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Alsafe

Safety Planning Tools for Alabama MPOs

presented to
NCAMPO

presented by
Cambridge Systematics, Inc.
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Research Overview



Objectives

- MPO Safety Analysis
- Tools to consider safety in prioritization
- Long range Safety Prediction



Outcomes

- Short range framework
- Long Range Safety Prediction Tool



Next Steps

- Translate to other MPOs
- Consider Federal Safety Performance Measures

Project Team

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Short-Term Safety Planning Tool Overview

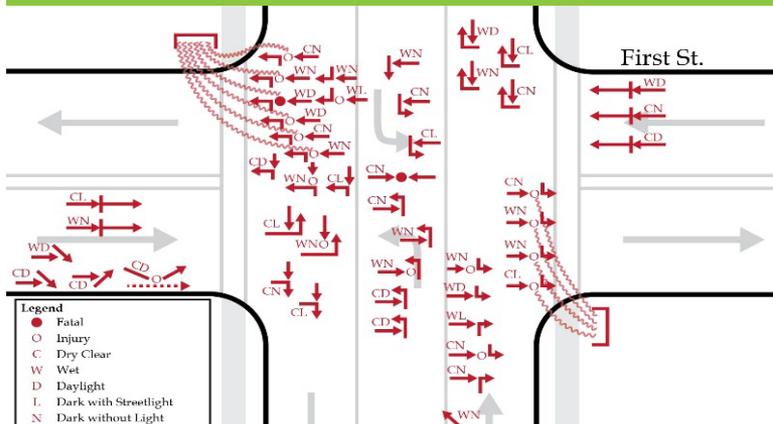
1. Develop Benchmarks



2. Evaluate Crash Trends and Characteristics



3. Identify and Evaluate Focus Crash Types



4. Identify and Implement Countermeasures



1. Benchmarking and FHWA Safety Performance Measures

➤ 5 Performance Measures

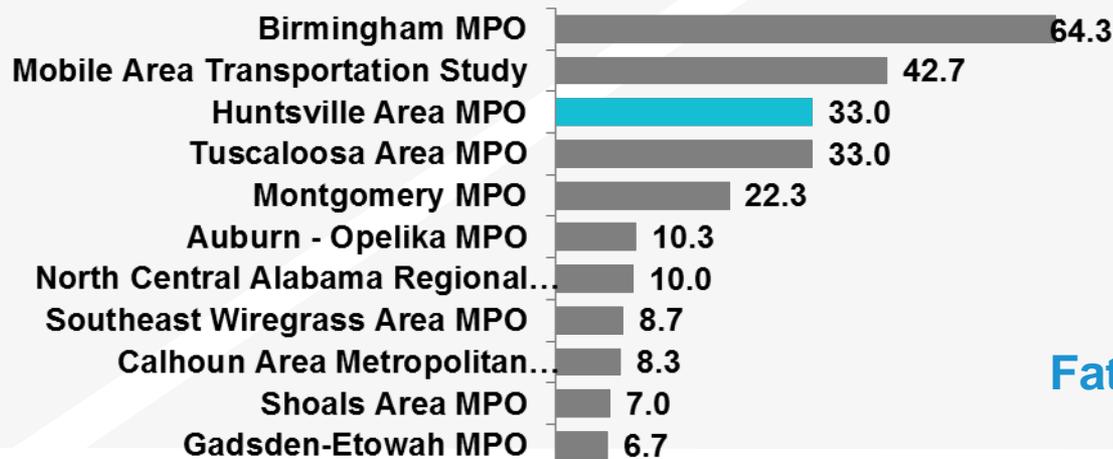
- » Number of Fatalities
- » Rate of Fatalities per 100 million VMT
- » Number of Serious Injuries
- » Rate of Serious Injuries per 100 million VMT
- » Number of Non-motorized Fatalities and Non-motorized Serious Injuries

➤ Who and When

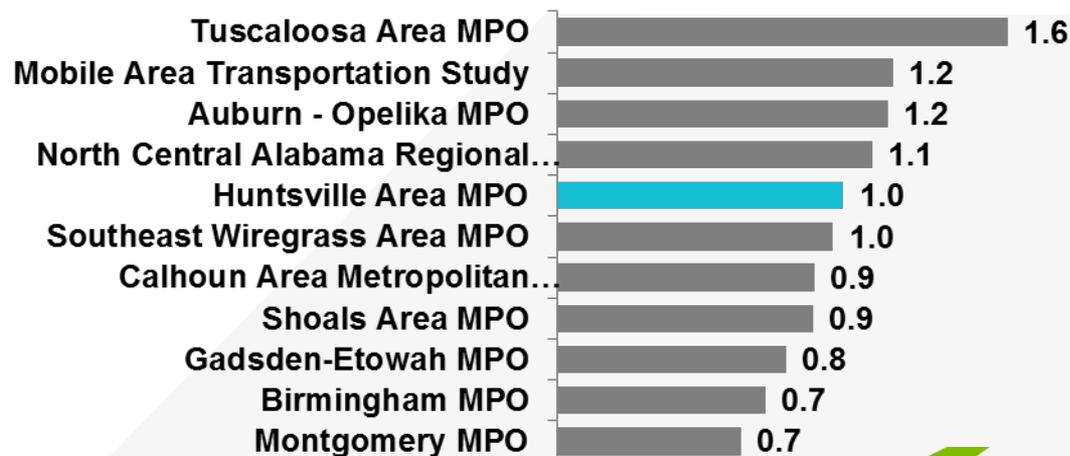
- » Initially State DOTs August 2017 Report for 2018 Year
- » MPOs 180 days after State

Example Benchmarks

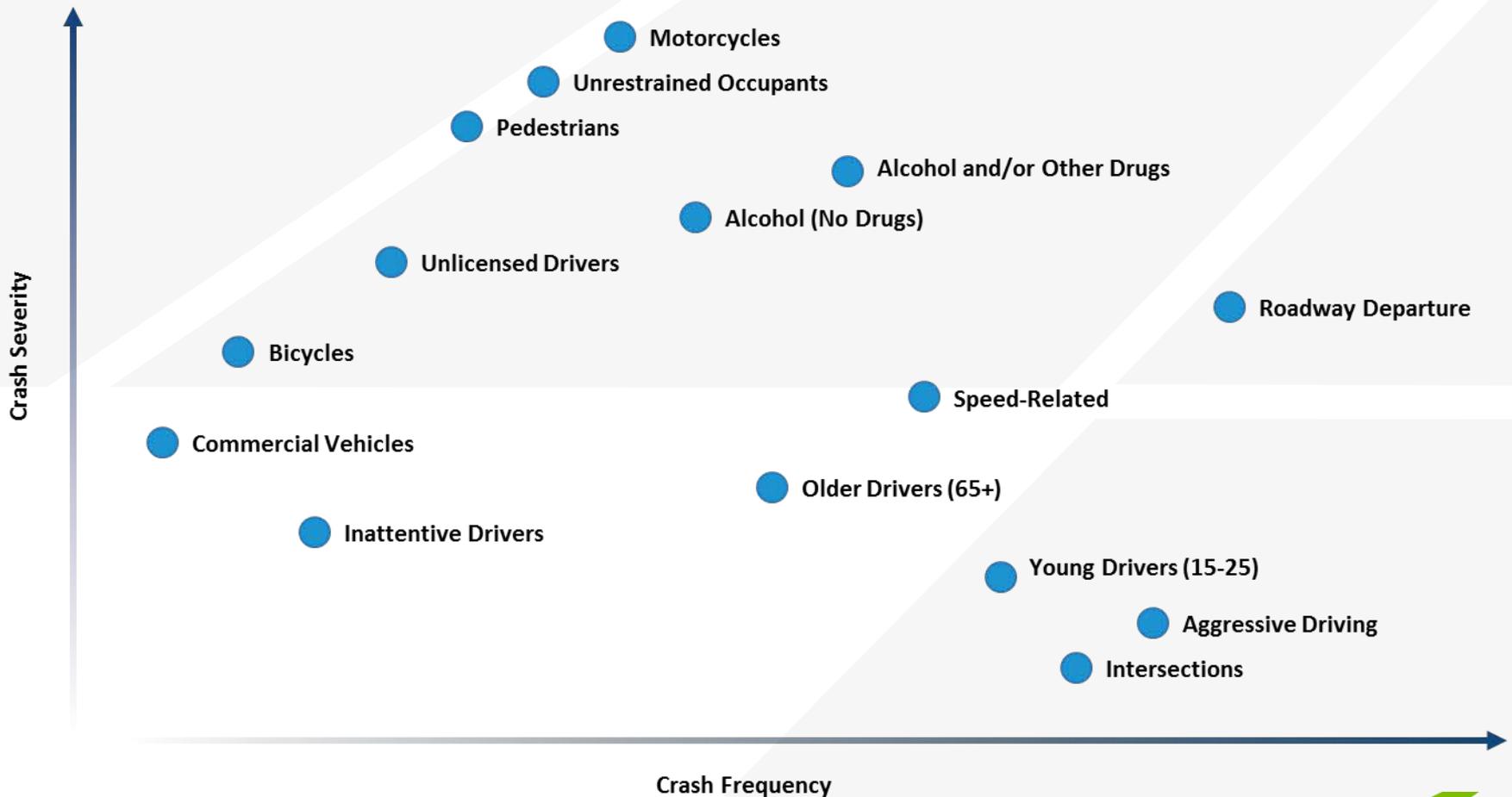
Fatalities



Fatalities Per 100 Million VMT

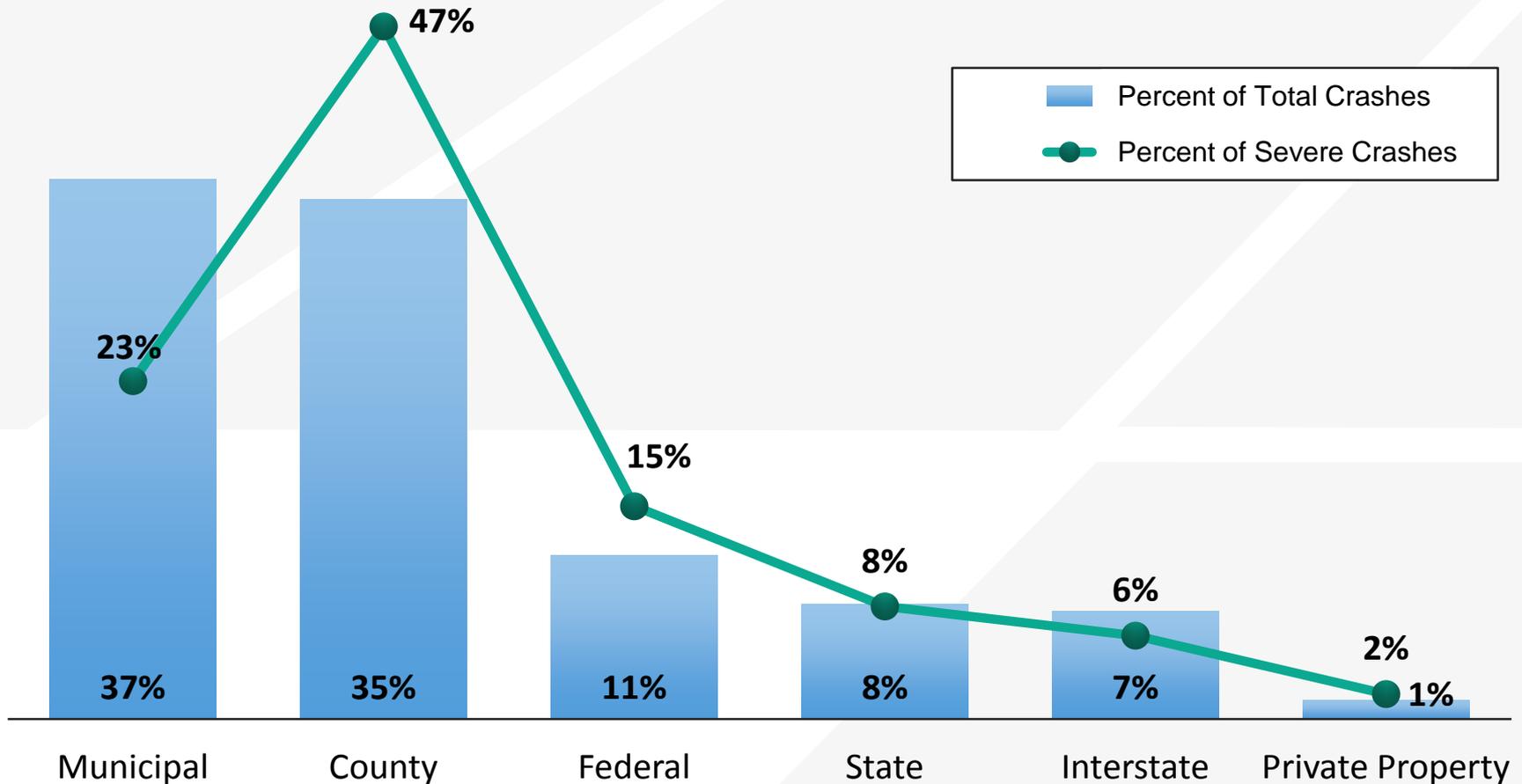


2. Identify Focus Crash Types



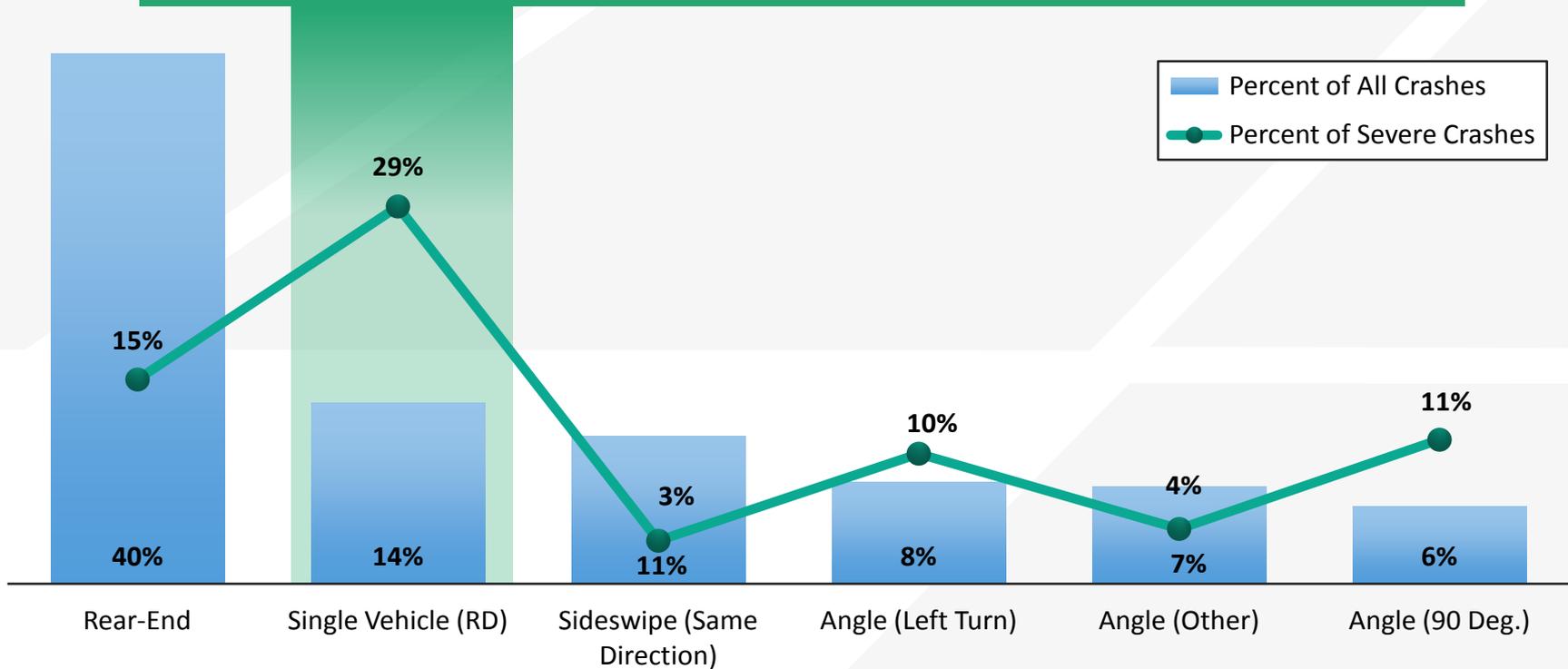
Focus Crash Types *(continued)*

Route Type (Single-Vehicle Roadway Departure Crashes)



3. Identify & Evaluate Patterns

Single-vehicle roadway departure crashes are over represented among severe crashes – they account for **29% of severe crashes** compared to only **14% of all crashes**



Short-Term Safety Planning Tool

- Develop Benchmarks
 - » MAP-21
 - » How are we doing?
- Evaluate Characteristics
 - » 5-Ws
- Identify and Evaluate Focus Crash Types
 - » Geographic distribution
 - » Risk factors
 - » Type
- Identify and Implement Countermeasures

Long-Range Safety Planning Tool Overview

1. Identify Long-Range Planning Scenarios



2. Use Formulas to Predict Crash Impacts of Alternatives



3. Evaluate Alternatives



4. Prioritize and Implement Projects

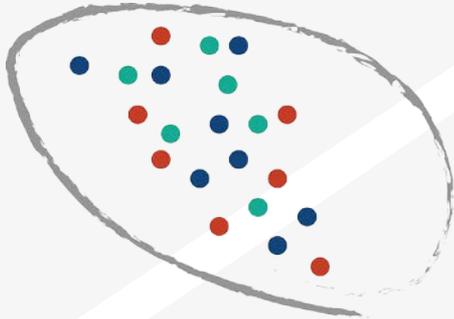


Model Research

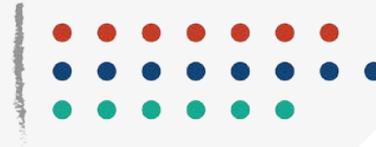
- Literature Review
- Collected/organized variables for Huntsville MPO area
- Variables tested

- ✓ Roadway mileage (by type)
- ✓ VMT (by roadway type)
- ✓ V/C ratio (by roadway type)
- ✓ Speed
- ✓ Number of lanes
- ✓ Intersection and signal density
- ✓ Percent of population male
- ✓ Retail and nonretail employment density
- ✓ Median household income
- ✓ Student enrollment

Technical Process Overview



Collect



Organize



Predict



Evaluate



Models Developed

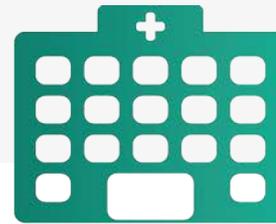
$$\mu = e^{(\alpha + \beta_1 X_1 + \beta_2 X_2 + \dots)}$$



Total Crashes



Fatal Crashes



Serious Injury
Crashes



Property Damage
Only

Sensitivity of Fatal and Serious Injury Crashes to Changes in Input Variables

Fatal and Serious Injury Crashes (Base Prediction = 1,138)		Primary Road VMT	Posted Speed	Secondary Road Miles	Local Road Miles	Average Number of Lanes	Inters. Den.	Number of Signals	Male Pop. Percent	Non-Retail Emp. Density
Average		4,119	34	0.41	10	3	110	0.79	50	901
Percent Change in Input Variable and Crash Outcome	-25%	-3%	-30%	-6%	-12%	10%	-3%	-4%	-12%	0%
	-10%	-1%	-12%	-3%	-5%	4%	-1%	-2%	-5%	0%
	10%	1%	13%	3%	6%	-4%	1%	2%	5%	0%
	25%	3%	32%	7%	16%	-9%	3%	4%	14%	0%

Key Predictor Variables –
Posted speed, local roadway mileage, male population

How to Use Models

	A	B	C	D	E	F	G	H	I	J
1							Baseline Crashes (2010-2012)	Predicted Crashes (3-yr. period)	% Change	Change in Cost of Crashes
2	Total Crashes						29,478	29,199	-0.9%	\$ (7,092,380)
3	Fatal and Serious Injury Crashes						1,138	1,201	5.5%	\$ 15,551,186
4	Injury Crashes						3,925	4,077	0.6%	\$ 14,750,342
5	Property Damage Only Crashes						24,988	24,698	-1.2%	\$ (3,848,940)
6										

9	TAZ	Total VMT	Primary Road	Local Road V	Highway V/C	Primary Road	Local Road V	Speed (log)	Primary Road Mileage	Secondary Road Mileage	Local Roadw	Average Number of Lanes (HPMS)	Intersection	Number of S
11	1	4522.5	0.0	3616.4	0.0	0.0	0.2	4.6	0.0	0.0	1.3	4.3	263.7	5.2
12	2	5463.1	0.0	3673.5	0.0	0.0	0.4	4.5	0.0	0.0	1.1	4.2	448.2	6.0
13	3	8492.7	0.0	9232.2	0.0	0.0	0.5	6.0	0.0	0.0	1.7	5.2	520.1	2.3
14	4	8978.2	0.0	10996.4	0.0	0.0	0.3	5.3	0.0	0.0	2.7	7.1	701.5	2.6
15	5	2579.1	0.0	4495.1	0.0	0.0	0.3	5.5	0.0	0.0	0.8	8.8	309.5	0.9
16	6	52200.0	2575.2	5114.4	0.9	0.0	0.1	4.7	0.0	0.7	1.3	5.9	297.6	2.5
17	7	1311.1	0.0	1861.1	0.0	0.0	0.2	3.8	0.0	0.0	0.6	8.0	873.9	0.0

What MPOs Thought

- Short-range process is familiar
- Long-range process looks valuable
 - » Quantitatively consider safety as a prioritization factor
 - » Comfortable with the relative comparison
 - » Push the tool to influence investments
- Application
 - » Less data is easier
 - » Simpler tool is easier

Next Steps

➤ Phase 2 Project

- » Other MPOs
- » Retroactive Application

➤ Long-term

- » Safety as a consideration in alternatives evaluation
- » Safety as a consideration in prioritization



Thanks! Any Questions?

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