Development of Preservation Project Selection Criteria for Pavement Management

An Implementation Case Study for New Mexico Department of Transportation

Presented by:

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NMDOT PMS Incorporating Preservation

- Committee Made it Clear that Pavement Preservation was Top Priority for Agency
- Important that PMS Incorporates Treatment Selections with Proper Timing for Preservation
- Preservation, Preventive, and Routine Treatments needed to Add Life to Pavements in Configuration
- Fog Seals, Patching, and Crack Sealing Had to be Included in Analysis Treatment Selections

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Pavement Distresses

Collecting Appropriate Condition Data to Trigger Pavement Repairs

Distresses Collected by Pavement Type

Flexible Pavements*	Rigid Pavements
Alligator Cracking	Corner Breaks
Transverse Cracking	Faulting
Edge Cracking	Joint Seal Damage
Longitudinal Cracking	Lane/Shoulder Drop-off
Block Cracking	Longitudinal Cracks
Patching	Patch Deterioration
Bleeding	Spalling of Joints & Cracks
Weathering & Raveling	Transverse & Diagonal Cracks

- *Reviewing Flexible setup due to time constraints

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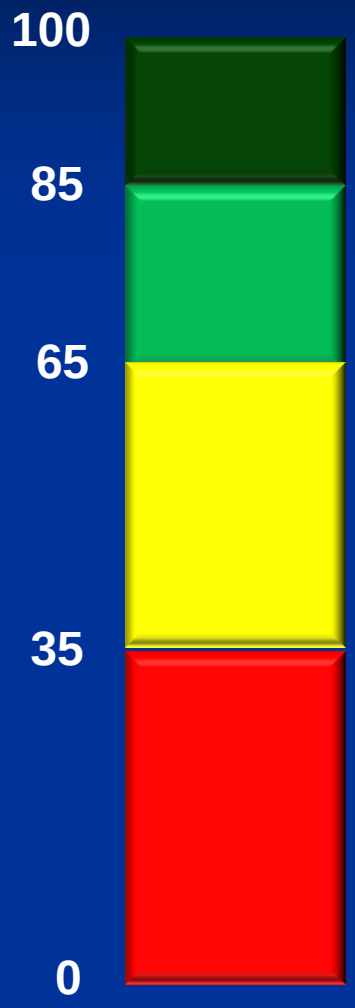
Condition Indexes

Converting Condition Data into Decision Variables for Triggering Treatments

Overall Condition Index



No Maintenance

Preservation

Rehabilitation

Reconstruction

Problem:

- Single Index Only Provides a General Indicator of Overall Health

Questions:

- What Distresses are Present?
  - Severities and Extents?
- What Repair(s) Is Required?
- Reasonable Cost of Repair?

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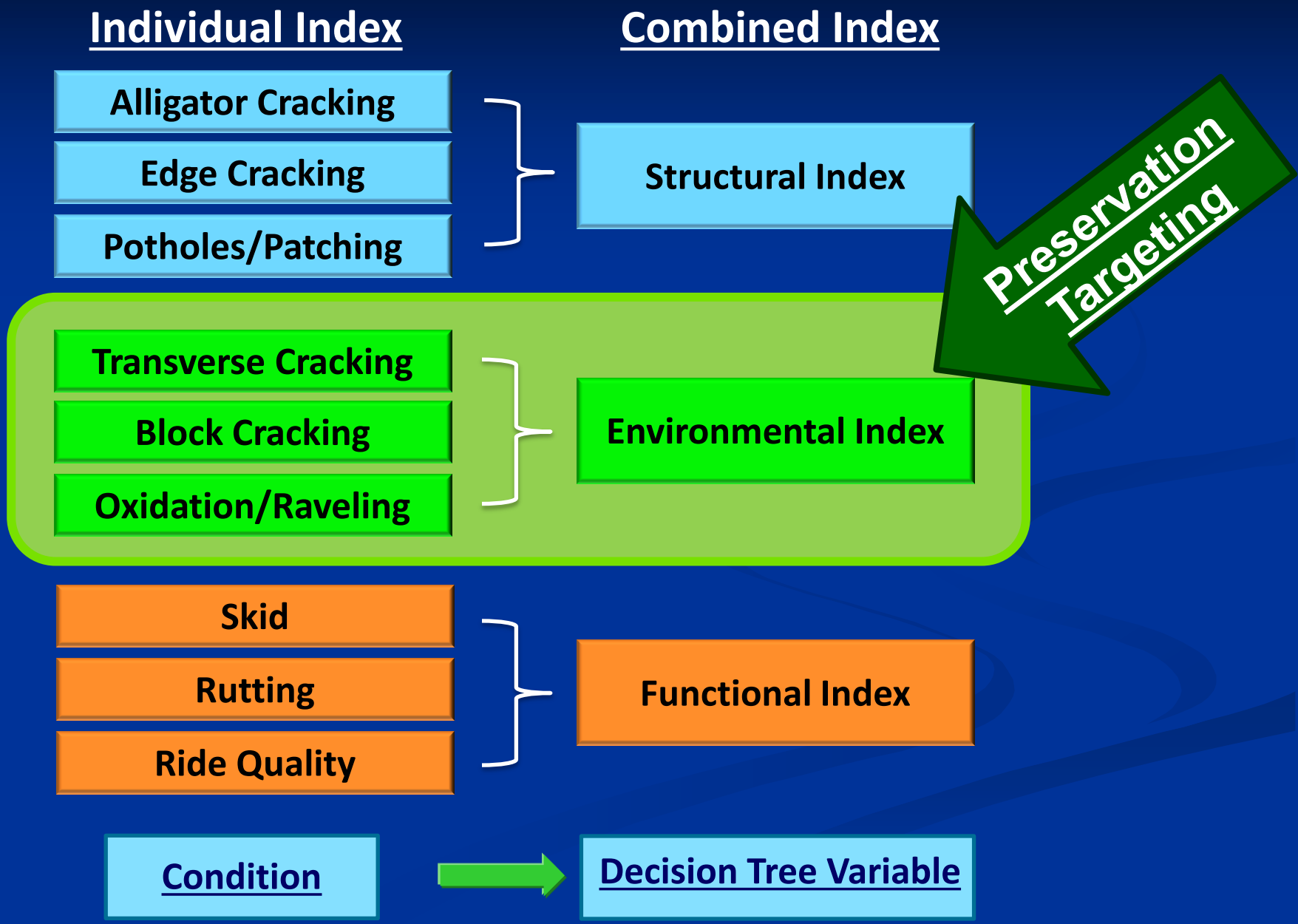
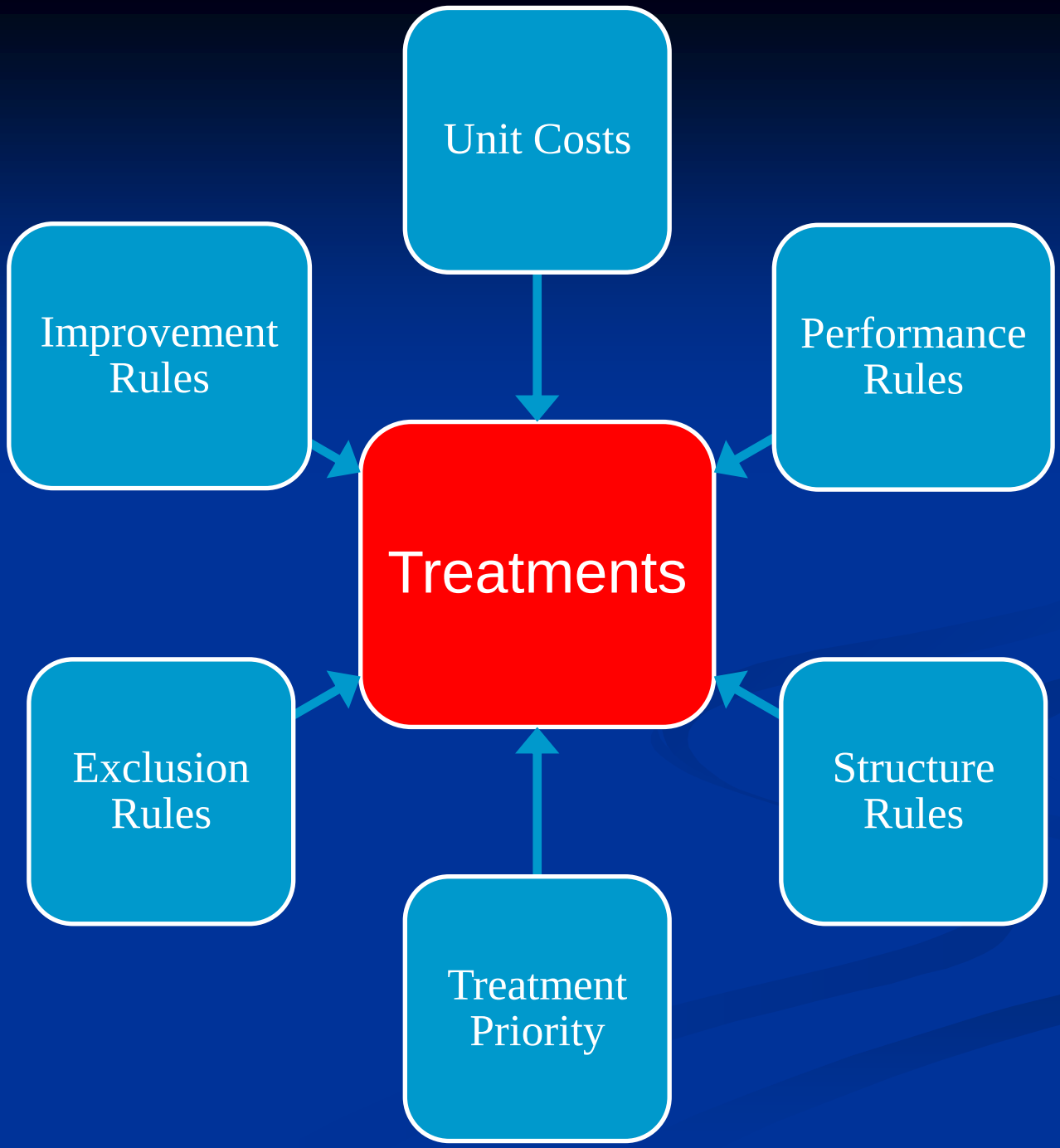
Treatment Selection Indexes



Treatments and Repair Strategies


Unit Costs
Improvement Rules
Performance Rules
Treatments
Exclusion Rules
Structure Rules
Treatment Priority

Treatments & Repair Categories

Flexible Repair Category	Treatment
0 - Monitor	0 – Monitor
F1 - Preventative	F1A - Crack Seal F1B - Fog Seal
F2 - Patch	F2 - Patch
F3 - Preservation (Minor)	F3A - Scrub Seal F3B - Chip Seal F3C - Slurry Seal F3D - Cape Seal F3E - OGFC F3F - Micro Surfacing F3G - Plant Mix Wearing Course overlay – Nova Chip
F4 - Preservation (Major)	F4A - Pavement Resurfacing and Curb line milling Cutler (1.5” to 2.5”) F4B - Hot In-Place Recycling (Remixing) (1.5” to 2.5”) F4C - Hot In-Place Recycling (Heater Scarification) (1.5” to 2.5”) F4D - Cold Mill Asphalt Recycling (Warm or Cold) F4E - HMA/WMA Mill and Inlay (1.5” to 2.5”) F4F - SMA Mill and Inlay (1.5” to 2.5”)
F5 - Rehabilitation (Minor)	F5A - HMA/WMA Mill and Inlay 2.5” to 4 F5B - Hot In-Place Recycling (Remixing) (2.5” to 4”) F5C - Hot In-Place Recycling (Heater Scarification) (2.5” to 4”) F5D - Pavement Resurfacing and Curb line milling Cutler (2.5” to 4”) F5E - HMA/WMA Overlay 2.5” to 4” F5F - SMA Mill and Inlay (2.5” to 4.0”)
F6 - Rehabilitation (Major)	F6A - HMA/WMA Mill and Inlay greater than 4” F6B - Hot In-Place Recycling (Remixing) greater than 4” F6C - Hot In-Place Recycling (Heater Scarification) greater than 4” F6D - Pavement Resurfacing and Curb line milling Cutler greater than F4” F6E - HMA Overlay greater than 4” F6F - Process Place and Compact W/Overlay F6G - Full Depth Reclamation (FDR)
F7 - Reconstruction	F7 - Reconstruction

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Preservation Treatments

Flexible Repair Category	Treatment
F1 - Preventative	F1A - Crack Seal F1B - Fog Seal
F2 - Patch	F2 - Patch
F3 - Preservation (Minor)	F3A - Scrub Seal F3B - Chip Seal F3C - Slurry Seal F3D - Cape Seal F3E - OGFC F3F - Micro Surfacing F3G - Plant Mix Wearing Course overlay – Nova Chip
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Condition Index Improvements by Repair Category

Indexes	Prevent.	Patch	Pres. (Minor)	Pres. (Major)	Rehab. (Minor)	Rehab. (Major)	Recon.
Structural	Add 0	Add 10	Add 5	Add 15	Add 40	Add 60	Reset to 100
Environmental	Add 10	Add 0	Add 10	Add 30	Add 50	Reset to 100	Reset to 100
Safety	Add 0	Add 0	Reset to 100	Reset to 100	Reset to 100	Reset to 100	Reset to 100
Roughness	Add 0	Add 0	Add 5	Reset to 100	Reset to 100	Reset to 100	Reset to 100

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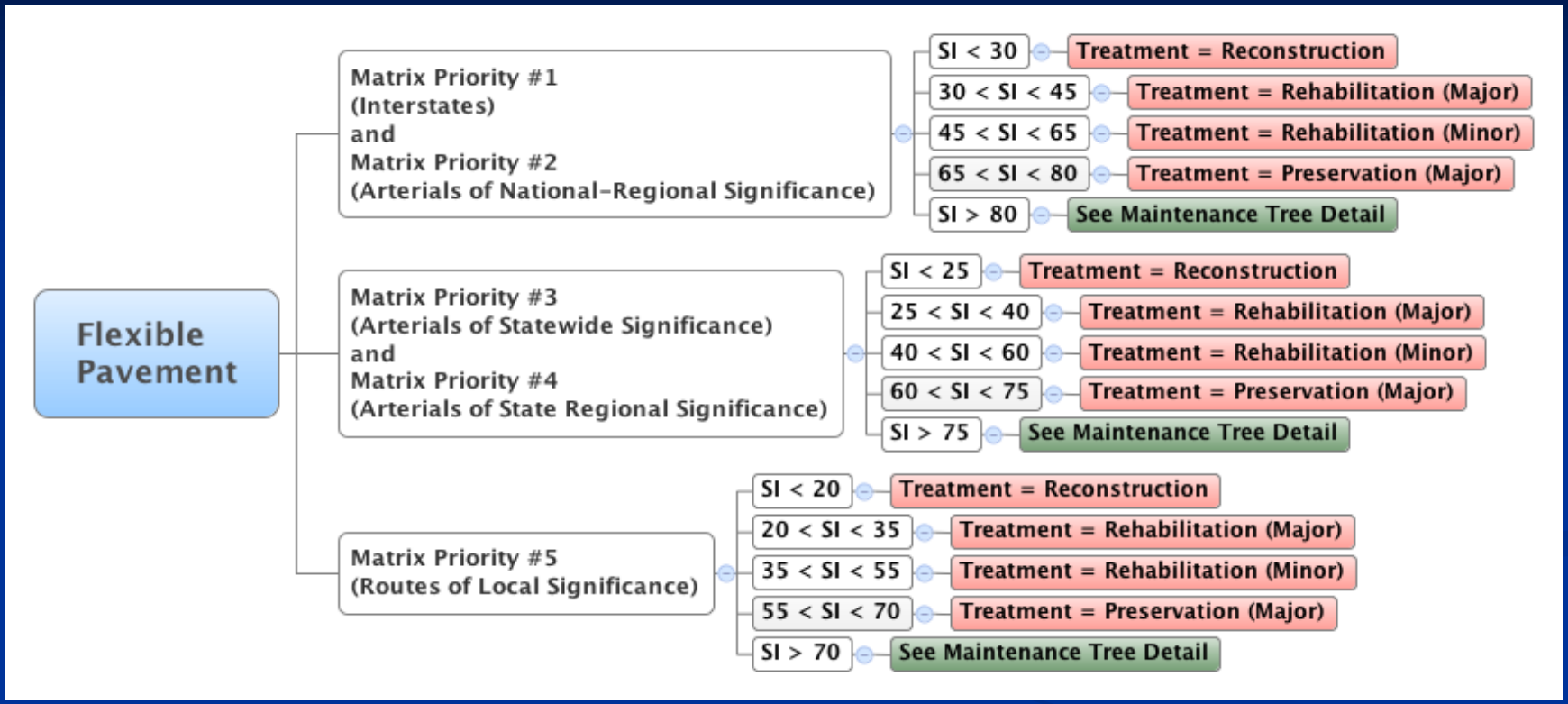
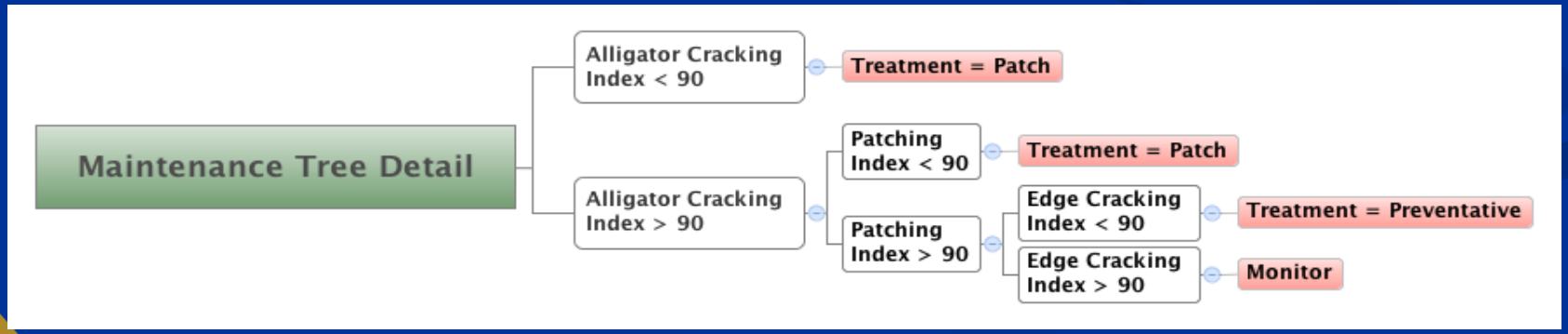
Decision Trees

Purpose:

Right Treatment, Right Place, Right Time

Structural Decision Tree





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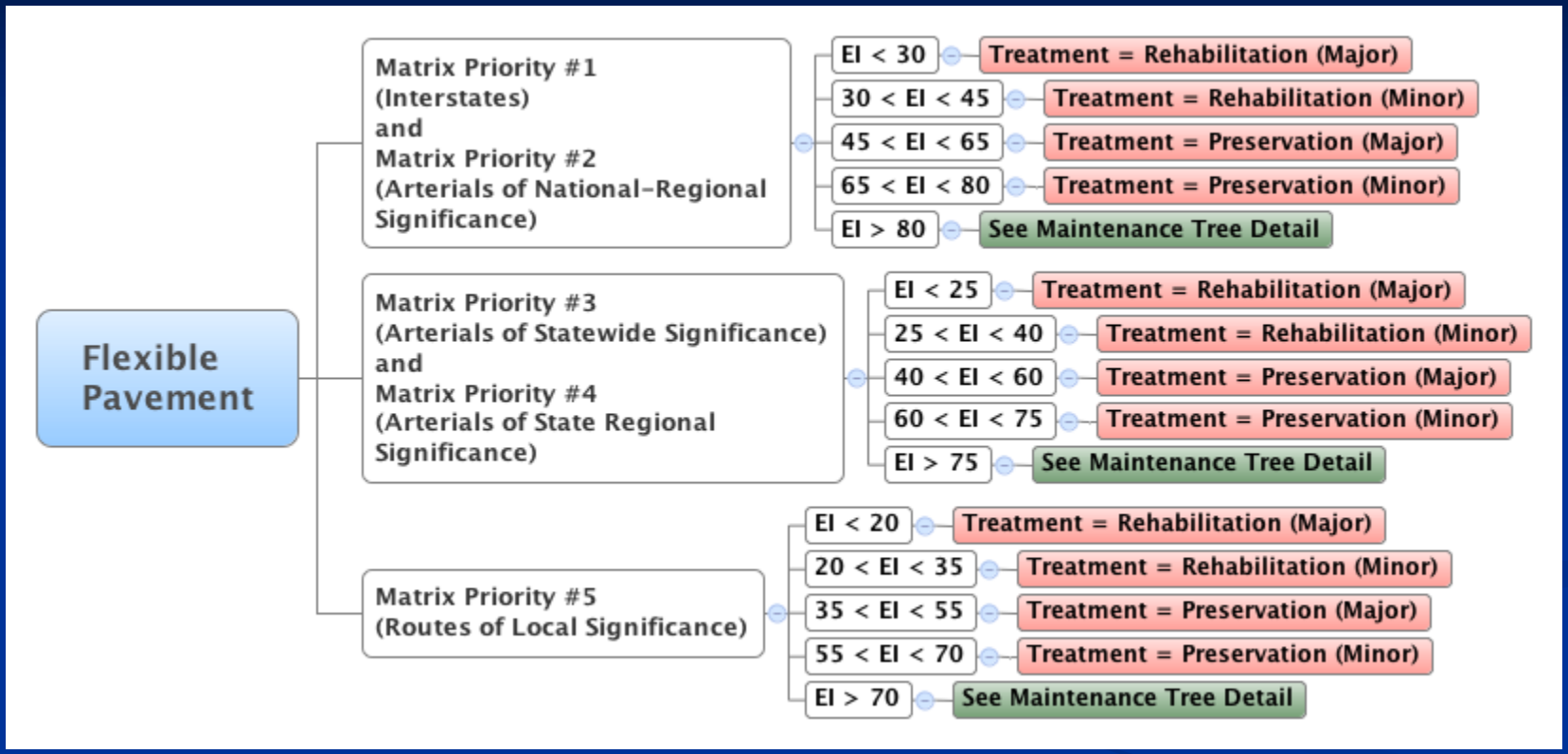
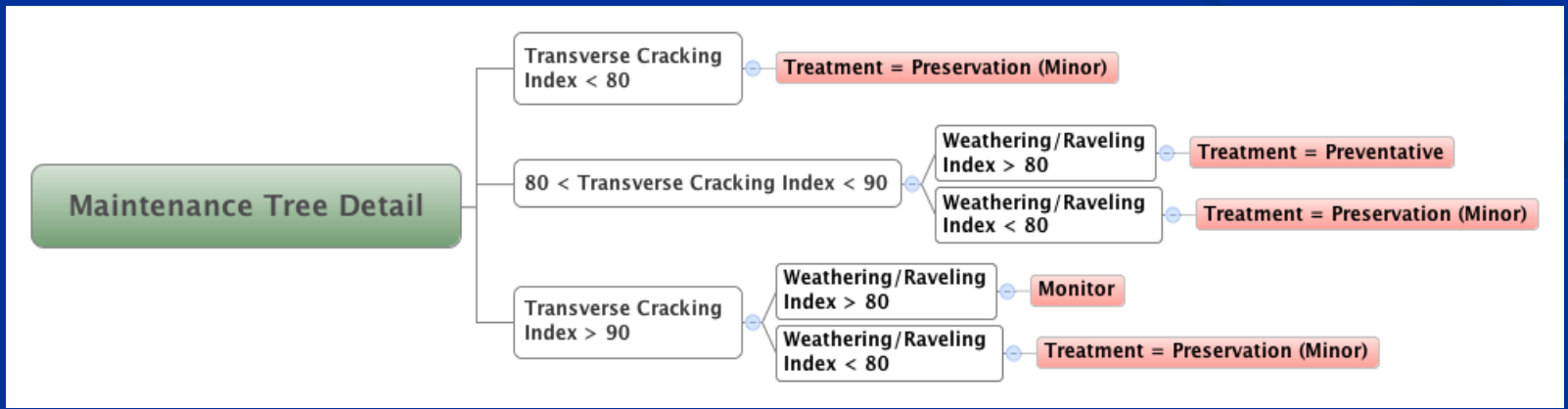
Environmental Decision Tree





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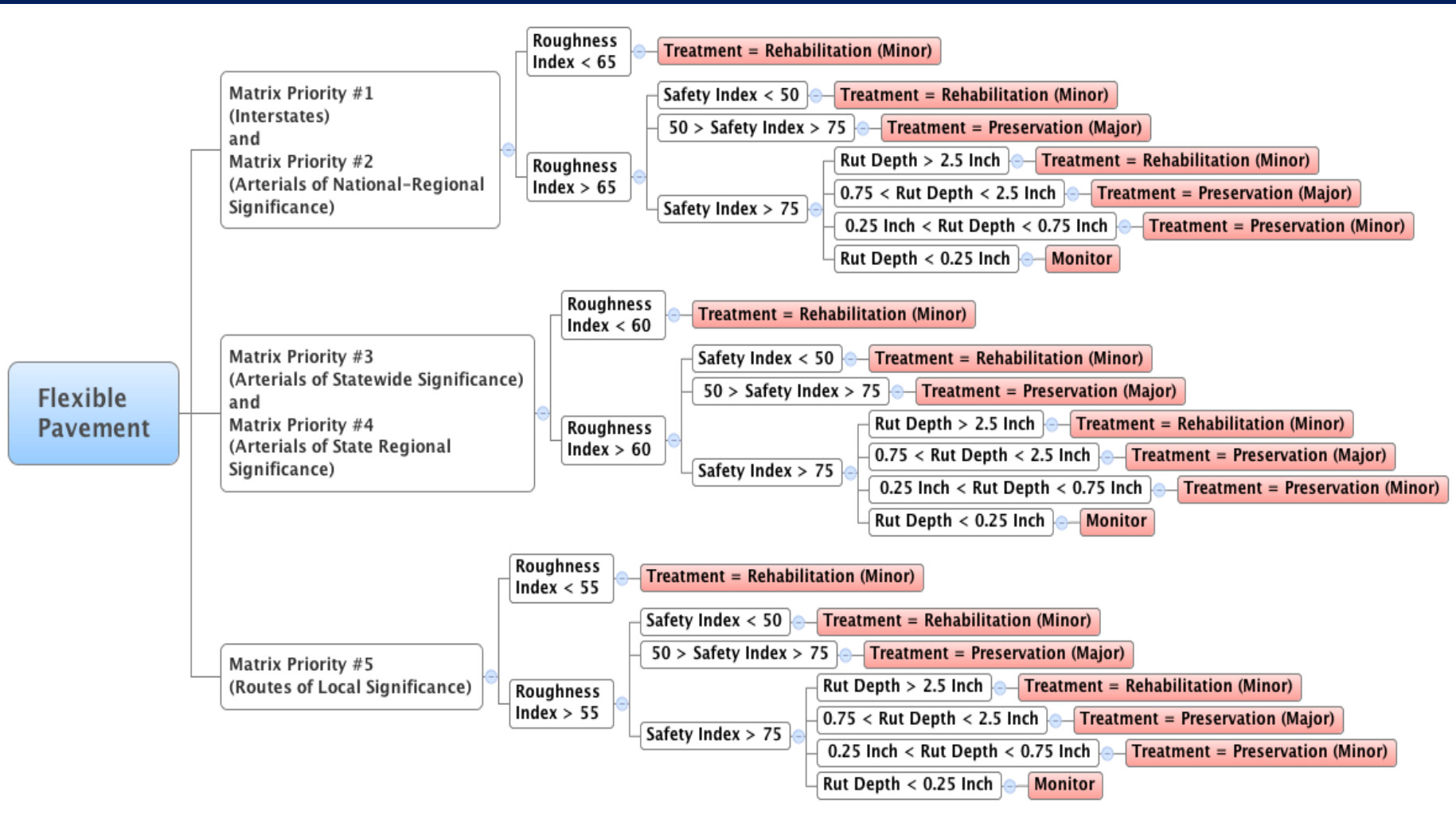
Functional Decision Tree



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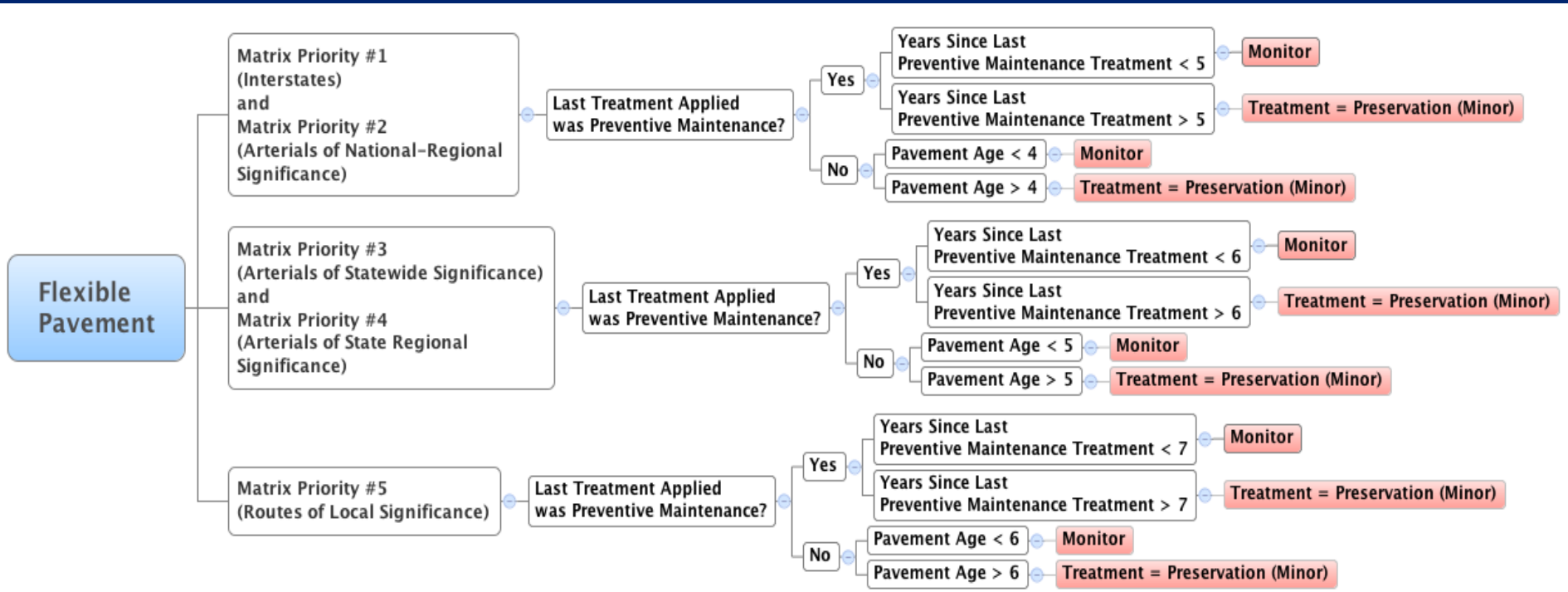
Pavement Age Decision Tree



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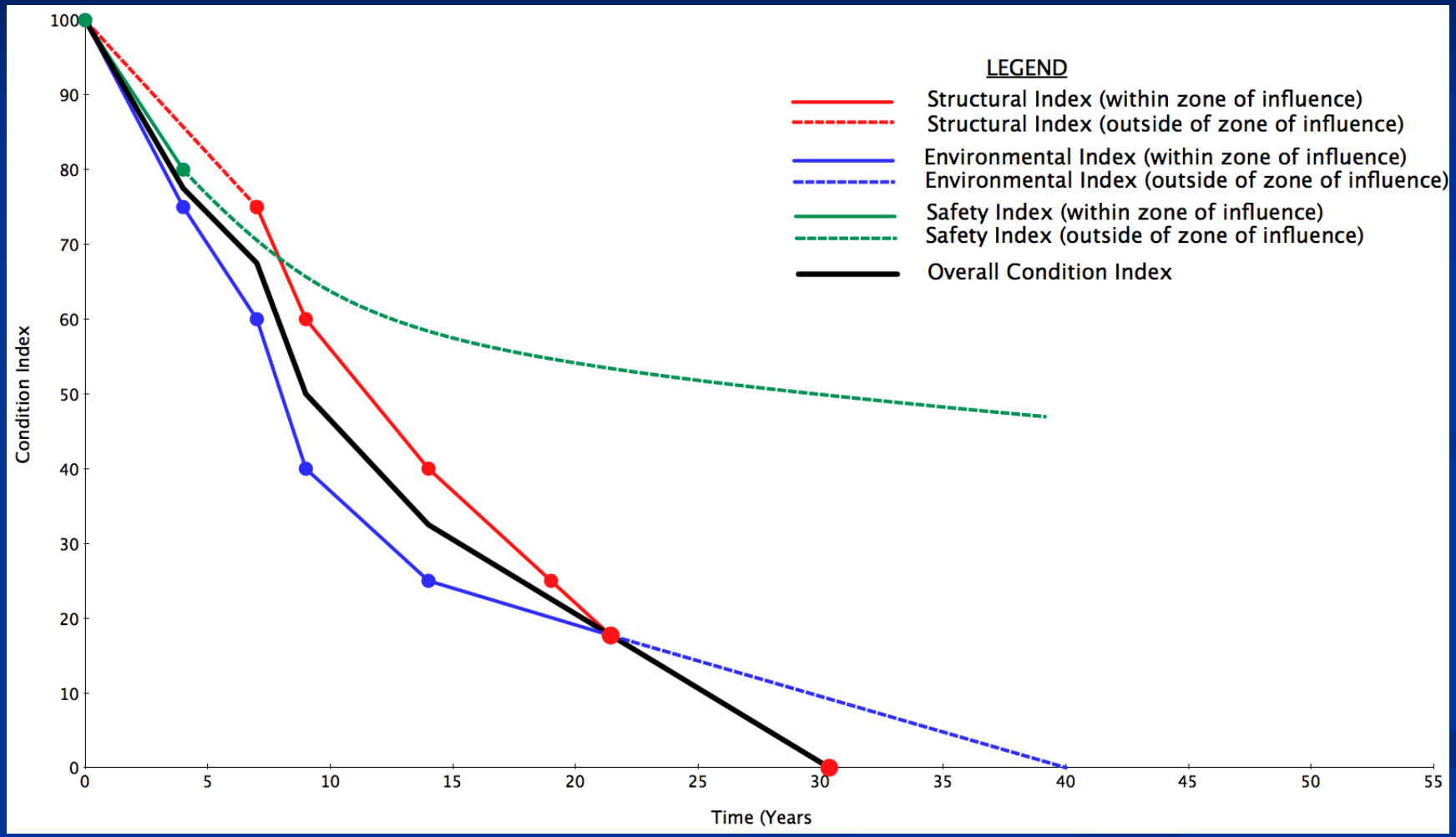
Performance Models

Purpose:

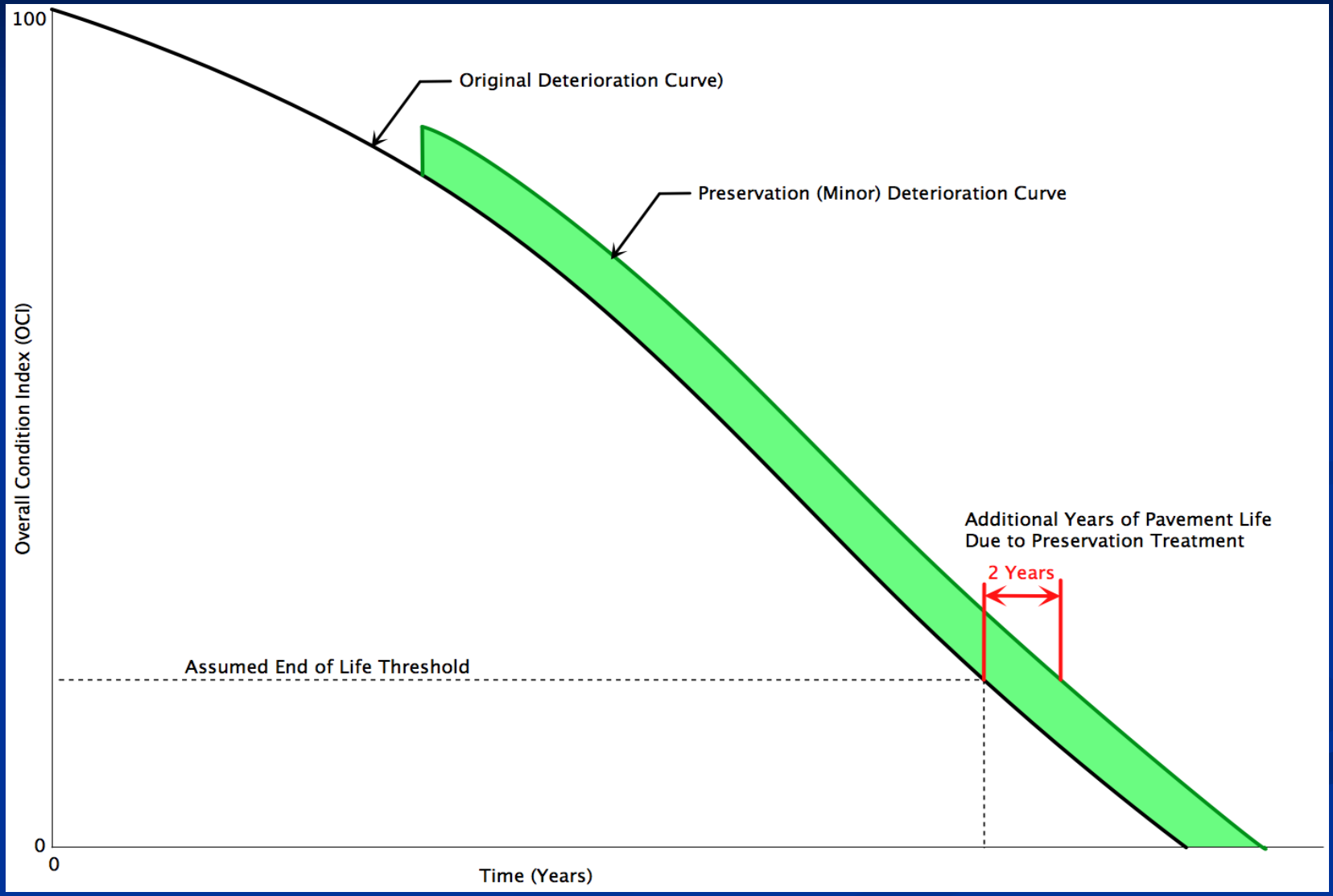
Define Treatment Life and Benefit

(Reviewing Preservation Only)

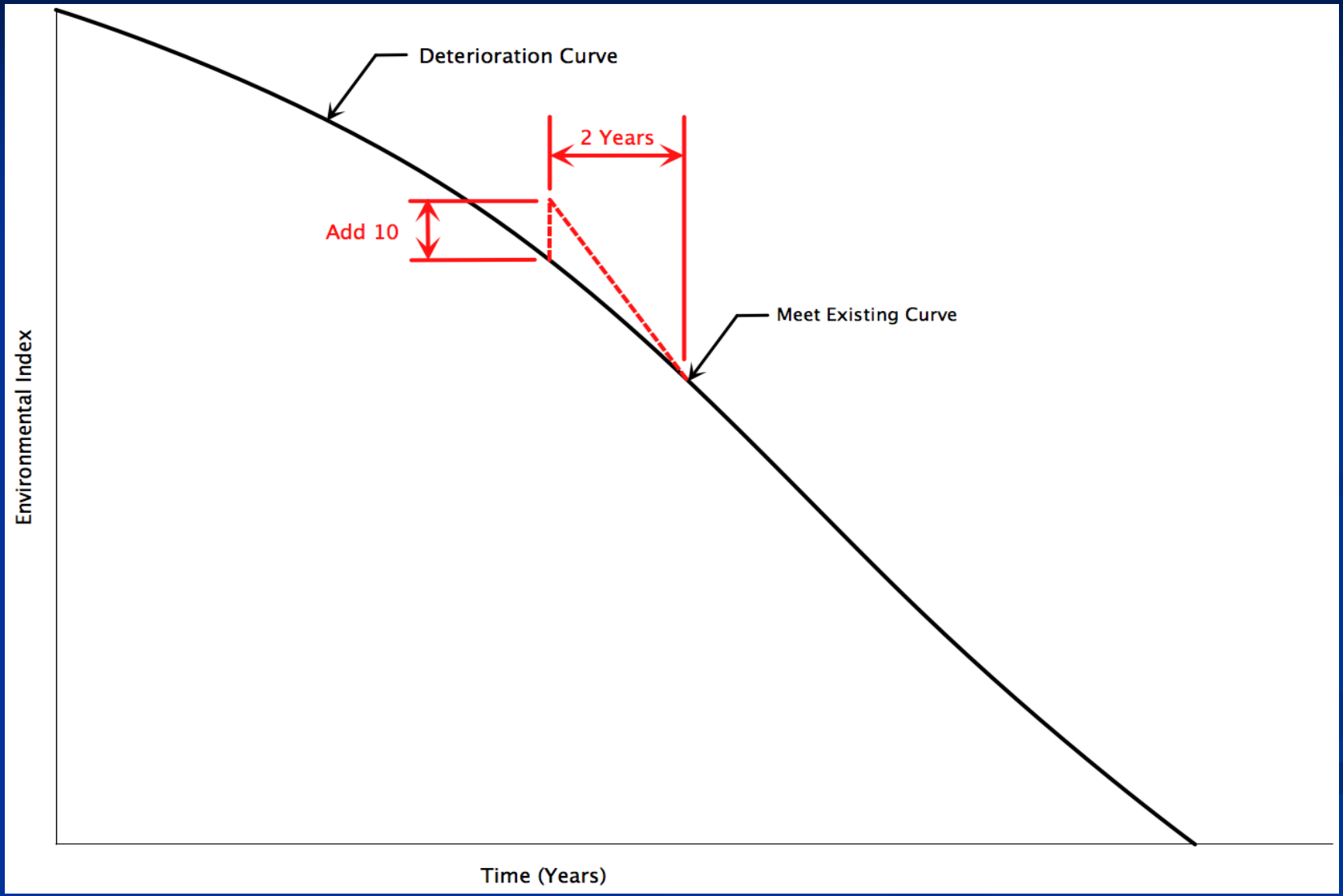
Preservation (Major) Models



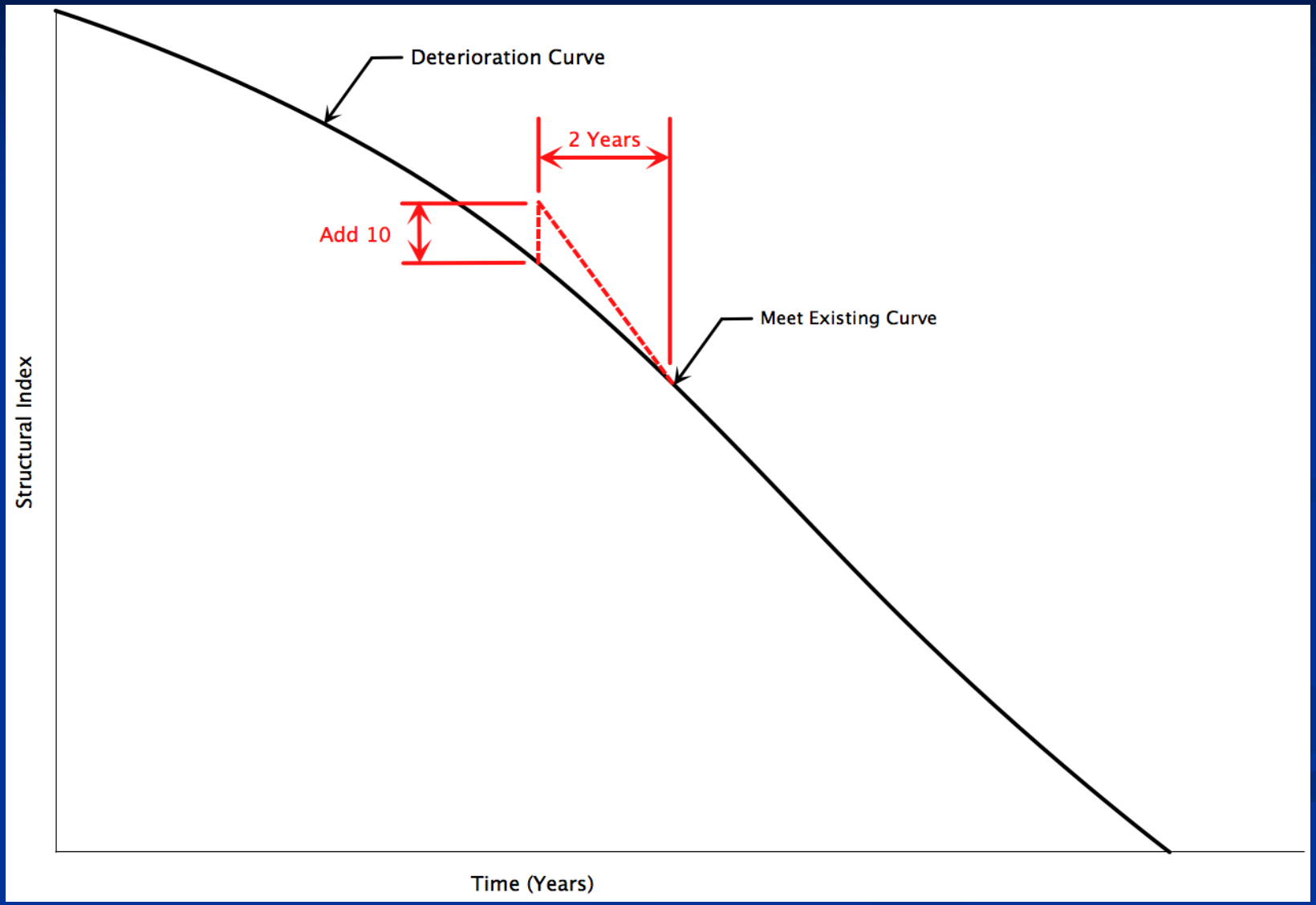
Preservation (Minor) Model



Crack Seal Model

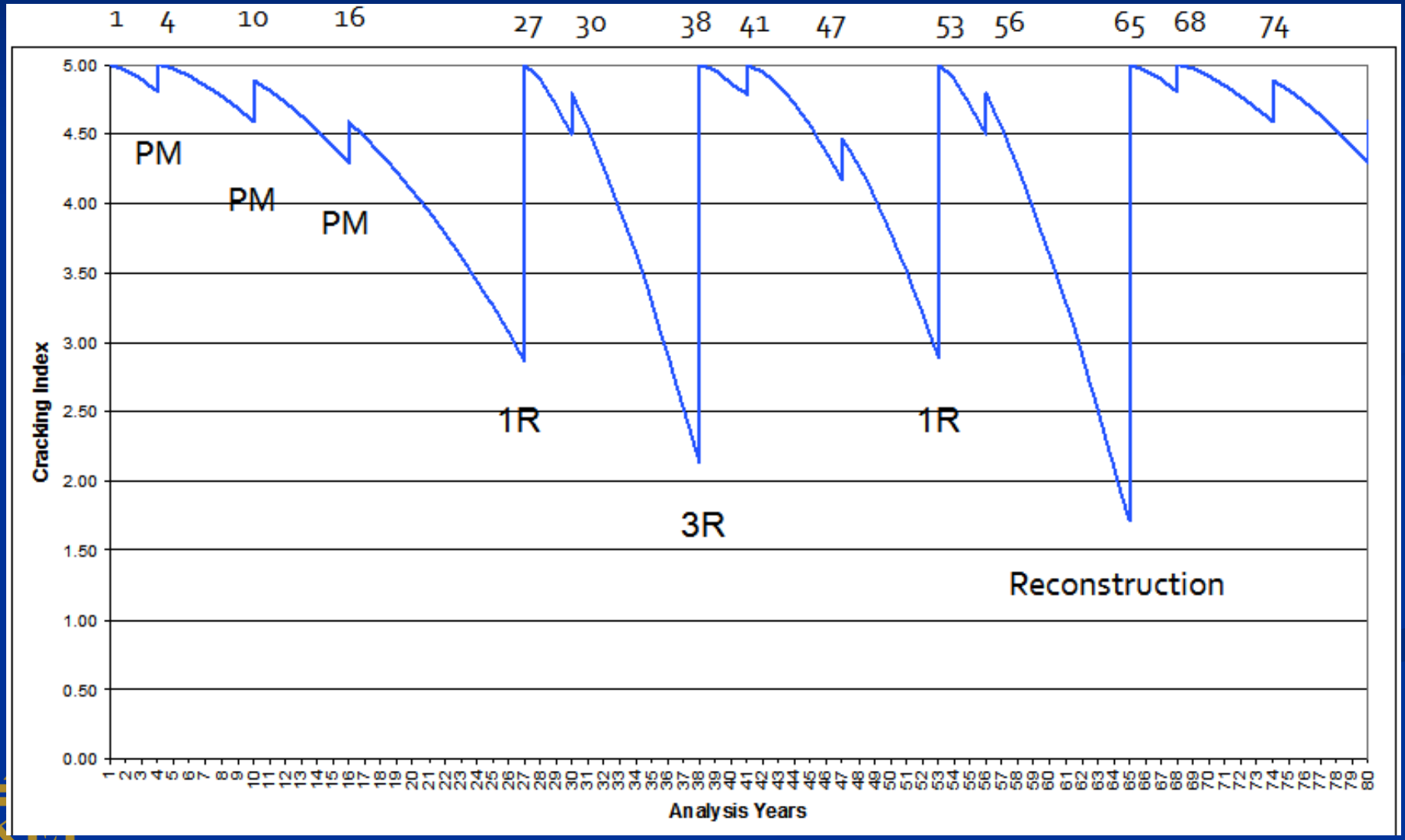


Patching Model



Life Cycle Treatment Rules

If Funded when Conditions Reach Threshold Values



Multi-Constraint Optimization Analysis

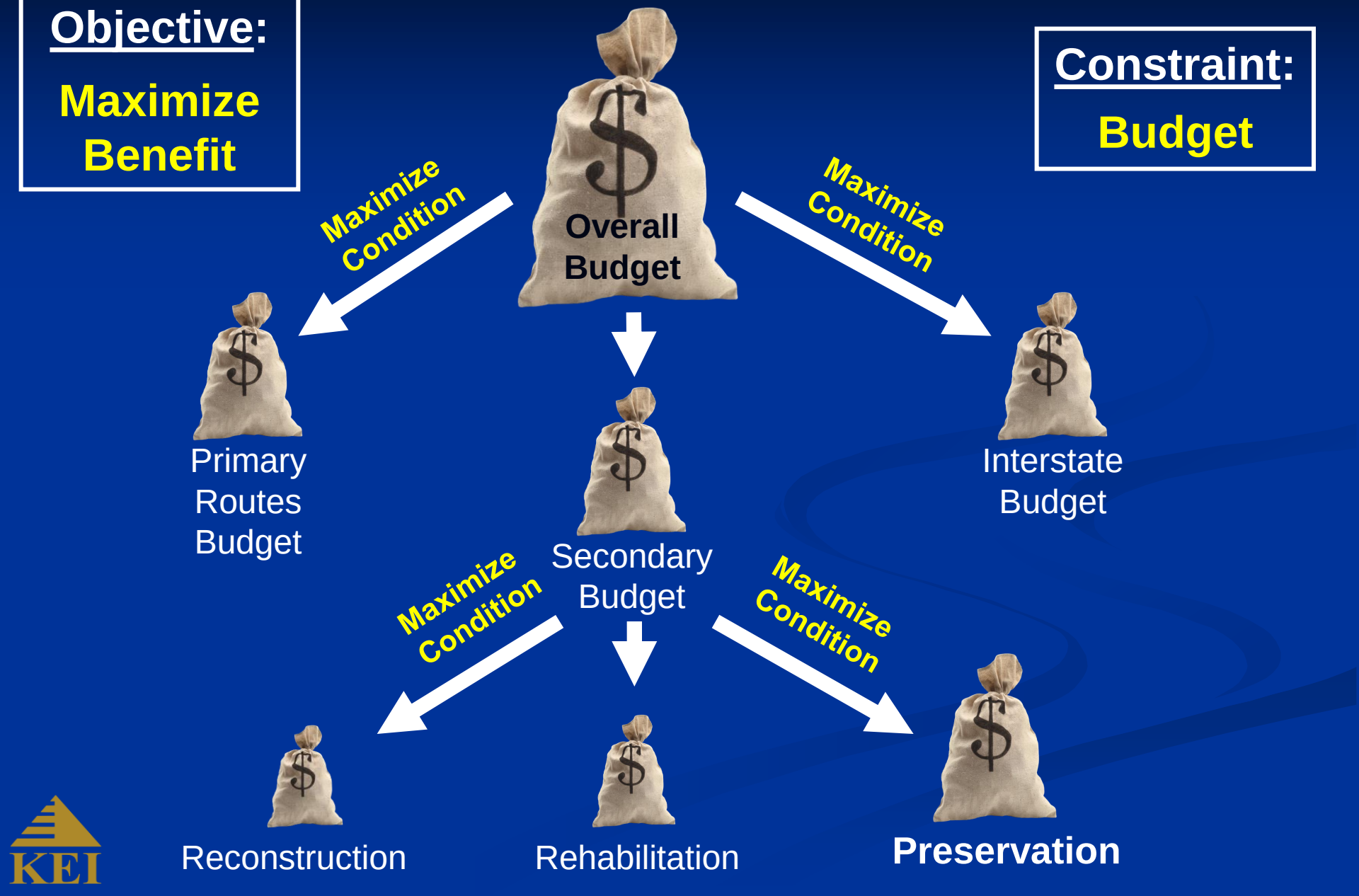
Multi-Constraint Optimization Analysis

Objective:

Maximize Benefit

Constraint:

Budget



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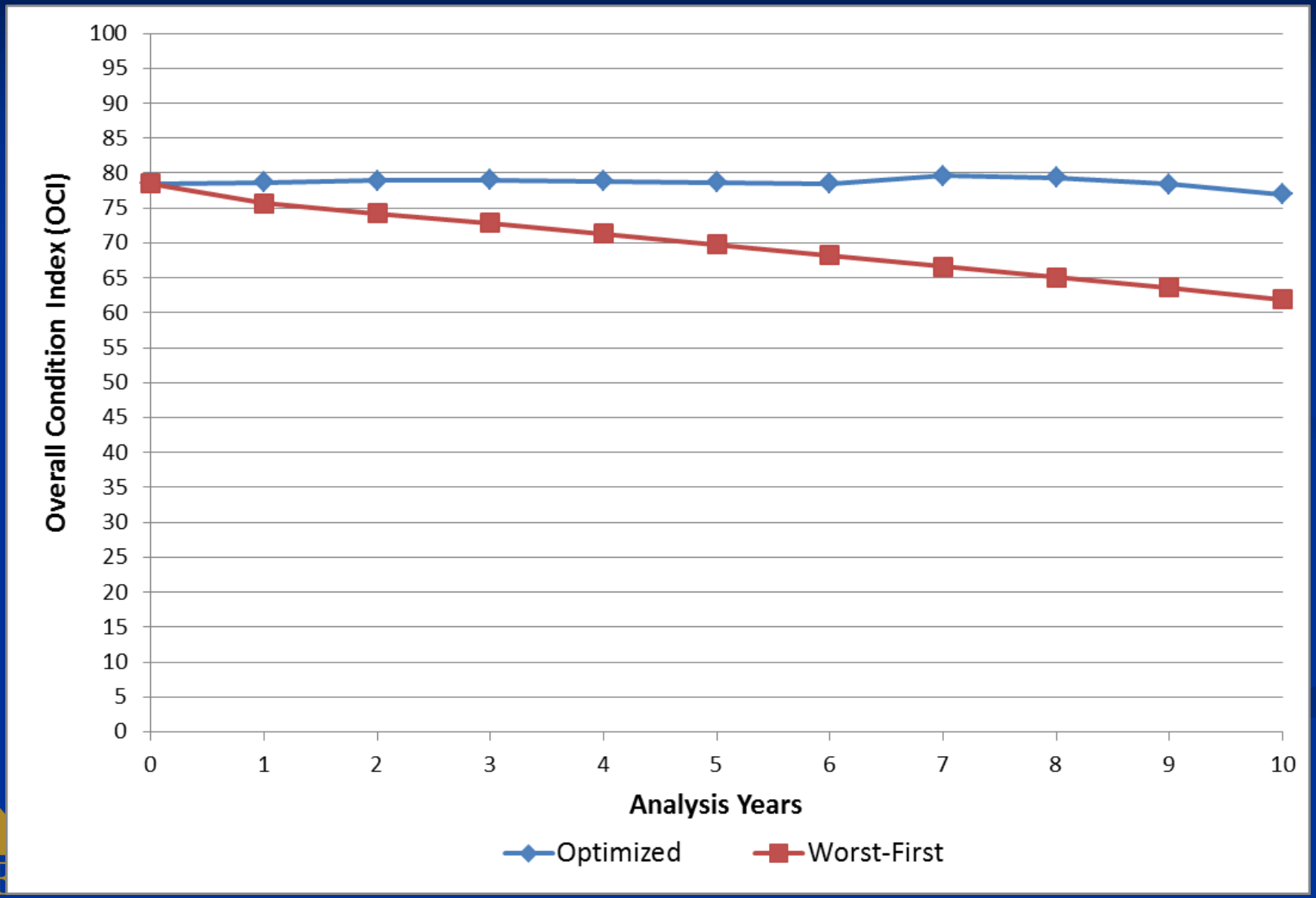
Optimized vs. Worst-First Analysis
Why Choosing Preservation is Critical



Thoughts on Software Calibration

- Reconstruction and Major Rehabilitation Treatments are Easy
  - Typically Indexes Reset to 100
  - Thickness of Treatments removes most if not all Distresses
  - Agency has Good Historical Data available to Support Performance Predictions
- Preservation Treatments are more Complex
  - Indexes Increase but may not Reset to Perfect
  - Typically, performance of the Treatment is dependent on the previous Treatment
  - Performance is Absolutely Dependent on Existing Condition

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NMDOT Moving Forward

- Transitioning from Manual Distress Surveys to Automated Surveys
- Linking Historical Construction Records with Pavement Performance
- Also Linking Pavement Design with Pavement Performance with MEPDG Dashboard
- More Analysis Testing to Ensure Configuration is Finely Tuned to Agency Expectations

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Questions????

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