MnROAD Monitoring Plan
2017-2018
Draft Plan – January 27, 2017

MnROAD has staffing to complete the following monitoring as part of the efforts/cost sharing with MnDOT, LRRB, NCAT and NRRA partners. This will enable MnROAD to focus the outside research to specific testing needs / research topics that is beyond the available staffing at MnROAD. Actual cost estimates are provided in a summary table.

Construction Monitoring

This monitoring depends on the study and the layers present. MnROAD will be able to provide the staffing and equipment to do testing related to the construction of each test cell.

MnDOT Design

Construction Activity	Costs

MnDOT or Contracted out

Construction Activity	Costs
Construction Inspection / Admin Costs (MnDOT or contracted out – working on)	10% of Construction Costs 2.52 million*10% ~ 252K

MnDOT Effort

Construction Activity	Costs
Intelligent Construction • IC Unbound Materials • IC HMA (Rollers/Lift) • IR HMA (Each Lift)	Partnership with Texas unbound 185,186,188,189,132,232 - 6 cells (partnership – help pay for NRRA sensors - they will map the unbound layers for these cells) IC will be used for acceptance for HMA (roller counts/IR each lift) but will utilize cores for HMA density (this will be in the construction funding) Unbound materials IC will not be utilized in the construction contract but partnerships will allow research data to be collected at MnROAD during the construction. Construction contract will include the costs
Unbound Strength Testing • DCP / FWD / Moisture / Nuc Gauge	20 hours per test cell of technician time $ 922 / 500’ cell
HMA Density • Rolling Density Meter - HMA Density (Longitudinal Joint Density) / Nuclear Density	1 day per cell (Testing and Analysis) Engineer Time = $461/ 500’ cell
3-D Ground Penetrating Radar • HMA Surface	1 day per cell (Testing and Analysis) Engineer Time = $461/ 500’ cell

"Standardized" Lab testing • Sampling / Unbound Gradations / Typical Asphalt properties / Performance Testing Needs? • Typical Concrete Mix Properties	See Maplewood Testing Rates Assumes $1,000/ 500' Cell
Construction Final Report Documentation • One report for each year	Assume $500/ 500' cell Overall costs of 39 cells = $19,500

Not Covered in Budget (work on as requested by NRRA teams)

Construction Activity	Costs
Contract (outside of MnDOT) for: • Plate load testing • HMA Performance Testing beyond standard DCT testing at MnDOT	TBD as requested

Performance Monitoring

MnROAD is moving towards using a new pathways van to "automate" our data collection monitoring but will continue to have available/use other past methods of performance data collection some depending on the study's needs. This list is broken into "Routine" and "Optional" monitoring.

Routine Monitoring (will be done)

Data to be Collected	MnROAD Freq/Costs	Milaca Freq/Costs	Description
Cracking	**Pathways Van** Every 2 Weeks (when above 32 F during Spring, Summer, Fall)		Video Manual Distress (monthly, office workstation) AutoCrack (Bi Weekly, office workstation)
Ruts/Faults			Bi Weekly, office workstation
Ride			Bi Weekly, office workstation
Texture			Bi Weekly, office workstation
	$38,600	$37,500	
Field Review	1X/ yr $6,800	3X / yr $16,600	Manual Distress Survey (Sketch and Distress Summary NCAT Survey (field review form)
FWD	4X / yr $70,000	3X / yr $6,600	Falling Weight Deflectometer (see documentation for testing patterns per study)
Profiler	4X / year $6,900	-	Light weight profiler (4X / yr) or test in Winter Australian Walker, dipstick as needed
Texture	-	-	Circular Texture Meter (currently equipment needs a upgrade to utilize it
Noise	4X / yr $6,300	2X / yr $6,300	On Board Sound Intensity (OBSI) used 4X and 2X / yr Sound Absorption as needed
Friction	2X / yr $8,700 3X / year $13,300	2X / yr $5,300 NA	Dynatest Locked Wheel DFT – Dynamic Friction Tester
Faulting	3x / year $5,200	-	FHWA Fault Meter
GPR	Construction and forensics (need to add)		Ground Penetrating Radar (2D and 3D), Rolling Density Meter

Snow Plow	$3,000	$3,000	Using MnDOT district documentation for plowing and salt use
Traffic	Continuous $3,000	Estimates $3,000	Weigh In Motion at MnROAD and estimated at Milaca – Working on getting a WIM for the offsite Milaca Pavement Preservation Study

Optional Monitoring (can be done with MnDOT Staff as needed for a cost)

Data to be Collected	MnROAD Freq	Milaca Freq	Description
Texture	as required		Circular Track Meter (needs replacement ~ $40K)
Video Gauge	as required		Movement of pavement surfaces – warp and curl
Permeability	per study	-	Permeometer

Sensor and Sensor Monitoring

MnROAD will have environmental (temp, moisture) and dynamic (strain, pressure) installed into many of its test sections. No instrumentation was installed at Milaca. The number of sensor and monitoring to be done on the newest 2016 NCAT partnership for the cracking experiment and the 2017 NRRA partnership will include:

Environmental Sensors – MnDOT will maintain the steady flow of data collected every 15 minutes.

Dynamic Monitoring – MnDOT will collect dynamic data from cells with the MnROAD truck (10 laps – 5 slow and 5 fast) and FWD testing on the sensors. Some live traffic dynamic data might also be pursued.

- NCAT (4 locations-Cells) – 8 times/year
  - Cost per year ~ Later
- NRRA (10 HMA + 10 PCC Cells sensor setups) – 4 times/year
  - Costs per year ~ $32,000