FHWA-23-CAI-008
November/December 2023 | V17 | Issue 99

INNOVATOR

U.S. Department of Transportation

Federal Highway Administration

Alaska pilots new features on unmanned aerial systems to monitor and mitigate high-risk avalanche corridors.

Credit: Alaska Department of Transportation & Public Facilities

Get Innovator on your mobile device! Text "FHWA Innovation" to 468311

Share

Alaska Expands Reach of UAS in Remote Locations and Extreme Conditions

The use of **unmanned aerial systems** (UAS) has exploded in recent years as State and local agencies continue to find new and innovative applications for this versatile technology. The Alaska Department of Transportation and Public Facilities (DOT&PF) recently expanded its UAS capabilities for critical infrastructure inspection with UAS docks and has approved UAS for a unique use-case—avalanche monitoring and mitigation.

Docks Provide Real-Time Link

Alaska's remote geography and frigid temperatures present several challenges for the DOT&PF. First, while UAS can help practitioners gain a bird's-eye view of bridges and other critical infrastructure, the pilots must typically still be onsite, requiring them to sometimes travel long distances and face potentially dangerous conditions to deploy UAS where needed.

To overcome this challenge, the DOT&PF spent nearly a year documenting and testing UAS docks. These docks are systems that allow full support for beyond visual line of sight (BVLOS) missions for UAS. BVLOS missions, where a pilot does not need to physically see the UAS during flight, represent the next big opportunity for agencies to expand UAS operations and their benefits.

The UAS docks provide a secure remote landing place allowing for rapid and continuous UAS deployments, significantly reducing personnel time on site. Once these systems are set up and a flight path is programmed on site by a pilot, docks can keep the UAS and its battery warm to prevent icing, provide a platform from which to take off and land, recharge the unit, and upload its data to the web through a satellite internet connection.

"Using docks replaces some of the human support needs on the ground and gives us better situational awareness through data collection," said Ryan Marlow, UAS/Drone Program Coordinator for the Alaska DOT&PF Division of Statewide Aviation.

The docks allow the DOT&PF to program flights for repeated data collection on a time schedule or on-demand, depending on the needs of the mission. While evaluating docks for emergency response along Alaska's Dalton Highway, the agency deployed UAS morning and evening, capturing data for managers to conduct analysis from over 600 miles away. The DOT&PF could also share the collected data in real-time with other organizations and groups, which led to more effective communication and collaboration.

"Everything is controlled through a web interface," Marlow added. "Users can access from home, work, or through a mobile device. These docks can provide a real-time link to the UAS, even during a mission, to anyone who needs access to the data. This greatly reduces the personnel needs of having to have experienced pilots onsite. Now, pilots can support these missions remotely, even from other States."

Even with the benefits that UAS docks offer, the agency still needs a way to deploy them quickly to sites that are sometimes very far away. The DOT&PF is testing lightweight dock units that can be shipped on the small aircraft used to travel between locations in the State. The agency is currently preparing for a full winter trial of these docks with icing and snowfall to test durability.

Avalanche Monitoring and Mitigation

Avalanches present a dangerous and sometimes deadly challenge for the people of Alaska. In all areas of the State, even near its biggest cities, losing road access can result in critical challenges to residents, infrastructure, first responders, and

UAS docks give the Alaska DOT&PF the ability to regularly monitor some of its most remote locations.

the supply chain due to single entry and exit points. Deploying docks to support UAS monitoring of avalanches offers a potentially safer, reliable alternative to traditional methods.

Preprogrammed UAS missions can collect snow distribution data automatically without the need for human interaction, providing the data to avalanche specialists who are sometimes hundreds of miles away. This important information can potentially be used to make data-driven decisions on hazards and where avalanche mitigation may be necessary.

"Using a remotely deployed dock and UAS, organizations can now accomplish in a day what would have taken an entire team several days of travel and acquisition to do using manned aircraft," said Marlow.

When it comes to actual avalanche mitigation, when conditions are appropriate, specially trained maintenance crews **use military artillery** and other methods to artificially trigger avalanches at certain sites. The DOT&PF gained Federal Aviation Administration approval to develop a dropping mechanism that will attach to the UAS and allow remotely controlled pinpoint explosive drops to trigger and redirect avalanches. This will offer an alternative mitigation option that requires less manpower compared to using military artillery, with the added safety benefit of reducing exposure times to personnel.

The combination of dock-based BVLOS operations and remote dropping capabilities is an advancement over all traditional methods of avalanche mitigation efforts. With these new capabilities, Alaska can monitor remote and difficult to access locations with high levels of precision to make highly informed decisions about where avalanches present the greatest risk. With the increased availability of avalanche risk data, the capability to precisely and remotely place explosives to trigger avalanches under controlled conditions represents an extreme improvement in safety for the public. This monitoring and mitigation approach with these new UAS-based technologies can serve to maintain high-risk avalanche corridors throughout the United States.

"The sky is truly the limit when it comes to UAS and their possibilities," said James Gray, Every Day Counts round five UAS team lead. "We, at FHWA, are excited to see States continue to embrace this technology and integrate it into their ongoing operations processes."

MORE INFORMATION

@ Contact **James Gray**, UAS program manager, FHWA Office of Infrastructure, for UAS information and technical assistance.

@ Contact **Ryan Marlow**, UAS program coordinator, Alaska DOT&PF, for details on Alaska's program.

Share this article on your social media accounts

Reducing Greenhouse Gas Emissions through Transportation Planning

Increased greenhouse gas (GHG) levels can lead to climate change and extreme weather, which affects both people and our investments in infrastructure. The United States has set an economy-wide **target** of reducing GHG emissions by at least 50 percent below 2005 levels by 2030. As the Nation's largest generator of GHG emissions, the transportation sector can significantly address GHG emissions and their impact on quality of life.

To help meet the target, FHWA included **integrating GHG assessment and reduction targets in transportation planning** as part of Every Day Counts round seven (**EDC-7**). This initiative addresses vehicle tailpipe and life-cycle emissions. Life-cycle emissions represent carbon emissions released through building materials, including mineral extraction, manufacturing, transportation, construction, and disposal.

"We're inheriting 100 years of infrastructure that has been focused on moving people around cities, States, and the country that is very carbon intensive," said David D'Onofrio, EDC-7 integrating GHG team co-lead. "It's a challenge, but transportation planning can retrofit that infrastructure and play a unique role in addressing GHG emissions in the future."

The planning process for agencies such as State departments of transportation (DOTs) and metropolitan planning organizations (MPOs) takes place over multiple years and lays the foundation for how funds will be invested in transportation infrastructure. By integrating GHG into the planning process and making it one of the key decision factors for infrastructure investments, agencies can curb future emissions.
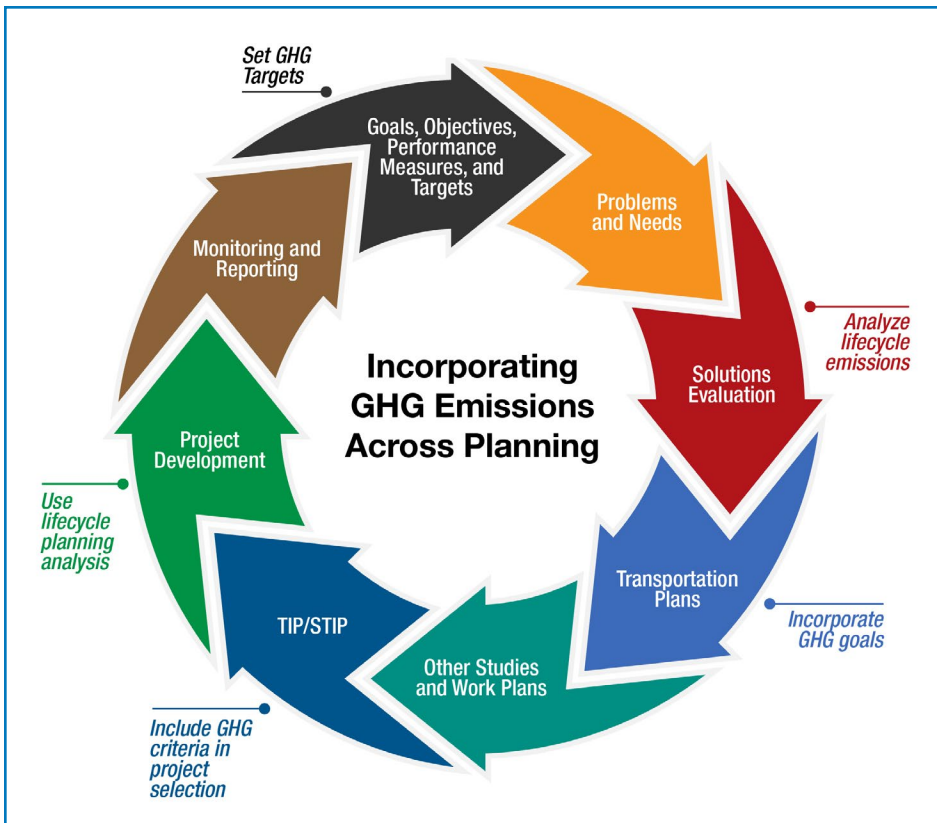
For example, expanding public transit networks, building more bike lanes, and creating pedestrian-friendly infrastructure could help reduce reliance on cars. Transportation planners can also promote the use of electric vehicles and expand the availability of charging infrastructure to help reduce tailpipe emissions. Another consideration is land use. The need to drive is often determined by the fact that housing and where people work, shop, play, or go to school may be far apart. By further integrating land use and transportation planning, planners can help reduce the need to drive.

Incorporating GHG assessment and reduction targets into the transportation planning process can seem overwhelming, but the EDC-7 initiative is designed to make it easier by linking stakeholders with information on when and how to incorporate GHG considerations. Even those

Credit: FHWA

*Watch this **spotlight video** to learn more about this EDC-7 innovation.*

Credit: FHWA

Incorporating GHG Emissions Across Planning

Set GHG Targets

Goals, Objectives, Performance Measures, and Targets

Problems and Needs

Analyze lifecycle emissions

Solutions Evaluation

Transportation Plans

Incorporate GHG goals

Other Studies and Work Plans

Include GHG criteria in project selection

TIP/STIP

Project Development

Use lifecycle planning analysis

Monitoring and Reporting

This graphic illustrates typical steps an agency completes during the transportation planning process. Examples are included on the outside of the planning wheel to show how GHG emissions can be considered.

transportation planners, engineers, and decision-makers make informed choices that promote lower-carbon infrastructure development. The tool allows users to assess the carbon footprint of various aspects of transportation projects, including construction materials, energy consumption, and vehicle operations.

In 2008, California adopted the Sustainable Communities and Climate Protection Act, **Senate Bill 375**, which sets regional GHG reduction targets for MPOs. The law requires MPOs to align land use planning and transportation investments to reduce the need for long car trips, promote transit-oriented development, and work with local governments to ensure housing is available near transit and employment centers.

The EDC-7 integrating GHG initiative will help transfer knowledge on tools and strategies currently in use among agencies so more agencies can act now to help decrease future emissions.

who may be halfway through the long process of creating a transportation improvement plan can benefit. "We want to meet agencies where they are in the process and provide useful information for whichever stage they are at on the planning wheel," said D'Onofrio.

Agency Examples

DOTs and MPOs in several States are taking action to integrate best practices related to GHG assessment and reduction into the transportation planning process.

Oregon is one of several States taking action to integrate GHG policy and analysis into planning and project development. "I think we need to consider how our investments affect how people travel," said Oregon DOT Policy, Data, and Analysis Administrator Amanda Pietz. "We must make the connection between end users and whether emissions will increase or decrease due to our investment."

The Minnesota DOT developed the **Minnesota Infrastructure Carbon Estimator** tool to help

MORE INFORMATION

↖ Visit the EDC-7 Integrating GHG Assessment and Reduction Targets in Transportation Planning **webpage**.

▤ Subscribe to the Integrating GHG Assessment and Reduction Targets in Transportation Planning **e-bulletin**.

@ Contact **David D'Onofrio** in the FHWA Office of Natural Environment or **Jim Thorne** in the FHWA Office of Planning for more information.

Share this article on your social media accounts

Giving First Responders the Green Light

Emergency Vehicle Preemption Speeds TIM Response

About 6 million **police-reported vehicle crashes** occur every year in the United States, impacting safety and system operations. Each crash places responders and motorists at risk of secondary crashes while causing delays that impact travel and freight movement. Next-Generation Traffic Incident Management (**NextGen TIM**) technologies help responders clear the road faster, reducing their exposure to traffic and restoring normal traffic flow sooner.

During Every Day Counts round 7 **(EDC-7)**, NextGen TIM is promoting life-saving innovations such as advance warning technologies, debris removal systems, emergency vehicle lighting and markings, unmanned aerial systems for TIM, and advancements in emergency vehicle preemption (EVP).
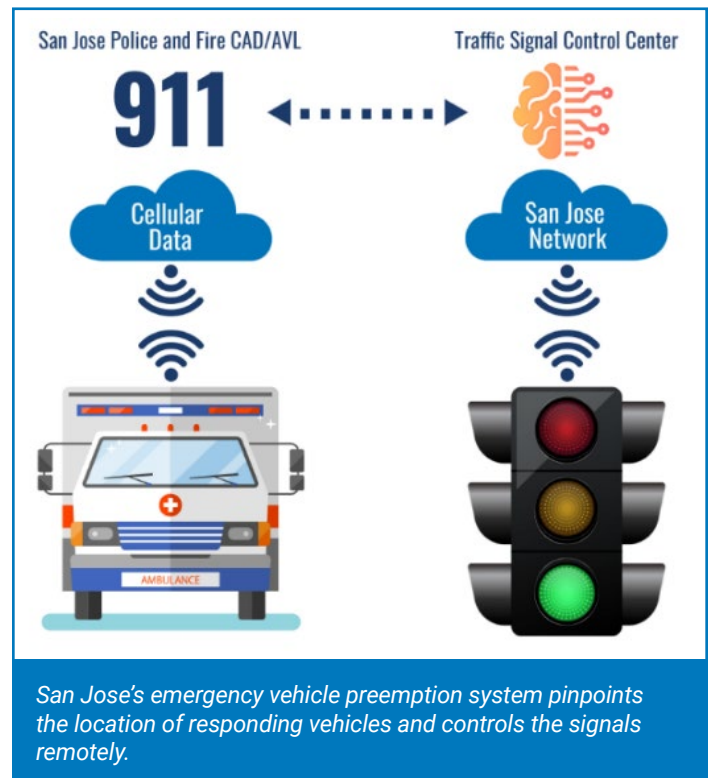
EVP improves incident responder safety and response time by changing traffic signals to green for an approaching response vehicle. Upon receiving a visual, audible, radio, or global positioning system (GPS) signal that a vehicle in emergency response mode is approaching, signal systems and controllers preempt the timing plans and give preference to the appropriate intersection approach. EVP has been around for several years but is gaining attention with new technologies that are making it more reliable, more cost effective, and less cumbersome to manage.

Different EVP Approaches

More than half the 3,332 signalized intersections in the metropolitan Phoenix, AZ, area are equipped with EVP. These systems use an equipment-based model where individual response vehicles and intersection signal controls are furnished with hardware to change signals on approach. The Maricopa Association of Governments (MAG) coordinates this regional EVP approach with more than 21 cities and dozens of public safety agencies in the Phoenix area. MAG agencies have embraced EVP and work together to improve compatibility and share resources. They also recently completed a pilot study of a GPS-based EVP system with favorable results. A GPS-based system represents the next innovative evolution of EVP that will enable a quicker response to incidents.

The city of San Jose, CA, has made significant strides in reducing response time through a centralized, dynamic, GPS-based approach to EVP. Instead of relying on equipment installed on each responder vehicle and at each of its 967 signalized intersections, San Jose's system uses GPS to leverage its advanced traffic management system, public safety computer-aided dispatch (CAD), and automated vehicle location information for police and fire vehicles across the city.

San Jose's emergency vehicle preemption system pinpoints the location of responding vehicles and controls the signals remotely.

Post-Crash Care for Emergency Medical Personnel

Credit: FHWA

Watch this __video__ to hear about the life-saving technologies NextGen TIM is promoting during EDC-7.

Through CAD integration, the advanced traffic management system knows when high-priority emergency calls are dispatched and which response vehicles are assigned. The automated vehicle location (AVL) pinpoints the real-time location of responding vehicles, and traffic signals are remotely controlled using a central traffic control system with controller firmware.

San Jose's EVP system allows the response vehicle to select any route to the emergency scene. Rather than define the route and trigger EVP at appropriate signals along the way, the system creates a geofence around the signalized intersection, detects the approaching emergency vehicle, and provides the appropriate green signal time.

"The centralized EVP approach lowered deployment and operating costs, created ease and consistency of operation, and simplified scalability," said Ho Nguyen, Intelligent Transportation System manager for the city of San Jose. "Intersection delay was reduced from 7 seconds per intersection to less than 1 second." San Jose Fire Chief Robert Sapien, Jr. noted that they are shaving nearly one-half minute off their average response time because they can now get through intersections faster.

EVP Benefits
EVP not only speeds response time, it makes emergency response safer. According to Chief

Sapien, over the past 5 years, the number of fire department vehicles involved in traffic crashes has been cut more than in half. In addition to training and agency safety initiatives, EVP is credited as part of this success.

EVP and other NextGen TIM technologies are also an important part of the **National Roadway Safety Strategy** because they address post-crash care in the **Safe System Approach**.

"TIM affects every one of us, every day," said NextGen TIM team co-lead Paul Jodoin. "We look forward to working with agencies during EDC-7 to increase implementation of EVP and other life-saving TIM technologies."

MORE INFORMATION

↖ Visit the FHWA Traffic Incident Management **webpage**.

▤ Subscribe to the NextGen TIM: Technology for Saving Lives **e-bulletin**.

@ Contact **Paul Jodoin**, **Jim Austrich**, or **Joe Tebo** of the FHWA Office of Operations for NextGen TIM information, technical assistance, and training.

[f] [t] [in]   *Share this article on your social media accounts*

EDC Legacy: Expanding the Reach of Public Engagement

For more than a decade, FHWA's Every Day Counts (EDC) program has promoted proven but underused innovations that enhance roadway safety, improve project delivery, and reduce traffic congestion. Across the country, agencies attest to the value of adopting these new technologies and processes, along with creative strategies for innovation deployment. As the transportation community participates in EDC round seven, Innovator is featuring articles that reflect on the program's accomplishments.

Effective public engagement offers opportunities for agencies to obtain meaningfulnput from the community and advance equity in transportation planning and project development. Engaging the public early and often is also a key strategy for reducing project delays and improving overall success. Traditionally, most of this outreach has occurred at in-person meetings. Then in 2020, the COVID-19 pandemic largely halted indoor meetings, prompting agencies to quickly expand their **virtual public involvement** (VPI) approaches to keep transportation plans and projects moving.

Fortunately, several agencies had already been experimenting with virtual tools and, in 2019, FHWA included a VPI initiative in round five of Every Day Counts (EDC-5) that promoted supplementing in-person engagement with virtual strategies. The EDC-5 effort identified and promoted the most effective VPI tools, and during the disruption caused by COVID, these tools became a necessity.

"Prior to 2019, most every agency was doing something in terms of using digital technologies for outreach, but it wasn't their focus," said Kevin McCoy, U.S. DOT Volpe Center and member of the EDC-5 VPI implementation team. "When people really needed it, EDC had resources to help them adjust quickly."

Bob Washington, FHWA Office of Project Development and Environmental Review and EDC team co-lead, said that in the early days of EDC-5, agencies were mostly interested in experimenting with different technologies and new techniques. "Once the pandemic occurred, it was an awakening," he said. "Agencies needed to continue to conduct business, and they saw virtual strategies as a viable tool to further transportation plans and projects, while achieving their public engagement plans."

Building a Community of Practice

VPI strategies include telephone town halls, online meetings, pop-up outreach, story maps, cell phone videos for quick project footage, survey tools, and visualizations. These tools and others not only improve access but can also enhance community understanding of proposed projects and plans through engaging visuals and interactive activities.

During EDC-5, the VPI team learned what works with different tools and methods for sharing information virtually, then incorporated these lessons into outreach strategies for States and metropolitan planning organizations (MPOs). For example, the team determined that most participants responded better to short online meetings. Breaking the meetings into small segments helped increase participation and offered more opportunities for engagement because it enabled customization and the use of different techniques.

A big challenge for the EDC team was helping transportation agencies find strategies for incorporating virtual methods in rural areas. Lack of broadband access was one obstacle, so they identified approaches such as using hotspots, inviting people to libraries and government buildings where public Wi-Fi was available, and holding telephone townhalls to provide the public with an alternative to internet in

rural areas, allowing them to engage in transportation plans and projects. The team also addressed overcoming accessibility issues to help improve outreach to community members with disabilities and expanding outreach to environmental justice populations.

During this time, the Iowa Department of Transportation (DOT) had developed an all-in-one, online platform called the **Public Involvement Management Application** (PIMA) that documents and tracks public comments throughout all phases of project delivery. Iowa shared information on PIMA and made it available to other States during EDC, then **began a partnership with other agencies** to enhance and grow its capabilities. "EDC helped jump-start the collaboration, and now 24 agencies are actively expanding it on their own, which is ultimately the mark of success," said Washington.

Mack Frost, FHWA Office of Planning, Stewardship, and Oversight and EDC VPI team co-lead, said MPOs have also been eager to adopt and use VPI. "It supports the many touchpoints they have with the community," said Frost, "MPOs are adept at **surveys**, **story mapping**, and **GIS**, and they are documenting their methods through public involvement plans, just like the State DOTs."

When FHWA continued VPI during EDC-6, the team placed an emphasis on helping agencies institutionalize VPI by adjusting policies and practices for disseminating information and collecting feedback to be consistent across projects, then adding these policies and practices to agency public involvement plans.

"EDC-5 helped build a community of practice for using different virtual technologies," said Washington. "This enabled the transition during EDC-6 to institutionalize a menu of strategies."

During EDC-5 and EDC-6, the team engaged with agencies in at least 35 States, including more than

Credit: FHWA

The **VPI capstone video** illustrates the benefits of virtual public involvement through examples from agencies across the country.

4,000 webinar attendees, 400 workshop participants, and 7,000 case study views. This broad reach helped expand use of VPI tools and practices to agencies across the country who are now using these technologies to make public involvement more convenient, meaningful, and equitable.

Agencies are also reporting increases in public participation numbers when employing VPI tools, illustrating how using a variety of methods to communicate different types of information can expand outreach.

MORE INFORMATION

@ Contact **Bob Washington**, FHWA Office of Project Development and Environmental Review, or **Mack Frost**, FHWA Office of Planning, Stewardship, and Oversight, for information and technical assistance.

➤ Visit the FHWA **virtual public involvement** website to access a VPI toolkit, case studies, and videos.

Share this article on your social media accounts

STIC Showcase Features Homegrown Innovations

As part of the Every Day Counts round seven (EDC-7) **virtual summit** held in February 2023, the **National STIC Network Showcase** provided a platform for State Transportation Innovation Councils (**STICs**) to share more than 100 homegrown innovations developed and implemented in their States with a wider audience to expand their potential use and impact. The following are just a few of the homegrown innovations featured.

Low-Cost Flood Sensors

The Delaware DOT (DelDOT) has deployed **low-cost flood sensors** that can be used to evaluate roadway conditions and advise the public when water hazards are present. Integration of water data with roadway elevations allows DelDOT to alert motorists of flooding concerns quickly and accurately via electronic notifications. Due to the cost effectiveness of the equipment and data collected, DelDOT is looking to further enhance the monitoring network across the State.

Credit: FHWA

Disaster Recovery Fiscal Playbook

The County Road Association (CRA) of Michigan developed a **Disaster Fiscal Recovery Playbook** to help Michigan's county road agencies ensure they receive all available State and Federal funding sources for disaster recovery efforts. The playbook and accompanying **videos** provide recommended actions and templates for use before, during, and after natural disaster events.

BIM Execution Plan

To unlock the powerful digital data structures and visualization capabilities of Building Information Modeling (BIM), the California DOT (Caltrans) developed a **BIM Execution Plan** template to align its information modeling requirements and govern its information management. Caltrans' template is based on the ISO 19650 standard and establishes a framework for applying a consistent approach to several different bridge types, while accelerating the agency's understanding of BIM for bridges in pilot projects.

Signals and Lighting Training Facility

The Missouri Department of Transportation (MoDOT) created a complete **signals and lighting training facility** on an agency parking lot. The onsite facility allows MoDOT to train lighting and signal workers in a safe environment where they can gain confidence and skills before working in live conditions. MoDOT saves money by recycling its own products for use during the training.

MORE INFORMATION

- Visit the **National STIC Network Showcase** webpage to read more about these and other Homegrown Innovations.

- **Register** for access to the EDC-7 virtual summit to view on-demand content through February 2024

Share this article on your social media accounts

States Innovate!

New Jersey Develops Online TIM Training

The New Jersey Department of Transportation (NJDOT) recently developed a **Traffic Incident Management** (TIM) training course that is self-guided and available online. According to an NJDOT **news release**, the agency's TIM training was previously only held in person, but they expect the online course to make it possible for even more emergency and incident response personnel to have access to this life-saving training. Interactivity is a key feature of the course, which includes videos, simulations, and interactive scenarios to provide participants with practical experiences that mimic real-world situations.

Build a Better Mousetrap 2023 Winners

The Federal Highway Administration recently announced the 2023 recipients of the **Build a Better Mousetrap** National Recognition Program for Transportation Innovation. Each year, FHWA recognizes and celebrates local government and tribal agencies who pioneer innovations that improve transportation performance. This year's winners are:

- Confederated Tribes and Bands of the Yakama Nation for the **Mobile Unit for Sensing Traffic** device that improves rural road safety.

States Receive Grants to Accelerate Innovation

The Federal Highway Administration (FHWA) recently **announced** $8.8 million in grants for 10 projects in eight States and the District of Columbia to encourage the use of tools that can improve safety on bridges and in work zones. The grants, which can also be used for other innovative transportation technologies, are provided by FHWA's **Accelerated Innovation Deployment** (AID) Demonstration program.

- New Jersey Department of Transportation for a **Road Diet** project to preserve an historic bridge.

- St. Louis County, MN, Public Works Department for **Solar-Powered Remote Cameras** to assist with emergency response during extreme weather events.

- City of Walnut Creek, CA, for the **Safe Sightings of Signs and Signals** software application to improve traffic signal visibility.

View the **2023 National Entry Booklet** for details on this year's winners and honorable mentions.

Credit: FHWA

*Watch a **video** announcement of the 2023 Build a Better Mousetrap winners.*

Share this article on your social media accounts

INNOVATOR

Applications Open for AID Demonstration Grants

The Federal Highway Administration recently announced a multiyear funding opportunity for the **Accelerated Innovation Deployment (AID) Demonstration**. This program provides incentive funds for Tribal Governments, Federal land management agencies, and State departments of transportation (DOTs) to accelerate the implementation and adoption of innovation in highway transportation and demonstrate state-of-the-art technologies. Local public agencies may apply through State DOTs.

AID Demonstration funds can be used in any phase of a highway transportation project between project planning and project delivery, including planning, finance, operation, structures, materials, pavements, environment, and construction.

AID Demonstration funds are distributed through a competitive discretionary grant process. Details on this funding opportunity are available on the AID Demonstration **webpage** and **Grants.gov** (search for *funding opportunity 693JJ324NF-AIDDP*). Please join the upcoming 2023 AID Demonstration Information Session on November 20, 2023 (3:00 PM ET – 4:30 PM ET). Click **here** to register!

Register Here

Subscribe Today!

Don't miss an issue! **Sign up** to receive EDC News and Innovator newsletters.

Want More Innovator?

Access past issues in the **Innovator Archive** and have the next issue sent to your mobile device by texting "FHWA Innovation" to 468311. Email reprint requests to **Julie Zirlin**.