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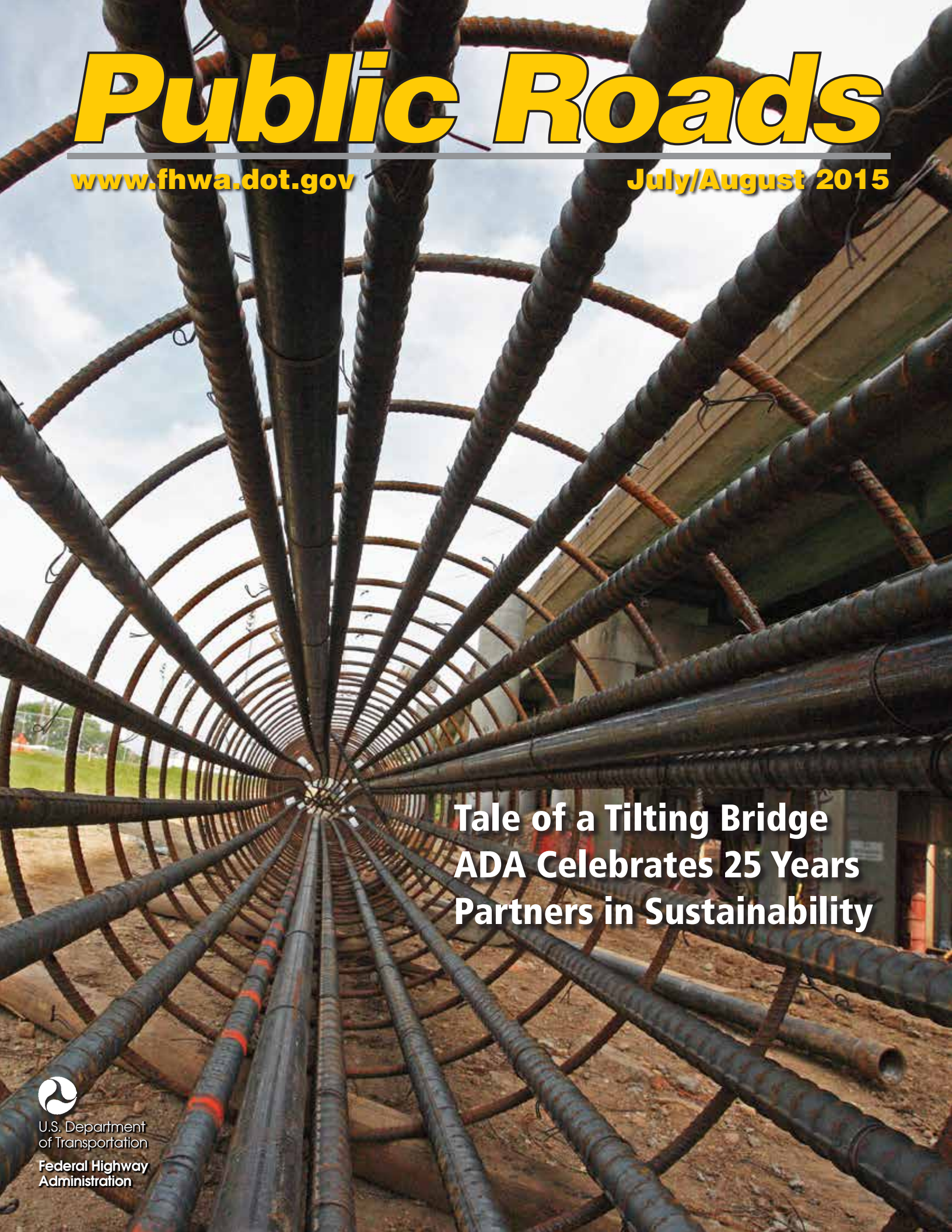

Tale of a Tilting Bridge
ADA Celebrates 25 Years
Partners in Sustainability

U.S. Department of Transportation
Federal Highway Administration

Public Roads

—featuring developments in Federal highway policies, programs, and research and technology—

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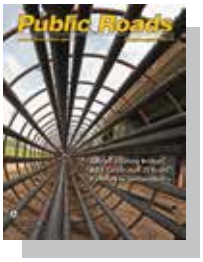

Front cover—This cage of rebar now helps support 1 of 11 bridges replaced as part of an ambitious bridge restoration project on I–95 in Richmond, VA. The Virginia Department of Transportation (VDOT) used accelerated bridge construction, a strong project management team, and community engagement to complete the project under budget and ahead of schedule. For more information, see "Keeping Virginia Moving" on page 2 in this issue of PUBLIC ROADS. *Photo by Tom Saunders, VDOT.*

Back cover—When a bridge carrying a busy interstate in Delaware started tilting, quick action was needed. Crews installed temporary support towers, shown here, to reopen the road to traffic. The temporary support towers also helped in the jacking and leveling operation, while permanent concrete support columns were cast between the temporary towers. For more information, see "How Could a Pile of Dirt Cause a Major Interstate Bridge To Tilt?" on page 32. *Photo by AECOM.*

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Guest Editorial

The ADA at 25: Still Under Construction

Have you ever had an injury or surgery that required you to use crutches or a wheelchair during recovery? Do you have an aging parent with a disability who relies on assistive technology for vision, hearing, or mobility to maintain his or her independence? Or maybe you, a friend, or a family member has a permanent disability that makes some aspect of independent living a challenge? Most people answer "yes" to one or more of these questions, because everyone is likely to have a disability at some point, whether temporary or permanent.

When Congress enacted the Americans with Disabilities Act (ADA) 25 years ago, its intent was to enable persons with disabilities to "compete on an equal basis and to pursue those opportunities" available to persons without disabilities. This milestone anniversary provides an opportunity not only to celebrate the achievements made in advancing accessibility since the groundbreaking law passed, but also to reflect on the future of disability in America. How should public entities respond to emerging challenges?

As many as 56.7 million people in the United States report having some of type of disability, and that number is likely to grow over the next 25 years. People are living longer and surviving injuries and conditions that used to be fatal.

In passing the ADA and subsequent amendments, Congress recognized that "physical and mental disabilities in no way diminish a person's right to fully participate in all aspects of society." But, reads the ADA Amendments Act of 2008, "people with physical or mental disabilities are frequently precluded from doing so because of prejudice, antiquated attitudes, or the failure to remove societal and institutional barriers."

The ability to make social and economic contributions often is limited by an individual's ability to travel. For example, most people have to travel to their places of employment, and need to arrive there reliably and safely. Some also may have to travel as part of their jobs,

Warren Whitlock

Butch Waidelich

or to attend school or community meetings, sporting events, cultural outings, religious gatherings, and the homes of family and friends. Persons with disabilities have the same needs, and the U.S. Department of Transportation and Federal Highway Administration play a role in making sure that transportation systems are accessible to everyone.

Sidewalks, curb ramps, street crossings, signal technologies, intersection designs, and transit stops are some of the many features in the public right-of-way that transportation agencies and infrastructure owners can improve to better function for people of all abilities. Although State and local entities have made significant progress since passage of the legislation, many opportunities for improvements remain. For more on progress at all levels of government to advance the goals of the ADA, see "Access for All" on page 10 in this issue of PUBLIC ROADS. For more information on the ADA and other accessibility resources, visit FHWA's Accessibility Resource Library at www.fhwa.dot.gov/accessibility.

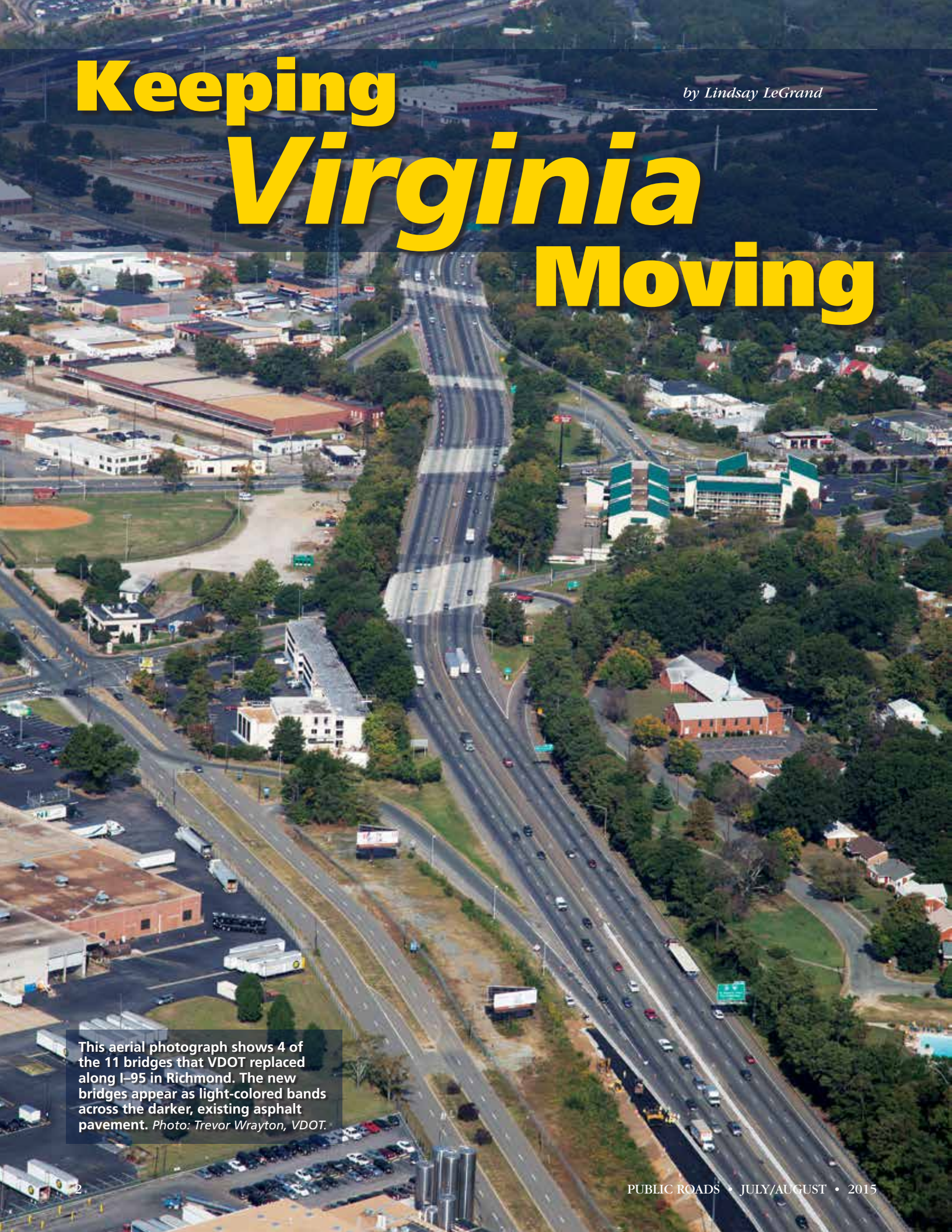
USDOT is committed to removing barriers to accessibility to create ladders of opportunity that connect everyone to jobs, schools, and a better quality of life.

Warren Whitlock
FHWA Associate Administrator for Civil Rights

Walter "Butch" Waidelich
FHWA Associate Administrator for Infrastructure

Keeping Virginia Moving

by Lindsay LeGrand



This aerial photograph shows 4 of the 11 bridges that VDOT replaced along I–95 in Richmond. The new bridges appear as light-colored bands across the darker, existing asphalt pavement. *Photo: Trevor Wrayton, VDOT.*

An ambitious project to restore nearly a dozen aging bridges on I–95 came in ahead of schedule and under budget—all while minimizing congestion. Here's how it happened.

Source: John Siddall, Siddall Communications.

Talk about solving a riddle! How does an agency replace 11 bridges in Virginia's capital region, all located at the confluence of two major interstates? Moreover, the structures—all 50 years old—carry four or five lanes of traffic and 150,000 vehicles per day. For additional complications, throw in overhead utility lines, a homeless population, shared rights-of-way with railroads, and construction over busy city streets. Also consider the major traffic impacts, which could overwhelm a regional area of active tourism and other businesses.

This is not just the story of the Interstate 95 Richmond Bridge Restorations project; this is how the Virginia Department of Transportation (VDOT) overcame seemingly insurmountable challenges to complete the project successfully more than 3 months ahead of schedule and $16 million under budget.

Aging Bridges

In its long-term plans in the late 1990s, VDOT identified the aging bridges in the I–95 corridor in the Richmond, VA, region as candidates for major repairs and possible replacement. Thirteen area bridges were considered, but with budget constraints, VDOT replaced only two bridges over the following years, completing those structures in 2003.

Once VDOT identified funding to replace the remaining structures, multiple players at nearly every level of government in the city of Richmond and Henrico County worked together to find efficient and cost-effective solutions. Three main components—accelerated bridge construction, solid project management, and effective communication—contributed to the project's success.

Accelerated Bridge Construction to the Rescue

Given the project's location at the confluence of two major interstates, I–95 and I–64, and the volume of traffic carried by the two highways, VDOT officials knew that keeping congestion to a minimum would be key. Conventional construction would have required shutting down the interstates in each direction, which was out of the question. The user costs in traffic backups would have been enormous, and the potential delays for emergency services providers were simply too risky. Instead, the project team elected to use accelerated bridge construction, which enabled construction to progress onsite and offsite concurrently.

"The answer was clear," says Scott Fisher, VDOT project manager. "We had to work when traffic volumes were lower, and complete as much work offsite as possible."

Accelerated bridge construction, in this case, meant that sections of the new bridge superstructure were preconstructed at an offsite location as composite units, which were then transported to the worksite for final placement. The 11 bridges required 234 preconstructed composite units. The units, fabricated at a casting yard, were transferred into place during 10-hour windows each weeknight between 8 p.m. and 6 a.m., when traffic volumes were lightest.

The casting yard provided unparalleled benefits for the project. Although finding a 25-acre (10-hectare) piece of land in an urban setting was difficult, VDOT

At the casting yard, a crew prepares a preconstructed composite unit for transport to one of the replacement sites.

Scott Fisher, VDOT

The Upham Brook bridges, shown here, pass under the Route 301 bridge and over Upham Brook near Flippen Creek. *Photo: Tom Saunders, VDOT.*

identified three potential properties in advance of bidding to ensure the project's constructability. The chosen site for the casting yard was managed by a full-time superintendent and inspectors to keep the work on schedule. The yard enabled crews to build and store preconstructed composite units in a controlled environment, where the safety hazards and pressures of high-volume traffic were nonexistent. The yard provided a safe zone for construction a few feet off the ground, as opposed to 30 feet (9 meters) in the air. Also, using the casting yard for construction allowed crews to accelerate productivity, focus on quality, and finish ahead of schedule.

Although helpful, the casting yard also presented its own challenges. Crews had to re-create each bridge's substructure in the yard and then build the bridge superstructure to ensure an exact fit for when it was hauled to the site. Building the bridge superstructure sections offsite left little room for error.

"We lived by the motto 'measure twice, cut once,'" Fisher explains. "We required two separate surveys of each section to be completed independently so that we would ensure that the bridge [superstructure] units would fit when we installed them. Even a couple of inches' difference in one [preconstructed composite unit] could throw us off completely."

Early each day at the casting yard, the construction team loaded the preconstructed composite sections onto large, 12-axle trailers and later took them to the replacement sites. During overnight lane closures, the team saw-cut the old bridge superstructure sections and used a pair of heavy cranes to lift them out of the way. The new preconstructed composite sections were then installed as the old units were carried away. Over time and with practice, the crews were able to replace two units instead of one each night as an added timesaver.

Months before installing the new units, crews made repairs to each bridge's substructure, including the existing concrete pier caps and abutments. The repairs were needed due to the deteriorated condition of the substructure and the need to restore and extend the service life of the bridge substructure to match that of the new precast composite units. To extend the service life of the substructure, VDOT used a combination of electrochemical extraction of chloride, cathodic protection, high-performance self-consolidating concrete for concrete repairs, and other innovative construction methods.

As a result, VDOT expects that the combination of prefabricated bridge elements and systems for the superstructure and repairing

the existing substructure will extend the service life of these bridges for at least 50 years and minimize future maintenance costs.

In addition to the repairs, three of the bridges had to be widened, which meant that nearly 50 permanent drilled shafts with an average depth of 55 feet (16.8 meters) were installed on this project.

If crews placed one preconstructed composite unit during an overnight shift, they would temporarily set several 2-inch (5-centimeter)-thick steel plates in the 30-inch (76-centimeter)-wide gap between the new preconstructed composite unit and the existing bridge section. This permitted smooth traffic flow until the next sections could be set. If a crew installed two sections during one shift, the contractor had to temporarily post-tension the two preconstructed composite units with a steel plate to ensure continuity between the two pieces. The construction crew performed final post-tensioning once they set the last preconstructed composite unit for each span.

Fitting the separate units together was a challenge. Eight of the eleven bridges were post-tensioned while the other three bridges had closure pours. The sections with closure pours could not be post-tensioned because of skewed angles greater than 20 degrees. Instead, crews installed stainless steel rebar between the two preconstructed composite units and placed rapid-set concrete to achieve a compressive strength of 4,000 pounds per square inch (27,580 kilopascals). Traffic was able to drive over the new concrete within 2 hours after the closure pour.

Additional Construction Challenges

Although each bridge presented logistical challenges, the northbound and southbound Upham Brook bridges were especially difficult because of their location over water and directly under another bridge that is diagonal to the line of traffic. The crews had to be creative in removing the old bridge sections. They could not use two cranes, as they had for the other bridges where they used a crane on each end to lift the units evenly. Instead, the teams used combinations of hoist trolleys and cranes to complete the job.

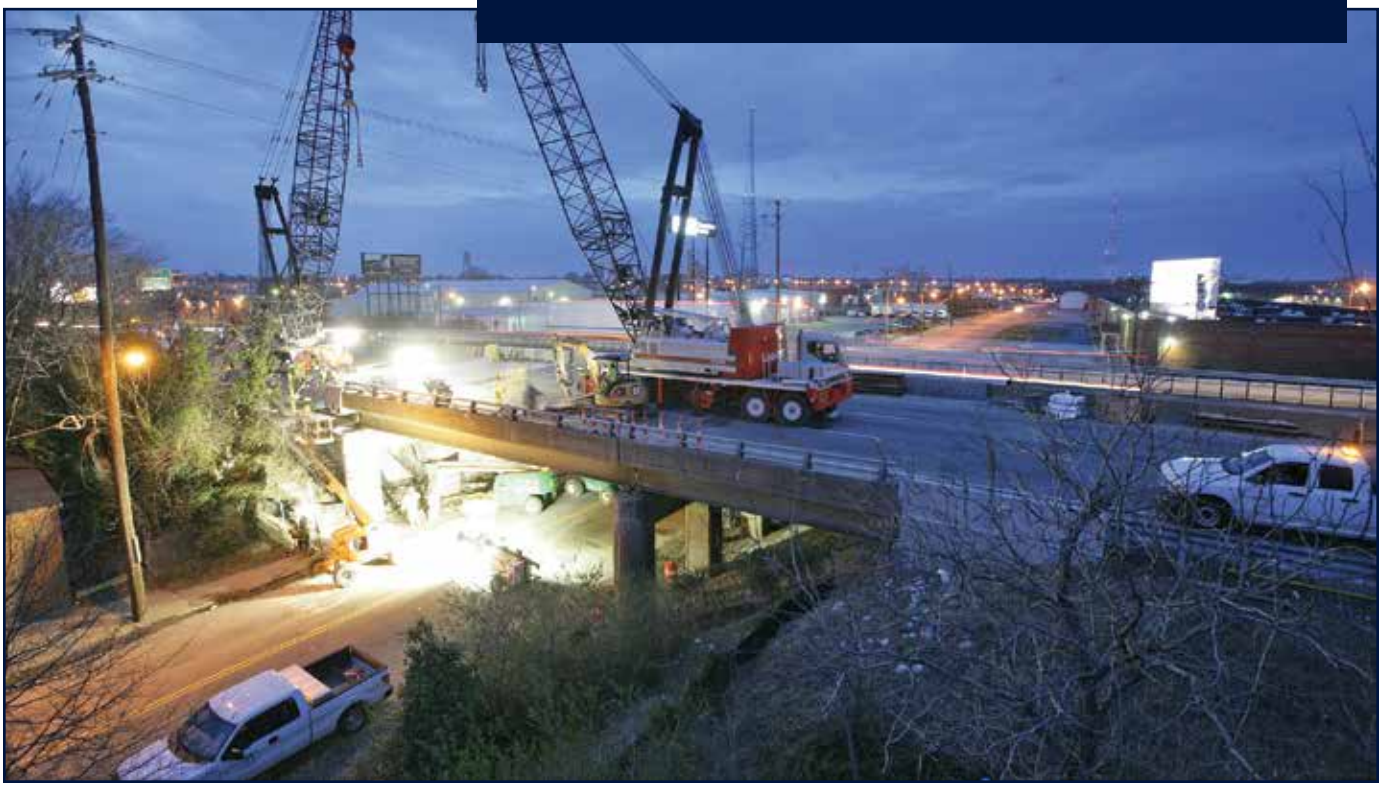
Although accelerated bridge construction helped to minimize congestion, traffic management remained a challenge. To allow enough room to remove and install the bridge superstructure units, lane closures necessitated moving all traffic in one direction to the other side of the interstate around the work zone using crossovers and moveable concrete barriers. During the beginning of the project, installing and removing the barriers could take several hours of the overnight shift. By the end of the project, crews were able to install and remove the barriers much more quickly due to increased proficiency and practice over time.

Managing the Logistics

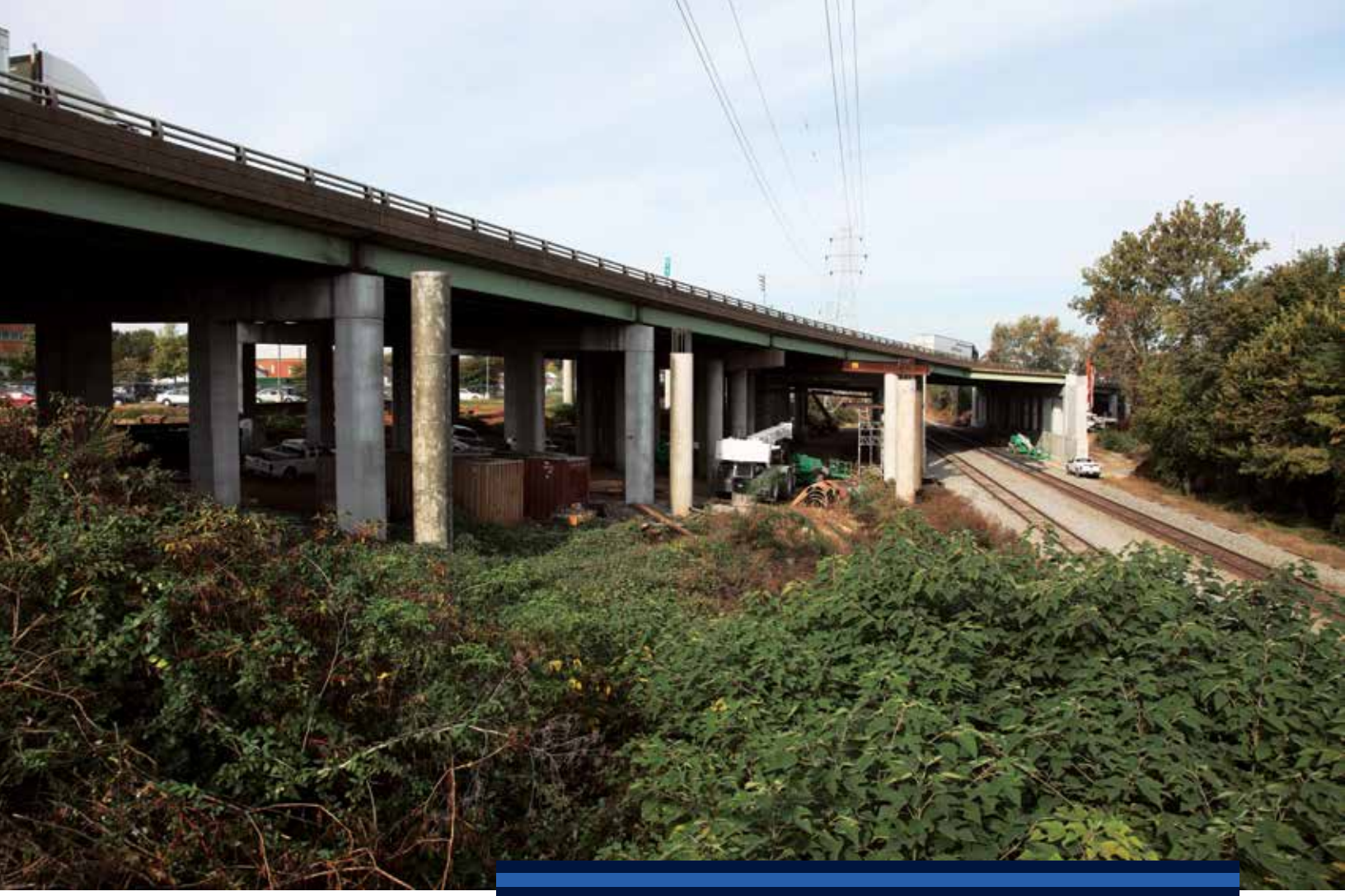
Extensive planning and research upfront helped save on contract change orders and provided an accurate scope of what the project would entail. "Before this project even began," says Fisher, "I spent an entire year just researching these bridges. We surveyed, measured, studied, and looked at every inch of these structures for potential issues before the contract was even written."

VDOT also gave the contractor a demonstration weekend, which

Here, workers use cranes to remove and replace sections of the Overbrook Road bridge during overnight lane closures.



Tom Saunders, VDOT



The proximity of the jobsite to utility lines, railroad tracks, and nearby businesses added to the challenge of coordinating construction activities. *Photo: Tom Saunders, VDOT.*

provided an opportunity to make adjustments and fine-tune the construction process. This trial run helped to ensure that the contractor performed future replacements as efficiently as possible. In addition, VDOT carefully crafted the contract to proactively address issues and to create both incentives and disincentives for day-to-day and overall scheduling. A consulting firm performed a constructability review, prior to advertisement, to ensure that the project was constructible.

Building a strong project management team was vital to the project's success. Scott Fisher was the sole VDOT project manager, which meant undivided focus on issues in the field, as well as overall project management. Fisher's workload was limited to this project so that he could focus his time on it. To provide continuity, VDOT's design firm stayed on during the construction phase to review submittals and address design-related questions. Overall, the team had strong structural engineering experience and a balance of VDOT employees and consultants.

Executive leadership supported the project management team as well. "Our leadership trusted us enough to let us get the job done," Fisher says. "Virginia's governor and secretary of transportation traveled these roads essentially every day in their own commutes and we never heard any complaints. Having their support was vital."

Once the team was assembled, creating a transparent environment of idea sharing and open communication was paramount. Project management met with the contractor on a weekly basis to brainstorm, communicate, and address issues proactively. Housing the offices of the project management team and contractor teams together, where possible, created an even more collaborative atmosphere.

Addressing Logistics During Planning

VDOT addressed several major logistical issues during the planning process. For example, the Lombardy Street bridge, the largest structure in the project at about 740 feet (225 meters) long, is located directly under high-power transmission lines, passes over city streets, and has two active railroad lines underneath it.

One of the reasons that VDOT installed the replacement bridge superstructure in sections is because of the corridor's tight right-of-way. The Lombardy Street bridge was widened to include 12-foot (3.6-meter) shoulders, which span the entire width of the right-of-way. With the railroad, city streets, and businesses located adjacent to the project, VDOT simply did not have space to install an entire bridge superstructure all at once.

Navigating the cranes under the transmission lines required installing three new 175-foot (53.3-meter)-tall towers, which subsequently raised the power lines an additional 90 feet (27.4 meters) to facilitate construction. With the higher lines, power service could remain uninterrupted, and bridge work could continue safely below.

Also during the planning process, the project management team formed a strong partnership with the city so they could store work vehicles close to the project and coordinate detours on city streets.

VDOT also worked closely with local emergency providers, business owners, and organization leaders to minimize possible conflicts. Richmond is host to several large festivals and auto races and is home to hospitals, corporate businesses, and several universities within hundreds of feet of the project's right-of-way. The team met with officials on a regular basis to plan detours and conduct open discussions, which continued as the project progressed.

Reaching Out to the Public

In a field where the measures of success are defined by being on time and on budget, VDOT helped pave the way for a new measurement—a well-informed public audience. During the planning process, nearly $3 million of the project's $106 million budget was allocated for communications, which proved to be one of the project's best investments. Allocating 1–2 percent of a project's budget to communications is recommended, especially if a major goal is to minimize congestion during construction. How could those traveling near the work zones know to avoid them without at least basic knowledge about the project?

The objectives of the communications aspect of the project were not only to educate the public, but also to change driver behavior by giving them the knowledge to take control of their commutes. Other objectives were to garner support for the project and promote safety within the work zones.

The teams identified the audiences they wanted to reach and focused on specifics. They targeted public safety partners; travel and tourism organizations; the transportation industry; area business leaders; government and public leaders; local homeowners; the public as a whole, including those traveling directly on and under the bridges, in vehicles, on bicycles, and on foot; VDOT employees; and neighboring States' transportation departments.

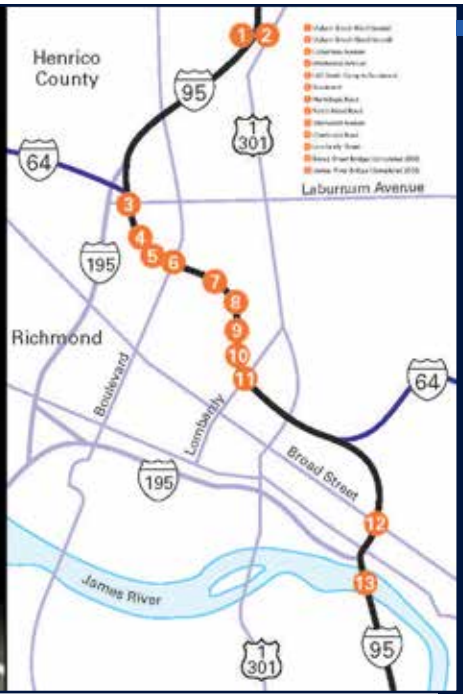
Day to day, the most affected were those traveling on and near the bridges, whether by vehicle, transit, or on foot. VDOT researched the daily routines of these audiences and used various informational tools to best reach them.

The team mapped out a typical day for someone working during daytime hours, and then the team targeted potential information sources. For example, a person might wake up to a radio alarm and hear VDOT updates on the radio, or maybe he or she might check the news online and read the Internet advertising banners and travel information. This person might then head to work and drive, bike, or walk past billboards near the project.

During downtime at work, he or she might check social media outlets, like Facebook and Twitter, and see locally targeted project ads and sharable images. At the end of the workday, a driver could hear traffic reports on the vehicle's radio, with information about nighttime lane closures and alternate routes. If the driver stops for gas on the way home, he or she might see gas

Tom Saunders, VDOT

The bridge restoration projects entailed close coordination with a variety of stakeholders. For example, at the Lombardy Street bridge, shown here, VDOT worked with rail operators to schedule restoration activities in the right-of-way above these train tracks.



Some advertising, such as this flyer, targeted customers at gas stations near the project limits. Sites 1–11 represent the bridges restored during this project. Sites 12–13 were completed in 2002. *Source: John Siddall, Siddall Communications.*

pump topper ads placed by the team. Once at home, if this person turns on the television, he or she might see TV banners, scrolling information, and traffic updates. Daily commuters thus could learn about the project in numerous ways throughout a typical day.

When considering those traveling from out of town, the team used targeted advertising on variable message signs, social media, and banners placed at rest areas throughout the State. In other words, the team used every outlet available to help disseminate information.

Because of the anticipated traffic impacts, the communications team made the I–95 Bridge Restorations project a priority, focusing on earned media, or nonpaid communications, such as news releases, social media, and other nonpaid outlets. For earned media, VDOT used its own toll-free VDOT hotline, the State's 511 traffic information program, the project's Web page, social media, email alerts, radio traffic reports, highway advisory radio, advertising, variable message signs along the corridor, and media kits for distribution to television stations and newspapers.

Although paid advertising is more expensive, it was an effective way to communicate information about the project. The communications consultants designed a full marketing campaign, including online ads that linked to the project Web page, social media ads, TV advertising, fixed and digital billboards, and radio spots for added reach.

The communications program also targeted two unique audiences—the homeless and transient populations. Given the bridges' locations in an urban area near railroad tracks, at times the homeless used some of the bridges as shelters. The project management and communications staffs worked with local organizations to warn the homeless populations in surrounding areas about the dangers of the work zones and to provide them with contact information for alternative sheltering options.

The homeless were given contact cards to help them find alternative shelters. *Source: John Siddall, Siddall Communications.*

Measuring Results

To measure the success of the project's communications plan, VDOT's independent consultant surveyed the public before, during, and after construction, using phone surveys and in-person interviews. Traffic counts were monitored, particularly on weeks with heavy advertising, to measure the success of the messaging. The consultant found that public approval of VDOT's project management grew from 28 percent in 2010 to 62 percent by 2014.

The research conducted part way through construction showed that traffic volume decreased by an average of 30 percent throughout the entire work zone. During periods of heavy construction and

I–95 Richmond Bridge Restorations Communications Awards

- 2014 Visit Richmond, VDOT I–95 Richmond Bridge Restorations Project, *2014 Tourism Impact Award*, presented by Governor Terry McAuliffe
- 2014 Public Relations Society of America, Richmond Chapter, *Community Relations, Award of Merit*
- 2013 American Association of State Highway and Transportation Officials National Transportation Public Affairs Workshop, I–95 Richmond Bridge Restorations Project, *Excel Award* (highest honor)
- 2012 Public Relations Society of America, Richmond Chapter, *Community Relations, Award of Merit*

advertising, the traffic counts decreased as much as 58 percent.

By the end of the project, results showed that an estimated 87 percent of motorists altered their driving behaviors based on the communications they received. This means that drivers were knowledgeable enough to adjust their travel times or to use an alternate route to avoid the work zones. The same survey found that nearly 60 percent of area residents were satisfied with the level of communications they received, and 8 out of 10 responders supported the need to replace the bridges.

The project enjoyed support from community leaders and partners. In an editorial in the *Richmond Times-Dispatch* dated July 19, 2014, the president and CEO of Richmond Region Tourism, Jack Berry, summed up the success of the communications program: "By partnering with the public, public safety organizations, and the travel industry, VDOT developed an innovative plan that minimized congestion and the impact on the tourism community, and for the residents of the region. . . .They launched a robust communications strategy to keep the traveling public informed of the construction schedule, empowering drivers to take control of their commute."

Based on support expressed by the public in surveys and changes in traffic counts, the communications program for this project was nationally recognized and won several awards for effective communications.

The communications program exemplified the need to build trust with the public, maintain relationships with stakeholders, remain relevant in an era of growing content, release reliable information, be accountable when plans change, and track the campaign's progress. With a project of this scale and the potential risks involved, communications was vital to both the project's and agency's success.

Keeping Virginians On the Road

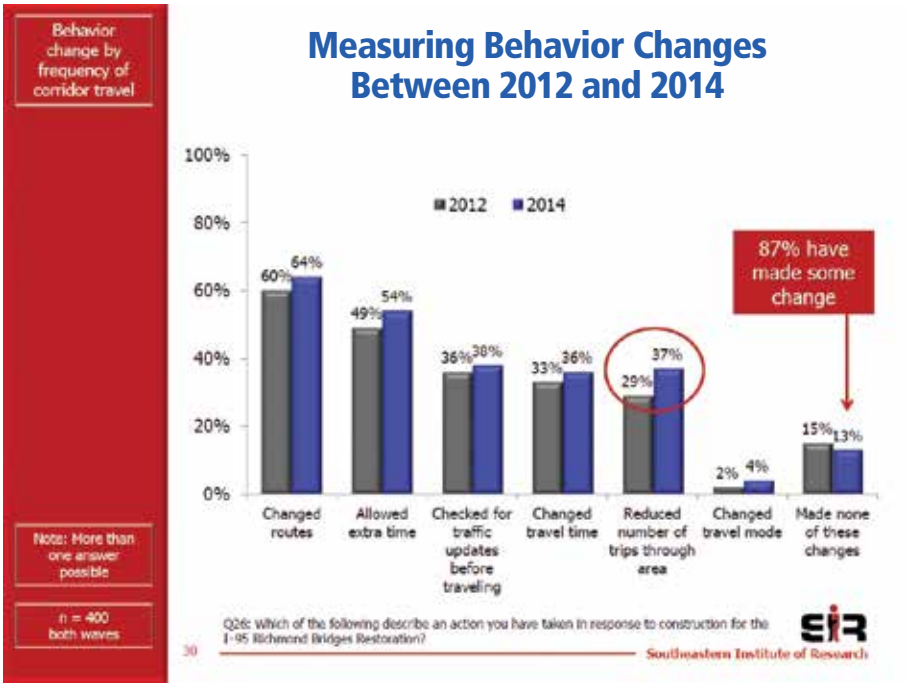
A project of this size and complexity provided VDOT the opportunity to practice construction, project management, and communications methods that could set the stage for future large-scale successes.

"Mismanaging any one of the many challenges could have had devastating effects on a grand scale, but with proper planning, a strong team, and creative solutions, VDOT rose to the challenge," says Vanna P. Lewis, P.E., former area engineer for the FHWA Virginia Division's Richmond District.

The I–95 Richmond Bridge Restorations project represents more than just a success story. Because of the innovative construction solutions employed, solid project management, and effective strategic communications, the project offers the promise of 50 years of improved safety and convenience, a solid investment in economic development and infrastructure, and an enduring example of how VDOT keeps Virginians moving.

Lindsay LeGrand is the communications manager of VDOT's Richmond District. She has a bachelor's degree in government and history from the College of William & Mary.

For more information, see i95bridges.org, or contact Lindsay LeGrand at 804-524-6179 or lindsay.legrand@vdot.virginia.gov.



Source: Southeastern Institute of Research.

Access for All

by Patrick Gomez, Candace Groudine, Elizabeth Hilton, and Brooke Struve

On the 25th anniversary of the Americans with Disabilities Act, FHWA celebrates milestones in an epic journey to remove barriers and empower travelers of all levels of ability.

Transportation fundamentally serves accessibility and mobility. It provides the foundation for how individuals live and connect with others, and how the economy grows at the local, State regional, and national levels. Social equity demands that transportation—its planning, development, and implementation—support mobility for people of varying levels of ability and income, and serve broader community goals such as economic development and community vitality.

According to the U.S. Census Bureau, approximately 56.7 million people living in the United States had some kind of disability in 2010.

(Above) A quarter-century after the passage of the ADA, accessibility for persons with disabilities has vastly improved in communities across the country.

These individuals offer unique sets of skills to the workforce, and they make up a significant market of consumers, representing more than $200 billion in discretionary spending in 2010, as reported by the U.S. Department of Labor.

The Americans with Disabilities Act (ADA) of 1990 aims to open doors to full participation by providing opportunities for people with disabilities. It fosters social equity and ensures nondiscrimination in all areas of life, including transportation.

Prior to implementation of the various disability rights laws, individuals with disabilities faced an uphill battle to attain a level playing field in pedestrian environments, the workplace, schools, places of entertainment, housing, shopping centers, and transportation. A common rationalization for not implementing such comprehensive protective laws for individuals with disabilities was the notion that there were not enough individuals with disabilities to warrant the expense of curb ramps, detectable warnings, and other public accommodations. As a result, most individuals with disabilities were not able to go about their daily lives independently outside their homes.

The ADA fostered a significant shift in the way the transportation industry approaches building and maintaining roadways, sidewalks, and other infrastructure. In many cases, the act literally paved a path for people with disabilities. This year marks the 25th anniversary of the ADA, and with that comes an opportunity to look back and celebrate its achievements—and look ahead at what remains to be done.

Landmark Legislation

The groundbreaking Civil Rights Act of 1964 guaranteed profound protections for many—prohibiting discrimination on the basis of race, color, and national origin—but it did not include protections for individuals with disabilities. In 1973, Congress recognized that society had historically discriminated against people with disabilities and condemned the "invisibility of the handicapped in America." To rectify this discrimination in programs conducted by Federal agencies or programs receiving Federal financial assistance, Congress passed the Rehabilitation Act of 1973. This act is widely recognized as the first civil rights statute for persons with disabilities (29 U.S. Code Section 701) and paved the way for passage of the ADA.

Enacted July 26, 1990, the ADA promotes a society in which persons of all abilities have the right to participate as valuable individuals in the areas of employment, public services, public accommodations, telecommunications, and transportation. The ADA broke down barriers that prevent persons with disabilities from receiving the benefits of society and making their own important contributions.

However, Congress did not fully anticipate the extent to which the ADA would be challenged in the courts. Subsequent case law narrowly construed the intent of the ADA and failed to provide the broad protections Congress intended for individuals with disabilities.

To clarify the original intent of the ADA, Congress enacted the ADA Amendments Act of 2008. These amendments clarified the ADA's objectives to provide "a clear and comprehensive national mandate for the elimination of discrimination" and "clear, strong, consistent, enforceable standards addressing discrimination" by reinstating a broad scope of protection to be available under the ADA (42 U.S. Code Section 12101).

Congressional findings written into the ADA best demonstrate the broad reach and necessity of the legislation. The statute refers to the 43 million people in the United States in 1990 who, at that time, had one or more physical or mental disabilities, and recognizes that this number would continue to grow, as it has done. The statute also acknowledges that individuals with disabilities are often excluded from services, programs, and activities, and points to the continuing discriminatory effects of architectural, transportation, and communication barriers. Congress' intent was clear: to enable persons with disabilities to "compete on an equal basis and to pursue those opportunities" available to persons without disabilities. Congress also recognized that "dependency" and "nonproductivity" come at an inevitable, unnecessary, and tremendous cost to society when such discrimination exists.

A case reflecting the broad reach of the ADA with regard to public rights-of-way is that of *Barden* v. *City of Sacramento*, 292 F.3d 1073 (9th Cir. 2002), which determined that local governments must maintain accessible sidewalks because doing so is simply a "normal function of a city." The court further found that the U.S. Department of Justice's ADA regulations require the provision of curb ramps to ensure the accessibility of sidewalks. The U.S. Department of Transportation, through the Federal Highway Administration, and the U.S. Department of Justice recently issued joint guidance on the requirements of Title II of the ADA to install curb ramps when roadways are altered. For more information, visit www.fhwa.dot.gov/civilrights/programs/ada.cfm.

"The ADA reflects a holistic approach to accessibility," says David M. Capozzi, executive director of the U.S. Access Board, a Federal agency that establishes accessibility guidelines for the built environment, transit systems, and information and communication technologies under the ADA and other laws. "Those who drafted the ADA recognized that equal access to public accommodations, goods and services, and employment were of limited benefit if barriers remained along the means of getting to them; so they included specific requirements for transportation systems in the statute."

The ADA requires the establishment of mandatory accessibility standards for the built environment and transportation systems based on guidelines established by the Access Board. Currently, the Access Board is finalizing new guidelines for accessible public rights-of-way. "These guidelines are the first of their kind in comprehensively addressing access to public streets and sidewalks," Capozzi says. "They will provide an essential tool in ensuring that the level of accessibility called for by the ADA is indeed met when streets and sidewalks are built or altered."

Proposed Guidelines for Accessible Public Rights-of-Way

The U.S. Access Board is developing guidelines for the accessible design of pedestrian facilities in the public right-of-way. The Access Board has not yet finalized these guidelines, but key elements of the current draft of the guidelines include the following:

- The minimum continuous width of sidewalks should be 4 feet (1.2 meters), exclusive of curb.
- The longitudinal grade of sidewalks may match, but not exceed, the grade of the adjacent roadway.
- Wherever pedestrian-activated signals are installed, the pushbuttons must be properly located and have locator tones and audible and vibrotactile indications.
- The cross slope of crosswalks at intersections may not exceed 2 percent if crossing traffic always slows or stops, as at a YIELD or STOP sign.
- The cross slope of crosswalks at intersections may not exceed 5 percent if crossing traffic may at times proceed through the intersection without slowing, as during the green phase of a signal.
- All crosswalks, whether marked or unmarked, must be accessible to the sidewalks via a curb ramp or blended transition.
- Curb ramps and blended transitions must have detectable warning surfaces to alert pedestrians with vision disabilities of the boundary between the sidewalk and street.
- Some parking spaces with accessible features must be provided wherever there is onstreet parking.

For more information, visit www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way.

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(Before, top) In Peoria, IL, this sidewalk at the intersection of Elm Street and Adams Street was inaccessible. (After) The city reconstructed and widened the sidewalk to provide an ADA-compliant curb ramp for each crosswalk. Street lamps were also installed as part of the project.

Compliance Oversight

The Department of Justice has primary authority for ensuring compliance with the ADA, but FHWA also has responsibilities for the enforcement of ADA compliance. Multiple disciplines at FHWA work to advance accessibility while closely coordinating with the agency's Office of Civil Rights to ensure that recipients of USDOT funding comply with Section 504 of the Rehabilitation Act and that State and local public agencies comply with the ADA. FHWA's key stewardship and oversight responsibilities related to the ADA include ensuring that its funding recipients and subrecipients are informed of their responsibilities to provide accessibility in their programs, activities, and facilities, and making sure that recipients and subrecipients are applying appropriate accessibility standards to all transportation facilities. FHWA also ensures that all complaints filed under Section 504 or the ADA are processed in accordance with established procedures.

In recent years, the majority of the complaints FHWA has addressed involved sidewalks and curb ramps. However, FHWA has handled a number of other types of complaints, such as those involving roundabouts, shared-use paths, signals, crosswalks, signage, and transition plans.

FHWA recommends resolving issues of discrimination voluntarily and informally whenever possible. Frequent consultation with ADA specialists in various FHWA Offices facilitates the informal resolution process and enables parties to deal with concerns before they become formal complaints. Such consultation also expedites the agency's ability to respond to complainants in a timely manner. These consultations include professionals with diverse backgrounds from the FHWA Offices of Civil Rights; Infrastructure; Chief Counsel; Planning, Environment, and Realty; and Technical Services.

FHWA officials anticipate that changing demographics (that is, a population with increasing numbers of older adults, veterans, and others with one or more disabilities) may result in an increase in the number of ADA complaints. "We're confident that our steadfast oversight of recipients and fine-tuned compliance process will enhance our ability to meet these challenges," says Nichole McWhorter, director of the compliance and coordination unit in FHWA's Office of Civil Rights.

Self-Evaluations and Transition Plans

The Department of Justice's ADA regulations require all public entities to conduct self-evaluations. At a minimum, public entities must "evaluate [their] current services, policies, and practices, and the effects thereof, that do not or may not meet the requirements of Title II of the ADA and, to the extent modification of any such services, policies, and practices is required, the public entity shall proceed to make the necessary modifications," according to 28 CFR 35.105(a).

In other words, all public entities, regardless of the number of employees, must assess everything that they are responsible for that may have an effect on persons with disabilities, including their public rights-of-way. After identifying all deficiencies, public entities must proceed to make necessary modifications to ensure accessibility. Public entities that employ 50 or more persons have additional responsibilities and must develop transition plans identifying the steps necessary to complete required changes. A transition plan is a prioritized planning document that outlines upcoming projects. In both the self-evaluation and transition plan processes, public entities must seek input from the public, especially from people with disabilities and organizations that represent people with disabilities.

If public entities fail to carry out their self-evaluation and transition plan obligations, they could face administrative enforcement actions, including potential suspension or loss of Federal funding in the absence of voluntary compliance, private litigation, or actions by the Department of Justice. Thus, it is imperative that all States and local public entities keep their transition plans current to ensure that the public is apprised of work that will be forthcoming and to ensure accessibility for everyone on public property.

"The Area Plan Commission of Tippecanoe County, the [metropolitan planning organization] for the Lafayette, IN, [metropolitan statistical area], prepared its current long-range plan to emphasize ADA and [support] multimodal projects on existing streets and roads," says Sallie Dell Fahey, executive director of the Area Plan Commission of Tippecanoe County. "Over time, programming projects that improve our existing assets will add significantly to the quality of place enjoyed by our communities. Real, measurable progress is being made in Greater Lafayette and in communities all over Indiana—progress directly attributable to the FHWA planning emphasis on creating and implementing ADA transition plans."

A National Cooperative Highway Research Program Project 20-7(232), titled *ADA Transition Plans: A Guide to Best Management Practices*, provides information for agencies working to develop or update their transition plans. The report is available at http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-07(232)_FR.pdf.

Complete Streets and Context Sensitive Solutions

Complete streets is a term used to define a street that functions holistically for its users and surrounding community, supporting not only all modes of transportation but also appropriate adjacent land uses and activities. Its guiding principle is to create roadways and related infrastructure that provide safe travel for users of all abilities.

Context sensitive solutions involve collaborative, interdisciplinary approaches that invite all stakeholders to play a role in designing a transportation facility that fits its setting. The approach leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources while improving or maintaining safety, mobility, and infrastructure conditions.

Advancing Livability and Sustainability Goals

In recent years, a surge of public interest has propelled the implementation of more pedestrian-friendly designs across the transportation system. This is in contrast to the automobile's former domination in U.S. transportation policy. Complete streets and context sensitive solutions are concepts that are an integral part of today's transportation dialogue, which includes a close examination of the fundamental social issues that transportation projects are trying to accomplish.

Highway engineers work to incorporate accessibility guidance into their manuals, and many also receive training in accessible pedestrian design. They are supported in this shift in perspective by advocates for livable and sustainable communities, including architects, environmentalists, public health officials, and urban planners.

The breadth of FHWA disciplines and ongoing collaboration among professionals across the agency involved in advancing accessibility reflect this conceptual change. For example, FHWA's Office of Planning, Environment, and Realty has developed tools to assess the degree to which a particular community is accessible for persons of all abilities and to evaluate programs and projects based on sustainability criteria, including accessibility.

PlaceFit is a Web-based tool that enables users to assess various features of a community—including accessibility—and compare them to other communities throughout the country. FHWA developed PlaceFit to emphasize the connection between transportation, livability, and communities by providing a central location for information from a variety of existing Web sites. This investigative tool can help users identify communities with characteristics that appeal to them and their lifestyle. Given the growing population of older adults, as well as persons with disabilities, accessibility in the public rights-of-way is increasingly becoming a more important factor for individuals trying to identify the "place" that "fits" best for them. The PlaceFit tool is available at www.fhwa.dot.gov/livability/tools/placefit.

FHWA's Infrastructure Voluntary Evaluation Sustainability Tool, known as INVEST, is a Web-based collection of best practices designed to help State departments of transportation, metropolitan planning organizations, local transportation agencies, and others assess and improve the sustainability of transportation projects and programs. FHWA's commitment to sustainability not only ensures that those parts of the transportation system over which it has responsibility are efficient, safe, convenient, healthy, and renewable, but also that the system operates fairly and is accessible to persons of all abilities.

"Both physical and equitable accessibility for persons of all abilities are among the criteria that can be assessed with this tool," says Clarence Dickerson, III, project development program manager with the District Department of Transportation's Infrastructure Project Management Administration, "thereby transforming

TxDOT

TxDOT

(Before, top) To access the elevated sidewalk and entrances to these businesses near the intersection of SH–11 and Taylor Street in Linden, TX, visitors had to climb this flight of stairs. (After) The Texas Department of Transportation (TxDOT) installed a split sidewalk providing both ramp and stair access to the sidewalk and businesses.

the transportation investment process in a way that incorporates the principle of social equity."

The tool enhances the capability of public agencies to consider persons of all abilities during the planning and development stages of a project. INVEST is available at www.sustainablehighways.org.

Showcasing Improved Accessibility

Infrastructure improvements that remove barriers to pedestrian access in public rights-of-way reap significant benefits to pedestrians with disabilities and society as a whole. Accessible facilities generally work better for everyone—those using wheelchairs or white canes to travel, parents with strollers, and those delivering goods. What follows are several examples highlighting how projects to improve the accessibility of infrastructure can make a real difference in communities.

Linden, TX

In 2012, the Texas Department of Transportation (TxDOT) completed pedestrian improvements along two State routes in Linden, TX, and along roads surrounding the Cass County Courthouse, the oldest continuously used courthouse in the State. The town of Linden was established in 1848. Like many towns of that era, sidewalks are elevated 2–5 feet (0.6–1.5 meters) above the roadway with steps along the sidewalk to access business entrances at varying elevations.

The $810,000 project was funded largely through the American Reinvestment and Recovery Act, (ARRA) along with other Federal, State, local, and private funds. The project included numerous features to improve pedestrian accessibility, such as eliminating sidewalk stairs and adding curb ramps and accessible onstreet parking. The project also upgraded storm drains, street lighting, and aesthetics.

Gardiner, NY

In 2004, the town of Gardiner, NY, identified needed pedestrian and bicycle facilities as part of its master plan for the community and to connect to the recently opened Wallkill Valley Rail Trail. The town applied for and received Federal funding for a combination of projects from the Transportation Enhancement Program and ARRA.

The projects included pedestrian facilities on Main Street (State Route 44/55) in the central business district and access to the regional system of trails, including the Wallkill Valley Rail Trail. The town constructed new sidewalks and crosswalks on Route 44/55 and made drainage improvements. The sidewalks are accessible to persons with disabilities and greatly improved overall pedes-

trian accessibility. The project was completed in October 2013.

"The installation of the sidewalks has helped revitalize the Gardiner Hamlet," says Carl Zatz, the town's supervisor. "Businesses are opening with a renewed confidence that pedestrian traffic will increase and business will grow. Lampposts illuminate the walkways, new landscaping lines Route 44/55, and disabled and senior access is more available, as is access to the George Majestic Memorial Park, the rail trail, and the town hall. Gardiner never imagined such a vibrant hamlet. Now the possibilities are endless."

Peoria, IL

The city of Peoria, IL, recently completed a $13.8 million project to make complete streets improvements in its Warehouse District. Funded through the Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant program, the improvements will make the street network safer, more attractive, and accessible for motorists, pedestrians, cyclists, and other users.

The scope of the project includes lane reductions, onstreet parking accommodations, widened sidewalks, improved lighting, and streetscape elements. Accessibility was a top priority in the design of all project elements. In addition, project designers incorporated sustainable design elements, such as stormwater bioinfiltration and LED traffic lights, into the infrastructure improvements.

The Value of Planning Ahead

Each of these highlighted projects demonstrates that consideration of accessible design elements during project scoping and throughout planning and design is essential to accomplish usable, functional, and aesthetically pleasing facilities. Detailed engineering work is often necessary, especially in complex environments, rather than an overreliance on standard detail drawings. Designing for proper drainage is also important early in planning to integrate accessible design elements with existing features and to avoid pools of water at the bottom of curb ramps.

Agencies that wait until the construction phase and then try to "fit in" the accessibility components find it difficult to achieve good design or ADA compliance. The location of curb ramps and sidewalks in relation to crosswalks, signal heads, pushbuttons, and other pedestrian features is critical throughout project design. Contractors must also understand these critical elements so field adjustments do not negatively impact the accessibility and usability of the final constructed design.

TxDOT

TxDOT

(Before, top) At the intersection of FM–125 at Rush Street in Linden, pedestrians had to climb several sets of steps to access this elevated sidewalk. (After) TxDOT supplemented the stairs at the intersection by adding a curb extension that connects to the curb ramp. These improvements provide better access to the area around the Cass County Courthouse.

Innovation and Emerging Technologies

In 2013, USDOT launched the Accessible Transportation

NYSDOT Region 8

NYSDOT Region 8

(Before, top) Previously, the entrance to Gardiner, NY, along Route 44/55 Main Street had a broad shoulder but no pedestrian accommodation. (After) The New York State Department of Transportation (NYSDOT) narrowed the shoulder to install a curb and sidewalk to improve pedestrian access.

Technologies Research Initiative (ATTRI), which leads research, development, and implementation of transformative solutions, applications, and systems for people of all abilities. The initiative seeks to enhance mobility choice and quality for travelers with disabilities by enabling them to reliably, safely, and independently plan and execute their travel. ATTRI identifies, coordinates, develops, and implements integrated technological solutions to advance these capabilities.

This 5-year USDOT joint research and development initiative is being co-led by FHWA and the Federal Transit Administration with support from USDOT's Intelligent Transportation Systems Joint Program Office and other Federal agencies. ATTRI leverages recent advances in vehicle- and infrastructure-based technologies and wireless communication and information technologies that connect users, mobile devices, vehicles, and infrastructure. These technologies can provide access to a wealth of real-time situational data sources, including transportation data, municipality data, points of interest data, crowdsourced data, and disability data.

"ATTRI seeks to find synergy not only among the new and emerging technology solutions, but also among the research conducted by Federal agencies and other public and private organizations," says Mohammed Yousuf, research transportation specialist in FHWA's Office of Operations Research and Development at the Turner-Fairbank Highway Research Center and program manager of ATTRI. "The goal really is to understand the travel needs of the people with disabilities, veterans with disabilities, and older adults, and design technology solutions that enhance independent mobility."

Research in accessible transportation has gained momentum in recent years as a result of several Federal initiatives (such as the Partnership for Sustainable Communities and USDOT Livability Initiative). The future of accessible transportation depends on finding synergies among these initiatives and combining their advances to address the needs of travelers with disabilities. USDOT and industry research in the program areas of vehicle-to-vehicle, vehicle-to-infrastructure, and vehicle-to-pedestrian communications; automation; Veterans Transportation and Community Living Initiative; and Mobility Services for All Americans could help produce seamless transportation capability for all citizens, particularly travelers with disabilities. In addition, emerging research and other technological innovations, such as assistive robots and crowdsourcing, increase the opportunities for enhancing accessibility.

By working with Federal partners, USDOT seeks to achieve an accessible transportation network that is far more economical, expansive, and welcoming—something that is of increasing importance to all travelers.

The Role of Collaboration

To create environments that provide access to people of all abilities requires meaningful and continuous community outreach and public involvement. This means that potentially affected stakeholders and residents have an opportunity to participate in decisions that affect transportation-related accessibility. Effective public involvement programs, in turn, enable transportation professionals to develop systems, services, and solutions that meet the needs of everyone in society.

FHWA has played a central role in providing extensive training and technical assistance in Section 504 of the Rehabilitation Act and ADA compliance, not only to civil rights specialists at State transportation agencies, but also for the many other practitioners who make

accessibility-related decisions. The agency's development of policy and guidance on Section 504 and ADA-related matters will continue to be a collaborative effort that crosses many disciplines.

As Warren Whitlock, associate administrator for the Office of Civil Rights at FHWA says, "Civil rights practitioners, community planners, environmental specialists, safety experts, and design and construction engineers must continue to work together to ensure that the social equity goals that are part of the ADA's ultimate objectives are met in the transportation planning and project development process."

Patrick Gomez serves as a civil rights specialist for the FHWA Resource Center where he performs work in various civil rights areas, but with a primary focus on disability law. Gomez has a B.A. from the University of Nevada, Las Vegas, and a J.D. degree from the Cleveland-Marshall College of Law at Cleveland State University.

Candace Groudine is senior policy and regulatory specialist for FHWA's Office of Civil Rights, where she focuses on disability law, environmental justice, and limited English proficiency. Groudine received a J.D. degree from Georgetown University Law Center, a Ph.D. in educational administration and policy studies from the University at Albany, an M.A. in philosophy from Columbia University, and a B.A. in philosophy and psychology from Brooklyn College.

Elizabeth Hilton is a geometric design engineer for the FHWA Office of Infrastructure where she focuses on geometric, bicycle, pedestrian, and accessible design. Hilton received a bachelor's degree in civil engineering from the University of Texas and a master's degree in public administration from St. Edward's University, both in Austin, TX. She is a licensed professional engineer in Texas.

Brooke Struve is a safety and geometric design engineer with the FHWA Resource Center, providing technical assistance on geometric design, designing for pedestrian and bicycle safety, and Performance-Based Practical Design. Struve graduated from Brigham Young University with a B.S. in civil engineering. She has a professional engineer's license in Utah.

For more information, see www.fhwa.dot.gov/accessibility or contact Patrick Gomez at 720-963-3269 or patrick.gomez@dot.gov; Candace Groudine at 202-366-4634 or candace.groudine@dot.gov; Elizabeth Hilton at 512-536-5970 or elizabeth.hilton@dot.gov; or Brooke Struve at 720-963-3270 or brooke.struve@dot.gov.

TERRA Engineering, Ltd.

(Before, top) Vehicles used to park on the sidewalk in front of this business in Peoria. (After) The city improved the sidewalk by adding a curb to definitively separate the parked vehicles from the pedestrian route and also added lighting.

Ohio's Training Gets a Boost

Here's how one State used FHWA's Federal-aid Essentials video library to build a robust eLearning program for staff at local public agencies.

by Victoria F. Beale and Rob Elliott

Anyone who works in government—whether at the local, State, or Federal level—knows that the order of the day is to do more with less. In 2013, the training team at the Ohio Local Technical Assistance Program (LTAP) Center, already responsible for coordinating more than 200 training sessions for 4,800 participants annually, confronted the seemingly impossible task of producing a 12-module course for local public agencies (agencies that receive funding through the Federal Highway Administration) on managing Federal-aid projects in just 12 months—with no added staff and limited resources.

The Ohio Local Technical Assistance Program took advantage of existing Federal-aid Essentials videos to develop a comprehensive training program for local public agencies. The training gives agencies the knowledge they need to meet the Federal-aid requirements for local-let projects, such as this one to construct a new roadway near Dayton, OH.

How did they do it? By deciding that they would use a proven training resource produced by FHWA to augment their course content: Federal-aid Essentials for Local Public Agencies. Federal-aid Essentials consists of a library of short, to-the-point videos covering various aspects of Federal-aid regulations and requirements, with topics ranging from project development and finance to civil rights and environmental considerations.

When the staff at the Ohio LTAP Center (located within the Office of Local Programs at the Ohio Department of Tranportation) integrated videos from Federal-aid Essentials with their own customized content, the end product was quick to create, low cost, and focused on their needs—results that would have been impossible if they had tried to develop the entire training program from scratch.

Federal-aid Essentials Explained

Established in 2012, the Federal-aid Essentials library now encompasses nearly 100 short, plain-language videos that each focus on a single topic. Federal-aid Essentials helps staff members at local public agencies (LPAs) gain the knowledge they need to progress more confidently and rapidly through Federal-aid projects. The video library and resources are available at www.fhwa.dot.gov/federal-aidessentials.

Bernetta Collins, director of the FHWA Resource Center and the project sponsor of Federal-aid Essentials, explains the thought process behind developing the video library: "You can go [through] volumes and volumes of the Code of Federal Regulations, you can talk to lots of your partners and contacts, and still walk away not really, truly understanding what it is you are looking for. What we've done with Federal-aid Essentials is simplified that process. We created one-topic scenarios so you don't have to wade through a lot of information. You go specifically to the information you want at the time you need it."

FHWA adds new videos regularly, routinely monitors video content versus regulation changes, and updates videos when needed. They can be viewed at any time, in any order, and as many times as needed. The videos clearly explain complex subjects using examples and stories, making Federal-aid Essentials a powerful resource for building consistency in understanding the regulations. The videos are free to watch, and FHWA encourages agencies to use them in their own training initiatives, as the Ohio LTAP did. In fact, in addition to using them as the foundation for its new training program, Ohio also uses Federal-aid Essentials videos as a classroom resource, at conferences, and as a training refresher.

The Need for Training

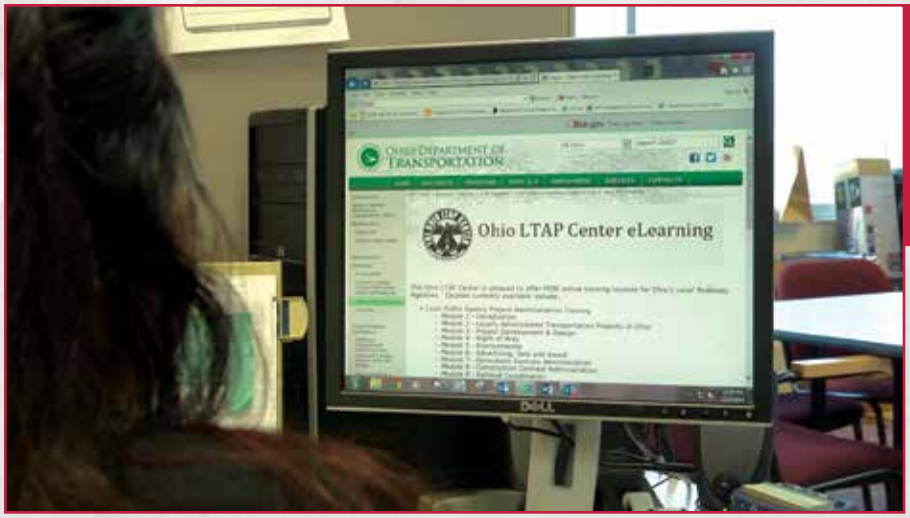
In Ohio, LPAs regularly contract with the Ohio Department of Transportation (ODOT) to deliver Federal-aid projects. These partnerships in the State are referred to as local-let projects. Local-let projects represent a total annual budget of $353 million—a number exceeding that of 14 other States' total Federal-aid apportionments. Administering this money in accordance with Federal requirements is an important responsibility.

For LPAs to achieve and keep the threshold qualifications required to take part in the local-let process, every local agency must complete training on Federal requirements. Each LPA may designate one person as the "person in responsible charge" to complete the training modules, or have several of the agency's staff complete the modules on behalf of the LPA.

In 2011, a national audit by the U.S. Department of Transportation Office of Inspector General of Federal-aid and American Recovery and Reinvestment Act projects administered by LPAs uncovered instances in which the agencies had not met Federal requirements. In response to these findings, ODOT chose to improve its own local-let program's compliance rate by revising the LPA qualification process. Ohio decided that training based on ODOT's *Locally Administered Transportation Projects Manual of Procedures* should be an integral part of the LPA qualification process. The next step was to develop the training.

Choosing an eLearning Platform

Before it could develop an effective training program, the LTAP Center's training team had to address three key items: (1) Which technological platform would best deliver the course and monitor its successful completion? (2) What content should the center



The Ohio LTAP Center used content from FHWA's Federal-aid Essentials video library to develop an online training program for transportation professionals at local public agencies. Shown here is the home page of Ohio's eLearning program.

include in the training? (3) How could the content be made relevant for program participants?

With its training staff of five having responsibility for coordinating hundreds of training sessions annually, Ohio's LTAP Center would be stretched thin trying to develop, coordinate, and maintain a new training program without adding new staff. In addition, the LTAP Center's training team suspected that LPAs would not have the resources to cover training costs and associated travel. With these challenges in mind, the team set out to eliminate as many obstacles to completing the training as possible. The LTAP Center addressed both concerns and lowered its own direct and indirect training costs by making the local-let program its first course offered online.

With no previous experience producing online, self-paced training, Ohio's LTAP Center committed to delivering 12 hours of instruction in 12 months.

The team's decision to embrace eLearning ultimately led to several significant benefits. First, the eLearning platform reduces both the learning curve for LTAP's content authors and the troubleshooting demands on their information technology and customer service personnel. Second, the content of the program not only addresses the needs of LPAs, but also engages students with media-rich content. Third, the eLearning approach now can be expanded into other program areas or shared with LTAP centers in other States.

Once the Ohio LTAP Center committed to an eLearning program, it applied for and received a $15,000 technology transfer grant from FHWA to buy the Web-based system necessary to develop the content and to run the training program. The center's training team selected an application that is easy to use and does not require participants (the end users) to have specialty plug-ins—a source of problems for agency employees in the past. The Sharable Content Object Reference Model-compliant application produces content in a format that is accessible by other platforms. In fact, ODOT's information technology department and the LTAP Center expanded the username and password process employed for authenticating users of other ODOT systems to include the new eLearning system.

Developing Course Content

Next, the training professionals at the LTAP Center needed to find valid sources of content with which to build the 12-module course. In its July 2011 audit report, *Federal Highway Administration's Oversight of Federal-aid and Recovery Act Projects Administered by Local Public Agencies Needs Strengthening*, the Office of Inspector General compiled a list of errors found in Federal-aid projects administered by LPAs nationally. The team used this list, as well as findings from regular reviews of local-let projects that ODOT conducts, to identify common LPA errors and establish a curriculum outline. For example, ODOT discovered that some LPAs were not adequately documenting all efforts charged to Federal-aid projects. Thus, the course developers created appropriate instructions to address this issue.

Quality assurance for the course was a joint effort between the FHWA Ohio Division and ODOT's LPA managers in the districts. One of the measures of training quality is whether the information in the course is current. The LTAP Center's training professionals knew that ongoing maintenance of the course would be essential to keep the content up to date.

Although course maintenance can be a significant issue for eLearning developers, the LTAP Center's team made several decisions that have greatly reduced maintenance. For one, ODOT topic area experts will remain involved to ensure accuracy and completeness of the content after each module's launch. The training team also selected an authoring tool that was simple enough for any staff member to change the static content easily. In addition, the LTAP Center's training team made it effortless for the team to keep the most current Federal-aid Essentials videos in the program. They accomplished this by using versions of the videos that are stored on the FHWA servers and maintained by FHWA personnel rather than storing the videos at the LTAP Center. This means that when FHWA updates a video, it is automatically updated in the local-let training program.

Adding Federal-aid Essentials to the Mix

When the LTAP Center's team learned about the Federal-aid Essentials video library, the members immediately saw how they could enhance the local-let training program. The team incorporated the videos throughout the lessons by including each Federal-aid Essentials video that overlapped with the curriculum outline and then filled the gaps with static content.

The LTAP Center's training professionals understood from the beginning that for learning to occur, the content of the training must be relevant. Because the Federal-aid Essentials videos target the LPA professionals who administer Federal-aid projects, the videos were an ideal source of material for the training program. The Federal-aid Essentials videos do not ask the LPA participants to fill in the blanks or generalize information. Rather, the videos present critical requirements in plain language and, in many cases, illustrate their application in situations that an LPA official is likely to encounter. The format fit well into the course and helps to hold participants' attention with interesting examples.

Including the videos not only improved the quality of the local-let training program, it also reduced the time and money needed to develop the program. One oft-quoted rule of thumb in the training industry states that, on average, it takes 100 hours of effort to develop a single hour of self-paced eLearning. Given that level of effort, developing the 12 modules of the local-let training program might have required as many as 30 weeks of work on top of the LTAP training staff's regular duties—resources that the LTAP Center simply did not have.

"It would have been nearly impossible to meet our 1-year timeline without including the Federal-aid Essentials videos," says Mike Fitch, LTAP program manager in ODOT's Office of Local Programs. "But by using the videos, we met our deadline, created a robust training program, and saved a lot of valuable agency resources."

The local-let training program's current format includes 22 videos, or about 2 hours of Federal-aid Essentials videos, with plans to include more. The videos make up about 25 percent of the course's content and represent a significant savings in production effort.

Federal-aid Essentials Videos Used in the Ohio Local-Let Training

- Acquisition and Negotiation
- Change Orders
- Compliance and Enforcement
- Documentation and the Environmental Process
- Endangered Species Act
- Form FHWA-1273
- Highway Traffic Noise
- Implementation Plans
- Introduction to Project Construction and Contract Administration
- Introduction to Right-of-Way Requirements and the Uniform Act
- Nondiscrimination Assurances
- Overview of NEPA as Applied to Transportation Projects
- Project Advertisement, Bid Review, and Request for Concurrence in Award
- Property Management
- Public Involvement
- Purpose & Need, and Alternatives
- Railroad Coordination and Certification Requirements
- Relocation Assistance
- Section 106 of the National Historic Preservation Act
- Supervising Agency Requirements (Responsible Charge)
- Utility Coordination and Certification Requirements
- Valuation

The Local-Let Training Program

Participants can find the local-let training program, known as the Local Public Agency Project Administration Training, on the Ohio LTAP Center's eLearning page at www.dot.state.oh.us/Divisions/Planning/LocalPrograms/LTAP/Pages/Ohio_LTAP_eLearning.aspx. Participants must log on to the site using the same username and password that they use to access other ODOT online programs. Once logged in, participants can register for any course or training module.

All content in the local-let training program focuses on the LPA professional and what he or she needs to know to administer a Federal-aid project successfully. The curriculum's 12 modules include 10 that closely follow ODOT's *Locally Administered Transportation Projects Manual of Procedures* and 2 additional modules on topics of special interest.

On average, each module takes about 1 hour to complete, as participants progress sequentially through the content screens. Some screens include static text accompanied by voiceover narration, while others include videos. Course participants demonstrate successful completion of each course by taking an exam. Exam questions include content covered on both text- and video-based screens.

Members of the Ohio LTAP Center's training team meet to discuss how they will use Federal-aid Essentials videos to supplement their course content in order to meet their project deadline.

Modules of Ohio's Local-Let Training

These 10 modules closely follow ODOT's *Locally Administered Transportation Projects Manual of Procedures*:

- Introduction
- Locally Administered Transportation Projects in Ohio
- Project Development & Design
- Right-of-Way
- Environmental
- Advertising, Sale, and Award
- Consultant Contract Administration
- Construction Contract Administration
- Railroad Coordination
- Utility Coordination

The special interest modules are:

- Title VI [or Nondiscrimination] for Local Public Agencies
- Financial Responsibilities Training

If a participant has questions or experiences difficulty during the enrollment or course completion process, Ohio's LTAP Center provides customer support, much as it would with its instructor-led courses. At the conclusion of each lesson, participants are invited to direct any unanswered questions to subject matter experts within ODOT.

Evaluation and Results

The local-let training program has been up and running for less than a year, so the full benefits of the training program are yet to be realized and measured. However, Ohio's LTAP Center reports that eLearning and the Federal-aid Essentials videos are the right combination for its training program.

Initial participant feedback collected by the LTAP Center points to the program's ease of use and quality, and the ability to complete the training from the participant's office. A referral from a participant is perhaps the greatest testament to a training program's quality, and some LPAs are referring their consultants to the LTAP Center's site. Others are even making it a requirement for those working with them on Federal-aid projects.

For example, Mark Zimmerman, a county engineer in Seneca County, OH, who completed the training, has since recommended it at a meeting of the County Engineers Association of Ohio. Zimmerman says that he found the training to be a "far superior way of learning. I could do it in the comfort of my own office, on my own time, and not be rushed. The details that were included—especially in administration and law—were very helpful."

Quality Improvement

The Ohio LTAP Center is committed to continuous quality improvement. Consequently, its next step is to fully assess the local-let training program to determine how well it is meeting the needs of program participants and stakeholders.

For the evaluation, the LTAP Center is planning a multiphase approach. The evaluation will focus on how well program participants are applying their acquired knowledge to Federal-aid projects. Are the number of errors on Federal-aid projects declining? For example, are LPAs fully documenting timesheets? Are they following the correct processes when acquiring right-of-way and when selecting and managing consultants?

To answer these questions, the LTAP Center plans to compare the types and frequency of errors found before and after the training. The results of the evaluations will help the center determine whether the content is sufficient or if it needs refinement or expansion.

The LTAP Center will also measure return on investment. Valuable LTAP Center resources were used to develop and maintain the local-let training program. In addition, LPAs invest agency time whenever an employee completes the training. By measuring improvements in performance after the training—such as an increase in the speed of project delivery, lower rates of errors on Federal-aid projects, or reduced need for supervision and oversight—the LTAP Center will be able to calculate the program's overall value to ODOT.

"When common errors on Federal-aid projects occur, we are grateful that ODOT works with the project sponsors to remedy the errors and provide the training that will help prevent them from happening in the future," says Michele Risko, the program manager of the county Surface Transportation Program and the local bridge program with the County Engineers Association of Ohio. "The eLearning modules should greatly help with this, and they are in the most user-friendly format available. We are very appreciative of LTAP's hard work."

Lessons Learned

Prior to the local-let training program, Ohio's LTAP Center had

Training participants are using the Ohio LTAP Center's computer lab to access the local-let training program and complete the self-paced modules.

The Ohio LTAP Center will evaluate its local-let training program in part by measuring improvements in performance on local projects, such as this one to improve Dogleg Road near the intersection of U.S. 40 in Dayton, OH.

no experience developing a self-paced, online learning program. Nonetheless, it produced a robust program that serves as a model for future eLearning development. During the process, the training team learned three important lessons that might be helpful to other State agencies developing similar training programs.

Use Federal-aid Essentials videos. The existing videos became the foundation for Ohio's program because the content applies to the LPA audience and is presented in a clear and interesting manner.

Do not reinvent the wheel. When possible, use existing content from other sources. For example, because Ohio's content uses a standardized Sharable Content Object Reference Model format, any State agency can import its program and use it as a starting point.

Allow sufficient time to create the content. Producing a training program is a significant effort for LTAP Center training professionals. In Ohio's experience, the more development time, the better.

Looking Ahead for Federal-aid Essentials

FHWA is committed to keeping Federal-aid Essentials robust. Since the program's inception, participants have shared ideas with FHWA for additional content. These suggestions, along with the need to address any regulatory changes, mean that Federal-aid Essentials always has something new to offer.

"We did not build [Federal-aid Essentials] to just launch and leave it tomorrow," says FHWA's Collins. "Maintaining and growing [Federal-aid Essentials] is an ongoing process. We will be constantly monitoring the videos that are there, ensuring that they are relevant."

Collins also has a vision of more State DOTs using Federal-aid Essentials to create training that fits their needs, just as ODOT has done with its local-let training program. As more LPAs discover its value, other agencies may find inventive ways to supplement their resources with Federal-aid Essentials.

Victoria F. Beale, Esq., is the director of the Ohio LTAP Center and the assistant administrator of ODOT's Office of Local Programs. Beale manages the LTAP's daily operations, including training and technical assistance for more than 2,300 LPAs in Ohio. She also oversees a $1 million annual Township Safety Signage Grant Program, focused on systemic signage improvements for Ohio's 1,308 townships. Beale is cochair of the Transportation Research Board's Standing Committee on Transportation Education and Training. She is a graduate of Capital University Law School and Franklin University, and she has a Senior Professional in Human Resources certification.

Rob Elliott, P.E., is manager of the Construction and Project Management Technical Service Team in the FHWA Resource Center. He is responsible for his team's technical assistance, technology deployment, training deliveries, strategic planning, and budget. Elliott also is the program manager for Federal-aid Essentials for Local Public Agencies. He serves on the Transportation Research Board's Project Delivery Methods Committee (AFH15) and coordinates with the Transportation Curriculum Coordination Council, the Associated General Contractors, and the American Road & Transportation Builders Association. Elliott is a graduate of Auburn University with a degree in civil engineering.

For more information, watch a video of the Ohio case study at http://youtu.be/UAbYuSWVNCI, or contact Victoria Beale at 614-466-3129 or victoria.beale@dot.state.oh.us. For more information on Federal-aid Essentials, see www.fhwa.dot.gov/federal-aidessentials, or contact Rob Elliott at 404-562-3941 or rob.elliott@dot.gov.

Changing the Landscape of Livability

by Shana Baker and Anna Biton

Since 2009, the multiagency Partnership for Sustainable Communities has worked to ensure that Federal policies and investments better serve U.S. citizens.

(Above) Research shows that people want to live in walkable neighborhoods with a variety of housing types, shops, restaurants, and amenities. The Wyomissing Square Mixed-Use Center in Reading, PA, an infill development on a 13-acre (10.5-hectare) brownfield site, offers all of the above: apartments, retail shops, office space, a hotel, and restaurants. The apartments pictured here are built above a restaurant. *Photo: Brickstone Realty.*

Communities across the United States face complex challenges in strengthening local and diverse economies, meeting changing demands for housing and transportation, and protecting the environment and public health. U.S. transportation investments over the last 50 years have often been poorly coordinated with other investments in land use planning, housing, and commercial development. This poor coordination has contributed to a prevalence of low-density, scattered, auto-dependent, and transit-inaccessible communities, and disinvestment in many of the Nation's core urban centers and early suburbs. Many communities and housing options across the country were built for a different time and are not what U.S. citizens want today.

Research from the real estate industry shows that many people want to live in more convenient, walkable neighborhoods. A National Association of Realtors survey showed that half of U.S. residents prefer a neighborhood with a variety of housing types, including

multifamily and single-family homes; shops, restaurants, and amenities within walking distance; and nearby public transportation. Walkable communities are particularly important to Millennials (born between 1981 and 1999), who will soon make up the largest percentage of the U.S. population; one research firm estimates that about 70 percent of them see walkability as "important" or "vital" when choosing a home.

Since 2000, U.S. residents have seen their combined costs for housing and transportation grow faster than household income, according to the Center for Housing Policy. This trend disproportionately affects households at or below the U.S. median income. Housing and transportation costs together account for nearly half of total income for median-income households and an even greater share for moderate-income (between 50 to 100 percent of median income) households.

To address these challenges, the U.S. Department of Housing and Urban Development (HUD), the U.S. Department of Transportation (USDOT), and the U.S. Environmental Protection Agency (EPA) formed the Partnership for Sustainable Communities in 2009. The partnership coordinates Federal housing, transportation, and other infrastructure investments to help neighborhoods become more prosperous, reduce pollution, and enable people to live closer to jobs. The partnership also helps communities improve access to affordable housing, increase transportation options, and lower transportation costs while protecting the environment. The partnership agencies incorporate six principles of livability (see "The Partnership's Six Guiding Principles") into Federal funding programs and policies to support locally developed projects.

Since its inception, the partnership has provided grants and technical assistance to ensure that Federal policies and investments improve quality of life. The partnership has developed tools for use in assessing, planning, and designing sustainable communities. The partners also increased flexibility and removed barriers to the use of Federal funds, promoted safe and accessible transportation choices, and supported disaster recovery and resiliency planning in impacted communities. In addition, the agencies convened leaders at all levels of government to share lessons learned and engage stakeholders in helping shape the partnership's efforts. What follows are highlights of the partnership's accomplishments to date.

According to a 2013 study by the National Association of Realtors, many Americans prefer to live in more convenient, walkable neighborhoods.
Source: National Association of Realtors, 2013.

Grants and Technical Assistance

Since 2009, the partner agencies have funded 1,066 projects in all 50 States, the District of Columbia, and Puerto Rico, totaling approximately $4.6 billion. The goal has been to use commonsense approaches to make grant and technical assistance programs better respond to communities' needs. For example, many of the three partner agencies' programs have evolved to consider housing, transportation, and environmental protection comprehensively—mirroring how these elements are linked in communities. The agencies also evaluate proposals based on how well they will achieve multiple benefits from individual investments.

"The partnership is helping us align our transportation investments with the goals of providing affordable housing and preserving the environment," says U.S. Secretary of Transportation Anthony Foxx.

Grant and technical assistance programs in all three agencies have incorporated language to encourage projects that support the partnership's guiding principles, align with local or regional integrated planning processes, and engage community residents, including historically underrepresented and overburdened populations, in planning and implementation.

Programs that have used this language include HUD's Sustainable Communities Regional Planning and Community Challenge Grant Programs. These programs have made a significant impact across the country. Nearly 40 percent of U.S. citizens live in a community that has benefited from one or more of these grants. These two programs alone represent a $240 million Federal investment in local planning efforts, and they were matched with $253 million in private investment and local funds. Over time, the partnership anticipates that this investment will spur many hundreds of millions of dollars in new economic growth.

One organization that has benefitted from a HUD Sustainable Communities Regional Planning

The Partnership's Six Guiding Principles

- Provide more transportation choices.
- Promote equitable, affordable housing.
- Increase economic competitiveness.
- Support existing communities.
- Leverage Federal investments.
- Value communities and neighborhoods.

Grant is the Thunder Valley Community Development Corporation, a nonprofit organization representing residents of the Pine Ridge Indian Reservation in South Dakota. Nick Tilsen, executive director of the Thunder Valley Community Development Corporation, says the grant helped community members take control of their lives and future.

"The Lakota people have always been warriors, fighting for our future," he says. "The HUD grant supported our development of a tribally approved, regional plan for the future of the Pine Ridge Reservation."

The Oglala Sioux Tribe adopted the Oglala Lakota Regional Plan in October 2012. The plan has already helped bring an additional $8 million in funding from USDOT's Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant program, which the tribe will use to pave an east-west road that connects the reservation's communities. This road serves as a route to bring supplies onto the reservation and take locally made goods out; paving it will save residents time and money.

Thunder Valley is now implementing a model community development initiative as part of the tribe's regional plan. Under this initiative, Thunder Valley will build a mixed-income, mixed-use development with 31 single-family homes, plus rental townhomes and apartments. In addition, the project will include a youth shelter, community facilities collectively called the Empowerment Center, retail space, a workforce development center, a small demonstration farm and greenhouse, and a daycare and fitness facility.

"This project shows what the future of rural Native American communities could look like and could be a model for sustainable affordable housing and poverty reduction," Tilsen says. "It's truly a community-based solution by Oglala Lakota people to develop a plan for our future."

Providing Tools For Communities

The Partnership for Sustainable Communities has developed a variety of tools that help assess, plan, and design sustainable communities. These tools cover a broad range of topics, including community design and planning, transportation and housing, and the environment.

"Communities know better than anyone else what they need," says EPA Administrator Gina McCarthy. "Through the Partnership for Sustainable Communities, we at the Federal level are organizing ourselves to give communities tools to address economic and environmental challenges in the way that works best for them."

Some of these tools are highlighted here. For a complete list, go to the Federal Highway Administration's Livability Initiative Web site at www.fhwa.dot.gov/livability/tools/sustainable_communities/index.cfm.

Sustainable Community Indicator Catalog. This tool helps communities identify indicators that can measure progress toward their sustainability objectives. Indicators focus on the relationships among land use, housing, transportation, human health, and the environment. Using this tool, communities can identify indicators that are most closely aligned with the issues of greatest concern to them.

Location Affordability Portal. Developed by HUD and USDOT, this portal helps consumers, researchers, and policymakers better understand how transportation costs affect housing affordability. The portal features two tools—My Transportation Costs Calculator and the Location Affordability Index—as well as cost data on housing and transportation at the neighborhood level, covering 94 percent of the U.S. population. This collaboration marks the first time that robust, standardized data on housing and transportation costs have been available at a national level to help families make more informed decisions about where to live and work, and to help policymakers pursue more sustainable investments.

Smart Location Mapping. EPA developed two data products to measure the built environment and transit accessibility of neighborhoods across metropolitan regions. The first, the Smart Location Database, summarizes indicators associated with the built environment, including density of development, diversity of land use, street network design, and accessibility to destinations, as well as various demographic and employment statistics. The second, the Access to Jobs and

Thunder Valley Community Development Corp.

Five men are putting the roof on a straw bale house as part of a Thunder Valley Community Development Corporation program in South Dakota to develop skills, knowledge, and capacity for tribal residents. Thunder Valley's model community initiative aims to create sustainable and interconnected communities that provide better housing, places for business to thrive, and a healthy and supportive environment for youth, older residents, and families.

Tools to Assess, Plan, and Design Sustainable Communities	
Sustainable Community Indicator Catalog	www.sustainablecommunities.gov/indicators
Location Affordability Portal	www.locationaffordability.info
Smart Location Mapping	www.epa.gov/smartgrowth/smartlocationdatabase.htm
Sustainable Communities HotReport	http://thedataweb.rm.census.gov/TheDataWeb_HotReport2/EPA2/EPA_HomePage2.hrml
CPD Maps	http://egis.hud.gov/cpdmaps
Environmental Justice Equals Healthy, Sustainable, and Equitable Communities	www.epa.gov/environmentaljustice/sustainability/index.html
PlaceFit Community Characteristics Database	www.fhwa.dot.gov/livability/tools/placefit
Community Vision Metrics	www.fhwa.dot.gov/livability/tools/community_vision

Workers via Transit Tool, compares the accessibility of neighborhoods to jobs via public transit service.

Sustainable Communities HotReport. This report uses data from the U.S. Census Bureau to give community leaders and residents a quick and easy way to determine how their community is performing on indicators related to transportation, housing, economic development, income, and equity. Users can view charts, tables, and maps showing trends over time and can compare performance among peer communities.

CPD Maps. HUD's Office of Community Planning and Development (CPD) worked with USDOT to expand a Web-based mapping tool, CPD Maps, by adding transportation data to the tool, which helps States and local governments plan the use of HUD block grants. The tool helps communities visualize how transit access can affect affordable housing locations and other investments. CPD Maps also display the boundaries of areas that received Sustainable Communities Regional Planning grants in the context of other demographic and investment data.

Environmental Justice Equals Healthy, Sustainable, and Equitable Communities. This guide, developed by EPA, HUD, USDOT, and the Centers for Disease Control and Prevention, shows how housing, health, transportation, environment, and other factors interact in creating sustainable and equitable communities. The resource provides information to help communities learn about their role in addressing longstanding environmental and health challenges, and revitalizing neighborhoods.

PlaceFit Community Characteristics Database. FHWA developed the database as an investigative tool that can help residents identify communities with characteristics that appeal to their needs when relocating for a job, schooling, retirement, or a variety of other reasons.

Community Vision Metrics. FHWA developed this tool to enable practitioners to search for performance indicators relevant to their specific circumstances, communities, and quality of life goals.

Increasing Flexibility and Removing Barriers

To make it easier for communities to implement their own visions for growth, the partnership agencies have worked to make their programs and guidance more flexible. The agencies also removed barriers that could inhibit developers from investing in communities.

For example, FHWA announced the Special Experimental Project No. 14 [SEP-14]–FHWA/HUD Livability Initiative in 2010 to better coordinate transportation and housing expenditures. Previously, FHWA and HUD had conflicting requirements related to hiring contractors. For example, HUD's Section 3 program requires preferential hiring of low-income residents living in a project area. This conflicts with FHWA rules that prohibit preferential hiring. For contracts approved under FHWA's SEP-14 program, however, the prohibition on hiring preferences can now be waived to accommodate HUD's Section 3 requirements. Under this waiver, FHWA permits States to request SEP-14 approval for contracting practices intended to enhance livability and sustainability as part of any project jointly funded by FHWA and HUD. The SEP-14 program makes it easier for communities to build the infrastructure they need and generate local jobs.

Since inception of the waiver in 2010, FHWA has approved three project work plans under the SEP-14 program. One project to improve the intersection of PA Route 56 and Johns Street in Johnstown, PA, was originally approved with funds from the Pennsylvania Community Transportation Initiative (PCTI). Pennsylvania DOT rejected all subsequent bids, however, because those funds were insufficient. For the successful rebid in March 2013, the scope of the project was reduced to accommodate available PCTI and HUD funding. The city of Johnstown, being granted via SEP-14 approval to combine both PCTI and HUD funding, saw a considerable savings from the elimination of duplicate payments, advertising costs, and potential and known economic impacts to the surrounding construction zone.

The Federal Emergency Management Agency (FEMA) and EPA also have worked together to remove obstacles for community development, particularly efforts to redevelop brownfield properties. Brownfields are property whose expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties protects the environment, reduces blight, and takes development pressures off green spaces and working lands.

(Left) FHWA supports the installation of well-designed, well-connected bicycle facilities. Protected bike lanes are physically separate from vehicles and are distinct from the sidewalk. Here, the Seattle Department of Transportation is adding a protected bike lane on the west side of Roosevelt Way, NE. *Photo: Seattle Department of Transportation.*

(Below) The partnership helped to align investments in the Indianapolis Cultural Trail, shown here. The project converted traffic lanes and parking spaces into a dedicated offroad trail for bicyclists and pedestrians. *Photo: Rundell Ernstberger Associates.*

Previously, FEMA's policies had rendered any contaminated properties ineligible for FEMA's Hazard Mitigation Grant Program, even if the State environmental agency had already approved the property for reuse through its own cleanup program. However, EPA and FEMA's different definitions of "clean" stood in the way of many promising redevelopment opportunities for State emergency management agencies that were interested in working on brownfield sites.

EPA worked with FEMA to change its contamination policy. FEMA's Hazard Mitigation Assistance Guidance update, released July 12, 2013, includes a new policy on hazardous materials that aligns FEMA and EPA perspectives on contamination. The guidance now states that if an appropriate local entity has determined that the site is now "certified clean," and that "no further remedial action is required to protect human health or the environment," it will be eligible for redevelopment under FEMA's Hazard Mitigation Grant Program. The update removes a longtime obstacle to communities accessing FEMA grants for hazard mitigation and provides more resources to invest in the development of brownfield properties.

For example, local leadership in Midland, MI, identified a repetitively flooded commercial structure and, in October 2013, approached the Michigan State Hazard Mitigation Officer about applying for a FEMA grant to have the flood-prone structure removed. The site was known to have been previously contaminated. As a part of the application process, the State provided FEMA with a letter indicating that no further action was required to protect human health or the environment. FEMA accepted this documentation as a clean site certification and awarded funding for the project in September 2014.

Promoting Safe And Accessible Transportation Choices

In addition to the health benefits of physical activity, encouraging

walking and bicycling helps reduce traffic and pollution from vehicles, and it provides inexpensive transportation options that are particularly important for people on a limited income. In the past, narrow interpretations of national design guidelines prevented communities from implementing connected bicycle and pedestrian networks, despite design resources that demonstrated their viability and benefits.

But on August 20, 2013, FHWA signaled the agency's support for a flexible approach to the design of pedestrian and bicycle facilities in a memorandum designating specific resources that can inform the design of safe and comfortable pedestrian and bicycle facilities that fit their community contexts. The memorandum, "Bicycle and Pedestrian Facility Design Flexibility," also highlights green-colored bike lanes as a successful example of a treatment that has been introduced through the interim approval process outlined in section 1A.10 of the *Manual on Uniform Traffic Control Devices*. The manual, which FHWA has administered since 1971, is the national standard for all traffic control devices, including pavement markings, highway signs, and traffic signals used on public streets and highways in the United States. All 50 States, plus the District of Columbia and Puerto Rico, have adopted either the 2009 edition of the manual, or a State equivalent that is in substantial conformance with the 2009 manual, as their legal standard for traffic control devices within their State.

By clarifying its support for well-designed, well-connected bicycle and pedestrian facilities, FHWA gave local and State transportation officials greater certainty and more flexibility to connect bicycle and pedestrian networks and craft plans that meet their communities' goals. Since then, several States have announced plans to better accommodate bicycle and pedestrian networks.

In April 2014, the California Department of Transportation identified a need to provide more flexibility in its highway design standards and procedures, especially in the context of urban environments and multimodal design. Similarly, in September 2014 the Colorado DOT published a memo to support a flexible approach when designing and planning the State's transportation system, and to identify resources that provide context-sensitive solutions that accommodate bicyclists and pedestrians.

Supporting Disaster Recovery and Resiliency Planning

The Partnership for Sustainable Communities has leveraged existing relationships and coordination to act quickly to support communities recovering from natural disasters. Following the September 2013 floods that displaced more than 18,000 people in Colorado and wreaked an estimated $3 billion in damages to housing, infrastructure, and the local economy, the partnership agencies supported local and regional resiliency efforts. FHWA worked with State and Federal partners to develop a statewide resiliency framework, revising design standards and processes to better address resiliency.

The partnership agencies worked together with FEMA, participating in more than 50 meetings with residents and State staff across 6 counties in Colorado. These groups held additional resource meetings with communities to discuss efforts to prevent future flooding and provide resource guides. In April 2014, HUD and EPA participated in a funding workshop for community leaders and recovery partners to discuss capacity building. HUD has provided more than $300 million in Community Development Block Grant Disaster Relief funds to all the communities impacted by the September floods. The partnership agencies continue to meet with State and local partners to discuss ways to provide support to communities for long-term planning.

Similarly, after Superstorm Sandy hit the east coast of the United States on October 29, 2012, partnership staff engaged immediately, meeting with FEMA to support all of its recovery support functions. The work included reviewing the recovery support strategies, providing training on the partnership's mission and goals, plus pinpointing available interagency resources. Other work involved identifying ways to integrate national and regional planning processes and resources. Partnership involvement helped to better integrate sustainability into recovery support activities.

The New York City region's transportation network encompasses the largest public system in the Nation, made up of subway, bus, commuter

Colorado Department of Transportation

The September 2013 floods in Colorado caused sections of U.S. 36, pictured here between Lyons and Estes Park, to collapse into the Little Thomson River. The partnership agencies worked with FEMA to provide local communities with flood recovery resources and plan efforts to prevent future flooding.

Flickr/accarrino

Superstorm Sandy caused this street flooding in Hoboken, NJ. The Partnership for Sustainable Communities has supported community-driven recovery efforts that have resulted in plans for cost-effective, sustainable stormwater management and flood control.

railroad, and ferry networks. When Sandy hit, nearly every element of New York's transportation system shut down. Sandy's storm surge flooded vehicular tunnels, subway stations, roads, and airports. Transportation outages followed, impairing mobility and access to, from, and within the city and the region, and affecting 8.5 million public transit riders, 4.2 million drivers, and 1 million fliers.

Two efforts from HUD's Sustainable Communities Regional Planning Grant Program underway before the storm—Together North Jersey and the New York–Connecticut Sustainable Communities Consortium—strongly supported the region's recovery after Sandy made landfall. Responding to the recovery challenges and needs at the municipal level, Together North Jersey modified local subgrant programs to support community-driven recovery efforts in Hoboken, Jersey City, and Ocean County, NJ, which had been hit by storm surges of more than 14 feet (4.3 meters). The work has resulted in plans for cost-effective, sustainable stormwater management and flood control, and opportunities to build upon EPA-funded technical assistance and other partnership investments in the region.

New York City's Department of City Planning also had worked with the partnership before Sandy hit, crafting an approach to resiliency and land use in its coastal communities. Using funds provided to the New York–Connecticut Sustainable Communities Consortium under the HUD Sustainable Communities Regional Planning Grant Program, the New York City Department of City Planning had completed two coastal climate resilience studies in the months prior to Superstorm Sandy's landfall. These studies helped the city respond quickly and strategically to the storm's widespread damage.

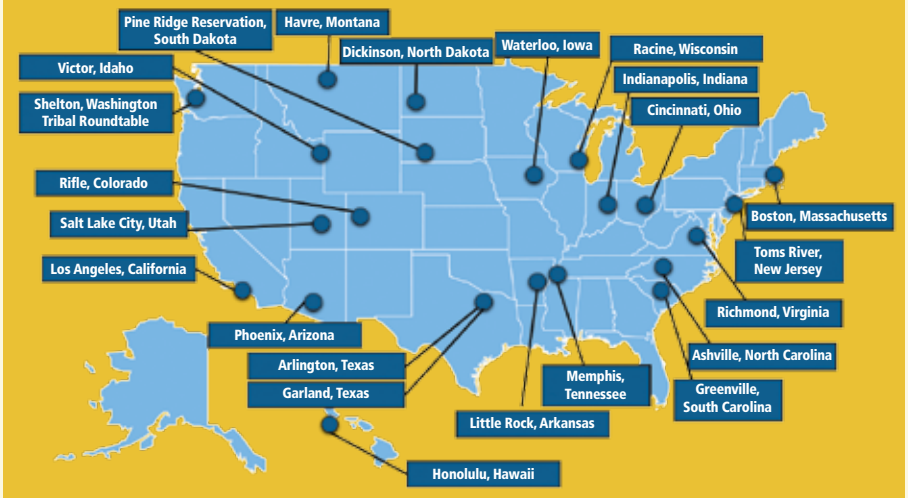
One study, *Designing for Flood Risk*, focuses on preparing buildings to withstand coastal flooding, while also supporting walkable neighborhoods and improving quality of life. The other, *Urban Waterfront Adaptive Strategies*, identifies strategies that can make urban coastal areas more resilient to hazards associated with rising sea levels. This study informed *A Stronger, More Resilient New York*, a comprehensive plan that contains actionable recommendations both for rebuilding the communities impacted by Sandy and increasing the resilience of transportation, infrastructure, and buildings citywide. Together, this body of work presents a roadmap for supporting existing communities and providing for a more sustainable future in waterfront neighborhoods.

"By providing a rigorous and replicable set of urban waterfront adaptive strategies, the city was able to respond to Hurricane Sandy and the risks of a changing climate by adopting a comprehensive climate resiliency plan that includes measures tailored to local conditions and focused on reducing risk," says Daniel Zarrilli, director of the New York City Mayor's Office of Recovery and Resiliency.

Bringing Key Players Together

The partnership also has worked with regional and local leaders to discuss important issues facing their communities. In 2013 and 2014, it held a series of roundtable discussions with communities across the country to learn how best to support them in achieving their visions for the future. Hundreds of representatives from Federal, State, and local government, tribes, businesses, nonprofits, neighborhood associations, metropolitan planning organizations, philanthropic organizations, communities, and the public came together over the course of 23 roundtable meetings to jumpstart local projects and to

Cities Where Regional Roundtables Were Held



Source: Volpe Center/Partnership for Sustainable Communities.

let Federal agencies know how they can best support communities.

In addition to the roundtables, since 2010 the FHWA Texas Division has worked with other regional agencies to organize and host an annual Texas Livability Summit. Located in a different region of the State each year, the summit brings together key players from throughout the State to share information on environmental, transportation, workforce, and housing issues affecting their communities.

The most recent summit was held in August 2014 in El Paso and drew approximately 110 participants from a range of organizations. The summit covered such topics as implementing complete streets policies and projects, developing new transit options, implementing bicycle sharing, and promoting affordable housing that is also environmentally friendly.

Follow-up evaluations from past summits indicate that the events have effectively communicated policy goals at the regional level. By bridging the gap between urban planners, engineers, university researchers, students, regional transit operators, and the public, the summits have encouraged new partnerships and problem-solving opportunities in a multidisciplinary environment.

"The Livability Summit came at a fortunate time for the central Texas region," says one participant who attended the Austin summit in July 2011. "Our region was beginning work [under a] regional planning grant and it was the start of new cross-agency and [cross]-disciplinary partnerships. The case studies gave us a preview of where we could go, and the facilitated breakout discussion groups began to break down our bureaucratic walls."

In response to feedback from the community and discussions at roundtables and summits, the partnership is focusing its future activities on the following:

Advancing economic opportunity and mobility. Work in communities to provide access to employment, education, and services; prevent displacement and increase connectivity; improve workforce training; and promote equitable outcomes for the environment, public health, and the economy.

Adapting to a changing climate, while mitigating future disaster losses. Work both with new Federal partners and within partnership agencies to offer guidance, best practices, and new Federal resources to adapt to and mitigate climate change.

Implementing community investments. Work to identify resources within and beyond the Federal Government to support the implementation of community-based development priorities stemming from partnership investments in planning and technical assistance.

Participants listen to a presentation at the El Paso Livability Summit in August 2014. The partnership has helped organize annual livability summits in Texas to share information on key environmental, transportation, workforce, and housing issues affecting local communities.

Moving Forward

Changes in local economies, in the demands for housing and transportation, and in efforts to protect the environment and public health affect where and how communities are built. Many of these changes—such as shifting economic bases and growing demand for walkable places, coupled with recent weather extremes—can present unfamiliar challenges to communities. They need resources, guidance, and innovative solutions to make the most of opportunities and mitigate any harm. The partnership will continue to help communities find ways to cope with the changing climate and encourage new investment and economic growth that benefit all residents. Every investment, program, and policy can be a chance to make a community more resilient and prepared for whatever the future holds.

"The Partnership for Sustainable Communities is about achieving one goal: expanding opportunity for American families," says HUD Secretary Julián Castro. "HUD is proud to work with regions to cultivate and connect all the community assets needed to thrive, from jobs to transportation. Working with local leaders, I'm certain that the investments our agencies have made will enhance the health and wealth of communities for decades to come."

Through these efforts, EPA, HUD, and USDOT will continue to help communities make better informed and more strategic investments in housing, transportation, and infrastructure to help residents improve their lives.

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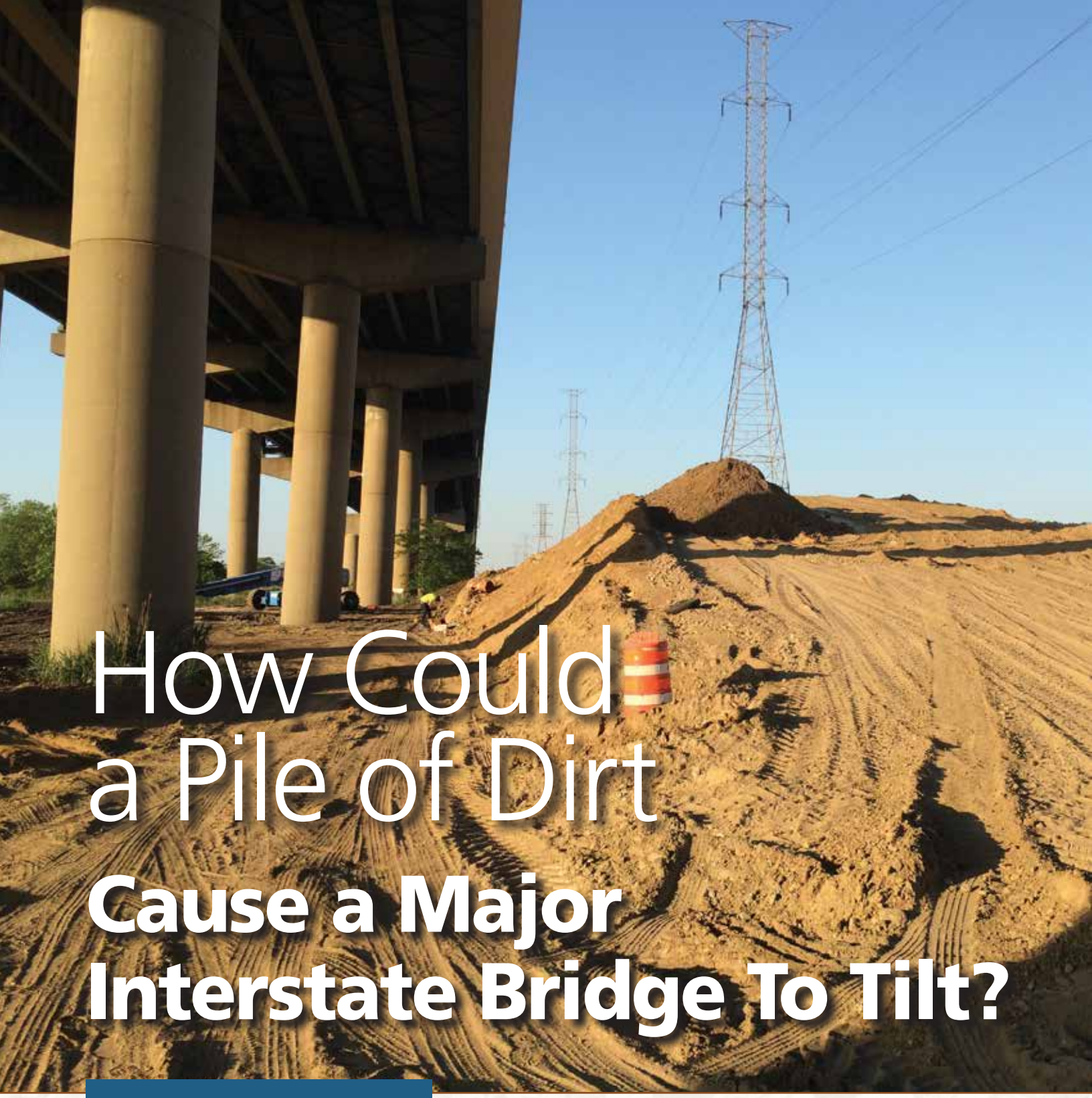
For more information, visit www.sustainablecommunities.gov or contact Shana V. Baker at shana.baker@dot.gov or 202-366-4649. Partnership for Sustainable Communities: Five Years of Learning from Communities and Coordinating Federal Investments *is available at www.sustainablecommunities.gov/sites/sustainablecommunities.gov/files/docs/partnership-accomplishments-report-2014-reduced-size.pdf.*



How Could a Pile of Dirt Cause a Major Interstate Bridge To Tilt?

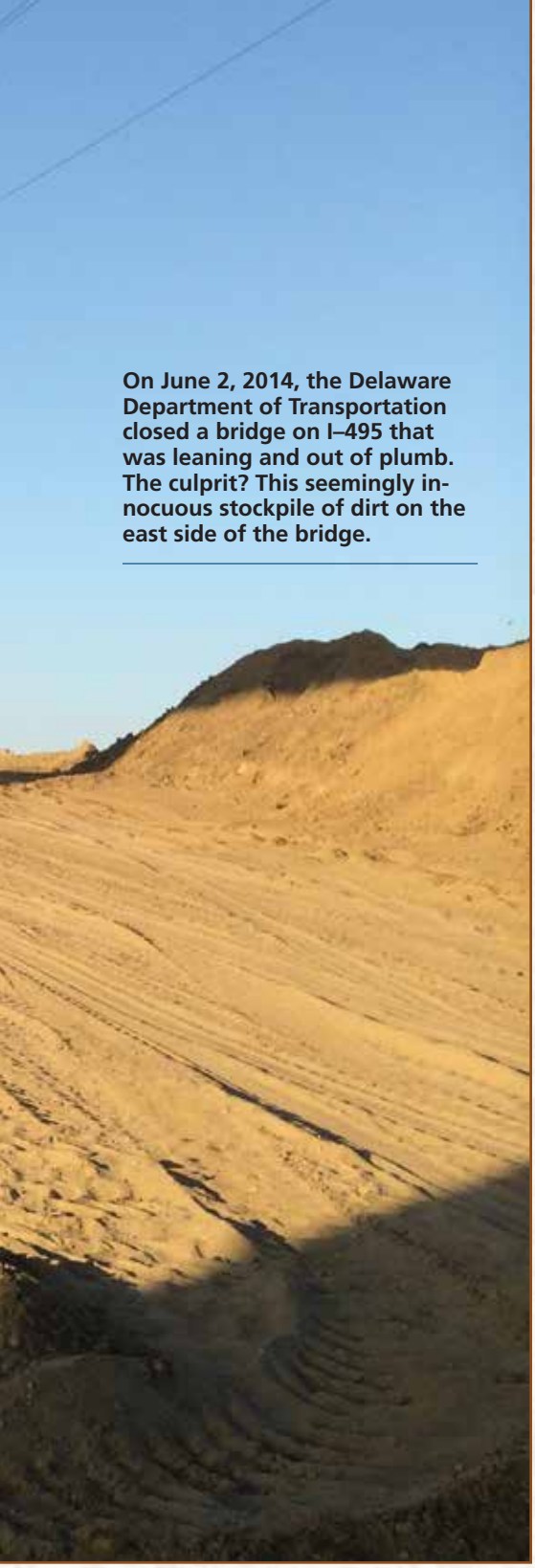
by Dennis M. O'Shea

Read on for the answer—and an important cautionary tale from Delaware. Could this happen in your State?

On the evening of June 2, 2014, a major interstate that parallels I–95 and bypasses Wilmington, DE, was closed to traffic. The closure of I–495, which carries nearly 90,000 vehicles per day, caused nightmares for local commuters and out-of-state travelers.

The Delaware Department of Transportation (DelDOT) had closed I–495 after completion of a damage inspection by DelDOT bridge inspectors. The inspection took place because of a phone call from a private citizen who said the bridge appeared to be leaning.

The 40-year-old bridge was indeed leaning. Four column supports were tilted, with the worst column leaning 4 percent out of plumb



On June 2, 2014, the Delaware Department of Transportation closed a bridge on I–495 that was leaning and out of plumb. The culprit? This seemingly innocuous stockpile of dirt on the east side of the bridge.

toward the east. The leaning was caused by uneven settling and lateral movement of the piers.

A telltale sign was revealed by the adjacent concrete median barriers of the northbound and southbound structures. The tops of the adjacent median barriers are typically at the same elevation and about 1 inch (2.5 centimeters) apart. But in this case, the top of the southbound's median side was 18 inches (46 centimeters) lower than the top of the northbound's median barrier, and there was a gap of about 3 inches (8 centimeters) in between. Given these findings, DelDOT closed the bridge that very evening, because of the obvious damage to the substructure units.

Bridge 1-813 carries I–495 over the Christina River and Christiana Avenue, east of downtown Wilmington and adjacent to the Port of Wilmington. Constructed in 1974, the bridge is approximately 4,800 feet (1,463 meters) long. The steel superstructure consists of two girder/floor beam stringer main spans located over the river and 35 multigirder approach spans. Fortunately, the tilt did not affect the two girder main spans over the river.

The settling occurred at the approach spans at piers 11 through 14. These four reinforced concrete piers are the single-column hammerhead pier cap type and are approximately 60 feet (18 meters) tall. The affected piers are founded on steel H-piles, which have an H shape and at this location are driven to bedrock.

Prior to the June 2014 findings, DelDOT had last inspected the bridge in October 2012. The agency schedules inspections every 2 years, so the discovery of the tilt and the subsequent closure occurred about 4 to 5 months before the next inspection would have taken place.

Looking south down the line of hammerhead columns makes the problem apparent. The column in the front is clearly leaning east.

DelDOT

These cracks in the soil adjacent to the stockpile of dirt suggest the extent of the differential settlement exerted by the stockpile on the existing ground. The white hardhat provides an idea of the size of the cracks.

Determining the Cause

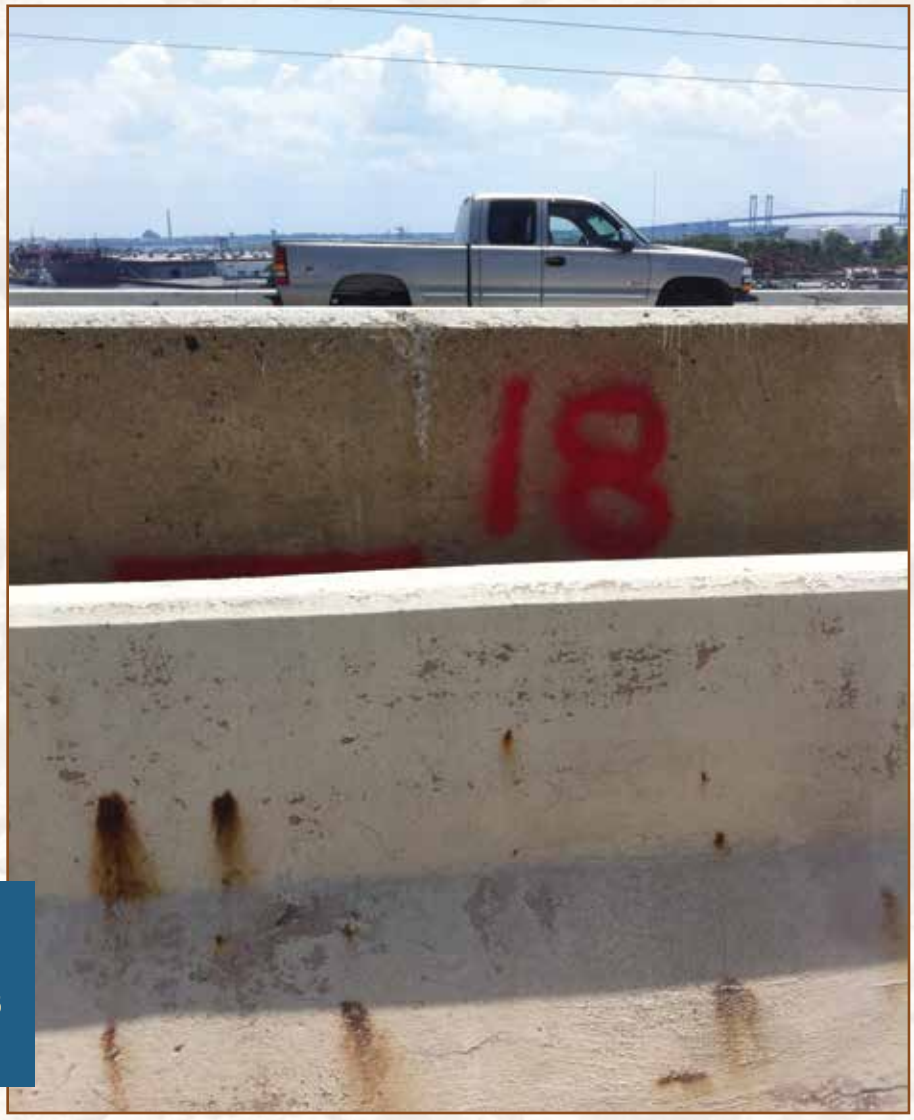
Investigation into the cause began immediately. DelDOT engineers and their design consultants, along with bridge personnel from the Delaware Division of the Federal Highway Administration, mobilized on the night of June 2. Once onsite, the DelDOT engineers and design consultants discussed a number of possible causes of the movement, plus potential fixes. In addition to engineers who were onsite, DelDOT's design consultants provided remote staff support from the consultant's offices throughout the country. Together, the engineers analyzed the situation and offered their determinations and recommendations.

While reviewing the site conditions for possible reasons for the movement, the engineers noted a large stockpile of fill adjacent to and east of the bridge. In addition to the settlement at the bridge, soil cracks, settlement, and heave were observed at several locations around the perimeter of the stockpile. Although the engineers were not completely certain yet as to the cause of the bridge's movement, they asked the owner of the stockpile to remove it immediately to eliminate any further potential impacts.

On the evening of June 2, Joey Hartmann, director of the Office of Bridges and Structures at FHWA headquarters, offered DelDOT and FHWA's Delaware Division access to any technical resources needed. The division requested assistance with geotechnical expertise. Hartmann called on Khalid Mohamed, a geotechnical engineer at FHWA headquarters, to review the situation. Mohamed's experience with a similar settlement problem involving the Leo Frigo Memorial Bridge in Wisconsin made him an ideal resource.

Based on a review of as-built drawings showing subsurface soil and foundation details, Mohamed anticipated that the supporting piles might have been damaged or fractured as had happened in Wisconsin and. He recommended that DelDOT maintenance personnel bring equipment to the site to excavate the soil around and under the reinforced concrete pile cap footings of the reinforced concrete hammerhead piers to expose the piles for inspection and evaluation. The engineers assumed that the soils in the area were corrosive because hazardous materials had previously been found nearby. However, the engineers found all of the piles to be intact and not fractured as suspected, although one steel pile was buckled.

Surprisingly, the main effects were on the concrete pile cap footings, which were found to be cracked horizontally and diagonally. The footings



DelDOT

This photo shows the settling problem, as evidenced by the displacement of the concrete bridge rails in the median. At this location, one rail is 18 inches (46 centimeters) below the other.

were 5.5 feet (1.7 meters) thick, with the northbound and southbound footings tied together with a reinforced concrete strut. As a result of these findings, the engineers determined the cause to be lateral displacement of the soil due to lateral squeeze of the underlying soft soils.

"After seeing the effects that an adjacent stockpile of dirt had on the I–495 bridge, we worked with FHWA headquarters and Resource Center staff to reach out to all of our State partners through each FHWA division office to let them know of the circumstances," says FHWA Delaware Division Administrator Mary Ridgeway. "It was also recommended that they include a visual check of the surroundings near their bridges during all of their future bridge inspections. This is an issue we are very aware of now."

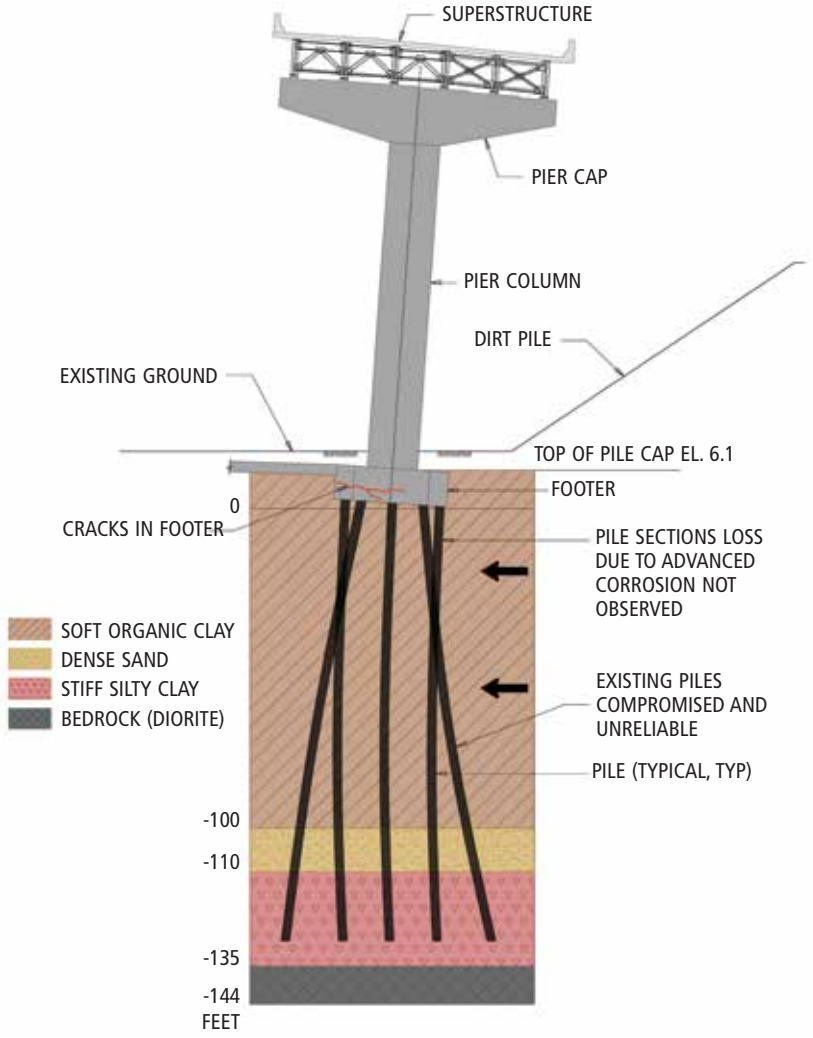
How Could a Pile Of Dirt Be the Cause?

The following perfect storm of factors caused the settling to occur:

- The soils in the area are organic, very soft, and compressible.
- The soft soils profile is especially deep at pier 12, where the worst damage occurred, and becomes even deeper approaching the Christina River. Below the surface, the soft soil is more than 100 feet (30 meters) deep before reaching stiffer soil and then bedrock.
- The bridge piers were erected on top of steel H-piles that were driven to bedrock when the bridge was built in the 1970s, requiring the piles to be more than 130 feet (40 meters) in length.
- The large stockpile of soil east of the bridge, estimated at approximately 50,000 (45,000 metric) tons, compressed the soils adjacent to the bridge and produced lateral forces on the piles, a phenomenon known as lateral squeeze of soft soil due to the occurrence of an unbalanced load at the surface forces on the piles.
- Because the H-piles' lateral load capacity was exceeded and the poor quality soils did not provide support, they deflected. Typically, pile capacity or resistance is developed through the strength of the pile and the soil, if it is dense enough.

Without any one of these factors, the damage likely would not have occurred.

Condition Prior to Repairs



Source: DelDOT.

Early Actions

To ensure that this was an isolated condition, DelDOT inspected all of the other piers of Bridge 1-813. The engineers found no damage at any locations other than piers 11 through 14.

DelDOT's testing consultant then installed tilt sensors on the piers to monitor the movement and determine whether the bridge was still moving. Field surveyors also came onsite to help monitor movement.

On June 3, Delaware Governor Jack Markell signed an emergency declaration, which enabled DelDOT to procure a contractor experienced in performing emergency bridge repairs. Fortunately, the agency's on-call design consultant was onsite during the initial investigation. Within days of the incident, Division Administrator Ridgeway authorized $2 million in initial quick-release Federal emergency relief funding, allowing work to start.

Removal of the stockpile had begun immediately on the night of June 2. After observing that the work was progressing slower than expected, DelDOT brought in additional trucks and loaders to expedite the removal. Working around the clock, the agency and its contractors completed the removal by June 10.

Path Forward

With 90,000 vehicles per day displaced and a daily traffic nightmare unfolding, time was of the essence in order to reopen the bridge. A team of experts from DelDOT, FHWA, the University of Delaware, on-call consultants, and the contractor gathered on June 4 to brainstorm whether to replace the affected spans or

Excavation of the material above and alongside the pier 13 footing shows shear cracks (seen here near the end of the tape measure).

rehabilitate them, and, depending on that decision, where materials could be acquired expediently.

Those discussions led to the decision that the most cost-effective and time-sensitive method would be to repair the structure. The critical issue for the repair alternative was the availability of fabricated materials, equipment, and manpower. Regarding the manpower issue, contractors immediately made staff available to start the drilling for new foundation shafts.

A key suggestion from the team was to contact other projects around the country, such as the Tappan Zee Bridge project in New York, to see whether any of that material was not being used and was available to be procured. In fact, DelDOT was able to procure equipment and materials from many agencies across the country.

"The response to the request for help was fantastic," says Dan Montag, FHWA's Delaware Division senior area engineer for the emergency project.

Reinforcing steel cages for the drilled shafts came from the Tappan Zee Bridge project, saving an estimated 10 to 12 weeks off the schedule. Steel casings used for the drilled shafts arrived from Oklahoma and Washington State. Drilling rigs, along with an efficient contractor for the drilled shafts, became available on short notice from New Jersey and Texas. These rigs were especially important because of the low working clearance under the existing bridge superstructure and the need to drill shafts up to 162 feet (50 meters) deep.

The work plan had two main phases. First, crews would make temporary repairs to stabilize the bridge by building new foundations for piers 12 and 13 and underpinning the foundations of piers 11 and 14, all of which would allow the opening of the bridge. Second, crews would complete the permanent solutions by demolishing and replacing piers 12 and 13, and reconstructing the girder bearings for the other piers. The goal was to open the bridge to traffic in one direction at a time: first southbound and then northbound.

Due to the urgency to reopen I–495, all work took place around the clock. That included borings, corings, survey, design, materials delivery, and drilling. Two DelDOT assistant directors, Barry Benton and Javier Torrijos, led the efforts of the team and made sure that coordination ran smoothly.

A first order of work was to provide additional safety and stability by tying the existing concrete pier hammerheads together, allowing them to act as a single unit. The team installed strain gauges on these ties to monitor any movement. The engineers also installed inclinometers and piezometers to monitor soil movements and pressures.

Coordination between DelDOT's design consultant and contractor was similar to a construction manager/general contractor method of project delivery. The consultant worked directly with the contractor to develop the design solutions.

Officials with New York's Tappan Zee Bridge project provided DelDOT with these reinforcing steel cages for the drilled shafts.

Temporary Phase Schedule

Activity	Location	Date Complete
Drilled shafts began on 6/13/14	All	7/16/2014
Underpinning	Southbound	7/26/2014
	Northbound	8/5/2014
Concrete grade beams	Southbound	7/8/2014
	Northbound	7/25/2014
Temporary jacking towers erected	Southbound	7/22/2014
	Northbound	8/5/2014
Jacking operations	Southbound	7/29/2014
	Northbound	8/20/2014
Open to traffic	Southbound	7/31/2014
	Northbound	8/23/2014

Source: FHWA.

One of the early safety measures was to tie together the hammerhead piers to make the two piers act as one.

The Temporary Repairs

Because the bridge did not tilt or settle uniformly, it needed to be brought back to its original alignment and cross section. Therefore, the first focus for the temporary repairs phase was to stabilize the bridge by supporting and realigning its 400-foot (122-meter) section. To accomplish this work, DelDOT's contractor completed the operation in phases. The first phase was to concentrate on the bridge's southbound section.

To provide stable support for the repairs to each of the four piers, DelDOT's contractors constructed new concrete-filled drilled shafts down to bedrock.

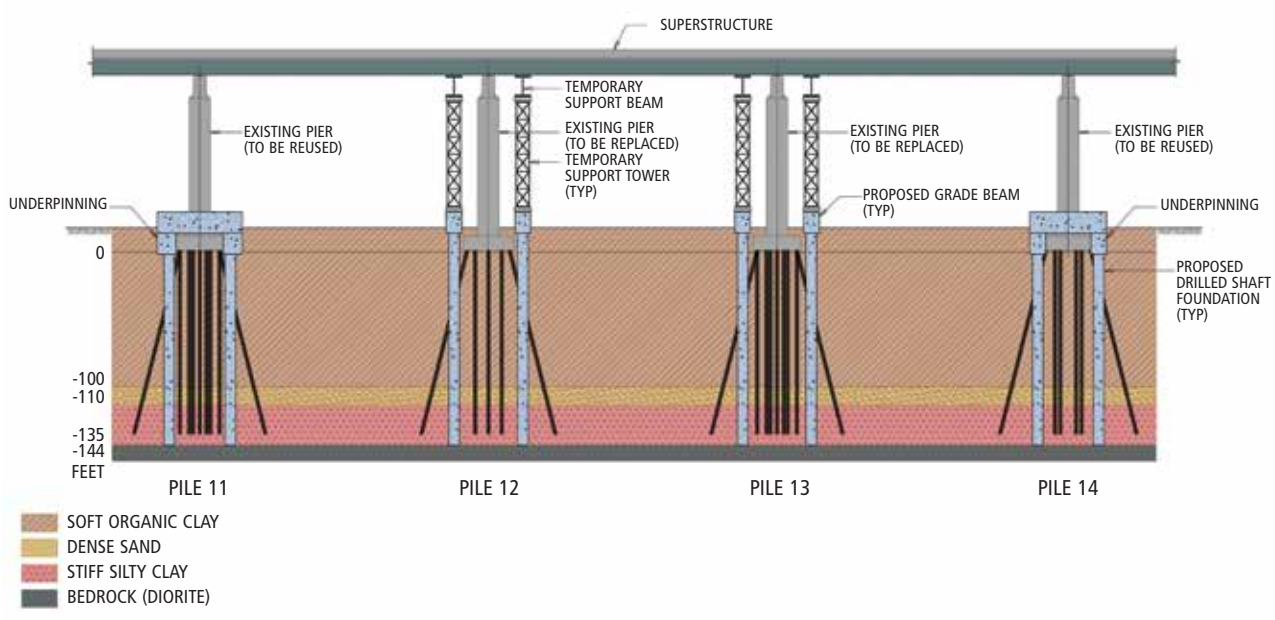
Piers 11 and 14 were underpinned by encasing the existing foundations with the new shafts, relying on those new drilled shafts for support. Underpinning restored the load-carrying capacity of these piers.

For piers 12 and 13, the contractor constructed a reinforced concrete grade beam supported by the concrete drilled shafts, which extended to the outer reaches of the bridge.

Then, the contractor erected temporary jacking towers on these grade beams, which supported the bridge until completion of the permanent phase.

As mentioned, the contractor restored the bridge's southbound superstructure to its original position through several intricate

Proposed Temporary Repairs



Source: DelDOT.

Grade beams shown here were cast on top of drilled shafts.

As a load test, these six (two rows of three) loaded dump trucks are stopped on the completed, leveled superstructure, which is supported solely on the temporary towers.

jacking operations vertically and laterally, including leveling. DelDOT completed a load test by running loaded dump trucks across the bridge and braking over the repaired area. Upon verification that the test was successful, the bridge was reopened. Once the southbound lanes were open, the focus shifted to the northbound section, and the same activities were completed.

To the delight of many motorists, I–495 southbound reopened to traffic on July 31, more than a month earlier than the original estimate of Labor Day. On August 23, I–495 northbound reopened. After opening the bridge to traffic, the contractor and design consultant were able to throttle down from the 24/7 schedule to more regular shifts. They completed the work for the removal and replacement of piers 12 and 13 under the bridge with little impact on the motoring public.

The Permanent Phase

After DelDOT stabilized the bridge with the temporary towers and reopened it, the crews demolished the existing pier 12 and 13 columns and hammerheads, and erected permanent new concrete columns on the grade beams. The drilled shafts constructed for the temporary towers were also used for the support of the new piers.

The designers altered the configuration for the reconstructed piers. Instead of two hammerhead piers supporting each direction, a single pier supported by three columns would carry both directions of I–495.

The crews performed additional work to reconstruct the girder bearings at piers 11 and 14. Fortunately, there was no damage to the superstructures due to the movement of the bridge.

The agency completed the permanent piers and bearing work in April 2015.

The Costs

Total cost for all of the repairs was close to $40 million.

As mentioned, Federal emergency relief funding was authorized within days of the incident. As with all emergency relief funds, the temporary repairs during the first 180 days were 100 percent reimbursable. Federal funds for permanent repairs were provided at the normal 90/10 Federal/State interstate share.

Traffic Mitigation

DelDOT mitigated the traffic situation by providing signed detour routes with adjusted signal timing. I–495 was closed between Terminal Avenue and 12th Street, which are the closest exits from each end of the bridge. The detour routed vehicles through Wilmington. DelDOT hired Wilmington police officers to direct traffic during peak hours. The agency also installed temporary signals at the exit to Terminal Avenue. For through traffic, DelDOT re-striped I–95 to create three lanes southbound from Wilmington. Lastly, the agency suspended all construction projects that impacted the detour routes.

Shown here is the jacking and leveling operation, taking place at night.

Outreach to Other FHWA Division Offices And the Public

FHWA emailed an event report on June 16 to all of its divisions notifying them of the issue and recommending that they alert their State transportation counterparts to review their bridges for any similar issues. A few States found similar situations and requested the owners move the soil stockpiles.

To provide updates to the public, DelDOT held several press conferences, both onsite and offsite when conditions required. The first was the day after the closure to explain what was known at that time.

Review of Other DelDOT Bridge Sites

DelDOT reviewed the agency's entire bridge inventory, searching for similar bridge designs in similar soil conditions and similar stockpiling uses. Field inspectors checked 29 bridges over 500 feet (152 meters) in length and 34 bridges 200 feet (61 meters) to 500 feet (152 meters) in length.

The inspectors found only one structure with a stockpile of soil located adjacent to the bridge. The owner moved the stockpile expeditiously.

As a result of this experience, DelDOT updated its bridge inspection protocols and also increased its level of comfort in the use of monitoring technology.

Visitors to the Site

Being located along a major north/south interstate route, the project attracted a great deal of attention and support, including the following:

- Then Delaware Secretary of Transportation Shailen Bhatt was on site immediately, continued to visit throughout the entire process, and attended planning meetings.
- Governor Markell toured the site on June 5.
- U.S. Secretary of Transportation Anthony Foxx showed his support and visited the site on June 13, along with Delaware's U.S. Senators Tom Carper and Chris Coons and U.S. Congressman John Carney.
- President Barack Obama visited the site on July 17, along with members of the Cabinet, Secretary Foxx, and U.S. Treasury Secretary Jacob Lew.

During the ordeal, DelDOT's Benton noted that one of the youngsters on his baseball team had heard a saying that truly applied to the bridge situation: "Everything will be okay in the end. If it's not okay, it's not the end."

Lessons Learned from a Tilting Bridge

- Monitor any stockpile of materials on adjacent properties, even if not on the State's right-of-way.
- React immediately to any notice of concern from the public.
- Develop an emergency relief skeleton contract for use during future events.
- Remember that normal contracting and contract administration methods do not always work during an emergency event.
- Realize that construction manager/general contractor methods of delivery might be especially useful, as this arrangement is a partnership working toward an end goal.
- Do not hesitate to ask other States for help.
- Direct all media requests through one outlet to ensure a consistent message.
- In emergency situations, everyone works 24/7.
- Deliver daily reports to leadership to resolve any issues before they become critical path items.

Dennis M. O'Shea is the bridge engineer in the FHWA Delaware Division Office. He joined FHWA in 2010, and until 2015 was responsible for the bridge programs for Delaware and Maryland in the former DelMar Division. Prior to joining FHWA, O'Shea worked for 27 years for DelDOT in many capacities, from bridge designer to assistant director responsible for several areas, including bridge design. He holds a B.S. in civil engineering from the University of South Alabama and is a professional engineer in Delaware and Pennsylvania.

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Along the Road

Along the Road is the place to look for information about current and upcoming activities, developments, trends, and items of general interest to the highway community. This information comes from U.S. Department of Transportation sources unless otherwise indicated. Your suggestions and input are welcome. Let's meet along the road.

Management and Administration

USDOT Challenges Mayors to Make Streets Safer

As part of the Safer People, Safer Streets initiative announced in early 2015, U.S. Secretary of Transportation Anthony Foxx issued the Mayors' Challenge for Safer People and Safer Streets. The challenge is a call to action for mayors and local elected officials of all political jurisdictions to take significant action to improve safety for bicyclists and pedestrians through early 2016.

The challenge is based on the 2010 USDOT Policy Statement on Bicycle and Pedestrian Accommodation to incorporate safe and convenient walking and bicycling facilities for users of all ages and abilities into transportation projects. Nearly 200 cities across the Nation have accepted the challenge, and more than 110 people representing 64 participating cities attended the kickoff summit in Washington, DC, in March 2015.

Secretary Foxx challenged mayors and officials to three calls to action: (1) issue a public statement about the importance of bicycle and pedestrian safety, (2) form a local action team to advance safety and accessibility goals, and (3) take local action on seven challenge activities. These activities include taking a complete streets approach, gathering and tracking biking and walking data, and improving walking and biking safety laws and regulations. Throughout the challenge year, cities have the opportunity to participate in peer-to-peer sessions, attend topical webinars, and receive USDOT updates and other resources and benefits.

For more information on the challenge and its activities, visit www.transportation.gov/mayors-challenge.

Secretary Foxx Visits Florida Bridge Replacement

As part of a 4-day bus tour, Secretary Foxx recently joined Florida Congresswoman Corrine Brown and Jacksonville Mayor Alvin Brown at the I–95 Overland Bridge Replacement Project in Jacksonville, FL. The structurally deficient interstate bridge serves an estimated 147,000 drivers each day.

Built in 1959 and reconstructed in 1989, the bridge was in need of improvement. At an estimated $160 million in construction costs alone, the project—which is relying on $73 million in Federal funding—is considered the largest highway construction effort in northeast Florida's history.

Construction began January 14, 2013, to replace a series of overpasses that carry traffic over four major streets along 2.3 miles (3.7 kilometers) of I–95. The project also includes widening I–95 southbound along the corridor, adding a full interchange between the interstate and a major local road, revamping traffic patterns, and adding bike lanes.

FDOT

Jacksonville Mayor Alvin Brown (front, fourth from left), U.S. Secretary of Transportation Anthony Foxx (to Brown's left), and Florida Congresswoman Corrine Brown (front, red trench coat) stand with the construction workers and inspection team under the I–95 overpass. The bridge replacement is one of the largest highway construction projects ever undertaken in northeastern Florida.

The bridge replacement will improve traffic flow along the I–95 corridor by relieving traffic congestion and providing more travel options. Planners expect the work to be completed in mid-2016.

Visit www.i95overlandbridge.com for more information.

Policy and Legislation

New Rule Improves Access to Public Transportation

Obstacles like sidewalk construction, snow, and illegally parked cars can make it difficult for riders to board a bus at the designated stop. For a transit user in a wheelchair, or in need of other types of assistance, these hindrances

Tracy Marshall

Heavy snow plowed to the side of this Boston, MA, road blocks the bus stop, making it difficult for passengers, especially those with disabilities, to board safely.

may be insurmountable. Often a bus driver will make some reasonable accommodation, but not always. To ensure everyone has equal access to public transportation, USDOT developed a new rule to offer a fair solution to address such situations.

The rule clarifies that public transportation providers are required to make reasonable modifications to their policies, practices, and procedures to avoid discrimination and ensure accessibility. The new rule applies to public entities that provide fixed route, dial-a-ride, and complementary paratransit services.

To help people with disabilities and public transportation providers better understand the line between reasonable and unreasonable modifications, the rule includes a list of 27 examples. However, because of the impossibility of listing all possible situations, it remains the responsibility of the transportation provider to develop a process for making decisions about how best to provide reasonable modifications to policies.

Examples of reasonable modifications include enacting policies permitting bus operators to adjust the boarding location if the designated stop is blocked. Another modification is allowing paratransit providers—who often operate curb-to-curb service—to assist a passenger to the door of the building if needed to enable the individual to use the service. Many transit providers already make these accommodations for riders with disabilities, but the rule ensures these adjustments are applied more uniformly and offers guidance for when reasonable modifications must be made.

For more information, the final rule is available at www.gpo.gov/fdsys/pkg/FR-2015-03-13/pdf/2015-05646.pdf. It became effective on July 13, 2015.

Public Information and Information Exchange

U.S. Drivers Topped 3 Trillion Miles in 2014

The Federal Highway Administration recently released new estimates showing that U.S. road users drove nearly 3.02 trillion miles (4.86 trillion kilometers) in 2014, the highest number since 2007 and the second highest since data collection began 79 years ago. The new data reaffirm projections included in *Beyond Traffic*, USDOT's 30-year vision for transportation, which shows significant increases in gridlock nationwide unless changes are made in the near term.

Drivers in December 2014 logged 251.4 billion miles (404.6 billion kilometers), the highest level for any December since data collection began. At 5 percent higher than the previous December, it was the year's biggest single-month increase and the Nation's tenth consecutive month of growth in vehicle miles traveled (VMT).

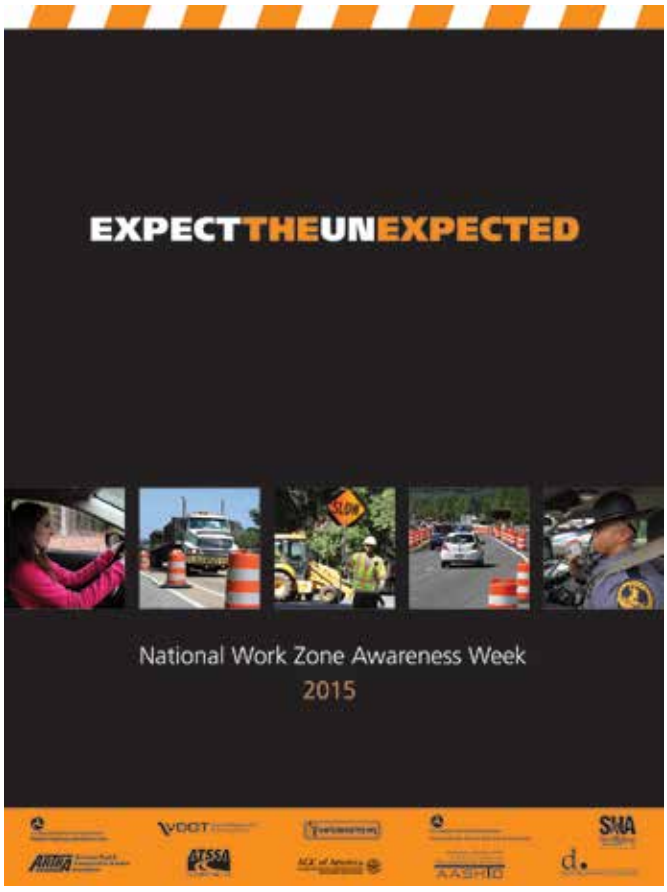
All States recorded traffic increases in December. At 10.5 percent, Indiana saw the largest single-State traffic increase compared to the same month a year earlier, followed closely by Oklahoma at 9.3 percent and Montana at 8 percent. Traffic in the South Gulf—a block of eight States including Kentucky and Texas—rose to nearly 49.1 billion VMT, a gain of 6.4 percent over the previous December and the tenth consecutive month of increased traffic for the region.

For more information on the VMT data in FHWA's Traffic Volume Trends reports, which are based on information collected from more than 2,000 road-mounted sensors nationwide, visit www.fhwa.dot.gov/policyinformation/travel_monitoring/tvt.cfm.

FHWA Celebrates 15 Years of Work Zone Awareness

FHWA, in partnership with State and local transportation agencies, sponsored the 15th National Work Zone Awareness Week from March 23 to March 27, 2015. Acting Federal Highway Administrator Gregory Nadeau joined State and Federal officials at the Washington Boulevard Bridge over Columbia Pike in Arlington, VA, for the national kickoff event to urge drivers to stay alert when driving near highway workers. Workers and families affected by work zone crashes joined the highway officials at the event.

This year's theme, Expect the Unexpected, was the same theme used at the first national event 15 years ago. The slogan emphasizes the need for drivers to constantly be prepared for changes such as reduced speed limits;



FHWA and its partners used this poster and other campaign materials, including public service videos, for the 2015 National Work Zone Safety Awareness Week in March.

narrowed, shifted, or closed lanes; and people who may be working on or near the road.

The annual initiative raises awareness of safety measures taken on roads around the country. FHWA works with State and local transportation officials to promote improvements in work zone planning and design, increased law enforcement near work zones, enhanced worker training, and heightened awareness among drivers. Since 2005, FHWA has awarded nearly $33 million in grants to promote training in work zone safety and the National Work Zone Safety Information Clearinghouse (www.workzonesafety.org).

The efforts by FHWA, State departments of transportation, and other agencies and organizations to increase awareness are working. Work zone fatalities have decreased by 34 percent since 1999. In 2013 there were 579 fatalities in work zones, a 6-percent decrease from 617 fatalities the previous year.

For more information on National Work Zone Awareness Week, visit www.ops.fhwa.dot.gov/wz/outreach/wz_awareness.htm.

Tribal Transportation Safety Gets a Boost

Secretary Foxx recently announced that 82 tribes will receive more than $8.5 million for 94 projects from FHWA's Tribal Transportation Program Safety Fund. The projects will improve transportation safety on tribal lands.

Tribes will use the funds for safety planning, engineering improvements, enforcement and emergency services, and education for tribal communities. This is the second year such funds have been awarded since the program's creation in the Moving Ahead for Progress in the 21st Century (MAP-21) Act. For this round, FHWA received 126 applications requesting a total of $27.1 million in assistance.

Congress created the program under MAP-21 to improve highway safety on tribal roads and other transportation facilities—statistically, some of the most hazardous in the Nation because of their poor physical conditions and other factors.

One grant recipient is the La Jolla Band of Luiseño Indians in California, which will receive $479,224 to better equip the tribe's emergency responders with supplies they need when responding to crashes on the area's winding mountainous roads. Another recipient, the Nome Eskimo Community in Alaska, will receive $60,868 to improve warning lights near the Nome Elementary School, making it safer for pedestrians and drivers alike in the extended darkness of Alaska's winter months.

For more information and a complete list of grant recipients, visit http://flh.fhwa.dot.gov/programs/ttp.

NHTSA Launches "Tween" Seatbelt Campaign

In the past 5 years, 1,552 children between the ages of 8 and 14—often called "tweens"—were not wearing seatbelts when they were killed in car crashes. To combat these statistics, the National Highway Traffic Safety Administration recently launched the Never Give Up Until They Buckle Up campaign, targeting seatbelt use for tween passengers and their caregivers driving the vehicles.

NHTSA

The campaign engages parents and caregivers to ensure that tweens consistently and properly wear their seatbelts every time they are in a moving vehicle. A recent series of NHTSA focus groups found that seatbelt use often falls by the wayside during the hectic shuttling of kids to and from school and activities, when running short errands, or when parents are simply worn down.

A section on NHTSA's "Parents Central" Web site at www.safercar.gov/parents is devoted to the campaign and offers tips to motivate tweens to buckle up, information on how to know when a child is ready to use an adult seatbelt, and more. The campaign's message is clear: the car does not move until everyone in the vehicle is buckled up. The site also provides campaign materials including TV and radio spots, Web and print ads, and social media badges designed for easy sharing online.

For more information, visit www.safercar.gov/parents/index.htm.

California Completes West County Connectors

The California Department of Transportation (Caltrans), in partnership with the Orange County Transportation Authority, recently completed the West County Connectors Project in Orange County, CA. The $297 million project, designed to improve mobility, relied on $141.4 million in Federal-aid funds—$49.6 million from the American Recovery and Reinvestment Act and $91.8 million in funds from the Congestion Mitigation and Air Quality Improvement Program.


Atkinson Construction

The recently completed West County Connectors Project in Orange County, CA, included improvements to carpool lanes on I–405 and I–605 to alleviate congestion along one of the busiest corridors in the Nation.

The project aims to relieve congestion on one of the Nation's busiest highways, cut commute times, and make travel more efficient. It links high-occupancy vehicle lanes/carpool lanes on the San Diego Freeway (I–405) with those on the Garden Grove Freeway (SR–22) and San Gabriel River Freeway (I–605) to create a seamless carpool connection. The 6-mile (9.7-kilometer)-long project creates a better link between the cities of Garden Grove, Long Beach, Los Alamitos, Rossmoor, Seal Beach, and Westminster.

The improvements included constructing two direct carpool connectors and the addition of a second carpool lane in each direction on the I–405 between SR–22 and I–605. The project also reconstructed numerous on- and offramps, and improved landscaping along the route.

New Mexico to Explore Innovative Contracting

The New Mexico Department of Transportation (NMDOT) recently received approval from FHWA to use an innovative contracting approach on an experimental basis. The approach may help NMDOT save time and money over the life of a construction project.

Typically, highway projects in New Mexico have gone to the lowest bidder, risking increased costs in later phases. Under the new system, in awarding the job, NMDOT considers a prequalification score based on the contractor's past performance in addition to the contractor's bid. The approach applies to projects with a cost of more than $5 million and provides an incentive for contractors to be more reliable with cost—with an eye toward winning future bids.

NMDOT will capture elements of a prime contractor's performance and calculate a yearly prequalification factor applied to future job bids. Construction quality, timeliness, job safety, compliance, and claims records will be taken into account to develop a rating. Since the system rewards good performers and encourages poor performers to improve, NMDOT anticipates it will hold contractors to greater accountability and help avoid escalating costs and delays.

FHWA requires NMDOT to evaluate the new process every 3 years and to report to FHWA on a regular basis. Once FHWA has sufficiently evaluated the process, the agency will take steps for future implementation.

The State received approval to use this approach under FHWA's Special Experimental Project No. 14 (SEP-14) for innovative contracting. Under SEP-14, FHWA has allowed many State DOTs to embark on nontraditional, but carefully monitored, contracting practices aimed at streamlining the process. Many approaches, such as design-build, which enables the simultaneous design and construction of different phases of a project, have proven to be successful and are now widespread.

Grants Expand Realtime Travel Information

FHWA recently announced $2.6 million in grants to expand the use of realtime travel information in 13 highly congested urban areas across 10 States. These selected cities or regions will combine numerous information technologies and realtime travel information from highway, rail, and transit operations.

Many State and local agencies offer similar travel information, but separately. This new effort, known as integrated corridor management, takes realtime information a step further by combining updated congestion and incident data from various State and local agencies.

Travelers can use realtime information to avoid congestion and find alternate routes or transportation systems, such as transit or rail. Shippers can receive information concerning the entire network, not just one route. Such tools can help engineers make better decisions about congestion management by recommending where traffic should flow and onto which systems commuters should be shifted based on up-to-the-second data.

The technologies rely on many data sources simultaneously, such as live camera feeds, hundreds of traffic speed and volume detectors, pavement sensors, and even weather monitors to gather, transmit, and analyze information.

Two pilot systems are currently operational—on U.S. 75 in Dallas, TX, and on I–15 in San Diego, CA—and the lessons learned there are helping to improve other deployments. San Diego's I–15 traveler information app is tied into integrated corridor response plans and provides realtime updated information about traffic incidents and alternative routes.

The 10 States with the 13 selected projects are Arizona, California, Florida, Maryland, New Jersey, New York, Oregon, Texas, Utah, and Virginia.

For the complete list of projects and corridor locations, visit www.fhwa.dot.gov/pressroom/fhwa1504.cfm.

Caltrans Updates Strategy for Safety and Mobility

In a continuing effort to provide a safe, sustainable, integrated, and efficient transportation system to enhance California's economy and livability, Caltrans has released its Complete Streets Implementation Action Plan 2.0. The updated strategy outlines how the department will continue to address the safety and mobility needs of all modes of transportation through June 2017.

The action plan illustrates and details all the current efforts underway at Caltrans to further integrate complete streets design from the earliest stages of system planning through project delivery and maintenance and operations. The plan includes 109 additional action items, such as developing a State bicycle and pedestrian plan, collecting complete streets data and performance measures, and providing the Complete Streets Overview Training Course for Caltrans staff in all departmental functions.

A complete street design addresses the needs of all users of the system, including bicyclists, pedestrians, transit riders, and motorists, in a way appropriate to the local community. Benefits include mobility options and access for nondrivers; decreased vehicle trips, associated air pollution, and greenhouse gas emissions; improved livability; and lower transportation costs.

Caltrans' original plan for 2010–2013 consisted of 73 action items. More than three-quarters of those items are now complete or have seen substantial progress. Two completed items are a comprehensive update to the

© California Department of Transportation

State Route 255, shown here as it passes through Arcata, CA, serves as a main street and gateway for the city. The SR–255 project is an example of Caltrans' efforts to incorporate complete streets design into planning. The project won the Caltrans 2014 Excellence in Transportation Award in the category of Highway as a Main Street.

Highway Design Manual to facilitate the design of complete streets, and the release of *Complete Intersections: A Guide to Reconstructing Intersections and Interchanges for Bicyclists and Pedestrians* available at http://nacto.org/docs/usdg/complete_intersections_caltrans.pdf.

For more information, visit www.dot.ca.gov/completestreets.

Caltrans

Reporting Changes of Address

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Internet Watch

by Carrie Boris

Expanded Resources for Safety Professionals

In 2013 in the United States, 32,719 people died in motor vehicle crashes. Roadway safety professionals across the country are striving to improve the safety of the Nation's roads, but they face challenges as technologies emerge and new professionals enter the field. To support these safety stakeholders, the Federal Highway Administration's Office of Safety recently introduced two resources focused on professional capacity building.

The first is the Strategic Highway Safety Plan Community of Practice site, launched in summer 2014. The second is the revamped and expanded Roadway Safety Data Dashboard, which went live in January 2015. These sites offer practitioners quality safety data and practices to help agencies make sound decisions regarding the design and operation of roadways.

Building a Professional Community

A State's strategic highway safety plan (SHSP) provides a comprehensive framework for reducing fatalities and serious injuries on public roads. The plan identifies the State's key safety needs and guides investment decisions toward actions with the most potential for positive impact. The Office of Safety's online SHSP Community of Practice, available at http://rspcb.safety.fhwa.dot.gov/SHSP_COP.aspx, offers a forum for safety professionals to interact with their peers and learn about the latest resources, practices, and events.

The Web site centralizes information about roadway safety practices and strategies. It includes nearly 70 examples focused on SHSP topics, as well as links to resources from FHWA and other partners. It also offers Safety Talk, a forum for safety professionals to discuss strategies and approaches for updating, implementing, and evaluating State safety plans. The forum is currently open to SHSP coordinators in State agencies, but FHWA may make it available to a broader group as well.

"The community of practice is intended for SHSP practitioners and stakeholders who represent the four E's of safety: engineering, enforcement, education, and emergency services and response," says Jennifer Warren, the SHSP program manager with the Office of Safety. "It builds community by offering a peer environment to develop informal mentoring groups and professional relationships and creates a 'home' for the most current SHSP information from around the country."

Improving the Roadway Safety Data Dashboard

As part of another community of practice focused on safety data, the Office of Safety redesigned and updated its Roadway Safety Data Dashboard, available at http://rspcb.safety.fhwa.dot.gov/dashboard. The dashboard provides graphical presentations of various data elements that characterize fatal crashes on U.S. public roadways. Users can create charts and graphs to display fatality data related to the crashes, the vehicles, and the people involved.

"The redesigned dashboard improves the usability while expanding the capabilities of the site," says Danielle Betkey, a safety data project manager with the Office of Safety.

FHWA overhauled the dashboard's workflow to condense what had been multiple menus into one easy-to-follow, step-by-step procedure. Users can configure the dashboard to display fatalities at the national level, within a State or metropolitan planning organization's jurisdiction, or between multiple geographic areas. The dashboard enables users to create customizable graphs and maps offering a wide variety of data and comparison options. Users also can share the customized dashboard using a link creator that generates a unique URL.

Expanded capabilities include the ability to add graphs comparing different States or regions to a single dashboard, as well as new display options such as line, spline (fitted curve), and area charts. Users also can take advantage of new combinations of ways to display and compare data, including the manner of collision, people involved, and location and setting.

For more information about the SHSP Community of Practice, contact Jennifer Warren at 202-366-2157 or jennifer.warren@dot.gov. For more information about the Roadway Safety Data Dashboard, contact Danielle Betkey at 202-366-9417 or danielle.betkey@dot.gov.

Carrie Boris is a contributing editor for PUBLIC ROADS.

Training Update

NATIONAL HIGHWAY INSTITUTE

by Judy Francis and Vanessa Almony

Utility Coordination for Highway Projects

Every highway agency participates in construction projects that include accommodation and relocation of utilities along public rights-of-way. If planners do not fully consider the potential impact of utilities on construction—and of construction projects on existing utilities—during a project's planning stages, the result can be costly delays and dissatisfied stakeholders. To improve the process, the National Highway Institute offers course 134006 Utility Coordination for Highway Projects.

The course explores the importance of ongoing communication, cooperation, and coordination of utility-related activities throughout a project's entire life cycle. Recently, the Rhode Island Department of Transportation (RIDOT) hosted the course for its highway planners and engineers, as well as utility representatives.

"With the financial constraints that State transportation agencies across the country face today, the importance of utility coordination has never been greater," says Wilfred Hernandez, a managing engineer in RIDOT's Construction Management Group. "The course provided valuable technical information, including resources that enable participants to create a personal resource toolkit to guide the owner, contractor, and stakeholders through utility-related issues."

A Blended Approach

The course employs two methods for delivering training: Web-based training and instructor-led training. This blended approach enables participants to minimize time away from the office by completing self-paced, introductory material online whenever and wherever it is convenient. As part of this Web-based introduction, participants explore the importance of a State policy for accommodating utilities, differentiate between requirements for public and private utilities, are introduced to clear zone policies, learn about subsurface utility engineering quality levels, review agreements and memoranda, and identify safety concerns.

After completing the Web-based portion, participants arrive at the 2-day instructor-led session with common baseline knowledge. The valuable classroom time is spent working together to predict risks and focus on applying resolutions at the most appropriate stage of a project.

A Cooperative Effort

The course targets Federal, State, and local personnel who are responsible for planning, designing, constructing, operating, and maintaining transportation facilities that involve the accommodation or relocation of utilities. The course is most effectively delivered with participation of public and private utility companies, State department of transportation contractors, risk managers, right-of-way staff, mid- to senior-level managers, and engineering consultants.

Massachusetts Department of Transportation

During the demolition and replacement of this bridge in Ashland, MA, these utility conduits remained in place. Proper coordination, communication, and cooperation between the utility companies and the Massachusetts DOT during planning and construction reduced costs and other impacts to the project and to utility customers.

Including utility company representatives, contractors, and risk managers is integral to the success of the course. A minimum of 10 percent of the participants in every class should come from outside Federal, State, and local transportation agencies; up to 30 percent is ideal.

"Due to the unique application of utility coordination, training opportunities for frontline utility engineers are extremely limited," says Ken Leuderalbert, a utility program manager with the Federal Highway Administration. "This NHI training helps to fill the void and provides State and local transportation agencies, as well as the utility owners, with tools to improve business practices that are proven to reduce utility claims and construction project delays."

Transportation agencies interested in hosting course 134006 may submit a host request form or find more information at www.nhi.fhwa.dot.gov/training/intro_hosting.aspx. To register for a course or sign up to receive email alerts when new sessions of a particular course are scheduled, visit the course description page.

Judy Francis is a contracted marketing analyst for NHI. **Vanessa Almony** is a contracted instructional systems designer for NHI.

Continuing Education and Professional Development

NHI offers more than 300 courses spanning 19 program areas. Professionals interested in earning continuing education units (CEUs) or professional development hours can browse the digital course catalog at www.nhi.fhwa.dot.gov. NHI is accredited as an authorized provider by the International Association for Continuing Education and Training (IACET). As such, NHI offers CEUs for its programs that qualify under the American National Standards Institute/IACET Standard. Completion of course 134006 Utility Coordination for Highway Projects earns 1.2 CEUs.

Communication Product Updates

Compiled by Lisa A. Shuler of FHWA's Office of Corporate Research, Technology, and Innovation Management

Below are brief descriptions of communications products recently developed by the Federal Highway Administration's Office of Research, Development, and Technology. All of the reports are or will soon be available from the National Technical Information Service (NTIS). In some cases, limited copies of the communications products are available from FHWA's Research and Technology (R&T) Product Distribution Center (PDC).

When ordering from NTIS, include the NTIS publication number (PB number) and the publication title. You also may visit the NTIS Web site at www.ntis.gov to order publications online. Call NTIS for current prices. For customers outside the United States, Canada, and Mexico, the cost is usually double the listed price. Address requests to:

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For more information on R&T communications products available from FHWA, visit FHWA's Web site at www.fhwa.dot.gov, the FHWA Research Library at www.fhwa.dot.gov/research/library (or email fhwalibrary@dot.gov), or the National Transportation Library at ntl.bts.gov (or email library@dot.gov).

Evaluation of Dynamic Speed Feedback Signs on Curves: A National Demonstration Project (Report)
Publication Number: FHWA-HRT-14-020

Each year, more than 10,000 people are killed in speed-related crashes. The majority of these crashes occur on roads that are not part of the interstate system. Local streets and collector roads have the highest speed-related fatality rate per vehicle mile driven. To address this issue, safety professionals must help drivers better recognize road geometries, characteristics, and conditions and adjust their speed appropriately. This report discusses the effectiveness of dynamic signs that alert drivers to changes in roadway conditions and provide drivers with recommended speeds to safely negotiate a curve.

Systems of dynamic speed feedback signs are one method to reduce vehicle speeds and, consequently, crashes on curves. These systems show promise, but they have not been fully evaluated on curves. The Center for Transportation Research and Education at Iowa State University conducted a national demonstration project to evaluate the effectiveness of two different signs in reducing speeds and crashes on curves along two-lane roadways at 22 sites in 7 States. The project aims to provide traffic safety engineers and other professionals with additional tools to more effectively manage speeds and crashes on rural horizontal curves.

Researchers collected data before and at 1, 12, and 24 months after installation of the dynamic speed feedback signs. On average, most sites had decreases in mean speeds, with decreases up to 10.9 miles (17.5 kilometers) per hour, noted at both the point of curvature and center of the curve. Researchers compared the numbers of vehicles traveling 5, 10, 15, and 20 miles (8, 16, 24, and 32 kilometers) over the posted or advisory speed limit. Large reductions in the number of vehicles traveling over the posted or advisory speed occurred for all of the after periods, indicating that the signs were effective in reducing high-end speeds, as well as average speeds.

Researchers also conducted a before-and-after crash analysis, and developed crash modification factors ranging from 0.93 to 0.95 depending on the crash type and direction of the crash.

This document is available to download at www.fhwa.dot.gov/publications/research/safety/14202/index.cfm.

Long-Term Bridge Performance High Priority Bridge Performance Issues (Report)
Publication Number: FHWA-HRT-14-052

FHWA initiated the Long-Term Bridge Performance (LTBP) Program to collect, store, and analyze data to better understand how bridges deteriorate over time. Bridge performance includes performance of materials, protective systems, individual components of the bridge, and the structural system as a whole.

The success of the LTBP Program depends on being able to identify the most important performance issues faced by bridge owners. As a starting point, researchers classified possible issues and the parameters influencing performance into the following categories: structural

condition (durability and serviceability, including fatigue); functionality (user safety and service); costs (to State departments of transportation and users); and structural integrity (safety and stability in failure modes).

Researchers sought input from bridge owners and key stakeholders. They interviewed bridge experts in 15 State DOTs and asked them to name the most common or difficult-to-solve performance issues in their bridge inventories. This report includes findings from these interviews. The research team also held a workshop to identify high priority issues related to the performance of bridge substructures.

Researchers used the findings from the interviews and workshop to develop a list of 22 high priority performance issues. From this list, they recommended six bridge performance issues as the first topics to be studied under the LTBP Program. These topics include treated and untreated concrete bridge decks, deck joints, bearings, coatings for steel bridge superstructure elements (including weathering steel), and detection of the condition of embedded pretensioned strands and post-tensioning tendons in prestressed concrete bridge sections.

This report is intended for bridge program personnel from Federal, State, and local agencies, as well as parties engaged in bridge-related research and the bridge engineering community.

This document is available to download at www.fhwa.dot.gov/publications/research/infrastructure/structures/ltbp/14052/index.cfm. Printed copies are available from the PDC.

Alkali-Silica Reaction Mechanisms and Detection: An Advanced Understanding (TechBrief) Publication Number: FHWA-HRT-14-079

Traditional attempts to mitigate deterioration in concrete structures caused by alkali-silica reaction (ASR) focused on preventing or reducing the amount of gel formed by modifying the chemical environment. Engineers have found that limiting the alkali content of concrete, using supplementary cementitious materials, and employing chemical admixtures are effective strategies and have been used extensively for that purpose.

Given the complexity of chemical and physical mechanisms of ASR, researchers face difficulty in developing reliable test methods for quality control and models for performance prediction. This study aimed to provide an increased understanding of the fundamental mechanisms of ASR and to develop additional options for detecting and controlling ASR in susceptible aggregates.

This document discusses detailed research methodology and several potential approaches to determine the reactivity of aggregate, mitigate ASR, and detect the damage caused by ASR. These approaches include the advanced quick chemical test, use of a model to predict the minimum dosage of lithium nitrate, use of acoustic emission, and x-ray and neutron imaging to detect damage caused by ASR.

Researchers expect that a more indepth understanding of the mechanisms underlying ASR, combined with methods to detect ASR damage developed in this study, will help to establish more reliable methods of mitigating ASR and to increase the design life of newly constructed concrete structures.

This document is available to download at www.fhwa.dot.gov/publications/research/infrastructure/structures/bridge/14079/index.cfm. Printed copies are available from the PDC.

Interlaboratory Variability of Slip Coefficient Testing for Bridge Coatings (Report) Publication Number: FHWA-HRT-14-093

Bolted connections are a critical part of most steel bridges. Crews assemble individual components in the field using high-strength bolts, which are often designed to prevent slipping by relying on friction between the bolted surfaces created by the clamping force of the bolts. Because steel bridges may be painted to prevent corrosion, the coatings used on these surfaces must demonstrate a predetermined friction coefficient. The friction coefficient is defined by a test method determined by the Research Council for Structural Connections (RCSC). In recent years, the bridge engineering community—through the National Transportation Product Evaluation Program of the American Association of State Highway and Transportation Officials—has noted concerns that ambiguities within the test method might increase the variability of reported friction coefficients.

This report outlines the findings and recommendations from a round-robin laboratory study on slip coefficients of organic zinc-rich primers for steel bridges. Prior to this work, coating manufacturers noted the variability of slip coefficients for the same coatings despite no changes in formulation. Researchers conducted the study to quantify the variability and recommend changes to RCSC to reduce the variability.

The researchers found that participating labs followed the RCSC procedure, but were sometimes reporting very different slip coefficients for identical coatings. The major finding was that the manner in which each lab measured slip displacement contributed to the greatest variability in frictional coefficient results.

The study recommends that RCSC clarify its intended method for measuring slip deformation. Once implemented, the team anticipates that the revised test method will appropriately quantify coating frictional coefficients and ensure proper connection performance.

This report will benefit those in charge of specifying and testing steel bridge coatings, including coating manufacturers, RCSC, State DOTs, researchers, and design consultants.

The document is available to download at www.fhwa.dot.gov/publications/research/infrastructure/structures/bridge/14093/index.cfm.

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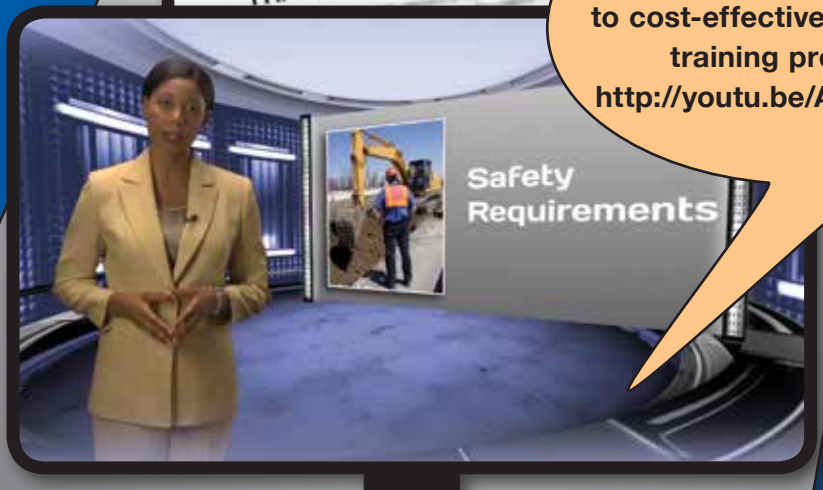

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