

Best Practices for Road Weather Management

Version 3.0

Vermont Agency of Transportation: Transportation Operations Center

The Vermont Agency of Transportation (VTrans) Transportation Operations Center (TOC) is the focal point for VTrans' Intelligent Transportation Systems (ITS) road weather management and traveler information systems operations. TOC staff are responsible for monitoring various ITS devices statewide, communicating with VTrans' road crews, public safety (state and local), and emergency providers via radio and telephone, and updating the general and traveling public via Condition Acquisition Reporting System (CARS). TOC staff input information into CARS and CARS disseminates the information out to the public via 511, Variable Message Signs (VMS), Low Power Frequency Modulation (LPFM) stations, web, e-mail, and text notifications.

System Components: The TOC consists of:

- Two Communications Specialists
- Internet Protocol (IP)-based Radio System that connects to all nine VTrans' districts as well Vermont State Police Dispatch and local police.
- Video Wall for displaying data and video feeds from RWIS, local news, as well as different websites including 511.

System Operations: The TOC relies on various ITS devices such as RWIS, VMS, 511, and LPFM (Low-Power FM).

The TOC has improved VTrans traveler information dissemination as well as winter road maintenance by providing VTrans' maintenance crews with advanced weather information to allow crews to be proactive versus reactive to road and weather conditions throughout the state. This advanced weather information is ascertained by TOC crews monitoring National Oceanographic and Atmospheric Administration (NOAA), National Weather Service (NWS), as well as local radar to see what types of weather patterns are heading toward Vermont. In addition they provide RWIS data to Lyndon State College Meteorology Department (LSC). LSC takes the data and inputs it into their computer models to analyze the data and provide accurate forecasts to the VTrans districts and 24 to 48 hour advanced weather forecasts.

Transportation Outcome(s): The TOC, though small and undermanned, has provided a wealth of information to VTrans' maintenance crews and the travelling public regarding adverse driving conditions during the winter, lane and road closures during road construction projects, and road closures due to crashes. VTrans' maintenance crews heavily rely on feedback from TOC staff as they monitor RWIS data and camera images, NOAA, NWS,



Figure VT-1. Traffic operations center.



Figure VT-2. Traffic operations center's Gregory Fox, VTrans' communications specialist.



Figure VT-3. Traffic operations center Mark Gerrish, VTrans' fiber optic project manager.

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and local weather radar, etc. This gives the maintenance crews more time to plan on winter maintenance activities versus waiting for the event to happen and then having to react. Crews can have trucks loaded with correct materials (salt, sand, de-icing, etc.) and in some cases pre-treat roads before winter events occur. The immediate benefit is less material wasted along with man-hours for having to return to the garage to change out materials due to changes in the weather patterns.

The travelling public and local media (TV and radio) have come to rely on 511 (both phone and web) and the various information disseminated. VTrans receives constant feedback (both positive and negative) from the public on how well the systems are working and how the information is used to make their travel more pleasant and feasible.

Implementation Issues: As with all new technology, implementation issues that have affected the TOC the most are reliability issues with ITS devices. VTrans relies heavily on the technology vendors to maintain and troubleshoot problems with the ITS devices. When an ITS device goes down, it may take the vendor a week or more to troubleshoot and fix. While the device is down, TOC staff cannot receive or review data from the device. This creates holes in the TOC staff's ability to provide information to road crews and the travelling public.

As stated earlier, VTrans TOC is undermanned making it nearly impossible to provide up to date information at all times. To offset this, VTrans has looked at automating some features including allowing RWIS to control VMS in their vicinity and display pertinent messages related to the adverse weather conditions detected by the stations. However in order to do this, the RWIS and VMS must be reliable, i.e., on and in proper working condition.

Another factor is communications. Because Vermont is such a rural state, Vermont is lacking in telecommunications infrastructure. This has also made it hard to implement ITS devices statewide and has thus further restricted the TOC's "eyes and ears" as to what is happening (weather and road incidents) around the state.

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Reference(s):

- State of Vermont 511 website <<http://www.511vt.com>>
- Vermont Agency of Transportation website <<http://www.aot.state.vt.us/>>
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Keywords: Traffic Operations Center, road weather information systems

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Appendix A

Acronym List

AFWS	Automated Flood Warning System
AASHTO	American Association of State Highway and Transportation Officials
ATIS	Advanced Traveler Information System
ATS	Automated Transportation System
ATM	Active Traffic Management
ATMS	Advanced Traffic Management System
AVCS	Advanced Vehicle Control System
AVL	Automatic Vehicle Location
AWOS	Automated Weather Observation Systems
B/C	Benefit/Cost
BMP	Best Management Practice
CARS	Condition Acquisition Reporting System
CCTV	Closed Circuit Television
CDPD	Cellular Digital Packet Data
CHP	California Highway Patrol
CMAQ	Congestion Mitigation and Air Quality
CMS	Changeable Message Signs
CSLS	Changeable Speed Limit Signs
DCP	Data Collection Platform
DCS	Data Collection System
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPS	Department of Public Safety
DSL	Digital Subscriber Line
DSS	Decision Support System
DUST	Dual Use Safety Technology
EMS	Extinguishable Message Signs
EOC	Emergency Operations Center
ESS	Environmental Sensor Station
EVMS	Equipment Vehicle Management System
FDWS	Fog Detection and Warning System
FIRST	Freeway Incident Response Safety Team
FHWA	Federal Highway Administration
FMS	Freeway Management System
GIS	Geographic Information System

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GOES	Geostationary Operational Environmental Satellite
GPS	Global Positioning System
HAR	Highway Advisory Radio
HARS	Highway Advisory Radio Service
HAZMAT	Hazardous Material
HDWS	High Water Detection Systems
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
IAP	Incident Action Plan
ICS	Incident Command System
ICWS	Icy Curve Warning System
ILCS	Intelligent Lane Control Signals
IP	Internet Protocol
IRIS	Intelligent Roadway Information System
ISP	Information Service Provider
ITS	Intelligent Transportation System
KHP	Kansas Highway Patrol
KTA	Kansas Turnpike Authority
LED	Light Emitting Diode
LPFM	Low Power Frequency Modulation
LSC	Lyndon State College
MDC	Mobile Data Collection
MDSS	Maintenance Decision Support System
MMDI	Metropolitan Model Deployment Initiative
MMS	Maintenance Management System
MRC	Measurement Research Corporation
MS/CVE	Measurement Standards and Commercial Vehicle Enforcement
MVDS	Microwave Vehicle Detection System
NCHRP	National Cooperative Highway Research Program
NDFD	National Digital Forecast Database
NOAA	National Oceanographic and Atmospheric Administration
NTCIP	National Transportation Communications for ITS Protocol
NWS	National Weather Service
OFCM	Office of the Federal Coordinator for Meteorology
OK-FIRST	Oklahoma's First-response Information Resource System using Telecommunications
OLETS	Oklahoma Law Enforcement Telecommunications System

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PC	Personal Computer
PLC	Programmable Logic Controllers
PMR	Performance Measurement and Reporting
PTR	Pointer Record
PRTU	Pump Station Remote Terminal Unit
PVC	Polyvinyl Chloride
RPU	Remote Processing Unit
RTMC	Regional Traffic Management Center
RVD	Radar Vehicle Detection
RWIS	Road Weather Information System
SCADA	Supervisory Control and Data Acquisition
SCHP	South Carolina Highway Patrol
SEOC	State Emergency Operations Center
SHA	State Highway Administration
SHEP	State Highway Emergency Patrol
STC	Smart Traffic Center
STMC	State Traffic Management Center
TCC	Traffic Control Center
TDP	Temperature Data Probe
THP	Tennessee Highway Patrol
TI	Traveler Information
TMC	Traffic Management Center
TP	Tow Plow
TOC	Traffic Operations Center
TRIS	Transportation Research Information Services
TTX	Table Top Exercises
UHF	Ultra-High Frequency
UPS	Uninterruptible Power Supply
US	United States
USDOT	United States Department of Transportation
UTCS	Uniform Traffic Control System
VDS	Vehicle Detection Station
VHF	Very High Frequency
VMS	Variable Message Sign
VSL	Variable Speed Limit
VSS	Variable Speed Sign
WAN	Wide Area Network

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U.S. Department of Transportation
Federal Highway Administration
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1200 New Jersey Ave., SE
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Publication No.: FHWA-HOP-12-046

Publication Date: August 2012