

# Scope Management

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Waste Volumes vs. Estimates

Excerpts From The Rocky Flats Experience

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January 18, 2006



# Scope Management<sup>1</sup>

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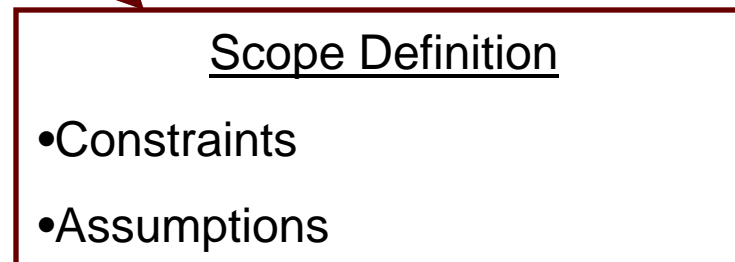
- Scope Planning
- Scope Definition
- Create Work Breakdown Structure
- Scope Verification
- Scope Control

<sup>1</sup>taken from “A Guide to the Project Management Body of Knowledge (PMBOK® Guide)”

# Scope Management

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- Scope Planning
- **Scope Definition**
- Create Work Breakdown Structure
- Scope Verification
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# Scope Management

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- Scope Planning
- Scope Definition
- Create Work Breakdown Structure
- Scope Verification
- **Scope Control**



## Scope Control

- Influencing factors that create scope changes
- Controlling impact of changes

## SCOPE DEFINITION

# The Contract

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- Risk “sharing”
  - The contractor accepted risk of volume differences for all but Remediation waste:
    - Low Level Waste (LLW)
    - Mixed Low Level Waste (MLLW) < 10 nCi/g
  - The government accepted risk of volume differences for Remediation waste:
    - LLW ER beyond 107,000 yd<sup>3</sup>
    - MLLW ER < 1 nCi/g beyond 41,000 yd<sup>3</sup>
    - MLLW ER > 1 nCi/g beyond 220 yd<sup>3</sup>
  - Schedule Incentive
  - Cost Incentive

Based on uncertainty associated with extent of soil contamination at the time of contract award



## SCOPE DEFINITION

# Original Estimates

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### □ History

#### ■ Decontamination & Decommissioning Waste

##### □ Systems Engineering Analysis (SEA) – 1994 – 1996

- Use of structural drawings to estimate material weights
- Use of walkdowns to estimate areas of contamination
- Limited to 20 “major” buildings
- Calculation of “average” values per ft<sup>2</sup> for given “type” of building, which was subsequently applied to all remaining structures
- MAJOR DRAWBACK: failed to account for expansion (i.e., inefficiencies) from in place to containerized waste for disposal

##### □ Building 889 Decommissioning – 1996

- Former Uranium contaminated size reduction facility
- Similar approach
- Utilized 20% expansion factor
- MAJOR DRAWBACK: predicted vs. actual volumes still too low; a poor predictor for other “unique” facilities

## SCOPE DEFINITION

# Original Estimates (cont.)

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### □ History (cont.)

#### ■ Decontamination & Decommissioning (cont.)

##### □ Building 779 Decommissioning – 1998 – 2000

- First major Plutonium contaminated structure
- Similar approach
- 25% expansion factor
- TRU waste assumed = in place glovebox volume
- Ventured into use of Surface Contaminated Object characterization<sup>1</sup> for larger containers leading to greater inefficiencies but allowed for *significant* risk reduction
  - Practical application of emphasis on worker safety resulted in compromise with waste efficiencies



<sup>1</sup> Full implementation by mid-FY 2002



## SCOPE DEFINITION

# Original Estimates (cont.)

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- History (cont.)
  - Decontamination & Decommissioning (cont.)
    - Equipment Metric Approach – 2000+
      - Utilize prior estimates and adjust based on Building 779 D&D experience
      - Metrics developed:
        - Glovebox volume
        - Glovebox surface area
        - Pipe length
        - Duct length
        - Tank volume
        - Miscellaneous items surface area
      - Established metrics library
      - Adjustment factor based on Building 779 actuals



## SCOPE DEFINITION

# Original Estimates (cont.)

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- History (cont.)
  - Environmental Remediation
    - Historical Release Report used to identify potential environmental release sites and potential contaminants of concern
    - Use of empirical data (contaminant type expected, release volumes, and contaminant pathways) to project volumes for each site
    - Initially based on Interim Action Levels
    - Limited quantitative knowledge of concentration and extent of contaminations

## SCOPE DEFINITION

# Original Estimates/Status

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<b>WASTE TYPE</b>	<b>ORIGINAL ESTIMATE - Closure Project Baseline - (June 2000)</b>	<b>REVISED LIFECYCLE ESTIMATE (September 2003)</b>	<b>CURRENT LIFECYCLE PROJECTION (October 2004)</b>	<b>ACTUAL LCTD (November 7, 2004)</b>
TRU/TRM	12,500 m <sup>3</sup>	14,237 m <sup>3</sup>	15,012 m <sup>3</sup>	13,399 m <sup>3</sup>
LLW	175,000 m <sup>3</sup>	227,705 m <sup>3</sup>	347,397 m <sup>3</sup>	257,169 m <sup>3</sup>
MLLW	44,500 m <sup>3</sup>	45,773 m <sup>3</sup>	48,288 m <sup>3</sup>	41,068 m <sup>3</sup>



## SCOPE CONTROL

# The Changes

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### □ Packaging efficiency

- Volume of waste “measured” in place is far different from waste containerized for final disposal
- Estimate assumed size reduction/decon to certain standards; practical application proved far different
- Continuous conflict between worker/public/environmental health & safety and waste minimization

### □ Strategic changes

- Structures originally estimated as free release (sanitary waste); shipped as LLW by rail in spite of heroic decontamination efforts



## SCOPE CONTROL

# The Changes (cont.)

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- Emerging technologies or failure of planned technologies resulted in different waste forms/types and quantities
- Emerging treatment/disposal options
- Waste management activities managed under one part of the WBS; waste generation activities managed under different part of the WBS
  - Leads to mis-estimation because of:
    - Internal priorities
    - Lack of “penalty” for inadequate data
    - Data generating entities are not the end user of the data
- IMPACT:
  - schedule acceleration (reduced cost)
  - reduced worker risk
  - increased transportation/disposal cost and risk



## SCOPE CONTROL

# The Changes (cont.)

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- Surface Contaminated Object (SCO) Characterization
  - Applied to gloveboxes
    - Rocky Flats was a glovebox operation = big impact
    - Needed measurement technique
  - Obvious safety improvement over glovebox size reduction
  - Original estimate was to size reduce and certify as TRU
  - SCO waste dispositioned as LLW thus increase in LLW as whole segments shipped
- IMPACT: avoided 3 – 4 fold increase in TRU volumes and Government Furnished Services/Items shipping impact
  - reduced transportation/disposal cost and risk



## SCOPE CONTROL

# The Changes (cont.)

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- Impure Oxides (Plutonium Recovery Residues)
  - Originally intended to go thru stabilization/packaging system then to Savannah River Site in 9 SST shipments
  - Would have prolonged stabilization/packaging system operations (and life of critical path structure D&D) by 3 months
- SOLUTION: terminate safeguards allowing for disposition at WIPP
- IMPACT: increased TRUPACT shipments by 46, or approximately 3 weeks
  - reduced schedule risk
  - increased transportation/disposal cost and risk

## SCOPE CONTROL

# The Changes (cont.)

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- Building 881
  - WWII subterranean type construction
  - Glovebox operations
  - Original Estimates:
    - LLW                    2,631 m<sup>3</sup>
    - MLLW                 2,336 m<sup>3</sup>
  - Actuals:
    - LLW                    19,213 m<sup>3</sup>
    - MLLW                 208 m<sup>3</sup>
  - What happened?
    - Really, really bad estimating
    - Decontamination and size reduction efforts not effective
    - Imploded the Building
- IMPACT:
  - increased transportation/disposal cost and risk

## SCOPE CONTROL

# The Changes (cont.)

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- 903 Pad
  - Asphalt capped contaminated soil area, formerly utilized for drum storage as well
  - Original Estimates:
    - LLW                    34,126 m<sup>3</sup>
    - MLLW                 3,321 m<sup>3</sup>
  - Actuals:
    - LLW                    45,566 m<sup>3</sup>
    - MLLW                 11,187 m<sup>3</sup>
  - What Happened?
    - Trade-off between:
      - infinite characterization/certain generation
      - vs.
      - limited characterization/uncertain generation
  - IMPACT:
    - increased transportation/disposal cost and risk



## SCOPE CONTROL

# The Changes (cont.)

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- Under Building Contamination
  - Two major structures contributed to the overall estimate
    - Building 776/777 – 11,178 m<sup>3</sup> estimate reduced to actual of approximately 2,000 m<sup>3</sup>
    - Building 771 - 7,680 m<sup>3</sup> estimate reduced to actual of < 100 m<sup>3</sup>
    - Why?
      - Buried equipment did not exist (“Urban Legend”)
      - Expected leak paths through floor slabs did not exist
- IMPACT:
  - reduced retrieval/transportation/disposal cost and risk



# Conclusion

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- Scope change will occur
  
- Key to success is how the change is managed
  - Remain flexible
  - Establish working customer/regulator relationship
  - Balance cost/schedule/risk impacts
  - Remain focused on the scope definition as an objective measurable result
    - During project execution, don't focus on how, focus on what
  - Maintain integrated, organizational control