

**Pooled Fund Study Project TPF-5(054)**  
**SDDOT Project SD2002 – 18**  
**Development of Maintenance Decision Support System**  
**Phase VI**  
**Second Quarter Progress Report**  
**April - June, 2011**

**Overview**

Phase VI second quarter 2011 saw the end of winter operations across all PFS state including forecasting support (where necessary) and on-site training. The process of compiling and providing each agency a listing of their current route configurations was a major task during Q2. Work also continued on various components of the MDSS interface as well as on the MMS integration and WMRI refinement tasks. Corresponding to the MMS integration work,, communication with each agency integrating MDC/AVL into MDSS was necessary in order to begin the process of addressing MDC/AVL dictionary issues for reporting e.g. material applications by each agency's fleet.

**Progress by Task**

Specific accomplishments on the explicit tasks of the Phase VI work plan during the second quarter of 2011 follow.

**TASK 14: Refine and evaluate techniques for acquiring, managing, using, and reporting information from mobile data collection equipment mounted in winter maintenance vehicles and for providing information to maintenance operators via the same equipment.**

Meridian continued to work with a number of PFS member agencies to incorporate and maintain data feeds and to resolve issues reported from the field relating to the provision of MDSS information back into maintenance vehicles. From the standpoint of managing and utilizing this information, the development of capabilities for generating reports that leverage the MDC/AVL information has continued to be a focus during Q2. This included the introduction of an initial capability for providing an end-of-shift report back into the maintenance vehicles via the VMDSS software. This report draws upon the MDC/AVL and MDSS data to compile information about where, when, and how much resources were expended during a particular shift or period of time.

**TASK 15.: Refine and evaluate the capability and performance of MDSS software components, including surface condition prediction models and graphical user interface.**

Task 15 efforts during Q2 have included continued development of various capabilities introduced during previous quarters. This includes the completion of a substantial overhaul of both the server-side and GUI components related to the "Route View" within

the MDSS GUI so as to permit provision of cross-sectional road profiles, deicer and abrasive residual amounts, depth profiles of pavement temperature, and support for segment 'tiles'. Tiles are considered to be generic subareas within an MDSS segment that are expected to exhibit a relatively uniform response to weather conditions. Examples of applications of tiles may be to model bridge decks within an MDSS segment separately from roads, or to model sheltered areas separately from open areas.

. The user assessment of recommendations subtask received minimal hours this quarter. Investigation has continued into resolution of the multiple segment evaluation problems that were identified in Q1. The assessment data collected during Q4 and Q1 have been evaluated further in Q2, with one obvious conclusion. Methods and the appropriate questions are needed to determine the actual reason for declining a recommendation. Further investigation will be conducted in this matter during Q3 for use in Q4. Identification of evaluators for the 2011-2012 winter season will begin in Q3. Those individuals that participated in the study last season will be contacted first to see if they are still interested in participating. We will continue the study for the 2011-2012 winter season.

**TASK 16: Recommend, develop, and evaluate methods for enhancing highway agencies' management through interfaces between MDSS and other management systems, analysis of winter maintenance practices, and extension of MDSS techniques to non-winter applications.**

Work toward improving the management reports toolset in the MDSS GUI has continued during the quarter (task 16.1). Efforts during Q2 have continued to focus heavily on continued assessment and refinement of a new tool for wintertime precipitation analysis. This tool is vital to the long-term viability of MDSS to support management-oriented performance analysis where an accounting for variable weather conditions is required. While still undergoing refinements, this tool is now serving as MDSS' primary resource for observed precipitation information. Refinements during the quarter have focused largely on the development of a tool for identifying the underlying biases of individual weather stations that impact the precipitation analyses. The output of this tool will be used by the precipitation analysis process to treat weather observations from each station appropriately in light of its unique, known tendencies.

The process of identifying storms to be used in an off-season training tool was completed during Q2 (Task 16.2). The guidelines used for the selection of storms were to ensure each agency would have at least one storm identified. Also, across all agencies different type of weather events were established. This included blizzards, light snow, freezing rain, and transition events (rain to freezing rain to snow, or vice versa). Once each storm was identified a weather summary of the event was created to provide users a prospective of the entire event and critical times and areas of significant changes that may have occurred during the event. The summaries are kept to a page in length. Preliminary steps have been made to create actual training information regarding two of the identified storms.

Work on the agency integration task (16.3) during Q2 has focused primarily upon continued integration of MDSS with maintenance management systems (MMS). Meridian has been directed to initially focus on the development of tools for generating

reports of the nature required by MMS systems. Toward this end, Meridian has completed design of an SQL database schema appropriate for storing MDSS and MDC/AVL data in a manner that is more amenable to the generation of MMS-oriented reports. Refinement of this schema, as well as development of software for interfacing with this database, has continued to be a primary focus of Q2. This includes the software required to populate, maintain, and query the database, and software oriented toward the development of specific reports. As of the end of Q2 the database and associated tools were mature enough to permit a proof-of-concept back-insertion of MnDOT MDC/AVL data for the 2010/2011 winter season, as well as the generation of reports pertaining to that data. Meridian offered a similar back-insertion of data to the other PFS agencies as desired, provided that agency-specific dictionary issues are worked out first.

No significant progress has been made in the task of improving integration between MDSS and ATIS systems. The SDDOT was nominated as the testbed for exploring these applications, and that effort is presently on hold pending SDDOT's transition to a new road condition reporting system.

**TASK 17: Develop a model MDSS procurement specification suitable for use by public highway agencies.**

No changes were made to the procurement specifications during Q2.

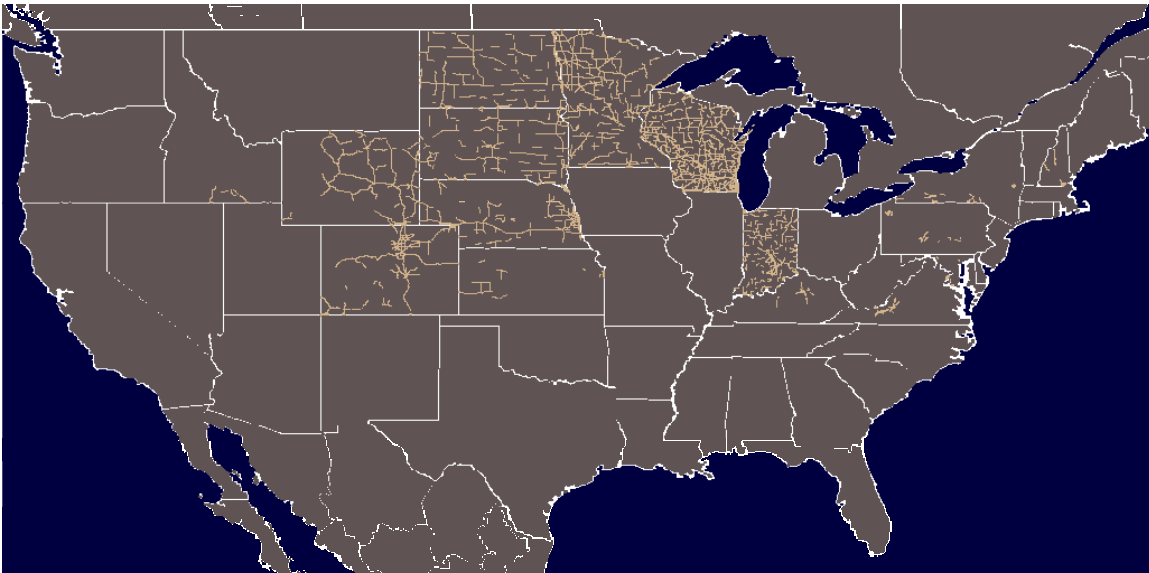
**TASK 18: Provide weather forecast support, MDSS Configuration support, live MDS operations, and necessary training for continuing limited deployment field trials in the participating highway agencies.**

The start of Q2 saw the end of winter operations for all agencies for the 2010-11 winter. Support was provided to those agencies during the beginning of Q2 including forecasting support (where necessary), full customer support, and minor route configuration changes where requested. At the conclusion of operations the annual process of compiling all operational routes for each agency was performed. This information was sent to each agency during Q2 to allow for a re-evaluation of current operational routes within MDSS.

Work was also completed in the integration of non-winter time operation information into MDSS. States were provided the opportunity to configure MDSS to provide "restricted" and "non-restricted" times of non-wintertime operation activities based on solely on weather and pavement conditions. Several states including, Kansas, Minnesota, Colorado, Wyoming, and New York had operational MDSS alerts available during Q2. Table 1 and Figure 1 shows the current routes configured within MDSS at the completion of winter operations (April 15<sup>th</sup>).

**Table 1: Breakdown of routes per state.**

| State     | # of Routes | State         | # of Routes |
|-----------|-------------|---------------|-------------|
| Colorado  | 140         | New Hampshire | 10          |
| Idaho     | 9           | New York      | 19          |
| Indiana   | 155         | North Dakota  | 105         |
| Kansas    | 22          | Pennsylvania  | 20          |
| Kentucky  | 12          | South Dakota  | 109         |
| Maryland  | 6           | Virginia      | 38          |
| Minnesota | 266         | Wisconsin     | 397         |
| Nebraska  | 140         | Wyoming       | 95          |



**Figure 1: Route Distribution as of April 15th, 2011**

**TASK 19: Prepare a report summarizing methodology, findings in performance, conclusions and recommendations.**

No activities have been performed for this task during Q2. A Major Report on the study to date was created during the Q1 2008 and will eventually serve as the basis for the Final Report.

**TASK 20: Make an executive presentation to the project's technical panel and provide electronic copies of the presentation material to participating states.**

No activities have been performed for this task during Q2.