Examples of Decision Support Using Pavement Management Data

John Coplantz, PE

Pavement Management Engineer

Oregon Department of Transportation

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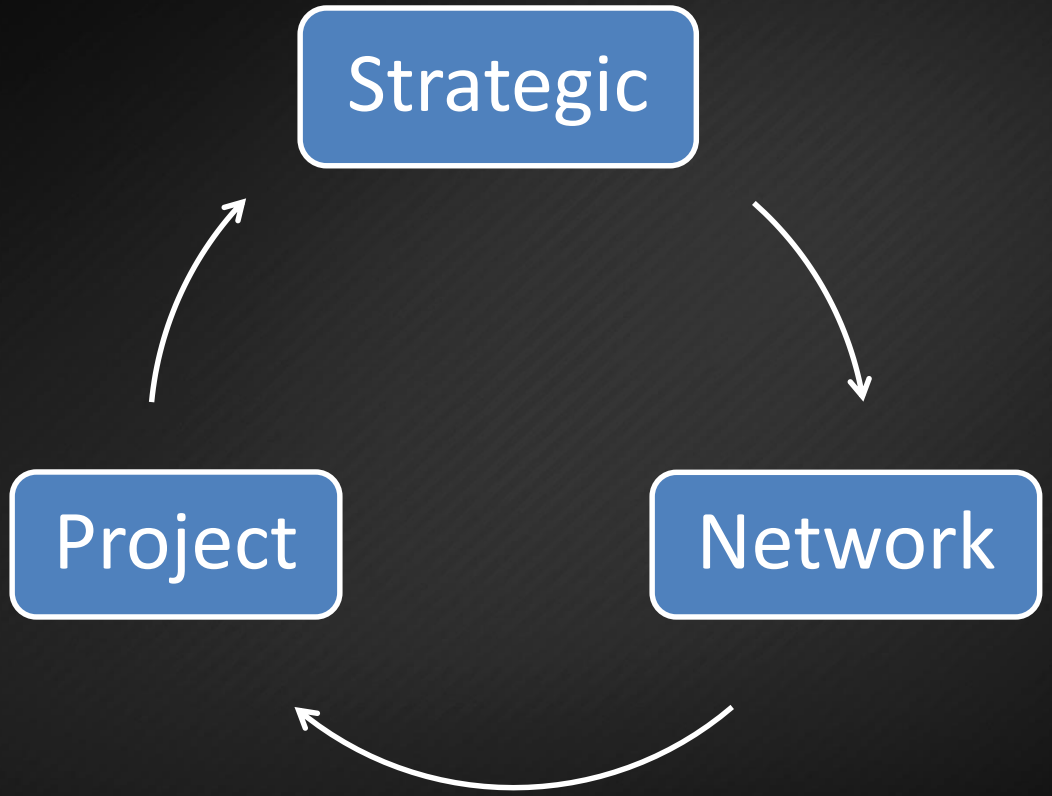
Decision Levels*

- Strategic
- Network (Tactical)
- Project (Operational)

*Pavement Management Guide, 2nd Ed.
AASHTO, 2012

Level	Audience	Types of Decisions	Apply to	Detail
Strategic	Politicians Commission Agency Heads	Perf. Meas./Targets Funding Impacts Pavement Strategy	Entire Network	Low
Network	Engr. Mgrs. District Mgrs. Planning Asset Mgrs.	Funding Allocations Pavement Workplan Project Selection Initial Scoping	Entire Network or Subset	Mod.
Project	Project and Maintenance staff	Scope refinement Thickness design Materials selection	Project or corridor	High


Strategic
Network
Project

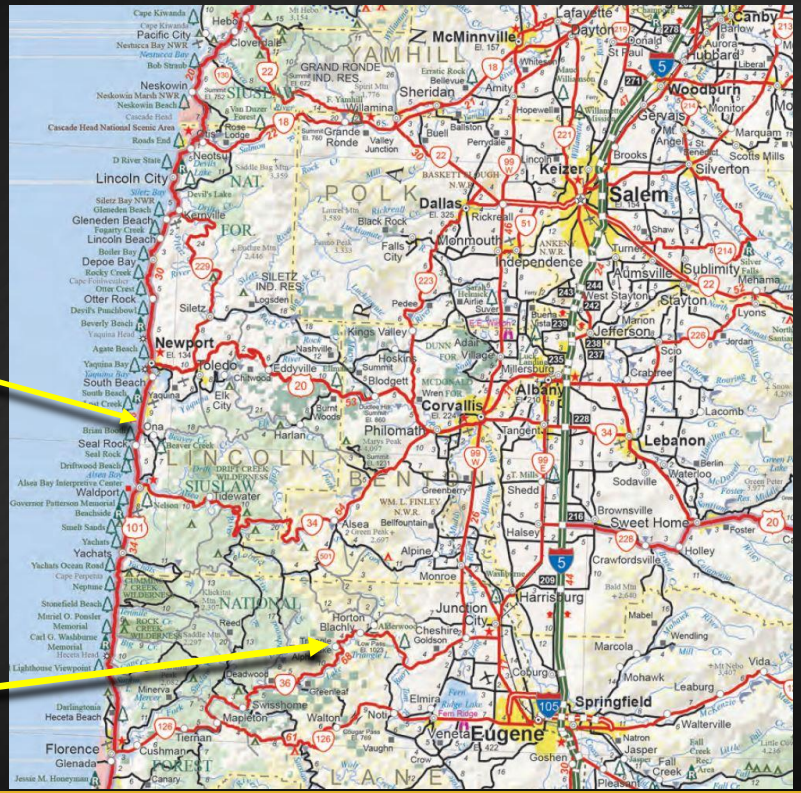
STRATEGIC LEVEL

- What is the condition of our roads?

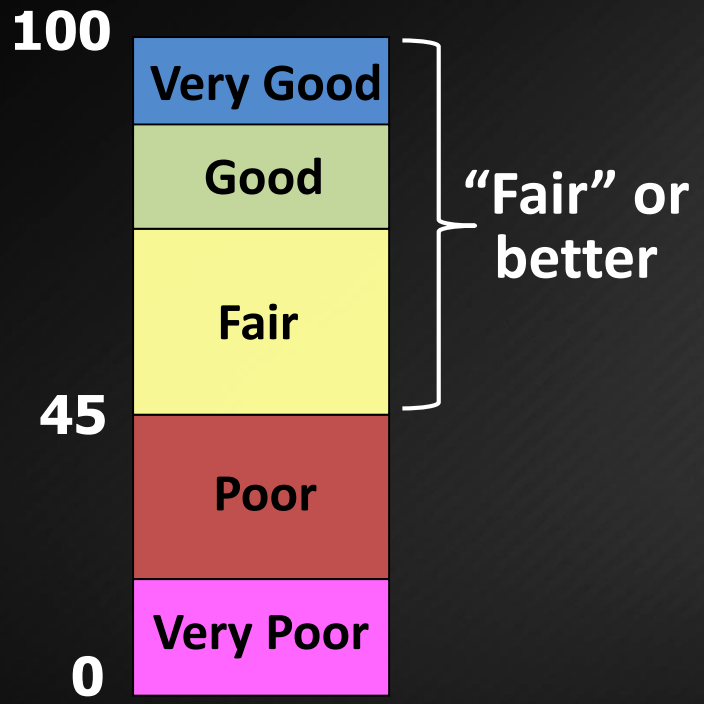
Measuring Pavement Conditions

AUTOMATED

WINDSHIELD



Pavement Rating

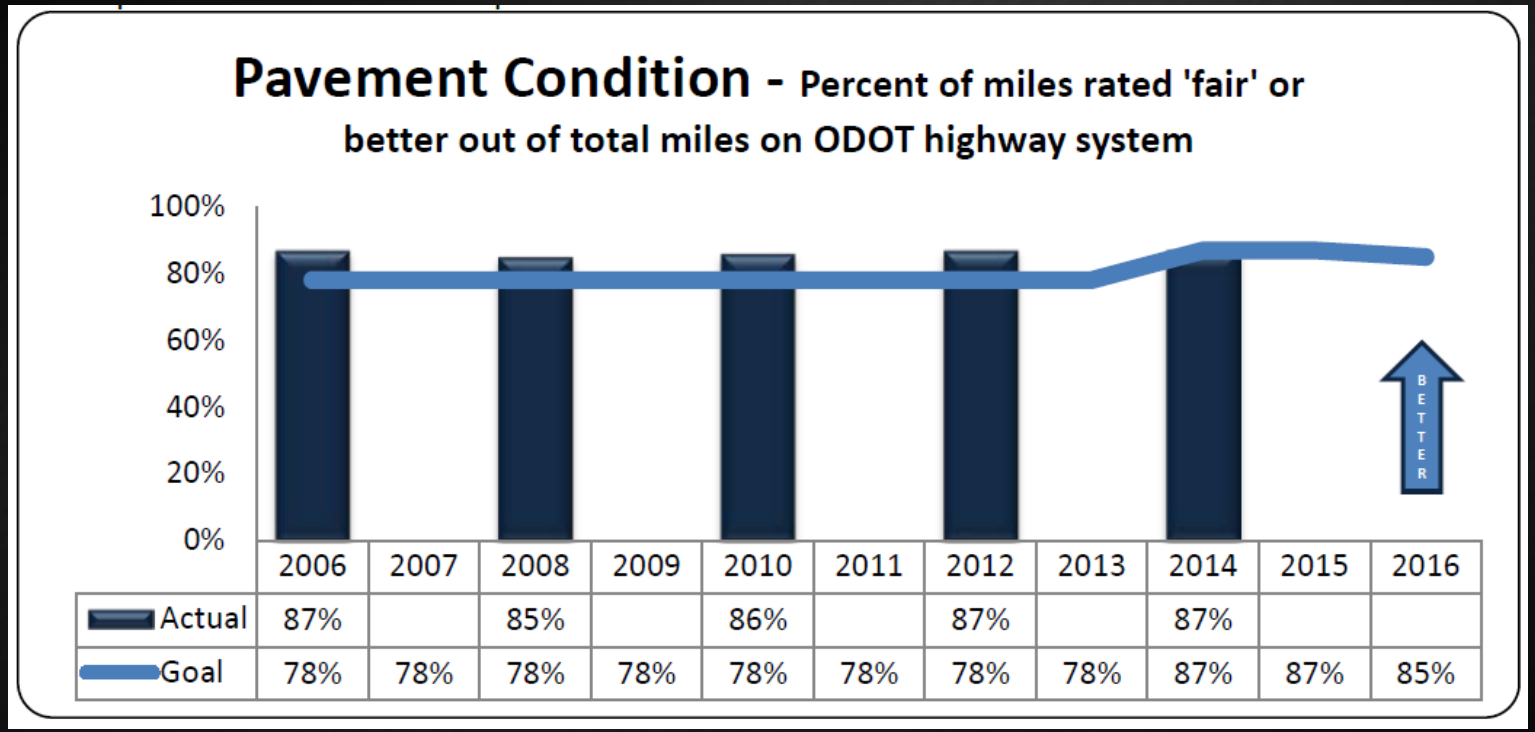


- 100% Survey
- Score each PMS section
- Sum miles in each category
- Calculate % Fair-or-better mileage

STRATEGIC LEVEL

- What is the condition of our roads?
- Are they getting better or worse?

Performance Measures and Targets

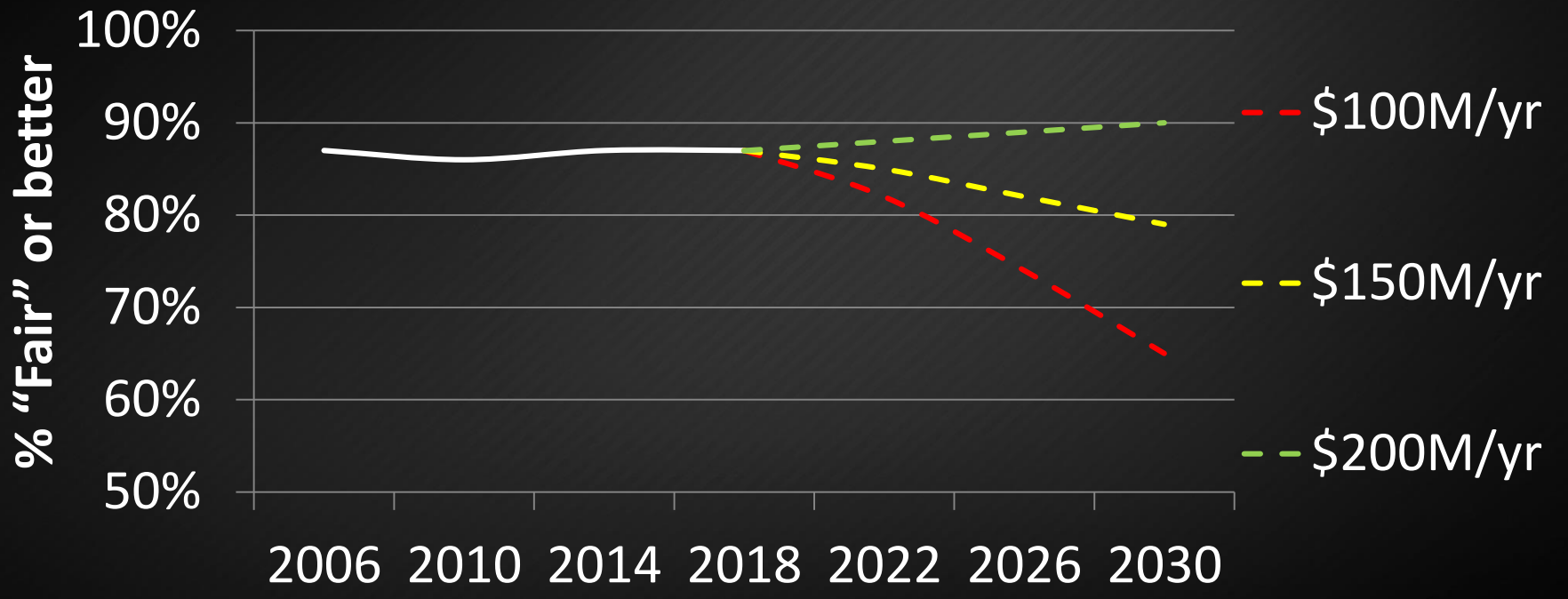


	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Actual	87%		85%		86%		87%		87%		
Goal	78%	78%	78%	78%	78%	78%	78%	78%	87%	87%	85%

STRATEGIC LEVEL

- What is the condition of our roads?
- Are they getting better or worse?
- How much money should we allocate to our pavement programs?

Funding Impacts

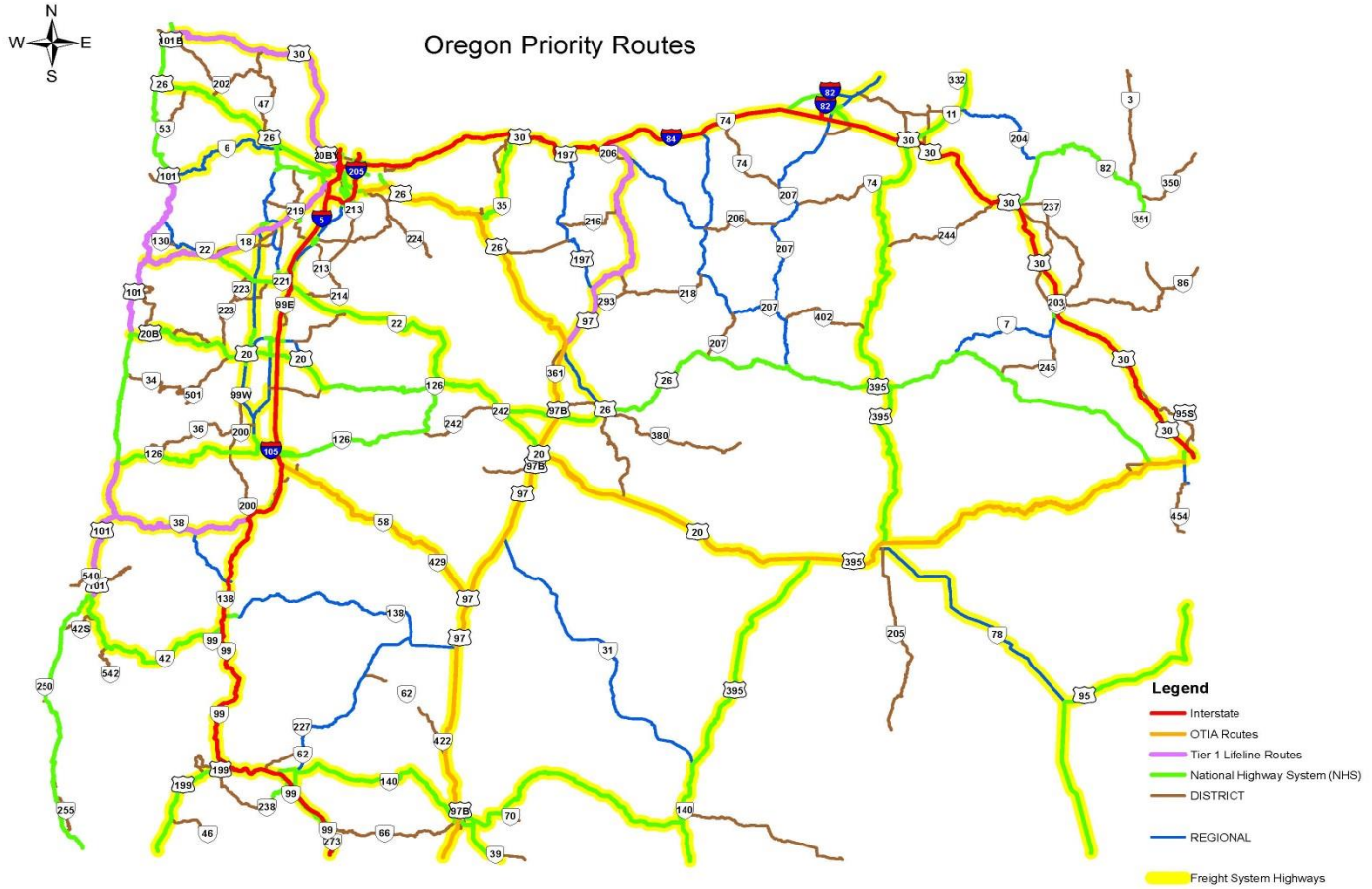


STRATEGIC LEVEL

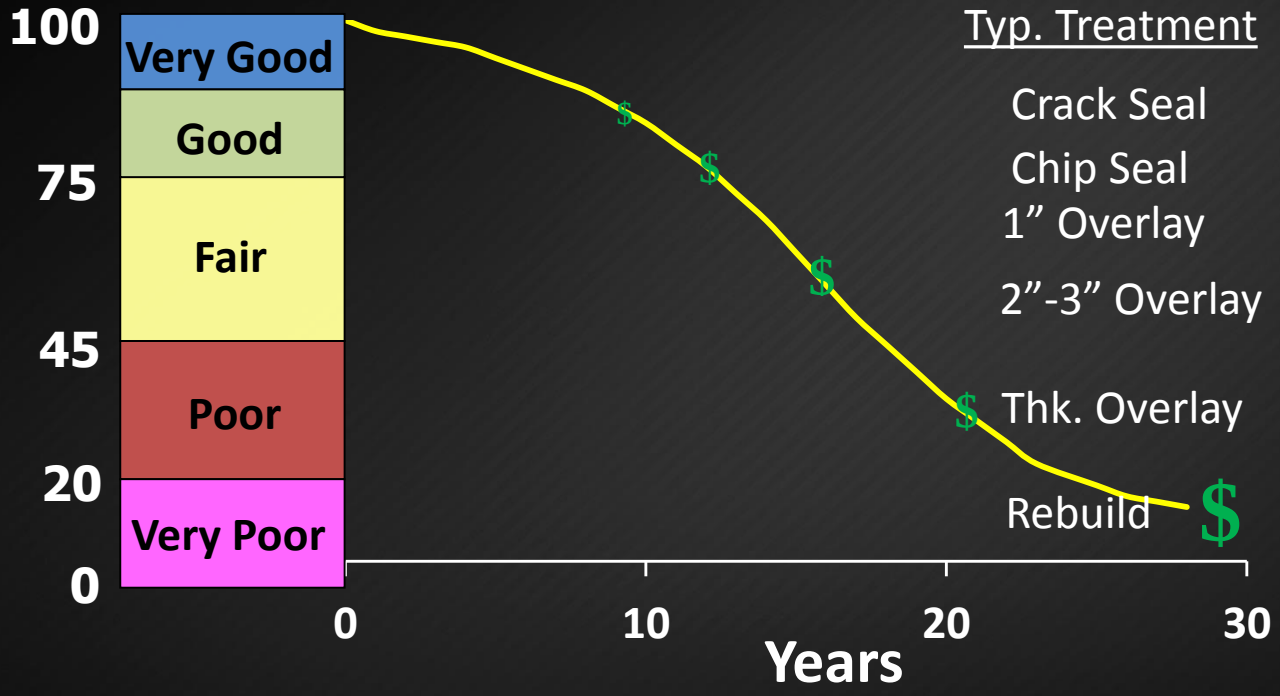
- What is the condition of our roads?
- Are they getting better or worse?
- How much money should we allocate to our pavement programs?
- How should we prioritize our pavement investments?

Investment Priorities

Route Strategy	Treatment Priorities
Level of Importance 1. Interstate 2. State Level (NHS) Routes 3. Region / District Level Routes	Cost / Benefit 1. Chip Seals / 1” Lift 2. 2”-3” Paving 3. Multi-lift 3R Paving 4. Reconstruction


N
W
E
S
Oregon Priority Routes
Legend
Interstate
OTIA Routes
Tier 1 Lifeline Routes
National Highway System (NHS)
DISTRICT
REGIONAL
Freight System Highways

Treatment Priorities



(varies by road section)

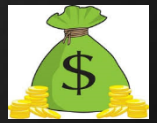
Typ. Treatment	Life	$/LM/Year
Crack Seal	2 yrs	$1,500
Chip Seal	5 yrs	$5,000
1” Overlay	9 yrs	$8,000
2”-3” Overlay	14 yrs	$12,000
Thk. Overlay	17 yrs	$16,000
Rebuild	40 yrs	$50,000

NETWORK LEVEL

- How do we divide the money up?

Money Allocations

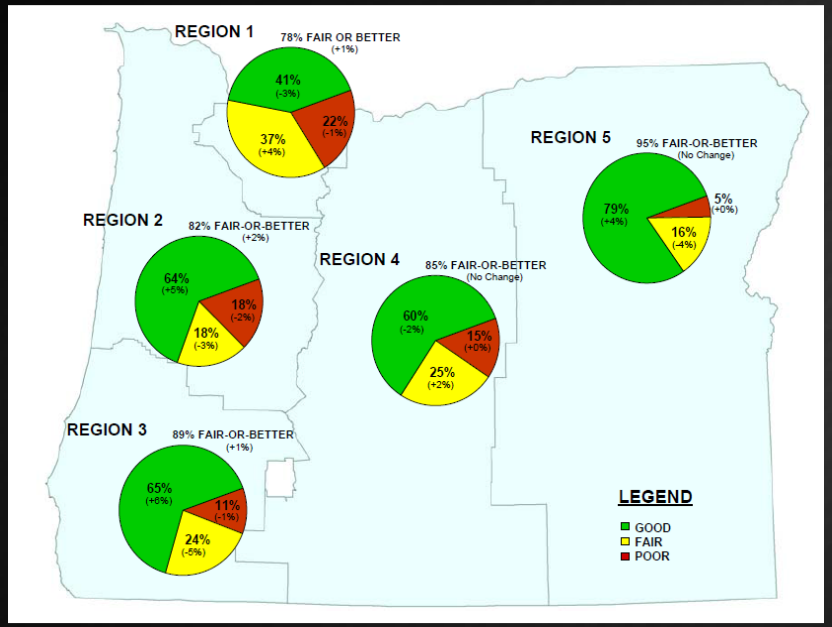
- Fix-It STIP (Federal Funds)
  - Interstate Paving
  - Region Paving
  - Chip Seals
- Maintenance Program (State Funds)
  - MIM (Interstate quick hit)
  - Low Volume (Chip Seals and Thin Paving)
  - Patching



Interstate Allocation

- Target - minimum 95% fair or better
- Revolving 8 Year Workplan – Update every 2 yrs.
  - Current 4-Year STIP
  - Draft STIP (Years 5 and 6)
  - Future STIP (Years 7 and 8)
  - Shelf Projects

Region Paving – Initial Allocation



1. Forecast conditions one STIP cycle ahead (8 yrs. from data year)
2. Compute % fair or better by Region
3. Compare to target (by Hwy. class)
4. Determine $ needs in each Region to reach target
5. Apply resulting percentages to funds available

Chip Seal Allocations

- STIP – Primary Routes
  - Target Cycle Time – 6-10 years
- Maintenance – Low Volume Secondary
  - District Discretion – up to 80% of their budget
  - Target Cycle Time – 8-14 years

NETWORK LEVEL

- How do we divide the money up?
- What projects should we do, and what year?

Fix-It STIP Paving Program

- Timeline – Data to Construction – 6 years!
- Use PMS to develop initial priority list
  - Project conditions 6 years ahead
  - Look to paving where chip seals, crack sealing, or patching is not viable option or will no longer work
  - Priority to higher classes / traffic highways
  - Priority to projects with higher cost effectiveness

Fix-It STIP Paving Program

- Regional preservation team (led by DM's)
  - Do road tour
  - Factor in regional and local issues, other work, etc.
  - Prioritize list for scoping

150% List

1. Start with Road Tour Priority List
2. Field Scope ≈200% of Initial Allocation
3. Refine Cost Estimates
   – Investigate differences - planning $ vs. scope $
4. Cut to 150% list

New Trial Process 150% → 100%

Applies to Pavement and Bridge Program

Score 1-5 for Each of these Factors	Weighting
Route Classification, ADT, Truck ADT	25%
Cost Effectiveness, Delay Risk	25%
Program Priority	25%
Region Priority	25%

Classification Points

Classification	Score
Interstate	5
OTIA or Seismic Lifeline	4
State Class Route or NHS	3
Regional Class Route	2
District Class or Other	1

ADT Points

Traffic Level (ADT)	Score
> 10,000	5
>4,000 to <=10,000	4
>1,500 to <= 4,000	3
>500 to <=1,500	2
<=500	1

Truck ADT Points

Truck ADT	Score
> 1,200	5
>600 to <= 1,200	4
>300 to <= 600	3
>100 to <=300	2
<=100	1

Cost Effectiveness

$ / Lane Mile / Year	Score
<= $10,000	5
>$10,000 to <=$15,000	4
>$15,000 to <=$20,000	3
>$20,000 to <= $40,000	2
>$40,000	1

Delay Risk

- Score 1 to 5
- Looks at Consequence of Delay beyond STIP
  - Maintenance Cost / Risk
  - Pavement Repair Cost Risk (missing the window)

Program Priority (1 to 5)

- Pavement Program Manager (yours truly) allotted 3 points per project
- Favor Projects which….

- Help performance measure achieve target
- Maximize benefit to the pavement and/or reduce maintenance requirements and costs
- Maximize long term pavement service life
- Provide safety benefits (i.e. rutting or pothole / failed pavement hazards / friction issues)
- Improve poor smoothness on routes with higher traffic speeds and freight movements

- Address severe raveling / degradation of driving surface too widespread for patching
- Minimize repetitive, reactive “throw away” maintenance costs
- Treat the disease rather than doing “short term fixes” that temporarily treat symptoms
- Have negative impacts if treatment is deferred beyond the STIP period

Region Priority (1 to 5)

- Regions Allotted 3 points per project
- Suggested criteria include, but not limited to:
  - Maintenance Impact
  - Community Impacts (economics, travel time, freight & modal impacts, etc.)
  - Safety Impact
  - Detour or alternative route availability
  - Project Delivery Staffing implications

100% List

1. Combine Bridge and Pavement project in one list
2. Rank by total weighted scores
3. Send to Highway Management Team
   - use results to set final Bridge/Pavement funding levels
   - use results for regional paving splits
   - use results for initial 100% project list

NETWORK LEVEL

- How do we divide the money up?
- What projects should we do, and what year?
- Are there bundling opportunities?
- Are there leveraging opportunities?

100% List → Final

- Start with 100% list
- Option to swap projects (leverage enhance)
  - Swap must be from the 150% list
  - Program Manager and District Manager must approve
- Shelf Program – develop from unselected projects

PROJECT LEVEL

- What is this road section made of?
  - Last resurfacing When? What? How thick?

Pavement History

SECTION: US 30 : LEG TO BEAVER FALLS RD - SWEDETOWN RD
HWY NO: 092
SEAL:
AGE:
BEGIN MP: 54.50
PVMT TYPE: DGAC THIN OVLY A
ENDING MP: 60.94
WC: B-MIX
AGE: 19
LENGTH: 6.44
REGION: 2

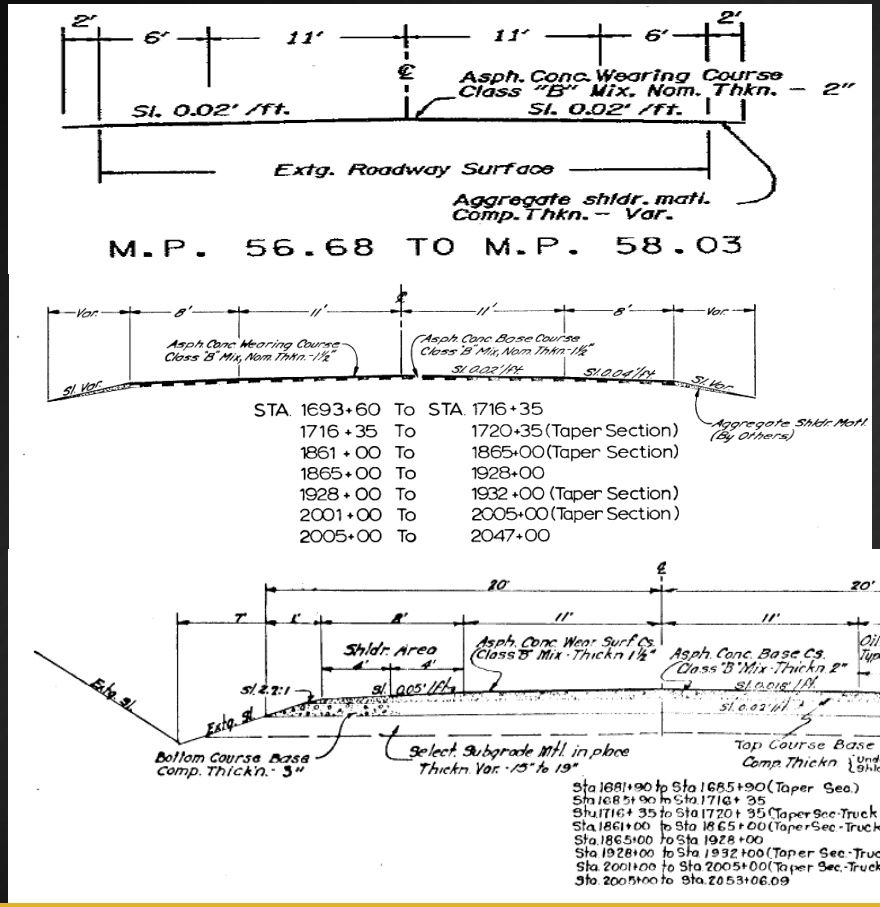
CONSTRUCTION HISTORY

DATE	THKN	MTRL	THKN	MTRL	THKN	MTRL	CPPR	THKN	BASE	THKN	SUB	V-FILE	CON #
1995	2	B										00V-226	C11477
COMMENTS:	Pres list, 58.0-60.7 (1992) 2" inly in climbing lane												
1972	1.5	B	1.5	B								10V-289	C07716
COMMENTS:													
1954	1.5	B	2	B				2	AG	16	AG	5V-026	C04172
COMMENTS:													

1995 00V-226

1972 10V-289

1954 5V-026



Total via Plans:

8.5” DGAC

4” Agg. Base

15”-19” Subbase

Mix Design Database

2007 US30: COLUMBIA COUNTY LINE - MP 61.70 (BOAT BMP 61.70 EMP 69.95 ☑ Wearing ☑ Base C13350

Asphalt Mix Properties:

Mix Type: 1/2" Dense Mix

Mix Level: 3

Number of Gyrations: 100

☐ Lime Added to Mix

Asphalt Grade: PG 64-22

%Rap: 30.00

Tensile Strength Ratio: 93

Volumetric Properties as Built:

Effective binder content (%): 11.0013

Air voids (%): 7

Total unit weight (pcf): 147.98

Asphalt Mix Gradation:

% Retained 3/4": 0

% Retained 3/8": 20

% Retained #4: 49

% Passing #200: 7.2

PAVEMENT SURVEY

Project	US30: Wonderly Rd - Swedetown Rd
Highway	Lower Columbia River Hwy
County	Columbia
Designer	KNS
BMP	50.35
EMP	60.81
Key	18610
EA	PE000000 - 000 - J13

Date: 7-16-15
Logged By: TB (BH) JM
DRILLED THROUGH PATCH: (Y) N
DRILLED ON CRACK: Y (N)
TYPE: Fat Trans Long

Core # 32 MP 56.00
Lane A (B) C D AUX SHD RAMP
Location (OWT) IWT BWT
Direction NB SB EB (WB)
Bridge #
Br Loc Ap Lv Deck Dist
Depth 8"

Comment:

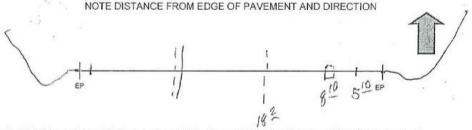
Direction of Travel

Depth Inches

Mat Type	Cond.
D	G
D	G
D	G
D	G

Photo:

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



Key: Mat Type- Open AC - O, Dense AC - D, Oil Mat - OM, Macadam - M, Concrete - PCC, Cement Treated Base - CTB, Chip Seal - C
Condition- Good - G, Fair - F, Poor - P. Conditions can be combined (ex. GF & FP)

PAVEMENT SURVEY

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Highway	Lower Columbia River Hwy
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Designer	KNS
BMP	50.35
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Key	18610
EA	PE000000 - 000 - J13

Date: 7-16-2015
Logged By: TB (BH) JM
DRILLED THROUGH PATCH: (Y) N
DRILLED ON CRACK: (Y) N
TYPE: Fat Trans Long +

Core # 33 MP 56.5
Lane A (B) C D AUX SHD RAMP
Location (OWT) IWT BWT
Direction NB SB EB (WB)
Bridge #
Br Loc Ap Lv Deck Dist
Depth 8"-8 1/2

Comment:

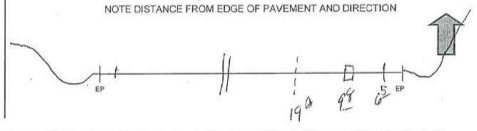
Direction of Travel

Depth Inches

Mat Type	Cond.
D	F (P)
D	F
D	P

Photo:

NOTE DISTANCE FROM EDGE OF PAVEMENT AND DIRECTION



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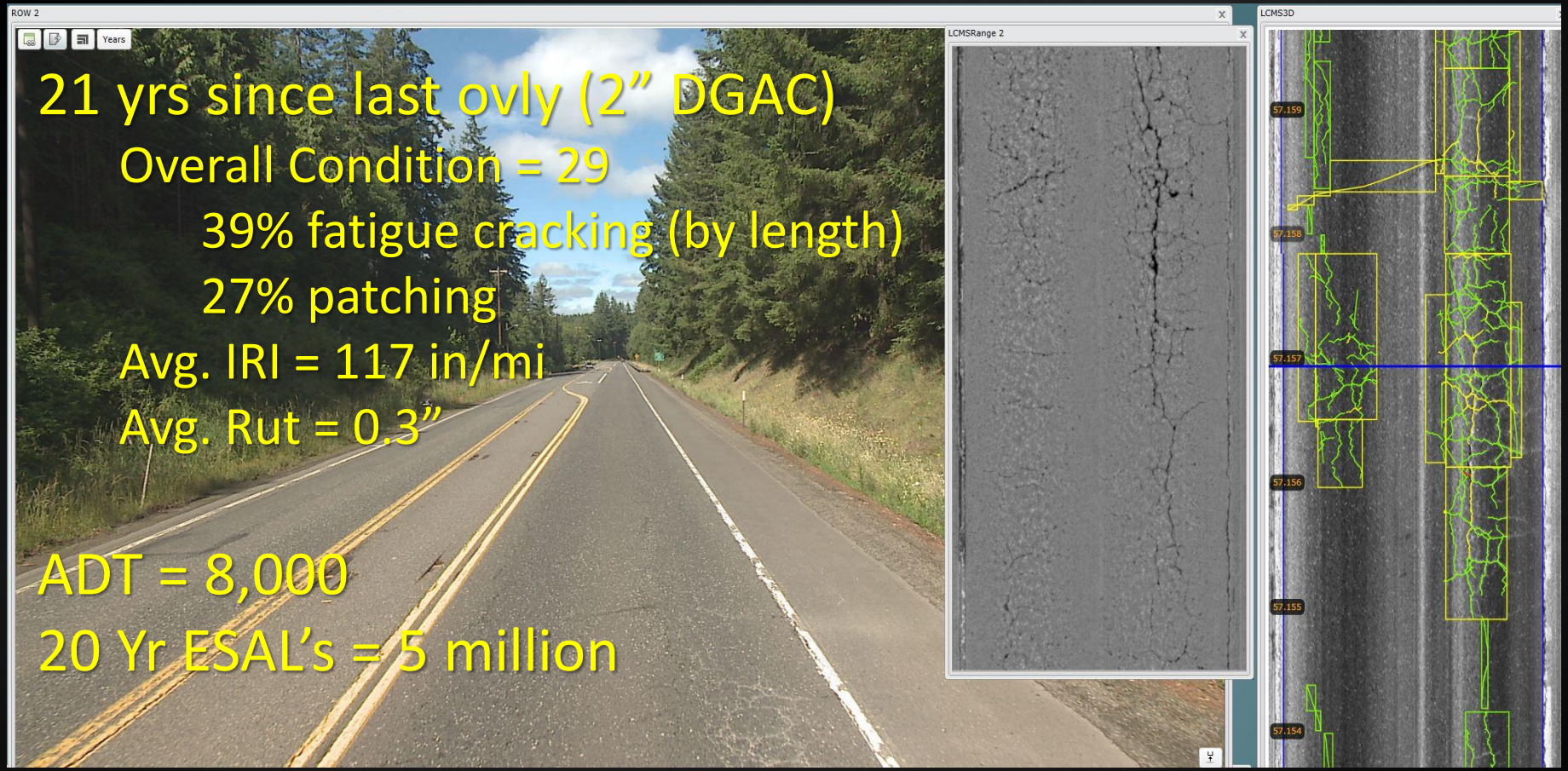
PROJECT LEVEL

- What is this road section made of?
  - Last resurfacing When? What? How thick?
- Performance?
  - How well has this section performed?

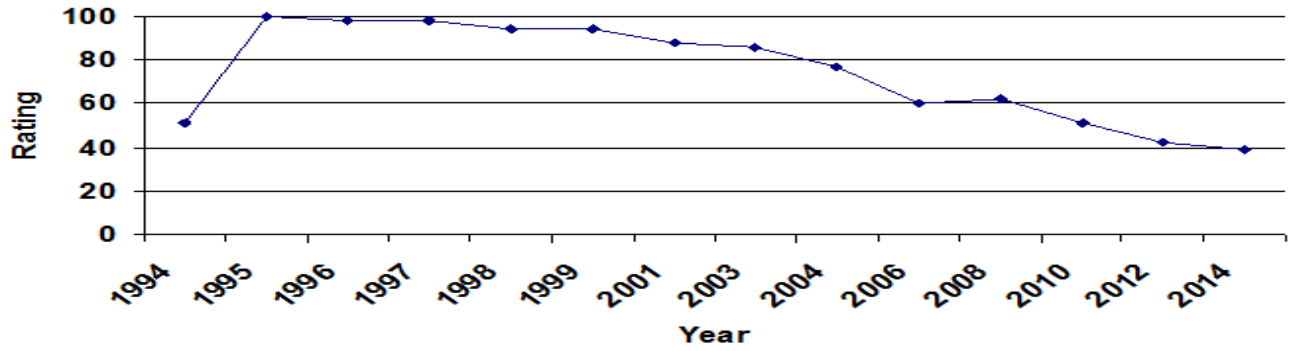

ROW 2
Years
21 yrs since last ovly (2” DGAC)
Overall Condition = 29
39% fatigue cracking (by length)
27% patching
Avg. IRI = 117 in/mi
Avg. Rut = 0.3”
ADT = 8,000
20 Yr ESAL’s = 5 million
LCMSRange 2
LCMS3D
57.159
57.158
57.157
57.156
57.155
57.154

Performance Over Time

CONDITION HISTORY

	1994	1995	1996	1997	1998	1999	2001	2003	2004	2006	2008	2010	2012	2014
RATING:	51	100	98	98	94	94	88	86	77	60	62	51	42	39
RUT:	0.43		0.23		0.22			0.22	0.21	0.22	0.27	0.29	0.31	0.27
IRI:	127		101		100			87	87	89	96	110	124	119
SKID:	55		49		49				47	49	45	50	53	

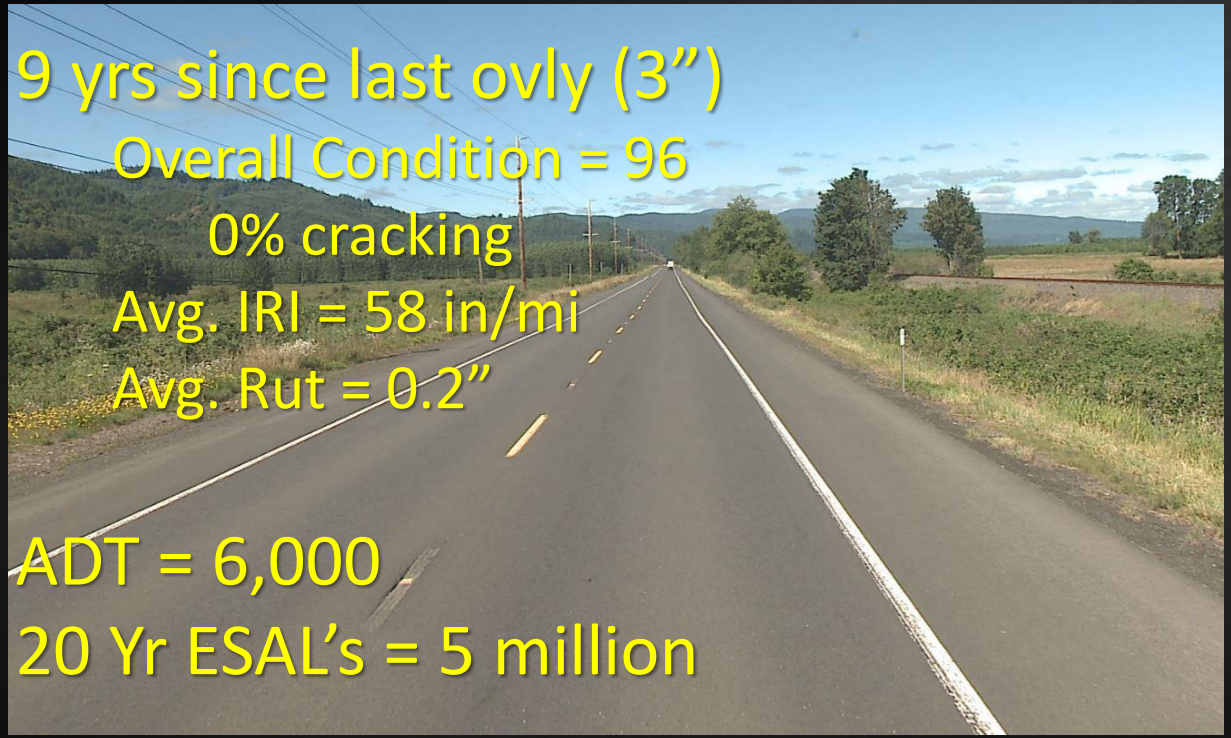
CONDITION GRAPH



PROJECT LEVEL

- What is this road section made of?
  - Last resurfacing When? What? How thick?
- Performance?
  - How well has this section performed?
  - How have other projects like the one we are planning to do been performing?

Nearby Project - Context



Total via Plans:

8.5” DGAC

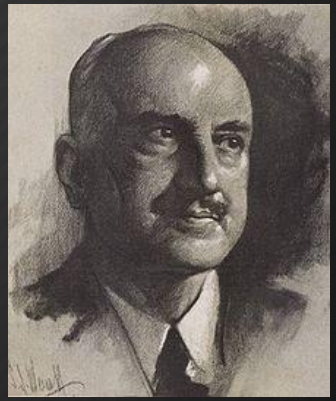
10” Agg. Base

18” Subbase

PMS Data has Lessons

- PMS data is the feedback tool for evaluating previous decisions that have been made
- PMS data can be an important knowledge transfer tool for future road managers

George Santayana



"Those who fail to learn from history are doomed to repeat it"

John Coplantz
Pavement Management Engineer

Oregon Dept. of Transportation
Pavement Services Unit
800 Airport Road
Salem, OR 97301
503-986-3119
john.s.coplantz@odot.state.or.us