Importance of Proactive Safety Analysis for Corridor Planning

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CDM Smith

Outline

- Example A: US 67 Corridor Master Plan
- Example B: FM 2271 Extension Regional Feasibility Study
- Pandemic Effects on Crashes FDOT District 7 – Tampa Bay
- Conclusion

US 67 Corridor Master Plan
Predictive Safety Analysis

DK3

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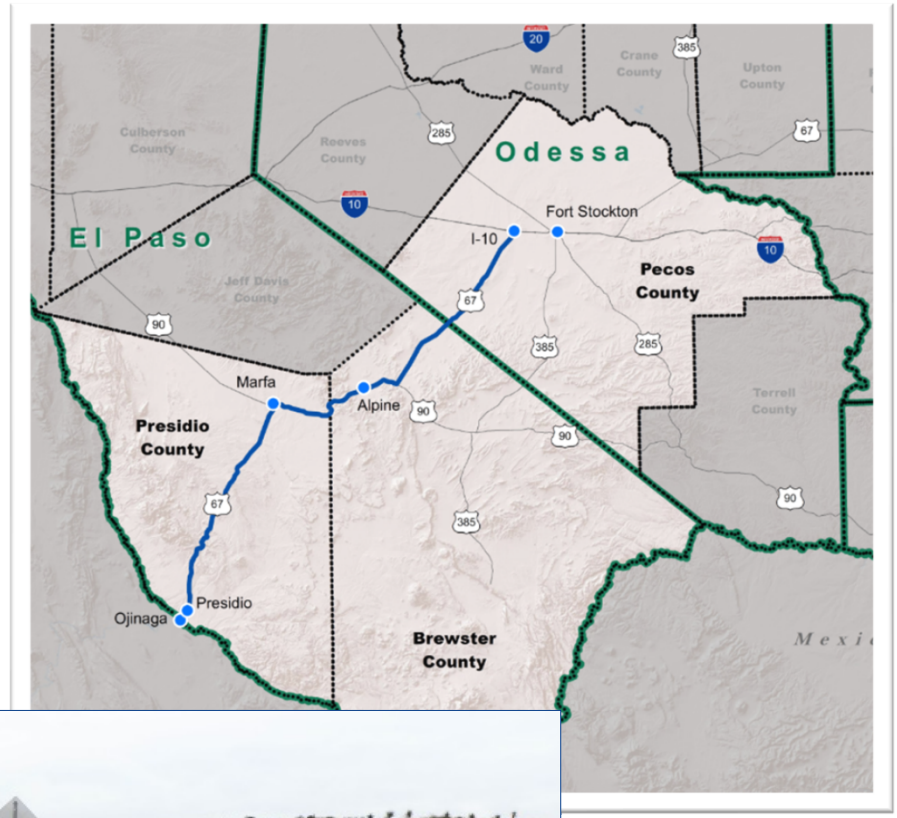
Slide 3

DK3 Not sure how I feel about these pics here. One could go where the globe is, but then we might have to replace the intro slide pic for all sections?
Daniel, Kara, 3/11/2022

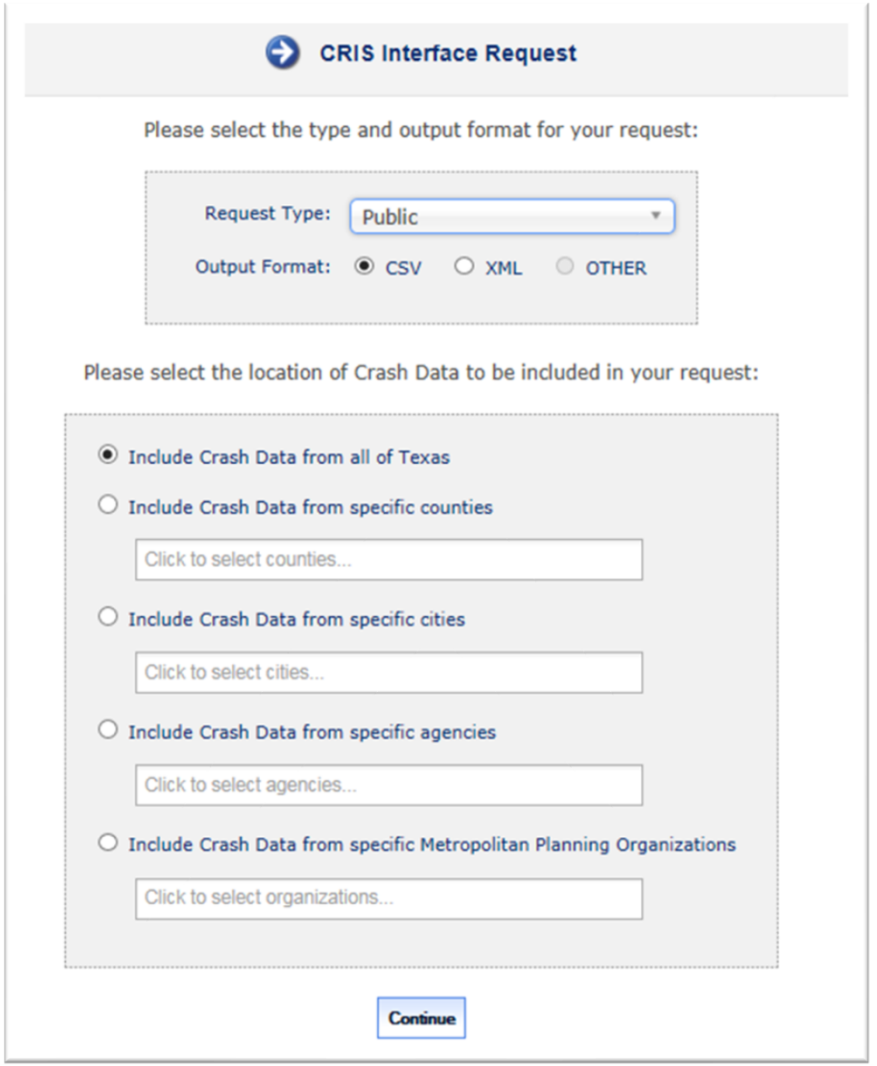
Study Background-Goals

- Study Limits: I-10 west of Fort Stockton to the Presidio Port of Entry (142 miles)
- Goal: Identify and evaluate current and future transportation needs along the US 67 corridor
- Develop a US 67 Corridor Master Plan
  - Enhance mobility and safety
  - Short, mid- and long-term solutions



Safety Analysis Approach

- TxDOT Crash Records Information System (CRIS) was used
- Reviewed crashes for 8 years (2010 to 2017)
- Separate tables for different parameters
  - Crashes Information
  - Driver Behavior Contributing Factors
  - Vehicle Characteristics
- Downloaded information was compiled into a master crash database



Safety Analysis Approach: Traditional Site Analysis Vs. Systemic Approach

Traditional Site Analysis Approach	▪ Evaluate all crash severities ▪ Focus on specific locations at hot spot locations ▪ Identify site-specific safety problems and countermeasures to address them
Systemic Approach to Safety	▪ Evaluate of only most severe crashes ▪ Identify roadway features (e.g., lane width, median presence) associated with severe crashes as risk factors ▪ Recommend systemic countermeasures for areas with present risk factors

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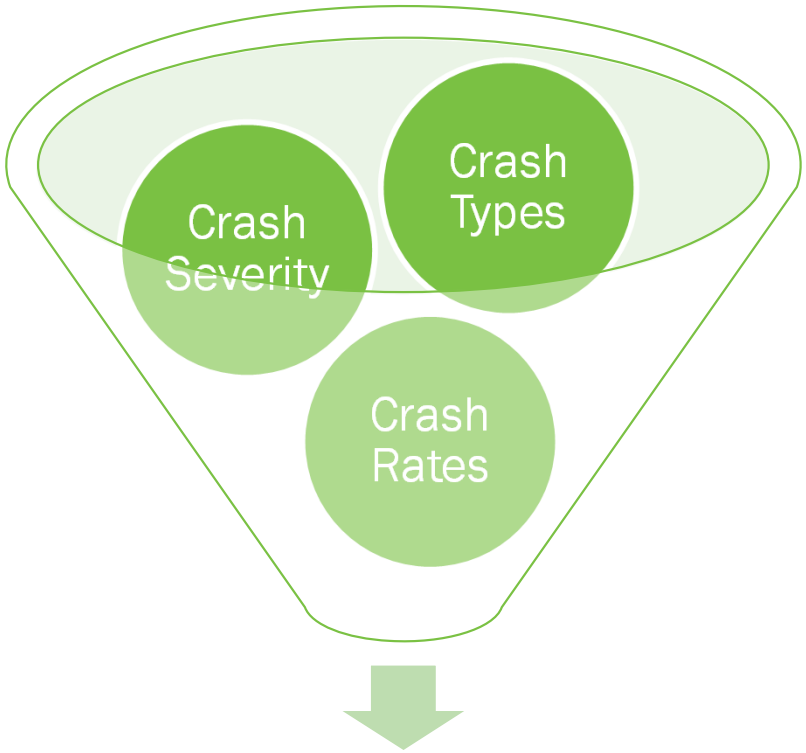
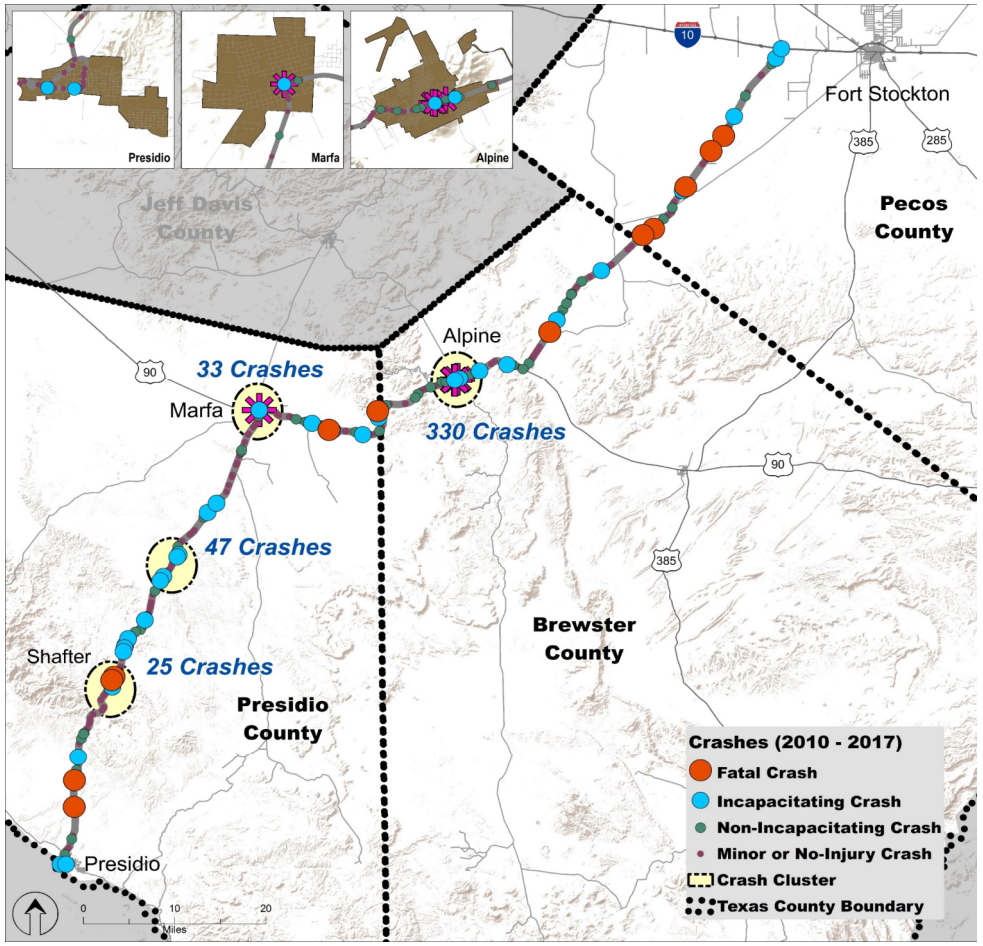
Traditional Site Analysis



Traditional Approach

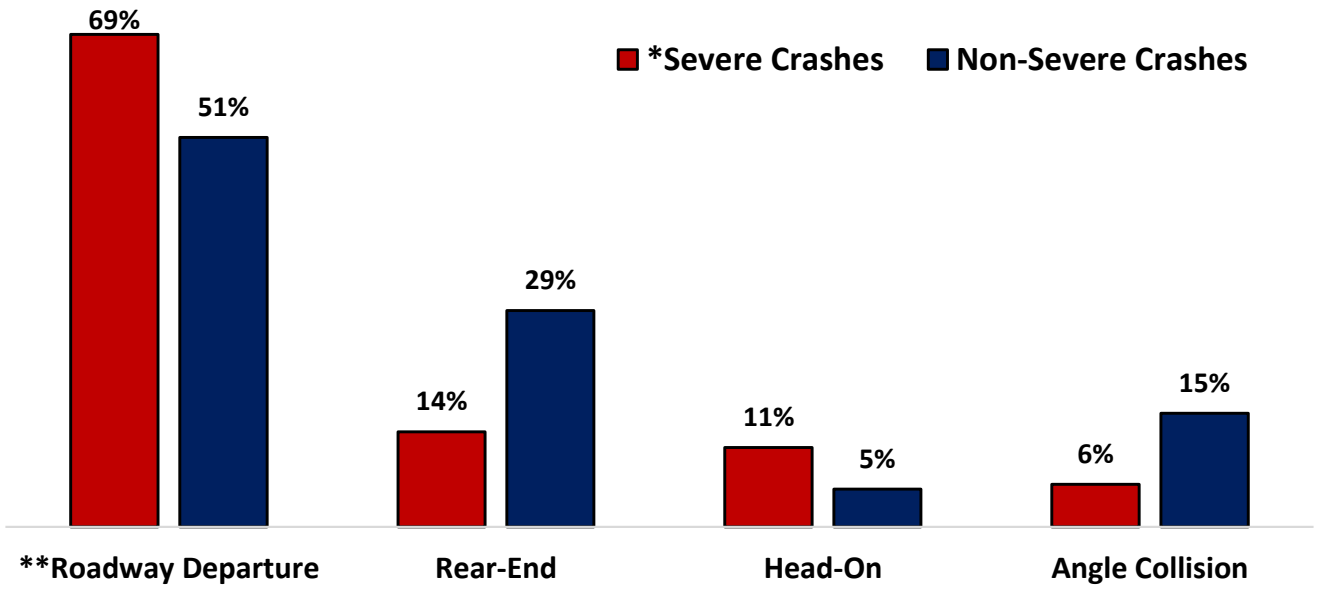
- Traditional safety implementation focused on
  - High number of crashes (Hot Spots)
  - High crash rate (compared to Statewide Rates)

Traditional Safety Analysis: Crashes Along the Corridor 2010–2017



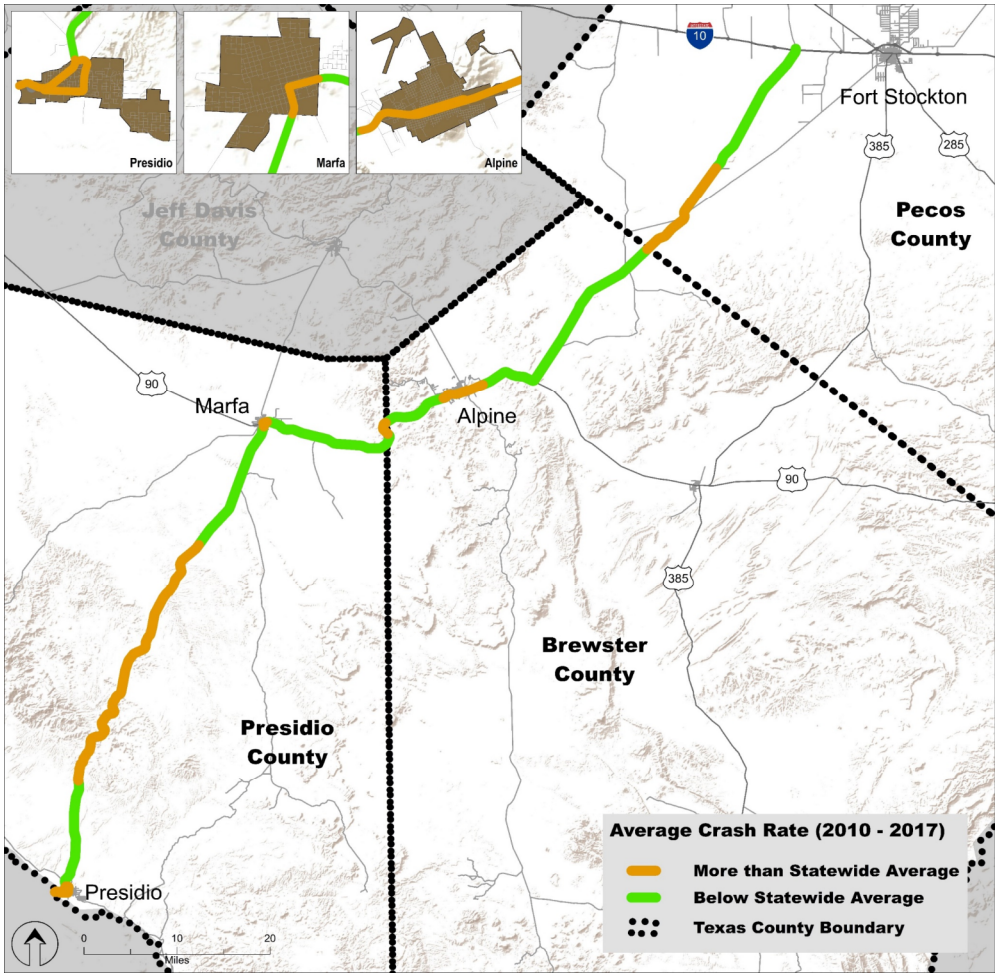
Source: TxDOT's Crash Records Information System (CRIS)

Traditional Safety Analysis: Crash Types vs. Crash Severity (2010 to 2017)



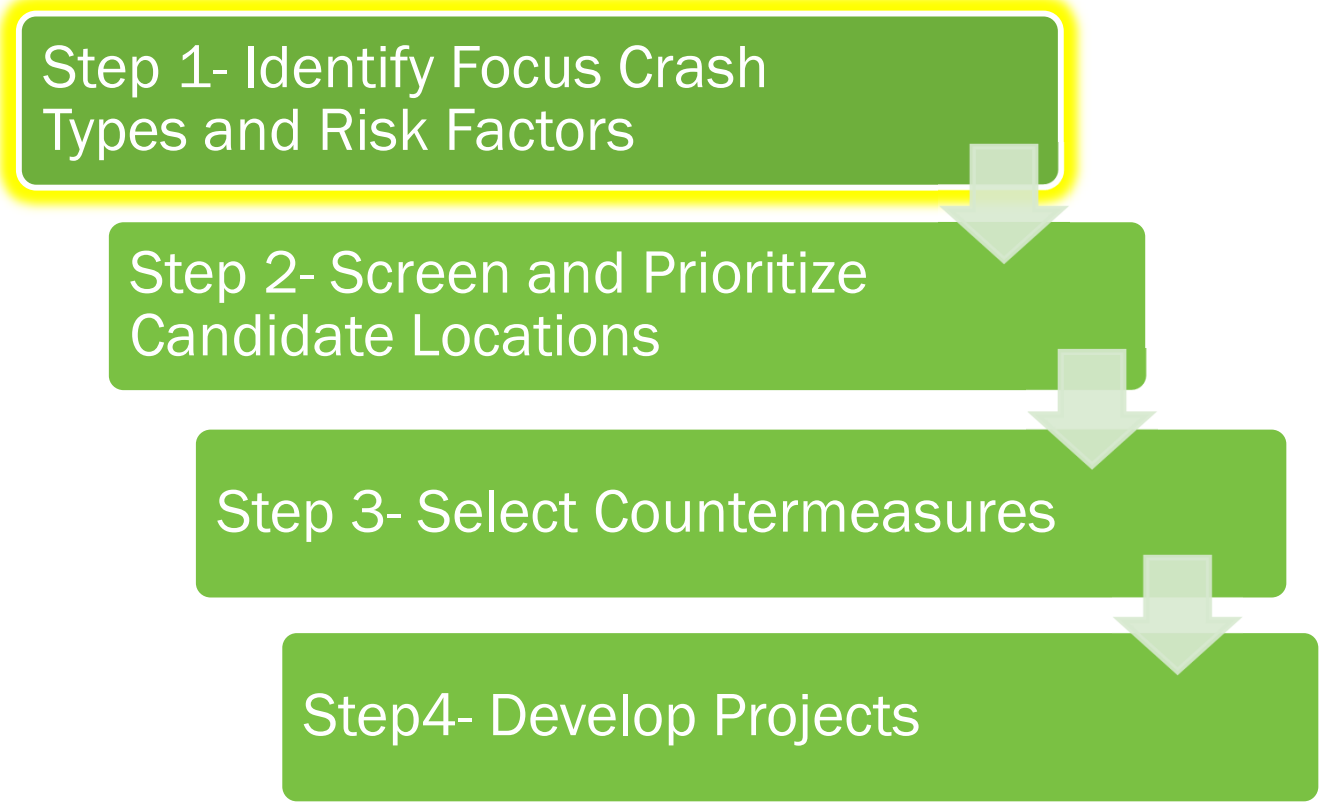
* Severe crashes include non-incapacitating, incapacitating, and fatal crashes
* Non-severe crashes include possible injury or no-injury crashes
** Roadway Departure includes crashes where only one motor vehicle was involved

Traditional Safety Analysis: Rural Crash Rate Map



Statewide average crash rates:
Rural 66.91
Urban 154.30

FHWA Systemic Safety Analysis:



Systemic Safety Analysis: Identify Focus Crash Types

- Focus crash types represent the greatest number of severe crashes across the system
- Used corridor specific characteristics and Texas Strategic Highway Safety Plan

SHSP Emphasis Areas/Focus Crash Types

- ❑ Distracted Driving
- ❑ Impaired Driving
- ❑ Pedestrian Safety
- ❑ Intersection Safety
- ❑ Speeding
- ❑ Roadway and Lane Departures
- ❑ Older Users

Corridor Specific Emphasis Areas

- ❑ Young Drivers
- ❑ Bicycle Crashes
- ❑ Towed-Trailer Crashes
- ❑ Commercial Motor Vehicle Crashes
- ❑ Animal-On-Road Crashes
- ❑ Head-On Crashes

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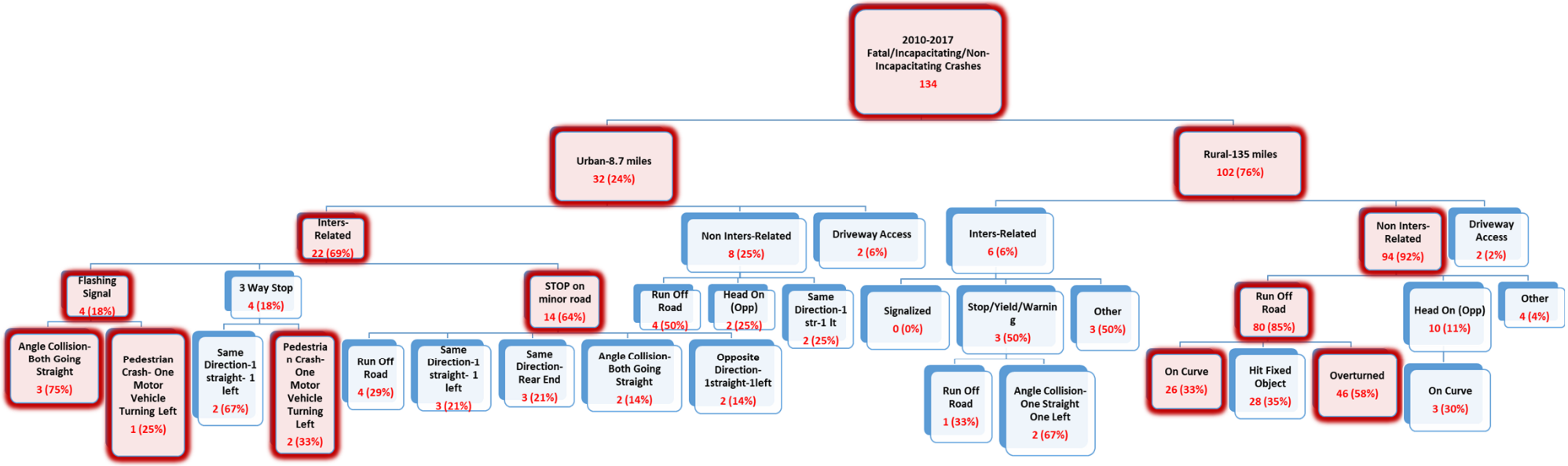
Systemic Safety Analysis: Identify Focus Crash Types

Emphasis Area		Rural Total (135 miles)		Urban Total (8.7 miles)	
Drivers	Young Drivers (under 21)	14	14%	7	22%
	Older Drivers (over 64)	14	14%	6	19%
	Aggressive Driving and Speeding-related	27	26%	3	9%
	Drug and Alcohol-related	10	10%	3	9%
	Inattentive, Distracted, Asleep Drivers	30	29%	16	50%
Special Users	Pedestrian Crashes	0	0%	3	9%
	Bicycle Crashes	0	0%	0	0%
Vehicles	Towed-trailer crashes	14	14%	0	0%
	Commercial Motor Vehicle Crashes	7	7%	0	0%
Highways	Animal-on-Road Crashes	8	8%	2	6%
	Road Departure Crashes (non-intersection)	80	78%	4	13%
	Intersection Crashes	6	6%	22	69%
	Head-on (opposite) Crashes	10	10%	2	6%
	Dark (no street-lights) Crashes	23	23%	3	9%
Total Fatal/Incapacitating/Non-incapacitating Injury Crashes		**102**		**32**	

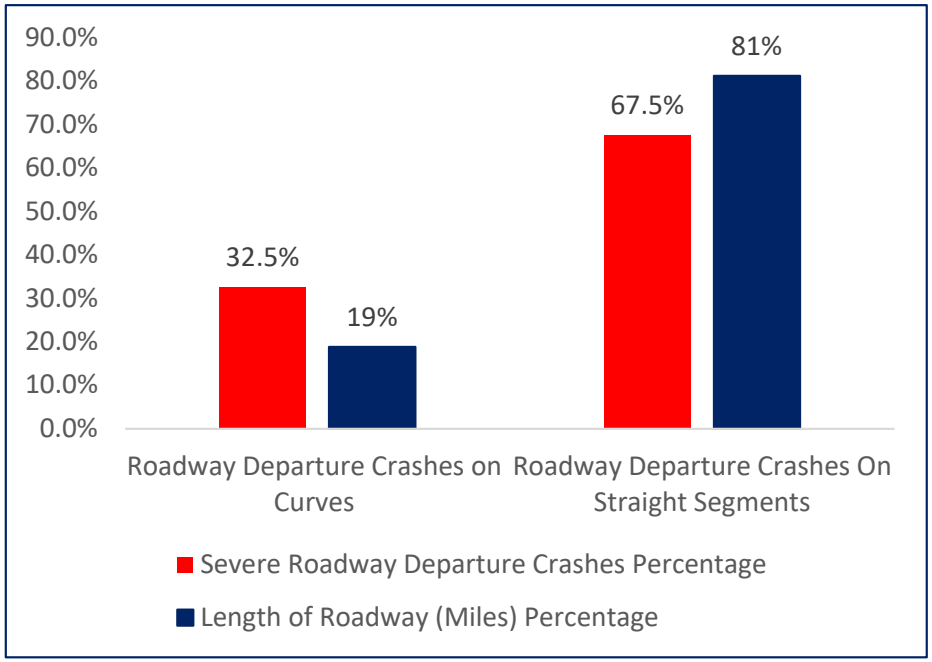
Systemic Safety Analysis: Select Focus Facilities



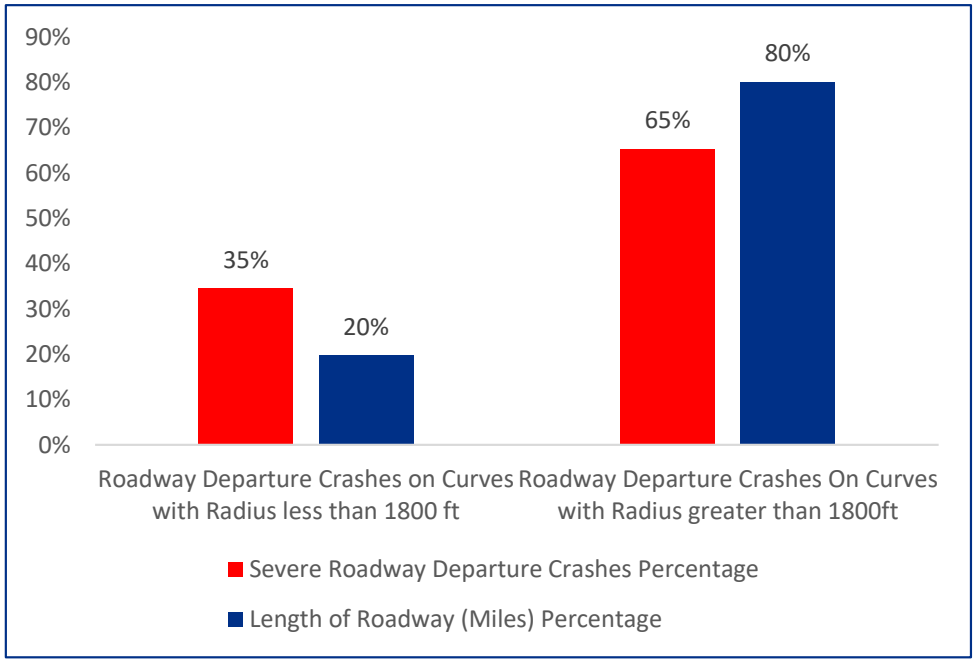
Systemic Safety Analysis: Step 1 - Evaluate Risk Factors

Roadway and Intersection Features	•Roadway Departure Density •Shoulder width and type •Curve Radius Density •Clear Zone Assessment •Roadway Gradient • Access Density • Presence of Lighting • Intersection Skew Angle • Slippery Pavement
Traffic Volume	•Average Daily Traffic Volume •Truck Percentages
Other Features	•Posted speed limit •Adjacent land use •Railroad crossing •Bus stop

Systemic Safety Analysis: Example Rural Roadway Departure Risk Factors

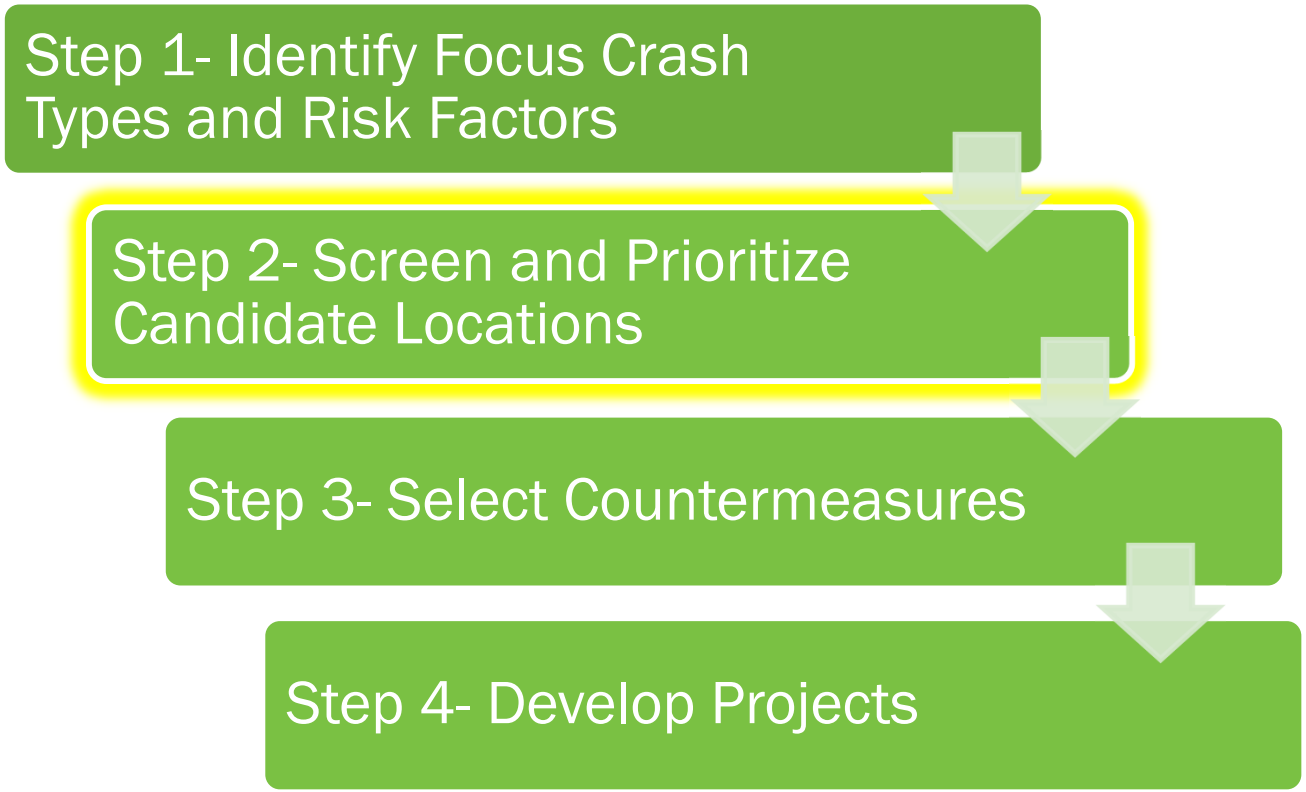


Crashes are overrepresented at curves than on straight segments.



Crashes are overrepresented at curves with radius less than 1800 ft.

FHWA Systemic Safety Analysis:



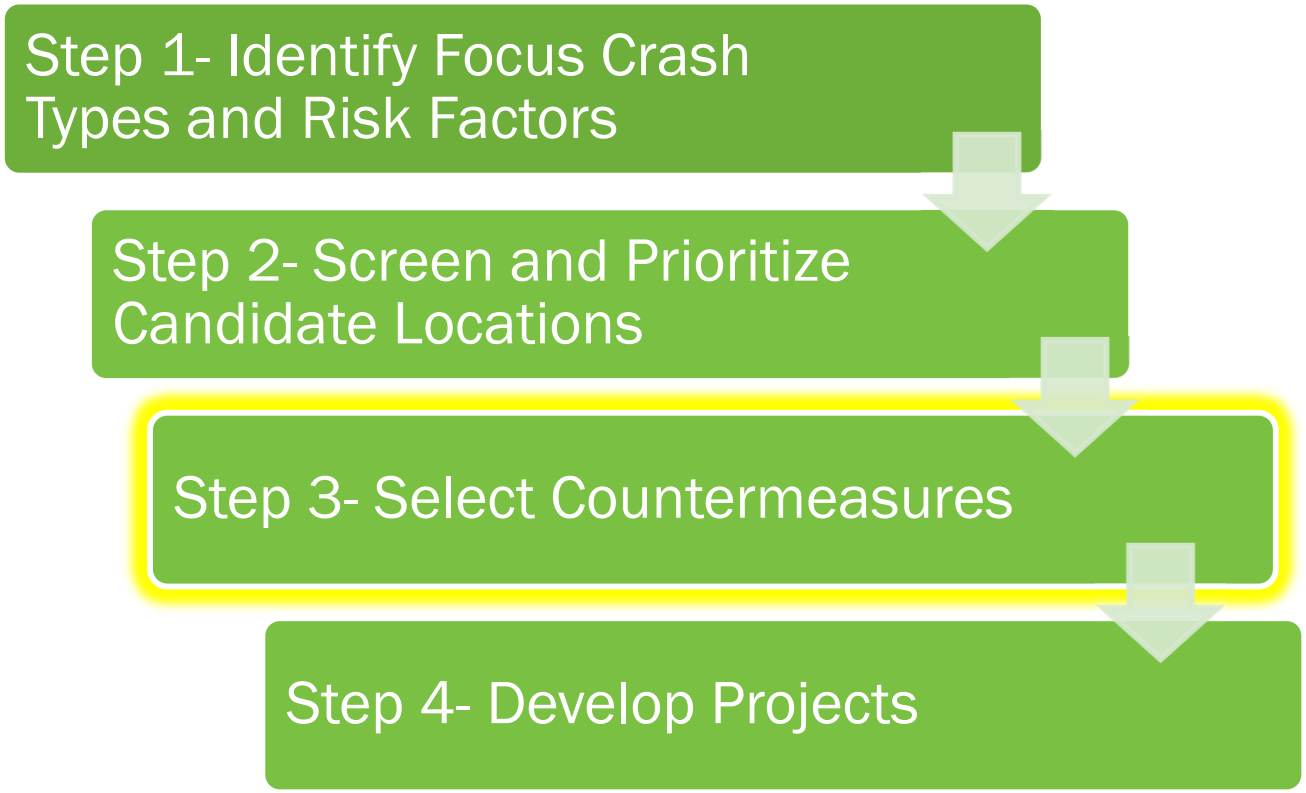
Systemic Safety Analysis: Step 2- Screen and Prioritize Rural Segments

Risk Factors	Over represented by (percentage)	Percentage of Severe Crashes with Risk Factor	Risk Factor Weight
AADT<1300	9	41	0.9
AADT>2100	6	28	0.6
Critical Curve	15	32	1.5
Clear Zone	8	55	0.8
Truck Percentage	7	24	0.7
In-the-Dark Crashes	10	94	1
Slippery Pavement	10	40	1

Systemic Safety Analysis: Step 2- Screen and Prioritize Rural Segments

Segments	Length (miles)	Number of Severe Crashes	Number of Severe Roadway Departure Crashes	Road Departure Crash Density	AADT Range	Critical Curve Radius Density	Clear Zone	Truck Percentage	Slippery Pavement	In the Dark Crashes	Total Score
0104-09	12.0	8	6	0.00	0.00	1.50	0.00	0.00	0.00	1.00	**2.50**
0104-08	13.1	9	6	0.00	0.90	1.50	0.80	0.00	0.00	1.00	**4.20**
0104-07	18.3	18	17	1.00	0.90	1.50	0.80	0.00	0.00	1.00	**5.20**
0104-06	14.9	6	2	0.00	0.89	0.00	0.00	0.00	0.00	0.00	**0.89**
0020-08	13.6	14	11	1.00	0.60	0.00	0.00	0.70	1.00	1.00	**4.30**
0020-09	1.3	0	0	0.00	0.60	0.00	0.80	0.70	0.00	0.00	**2.10**
0020-10	1.5	4	4	1.00	0.60	1.50	0.80	0.70	1.00	1.00	**6.60**
0020-11	7.1	5	4	0.00	0.60	0.00	0.80	0.70	1.00	1.00	**4.10**
0021-01	5.8	5	3	0.00	0.60	0.00	0.80	0.00	1.00	0.00	**2.40**
0075-01	19.7	10	7	0.00	0.88	0.00	0.00	0.00	0.00	1.00	**1.88**
0075-02	11.9	12	10	1.00	0.90	0.00	0.00	0.00	1.00	1.00	**3.90**
0075-03	15.8	11	10	1.00	0.88	0.00	0.80	0.00	0.00	1.00	**3.68**

FHWA Systemic Safety Analysis:



Systemic Safety Analysis: Step 3- Select Countermeasures

- NCHRP report 500 provides comprehensive countermeasures
- Reviewed countermeasures for corridor related factors
- Reviewed relative advantages and disadvantages

Distracted Driving	Rural Road Departures	Speeding	Horizontal Curves	Steep Slopes
▪ Rumble Strips ▪ Safe Rest Areas ▪ Turnouts ▪ Education and Awareness	▪ Rumble Strips ▪ Install passing or climbing lanes ▪ Increase shoulder width ▪ Improve lighting/signing/marking	▪ Implement Variable Speed Limits ▪ Automated Speed Enforcement ▪ Improve Speed Limit Signage	▪ Improve Super elevation ▪ Lighting of the Curve ▪ Dynamic Curve Warning System ▪ Grooved/Skid-Resistant Pavement	▪ Safer slopes and ditches ▪ Remove/relocate objects in hazardous locations ▪ Add/Extend guardrail ▪ Improve design and application of barrier systems

Systemic Safety Analysis: Step 3 - Select Countermeasures for Curves

Criteria	Curve Countermeasures
Radius of curve less than 1800 ft and occurrence of a severe crash	**High Friction Surface Treatment** + Advisory Speed Limit Sign + Sequential Dynamic Curve Warning Sign
Radius of curve less than 1800 ft and absence of a severe crash	**High Friction Surface Treatment** + Advisory Speed Limit Sign + Flashing Beacon
Radius of curve between 1800 ft and 2195 ft (3390 ft for level terrain) and occurrence of a severe crash	**High Friction Surface Treatment** + Static Chevrons
Radius of curve between 1800 ft and 2195 ft (3390 ft for level terrain) and absence of a severe crash	**High Friction Surface Treatment** + Static Horizontal Curve Warning Signs
Radius of curve greater than 2195 ft (3390 ft for level terrain) and occurrence of a severe crash	Static Chevrons
Radius of curve greater than 2195 ft (3390 ft for level terrain) and absence of a severe crash	Static Horizontal Curve Warning Signs
Radius of curve greater than 10,000 ft or deflection angle less than 10 degrees	None

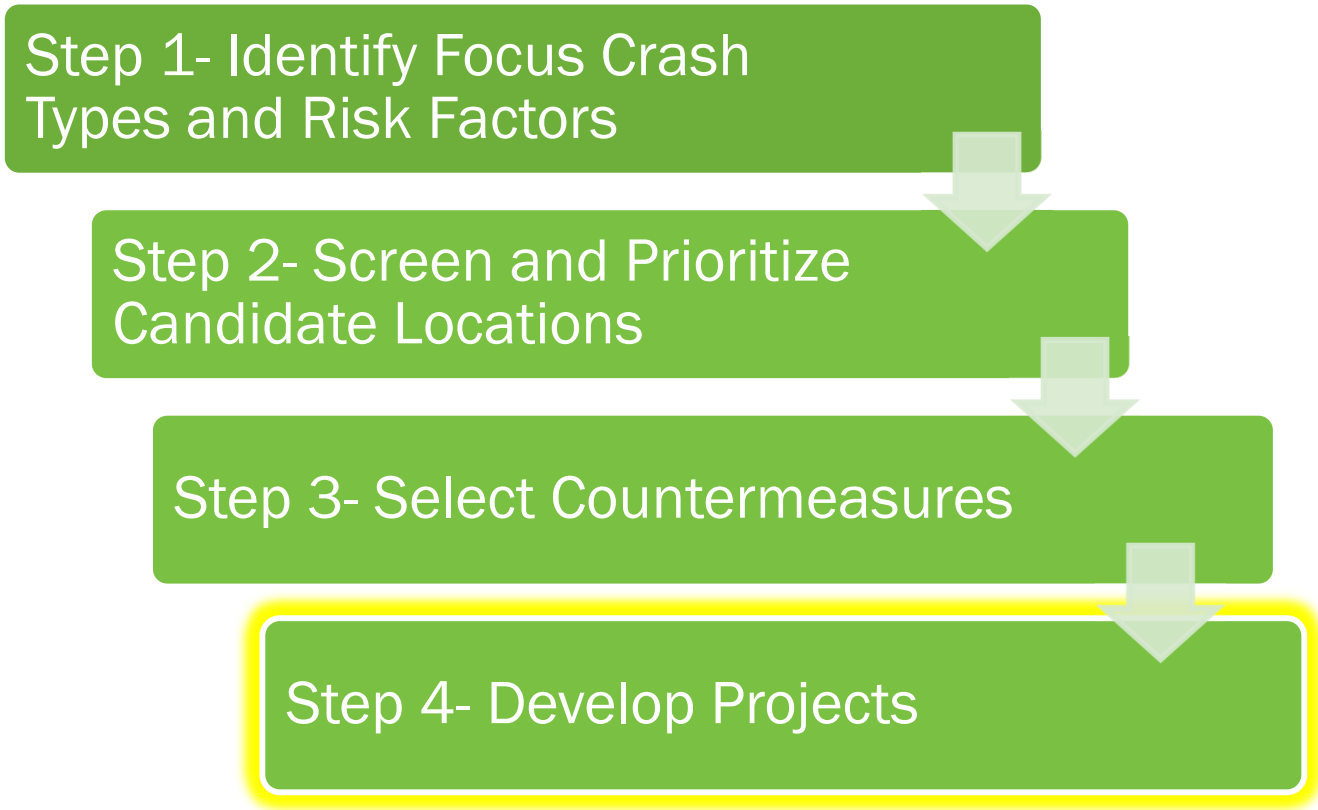
- HFST – High Friction Surface Treatment
- 3005 FT is the usual minimum radius for curves with a superelevation of 8% at a design speed of 70mph
- 1810 FT is the absolute minimum radius for curves with a superelevation of 8% at a design speed of 70mph

Criteria for Improving Superelevation

- Criteria for improving superelevation is based on the difference between the existing superelevation on the horizontal curves and minimum required superelevation based on current design standards.

Range of Superelevation Deficiency, Δe	Recommended Countermeasure
$\Delta e \leq -1\%$	Improvement to Superelevation is Required
$-1\% < \Delta e \leq -0.5\%$	Improve Superelevation, or Use HFST
$-0.5\% < \Delta e < 0\%$	Implement Horizontal Curve Countermeasure

FHWA Systemic Safety Analysis:



Systemic Safety Analysis: Step 4- Develop Projects (Control Section 0104-07)

Short List of Countermeasures Considered						
Time	Cost	Countermeasures	Unit	Quantity	Cost per Unit	Cost
Short	Low	Horizontal Curve Warning Signs	EA	14	$600	$8,400
		Chevrons	EA	22	$600	$13,200
		Advisory Speed Limit Signs	EA	10	$600	$6,000
		Vertical Grade Signs	EA	48	$600	$28,800
		Curve Blocks View Sign	EA	3	$600	$1,800
		Install centerline rumble strip	MILE	18	$1,650	$30,200
		Install shoulder rumble strip	MILE	37	$800	$29,300
		Passing lane ahead and lane ends merge left signs	EA	16	$600	$9,600
		No Passing Zone Signs	EA	56	$600	$33,600
		Tree Trimming/Brush Removal	MILE	5.49	$2,000	$11,000
						$171,900
		TOTAL (Including Mobilization, Contingency, Construction Engineering and Traffic Control)				$286,000
Medium	Moderate to High	Improve design and application of barrier systems	EA	10	$2,500	$25,000
		Add/Extend Guardrail	MILE	5	$160,000	$800,000
		Provide guardrail end treatment	EA	80	$2,850	$228,000
		Flashing Beacon Signs	EA	6	$10,000	$60,000
		Sequntial Dynamic Curve Warning Sign	EA	2	$25,000	$50,000
		Provide adequate sight distance	CY	4952	$200	$990,400
		Provide lighting at intersections	EA	2	$10,000	$20,000
		Raised Pavement Markers	EA	2657	$50	$132,900
		Design safer slopes when fill height is less than 5 feet	CY	20704	$50	$1,035,200
		Provide Rest Area	EA	1	$1,000,000	$1,000,000
		Provide Turnouts	SY	12810	$200	$2,562,000
		Superelevation Improvement	TON	7500	$120	$900,000
		High Friction Surface Treatment	SY	18800	$47	$883,600
						$8,687,100
		TOTAL (Including Mobilization, Contingency, Construction Engineering and Traffic Control)				$14,453,200
Long	High	Widen Shoulders	MILE	18.3	$1,333,333	$24,400,000
		Construct Texas Super 2	MILE	16	$2,000,000	$31,200,000
						$55,600,000
		TOTAL (Including Mobilization, Contingency, Construction Engineering and Traffic Control)				$92,504,500

FM 2271 Extension Feasibility Study
Comprehensive Safety Analysis

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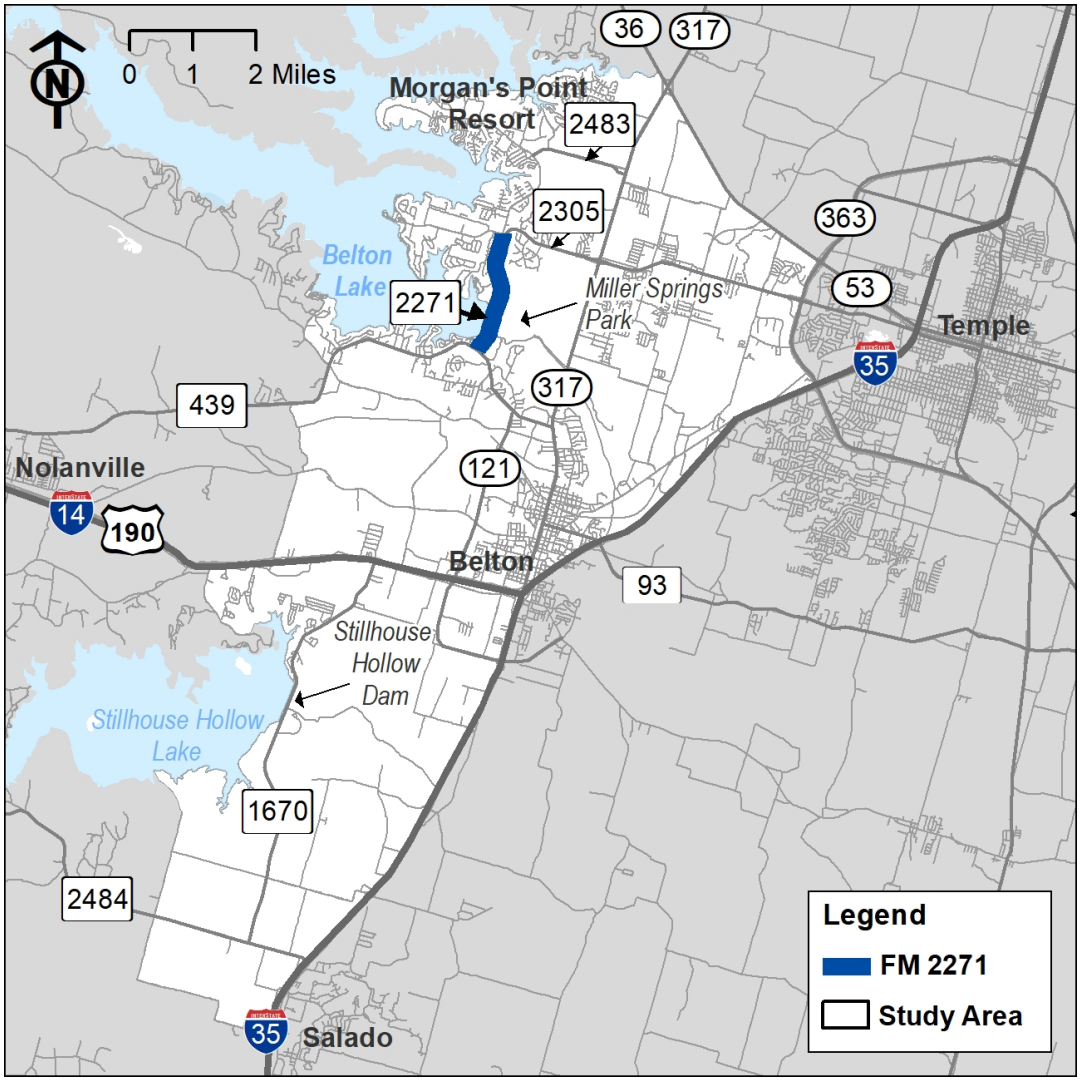
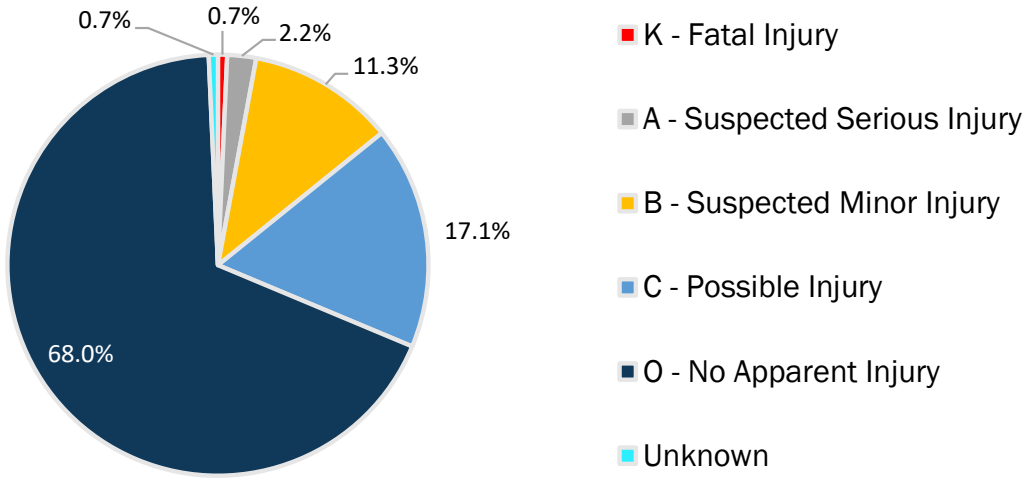
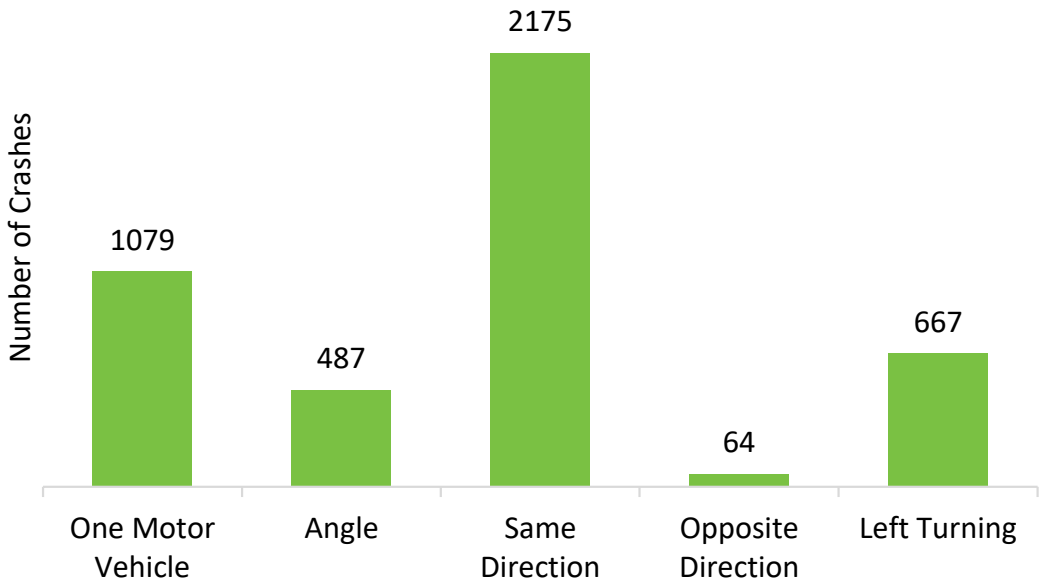
FM 2271 Study Area

- **Study Area:** Extends east to west from Interstate 35 to Fort Hood and north to south from Airport Road to FM 2484
- **Influence Area:** Determined by big data analytics (presented later)

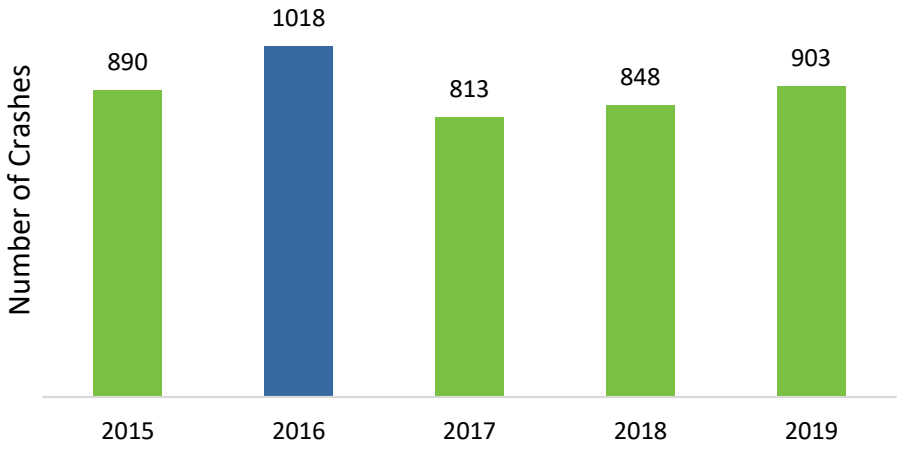


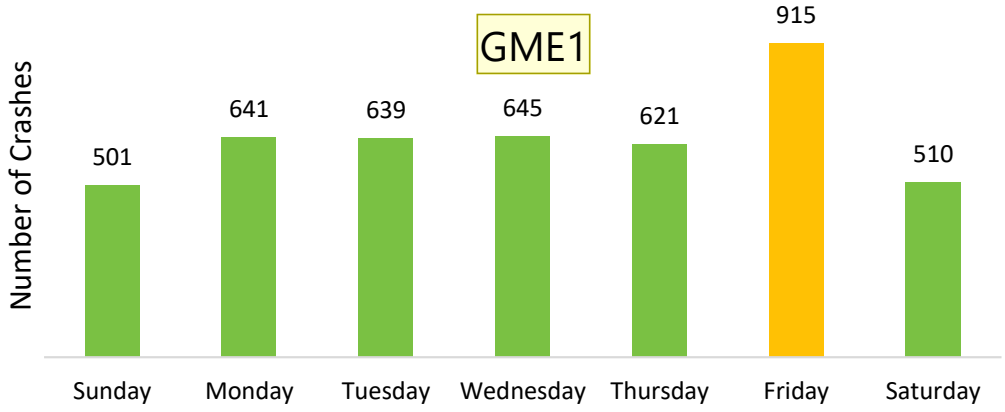
Study Area Crash Trends

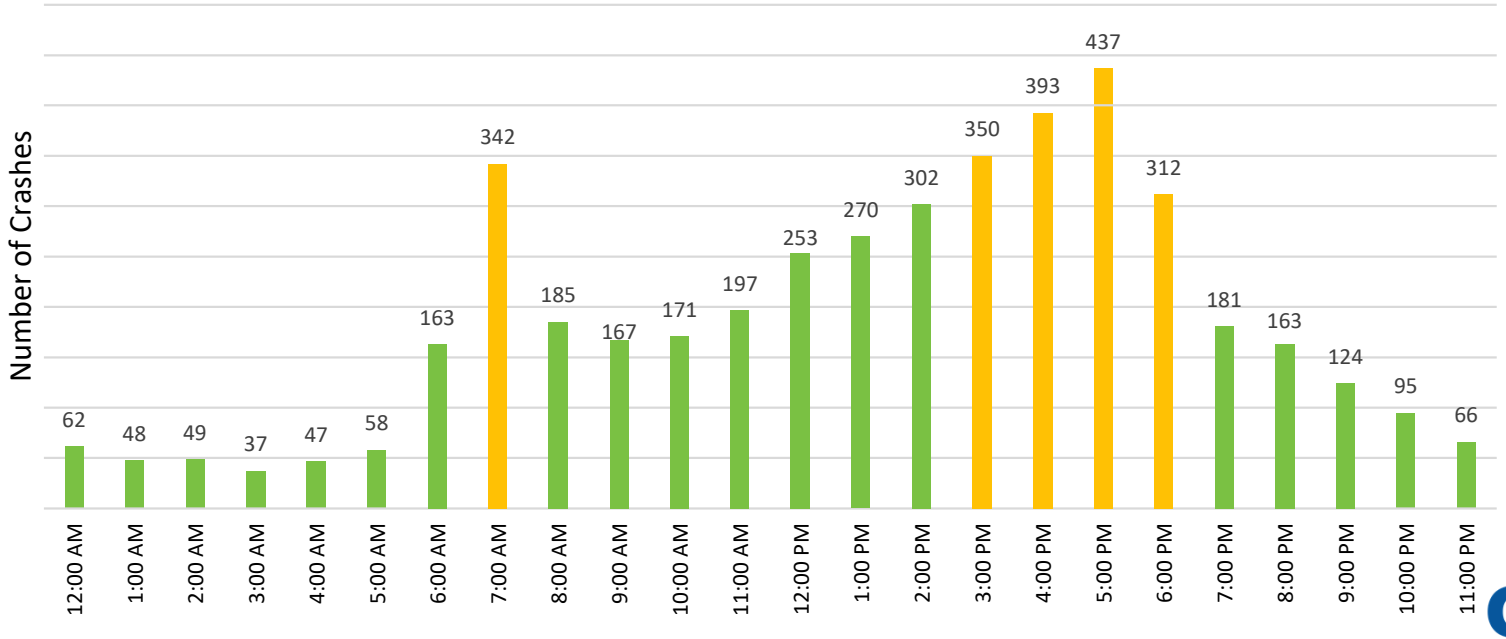




Study Area Crash Trends (Cont.)







GME2

Slide 29

GME1 2015-2019?
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GME2 2015-2019?
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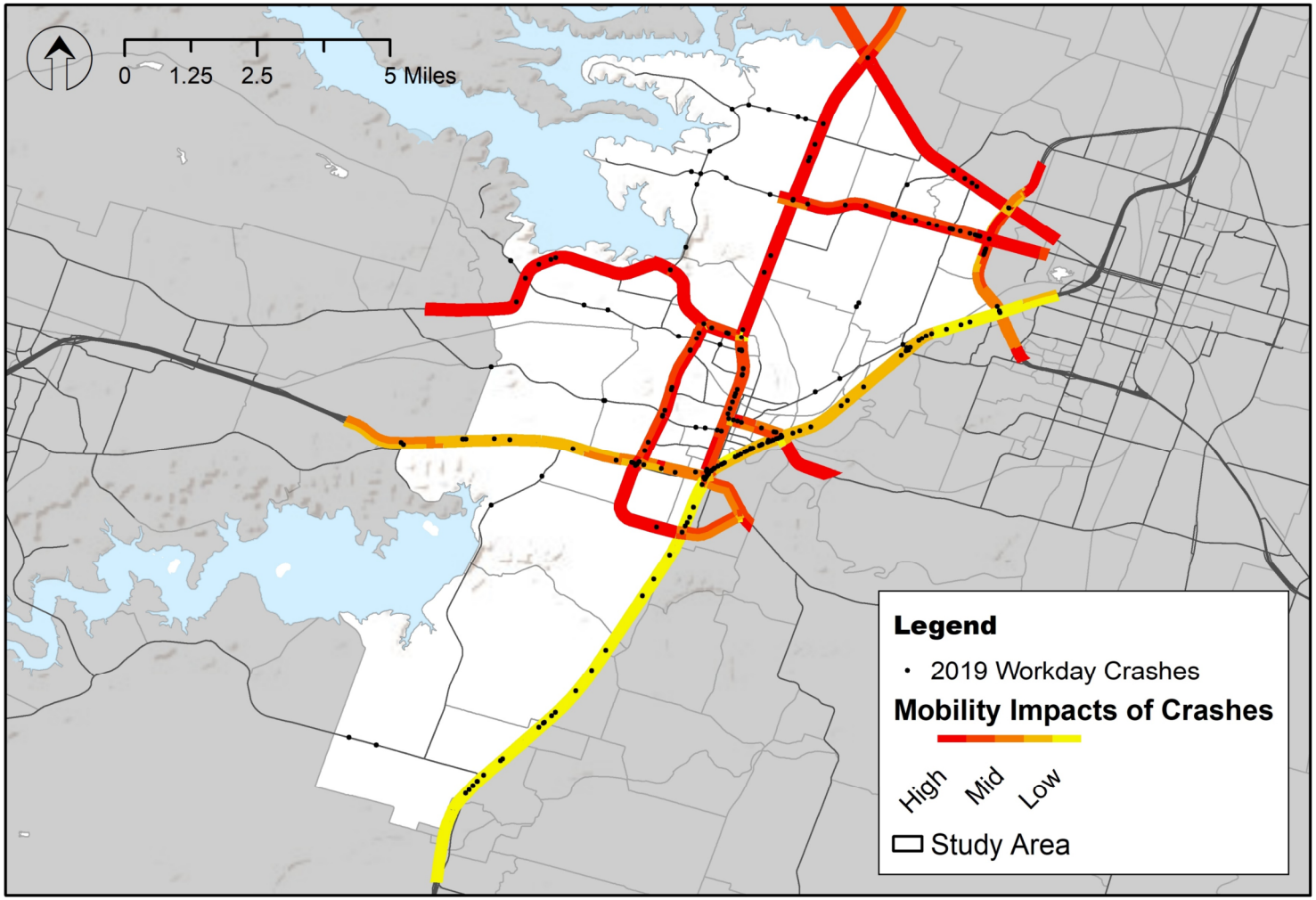
Alignment of Crash Records with Non-Recurring Congestion



GME3

Slide 30

GME3 Please spell out acronyms in notes

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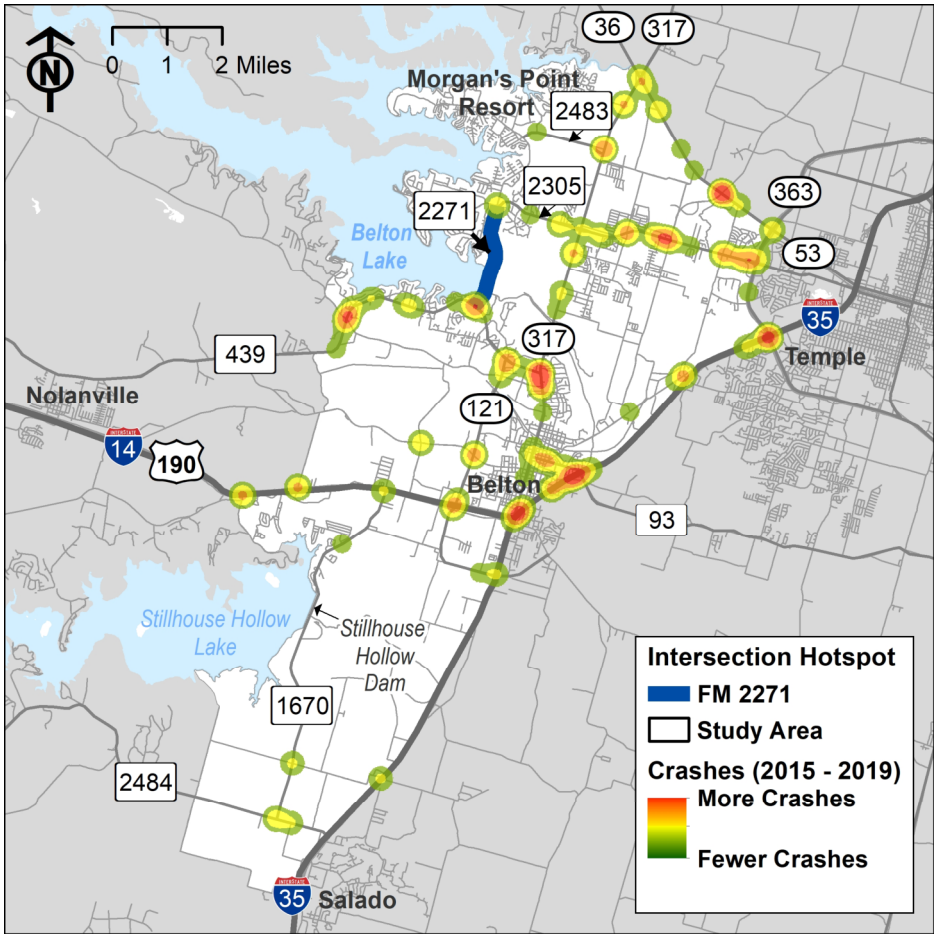
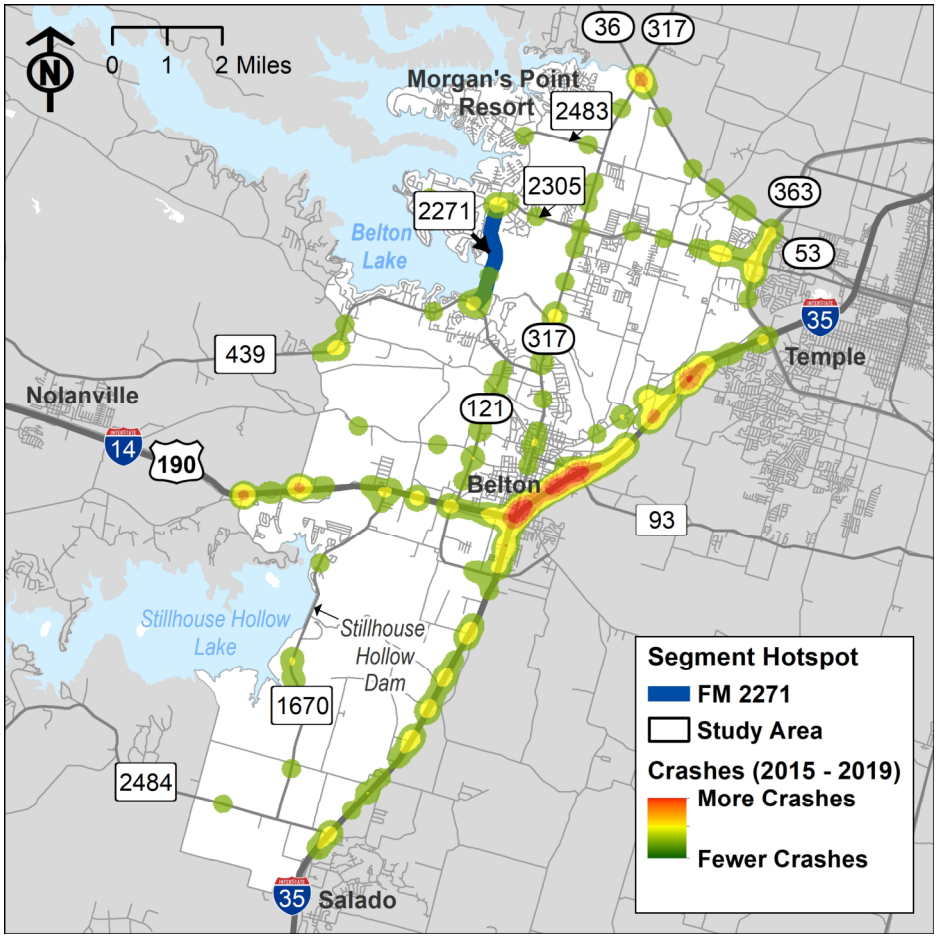
Site-Specific Safety Analysis: Methodology

- Download 2015-2019 Crash data from Crash Records Information System (CRIS)
- Calculate density of crashes at intersections and segments using Kernel Density tool in ArcMap
- Identify site characteristics at hotspot locations
- Identify Near-Term and Long-Term HSIP work codes to address identified safety problems at intersections and segments

Site-Specific Safety Analysis: Kernel Density Maps



- 21 Intersection Locations

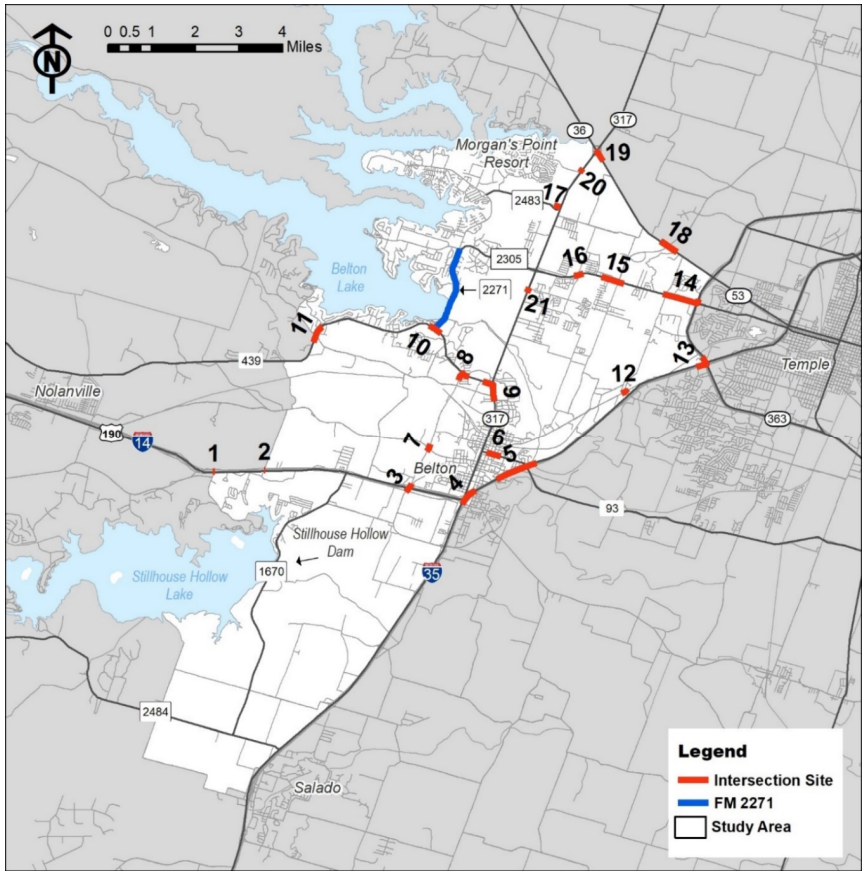


- 7 Segment Locations

Site-Specific Safety Analysis: Location Characteristics

Reviewed site characteristics including:

- Segment length
- Lane width
- Number of lanes
- Shoulder width
- Curve presence
- Intersection control
- Striping condition
- Presence of traffic signs
- Median presence and type
- Number, severity, and type of crashes
- Harmful events of crashes
- Truck crashes
- Roadway part



Site-Specific Safety Analysis: HSIP Work Codes

Top countermeasures include:

- 203 - Install raised median (Reduction Factor - 25%)
- 401 - Install Pavement Markings (Reduction Factor - 20%)
- 108 - Improve Traffic Signals (Reduction Factor - 24%)

Inters. Site No.	Identified Pattern(s)	Site Description	Near-Term Strategies	Long-Term Strategies
5	61% of KAB crashes occurring at intersection site 5 are same direction crashes and 1 was a pedestrian crash (no crosswalk present)	The KAB crash hotspot at these locations consisted of four intersections. Two intersections are on a curve and have traffic signals. Striping is good, traffic control signs are present. At 6th street intersections there is no median.	124 - Install Advanced Warning Signals and Signs (Intersection) (Reduction Factor - 27%) 403 - Install Pedestrian Crosswalk (Reduction Factor - 20%)	203- Install Raised median (Reduction Factor - 25%) where it doesn't exist

Systemic Safety Analysis: Methodology

- Focus analysis on most severe crashes (Fatal, Suspected Serious Injury, and Suspected Minor Injury Crashes)
- Identification of Focus Crash Types
- Identification and Analysis of Contributing Factors
- Identify systemic Near-Term and Long-Term HSIP Work Codes to address identified safety problems at intersections and segments

Data Structure

- Merged crash data into one text file
- Downloaded Roadway data as a file geodatabase (RINO data)
- Used scripts that automate most of the process from merging datasets to merging with roadway data and summarizing crash statistics for each highway and DFO limit

Slide 36

GME4 Spell out DFO limit in Notes at least

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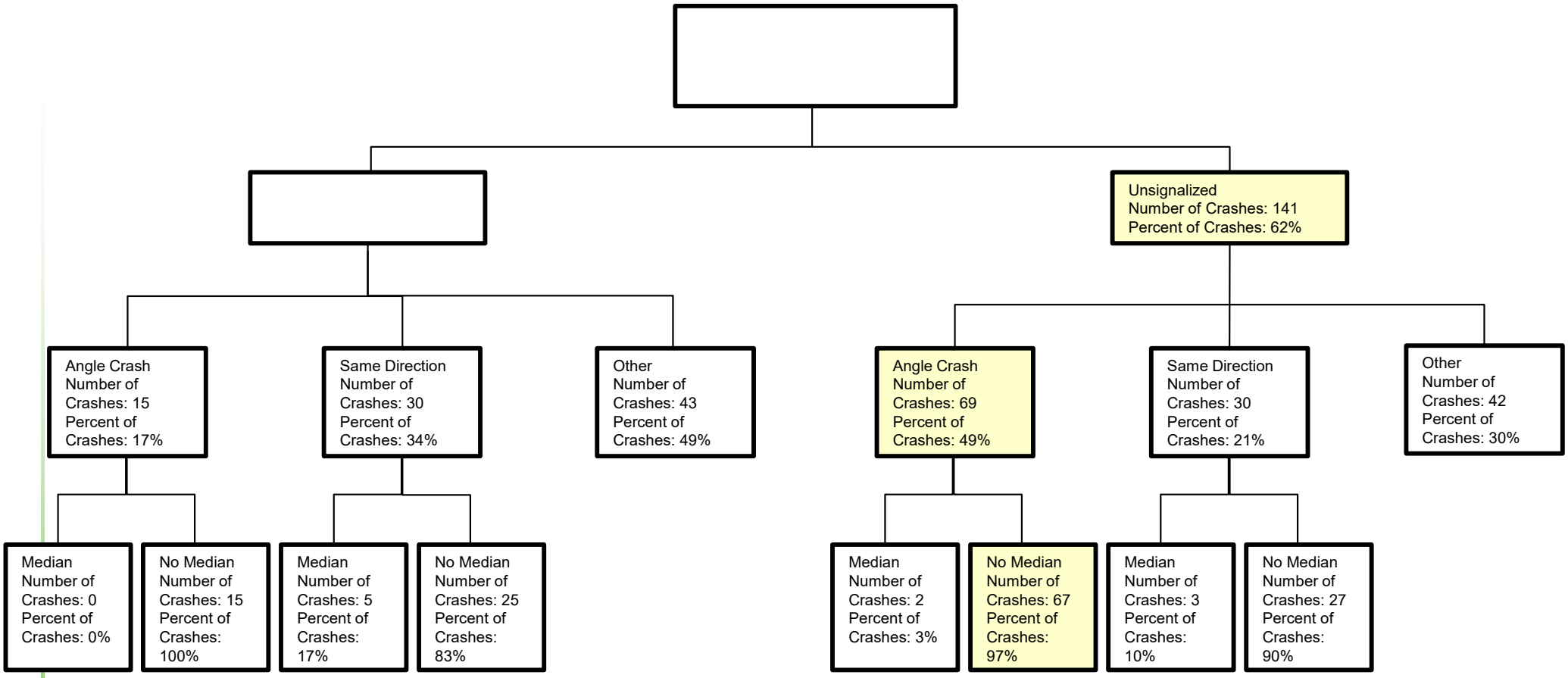
Systemic Safety Analysis: Identify Focus Crash Types



Slide 37

GME5 Blow up unsignalized tree - animate or add slide

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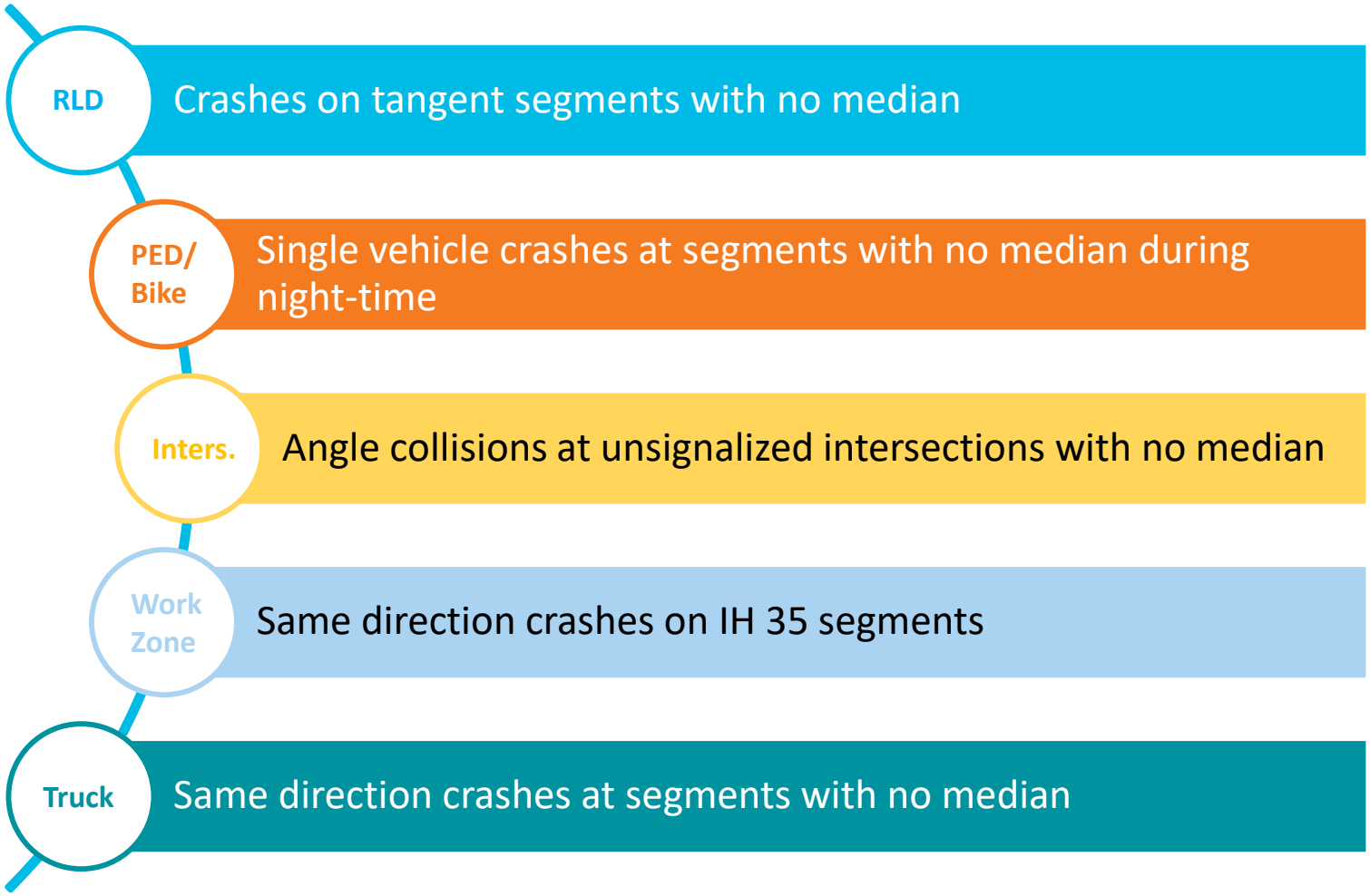
Systemic Safety Analysis: Identify Focus Crash Types (Cont.)



GME6

Systemic Safety Analysis: Analyze Risk Factors

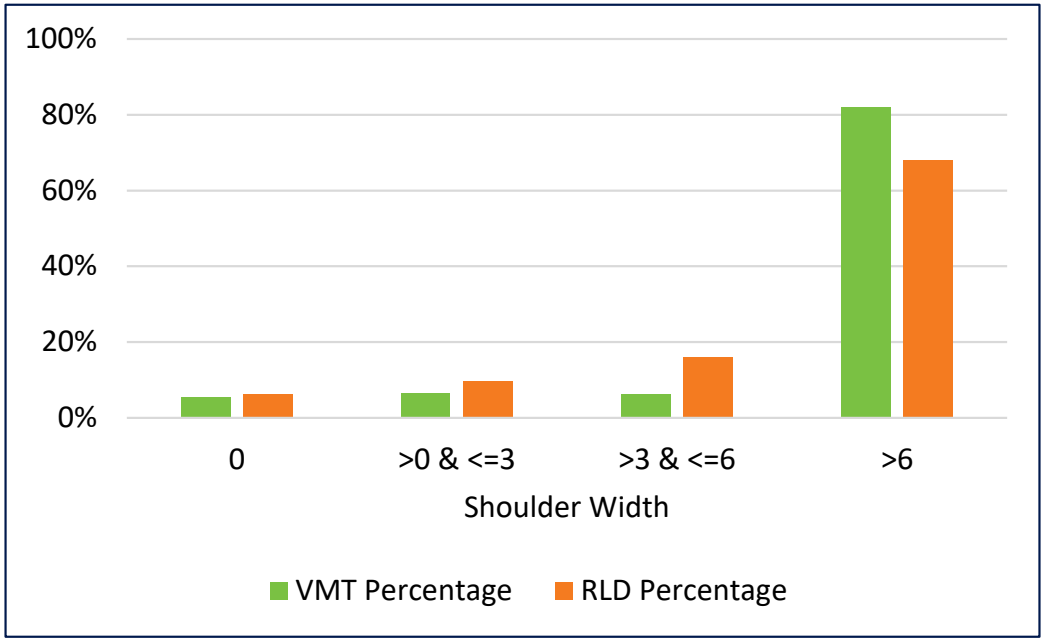
Roadway Characteristic	Category/Bins				
Number of Lanes	<4	≥4 & < 7		≥7	
Percentage VMT	17%	82%		1%	
Lane Width	≤10	11	12	>12	
Percentage VMT	4%	1%	79%	16%	
Shoulder Width	0	>0 & ≤3	>3 & ≤6	>6	
Percentage VMT	6%	6%	6%	82%	
Functional Classification	Interstate	Principal Arterial	Minor Arterial	Collectors	Local
Percentage VMT	68%	13%	7%	10%	2%
Presence of Medians	With Median		Without Median		
Percentage VMT	74%		26%		

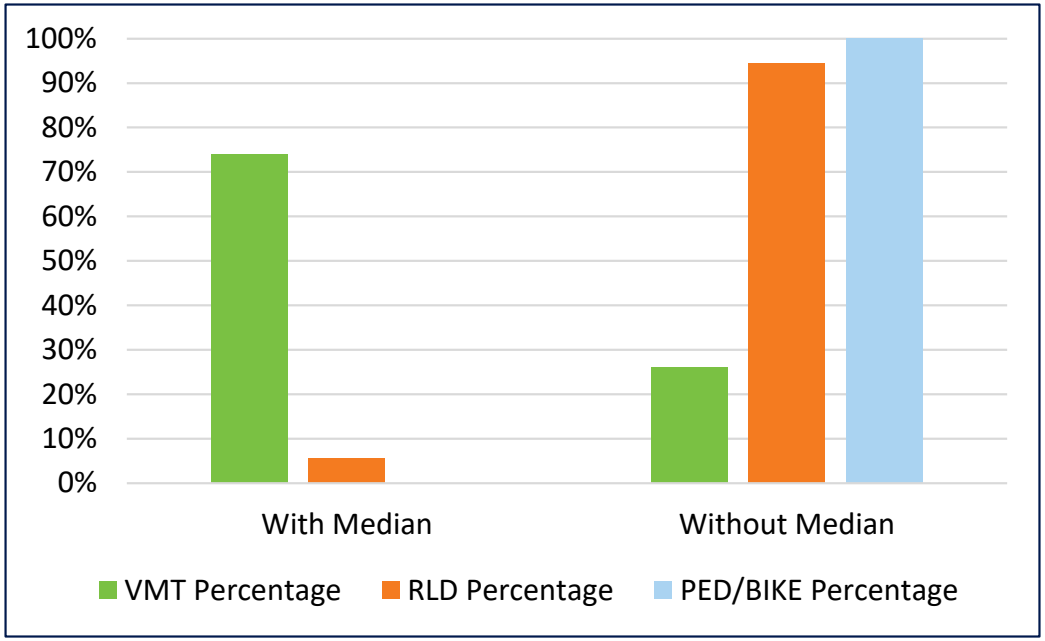
Roadway Characteristic	Category/Bins				
Number of Lanes	<4	≥4 & < 7		≥7	
% RLD Crashes	-	-		-	
% PED/BIKE Crashes	31%	69%		0%	
Lane Width	≤10	11	12	>12	
% RLD Crashes	3%	6%	79%	12%	
% PED/BIKE Crashes	-	-	-	-	
Shoulder Width	0	>0 & ≤3	>3 & ≤6	>6	
% RLD Crashes	6%	10%	16%	68%	
% PED/BIKE Crashes	-	-	-	-	
Functional Classification	Interstate	Principal Arterial	Minor Arterial	Collectors	Local
% RLD Crashes	54%	16%	10%	20%	0%
% PED/BIKE Crashes	38%	23%	0%	39%	0%
Presence of Medians	With Median		Without Median		
% RLD Crashes	6%		94%		
% PED/BIKE Crashes	0%		100%		

Slide 39

GME6 What is the story to tell here? Are peds and bikes allowed on interstates in TX or are these at ramps or disabled vehicles? May want to circle key cells
Guttenplan, Martin E., 3/7/2022

Systemic Safety Analysis: Analyze Risk Factors (Cont.)





Systemic Safety Analysis: HSIP Work Codes

Top countermeasures include:

- 203 - Install raised median (Reduction Factor - 25%)
- 305 - Safety Lighting at Intersection (Reduction Factor - 13%)
- 532 - Milled Edgeline Rumble Strips (Reduction Factor - 15%)

Emphasis	Identified Issues	Near-Term Strategies	Long-Term Strategies
RLD	RLD crashes are over-represented on collectors, minor arterials, followed by principal arterials	532 - Milled Edgeline Rumble Strips (Reduction Factor - 15%) 542 - Install Milled Centerline Rumble Strips (Reduction Factor - 26%) on high-speed roadways	203 - Install raised median (Reduction Factor - 25%) on arterials where it currently doesn't exist 503 - Widen Paved Shoulder (to 5 ft. or less) (Reduction Factor – 25%) where is less than 6ft
	94% of RLD crashes occur on segments with no median which only constitute 26% of total VMT		
	16% of RLD crashes occur on segments with shoulder width between 3 and 6 ft while constituting only 6% of the total VMT		
	Of the same direction crashes, 100% occurred on location with no median. Note that 37% of same direction crashes occurring at Dark		

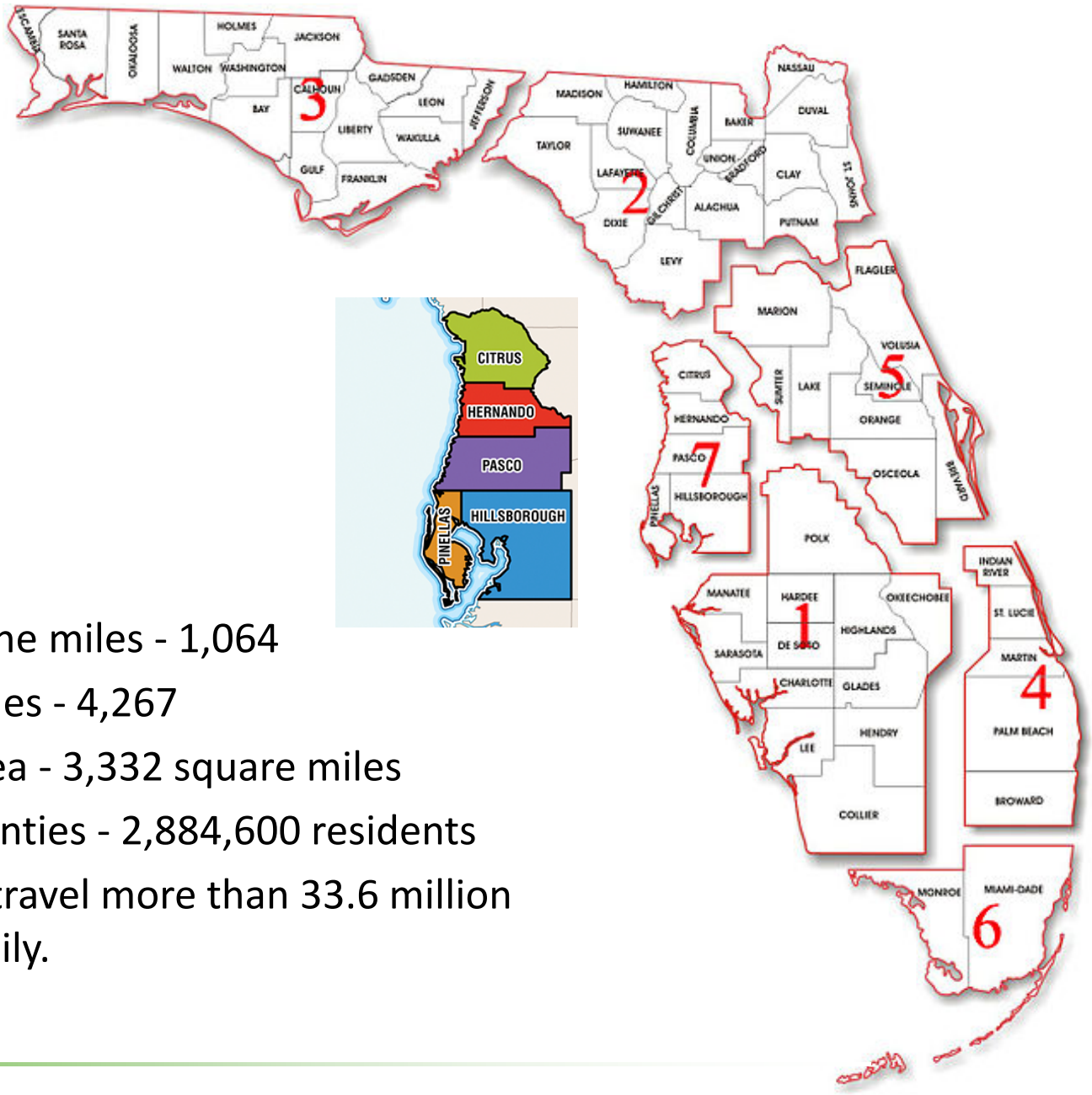
Slide 41

GME7 "if" 5' or less? instead of "to" 5' or less
Guttenplan, Martin E., 3/7/2022

GME8 If this is to be RLD emphasis only, then you probably don't need 305. If it is ped/bike than we need to show that in the slide
Guttenplan, Martin E., 3/7/2022

Pandemic Effects on Crashes
FDOT District 7 – Tampa Bay

FDOT District 7 – Tampa Bay



- Centerline miles - 1,064
- Lane miles - 4,267
- Land area - 3,332 square miles
- Five counties - 2,884,600 residents
- Drivers travel more than 33.6 million miles daily.

2020 Fatal Crash Data Trends – FDOT District 7

509 people lost their lives in traffic crashes in 2020

35% Bicycle Pedestrian
1% Decrease

37% Intersections
22% Increase

25% Lane Departure*
29% Increase

47%: Off System Roadways, 8*% increase*

53%: On Roadways, 8% increase

Remaining % in parking lots, private roads, Turnpike, etc.

27% Pedestrian, 8*% decrease*

8% Bicycle, 28*% increase*

18% Motorcycle, *13% decrease*

20% Impaired Driving, 7*% Decrease*

67% Nighttime, 20*% Increase*

8% Increase in Overall Fatalities
(Compared to 2019)

CDM Smith

2021 FDOT District 7 Crash Trends

January-June 2021, 304 people died in traffic crashes in D7

21% Increase Compared to January to June 2020

46% related to vulnerable road users in January to June 2021

24.4% of D7 total

4.2% of D7 total

17.5% of D7 total

42% of fatalities occurred on local roads in January to June 2021

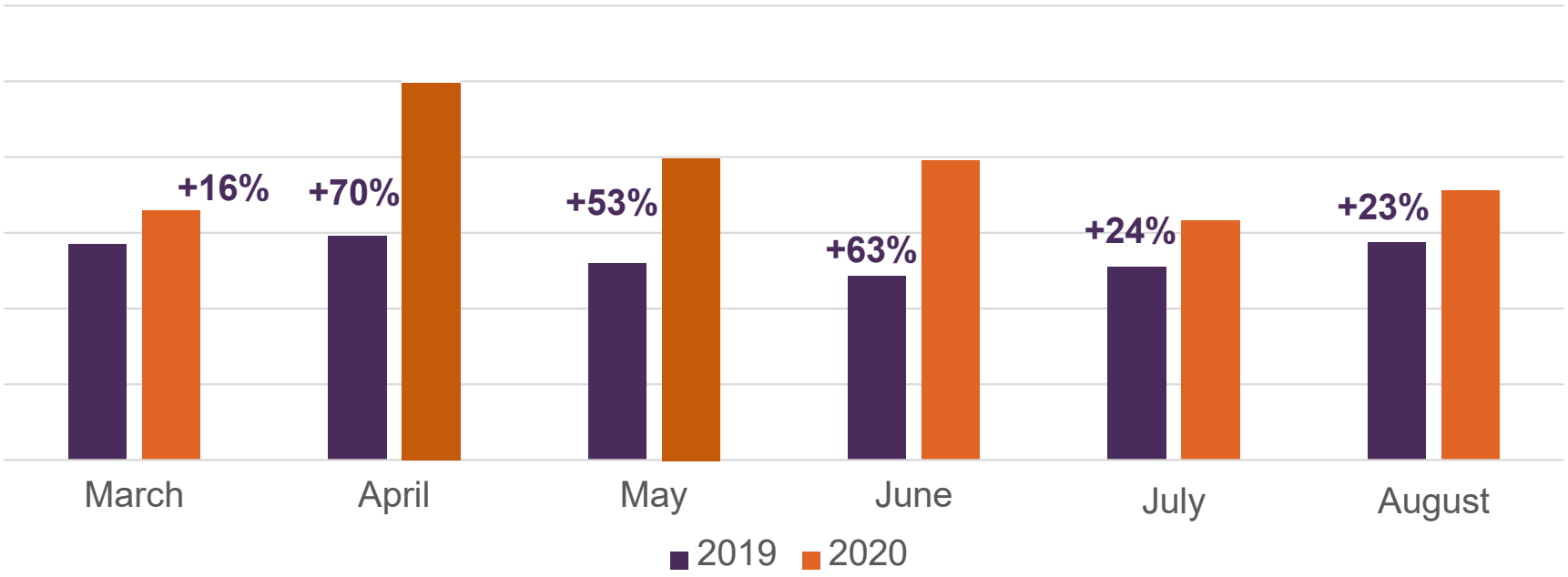
Nighttime related fatalities 23% increase compared to Jan. to June 2020

NOTE: Year over Year - Serious Injuries are down 6% while fatalities are up ~ 9%

SPEED can be inferred as a main cause as serious injuries are down, but fatalities are up.

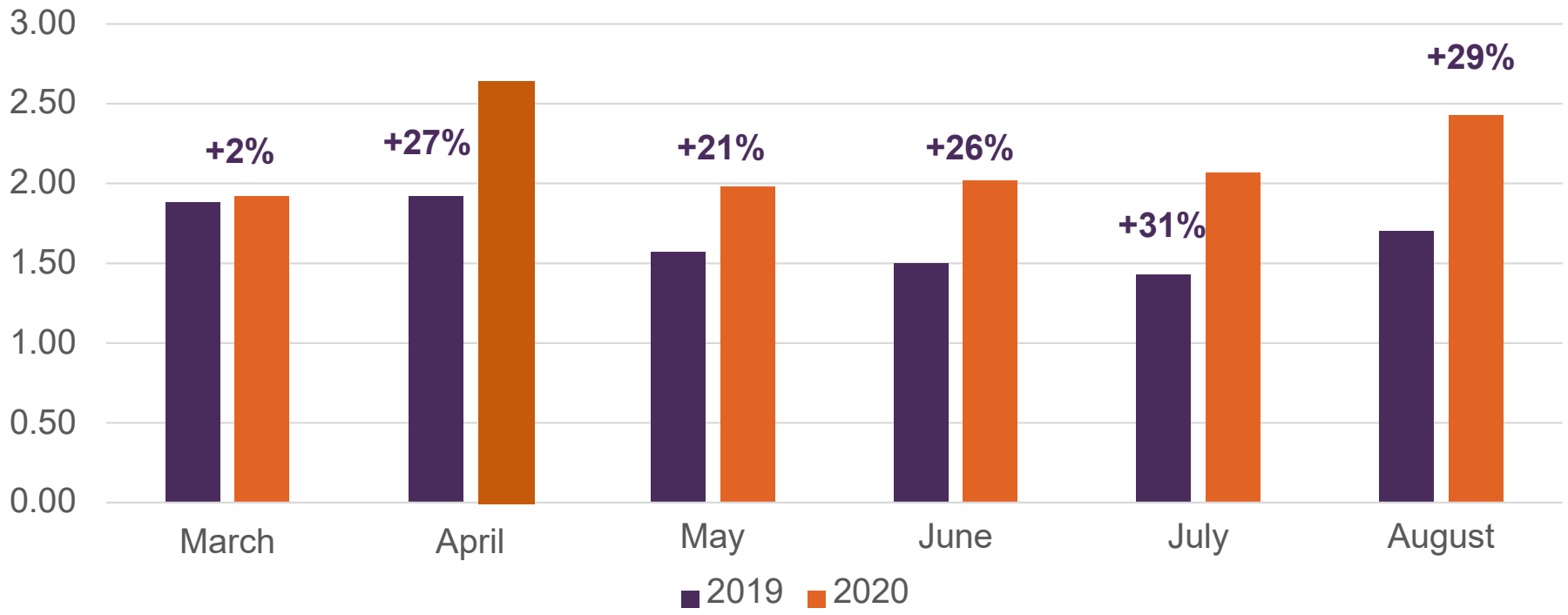
CDM Smith

2020 FDOT District 7 Crash Trends



Collisions that resulted in a severe injury or fatality as a Percent of Total Collisions, Pinellas County

2020 FDOT District 7 Crash Trends



Comparison of crashes that resulted in a severe injury or death in Pinellas County normalized by vehicle miles of travel pre-COVID vs COVID.

GME9

FDOT District 7 Speed Management

Speed Management Strategies: E Busch Boulevard

Speed Feedback Signs

- Collects speed data for evaluation

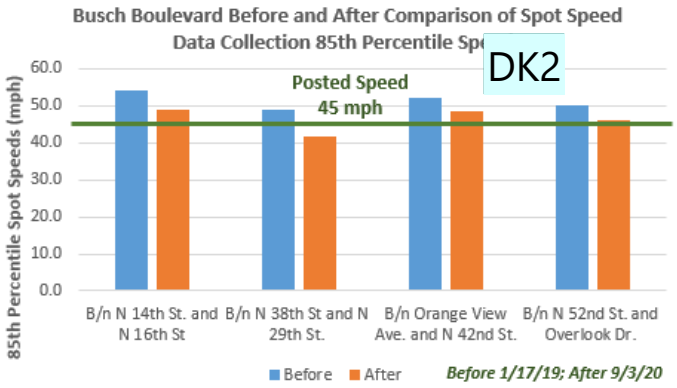
Pedestrian Hybrid Beacons

- Busch Boulevard at 12th Street, Brooks Street, Overlook Drive, and Pawnee Avenue

Context Sensitive Signal Timing

- Busch Boulevard. from Dale Mabry Ramp to 50th Street. – Jan 2020
- Green band for vehicles driving at or below speed limit
- Cycle lengths reduced from 220 to 180 seconds to 190 to 130 seconds

Education and Enforcement Efforts



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Slide 48

GME9 Optional slide
Guttenplan, Martin E., 3/8/2022

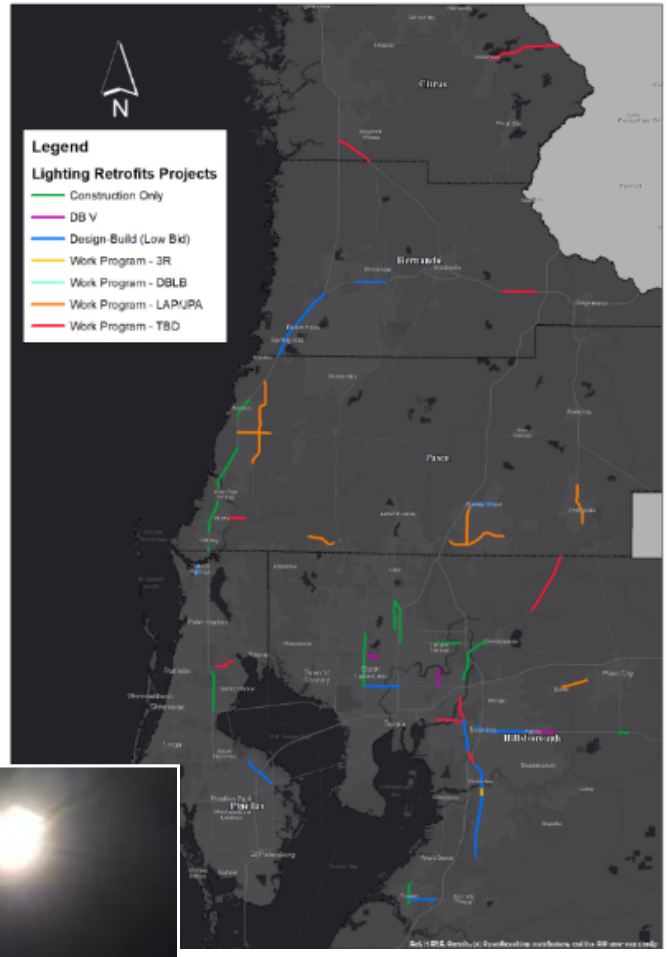
DK2 Just looking at this, can't tell which header the graph belongs to. Not sure if it matters.
Daniel, Kara, 3/11/2022

Case Sample: Districtwide 7 Lighting Retrofit

- Target high nighttime crash spots and segments (overall crashes and fatal/severe crashes)
- Multiple innovative delivery methods
  - Lighting retrofit to LED of all FDOT owned poles on-system corridors
  - Partnering with Local agencies for installation of new corridor/intersection lighting on priority On-System/Off-System corridors
  - Partnering with Power Companies to have lighting designed/installed by them on their own poles or constructing new lighting in areas with conflicting overhead electric lines and R/W constraints.
  - Usage of drones for field review of recent completed Lighting Projects.

Engineering

Innovation



CDM Smith

GME11

Corridors: FDOT D-7 Lighting Retrofit Projects- US 19 Pasco County

Slide 50

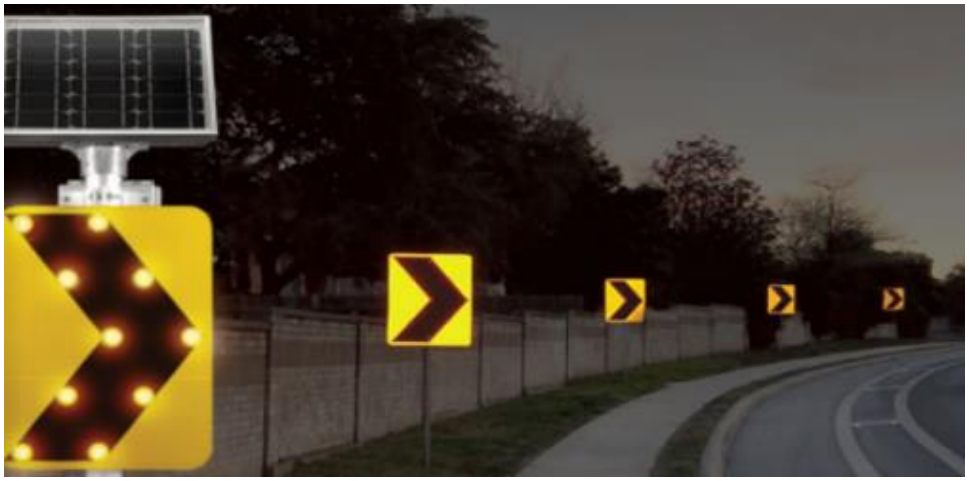
GME11 Optional slide

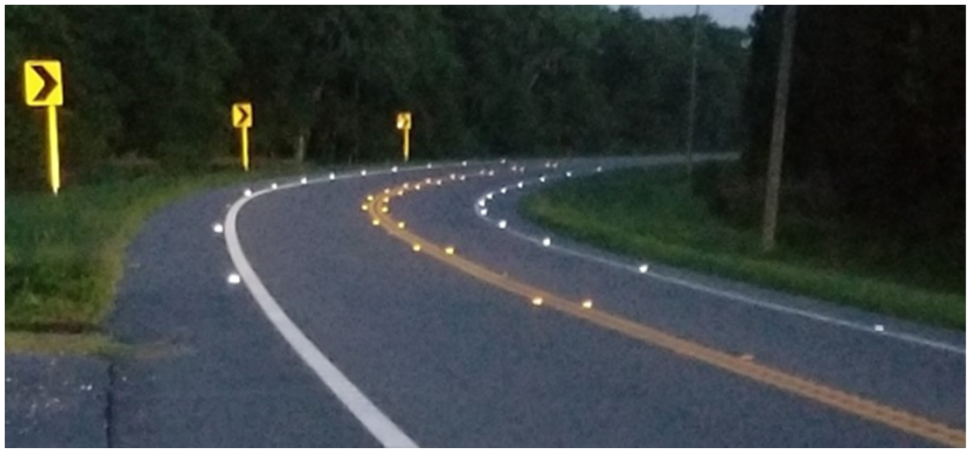
Guttenplan, Martin E., 3/8/2022

GME12

FDOT D-7 Engineering Approaches

- LED Chevrons and Solar In-Road currently being tested to reduce lane departure crashes.
- We are installing Speed Feedback signs in advance of curves and working with local agencies to install/enhance signage and pavement markings in lane departure hot spots and segments.





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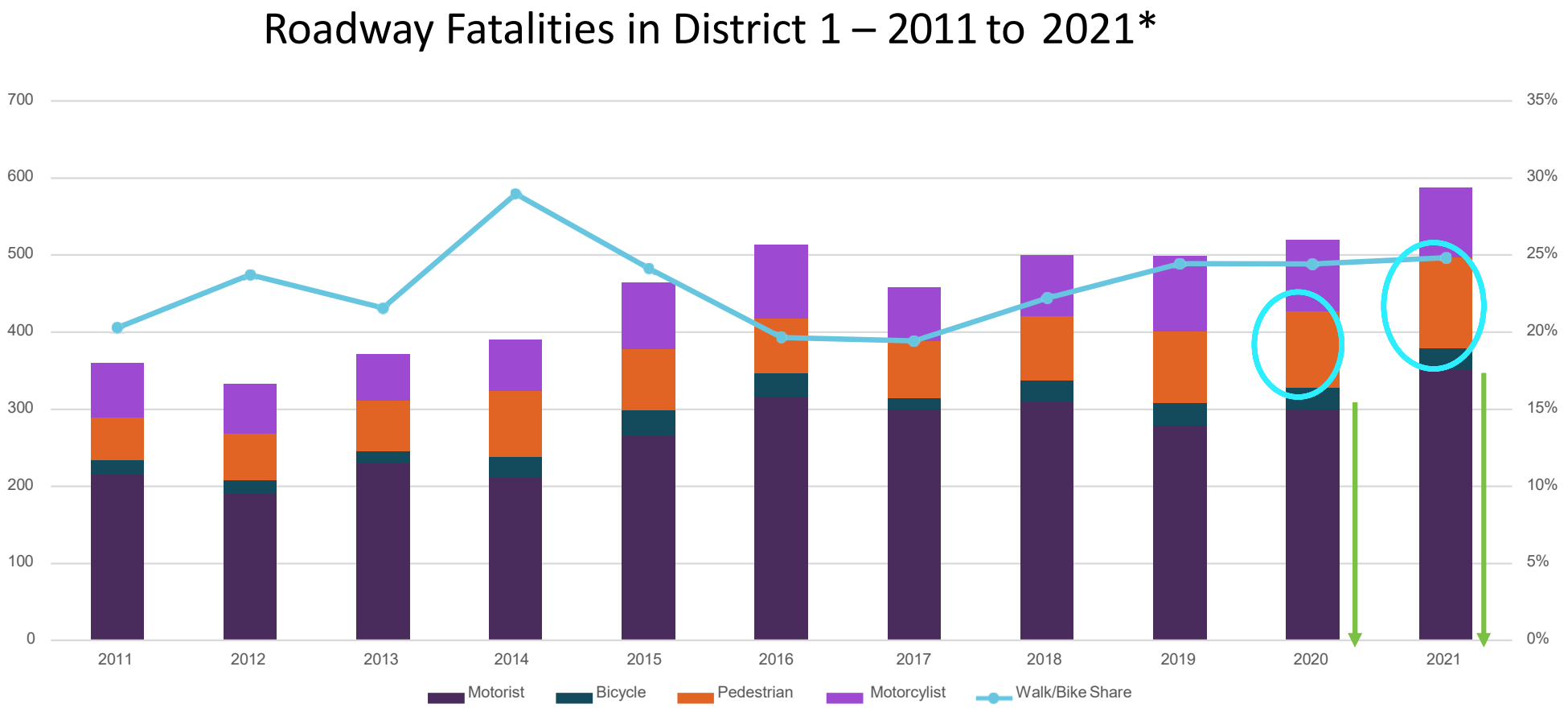
Slide 51

GME12 Optional slide

Guttenplan, Martin E., 3/8/2022

Pandemic Effects on Crashes FDOT District 1 – South Central and West Florida



* Data as of 1/31/2022

Pandemic Effects on Crashes FDOT District 1

DK1
GME13

Emphasis Area – Disproportionate Effects

- Lane Departures: an element of **31 percent of all crashes**, 37 percent of serious injury crashes and **48 percent of fatal injury** crashes
- Intersections: an element of 30 percent of all crashes, 39 percent of serious injury crashes and 28 percent of fatal injury crashes
- Bike and Ped: an element of **3** percent of all crashes, 11 percent of serious injury crashes and **25 percent of fatal injury** crashes

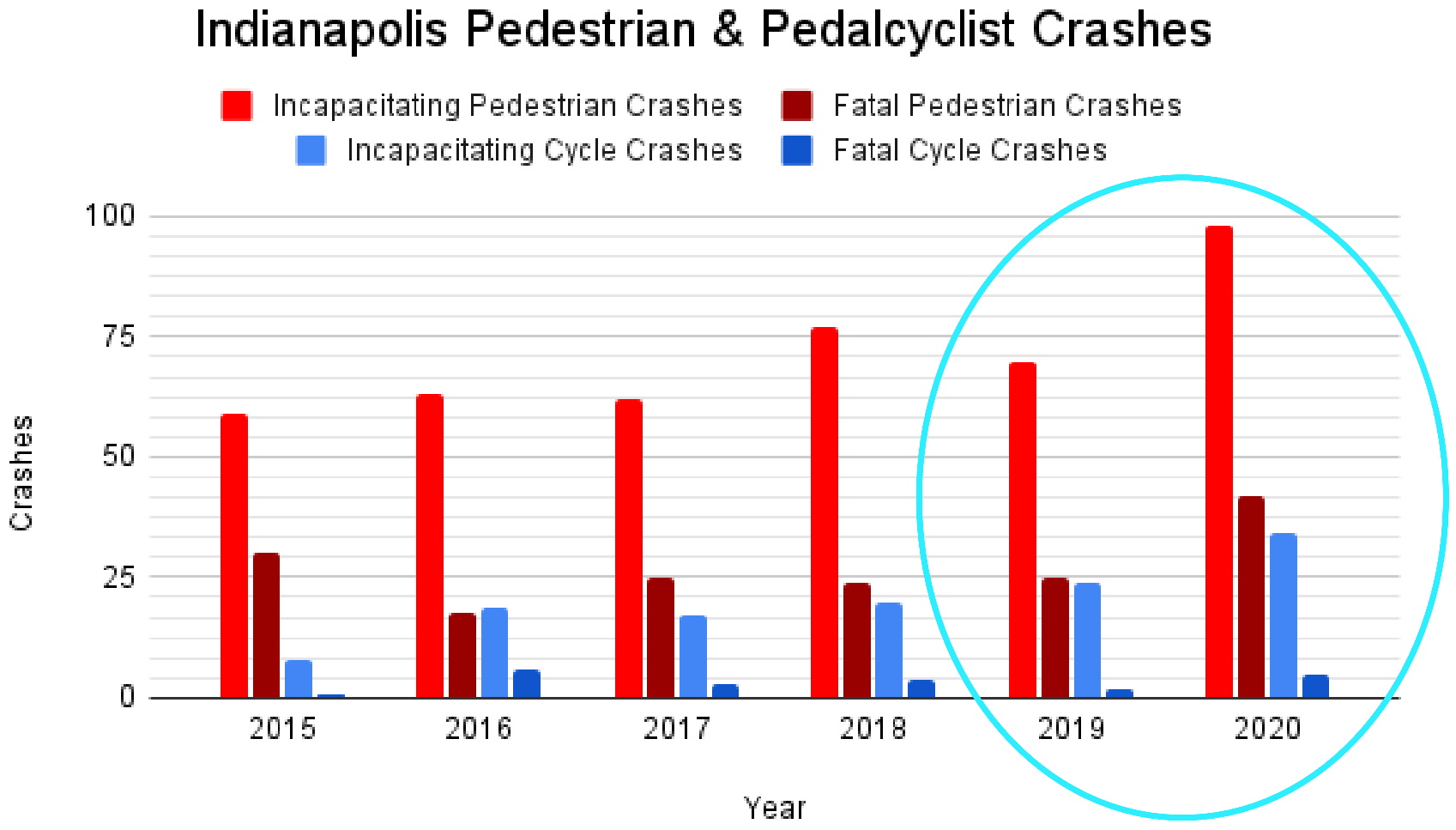
CDM Smith

Slide 53

DK1 Incomplete title?
Daniel, Kara, 3/11/2022

GME13 fixed
Guttenplan, Martin E., 3/11/2022

Indianapolis Pedestrian and Bicycle Crash Data



Source: Indianapolis Metropolitan Planning Organization

Conclusion

- Systemic approach valuable way to address serious crashes
- Presentation showed detailed use in 2 Texas Projects
- Pandemic influenced crashes resulted in higher speed and severity in FL
  - Vulnerable road unequally affected
  - Consistent with national trends

Importance of Proactive Safety Analysis for Corridor Planning

Thank you for attending our session

- Houssam Ghandour, PE, CDM Smith – Transportation Planner, GhandourH@cdmsmith.com

- Martin Guttenplan, AICP, PMP, CDM Smith - National Discipline Lead – Bicycle/Pedestrian/Nonmotorized Guttenplanme@cdmsmith.com

CDM Smith