

# *Transportation Management Center (TMC) & Intelligent Transportation Systems (ITS)*

*Vermont Senate Transportation Committee*



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Operations and Safety Bureau (OSB)  
Vermont Agency of Transportation**

# TMC Mission

*Detect, verify, and respond to incidents affecting mobility on Vermont's transportation infrastructure. Provide the public and state agencies timely, accurate, and impactful travel information to promote safe and efficient travel 24-hours per day.*

# TMC Overview

- TMC Team
  - ITS Manager (1)
  - TMC Supervisor (1)
  - TMC Operators (3)
- Monitor mobility related incidents and trips on State of Vermont maintained roadways
- Disseminate travel information
- Maintain 24/7/365 Operations
- Central hub for information flow internally and externally for the Agency



# TMC Customers

- Provide timely, accurate, and impactful travel information to:
  - AOT District Maintenance, Fleet, and Executive leadership
  - Vermont State Police
  - State Agencies
  - Traveling public

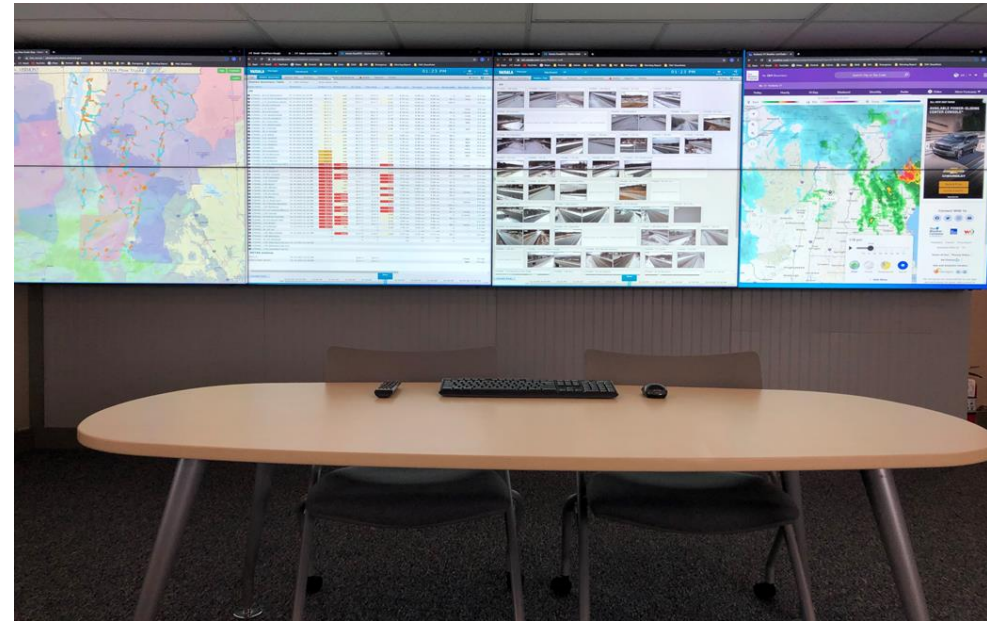


# TMC Operations, Job Duties, and Capabilities

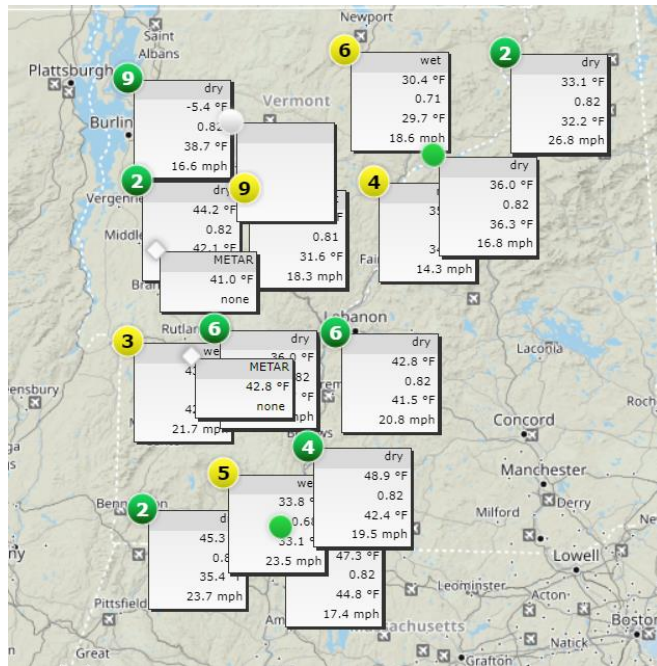


# Monitor Road Conditions

- Systems utilized
  - Road Weather Information System (RWIS) – Vaisala
  - Closed-circuit TV (CCTV)
  - Google Traffic
  - WAZE
  - Radio communications
  - Telephone
  - Email
  - Social media
  - Survey 123
  - Plow Finder/AVL
  - Changeable Message Signs
  - New England Compass/511
  - VT-Alert
  - Wavetronix



# Road Weather Information System (RWIS) & CCTV



**VTRANS - I-89 Berlin MM 50.10** (Show station on map)

**Coordinates:** 72° 35' 0" W 44° 12' 44" N  
**Altitude:** 1040 ft

**Nearest stations:**  
 VTRANS - I-89 Middlesex MM 55.8 5.1 mi  
 VTRANS - I-89 Waterbury MM 61.1 19.9 mi  
 VTRANS - I-89 Brookfield MM 10.2 mi 39.4  
 VTRANS - I-89 Brookfield 11.8 mi  
 Guardian MM 37.8  
 VTRANS - I-89 Waterbury Exit 12.0 mi

**Groups:**  
 District 4 - OPS - Randolph  
 District 4 - OPS - Rochester  
 District 4 - OPS - Royalton  
 District 4 - OPS - Thetford  
 ... and 5 more.

**Station Overview** | Graph | Camera History | History Table


**Current conditions** 02.08.2023 03:10 PM

- Air Temp: **39.6 °F**
- Dew Temp: **22.6 °F**
- Visibility: **—**
- Level of grip: **0.82**
- Surface State: **moist**
- Surface Temp: **36.3 °F**

**Wind** 02.08.2023 03:10 PM

Wind direction: **290°**  
 Wind speed: **4.5 mph**

**Roadside camera** 02.08.2023 03:13 PM



**Traffic counting**

	Timestamp	Average/5min Vehicle Speed (mph)	Average/5min Occupancy of road (%)	Traffic Volume
I-89 SB Travel Lane - Traffic	02.08.2023 03:05 PM	80.3	3	42
I-89 SB Passing Lane - Traffic	02.08.2023 03:05 PM	81.8	1	17
I-89 NB Passing lane - Traffic	02.08.2023 03:05 PM	74.0	3	37
I-89 NB Travel Lane - Traffic	02.08.2023 03:05 PM	58.1	2	16

# Road Weather Information System (RWIS) & CCTV

**Station Summary Table** ⚙ Table Settings ☐ Show sensor sites

Station Name	Timestamp	Surface Tr	Surface Sta...	Air Temp	Dew Temp	Grip	Water Layer	Ice Layer	Snow Layer	Rel Humidity	Rain State	Wind Speed...	Wind Direct...	Visibility	AvgSpd
<a href="#">VTRANS - RT 109 Jay MM 3.0</a>	02.08.2023 04:05 PM	-11.7 °F	dry	42.1 °F	24.6 °F	0.82	0.01 mm	0.00 mm	0.00 mm	50 %	none	3.1 mph	W	— ft	70.2 mph
<a href="#">VTRANS - RT 17 Buels Gore MM 2.4</a>	02.08.2023 03:59 PM	27.3 °F	moist	31.3 °F	21.7 °F	0.81	0.00 mm	0.00 mm	0.00 mm	67 %	none	3.4 mph	E	6562 ft	— mph
<a href="#">VTRANS - RT 242 Westfield MM 2.5</a>	02.08.2023 04:00 PM	28.2 °F	wet	29.1 °F	24.3 °F	0.76	0.17 mm	0.00 mm	0.00 mm	82 %	—	8.7 mph	N	— ft	— mph
<a href="#">VTRANS - RT 114 Canaan MM 0.6</a>	02.08.2023 04:00 PM	31.1 °F	dry	31.6 °F	23.4 °F	0.82	0.00 mm	0.00 mm	0.00 mm	71 %	none	4.0 mph	W	6562 ft	52.9 mph
<a href="#">VTRANS - RT 9 Marlboro MM 0.4</a>	02.08.2023 04:00 PM	31.8 °F	moist	33.1 °F	24.8 °F	0.82	0.04 mm	0.00 mm	0.00 mm	71 %	none	10.1 mph	N	6562 ft	— mph
<a href="#">VTRANS - RT 100 Lowell MM 1.1</a>	02.08.2023 04:00 PM	32.2 °F	wet	36.1 °F	23.9 °F	0.81	0.08 mm	0.00 mm	0.00 mm	61 %	none	2.9 mph	S	6562 ft	60.0 mph
<a href="#">VTRANS - RT 5A Westmore MM 1.5</a>	02.08.2023 03:50 PM	32.4 °F	wet	35.4 °F	23.9 °F	0.78	0.14 mm	0.00 mm	0.00 mm	63 %	none	4.3 mph	N	6562 ft	— mph
<a href="#">VTRANS - RT 9 Searsburg MM 2.1</a>	02.08.2023 04:00 PM	33.4 °F	moist	33.1 °F	25.2 °F	0.82	0.03 mm	0.00 mm	0.00 mm	73 %	none	6.9 mph	W	6562 ft	54.3 mph
<a href="#">VTRANS - RT 102 Maidstone MM 5.</a>	02.08.2023 04:00 PM	33.8 °F	dry	37.6 °F	22.5 °F	0.82	0.00 mm	0.00 mm	0.00 mm	54 %	none	2.5 mph	W	6562 ft	47.1 mph
<a href="#">VTRANS - US 2 Cabot MM 1.90</a>	02.08.2023 04:00 PM	34.3 °F	moist	37.4 °F	23.0 °F	0.81	0.00 mm	0.00 mm	0.00 mm	55 %	none	2.7 mph	W	65617 ft	57.5 mph
<a href="#">VTRANS - I-93/RT 18 Waterford M</a>	02.08.2023 04:00 PM	34.7 °F	dry	36.9 °F	21.7 °F	0.82	0.00 mm	0.00 mm	0.00 mm	54 %	none	8.1 mph	NW	6562 ft	67.6 mph
<a href="#">VTRANS - RT 103 Mount Holly MM.</a>	02.08.2023 03:59 PM	34.9 °F	dry	38.5 °F	23.5 °F	0.82	0.00 mm	0.00 mm	0.00 mm	54 %	—	6.3 mph	N	— ft	— mph



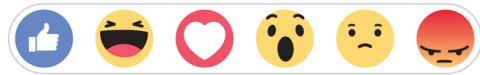


# Radio Communications

- AVTEC Radio Consoles
- Maintain direct communication with VTrans' Maintenance staff throughout the state
  - Life safety component
- Capabilities to monitor Vermont State Police channels for situational awareness



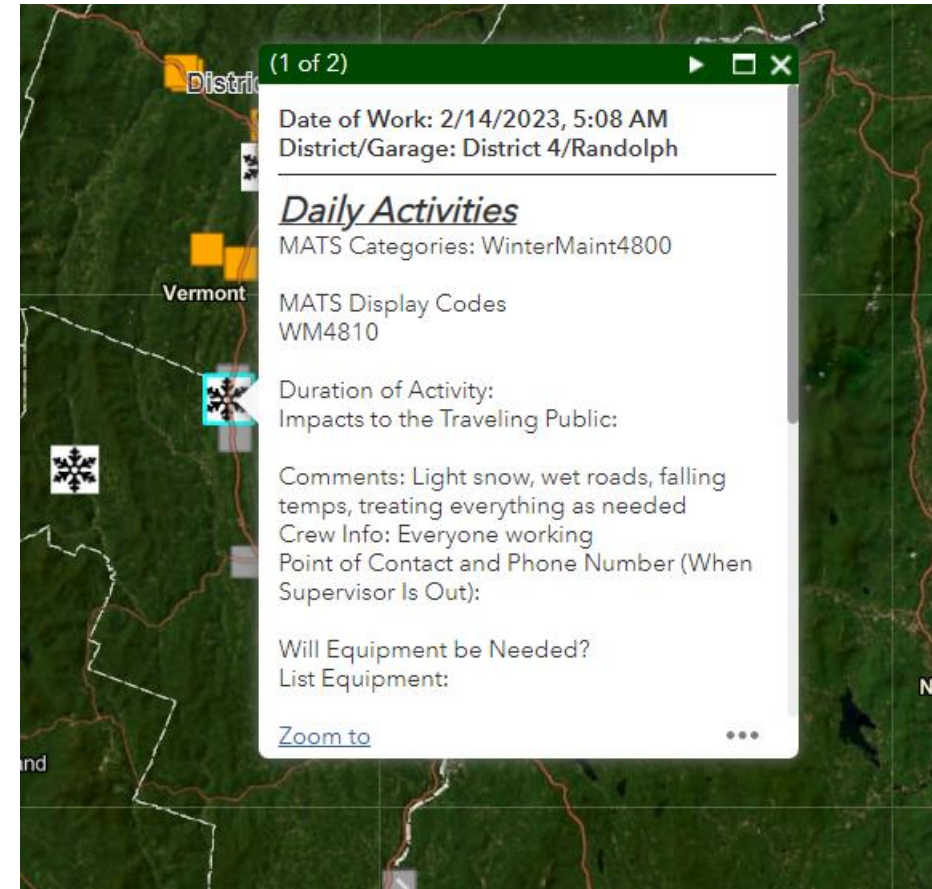
# Social Media



- Utilizing Agency of Transportation Facebook and Twitter pages to post real-time information about roadway conditions or issues impacting travel
- Monitor social media groups and comments for real-time information about roadway incidents unreported to the TMC

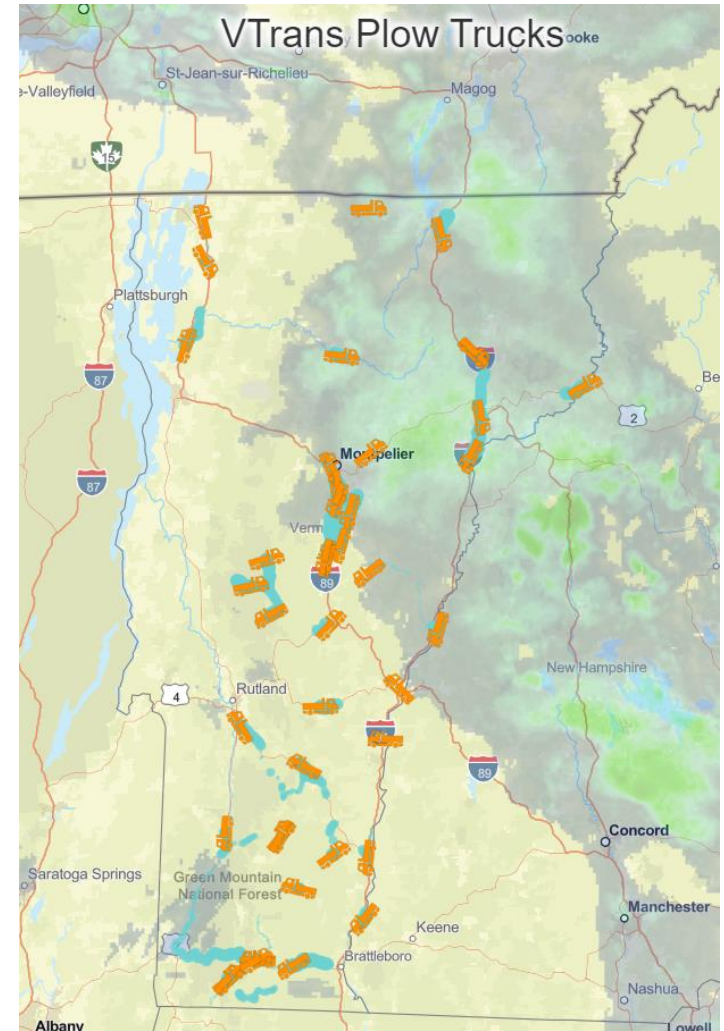
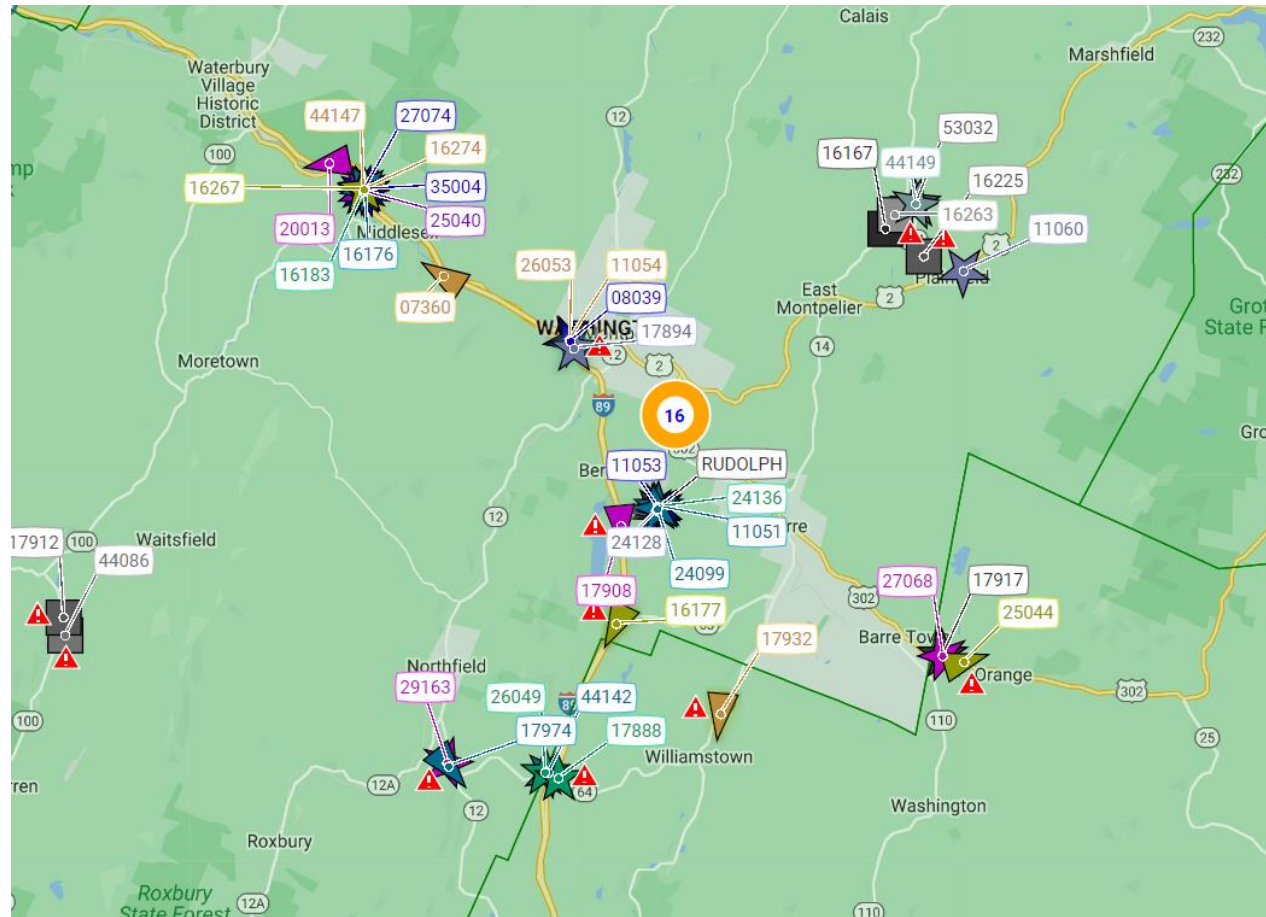
# Survey 123

- District Transportation Area Maintenance Supervisors (TAMS) enter information into a Morning Report
- Morning Reports consist of:
  - Road conditions
  - Weather conditions
  - Crew activities
  - Impacts to the public
  - Equipment needs
  - Points of contact



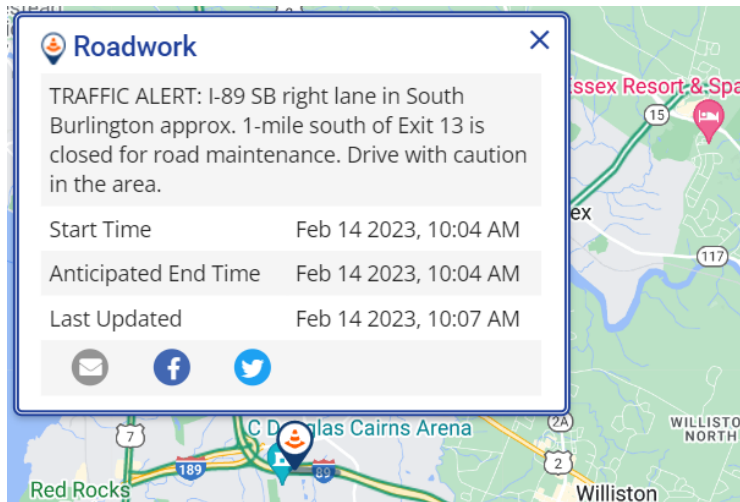


# Automatic Vehicle Locating (AVL)/Plow Finder





# Disseminate Travel Information



Feb 14, 2023 at 08:49:36

## Traffic Events Within Windham County

You have confirmed. ✓

**Event Description:** Roadwork Closure - Updated  
TRAFFIC ALERT: Today at 9 AM to 3 PM I-91 NB Westminster will be closed to all traffic between Exits 5 & 6 for bridge maintenance. Detour exit 5 to US 5 to Exit 6.  
Start Time Feb 14 2023, 9:00 AM  
Anticipated End Time Feb 14 2023, 3:00 PM

**Area Notification:** Windham County

[Click here](#) for all State of Vermont road closures.

# Changeable Message Signs (CMS)

- AOT has deployed various message signs across the state along state highways and interstates.
- Permanently mounted and portable
- Use cases:
  - Road closure notices
  - Traffic safety messages
  - AMBER Alerts
  - VT Route 9 Chain-up Law



# Road Conditions Reports



\*\*\* VTrans A.M. Road Conditions Report \*\*\*

As of 6:00 a.m. Wednesday, February 15, 2023

Statewide: VTrans "Road Weather Information Systems" (RWIS) showing data of roadways across the state to be mostly bare and dry. However, above-seasonal average air temperatures have caused snow melting making for areas of wet conditions. Temperatures this morning are ranging from the low 20s' to the low 40s' with pavement surface temps from the low 20s to mid-30s'. Above-average temperatures are expected to continue today and tomorrow. Drivers for the morning commute can plan on fairly good travel conditions for this morning but may change over to some wet conditions as some light rain or snow showers are possible during the mid-morning hours.

VTrans: Crews will be out this morning treating roads if necessary and conducting other roadway maintenance. If you happen to encounter maintenance vehicles give them room to work, and don't crowd the plow! Drive Safely.

For additional roadway condition information and roadway alerts:

VTrans website, Winter Weather Central: <https://vtrans.vermont.gov/operations/winter>

Plow Finder: <http://plowtrucks.vtrans.vermont.gov/>

Highway Webcams: <https://vtrans.vermont.gov/operations/rwis>

New England 511: <http://newengland511.org/Home/Index>

VT-Alert: <https://vem.vermont.gov/vtalert>

VTrans on Facebook: <https://www.facebook.com/VTransontheroad/>

VTrans on Twitter: <https://twitter.com/AOTVermont>

Media Inquiries:

During regular business hours (Mon-Fri, 8:00 a.m. – 5:00 p.m.), contact AOT's Director of Communications and Public Outreach at [Amy.Tatko@vermont.gov](mailto:Amy.Tatko@vermont.gov) or (802) 498-8025.

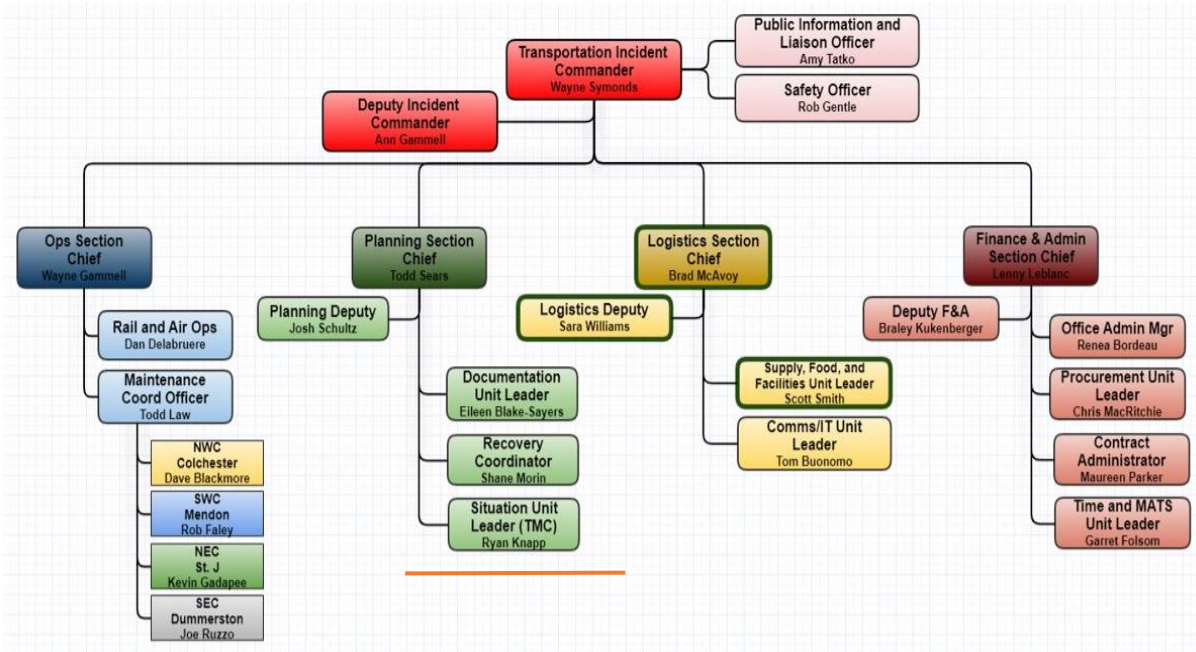
At all other times, contact [AOT.TMC@vermont.gov](mailto:AOT.TMC@vermont.gov).

Next Report: 3:00 p.m. Wednesday, February 15, 2023

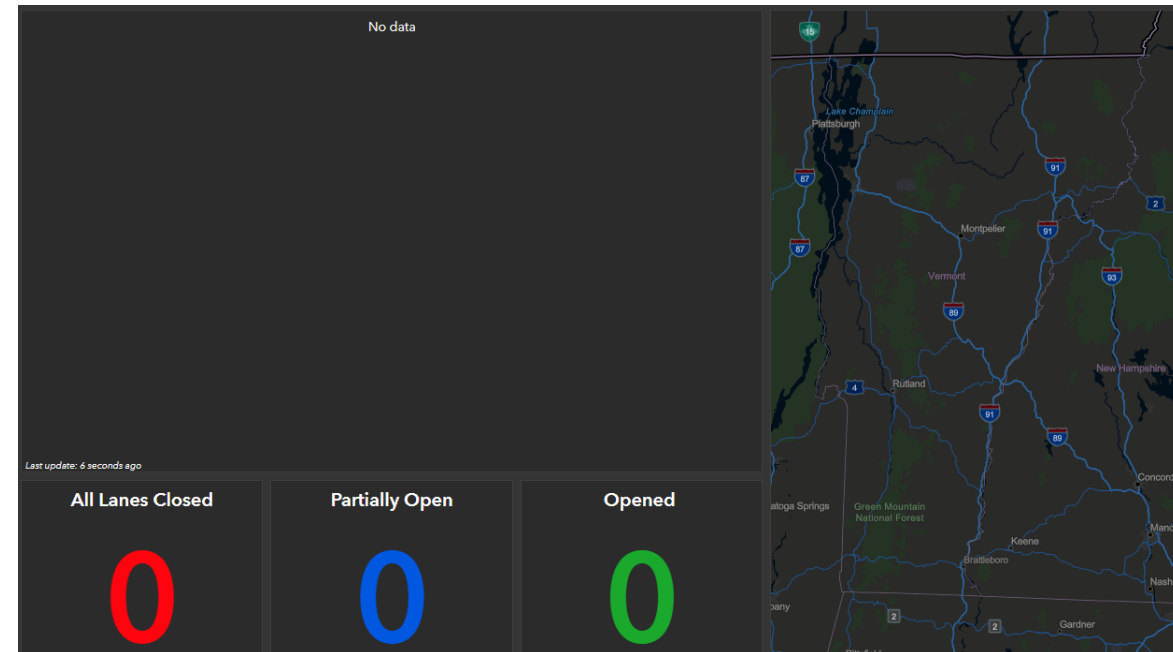
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- Twice daily report issued by the TMC Operators to media contacts
- Summarized road conditions, weather impacts, and implications for the traveling public
- Monday through Friday at 6:00 a.m. and 3:00 p.m. and as needed on the weekends
- November 15<sup>th</sup> through April 15<sup>th</sup>

# ICS Activations



Administer Common Operating Picture (COP)



- 1) Situation Unit Leader
- 2) TMC Operators (2)
- 3) GIS Professional
- 4) Conduit to VEM



# Redundancies

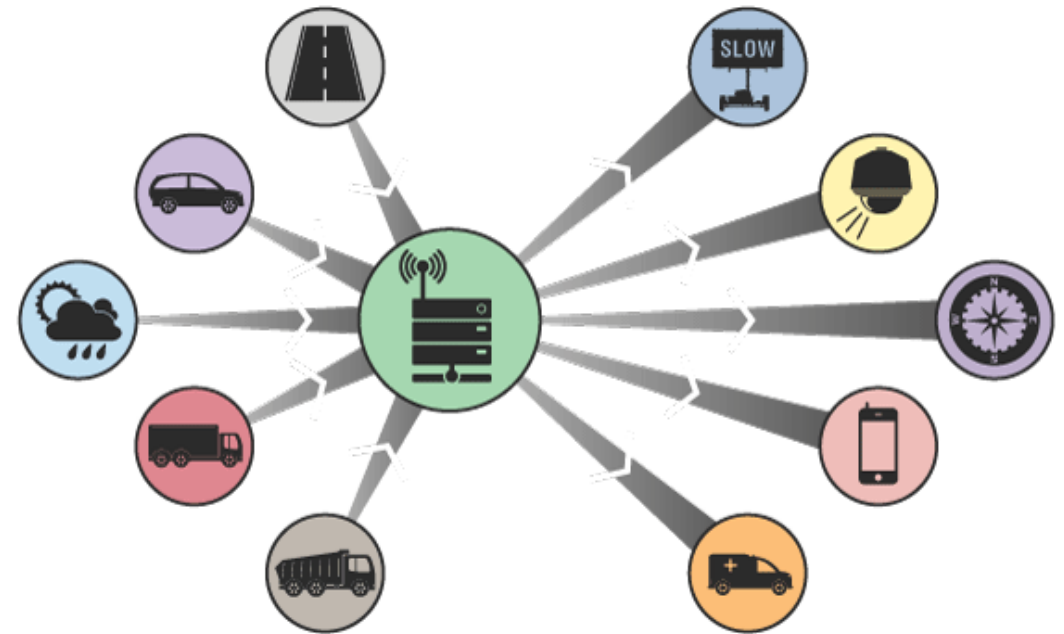
- In order to maintain operations, the TMC has several redundant communication methods.
  - Satellite phones
  - HAM (Amateur) Radio
  - State Network and back-up internet
  - Cellular hot spots
  - Portable AVTEC radio consoles
  - Generator power



# Intelligent Transportation Systems (ITS)

# 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



# 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

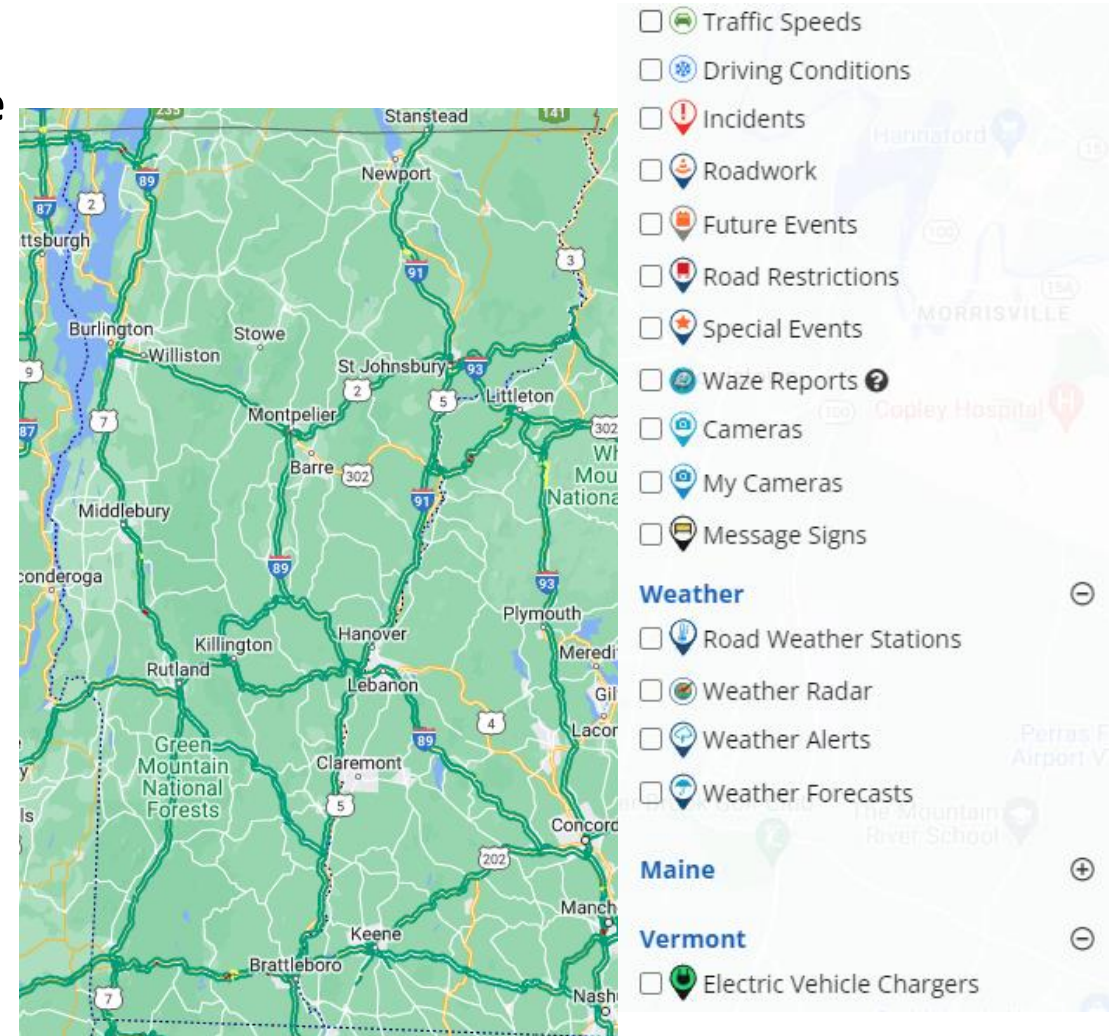


# Road Weather Information System (RWIS) & CCTV

- Comprised of environmental sensor stations, communication system, and central systems to collect data.
- RWIS Stations also have CCTV cameras incorporated with each site
  - CCTV allows for real-time imaging to help inform AOT and the public to current road conditions
- Sensors
  - Thermometer – measuring air temperature and pavement temperatures
  - Anemometer – measuring wind speeds
  - Wind vane – measuring wind directions
  - Visibility – measuring site distance
  - Surface sensors – measuring road surface temperature, dry or wet states, and water depth
  - Precipitation type – depicting light rain, rain, heavy rain, snow, sleet, freezing rain, etc.
  - Other – dew point, road friction coefficient, humidity
  - Wavetronix – traffic volume, speed data, occupancy rate

# New England Compass Enhancements

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

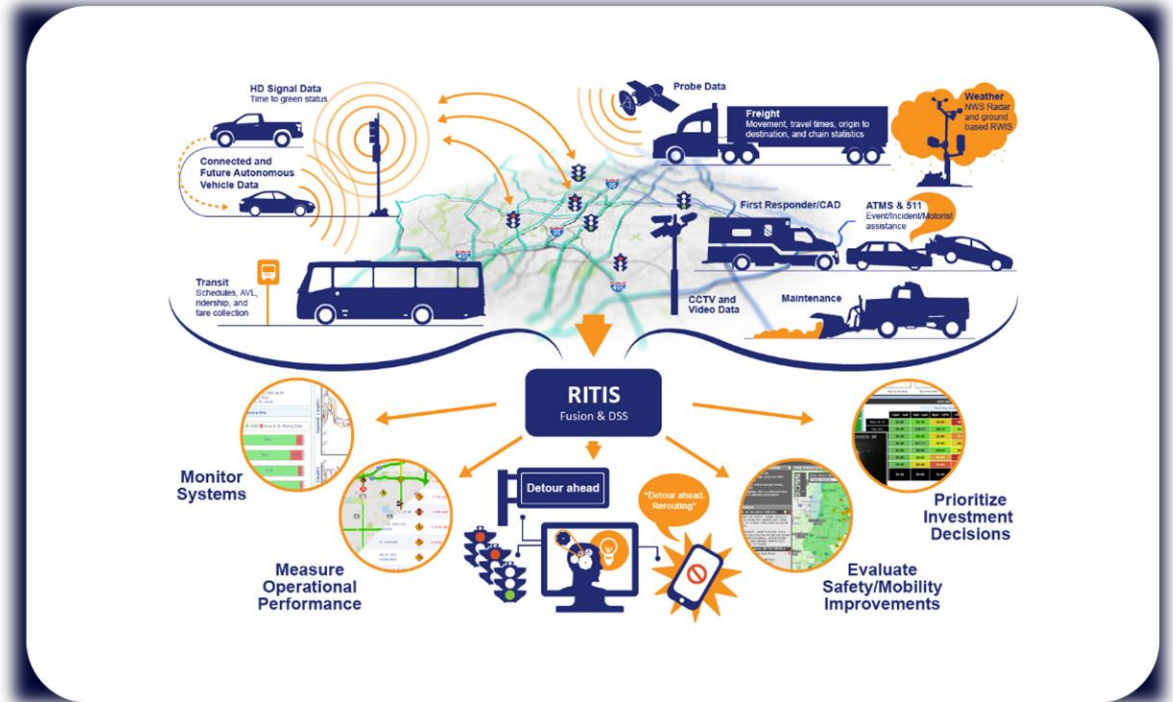


# Big Transportation Data & RITIS

- **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





# Thank You!

