# ASHE Scanner

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Summer 2016
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**Changing Dangerous and Drab to Safe and Fab**
*See page 28*

**Bringing Streetcars Back to Charlotte**
*See page 22*

**America's First Super-highway Turns 75**
*See page 34*

ASHE

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**Larry Ridlen, PE**
ASHE National President 2016–2017

# New Directions

What a distinguished privilege to serve as the National President of a great organization like ASHE. I am truly honored by the opportunity, and I promise to serve to my upmost capabilities. I could not be your President without the influence of numerous individuals within the ASHE organization for whom I have enormous respect. These individuals include Past Presidents whom I have served under, board members both present and past, who have shown me the ropes, and fellow ASHE members at the Section and Region levels who are always striving to make ASHE better. I also cannot forget the investment that Gresham, Smith and Partners has made in my involvement with ASHE at every stage. Without GS&P's support, I would not have been able to succeed in this journey.

I joined ASHE in 2005 as a Charter member of the Middle Tennessee Section. I had the good fortune to collaborate with Brad Winkler on the pre-organization work necessary to charter the Section with 80 members. In my first couple of years as the Middle Tennessee Section president, I learned this was a collaborative effort that required the talents of many different individuals. That lesson sticks with me as I now look at ASHE from the national level with the National Board and the organization's numerous committees. Different personalities and skill sets from different parts of the United States have come together to support the common mission of providing a forum for members and partners of the transportation industry to promote a safe, efficient and sustainable transportation system through education, innovation and fellowship. We have creative thinkers who are concentrating on our public image or the next location for a new Section, and we have technical thinkers who are examining how we are organized, communicating and functioning. Each person is key to our success, and I am so thankful that these individuals have given of their valuable time to make ASHE what it is today.

If you notice in the previous paragraph, I stated the mission using the term "sustainable transportation system"—and no, it is not a misprint. In the last couple of years, as part of the Strategic Plan update, a minor update was made to the ASHE Mission Statement. The change of the second use of the word "highway" to "transportation" shows that ASHE has been and continues to be inclusive of all transportation systems, and we promote the multi-modal industry and its professionals. Please update your websites, presentations and other documents that use the ASHE Mission Statement as follows:

> *Provide a forum for members and partners of the highway industry to promote a safe, efficient and sustainable transportation system through education, innovation and fellowship.*

Being the engineer that I am, I wanted to figure out just how many individuals held an official position within the ASHE organization. It was easy to learn that at the National level, there are more than 60 positions, but the numbers were more difficult to identify at the Region and Section level. Pulling out my calculator and using that well-known engineers' equation called "Engineering Judgement," I came to the conclusion that there are 701.56 positions (but don't ask me to prove it!). For the sake of simplicity, I will say that

*(continued on page 17)*

SUMMER 2016

# In This Issue

ASHE scanner











## on the cover

**Bringing Streetcars Back to Charlotte**

**ASHE Carolina Piedmont Section**


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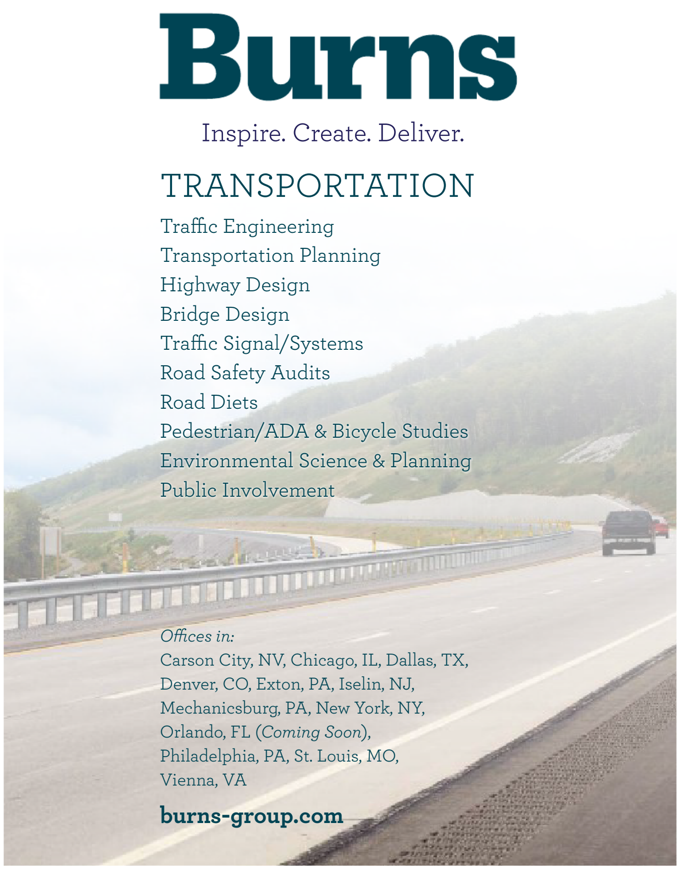


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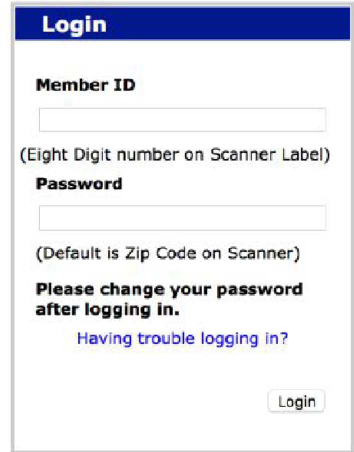



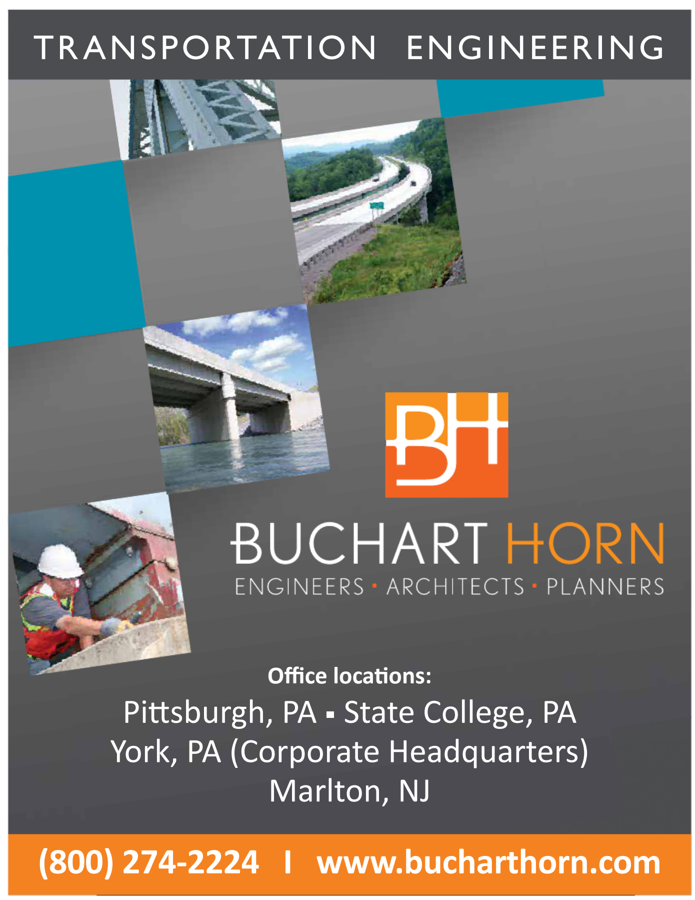

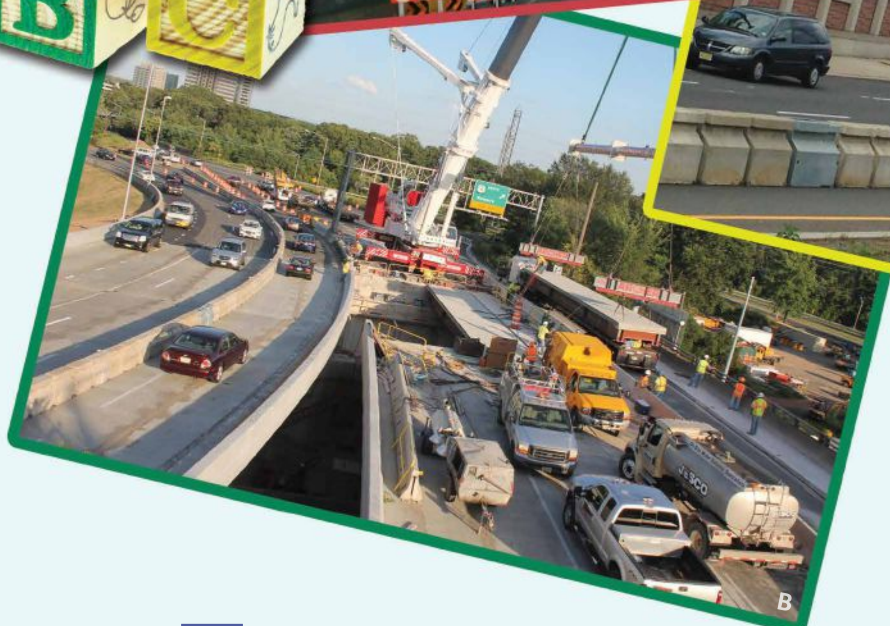

# Route 18 Bridge over Route 1: The ABCs of Superstructure Replacement

by Samir D. Shah, PE, PMP, Project Manager, NJDOT, and Steven Manera, PMP, Project Manager, HNTB, **ASHE North Central New Jersey Section**

- **Photo A:** Route 18 northbound Span 2 superstructure construction (view from Route 1 southbound)
- **Photo B:** Route 18 southbound Span 1 superstructure replacement (looking east)
- **Photo C:** Route 18 southbound concrete moveable barrier curb installation (west of the interchange) to establish the Route 18 northbound contra-flow lane

The New Jersey Department of Transportation's (NJDOT) Bridge Management System determined that the bridge decks for the Route 18 structure over Route 1, a grade-separated interchange in Middlesex County where two major state highways converge, had deteriorated to the point of requiring replacement. NJDOT was confronted with the challenge of reconstructing bridge decks on Route 18, with an average daily traffic (ADT) of 118,000 vehicles per day (VPD) and no shoulders, over Route 1 with an ADT of 123,000 VPD. The interchange is located adjacent to Rutgers University's New Brunswick campus and is one-half mile from the New Jersey Turnpike's Interchange 9. This project would have significant regional traffic impacts and require extensive coordination with community stakeholders. To meet the challenges of this complex project, Accelerated Bridge Construction (ABC) techniques were proposed. This resulted in an overall shorter construction duration, no reduction in travel lanes Monday to Friday from 6:00 AM to 10:00 PM, and the superstructure demolition and replacement work was confined to weekends when lane reductions were acceptable to NJDOT and stakeholders.

NJDOT retained HNTB Corporation to perform an alternatives analysis and design a solution with the primary goals being to replace the bridge decks and widen Route 18 in the northbound direction. The existing structure over Route 1 consisted of two simple spans using rolled steel beams and carried seven lanes of traffic, with an adjacent structure over a ramp consisting of a single span using rolled steel beams and carrying three lanes of traffic. NJDOT Traffic Operations determined that long-term lane closures would not be permissible due to the long queues created by the loss of capacity. This meant that any alternative needed to be constructed using overnight lane closures, with additional closures permitted during weekends. The design was further constrained by the presence of lead-based paint on the top flange of the girders and complex framing of the superstructure. The alternatives analysis considered cast-in-place and precast deck replacement options, as well as full superstructure replacement. The deck replacement options require removing the bridge deck, which would expose the top flange of the girders and require time-consuming abatement of the lead-based paint. The complex framing made the use of temporary deck panels impractical as many unique panels would have been required, adding cost and time to the alternative. Following a Value Engineering review, NJDOT determined any deck replacement alternative would have a greater traffic impact than allowable and chose superstructure replacement as the Preferred Alternative, due to the advantages this option presented in conjunction with an innovative staging plan developed by HNTB.

The project team proposed installing prefabricated superstructure units (PSU) during 10 weekends of round-the-clock work (from Friday, 10:00 PM, to Monday, 5:00 AM), while maintaining two lanes of traffic in each direction of Route 18. All lanes on Route 1 were also maintained except during limited overnight hours when detours were implemented. From Monday morning to Friday evening, preparatory work was performed offline or during allowable overnight lane closure hours, minimizing impacts to weekday traffic. The ABC approach also included constructing temporary median crossovers to establish a contra-flow lane using concrete moveable barrier curb (CMBC), which provided the required work zone for the cranes. Execution of the staging plan involved several key elements being completed prior to the superstructure replacement:

- Widening the existing abutments, pier and roadway on Route 18.
- Constructing temporary median crossovers on Route 18, on each side of Route 1.
- Pre-deployment of the CMBC along the inside shoulder for the full length of the work zone (left in place Monday to Friday).

Each of the 10 weekends included the following:

- Beginning Friday night, the transfer machine moved the CMBC into place, establishing the contraflow lane for the weekend condition.
- Precast construction barrier curb was used to protect the superstructure replacement work zone.
- One lane of traffic was moved to the contraflow lane while the second lane remained on the existing structure.
- Mobilizing a 600-ton and a 300-ton crane required to demolish the existing superstructure and erect the proposed superstructures.
- Saw-cutting and demolishing a portion of the existing superstructure.
- Installing new bearings.
- Erecting two to three PSUs.
- Installing diaphragms and temporary deck supports at the joint between the existing and proposed bridge decks.
- Installing polyester polymer concrete longitudinal joints between adjacent PSUs.
- After a brief curing period, the CMBC was returned to the inside shoulder and the remaining traffic control devices positioned to establish three lanes of traffic in each direction for the weekday condition.

Based on lighter traffic volumes, smaller number of students and staff commuting to Rutgers, more daylight hours and better weather conditions, the summer months were chosen for the weekend work. As work progressed, the contractor, Anselmi and DeCicco, gained experience and efficiencies in their operations, resulting in each work cycle being completed Sunday afternoons, for traffic restoration hours ahead of the 5:00 AM Monday deadline. The success of the weekend construction cycles allowed the contractor to utilize the weekend staging plan to install the bridge approach slabs instead of using nighttime lane closures as originally intended.

With the weekend superstructure and approach slab work completed, the contractor could now focus on the final phase of the project: reconstructing the existing retaining wall-supported ramp that connects Route 18 northbound with Route 1 southbound (Ramp D). The substandard geometry of this ramp has been a contributing factor to accidents, particularly those involving tractor-trailers overturning. Reconstructing Ramp D required the installation of both cast-in-place and mechanically stabilized earth walls with an ashlar formliner finish. The

Demolished section of superstructure being loaded onto a trailer for offsite dismantling and disposal

majority of the new ramp alignment is beyond the footprint of the existing ramp, allowing most of the retaining walls to be constructed without impacting traffic. Weekend closures will be utilized to construct the interfaces between old and new ramp and switch traffic to the new alignment.

Substantial completion for this project was anticipated in April 2016, with final completion in June 2016.

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## ASHE Chesapeake Section Attends Maryland Quality Initiative Conference


*ASHE Chesapeake members sponsored a booth at the 2016 MdQI Conference in Baltimore, MD. From left: Dion Ho, Secretary; Brian Post, President; and Heather Henck, Vice President*

ASHE Chesapeake Section Members attended the Maryland Quality Initiative (MdQI) Conference in Baltimore, MD, on February 3 and 4. The 23rd annual conference's theme was "Continuous Quality Improvement," with more than 20 technical sessions covering a variety of transportation-related topics. It also included the crane-building competition and pinewood derby races, concluding with the awards banquet and project awards.

The conference gives attendees opportunities to share ideas, technologies, current trends and projects associated with the transportation industry. It also provides a forum for ASHE to attract new members and foster existing relationships with industry partners. The Chesapeake Section sponsored a booth to promote ASHE and its local, regional and national activities.

*Tom Brown, ASHE North Central West Virginia Section President, accepted the group's 35th-year anniversary certificate from Larry Ridlen, (then) ASHE National First Vice President, now National President.*

## North Central West Virginia Section Marks 35th Anniversary

The ASHE North Central West Virginia Section (NCWV) celebrated its 35th anniversary at the Bridgeport Conference Center on February 18. The group received its Charter on February 6, 1981, with 86 members. Yearly events include the Commissioner's dinner, member meetings and the Man of the Year banquet. The group continues to mentor Fairmont State University students and hold golf tournaments to support their scholarship program. Larry Ridlen, (then) ASHE National First Vice President, now National President, attended the celebration, presenting President Tom Brown with the Section's 35th-anniversary certificate. Congratulations to the North Central

*(MileMarkers continued on page 13)*

Tube being connected to grouting port

# Pipe Culvert's Relining Adds Longevity to Four-Lane Arterial in Pennsylvania

by John J. Urick, Jr., PE, **ASHE North East Penn Section**

Corrugations misaligned at perforation

The Pennsylvania Department of Transportation (PennDOT) Engineering District 4-0 selected STV, Inc., (STV) to provide preliminary and final design services for the rehabilitation of an eight-mile section of SR 0006, a four-lane divided arterial, in Wyoming and Lackawanna Counties of northeastern Pennsylvania.

During a field view, advanced deterioration of a triple 14-foot-diameter corrugated metal pipe (CMP) culvert was discovered. The culvert carries Ackerly Creek under SR 0006 at an inlet of Glenburn Pond, with the pond backwater extending into the pipes. The normal water surface elevation had been constant for 60 years until the dam was recently breached.

Deterioration accelerated at the former water elevation to the point that the walls of the pipes were perforated along the length of the pipes, with displacement of the corrugations occurring. This suggested that arching action of the embankment was contributing to the support of the pipes. To make the situation more urgent, gravel was observed through the perforation. The lack of fines indicated that embankment was washing from behind the pipes during storm events and, if it continued, would compromise the support provided by the embankment.

Because this reach of Ackerly Creek is a Federal Emergency Management Agency (FEMA) study area, any solution would not be allowed to raise the backwater surface elevation. STV studied a full range of solutions, and the alternatives included:

- Replace with new CMPs
- Replace with a box culvert
- Replace with a precast arch
- Replace with a bridge—including an option to remove embankment to the top of the pipes—and construct a bridge over the pipes. The pipes would be removed after the bridge was constructed.

End bevel spread to facilitate liner installation

- Install steel liner
- Install aluminum liner

Considerations/constraints included:

- Safety of the public and contractors
- Maintenance of traffic
- Constructability
- Disturbance of the pipes during construction
- Hydraulics
- Duration of construction: Pipe construction needed to be complete prior to the start of the main project.
- Cost: The range of solutions came with a range of costs from $1 million to $4 million.
- Utilities: Water main in the embankment and aerial electric
- Impacts had to be avoided on both sides of the embankment.

Initial studies showed that an aluminum liner was most promising. For the lining alternative to be feasible from a hydraulic perspective, the liner diameter needed to be small enough to be inserted into the original pipe, while large enough to carry the design flow and not raise the water surface elevation. The existing condition, as well as several reduced diameter pipes, was modeled. Due to the low velocity of normal flow prior to the dam breach, one to three feet of sediment had been deposited in the pipes. The existing condition model included the sediment. The proposed condition was modeled with one foot of stream bed material. This was considered an acceptable modeling approach because the velocity has increased with the lowered water surface and is considered to be self-cleaning.

The team ultimately recommended 0.25-inch aluminum tunnel liner plate as the best solution. It was the least costly and avoided the negatives associated with replacement alternatives. Due to aluminum's resistance to oxidation, the pipe lining would potentially provide in excess of 100 years of service life for the culverts. Additionally, the diameter of tunnel liner plate could be customized to maximize the hydraulic opening, while providing adequate space between the old pipe and the liner for constructability. Because the bolt pattern has a six-inch repeat, diameters of two-inch increments could be provided. A diameter of 12 feet, 10 inches was selected. Hydraulic analyses indicated that the water surface elevation would be slightly lower than existing at that diameter.

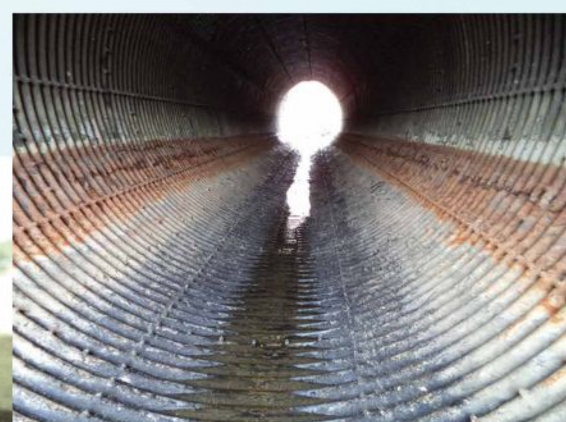
Traffic was maintained in the left lane in each direction, while the contractor used the right lane and shoulder for topside equipment and staging. No roadway elements were disturbed except for the removal of guide rail elements for access. A small area at the ends of the pipes was defined for inserting the liner and constructing concrete collars, aiding to minimize environmental impacts.

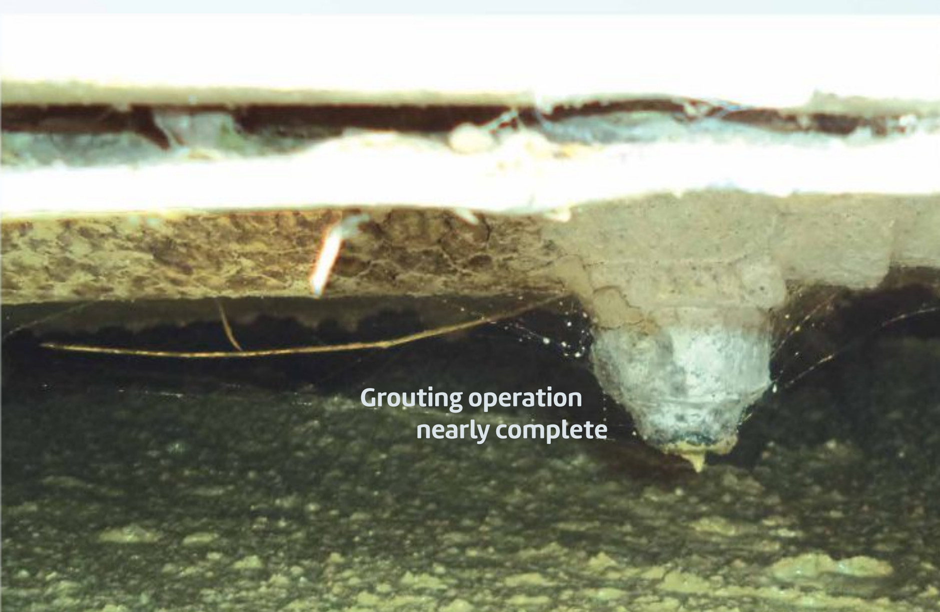
Helping to facilitate the sub-assembly of the sections, the heaviest plate weighed about 33 pounds, the material was moved from the point of sub-assembly to the inside of the pipes easily and efficiently. Light equipment capable of operating beneath overhead utilities was used. Utility relocation was not required.

Construction was staged for dewatering, a sediment removal and liner installation one pipe at a time, diverting flow to the other two. The space between the liners and the original pipes was grouted to hold the liners in place and transfer load. The aluminum liner solution took six months to construct, meeting schedule requirements.

The aluminum liner plate used for the rehabilitation of the SR 0006 culvert proved to be a simple, yet effective solution to a complex problem. It addressed all project considerations and constraints.

Sediment removed and ready for liner installation



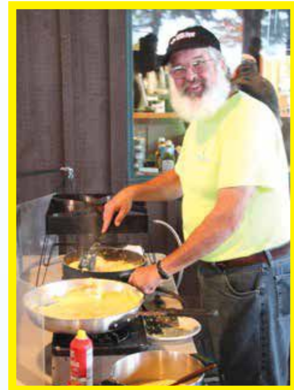


Grouting operation nearly complete


# MileMarkers

News From Across ASHE-Miles

## North East Penn Section Golf Tournament Helps Support Area Students



*Ron Lucas (NE Penn) started cooking well before daylight.*

The North East Penn Section's 2015 Golf Tournament raised more than $13,000 for the Section's scholarship program. This fund has enabled the Section to create a permanent endowment at Wilkes University in memory of longtime PennDOT executive and ASHE supporter Chuck Mattei. The monies raised will support local students at Wilkes, Drexel, Penn State and Villanova universities and Lafayette College.

The annual June tournament, held at the Mountain Valley Golf Course near Frackville, PA, began with breakfast prepared by Section Life Members Bill Lesek, Greg Wilson and Ron Lucas, for 210 golfers.

*(Left to right) Bill Laird (HDR); Jeff Hann (HDR); Ted Otteni (CHA); Dan Giles (HDR)*

In the damp weather, even on the par threes, the golfers could barely see the green from the tee. The fog made for a challenging day for the folks trying for the hole-in-one, as well as those watching. This year the lucky golfer would have won a 2015 Cadillac, but for the 15th year in a row, no one hit a hole-in-one.

*Mountain Valley Golf Course, Hole-in-One contest location barely visible in the fog*

Twenty-six volunteers provided refreshments in designated areas throughout the 27 holes used in the shotgun-start tournament. The high score was 81, and the low was 58. The golfers also competed in the putting contest, with a $5,000 reward for the best putter in the field. Dinner was served at the conclusion of the tournament.

This year's tournament was held on Thursday, June 16.

*Golf Tournament chairman Dominic Yannuzzi (Benesch) speaks with Drexel's Ann Hedges, Associate Director of Development in the College of Engineering.*

*Cynthia Bardman (Summit Environmental); Jaime Volonakis (Pennoni); Jerilyn Luben (L & V Engineering) assist with registration.*

*(MileMarkers continued on page 16)*

# Raising the Bar on Pedestrian Design

by Jeremy Kubac, PE, Gresham, Smith and Partners,
**ASHE Derby City Section President**

The design and construction of pedestrian facilities has been the focus of an ideological shift over the last several decades. The confluence of the Americans with Disabilities Act (ADA), federal policy aimed at improving health, air quality and congestion, as well as a growing desire for communities to become more walkable has, in large part, led to this shift. The ADA and the design guidance it inspired have led to pedestrian facilities that are more usable for people of all levels of ability. Whereas the ADA has influenced design details, the walkable communities movement has had a broader impact, influencing the planning of pedestrian facilities and leading to the inclusion of these facilities on both public road projects and private development. Recognizing that every destination requires the pedestrian mode at some point in a trip, professionals, as well as end users, have advocated for more useful and intuitive facilities beyond that which is mandated by law. Some communities have taken this planning a step further by creating projects with the sole purpose of making pedestrian connections between existing facilities.

One aspect of pedestrian facility design that has come a long way, but still has much room for improvement, is its placement in the hierarchy of a typical roadway project. A project whose sole purpose is pedestrian oriented will look at pedestrian safety and mobility first, while still addressing the needs of the motoring public and bicyclists where these modes meet. Often, however, the focus on pedestrians takes a back seat on a typical roadway project. This is not to say that pedestrian facilities are not included. Their inclusion, however, is limited by the level of detail in the plans and the degree to which details are left to the contractor to work out in the field. While the treatment of pedestrian facilities is often clear on typical sections, it is at intersections where sidewalks cross each other and eventually cross the roadway pavement that additional detail is most important.

One detail item that can be addressed without adding design scope is the placement of drainage structures. All too often, drainage structures are placed without adequate horizontal clearance from pedestrian ramps. This leaves the contractor with a difficult task to "make it work." It is possible that this occurs when pedestrian ramps are detailed near the end of a project after the drainage has been finished. Moving the layout of pedestrian ramps to an earlier phase of design would allow for accommodations to be made when laying out drainage inlets. This approach would also allow inlets to be placed upstream from ramps when possible. Another detail that does not add to the design scope is the alignment of ramps. While it may be convenient for the designer to bring sidewalks together at one radial ramp, developing two separate ramps for perpendicular movements creates a more intuitive path for the visually impaired and keeps waiting pedestrians out of the path of oncoming pedestrians. Of course, when using this approach, one must ensure adequate sight lines between right-turning motorists and pedestrians. Finally, it is important to have a discussion on the sidewalk/driveway crossings early in design. While it is preferred to maintain the sidewalk grade through the driveway, this is not

This driveway, constructed by a developer around 1999, left the sidewalk with a 12% cross slope.

The retrofit, constructed here as part of a resurfacing project, corrected grade issues resulting from an adjacent 1960s vintage curb box inlet.

always possible. Sidewalks adjacent to the curb and steep driveways can force the sidewalk out of its typical plane, making for an uncomfortable user experience.

Taken a step further, it is often beneficial to develop ramp transitions and crossing sidewalks with spot elevations. While it is common to go to this level of effort for pavement at intersections, the grade and cross slope of pedestrian ramps is just as critical. Recognizing that this represents a greater scope than what departments of transportation may be willing to pay for across the board, a case can be made that some scenarios are more critical than others based on the roadway grade, roadside grade and right-of-way constraints. Identifying these critical areas during design contract negotiations may help include these design considerations on a case-by-case basis. This level of effort is already required for pedestrian improvements associated with private development in some areas.

The design of traffic signals, while often done as a stand-alone operation, is inextricably linked to pedestrian facilities. The placement of poles, pedestrian actuation buttons and controller cabinets is almost entirely within the pedestrian realm. When the design of signals is included in the road design contract, it is a perfect opportunity to merge the layout of signal equipment, sidewalks and ramps as one holistic design. This can reduce the need for supplemental pedestals for pedestrian signals and push buttons, as well as ensure adequate right-of-way taking. The same logic can be applied to utility relocations when they are included in the roadway contract. At a minimum, the coordination of utility relocations should incorporate the design of pedestrian facilities. When signals are planned but not included in the roadway design contract, it is still beneficial to have a signal layout in mind when designing pedestrian facilities. This layout can be shared with whoever is tasked with signal design in order to communicate the design intent. Unfortunately, as warrants for signals are often met after the initial construction, they must then be designed as a retrofit. In these cases, it is still beneficial for the roadway designer to have a signal layout in mind, especially at intersections that are expected to eventually meet signal warrants. While it would likely be difficult to negotiate for this increase of scope, it could be considered an element of good practice, ensuring adequate right-of-way for future needs.


**This development entrance was constructed with directional ramps. Signals were designed concurrent with the roadway and pedestrian improvements, allowing for adequate Right-of-Way to be dedicated.**

When it comes to the design of pedestrian facilities, it is safe to assume that the bar will continue to move higher. As this occurs, it is essential that pedestrian facilities find their place within the roadway design hierarchy as other modes, such as cycling, begin to emerge. Whether it takes well-rounded designers who can practice in multiple areas to incorporate pedestrian design into drainage, signals, right-of-way, etc., or the collaboration of design specialists, transportation professionals must move beyond designing pedestrian connections as an afterthought. Placing the contractor in a "just make it work" situation is a disservice to the end user and can lead to facilities that are neither intuitive nor safe. As design professionals in a dense urban environment, many hold a worldview on this topic that has been shaped by one's experience navigating the streets among cars, buses, bikes and other pedestrians, as well as by learning how those with special needs do the same. The pursuit of a better pedestrian experience is not a special interest, but rather a universal interest as everyone is a pedestrian at some point in our respective journeys.

http://www.bikewalk.org/pdfs/sopada_fhwa.pdf

*For further reading, please see the following resources:*
https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/sidewalks207.cfm
http://www.bikewalk.org/pdfs/sopada_fhwa.pdf


# MileMarkers

News From Across ASHE-Miles

## ASHE Williamsport Section Celebrates 50 Years—1965-2015

by ASHE Past President Hal C. Gee, Jr., Vice President, Energy Development, Glenn O. Hawbaker



In November 2015, ASHE Williamsport marked its 50th anniversary at Herman & Luther's Barn on SR 87 north of Williamsport. The recently renovated, historic stone barn is owned by George "Herman" Logue, Jr., longtime member and supporter of the Section. The event was catered by Acme Barbecue & Catering Company, owned by George E. Logue, III. Herman and George, III, are the son and grandson, respectively, of former local contractor and legendary "CAT Barn" owner, George Logue, Sr. The well-known George E. Logue Caterpillar Equipment Barn was home to many ASHE Williamsport events over the years. Unlike his father's barn, Herman's originally housed farm equipment and hay.

Prior to Herman's purchase of the barn, it was owned by the Luther Heim family since the 1770s. The Heims operated Lycoming Silica Sand and were also Section members in the early days. For this event, the barn entrance was lined with construction cones (spaced per Pub. 213), as well as a programmable message board to greet Section Members and guests. The original Section Charter and ASHE Williamsport banner were displayed.

Among the nearly 80 attendees were Charter members Richard Doebler and Jim Seksinsky. Both spoke of the Section's early years and its growth. The Section initially consisted of mostly PennDOT employees who joined for networking opportunities.

Section President Justin Jackson thanked charter members for their contributions, and past National President Ron Springman gave a slide show about the Section's history. Former Section Treasurer Atwood Welker, a member for 30+ years, also spoke about the group's scholarship efforts. Greg Dutton, (then) ASHE National Second Vice President from the Northeast Florida Section, was on hand to share best wishes and future goals.

After dinner, Sandra Tosca, PE, District Executive for PennDOT Engineering District 3-0, spoke about the 2015 construction season and projects planned for 2016. Special thanks to Section Secretary Tom Adams and his wife for the cupcakes topped with an edible ASHE logo—and thanks, also, to Past Presidents Jim Kendter, Ron Springman and Chris Logue for their contributions to the event.

*The Past Presidents of Williamsport's Section attended the celebration, making for a special photo opportunity.*



## New Directions *(continued from page 3)*

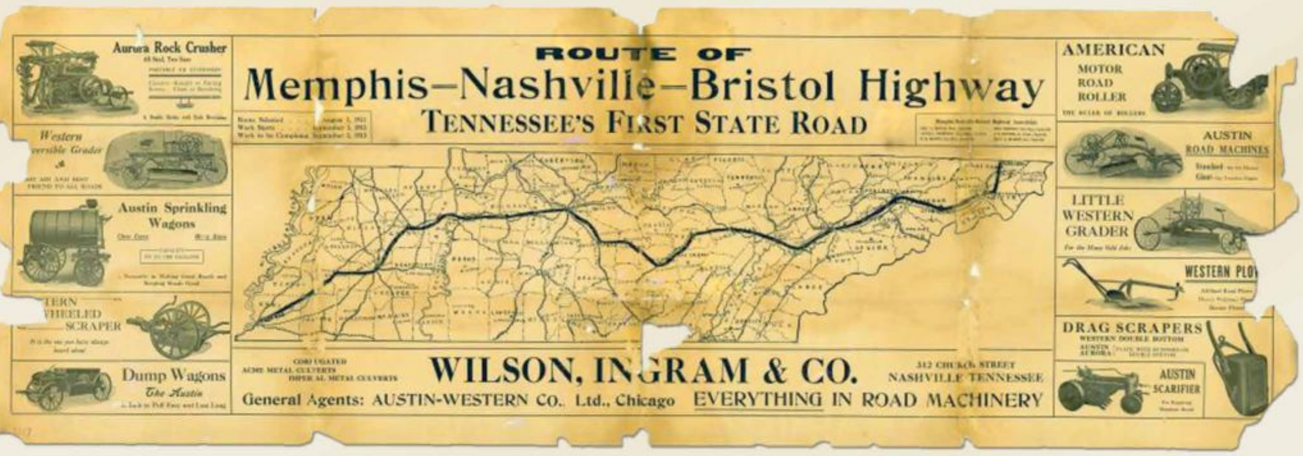
more than 10% of ASHE's membership is either involved in a committee or serves as an officer. This figure, however, does not account for all of the individuals behind the scenes who have also offered their time for the numerous things that need to be done. Adding these individuals into my calculation pushes the number toward 6,400 members, or nearly 100%. So, thank you to so many people who support ASHE in myriad ways, and for those not currently among the 10% who hold an official ASHE position, I encourage you to seek out an ASHE officer at the Section, Region or National level to ask where you can become more involved. Let's keep the success going!

As we move into 2016-2017, my predecessors have established the course for ASHE, and I am not making any right turns; rather, I am committed to staying the course. With the Strategic Plan and a SWOT (Strengths/Weaknesses/Opportunities/Threats) analysis several years ago, several goals were identified: to grow with the addition of new Sections and expansion of our existing Sections, to improve communications throughout the organization, to provide training opportunities and to ensure that our governance structure is efficient and productive.

These are challenging objectives, and seeing them through will require the dedicated involvement of each of our National Committees. In addition, each National Committee has been asked to define their own goals for the year. Among them, the New Section Committee has developed a Strategic Plan that will help achieve growth in a number of states, and the newly established Governance Committee is examining the organization and its business functions for improvement opportunities moving forward.

We have an exciting but challenging year ahead of us. The leadership of our Past Presidents has set a great path for ASHE. I would like to especially thank Bob Hochevar for his excellent leadership this past year and for making my transition an easy one. We may be changing titles and roles, but we have already been working together on ASHE's future. Please contact me anytime if there is something that I can do to help you or your Section.

# The Memphis to Bristol Highway:
# Commemorating TDOT's First State Road



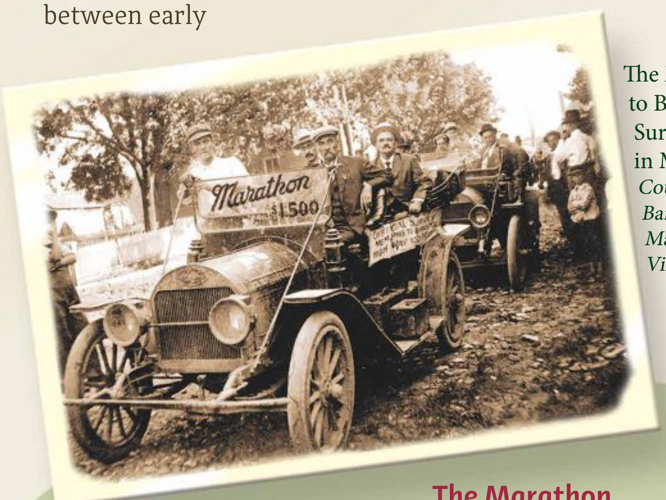

A 1911 promotional road map, distributed by Wilson, Ingram and Company that sold road-building equipment
*Courtesy of Tennessee State Library and Archives*

by Tammy Sellers and Holly Barnett,
**ASHE Middle Tennessee Section**

In preparation for the Centennial Celebration of Tennessee's Department of Transportation (TDOT) its historians uncovered the fascinating story of the Memphis to Bristol caravan. The 1910 publicity event galvanized support statewide for a "good road" or highway to connect the horizontally challenged Tennessee from its southwesternmost point in Memphis to Bristol, the town shared with Virginia in the upper eastern part of the state. It marked an important intersection between early governmental influence in road-building and good roads boosterism that led to the Memphis to Bristol corridor becoming Tennessee's first state highway.

By the late 1800s and early 1900s, the nation witnessed countless activist efforts, including education reform, prison reform and better working conditions for all workers, that came to be known as the Progressive Movement. The Good Roads Movement was a part of these reforms to correct the deficiencies in the nation's lagging roadway network. Bicycle enthusiasts were the first group to start lobbying for better roads, but serious efforts did not begin until the popularity of the automobile spread. The movement gained ground and supporters, leading to the creation of the National League of Good Roads in 1892. Although they were first opposed to paying taxes to build better roads, farmers became the main "Good Roads" proponents with the popular slogan "Get the Farmer Out of the Mud," arguing that farm-to-market roads increased rural commerce.

The movement in Tennessee splintered as regionalism and politics took precedence over the desire for a cohesive roadway network. Private roadway associations, such as the Dixie Highway Association, were most often created to transport tourists to a specific destination. The roads built along the way required communities to lobby for the "named road" to pass through their area. Tennessee had many named highways throughout the state. Two of such highways would become the top priorities of the State Highway Department (SHD) upon its creation in 1915: the Dixie Highway and the Memphis to Bristol Highway.




The Memphis to Bristol Survey Team in Marathon
*Courtesy of Barry Walker, Marathon Village*

## The Marathon

Started in 1884 in Jackson, Tennessee, the Southern Engine and Boiler Works manufactured industrial machines. In 1906, a company employee, W.H. Collier, convinced owners to let him build an automobile that became known as the Marathon. In 1909, the company offered two $1,500 models—the A9, a five-seat touring car, and the B9, a roadster with a rumble seat. The company relocated to Nashville in 1910 and developed more models. It is unknown how many Marathons were manufactured, but by 1914 the plant ceased automobile production. Today the former Marathon Motor Works plant houses a vibrant community of shops and art studios, including the Nashville location of Antique Archaeology, popularized on the History Channel's show, *American Pickers.*

Prior to that in 1910, the Memphis to Bristol Highway became the main focus of the Tennessee Good Roads Association. Support for the road led to the creation of the Memphis to Bristol Highway Association that focused solely on building this intrastate road. Recognizing the need for the proposed highway, Governor Ben W. Hooper determined that each county government should issue bonds and build the section of the proposed highway through their own county. However, Hooper realized the importance of having a layout and design that transcended individual counties to create a cohesive road, and appealed to the Office of Road Inquiry in the Department of Agriculture for help. The federal government sent an engineer to Nashville to help design the road. In order to garner additional support and determine the best possible route for the Memphis to Bristol Highway, representatives from the Memphis to Bristol Highway Association and the State Commission on Public Roads planned an automobile tour to scout out a potential road location. The survey commission searched for a reliable automobile that could travel unimproved roads—and settled on the Nashville-built Marathon.

On September 20, 1911, a group of 10 men representing the State Commission on Roads, the Federal Office of Road Inquiry and the Memphis to Bristol Highway Association met at the Hermitage Hotel to embark on the 1,000-mile journey. With automobiles still relatively new, the group encountered excitement at all of their stops. The tour highlighted poor road conditions, with many in the group surprised that the Marathon automobiles were able to make the trip. The group drove from Nashville to Bristol and back to Nashville with stops along the route. Many towns provided welcoming parties to celebrate the possibility of the highway going through their town, and people were often curious about how the automobiles climbed mountains and crossed certain streams. The group returned to Nashville and headed to west Tennessee the next week, facing wet, sandy roads that presented a different set of challenges for road building. The Memphis to Bristol Motorcade successfully showed that a good-quality road would allow travelers to move across the state of Tennessee in a safe and timely manner.

A 1911 promotional road map from Wilson, Ingram and Company, specializing in road-building equipment, shows the route laid out during the caravan that was eventually built by the SHD. The only deviation from the 1911 map is that the highway was shifted slightly to the north in upper east Tennessee. Traversing the state at over 530 miles, the Memphis to Bristol Highway took 15 years to complete, but each completed segment was a feat for the SHD. This highway has seen many improvements over the last 100 years, but it remains the hallmark road of the Department with its designation as SR 1, eventually being known as US 70, a primary east-west corridor.

In 2015, along with publishing a history of the department and unveiling a marker on the grounds of the Bicentennial Mall, TDOT celebrated its centennial by recreating the Memphis to Bristol caravan.

TDOT Commissioner John Schroer unveiled a commemorative First State Highway sign on the Memphis to Bristol Highway.

At stops along the way, Commissioner John Schroer and Department representatives unveiled signs along the original route commemorating Tennessee's first state road. Just like over a century before when people expressed great interest in the original caravan, crowds gathered to hear the Commissioner speak about TDOT's past and future.

# **Emlenton Walls Alternate Design:** Cost-Effective Solution for a Challenging Project

by Ray Henney, PE, SAI Consulting Engineers, Inc., **ASHE Southwest Penn Section**

Located in northeast Pennsylvania, the Emlenton project is in PennDOT District 1-0 of the ASHE Franklin Section.

As part of the reconstruction of SR 0038, Section A00, a roadway fill was constructed for the realignment of SR 0038 between Exit 42 of I-80 and the SR 0268 intersection near the bridge over the Allegheny River into Emlenton Borough. The roadway consists of two 12-foot-wide travel lanes and four-foot to eight-foot shoulders. Because roadway realignment was to be performed on SR 0038 near Emlenton, the construction required six retaining walls to support the reconfigured roadway. The realignment eliminated a reverse curve, poor site distance and slide issues on the steep hillside. The Emlenton walls supporting the reconstructed roadway are located on a steep (1:1) hillside with sharply sloping rock, historically prone to slides. Evidence of existing slides are prevalent along the outside edge of the existing roadway. Six retaining walls were redesigned by SAI Consulting Engineers, Inc., as an alternate for Mekis Construction; the retaining walls had to account for difficult site conditions for construction. All walls were originally designed as soldier pile walls with a cast-in-place concrete facing; three of the walls utilized rock anchors. Due to the roadway grade and steep slopes on both sides of the road, construction access to the site was difficult.

A narrow road was built in front of the wall to allow for drilling the caissons and rock anchors.

At Wall 4, the roadway was relocated away from the hillside, which required a need for a wall with a maximum exposed wall height of 50 feet and a total length of 360 feet. Global stability runs were performed, using the computer program GSTABL for multiple sections along the wall. The soil profile consists of three layers, residual soil on top of both fractured and competent rock. The first layer was modeled as sand with the determined friction angle and unit weight parameters of the residual soil. The second layer, a very fractured siltstone, was modeled as a soil with a modulus of E50 assuming values for stiff clay. The final layer of sandstone was treated as strong rock.

For the alternate design, a premium was placed on eliminating as many rock anchors as possible, due to the high installation cost per anchor and the difficulty in accessing them. Originally, double-piles were used, and rock anchors were utilized at every pile location. Rather than placing anchors at every pile location, anchors were placed mid-span between the piles in alternate pile bays. Although the anchor loads increased slightly, 35 anchors were eliminated from the design (116 to 81). To transfer the anchor loads to the piles, steel walers were provided that spanned between the piles in the alternate pile bays. The added weight of steel in the walers was offset by reducing the weight of the piles by changing from double h-piles to single piles. When using the single pile, a deeper section could be used and still maintain clearances in the drilled shaft, allowing pile strength to increase without using a heavier section.

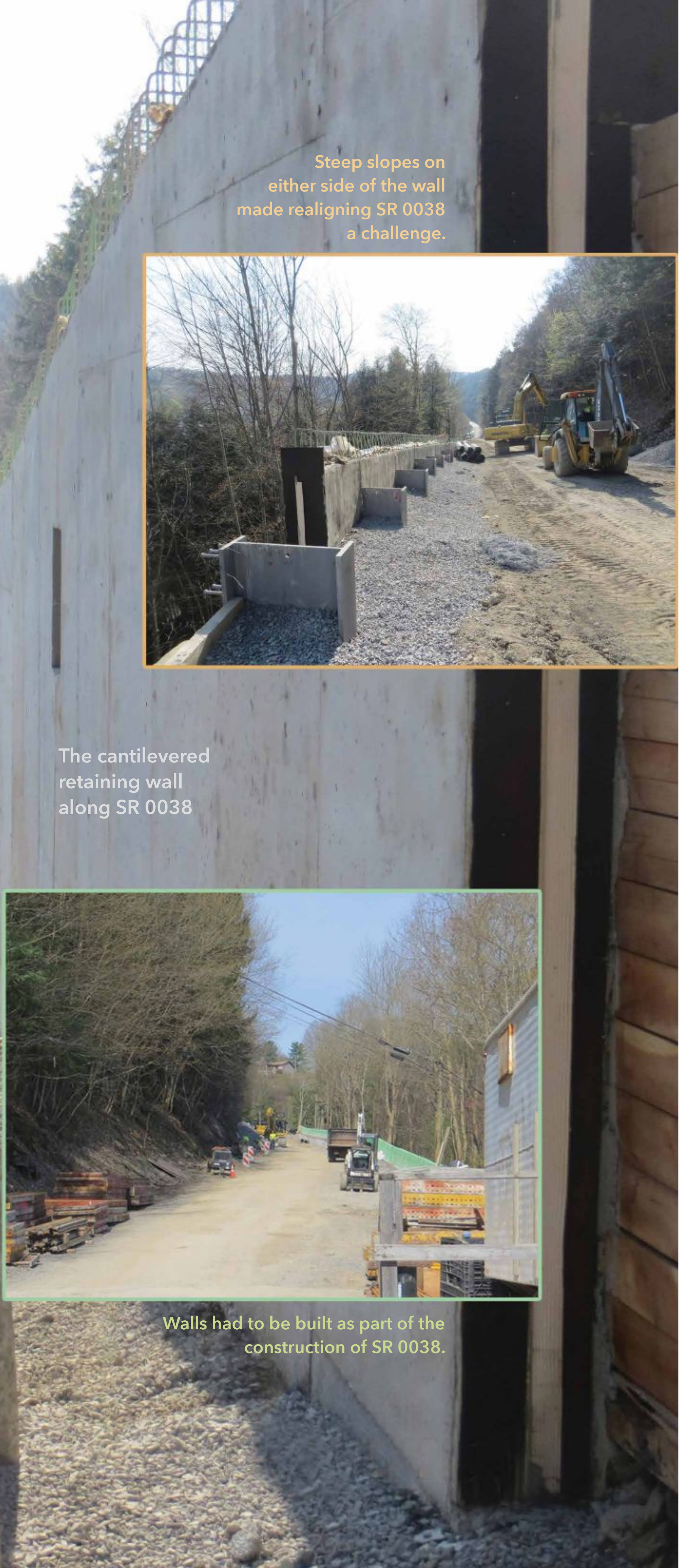
To facilitate construction, wood lagging was designed to support the entire backfill load during construction throughout all phases of the wall installation up to the final condition. The required cast-in-place concrete facing, in accordance with the special provisions, accelerated construction by allowing roadway reconstruction to begin once all anchors and backfill were installed. Since concrete facing was not integral to the capacity of the wall, the roadway construction and concrete facing were worked on simultaneously once the wood lagging was installed, which reduced the schedule length. Other cost savings in Wall 4 included the elimination of permanent shoring behind the wall by accounting for steeper cuts in the rock, eliminating the reinforcing in the caissons by allowing the steel piles to handle all loads, and reducing the rock socket depths.

Finite element models were created for each final condition design height and for each stage during the bottom-up construction. As required by the special provisions, redundancy was checked by assuming a failed anchor in the finite element model.

Alternate designs of two other anchored soldier pile walls were completed similar to Wall 4, which completely eliminated all rock anchors in those walls. The walls were designed strictly as a cantilevered soldier pile wall. For these walls, the increased bending in the piles due to anchor elimination required a deeper, heavier pile section to be used, although the double piles were eliminated. The elimination of the rock anchors provided significant cost savings to Mekis Construction, while accelerating the construction schedule of the wall, providing the contractor with valuable time-savings. In addition, the cast-in-place thickness of the concrete facing was reduced, along with the amount of reinforcing in the wall, and all reinforcing in the caissons was eliminated.

Two soldier pile walls were redesigned as conventional concrete cantilever walls with spread footings to provide additional savings. In these areas, the rock was shallow, and minimal excavation was required to construct the spread footings on rock and eliminate caissons. In the area of these two walls, slides were not an issue.

The alternate walls were completed on schedule in October 2014. The cost-saving measures of the alternate design that was provided enabled Mekis Construction to accelerate the construction schedule. The walls also alleviated the concern of having continued slope failures that were previously evident along the existing hillside.



The cantilevered retaining wall along SR 0038

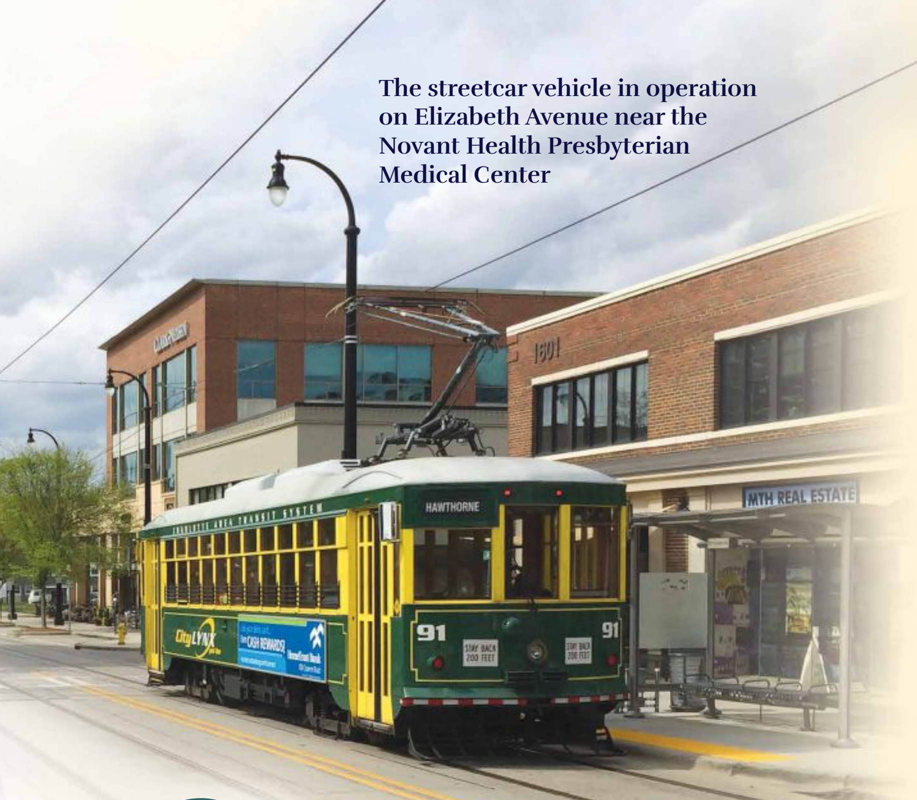
Steep slopes on either side of the wall made realigning SR 0038 a challenge.

Walls had to be built as part of the construction of SR 0038.



**Correction:**

An article in the spring 2016 issue of *scanner*, "Network Mapping Using Multichannel 3D GPR Array Technology: New Jersey Route 70," incorrectly stated that Kaz Tabrizi, an author, was affiliated with McCormick Taylor. Mr. Tabrizi is affiliated with Advanced Infrastructure Design, Inc.




The streetcar vehicle in operation on Elizabeth Avenue near the Novant Health Presbyterian Medical Center

# Bringing Streetcars Back to Charlotte

by Dominic J. Geiser*, PE, Consultant Project Manager, AECOM Technical Services of North Carolina, Inc., for the CityLYNX Gold Line, **ASHE Carolina Piedmont Section**

Charlotte, NC, has been building a streetcar program one step at a time for many years, and the ongoing effort continues to pay off. When the bell clanged on opening day on July 15, 2015, the city had its first operational streetcar in over 77 years. Nearing its first anniversary, Phase 1 of the CityLYNX Gold Line has been a success. The one-and-one-half-mile alignment is the first phase of a 10-mile east-west corridor, connecting uptown Charlotte to nearby high-density and suburban neighborhoods. Benefits of the system include enhanced transit opportunities connecting key sites in and near uptown, reduced traffic speeds, improved pedestrian facilities and incentive for development on the corridor.

The Gold Line – Phase 1 corridor echoes the original streetcar vision of the city. Like numerous cities across the country, Charlotte once had a thriving streetcar network consisting of overhead power lines and tracks integrated into the roadway pavement. The Trade Street and Elizabeth Avenue alignment was the second segment of the original streetcar network, constructed to allow the city to spread into its first streetcar suburb—what is now the historic Elizabeth neighborhood. This urban neighborhood has been home to several Charlotte institutions, such as Novant Health Presbyterian Medical Center (formerly Elizabeth College) and the central campus of Central Piedmont Community College (CPCC), (formerly Central High School). Unfortunately, like most cites, the streetcar system was eventually discontinued, with the original tracks buried under asphalt.

On November 15, 2006, the Metropolitan Transit Commission adopted the 2030 Transit Corridor System Plan, which included the Center City Streetcar Project, a 10-mile, east-west corridor. It extended from Rosa Parks Community Transit Center on Beatties Ford Road east through downtown via Trade Street and Elizabeth Avenue, continuing to the Eastland Community Transit Center via Hawthorne Lane and Central Avenue with modern streetcar vehicles. The city sought to advance the implementation of streetcar service, and the initial opportunity to do so was recognized with the Elizabeth Avenue Business Corridor Project. This corridor improvement project installed the initial half-mile of tracks with local funding. The corridor project converted a narrow three-lane section into a two-lane section with on-street parking, street trees, improved sidewalk facilities and bike lanes.

In order to fulfill the vision of collaborative projects, the city expanded the corridor improvement project to include streetcar tracks and streetcar overhead catenary poles with street lighting for the proposed streetcar project, bike lanes in the CPCC section for the bicycle plan, widened sidewalks and on-street parking in the developer areas for the Elizabeth Area Plan and utility infrastructure per the Utility Plan. The roadway was narrowed to slow traffic speeds and improve pedestrian safety to encourage economic development. The city partnered with stakeholders along the project to include the relocation of overhead utilities to a joint-use underground duct bank to eliminate the overhead "clutter." The Elizabeth Avenue Business Corridor project was completed in 2007.

Charlotte continued to implement the streetcar system, and in July 2010, the city was awarded an FTA Urban Circulator Grant. This funding, and final completion of the NEPA process in June 2011, allowed the city to complete the design and construction of the CityLYNX Gold Line – Phase 1 project. The project utilized the installed tracks and infrastructure from the Elizabeth Avenue Business Corridor project, constructing the streetcar system along Trade Street/Elizabeth Avenue from the Charlotte Transportation Center (CTC) one and one-half miles east to Novant Health Presbyterian Medical Center on Hawthorne Lane. Implementation of this initial segment provides connectivity between major activity centers, including the CTC, Time Warner Cable Arena (home of the Charlotte Hornets), Charlotte-Mecklenburg Government Center, CPCC and Novant Health Presbyterian Medical Center.

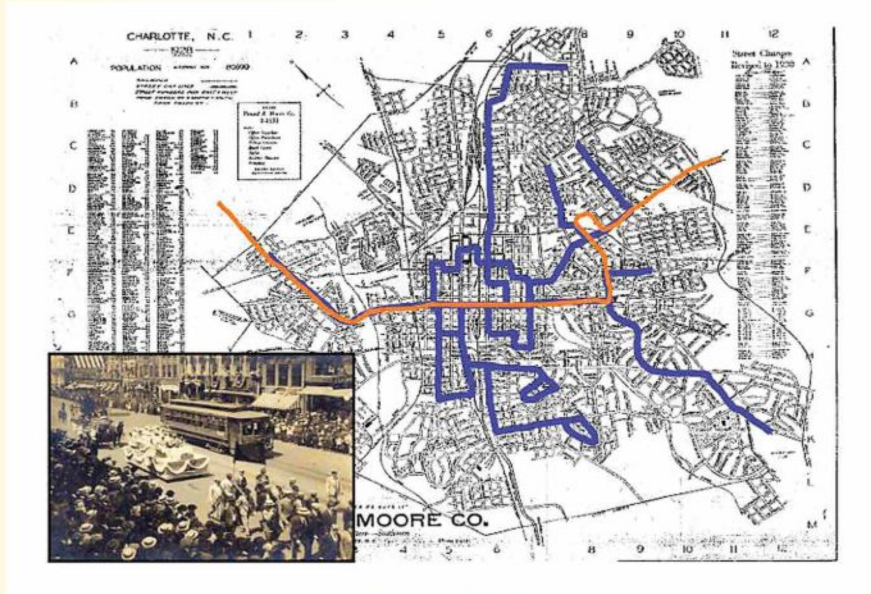
Phase 1 utilized three existing Gomaco Replica Trolleys that the city already owned, as well as the traction power substations that were purchased with the trolleys. Phase 1 also included a connection to the LYNX Blue Line light rail system that allowed the vehicles to continue to be housed and maintained at the existing Light Rail Vehicle Maintenance Facility. This allowed Charlotte the flexibility to look at hybrid options on future vehicles.

The city continued its collaborative approach with the project, implementing maintenance and system improvements to the water, sewer and storm water infrastructure. Other stakeholders also became involved, with Novant Health and Duke Energy implementing a power duct bank installation in conjunction with the project.

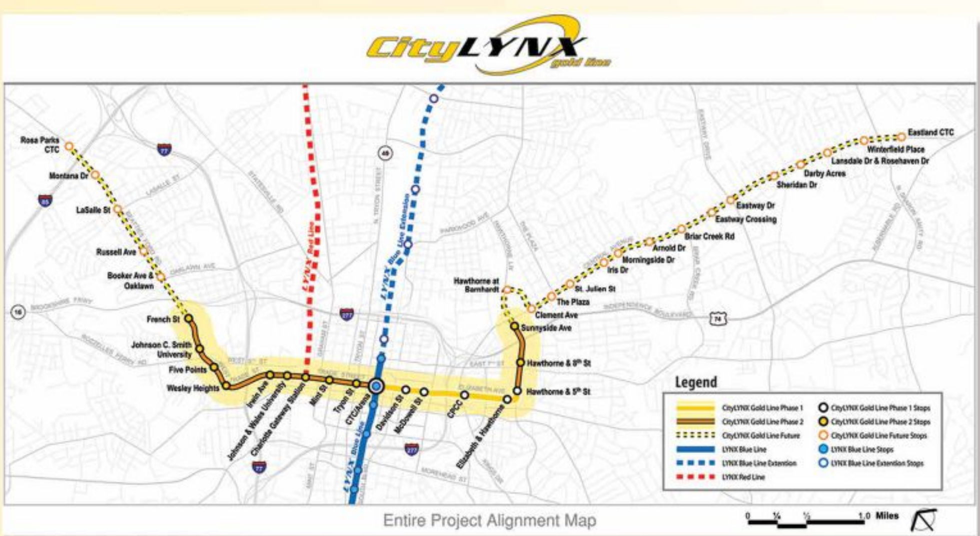
Pedestrian accommodations were maintained along the corridor, and improvements were made to crosswalks, sidewalks and platform access locations. Street lighting was provided via joint-use poles—city-owned poles accommodating the overhead wiring for the streetcar, with Duke Energy-owned streetlights mounted on top. This solution, reached through Charlotte/Duke Energy agreements, kept pole clutter to a minimum on the corridor.

With Phase 1 nearing its first operational anniversary, Phase 2 design is nearly complete. The city of Charlotte is in final negotiations for a Small Starts Grant that would provide 50 percent of the funds to extend the project approximately two miles to the west, and one-half mile to the east. Not only will this project extend the streetcar system to a total corridor length of four double-track miles; it will also expand connectivity between locations along the alignment. The four-mile Gold Line corridor will connect seven educational facilities (Johnson C. Smith University, Johnson & Wales University, Northeastern University–Charlotte, UNC Charlotte–Uptown Campus, CPCC, Wake Forest–Uptown Campus and Kings College) and six cultural facilities (Bechtler Museum, Mint Museum, Gantt Center for African-American Arts and Culture, Blumenthal Performing Arts, Discovery Place and ImagineOn). It will also connect four professional sporting venues (Bank of America Stadium, BB&T Ballpark, Time Warner Cable Arena and the NASCAR Hall of Fame) and two major transit transfer hubs (the CTC and Gateway Station, which houses the Greyhound Intercity Bus Station and the future Amtrak Intercity Rail at Gateway Station). In addition to the two and one-half miles of track and roadway infrastructure, major components of Phase 2 include a modern fleet of streetcar vehicles with wireless option, an overhead contact system with new traction power substations and the replacement of the Hawthorne Lane bridge over US 74.

Charlotte Streetcar System map circa 1928; the CityLYNX Gold Line follows and extends one of the original system corridors.




The current CityLYNX Gold Line System Map serves the central business district and neighborhoods east and west of uptown Charlotte.




In addition to enhanced connectivity, the Gold Line is poised to succeed in reaching its other goals. The project continues to gain the attention of developers and investors, as seen in the amount of development along the corridor. The city is excited about this continued success. With the recent completion of Phase 1, and construction of Phase 2 scheduled to begin in late 2016, the CityLYNX Gold Line will continue to change the face of Charlotte, building the transit corridor one link at a time.

**Mr. Geiser is the immediate Past President of the ASHE Carolina Piedmont Section.*

# Pavement Rehab in Florida Not Always a Smooth Process

by Tabatha Carlton, PE, Senior Project Manager, Pond & Company, Inc. ASHE Northeast Florida Section

Every year I go to my daughter's school for the Great American Teach-In and explain that engineers design, build, operate and maintain just about everything we use in our everyday lives. The students get to "design" and "build" a marshmallow tower. They "operate" or play with it until it starts falling apart. When it is time to "maintain" it, that is where I lose them. Restoring their original creation is no longer a priority. Maintaining the usability of an occupied space is often approached as a rudimentary and secondary activity—a dreaded chore much like the way my daughter views maintaining her room in some order. In terms of highway design, asphalt roads are maintained by milling and resurfacing, and concrete pavements are restored by sealing cracks and replacing slabs. These activities by themselves seem fairly simple and routine. However, the resurfacing, restoration and rehabilitation (RRR) program in Florida is anything but simple, often requiring out-of-the-ordinary fixes.

The first sentence of the Florida Department of Transportation (FDOT) Plans Preparation Manual (PPM), Chapter 25, states: "Resurfacing, restoration and rehabilitation (RRR) work is defined as work undertaken to extend the service life of an existing highway and/or enhance highway safety." Since asphalt was first used in the United States in the 1860s, there has been a need to maintain and prolong the life of the asphalt. Most state departments of transportation (DOTs) have a resurfacing program. The Federal Highway Administration document, "Good Practices: Incorporating Safety into Resurfacing and Restoration Projects" (December 2006), discusses how roadway maintenance programs and safety programs are merging, and provides guidance on how to accomplish this. Florida developed a separate RRR guide that was at first just referenced in the PPM in 1981 and was officially incorporated into the PPM in 1994 after the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) expanded eligibility for federal safety funds.

The RRR process in Florida begins with "extending the service life" of pavement. This can be more complicated than it sounds. Most asphalt pavements are designed for a 15- to 20-year service life, and concrete pavement can last up to 30 years without major rehabilitation. But this is only if the traffic projections and equivalent single-axle loads (ESALs) over the design service life match actual conditions. While estimates and calculations are usually correct, there are always special cases when unknown factors cause a roadway's service life to be significantly lower than anticipated.

One example of a special case was SR 44 in Lake County from the Lake/Sumter County Line to SR 44/CR 468. The existing pavement was failing and severely rutted. After obtaining traffic data and looking at both current and projected ESAL values, it was determined the existing asphalt pavement section was structurally deficient (simply not thick enough) to handle increased truck traffic on the corridor. Two options to rehabilitate the roadway were reviewed: reconstruction of the entire roadway or adding structural course to the existing pavement section, raising the roadway profile. Ultimately, adding two-and-one-half inches of additional structural course was the more feasible option, but it triggered all median openings to be raised and reconstructed, shoulders to be reconstructed, front slopes revised and all driveways to be reprofiled.

Florida's other RRR process goal is to "enhance highway safety." This starts with a thorough review of the 13 AASHTO Controlling Design Elements: design speed, lane width, shoulder width, bridge width, structural capacity, vertical clearance, grade, cross slope, superelevation, horizontal alignment, vertical alignment, stopping sight distance and lateral offset (clearzone). Like most states, AASHTO sets the minimum criteria, while FDOT has developed more stringent standards. Designers attempt to correct as many deficient elements as the budget, schedule and right of way limits will allow. For those elements that cannot be corrected on a RRR project, either a design variation or exception is prepared. A variation is prepared when the design element meets minimum AASHTO criteria but not FDOT criteria. A design exception is required for any element below the minimum AASHTO criteria. Other safety considerations on RRR projects include:

- Intersection operations, signalization, pavement markings, turning radii, channelization and ADA
- Drainage concerns where there is a history of flooding or potential for hydroplaning
- Pedestrian, bicycle and transit needs
- At-grade railroad crossings
- Aesthetics and landscaping
- Highway lighting
- Highway traffic control devices
- Bridges and associated design elements of a bridge
- Roadway safety hardware such as guardrails
- Ancillary structures associated with signs, signals, lighting and ITS

The PPM also allows for engineering judgment to be exercised to determine when certain elements should be corrected with a RRR project. To supplement the PPM, the FDOT has developed RRR Practical Design Guidelines that consist of three basic lists: items to always correct on a RRR project, items that do not need to be corrected and discretionary items.

On all roads, whether it is resurfacing to extend its pavement life or adding sidewalk for pedestrians, there is always a challenge in the design that makes our jobs as engineers fun and interesting. Now if I could only figure out a way to make cleaning the bedroom fun and interesting for my teenager. That would be an accomplishment.

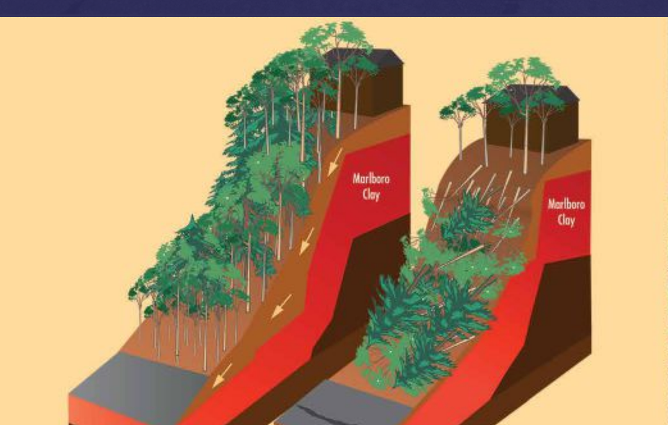


US Alt. 19A at Virginia Ave. before (top) and after (left) RRR Improvements

The landslide lowered a 65-foot-high ridge as much as 12 feet in places, taking down trees and utility lines.

The landslide caused homes along the top (red), now at the edge of the cliff, to be deemed uninhabitable.

Cracks split the asphalt along Piscataway Drive; highway sections and surrounding land sloughed down the hillside toward the creek.




The top layer of soil moved over the middle 30-foot-thick stratum of Marlboro Clay, bringing down trees and causing roadway failure.

# Piscataway Hills Land

by Kenneth Briggs, PE; Mary Wiedorfer, PE, CCM,PMP, LEED AP; Kwabena Ofori-Awuah, PE; and Dion Ho, PE, KCI Technologies, Inc., **ASHE Chesapeake Section**

In late spring 2014, heavy rains fell on already-saturated soils, triggering a landslide in the Piscataway Hills neighborhood, located in Prince George's County, MD, southeast of Washington, DC. The slide opened large cracks along the roadway, caused trees to tumble down the 65-foot-high ridge, and left several homes sitting precariously at the edge of the newly formed cliff. Piscataway Drive, which provides the only access into the neighborhood, dropped four feet in one location. That damage, along with fractured water and sewer lines and the unsafe nature of the hillside, led to an immediate road closure and subsequent evacuation of 28 homes.

Consulting engineering firm KCI Technologies, Inc., based in Sparks, MD, assisted the Prince George's County Department of Public Works and Transportation in investigating the cause of the failure, prepared engineering plans for repairs and provided construction oversight to restore service and access to the residents. The team mobilized immediately on-site to initiate a comprehensive geotechnical study. Two weeks after the collapse, engineers delivered a report outlining their findings and identifying three distinct soil strata. The middle layer, which was composed of a 30-foot thick layer of Marlboro Clay, showed evidence of failure plains. Found throughout southern Maryland, this type of soil stratum is known to be highly susceptible to landslides because it cannot absorb subsurface water. Instead, water moves across the top of the layer, creating a slick surface.

### Fast-Track Design

With the cause defined, engineers began developing alternatives to stabilize the area. The team consulted with national geotechnical experts Richard Ortt, MD Geological Survey, and Francis Ashland, U.S. Geological Survey, in developing proposed solutions. Slope stabilization approaches that were considered included drilled shafts, soil nailing, retaining walls with deep foundations and driven steel piles.

Engineers worked with the county using "Most Practical Source" procurement method to identify and solicit proposals from several qualified contractors, bypassing the traditional design-bid-build and

The KCI team installed equipment to monitor the hillside for future movement.

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# dslide Stabilization

design-build approaches that could have delayed the schedule. Corman Construction, based in Forest Hill, MD, was selected and became a critical part of the design team, attending weekly meetings and working through constructability issues that included equipment availability and material selection.

Schedule was a driving force throughout the project, and the team employed several strategies to keep the project on track. During the initial investigation, engineers worked from a trailer on-site to gather and analyze soil, inclinometer, piezometer and survey data as it became available. In final design, co-located weekly team meetings and over-the-shoulder reviews with the county environmental and soil conservation agencies allowed the team to minimize review times in order to secure permits.

The county, engineering and contracting team continued to revisit design alternatives for stabilizing the roadway and slope in terms of cost, schedule and constructability. One option even considered purchasing all 28 homes and turning that portion of the neighborhood into a permanent greenspace. Instead, the county focused on repairing the damage within the right-of-way and elected to purchase six homes that remained at risk and deemed uninhabitable. Demolishing the homes simplified slope stabilization methods and types of equipment proposed and reduced construction and engineering costs.

The final remediation design called for 411 steel H-piles in 60- and 70-foot lengths to be driven along either side of the roadway, with some areas requiring two rows of piles. To ensure the materials were available for construction notice-to-proceed, the county approved an early payment to purchase the piles before roadway and utility plans were completed. The construction would take approximately six months and cost $11 million, making the Piscataway landslide the most costly natural disaster in the history of Prince George's County.

### Supporting a United Community

From the beginning, the county worked diligently to inform and engage residents. Public meetings were challenging, as residents fought to regain access to their homes and, in some cases, retain their homes. The goal of the entire team was to stabilize the slopes and restore the roadway so that residents could return to their homes as quickly as possible. Although homeowners had been allowed access to their property once basic services, including water, sewer and temporary roadway access, had been returned, construction of permanent repairs would again cut off their vehicular access, mail and trash removal services. In the months leading up to the pile driving that would completely block Piscataway Drive, the community joined together to build temporary mailboxes and garbage receptacles at the top of the roadway. They also erected two sets of stairs and a series of pathways that would allow residents egress and ingress to their properties without crossing the dangerous construction work zone.

The team worked with residents to ensure that first responders could service homeowners in case of a fire or medical crisis. A protocol was developed that employed a locked cable across the roadway width instead of traditional barricades. A key was given to a resident who volunteered to coordinate with on-site inspectors to make sure nothing was in the way when the contractor left each day.

### Expedited Construction Led to Quick Restoration

Notice-to-proceed in June of 2015 kicked off an accelerated schedule aiming to stabilize the slope, and restore the utilities and roadway before winter weather could delay construction and turn the residents' steep bypass into a treacherous icy crossing. Thanks, in part, to fluid coordination, technical excellence and diligent management, along with favorable fall weather, the community celebrated when Piscataway Drive was reopened Christmas Eve. The geotechnical team continues to monitor the site regularly for movement and will continue to do so for the year following the stabilization efforts.

ommunity built lighted stairs to bypass the ruction site; a zip line helped residents move r items up and down the steep slope.

A new Juntann rig was selected for its ability to quickly drive the H-piles.

Residents celebrated when construction barriers were removed just before Christmas 2015.

Dorr Street corridor: looking west *before* improvements

Dorr Street corridor: decorative traffic median *after* improvements

Dorr Street corridor: decorative traffic median *after* improvements

Dorr Street corridor: crosswalk *before* improvements

# Changing Dangerous and Drab to Safe and Fab

by Richard J. Spino and Jean M. Hartline,
**ASHE Northwest Ohio Section**

Ranked as one of the most beautiful campuses in the nation, the University of Toledo (UT), in northwest Ohio has been known for rambling walkways, canopies of mature trees and the iconic University Hall building with its 10-story clock tower on its northern border. However, as the university continued to grow and expand southward with new dormitory buildings and a large "Gateway" project with restaurants and retail establishments, the Dorr Street (SR 246) corridor on the south side of campus remained an eyesore. With more than 20,000 students on the adjoining campus, negotiating the Dorr Street corridor by foot or by car was a nightmare. As the university planned for the Gateway project, Dorr Street continued to be a problem. The turning point was the eventual ranking of Dorr Street as the 19th most likely location in the state for crashes in its classification as an urban arterial roadway.

The Dorr Street Corridor Project involved partnerships that united the goals and objectives of the City of Toledo, UT and the Ohio Department of Transportation (ODOT). The city desired roadway improvements to upgrade local infrastructure, improve safety, enhance mobility, promote greater livability among students and neighborhood residents and create a positive environment for local business. UT wanted to eliminate the eyesore that the Dorr Street corridor had become, with improved aesthetics to match the university's investment of new dormitories and the Gateway restaurants and retail development on its southern border. ODOT needed to address the severe crash problem along the corridor and safely accommodate the 25,000 vehicles that used the corridor every day.

The improvements to Dorr Street started in 2009 with the Dorr Street Corridor Vision Plan, which included input from 10 community and neighborhood agencies. The Vision Plan set the groundwork for the future of Dorr Street by uniting the local partners to a common vision and goal. The partnership started with a small seed project involving The Mannik & Smith Group (MSG), the city and UT in 2010 to prepare a safety study and safety funds application for the corridor. As a result, ODOT awarded Toledo $4.4 million in federal safety funds for roadway improvements to address the problem.

UT's role as a project partner was vital to improving the appearance of the corridor. UT contributed $500,000 for aesthetic improvements, including bollards, columns, plantings, irrigation and decorative lighting, using color and texture to transform the corridor. UT also funded $1 million to bury unsightly overhead utilities.

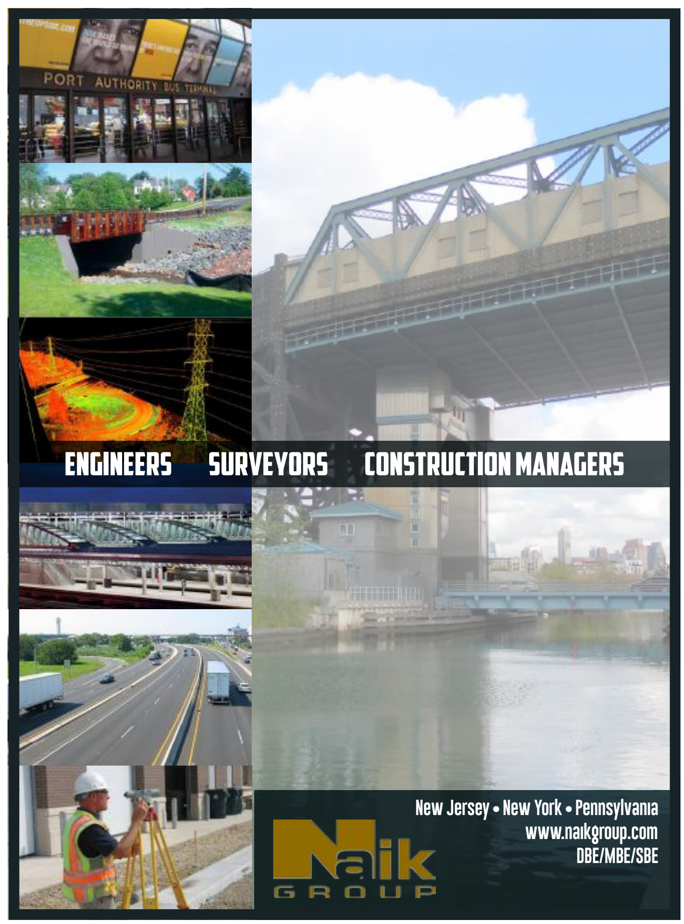
The preliminary engineering for the project involved the evaluation of several improvement scenarios, including jug handles (ramp that changes the way traffic turns left at an at-grade intersection), left-turn lanes, medians, Michigan left U-turns (at-grade intersection design, which replaces each left turn with a U-turn and a right turn) and roundabouts. Ultimately, the preferred alternative involved improvements to widen the one-mile corridor from west of Byrne Road to east of Secor Road by 17 feet; add a median and left-turn lanes; extend the median from Secor Road to west of Towerview Drive (within the existing pavement width); improve signalization; add pedestrian improvements including sidewalks, crosswalks and pedestrian storage islands (for staged crossings); and provide access management (medians with U-turn bays for displaced left turns).

Challenges on the project primarily involved four areas: 1) balancing the needs for all stakeholders; 2) minimizing right-of-way impacts; 3) relocating utilities; and 4) meeting the design schedule. The first and foremost challenge involved satisfying the diverse objectives of the university and an array of large and small businesses with the surrounding neighborhood to create a transportation corridor that would enhance UT and the commercial establishments, yet preserve the area's character. Issues such as cut-through traffic and traffic calming needed to be addressed with medians in the right locations to serve all users. Additionally, there were several businesses that were concerned about access and their ability to maintain viability in an access-managed corridor. To overcome these issues, the project included an outreach program that involved not only public meetings but also one-on-one meetings with businesses and concerned residents.

Property impacts along the corridor were minimized by limiting the widening and closely evaluating the alignment to avoid impacts that would result in total property takes. The 17-foot widening of the roadway was designed primarily for the south side of Dorr Street to take advantage of vacant land that was under the ownership of UT. Ten left-turn lanes were reduced to 10 feet wide, which resulted in saving at least three businesses from total property takes.

(continued on page 33)





# Construction Finally Begins on Central PA's Missing Highway Link

by Margaret Jackson, PE, PennDOT District 3-0, ASHE Williamsport Section

After decades in development, the first component of a significant transportation project for District 3-0 of the Pennsylvania Department of Transportation (PennDOT) finally advanced to construction in late 2015.

The project, done in conjunction with the Federal Highway Administration (FHWA) in central Pennsylvania, is known as the Central Susquehanna Valley Transportation (CSVT) Project. It is a new four-lane, limited access highway that stretches approximately 13 miles through five municipalities and three counties. The new highway will connect US Routes 11/15 north of Selinsgrove (Snyder County) to US Route 15 near Winfield (Union County) to PA Route 147 south of Milton (Northumberland County). The project consists of several key features, including:

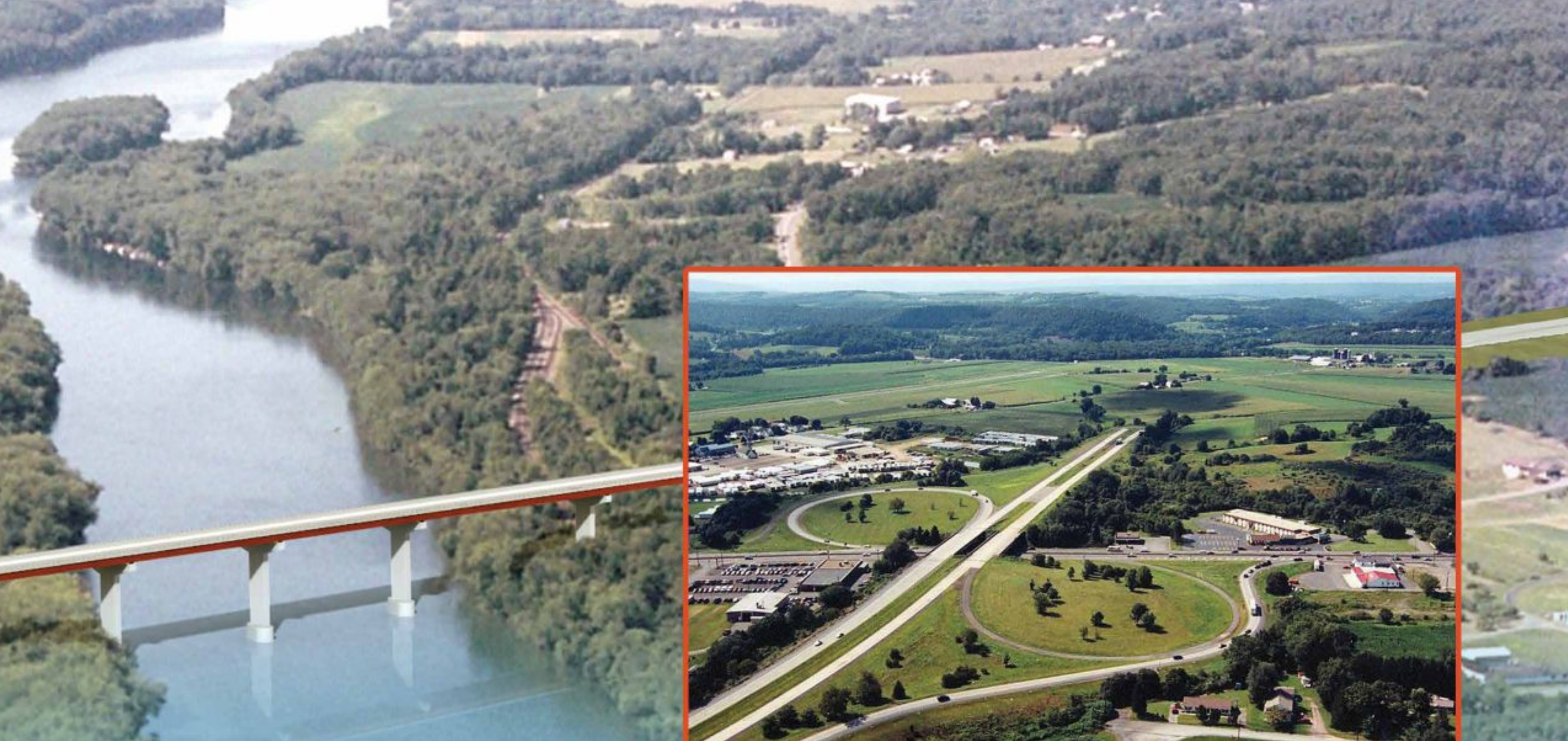
- Five interchanges
- 19 new bridges, including a structure spanning the West Branch Susquehanna River
- Approximately nine million cubic yards of earthwork
- An approximately one-mile-long roadway connecting the new highway to existing PA Route 61 and the city of Sunbury

For design and construction purposes, the project is broken into two sections, the Northern and Southern Sections, and it is currently planned to be completed through a total of seven construction contracts. The preconstruction cost for both sections, including costs for design, right-of-way acquisitions and utility relocations, is estimated at approximately $101 million, and the total construction cost for all seven contracts is estimated at approximately $569 million. Combining the preconstruction and construction costs, the total estimated cost for the project is $670 million (with all costs based on the anticipated year of expenditure).

The connection to be created by the CSVT Project will eliminate a major missing link to a continuous north-south limited access highway corridor in central Pennsylvania. Over the last several decades, residential and economic growth has resulted in traffic congestion and above-average crash rates on the primary roadways within the project area, particularly due to conflicts between local traffic and the high volumes of trucks and through traffic using the existing free-access corridor. Specifically, traffic signals line the existing four-and one-half-mile urbanized section of US Routes 11/15 in Shamokin Dam, and there are over 100 access points to businesses and developments within that area, resulting in traffic conflicts, as noted. Meanwhile, of current traffic volumes within the project area, over 50 percent of passenger vehicles and over 90 percent of trucks do not have an origin or a destination within the area.

While the concept of a new highway to separate trucks and through traffic from local traffic originated in the 1960s, its development has experienced numerous starts and stops primarily due to funding constraints. The CSVT Project was re-initiated in 1994, when PennDOT contracted Skelly and Loy, Inc., as the prime consultant for preliminary design to conduct the studies required to address the above transportation problems.

In the following years, a needs analysis was conducted, and the results were used to establish the purpose of the project. Simply stated, the purpose of the CSVT Project is to reduce congestion, improve safety and



accommodate further anticipated growth within the central Susquehanna Valley. Various potential alignments for a new highway were then developed, and each alternative was weighed against a broad spectrum of impacts, including those to natural, socioeconomic and cultural resources. In addition, an extensive outreach program was conducted in order to receive and consider public input during the development of the alternative alignments. Overall, 150 meetings were held from 1995 to 2003, ranging from full public meetings to smaller meetings with individual property owners.

The results of the alternatives analysis were summarized in the project's Environmental Impact Statement, which was finalized in 2003. From these results, the preferred alignment was chosen, and the project proceeded into final design. PennDOT selected STV Incorporated as the prime consultant for final design of the project's Northern Section, with HNTB Corporation as the lead designer for the river bridge.

After several years under final design, the project was again delayed in 2008 due to a lack of funding; however, with Pennsylvania's passage of state transportation funding legislation (Act 89) in late 2013, sufficient funding was identified to complete the project, and it was given the "green light" to once again move ahead.

With funding identified, the initial goal was to reactivate final design of the project and open bids for the first construction contract within 18 months. This would prove to be challenging, since that contract would involve construction of the new bridge over the West Branch Susquehanna River. Several issues had to be overcome during final design of the bridge. One of the major obstacles was the hydraulic modeling required for the backwater increases that the new structure will cause within a detailed Federal Emergency Management Agency (FEMA) study area. Initially, a one-dimensional model was used, but the results were unrealistic (showing backwater increases extending miles upstream) due to the flat slope of the river at the bridge location. Through coordination with FEMA, it was determined appropriate to use a two-dimensional model, which ultimately showed that backwater increases will be localized around the proposed piers and, therefore, they provided realistic results that could be used to revise FEMA's flood insurance rate maps.

Other noteworthy issues addressed during final design of the bridge include precautionary measures for handling acid-bearing rock within foundation excavation, avoidance of archaeologically sensitive sites and tree-clearing restrictions to avoid impacts to a threatened bat species. It also entailed coordination with Norfolk Southern Railroad regarding three tracks crossed by the new structure and use of a half-width causeway to minimize temporary impacts to the recreational boating that is prominent on the river.

Bids for the river bridge construction contract were opened in September 2015, and the contract was awarded to Trumbull Corporation of Pittsburgh, who submitted the lowest bid of $155.6 million. The proposed bridge will have 15 spans stretching 4,545 feet. The piers will range from 60 to 180 feet high, and the superstructure will consist of steel I-girders with maximum span lengths of 350 feet. Construction of the bridge is anticipated to last approximately four years.

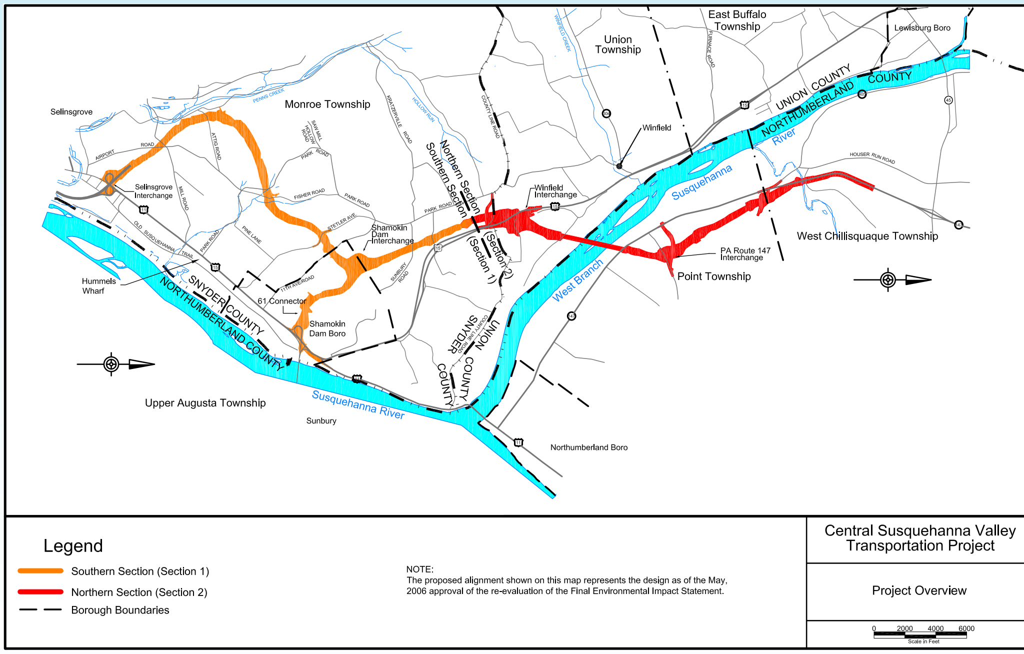
As the river bridge construction proceeds, final design of the remaining portions of the CSVT Project continues forward. The next construction contract will involve earthwork and non-river structures for the Northern Section, and bids are scheduled to be opened in late summer 2016. Overall, the entire project is currently scheduled to be completed by 2024.

*(continued on page 32)*

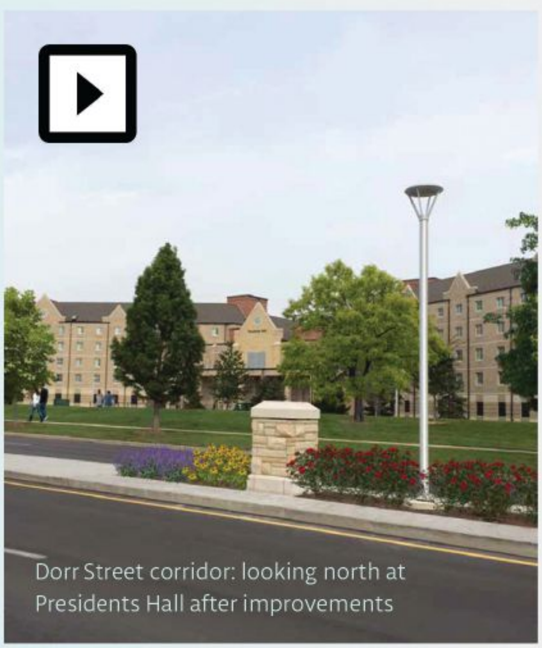
## Construction Finally Begins on Central PA's Missing Highway Link *(continued from page 31)*

Similar to the river bridge, the rest of the Northern Section and the Southern Section both have design challenges to overcome.

- The Northern Section involves:
  - Significant excavation into a rock formation that may contain hydrothermal veins of pyritic, acid-bearing material that is difficult to detect during pre-construction investigations
  - Karst topography prone to sinkholes
  - Two miles of electric transmission lines that must be relocated
  - Approximately 80 right-of-way claims
- The Southern Section's challenges:
  - Multiple conflicts with high-voltage electric transmission lines
  - Impacts to two ash-waste basins from a local coal-powered electric plant
  - Impacts to public water supply wells
  - Coordination with a nearby airport
  - Approximately 90 right-of-way claims




Although there are still years of design work and construction to be completed, the CSVT Project has come a long way from its start decades ago. A project that many people claimed would never happen finally has shovels in the ground. Travelers who have waited with great anticipation will start seeing physical progress toward a safer, more efficient highway network with the completion of a major missing highway corridor link in central Pennsylvania.



Dorr Street corridor: looking north at Presidents Hall after improvements

## Changing Dangerous and Drab to Safe and Fab *(continued from page 29)*

An additional challenge was corralling the utilities to meet the aggressive schedule for their relocations. This was accomplished by establishing the agreement on avoidance, impacts and relocations early in the project design process and the continual follow-up with utilities. Major power transmission lines needed to be relocated in areas where lines were not being buried. AT&T also had two 48-inch banks of fiber communication line located four feet under the pavement that needed to be avoided.

The project schedule was extremely tight with only 14 months for design, environmental studies and right-of-way acquisition of 25 parcels, with the sale date set for the final week of the fiscal year. Missing the fiscal year could jeopardize project funding and result in cancellation of the project. Property takes on the university's campus required a state procedure ending with the governor's signature—a process that could take six months. To resolve this, the university executed right-of-entry agreements that allowed the project to proceed while the final land sale was executed. As a result, the schedule was not only met but delivered six weeks in advance of the target date.

The transformation of the Dorr Street corridor has changed the face of UT's south campus, adjacent businesses and the surrounding neighborhood. The industrial appearance has been replaced with a driving experience that is calmer, safer and more visually appealing. The project was open to the public in June 2015 and is expected to be an impetus for continued development. In March 2016, the Dorr Street Corridor Project was awarded the Outstanding Achievement Award from the American Council of Engineering Companies of Ohio.

# America's First Superhighway Turns 75

by Curtis Miner, PhD, Senior History Curator, The State Museum of Pennsylvania, **ASHE Harrisburg Section**

On October 1, 1940, hundreds of Pennsylvania motorists descended on Carlisle, Cumberland County, and Irwin, Westmoreland County, to participate in what they expected to be a historic event: the official public opening of the first section of America's first superhighway. During its first week of operation, an average of 6,000 cars per day traversed the new Pennsylvania Turnpike. The press hailed it as a "dream highway"—approximately 160 miles of smooth, four-lane, paved roadway connecting Harrisburg, in central Pennsylvania, to Pittsburgh, in the southwestern corner. Motorists seemed to agree.

Today, as the Pennsylvania Turnpike celebrates its 75th anniversary, it is easy to understand the enthusiasm of its first customers. Though there had been other roadways that allowed motorists to get from point A to point B, no other existing highway made the drive faster, safer or more convenient. The proof was in the time clock: the opening of the Turnpike's first section cut travel time between these two principal cities in half.

What is less appreciated today—and less apparent—is the engineering and construction plan that made it possible. That is in large part due to the Turnpike's overwhelming success as a model of superhighway design. The very qualities that made the tolled roadway so remarkable in 1940 have been so thoroughly integrated into our modern highway system that they largely escape public notice.

That, of course, was not always the case. Prior to 1940, the typical long-distance highway offered more adventure (and unpredictability) than ease of travel. Although paved roads like the Lincoln Highway (today's Route 30) crossed vast distances, travel was inefficient, slow and often dangerous. Traffic was confined to two lanes of often uneven construction and maintenance, and the roadway followed the contours of the terrain. For motorists, that meant steep ascents, sharp curves and treacherous travel, especially during winter months.

Population centers added to the aggravation. Most highways back then went through cities and towns. There, motorists encountered intersections, railroad crossings, traffic lights and other annoyances that extended travel time.

It's no wonder that a typical trip from Harrisburg to Pittsburgh—in good weather—took seven hours or longer.

Interstate highway travel might have continued that way had it not been for an unusual convergence of events just before World War II. The first was the crisis of the Great Depression, which motivated government officials to seek out and sponsor public works projects capable of employing millions of jobless people. The second was a fortuitous meeting among a group of Harrisburg politicians that resulted in the authorization of the Pennsylvania Turnpike Commission in 1937 and a proposal to build a motor vehicle corridor across the southern half of Pennsylvania.

The proposal for the corridor had been inspired by a quirk of history—a partially completed railroad right of way over the Allegheny Mountains that had been laid out in the 1880s, worked on for a time and then abandoned. The South Penn Railroad (as the aborted venture had been called) offered Turnpike planners a path forward—specifically, a relatively straight, low-grade path across the rugged Appalachian terrain that extended across southwestern and central Pennsylvania. Highway engineers picked up where railroad engineers and workers had left off. After ground was broken in late October 1938—with a mandate from the federal government to complete the project within two years—they set about refining it and adapting it to automobile traffic.


Laurel Hill Westmorel

The first task was to re-survey the route and acquire additional property, as necessary. The South Penn Railroad had provided about 25 percent of the land needed for the new highway, including a series of partially-bored railroad tunnels. About three-quarters of the projected right of way had to be acquired, piecemeal, from hundreds of individual property owners.

Engineers and work crews then began leveling the grade to a maximum of three percent. Although vehicles could tolerate steeper grades than railroads, planners reasoned that lower grades meant safer and faster travel. For similar reasons, curves were designed to be gentle. During subsequent extensions, engineers deliberately built curves into the roadway on long straightaways to help prevent drivers from being lulled to sleep.


Carlisle toll plaza construction 1939

On the rugged original section, creating low grades and smooth curves frequently required work crews to cut hillsides, fill ravines and build bridges and culverts to divert water courses. The largest cut and fill, a section of hillside in Bedford County known as Clear Ridge, removed over a million cubic yards of earth. Some referred to it as "Little Panama."

A primary Pennsylvania Turnpike Commission objective was uniformity of design. Although it was later resurfaced with asphalt, the first 160-mile corridor was a continuous, four-lane ribbon of concrete, with each mile paved to the same standard. Medians and shoulders were designed with a uniform width and construction. Originally, the median separating opposing lanes of traffic was open, on the assumption that the likelihood of collisions was remote. Guard rails were installed later.

and County, east approach looking west, May 1940

The most challenging engineering problem was the design and construction of the tunnels. Although the South Penn Railroad had located and partially bored seven tunnels, each of the locations had to be fully bored, dewatered, reinforced, paved and ventilated (to prevent dangerous carbon monoxide buildup). The longest tunnel, at Sideling Hill, was over a mile long.

Along with the tunnels, Turnpike crews built over 300 concrete underpasses, overpasses and bridges to divert local roads and allow the Turnpike to extend over the occasional river, stream or valley. Between the demands of these structures and the paving of the roadway itself, an unprecedented amount of concrete was poured during the final months of the 23-month construction project, with crews working around the clock.

In order to better manage merge points, Turnpike planners limited access to 11 strategically located interchanges along the route. Manned tollbooths—originally referred to as "ticket booths"—regulated entry and exit for cars, buses and trucks, and distributed and collected the fares that paid for roadway maintenance. (The original tolls were a penny a mile.) Since the new roadway now bypassed local diners and filling stations, specially built service plazas (operated from 1940 until the late 1970s by Howard Johnson) were located approximately every 25-30 miles, and allowed travelers to refuel without having to exit the Turnpike.

Although modern highways have come a long way since 1940, and the industry continues to look for ways to improve the driving experience, the basic formula for superhighway construction and engineering continues to this day. Motorists have come to expect interstate highways to offer fast, safe and convenient travel. For that, they can thank the pioneering work of America's first superhighway, the Pennsylvania Turnpike.

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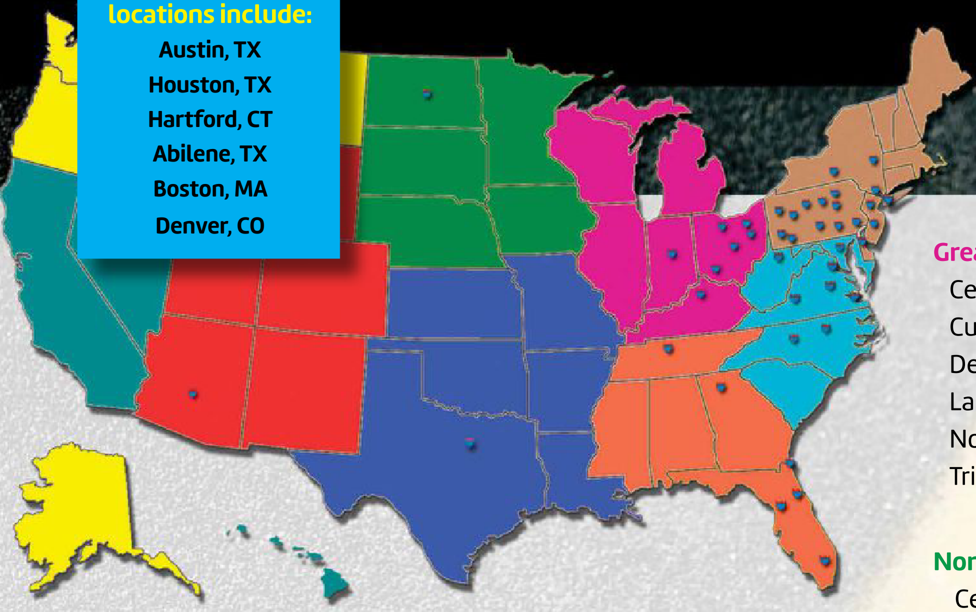

## Northeast Region

| | |
|---|---|
| Albany | 117 |
| Altoona | 211 |
| Central New York | 49 |
| Clearfield | 155 |
| Delaware Valley | 397 |
| East Penn | 78 |
| First State | 141 |
| Franklin | 145 |
| Harrisburg | 355 |
| Long Island | 45 |
| Mid-Allegheny | 132 |
| New York Metro | 86 |
| North Central New Jersey | 166 |
| North East Penn | 123 |
| Pittsburgh | 550 |
| Southern New Jersey | 180 |
| Southwest Penn | 292 |
| Williamsport | 129 |
| **Subtotal** | **3,351** |

## Mid-Atlantic Region

| | |
|---|---|
| Blue Ridge | 91 |
| Carolina Piedmont | 58 |
| Carolina Triangle | 233 |
| Chesapeake | 207 |
| Greater Hampton Roads | 131 |
| North Central West Virginia | 37 |
| Old Dominion | 97 |
| Potomac | 275 |
| **Subtotal** | **1,129** |

## Southeast Region

| | |
|---|---|
| Central Florida | 48 |
| Georgia | 328 |
| Gold Coast | 11 |
| Middle Tennessee | 252 |
| Northeast Florida | 203 |
| Tampa Bay | 97 |
| **Subtotal** | **939** |

## Great Lakes Region

| | |
|---|---|
| Central Ohio | 187 |
| Cuyahoga Valley | 120 |
| Derby City | 83 |
| Lake Erie | 140 |
| Northwest Ohio | 42 |
| Triko Valley | 173 |
| **Subtotal** | **745** |

## North Central Region

| | |
|---|---|
| Central Dacotah | 123 |
| **Subtotal** | **123** |

## Rocky Mountain Region

| | |
|---|---|
| Phoenix Sonoran | 142 |
| **Subtotal** | **142** |

## South Central Region

| | |
|---|---|
| Dallas-Fort Worth | 73 |
| **Subtotal** | **73** |

## Other Memberships

| | |
|---|---|
| Domestic At-Large | 11 |
| International At-Large | 2 |
| **Subtotal** | **13** |

| | |
|---|---|
| **National Total** | **6,515** |
| Professional Status | 58% |
| Government | 13% |
| Consultant | 69% |
| Contractor | 5% |
| Other | 13% |

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