Roadway Safety
Professional Capacity
Building Program

Through engaging peer workshops, the RSPCB Program matches agencies seeking solutions to roadway safety issues with trailblazers who have addressed similar challenges and emerged with a roadmap and noteworthy practices for approaching the issue.

U.S. Department of Transportation
Federal Highway Administration

ARKANSAS HIGHWAY SAFETY IMPROVEMENT PROGRAM PEER EXCHANGE

An RSPCB Peer Exchange

INTRODUCTION

The Arkansas State Highway and Transportation Department (AHTD) hosted a Peer Exchange to share information and experiences for improving its Highway Safety Improvement Program (HSIP). The event was held October 18 and 19, 2016 in Little Rock, Arkansas. This report summarizes the results of the peer exchange, which was supported by the Federal Highway Administration (FHWA) Office of Safety's Roadway Safety Professional Capacity Building Program and the FHWA Arkansas Division Office.

The FHWA Office of Safety and the FHWA Arkansas Division Office worked with AHTD to convene representatives from four peer States, Georgia, Kentucky, Utah, and Washington, to assist Arkansas in its effort to refine its HSIP project development process. Topics at the peer exchange included: HSIP management, organizational structure and work flow, project screening, engineering studies, project prioritization, design issues/processes, funding, and evaluation processes.

The list of participants is available in Appendix A and the full agenda is available in Appendix B.

OBJECTIVE

The purpose of the peer exchange was to understand the current state of HSIP in Arkansas and explore best practices for streamlining HSIP project delivery in peer states including: work flow, planning, implementation, and evaluation. Some of the key takeaways for a successful HSIP based on the peer state experiences focused on using tools and guidelines to provide a consistent approach to planning and project selection and working to gain leadership approval and buy-in.

The peer exchange concluded with the group compiling recommendations for actions specific to AHTD to improve its HSIP.

PROCEEDINGS

During the first day of the peer exchange, AHTD and the peer states presented an overview of their respective HSIPs. The States compared and discussed administration, program development, project management, and technical accomplishments. Peer states responded to questions from AHTD about their HSIPs and identified key takeaways.

ARKANSAS HSIP BACKGROUND

Arkansas receives roughly $55 million a year in HSIP funding that includes $12 million from Section 154 transfer funds due to non-compliance with open container laws. Implementation of selected projects can be affected by other Federal-aid projects, preventative maintenance projects, rehabilitation projects, etc. In the past decade Arkansas has reduced its fatalities considerably but in 2014 the rate of reduction started to stagnate. In 2015, fatalities nationwide and in Arkansas began to rise and have increased in 2016 as well.

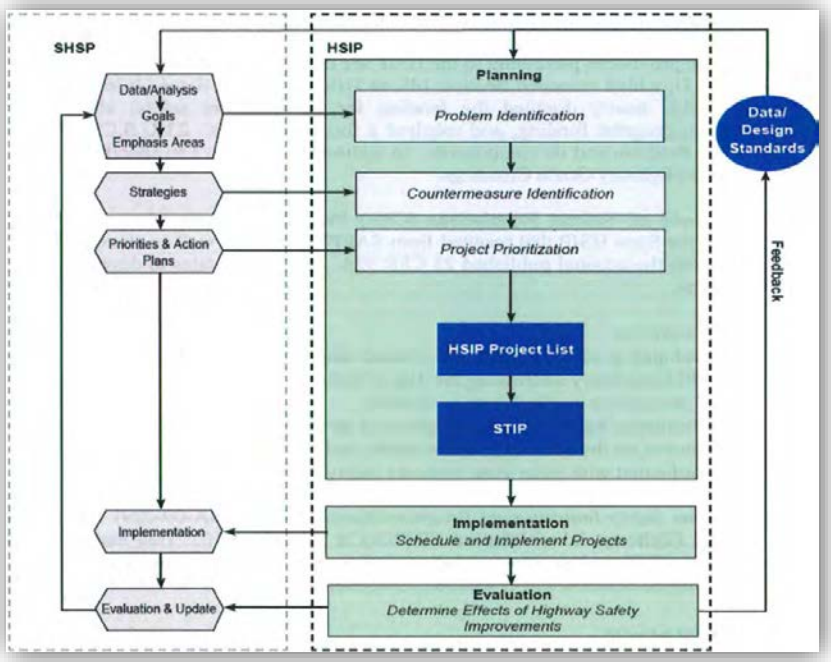

Figure 1: AHTD HSIP work process

AHTD's HSIP work process begins with problem identification using conventional crash data, along with other sources (e.g. traffic records, road inventory, interchange database, skid resistance data, signs database, and speed differential curve data). The Traffic Safety team analyzes data for screening purposes and also to respond to requests from other Divisions within AHTD, public officials, and citizens. After looking at crash types, contributing factors, crash patterns, collision diagrams, and an assessment of site conditions, AHTD identifies suitable countermeasures by referencing toolboxes for high risk rural roads, intersection crashes, roadway departure crashes, etc., as well as research on innovative countermeasures.

Projects are prioritized by estimating the project benefit and cost. The costs are calculated using AHTD's cost-per-mile sheet, weighted average costs of past projects, estimates by maintenance and roadway design, and preliminary engineering. Benefits are estimated using crash frequency and severity, comprehensive crash costs from the Highway Safety Manual (HSM) adjusted by the Consumer Price Indices and Employee Cost Indices, and expected reductions in crashes based on crash modification factors (CMF). AHTD annualizes the benefits and costs of treatments by incorporating life-cycle of treatments, discount factors, and annual maintenance cost of treatments. AHTD then determines the benefit to cost ratio (BCR) for each treatment and overall BCR for the projects. In general, AHTD prioritizes systemic projects. For project selection, they compare overall BCR of projects, the cost of projects (low cost projects may come first prior to more expensive countermeasures), and political influence.

AHTD is working to update its 2013 SHSP and plans to incorporate feedback from a safety summit held in September 2016. In the current HSIP, they have reviewed 40 sites generated from the high risk rural roads program. Sites considered included sections 5.0 to 7.3 miles long, with 10 or more total crashes, and a KA crash rate of 0.39 crashes per 100 million vehicle miles traveled (VMT) or higher.

AHTD's current HSIP includes a Railway-Highway Grade Crossing Program that uses a safety hazard rating index to identify projects like improvements to lights and gates and sometimes overpasses. In 2015, AR prepared the HSIP report using FHWA's online reporting tool for the first time. As part of the reporting process, AR works to complete before/after studies of HSIP improvements, and the effectiveness of the Railway-Highway Grade Crossing Program.

PEER HSIP BACKGROUND PRESENTATIONS

States described specific details about HSIP project planning and delivery during peer presentations.

Georgia Department of Transportation (GDOT)

GDOT's Safety Program Supervisor reviewed the HSIP process in Georgia. Years ago, the plan was managed centrally from planning to construction and the spending areas were not defined. However, the new format includes a project management office that manages the scope, budget, and entire process once the project is selected. With the new format, there were issues with scope creep particularly in the conceptual design phase caused by poor communication and the right people were not always in the room. GDOT has recently added a traffic operations program manager to limit scope creep, and also traffic operations schedule templates to encourage efficiency. GDOT utilizes three safety consultant contracts.

GDOT has defined spending areas: 35 percent roadway or lane departure, 35 percent intersection safety, 10 percent off-system safety, 10 percent high risk rural road safety, 5 percent pedestrian safety, and 5 percent other additional safety. GDOT is working now to determine what percentage to spend on systemic versus traditional projects.

Kentucky Transportation Cabinet (KYTC)

KYTC's Transportation Engineer Specialist described the organizational structure for HSIP at KYTC. In Kentucky, HSIP is broken up into 2 areas: the Office of Highway Safety, which manages 3 of the 4 Es – Education, Enforcement, and Emergency Services and the Division of Traffic Operations which is responsible for the 4th E – Engineering. Four staff are dedicated to HSIP in Traffic Engineering under the Division of Traffic Operations including three professional engineers and one traffic engineering technologist. HSIP is administered through a data driven project selection process at the central office. Districts assist with project development through design staff and section engineers; KYTC recently engaged several consultants that are able to assist in increasing the number of projects. Consultant support includes four consultant contracts and data analysis at the University of Kentucky.

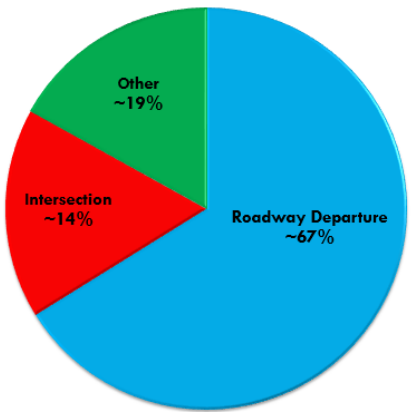

Figure 2: KYTC Spending Plan

KYTC recently updated its investment plan according to the Fixing America's Surface Transportation Act. HSIP receives approximately $41.1 million and no other funding is dedicated specifically for safety. Roughly

67 percent of fatal crashes result from roadway departures, 14 percent from intersections, and the remaining comes from other types. KYTC's spending plan (Figure 2) is based roughly on the fatal crash breakdowns. A non-motorized user category was added recently.

Utah Department of Transportation (UDOT)

The Safety Programs Engineer at UDOT presented an overview of how the organization manages its HSIP program. The HSIP process involves planning, analysis, prioritization, programming, implementation, and project evaluation. The central office does all analysis and final selection for what projects get funded. They receive input from four regional offices to identify scope and budgets. UDOT employs two processes: proactive and reactive. The reactive approach looks at crash history and analyzes specific locations. For the proactive approach, they analyze crash data and its relationship to roadway characteristics. For project prioritization, they make decisions based on what project has the greatest ability to reduce fatal and serious injury crashes along with B/C ratio, completion timeline, and coordination with other projects (piggyback potential).

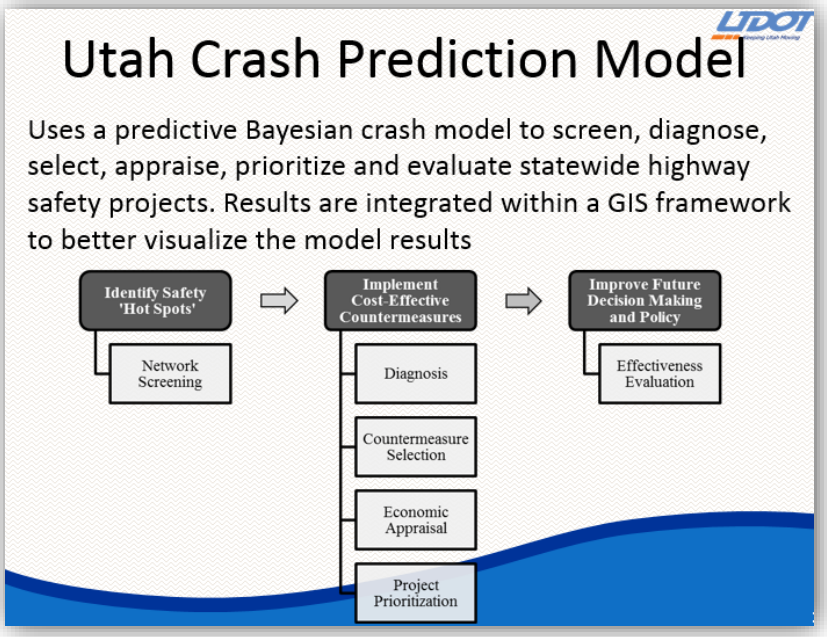

Figure 3: Utah's Crash Prediction Model

UDOT assigns projects to a 3 year planning horizon and then finalizes project scope, schedule, and budget. The regional offices take ownership of each project and they assign a project manager who oversees design and construction of the project. UDOT conducts a 3 year before and after evaluation to include in its HSIP report.

UDOT uses a predictive Bayesian crash model created by a local university to screen, diagnose, select, prioritize, and evaluate highway safety improvement projects. The results are integrated within a GIS framework to better visualize the model results.

UDOT developed a website that can be accessed by internal staff along with some stakeholders and partners. The UDOT SafeMap lets the user zoom into particular areas and locate hot spots. Users can do a crash query and conduct some amount of network screening. UDOT districts can use this website to help justify projects to headquarters.

UDOT also uses usRAP, a software tool that uses predictive models and limited crash data to characterize crash risk. The primary product includes a program of highway infrastructure improvements that are prioritized on a benefit-cost basis. usRAP requires a limited selection of roadway variables in order to identify potential hazardous conditions. The tool helps to assess cost benefits when there is no history of crashes, and could be used to help prioritize systemic projects.

UDOT is embarking on an initiative to get the tools and methods into every project at the DOT. They are

considering what the ideal or desirable safety profiles are for specific roadway types. They are looking to use a design matrix for specific roadway types (currently being developed by American Automobile Association, expected completion January 2017) to assist in scoping and designing projects.

Washington State Department of Transportation (WSDOT)

WSDOT's Prioritization and Scoping Manager described WSDOT's safety program management. The Capital Program Development and Management Office (CPDM) is responsible for prioritizing and programming the projects that are funded with HSIP. CPDM is responsible for managing the oversight of both State and Federal Highway Funds on all projects that are delivered via the Capital Construction Program. There are approximately 42 full time employees that work in the office. The Scoping and Prioritization team within CPDM is responsible for managing the scoping and programming of HSIP projects. The office reports to the Assistant Secretary, Financial Administration, who reports to the WSDOT Deputy Secretary. HSIP contributes approximately 25 percent of the funding that is used for safety projects. The biennial budget for safety is between $100 to 120 million. These funds are separated in to two categories: Collision Reduction and Collision Prevention.

WSDOT provided a diagram outlining the safety scoping decision process to the peers. Washington has been using SafetyAnalyst since 2010; all data from collisions are input into SafetyAnalyst each year. WSDOT conducts network screening and reviews locations for fatal and serious injury crashes. Each location gets a rating and then the locations are prioritized and broken into regions. Each region is asked to evaluate the locations and report back if they are going to make an improvement or, if not, why. Prioritizing by region is important to prevent big cities like Seattle from receiving a disproportional amount of funding.

WSDOT has six regions and each region has a regional engineer; each engineer is responsible for evaluating safety projects. When the regions receive the list of locations, a "Crash Analysis Report" is prepared for selected project locations which includes a scope and suggested countermeasures. The reports are presented to a panel made up of regional safety engineers and risk managers. Individual projects cannot be more than $5M. When regions present projects to the panel, they are asked if they have considered a low cost countermeasures first. For the 200 sites generated, every region is asked to prepare 20 sites. WSDOT programs 6 years of projects; however, the goal is to have ten years of projects programmed at any time.

WSDOT has made an effort recently to install roundabouts and created an incentive for using them in design. If a roundabout analysis is completed and accepted as a design, a traffic signal analysis is not required. However, if a traffic signal analysis is completed they also have to do a roundabout analysis. In addition to safety benefits, the maintenance benefit of not having to clean and maintain the traffic signals is significant.

WSDOT has a Target Zero implementation plan; challenges include increased fatal crashes, increased VMT, and increased marijuana use.

KEY TAKEAWAYS: PEER PRESENTATIONS

The group noted the following themes from the peer HSIP presentations:

- Peers noted the importance of well documented, established programs using a standard framework.
- Peers use a combination of spot and systemic projects.
- Peers set funding goals based on fatalities by district or SHSP emphasis areas, with the exception of WA who does not set funding goals.
- Peers discussed what values they use for minimum benefit cost ratios.

- Minimum cost thresholds on projects is on average $400k.
- An effective HSIP requires adequate staffing. Peers have 4 to-10 full time employees as well as support from consultant or university partnerships.

Key takeaways related to Arkansas included:

- Arkansas identified a challenge related to scope creep on larger projects. Arkansas should consider smaller scope and lower cost projects.
- Arkansas' fatal and serious injury crash costs are high compared to peers; Georgia has similarly high costs.
- Arkansas is interested in using weighted crash costs similar to Utah.
- Arkansas is interested in a documented process for how to finalize the scope of safety projects across safety, planning, and design is needed. Some States have forms that help enable this.
- Arkansas is interested in using force accounts for smaller scope projects.

KEY TAKEAWAYS: ROUNDTABLE DISCUSSIONS

Incorporating HSIP into the Project Development Process

A peer panel discussion covered several topics including corridor improvements, crash cost values and scope creep. Following is a summary of the discussion.

- **Corridor Improvements.** AHTD is challenged with funding corridor projects as they become expensive if the entire corridor is brought to Green Book standard. UDOT funds only a particular countermeasure for corridor improvements and does not necessarily pursue comprehensive safety improvements; WSDPT is moving towards a practical solutions approach.
- **Crash Cost Values.** UDOT uses roughly $1.3M per crash; WSDOT uses $2M for fatal, $1M for serious injury; KYTC uses $2M for KA crashes and $600K for B crashes; AHTD uses a comprehensive $5.5M cost for fatal crashes. GDOT uses $9.1M for a fatality and $855,500 for injury.
- **Scope Creep.** GDOT reported documenting the intentions of safety countermeasure projects helps to improve relations between the planning and design departments and reduce scope creep.

Developing Systemic Safety Improvement Projects

Peer States reported on experience with selecting and selling systemic safety projects to leadership. WSDOT implemented a signage plan successfully by compromising with the maintenance department on the number of signs; KYTC focuses on incorporating systemic improvements on spot-treatment-type projects; and UDOT reported on successful expansion of cable median barriers from spot-type-treatments to a systemic treatment after measuring the success of the projects.

Engineering Studies

UDOT, GDOT, and KYTC rely on region staff or consultants to conduct engineering studies and site visits for HSIP projects. WSDOT visits all possible site projects. The makeup of the multidisciplinary team varies based on the characteristics and challenges of a particular site.

CONCLUSION & ACTION PLANNING

The peer exchange brought four peer states (Georgia, Kentucky, Utah, and Washington) to Arkansas to explore streamlining HSIP project delivery in AHTD. The event reinforced that there are a number of elements contributing to a successful HSIP including leadership support and clear documentation of work flow, project prioritization, implementation, and evaluation processes. Peers shared information and experiences on each of

these areas and helped AHTD generate a robust list of action items to move on forward.

AHTD plans to refine the list of actions and determine the constraints, timelines, and champions for future implementation.

- Establish HSIP funding goals. (e.g. by sub-program, initiatives, focus areas, districts, regions, data, emphasis areas, etc.). Consider the use of placeholders in the STIP for sub-programs.
- Document the current HSIP process and share with leadership to help them understand the basis of the program including Federal requirements. Consider lessons learned from peer event to incorporate into the process.
- Consider a review of historical HSIP projects.
- Explore HSIP project funding limits. Review how HSIP projects are scoped and how other states scope similar types of projects (length of corridors and type of countermeasures); consider using "tiered" countermeasure selection to limit use of high cost countermeasures and the need to obtain right-of-way (ROW).
- Refine and develop sub-program initiatives (guardrail end treatments, shoulder widening, curve signing, etc.). Look at current processes, available data, and determine priorities for Arkansas.
- Review the possible use of on-call consultants and/or university resources. Review activities that could be shifted; consider current staffing and identify gaps.
- Develop or adopt a network screening tool. Consider use of safety performance functions or another data driven process for project selection.
- Establish a countermeasure and project prioritization process. Review and revise the crash cost values, the use of weighted averages, and the values used for minimum benefit cost ratios (consider raising to 2.0 or greater). Review and revise lifecycle benefit cost methodology and how the affects the scoping of HSIP projects.
- Document the scoping process including planning, design, maintenance, ROW, utilities, and environmental impacts. Consider possible use of a standard form or procedure set for site visits and road safety audits.
- Explore the use of force accounts or on-call contracts for construction (particularly for small local and low cost projects).
- Continue development of intersection database.

APPENDIX A: LIST OF PARTICIPANTS

ARKANSAS					
Scott	Bowles	Field Operations Team Leader	FHWA-AR	AR	scott.bowles@dot.gov
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APPENDIX B: AGENDA

TUESDAY, OCTOBER 18TH

8:00 AM	**Registration**	
8:30 AM	Welcome • Peer Exchange Objectives • Introductions	Angel Correa, FHWA Arkansas Division Administrator Kevin Thornton, P.E., AHTD Assistant Chief Engineer – Planning
9:00 AM	Arkansas HSIP Overview and Future Direction	Adnan Qazi, AHTD
10:00 AM	Break	
10:15 AM	Peer States HSIP Overview	David Adams and Michael Turpeau, Georgia DOT David Durman and Michael Vaughn, Kentucky Transportation Cabinet Scott Jones, Utah DOT Matt Neeley, Washington State DOT
12:15 PM	Lunch	
1:15 PM	Roundtable Discussion	All
2:00 PM	Stakeholder Input	AHTD Stakeholders
3:00 PM	Break	
3:15 PM	Panel Discussion #1: Incorporating HSIP into the Project Development Process	Peer States
4:45 PM	Wrap-up	Karen Scurry, FHWA
5:00 PM	Adjourn	

WEDNESDAY, OCTOBER 19TH

8:00 AM	**Welcome Back/Day 1 Recap**	**Karen Scurry, FHWA**
8:30 AM	Panel Discussion #2: Developing Systemic Safety Improvement Projects	Peer States
10:00 AM	Break	
10:15 AM	Panel Discussion #3: Engineering Studies OR Prioritization Processes (use of B/C, CMF, SPF, etc.)	Peer States
11:30 AM	Key Takeaways	All
Noon	Lunch	
1:00 PM	Action Planning	AHTD, with input from peer state
3:00 PM	Wrap-up/Adjourn	Karen Scurry, FHWA