Pennsylvania Highway Safety Improvement Program (HSIP)

Project Applications and Project Implementation Studies

Photo: PA State Police

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FAST Act HSIP Vision

- To achieve a significant reduction in fatalities and serious injuries **on all public roads**. (FHWA HSIP Final Ruling Guidelines, April 2016)

- The HSIP is a Federally-funded, State-administered program legislated under:
  - 23 USC 148, 23 USC 150, and 23 USC 130
  - Regulated under 23 CFR Parts 924 & 490

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Goals & Objectives

- Address PA Strategic Highway Safety Plan (SHSP) priority
- Evaluate State HSIP in yearly report to the FHWA
- Project Selection by Data Driven Safety Analysis (DDSA)
- A Well documented project application process
- HSIP Set-Aside Project Solicitation

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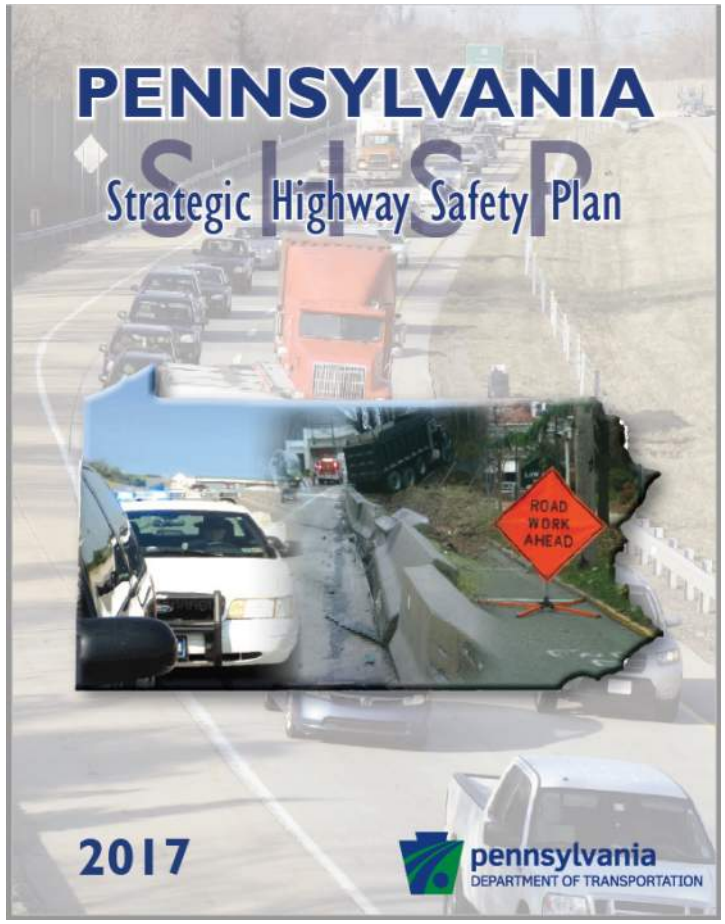
Pennsylvania SHSP

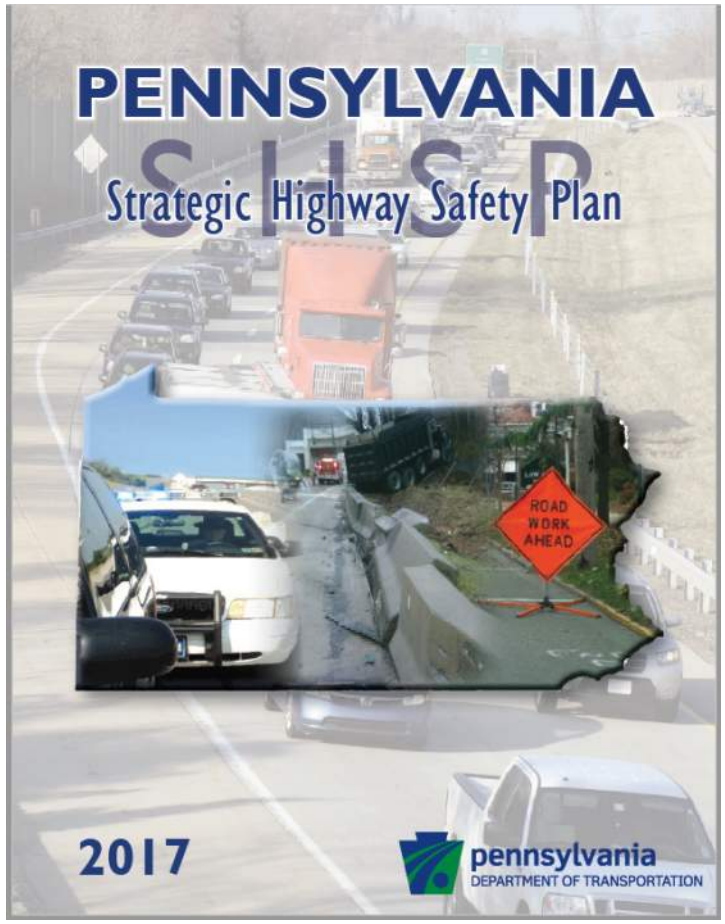
- Data-driven, multi-year plan
- Establishes statewide goals, objectives, and key emphasis areas
- Must be updated every 5 years
- HSIP funded projects must be consistent with PA's SHSP focus areas
- Developed by statewide safety partners
  - Not just a PennDOT Safety Plan



Pennsylvania SHSP

Focus Areas

- Reducing Impaired Driving
- Increasing Seat Belt Usage
- Infrastructure Improvements
  - Lane Departures
  - Improving Intersection Safety
- Reducing Speeding& Aggressive Driving
- Reducing Districted Driving
- Mature Driver Safety (Elderly)
- Motorcycle Safety
- Young & Inexperienced Drivers
- Enhancing Safety on Local Roads

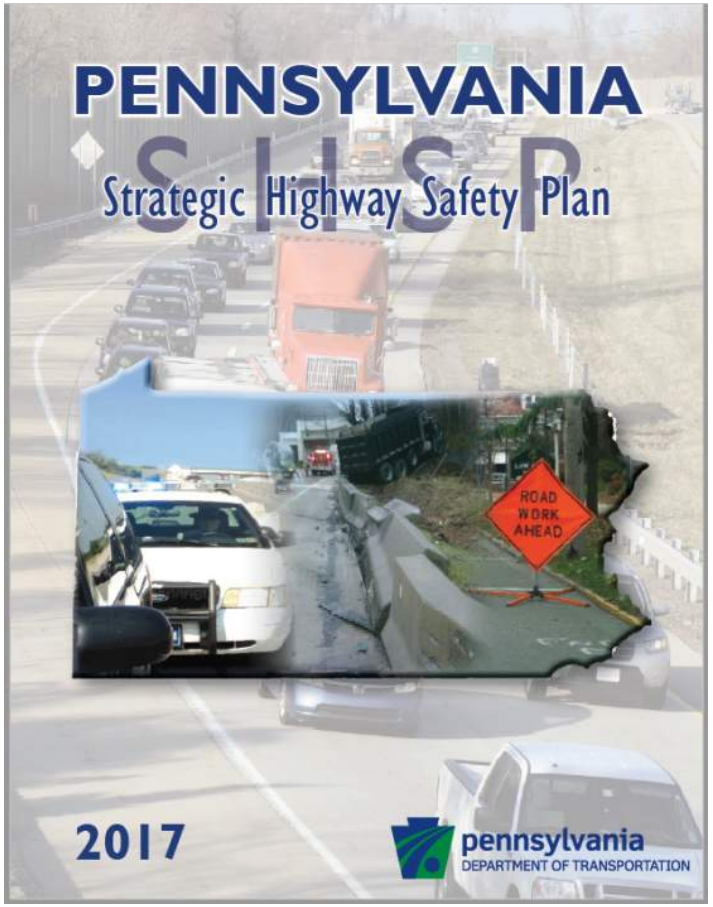


Pennsylvania SHSP

Focus Areas (Continued)

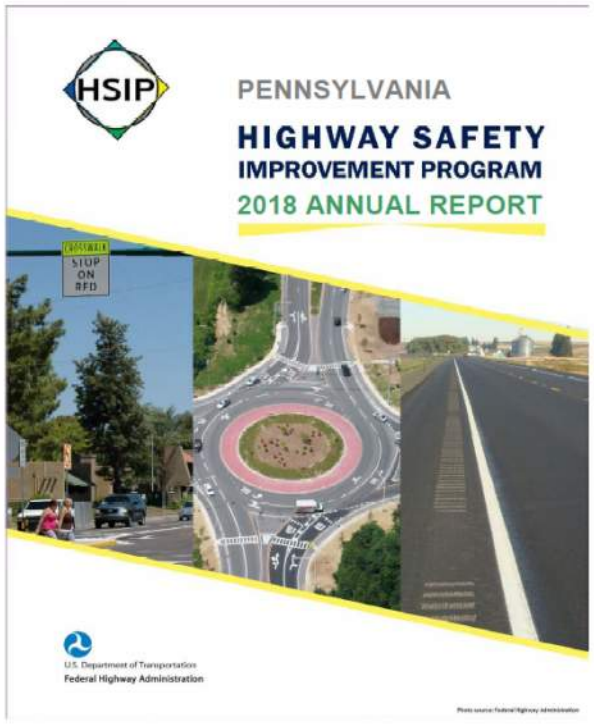
- Improving Pedestrian Safety
- Improving Traffic Records Data
- Commercial Vehicle Safety
- Improving Emergency/Incident Influence Time
  - Emergency Medical Services
  - Traffic Operations
- Improving Bicycle Safety
- Enhancing Safety In Work Zones
- Reducing Vehicle-Train Crashes

❖ *Autonomous Vehicle Technology*



HSIP Yearly Reports

- The effectiveness of HSIP funded projects
  - Provide Cost-Benefit of constructed projects
  - Status of Systemic improvements
  - Regulatory Mandates (MIRE, MMUCC, etc.)
- Report on yearly targets
  - Fatalities
  - Fatal Rate
  - Serious injuries
  - Serious Injury Rate
  - Non-motorized fatalities and serious injuries
- Due every year on August 31st.
- https://safety.fhwa.dot.gov/hsip/reports/



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Overall Assessment of the PA HSIP

- Look at Injuries before and after construction
- Look at Crashes before and after construction

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5 Years Before and After Analysis (Injuries)

(8/30/2019)

Report Year	Project Year	Fatalities	Suspected Serious Injuries	Suspected Minor Injuries	Possible Injuries	Unknown Severity	PDO
2011	2002-2007	23	92	808	2540	-1919	24
2012	2008	13	24	158	685	-20	260
2013	2009	-1	18	20	106	8	-33
2014	2010	19	15	121	421	218	-15
2015	2011	5	8	-7	291	63	17
2016	2012	37	30	-110	480	-285	-35
2017	2013	-3	-7	-67	107	-70	-98
2018 (4)	2014	7	-9	-78	308	-6	-35
2019 (3)	2015	-1	3	-288	445	0	-153
Total Injuries	-----	**99**	**174**	**557**	**5383**	**-2011**	**-68**

(a) – Evaluations exclude construction time from NTP date to physical work complete date in MPMS/ECMS
(4) – 4 years of crash data.
(3) – 3 years of crash data.

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5 Years Before & After Analysis (Crashes) (8/30/2019)

Report Year	Project Year	Total Project Cost	Fatal Crashes	Serious Injury Crashes	Minor Injury Crashes	Possible Injury Crashes	Unknown Severity Crashes	PDO Crashes	Net Benefit (Dollars)	B/C Ratio
2011	2002-2007	$98,248,798	18	68	541	1621	-1188	-237	$277,210,762	2.82
2012	2008	$12,188,969	10	29	107	438	45	256	$124,899,675	10.25
2013	2009	$17,931,082	0	10	15	74	-8	-13	$16,749,099	0.93
2014	2010	$26,203,095	21	3	60	167	86	-23	$152,673,735	5.83
2015	2011	$23,991,730	4	-2	1	172	22	17	$25,440,005	1.06
2016	2012	$45,223,110	29	17	-76	266	-147	-35	$338,145,500	7.48
2017	2013	$47,814,438	3	-9	-56	53	-56	-98	$15,332,200	0.32
2018 (4)	2014	$68,969,364	4	-9	-58	222	-16	-35	$53,230,700	0.77
2019 (3)	2015	$45,419,882	-2	2	-192	350	-19	-19	-$18,045,300	-0.40
Total	----	$385,990,469	87	109	342	3363	-1281	-187	$985,636,376	2.55

(a) – Total Project costs include all phase costs (PE, FD, ROW, Utilities, and Construction) funded with HSIP
(c) – Evaluations exclude construction time from NTP date to Physical work complete date in MPMS/ECMS
(e) – Benefit costs based on the FHWA's 2017 Crash Costs for Highway Safety Assessments (FHWA-SA-17-071)
(4) – 4 years of crash data.
(3) – 3 years of crash data.

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Evaluate the Data

To ensure the HSIP funding and other safety funded programs are effective we must use data after implementation

- Systemic Safety Improvement options
  - Rumble strips
  - High Friction Surface Treatments,
  - High Tension Cable Barrier
  - Intersections
  - Others
- Individual Project performance (Before and after open to traffic date)

Use the data to determine what options work and what aspects need modified/corrected or stopped

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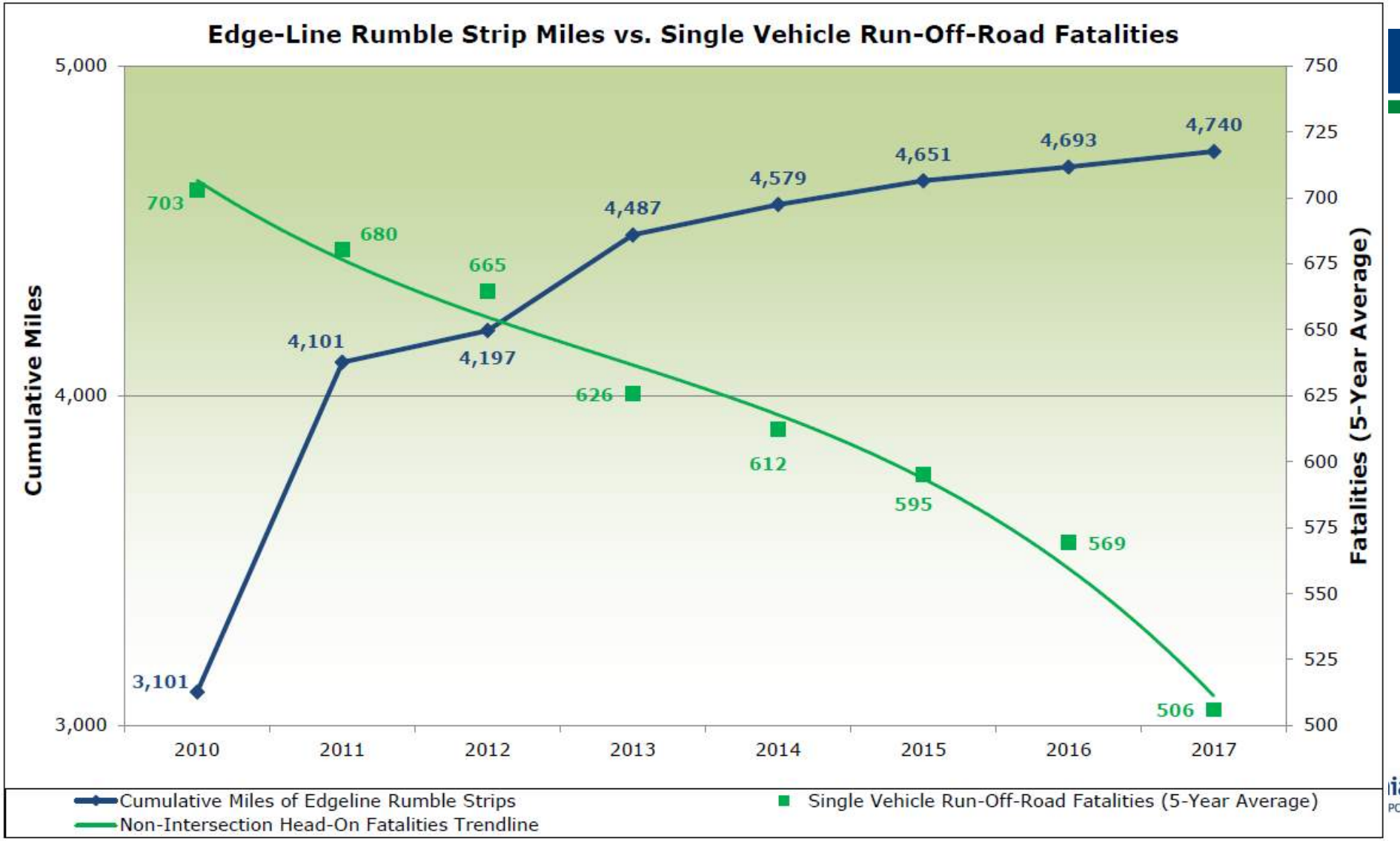
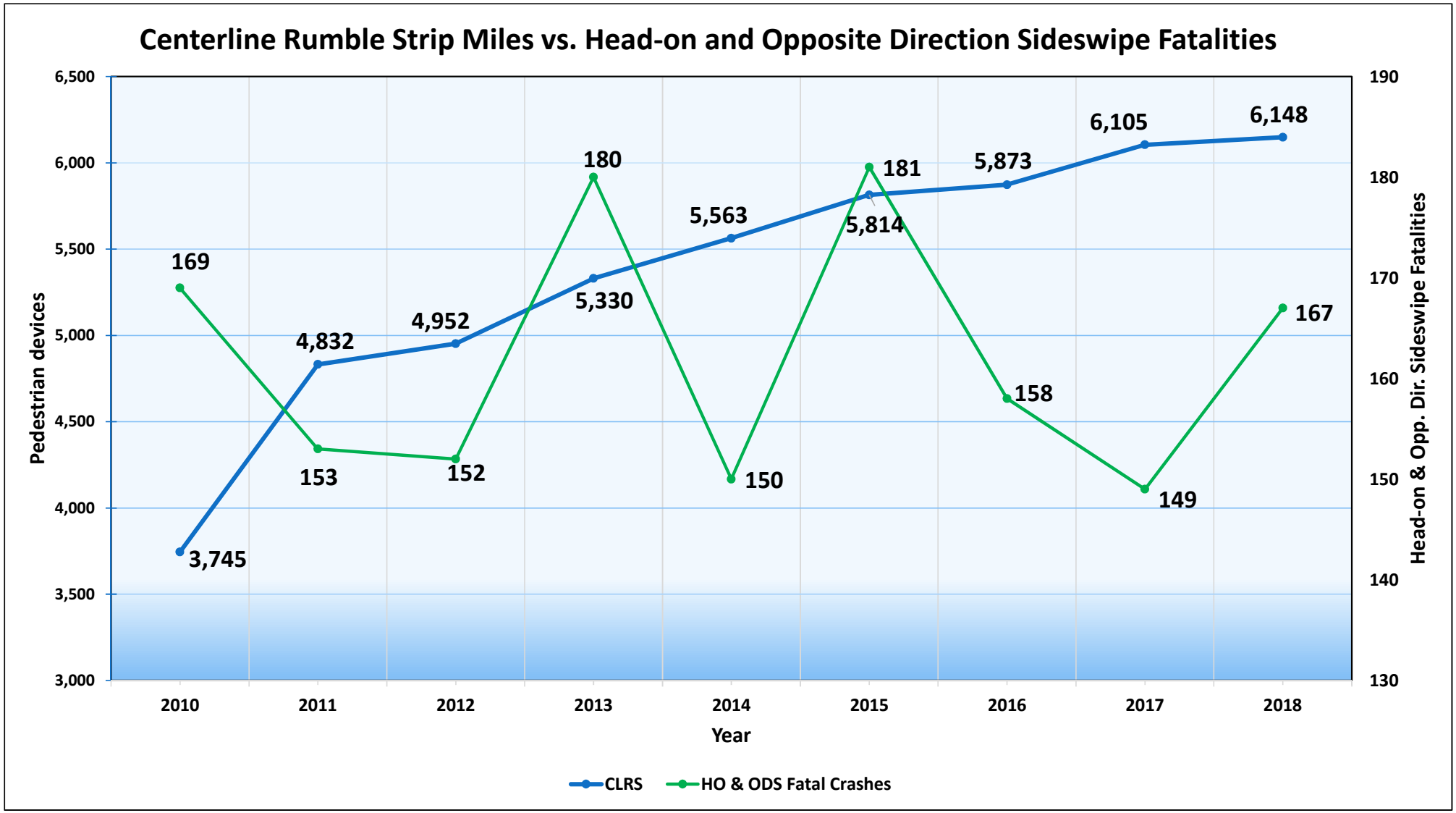
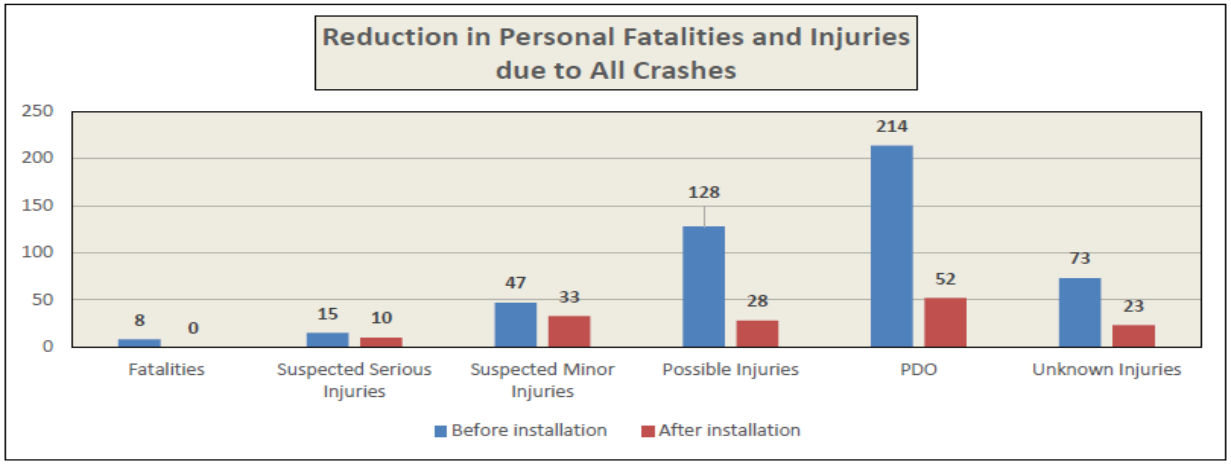

Edge-Line Rumble Strip Miles vs. Single Vehicle Run-Off-Road Fatalities
Cumulative Miles
Fatalities (5-Year Average)
5,000
4,000
3,000
750
725
700
675
650
625
600
575
550
525
500
2010
2011
2012
2013
2014
2015
2016
2017
3,101
4,101
4,197
4,487
4,579
4,651
4,693
4,740
703
680
665
626
612
595
569
506
Cumulative Miles of Edgeline Rumble Strips
Non-Intersection Head-On Fatalities Trendline
Single Vehicle Run-Off-Road Fatalities (5-Year Average)

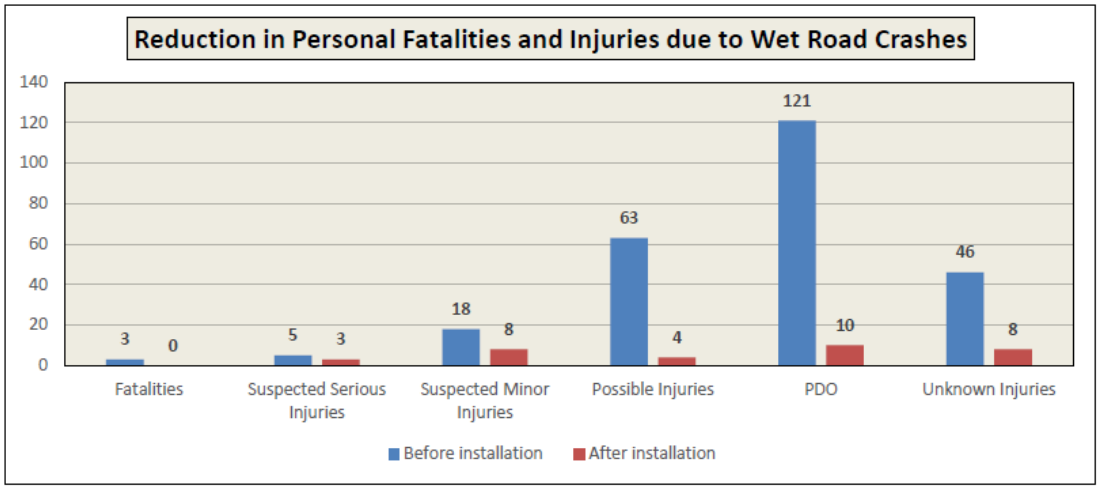

Centerline Rumble Strip Miles vs. Head-on and Opposite Direction Sideswipe Fatalities
Pedestrian devices
Head-on & Opp. Dir. Sideswipe Fatalities
Year
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
190
180
170
160
150
140
130
2010
2011
2012
2013
2014
2015
2016
2017
2018
3,745
4,832
4,952
5,330
5,563
5,814
5,873
6,105
6,148
169
153
152
180
150
181
158
149
167
CLRS
HO & ODS Fatal Crashes

High Friction Surface Treatments



- Resulted in a Benefit to cost ratio of 5.50 for all crashes based on 2017 crash costs

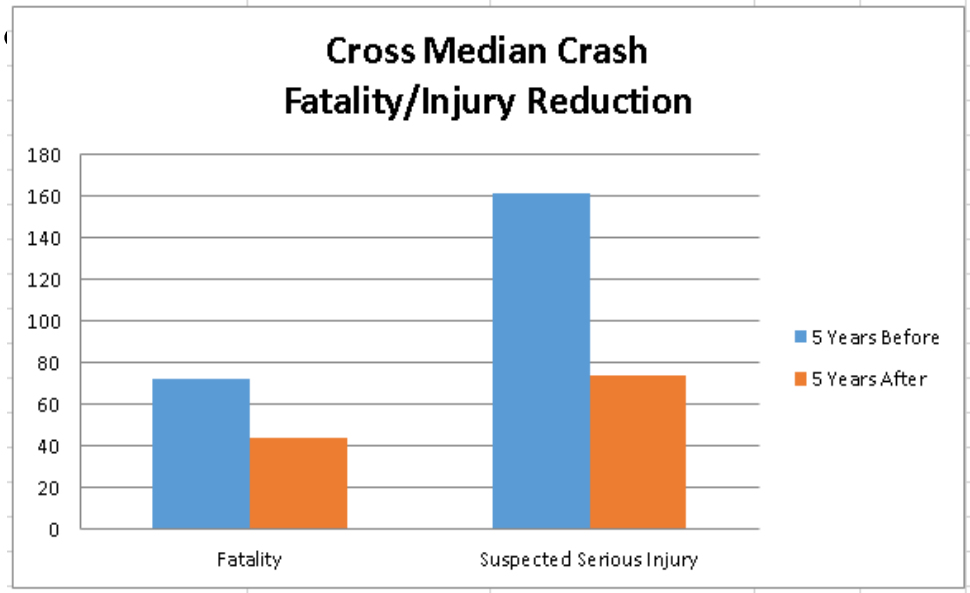
- Resulted in a Benefit to cost ratio of 2.40 for Wet Road crashes based on 2017 crash costs

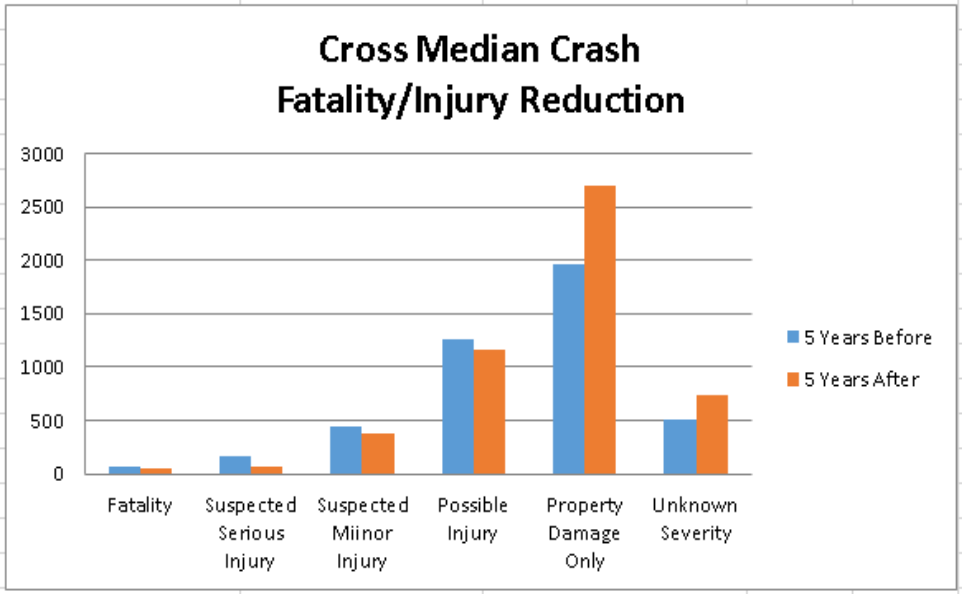


High Tension Cable Median Barriers

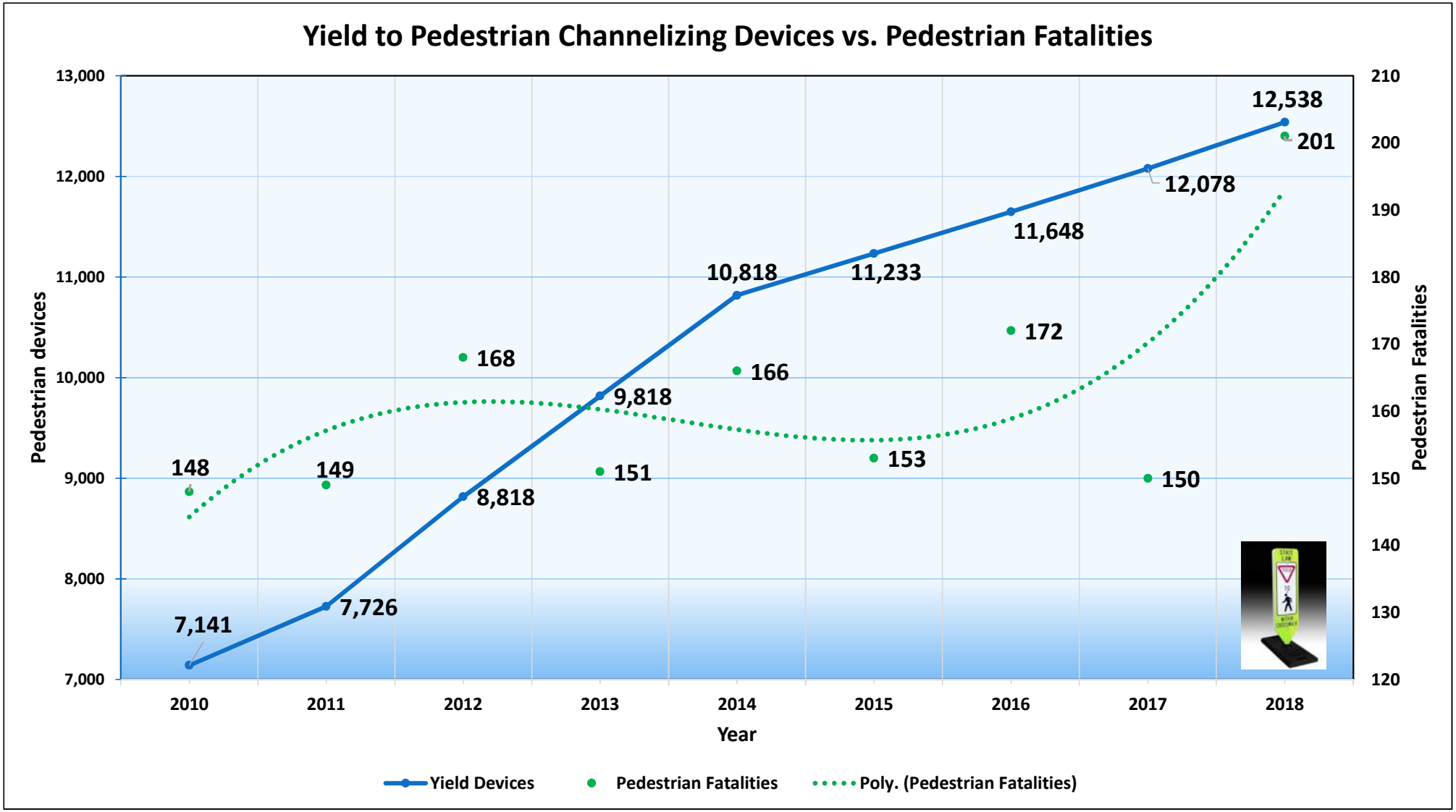
In 2017 PennDOT studied HTCMB effectiveness from June 2005 to December 2011.

- 44 total locations totaling 116.13 miles of HTCMB on freeway
- Resulted in a 28:1 Benefit Cost Ratio (based on 2017 injury costs)
- KABC severity cross median crashes dropped significantly

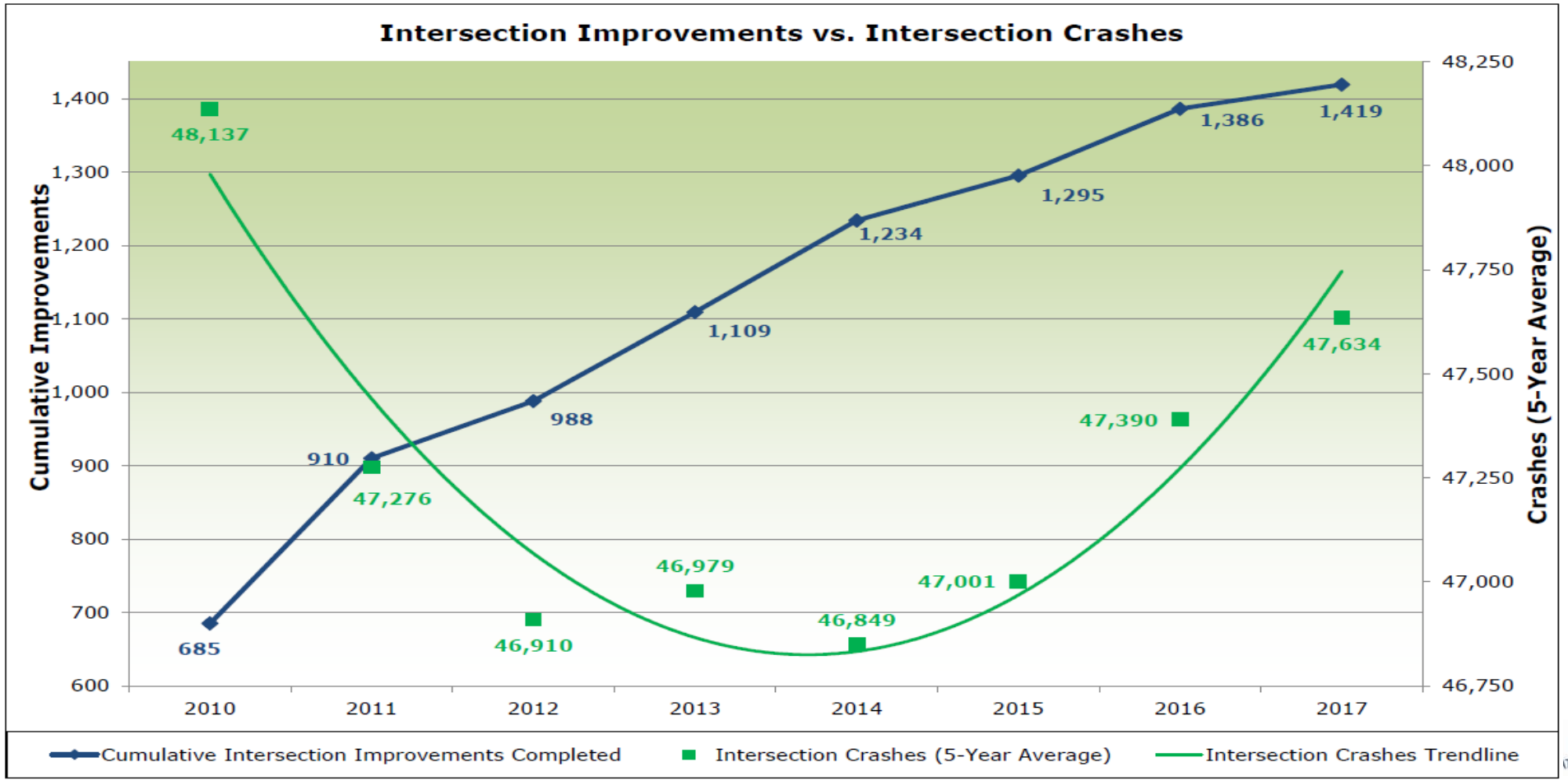




Yield to Pedestrian Channelizing Devices vs. Pedestrian Fatalities



Why Data Driven Safety Analysis is Important



Systemic Improvements Summary

- HFSTs locations
  - Over 315 installed locations since 2006
  - Over 231 more locations planned
  - Over 82 miles
- CLRS
  - 6,148 total miles
  - 72 miles installed in 2018
- ELRS
  - 4,787 total miles
  - 58 miles installed in 2018
- HTCMB
  - Over 416 total miles
  - About 74 miles installed in since August 2018

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HSIP Application Process

- The Process is in PennDOT's District Highway Safety Guidance Manual, Publication 638 Chapter 6
  - Updated in May 2019
- Applications are submitted through the HISP Share Point site
- Regulated by 23 USC § 148

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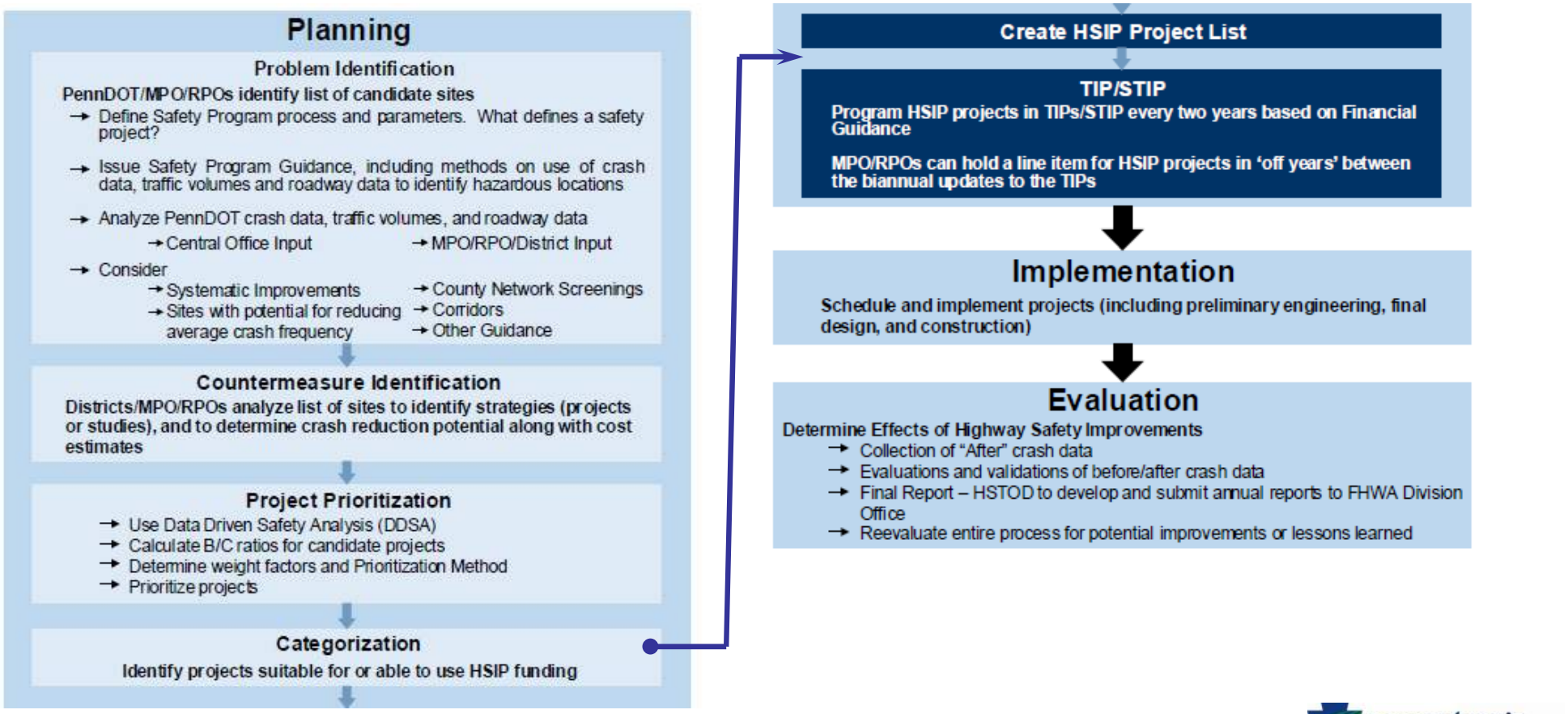
HSIP Application Process



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HSIP Application Process

How the 148 Funds are distributed

- Every planning region receives $500K
- $35 million is set aside for competitive safety bidding
  - Projects selected by
    - best safety benefit &
    - quickest delivery to construction
- The remaining funds are allocated base on regional crash data
  - Weighted by F&I costs and PDO costs

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Implementing the Highway Safety Manual into HSIP Funds

Safety Assessment Methods

What we were doing in the past

What is now required

Table 1. Primary Analysis Application for Safety Assessment Methods

Application	Basic				Intermediate		Advanced
	Site Evaluation or Audit	Historical Crash Data Evaluation	CMF Applied to Observed Crashes	CMF Relative Comparison	AADT-Only SPF	SPF with CMF Adjustment	SPF with CMF Weighted with Observed Crashes
	Observed Crashes				*Predicted Crashes*		*Expected Crashes*
Performance of an Existing Road	1	1, 2	1, 2, 3	1, 3	1, 4	1, 3, 4	1, 2, 3, 4
Future Impact of Minor Geometric Changes to Existing Road			1, 2, 3	1, 3		1, 3, 4	1, 2, 3, 4
Future Impact of Major Geometric Changes to Existing Road						1, 3, 4	
Future Performance for a New Facility					1, 4	1, 3, 4	

Note: AADT = average annual daily traffic. CMF = crash modification factor. SPF = safety performance function.
Basis for Analysis: 1 = site characteristics, 2 = crash history, 3 = CMF values, and 4 = AADT.

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Advantages of the HSM Over Observed Crashes

Limits of Using Only Observed Crash Data

- Variability in Crash Frequency and Severity
- Isolated to only that specific location
- Regression to the Mean
- Doesn't account for changing site conditions

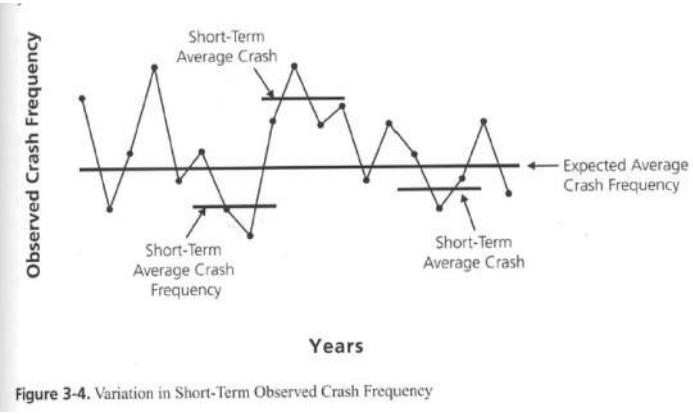

Figure 3-4. Variation in Short-Term Observed Crash Frequency

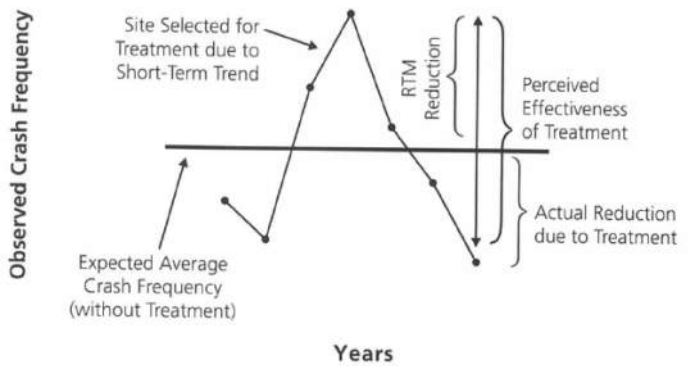

Figure 3-5. Regression-to-the-Mean (RTM) and RTM Bias

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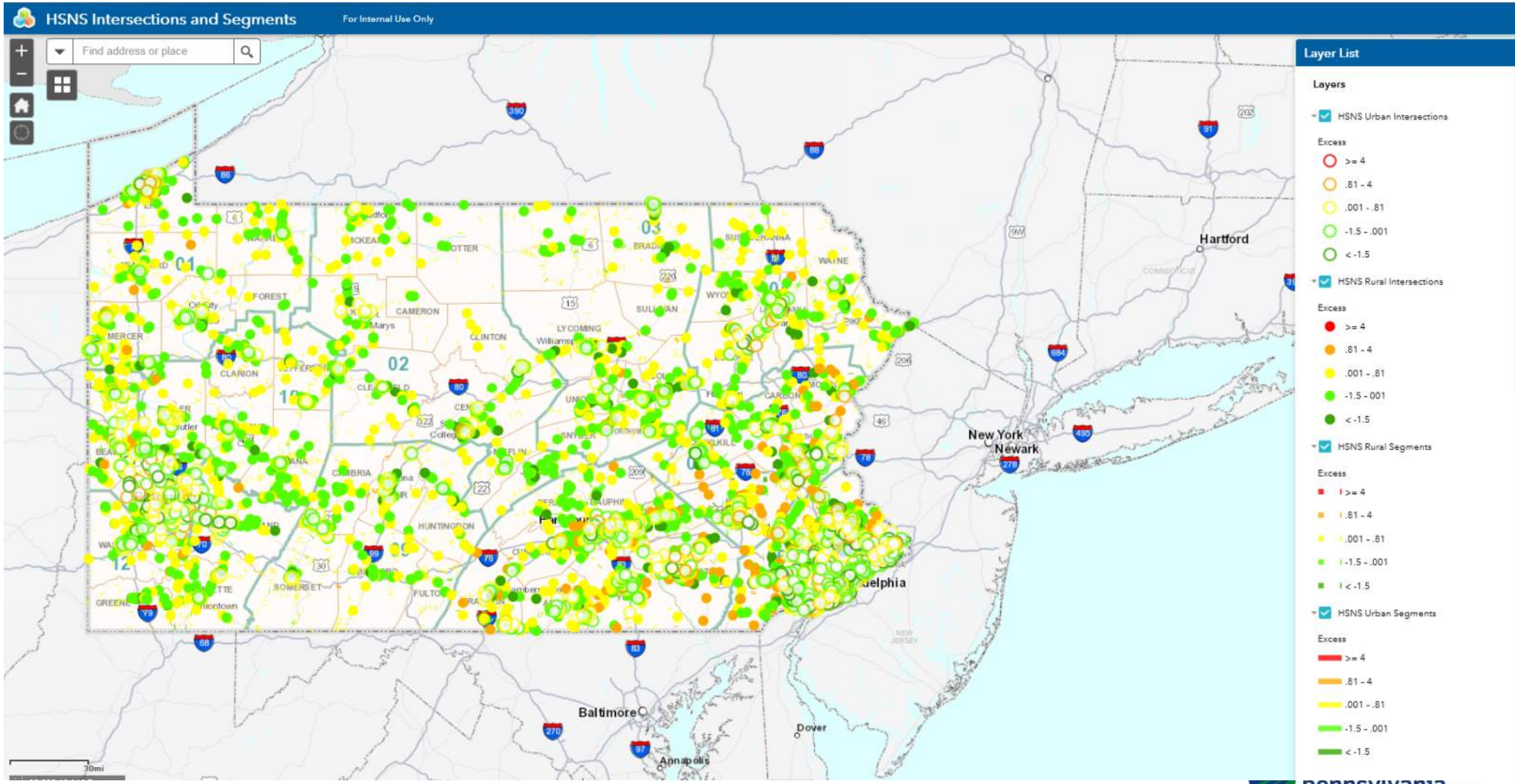
Network Screenings

- Created for each County
- Cover rural and urban locations
- Cover intersections and segments
- Available in CDART as a Heat Map
- Also available as individual county spreadsheet lists
- Prioritize locations based on Excess Crash Frequency Values
  - Also known as Potential for Safety Improvement (PSI)
- Updating in 2020
  - Will expand to include:
  - suburban/urban collector roads
  - Freeways, Ramps, and Ramp Terminals
  - Will provide excess values for F&I, PDO, Total Crashes
  - Locations will be weighted based on cost per crash severity (F&I + PDO)



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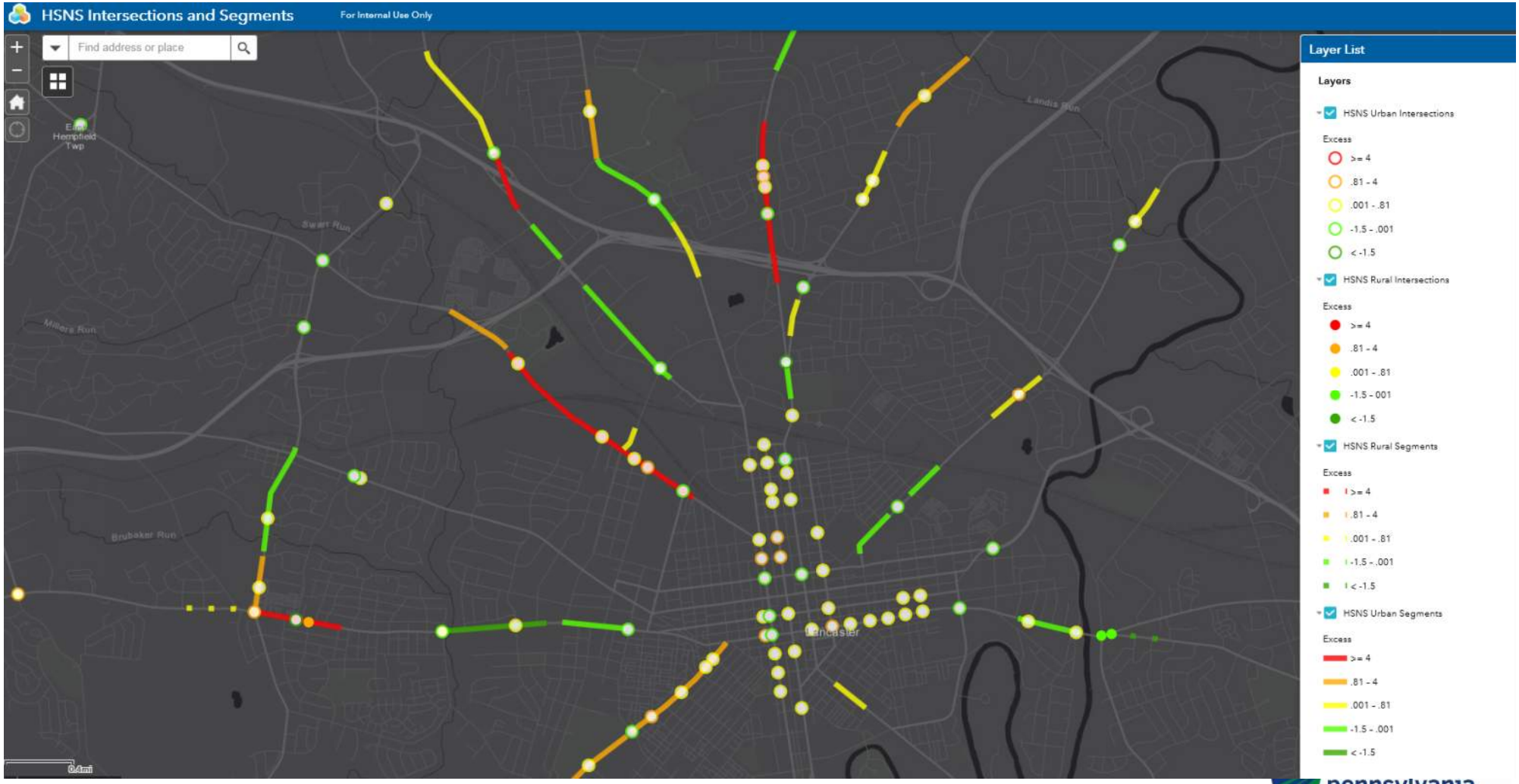

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HSIP Application Process

Selection criteria

- Listed in Section 6.3.1, 6.3.2, and 6.3.4
- Regulation requirements
  - MIRE Data collection
  - Highway Safety Network Screening
- Spot locations
  - All spot location application must include a BCA
  - BCR of 1.0 or greater is required
  - Must include a HSM based analysis
- Systemic projects
  - Must show planned locations
  - Include crash data that relates specifically to the systemic countermeasure
  - Crash reduction must be reflected by a quality CMF
- Project Delivery issues
  - More complex projects should use regional allotments
  - Set aside funds are for construction ready projects

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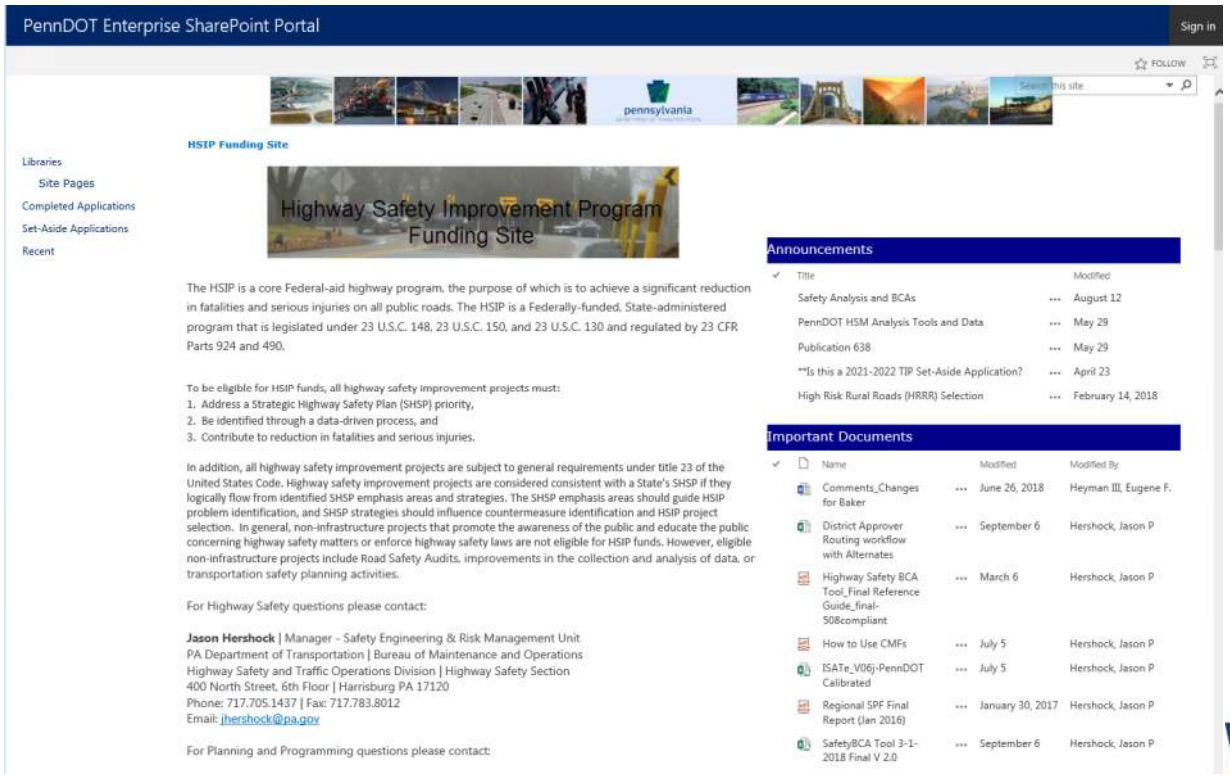
HSIP Project Application Process

- Share Point Website
  - https://spportal.dot.pa.gov/Planning/AppReg/HSIP/Pages/default.aspx



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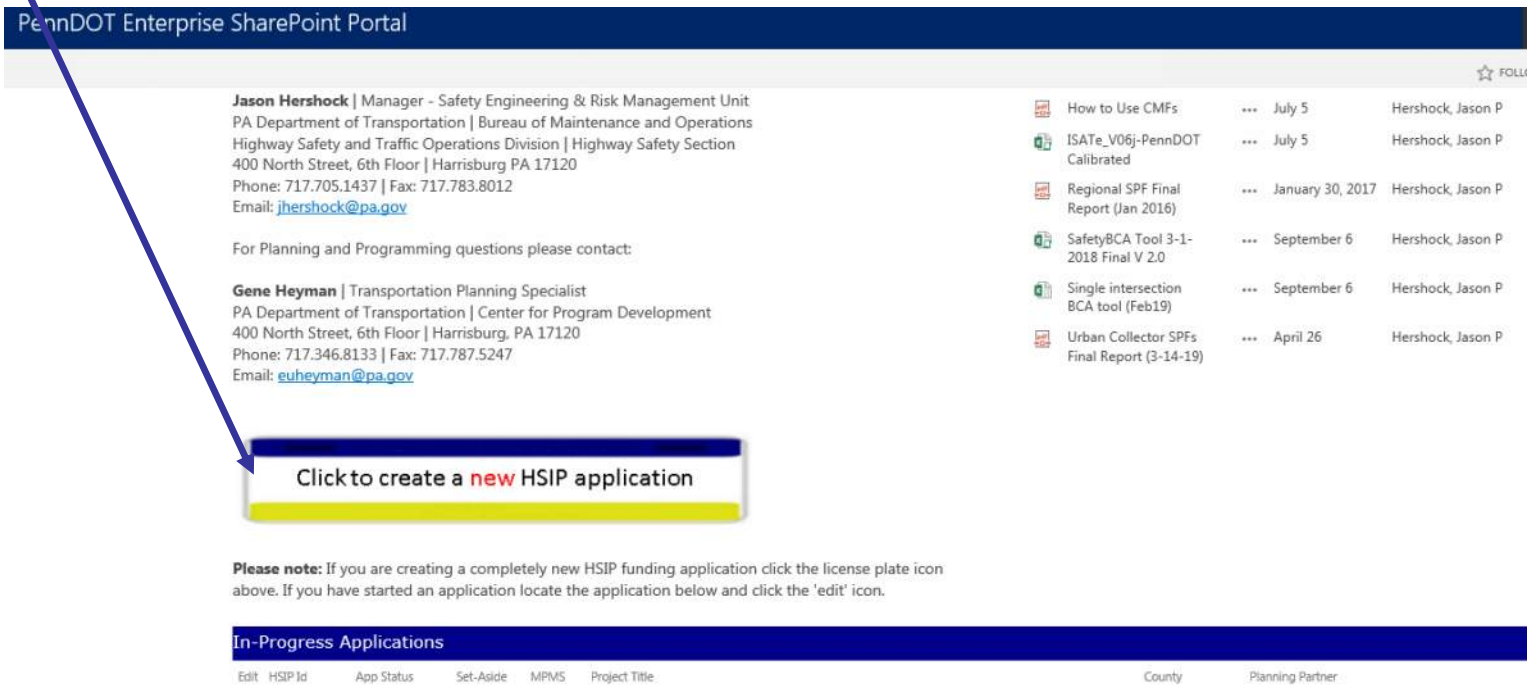
HSIP Application Process

Click here to start a new application



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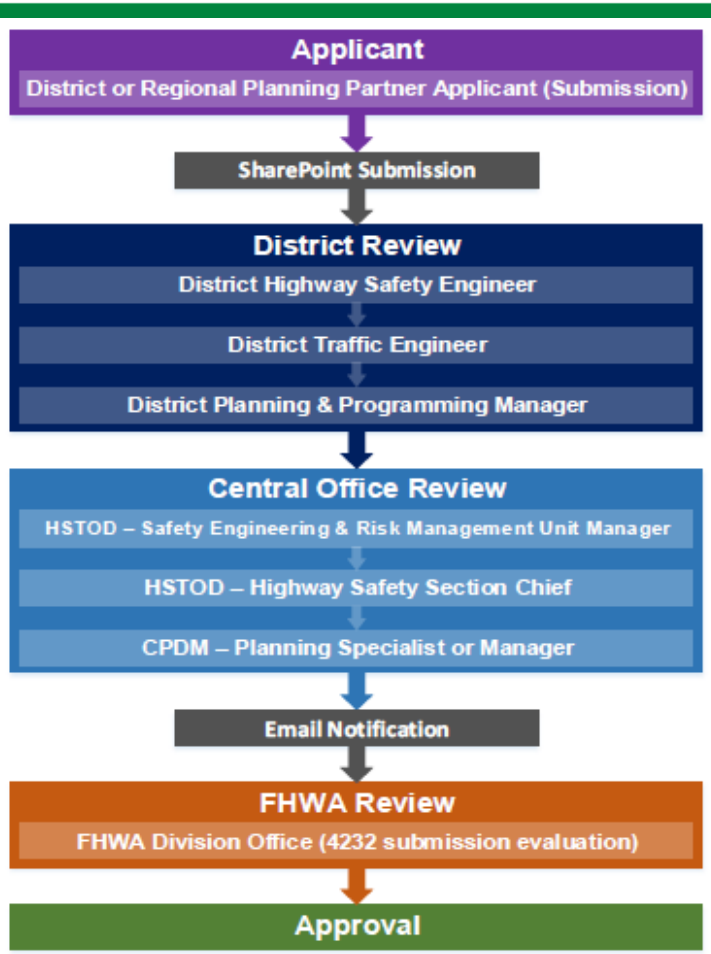
Approval Process



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Questions

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