



## Cost and Schedule

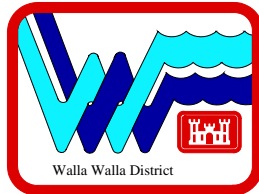
## Risk Analysis

Aug 2009





# US Army Corps of Engineers



**USACE Cost Engineering  
Directory of Expertise  
WALLA WALLA DISTRICT**

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## The Problem

- Busted Budgets
- Busted Schedules
- Inaccurate Contingencies
- Challenges with the Process
- Process Bottlenecks





## Top Reasons for Major Cost Variations

**Definition and Packaging of Product**



**Clear Scope of Work**



**Accurate Contingency Levels**



**Defined Acquisition Strategy**



**Accurate Quantities**



**Estimate Details**



**Other**



**Top Reasons for Major Cost Differences**  
**Early Planning Level to Construction**  
**Award**



## RECENT COST GUIDANCE

- **Major General Riley Memo 3 Jul 2007**
- **E&C Bulletins 10 Sep 07 and 22Aug 08**
- **ER 1110-2-1150 Engineering and Design for Civil Works Projects**
- **ER 1105-2-100 Planning Guidance Notebook**
- **ER 1110-2-1302 Civil Works Cost Engineering**
- **ETL 1110-2-573 Construction Cost Estimating Guide for Civil Works**



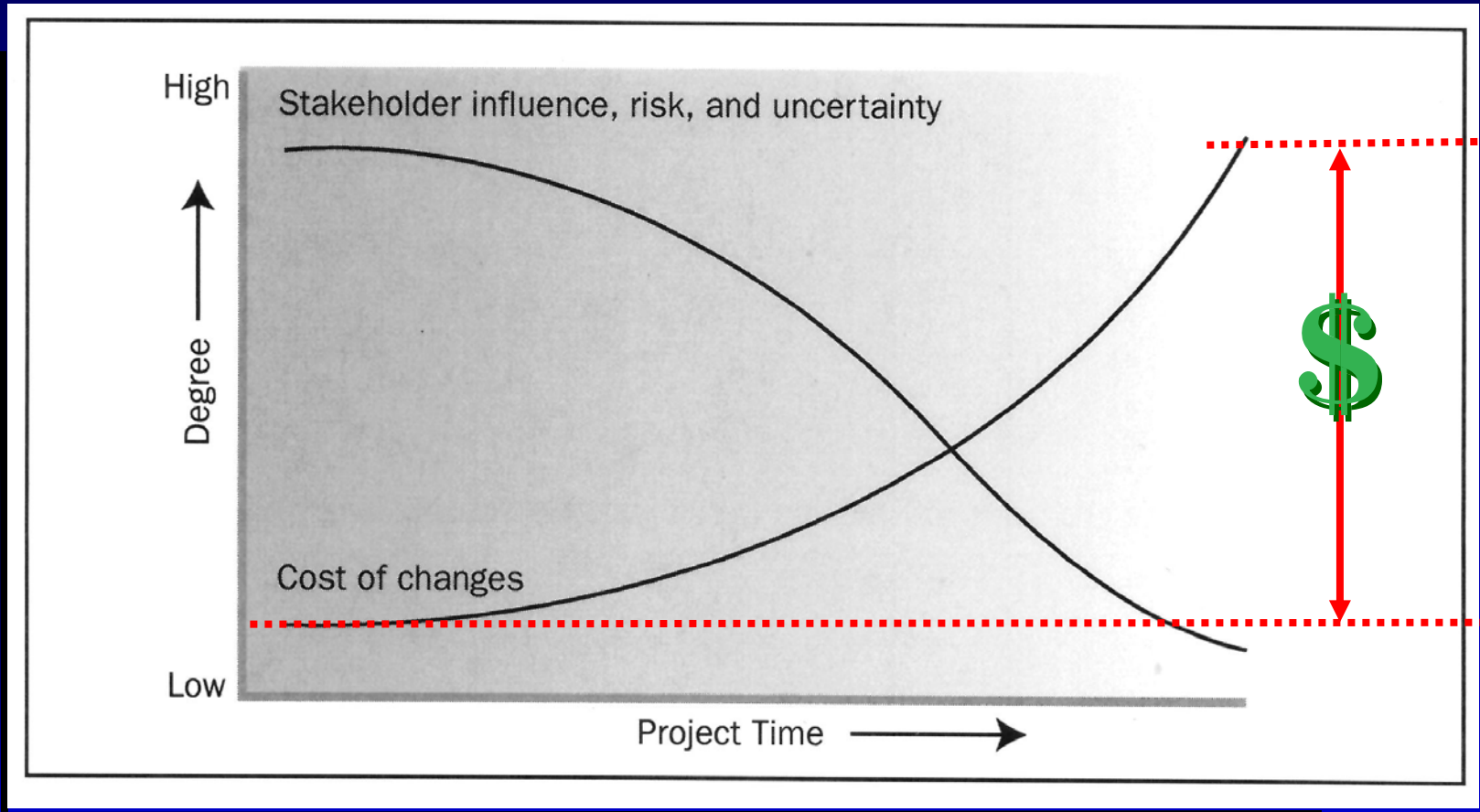


## Key Cost Impacts from Revised Regulations

- ATR- Agency Technical Review of Cost
  - Requires National Planning Centers of Expertise (PCX) coordinate with the Cost Engineering Directory of Expertise (Dx) at the Walla Walla District for independent Agency Technical Review (ATR) of cost estimates, construction schedules and contingencies included in all decision documents requiring Congressional authorization.”
- CSRA- Cost and Schedule Risk Analysis
  - Formal analysis required on all projects requiring authorization and anticipated to be \$40 Million or more in total project cost.
  - Required at Feasibility w/updates during PED
  - Required for Reauthorization
- Total Project Cost Summary Sheet
  - Required for all active projects
  - Updated at least annually
  - Estimates may only be two years old

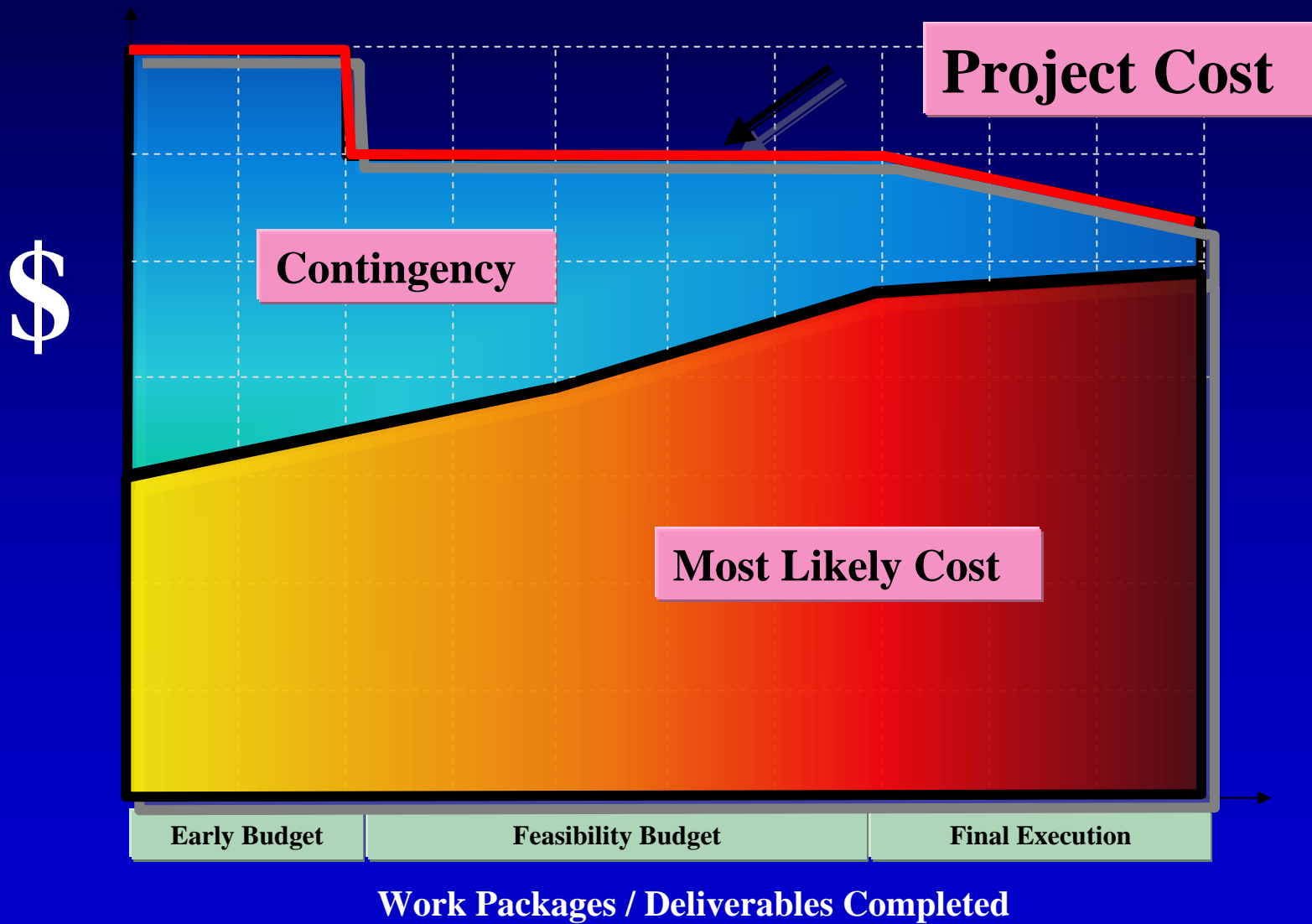


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## RISK MANAGEMENT

### **Risk Management (PMBok® Guide):**

***“Project Risk Management includes the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project; most of these processes are updated throughout the project.”***



## Cost & Schedule Risk Analysis (CSRA)

- Technique used to improve development of contingencies
- Formal analysis required on all projects requiring authorization and anticipated to be \$40 Million or more in total project cost
- Relies on qualitative and quantitative studies
- OUTPUT quality is limited by INPUT quality (inputs are estimates and schedules)





## Risk Analysis Process

- **The Team Develops the Risk Register**
- **Develop Cost and Schedule Model**
- **Identify Sensitivity of Risk Elements**
- **Identify Risk Mitigation Efforts**
- **Confidence Levels and Contingency**
- **Communicate**
- **Monitor and Act**



## Development of the Risk Register

- **Brainstorming effort**
- **Brings focus to risk levels on specific areas**
- **Communication tool**



## BASIC RISK ASSUMPTIONS

We know it's gonna happen.

Known  
Knowns

Why didn't they say something sooner!

Known  
Unknowns

Unknown  
Knowns

It might happen, but at least we know about it.

Unknown  
Unknowns

Didn't see that coming!



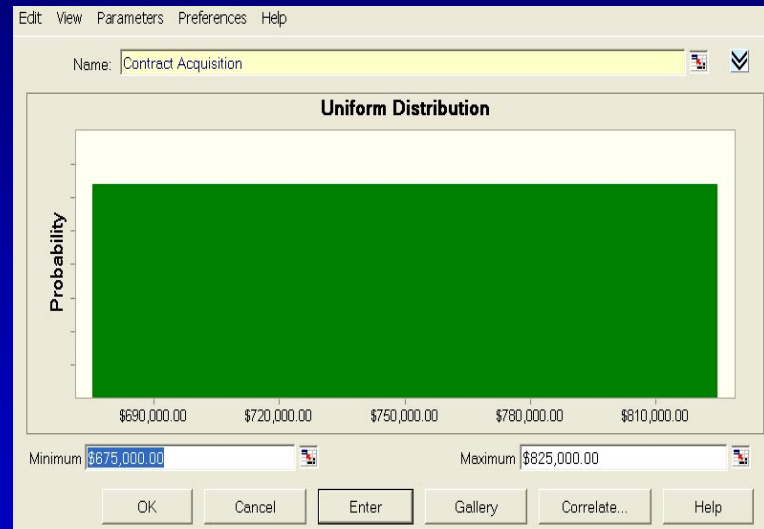
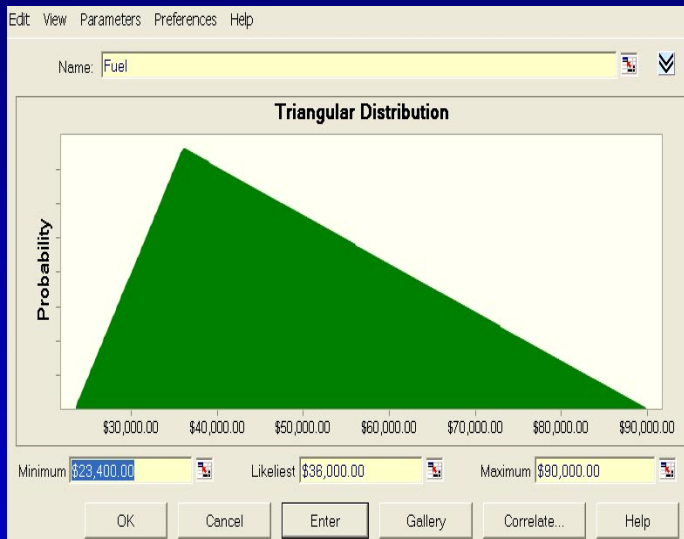


## Examples of Qualitative Risk Analysis

Risk Register					
<div> <div> <div> <div> <div>Very Likely</div> <div>Likely</div> <div>Unlikely</div> <div>Very Unlikely</div> </div> <div> <div>Low</div> <div>Moderate</div> <div>High</div> <div>High</div> <div>High</div> </div> <div> <div>Low</div> <div>Moderate</div> <div>High</div> <div>High</div> <div>High</div> </div> <div> <div>Low</div> <div>Low</div> <div>Moderate</div> <div>Moderate</div> <div>High</div> </div> <div> <div>Low</div> <div>Low</div> <div>Low</div> <div>Low</div> <div>High</div> </div> </div> <div> <div>Negligible</div> <div>Marginal</div> <div>Significant</div> <div>Critical</div> <div>Crisis</div> </div> </div> </div>					
Risk No.	Risk Event	Likelihood	Impact	Risk Level	Notes
1	Bidding Climate – Saturated Local Market	LIKELY	MARGINAL	MODERATE	\$3 Billion construction will be going on in downtown Pittsburgh over the next 5 years.
2	Volatile Real Estate Values	UNLIKELY	NEGLEGIBLE	LOW	Little to no Real Estate to be purchased
3	Scope Definition	UNLIKELY	NEGLEGIBLE	LOW	Scope is well defined, There is minimal likelihood of scope increase or changes from the current documents used for estimate development
4	Scope Growth / Reduction	LIKELY	NEGLEGIBLE	LOW	Scope is well defined, There is minimal likelihood of scope increase or changes from the current documents used for estimate development
5	Weather	LIKELY	MARGINAL	MODERATE	Work will be done on the river, unpredictable, scour protection is more vulnerable
6	Schedule Constraints	LIKELY	SIGNIFICANT	HIGH	There are tight delivery windows that will require mitigation efforts if not met.
7	Labor Availability/Pricing	LIKELY	MARGINAL	MODERATE	\$3 Billion construction will be going on in downtown Pittsburgh over the next 5 years.
8	Equipment Availability/Pricing	UNLIKELY	NEGLEGIBLE	LOW	Fuel prices will impact equipment operating costs
9	Material Availability/Pricing	LIKELY	SIGNIFICANT	MODERATE	Fuel prices will impact delivery of materials and the cost of petroleum based materials, steel market still potentially volatile
10	Fuel Prices	VERY LIKELY	SIGNIFICANT	HIGH	\$2.65 per gallon was used in the Oct 06 MCACES, increases will effect equipment and delivery of materials
11	Potential savings due to innovation, streamlining, and gains in efficiency	UNLIKELY	NEGLEGIBLE	LOW	Value Engineering has already been incorporated into the project
12	Acquisition Plan	LIKELY	SIGNIFICANT	HIGH	The estimate was based on full and open competition, with minimal tiering of contractor subs. The Acq Plan has not been finalized, therefore there is a potential for additional tiering of the contracts



## Develop Cost and Schedule Model

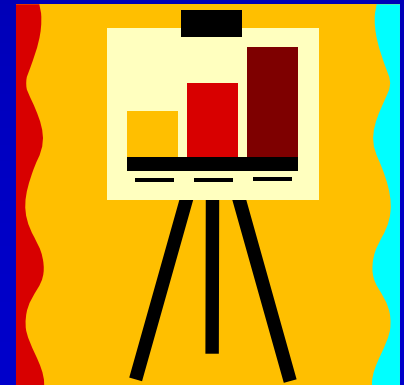


## Most Likely - High - Low - Distributions



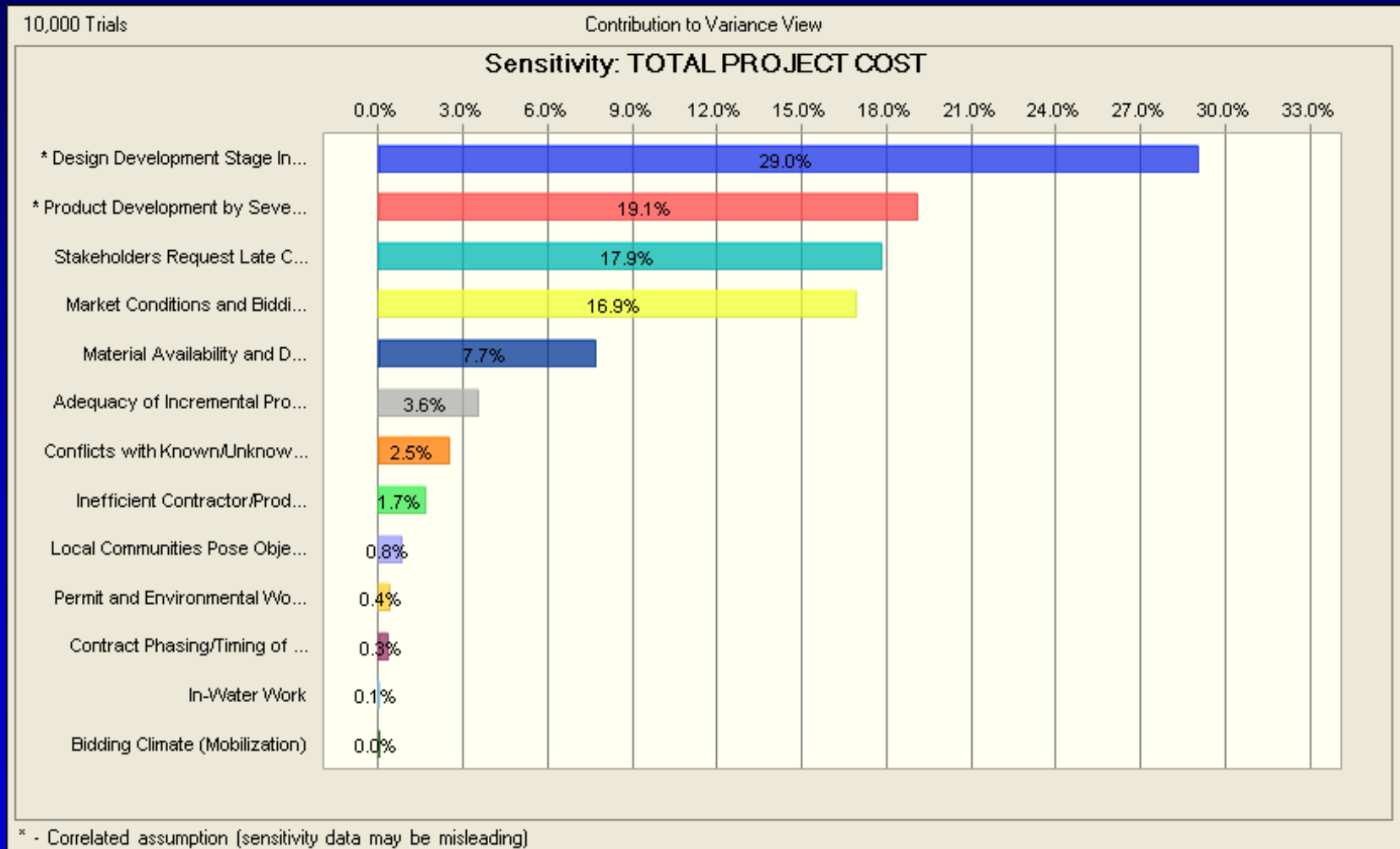
## PRODUCTS

- **Risk Register**
- **Most Likely Estimate/Most Likely Schedule**
- **Best & Worst Case Estimates/Schedules**
- **Model & Output**

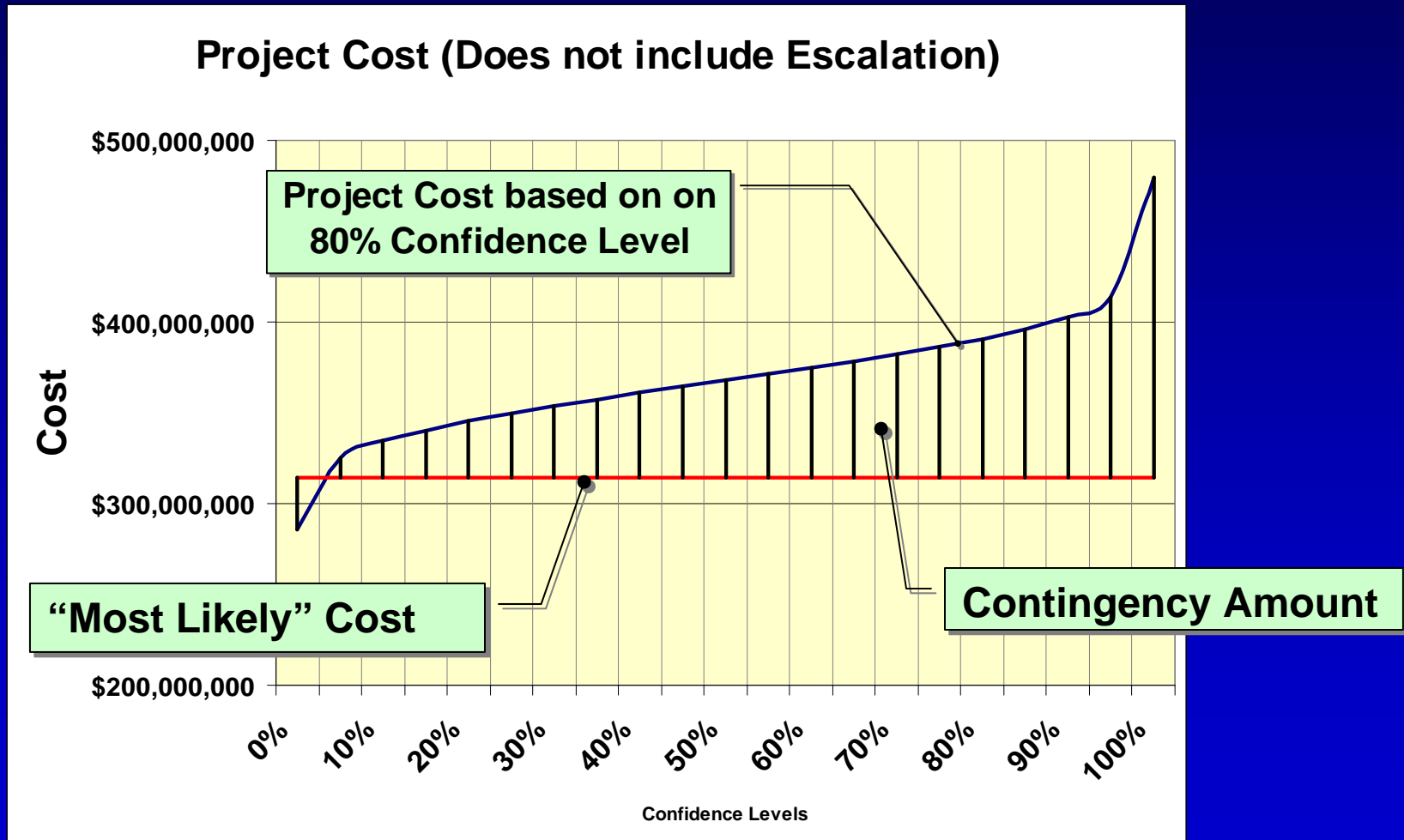




## Sensitivity Report



## Confidence Levels and Contingency Communication







## Monitor and Act

- Most critical aspects.....





## SUMMARY OF CSRA

- **Emphasis on accurate cost and schedule.**
- **Accurate Cost and Schedule starts with DEFINED SCOPE**
- **Required Detailed Risk Analysis on Projects  $\geq$  \$40M and Risk Analysis is a team product**
- **Recommended on all projects where you might have any of the following conditions; high cost, complexity, high visibility, new one of a kind.**
- **Risk Management should be utilized throughout the life of the project.**



# US Army Corps of Engineers



NEWSROOM WHO WE ARE MISSIONS HISTORY RELATED LINKS



US Army Corps  
of Engineers

WALLA WALLA DISTRICT

RELEVANT  
READY  
RESPONSIVE  
RELIABLE

Proven service the world needs and  
the Nation now and in the future

Walla Walla District

Engineering & Construction  
Division

Cost Engineering Branch &  
Directories of Expertise

What is Cost Engineering?

DX for Civil Works and  
Support for Other Programs

- Agency Technical Reviews
- Risk Analysis
- IDIQ Contracts
- FAQs

DX for Construction  
Equipment/Cost Index  
Database

- EP 1110-1-8 & Checkrate
- CWCCIS EM 1110-2-1304
- CCEEP Credge Programs
- FAQs

TRACES

Contact Us

Related Links

Cost Estimating

## Cost Engineering Branch & Directories of Expertise (DX)

Walla Walla District's Cost Engineering Branch provides the U.S. Army Corps of Engineers with estimating services for the construction features on all projects from the planning phases through construction, maintenance and rehabilitation of facilities.

Cost Engineering Branch also serves as the Directory of Expertise (DX) of Cost Engineering for Civil Works and the Support for Others Program as well as the DX for Construction Equipment/Cost Index Database.

Walla Walla's diversified cost team strives to provide expert technical support for all customers, both Corps and other governmental agencies.

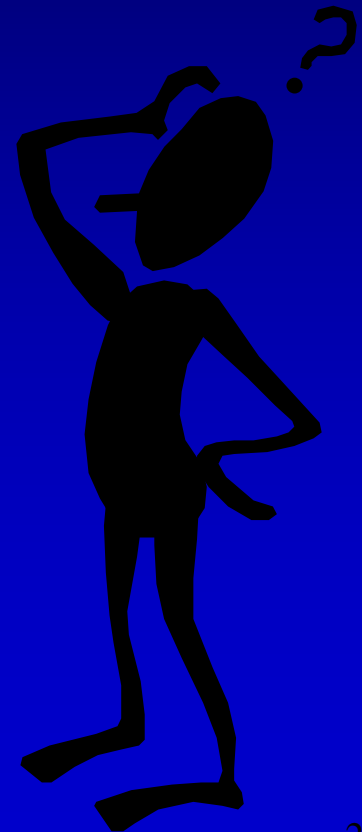
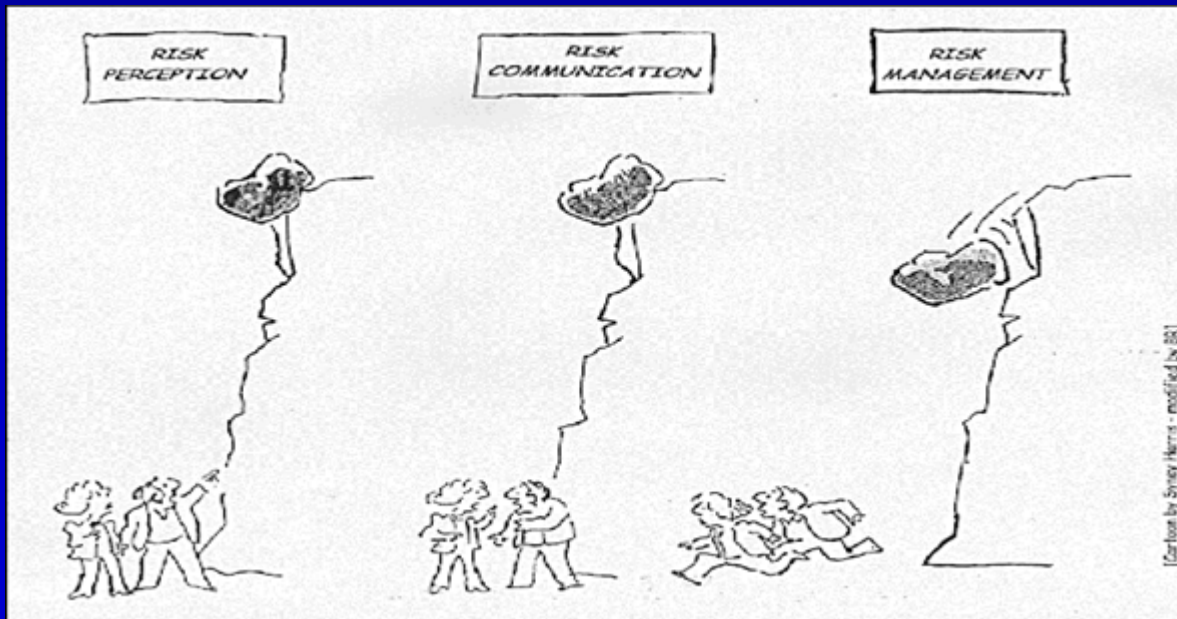
### Primary Services:

- Cost Estimates
- Project Schedules
- Value Engineering Estimates
- Agency Technical Review
- Cost and Schedule Risk Analysis
- Construction Equipment Cost Rate and Methodology
- Construction Cost Escalation

Chief - Cost Engineering Branch, Walla Walla District  
Email: [CENWW-SC-X](mailto:CENWW-SC-X)  
Phone: (509)527-7510

<http://www.nww.usace.army.mil/html/OFFICES/Ed/C/default.asp>

## Questions/ Group Discussion







## Walla Walla Cost DX POCs

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