Federal Highway Administration
Risk Management Approach

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Federal Highway Administration

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Canadian Society of Value Analysis

October 24, 2006

"Providing Efficiencies for Stewardship/Oversight"

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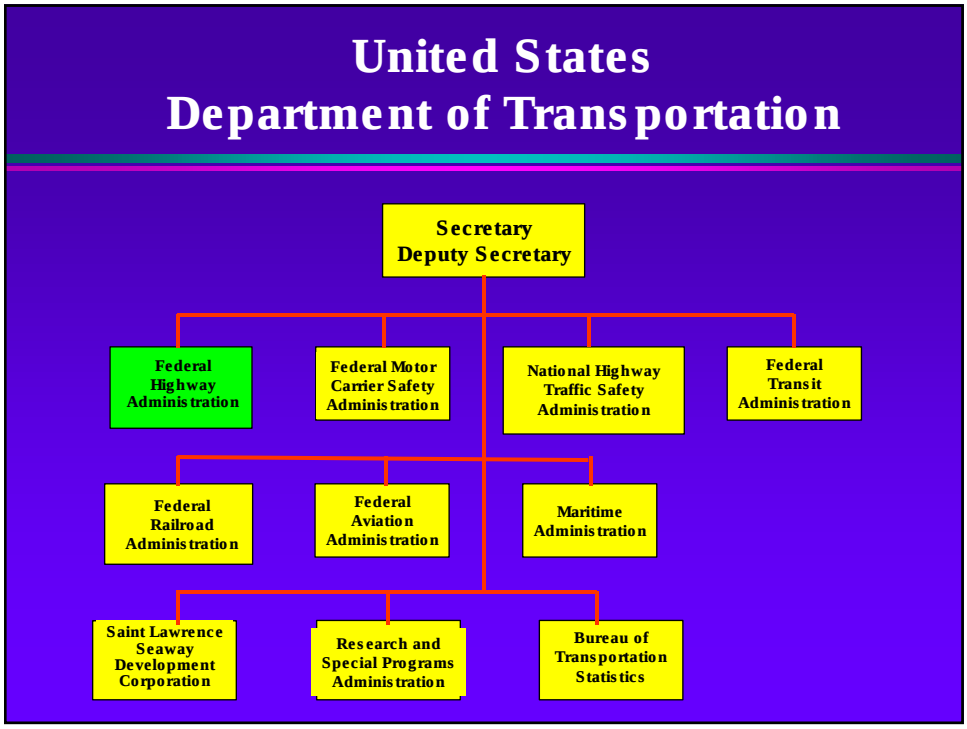
Risk Management Approach

Presentation Focus:

- Federal Highway Administration Risk Management
- Project Level Risk Management/Risk Based Cost Estimating
- Program Level Risk Management Opportunities

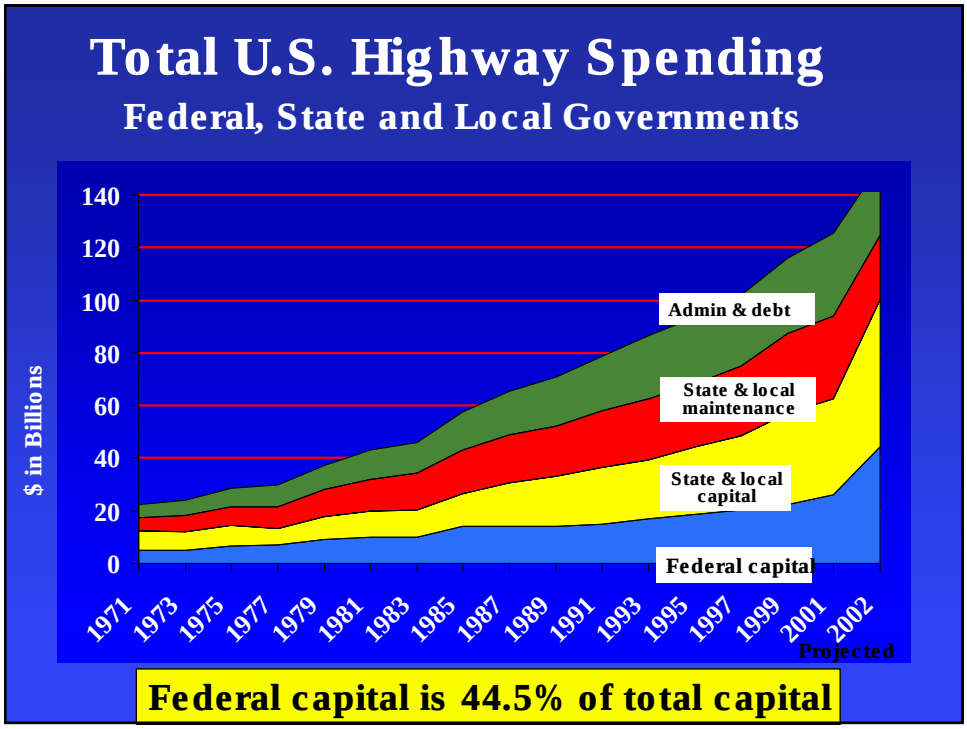
"Providing Efficiencies for Stewardship/Oversight"

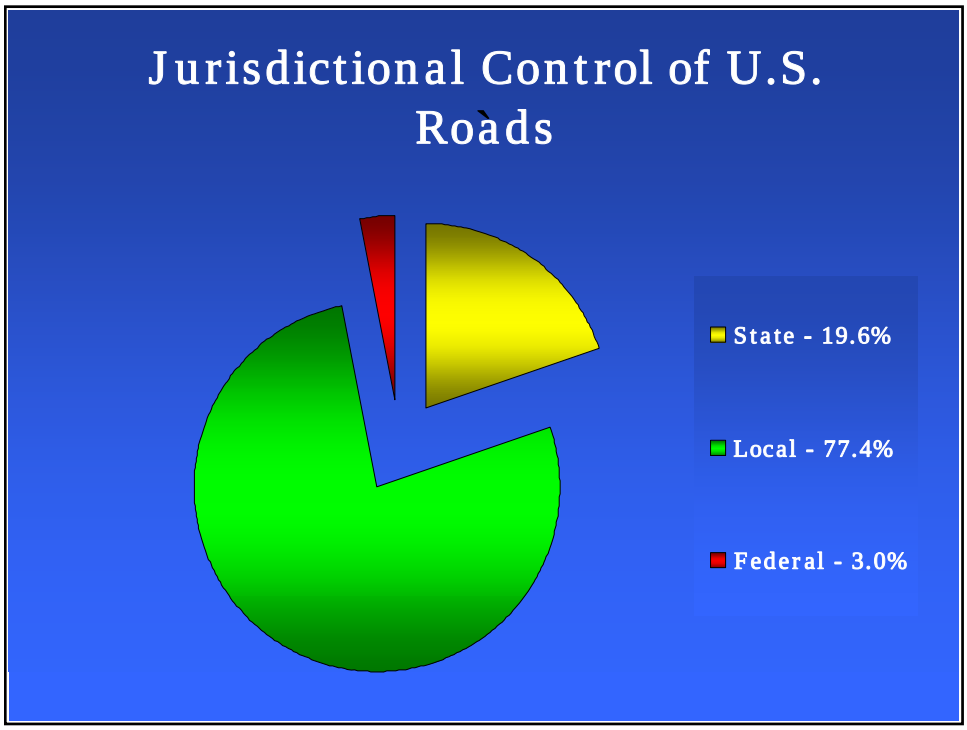
United States Department of Transportation



FHWA National Structure

An Office in Every State


Total U.S. Highway Spending
Federal, State and Local Governments
$ in Billions
140
120
100
80
60
40
20
0
Admin & debt
State & local maintenance
State & local capital
Federal capital
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2002
Projected
Federal capital is 44.5% of total capital


Jurisdictional Control of U.S. Roàds
State - 19.6%
Local - 77.4%
Federal - 3.0%

The Federal-Aid Highway Program

- Federal Assisted, State Administered

- Funding Tied to Specific Systems

- Requires States to have Transportation Agency

- Highway Trust Fund

- Approximately $40 billion/yr

- Minnesota: Approximately $600 million/yr

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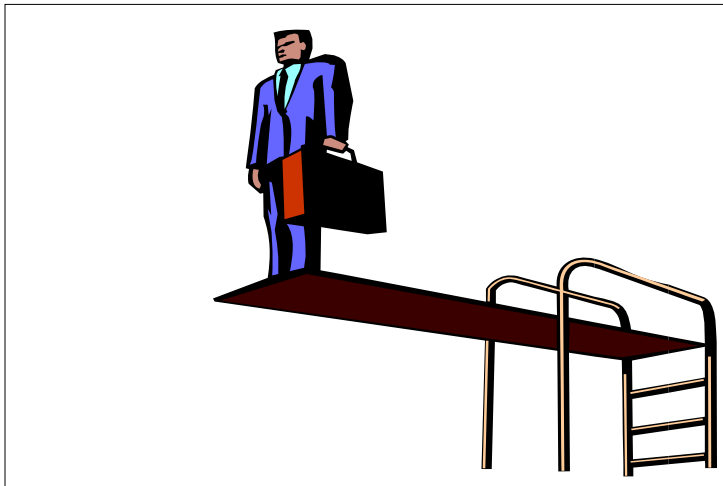

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Agency-Wide Risk Management Approach

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Genesis of FHWA Risk Management:

- March 2001 Stewardship/Oversight Task Force
- June 2001 Policy memorandum from the Executive Director
- Initial Risk assessments in fall of 2001

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Genesis of FHWA Risk Management (cont'd):

- In 2002, the Office of Infrastructure initiated a two-phased approach

  1. Review current Division Office risk assessment activities
  2. Develop an agency-wide risk "management" approach

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Objectives of Phase I:

- ✓ Identify current internal practices in Divisions, States, and external public agencies
- ✓ Identify critical issues and elements
- ✓ Document and share successful practices/processes

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Phase I Major Conclusions:

- ✓ There are issues in identifying low risk areas and adjusting resources accordingly
- ✓ Using the results of risk assessments in stewardship/oversight is mixed
- ✓ Risk management should occur at an agency level

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Phase I Major Conclusions (cont'd):

- ✓ The severity-frequency model holds promise for agency-wide application
- ✓ Executive summary and report issued with King Gee's memorandum of March 31, 2003
- ✓ Phase II should be initiated

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Objectives of Phase II:

- ✓ Identify critical major program elements to ensure greater consistency in assessing risk throughout agency
- ✓ Incorporate the results of the Phase I effort into a corporate strategy
- ✓ Develop an agency-wide risk management framework

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Phase II Steps:

- ✓ Initial Corporate Risk Profile (CRP)
- ✓ Develop a Risk Management Framework
- ✓ Pilot Program
- ✓ Adoption of Framework
- ✓ Integrate Framework into business planning process

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Creation of the Corporate Risk Profile (CRP)

- ✓ Initiated by interviewing Associate Administrators
- ✓ Held discussion with Office Directors
- ✓ Identified Programs and Critical Program Elements
- ✓ Completed assessments
- ✓ Developed Risk Maps for each Office

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Corporate Risk Profile Recommendations:

- ✓ Develop a Risk Management Framework
- ✓ Identify the Agency's high risk areas
- ✓ Pilot the Framework
- ✓ Fill the Stewardship/Oversight Gap between strategic planning and operational planning

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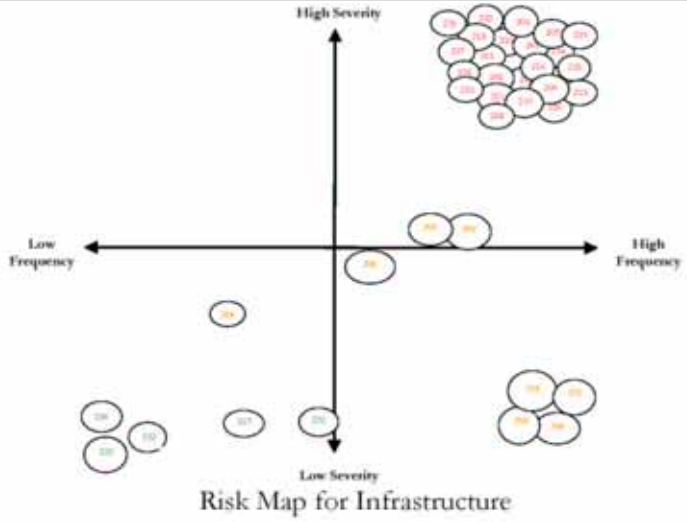

Risk Map for Infrastructure

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Pilot Program

Purpose:

- Try agency-wide risk "management" approach
- Gain risk management experience
- Identify and make process improvements
- Evaluate and qualify the processes gap filling benefits to facilitate cultural change

Participants:

- Office of Infrastructure
- Office of Highway Policy Information
- The Six Phase I Divisions

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At the Conclusion of Pilot Program ...

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Everything Changed!!

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- Process Driven at Division Office Levels

- Folded into National Plan

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In Minnesota:

- 10 Facilitated Risk Assessments Completed. Over 300 Risks Identified.
- Risks Prioritized within each Program Area. (Probability * Impact)
  - Functional Areas represented included: Right-of-way, Environment, Design, Planning, Civil Rights, Finance, System Preservation, Safety, Construction and Operations.
- Risk Prioritized at a Global Level. (Score * Leadership Weight)
- New Verbiage in Stewardship Agreement has been proposed.

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What is Number #1 Overall?:

- Top 8 Risks in each Functional Area Evaluated by Leadership
- Leadership "Weights" the functional area.
- Weights used to re-prioritize and find Global #1.
- Next Steps include Collaboration…

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Top 10 Risk Events to the Highway Program

1. The lowest throughputs accepted during high congestion time periods, causing further delays and higher thresholds of congestion and crash tolerance.
2. Resource allocation is inefficient because of ever changing priorities….misdirection of resources.
3. Current standards and guidelines may not allow sufficient flexibility for sound professional judgment, creating more innovative solutions to enhance safety, cost effectiveness, and sensitivity to environment and communities.
4. Construction inflation costs increase faster than historical rates, causing revenue stream problems and inadequacies.
5. Escalation of material costs fluctuates and is more volatile that forecasted, causing inability to predict costs. Reduces program funding planned.
6. (Opportunity) More and more design build projects implemented, causes the ability to deal with influx of money. New alternative methods enhanced….
7. Local initiated project is counter to federal and state goals and values, erodes the ability to operate and maintain the system. Can't do what we really need to do….
8. System preservation projects not delivered due to capital improvement projects, causing (politics) degradation of infrastructure.
9. Mega projects are delivered, causing shift in program priorities.
10. Eminent domain loads project delivery process, increases the ROW acquisition time and cost.

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Next Steps:

➢Market Research of FHWA customers integrated into Strategy Development.

➢Collaboration effort initiated by FHWA Servant Leaders to Manage Program Risks in partnership with customers.

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Process Conclusions:

➢ Effective Partnering opportunity that resulted in plenty of fruitful communication about the future of transportation in Minnesota.

➢ Servant Leadership partnering efforts critical to focus collaborative efforts.

➢ Database architecture should be created to enhance reporting, to elaborate, and to effectively manage strategies.

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Risk Management Process:

Manage

Risk Response Strategies

- Start with highest ranked risk statements:

- Develop Response Strategies
  - Acceptance
  - Transference
  - Avoidance
  - Mitigation (Enhance if Opportunity)

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Risk Management Process:

Manage

Analyzing Residual Risk (r)

$$r = R - RS$$

Requires:

- **Assessed Risk Level, R**
- **Estimation of Response Strategy effectiveness, RS**
- **Did the RS work?**

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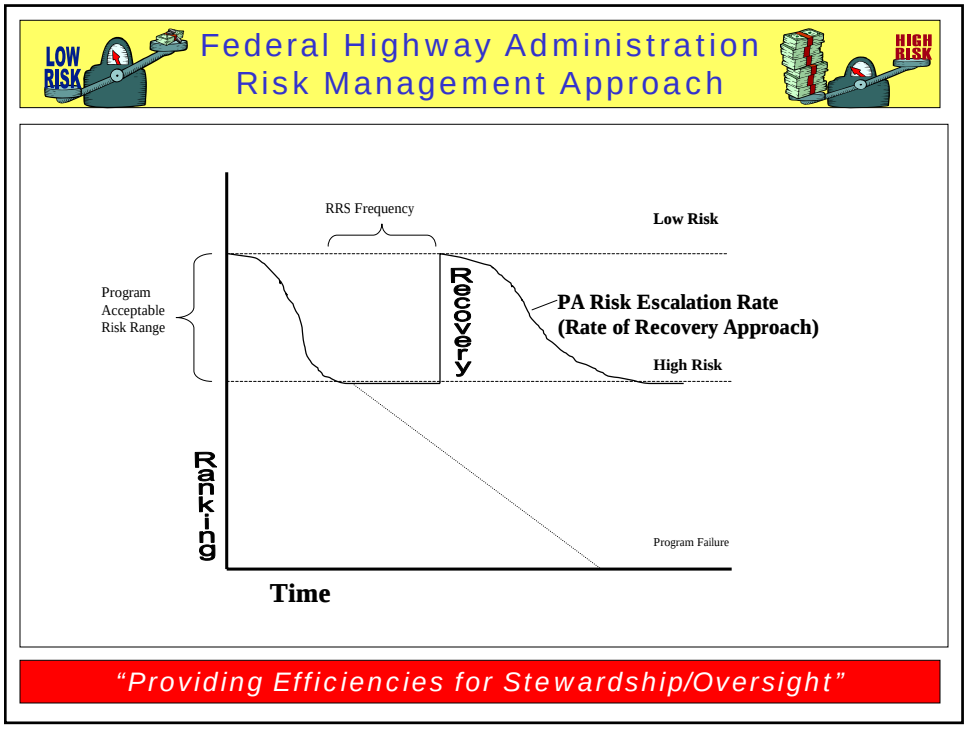


Cost Estimate Validation

- FHWA Interim Major Project Guidance and Oversight Framework – January 27,2006 memo from Rick Capka
- FHWA Major Project Cost Estimate Training
  - Ensuring complete and logical estimates
  - Not "How to" develop and estimate
- FHWA Draft Cost Estimate Guidance

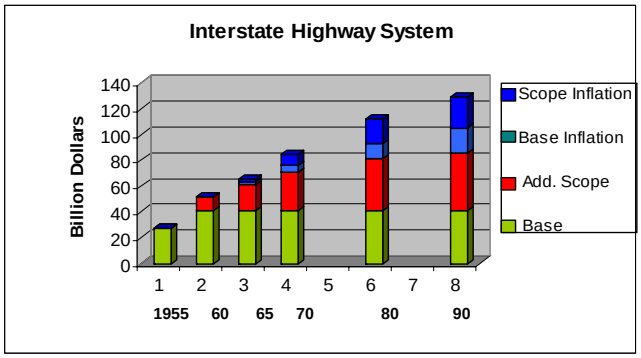
Why Validate?

- SAFTEA-LU
  - A financial plan shall–
  - ``(A) be based on detailed estimates of the cost to complete the project; and
  - ``(B) provide for the annual submission of updates to the Secretary that are based on reasonable assumptions, as determined by the Secretary, of future increases in the cost to complete the project.

Why?

- Government Auditing Agencies (GAO, DOT IG)
- NCHRP 20-7 (152), Flyvbjerg, LA County Metro Transportation Planning Authority, etc.
- History of Cost Estimating issues with Major Projects

Past Example
Evolution of Cost for US Interstate Highway System



Again…scope & inflation are the changes

MAJOR PROJECT RESPONSIBILITIES

- State DOT Responsibilities
  - Project Management Plans
  - **Initial Financial Plans and Annual Updates**
  - **Independent Cost Validations**
- FHWA Responsibilities
  - **Review and approve** PMP and **Annual FP**
  - **Independently verify costs**
  - Monthly Report on Status
  - Use Project Indicators to Forecast Challenges

Cost Estimate Training for Major Projects

- 2 Pilots in DC in FY 2005
- 1 Course in Atlanta – September 2005
- 1 Course in Austin – October 2005
- 2 Courses in St. Louis and Denver – December 2005
- 1 Course in Baltimore in August 2006
- 3 Courses in Sacramento, Orlando, and Ames in September 2006
- Look for a future NHI course

Cost Estimate Validation

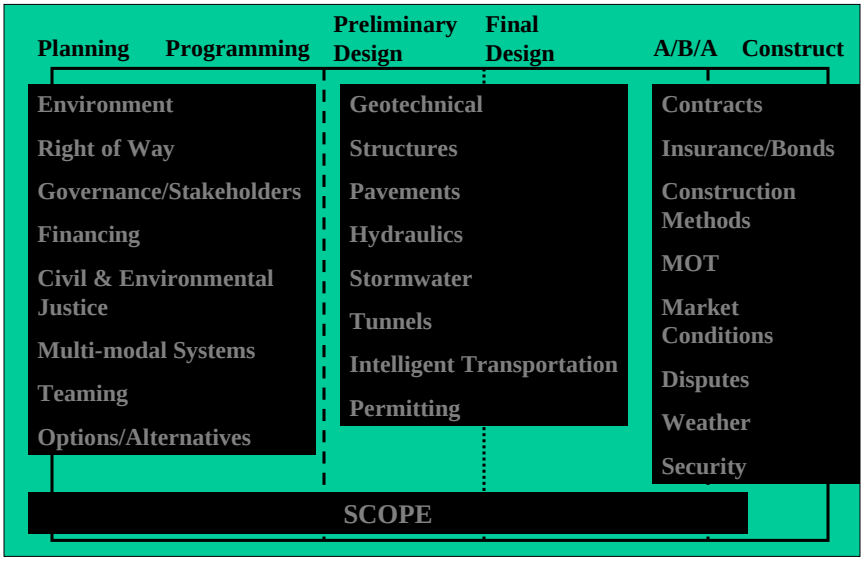
- Guidance and Training are based on the concept of including estimates of **all** costs at **all** stages of a project using a risk based approach to cover uncertainties and unknowns.
  - Deterministic with contingencies
  - Probabilistic range

Association for the Advancement of Cost Engineering International (AACEI)

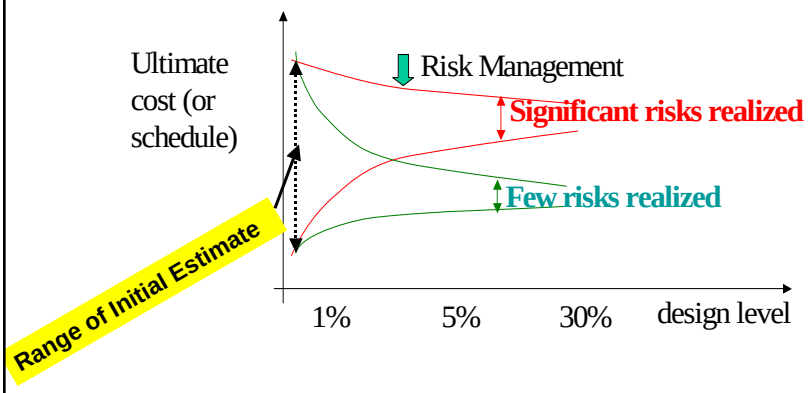
AACEI Generic Cost Estimate Classification Matrix (from AACEI, 1997)

Estimate Class	Level of Project Definition	Purpose of the Estimate	Estimating Methodology	Expected Accuracy
Class 5	0 to 2%	Screening or Feasibility	Judgment or Stochastic	+100 to -50
Class 4	1% to 15%	Conceptual Studies or Feasibility	Primarily Stochastic	+75 to -40
Class 3	10% to 40%	Budget Authorization Design (Control)	Mixed, but Primarily Stochastic	+40 to -20
Class 2	30% to 70%	Design or Bid/Tender	Primarily Deterministic	+20 to -10
Class 1	50% to 100%	Check Estimate or Bid/Tender	Deterministic	+10 to -5

Where Uncertainties (Risks) Need to be Resolved



Q: Why look at risks early?
A: Uncertainty decreases with design development



Low Intensity Validation (2 Days)

- $500 million; Straightforward; Few Contracts; Relatively Short Timeframe
  - Interviews
  - Process review
  - Risk review
  - Ensure all costs (including uncertainties) are included and are in YOE.
  - Estimate is most likely a point estimate

Low Intensity Validation

- Purpose is the same: To Validate the accuracy and reasonableness of the cost estimate
- Methodology: Review scope and design, estimates, and schedules, and interview State DOT
- Analysis: Areas of good practices and concerns (risks) and determine if estimate meets FHWA guidance.

Low Intensity Validation

- Sample conclusions:
  - Include anticipated cost growth during construction
  - Include construction engineering costs
  - Increase contingency for right-of-way acquisition
  - Add a management reserve contingency
  - Revise unit price for asphalt
  - Express estimate in year of expenditure dollars
- Request response from State DOT

Medium Intensity Validation (3 to 5 Days)

- $1 billion +; Medium Complexity; Multiple Contracts; Longer Timeframes
  - Interviews
  - Review of unit prices, calculations, and process
  - Risk review
  - Ensure all costs (including uncertainties) are included and are in YOE.
  - Apply probability distributions to uncertain cost elements
  - Estimate is either a point estimate or range

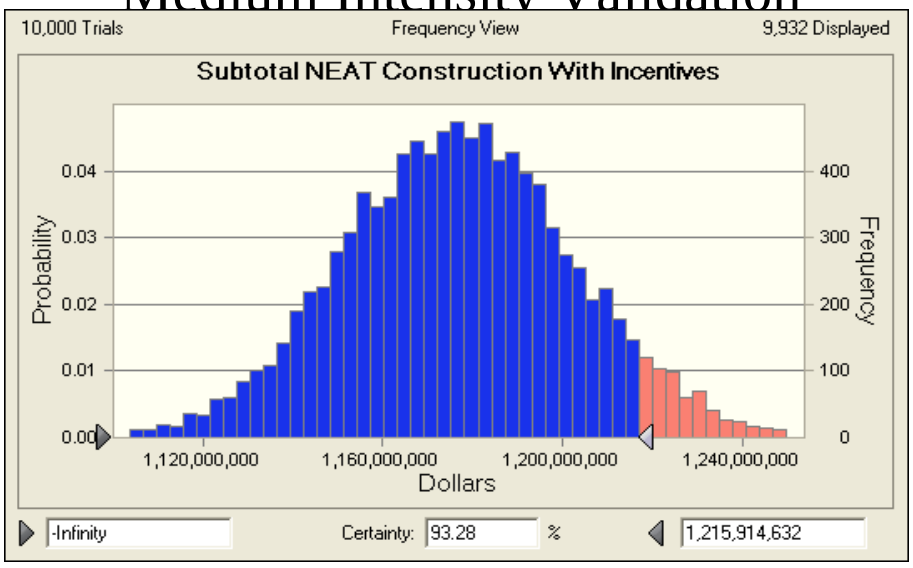
Medium Intensity Validation

- Purpose is the same: To Validate the accuracy and reasonableness of the cost estimate
- Methodology: Site visit, review scope and design, review quantities and unit prices, and review schedules, and interview State DOT
- Analysis: Areas of good practices and concerns (risks) and determine if estimate meets FHWA guidance.
  - May include probability analysis

Medium Intensity Validation

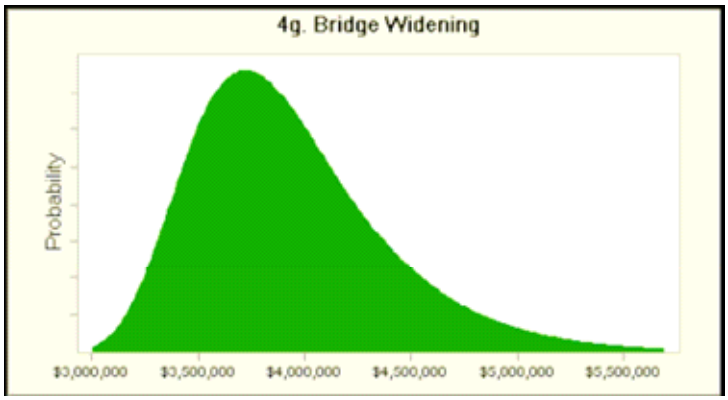
- Sample conclusions (Low intensity +):
  - Revise earthwork quantities
  - Modify mobilization costs
  - Revise inflation factor based on revised project completion date
- Request response from State DOT

Medium Intensity Validation



Medium Intensity Validation

Risk analysis of cost element:



High Intensity Validation (1 Week)

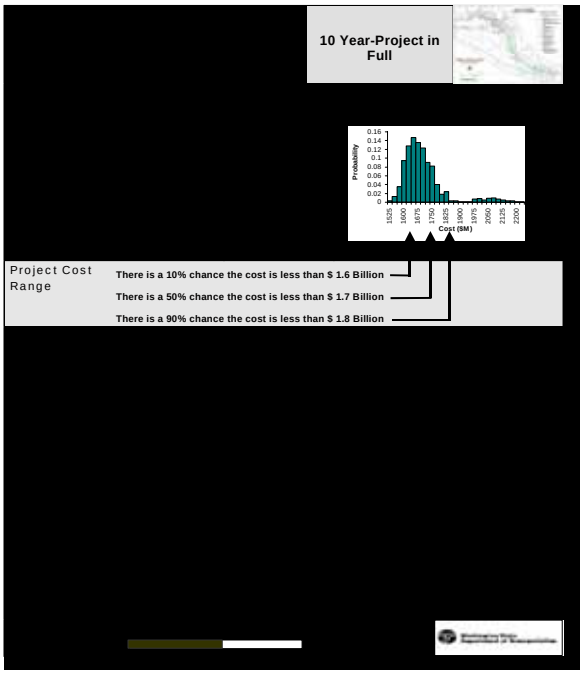
- Well over $1 billion; Complex Projects; Many Contracts; Long Timeframes (CEVP™)
  - Modeling of a schedule related estimate
  - Separation of base estimate and risk estimate
  - Individual risk elicitation and review
  - Apply probability distributions to each significant risk
  - Estimate and schedule is always a probabilistic range.

High Intensity Validation

- Purpose is the same: To Validate the accuracy and reasonableness of the cost estimate
- Methodology: Site visit, review scope and design, review quantities and unit prices, and review schedules, with multi-disciplined team
- Analysis: Model schedule and estimate, benefits, specific cost and schedule risks, and determine if estimate meets FHWA guidance.

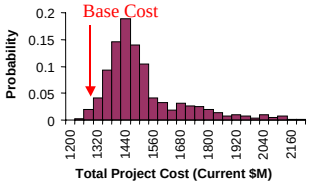
High Intensity Validation

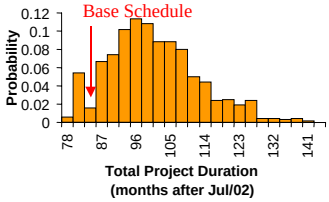
- Sample conclusions :
  - Revised probabilistic cost and schedule estimates
  - Costs and probabilities of all significant risks incorporated in the estimates
- Request response from State DOT



CEVP Results & Deliverables

RICH SOURCE OF INFORMATION





Current $ or YOE $

Quantified risk registry can feed & focus VE & Risk Management

Risk Rank	Contribution to Expected Cost Risk		Risk Event
	%	Current $M	

Cost Risk Contribution By Item

Rank	Relative Contribution to Risk Cost	Description
1	14%	Future Leadership & Management
2	11%	Contracting Process
3	11%	Guideway Design Cost Risk
4	10%	ROW Acquisition Uncertainty
5	8%	Additional Parking Required
6	8%	Urban Design Risk
7	6%	other risk items
8	6%	Utility Relocation Issues
9	5%	Other Scope Risk
10	5%	W. Seattle Bridge Design Risk
all others	17%	

Communication Benefits of Probabilistic Estimates

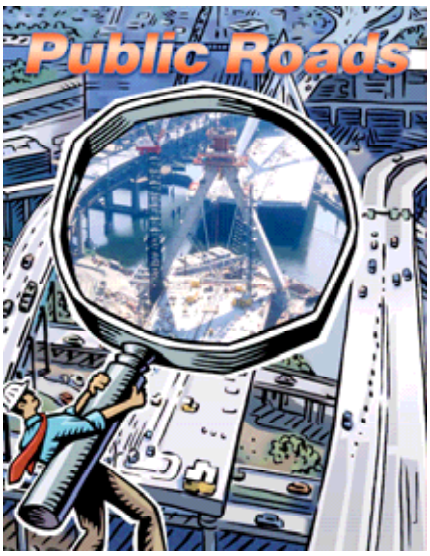
- Value of audience understanding
  - More realistic expectations
  - Framework for time delay & low probability risk
- The public is very savvy when it comes to transportation projects.

Validation then Verification

- Verification by the Division
- Assurance that the validation was done correctly and that FHWA agrees with the findings
- Ultimate goal is a reasonable and complete cost for the project

July/August

2004



MEGAPROJECTS

Are you ready for one?

Take a closer look

http://www.tfhrc.gov/pubrds/04jul/index.htm

Resources

FHWA Website:
http://www.fhwa.dot.gov/programadmin/mega/index.htm

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Program Level Risk Management Opportunities:

- Partnering (Statewide Program)
- Use of Risk Based Estimates in Programs
- Range of Risks in Programs determines stewardship/oversight

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NCHRP 8-49: Procedures for Estimation And Management for Highway Projects During Planning, Programming, and Preconstruction

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Guidebook focuses on:

- Management Strategies
- Scope/Schedule Strategies
- Off-prism Strategies
- Risk Strategies
- Delivery and Procurement Strategies
- Document Quality Strategy
- Estimate Quality Strategy
- Integrity Strategy

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Minnesota Implementation Strategy:

- Cost Estimation Process Improvement and Organizational Integration Project

- Goal: To Achieve consistency, accuracy, and accountability throughout MnDOT's cost estimation management processes.

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Minnesota Implementation Strategy:

- Four-phased approach underway

- Complete March 31, 2007

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Other NCHRP Efforts:

- Right of Way Methods and Tools to Control Project Cost Escalation
- Risk Management Manual for Methods and Tools to Control Project Cost Escalation

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Other NCHRP Efforts:

- Implementing Project Cost Estimation and Management Process Improvements (proposed)
- Capacity Building Project: Cost Estimating and Management Workshop

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Why Worry About Cost Estimating?

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Public Trust and Confidence!!!!

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Questions?

Concerns?

Comments?

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