# Best Practices for Road Weather Management
Version 2.0

Washington State DOT Road Weather Information for Travelers

The Washington State Department of Transportation (DOT) has collaborated with the University of Washington to provide travelers with comprehensive, integrated road weather information. The DOT maintains one of the most advanced traveler information web sites, which allows users to access current and predicted road weather conditions on an interactive, statewide map.

System Components: The DOT owns 50 Environmental Sensor Stations (ESS) that collect air temperature, atmospheric pressure, humidity, wind speed, wind direction, visibility distance, precipitation, pavement temperature and subsurface temperature. Some stations are equipped with Closed Circuit Television (CCTV) for visual monitoring of pavement and traffic flow conditions. The DOT is also a member of the Northwest Weather Consortium, which collects and disseminates real time data from an extensive environmental monitoring network. This network gathers and disseminates data from over 450 ESS owned by nine local, state and federal agencies. A statewide communication network transmits this ESS data to the Seattle Traffic Management Center (TMC) and to a computer at the University's Department of Atmospheric Sciences for data fusion and advanced modeling.
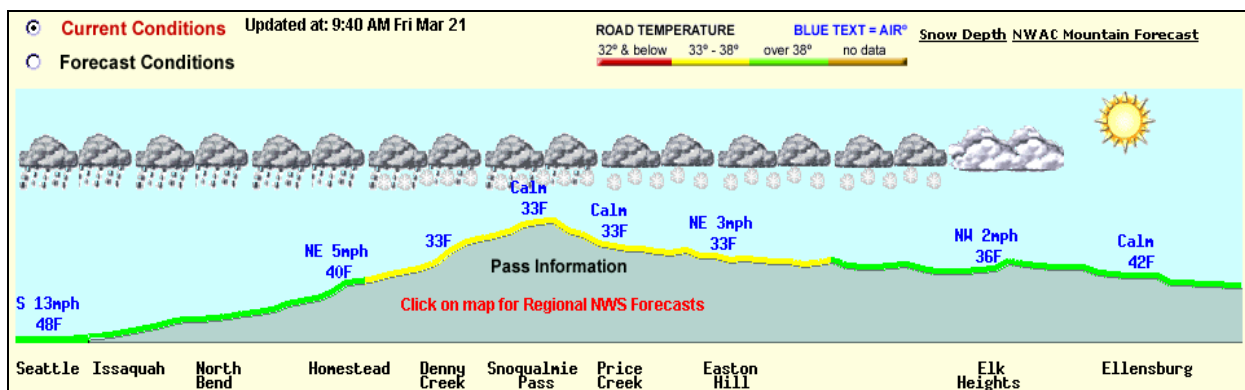
Washington State DOT Route-Specific Road Weather Information Display

System Operations: A sophisticated computer model developed by the university ingests ESS data to determine prevailing and predicted pavement temperatures and generate high-resolution, numerical weather forecasts for the entire state. Observed environmental data is integrated with other information including National Weather Service (NWS) forecasts, satellite and radar images, video from 350 CCTV cameras, traffic flow data from inductive loop detectors, incident and construction data, ten mountain pass reports, and audio broadcasts from four Highway Advisory Radio (HAR) transmitters. As shown in the figures, route-specific traveler information is disseminated through the DOT's Traffic and Weather web site (*www.wsdot.wa.gov/traffic*) and via an interactive voice response telephone service (*800-695-ROAD*).

**Washington State DOT
Video of Selected Route with
Vehicle Restrictions**

To make travel decisions, the public may access the web site to view state, regional and local maps with environmental observations, weather and pavement condition forecasts, video from freeway CCTV cameras, information on road maintenance operations, and travel restrictions on mountain passes (e.g., reduced speed limits, prohibited vehicle types).

Transportation Outcome: Road weather data available through the web site and telephone service allows users to avoid hazardous conditions, modify driving behavior, and reduce crash risk. A user survey found that travelers feel safer when they have access to real-time road weather information. The survey also revealed that users frequently access the web site to prepare for prevailing conditions along a selected route (i.e., 90 percent of respondents), for general weather conditions (i.e., 86 percent), to check weather for a specific recreational activity (i.e., 66 percent), and to determine travel routes or travel time.

Usage logs from the web site indicate that travelers access condition data more frequently during adverse weather events. On average, there were over 3,700 user sessions per day in February 2001. During a snowstorm on Friday, February 16th (before a three-day weekend) site usage increased to nearly 13,000 user sessions. The interactive telephone service typically receives one million calls each winter (i.e., an average of 8,000 calls per day) with call volumes increasing during inclement conditions or major incidents.

Maintenance managers also benefit from access to detailed road weather data. This data serves as support for operational decisions, such as resource allocation and treatment planning. More effective and efficient resource decisions reduce labor, equipment and material costs. The ability to employ proactive road treatment strategies, such as anti-icing, also improves roadway mobility.

Implementation Issues: The web site project was funded by a grant from U.S. Department of Transportation and a 20 percent match from Washington State DOT. To collect environmental data for the site, the DOT wanted to procure ESS from different vendors and display field data on a single user interface. Project managers developed functional specifications and issued a request for proposals to furnish ESS capable of communicating with an existing server using National Transportation Communications for ITS Protocol (NTCIP) standards. After resolving technical issues related to object definitions, one vendor successfully demonstrated that their sensor stations could communication with another vendor's server.

This simplified management of environmental data and avoided the need for additional hardware, software and communications infrastructure. By using the open communication standard the DOT encouraged competition among vendors that reduced ESS procurement costs by nearly 50 percent. The NTCIP will also facilitate future expansion of the environmental monitoring system.

The Washington State DOT has initiated a project to deliver traveler information via 511, the national traveler information telephone number. The agency is developing a program with natural language speech recognition to read web site data and disseminate tailored information. The DOT is in negotiation with local cellular telephone companies to offer 511 free of charge. The toll-free telephone number will be phased out as the 511 implementation project proceeds.

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Keyword(s): adverse weather, road weather information for travelers, traveler information, advisory strategy, weather information, pavement temperature, environmental sensor station (ESS), closed circuit television (CCTV), Internet/web site, decision support, institutional issues, road weather information system (RWIS), safety, productivity