Highway Maintenance and Preservation Needs

WSDOT Can Provide Reliable Long-Term Pavement Estimates, but Accuracy of Bridge Estimates Is Uncertain

Presentation to Washington State Transportation Commission

Valerie Whitener, Mark Fleming, and Eric Thomas
JLARC Staff

Joint Legislative Audit & Review Committee

January 21, 2015
Who We Are & What We Do

- The Joint Legislative Audit & Review Committee (JLARC) is a joint, bi-partisan committee of 16 legislators.
- JLARC has conducted performance audits and other studies for the Legislature since 1973.
- Non-partisan staff conduct work using Generally Accepted Government Auditing Standards.
- Study assignments are made by the Legislature and the Committee itself.
  - This study was assigned in the 2013-15 transportation budget.
Key findings related to estimating highway preservation costs

1. Long-term (10-year) cost estimates reliable for pavement, not bridges

<table>
<thead>
<tr>
<th>Pavement</th>
<th>Condition data is accurate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost estimates can be verified</td>
</tr>
<tr>
<td></td>
<td>• Developed using industry best practices</td>
</tr>
<tr>
<td></td>
<td>• Viewed as national leader</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bridges</th>
<th>Condition data is accurate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost estimates cannot be verified</td>
</tr>
<tr>
<td></td>
<td>• Not developed using industry best practices</td>
</tr>
<tr>
<td></td>
<td>• May be high or low</td>
</tr>
</tbody>
</table>

2. Involving stakeholders in estimating process improves confidence in long-term cost estimates
Two part review of WSDOT’s long-term cost estimating practices

Driven by 2013 needs estimate — focus on highway maintenance and preservation needs

Phase 1 of 2: December 2013

How are maintenance and preservation needs identified and documented?

*JLARC staff found that WSDOT uses a logical process but has limited documentation for preservation*

Phase 2 of 2: December 2015

Procedures consistent with industry & other practices?

*JLARC staff engaged bridge and pavement experts to assess long-term estimating practices*
Preservation is 11% of WSDOT’s 2013-15 $6.5 billion biennial budget.

Preservation:
- Repave highways
- Paint bridges
- Replace bridges
- Stabilize slopes

Highway Improvements:
- Capital Budget
- Operating Budget

January 21, 2015

Highway Maintenance & Preservation Needs
Consultants reviewed cost estimating best practices

<table>
<thead>
<tr>
<th></th>
<th>Expected asset deterioration</th>
<th>Expected effectiveness of maintenance and preservation work</th>
<th>Investment options and predicted conditions for different funding scenarios</th>
<th>Investment recommendations based on life cycle cost analysis</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Partial</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Yes</td>
<td>Partial</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Yes</td>
<td>Partial</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**Expected asset deterioration**

**Asset deterioration models** allow a DOT to:
- Estimate future costs, and
- Use life cycle cost analysis to compare different preservation alternatives.

<table>
<thead>
<tr>
<th>Pavement – Yes</th>
<th>Bridges – Partial</th>
</tr>
</thead>
</table>
| Maintains site-specific models to characterize condition and determine when different sections are due for treatment | • No deterioration models for most bridge elements  
• Deterioration analyses are used ad hoc, rarely documented |
By measuring the effectiveness of preservation and maintenance work, a DOT can more accurately estimate the need for and impact of future work.

**Pavement – Yes**
- Models and data are specific to the work completed
- Update details of completed work in Pavement Management System and continuously recalibrated

**Bridges – Partial**
- With a few exceptions, effectiveness of bridge preservation work not measured
- No comparable bridge management system
Allows Legislature to consider data-driven investment alternatives and answer questions such as:

• Cost to bring 95% of state roads to fair or better condition?
• Impact of investing $300 million more on bridge preservation compared to $500 million?

<table>
<thead>
<tr>
<th>Pavement – Yes</th>
<th>Bridges – No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provided report to Legislature on estimated outcomes of three funding scenarios in 2010</td>
<td>Estimated condition not based on validated, quantitative analysis of deterioration or treatment effectiveness</td>
</tr>
</tbody>
</table>
Life cycle cost analysis supports long-term, cost effective decisions

Evaluates feasibility of incurring a smaller expense (e.g., maintenance) to postpone a bigger expense.
Investment recommendations based on life cycle cost analysis

Work appropriate and effective for specific bridge or pavement segment may not be viable for entire system. LCCA helps determine:

- Timing of specific work
- Condition levels that can be maintained at lowest cost over long term, and strategies to do so

| Pavement – Yes | Bridges – No |
---|---|
Determine funding needs using strategies that produce lowest life cycle cost and satisfy performance criteria | Does not have the models or software to estimate long-term costs or perform life cycle cost analysis
Long-term needs estimate should acknowledge inevitable uncertainties. A DOT needs to analyze and develop contingency strategies to address:

- **Systemic risks**, such as changes in the cost and quality of materials and in available revenues, and
- **Site specific risks**, such as natural or man-made hazards.

**Pavement – Yes**
Quantify systemic risk, and consider risk during project prioritization process

**Bridges – Partial**
Do not include all man-made hazards (e.g., over-height or over-loaded trucks)
Use best practices for bridge cost estimates

Recommendation 1: WSDOT should use best practices to make its bridge estimates as reliable as pavement estimates.

Start with a multi-year plan

Effective bridge management systems require several years of incremental changes
• Develop implementation plan by June 30, 2015
• Identify near-term and longer-term actions

WSDOT and OFM: Concur
National best practices identify elements contributing to a forecasting and estimating process that builds stakeholder confidence.
Common theme: Involve other parties

<table>
<thead>
<tr>
<th>Documented estimates</th>
<th>Clear, routine communication</th>
<th>Internal and external review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I found process for long-term estimates not well documented</td>
<td>Communicate assumptions, uncertainties, and estimate changes</td>
<td>Examples such as project reviews and Caseload Forecasting Council</td>
</tr>
</tbody>
</table>

**Organizational buffers**

Ensure integrity in the processes of developing and identifying needs during estimate development.
Improve stakeholder confidence

Recommendation 2: WSDOT and OFM should develop a process to improve stakeholders’ confidence in its highway estimates.

Apply best practices
- Identify an approach that incorporates best practices
- Report plans by June 30, 2015

WSDOT and OFM: Concur
Contact Information

Valerie Whitener, Project Supervisor
valerie.whitener@leg.wa.gov
360-786-5191

Mark Fleming, Research Analyst
mark.fleming@leg.wa.gov
360-786-5171

Eric Thomas, Research Analyst
eric.thomas@leg.wa.gov
360-786-5172