LRGVAIA
LOWER RIO GRANDE VALLEY
AMERICAN INSTITUTE OF ARCHITECTS

Provider Number: J884

Methodologies of Sustainable Pavements
MSP001

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CONTINUING EDUCATION
AIA

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Course Description

Engineered Pavement Management Systems (EPMS) are an emerging analytical method that provides today's professional access to various new tools in their tool chest. The design professional is continually looking for methods available to optimize and minimize their clients maintenance and rehabilitation costs associated with their designs. The design professional will learn methods for gathering, storing, retrieving, manipulating and reporting information related to the existing pavement infrastructure. Methodologies of Sustainable Pavement will adequately introduce the participants to the new equipment and strategies available to optimize and extend the design life of the pavement infrastructure associated with their projects.

Learning Objectives

At the end of the this course, participants will be able to:

1. Participants will have a working knowledge of Engineered Pavement Management Systems and how it allows the professional to develop long term maintenance plans and recommendations.
2. Participants will be able to identify various testing methods available (including non-destructive) to ascertain the structural condition of existing pavements at a project site.
3. Participants will be able to understand the Pavement Condition Index strategy and it relationship to various rehabilitation options.
4. Participants will be able to observe the relationship of the life-cycle cost of pavement rehabilitation and the effect upon the client's future maintenance budget.

Incident and Injury Free Moment

Terracon Consultants, Inc.

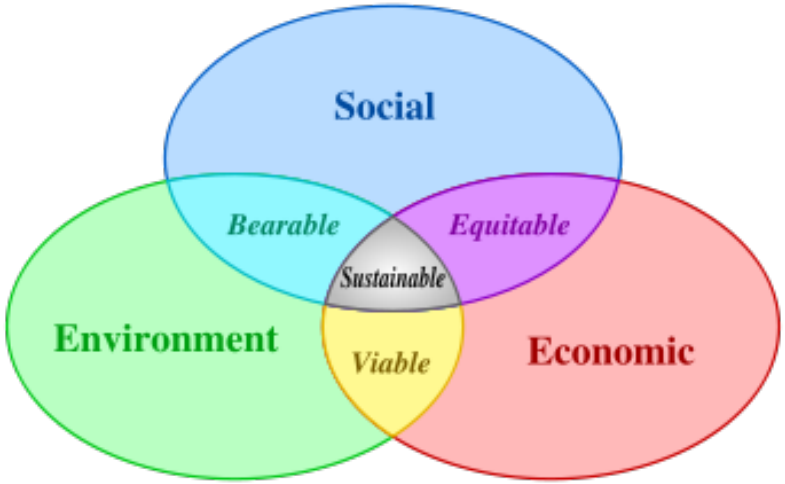
- Alton G. Rogers, P.E., CSM
  - BS Civil Engineering – Texas A&M University
  - 37 Years in the Industry
  - Materials Testing and Forensic Background
  - Former Asst. Director of Public Works
  - Former Owner of Civil Engineering Firm

What is Sustainability?

- Sustainability means meeting the needs of the present without compromising the ability of the future generations to meet their own needs.
- In other words, it is the same thing our parents used to tell us - Do what is right!

Principles of Sustainability

- Basic Principles
  - minimizing the use of non-renewable resources
  - minimizing impacts on the natural environment
  - protecting biodiversity
  - using renewable resources in a sustainable manner



Result of Sustainable Practices

- Improved Air Quality
- Use of Recycled Materials
- Improved Safety
- Improved Water Quality
- Noise Reduction
- Life Cycle Cost Savings

What Are Methodologies of Sustainable Pavements?

Methodologies of Sustainable Pavements means to use good Engineering Principles, Life Cycle Cost Economics and Environmental considerations to design, construct, rehabilitate and replace pavements in the present without compromising the ability of future generations to meet their transportation needs. This requires the design professional to become familiar with new materials, new tools, and new techniques to evaluate when to rehabilitate or replace pavements.

Sustainable Pavement to Our Grandparents

Sustainable Practices Today Use

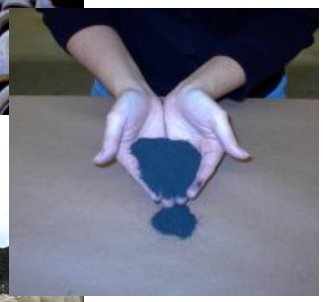
- New and Innovative Material mixes which are available other than conventional HMA and PCC mixes
- New Tools to evaluate the pavement characteristics nondestructively
- Engineered Pavement Management Systems

New and Innovative Materials

Sustainable Technologies Available

- Recycling Applications
  - Reclaimed Asphalt Pavement (RAP)
  - Recycled Concrete Aggregate
  - In-Place Recycling

- Reuse Applications
  - Fly Ash
  - Tire Rubber
  - Recycled Asphalt Shingles (RAS)
  - Foundry Sand



- Warm-Mix Asphalt (WMA)
- Permeable Friction Course Asphalt (PFC)

Types of Sustainable Pavements Used by TxDOT

- Hot Mix Asphalt (HMA) (Temp = ~320°)
  - w/ RAP, RAS and Substitute Binders
  - RAP & RAS Results in a 10 to 30 % Cost Savings
- Warm Mix Asphalt (WMA) (Temp = ~270°)
  - w/ RAP, RAS and Substitute Binders
  - Reduced Emissions
  - Longer Paving Window
- Permeable Friction Course Asphalt (PFC)
  - Longer Overlay Life (offsets higher cost)

RAP & RAS Benefits

- Reduces the cost of HMA construction
- Reduces consumption of raw materials
- Reduces construction waste that would go to landfills
- Asphalt materials can be recycled several times
- Reduces carbon footprint

WMA Benefits

- Uses same materials as HMA with an additive to lower workable temperatures
- Increased RAP content is possible with lower temperatures
- Less Emissions During Production
- Reduced Production Plant Wear
- More Durable Pavement
  - Less Oxidization & Absorption
  - Better Fatigue Life
- Wider Paving Window
  - Winter Paving
  - Night Paving

Permeable Friction Course Asphalt

- PFC is an overlay used on higher speed roads (>45 mph)
- PFC is best used in areas prone to wet weather accidents.
- Expected life of PFC is 10-14 years vs. ~7 years for a conventional overlay
- Types of PFC
  - PFC Asphalt-Rubber (A-R)
    - Contains rubber from recycled tires
    - Recommended as an overlay for concrete pavement
  - PFC – Performance Grade (PG)
    - Contains Performance Grade Asphalt, fiber and lime

PFC Benefits

- Safety
  - Drains water off the roadway quicker
  - Reduces spray and glare
  - Improves friction and skid characteristics
- Traffic Noise Reduction
  - Approximately a 15% reduction in noise levels
- Ride Quality
  - Measured using the International Roughness Index (IRI)
- Quality
  - Improves water quality
  - Reduces runoff rates

New Nondestructive Tools to Assess Existing Roadways

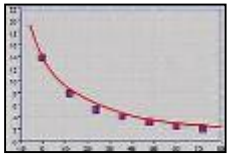
Sustainable Pavement Analysis Tools

Video

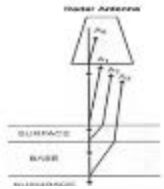
Visual assessment of surface condition

FWD Test

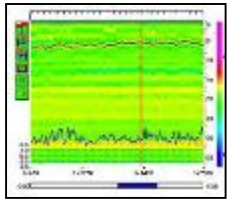
Falling Weight Deflectometer (FWD) back calculation



GPR Test



Pavement interface structure and dielectric constant data



Core Data

Layer quality assessment and thickness validation

GPS Data

Global Positioning System (GPS) data: location & maps

Pavement Condition Survey Equipment

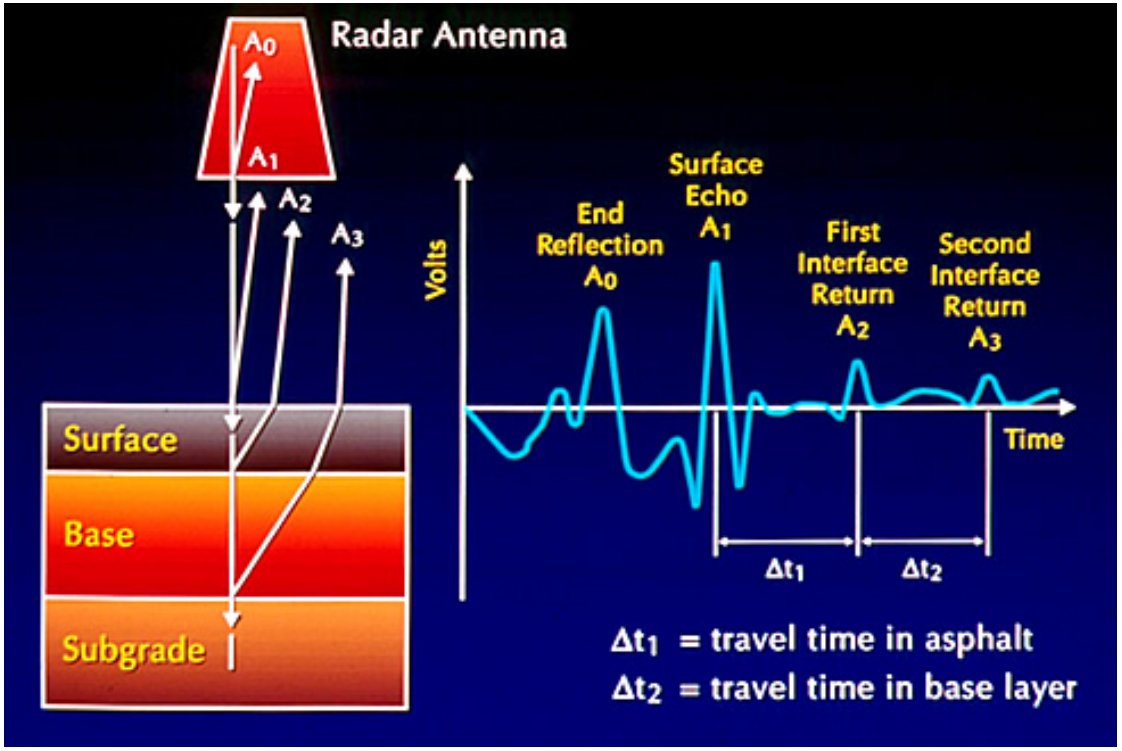
Falling Weight Deflectometer
(Strength of Pavement Layers)

GPR (Layer Thickness,
Trapped Moisture)

Pavement Profiler
(Surface Roughness)

Skid Trailer (Friction)

Principles of Ground Penetrating Radar (GPR)

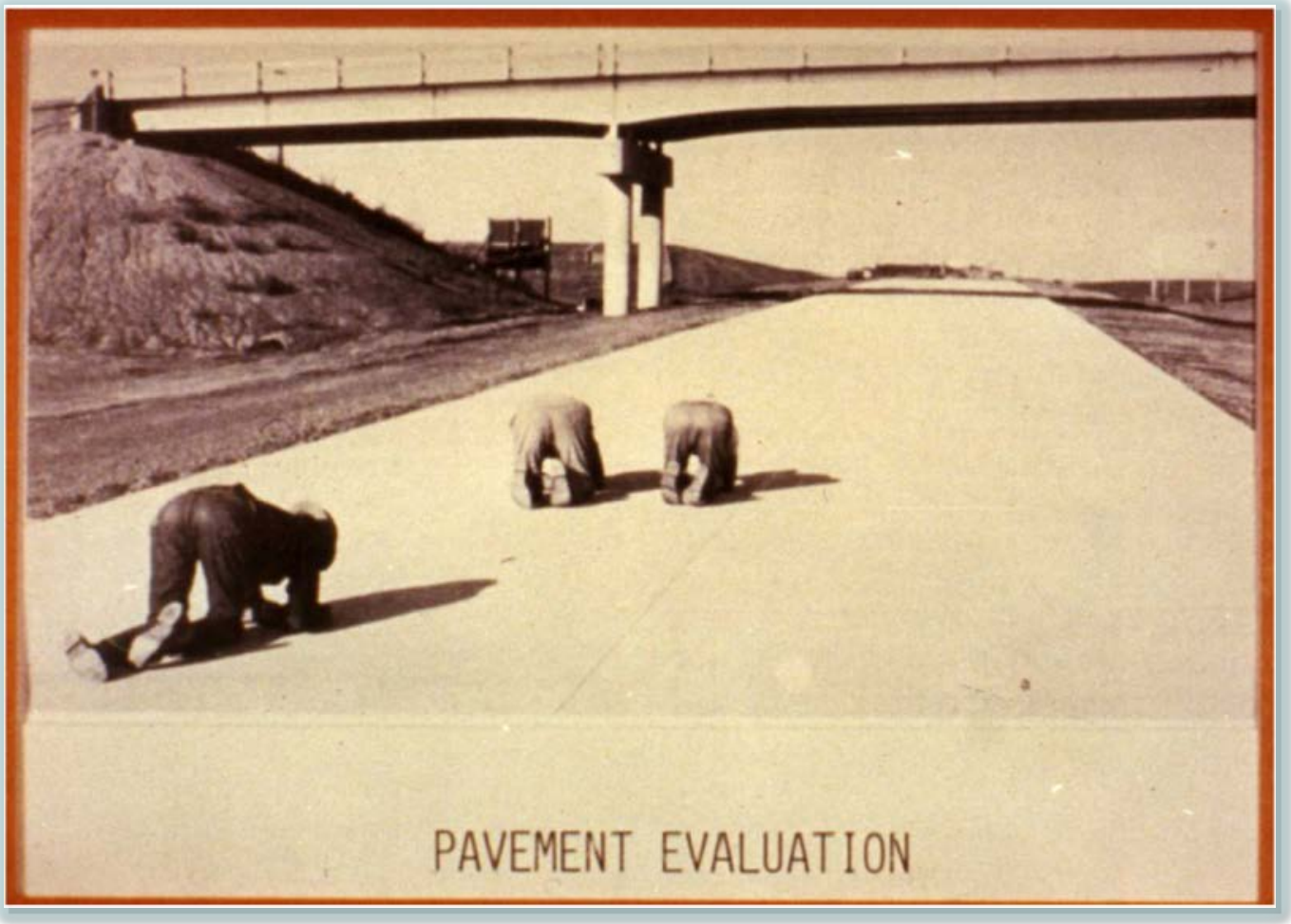


Application of GPR Results

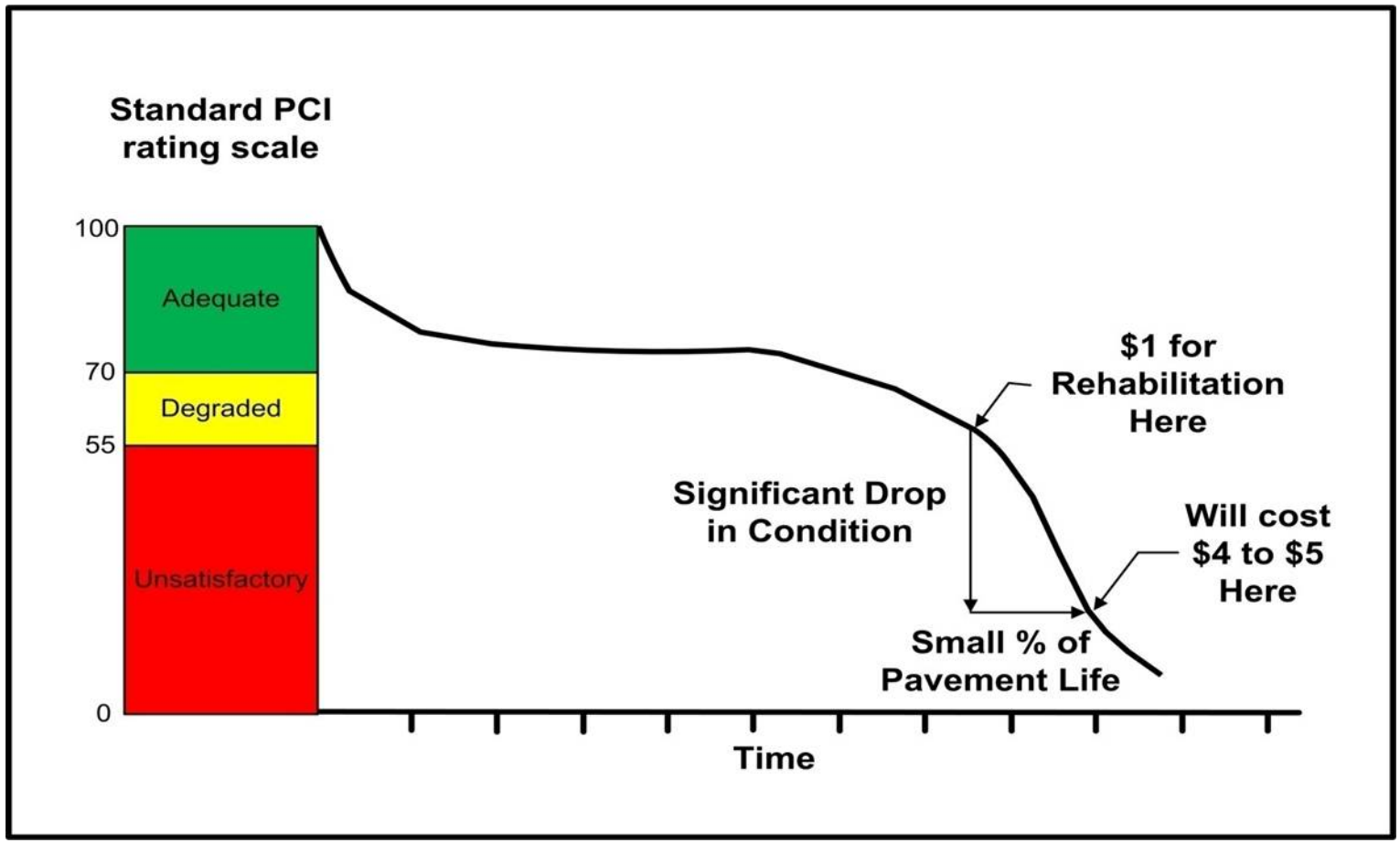
- Collected GPR Data
  - Surface condition of the tested roadways
  - Pavement Structure Uniformity
  - Thickness of individual layer
- Sampling Locations
  - Assigned based on the GPR data analysis
  - 2-3 sampling locations per tested road

Engineered Pavement Management System

Past Pavement Management Techniques

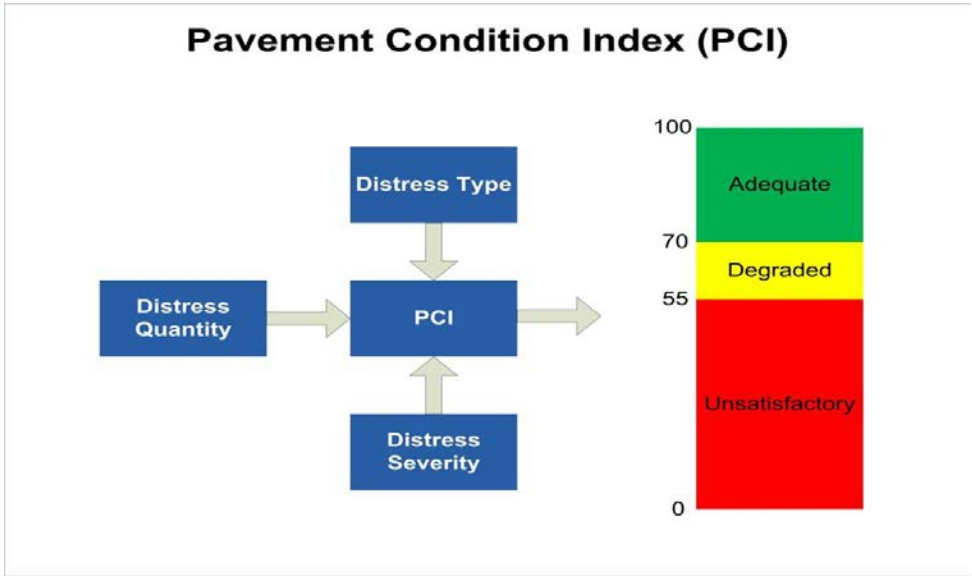


Life Cycle Cost

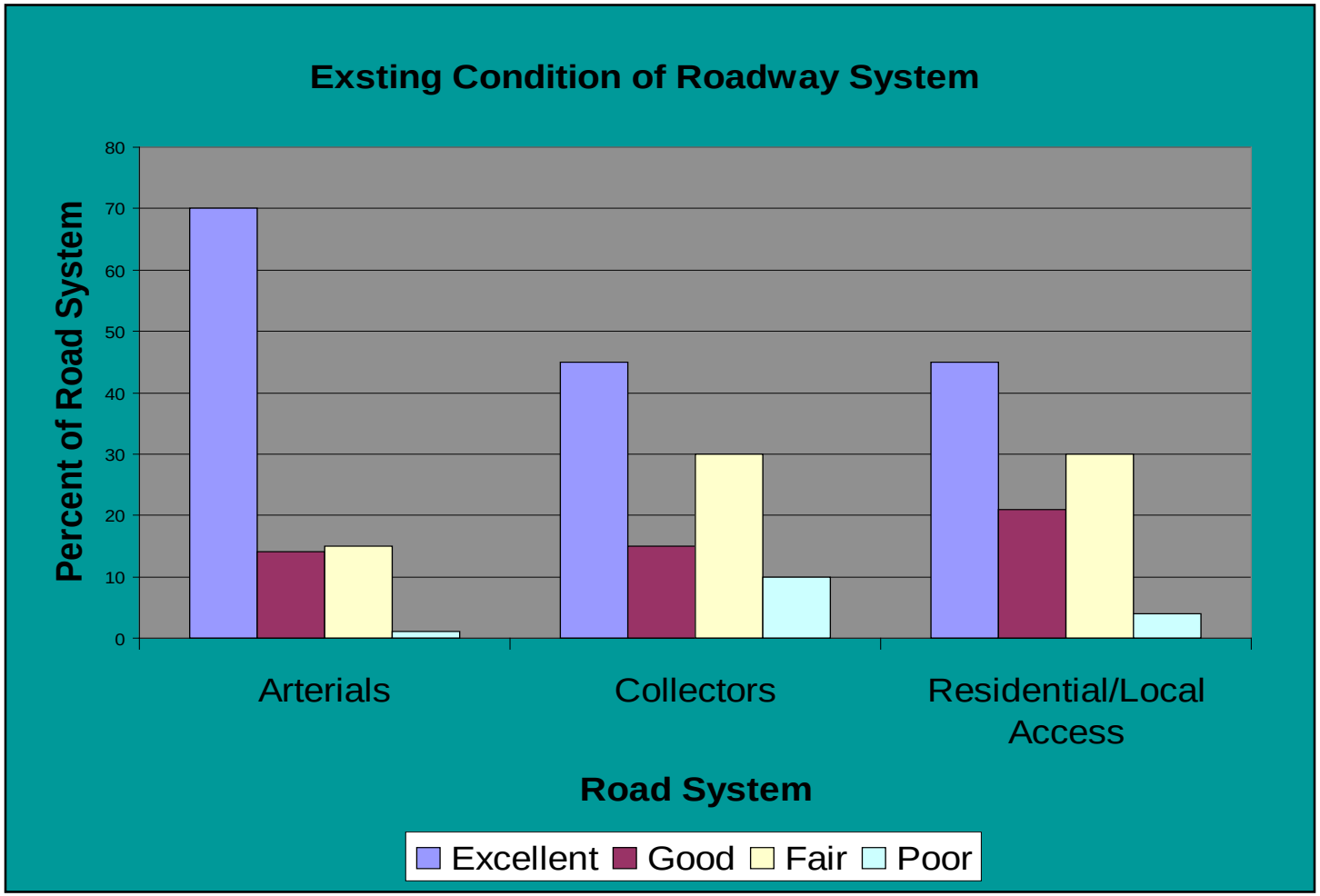


EPMS Process

- Inventory
- Inspection
- Reporting
- Modeling
- Condition Analysis
- M&R Planning



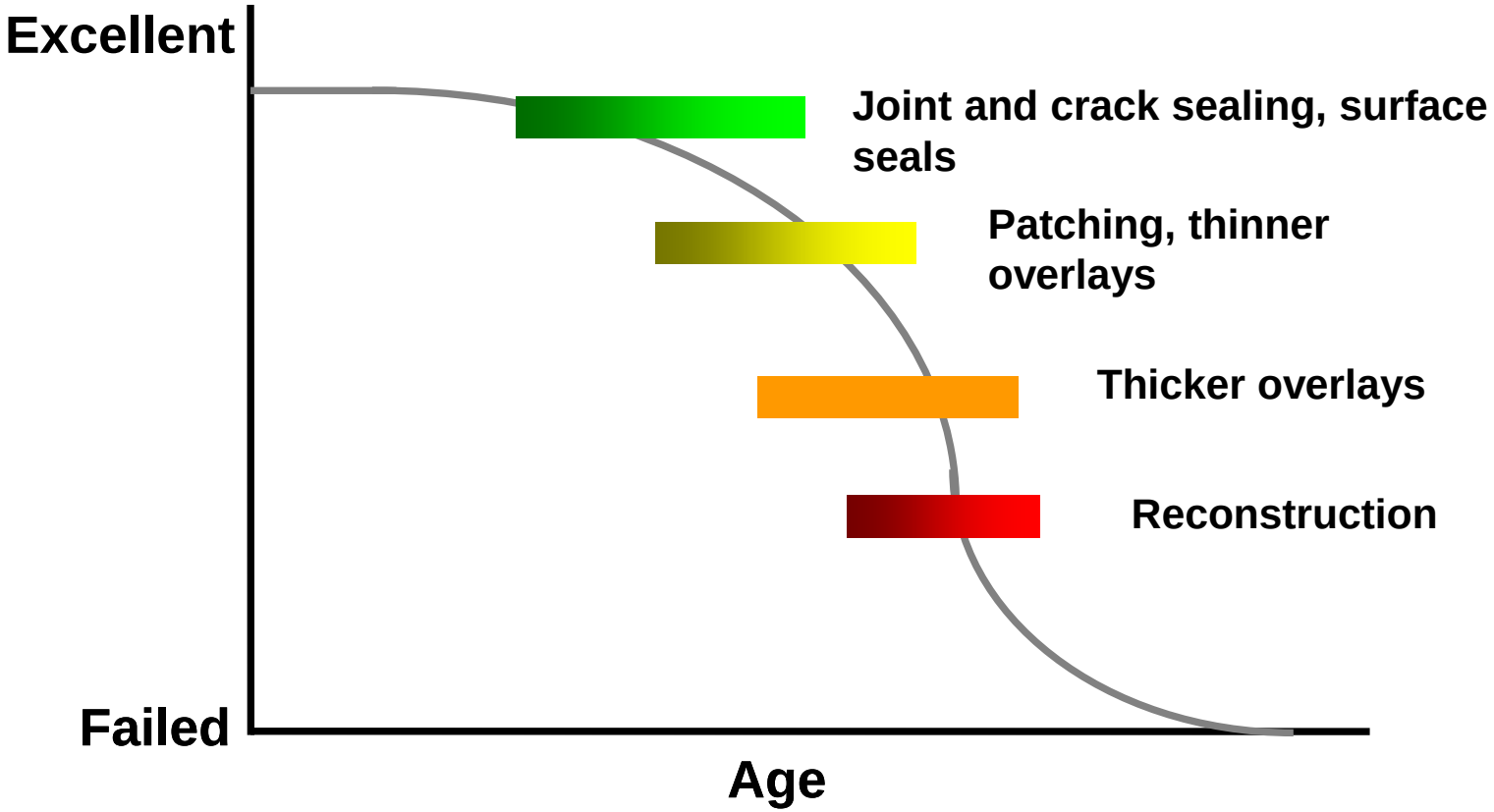
Condition Summary on a Network Basis



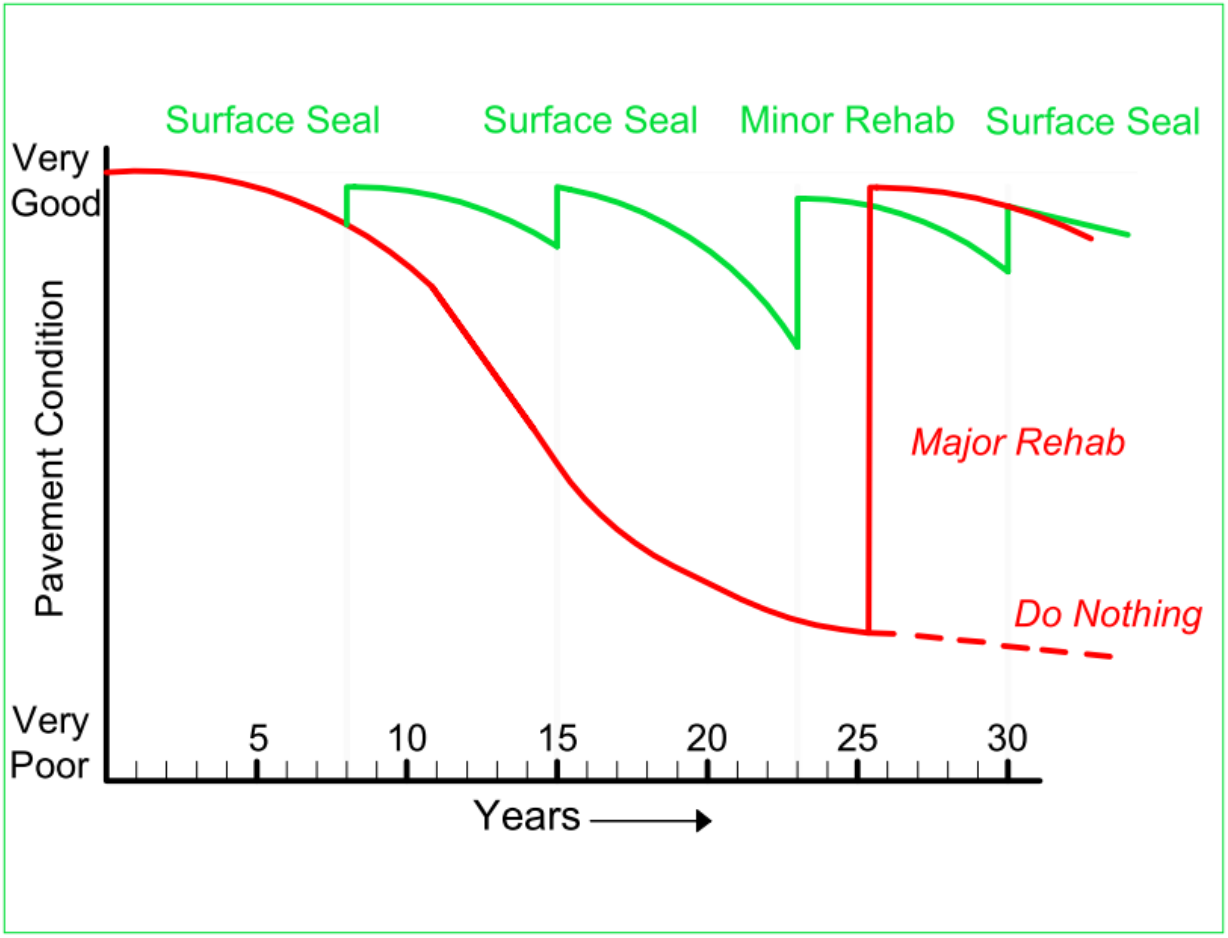
EPMS With Modeling Capabilities

- Development of multi-year programs
  - 5 or 10 year plans
- Provides predictions of future conditions
  - Assesses when is the optimum time to rehabilitate
- Determines comparisons over time of various maintenance options
- Predicts future budget needs
  - M&R Planning

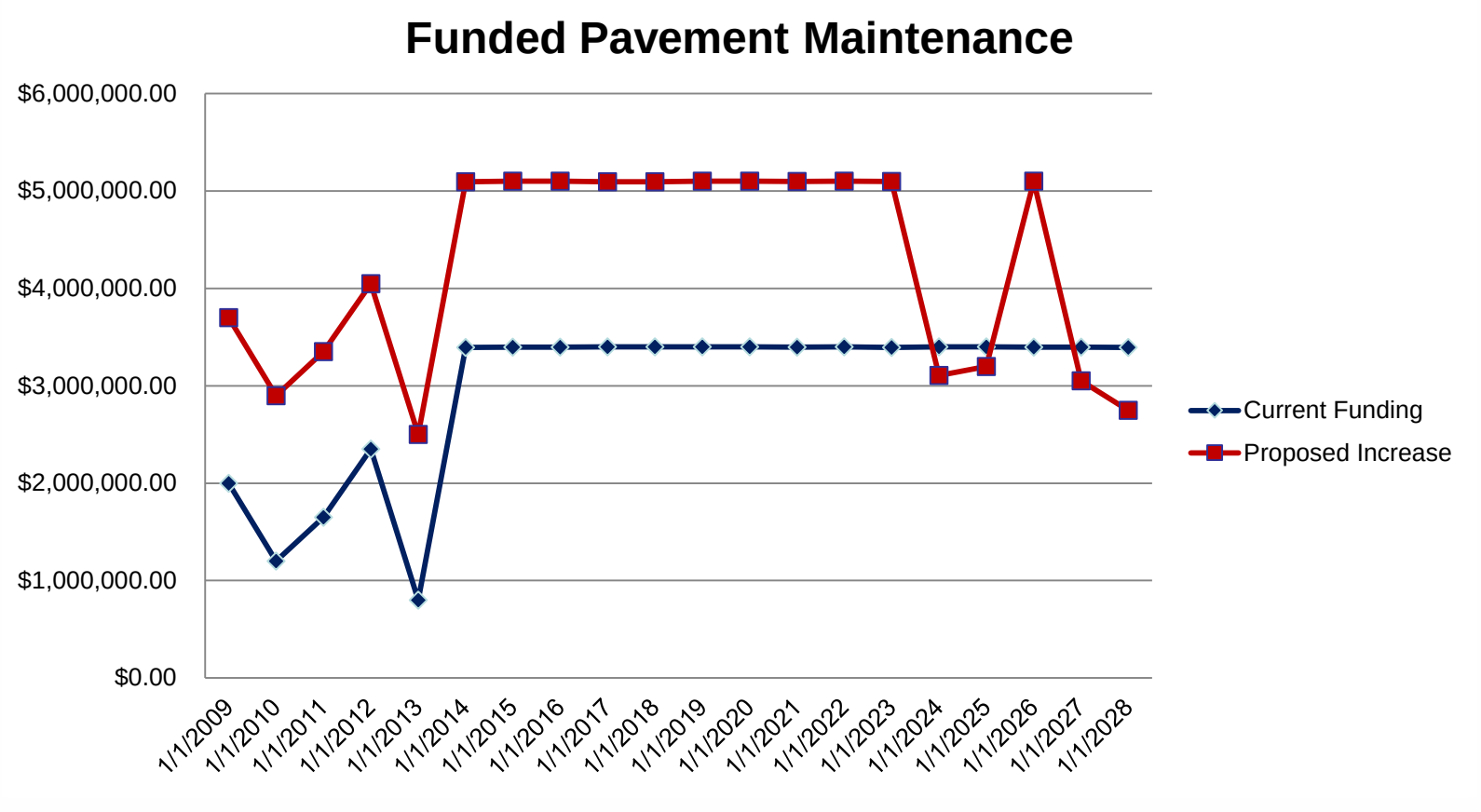
What About Rehabilitation Strategies?



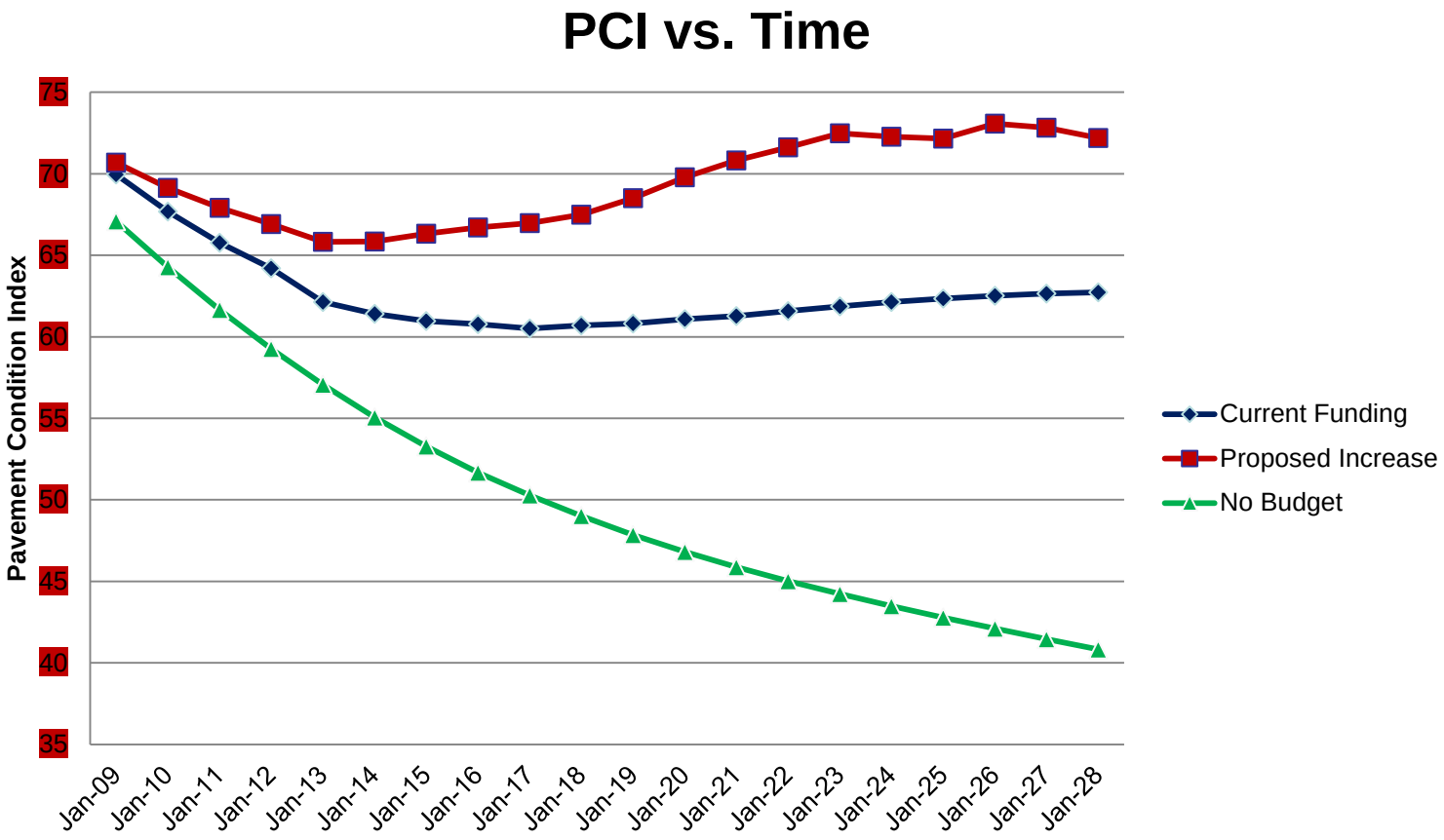
What About Rehabilitation Strategies?



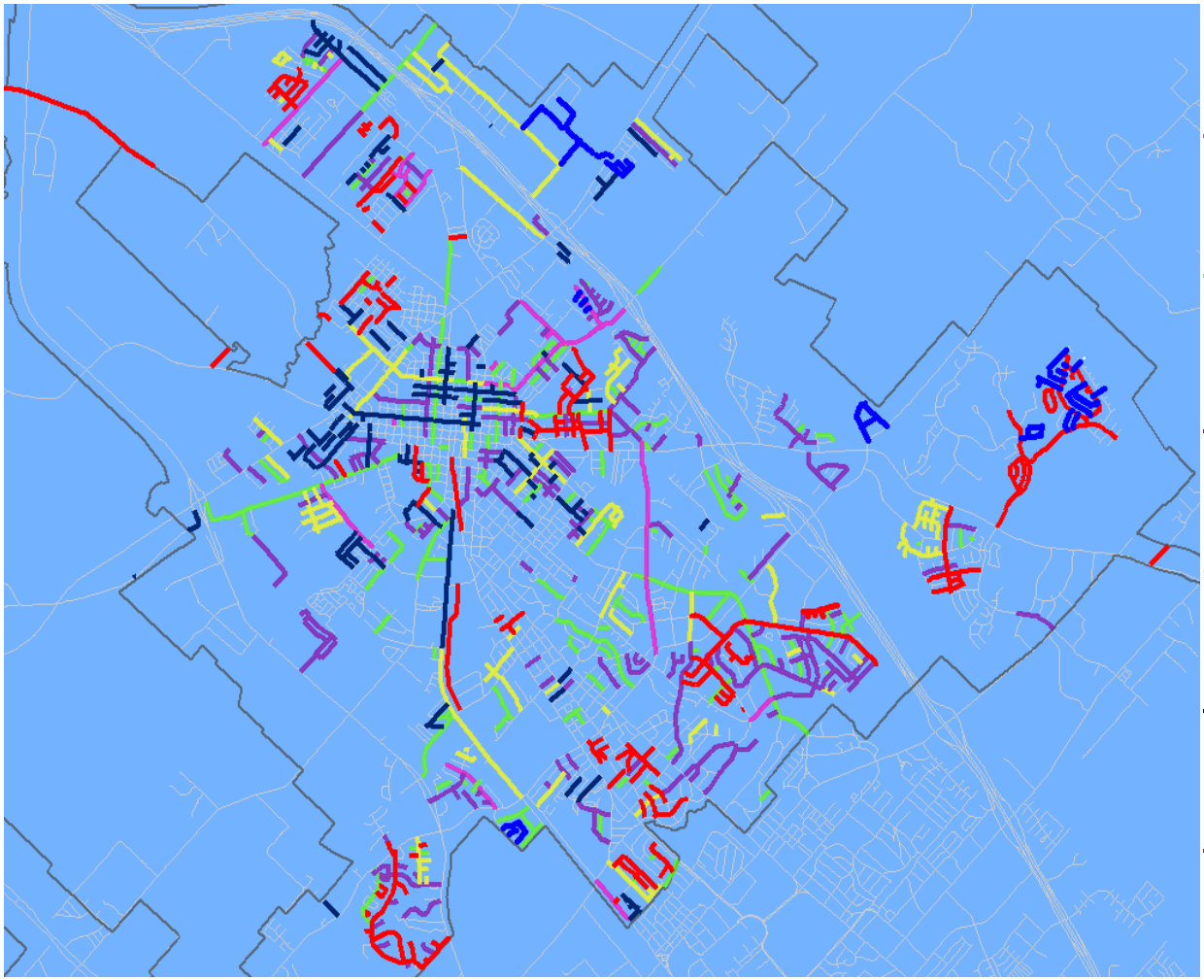
Future Budget Projections



Expenditure vs. Condition Scenarios



Display Historical Maintenance Records



–FY’07

–FY’08

–FY’09

–FY’10

–FY’11

–FY’12

Benefits of EPMS

- More efficient use of available resources
- Ability to justify funding needs
- Provides more accurate and accessible information with regards to the pavement network
- Ability to track pavement performance
- Ability to show impacts on condition
- Assist in determine assets value

Questions

This concludes The American Institute of Architects
Continuing Education Systems Course

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