Pooled Fund Study Project TPF-5(054)
SDDOT Project SD2002 – 18
Development of Maintenance Decision Support System
Phase IV
FIRST QUARTERLY PROGRESS REPORT
January – March, 2006

Overview

The first quarter of Phase IV focused on activities related to the Demonstration Field Test for Year 2 (DFT-2). Three major tasks were accomplished in this quarter. The activation of the blowing snow alerts on February 14 was the first major change visible to the users. This was a direct result of an intense period of research and modification to the blowing snow model at the University of North Dakota (UND) Surface Transportation Weather Research Center (STWRC). Secondly, throughout the first half of the quarter, a number of new features were developed and tested, while some minor bugs were identified and fixed. This culminated with the release of version 2.15 to the Technical Panel on February 23, followed by the official release of version 2.20 to the community on March 6. Finally, a number of MDSS case studies were conducted in as many locations as feasible based upon the timing and predictability of winter weather situations across the MDSS domain.

Evaluation of the performance of the MDSS during 2005-06 winter operational maintenance activities (Task 1)

Subtask 2

MDSS server-side processing and weather and maintenance forecast services were provided 24-hours per day, 7-days per week throughout the entire quarter in support of the DFT-2 field demonstration test for all of the MDSS regions.

Subtask 3

By the start of the quarter, Meridian had established an internal protocol and procedures for activating field observing crews during winter weather events for purposes of conducting MDSS data gathering in the field. A 2-5 day forecast was generated daily by a single forecaster, and a single point-of-contact was responsible for alerting declared DOT field observers when the potential for winter weather was expected to be elevated. Meridian field observers communicated via an internal mail list, which enabled quick coordination among the members of the field teams when remote operations needed to be arranged with little notice.

Meridian continued to support the various methods of reporting maintenance actions to the system. A bug was found and fixed in the IVR reporting system, which is now only being used by a small percentage of users. The most widely

used method is submission via the web or the graphical user interface (GUI). The use of automated Mobile/Maintenance Data Collection (MDC) systems continues to grow. Data from North Dakota trucks equipped with Location Technologies equipment began flowing into the system early in the quarter. There were numerous issues, however, with the data formatting and communications infrastructures, as well as the interface at the truck-level. In addition, training of the drivers also was inconsistent. Several of the issues with data entry were worked out during site visits early in the quarter (associated with case studies). Vendor issues were repaired throughout the quarter, with some issues noted for later action (such as those associated with the actual display interface in the truck). Data from Iowa trucks equipped with ThomTech Design equipment began flowing into the system by early March. As with the other systems, there were minor issues with communications and interpretation of data formats that needed to be worked out early-on, but complete and useful data were flowing regularly by the end of the quarter. Minnesota and ThomTech Design continue to work on their AVL/MDC system with the hope that data will be flowing to MDSS, and any bugs resolved before the 2006-2007 season.

Subtask 4

Regular feedback from DFT-2 participants provided guidance for refinements during the quarter. A number of refinements were made to both the GUI and the server-side processing of the MDSS. GUI enhancements included:

- A tool for customizing the area and routes monitored by the Alert Panel
- Peer-to-peer and intra-computer user-to-user file sharing capabilities
- A right-click function for accessing buried features on Map View
- A Message Center for exchanging messages with MDSS users
- The initiation of blowing snow alerts

Server-side processing enhancements included:

- The consideration of blowing snow in the MDSS maintenance recommendations
- Improved logic for choosing between liquid and solid applications
- Refinements to the traffic modeling module of the MDSS
- Introduction of plow-only recommendations in non-compacting snow

As mentioned above, version 2.20 of the MDSS GUI was released to the user community on March 6th. In addition to the enhancements listed above, 2.20 also contained a tool which monitors for problems (exceptions) and automatically e-mails the MDSS development team of these exceptions, whether they affect the user's experience or not.

Subtask 5
Meridian felt that combining the field operations with site visits would provide the best feedback for the project. Thus, each MDSS case study field visit included substantial time working with the DOT users to help their understanding of the system, and to evaluate potential improvements based upon actual user observations.

Subtask 6
As noted above, users found and reported some bugs in the system during the quarter. These issues were resolved and new versions were tested either internally or through participation of a small group of users. After validation of the modifications, Meridian issued a major release in early March making these changes available to all users.

Perform scientific validation of observed weather variables and comparison with input variables to the PFS MDSS (Task 4)

Subtask 1
The data collection necessary to perform the scientific validations was accomplished throughout the quarter. Data collection was a coordinated effort amongst state agencies, Meridian, and the University of North Dakota (UND) Surface Transportation Weather Research Center (STWRC). A couple of states actively participated in detailed field collection activities by providing field observations, photographs, camera imagery, and samples from field activities. When these field activities were coordinated with Meridian, the field data were supplemented by the collection and archival of screen shots, a complete set of MDSS support data, and weather imagery. All of these results were archived to support the validation process scheduled for quarters 2 and 3. Data from the UND/STWRC field site (along segment ND-03) were also archived to aid in the assessment, while STWRC also archived data related to assessment of the blowing snow algorithm from all MDSS regions.

Perform an assessment of the validity, acceptance, utilization and operational requirements of MDSS within State DOT winter maintenance practices (Task 5)

Subtask 2
As outlined above, plans were in place for case studies on designated MDSS routes. The 2006 winter evolved slowly across the domain. While there were a number of small events (notably freezing drizzle events), the warm pattern resulted in insufficient criteria for MDSS field operations through much of January. February brought a slight increase in storms, but many of these had sufficient uncertainty that research teams could not be activated quickly enough. March saw a significant upswing in winter weather, and several case studies were conducted throughout the month. The nature of the systems was such that chemical use was limited as weather conditions were sufficient to keep the roads

wet with minimal or no maintenance intervention. The result was a less-than-expected assessment of the actual effect of chemical on the contaminant layer. Nevertheless, by season's end, over 15 case study datasets had been gathered involving a variety of scenarios. Several of these datasets were obtained on the ND-03 "super case study" segment in cooperation with UND/STWRC. Concurrently with the field observations and assessment of field operations, Meridian personnel involved in the case studies worked with DOT maintenance personnel at each of the test sites evaluating how DOT users were utilizing the MDSS program and recommendations in their normal operations. During interactions with the maintenance personnel involved in these case study situations, the Meridian observers made and recorded subjective evaluations of user understanding of the MDSS and their implementation of MDSS output. These datasets and the personal observations made by the Meridian case study team form the foundation for the evaluation tasks scheduled for the next 2 quarters.