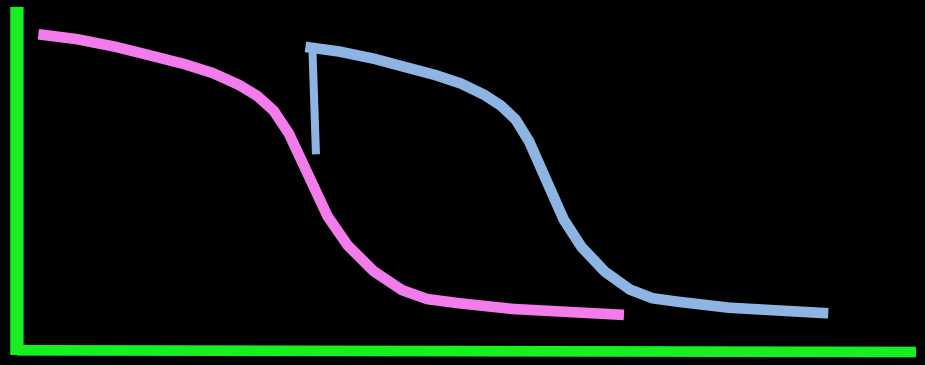
The True Value of Pavement Preservation



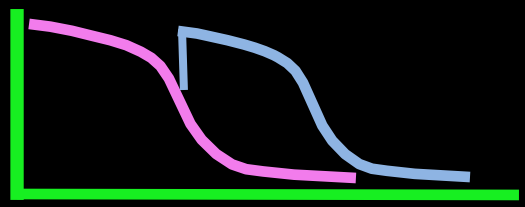
Don Newell

Marion County, Oregon

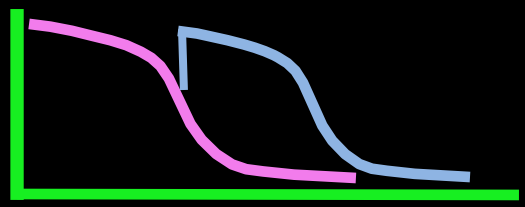
Two fold mission of Public Road Agencies

(Public Works):

- reserve the ublic's



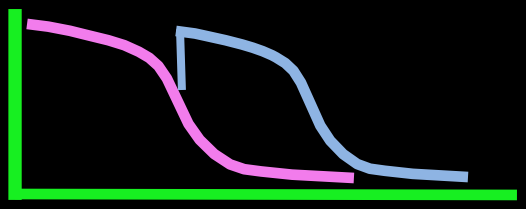
Current trends in local NW governments (2011):



Understand Your Road System

+ Understand Changes

You Will Know What You Should Next



Pavement Management define:

Systematic method of

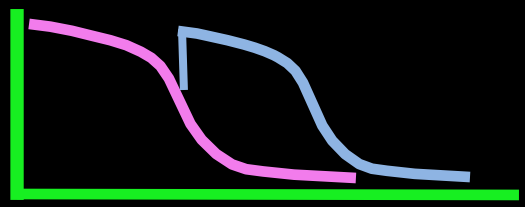
routinely collecting and processing

decision-making data

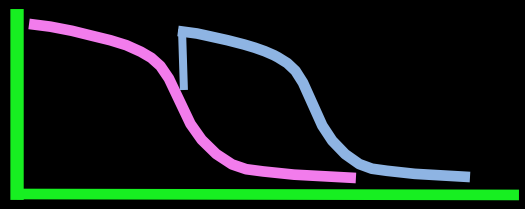
needed to make maximum use of

limited preservation dollars.

Decision Making Tool



Decision Making Tool



Pavement Management aids in:

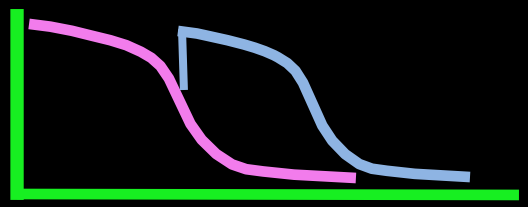
Applying the

correct pavement treatment

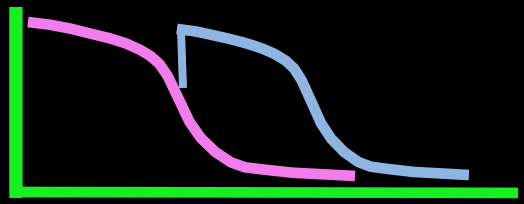
At the correct location

At the correct time.

Decision Making Tool



The Pavement Deterioration Curve



Very Good

Good

$

Routine Maintenance

Fair

$$

Preventive Maintenance

Poor

$$$

Rehabilitation

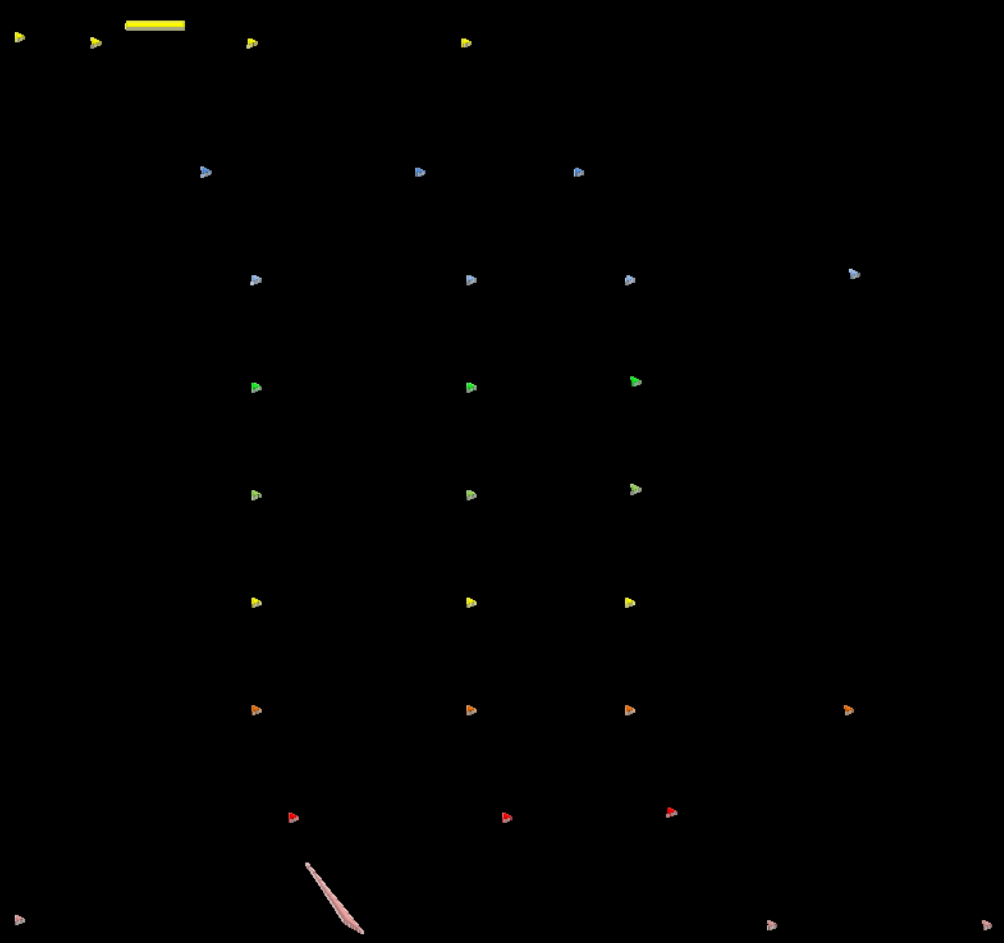
Very Poor

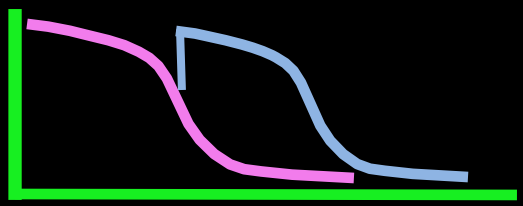
$$$$

Reconstruction

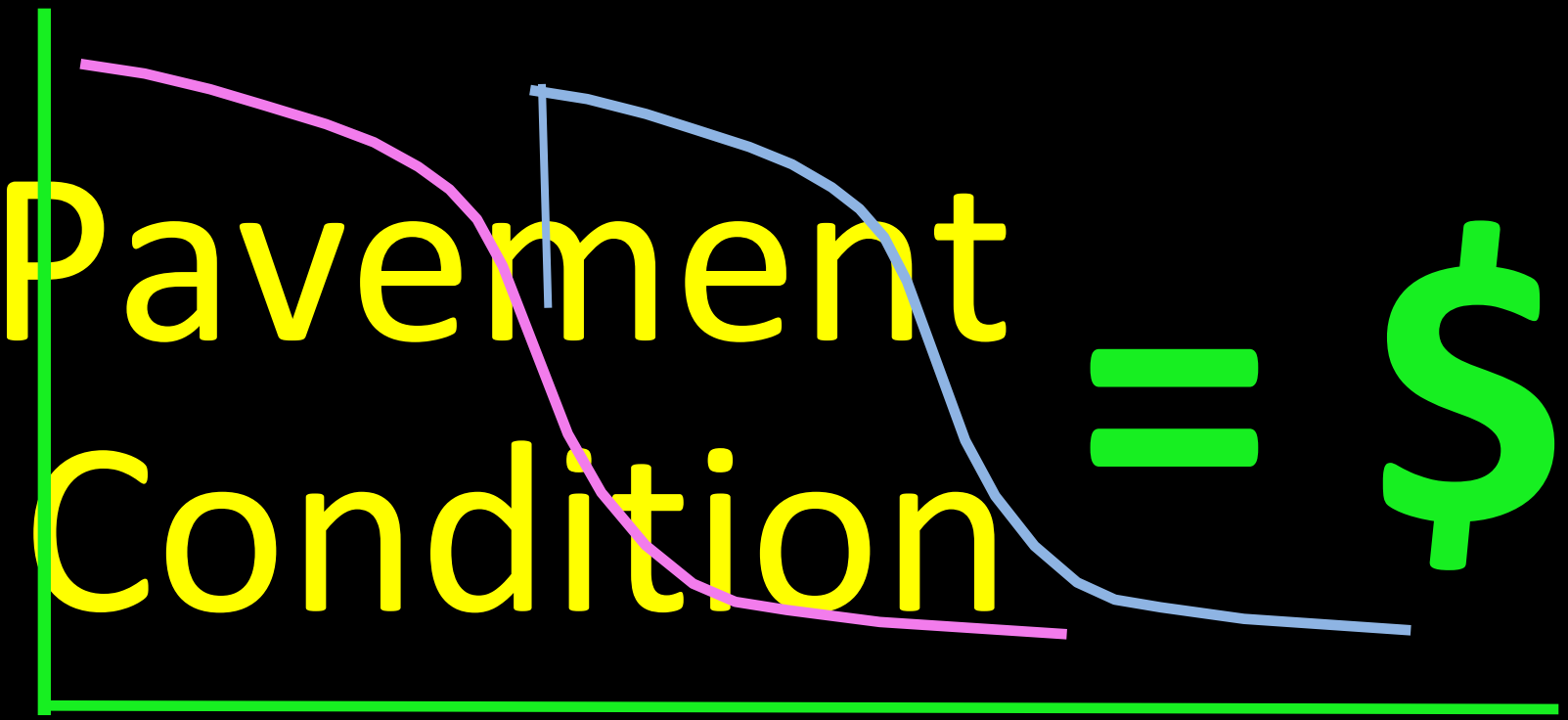
Time – life of highway

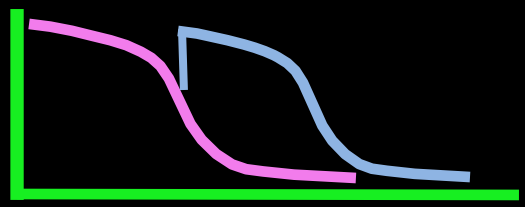
My career PaveMngt reference base:



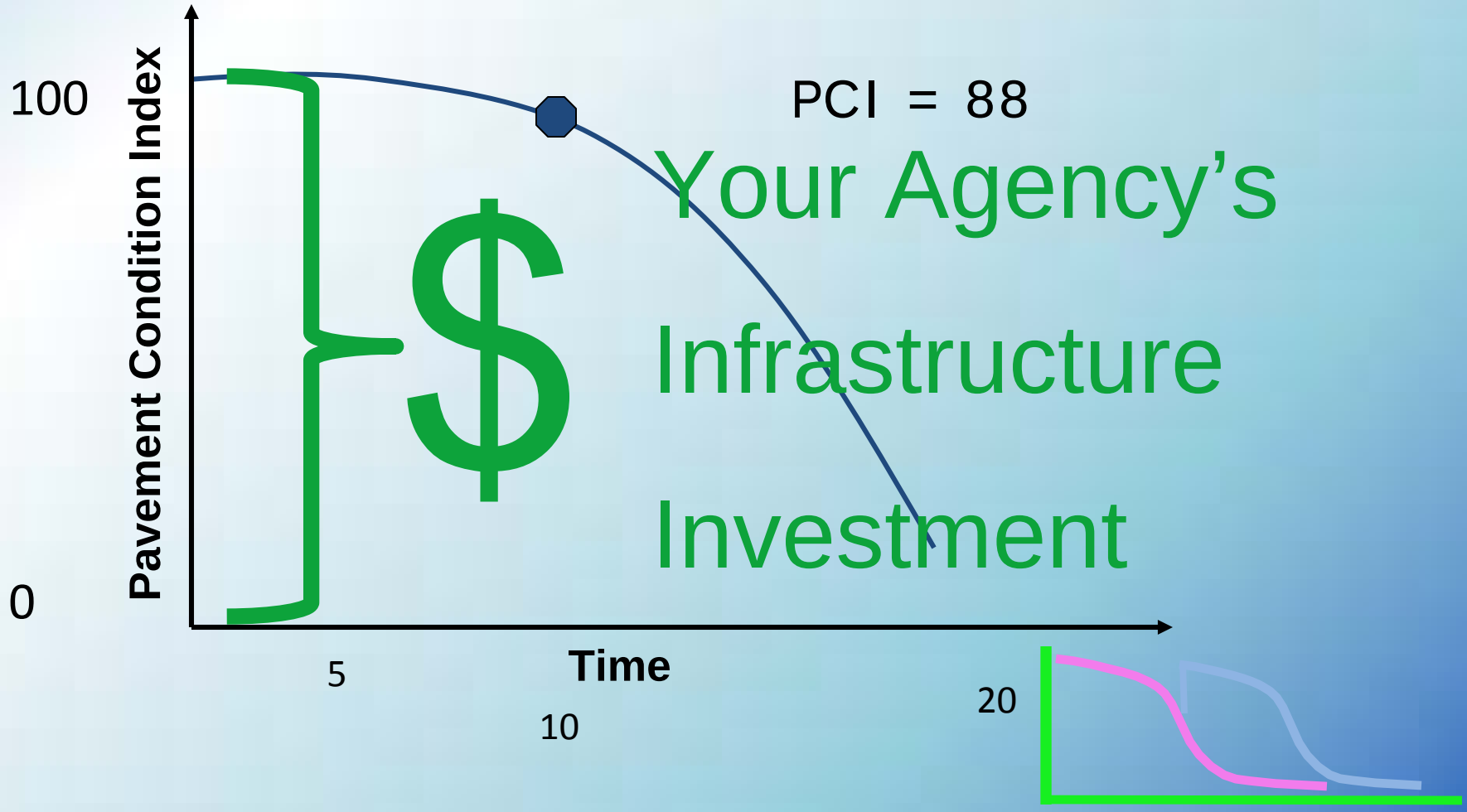


Pavement Condition is the "Y" axis

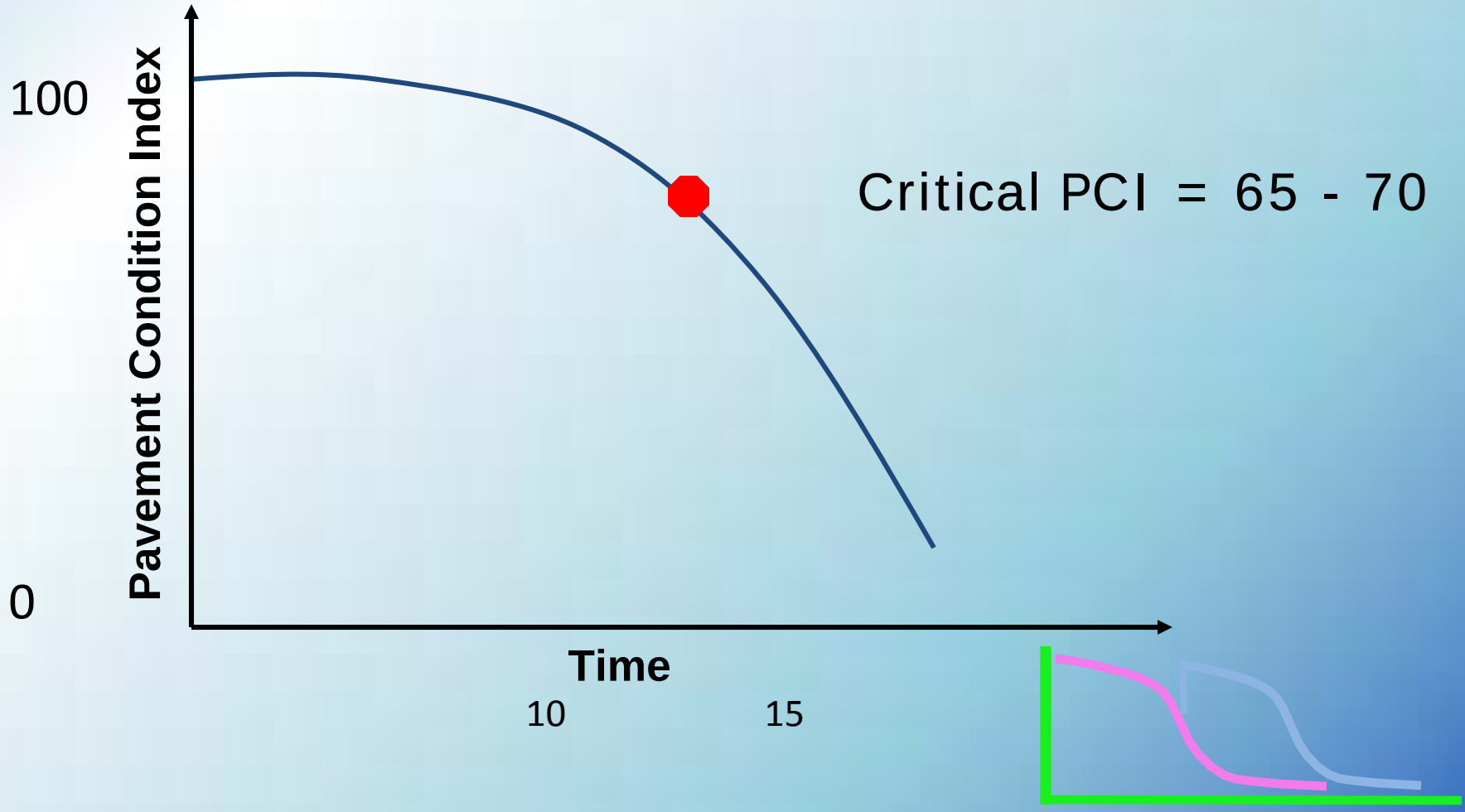




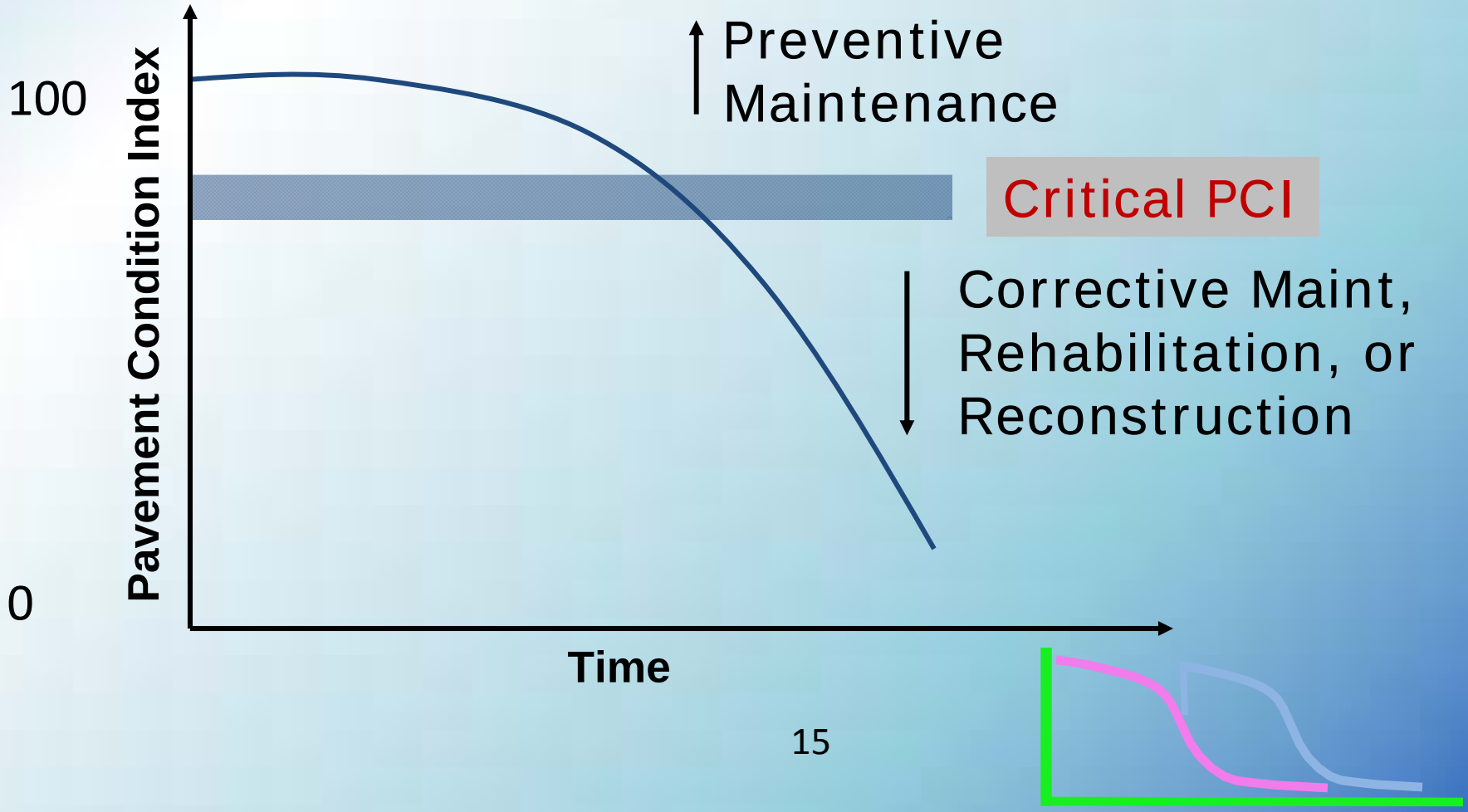
Pavement Condition



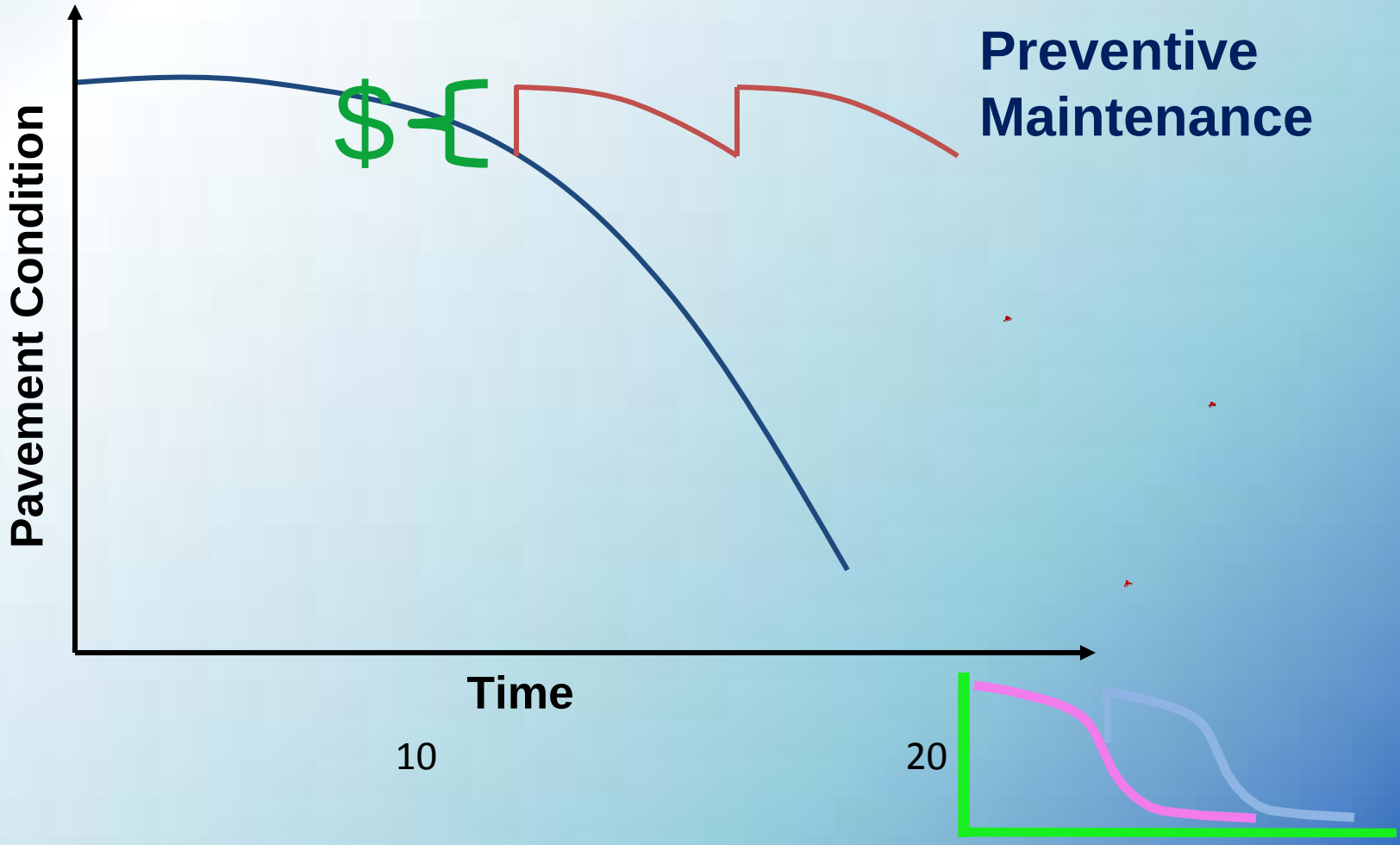
Pavement Condition



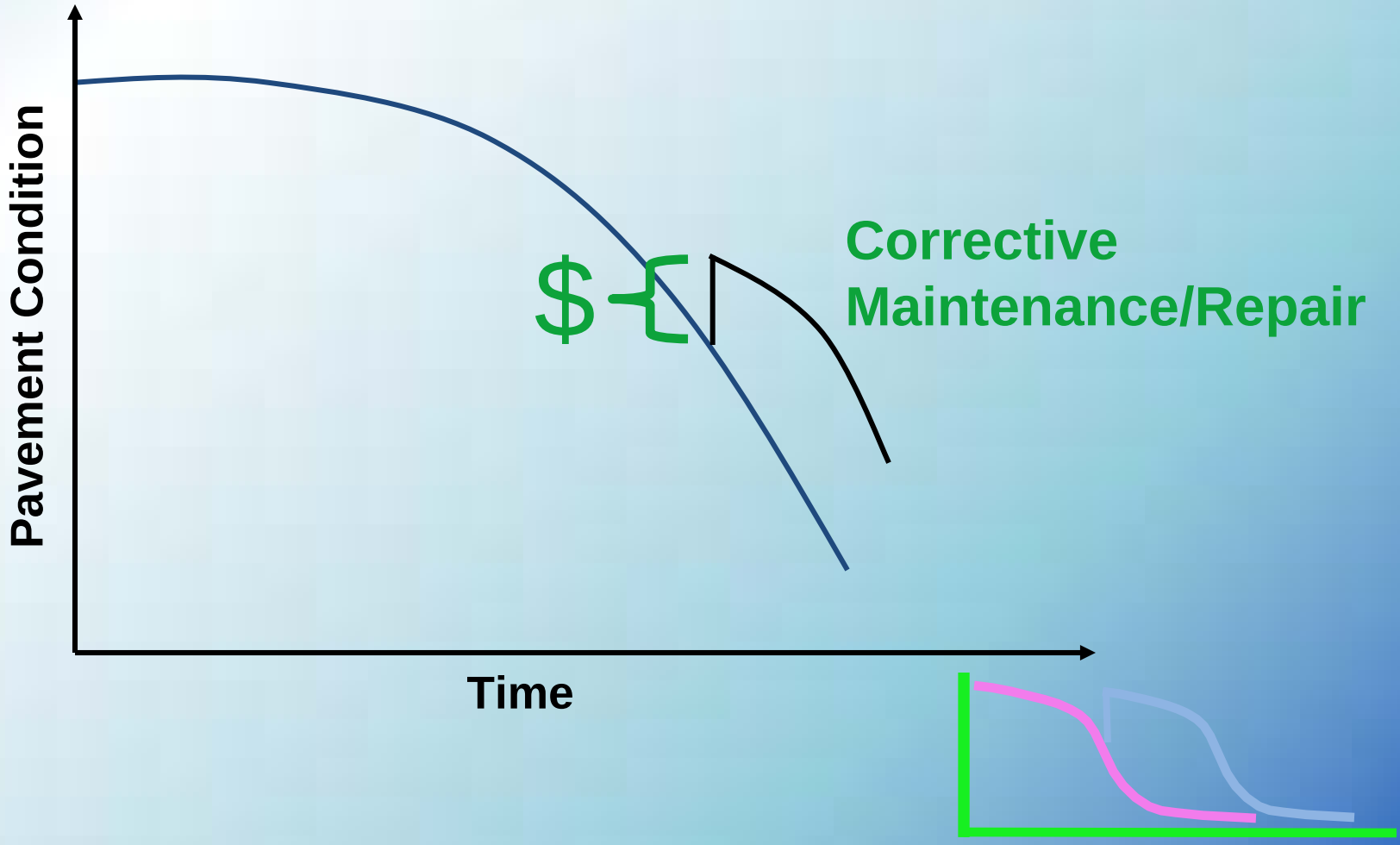
Critical PCI



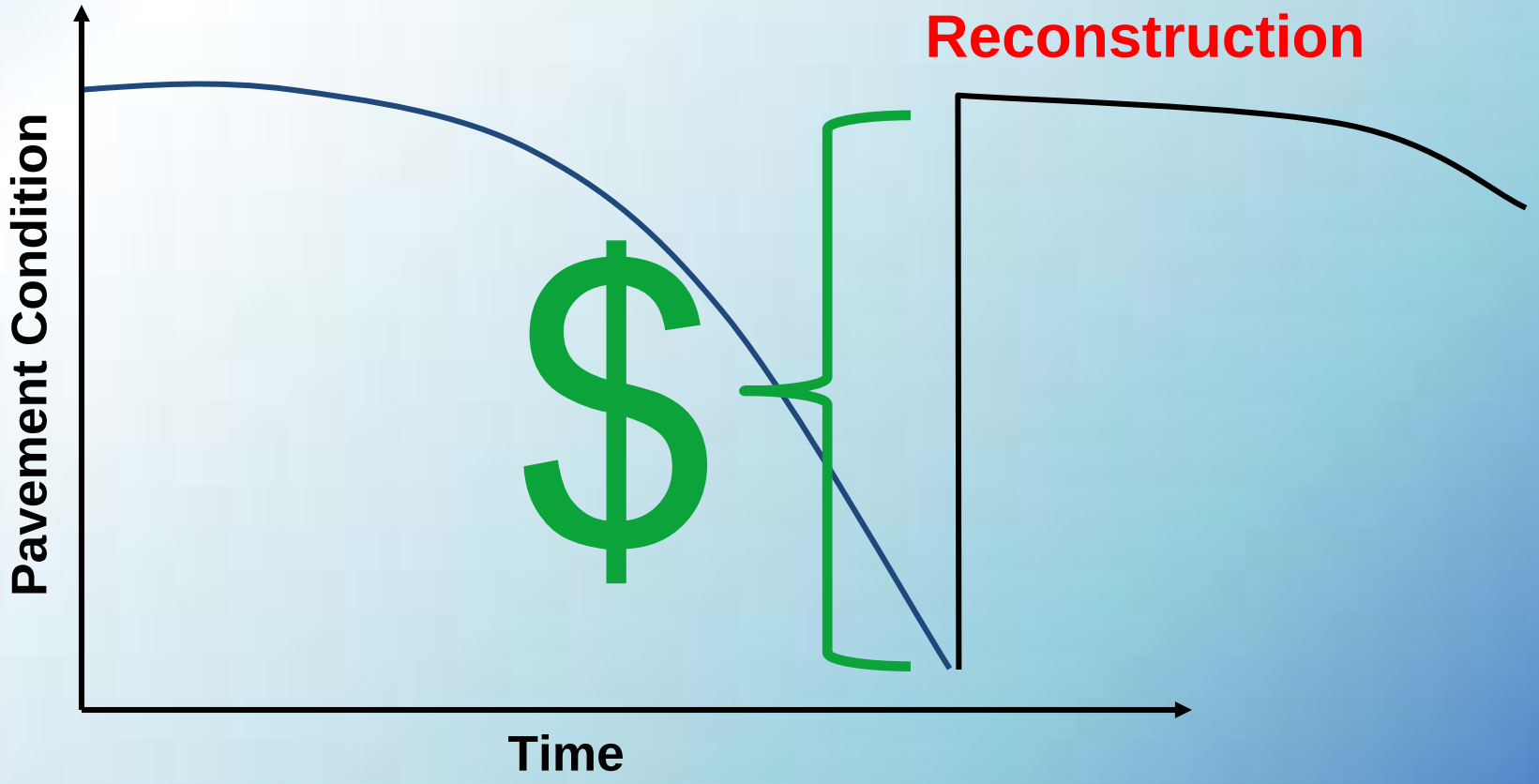
Preventive Maintenance



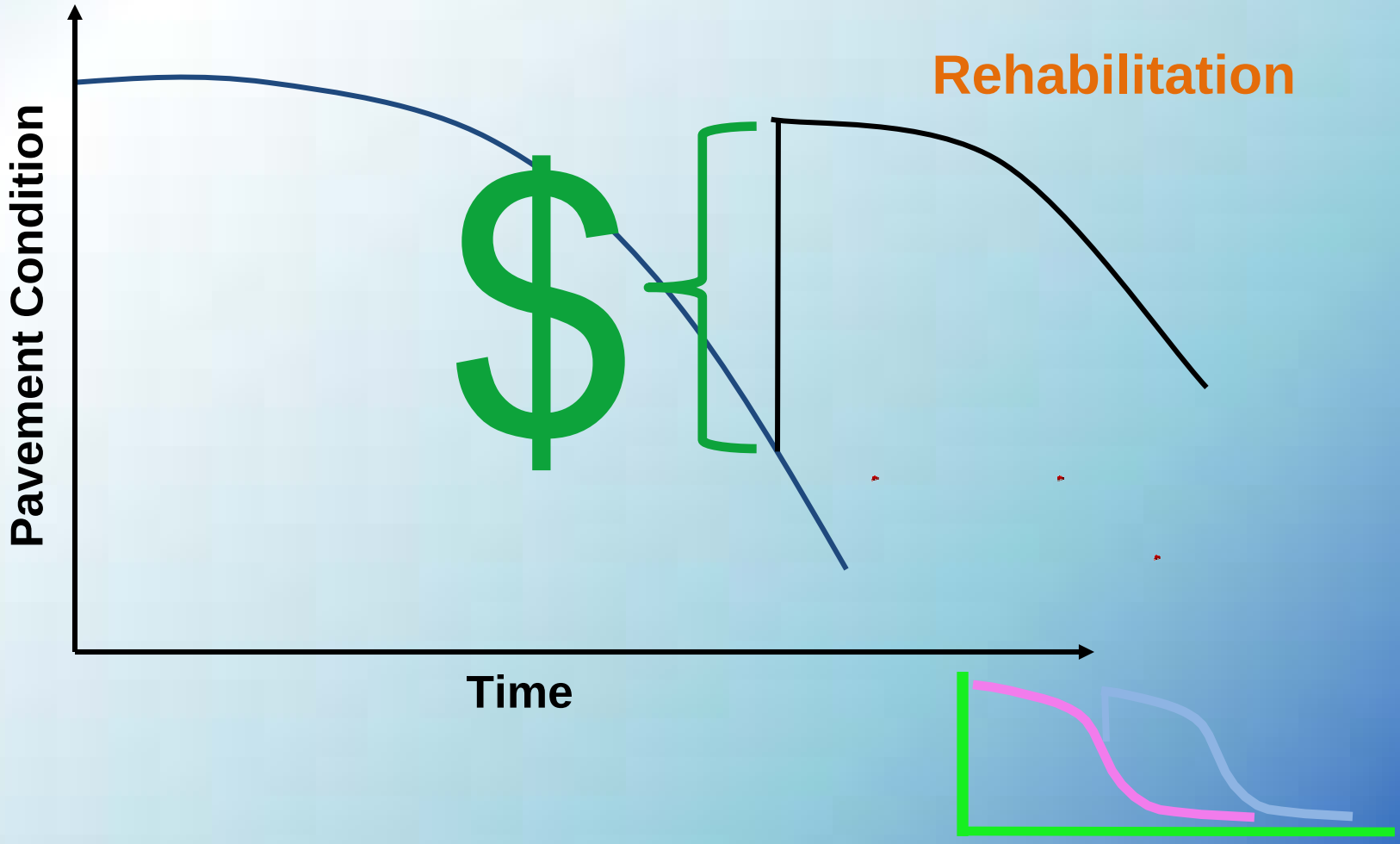
Corrective Repairs



Reconstruction



Rehabilitation



Where are we today?

We have been using Pavement Management Software Systems for time now…..

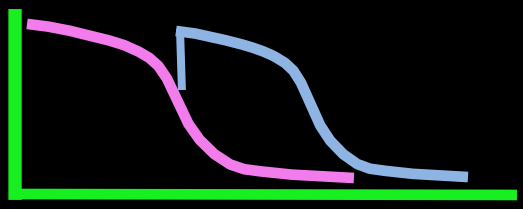
Our work is now recognized - *examples:*

Improved Tools – i.e. GIS ; Web presence

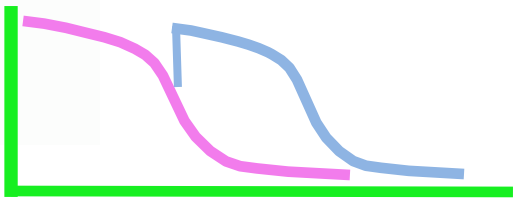
2001 - GASB 34

2009 - Obama Stimulation Package

Public Engagement / Informed – *Even Electives!*



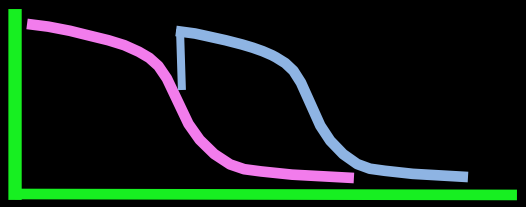
You come a long way baby!



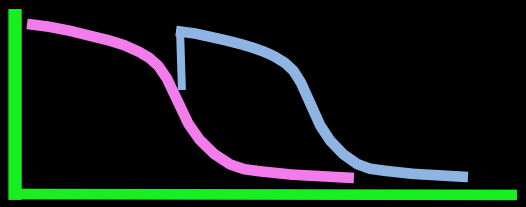
Understand Your Road System

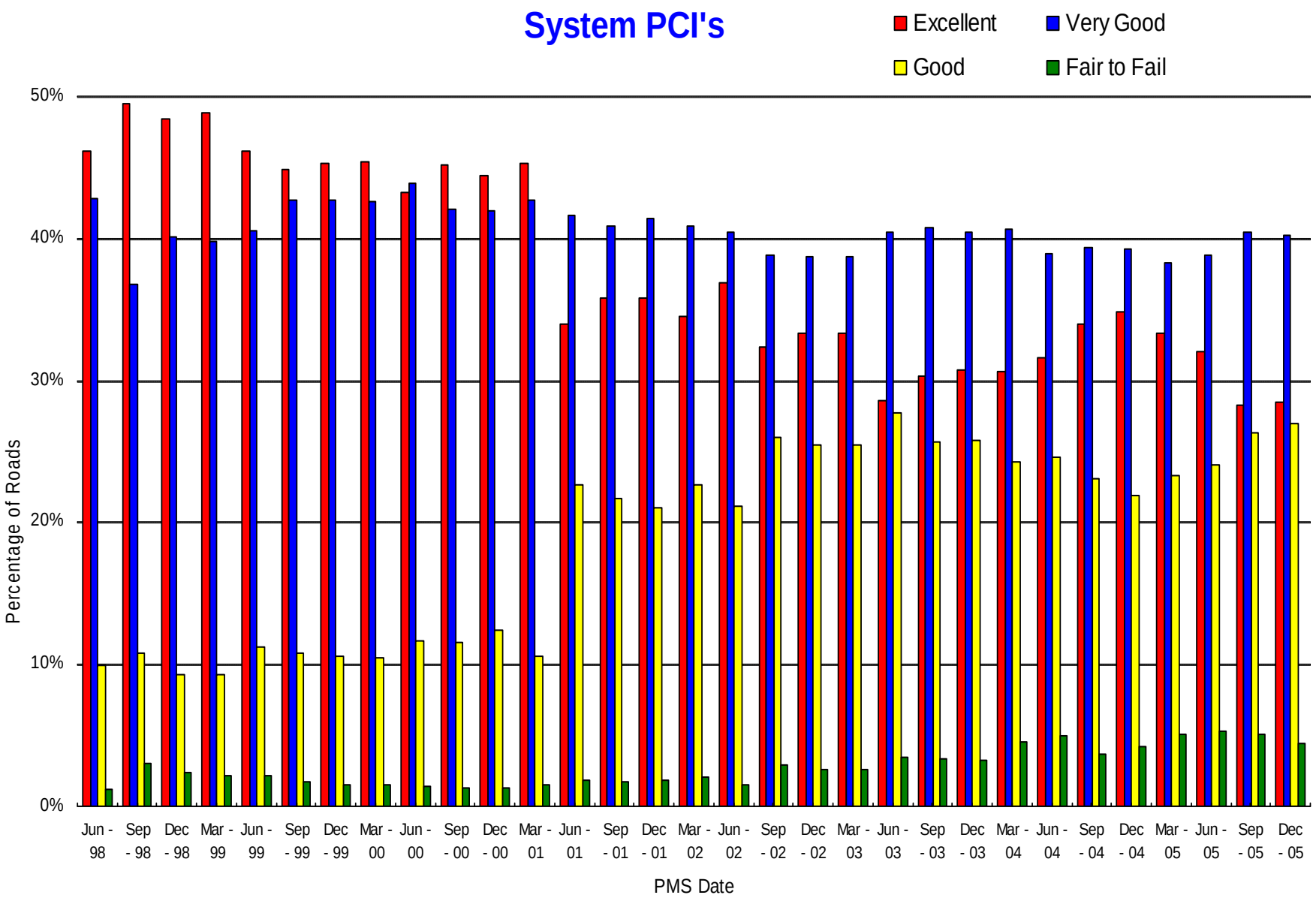
\+ Understand Changes

You Will Know What You Should Do Next

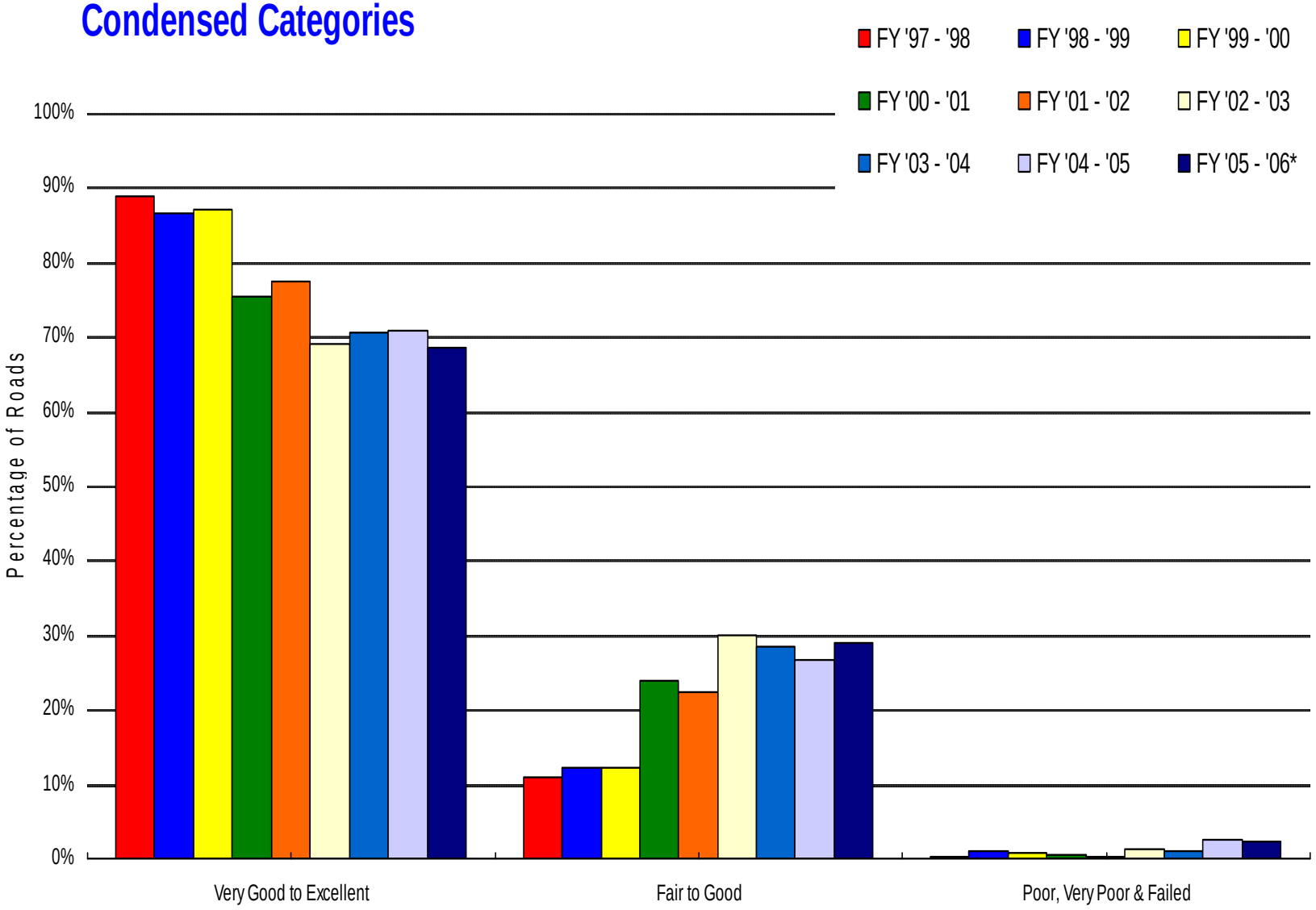


Understand Your Road System

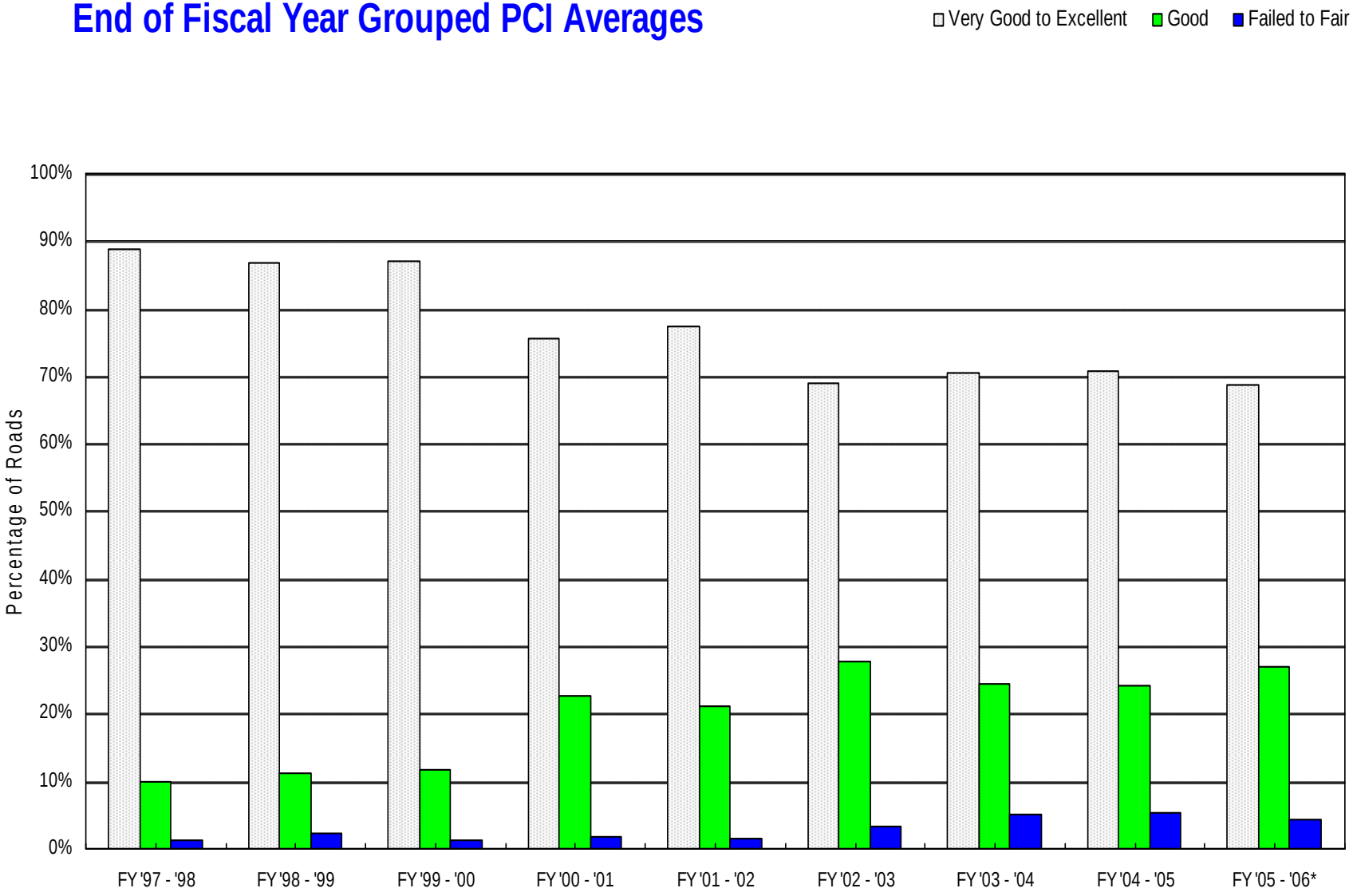



System PCI's
Excellent
Very Good
Good
Fair to Fail
50%
40%
30%
20%
10%
0%
Percentage of Roads
Jun - 98
Sep - 98
Dec - 98
Mar - 99
Jun - 99
Sep - 99
Dec - 99
Mar - 00
Jun - 00
Sep - 00
Dec - 00
Mar - 01
Jun - 01
Sep - 01
Dec - 01
Mar - 02
Jun - 02
Sep - 02
Dec - 02
Mar - 03
Jun - 03
Sep - 03
Dec - 03
Mar - 04
Jun - 04
Sep - 04
Dec - 04
Mar - 05
Jun - 05
Sep - 05
Dec - 05
PMS Date

Very Good to Excellent
Condensed Categories

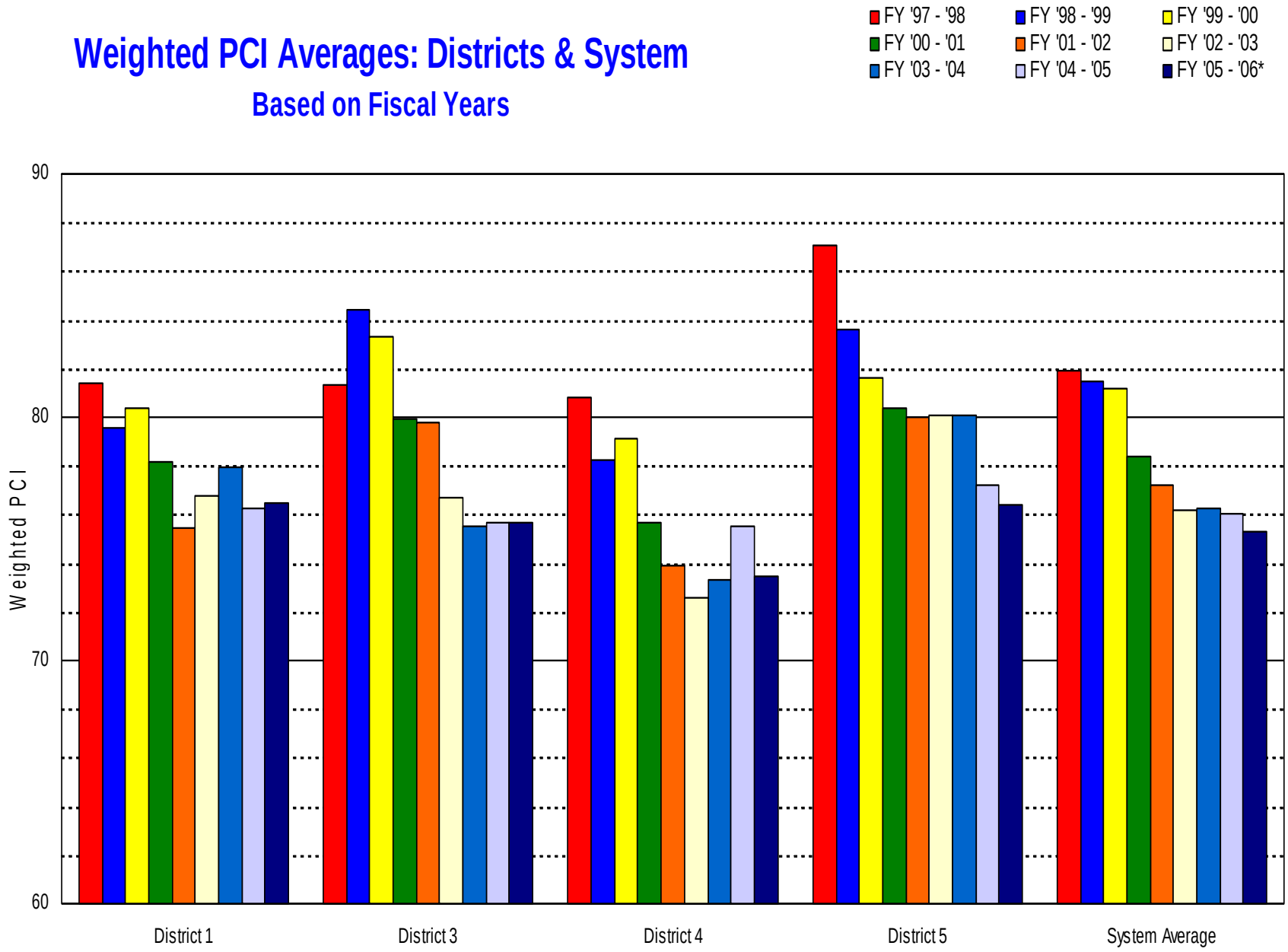


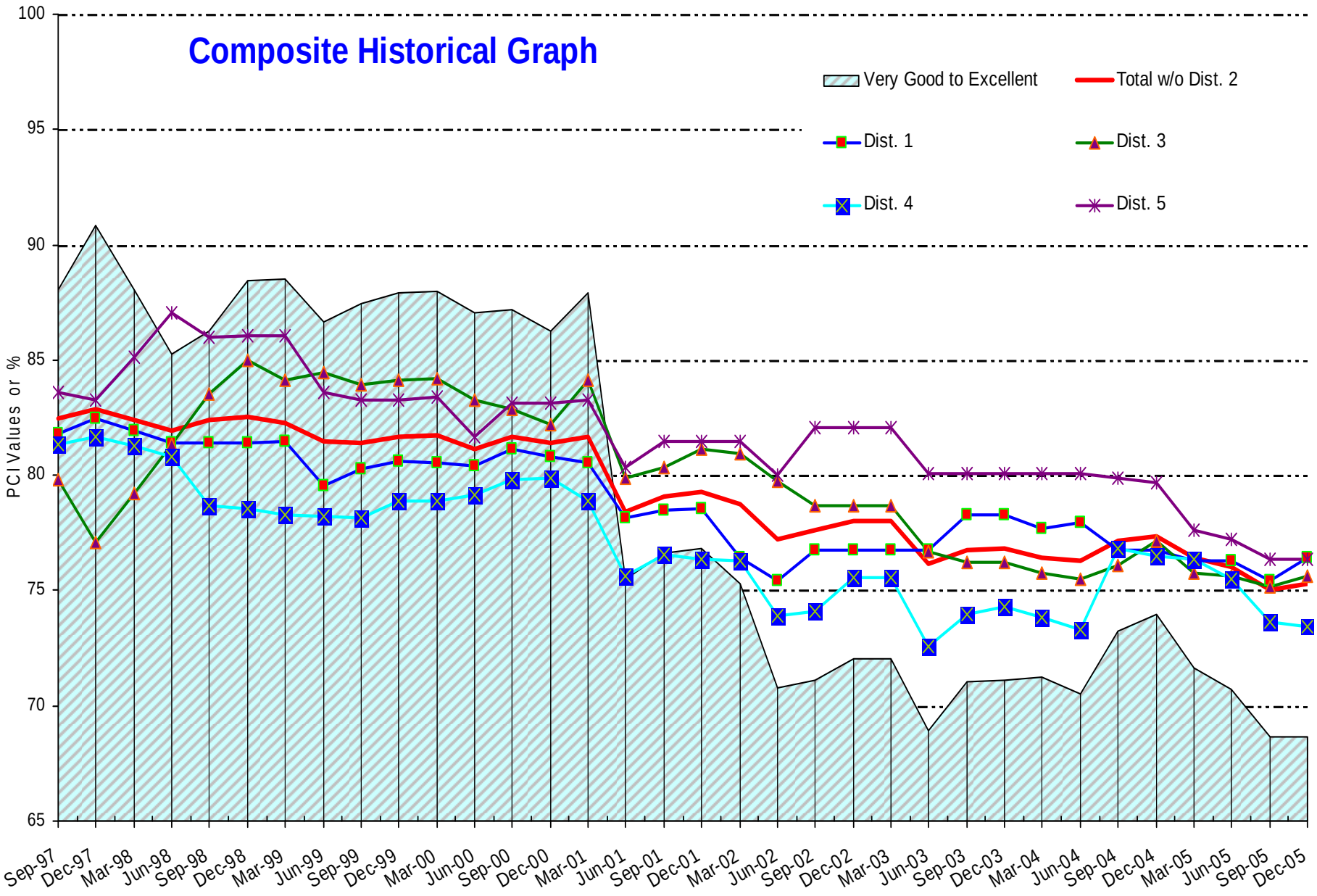
End of Fiscal Year Grouped PCI Averages



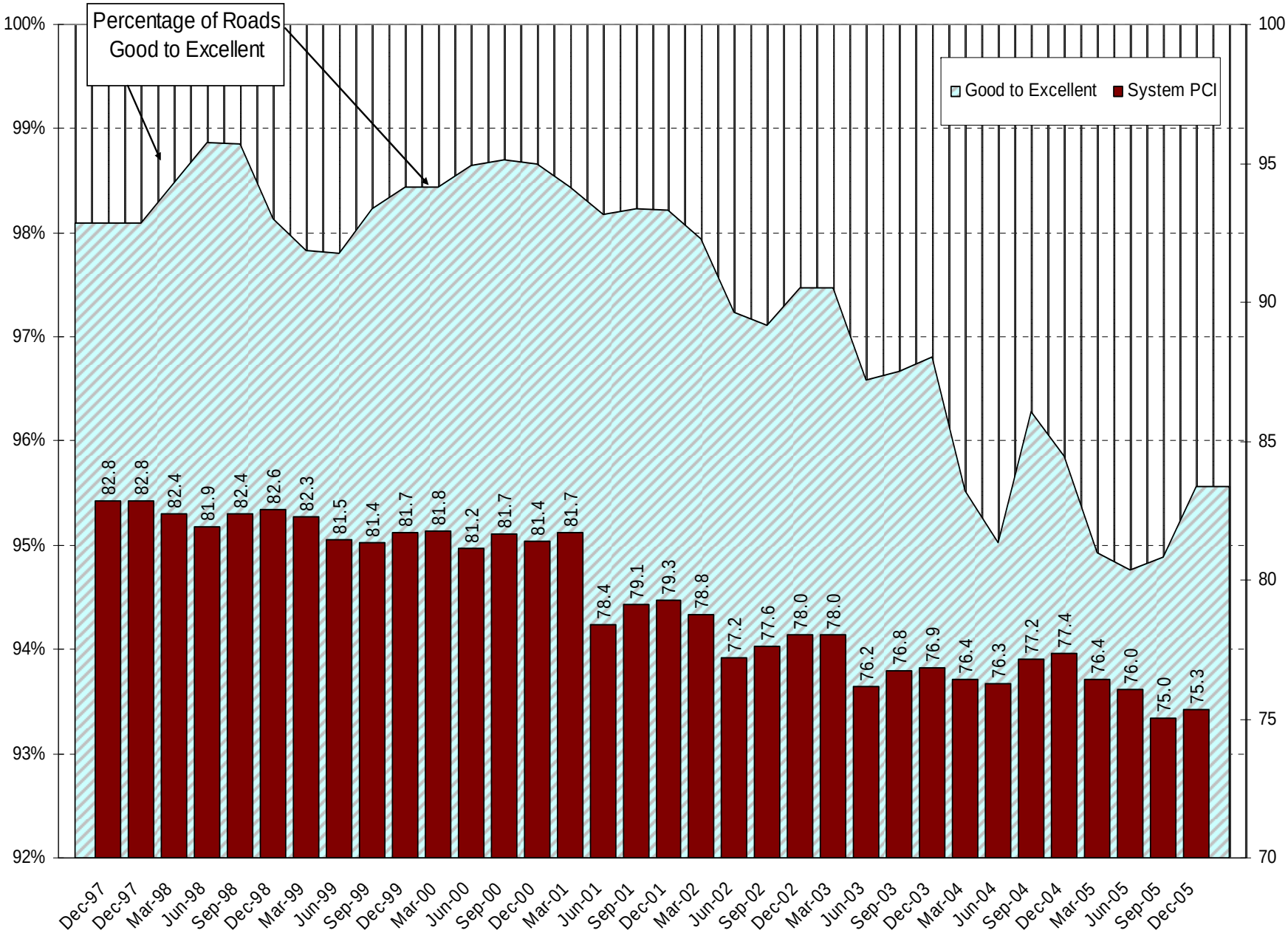
Weighted PCI Averages: Districts & System

Based on Fiscal Years




Composite Historical Graph
Very Good to Excellent
Total w/o Dist. 2
Dist. 1
Dist. 3
Dist. 4
Dist. 5
PCI Values or %
100
95
90
85
80
75
70
65
Sep-97
Dec-97
Mar-98
Jun-98
Sep-98
Dec-98
Mar-99
Jun-99
Sep-99
Dec-99
Mar-00
Jun-00
Sep-00
Dec-00
Mar-01
Jun-01
Sep-01
Dec-01
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05

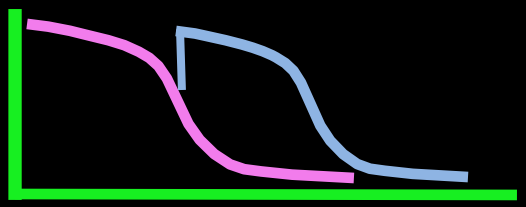
Historical Road Pavement Condition



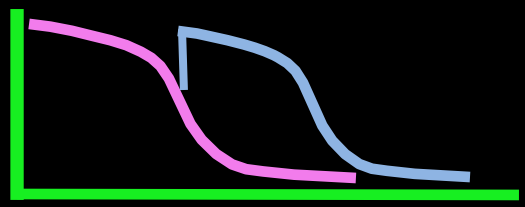
Understand Your Road System

\+ Understand Changes

You Will Know What You Should Do Next

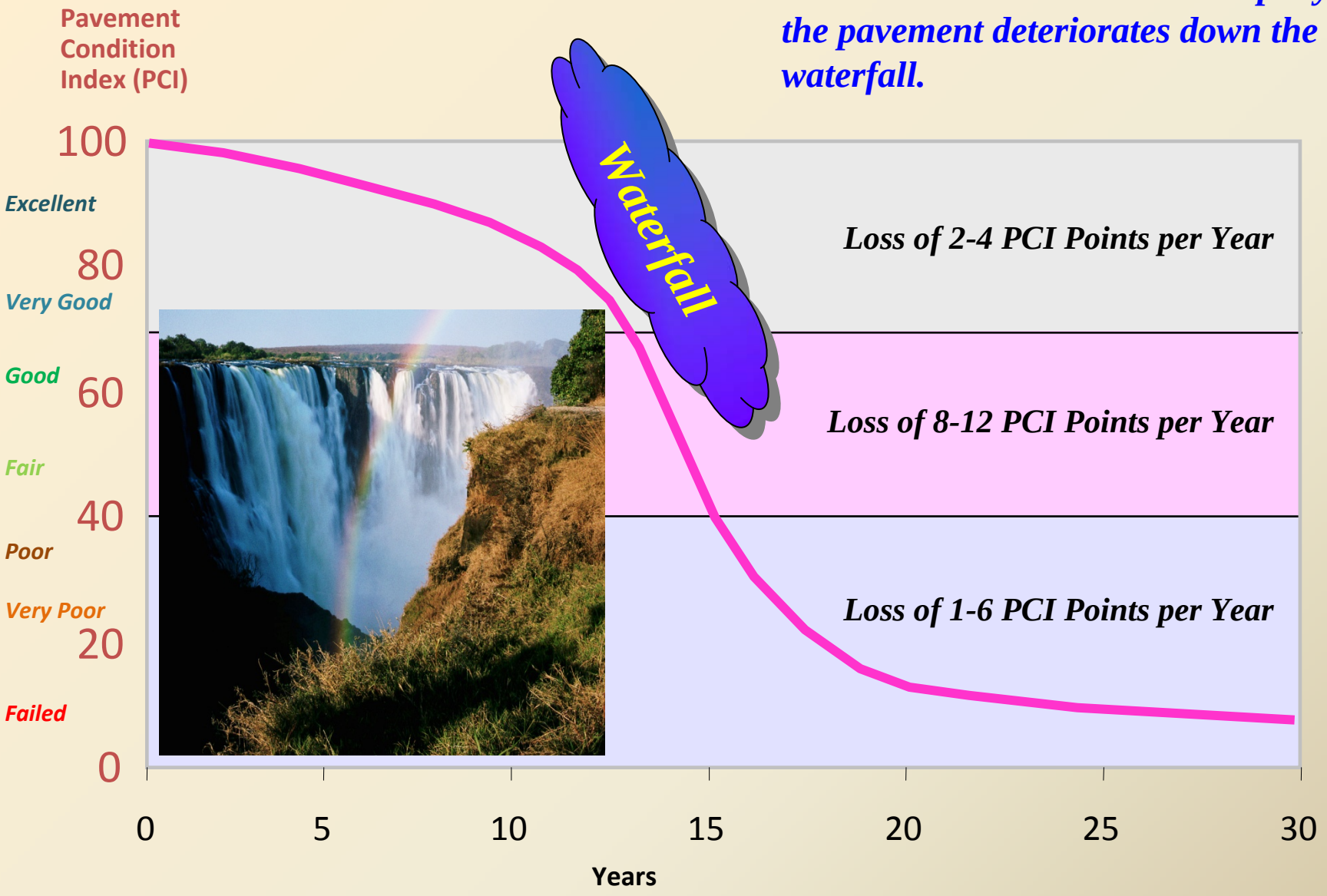


Understand Changes



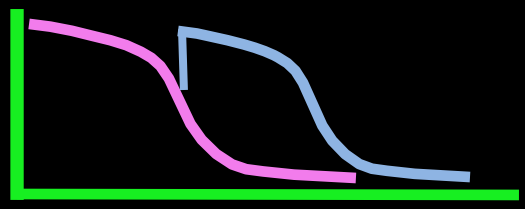
PCI Points Lost per Year
Model for Pavement Life of 30 years

Financial liabilities increase rapidly as the pavement deteriorates down the waterfall.



Modeling:

Trending sub-groups range performances



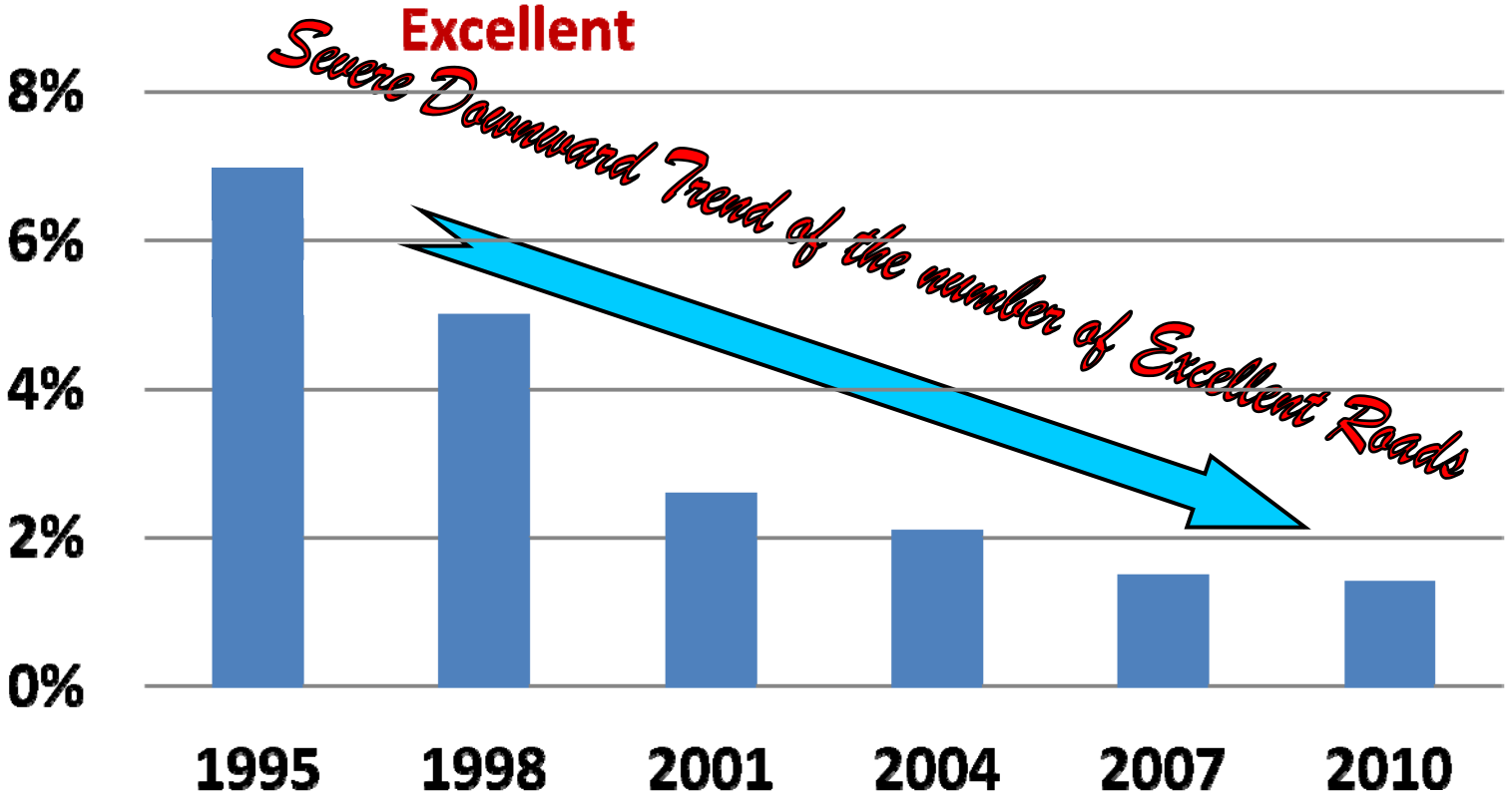
Well Maintained Barn

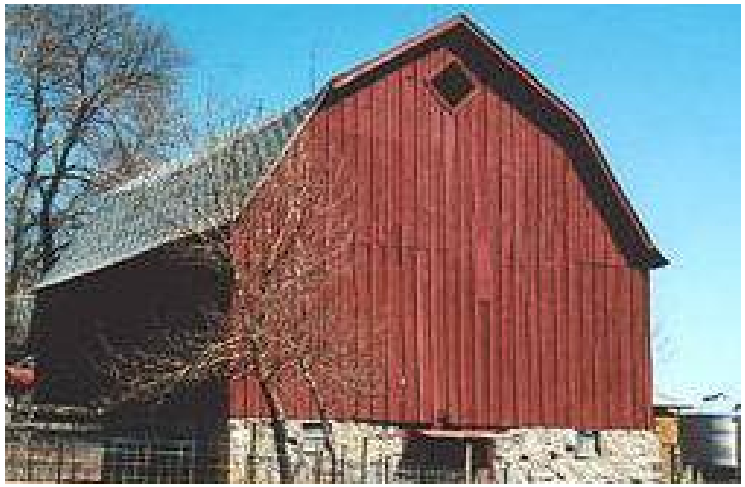
Road Condition: Excellent PCI: 91 - 100

Treatments: Minimal to None

Service Cost: Minimal to None

Inventory Trend: Severe Decrease





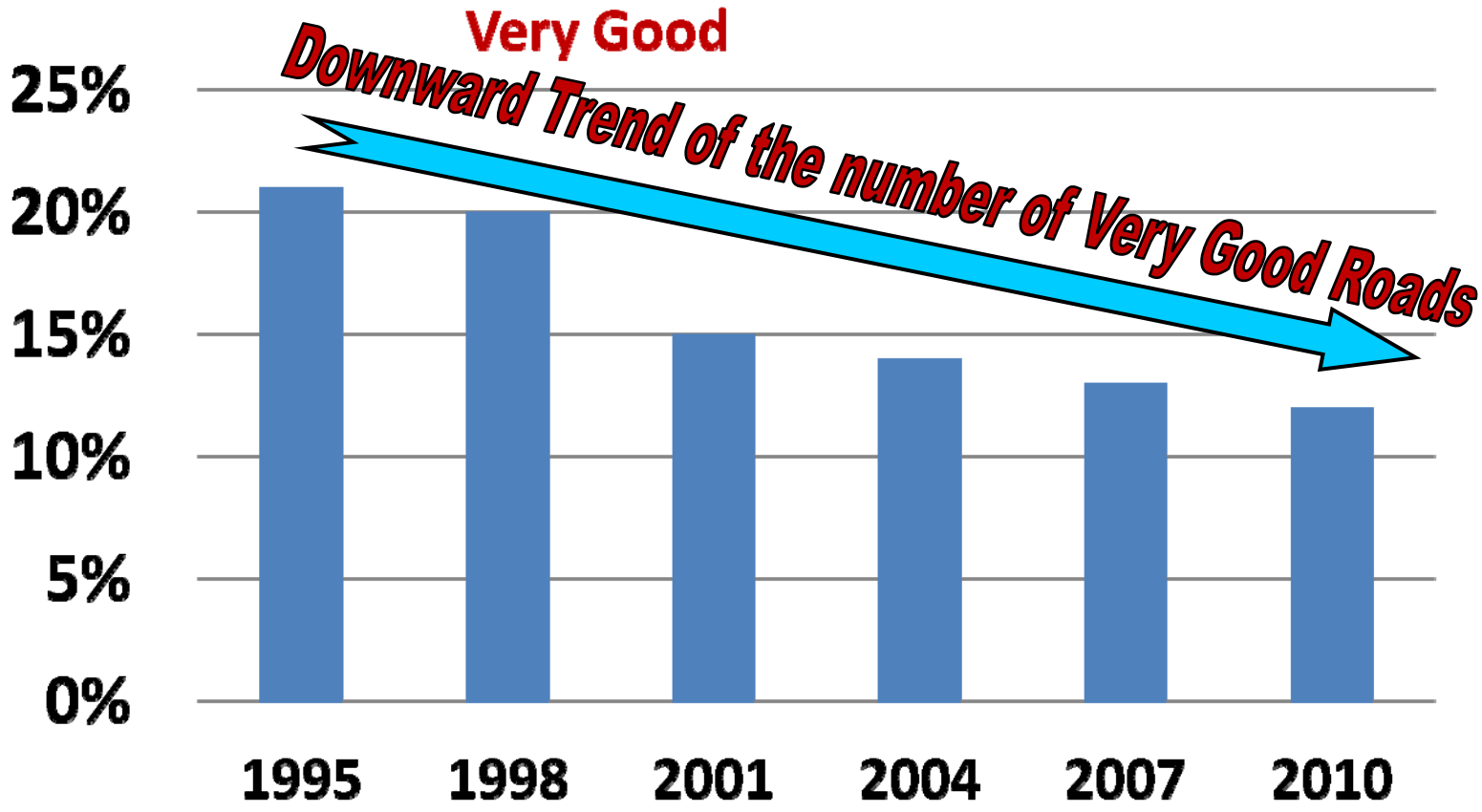
Minor Repairs

Road Condition: Very Good PCI: 80 - 89

Treatments: Seals & Patching

Service Cost: $1/Sq Yd

Inventory Trend: Slight Decrease



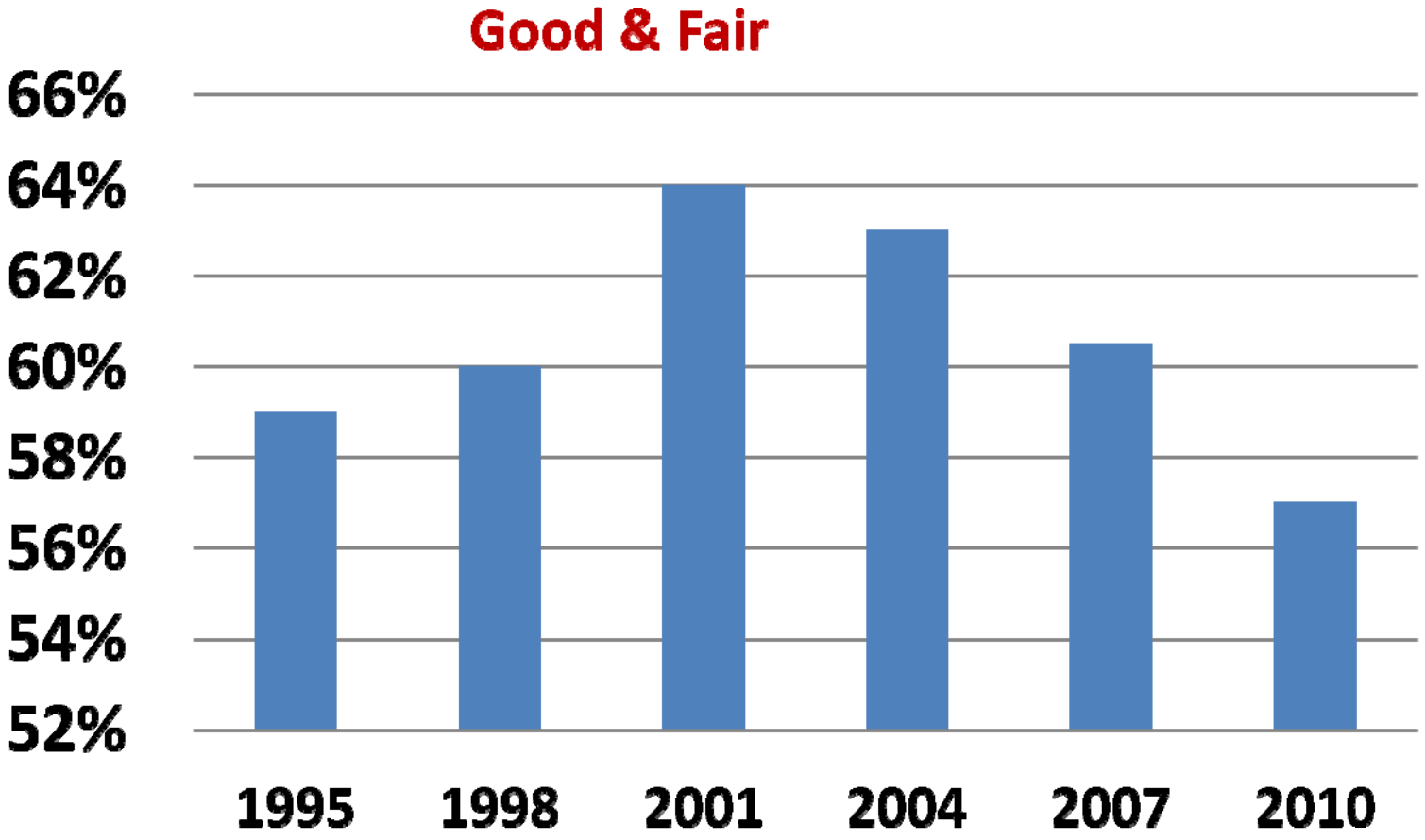
Major Repairs

Road Condition: Good-Fair PCI: 55 - 79

Treatments: Overlays

Service Cost: $7/Sq Yd

Inventory Trend: Flat – moving downward



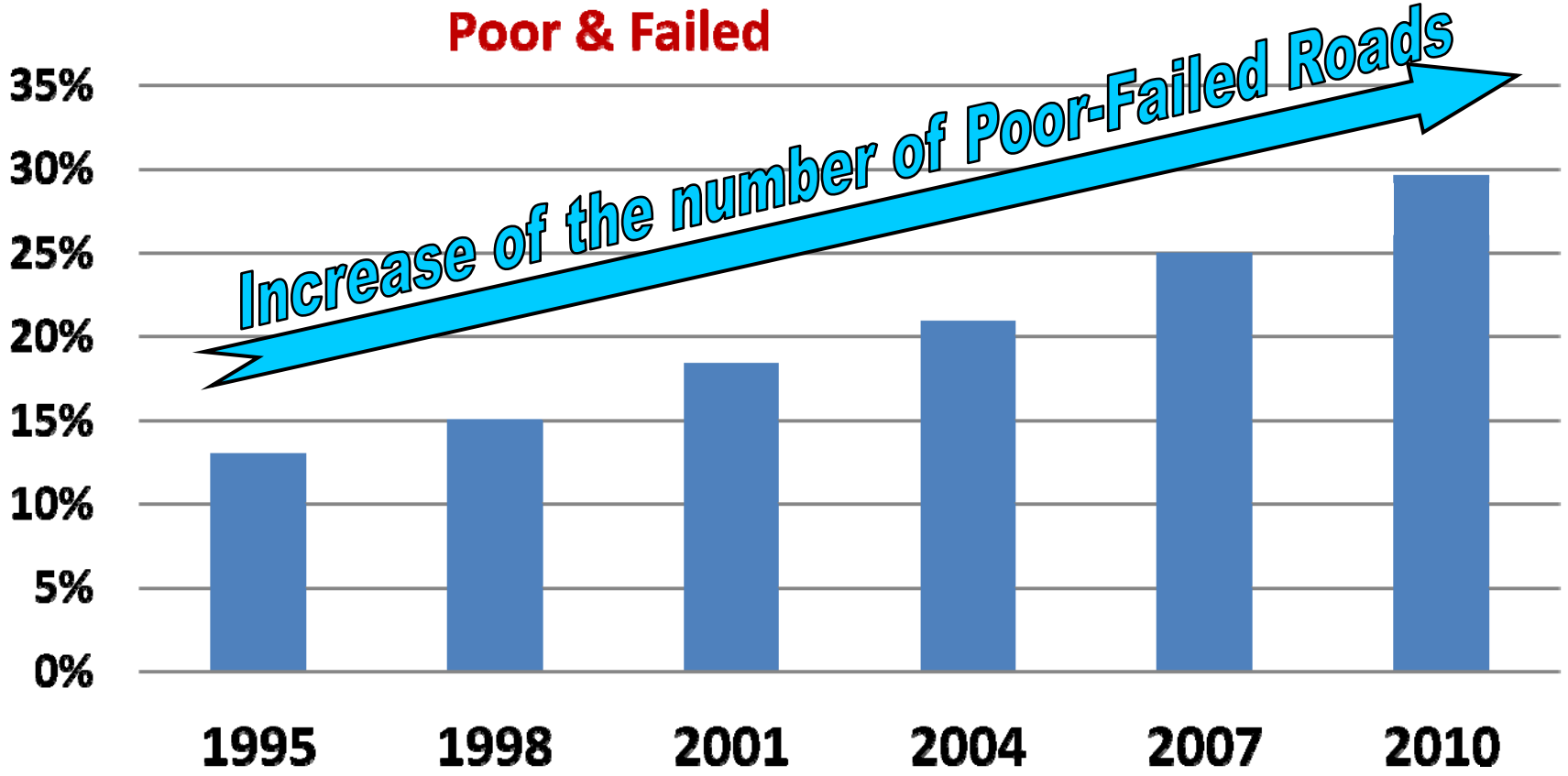
Time to Rebuild!

Road Condition: **Poor-Failed** **PCI: O - 54**

Treatments: Generally Reconstructions

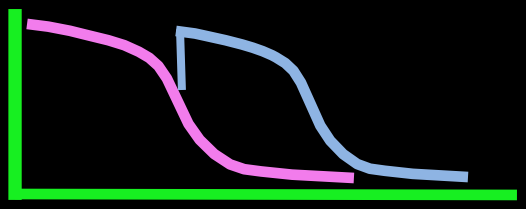
Service Cost: $25/Sq Yd

Inventory Trend: Increase

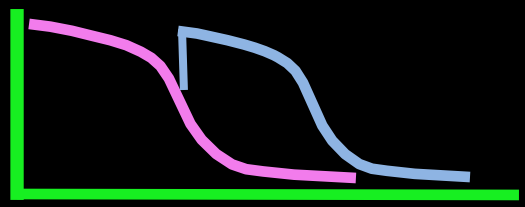


You shouldn't be remodeling the kitchen

if the roof is leaking!

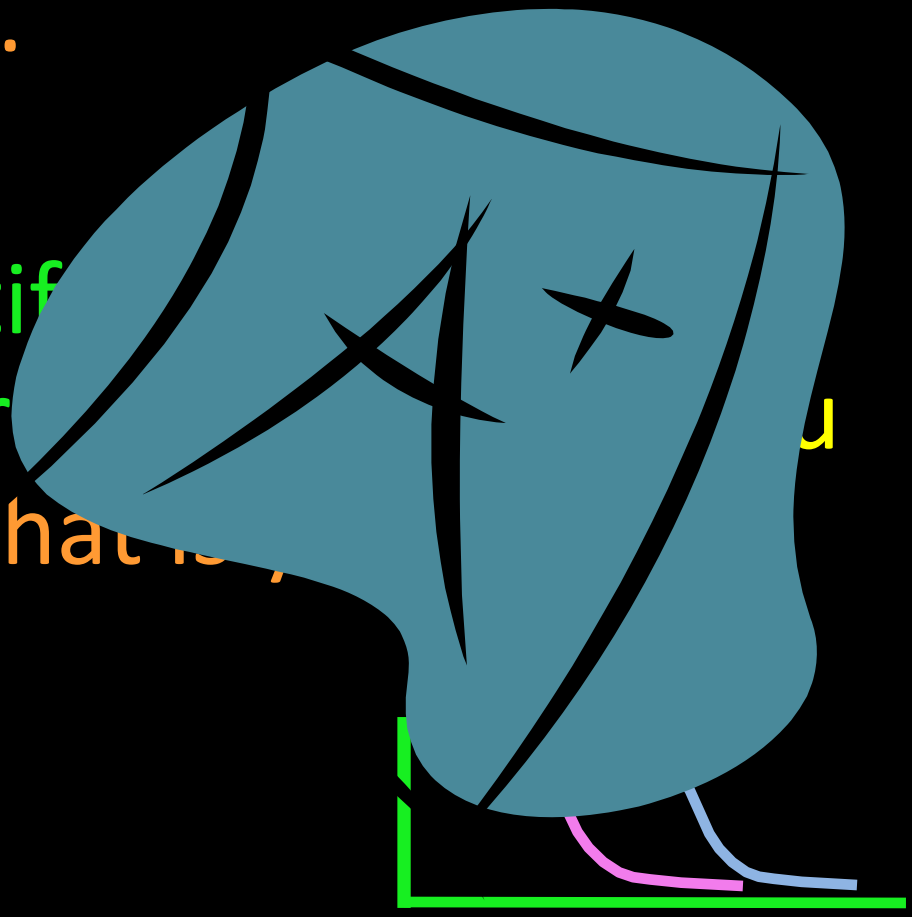


Understand Changes



Your Network PCI is only a Snapshot in time of how your system is performing – just like your child's report card grade.

What is key is identif
change as it occur u
can respond to - that is
homework.

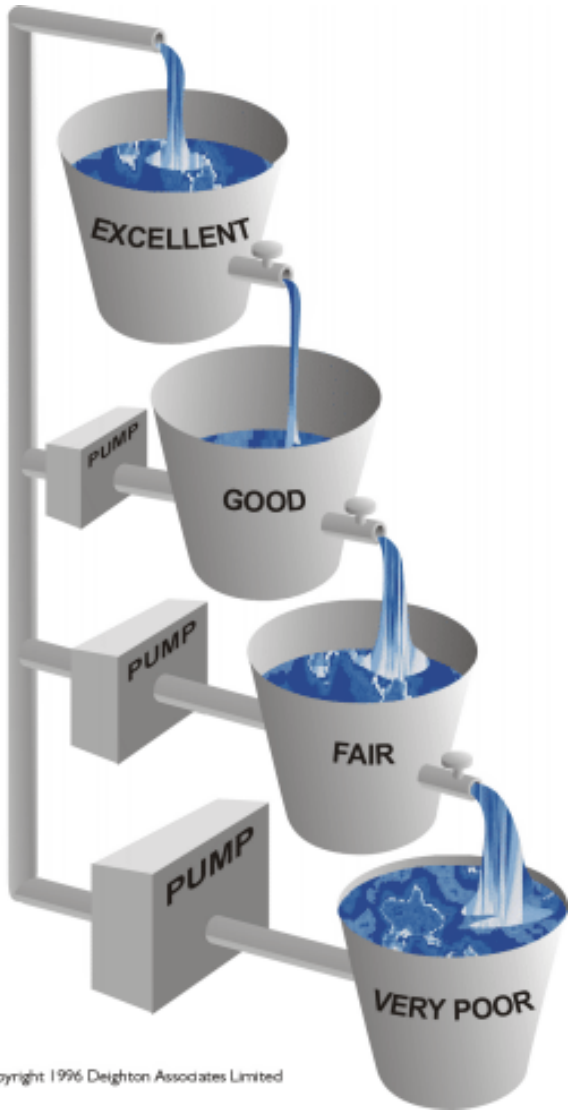


An Analogy

Seal =
$1 / sq yd

Overlay =
$7 / sq yd

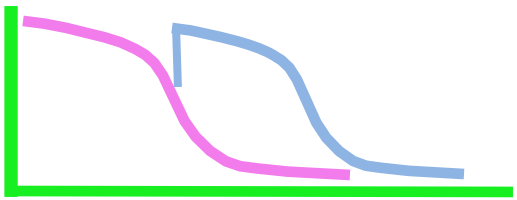
Reconstruct =
$25 / sq yd



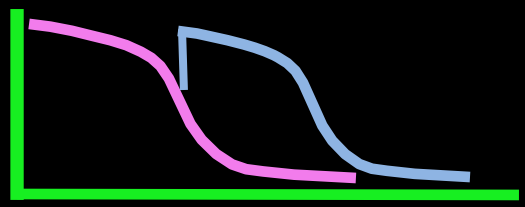
Process is continuous and inevitable

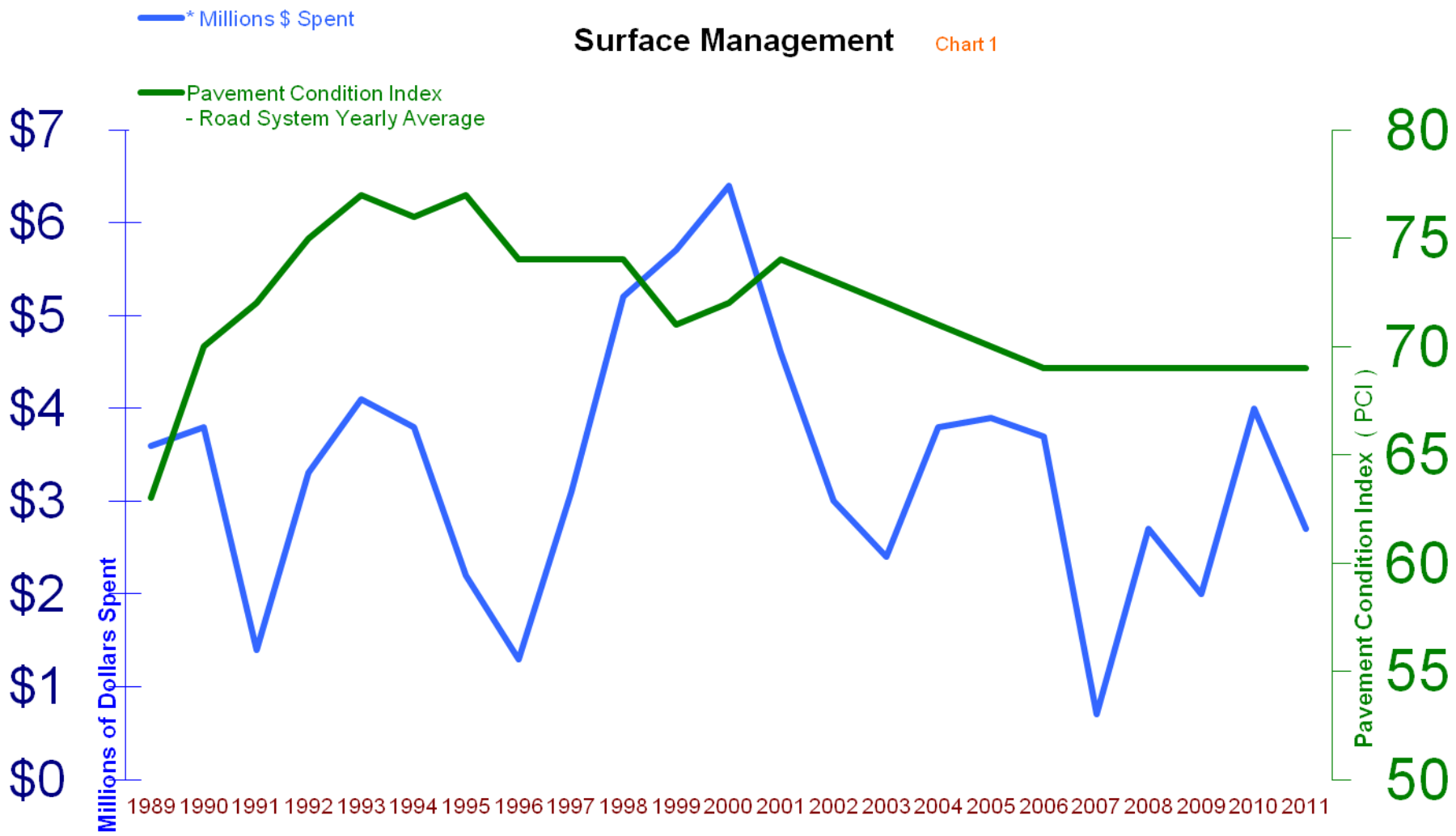
The rate of water flow increases as condition decreases

The effort to pump water increases with decreasing condition



When you can,
tie your
Pavement
Performance
Data to $



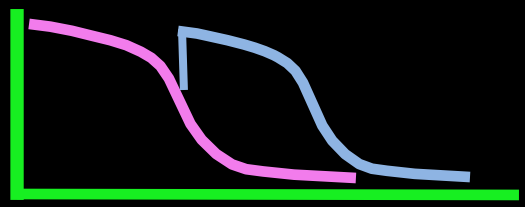


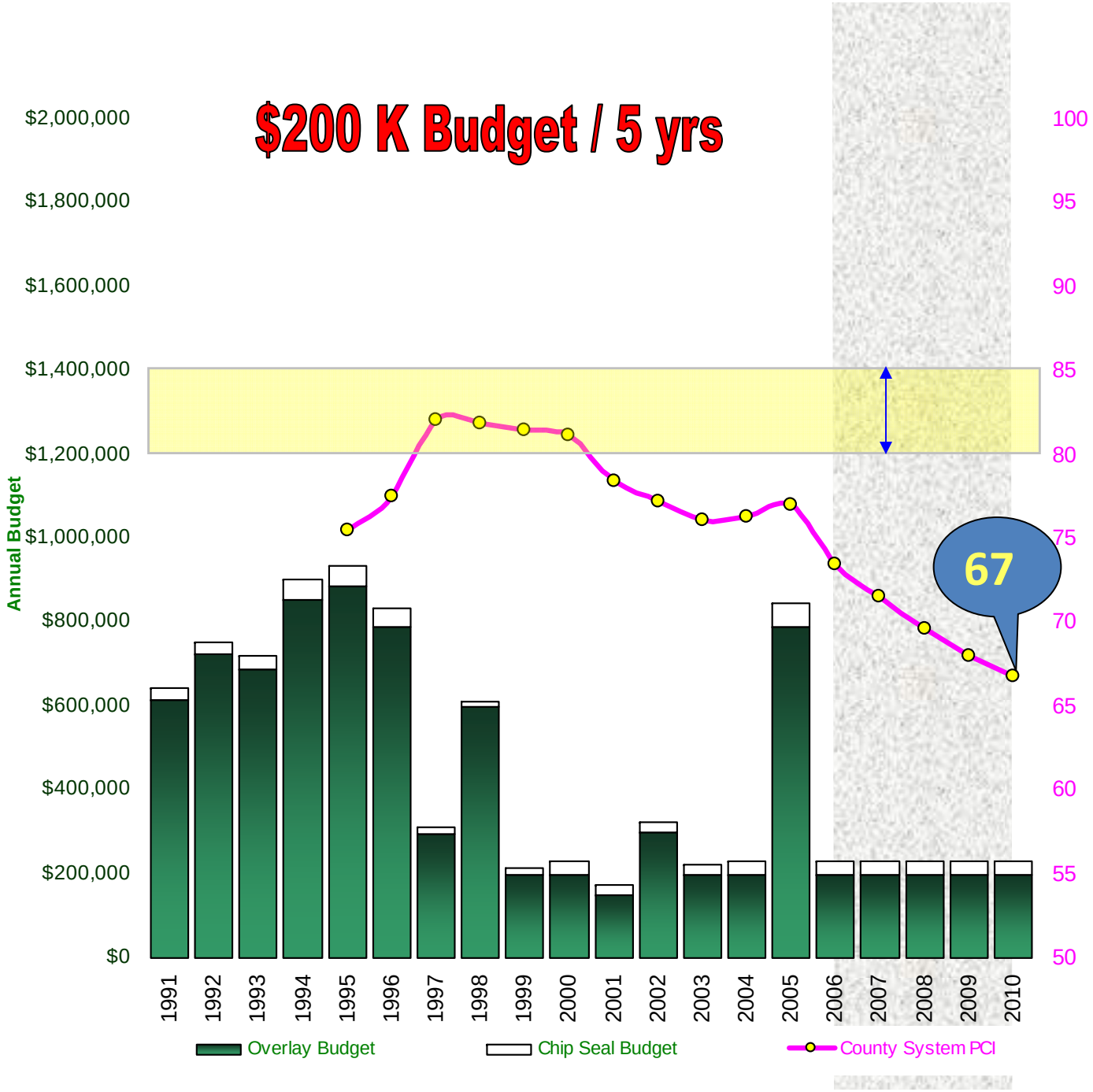
Link your data to $

What will our money buy?

Modeling:

Predicting the Future Performance





Overlay Budgets

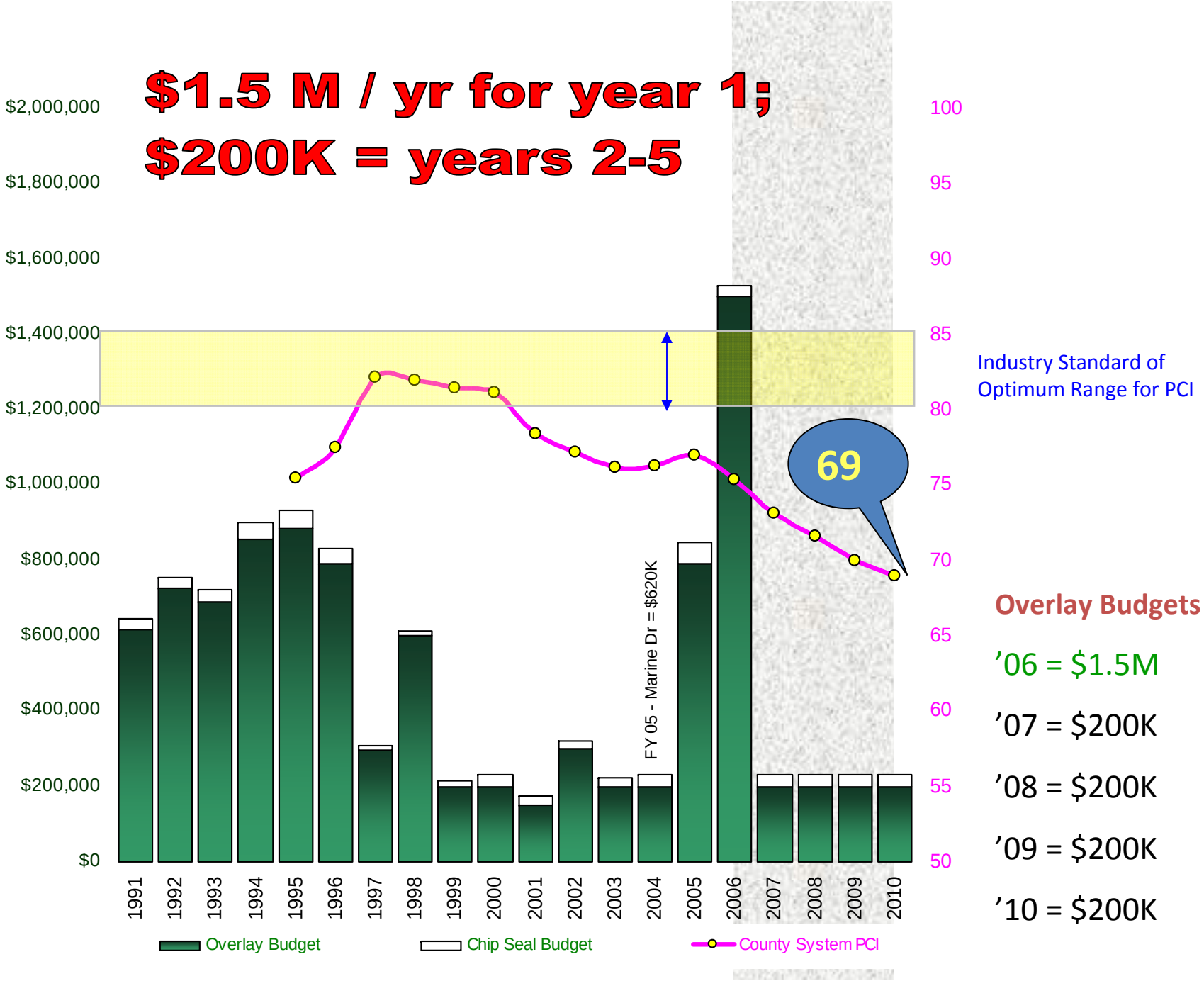
’06 = $200K

’07 = $200K

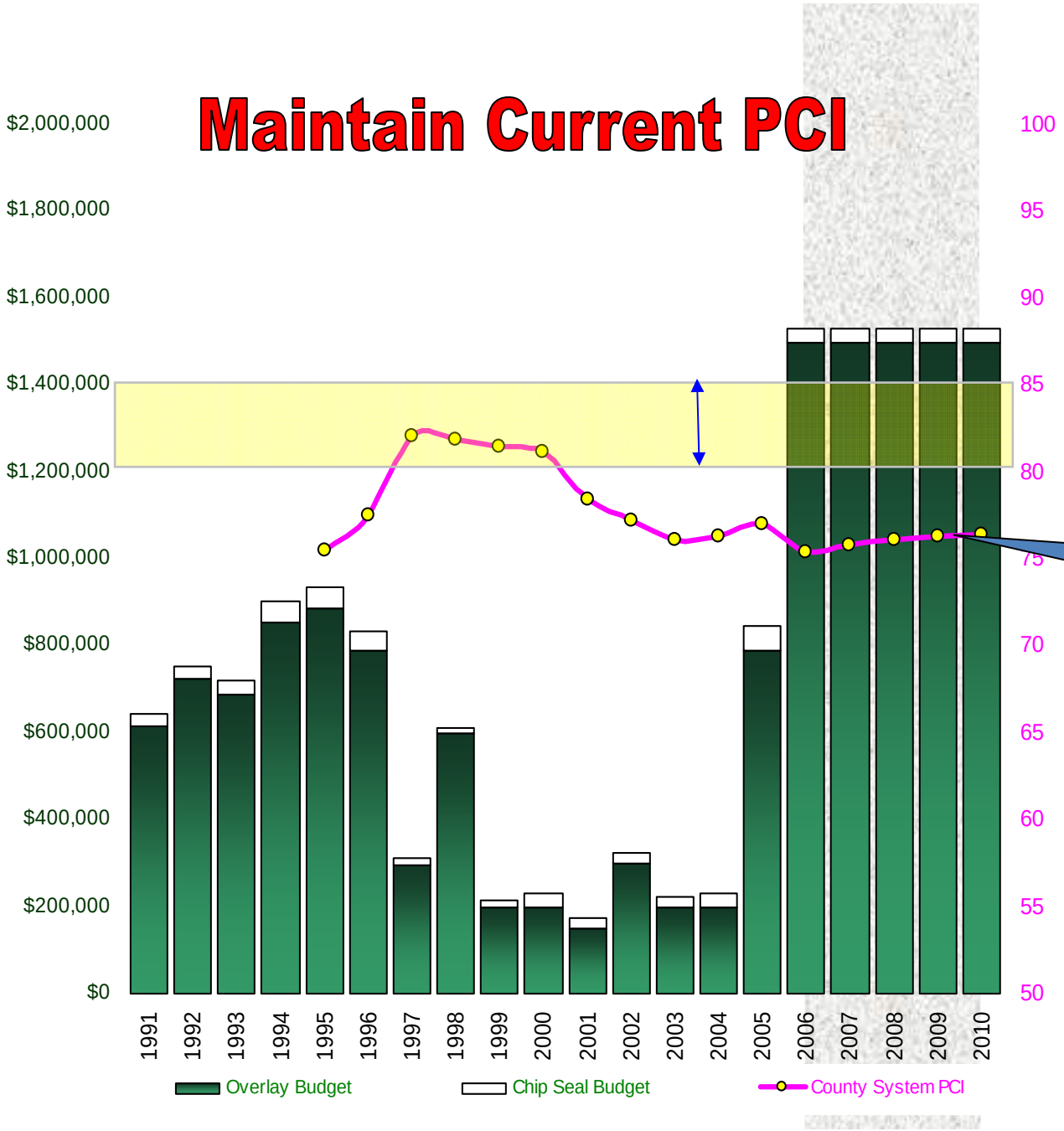
’08 = $200K

’09 = $200K

’10 = $200K


$1.5 M / yr for year 1;
$200K = years 2-5
$2,000,000
$1,800,000
$1,600,000
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$0
100
95
90
85
80
75
70
65
60
55
50
69
FY 05 - Marine Dr = $620K
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Overlay Budget
Chip Seal Budget
County System PCI
Industry Standard of
Optimum Range for PCI
Overlay Budgets
’06 = $1.5M
’07 = $200K
’08 = $200K
’09 = $200K
’10 = $200K

Maintain Current PCI



Overlay Budgets

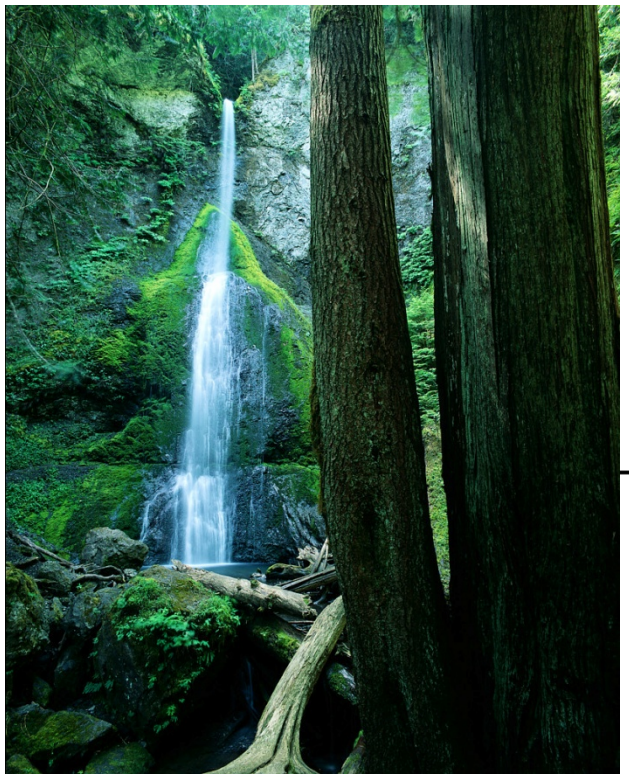
’06 = $1.5M

’07 = $1.5M

’08 = $1.5M

’09 = $1.5M

’10 = $1.5M



Industry Standard: PCI 80-85

History

$2.1 M (5 yrs) then $1.9 M (15 yrs)

$1 M / Year

$200 K / Year

No Treatments

Excellent

Very Good

Good to Fair

Poor to Failed

100

90

80

70

60

50

40

30

20

Pavement Condition Index (PCI)

1995

2000

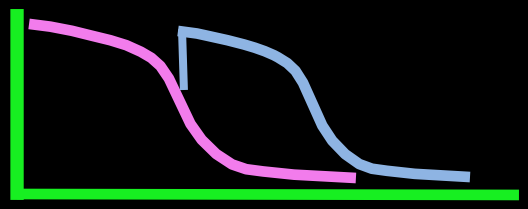
2005

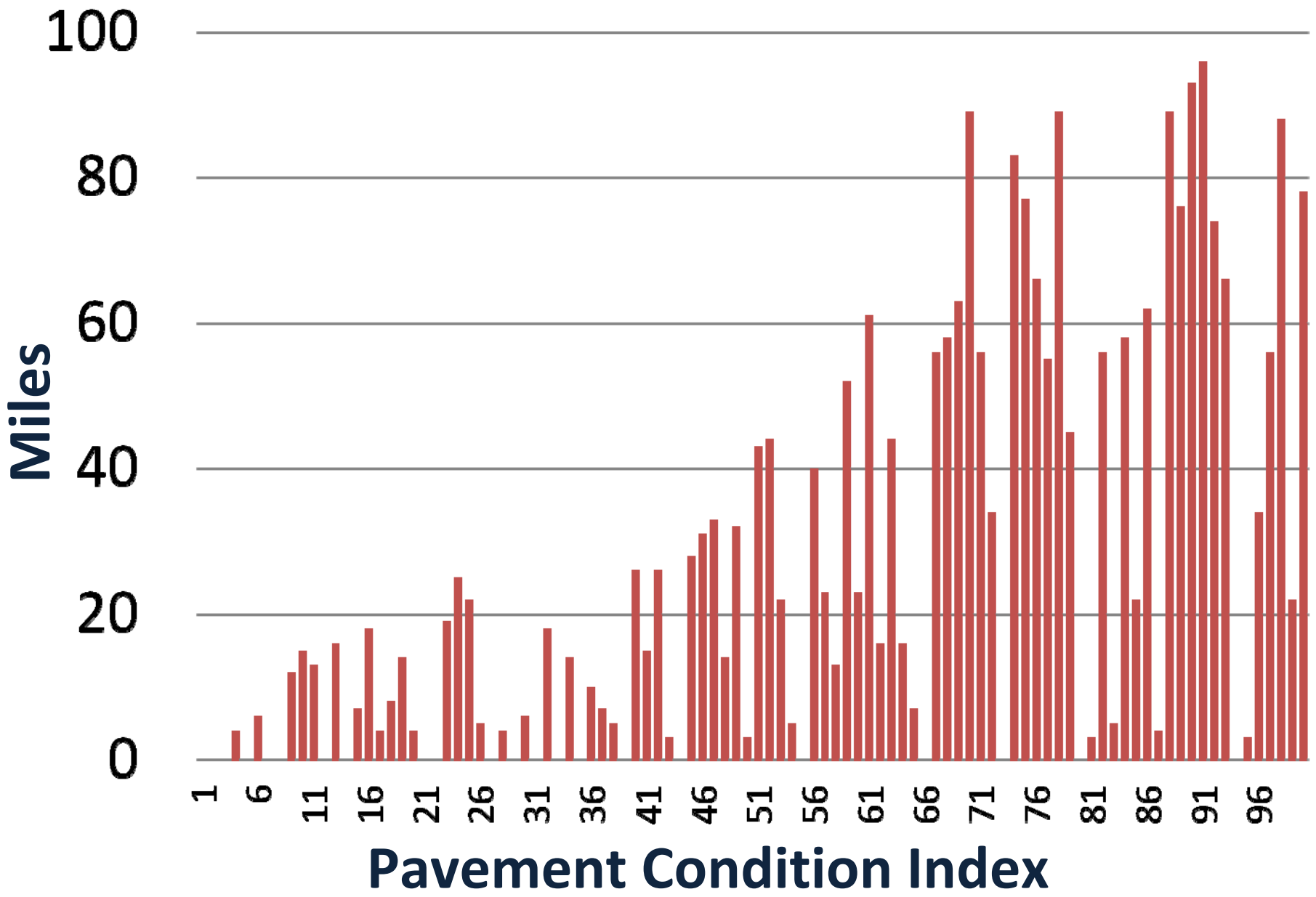
2010

2015

2020

Modeling: Overall Impacts of Treatment Choices

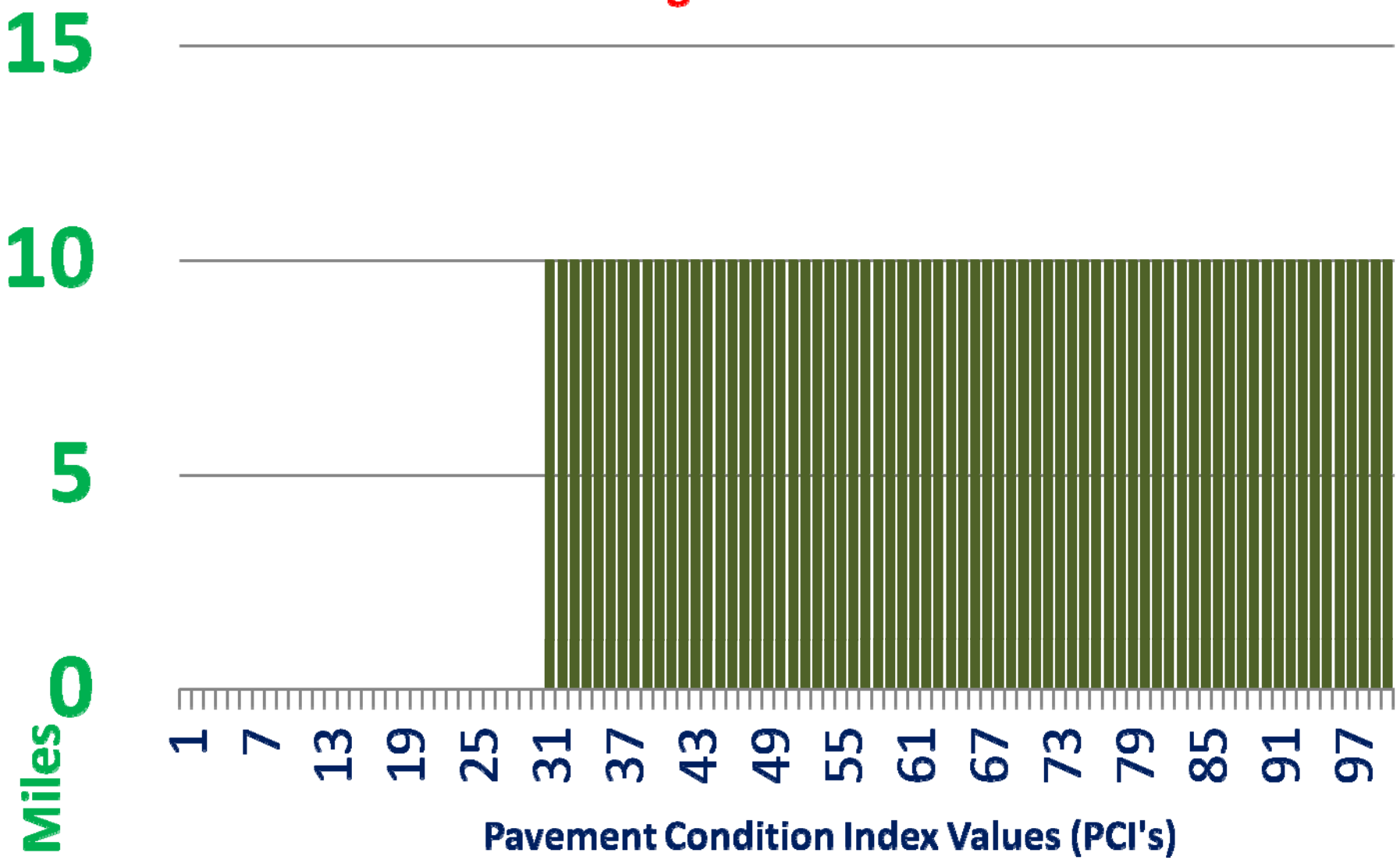



100
80
60
40
20
0
Miles
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96
Pavement Condition Index

Untreated Road System

700-miles, 10-miles of each PCI value: 31-100

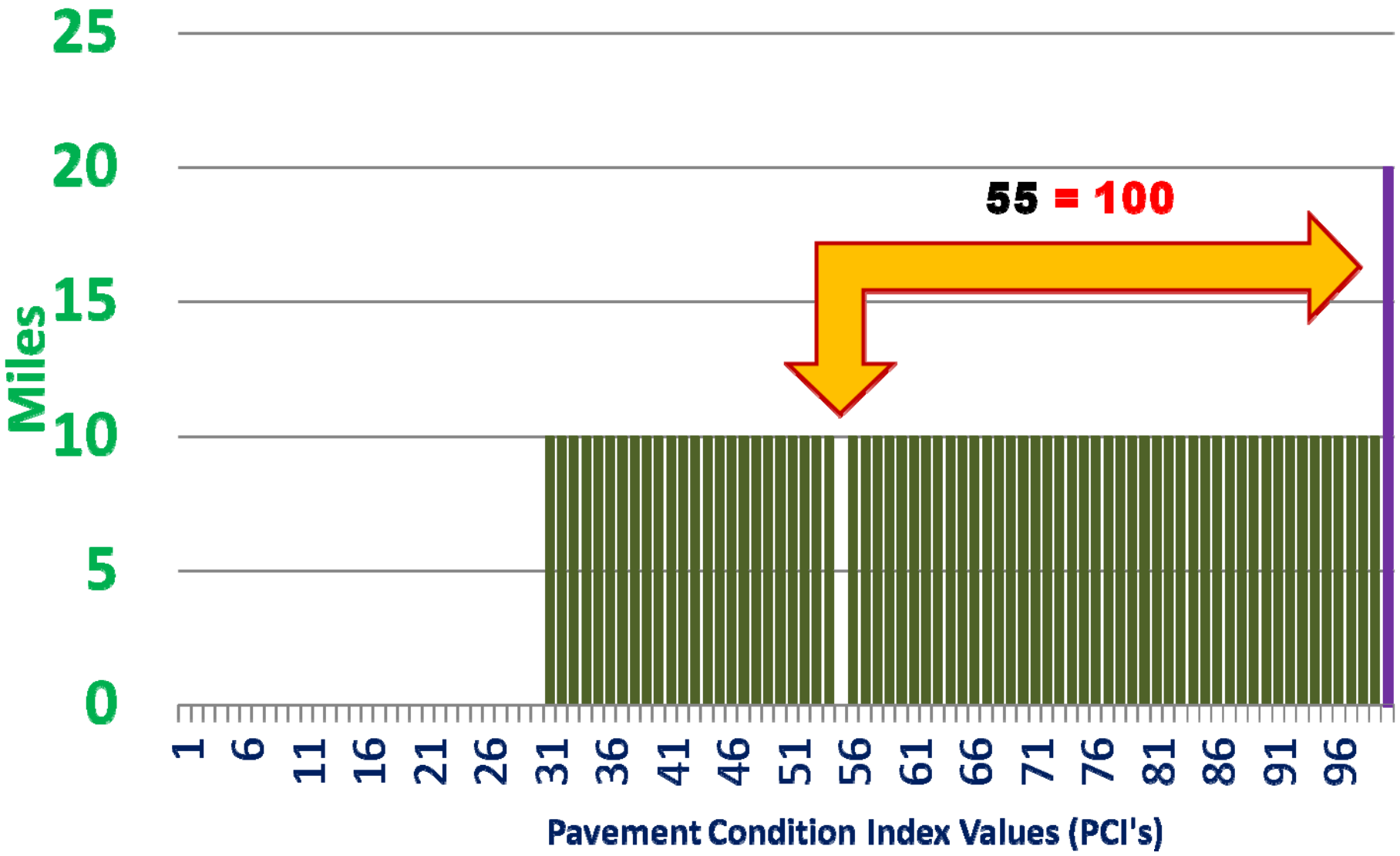
average PCI = 65.5



Treated Road System - Scenario #1: Asphalt Concrete Overlays - 2"

10-miles of PCI value: 55 (new 100 PCI) @ $180K/mile = $1.8M

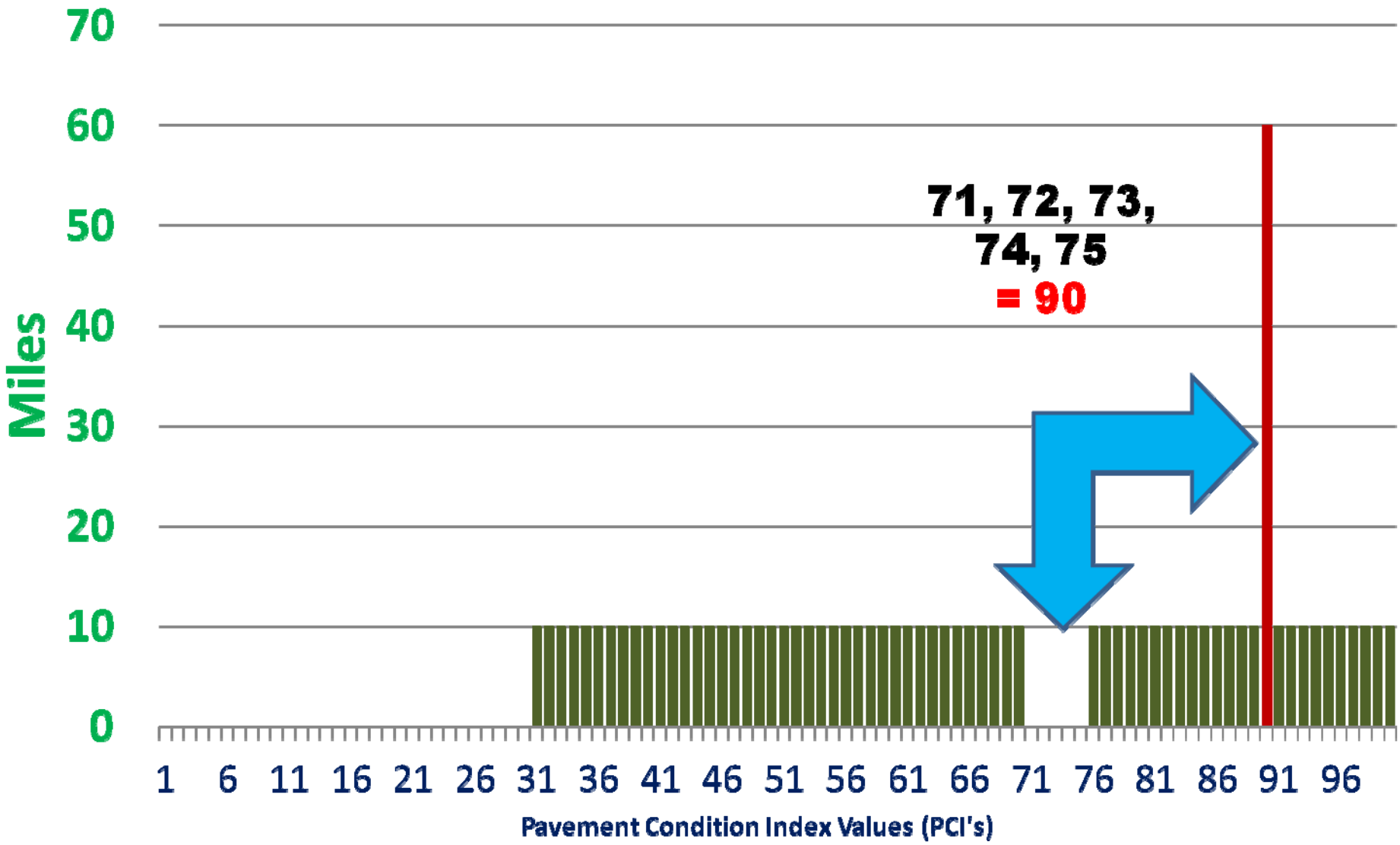
new average PCI = 66.14 + 0.64 increase



Treated Road System - Scenario #2: Chip Seals

50-miles of PCI values: 71-75 (new 90 PCI) @ $36K/mile = $1.8M

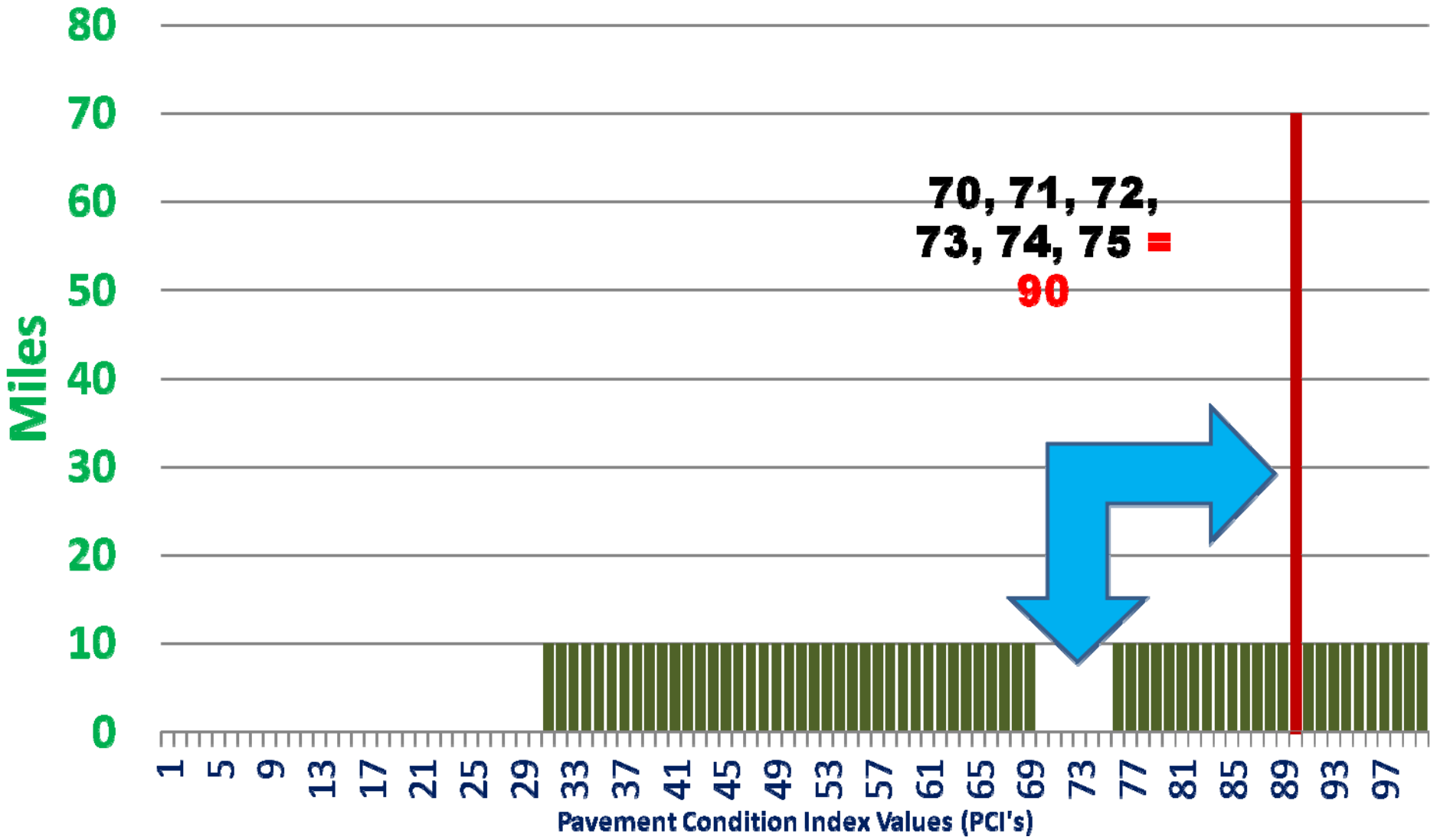
new average PCI = 66.71 + 1.21 increase 47% above AC Overlays

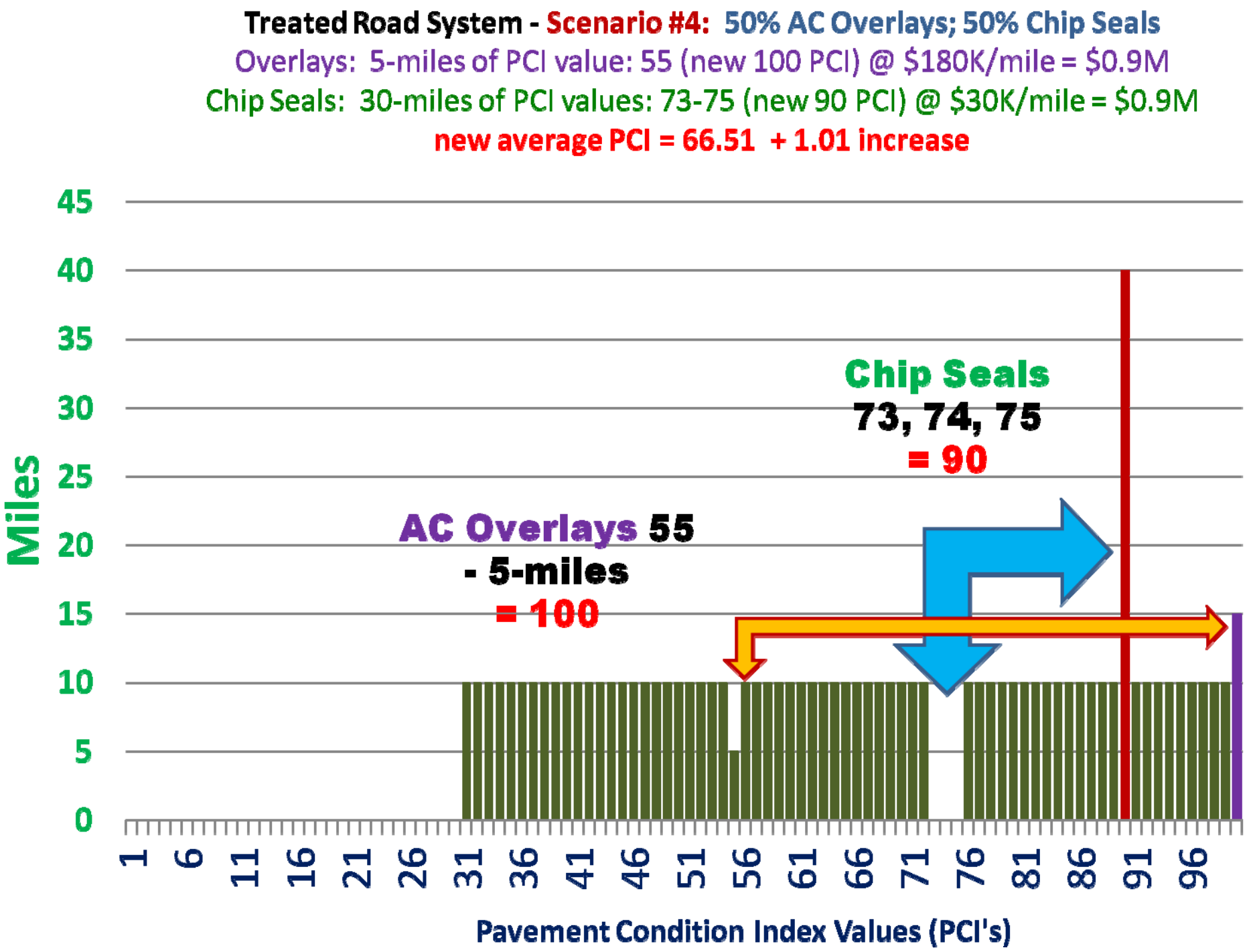


Treated Road System - Scenario #3: Chip Seals

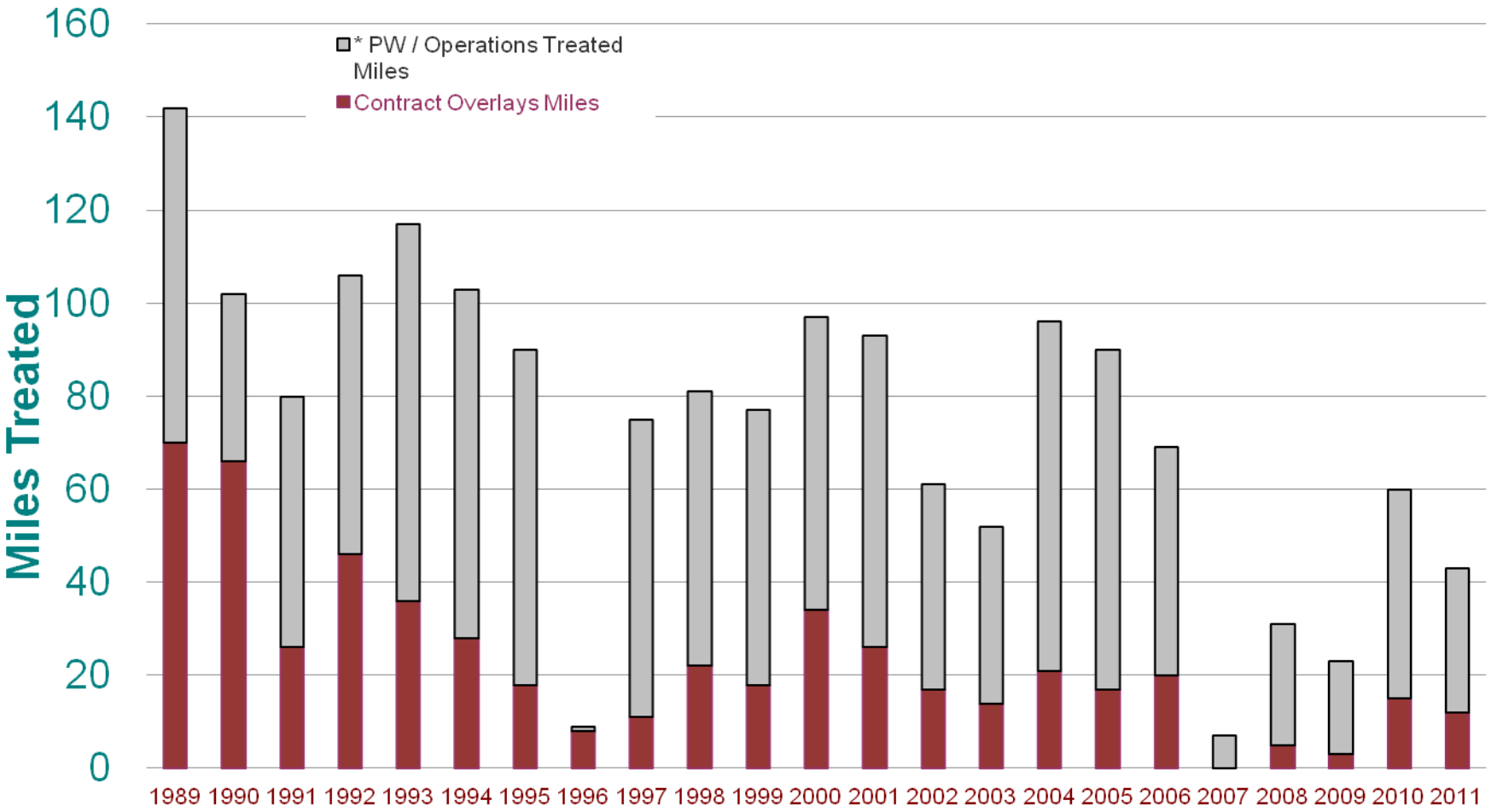
60-miles of PCI values: 70-75 (new 90 PCI) @ $30K/mile = $1.8M

new average PCI = 67 + 1.5 increase 57% above AC Overlays



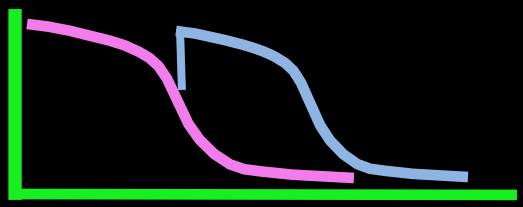

Treated Road System - Scenario #4: 50% AC Overlays; 50% Chip Seals
Overlays: 5-miles of PCI value: 55 (new 100 PCI) @ $180K/mile = $0.9M
Chip Seals: 30-miles of PCI values: 73-75 (new 90 PCI) @ $30K/mile = $0.9M
new average PCI = 66.51 + 1.01 increase
Chip Seals
73, 74, 75
= 90
AC Overlays 55
- 5-miles
= 100
Miles
45
40
35
30
25
20
15
10
5
0
1
6
11
16
21
26
31
36
41
46
51
56
61
66
71
76
81
86
91
96
Pavement Condition Index Values (PCI's)

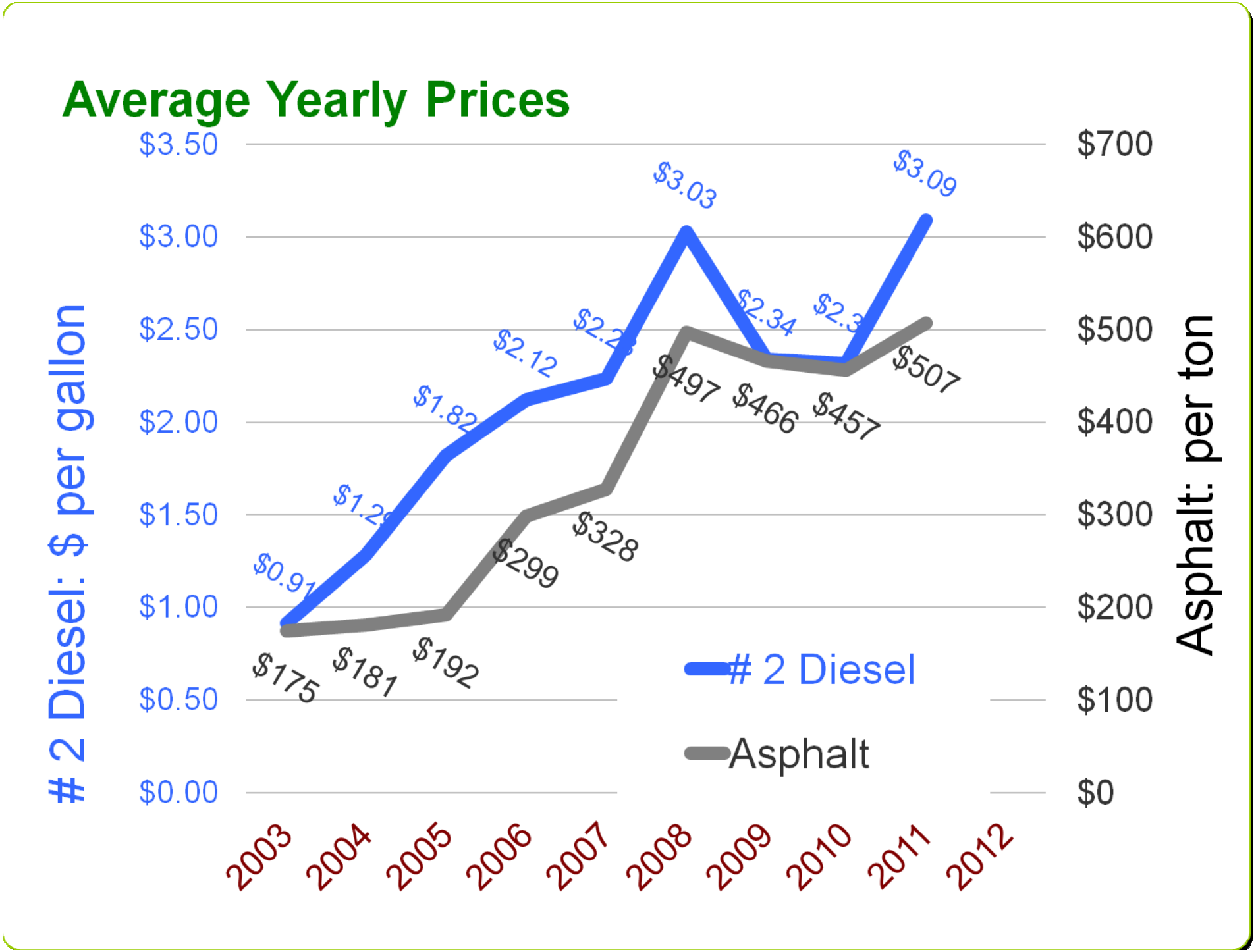
Contract Overlays & Public Works / Operations Preservation Treatments Chart 2



Multi-year Treatment Planning

Do you know what roads are candidates for treatments 4-years from now?




Average Yearly Prices
2 Diesel: $ per gallon
Asphalt: per ton
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
$700
$600
$500
$400
$300
$200
$100
$0
$0.91
$1.29
$1.82
$2.12
$2.22
$3.03
$2.34
$2.3
$3.09
$175
$181
$192
$299
$328
$497
$466
$457
$507
2 Diesel
Asphalt
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

Monthly Prices
2 Diesel
Paving Seasons
Asphalt
#2 Diesel: $ per gallon
Asphalt: $ per ton
$4.00
$3.50
$3.00
$2.50
$2.00
$1.50
$1.00
$0.50
$0.00
$800
$700
$600
$500
$400
$300
$200
$100
$0
2 Diesel, $1.24
2 Diesel, $0.77
Asphalt, $168
2 Diesel, $2.55
Asphalt, $315
2 Diesel, $3.92
Asphalt, $747
2 Diesel, $1.22
$3.50
$566
Paving Seasons
Jan-03
Apr-03
Jul-03
Oct-03
Jan-04
Apr-04
Jul-04
Oct-04
Jan-05
Apr-05
Jul-05
Oct-05
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Apr-10
Jul-10
Oct-10
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12

Modeling:

Long-term Real Costs

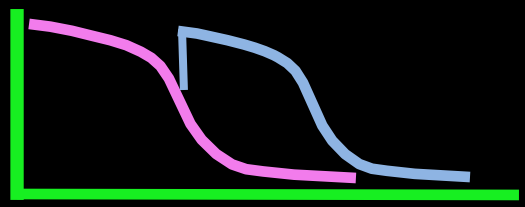
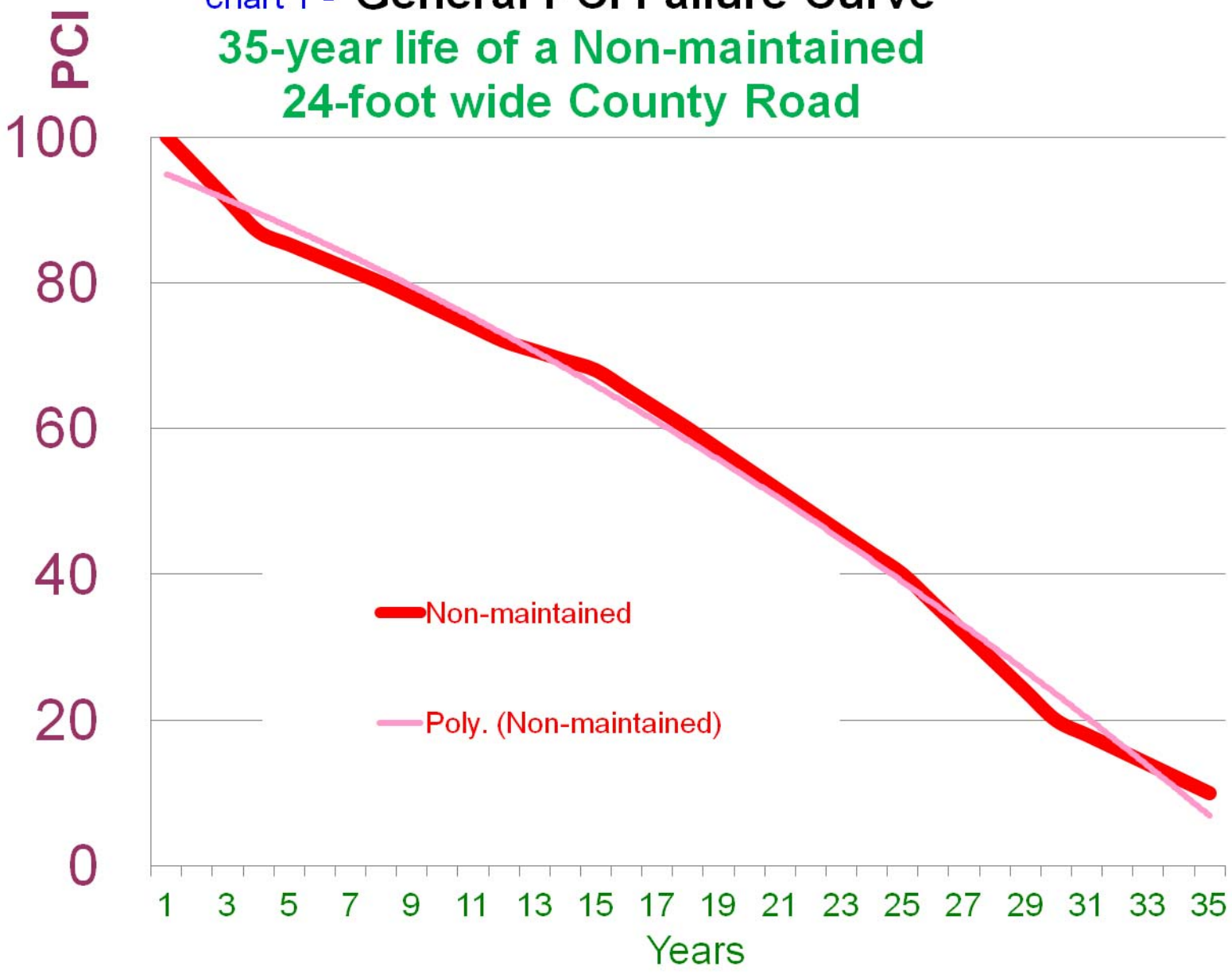


chart 1 - **General PCI Failure Curve**

35-year life of a Non-maintained
24-foot wide County Road



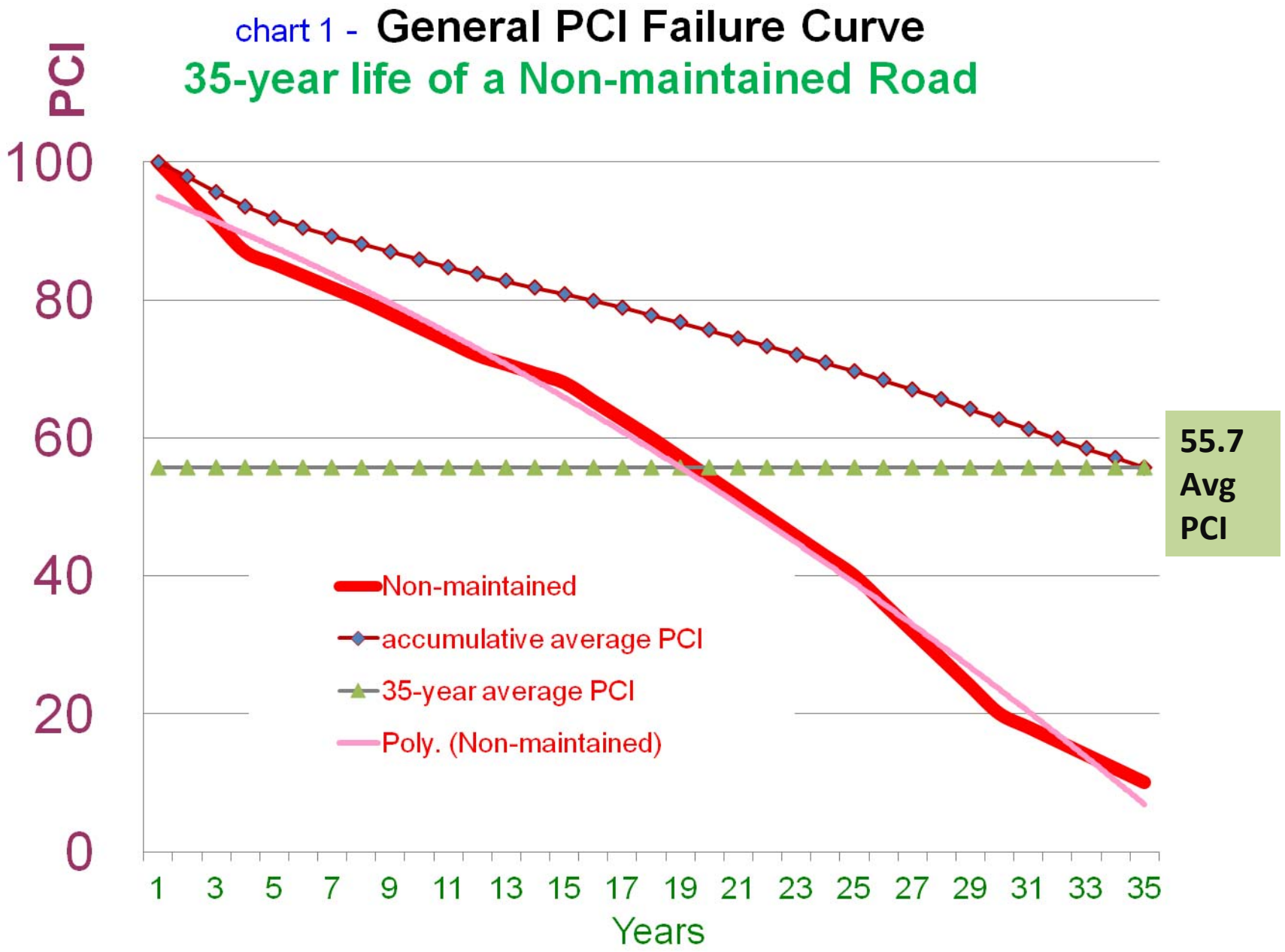


chart 1 - General PCI Failure Curve
35-year life of a Non-maintained Road
PCI
100
80
60
40
20
0
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35
Years
Non-maintained
accumulative average PCI
35-year average PCI
Poly. (Non-maintained)
55.7
Avg
PCI

chart 2 - **PCI over time - 75 years**

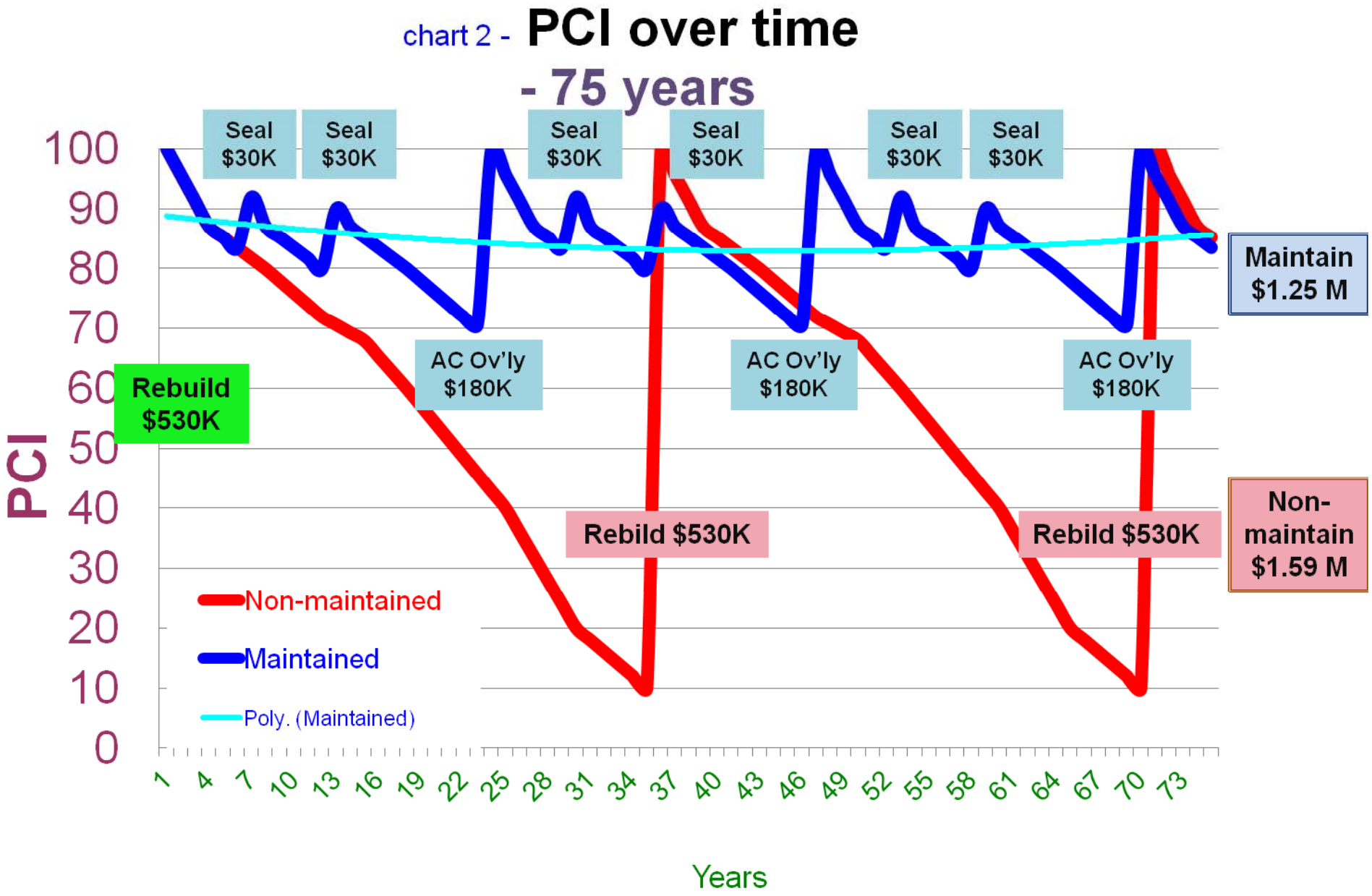


chart 2 - PCI over time
- 75 years
Seal $30K
Seal $30K
Seal $30K
Seal $30K
Seal $30K
Seal $30K
Rebuild $530K
AC Ov'ly $180K
AC Ov'ly $180K
AC Ov'ly $180K
Rebild $530K
Rebild $530K
Maintain $1.25 M
Non-maintain $1.59 M
Non-maintained
Maintained
Poly. (Maintained)
PCI
Years
100
90
80
70
60
50
40
30
20
10
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73

chart 2 - **PCI over time - 75 years**

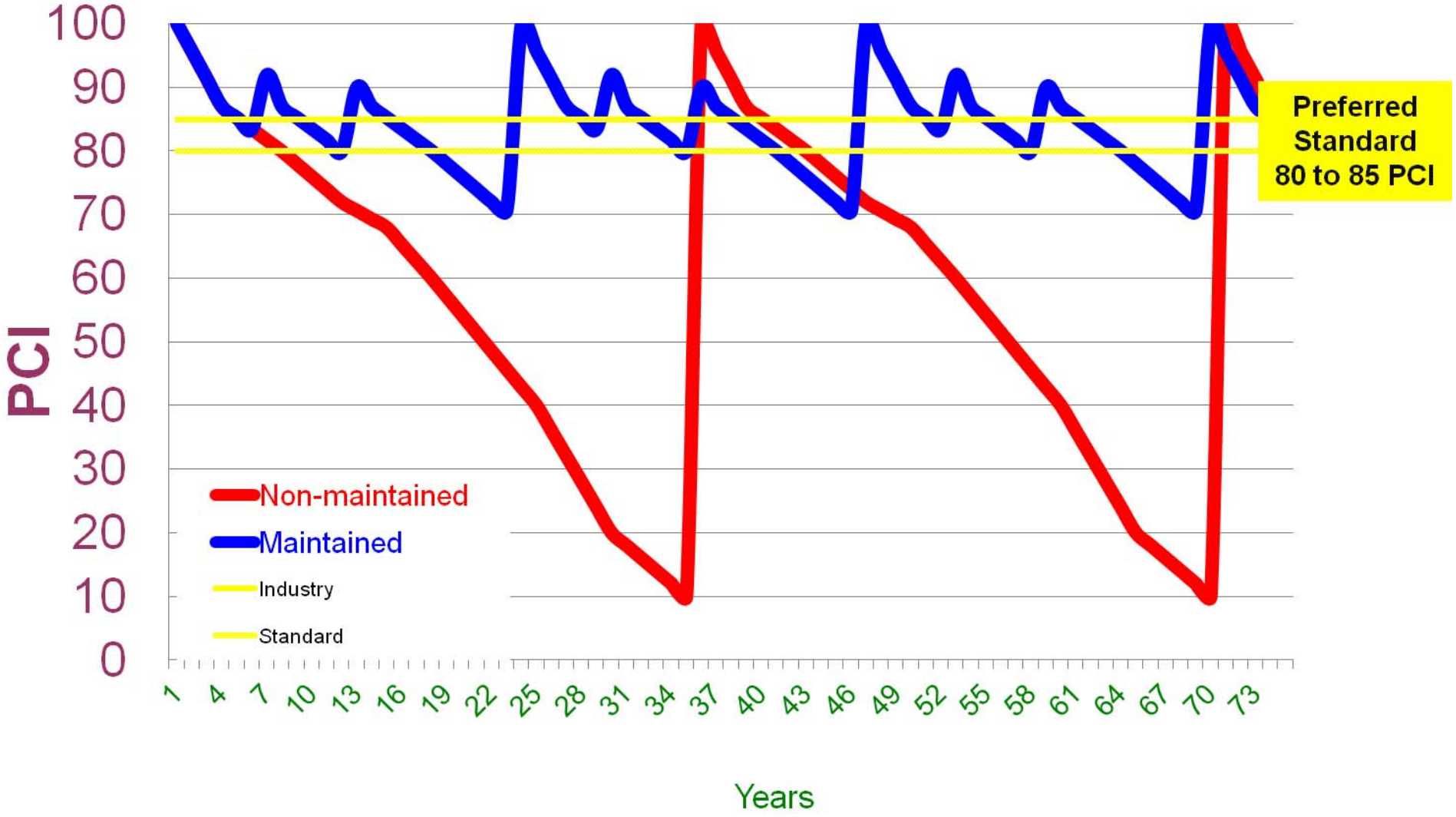
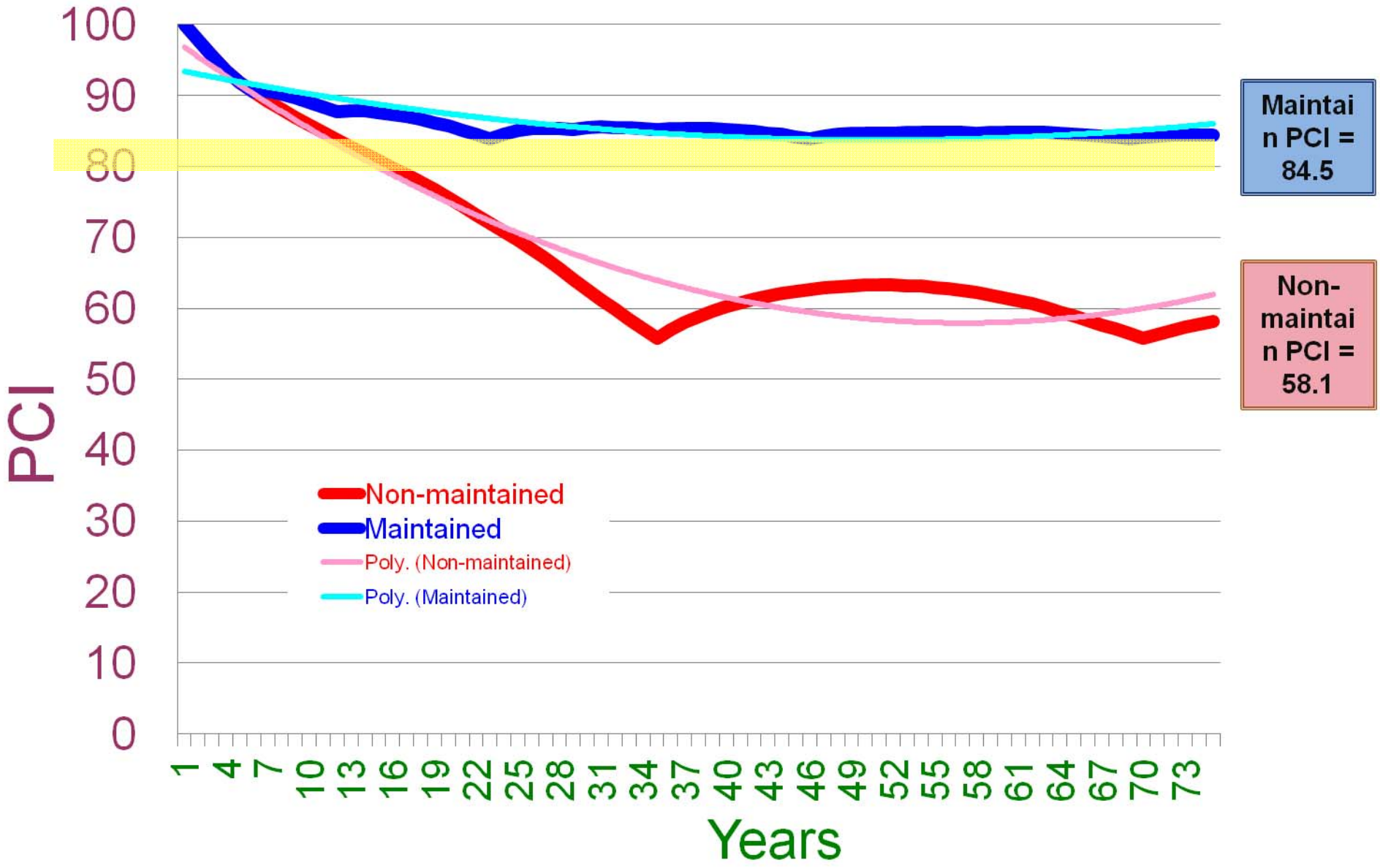


chart 3 - **Average PCI over time**



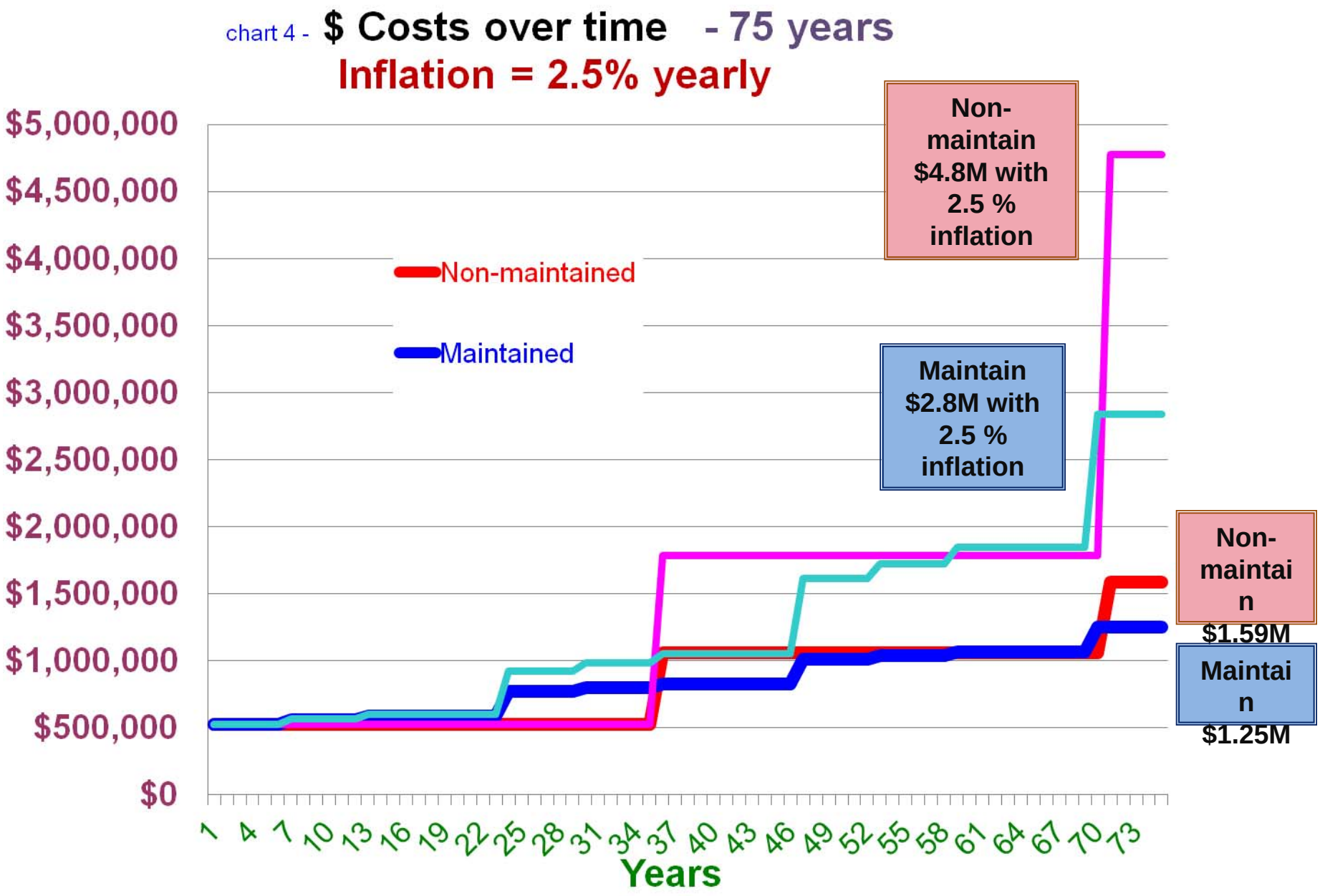


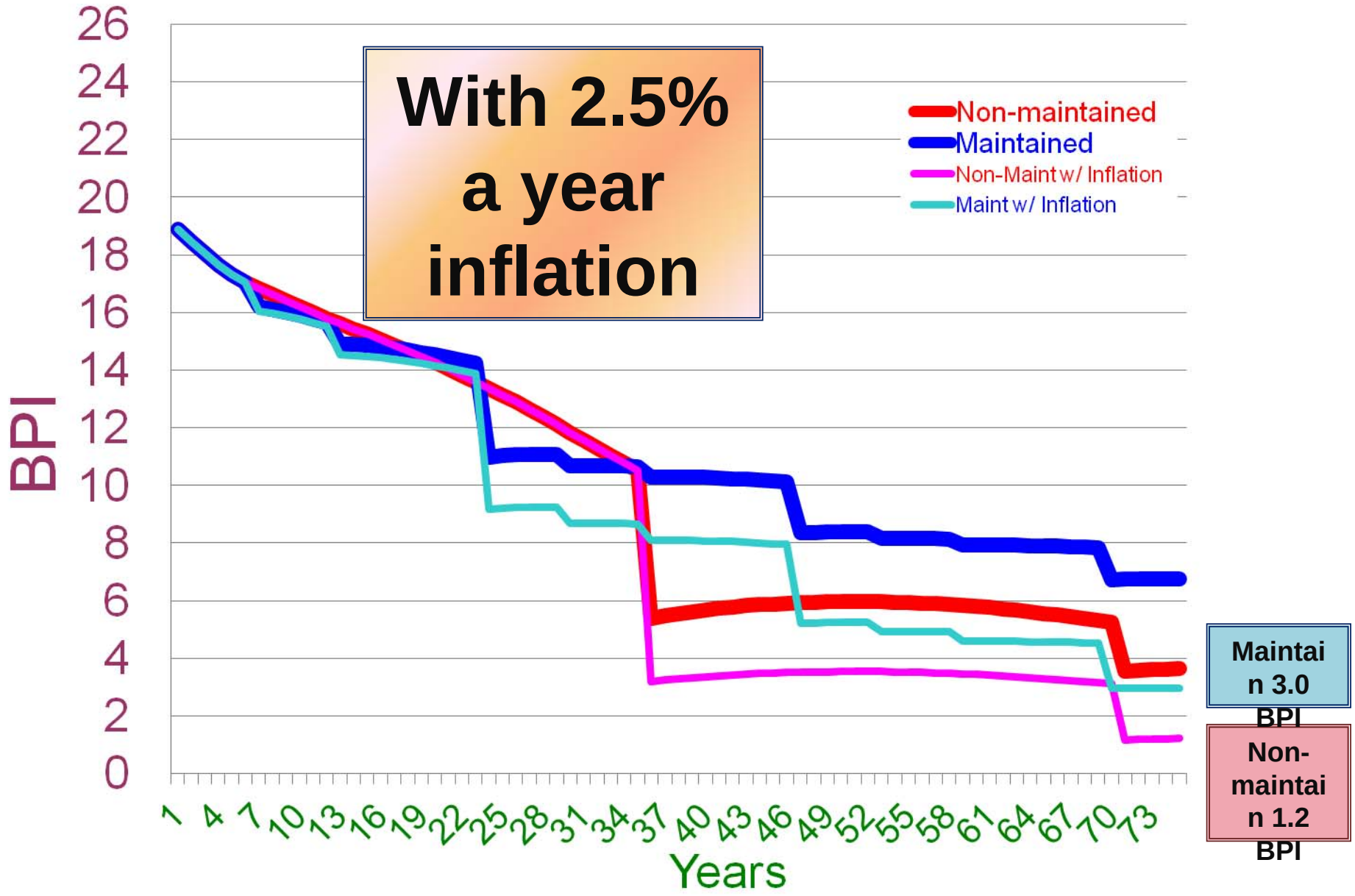
chart 4 - $ Costs over time - 75 years
Inflation = 2.5% yearly
$5,000,000
$4,500,000
$4,000,000
$3,500,000
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$0
Non-maintained
Maintained
Non-maintain $4.8M with 2.5 % inflation
Maintain $2.8M with 2.5 % inflation
Non-maintain $1.59M
Maintain $1.25M
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73
Years

chart 5 - **Buying Power Index** (BPI) = PCI per $ spent

(Accumulative PCI / Accumulative $ spent / $100,00) = BPI

chart 5c - **Buying Power Index** (BPI) = PCI per $ spent

(Accumulative PCI / Accumulative $ spent / $100,00) = BPI



In Summary

	Non Maintained	Maintained	Difference	%
$ spent	$1,590,000	$1,250,000	$340,000	27%
$ spent w/o Cap	$1,060,000	$720,000	$340,000	47%
PCI	58.1	84.5	26.3	45%
$ spent w/ inflate	$4,772,813	$2,838,868	$1,933,945	68%
$ spent w/ inflate w/o Cap	$4,242,813	$2,308,868	$1,933,945	84%
BPI	3.7	6.8	3.1	85%
BPI w/inflate	1.2	3.0	1.8	144%

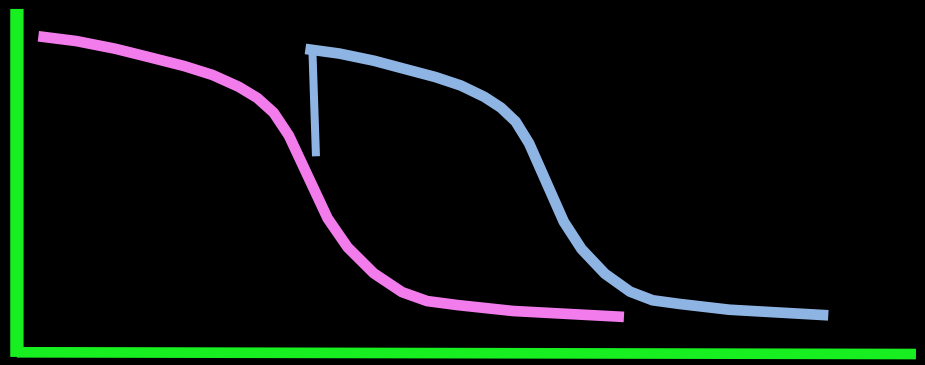
Budget X *Percentage %* Efficiencies

Management, Workmanship

= Performance

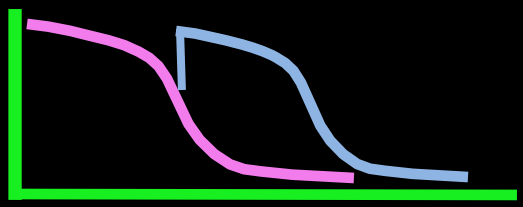
PCI, Remove Risks / Hazards

The True Value of Pavement Preservation



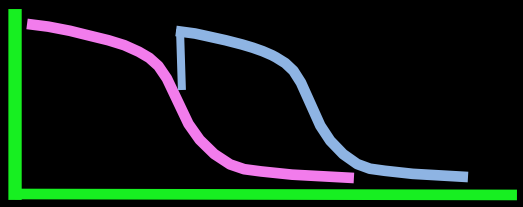
The True Value of Pavement Preservation

- reserve the ublic's



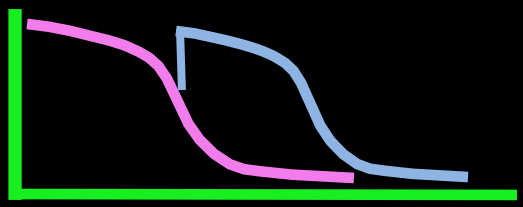
The True Value of Pavement Preservation

3. Understanding Your Road System, It's Changes and What To Do Next

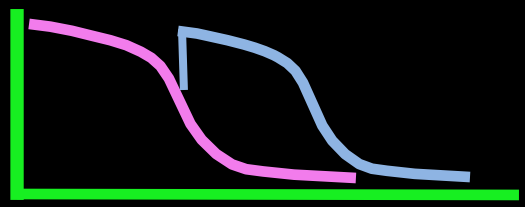


The True Value of Pavement Preservation

4. Applying the correct pavement treatment at the correct location at the correct time.



The True Value of Pavement Preservation



City of Portland
The City That Works
Call 823-4000
BG-210B
BARBER-GREENE