

MOUNTAIN-PLAINS CONSORTIUM

RESEARCH BRIEF | MPC 16-314 (project 441) | November 2016

Pavement Management System for City of Madison



the **ISSUE**

Keeping city streets in good state of repair has been a significant challenge for small communities where both road repair budgets and staff resources are lacking. To prevent pavement deterioration at a large scale, local governments need to find effective ways to support informed decision-making in pavement maintenance and rehabilitation.

the **RESEARCH**

In this study, a complete pavement management system (PMS) was created and implemented in Madison, SD. The system consists of a street geodatabase, development of pavement performance models and maintenance & rehabilitation (M&R) plans. The PMS database includes an accurate road GIS map and information pertinent to pavement such as street inventory, pavement conditions, traffic conditions, history of maintenance and improvement work, and costs. Pavement Condition Index (PCI) was selected as a composite pavement performance measure which incorporates distress type, quantity, and severity. Pavement condition was evaluated based on a field survey. Pavements with similar characteristics (e.g., pavement structure, traffic, weather) were grouped together because they are expected to behave and deteriorate in a similar and consistent manner under the same environment. The performance functions were then created based on pavement age and pavement conditions for each group. M&R plans were analyzed and recommended using MicroPAVER based on various budget scenarios. Four types of M&R treatment were considered: localized stopgap (safety), localized preventive treatment, global preventive treatment, and major repairs. Within the current city's budget, several M&R five-year plans were developed, analyzed and compared by maximizing the overall pavement conditions and minimizing the percentage of poor pavement areas by the end of 2020.



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Project Title

Pavement Management
System for City of Madison

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the FINDINGS

Based on the road condition survey in 2014, nearly 60% of the current pavement in Madison, SD, can be considered as good (PCI>70). The most common pavement distress types for asphalt pavement are longitudinal cracking, rutting, block cracking, and alligator cracking; and linear cracking, large patch/utility cut for concrete pavement. Analysis shows that pavement maintenance in Madison is underfunded. Required funding for backlog elimination by the end of 2020 is about 2.90 million/year, which is far more than city's current budget. The current budget cannot even maintain the same level of pavement performance by 2020. Hence, additional funding is recommended for pavement maintenance and repair. Within the projected city budget for road repair, two plans were recommended among a range of M&R plans for their better pavement performance after optimizing major repair sequence and selecting appropriate preventive M&R strategies.

the IMPACT

This study presents the flexible and practical process of implementing a PMS in a small community, Madison, SD. The solutions and strategies used during the implementation can be transferred and applied to other small communities with similar issues and circumstances. The intent is to advance knowledge of preserving pavement and promote the use of PMS at small communities.

For more information on this project, download the entire report at <http://www.ugpti.org/resources/reports/details.php?id=861>

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7938 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.



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