Section 3

Validation of a Cost Estimate/ Lessons Learned

1

In Section 2 we discussed and demonstrated the development of planning and detailed estimates. In this section, we will discuss and demonstrate the validation of a cost estimate.

The following subsections will cover:

Section 3.1 will discuss the why's, who's, where's, and when's of a cost-estimate validation;

Section 3.2 will review the validation process; and

Section 3.3 will use a real-life DOE project example to work through a validation exercise.

Notes / Discussion Points / Lessons Learned: _____

Validation Guidance

IPABS provides the following validation guidance:

- **Site is responsible for validation**
- **Validation is commensurate with the complexity and size of the project**
- **HQ provides the Field necessary elements of validation**
- **Project Manager determines when to validate**
- **Project Manager determines who will validate**
- **Project Manager invites HQ's participation**

2

IPABS provides the following guidance for project validation:

- Each site is responsible for having a process for validating project baselines (schedule, cost, and scope).
- The depth and scope of the validation process is to be commensurate with the complexity and size of the project.
- To ensure consistent validation standards throughout the EM complex, HQ establishes and provides the Field with the necessary and sufficient elements of a validation.
- The Project Manager determines when a project should be validated.
- The Project Manager determines the appropriate level and cross section of organizations to assist in the validation.
- The Project Manager invites HQ personnel to participate in the project validations that are conducted at the convenience of the site.

Notes / Discussion Points / Lessons Learned: _____

Validation

Note:
Different programs call "validation" by different names. We will not discuss differences in what we call validation or which program is performing validation, but we will discuss validation as a general process.

3

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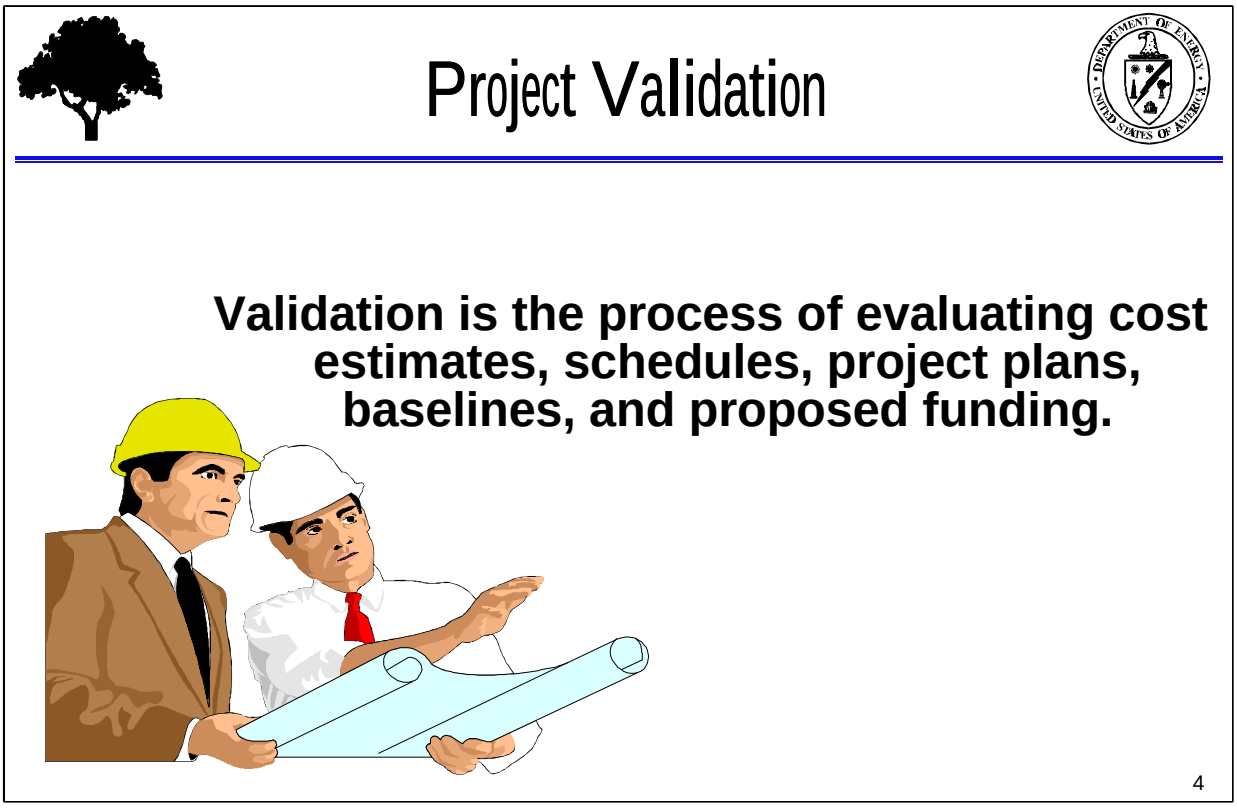
Notes / Discussion Points / Lessons Learned: _____



Validation is the process of evaluating cost estimates, schedules, project plans, baselines, and proposed funding.

Validation is required for projects or systems before seeking funding.

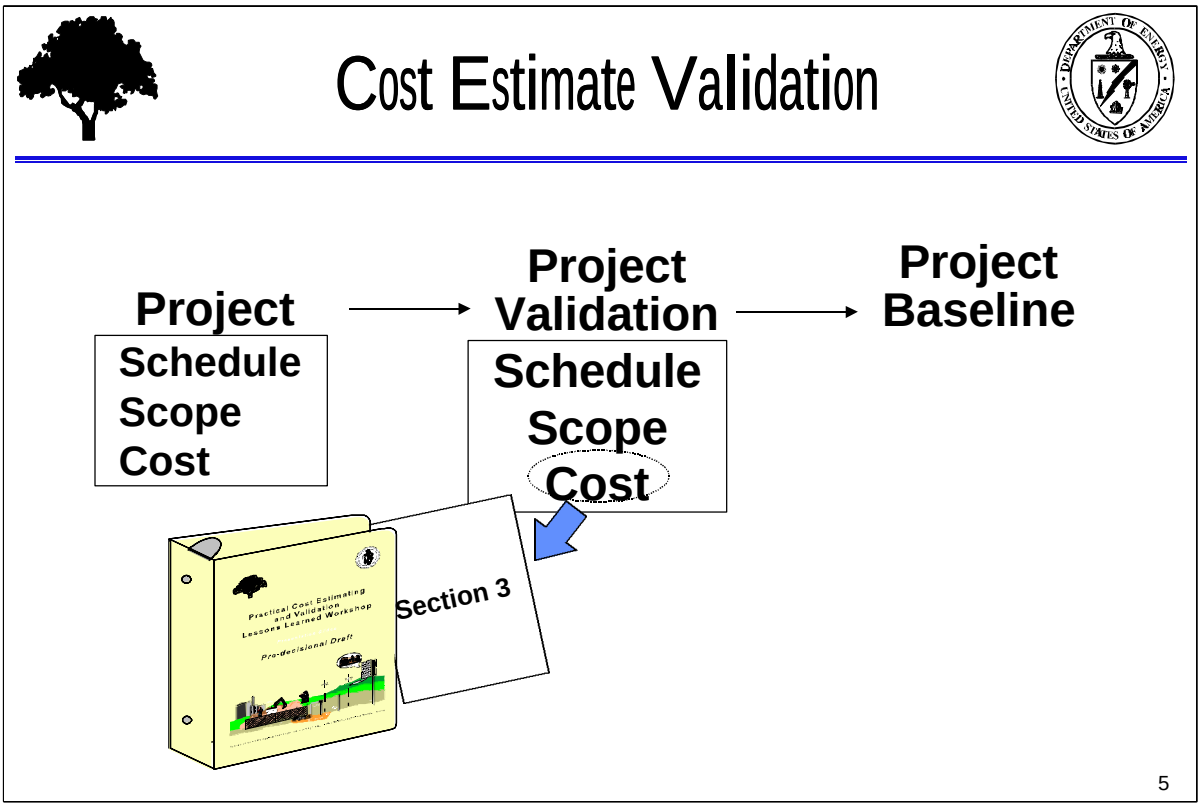
The process requires a review of project planning and conceptual development documentation.

The process requires discussion with program or field elements and principal contributing contractors to determine the validity of requirements for proposed project scope, cost, schedule, and funding.

Findings and recommendations resulting from the validation process are provided for use in formulating the annual budget.

Notes / Discussion Points / Lessons Learned: _____

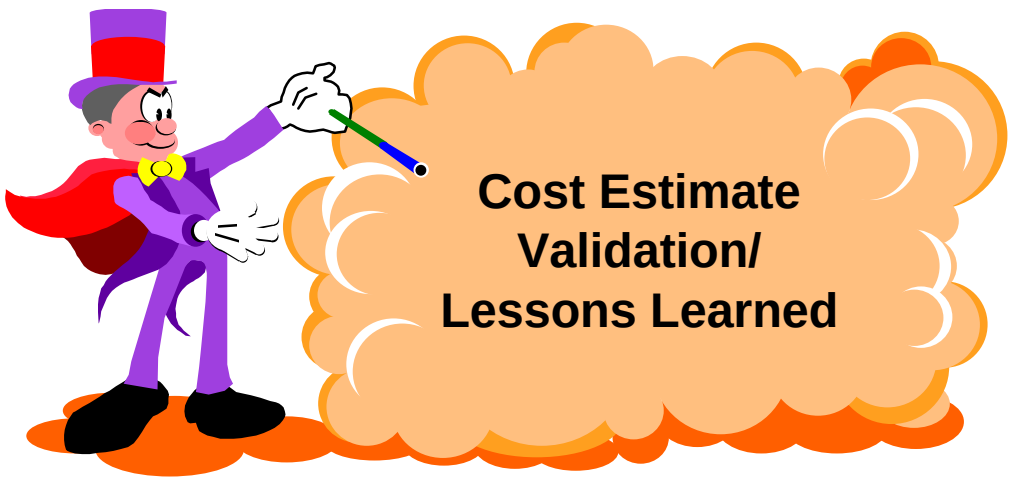
Section 3: Validation of a Cost Estimate/Lessons Learned



The following subsections will focus on the validation workshop of a cost estimate as a key part of the project validation.

Notes / Discussion Points / Lessons Learned: _____

Section 3.1



1

This section will include the following topics:

- Why validate a cost estimate?
- What are the types of cost-estimate validations?
- Who is involved in cost-estimate validation?
- Where is cost-estimate validation performed?
- When do cost-estimate validation efforts occur?

Notes / Discussion Points / Lessons Learned: _____

Why Validate a Cost Estimate?

- **To ensure that the estimate is ready for inclusion in the DOE Internal Review Budget (IRB) EM Corporate Budget Review process**
- **To ensure that the DOE funding request is consistent with scope of work**
- **To ensure a good baseline estimate for performance measurement**

2

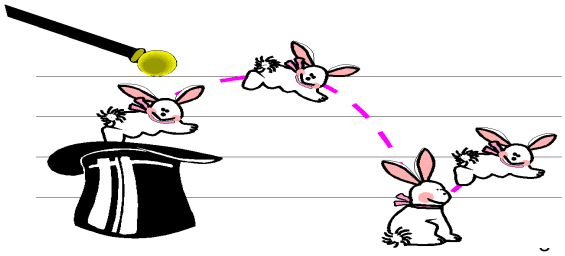
Baseline estimates should be validated for the following reasons:

- To ensure that all line items are ready for inclusion in the DOE Internal Review Budget (IRB)/EM Corporate Budget Review process (EM has streamlined the Budget Process Review process so that the internal review would go straight to corporate Budget Review.)
- To ensure that the DOE funding request is consistent with the scope of work
- To ensure a good baseline estimate for accurate performance measurement

Notes / Discussion Points / Lessons Learned: _____

What are the Types of Cost-Estimate Validations?

- **Independent cost estimate (ICE)**
- **Independent cost review (ICR)**
- **Program or internal review**
- **Comparisons or estimate check using parametric tools**



Typically, a validation must look at the technical scope, cost, and schedule. However, attempts are sometimes made to do these reviews as separate efforts. A cost estimate must have adequate scope and technical basis as well as a schedule. Validation is performed to verify or validate the reasonableness, correctness, and completeness of the estimate. The types of validations include Independent Cost Estimate (ICE), Independent Cost Review (ICR), Program or Internal Review, and Parametric Technique.

Independent Cost Estimate (ICE)

ICE is a documented cost estimate with the express purpose of which is to be an analytical tool to validate, cross-check, or analyze an estimate developed by proponents of a project. An ICE also serves as a basis for verifying cost-risk assessment.

Independent Cost Review (ICR)

ICR is also a validation process. An ICR differs from an ICE in that the independent team/person critiques or reviews the existing estimate as opposed to performing a separate independent estimate. An ICR is performed by someone who had no involvement in the original estimate. Management may use an ICR to review the estimate for completeness, reasonableness, and consistency. The review may use historical data, parametric techniques, expert opinions, and other means to verify the reasonableness of unit prices and other values in the original estimate.

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Notes / Discussion Points / Lessons Learned: _____

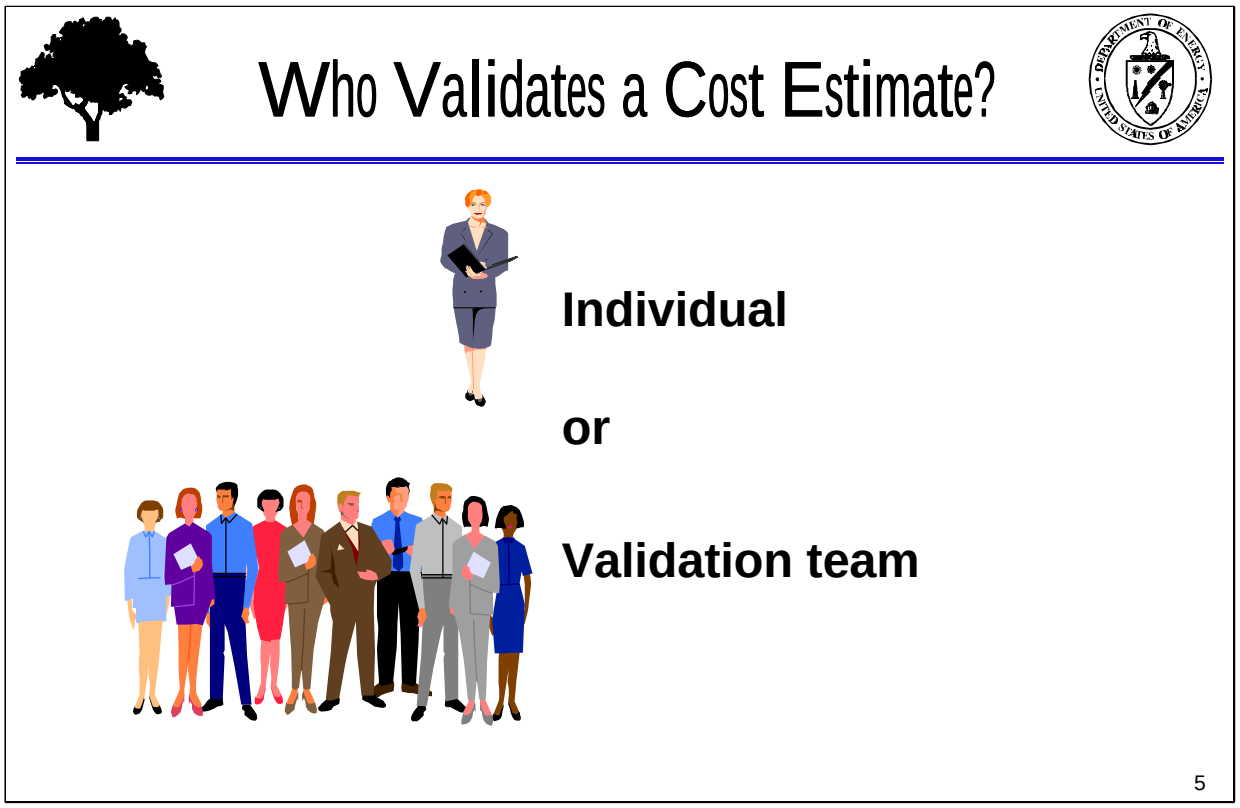
Program or Internal Review

A Program or Internal Review is a review or check of an existing cost estimate to assess the correctness and completeness of the estimate. This review is done by the program/project.

Parametric Technique

Parametric estimating models can be used to verify or check the reasonableness of an estimate. Several parametric models have been developed with government funds for this purpose (e.g., RACER, SCEES, CORA). These models are described in detail in the *Catalog of Cost Estimating Models and Evaluation of the Development of a Cost Estimating Tools Library on Electronic Media* prepared for Office of Infrastructure Acquisition (FM50), U. S. Department of Energy, September 1995.

Notes / Discussion Points / Lessons Learned: _____



Validation of a cost estimate may be accomplished by either an individual or a team. The correct resource or resources required for validation will depend on the validation objectives and the method of validation selected. Factors to consider in the determination of who should validate a baseline estimate should include the following:

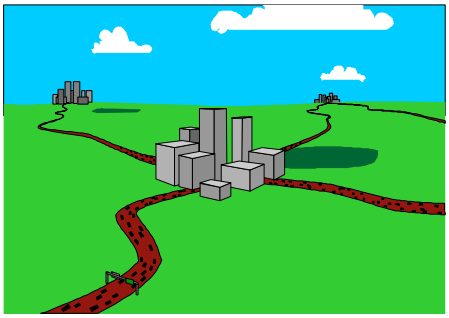
1. To define special skills for the validation.

2. To balance technical expertise, program/project control, cost estimating, scheduling, regulatory, audit, and oversight capabilities.

3. To select individuals/team members to match the necessary skill mix.

Notes / Discussion Points / Lessons Learned: _____

Where is Validation Accomplished?



- **Typically, at the site**
- **Sometimes, independently off-site**
- **Combination of on-site and off-site**

6

Validation can be accomplished either on-site, or off-site, or a combination of both. Determination of where the validation will be conducted is based on the validation objectives and the method employed.

Notes / Discussion Points / Lessons Learned: _____

When to Validate a Cost Estimate

- **Before project start for an accurate performance baseline**
- **For project inclusion into the DOE budget**
- **Before seeking increased funding for an existing project**
- **When the integrity of the baseline is questioned and the expense of validation is warranted**

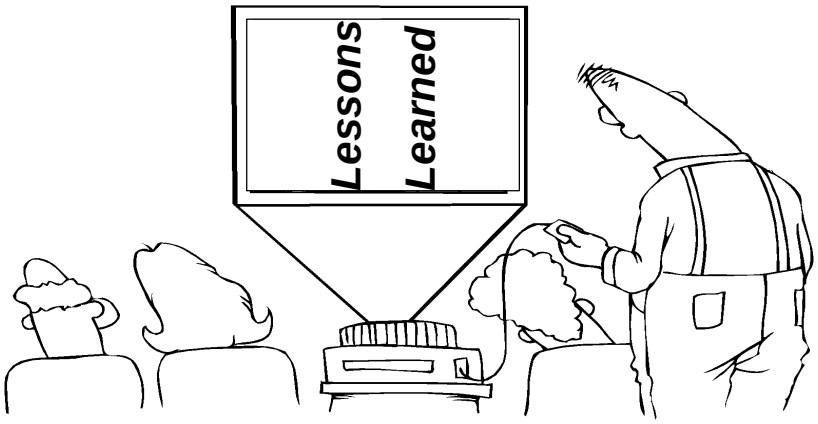
7

Validation should be conducted:

- Before the project start to establish an accurate baseline for project execution and performance measurement
- Before inclusion of a project into the DOE budget
- Before requesting increased funding for an existing project
- When the integrity of the baseline is questioned and the expense of the validation is warranted

Notes / Discussion Points / Lessons Learned: _____

Lessons Learned



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1. Does validation occur on projects seeking funding?
   Who does the validation?
   What type is done?
   Who decides what type of validation is required?
   How is the validation request and actual validation documented?
   What types of changes have resulted from the validations?
   Based on the validation results, how is the funding request changed?

2. How much involvement does the program-level management have in validation results?

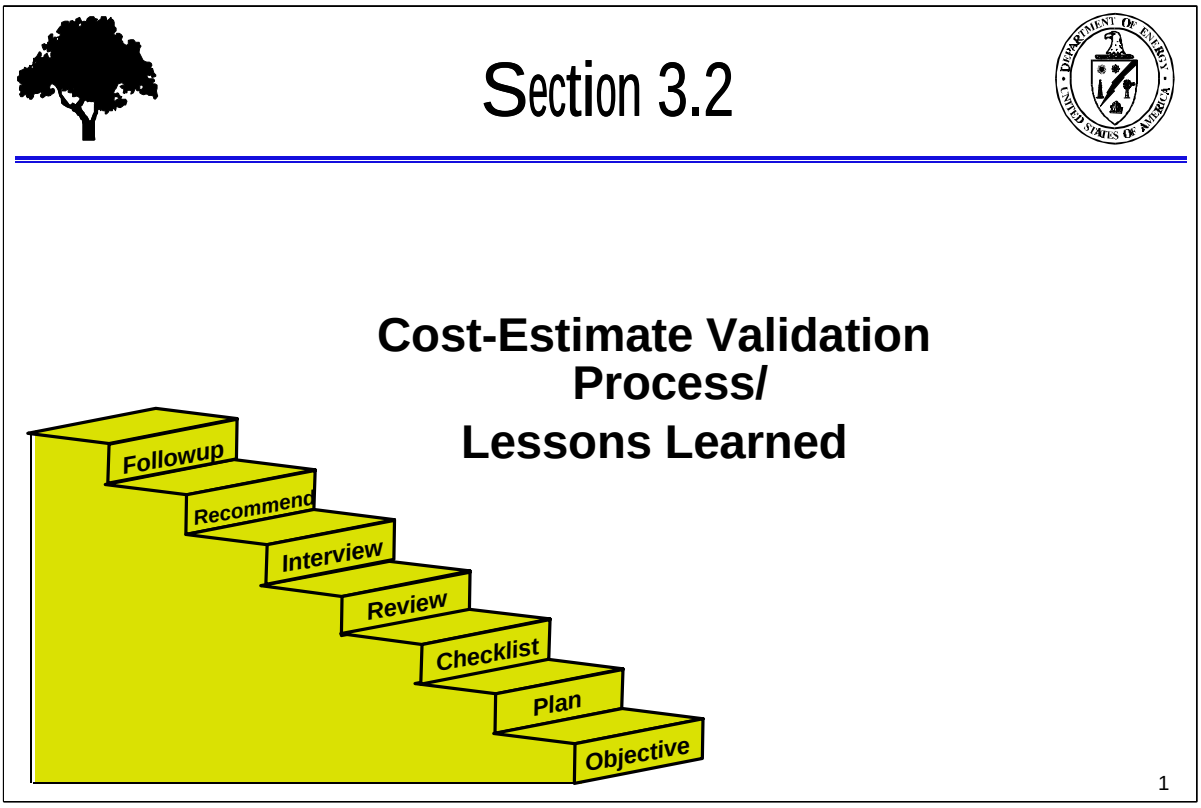
3. What/who decides when an ICE is required?

4. Who decides whether a team or an individual validates a project baseline?
   How is independence ensured?

5. If a team is to validate a baseline, who decides on the members? How is the skill mix defined, and how is it satisfied?

6. Who leads a validation? Who decides who the leader is?

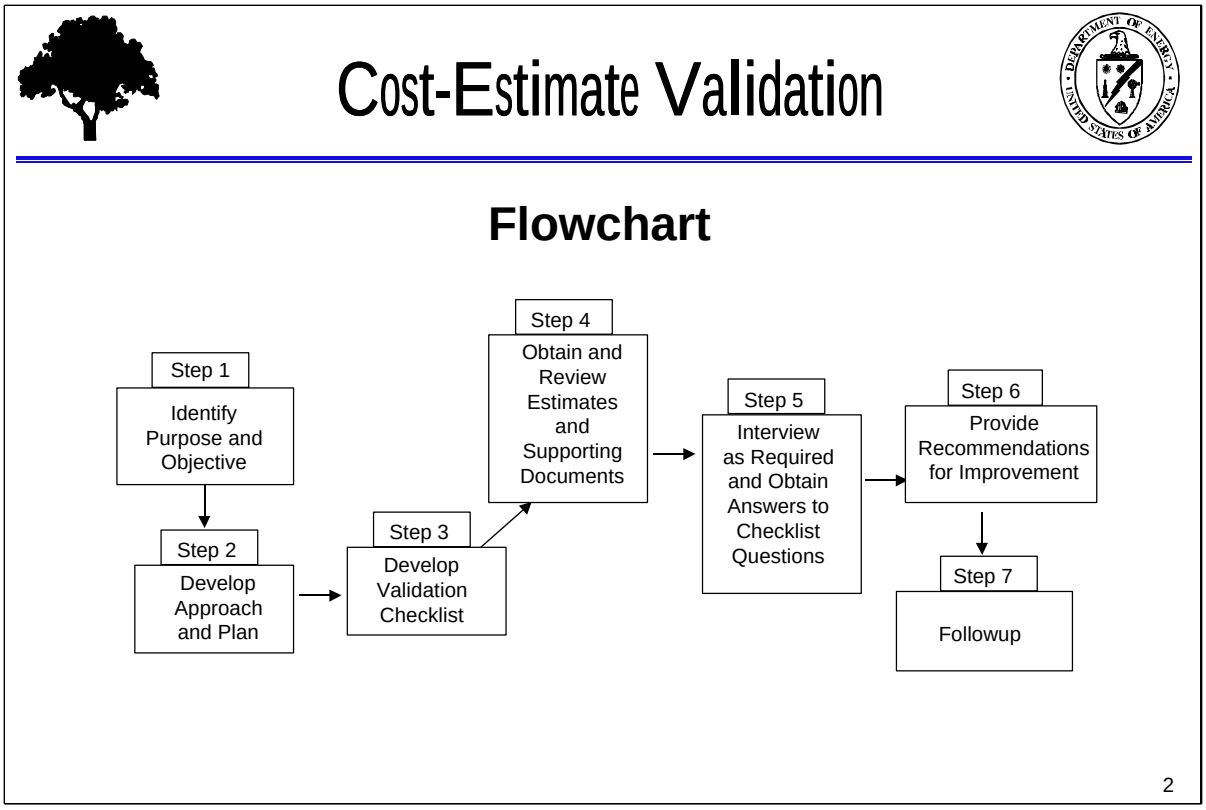
Notes / Discussion Points / Lessons Learned: _____



The section will discuss how to validate a cost estimate. A flow chart for this process will be presented, and application of each process step will be discussed.

Notes / Discussion Points / Lessons Learned: _____

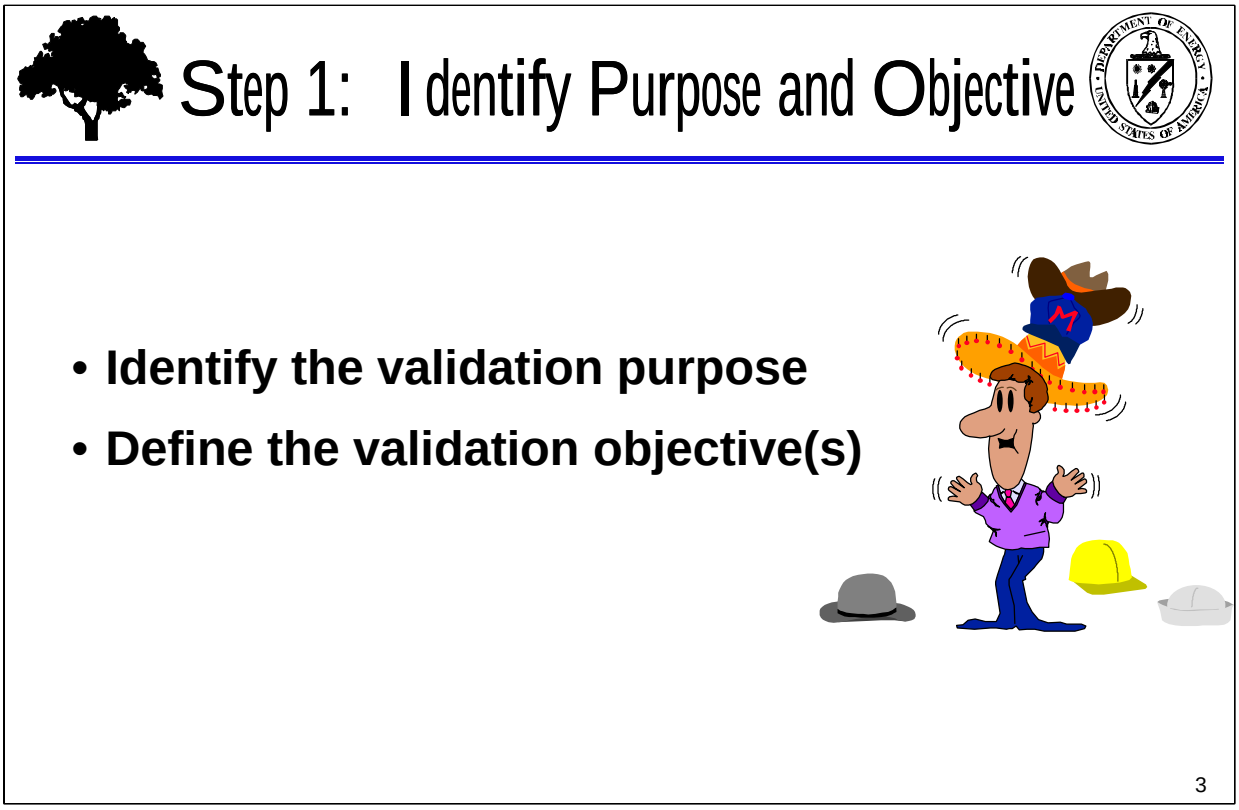
Section 3.2: Cost-Estimate Validation Process/Lessons Learned



Discussion Leader/Facilitator Notes: Leave this slide on the second projector as a visual reference while going through the example.

The steps involved in the validation process are represented in this flowchart and will be discussed in general terms on the following pages.

Notes / Discussion Points / Lessons Learned: _____



Discussion Leader/Facilitator Notes: Remember the steps of the validation process just discussed. Put the validation flowchart on one projector and the individual step overheads on the second projector.

General Application - Step 1

The validation purpose and objective must be clearly identified. An understanding of the validation purpose and objective will aid in identifying both the appropriate validation method and the approach.

The purpose identifies why the validation is being done, such as validation of a program baseline or an individual project estimate. This definition provides the scope of the validation effort.

Example Purposes:

- Verify the reasonableness, correctness, and completeness of the XYZ project estimate
- Verify the proposed project baseline for project execution

Based on the defined validation purpose, the validation objectives clearly identify the validation focus and approach.

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Notes / Discussion Points / Lessons Learned: _____

Section 3.2: Cost-Estimate Validation Process/Lessons Learned

Example Objectives:

- Provide well-supported project funding recommendations to the Chief Financial Officer.
- Examine the planning, technical, cost, schedule baseline, and facilities management aspects of the project.
- Assure departmental management that line item projects are ready for inclusion in the department's Internal Review Budget.
- Ensure that the cost estimate is consistent with the scope of work.

Notes / Discussion Points / Lessons Learned: _____

Step 2: Develop Approach and Plan

- **Develop a well-organized, planned, and executable approach.**
- **Structure the approach to accomplish the identified purpose and objective.**
- **Determine individual or team.**
- **Plan the communications**

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General Application - Step 2

The validation process, like any well-executed effort, deserves a well-planned and organized approach.

The validation approach must be structured to accomplish the identified validation purpose and objective(s).

The validation plan must include the selection of the validator or the validation team. Once the validation purpose and objectives have been identified and the validation approach is established, the individual or team members should be selected based on the skill mix required to accomplish the objectives.

Effective communications must be planned into the validation process.

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Notes / Discussion Points / Lessons Learned: _____

Step 2: Develop Approach and Plan (Continued)

Planning communications into the validation process:

- **Plan for early communication between the validators and the validatees.**
- **Publish the validation plans and schedule.**
- **Provide a checklist up front to the validatees.**
- **Request the necessary documents and information early.**
- **Establish a team approach between the validators and the validatees.**

6

General Application - Step 2 (continued)

Communication is the key to executing a validation effectively. It must be part of the planned process and can be accomplished by

- Planning for early communications between the validators and the validatees.
- Publishing validation plans and schedules to all team members and validatees.
- Providing the validatees with the checklist up front to allow them to prepare answers to checklist questions.
- Requesting required documents and information as early as possible.
- Establishing a working relationship and a team approach between the validators and the validatees.

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Notes / Discussion Points / Lessons Learned: _____

Step 2: Develop Approach and Plan (Continued)

Considerations during validation planning:

- **The intent should always be to help and improve.**
- **The validation provides fresh eyes.**
- **Develop a team effort between the validators and the validatees.**
- **Avoid the us-versus-them intimidation.**

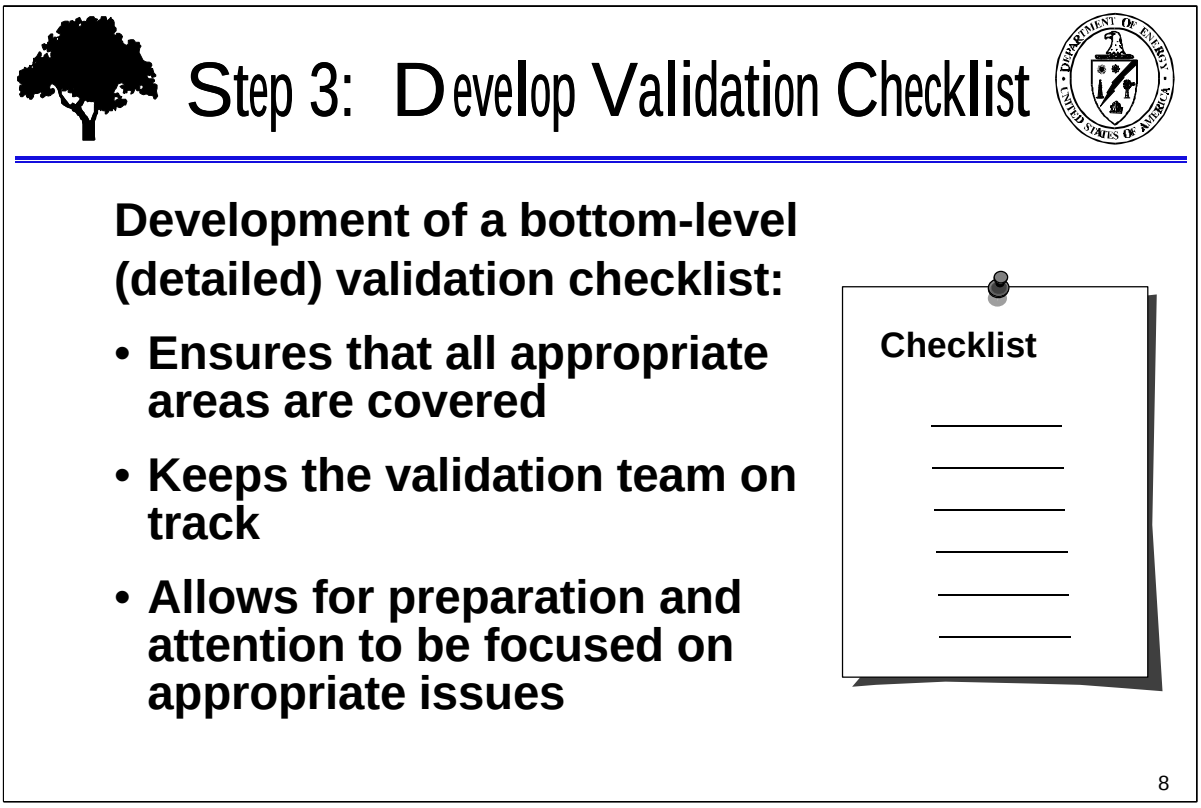
7

General Application - Step 2 (continued)

Considerations to remember when planning a validation:

- The intent of the validation is always to improve and validate the estimate.
- The plan should develop a team effort between validators and the validatees.
- Avoid the us-versus-them intimidation in the validation process.

Notes / Discussion Points / Lessons Learned: _____



General Application - Step 3

Development of a validation checklist:

- Ensures that all areas that support the validation purpose and objective are covered.
- Keeps the validation team on track.
- Allows both the validators and the validatees to prepare and focus attention and energies on appropriate issues.

Notes / Discussion Points / Lessons Learned: _____

Step 3: Develop Validation Checklist (Continued)

Things to consider when preparing a validation checklist:

Background and conditions

- **Method used and documentation provided for definition of scope and technical approach**
- **Appropriateness of estimate type, approach, and method related to estimate objective and stage of project definition**

9

General Application - Step 3 (continued)

The following factors should be considered when you are preparing checklist items:

Background and conditions

- Understanding how the scope was defined and how well it is documented will provide insight as to the potential for consistency and completeness within the estimate.
- Evaluating the estimate type, approach, and method related to the objective of the cost estimate and the stage of project definition will provide the validators up-front information as to the appropriateness and even the correctness of the estimate.

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Notes / Discussion Points / Lessons Learned: _____

Step 3: Develop Validation Checklist (Continued)

Background and conditions (Continued)

- **Use of estimating tools and software**
- **Completeness of estimate basis and assumptions made**
- **Estimate and scope review process**

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General Application - Step 3 (continued)

Background and conditions (continued)

An understanding of the estimating tools and software used will provide the validators information on the items that do not need to be reviewed. An example would be that the validators identify that the estimate was prepared using a particular commercial estimate package. Knowing this information, the validators are confident that there would not be a mathematical error in the estimate summarization or in the calculation of such items as escalation. On the other hand, if the validators identify that the estimate was prepared using a spreadsheet, a check of the spreadsheet formulas may be required.

- The estimate basis and the assumptions made are vital to the validators' understanding of both the project and the estimate.

- The number and types of reviews that the estimate has undergone provide the validators key information relevant to the estimate completeness and accuracy. It is almost always safe to say that the more reviews an estimate has undergone by credible sources, the more accurate and complete it will be.

Notes / Discussion Points / Lessons Learned: _____

Step 3: Develop Validation Checklist (Continued)

Direct Costs

- **Where and how were the quantities obtained?**
- **Verify the method of arriving at the labor hours.**
- **Were any productivity or job factors considered and applied?**
- **Verify the consistency and correctness of the wage rates applied to labor hours.**
- **Verify the method(s) used for costing.**
- **Review the reasonableness of manpower loading and scheduled time periods.**

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General Application - Step 3 (continued)

Direct Costs

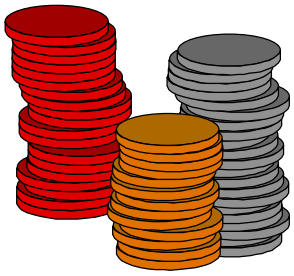
- An understanding of where and how the quantities were obtained can often be gained from the estimate review. Typically, quantity calculation will be included in the estimate.
- A review of the estimate should also clearly communicate the method for arriving at labor hours.
- The validators must understand what productivity factors may have been used and how they were applied and ensure that factors have not been duplicated. Factor duplication can often happen if the base rates used included an adjustment but a factor was still added (i.e., if the actual unit rates used were from a Level B dress-out project and a factor was also added for Level B dress out).
- Wage rates, whether loaded or unloaded, must be applied consistently and correctly.
- Knowing the costing sources used can help ensure confidence and credibility in the costs.
- The estimate and the schedule must be integrated, and manpower loading must be leveled for the schedule time periods.

Notes / Discussion Points / Lessons Learned: _____

Step 3: Develop Validation Checklist (Continued)

Indirect Costs

- **Are job indirect costs appropriate and reasonable for the jobsite conditions and the length of the job?**
- **Have overheads been applied appropriately and not duplicated?**



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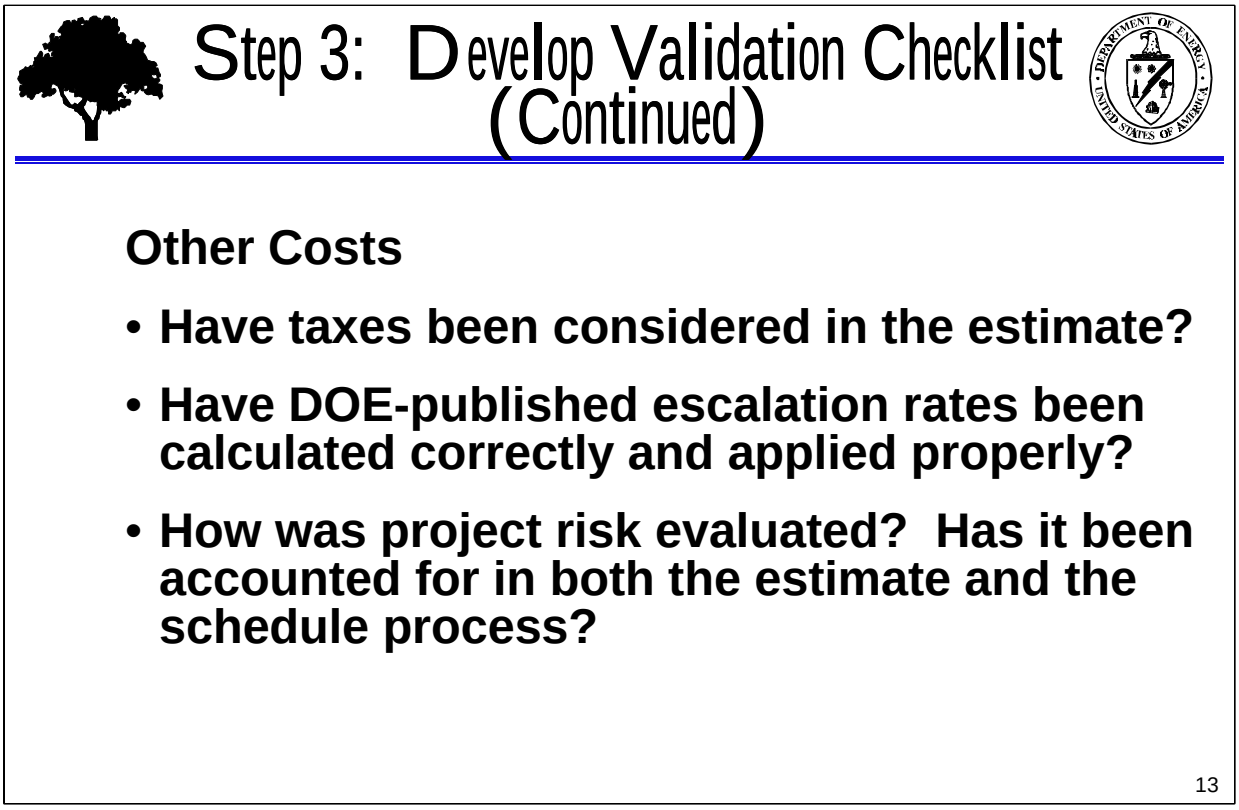
General Application - Step 3 (continued)

Indirect costs may be one of the most vulnerable parts of DOE estimates. In this area, including duplicate costs is easy. The validators must evaluate appropriateness and correctness of overheads carefully.

Notes / Discussion Points / Lessons Learned: _____

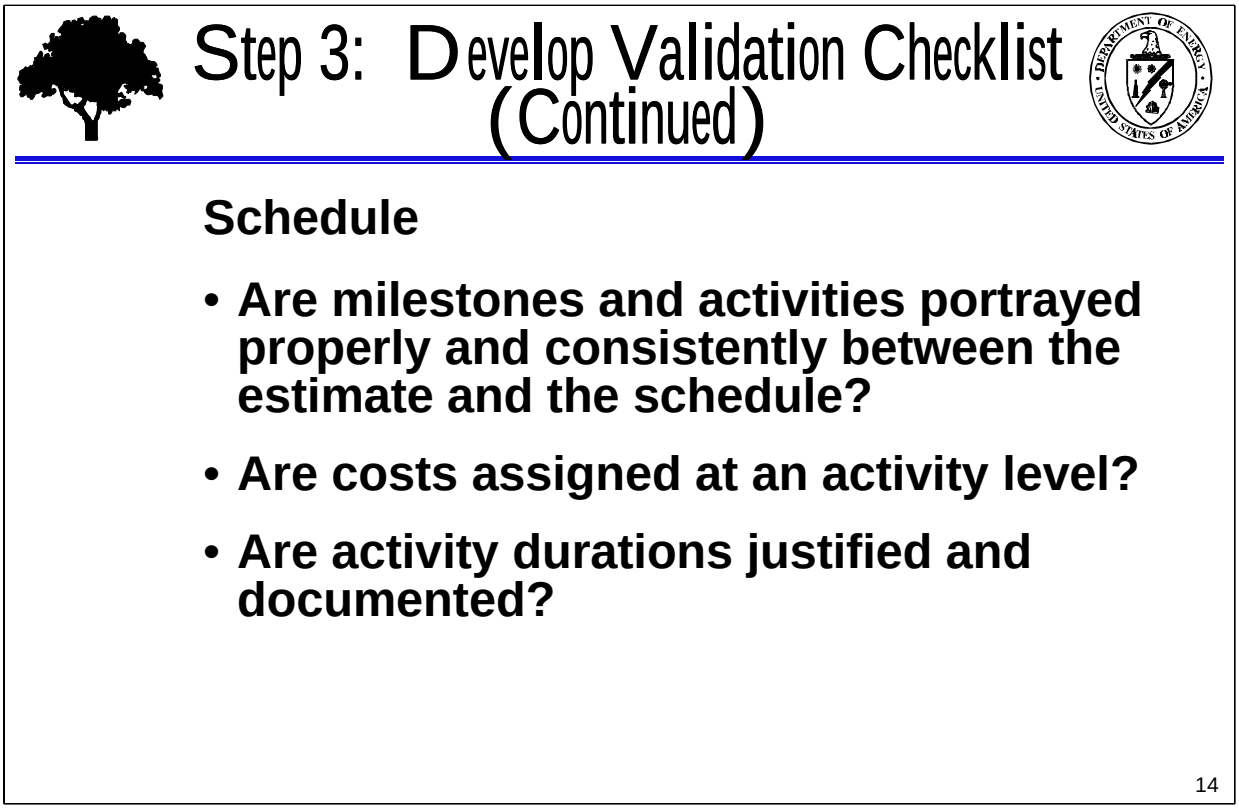


General Application - Step 3 (continued)

Other Costs

This part of the estimate may be vulnerable to overlooked or miscalculated costs.

Notes / Discussion Points / Lessons Learned: _____



General Application - Step 3 (continued)

Schedule Analysis

Schedule analysis and consistency between the estimate and the schedule are important in verifying the estimate feasibility and accuracy. If the schedule and the cost estimate are not consistent, the estimate could have very serious accuracy problems.

The scheduling and cost-estimating processes are concurrent and iterative. A cost estimate cannot be prepared without consideration of activity durations. Many costs are directly related to time. A schedule cannot be completed without consideration of costs and hours. Many activity durations are based on estimated hours and the availability of staffing.

A review should involve evaluating the cost estimate and the schedule separately and comparing them.

Both the cost estimate and the schedule must be consistent with both the technical scope and each other. As a general rule, activities that do not appear in the schedule should not appear in the cost estimate. Depending on the detail in the schedule, however, some activities costed in the cost estimate may not appear explicitly in the schedule because they have been consolidated.

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Notes / Discussion Points / Lessons Learned: _____

The key point to remember when reviewing the cost estimate and the schedule against the budget authority/budget outlay (BA/BO) schedule is that funds for activities (e.g., procurement) must be available when they are needed in the amounts indicated on the cost estimate.

Also, as a general rule, carry-over funds should be built into the BA/BO schedule for any particular year to cover at least part of the funding requirements for activities scheduled for the first quarter of the subsequent fiscal year. The carryover helps to avoid project delays that could result if funding for a project is delayed at the beginning of a fiscal year.

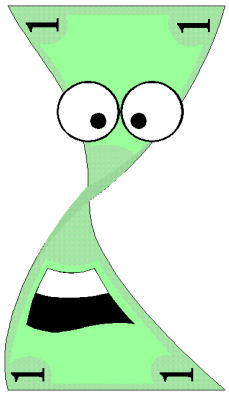
Both cost contingency and schedule contingency should be determined based on an analysis of activity-specific risk, so they are likely to be larger or smaller for the same activities.

Notes / Discussion Points / Lessons Learned: _____

Step 3: Develop Validation Checklist (Continued)

Have any estimate analyses been done, such as

- **Alternative approaches,**
- **Application of value engineering,**
- **Cost savings/avoidance, or**
- **Sensitivity analysis?**



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General Application - Step 3 (continued)

Estimate analysis

The validation process will be aided by an understanding of what analysis efforts the project has undergone in terms of evaluation of alternative approaches, application of value engineering, cost savings or avoidances that have been considered, and any sensitivity analysis that has been done.

Notes / Discussion Points / Lessons Learned: _____

Step 3: Develop Validation Checklist (Continued)

Example

The DOE EM-40 Environmental Management Project Manager's Handbook for Improved Project Definition, February 1995
(Appendix G)

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Discussion Leader/Facilitator Notes: Don't go through this checklist, but merely point it out as a good example to use.

An example validation checklist is provided in Appendix G to give an idea of typical checklist questions. Checklists should be tailored to focus the validation toward accomplishment of the validation purpose and objectives.

Notes / Discussion Points / Lessons Learned: _____

Step 4: Obtain and Review Estimates and Supporting Documents

- **Request necessary documentation early.**
  - **Ensure that you have all pertinent documentation.**
  - **Communicate with contractors to obtain any missing information.**
- **Become familiar with the project.**
  - **Technical scope**
  - **Major activities and milestones**
  - **Project history**

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Discussion Leader/Facilitator Notes: To get to the application of this step, cover the slide material and do not discuss all the detail provided in the student notes.

General Application - Step 4

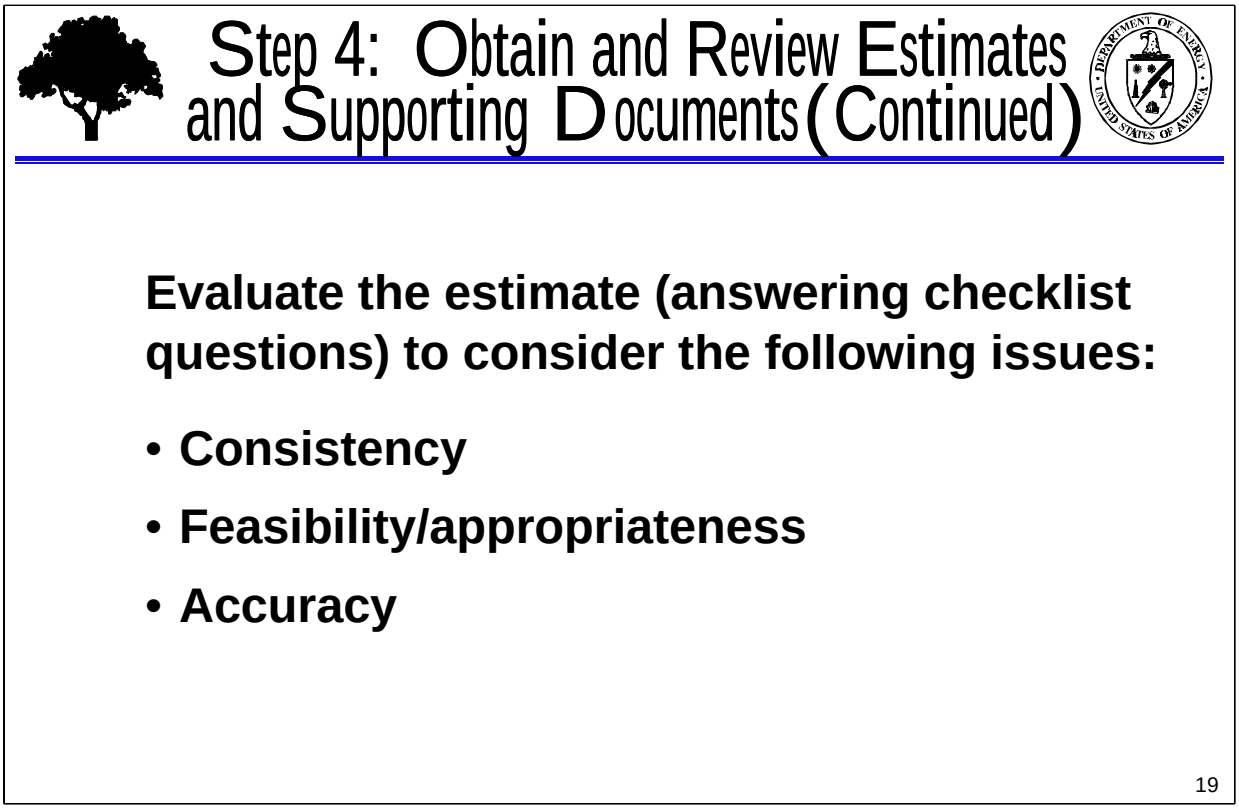
Pertinent information you should have includes the following:

- Technical scope description, including WBS and WBS dictionary
- Assumptions and exclusions
- Methodology and historical basis
- Contingency and escalation analyses
- Appropriate schedule with milestones
- Previous and current cost estimates and estimate back-up sheets
- Change control documentation, if appropriate
- Breakdown of indirect costs
- Identity of individuals who developed and validated the schedule and the cost estimate

Validators are encouraged to communicate with the validatees at this point to clarify any uncertainties or to obtain additional information, such as how the cost estimate and the schedule were prepared, before proceeding with a review of the cost estimate or the schedule.

In becoming familiar with a project's history, be sure to review any prior cost estimates and schedules, information on past activities conducted, any performance data to date, and any information on changes in the project.

Notes / Discussion Points / Lessons Learned: _____



General Application - Step 4 (continued)

Consistency

Cost estimates should be consistent with
- Technical scope and schedule,
- Assumptions,
- Risk and uncertainties,
- Budget/funding cycle, and
- Type of funding.

Checking consistency with technical scope is especially important when you have made prior changes to either the cost estimate or the schedule.

Assumptions regarding contracting requirements, any research and development needs, and any training and certifications should be reflected in the cost estimate and the schedule. Procuring contractors can take significant time. Training and certifications can be a big cost for large, highly technical projects. Research and development needs and training and certifications may be program costs rather than project costs.

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Notes / Discussion Points / Lessons Learned: _____

The level of detail of the cost estimate and schedule and the amount of cost and schedule contingency should be commensurate with project complexity and uncertainty.

The cost estimate and the schedule should roll up into the BA/BO schedule.

You must ensure that operating funds and plant and equipment (PACE) funds are being used properly.

Feasibility/Appropriateness

- Milestones should be achievable and measurable.
- Completion of critical path activities should be possible under known risks.
- Cost estimates must be realistic.
- The amount of cost and schedule contingency should be appropriate for project risks.
- Current DOE-approved escalation rates should have been used.
- Approved indirect rates should have been applied.
- Resources should be sufficient and appropriately allocated.
- Procurements, research and development, and training and certifications must be achievable within time and financial constraints.

Accuracy

- All costs must add up to the total.
- The durations of activities must be justified and documented.
- Milestones and activities must be properly portrayed.
- Current and approved escalation rates must be properly applied.

Notes / Discussion Points / Lessons Learned: _____

Step 4: Obtain and Review Estimates and Supporting Documents (Continued)

Additional Key Questions to Ask:

- **Has adequate information for evaluating cost performance been provided?**
- **Are the costs for activities reasonable?**
- **Has escalation been included and properly calculated?**
- **Has cost contingency been included and justified?**

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General Application - Step 4 (continued)

In evaluating whether adequate cost information has been provided, assess whether all activities described within the technical scope have been identified and costed.

Ensure that all direct costs and subcontractor costs are included in the estimate and that indirect costs have been properly applied. As a general rule, as projects become better defined, their cost estimates should become more detailed.

It is not always practical to evaluate every element that composes the cost estimate for a project. Pay particular attention to elements that appear to have the greatest contribution to the overall cost of the project.

Attempt to ensure that appropriate historical data were used in developing cost estimates for project activities. The data should be reasonable, and their selection should be documented. Any assumptions regarding how data were used should be reasonable.

Properly calculated escalation should be based on current DOE-approved rates and formulas and should be arithmetically accurate.

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Notes / Discussion Points / Lessons Learned: _____

Like schedule contingency, cost contingency should be calculated based on activity-specific risks and on reasonable assumptions. All assumptions regarding its calculation should be well documented. Cost contingency should never be a lump-sum value calculated as a percentage of the overall project cost.

Notes / Discussion Points / Lessons Learned: _____

Step 4: Obtain and Review Estimates and Supporting Documents (Continued)

Additional Key Questions to Ask:

- **Are allowances or lump-sum rates explained and well-documented?**
- **Are site/contractor indirects realistic and based on approved rates?**
- **Does the estimate add up?**

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Be suspicious of allowances and lump-sump rates, and ensure that any such amounts in the cost estimate have been explained and well-documented. Check to see what they comprise and ask your contractors why they needed to be included in the estimate.

Although many contractors develop estimates using computer software, you may still need to check the math. You should also check for any blatant errors or omissions.

Notes / Discussion Points / Lessons Learned: _____

Step 5: Interview as Required and Obtain Answers to Checklist Questions

- **Interview as required to obtain answers for unresolved checklist questions.**
- **Address the following areas of concern.**
  - **Question assumptions.**
  - **Get clarification of details when necessary.**
  - **Recalculate costs.**
  - **Get answers.**

24

Discussion Leader/Facilitator Notes: At this point, the project team will be interviewed and questioned to obtain answers to questionable items.

General Application - Step 5

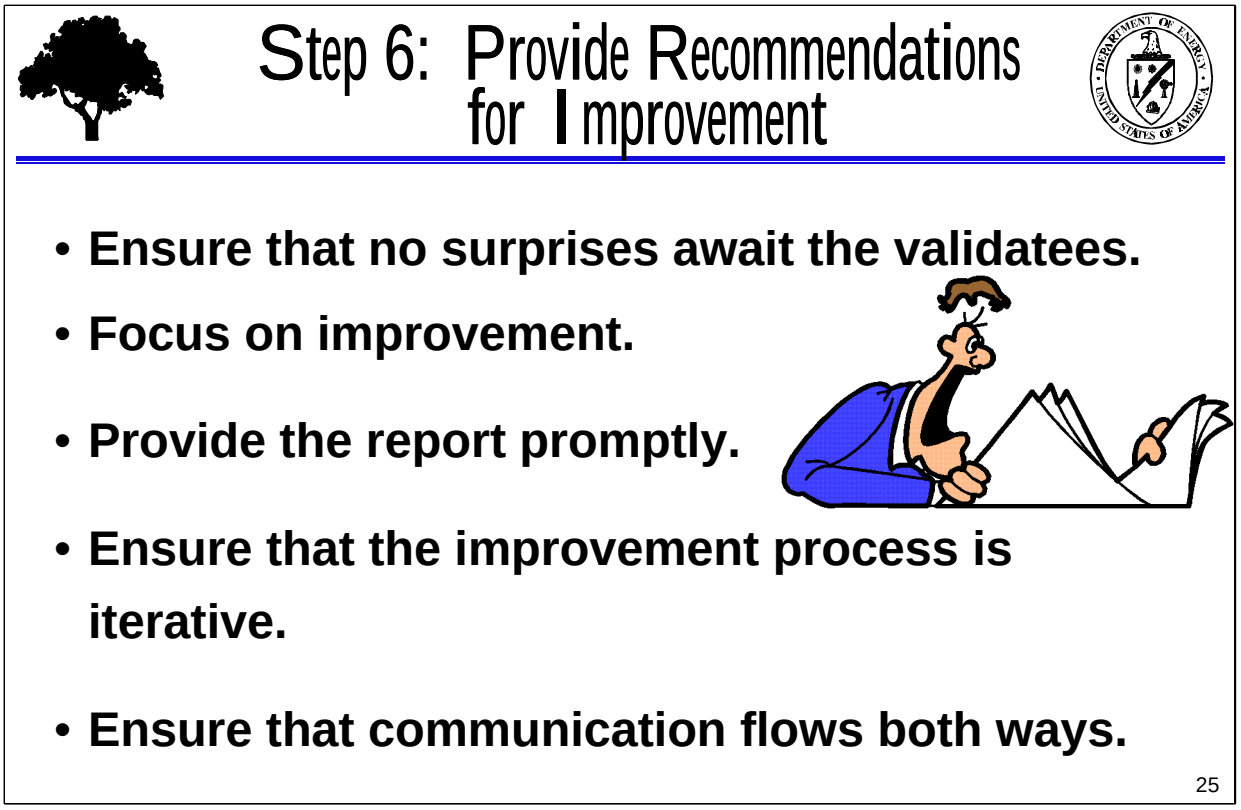
When interviewing

- Provide validatees with specific areas/questions to be addressed.
- Try to address all questions at one time thereby preventing multiple returns.
- Minimize the time that validatees are tied up; their time is our money.
- Be up front and honest; put all concerns and findings on the table early.
- Take a positive approach.

Typical areas of concern in cost estimates:

- Not sufficiently detailed
- Not credible
- Too many “soft” areas
- Too many overcharges, hidden contingency, and design allowances
- Unable to explain how costs were developed
- Too low; not commensurate with scope

Notes / Discussion Points / Lessons Learned:

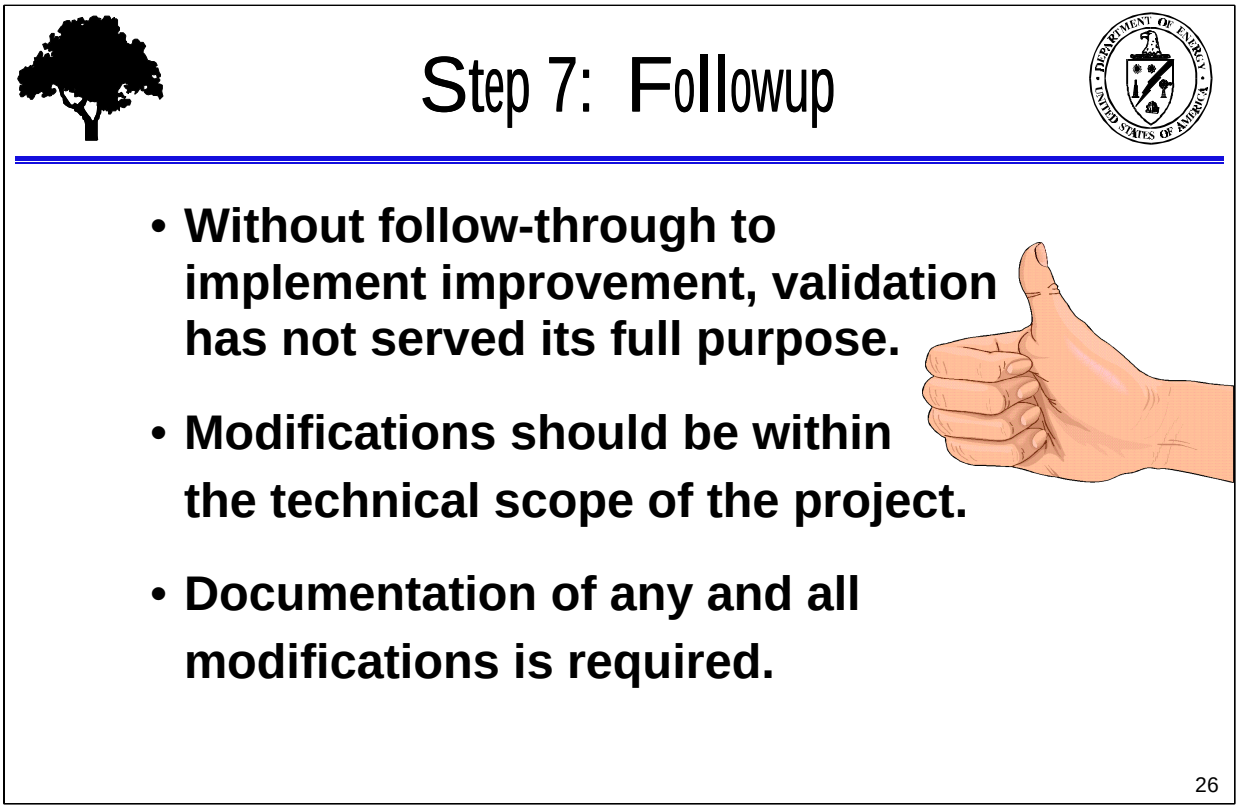


General Application - Step 6

Communication should be open and two-way throughout the validation process to ensure that no surprises to the validatees occur when the final recommendations are reported.

- The focus of the validation and the recommendations should be on improvement and should not be "critical."
- Recommended improvements should be provided in a promptly.
- The improvement process will be an iterative process until improvements are satisfactorily implemented.
- Improvement requires two-way communication between the validators and the validatees.

Notes / Discussion Points / Lessons Learned: _____



Discussion Leader/Facilitator Notes: The facilitator is to lead the group through defining follow-up steps that will support implementation of recommended improvements.

General Application - Step 7

The implementation of improvement is a very important step in the validation process. If necessary improvements are not implemented effectively, the validation has not served its full purpose.

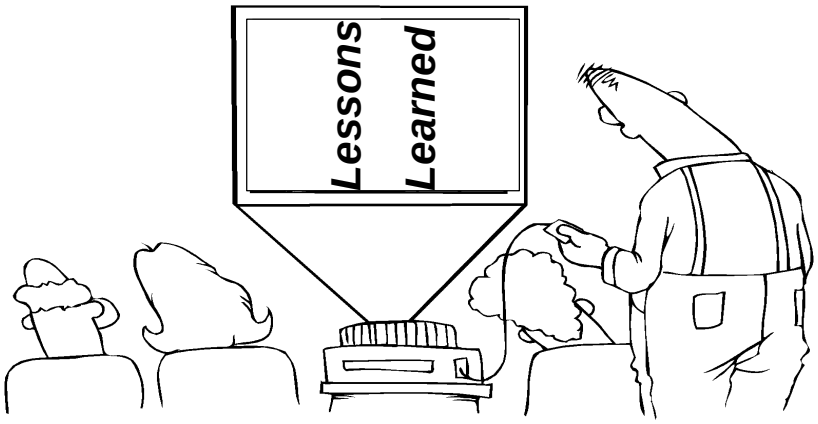
Changes and modifications to the estimate should be implemented.

Each modification to the cost estimate or schedule, including changes based on the validation, should be accompanied by a well-documented paper trail that

- Specifies all changes in detail;
- Provides rationale for changes; and
- Provides the name of a contact to answer questions.

Notes / Discussion Points / Lessons Learned: _____

Lessons Learned



27

1. Which values of increase are used to define when a project will be validated?

2. Should validation data have official signatures included?

3. Traceability throughout the data is important. What do you do when this does not occur?

4. Is it key/paramount that the code of accounts be provided in the estimate survey? If so, why?

5. How are “we/them” problems alleviated?

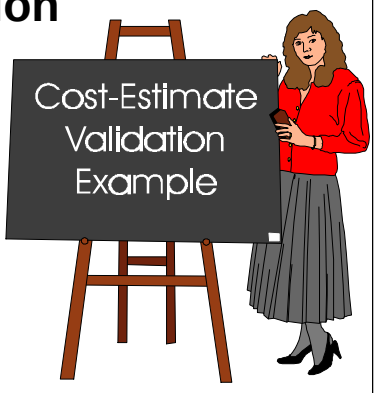
6. Good personnel are always working and not available. How do you find good team members for a validation? How do you get their full commitment?

7. How do you know as validator whether wage rates are correct? How do you know whether they are loaded or not?

Notes / Discussion Points / Lessons Learned: _____

Section 3.3

Cost-Estimate Validation Example/ Lessons Learned



1

This section will present a real-life DOE project and will work through the validation processes using the DOE project example.

The real-life DOE project example is the XYZ Capping Project.

Notes / Discussion Points / Lessons Learned: _____

Example Project

XYZ Capping Project

Example Validation

2

Discussion Leader/Facilitator Notes: As the facilitator leads the class through the background information, the facilitator will highlight key points/issues (in bold) and describe exhibits as indicated in facilitator notes. Also, by nature, validation requires a thorough review of the project documentation, and the identification of highlighted information should not bias the validators to look at specific information.

The following pages describe the XYZ Capping Project example used in this section. The information provided includes the following:

- Validation Request Letter
- Cover letter for planning estimate
- Cost-estimate summary by work breakdown structure (WBS) for Life-Cycle Project Costs
- Summary cost-estimate sheets for the 100-Year Cap Installation Remedial Design/Remedial Action (RD/RA) Cost Estimate
  - Cost-estimate support data recapitulation (scope and basis assumptions)
  - Project schedule
  - Detailed cost-estimate sheets
  - Summary sheet by work element
  - Detail by COA (division)
  - Contingency analysis
- Detailed cost-estimate sheets for 30-year operation and maintenance of cap
- Estimate and scope for capping project Cost Account Management and Paperwork
  - Notegram transmitting estimate
  - Scope and estimate

Notes / Discussion Points / Lessons Learned: _____

Discussion Leader/Facilitator Note: This is the validation request letter

United States Government **Department of Energy**

memorandum

DATE: March 15, 1995

REPLY TO
ATTN OF: DOE Program Manager

SUBJECT: DOE XYZ Capping Project XYZ-p

TO: DOE Project Manager

A cost baseline estimate has been completed for the DOE XYZ Capping Project XYZ-p. This project is scheduled to start this next fiscal year and will be included in the funding request submittal due next month.

Funding is extremely limited for next year. Priority on this project may require a delay of other work. Before submitting the funding request, please ensure that **this project estimate is validated and that the requested funding can be substantiated.**

In light of the political issues associated with this project, I recommend a **team validation**.

Attachments

cc:
Project File # XYZ-p

Notes / Discussion Points / Lessons Learned: _____

Discussion Leader/Facilitator Note: Estimate Transmittal Cover Letter

INTERDEPARTMENTAL COMMUNICATION

Date: January 2, 1995

To:

From:

Subject:**XYZ Capping Project Cost Estimates**

References: XYZ CAP - XYZ-p

Cost Estimating has generated the attached **Planning Estimate for the above-referenced project. Per direction, costs and backup documentation were developed for a 100-year cap. Operational costs to maintain the cap for a period of 30 years have been developed** and are reflected in the attached documentation. The cost estimate totals are as follows:

		"Use" Totals	Cost Totals
1.	100-Year Cap Installation RD/RA Cost Estimate	= $75,000,000	$75,155,000
2.	30-Year Operations and Maintenance Cost Estimate	= $11,500,000	$11,466,000
3.	Cost Account Management and Paperwork Cost Estimate	= $ 743,900	$ 743,900
		$87,243,900	$87,364,900

Documentation developed to substantiate the costs reflected on the attached detailed sheets includes the following:

- A sketch depicting the cap configuration
- Modeling profiles of the final cap configuration
- Summary sheets reflecting unit costs
- Assumptions forming the basis for the costs
- Detailed estimate sheets

The general and administrative (G&A) at a percentage of 30% has been applied according to the current company standard.

If you have any questions, please feel free to contact us at 1(800)555-4735, business hours 8:00 a.m. to 5:00 p.m.

bb

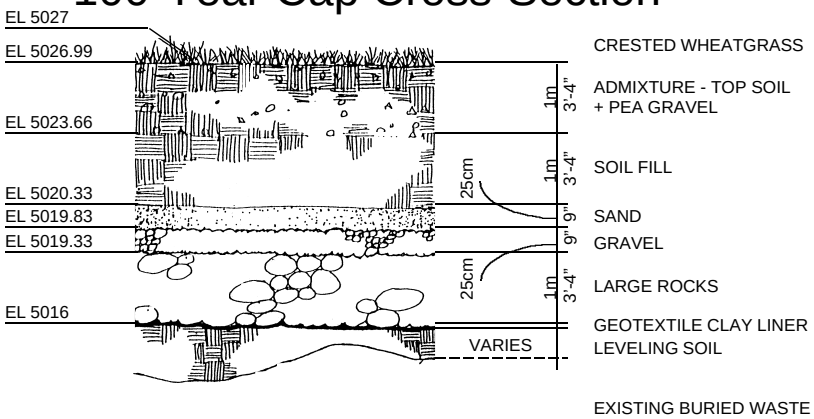
Attachments

cc:
Estimate File #XYZ-p

Notes / Discussion Points / Lessons Learned: _____

XYZ Capping Project

100-Year Cap Cross-Section



5

Discussion Leader/Facilitator Notes: This cross-section shows the layers of materials that make up the 100-year cap. Point out the different layers moving from the bottom to the top.

Notes / Discussion Points / Lessons Learned: _____

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Total Project Cost (Life Cycle)
Cost-Estimate Summary

Project: XYZ CAP
100-Year Cap
Location:
Requester:

Date: 01/02/95
Prep'd By: Various
File No.: XYZ-p

Acct. Number	Description	Bottoms Up Cost Estimate
ER1240	**Project Oversight**	
ER1244001	WAG Management (Cost Account Management cost estimate)	$2,000,000
ER124001	RD/RA Oversight - Subcontractor Proj. Mgmt. (RD/RA cost estimate)	$1,720,000
ER12302206	Remedial Action Report (paperwork cost estimate)	$15,600
ER124004	RD/RA 5 Yr. Review (paperwork cost estimate)	$2,600
ER118006	Construction Project Management (RD/RA cost estimate)	$240,000
ER1210	**Design**	
ER121002	RD/RA SOW (paperwork cost estimate)	$31,200
ER121033	RD/RA Workplan (paperwork cost estimate)	$124,800
ER12100703	Auditable Safety Analysis & Safety Analysis Plan (paperwork cost estimate)	$30,000
ER12103304	QAPjP	$0
ER12103302	Health and Safety Plan	In ASA & SAP
ER12103310	Packaging, Shipping, Transportation Plan (paperwork cost estimate)	$1,200
ER121008	Final Design Construction Document Package (RD/RA cost estimate)	$680,000
ER121008	Title III - Inspection (RD/RA cost estimate)	$160,000
ER121008	Pre-Final Inspection Report (paperwork cost estimate)	$8,100
ER121010	Permitting (RD/RA cost estimate)	
ER12300705	**Construction (RD/RA cost estimate)**	$53,355,000
	(Including GFE, Procurement Fees, and G&A)	
ER123018	**Operations (Operations and Maintenance and cost estimate)**	$8,820,000
	Annual Operations and Maintenance Reports (paperwork cost estimate)	$5,400
ER123015	**Facilities Demolition**	N/A
ER131004	Surveillance and Monitoring	$0
	Subtotal	$67,718,900
	Contingency (RD/RA and Operations and Maintenance cost estimates)	$19,646,000
	TOTAL PROJECT COST IN FY 1996 DOLLARS ESTIMATE	**$87,364,900**

Discussion Leader/Facilitator Notes: This is the Cost-Estimate Summary by WBS.

The total life-cycle cost of this project is detailed in three separate estimates.

Various line items from the summary descriptions are in one of the three estimates. The estimate title inside the parentheses on each summary line indicates the detail estimate that the summary line is part of (i.e., RD/RA cost estimate, operations and maintenance cost estimate, Cost Account Management and Paperwork cost estimate). Following are the three separate cost estimates included in the example:

1. 100-Year Cap Installation RD/RA Cost Estimate,
2. 30-Year Operations and Maintenance Cost Estimate, and
3. Cost Account Management and Paperwork Cost Estimate.

Notes / Discussion Points / Lessons Learned: _____

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Discussion Leader/Facilitator Notes: This is the cost estimate summary for the 100-Year Cap Installation RD/RA costs (not life-cycle costs)

COST ESTIMATE SUMMARY

Project	XYZ Cap	Type of Est	Planning	Date	01/02/95
	100 Year Option	File No	XYZ-p	Chk'd By	
Requester		Prep'd By	BB	Appr'd By	

ENGINEERING, DESIGN AND INSPECTION	5% of Construction Costs and GFE		2,840,000
Title I and II Design	680,000		
Title III Inspection	160,000		
Permitting	2,000,000		
MANAGEMENT			1,960,000
Project Management	1,720,000		
Construction Management	240,000		
CONSTRUCTION COSTS			52,241,000
Division 1 General Requirements	8,810,000		
Division 2 Sitework	43,431,000		
Division 3 Concrete			
Division 4 Masonry			
Division 5 Metals			
Division 6 Wood and Plastics			
Division 7 Moisture Protection			
Division 8 Doors and Windows			
Division 9 Finishes			
Division 10 Specialists			
Division 11 Equipment			
Division 12 Furnishings			
Division 13 Special Construction			
Division 14 Conveying Systems			
Division 15 Mechanical			
Division 16 Electrical			
GOV'T FURNISHED EQUIPMENT (GFE)	30,000		30,000
PROCUREMENT FEES	784,000		784,000
G&A	**300,000**		**300,000**
SUBTOTAL			**58,155,000**
PROJECT CONTINGENCY (29% Subtotal)			17,000,000
Management Reserve	**5,336,000**		
Contingency	**11,664,000**		
TOTAL UNESCALATED			75,155,000

TOTAL ESTIMATED COST: USE $75,000,000

Notes / Discussion Points / Lessons Learned:

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Discussion Leader/Facilitator Notes: The next eight pages provide the estimate scope, basis, and assumptions for the 100-Year Cap Installation RD/RA Cost Estimate.

COST ESTIMATE SUPPORT DATA RECAPITULATION

Page 1 of 8

Project Title: XYZ Capping — Estimator: B.B.
Type of Estimate: Planning — Date: 01/02/95
File No: XYZ-p — Approved By: John Doe, Proj Mgr

I. SCOPE OF WORK

Brief description of the proposed project.

Investigate the capping of Site XYZ, encompassing approximately **90 acres** in area. The capping project is costed for the **cap designed for a 100-year life**. Costs for **30 years of operations to maintain the capping** options have also been estimated. Reference the attached sketch for the configuration of materials constituting the cap.

II. BASIS OF THE ESTIMATE

Drawings, design report, engineers' notes, and/or other documentation upon which the estimate is originated.

Rough Draft of Engineering Assumptions for Cap and Ongoing Communications with cognizant personnel.

III. ASSUMPTIONS

Condition statements accepted or supposed true without proof or demonstration. An assumption has a direct impact on total estimated cost.

The following assumptions have formed the basis for the costs generated for the capping:

GENERAL

(1) All **costs are reflected in current year 1985 dollars. No escalation or discount rates have been applied.**

(2) The estimated duration and **schedule** for this project has been **6 days per week, 10 hours per day** during fair weather. It is assumed that **shutdown will occur with** the initial **onset of winter season** and **actual construction can be conducted for** approximately **(8) months** during the estimated **three years scheduled** for construction, **starting April 1 to the end of November.** The costs are generated for fair weather working conditions and **do not include contingencies or adjustments for overtime or inclement weather protection.**

(3) **No costs have been included for sampling other than those required for construction-related mined material and compaction capping samples.**

- Continued on Page 2 -

Notes / Discussion Points / Lessons Learned: _____

COST ESTIMATE SUPPORT DATA RECAPITULATION
(CONTINUATION)

File No: XYZ-p Page 2 of 8

III. ASSUMPTIONS (Continued)

GENERAL (Continued)

(4) Estimates for the **capping material include a 15% swell adder** to allow for slopes and access to each area.

(5) It is assumed that the entire construction surface area has been approved and released by operational programs to include: (1) **all depressions are filled to grade and meet compaction requirements** to support construction activities, (2) radiological surveys deem the area to have a **contamination-free surface**.

(6) **Costs have not been included for any new major roads or accessways for bicycle or pedestrian traffic.**

(7) **The project will not require any new major utilities or support structures. Costs have not been included for the installation of power, water, sewage, etc. Any utilities** required during the construction phase are assumed to exist, **be readily accessible,** and require minor modifications.

(8) **Construction of 11,000 lf of standard 6-ft-high chain link fence with three-strand barbed wire top and metal posts set in concrete** will provide administrative control around the final capping configuration.

(9) **A new gravel service road will be provided around the perimeter of the cap** for inspection and maintenance.

DEMOLITION

(1) **All existing structures, monitoring wells, and miscellaneous fencing within the construction area presumably will be removed** by others **before the capping subcontract.**

(2) **Only costs for removing the existing 11,000-lf security fence have been included** for demolition within the construction area. Labor costs have been included for cutting existing fence posts and removing the above-ground portion of the fencing materials. The existing fence consists of a 6-ft-high security fence with three-strand barbed wire along the top and concrete set posts.

- Continued on Page 3 -

Notes / Discussion Points / Lessons Learned: _____

COST ESTIMATE SUPPORT DATA RECAPITULATION
(CONTINUATION)

File No: XYZ-p Page 3 of 8

III. ASSUMPTIONS (Continued)

DEMOLITION (Continued)

(3) **Existing roadways, personnel access, drainage ditches, and berms will be covered with a leveling layer** (compacted base) **of soil to a** consistent elevation from which to start the capping cover. **Presumably, the perimeter drainage ditch will not be replaced.**

PERMITTING

(1) The current Environmental Impact Statement (EIS) will cover the necessary permitting for the capping materials.

(2) This project will require the completion of the Environmental Checklist Form for access to the areas containing materials necessary for the cap.

(3) **Costs have not been included for any permitting at this time.**

CAPPING

(1) **Costs have been developed for a 100-year cap**. Capping costs have also been reflected in a unit cost.

(2) Assume that the cap can overextend the boundaries of the current area to allow for gradient slope on all sides. Conflicts with the operational area office shacks and equipment storage piles may exist.

(3) **Drainage will be controlled away from the cap with a perimeter slope** of approximately 3% to 8% and consisting of large rock.

(4) **Existing roadways will withstand the weight and transport of equipment** without any modifications to the equipment or surfaces to support the movement of the equipment.

- Continued on Page 4 -

Notes / Discussion Points / Lessons Learned: _____

COST ESTIMATE SUPPORT DATA RECAPITULATION
(CONTINUATION)

File No: XYZ-p Page 4 of 8

III. ASSUMPTIONS (Continued)

CAPPING

(5) In lieu of radiological surveying of equipment in and out of the site area, independent **material drop areas will be located around the site** to allow for transfer of clean materials. **Drop areas will require costs for the prepping and cleaning** of areas acceptable for stockpiling capping material.

SURVEYING

Surveying will require minimal personal protective equipment (PPE) during the initial phases for protection against the potential for contamination.

Continuous survey will be met by the capabilities of **two full-time crews** for the construction duration.

A **Survey Crew** consists of:
1 Crew Chief
1 Rodman
1 Stakeman
Equipment
Crew Rate = **$95/hr/crew**

CLEARING AND GRUBBING

Remove vegetation (grass) and scarify 2 in. maximum top soil and debris. Assume that the existing grade, after scarifying, will meet the compaction for acceptance of the leveling soil layer.

Minimal PPE will be required for this phase in case of potential insect retaliation. A **productivity factor of 25% has been included** for PPE changeout, four times/day.

- Continued on Page 5 -

Notes / Discussion Points / Lessons Learned: _____

COST ESTIMATE SUPPORT DATA RECAPITULATION
(CONTINUATION)

File No: XYZ-p Page 5 of 8

III. ASSUMPTIONS (Continued)

CAPPING LAYERS

Mining of raw materials from existing pit areas was discussed. The large quantity preliminarily estimated for the capping effort for each layer source was reviewed to identify the potential locations for mining and hauling. Based on the document Gravel/Borrow Resources and Compliance Assessment, dated July 1994, material quantities required appear to be available. The potential borrow areas are as follows:

(1) The **composition of the capping layers are assumed to consist of materials available** and all of these **materials will exist in sufficient quantities** around the Site **and will not have to be hauled in** from other areas. Each site will have a central point of operations that will include office shack, etc.:

Pit run - North Island Field
Sands - Lincoln Boulevard
Pea gravel - Jade Mine
Aggregated - Jade Mine
Large Rock and Gravel - Gravel Pit
Silt/Clay - Rice County
Basaltic Rock - Volcano Area
Top Soil - Assumed available at Jade Mine

(2) A **geotextile liner will be purchased and trucked to site by the subcontractor**.

(3) The inclusion of an asphaltic layer is similar to that of a Permanent Isolation Surface Barrier (PISB). **The asphaltic concrete that is in specified limits aggregate size to 0.5 in. in diameter and requires a spray coat of styrene-butadiene polymer-modified asphalt surface**. Costs will be more expensive for this application in relationship to standard asphaltic pavement. The magnitude of the quantity required for this project will require that **a batch plant be constructed close to the site.**

- Continued on Page 6 -

Notes / Discussion Points / Lessons Learned: _____

COST ESTIMATE SUPPORT DATA RECAPITULATION
(CONTINUATION)

File No: XYZ-p Page 6 of 8

III. ASSUMPTIONS (Continued)

TEMPORARY PROJECT SUPPORT STRUCTURES, LABOR, AND MISCELLANEOUS ITEMS

Allowances have been made for temporary support structures, etc., indigenous to the project, including the following:

(1) Continuous **maintenance and upkeep of access roads will be necessary** because of the deterioration resulting from the high traffic of transporting capping materials. The costs are comprised of

Maintenance crew of use of on-site construction equipment assumed (no additional costs):

1 Grader Operator
2 Loader Operators
1 Water Truck Operator

(2) **Maintenance and repair** required to **service the heavy equipment and vehicles** during construction of the cap **will require the following personnel:**

4 Full-time mechanics
2 Off-shift mechanics
Crew rate = $125/hr

(3) **Temporary decontamination pad makeup and cost was derived from similar projects**. This area comprises a geotextile membrane for the containment of decontamination mediums. Perimeter railroad ties are required for the curbing for the containment. Approximately 400 square ft accommodates a large piece of earth moving equipment.

(4) **Temporary water lagoon with geomembrane liner is required to contain the necessary water to supply the water truck** throughout the capping operation for dust suppression. Assume that the temporary water lagoon will be located adjacent the existing well now being used by the sewage treatment plant.

(5) **Minimal roadway construction, including a ramp configuration, will provide access to designated gates** through the security fence to allow for maintenance and visual inspection of the cap.

- Continued on Page 7 -

Notes / Discussion Points / Lessons Learned: _____

COST ESTIMATE SUPPORT DATA RECAPITULATION
(CONTINUATION)

File No: XYZ-p Page 7 of 8

III. ASSUMPTIONS (Continued)

OPERATIONS (Continued)

(1) **Life-cycle costs will encompass only 30 years. Assume that the only activities that will be required will be visual inspection of surface conditions (repair as necessary) and vegetation control.**

(2) **Maintenance operations of vegetation** will **include the slashing and burning of** the **vegetation and periodic drainage of the site**. These activities have been estimated to include the following personnel:

1	Dump truck with driver	80 hrs
1	Compactor with flame thrower	80 hrs
1	Laborer	40 hrs
	Total hours/yr	200 hrs

(3) **Assume that the well servicing the sewage treatment plant facility will provide the necessary capacity of water** to the project during construction and future irrigation demand to water the surface vegetation of the cap.

(4) **Purchase costs of irrigation equipment have been included in the capital construction costs. Operational costs have been included for annual setup and removal to storage of the above-ground sprinkler system.**

(5) **Visual inspection and minor upkeep and repair of the fence and signage will be required.**

(6) **Administrative controls will be limited, requiring only the installation of a perimeter security fence and permanent signage. A full-time guard will not be needed.**

(7) **Institutional controls** such as alarms and security **will not be required** for the duration of the life of the various caps. **No costs have been included.**

- Continued on Page 8 -

Notes / Discussion Points / Lessons Learned: _____

COST ESTIMATE SUPPORT DATA RECAPITULATION
(CONTINUATION)

File No: XYZ-p Page 8 of 8

IV. CONTINGENCY GUIDELINE IMPLEMENTATION The percentage used for contingency as determined by the contingency allowance guidelines can be altered to reflect the type of construction and the conditions that may affect the total estimated cost.

The complexity of the capping project does not pose extraordinary considerations. However, the immense **volumes of materials required raise the following potential risk questions:**

- **Do sufficient quantities exist on-site?**
- Does the **local subcontracting community** have the **capability** and resources to mine, transport, and place materials equitably and efficiently?
- **Do potential contamination risks exist?**

Contingency analysis results in a range of 30% to 35%.

V. OTHER COMMENTS/CONCERNS SPECIFIC TO THE ESTIMATE

Transporting of raw materials to the construction site may have a major impact on the current unimproved trails at the site.

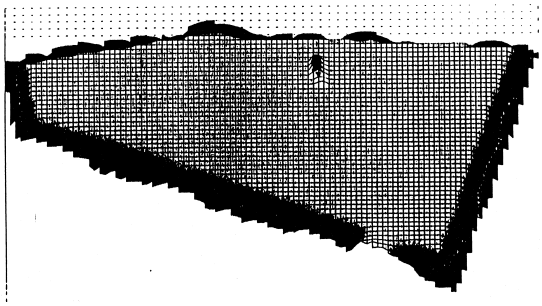
All of the materials presumably can be obtained on-site and can be re-used or stockpiled. If, in fact, materials must be purchased or manufactured off-site and trucked in, the costs would increase dramatically.

This estimate does not account for additional costs for removal around active utilities, buildings, facilities, etc.

Structural analysis will be required to determine the integrity of the waste masses and/or containers in relation to withstanding the weight of the cap and the construction equipment.

Any changes in the permitting requirements or institutional and administrative controls will affect final costs.

Notes / Discussion Points / Lessons Learned: _____



MODELING PROFILE OF FINAL CAP CONFIGURATION - 100-YEAR CAP

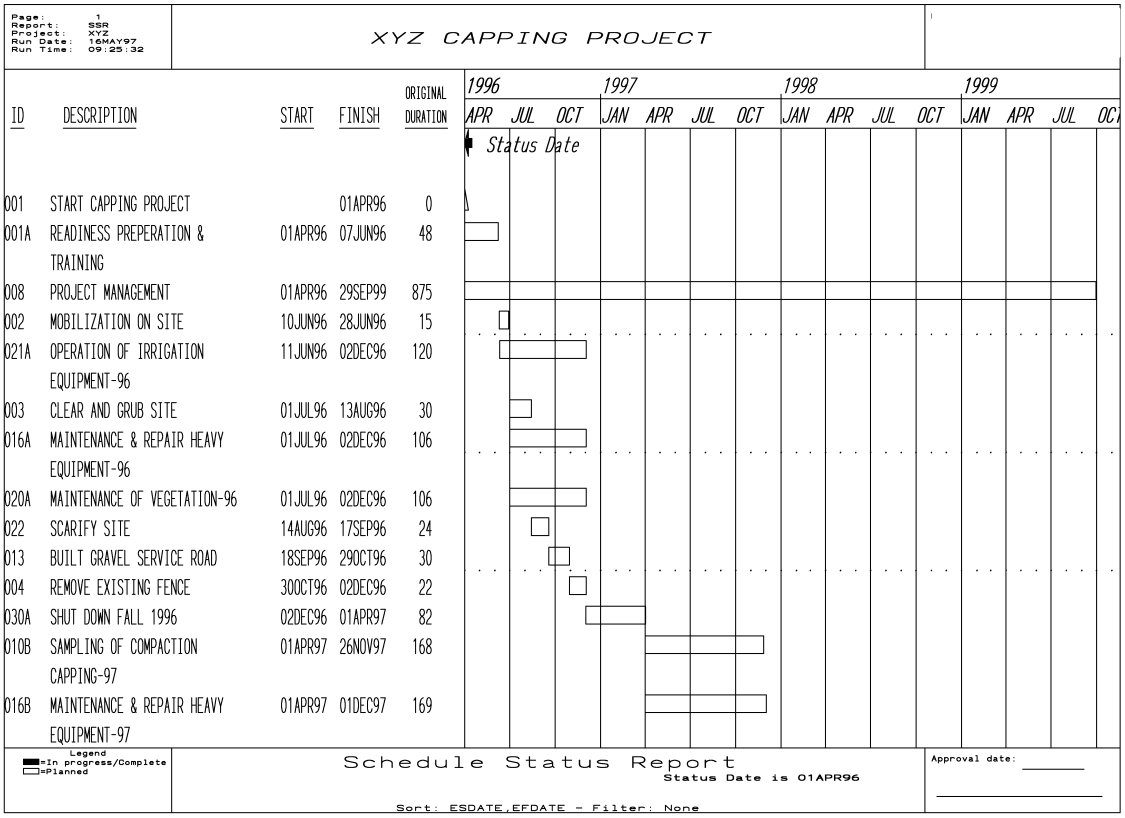
16

Discussion Leader/Facilitator Notes: This is a modeling profile showing the configuration of the 100-year cap.

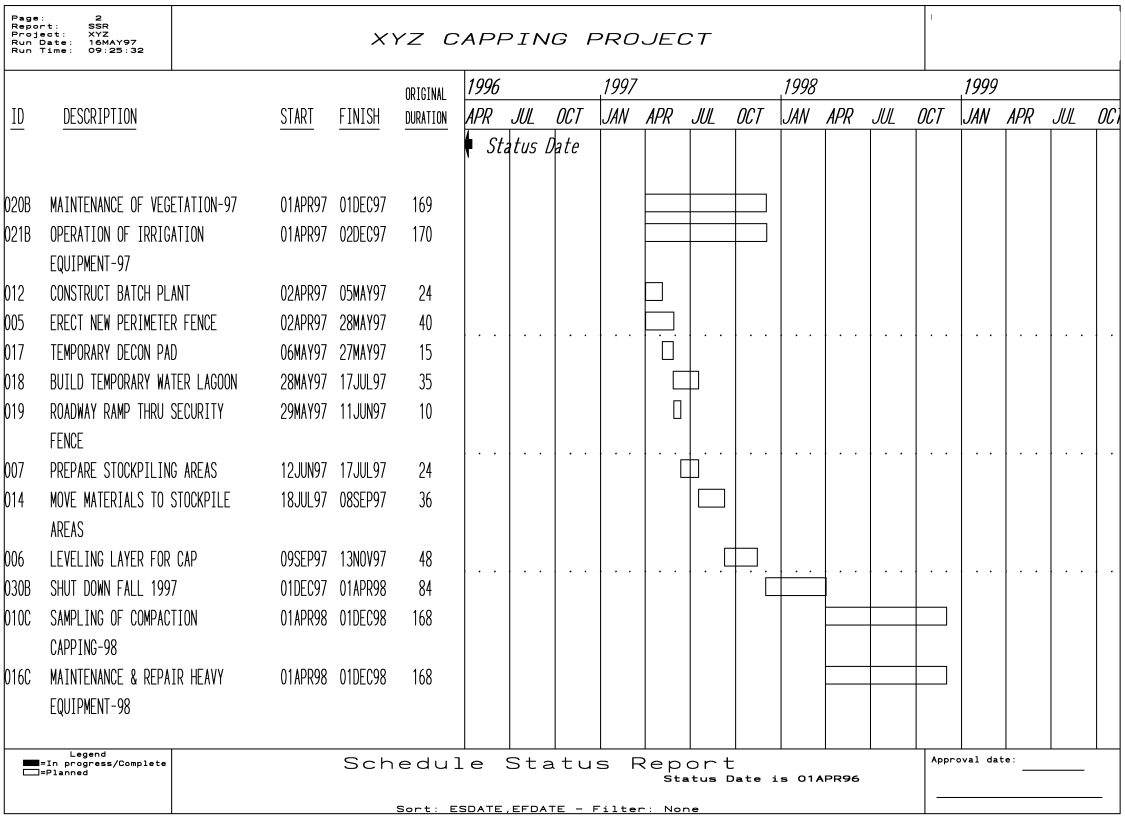
Notes / Discussion Points / Lessons Learned: _____

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Discussion Leader/Facilitator Notes: This bar chart (Gantt chart) shows the scheduled activities for the capping installation from installation project start (April 1, 1996) to installation project completion (September 30, 1999).



Notes / Discussion Points / Lessons Learned: _____



Page: 2
Report: SSR
Project: XYZ
Run Date: 16MAY97
Run Time: 09:25:32

XYZ CAPPING PROJECT

ID	DESCRIPTION	START	FINISH	ORIGINAL DURATION
020B	MAINTENANCE OF VEGETATION-97	01APR97	01DEC97	169
021B	OPERATION OF IRRIGATION EQUIPMENT-97	01APR97	02DEC97	170
012	CONSTRUCT BATCH PLANT	02APR97	05MAY97	24
005	ERECT NEW PERIMETER FENCE	02APR97	28MAY97	40
017	TEMPORARY DECON PAD	06MAY97	27MAY97	15
018	BUILD TEMPORARY WATER LAGOON	28MAY97	17JUL97	35
019	ROADWAY RAMP THRU SECURITY FENCE	29MAY97	11JUN97	10
007	PREPARE STOCKPILING AREAS	12JUN97	17JUL97	24
014	MOVE MATERIALS TO STOCKPILE AREAS	18JUL97	08SEP97	36
006	LEVELING LAYER FOR CAP	09SEP97	13NOV97	48
030B	SHUT DOWN FALL 1997	01DEC97	01APR98	84
010C	SAMPLING OF COMPACTION CAPPING-98	01APR98	01DEC98	168
016C	MAINTENANCE & REPAIR HEAVY EQUIPMENT-98	01APR98	01DEC98	168

1996 1997 1998 1999
APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT

Status Date

Legend
=In progress/Complete
=Planned

Schedule Status Report
Status Date is 01APR96
Sort: ESDATE,EFDATE - Filter: None

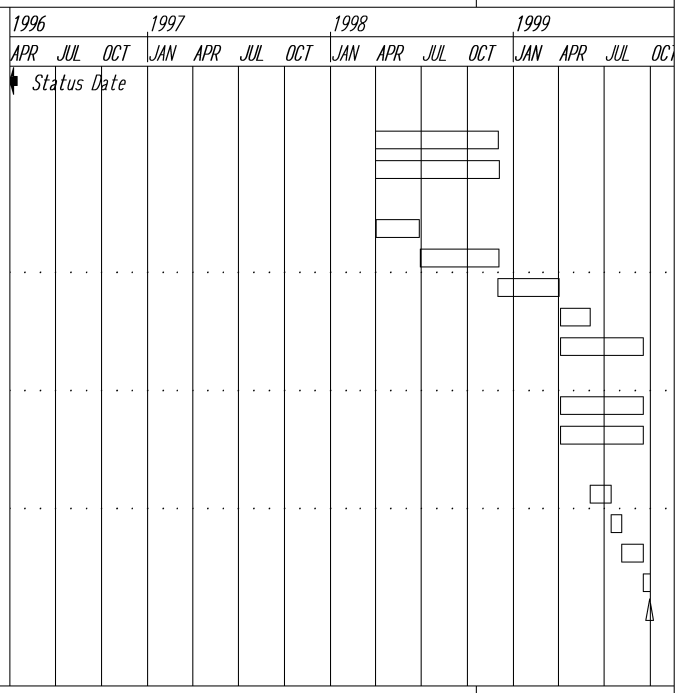
Approval date: _____

Notes / Discussion Points / Lessons Learned: _____

Page: 3
Report: SSR
Project: XYZ
Run Date: 16MAY97
Run Time: 09:25:32

XYZ CAPPING PROJECT

ID	DESCRIPTION	START	FINISH	ORIGINAL DURATION
020C	MAINTENANCE OF VEGETATION-98	01APR98	01DEC98	168
021C	OPERATION OF IRRIGATION EQUIPMENT-98	01APR98	03DEC98	170
025	PLACE GEOTEXTILE LINER	02APR98	26JUN98	60
031	GRAVEL & DIRT FILL - CAP	29JUN98	02DEC98	108
030C	SHUT DOWN FALL 1998	01DEC98	01APR99	84
011	ASPHALTIC LAYER	05APR99	02JUN99	42
016D	MAINTENANCE & REPAIR HEAVY EQUIPMENT-99	05APR99	16SEP99	115
020D	MAINTENANCE OF VEGETATION-99	05APR99	16SEP99	115
021D	OPERATION OF IRRIGATION EQUIPMENT-99	05APR99	16SEP99	115
009	ADD 15% SWELL	03JUN99	14JUL99	28
032	PLANT WHEAT GRASS CAP	15JUL99	04AUG99	15
050	RECLAIMATION OF BORROW PITS	05AUG99	16SEP99	30
015	DEMOBILIZATION	17SEP99	30SEP99	10
060	PROJECT COMPLETION		30SEP99	0



Legend
=In progress/Complete
=Planned

Schedule Status Report
Status Date is 01APR96
Sort: ESDATE,EFDATE - Filter: None

Approval date: _____

Notes / Discussion Points / Lessons Learned: _____

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Discussion Leader/Facilitator Notes: The following pages are printouts of the detailed cost estimate for the 100-Year Cap Installation RD/RA Cost Estimate. This first sheet provides a summary by work element. Following the summary are detailed cost-estimate sheets that provide the detailed estimate.

100-Year Cap Installation
RD/RA Cost Estimate

Page 1 0f 9

Project: XYZ CAP
100-Year Cap - Quantities & Unit Costs
Location: XYZ Plant
Requester: Mary Smith

Source

Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

File No. XYZ-p

Date 01/02/95
Prep-d By DNS/TES
Appr'd By John Doe

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	100 YEAR CAP - EL 5016: EL 5027										
	Cap Cut and Prep Volume:										
	Clear and Grub - 37,088 bcuyd		6,300,000 sqft	0.06					378,000		378,000
	Leveling Soil:										
	Leveling Soil Layer to Grade (include replace clear & grub		1,000,000 bcuyd	6.5					6,500,000		6,500,000
	Cap Layer Log: (Total Cap Fill Volume = 3,261,136 bcuyd										
	Basaltic Rip Rap - 1 m		N/A								
	Bottom Layer Low Permable Soil - 15 cm		N/A								
	Sealed Asphaltic Concrete - 15 cm		N/A								
	Top Layer Low Permeable Soil - 15 cm		N/A								
	Geosynthetic Clay Liner (GLC)		5,000,000 bcuyd	1.8					9,000,000		9,000,000
	Large Rock - 1 m		604,600 bcuyd	7.5					4,534,500		4,535,000
	Gravel - 25 cm		136,000 bcuyd	7.5					1,020,000		1,020,000
	Sand - 25 cm		136,000 bcuyd	9.2					1,251,200		1,251,000
	Soil Fill - 1 m		605,000 bcuyd	7.5					4,537,500		4,538,000
	Admixture - Top Soil & Pea Gravel mix - 1 m Total		605,000 bcuyd	9.7					5,868,500		5,869,000
	Top Soil - 85% = 514,000 bcuyd		include above								
	Pea Gravel - 15% = 91,000 bcuyd		include above								
	Crested Wheat Grass - 6,315,172 sq ft		100 acres	2,000					200,000		200,000
	Perimeter Drainage Slope - Rock		447,000 bcuyd	7.5					3,352,500		3,353,000
	Other Construction Costs		1 lot	15,597,000					15,597,000		15,597,000
	Total Construction Costs										52,241,000
	Project Support Costs		1 lot								
	Engineering, Design and Inspection		1 lot	2,840,000					2,840,000		2,840,000
	Project Management		1 lot	1,720,000					1,720,000		1,720,000
	Construction Management		1 lot	240,000					240,000		240,000
	Government Furnished Equipment (GFE)		1 lot	30,000					30,000		30,000
	Procurement and G&A			1,084,000					1,084,000		1,084,000
	Contingency		1 lot	17,000,000					17,000,000		17,000,000
	TOTAL COST										75,155,000
										USE	**75,000,000**

Notes / Discussion Points / Lessons Learned: _____

100-Year Cap Installation
RD/RA Cost Estimate

DETAILED COST ESTIMATE SHEET (CONT. SHEET)

Page 2 0f 9

Project: XYZ CAP | Type of Est. Planning | File No. XYZ-p | Date 01/02/95

100-Year Cap - Quantities & Unit Costs | Source (E) Eng. Est. | Prep-d By DNS/TES

Location: XYZ Plant | (V) Vendor | Appr'd By John Doe

Requester: Mary Smith | (P) Pur. Order

(H) Handbook Ref.

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	DIVISION 1000 - GENERAL REQUIREMENTS										
	Mobilization/Demobilization of Project Overhead	E	1 lot		80	80	300	24,000			24,000
	Project Office Trailer/Equipment/Supplies	E	24 mths	150	2	48	400	19,200	3,600		22,800
	Full-Time Nonw orking Superintendent/Pickup	E	24 mths	450	1	24	6400	153,600	10800		164,400
	CPM Scheduler	E	24 mths	1000	40	960	36	34,560	24,000		58,560
	Temporary Construction Fencing and Signage	E	11,000 lf	2.5					27500		27500
	Portable Toilets	E	24 mths		6	144	125	18,000			18,000
	Temporary Electrical Hookup to Office Area	E	1 lot	10000					10,000		10,000
	Misc. Consumables & Small Tools	E	24 mths	1000					24,000		24,000
	Final Cleanup	E	1 mths	150					150		150
	Personnel Training										
	Rad. Worker I Training Refresher	E	30 fte		24	720	35	25,200			25,200
	Site-Specific Gate House	E	30 fte		4	120	35	4,200			4,200
	Rad. Worker I Training Refresher (yrs 2)	E	30 fte		24	720	35	25,200			25,200
	Site-Specific Gate House (yrs 2)	E	30 fte		4	120	35	4,200			4,200
	DIVISION 1000 - DIRECT PROJECT OVERHEAD										408,210
	DIVISION 2 THRU 16 - PRIME CONTRACTOR DIRECT CONSTRUCTION COSTS PLUS SUBCONTRACTOR SUPPLIER COSTS, INCLUDING OH&P										33,142,650
	SUBTOTAL COSTS DIVISION 1 THRU 16										**33,550,860**
	DIVISION INDIRECTS OH & P										
	Prime Contractor Overhead @ 12%										4,026,103
	Prime Contractor Profit @ 10%										3,757,696
	Bond and Insurance @ 1.5%										620,020
	INDIRECT PROJECT OVERHEAD - TOTAL AMOUNT										8,403,819
	DIVISION 1000 - DIRECT PROJECT OVERHEAD										408,210
	TOTAL DIVISION 1000 - GENERAL REQUIREMENTS										8,812,029
										USE	**8,810,000**

Notes / Discussion Points / Lessons Learned: _____

100-Year Cap Installation
RD/RA Cost Estimate

DETAILED COST ESTIMATE SHEET (CONT. SHEET)

Page 3 0f 9

Project: XYZ CAP
100-Year Cap - Quantities & Unit Costs
Location: XYZ Plant
Requester: Mary Smith

Source
Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

File No. XYZ-p
Date 01/02/95
Prep-d By DNS/TES
Appr'd By John Doe

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	DIVISION 2000 - SITE WORK										
	Division 02210 - Surveying, Grades, Lines, and Levels										
	Project Layout/control points	E/V	2 crews		200	400	95	38,000			38,000
	Leveling Course/Compacted Soil Base	E/V	2 crews		200	400	95	38,000			38,000
	Large Rock Grade Elevation Survey	E/V	2 crews		200	400	95	38,000			38,000
	Gravel Elevation Survey	E/V	2 crews		200	400	95	38,000			38,000
	Sand Layer Elevation Staking	E/V	2 crews		200	400	95	38,000			38,000
	Soilfill Topsoil Elevation Survey	E/V	2 crews		200	400	95	38,000			38,000
	"As-Builts" and Certification at Each Layer	E/V	2 crews	500	40	80	95	7,600	1,000		8,600
	Office-Plotting and Documents at 10% of Field Time	E/V	2 crews		40	80	95	7,600			7,600
	Subtotal Division 2000 This Section					2,560					**244,200**
	DEMOLITION - SITEWORK										
	Remove Existing Security Fence		11000 lf		0.05	550	45	24,750			24,750
	Remove Miscs. Out Buildings		N/A								
	Subtotal Demolition Division 2000 This Section										**24,750**
	DIVISION 2000 - SITE WORK (Continued)										
	Clear and Grub 2", scrape surface vegetation and debris	E/V	6,3000,000 sf	0					378,000		378,000
	Leveling Layer - Assumed @ Lincoln Blvd										
	Mine material at Lincoln Blvd	E/V	1,000,000 cy	1					1,000,000		1,000,000
	Dozer, loader, clear & grub, place back										
	Haul Clean Fill to Material Stockpile Area	E/V	1,000,000 cy	2					2,000,000		2,000,000
	Haul Clean Fill within Island jobsite	E/V	1,000,000 cy	1					1,000,000		1,000,000
	Loader, truck										
	Place and compact material	E/V	1,000,000 cy	25					2,500,000		2,500,000
	Sheepsfoot compactor, roller, grader										
	Subtotal Division 2000 Sitework This Section										**6,878,000**

Notes / Discussion Points / Lessons Learned: _____

100-Year Cap Installation
RD/RA Cost Estimate

DETAILED COST ESTIMATE SHEET (CONT. SHEET)

Page 4 0f 9

Project: XYZ CAP
100-Year Cap - Quantities & Unit Costs
Location: XYZ Plant
Requester: Mary Smith

Source
Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

File No. XYZ-p

Date 01/02/95
Prep-d By DNS/TES
Appr'd By John Doe

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	DIVISION 2000 - SITE WORK (Continued)										
	Geosynthetic Clay Liner (GCL)	E/V	5,000,000 sf	1.8					9,000,000		9,000,000
	Large Rock Layer - Material from Gravel Pit										
	Mine material at Gravel Pit	E/V	604,600 cy	1					604,000		604,000
	Dozer, loader, clear & grub, place back										
	Haul material to jobsite	E/V	604,600 cy	4					2,416,000		2,416,000
	Loader, truck										
	Place material	E/V	604,600 cy	2.5					1,510,000		1,510,000
	Account Number - 301405										
	Drainage Gravel Layer - Material from North Field										
	Mine material at North Field	E/V	136,000 cy	1					136,000		136,000
	Dozer, loader, clar & grub, place back										
	Haul material to jobsite	E/V	136,000 cy	4					544,000		544,000
	Loader, truck										
	Place and light compact material	E/V	136,000 cy	3					340,000		340,000
	Sheepsfoot compactor, roller, grader										
	Subtotal Division 2000 This Page										**14,550,000**

Notes / Discussion Points / Lessons Learned: _____

100-Year Cap Installation
RD/RA Cost Estimate

DETAILED COST ESTIMATE SHEET (CONT. SHEET)

Page 5 0f 9

Project: XYZ CAP
100-Year Cap - Quantities & Unit Costs
Location: XYZ Plant
Requester: Mary Smith

Source
Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

File No. XYZ-p
Date 01/02/95
Prep-d By DNS/TES
Appr'd By John Doe

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	DIVISION 2000 - SITE WORK (Continued)										
	Sand Filter Layout - Assumed @ Lincoln Blvd										
	Mine material at Lincoln Blvd	E/V	136,000 cy	1					136,000		136,000
	Dozer, loader, clear & grub, place back										
	Haul material to jobsite	E/V	136,000 cy	5.7					775,200		775,200
	Loader, truck										
	Place and compact material	E/V	136,000 cy	2.5					340,000		340,000
	Sheepsfoot compactor, roller, grader										
	Silt Soiler Layer - Material from Rice										
	Mine material at Rice	E/V	605,000 cy	1					605,000		605,000
	Dozer, loader, clear & grub, place back										
	Haul material to jobsite	E/V	605,000 cy	4					2,420,000		2,420,000
	Loader, truck										
	Place and compact material	E/V	605,000 cy	2.5					1,512,500		1,512,500
	Silt Soil/Gravel Mix Layer - Material at Rice										
	Mine Soil material at Rice	E/V	514,000 cy	1					514,000		514,000
	Dozer, loader, clear & grub, place back										
	Mine Gravel material at North Field	E/V	91,000 cy	1					91,000		91,000
	Dozer, loader, clear & grub, place back										
	Mix Soil and Gravel Admixture	E/V	605,000 cy	1					302,500		302,500
	Harrow Loader										
	Haul material to jobsite	E/V	605,000 cy	6					3,448,500		3,448,500
	Loader, truck										
	Place and light compact material	E/V	605,000 cy	3					1,512,500		1,512,500
	Sheepsfoot compactor, roller, grader										
	Subtotal Division 2000 This Page										**11,657,200**

Notes / Discussion Points / Lessons Learned: _____

100-Year Cap Installation
RD/RA Cost Estimate

DETAILED COST ESTIMATE SHEET

Page 6 0f 9

Project: XYZ CAP
100-Year Cap - Quantities & Unit Costs
Location: XYZ Plant
Requester: Mary Smith

Source

Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

File No. XYZ-p

Date 01/02/95
Prep-d By DNS/TES
Appr'd By John Doe

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	DIVISION 2000 - SITE WORK (Continued)										
	Large Rock Perimeter Drainage Slope - Material from Gravel Pit										
	Mine material at Gravel Pit	E/V	447,000 cy	1					447,000		447,000
	Dozer, loader, clear & grub, place back										
	Haul material from to jobsite	E/V	447,000 cy	4					1,788,000		1,788,000
	Loader, truck										
	Place material	E/V	447,000 cy	2.5					1,117,500		1,117,500
	Crested Wheatgrass - Seeding of Cap Area	E/V	100 acres	2000					200,000		200,000
	Above-Ground Irrigation Piping	E/V	1 lot	200,000					200,000		200,000
	Reclamation of Borrow Pit Area										
	Grading and Reseeding	E/V	100 acres	2,500					250,000		250,000
	Division 2000 - Sitew ork Support Equipment and Labor										
	Mobilization and Demobilization of Equipment	E/V	40 pcs		40	1,600	65	104,000			104,000
	Water Truck w ith Teamster for Dust Control	E/V	4 ea		2,560	10,240	85	870,400			870,400
	Water w agon with Operator	E/V	4 ea		2,560	10,240	100	1,024,000			1,024,400
	Grade Checker w ith Pickup Truck	E/V	2 fte		2,560	5,120	40	204,800			204,800
	Mechanic w ith Service Truck	E/V	4 fte		2,560	10,240	45	460,800			460,800
	Subtotal Division 2000 This Page										**6,666,500**

Notes / Discussion Points / Lessons Learned: _____

100-Year Cap Installation
RD/RA Cost Estimate

DETAILED COST ESTIMATE SHEET

Page 7 0f 9

Project: **XYZ CAP**
100-Year Cap - Quantities & Unit Costs
Location: **XYZ Plant**
Requester: **Mary Smith**

Source
Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

File No. XYZ-p

Date 01/02/95
Prep-d By DNS/TES
Appr'd By John Doe

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	DIVISION 2000 - SITE WORK (Continued)										
	Divisions 02700 and 02830 - Allowance Miscellaneous Items and Temporary Structures										
	Lagoon with Liner for Water Fill Station	E/V	1 lot	50,000				complete	50,000		50,000
	Temporary Equipment Decon Pad	E/V	1 lot	25,000				complete	25,000		25,000
	Road Maintenance and Construction	E/V	24 mths	1,000	160	3,840	300	1,152,000	24,000		1,176,000
	Access Roadways, 20" wide, 6" compacted fill	E/V	15,000 lf	95				complete	1,425,000		1,425,000
	Drainage Control	E/V	6 mths	25,000	160	960	300	288,000	150,000		438,000
	Site perimeter fence	E/V	11,000 lf	26				complete	286,000		286,000
	Gate - 24'-0"	E/V	4 ea	400	16	64	33	2,112	1,600		3,712
	Signage - Includes posts where required & Equip.	E/V	50 ea	50	1	50	33	1,650	2,500		4,150
	Division 02840 - Site Markers										
	Brass caps w/3 ea. guard posts	E/V	4 plcs	550				complete	2,200		2,200
	Subtotal Division 2000 This Page										3,410,062
	TOTAL DIVISION 2000										43,430,712
										USE	**43,431,000**
	TITLE I and II Design										
	Title Sheet, Site and Area Map	E	1 dwg	2,500					2,500		2,500
	Civil Drawings										
	Topography	E	16 dwgs	5,000					80,000		80,000
	Contour/Profile	E	60 dwgs	5,000					300,000		300,000
	Cap Sections and Details	E	30 dwgs	5,000					150,000		150,000
	Roadway Sections and Details	E	20 dwgs	5,000					100,000		100,000
	Materials Test Lab	E	1 FTE		320	320	56	17,920			17,920
	Site Investigation/Soils Reports	E	3 FTE		160	480	65	31,200			31,200
	Subtotal Title I and II Design		126 dwgs								681,620
										USE	**680,000**

Notes / Discussion Points / Lessons Learned: _____

100-Year Cap Installation
RD/RA Cost Estimate

DETAILED COST ESTIMATE SHEET (CONT. SHEET)

Page 8 0f 9

Project: XYZ CAP
100-Year Cap - Quantities & Unit Costs
Location: XYZ Plant
Requester: Mary Smith

Source
Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

File No. XYZ-p
Date 01/02/95
Prep-d By DNS/TES
Appr'd By John Doe

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	TITLE III INSPECTION										
	Field Engineer	E	0.5 FTE		3,520	1,760	68	119,680			119,680
	Administrative and Support Costs	E	0.15 FTE		3,520	528	68	35,904			35,904
	Subtotal Title III Costs										155,684
										USE	**160,000**
	PERMITTING										
	Permitting and Legal Counsel	E	1 LS	2,000,000					2,000,000		2,000,000
	TOTAL ENGINEERING DESIGN AND INSP.										2,840,000
										USE	**2,840,000**
	PROJECT MANAGEMENT										
	Project Manager	E	2 FTE		5,200	10,400	85	884,000			884,000
	Project Management Support and Administration	E	1 FTE		5,200	5,200	85	442,000			442,000
	IHs, Rad-Con Techs, Safety, Quality	E	2 FTE		3,520	7,040	56	394,240			394,240
	TOTAL PROJECT MANAGEMENT COSTS										1,720,240
										USE	**1,720,000**
	CONSTRUCTION MANAGEMENT										
	Construction Management	E	2 FTE		3,520	7,040	78	549,120			549,120
	Construction Management Support and Administration	E	0.5 FTE		3,520	1,760	78	137,280			137,280
	Materials Test Lab	E	0.5 FTE		3,520	1,760	56	98,560			98,560
	TOTAL CONSTRUCTION MANAGEMENT COSTS										235,840
										USE	**240,000**

Notes / Discussion Points / Lessons Learned: _____

100-Year Cap Installation
RD/RA Cost Estimate

DETAILED COST ESTIMATE SHEET (CONT. SHEET)

Page 9 0f 9

Project: XYZ CAP
100 Year Cap - Quantities & Unit Costs
Location: XYZ Plant
Requester: Mary Smith

Source
Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

File No. XYZ-p

Date 01/02/95
Prep-d By DNS/TES
Appr'd By John Doe

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	GOVERNMENT FURNISHED EQUIPMENT										
	Personal Protective Equipment Allow ance	E/V	1 lot	30,000					30,000		30,000
	TOTAL GOVERNMENT FURNISHED EQUIPMENT										30,000
										USE	**30,000**

Notes / Discussion Points / Lessons Learned: _____

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Discussion Leader/Facilitator Notes: This is a contingency analysis sheet that shows how contingency was developed.

100-Year Cap Installation RD/RA Cost Estimate

CONTINGENCY ANALYSIS

Project: XYZ Cap
100-Year Cap Quantities & Unit Costs
Location: XYZ Project
Requester: Mary Smith

Source

Type of Est. Planning
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

			PROBABLY % VARIATION					PROJECT CONTINGENCY		Summary
Cost Estimate Element	Escalated Cost	% TC	Prob% Var from Est		Wt % of Prob		Contingency	%	Cost	Total Cost by Element
			(-)	(+)	(-)	(+)				
Title I and II Design	680,000	1	5	30	0.06	0.35	0.31%	1.03%	120,000	800,000
Title III Inspection & Permitting	2,160,000	4	5	30	0.19	1.11	0.98%	3.28%	383,000	2,534,000
General Requirements	8,810,000	15	5	30	0.76	4.54	4.01%	13.38%	1,561,000	10,371,000
Sitew ork	43,431,000	75	5	35	3.73	26.14	23.15%	77.18%	9,003,000	52,434,000
Concrete										
Masonry										
Metals										
Wood and Plastics										
Moisture Protection										
Doors and Window s										
Finishes										
Specialities										
Equipment										
Furnishings										
Special Construction										
Conveying Systems										
Mechanical										
Electrical										
GFE	30,000	0.05	5	30	0.00	0.02		0.05%	5,000	35,000
Subcontract Procurement Fee	784,000	1	5	30	0.07	0.40		1.19%	139,000	923,000
Material handling Fee	300,000	1	5	30	0.03	0.15		0.46%	53,000	353,000
Project Management	1,720,000	3	10	35	0.30	1.04		3.01%	351,000	2,071,000
Construction Management	240,000	0	10	35	0.04	0.14		0.42%	49,000	289,000
Subtotal	58,155,000	100			5.17	33.90				
Calculated Contingency	17,443,870						30.00%			
Resultant TEC	75,598,870									
Rounded TEC	75,000,000									
Project Contingency	17,000,000						29.23%			
Management Reserve	5,336,000									
Contingency	11,664,000									5,336,000
Risk to Project							18.76%			
Total	**75,155,000**								**11,664,000**	**75,155,000**

CONFIDENCE LEVEL AND ASSUMED RISKS:

The Cost Estimate Contingency Analysis Model is based on the applied contingency and the assumptions upon which the estimate was predicated. The model is applied with a suggested risk level of 18% and a level of confidence of 90% that the estimate will fall within the bid range. The Contingency Analysis is based on a weighted average to provide a 90% probability of underrun and a 10% probability of overrun.

CONTINGENCY ANALYSIS GUIDE BY TYPE OF ESTIMATE

Guidelines established by DOE/FM-50, Cost-Estimating Guide Cost Guide, and as presented in the INEL Cost-Estimating Guide.

P lanning 20%-30%
Experimental /Special Conditions Up to 50%
Conceptual 15%-25%
Experimental /Special Conditions Up to 40%
Title I 10%-20%
Title II 5%-15%
Title III/AFC Market Conditions

Notes / Discussion Points / Lessons Learned:

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Discussion Leader/Facilitator Notes: The following pages are printouts of the detailed cost estimate for the 30-year operation and maintenance of the cap. This first sheet provides a summary of the annual cost, then a total 30-year cost. Following the summary are detailed cost- estimate sheets that provide the detailed estimate for the cap operation and maintenance.

30-Year Operations and Maintenance of the Cap

DETAILED COST ESTIMATE SHEET

Page 1 of 4

Project: XYZ CAP Type of Est. Planning File No. XYZ-p Date 01/02/95

100-Year Cap - Quantities & Unit Costs Source (E) Eng. Est. Prep-d By

Location: (V) Vendor

Requester: (P) Pur. Order

(H) Handbook Ref.

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	CAPPING OPERATIONS										
	Annual Summary										
	Maintenance Management										17,000
	Engineering										10,000
	Radcon and Life Safety										7,000
	Capping Grounds										126,000
	Perimeter Fencing										6,000
	Cap Perimeter Flood Control										10,000
	Equipment Maintenance										56,000
	Irrigation										61,000
	Annual Summary Total Cost										293,000
										USE	**293,000**
	30-Year Operations Cost		30 yrs	293,000					8,790,000		8,790,000
	Major Equipment Replacement		2 ea	15,000					30,000		30,000
	Summary Subtotal Cost										8,820,000
	Contingency at 30%										2,646,000
	Summary Total Cost										11,466,000
										USE	**11,500,000**

Notes / Discussion Points / Lessons Learned: _____

30-Year Operations and Maintenance of the Cap

DETAILED COST ESTIMATE SHEET (CONT SHEET)

Page 2 of 4
Project: XYZ CAP Source Type of Est. Planning File No. XYZ-p Date 01/02/95
100-Year Cap - Quantities & Unit Costs (E) Eng. Est. Prep-d By
Location: (V) Vendor
Requester: (P) Pur. Order
(H) Handbook Ref.

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	CAPPING OPERATIONS (cont.)										
	Maintenance Management - Work Package Management and Development, Earned Value Reporting, Cost Accounting, a										
	Facility Manager		1 FTE		32	32	90	2,864			2,864
	Administrative Support		1 FTE		48	48	50	2,400			2,400
	Maintenance Supervisor		1 FTE		24	24	50	1,200			1,200
	Project Controls		1 FTE		80	80	50	4,000			4,000
	Maintenance Operations Foreman		1 FTE		100	100	50	5,000			5,000
	Plant Engineer		1 FTE		40	40	50	2,000			2,000
	Subtotal Maintenance Management										17,464
										USE	**17,000**
	Engineering - Provide Systems Engineering Support for Flood Control, Roads and Grounds, and General Site Maintenance										
	Civil Engineer		1 FTE		160	160	60	9,600			9,600
	Subtotal Engineering										9,600
										USE	**10,000**
	Radcon and Life Safety - Radiation Monitoring Equipment, Calibration and Repair, Preventative and Corrective Maintenance										
	Instrument Tech		1 FTE		32	32	90	2,864			2,864
	Life Safety Tech		1 FTE		48	48	50	2,400			2,400
	Consumable Materials		1 lot	1500					1,500	500	2,000
	Subtotal Radcon/Life Safety										7,264
										USE	**7,000**

Notes / Discussion Points / Lessons Learned: _____

30-Year Operations and Maintenance of the Cap

DETAILED COST ESTIMATE SHEET (CONT. SHEET)

Page 3 of 4

Project: XYZ CAP Type of Est. Planning File No. XYZ-p Date 01/02/95

100-Year Cap - Quantities & Unit Costs Source (E) Eng. Est. Prep-d By

Location: (V) Vendor

Requester: (P) Pur. Order

(H) Handbook Ref.

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	CAPPING OPERATIONS (cont.)										
	CAPPING Grounds-Monsoon Drainage, Subcontract for Road Maintenance including surface w ater, crow ning, dust control, fill , contour subsidences, area cleanup and										
	Equipment Operators		2.5 fte		320	800	50	40,000			40,000
	Laborers		3 fte		320	960	50	48,000			48,000
	Compaction/Flame Throw er		1 lot	29,000					29,000	1,000	30,000
	Consumables		1 lot	7,800					7,800	200	8,000
											126,000
	Subtotal CAPPING Grounds									**USE**	**126,000**
	Perimeter Fencing - Sign Maintenance, Gate Servicing, and General Repair										
	Plant Engineer		1 fte		40	40	50	2,000			2,000
	Laborers		2 fte		40	80	50	4,000			4,000
	Subtotal for Perimeter Fence										6,000
										USE	**6,000**
	Cap Perimeter Flood Control - Inspection, Erosion and Weed Control										
	Equipment Operators		1 fte		40	40	50	2,000			2,000
	Laborers		1 fte		160	160	50	8,000			8,000
	Subtotal Perimeter Flood Control										10,000
										USE	**10,000**
	Equipment Maintenance - Rental of Equipment Including: Scraper, Dozer, Fron Loader, Forklift, and Dump Truck										
	Equipment Rental and Inspection		1 lot	48000					48,000	2000	50,000
	Consumables - Direct Purchases		1 lot	5,500					5,500	500	6,000
	Subtotal for Equipment Maintenance										66,000
										USE	**66,000**

Notes / Discussion Points / Lessons Learned: _____

30-Year Operations and Maintenance of the Cap

DETAILED COST ESTIMATE SHEET (CONT. SHEET)

Page 4 of 4

Project: XYZ CAP
100-Year Cap - Quantities & Unit Costs
Location:
Requester:

Source
(E) Eng. Est.
(V) Vendor
(P) Pur. Order
(H) Handbook Ref.

Type of Est. Planning
File No. XYZ-p
Date 01/02/95
Prep-d By

ACCT NO	DESCRIPTION	E.V. P.H.	MAT'L UNIT	MAT'L UT COST	UNIT LAB HRS	TOTAL LAB HRS	LABOR RATE	LABOR COST	MAT'L COST	OTHER COST	TOTAL COST
	CAPPING MAINTENANCE (cont.)										
	Irrigation - Above Ground Sprinkler System, Annual Installation, Zone Operations and Maintenance										
	Laborers		3 fte		320	960	50	48,000			48,000
	Consumables		1 lot	10,000					10,000	200	10,200
	Electrical Usage (60 HP for 3 mths)		100,000 kWh	0.03					3,000		3,000
	Subtotal Irrigation										61,200
										USE	**61,000**

Notes / Discussion Points / Lessons Learned: _____

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Discussion Leader/Facilitator Notes: This is a cost estimate to provide The Cost Account Manager and CERCLA Paperwork activities for this project during cap installation. These are owner cost items that are not included in the 100-Year Cap Installation RD/RA submitted detailed estimate.

NOTEGRAM

Date: January 4, 1995
To:

From:

Subject: XYZ Project - Cost Account Management and Paperwork Cost Estimate

References: (1) ABC Sewer Pond Lining Project Cost Plans
(2) Verbal communication with ABC Engineers

The Cost Account Estimate has generated the following cost information **to be used as cost basis for the XYZ Capping Project Cost Account Management and Paperwork costs**.

Cost Account Management costs for 3 years have been developed and are $525,000. Paperwork associated with CERCLA projects are estimated at $218,900. The total cost equals $743,900.

If you have any questions or concerns, please feel free to call us at 1-800-555-4735 during business hours (8:00 a.m. to 5:00 p.m.).

Please see the attached details.

cc: Estimate File #XYZ-p

Notes / Discussion Points / Lessons Learned: _____

FY 1997 Cost Account Management Cost-Estimate activities:

- Change Control preparation @ 40 hours/year = 40 hrs, assumes (1) Group I.
- Corrective Action Planning/Implementation @ 100 hrs/year (UPG=5 hrs).
- EAC preparation @ 3 hrs/month = 36 hrs (UPG 48 hrs).
- Ensure compliance of government regulation @ 4 hrs/month = 48 hrs (UPG 96 hrs).
- Meetings w/ support organizations @ 4 hrs/week = 208 hrs (UPG = 96-192 hrs).
- Meetings w/ routine technical support @ 8hrs/week = 416 hrs (UPG = 96-192 hrs).
- Cost Account Management Plan preparation @ 40 hrs/year = 40 hrs (UPG = 80 hrs.)
- Monthly Report @ 4 hrs/month = 48 hrs (UPG = 4hrs).
- Weekly Meeting @ 2 hrs/week = 104 hrs (UPG = 416).
- Weekly Report @ 2 hrs/week = 104 hrs (UPG = 52 hrs).
- Weekly Statusing @ 3 hrs/week = 156 hrs (UPG = 52 hrs).
- Update Unit Price Guide book (twice per year) @ 40 hrs/year = 40 hrs (UPG = 40 hrs).
- Mid-year review @ 20 hrs/year = 40 hrs (UPG = 80 hrs).
- Year-end review @ 40 hrs/year = 40 hrs (UPG = 120 hrs).
- Quarterly reviews @ 20 hrs/year = 20 hrs (UPG = 40 hrs).
- Audit participation @ 100 hrs/year = 100 hrs, assumes 100 hrs for nonfield audits, (UPG = 100-250).
- Required training/meetings @ 240 hrs/year = 240 hrs (UPG = 300 hrs).
- Special requests @ 2 hrs/week = 104 hrs (UPG = 208 hrs).
- Subcontract preparation & support @ 4 hrs/month = 48 hrs (UPG = 52 hrs).
- Variance analysis @ 1 hr/week = 52 hrs (UPG = 104 hrs).
- Weekly Gantts for meetings @ 2 hrs/week = 104 hrs (UPG = 104 hrs).
- Self-assessments @ 1 hr/week = 52 hrs (UPG = 208).
- Uncosted obligations analysis @ 1 hr/month = 12 hrs (UPG = 104 hrs).
- Staff meeting @ 1 hr/week = 52 hrs (UPG = No Data)
- Travel to and from site/main office @ $1000/trip for 1 trip/2 people x 2 trips/month x 8 months/year = $32000/year (UPG = No Data).

Labor Costs 2204 hours x $65.00 =	$143,260
Nonlabor Costs	$ 32,000
Total Costs/Year	$175,260

(Use $175,000)

Life-Cycle Costs = $175,000 x 3 years = $525,000

Notes / Discussion Points / Lessons Learned: _____

Section 3.3: Cost-Estimate Validation Example/Lessons Learned

Scope of Work: (Concise description of objective and work to be performed)

This list collects the costs associated with Cost Account Management Plan for conducting the CERCLA Process for the XYZ Capping Project. These Cost Account Management Plan and interface support activities include but are not limited to the following activities:

- Developing and negotiating the work scope, assumptions, deliverables, schedules, milestones, prerequisites, resource analyses, and cost estimates for current and future Cost Account Management;
- Preparing Cost Account Management;
- Assisting and supporting audits and preparing responses to audit findings;
- Defining, planning, scheduling, and negotiating work performed by support organizations;
- Providing Cost Account Management status as required (weekly, monthly, and as requested), including cost and schedule variance, variance analysis, problems analysis, corrective action initiatives, milestone status, and "at completion" projections;
- Ensuring performance of work as planned;
- Maintaining proper change/revision control of the Cost Account Management;
- Initiating and completing corrective actions as required;
- Performing all administrative and technical tasks associated with bringing a subcontractor on board to perform services (award subcontract, track subcontract progress, attend scoping meetings, etc.); and
- Supplying necessary training to individuals supporting the XYZ Capping Project [including, but not limited to Occupational Safety and Health Administration (OSHA), Radworker, Respirator, Safety, Waste Minimization, and Risk Assessment].

The Products and Deliverables for the Cost Account Management will be as follows:

- Weekly/monthly reports,
- Required/supplemental training completed/documented,
- FY Cost Plans,
- Special reports/presentations, and
- Audit response.

Bases of Estimate

1. ABC Sewer Pond Lining Project Cost Account Management Actuals
2. Verbal communication with ABC engineering
3. FY 94 Unit Price Guide for ER1170.01. (Estimates differing from those found in ER1170.01 are based on actuals.)

Assumptions (Identify assumptions made when developing the Work Scope.)
The intensity of project management involvement remains at the same level of Project Management and Cost Account Management control as the ABC Pond Lining Project.

Contingency Guidelines
No contingency has been applied to this work scope.

Other comments/concerns specific to the estimate
None.

Notes / Discussion Points / Lessons Learned: _____

Paperwork Cost Estimate

Remedial Action Report	2 people at $65/hr x 40 hr/wk x 3 weeks =	$ 15,600
RD/RA 5-Year Review	1 person at $65/hr x 10 hr/wk x 4 weeks =	$ 2,600
RD/RA SOW	3 people at $65/hr x 40 hr/wk x 4 weeks = (comparable to XYZ Capping RI/FS SOW)	$ 31,200
RD/RA Work Plan	4 people at $65/hr x 40 hr/wk x 12 weeks= (comparable to ABC Sewer Pond Lining RI/FS Work Plan)	$124,800
Auditable Safety Analysis Safety Analysis Plan Health and Safety Plan	Contract Price of Palms, Ltd. = (in above contract) (in above contract) (comparable to XYZ Capping RI Safety Documentation)	$ 30,000
Packaging, Shipping, Transportation Plan	1 person at $120/hr x 10 hr = (modifying FY 93 plan)	$ 1,200
Pre-Final Inspection Report	2 people at $45/hr x 30hr/wk x 3 weeks = (comparable to ABC Sewer Pond Lining Pre-Final Inspection Report)	$ 8,100
Annual Operations and Maintenance Report	1 person at $45/hr x 40hr/wk x 3 weeks = (comparable to ABC Sewer Pond Lining Annual Report)	$ 5,400
	Paperwork Total Costs	$218,900

Notes / Discussion Points / Lessons Learned: _____

How to Validate a Cost Estimate

For each step of the validation process we will

1. **Apply the step to an example project.**
2. **Discuss and share lessons learned.**

38

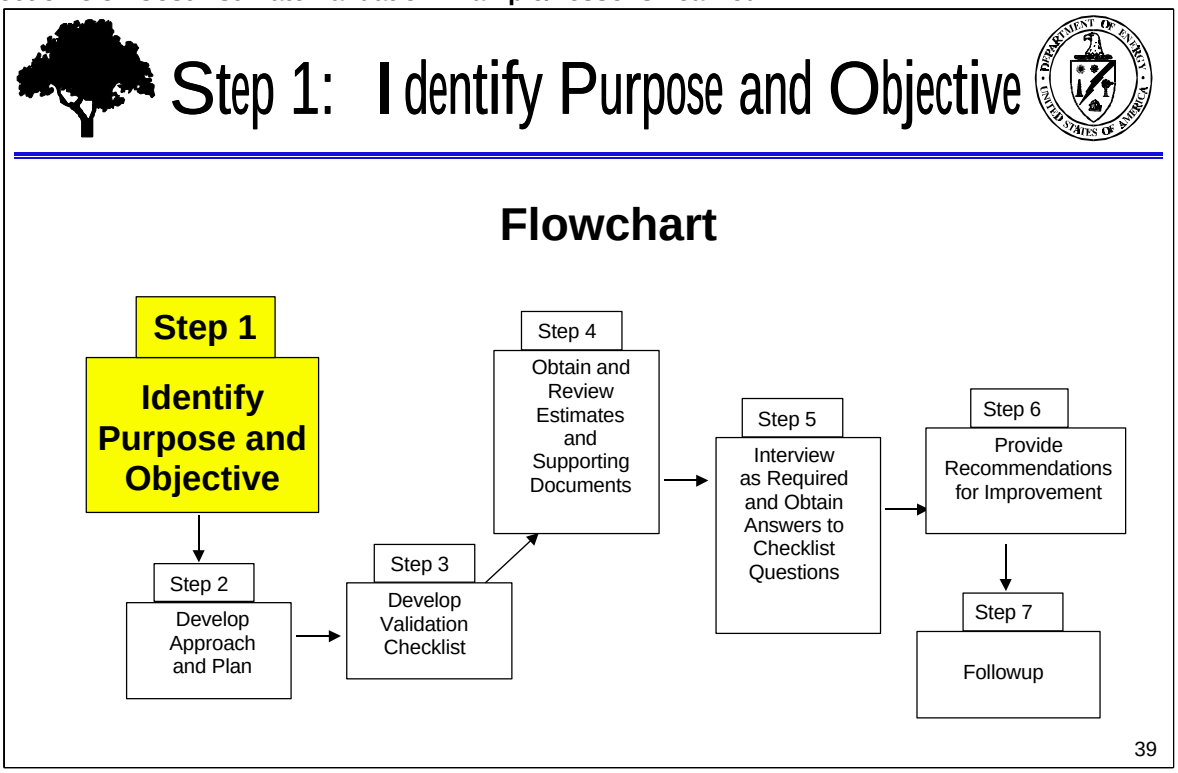
Discussion Leader/Facilitator Notes: Ensure that the group understands that without all necessary documentation, we are concentrating on the thought process necessary to validate the baseline. Where possible, answers have been given for the questions. The facilitator should put the flowchart process presented in Section 3.2 on the second projector. Point out that the material that is coming has so much detail that many slides are needed to cover the subject. Our attempt will still be to discuss the application to our example problem.

The process we will use for walking through the cost-estimate validation process is to take each step of the estimating process and

1. Apply the step to an example project (XYZ Capping Project).

2. As applicable, discuss results of the example problem and related issues of interest, and share any lessons learned.

Notes / Discussion Points / Lessons Learned: _____



Discussion Leader/Facilitator Notes: The steps of the validation process just discussed in Section 3.2 will be used to demonstrate the application to the example problem. Put the validation flowchart on one projector and the individual step overheads on the second projector. The facilitator is to provide the validation request and supporting project information. As a group example, discuss and identify the validation purpose and objectives.

Application to the XYZ Capping Project - Step 1

As a group, identify the validation purpose and objectives

Q What is the purpose of the validation?

A

1. To validate the cost baseline for the XYZ Capping Project to substantiate requested funding.
2. To validate the cost estimate to provide a baseline for performance in project execution.
3.

(Continued on next page)

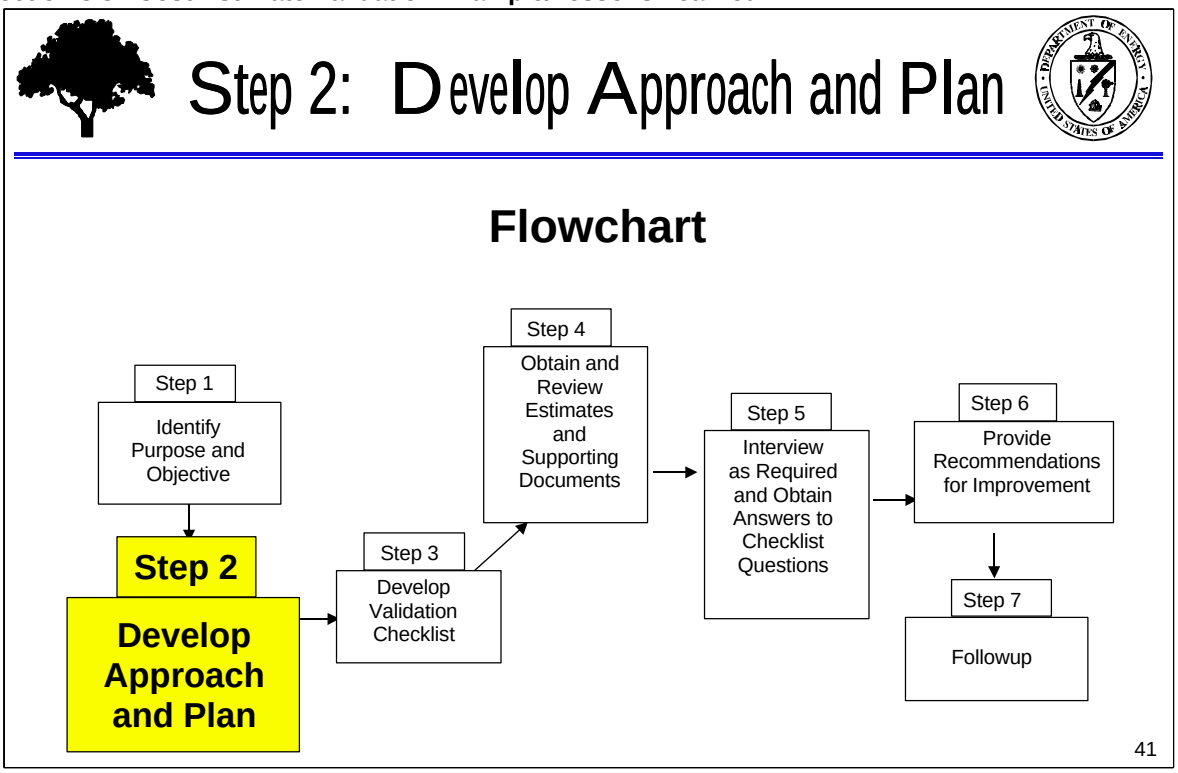
Notes / Discussion Points / Lessons Learned: _____

Q What are the objectives of the validation?

A

1. To substantiate the reasonableness and accuracy of the estimate by which funding can be requested and supported.
2. To review the amount of technical scope available.
3. To ensure that a "good" resource-loaded schedule exists.
4. To look at the quality of the cost estimate.
5. To ensure that the cost estimate is consistent with the technical scope.
6.
7.
8.

Notes / Discussion Points / Lessons Learned: _____



Discussion Leader/Facilitator Notes: For application of Step 2 to the XYZ Capping Project, lead the group in discussing and determining the validation type and whether team or individual skills are needed for validating and developing a validation schedule.

Application to the XYZ Capping Project - Step 2

Q As a group, determine the validation method and schedule:

- Determine the type of validation that is required.
- Select a team or an individual.
- Define the skills needed for validation.
- Develop a validation schedule.

A **Type of validation:** (refer to Section 3.1 for validation types)

An Independent Cost Review team will meet to validate the reasonableness and accuracy of the baseline estimates and the funding request. An Independent Cost Review will be less expensive and time-consuming than an Independent Cost Estimate. (Independent Cost Review is chosen.)

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

Team or individual:

Team (This option was specifically requested in the validation request memorandum because of the political sensitivities of this project.)

Skills needed for validation:

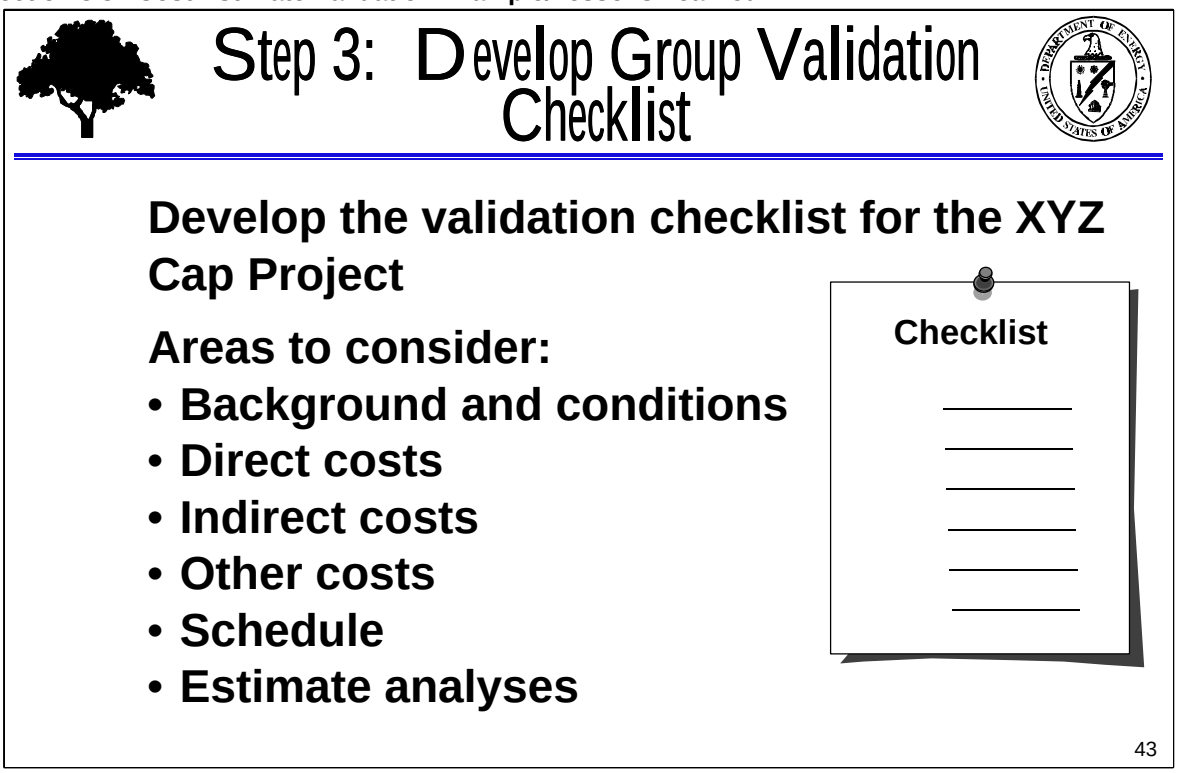
1. Scheduler
2. Finance Expert
3. Field Engineer/Manager
4. Design Engineer
5. Estimator
6. Program/Project Management
7. Team Leader
8. Remediation Scientist
9.
10.
11.

Validation schedule:

Because this is a single project, we will have a short-duration schedule. Activities might include the following:

1. Form a team,
2. Develop a plan,
3. Collect information,
4. Review the facts,
5. Review the scope for internal consistency and not correctness,
6. Review the schedule for internal consistency and not correctness,
7. Validate the manpower/dollar estimate,
8. Validate the cost baseline,
9. Review the information with project personnel,
10. Prepare a report, and
11. Followup.

Notes / Discussion Points / Lessons Learned: _____



Discussion Leader/Facilitator Notes: The facilitator is to lead the group in discussing the development of a validation checklist for the Cap Project Facilitator by which he/she will refer participants to examples in Section 3.2 to help develop the checklist.

Application to the XYZ Capping Project - Step 3

Q Develop a checklist for background and conditions, direct costs, indirect costs, other costs, schedule, and estimate analysis.

A Develop a validation checklist for the Cap Project.

1. Is the estimate current?
2. Are all of the components of the project scope addressed in the estimate?
3. Are the scope statements clear?
4. Is the documentation provided complete?

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

5. Are the assumptions consistent with the scope?
6. Is the detailed cost estimate consistent with the assumptions and the scope?
7. Was estimating software used? What was the name of the estimating software package?
8. How many revisions has the estimate undergone?
9. Who reviewed and approved the estimate?
10.
11.
12.

Direct costs:

1. What method was used for obtaining labor hours?
2. Where did quantities come from?
3. Were productivity and/or job factors used? Were they properly applied to the estimate?
4. Were correct wage rates used?
5. Were rates loaded or unloaded?
6. Have all direct costs been included?
7. Are labor rates proper?
8. Have job factors been considered?
9.
10.

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

Indirect costs:

1. Have overheads been appropriately applied?
2. Do we have omissions in the overhead?
3. Do we have duplications of overhead?
4. Have overheads been properly applied?
5. Are indirect costs appropriate for the length of the project?
6.
7.

Other costs:

1. Are taxes included in the estimate?
2. Are proper DOE escalation rates used and correctly applied?
3. Is project risk accounted for in the estimate and schedule?
4. Are taxes included in costs?
5. Is project risk included in costs?
6. Have DOE-published escalation rates been calculated correctly?
7.
8.

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

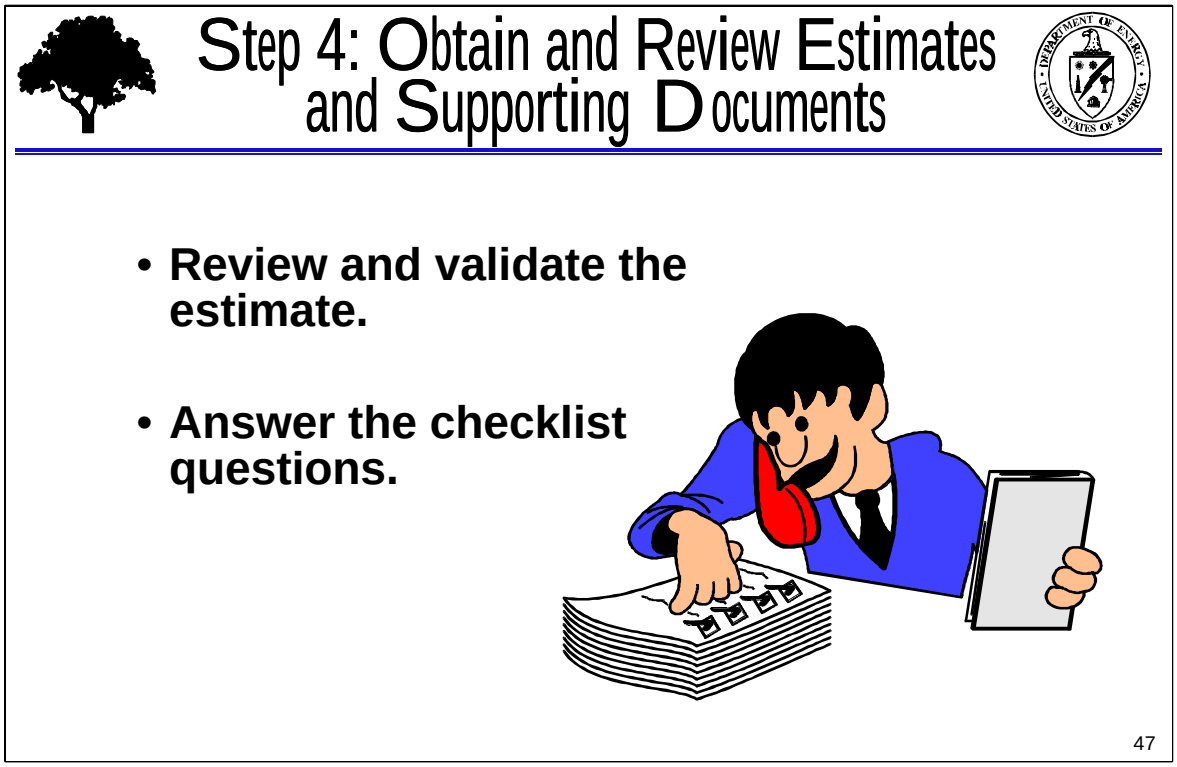
Schedule costs:

1. Is there a schedule?
2. Does the schedule include all of the technical scope?
3. Are activity durations realistic?
4. Is the schedule logical? Is the logic correct?
5. Are both the estimate and the schedule consistent?
6. Are costs assigned at the activity level?
7. Are activity durations correct?
8. Are both the estimate and schedule activities consistent?
9.

Estimate analysis:

1. Are labor rates correct?
2. Does the estimate match the technical scope and the schedule?
3. Does the funding request match the project plan?
4. Is contingency included? Is it the right amount of contingency for the technical scope?
5. At what level is contingency applied?
6. What type of estimate and approach were used?
7. Will we check spreadsheet calculations?
8.

Notes / Discussion Points / Lessons Learned: _____



Discussion Leader/Facilitator Notes: As a group, review the project documents, answer the checklist questions, and make a list of areas requiring further examination.

Application to the XYZ Capping Project - Step 4

Because of time constraints, we will obtain answers to only a few of the checklist questions.

Review the estimate and supporting documents to answer the following checklist items. (From these answers, a list of questions or areas would be made for areas in the estimate that require further examination.)

Q Is the estimate current?

A

According to General Assumption 1, on Page 1 of the Cost Estimate Support Data Recapitulation, the estimate reflects "1985" dollars. This is consistent with dates on all supporting information.

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

Q Are all of the components addressed?

A No.

Surveillance and Monitoring (S&M) is not addressed. No costs, scope statements, or assumptions are relevant to S&M, even through the potential exists for large S&M costs over 30 years of operations or 100 years of institutional control. Historical costs for a Radiological Disposal area at a DOE facility have run $270,000/year. Using the historical costs to estimate 30 years of S&M, $8,100,000 would be required to cover this element. This is a large cost not to have been addressed.

Q Are scope statements clear?

A Yes, in general.

However, in the paperwork section of Project Management Costs is a very poorly documented assumption, and an unnecessary plan is possibly indicated. A general site layout or description would also be helpful to define how large this site is and what the site conditions are.

Q Is the documentation provided complete?

A Not as complete as it should be.

The ingredients that should be included in an estimate package (Section 1.9) compared with what is provided are as follows:

- Document ownership - a cover memo is provided, and estimate assumptions are signed by the project manager, and the fact that the 100-Year Cap Installation RD/RA estimate is a planning estimate is documented throughout the package.
- Identification of source documents - identification of source documents is provided as “rough draft of Engineering Assumptions for cap and ongoing communications with cognizant personnel.”
- Work breakdown structure, code of account structure, and summarization of estimate are not explicitly defined, making understanding the summaries provided or comparing them with the detailed backup somewhat confusing. The detail sheets have a column defined for “Acct No.,” but it is not filled in.

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

- Schedule - a schedule Gantt chart is provided, and general schedule assumptions are included in the 100-Year Cap Installation RD/RA estimate support data recapitalization. Determining whether the schedule has been or could be resource loaded is difficult because schedule activities do not correspond to the estimate summaries provided.
- Quantity survey - Because the 100-Year Cap Installation RD/RA Cost Estimate is a planning estimate with only a rough draft of engineering assumptions, telling how quantities were obtained/calculated is difficult (e.g., determining how 6,300,000 square ft of clearing and grubbing was calculated: 90 acres x 43,560 square ft/acre = 3,920,400). This difficulty raises the question of the size of the site.
- Units-of-measure acronyms are not defined.
- Source of rate (labor and equipment), pricing, burdens, or markups are not explicitly provided.
- Temporary support structures and labor assumptions and estimates are provided in detail.
- Contingency evaluation is very clearly provided for cost on the 100-Year Cap Installation RD/RA estimate; however, schedule contingency does not appear to be evaluated. Contingency evaluations are not included for the other two estimates.
- A revision log or indication of previous estimates is not provided.
- Indication of reviews and reviewers' signoff are not included.
- Back-up supporting documents or attachments are not included.

Q Are the assumptions consistent with the scope?

A Yes, in general.

However, Assumption 3 under capping layers indicates that an "Asphaltic Layer" is part of the estimate, but neither the drawing nor the cost estimate indicates the presence of this layer. Is the assumption correct and the estimate detail incorrect, or vice versa?

Q Is the detailed cost estimate consistent with the assumptions and the scope statement?

A Yes, in general, but some inconsistencies exist:

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

- Project management costs are calculated for only 1 year, when they should have been calculated for all 3 years of construction.
- Permitting costs are included in the detailed estimate, whereas Assumption 3 under permitting specifically excludes permitting scope from the estimate.
- The contingency analysis amount does not match the contingency amount on the summary estimate sheet.
- The contingency analysis sheet indicates that cost items are “escalated cost” where the assumptions stated that costs were not escalated.
- Comparing summary costs to the detail provided is difficult.
- The cost-estimate cover letter states G&A is 30%. This is inconsistent with the estimate summary amount.

Q Was estimate software used? What was the name of the estimating software package?

A It is hard to tell by the information provided.

Q How many revisions has the estimate undergone?

A Revision log or references are not included in the package

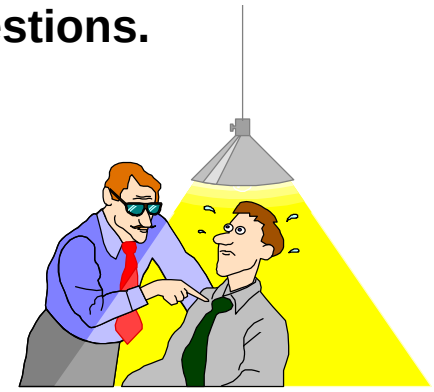
Q Who reviewed and approved the estimate?

A Other than the name of the project manager, reviewer information is not provided.

Notes / Discussion Points / Lessons Learned: _____

Step 5: Interview as Required and Obtain Answers to Checklist Questions

Interview as required to obtain answers for unresolved checklist questions.



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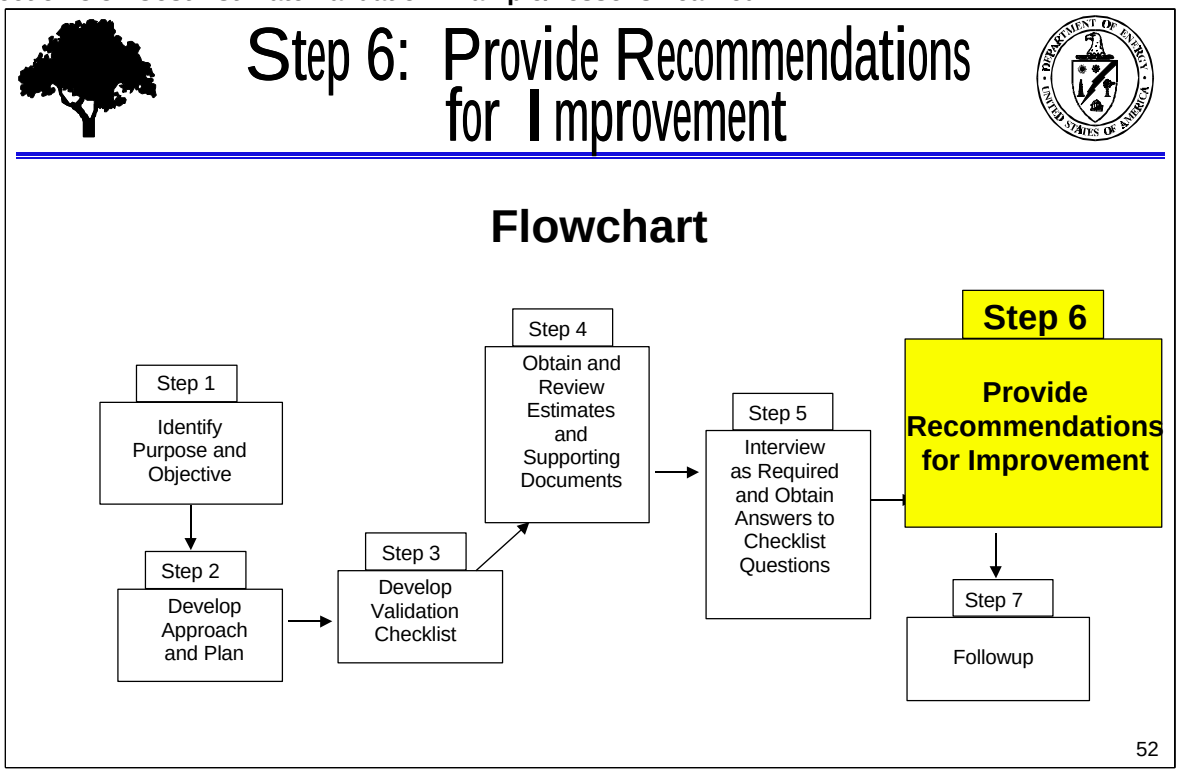
Discussion Leader/Facilitator Notes: At this point, the project team will be interviewed and questioned to obtain answers to questionable items.

Application to the XYZ Capping Project - Step 5

At this point, the project team will be interviewed and questioned to obtain answers to questionable items.

Caution:
The interview should not be an interrogation.

Notes / Discussion Points / Lessons Learned: _____



Discussion Leader/Facilitator Notes: The facilitator is to lead the group through defining recommended improvements based on the estimate reviews and validation findings.

Application to the XYZ Capping Project - Step 6

Q As a group, make a list of identified potential improvements.

A

1. Add the S&M cost, scope, and schedule to the estimate, or address why S&M is not required on this project.

2. Clarify the "Cost Account Management and Paperwork" cost estimate to better explain why these costs are in a separate estimate from the 100-Year Cap Installation RD/RA costs estimate.

3. Provide general site layout information.

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

4. Provide WBS or summarization structure that would clarify how detail has been summarized.

5. Identify if the schedule is resource loaded.

6. Provide additional estimate backup that defines how quantities were calculated/obtained and the source of rates, pricing, markups, and burdens.

7. Reconcile the difference in contingency amounts between the contingency analysis and the cost summary.

8. Provide an estimate revision log or indicate the estimate as Revision 0.

9. Reconcile whether the cap will include an "asphaltic layer," and ensure that the drawing, scope, and estimate reflect the same information.

10. Correct the calculation of project management costs to include 3 years of project management instead of 1 year.

11. Reconcile whether permitting will be required, and ensure that the assumptions and the estimate reflect the same information.

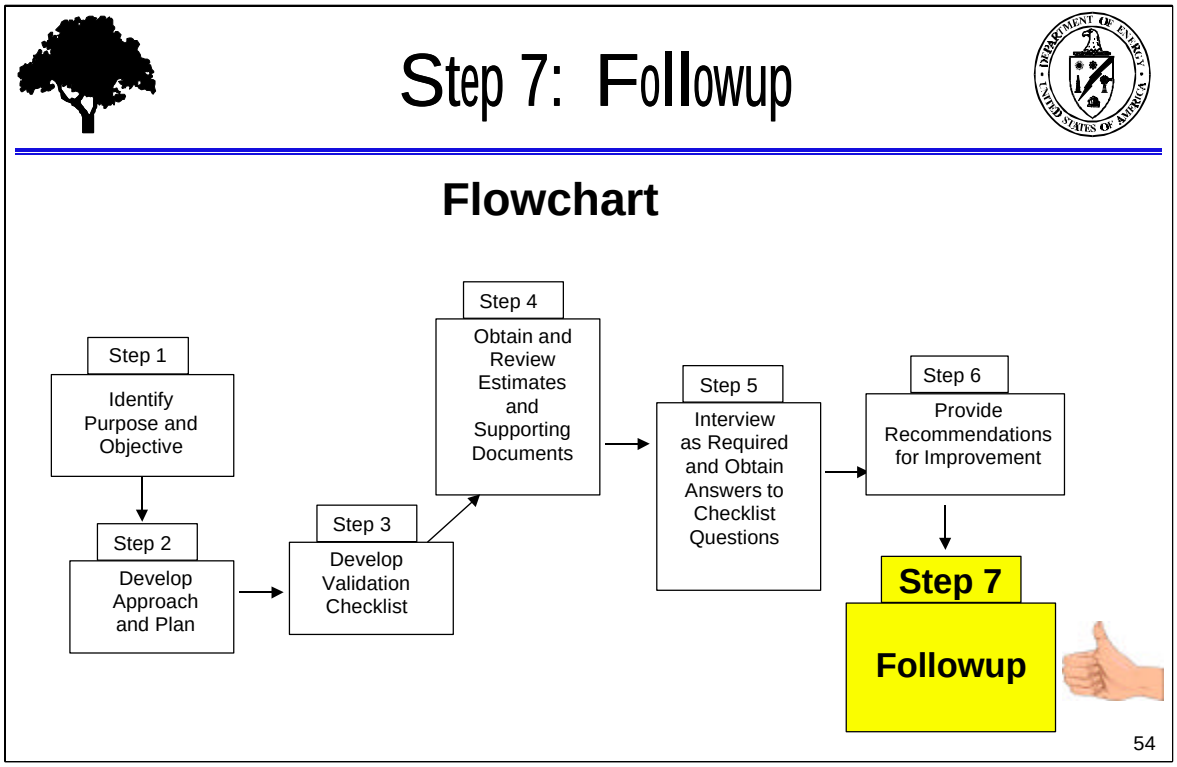
12. Reconcile whether costs are escalated, and either change assumptions or change the contingency analysis sheet to "unescalated costs."

13.

14.

15.

Notes / Discussion Points / Lessons Learned: _____



Discussion Leader/Facilitator Notes: The facilitator is to lead the group through defining follow-up steps that will support implementation of recommended improvements.

Application to the XYZ Capping Project - Step 7

Q As a group, discuss plans for ensuring that improvements are implemented.

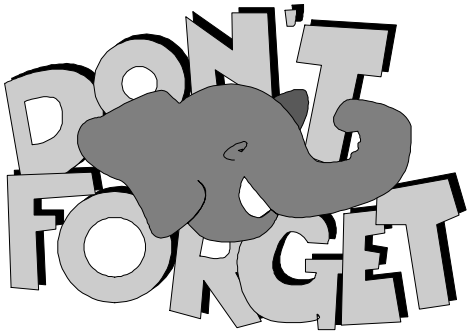
A

1. Get a monthly status report of the implementation of recommended improvements.
2. Get an implementation schedule of improvements.
3. Make a follow-up visit to discuss the status of improvements.
4.
5.

Notes / Discussion Points / Lessons Learned: _____

Summary

Key Points to Remember



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Key points to remember on baseline cost-estimate validations include the following:

- Provide the team with a clear sense of the validation purpose and approach.
- Instill an attitude of support and peer review rather than “what you did wrong.”
- Commit to meeting the validation schedule.
- The validator leader is the central point of contract for coordinating the validation meeting and scheduling any follow-up actions.
- The validator leader is in charge of the validation close-out meeting and has the ultimate responsibility for providing the validation report.
- The validators also set the ground rules by which validation support contractors participate in the validation meetings.

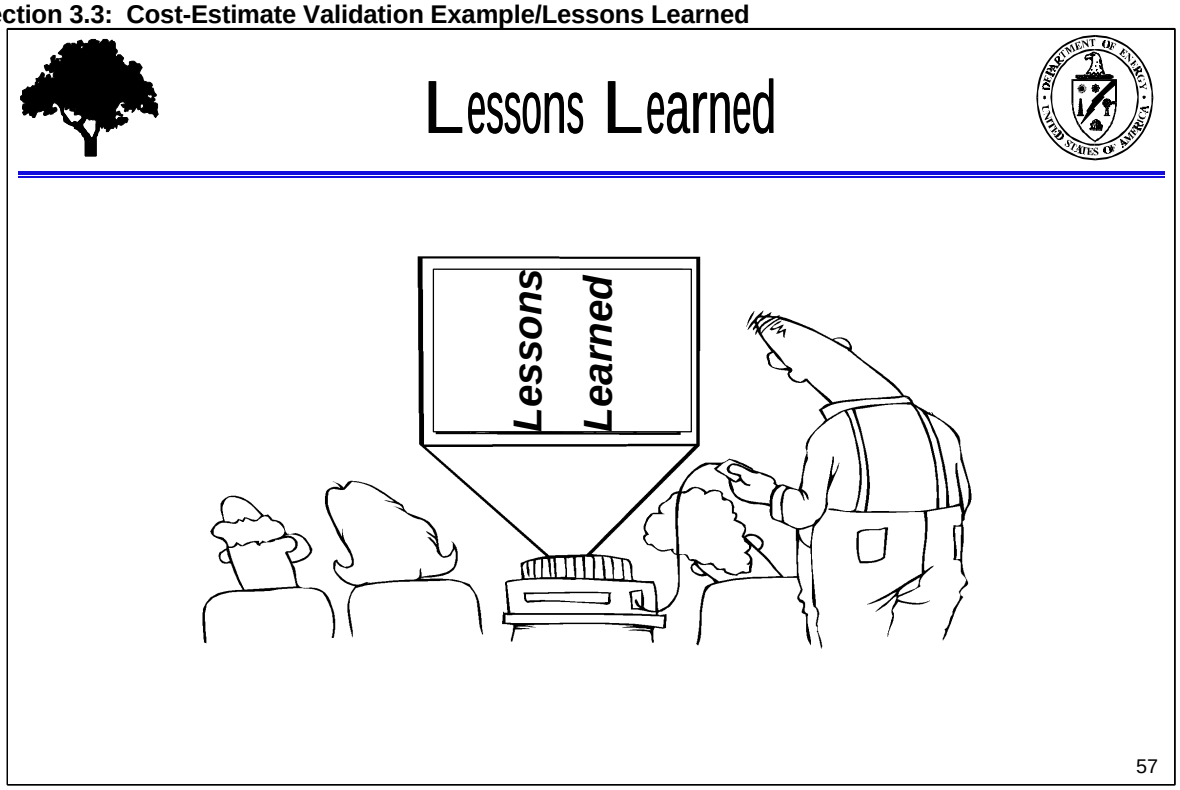
(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

- The Field Office is responsible for ensuring that all project review documents are provided to the validator promptly.
- The Field Office provides information on how the project fits into the overall program strategic plan.
- The site is responsible for developing the cost-estimate documentation.
- The site is also responsible for providing the appropriate data to the validators before the validation meeting.
- The contractors supporting the program or validators are allowed to discuss technical details at validation meetings but are under the control of the DOE representative who invited them and must adhere to his/her guidance.

Notes / Discussion Points / Lessons Learned: _____

Section 3.3: Cost-Estimate Validation Example/Lessons Learned



1. If the validation differs from the baseline, does the baseline get changed? What is needed to make the baseline change?

2. How many times has the project validation concluded that the project was not ready for the IRB?

3. Are G&A quantities of 30% reasonable? Against what are they usually applied? How is the percentage for G&A determined?

4. Should a site map always be included in a validation package?

5. Should management reserve be included in the estimate?

6. In Section II, "Basis of the Estimate," were the appropriate drawings and design report available?

7. Is it acceptable that no escalation was included in the data? What would/should be done to ensure that this is properly addressed?

(Continued on next page)

Notes / Discussion Points / Lessons Learned: _____

8. Is Demolition 2 acceptable? How does it related to General Assumption 8 above 3? Does this all make good sense?

9. Is the assumption on copying No. 5 overkill? As a validator, how much judgment are you allowed to use?

10. Does the statement “contingency analysis results is a range of 30% to 35%” make good sense?

11. Should the signatures approval be on each schedule? What do you do if the signatures approval is missing?

12. How do you verify the volumes that are presented in the detailed cost estimate?

13. Should O&M have contingency included? How would it be calculated?

Notes / Discussion Points / Lessons Learned: _____

Section 3: Close-out Slide

Completed:

- ✓ **Cost-Estimating Concepts**
- ✓ **Preparation of a Planning Cost Estimate**
- ✓ **Preparation of a Detailed Cost Estimate**
- ✓ **Validation of a Cost Estimate**

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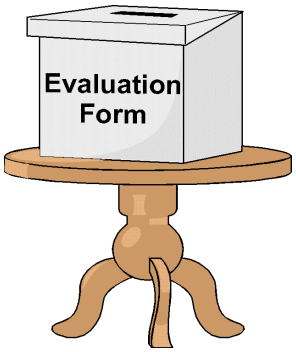
We have now completed the training. We hope that you have enjoyed the class and that it has met your expectations. Please be sure to complete the evaluation forms, and have a safe trip home.

Notes / Discussion Points / Lessons Learned: _____

Evaluation Form

Please complete the evaluation form before you leave.



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Notes / Discussion Points / Lessons Learned: _____

Evaluation Form

Date: _____
Location: _____

	AREAS OF EVALUATION				Rating		
	Place an (X) in appropriate column to indicate your evaluation of lines 1 through 34.				A	B	C
1.	Organization of subject matter?	A=Excellent	B=Adequate	C=Poor			
2.	Cost-Estimating Concepts (Section 1)	A=Excellent	B=Adequate	C=Poor			
3.	Coverage of the subject?						
4.	Level of difficulty?						
5.	Quality of examples?						
6.	Quality of lessons learned?						
7.	Length of section?						
8.	Applicability of subject matter to the job?						
9.	Preparation of a Planning Cost Estimate (Section 2.1)	A=Excellent	B=Adequate	C=Poor			
10.	Coverage of the subject?						
11.	Level of difficulty?						
12.	Quality of examples?						
13.	Quality of lessons learned?						
14.	Length of section?						
15.	Applicability of subject matter to the job?						
16.	Preparation of a Detailed Estimate (Section 2.2)	A=Excellent	B=Adequate	C=Poor			
17.	Coverage of the subject?						
18.	Level of difficulty?						
19.	Quality of examples?						
20.	Quality of lessons learned?						
21.	Length of section?						
22.	Applicability of subject matter to the job?						
23.	Validation of a Cost Estimate (Section 3)	A=Excellent	B=Adequate	C=Poor			
24.	Coverage of the subject?						
25.	Level of difficulty?						
26.	Quality of examples?						
27.	Quality of lessons learned?						
28.	Length of section?						
29.	Applicability of subject matter to the job?						
30.	Length of workshop?	A=Too Long	B=Appropriate	C=Too Short			
31.	Applicability of subject matter to EM Program?	A=Excellent	B=Adequate	C=Poor			
32.	Facilities?	A=Excellent	B=Adequate	C=Poor			

Notes / Discussion Points / Lessons Learned: _____

Evaluation Form

					Rating		
					A	B	C
33.	Were your objectives in taking the workshop met? What were they?	A=Yes	B=Partially	C=Poor			
34.	Would you recommend this workshop to others? If so, to whom?	A=Yes	B=May be	C=No			
35.	Comments on weak points of the workshop:						
36.	Comments on strong points of the workshop:						
37.	Additional comments/improvements/recommedations:						
38.	Optional _____ Name/Organization Phone Number						

Notes / Discussion Points / Lessons Learned: _____