OMAINTEC
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EXHIBITION
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**Pavement Management Systems
Lessons Learned
And
Key Considerations**

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Lessons Learned

The slides that follow were developed from Lessons Learned… some the hard way… from previous PMS implementations

<u>Communications</u>

The PMS project starts with communications between the PMS consultant and the client

It is important for the PMS consultant to understand the client's needs and desires

It is important for the client to understand the components of a PMS system and what the PMS consultant plans to do to meet their needs

Each PMS project is unique

Pavement Management System

A Pavement Management System (PMS) is designed to provide objective information and useful data for analysis so that road managers can make more consistent, cost-effective, and defensible decisions related to the preservation of a pavement network.

While the PMS system does not make final decisions, it can provide the basis for an informed understanding of the possible consequences of alternative decisions.

A PMS does NOT make decisions, Managers DO!

Pavement Management System

It is important to emphasize that the PMS is

- A set of processes for collecting pavement information on the agency's pavement network

- Datasets of pavement inventory, condition, and treatment history that can be used to perform a variety of performance and economic analyses

- A basis for making consistent, cost-effective, and defensible management decisions
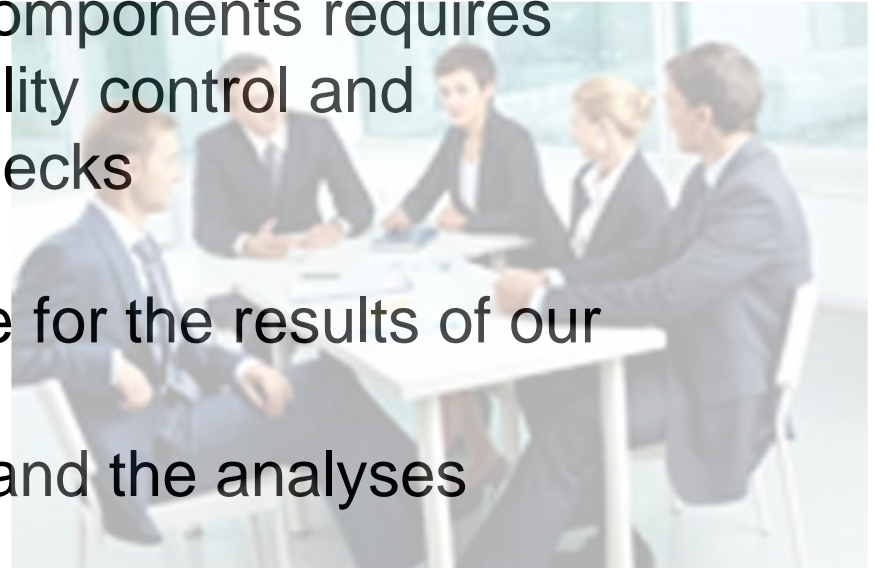
Components

- Inventory
- Pavement Condition Survey
- Pavement Performance Analysis
- Economic Analysis

The data collection and analyses for each of the PMS components requires validation, and quality control and reasonableness checks

We are responsible for the results of our work…
the data collected and the analyses performed

Inventory Data for Municipalities

- Street Name
- From-To Intersections
- Functional Class
    (Urban, Rural, Local, Collector, Arterial)
- Length (from-to)
- Divided/Undivided Route Section
- Pavement Type
- Number of Lanes and Widths
- Shoulder Type and Width
- Wards, Regions, Neighborhoods

The PMS inventory must be tailored to meet the unique data needs of each project and the data must be <u>validated</u> to form a solid foundation for the PMS system data collection and analysis

Pavement Condition Data Collection

The Pavement Condition Survey provides a means of assessing the current pavement condition of the PMS Sections, identifying those that need repair and the appropriate (preservation, rehabilitation, or reconstruction) treatment

- Forms the basis for the performance and economic analysis
- Provides a rational and consistent method of allocating limited financial resources for pavement preservation
- It has also been described as a means of describing the "health" of the network

Good Network

Average Network PCI of 82
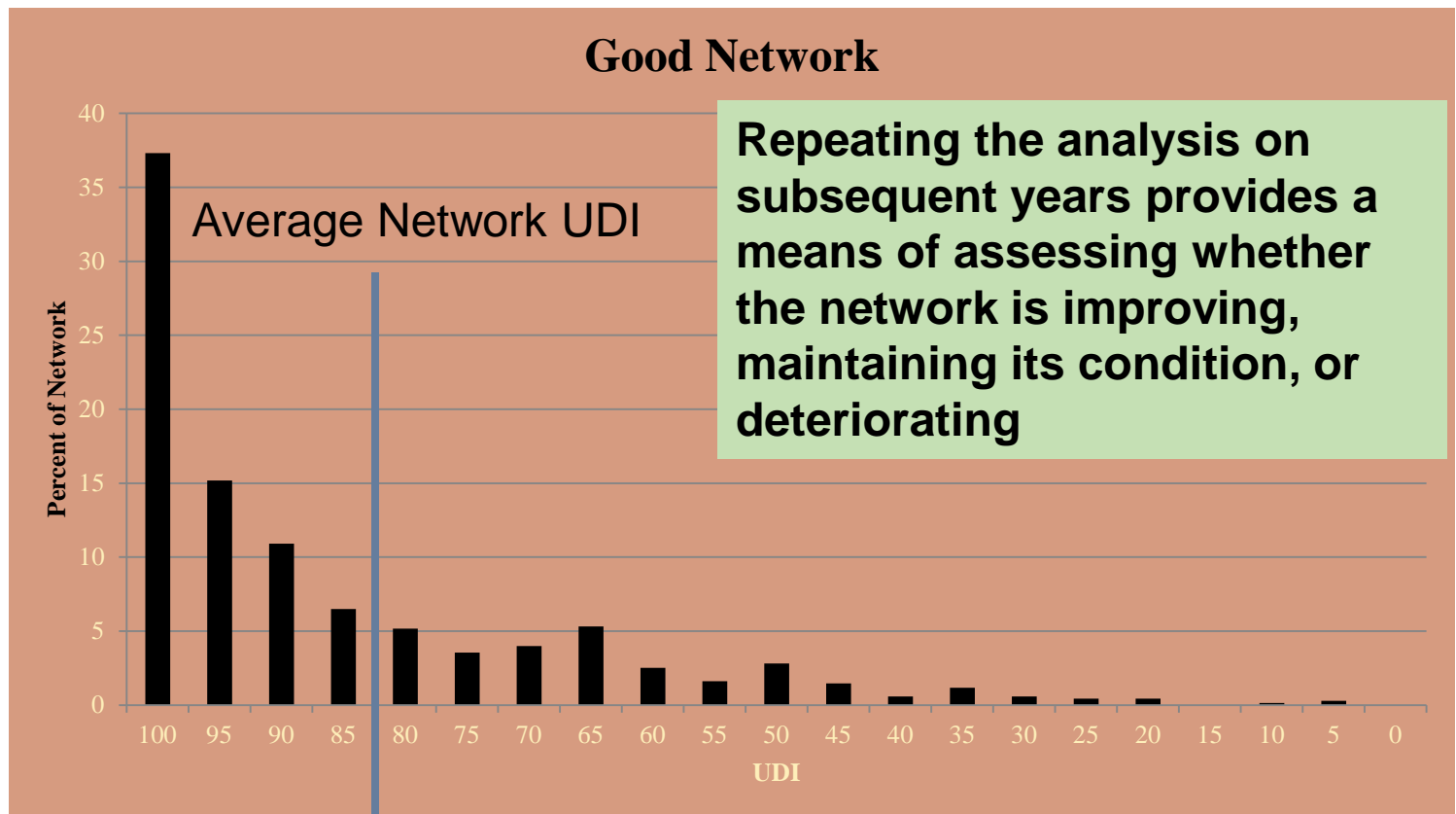
Pavement Distresses

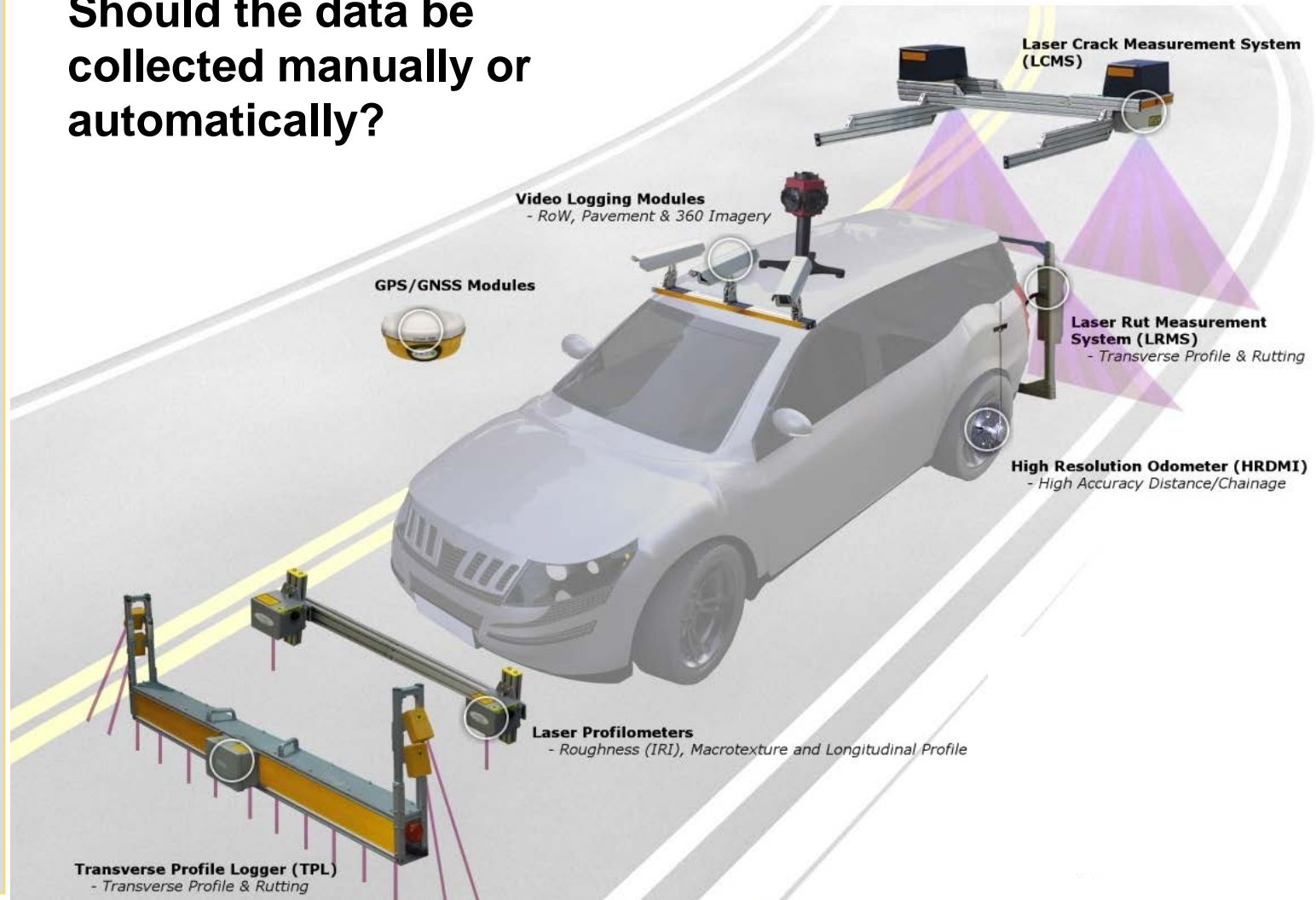| Distress |
|---|
| |
| **Municipal PMS** |
| Fatigue cracking |
| Block Cracking |
| Longitudinal Cracking –in Wheel Paths |
| Patching |
| Potholes |
| Depression |
| Rutting |
| Shoving |
| Bleeding |
| Polished Aggregate |
| Weathering & Raveling |
| Patching Cracks |
| Patching Depression |
| Patching Potholes |
| Patching Weathering & Raveling |
| Transverse Cracking |
| Longitudinal Cracking – out of Wheel path |
| Reflection Cracking |
| Edge Cracking |

The distresses collected should be reviewed periodically for each functional class.

While some distresses may occur on major highways, they may not occur on local streets.

Those distresses that do not occur or occur infrequently can be eliminated to simplify the distress data collection.

Automated Pavement Condition Collection

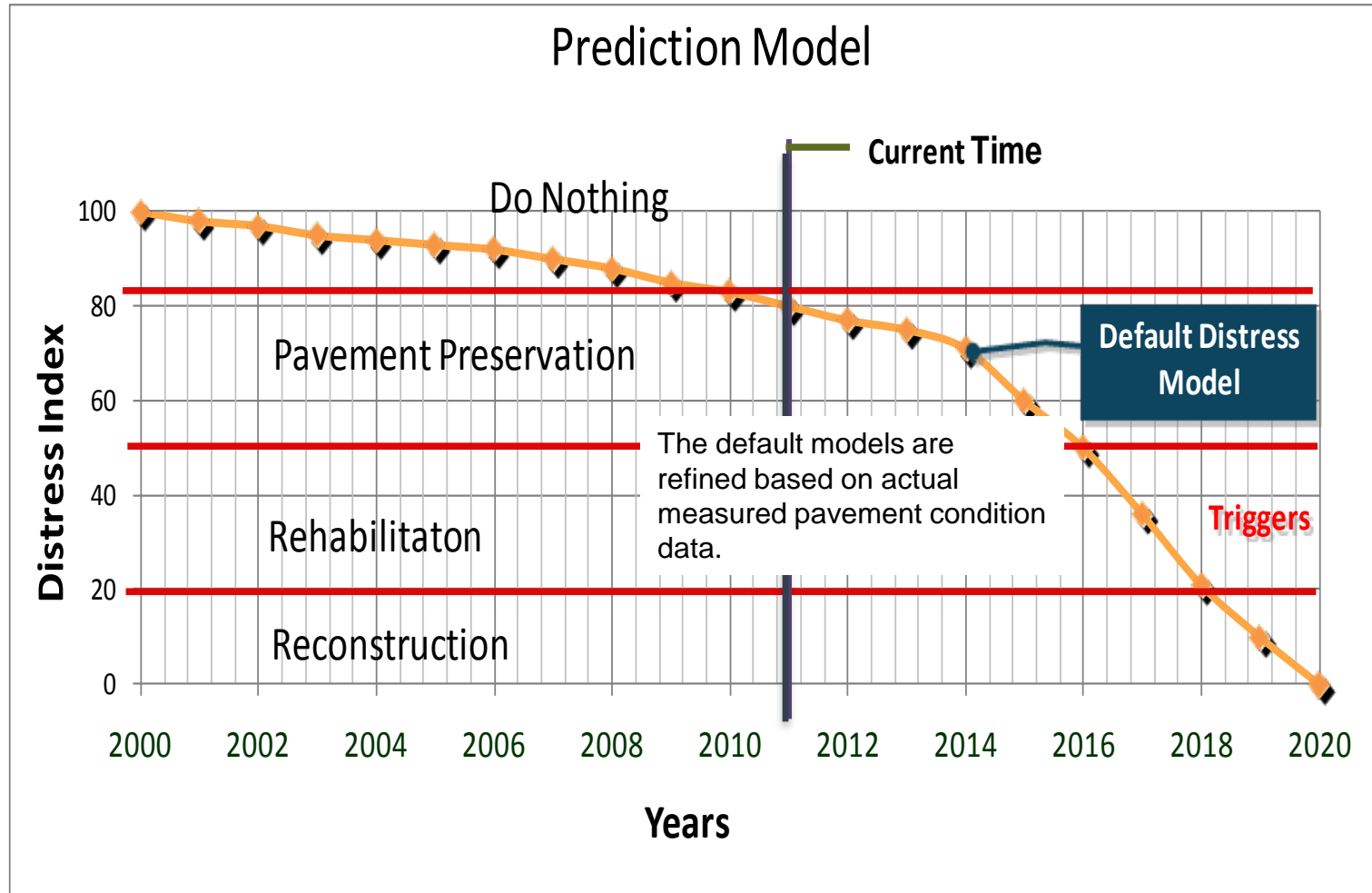**Should the data be collected manually or automatically?**

Does the road network justify the use of automated data collection equipment or is manual data collection sufficient or preferable?

Pavement Performance Model

Prediction Model

Current Time

Do Nothing

Pavement Preservation

Default Distress Model

The default models are refined based on actual measured pavement condition data.

Rehabilitaton

Triggers

Reconstruction

Distress Index

100
80
60
40
20
0

2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020

Years

Performance Model for Mill + Overlay

$$PCI = -0.5309Age^2 - 2.9328Age + 100$$

$$R^2 = 0.9834$$

General or default Performance Curve - The PCI for the entire municipality (all functional classes and all treatment types)

Specific Performance Curve - For each functional class of pavement (highways, principal arterials, collector roads, and local roads / for each treatment type (overlay, mill and overlay, deep patch, shallow patch, etc).

UDI

Age

Performance Model for Secondary Roads

Data Quality checks should be performed each year to ensure that the data is reasonable

Identify Data anomalies

- Having PCI levels of less than 50 after only 3 years is very unlikely

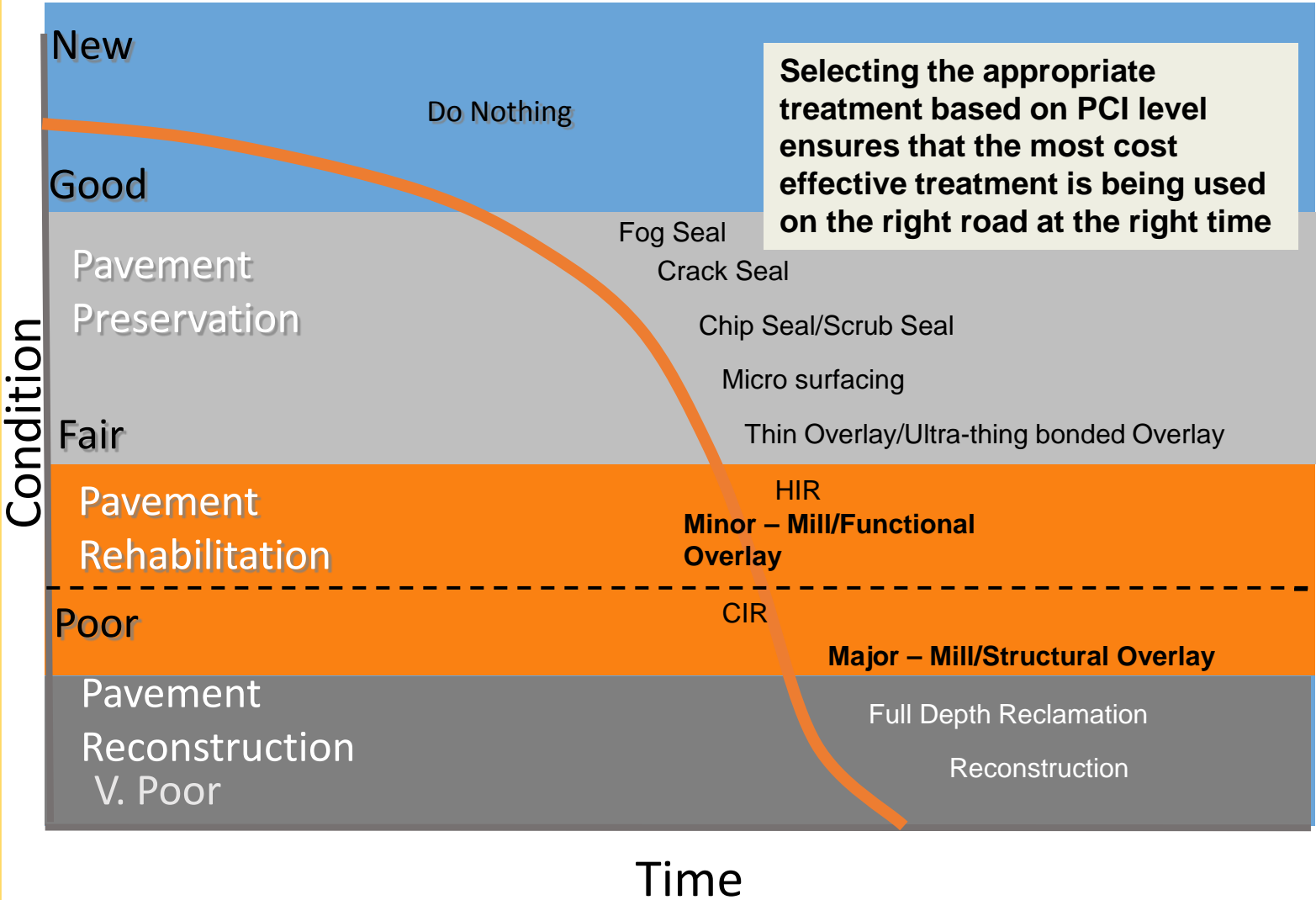- Having PCI levels of near 100 after 15 years is very unlikely
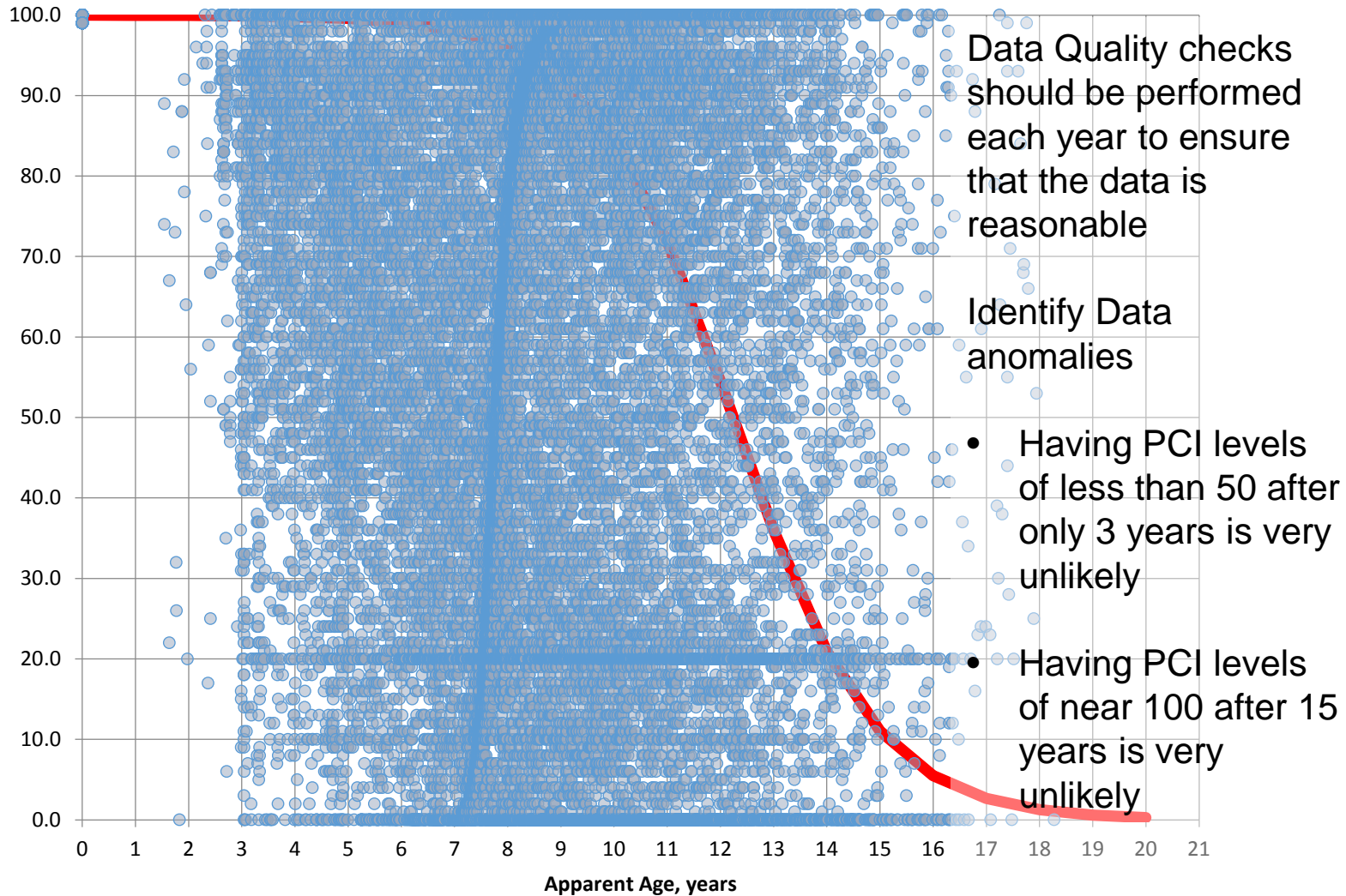
Data Quality Control Checks

- Calculated PCI values should be checked after each pavement condition data collection

- The data check should simply be a comparison of the UDI values since the pavement section was last treated to the present.

- Is the PCI level appropriate or reasonable?

- PCI values that have decreased greater than 10 units in one year or have increased more that 10 units in a single year without a treatment are anomalies and should be checked

- Check the distress types, severity levels, and extent to identify the data problem
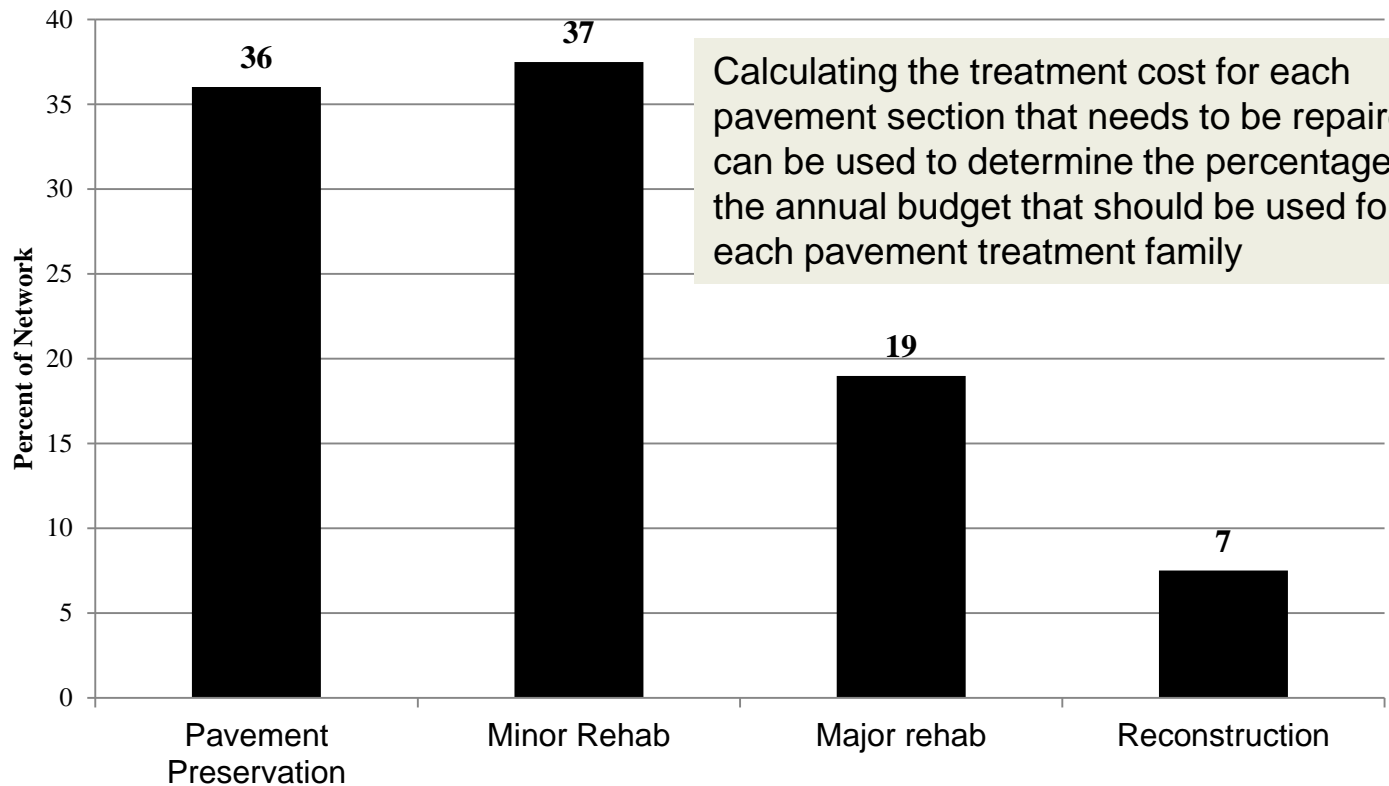
Treatment Selection and Timing

Generalized Pavement Selection Criteria

New

Do Nothing

Selecting the appropriate treatment based on PCI level ensures that the most cost effective treatment is being used on the right road at the right time

Good

Pavement Preservation

Fog Seal
Crack Seal
Chip Seal/Scrub Seal
Micro surfacing

Fair

Thin Overlay/Ultra-thing bonded Overlay

Pavement Rehabilitation

HIR
Minor – Mill/Functional Overlay

Poor

CIR
Major – Mill/Structural Overlay

Pavement Reconstruction
V. Poor

Full Depth Reclamation
Reconstruction

Condition

Time

Network Needs Treatment Cost Distribution - Good Network

Percentage of the Network Treatment Costs

Calculating the treatment cost for each pavement section that needs to be repaired can be used to determine the percentage of the annual budget that should be used for each pavement treatment family
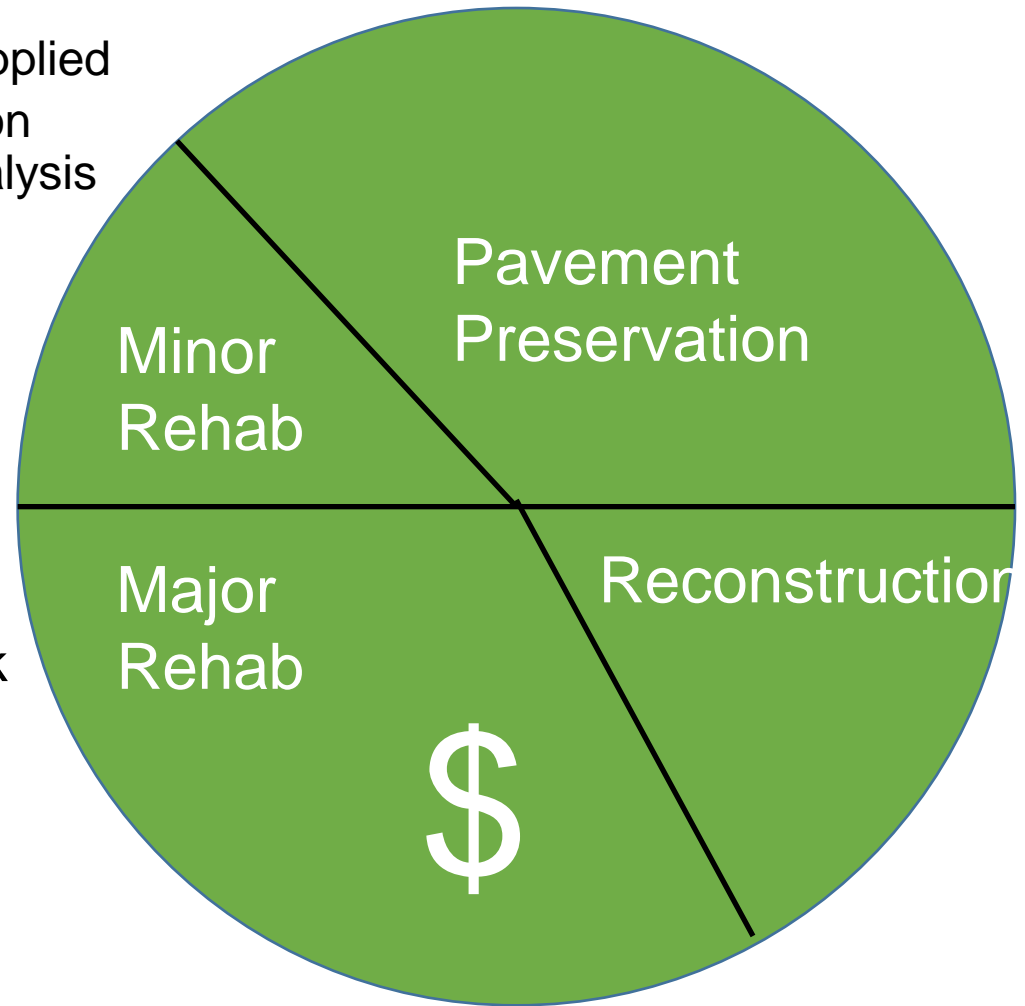
Incremental Budget

- A "mix of fixes" is applied
- Distribution based on Network Needs Analysis

The budget distribution provides a justification for applying a mix of fixes to the pavement network

This approach ensures that the appropriate funding level is applied to each group of pavements

Budget Pie

Economic Analysis

Budget Amounts

- No funds
- $1,000,000 - Less
- $1,500,000 - **Current**
- $3,000,000 - More
- Unlimited

Performing multiple economic analyses at various budget levels provides the client with an illustration of the effects of various funding scenarios
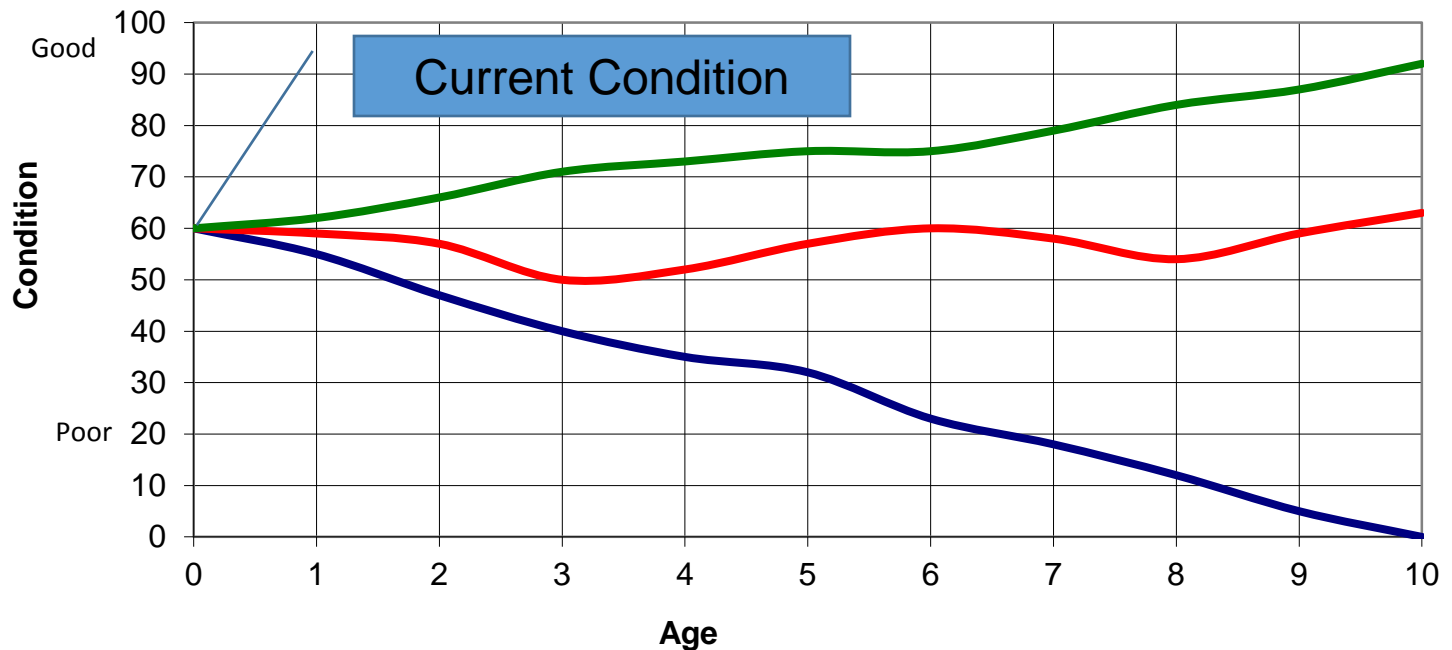
Example Network Performance Scenario

Policy Decisions can be based on the **average projected condition** at various budget levels for a single asset or for the entire network

Network Performance Budget Scenarios

■ Do nothing   ■ Spend $1 million   ■ Spend $3 million

Key Considerations

- Communications is <u>key</u> to the successful implementation of a PMS

- Quality control and reasonableness checks are <u>critical</u> at every stage of the development and implementation for each component of the PMS

- Periodic meetings between the consultant and the client allow both parties to understand what work was done and the work to be done in the next phase and any data issues or anomalies

- <u>Remember</u> that the original proposal was a "plan" and the consultant and client may modify the approach as the work progresses

- Issues or results identified during the project may require additional work or modifications to meet the client's original or changing needs and desires