Low Volume Road Surface Selection Tool

January 22nd, 2015

Brad Wentz, P.E.
Program Director - UGPTI
North Dakota State University
Presentation Outline

- Purpose and Need for Tool
- Existing South Dakota Tool
- Objectives for improvements to SD Tool
- Overview of newly developed SST
- Deployment Plans
- Questions
Purpose and Need for Tool

- What is the most common question/complaint as County Engineer?
Purpose and Need for Tool

“When you gonna pave this damn dusty gravel road?”

Becker County
- 450 miles Paved
- 250 miles gravel
Purpose and Need for Tool

- The answer usually involved something like... We just don’t have enough $ for that or some rule of thumb.

- Instead we should be analyzing and reporting total life cycle costs of available options considering...
  - Various levels of traffic
  - Several surface type options
  - Initial construction and all maintenance costs
  - Agency and optional user costs
Existing South Dakota Tool

- This type of analysis is typically not done

- South Dakota tool developed to assist Counties in developing this type of detailed cost analysis
  - Spreadsheet tool for download
  - Default values with ability to change
  - Reporting of total life cycle costs with 4 treatments
Existing South Dakota Tool

Introduction
The analytical tool applies the low-volume road management methodologies recommended under the project titled Local Road Surfacing Criteria (SD-2002-10). The objective of this study is to develop a methodology that allows the user to compare the costs associated with different road surfaces. Specifically, this spreadsheet tool is used to determine the costs associated with maintaining roads with different surfaces and selecting the most appropriate road surface for a specific set of circumstances.

To start your analysis session, fill in the general project description information below and click on the "Next" button. Continue progressing through the analysis setup steps by clicking the "Next" buttons in subsequent dialog boxes. To enable additional inputs for advanced users, click on the "Enable Advanced User Inputs" check box below.

Agency Cost Details
Use the following controls to define the cost details associated with each surface type you have chosen to include. Note that a separate tab is displayed for each surface type you have chosen to include in the analysis.

HMA | Blotter | Gravel

Use these controls to define specific maintenance-related costs associated with HMA surface treatments.

Cost of initial HMA construction (or last major rehabilitation): $96,450 per mile

Maintenance Treatment Timing and Cost Details

<table>
<thead>
<tr>
<th>Maintenance Treatments</th>
<th>Treatment Application Timing/Frequency</th>
<th>Unit Treatment Cost ($/project application, $/mile, or $/square mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crack Sealing</td>
<td>Applied 1 time(s)/yr every 5 years</td>
<td>$1,200/mile</td>
</tr>
<tr>
<td>Seal Coat</td>
<td>Applied 1 time(s)/yr every 6 years</td>
<td>$15,000/mile</td>
</tr>
<tr>
<td>Overlay (thickness: 2 in.)</td>
<td>Applied 1 time(s)/yr every 20 years</td>
<td>$36,450/mile</td>
</tr>
<tr>
<td>Striping and Marking</td>
<td>Applied 1 time(s)/yr every 20 years</td>
<td>$450/mile</td>
</tr>
<tr>
<td>Patching/Maintenance</td>
<td>Applied 1 time(s)/yr every 1 year</td>
<td>$300/mile</td>
</tr>
<tr>
<td>Other</td>
<td>Applied 1 time(s)/yr every 1 year</td>
<td>$0/mile</td>
</tr>
</tbody>
</table>
Objectives for enhancing SD Tool

- Update the hard coded default values
- Transform to a Web-based tool
- Consider additional surface types
- Add options to improve initial construction costs
- Add capability for storing County and Regional values
- Allow Counties to create a save default values
- Update user cost methods
Overview of ND/SD SST

Local Road Surface Selection Tool

Home Analysis Administration Help Contact

This analytical tool applies the low-volume road management methodologies recommended under the project titled “Local Road Surfacing Criteria (SD 2002-10)”. The objective of this study is to develop a methodology that allows the user to compare the costs associated with different road surfaces. Specifically, this tool is used to determine the costs associated with maintaining roads with different surfaces and selecting the most appropriate road surface for a specific set of circumstances. More information about this project and tool can be found by clicking “Software Introduction”.

Click “Start Analysis” to start a regular analysis.
Click “Administrator Login” to log in if you are an administrator.
Detailed user’s guide is available by clicking “User’s Guide”.

DISCLAIMER: Although the information generated by this model has been produced and processed from data that is believed to be reliable, the information generated by this model is for estimation uses only. The Upper Great Plains Transportation Institute and North Dakota State University make no representation or warranty, expressed or implied, regarding the accuracy or reliability of the model or results.

Start Analysis

© UCPTT 2015
Overview of ND/SD SST

Local Road Surface Selection Tool

Home  Analysis  Administration  Help  Contact

Please select your state and county:

Select your state
North Dakota ▼

Select your county
Adams ▼

Next
Overview of ND/SD SST

Local Road Surface Selection Tool

Home  Analysis  Administration  Help  Contact

General Setup

Selection of Default Setting Type

- Region-Level
- County-Level

Selection of Surface Types

- Hot-Mix Asphalt (HMA)
- Asphalt Surface Treatment (AST)
- Gravel
- Dust Control
- Stabilized Gravel

Selection of Alternative Cost Items

- Include Salvage value
- Include user costs

Back  Next  HELP
Overview of ND/SD SST

Local Road Surface Selection Tool

Home  Analysis  Administration  Help  Contact

Common Parameters Setup

Project Length  5 miles  Project Width  24 feet
Average Daily Traffic (ADT)  100-199 vehicles/day  Analysis Period  20 years
Discount Rate  3.5 %  Start Year of Analysis  2015

Reset

Back  Next  Help

NDSU UPPER GREAT PLAINS TRANSPORTATION INSTITUTE
Overview of ND/SD SST

### Agency Cost Parameters Setup

**HMA**

<table>
<thead>
<tr>
<th>Treatment Selection</th>
<th>Treatment Name</th>
<th>Application Times Per Year</th>
<th>Year Interval Between Applications</th>
<th>Application Start Year</th>
<th>Unit Cost (dollars)</th>
<th>Unit Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>Crack Sealing</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>10000</td>
<td>per mile</td>
</tr>
<tr>
<td>✔</td>
<td>Seal Coat</td>
<td>1</td>
<td>7</td>
<td>3</td>
<td>20000</td>
<td>per mile</td>
</tr>
<tr>
<td>✔</td>
<td>Thin Lift OverLay</td>
<td>1</td>
<td>20</td>
<td>20</td>
<td>250000</td>
<td>per mile</td>
</tr>
<tr>
<td>✔</td>
<td>Striping and Marking</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2000</td>
<td>per mile</td>
</tr>
<tr>
<td>✔</td>
<td>Patching/Maintenance</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3000</td>
<td>per mile</td>
</tr>
</tbody>
</table>

**Other**

<table>
<thead>
<tr>
<th>Treatment Selection</th>
<th>Treatment Name</th>
<th>Application Times Per Year</th>
<th>Year Interval Between Applications</th>
<th>Application Start Year</th>
<th>Unit Cost (dollars)</th>
<th>Unit Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>per mile</td>
</tr>
</tbody>
</table>

**INITIAL COST**

Total Initial Cost ($/mile): **$725,115**

[Initial Costs Calculator]
## Overview of ND/SD SST

### Local Road Surface Selection Tool

#### HMA Initial Cost Parameters Setup

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>VALUE</th>
<th>UNIT</th>
<th>PARAMETER</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMA Thickness (new)</td>
<td>4</td>
<td>inches</td>
<td>Reshaping / Sub-grade Prep</td>
<td>200000</td>
<td>$/Mile</td>
</tr>
<tr>
<td>HMA Cost (placed)</td>
<td>120</td>
<td>$/Ton</td>
<td>Reclaiming / Milling (if asphalt)</td>
<td>0</td>
<td>$/Sqyd</td>
</tr>
<tr>
<td>Base Thickness (New)</td>
<td>4</td>
<td>inches</td>
<td>Widening (if necessary)</td>
<td>0</td>
<td>$/Mile</td>
</tr>
<tr>
<td>Base Gravel Cost (placed)</td>
<td>26</td>
<td>$/Ton</td>
<td>Pavement Marking</td>
<td>2000</td>
<td>$/Mile</td>
</tr>
</tbody>
</table>
| Engineering / Contingencies    | 20    | % of total

**Total Initial Cost ($/mile)** $725,115

[Done][Cancel][Reset][Help]
Overview of ND/SD SST

Agency Cost Parameters Setup

Dust Control

Total Initial Cost ($/mile): $286,182

Maintenance Cost

<table>
<thead>
<tr>
<th>Treatment Selection</th>
<th>Treatment Name</th>
<th>Application Times per year</th>
<th>Year Interval Between Applications</th>
<th>Application Start Year</th>
<th>Unit Cost (dollars)</th>
<th>Unit Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>Blading</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>200</td>
<td>per mile</td>
</tr>
<tr>
<td>✓</td>
<td>Regravel</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>20000</td>
<td>per mile</td>
</tr>
<tr>
<td>✓</td>
<td>Reshape Cross Section</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2000</td>
<td>per mile</td>
</tr>
<tr>
<td>✓</td>
<td>Reapply Dust Control</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>8000</td>
<td>per mile</td>
</tr>
<tr>
<td>□</td>
<td>Other</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>per mile</td>
</tr>
</tbody>
</table>

Reset

Previous Surface  Next Surface  Back to Common Parameters Setup  View Analysis Summary  Help
Overview of ND/SD SST

Agency Cost Short Summary - Per Mile

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>HMA</th>
<th>AST</th>
<th>Gravel</th>
<th>Dust Control</th>
<th>Stabilized Gravel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Initial Cost</td>
<td>$ 927,149</td>
<td>$ 330,455</td>
<td>$ 506,773</td>
<td>$ 531,773</td>
<td>$ 94,182</td>
</tr>
<tr>
<td>Total Maintenance Cost</td>
<td>$ 299,164</td>
<td>$ 443,442</td>
<td>$ 633,314</td>
<td>$ 537,404</td>
<td>$ 398,303</td>
</tr>
<tr>
<td>Total Salvage Value</td>
<td>$ 0</td>
<td>$ 0</td>
<td>$ 0</td>
<td>$ 0</td>
<td>$ 0</td>
</tr>
<tr>
<td>Total Agency Cost</td>
<td>$ 1,226,313</td>
<td>$ 773,897</td>
<td>$ 1,140,087</td>
<td>$ 1,069,177</td>
<td>$ 492,485</td>
</tr>
</tbody>
</table>

Comparison of Cumulative Costs Associated with Different Surface Types

Cumulative costs, dollars

Years since initial construction or last major rehabilitation

- HMA
- AST
- Gravel
- Dust Control
- Stabilized Gravel
Overview of ND/SD SST

- Administration – Region and County

State Administration

You are Welcome, state administrator of North Dakota!

Functionality

- Region Management
- Update Initial Cost Default Values
- Update maintenance Cost Default Values
- County Administrator Account Management
- Reset Personal Password
- Communication

Maintenance Costs Default Values Up

Select region you want to update

Select a treatment

HMA: Seal Coat

<table>
<thead>
<tr>
<th>ADT Level (vehicles/day)</th>
<th>Times per Year (County AVG)</th>
<th>Year Interval (County AVG)</th>
<th>App Start Year in order (County AVG)</th>
<th>Unit Cost (County AVG) [$/mile]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-99</td>
<td>1 (1)</td>
<td>7 (3)</td>
<td>3 (3)</td>
<td>1000 (1000)</td>
</tr>
<tr>
<td>100-199</td>
<td>1 (1)</td>
<td>7 (3)</td>
<td>3 (3)</td>
<td>1000 (1000)</td>
</tr>
<tr>
<td>200-299</td>
<td>1 (1)</td>
<td>7 (3)</td>
<td>3 (3)</td>
<td>1000 (1000)</td>
</tr>
<tr>
<td>300-399</td>
<td>1 (1)</td>
<td>7 (3)</td>
<td>3 (3)</td>
<td>1000 (1000)</td>
</tr>
<tr>
<td>400-499</td>
<td>1 (1)</td>
<td>7 (3)</td>
<td>3 (3)</td>
<td>1000 (1000)</td>
</tr>
<tr>
<td>500-599</td>
<td>1 (1)</td>
<td>7 (3)</td>
<td>3 (3)</td>
<td>1000 (1000)</td>
</tr>
<tr>
<td>&gt;=600</td>
<td>1 (1)</td>
<td>7 (3)</td>
<td>3 (3)</td>
<td>1000 (1000)</td>
</tr>
</tbody>
</table>

Set To County Average   | Restore Region Default

Save All Changes To Database
Back to Administration Page
Deployment Plans

- Finish any missing items such as...
  - User Costs
  - Help links
  - Any bugs identified in testing
- Meet with LTAP Directors and complete Region Defaults
- Create County contact email list and send out link
- Complete Tool and put link on UGPTI website by May
Local Road Surface Selection Tool

January 22, 2015

Questions?

Demonstration

Brad Wentz, P.E.
Program Director – NDSU/UGPTI
Bradley.wentz@ndsu.edu