Idaho Cleanup Project

IWTU Project
Risk Management Overview

Presented at

U.S. Department of Energy
Risk Management Meeting
November 4-6, 2009

Bob Williamson
IWTU Risk Manager

CH2M•WG IDAHO, LLC

IWTU (Sodium-Bearing Waste) Project

- Part of the Idaho Cleanup Project (ICP) contract
  - Contract period May 2005 – September 2012
  - Scope reflects EM cleanup mission at the INL
  - Total Cost ~ $2.9 B
- ICP contract Sodium Bearing Waste Scope
  - Provide treatment of approximately 900,000 gallons of Sodium Bearing Waste (SBW) stored at the Idaho Tank Farm Facility to a stable waste form suitable for disposition at the Waste Isolation Pilot Plant (WIPP).
- Line Item Project 06-D-401 designs, constructs, and commissions a new treatment facility
  - Total Project Cost - $570.9 M

IWTU (Sodium-Bearing Waste) Project Objectives

- Design, Construct, and Test IWTU Project Milestones
  - August 2010 – Construction Complete
  - August 2011 – Approve Operations Start
- Operate the Sodium Bearing Waste Treatment Facility
- Process all sodium-bearing waste material
  - December 2012 – SBW Treatment Complete

Largest of the six major process vessels being lifted into place

IWTU (Sodium-Bearing Waste) Project

Status:

- All major concrete placements complete for the Process and Packaging Cells (PPC), Off-gas Building foundations, and Mechanical Building foundations.
- Majority of Structural Steel erection complete.
- Fabrication and installation of major process vessels and skids complete.
- Piping and electrical components installation in progress
- Product Storage Building construction well under way.
- Current completion metrics:
  - ~ 50% complete
  - ~39% of construction physically completed

Project Baseline Change

- February 2008 estimate-to-complete analysis showed significant line-item project cost growth
  - Concerns with limited overall FY09 ICP funding
  - DOE-EM direction in May 2008 to develop BCP reflecting a 1-year delay in the start of operations
- BCP submitted July 2008 - approved January 2009
- REA submitted September 2008 – remains under DOE review
- Poor cost/schedule performance since August 2008 necessitated development of Project Completion Plan
  - Issued May 2009
  - Reflects measures taken to improve performance and complete project on-time and within TPC
  - Currently being updated

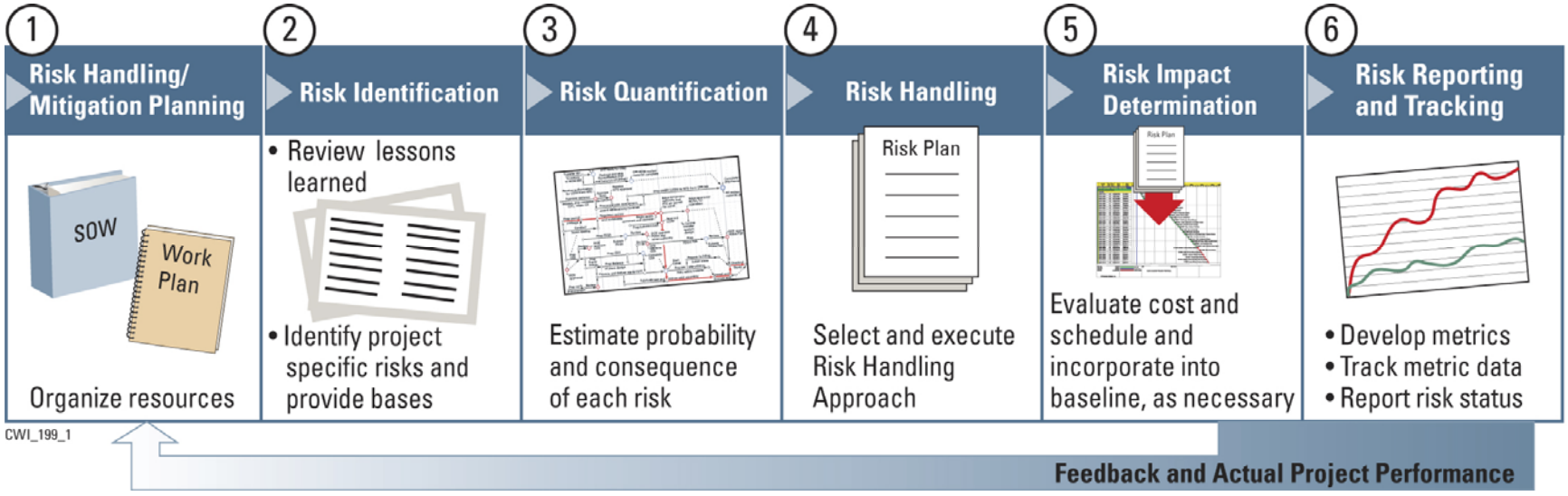
ICP Risk Management

- Risk Management is required by the ICP Contract
- The specific contract requirements relating to the development and maintenance of the Risk Management Plan include:
  - The risk management plan shall be updated annually.
  - The contractor's risk management plan shall address:
    - Identify uncertainties and assess the impact on project cost and schedule
    - If there is significant cost and schedule risk identify approach to eliminate, avoid, or mitigate the risks.
    - If the contractor proposes an aggressive or innovative technical approach, the contractor shall evaluate the confidence level and feasibility for achieving successful work scope completion and the risk mitigation strategy for this innovative technical approach.
    - The contractor shall explain its approach for identifying future uncertainties and their associated programmatic risks, including the availability of funds.
    - The Risk Plan shall describe how risks will be identified, managed and communicated.
- All of the DOE Risks identified in the GFSI Risk Management Plan were closed or included in the ICP Risk Management Plan
- The ICP Risk Plan includes the IWTU Project Risk
- The IWTU Line Item Project has a separate Risk Plan

ICP Risk Management

Idaho Cleanup Project Programmatic Risk Management Plan

- Identifies the Mitigation Strategies for 10 DOE-Identified Uncertainties
  - All of the DOE identified uncertainties are closed
- Identifies the Mitigation Strategies for 66 CWI-Identified Significant Uncertainties
  - The IWTU Project is one of these Significant Uncertainties
  - 49 of the 66 CWI identified uncertainties are closed
- Identifies the Risk Management process



ICP Risk Management Plan

The risk associated with the IWTU Project is included in the ICP Risk Management Plan

Item	Probability	Consequence	Risk	CWI Cost Impact	CWI Schedule Impact	Risk Mitigation Strategy	Mitigation Actions	Responsible Manager	DOE Actions Required
C.11.a IWTU Project This risk includes risk associated with the following subprojects of IWTU: waste feed nozzle deposits, product solid handling, material availability and achievability, weather impacts, limited work force constructions, equipment deliveries to support construction schedule, GAC exothermic reaction, cost estimate accuracy, scaling observed during Hazen Testing, NWFC facility modifications, compete with Remote Handled TRU and filter leach projects, fabrication of process vessels and skids not meeting construction schedule, and contamination of soils around NWFC.	Very Likely	Crisis	High	$32.1M	3.8 months	Although a subproject to the ICP, the Integrated Waste Treatment Unit (IWTU) is a Congressional Line Item Project Managed per the requirements of DOE O 413.3A. Per DOE O 413.3A a project specific risk plan has been developed and maintained to monitor and address project specific risks. Project risks are identified and evaluated by the DOE Integrated Project Team with support from the CWI project team. See PLN-1973, "Integrated Waste Treatment Unit Risk Mitigation Plan," for the mitigation strategies and response actions.	See PLN-1973, "Integrated Waste Treatment Unit Risk Mitigation Plan"	Bill Lloyd	See PLN-1973

IWTU Risk Management Plan

- Identifies the IWTU Risk Management Process
  - Responsibilities and Approach
  - Risk Identification and Assessment
  - Risk Assumptions and Monitoring
  - Risk Handling
  - Risk Impact determination
  - Risk reporting and Tracking
- The purpose of the RMP is to document and communicate an approach that enables early identification of and proactive response to and control project risks
- Initial plan developed at contract initiation Currently on revision 9
- Each identified risk is documented and evaluated on an IWTU Project risk assessment form, which includes “response plan actions” for each risk
- “Response plan actions” are produced with the participation of all project functions using the “what if” approach
- To maintain the risk management effectiveness, risks are monitored on a monthly basis.
- New risk are added as they are identified or closed when mitigated
- The potential impact to cost and schedule of the identified risks is used in determining the project cost and schedule contingency

Risk Identification and Assessment

- Project risks include any condition that could cause the project to deviate from accepted safety norms, specified quality levels, baseline cost, scope, or schedule
- Identifying something as a risk increases its visibility, and allows proactive risk management techniques to be put into place
- Assessment quantifies the “likelihood of failing to achieve a particular outcome, and the consequences of failing to achieve that outcome”
- A Risk Assessment Form is completed for each risk and the risk is entered into the Risk Register

Risk Assessment Form

Risk # IWTU-XXX **Risk Title:** _____

Risk Owner _____ **Date Identified** _____ **WBS (at least Level 3)** _____

A. Description of Risk

B. Risk Trigger (describe the event or activity that is the cause of the risk and indicate the risk duration)

Risk duration from ___ (mo.) / __ (yr) to ___ (mo.) / __ (yr)

C. Assumptions (if applicable)

1.
2.

D. Uncertainties (if applicable)

1.
2.

E. Probability

☐ Very Unlikely ☐ Unlikely ☐ Possible ☐ Likely ☐ Very Likely

(reason for selection):

F. Consequences

	Cost	Schedule	Bases of Estimate	Comments
Best				
Most Likely				
Worst				

☐ Negligible ☐ Marginal ☐ Significant ☐ Critical ☐ Crisis

(reason for selection):

G. Risk Level

☐ Low ☐ Medium ☐ High

H. Additional Comments (if applicable)

I. Risk Response Plan

Describe plan to eliminate or reduce the risk

Response Plan Actions	Scheduled Implementation	Responsibility	Current Status

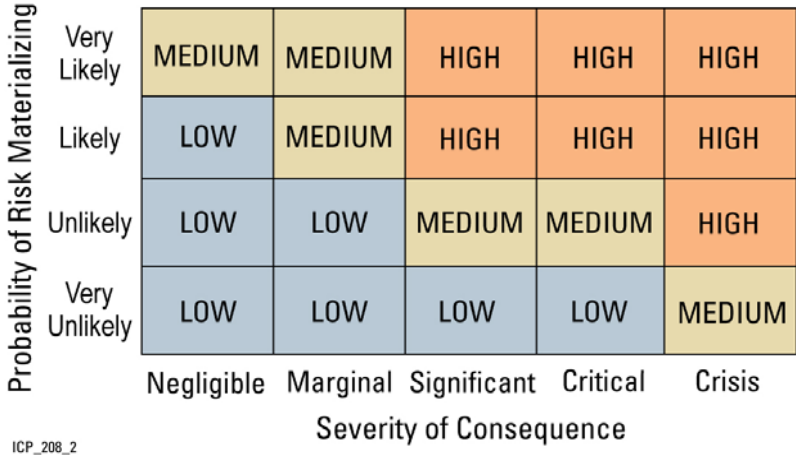
CH2M•WG IDAHO, LLC

Risk Quantification

The risk owners determined probability and consequence

- Risk Event Probability (or Likelihood)
  - Very Unlikely: The risk event is very unlikely to occur during the life of the project. If this project were completed 100 times, it would not be expected to occur once (0.01).
  - Unlikely: The risk event might occur once if this project were completed 4 times, but is unlikely to occur during this project (0.25).
  - Possible: The risk event could occur once during the project (0.50).
  - Likely: The risk event is likely to occur at least once during the project. More often than not, on a similar project, it will occur (0.75).
  - Very Likely: The risk event is very likely to occur at least once and may occur multiple times. It is likely that it will occur during the life of the project (0.99).
- Risk Event Consequence (or Severity)
  - Negligible: Safety, cost, and schedule impacts would be of little or no consequence. Most likely cost impact would be <$500K. The schedule consequence would be a minor slip.
  - Marginal: Safety, cost, or schedule impacts would be minor. Most likely cost impact would be >$500M but < $1M. The schedule consequence would be a minor slip of noncritical-path activities for a duration of 1 to 2 months.
  - Significant: Safety, cost, or schedule impacts would be significant. Most likely cost impacts would be >$1M but <$3M. The schedule consequence would be a slip in noncritical-path activities for a duration of 2 to 6 months.
  - Critical: Safety, cost, or schedule impacts would affect design, and construction could not be completed as planned. Most likely cost impact would be >$3M but <$5M. The schedule consequence would be excessive slip of noncritical-path activities for a duration of 6 to 12 months. The critical path may be impacted.
  - Crisis: Safety, cost, or schedule impacts would jeopardize the overall mission. Most likely cost impact would be >$5M. The critical path would be impacted.

Risk Level Determination



Risk Levels

- The risk levels are based on the probability and the consequence
- The risk level is determined from the risk level table

- Low Risk
  - Normal risk management practices should be sufficient, but CPT awareness should be maintained. A risk assessment form is completed for a low risk using a graded approach.
- Medium Risk
  - The CPT shall perform sufficient analysis to ensure that the event is understood and appropriate response actions are identified. A risk assessment form shall be prepared. Monthly tracking of these risks and their response actions by the IWTU risk manager and IWTU project manager shall be performed.
- High Risk
  - The CPT shall perform sufficient analysis to ensure that the event is understood and appropriate response actions are identified. A risk assessment form shall be prepared. At least monthly tracking of these risks and their response actions by the IWTU risk manager, the IWTU project manager, and the IWTU project director shall be performed.

Risk Response

- For each medium and high risk, a “risk response plan” is developed.
- General responses to risk are as follows:
  - Avoidance
  - Transfer
  - Sharing
  - Acceptance and Management
  - Insurance.
- Risk response should fall within these broad groupings, but when actions are required in the “risk response plans,” which are documented on the risk assessment forms, the actions should be more specific.
- Specific actions to mitigate the risk are documented on the risk assessment form.

Risk Monitoring

- Risk monitoring is the process of ensuring that the project stays focused on risk management, identifying new risks and tracking efforts to control already identified risks.
- Monthly the Risk Owners, Risk Manager, and Project Manager review the status of the open risks and the actions identified in the risk response plans.
- New risks are added to the Risk Register when they are identified.
- Project risk items are determined to be “closed” when any one of the following conditions is met:
  - All response plan actions have been completed and closed out
  - The risk has been fully realized
  - The IWTU risk manager and project manager determine the risk item is closed out.

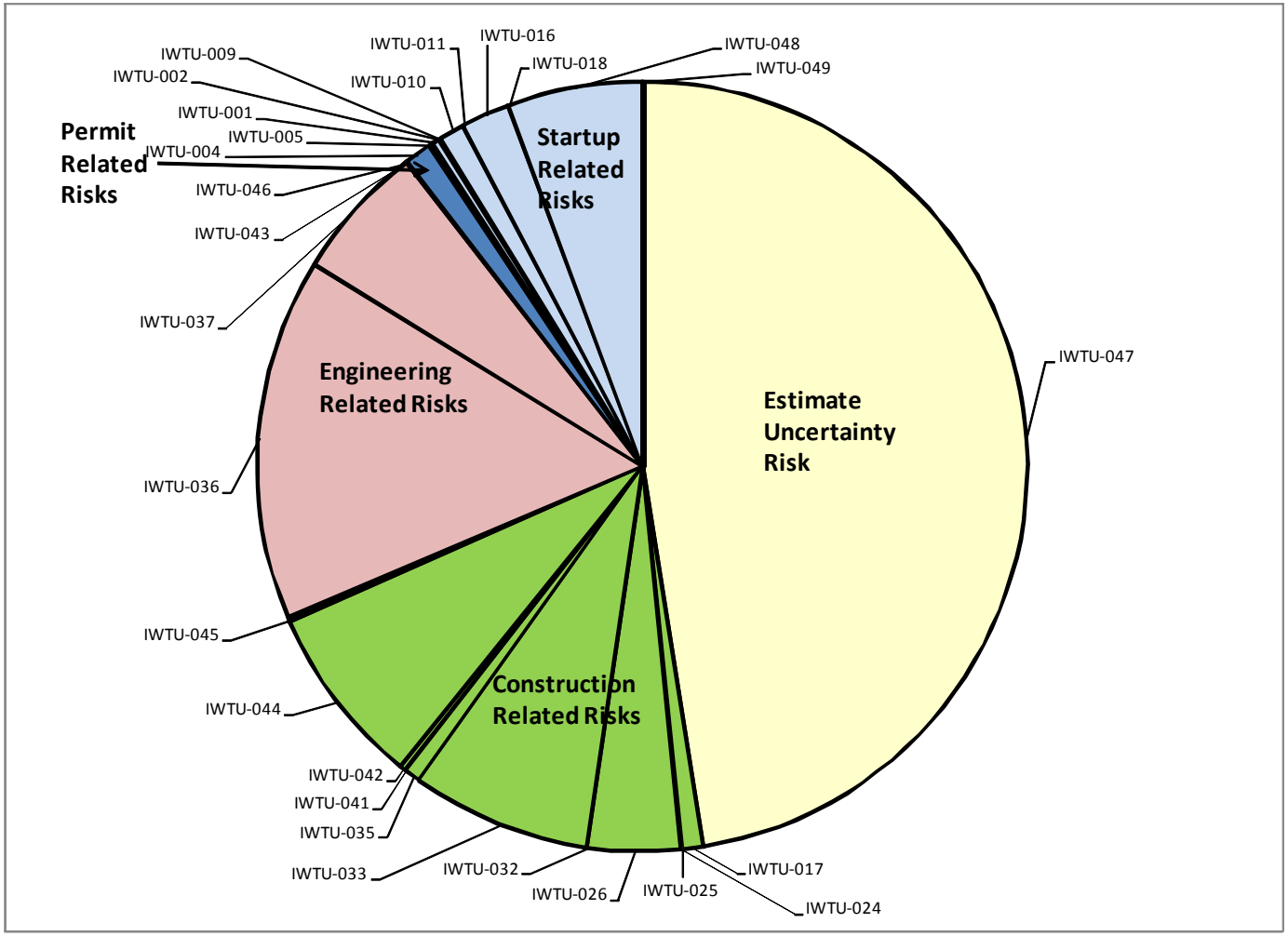
IWTU Identified Risks

- The following 49 risks were identified for the IWTU Project
- The 27 risks that are highlighted are closed

IWTU-001	DMR Waste Feed Nozzle Plugs Requiring Nozzle Changeout
IWTU-002	Scale-up Uncertainties
IWTU-003	SBW Treated Product Does Not Meet WIPP WAC
IWTU-004	IWTU Environmental Permit Approval
IWTU-005	Off-Gas Emissions Are Not Compliant with Regulatory Requirements
IWTU-006	DEQ Does Not Issue Temporary Authorization for Early Construction
IWTU-007	Long Lead Procurement Is Denied or Delayed
IWTU-008	Site Specific Geological Investigations Identify Conditions That Affect Seismic Design Basis
IWTU-009	Particle Size Control Problems
IWTU-010	Product Solids Handling Plugs Impacting SAT
IWTU-011	Actual Waste Received at IWTU Is Different from Contracted Waste Characterization Data
IWTU-012	Waste/Product Sampling Requirements
IWTU-013	Changes in MACT Requirements (Bounding Assumption)
IWTU-014	100-year Flood Plain
IWTU-015	SR Product Density Not Achieved
IWTU-016	Start-up Testing Takes Longer Than Anticipated Due to Equipment Failures/Malfunctions
IWTU-017	Construction/Fabrication Material Availability in Excess of Normal Escalation
IWTU-018	DMR-CRR Operation Is Difficult to Balance and Control
IWTU-019	Early Site Work Approval Is Denied
IWTU-020	Canister Filling and Closure
IWTU-021	Process Off-Gas Filter Performance
IWTU-022	Mercury Emissions Higher Than Expected at Hazen
IWTU-023	Quality Assurance Not Adequately Implemented
IWTU-024	Weather Impacts Construction
IWTU-025	Latent Contamination of Soils
IWTU-026	Limited Work Force for Construction
IWTU-027	Program - Equipment Deliveries Needed to Support Construction
IWTU-028	Simplified Soil-Structure Interaction (SSI) Analysis Is Non-conservative
IWTU-029	Controls to Prevent GAC Exothermic Reaction Not Sufficiently Developed
IWTU-030	IWTU CD-2/3B Cost Estimate Accuracy
IWTU-031	Scaling Observed in DMR During Hazen Testing
IWTU-032	NWCF Facility Modifications Compete with Remote-Handled TRU for the Same Area
IWTU-033	Delivery of Six Pack Vessel/Skid Assemblies Does Not Meet Construction Installation Schedule
IWTU-034	Program/Internal - Latent Contamination of Soils Around NWCF
IWTU-035	Additional Construction Cost Uncertainty Due to Timeliness of Delivery of Construction Bulks
IWTU-036	Additional Engineering and Design Uncertainty
IWTU-037	Engineered Equipment Cost Uncertainty
IWTU-038	Turnover of Key Personnel
IWTU-039	Quality Assurance Staffing Uncertainties
IWTU-040	Canister Fill Level Detection System Exceeds Current Estimate
IWTU-041	Terms and Conditions
IWTU-042	Engineered Equipment Schedule Uncertainty
IWTU-043	Unable to Secure Engineering Resources Timely
IWTU-044	Assumed Construction Productivities Are Incorrect
IWTU-045	Cost for Phased Array UT Higher Than Planned
IWTU-046	Implementation of ISA 84.00.01 Is Required
IWTU-047	Estimate Uncertainty for the Balance of the Project
IWTU-048	DEQ Review and Approval of CPT Plan
IWTU-049	NOx Performance Test Report

IWTU Cost Risks

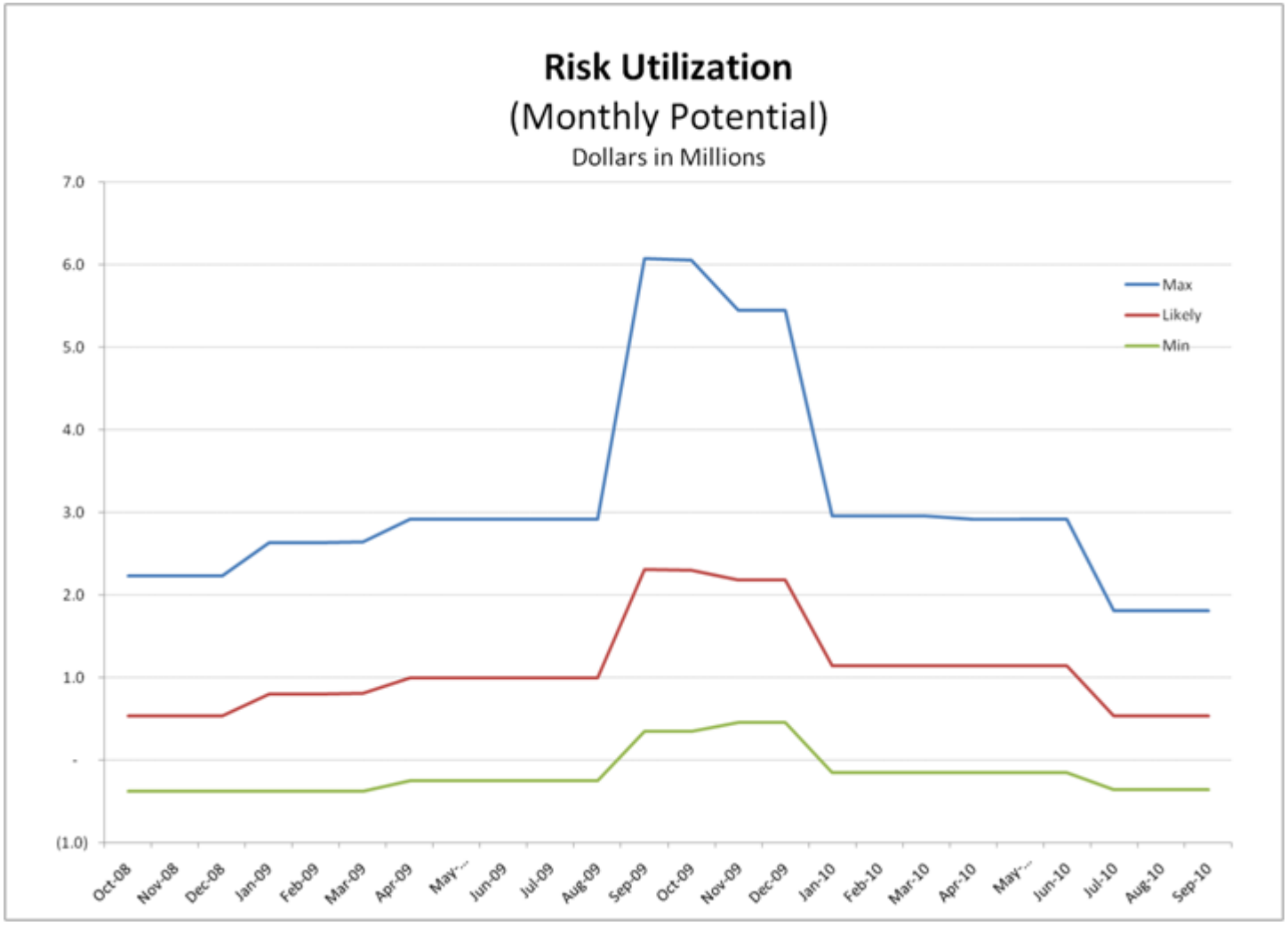
- Specific risks are identified with a single risk for all not defined



For this chart the value is based on the most likely cost for the risk times the probability of occurrence

IWTU Risks (Updated)

- The project has entered the time period with the highest projected risk



CH2M•WG IDAHO, LLC

IWTU Risk Realization

The Risk Manager maintains a Risk Log to track risk realization

WBS	Title	Risk 017	Risk 033	Risk 036	Risk 037	Risk 041	Risk 044	Risk 045	Risk 047
P.1.04.03									
	Approved BCP 110	0	0	985,430	0	0	0	0	0
	Approved BCP 111	0	0	1,743,000	0	0	0	0	0
	Resolved Trends	0	0	985,892	0	95,418	0	0	0
	Subtotal P.1.04.03	**0**	**0**	**3,714,322**	**0**	**95,418**	**0**	**0**	**0**
P.1.04.05									
	Approved BCP 110	0	0	122,026	0	0	0	0	499,355
	Approved BCP 111	0	0	452,550	0	0	0	0	556,827
	Unabsorbed OH Trend								1,985,866
	Resolved Trends	0	0	79,002	0	0	0	271,480	1,374,801
	Variance								
	Material Cost higher than planned	1,026,000	0	0	0	0	0	0	0
	Expediate 6-Pac Delivery	0	2,770,200	0	0	0	0	0	0
	Vessel Fabrication	0	0	0	0	0	0	250,000	1,610,568
	Subtotal P.1.04.05	**1,026,000**	**2,770,200**	**653,578**	**0**	**0**	**0**	**521,480**	**6,027,417**
P.1.04.06.02 - 11									
	Approved BCP 110	0	0	0	0	0	0	0	616,601
	Approved BCP 111	0	0	0	0	0	0	0	267,548
	Resolved Trends	0	0	0	0	0	0	0	7,277,664
	Variance								
	Material Cost higher than planned	1,500,000	0	0	0	0	0	0	0
	Extra Labor for concrete	0	0	0	0	0	2,000,000	0	2,800,000
	Extra Labor for steel	0	0	0	0	0	1,500,000	0	2,000,000
	Other						0		1,300,000
	Subtotal P.1.04.06.02 - 11	**1,500,000**	**0**	**0**	**0**	**0**	**3,500,000**	**0**	**14,261,813**
P.1.04.06.14									
	Approved BCP 110	0	0	0	326,945	0	0	0	0
	Approved BCP 111	0	0	0	89,000	0	0	0	0
	Resolved Trends	0	0	0	(1,936,100)	0	0	0	0
	Variance				(3,468,402)				
	Subtotal P.1.04.06.14	**0**	**0**	**0**	**(4,988,557)**	**0**	**0**	**0**	**0**
	Realized Total by Risk	**2,526,000**	**2,770,200**	**4,367,900**	**(4,988,557)**	**95,418**	**3,500,000**	**521,480**	**20,289,230**

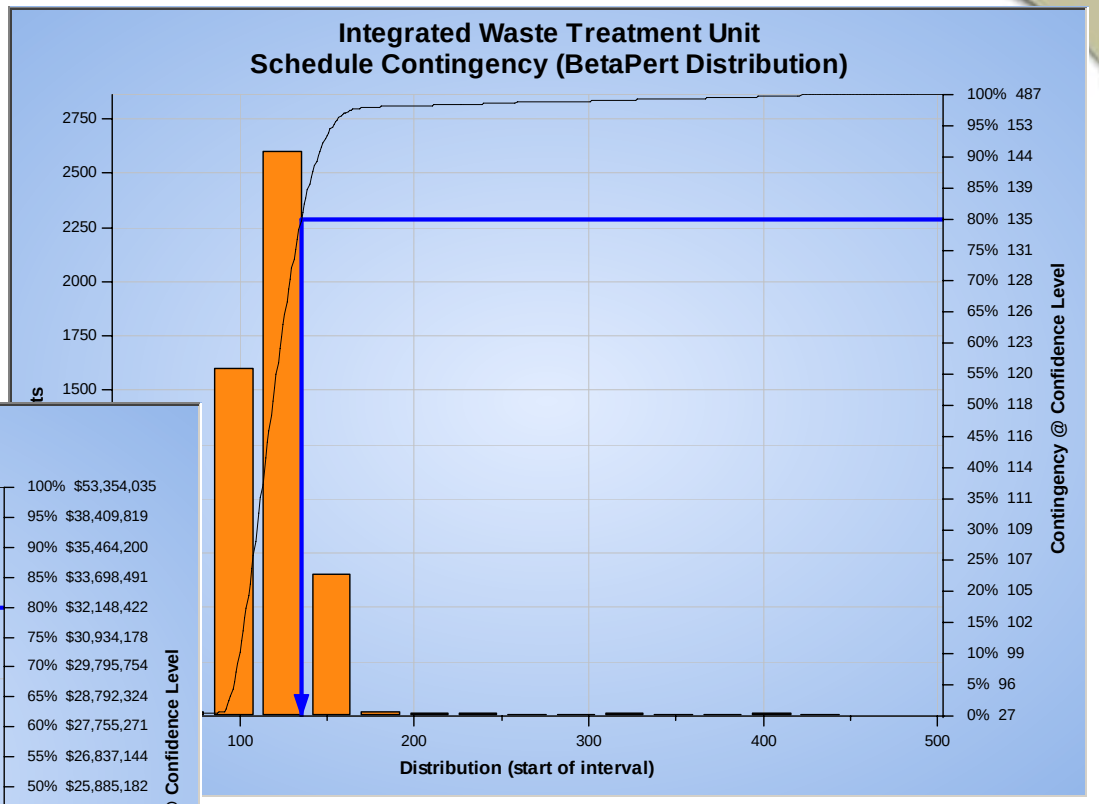
Risk	Title
IWTU-017	Const/Fab Material Escalation
IWTU-033	Late Six Pack Vessel/Skid Delivery
IWTU-036	Additional Engr & Dsn Uncertainty
IWTU-037	Engineered Equipment Cost Uncertainty
IWTU-041	Supplier Contract Terms & Conditions
IWTU-044	Assumed Construction Productivities Are Incorrect
IWTU-045	UT NDE of Haynes Welds
IWTU-047	Estimate Uncertainty

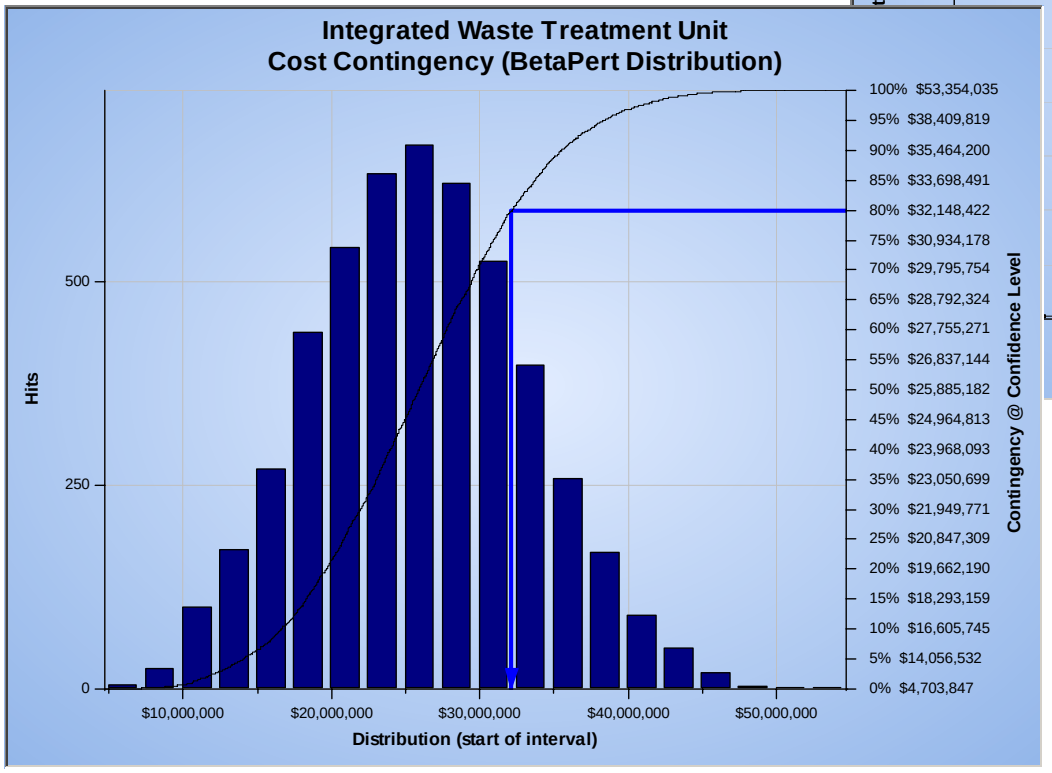
CH2M•WG IDAHO, LLC

IWTU Cost and Schedule Contingency

- The IWTU contingency is based on a Monte Carlo simulation using the identified risks.
- Inputs to the analysis are the likelihood (probability of occurrence) and impacts (consequence of cost and schedule uncertainty expressed as minimum, most likely and maximum) associated with each risk.
- The simulation was done with PertMaster using a BataPERT distribution.
- The result was 135 days of schedule contingency and $32.1 million of cost contingency at 80% probability.

Monte Carlo Results





Lessons Learned

- The total contingency determined by the Monte Carlo simulation should be split between contractor management reserve and contingency held by the DOE.
- Allocation of management reserve to the contractor is needed for proper EV reporting.
- There is a need to track/quantify the amount of risk realized.
- Risk management and project trending are closely related.
- Its never too early to implement the full risk management process

Gaps / Weakness in Risk Management Approach

- Policy, Requirements, Management Actions
  - The policy needs to recognise:
    - As the project progresses the identified project risks evolve, the risk management plan is updated, additional risks may be identified that increase the total project cost risk.
- Guidance and Best Practices
  - Guidance is needed on how to address the changes that occur as the risk management plan is updated.
  - Are all risks identified in the risk planning:
    - Is there contingency above the level determined by the risk analysis?
    - Should a risk be identified for:
      - Rework because of mistakes, omissions, errors, etc.?
      - Delays, loss of productivity, safety stand-downs, etc.?
- Tools and SMEs
  - None Identified
- Training, Personnel Development, and Certifications
  - None Identified