

ROAD WEATHER INFORMATION SYSTEM (RWIS)

BACKGROUND

A Road Weather Information System (RWIS) collects and displays data from a network of pavement and atmospheric sensors to provide site-specific weather and pavement surface condition information. RWIS data is used to predict the onset, duration, and intensity of winter storms, and can send a warning when hazardous conditions are imminent. Accident reduction, motorist convenience, and improved use of maintenance resources are all potential benefits of RWIS technology. In addition, the RWIS system can be expanded to provide traffic related information relative to volume, speeds, and congestion, ultimately assisting with operational issues involving incident and traffic management.

LITTLE BAY BRIDGE—Phase 1

This research project provided for the installation of an RWIS system at the Little Bay Bridge in Newington/Dover, NH. This site was selected because it experiences a high incidence of winter accidents associated with heavy traffic volumes and the frequent occurrence of unexpected icing. The RWIS was first activated in November of 1997. This initial installation provided an opportunity to evaluate the value of RWIS technology and the potential benefits of site-specific weather and surface condition forecasts.

Two contracts were initiated to provide for 1) RWIS installation and maintenance as well as training of Highway Maintenance personnel, and 2) site-specific weather and pavement condition forecasting using data from the Little Bay site. A 30-foot tower and enclosure were erected at the site to house the atmospheric weather sensors and a data acquisition computer known as a RPU. The atmospheric weather sensors included instruments to measure wind speed and direction, atmospheric temperature, relative humidity, and precipitation. Pavement surface sensors provided measurements for determining pavement surface temperature, presence of surface moisture, presence of ice or snow, concentration of deicing chemical in surface moisture, and the predicted freeze point of pavement surface moisture. The RPU collects and stores data from atmospheric and pavement surface sensors. A central server polls the RPU at regular intervals to retrieve, process, and disseminate the RWIS data.

Lessons Learned

This system was evaluated over two winter seasons. The following shortcomings were identified:

- Pavement sensors exhibited inadequate life span.
- Training failed to provide maintenance staff with an adequate understanding of system alarms and how to use information provided by the RWIS.
- Maintenance crews did not receive forecast updates, system alarms, and site-specific forecasts during off-hours.

LITTLE BAY BRIDGE—Phase 2

As pavement sensor failure eventually rendered the Little Bay RWIS inoperable, a demonstration project was initiated in late 2003 to reactivate the site and provide an opportunity to address the shortcomings identified in Phase 1. Emphasis was placed on system reliability, product performance, training, and technical support. Forecasting service was not included in this procurement.

The selected vendor chose to replace all system components and used only the tower from the original system. In addition, a separate "slave" RPU was added to allow the new bridge deck surface sensors and two fixed focus cameras to be located at the mid-span of the bridge.

Lessons Learned

Snowplow damage to a conduit resulted in system failure early in 2005. Although the software is not judged to be user-friendly, there are no apparent reliability issues with system components. The delivery of current RWIS data and alarms to maintenance crews remained a problem. To send alarms, the system relies on a cell phone technology that is not widely available in NH. As RWIS data was displayed only at the maintenance shed, it was only viewed when the crew was present. To assure success, RWIS data and alarms should go to a facility that is manned around the clock during the winter months.

STATEWIDE RWIS DEPLOYMENT

The Department is currently in the process of deploying a statewide system of RWIS stations in partnership with Plymouth State University. Eleven RWIS stations are being installed, and a central server will collect the data and display it on a website. As communications options vary with location, the system will utilize a combination of wireless, dial-up, and satellite data transmission. Alarms will be sent to the appropriate Maintenance District office. A significant training program will educate highway maintainers and those who will maintain the RWIS system. The Little Bay site will be repaired and integrated into the statewide system. Additional RWIS sites are planned as funding allows.

Plymouth State University is providing a portion of the funding for these sites and will use the data for research and educational purposes in addition to designing web based tools for NHDOT.



Little Bay RWIS



Pavement Sensor Locations



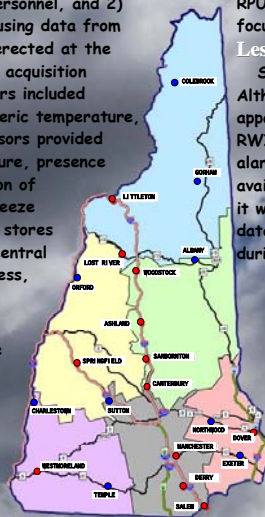
Little Bay Bridge



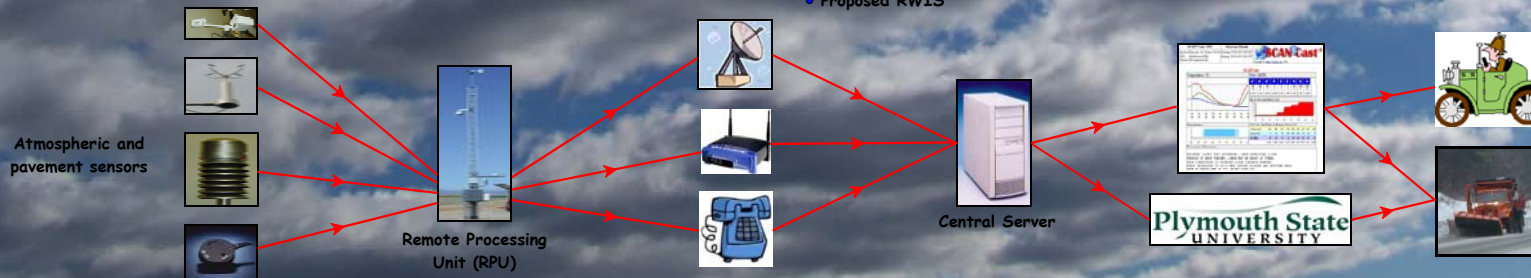
Little Bay Camera Image



Littleton RWIS



• RWIS Locations
• Proposed RWIS



- ### ACKNOWLEDGMENTS
- Technical Advisory Group, 1st project
 Mike O'Malley
 Steve Gray
 Alan Rawson
 Glenn Roberts
- Technical Advisory Group, 2nd project
 Alan Rawson
 Steve Gray
 Mike O'Malley
 Ken Kyle
 Dave Barker
 Subramanian Sharma
 Gordon Graham
 Marty Calawa
 Bill Reel
- Participants
 Turnpikes Maintenance Shed #835
 Leo Gerrior

For more information: Contact the NHDOT Research Section at (603) 271-3151 or visit www.nh.gov/dot/research

