VERMONT
AGENCY OF TRANSPORTATION

Operations & Safety Bureau

Intelligent Transportation Systems (ITS)

CCRPC Transportation Advisory Committee

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Vermont Agency of Transportation

Overview

- What are Intelligent Transportation Systems?
- Vermont's Architecture
- ITS Management Plan
- BlueToad Project Update
- 511 Traveler Information System
- Enhancements & Innovation

Systems

- RWIS, CCTV, CMS, traffic heat maps
- Weigh in motion Systems (WIMS)
- Traffic counting devices
- Traffic signals
- Big transportation data (probe data)
- Radar feedback signs
- Pedestrian crossing buttons

Statewide Architecture

Current

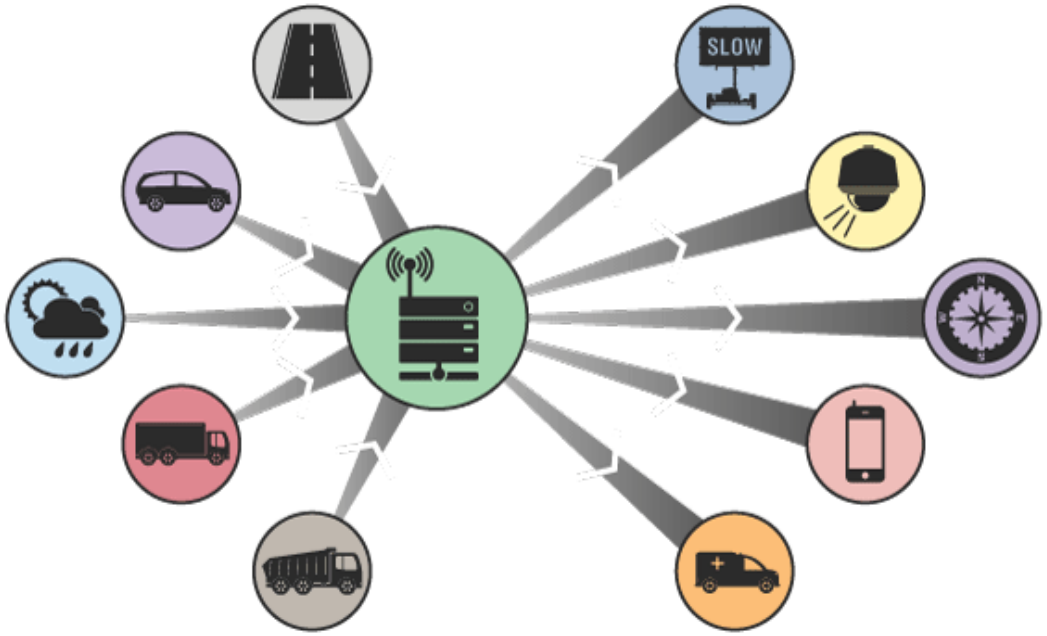
- 54 road weather information systems
- 59 CCTV
- 100+ digital message signs
- 19 weigh in motion systems
- 60 continuous traffic count systems
- 8 Wavetronix sensor trailers
- 4 radar feedback signs
- 163 state-maintained traffic signals (75 Chittenden County)
- 33+ Bluetooth Sensors

2023 Installations

- 4 road weather information systems
- 4 CCTV
- Digital message signs
- 4 Grand Cast Sensors

ITS Management Plan

- 5-year plan
  - Mission, Vision, Objectives
  - Statewide Architecture Overview
  - Capability and Maturity Model Assessment
  - Potential ITS Projects and Solutions
  - Project Priorities, Funding, Project Considerations and Criteria
  - BlueToad AID Project



ITS Mission & Vision

Mission

Implement transportation technologies to support the VTrans Mission to provide excellent customer service and ensure the safe and efficient movement of people and goods in a socially, economically, and environmentally sustainable manner.

Vision

Through ITS systems, to support the VTrans Vision and Mission by providing relevant and actionable real time traffic information to the public and state agencies, and an archive of historical data for use by decision makers to allow for the safe and more efficient transportation systems for all modes throughout Vermont.

Objectives

- Establish ITS as an asset to the Agency and other stakeholders and improve inter-Agency coordination and communications
- Demonstrate the value of the intelligent transportation systems within the Operations & Safety Bureau.
- Integrate Information. With the goal of providing timely information to the public for safe travel and maintenance of our roadways.

Objectives continued…

- Communicate real time, relevant, and reliable traveler information, weather conditions, and roadway incidents through the TMC.
- Strategically maintain, upgrade, and expand existing ITS infrastructure through the management of assets.
- Invest in infrastructure that strengthens the Agency's ability to adapt and utilize changing technologies and engage in innovation.
- Establish institutional mechanisms to promote the development and deployment of ITS projects and the incorporation of ITS infrastructure Agency projects.

CHITTENDEN COUNTY RPC
Communities Planning Together

Advanced Traffic Monitoring System using Bluetooth Technology - Summary

Accelerated Innovation Deployment (AID) FHWA Grant

March 08, 2023
Transportation Advisory Committee
CCRPC

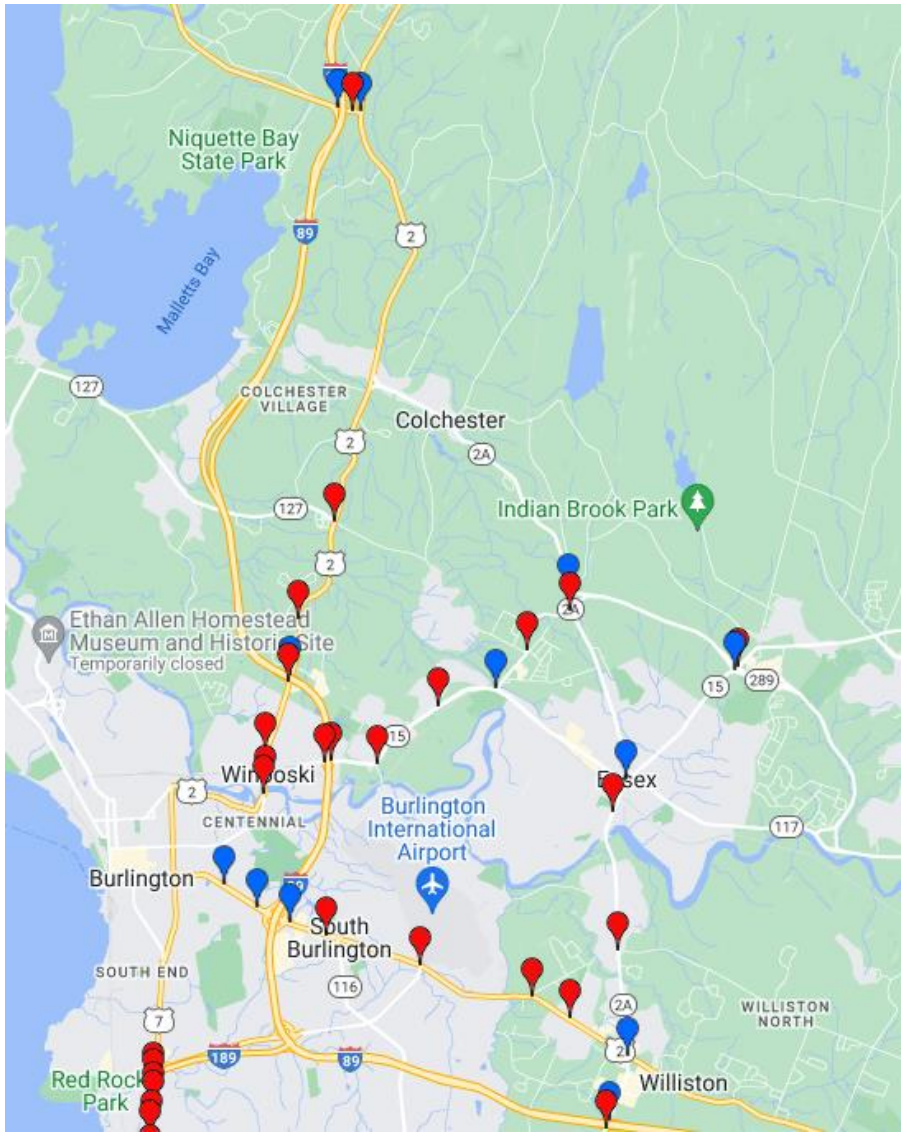
Background

- CCRPC & VTrans, applied for (2014) and received (2015) an AID FHWA grant ($981,780)
  - Implement corridor level real-time traffic monitoring system using Bluetooth technology
    - **Gather corridor travel times and travel speeds for various applications**
  - Integrate with Tri-State Advanced Transportation Management System (ATMS) and Traveler Information System (TIS) through the State Traffic Operations Center (TOC)
  - CCRPC selected Gannett Fleming Inc., for design and deploy

Project Area Corridors

- 5 corridors located in 4 municipalities
  - Corridor 1: I-89 Exit 14, US 2 in South Burlington
  - Corridor 2: VT 289, Susie Wilson Rd. & VT 15 in Essex
  - Corridor 3: I-89 Exit 12, US 2/VT 2A in Williston
  - Corridor 4: I-89 Exit 17 in Colchester
  - Corridor 5: I-89 Exit 16, US 2 in Colchester

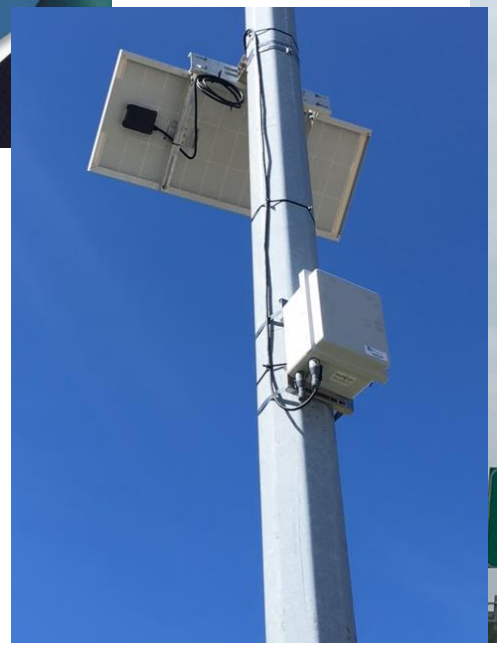
Project Area – Bluetooth Sensors



Project Schedule

Description	Date
AID Grant Award and Agreements	Summer, 2015
Design Consultant Selection	Spring, 2016
Systems Engineering	Fall, 2016
First Training Session	Winter, 2017
Vendor Selection	Spring, 2017
Pilot Corridor Implementation	Summer, 2017
Data Collection and Test Drive	Fall, 2017
Final Implementation	Summer and Fall, 2018
Second Training Session	Summer, 2018
Maintenance Agreement	Winter, 2020

BlueTOAD Spectra



Implementation

- Installed 33 Bluetooth Sensors along 5 Project Area Corridors.
- 14 sensors are solar powered retrofitted with double battery pack, and 19 sensors are powered using Power Over Ethernet (PoE).
- TrafficCast's **BlueARGUS** web-based software was used to process data and reporting speed and travel-time.
- Real time color-coded speed map available to public via a URL link.
- ATMS enhancements at VTrans delayed the Bluetooth data integration.
- Maintenance of Bluetooth sensors.

Lessons Learned

- Some Bluetooth sensors failed to collect data regularly and generally did not perform as expected.
- Failure of Bluetooth sensors was mainly due to Vermont's harsh winters with extremely low temperatures and snow.
- Sensors powered through PoE performed better than solar-powered sensors.
- Power supply to the sensors regularly failed in freezing temperature.
- Even the double battery packs failed to provide enough power to sensors.
- Sensors had to be rebooted manually whenever power supply failed.

Conclusion and Recommendations

- Failure of reliable power supply to sensors and frequent manual maintenance of sensors made the system non-reliable.
- Since inception of this project, several technologies for collecting and disseminating live traffic data and analytic tools such as INRIX, StreetLight, etc., became available in the market.
- VTrans is working on a Thin Client ATMS enhancement project that can provide travel times to the public.
- CCRPC and VTrans jointly decided **NOT** to maintain the Bluetooth sensors as they continue to fail.
- The entire Bluetooth system will eventually be decommissioned.
- Bluetooth sensors maybe efficient in small-scale, short-term applications such as monitoring travel conditions in work zones, conducting cut-through traffic and Origin-Destination studies.

On the Horizon

- 511 site and New England Compass enhancements
- Survey123 and VAMIS
- Permanent message board installations
- RWIS, grand cast sensors, and road condition forecasting
- Construction projects & ITS
- Probe Data (big transportation data)

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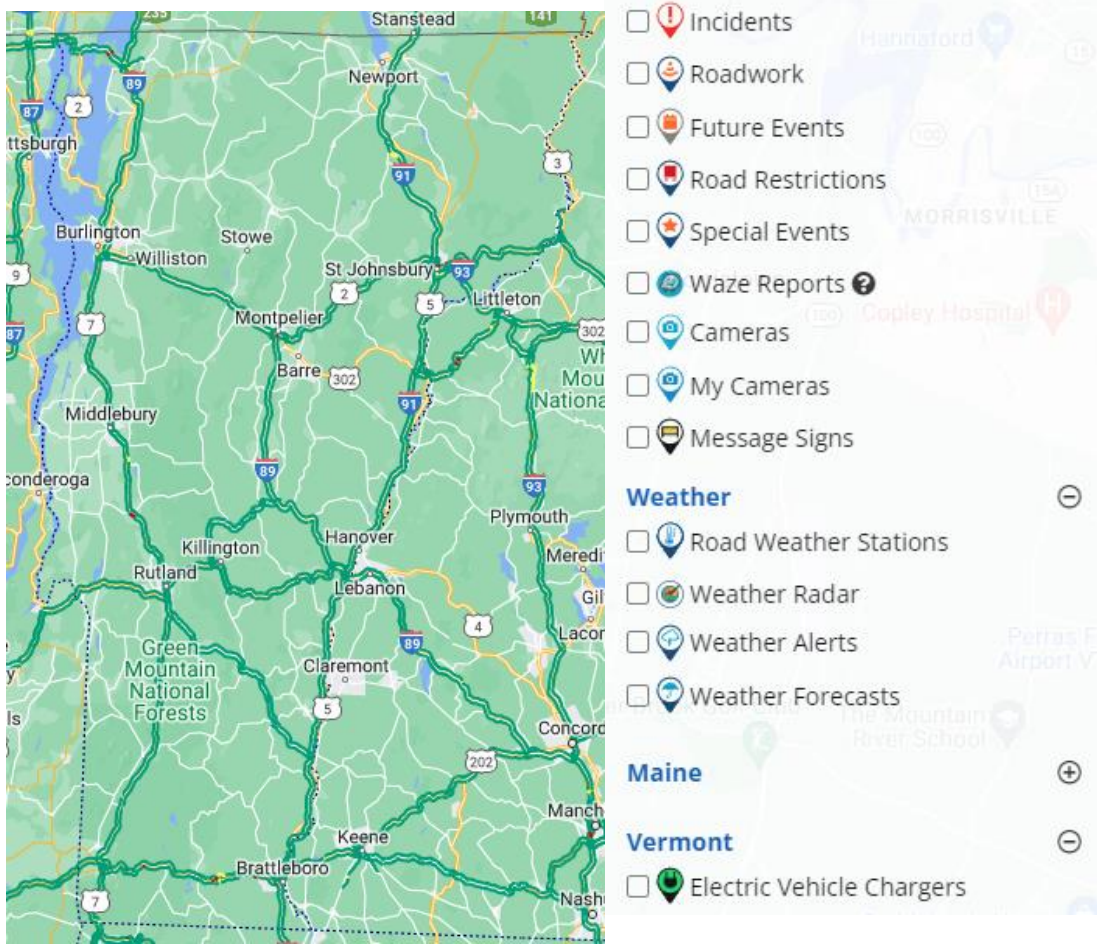
New England Compass Enhancements

- **New and Improved 511 Traveler Information Website**
- Thin Client Application
- ESRI Integration
- Power BI Integration



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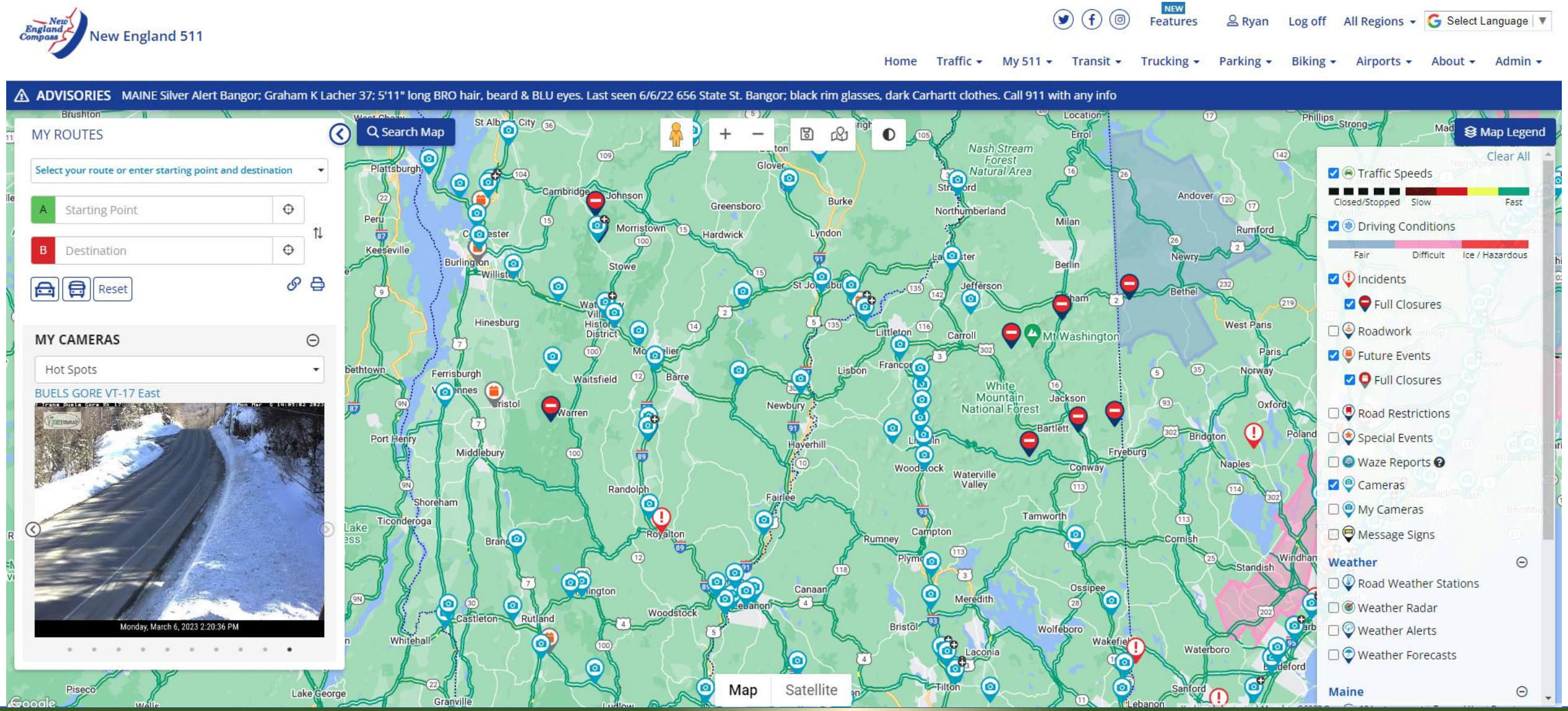
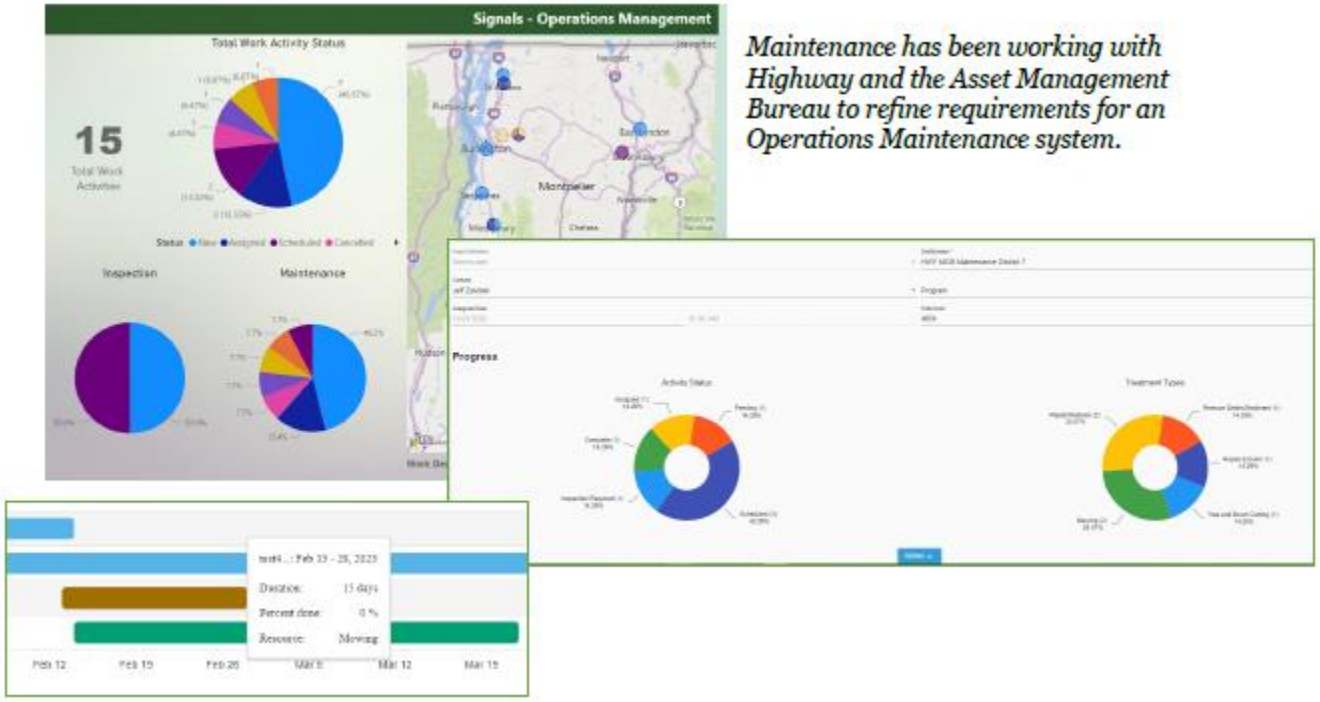
511 Traveler Information Upgrade



Survey123 & VAMIS



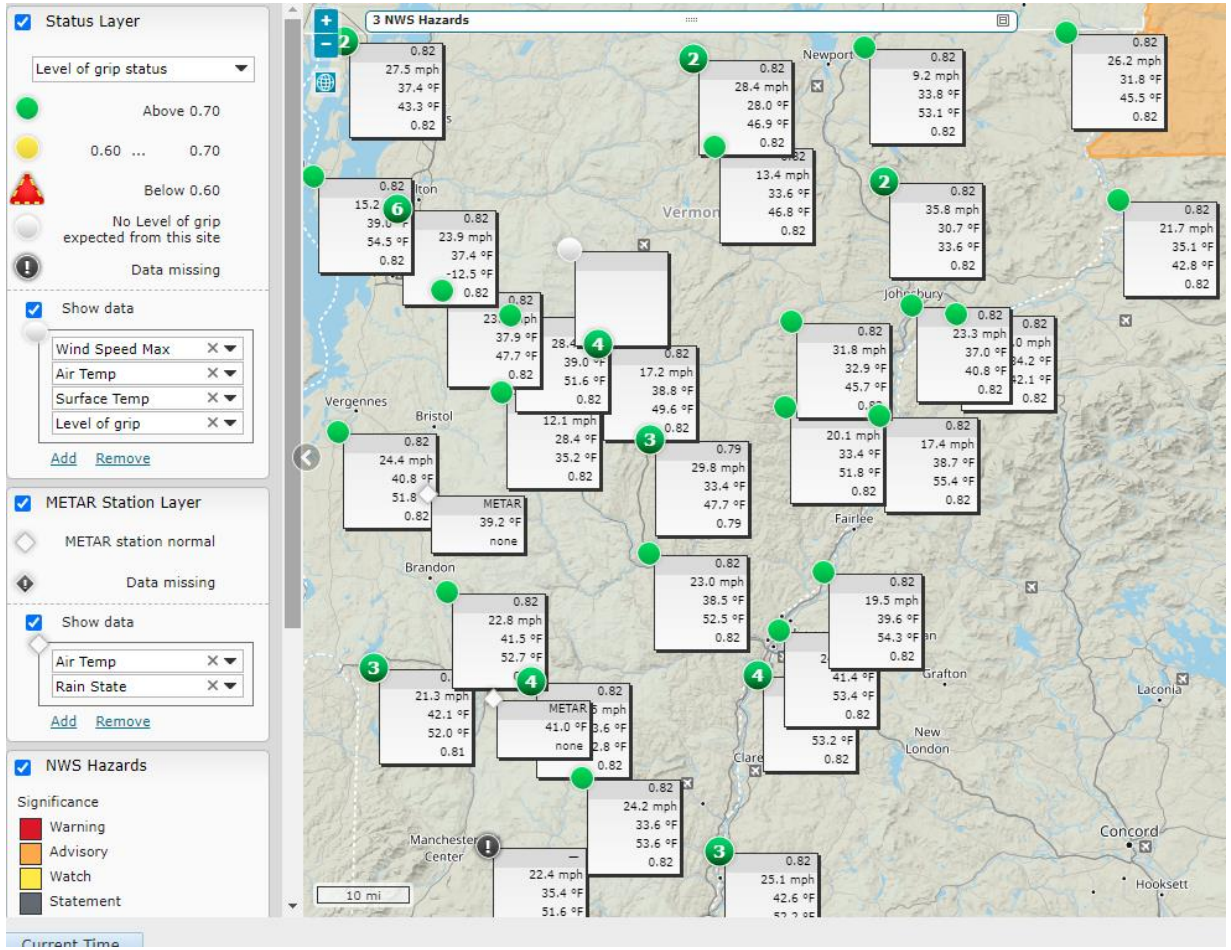
Maintenance has been working with Highway and the Asset Management Bureau to refine requirements for an Operations Maintenance system.

- Asset Inventory
- Maintenance tracking and operations management
- Life cycle costs
  - Age, risk, condition
- Return on investment

Digital Message Signs

- Shift from portable to permanent where feasible
  - Permanent power and communications
- DMS between every exit on Interstates
- Best practice training (districts)
- New England Compass enhancements
  - Scheduling
  - Edit and move
- Evaluate crash data and “hot spots”

RWIS and Road Condition Forecasting



- Reaching RWIS Saturation
- Maintain current assets and supplement with additional sensors
  - Ground cast sensors, high water sensors, etc.
- Road Condition Forecasting
  - SMART grand application
  - AVL Integration
- Hybrid power

Construction & ITS Specifications

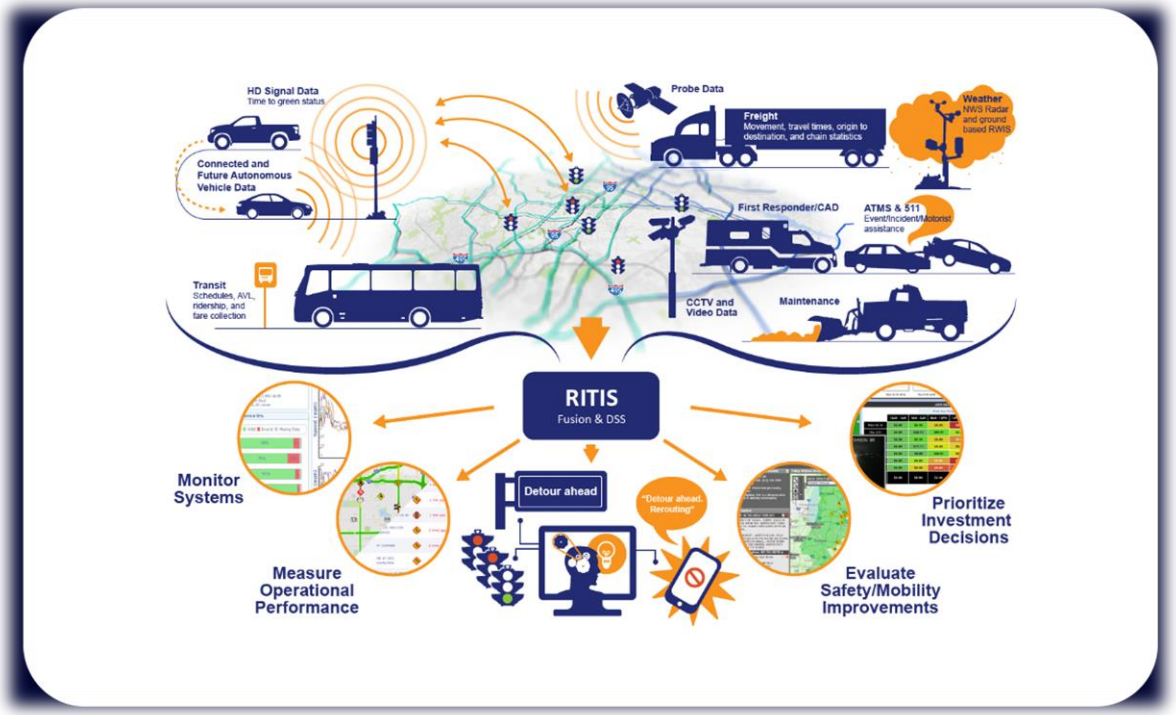
- Create standard specification for ITS installations
- Integrate installations and maintenance into construction projects
  - Leverage federal dollars
  - Supplement with contractors
- Get project personal thinking about ITS
- Smart Work Zones

Big Transportation Data & RITIS

- **Data Types:** Travel Time & Speed, Origin/Destination, Volume, Conflation (mapping)
- **Analytic Tool:** RITIS

Use Cases

- Incident Detection and Response
- Integration into existing ITS structure
- Inform Crash and Network Screening Analysis
- Improve Project Development
- Improve fidelity to:
  - Statewide Speed analysis
  - Statewide Traffic volume analysis
  - Statewide Mobility analysis
- Increase border traffic understanding and fidelity
- Enable real time data visualization and support to Execs
- Use freight information to improve economy



Source: https://www.ritis.org/intro

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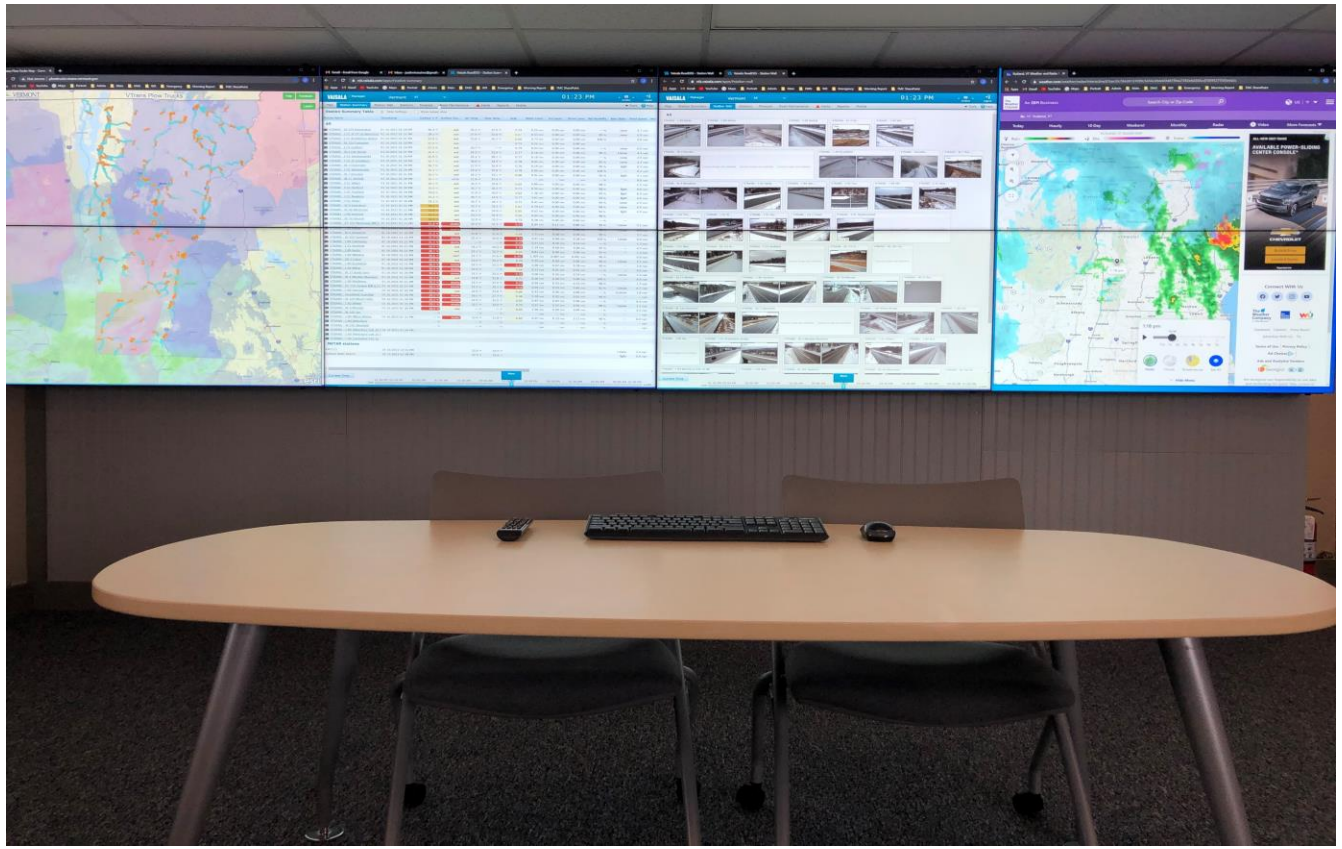
Thank You!