Safety upgrades for cyclists, pedestrians and drivers in Washington, DC

See page 41

2025 ASHE NATIONAL CONFERENCE

POCONO MANOR, PENNSYLVANIA

JUNE 4 - 8, 2025

A Gateway to Transportation Adventures

The three Sections of Eastern Pennsylvania are honored to host the 2025 American Society of Highway Engineers (ASHE) National Conference. Our agenda is filled with informative technical sessions, guest & technical tours, social events, and networking opportunities. Join us for a memorable conference!

Conference Registration

Registration for the conference is open.

https://www.2025conference.ashe.pro/registration.php

Keynote Speaker Announced!

Noted golfer and author **Tom Coyne** will kick off the 2025 National Conference. Tom Coyne is an award-winning and New York Times bestselling author who has been publishing golf stories since 2001. Tom will be playing in our golf tournament!

Bonus - Conference golfers will receive an autographed copy of his latest book.

Golf Outing

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2025conference.ashe.pro

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ASHE

AMERICAN SOCIETY OF HIGHWAY ENGINEERS

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MISSION

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.

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Donato Di Zuzio, PE
ASHE National President 2024-2025

New Directions

The winter months of 2025 have presented challenges. We have had frigid temperatures at times, with winds making it feel even colder. And the wildfires of California provided enormous challenges of their own. But with warmer, sunnier days ahead, we look forward to shedding winter coats and enjoying the outdoors soon. More important, our construction projects will also resume and make necessary improvements to our aging infrastructure, at least in the Northeast. During my travels in 2024 and early 2025, I have seen tremendous focus on roads, bridges and water infrastructure and the efforts to repair them. Federal support through the IIJA (Infrastructure Investment and Jobs Act) funding has provided a much-needed boost to maintain and, in some cases, improve our infrastructure systems.

The ASHE National Board and its Committees have been busy with initiatives to move the organization forward. We are planning for the next four National Conferences, with a site already selected for 2028. This year's National Conference in June will be at the Kalahari Resort and Convention Center in Pennsylvania's Pocono Mountains.

After the successful chartering of the Colorado and San Antonio Sections, we now draw closer to chartering new Sections for Carolina Coastal, Kansas City, New England and Illinois.

We have established the ASHE Scholarship Foundation, and we plan to award $10,000 at the June Conference. This will promote interest in the transportation field and, more importantly, assist future leaders in achieving their goals. ASHE membership is increasing, and the National Board will continue to support the Sections and Regions for future growth. These are the objectives we set out to accomplish when we adopted the three-year ASHE Strategic Plan. We continue to promote diversity, education and innovation, our core values.

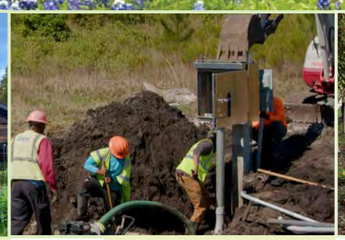
On January 10 and 11, the National Board braved challenging weather and gathered in Houston, TX. Both days were busy, starting with the Executive Committee meeting, followed by an informative and engaging afternoon workshop and an evening gala. It was the Houston Section's Second Annual Gala and Scholarship Fundraiser. This well-attended event included many owners and agencies' representatives. Once again, I want to congratulate the Houston Section, the gala committee and all the award recipients on a successful evening. I also want to thank Nikole Cao personally for the hospitality and kindness that the National Board and I received.

On Saturday morning, Committee Chairs and Directors reported on their activities from the previous quarter. Some of the initiatives that we have undertaken include streamlining a digital Section Health Form to better monitor and help Sections that may require some assistance. We now have a bylaws template to help Sections and Regions update their respective bylaws. In the spirit of innovation, the Technology Committee is hard at work to recommend what ASHE's future should look like when it comes to streamlining the membership application and the membership dues process. We are looking at this group's online documents, with plans to update those outdated ones soon. (continued on page 10)

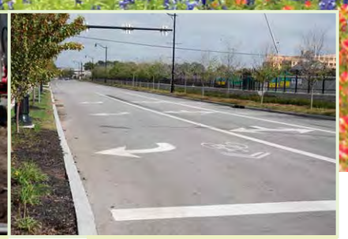
In This Issue

ASHE scanner

6 Repurposing with a Purpose



24 Revolutionizing Roadways



38 Advancing Safety and Connectivity

From *scanner*'s Chair

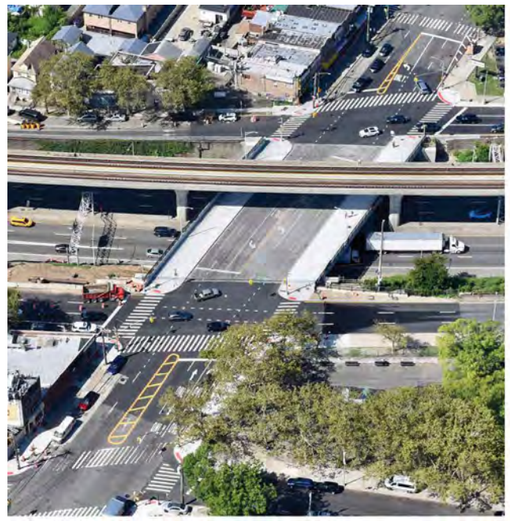
Scanner Say Article of the Year AWARD

The *scanner* is the place for showcasing groundbreaking transportation projects from coast to coast. We invite you to share how you overcome challenges, integrate innovative solutions, drive continuous improvement and cultivate a strong culture of leadership. By prioritizing leadership development, organizations can effectively manage the increasing complexity of infrastructure projects, optimize public funds and secure the long-term sustainability of essential assets.

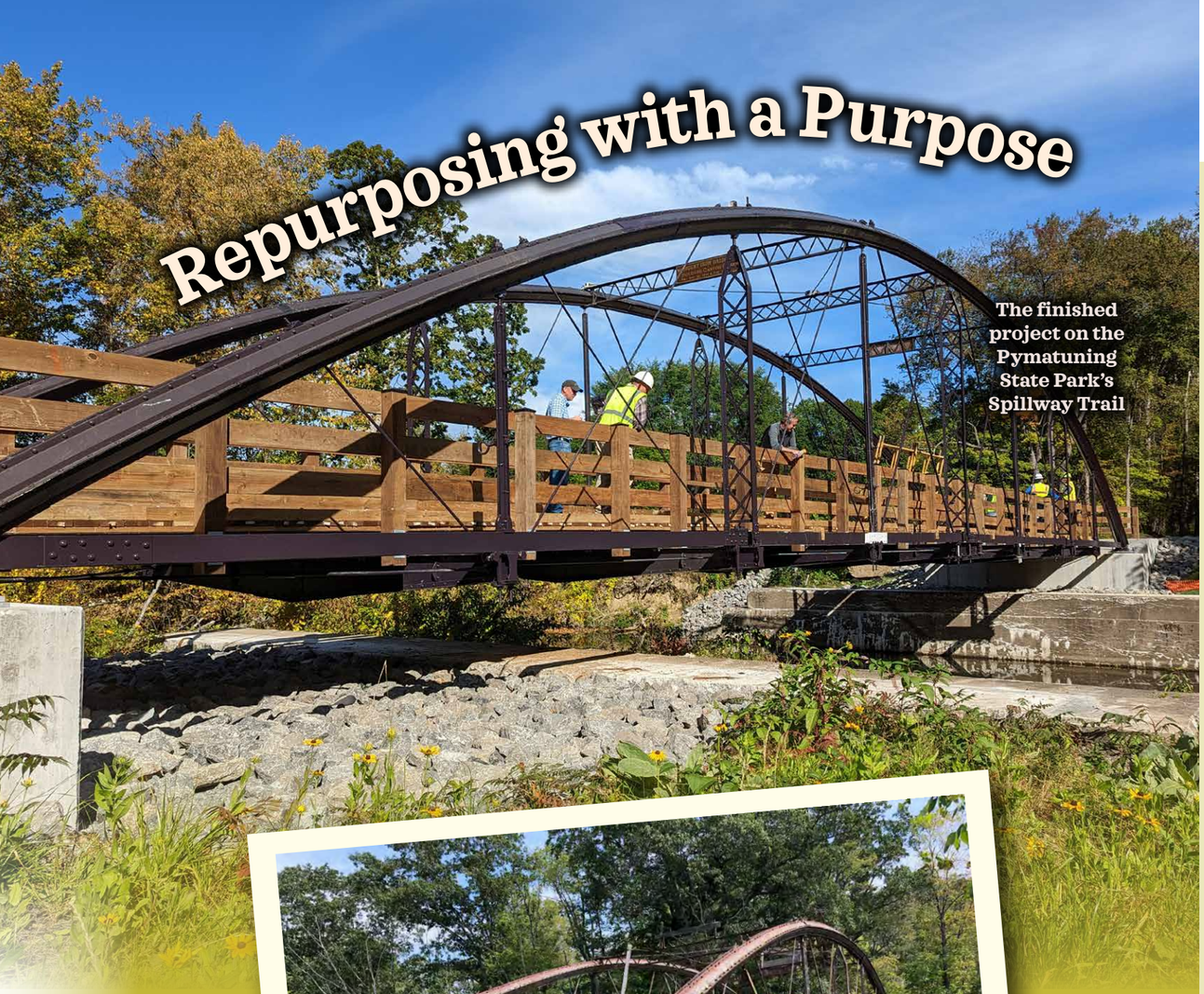
Our industry recognizes the critical importance of equipping future leaders with the training and mentorship needed to navigate the evolving landscape of infrastructure development. We are eager to learn about the initiatives you are investing in, whether through scholarship programs, creative outreach to emerging talent or dynamic Future Leaders and mentorship initiatives. We also encourage you to submit details about your Project of the Year winners, including photos of award recipients.

Looking ahead, we are excited for the upcoming ASHE National Conference, scheduled for June 4-8, 2025, at the Kalahari Resort in the Pocono Mountains, Mount Pocono, PA. The *scanner* Committee is already scoring all articles in each of the four issues, fall through summer of 2024-25, for the SAY (Scanner Article of the Year) Awards. We will recognize the top articles and give awards to the authors at the National Conference. Additionally, we hope you will participate in the "People's Choice" Award. Cast your vote for your favorite article by scanning the QR code in your welcome packet at the Conference. With the increasing quantity and quality of submissions, we commend all of you for your ongoing commitment to excellence. Keep up the outstanding work!

Rhonda Cardone
scanner Chairwoman
ASHE New York Metro Section



Repurposing with a Purpose



The finished project on the Pymatuning State Park's Spillway Trail

Messerall Truss Bridge in its original location

by Tom McClelland, PE, PTOE, Assistant District Executive-Design, Pennsylvania Department of Transportation (PennDOT); Jill Harry, Community Relations Coordinator, PennDOT; Dawn Schilling, PE, AICP, Senior Project Manager, McCormick Taylor, Inc.; Brandon Newpher, PE, Associate Project Manager, Structural Engineering, McCormick Taylor, Inc., **ASHE Franklin Section**

Anyone who grew up in western Pennsylvania can identify with the area's industrial blue-collar roots and its steel truss bridges. The state is blessed (or cursed) with many of these aged structures that may not meet modern-day traffic needs but are a community asset and a link to our rich history.

The Messerall Truss Bridge was built in 1876 by the Wrought Iron Bridge Company of Canton, OH. The 103-foot, one-lane span once carried Messerall Road over Pine Creek outside of Titusville, PA. Messerall Road was a main travel route supporting the oil and lumber industries in the late 1800s. To put this in perspective, this was 15 years after the drilling of the United States' first oil well in Titusville, PA, where the bridge resided, and more than 20 years before mass manufacturing of the automobile. The metal bowstring arch through truss bridge was owned and maintained by Crawford County until its closure in 1987 due to deterioration. It is only one of two bowstring trusses left in Pennsylvania, adding to the significance of saving and repurposing this structure.

The idea of reusing the historic bridge arose when the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) obtained a grant for an extension of the Pymatuning Spillway Trail. The grant required a stream crossing that had a span much like that of the Messerall Truss.

The trail extension project was then reconfigured to include the truss through a collaborative effort between Pennsylvania Department of Transportation (PennDOT) and PA DCNR. Rehabilitation and reuse of such a structure for a trail project, using local project delivery procedures, required careful selection of the design team. McCormick Taylor, Inc., having experience with trails, local projects and rehabilitating historic trusses, was chosen to lead the project and rehabilitation efforts. The Markosky Engineering Group, Inc., assisted with the trail design.

The project was a culmination of 35 years of effort to find a new home for this bridge. Following its closure, Messerall Road was eventually bypassed and closed as well. Many people did not even know the bridge existed; it was off the main way of travel, obscured by vegetation. PennDOT partnered with Crawford County and PA DCNR to transfer ownership and to rehabilitate and relocate the truss to Pymatuning State Park. The relocation enhanced a previously planned, long-awaited trail extension for PA DCNR. It also resulted in Crawford County removing a closed bridge from its inventory. Most important, PennDOT facilitated what could sometimes become a complicated construction process for the benefit of the community, as well as thousands of park visitors every year.

In August 2021, the bridge was hoisted by crane and removed from its Pine Creek abutments in one piece. It was partly dismantled on-site and taken to Lockhart Ironworks, a blacksmith workshop in Logan, OH. There, it would be rehabilitated, using approximately 75 percent of the bridge's original parts. The bridge was reassembled near Linesville Creek in late August 2022. The modification included nearly 3,000 hot driven rivets, emulating the process used during the structure's original construction. Much attention to detail during design and

(continued on page 8)

Repurposing with a Purpose

(continued from page 7)

A trail user's view of the Messerall Bridge after project's completion

rehabilitation allowed the bridge to remain eligible for a historic registry while providing a safe and reliable pedestrian crossing for the trail.

The prime contractor, Horizon Construction Group, Inc., of Sandy Lake, PA, completed the project in October 2022. The construction contract cost was $2,289,000, paid entirely by the Federal Transportation Alternative Set-Aside Program. This initiative provides money for projects that support on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving nondriver access to public transportation and enhancing mobility. The program also fosters community improvement activities, environmental mitigation, trails that serve a transportation purpose and safe routes to school projects.

The bridge is located along a new portion of the trail outside Linesville Borough in Crawford County. Now fitted with a wooden deck, the structure carries hikers and cyclists over Linesville Creek near the Pymatuning Reservoir. The overall project increased the length of the trail from just over one mile to more than three miles.

The Messerall Truss is the second historic bridge that PennDOT District 1-0 in northwestern Pennsylvania has repurposed in the last few years. The first was the Quaker Bridge in Mercer County, which won the Ralph Modjeski Award for excellence in transportation design, preservation and archaeology at the 2016 Pennsylvania Historic Preservation Awards. PennDOT and this project's partners, PA DCNR and Crawford County, are proud to continue the preservation efforts started with Quaker Bridge through this beneficial reuse of the Messerall Truss.

New Directions

(continued from page 3)

At the end of January, I visited the Franklin Section and my friend JT Lincoln to enjoy their famous venison dinner, a unique and important event for the area. In mid-April, I plan to attend a joint meeting in the same area and meet with five ASHE Sections. Also, later in April, the National Board will head to Birmingham, AL, for the next quarterly board meeting.

For the next several months we still will have plenty to accomplish, and I promise to continue to do my best. My travels will take me to Kalahari Resort for the National Conference in June. Here this wonderful journey will end, but my 30 years of support to ASHE will continue. It has been truly an honor and privilege to serve as your President. I want to thank the National Board for their support and collaboration during my presidency, and all the people I have met during my travels. I especially want to thank Nancy Morisi for her guidance, constant reminders and for all that she does as ASHE's Administrative Assistant.

I will continue to look forward to meeting new colleagues and making new friends. Hope to see many of you in June at the National Conference. All the best to all of you; enjoy a healthy and safe spring!

MileMarkers

News From Across ASHE-Miles

Bowling'em Over for Scholarships

ASHE Circle City Section hosted its second annual Strikes for Scholarships event in January. More than 90 people from 18 companies in central Indiana gathered for an afternoon of bowling to raise money for scholarships that benefit Indiana students.

The Section's Scholarship Committee organized the event with Katelyn Tedder, Section Vice President, serving as Chair. Her group worked with the bowling facility, selected the lunch menu, found event sponsors and volunteers, solicited items for a silent auction and found ways to make the event more fun and attract more participation. ASHE's Circle City Section benefited from Tedder's experience in organizing a similar scholarship event for WTS (Women's Transportation Seminar).

The bowling event is a competition among teams, consisting of up to six people in one lane. The top four scores in each of two games are added together to determine the lane's final score. In addition to the bowling scores, the teams can score bonus points by completing challenges on a bingo card. Some of the challenges include picking up a spare, getting a team turkey (i.e., bowling three strikes in a row) and creating a team chant. The winning team receives a trophy and bragging rights. The event also features a competition lane where participants can challenge one another. A silent auction features packages from local businesses, as well as signed racing memorabilia. All the activities during the event help generate money that goes straight into the scholarship program.

For Clayton Heavin, one of the participants, this was his first event with ASHE. "It's been a lot of fun, and I've met people in other disciplines within the transportation industry that I normally would not have a chance to meet. Knowing my participation is helping students is great too."

During his statements to kick off this year's Strikes for Scholarships, Section President Dustin Quincy said, "When we chartered this Section a few years ago, one of our first priorities was to establish a scholarship fund for students." ASHE's Circle City Section was Chartered in 2022 after a previous attempt under different leadership. Since its Chartering, the Section has grown rapidly; it won the George K. Hart Award at the 2024 ASHE National Conference for having a 41 percent increase in Section membership. The group hosts regular social events and lunches with industry speakers, but Strikes for Scholarships is the group's biggest event of the year.

The inaugural Strikes for Scholarships in 2024 was a success with 60 participants, raising over $4,000 to start the Section's scholarship fund. Three of the student winners from that event attended the event this year to bowl with the firms for whom they had interned or co-oped. These students represented three Indiana schools (Indiana State University, Purdue University and Valparaiso University), all with engineering programs. The 2025 event on January 22 appears to have raised the same amount of money as last year, acknowledging some increased costs in hosting the event from 2024. Circle City Section plans to explore increased sponsorship and continued growth of the event with hopes to raise more money for students in Indiana's engineering programs.

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Urban Mini Roundabouts Replace 96 Conflict Points

by Chad Rundle, PE, Roadway Department Manager, DLZ Ohio, Inc., ASHE Central Ohio Section

ASHE Great Lakes Region
2024 Project of the Year Award
Under $10 Million

Medians were used to restrict through and left-turn movements through the service road intersections.

The SR 161 corridor through the northern part of Columbus, OH, was widened and improved in the 1970s. To safely manage projected traffic for a rapidly developing area, improvements then applied state-of-the-art ideas in access management. These included medians and service roads close to mainline SR 161. The service road intersections along the corridor were separated from SR 161 by only 60 to 70 feet, far short of the 300-foot separation recommended by the National Cooperative Highway Research Program.

The two service road intersections, in addition to the SR 161 intersection, created three closely spaced crossings with 96 total vehicular conflict points. As this area continued to develop, increasing traffic and service road intersections too close to SR 161 created safety concerns. The City of Columbus selected DLZ to prepare the State Route 161 Corridor Study (PID 97169), which produced six short-term improvements and four long-term alternatives.

Exploring Alternatives

Short-term alternatives included an education plan, an enforcement zone, minor signal modifications and “Do not block the box intersection” signs. One other short-term option, which became part of the construction, included placing a queue-cutting traffic signal at the end of the service road. This signal provided a red light at the intersection of the service road with Cleveland Avenue. It allowed traffic entering Cleveland Avenue to cut across four lanes of traffic stopped by the signal and safely enter the southbound left-turn lane. The long-term alternatives studied included:

- maintaining two-way operation on service roads with medians and mini roundabouts
- relocating the service road intersections further from SR 161,
- placing cul-de-sacs at the end of the service roads
- placing mid-block right in/right out for access and removing left-turn lanes and installing mid-block r-cuts.

The Decision

Based on the study's results and feedback from stakeholders and the public, the preferred alternative was to maintain two-way operation on the service roads. M*edians on the side streets* and mini roundabouts would drastically decrease conflict points. The first improvement would be to Maple Canyon Avenue, because it ranked third on the Mid-Ohio Regional

(continued on page 16)

ASHE Central Ohio Section
2023 Project of the Year Award
Under $10 Million

Mini roundabouts were placed both north and south of SR 161.

Urban Mini Roundabouts **Replace 96 Conflict Points** *(continued from page 15)*

Planning Commission's yearly Top 40 Regional High Crash Locations list. Construction began in spring 2022.

Reasons for Use of Mini Roundabouts

Using traditional roundabouts in this busy urban area would damage property significantly. These were the first mini roundabouts designed in Columbus, so the team visited numerous mini roundabouts in Ohio and Michigan to observe their performance. They evaluated many sizes of the mini roundabouts, from a 70-foot inscribed circle diameter (ICD) to a 100-foot ICD.

Queue-Cutter signal at the end of the service roads

The team also evaluated many design vehicles, including passenger cars, semi-trucks, school buses, delivery trucks and fire trucks. To balance improved traffic operations with property impacts, Columbus selected a 90-foot ICD. The city laid out this design in a parking lot and drove fire trucks and garbage trucks through the layout to ensure this mini roundabout concept could accommodate the vehicles. Medians placed through the side streets prevent through- and left-turning movements.

The team performed a queuing analysis to ensure that traffic waiting at the SR 161 traffic signals would not back up into the mini roundabout. This location also includes Columbus Fire Station. The project provided signal pre-emption for the SR 161 traffic signal as well as a depressed median with stamped concrete to allow emergency vehicles to turn left toward SR 161 across the median.

Additional Enhancements

The project included:

- decorative, gray-stamped concrete
- mainline SR 161 signal improvements
- a shared-use path
- storm sewer improvements
- signal improvements
- sidewalks
- water improvements
- street lighting
- Best Management Practices, including a Silva Cell stormwater management system, oversized pipes and bioretention swales.

Columbus' Overall Vision

Construction using mini roundabouts will eventually take place at seven sets of intersections along the SR 161 corridor. Maple Canyon Avenue's construction ended in September 2023, improving the corridor's safety and traffic operations. Construction is underway or completed for three other mini roundabouts within the SR 161 Corridor Study. Design is ongoing to place roundabouts at the remaining intersections.

by David Jackson, PE, Michael Baker International, Inc., **ASHE Pittsburgh Section**

Mini roundabouts were selected to minimize impacts to structures, such as the apartments southeast of this roundabout.

MileMarkers

News From Across ASHE-Miles

ASHE Albany Section Members Tour New Plant

Members of **ASHE Albany Section** recently toured the Soleno USA plant in Saratoga Springs, NY. This brand-new, state-of-the-art facility manufactures a specialized high-density polyethylene pipe (HDPE) called KUSTOMFLO, ranging from 24 to 136 inches in diameter. The group's visit began with an overview of the plant's operations, a Professional Development Hours presentation on HDPE pipe and the manufacturing process, lunch and a tour of the plant. ASHE Albany Section extends its thanks to the Soleno team members who provided an interesting and informative day.

ASHE Mid-Allegheny Section
2023 Outstanding Highway Engineering Award
Over $2.5 Million

Freedom Road Gets a Complete Streets Makeover

by Rob Nuss, PE,
KCI Technologies, Inc.,
ASHE Mid-Allegheny Section

Cranberry Township, Butler County, lies in the heart of southwestern Pennsylvania. Historically a residential area, it recently saw much growth due to commercial industrialization. Along with the area's economic expansion came a surge of traffic and a desire for an alternative, accessible transportation system. In response, the township and csounty commissioned KCI Technologies, Inc., (KCI), with oversight from the Pennsylvania Department of Transportation (PennDOT) and the Federal Highway Administration (FHWA), to formulate a plan. It would widen a one-mile stretch of Freedom Road, a roadway vital to local travel, from two lanes to five lanes.

The project, funded by a $20 million Better Utilizing Investments to Leverage Development (BUILD) grant, entailed a comprehensive list of tasks. These included preliminary engineering, National Environmental Policy Act clearance, right-of-way acquisition, utility coordination, site surveying and final design.

The BUILD grant encompassed two key projects: the Freedom Road widening project, begun in spring 2021, and a PennDOT District 10-0 SR 228 Three Degree Road Project. Stipulated by the grant, the project had to be completed on an aggressive timeline; otherwise, funding would be retracted. Working to mitigate this complication, KCI assembled McCormick Taylor, Inc., for environmental clearance, public involvement and traffic signal design; Navarro & Wright Consulting Engineers, Inc., for geotechnical services; and Collective Efforts, LLC, for additional public outreach.

As commercial development and the number of vehicles increased along Freedom Road, the two-lane street experienced traffic delays.

Implementation of the project began with the township's transition from standard roadways to the Complete Streets approach. This would accommodate all transportation modes through bike lanes, medians and pedestrian crosswalks and sidewalks on both sides of the road. It made safer and more accessible travel for everyone, from motorists to cyclists and pedestrians.

As traditional surveying methods proved inadequate due to high traffic volumes, the project team opted to use a stationary LiDAR scanner for efficient and accurate data collection. Moreover, demonstrating a commitment to sustainability and environmental conservation, the project salvaged preexisting pavement to reconstruct the widened roadway. By reusing on-site materials, the team reduced both the unnecessary consumption of resources and optimized the use of grant funding.

Despite the team's commitment to efficiency, the project was not exempt from challenges. Residents along the roadway expressed concerns about increased traffic flow and potential impacts on their quality of life. The team addressed the issues through extensive public outreach, including meetings and stakeholder consultations. Incorporating feedback, the team minimized disruptions, such as shifting driveways and modifying stormwater features. They also collaborated with businesses on driveway designs, parking impacts and staging during construction.

(continued on page 21)

Through lane widening the roadway and adding a two-way left-turn lane, the area is better equipped to manage higher amounts of traffic.

The 0.5:1 geosynthetic reinforced soil slope helped minimize environmental impacts.

Freedom Road Gets a Complete Streets Makeover

(continued from page 19)

As the project progressed, engineers evaluated a culvert at the eastern end that would have traditionally required extension. The team implemented a geosynthetic reinforced soil slope at a steeper 0.5:1 slope, rather than the standard 2:1. This included an R-5 rock lining and primary as well as secondary geosynthetic members, helping to minimize impacts on local wetlands, streams and the 100-year floodplain. The use of steeper slopes not only avoided the need for a culvert extension but also maintained the project's accelerated schedule.

Efficient collaboration among everyone involved made it possible to meet the project's stringent schedule. Completion of the design required only 18 months instead of the typical three to four years needed for similar projects. The expedited timeline was aided by weekly client updates and bi-weekly status meetings with PennDOT and FHWA.

Completed in summer 2023, the widening of Freedom Road, paired with additional improvements in signalization and new turn lanes, enhances vehicular safety and traffic flow. The new infrastructure supports efficient travel, even during peak traffic hours, and the addition of bike lanes and sidewalks offers more safety for multimodal travelers, promoting equity and accessibility for the entire community.

MileMarkers

News From Across ASHE-Miles

ASHE New York Metro Section Announces Projects of the Year

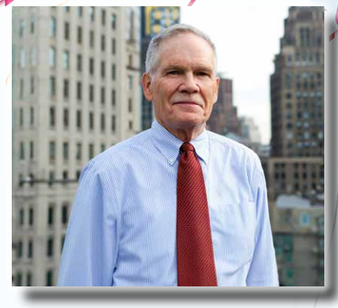
Winning Project Team: MTA Construction & Development / MTA Bridges & Tunnels; HNTB New York Engineering and Architecture, PC; DeFoe Corp.; LiRo-Hill Inc.

ASHE New York Metro Section's first two monthly meetings in 2025 featured the presentation of its 2024-2025 Project of the Year (POY) Awards. At the Section's January meeting, the ***POY Award for Large Projects over $40 million went to Project RK-93, a $108-million design-build project*** (above)**.** Located at the Metropolitan Transportation Authority's (MTA) Robert F. Kennedy (RFK) Bridge on Randall's Island, New York City, the construction of five new ramps improved access to the island. Two new vehicular ramps enhanced traffic flow, eliminating inefficient merges, and facilitated future projects at the RFK facility. Three dedicated shared use paths provided ADA-compliant access to Randall's Island Park for cyclists and pedestrians. At-grade improvements included reconfigured intersections and improved pedestrian access. The project also added new crosswalks and a dedicated bus lane, uniting the new structures to streamline access and enhance safety for park visitors.

Project CB-30 at MTA's Rockaway Bridges received ASHE New York Metro Section's POY Award for Small Projects under $40 million (below) at the group's February meeting. This project focused on the structural rehabilitation of the span over the navigation channel. It also replaced the existing pedestrian ramp to create an ADA-compliant shared-use path for pedestrians and bicyclists on the Cross Bay Bridge. This project entailed the replacement of finger joints and installation of prototype aluminum orthotropic deck panels at the Marine Parkway Bridge as well as Weigh-in-Motion upgrades at both bridges.

The ASHE New York Metro Section's panel of judges stated, "RK-93 and CB-30 stood out among a highly competitive field due to their complexity, innovative approach, social/economic considerations, safety, aesthetics and sustainable features as well as exceeding established goals."

Winning Project Team: MTA Construction & Development / MTA Bridges & Tunnels; Dewberry; El Sol/ES II Enterprises JV; SJH Engineering, P.C.



Spotlighting Mike Hershey

Michael Hershey, PE, is an advisor and **Charter Member** of the **ASHE New York Metro Section.** In September 2004, Mike became the first President and co-founder of the group. At the first meeting, over 90 Charter members received recognition.

Through Mike's knowledge and experience at the New York City Department of Transportation, as Director of Movable Bridges, he initiated the idea of a potential ASHE Section in the New York metropolitan area. It had a diverse cross section of people involved in the highway and transportation industry.

During the recent ASHE New York Metro Section's 20th anniversary celebration at the 101 Club in New York City, Mike said, "All participants of our transportation industry are welcome to take part and be a contributing voice and advocate. It's what keeps the ASHE community together and has allowed us to achieve ever-increasing success and recognition." The ASHE organization is the "spirit of fellowship, camaraderie and inclusivity."

Revolutionizing Roadways:

An Innovative Test Facility on US 301

by Florida Department of Transportation Public Information Office, **ASHE Northeast Florida Section**

The Florida Department of Transportation (FDOT) has opened the first-of-its-kind concrete and asphalt test facility in the southeastern United States. Located on US 301 in northeast Florida, this site provides opportunities for full-scale, controlled roadway experiments, featuring both concrete and asphalt. It can transform pavement design by providing critical insights into material performance under real-world traffic conditions. The data collected will guide future pavement design practices, resulting in more durable, sustainable and cost-effective roadways for Florida's residents and visitors.

The Concrete Test Track: A Living Laboratory

Completed in 2023, the concrete test track spans approximately four miles parallel to the northbound lanes of US 301. It includes 52 experimental concrete pavement sections, each uniquely designed. Embedded pavement testing equipment and monitors capture real-time data as live traffic, including heavy trucks, traverses the test sections.

Engineers can divert traffic off the test sections when needed, allowing for in-depth evaluations and the construction of new sections without disrupting traffic flow on US 301.This approach ensures continuous data collection while minimizing traveler inconvenience. Three primary experiments are underway on the concrete test track:

- Structural experiment investigates the impact of varying concrete thicknesses (six to 10 inches) and five different base configurations. Researchers are also examining the use of reclaimed asphalt pavement (RAP) as an aggregate source for the concrete.
- Drainage experiment evaluates the effectiveness of edge drains by constructing sections with and without them and explores the impact of water infiltration through unsealed joints on pavement performance.
- Calibration experiment aims to calibrate the fatigue cracking equation within the American Association of Highway and Transportation Officials Design Guide by varying joint lengths and curing application rates.

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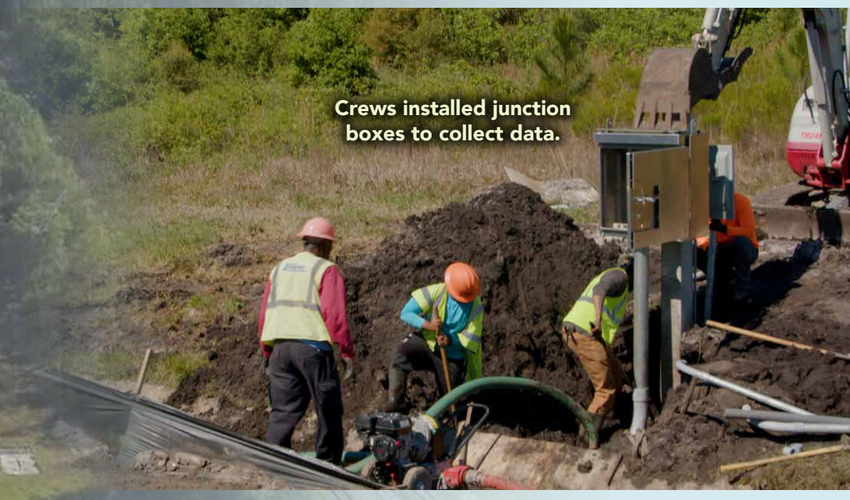
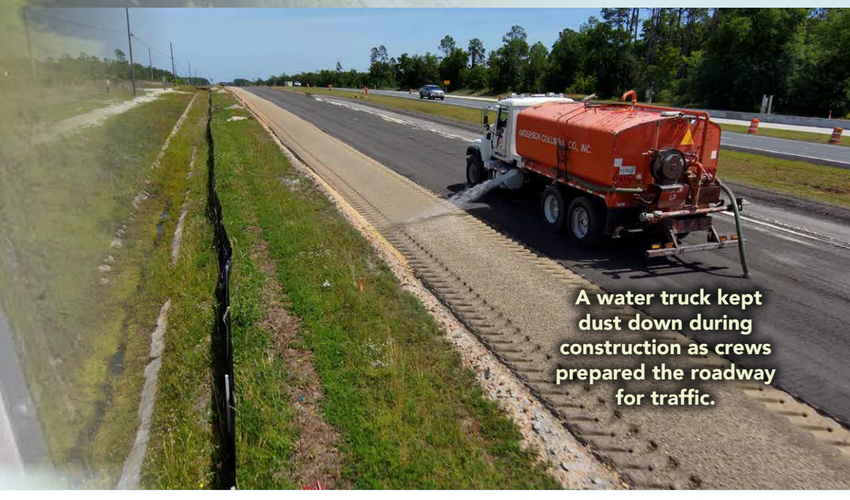
Twelve asphalt test sections, each with a unique combination of pavement and base materials, were installed along the corridor.



Crews installed junction boxes to collect data.

Aerial view of the US 301 testing facility, set to transform pavement research with crucial data for various pavement types



A water truck kept dust down during construction as crews prepared the roadway for traffic.

Revolutionizing Roadways:
An Innovative Test Facility on US 301

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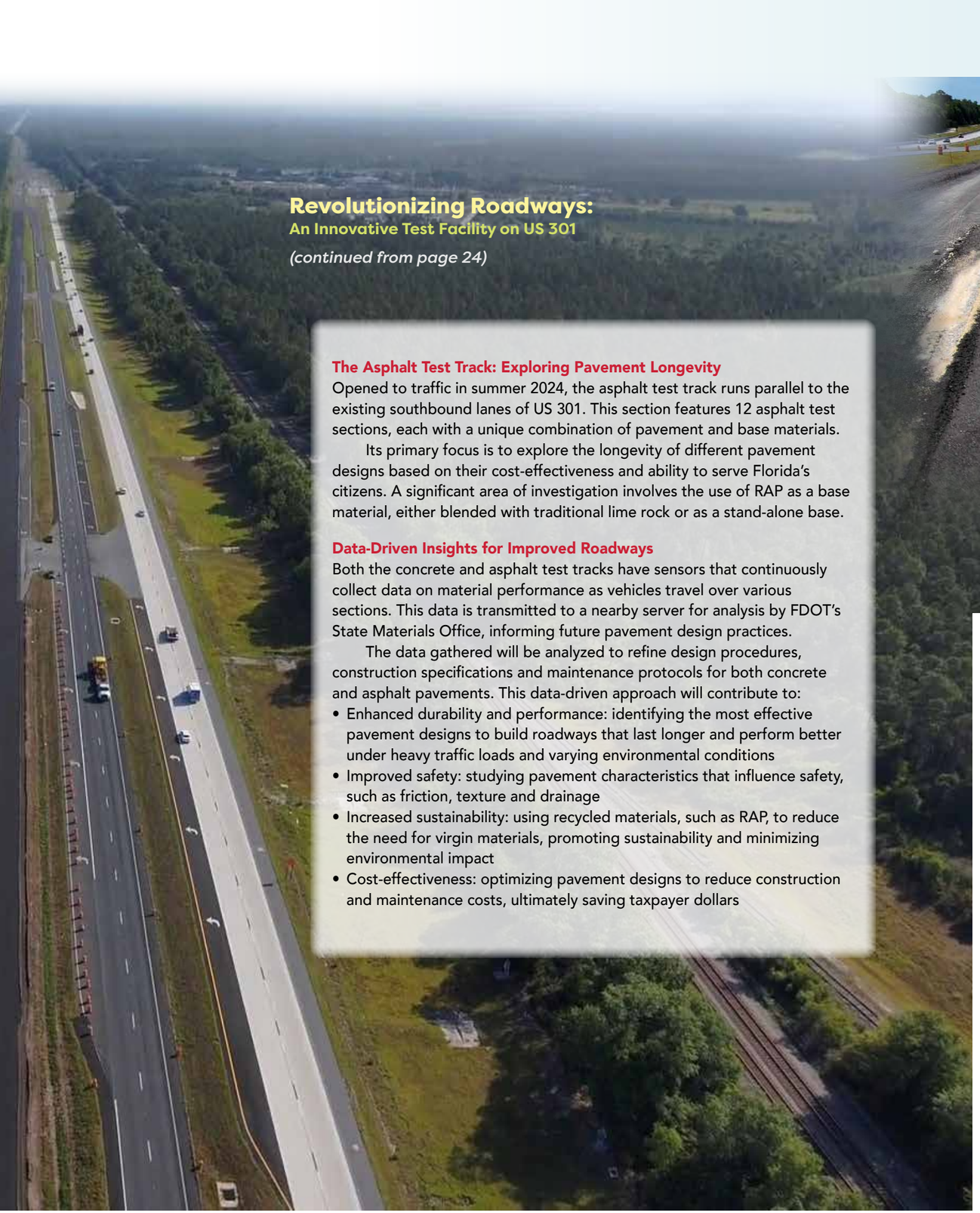


The Asphalt Test Track: Exploring Pavement Longevity

Opened to traffic in summer 2024, the asphalt test track runs parallel to the existing southbound lanes of US 301. This section features 12 asphalt test sections, each with a unique combination of pavement and base materials.

Its primary focus is to explore the longevity of different pavement designs based on their cost-effectiveness and ability to serve Florida's citizens. A significant area of investigation involves the use of RAP as a base material, either blended with traditional lime rock or as a stand-alone base.

Data-Driven Insights for Improved Roadways

Both the concrete and asphalt test tracks have sensors that continuously collect data on material performance as vehicles travel over various sections. This data is transmitted to a nearby server for analysis by FDOT's State Materials Office, informing future pavement design practices.

The data gathered will be analyzed to refine design procedures, construction specifications and maintenance protocols for both concrete and asphalt pavements. This data-driven approach will contribute to:

- Enhanced durability and performance: identifying the most effective pavement designs to build roadways that last longer and perform better under heavy traffic loads and varying environmental conditions
- Improved safety: studying pavement characteristics that influence safety, such as friction, texture and drainage
- Increased sustainability: using recycled materials, such as RAP, to reduce the need for virgin materials, promoting sustainability and minimizing environmental impact
- Cost-effectiveness: optimizing pavement designs to reduce construction and maintenance costs, ultimately saving taxpayer dollars

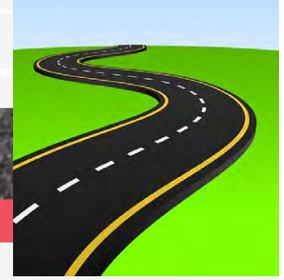
The asphalt sections provide researchers with vital information that can result in a more resilient infrastructure.

A Model for the Future of Pavement Engineering

The US 301 Test Tracks represent a significant investment in research and development by FDOT. They emphasize the agency's commitment to advancing pavement engineering and providing Florida with a sustainable transportation infrastructure. By leveraging real-world data and advanced technology, these tracks lead the way to a future of data-driven pavement design for safer, more durable and cost-effective roadways.

As The Wheel *Turns*

ASHE Members on the Move!



Urban Engineers Welcomes Andy Cushman

Philadelphia, PA—**Andy Cushman** has rejoined Urban Engineers (Urban) as Director of Business Development and Proposals. Cushman, a member of **ASHE's Delaware Valley Section**, will be responsible for the firm's marketing, business development and strategic efforts. With more than 20 years of experience in the architecture, engineering, and construction industry, he leads and executes communications, marketing, and teaming and project pursuit strategies to achieve bottom-line results. His history with Urban dates to 2005, when he was hired as a Marketing Coordinator. He ultimately became the firm's youngest Vice President of Corporate Development.
A graduate of La Salle University in Philadelphia, Cushman holds a Master's degree in Business Administration and a Bachelor's degree in Communication. Throughout his career, he has also been actively engaged in such industry associations as American Council of Engineering Companies, Society for Marketing Professional Services and WTS (originally Women's Transportation Seminar).

ANNOUNCING

Scanner Article of the Year AWARD

Say *what?*

Starting with all articles appearing in ***scanner*** from summer '24 through spring '25 issues, the ***scanner*** committee will choose first-, second- and third-place winners for the **SAY** Award. The committee will judge each article on:

- Value to the engineering profession
- Value to the community
- Innovation
- Photo quality/content connection
- Overall uniqueness

All incorporating ASHE Strategic Plan Objectives.

The annual **SAY** Award winners will be announced at ASHE National Conference Luncheon, Friday, June 6, 2025.

Sections, keep those articles coming!

ashe.pro/latest-news/scanner-newsletter/

Craighead Street Improvements Upgrade Safety, Accessibility

by Taylor Hagood, Principal Engineer/ Client Services Leader, LDA Engineering, **ASHE Middle Tennessee Section**

The Wedgewood-Houston neighborhood, just south of downtown Nashville, is home to young professionals and a thriving arts community that has brought new life to former factories and other industrial areas. It is also the home of multiple pedestrian-focused destinations. These include GEODIS Park soccer stadium and The Fairgrounds Nashville, which hosts more than two million visitors each year at its fairgrounds, indoor event spaces and Nashville Fairgrounds Speedway.

The award-winning Craighead Street Pedestrian Improvements Project boosted safety and enhanced pedestrian access through infrastructure enhancements around GEODIS Park and The Fairgrounds Nashville. The project established a direct connection between flanking thoroughfares, Nolensville Pike and Eighth Avenue, and linked surrounding neighborhoods. It also opened a direct accessible route to public transportation and a dedicated rideshare area.

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Safety Prioritized While Enhancing Community

Nashville is working toward Vision Zero, a global strategy to reduce traffic-related deaths and severe injuries, while also improving safety, equity and mobility for all users. The improvements in the Craighead Street project were within an identified high-injury network (HIN), an area with a disproportionately high number of traffic crashes resulting in serious injuries or fatalities. Improvements to make this area safer became an urgent priority.

Tennessee-based LDA Engineering partnered with the Nashville Department of Transportation and Multimodal Infrastructure (NDOT) to serve as program manager for the project's planning, design and construction phases. The timeline of the project, begun and completed in spring 2024, was expedited through a new alternative delivery approach. This entailed constructing the project in multiple phases to accommodate event schedules at GEODIS Park and The Fairgrounds Nashville. It allowed NDOT the flexibility to coordinate with adjacent projects and quickly complete construction to minimize impact on the community. Completing the project in phases also provided additional financing flexibility so the municipality could fund the project in segments.

(continued on page 32)

The design included ADA-compliant ramps to improve accessibility around GEODIS Park.

Craighead Street Improvements Upgrade Safety, Accessibility

(continued from page 31)

The new sidewalks accommodated increased pedestrian capacity for the tens of thousands who visit the venues weekly. They expanded access to community businesses and created a vibrant, walkable environment that attracts residents and visitors alike. The project also incorporated often overlooked features, such as dedicated rideshare loading zones and safer access to public transportation. The enhancements along Nolensville Pike, an HIN area, have significantly improved safety for pedestrians using public transit at one of the highest frequency transit stops in the city.

Enhanced Areas to Serve All

Dedicated rideshare loading zones offer a 2,300-foot-long platform to effectively manage event traffic, especially crucial for an area that can host 30,000 soccer fans but offers only 5,000 parking spots. The rideshare platform facilitates carpooling and provides a designated area for pickups and drop-offs. This has helped reduce traffic congestion and minimize the environmental impact of single occupancy vehicles. The team also added ADA-compliant ramps to improve accessibility surrounding GEODIS Park.

Design Considerations

Through careful consideration of the project's layout and grading within the Brown's Creek floodway, the design met Federal Emergency Management Agency regulations. With various design iterations, this project met "no-rise" requirements, utilizing strategic cut and fill balancing within the floodway. This project has not only increased the community's connectivity but also improved the area's flood resilience and helped preserve the environmental health of the surrounding community.

The Craighead Street project has created community connectivity, provided accessibility and moved Nashville toward Vision Zero while supporting the economy in the Wedgewood-Houston community. Its delivery in expedited phases minimized event disruptions and now offers safe pedestrian facilities in a formerly dangerous corridor. The team was proud to be a part of this community infrastructure transformation.

The project received recognition from NDOT and members of the Metropolitan Council of Nashville and Davidson County. It also earned a Grand Award from the American Council of Engineering Companies of Tennessee.

Public infrastructure projects such as this one, that consider safety, economic impact and end users, are well worth the investment of time and creativity to deliver engineering solutions. These are the types of projects and engineering solutions that aid communities in growth and help them to thrive.

New 12-foot sidewalks with seed and straw matting help mitigate erosion and promote growth of vegetation

Surveying a Bridge to the Past

by Shawn Beall, LS,
Rice Associates, Inc.,
ASHE Potomac Section

Loudoun County, VA, houses the largest network of historic roads statewide. It has miles and miles of gravel roads still in use today, carved by early colonists into Virginia's bumpy terrain. Recently, Loudoun County leadership announced plans to add historic gravel roads within the county to the National Register of Historic Places as part of a larger campaign to recognize and, hopefully, preserve these historic roads.

Ideally, a preserved historic road safely fits into larger roadway systems with minimal notice while maintaining its historic qualities; it can look and feel old, but it needs to be safe and easy to use. Practically, this calls for maintaining the road's traditional alignments and widths, improving selected sections of the road and protecting stone walls, roadside trees and banks. Striking this balance between ideals and practicality is the challenge of preservation.

Surveyors are best equipped to provide the data needed to determine balanced and quality preservation. Mapping historical elements has been a significant part of surveyors' work. They collaborate with engineers and architects to help design the modern landscape. A good surveyor's tools and expertise can provide irreplaceable data and recommendations for preservation efforts.

For example, consider the masonry stone arch bridge built in 1892 and recently earmarked by Loudoun County for historic rehabilitation. The bridge, considered a piece of county history, places Dry Mill Road (SR 699) over the paved Washington & Old Dominion Trail, a popular pedestrian greenway. The county's goals for the restoration included:

- Remove the current 27-ton weight restrictions through system strengthening
- Repair stone walls and masonry
- Upgrade parapets
- Install slope protection and guardrail end treatments
- Wash the bridge
- Repave roadway approaches

The potentially month-long project aims to improve driver and trail user safety and extend the overall life of the bridge.

Anyone walking the path below would see the bridge's current conditions are not good. There is widespread deterioration: loose stones, water seepage and damaged mortar throughout. Stones along the bottom of the structure are cracked and weathered; some stones along the arch walls are missing completely. Under the bridge there is a constructed wooden canopy that covers about half the pathway to protect trail users.

Surveyors at Rice Associates, Inc., (RA) were contracted to provide not only a full assessment of existing conditions but to contextualize project goals with quality, decision-informing data.

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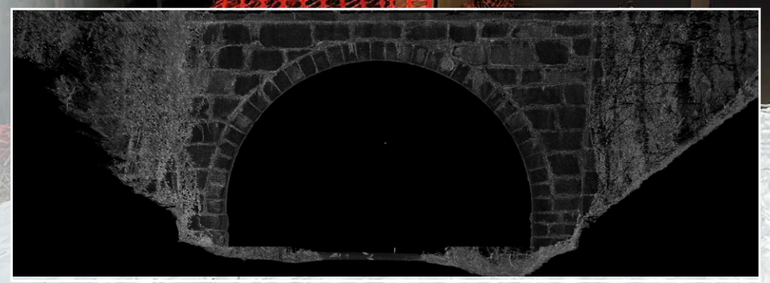

Project North-Western location as viewed using Leica Cyclone software

Project South-Eastern location as viewed with Leica Cyclone

Surveying a Bridge to the Past

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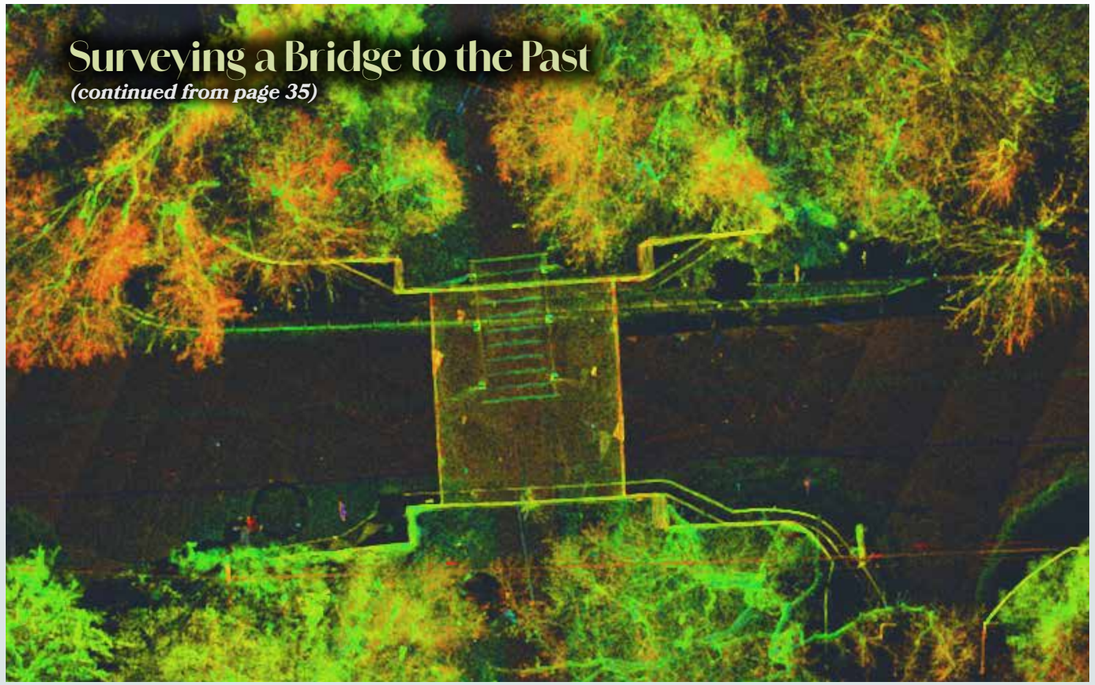

Project location as viewed in AutoCAD with planimetric overlay

System strengthening only becomes possible when system flaws and needs are found and known.

When we RA surveyors first assessed the project area, we determined existing conditions, and surrounding terrain would be best documented by Scan-to-Building Information Modeling (Scan-to-BIM) and conventional surveying. We used terrestrial LiDAR for numerous project needs, from modeling industrial elements to incorporating ground penetrating radar and thermography to highlight concrete delaminations in hard surfaces.

To prepare for the Scan-to-BIM model, the team used the Leica P50 scanner, known for its good long-range capabilities. (Accessing any bridge, in general, is a potential issue and requires accuracy at range from the available vantage points.) We were able to move ourselves and the scanner closer, minimizing potential errors and providing a better angle of incidence, which is not always possible. Additionally, such a close scan also ensured a dense and precise point cloud to pull from.

This is why the Leica P50 scanner is so often used for scanning bridges. Its exceptional long-range scanning capabilities can capture detailed, 3D images of large structures from a safe distance, with minimal noise. It produces a detailed analysis of bridge components pinpointing potential damage. High dynamic range (HDR) imaging uses this same high-dynamic imagery for better visualizations and documentation. As it is being captured, 3D data and HDR imaging occur at an extremely fast scan rate of 1 million points per second at ranges below 3,280 feet.

The surveyors used this wealth of data captured by the Leica P50 to create a digital version of the road, bridge and greenway. This visualization can fully document and map the missing stones and mortar loss and the critical repairs needed before the strengthening system can be safely installed. It can also determine whether the weight-restriction removal rehabilitation goal is possible.

This is a best-case scenario for surveyors on preservation projects: providing the data and expertise needed to contextualize and realize complex, historic project goals. We know what is needed and know how to tell whoever needs to know it.

Advancing Safety *and* Connectivity *in Columbus*

by Michael Taricska, PE, Burgess & Niple, **ASHE Central Ohio Section**

The I-70/I-71 split in Columbus, OH, is a highly congested area composed of overlapping merges entering and leaving downtown. Identified by the Ohio Department of Transportation (ODOT) as a high-crash location, this area is part of the multibillion-dollar, multiphase Columbus Crossroads Project aimed at rebuilding and improving the split. Due to the size and scope, it consisted of six phases. Phase 3 was divided into Project 3B and Project 3 to prioritize the most critical portions and accommodate available funding options.

The $45 million FRA-71 Project 3B addressed infrastructure needs by reconstructing and widening the city's Broad Street Bridge. This would eliminate problematic lane drops on southbound I-71, creating a continuous lane from I-70 west to I-71 north to improve vehicular traffic. The project also included local road improvements, connecting Broad Street to nearby Long Street with the extension of Lester Drive and Elijah Pierce Avenue. Pedestrian and bicycle access also received upgrades with wider sidewalks and bike lanes. This exemplified a Complete Streets approach, enhancing the connectivity between downtown Columbus and surrounding neighborhoods.

The complexity of Project 3B, begun in spring 2020, was considerable. Functionality of vital infrastructure had to remain during the phased construction over major utilities and coordination with adjacent historic structures. The project team's innovative approach was central to solving the challenges of fitting Project 3B within the broader multiphased initiative. ODOT and the lead design firm Burgess & Niple collaborated on the project to minimize reconstruction work in future phases through careful planning and coordination.

Rising Above Challenges

One of the most intricate portions of the project involved the reconstruction of the Broad Street Bridge over I-71. It required raising the bridge profile and lowering I-71 to provide sufficient vertical clearance. It also had to avoid impacts on a nearby historic property. The I-71 profile had to be maintained in a way that could allow Project 3 to tie into it in the future condition. Widening the bridge provided new pedestrian and bicycle accommodation as well as aesthetic benefits. These included landscaping, a lighted screen wall and other decorative features.

Other challenges included a three-phased Broad Street maintenance of traffic scheme due to five major utilities attached to the bridge. These had to be moved during a complex part-width construction to maintain Broad Street traffic. Additional complications included the relocation of a massive sanitary siphon and the installation of intelligent transportation systems. These comprised fiber cables, traffic signals and traffic flow monitoring cameras, which enhanced safety and efficiency.

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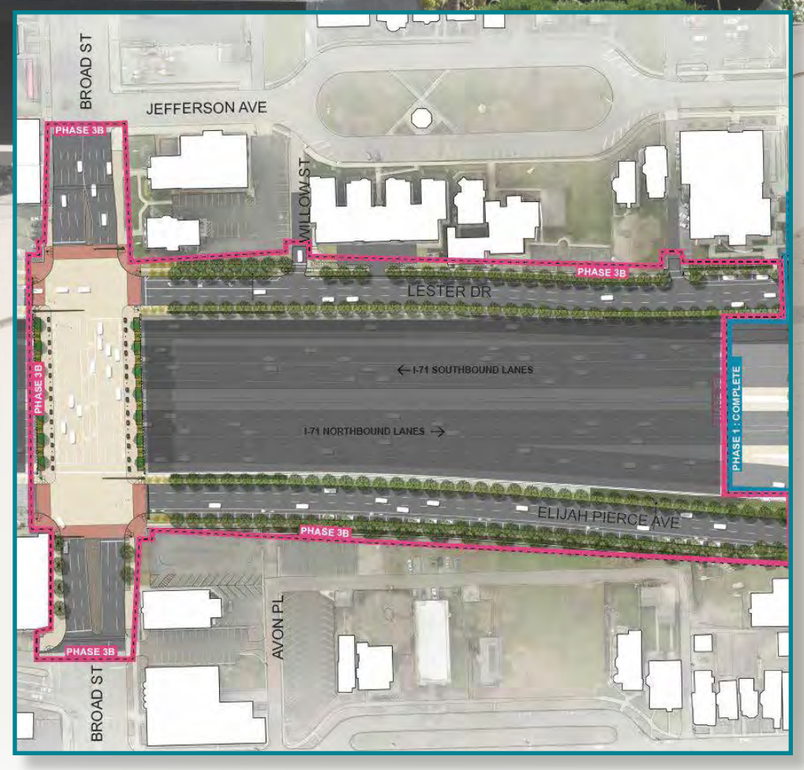

The elimination of ramps that caused weaving helped improve vehicular mobility and safety.

The bridge's designs included architectural elements that reflect the historic surroundings.

Advancing Safety *and* Connectivity *in Columbus*

(continued from page 39)

The reconstructed bridge provided a much-needed connection between area neighborhoods and downtown.

A Smoother, Safer Commute

Completed in 2022, FRA-71 Project 3B benefits the public through improving overall vehicular safety and mobility in the area. Built in the 1960s to accommodate an average of 125,000 vehicles per day, the interchange now regularly carries 175,000 vehicles per day. According to ODOT, the split was one of the most congested areas in the state; it once ranked fourth statewide for crashes and congestion.

The reconstruction of Broad Street Bridge over I-71 required raising the bridge profile and lowering I-71 to provide sufficient vertical clearance.

The new design eliminated the Broad Street ramps that caused considerable weaving and streamlined the connections between I-670 and local roads. Previously, drivers had to merge over multiple lanes to exit I-71 southbound onto the local street network. Additionally, the extension of Elijah Pierce Avenue and Lester Drive from Long Street to Broad Street has provided a direct connection to I-670 and I-71. This also sets up the future extension of Lester Drive and Elijah Pierce for full frontage road connectivity between nearby Long and Main Streets and provides on-street parking along Elijah Pierce.

Connecting Communities

Beyond vehicular improvements, a key consideration of Project 3B was improving active transportation in the area and enhancing public life. During the public involvement phase, citizens noted a need to connect neighborhoods to downtown with access for pedestrians and bicyclists, something that the Broad Street Bridge previously lacked. During this phase, the team worked with ODOT District 6 and Columbus to determine the preferred bridge designs and aesthetics that would help establish this community connection.

In response, the wider sidewalks and bike lanes added to the Broad Street Bridge connect downtown to surrounding neighborhoods and promote pedestrian and bicycle travel. The project introduced bike boxes at intersections, a feature that promotes cyclist safety and visibility. It added custom architectural elements, such as lighted screen walls and landscaping with built-in irrigation, further enhancing the urban environment.

The Road Ahead

The successful completion of Project 3B has set the stage for future phases of the Columbus Crossroads Project while improving safety, mobility and connectivity for the public. The project provided an example of complex engineering solutions that met public needs while promoting sustainability, encouraging more physically active transportation and enhancing the urban fabric of the city.

A lighted screen wall installed on either side of the bridge added to its aesthetic appeal, with remote controlled, customizable lights.

Transforming the Capital's C Street NE Corridor

by Oliver Boehm, PLA, ENV SP, LEED-AP, Volkert, Inc., **ASHE Potomac Section**

Photo Credit – W.A.

The rehabilitation of C Street NE in Washington, DC, transformed a thoroughfare into a corridor with improvements focused on the local community. Located at the eastern edge of the Capitol Hill neighborhood, the project had an impact on residential communities, schools, recreation centers and a designated historic district.

The District Department of Transportation (DDOT) selected Volkert, Inc., to develop a comprehensive redesign of the corridor to control vehicular traffic and provide safe and attractive conditions for pedestrians, cyclists and transit users. Starting the project's design in 2017, the team applied a holistic approach to repairing transportation deficiencies, addressing environmental concerns and improving the community's quality of life. During the concept phase, they conducted design charrettes and pre-review meetings. These explained the project's intent, gained support and obtained guidance from parties expected to provide design approvals. Such an approach was necessary due to the unique design solutions needed and helped to consistently advance every aspect of the design.

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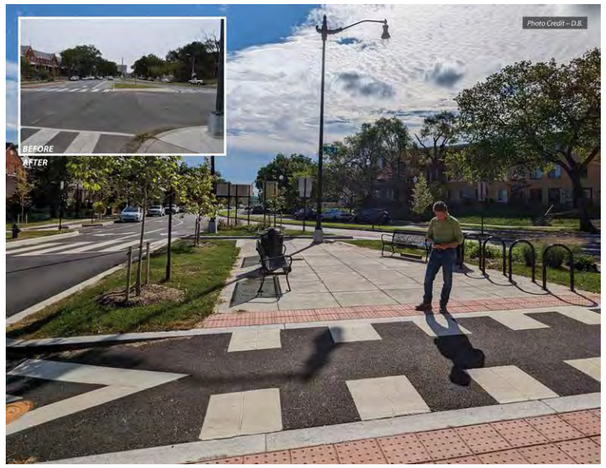


Multiple slip lanes were closed and much of the roadway's asphalt replaced with planting areas and pedestrian public spaces.

Curb extensions along the entire corridor help define parking and manage traffic.

The design balanced the needs of the traveling public and those of the community, emphasizing pedestrian and bicycle safety.

Yellow directional indicator pavers direct pedestrians toward safe crossings at the cycle track and the roadway.

Transforming the Capital's C Street NE Corridor

(continued from page 41)

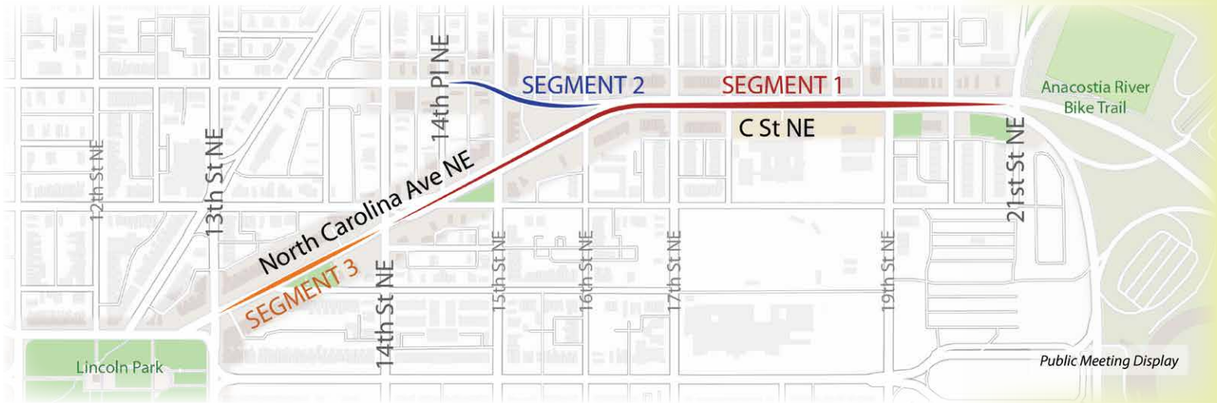
Application of Complete Streets Principles

C Street NE is a minor arterial, serving as an urban gateway into the heart of Washington. Prior to its rehabilitation, it consisted of two outbound and three inbound travel lanes, restricted parking lanes, unprotected bicycle lanes and 90-foot-wide roadway crossings. These conditions led to frequent speeding and unsafe conditions for all users.

The team applied Complete Streets principles to achieve a design able to meet the community's expectations and transportation requirements. Multiple traffic calming devices and minimization of disturbance to existing trees were just part of the challenges. The team also had to enhance the area's transit facilities and meet drainage and stormwater management requirements as part of the design.

Multiple design strategies went into a comprehensive set of construction documents. The team's Road Diet strategies included:

- removal of one travel lane in each direction
- introduction of bulb-outs and raised crosswalks
- better defined on-street parking
- upgrades to existing sidewalks and design of ADA-compliant, pedestrian-focused intersections
- shortened crosswalks
- prioritization of bicyclists and pedestrians



The project's resulting separated cycle track was the first of its kind designed in Washington, DC. It is separated from the travel lanes by a planted green space and a dedicated parking lane and curb extensions used for pedestrian bus platforms and green infrastructure.

The design provided large stretches of green space, replacing impervious roadway surfaces with trees, creating an enhanced gateway and recognizing the importance of street tree preservation. The team designed new drainage structures and pipes, underground conduits and the rest of the roadway and streetscape around existing trees. The stormwater management design resulted in a total of 3,771 cubic feet of retention volume, exceeding the District's 1.2-inch storm event requirement of 3,693 cubic feet. These were attributable to the creation of bioretention planters integrated into bulb-outs along with reuse of part of the roadway for the cycle track.

Directional indicator pavers, rather than bollards and railings, guide visually impaired pedestrians safely through areas of conflict and create a barrier-free environment. Detectable warning pavers, typically used in accessible ramps as two-foot-wide pavers, were used as a one-foot-wide banding for crossing the separated cycle track. These help the visually impaired to differentiate a street crossing from a separated cycle track crossing.

The project also introduced traffic controls focused on bicycle and pedestrian safety, such as high-intensity activated crosswalk signals, bicycle traffic lights, wayfinding signage and unique bicycle pavement markings. The team provided two rows of LED streetlights: one to illuminate the roadway and another row to illuminate both the sidewalk and the cycle track.

Stakeholder Engagement

The team's stakeholder engagement process was not limited to the public at large, special interest groups or elected officials. It also required engaging with internal regulatory groups who had limited knowledge of the comprehensive nature of the solutions proposed.

A series of design meetings addressed issues regarding stormwater management, tree preservation and bicycle and pedestrian operations. The meetings also covered ADA compliance, utility relocation, historic preservation and vehicular traffic. Public involvement included three at-large meetings, Advisory Neighborhood Commission meetings, site walks, a dedicated project website and meetings with individual residents.

The project, completed in 2023, cost $16 million. The experience of riding a bicycle in the transformed corridor can be seen in at https://vimeo.com/999258333?share=copy

Large Diameter Drilled Shafts in Karst

by Elizabeth M. Smith, PE, GE, BC GE,
Terracon Consultants, Inc., **ASHE San Antonio Section**

The ongoing I-35 Northeast Expansion (NEX) Central Project is a major design-build program in San Antonio for the Texas Department of Transportation (TxDOT). Alamo NEX Construction (ANC, a joint venture led by Ferrovial Construction and Webber LLC) was awarded the $1.59 billion project in August 2021. The project improvements include design, construction and maintenance of elevated non-tolled managed lanes. The elevated lanes are separate northbound and southbound bridges constructed above the existing interstate. Figure 1 shows the project layout, and Figure 2 shows the project typical section.

I-35/I-410 Interchange Layout

The elevated structures' locations in Figure 3 were segmented into bridge numbers to simplify the design and construction workflow. The bridges are numbered consecutively from south to north (according to the project stationing). The southbound mainline structure starts at Bridge 100; the northbound mainline structure starts at Bridge 0. The 300 series bridges are elevated interchange ramps.

Site Evaluation

The first step of any foundation project is to perform a desktop review, which includes studying the site's geology, topography, historic site usage and existing available subsurface information.

Historic topographic maps are helpful when looking for previous site conditions, particularly on transportation projects where the infrastructure obliterates streams and creeks. The United States Geological Survey now has most of the maps digitized so it is easy to download historic topographic maps from Get Maps | topoView (usgs.gov).

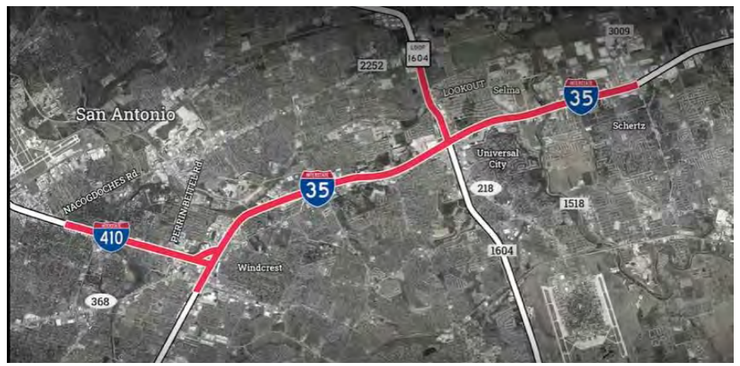


Figure 1: I-35 NEX central project map

Figure 4 shows the 1953 (top) and 2019 (bottom) maps with the interchange area circled, and a detail that shows the previous creek sketched on the existing configuration. This creek historically ran east to west across the interchange. The stream was routed into a series of culverts and ditches, and the creek is no longer visible at the interchange. The presence of a creek in karst geology indicates that karst features may be present.

Terracon prepared subsurface profiles using TxDOT-provided subsurface data in the Reference Information Documents (RID), as-built plans and previous borings. None of the RID borings indicated karst features at the intersection. A previous boring at the interchange encountered a 12-foot layer of lean clay sandwiched in the limestone, 20 feet below the top of limestone. Two other RID borings showed clay layers in the limestone north of the interchange. Although nothing emphasized karst, the geology, topography and previous boring data indicated that karst features may be encountered.

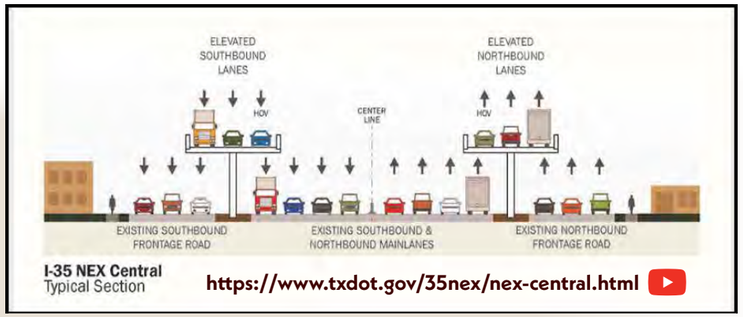


Figure 2: I-35 NEX central project configuration (TxDOT)

Field Investigation and Subsurface Profile

The subsurface investigation approach for the overall project was to drill a boring at each foundation. Most foundations would be nonredundant, with heavily loaded single column bents on one large, drilled shaft. Most karst features identified during the geotechnical investigation were interpreted as being clay filled. The subsurface exploration plan for the I-35/I-410 interchange is shown in Figure 5.

To further investigate the presence of the karst features, both Multichannel Analysis of Surface Waves (MASW) and electrical resistivity imaging (ERI) surveys were performed to determine the approximate depths of karst features and if the features were continuous or discrete. Voids were expected in the areas of Bridges 0, 1, 100 and 101 (see Figure 3). The geophysical testing at Bridge 100 indicated the voids were clay filled.

Terracon developed subsurface profiles for each structure based on the borings and the geophysical findings.

Foundation Design in Karst Geology

The approach to foundations in known karst areas was to design for skin friction and neglect end bearing to prevent punching shear at the shaft base if unknown karst features were present. Borings were drilled at every bridge bent, so each drilled shaft was designed individually based on the imposed loads, column sizes and lateral demands. The drilled shafts were evaluated following the procedures outlined in Federal Highway Administration Geotechnical Engineering Circular 10 (2018). The evaluation also followed procedures outlined in American Association of State Highway and Transportation Officials Load and Resistance Factor Design 8 (2017) for side and end bearing (where used) in rock based on the unconfined rock strength tests performed for the project.

Because this was a design-build project, the geotechnical designers could provide these recommendations, knowing each shaft would be observed during construction to verify the depths and competence of the rock. Where the team had concerns about the conditions at a given bent, a core hole was required below the design tip. Core holes were also required at monoshafts and straddle bents where the nearest boring was over 50 feet from the center of shaft. The bridge plans included a foundation data table with design details at each bent. These included notes regarding karst features and if a core was required. At Bridge 101, a core was required at each drilled shaft location to confirm the suitability of the rock within 1.5 diameters below the shaft tip.

The foundation data sheet included the following instructions for field evaluation of the shafts and karst features:

- Drilled shafts shall be founded at the elevations shown or deeper to obtain the minimum embedment into the bearing stratum.
- Elevation of bearing stratum shall be verified in the field by inspector. If elevation is found to be more than six feet below the expected elevation, notify the engineer of record or designee prior to the construction of the shaft. If elevation of bearing stratum is up to six feet below the estimated elevation, the shaft and its reinforcement shall be extended.
- The nature of the bearing stratum and potential karst locations shall be confirmed when drilled shaft excavation is complete by means of a core hole and shall be validated by the inspector at indicated locations.
- Foundation design assumptions shall be verified during construction at each drilled shaft location specified in the table by performing a core hole per TxDOT Standard Specification Item 416. Should karst features or low strength strata be encountered within this depth, the core hole shall be extended to a depth recommended by the

(continued on page 46)

Large Diameter Drilled Shafts in Karst

(continued from page 45)

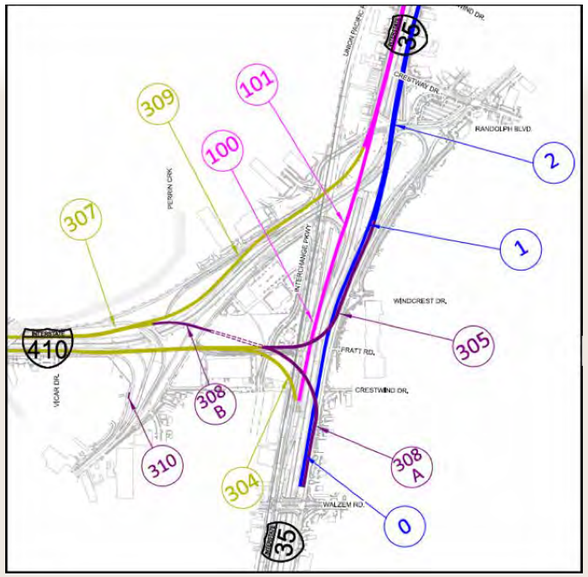


Figure 3: Bridge key map at I-35 and I-40 interchange

geotechnical engineer (ANC's engineer). Rock core photos and drill logs shall be provided to the geotechnical engineer for review. Final tip elevations for the drilled shafts will be provided by the geotechnical engineer.

- For karst features found to conflict with drilled shafts during construction, the project geotechnical engineer shall provide a new recommended drilled shaft length.
- The contractor shall supply a digital picture/video documentation of all karst features. For karst features that cannot be safely explored, a drone or other device shall be provided to document the karst feature.

Foundation Construction

During construction, clay-filled karst features were encountered at Bridge 101, Bent 9, which has a 96-inch diameter shaft and was the first shaft constructed for this segment. The top of chalk bearing stratum was expected at Elevation (El.) 670. Figure 9 is a photo of the drill spoils from El. 668 to 670, showing that the material excavated was not chalk. Drilling continued, and rock was finally encountered at El. 644 and confirmed by coring to El. 634. Terracon received a request for information from the construction team asking for guidance in addressing the clay-filled karst features. Terracon's response included the following recommendations:

- Permanent casing is not required because open voids were not encountered.
- Lower the top of bearing stratum to El. 643 with the shaft tip at El. 634.
- The structural engineer must verify the tip elevation meets the required fixity criteria.
- Terracon reevaluated the drilled shaft design based on the encountered materials, where all contribution of skin friction in the void areas was ignored. The shaft resistance is carried in skin friction, and end bearing was not used at the shaft tip at El. 634. The shaft was tipped at El. 634 because the approved plans required a minimum eight-and-three-quarter-foot embedment in intact limestone.

The shafts were inspected during excavation using drones to image the entire shaft excavation. Karst features were encountered in drilled shaft excavations at Bents 3, 4, 5 and 9 of Bridge 101. The karst features were consistent with the geotechnical investigation and recommendations at Bridge 101.

Conclusions

The geotechnical engineer performed a thorough site investigation and informed the structural engineer and the contractor about the karst features from the beginning of the project. Communication was key to avoiding surprises and addressing construction solutions during design.

The following steps were taken during the design phase:

- A detailed review of previous boring data, topographic and geologic maps.
- Borings were drilled at each bent to identify karst features during design.
- Geophysical MASW and ERI investigations helped predict the presence of karst features.
- Detailed subsurface profiles showed areas of potential karst.
- Design evaluations considered site-specific rock strength, neglected skin friction in known karst zones and neglected end bearing where the shaft could not be tipped below a karst feature. Given the construction of hundreds of shafts at this interchange, encountering an unidentified karst feature at only one shaft is a statistically favorable outcome.

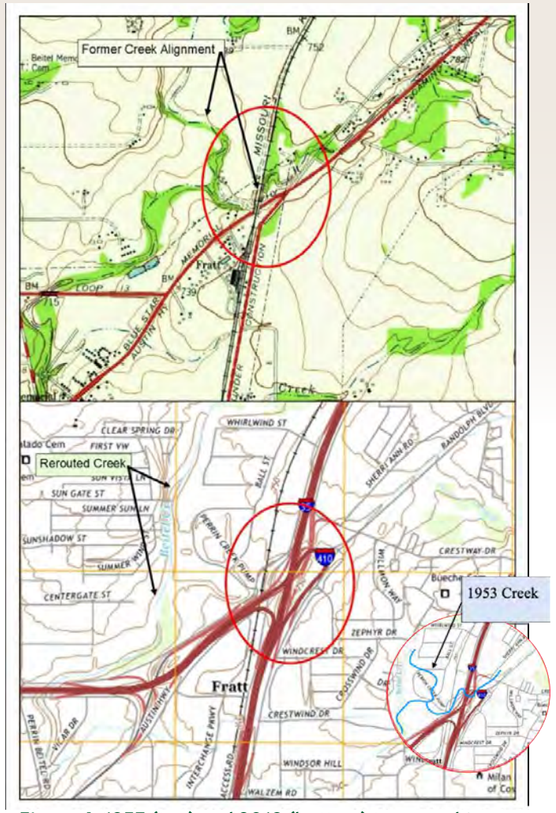


Figure 4: 1953 (top) and 2019 (bottom) topographic maps (U.S. Geological Survey) showing interchange location and creek locations, with detail overlay

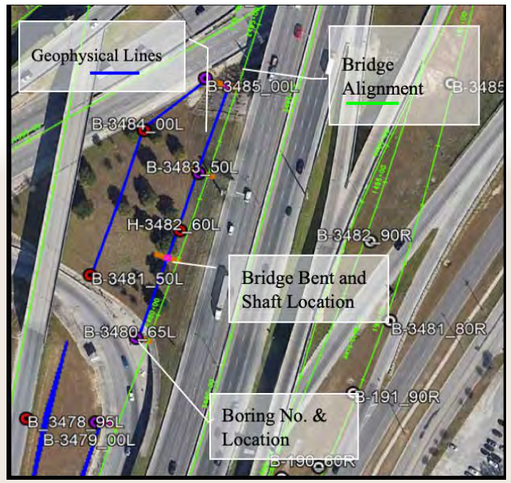


Figure 5: Boring and geophysical investigation plan

We regret that due to space limitations, additional images provided by the author could not be included with this article.

Figure 9: Bent 9 drill spoils at El. 668 to 670 (courtesy of Alamo NEX Construction)

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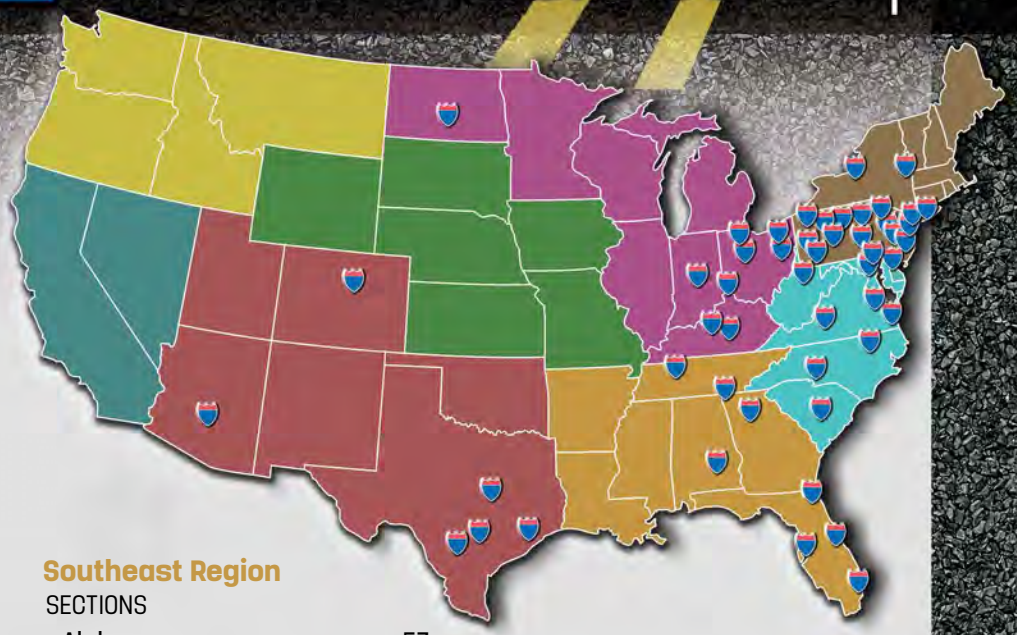

Regions *and* Sections

Northeast Region

SECTIONS	
Albany	84
Altoona	201
Central New York	49
Clearfield	190
Delaware Valley	340
East Penn	125
First State	228
Franklin	103
Harrisburg	403
Long Island	34
Mid-Allegheny	94
New York Metro	115
North Central New Jersey	119
North East Penn	155
Pittsburgh	519
Southern New Jersey	200
Southwest Penn	239
Williamsport	71
Subtotal	**3,270**

Mid-Atlantic Region

SECTIONS	
Blue Ridge	50
Carolina Piedmont	52
Carolina Triangle	223
Chesapeake	264
Greater Hampton Roads	72
North Central West Virginia	51
Old Dominion	79
Potomac	172
South Carolina	58
Subtotal	**1,021**

Southeast Region

SECTIONS	
Alabama	57
Central Florida	116
Georgia	625
Middle Tennessee	293
Northeast Florida	216
South Florida	18
Tampa Bay	64
Tennessee Valley	123
Subtotal	**1,512**

Great Lakes Region

SECTIONS	
Bluegrass	140
Central Dacotah	65
Central Ohio	211
Circle City	62
Cuyahoga Valley	102
Derby City	98
Lake Erie	249
Northwest Ohio	43
Triko Valley	152
Subtotal	**1,122**

Southwest Region

SECTIONS	
Central Texas	74
Colorado	40
Dallas-Fort Worth	69
Houston	97
Phoenix Sonoran	145
San Antonio	38
Subtotal	**463**

National Total	**7,388**
Professional Status	56%
Government	12%
Consultant	75%
Contractor	5%
Other	8%

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