NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

TRB Webinar: Utilizing External Data Sources for Maintenance Decision Making

December 13, 2024

1:00 – 2:30 PM

PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at TRBwebinar@nas.edu

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AICP Credit Information

1.5 American Institute of Certified Planners Certification Maintenance Credits

You must attend the entire webinar

Log into the American Planning Association website to claim your credits

Contact AICP, not TRB, with questions

Purpose Statement

This webinar will explore how state agencies are utilizing external data sources for maintenance decision making. Presenters will discuss how automated vehicle location, crowd sources, and connected autonomous vehicle data can improve maintenance and operations of the transportation network.

Learning Objectives

At the end of this webinar, you will be able to:

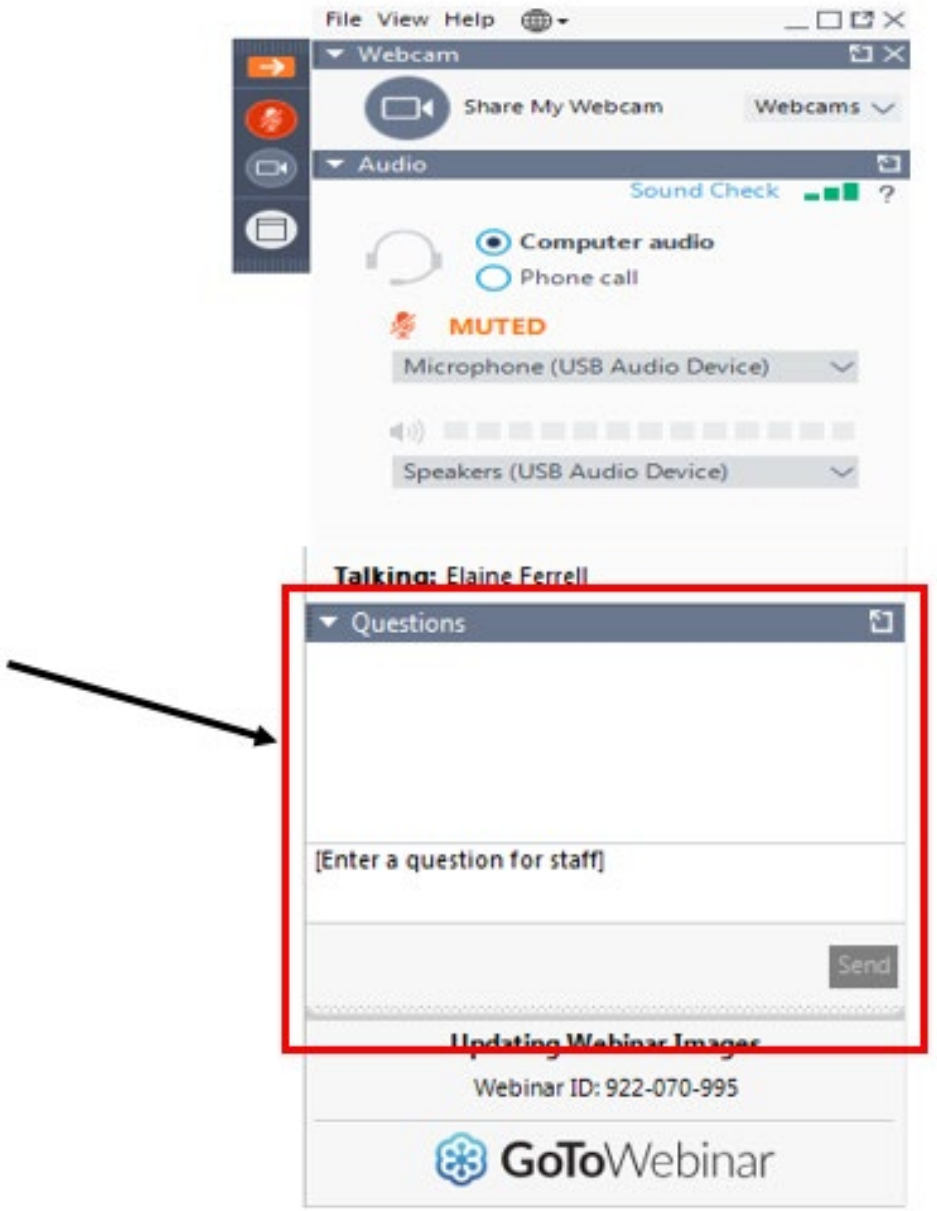
(1) Assess different external data sources

(2) Identify potential scenarios for external data in maintenance and operations

(3) Evaluate value for external data

Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



Today's Presenters

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Nick Hegemier
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Transformational Telematics For MnDOT Decision Making

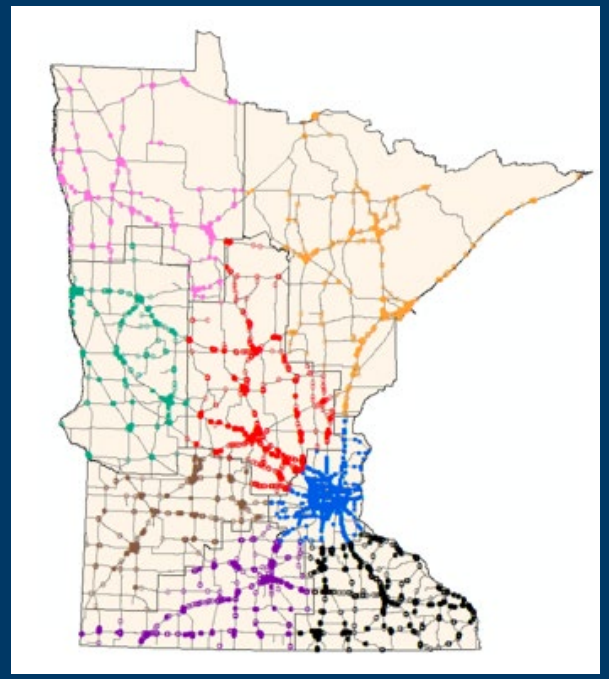
Trisha Stefanski, P.E.

Asset Management Program Office Manager

Telematics

“the branch of information technology which deals with the long-distance transmission of computerized information.”

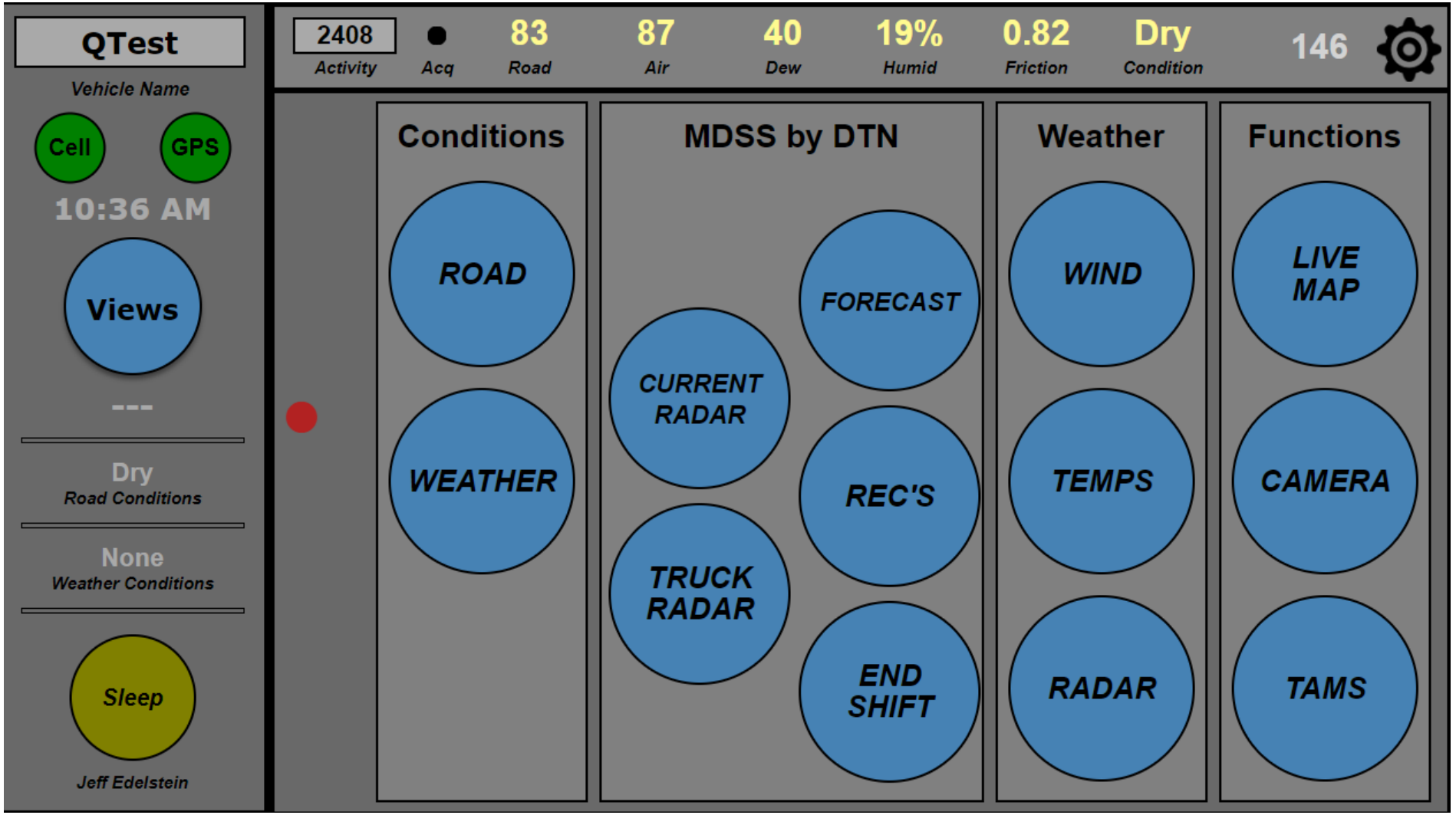
Minnesota Nice



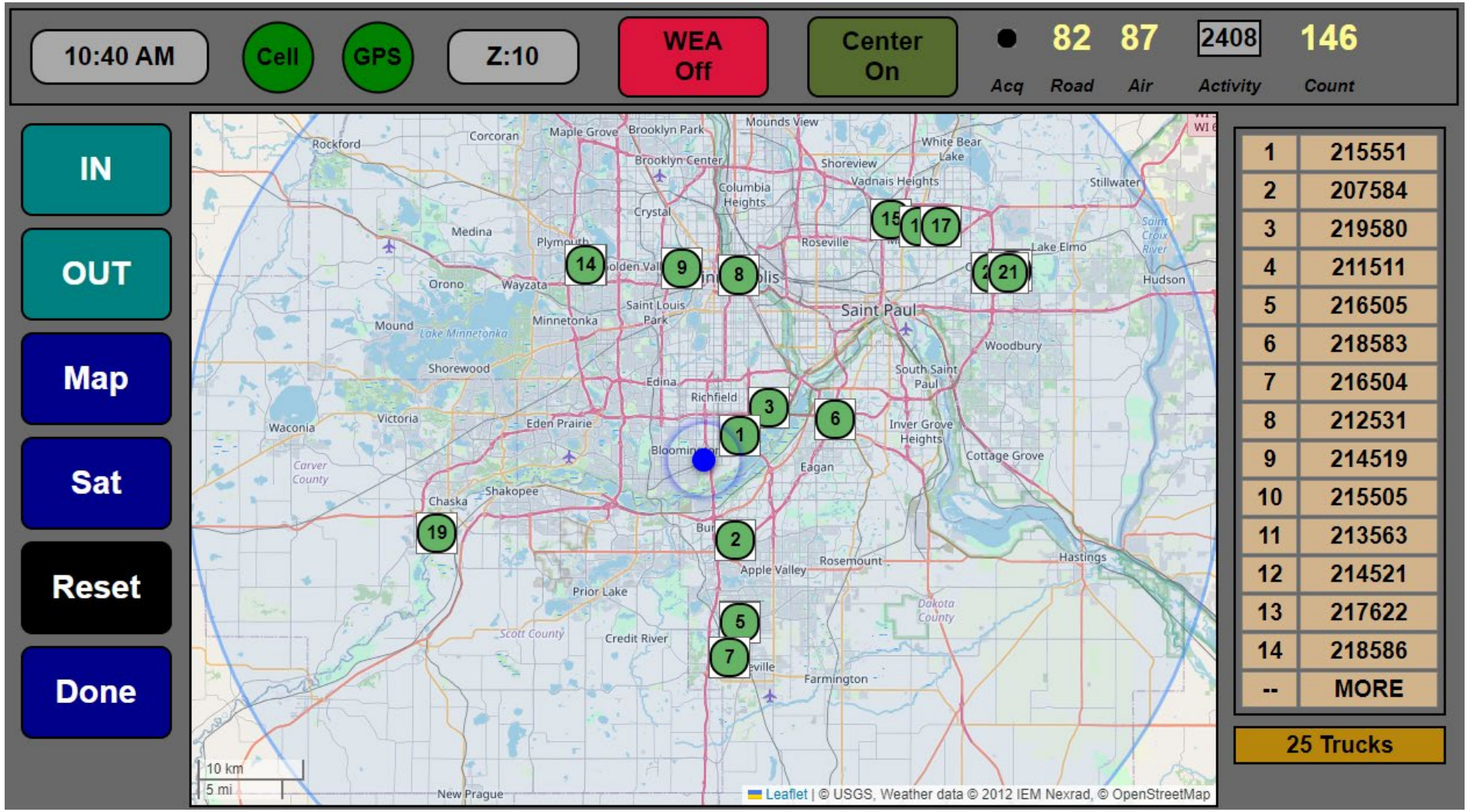
"Land of 10,000 Lakes" and "Uffda!"
MSP Avg 54" snowfall
Avg 41 degree (47 out of 50 coldest)

5th largest Roadway network -12,000 clm
20,000 bridges
3600 employees/8 Districts
78 Asset Classes

“Snowbi Wan Kenobi” Snowplow User Interface



“The Truck Formerly Known As Plow” Snowplow User Interface



Business Decisions Using Telematics

- How should MnDOT distribute maintenance and operations funding?
- What is the ROI for snow fence?
- Where are the material application hot spots?
- Is time to bare lane the best indicator of performance?
- Should MnDOT add or move S&I resources around?
- What are granular S&I costs by person, by shop, by route?

Transportation Enterprise Asset Management and Maintenance Management System

Circa 2016

Breadth of Data

- 20 Asset Classes – Including Pavement, Geotech, Hydraulics, Electrical Systems, Fleet FY24
- 5 Modules – Including Damage Reimbursement
- 2000 Users

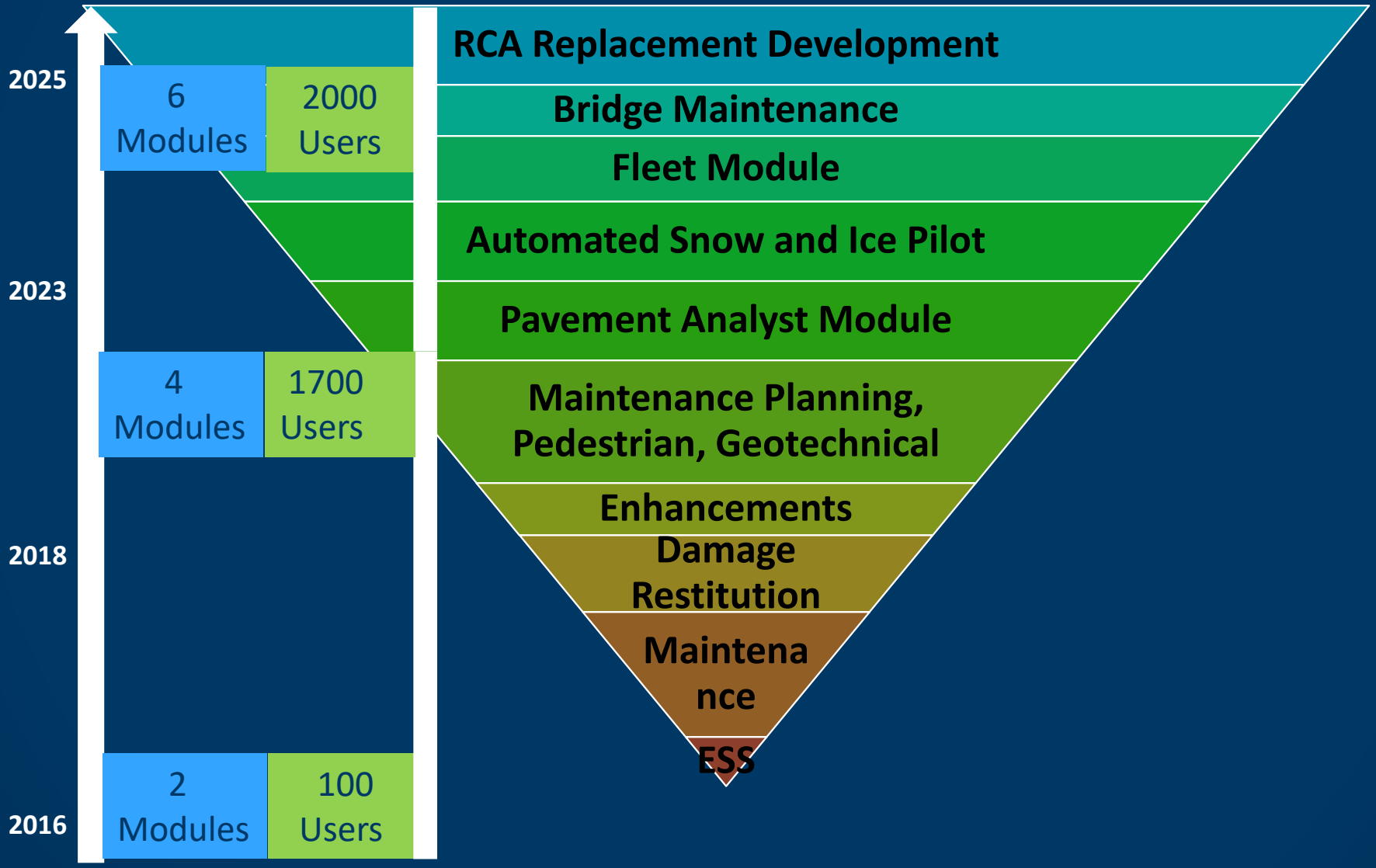
Access To Data

- MnDOT Warehouse
- Spatial GIS Analytics
- GIS Viewer Application
- Field Work Manager

Numerous Interfaces

- Linear Referencing System
- Timesheets
- ITS Operations Database
- Document Management System
- Herbicide Sprayer Controller
- Snow and Ice Vehicle Location Data
- Planning Data
- Construction Project Data

TAMS Growth


2025
2023
2018
2016
6 Modules
2000 Users
4 Modules
1700 Users
2 Modules
100 Users
RCA Replacement Development
Bridge Maintenance
Fleet Module
Automated Snow and Ice Pilot
Pavement Analyst Module
Maintenance Planning, Pedestrian, Geotechnical
Enhancements
Damage Restitution
Maintena nce
ESS

Synergy = Telematics + TAMS

- Commitment from Vendors To Perform Concurrent Development
- Investigate Data and Data Integrations
- Create Business Pilot Project Plan
  - Pilot Areas
  - Partners
  - Timing
  - Training
  - Measuring Success

DEPARTMENT OF TRANSPORTATION

TAMS Snow and Ice Pilot Project

This document describes the TAMS Snow and Ice AVL integration pilot project. Items included are:

- Timeline
- General Overview
- Pilot Subareas
- Setup Activities
- Step by step guide for checking data imported from the controller
- Step by step guide for entering in snow plowing data when import fails
- Evaluating the effort and describing "What Success Looks Like".
- Next Steps

Implementation Details

Fill Initial Data Gaps

- Plow - Employee Login, Routes
- Plow and TAMS - Material Types
- TAMS - Snowplow Route Inventory
- Database link

Implementation Details

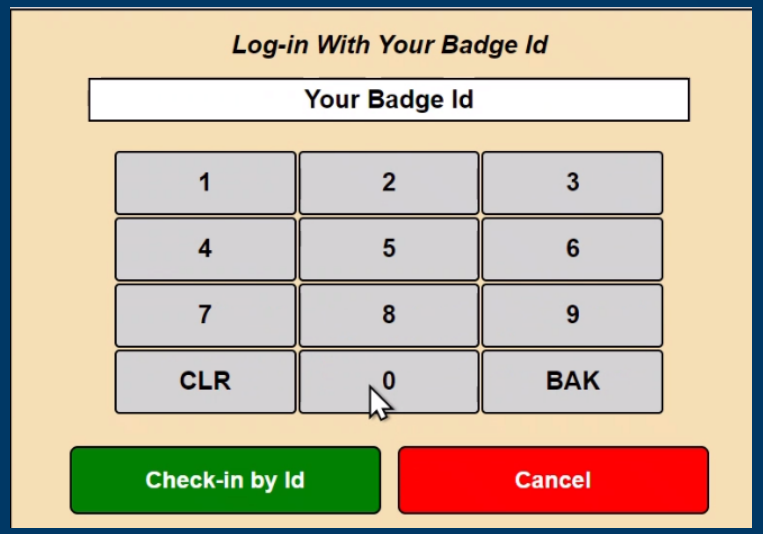
- TAMS Work Order System Automatically…
  - Assigned To Employee Truck Station
  - Triggered By Date, Activity, Plow Route
  - Material Calculation = Pt. B minus Pt. A
  - If Timeframe is >15 min, tracking Employee Hours and Snowplow Miles
  - Each Individual Material Total is Accumulated Per Work Order
  - Material is Accumulated for Every 0.1 Mile

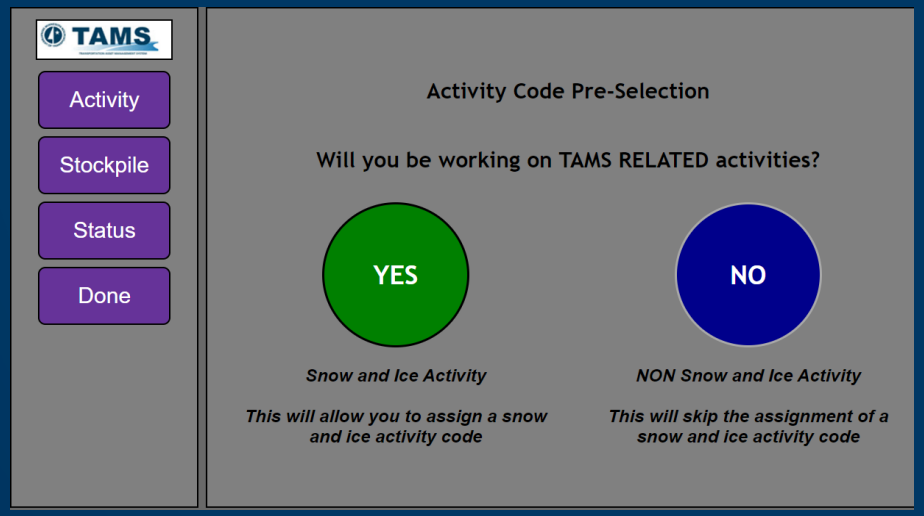
Large Amount Of Data

*800 Trucks * 120 Points/Hour * 24 hours *0.9 Trucks Deployed = 2.3M data points*

“Plowasaurus Rex” Snowplow User Interface

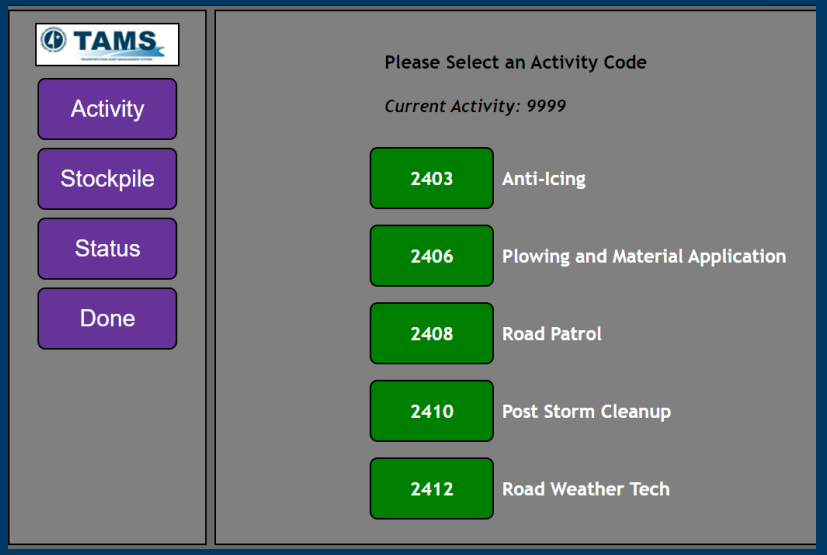
- Labor Hours Tracked w/ Employee ID
- Large Buttons
- Clear Message

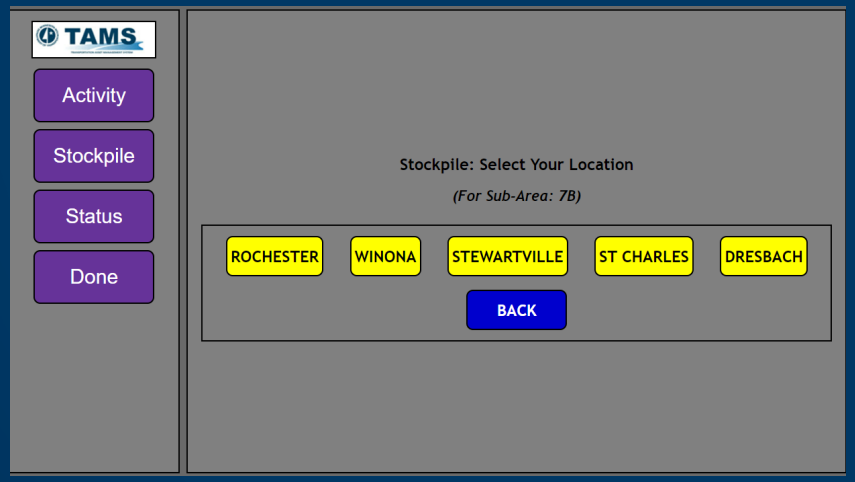


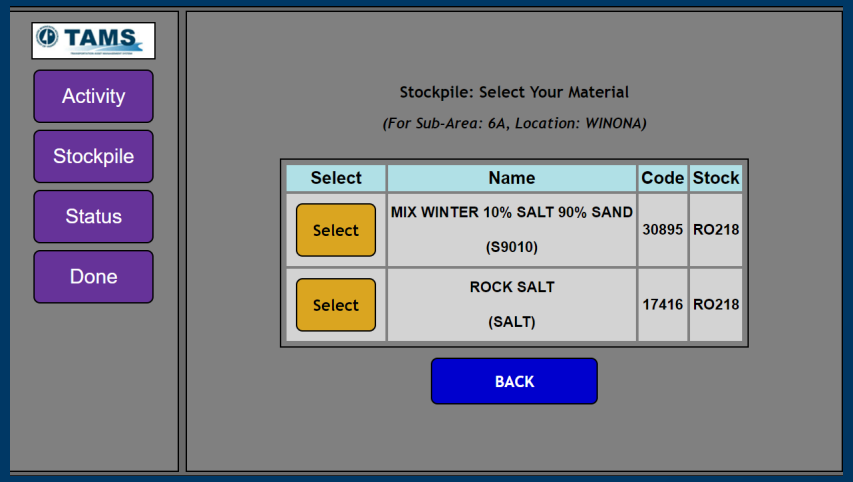


“No More Mr. Ice Guy” Snowplow User Interface

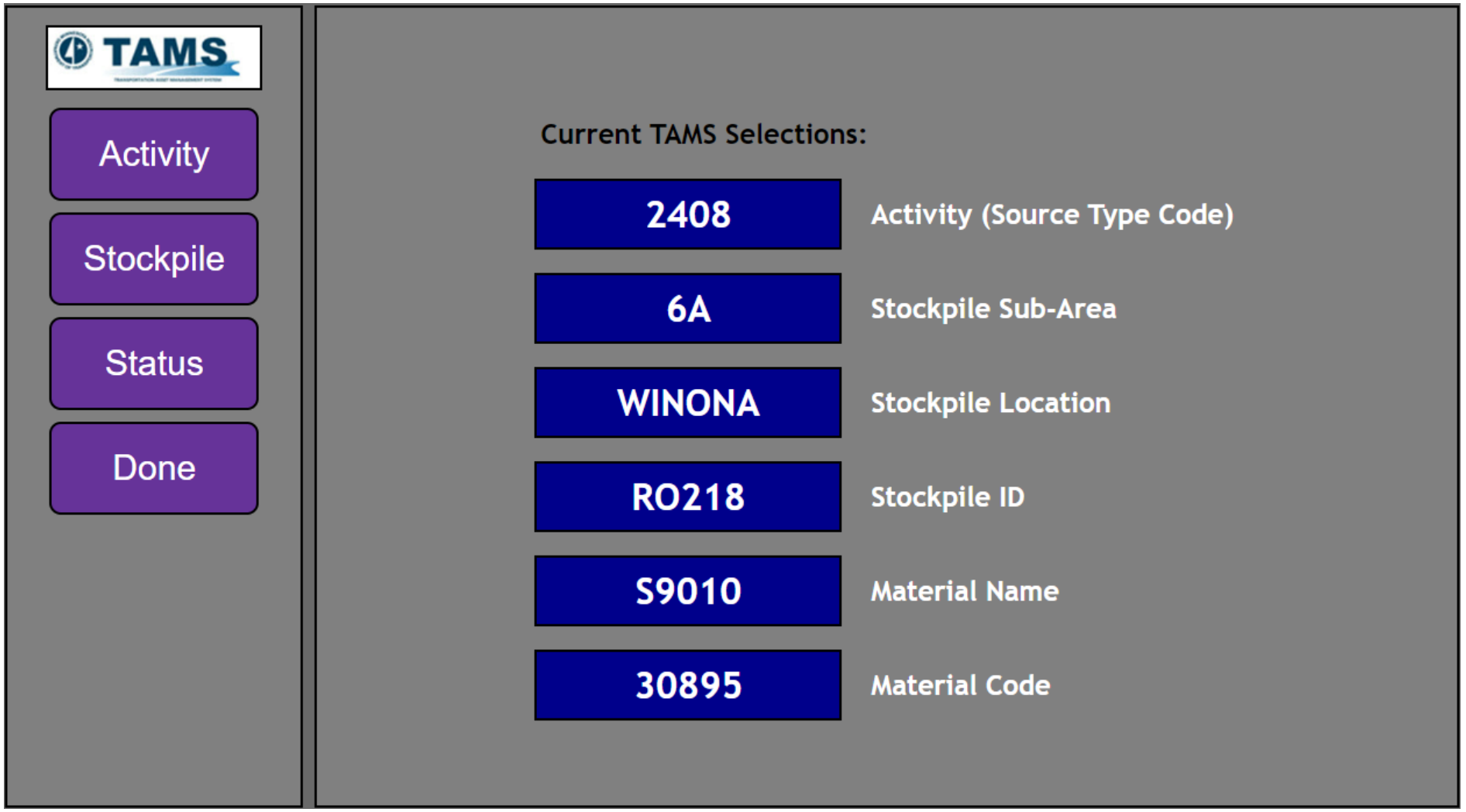
- Limited Number of Activities
- Employee ID Linked to Stockpiles By Truck Station
- Materials Types



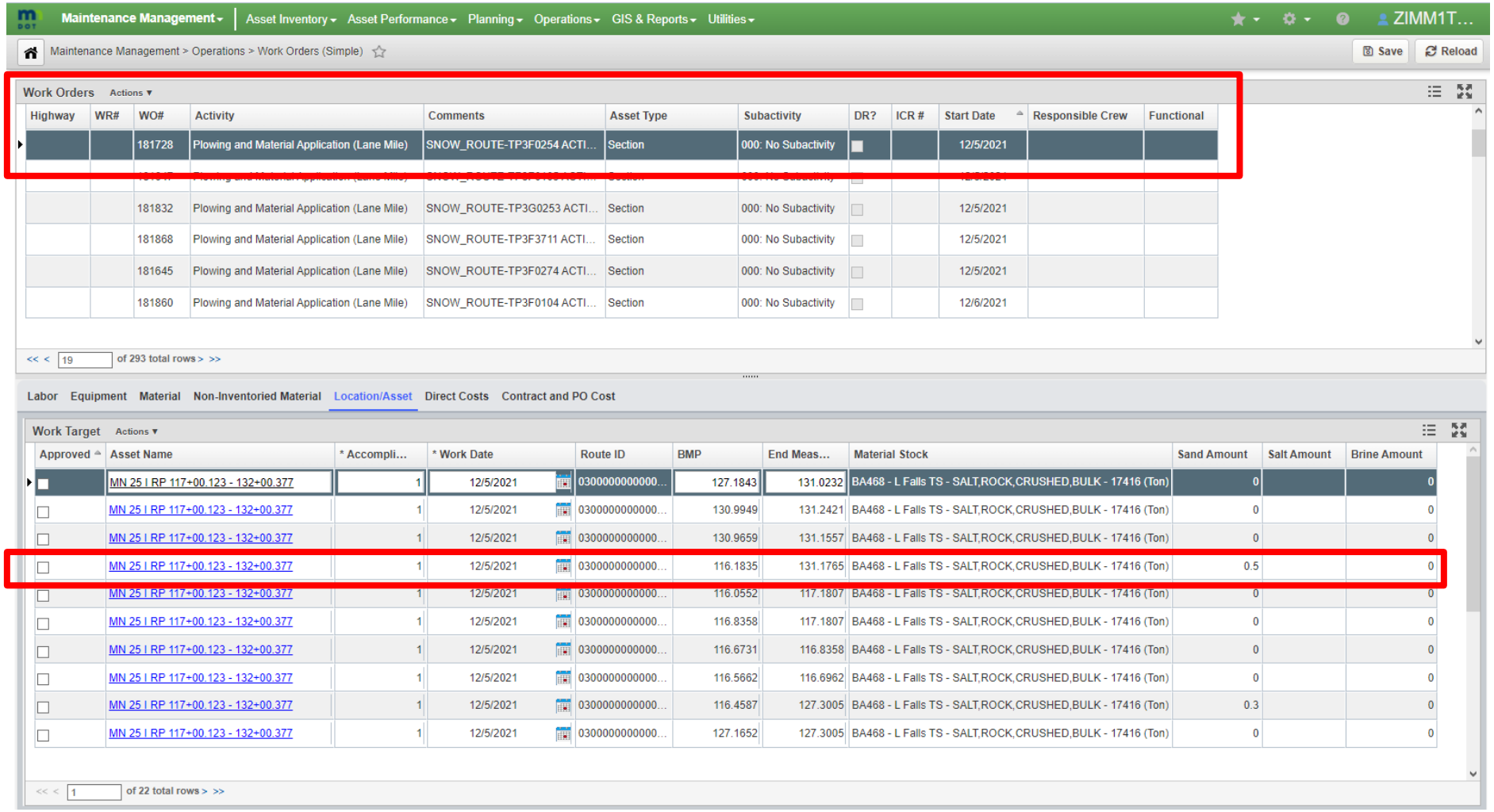




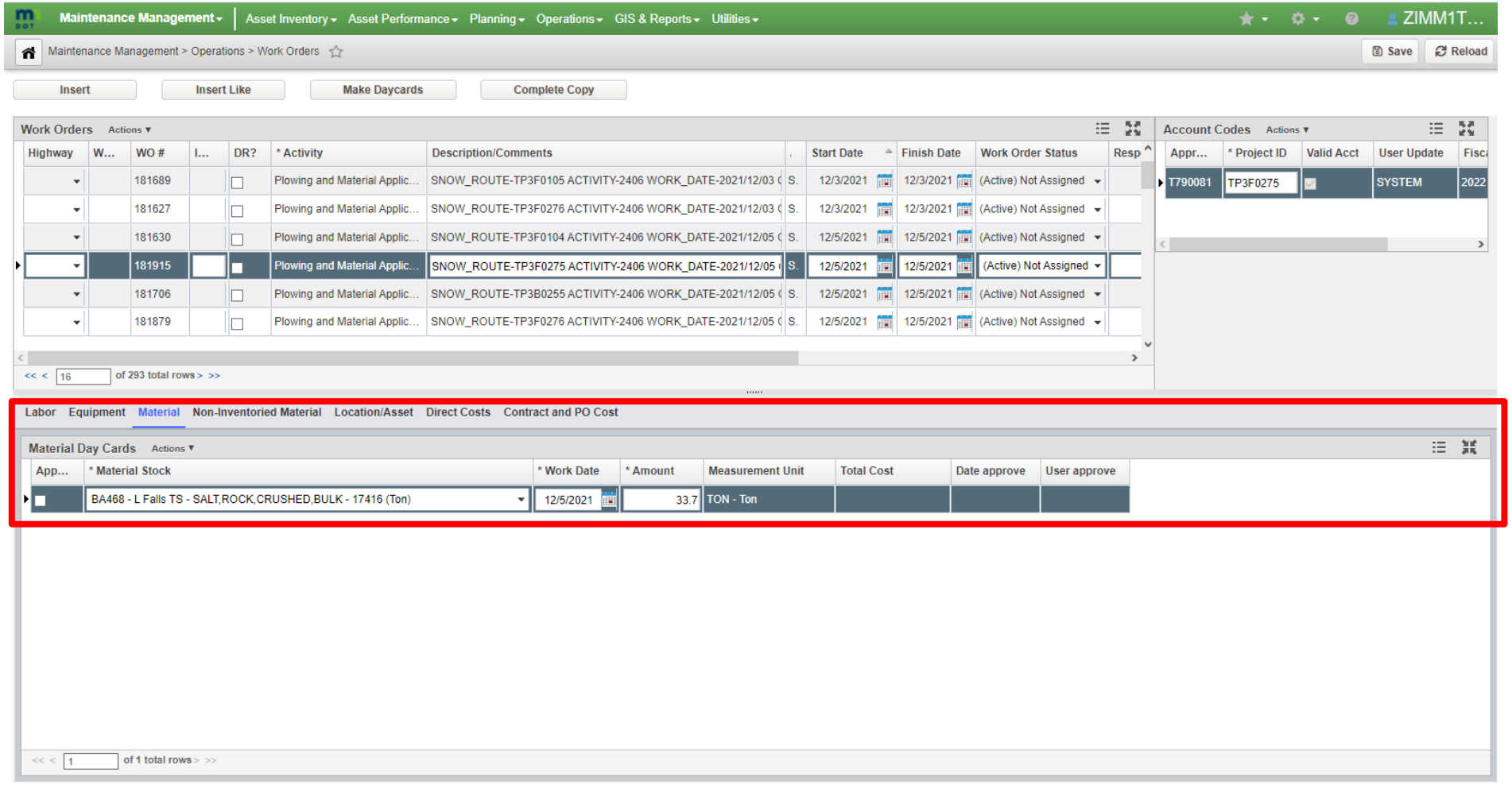
“Duck Duck Orange Truck” Snowplow User Interface



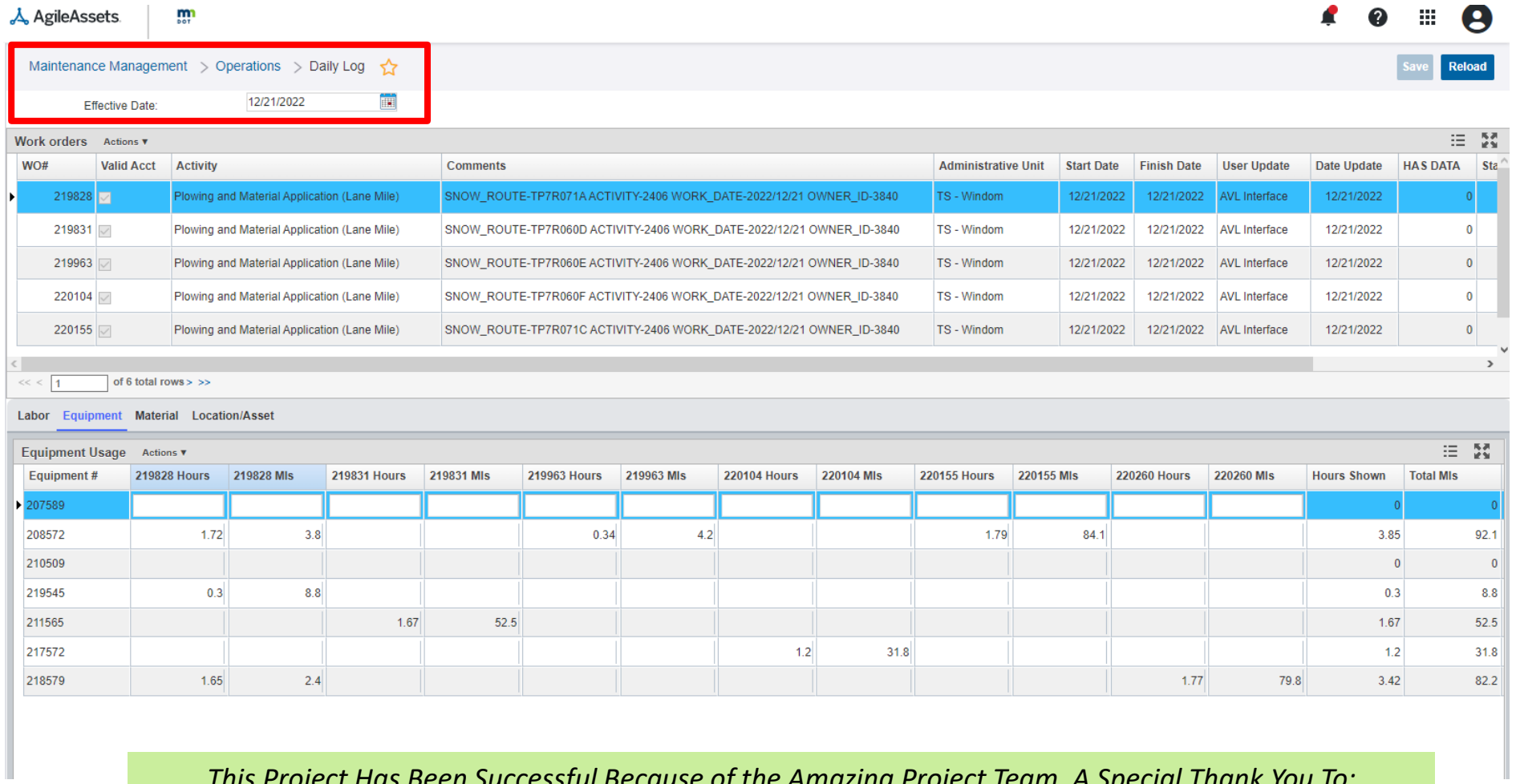
TAMS System User Interface



TAMS System User Interface



TAMS System User Interface



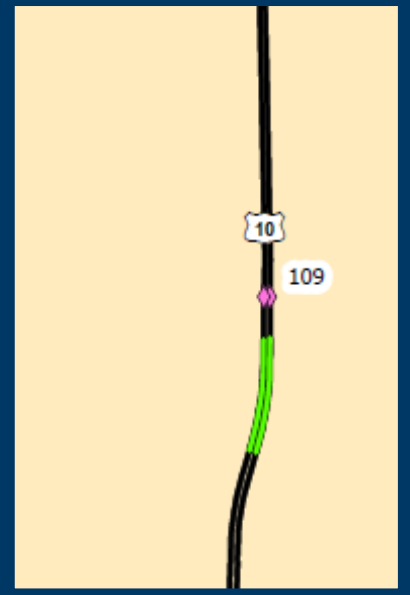
This Project Has Been Successful Because of the Amazing Project Team. A Special Thank You To: Tom Zimmerman, Joseph Huneke, Matt Krueger, Cameron Gjovik (MnDOT), Mike Reynolds (MnIT), Faris Alsaeedi (MnIT), & Jeff Edelstein (Ameritrak).

Change Happens

MnDOT is moving to new technology solution provider for Automated Vehicle Information.

- New Hardware
- Interface Changes
- MARCUS (RCA Replacement)
- Conceptual → Pilot is Good.
  - Understand requirements for TAMS
  - Snowplow Interfaces work for users (simple is better)
  - Simplify TAMS Approval Screens

Next Plow Name “Snow It All”?



Using External Data Sources for Maintenance Decision Making

December 13, 2023

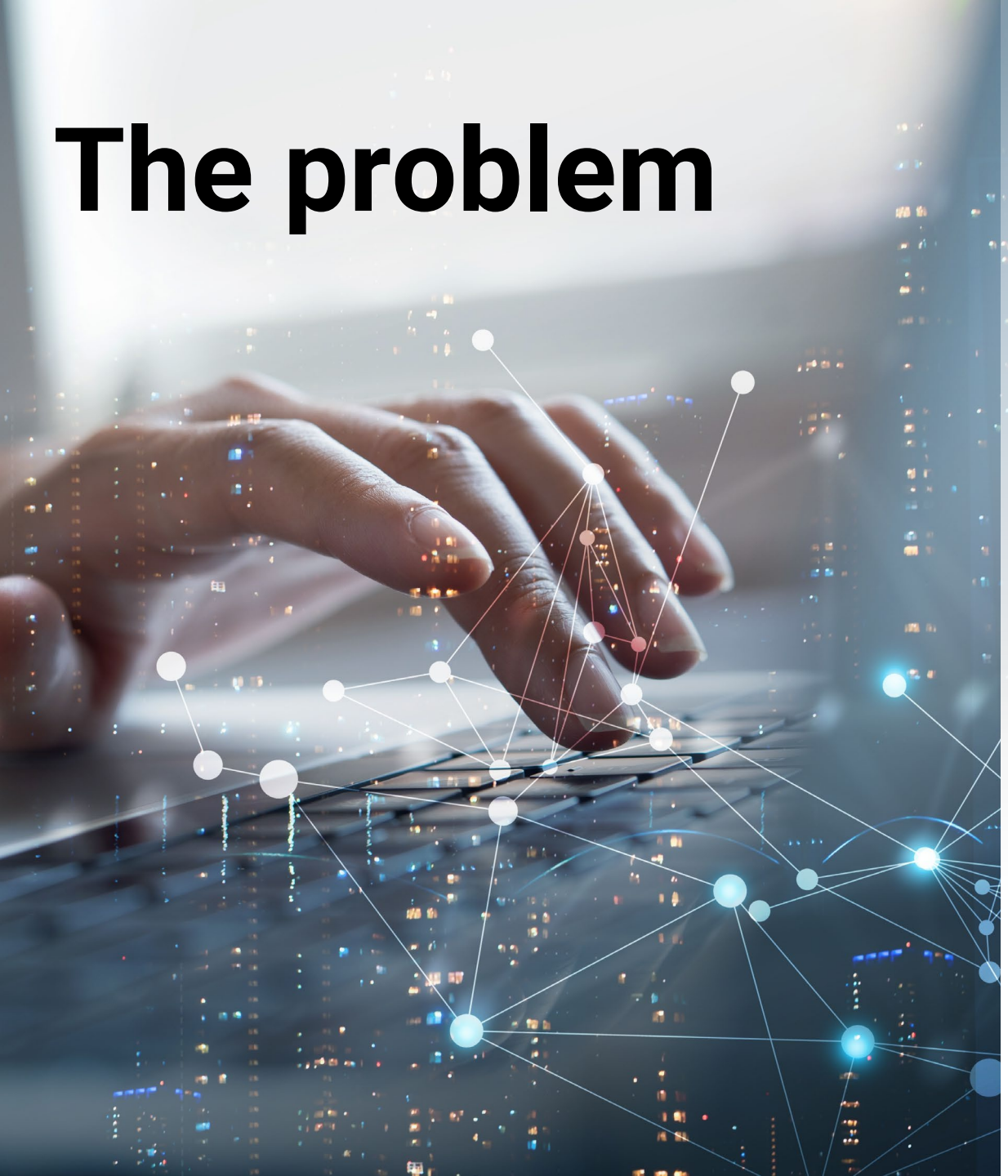
DriveOhio

Agenda

- Ohio DOTs Data Platform
- Future Vision
- Roadway Data Pilot

Event Streaming Platform

The problem



Transportation leaders lack visibility into surging geospatial data, hampering their decision support capabilities. Fragmented systems and teams cannot manage the real-time event data’s exponentially rising volumes.

This prevents organizations from harnessing the geospatial insights it contains.

Why it matters

Challenges

Keeping up with rapidly growing geospatial data demands more from operations teams.

Because these aging systems are disconnected, transportation needs to integrate geospatial data across systems and teams.

Negatives

As transportation organizations face mounting pressure to react swiftly to situations, decision-makers can't access and analyze critical real-time geospatial data across disparate systems to guide operations teams.

Optimization, emergency management and public guidance suffer.

The problem in numbers

20%

Expected growth of geospatial event data per year **ScienceDirect*

$81B

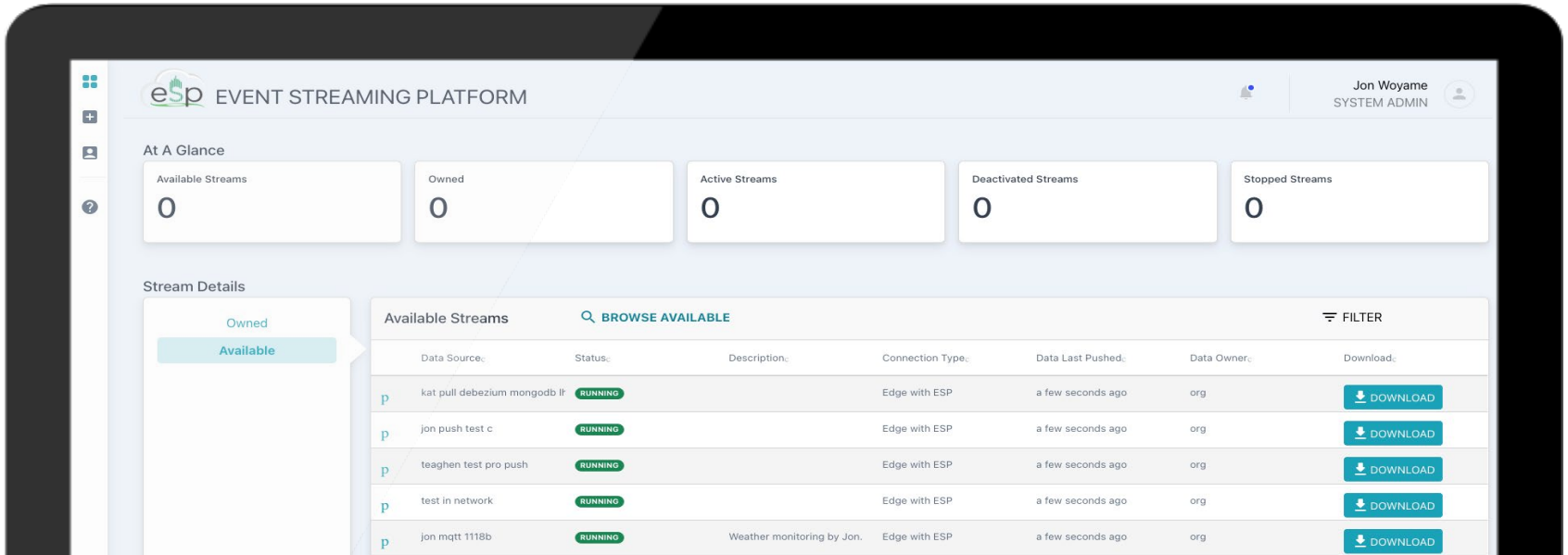
Lost time and revenue due to congestion **Govtech*

51

hours lost every year in traffic for the typical US driver **Inrix*

The solution

ESP fuses rich geospatial content with traditional transportation data from disparate systems and sources at tremendous speed and scale.
This enables transportation leaders to foster enrichment and collaboration for data-driven decision making.



Analytics and decision support

With flexible and seamless ingestion capabilities, ESP empowers organizations to aggregate dispersed data silos into an integrated environment. It can ingest and combine data from diverse sources to enrich understanding of events.

Advanced analytics and visualization tools unlock deep insights from fused data to inform critical decisions across transportation operations and planning.

Collaboration and orchestration

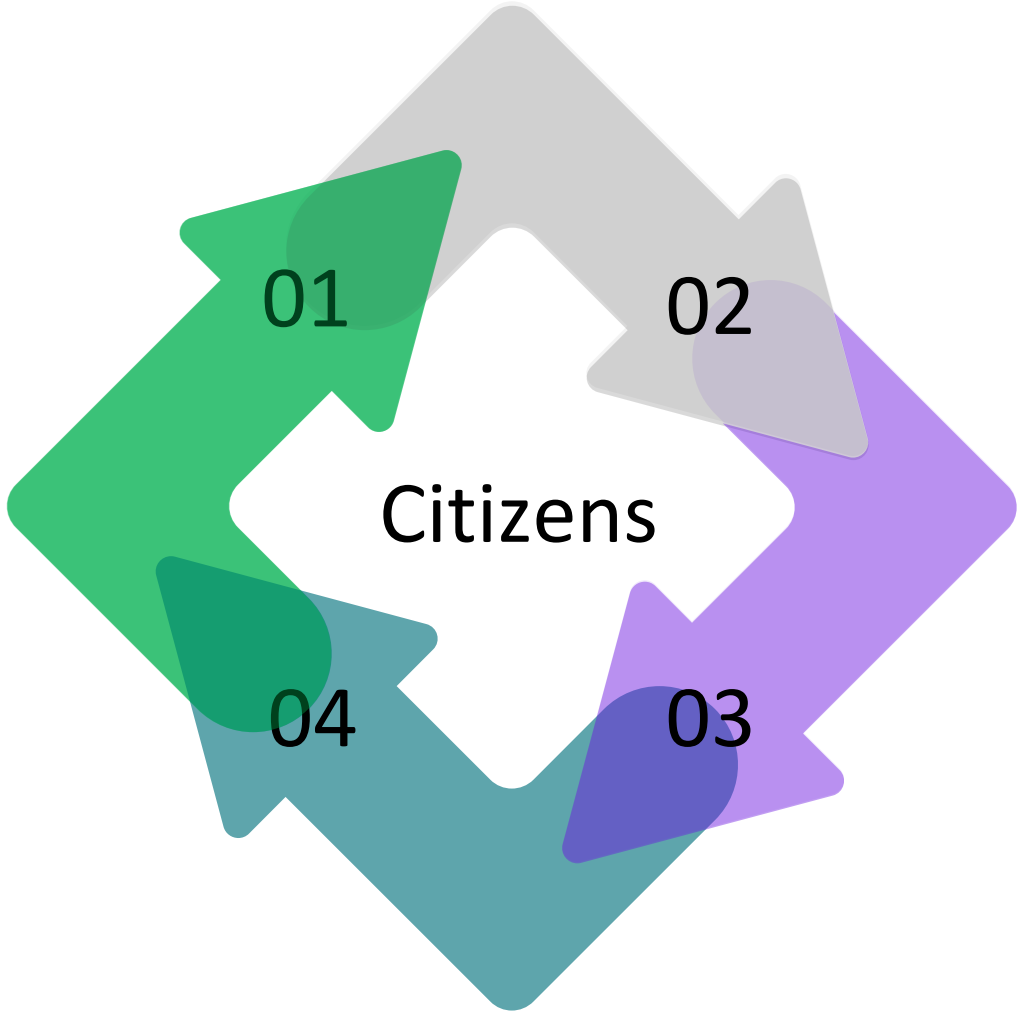
By chaining together actions across multiple systems, it enables the orchestration of repetitive tasks like ticket handling and alert prioritization.

The platform provides the flexibility to build custom playbooks that coordinate tools to carry out complex transportation operational use cases.

Impact where it matters

DOT Operations

Optimize freeways and mobility transitions



City Management

Enables data-driven optimization of city operations

Private Sector

Opportunities for transportation innovation and decisioning

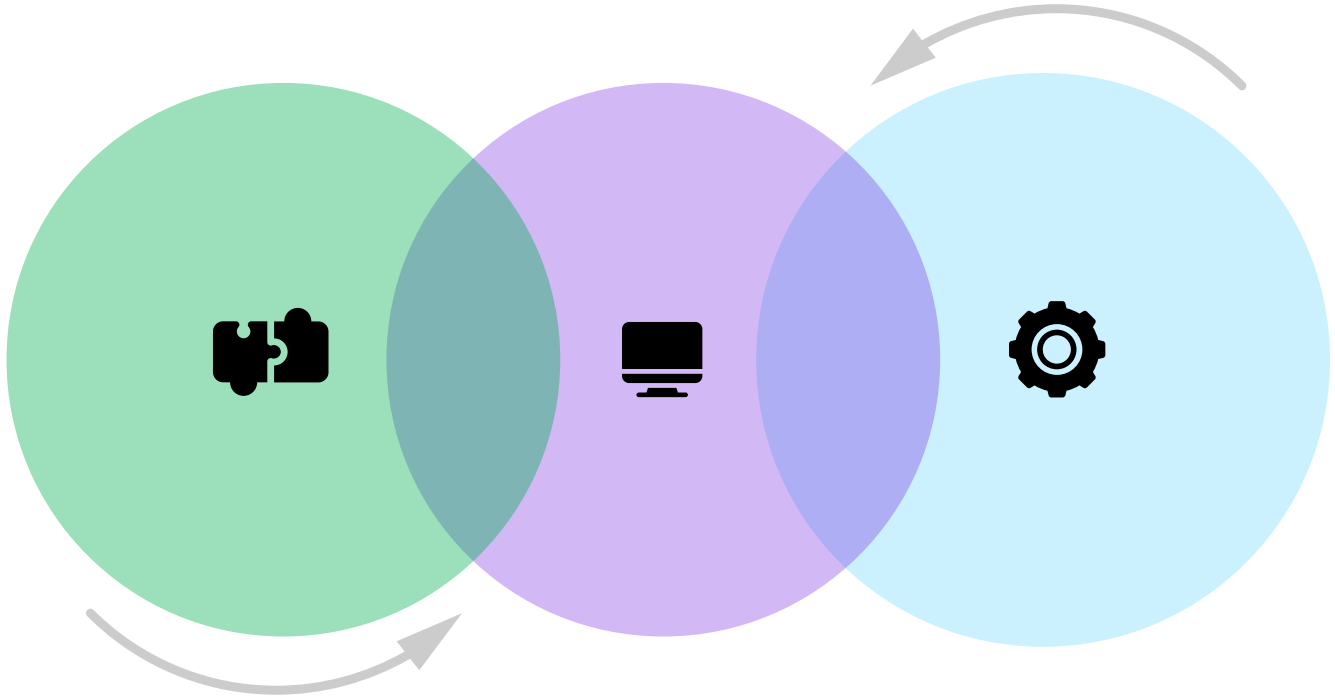
Transit

Forecasts for current and expected future conditions

ESP Empowers Collaboration and Proactive Decision Support

Flexible Platform

Scalable, flexible, open-source with integrations and orchestration engine

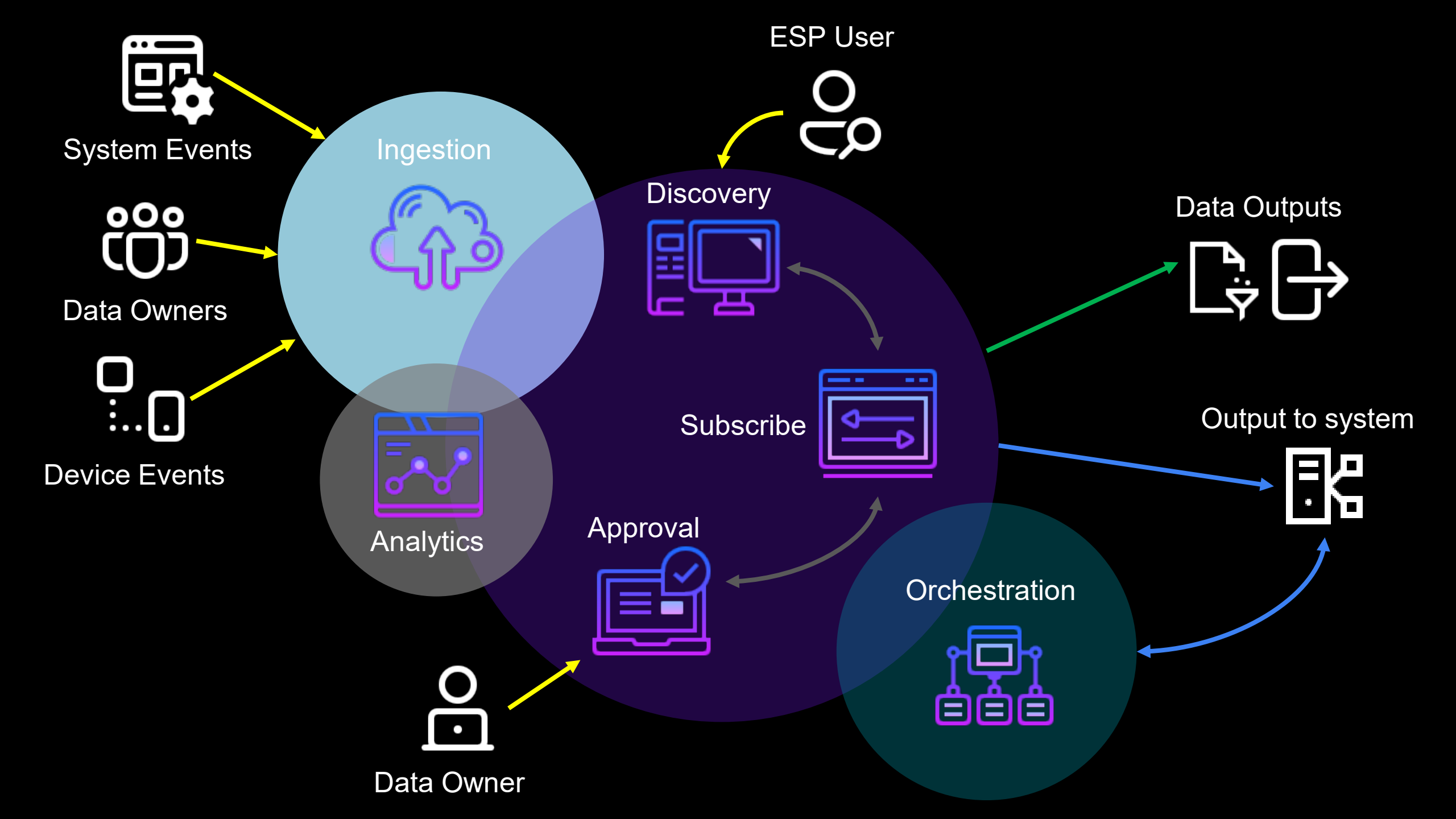


Data as a Service

Rich repository of data with opportunities for added value

Informed Decision Making

Action-based analytics driven dashboards


System Events
Data Owners
Device Events
Ingestion
Analytics
ESP User
Discovery
Subscribe
Approval
Data Owner
Data Outputs
Output to system
Orchestration


A Drive Into the Future
dot
DriveOhio

How are we working toward that future?

Vehicle-Based Roadway Data Pilot

- Determine whether roadway condition data from vehicles can support maintenance and asset management

Roadway Deficiency Data

- OEM Vehicle Detection of the following roadway elements
  - Location and size of Potholes
  - Location and change detection of Signage
    - Damaged or missing
  - Location and change detection of Barrier
    - Cable Barrier vs. Guardrail
  - Measurement of Berm Dropoff
    - Greater than 1.5 inches
  - Road Rideability (Roughness Index)
  - Location and Quality information for Lane Markings

Project Selection

- Ohio DOT received 4 proposals
  - Requirement for OEM partner on each proposal
  - Selection and award was made to a team led by Honda American Motor Co.
  - Project partners include:
    - Parsons
    - University of Cincinnati
    - i-Probe

Project Elements

- Two Research Vehicles to develop and test detection applications
  - Examine what can be done with existing vehicle technology vs. what will require new or enhanced technology
- Cloud-hosted solution
- DOT would only receive alerts when a deficiency is detected

Project Locations

- Ohio DOT District 10 – Southeast Ohio
  - Very Rural, Hilly Roadway Terrain
- Ohio DOT District 6 – Central Ohio
  - Flat, Straight Roadways
- a solution that works everywhere

Project Timeline

- The pilot will perform over a 2-year timeline.
  - Initial Technology Development (prioritize applications)
  - Data Collection and Analysis
  - Subsequent Development
    - Based on lessons learned during data collection and analysis step
  - Data Collection and Analysis
  - Business Development Lessons Learned
    - Measuring the benefits

Project Goals

- Research what data can easily be provided by vehicle to support Ohio DOT needs
- Measure the benefits of related vehicle data
- Determine related business models representative of data costs
    - How do we scale to production vehicles?
    - How do we convince public to share the data?

More to learn over the next 2 years!

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DriveOhio

Utilizing Crowdsourced and Real-Time Data for Snow and Ice Decision Making

TRB Webinar: Utilizing External Data Sources for Maintenance Decision Making

Presentation by Randi Feltner

December 13, 2023

Crowdsourcing, Other Real-Time Sources

- Waze
- Social Media
- Our Own Users
- Free Public Info
  - CoCoRahs
  - NWS Chat (Slack)
- HERE
- AVL

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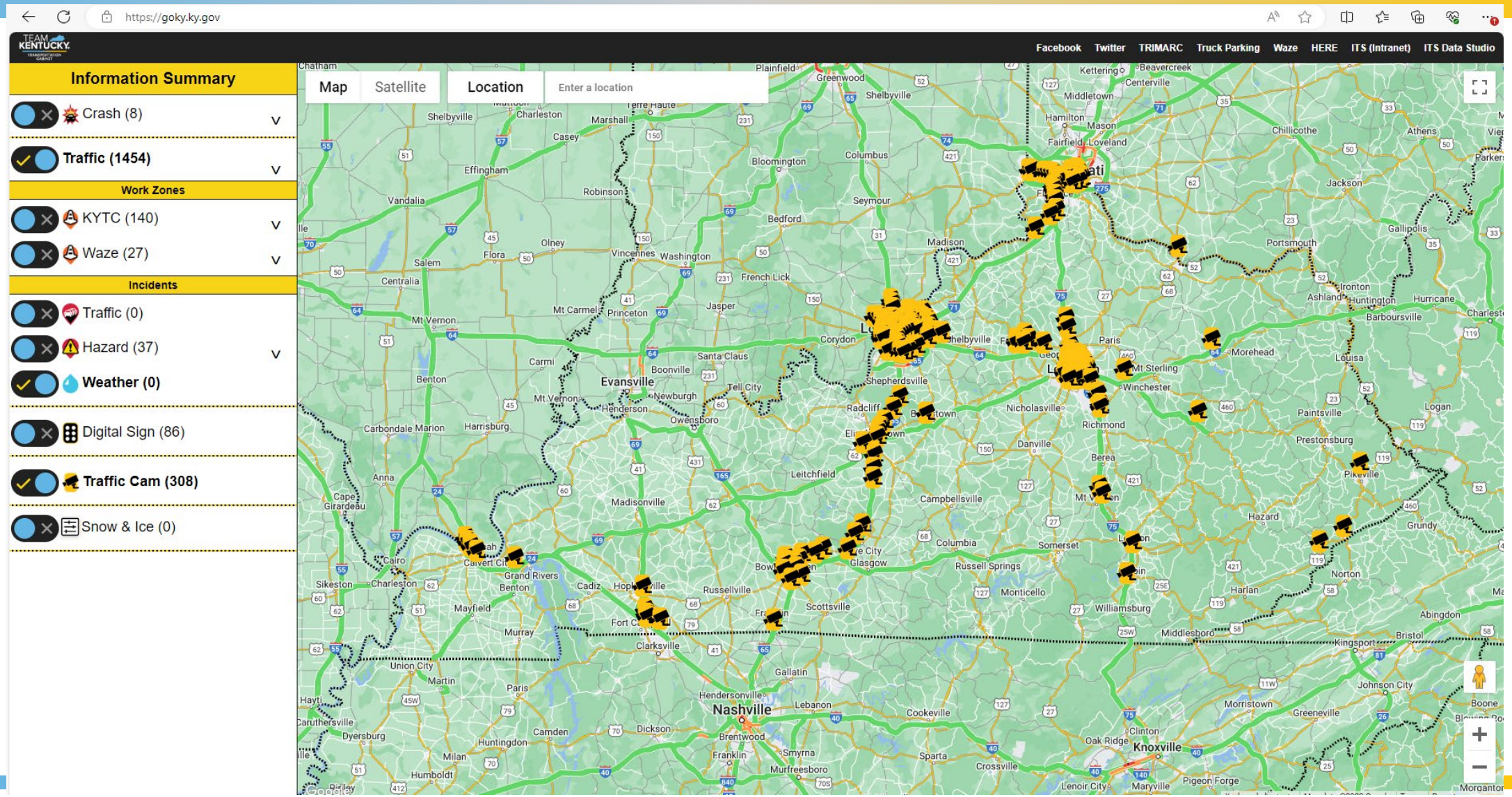
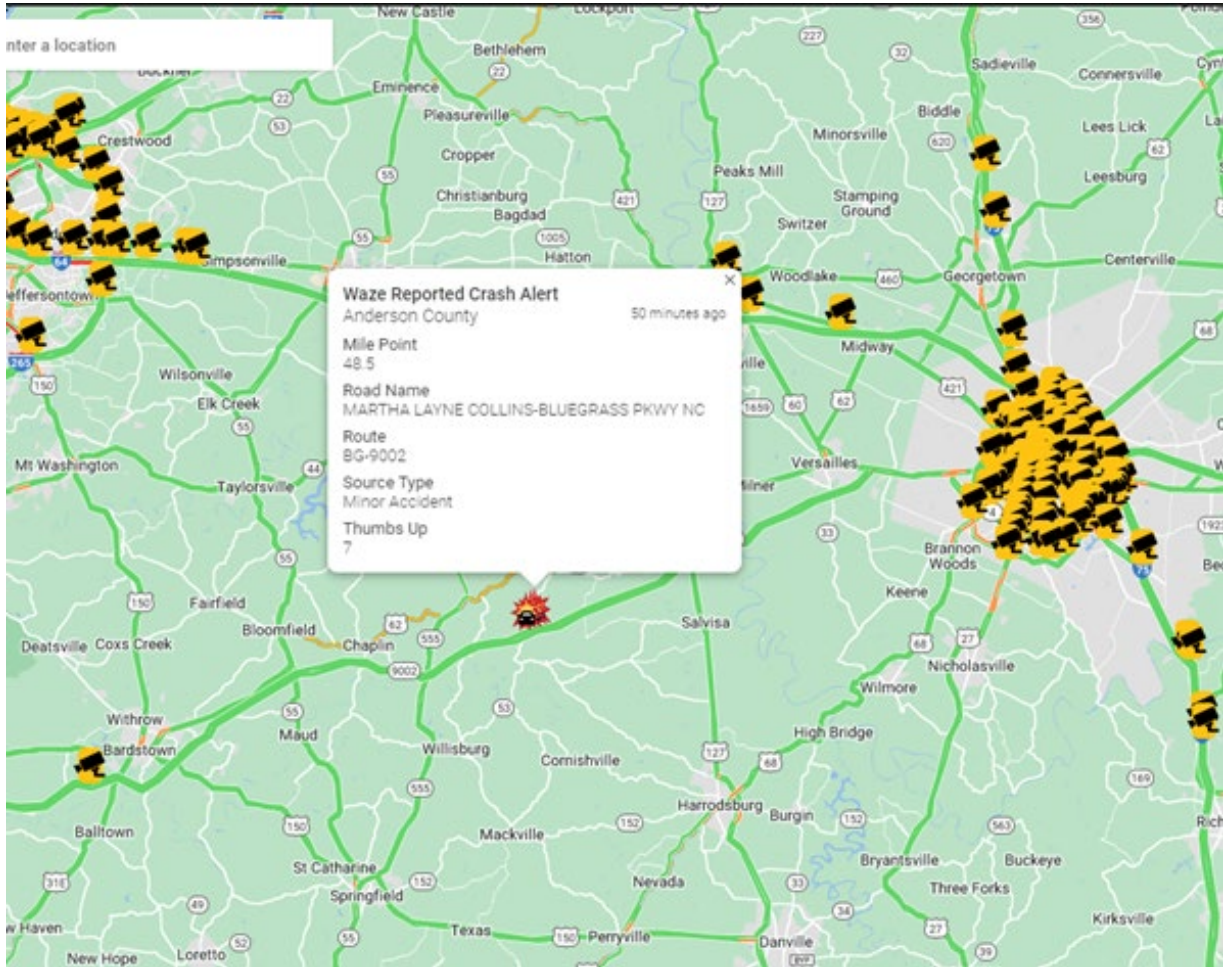
Camera Coverage



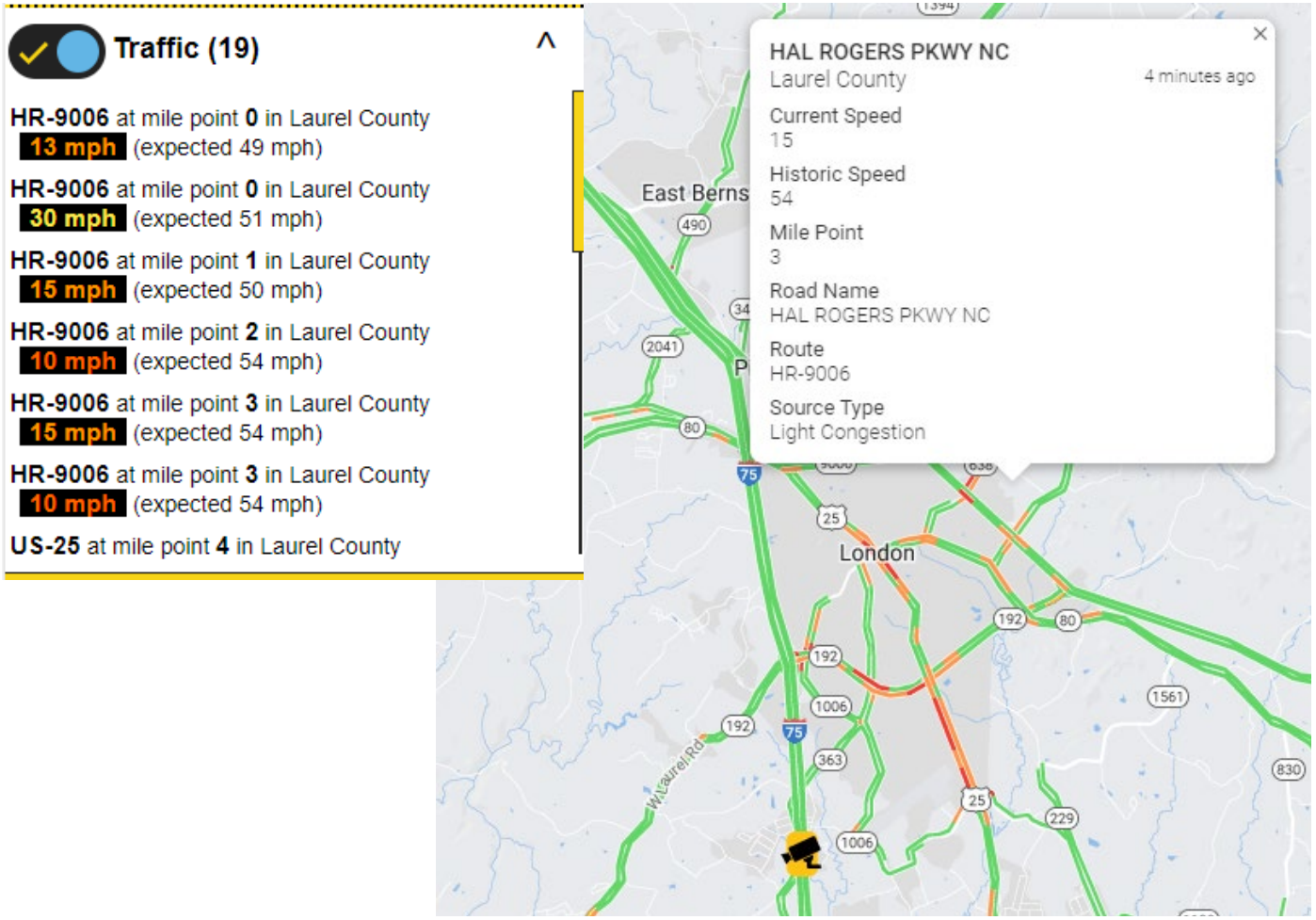
RWIS Coverage

Waze Data



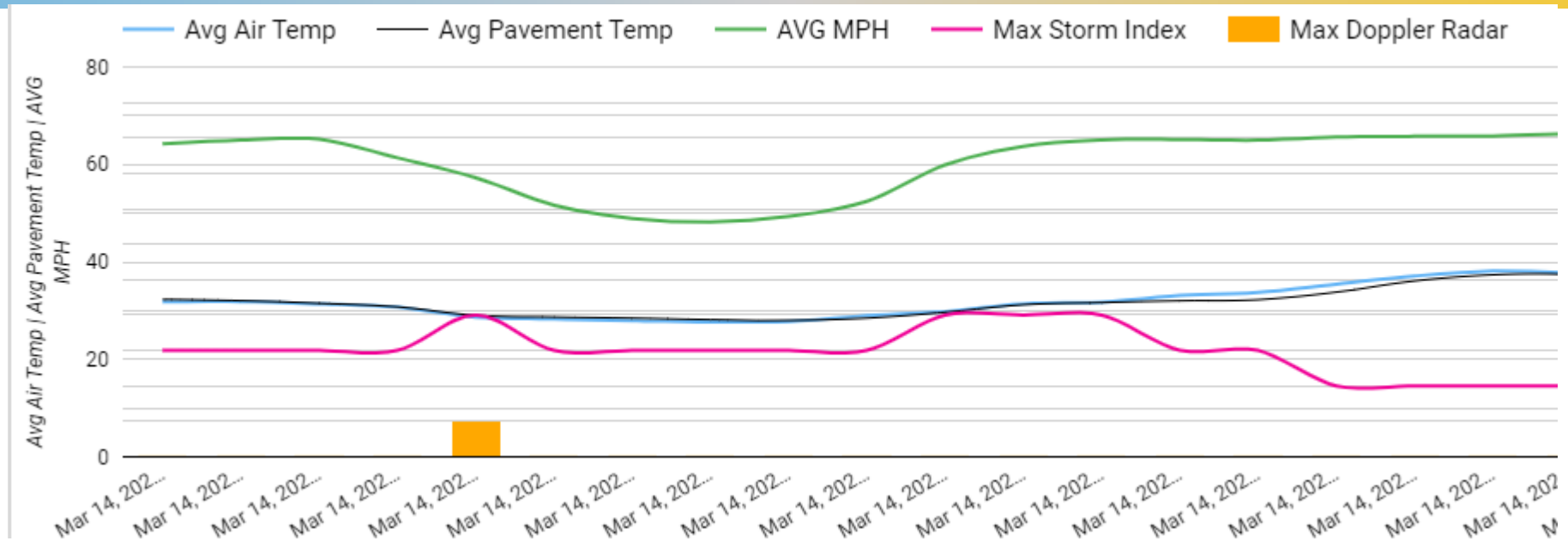
- Waze user has reported a crash
- In this screenshot, there are 7 ‘thumbs up’ which means 7 other users agree with the report.
- Only Waze reports with at least 1 ‘thumbs up’ will report – validating the report in the quickest way
- Rural area – no cameras nearby

HERE Data



- HERE data shows non-recurring congestion in a small city
- One camera available in the screenshot but on the other side of town on the interstate

Data Trends



View: Looker Studio

- Dashboarding allows trends to be spotted
- Experience helps to spot issues

TEAM KENTUCKY TRANSPORTATION CABINET

What Real-Time Data Is, and Is Not

- Real-Time Data can provide insight to areas lacking camera or coverage with other hardware.
- Provides ‘clues’ into what the roadway conditions are beyond what you’re able to get reports from or observe.
- Another tool for an experienced employee to make decisions during operations
- Real-Time Data is not a decision-making tool itself

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December 14, 2023

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January 7-11, 2024

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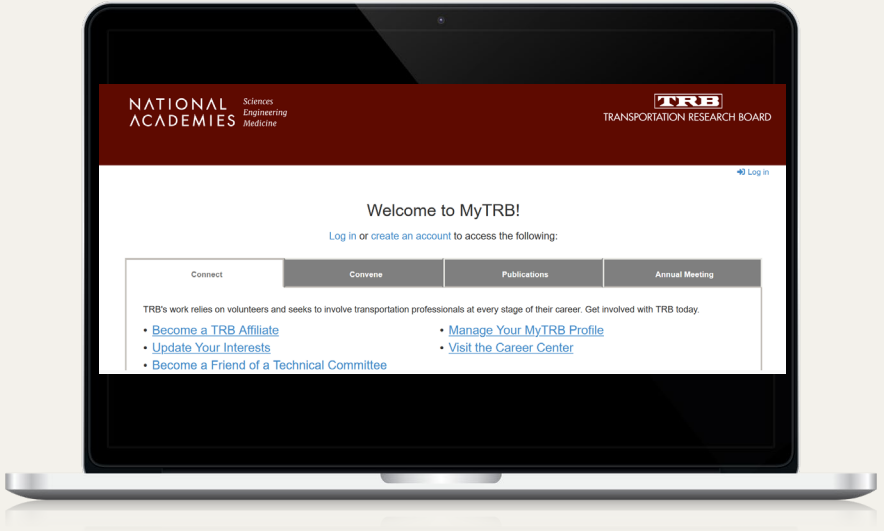

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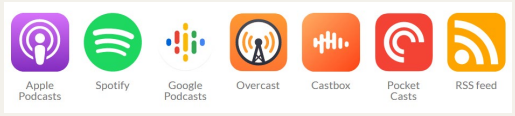

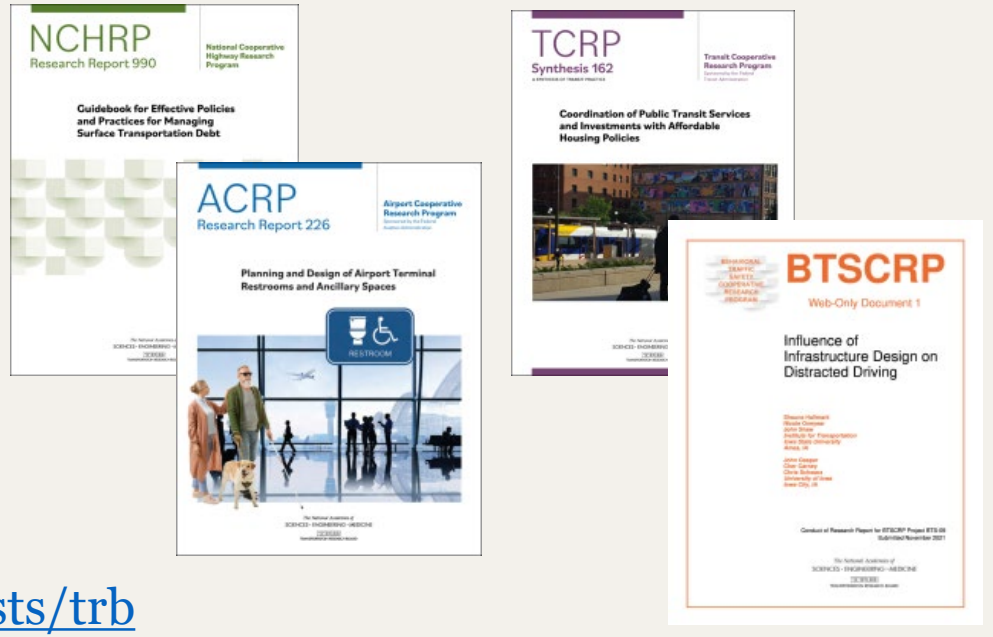

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