

**WEATHER INFORMATION FOR SURFACE TRANSPORTATION:  
Providing Integrated Services Across the North American Continent**

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**ABSTRACT**

Weather has an enormous effect on travel and road conditions. Drifting snow, ice, fog, and gusty winds are some of the weather events that contribute to the deaths of more than 1150 U.S. and Canadian highway users every winter. Adverse conditions cut surface friction, impact highway capacities and reduce accessibility, damaging industry and rural economies alike. Over \$2 billion is spent on snow and ice control each year in North America. Despite this, estimates indicate:

- between 25 and 35 per cent of inter-urban incidents occur during adverse weather conditions;
- accidents increase during adverse weather by factors of between two and five; and
- U.S. injury accidents alone exceed 65,000 due to adverse road conditions.

To help address these difficulties, various agencies within the U.S. and Canada are currently working together to develop an integrated strategy for providing detailed, up-to-the-minute weather information dissemination services. However, these efforts will not solely concern winter weather conditions information, and will not target surface transportation alone. In addition to providing information to travelers, industry, and agencies charged with transportation infrastructure maintenance, it is envisioned that links can be forged with the railroad, aeronautical and waterways sectors. Beyond transportation even, is it hoped to that by progressive diversification it will be possible to meet the routine and disaster needs of farmers, emergency management agencies, flood control districts, and many others.

Various weather information needs analyses, performed by bodies such as the Strategic Highway

Research Program (SHRP) Storm Monitoring and Communications Project, intelligent transportation systems (ITS) groups such as ENTERPRISE, and road-weather programs like Aurora, show that:

- the most important need is to pull together all of the existing weather and road condition data sources. Future systems should not be limited to one or a few data sources, but should integrate information from all available sources, including for example, national meteorological agencies, and private 'value-added' weather services, as well as R/WIS field stations;
- as weather honors neither political boundaries nor institutional divisions, agencies and firms must share information to improve their weather tracking and monitoring capabilities;
- road-weather information must be timely and accurate. Detailed, location-specific forecasts and nowcasts are essential. The numerous advances in meteorology, computing power and telecommunications have created a situation in which forecasters have more to offer transportation operators and users than ever before;
- users require multiple means of information access, including radio, television, conventional and cellular phone, pager, and the Internet. Information must be available on-demand and should also be available in tailored packages 'pushed' to key users when threshold conditions are exceeded;
- users need flexible information presentation formats. The information is often far too complex to provide all data to users. Effective, proven decision support systems are vital for user buy-in; and
- an open system architecture is essential. Due to the complexity and number of fast-evolving information systems which need to be linked together, it is imperative that standardized communications protocols, such as the U.S. National Transportation Communications ITS Protocol (NTCIP) Environmental Sensor Station initiative, be utilized from the start.

This paper explores the possibilities for innovative approaches to providing road and weather condition information to diverse users, and suggests ways to broaden the traditional views of information provision through wide-ranging public / private partnerships. Details will be provided of various initiatives which, though they are at the conceptual stage at the present time, will seek to:

- make use of multiple meteorological agency data sources, models and technical / human resource infrastructures for providing basic nowcasts and forecasts;
- transfer energy balance models developed in Europe for pavement condition forecasting, taking proven approaches further to address particular North American conditions, and bringing the work into the public domain for full academic scrutiny;
- build on public-private partnerships to establish rural ITS Service Centers that are capable of data fusion and real-time prediction, to close the gap where some public agency responsibilities end; and
- disseminate 'baseline' free-at-point-of-use safety information and added-value tailored information services to travelers, DOT maintenance personnel and many others, using the full range of available / emerging commercial and ITS traveler information media.