Building a Risk Program

at WSDOT

CSVA 2009 Conference
Ottawa, Ontario
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Assistant State Design Engineer
Washington State Dept of Trans.
Overview

- Why start a risk program
- WSDOT history with Risk Based Estimating
- What tools are needed
- Threats to a risk program
- Opportunities of a risk program
- Continuing efforts and helpful hints…
- Top ten reasons to do risk based estimating
For Effective Project Management you must do Risk Management

- Project risk management offers:
  - Expanded project insight
  - Actionable information
  - Fewer surprises by threats
  - Capitalizing on opportunities
  - Recognition of risk and uncertainty
Project Management
On-Line Guide

Pre-Construction

Initiate and Align
- Project Description
- Team Mission/Assignment
- Major Milestones
- Boundaries
- Team Identification
- Roles/Responsibilities
- Measures of Success
- Operating Guidelines

Plan the Work
- Work Breakdown Structure (WBS)/Master Deliverables List (MDL)
- Task Planning and Scheduling
- Budget
- Risk Planning
- Communication Plan
- Change Management Plan
- Quality (QA/QC) Plan
- Transition and Closure Plan

Endorse the Plan
- Project Team Commitment
- Management Endorsement

Manage Change
- Manage the Scope, Schedule and Budget
- Manage Risks
- Manage Change
- Communicate
  - Progress
  - Issues
  - Lessons Learned

Work the Plan

Transition and Closure
- Implement Transition Plan
- Review Lessons Learned
- Reward & Recognize
- Archive
One main function of Risk Based Estimating

The RBE aims to keep “the decision makers” from being surprised.

Examples of surprises:
- Significant increase in the project cost
- Significant delay of the project schedule

Bad news “let me know ASAP.”

- Significant decrease in the project cost
- Significant reduction of the project schedule

Good news “let me know as soon as you are sure about it.”
Inaccurate cost estimating has dogged transportation projects for years.
Schedule delays impacted the public unnecessarily.
WSDOT, had a pivotal moment with one project in particular…
Why did this estimate go wrong?

Cost Estimate for WSDOT SR 167 Project

1990 - Scoping Phase
$150 million

1993 - Draft Tier 1 EIS
$133 million

1999 - FEIS
$212 million

2000 - Preliminary Design
$972 million

2005 – Preliminary Design
$2.3 billion
<table>
<thead>
<tr>
<th>Project Development Level</th>
<th>Project Maturity (% of design completed)</th>
<th>Purpose of Estimate</th>
<th>Methodology</th>
<th>Estimate Range</th>
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</thead>
<tbody>
<tr>
<td><strong>Planning</strong></td>
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<tr>
<td>Washington</td>
<td>0% to 2%</td>
<td>Screening or Feasibility WTP/HSP (20 Year Plan) WTP – Washington Transportation Plan HSP – Highway Systems Plan</td>
<td>Risk-based or Judgment Historical % Similar Projects Parametric MP3 PLCE</td>
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<tr>
<td>Highway System Plan</td>
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<td>Design Studies</td>
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<td>Route Dev. Plans</td>
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<tr>
<td><strong>Scoping</strong></td>
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<tr>
<td>Project Summary (PD, DDS, ERS)</td>
<td>1% to 15%</td>
<td>Concept Study or Feasibility Implementation Plan (10 Yr. Plan)</td>
<td>Parametric MP3, PLCE Analogous Projects Historical % Risk-based CEVP CRA Self-Modeling</td>
<td>-40% to 100%</td>
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<td><strong>Design</strong></td>
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<td>Design Documentation</td>
<td>10% to 30%</td>
<td>Budget Authorization or Control Capital Improvement &amp; Preservation Plan (CIPP)</td>
<td>Parametric MP3, PLCE Analogous Projects Historical bid-based (UBA, BidTabs Pro) Risk-based CEVP, CRA Self-Modeling</td>
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<td>Design Approval</td>
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<td><strong>PS&amp;E</strong></td>
<td></td>
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<tr>
<td>Plans, Specs, Estimate</td>
<td>90% to 100%</td>
<td>Engineer’s Estimate (prior to bid)</td>
<td>Historical bid-based (UBA, BidTabs Pro, EBASE) Cost-based Risk-based CEVP CRA Self-Modeling</td>
<td>-5% to +10%</td>
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## WSDOT Risk-Based Estimating History

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<td><strong>2009</strong></td>
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- CRA Workshop Process scaled for smaller projects.
- Cost Estimate Process NCHRP Report 574
- Project Estimating Guide posted on web
- E 1038 Enterprise Risk Management
- E 1053 $10M+ Quantitative Risk Assessment
Risk-Based Estimating

*Forecast number of workshops in 2009 is between 20 and 30
Tools Needed

- Executive management support
- Effective estimating and scheduling programs
  - Estimating manual to ensure consistency and completeness of estimates
  - Scheduling software that creates realistic schedule
- Simple and understandable modeling tools
  - Self-modeling spreadsheet allows project managers to use it themselves which builds confidence
- Scalability of tools for pessimistic managers
- Outputs that help the project manager deliver his/her project
  - One pagers
## Risk Based Estimate Self-Modeling

<table>
<thead>
<tr>
<th>Project Title</th>
<th>S.R. 9 Lake Stevens east to 20th St. SE</th>
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<tbody>
<tr>
<td>Estimate Date</td>
<td>July 9, 2007</td>
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<tr>
<td>Project Phase</td>
<td>Construction</td>
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<tr>
<td>Risk Trigger</td>
<td>Damage to water line during construction</td>
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<tr>
<td>Probability</td>
<td>5%</td>
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<tr>
<td>Cost</td>
<td>£10,000</td>
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<tr>
<td>Cost COV</td>
<td>0.15</td>
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</tbody>
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<table>
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<tr>
<th>Threat</th>
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### Risk Response Plan
- **Mitigation**: Additional environmental permit requirements are needed. Mitigation issues identified are stream relocation, fish passage issues, and wetland impacts.
- **Impact**: Very low
- **Probability**: Very high

### Monitoring and Control
- **Final Costs**: Data, status, and review comments (do not update prior comments, therefore providing a baseline).
- **In Risk on Critical Path**: Yes

### Critical Issues
- **Action to Be Taken**: Response actions including advantages and disadvantages include data.
**Project Description:**

This 2005 Transportation Partnership project will widen SR-9 to five lanes between MP 13.70 and MP 14.50, providing a northbound and southbound left turn lane, a southbound right turn drop lane, a northbound right turn pocket, one southbound through lane, and two northbound through lanes. The project is located in Sections 24 and 25 of Township 29 North Range 95 East, in Snohomish County. The project will include erosion control measures, minor safety improvements, signalization and illumination, relocation of affected utilities, replacement of bridge 9/125 (which crosses city’s water lines) retaining walls, permanent signing and striping, relocation of a portion of Cenennial Creek, drainage, new stormwater runoff quality and quantity treatment facilities, and traffic control.

**Project Benefits:**

- **Safety** – Intersection improvements at SR 9/S. Lake Stevens Road and SR 9/20th St. SE

- **Environmental** – Install retaining walls, stream relocation, drainage, retention pond

- **Congestion** – Roadway widening between these intersections traffic signal rebuild at SR 9/20th St. SE, construction traffic control and other work

- **Bridges** - Replace bridge 009/125 with a five lanes single span structure.

**Construction Cost Range:**

- 10% chance the cost less than $9.18 Million
- 50% chance the cost less than $9.53 Million
- 90% chance the cost less than $10.02 Million

**Project Time Line:**

- AD date Spring, 2008
- Open to traffic Summer 2009

**Cost Risks:**

- Damage to water line(s) during construction. There are three City of Everett water lines that cross the project. The price is estimated at $1,500/ft for the water line if impacted.

- City of Everett requires a longer bridge

**Schedule Risks:**

- Right of way acquisition for detention pond is delayed or needs to go to condemnation.

**Level of Project Design:**

<table>
<thead>
<tr>
<th>Level</th>
<th>Low</th>
<th>Medium</th>
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<td>July 12, 2007</td>
<td>Washington State Department of Transportation</td>
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Threats to a Risk Program

- Project Managers feel the cost range is extreme.
- Garbage in is garbage out.
- Make sure you have the right people in the room at the right time.
- Don’t allow discussions on inflation to occur at your workshop.
- Watch for managers creativity.
- Keep focused on significant risks.
What we have learned...

- Need to have strong support from the top, and enthusiastic participation from all levels
- Have an established project management process
- Stay focused on the fundamentals (documented, well organized and developed base cost estimates)
- Use experts in the field of risk elicitation and assessment
- Adjust the process to meet the needs of project managers delivering the projects
- Develop knowledge and expertise within your organization to do QA/QC
Top Ten reasons why to implement a Risk Program

- Proactive versus reactive management
- Documented Risks and Impacts
- Ability to report the costs in ranges
- Increase in public and legislative confidence
- Educating the public about the challenges that could be encountered with project delivery
- More aggressive and effective risk management
- Cost and schedule savings
- Better understanding of the Project
- Validates cost estimate
- Validates project schedule
Continuing efforts and helpful hints...

- Make “mastering the fundamentals” a priority
- Training: providing and pursuing
- Share what we learn with others – and learn from them
- We continue to seek opportunities for user-friendly ways to integrate project risk management for our project offices
- Emphasize the benefits – many are qualitative and do not lend themselves to quantitative measures
Range and Shape of the Pre-Mitigated vs. Post Mitigated

Probability

Total Construction Cost (CY) $M

Post Mitigated

Pre-Mitigated
Contact and references

- Terry Berends, WSDOT
  509.667.3041
  berendt@wsdot.wa.gov

- wsdot.wa.gov > cost risk assessment
  http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/