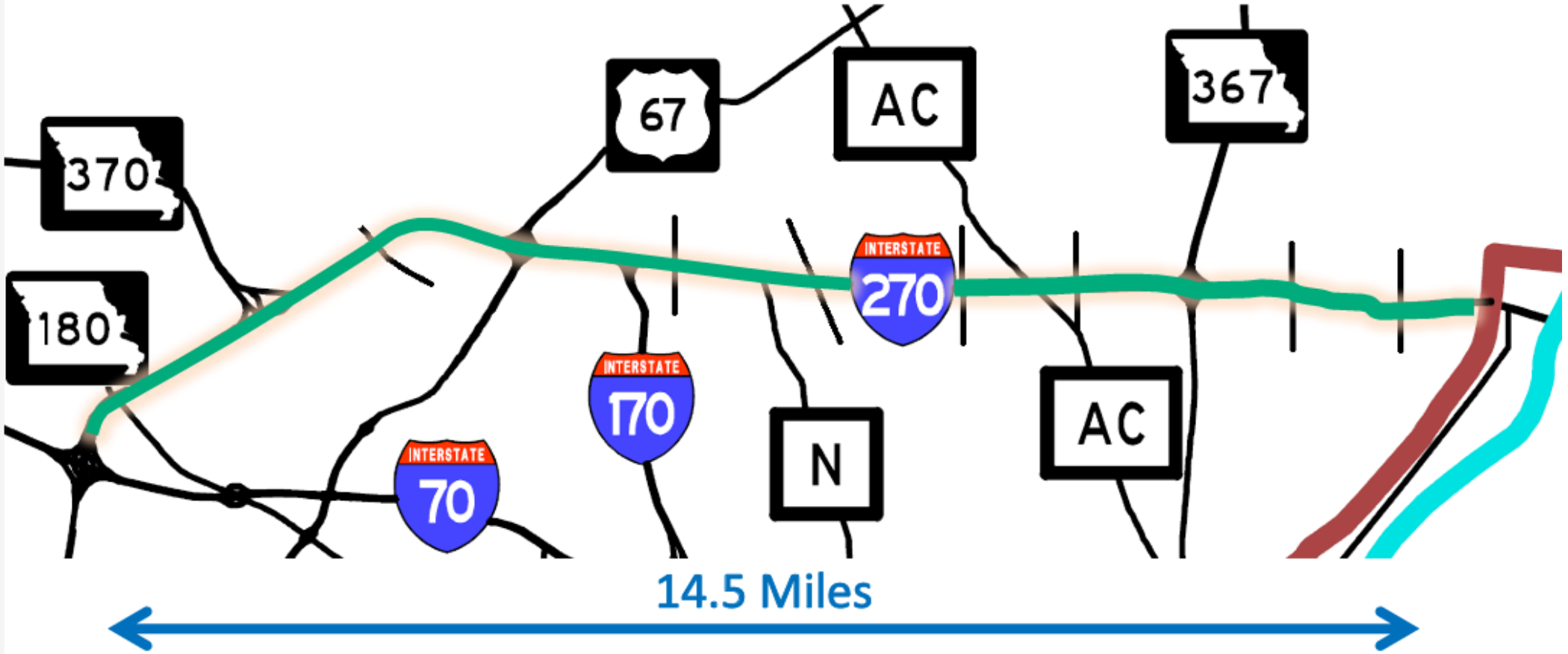
I-270 Predictive Layered Operation Initiatives

Ploisongsaeng Intaratip, MoDOT
Mike Dolde, WSP

I-270 North Project

- $278 million
- Safety, reliability, deteriorated infrastructures, and Non-motorized users
- Largest work zone area in the St. Louis
- 4 years duration

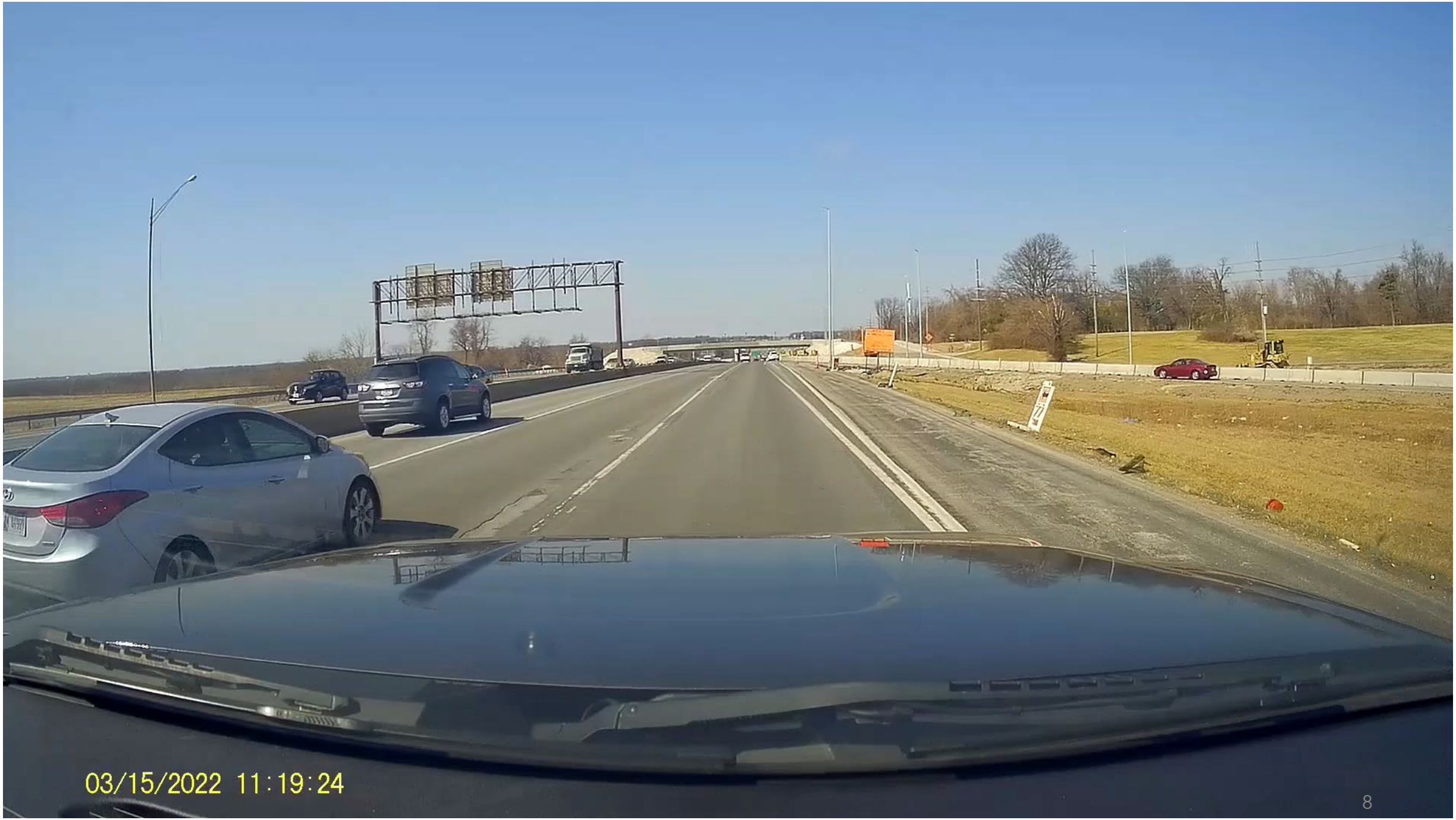
I-270 North Project



MoDOT | I-270 NORTH Build. Progress. Together. | MILLSTONE WEBER | PARSONS


COLLEGE
07/22/2022 14:39:55


12/05/2021 00:54:54


03/15/2022 11:19:24


12/13/2021 14:37:14

Newsroom

Press Releases

Speeches & Testimony

Media Contacts

Connect with Us

Contact Us

FHWA Office of Public Affairs - Nancy Singer
U.S. Department of Transportation, Federal Highway Administration, Office of Public Affairs
1200 New Jersey Avenue, SE
Washington, DC 20590
United States

Email: Nancy.Singer@dot.gov
Phone: 202-366-0660

If you are deaf, hard of hearing, or have a speech disability, please dial 7-1-1 to access telecommunications

U.S. Department of Transportation Awards $1 Million to Missouri's I-270 Predictive Layered Operations Initiative

Tuesday, June 16, 2020

FHWA10E-20
Contact: Nancy Singer
Tel.: (202) 366-0660

WASHINGTON – The U.S. Department of Transportation's Federal Highway Administration (FHWA) today awarded a $1 million Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) grant to the Missouri Department of Transportation for its Predictive Layered Operation Initiative (PLOI) on I-270. The ATCMTD program this year awarded grants valued at $43.3 million to ten projects that use cutting-edge technologies to improve mobility and safety for America's travelers.

"This $43.3 million in federal funding will advance innovative technologies that will improve mobility and safety in America's transportation network," said U.S. Transportation Secretary Elaine L. Chao.

The Missouri project will deploy a predictive analytics platform that uses complex algorithms based on traffic, weather and incident data to improve response and operations. The system will use predictive models that consider several different factors, traffic volumes, weather or special events, to determine the likelihood of crashes and identify response times. The project aims to improve public safety by modeling, for example, whether crashes would increase as the result of traffic increases from a major sporting event.

FHWA's ATCMTD program funds early deployments of forward-looking technologies that can serve as national models. This year, the grants will fund projects that use advanced real-time traveler information, vehicle communications technologies, artificial intelligence, regional approaches and bicycle-pedestrian safety features.

"The program selections this year aim to benefit communities across the country by improving safety and efficiency on our roads through the deployment of advanced technologies," said Federal Highway Administrator Nicole R. Nason. "State-of-the-art systems will improve winter maintenance and traffic incident management along I-270 in Missouri."

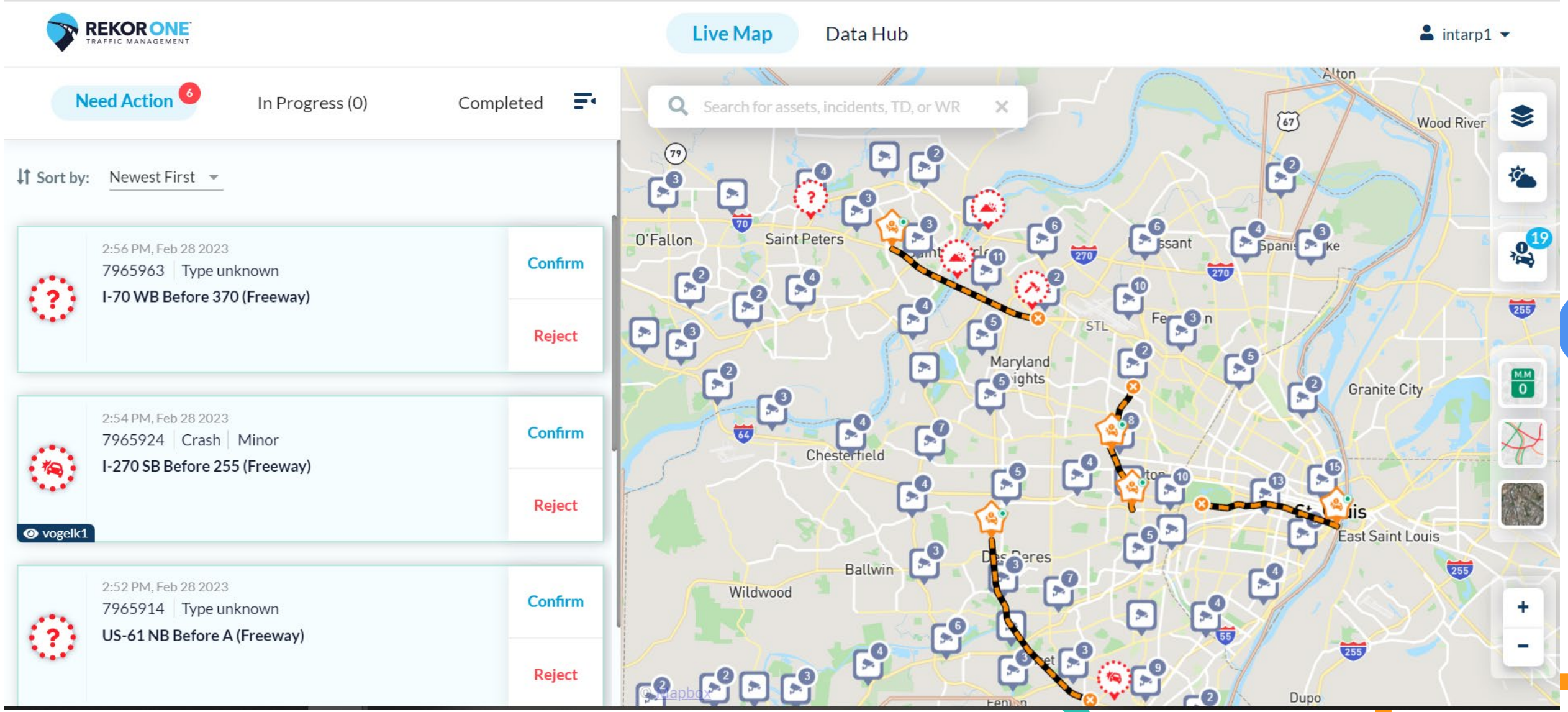
I-270 PLOI Goals

- Improve **Safety**
- Improve **Mobility**
- Improve MoDOT Emergency Response (ER) vehicle **response time**
- Improve return on **investment** and realize **cost savings**

Predictive Analytics

Rekor

- Crash Risk Area Prediction
- Incident Identification


REKOR ONE
TRAFFIC MANAGEMENT
Live Map
Data Hub
intarp1
Need Action 6
In Progress (0)
Completed
Sort by: Newest First
2:56 PM, Feb 28 2023
7965963 | Type unknown
I-70 WB Before 370 (Freeway)
Confirm
Reject
2:54 PM, Feb 28 2023
7965924 | Crash | Minor
I-270 SB Before 255 (Freeway)
Confirm
Reject
vogelk1
2:52 PM, Feb 28 2023
7965914 | Type unknown
US-61 NB Before A (Freeway)
Confirm
Reject
Search for assets, incidents, TD, or WR
O'Fallon
Saint Peters
Maryland Heights
Chesterfield
Wildwood
Ballwin
Granite City
East Saint Louis
Dupo
STL
Wood River
Alton
MM 0

REKOR ONE
TRAFFIC MANAGEMENT

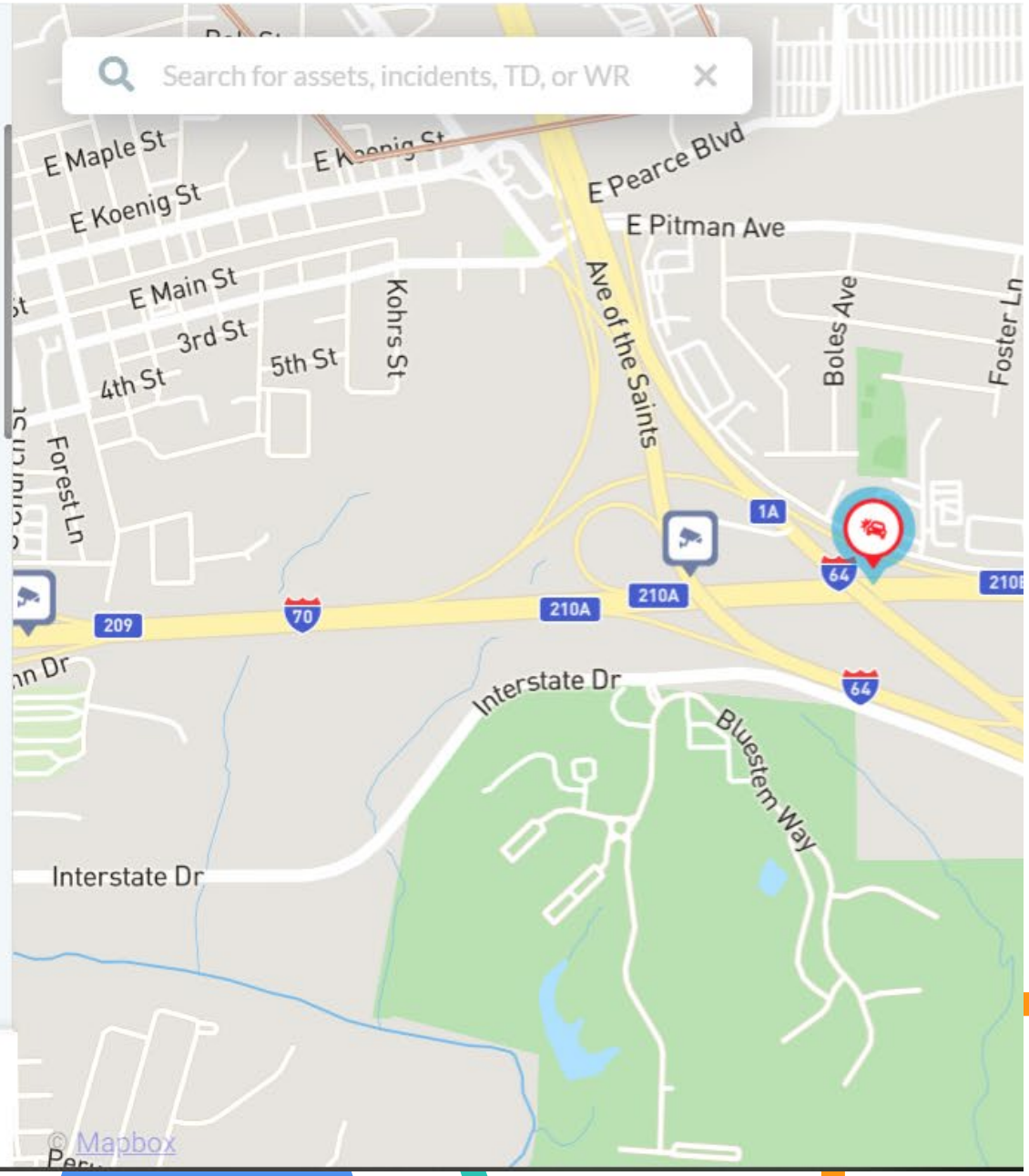
Live Map | Data Hub

CCTV (6) | DASHCAMS (0)

IS070W210.5_I64 Main

Share options

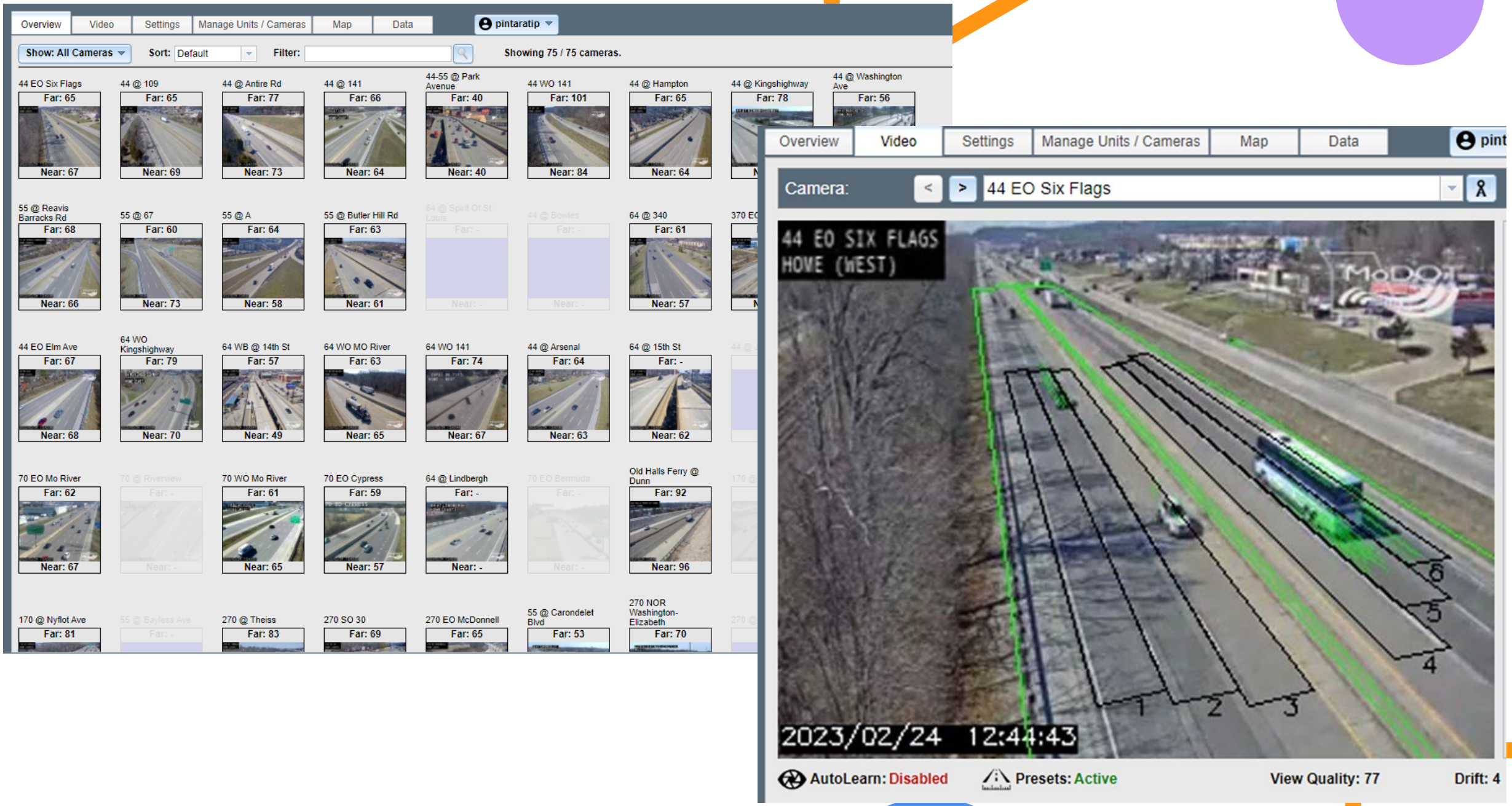
Edit



Video Analytics

Traffic Vision

- Incident Identification and Detection


Overview
Video
Settings
Manage Units / Cameras
Map
Data
pintaratip
Show: All Cameras
Sort: Default
Filter:
Showing 75 / 75 cameras.
44 EO Six Flags
Far: 65
Near: 67
44 @ 109
Far: 65
Near: 69
44 @ Antire Rd
Far: 77
Near: 73
44 @ 141
Far: 66
Near: 64
44-55 @ Park Avenue
Far: 40
Near: 40
44 WO 141
Far: 101
Near: 84
44 @ Hampton
Far: 65
Near: 64
44 @ Kingshighway
Far: 78
44 @ Washington Ave
Far: 56
55 @ Reavis Barracks Rd
Far: 68
Near: 66
55 @ 67
Far: 60
Near: 73
55 @ A
Far: 64
Near: 58
55 @ Butler Hill Rd
Far: 63
Near: 61
64 @ 340
Far: 61
Near: 57
44 EO Elm Ave
Far: 67
Near: 68
64 WO Kingshighway
Far: 79
Near: 70
64 WB @ 14th St
Far: 57
Near: 49
64 WO MO River
Far: 63
Near: 65
64 WO 141
Far: 74
Near: 67
44 @ Arsenal
Far: 64
Near: 63
64 @ 15th St
Far: -
Near: 62
70 EO Mo River
Far: 62
Near: 67
70 WO Mo River
Far: 61
Near: 65
70 EO Cypress
Far: 59
Near: 57
64 @ Lindbergh
Far: -
Near: -
Old Halls Ferry @ Dunn
Far: 92
Near: 96
170 @ Nyflot Ave
Far: 81
270 @ Theiss
Far: 83
270 SO 30
Far: 69
270 EO McDonnell
Far: 65
55 @ Carondelet Blvd
Far: 53
270 NOR Washington-Elizabeth
Far: 70
Overview
Video
Settings
Manage Units / Cameras
Map
Data
pint
Camera:
44 EO Six Flags
44 EO SIX FLAGS
HOVE (WEST)
MoDOT
1
2
3
4
5
6
2023/02/24 12:44:43
AutoLearn: Disabled
Presets: Active
View Quality: 77
Drift: 4

Pedestrian Detection

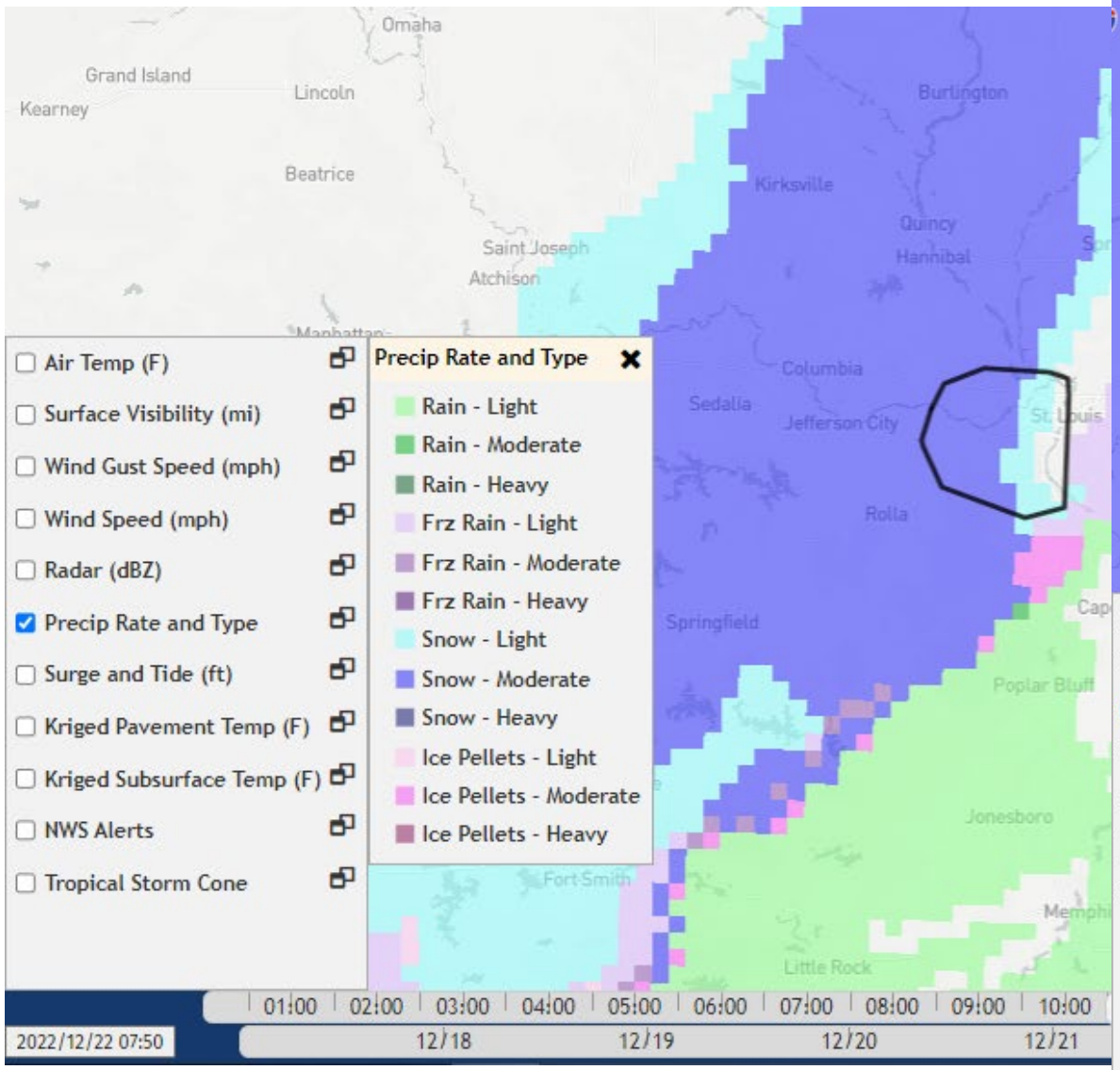
Stopped Vehicle Detection

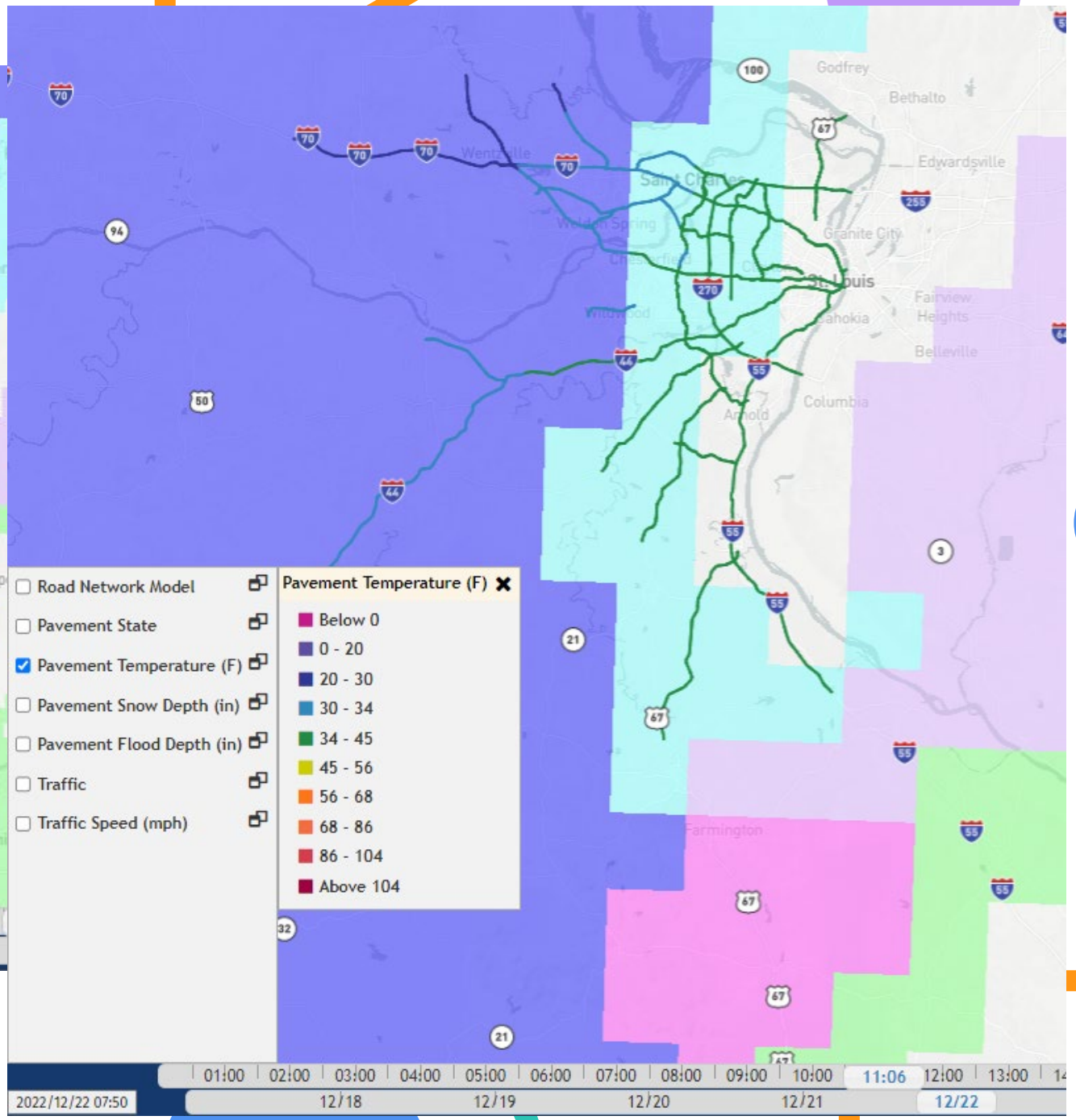
Congestion Detection

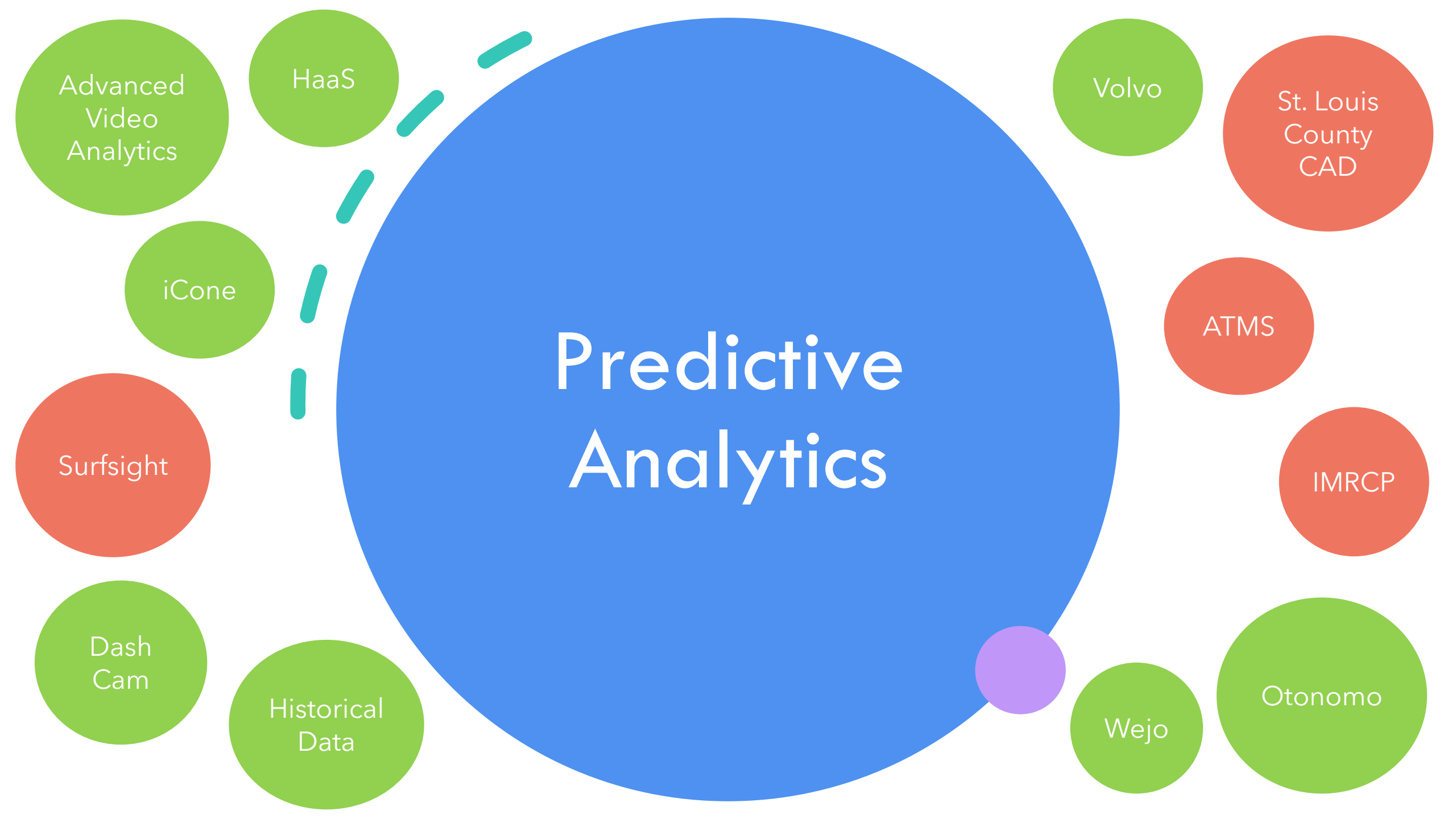
Weather Analytics

Synesis

- Integrated Modeling Road Condition Prediction (IMRCP)


Omaha
Grand Island
Lincoln
Kearney
Beatrice
Burlington
Kirksville
Quincy
Hannibal
Saint Joseph
Atchison
Columbia
Sedalia
Jefferson City
St. Louis
Rolla
Springfield
Poplar Bluff
Jonesboro
Fort Smith
Little Rock
Air Temp (F)
Surface Visibility (mi)
Wind Gust Speed (mph)
Wind Speed (mph)
Radar (dBZ)
Precip Rate and Type
Surge and Tide (ft)
Kriged Pavement Temp (F)
Kriged Subsurface Temp (F)
NWS Alerts
Tropical Storm Cone
Precip Rate and Type
Rain - Light
Rain - Moderate
Rain - Heavy
Frz Rain - Light
Frz Rain - Moderate
Frz Rain - Heavy
Snow - Light
Snow - Moderate
Snow - Heavy
Ice Pellets - Light
Ice Pellets - Moderate
Ice Pellets - Heavy
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
2022/12/22 07:50
12/18
12/19
12/20
12/21


Godfrey
Bethalto
Edwardsville
Granite City
St. Louis
Fairview Heights
Belleville
Columbia
Arnold
Farmington
Road Network Model
Pavement State
Pavement Temperature (F)
Pavement Snow Depth (in)
Pavement Flood Depth (in)
Traffic
Traffic Speed (mph)
Pavement Temperature (F)
Below 0
0 - 20
20 - 30
30 - 34
34 - 45
45 - 56
56 - 68
68 - 86
86 - 104
Above 104
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:06
12:00
13:00
2022/12/22 07:50
12/18
12/19
12/20
12/21
12/22


Advanced Video Analytics
HaaS
Volvo
St. Louis County CAD
iCone
ATMS
Surfsight
IMRCP
Predictive Analytics
Dash Cam
Historical Data
Wejo
Otonomo

Verification & Evaluation

- Verify **accuracy** of each platform
- Evaluate **effectiveness** of each platform
- Calculate return on **investment** and realize **cost savings**
- Document **lessons learned**
- Make **recommendation** for continued use of technologies

Verification

Rekor

- Accuracy of Crash Risk Areas
- Accuracy of Incident Detection

TrafficVision

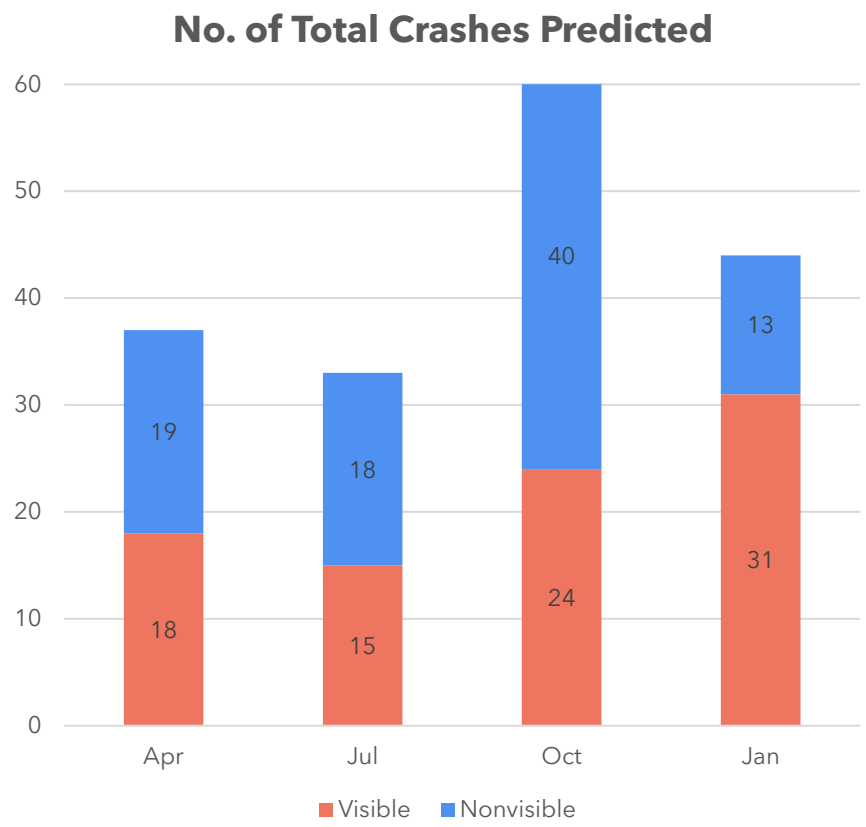
- Accuracy of Each Alert Type
- Identification of Locations with Most Alerts

IMRCP

- Accuracy of Road Predictions During Winter Weather Events

Rekor Verification Results

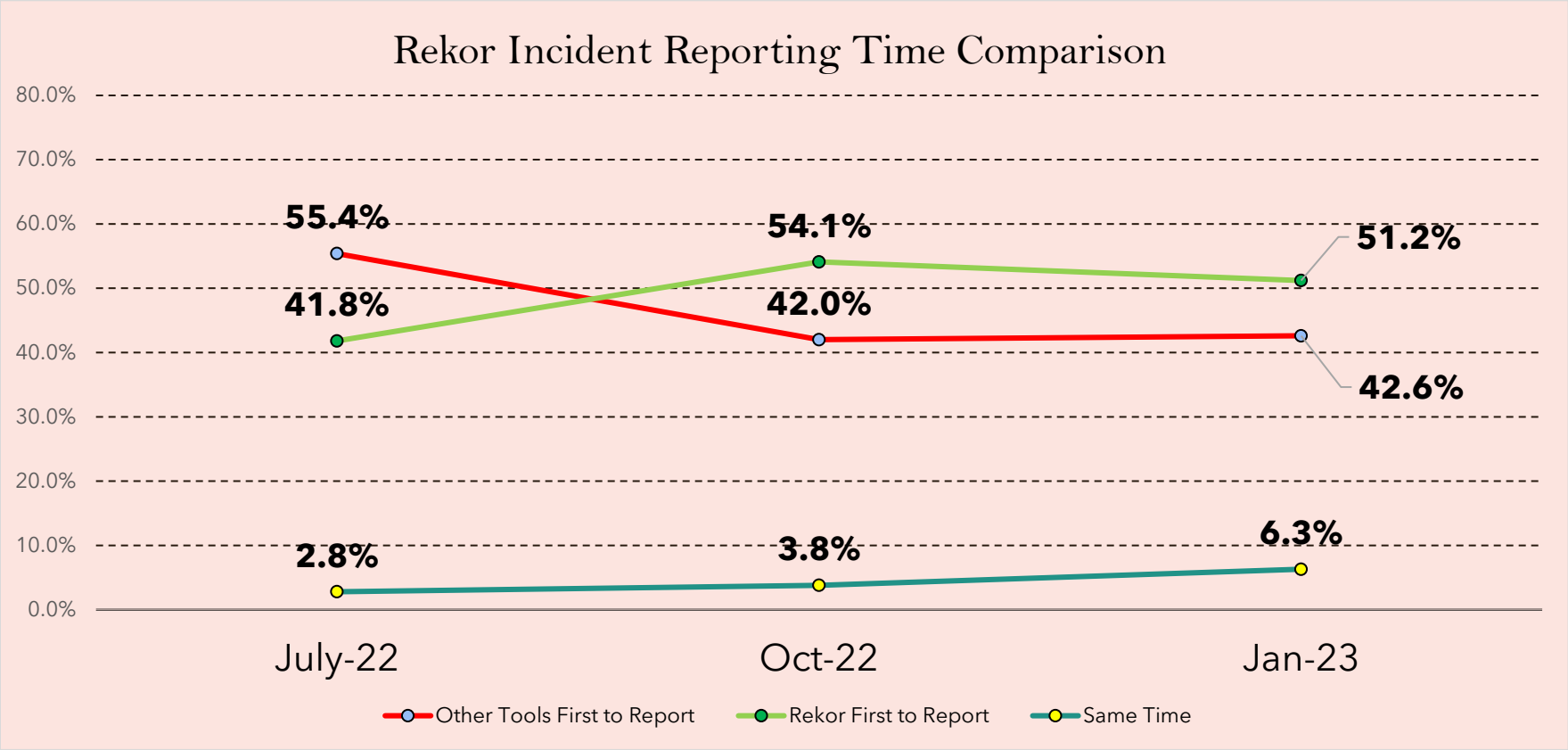
Crash Risk Areas



January Crash Risk Areas
752 Visible & 351 Non-Visible

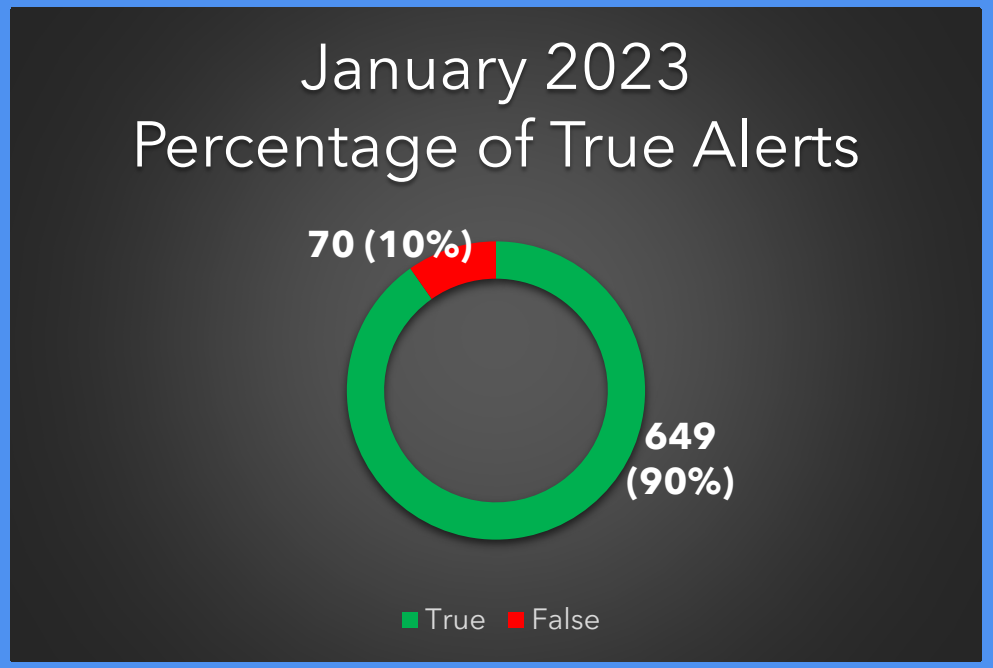
Incident Detection Comparison

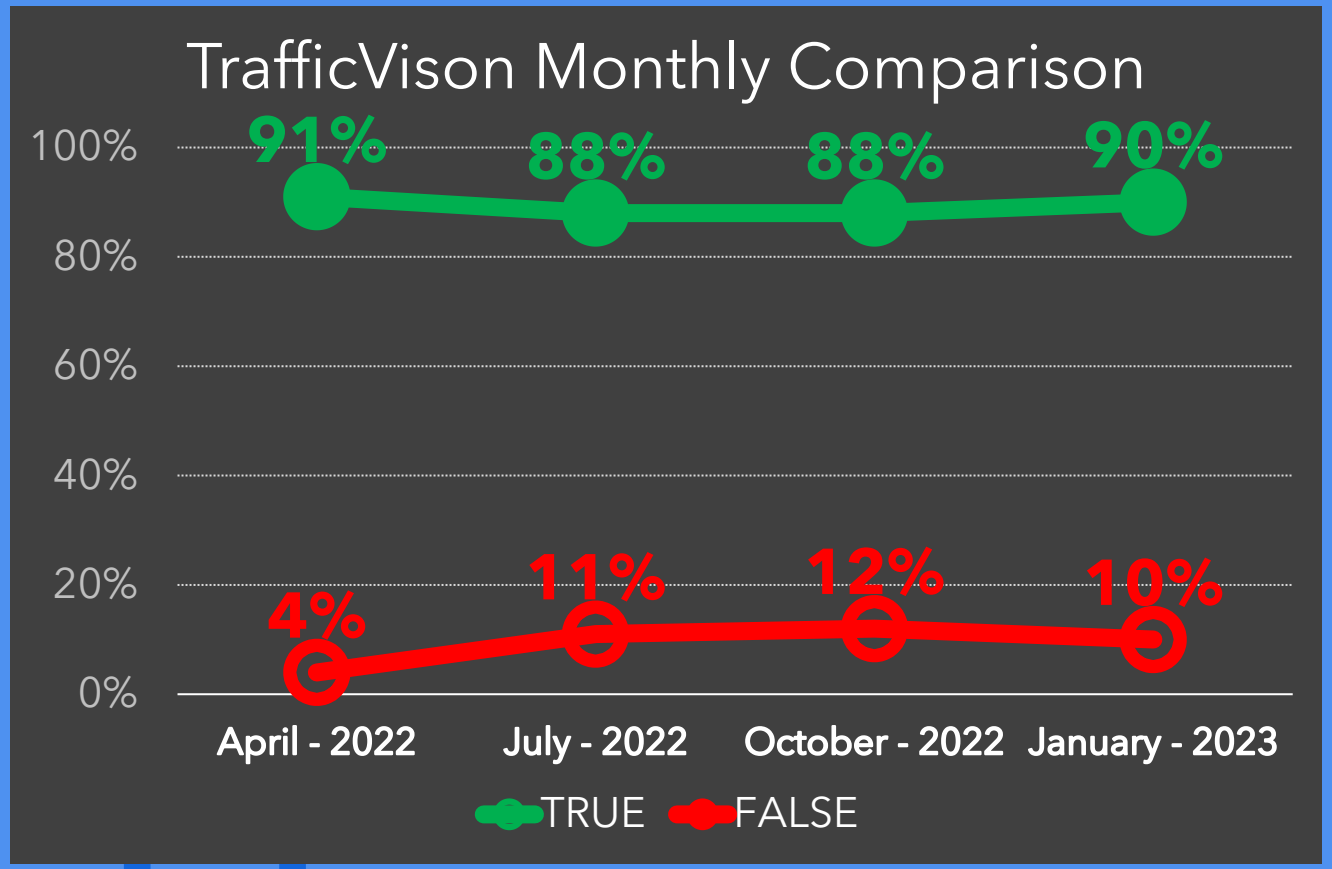
Rekor vs. Standard Operating Procedures



Rekor Verification Results

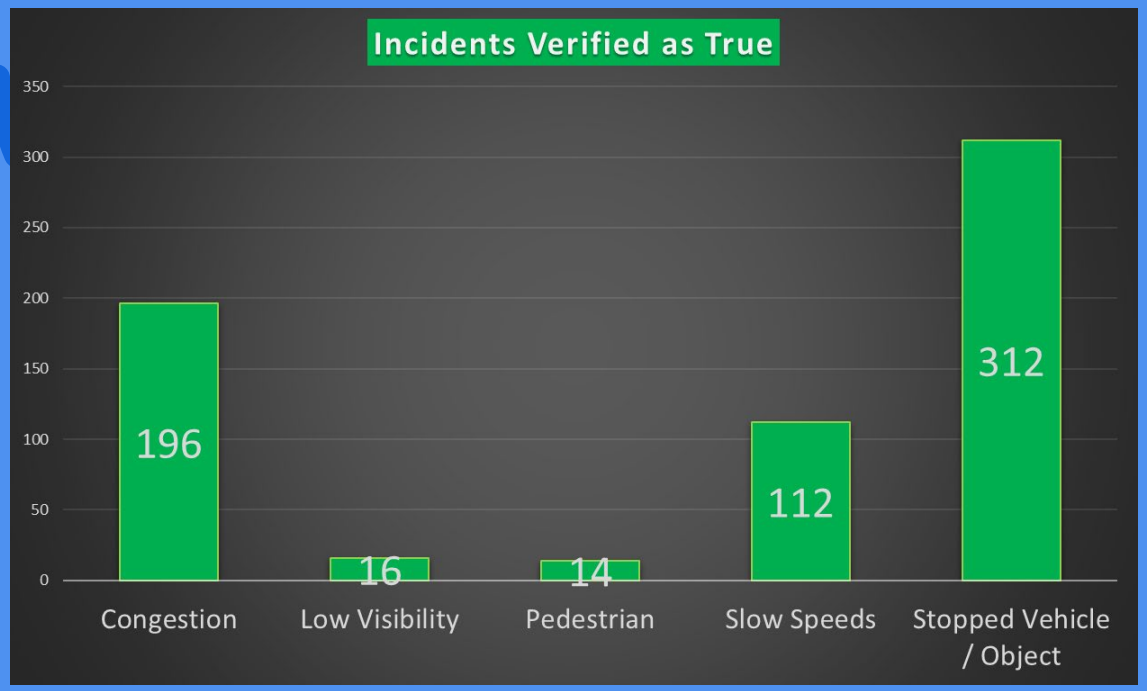
TrafficVision Verification Results

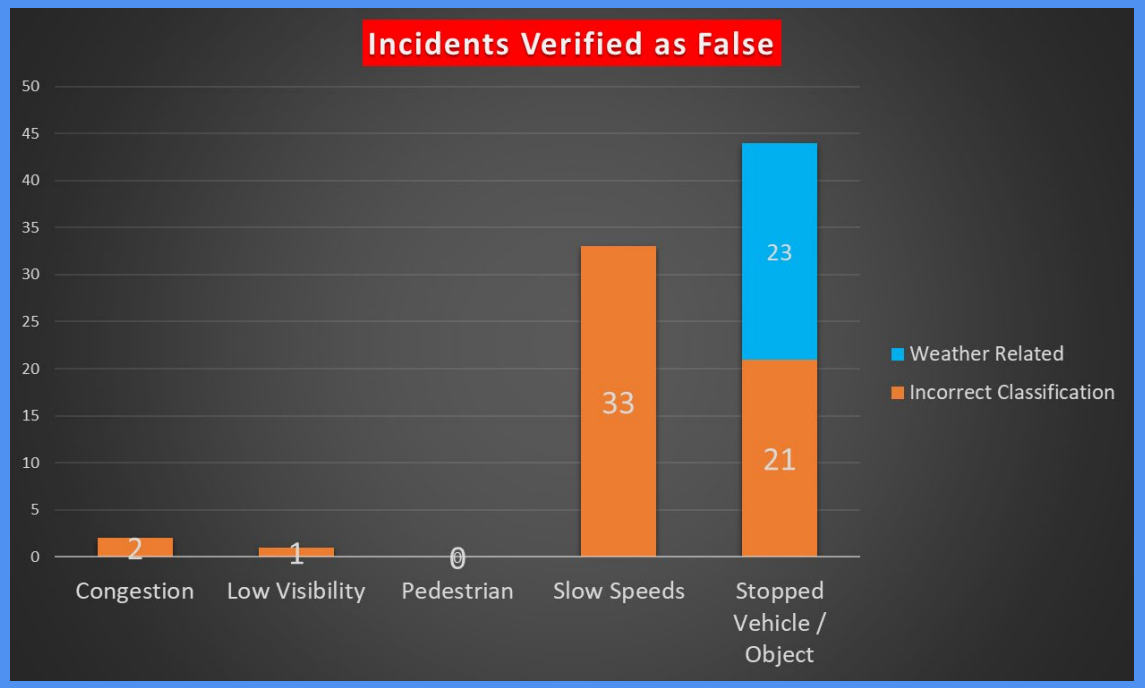




Verification of Incident Alerts

TrafficVision Verification Results

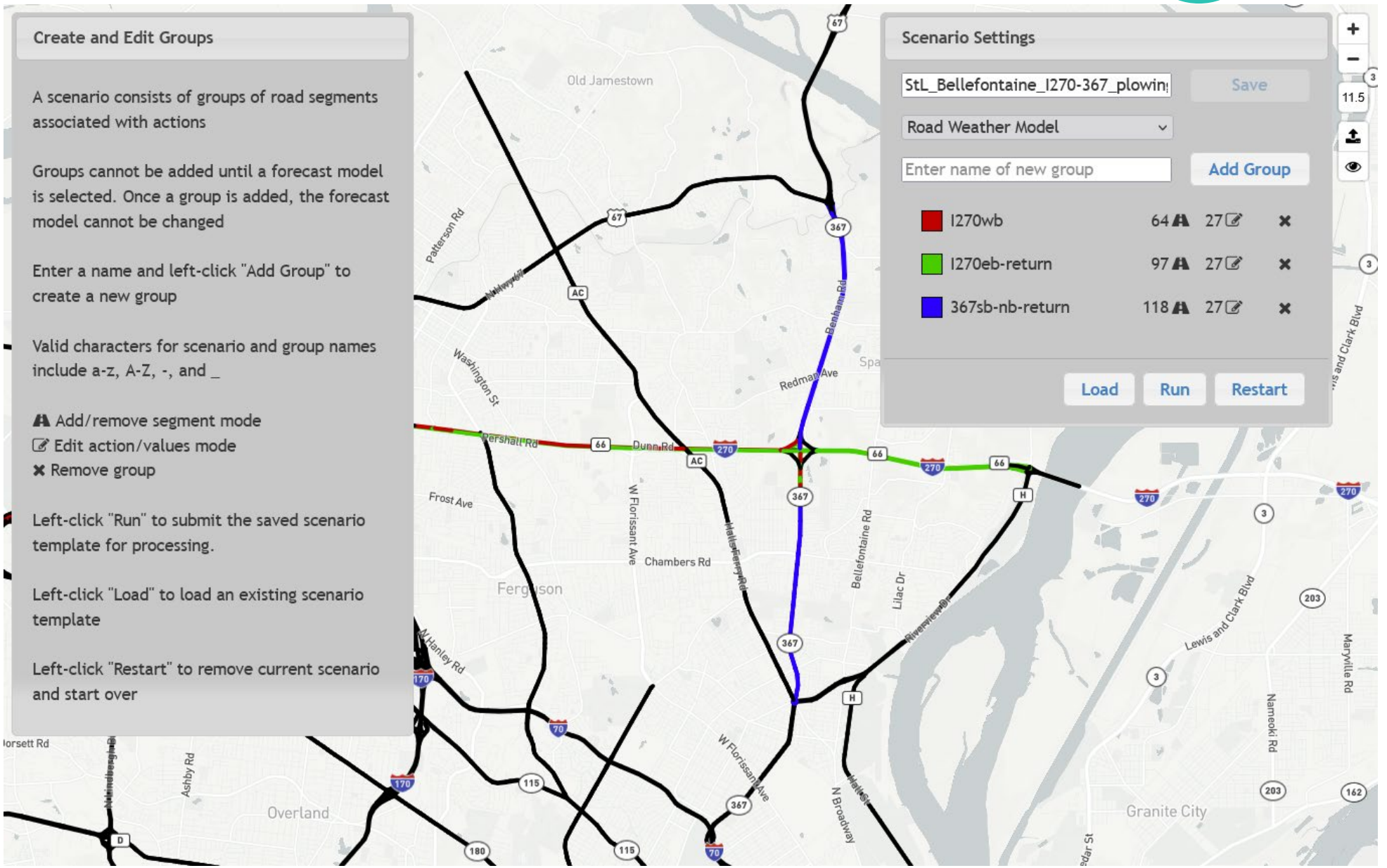




Composition of True and False Alerts – January 2023

IMRCP

1/25/2023 Winter Weather Event



Benefit-Cost Evaluation

Potential Future Benefits were calculated for all technologies combined using:

- **MO-specific** Comprehensive Crash Unit Cost
- Costs Related to Cash Delay, Value of Time and Emission
- Potential Cost Incurred by Police and Other Agencies

Benefit-Cost Analysis:

Input Data:

- Crash Data w/ MO Specific **Comprehensive Unit Cost** (2022-2026)
- **Vehicle Delay Hours** by Crash Severity and Roadway Type
- **Average Value of Travel** (VOT) per Hour by Road Type
- Net increase in and **cost of fuel consumption** for different crash types
- Historic **Gasoline Prices** in St. Louis (2021-2023)
- Estimated Value of **Net Emissions/Crash** by Facility Type
- Hourly **Cost of Police Patrol** in St. Louis Region (includes Median wage, OH, Annual Benefits, Fuel, Maintenance, Insurance cost etc.)
- **Cost of Service Procurement** (Location Prediction and Incident Identification Tool/ Advanced Video Analytics/ IMRCP)
- **MoDOT TMC Cost**
- **Interagency Communication Cost**

Comprehensive Crash Unit Cost for Missouri (2022-2026, Source: MoDOT)

Severity	Comprehensive Crash Unit Cost (2023 MO)
K	$11,653,800
A	$675,800
B / C	$175,800
O	$12,300

Benefit-Cost Analyis:

Cost of Police Deployment in Different Scenarios

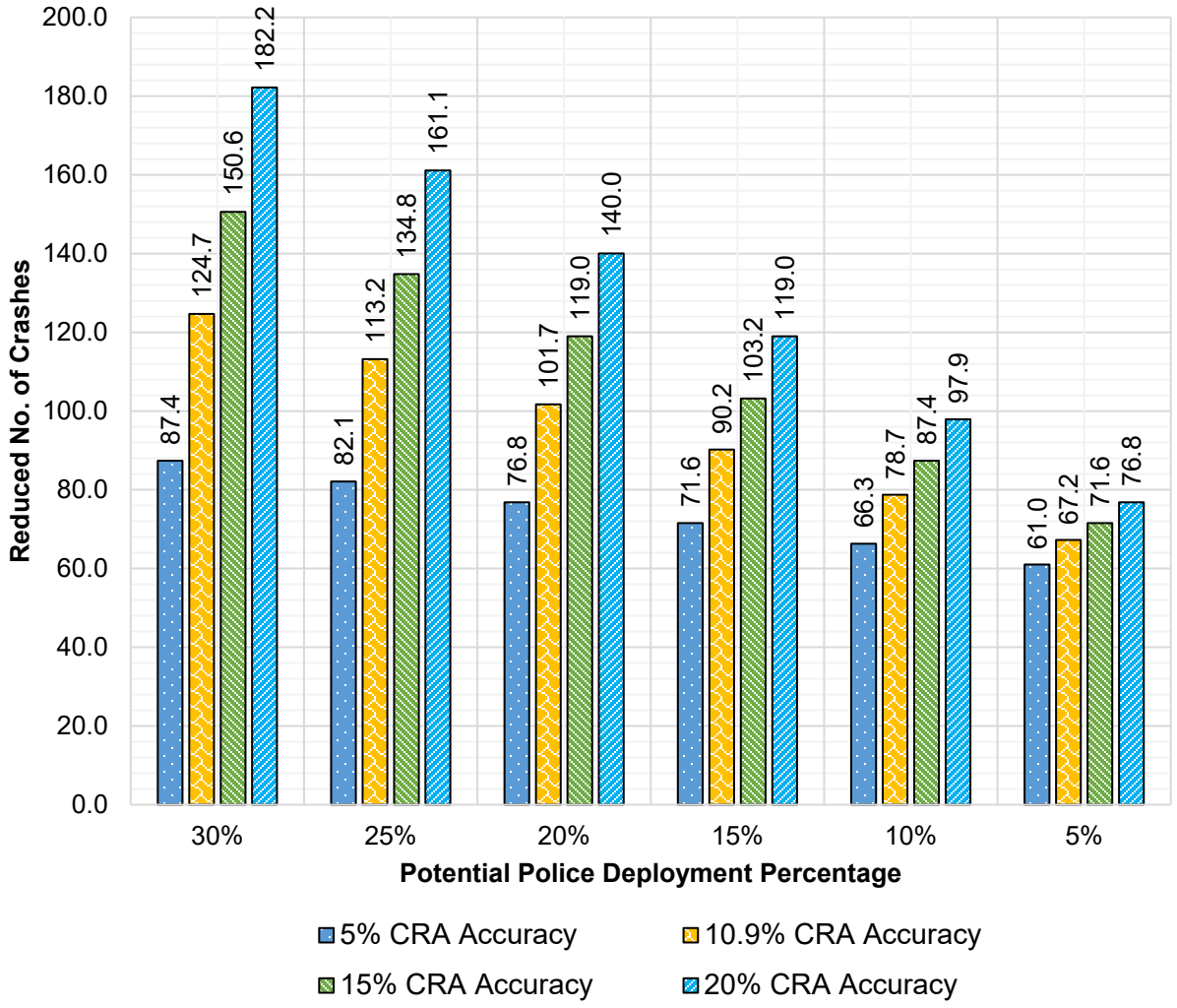
Police Deployment	No. of Events	Hours Per Event	Cost of Patrol/Day	Cost Per Year		
				Weekdays	Weekends	7-Days
30%	5.0	1	$600	$156,000	$62,400	$218,400
25%	4.2	1	$500	$130,000	$52,000	$182,000
20%	3.3	1	$400	$104,000	$41,600	$145,600
15%	2.5	1	$300	$78,000	$31,200	$109,200
10%	1.7	1	$200	$52,000	$20,800	$72,800
5%	0.8	1	$100	$26,000	$10,400	$36,400
0%	0.0	1	$0	$0	$0	$0

- Bureau of Labor Statistics were used for median salary of St. Louis Region Police

Potential Reduction in Overall Crashes:

Potential Crash Reduction using Police Patrol with:

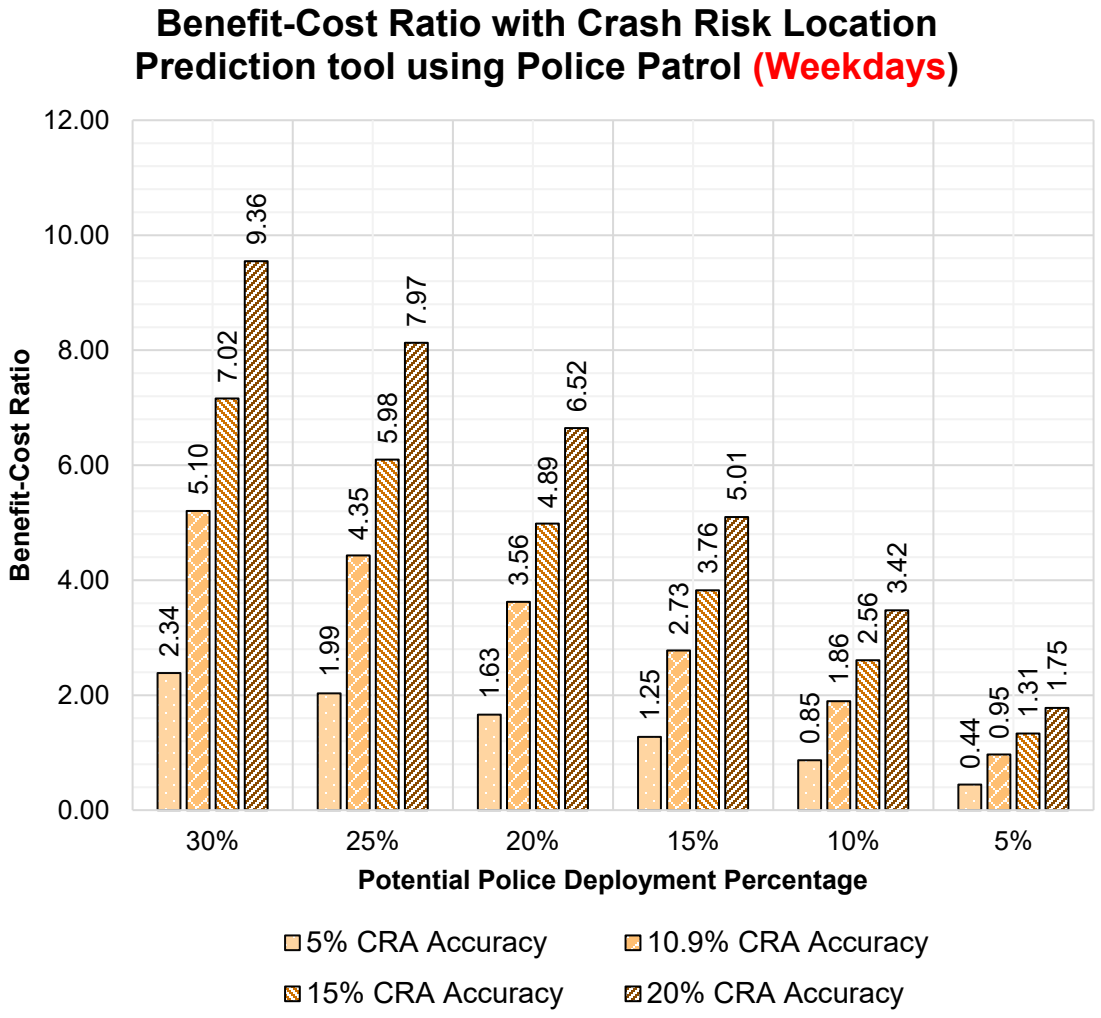
- **Crash Risk Location Prediction**
- **Incident Identification**
- **Advanced Video Analytics tool**



Benefit Cost Ratio

Benefit-Cost Ratio for Weekdays using Police Patrol with:

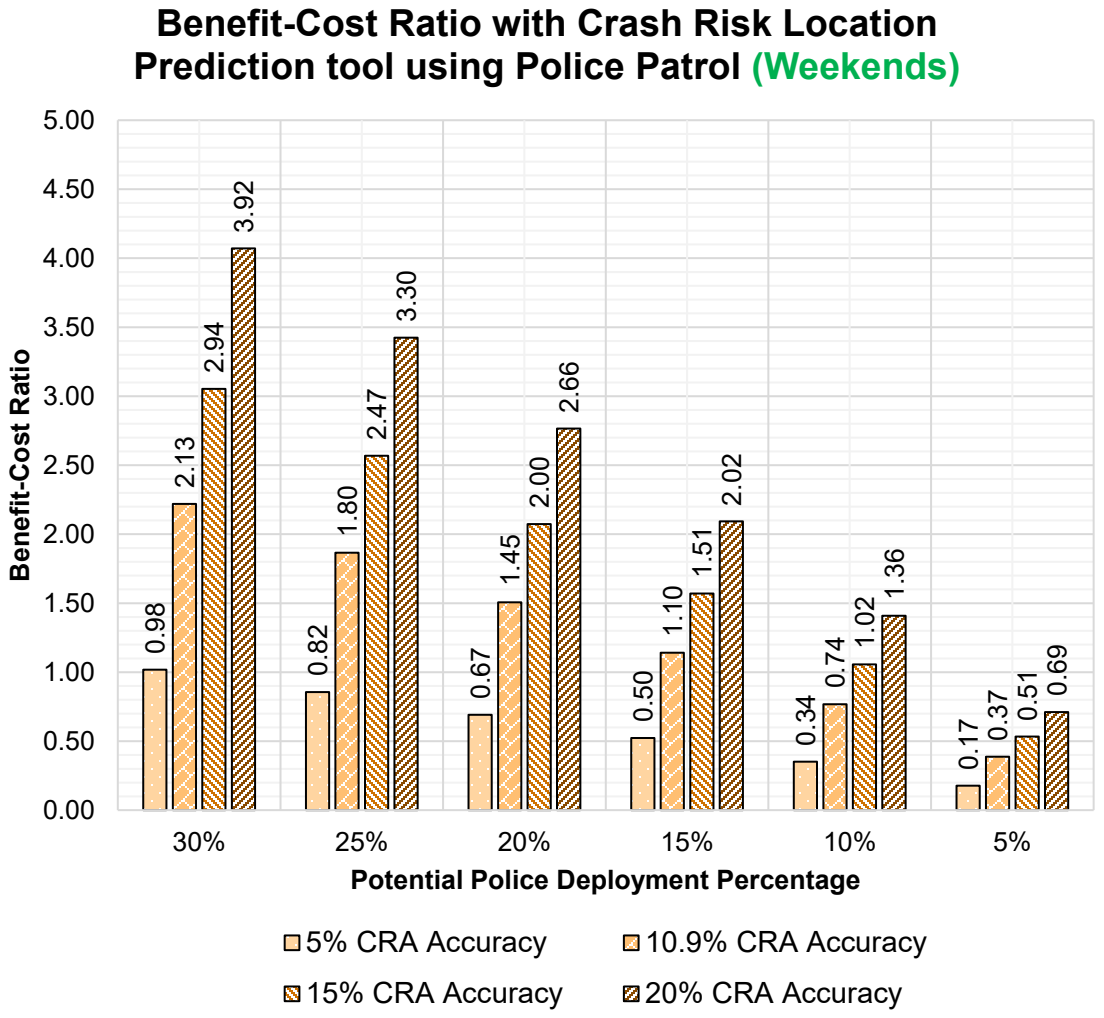
- **Crash Risk Location Prediction**
- **Incident Identification**
- **Trafficvision's Advanced Video Analytics**



Benefit Cost Ratio

Benefit-Cost Ratio for Weekends using Police Patrol with:

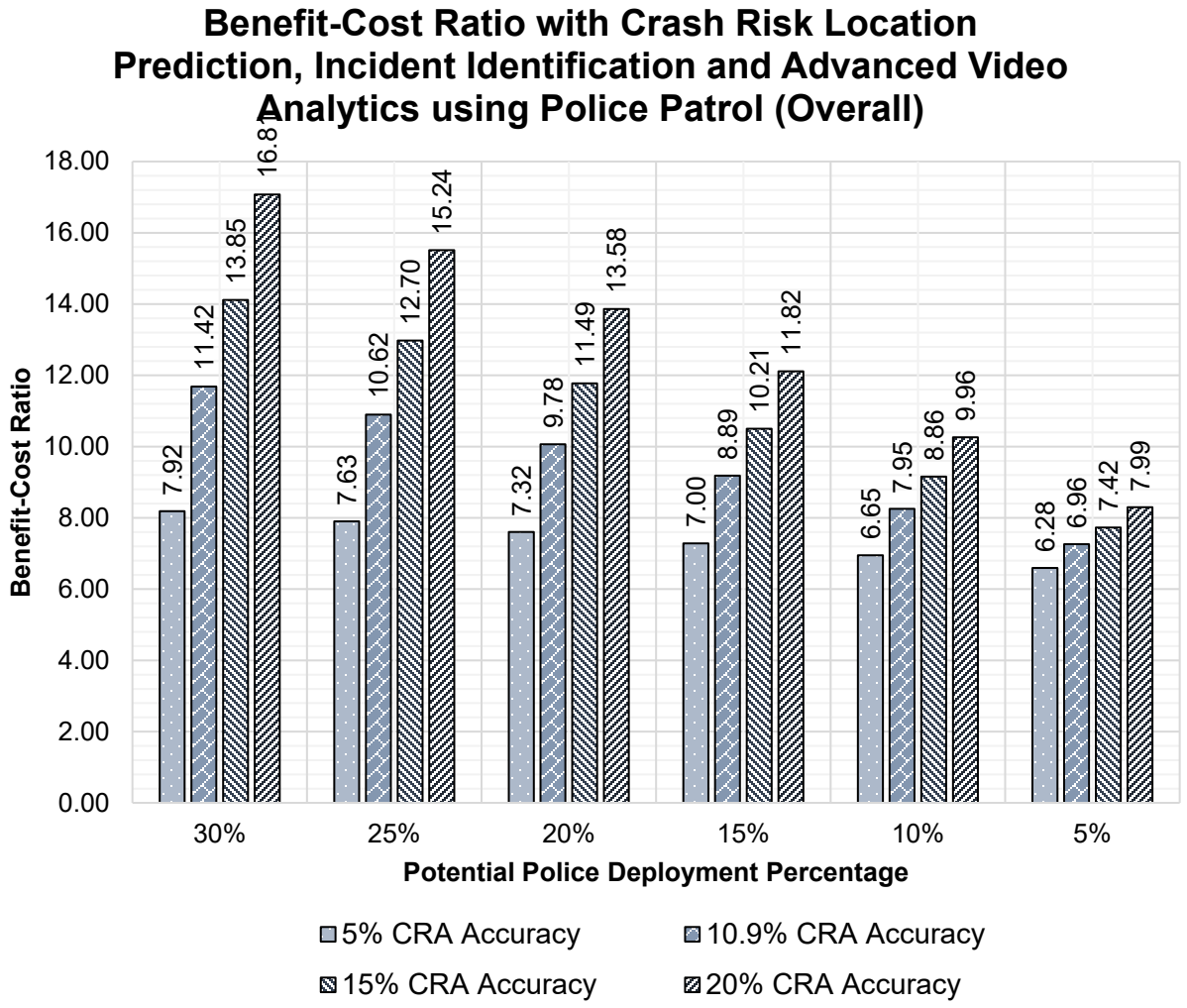
- **Crash Risk Location Prediction**
- **Incident Identification**
- **Trafficvision's Advanced Video Analytics**



Benefit Cost Ratio

Benefit-Cost Ratio Overall using Police Patrol with:

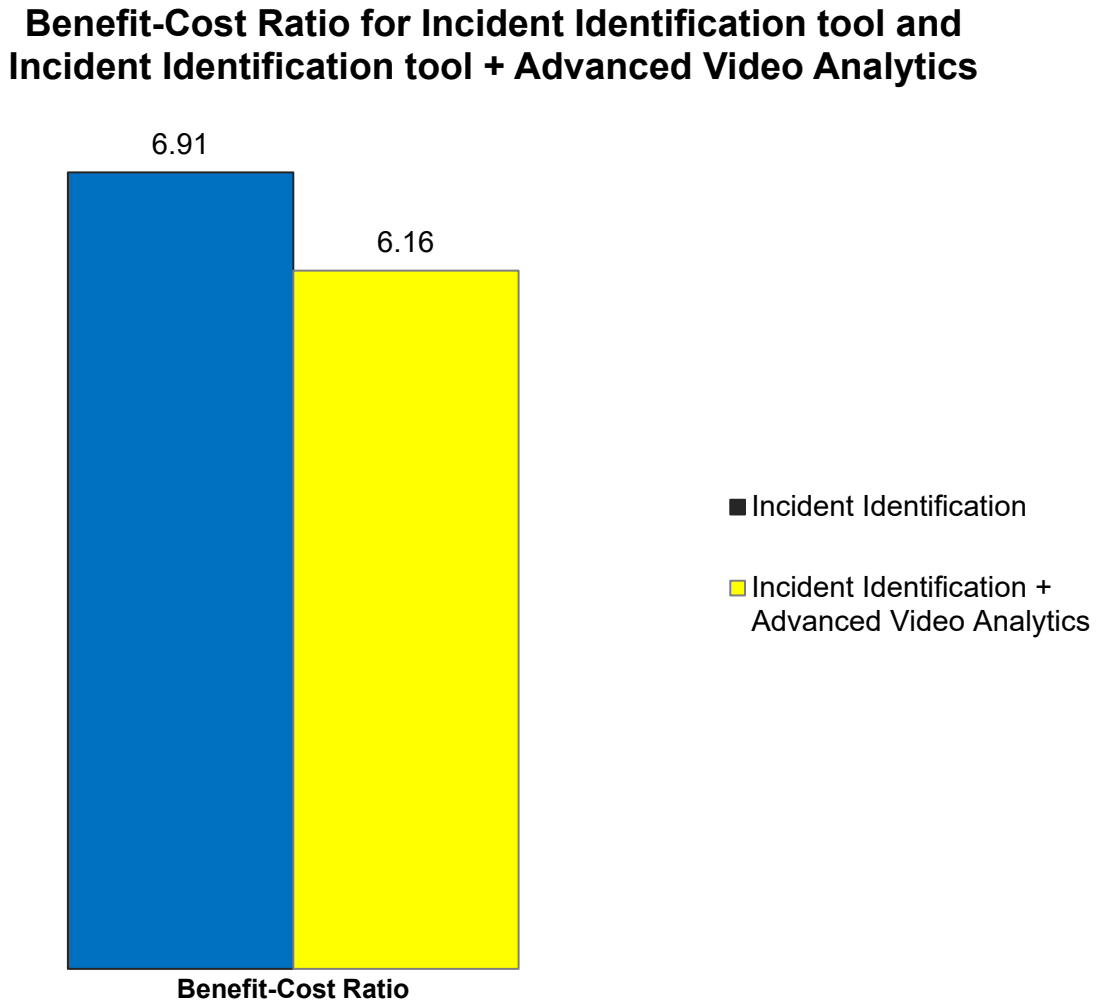
- **Crash Risk Location Prediction**
- **Incident Identification**
- **Trafficvision's Advanced Video Analytics**



Benefit Cost Ratio

Benefit-Cost Ratio with no Police Deployment:

- **Rekor Incident Identification**
- **Trafficvision's Advanced Video Analytics**



Evaluation - Staff Interviews

TMC Operators

- **Benefits:**
  - Rekor and TrafficVision identify unknown incidents
  - Helps pinpoint location of incidents
- **Difficulties:**
  - Duplicate incident listings create additional work

Emergency Response Operators

- **Benefits:**
  - Gives operators map of incidents
  - Rekor reduces radio traffic
- **Difficulties:**
  - GPS location issues
  - Cannot keep tablet on while driving
  - Safety protocols prevent full use

MoDOT Supervisors and Managers

- **Benefits:**
  - Consolidated Information
  - Creates historical data
  - Provides organizational experience
- **Difficulties:**
  - Not all platforms were user ready
  - Prediction accuracy

Lessons Learned

- Internal and External knowledge and expectations
- Level of trust in data and result
- Frequency of use
- Data availability, relevance, and cost
- Staffing levels
- Integration of multiple technologies
- Weather
- Rules, policies, requirements, etc.
- Duration of the project
- Report

Thank you

Ploisongsaeng Intaratip, MoDOT

Ploisongsaeng.Intaratip@modot.mo.gov

Mike Dolde, WSP

Michael.dolde@wsp.com