

RISK MANAGEMENT ON USACE CIVIL WORKS PROJECTS

Identify, Quantify, and Manage

Jason Krick, P.E.

Justin McDonald, P.E.

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TOPICS OF DISCUSSION

Part I: Overview of Risk

Part II: Risk in the Planning and Design Phase

- How do we identify and communicate risk?
- How do we quantify risk?
- How do we manage risk?



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RISK

What is Risk?

A measure of the probability and consequences of uncertain future events.

Simple “Conceptual” Equation:

$$\text{Risk} = \text{Probability} \times \text{Consequences}$$

4 Main Questions:

1. What can go wrong?
2. What can happen?
3. What are the consequences?
4. How likely is it to happen?



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ELEMENTS OF RISK

4 Essential Elements of Risk:

1. Trigger - hazard or opportunity
2. Uncertainty - the outcome is unknown
3. Harm - an undesirable outcome
4. Exposure/Probability – a sequence of events that result in the harm



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QUALITATIVE VS. QUANTITATIVE

Qualitative: uses descriptive words
rankings i.e. high, medium, low
not a numerical value

Quantitative: is a numerical expression
uses deterministic and probabilistic point
estimates

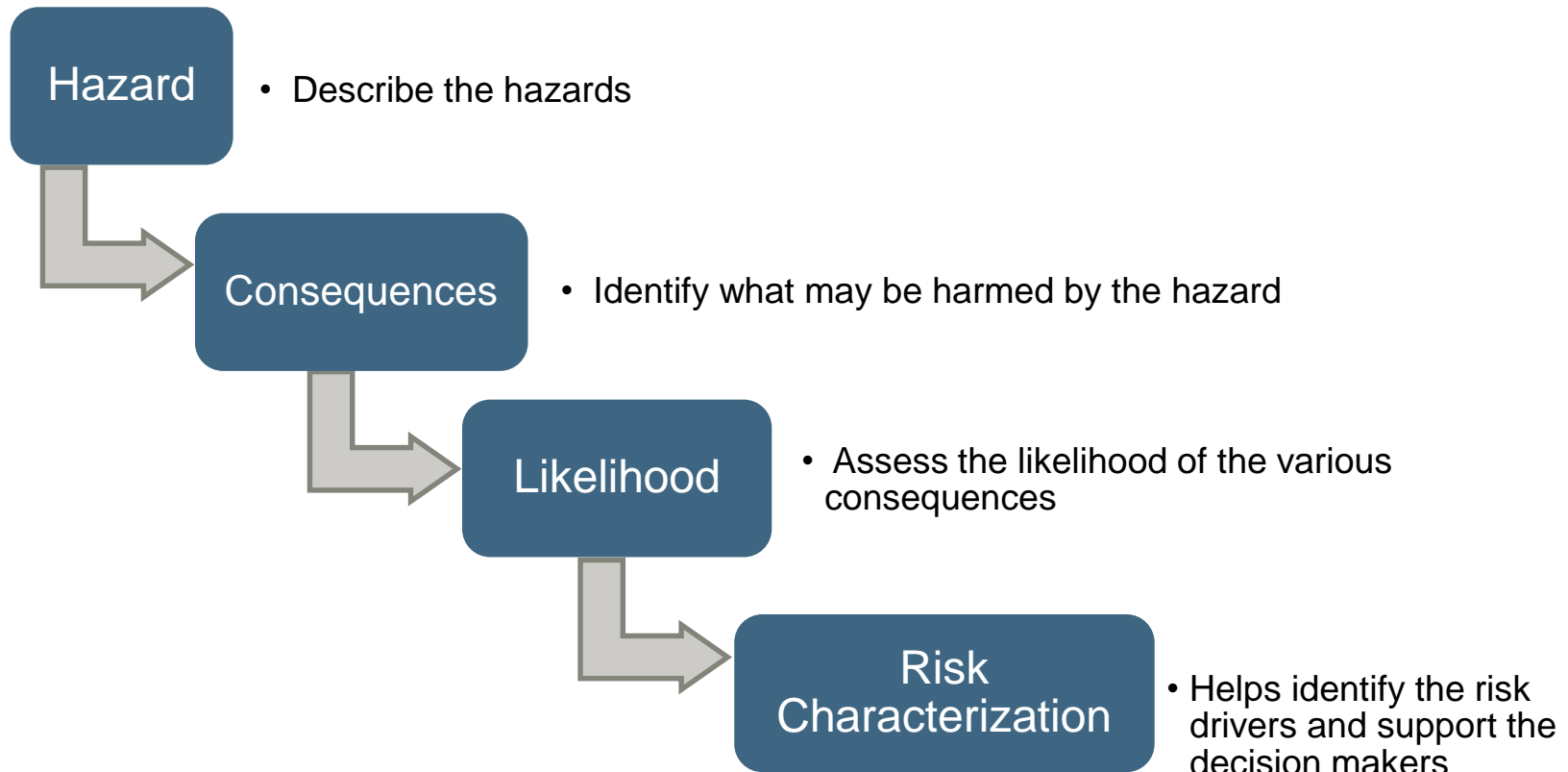


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RISK ASSESSMENT

Generic four-step model



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ACCEPTABLE AND TOLERABLE RISK

Acceptable:

- probability is so small
- consequences are minor
- benefit is great

Tolerable:

- Normally a risk we see “unacceptable” but can be reduced

Tolerated for 3 reasons:

1. May be impossible to reduce the risk further
2. The cost to reduce is excessive
3. Magnitude of the benefits associated with the risky activity are too great to reduce anymore



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RISK MATRIX

		Consequences				
		Very Low	Low	Medium	High	Very High
Likelihood	Very High					
	High			Acceptable w/ Mitigation	Unacceptable	
	Medium					
	Low	Acceptable				
	Very Low					



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RISK COMMUNICATION

- Open two-way exchange of information
- Purpose is to inform our stakeholders and various publics about the risks and how to better manage the risks
- Helps stakeholders understand the nature and magnitude of the risk



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RESIDUAL RISK

Residual risk is the risk that remains after you have treated risks. Risk management involves treating risks meaning that a choice is made to avoid, reduce, transfer or accept each individual risk. It is difficult to completely eliminate risk and normally there is a residual risk that remains after each risk has been managed.

The following are a few examples of residual risks:

1. Risk Avoidance

A business decides to avoid the risk of developing a new technology because the project has many risks. The residual risk is that a competitor will develop the technology instead and the business will become less competitive.

2. Risk Reduction

An airline reduces the risk of an accident by improving maintenance procedures. Residual risks remain in the process including a chance of human error such as skipping steps in the procedure.



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RISK IN THE PLANNING AND DESIGN PHASE

- How do we identify and communicate risk?
- How do we quantify risk?
- How do we manage risk?



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RISK IDENTIFICATION & MANAGEMENT

- Step 1: **Describe** the scoping choice.
- Step 2: **Identify** the risk of the scoping choice and its cause.
 - What can go wrong?
 - How can it happen?
- Step 3: **Communicate** the consequence (and magnitude) if things do “go wrong” and the likelihood it will occur.
- Step 4: **Rate** the risk based on likelihood and magnitude of the consequence.
- Step 5: **Quantify** risk through contingency.
- Step 6: **Manage** scoping choice to mitigate unacceptable risks.



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RISK IDENTIFICATION EXAMPLE

- **Scoping Choice:** Use historical borings within the area to develop soil type assumptions for feasibility analysis. Delay geotechnical investigation/borings until final design phase.
- **Risk and Its Cause:** No data exists for roughly 50% of the channel beyond the current depth resulting in low confidence in determination of soil conditions where data gaps are present.
- **Consequence (Magnitude):** Increased cost estimates/contingencies due to uncertainty in dredging production rates, suitability for placement (beneficial use vs. offshore), and slope stability near existing structures... (**HIGH**)
- **Likelihood:** **MEDIUM**
- **Risk Rating:** **HIGH**



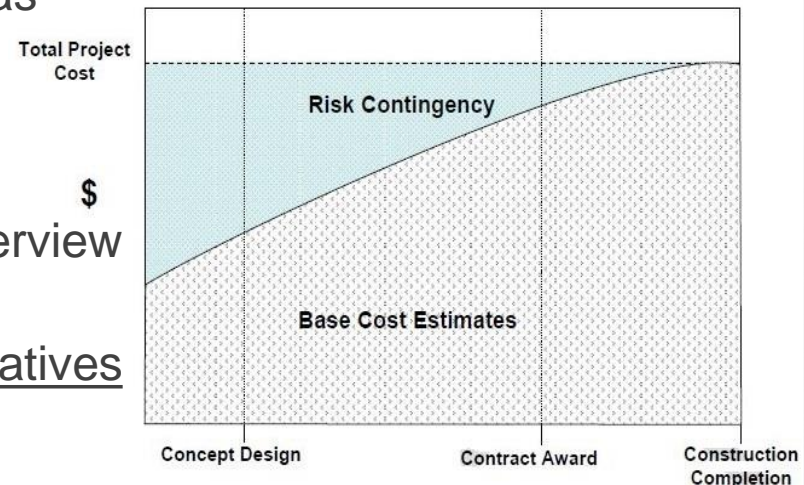
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QUANTIFYING RISK CONTINGENCY

Abbreviated Risk Analysis (ARA):

- Based on predefined max cost growth as well as subjective and qualitative feedback from experts
- Quantifies costs without schedule
- Results are expressed with a broad overview risk rating and contingency %
- Useful for high level screening of alternatives



Cost Schedule Risk Analysis (CSRA):

- Crystal Ball software based on Monte Carlo principles with calculated user defined costs and schedule implications of each risk
- Quantifies potential variances to the project cost and schedule
- Results are expressed as contingency amounts in the form of dollars and time with reflective confidence levels for successful execution
- Useful for managing and communicating potential project costs and schedules



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RISK MANAGEMENT OPTIONS

- **Option 1:** Conduct investigation during feasibility phase to reduce data gaps to 25% of the channel. Resolve the remaining data gap during the final design phase.
 - ❖ Cost: \$400k
 - ❖ Schedule: 6 months
 - ❖ Risk Rating: **Medium**
 - ❖ Risk Contingency Reduction from ARA: **6%**
- **Option 2:** Resolve all data gaps during the feasibility phase.
 - ❖ Cost: \$650k
 - ❖ Schedule: 8 months
 - ❖ Risk Rating: **Low**
 - ❖ Risk Contingency Reduction from ARA: **9%**



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QUESTIONS?



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