PPRA™

Better roads today. Stronger networks tomorrow.

RoadResource.org

A Comprehensive Resource for Optimizing Network Management

Lindsay Matush | Vario Consulting

Lindsay Matush
CEO & Founder
Vario Consulting

Scott Assenmacher
Professional Engineer Sales
Asphalt Materials, Inc.
Road Resource Trained Super User

Brought to you by:

Asphalt Materials

PPRA™
Better roads today. Stronger networks tomorrow.

PPRA

Better roads today. Stronger networks tomorrow.

AGENDA

1 | Background

2 | Tools & Features

Decision-Making Tools | Ensure Treatment Success | 40 Years or More | Network Strategies

3 | Additional Resources

Ask an Expert | Ahead of the Curve | Social Channels

Traits of successful road managers & agencies

1

Robust arsenal of asphalt treatments, applied appropriately

2

Network-level considerations and concepts applied with each treatment plan

3

Draw upon the success and innovation of others in similar regions and climates

4

In-touch with the industry at-large

Three Associations Join Together to Support the Industry

AEMA™
ASPHALT EMULSION MANUFACTURERS ASSOCIATION

ISSA®
PRESERVING PAVEMENT

ARRA™
Asphalt Recycling & Reclaiming Association

FORMING THE PAVEMENT PRESERVATION & RECYCLING ALLIANCE

PPRA™
Better roads today. Stronger networks tomorrow.

Objectives

1

Expand understanding of various **asphalt treatments and demystify emulsions**

2

Teach **network-level thinking** to make better use of resources for the long-term

3

Equip with technical information and **best practices to increase success**

4

Align consistent information into a single **easy-to-understand resource**

PPRA™
Better roads today. Stronger networks tomorrow.

3 Years of Research & Collaboration

Competitive exploration & industry affiliations

North American data survey

Retreats with ISSA, AEMA & ARRA leadership

Input from over 45 agency and industry leaders

Interviews & beta-testing with agency users, pavement managers, DOTs, & roadway engineers

Page by page technical review from multiple committees

PPRA
Better roads today. Stronger networks tomorrow.

500 pages of

RoadResource.org

PPRA™

Better roads today. Stronger networks tomorrow.

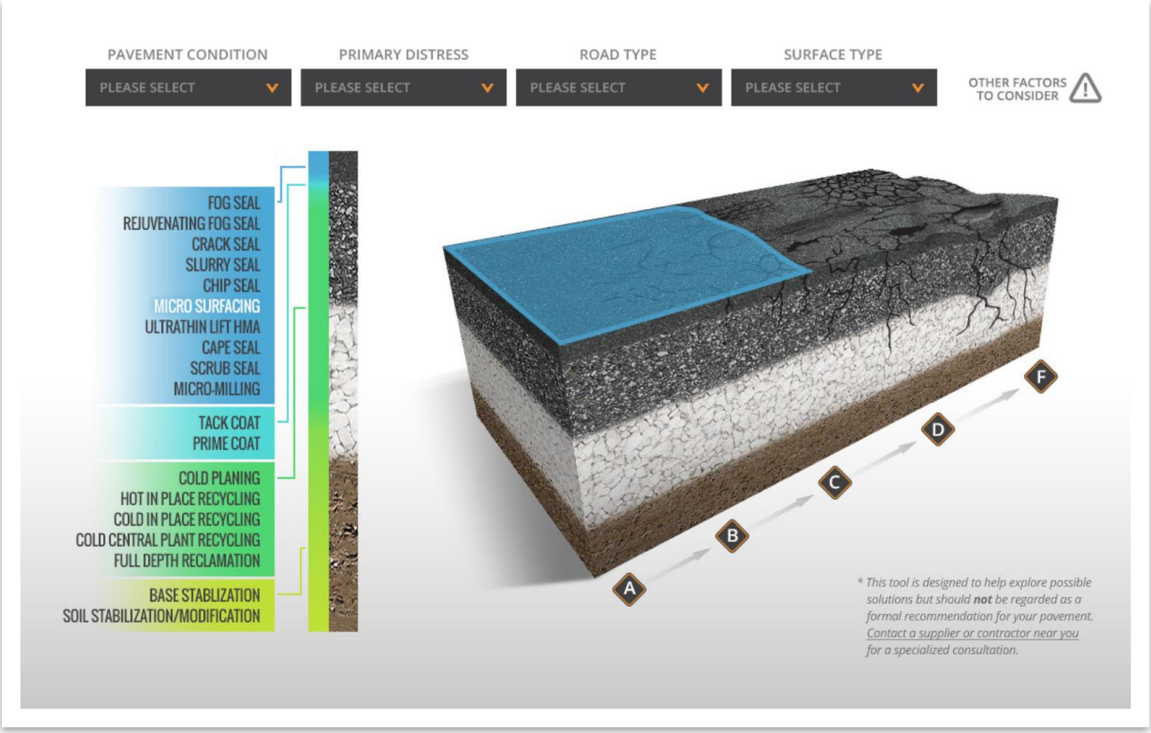
What treatment is best for my road?

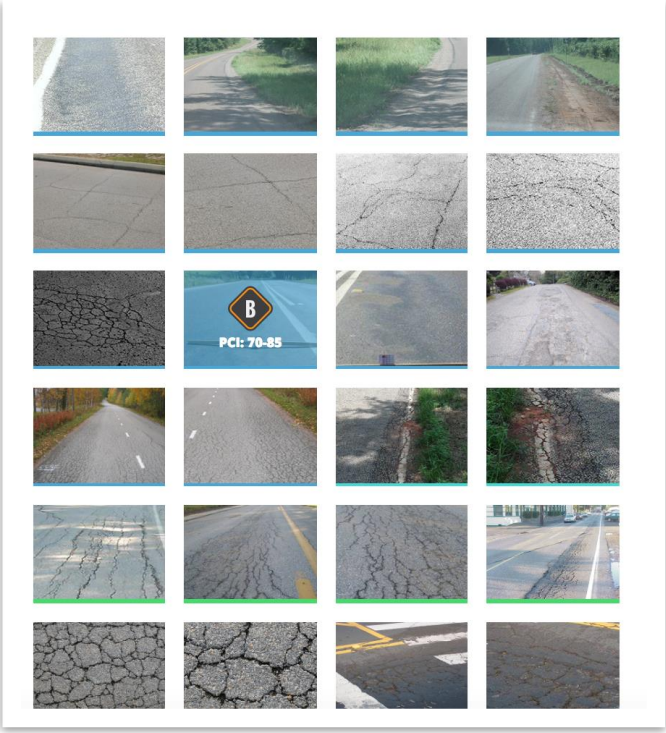
Decision-making tools
Compare treatment costs & environmental impact

Decision-Making Tools

Which treatment is best for my road?

Input pavement criteria or select photos for treatment options





Compare Treatments

My PPRA Account

Input costs and life extension in your area to make the most of the site & tools

Stored Data & Preferences

Units of Measure

Select the display units for site-wide calculators

U.S. DOLLARS | CANADIAN DOLLARS

US STANDARD | METRIC

My Stored Data

Input data relevant to your region. When you are logged in, this data will auto-populate within calculators across the website for more accurate comparisons and tools.

This data will NOT be used or monitored by any associations within PPRA or other third-party sources. The purpose if this dashboard is only to better equip users with more useful and relevant information.

Pre-loaded cost data was gathered from a nationally-aggregated cost survey. Learn More.

Costs for Treatments | Costs for Structural Calculator

Treatment Type	Unit Cost (Per Sq. Yard)	Life Extension	Structural Coefficient
Base Stabilization + 4" HMA	1.0	15.0	0.23
Cape Seal	1.0	10.0	0.0
Chip Seal	2.06	6.0	0.0
Cold Recycling + 1.5" HMA	13.98	15.0	0.34
Cold Recycling + Double Chip Seal	10.36	13.0	0.34
Crack Seal	0.48	2.0	0.0
Fog Seal	11.0	2.0	0.0
Full Depth Reclamation + 4" HMA	28.54	25.0	0.22
Granular Base (New)	0.0	0.0	0.1
HMA	0.0	0.0	0.44
Hot In-Place Recycling +1.5" HMA	11.91	11.0	0.43
Hot In-Place Recycling- 1"+Single Chip Seal	11.91	11.0	0.43
Micro Surfacing- Double Lift	3.92	8.0	0.0
Micro Surfacing- Single Lift	2.77	6.0	0.0
Rejuvenating Fog Seal	0.67	3.0	0.0
Remove Existing Asphalt	0.0	0.0	0.0

NOTE:

Change averaged costs, life extension, and structural numbers relevant to you. Tools throughout the site automatically re-populate with your data every time you log in.

Equivalent Annualized Cost

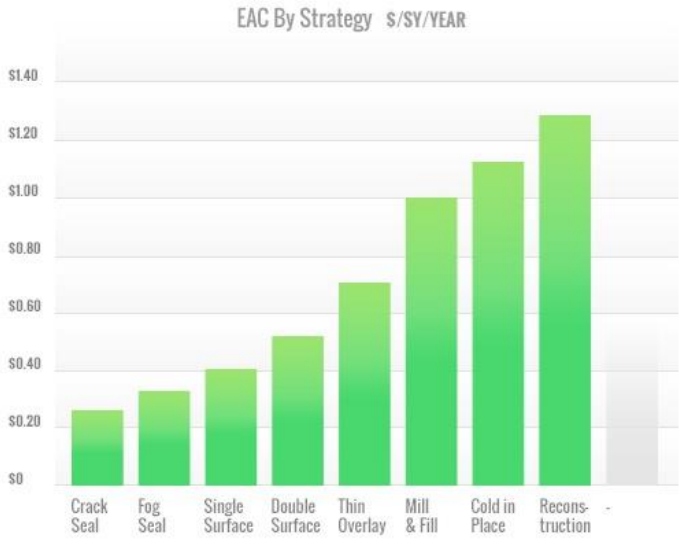
Compare treatment cost based on Life Extension

Use our nationally aggregated data or enter your own data

Treatment Type	Cost Per Sq Yard	Life Extension	EAC $ SY/YEAR
Crack Seal	$0.50	2	$0.25
Fog Seal	$1.00	3	$0.33
Single Surface Tr,	$2.00	5	$0.40
Double Surface Tr.	$4.25	8	$0.53
Thin Overlays	$7.00	10	$0.70
Mill-and-Fill	$12.00	12	$1.00
Cold In Place	$17.00	15	$1.13
Reconstruction	$25.00	20	$1.25
-	-	-	-

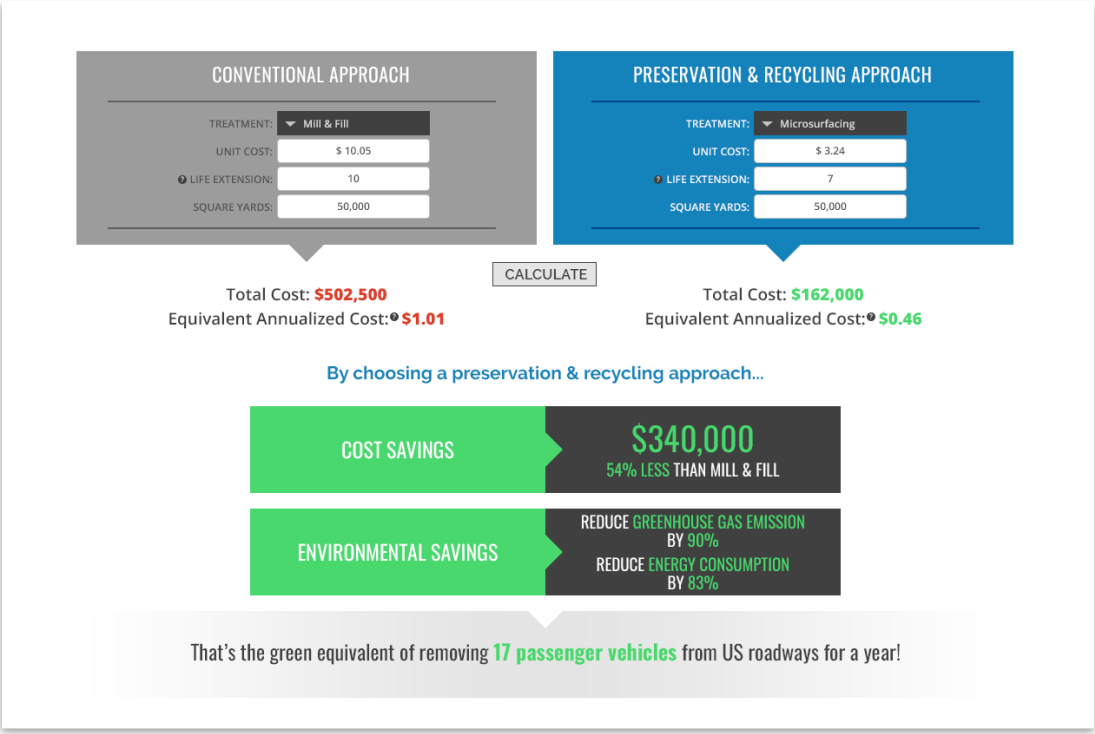
Clear Data / Chart Your Own

CHART IT



Compare Cost & Environmental Impact

Project Cost & Environmental Benefits



South Stony Creek

Situation: 12 Mile Corridor of county primary road all season truck route. Road was neglected, deteriorated beyond reasonable repair, but reactionary maintenance costs forced county to rebuild the road. Generally 7-8” of bituminous surface, over good base & subgrade.

Comparison: 4” CIR and 8”FDR, both topped with single lift HMA

Outcome: County recognized value in added structure and chose FDR.

Structural Comparison

Compare treatment cost based on Life Extension

CIR vs. Mill & Fill

ABOUT | CALCULATOR

Existing Road Condition

Existing Layer Type	Depth (in)	Co-Eff	SN
HMA Wearing Course	2	0.20	0.40
HMA Base Course	4	0.20	0.80
SubBase / Granular Base	8	0.12	0.96

Approximate SN (Structural Number) 2.16

Conventional: Mill & Fill

Many agencies are learning that the use of limited funds toward a "worst first" approach accelerates the decline of their overall network, as miles of good roads go untreated each year.

Layer Type	Depth (in)	Co-Eff	$/SY	SN
3" HMA Mill & Fill	3	0.44	$16.64	1.32
Remaining Asphalt (Existing)	3	0.20	-	0.60

VS.

Optimized: Cold In Place

Consider an Optimized approach, which reallocates funds across more efficient strategies to keep good roads good and help you get ahead of the curve.

Layer Type	Depth (in)	Co-Eff	$/SY	SN
Thin Lift HMA	1	0.44	$6.97	0.44
Cold-In-Place Recycling	3	0.35	$6.70	1.05
Remaining Asphalt	3	0.20	-	0.60

Total Sq. Yards To Be Treated: 100000

Conventional Approach

VS.

Optimized: Recycling First

yd

Layer Type	Depth (in)	Coefficient	Cost/SY	SN
HMA 3"	3.0	0.44	13.94	1.32
Remaining Asphalt (Existing)	2.0	0.2	0.00	0.40
Granular Base (Existing) 6"	6.0	0.1	0.00	0.60
Select...				0.00

ADD ROW

Overall Structural Number: 2.32
100,000 SY x $13.94 /SY = $1,394,000 total

yd

Layer Type	Depth (in)	Coefficient	Cost/SY	SN
Chip Seal	0.0	0.0	2.06	0.00
Cold Recycling 4"	4.0	0.34	7.50	1.36
Remaining Asphalt (Existing)	2.0	0.2	0.00	0.40
Granular Base (New) 6"	6.0	0.1	0.00	0.60

ADD ROW

Overall Structural Number: 2.36
100,000 SY x $9.56 /SY = $956,000 total

By choosing the recycling first approach...

TOTAL OPTIMIZED STRATEGY COST SAVINGS **$438,000**

Conventional Approach

VS.

Optimized: Recycling First

yd

Layer Type	Depth (in)	Coefficient	Cost/SY	SN
Mill & Fill 2"	2.0	0.44	9.60	0.88
Mill & Fill 2"	2.0	0.44	9.60	0.88
Remaining Asphalt (Exist	3.0	0.2	0.00	0.60
Granular Base (Existing)	4.0	0.1	0.00	0.40

ADD ROW

Overall Structural Number: 2.76

161,000 SY x **$19.20** /SY = **$3,091,200** total

yd

Layer Type	Depth (in)	Coefficient	Cost/SY	SN
HMA 2"	2.0	0.44	8.40	0.88
Cold Recycling 4"	4.0	0.32	8.00	1.28
Remaining Asphalt (Exist	3.0	0.2	0.00	0.60
Granular Base (Existing)	4.0	0.1	0.00	0.40
Select...			0.00	0.00

ADD ROW

Overall Structural Number: 3.16

161,000 SY x **$16.40** /SY = **$2,640,400** total

PPRA™ Better roads today. Stronger networks tomorrow.

Conventional Approach

VS.

Optimized: Recycling First

yd

Layer Type	Depth (in)	Coefficient	Cost/SY	SN
Mill & Fill 2"	2.0	0.44	9.60	0.88
Mill & Fill 2"	2.0	0.44	9.60	0.88
Remaining Asphalt (Exist	3.0	0.2	0.00	0.60
Granular Base (Existing)	4.0	0.1	0.00	0.40

ADD ROW

Overall Structural Number: **2.76**

161,000 SY x **$19.20** /SY = **$3,091,200** total

yd

Layer Type	Depth (in)	Coefficient	Cost/SY	SN
HMA 2"	2.0	0.44	8.40	0.88
Full Depth Reclamation E	8.0	0.3	8.80	2.40
Granular Base (Existing)	4.0	0.075	0.00	0.30
Select...			0.00	0.00
Select...			0.00	0.00

ADD ROW

Overall Structural Number: **3.58**

161,000 SY x **$17.20** /SY = **$2,769,200** total

PPRA™
Better roads today. Stronger networks tomorrow.

PPRA™

Better roads today. Stronger networks tomorrow.

How can I ensure treatment success?

Treatment Resource Center

Ensure treatment success with comprehensive information on 18 treatments

FOR PAVEMENT CONDITIONS C-D-F (PCI of less than 70)

A cost-effective, long-lasting, greener alternative to conventional maintenance and rehabilitation techniques. Cold In-place recycling (CIR) is a process that cold mills and recycles the top 2-5 inches of asphalt using a continuous train operation. Through the complete reuse of existing material, CIR greatly reduces trucking, time and natural resources to significantly lower project costs. Generally, any road that is a candidate for mill & fill is a candidate for CIR.

- 20%–50% less expensive than conventional maintenance and reconstruction methods
- Reduce Greenhouse emissions by Up to 90%
- Reuses 100% of existing materials
- 20%–40% faster construction times
- Adds 15–20 years (combined with appropriate wearing course)
- Most agencies use SLCs between 0.30–0.38 (Recent research indicates values from 0.36–0.44 may be more appropriate)

ISSUES ADDRESSED
- Frequent, severe, non-load distresses in top lift of hot mix
- All distresses within the recycling depth (2-5 inches)
- Reflective cracking from below CIR layer
- See all

ATTRIBUTES
- Eliminates defects within the recycling depth
- Blocks or slows reflective cracking
- Reuses existing material in place
- Replaces 1 or 2 lifts of hot mix
- Allows for road widening where desired

COMMON COMBINATIONS

CIR	Optimum Performance	Average Performance	Stop-Gap Performance
Types of Distress	• Transverse, longitudinal, multiple cracking • Ravelling • Oxidation	• Wheelpath cracking • Rutting (asphalt or subgrade)	• Alligator cracking from base failure • Distortion
Depth of Distress	Within treatment depth (2"–5")	1"–3" below treatment depth	More than 4"–6" below treatment depth
Life Extension	20–25 years	10–20 years	5–10 years

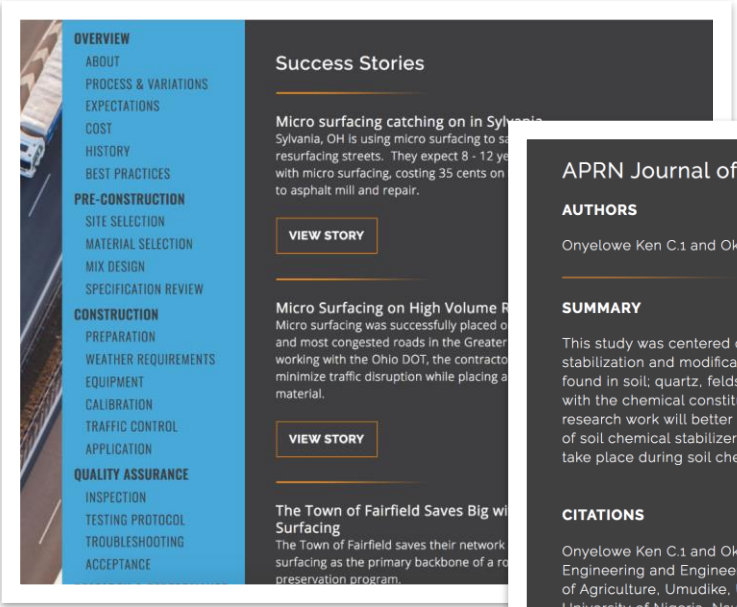
EXAMPLES OF ROADS THAT HAVE BEEN TREATED WITH COLD IN-PLACE RECYCLING OVER VARIOUS STAGES IN SERVICE LIFE:

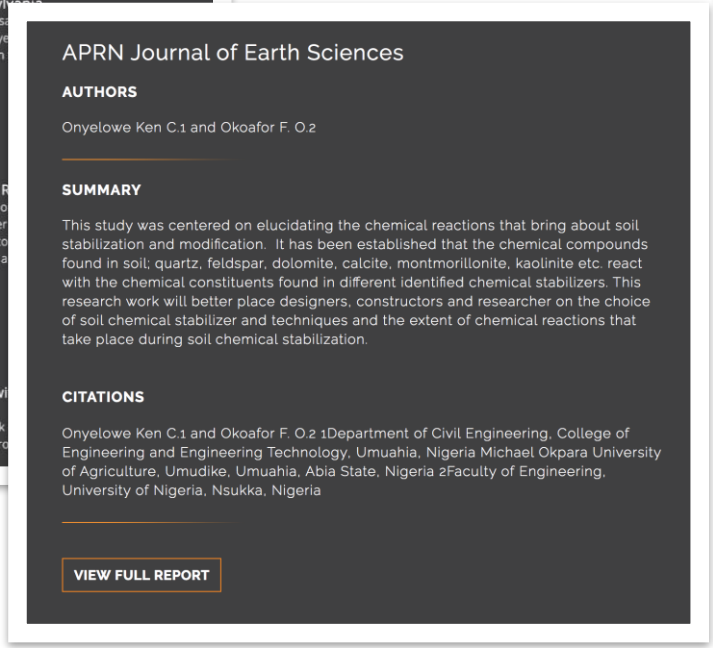
CIR 1 y… | CIR 3 years later: Prescott-Russel County Road, Ontario | CIR 5 years later: Bloomington Road, Ontario | CIR 7 years later: Hwy 6, Ontario

If a CIR mix ravels excessively due to rain, the mat can be re-processed with or without adding cement to facilitate drying

Success Stories & Research

Use, performance & best practices in your region





APRN Journal of Earth Sciences

AUTHORS

Onyelowe Ken C.1 and Okoafor F. O.2

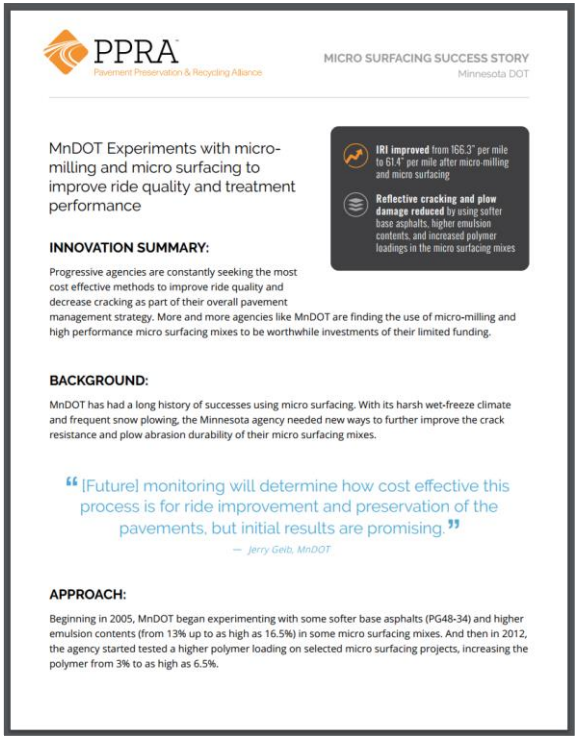
SUMMARY

This study was centered on elucidating the chemical reactions that bring about soil stabilization and modification. It has been established that the chemical compounds found in soil; quartz, feldspar, dolomite, calcite, montmorillonite, kaolinite etc. react with the chemical constituents found in different identified chemical stabilizers. This research work will better place designers, constructors and researcher on the choice of soil chemical stabilizer and techniques and the extent of chemical reactions that take place during soil chemical stabilization.

CITATIONS

Onyelowe Ken C.1 and Okoafor F. O.2 1Department of Civil Engineering, College of Engineering and Engineering Technology, Umuahia, Nigeria Michael Okpara University of Agriculture, Umudike, Umuahia, Abia State, Nigeria 2Faculty of Engineering, University of Nigeria, Nsukka, Nigeria

VIEW FULL REPORT



PPRA
Pavement Preservation & Recycling Alliance

MICRO SURFACING SUCCESS STORY
Minnesota DOT

MnDOT Experiments with micro-milling and micro surfacing to improve ride quality and treatment performance

IRI improved from 166.3" per mile to 61.4" per mile after micro-milling and micro surfacing

Reflective cracking and plow damage reduced by using softer base asphalts, higher emulsion contents, and increased polymer loadings in the micro surfacing mixes

INNOVATION SUMMARY:

Progressive agencies are constantly seeking the most cost effective methods to improve ride quality and decrease cracking as part of their overall pavement management strategy. More and more agencies like MnDOT are finding the use of micro-milling and high performance micro surfacing mixes to be worthwhile investments of their limited funding.

BACKGROUND:

MnDOT has had a long history of successes using micro surfacing. With its harsh wet-freeze climate and frequent snow plowing, the Minnesota agency needed new ways to further improve the crack resistance and plow abrasion durability of their micro surfacing mixes.

"[Future] monitoring will determine how cost effective this process is for ride improvement and preservation of the pavements, but initial results are promising."
— Jerry Geib, MnDOT

APPROACH:

Beginning in 2005, MnDOT began experimenting with some softer base asphalts (PG48-34) and higher emulsion contents (from 13% up to as high as 16.5%) in some micro surfacing mixes. And then in 2012, the agency started tested a higher polymer loading on selected micro surfacing projects, increasing the polymer from 3% to as high as 6.5%.

PPRA™

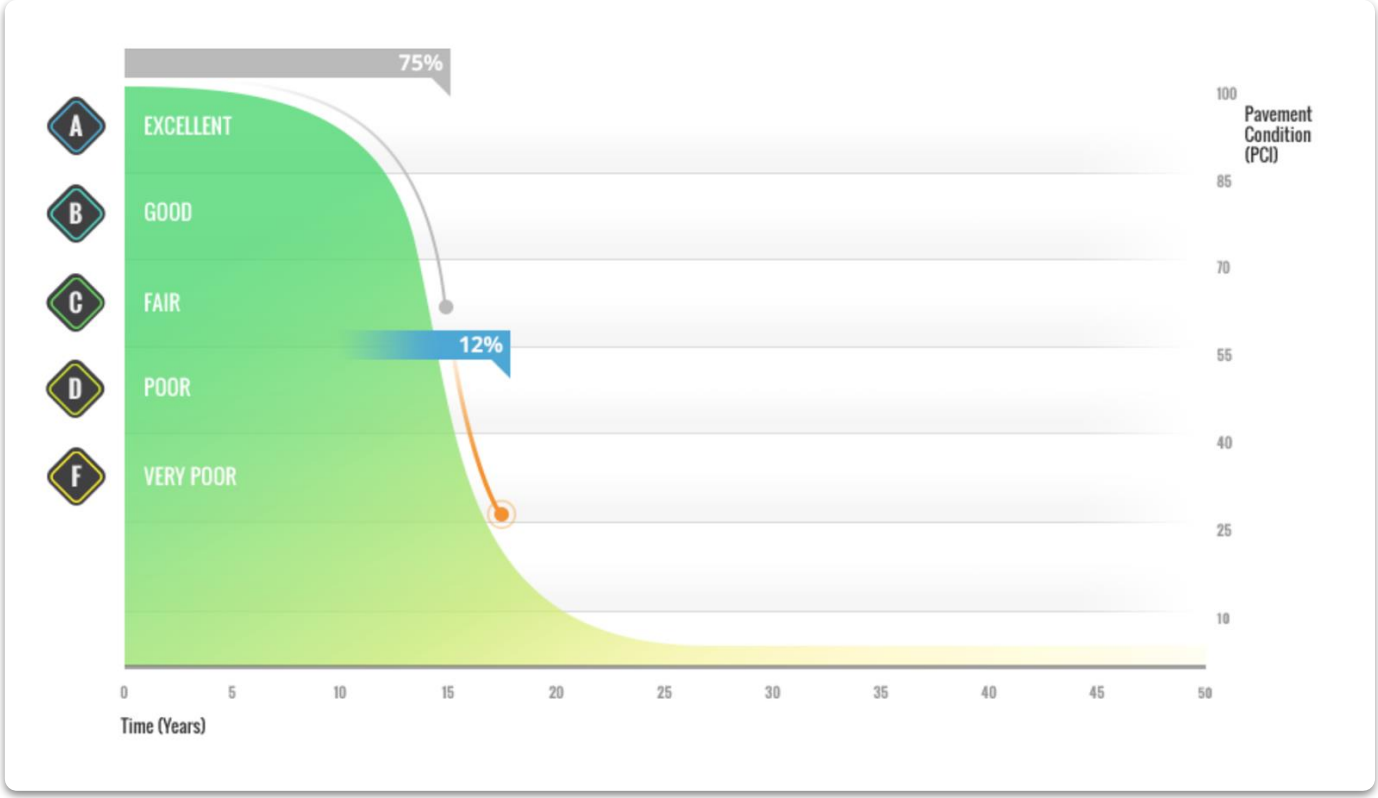
Better roads today. Stronger networks tomorrow.

Plan for 40 years or more

How do savings add up over time?

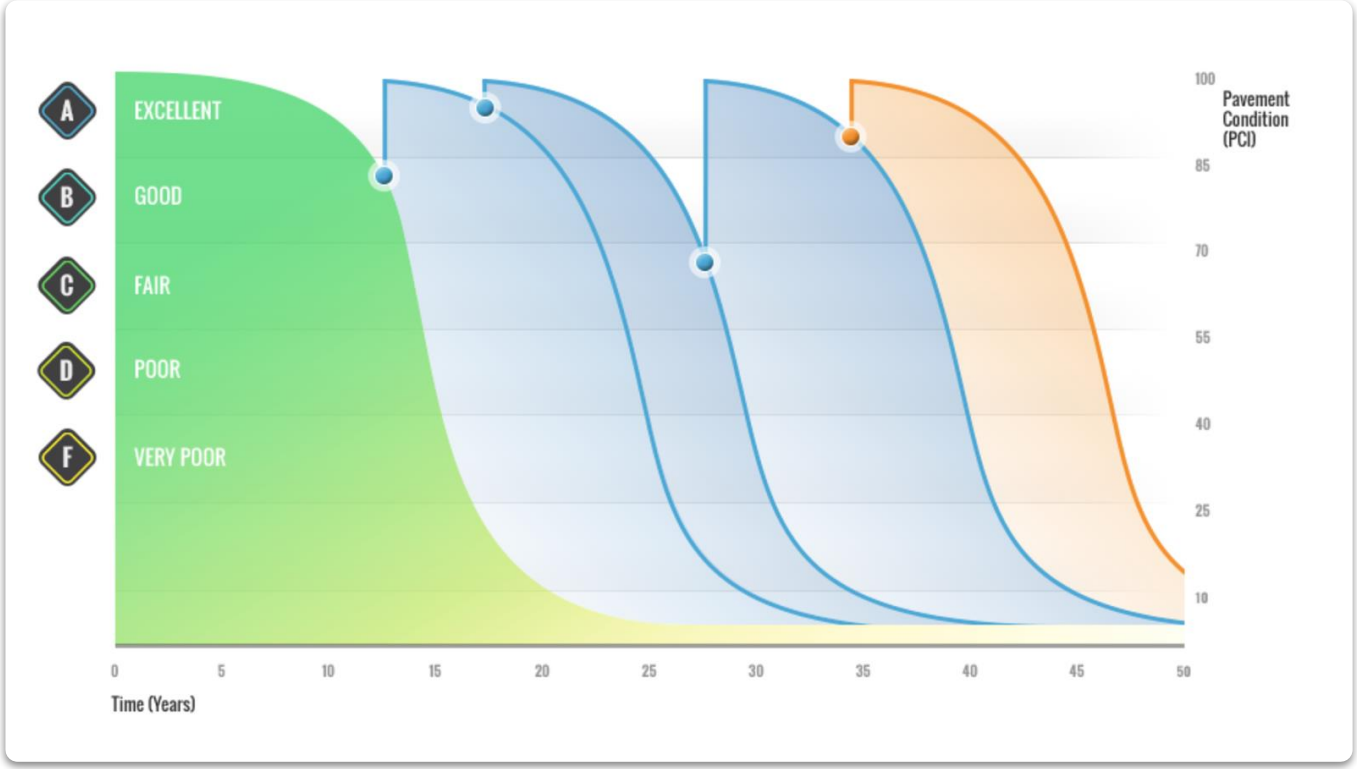
Deterioration Curve

Understanding the life cycle of a road



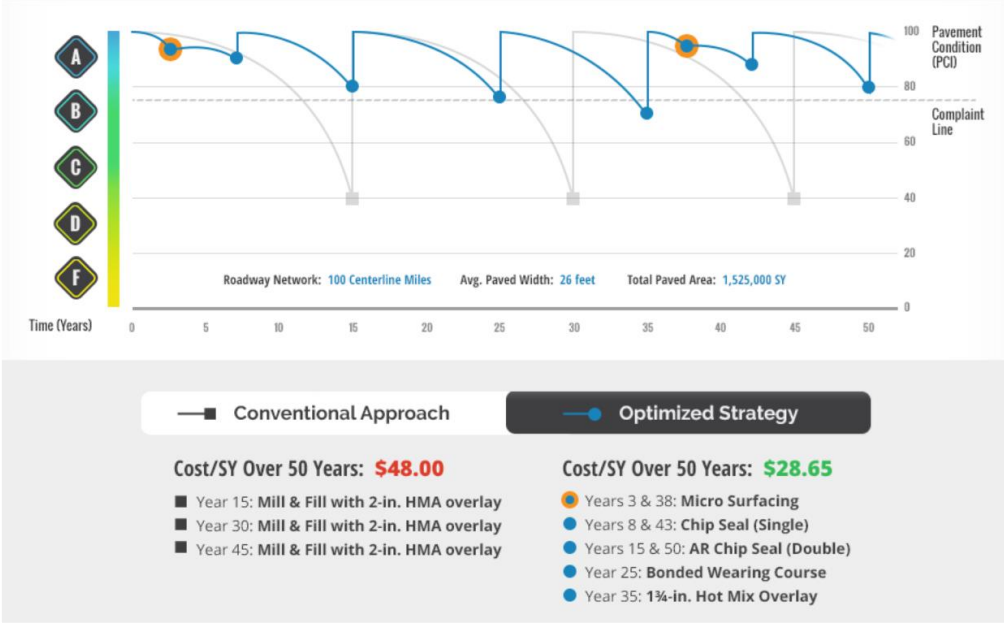
Deterioration Curve

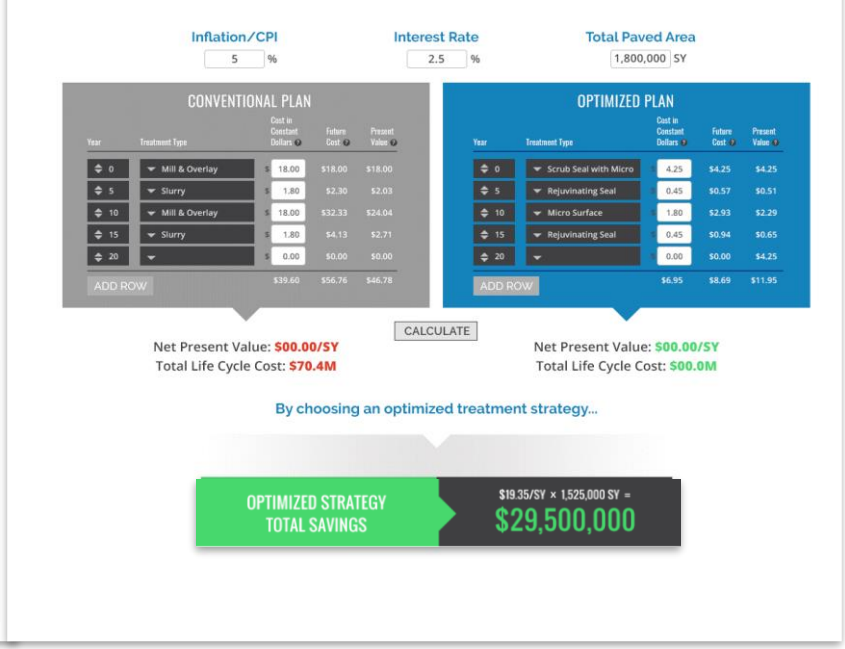
Understanding the life cycle of a road



Life Cycle Cost Calculator

Save big over the life of your pavement with progressive maintenance





PPRA™

Better roads today. Stronger networks tomorrow.

Create a Network Plan & Stretch Resources Further

What is the impact on my network?
How should I prioritize projects?

What is the impact on my network?

Remaining Service Life

How much life is your network gaining or losing each year?

ABOUT | CALCULATOR

Remaining Service Life

Is your network gaining or losing life each year?

Understanding Remaining Service Life (RSL) is critical to designing a treatment plan that stretches your budget further and reverses the trend of a deteriorating network.

Download the FHWA RSL pub IF-07-006

CRITICAL CONCEPT

A 500-mile network loses 500 mile-years of life annually.

Every year, every mile of your network loses 1 mile-year of life. To avoid losing ground, the roadway owner must design a treatment plan that adds 500 mile-years of life or more!

See how this agency reallocated funds to inject more life into their network, using the same budget

RSL Calculator

How to use this Tool

Use the calculator below to explore how different treatment combinations can be varied to inject maximum life into your network and use your resources more wisely. See examples and learn more about remaining service life here.

Total Network Lane-Miles	Average Lane Width (ft)	Total Budget	Remaining Budget
1000	15	$ 5000000	$2,920

yd

Treatment Type	Category	Life Extension	Lane-Miles* Treated	Lane-Mile-Years	Unit Cost	Total Cost
Rejuvenating Fog Seal	Preservation	3.0	25	75	0.67	$147,400
Micro Surfacing- Double Lift	Preservation	8.0	34	272	3.92	$1,172,864
Chip Seal	Preservation	6.0	40	240	2.06	$725,120
Cape Seal	Preservation	10.0	24	240	5.20	$1,098,240
Minor Mill & Fill	Rehabilitation	11.0	2	22	9.80	$172,480
Cold Recycling + 1.5" HMA	Rehabilitation	15.0	4	60	13.98	$492,096
Full Depth Reclamation + 4" HMA	Reconstruction	25	2	50	28.54	$502,304
Full Depth Remove & Replace	Reconstruction	25.0	2	50	39.01	$686,576

ADD ROW

Congratulations

YOU ADDED 1,009 LANE-MILE-YEARS OF LIFE

9 LANE-MILE-YEAR NET GAIN

13% OF ROADS ADDRESSED

How should I prioritize my projects?

Cost-Benefit Value

Which projects will give me the "biggest bang for the buck?"

Cost-Benefit Value

With limited funding, how do I prioritize my projects?

CBV offers roadway managers a way to prioritize projects while accounting for the variables relevant to you and the realities
life extension.

$$CBV = \frac{(\text{Traffic} / \text{Constraint Factor}) \times (\text{Life Extension})}{(\text{Unit Cost}) \times (\text{PCI})}$$

Two road comparison: Which road should I treat first?

ROAD 1	Worst First Reconstruction	AADT: 5000 PCI: 30	$\frac{(5000_{\text{AADT}} / 7_{\text{CF}}) \times (25_{\text{YEARS}})}{(\$39_{\text{PER SY}} \times 30_{\text{PCI}})}$	= 1
ROAD 2	Pavement Preservation Chip Seal	AADT: 5000 PCI: 75	$\frac{(5000_{\text{AADT}} / 7_{\text{CF}}) \times (6_{\text{YEARS}})}{(\$2_{\text{PER SY}} \times 75_{\text{PCI}})}$	= 29 CBV

CRITICAL CONCEPT

For Equal Traffic, Preservation Has A Higher Benefit.

Total Network Lane-Miles: 500

AADT Constraint: 7

Total Budget: $ 2500000

yd

Road Name	Segment From / To	PCI	AADT	Length (ft)	Width (ft)	Treatment	Life Extension	Unit Cost	Segment Cost	Cumulative Cost	CBV
Midway road	Oakland to Folsom	86	8500	26400	15	Rejuvenating Fog Sea	3.0	0.67	$29,480	$29,480	63.22
Thorn Ave.	Oak to Rowland	84	5500	105600	15	Crack Seal	2.0	0.48	$84,480	$113,960	38.97
Beach Street	Baxter to Clayton	64	7500	36850	15	Cape Seal	10.0	5.20	$319,367	$433,327	32.19
Adams Street	First to 17th	72	6500	47520	15	Micro Surfacing- Dou	8.0	3.92	$310,464	$743,791	26.32
Williams Ave.	Clayton to Market	68	3500	42680	15	Chip Seal	6.0	2.06	$146,535	$890,325	21.42
Arthur Ave.	Condor to Southw	43	7000	32650	15	Full Depth Reclamati	25.0	28.54	$1,553,052	$2,443,377	20.37
Canal Street	Cherry to Park	62	3000	7920	15	Minor Mill & Fill	11.0	9.80	$129,360	$2,572,737	7.76
South Road	Redding to Shenar	47	1500	16500	15	Full Depth Remove &	25.0	39.01	$1,072,775	$3,645,512	2.92
						Select...			$0	$3,645,512	0.00

Budget Line

ADD ROW

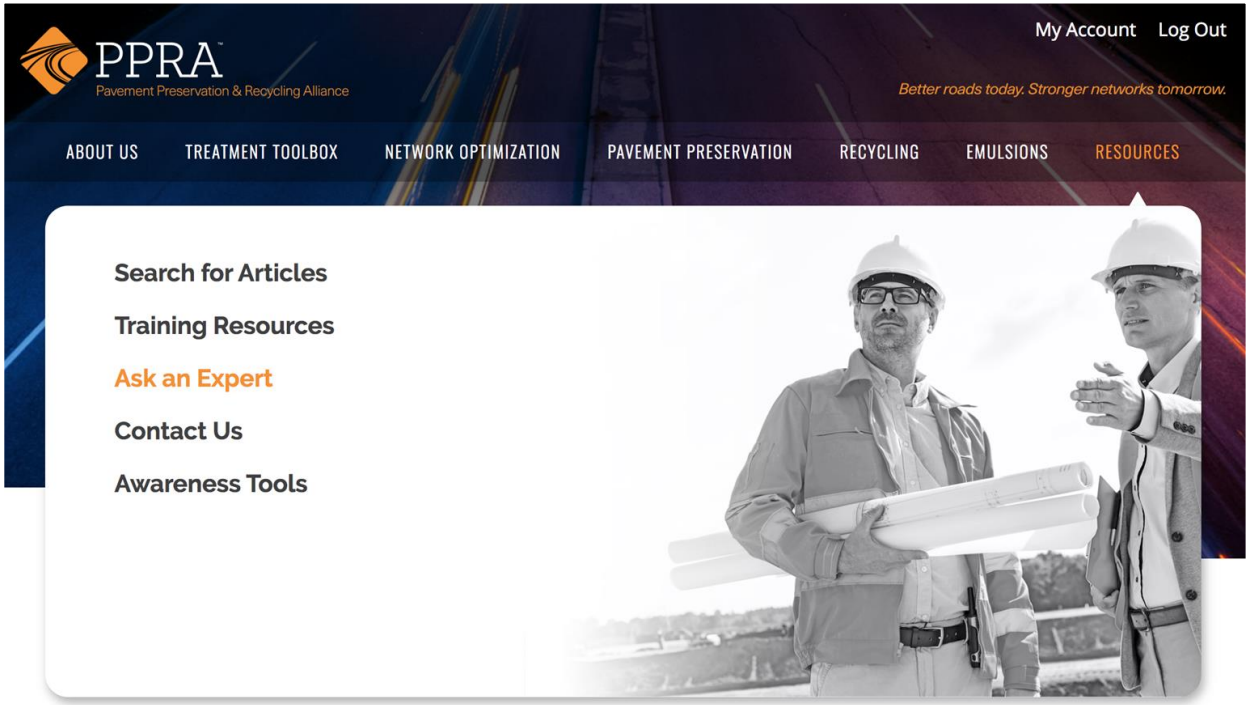
PPRA™

Better roads today. Stronger networks tomorrow.

Additional Resources

AEMA, ISSA, ARRA members
Ahead of the Curve - PPRA Newsletter
Social Channels

AEMA, ARRA, ISSA members



PPRA
Better roads today. Stronger networks tomorrow.

Subscribe to *Ahead of the Curve*

Stay up-to-date with the latest in industry news, innovation and research

Sign Up for the PPRA Industry News E-Blast

Get the latest in industry trends, research, success stories, and technical updates in a succinct e-newsletter.

Email

SUBMIT

PPRA™
Better roads today. Stronger networks tomorrow.

Like and Follow PPRA on Social Media

PPRA™
Better roads today. Stronger networks tomorrow.

Questions?

RoadResource.org

AEMA ASPHALT EMULSION MANUFACTURERS ASSOCIATION | ISSA PRESERVING PAVEMENT | ARRA Responsible Renewal. Reliable Results.