January 2014 **FHWA-NJ-2014-001**

New Jersey Department of Transportation
Bureau of Research

Technical Brief

Snow Model Analysis

This study developed a new snow model and a database which warehouses geometric, weather and traffic data on NJ highways. The complexity of the model lies in dealing with heterogeneous road geometric conditions, truck capacities, spreading/plowing patterns, and traffic speeds under different weather conditions. The model outcomes can be used to assist managers determining needed truck fleet size before a winter season and during/after a snow storm based on forecasted weather and traffic conditions.

Background

The New Jersey Department of Transportation (NJDOT) utilizes a wide array of resources to improve road conditions during each winter storm. The current snow model used by NJDOT was developed in 1978, which is not accurate due to significant changes in road geometry, lane-mile and traffic conditions in New Jersey over the past 30 years. Under the mounting pressure of high demand for improving winter road safety and mobility subject to budget constraints, it is imperative for NJDOT to pursue the most cost-effective usage of their resources. Hence, a robust snow model is desirable to determine the quantity of salt to spreading and required fleet size subject to a certain service time constraint for both spreading and plowing operations.

Research Objectives and Approach

The objective of this study is to develop a new snow model, which can be applied to determine the needed fleet size for salt spreading and snow plowing operations subject to pre-specified service time constraints considering road geometry, weather and traffic.

Findings

The snow model developed in this study can be applied to resources allocation and management for winter road maintenance in New Jersey. The estimated quantity of salt by crew and fleet size by snow section can be used to evaluate current spreading and plowing operation plans.

Table 1 indicates the estimated quantity of salt for each region at spreading rate of 350 lb/ln-mi. In Table 2, the estimated fleet size for snow plowing in each region is included, considering 15-mph plowing speed and 2-hour service time. The results are compared with

those listed in the Bid Sheet (2012). Other outputs including fleet sizes for spreading and plowing operations under different time periods and snow intensities are suggested in the final report.

Table 1 Estimated Quantity of Spreading Salt

Region (1)	2009 SLD		NJDOT Deployment Plan (2012)		Lane Miles Difference* (6)	Salt Tons Difference** (7)
	Lane Miles (2)	Salt Tons Needed (3)	Lane Miles (4)	Salt Tons Needed (5)		
North	3206.2	561	4392.99	730.67	1186.9	169.7
Central	3348.4	586	2571.89	450.14	-776.4	-135.9
South	2550.5	446.5	2629.91	456.3	113.8	9.8
Total	**9105.1**	**1593.5**	**9594.79**	**1637.11**	**524.3**	**43.6**

* (6) = (4) – (2)
** (7) = (5) – (3)

Table 2 Estimated Number of Plowing Trucks

Region (1)	No. of Trucks		Difference* (4)
	Plowing Model (2)	NJDOT 2012 Bid Sheet (3)	
North	393	585	192
Central	410	581	171
South	294	389	95
Total	**1097**	**1555**	**458**

* (4) = (3) – (2)

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A final report is available online at: http://www.state.nj.us/transportation/refdata/research/.
If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.

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NJDOT Research Report No: FHWA-NJ-2014-001