parking decks consisting of cast-in-place concrete, with visible signs of distress and deterioration. Work involved inspection, analysis, report, and recommendations for repairs.

Community Buildings:

North Carolina Museum of Art, Raleigh, NC Engineering services for an outdoor amphitheater, stage and cinema area at the North Carolina Art Museum. The project consisted of fixed seating and an informal grassy area to accommodate up to 2,300 persons. The stage includes a mechanized roof to allow for a covered or open stage. The outdoor screen, approximately 30 x 50 feet, serves as a projection surface for film programs.

Churches:

St. Matthew's Episcopal Church Restoration, Hillsborough, NC Condition assessment and restoration of a gothic revival church that dates to 1825. As structural engineer, conducted in-depth field investigation, structural evaluations and development of repair and maintenance recommendations.

Apex Baptist Church, Apex, NC Site engineering services for a 28,500 square-foot building addition on the existing urban site. The work consisted of preparing construction contract documents that included grading, erosion control, storm drainage design, pavement design, site layout plan, and coordination with the Town of Apex for review and approval.

King's Park International Church, Durham, NC Site engineering services for a 61,500 square-foot multi-purpose facility on a 32-acre site bordered by Northeast Creek to the east, Martin Luther King Boulevard to the north, and residential development to the west and south. A portion of the project site is located within the 100-year flood plain and is bordered by the floodway fringe for Northeast Creek. Site design elements include grading, staking, erosion control plan, water and sanitary sewer utilities, storm drainage design and pavement design.

Longview Baptist Church, Raleigh, NC Site layout and structural design for a 5,600 square foot addition to Longview Baptist Church. Work included site layout, grading and erosion control, design of reinforced concrete foundations and masonry walls, wood truss layout, partial demolition of the existing facility and determination of loadings for movable partitions.

Historic Preservation:

Kenan House Historical Renovation, Wilmington, NC Project manager as a consultant to HagerSmith Design, PA, to oversee the structural assessment of the Kenan House on the UNC-Wilmington campus. Responsible for managing the assessment of the existing structural framing system, coordination with the owner, architect, sub-consultants, and reviewing agencies, preparation of conceptual sketches and preparation of an engineer's opinion of probable construction costs.

Morganton Train Depot Historical Preservation, Morganton, NC Project manager as a consultant to HagerSmith Design, PA, to oversee the renovation of the Morganton Train Depot. Responsible for managing the structural investigation and analysis of wood roof joists, designing new laminated veneer lumber (LVL) ceiling joists to support the masonry chimneys, the structural analysis of 2x4 stud wall at outriggers and the structural analysis of 4x8-1/2 timber beams. The existing framing system was supplemented to provide adequate structural support for the new outriggers while maintaining the historic integrity of the structure.

Healthcare:

Veterans Life Center, Butner, NC 2015 Reviewed structural plans and conducted field measurements of Building 71, constructed in the 1940s to verify and document the deficiencies and structural condition. Performed analysis of structural elements and provided for building rehabilitation.

UNC Hospital Anderson Pavilion MRI Replacement, Chapel Hill, NC Structural investigation, evaluation of existing floor structure, and shoring recommendations to support the removal of the existing MRI equipment.

UNC Hospitals, Chapel Hill, NC Catheterization Lab Toshiba Equipment Installation: Structural investigation and floor and roof capacity evaluation to support the installation of new floor-mounted and ceiling-suspended equipment in the Clinic Building Catheterization Lab A.

UNC Hospital Angiography Suite, Chapel Hill, NC Structural investigation, floor capacity evaluation, and preparation of construction documents for the installation of Siemens Axiom Artis T and associated equipment.

Rex Hospital Elevator Addition, Raleigh, NC Elevator addition to existing three story hospital ward as part of overall renovation. Provided structural design for elevator addition, construction drawings, specifications, and construction services.

UNC Hospital Gym Modification Chapel Hill, NC Structural investigation and floor capacity evaluation to convert half of the existing gym into a two-level office space. Preparation of preliminary design of structural system to support the gym modification and construction cost estimate.

Moore Regional Hospital CEP, Pinehurst, NC 4,300 square-foot addition to hospital energy plant and mechanical unit supports. Provided structural investigation of existing building, structural design of addition and unit supports, construction drawings, and specifications.

Durham Radiology Clinic, Durham, NC Office renovation with new equipment supports: Structural design and preparation of construction documents for support of new Siemens Sireskop – 5/45 equipment in a renovated lab space.

Craven Medical Center Chiller Building, New Bern, NC Structural and incidental architectural design and preparation of construction documents for a building to house two new 400-ton gas engine-driven chillers and associated pumps and equipment.

High Point Regional Hospital, High Point, NC Renovation: Structural evaluation of existing floor system to facilitate installation of new Somatom CT scan room equipment.

Umstead Hospital, Butner, NC Structural design and preparation of construction documents for foundations to support a cooling tower.

WakeMed Adaptive Reuse Feasibility Study, Raleigh, NC Structural evaluation of a 49,000 square foot existing building to determine the possibility of converting the facility into a central plant and data center. The work included in-depth field verification of existing building structural systems and preliminary seismic analysis of existing structural capacities.

WakeMed Orthopedic Center Upfit, Raleigh, NC Structural analysis of the existing building roof and floor system to determine adequacy of the structural system with new equipment loadings. In-depth field verification for new framing of penetrations and stairwell reconfiguration.

WakeMed Angiography Suite Upfit, Raleigh, NC Structural investigation, floor and roof capacity evaluation and preparation of construction documents for the installation of Philips Medical Systems Integris V5000 and associated equipment.

WakeMed President's Office expansion Raleigh, NC Structural investigation of the expansion of the president's office between two adjacent buildings. Conceptual design and development of two concepts of structural framing systems between two dissimilar buildings.

WakeMed Chiller Addition Raleigh, NC Civil and structural engineering for the addition of a new 400-ton chiller located adjacent to the pump house. The work included demolition of an existing smoking area, design and construction documents for cast-in-place concrete screening wall, gates, steps, structural slab, and guard rail.

Duke Eye Center RTUs, Durham, NC Structural design and construction documents of a new steel structural support system for two air handling units. The project required analysis and design for two different building construction types.

Cape Fear Valley Hospital RTUs, Fayetteville, NC Structural design of new supports for roof top air handling equipment as part of a project to upgrade the HVAC system in the west tower.

Halifax Memorial Hospital, Roanoke Rapids, NC Site engineering services for a single story 4,134 square feet addition and a three story 33,527 square feet addition at the hospital. Site work including grading, storm drainage, erosion control and water and sewer system relocations. The water and sewer relocations were reviewed and approved by the Roanoke Rapids Sanitary District. In addition, prepared a flood study of the site for a map revision to the City of Roanoke Rapids Flood Insurance Rate Map on the Chockoyotte Creek.