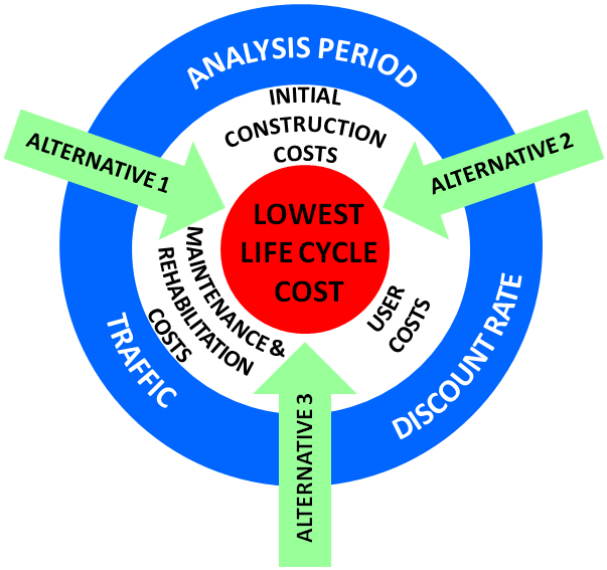
Caltrans 2013 Life-Cycle Cost Analysis

Webinar



Amy Fong

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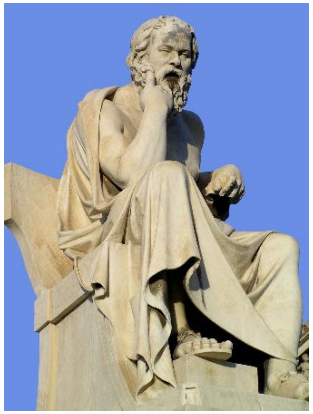
California Department of Transportation

August 22, 2013

Front Page News

Updated 2013 LCCA Procedures Manual and RealCost v2.5 CA software

Purpose of the Webinar



Overview of 2013 LCCA:

- *Changes in Policy*
- *Changes in Procedure*
- *Changes in RealCost v2.5CA*
- *Available resources*

Agenda

Topic	Presenter	Affiliation	Time (Min.)
1. Policy and Procedures	Amy Fong	Caltrans HQ Pavement Program	20
2. RealCost v2.5CA	Dr. Changmo Kim	University of California Pavement Research Center (UCPRC)	20
3. Resources	Dr. Ding Cheng	CSU Chico California Pvmt Preservation Center	20
4. Questions & Answers	All Caltrans Participants		30

Deputy Directive (DD) #107

June 30, 2010

"The California Department of Transportation ensures investments in California's transportation system are cost effective and efficient from the initial capital expenditure to the later maintenance and operations expenditures.

The Department uses Life-Cycle Cost Analysis (LCCA) to ensure that the costs over the life of a facility are considered when making project decisions."

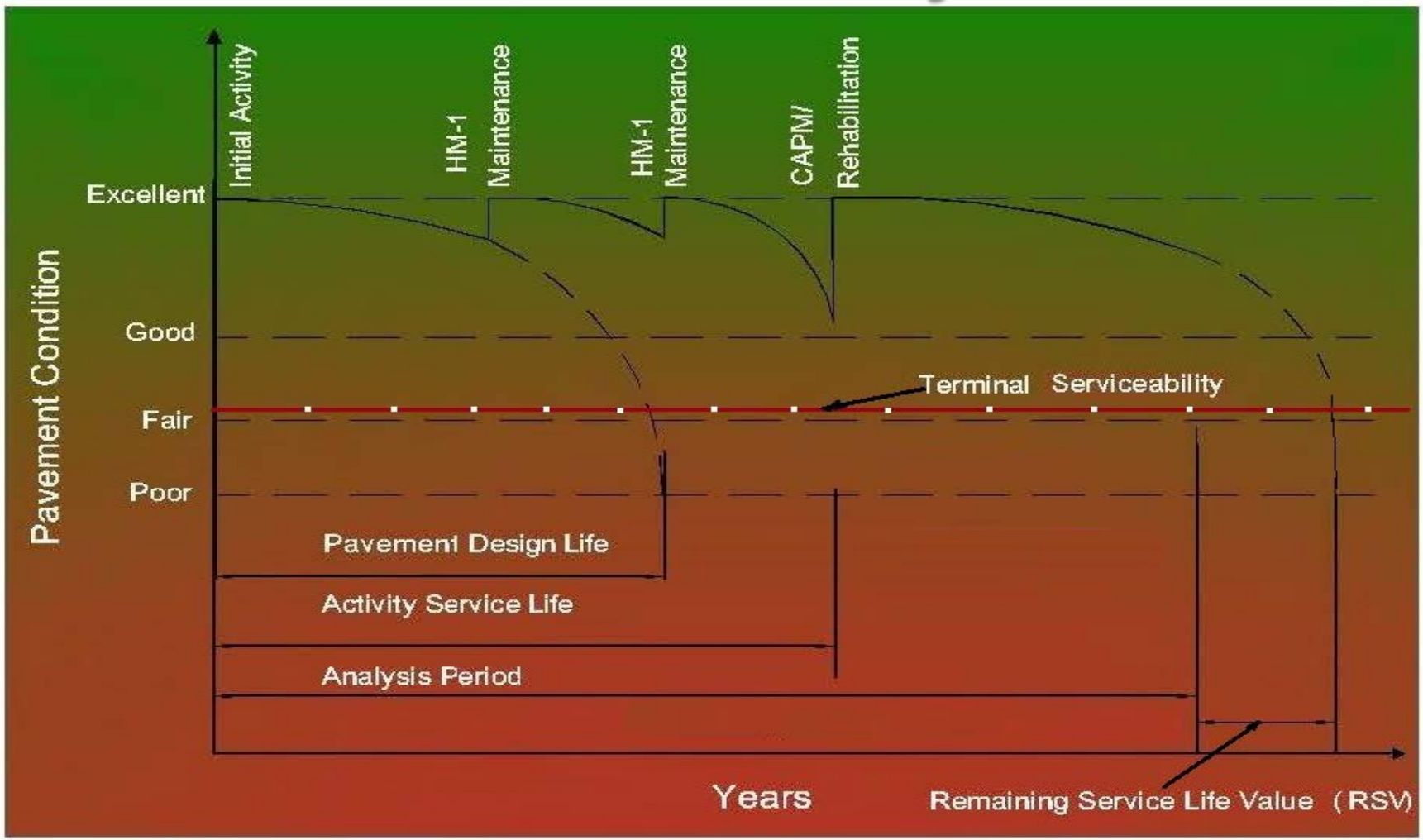
Principles

Get the most out of what you build

- Balance between initial and future costs (LCC)
- Minimize user delay
- Maximize worker safety
- Optimize materials

LCCA = Long Term Cost Savings

Typical Analysis Period for Pavement Project



LCCA Exception (2007)

1) Major Maintenance
2) Minor A and Minor B
3) Projects using PEER
4) Maintenance pullout
5) Landscape paving

Additional Exception (2013)

LCCA CAPM has little to no impact on results

- Limited options
- Low costs & savings
- Answers the same
- State Law gives preference to rubber

2013 LCCA Update

Dropping requirement for CAPM in 2013 update

Pavement Alt Selection (2007)

Table 1. Typical Alternatives for Various Types of Projects with Pavement [1]

Pvmt Project Type	Document	Conditions	Alternative 1	Alternative 2	Alternative 3	Other Alternatives that could be considered		
New/ Reconstruction	PID	20-yr Traffic Index (TI_{20})						
		$TI_{20} > 15$	20-yr Rigid (JPCP)	40-yr Rigid (JPCP)	40-yr Rigid (CRCP)	20-yr Flex[2]	20-yr Composite[3]	40-yr Composite[3]
		$10 < TI_{20} \leq 15$	20-yr Flex[4]	40-yr Rigid (JPCP)	40-yr Flex[4]	40-yr Rigid (CRCP)	20-yr Composite[3]	40-yr Composite[3]
		$TI_{20} \leq 10$	20-yr Flex[4]	40-yr Rigid (JPCP)	40-yr Flex[4]	20-yr Composite[3]	40-yr Composite[3]	
	PR (PA&ED)	PID Preferred Pvmt Type & Design Life						
		Flexible (20-yr design)	Flex (HMA)	Flex (RHMA)	Rigid (JPCP)	Flex (HMA w/ OGFC)	Flex (RHMA-G w/ RHMA-O)	Flex (HMA w/ RHMA)
		Flexible (40-yr design)	Flex (HMA w/ OGFC)	Flex (RHMA-G w/ RHMA-O)	Rigid (JPCP)	Flex (HMA w/ RHMA)	Rigid (CRCP)	
		Rigid (20-yr design)	Rigid (JPCP)	Flex (RHMA)	Flex (HMA)			
		Rigid (40-yr design)	Rigid (JPCP)	Rigid (CRCP)[5]	Flex (RHMA w/ RHMA-O)	Composite[3]	Flex (HMA w/ RHMA)	
		Composite (20-yr design)	Composite (HMA)	Composite (RHMA)	Flex (HMA)	Flex (RHMA)	Rigid (JPCP)	Flex (HMA w/ RHMA)
		Composite (40-yr design)	Composite (HMA)	Composite (RHMA)	Rigid (JPCP)	Rigid (CRCP)	Flex (RHMA-G w/ RHMA-O)	Flex (HMA w/ RHMA)

Pavement Alt Selection (2013)

Pavement type selection is too complicated (from Users Group feedback)

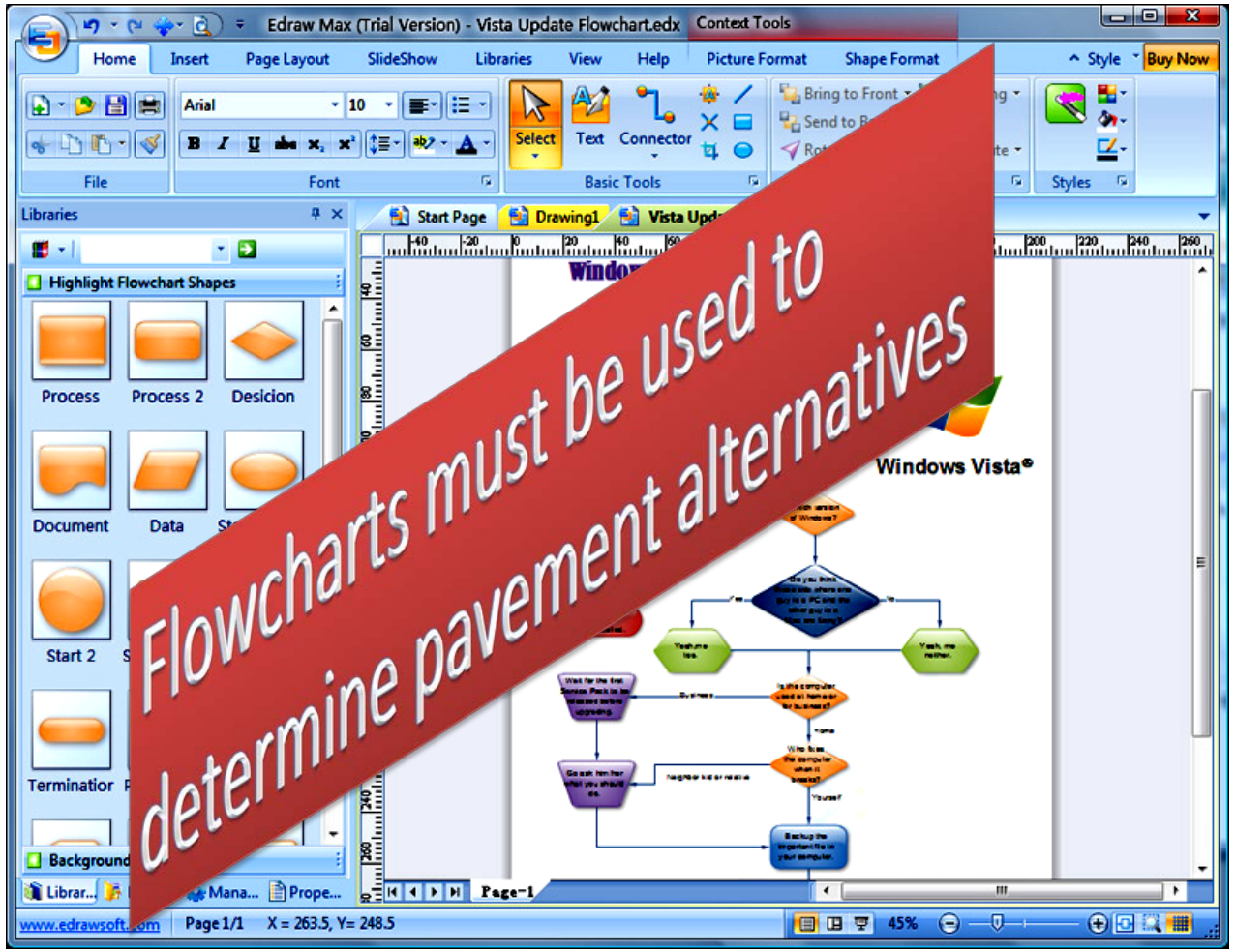
- Multiple rules to comply
- Too many choices
- Don’t know which choices are viable pavement alt

2013 LCCA Update

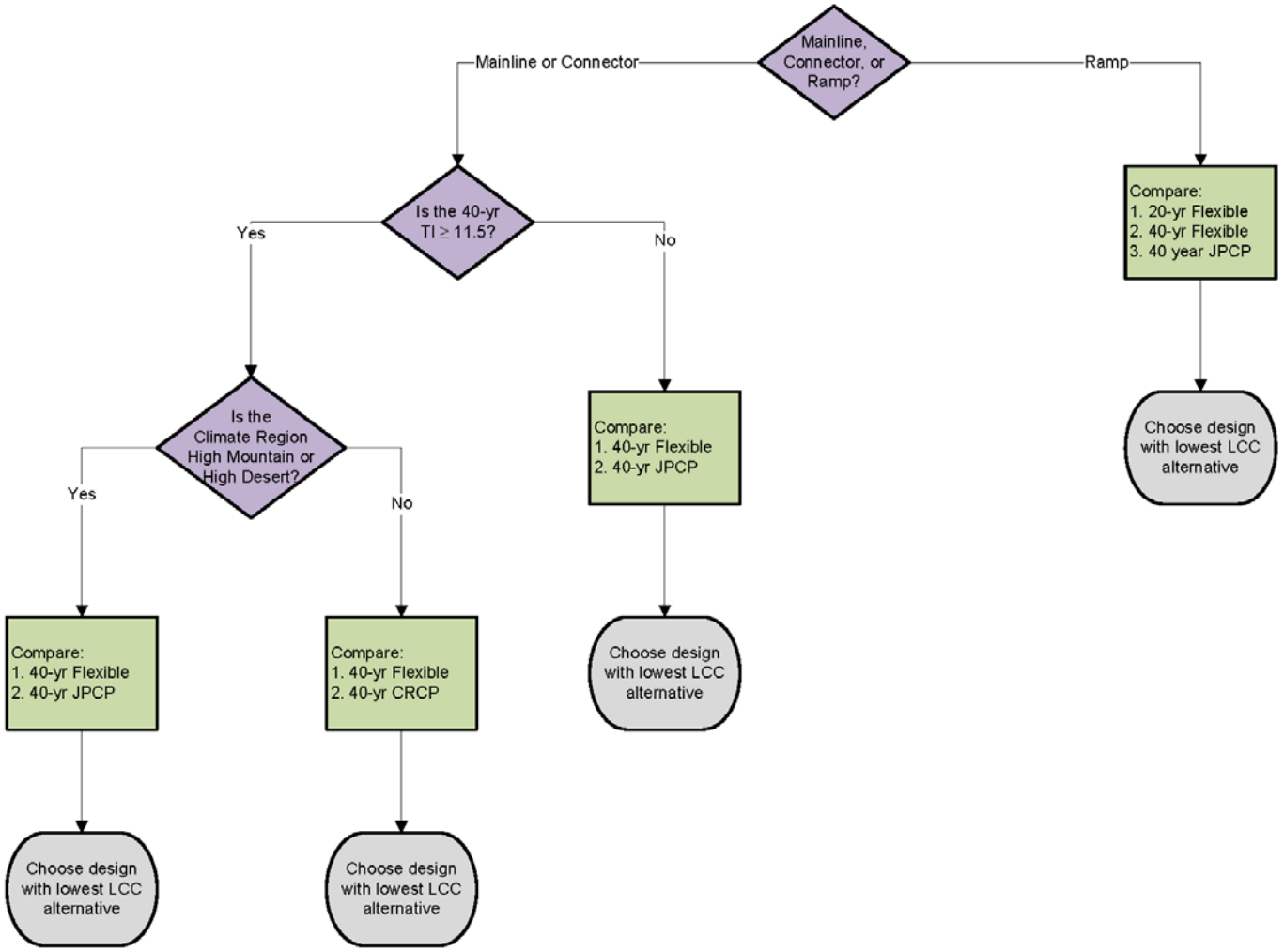
Pavement Type Selection Flowcharts

1. New Construction/Reconstruction
2. Rehabilitation
3. Widening

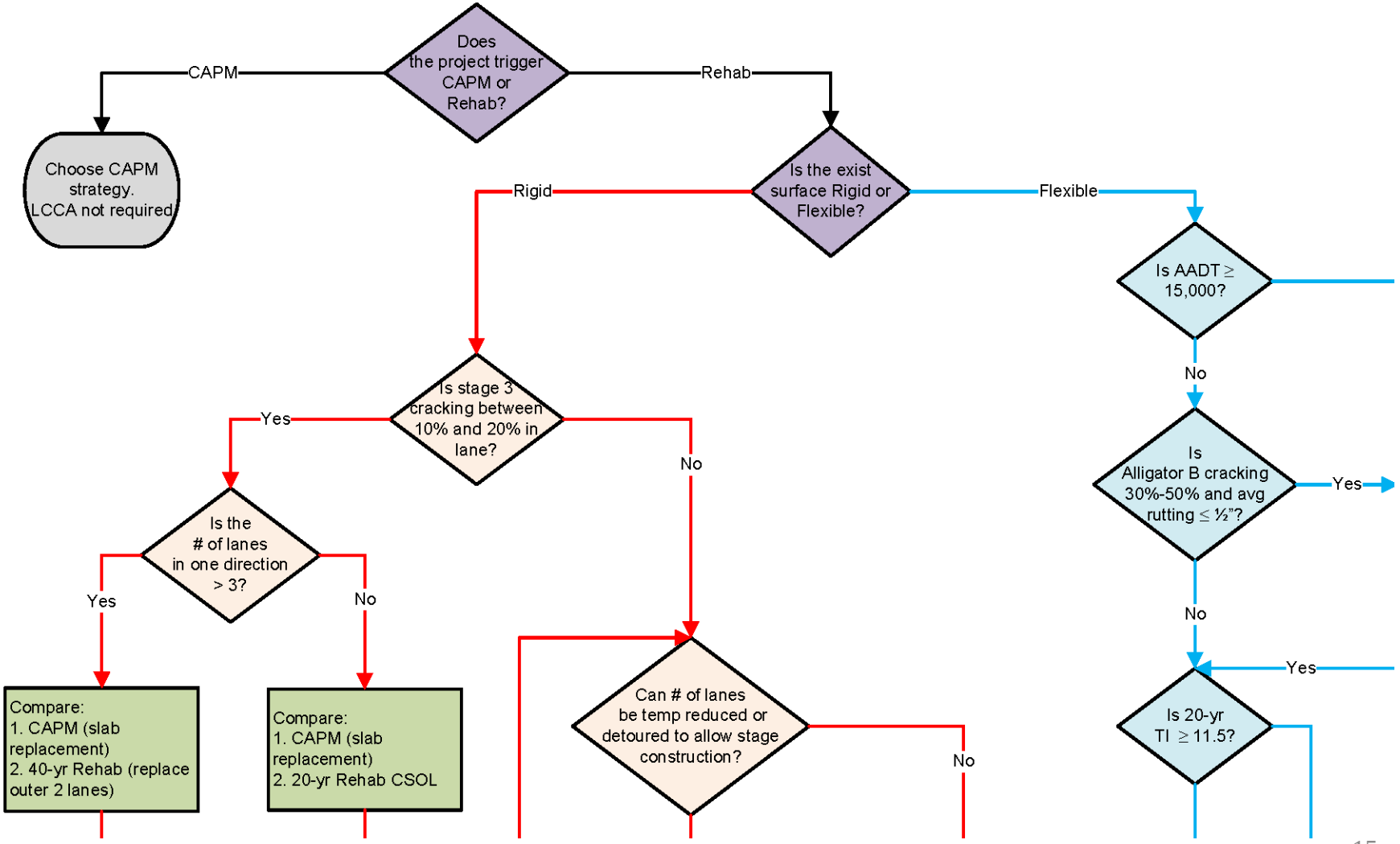
New Procedure Flowcharts



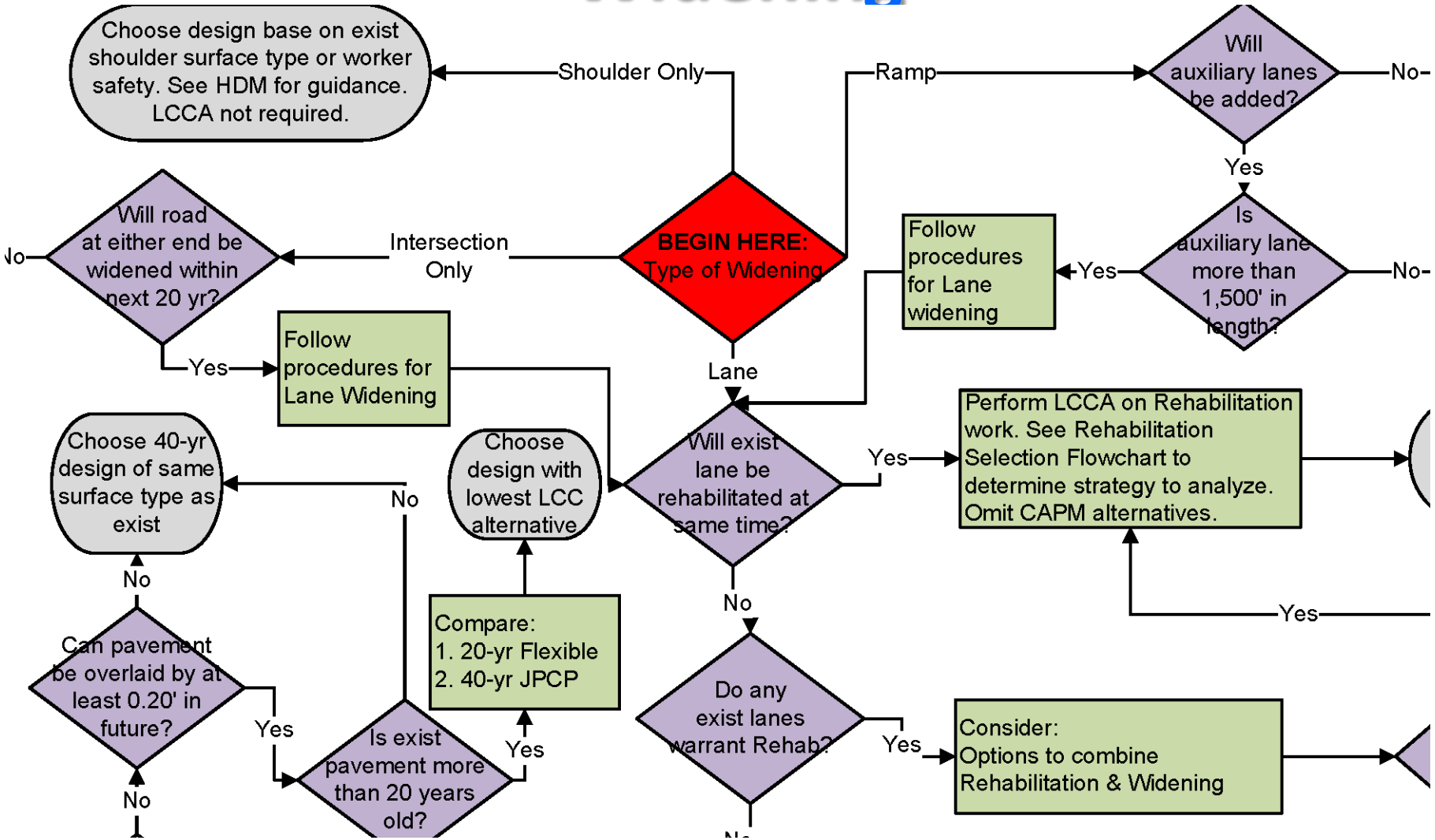
Pavement Flowchart
New Construction/Reconstruction



Pavement Flowchart Rehabilitation



Pavement Flowchart Widening



Ramp LCCA

Clarified Ramp LCCA Instructions

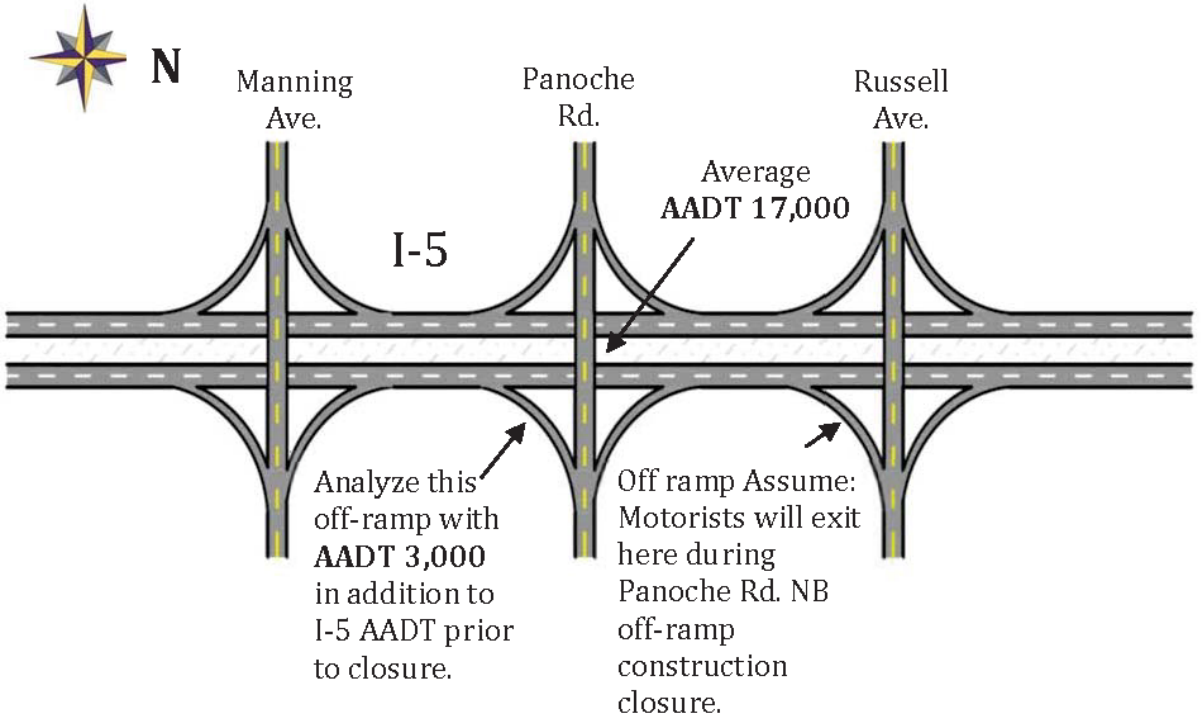


Figure A3-1 Layout showing AADT for I-5 and for off-ramp (pre-construction)

Production Rate Tables

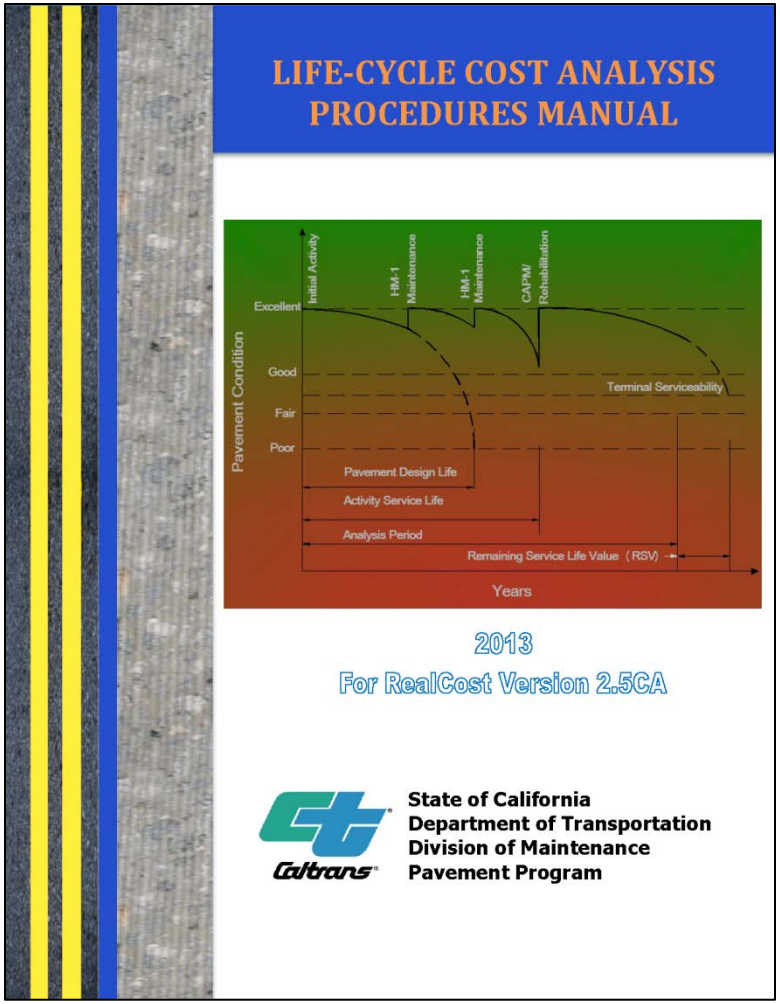
- Reviewed production rates
- New ramp production rate tables

Table 3-4 Productivity Estimates of Typical Future Rehabilitation Strategies for Flexible Pavements

Final Surface Type	Future M&R Alternative	Pavement Design Life (years)	Maintenance Service Level	Average Lane-mile Completed Per Closure				
				Daily Closure (Weekday)		Continuous Closure		
				5 to 7-Hour Closure	8 to 12-Hour Closure	16 hour/Day Operation	24 hour/day Operation	55-hour Weekend Closure
CAPM								
HMA	Overlay	5+	1,2,3	0.84	1.73	2.9	4.81	12.25
	Mill & Overlay	5+	1,2,3	0.36	0.75	1.18	2.21	5.20
HMA w/OGFC	Overlay	5+	1,2,3	0.55	1.14	1.9	3.17	8.09
	Mill & Overlay	5+	1,2,3	0.30	0.61	0.97	1.86	4.35
HMA w/ RHMA	Overlay	5+	1,2,3	0.55	1.14	1.9	3.17	8.09
	Mill & Overlay	5+	1,2,3	0.30	0.61	0.97	1.86	4.35
RHMA-G	Overlay	5+	1,2,3	1.12	2.32	3.86	6.41	16.33
	Mill & Overlay	5+	1,2,3	0.48	1.00	1.56	2.93	6.88
RHMA-G w/RHMA-O	Overlay	5+	1,2,3	0.84	1.73	2.9	4.81	12.25
	Mill & Overlay	5+	1,2,3	0.34	0.72	1.14	2.17	5.13

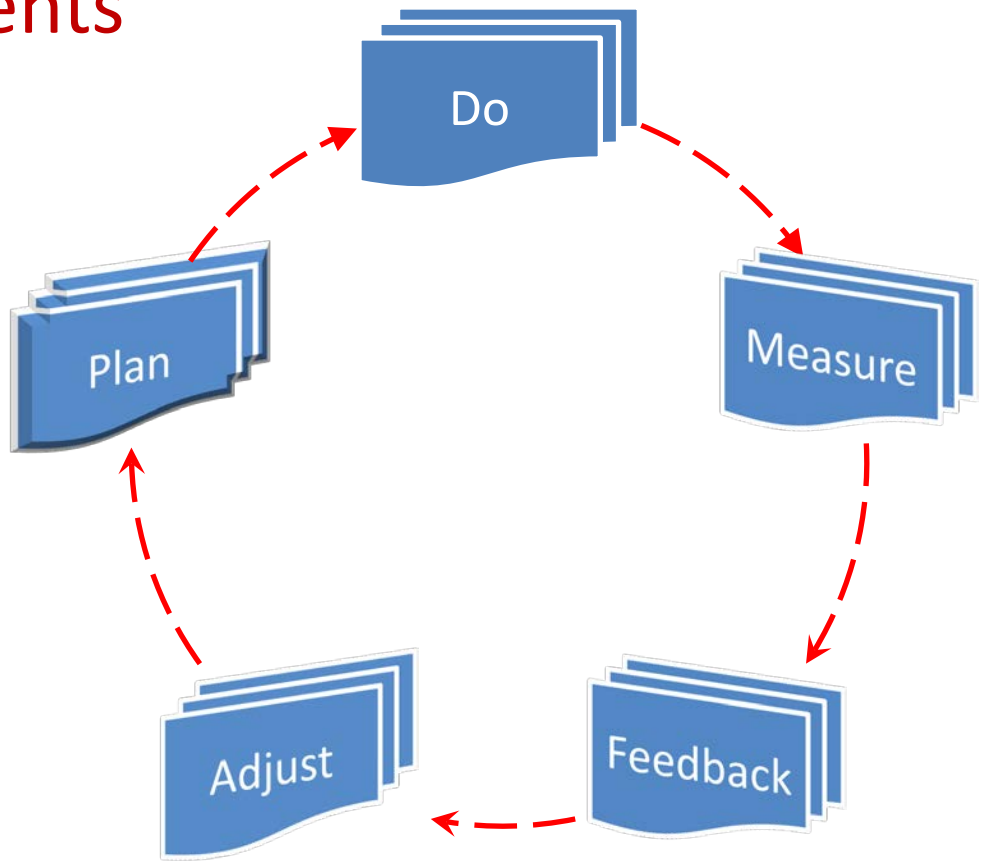
2013 LCCA Procedure Manual

- Expand purpose and need
- Expand what to do
- Update RealCost chapter
- Expand interpreting results



Continuous Improvements

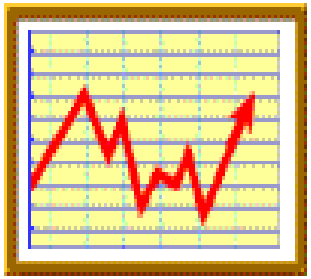
- Identify improvements
- Monitor & learn



Challenges that RealCost v2.5CA Addressed

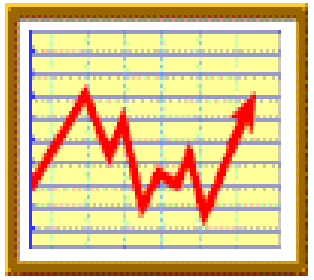
RealCost v2.5CA Enhancements

1. Up to 4 pavement alternatives
   - Makes it easier to analyze multiple alternatives at the same time
2. Up to 24 future M&R activities
   - Capability to include future preventive maintenance projects as M&R activities → more accurate
   - Ability to expand M&R sequences



RealCost v2.5CA Enhancements (Cont.)

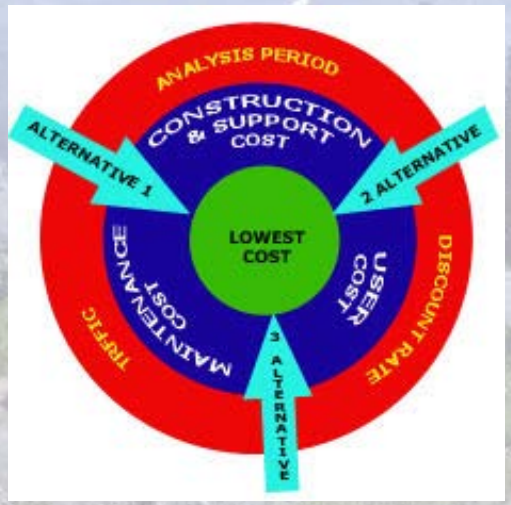
3. Up to 4 Traffic Pattern to choose from
   - More accurate user costs
4. M&R Sequence Automation
   - Less time consuming
   - Less likelihood of errors



5. M&R Cost Estimate Calculators
   - More accurate project specific costs

Today decides tomorrow!!!

Caltrans LCCA Resources



By

Dr. DingXin Cheng, Director

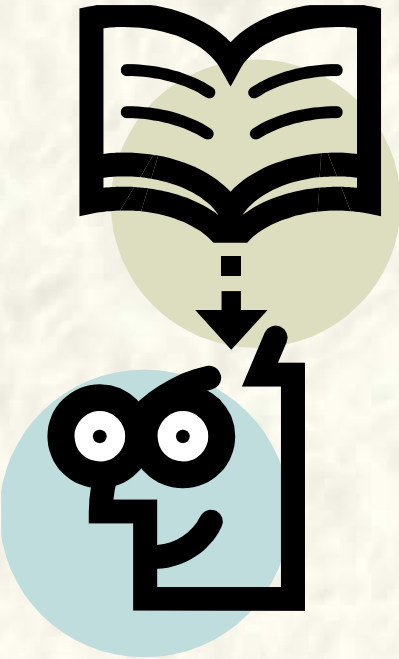
California Pavement Preservation Center

California State University, Chico

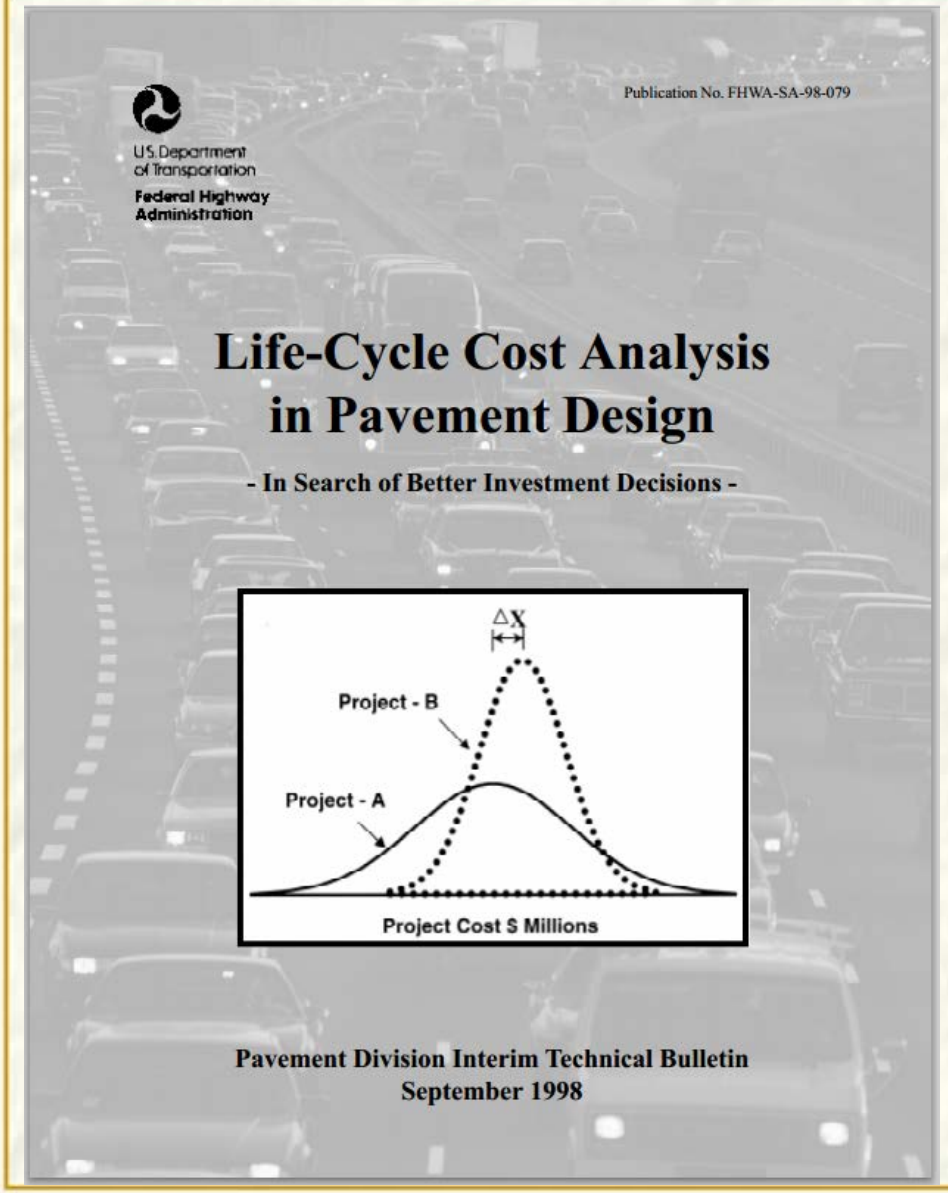
August 22, 2013

Presentation Outline

- FHWA LCCA Website
- Caltrans LCCA Website
- New RealCost version 2.5CA and LCCA Procedures Manual
- Caltrans LCCA Online Training
- Caltrans LCCA Examples



FHWA LCCA Website



- Technical Guidance
- Recommendation
- Good/Best Practices

LCCA Fact Sheets

Improving Transportation Infrastructure Investment Decisions Through LCCA

1. Which pavement alternative results in the lowest total cost to the agency over the life of the project?

2. To what level of detail have the alternatives been investigated?

3. What are the user-cost impacts of alternative pavement design strategies?

Caltrans LCCA Website

CALIFORNIA DEPARTMENT OF TRANSPORTATION

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Department links

- Caltrans Internet
- Maintenance Internet
- Pavement Home Page
  - Pavement Resources
  - Rock Products Committee (RPC)
  - Pavement Contacts
  - Site Index

PAVEMENT TOPICS

- Standards
- Plans and Specifications
- Types
  - Asphalt
  - Rigid
  - Composite

Caltrans > Pavement > Office of Pavement Engineering > **Life-Cycle Cost Analysis (LCCA)**

Life-Cycle Cost Analysis

Aerial Photo of Interchange

TOOL BOX

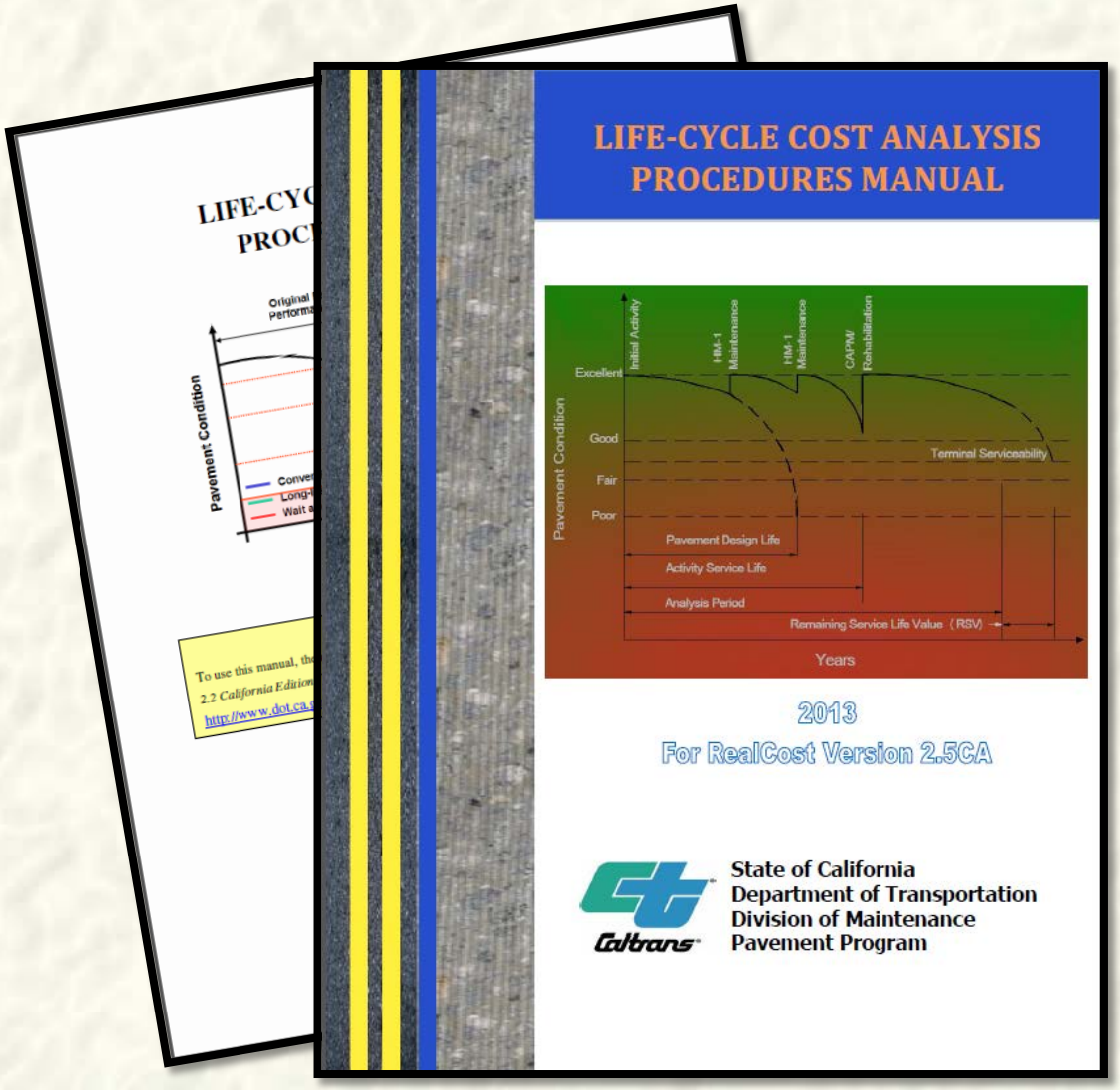
New Caltrans LCCA Website

Tool Box

- *RealCost Version 2.5CA*
- Pavement Climate Regions Map
- Appendix O-O
- Frequently Asked Questions (FAQs)
- 2012 Consumer Price Index (CPI) Value
- 2012 Value of User Time

Caltrans LCCA Procedures Manual

2007/2010 Manual to 2013 Manual



- **Updated 2013 LCCA Procedures Manual**
- **For RealCost version 2.5CA**

New Caltrans LCCA Website

Description	Last Updated
Title Page, Disclaimer & Acknowledgement	August 1,2013
Preface	August 1, 2013
Table of Contents, List of Figures, & List of Tables	August 1, 2013
Chapter 1: Introduction	August 1, 2013
Chapter 2: LCCA Approaches	August 1, 2013
Chapter 3: RealCost Version 2.5CA	August 1, 2013
Chapter 4: Summary and Conclusions	August 1, 2013
References	August 1, 2013
Appendix 1: Glossary and List of Acronyms	August 1, 2013
Appendix 2: List of RealCost Limitations and Bugs	August 1, 2013
Appendix 3: Procedures for Estimating Ramp Alternatives	August 1, 2013
Appendix 4: Typical Pavement M&R Schedules for California	August 1, 2013
Appendix 5: Traffic Inputs Estimation	August 1, 2013
Appendix 6: Alternate Procedure for Calculating Construction Year AADT	August 1, 2013
Appendix 7: List of Tables	August 1, 2013
Appendix 8: LCCA Pavement Type Selection Flow Charts	August 1, 2013

Caltrans LCCA Online Training

Introduction

- **Life-Cycle Cost Analysis Introduction, (in development, check back in September, 2013)**

Interactive Training

- **Life-Cycle Cost Analysis Interactive Training, (Dec 2009 – To be updated for RealCost v 2.5CA in October 2013)**

Conclusion and Summary

- **Life-Cycle Cost Analysis Conclusion, (in development, check back in September, 2013)**

Caltrans LCCA Examples

- LCCA Example Roadway Rehabilitation
- LCCA Example Ramp (in development)
- LCCA Example Widening (in development)
- Project Document LCCA Description Example
- LCCA Exception Request Example
- LCCA Report Example
- Appendix O-O Example

Website: LCCA District PEER Exchange

- District 7 LCCA Policy DP-96
- District 8 Materials Design LCCA Checklist for v2.2 (contact info: Bruce Kean)
- District 8 Materials Design LCCA Report Guide for v2.2 (contact info: Bruce Kean)

Caltrans LCCA Related Resources

- Deputy Directive: Use of LCCA in Project Decision Making (June 30, 2010)
- Highway Design Manual - Chapter 610: Pavement Engineering Considerations (see Topics 612 and 619)
- Project Development Procedures Manual: Chapter 8 - Overview of Project Development
- Traffic Data Branch (Division of Traffic Operations Vehicle Systems Unit)

Transmittal of LCCA Information

Submit your LCCA to HQ
Attn: HQ Life-Cycle Cost Analysis Coordinator
HQ Division of Maintenance, Pavement Program
Transportation Laboratory, MS5

5900 Folsom Boulevard, Quad 1
Sacramento, CA 95819-4612

Or

e-mail PDF files to
LCCA@dot.ca.gov

Other Resources

- **HQ LCCA Coordinator Contact information**
  - **Amy Fong, amy.fong@dot.ca.gov, (916) 227-5838**
- **Frequent *RealCost v2.5CA* Error Messages**
- **Life-Cycle Cost Analysis Procedures Manual (PDF, 3.4MB), (Modified Aug, 2010)**
  - ***RealCost* v2.2CA**
- **Division of Transportation Planning manuals and technical supplements**
- **CA4PRS Home Page**
- **FHWA LCCA Website**

Wake Up!
Turn on the light!
Act amazed.
Thank you.

THANK YOU!!!

Questions or Comments Regarding to RealCost

Please contact Caltrans
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