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Instrument Landing System (ILS) Feasibility Study Completed for Mount Washington Regional Airport

In October 2007 the Department entered into an agreement with the Federal Aviation Administration (FAA) to investigate the feasibility of establishing a full Instrument Landing System (ILS) on Runway 10 at the Mount Washington Regional Airport in Whitefield. The purpose of the study was to determine if a full ILS could be successfully sited given the terrain and airfield layout limitations at the airport, and to provide a preliminary cost estimate for the installation.



As a result of the study, the FAA determined that an ILS utilizing an End Fire Glide Slope (EFGS) antenna system can be properly sited and would provide the best results for a precision approach at the airport.

The results of this research, along with two other ongoing studies at the airport, will give airport personnel and aviation officials a more complete picture of the implementation needs of an ILS at Mount Washington Regional Airport and allow an environmental assessment and preliminary design to proceed.

The FAA recommends proceeding to field test and flight check the full EFGS system to verify that the glide slope signal in space is adequate for a CAT I ILS approach.

Spring Thaw Predictor & Development of Real-Time Spring Load Restrictions

In the fall of 2006 research was begun to develop a real-time Spring load restriction methodology for NHDOT. The methodology is intended to guide Maintenance Districts in their annual management of load restrictions on state roadways by identifying the beginning and duration of the spring thaw period.

The expected result of the project is a computer-based roadway strength forecasting model that will help determine the starting date and duration of load restrictions. This will include a modification of the Enhanced Integrated Climatic Model (EICM) currently utilized as part of the AASHTO pavement design guide. The model will be calibrated to optimize the match between predicted and actual conditions using moisture-temperature-strength relationships.



These relationships are becoming better understood in New Hampshire as a result of data gathered from five representative pavement sections during 2007 and 2008. A forecasting component using the 10-day forecast to develop strength predictions will be added to form the strength prediction model.

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Implementation Corner

Performance of Concrete Sealers

Until recently, the Department specified that bridge abutments be coated with a film-forming concrete sealer prior to structural steel erection. The expectation was that the film-forming sealer would make it easier to remove rust staining, as well as protect against chloride intrusion. A laboratory testing program sought to verify that NHDOT-qualified film-forming sealers provide adequate protection against rust staining and chlorides. Performance was compared to that of the penetrating sealers (silane) specified for other exposed concrete surfaces on bridges, and to untreated concrete.

To evaluate the sealers' ability to resist rust staining, mortar cubes coated with both types of sealers and untreated control cubes were covered with a pad of steel wool and placed in a moist cure room to develop a rust stain. The effort to remove staining, using water and increasing concentrations of ferrous stain remover was evaluated.

Resistance to chloride intrusion was evaluated using a test method that is based on NCHRP 244. After soaking in a 15% NaCl solution for 21 days, test cubes were weighed to determine water absorption and tested to determine chloride content.

It was determined that film-forming sealers do not provide adequate chloride protection and provide minimal protection against permanent rust staining. Based on this research, silane is now specified in lieu of film-forming sealers on abutments.



NHDOT RAC Prioritizes New Problem Statements

The NHDOT Research Advisory Council (RAC) plays a key role in evaluating and prioritizing problem statements submitted to the Bureau of Materials & Research. The RAC consists primarily of Bureau Administrators representing the major engineering, operations, and planning divisions of the Department. Both highway and non-highway transportation modes are represented.

Problem statements can be submitted by any Department employee, FHWA, or universities and other organizations. A RAC member or other Department manager is required to endorse submissions submitted from outside NHDOT. Alan Rawson, Administrator of the Bureau of Materials and Research, is Chairman of the RAC.

This year's meeting was held on May 29th at the New Hampshire Higher Education Assistance Foundation (NH HEAF) in Concord. Following an initial literature search and screening process conducted by the Research Section, eleven new projects were presented to the RAC. Presenters from various NHDOT Bureaus, Fish & Game, the University of New Hampshire, and Plymouth State University participated in the program. Andy Hall of Materials & Research presented preliminary findings from the Spring Thaw Predictor research project highlighted on the front page of this newsletter.

Approximately \$500,000 is expected to be programmed for FY 2009. The top five problem statements as balloted by the RAC are summarized below.

New Research

Top-Ranked New Research Projects — May 2008

1. Pavement Instrumentation for Local Calibration of the Mechanistic Empirical Pavement Design Guide (MEPDG)
2. Modular Full-Depth Bridge Decking
3. Increasing Safety at Portsmouth International Airport at Pease (PSM) by Reducing Bird Strike Risk through Research on Breeding Upland Sandpiper Habitat
4. Determining a Strategy for Efficiently Managing Sign Retroreflectivity
5. Centerline and Shoulder Rumble Strip Noise



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RWIS — System Validation and Assessment

NHDOT has implemented a system of 12 RWIS stations located throughout NH. Through a “Cooperative Project Agreement,” Plymouth State University (PSU) has been evaluating the accuracy of RWIS atmospheric and pavement sensor data. RWIS data was statistically compared to data from nearby National Weather Service and Federal Aviation Administration weather stations and to portable weather instruments. PSU concluded that, in general, RWIS atmospheric data is accurate and reliable.

In addition, PSU has been comparing RWIS data, observed weather conditions, and maintenance activities with the goal of providing guidance on how to best use information from the RWIS system to improve maintenance decision making. The final report is expected to highlight several specific weather events and show how a better understanding of RWIS data could have improved maintenance response to the events.

Raw RWIS data sent to the 511 website sometimes includes default values indicating a system error or missing data. The default values can result in obviously erroneous readings being displayed to the public. As part of their ongoing work for the Department, PSU developed algorithms to successfully filter out this erroneous data.



Ongoing Studies

In-Service Performance Monitoring of CFRP-Reinforced HPC Bridge Deck in Rollinsford

In April, a load test was conducted on the Rollins Road bridge in Rollinsford by University of New Hampshire (UNH) researchers as part of an ongoing study sponsored by NHDOT. The bridge, opened in 2000, features a deck constructed of high-performance concrete (HPC) with carbon fiber reinforced polymer (CFRP) reinforcement.

When constructed, the deck was instrumented with a series of strain and temperature sensors to monitor and study the structural behavior of the bridge deck and girders. The on-site data acquisition system continues to be maintained and can be configured for load testing applications.

The load test repeated a similar experiment conducted in 2001. Current (Year 8) temperature strains will be statistically compared with Year 1 data to evaluate performance of the CFRP and HPC. In addition, results from the test will be used to create and update a mathematical model for use in NHDOT’s long term structural health monitoring (SHM) program for bridges. Long-term, an SHM can supplement visual inspections by capturing the behavior of bridge components for condition assessment and asset management purposes.



Culverts and Connectivity

In May, graduate student Kelly Schmidt of Antioch University New England completed her Master’s thesis evaluating the influence of roadway culverts in connecting wildlife habitats.

The goals of the research were to determine if, and under what circumstances, culverts are effective at minimizing the mortality of reptiles and amphibians on roadways. It is hoped that the study will provide roadway planners with additional data and management strategies related to the influence of culvert size on the number and types of animals passing. The NHDOT participated in the research through the purchase of infrared monitors and automated camera kits. Rene Fish of District 4 played a key role in the installation of equipment in the field. The study concluded that various types of culverts and ecopassages maintain connectivity between habitats fragmented by roadways and provide wildlife an avenue for safe passage, thereby reducing road mortality and helping to preserve critical population densities.



“You can’t steal second base and keep one foot on first.”

- Tom Mooney

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Spring Thaw Predictor (cont'd from Page 1)

The project is currently approaching the end of the data processing phase. Strength data have been gathered through extensive use of a Falling Weight Deflectometer (FWD) at each site throughout the thaw of 2008. The FWD was obtained through a rental-agreement with the Worcester Polytechnic Institute (WPI). Atmospheric and subsurface climatic data gathered concurrently with the strength data will be used to establish the moisture-temperature-strength relationships. After these relationships have been used to calibrate the model and the forecasting component is completed, the NHDOT and the USDA Forest Service, which has partnered with the NHDOT on this project, should have a model capable of showing the advancement of spring thaw across the State based on the 10-day forecast.

Pooled-Fund Update - NHDOT Partners in New Research

The Transportation Pooled-Fund (TPF) program enables State DOTs, the Federal Highway Administration (FHWA), and other public and private partners to join forces and combine resources to accomplish research of common need. The Department recently committed to a number of new or proposed pooled-fund studies addressing a wide range of topics:

- **Construction of Crack-Free Bridge Decks, Phase II**, lead by Kansas DOT, will implement the most cost effective techniques for improving bridge deck life through the reduction of concrete cracking.
- **Implementation of the Asphalt Mixture Performance Tester (AMPT) for Superpave Validation**, lead by the FHWA, will nationally procure an AMPT for highway agencies interested in using the device to characterize Superpave asphalt mixtures. Technician training and a nation-wide assessment of the tester over a wide range of climatic conditions, materials, and structures is also planned.
- The **Recycled Materials Resource Center (RMRC)**, lead by the FHWA, is continuing its mission of increasing the wise use of recycled materials in the transportation infrastructure in a cost-effective and environmentally sound manner through research, development, outreach, and technology transfer.
- **SafetyAnalyst Support**, lead by the FHWA, will complete development of the SafetyAnalyst software in preparation for long-term distribution, maintenance, technical support, and enhancement as an AASHTOWare product. The project will be very beneficial for the work that the Department is required to do under the Highway Safety Improvement Program and Strategic Highway Safety Plan.

Completed Research



NHDOT Conducts Experiment on Pile Point Performance

Pile points included on the Department's Qualified Products List are qualified based on steel grade and a comparative analysis of weight, thickness, and configuration. A lightweight pile point submitted for acceptance in 2002 raised the question of how such parameters truly affect the performance of the points.

An experiment was undertaken to evaluate the performance of four combinations of steel grade, weight, and thickness in the field. The field testing took place in mid-April 2008 at the Spaulding Turnpike Exit 12 Interchange in Rochester. Three points of each combination were driven along with three unprotected piles for control. Each pile was instrumented with a Pile Dynamic Analyzer during driving.

The performance of the points is defined by how well they protect the pile from damage during driving. All of the unprotected piles sustained damage. A high strength/low thickness point with tapered section failed to protect two of its three test piles. All of the other piles were effectively protected. Based on this research, NHDOT engineers have an improved basis for qualifying or rejecting pile points submitted for consideration.



WHAT'S YOUR PROBLEM?