TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT
for
National Road Research Alliance (NRRA)

Lead Agency: Minnesota Department of Transportation

INSTRUCTIONS:
Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # TPF-5(341) *http://www.pooledfund.org/Details/Study/590*	**Report Period:** Quarter 3 (July 1 – September 30, 2020)	
Project Title: National Road Research Alliance – NRRA http://www.dot.state.mn.us/mnroad/nrra/index.html		
Project Manager(s): Glenn Engstrom (MnDOT) Robert Orthmeyer (FHWA)	**Phone Number:** (651) 366-5531 (708) 283-3533	**E-Mail** glenn.engstrom@state.mn.us Robert.orthmeyer@dot.gov
Lead Agency Project ID: None	**Other Project ID (i.e., contract #):** None	**Project Start Date:** February 22, 2016
Original Project End Date: September 30, 2018 (29 months)	**Current Project End Date:** February 22, 2021 (60 months)	**Number of Extensions:** 1 (Approved - Dec 2017 by NRRA Executive Committee)

Project schedule status → On schedule

Overall Project Statistics:

Total Project Budget	Total Costs obligated to Date for Project	Percentage of Tim and Funding Completed to Date
$4,850,000 (State SPR Funds obligated) Includes 150K - WI partnership funding along with 150K Illinois Tollway Funding MnDOT also has a separate MnDOT partnership fund for groups joining in as associate members – not shown in the total pooled fund dollars above.	SPR Funding Budgeted to date $4,839,514 (99.8%) Funds Remaining $10,486 Funding paid out to support NRRA efforts $ 2,196,868 (45.4% of the budget SPR $)	Time = 93% (56/60 months)

Project Description:
This pooled fund is open for new states and they can join at any time. This pooled fund will help direct and compliment the use of the MnROAD test track for local, regional and national research, tech transfer and implementation needs. Road owner agencies will provide input and participate in the decision making needed for future MnROAD construction and research scheduled in 2017. MnDOT and Missouri have funded construction in both states. MnDOT funded 2017 construction of test sections at MnROAD to support common goals. Industry and academia will also play an important role to provide critical input on long-term future trends in research and barriers to implementation, including working with their customers and members who play a direct role in implementation.

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):
To date ten (10) government agencies and over fifty-five (55+) industry, associations, consultants, and academic institutions have become NRRA members to share their expertise and are learning about new tools and methods to improve and expand upon transportation systems nationally.

- NRRA short and long term research projects are all under contract and work is progressing from 2017 and 2019 along with 5 projects being completed after a call for innovation in 2019, and a 2020 call for innovation went out to the associate membership for future funding in the next quarter of this year and six projects were selected with the remaining NRRA funding.
- All the Long and Short term research projects all have separate online project pages under the teams that are supporting these efforts.
- NRRA members/Teams have met every monthly again this quarter which also acts as TAP meetings for each teams short and long term research efforts.
- Executive Committee meetings (See team page)
    - Call for Construction sent out and ideas are being submitted – one formal idea so far and other potential ideas
    - Veta Pooled fund is added to NRRA phase-II
    - States are asked to join Phase-II online and talk with other states and potential associate members.
- Monthly Research pays off webinars have been completed
- NRRA Workshop Seminars are done from this May – others are being planned as needed by the teams.
- Budget sheet is attached at the end of this report.
- See the NRRA website for details on all the teams' activities.
- MnROAD will be reconstructing cells 139,705,805 because the sections have achieved their purpose
- Fall MnROAD monitoring being wrapped up and data being sent to contractors

Anticipated work next quarter:
The following is expected to be completed for next quarter.

- See listing of contracts in attachment C – working to contract the 2020 call for innovation projects this quarter.
- 2020 Call for Innovation projects will be contracted – 6 projects
- NRRA Research Pays-Off and Newsletters will be done each 3rd week of each month.
- TRB session and booth will not be done for January 2021
- NRRA members are planning for the second phase of NRRA and what the specific focus area are. New States are showing interest and are expected to join.

Significant Results:
Currently this pooled fund is working well for all the members. We have shared resources and technology with each other related to intelligent construction and have discuss a number to topics in the technical teams. More formal documentation will start to be developed at the contracts are awarded and this work begins.

NRRA is now up to 10 government members and at 55+ associate members. NRRA Agencies and Associates members make up the now 6 teams that play an important technical role in setting both the technology transfer and long term research needs. Each team has been active this summer meeting every two weeks to develop and prioritize ideas that fall into each of these categories above to meet both local, state, regional and national research needs. The teams report directly to the NRRA executive committee.

The initial push by each of the NRRA technical teams is to develop long term research needs and the MnROAD test sections that will be used to support these initiatives. MnDOT is providing $3.1 million of construction funding to support NRRA long term research needs to be built at MnROAD in the summer of 2017. Each team is working to get the final designs and special provisions to MnDOT so the plans can be developed and a formal construction project can be let in March 2017. Long term research includes researching HMA overlays of PCC, enhancing HMA compaction, fiber reinforced concrete, effects of diamond grinding on questionable aggregates, PCC early opening to strength, optimizing PCC cement content, compacted concrete pavements for city streets, cold central plant recycling, recycled aggregate bases, large stone subbases, maintaining HMA and PCC roadways, and PCC partial depth repair. Each topic/test section will provide a resource for future research contracts that are under development by teach team.

Other important team activities include the formation of technology transfer topics. The NRRA technology transfer team has been approved by the executive committee to fund 2 technology transfer topics from each of the four technical teams. Each topics goal is to pull together the existing state and national state of practice so that a common practice or specification can be developed by the members. Prioritized topics include longitudinal joint construction performance, tack coats, design and performance of concrete unbonded overlays, repair of concrete joint related distress, large unbound subbase materials, subgrade design, surface characteristics of diamond ground PCC, and pavement preservation approaches to lightly surfaced roadways. Currently the teams are updating the problem statements so that a MnDOT hired contractor can be hired to complete the work.

More information on these efforts including the long term research and technology transfer topics can be found under each of the team member's webpage. Summary of the projects are also attached in attachment C at the end of this report.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems)

None

Potential Implementation:
See the NRRA team pages for implementation topics that are being developed – TAP members of each of the contracts and teams will be asked to help the development of implementation for the technology transfer team to push with its members. This is a focus area that is probably the hardest part of successful research. The technology transfer team will be focused on this topic in the upcoming months.

Attachment A - NRRA Budget Summary (October 22, 2020)

TPF-5(341) National Road Research Alliance - NRRA Pooled fund

Associate portion see 2017-010 - TPF-5(341)

Current		2016	2017	2018	2019	2020	2021	Total
CA	Obligation	-	150,000	50,000	150,000	150,000	150,000	650,000
	Payment	-	150,000	50,000	150,000	150,000		500,000
IA	Obligation					150,000		150,000
	Payment					150,000		150,000
IL	Obligation	150,000	150,000	150,000	150,000	150,000		750,000
	Payment	150,000	150,000	150,000	150,000	150,000		750,000
MI	Obligation	150,000	150,000	150,000			300,000	750,000
	Payment	150,000	150,000	150,000				450,000
MN	Obligation	150,000	150,000	150,000	150,000	150,000		750,000
	Payment	150,000	150,000	150,000	150,000	150,000		750,000
MO	Obligation	150,000	150,000	150,000	150,000	150,000		750,000
	Payment	150,000	150,000	150,000	150,000	150,000		750,000
ND	Obligation	-	-	-	75,000	75,000		150,000
	Payment	-	-	-	75,000	75,000		150,000
WI	Obligation	150,000	150,000	150,000	150,000	150,000		750,000
	Payment	150,000	150,000	150,000	150,000	150,000		750,000
Illinois Tollway	Obligation					150,000		150,000
	Payment					150,000		150,000
Totals	Obligation	750,000	900,000	800,000	825,000	1,125,000	450,000	4,850,000
	Payment	750,000	900,000	800,000	825,000	1,125,000	-	4,400,000

Funding Summary - January 2020

Current Obligation	4,400,000	Illinois Tollway Partnership Added to $ total
Funding Expected	4,850,000	MI and CA are paying 2021 dollars to Phase-I

Attachment B - NRRA Budget Summary (October 22, 2020)

This spreadsheet is approximate summary of income and spending – MnDOT finance has the official dollars.

For 2020 - quarter 3 report - updated 10/22/2020

Funding Group	Description	Funding Totals	Percent	Remaining
States (SPR)	SPR - Pooled Funds (9 agencies) - Pooled Fund + Wisconsin 150K + 150K Tollway	$ 4,850,000		
	Total SPR Encumbered =	$ 4,839,514	99.8%	$ 10,486
	Paid Invoices =	$ 2,196,868	45.4%	
Additioanl State Funding (Not NRRA SPR Dollars)	MnDOT Constrction Funding for 2017 MnROAD Construction	$ 3,132,681		
	Missouri DOT funding of the roller compacted PCC construciton and research effort	$ 275,000		
	NRRA Associate funding not included in this budget	Not in this report		
		$ 8,257,681		

Spending Details **SPR Dollars Budget/Spending**

NRRA Focus Areas	Effort Type	Item (Letter.#)	Project Charge	General Outcome / Deliverable	Vendors	SPR Encumbered	Encumbered Line Items	Payments Invoiced	Payment Percent
Marketing	Labor	M1.1	TPF15341A	MNDOT Labor - (Website, Monthly Newsletter, Written Documents/Marketing)	MnDOT	138,891	138,891	138,891	100%
Tech Transfer (T)	Purchase	T1.1	TPF15341	Agency travel / meals / meeting room costs (assume no more travel in 2020)	MNDOT PO	33,108	33,108	33,108	100%
	Contract	T1.2		Communication (Written, Newsletter, video, Website) - MnDOT will not charge	Not Done				
	Contract	T1.3.1	TPF15341	Tack Coats Longitudinal Joint Construction Performance Design and Performance of Concrete Unbonded Overlays Repair of Joint Associated Distress Pavements Larger Subbase Materials - Done by Iowa State Subgrade Design for New and Reconstructed Surface Characteristics of Diamond Ground PCC Surfaces Pavement preservation approaches for lightly surfaced roadways Partial Depth Repairs of Concrete E-Ticketing	2016 State of Practice (SRF) top two topics from each team established in 2016	95,626	95,626	95,565	100%
	Labor	T1.3.2	TPF15341B	Tech transfer write-ups (MnDOT Labor) - Topics Below	MnDOT	19,749	19,749	19,749	100%
	Contract	T1.5.1	TPF15341	HMA – Asphalt Mixture Rejuvenator Synthesis PM - NRRA Spray on Rejuvenator Synthesis PM - Concrete Pavement Restoration (CPR) for BCOA PM - Service Life Enhancement of Substrates Overlaid with Thin Overlays	2019 State of Practice (WSB)	92,302	92,302	92,302	100%
Research (R)	Purchase	R1.1	TPF15341	2017 MnROAD Constrruction Sensor Purchases 2018 CCP Missouri Sensor Purchases - broken off the 60K avalible	MnDOT PO	184,672	159,130 25,542	184,672	100%
	Labor	R1.3	TPF15341C	Inspection (MnDOT) - costs over the initial budget	MnDOT	100,021	100,021	100,021	100%
	MnROAD Labor	R1.4	TPF15341D	MnROAD Staff - Construction, Sensors and Performance Monitoring MnDOT approved operating funds for any additonal costs - 120K approved by EC - MnDOT fund from Dec 17 budget report	MnDOT	675,364	279,318	675,364	100%
		R2.4		Approved $120K extra funding for monitoring 2018			120,000		
		R3.4		Approved $200K extra funding for monitoring 2019			200,000		
		R4.4		Approved $200K extra funding for monitoring 2020			50,046		
		R1.8		Missouri Sensor Labor Costs for 2018 installs - CCP - broken off the 60K avalible			26,000		
	Contract	R1.5	TPF15341	PCC Sampling/Testing	AET Consultant	61,514	20,000	61,514	100%
		R2.5		Additional Funding Approved (low initial estimate)			41,514		
	Contract	R1.6		HMA Performance Testing (75K original Estimate - will not use in Phase-I)	Not Done				
	Contract	R1.7		Partial Depth Repairs Construction (not in construction contract)	Diamond Surfacing	78,662	40,000	78,662	100%
		R2.7		Additional Funding Approved			38,662		
	MnDOT Agreement	R1.8		Compacted Concrete Pavement Construction (not in construction) - $50K original	Missouri DOT Hired University				
	Contract	R1.9		Diamond Grinding Construction (not in construction contract) - $50K	**Not Done**				
	2017 Long Term Projects	R1.10	TPF15341	HMA Overlay and Rehab of Concrete and Methods of Enhancing Compaction	UNH	169,970	169,970	82,592	49%
		R1.11		Cold Central Plant Recycling	AET Consultant	99,997	99,997	72,629	73%
		R1.12		Fiber Reinforced Concrete Pavements	UMD	149,999	149,999	44,048	29%
		R1.13		Long Term Effects of Diamond Grinding - $75k	**Not Done**				
		R1.14		Conctete Early Opening Strength to Traffic	UofPitt	149,999	149,999	34,770	23%
		R1.15		Optimizing the Concrete Mix Components for Contractors	Iowa State	147,627	147,627	100,098	68%
		R1.16		Compacted Concrete Pavements for Local Streets - $80K - Did do in Missouri	**Not Done**				
		R1.17		Recycled Aggregates in Aggregate Base and Larger Subbase Materials	Iowa State	225,000	225,000	77,233	34%
		R1.18		Maintaining Poor Pavements	SRF	28,725	28,725	28,725	100%
		R1.19		Partial Depth Repair	Braun Inertec	74,978	74,978	44,586	59%
	2019 Long Term Research	R1.21	TPF15341	HMA – Asphalt Mix Rejuvenator Test Sections (added 50K in April 2020)	UNH	148,981	148,981		0%
		R1.22		PM - Spray on Rejuvenator Test Sections (added 50K in Aprl 2020)	RFP coming out	150,000	150,000		0%
		R1.23		ICT - Levels 3-4 Intelligent Compaction Measurement Values (ICMV) for Soils Subgrade/Aggregate Subbase Compaction	Transtec Group	162,024	162,024		0%
		R1.24		ICT - Support Importing, Viewing and Analysis of Dielectric Constant Data in Veta	Transtec Group	45,000	45,000		0%
		R1.25		ICT - HD and VHD Seismic Approaches for Roadway Evaluation	Park Consulting	299,886	299,886	124,738	42%
		R1.26		Geo - Mechanistic Load Restriction Decision Platform for Pavement Systems Prone to Moisture Variations	UNH	90,231	90,231	31,057	34%
		R1.27		Geo - Environmental Impacts on the Performance of Pavement Foundation	Michigan State	35,000	35,000	15,000	43%
		R1.28		Geo - Permeability of Base Aggregate and Sand		30,000	30,000	2,000	7%
		R1.29		Geo - Improve material inputs into mechanistic design properties for reclaimed HMA Roadways		30,000	30,000	3,000	10%
		R1.30		PCC - Construction Report for Jointless FRC Roundabout in Minnesota	Iowa State	49,999	49,999	30,076	60%
		R1.31		PCC - Incorporate Joint Faulting Model Into BCOA-ME	Contracting Uof Pittsburg	24,999	24,999		0%
		R1.32		PCC - Engineered Dowel and Tie Bars combined with LTPP SPS-2 Determination of Causes for Cracking Over Dowel Bars	ERES Consulting	101,083	101,083	26,468	26%
	2019 Call for Innovation	R1.33	TPF15341	Blending of Higher Strength Aggregates with Recycled Concrete and Marginal Aggregates to Improve Concrete Properties	Contracting - UofSt Thomas	32,332	32,332		0%
		R1.34		Performance of Concrete Overlays over Full Depth Reclamation (FDR)	ARM	34,265	34,265		0%
		R1.35		Bio-material Maintenance Treatments	Iowa State	50,000	50,000		0%
		R1.36		Innovative Practical Approach To Assessing Bitumen Compatibility As A Means Of Material Specification	Cargill	204,119	204,119		0%
		R1.37		Cold Asphalt Recycling Technologies using Rejuvenating Asphalt Emulsion: Impact; Implementation; Specification	UNH	141,442	141,442		0%
	Contract	R1.38		Support Contract for T1.3.1 (SRF) Repair of Joint Associated Distress Pavements	Iowa State	4,972	4,972		0%
	2020 Call for Innovation	R1.39		Pavement-Specific Structural Synthetic Fibers	UMD	99,999	99,999		0%
		R1.40		Understanding and Improving Pavement Milling Operations	University of New Hampshire	100,000	100,000		
		R1.41		Novel Methods for Adding Rejuvenators in Asphalt Mixtures with High Recycled Binder Ratios	NCAT	80,000	80,000		
		R1.42		Impact of Polymer Modification on IDEAL-CT and I-FIT for Balanced Mix Design	NCAT	100,000	100,000		
		R1.43		Asphalt Real Time Smoothness (ARTS) for Asphalt Paving	Transtec Group	98,978	98,978		
		R1.44		Enhanced Entrained Air Void System Characterization for Durable Highway Concrete	TSU	100,000	100,000		
		R1.45		Continuous Moisture Measurement during Pavement Foundation Construction	UTEP	100,000	100,000		
					Totals =	**4,839,514**	**4,839,514**	**2,196,868**	**45.4%**

Attachment C – NRRA Project Listing

Team	NRRA Project (Title might be abrevated)	Contractor	Status	2017	2018	2019	2020	2021	2022
Flex	Developing Best Practices for Rehabilitation of Concrete with Hot Mix Asphalt (HMA) Overlays	University of NH	85%		2017 Research				
Flex	Cold Central Plant Recycling (CCPR)	AET Consulting	90%		2017 Research				
Flex	Longitudinal Joint Construction Performance	MnDOT	100%	Synthesis					
Flex	Tack Coats	MnDOT	100%		Synthesis				
Flex	Mix Rejuvenator Synthesis (Phase I)	WSB Consulting	100%			Synthesis			
Flex	Cold Asphalt Recycling Technologies using Rejuvenating Asphalt Emulsion	Cargill	10%				2019 Call for Innovation		
Flex	Innovative Practical Approach to Assessing Bitumen Compatibility as a Means of Material Specification	University of NH	12%				2019 Call for Innovation		
Flex	Mix Rejuvenator Test Sections (Phase II)	University of NH	5%				2019 Call for Innovation		
Flex	Novel Methods for Adding Rejuvenators in Asphalt Mixtures with High Recycled Binder Ratios	NCAT	TAP Review					2020 CFI Research	
Flex	Impact of Polymer Modification on IDEAL-CT and I-FIT for Balanced Mix Design	NCAT	TAP Review					2020 CFI Research	
GeoTech	Improve Material Inputs into ME Design Properties for Reclaimed HMA & Concrete Aggregates	Michigan State	35%			2019 Research			
GeoTech	Environmental Impacts on the Performance of Pavement Foundation Layers - Phase I	Michigan State	40%			2019 Research			
GeoTech	Subgrade Design for New and Reconstructed	SRF Consulting	Phase-II		Synathesis				
GeoTech	Permeability of Base Aggregate and Sand	University of WI	40%			2019 Research			
GeoTech	Mechanistic Load Restriction Decision Platform for Pavement Systems Prone to Moisture Variations	University of NH	60%			2019 Research			
GeoTech	Determining Pavement Design Criteria for Recycled Aggregate Base and Large Stone Subbase	Michigan State	90%		2017 Research				
GeoTech	Large-Aggregate Granular Materials (3-6+ inch) Used as Bases or Sub-bases	Michigan State	100%		Synthesis				
GeoTech	Continuous Moisture Measurement during Pavement Foundation Construction	UTEP	TAP Review					2020 CFI Research	
ICT	Support Importing, Viewing and Analysis of Dielectric Constant Data in Veta	Transtec Group	1%			2019 Research			
ICT	Seismic Approach to Quality Management of HMA	Park Seismic, LLC	6%				2019 Research		
ICT	Evaluation of Levels 3-4 Intelligent Compaction Measurement Values (ICMV)	Transtec Group	10%			2019 Research			
ICT	Validation of Electronic Truck Delivery Ticketing of HMA Material	SRF Consulting	100%		Synathesis				
ICT	Understanding and Improving Pavement Milling Operations	University of NH	TAP Review					2020 CFI Research	
ICT	Asphalt Real Time Smoothness (ARTS) for Asphalt Paving	Transtec Group	TAP Review					2020 CFI Research	
PM	Pavement preservation approaches for lightly surfaced roadways	SRF Consulting	100%		Synathesis				
PM	Effective Long Lasting Partial Depth Joint Repairs for Challenging Conditions	Braun Intertec	95%		2017 Research				
PM	Service Life Enhancement of Substrates Overlaid with Thin Overlays	WSB Consulting	100%			Synathesis			
PM	Concrete Pavement Restoration (CPR) for Bonded Concrete Overlays of Asphalt	WSB Consulting	100%			Synathesis			
PM	Surface Characteristics of Diamond Ground PCC Surfaces	SRF Consulting	100%		Synathesis				
PM	Spray on Rejuvenator Synthesis	WSB Consulting	100%			Synathesis			
PM	Maintaining Poor Pavements	SRF Consulting	100%		2017 Research				
PM	Bio-Materials Maintenance Treatments	Iowa State	1%				2019 CFI Research		
PM	Spray on Rejuvenator Test Sections	RFP out April 2020	RFP				2019 Research		
Rigid	Repair of Joint Associated Distress Pavements	SRF Consulting	100%		Synathesis				
Rigid	Solutions to Mitigate Dowel/Tie-Bar Propagated Cracking	ARA, Inc.	12%				2019 Research		
Rigid	Compacted Concrete for Local Streets	Missouri University	70%			2018 Research / Missouri Lead			
Rigid	Construction Report for Jointless FRC Roundabout in Minnesota	Iowa State	80%			2019 Research			
Rigid	Reduced Cementitious Material in Optimized Concrete Mixture	Iowa State	80%		2019 Research				
Rigid	Performance Benefits of Fiber-Reinforced Thin Concrete Pavement and Overlays	University of UMD	80%		2019 Research				
Rigid	Evaluation of Long-Term Impacts of Early Opening of Concrete Pavements	University of Pitts	80%		2019 Research				
Rigid	Design and Performance of Unbonded PCC Overlays	SRF Consulting	100%		Synathesis				
Rigid	Performance of Concrete Overlays over Full Depth Reclamation (FDR)	ARM of Minnesota	10%				2019 CFI Research		
Rigid	Incorporation of Joint Faulting Model into BCOA-ME	University of Pitts	Contracting				2019 Research		
Rigid	Effect of Low and Moderate Recycled Concrete Aggregate Replacement Levels on PCC Properties	St Thomas	Contracting				2019 CFI Research		
Rigid	Pavement-Specific Structural Synthetic Fibers	UMD	TAP Review					2020 CFI Research	
Rigid	Enhanced Entrained Air Void System Characterization for Durable Highway Concrete	TSU	TAP Review					2020 CFI Research	
NCAT	Cracking Group Experiment (CG2) Development of a asphalt mix cracking test	MnROAD/NCAT	85%						
NCAT	Preservation Group Experiment (PG2) Development of life extending benefits of preservation techniques	MnROAD/NCAT	50%						
VEDA	TPF-5(334) Enhancement to the Intelligent Construction Data Management System (Veta) and Implementation	MnDOT	ongoing						
DPS	TPF-5(443) Continuous Asphalt Mixture Compaction Assessment using Density Profiling System (DPS)	MnDOT	ongoing						

Original Contract Duration

Extension