

# Moving Forward with Non-Traditional Safety Data

TRB ASC20 Safety Performance and Analysis Committee  
2023 Mid Year Meeting  
Wednesday June 28<sup>th</sup>; 2:00 - 2:50 pm  
Beckman Center, Irvine, California

## Agenda

- Objectives
- Definitions
- Examples of non-traditional data in action
- Discussion
- Wrap up

---

Kim Kolody, Jacobs

---

Daniel Carter, North Carolina DOT

---

Kelly Hardy, AASHTO

---

Derek Troyer, FHWA

---

Christina McDaniel - Wilson, Oregon DOT

---

Jiguang Zhao, Oregon DOT

---

Dr. Jonathan Wood, Iowa State University

---

Paul Kornyoh, Jacobs

---

Katie Coon, Jacobs

---


Kerry Wilcoxon, Arizona DOT


---

Darren Torbic, Texas Transportation Institute


Thank you to  
the session  
planning  
working group!

# Objectives






Continue to evolve transportation safety analysis approaches and methods




Prepare for the future and lay the foundation for improved transportation safety decision making

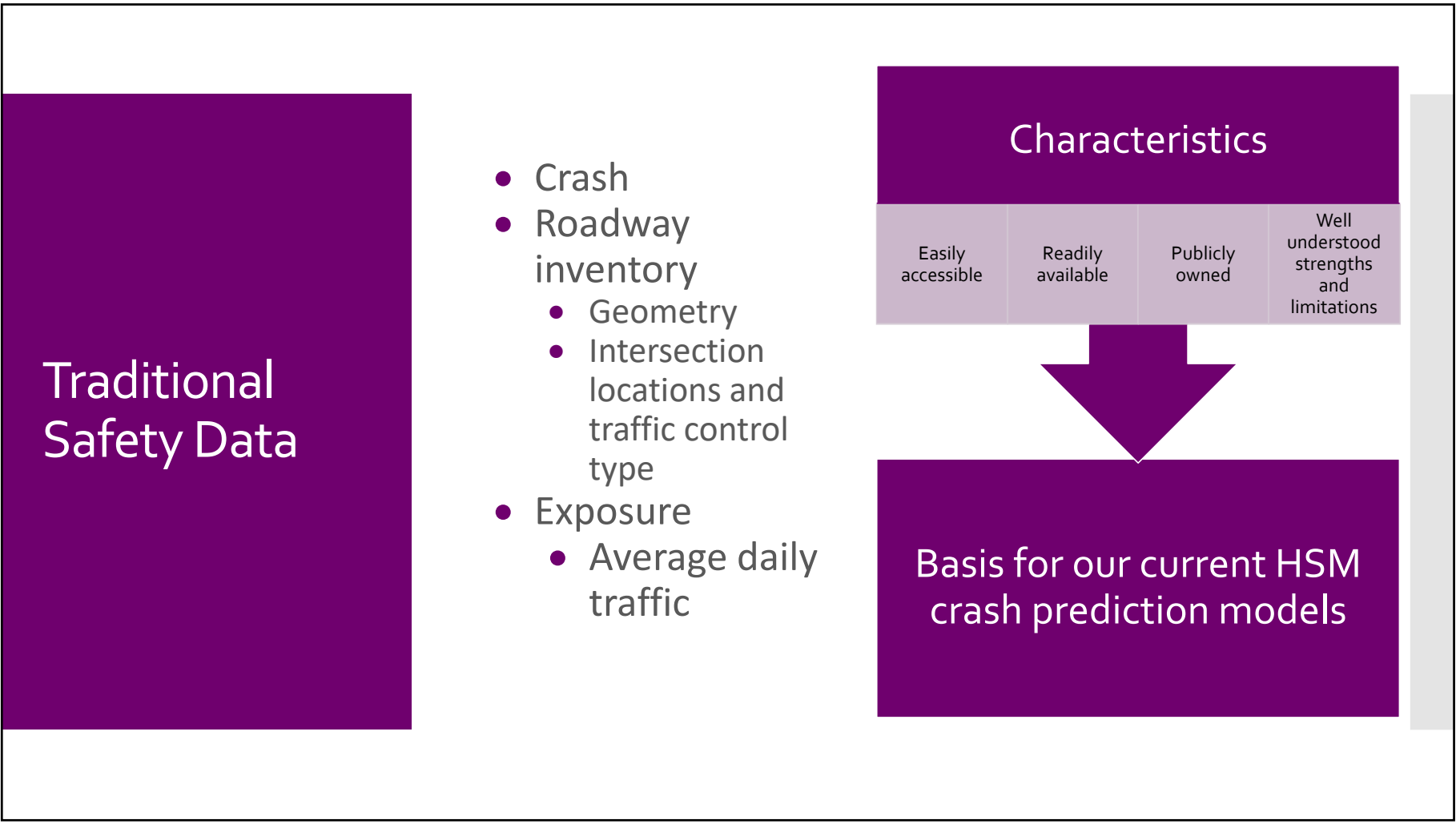


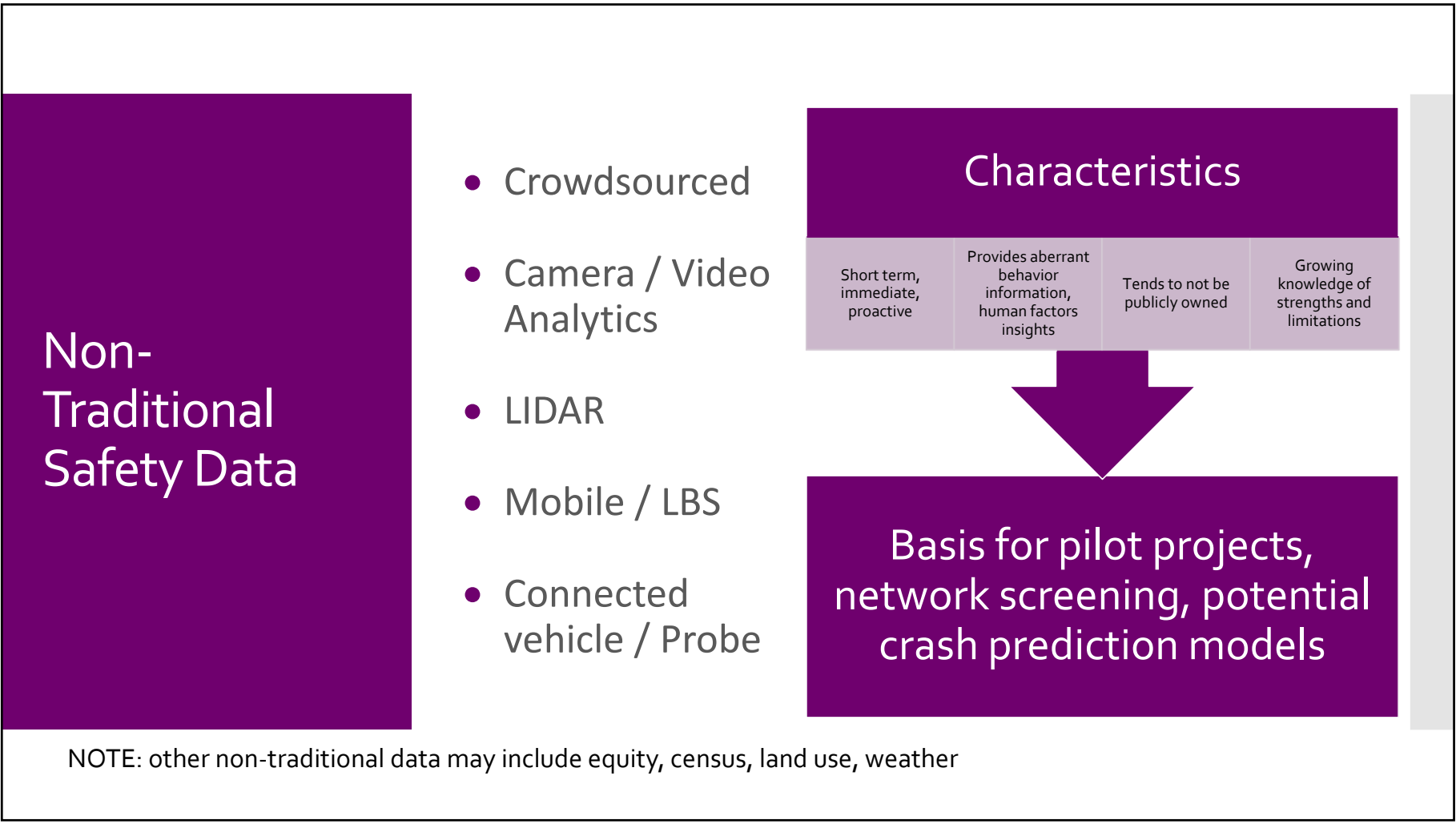
Gain a better understanding of ...

- the use an application of non-traditional data set
- different data sources
- concerns and limitations
- successes and innovative applications



Begin to map the future for use of non-traditional data

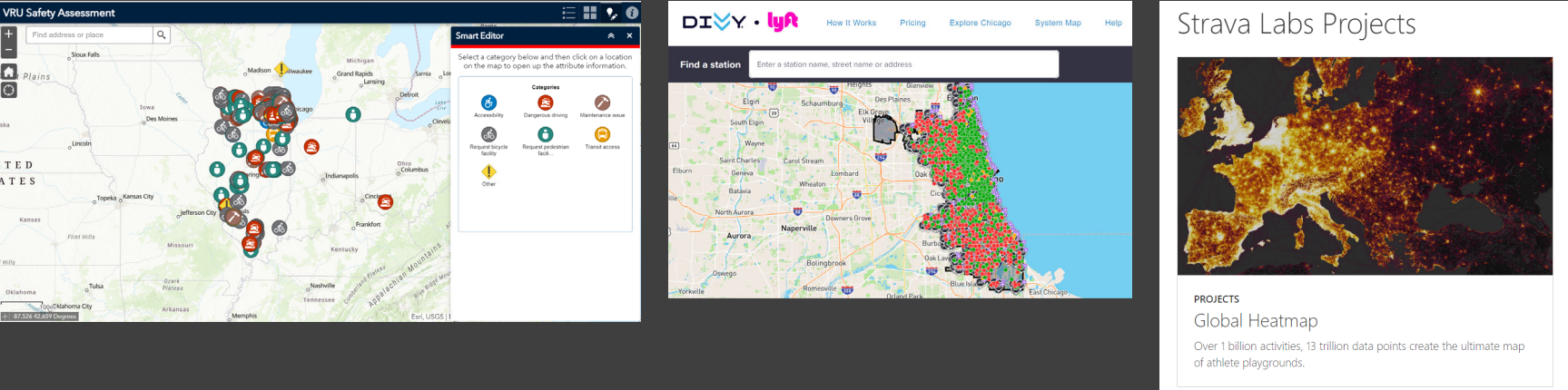






## Mobile / Location Based Services (LBS)

- Provides location, hard braking, hard accelerating, speed
- Provides use of phone while driving

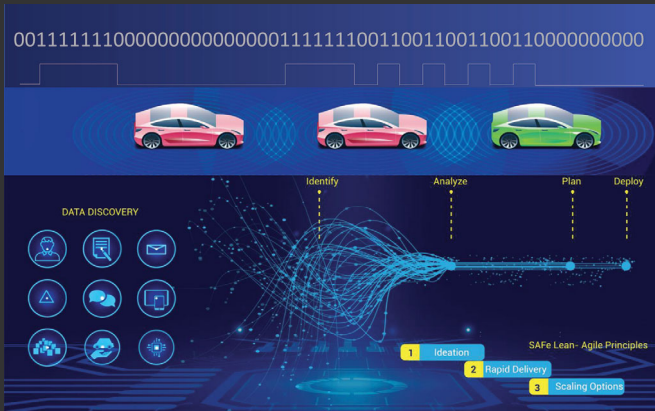


The image displays three screenshots of location-based service (LBS) applications. The first screenshot, titled "VRU Safety Assessment", shows a map of the United States with various colored icons representing different safety categories. A "Smart Editor" panel is overlaid on the map, listing categories such as "Accessibility", "Change in driving", "Maintenance issue", "Request bicycle facility", "Request pedestrian facility", "Tandem access", and "Other". The second screenshot, titled "DIVY.lyft", shows a map of Chicago with a "Find a station" search bar and a "Find a station" button. The map displays numerous colored dots representing station locations. The third screenshot, titled "Strava Labs Projects", shows a global heatmap of athlete activities, with a "PROJECTS" section below it listing "Global Heatmap" and describing it as "Over 1 billion activities, 13 trillion data points create the ultimate map of athlete playgrounds."

## Crowdsourced and Location Based Services (LBS)

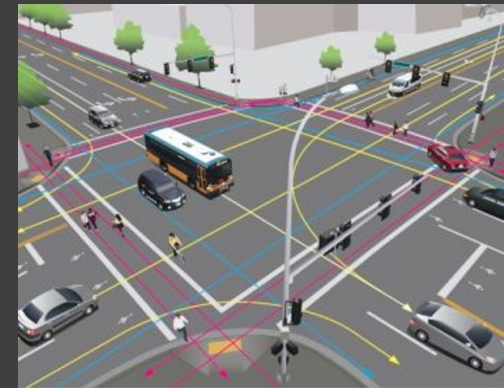
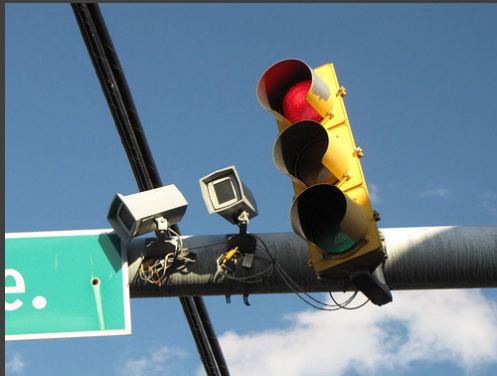
- Provide insights on perceived system needs
- Provide exposure for bicyclists, scooters





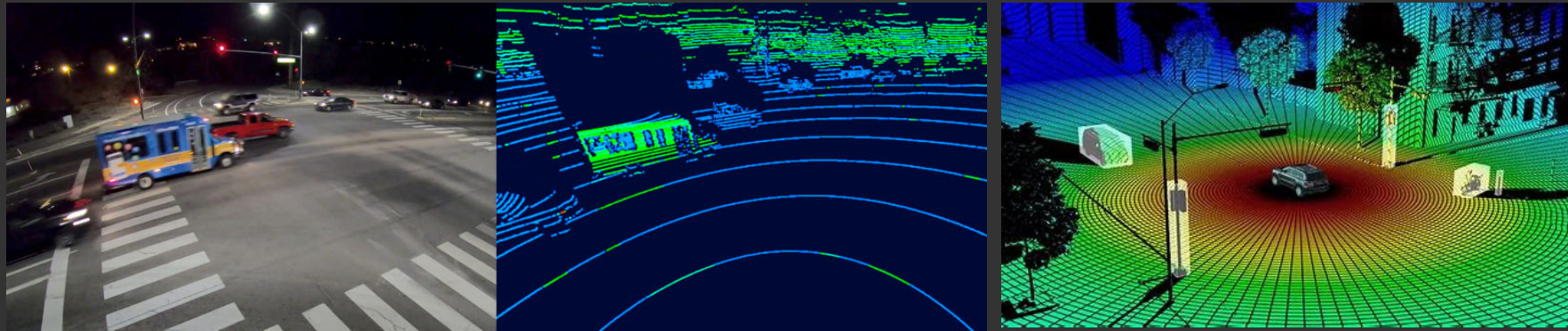
# Connected Vehicle / Probe

- Provides hard braking, hard accelerating, speed, rapid lane changing
- Provides seat belt use, headlight use



## Camera /Video Analytics

- Provides near miss between vehicles, pedestrians and bicyclists



## LIDAR

- Provides shapes, images for faster assessment of near miss and other operations

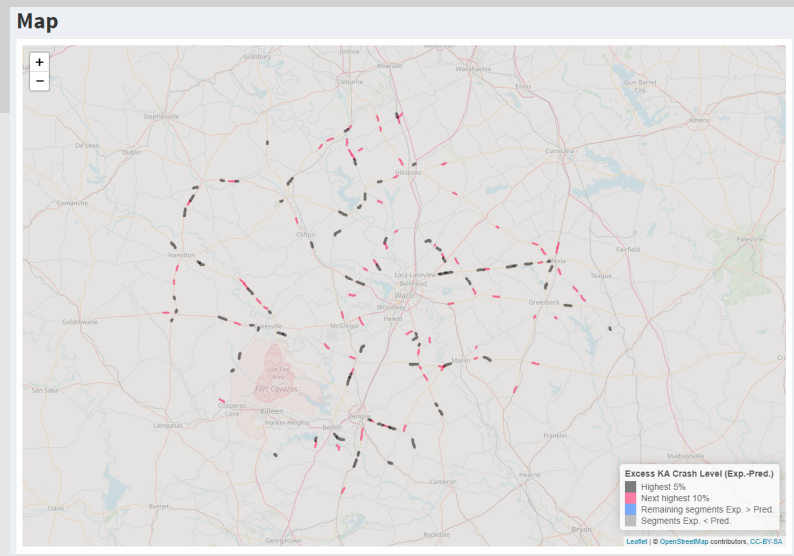


# Use of non-traditional safety data in action

State Examples

## Rural Two-Lane Roads: Network Screening Tool

- Web-based tool used to screen high-speed rural two-lane roads in Waco District
- Incorporates traditional data (i.e., roadway inventory, traffic volume, and crash) and vehicle event and motion data
- Incorporates predictive methods
- Prioritizes sites for potential safety improvement based on fatal and serious injury (KA) crashes
  - User selects the number or percentage of segments to include in the output
- Provides output in two formats:
  - Graphically (i.e., map)
  - Tabular (i.e., worksheet)



Ranking	Highway	From DFO	To DFO	AADT	Truck AADT	Truck Percentage	Posted Speed Limit	85th Percentile Space Mean Speed	Average Space Mean Speed	Space Mean Speed Std. Dev.	Weighted Curvature	Average Curvature	Sinusosity	Intersection Density	Excess KA Crashes
1	US0084	452.359	453.959	4383	593	13.53	75	78.94	72.3	10.08	0	0	1	0.62	0.47
2	SH0036	119.763	120.984	2331	572	24.54	75	79.07	73.56	7.63	1.92	1.92	1.03	0	0.44
3	SH0164	31.235	32.733	4962	733	14.77	70	75.47	69.43	7.85	0	0	1	2.67	0.42
4	US0077	108.090	109.284	3711	755	20.34	70	75.00	69.35	6.83	0.02	0.02	1	0.84	0.34
5	FM2311	4.02	5.344	1312	126	9.6	60	66.18	59.28	7.67	40.21	40.13	1.22	2.27	0.32
6	SH0014	24.502	25.712	5937	846	14.25	70	70.63	64.99	7.23	10.73	10.42	1.04	6.61	0.32
7	US0084	444.349	445.703	5144	643	12.5	75	78.48	72.46	7.5	0	0	1	1.48	0.31
8	SH0022	52.729	53.655	5304	1065	20.08	70	69.63	63.54	7.62	6.59	6.59	1.03	4.32	0.28
9	US0084	442.626	443.871	6785	752	11.08	75	78.61	72.12	7.68	0	0	1	3.21	0.28
10	US0084	464.694	466.357	3400	527	15.5	75	78.61	72.83	6.64	0	0	1	0.6	0.27
11	SH0022	55.543	57.004	7883	630	7.99	70	68.98	63.2	6.55	1.08	1.07	1	3.42	0.26

The logo for the Arizona Department of Transportation (ADOT), featuring the letters "ADOT" in a white, bold, sans-serif font on a dark blue rectangular background.

# Using Non-Traditional Data to Advance Traffic Safety Congestion Mitigation In Arizona

Transportation Research Board ACS20  
Midyear Meeting

Kerry Wilcoxon, PE, PTOE, RSP<sub>1</sub>  
Arizona State Traffic Safety Engineer

June 28, 2023

ARIZONA DEPARTMENT OF TRANSPORTATION



ARIZONA DEPARTMENT OF TRANSPORTATION

# Maricopa County, Arizona General

Size: 9,224 sq miles

Population: 4.5 million residents

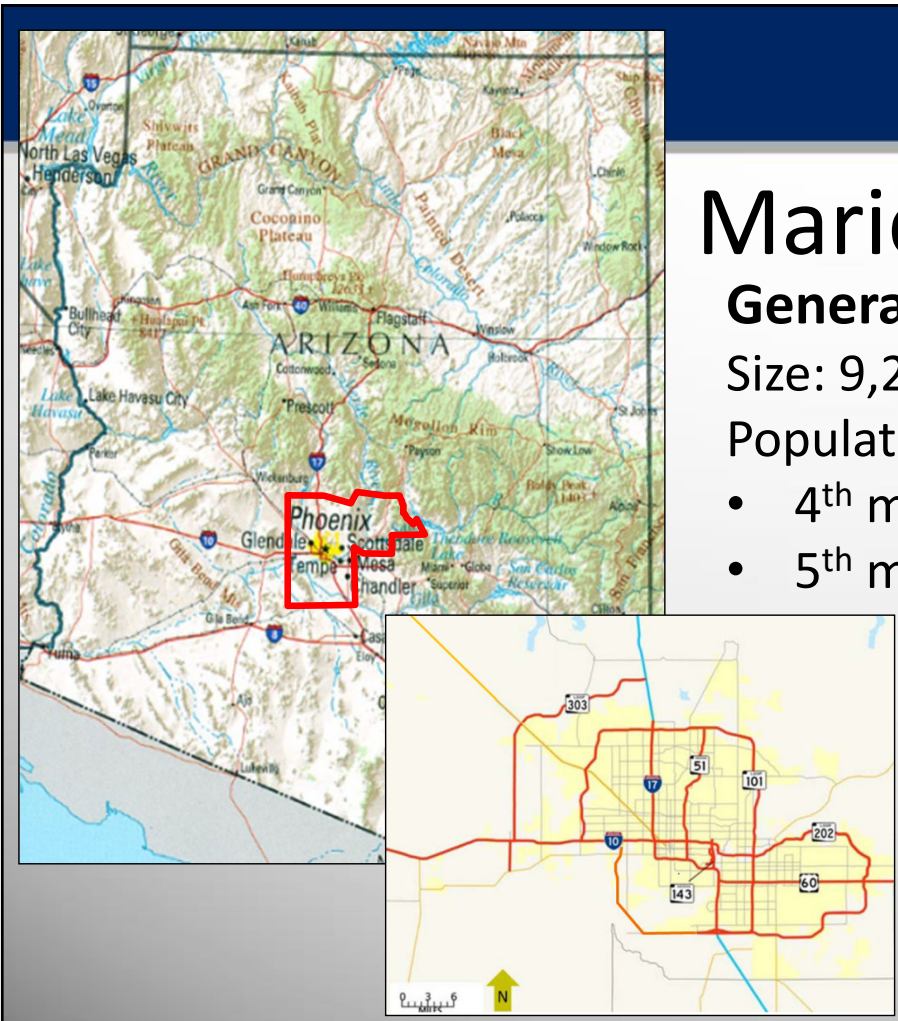
- 4<sup>th</sup> most populous County
- 5<sup>th</sup> most populous City

## Freeway System

Length: Over 1405 lane miles

Combined AADT: 2.5 Million VMT

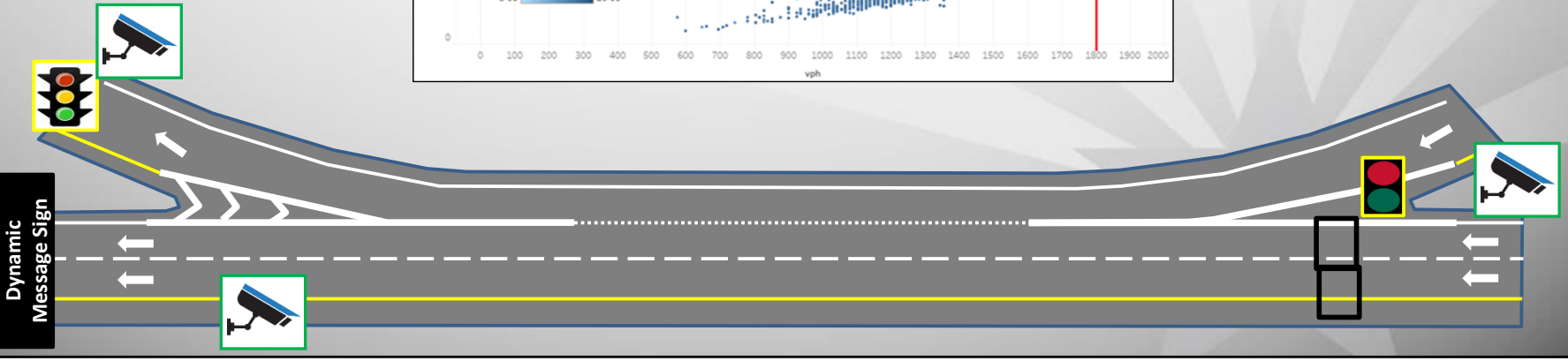
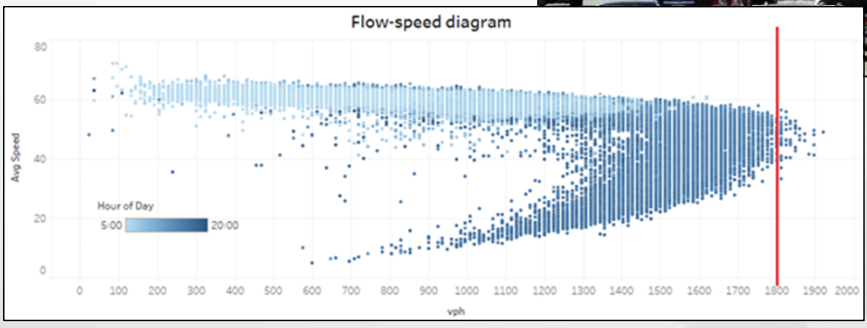
Crashes: 60% of total Statewide  
Air Quality Attainment Area





# Freeway Congestion

- AM/PM Peak hour
- Crash
- Special Events







ARIZONA DEPARTMENT OF TRANSPORTATION

# ADOT Traffic Operations Center (TOC)

Received input from statewide signal and freeway cameras

Monitors signal and ramp meter operations

Dynamic Messaging Sign (DMS) programming

Run by ADOT with DPS officer co-located

- ASU Meteorologist

Allows regional and statewide responses:

- Traffic Incident Management – Fire, floods, weather, special events
- Traffic Management Training
  - Quick clearance policy

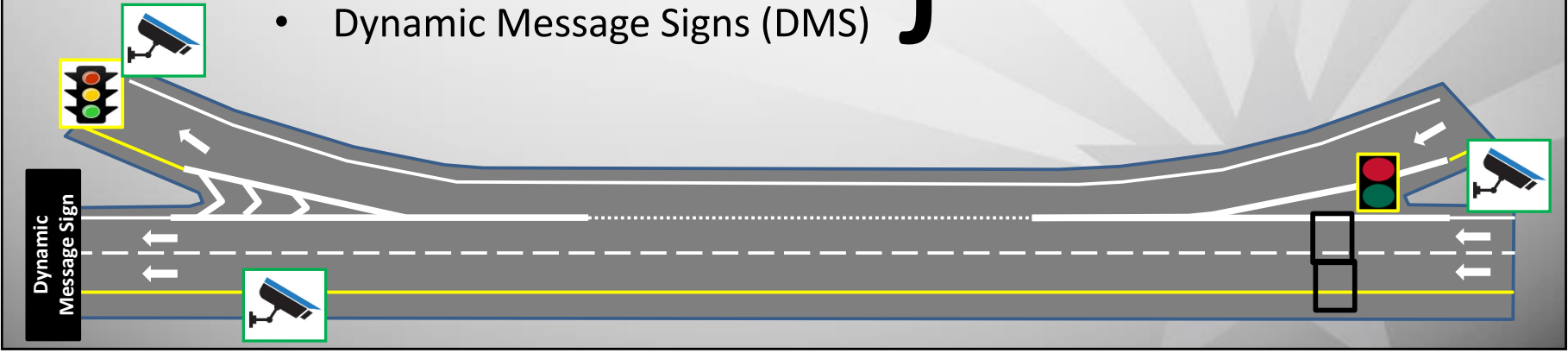




ARIZONA DEPARTMENT OF TRANSPORTATION

# Typical Speed Management Tools

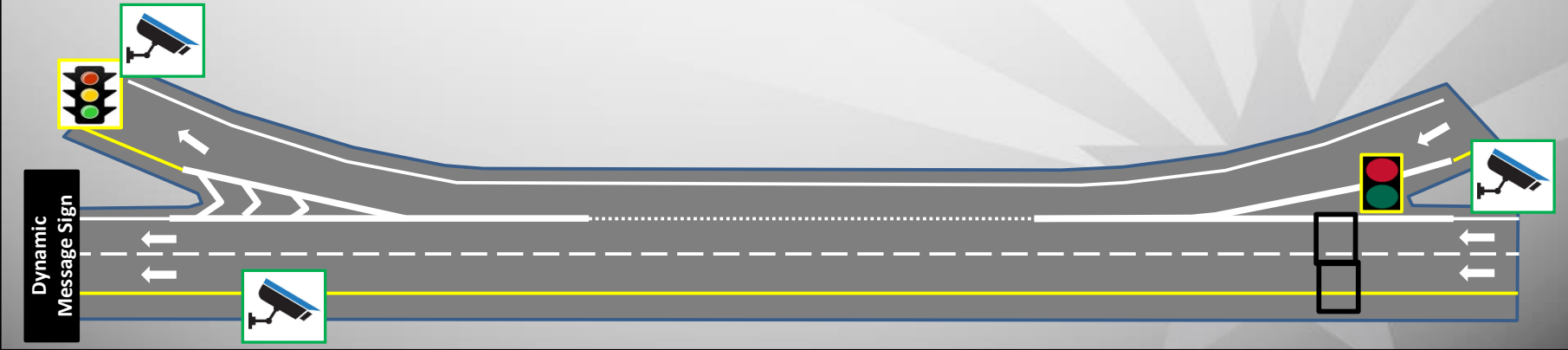
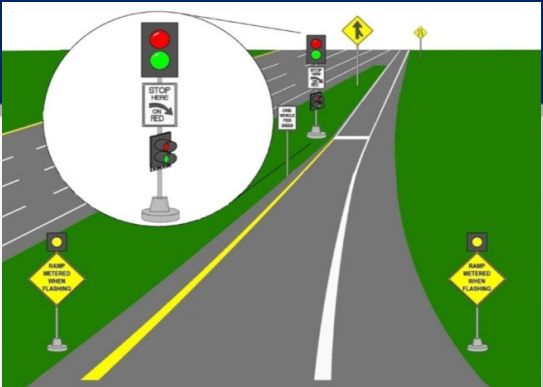
- Loop detectors
  - Cameras (optical and thermal)
  - Ramp meters
  - Ramp signals
  - Dynamic Message Signs (DMS)
- } Input – Speed & Volume
- } Output – Capacity Mgt.





# Ramp Meters

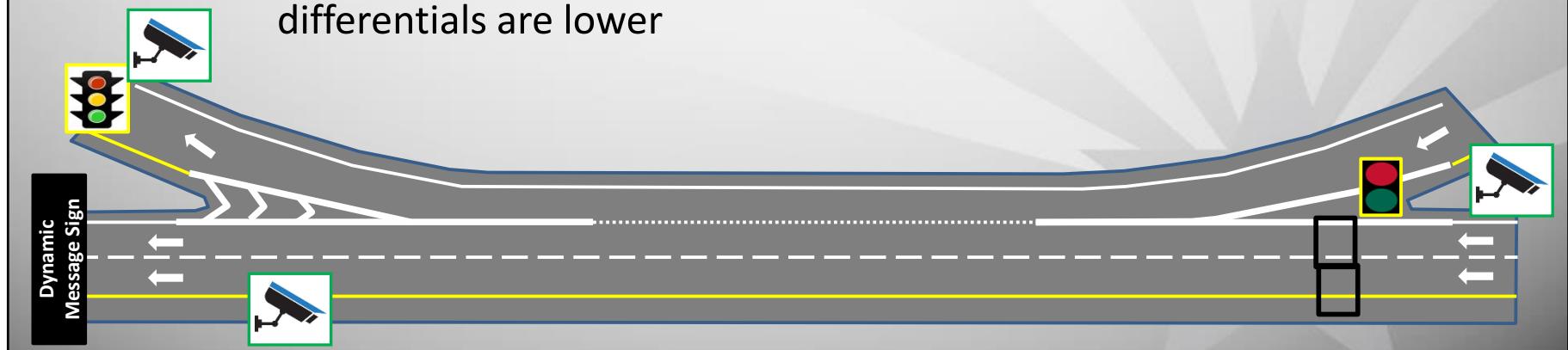
Loop speeds used as an input to adjust metering rates  
Drop in mainline speed could indicate that ramp metering is needed  
While flows are often used for determining metering rates, freeways above capacity can actually have low flows, making speed a good check



# Ramp Signals

Signals controlled by ADOT and local agencies but control is manual  
Locally controlled signals operate under IGA with ADOT requiring ramps to remain clear of back ups

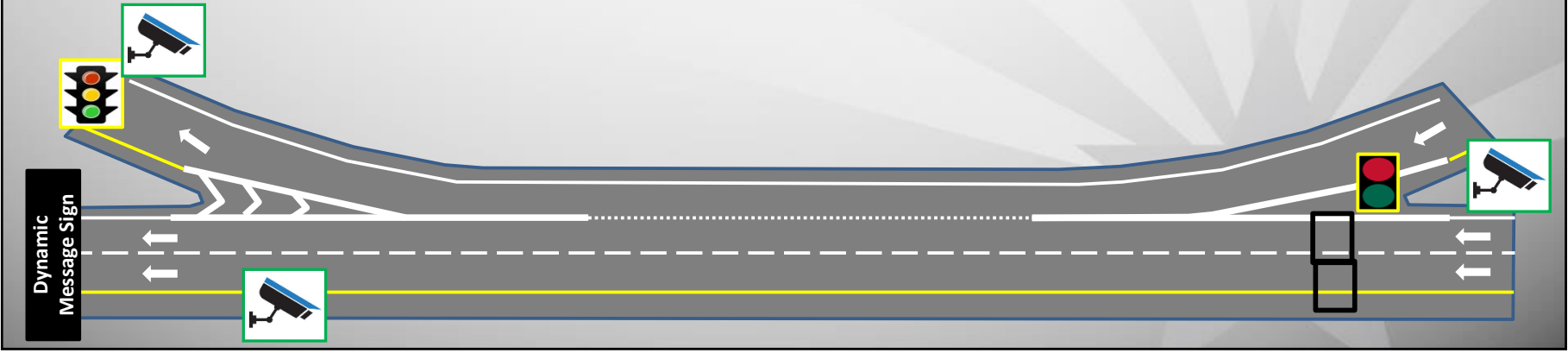
- Relief of ramp queuing prevents spill over to mainline
- Shifts delay onto lower speed arterial streets where potential speed differentials are lower





# Dynamic Message Signs (DMS)

- Least effective control measure
- Provides information to drivers based on INRIX data
- Allows time and space for slowing and/or alternative route selection
- No reliable data to determine effectiveness



# Additional Efforts – Bottleneck Elimination Project

In 2018-20 conducted a series of road safety audits throughout the Maricopa County Region focused on identifying and eliminating traffic bottlenecks on valley freeways

- Relied on crash and speed data (lane-lane and segment)
- RSA recommendations implemented on several ramps and segments to reduce congestion related speed differentials
- More changes are planned but long term affects of pandemic travel changes are still being evaluated

# Future Plans

- Adaptive Ramp Metering
  - Currently 75% of meters are adaptive
  - Shifting operations to be more reliant on speeds
- Integrated Corridor Management (ICM)
- Back of Queue Warning Systems
  - Analytics to determine when critical speed threshold is reached on traffic stream



# Questions?

**TRAFFIC SAFETY STARTS AT AND ENDS AT HOME,  
*DRIVE, BIKE AND WALK SAFELY!***

**Kerry Wilcoxon**, P.E., P.T.O.E., RSP<sub>1</sub>

State Traffic Safety Engineer

Arizona Department of Transportation

[kwilcoxon@azdot.gov](mailto:kwilcoxon@azdot.gov)

602-712-2060



ADOT Road Safety Audit Program

<https://azdot.gov/business/transportation-systems-management-and-operations/operational-traffic-safety/road-safety>

ARIZONA DEPARTMENT OF TRANSPORTATION





# Discussion

## Menti

- What types of non-traditional data sets are being used?
- What sources of non-traditional data sets are being used?
- Challenges and needs to expand the use of non-traditional data
- Opportunities or applications using non-traditional data

Join at [menti.com](https://menti.com) use code 8988 7711

Mentimeter

### What types of non-traditional data sets are being used?

0 Crowdsourced 0 Mobile LIS 0 Connected Vehicle, Probe 0 Camera Video 0 LEAD 0 Other

Menti

8988 7711



Wrap Up

• How can we develop a vision and path for use of non-traditional data to improve safety analytics and reduce more fatalities and injuries?