

Life Cycle Planning

California Transportation Asset Management Plan

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Background

- Transportation Asset Management Plans include Life Cycle Planning to inform performance targets as required by California law and federal regulations
- Life Cycle Planning is a strategy for managing an asset over its life to achieve target level performance while minimizing life cycle costs



Life Cycle Planning

Federal requirements for the TAMP state that LCP include the following:

- Identification of deterioration models
- Potential work types, including treatment options and unit costs
- A strategy for minimizing life cycle costs and achieving performance targets
- Asset performance targets



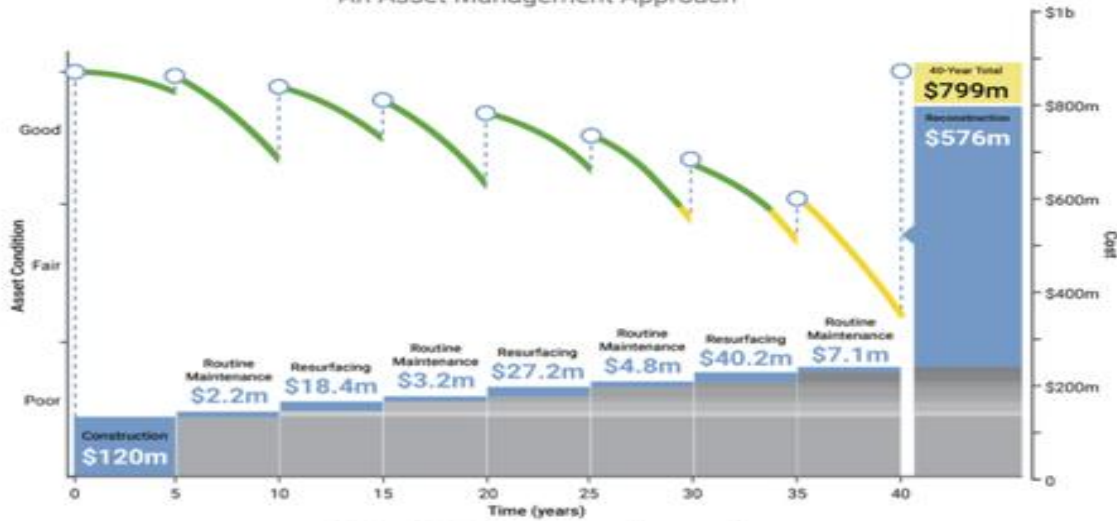


Life Cycle Planning for Bridges

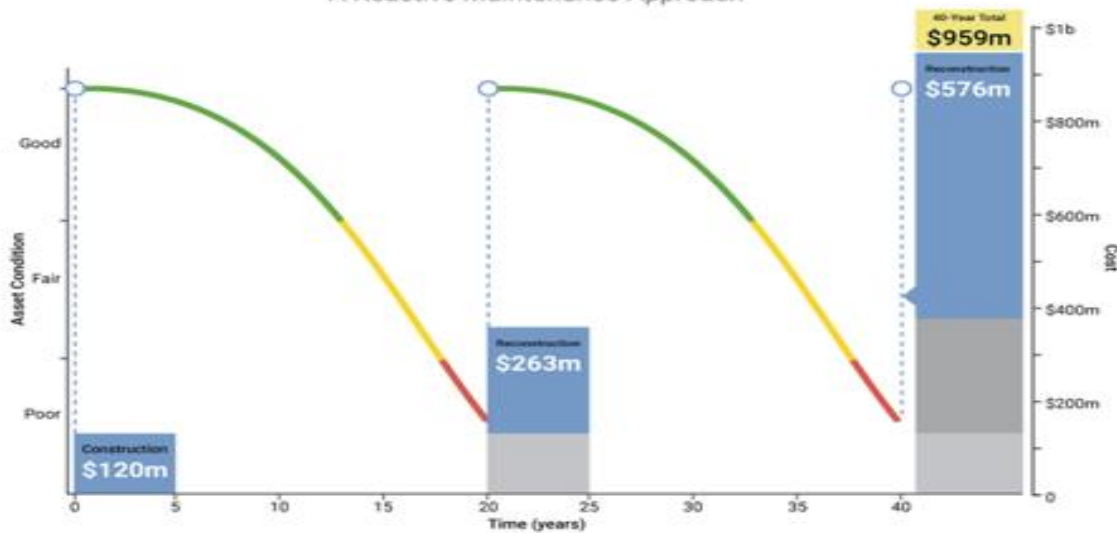


Life Cycle Planning

An Asset Management Approach



A Reactive Maintenance Approach



Asset Management saves money

- Performing preventive maintenance keeps assets in better condition – at a lower cost over the long term

Deferring maintenance costs more

- Higher-cost reconstruction or replacement is needed when assets are not maintained in a state of good repair



Life Cycle Planning for Bridges

- Caltrans owns and manages over 13,160 bridges.
- On average, most of the bridges in California are over 45 years old and have increasing maintenance needs.
- A three-pronged approach to asset (bridge) management has been a successful strategy for many years but there is still work to be done.



Extending the Service Life of Bridges

(A Three Pronged Approach)

Strategy to maintain “Good” and some “Fair” condition Bridges

- **Preventive Maintenance Program** - *Minor work* such as immediate repairs, joint and spall repairs, painting needs, and other maintenance type work
 - 1) Caltrans bridge crews
 - 2) Maintenance contractors

Strategy for “Poor” and some “Fair” condition Bridges

- **Caltrans SHOPP Program** - *Major work* including rehabilitation or replacement work
 - 3) Major construction projects



Best Management Practices

Caltrans has a number of Best Management Practices that preserve the life of our bridges

- Experienced Bridge Inspectors that analyze and identify bridge needs
 - On-going training for both state and local inspectors
- Centralized statewide management of bridges
- Bridge strategy meetings that provide a uniform approach to recommended maintenance activities
- Bridge scour and seismic vulnerability screenings to ensure that the most critical needs are addressed
- Detailed project specifications for construction methods
- Strict oversight of bridge construction



Best Management Practices

Caltrans also employs additional strategies for improving the life of bridges:

- Utilizing new materials that last longer and are easier to apply
- Implementing new policies to ensure that new projects are built with cost effective and easily maintained elements
- Applying accelerated bridge construction techniques



Typical Bridge Treatment

Typical Concrete Bridge Treatment Costs

Activity Costs			
Activity		Unit	Unit Cost
Methacrylate Deck		Square Feet	\$4
Replace Joints		Linear Feet	\$200
Polyester Concrete Overlay		Square Feet	\$25
Deck on Deck		Square Feet	\$125
Rail Replacement		Linear Feet	\$250
Replace Bridge		Square Feet	\$635



Bridge Unit Costs for Fixing Bridges

Unit Costs for State Hwy System Bridges

Costs Per Square Foot			
	Fix Fair to Good	Fix Poor to Good	Add New
SHS Bridge	\$344	\$483	\$635



Current vs. Future LCP Strategies

Caltrans **current strategy** to perform bridge work is according to the work recommendation generated by inspections.

- Identify preventive maintenance (preservation)
- Identify rehabilitation or replacement (non-preservation)

Caltrans **future strategy** to perform bridge work is to move towards a more systematic approach that would routinely apply preservation strategies prior to identification of defects.

- More work is needed to achieve this strategy, but is being considered as we mature in the area of LCP



LCP Strategies

Condition-Based LCP Strategy for an Example Concrete Bridge

Costs Per Square Foot			
Activity	Year	Cost	Present Value (PV)
New Construction	0	\$7,620,000	\$7,620,000
Methacrylate Deck Replace Joints	15	\$64,000	\$35,537
Polyester Concrete Overlay Replace Joints	30	\$316,000	\$97,429
Replace Bridge	75	\$7,620,000	\$402,211
Net Present Value			\$8,155,177



LCP Strategies

Alternative Systematic-Based LCP Strategy for a Concrete Bridge

Costs Per Square Foot			
Activity	Year	Cost	Present Value (PV)
New Construction	0	\$7,620,000	\$7,620,000
Methacrylate Deck Replace Joints	10	\$64,000	\$43,236
Polyester Concrete Overlay Replace Joints	20	\$316,000	\$144,218
Deck on Deck Rail Replacement	40	\$1,655,000	\$344,718
Methacrylate Deck on Deck Replace Joints	50	\$64,000	\$9,006
Polyester Concrete Overlay Replace Joints	70	\$316,000	\$20,293
Replace Bridge	90	\$7,620,000	\$223,334
Net Present Value			\$8,404,805



Present Value Costs in Life Cycle Analysis

Background Information

- Followed FHWA Guidelines for Benefit-Cost Analysis of Federal Programs and US DOT Economic Analysis Primer
- February 2017 California Life Cycle Benefit/Cost Analysis was used for Present Value calculation
- Caltrans Program (Asset) Managers were consulted on treatment schedules and unit costs



General Principles Net Present Value

The standard criterion for deciding whether a government program can be justified on economic principles is *net present value*.

Net present value is computed by...

- Assigning monetary values to benefits and costs
- Discounting future benefits and costs using an appropriate discount rate; and
- Subtracting the sum total of discounted costs from the sum total of discounted benefits

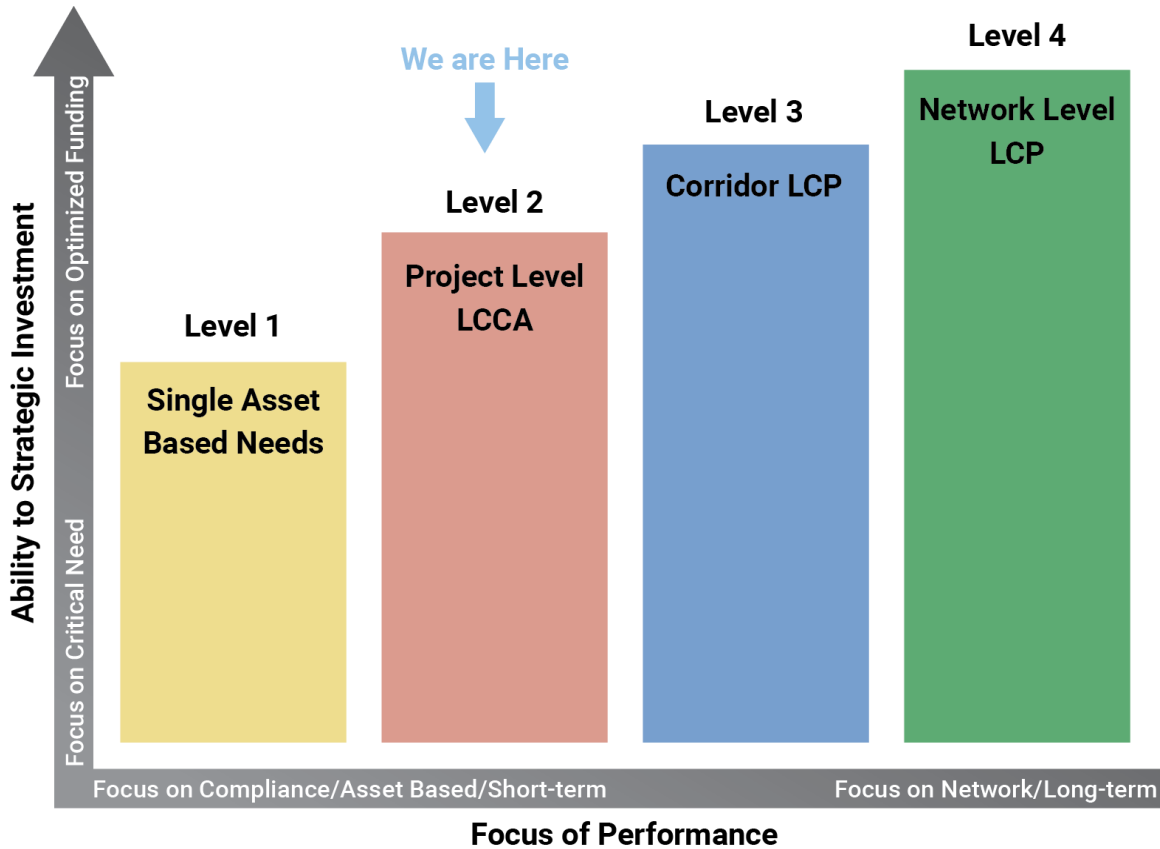


What about the Locals?

- California conducts a statewide local streets and roads needs assessment every two years.
 - Documents LCP practices across local agencies (600+ in California)
- Caltrans inspectors provide routine inspections typically performed biannually for state and most locally owned bridges
- All data collected during inspection process are documented and maintained in the SMART (Structure Maintenance Automated Report Transmittal) bridge management system
- A Local Bridge Advisory Committee made up of city and county organizations, FHWA, and the California Transportation Commission provide a forum to confer with cities and counties on local bridge funding for improving local bridges



LCP Maturity



- **Level 1:** Single Asset Based Needs
- **Level 2:** Project Level LCCA
- **Level 3:** Corridor LCP
- **Level 4:** Network Level LCP



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