# Transportation Disruption and Disaster Statistics (TDADS) - Congestion Pie Chart

## PROGRESS WEB MEETING

November 21, 2019

I-95 CORRIDOR COALITION

**xxxx & enter xxxx**

# Identifying and Quantifying the Causes of Congestion

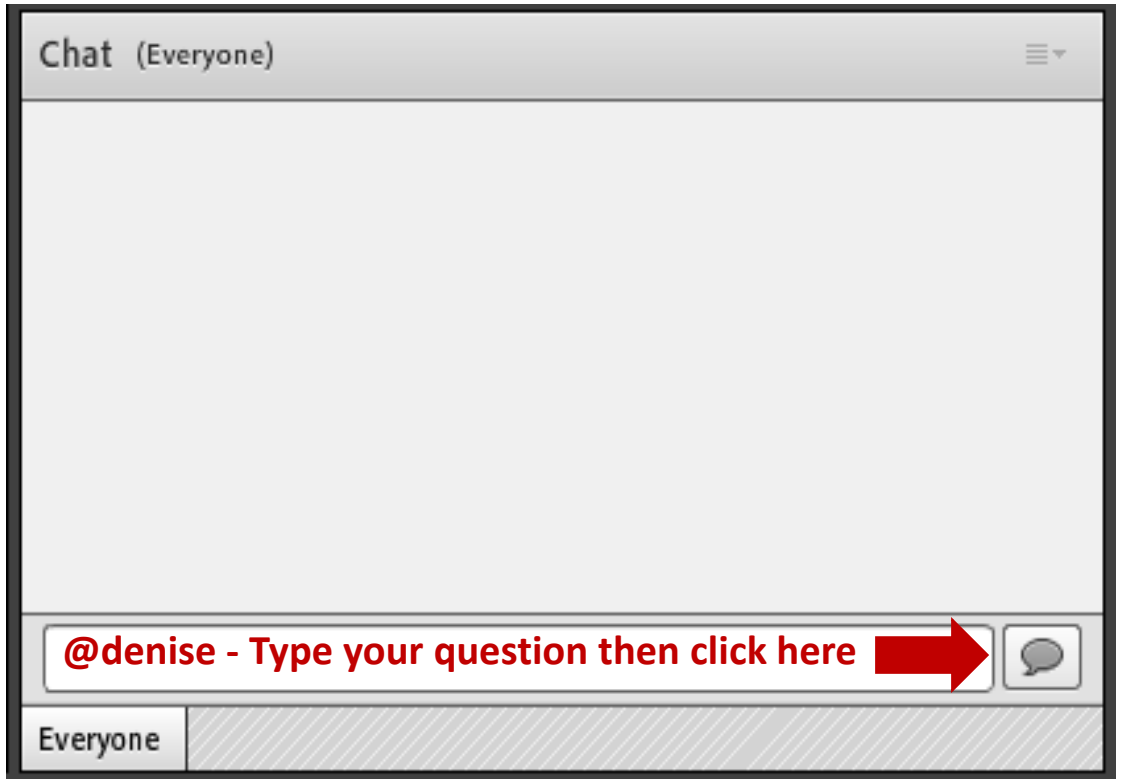
Project Sponsor: Bureau of Transportation Statistics

# Webinar & Audio Information

- The call-in phone number is: **xxxx & enter xxxx at the prompt**
- **Participants will be in "Listen Only" mode throughout the webinar**
- Please press *0 to speak to an operator for questions regarding audio
- Please call Justin Ferri at xxxx for difficulties with the web or audio application
- This webinar will be recorded.
- Presentations will be posted to the I-95 Corridor Coalition website. Participants will receive a link to the presentations after they are posted.

# Asking Questions

- Please pose your questions using the **chat box**
- Questions will be monitored then answered by the speakers either at the end of their presentation or at the end of the webinar
- Please direct your question to the appropriate speaker



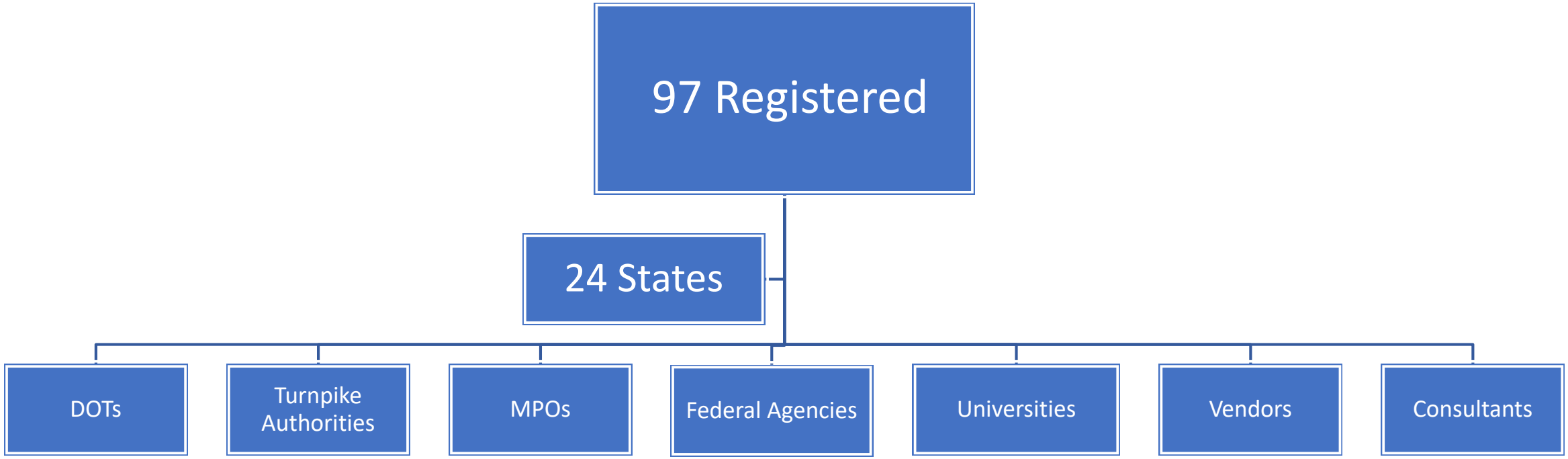
# Welcome & Introductions

Denise Markow, PE, I-95 Corridor Coalition

# Agenda

| Topic | Speaker |
|---|---|
| Background and Objectives | Denise Markow, I-95 Corridor Coalition |
| Data Sources and Terminology | Mark Franz, UMD CATT Lab |
| Methodology<br>• Identify congestion<br>• Quantify congestion<br>• Assign to cause of congestion | Mark Franz |
| Preliminary Results | Ignacio Tous, UMD CATT Lab |
| Interface Design | Ignacio Tous |
| Polling, Questions & Wrap Up | Denise Markow |

# I-95 Corridor Coalition Sponsored Event



# Today's Speakers

**Denise Markow, PE**
I-95 Corridor Coalition
*TSMO Director*

**Mark Franz, PhD**
University of Maryland
CATT Lab
*Lead Transportation Analyst*

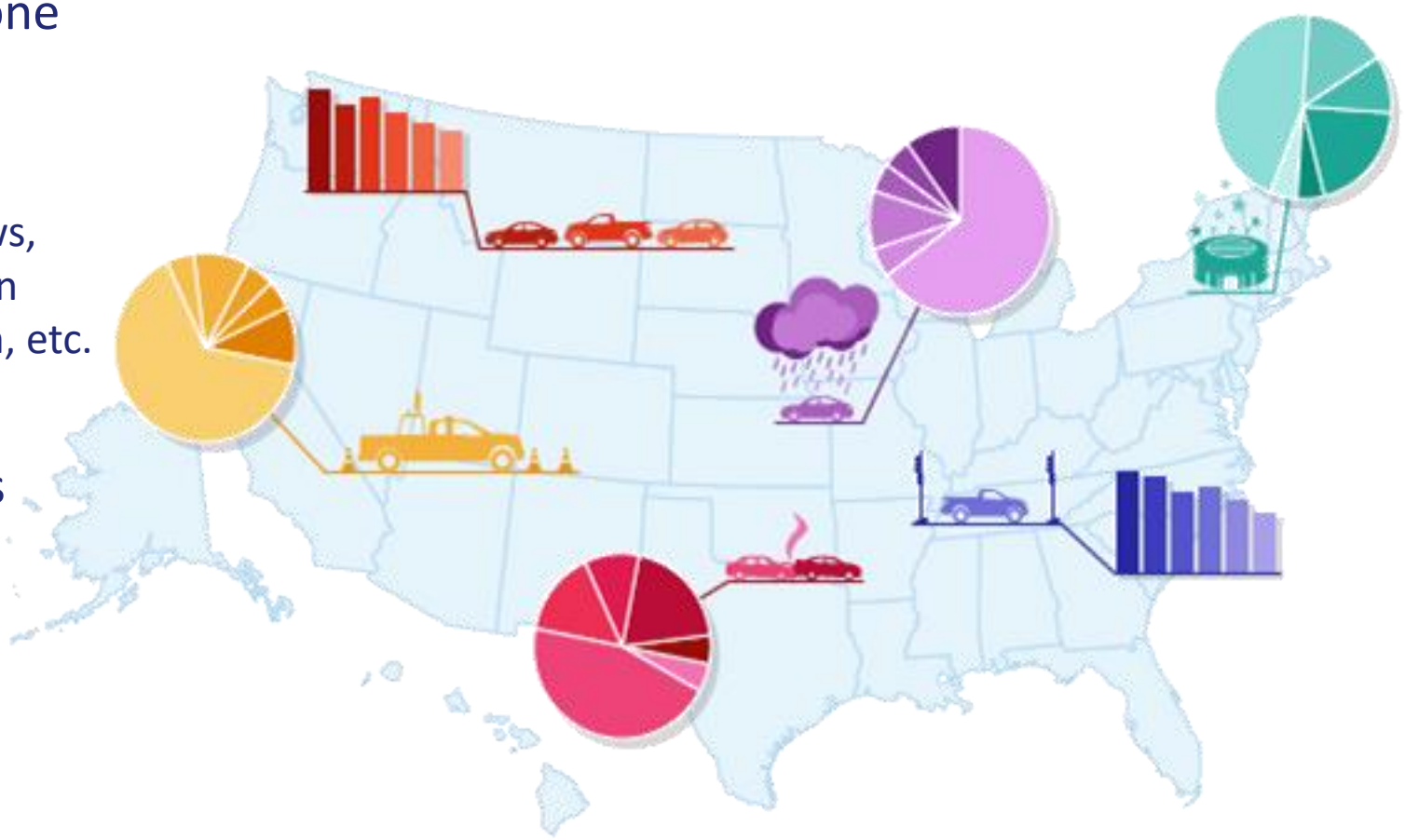
**Ignacio Tous**
University of Maryland
CATT Lab
*Lead Data Scientist*

# Background & Objectives

Denise Markow, PE, I-95 Corridor Coalition

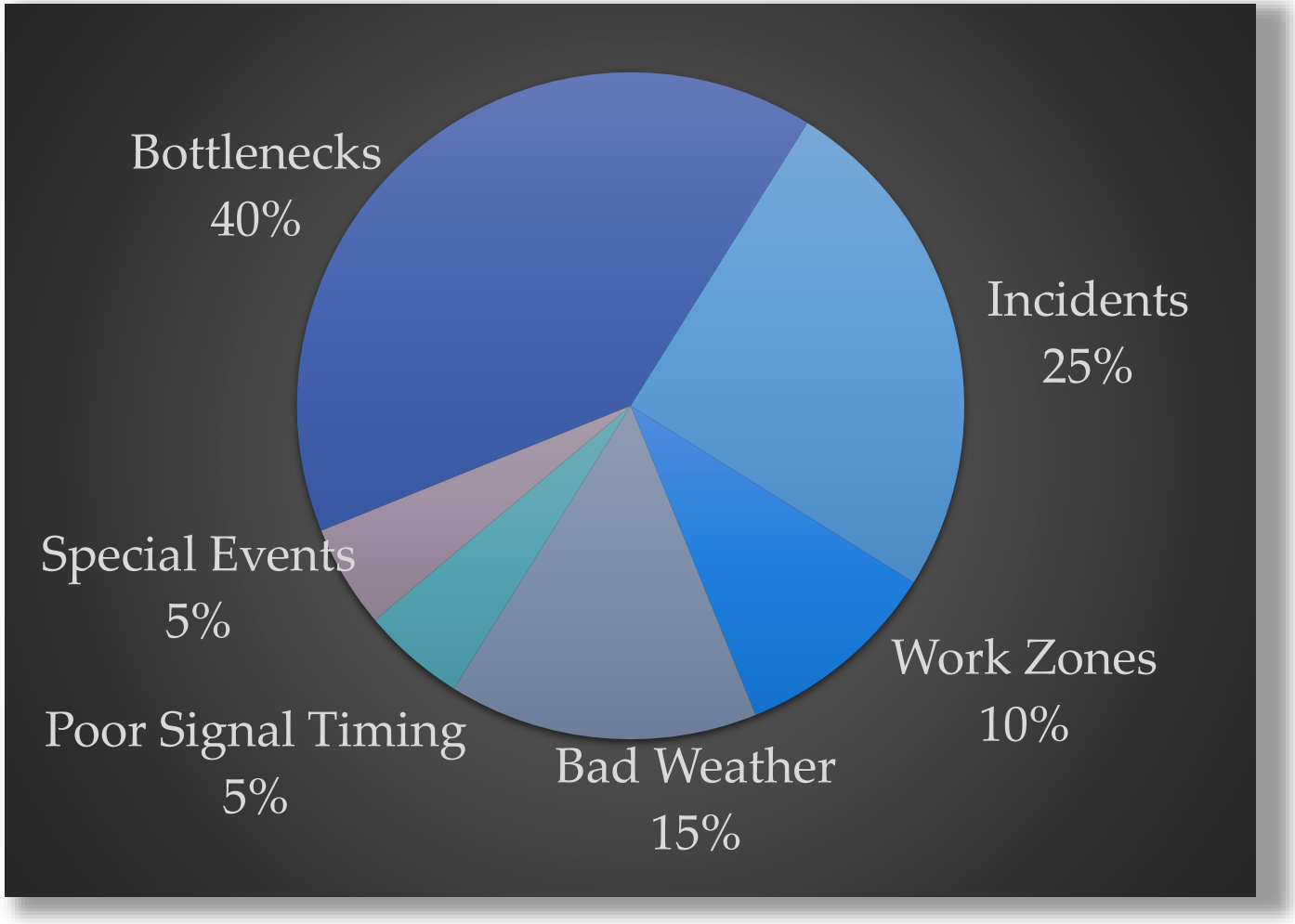
# Getting to the root causes of congestion…….

- One stat can’t represent everyone
- Many regional factors:
  Climate, demographics, policies, laws, infrastructure conditions, population density, technology, roadway design, etc.
- Wise decision-making demands current and regionally-relevant information.



# Moving Past Old Assumptions
# "The Pie Chart"

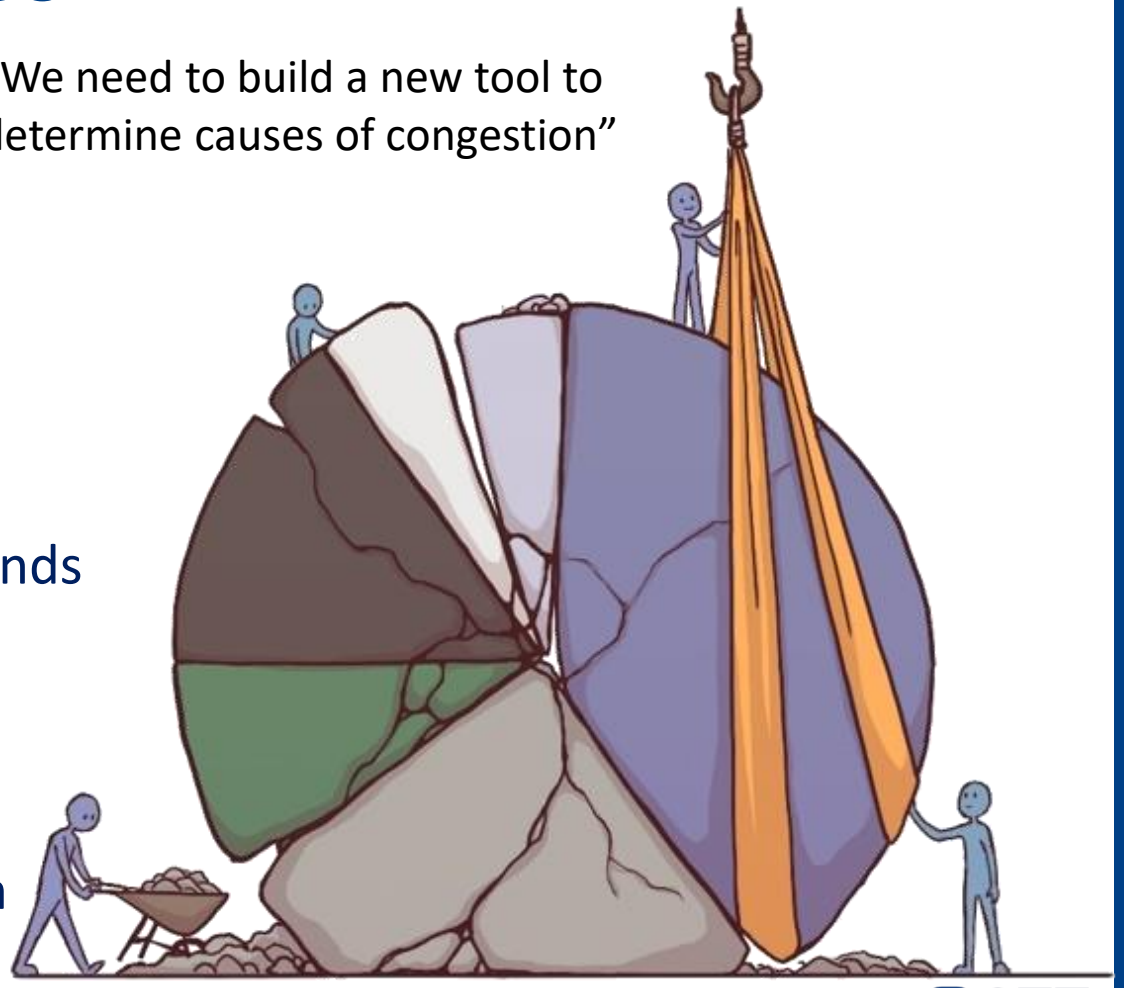
- National statistic
- 14+ years old
- Largely modeled
- In a nutshell… outdated



# Transportation Disruption & Disaster Statistics (TDADS) - Project Objectives

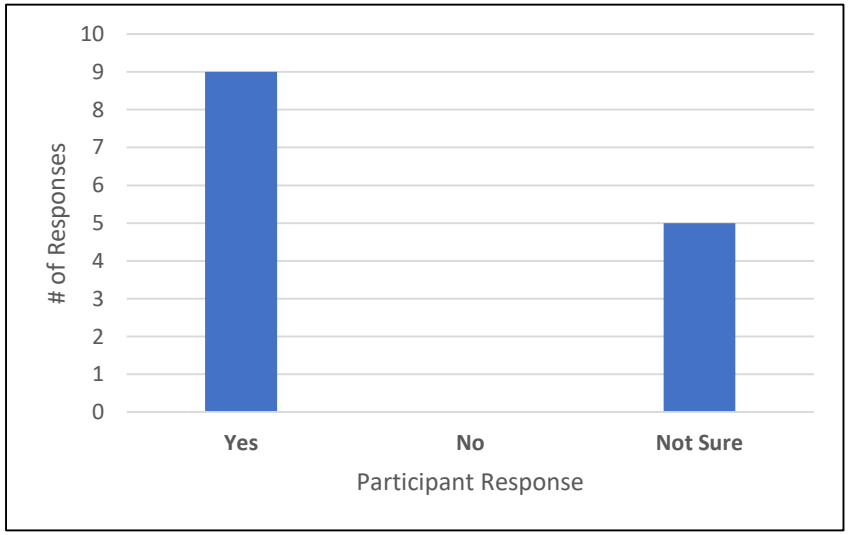
1. Upgrade the ancient “pie chart”
   - ✓ Across entire U.S.
   - ✓ Using the nation’s best data
2. Evaluate regional factors
3. Create interactive, easily-accessible tool in the hands of decision makers
4. Practitioner Steering Committee guide ALL work
5. Using entire National Highway System (NHS) from August 2018 – July 2019

“We need to build a new tool to determine causes of congestion”

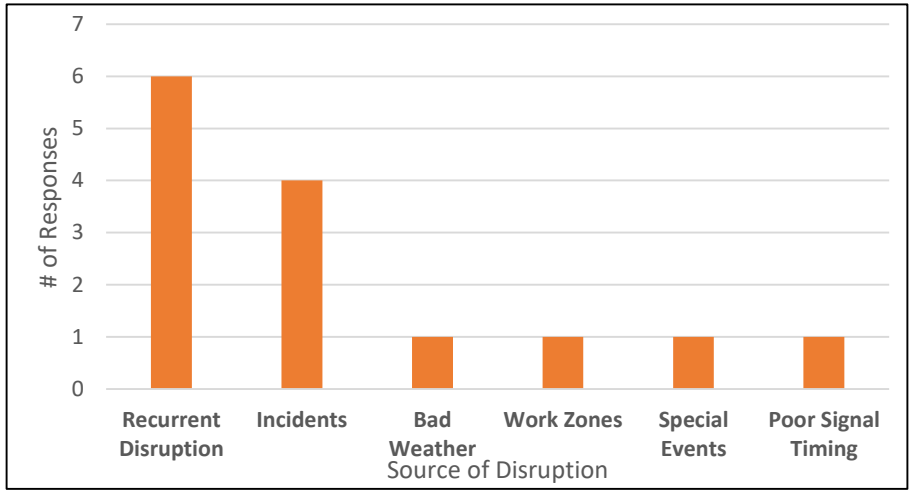


# Polling Results (May 2019)

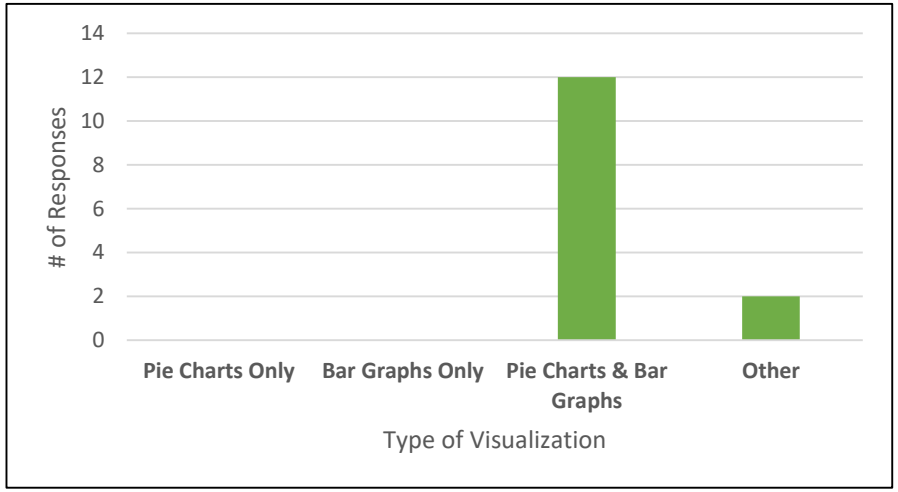
**POLL 1**: Do you agree with the proposed six sources of disruption to define our national pie chart? (Sources of Disruption: Recurrent Disruption, Incidents, Bad Weather, Work Zones, Special Events, Poor Signal Timing)




**POLL 2**: Of the sources of disruption, which category would it be beneficial to have additional details or breakdown, in the future?




**POLL 3**: What visualization of the TDADS results is the most useful for your organization?



# Data Sources & Methodology

Mark Franz, PhD, University of Maryland CATT Laboratory

# Data sources and terminology

# TDADS Data Sources and Terminology

| Recommended Terminology | | Data Sources | Definition | Details |
|---|---|---|---|---|
| **Disruption** | | • 1- minute probe data | A sustained interruption in the flow of traffic that results in travel delay. | • Time and location of an event that causes a speed drop of at least 60% of the reference speed that is sustained for at least 5 minutes. This location is the head of a traffic queue. |
| **Disruption Sources** | **Recurrent Disruption** | • 1-minute probe data | A predictable and regular pattern of interruption in traffic flow that results in travel delay. | • Disruption pattern that is predictable in both space and time and is observed on a regular basis<br>• Typically caused by surge in demand near or above the capacity of the corridor |
| | **Incidents** | ~~• DOT data~~<br>~~• FARS~~<br>• Waze (national archiving since August 2018)<br>~~• CAD~~ | Interruption in traffic flow caused by an unplanned in-road or roadside obstruction that results in travel delay. | • Disabled vehicle<br>• Crash/Incident<br>• Emergency roadwork<br>• Road obstruction |
| | **Weather** | • NOAA Radar | Interruption in traffic flow caused by inclement weather conditions. | • Rain<br>• Snow |
| | **Work Zones** | ~~• State or Agency provided~~<br>• Waze | Interruption in traffic flow caused by a planned construction or maintenance project/activity. | • Planned work zones |
| | **Holiday Travel** | • Holidays & Travel Days | Interruption in traffic flow caused by a scheduled occasion. | • Before, on or after major holidays |
| | **Signals ~~Timing~~** | ~~• DOT asset management records/maps~~<br>• OSM Traffic Signal Database | Interruption in traffic flow caused by improperly timed traffic signals. | • Delay incurred at signalized intersections |
| | **Multiple Causes** | • Multiple | Disruption/congestion event caused by more than 1 factor | • Self-explanatory |
| | **Unclassified Disruption** | • 1-minute probe data | Interruption in traffic flow with no discernable cause. | • Disruption/congestion with unknown cause (ie. no matching event) |

# Poll Question #1 – Additional Data Sources

1 Does your agency have data sources that can enhance the national data set? *(please check all that apply)*

___ **Incident Data (beyond Waze)**

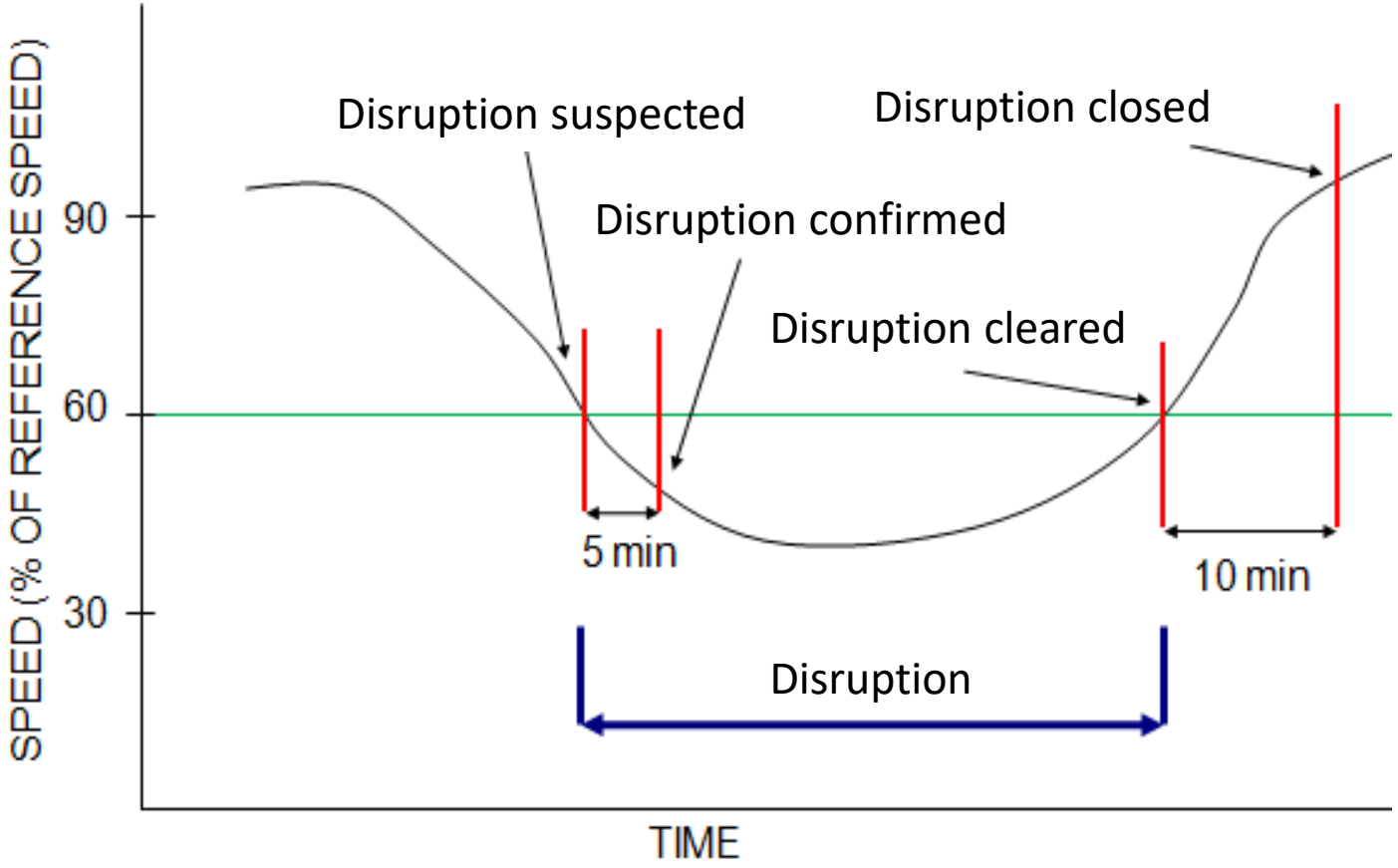
___ **Weather data (beyond NOAA Radar)**

___ **Planned event WZ data (beyond Waze)**

___ **No additional data sources**

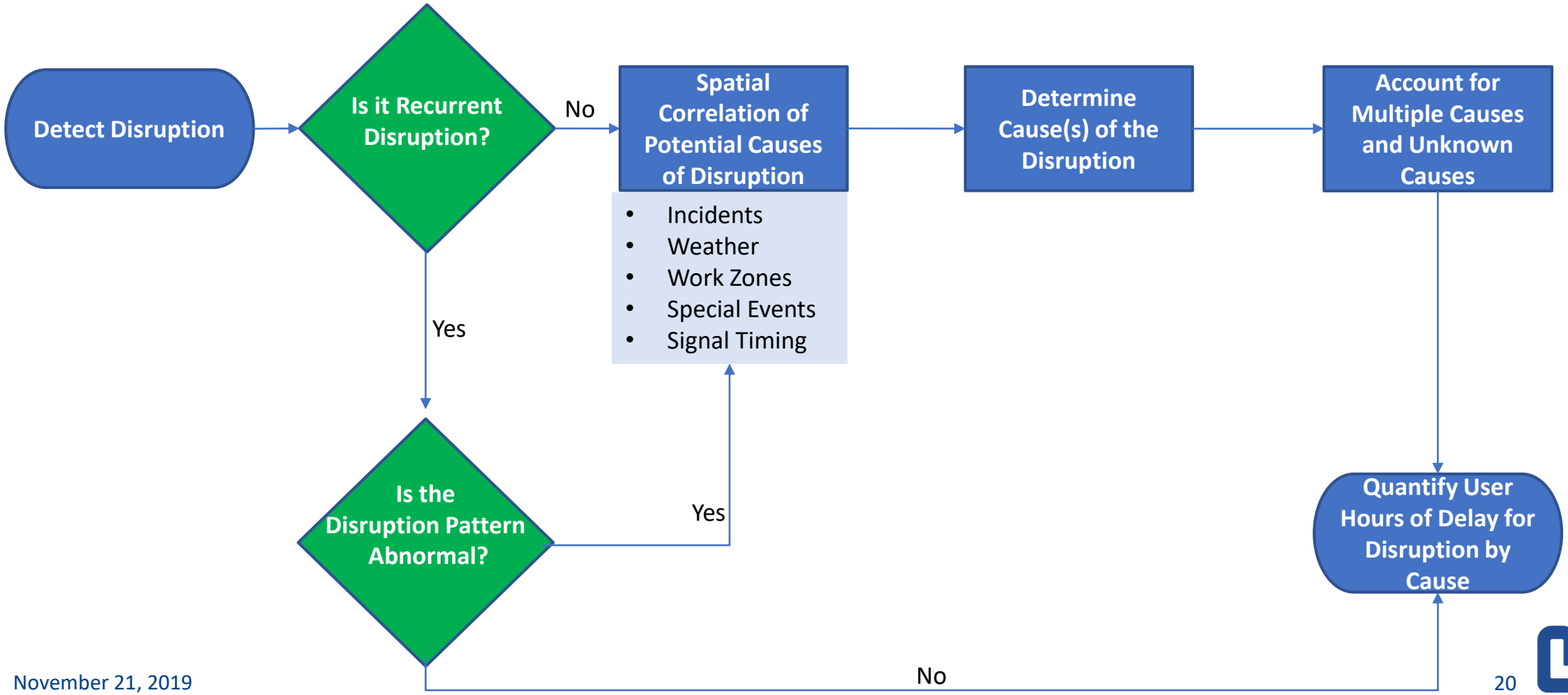
# Methodology

# Defining Disruption

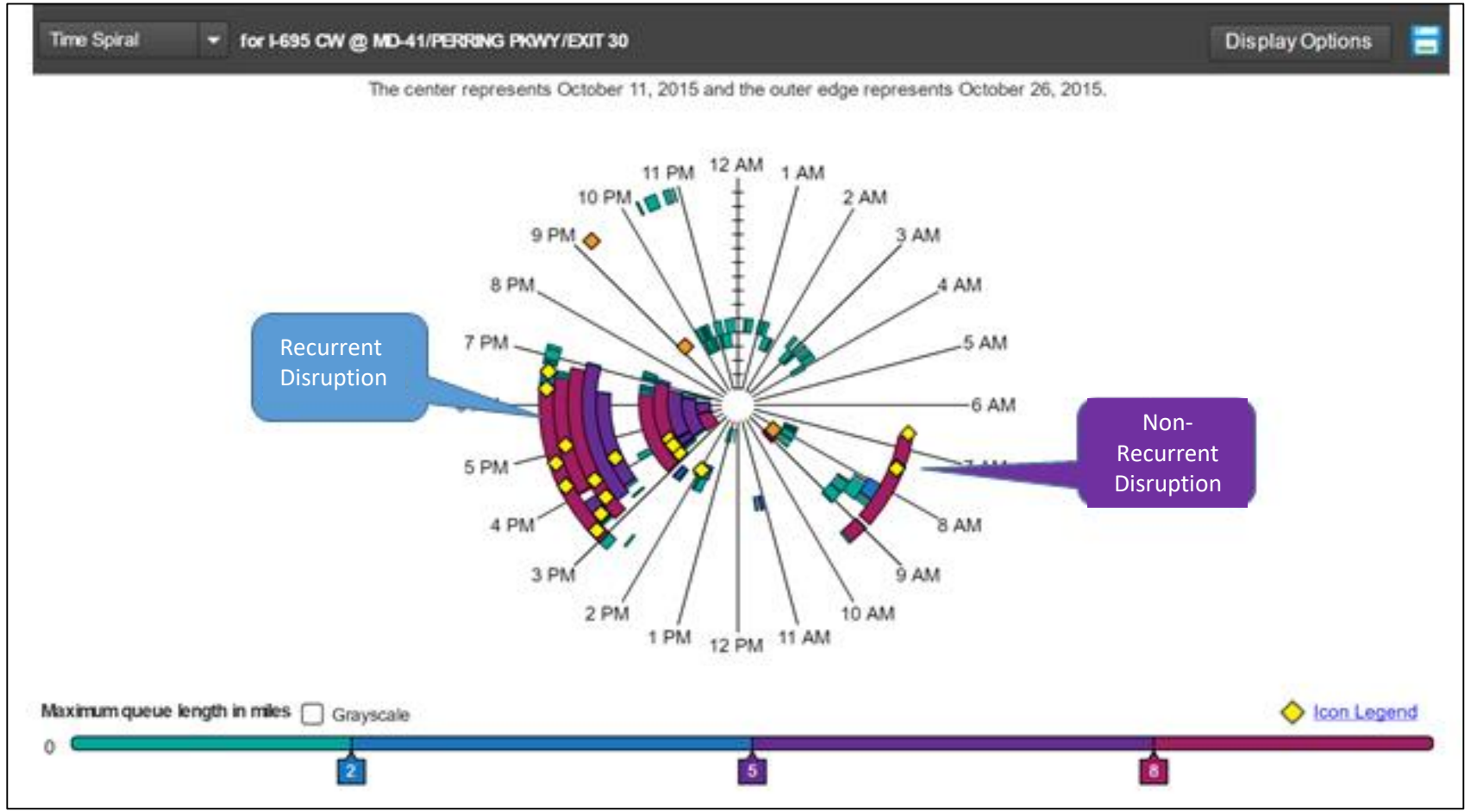



Lund, A., Pack, M.L., Plaisant, C., and Franz, M.L. Algorithms for Identifying and Ranking Bottlenecks Using Probe Data. Transportation Research Board 96h Annual Meeting. Washington, D.C. 2017.

# High Level Approach to Quantifying Disruptions

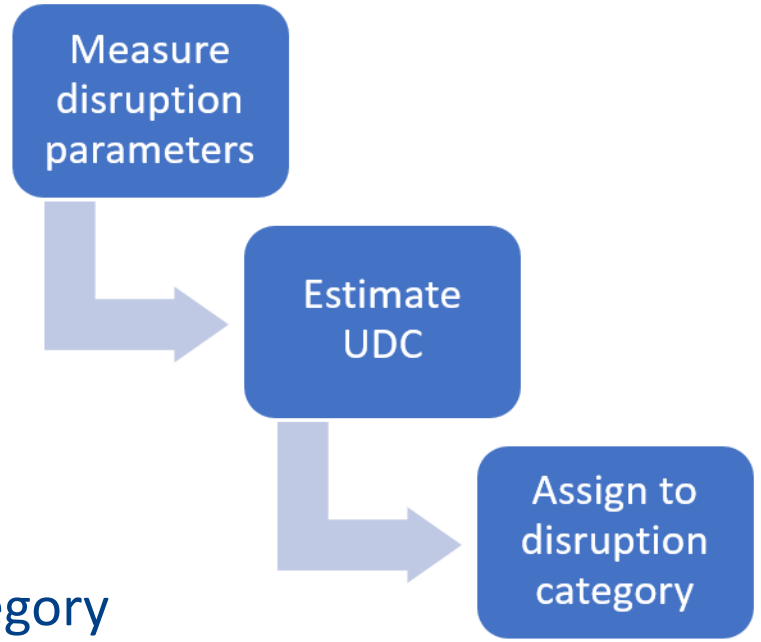


# Recurring vs. Non-recurring



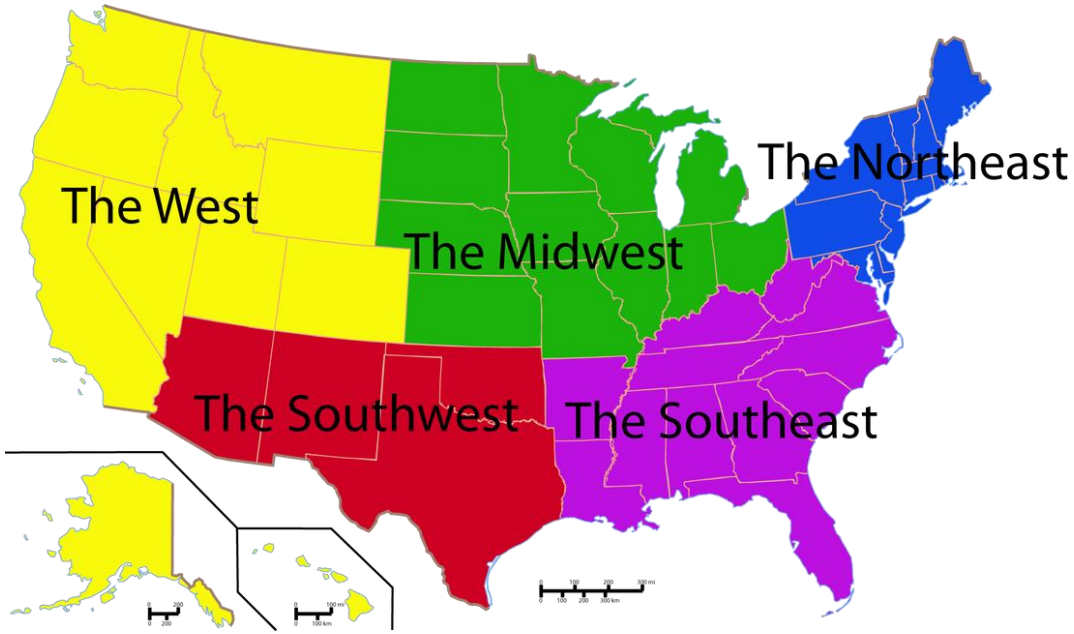
# Quantifying Disruption: User Delay Cost (UDC)

- Convert delay to a dollar value
- Inputs/Assumptions:
  - Travel time delay
  - Traffic volume
  - Commercial vehicle percentage
  - Value of time passenger vehicles
  - Value of time commercial vehicles
- Assign UDC from each disruption to a disruption category
- Pie/Bar chart based on total UDC in each category



# Plan for Multi-Factor Cause Analysis

- Sample 4 months (to cover seasonality) and 5~6 states (to cover regions)
- Discover the most prevalent ~4 multi-factor combinations and report those combinations for every state




<u>Months to Analyze</u>

- February (Winter)
- May (Spring)
- August (Summer)
- October (Fall)

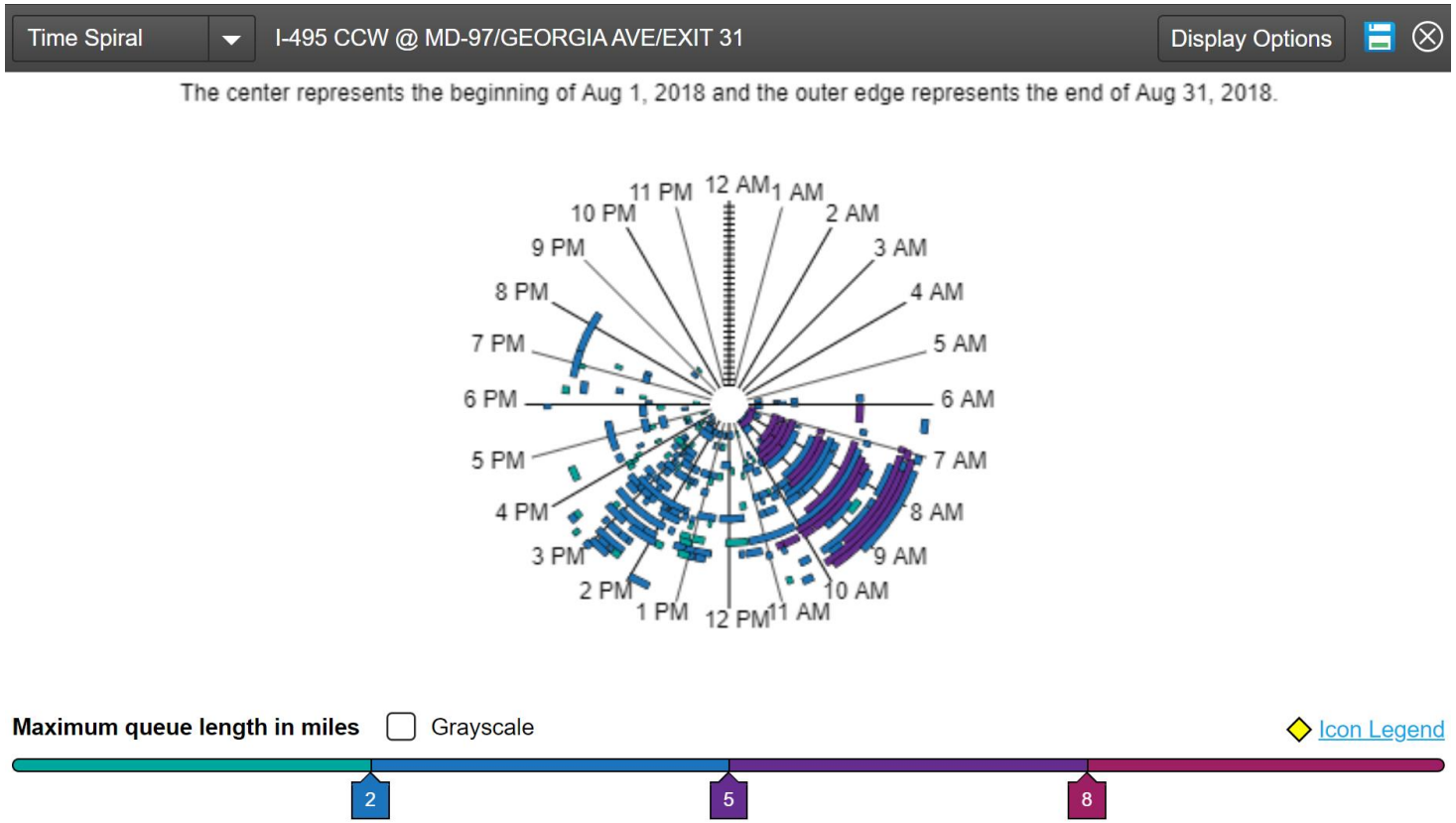
# Preliminary Results & Interface Design

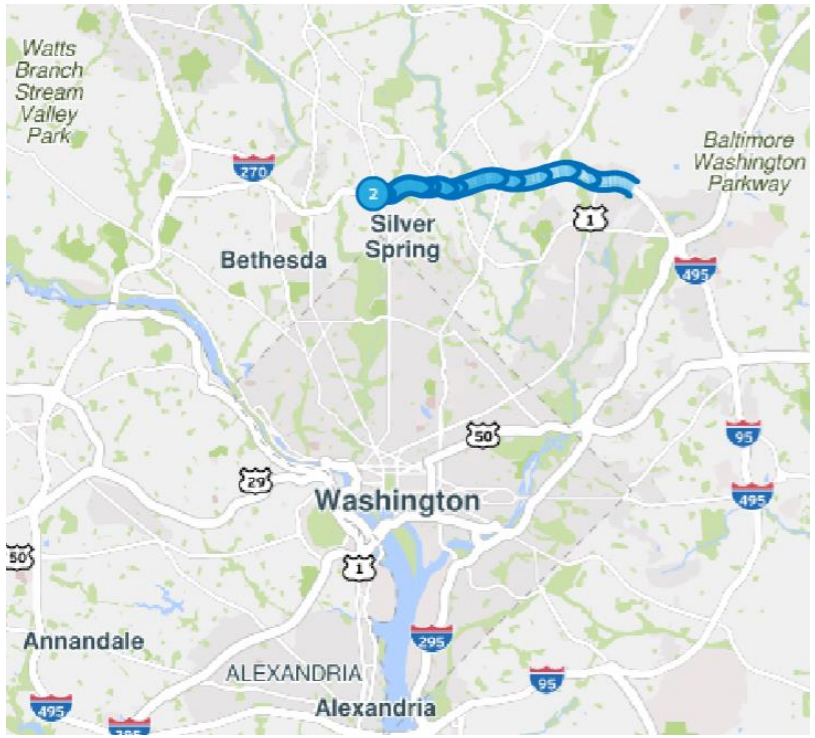
Ignacio Tous, University of Maryland CATT Laboratory

# Preliminary Results

# Preliminary Results: I-495 Outer Loop at Georgia Ave. Aug 2018

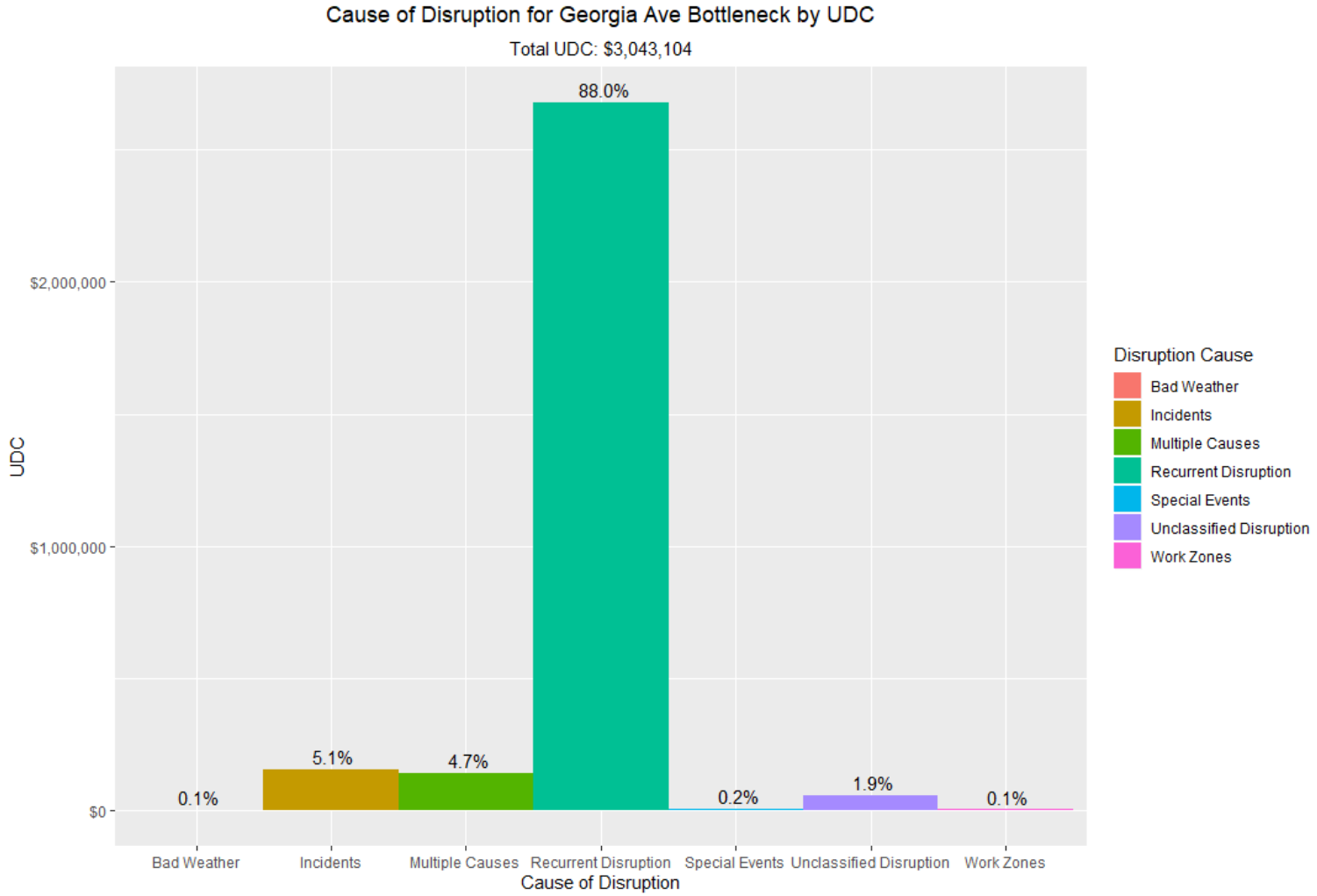
Output from the PDA Bottleneck Ranking Tool

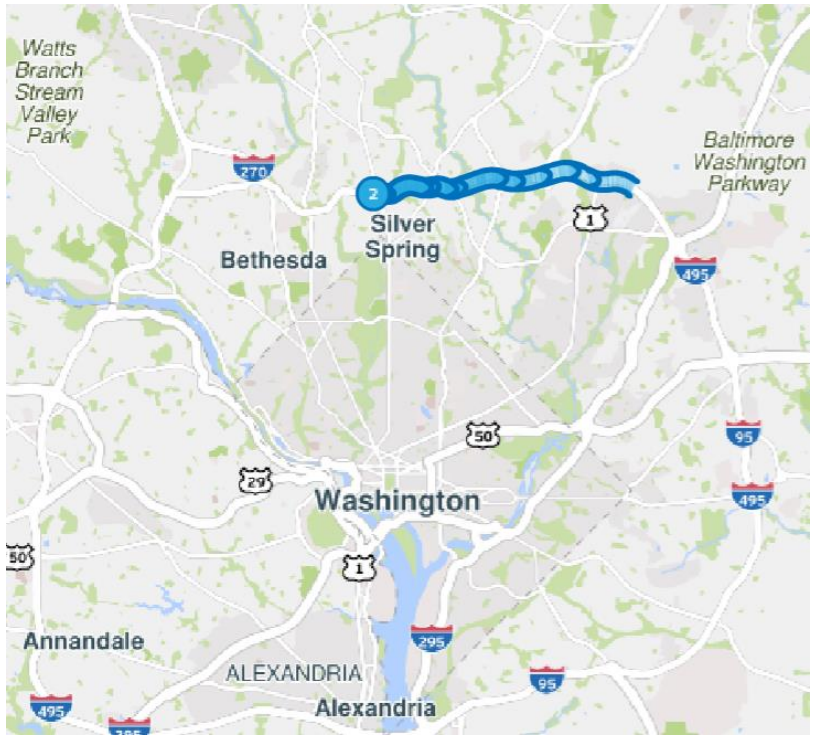


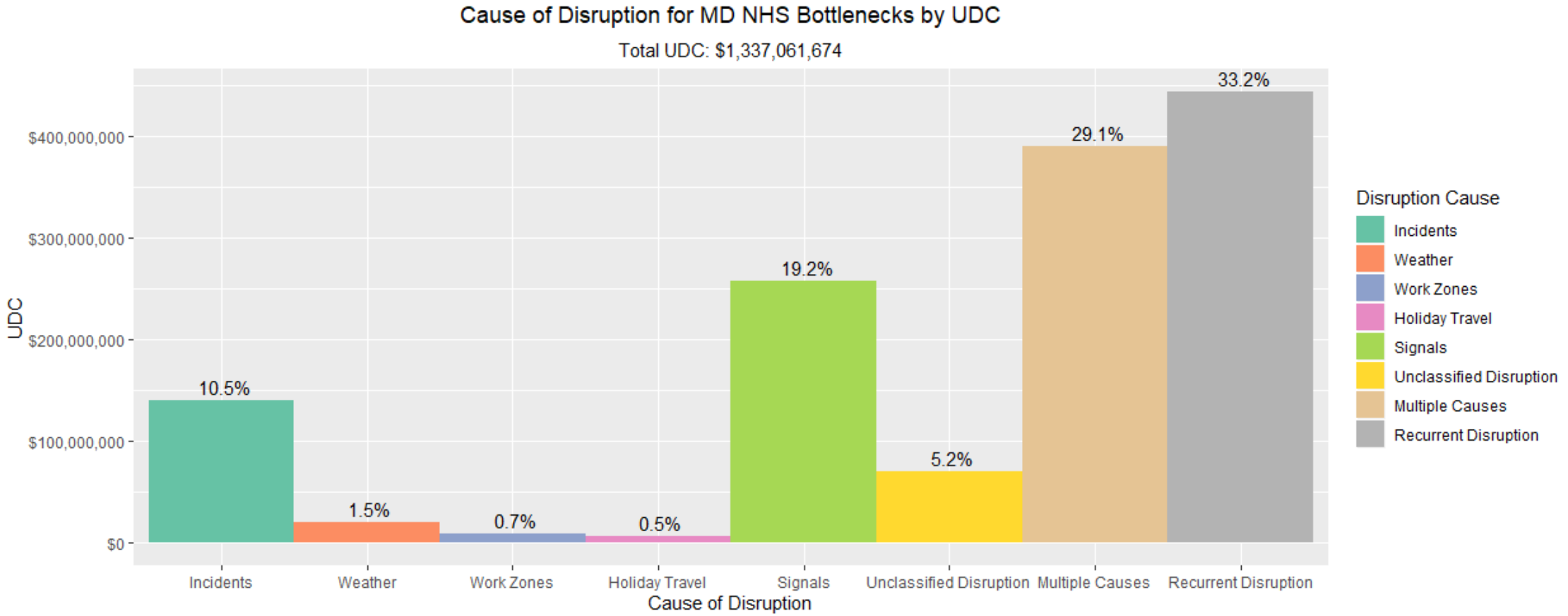
# Preliminary Results: I-495 Outer Loop at Georgia Ave. Aug 2018

## Output from the TDADS Methodology



# Preliminary Results: Maryland NHS – Aug 2018 – July 2019

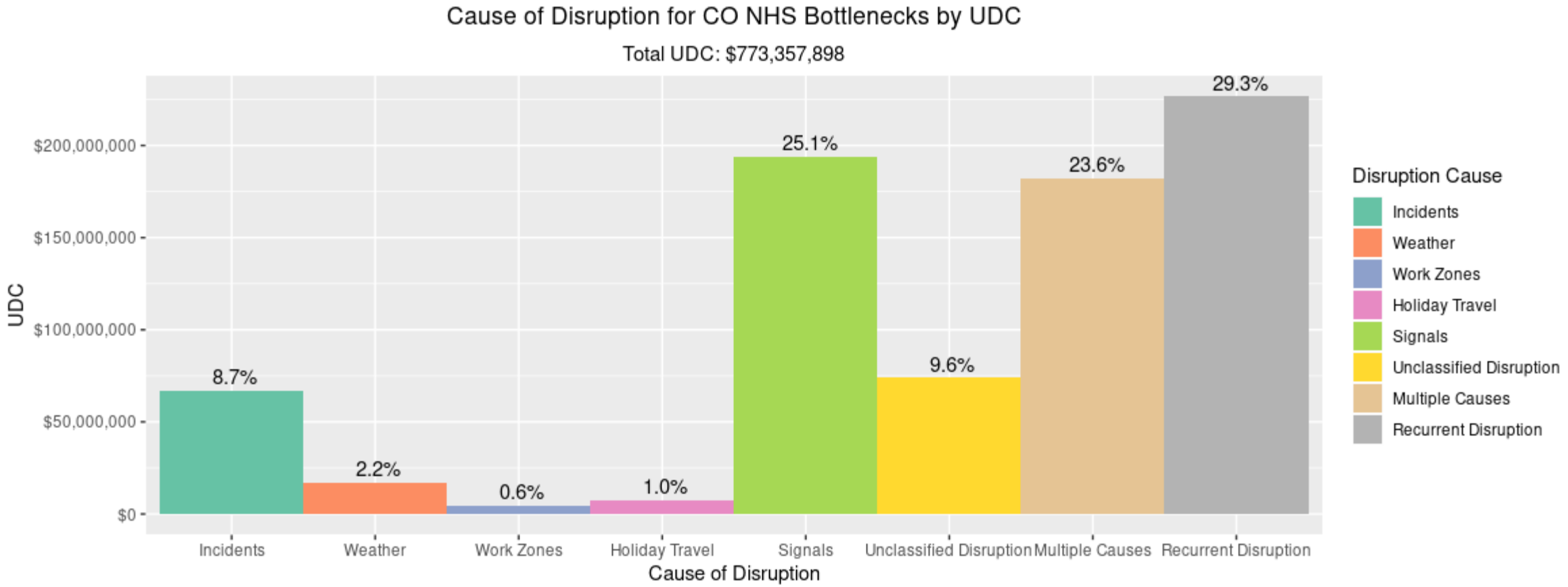


# Maryland Multi-Factor Causes

| Disruption Cause | UDC | UDC% |
|---|---|---|
| Recurrent | $443,263,191 | 33.2% |
| Signals | $257,187,189 | 19.2% |
| Incident | $140,088,876 | 10.5% |
| Unclassified Disruption | $70,006,770 | 5.2% |
| Weather | $20,667,658 | 1.5% |
| Work Zone | $9,014,511 | 0.7% |
| Holiday Travel | $7,081,332 | 0.5% |
| Multiple Causes | $389,752,148 | 29.1% |

| Disruption Cause | UDC | UDC% |
|---|---|---|
| Incident & Weather | $87,523,457 | 6.5% |
| Signals & Weather | $55,003,642 | 4.1% |
| Incident & Work Zone | $34,687,217 | 2.6% |
| Recurrent & Incident | $29,356,589 | 2.2% |
| Other Multiple Causes | $183,181,243 | 13.7% |

# Preliminary Results: Colorado NHS – Aug 2018 – July 2019

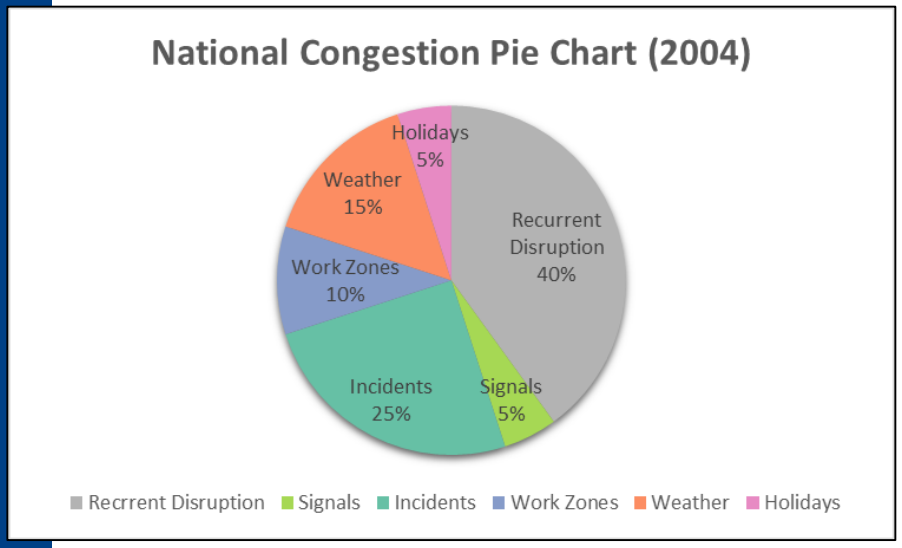


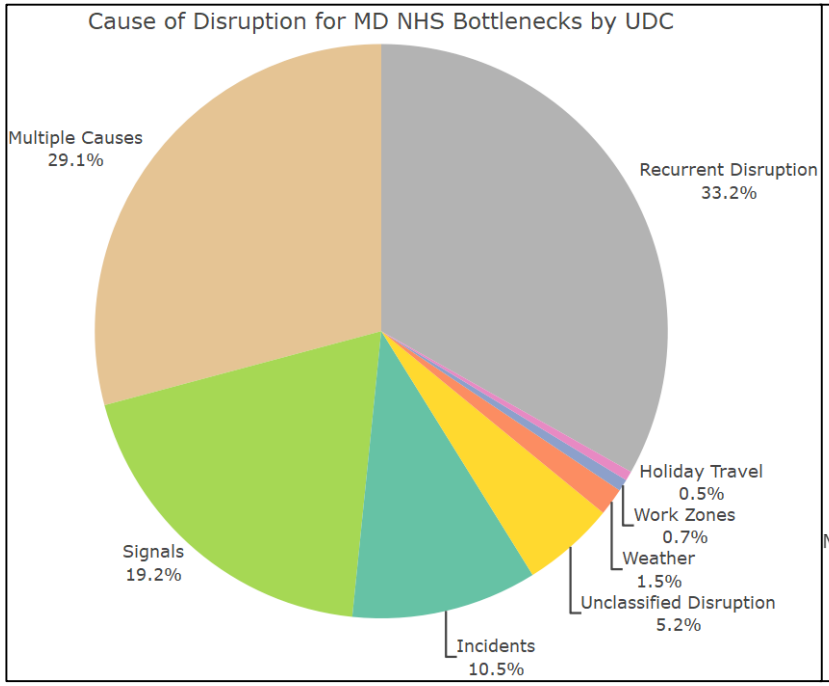
# Colorado Multi-Factor Causes

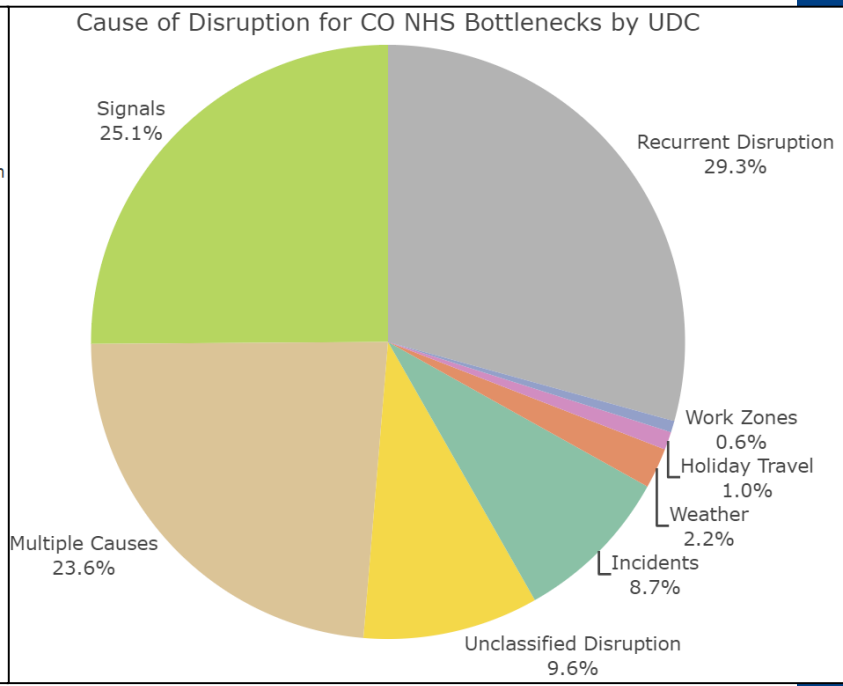
| Disruption Cause | UDC | UDC% |
|---|---|---|
| Recurrent | $226,589,020 | 29.3% |
| Signal Timing | $194,156,997 | 25.1% |
| Unclassified Disruption | $73,880,508 | 9.6% |
| Incident | $67,085,202 | 8.7% |
| Weather | $17,000,599 | 2.2% |
| Holiday Travel | $7,593,232 | 1.0% |
| Work Zone | $4,747,755 | 0.6% |
| Other Multiple Causes | $182,304,585 | 23.6% |

| Disruption Cause | UDC | UDC% |
|---|---|---|
| Incident & Weather | $35,313,917 | 4.6% |
| Signals & Weather | $31,399,493 | 4.1% |
| Signals & Holiday Travel | $19,186,673 | 2.5% |
| Recurrent & Incident | $10,638,954 | 1.4% |
| Other Multiple Causes | $85,765,548 | 11.1% |

# Comparison to the 2004 National Study



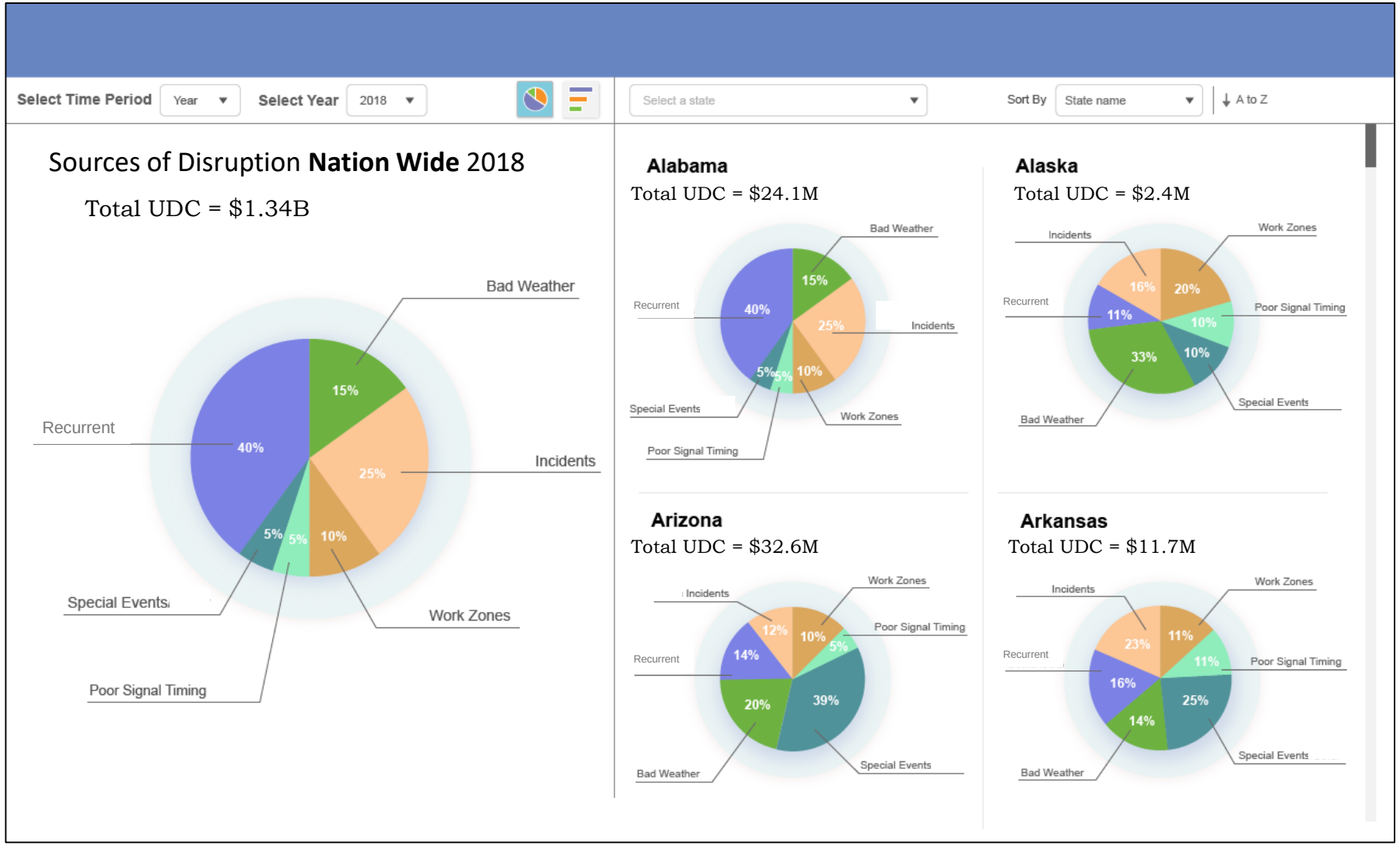




Note:

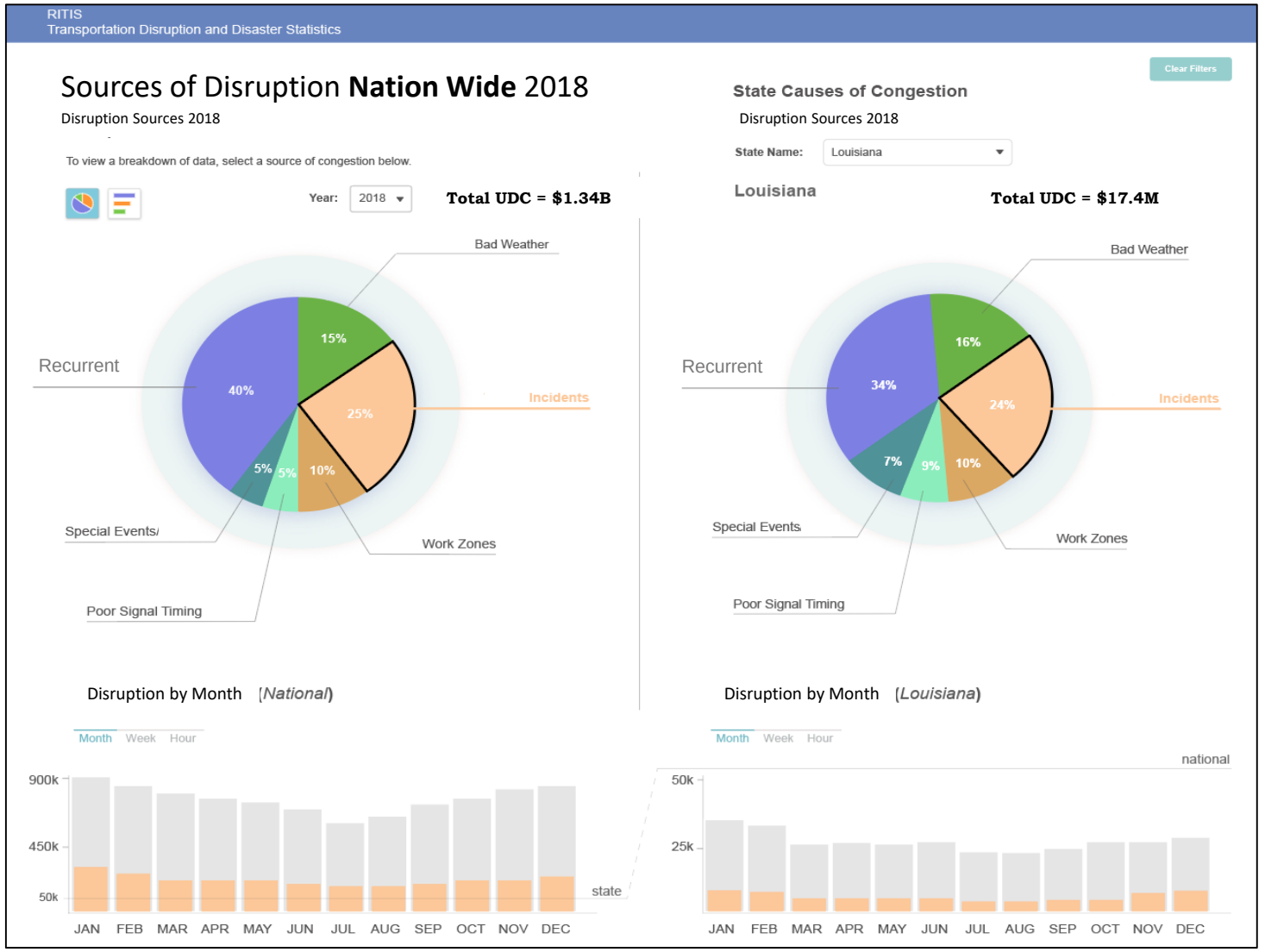
1. The 2004 categories in the chart above were renamed to match the categories in the MD and CO charts
2. The MD and CO results include multiple causes and unclassified disruption, the 2004 study did not

# Interface Design

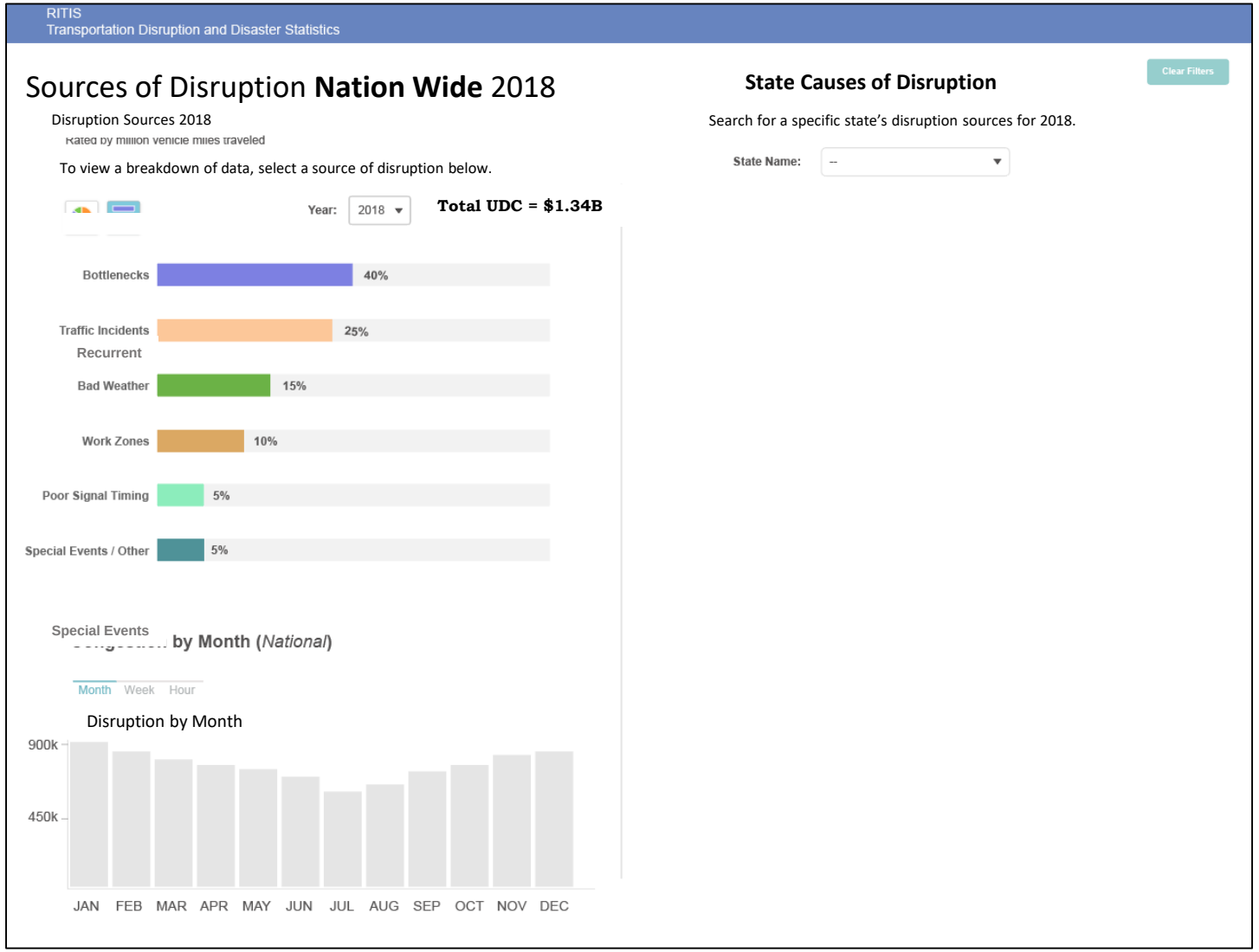
# Conceptual Interface Design



# Conceptual Interface Design

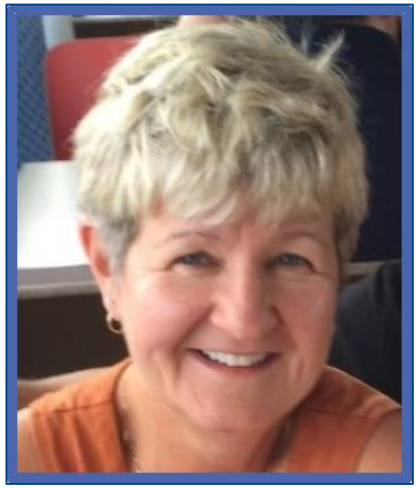


# Conceptual Interface Design



# Polling, Questions & Wrap Up

Denise Markow, PE, I-95 Corridor Coalition



# Poll Question #2 – Next Steps

2 What would you like to see as the next steps for this work?

___ **Take a deeper dive for the highway mode**

___ **Explore multiple modes**

___ **Not Sure**

# Poll Question #3 – Similar Work

3

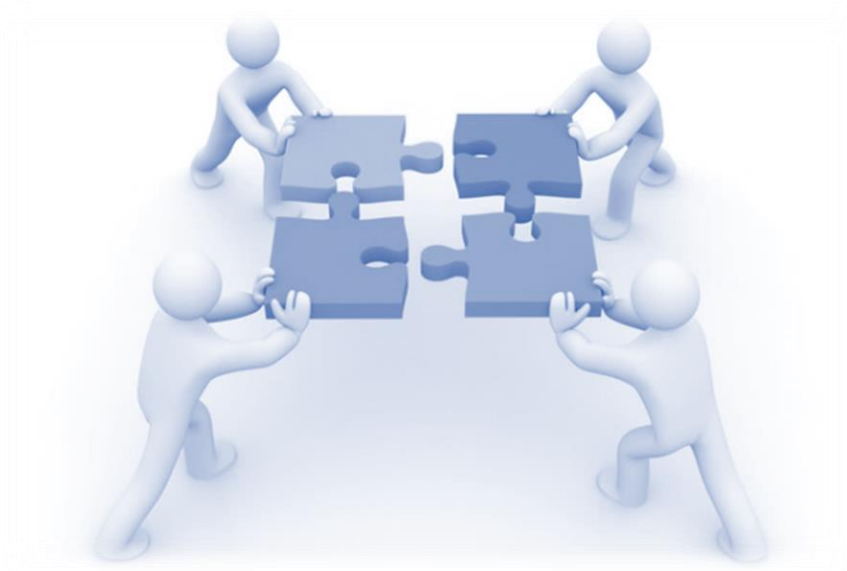
Are you aware of your agency working to develop a similar tool?

___ **Yes**

___ **No**

___ **Not my agency, but I have heard about other agencies doing this type of analysis**

# Questions?



# In Closing….

## Thank you for joining today

For Additional Information, please contact:

Denise Markow

Director, TSMO

I-95 Corridor Coalition

(301) 789-9088

dmarkow@i95coalition.org