applied pavement TECHNOLOGY

Effective Lifecycle Planning

15TH NATIONAL CONFERENCE ON TRANSPORTATION ASSET MANAGEMENT

Brad Allen, P.E.

Required Content of Asset Management Plans

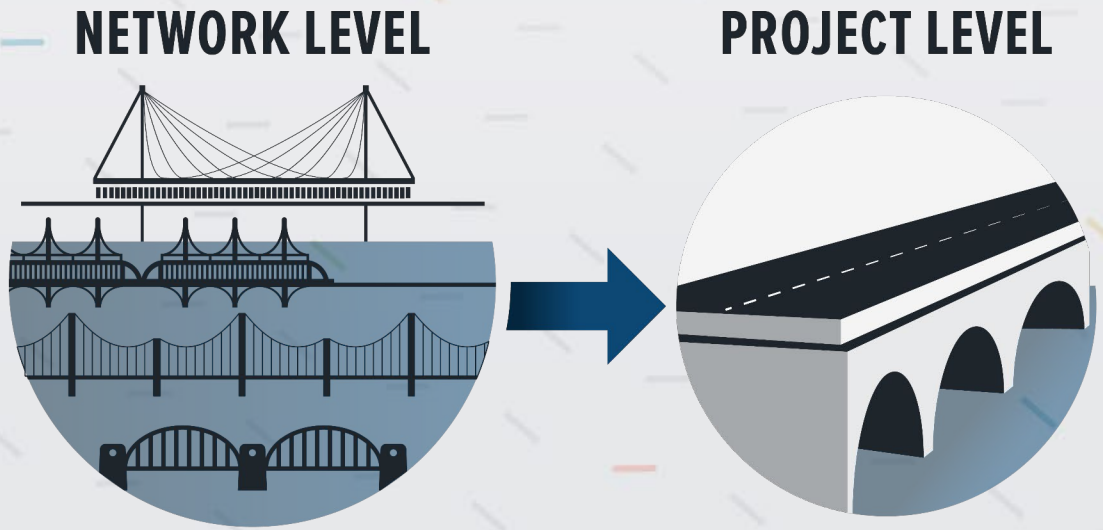
- Summary listing of assets, including a description of the condition of those assets
- Asset management objectives and measures
- Performance gap identification;
- Lifecycle cost analysis, with consideration to extreme weather and resilience
- Risk analysis, with consideration to extreme weather and resilience
- Financial plan
- Investment strategies

23 USC 119(e)(4)

What is Life-Cycle Planning

- *Life-cycle planning* means a process to estimate the cost of managing an asset class, or asset sub-group over its whole life with consideration for minimizing cost while preserving or improving the condition. (23 CFR 515.5)

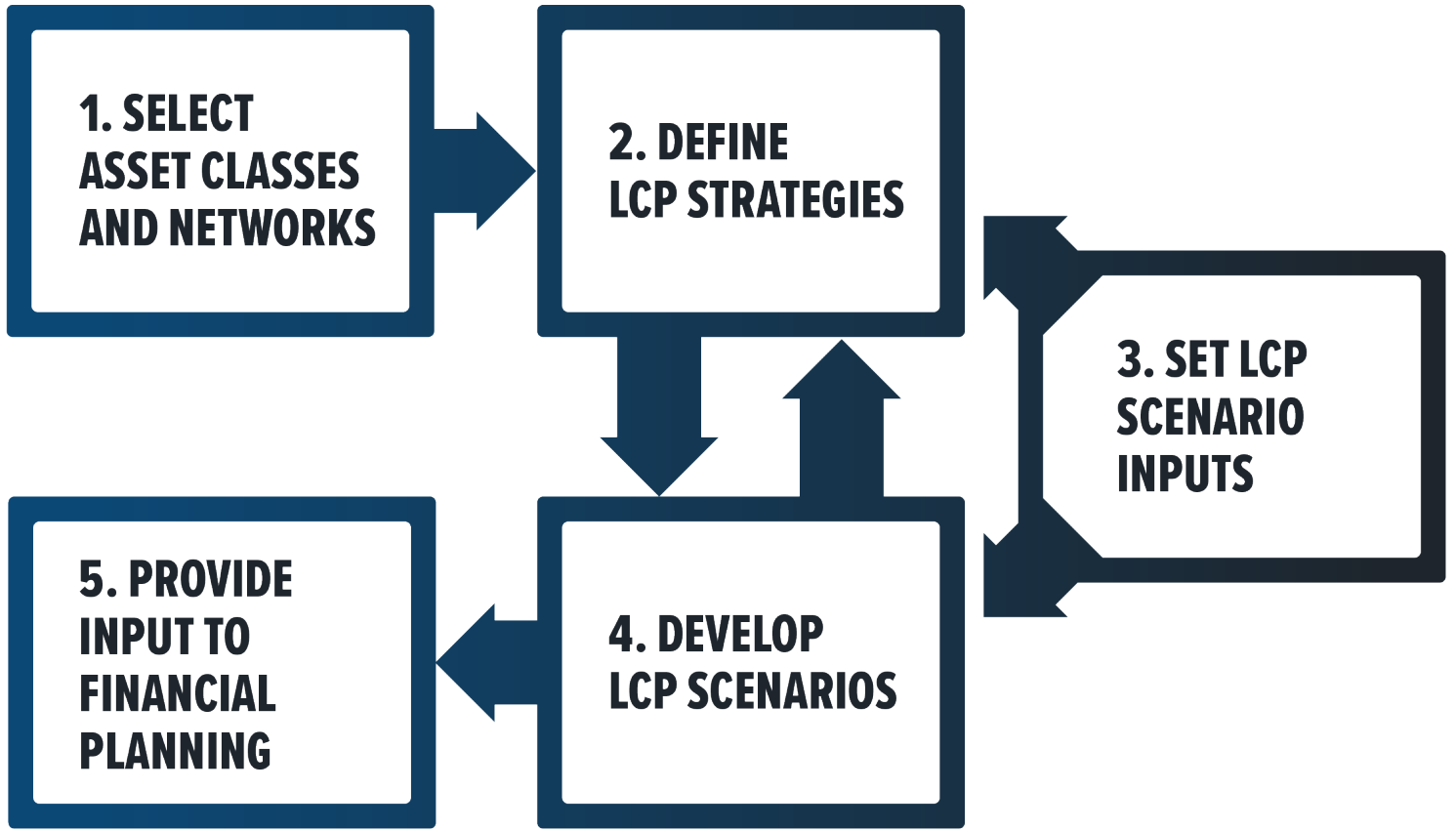
- This term was created to avoid confusion with life-cycle cost analysis (LCCA), which is used for project-level decision making.



Key Features of LCP

- Availability of different treatment options
- Opportunity cost
- Funding and other constraints
- Analysis period
- Time value of money

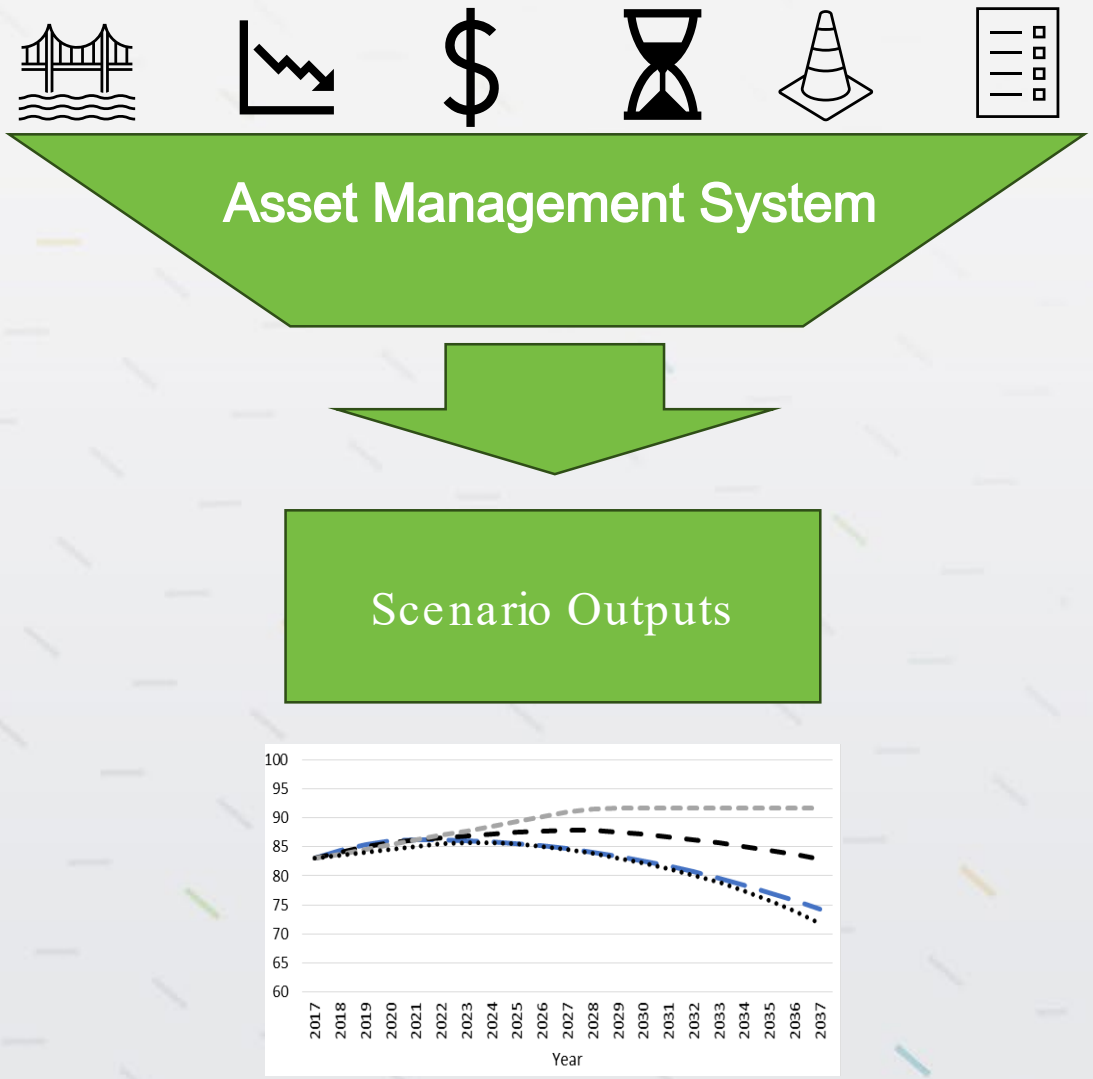
Life-Cycle Planning Process



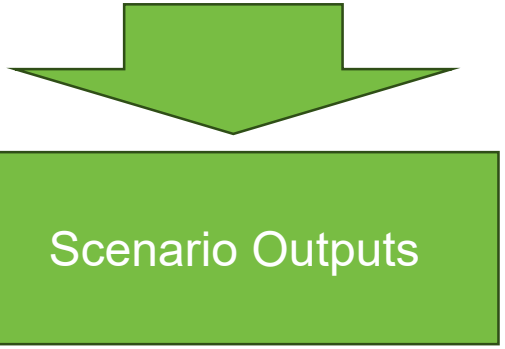
FHWA 2017

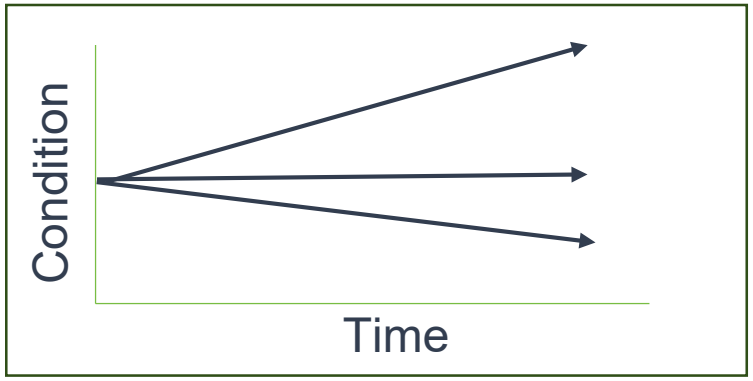
Life-Cycle Planning Inputs

- Current inventor and conditions
- Performance/deterioration models
- Funding levels
- Analysis timeframe
- Treatment
  - Warrants & application rules
  - Improvement
  - Costs
- Strategy details and rules
  - Benefit or objective function
  - Priorities
  - Assumptions



Life-Cycle Planning Analysis





How Can We do Better?

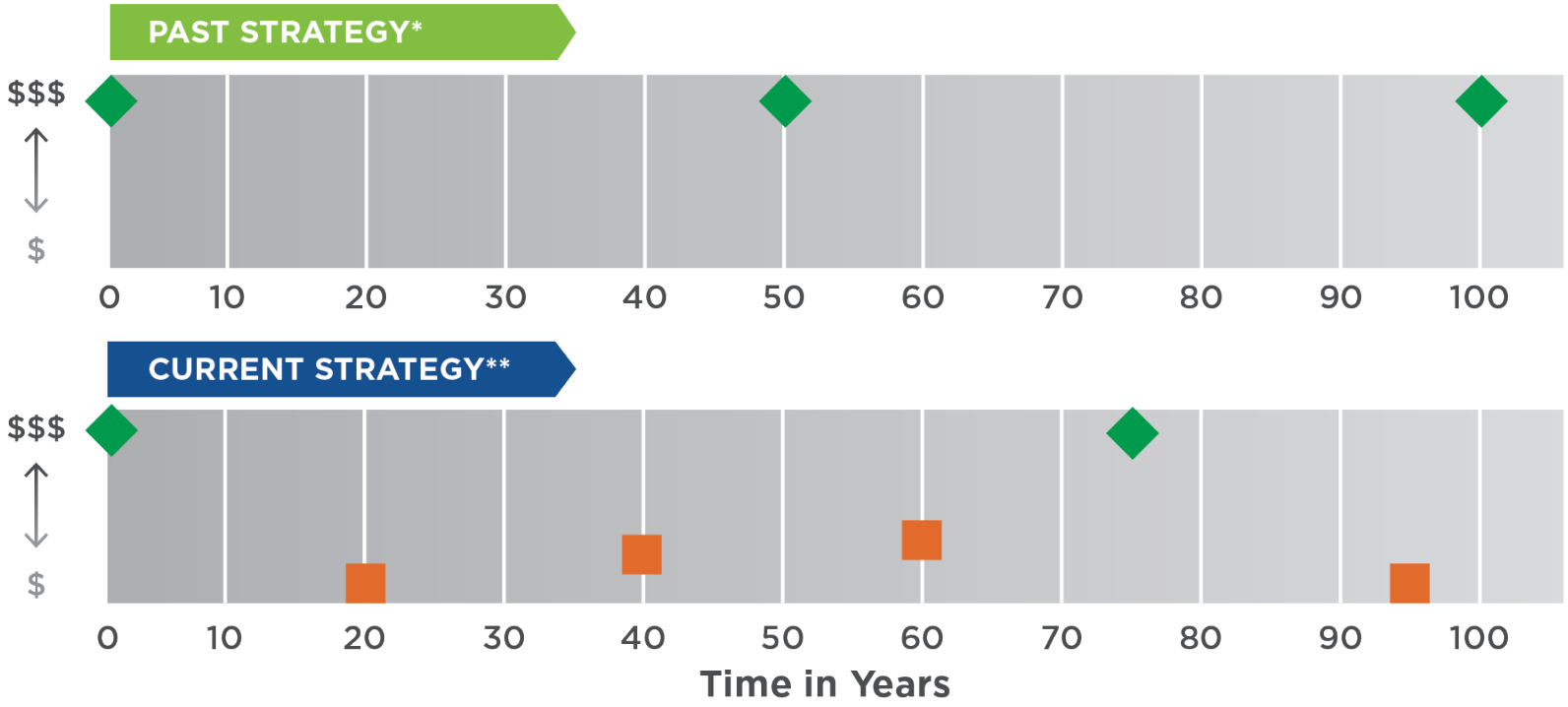
- Investigate new treatments.
- Evaluate different priorities or objectives.
- Expand the use of low-cost treatments.
- Don’t just consider resilience, factor it into your analysis.

Examples of Effective LCP

FROM 2022/23 STATE ASSET MANAGEMENT PLANS

Ohio DOT

Bridge Preservation Strategies



Preservation treatments: 20 years = $29k per bridge
40 years = $110k per bridge | 60 years = $149k per bridge

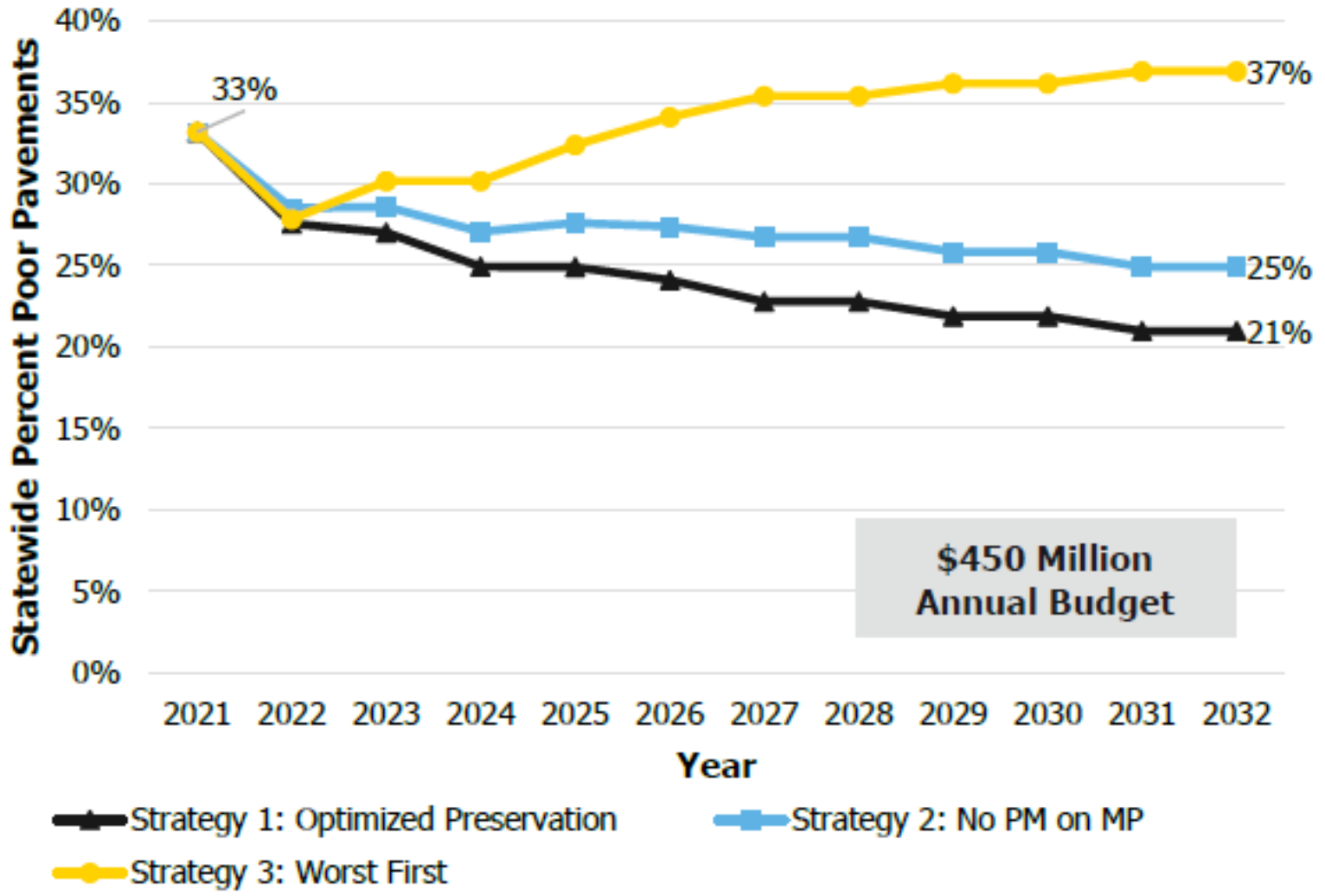
New or replaced bridge | $1.9 million

*Past strategies do not include preservation; only routine maintenance amounting to $2.5k per bridge per year.

**Current strategies include treatments like bridge deck sealing and bridge washing.

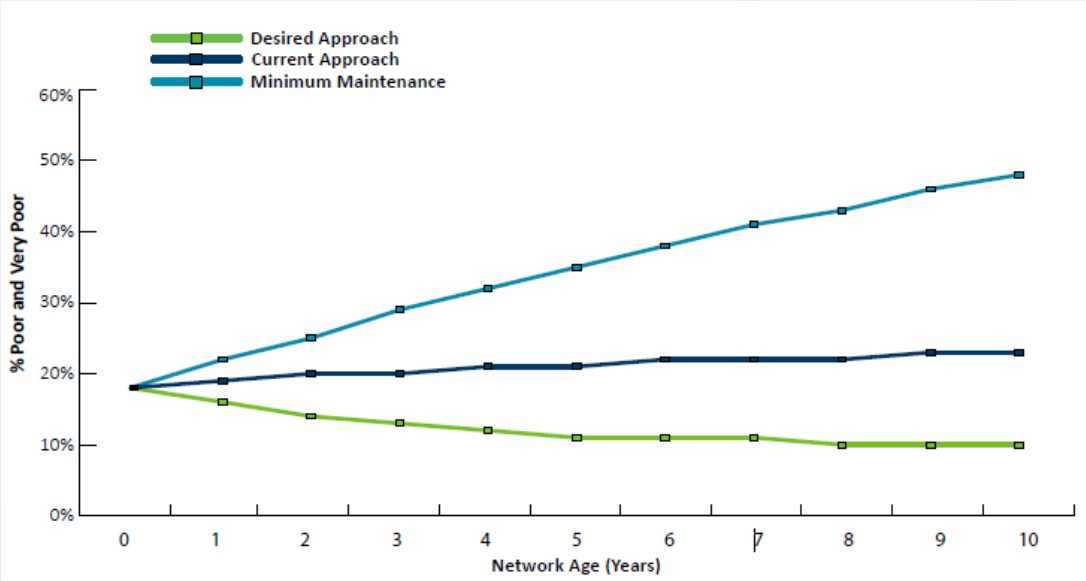
Source: Ohio DOT Transportation Asset Management Plan, 2018

Kentucky – Expanding Preservation

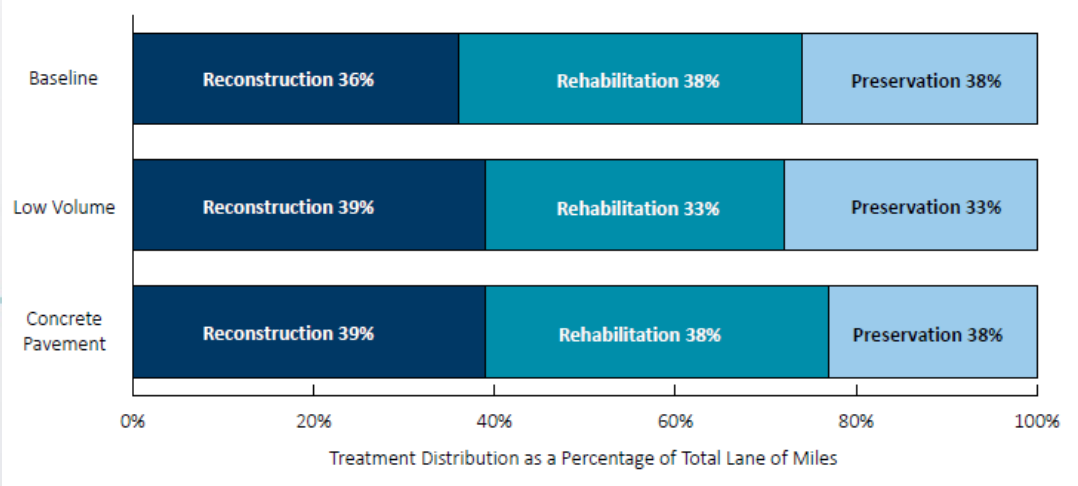


Minnesota DOT

HIGHWAY CULVERTS

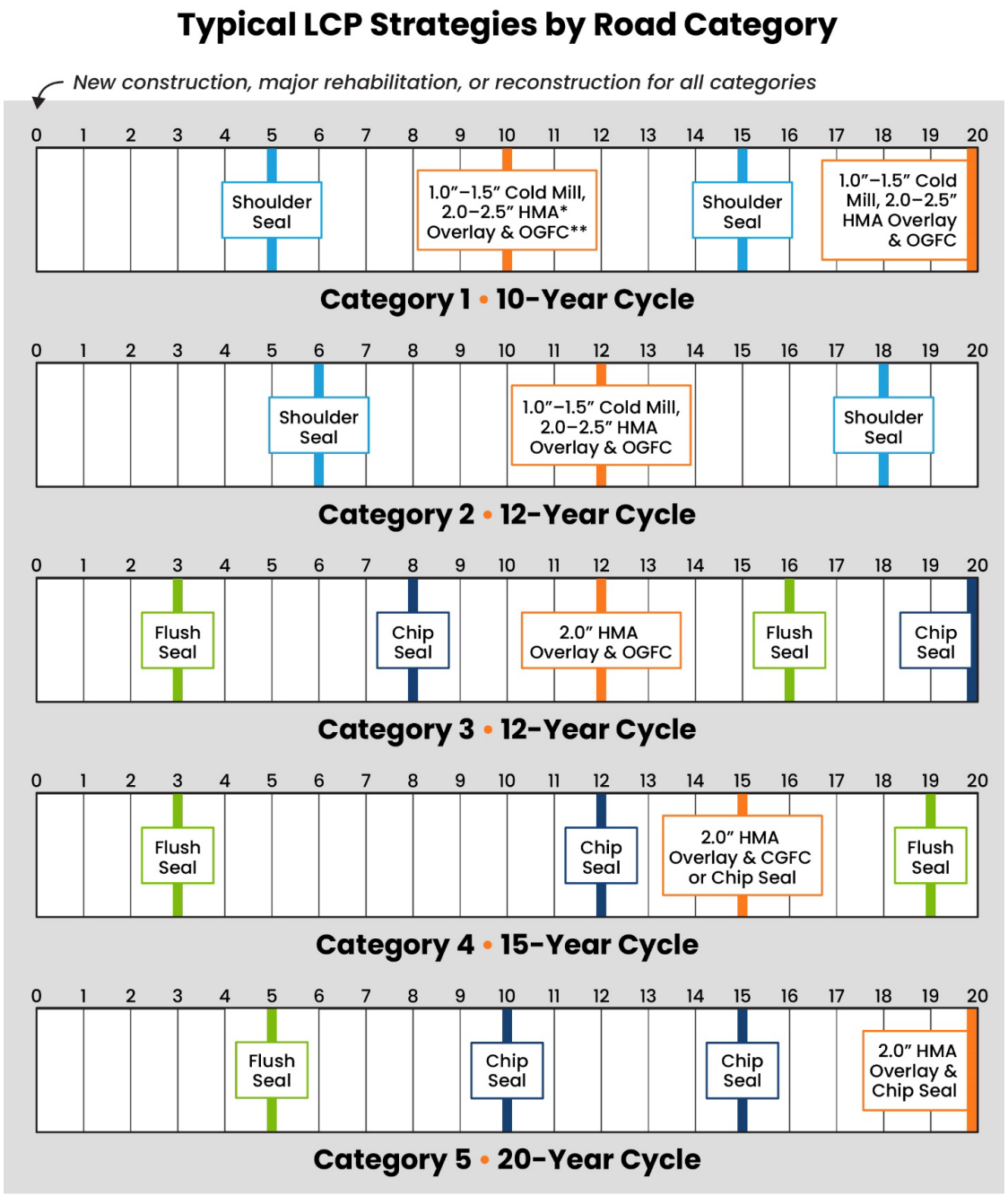


PAVEMENTS



- MnDOT include 12 asset classes in their 2022 TAMP.

Nevada – Different Strategies for Different Subnetworks



*HMA Overlay = Hot Mix Asphalt Overlay
**OGFC = Open-graded Friction Course

Alaska – Extreme Example of Resilience in LCP

- Pavements with unstable subgrade (due to permafrost) have different life-cycle expectations.
- These pavements are designed for 5 years of traffic loading (instead of 20).

Asset Class	*Subgroups*	
Pavement	Stable Subgrade	AADT<2000
		2000≤AADT<5000
		5000≤AADT<25000
		AADT≥25000
	Unstable Subgrade	No Traffic Levels

Arizona – Risks Included in the PMS

- 25% of the benefit awarded to a potential treatment is based on risks that would be mitigated by that treatment.

- Earth cracking
- Rockfall
- Expansive-collapsing soils
- Fault
- Flooding
- Landslide Low water crossings
- Slip-fault and erosion
- Slope instability
- Soil pumping
- Unstable subgrade
- Unstable subgrade & wash out

Life-Cycle Planning Analysis