

West Virginia DOT Roadway Departure Countermeasures Rapid Deployment

Executive Summary

Across the Nation, every State department of transportation (DOT) is challenged to wisely allocate resources. Agencies are also under constant pressure to increase efficiency in resource allocation. As demographics shift, challenges in managing human resources may also arise as the number of personnel with the expertise to execute agency plans and programs successively fluctuates. Facing this situation, the West Virginia DOT (WVDOT) undertook a unique, rapid-deployment initiative focused on reducing roadway departure (RwD) crashes by dedicating unspent Highway Safety Improvement Program (HSIP) funds exclusively on RwD countermeasures.

The Challenge

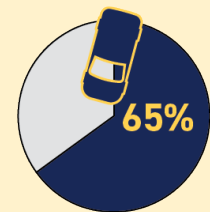
Over the course of the 3 years prior to 2017, Federal-aid funds for highway safety improvements in West Virginia, while never lapsing, were steadily accumulating. These monies were part of the HSIP—a Federal Highway Administration (FHWA) program designed to reduce fatal and serious-injury crashes on public roads by funding safety improvements. States are required to disperse HSIP funding according to data-driven strategies defined in their Strategic Highway Safety Plans (SHSP). This helps FHWA ensure that States are directing budgetary resources where they have the greatest potential to drive down the most critical crash types in each State, maximizing positive safety outcomes.

Prior to 2017, West Virginia's HSIP pool had grown to about \$70 million in undisbursed funds. The State's inability to spend the surplus was primarily due to two major factors:

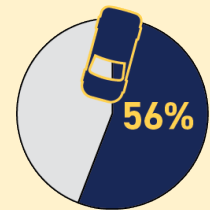
- Increasingly larger amounts of funding being allocated to the State.
- Significant understaffing in the agency's Highway Safety Planning and Implementation areas.

West Virginia's HSIP is coordinated within WVDOT's Traffic Engineering Division. When considering projects to be funded through the HSIP, WVDOT reviews and evaluates candidate projects, including those suggested by the agency's safety partners, legislators, or the public. WVDOT's initial review and evaluation of a potential project includes an analysis of crash data for the location, a field review of the site which may include a Road Safety Assessment, and the collection of any other information found appropriate to evaluate the proposed project.

In 2017, RwD crashes in West Virginia:



Accounted for 65 percent of all fatal crashes.



Made up 56 percent of all serious injury crashes.



Resulted in 12 percent more fatalities than impaired driving, the second leading cause of roadway fatalities in the State.

In WVDOT's first step of their analysis, WVDOT staff develop a benefit-cost ratio and determine whether the candidate project is eligible for HSIP funding. The result of the benefit-cost ratio also assists with project prioritization. While this practice is not a specific requirement of the HSIP, the program's guidance and WVDOT's program elements support it as an additional eligibility tool. This is the first step to ensure the investment of safety program funds will likely result in a positive impact on highway safety and to properly place it within the overall program of projects. WVDOT officials estimate the project cost to fund the appropriate countermeasure for each identified concern. By dividing the monetized safety benefit by this cost, they arrive at the benefit-cost ratio. If this quotient exceeds 1, the project is further considered for funding.

Once the project is determined to be eligible and a positive safety benefit is determined to exist, the Traffic Engineering Division selects and prioritizes projects for funding through the HSIP. After being selected for HSIP funding, staff select an HSIP funding category for the project and submit the appropriate programming documents. Projects are assigned to the State's Statewide Transportation Improvement Program, which makes the HSIP funds available. The Mobility and Safety Section remains responsible for monitoring and balancing the use of HSIP funds and evaluating the effectiveness of a project following its completion.

As might be expected, other functional areas outside of the Traffic Engineering Division were unfamiliar with the requirements for allocating HSIP funding.¹ Additional labor resources to conduct project eligibility evaluations were not readily available because the nature of the work in deploying HSIP funding is so specialized, it falls outside the normal realm of design consultant work, and even in-house construction-inspection forces were not accustomed to administering the variety of contracts inherent in HSIP implementation.² As such, contract labor was not an ideal first choice to supplement State forces.



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Figure 1. Graphic. Recommended speed sign and guardrails before a curve.

Amid this backdrop of an understaffed highway safety and design personnel in the DOT as well as unfamiliar consultant personnel with this specific type of work, another critical issue was plaguing the State: ***RwD crashes were the leading cause of fatal and serious injury crashes on West Virginia roadways.*** In fact, in 2017 RwDs accounted for 65 percent of all fatal crashes and 56 percent of all serious injury crashes in the State. In terms of fatalities, the percentage of RwD crashes was 12 percent higher than impaired driving, the second leading cause of roadway fatalities in the State.³ In many cases these two classes (RwD and impaired driving) of fatal crashes overlap, so an investment in one type may lead to a reduction in both classifications.

¹West Virginia Department of Transportation, *West Virginia Highway Safety Improvement Program 2016 Annual Report*, (Charleston, WV: 2016).

²Telephone Interview conducted with D. Hardy of the West Virginia Department of Transportation Mobility and Safety Section, March 5, 2020.

³West Virginia Department of Transportation, *2017-2021 West Virginia Strategic Highway Safety Plan*, Strategic Highway Safety Plan, (Charleston, WV: 2017).

Implementation Approach



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Figure 2. Graphic. Enhanced curve signing.

When considering how to best use HSIP funding, WVDOT structured its search around the question, “How can we save the most lives?” Focusing on their greatest problem (the urgent need for Rwd crash mitigation) was the obvious answer.

To build support for this large-scale focus on, and investment in, Rwd safety improvements, the Traffic Engineering Division coordinated with the agency’s upper management to develop a targeted plan to spend all of the surplus in that area. For the first time in the

history of the program, the vast majority of funds were specifically dedicated to the type of countermeasures that prevent or reduce the severity of Rwd type crashes. A program of this magnitude necessitated that all Divisions within the DOT coordinate to ensure its success. A concerted effort was made to make sure that everyone involved within the DOT was aware of the HSIP Rwd focus and every opportunity was taken to bring Rwd safety to the forefront. During every internal safety or divisional conference, Traffic Engineering Division personnel were included to present a session on the topic of Rwd crash mitigation.

All of these efforts, in some way, have drawn attention to the importance of Rwd safety. The agency’s upper management approved the conceptual plan with broad Rwd countermeasures and funding allocations then requested a detailed plan for spending the unused HSIP funding on Rwd. Faced with tens of millions of dollars in accrued funding, West Virginia safety professionals had to quickly devise a method to spend it all.

In building a Rwd safety program of such magnitude, the agency realized the importance of including all divisions within the DOT. This turned the undertaking into an agency priority rather than just a matter of significance to the Traffic Engineering Division. The support from the agency’s upper management was instrumental in making the effort a department-wide goal: a stark departure from the “silo” mentality under which staff had operated for decades with a program of projects that were indeed good projects but not a coordinated effort of related projects with the primary focus of reducing Rwd crashes and their severity.

Through frequent meetings and work sessions, the agency developed a two-phased plan under which the entire \$70 million surplus would be spent in the first phase followed by an additional \$10–15 million (plus \$3–4 million for curves alone) in the second.

All roads (except city streets) in West Virginia are State owned. DOT safety professionals coordinated with county leaders to make sure that each county had a planned Rwd project programmed within its borders. DOT staff explained the priorities and project selection and stressed that all areas of the State would be touched with a Rwd project.

Safety Solutions

As early as 2017, WVDOT had been working closely with the FHWA Office of Safety to arrange for technical assistance in developing a Rwd Safety Implementation Plan (RwDSIP) compatible with the West Virginia SHSP. The technical assistance included development of a data analysis package, several technical training workshops, and a RwDSIP meeting with WVDOT safety personnel and other stakeholders. The overarching goal of this effort was developing a set of countermeasures, deployment levels, and costs aligned with the lane departure emphasis area recommendations in the SHSP.

The plan included enhancements to the current safety program for WVDOT, including the following:

- Expansion of the safety program to systemically implement a large number of safety treatments at locations where they will prove most effective. The plan called for countermeasures such as enhanced signing and marking for curves, edge/shoulder rumble strips, roadway lighting, and centerline rumble strips, which comprise the most effective treatments for saving lives.
- Inclusion of certain cost-effective treatments in current resurfacing and other surface transportation projects.
- High friction surface treatments to reduce wet and otherwise low friction pavement crashes.
- Roadside safety improvements such as culvert and ditch improvements to flatten median cross-slopes.
- Select tree removal, utility pole relocation, and roadside fixed object crash prevention countermeasures such as tree or fixed object shielding.
- Adding new or upgraded barrier.
- Installing cable median barrier to reduce cross-median crashes.

This Plan, which was completed in January of 2019, provided recommendations on how WVDOT can implement these additions to the current safety practices effectively, how they can estimate the number of lives saved, and estimate the required investment to implement infrastructure improvements and education and enforcement initiatives.



WEST VIRGINIA ROADWAY DEPARTMENT SAFETY IMPLEMENTATION PLAN

Original Date: April 2018
Updated Draft: October 2018
Final Draft: December 2018



Source: FHWA

Figure 3. Graphic. Cover for the West Virginia Roadway Department Safety Implementation Plan.

Overcoming Challenges

As with any effort of this magnitude, the agency experienced some obstacles along the way. The most pronounced was the task of programming so many projects in such a short amount of time. The agency overcame this through persistence, constant monitoring, and solving small problems before they could turn into larger ones.

For example, WVDOT relied on the findings of the FHWA-sponsored RwDSIP, to garner management and FHWA support. WVDOT staff also brought the Rwd issue to the forefront at every DOT function. They relied on the confidence of the agency's management, who in turn were instrumental in motivating DOT professionals and maintaining morale during this fast-paced implementation.

WVDOT also experienced some difficulty in securing the large team of design consultants necessary to supplement the expertise of their small safety staff and produce the volume of plans they required. Even when the agency did manage to contract with the needed professional services, the required skillset was so unique that the consultants had a steep learning curve. To overcome this significant hurdle, WVDOT sponsored an FHWA-led Rwd safety training, which FHWA customized for WVDOT's efforts (as FHWA does for most of their FHWA technical assistance).

The consultants, once they completed the training, analyzed all of the highest-crash-rate US and WV (State) routes to identify appropriate countermeasures. WVDOT also hired two additional consultants to guide the plan production and ensure consistency.⁴

Other challenges WVDOT faced included having to train their own construction staff on how to inspect the projects with which they were somewhat unfamiliar. WVDOT's final challenge was their construction costs, which were higher than average due to a lack of competition in the market.



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Figure 4. Graphic. Enhanced curve and speed signing along a West Virginia roadway.

⁴ West Virginia Department of Transportation, *West Virginia Highway Safety Improvement Program 2019 Annual Report*, (Charleston, WV: 2019).

Key Outcomes

To date, WVDOT has received some public feedback from users who have seen the improvements implemented elsewhere and want similar work performed in their counties. WVDOT reviews these suggestions on a case-by-case basis to determine their feasibility. This type of positive public feedback is a good indicator that West Virginia's Rwd safety improvement program was successfully implemented.

WVDOT staff noted some lessons learned along the way. Agency staff urge other States who are considering a similar endeavor to develop project development templates and have them in place before retaining consultants to perform design work. These templates greatly streamlined implementation efforts through inclusion of design and specification elements that were common to all projects. As such, designers did not have to repeat a great deal of work to get to the same result on the next job. The agency plans to continue applying this highly efficient development and implementation process in future years, especially for their second phase of Rwd safety improvements.

Given the recent, and in some cases, ongoing construction of these projects, WVDOT has not conducted a rigorous investigation of the program's impact on crashes. They are confident however, that having dedicated so much time, funding, and proven countermeasures to the problem, their efforts will have impacted, and hopefully reduced, the State's leading cause of fatal and serious injury crashes.

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ZERO IS OUR GOAL
A SAFE SYSTEM IS HOW WE GET THERE