Gravel Road Management Tool

Highlights of an LRRB Project

TRB Low Volume Road Conference – Cedar Rapids, IA

July 26, 2023

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BOARD

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DEPARTMENT OF TRANSPORTATION

LRRB LOCAL ROAD RESEARCH BOARD

Agenda

- LRRB Overview
- Review of Gravel Road Management Tool
  - Goal/Purpose
  - Process
  - Deliverable

Overview of LRRB

LRRB
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Addressing the needs of local agencies in Minnesota

The LRRB is a practitioner-run organization that sponsors research and educational initiatives that address local transportation needs.

The impact of this research multiplies as practitioners see potential applications through the efforts of LRRB's Research Implementation Committee.

Learn more at www.lrrb.org

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- Established in 1959
- Serves as “think tank” for MN Cities and Counties
- Precursor to MN LTAP
  MN was last state to establish an LTAP (1991); prior to that LRRB worked closely with ND LTAP

The Local Road Research Board

$4M IN ANNUAL FUNDING

25+ **NEW** PROJECTS EACH YEAR

75+ **ACTIVE** PROJECTS

12 CITY/COUNTY **BOARD MEMBERS**

100+ **TAP** CITY/COUNTY **MEMBERS**

Who is the Local Road Research Board?

Jim Foldesi (Chair)
St. Louis County

Kristine Elwood
MnDOT State Aid

Brian Giese
Pope County

Duane Hill
MnDOT D1

Katie Walker
MnDOT R&I

Matt Leonard
City of Monticello

Kyle Shelton
MnDOT R&I

Lon Aune
Marshall County

Paul Oehme
City of Lakeville

Wayne Sandberg
Washington County

Who is the Research Implementation Committee?

Will Manchester (Chair)
City of Minnetonka

Ted Schoenecker
MnDOT State Aid

Ben Worel
MnDOT Road Research

Fausto, Cabral
MnDOT D1

Guy Kohlnhofer
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Gravel Road Management Tool


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Gravel Road
Management Tool
HOW ARE YOU MANAGING YOUR GRAVEL ROADS?

Gravel Road Management Tool

Research Need

- About one-half of Minnesota's roadway system is gravel/crushed rock (70,000 miles)
- Gravel roads are vital to connect farmlands and other rural locations to the state's mainstream economy.
- Managing these gravel road networks requires tracking road conditions, past repairs, etc.
- Tools for managing paved road systems are widely available, very few for gravel.

Mike Flaagan, Pennington Co, Chair
Lon Aune - Marshall Co
Bruce Hasbargen - Beltrami Co
Jonathan Large - Mahnomen Co
Kris Lyytinen - Cass Co
Rich Sanders - Polk Co
Eddie Johnson - MnDOT
Joel Ulring - MnDOT
Bradley Wentz - NDSU
Ken Skorseth - SD LTAP
Renae Kuehl, SRF Consulting
Michael Marti - SRF Consulting
Susan Miller - SRF Consulting
Ann Johnson - PE Services
Rick West - Stonebrooke

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Gravel Road Management Tool

Project Goal

- Develop a data management resource that local agencies could use to track and manage gravel road systems.
- The tool needed to be:
  - Easy to use by engineers and maintenance superintendents
  - Be customizable and scalable to work with available data that may also vary significantly from user to user.

Gravel Road Management Tool

What was developed

A simple tool using MS Excel that can be used as both an inventory and planning tool, providing one location for keeping track of gravel road:

- Construction data
- Maintenance and treatment activities
- Gravel thickness
- Surface condition ratings
- Costs

Example Data Entry:

Segment ID	Date of Evaluation	GRAVEL LAYER RATING	CROWN RATING	WASHBOARD RATING	RUTTING RATING	POTHOLE RATING	LOOSE AGGREGATE RATING	DITCHES	ROADSIDE PONDING	DUST	Usability Percentage
MainStreet:135th-165th	5/10/2016	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	EXCELLENT	GOOD	FAIR	EXCELLENT	STABILIZED HIGH	85%
155th:145th-90th	5/1/2016	GOOD	FAIR	DEFICIENT	GOOD	POOR	GOOD	DEFICIENT	APPROACHING	NOT STABILIZED	55%
145th:125th-Ranneby	6/20/2016	FAIR	EXCELLENT	FAIR	POOR	FAIR	POOR	GOOD	IMPACTING	STABILIZED LOW	59%
SycamoreRd:120th-MN7H_25	5/17/2017	FAIR	EXCELLENT	DEFICIENT	POOR	DEFICIENT	FAIR	DEFICIENT	IMPACTING	STABILIZED HIGH	40%
125thave:SchoolHouse-MN7H_85	5/29/2017	DEFICIENT	GOOD	FAIR	FAIR	POOR	POOR	DEFICIENT	APPROACHING	STABILIZED LOW	50%

Segment ID	Date of Evaluatio	GRAVEL LAYER RATING	CROWN RATING	WASHBOARD RATING	RUTTING RATING	POTHOLE RATING	LOOSE AGGREGATE RATING	DITCHES	ROADSIDE PONDING	DUST	Usability Percentage
WalnutDr:5th-10th		EXCELLENT	FAIR	DEFICIENT	GOOD	POOR	GOOD	POOR	APPROACHING	STABILIZED LOW	62%

Gravel Road Management Tool

Introduction

Gravel Road Management Tool

Introduction:
This spreadsheet tool is designed to be a data management resource for county engineering offices to better track and manage gravel roads.
This spreadsheet can be used as an inventory tool, providing one location for keeping all maintenance and construction data about a gravel road system.
It can also be used to track costs and optimize spending. The tool was developed to be flexible and customizable for a variety of purposes and system sizes.
Default values are included in the drop down selections in the various columns. However, users have the ability to change the options included in the drop down boxes by making edits in the red tab "Agency Dropdown Customization"

Caution:
This spreadsheet is not protected. Users can edit and change all cells as they see fit. However, many of the cells reference other areas of the spreadsheet. Unless the user has a significant level of Excel experience, it is not recommended to edit any of the formulas or dropdown menus already populated.

Cells colored in blue, contain prepopulated formulas. All cells that are not colored in each table will require a user input, either from manually entry or selection from a drop down

Development Date: March 2019
Developed by: Minnesota Local Road Reseach Board (LRRB) and SRF Consulting Group
Project Number: 2019RIC03
Supplemental Guidance Document: http://mndot.gov/research/reports/2019/2019RIC03.pdf
Link to download this spreadsheet: http://mndot.gov/research/reports/2019/2019RIC03.xlsx

Gravel Road Management Tool

Road Segments

- Agency can enter entire network or segments they specifically want to manage
- Segments entered into this tab will be used in the other tables throughout the spreadsheet.

Road Segment Inventory

Instructions:
This tab is intended to provide the user to ability to build an inventory of Gravel Road within their jurisdiction. The table below does not need to contain an exhaustive list of all the Gravel Roads within a specific that are due for maintenance or Roadways that have historically been problematic.

Segments entered into this tab will be used in the other tables throughout the spreadsheet.

1. Work LEFT to RIGHT in the table to add Segments as necessary.
2. The Start and End Road are the intersecting cross street for each road segment. If available, add the start and end latitude and longitude of the segment to aid in future identification of the road segment.
3. There are also options to add details regarding the characteristics of the roadway. Enter a value for the average maintained surface width to allow future calculation of gravel costs.

KEY: Dark Blue Cells contain prepopulated formulas

Example Data Entry:

Colu n1	Segment ID	County	CTY_CODE	Road Name	Begin Termini	End Termini	Start Lat, Long	End Lat, Long	MNDOT Road Name	ROUTE_ID	Se
1	MainStreet:135th-165th	Benton	5	115th Ave NE	135th	165th	46.XXXXXX, -96.XXXXXX	46.XXXXXX, -96.XXXXXX	115th Ave NE	07000005945000065 /	
2	155th:145th-90th	Benton	5	155th	145th	90th	46.XXXXXX, -96.XXXXXX	46.XXXXXX, -96.XXXXXX	155th Ave NE	07000005945000067 /	
3	145th:125th-Ronneby	Benton	5	145th	125th	Ronneby	46.XXXXXX, -96.XXXXXX	46.XXXXXX, -96.XXXXXX	145th St NE	07000005945000063 /	
4	SycamoreRd:120th-MNTH_25	Benton	5	Sycamore Rd	120th	MNTH 25	46.XXXXXX, -96.XXXXXX	46.XXXXXX, -96.XXXXXX	Sycamore Rd SE	07000005951000002 /	
5	125thave:SchoolHouse-MNTH_95	Benton	5	125th ave	School House	MNTH 95	46.XXXXXX, -96.XXXXXX	46.XXXXXX, -96.XXXXXX	125th Ave NE	07000005945000064 /	

Gravel Road Management Tool

Maintenance Records

- Track maintenance carried out on the roadway
- Requires cost of maintenance (per mile); length of segment

Example Data Entry:

Segment ID	Date maintenance	Type of maintenance	If other, specify:	Maintenance cost per mile	Segment Length (miles)	Total Cost
MainStreet: 135th-165th	7/7/2016	Stabilization		$98.00	4	$392.00
155th: 145th-90th	08/08/16	Major Work		$500.00	5.5	$2,750.00
145th: 125th-Ronneby	06/21/17	Regraveling		$70.00	2	$140.00
SycamoreRd: 120th-MNTH_25	09/04/18	Major Work		$500.00	0.5	$250.00
125thave:SchoolHouse-MNTH_35	10/15/18	Other	Pothole filling	$35.00	2	$70.00

Gravel Road Management Tool

Desired Thickness

- User enters actual and desired thickness of road segment
- User enters gravel type and unit cost
- Spreadsheet calculates required additional quantities and cost

Measured Thickness (	Desired Thickness	Difference	Cubic Feet Needed	Gravel Cost per Ton	Total Gravel Cost
7	8	1	31680	$20.00	$633,600
7	8	1	48400	$20.00	$968,000
9	6	0	0	$15.00	$0
8	9	1	3740	$67.90	$253,946
4	8	4	70400	$22.00	$1,548,800

Gravel Road Management Tool

Segment Evaluation

- As maintenance is conducted, new condition ratings are entered
- Usability score is then calculated based on predetermined ratings
- Definitions of the condition ratings (excellent, good, poor, etc.) for each surface issue are included in the "Evaluation Guide" tab.

SURFACE CONDITION ELEMENTS (ALWAYS COLLECT ON EVERY SEGMENT)		
GRAVEL LAYER RATING (4" is the minimum)	ROAD RECENTLY GRAVELED. REMAINS IN EXCELLENT CONDITION WITH NO GRAVEL LOSS.	EXCELLENT
	AGGREGATE COVERING ENTIRE ROAD SURFACE AND ADEQUATE FOR TRAFFIC	GOOD
	ADDITIONAL GRAVEL NEEDED IN SURFACE DEFORMATIONS (ROAD HAS >50% ADEQUATE GRAVEL COVERAGE)	FAIR
	ADEQUATE GRAVEL COVERAGE IS < 50% OF SURFACE	DEFICIENT
CROWN RATING (AT LEAST 4% IS NEEDED)	4% CROWN PRESENT ON ENTIRE SEGMENT	EXCELLENT
	>50% OF SEGMENT LENGTH HAS 4% CROWN. CROWN PRESENT ON OTHER SECTIONS.	GOOD
	<50% OF SEGMENT LENGTH HAS 4% CROWN. CROWN PRESENT ON OTHER SECTIONS.	FAIR
	NO CROWN PRESENT	DEFICIENT
WASHBOARDING RATING	NOT PRESENT	EXCELLENT
	SLIGHT WASHBOARDING	GOOD
	WASHBOARDING 1" - 2" DEEP, COVERING 10 - 25% OF SURFACE	FAIR
	WASHBOARDING >3" DEEP, COVERING > 25% OF SURFACE	POOR
RUTTING RATING	NOT PRESENT	EXCELLENT
	INFREQUENT RUTTING < 1"	FAIR
	RUTTING 1" - 3" DEEP & 10 - 25% OF SURFACE	POOR
	RUTTING > 3" DEEP & > 25% OF ROAD AREA	DEFICIENT
POTHOLE RATING	NOT PRESENT	EXCELLENT
	OCCASIONAL POTHOLE < 2" DEEP	FAIR
	POTHOLES 2" - 4" DEEP & 10 - 25% OF SURFACE	POOR
	POTHOLES > 4" DEEP & > 25% OF ROAD AREA	DEFICIENT
LOOSE AGGREGATE RATING	NOT PRESENT	EXCELLENT
	MODERATE LOOSE AGGREGATE	GOOD
	SOME LOOSE AGGREGATE UP TO 2" DEEP	FAIR
	SEVERE LOOSE AGGREGATE > 4" DEEP AT SHOULDER, SUBGRADE EXPOSED IN WHEELPATHS	POOR

Gravel Road Management Tool

Customization

- Allows the user to adjust and/or add values to the dropdown menu used throughout the spreadsheet

Agency Dropdown Customization

Instructions:
This tab allows the user to adjust and/or add values to the dropdown menu throughout the rest of the spreadsheet.
To add additional values, enter text into the cell directly below the last entry in the relevant table.
To change existing values, simply edit the text in place.
To delete existing values, right click the entry in the table, select Delete; select: Table Rows.

County	CTNY_CODE	Surface Typ	Treatment Type	Soil Factor	Type of maintenance	Nickname	YES or NO
Aitkin	1	Earth: unformed	Stabilized	20	Blading	blade	YES
Anoka	2	Earth: formed	Stabilized with MgCl	30	Reshaping	shape	NO
Becker	3	Class 1	Stabilized with CaCl	40	Drainage Maintenance	drain	
Beltrami	4	Class 2	MgCL	50	Regraveling	gravel	
Benton	5	Class 3	CaCl	50	Dust Control	dust	
Big Stone	6	Class 5	None	75	Stabilization	stable	
Blue Earth	7	Class 13		100	Isolated Repairs	repair	
Brown	8			120	Major Work	major	
Carlton	9			130	Other	other	
Carver	10						
Cass	11						
Chippewa	12						

Gravel Road Management Tool

Segment Data Can Be Pre-populated

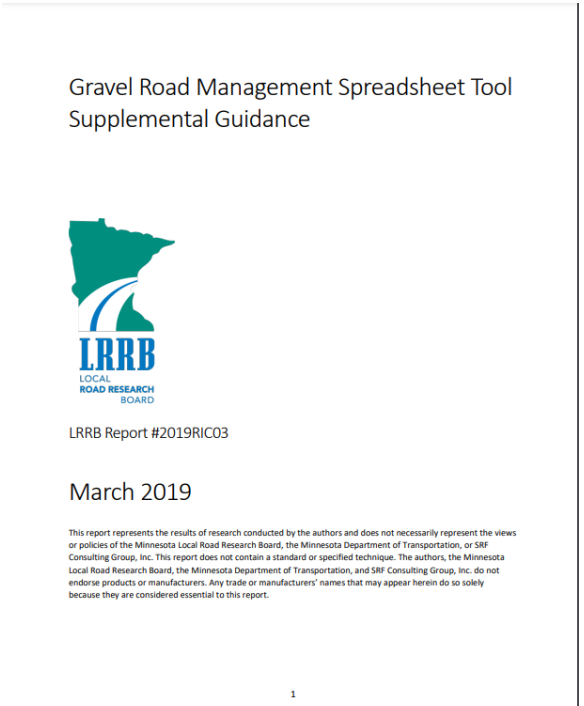
- Pulled from MNDOT Linear Referencing Network
- Via filters, segment data can be automatically entered

ROUTE_ID	STR_NAME	COUNTY _NAMI	COUNTY _CODE	LOOKUP
0900006631980530-I	154th Ave	Aitkin	1	1 154th Ave
0400006631980026-I	160th Pl	Aitkin	1	1 160th Pl
0400006631980035-I	190th Ave Ave	Aitkin	1	1 190th Ave Ave
0900006631980022-I	230th Pl	Aitkin	1	1 230th Pl
0900006631980551-I	250th Ave	Aitkin	1	1 250th Ave
0900006631980152-I	257th Pl	Aitkin	1	1 257th Pl
0700006631980059-I	260th AVE	Aitkin	1	1 260th AVE
0700006631980058-I	280th AVE	Aitkin	1	1 280th AVE
0900006631981402-I	282nd Pl	Aitkin	1	1 282nd Pl
0900006631980564-I	320th Pl	Aitkin	1	1 320th Pl
0900006631980488-I	340th Ave	Aitkin	1	1 340th Ave

Gravel Road Management Tool

Instructions/Guidance

- Each tab of the spreadsheet has detailed instruction on how to use
- Additionally, there is a guide with additional details and 4 appendices:
  - Appendix A: Soil Factor, R-Value, and MnDOT Grading and Base Specifications
  - Appendix B: Creating Pivot Tables
  - Appendix C: Linking to GIS data
  - Appendix D: Additional Resources



Gravel Road Management Spreadsheet Tool
Supplemental Guidance

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LRRB Report #2019RIC03

March 2019

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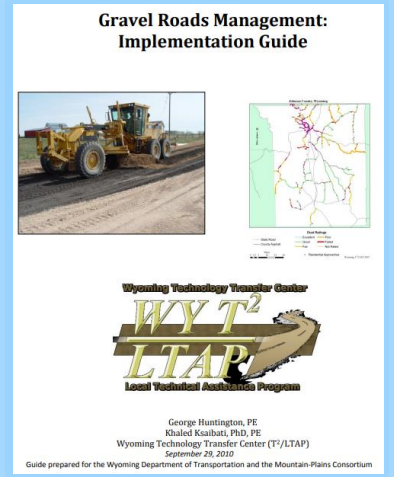
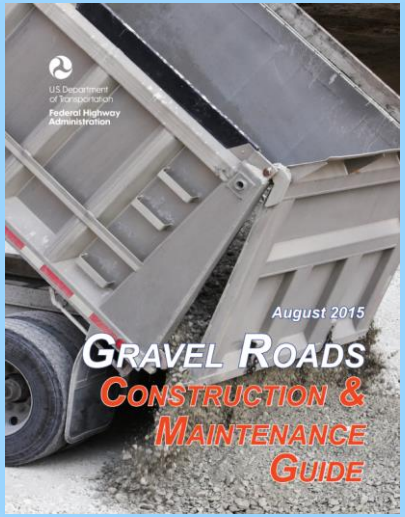
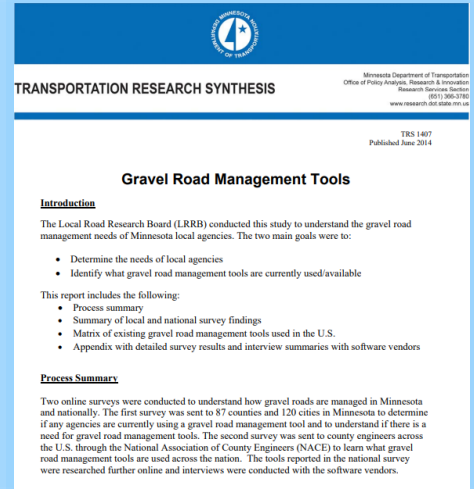
Appendix D - Additional Resources

- Upper Great Plains Transportation Institute (UGPTI) GRIT program
- Wyoming LTAP Gravel Roads Implementation Tool
- FHWA Gravel Roads Construction and Maintenance Guide
- MnDOT Transportation Research Synthesis on Gravel Roads Management







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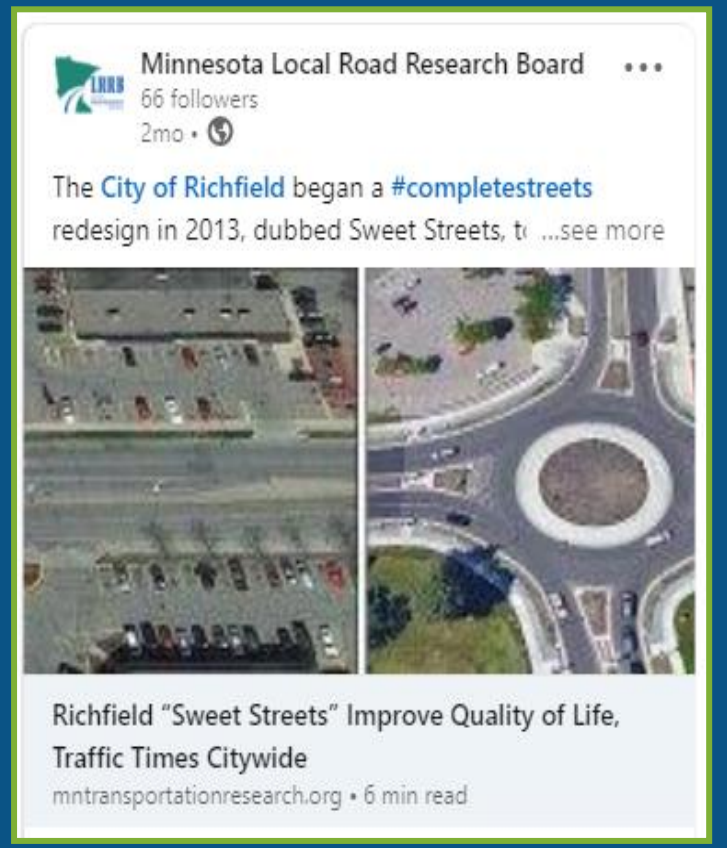

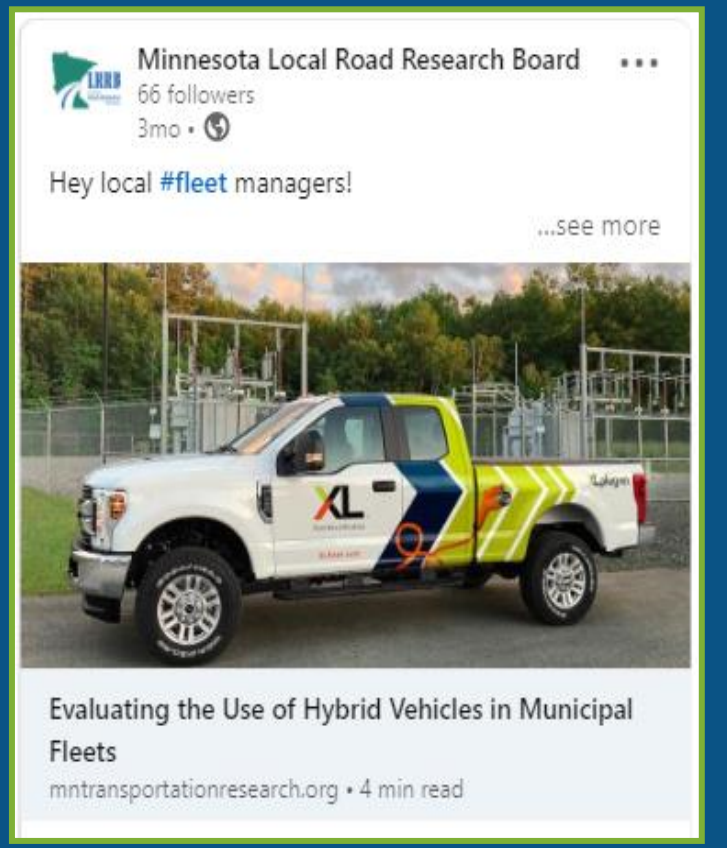

Questions?

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