Safety Improvements Project: A Lifesaving Partnership

Stacey Smith
MoDOT Project Director

James Ritter
Owner's Consultant Project Manager

Eddie Watkins
MoDOT Traffic Operations Engineer

Jarrett Jasper
Design Manager

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SAINT LOUIS COUNTY
Missouri

MoDOT

Overview

- Background
- Safety Analysis
- Design-Build Project Development
- Proposal, Design, and Construction
- Results & Lessons

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6,642

Fatal and Serious Injury Crashes

Study Period: 2016-2020
Location: Jefferson, Franklin, St. Charles, St. Louis Counties, and St. Louis City

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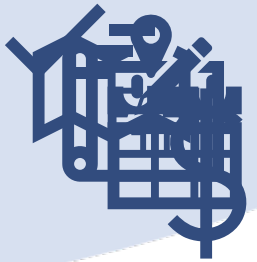
Initial Direction



- Budget: $52 million
  - $4 million: St. Louis County/Federal HSIP Funds
  - $48 million: MoDOT/Federal Funds
- Schedule: Award by Winter 2024
- Scope: Include improvements to both MoDOT and St. Louis County roadways
- Build on lessons learned and successes of first Safety Improvements Design-Build Project (2016-2019)

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Why Design-Build?

- Many ways to improve safety
- Teams of contractors and designers collaborate on proposals
  - Company specialties
  - Means and methods
- Faster schedule to construction of improvements

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MoDOT's Design-Build Process

- MoDOT:
  - Shortlists most qualified teams
  - Meets with teams during proposal development
  - Awards contract to proposer offering best value
- Contractor:
  - Completes design of project
  - Constructs project, often starting before design is complete

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Jacobs

EFK·Moen
Civil Engineering Design

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KES
KIVINDYO ENGINEERING SERVICES

U.S. Department of Transportation
Federal Highway Administration

VECTOR
COMMUNICATIONS

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Where should we focus?

1. Where are crashes occurring?
2. What types of crashes are occurring there?
3. Which crash patterns can MoDOT or St. Louis County address?

Types of Crashes:

Angle	Animal	Head-on
Pedalcyclist	Pedestrian	Road Departure
Rear End	Sideswipe	Turning

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Safety Analysis

James Ritter

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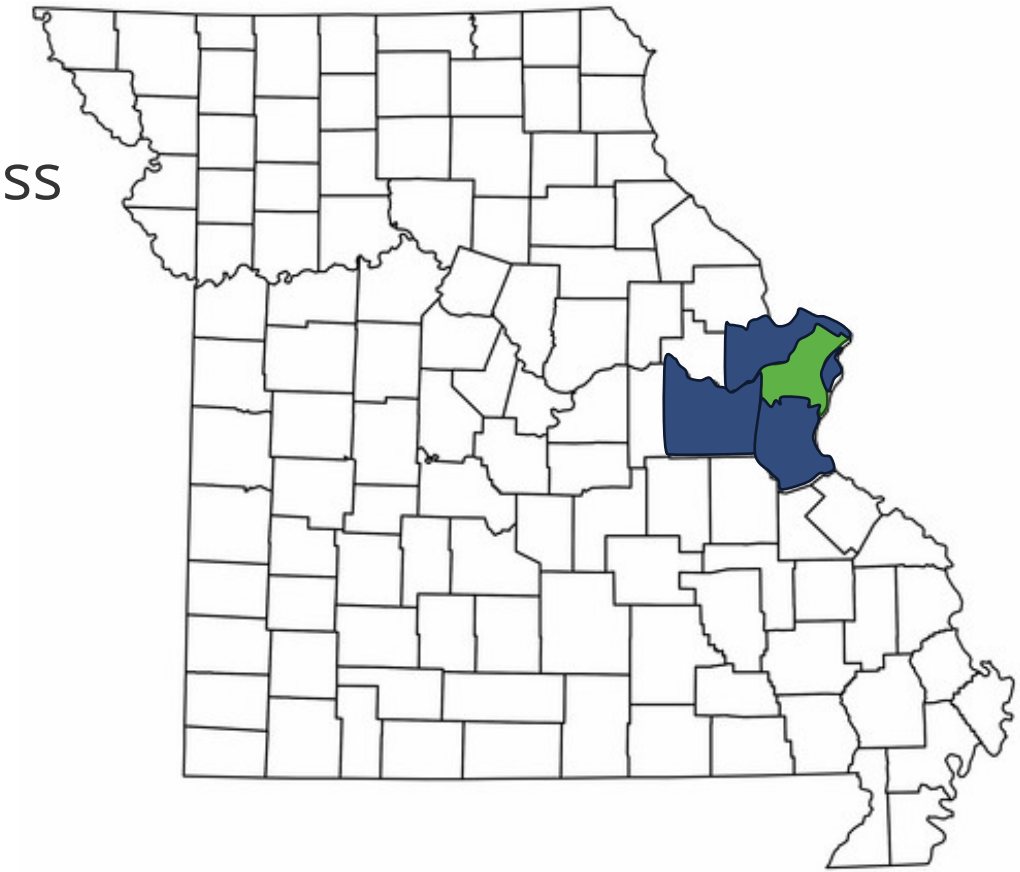
What should be analyzed?

- **MoDOT St. Louis District**
  - District-wide analysis on state owned and maintained roads across four counties and the City of St. Louis
- **St. Louis County**
  - County-wide analysis on County owned and maintained roads ranging from arterial roadways to local streets



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How should the systems be analyzed?

High Frequency Crash Analysis

- Reactive addressing of higher-crash locations

Systemic Safety Analysis

- Proactive addressing of locations with higher crash potential

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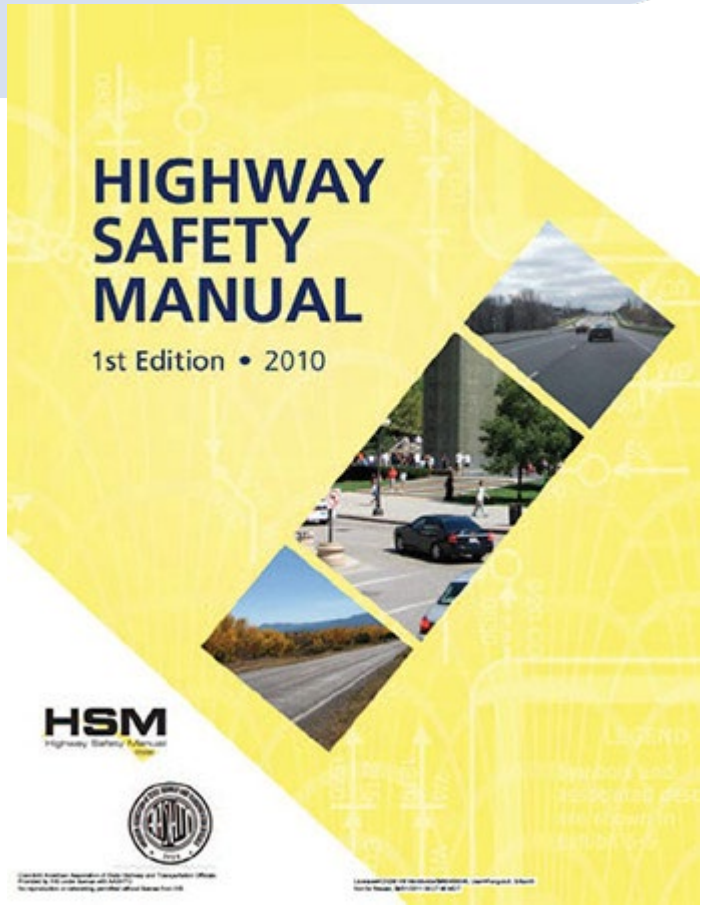
Crash Frequency Analysis

Highway Safety Manual (HSM) based network screening approach

Define Peer Groups

Determine Analyses Methods and Execute Network Screenings



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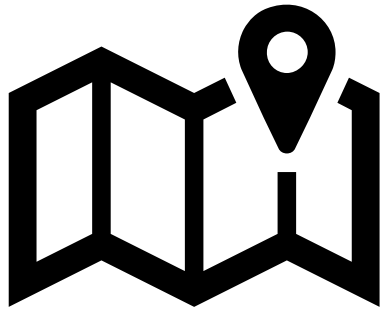
Crash Frequency Analysis
Peer Groups



Divide the networks into Peer Groups

- Relatively similar operational characteristics
- Adequate sample sizes for analyses
- Keep it simple, logical, and repeatable

Resulting Peer Groups

- *Segments*: Freeways (4-6, 8+ lanes), Ramps, Expressways, Rural, Urban
- *Intersections*: Signalized, Rural unsignalized, Urban Unsignalized

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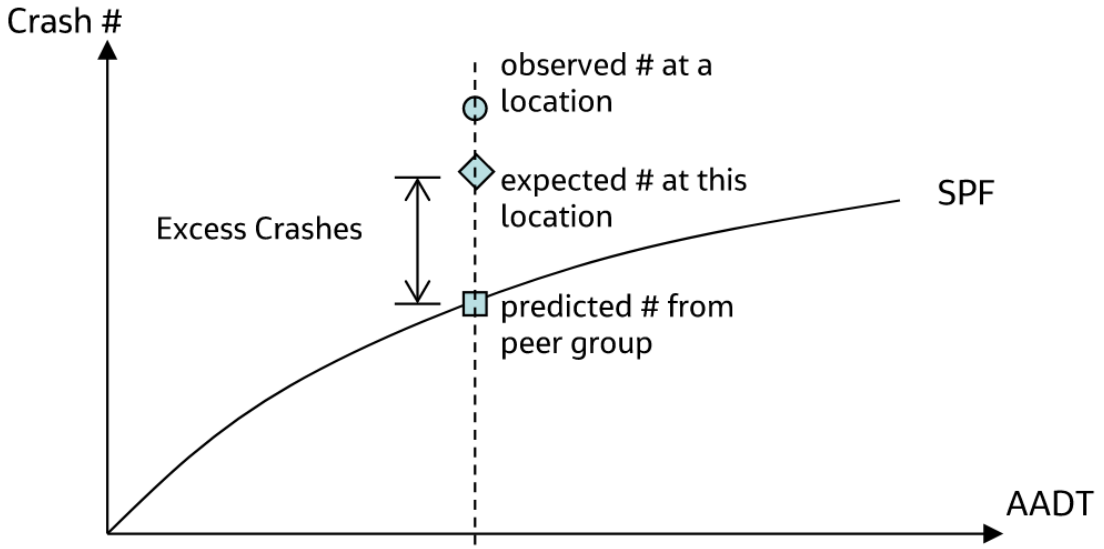
Crash Frequency Analysis Network Screenings

1. **Historical Crash Density**
   - Using a sliding window analysis to account for data variability
2. **Excess Crash Density**
   - Based on peer group and AADT; expected vs. predicted crashes
3. **Crash Type/Characteristic Overrepresentation**
   - Identifying where the same type of crash repeats more than usual



Safety Performance Function (SPF) for each peer group relates AADT to crashes

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Systemic Safety Analysis

Data-driven screening process

- Focused on fatal and serious injury crash potential

Proactively Implement Safety Treatments

- Using proven safety countermeasures

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Systemic Safety Analysis Process

What crash types result in more severe injuries? Roadway Departure, Head-on, Pedestrian, Turning, Angle

What roadway types see more of these crashes? Classification, Area Type, Divided/Undivided, Speed Limit

What roadway features are present where these types of crashes are happening?

How common are these features throughout roadway system?

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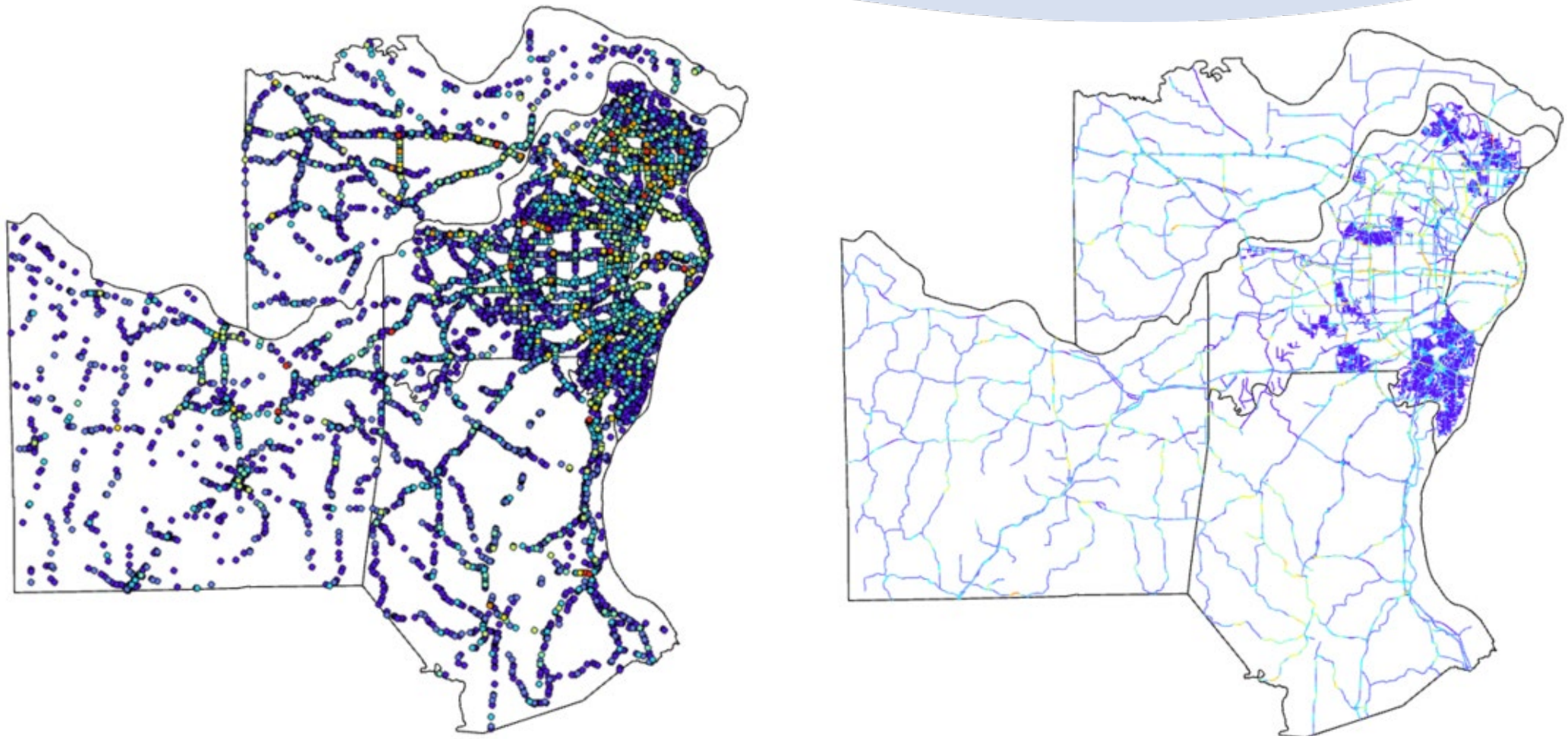
Network Screening Results
Intersections and Roadway Segments



Crash Frequency Analysis – Color coded results for intersections and roadway segments

Identifying Potential Countermeasures

Countermeasures seek to **prevent** or **reduce severity** of crashes

- Warning drivers of changing conditions
- Alerting drivers to the presence of pedestrians
- Controlling errant vehicles

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Identifying Potential Countermeasures

- **Identified based on**:
  - Potential Crash Reduction
  - Past Performance
  - Applicability to Crash Type
  - Installation Cost
  - ROW and Environmental Impacts
  - Durability
  - Maintenance
  - Public Acceptance

Potential Crash Reduction:

- Crash Modification Factors (CMFs)
- Indicate estimated crash reduction/effectiveness
- Based on historical data and statistical analysis
- May vary by crash type and facility type
- CMF Clearinghouse https://cmfclearinghouse.fhwa.dot.gov/

Design-Build Project Development

Eddie Watkins

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Safety Improvements Project Goals

1. Reduce **fatal and serious injury crashes** within the budget of $52 million. *
2. Maximize safety improvements for **pedestrians and roadway users** distributed equitably across the project area.
3. Provide improvements with **reasonable maintenance** and service life.
4. Construct improvements with an emphasis on safety for workers and the traveling public.
5. Deliver the project by June 30, 2026 using a diverse workforce.

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** Federal funds designated specifically for safety improvements*

General Safety

- Reactive addressing of higher-crash locations

Systemic Safety

- Proactive addressing of high-potential locations

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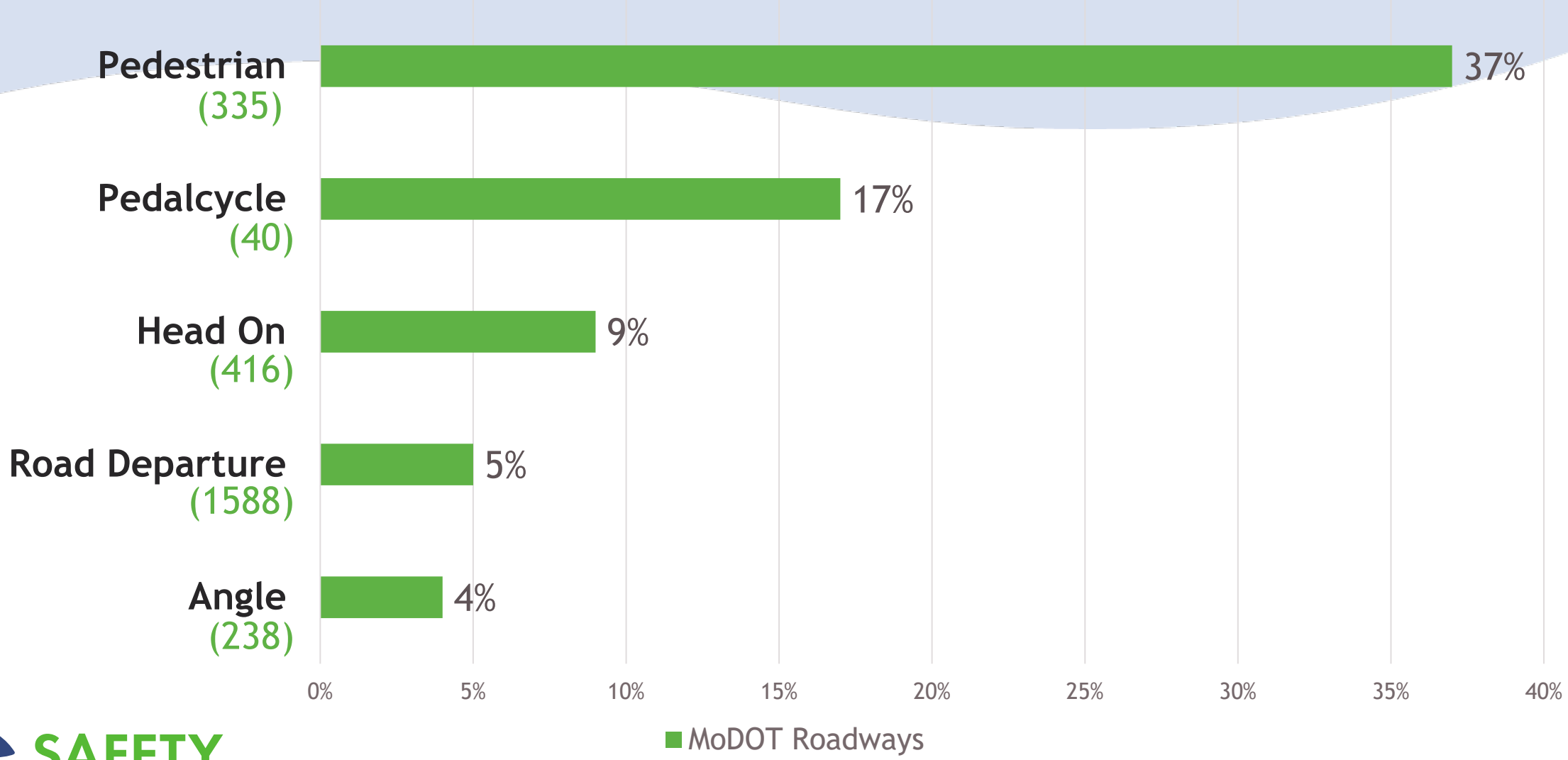
Fatal and Serious Injury Rate by Crash Type



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Project Budget

Design-Build Contract:
$42.5 million

Stipends:
$250,000

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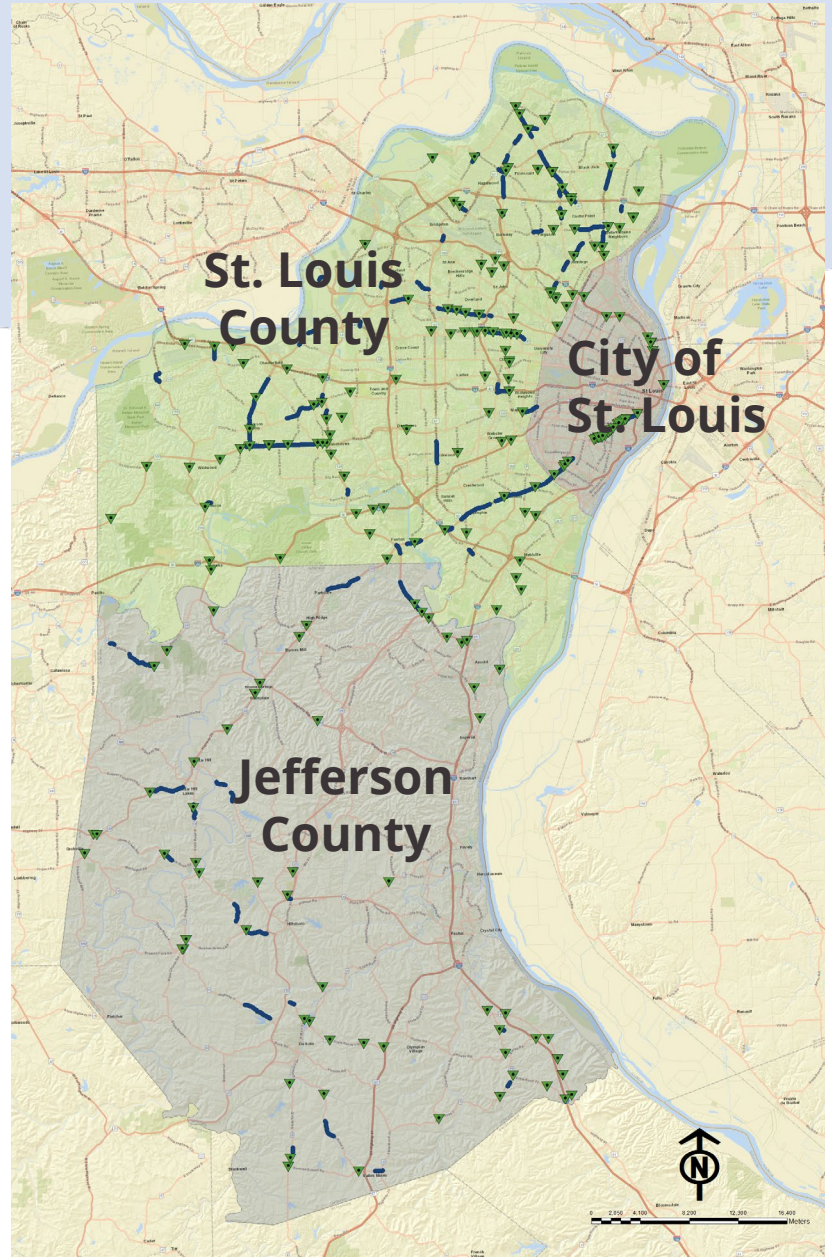
Potential Locations

- 3 counties
- 416 intersections or segments
- 46 countermeasures



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Limited Complexities

- Removed locations on interstates, freeways, and ramps
- Removed locations that conflict with STIP projects
- Removed countermeasures with a high PI requirement
  - Roundabouts, J-Turns, Median U-Turns, Road Diets

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Opportunities for Innovation

- Additional Applicable Standards (AAS)
  - Standards not used MoDOT
  - Reviewed by SL County, MoDOT, and FHWA

- Additional Applicable Countermeasures (AAC)
  - MoDOT/SL County pre-approved countermeasures
  - Teams encouraged to submit additional countermeasures with supporting documentation

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Lessons Learned from Safety 1.0?

- Simplify!!!!
  - Thousands of HSM spreadsheets for fewer locations
  - Proposer's time to organize, combine, and analyze then iterate with the data
  - Limited time for proposal development
- This project: higher budget, more locations, two agencies' roads

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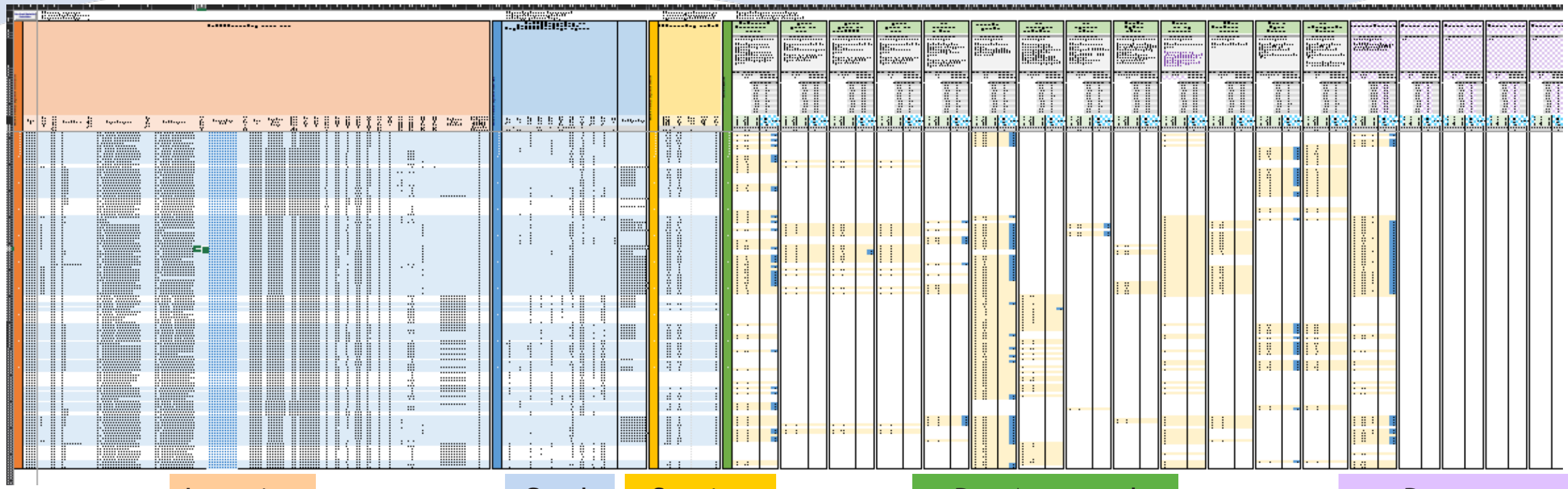
Safety Improvements Selection Tool

Centralized, End-to-End Spreadsheet Tool



Location Data

Crash Data

Scoring Summary

Pre-Approved Countermeasures With Validation

Proposer Countermeasure Inputs

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Safety Improvements Selection Tool
(Simplified)

Location	Crashes			Countermeasures			
	Angle	Rear End	Run off Road	Chev-rons	Raised Median	Back-plates	AAC
Location 001	0.5	0.0	3.0	X			
Location 002	2.0	3.0	2.0		X	X	X
Location 003	0.5	5.0	0.2			X	

Credits = (Crash Data) x (CMF) x (Service Life)

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Proposal, Design, and Construction

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Scoring Categories

- General Safety Improvements Definition – 60 points
  - MoDOT Improvements – 40 points
  - St. Louis County Improvements – 10 points
  - Summary (Quality of Implementation) – 10 points

Self-scored

- Systemic Safety Improvements Definition – 15 points
- Maintenance and Durability – 20 points
- Work Zone Management – 5 points

TOTAL – 100 points

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West's Proposal: General Locations

	By the Numbers
Locations Proposed	195
Additional Countermeasures and Standards	37
Safety Value Credits	2,886
Estimated Fatal and Serious Injury Crashes Reduced (10 years)	**170+**

Top scoring countermeasures:

- Improve Right Turn Angle
- Offset Existing Left Turn Lanes
- Improve Signal Visibility

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West's Proposal: General Improvements

- **Improve Right-Turn Angle**
- **Offset Left-Turn Lane**
- Traffic Calming
- Convert TWLTL to Raised Median
- Transverse & Longitudinal Rumble Strips
- Intersection Conflict Warning System (ICWS)
- Stop Ahead Pavement Markings
- LED Stop Signs
- Dynamic Signal Warning Flashers (DSWF)
- Curve Warning Pavement Markings
- Narrow Travel Lanes
- Supplemental Signing
- High Friction Surface Treatment (HFST)
- **Retroreflective Backplates**
- Traffic Signal Enhancements

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West's Proposal: Systemic Improvements

- Add Sidewalk
- Traffic Calming
- ADA Curb Ramps
- High-Visibility Continental Crosswalks
- Pedestrian Countdown Timers
- Retroreflective Backplates
- Lead Pedestrian Intervals
- Protected Only Left Turns

40 Systemic Locations

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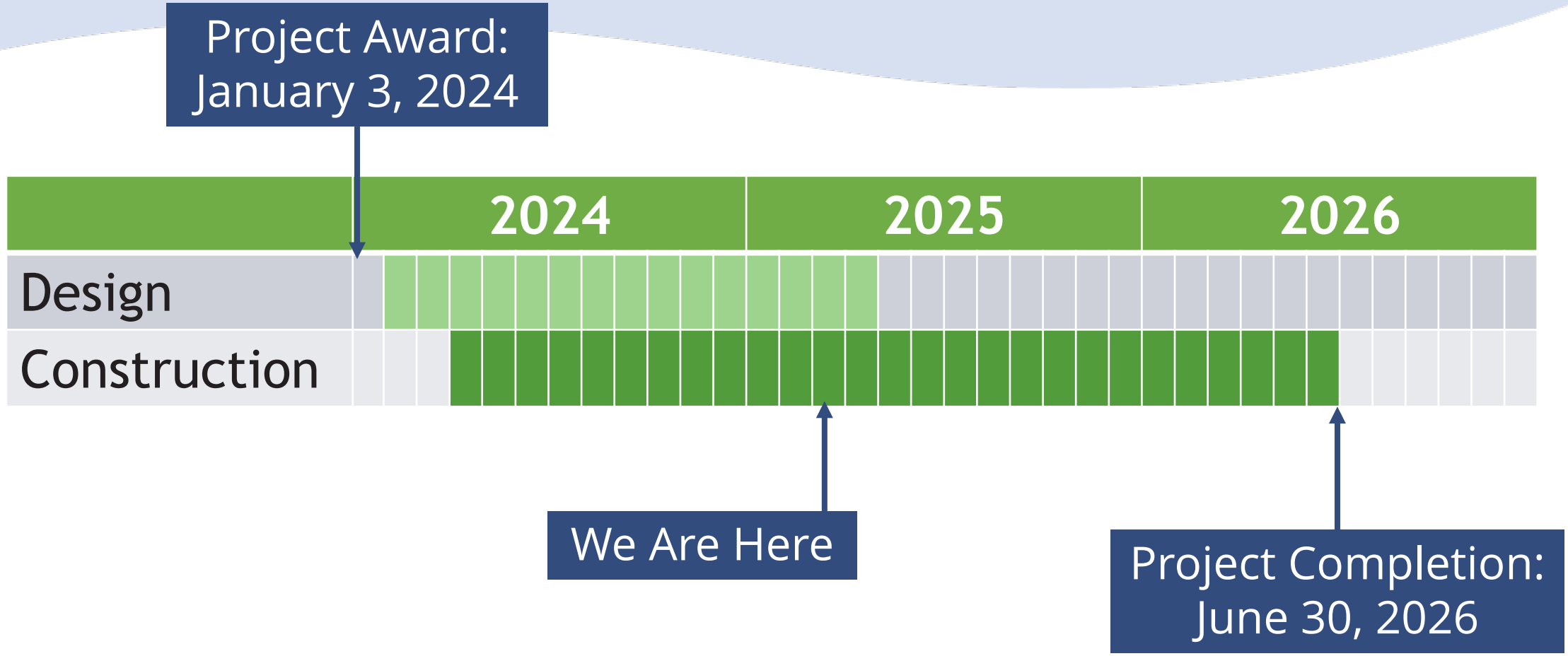
Project Schedule & Status



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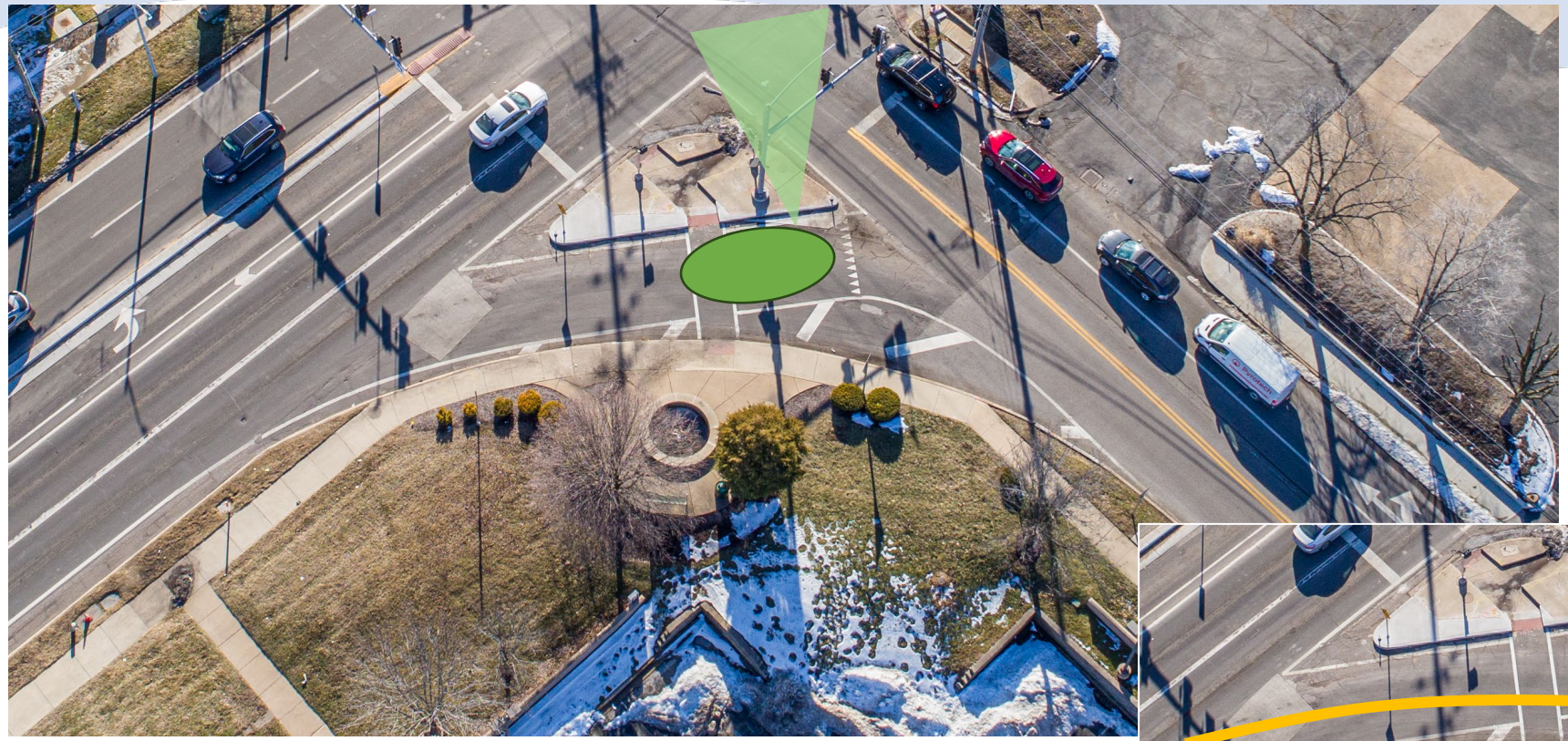
Individual locations will be completed throughout each year.

Modified Right Turn Angles



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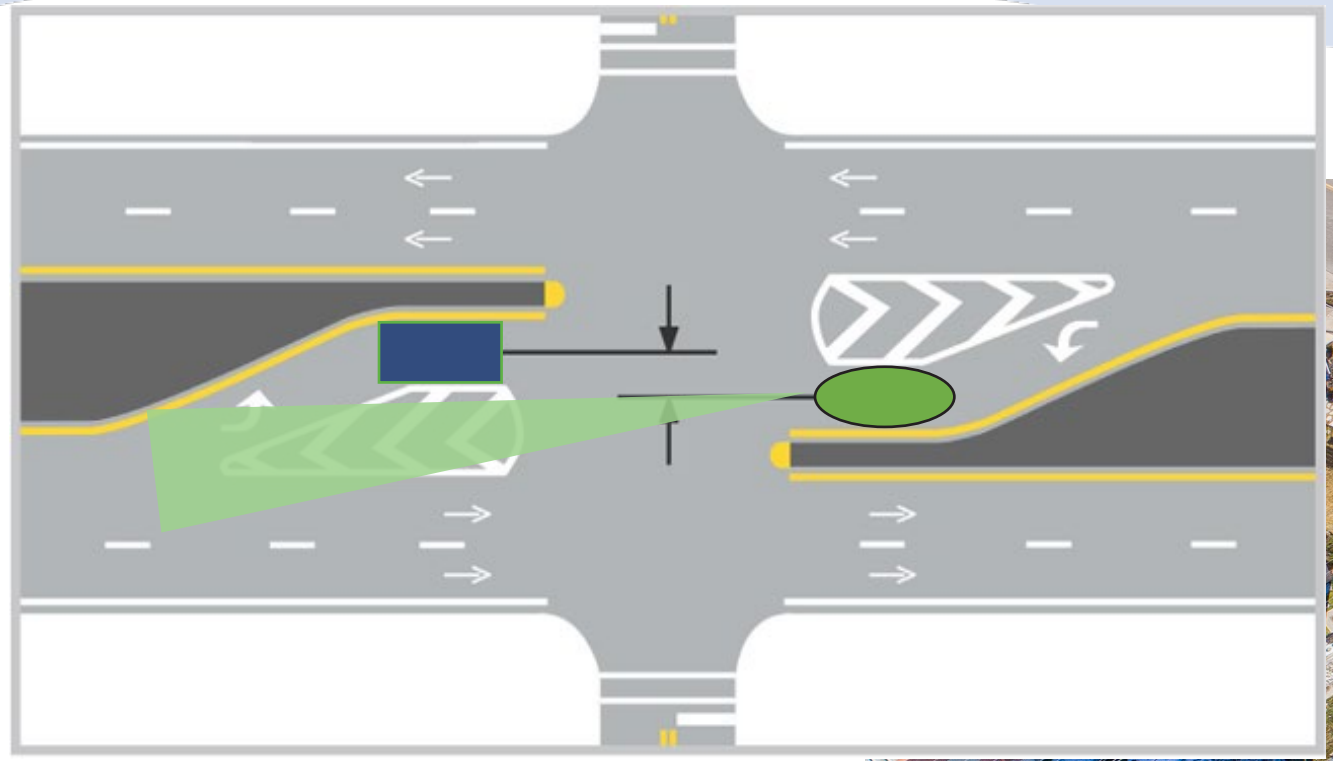
Offset Left-Turn Lanes



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Hardened Centerlines

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Lessons Learned and Results

Stacey Smith

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Challenges and Lessons Learned

- More time!
  - High number of decisions to get to RFP
  - Site investigations (utilities, right of way, etc)
  - More pre-approved countermeasures
- Coordination with other projects
- More complex/high-impact improvements
- Staff continuity
- Importance of partnering
- Public perception, acceptance, and awareness

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$1.2 Billion

In estimated societal savings due to crash reduction

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Source: Missouri Department of Transportation and Federal Highway Administration

170

Fatal and Serious Injury Crashes Reduced
(Estimated) over ten-year period

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Source: *The Highway Safety Manual*

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MOVEMENT

Missouri Coalition for ***Roadway Safety***

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modot.org/bupd

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Questions

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Schedule

Design-Build Authority	October 2022
Procurement	July to December 2023
Project Award	January 2024
Final Design	2024 to early 2025
Construction	April 2024 to June 2026

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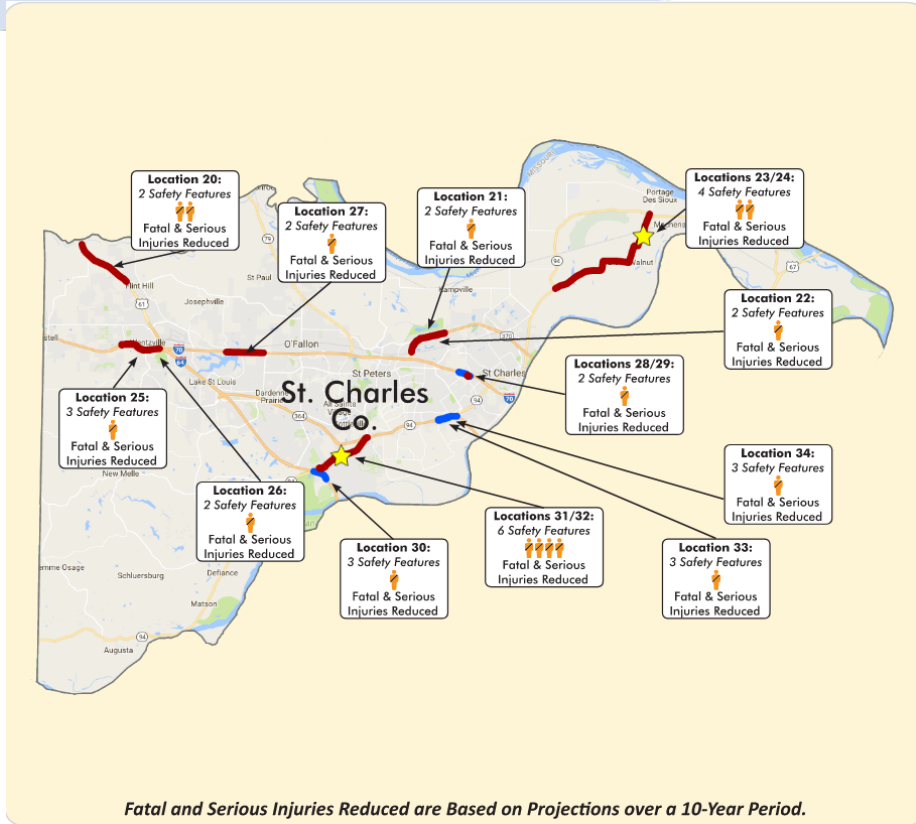
Safety Improvements Design-Build Project (Safety 1.0)

Road to Saving Lives

- Awarded in May 2017 with $22 million budget
- Included 34 locations on MoDOT's High Severity Crash List in Franklin and St. Charles Counties
- Estimated reduction of 70+ fatal and serious injury crashes
- Before/After Study – In Progress



Fatal and Serious Injuries Reduced are Based on Projections over a 10-Year Period.

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