Risk Based Estimating and Management at WSDO

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Terry Berends, PE
Assistant State Design Engineer
Overview

- Risk Based Estimating @ WSDOT
- Risk Management @ WSDOT
- Risk Reserve Budgeting
- Performance measurements
- Best Practices
- Lesson’s Learned
- Next Steps
Why the need for Risk Based Estimating?

Improve chances of delivering project on time and within budget

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.”

- Improve communication between Project managers, support office managers and executives.
## WSDOT Risk-Based Estimating History

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>WSDOT Creates CEVP®</td>
<td>Number of workshops and interest grows</td>
</tr>
<tr>
<td></td>
<td>CRA Workshop process scaled for smaller projects</td>
<td>NCHRP Report 574 Began combining VE and CRA workshops in Cost estimate process</td>
</tr>
<tr>
<td>2003</td>
<td>Policy and guidance posted</td>
<td>WSDOT estimating guide provided</td>
</tr>
<tr>
<td>2004</td>
<td>Self-model tool developed</td>
<td>E 1038 Enterprise Risk Mgmt</td>
</tr>
<tr>
<td>2006</td>
<td>Project Risk Management Guide posted</td>
<td>Updates to basis of estimate and QA/QC</td>
</tr>
<tr>
<td>2007</td>
<td>Risk reserves now required for all for projects that have had a risk-based estimate</td>
<td>Expect greater emphasis on estimate reviews and QA/QC</td>
</tr>
<tr>
<td>2008</td>
<td>Expand training and Implement certification</td>
<td></td>
</tr>
<tr>
<td>Estimating</td>
<td>Project Development Level</td>
<td>Project Maturity (% of design completed)</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>● Planning</td>
<td>Planning</td>
<td>0% to 2%</td>
</tr>
<tr>
<td></td>
<td>Planning</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scoping</td>
<td>1% to 15%</td>
</tr>
<tr>
<td></td>
<td>Design</td>
<td>10% to 30%</td>
</tr>
<tr>
<td></td>
<td>PS&amp;E</td>
<td>30% to 90%</td>
</tr>
<tr>
<td></td>
<td>PS&amp;E</td>
<td>90% to 100%</td>
</tr>
</tbody>
</table>
Tools Needed

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

<table>
<thead>
<tr>
<th>Project Title</th>
<th>SR 9, S. Lake Stevens Road to 20th St. SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate Date</td>
<td>July 9, 2007</td>
</tr>
<tr>
<td>Project Mgmt.</td>
<td>Jason Rodrock</td>
</tr>
<tr>
<td>Last Review Date</td>
<td>July 11, 2007</td>
</tr>
<tr>
<td>Target T/O Date</td>
<td>April 2008</td>
</tr>
<tr>
<td>Target End Construction Date</td>
<td>2%</td>
</tr>
<tr>
<td>Estimated Construction Cost</td>
<td>$23.0M</td>
</tr>
<tr>
<td>Base Construction Duration</td>
<td>7.0 Months</td>
</tr>
</tbody>
</table>

### Risk Identification

<table>
<thead>
<tr>
<th>Priority</th>
<th>Name</th>
<th>Date</th>
<th>Event Description</th>
<th>Probability</th>
<th>Risk Trigger</th>
<th>Cost</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Active Damage to Waterline(s) during construction, there are three City of Everett waterlines that cross the project. The pipe is estimated at $1,000,000 for the water line if impacted.</td>
<td>9%</td>
<td>0.10$M</td>
<td>**</td>
<td>1.50$M</td>
<td>**</td>
<td>0.35$M</td>
</tr>
<tr>
<td>2</td>
<td>Active Additional environmental permit requirements are needed. Mitigation issues dealing with arroyo relocation, fish passage issues and/or wetland impacts.</td>
<td>20%</td>
<td>0.05$M</td>
<td>**</td>
<td>1.00$M</td>
<td>**</td>
<td>0.20$M</td>
</tr>
<tr>
<td>3</td>
<td>Active Condition exceed worse than expected</td>
<td>10%</td>
<td>0.01$M</td>
<td>**</td>
<td>0.02$M</td>
<td>**</td>
<td>0.02$M</td>
</tr>
</tbody>
</table>
Risk Management @ WSDOT

- **WSDOT requires all projects over $10 million to use the risk based estimating process**

- **WSDOT requires all projects to have a project management plan which must include a risk management plan**

- **Mitigation strategies are required for identified significant risks**

- **Risk reserve budgeting is required for all projects over $10 million**
Project Management On-Line Guide

Pre-Construction

- Initiate and Align
- Plan the Work
- Endorse the Plan
- Work the Plan
- Transition and Closure

Manage Change

Overview | Process
---|---

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

- 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

- Project Team Commitment
- Management Endorsement
- Manage the Scope, Schedule and Budget
- Manage Risks
- Manage Change
- Communicate
- Progress Issues Lessons Learned

- Implement Transition Plan
- Review Lessons Learned
- Reward & Recognize
- Archive
Project Budgeting

- When WSDOT started using Risk Based Estimating, most projects were funded at the 90% confidence level
  - This generous budget minimized the incentive of good risk management and many “desired things” crept into projects
  - This did not create an environment conducive to aggressive risk management
Project Budgets with Risk Reserves

- We developed a systematic approach and defined a new budget process called “risk reserve” budgeting.

- We have lowered the total budget figure to the 60% confidence level (strongly recommend using the post mitigated results if available).

- The Project Manager is expected to manage the project to the estimated base cost.
  - Our experience shows that typically the base cost estimate falls in the 25% to 40% confidence level.
RBE and Risk Reserve Flowchart

Know and understand WSDOT estimating and Risk Assessment policies and practices.

Is project over $10M?

- Yes
  - When ready perform Quantitative Risk Analysis (per E 1053.00)
  - Quantitative Risk Assessment Optional

- No
  - $10M to $25M you can "do-it-yourself" with the WSDOT self-modeling spreadsheet
  - $25M - $100M Cost Risk Assessment (CRA) Workshop
  - $100M and up Cost Estimate Validation Process (CEVP) Workshop

Results (Base and probability range)

Report to Region Program Management

\[ \text{PE} + \text{RW} + \text{CN} = \text{TOTAL BASE ESTIMATE FOR PROJECT} \]

This is the Project WIN

Report to Region Program Management

Project Risk Reserve = (60%-ile – BASE)

This is the Risk Reserve WIN

NOTE: When there are multiple funding sources coordinate with HQ program management on how to setup risk reserves.

NOTES: When planning for a risk assessment workshop use the guidance in the WSDOT Project Risk Management Guide, the WSDOT Cost Estimating Manual, and the WSDOT Guidelines for CRA - CEVP Workshops. Project information (such as estimates, scopes, etc.) should well organized by PIN(s), anticipated contract packages, and other as appropriate. Basis of Estimate must be completed prior to workshop.

For straight-forward projects, with little risk, the standard 4% contingency may suffice; for example, P1 HMA pavers would not typically require a formal quantitative risk analysis.

For projects with...
- Multiple PINs
- Fixed contributions
- Local contributions
- Other non-standard conditions
Contact your region program management office and with them discuss with HQ program management on how to best deal with your particular situation.
Budget

Figure using

Risk Reserve
Base Cost & PM target budget & RR

Base cost includes a “construction contingency” that the PM will use first to cover adjustments during construction.

The Risk Reserve may be used only with approval by Region Program management.

The risk reserve is monitored and as risks are retired, the amount will be adjusted.
Challenges with implementation...

- Provide opportunity for all regions to review and comment on drafts of this new policy
- Obtain upper *and* mid-level management support
- Provide implementation guidance
- Do not make it burdensome for project managers to implement
- Highlight the benefits
- Applying it to existing projects
- Allow a process for flexibility
Risk Reserve is not a “silver bullet”

Very Low probability 2%
Impact 20 $M to 60 $M

Occurred 100 $M
Here are the headlines from the Seattle PI newspaper:
WSDOT Says: 40% Chance of Tunnel Cost Overruns
Performance Measurement

Here are some common questions from Project managers, executives, legislature and the public:

- Is there any value with spending the money and effort doing risk based estimating?
- This is a lot of work why are we doing this?
- Haven’t we always been doing this?
Benefits and outcomes of RBE

- Better use of program funds
- Moves towards working within a estimate range
- More aggressive project risk management
- Tighter control of scopes
- Budgeting reflects risk and uncertainty
- More consistency
- More transparency
- Better documentation and tracking
Performance Measurement comparing costs

CEVP Range vs Actual
(at time of contract award)
Threats to a Risk Program

- Project Managers are allowed to influence process with optimistic inputs
- 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.
- **Cost Estimate is not complete**
- If a workshop is not ready do not move forward with the workshop
BASE UNCERTAINTY
(base variability; market conditions)

Higher cost limit: reflects uncertain market conditions - “worse than expected”.

Lower cost limit: reflects uncertain market conditions - “better than expected”.

Base cost
Base Variability $\pm x\%$

slope given by inflation rate
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
Range and Shape of the Pre-Mitigated vs. Post Mitigated

Post Mitigated

Pre-Mitigated

Total Construction Cost (CY) $M

Probability

Range and Shape of the Pre-Mitigated vs. Post 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/
Questions