

SHRP2

Moving Us Forward

The Second Strategic Highway
Research Program (SHRP2)

Implementation Highlights 2015



SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD



U.S. Department of Transportation
Federal Highway Administration

AASHTO



Award-winning bridge project drew observers from across the country.

Representatives from Gila River Indian Community, state departments of transportation, FHWA Division offices, and AASHTO (above and right) gathered in **Arizona** to watch the final construction of the Gila River Bridge, which used the concepts of accelerated bridge construction from SHRP2's **Innovative Bridge Designs for Rapid Renewal (R04)**. Read the full story on page 8.



Working in Partnership

The second Strategic Highway Research Program (SHRP2) is a partnership of the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the Transportation Research Board (TRB). TRB

completed the research, and now FHWA and AASHTO are jointly implementing the resulting SHRP2 Solutions that will help the transportation community increase safety, enhance productivity, boost efficiency, and improve the reliability of the nation's highway system.

Cover photos illustrate SHRP2 in action. From top: Accident clean up using techniques from the *National Traffic Incident Management (TIM) Responder Training Program* – Photo courtesy Tennessee Department of Transportation (DOT); Massachusetts showcase for *Guidelines for the Preservation of High-Traffic-Volume Roadways* – Photo courtesy David Peshkin; Bridge Deck Scanner (BDS) using *Nondestructive Testing for Concrete Bridge Decks* – Photo courtesy Olson Engineering; *Innovative Bridge Designs for Rapid Renewal* showcase event – Photo courtesy Finn Hubbard, Fish & Associates; *Organizing for Reliability* – Photo courtesy FHWA; finished bridge using *Innovative Bridge Designs* – Photo courtesy Derin Campbell.

Moving Us Forward

The Second Strategic Highway Research Program (SHRP2)

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Photo courtesy RIDOT



Photo courtesy Shiraz Tayabji, Applied Research Associates, Inc.



Photo courtesy Carolyn Washburn, CH2M HILL



Photo courtesy VDOT

Partners in Innovation



Tools for the Road Ahead

As President of AASHTO, one of my goals is to ensure that the organization is well positioned to serve its membership for years to come. This means laying a solid foundation today for the kinds of transportation infrastructure Americans will use in the future. One way to achieve this goal is to make sure that our state departments of transportation have the tools they need now to face the many challenges ahead.

Thanks to the second Strategic Highway Research Program (SHRP2), AASHTO and its partner, the Federal Highway Administration, are bringing innovative approaches and technologies to transportation agencies across the country through targeted technical assistance and funding. I am pleased that my home state of Iowa is already benefiting from many SHRP2 innovations.

Currently, the Iowa Department of Transportation is deploying seven SHRP2 products that will help us make our roads safer; better manage utilities during construction; repair our bridges in a more cost-effective manner; improve travel-time reliability; and reduce congestion.

As you review this SHRP2 report, I hope you will see how significant the SHRP2 program has been to date. The four products highlighted are a testament to how SHRP2 is changing cultures within the transportation field and beyond, and are helping us save lives, save money, and save time.

As we enter the fourth year of SHRP2 implementation, my hope is that every state transportation agency finds ways to leverage the valuable tools available under the SHRP2 program.

Paul Trombino III
President, AASHTO
Director, Iowa Department of Transportation



Building an Innovation Culture

More than three years ago, FHWA and AASHTO—as long-time transportation partners—embarked on a journey to put SHRP2 Solutions into the hands of transportation agencies at every level of government. We knew that the extensive research conducted would reap important innovations that could change the way transportation agencies approach familiar problems. SHRP2 has seen a sustained high level of activity since its inception. As the program continues to build momentum, we are happy to report that this effort has been an unqualified success.

All 50 states, the District of Columbia, and Puerto Rico are now engaged in implementing more than 60 SHRP2 Solutions to address state-specific priorities and programs. With the deployment of these innovative products, we are now realizing the benefits associated with safer roadways, smarter transportation options for users, and increased efficiencies, resulting in cost savings to states, local and tribal agencies, and taxpayers. Innovation is essential to progress, but it does not come without risk. The FHWA-AASHTO SHRP2 Implementation Assistance Program (IAP) was designed to help transportation agencies access innovative solutions while providing financial and technical support to help minimize that risk.

In this report, you will find highlights from the first three rounds of the IAP. As SHRP2 continues to expand its reach, we thought it important to share early implementation results. In the following pages, we report on the progress we have made deploying the SHRP2 innovations from the earliest days of the IAP and highlight four solutions for which we have seen extraordinary results. We are saving lives, money, and time. As you read through the following stories, be assured there is much more to come.

SHRP2 implementation continues, and subsequent reports will focus on the products launched in rounds 4-7 of the IAP, as well as provide an update on the improvements that SHRP2 Solutions are bringing to the state of practice—improvements that will benefit the traveling public for years to come.

Both FHWA and AASHTO have a long-term commitment to building a culture of innovation—one where SHRP2 and complementary initiatives such as Every Day Counts are part of every transportation agency's normal business practices. Together we are moving forward and turning innovation into action.



Anthony T. Furst
Acting Executive Director, FHWA



Bud Wright
Executive Director, AASHTO

SHRP2

Real-World Solutions for Real-World Transportation Challenges

America's highway system provides vital links among all modes of transportation and supports everything we do. So we're keenly aware when the system isn't working as well as it could. Crash fatalities and injuries, deteriorating bridges and pavements, relentless congestion, and insufficient capacity to sustain a growing population—these all affect our nation's economy and quality of life.

Mandated by Congressional authorization in 2005, the second Strategic Highway Research Program (SHRP2) sought to address these pervasive highway transportation problems on a scale never before attempted. Building on the success of the first Strategic Highway Research Program, SHRP2 broadened its focus to address four strategic areas: safety, renewal, reliability, and capacity. These research focus areas addressed the most critical needs as discerned by the Transportation Research Board (TRB) and a broad array of stakeholders. From 2007 through 2013, TRB managed more than 100 individual research projects to find workable solutions in each focus area, supported by a \$224 million budget.

Those research projects resulted in more than 60 real-life solutions, and in 2010 the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) partnered to plan for the implementation of those solutions. An authorized budget of just over \$170 million supports SHRP2 implementation activities—with

about \$60 million of that contributed by the state departments of transportation (DOT) from their research funds.

In 2013, FHWA and AASHTO launched the SHRP2 Implementation Assistance Program (IAP) with a goal of deploying the products in as many real-world situations as possible, thereby significantly improving the state of practice. The three-tiered program has served as the primary framework for deploying SHRP2 Solutions. Under the IAP, SHRP2 Solutions are implemented at varying levels of product readiness, so three levels of assistance are offered: Proof of Concept, Lead Adopter, and User Incentive.

As of November 2015, SHRP2 has successfully delivered financial and technical assistance to recipients in every state, the District of Columbia, and Puerto Rico on more than 350 projects. More than 40 SHRP2 Solutions have gone through the IAP, enabling state DOTs, metropolitan planning organizations (MPOs), tribal agencies, FHWA's Federal Lands divisions, utilities, and other agencies to benefit from the power of innovation. Other significant SHRP2 deployments have taken place outside the IAP, most notably through FHWA's Every Day Counts (EDC) initiative.

As we reflect on the early implementation efforts, we can begin to see the benefits of those innovations, as foreseen in the strategic vision of SHRP2. This report highlights the successes of the first three rounds of the IAP and shares the bigger picture of the full



SAFETY
Identifying the behaviors that cause and avert collisions



RENEWAL
Enabling faster, minimally disruptive, and longer-lasting infrastructure improvements



RELIABILITY
Championing predictable travel times



CAPACITY
Bringing greater collaboration to road building

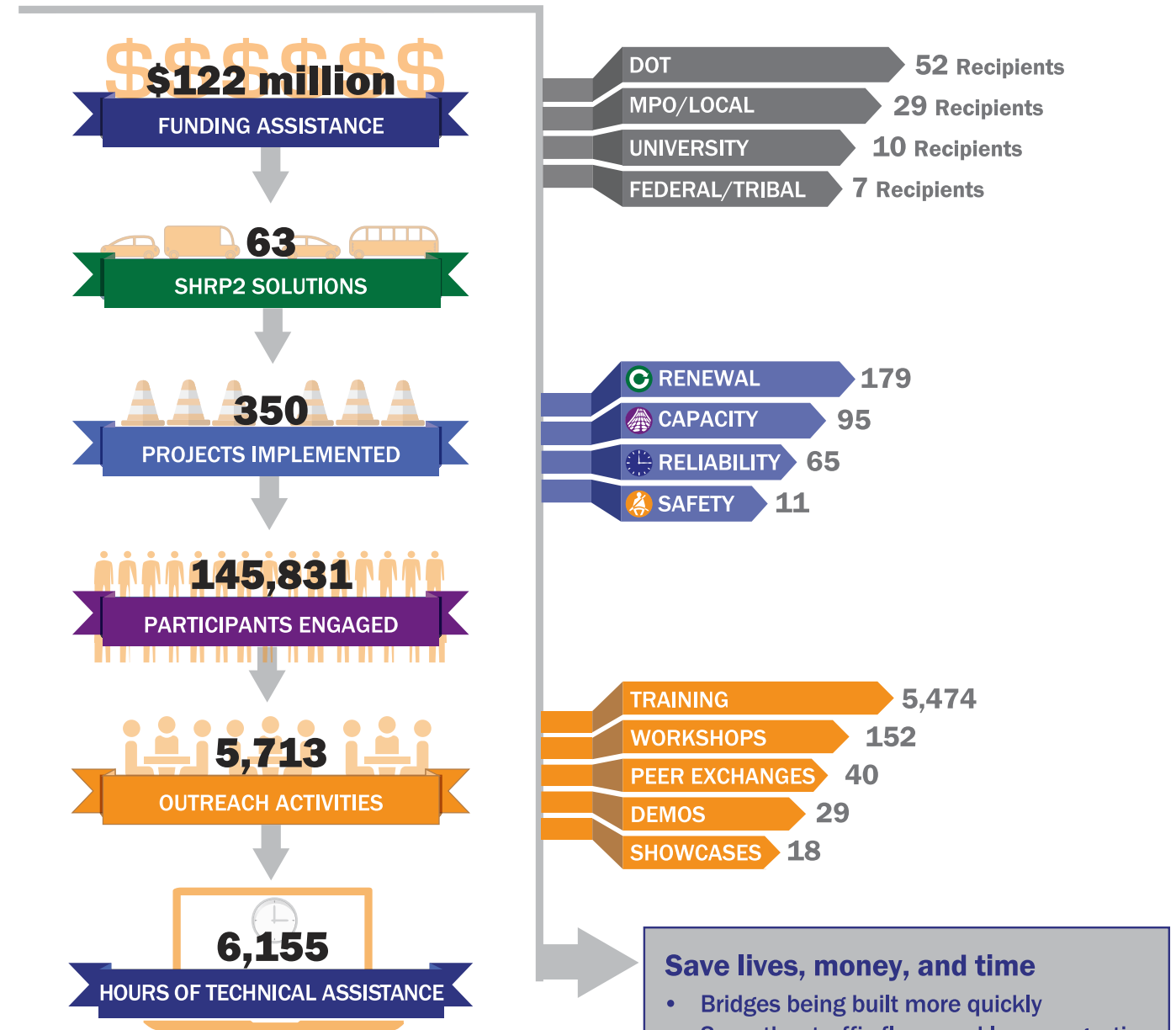


SHRP2 implementation, including the groundbreaking SHRP2 safety research. Subsequent reports will cover the remaining rounds and explore SHRP2's long-term impact on the state of practice in the transportation industry, as well as its benefits to the traveling public.

Big Impact, Real Results

From Research into Practice: SHRP2's Implementation Progress

Innovations to help America improve safety, rebuild and repair aging roads and bridges, and reduce congestion.



Save lives, money, and time

- Bridges being built more quickly
- Smoother traffic flows and less congestion
- Reduced construction costs
- Safer roadways
- Smarter environmental reviews

*The data shown here and throughout this report are as of November 1, 2015.



Rhode Island DOT replaced and reopened the Warren Avenue Bridge in just 21 days using *Innovative Bridge Designs for Rapid Renewal*. | Photo courtesy RIDOT



Building Bridges More Quickly Innovative Design Draws Award from ENR for Arizona Bridge

In Arizona, a traffic detour lasted only 11 days instead of an expected six months while a new bridge was constructed over the Gila River. In Rhode Island, a busy highway ramp in Providence was closed for only 21 days to replace a bridge leading to Interstate 195, compared to a 330-plus-day closure for a similarly sized bridge reconstruction using conventional methods.

In both cases, the bridges being reconstructed used the SHRP2 Solution, *Innovative Bridge Designs for Rapid Renewal* (R04). The process uses a variety of accelerated techniques, including precast bridge superstructures that are often constructed right next to the existing bridge, to speed construction and reduce the time a bridge is closed. With more than 50,000 bridges across the country needing replacement or major repairs, these accelerated bridge techniques can significantly reduce the inconvenience to motorists, compared to the much longer time bridges are closed using more traditional methods.

For motorists, these brief closures mean fewer hours making major detours, lower fuel costs, and less time sitting in backups due to construction. For transportation agencies, typical bridges can be built or replaced faster; reducing onsite construction time; minimizing traffic delay and community disruption; improving work zone safety; and improving bridge quality. Since many of the strategies don't require special equipment or construction techniques, this approach can be used by local contractors.

"Using accelerated bridge construction can be viewed as more expensive from a material and perceived

risk perspective, but the savings to the public from traffic delays and detours can be many times the cost of the bridge repair," said Pam Hutton, AASHTO's SHRP2 implementation manager. If all these savings are calculated, Hutton, who is the former chief engineer for the Colorado Department of Transportation, estimates that the nation's taxpayers could potentially save more than \$35 billion if DOTs used accelerated bridge techniques when replacing the tens of thousands of aging bridges needing reconstruction.



The completed Rustic Road Bridge, Boone County, MO | Photo courtesy Derin Campbell

Reducing the aggravation to drivers was an important consideration for the Gila River Indian Community when it needed to replace a dangerous bridge over the Gila River in Sacaton, AZ. The bridge had no sidewalks or shoulders and was both structurally deficient and functionally obsolete.

"Because the bridge provides a vital link in the community, a long closure for repairs would present a substantial hardship. It had to be replaced and quickly," said Sasha Pachito, planning manager in the Gila River Indian Community DOT.

ENR Southwest recognized the Gila River Bridge reconstruction with its Best Projects Merit Award in the highways and bridges category, one of commercial construction's most prestigious honors.

Using the SHRP2 process, the new bridge segments were constructed next to the existing bridge using conventional technology. Then the old bridge was demolished and four new bridge segments were slid into place using hydraulic jacks, resulting in only an 11-day bridge closure.

Pachito said that the replacement was such a success the agency is planning to use a similar process for other bridge replacements on the reservation.

Matthew DeMarco, FHWA's SHRP2 renewal program engineer for structures, pointed to another important benefit to using accelerated construction – decreased worker exposure to hazardous construction environments. "When you consider

that over 500 construction workers died on highway job sites last year due to traffic encounters, safety becomes an important consideration when opting for accelerated construction."

In another example, the Missouri Department of Transportation used the innovative bridge technology to replace a 57-year-old bridge in Columbia. The Route B Bridge over Business Loop Interstate 70 carries up to 22,000 vehicles a day between Columbia's central business district and its northeast suburbs.

The bridge reconstruction posed numerous challenges due to very tight right-of-way constraints, underground utilities, pedestrian and railroad access, lack of space to store materials, height and safety concerns, and significant traffic under the bridge. The existing bridge was closed, demolished, and replaced with a shorter and wider structure on nearly the same alignment in 35 days. Using more standard construction techniques, a similar bridge reconstruction would take 60 days to three months to complete, adding more delays, detours, and congestion for people using this route.

Derin Campbell, Boone County, MO, county engineer, drew inspiration from this reconstruction when he designed the Rustic Road Bridge, which had its own complications because it was the only access point into a community.

"We were able to complete the bridge in less than 25 days,"



Engineers observe the "side-slide" bridge project at the Gila River Indian Community in Sacaton, AZ during a showcase event for *Innovative Bridge Designs for Rapid Renewal*. | Photo courtesy Finn Hubbard, Fish & Associates

"Due to these successes and the information we are sharing with the bridge community, we are expanding the reach of this SHRP2 effort beyond our initial implementation – a major goal for us."

—MATTHEW DEMARCO, FHWA



The completed Warren Ave Bridge, Providence, RI | Photo courtesy RIDOT

Campbell said. "We were also able to engage the contracting community and get them on board with the new techniques, which is critical if we are going to replicate this process with other bridges in our county."

Thanks to a concerted effort to promote the accelerated construction techniques to a wide range of audiences, FHWA hopes more agencies will see the value in using this approach for their bridge projects.



Organizing for Reliability helps agencies assess and improve their operational, technical and business processes to better manage unexpected congestion. | Photo courtesy Trevor Wrayton, VDOT



Reducing Congestion Without Adding More Lanes

Sitting in traffic is no one's idea of a good time. But more often than not, this has become commonplace, regardless of where you live or what time of day.

A recent study by the Texas Transportation Institute (TTI) found that rush-hour commuters in urban areas spend an extra 42 hours a year on average in bumper-to-bumper traffic. More than half of these delays are due to crashes, special events, road work, bad weather, or poorly timed traffic signals. When delays are unexpected or unpredictable, commuters, freight haulers, or other motorists have a harder time knowing how long to plan for a trip, leading to frustration and wasted time. As a result, TTI reports that the average commuter faces more than \$960 a year in additional costs due to time lost and increased fuel consumption.

Because of tighter state transportation budgets, fewer new roads or additional lanes are being constructed. As a result, many transportation agencies are implementing sophisticated processes designed to reduce congestion and keep traffic moving without adding capacity. Traffic management centers, cameras, managed lanes, and other operational techniques are being employed to leverage existing roadway capacity, create safer roadways, and provide more reliable traffic flows so drivers can better plan their days.

To ensure that these systems are being used to maximum effect, transportation agencies turned to SHRP2. SHRP2's **Organizing for Reliability** (L01/L06) is fostering more reliable travel times by helping transportation agencies advance their business processes and organizational capabilities for operations. Through the Capability Maturity Model (CMM) tool developed as part of *Organizing for Reliability*, agencies can evaluate their strengths and weaknesses in six areas: business processes, systems and technology, performance measurement, culture, organization and workforce, and collaboration.

Transportation agencies, with support from FHWA, use the CMM tool to conduct an agency self-assessment. Using the results, agencies develop an action plan to address weaknesses in the six CMM dimensions. By systematically advancing their action plans, agencies can improve their transportation systems management and operations programs, also referred to as TSM&O programs. Improving



A traffic operations center in Fairfax County, VA | Photo courtesy Trevor Wrayton, VDOT

TSM&O programs can lead to reduced congestion and enhanced travel-time reliability.

Already more than 38 transportation agencies, including DOTs, MPOs, and regional or corridor coalitions, are using the CMM self-assessment tool to help advance their TSM&O programs and the reliability of their highway systems. As one example, crippling congestion along the Interstate 24 corridor between Nashville and Murfreesboro and in other high-traffic areas recently prompted the Tennessee Department of Transportation (TDOT) to conduct a top-to-bottom CMM self-assessment of how the agency is managing its highway networks with a goal of reducing congestion and improving traffic flows on its highways.

Paul Degges, TDOT's chief engineer and vice chair of the AASHTO Standing Committee on Highways, is a big supporter of TSM&O programs and use of the CMM. "The public has paid for those traffic lanes, and we need to do what we can to maximize their efficiency.

"Following the CMM self-assessment, we totally recrafted how our maintenance and operations staff work together in the field, and we've created a new Traffic Operations Division, helping the agency function more efficiently and save money.

"How does this help the driving public? What drivers will notice is that 'I'm not hung up in traffic,'" Degges said.

Joe Gregory, FHWA's SHRP2 *Organizing for Reliability* program manager, also credits the CMM

tool as opening the eyes of TSM&O professionals to relatively low-cost options that will help them address congestion. "Conducting a self-assessment using the CMM tool helps agencies look within their organization and ask the right questions about their capabilities and guides their direction to effectively improving the mobility and reliability of their transportation system," Gregory said.

Ohio drivers are experiencing fewer delays due to a comprehensive review and subsequent actions by the Ohio DOT using SHRP2's Organizing for Reliability tools.

The Ohio Department of Transportation (ODOT) is another state engaged in implementing the CMM self-assessment. Ohio is a crossroads state, a Northeast-Midwest-Great Lakes multistate corridor linchpin vital to national freight mobility. Jason M. Yeray, administrator for ODOT's Traffic Operations, said that by looking comprehensively at all aspects of TSM&O—from traffic signals to intelligent transportation systems components and snow removal—traffic congestion has been reduced, with 93 percent of all trips experiencing little delay. More reliable travel times for freight and other traffic are being realized due to the state's benchmarking.

The California Department of Transportation (Caltrans) also sees savings in agency budgets as a result of its CMM self-assessment. Nick Compin, chief of the Advanced System Management Branch, Caltrans Division of Traffic Operations, said, "It would have

Featured SHRP2 Solutions *Organizing for Reliability*



DOTs are using the CMM tool to improve TSM&O programs and reduce congestion. | Photo courtesy FHWA

TSM&O investments lead to:

- A safer highway system for drivers and for incident responders.
- More efficient and effective use of the existing capacity.
- Enhanced customer mobility via state-of-the-art technologies.
- More reliable service for commuters and shippers, thereby enhancing economic competitiveness.
- Fewer bottlenecks without new construction through the use of techniques such as ramp metering or hard shoulder running.

“More and more people are now realizing that we can't tackle non-recurring congestion without partnerships and coordination. In the long run, we know this will result in big improvements in our state's travel-time reliability.”

**—JOAN SOLLENBERGER
CHIEF OF THE OFFICE OF STRATEGIC
DEVELOPMENT, CALTRANS DIVISION OF
TRAFFIC OPERATIONS**

taken years of funding to create a TSM&O program without the Capability Maturity Model. That alone saved us a huge amount of time and effort.”



Balancing transportation and the environment | Photo courtesy MDOT



Saving Time While Protecting the Environment

More than half of Maine's rivers and streams provide habitat to sustain the last remaining populations of Atlantic salmon in the United States. As a result, whenever the Maine Department of Transportation (MaineDOT) has to expand a road or reconstruct a highway, it has to ensure this salmon habitat is protected. Similarly, halfway across the country, the Michigan Department of Transportation (MDOT) is working to ensure the waters and wetlands of the sensitive Western Lake Erie Basin are protected as it rebuilds Interstate 75.

Both states have turned to **Implementing Eco-Logical** (C06) to help them meet both their ecosystem and transportation goals, while reducing delays during environmental reviews and permitting. *Implementing Eco-Logical* brings together transportation agencies, resource agencies, and other key stakeholders to identify and map critical ecological areas. Through this collaborative process, environmental impacts can more quickly be addressed before, or during, the planning stage of transportation projects.

"One of our greatest challenges as transportation agencies is moving a project through the environmental review process in a timely fashion," said Pam Hutton, AASHTO's SHRP2 implementation manager and former chief engineer for the Colorado Department of Transportation. "With *Eco-Logical* we can achieve positive environmental outcomes while delivering transportation projects more quickly to our customers, saving taxpayer dollars."

Reducing Delays and Protecting Salmon Habitat in Maine

For MaineDOT, the endangered species designation for Atlantic salmon means that even small infrastructure projects, such as replacing a culvert, may require consultation under Section 7 of the Endangered Species Act. The lengthy consultation process can sometimes take up to two years. As a result, approvals also required under the National Environmental Policy Act are frequently delayed. The result: 100 percent of MaineDOT projects requiring consultation for Atlantic salmon missed their initial target date for construction bidding schedules.

By using the approach included in *Eco-Logical*, MaineDOT, in coordination with the U.S. Fish and Wildlife Service (USFWS), is drafting a programmatic biological assessment (BA) for the endangered salmon. Judy Gates, director of MaineDOT's Environmental Office, anticipated this will reduce the required consultation process to five to 10 days, compared to the roughly two years it currently takes.

Gates said the programmatic BA includes a set of activities and performance standards that will ensure protection of the Atlantic salmon during transportation construction projects near salmon

habitats. Working with agencies such as the USFWS and the National Marine Fisheries Service, MaineDOT is identifying top priority areas for Atlantic salmon conservation and restoration and is improving the dialogue with environmental regulators and research agencies.

Reducing the required consultation process from two years to 10 days is a game changer.

Gates said, "Once completed, the programmatic BA would be a game changer for us. It would dramatically streamline the permitting process, saving the state time and money."

Protecting Lake Erie While Rebuilding Michigan's Interstate 75

Interstate 75 along Lake Erie is the busiest freight corridor in the state. As it plans to rebuild a 20-mile stretch along the lake, MDOT must protect 40 acres of wetland impacts, threatened and endangered species, water quality, and impaired streams. Using *Eco-Logical*, MDOT, federal, state, and local agencies, and private stakeholders such as the Nature Conservancy are working together to identify ways to avoid adversely impacting Lake Erie and its habitats as they improve the roadway.

By mapping ecological concerns and developing mitigation strategies across the watershed, MDOT is building strong relationships with regulatory agencies and is developing several programmatic agreements, according to Margaret Barondess, MDOT manager of the Environmental Services Section,

Bureau of Development. One key outcome will be the creation of 30 acres of coastal wetland in the Erie State Game Area.

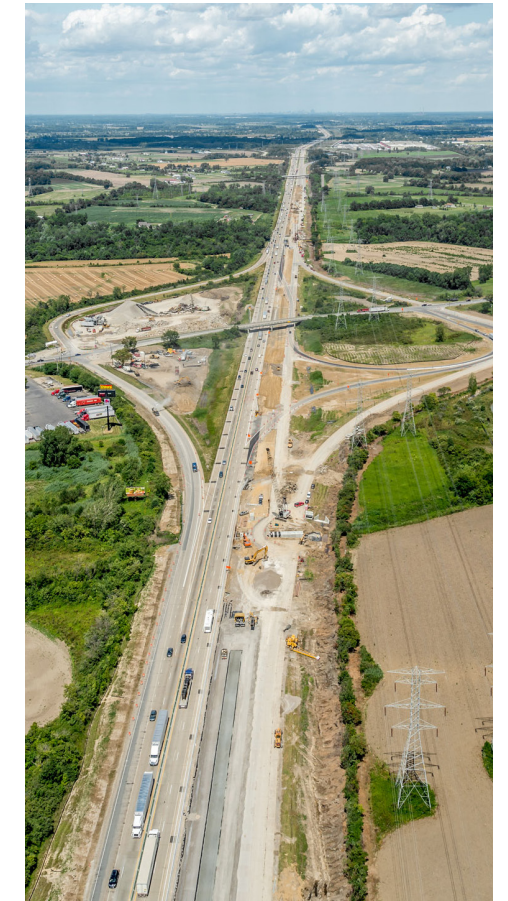
"With our interagency agreements, we are realizing time savings in the environmental review process through the digitizing of information on state parks and recreation properties. Now we can access the data immediately versus doing time-consuming research," Barondess said. "We are also breaking down barriers to placing wetland mitigation sites on state lands managed by the Michigan Department of Natural Resources, opening up a new area of cooperation for mutual benefit between two state agencies."

David Williams, FHWA's SHRP2 environmental protection specialist, said the ability to bring together agencies with very different missions makes this SHRP2 product unique and powerful.

Featured SHRP2 Solutions Implementing Eco-Logical



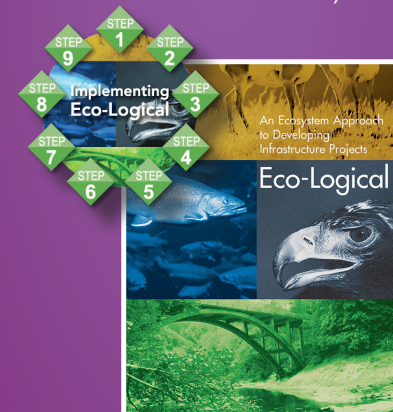
Mitigation banking peer exchange
| Photo courtesy Carolyn Washburn, CH2M HILL



I-75 in southeast Michigan near Lake Erie
| Photo courtesy MDOT

“Implementing *Eco-Logical* is about people coming together, sharing quality data and conservation priorities with the goal of efficient project delivery—accompanied with successful environmental outcomes that serve the public's interest. **”**

—DAVID WILLIAMS
ENVIRONMENTAL PROTECTION
SPECIALIST, FHWA



“Using *Implementing Eco-Logical* enables those conversations with federal agencies so that we end up with a project that does the right thing for the environment at the right time and in the right place. **”**

—KIRK STEUDLE
DIRECTOR, MICHIGAN DEPARTMENT
OF TRANSPORTATION



Northern VA responders work in a coordinated manner to clean up a major vehicle crash on I-495. | Photo courtesy VDOT



Incident responders in Las Vegas put the lessons from the TIM Responder Training to use. | Photo courtesy Nevada Highway Patrol

Featured SHRP2 Solutions
Incident Responder Training



Prince William, VA, County firefighter reviews the online TIM training | Photo courtesy Prince William County, VA, Fire and Rescue



‘Safe, Quick Clearance’ Training Protects Incident Responders and the Traveling Public

In the middle of the morning rush hour on the Virginia side of Washington, DC’s Capital Beltway, a tractor trailer collided with a passenger vehicle. The tractor trailer split in half and overturned. Gridlock ensued on Interstate 495, one of the busiest highways in the nation – with both the inner and outer loops closed.

Law enforcement, fire and rescue, emergency medical services, towing companies, and transportation officials immediately converged on the scene—with clear and deliberate action. These skilled responders had completed SHRP2’s *National Traffic Incident Management (TIM) Responder Training Program (L12)*. They were able to work together like a NASCAR pit crew to tend to the injured, remove the wreckage from the scene, clear debris, and reopen traffic lanes.



Training at Tennessee’s new Traffic Incident Management Training facility. | Photo courtesy Tennessee DOT

Vehicle crashes can be dangerous not only for the drivers and passengers involved but also for the police, fire, and rescue crews assisting at the crash scene. On average, 100 responders die annually in the United States as they work to clear traffic crashes.

“Due to the complexity of that event, so many agencies responded but we were regularly coordinating with each other and we leveraged extra resources from each of the agencies to clear the scene quickly,” said Mike Wood, regional incident management coordinator with the Virginia Department of Transportation (VDOT). “Because of the training, all of the responders were focused on opening travel lanes as soon as possible.”

The TIM training is sponsored by the Federal Highway Administration and was created by responders for responders. Participants learn how to better manage traffic flows around crashes, work more efficiently as a team, and put in place “quick clearance” techniques to create a safe work area. This allows responders to clear crashes more quickly, reducing congestion delays and secondary crashes.

Training developed by responders for responders.

More than 136,000 incident responders across all 50 states, the District of Columbia, and Puerto Rico have been trained using the TIM Responder Training curriculum. Fifteen public safety academies have adopted it for all new recruits.

The Vermont State Police integrated the TIM curriculum into its police academy to ensure that all new state, local, and county law enforcement officers receive the training. Lieutenant Garry Scott, with the Vermont State Police Traffic Operations Unit, notes that coordination among responders has improved dramatically.

After TIM training in Arizona, roadways were cleared of non-injury crashes 52 percent faster – resulting in fewer secondary accidents.

“Our police officers and responders are on the road in dangerous situations every day. The TIM training is one way we can all be on same page and understand where we should be positioning ourselves to ensure that we’re as safe as possible when we’re responding to a crash,” Lt. Scott explained.

incident responders across all agencies in the United States during the next several years. FHWA recently released a new tool that may be used by jurisdictions to objectively measure and identify any links between the course, individuals trained, and improved field performance.

“We know this works. We want our folks out there to be safe and to keep motorists safe as well, and not just now, but well into the future,” Austrich said. “The Virginia Capital Beltway incident is a good example of the benefits of the TIM training – communication, coordination, and cooperation.”

Jurisdictions using the TIM curriculum report positive – and immediate – results. In July, two car-sized granite boulders fell onto the roadway of Nevada State Route 28 near the north side of Lake Tahoe, blocking both travel lanes on a blind curve. Responders came from the Nevada DOT, highway patrol, fire departments and the sheriff’s office. Instead of a one- to two-hour clean up, the scene was cleared in less than 30 minutes. The difference? All of the responders had completed TIM training.

Incident responders can receive the free training via three options:

- One 8-to-10-hour, in-classroom intensive course with tabletop exercises and field discussions
- One 4-hour, in-classroom condensed version
- Ten web-based, self-directed online modules delivered through the **National Highway Institute** for a total of 4 hours of training

In all cases, the training covers these TIM best practices:

- TIM fundamentals and terminology
- Notification and scene size-up
- Safe vehicle positioning
- Scene safety
- Command responsibilities
- Traffic management
- Special circumstances
- Clearance and termination
- Telecommunications

“The training is paying dividends. It’s created a shift in culture. You’re seeing a greater degree of coordination between responders and our towing companies, improved resource sharing, and a greater commitment to developing a unified command approach to traffic incidents.”

—MIKE WOODS
REGIONAL INCIDENT MANAGEMENT
COORDINATOR, VDOT

Product Highlights from Rounds 1-3

The FHWA/AASHTO Implementation Assistance Program (IAP) provides financial and technical assistance to state departments of transportation (DOTs), metropolitan planning organizations (MPOs), and other organizations interested in deploying SHRP2 Solutions. Six implementation assistance offerings have been made through 2015. The Product Highlights section provides a brief overview of products offered in Rounds 1 through 3, and includes data on the range of activities that have been undertaken to date.

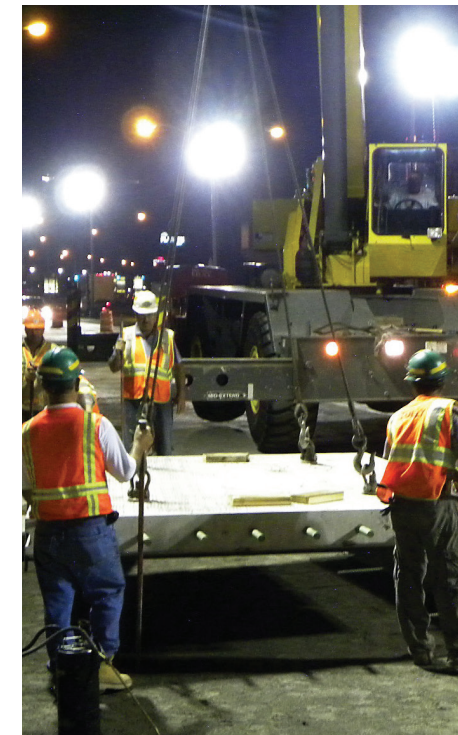
Roads and Bridges

Replacing Bridges in Days Instead of Months or Years

Across the country, agencies are applying smarter, faster ways to replace aging bridges using innovative designs and accelerated bridge techniques that will increase safety, save money, reduce traffic disruption, and win public support. SHRP2's **Innovative Bridge Designs for Rapid Renewal** (R04) offers standard plans and techniques that can be adapted to rebuild most small- to medium-sized bridges. Bridges are replaced in less time, and installed in hours or days, rather than weeks or months.

●13 BRIDGES BUILT ●3 FIELD DEMONSTRATIONS ●3 PEER EXCHANGES
●3 SHOWCASES ●1 TRAINING SESSION ●1 WORKSHOP ●700+ PARTICIPANTS

Thirteen new bridges have been constructed using these techniques. In Providence, **Rhode Island**, a bridge was replaced in only 21 days compared to 330 days for a similar project using traditional methods. A bridge important to tourism in southern **Maine** was replaced in only 29 days. By using precast elements in **Michigan** during freezing weather, contractors were able to avoid environmental damage from heavy equipment. Others implementing this product are: **Arizona, California, Kentucky, Missouri, and Wisconsin.**



The SHRP2 *Precast Concrete Pavement* toolkit is being used in 25 states and the District of Columbia to repair highway pavements. | Photo courtesy FHWA

Precast Concrete Speeds Pavement Repairs

Well-designed and well-constructed precast concrete pavement (PCP) systems are often a good choice to rapidly repair and rebuild existing highway pavements. The SHRP2 Solution, **Precast Concrete Pavement** (R05), offers a series of guidelines and model specifications to help agencies know when to use PCP, and how to design, fabricate, and install long-life jointed and prestressed PCP systems.

From repairing interstate freeways to ramps, intersections, bus pads and bridge approaches, PCP is in use in a wide range of applications in **Alabama, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, Pennsylvania, Texas, Utah, Virginia, West Virginia** and **Wisconsin.**

●7 WORKSHOPS ●5 TRAINING SESSIONS ●2 SHOWCASES
●1 FIELD DEMONSTRATION ●1 PEER EXCHANGE ●400+ PARTICIPANTS

Identifying Pavement Options for Heavily Traveled Roadways

Extending the life of high-traffic roadways without major reconstruction and traffic disruption can save time and money. **Guidelines for the Preservation of High-Traffic-Volume Roadways** (R26) provide transportation agencies with the decision-making tools they need to identify the right pavement preservation technique to use for their unique situation.

●3 PEER EXCHANGES ●2 WORKSHOPS ●1 SHOWCASE ●245 PARTICIPANTS

Peer exchanges in **Minnesota, Alabama, and Massachusetts** are sharing lessons learned with the 14 transportation agencies using this solution. A new **video** and **Data Collection Guide** offer specific steps for users to identify data requirements for project and treatment selection. Other states using this resource are **Arizona, Delaware, District of Columbia, Georgia, Kentucky, Maine, Missouri, Pennsylvania, Rhode Island, Tennessee, Washington, and Wisconsin.**

Use of Existing Pavements Can Save Money

By reusing existing pavements when rehabilitating roadways, transportation agencies experience a win-win environmental and economic solution—the process reduces costs, speeds project completion, and saves resources while building pavements that can last 30 to 50 years. By using *rePave*, an interactive web-based pavement design scoping tool as part of **Pavement Renewal Solutions** (R23), agencies can target the best treatment options for any specific site conditions.

When the Washington Department of Transportation used these tools on a project to rehabilitate Interstate 5, the agency saw a 20 percent savings in construction costs, and



A pavement recycling operation in Virginia. | Photo courtesy VDOT

reduced construction-related lane closures by 43 percent. Nine states are now actively engaged in implementing this product: **California, Kentucky, Louisiana, Minnesota, New Jersey, New York, North Dakota, Utah** and **Arizona.** **California** is considering ways to incorporate these tools into its existing policies and procedures, other states are developing policy guides about when and where to use this technique.

●8 SITE VISITS AND PROGRAM REVIEWS ●4 TRAINING SESSIONS
●2 USER GROUP WEBINARS ●120+ PARTICIPANTS



The Sacaton Bridge was replaced using the *Innovative Bridge Designs* toolkit and was the first "bridge slide" project used by a tribal nation. | Photo courtesy Gila River Indian Community



Wisconsin DOT applies a pavement preservation treatment using the *Guidelines for the Preservation of High-Traffic-Volume Roadways.* | Photo courtesy WisDOT

Roads and Bridges *(continued)*



Knowing the proper soil conditions before construction begins is critical to keeping on budget and on schedule. | Photo courtesy Ryan Berg

Choosing the Right GeoTech Solution

A significant number of construction claims can be attributed to soil-related issues, often generating unexpected costs for transportation agencies. Understanding how issues with the ground conditions may impact road or bridge construction is critical to ensuring safe and cost-effective projects. New tools and a website developed through **GeoTechTools** (R02) help engineers and project managers select and apply the most appropriate solution considering site-specific conditions. Using these tools earlier in the planning stages also leads to better-informed decisions and reduced risk.

Fourteen states and FHWA Federal Lands Highway Division are currently using this product, including **Arizona, Connecticut, Florida, Iowa, Kentucky, Louisiana, Massachusetts, Minnesota, Mississippi, Missouri, New Jersey, New York, Utah, and West Virginia.**

●4,600 REGISTERED WEBSITE USERS ●18 TRAINING WORKSHOPS ●300 PARTICIPANTS

Set the Goals and Make Way for Creative Solutions

Allowing the contracting industry to provide creative solutions in transportation projects can result in faster project delivery, minimal disruption, and greater durability. By focusing on the outcomes instead of the methods employed, the specifications included in **Performance Specifications for Rapid Renewal** (R07) can promote faster construction and improved quality, while reducing costly oversight. This leads to streamlined, faster construction, and reduced

worker and motorist exposure to construction-zone hazards.

Five states are currently using this product for a wide range of activities such as project selection, specification development, procurement, and changes that are necessary to achieve desired performance. Implementation is underway in **Alabama, Maine, Missouri, Pennsylvania, and Vermont.**

●1 PEER EXCHANGE ●1 WORKSHOP
●160 HOURS OF TECHNICAL ASSISTANCE



Performance specifications can result in faster project delivery, minimal disruption, and greater durability. | Photo courtesy Gallivan Consulting, Inc.

“SHRP2 is one of those engines that generates new ideas, new thoughts about how we can do things better. As a result, we will end up with a stronger transportation network that allows us to be able to support a growing economy and a much safer way of traveling.”

—PAUL DEGGS
CHIEF ENGINEER, TENNESSEE
DEPARTMENT OF TRANSPORTATION,
AND VICE-CHAIR, AASHTO STANDING
COMMITTEE ON HIGHWAYS

Planning and Project Delivery

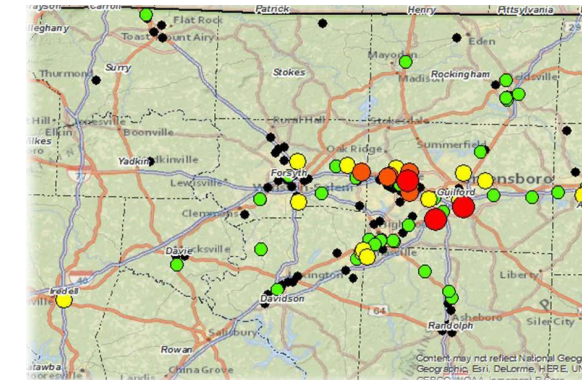
Planning for a Growing Freight Economy

Moving freight efficiently is a winner for everyone—from shippers and motorists who share the roadways to the consumers who receive the goods and services carried by millions of trucks each day. Understanding and forecasting freight flows are critical to planning for the rapid increases in freight traffic that affect every aspect of transportation from roadway safety and congestion to the condition of the pavements. Targeting limited investments through the use of state-of-the-art modeling practices can increase a region’s economic vitality while ensuring good freight movements across the country.

Freight Demand Modeling and Data Improvement (C20)

offers tools and a road map that will enable state, regional, and local planners to better predict freight movement trends and make more informed project investment decisions.

Eleven agencies are engaged in a range of projects to enhance freight movement. The **Winston-Salem, NC, Metropolitan Planning Organization** is using site visits and surveys to improve its freight datasets. The **Delaware Valley Regional Planning Council** is enhancing its *Philly-Freight-Finder* app, which can be used by other agencies to map data. Other transportation agencies engaged in using this product are located in **Arizona, Maryland, Oregon, Florida, Missouri, New York, South Dakota, Washington, and Wisconsin.**



Key freight nodes are being identified as part of a three-stage plan to develop an enhanced freight model for Winston-Salem, NC. | Photo courtesy Piedmont Triad Freight Study Final Report

●20 TRAINING WORKSHOPS ●3 PEER EXCHANGES ●3 SHOWCASES ●2 TRAINING SESSIONS ●250+ PARTICIPANTS



FHWA’s David Williams and Larry Anderson at a training session on *Expediting Project Delivery* | Photo courtesy SDDOT

Speeding Up the Delivery of New Transportation Projects

Speeding up the delivery of needed transportation projects is high on everyone’s agenda—from the traveling public to the local communities that rely on scheduled delivery of goods and services. **Expediting Project Delivery** (C19) offers two dozen strategies, innovative approaches, and pathways for early coordination with resource agencies, stakeholders, and the public. This approach can help transportation agencies avoid or reduce delays in all phases of project development, from planning to final construction.



The Florida Department of Transportation will conduct a mitigation risk analysis on the Gateway Express project in Pinellas County. | Photo courtesy FDOT

Among the 10 agencies implementing these strategies is the **Massachusetts Department of Transportation**, which is developing an environmental screening tool and enhanced early environmental coordination tools to help expedite project delivery. In **Arizona, the Maricopa Association of Governments** is developing a risk register with stakeholders to expedite the planning and environmental reviews of key regional transportation projects in the Intermountain West. Other transportation agencies implementing this product are located in **Arkansas, Florida, Idaho, California, Nebraska, South Carolina, South Dakota, and Vermont.**

●8 WORKSHOPS ●225 PARTICIPANTS

Planning and Project Delivery *(continued)*



The Ochocho Creek Bridge in Prineville, OR that will be replaced using *Managing Risk in Rapid Renewal Projects*. | Photo courtesy Lea Ann Hart-Chambers, Oregon DOT

Better Risk Management to Help Keep Projects on Time and on Budget

Highway projects that combine innovative solutions with good project management strategies are often completed more quickly, saving money, creating less traffic disruption, and reducing exposure for workers and drivers during construction. The practical methods included in *Managing Risk in Rapid Renewal Projects* (R09) help transportation agencies identify, assess, mitigate, and monitor project risk, leading to better financial management of budgets and fewer construction changes due to unanticipated issues—saving both project time and money.

Nine states, **Puerto Rico**, and **FHWA Federal Lands Highway Division** are leading the implementation of these new methods and incorporating them into their existing policies and practices. As examples, **Florida** has acquired risk analysis software for statewide risk management and is implementing risk-based project contingencies. **Oregon** is incorporating a risk management framework for its Project Delivery Guidance. Others engaged in implementation include **Alabama, Alaska, Arizona, Georgia, Pennsylvania, Minnesota, and New Mexico.**

•10 WORKSHOPS •2 TRAINING SESSIONS •250 PARTICIPANTS

Management Strategies Spur Innovation in Building Complex Projects

The delivery and construction of today’s complex transportation projects are being accelerated through a new management approach that speeds decision making, addresses complex issues, and expedites government approvals to more rapidly replace aging highways, bridges, and other transportation facilities.

The SHRP2 Solution, *Project Management Strategies for Complex Projects* (R10), offers practical tools and techniques to spur innovation while minimizing schedule and budget risks on both large and small projects. By expanding the typical management considerations of technical, schedule, and cost requirements to include finance and context, these strategies encourage innovation and partnering while recognizing that each complex project has its own distinct challenges and goals.

Twelve DOTs and **FHWA Federal Lands Highway Division** are implementing the strategies, including **Alaska, Georgia, Iowa, Massachusetts, Michigan, New Hampshire, North Carolina, Rhode Island, Washington,** and **Wisconsin.** **Michigan** is using these strategies in its major project management plans for improvements to I-75 and I-94 modernization projects. Similarly **Georgia** is using the process as it constructs almost 30 miles of new reversible managed lanes in the Northwest Corridor Project in Atlanta.

•18 WORKSHOPS •3 TRAINING SESSIONS •400+ PARTICIPANTS



Members of the RIDOT project team discuss the I-95 Northbound Viaduct project during a workshop. | Photo courtesy FHWA

Operations



Organizing for Reliability is a set of tools that helps agencies assess and improve their technical and business processes to better manage unexpected congestion. | Photo courtesy FHWA

Improving Traffic Operations to Create More Predictable Travel Times

Making travel times more predictable by reducing intermittent congestion can also improve safety by reducing crashes and help maximize existing roadway capacity. By using the assessment tools in *Organizing for Reliability* (LO1/06), agencies are improving their day-to-day traffic operations and are better managing traffic interruptions. The tools enable transportation agencies to examine their current operational practices, look for organizational efficiencies, and determine what steps to take to improve their transportation systems management and operations (TSM&O) programs.

Thirty-eight transportation agencies at the state, local, and regional levels are now developing action plans based on these assessments in these states: **Arizona, California, Colorado, District of Columbia, Florida, Georgia, Indiana, Iowa, Kansas, Maryland, Michigan, Missouri, Nevada, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Tennessee, Utah,** and **Washington.**

•48 TRAINING SESSIONS •47 WORKSHOPS •19 PEER EXCHANGES •5 SHOWCASES •2,800+ PARTICIPANTS

Saving Lives through Quicker and More Coordinated Crash Clearance

Three injury crashes occur every minute in the United States, putting incident responders and the traveling public potentially in harm’s way. It’s a sad fact that on average 100 responders die each year as they work to clean up traffic crashes. To improve safety at crash scenes and reduce congestion and secondary incidents caused by back-ups, a new traffic incident management curriculum was developed through SHRP2. The *National Traffic Incident Management (TIM) Responder Training Program* (L12) trains teams of incident responders to work together in a coordinated manner, from the moment the first emergency call is made to final scene clearance.



Northern VA responders clear debris from a major vehicle crash on I-495. | Photo courtesy VDOT

Already more than 136,000 incident responders in all 50 States, the **District of Columbia,** and **Puerto Rico** have been trained. Three free training options are available: in-person classroom, web-based, and a “train the trainer” program, which encourages those who have completed the training to train others in their agencies.

At least 15 public safety academies are now requiring the online training course for new recruits. The **Tennessee** Departments of Transportation and Highway Patrol have built a new modern training facility, and are requiring all contractors to take the training.

•5,151 IN-PERSON RESPONDER TRAINING SESSIONS WITH 127,848 PARTICIPANTS •1,835 PARTICIPANTS IN WEB-BASED TRAINING •193 TRAIN-THE-TRAINER SESSIONS WITH 7,115 PARTICIPANTS •136,798 RESPONDERS TRAINED

Operations *(continued)*

New Resource to Support Smarter and More Efficient Operations

Transportation agencies, researchers, and policymakers now have convenient access to best practices, webinars, peer exchanges, technical reports, and services through the new **National Operations Center of Excellence** (NOCOe), designed for the transportation systems management and operations (TSM&O) community.

A comprehensive **website** contains case studies, technical resources, recorded webinars for on-demand learning, links to an array of

information, discussion forums, and a calendar of TSM&O-related events. The center's Technical Services Program, funded through contributions from state transportation agencies and FHWA, offers opportunities for participants to share and discuss key challenges, and receive training and technical assistance on subjects ranging from software and equipment options, emerging traffic management approaches, organizational structure, new maintenance techniques, or a myriad of other issues. The center is a partnership of AASHTO, the Institute of Transportation Engineers (ITE), and



Since holding a TSM&O workshop in 2009, Tennessee DOT created a Traffic Operations Division, which uses cameras like this one to monitor traffic flow on its highways. | Photo courtesy TDOT

the Intelligent Transportation Society of America (ITSA) with support from the FHWA.

Solutions to Address Utility and Railroad Coordination



To coordinate a bridge removal project in Oregon over Burnt River and the Union Pacific Railroad, transportation officials used SHRP2's *Railroad DOT Mitigation Strategies*. | Photo courtesy FHWA

Improving Coordination Where Highways and Railroads Intersect

Each year, transportation agencies construct hundreds of highway projects that cross over, under, or parallel railroad rights of way. As railroad volumes continue to grow, effective project coordination between public highway departments and railroads is essential. The tactics included in **Railroad-DOT Mitigation Strategies** (R16), streamline and improve the coordination process, saving time and money for both entities. Through a collection of model agreements, sample

contracts, training materials, and standardized best practices, public agencies and railroads can identify and work through or avoid sources of conflict to advance projects more quickly.

Fourteen DOTs are working on implementing this solution: **Arkansas, California, Colorado, Delaware, District of Columbia, Florida, Idaho, Kentucky, New York, North Carolina, Pennsylvania, South Dakota, Texas, and Utah.**

- 7 REGIONAL SUMMITS (THROUGH FHWA'S EVERY DAY COUNTS)
- 2 TRAINING SESSIONS
- 1 WORKSHOP
- 413 PARTICIPANTS

Transportation and the Environment

“When we build our highways, our bridges, our other modal facilities, it's very important that we take the environment as a concern, and we make sure we do things properly.”

—DAVID BERNHARDT
COMMISSIONER, MAINE
DEPARTMENT OF TRANSPORTATION,
AASHTO VICE PRESIDENT



In April, AASHTO and FHWA facilitated an *Eco-Logical* workshop with MaineDOT, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the National Marine Fisheries Service, and the Maine Department of Marine Resources. | Photo courtesy Carolyn Washburn, CH2M HILL

Improving Environmental and Transportation Outcomes

Transportation agencies are always looking for better ways to do the right thing for the environment while building needed transportation projects. By using the tools offered in **Implementing Eco-Logical** (C06), transportation agencies can improve environmental outcomes, stay on schedule, and strengthen relationships with federal, state, and local regulatory agencies. Most notably, early collaboration with environmental agencies has led to quicker and more balanced decisions for projects.

Activities include the development of a new web-based **Eco-Logical Starter Kit** that provides the tools to implement the *Eco-Logical* approach and steps to establish a Regional Ecosystem Framework (REF). A new case study featuring the **Colorado** Department of Transportation's Interstate 70 Mountain Corridor is also available. Transportation agencies and metropolitan planning organizations in the following 13 states are using the *Eco-Logical* approach: **California, Colorado, Georgia, Idaho, Indiana, Kentucky, Maine, Michigan, Missouri, New Hampshire, Ohio, Texas, and Virginia.**

- 5 TRAINING SESSIONS
- 4 PEER EXCHANGES
- 4 SHOWCASES
- 2 FIELD DEMONSTRATIONS
- 1 WORKSHOP
- 412 PARTICIPANTS

Managing Utility Issues to Speed Projects

Telephone and Internet cables, electric and gas lines, and pipes of all sizes have to be considered when a transportation agency digs near underground utilities. Early identification of any potential utilities that might exist in the right of way for a planned construction or rehabilitation project is critically important. By using the tools contained in **Identifying and Managing Utility Conflicts** (R15B), agencies can identify and resolve utility conflicts early in a project, avoiding costly delays and saving thousands of dollars.

States implementing the product include **California, Delaware, Indiana, Iowa, Kentucky, Maryland, Michigan, New Hampshire, Oklahoma, Oregon, South Dakota, Texas and Utah.** **Kentucky** developed the Kentucky Utilities and Rail Tracking System or KURTS; three other agencies are studying the KURTS system for potential use in their own states.

- 14 TRAINING SESSIONS
- 350 PARTICIPANTS



Gas company employees repairing a utility line on a road in Alexandria, VA | Photo courtesy Liz Roll, FEMA



FHWA's Safety Training and Analysis Center (STAC) provides transportation researchers with training, technical assistance, and analytical tools to expand the use of the SHRP2 data.

Photo courtesy FHWA



“SHRP2 has developed tremendous resources for the transportation industry, and I guarantee that every state can find and use something that suits their needs and that they will reap real benefits.”

—KIRK STEUDLE

DIRECTOR, MICHIGAN, DEPARTMENT OF TRANSPORTATION,
CHAIR, AASHTO STANDING COMMITTEE ON HIGHWAYS,
FORMER CHAIR, SHRP2 OVERSIGHT COMMITTEE

New SHRP2 Data May Lead to New Solutions to Reduce Crashes and Improve Highway Safety

Traffic safety is a top priority of transportation agencies across America—safety for all road users including motorists, pedestrians, highway workers, and incident responders. Every 14 seconds someone is injured on America's highways.

Although driver behavior is cited as the primary factor in more than 90 percent of crashes, little is known about what role this behavior plays in causing or preventing the crash. A newly created resource will enable agencies and their researchers to understand exactly what drivers are doing during real-world conditions and then associate this behavior with actual roadway characteristics and driving conditions.

SHRP2's three-phased approach to safety research—called **Concept to Countermeasure, Research to Deployment Using the SHRP2 Safety Databases**—is supported by \$7 million in financial and technical assistance through the SHRP2 Implementation Assistance Program. Developed through the SHRP2 Safety focus area,

the Naturalistic Driving Study (NDS) database and Roadway Information Database (RID) offer more than two petabytes of driver behavior data to researchers and their DOT counterparts.

Rudy Malfabon, director of the Nevada Department of Transportation and chair of AASHTO's Safety Task Force, said, "This research will ultimately enable states to develop specific measures that will help us reduce crashes and save lives."

In the first phase of research conducted this year, 11 teams from 10 states used small sets of data to conduct preliminary analyses of eight different safety concerns. In Phase 2, which was just announced, nine teams will continue their research and conduct more thorough, in-depth analyses using a larger set of data from the NDS and RID. In the final phase, tentatively set for 2017, the most promising countermeasures identified in the research will be considered for implementation in

Phase 3. These countermeasures could include new engineering designs or concepts, more precise public outreach efforts, or other measures to improve highway safety.

To continue this research beyond SHRP2, FHWA established the Safety Training and Analysis Center (STAC) at the Turner-Fairbank Highway Research Center. The STAC will expand FHWA's services to state DOTs by providing technical assistance and training opportunities that increase their knowledge of the data and its potential to address a variety of transportation problems, especially those related to driver behavior.

Areas of Study

- Pedestrian Safety
- Roadway Departures
- Speeding
- Work Zones
- Horizontal and Vertical Curves
- Interchange Ramps
- Adverse Conditions
- Roadway Lighting

What's Ahead: SHRP2 in the Future

As FHWA and AASHTO approach the mid-point of SHRP2 implementation, activities at the state, federal, and local levels are in high gear and will continue at a furious pace. More than 50 workshops, peer exchanges, showcases, field demonstrations, training sessions, and other activities are already scheduled for 2016, with many more being added as new products are introduced. Significant efforts to assess the performance, benefits, and value of these solutions will also continue.

The final round of the **Implementation Assistance Program** will be offered from April 1 – 26, 2016, with informational webinars scheduled in February and March. Five new products will be available for technical and financial assistance along with ten already in implementation. Three utility products will be offered in a “bundle” for the first time to maximize their efficiencies and effectiveness. (A complete list is on page 27.)

Ten universities will advance their work in SHRP2's **Education Connection** in the year ahead, developing college-level curriculum that will prepare the transportation workforce of the future with the latest in SHRP2 tools, processes, and innovative state-of-the-practice solutions.

The **SHRP2 Milestones** quarterly newsletter will continue to highlight stories of successful implementation across the four focus areas—renewal, capacity, reliability, and safety.

Finally, the next phase of safety research using the **Naturalistic Driving Study** and **Roadway Information** databases will get underway. (See adjacent story.)

Taken together, SHRP2 implementation continues to gather momentum, offering promising solutions to the key challenges faced daily by transportation agencies at every level of government.



Service Life Design for Bridges (R19A) | Photo courtesy KYTC



Technologies to Enhance Quality Control on Asphalt Pavements (R06C) | Photo courtesy Rutgers University



Nondestructive Testing for Tunnel Linings (R06G) | Photo courtesy Olson Engineering

Important SHRP2 Online Resources for Transportation Agencies



Numerous websites and web-based software applications have been developed through SHRP2. This year, several were launched and are already providing a wealth of information, processes, opportunities for online discussions and peer exchanges, manuals, and other resources. | www.fhwa.dot.gov/GoSHRP2 or <http://SHRP2.transportation.org>

SHRP2 Solutions in Round 7 of the Implementation Assistance Program

The following SHRP2 Solutions are scheduled to be available through the FHWA/AASHTO Implementation Assistance Program in 2016. This will be the last opportunity to take advantage of the IAP's financial and technical assistance to implement SHRP2 products.



Application Period: April 1 – April 29, 2016
Webinars: February – March 2016 (dates TBD)



Implementing Eco-Logical – A web-based toolkit to implement the *Eco-Logical* approach and to establish a Regional Eco-System Framework.

<https://www.environment.fhwa.dot.gov/ecological/ImplementingEcoLogicalApproach/default.asp>



PlanWorks – Web-based resource designed to support collaborative decision making to deliver projects that meet environmental, community, and mobility needs.

<https://fhwaapps.fhwa.dot.gov/planworks/>



TravelWorks – Enhanced models that better account for traveler behavior, leading to more informed decisions about highway capacity needs.

<https://planningtools.transportation.org/10/travelworks.html>



NOCoe – The National Operations Center of Excellence and related website.

<http://transportationops.org>



rePave – An interactive web-based pavement design scoping tool that provides options for rehabilitating pavements based on existing pavement conditions. The study, scoping tool, and accompanying resources focus on long-life options (30 to 50 years).

<http://www.pavementrenewal.org/>

GeoTechTools – A technology selection tool and resource identifying more than 40 geotechnical solutions.

<http://GeoTechTools.org>



EconWorks – Easy-to-use tools for economic analysis of transportation investments.

<https://planningtools.transportation.org/13/econworks.html>

CAPACITY

PlanWorks (C01)

Systematic web-based resource that supports collaborative decision making to deliver projects that meet environmental, community, and mobility needs.

RENEWAL

Utility Bundle (R01A/R01B/R15B)

Products to identify, record, and retrieve utility locations throughout the design process to aid in reducing costly relocations.

Railroad-DOT Mitigation Strategies (R16)

Model agreements to improve coordination between transportation agencies and railroads.

Techniques to Fingerprint Construction Materials (R06B)

Procedures and equipment to identify various construction materials in the laboratory and with portable devices.

Advanced Methods to Identify Pavement Delamination (R06D)

Tools to detect subsurface delamination in asphalt pavements.

Guidelines for the Preservation of High-Traffic-Volume Roadways (R26)

Your guide to selecting the most-affordable options for extending pavement life.

Nondestructive Testing for Concrete Bridge Decks (R06A)

Recommended technologies to detect deterioration of concrete bridge decks.

Nondestructive Testing for Tunnel Linings (R06G)

Nondestructive testing technologies to pinpoint defects in or behind tunnel linings.

Service Life Design for Bridges (R19A)

Guidance, training, and technical assistance promoting service life design concepts and methods.

Service Limit State Design for Bridges (R19B)

Tool kit to perform state or site-specific calibrations for service limit state design for bridges.

RELIABILITY

Reliability Data and Analysis Tools Bundle (L02/L05/L07/L08/C11)

Tools to help transportation planners and engineers improve monitoring and analysis of data to achieve more consistent, predictable highway travel.

Reliability in Simulation and Planning Models (L04)

Guidelines for incorporating reliability performance measures into travel models.

Regional Operations Forum (L36)

Training program to advance transportation systems management and operations.



SHRP2 photos, from top: Roadway lighting system, *Safety* – Photo courtesy WSDOT; *Innovative Bridge Designs for Rapid Renewal* showcase event – Photo courtesy FHWA; *Organizing for Reliability* – Photo courtesy FHWA; *Expediting Project Delivery* training – Photo courtesy FHWA; *Implementing Eco-Logical* project in Maine – Photo courtesy MaineDOT.

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