Institutional Context of Pavement Management Systems and PMS Data Collection

Presented by
Edgardo D. Block
Connecticut Department of Transportation

Role of Data in Decision Systems

- Decision systems rely on data to make or justify decisions
  - Simulation software has been used to successfully map actual pavement decision systems as they exist
    - Worst-first, legacy systems
    - Pavement management systems

Data in Pavement Management Systems

- Pavement history and composition
- Objective, quantitative condition data
- Pavement-related information
- Used for performance modeling and development of a pavement program

Other important uses of PMS data

- Engineering applications
- Marketing Pavement Management
- Supporting new initiatives

Case Study: Making the PMS case to agency executives

- Objective: Secure continued support for PMS within the agency; highlight impending pavement-needs backlog
- Use simple pavement measures
- Put the data into context
  - Business analysis
  - Let the data make its own point
- Burn the midnight oil if necessary
  - Especially if the system is not yet in place

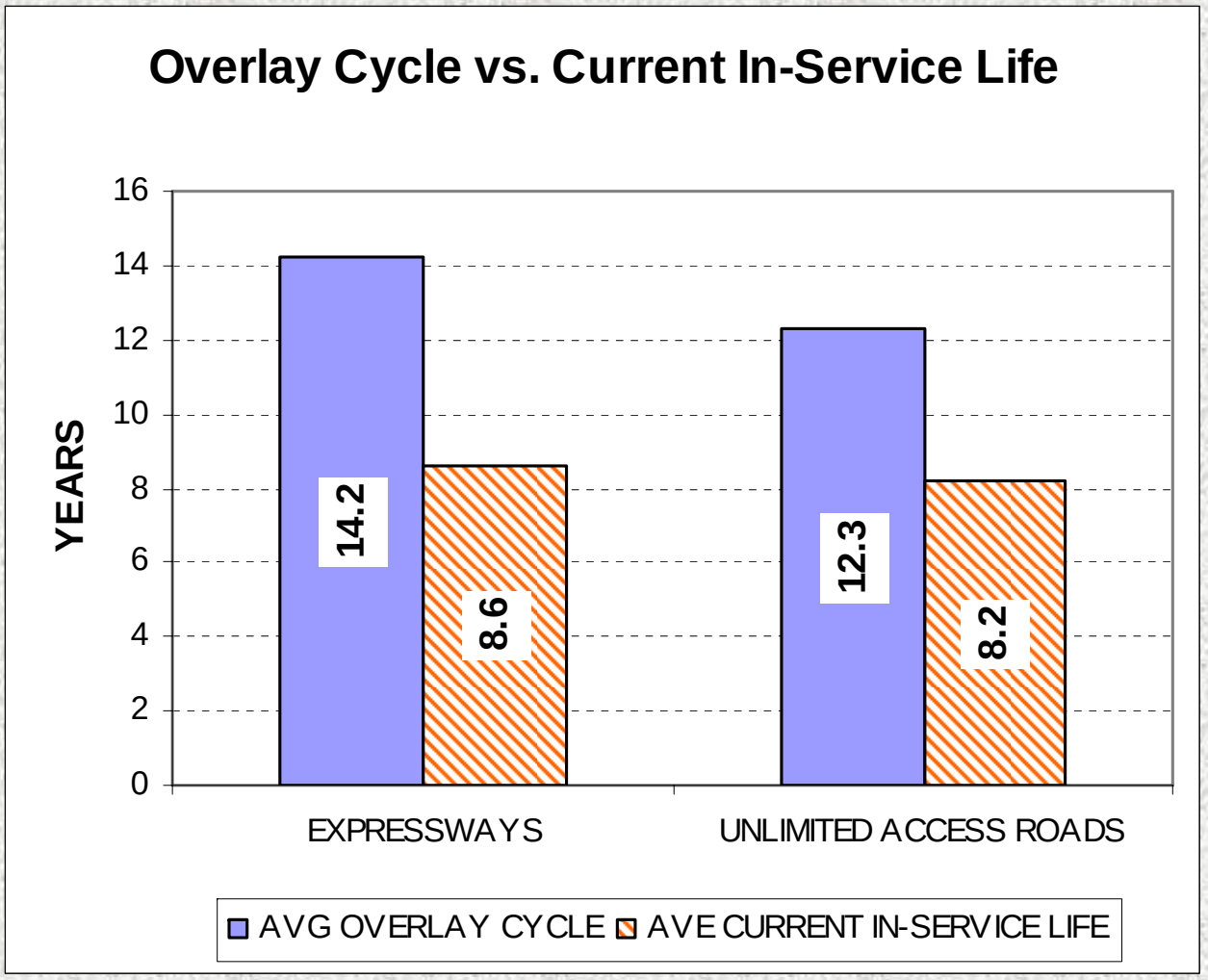
State of the network

- PAVEMENT LONGEVITY MEASURES
  - Average overlay cycle
    - Time between overlays. Measure of pavement longevity.
  - Average in-service life
    - Time from the last overlay to the present. Measure of program effectiveness in maintaining network condition.
  - Data Sources
    - Data sources: Planning, Inventory and Data, Maintenance, Photolog, Pvt Mgmt

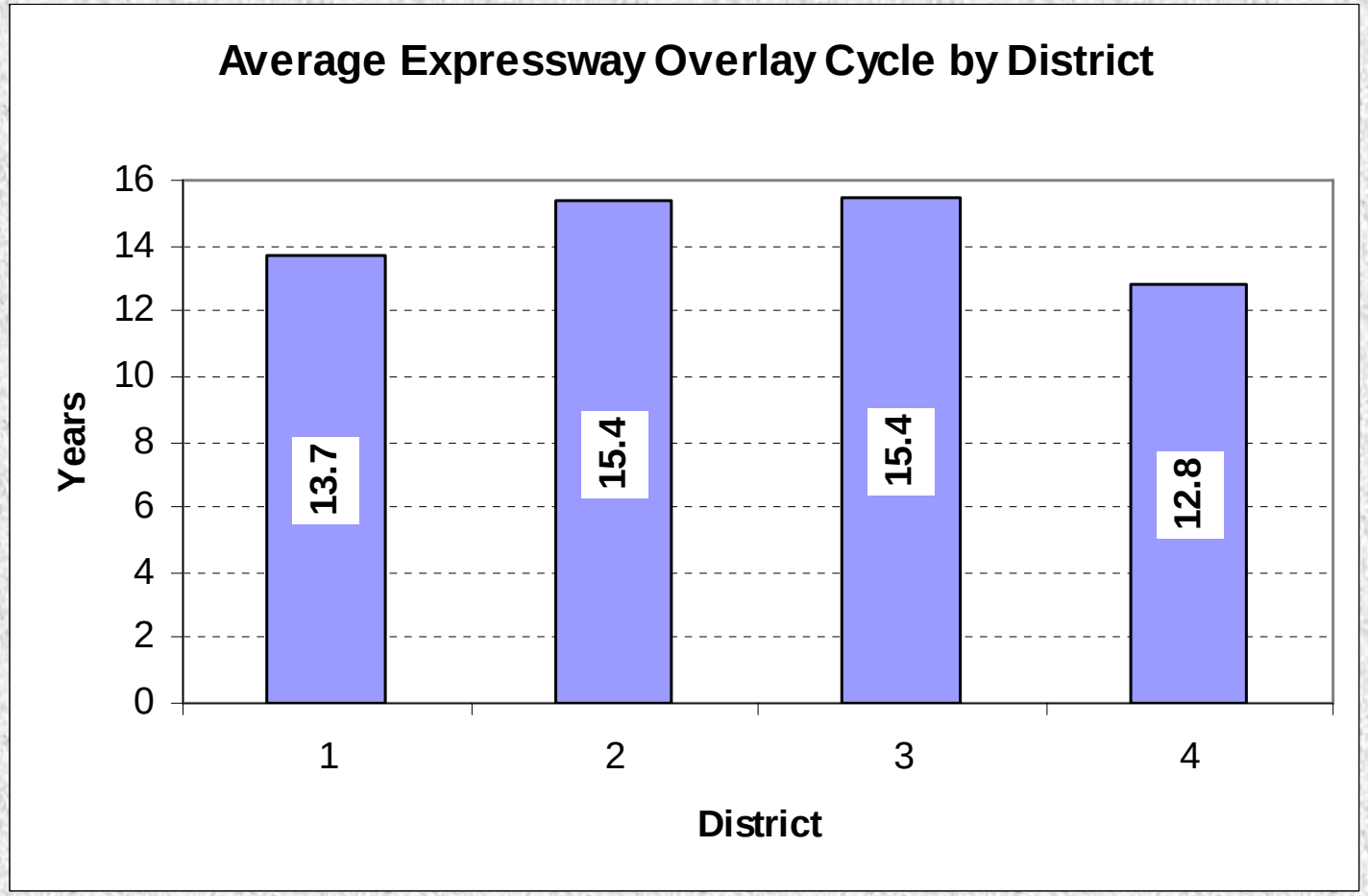
State of the network

- **PAVEMENT LONGEVITY OF THE NETWORK**
  - Stratified random sampling
    - Expressways vs. Unlimited-Access Roads
    - Districts (4 Districts)
  - Random selection of towns within each stratum
  - 24 towns for Interstate roadways
  - 24 for unlimited-access roads
  - 6 towns per district in each case.
  - All roadway segments within each town were considered

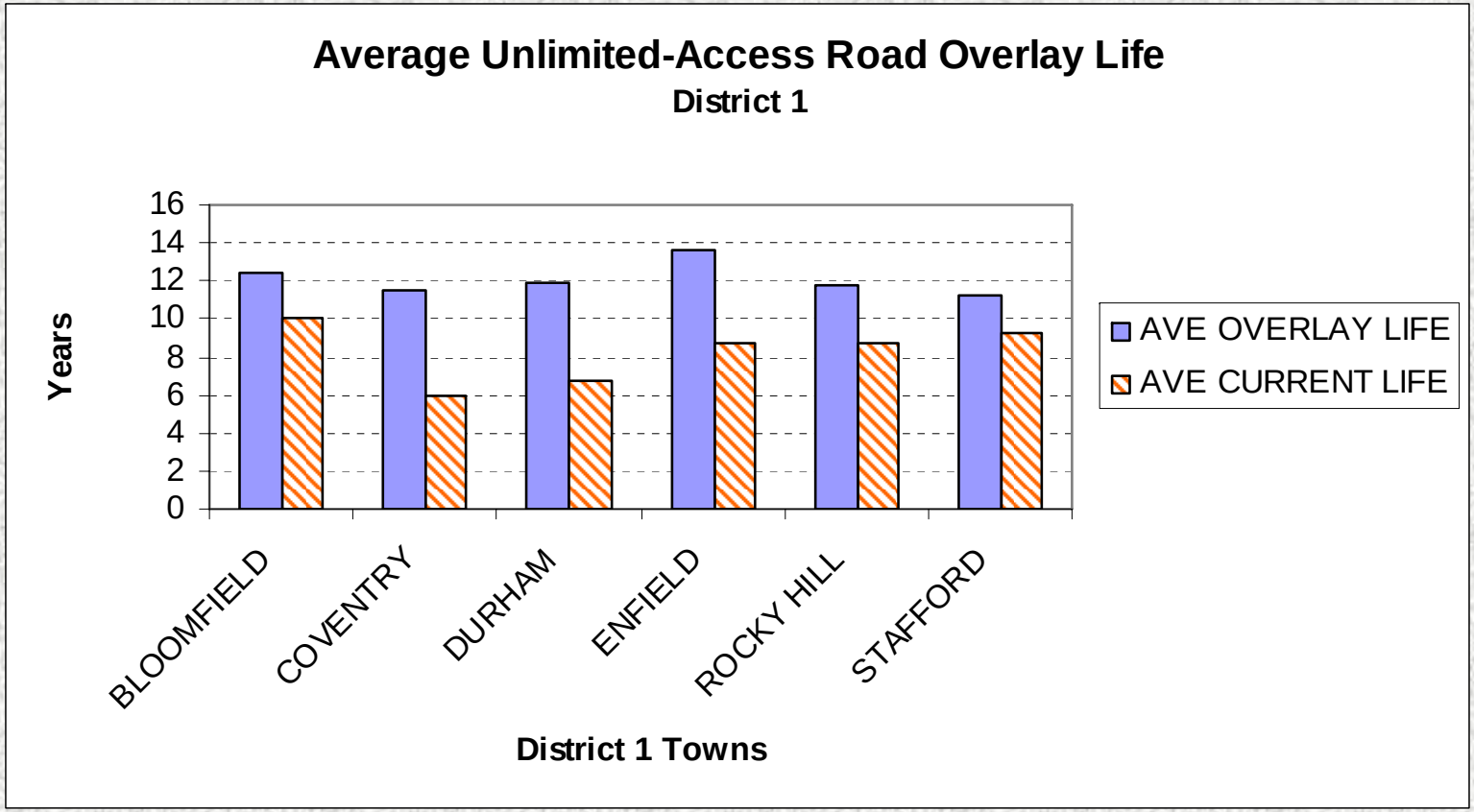
Overlay Cycle - Overall



Overlay Cycle: Expressways



Overlay Cycle: Unlimited Access



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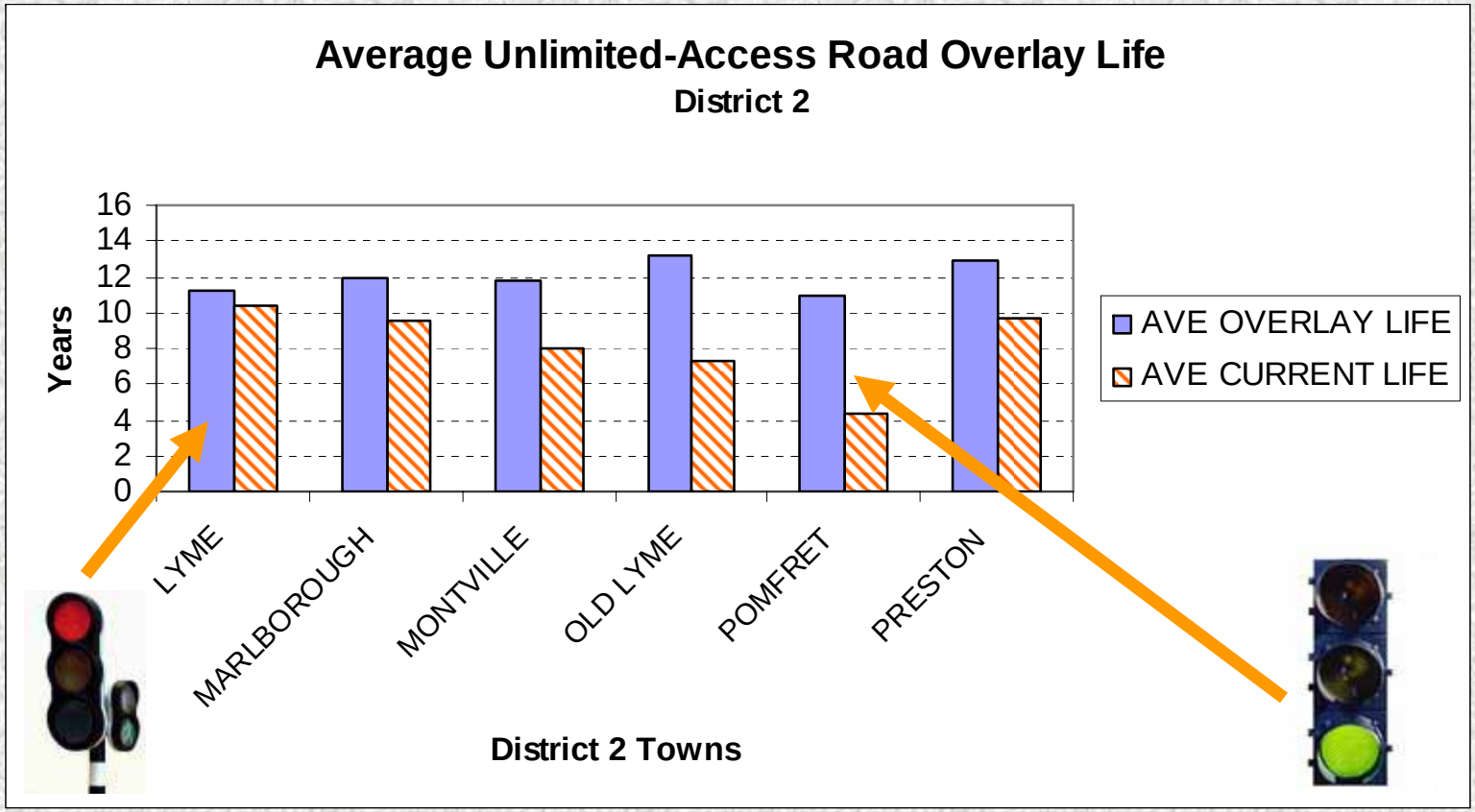

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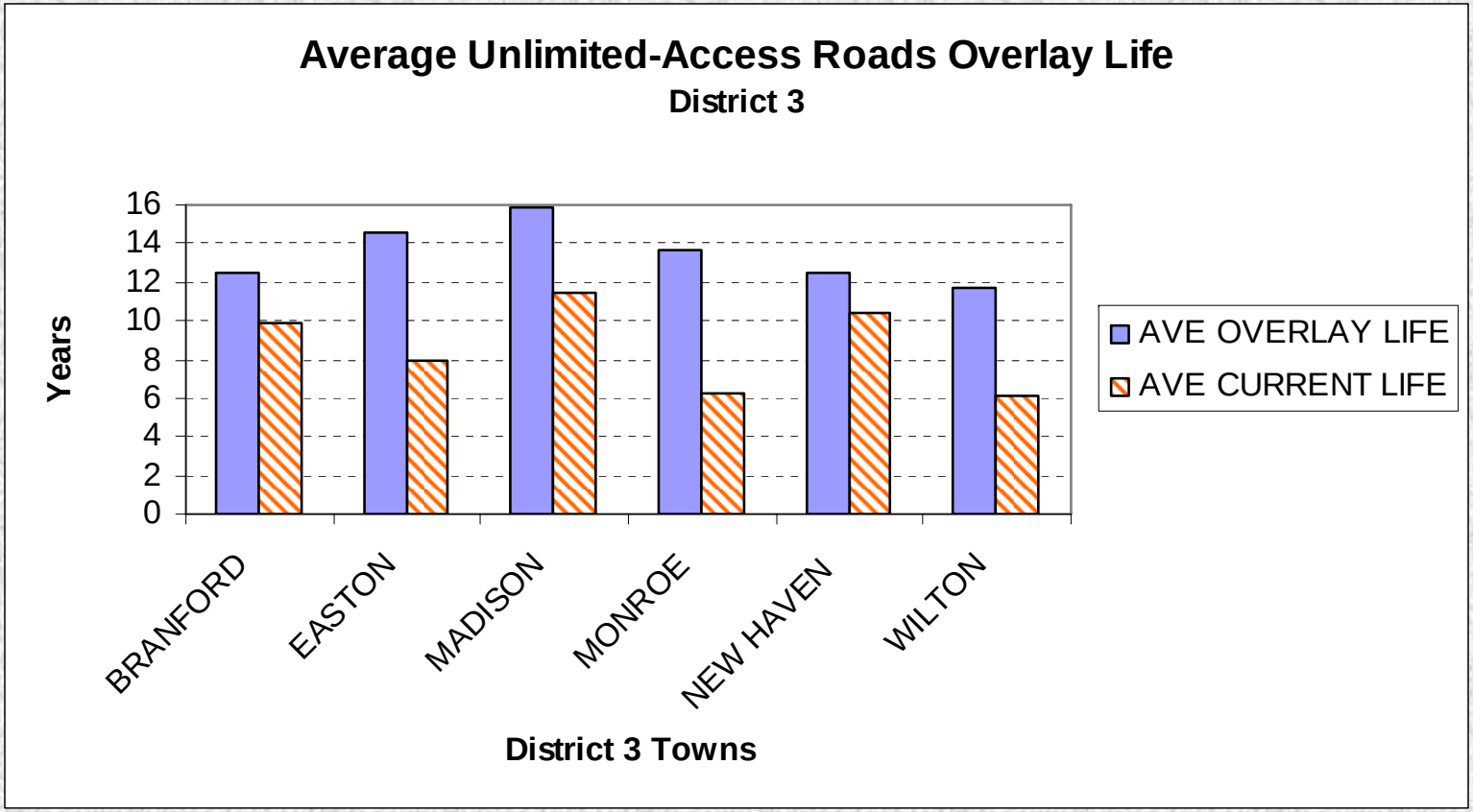

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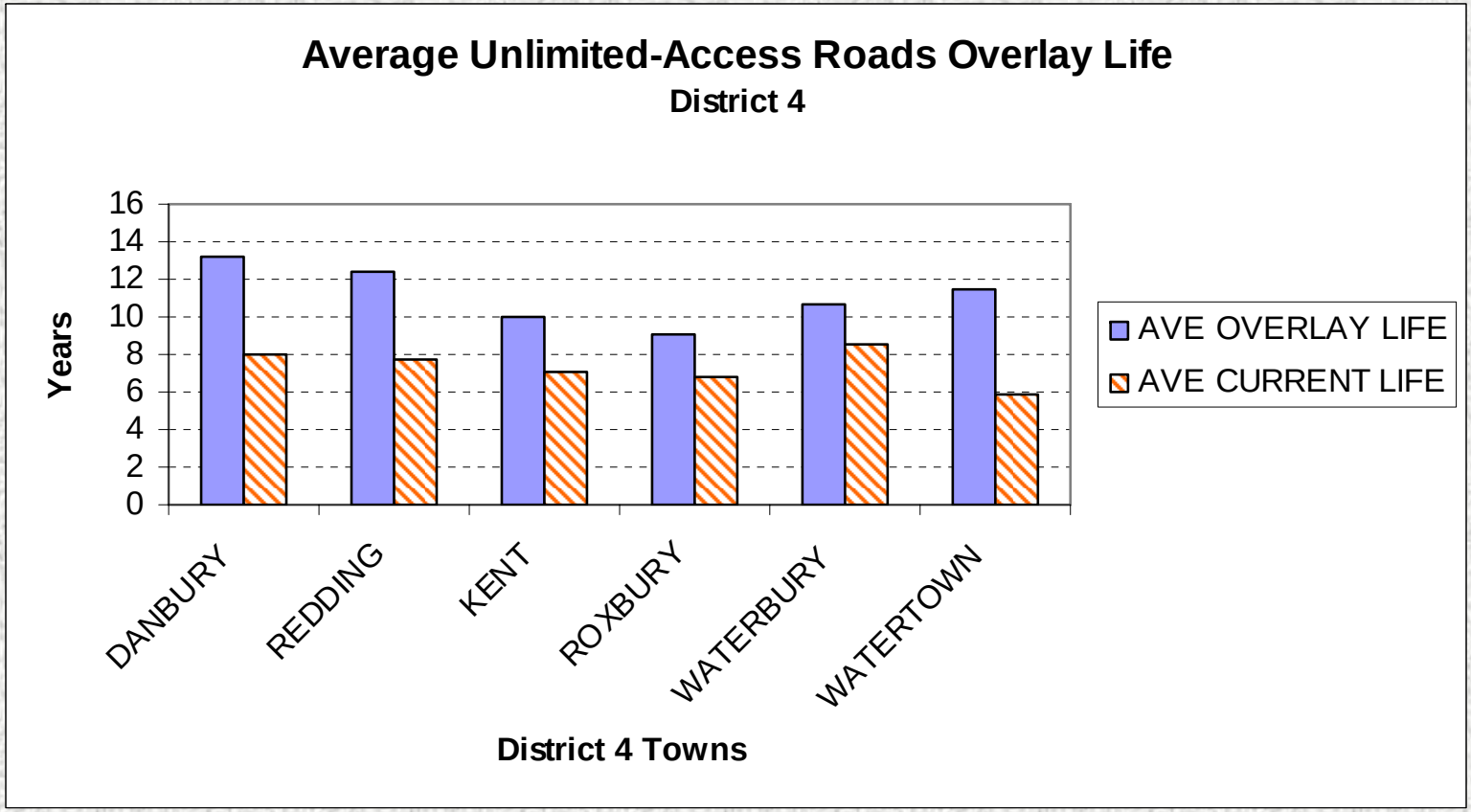
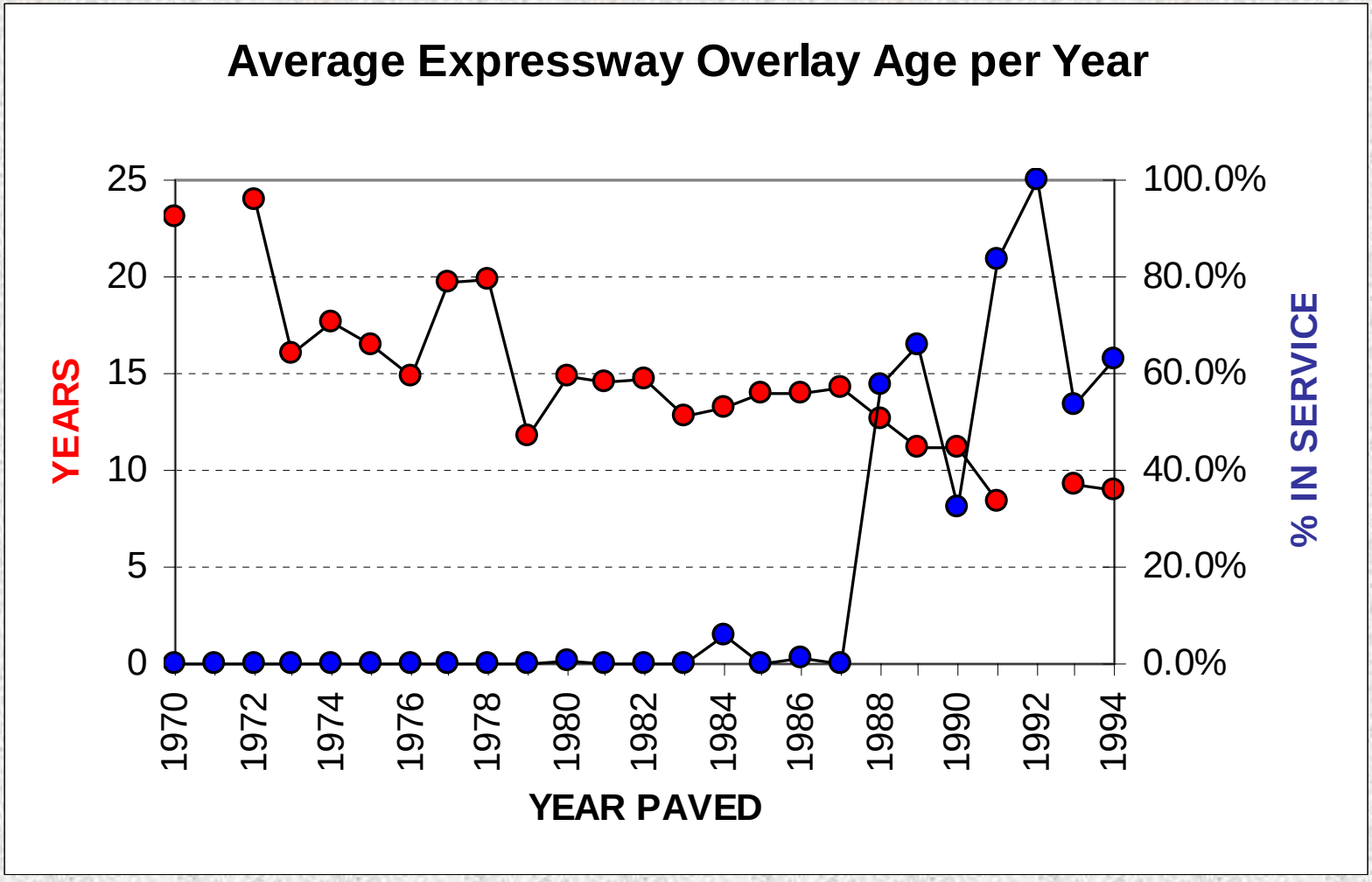


Overlay Cycle: Expressways



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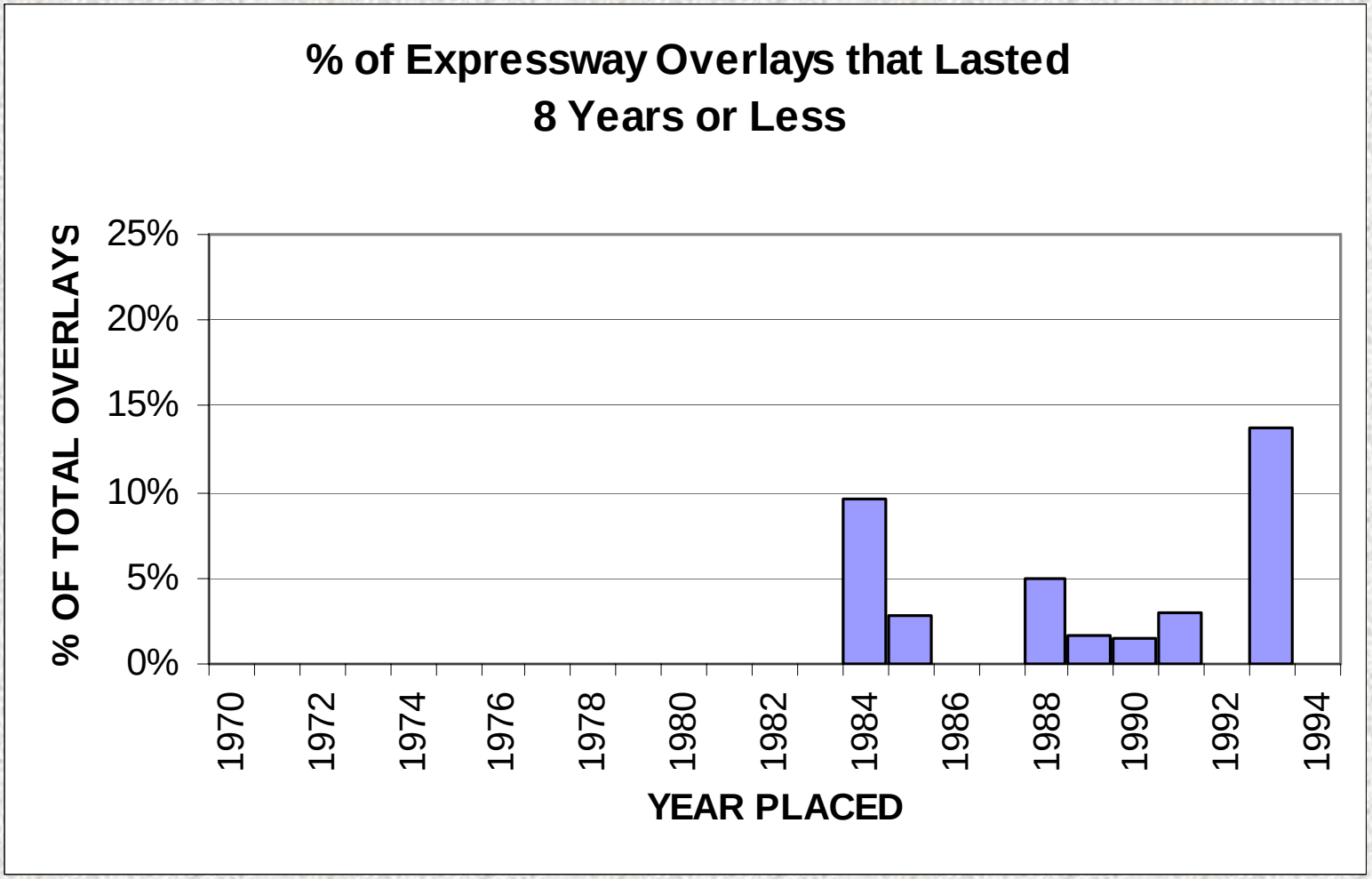

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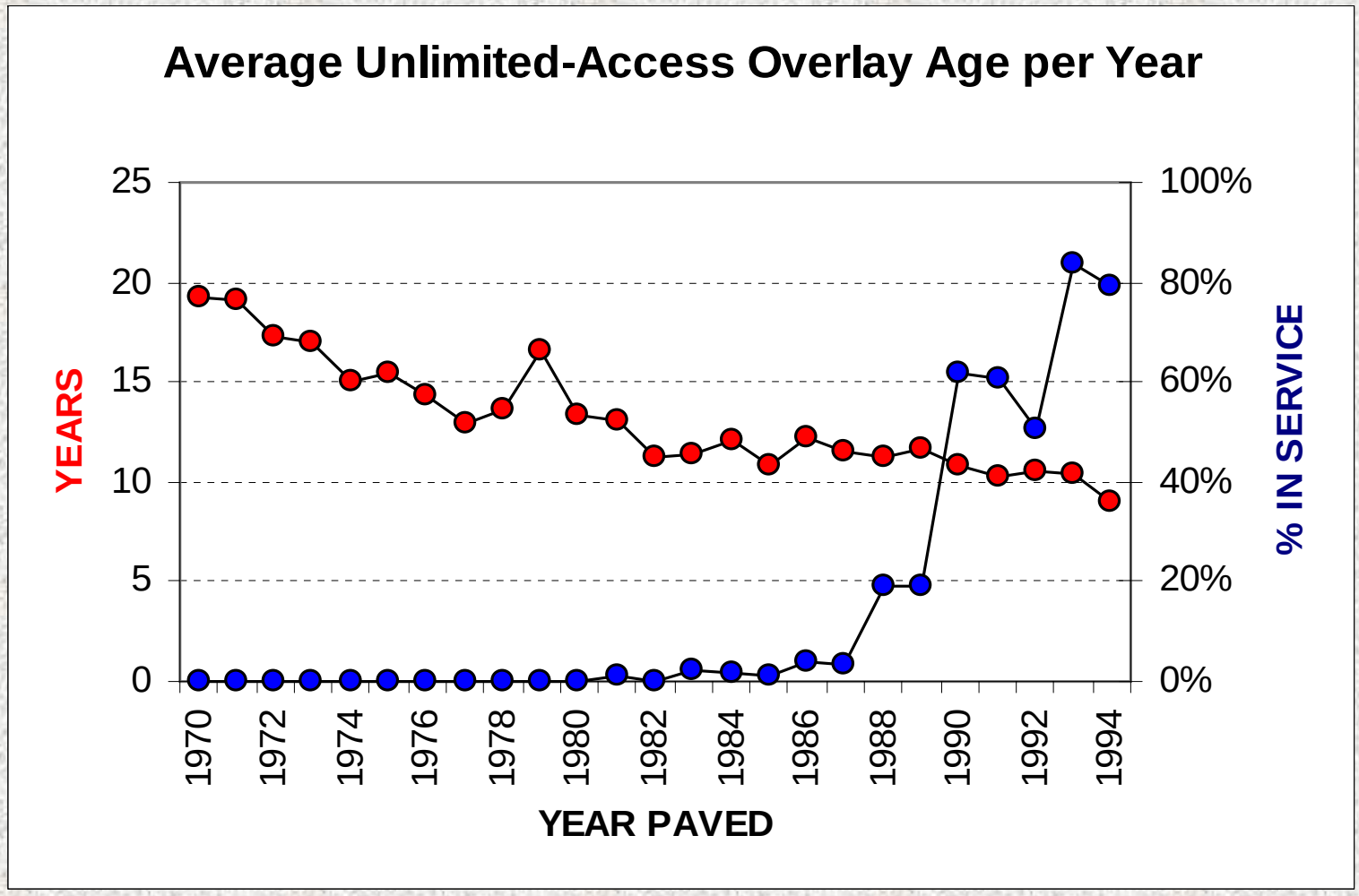

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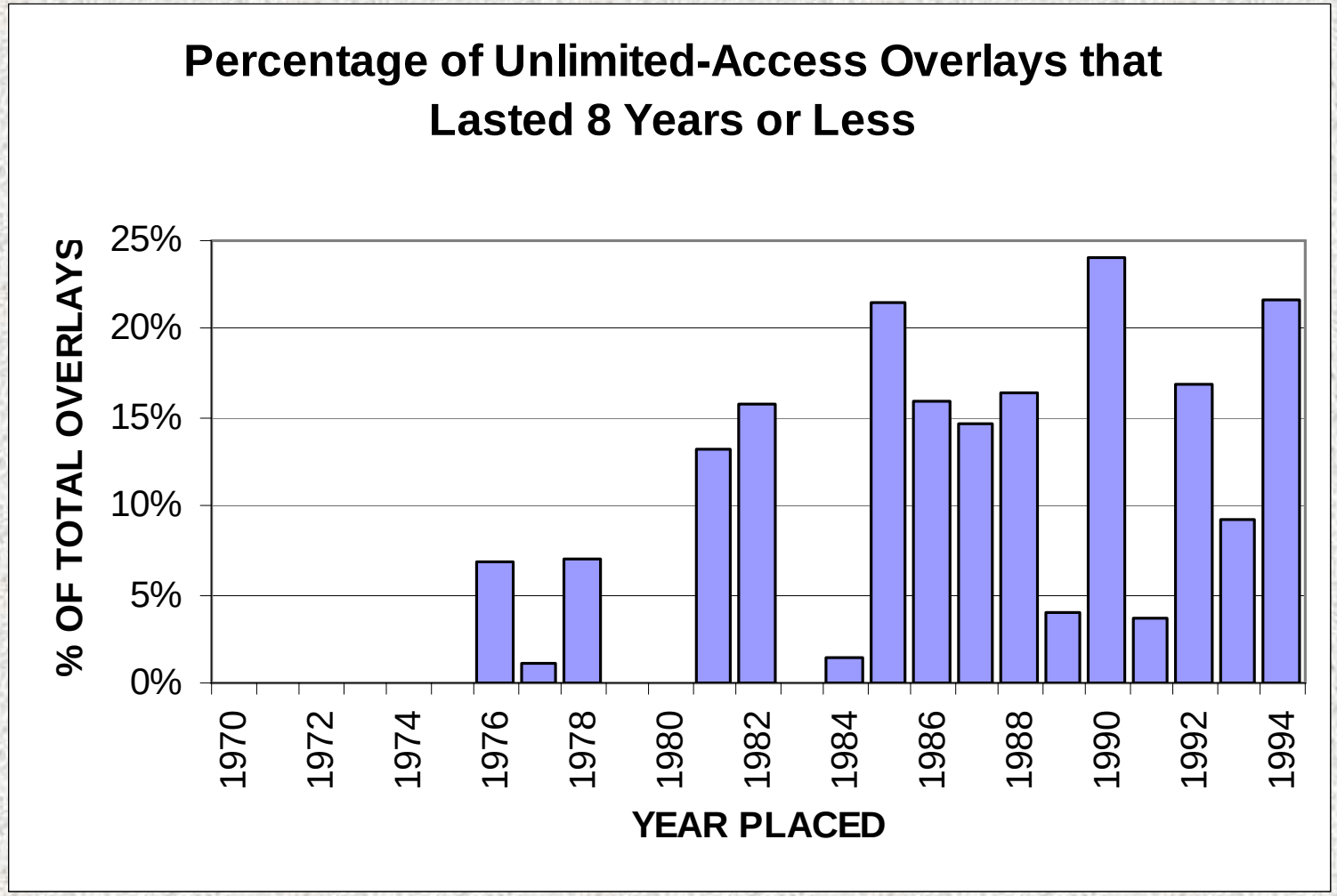
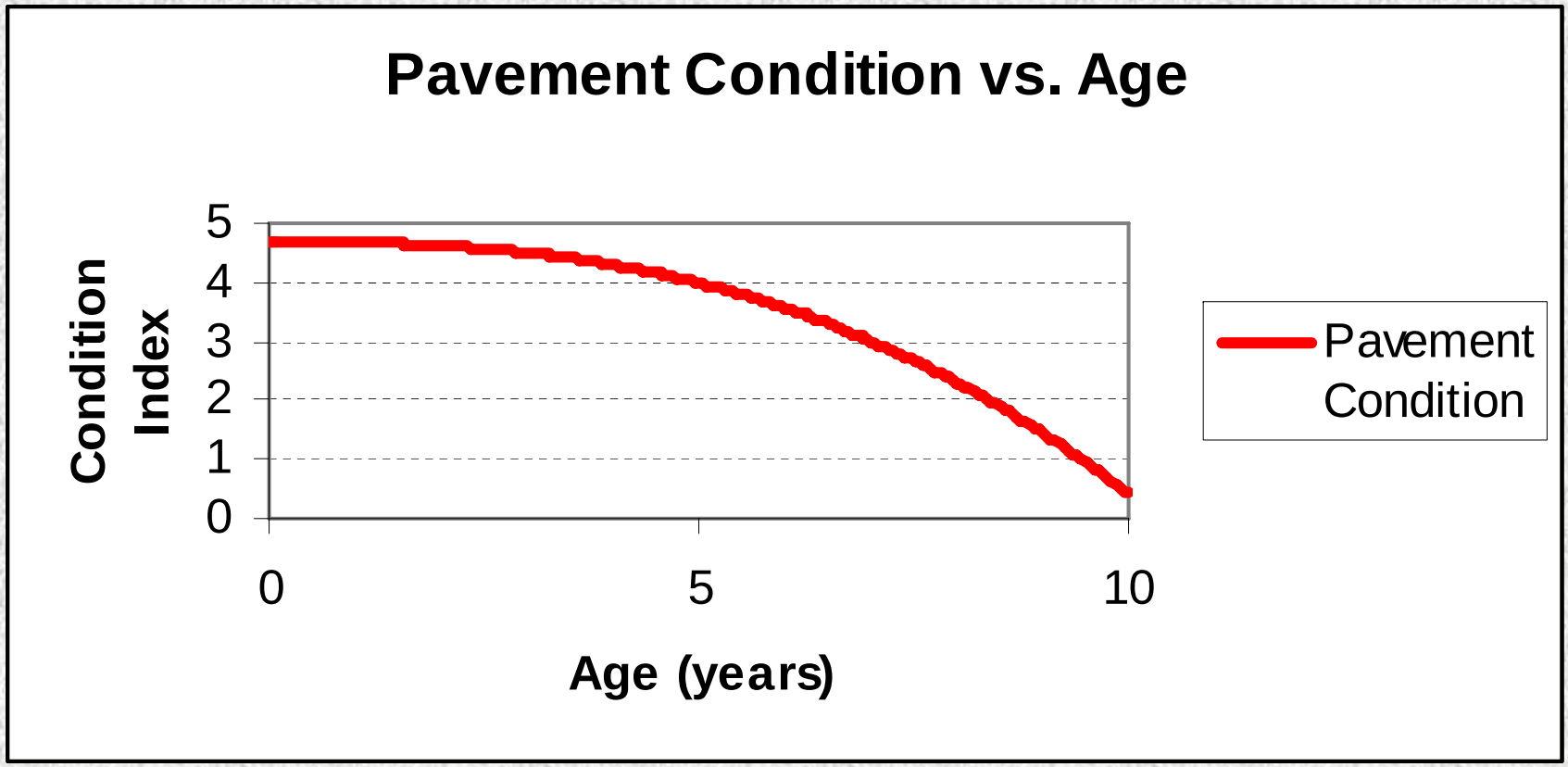


STATE OF THE NETWORK

- Shrinking overlay cycle
  - True of both expressways and unlimited-access highways
  - Substantial increase in overlays that last eight years or less
- Average in-service life is past midpoint of overlay cycle
  - More difficult and costly to catch up later in the pavement service life, as distress propagates

Pavement Deterioration Curve



Key point: Rate of change in condition increases with pavement age

STRATEGIC ANALYSIS

PAVEMENT DETERIORATION FACTORS

EXOGENOUS FACTORS

- Environment
- Traffic
- Age
- Regulatory
- Political

ENDOGENOUS FACTORS

- Availability of materials
- Design methods
- System management
- Construction practices

PAVEMENT CONDITION OF THE HIGHWAY NETWORK

STRATEGIC ANALYSIS

Deterioration factors that can be influenced

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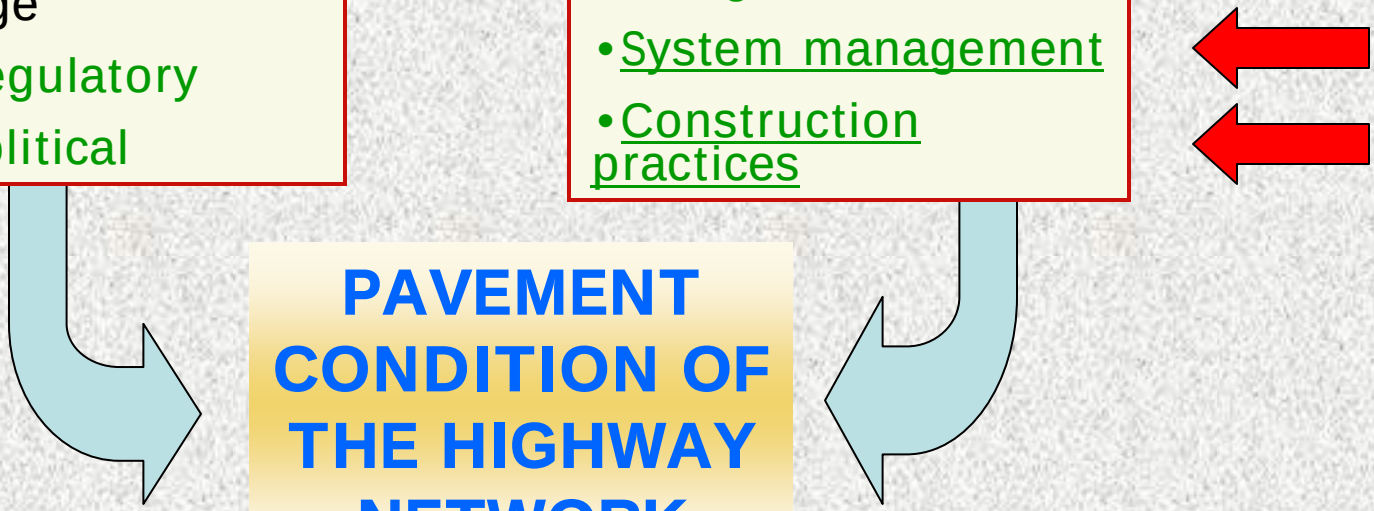

PAVEMENT CONDITION OF THE HIGHWAY NETWORK

SITUATIONAL ANALYSIS

Classic S.W.O.T. perspective

STRENGTHS	OPPORTUNITIES
• Good source aggregates • Few miles of road / taxpayer • Conceptual political support from the Executive	• Get out of worst-first scenario • Implement lifetime pavement strategy • Adopt emerging pavement technology (more rehab tools) • Optimize treatment selection
WEAKNESSES	**THREATS**
• Preservation strategy • State-of-the-art of mix and pavement design • Resources for inspection and acceptance	• Older network • Surface age is beyond steady state • “Shrinking” resources • Materials availability

STRATEGY FORMULATION

- **Degree of agency influence**
  - **Regulatory environment (minor)**
  - **Political (relatively minor)**
  - **Materials availability (minor)**
  - **Design methods (major, but difficult to produce immediate results)**
  - **System management (major)**
  - **Construction practices (major)**

STRATEGIC FORMULATION

- **Endogenous factors**
  - **Materials availability**
    - **Promote competition and quality, look at modified binders**
  - **Design methods**
    - **Keep abreast of state of the art design methodology**
    - **Study regional factors of mix and pavement design**
    - **Design for durability and [im]permeability**
    - **Keep focus on rut resistance on high-truck-truffic pavements**
  - **System management**
    - **Stop worst-first network management**
    - **Develop network goals and design multi-year program on that basis**
    - **Implement pavement-preservation program (pavement strategy: the right treatment on the right pavement at the right time)**
  - **Construction practices**
    - **Focus on compaction**
    - **Focus on permeability**
    - **Minimize late season paving**
    - **Attention to detail**

CONCLUSION (not necessary)

- There is no single “golden bullet”
- Focus on system management and construction practices can have immediate impact
- Efforts on design methods are important, too. Renewed focus on durability and impermeability

Case Study: Spearheading new initiatives

- Objective: Develop a Pavement Preservation program project-selection process (one treatment)
- Show a process
- Keep focus on process stability
  - Objectivity of data is essential
- Burn the midnight oil if necessary

Pavement Preservation

- Pavement Preservation Technical Assessment Visit, Summer 2006 (FHWA Asset Management, NCPP)
- Pavement-preservation group formed
  - Develop “toolbox”
  - Identify one treatment we could get started on
  - Develop a project-selection process for that treatment

Project-Selection Process for Ultra-thin Hot-mix asphalt

- (Older) pavements in structurally sound condition
  - Limit rutting, roughness
  - Select based on cracking
- Use distress data obtained with agency's data-collection vehicles
  - Total cracking length per 10-meter lane segment
  - Longitudinal cracking/total cracking

Project-selection process

- Identify age range (7-10 years)
- Order from least to most cracking
- Conduct photolog review (HD images)
  - Identify cracking threshold
    - Value above which ultra-thin HMA not very effective extending pavement life
  - Filter out segments with obvious safety concerns
  - Filter out segments with other planned work
- Conduct final field review

Outcome

- Pavement preservation projects were not equally distributed across the state
- Process and project-candidate list were approved in concept
- Will apply similar methodology for other pavement-preservation treatments
- Need to refine methodology to include other distress types

Case Study: Support for Data Collection within the Agency

- Identify synergies with other data-collection efforts that can be accomplished with ground-based vehicles
- Build and expand a customer base within and outside the agency
- Share costs

Case Study: Support for Data Collection within the Agency

- Connecticut has been a leader in roadway imaging
  - Dr. Charles Dougan, James Sime, John Hudson, Bradley Overturf, Richard Hanley
- Developed Pavement Rating System using zoom photolog images in the mid 1980's
  - Established link between photolog and pavement-condition data
- New-generation vehicles obtained in 1995
  - Contacted every group within DOT who would be a data customer to obtain support

Case Study: Support for Data Collection within the Agency

- Demonstrated cost-effectiveness of photolog operation
  - Saved field trips, claims against the state
- Currently, over 200 users of Digital/Hiway
  - Keep track of where users “traveled,” estimate that a percentage of them are saved field trips
- Pavement Management supports the data-collection modules
  - This makes it easier to fund the entire data-collection effort

Conclusions

- There is a dynamic relationship between data collection, pavement management systems, and the institution in which they reside
  - Sound data is fundamental in supporting the case for PMS and other pavement initiatives within the institution
  - The institution can be instrumental in supporting PMS data collection if relationships are developed and nurtured