Preventive Maintenance Project & Treatment Selection

19th Annual TERRA Pavement Conference

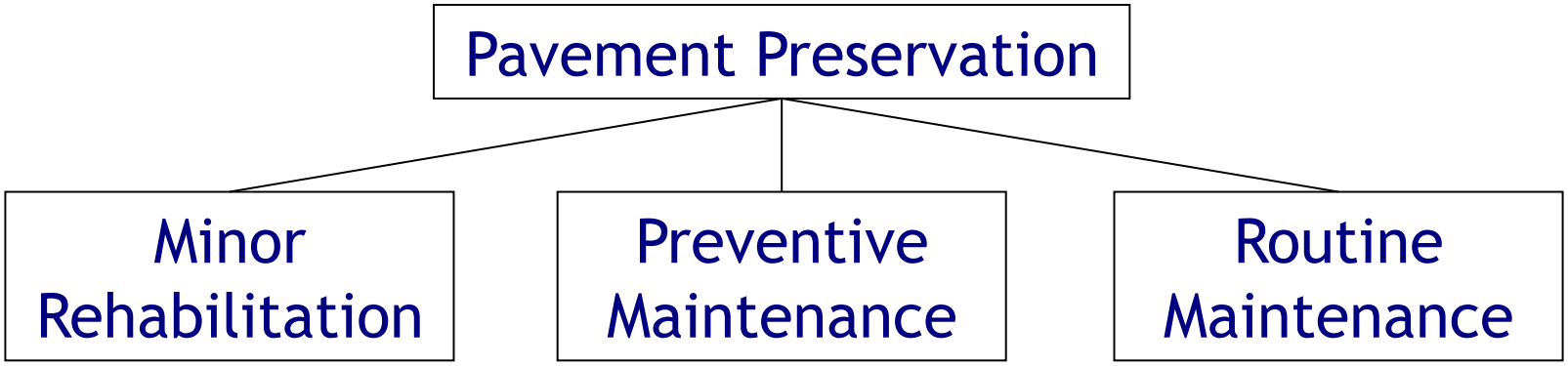
February 12, 2015, St. Paul, MN

Mark Watson, MnDOT Maintenance

Outline

- Introduction
- Network Level
- Project Level
- Summary

Definitions



Pavement Preservation (PP) is a network level, long term program to enhance pavement performance: extend life, improve safety and meet motorist expectations

Preventive Maintenance (PM) treatments are surficial & applied to structurally sound pavements in good condition

Right x (Treatment + Road + Time) => Keep good roads good

Preventive Maintenance

- Surface Treatments
  - Thin (2”) Hot Mixed Asphalt Overlays
  - Ultra-Thin (5/8”) Bonded Wear Course
  - Micro-Surface (3/8” to ½”)
  - Chip Seal (3/8”)
  - Fog Sealing + Sand (Shoulder Only)
- Localized Treatments
  - Crack Sealing
  - Mastic
- Concrete Pavement Repair
- Bridge

MicroSurface + Mastic

Chip Seal + Fog Seal

UTBWC

MnDOT Metro Maintenance

- Bridge & Road Construction ("BARC") – Not PM
  - ~$1.2M Pavement
  - ~$350k Materials "In-House" Maintenance
- Preventive Maintenance (PM) $4.5 - $5.0M
  - Dist. Set-Aside (Programmed $ not Projs.)
  - Contract Work
  - Supportive Materials Engineer
  - PM Program for 14+ Years

Why do PM?

Cumulative effect of systematic, successive PM treatments is to postpone costly rehabilitation and reconstruction

Less Traffic Impact

Greater user Satisfaction

Safer

How do they work?

Sealing helps protect against:

- Ultraviolet Radiation => Aging, more brittle, raveling

- Moisture/Water infiltration => moisture damage, potholes, base deterioration

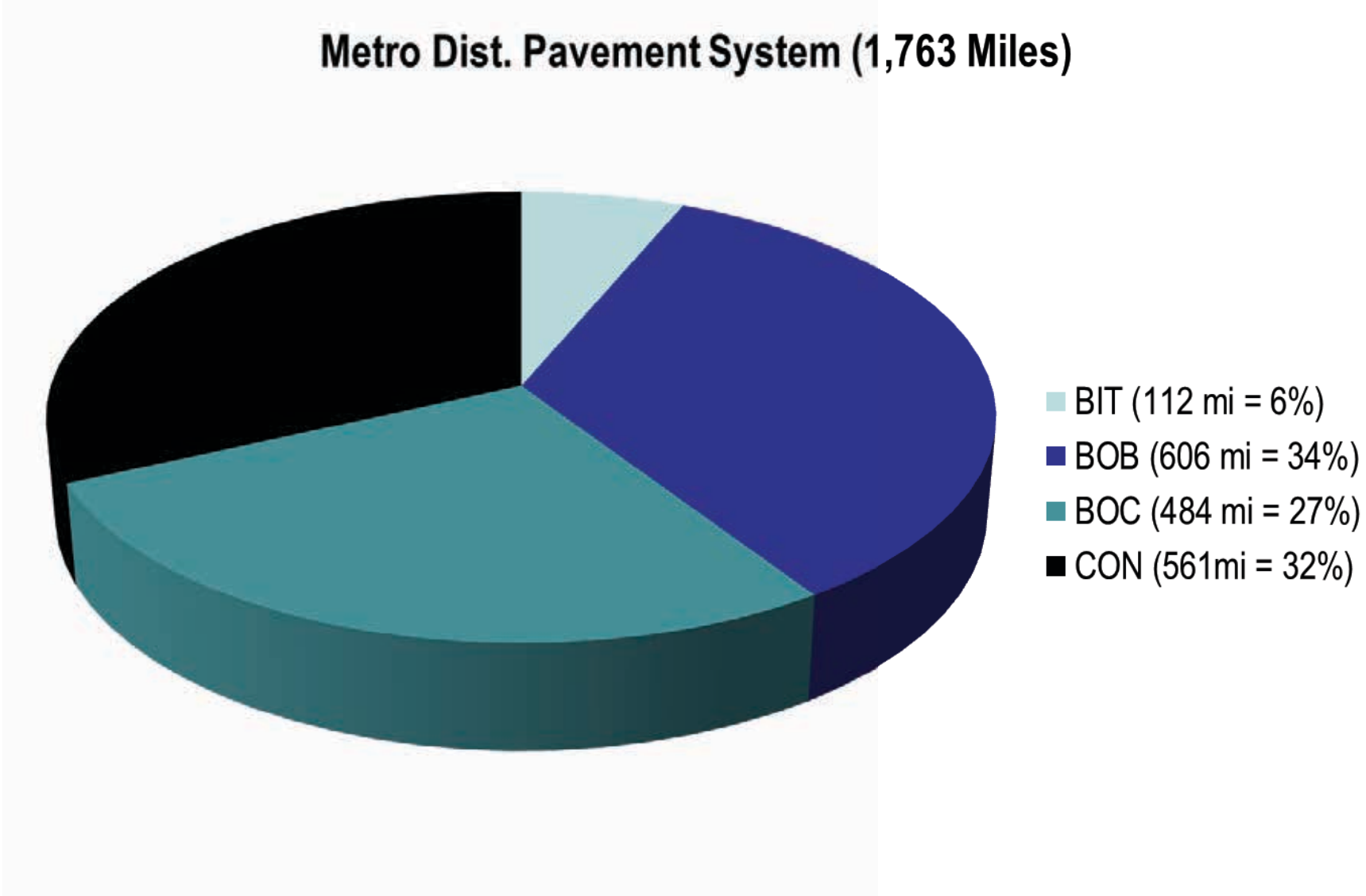
Protect Surface

Keep Water Out

Planning


TH 494
TH 47
TH 100
TH 62
TH 7
TH 35E
TH 13
TH 694
TH 65
TH 169
TH 36
TH 5
TH 35W
TH 55
TH 41
TH 61
TH 252

Metro District System



Data Collection

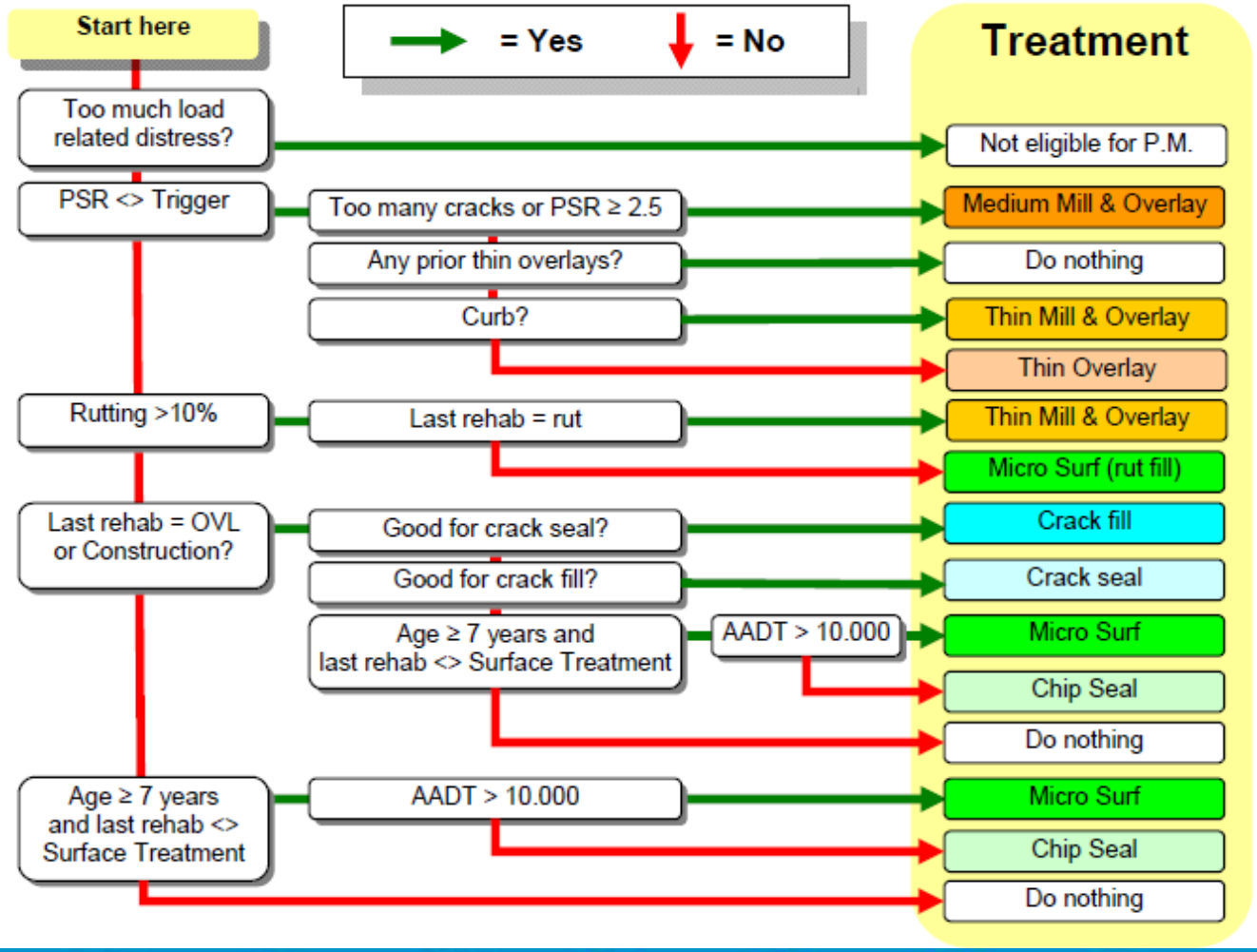
Van driven on all State owned highways, in both directions, every year.

Front lasers measure pavement profile => Roughness.

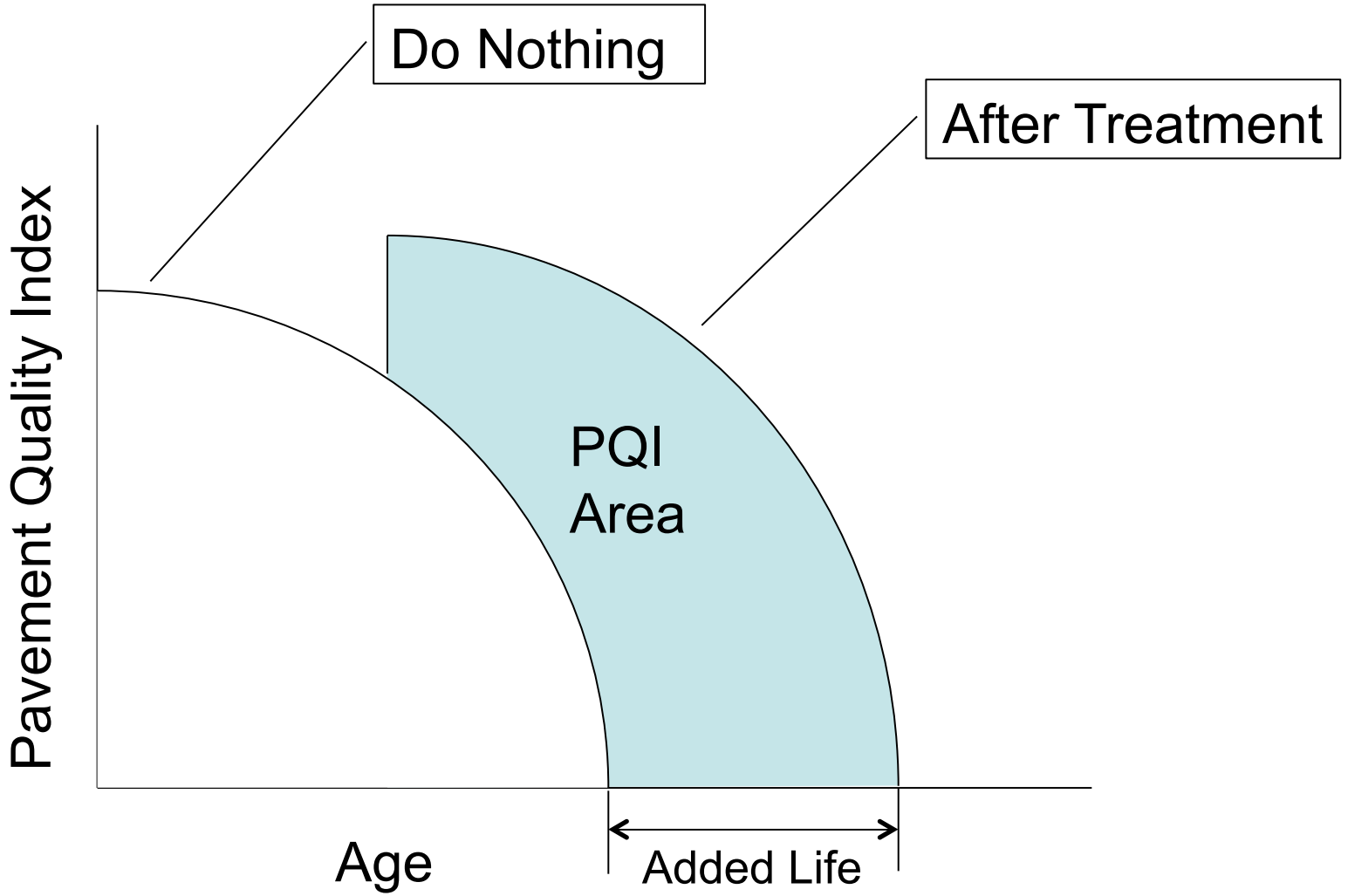
3D cameras & lasers are used for completing distress surveys

Network Level

Decision Trees: What to do and When



Determining Effectiveness



Cost Effectiveness

Network Optimization (When Needs > $)

"Marginal Cost Effectiveness technique chooses the combination of projects that give the highest total cost-effectiveness for the network for a budget &/or target => better overall system for the dollars"

$$MCE = \frac{(E_S - E_r)}{(C_S - C_r)}$$

E_S = Effectiveness of Selected
E_R = Effectiveness of Comparison
C_S = Cost of Selected
C_R = Cost of Comparison

Network Level Output

ROUTE TYPE	ROUTE NUM	AUX	DIR	BEGIN_MILE	END_MILE	BEGIN_REFP	END_REFP	BEGIN_DESC	END_DESC	LANE_MI	PAVE TYPE	IMP YEAR	ALT_NAME	COST_EFF
IS	35	E	D	93.21	98.272	93+0.182	98+0.169	.5 MI N TH-77	.2 MI S LONE OAK RD	15.186	CD	2014	Min CPR/PI	0.597
IS	35	E	I	127.008	127.608	126+0.820	127+0.420	.6 MI S I35E/35W	N JCT ISTH-35;N JCT ISTH	1.2	BOC	2014	Crack Seal	1.144
IS	35		I	127.497	130.034	128-0.580	129+0.955	N JCT I-35E & I-35W	ANOKA-WASHINGTON CO LN	7.611	BOC	2014	Crack Seal	1.646
IS	494		I	11.746	12.065	11+0.744	12+0.056	.1 MI W FLYING CLD DR	.08 MI W OF W TH-5 BR	0.957	CD	2014	Plane	0.154
IS	494		D	65.037	68.244	65+0.018	68+0.133	100' W RAMP TO 5TH AVE	PIEPER RD BR (RD2)	9.621	BOB	2014	Micro-Surf	0.325
IS	694		D	45.168	45.362	45+0.195	45+0.389	.1 MI E OF TH-49 (RD 2)	.3 MI E OF TH-49 (RD 2)	0.388	BOB	2014	Thin OL	0.267
IS	694		I	45.168	45.399	45+0.195	45+0.426	.1 MI E TH-49 (RD1)	.3 MI E TH-49 (RD1)	0.693	BOB	2014	Thin OL	0.207
MN	13		U	81.839	84.327	80+0.648	83+0.136	.3 MI S TH-282	.09 MI E 176TH ST	4.976	BOB	2014	Chip Seal	0.179
MN	55		D	180.293	180.586	180+0.296	180+0.589	FERNBROOK	.09 MI E E END BR OVR 49	0.586	BOB	2014	Thin OL	0.174
MN	55		I	180.293	180.654	180+0.296	180+0.657	FERNBROOK	.05 MI E E END BR OVR 49	0.722	BOB	2014	Thin OL	0.183
MN	55		I	184.676	186.106	184+0.665	186+0.128	.09 MI E GEN MILLS BLVD	250 FT E DOUGLAS DR.	2.86	BOB	2014	Thin OL	0.205
MN	55		D	203.109	204.288	202+0.871	204+0.050	.2 MI E STH-149	.1 MI E CR-63	2.358	BOC	2014	Micro-Surf	0.213
MN	65		I	0	0.677	0+0.000	0+0.677	I-35W, S 26TH ST	JCT I-94	2.031	BOC	2014	Crack Fill	2.955
MN	316		U	4.711	5.471	4+0.706	5+0.462	.1 MI N PINE RIDGE RD	190TH ST X-ING	1.52	BOB	2014	Chip Seal	0.176
US	12		I	154.783	155.586	154+0.941	155+0.708	.016 MI E CS-101 BR	.13 MI E OF WB EXIT CS-1	2.409	BOC	2014	Crack Fill	1.923
US	52		D	125.996	129.619	125+0.658	129+0.281	N RAMPS I-494	.1MI N OF N END CONCORD	7.246	BOC	2014	Micro-Surf	0.268
US	52		I	129.619	130.682	129+0.281	130+0.344	.1MI N OF N END CONCORD	S END LAF BR OV MISS RV	2.126	CD	2014	Min CPR/PI	0.519
US	61		D	118.39	119.032	118+0.643	119+0.297	.25 MI N N CL HASTINGS	.2 MI N TH-10	1.284	BOB	2014	Micro-Surf	0.086
US	61		D	140.159	141.214	140+0.372	141+0.438	.2 MI S ROSELAWN	RAMP TO EB-36	2.11	BOC	2014	Crack Seal	0.875
US	212		I	156.831	157.55	157+0.274	158+0.119	JCT TH-5	.4 MI E MITCHELL BR	2.876	CD	2014	Plane	0.321
US	212		D	157.55	158.574	158+0.119	159+0.269	.4 MI E MITCHELL BR	.1 MI E I-494	4.096	CD	2014	Plane	0.27
IS	35	E	I	93.21	98.361	93+0.182	98+0.258	.5 MI N TH-77	.2 MI S LONE OAK RD	15.453	CD	2015	Min CPR/PI	0.507
MN	55		I	203.109	204.288	202+0.871	204+0.050	.2 MI E STH-149	.1 MI E CR-63	2.358	BOC	2015	Micro-Surf	0.138
MN	65		D	20.031	28.781	18+0.178	26+0.923	.32 MI S 229TH AVE	.01 MI N 217TH AV NE RT	17.5	BOB	2015	Micro-Surf	0.399
MN	120		D	2.114	2.673	2-0.011	2+0.548	500 FT N RIDGE DRIVE	25 FT N 4TH ST /OAKDALE	1.118	BOB	2015	Crack Seal	0.907
MN	120		I	2.114	2.673	2-0.011	2+0.548	500 FT N RIDGE DRIVE	25 FT N 4TH ST /OAKDALE	1.118	BOB	2015	Crack Seal	0.907
MN	610		I	9.484	10.064	9+0.484	10+0.064	.3 MI W BRAUN BR	N END BR OVER MISSISSIPP	1.16	BOB	2015	Thin OL	0.126
US	12		D	154.783	155.586	154+0.941	155+0.708	.016 MI E CS-101 BR	.13 MI E OF WB EXIT CS-1	2.409	BOC	2015	Micro-Surf	0.162
IS	35		D	127.497	130.034	128-0.580	129+0.955	N JCT I-35E & I-35W	ANOKA-WASHINGTON CO LN	7.611	BOC	2016	Micro-Surf	0.324
MN	13		D	89.955	91.857	88+0.773	90+0.665	JCT CONNELLY PKWY	0.1 MI S LEG-OLD MN101	3.804	BOB	2016	Micro-Surf	0.113
MN	62		D	104.753	107.369	104+0.753	107+0.369	SHADY OAK RD (CSAH 61)	TRACY AVE BR	5.232	BOC	2016	Micro-Surf	0.249
MN	95		U	104.801	109.827	104+1.397	110+0.360	S JCT TH-36	.7 MI N I-94	10.052	BOB	2016	Micro-Surf	0.109
MN	100		D	7.183	8.322	7+0.172	8+0.318	N END CEDAR LK BR	UNDER GLENWOOD BR	3.417	BOB	2016	Thin M&OL	0.177
MN	36		D	17.101	18.47	17+0.051	202+0.120	.3 MI E CR-15/MANNING	.2 MI E WASHINGTON	2.738	BAB	2017	Thin OL	0.106

Project Level

"Engineering Judgment"

- Metro "Drive Around"
  - Appearance: ravelling, cracking, overall condition, potholes/patching, rutting, shoulders, ramps, frontage roads
  - Pavement Age & time since last treatment
  - Scheduled next treatment "Rehabs" – are scoped 5 years out, planned 5-10 years out
- Feedback from Maintenance Supervisors
  - Performance over spring-thaw, patching, problem areas

Project Level

"Engineering Judgment"

- Striping
  - Time since last application, scheduled next application
  - Bike Lanes, other users?
- ADA Compliance
  - Microsurfacing meets threshold
  - Do curb ramps need updating? Which Proj.?
- Traffic
  - Minimal Impacts, local projs., detours, etc.?
  - Higher Traffic => less chip seals in metro*

TH 52

- Selected by Network Level Analysis
- Next treatment 2023? Last 2007/2005
- Good Ride – No milling needed
- No ADA upgrade work needed
- Due for restriping
- Pavement: cracking (sealed), min patching, rutting
- Shoulders in fair condition, weathered
- No conflicting work on other projects/ routes

TH 52

- Microsurface (two coat system) for ML & Fog Seal + Sand for Shoulders
- Filled in ruts, sealed surface
- Restored functional characteristics: friction, appearance
- Coincided with restriping
- Quick, Economical method to preserve roadway

Striping

Two Coat System Creates Recessed Area

- Before Recessing: 40-90% Loss
- After Recessing: 80-90% Retained

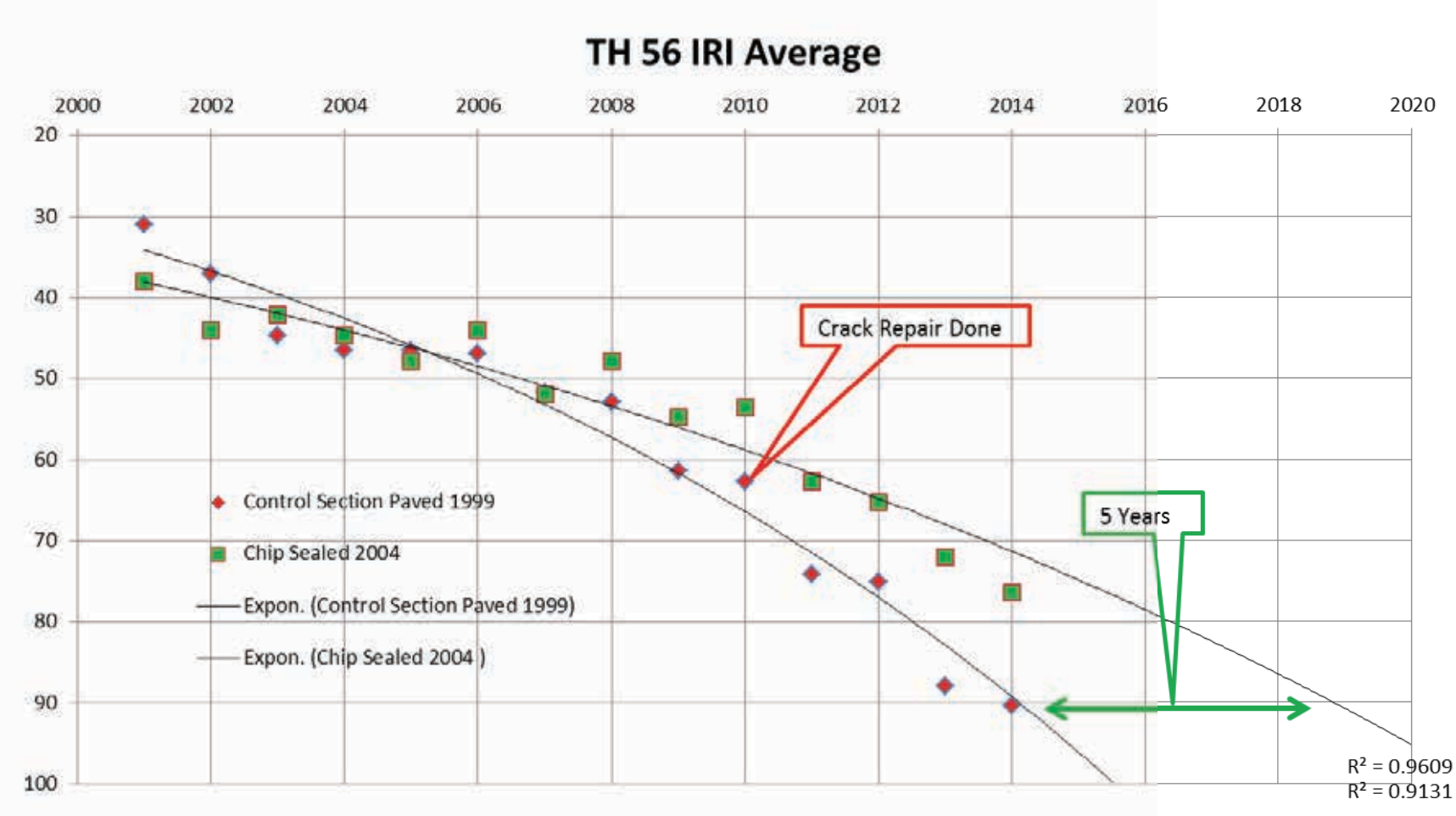
Striping Test Deck Installed to Improve Performance

Summary

- MnDOT has 14+ years experience of coordinated pavement preservation efforts
- Preventive Maintenance is Programed, long term, and recurring
- Projects are selected based on network & roadway attributes
- Coordination with other functional groups is important
- Preventive Maintenance has yielded substantial benefits & Agency has wide support
- Potential to Add PM treatment as part of Initial Construction Contract

Thank You!

Mark Watson
mark.watson@state.mn.us
(651) 234-7943



Cumulative effect of systematic, successive PM treatments is to postpone costly rehabilitation and reconstruction