



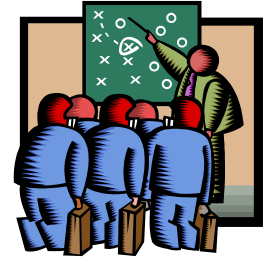
Life Cycle Cost Analysis

Judith Corley-Lay, PE

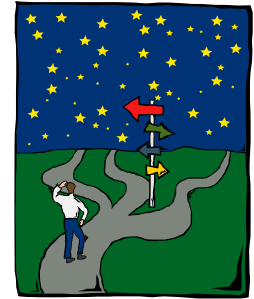
October 28, 2014

Outline of Presentation

- Definition and Goal
- Components of Life Cycle Cost Analysis
- Revision Process
- Comparison to Other States
- Approved LCCA
- Next Steps

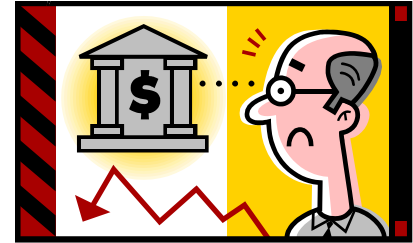


Definition and Goal



- LCCA is a method of calculating the economic value of a pavement alternate considering its initial cost and the costs of future treatments over an analysis period.
- *Goal: Make the best business and engineering pavement type decision for each project.*

Components of LCCA



- Design life: establishes the initial thickness of layers during the pavement design process.
- Discount rate: used to consider the time value of money from standard economic analysis.
- Treatments: most common treatment for that pavement type in NC.

Components (continued)



- Treatment timing: the time from the beginning of the analysis period to the application of the first treatment.
- Salvage value: any remaining treatment life at the end of the analysis period.
- User costs: costs born by the public due to increased vehicle operating costs or delay. These are considered separately from other costs.

Revision Process



- NC Turnpike Authority sought consensus on LCCA beginning in 2009-2011.
- Outside review, by David Peshkin, PE, of NCDOT's 2007 process received in Jan 2012. LCCA procedure was modified.
- SAS report on treatment timing completed Aug 2012. LCCA modified.

Revision Process

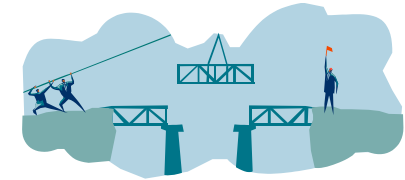


- Re-review of LCCA process by David Peshkin received Dec 2012.
- Follow-up meetings with concrete and asphalt industries in Dec 2013. Concerns of both industries are detailed in our report. Additional meetings in Jan and Feb 2014.

Process (continued)

- Presentation to Legislature April 2014
- Additional meeting with industries May 21, June 12
- NAPA webinar on June 4
- Presentation to Board of Transportation July 9, 2014
- Approved by BOT on August 7, 2014.

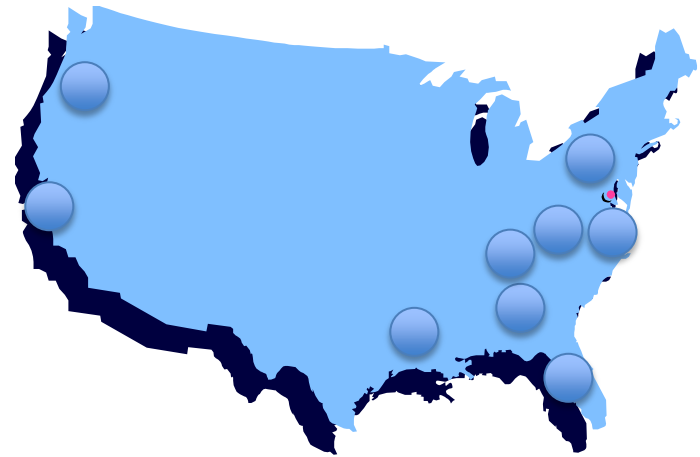
Proportion for which LCCA is Conducted



- Done for many centrally designed and centrally let Transportation Improvement Program (TIP) Projects.
- Not done for Bridge projects. Also not done for very short projects, or variable widening.
- 37% of Interstate, 100% of rest area and welcome center, 43% of rural, 36% of urban.

Similar States Used in Comparison

- Alabama
- California
- Florida
- Georgia
- Louisiana
- Oregon
- Pennsylvania
- Tennessee
- Virginia
- West Virginia



Comparison to Similar States



- Our 2011 analysis period of 30 years was similar to 4 of the comparison states. Many agencies are moving to longer analysis periods nationally.
- Most of the comparison states used the same design life for asphalt and concrete.
- Most did LCCA for new location and rehab.

Comparison to Similar States



- NCDOT process was similar in calculation of agency costs.
- Most of comparison states calculate user costs. Use of work zone delay and operating costs are most common. All considered separate from agency costs.

Stakeholder Involvement



- Citizens are the ultimate stakeholder. FHWA holds us to good practice and fiscal responsibility.
- Asphalt and concrete industry are directly impacted by LCCA decisions. The aggregate industry is also a major material supplier.

Concrete Industry Concerns



- Believe that use of 15' slabs and dowels will improve performance.
- Want rehab to consist of ultrathin bonded wearing course rather than unbonded overlay.
- Wants discount rate to be the OMB 30-year discount rate.

What was Approved?



- Present Worth Analysis with 45 year analysis period.
- 30 Year design life for both asphalt and concrete pavements.
- 30-year OMB discount rate set for the year after the first update in the calendar year.

More on what was approved.



- 3 flexible options: FDA, ABC, CTABC
- Concrete: For high truck traffic, use 3 inch drainage layer and 1.25" separator layer. Can use tied concrete shoulders or widened truck lane with asphalt shoulders.
- For lower truck traffic, place on 6" ABC with asphalt shoulders and 12' lanes.

Approved (continued)



- Salvage value calculated as the unused life of the last applied treatment as a proportion of the cost of the last treatment.
- Alternate bid possible if LCCs are within 10%. Still working on Alternate Bid process. Division preference considered if within 15% with Chief's concurrence.

Treatments in Approved LCCA- Flexible

- @ 12 years, cost to mill and replace 1.5" of surface and fog seal shldr.
- @ 23 years, cost to mill and replace 1.5" of surface course including shoulders.
- @ 34 years, mill 3", replace with intermediate course and add one or two lifts of surface to add 20 years of additional life.
- Salvage value of 45% of year 34 treatment.

Treatments in Approved LCCA- Rigid

- @17 years, clean and reseal joints, patch 1%, fog seal shoulders if asphalt.
- @30 years, 1% patching + either diamond grinding or overlay with ultrathin bonded wearing course.
- @40 years, overlay with 5.5" HMA
- Salvage value: 75% of year 40 treatment.

Next steps



- Working on Alternate Bid process, and this will be developed with input from all industries. Requires FHWA agreement. Expect to begin with pilot projects.
- Working on User Cost calculation.

LCCA



- LCCA is a process that impacts pavement type selection in an agency.
- Any change impacts the balance between stakeholders.
- The goal is selection of the best pavement type for each project.

Thank you for your attention.

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Are there any questions?