



We developed a tool to estimate bridge construction time based on past projects. ▶ [Report 2020-01](#)

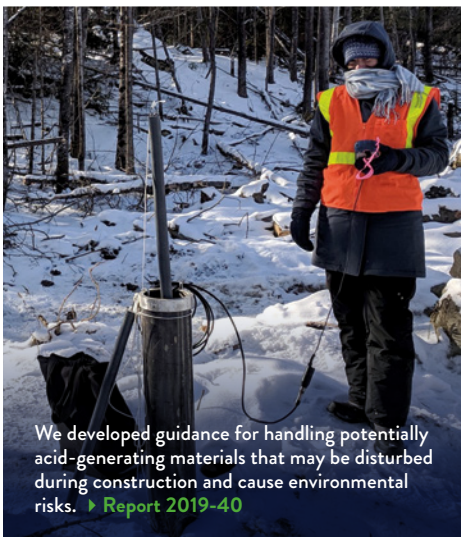


DEPARTMENT OF
TRANSPORTATION
OFFICE OF RESEARCH & INNOVATION

mndot.gov/research

FY2020: JULY 1, 2019 – JUNE 30, 2020

RESEARCH AT-A-GLANCE



We developed guidance for handling potentially acid-generating materials that may be disturbed during construction and cause environmental risks. ▶ [Report 2019-40](#)



We tested the nighttime wet reflectivity of pavement markings to ensure visibility. ▶ [Report 2020-09](#)



We developed a way to objectively calculate costs and benefits of public transit services. ▶ [Report 2020-10](#)

FY2020 RESEARCH ACTIVITIES

FINANCIAL OVERVIEW

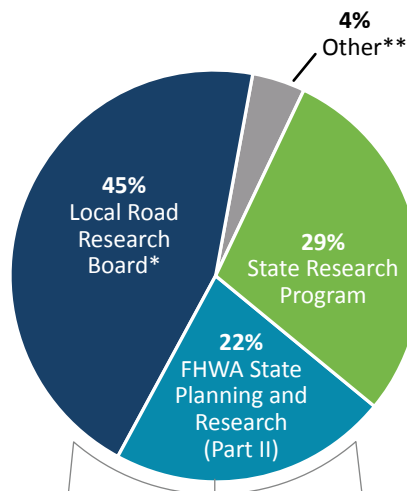
MnDOT's Office of Research & Innovation administers state research and implementation activities funded by the MnDOT State Research Program (SRP) and Federal Highway Administration (FHWA) State Planning and Research (SP&R) Program (Part II). The office also administers city and county research and activities funded by the Minnesota Local Road Research Board (LRRB).

FY2020 Research Funds by Funding Source

State Research Program	\$ 4,649,470
FHWA State Planning and Research (Part II)	\$ 3,534,263
Local Road Research Board*	\$ 7,214,089
Other**	\$ 566,283
Total	\$ 15,964,105

* Includes \$3,173,887 carried forward from period after FY2019.

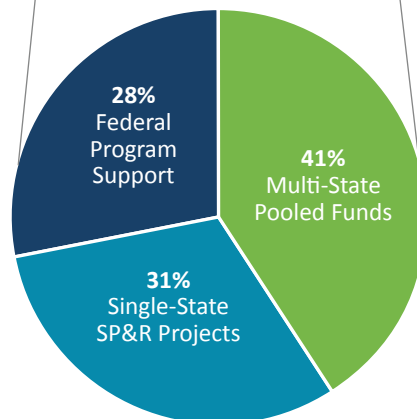
** Includes contributions from other MnDOT funds, partnerships with other agencies and other federal sources.



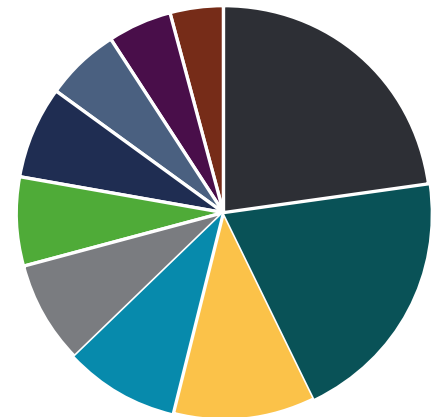
Subset: FY2020 SP&R (Part II) Funding Distribution

FHWA SP&R (Part II) funds are allocated to MnDOT for eligible state-specific needs and to participate in multi-state initiatives as shown below:

Multi-State Pooled Funds	\$ 1,368,000
a: Participation in Pooled Funds Led by Other States	\$ 913,000
b: MnDOT-Led Pooled Funds	\$ 455,000
Single-State SP&R Projects	\$ 1,047,043
Federal Program Support	\$ 918,434
a: National Cooperative Highway Research Program	\$ 777,538
b: Transportation Research Board	\$ 140,896
Total	\$ 3,333,477



FY2020 Research Funds Allocated by Topic Area



Total: \$11,519,625*

- 23%** Dedicated Programs (Center for Transportation Studies & Local Technical Assistance Program)
- 20%** Materials & Construction
- 11%** Traffic & Safety
- 9%** Maintenance Operations
- 8%** Federal Program Support
- 7%** Environmental
- 7%** Bridges & Structures
- 6%** Multimodal
- 5%** Administrative
- 4%** Policy & Planning

*This total is less than the total at left because it includes only contracts and leaves out purchase orders, travel and most staff salaries.

FY2020 RESEARCH CONTRACTS

Each research topic area on the following pages includes two tables:

- Research reports completed in fiscal year 2020 (FY2020), followed by other research contracts active during FY2020, sorted by contract end date.
- Multi-state pooled funds and American Association of State Highway and Transportation Officials (AASHTO) projects, with MnDOT-led pooled funds listed first.

For more information about projects, including two-page Technical Summaries for completed reports, search by the title on the “Search Projects” tab at mndot.gov/research. For more information about pooled funds, search at pooledfund.org.

BRIDGES & STRUCTURES					
Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019-30	Debonded Strands in Prestressed Concrete Bridge Girders	Cathy French, University of Minnesota	Brian Homan	7/31/19	\$35,000
2019-37	Maintenance Painting for Steel Bridges: Evaluation of Coating Systems Over Minimally Prepared Surfaces to Delay Rehabilitation	Daniel Zienty, Short Elliott Hendrickson, Inc.	Sarah Sondag	8/31/19	\$94,738
2019-45	Evaluation of Electrochemical Chloride Extraction, Fiber-Reinforced Polymer Wraps and Concrete Sealers for Corrosion Mitigation in Reinforced Concrete Bridge Structures	Mark Chauvin, Wiss, Janney, Elstner Associates, Inc.	Paul Pilarski	1/31/20	\$34,998
2020-05	Field Investigation of Bridge Deck Reinforced With Glass Fiber Reinforced Polymer (GFRP) Rebar	Behrouz Shafei, Iowa State University	Paul Rowekamp	2/29/20	\$88,000
2020-14	Implementation of New Guidelines for Tightening Large Anchor Rods of Support Structures for Signs and Luminaires	Brent Phares, Iowa State University	Jihshya Lin	6/20/20	\$125,500
2020-16, 2020-16A	Development of Cost-Competitive Timber Bridge Designs for Long-Term Performance	Don Fosnacht, University of Minnesota Duluth	David Conkel	8/31/20	\$212,883
2020-18	Understanding and Mitigating the Dynamic Behavior of RICWS and DMS Under Wind Loading	Lauren Linderman, University of Minnesota	Jihshya Lin	6/30/20	\$182,034
2020-19	Ten-Year Review of Monitoring System on I-35W St. Anthony Falls Bridge	Lauren Linderman, University of Minnesota	Benjamin Jilk	6/30/20	\$76,576
2020-24, 2020-24A	Appendices for Review and Assessment of Past MnDOT Bridge Barrier Types	William Williams, Texas A&M Transportation Institute	Paul Rowekamp	7/31/20	\$175,304
	Development and Integration of Advanced Timber Bridge Inspection Techniques for NBIS Purchase Equipment and Train Users	Victor Krause, University of Minnesota Duluth	David Conkel, Peter Wilson	1/20/20	\$42,794
	Unmanned Aircraft Systems (UAS): Metro District Bridge Inspection Implementation	Barritt Lovelace, Collins Engineers, Inc.	Jennifer Wells	1/31/21	\$99,897
	Steel Reinforcement Section Loss Guidance Tables	Behrouz Shafei, Iowa State University	Paul Pilarski	4/30/21	\$100,966
	Mitigating Seasonal Movement at Culverts and Utilities	Michael Marti, SRF Consulting Group, Inc.	Guy Kohlhofer	6/21/21	\$34,676
	Retightening the Large Anchor Rods of Support Structures for Signs and Luminaires—Phase II	Brent Phares, Iowa State University	Jihshya Lin	9/30/21	\$175,000
	Detecting Pile Length of Sign Structures and High Mast Poles	Bojan Guzina, Lauren Linderman, University of Minnesota	Richard Lamb	12/31/21	\$198,000
	Implementation of Culvert Design Guide for Stream Connectivity and Aquatic Organism Passage (AOP)	Matt Hernick, University of Minnesota	Nicole Bartelt	1/31/22	\$60,001
	Load Rating Assessment of Three Slab-Span Bridges Over Shingle Creek	Ben Dymond, University of Minnesota Duluth	Yihong Gao	6/30/22	\$150,800

BRIDGES & STRUCTURES [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
	Assessment of Bridge Decks With Glass Fiber Reinforced Polymer (GFRP) Reinforcement	Behrouz Shafei, Iowa State University	Paul Kettleson	3/31/23	\$100,104

TENTATIVELY FUNDED FOR FY2021: Bridge Low Slump Concrete Overlay Mix Design for Mobile Mixers; Culvert Type Evaluation: Concrete vs Plastic vs Corrugated Metal; Evaluation of Corrugated HDPE Pipes Manufactured With Recycled Content; Quantifying Benefits of Bridge Maintenance

Bridges & Structures Pooled Fund Studies

Study Number	Title	Lead State or Agency	Number of Participating Agencies	Total Cost	2020 MN Contribution	Total MN Contribution	Current MN Contribution End Date
TPF-5(356)	Structural Design Methodology for Spray-Applied Liners in Gravity Stormwater (SAPL)	OH	8	\$529,547	\$0	\$79,221	2019
TPF-5(372)	Building Information Modeling (BIM) for Bridges and Structures	IA	24	\$2,080,000	\$20,000	\$80,000	2022
TPF-5(381)	Evaluation of Lateral Pile Resistance Near MSE Walls	UT	7	\$240,000	\$0	\$40,000	2019
TPF-5(387)	Development of an Integrated Unmanned Aerial Systems (UAS) Validation Center	IN	9	\$650,000	\$25,000	\$75,000	2020
TPF-5(392)	Construction of Low-Cracking High-Performance Bridge Decks Incorporating New Technology	KS	2	\$390,000	\$105,000	\$255,000	2021
TPF-5(432)	Bridge Element Deterioration for Midwest States	WI	12	\$480,000	\$20,000	\$40,000	2020
TPF-5(436)	Development of Criteria to Assess the Effects of Pack-Out Corrosion in Built-Up Steel Members	IN	6	\$760,000	\$40,000	\$120,000	2021

ENVIRONMENTAL

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019-22	Investigating Wastewater Reuse at MnDOT Truck Stations	Sara Heger, University of Minnesota	Neile Reider	8/31/19	\$150,301
2019-25	Monitoring and Habitat Assessment of Declining Bumble Bees in Roadsides in the Twin Cities Metro Area of Minnesota	Daniel Cariveau, University of Minnesota	Christopher Smith	8/31/19	\$111,264
2019-27	Iron-Enhanced Swale Ditch Checks for Phosphorus Retention	John Gulliver, University of Minnesota	Beth Neuendorf	8/31/19	\$200,036
2019-31	Development and Regionalization of In Situ Bioslopes and Bioswales	David Saftner, University of Minnesota Duluth	Dwayne Stenlund	10/31/19	\$195,955
2019-38	TPF 5(346): Regional Roadside Turfgrass Testing Program	Eric Watkins, University of Minnesota	Dwayne Stenlund	10/31/19	\$200,000
2019-40	MnDOT Guidance Manual for Potentially Acid-Generating Materials in Northern Minnesota	Ward Swanson, Barr Engineering Company	Jason Richter	10/31/19	\$138,949
2020-03	Expanding the Success of Salt-Tolerant Roadside Turfgrasses Through Innovation and Education	Eric Watkins, University of Minnesota	Dwayne Stenlund	2/29/20	\$168,974
2020-15	Permeable Pavement for Road Salt Reduction	John Gulliver, University of Minnesota	Richard McCoy	8/31/20	\$197,835
2020-21	Slope Vulnerability Assessment Project—Phase III	Jen Holmstadt, WSB & Associates, Inc.	Raul Velasquez	8/31/20	\$94,097
2020-23	Monitoring and Performance Analysis of the TH610 Iron-Enhanced Filtration System	Omid Mohseni, Barr Engineering Company	Beth Neuendorf	8/31/20	\$65,001

ENVIRONMENTAL [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2020-26	Use of Innovative Technology to Deter Bat Bridge Use Prior to and During Construction	Basak Aldemir Bektas, Minnesota State University, Mankato; Katelyn Freese, Iowa State University	Christopher Smith	10/31/20	\$143,290
2020-27	Characterization of Runoff Quality From Paved Low-Volume Roads and Optimization of Treatment Methods	John Gulliver, University of Minnesota	John Welle	11/30/20	\$192,527
	TPF-5(362): Improvements to the Infrastructure Carbon Estimator (ICE)	Jeffrey Ang-Olson, ICF Incorporated, LLC	Timothy Sexton	1/31/21	\$409,992
	Continued Monitoring of Stormwater Effluents From Filter Media in Two Bioslope Sites	Meijun Cai, University of Minnesota Duluth	Dwayne Stenlund	6/30/21	\$33,250
	Highway Renewable Energy: Harnessing the Sun's Energy Through Noise Barriers and Structural Snow Fencing	Mijia Yang, North Dakota State University	Daniel Gullickson	6/30/21	\$149,060
	Assessment of Field Infiltration Performance of Swales in Comparison to Minnesota Swales Calculator Estimates	Joel Toso, Wenck Associates, Inc.	Nicklas Tiedeken	7/31/21	\$99,897
	Assessing Culverts in Minnesota: Fish Passage and Storm Vulnerability	Jessica Kozarek, University of Minnesota	Nicole Bartelt	7/31/21	\$158,374
	Design and Construction of Infiltration Facilities	John Gulliver, University of Minnesota	Dwayne Stenlund	8/31/21	\$238,572
	Reuse of Regional Waste in Sustainably Designed Soils	Marsha Patelke, University of Minnesota Duluth	Dwayne Stenlund	1/31/22	\$197,406
	Environmental Field Evaluation of Potassium Acetate (KAc)	Chris Rehmann, Iowa State University	Tara Carson	6/30/22	\$212,877
	Wet Pond Maintenance for Phosphorus Retention	John Gulliver, University of Minnesota	Leslie Stovring	6/30/22	\$222,467
	Evaluation of Environmental Impacts of Potassium Acetate Used as a Road Salt Alternative	John Gulliver, University of Minnesota	Nicklas Tiedeken	7/31/22	\$214,743
	Regional Optimization of Roadside Turfgrass Seed Mixtures—Phase II: Regional Field Trials and Economic Analysis	Eric Watkins, University of Minnesota	Dwayne Stenlund	8/31/22	\$467,139

TENTATIVELY FUNDED FOR FY2021: Comparison of 25 mph Residential Speed Limit: Question Regarding New Statute and Guidelines for Conducting Speed Zone Studies; Compost and Proprietary Soil Amendments for Vegetation Establishment

Environmental Pooled Fund Studies

Study Number	Title	Lead State or Agency	Number of Participating Agencies	Total Cost	2020 MN Contribution	Total MN Contribution	Current MN Commitment End Date
TPF-5(362)	Improvements to the Infrastructure Carbon Estimator (ICE)	MN	8	\$425,000	\$0	\$30,000	2019
TPF-5(352)	Recycled Materials Resource Center—4th Generation	WI	9	\$1,335,000	\$40,000	\$200,000	2020
TPF-5(358)	Wildlife Collision Reduction and Habitat Connectivity	NV	13	\$1,275,000	\$20,000	\$100,000	2021

MAINTENANCE OPERATIONS

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019-44	Expanding Landowner Adoption of Snow Control Measures Through a Better Understanding of Landowner Knowledge, Attitudes and Practices	Dean Current, University of Minnesota	Daniel Gullickson	1/31/20	\$104,974
2019-46	Optimized Taconite-Based Pavement Repair Compound and Deployment System	Lawrence Zanko, University of Minnesota Duluth	Perry Collins	12/31/19	\$100,000

MAINTENANCE OPERATIONS [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019RIC09, 2019RIC09H	Best Practices for Boulevard Turf Design and Maintenance: From Seed to Turf	Michael Marti, SRF Consulting Group, Inc.	Paul Oehme	6/12/21	\$47,393
2019RIC10, 2019RIC10S, 2019RIC10T	Best Practices: Corridor Management/Maintenance of Paved Recreational Trails	Michael Marti, SRF Consulting Group, Inc.	Steven Bot	6/12/21	\$36,041
2020-20	Assessing the Effectiveness of Potassium Acetate to Control Snow and Ice on Minnesota Highways	Patrick Casey, CTC & Associates, LLC	Perry Collins	6/30/20	\$93,948
2020-25	Techno-Economic Analysis of Implementing Hybrid Electric Utility Vehicles in Municipal Fleets	Will Northrop, University of Minnesota	Kevin Schlangen	7/31/20	\$100,767
2020RIC02, 2020RIC02M	Treatment Selection Guidelines for Flexible Pavements, Other Pavement Preservation Techniques (Local Agency Focused)	Michael Marti, SRF Consulting Group, Inc.	Joel Ulring	6/12/21	\$35,879
TRS 2003	Expedited Process for Developing Specifications on New Products	Patrick Casey, CTC & Associates, LLC	Joel Ulring, Clark Moe	11/30/20	\$15,020
TRS 2004	Preventive Maintenance and Inspection for Traffic Signals, Roadway Lighting and Overhead Sign Structures	Mark Linsenmayer, CTC & Associates, LLC	Ray Starr	11/30/20	\$16,580
	TPF-5(218): Clear Roads Weather Event Reconstruction and Analysis Tool	Chris Albrecht, The Narwhal Group	Thomas Peters	12/31/19	\$93,223
	TPF-5(353): Clear Roads II: Standard Specifications for Plow Blades With Carbide Inserts	Erik Minge, SRF Consulting Group, Inc.	Fausto Cabral Neto	4/30/20	\$53,787
	TPF-5(353): Clear Roads II: Alternative Methods for Deicing	Laura Fay, Montana State University, Western Transportation Institute	Thomas Peters	7/31/20	\$77,529
	TPF-5(353): Clear Roads I: Defensive Driving for Snowplow Operators	Matthew Camden, Virginia Polytechnic Institute and State University	Thomas Peters	8/31/20	\$70,000
	TPF-5(353): FY2020 T79 Plug-and-Play Amendment 1 (MnIT Contract)	Parsons Transportation Group, Inc.	Thomas Peters	9/30/20	\$40,000
	Adaptive Management to Improve Deicing Operations	Larry Baker, University of Minnesota	Ross Bintner	12/31/20	\$204,000
	TPF-5(353): Clear Roads II: Evaluation of SSI and WSI Variables	Chris Albrecht, The Narwhal Group	Thomas Peters	12/31/20	\$74,940
	TPF-5(353): Clear Roads II: Review and Summary of Prewet Methods and Procedures	Xianming Shi, Washington State University	Thomas Peters	12/31/20	\$74,721
	TPF-5(353): Clear Roads II: Integrating Advanced Technologies Into Winter Operations Decisions	Erik Minge, SRF Consulting Group, Inc.	Thomas Peters	12/31/20	\$90,311
	Hot Shots for Cold Climes: Evaluating Treatment of the Hardest Icy Spots	Stephen Druschel, Minnesota State University, Mankato	Thomas Peters	1/31/21	\$170,315
	TPF-5(353): Clear Roads II: High-Performance Blade Evaluation	William Schneider, University of Akron	Thomas Peters	1/31/21	\$99,674
	TPF-5(353): Synthesis of Technical Requirements and Considerations for an Automated Snowplow Route Optimization RFP Template	Jonathan Dowds, University of Vermont	Thomas Peters	4/30/21	\$73,516
	TPF-5(353): Clear Roads I: Clear Roads Administration, Research Support and Information Services	Patrick Casey, CTC & Associates, LLC	Thomas Peters	6/30/21	\$751,585

MAINTENANCE OPERATIONS [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
	TPF-5(353): Clear Roads II: Aftermarket Cameras in Winter Maintenance Vehicles	Erik Minge, SRF Consulting Group, Inc.	Thomas Peters	6/30/21	\$92,977
	Best Practices to Manage Effects of Settlement and Heave at Catch Basins and Manholes	Derek Tompkins, American Engineering Testing, Inc.	Steven Bot	7/31/21	\$59,676
	Evaluation of Slurry Box, Underbody Scraper and Two-Way Reversible Plow	Brian Hirt, CTC & Associates, LLC	Thomas Peters	7/31/21	\$63,526
	TPF-5(353): Recruitment and Retention of Highway Maintenance Workers	Laura Fay, Montana State University, Western Transportation Institute	Thomas Peters	7/31/21	\$70,000
	TPF-5(353): Measuring the Efficiencies of Tow Plows and Wing Plows	Ty Lasky, University of California, Davis	Thomas Peters	7/31/21	\$124,980
	TPF-5(353): Clear Roads II: Standard Test Procedure for Ice-Melting Capacity of Deicers	Xianming Shi, Washington State University	Thomas Peters	7/31/21	\$74,087
	Implementation of Lane Boundary Guidance System for Snowplow Operations	Max Donath, University of Minnesota	Daniel Rowe	10/31/21	\$351,831
	Reducing Winter Maintenance Equipment Fuel Consumption Using Advanced Vehicle Data Analytics	Will Northrop, University of Minnesota	Joseph Huneke	1/31/22	\$212,919
	Promoting the Adoption of Snow Fences Through Landowner Engagement	Dean Current, University of Minnesota	Daniel Gullickson	1/31/22	\$134,967

TENTATIVELY FUNDED FOR FY2021: BMP of Drain Tile Within the Roadway; Snowplow Optimization and GPS/AVL on Maintenance Equipment

Maintenance Operations Pooled Fund Studies

Study Number	Title	Lead State or Agency	Number of Participating Agencies	Total Cost	2020 MN Contribution	Total MN Contribution	Current MN Commitment End Date
TPF-5(353)	Clear Roads II	MN	36	\$3,975,000	\$25,000	\$125,000	2021
TPF-5(347)	Development of Maintenance Decision Support System	SD	14	\$1,805,149	\$30,000	\$195,000	2022

MATERIALS & CONSTRUCTION

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019-24	Disc-Shaped Compact Tension (DCT) Specifications Development for Asphalt Pavement	Andrea Schokker, University of Minnesota Duluth	Shongtao Dai	7/7/19	\$172,728
2019-36	Life Cycle Civil Integrated Management (CIM) Advancements in Preliminary Design BIM for Infrastructure	Chris Trboyevich, SRF Consulting Group, Inc.	Lyndon Robjent	10/31/19	\$99,955
2019-41	Experimental and Computational Investigations of High-Density Asphalt Mixtures	Mihai Marasteanu, University of Minnesota	Eddie Johnson	4/30/20	\$150,935
2019-43	Evaluating Effective Asphalt Content in Cold In-Place (CIR) Mixtures	Daniel Wegman, Braun Intertec Corporation	Wayne Stevens	3/31/20	\$33,553
2019RIC04	Lightly Surfaced Roads Training and Workshop Curriculum	Michael Marti, SRF Consulting Group, Inc.	John Brunkhorst	6/12/21	\$15,168

MATERIALS & CONSTRUCTION [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2020-04	Development of Pavement Condition Forecasting for Web-Based Asset Management for County Governments	Bradley Wentz, North Dakota State University	Bruce Hasbargen	4/30/20	\$92,831
2020-08	TPF-5(269): Development of an Improved Design Procedure for Unbonded Concrete Overlays	Lev Khazanovich, University of Pittsburgh	Thomas Burnham	11/30/19	\$118,318
NRRA202001, NRRA202002, NRRA202003, NRRA202004	TPF-5(341): Spray-On Rejuvenator Synthesis	Andrea Blanchette, WSB & Associates, Inc.	Thomas Burnham	6/30/20	\$92,302
NRRA202005, NRRA202006, NRRA202007	TPF-5(341): Repair of Joint Associated Distress Pavements	Renae Kuehl, SRF Consulting Group, Inc.	Benjamin Worel	8/31/20	\$95,626
TRS 1901	Mitigating Construction Impacts on Local Businesses	Patrick Casey, CTC & Associates, LLC	Jeanne Aamodt	8/31/19	\$9,972
TRS 1904	Ultra-Thin Bonded Wearing Course (UTBWC) Winter Maintenance	Mohammad Sabouri, Braun Intertec Corporation	Cody Brand	3/31/20	\$38,464
TRS 1905	Preferred Aggregate Base Courses for Low-Volume Roads	Patrick Casey, CTC & Associates, LLC	Richard West	1/31/20	\$10,376
TRS 2002	Life Cycle Cost of Local Roads	Michael Marti, SRF Consulting Group, Inc.	Brian Giese	8/31/20	\$15,356
	TPF-5(341): National Road Research Alliance (NRRA): Maintaining Poor Pavements	Renae Kuehl, SRF Consulting Group, Inc.	Gerard Geib	5/31/20	\$77,963
	Construction Inspection and Documentation Training Course	Stephanie Malinoff, University of Minnesota—CTS	Rollin Larson	12/30/20	\$137,338
	Is Seal Coating Counterproductive or Not? Evaluation of Stripping Under Chip Seals—Phase II	Zhanping You, Michigan Technological University	Steven Bot	12/31/20	\$140,508
	Milling Method Using Relative Surface for Vertical Precision	Blair Scheibel, RDO Equipment Co.	Shawn Groven	12/31/20	\$34,559
	Use of J-Band to Improve the Performance of the HMA Longitudinal Joint	Christopher Williams, Iowa State University	Eddie Johnson	12/31/20	\$125,871
	TPF-5(334): Enhancement to the Intelligent Construction Data Management System (Veta) and Implementation—Phase I	George Chang, The Transtec Group, Inc.	Rebecca Embacher	1/31/21	\$1,232,189
	TPF-5(341): NRRA: Cold Central Plant Recycling (CCPR)	Dave Rettner, American Engineering Testing, Inc.	Michael Vrtis	1/31/21	\$99,997
	TPF-5(341): Performance Benefits of Fiber-Reinforced Thin Concrete Pavement and Overlays	Manik Barman, University of Minnesota Duluth	Thomas Burnham	1/31/21	\$149,999
	TPF-5(341): Evaluation of Long-Term Impacts of Early Opening of Concrete Pavements	Lev Khazanovich, University of Pittsburgh	Bernard Izevbekhai	1/31/21	\$149,999
	Use of e-Ticketing to Capture Asphalt Computer Generated (Paper) Weight Tickets	Rebecca Embacher, MnDOT Office of Materials	Rebecca Embacher	1/31/21	\$150,000
	TPF-5(341): Permeability of Base Aggregate and Sand	William J. Likos, University of Wisconsin—Madison	Terrence Beaudry	2/28/21	\$30,000
	Modulus and Dynamic Cone Penetrometer Data Collection for Full-Depth Reclamation Projects	Derek Tompkins, American Engineering Testing, Inc.	Bruce Tanquist	2/28/21	\$99,997
	Test Methods for Verification of Low-Temperature Cracking Resistance of Asphalt Binders and Mixtures	Dave Newcomb, Texas A&M Transportation Institute	David Van Deusen	2/28/21	\$203,641
	GeoRisk Scoping Implementation (Slope Vulnerability Assessment Project—Phase IV)	Jen Holmstadt, WSB & Associates, Inc.	Raul Velasquez	2/28/21	\$60,635
	TPF-5(341): Reduced Cementitious Material in Optimized Concrete Mixtures	Peter Taylor, Iowa State University	Bernard Izevbekhai	2/28/21	\$147,627

MATERIALS & CONSTRUCTION [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
	TPF-5(341): Determining Pavement Design Criteria for Recycled Aggregate Base and Large Stone Subbase	Halil Ceylan, Iowa State University	Raul Velasquez	2/28/21	\$225,000
	TPF-5(341): Improve Material Inputs Into Mechanistic Design Properties for Reclaimed Hot-Mix Asphalt (HMA) and Recycled Concrete Aggregate (RCA) Roadways	Bora Cetin, Michigan State University	Timothy Andersen	2/28/21	\$30,000
	TPF-5(341): Environmental Impacts on the Performance of Pavement Foundation Layers—Phase I	Bora Cetin, Michigan State University	Raul Velasquez	2/28/21	\$35,000
	Quantifying Benefits of Improved Compaction	Christopher Williams, Iowa State University	Kyle Hoegh	3/31/21	\$125,529
	TPF-5(341): NRRRA: Developing Best Practices for Rehabilitation of Concrete With Hot-Mix Asphalt (HMA) Overlays Related to Density and Reflective Cracking	Eshan Dave, University of New Hampshire	Shongtao Dai	4/30/21	\$169,970
	TPF-5(341): Effective Long-Lasting Partial Depth Joint Repairs for Challenging Conditions	Heidi Olson, Braun Intertec Corporation	Gerard Geib	4/30/21	\$74,978
	Implementation of Recycled Unbound Base Material Properties for MnPAVE	Derek Tompkins, American Engineering Testing, Inc.	David Van Deusen	5/31/21	\$74,999
	Full Depth Reclamation (FDR) for Urban and Suburban Street Application	Michael Marti, SRF Consulting Group, Inc.	Steven Bot	6/12/21	\$82,214
	Innovative Materials and Advanced Technologies for a Sustainable Pavement Infrastructure	Jia-Liang Le, University of Minnesota	Juan Pinero	6/30/21	\$151,514
	Pavement Thickness Evaluation Using 3D Ground Penetrating Radar	Lev Khazanovich, University of Pittsburgh	Shongtao Dai	6/30/21	\$113,852
	Remaining Service Life Asset Measure—Phase II	Mihai Marasteanu, University of Minnesota	Glenn Engstrom	6/30/21	\$118,834
	TPF-5(341): Solutions to Mitigate Dowel/Tie-Bar Propagated Cracking—Phase I	Shreenath Rao, Applied Research Associates, Inc.	Thomas Burnham	6/30/21	\$101,083
	Establishing Fresh Properties of Fiber-Reinforced Concrete for Performance Engineered Mixture (PEM)	Manik Barman, University of Minnesota Duluth	Robert Golish	7/31/21	\$147,070
	Construction Incentives--Are They Working?	Mohamed Diab, Minnesota State University, Mankato	Fausto Cabral Neto	7/31/21	\$88,620
	Ineffectiveness of Geotextiles/Geogrids in Roadway Construction: Determine a Granular Equivalent (GE) Factor	Vernon Schaefer, Iowa State University	Michael McCarty	7/31/21	\$197,339
	Optimizing Asphalt Mixture Designs for Low-Volume Roads of Minnesota	Manik Barman, University of Minnesota Duluth	Joel Ulring	7/31/21	\$161,333
	TPF-5(341): Mechanistic Load Restriction Decision Platform for Pavement Systems Prone to Moisture Variations	S. Masoud Mousavi, University of New Hampshire	Timothy Andersen	7/31/21	\$90,231
	Evaluation of SFDR Stabilizing Products	Michael Marti, SRF Consulting Group, Inc.	Bruce Hasbargen	7/31/21	\$74,986
	Effectiveness of Fog Seal on Chip Sealed Low-Volume Roads	Mike Rief, WSB & Associates, Inc.	Steven Bot	7/31/21	\$71,539
	Ride Quality of Asphalt Pavements (Overlays and New Construction), Performance of Overlays, Best Practices to Reduce Reflective Cracking	Michael Marti, SRF Consulting Group, Inc.	Joe Triplett	7/31/21	\$99,577
	Cold In-Place Recycling (CIR) for Bituminous Over Concrete (BOC)	University of New Hampshire	Terrence Beaudry	8/31/21	\$39,995
	TPF-5(341): Seismic Approach to Quality Management of HMA	Choon Park, Park Seismic, LLC	Jason Richter	10/31/21	\$299,886

MATERIALS & CONSTRUCTION [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
	TPF-5(341): Construction Reports for 2018 Fiber-Reinforced Concrete Roundabout and Thin Whitetopping Projects	Peter Taylor, Iowa State University	Maria Masten	10/31/21	\$49,999
	Development of Superpave 5 Asphalt Mix Designs for Minnesota Pavements	Mihai Marasteanu, University of Minnesota	Chelsea Bennett	2/28/22	\$144,405
	Evaluation of Curing Effects on Cold In-Place Recycling (CIR)	Eshan Dave, University of New Hampshire	Joel Ulring	4/30/22	\$156,052
	TPF-5(341): An Innovative Practical Approach to Assessing Bitumen Compatibility as an End Means of Material Specification	Eshan Dave, University of New Hampshire	Michael Vrtis	4/30/22	\$204,119
	TPF-5(341): Evaluation of Levels 3-4 Intelligent Compaction Measurement Values (ICMV) for Soils Subgrade and Aggregate Subbase Compaction	George Chang, The Transtec Group, Inc.	Rebecca Embacher	6/30/22	\$162,024
	TPF-5(375): National Partnership to Determine the Life-Extending Benefit Curves of Pavement Preservation (MnROAD/NCAT Joint Study)	Adriana Vargas-Nordbeck, Auburn University	Gerard Geib	6/30/22	\$1,750,000
	Base Stabilization Additives: Effect on GE	Halil Ceylan, Iowa State University	Chad Hausman	1/31/23	\$197,864
	Performance Monitoring of Olmsted CR 117/104 and Aggregate Base Material Update	Kyle Hoegh, MnDOT Materials and Road Research	Kaye Bieniek	11/30/23	\$44,000

TENTATIVELY FUNDED FOR FY2021: Benefits of Preventive Maintenance; BMP for Issues With Asphalt Centerline Joint and Intelligent Compaction for Local Agencies; Cost/Benefit Analysis of the Effectiveness of Crack Sealing Techniques; Cost Estimate of B vs. C Grade Asphalt Binders; Cost-Effectiveness of Various Pavement Markings; Evaluation of Proprietary Rejuvenators; Pavement Marking/Colored Pavement Friction Differential and Product Durability; MnDOT Haul/Detour Routes: Impacts on Local Roads

Materials & Construction Pooled Fund Studies

Study Number	Title	Lead State or Agency	Number of Participating Agencies	Total Cost	2020 MN Contribution	Total MN Contribution	Current MN Contribution End Date
TPF-5(341)	National Road Research Alliance (NRRRA)	MN	8	\$4,700,000	\$150,000	\$750,000	2020
TPF-5(375)	National Partnership to Determine the Life-Extending Benefit Curves of Pavement Preservation (MnROAD/NCAT Joint Study—Phase II)	MN	22	\$3,600,000	\$50,000	\$250,000	2022
TPF-5(297)	Improving Specifications to Resist Frost Damage in Modern Concrete Mixtures	OK	19	\$1,237,500	\$0	\$105,000	2019
TPF-5(313)	Technology Transfer Concrete Consortium (TTCC)	IA	36	\$1,736,000	\$0	\$60,000	2019
TPF-5(368)	Performance-Engineered Concrete Paving Mixtures	IA	20	\$2,185,000	\$15,000	\$75,000	2021
TPF-5(374)	Accelerated Performance Testing on the 2018 NCAT Pavement Test Track With MnROAD Research Partnership	AL	16	\$0	\$100,000	\$300,000	2020
TPF-5(437)	Technology Transfer Concrete Consortium (TTCC)	IA	34	\$1,556,000	\$12,000	\$60,000	2023
TPF-5(443)	Continuous Asphalt Mixture Compaction Assessment Using Density Profiling System (DPS)	MN	13	\$1,000,000	\$25,000	\$75,000	2021
TPF-5(448)	Integrating Construction Practices and Weather Into Freeze-Thaw Specifications	OK	12	\$600,000	\$20,000	\$60,000	2022

MULTIMODAL

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019-29	Evaluation of Sustained Enforcement, Education and Engineering Measures on Pedestrian Crossings	Nichole Morris, University of Minnesota	Melissa Barnes	8/31/19	\$177,226
2020-10, 2020-10E, 2020-10S	Measuring the Economic Benefits of Rural and Small Urban Transit Services in Greater Minnesota: Executive Summary	Jeremy Matts, North Dakota State University	Sara Dunlap	6/30/20	\$120,534
2020-22	How Do Complete Streets Matter for Communities? The Case of Richfield, Minnesota	Zhirong Jerry Zhao, University of Minnesota	Jack Broz	10/31/20	\$103,834
2020-29	Pedestrian Crossings and Safety on Four Anishinaabe Reservations in Minnesota	Greg Lindsey, University of Minnesota	Hannah Pritchard	1/31/21	\$150,000
2020RIC01, 2020RIC01G	Uncontrolled Pedestrian Crosswalk: Quick Reference Guide	Kate Miner, Stonebrooke Engineering, Inc.	Marc Culver	5/31/20	\$58,846
2020RIC03	Bicycle Facility Implementation: Quick Reference Guide	Michael Marti, SRF Consulting Group, Inc.	Chad Millner	10/31/20	\$62,994
	ADA Workshops for Local Agencies (FY2018)	Mindy Carlson, University of Minnesota—CTS	Kristine Elwood	8/31/19	\$125,000
	Impact of Transitways on Travel on Parallel and Adjacent Roads	Alireza Khani, University of Minnesota	Jim Henriksen	1/31/21	\$109,952
	TPF-5(315): National Accessibility Evaluation Years 4-5	Andrew Owen, University of Minnesota	Deanna Belden	1/31/21	\$881,500
	Guidance for Separated/Buffered Bike Lanes With Delineators	John Hourdos, University of Minnesota	Paul Oehme	5/31/21	\$90,578
	Understanding Pedestrian Travel Behavior and Safety in Rural Settings	Greg Lindsey, University of Minnesota	Hannah Pritchard	6/30/23	\$311,434

TENTATIVELY FUNDED FOR FY2021: Designing and Implementing Maintainable Pedestrian Safety Countermeasures; Identification of Best Types of Commodity Flow Data for Freight, Railroad, Ports and Waterways Studies; Mobile Device Data, Non-Motorized Traffic Monitoring, and Estimation of Annual Average Daily Bicyclist and Pedestrian Flows; Multi-Method Investigation of Pedestrian Safety Impacts of Right-Turn Lanes; Rural Community Transit Strategies

Multimodal Pooled Fund Studies

Study Number	Title	Lead State or Agency	Number of Participating Agencies	Total Cost	2020 MN Contribution	Total MN Contribution	Current MN Commitment End Date
TPF-5(315)	National Accessibility Evaluation	MN	15	\$1,994,000	\$0	\$225,000	2019
TPF-5(396)	Mid-America Freight Coalition (MAFC)—Phase III	WI	10	\$1,110,000	\$37,000	\$111,000	2021

POLICY & PLANNING

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019-42, 2019-42G, 2019-42P, 2019-42W	Converting Severely Distressed Low-Volume Paved Roads to Engineered Unpaved Roads: PowerPoint	Laura Fay, Montana State University, Western Transportation Institute	Tim Stahl	3/31/20	\$100,047

POLICY & PLANNING [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019RIC06, 2019RIC06I	Asset Management Guide for Local Agencies	Michael Marti, SRF Consulting Group, Inc.	Lyndon Robjert	6/12/20	\$67,128
2019RIC20, 2019RIC20A, 2019RIC20G	Managing Utility Congestion Within Rights of Way: Appendix A	Bryan Nemeth, Bolton & Menk, Inc., Consulting Engineers & Surveyors	Julie Long	12/31/19	\$59,824
2020-12	Local Contributions to State and Regional Transportation Facilities in Minnesota	Zhirong Jerry Zhao, University of Minnesota	Russ Matthys	8/31/20	\$121,668
2020RIC15, 2020RIC15Q	Quick Start Guide: GIS Tools and Apps, Integration With Asset Management	Annette Theroux, Pro-West & Associates, Inc.	John Brunkhorst	2/29/20	\$59,031
TRS 1903	360-Degree Point Cloud Technology for Building Management	Barritt Lovelace, Collins Engineers, Inc.	Christopher Bjork	8/31/19	\$23,303
	Workforce Planning and Human Resource Development Strategies for Minnesota's Public Transportation Agencies	Kenneth Bartlett, University of Minnesota	Lyndon Robjert	3/31/21	\$137,281
	System Preservation Guide: A Planning Process for Local Government Management of Transportation Networks	Michael Marti, SRF Consulting Group, Inc.	Andrew Witter	6/12/21	\$91,193
	Americans With Disabilities Act (ADA) for Local Agencies: Training Workshop	Michael Marti, SRF Consulting Group, Inc.	Ted Schoenecker	6/12/21	\$40,809
	A Qualitative and Quantitative Assessment of Pavement Segments That Have Remained in Poor Condition for 5+ Years	Mihai Marasteanu, University of Minnesota	Shannon Foss	6/30/21	\$85,045
	Extreme Flood Vulnerability Analysis	Rawlings Miller, WSP/Parsons Brinckerhoff, Inc.	Jeffrey Meek	6/30/21	\$81,357
	Building 360 Scanning and Reality Modeling	Barritt Lovelace, Collins Engineers, Inc.	Christopher Bjork	7/31/21	\$99,709
	Expanding the Transportation Workforce in Local Agencies: Awareness-Building Activities and Development of the Training Course Roadmap for Future Civil Technicians	Stephanie Malinoff, University of Minnesota	Chris Byrd	8/31/21	\$99,983

TENTATIVELY FUNDED FOR FY2021: Addressing Drainage Requests From Residents and Policy on County Road Ditches and Drainage; Advancing Equity in Accessibility and Travel Experiences: The Role of Gender and Identity; Assessing the Effects of Highway Improvements on Adjacent Businesses; BMP for Using Social Media for Local Agencies; Contractors Missing Deadlines/Overcommitting; Improving Transportation Equity for All by Centering the Needs of Marginalized and Underserved Communities; Maximizing Transportation Assets by Building Community Connection Through Innovative Development of Rights of Way and Airspace; Remote Sensing in Unsheltered Encampments

Policy & Planning Pooled Fund Studies

Study Number	Title	Lead State or Agency	Number of Participating Agencies	Total Cost	2020 MN Contribution	Total MN Contribution	Current MN Contribution End Date
TPF-5(455)	Access Across America: National Accessibility Evaluation—Phase II	MN	8	\$1,044,000	\$36,000	\$180,000	2024
TPF-5(198)	Urban Mobility Study: 2009 Continuation	TX	16	\$3,050,000	\$0	\$460,000	2019
TPF-5(326)	Develop and Support Transportation Performance Management (TPM) Capacity Development Needs for State DOTs	RI	37	\$4,568,500	\$0	\$195,000	2019
TPF-5(335)	Biennial Asset Management Conference and Training on Implementation Strategies (2016-2020)	IA	21	\$714,000	\$12,000	\$36,000	2020
TPF-5(384)	Exploring Nontraditional Methods to Obtain Vehicle Volume and Class Data	FHWA	18	\$1,485,000	\$0	\$50,000	2019

TRAFFIC & SAFETY

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019-19	Cloud-Based Dynamic Warning System	Bradley Wentz, North Dakota State University	Richard West	8/31/19	\$79,629
2019-32	Design Standards for Unobstructed Sight Lines at Left-Turn Lanes	David Noyce, University of Wisconsin–Madison	Kristi Sebastian	8/31/19	\$50,008
2019-34	Examining Optimal Sight Distances at Rural Intersections	Nichole Morris, University of Minnesota	Tracey Von Barga	9/30/19	\$170,549
2019-35	How Locals Need to Prepare for the Future of V2V/V2I Connected Vehicles	John Hourdos, University of Minnesota	Deb Heiser	11/30/19	\$79,260
2020-02	Improve Traffic Volume Estimates From MnDOT's Regional Traffic Management Center	Taek Kwon, University of Minnesota Duluth	Gene Hicks	4/30/20	\$97,484
2020-09	Pavement Markings: Wet Retroreflectivity Standards	Adam Pike, Texas A&M Transportation Institute	Kenneth Johnson	3/31/20	\$175,062
2020-13	Assessing the Impact of Pedestrian-Activated Crossing System	John Hourdos, University of Minnesota	Melissa Barnes	5/31/20	\$153,962
2020-17	Evaluation of the Effectiveness of Stop Lines in Increasing the Safety of Stop-Controlled Intersections	John Hourdos, University of Minnesota	Nick Bauler	8/31/20	\$150,528
2020-28	Deploy and Test a Smartphone-Based Accessible Traffic Information System for the Visually Impaired	Chen-Fu Liao, University of Minnesota	Michael Fairbanks	12/31/20	\$165,780
TRS 1902	Road Weather and Creative Safety Messaging on Dynamic Message Signs	Patrick Casey, CTC & Associates, LLC	Brian Kary	10/31/19	\$55,182
TRS 2001	Notifying the Public of Local Road Closures Via Common Smartphone Map Apps	Mark Linsenmayer, CTC & Associates, LLC	Darin Mielke	4/30/20	\$14,793
	RCI Video Project	James Douglas, Nighthawk Marketing	Scott Thompson	8/31/19	\$20,000
	TPF-5(190): North/West Passage Pooled Fund Study Website Maintenance	Bradley Wentz, North Dakota State University	Cory Johnson	1/31/20	\$10,570
	TPF-5(190): Program Support Services and Technical Writing for the North/West Passage Pooled Fund Research Program	Dean Deeter, Athey Creek Consultants, LLC	Cory Johnson	1/31/20	\$88,008
	Effectiveness of Teenage Support System (TDSS) on Reducing Traffic Violation Behaviors for Teenage Drivers at the Early Time of Licensure	Nichole Morris, University of Minnesota	Joe Gustafson	2/29/20	\$93,928
	TPF-5(376): North/West Passage Corridor Safety and Mobility Assessment	Renae Kuehl, SRF Consulting Group, Inc.	Cory Johnson	5/31/20	\$49,981
	Road Weather Messaging on Dynamic Message Signs (DMS)	Michael Marti, SRF Consulting Group, Inc.	Brian Kary	12/30/20	\$129,661
	Integrate RTMC Vehicle-Length Classification Data to the Current Detector Volume	Taek Kwon, University of Minnesota Duluth	John Hackett	1/31/21	\$26,642
	Validating AADT Estimates From Mobile Source Data	Shawn Turner	Ian Vaagenes	1/31/21	\$50,000
	TPF-5(376): North/West Passage Freight Task Force—Year 4	Erika Witzke, CPCS Transcom, Inc.	Cory Johnson	1/31/21	\$49,880
	Traffic Sign Life Cycle Evaluation: TRS	Gene Hawkins, Texas A&M Transportation Institute	Josephine Tayse	1/31/21	\$65,482
	INV 645: Strategies for Effective Roundabout Approach Speed Reduction	Kate Miner, Stonebrooke Engineering, Inc.	Joe Gustafson	2/28/21	\$32,853
	Generating Traffic Information From Connected Vehicle V2V Basic Safety Messages	Michael Levin, University of Minnesota	Ray Starr	3/31/21	\$249,994

TRAFFIC & SAFETY [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
	Evaluation and Refinement of Minnesota Queue Warning Systems	John Hourdos, University of Minnesota	Garrett Schreiner	6/30/21	\$254,187
	Development and Demonstration of an In-Vehicle Lane Departure Warning System Using DSRC-Based V2V Communication	Imran Hayee, University of Minnesota Duluth	Victor Lund	6/30/21	\$133,656
	Work Zone Intrusion Mobile Application	Brian Davis, University of Minnesota	Todd Haglin	6/30/21	\$158,029
	Pavement Marking Patterns and Widths: Human Factors Study	Adam Pike, Texas A&M Transportation Institute	Ethan Peterson	6/30/21	\$208,890
	Criteria and Guidelines for Three-Lane Road Design and Operation	Gary Davis, University of Minnesota	Jack Broz	8/31/21	\$155,559
	Evaluation of Road Weather Messages on DMS Based on Roadside Pavement Sensors	Skylar Knickerbocker, Iowa State University	Garrett Schreiner	11/30/21	\$75,270
	TPF-5(376): North/West Passage Website Maintenance	Patrick Nichols, North Dakota State University	Cory Johnson	2/28/22	\$10,243
	Evaluation of Metro Freeway System for Reliability and Resilience	Eil Kwon, University of Minnesota Duluth	Brian Kary	2/28/22	\$118,000
	Toward Implementation of Max-Pressure Signal Timing on Minnesota Roads	Michael Levin, University of Minnesota	Ben Hao	2/28/22	\$177,000
	Can Automated Vehicles “See” in Minnesota? Ambient Particle Effects on Lidar Systems	Will Northrop, University of Minnesota	Robert Chaucierre	2/28/22	\$237,840
	Establishing a Repeatable Method for Presenting Nontraditional Traffic Treatments to Maximize Stakeholder Support	Nichole Morris, University of Minnesota	Scott Thompson	6/30/22	\$348,994

TENTATIVELY FUNDED FOR FY2021: Best Practice Guidelines for Intelligent (Active) Warning Devices; Designing an Autonomous Service to Cover Transit Last Mile in Low-Density Areas; Enhancing Managed Lane Equity Analysis; Identifying Deer-Vehicle Collision Concentrations in Minnesota; Influence of Autonomous and Partially Autonomous Vehicles on Minnesota Roads; Performance Evaluation of Different Detection Technologies for Signalized Intersections in Minnesota; Tool to Estimate the Safety Impact of Vehicle Levels of Automation on Minnesota Roads; User-Centered Smart Traffic Sign Development Study; Vehicle-Mounted Debris Removal Tool

Traffic & Safety Pooled Fund Studies

Study Number	Title	Lead State or Agency	Number of Participating Agencies	Total Cost	2020 MN Contribution	Total MN Contribution	Current MN Contribution End Date
TPF-5(376)	North/West Passage—Phase IV	MN	6	\$650,000	\$25,000	\$125,000	2021
TPF-5(193)	Midwest States Pooled Fund Crash Test Program	NE	23	\$15,153,491	\$0	\$719,500	2019
TPF-5(319)	Transportation Management Center Pooled Fund Study	FHWA	23	\$3,020,569	\$25,000	\$125,000	2020
TPF-5(322)	High Occupancy Vehicle (HOV)/Managed Use Lane (MUL)	FHWA	12	\$430,000	\$0	\$75,000	2019
TPF-5(343)	Roadside Safety Research for MASH Implementation	WA	28	\$4,475,363	\$50,000	\$250,000	2020
TPF-5(359)	ITS Pooled Fund Program (ENTERPRISE)	MI	8	\$1,354,920	\$30,000	\$150,000	2021
TPF-5(377)	Enhanced Traffic Signal Performance Measures	IN	10	\$900,000	\$30,000	\$90,000	2020
TPF-5(380)	Autonomous Maintenance Technology (AMT)	CO	14	\$1,000,000	\$25,000	\$75,000	2020
TPF-5(430)	Midwest States Pooled Fund Crash Test Program	NE	22	\$41,120,996	\$66,000	\$66,000	2020

Traffic & Safety Pooled Fund Studies [cont.]

Study Number	Title	Lead State or Agency	Number of Participating Agencies	Total Cost	2020 MN Contribution	Total MN Contribution	Current MN Contribution End Date
TPF-5(290), TPF-5(435)	Aurora Program	IA	18	\$3,800,000	\$25,000	\$275,000	2023
TPF-5(444)	Traffic Safety Culture—Phase II	MT	20	\$1,430,000	\$10,000	\$50,000	2024

ADMINISTRATIVE

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
2019-33	LRRB Strategic Plan 2019-2024	Vivek Sakhrani, CPCS Transcom, Inc.	Jim Foldesi	7/31/19	\$88,821
	Technology Transfer Material Development (RS AAG and Newsletter) (2018-2019)	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	7/31/19	\$99,773
	LRRB Outreach and Marketing Support (2018-2019)	Renae Kuehl, SRF Consulting Group, Inc.	Shannon Fiecke	8/31/19	\$99,886
	Research Project Management and Implementation Support	Patrick Casey, CTC & Associates, LLC	Hafiz Munir	8/31/19	\$46,991
	Research Management Training	Patrick Casey, CTC & Associates, LLC	Hafiz Munir	11/30/19	\$42,806
	LRRB Technology Transfer Materials Development (FY2018)	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	2/29/20	\$99,824
	LRRB Outreach and Marketing Support (2019-2020)	Renae Kuehl, SRF Consulting Group, Inc.	Kristine Elwood	7/31/20	\$99,965
	ARTS Technical Support and Maintenance Services (FY2019)	Ryan Anderson, ArchWing Innovations, LLC	Katie Fleming	7/31/20	\$152,190
	MnDOT Library Strategic Plan	Patty Henderson, Radford Henderson, LLC	Catherine Walker	8/31/20	\$4,950
	TPF-5(376): Program Support Services and Technical Writing for the North/West Passage Pooled Fund Research Program—Work Plan 14	Dean Deeter, Athey Creek Consultants, LLC	Cory Johnson	8/31/20	\$97,290
	MnDOT Research Technical Summaries	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	11/30/20	\$99,984
	LRRB Technical Summaries and Project Evaluation Forms (LRRB Technical Transfer Materials Development) (FY2019)	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	12/31/20	\$99,913
	Technology Transfer (T2) Material Development: R&I At-A-Glance, Accelerator Newsletter, Other T2 Materials (FY2020)	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	1/31/21	\$99,947
	Research Implementation Committee (RIC): Implementation of Research Findings (FY2017-2019)	Michael Marti, SRF Consulting Group, Inc.	Michael Flaagan	6/12/21	\$792,295
	LRRB Technical Transfer Materials Development (FY2020)	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	6/30/21	\$48,961
	Office of Research & Innovation Report Publication Services (FY2020-2021)	Arlene Mathison University of Minnesota—CTS	Shannon Fiecke	6/30/21	\$109,169
	MnDOT Research Technical Summaries	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	6/30/21	\$99,923

ADMINISTRATIVE [cont.]

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
	LRRB Outreach and Marketing Support (2020-2021)	Renae Kuehl, SRF Consulting Group, Inc.	Shannon Fiecke	7/31/21	\$99,985
	LRRB Technology Transfer Materials Development (FY2021)	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	7/31/21	\$99,972
	LRRB Website Development and Hosting	Patrick Casey, CTC & Associates, LLC	Shannon Fiecke	7/31/21	\$39,462

Federal Program Support

Study Number	Title	2020 MN Contribution
TPF-5(420)	National Cooperative Highway Research Program (NCHRP)	\$777,538
TPF-5(450)	Transportation Research Board (TRB)	\$140,896

DEDICATED PROGRAMS

Report Number	Title	Investigator	Technical Liaison	End Date	Total Cost
	Local Technical Assistance Program (LTAP) (FY2019)	Stephanie Malinoff, University of Minnesota–CTS	Mitchell Rasmussen	9/30/19	\$450,500
	MnDOT Research Librarian Services (2019-2020)	Arlene Mathison, University of Minnesota–CTS	Sheila Hatchell	6/30/20	\$77,274
	Local Technical Assistance Program (LTAP) (FY2020)	Stephanie Malinoff, University of Minnesota–CTS	Kristine Elwood	9/30/20	\$450,500
	CTS Operations (FY2020-2021)	Laurie McGinnis, University of Minnesota	Catherine Walker	6/30/21	\$3,964,606
	Operational Research Program for Local Transportation Groups (OPERA) (FY2019-2020)	Mindy Carlson, University of Minnesota–CTS	Kristine Elwood	10/31/21	\$160,000
	LTAP Expanded Activities (FY2021-2022)	Stephanie Malinoff, University of Minnesota–CTS	Kristine Elwood	6/30/22	\$438,000



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You can help shape research and innovation projects in your subject area by serving on a Technical Advisory Panel (TAP). Involvement may include attending a few meetings and providing assistance developing work plans and reviewing final deliverables.