Funding and Evaluating Systemic Safety Improvements for Pedestrians

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March 5, 2019

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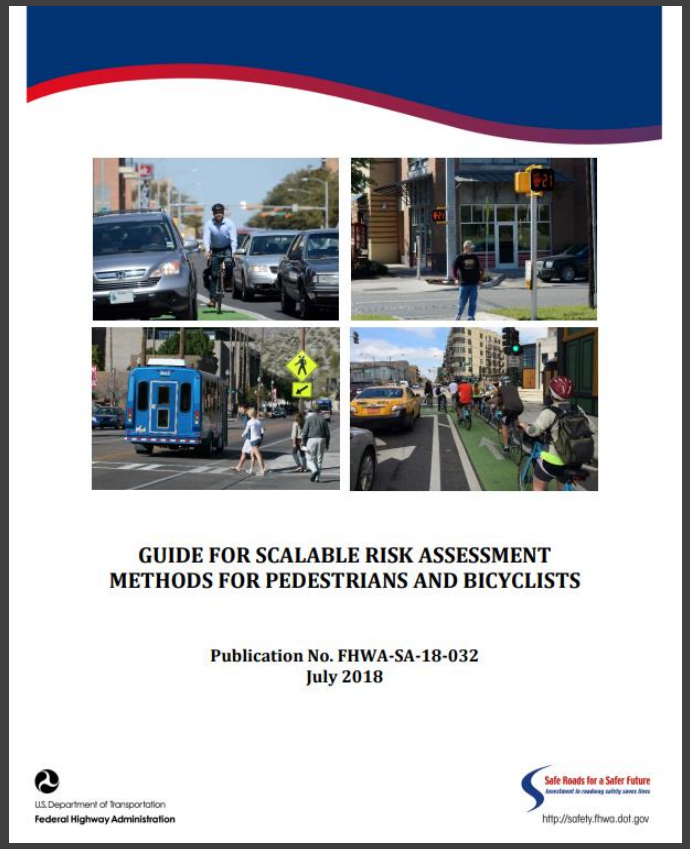


Two Tools for Risk-Based Safety Analysis

Objectives of NCHRP Report 893

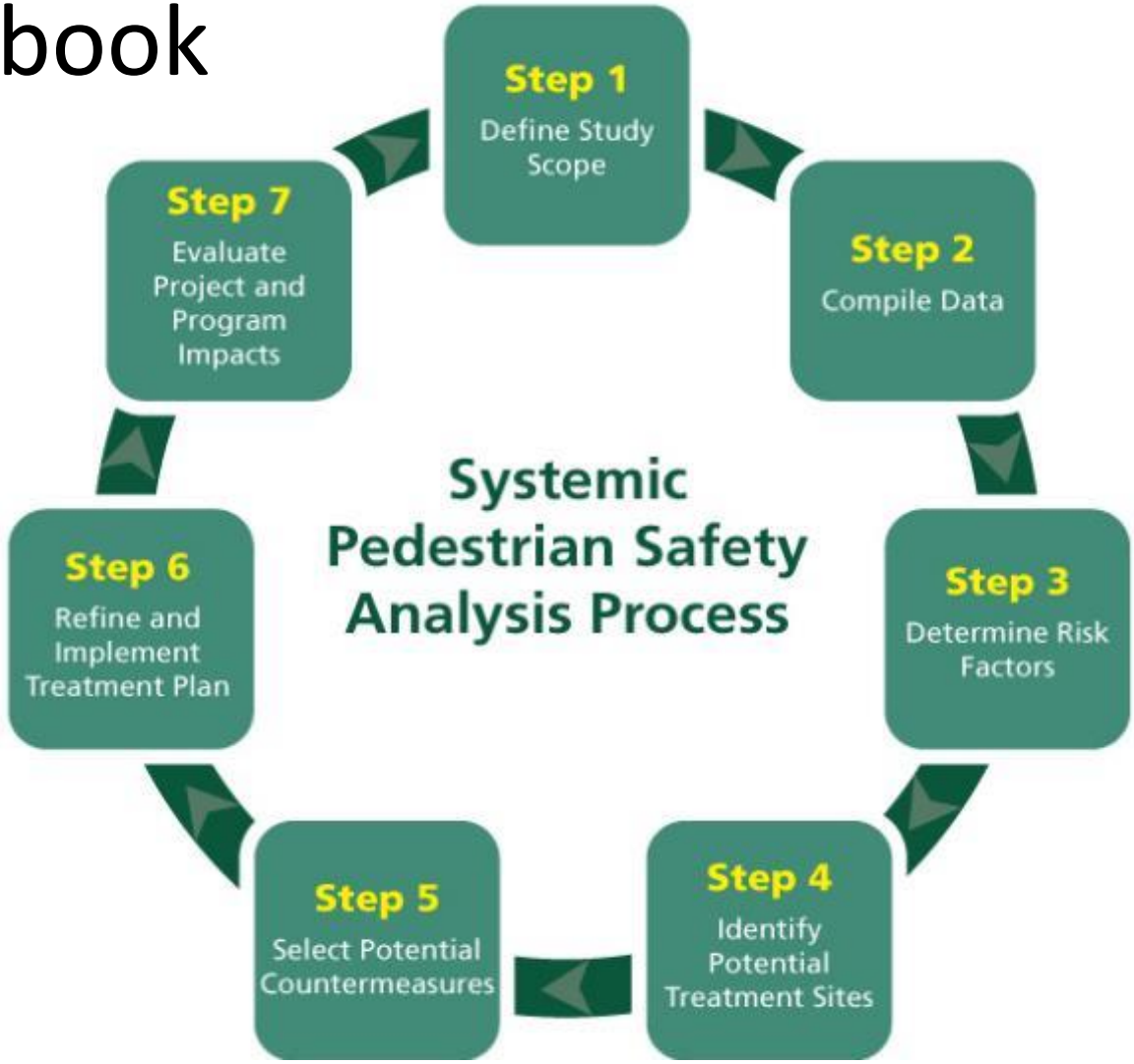
Develop a process (and Guidebook) that includes:

1) Analytical methods to identify roadway features, behaviors, and other contextual risk factors associated with pedestrian crashes
2) Methods to identify appropriate and cost-effective systemic pedestrian safety improvements to address the associated risk factors
3) Information to enable transportation agencies to prioritize candidate locations for selected safety improvements

Guidebook Elements

- Overview
  - Background on a Systemic Process and key features
  - How to use the Guidebook and intended audience
  - Relation to other agency processes
- Process steps
- Examples
- Glossary of key terms
- Appendices
- Companion: Final Report

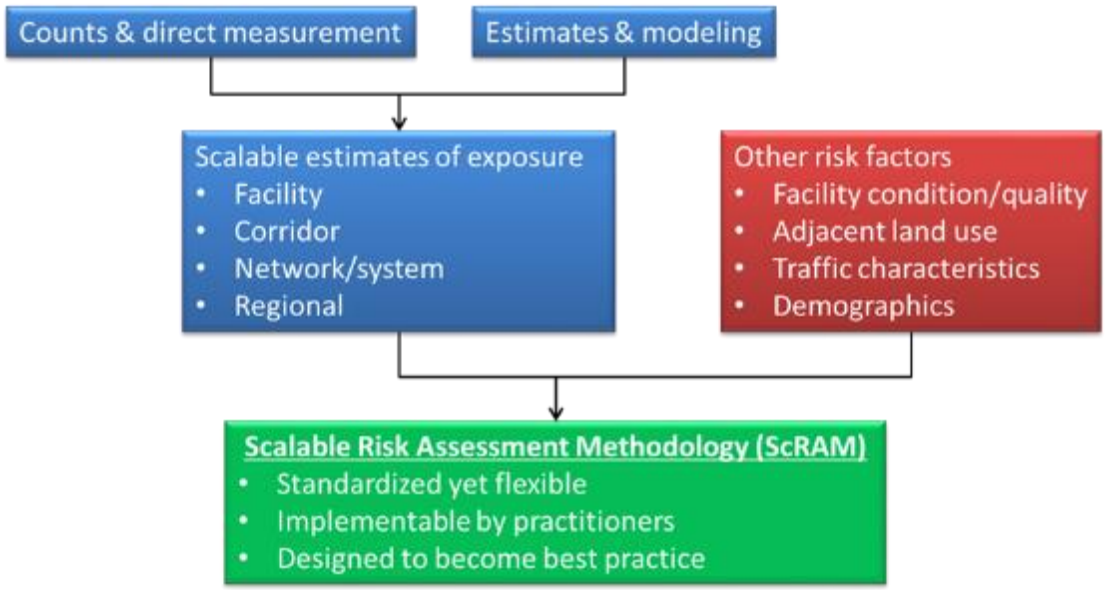
Steps in the Guidebook



Scalable Risk Assessment Methodology

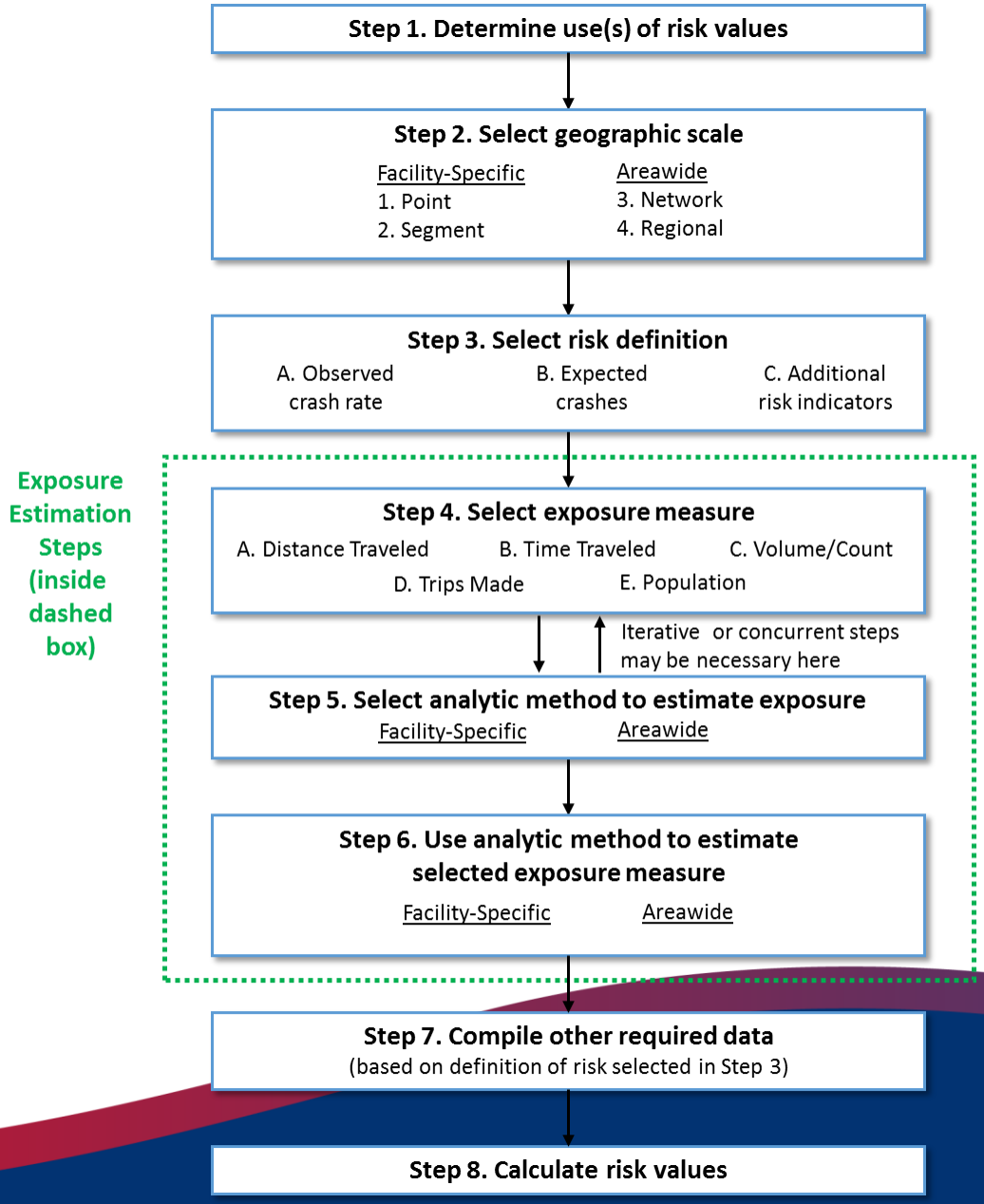
- Develop a standardized approach to estimate pedestrian and bicyclist exposure to risk.
- ScRAM Complete May 2018.
- Technical Assistance and Training Available 2018 ~May 2020.

Conceptual Framework for ScRAM



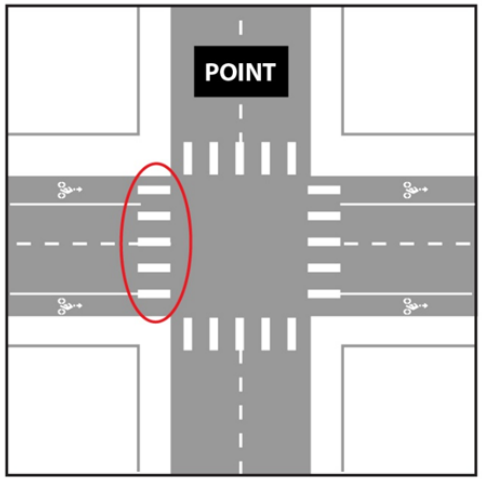
8 Steps

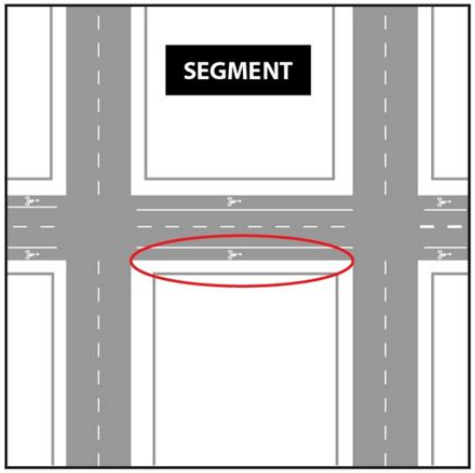
- Framework with flexibility
- Scale matters (a lot)
- Exposure is key ingredient, focus in project



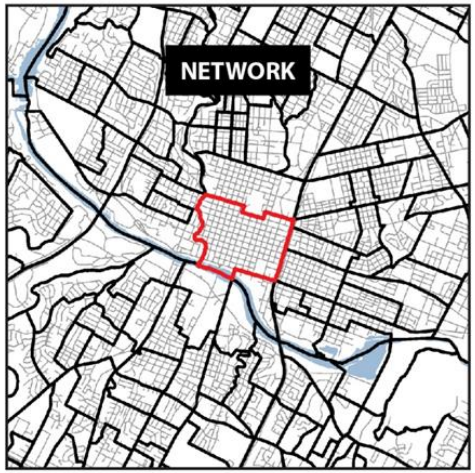
Geographic Scales Covered

Facility-Specific



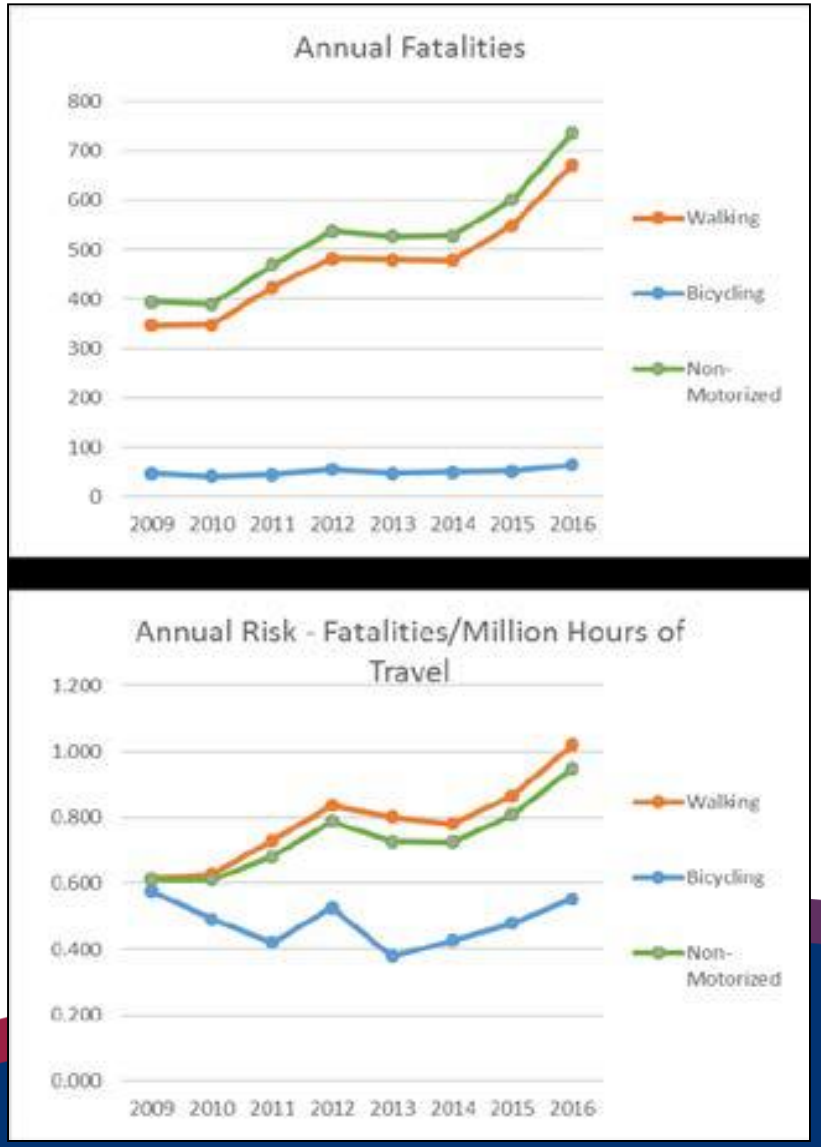


Areawide



Areawide Non-Motorized Exposure Tool

- Combines the best of NHTS and ACS travel surveys
- Statewide and MPO area estimates of TOTAL pedestrian and bicyclist exposure



Resources

- Synthesis of Methods (FHWA-SA-17-041)
  - https://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa17041/index.cfm
- Guide for Scalable Risk Assessment https://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa18032/
- Scalable Non-Motorized Exposure Tool
  - Can be downloaded here: https://safety.fhwa.dot.gov/ped_bike/tools_solve/

How HSIP can be used to support systemic safety projects

Funding and Evaluating Systemic Pedestrian Safety Improvements Webinar

March 5, 2019

Karen Y. Scurry, P.E.
FHWA Office of Safety

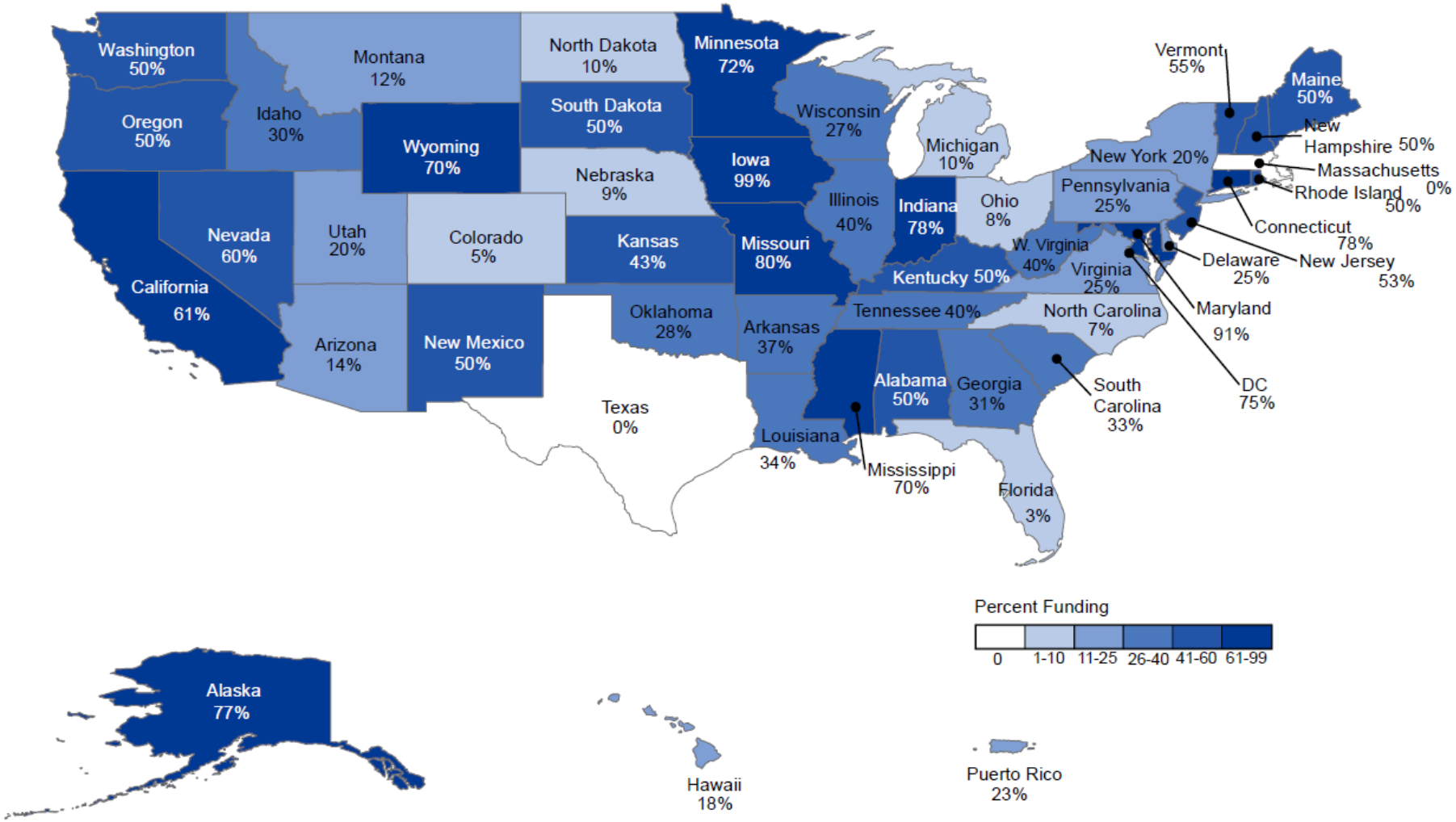
U.S. Department of Transportation
Federal Highway Administration

Safe Roads for a Safer Future
Investment in roadway safety saves lives
http://safety.fhwa.dot.gov

Highway Safety Improvement Program (HSIP)

Percent of 2017 HSIP Funding Toward Systemic Safety Improvements

National Average: 40%



Source: 2017 HSIP Reports

How can HSIP be used to support systemic projects?

- What is HSIP?
- What are HSIP eligibility requirements?
- What are systemic projects?
- Are systemic safety projects necessary?
- Are systemic projects cost effective?
- What resources are available?

Highway Safety Improvement Program

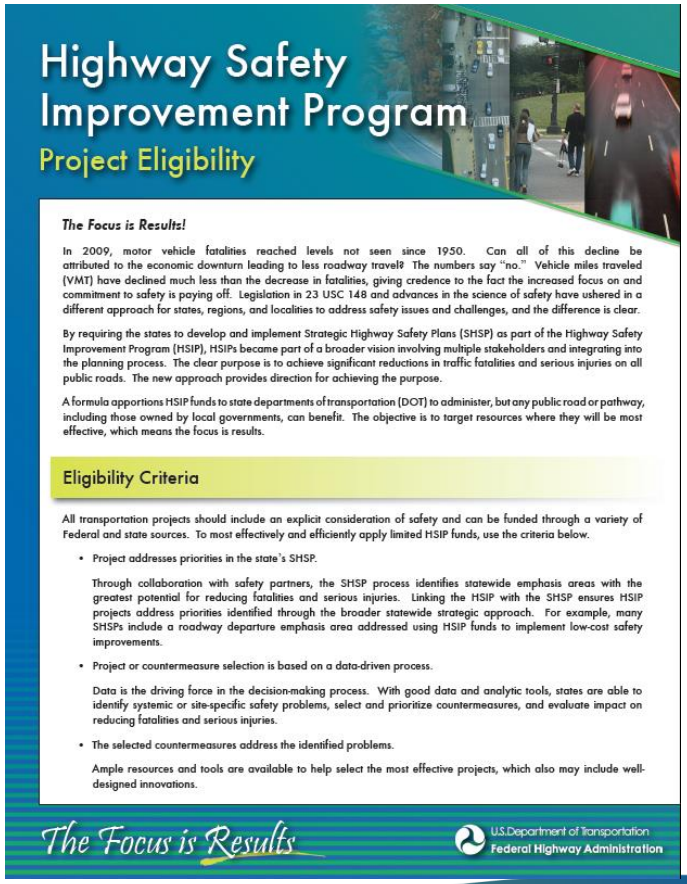
Purpose:

Reduce fatalities and serious injuries on ALL public roads

- Strategic safety planning
- Data-driven roadway safety management process
- Highway safety improvement projects
- Federally-funded, state administered

HSIP Project Eligibility

- Addresses an SHSP Priority
- Identified through a data-driven process
- Targets identified safety issue
- Reduces fatalities and serious injuries



Highway Safety Improvement Program

Project Eligibility

The Focus is Results!

In 2009, motor vehicle fatalities reached levels not seen since 1950. Can all of this decline be attributed to the economic downturn leading to less roadway travel? The numbers say "no." Vehicle miles traveled (VMT) have declined much less than the decrease in fatalities, giving credence to the fact the increased focus on and commitment to safety is paying off. Legislation in 23 USC 148 and advances in the science of safety have ushered in a different approach for states, regions, and localities to address safety issues and challenges, and the difference is clear.

By requiring the states to develop and implement Strategic Highway Safety Plans (SHSP) as part of the Highway Safety Improvement Program (HSIP), HSIPs became part of a broader vision involving multiple stakeholders and integrating into the planning process. The clear purpose is to achieve significant reductions in traffic fatalities and serious injuries on all public roads. The new approach provides direction for achieving the purpose.

A formula apportions HSIP funds to state departments of transportation (DOT) to administer, but any public road or pathway, including those owned by local governments, can benefit. The objective is to target resources where they will be most effective, which means the focus is results.

Eligibility Criteria

All transportation projects should include an explicit consideration of safety and can be funded through a variety of Federal and state sources. To most effectively and efficiently apply limited HSIP funds, use the criteria below.

- Project addresses priorities in the state's SHSP.

  Through collaboration with safety partners, the SHSP process identifies statewide emphasis areas with the greatest potential for reducing fatalities and serious injuries. Linking the HSIP with the SHSP ensures HSIP projects address priorities identified through the broader statewide strategic approach. For example, many SHSPs include a roadway departure emphasis area addressed using HSIP funds to implement low-cost safety improvements.

- Project or countermeasure selection is based on a data-driven process.

  Data is the driving force in the decision-making process. With good data and analytic tools, states are able to identify systemic or site-specific safety problems, select and prioritize countermeasures, and evaluate impact on reducing fatalities and serious injuries.

- The selected countermeasures address the identified problems.

  Ample resources and tools are available to help select the most effective projects, which also may include well-designed innovations.

The Focus is Results

U.S.Department of Transportation
Federal Highway Administration

http://www.fhwa.dot.gov/map21/guidance/guidehsip.cfm

Strategic Highway Safety Plans (SHSPs)

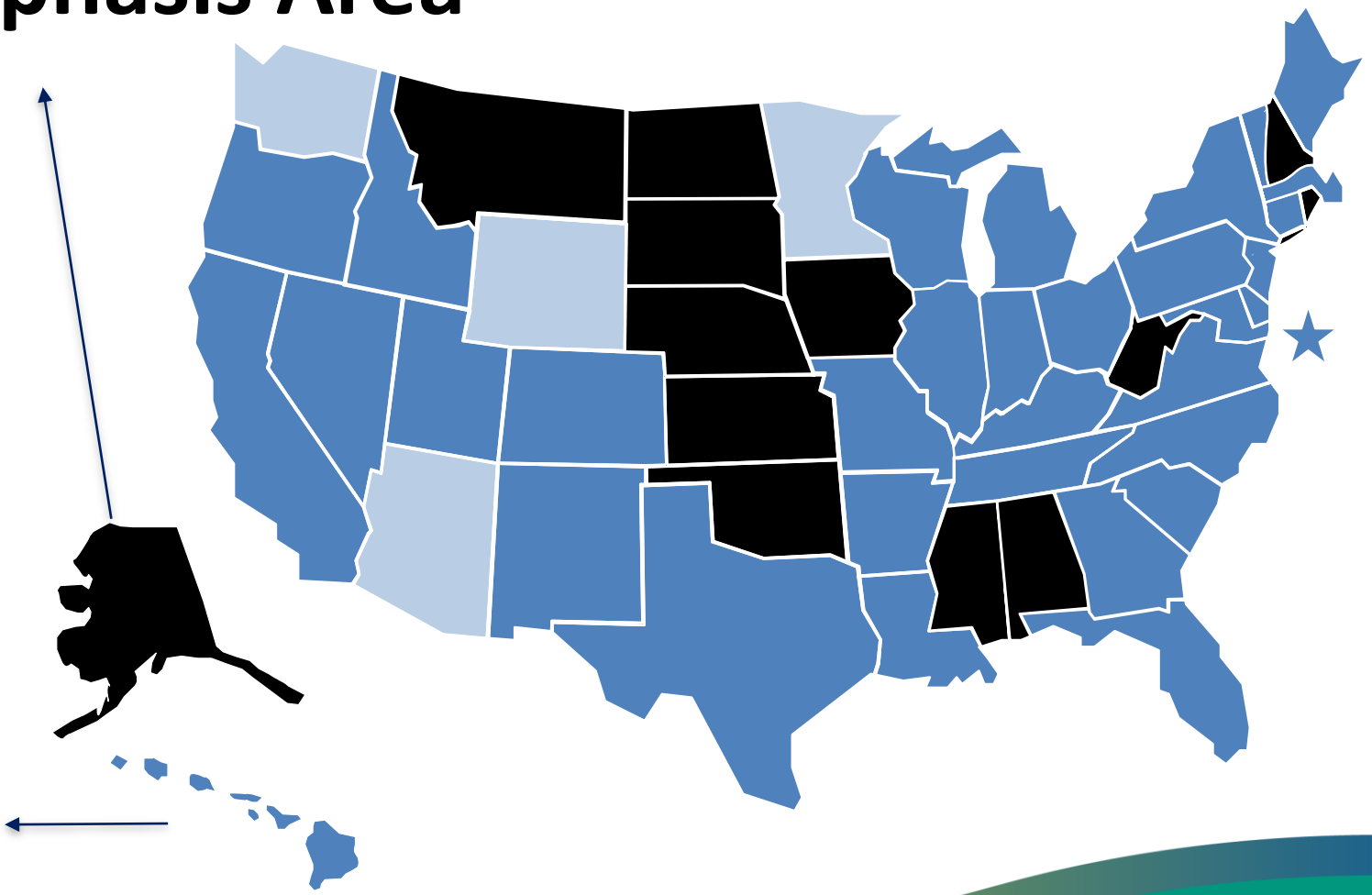
Vision

Innovation

Data-driven *statewide* plan

- Establishes a common vision, mission and goals to save lives on all public roads
- Identifies a State's key transportation safety needs and guides investment decisions
- Prioritizes strategies with the greatest potential to reduce fatalities and serious injuries
- Developed in collaboration with a broad range of stakeholders
- Multidisciplinary addressing 4 Es of Safety

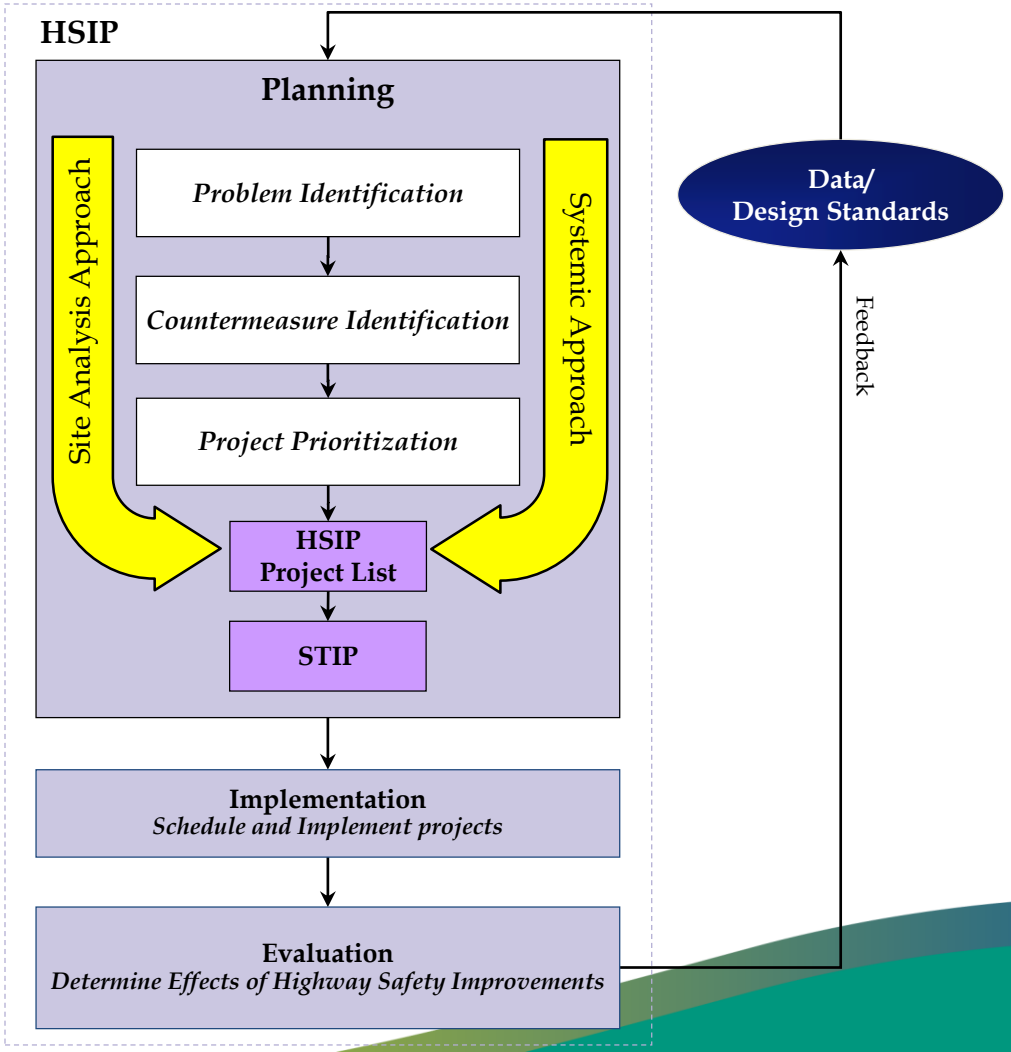
State SHSPs with Pedestrian-related Emphasis Area



Source: SHSP Database

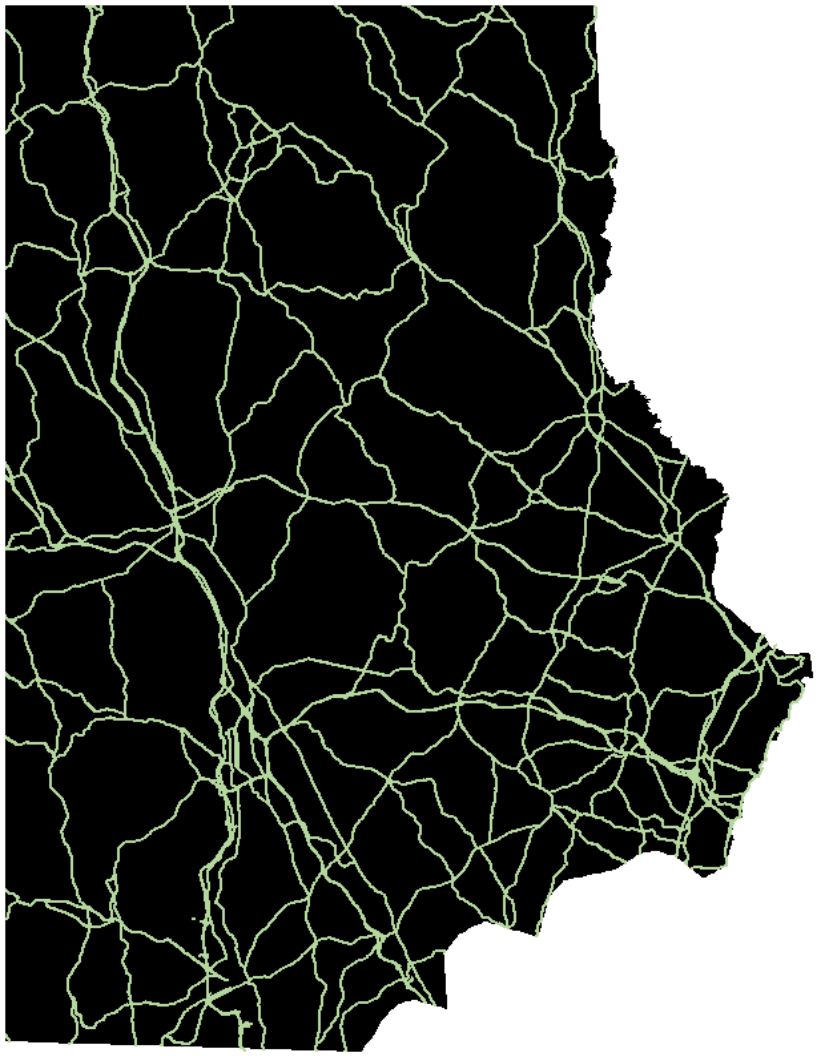
https://safety.fhwa.dot.gov/shsp/other_resources.cfm

Data-Driven Process



What is systemic safety?

- Hotspot Screening
  - High crash locations
  - Address unique problems
  - Higher cost projects
- Systemic Approach
  - Moderate-low crash locations
  - Address common problems
  - Lower cost projects
- Systematic Approach
  - Policy-based improvements
  - Address all necessary sites



What is systemic safety?

Systemic safety improvement means a **proven** safety countermeasure(s) that is widely implemented based on **high-risk** roadway features that are correlated with particular **severe** crash types.

Are systemic projects necessary?

States are required to establish:

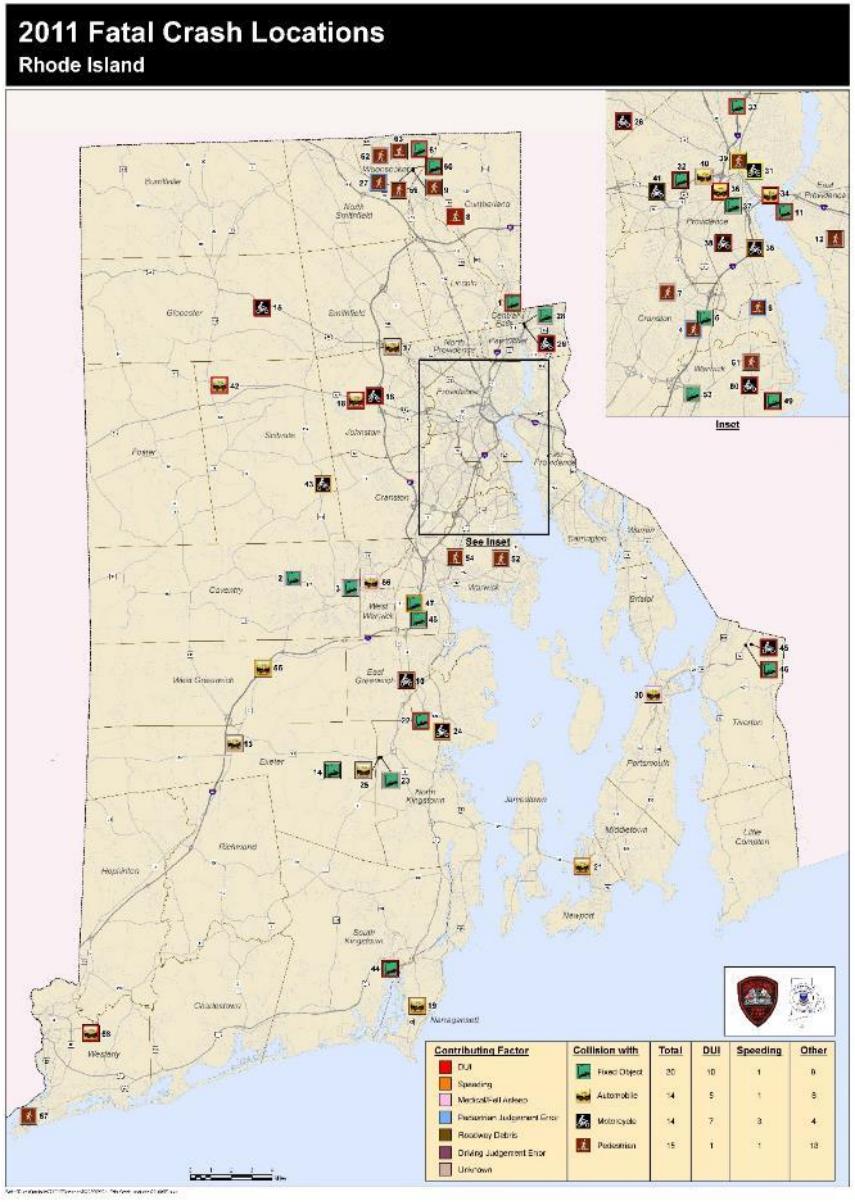
A process for analyzing safety data to:

(i) Develop a program of highway safety improvement projects, in accordance with 23 U.S.C. 148(c)(2), to reduce fatalities and serious injuries on all public roads through the implementation of a **comprehensive program** of systemic and spot safety improvement projects.

Source: 23 CFR 924

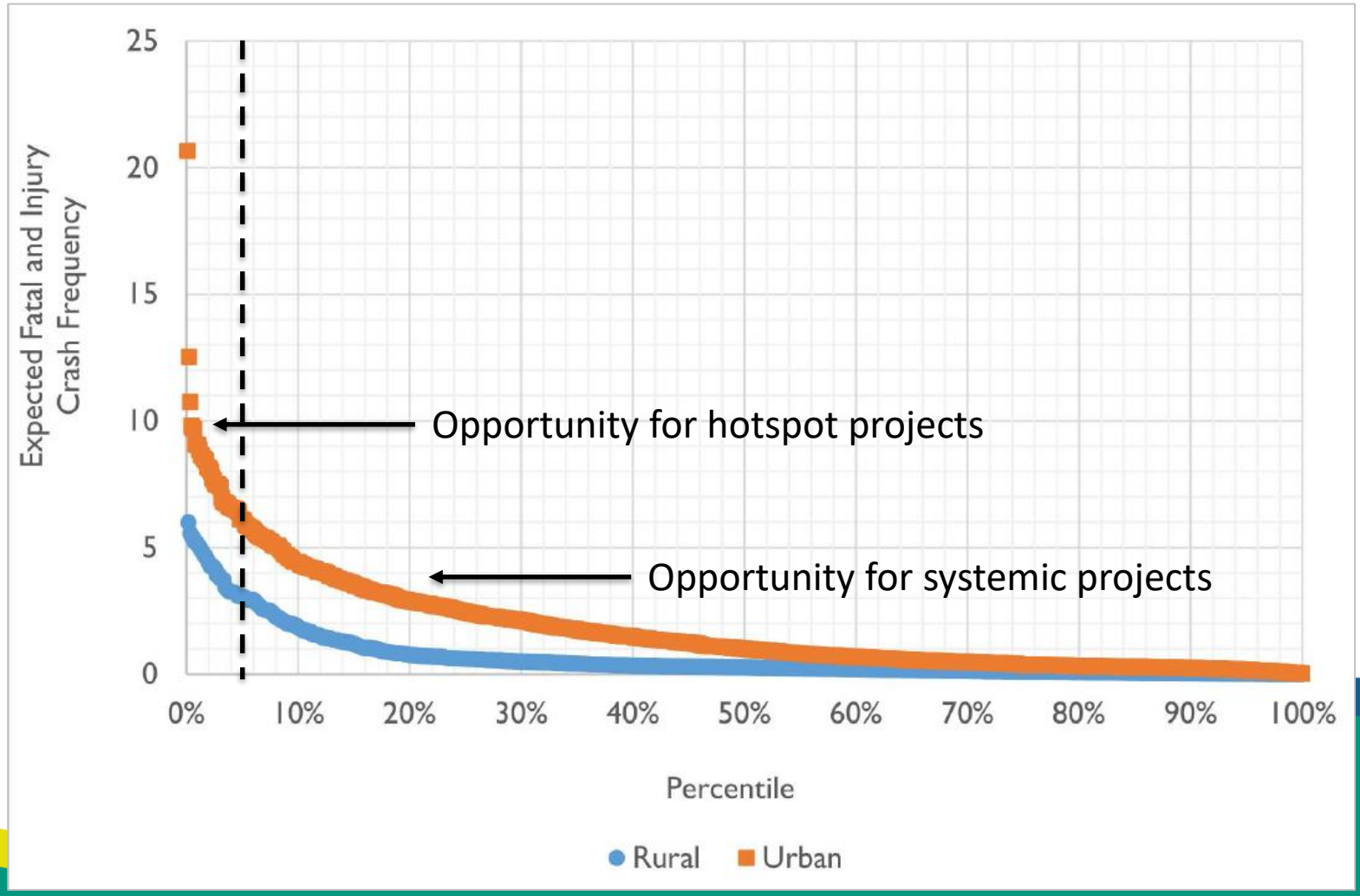
Are systemic projects necessary?

- Don’t chase fatals
- Identify sites with potential for safety improvement



Are systemic projects necessary?

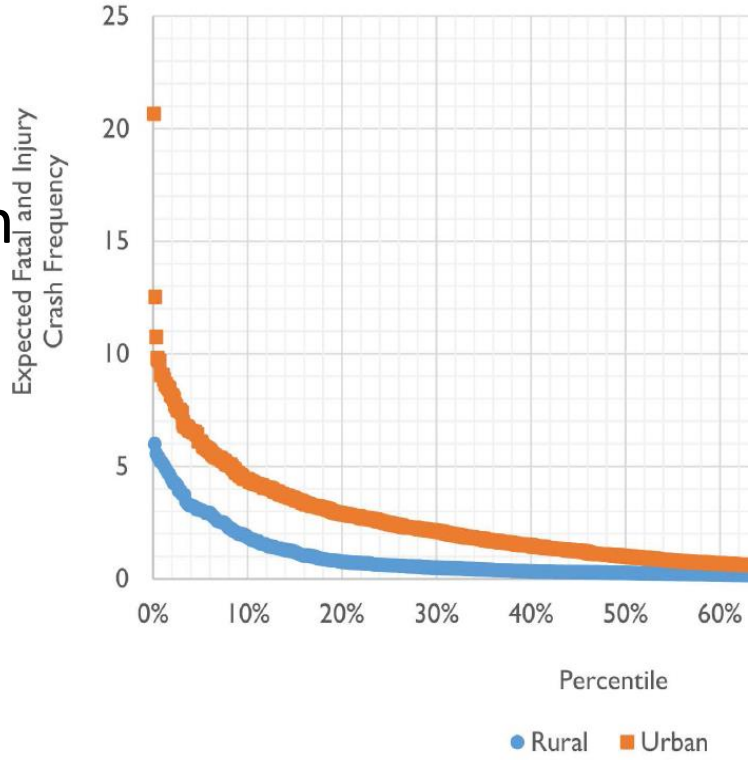
Statewide Distribution of Intersection Safety Performance



Is it more cost-effective to implement hotspot or systemic projects?

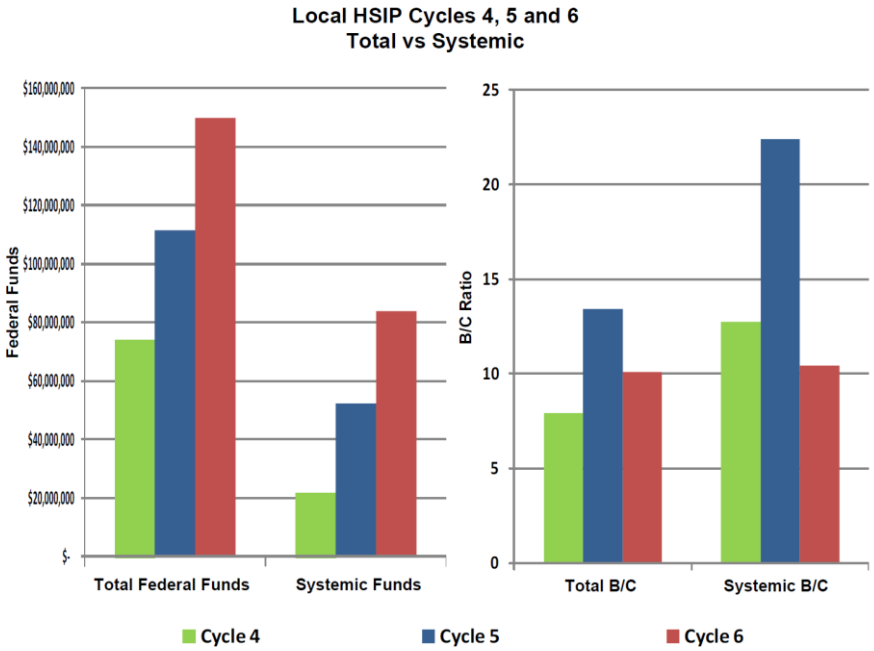
Budget = $3M

- Site-specific
  - 3 roundabouts @ $1M/site
  - CMF_{Total} = 0.60 (40% reduction)
  - 10-20 crashes/yr without treatm
  - Benefit = 12 – 24 crashes/yr
- Systemic
  - 500 intersections @ $6000/site
  - CMF_{Total} = 0.95 (5% reduction)
  - 3 crashes/yr without treatment
  - Benefit = 75 crashes/yr



Caltrans Local Safety Success

- In addition, the B/C for "Systemic" projects continued Cycle 5's trend with 40% higher B/Cs than "Spot Location" projects (11.59 vs. 8.25) and over 45% more Systemic-type applications submitted.

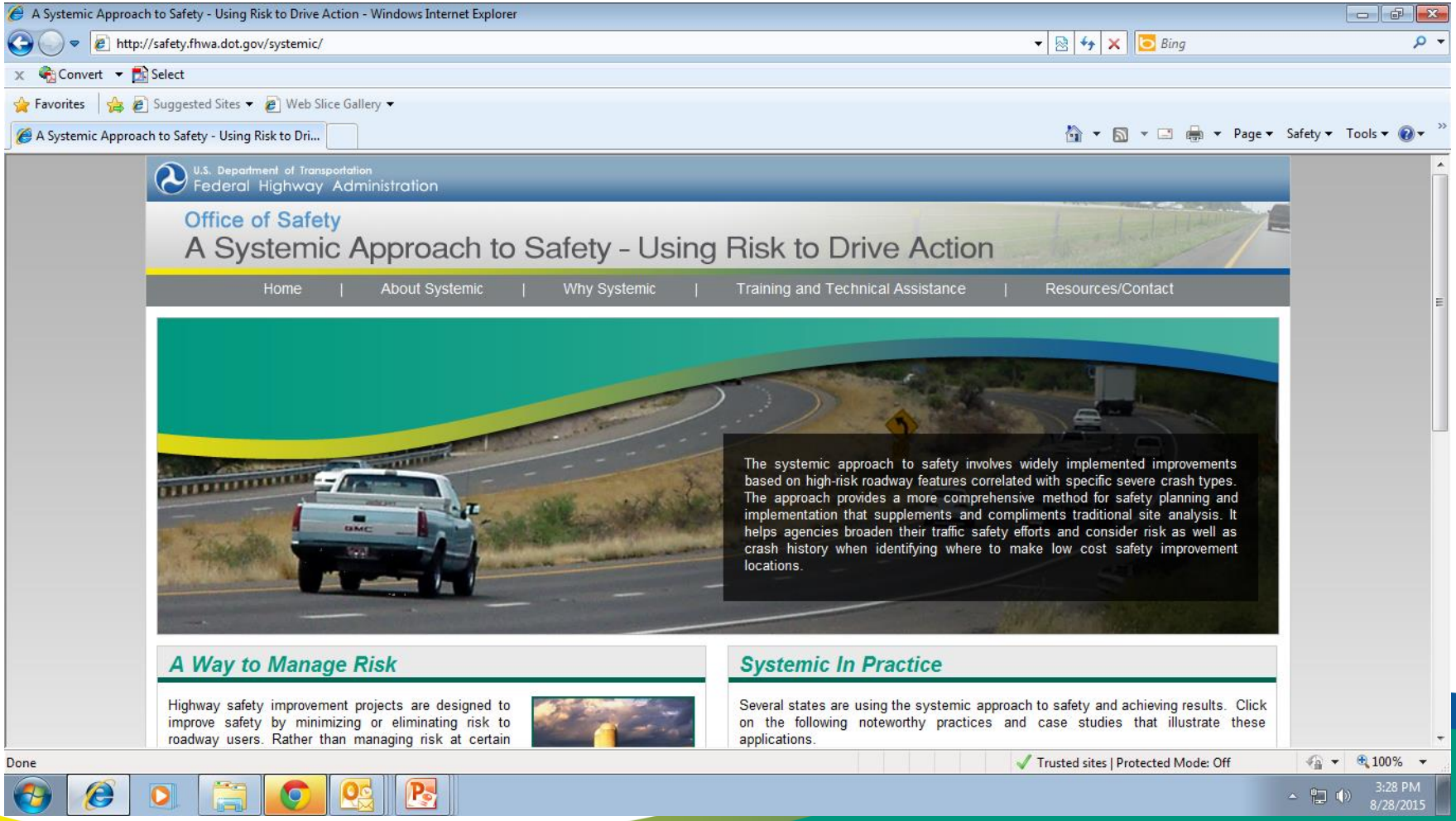


Source:
http://www.dot.ca.gov/hq/LocalPrograms/HSIP/summary-of-results-cycle6.htm

Are systemic projects HSIP-eligible?

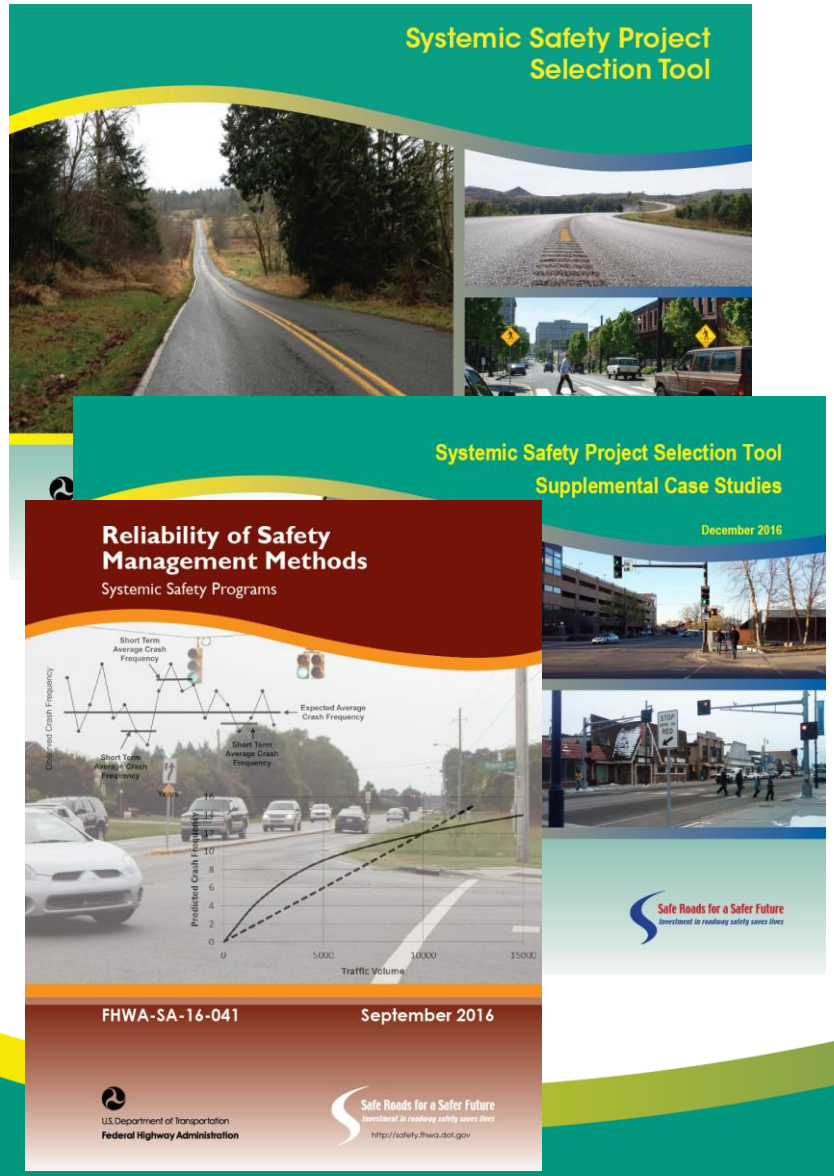
- Addresses priority in State SHSP
  - Intersections, Roadway Departure, **Pedestrians**, Bicyclists
- Identified through data-driven process
  - Selected based on crash experience **or other data-supported means** using either a hotspot analysis **or risk-based system approach**
- Targets identified safety problem
  - Focus on **risk factors** tied to focus crash type and facility type
- Contributes to reduction in fatalities and serious injuries
  - Research-based, **proven**, effective countermeasures

Systemic Approach to Safety: Using Risk to Drive Action



http://safety.fhwa.dot.gov/systemic

FHWA Resources



- Systemic Safety Project Selection Tool
- Supplemental Case Studies
  - Limited Data
  - Pedestrian Safety
- Reliability of Safety Management Series: Systemic Safety Programs
  - https://safety.fhwa.dot.gov/rsdp/downloads/fhwasa16041.pdf
- Focus Crash Types and Risk Factors Research Project
  - To be published in Spring 2019

Training & Technical Assistance

Available upon request

- Systemic safety training
  - Introduces the systemic safety analysis process with examples and case studies
  - 4-hr instructor led workshop
- Technical Assistance
  - Systemic safety analysis
- Determine the balance between spot and systemic improvements
  - Evaluation of systemic improvements

Questions???

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Highway Safety Improvement Program

Data Driven Decisions


VDOT
Virginia Department of Transportation

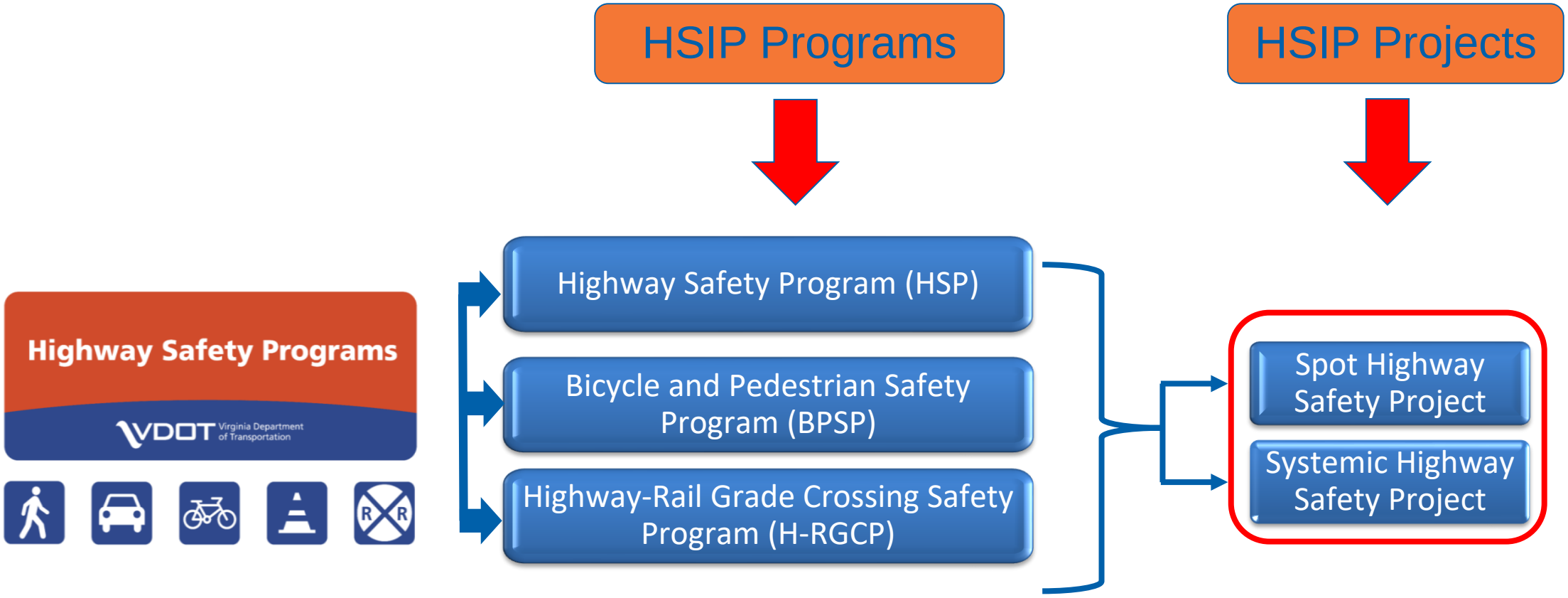
SYSTEMIC SAFETY IMPROVEMENT

Bicycle & Pedestrian Focus

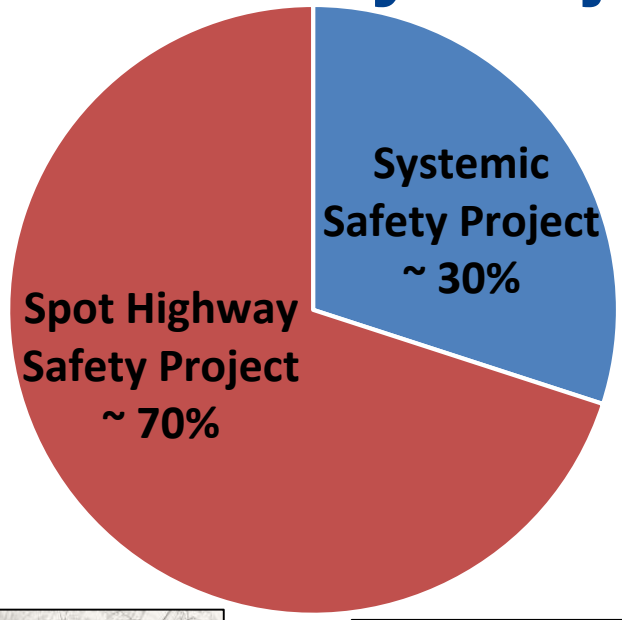
Tracy Turpin, PE.
HSIP Project Delivery Program Manager

03/05/2019

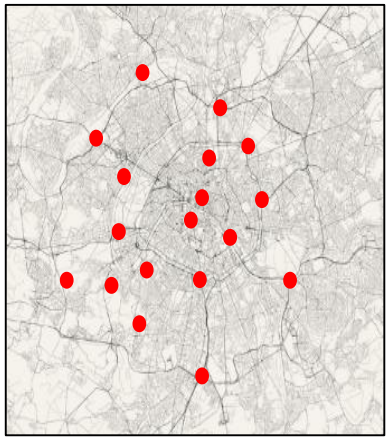
VDOT Safety Program:



VDOT Safety Projects:



Spot Highway Safety Project



Systemic Highway Safety Project

VDOT Business Plan Action Item 3.2.3 States:

Systemic Highway Safety Project –

- A project that consists of a lower-cost/high-benefit highway safety countermeasure that is deployed at multiple higher-risk roadway locations to address a particular crash type.
- Systemic projects rarely involve reconstruction of the existing roadway features.
- Typical lower-cost safety countermeasures range from $1000 to $100,000 per treated location.

Spot Highway Safety Project –

- A project that deploys a safety countermeasure or countermeasures at a single location or along a single corridor on the highway network.
- The scope of work often involves reconstruction of existing roadway features or construction of new features such as turn lanes or new travel lanes.
- Typical cost to treat a single location is much higher than the individual cost of a single location within a systemic project.
- Costs for spot projects can vary widely but are generally in the $100,000 to $10,000,000 range.

VDOT Systemic Safety Process:

Step 1: Determine Focus (crash and/or facility type)

- Focus Crash Type (angle, rear-end, etc.)
- Focus Facility Type (unsignalized intersections, undivided corridors, etc.)

Step 2: Analyze Risk Factors

- Determine what roadway elements are associated with those focus crash or facility types
- Example risk factors can be found in the HSM

Step 3: Select Countermeasures

- Select countermeasures to address the focus crash/facility type and corresponding risk factors.

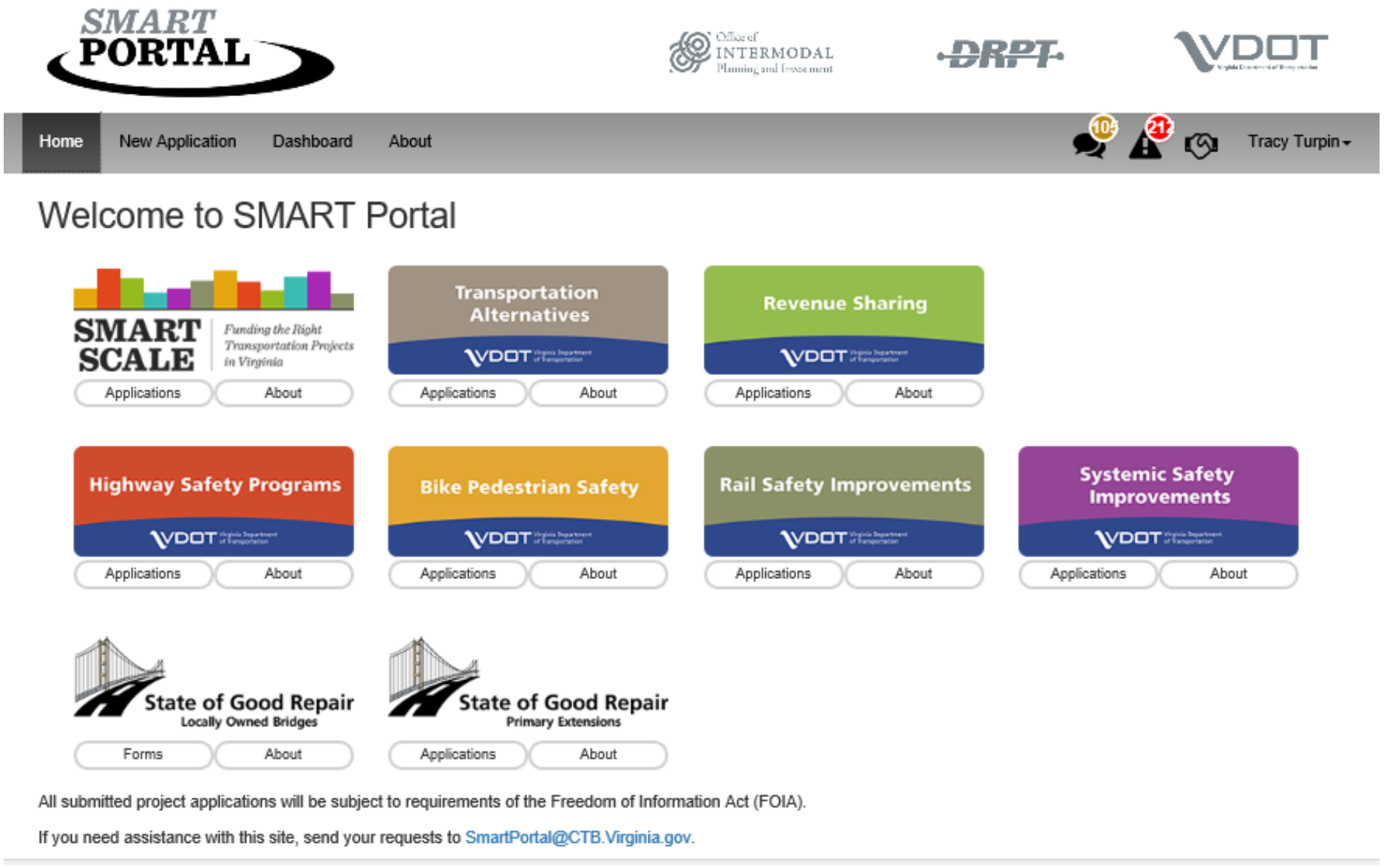
Steps 4 - 8: Determine number of Locations

- Select the total number of locations that have the selected risk factors present.
- Select a crash threshold.
- Determine the number of locations that meet that threshold.
- Based on the available budget or other constraints, determine the deployment level estimate.

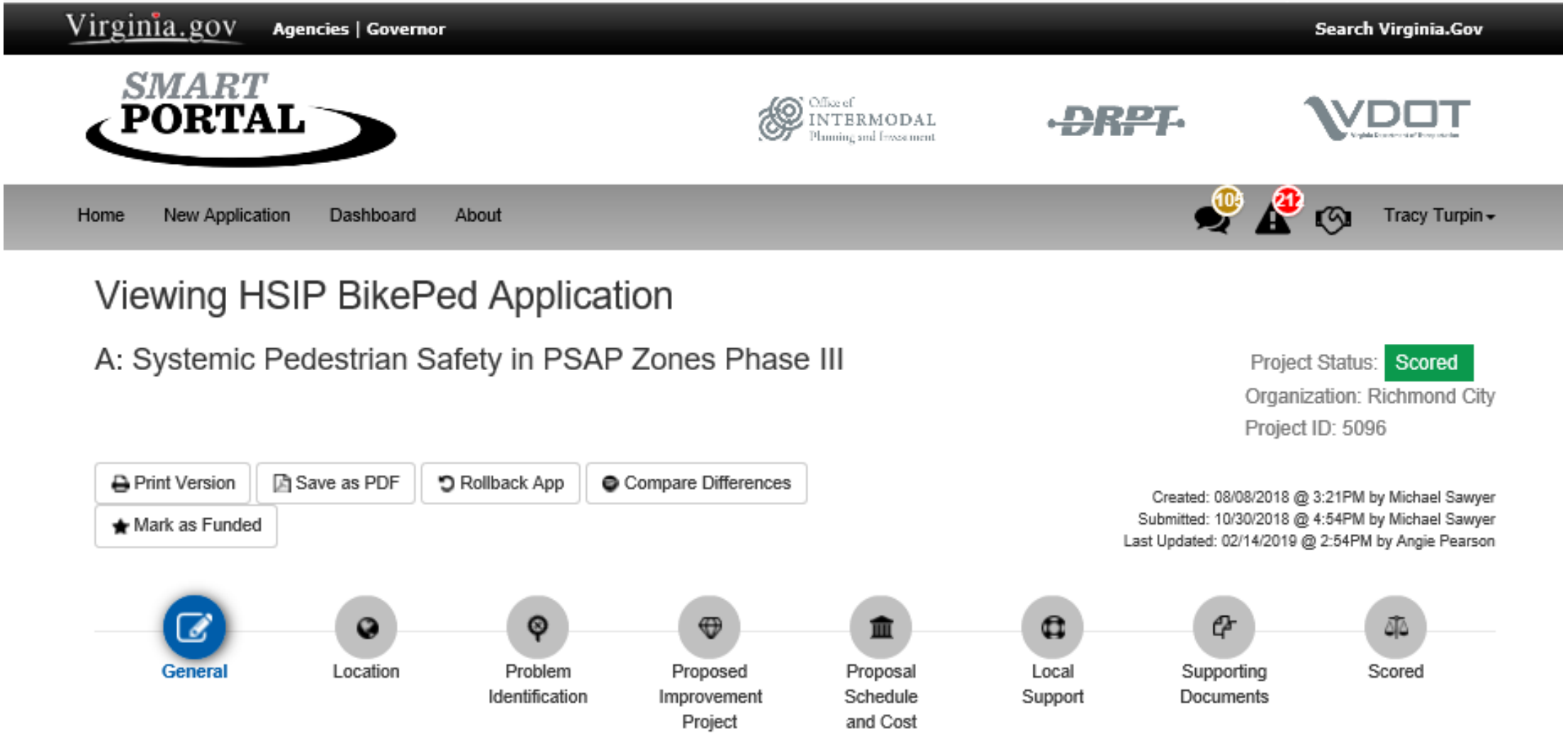
Step 9: Determine Targeted KAB Crashes

- Determine the number of KAB crashes that will be addressed at the Systemic Improvement Deployment Locations.

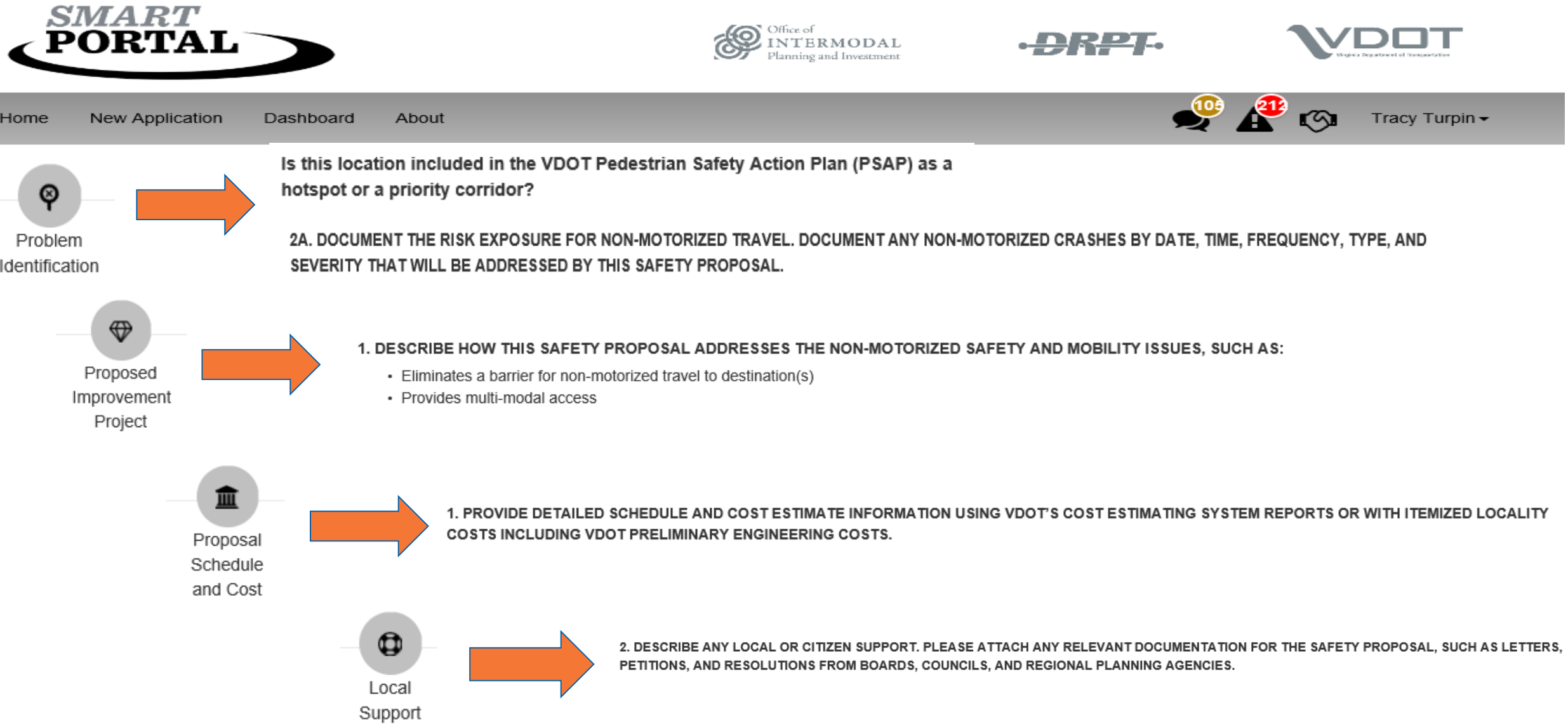
VDOT One Stop Shop:



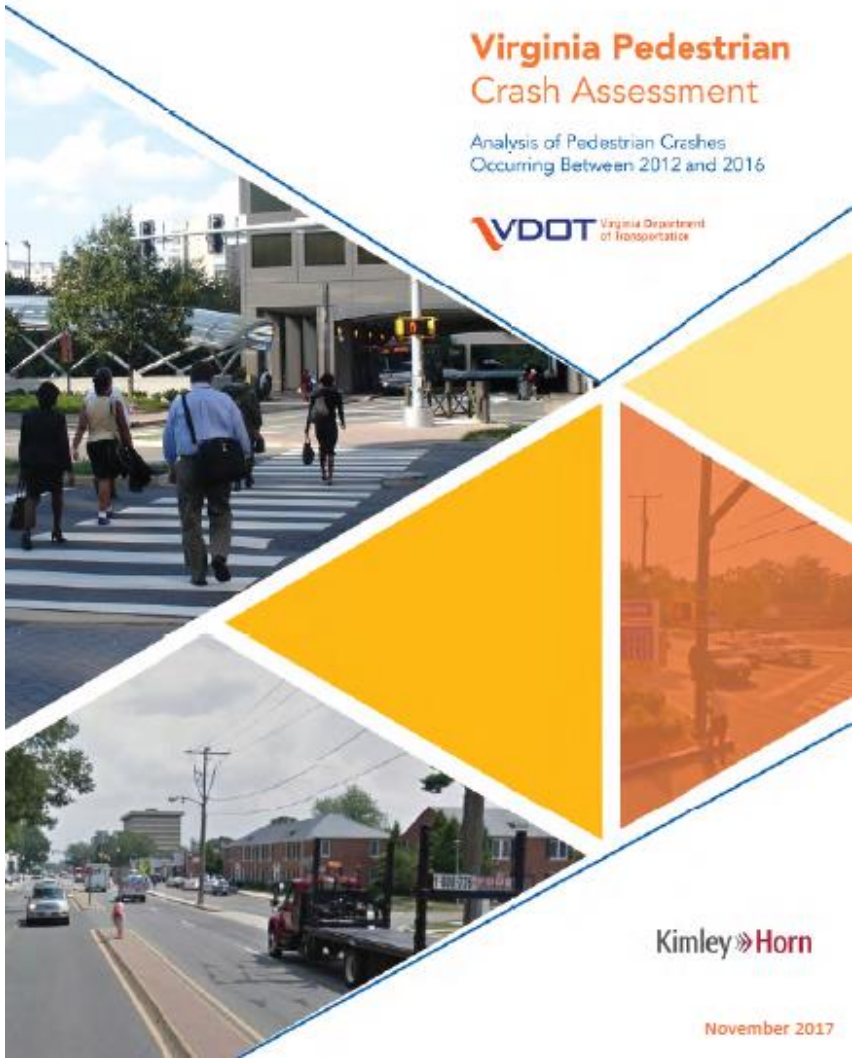
Systemic BikePed Application:

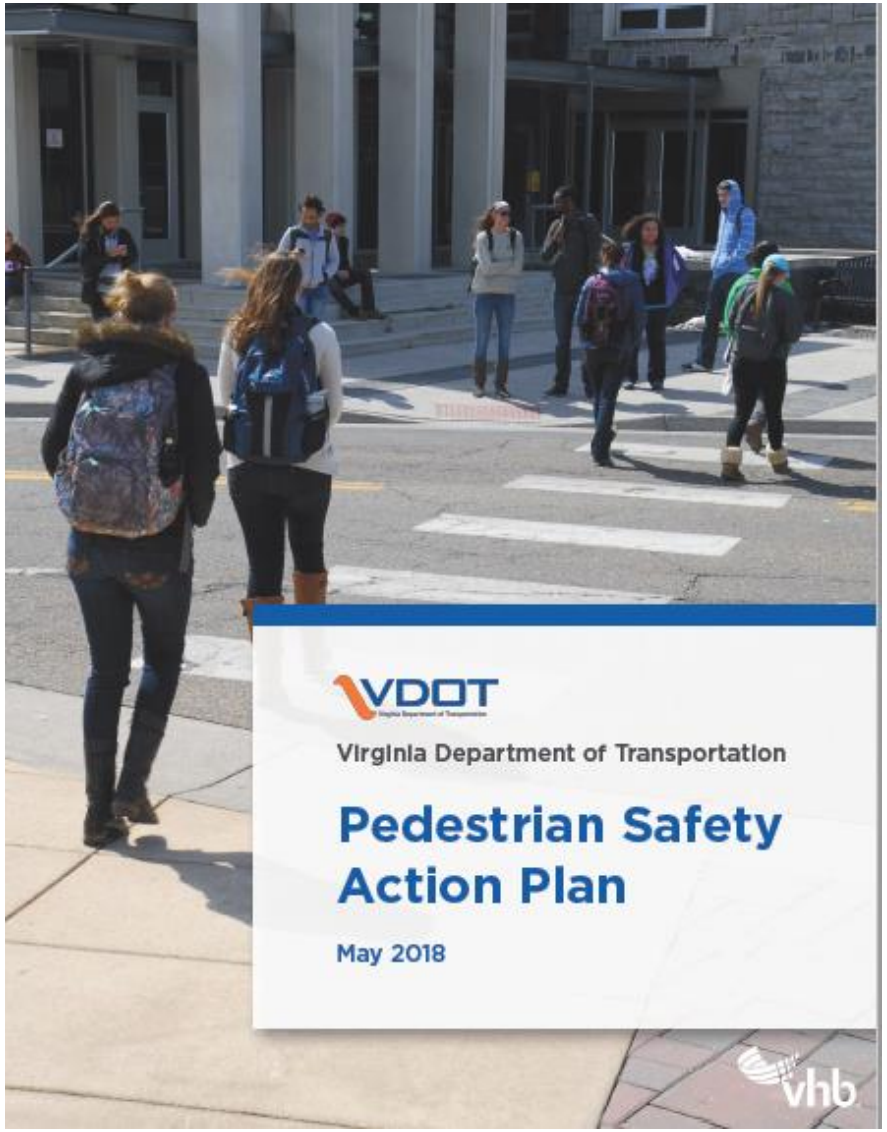


Systemic BikePed Application Contd..:



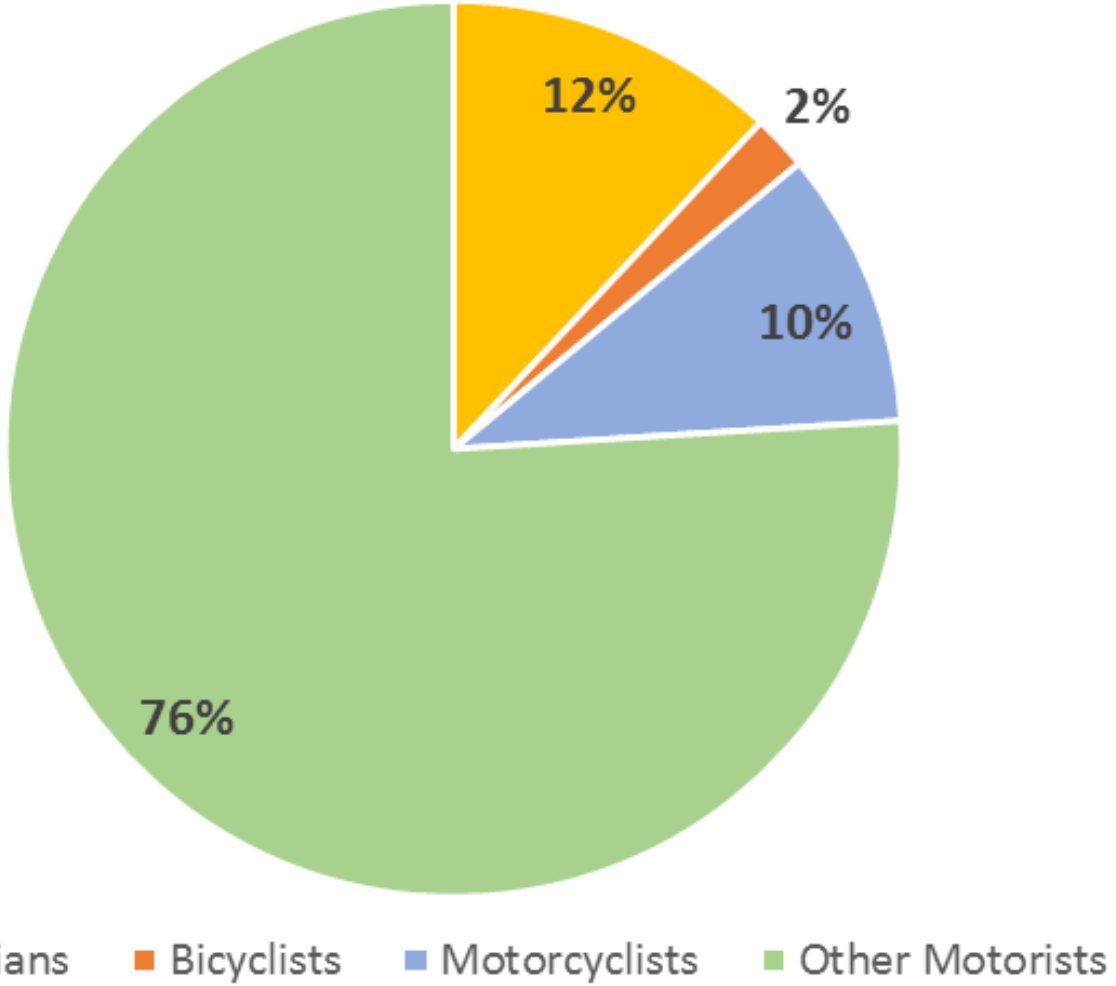
PSAP Crash Assessment and Action Plan:





Virginia Traffic Deaths By Roadway User Type
(2011-2016)

In 2017,
234 vulnerable road users died,
27% of all traffic deaths



Goals for the VDOT Pedestrian Safety Action Plan (PSAP)

- To better understand the pedestrian safety concerns throughout the state and identify countermeasures to address those concerns
- Consider policy, procedure, and practice changes to better promote safe pedestrian travel
- To consider the relationship between land development and pedestrian safety
- To consider maintenance issues for pedestrian access and safety
- To identify HSIP pedestrian safety projects

Step 1: Policy Review

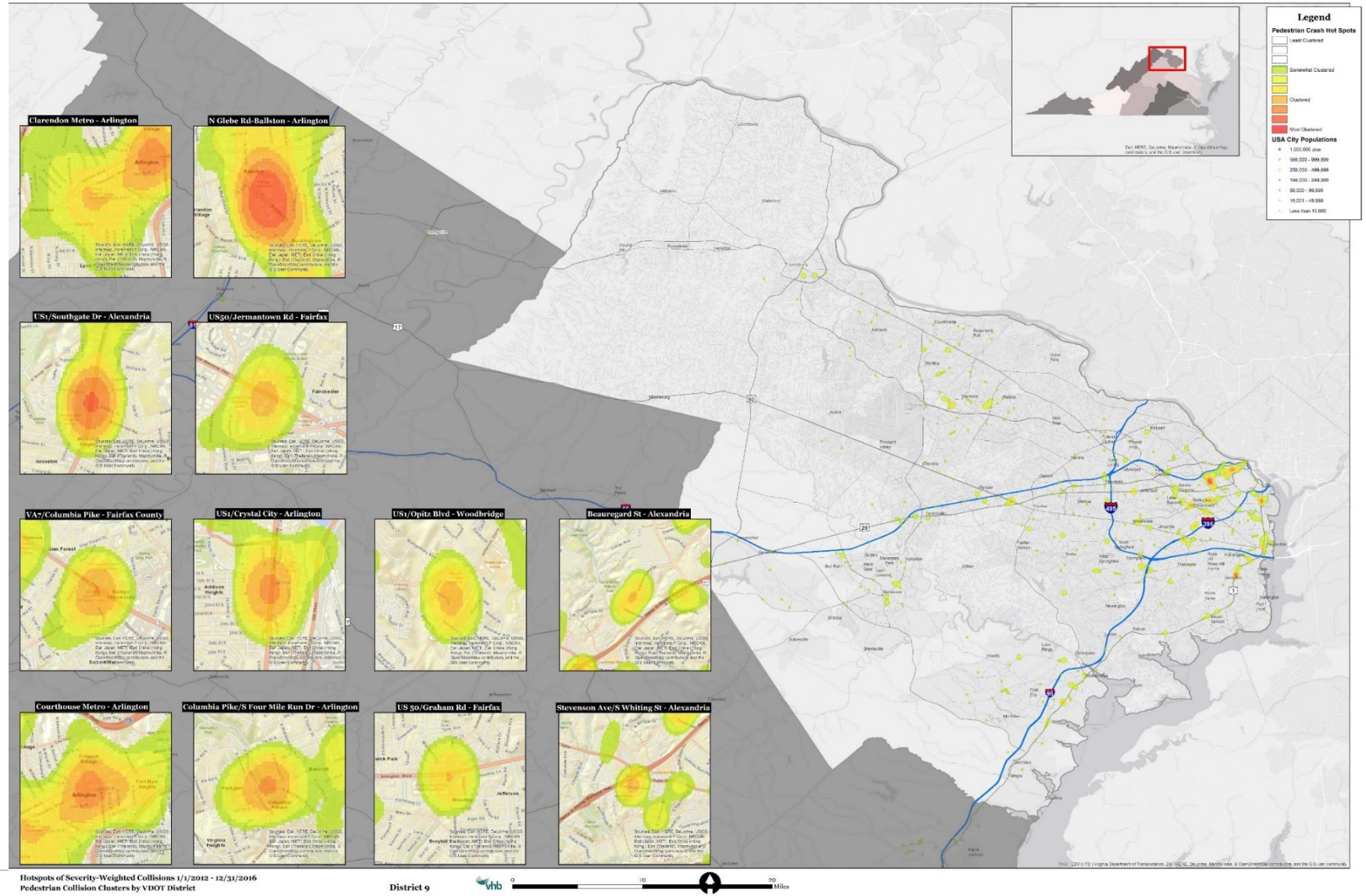
Step 2: Crash and Data Analysis

Step 3: Countermeasure Selection

Crash and Data Analysis

Crash Clusters

- smaller scale
- focus on crash types

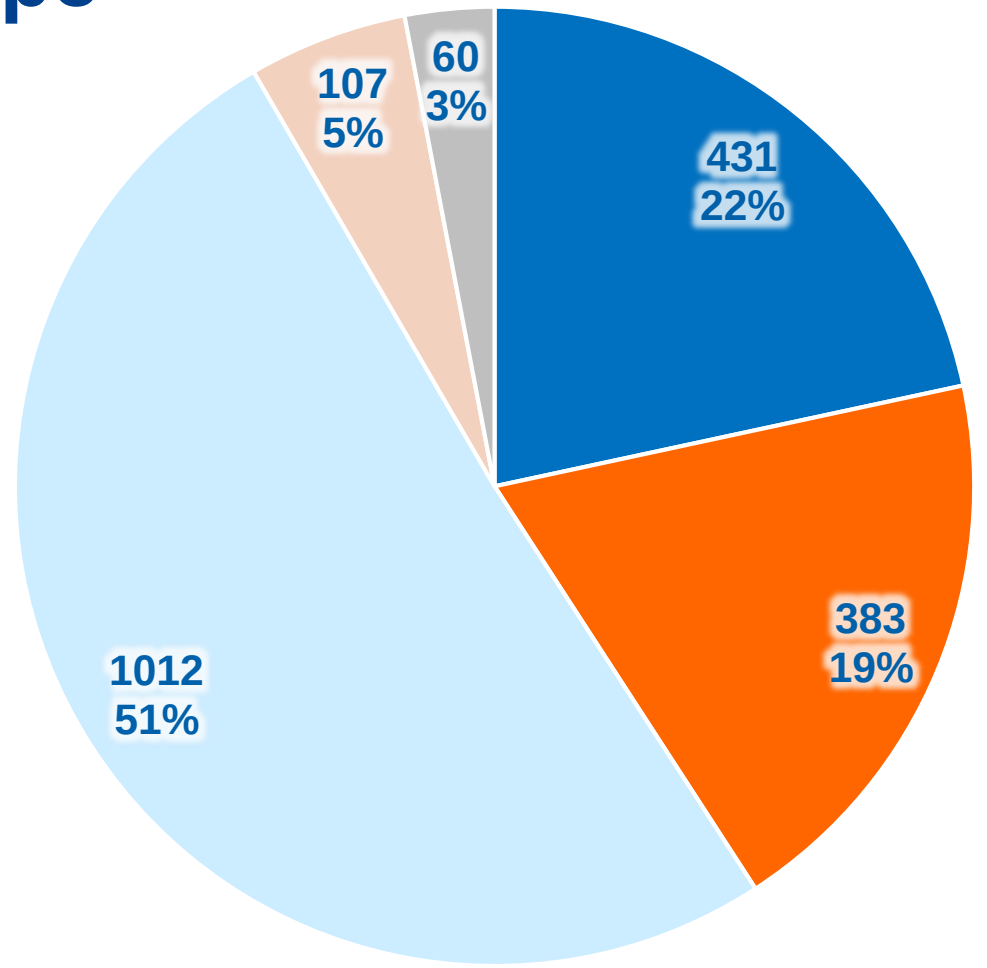


Crash and Data Analysis

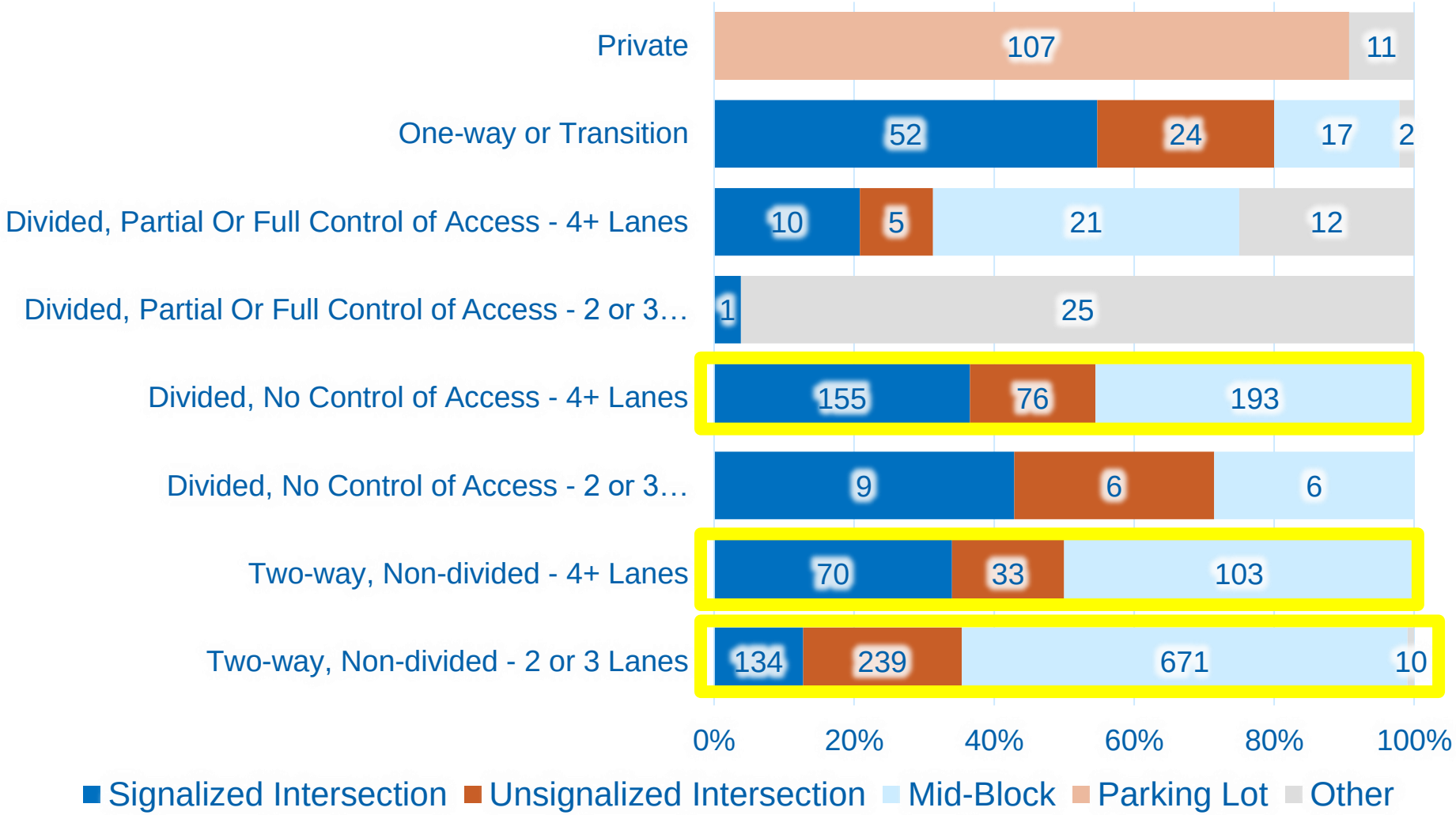
Priority Pedestrian Corridors

- larger scale
- selected per criteria evaluating risk for crashes

Pedestrian Crashes (Injuries Only) By Intersection Type



Pedestrian Crashes (Injuries Only) By Facility and Crossing Type



Corridor Evaluation: Criteria Considered

LAND USE FACTORS

- ✓ Pedestrian destinations (parks, trails, and schools)
- ✓ MPO urban area/land use data layer
- ❑ Bus stops and transit/passenger rail stations

SPEED FACTORS

- ✓ Posted speed limits
- ❑ Operational speeds

VISIBILITY FACTORS

- ❑ N/A: Lighting
- ❑ N/A: Pavement markings and crossing

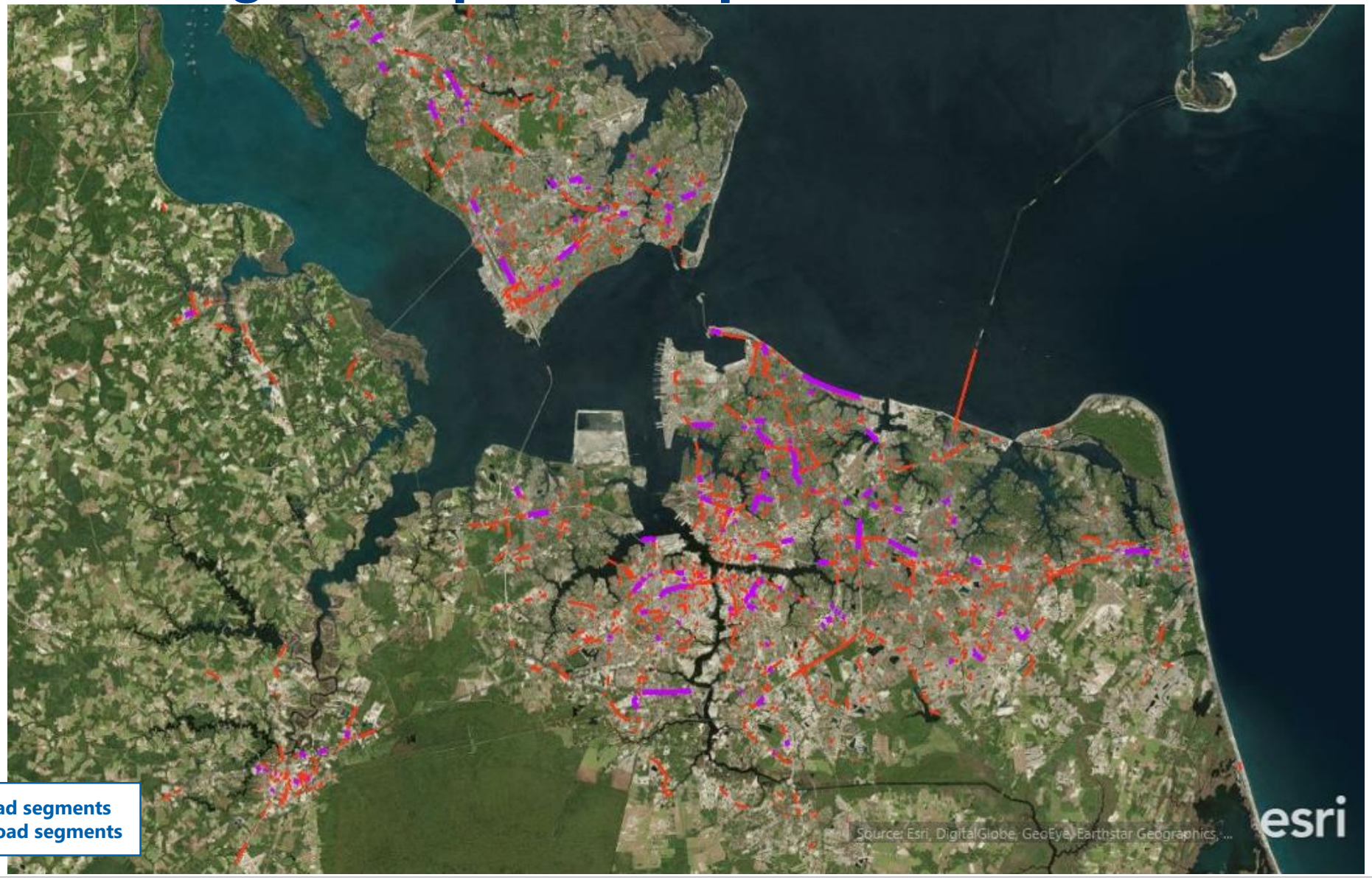
DESIGN/INFRASTRUCTURE FACTORS

- ❑ Signal density
- ❑ Intersection locations
- ❑ N/A: Sidewalk and path accommodations maintained by VDOT
- ❑ N/A: Crossing distance

VOLUME/OTHER FACTORS

- ✓ Pedestrian crash data
- ✓ Vehicle traffic volumes
- ✓ Population and employment density (US Census)
- ✓ Vehicle ownership (US Census)
- ✓ Poverty levels (US Census)
- ✓ Prevalence of impaired (alcohol) citations

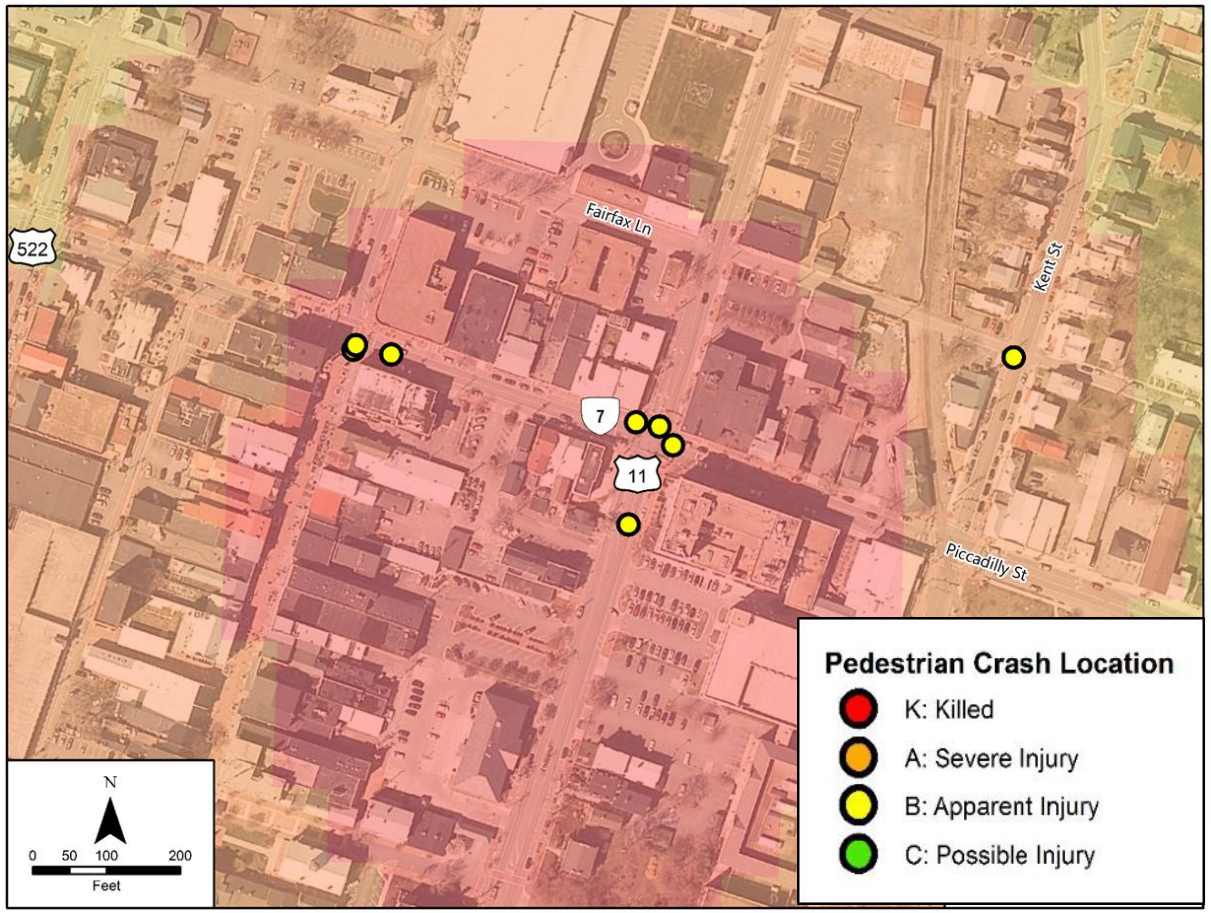
Corridor Scoring Example: Hampton Roads



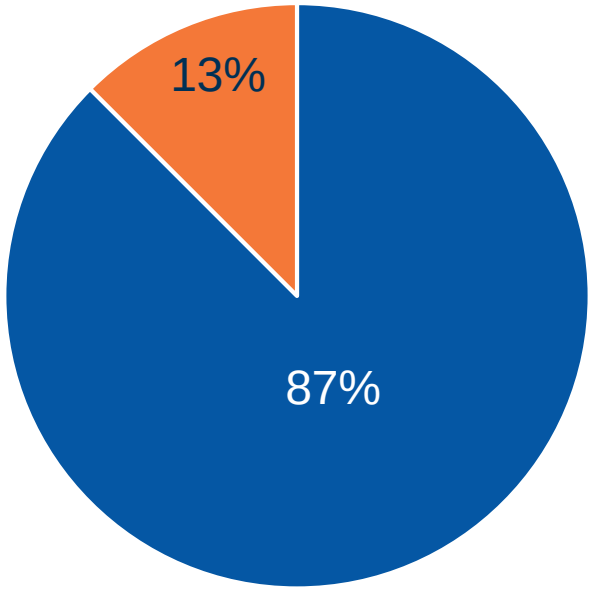
Priority Corridor Example: Chesapeake Blvd, Norfolk (VA 194)

Piccadilly Street (SR 7)

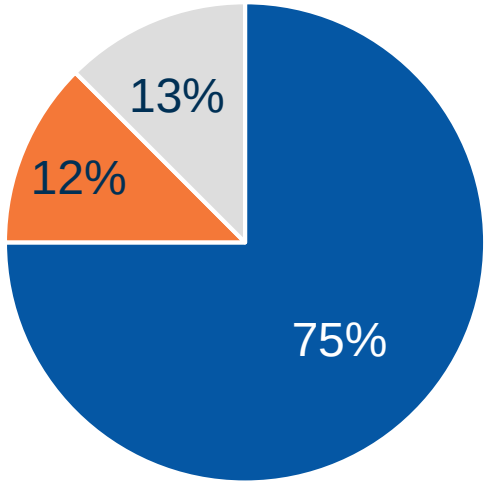
Community: Winchester
VDOT District: 8 (Staunton)



Crash Location



Pedestrian Action



7 out of 8 crashes occurred on 2-lane undivided roadway, all crashes occurred in a 25 mph zone, and 5 out of 8 crashes involved improper action by the driver.

High visibility crosswalks; Right Turn on Red restrictions or Leading Pedestrian Interval

Electric Road (SR 419) – Sheet 1 of 1

Community: Roanoke County
VDOT District: 2 (Salem)

- 4-lane median divided roadway with minimal pedestrian crossings and low density residential and commercial land uses. AADT: ~25,000; Speed Limit: 45
- Little to no existing pedestrian crossing infrastructure and wide crossing distances.

Consider sidewalks, pedestrian countdown signals;
PHBs at key mid-block crossings

Countermeasure Selection

Princeton, NJ

- **Focus on FHWA Proven Safety Countermeasures**
- **Review other research and guidance: PEDSAFE and NCHRP reports**
- **Existing VDOT policies**

http://vdot.maps.arcgis.com/home/webmap/viewer.html?webmap=953f54350b084601bc63843b29487b07

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Legend

Priority_Cluster_Points

Priority_Corridors_Report

Priority_Corridors_All

Ped_Crash_2012_16

- K.Fatal Injury
- A.Ambulatory Injury
- B.Visible Injury
- C.Non-Visible Injury
- P.Property Damage Only

Heat Map

ClustersVA

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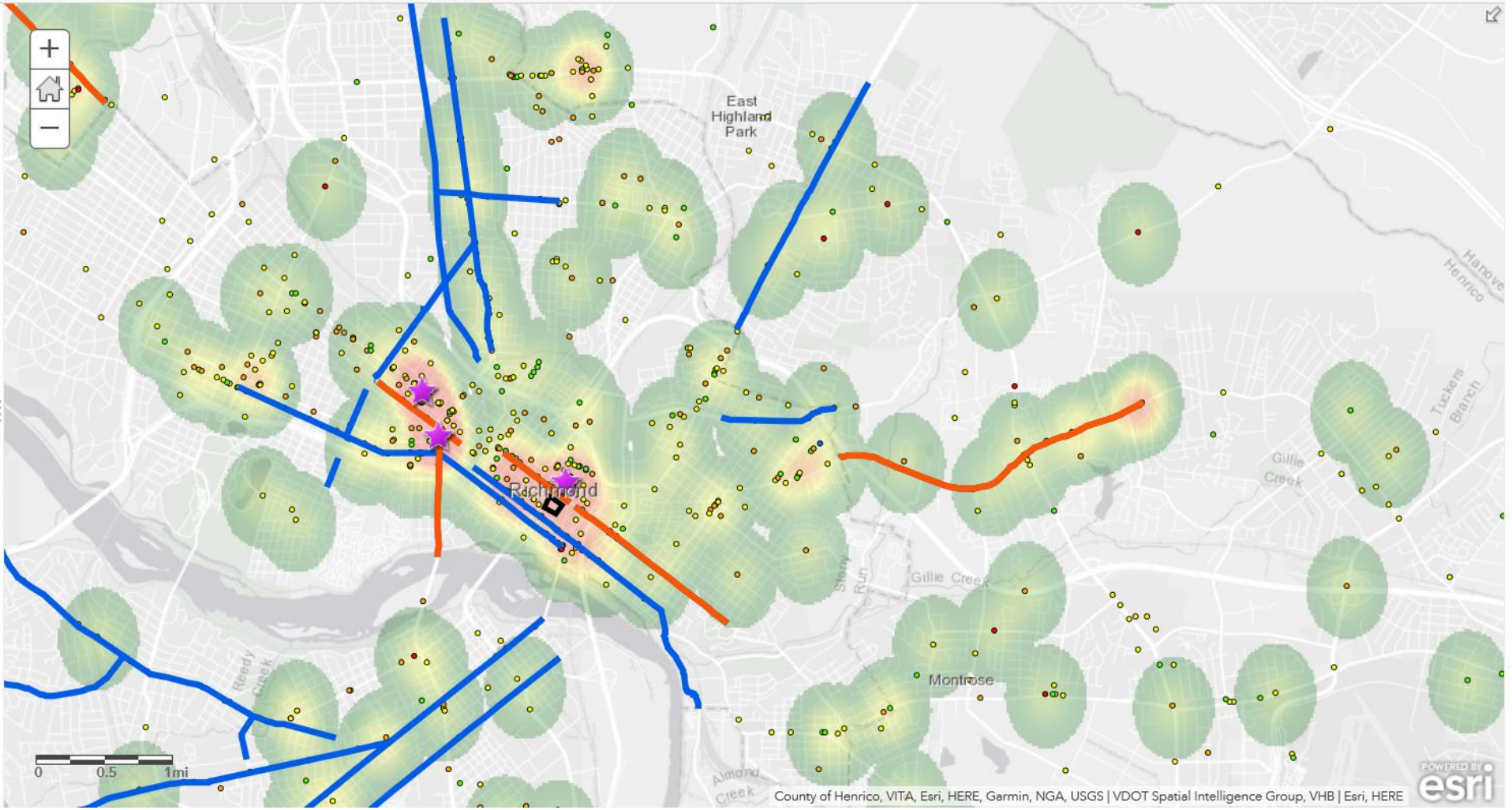


Bike Ped Application Scoring Factor & Criteria:

Factor	Description	Weight
Project Identification	Identify the Issues	30%
Proposed Improvement Projects	Identify potential measures to address the issues	45%
Cost Estimate	The cost estimate is uploaded to the Smart Portal and accurately uses PCES or VDOT approved line item costs to estimate the Preliminary Engineering, ROW and Utilities/ Environmental Clearance and Construction costs.	5%
Project Schedule	The project schedule is uploaded to the Smart Portal and indicates start and end dates for the Preliminary Engineering, ROW and Utilities/ Environmental Clearance and Construction phases.	5%
Multiple Funding Sources	The application indicates whether the project requires multiple funding sources.	5%
Supporting Documents	The necessary supporting documents to are uploaded to the Smart Portal.	10%

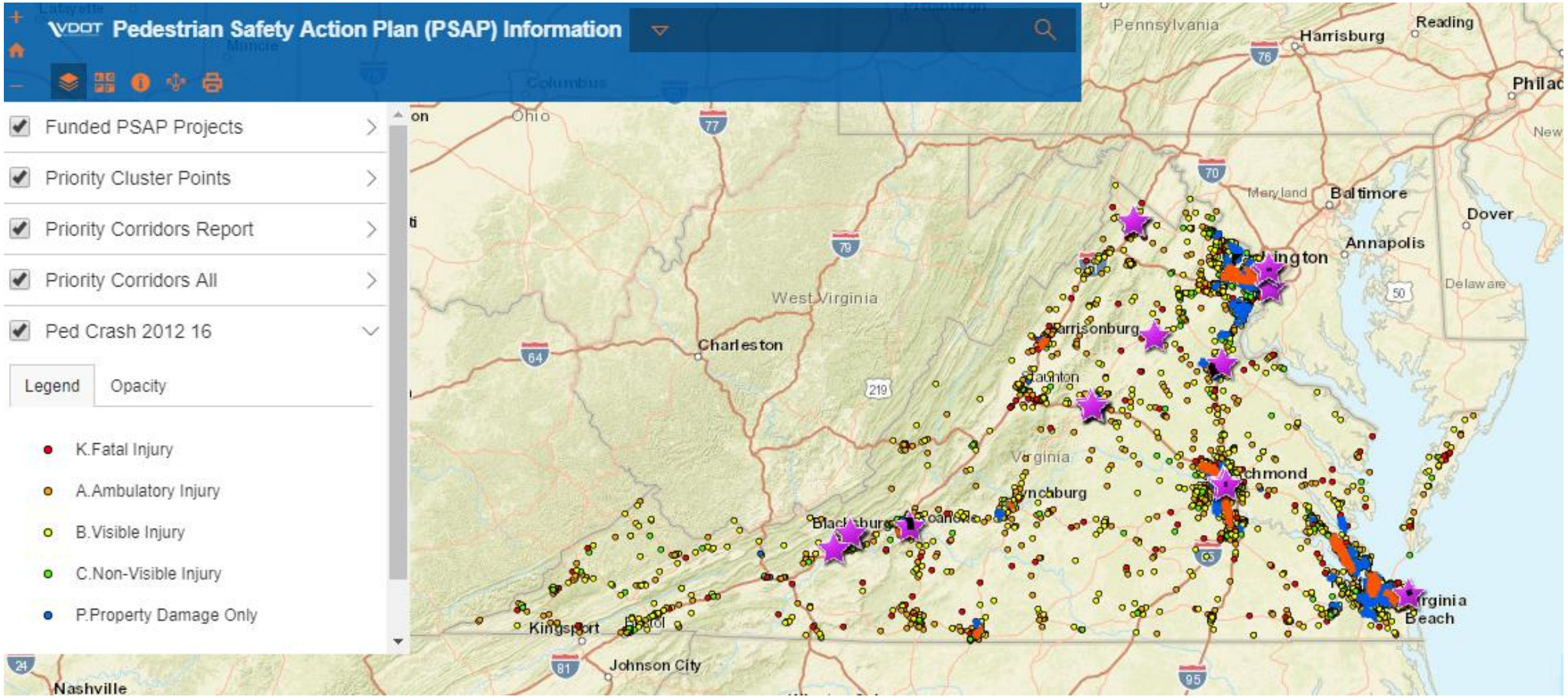
Bike Ped Application Scoring Factor & Criteria:

Scored

Factor	Score
Multiple Funding Source	5/5
Cost Estimate	5/5
Project Schedule	5/5
Problem Identification	30/30
Proposed Improvement Project	45/45
Supporting Documents	10/10
Final Score	100/100

Funded	(green)	>=75%
Waiting List	(yellow)	>=50% to <75%
Returned	(red)	<50%

PSAP Priority Corridor Map and Funded Projects:



Virginia State Preferred CMF list (Bike and Ped)

VIRGINIA STATE PREFERRED CMF LIST

Table 1 Virginia State Preferred CMF List

	COUNTERMEASURE	CRASH TYPE	AREA TYPE	K	A	BC	O	SERVICE LIFE	FUNCTIONAL CLASS	SITE DESCRIPTION	PRIOR CONDITION	REFERENCE
BIKE/PED	Add Crosswalk	VP	-	1	1	1	1	2	-	Pedestrian Crossing	No Marked Crosswalk	FHWA Safety Report
	Add Crosswalk Lighting	VP	-	0.56	0.41	0.41	0.56	15	-	Pedestrian Crosswalk	No Lighting Present	CMF ID: 441, 2379
	Add Curb Extensions/ Corner Bulb Outs	VP	-	1	1	1	1	20	-	Pedestrian Crossing at an Intersection Approach	No Bulb Outs or Curb Extensions Present	NYC Study
	Add Median Pedestrian Island	VP	-	0.75	0.75	0.75	0.75	20	-	Multilane Pedestrian Crossing	One-Stage At-Grade Pedestrian Crossing	PED CMF Toolbox
	Add or Upgrade Sidewalk	VP	-	0.12	0.12	0.12	0.12	20	-	Roadway Segment with Pedestrian Traffic Along Roadside	No Sidewalk or Deficient Sidewalk Present	PED CMF Toolbox
	Add Pedestrian Bridge	VP	-	0.1	0.1	0.1	0.14	30	-	High-Volume Pedestrian Crossing	At-Grade Pedestrian Crossing	PED CMF Toolbox
	Add Pedestrian Hybrid Beacon (PHB)	VP	U+S	0.453	0.453	0.453	0.453	20	Minor Arterial	Mid-Block Pedestrian Crossing	No Pedestrian Hybrid Beacon Present	CMF ID: 9020
	Add PHB, Advanced Yield/ Stop Markings	VP	U+S	0.432	0.432	0.432	0.432	20	Minor Arterial	Mid-Block Pedestrian Crossing	No Pedestrian Hybrid Beacon Present	CMF ID: 9021
	Add Pedestrian Signal Heads	ALL	U+S	0.85	0.85	0.85	0.96	20	-	Signalized Intersection with Pedestrian Crossings	No Pedestrian Signals Present	CMF ID: 8480, 8481
	Add Rectangular Rapid Flashing Beacon (RRFB)	VP	U+S	0.526	0.526	0.526	0.526	6	Minor Arterial	Mid-Block Pedestrian Crossing	No RRFB present	CMF ID: 9024
	Add Shared Use Path	VB	Urban	1	0.41	0.41	1	20	-	Roadway segment with Pedestrian and Bicycle Traffic	No Shared-Use Path Present	CMF ID: 4102
	Change Pedestrian Phase to Barnes Dance	VP	Urban	0.49	0.49	0.49	0.49	20	-	Signalized Intersection with Pedestrian Crossings	No Pedestrian Phasing or Standard Pedestrian Phasing	CMF ID: 4117
	Convert from Walk/ Don't Walk to Pedestrian Countdown	VP	-	0.3	0.3	0.3	0.3	20	-	Signalized Intersection with Walk/Don't Walk Pedestrian Signals	Walk/Don't Walk Pedestrian Signal	CMF ID: 5272

Systemic Low Cost Safety Countermeasures – Bike & Ped:

High intensity Activated Crosswalk Beacon

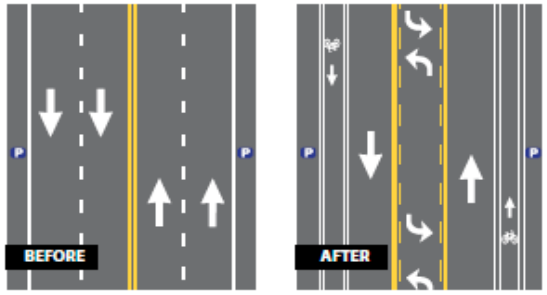
Cost: HAWK Signal: $90-120K per location
CRF: 29% Total Crashes, 69% Ped Crashes.

Ped Refuge Islands

Cost: $20-30K/location if no R/W needed
CRF:Ped crash by 46%40-45 % of all crashes

Rectangular Rapid Flashing Beacon

Cost: $30-50K/location if no R/W needed
CRF: K Crash By 48% and ABC Injury By 48%



Road Diet

Cost: $20-30K/mile for pavement marking changes
CRF: 29%
Reduction in total crashes

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Discussion

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- Archive at www.pedbikeinfo.org/webinars